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AUTHORITY

**NAVCOMP ltr, 25 Mar 1992**

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# DEPARTMENT OF THE NAVY SUPPORTING DATA FOR FISCAL YEARS 1988 AND 1989 BUDGET ESTIMATES DESCRIPTIVE SUMMARIES (U)

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SUBMITTED TO CONGRESS JANUARY 1987

RESEARCH, DEVELOPMENT, TEST & EVALUATION, NAVY

BOOK 2 OF 3 BOOKS

## TACTICAL PROGRAMS

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DEPARTMENT OF DEFENSE, MILITARY
RDT&E, NAVY
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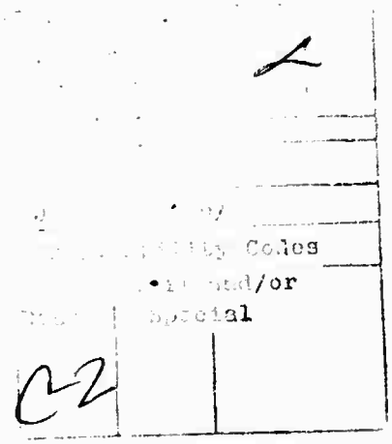

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## SECTION II

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MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT--OWNED FACILITIES FUNDED BY RDT&E,N NAVY

MILITARY CONSTRUCTION PROJECT DATA

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 24134N
Title: A-6 Squadrons
DoD Mission Area: 232 - Amphibious, Strike, And Antisurface Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 19,874 | 11,684 | 2,773 | 8,500 | Continuing | Continuing |
| W1638 | A-6 Weapons Integration | 19,874 | 11,684 | 2,773 | 8,500 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program enhances the offensive all-weather attack capability of the carrier battle group and the survivability of the A-6 in the increasing Soviet surface-to-air and air-to-air threat. It provides for development associated with integration of a variety of standoff weapons (e.g., HARM, LASER MAVERICK, I²R MAVERICK, HARPOON 1C, Standoff Land Attack Missile (SLAM)) into the A-6 aircraft, including development of an integrated missile panel for common control compatibility with all projected missiles and an infrared video autotracker for improved weapons delivery accuracy. The autotracker will provide stabilized target tracking during combat maneuvering and will increase tracking accuracy over present manual tracking at the standoff ranges required for weapons integrated under this project. The above development efforts must be completed to satisfy the contractual baseline for A-6F full scale development. Also, tactical capability is improved via the A-6E Analog Night Attack Navigation System (NANS) which permits low-altitude passive terrain following at night. A Forward Air Controller Target Data Communicator (FAC-TDC) will enable long-range targeting of close air support objectives and jam resistant two-way air-to-ground communications during close air support missions.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: decrease in FY 1986 of 2,308 due to GRH and Department budget and program adjustments, net decrease in FY 1987 of 2,136 due to Congressional action and adjustments partially defrayed by Department program and budget adjustments thus causing a delayed start of the analog night attack navigation system integration, FY 1988 decrease of 11,709 due principally to Department budget and program adjustments and a minor NIF adjustment.

Program Element: 24134N Title: A-6 Squadrons

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 21,472 | 22,382 | 13,820 | 14,482 | 26,136 | 111,532 |
| W1638 | A-6 Weapons Integration | 21,472 | 22,382 | 13,820 | 14,482 | 26,136 | 111,532 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable

E. (U) RELATED ACTIVITIES: Alternate Warhead LASER MAVERICK, Program Element 63313N; HARM Improvement Program Element 25601N. These programs develop the weapons to be integrated into the A-6 aircraft in this Program Element. This project (P.E. 24134N) forms a part of the baseline configuration for A-6F (P.E. 63257N).

F. (U) WORK PERFORMED BY: CONTRACTORS: Grumman Aerospace Corporation, Bethpage, NY. IN-HOUSE: Naval Weapons Center, China Lake, CA; Naval Air Test Center, Patuxent River, MD; Pacific Missile Test Center, Point Mugu, CA;.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W1638, A-6E Weapons Integration:

1. (U) Description: This project provides for the development of hardware and software, development flight testing and operational test and evaluation required for achieving the capability to utilize new standoff weapons with the A-6E aircraft. Such weapons include HARM, the MAVERICK series, HARPOON 1C and anticipated advanced air-to-surface standoff weapons. The project includes development of an integrated missile panel for common control of all projected missiles, an infrared video autotracker for improved weapons delivery capability, integration of a passive night attack navigation system to assist the flight crew in operation below enemy defenses, and development of an airborne data terminal used with the Forward Air Controller Target Data Communicator (FAC-TDC) to enable jam resistant low probability of intercept two-way air-to-ground communications during close air support missions.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Completed validation and merge of software for multiple weapons integration. Conducted software validation of integrated missile panel/avionics interface set. Completed development flight testing of weapons integration. Continued integration of the video auto tracker, and commenced lab and flight testing. Began initial development of airborne FAC-TDC hardware leading to aircraft integration.

Program Element: 24134N Title: A-6 Squadrons

b. (U) FY 1987 Program: Continue flight testing and software validation. Complete TECHEVAL and OPEVAL of the integrated standoff weapons capability. Conduct development flight testing of the video autotracker. Commence integration of FAC-TDC airborne hardware. Correct HARM glint problem.

c. (U) FY 1988 Planned Program: Conduct follow-on test and evaluation to correct weapons integration discrepancies noted during TECHEVAL/OPEVAL. Conduct TECHEVAL and OPEVAL of FAC-TDC. Conduct follow-on testing to correct discrepancies in the infrared video autotracker. Initiate integration efforts related to SLAM.

d. (U) FY 1989 Planned Program: Continue development, integration, and testing efforts related to A-6E improvements including SLAM integration.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones:

| | | |
|---|---|---|
| 1. | Avionics Interface Set TECHEVAL | FY 87/2 QTR |
| 2. | Avionics Interface Set OPEVAL | FY 87/4 QTR |
| 3. | IR Video Autotracker design and fab. | FY 87/4 QTR |

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 24136N
Titie: F/A-18 Squadrons
DoD Mission Area: 232 - Amphibious, Strike, And Antisurface Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Titie | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 54,291 | 31,659 | 17,316 | 19,897 | Continuing | Continuing |
| W1662 | F/A-18 Improvements | 54,291 | 31,659 | 17,316 | 19,897 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The F/A-18 is missionized in fighter and attack squadrons through selected use of external equipment to perform either fighter or attack missions. The capabilities of the F/A-18 weapon system can be upgraded to accommodate and incorporate new or enhanced weapons as well as advances in technology to respond effectively to emerging future threats. Continued development capability is required to successfully integrate the F/A-18 weapon system into the fleet. Additionaiiy, continued improvements in reliability and maintainability are necessary to ensure maximum benefit is achieved through reduced cost of ownership and to provide enhanced availability. The F/A-18 Naval Strike Fighter program transitioned from full-scale engineering development to operational systems development during FY 1983. As F/A-18 squadrons report discrepancies and requirements, a continuing capability is needed to perform post-FSD technical evaluations, investigative flight testing and software support, and incorporate pre-planned product improvements (i.e. capability enhancements) to ensure the F/A-18's ability to fulfiil assigned roles against emerging threats. Navy Pre-Planned Product Improvement is not intended to fund deficiency correction/baseiine maintenance activities but to support the requirement for development of enhanced effectiveness stimulated by new and maturing technologies and growth in adversary effectiveness.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: The change between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as folows: In FY 1986, the decrease of 3,983 is the result of automatic budget cuts associated with G-R-H legislation; the decrease in FY 1987 of 27,434 is the result of Congressional action and adjustment and Department program/budget adjustments;and the FY 1988 decrease of 46,158 is the result of Department program adjustments.

Program Element: 24136N Title: F/A-18 Squadrons

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 31,236 | 58,274 | 59,093 | 63,474 | Continuing | Continuing |
| W1662 | F/A-18 Improvements | 31,236 | 58,274 | 59,093 | 63,474 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| TOTAL FOR PROGRAM ELEMENT | | | | | | |
| APN Funds (BA: 1/6) | 2,293,040 | 2,429,932 | 2,468,058 | 2,466,956 | Continuing | Continuing |
| Quantity | 84 | 96 | 84 | 72 | 424 | 1,157 |
| MILCON | 645 | 880 | 0 | 3,376 | Continuing | Continuing |

E. (U) RELATED ACTIVITIES: The Secretary of the Navy approved a F/A-18 Night Attack Program on 24 December 1984. The program consists of development and integration of the following sub-systems: Fixed wide-field-of-view navigation FLIR, raster scan heads-up-display (HUD), night vision goggles (NVG) compatibility, and decoupled aft cockpit/independent displays. The program is being conducted in parallel with a similar AV-8B effort (PE 64214N), with a joint R&D cap of $90M. Production deliveries of both F/A-18 and AV-8B night attack aircraft will begin in October of 1989. The F/A-18 program is currently integrating advance medium range air-to-air missile (AMRAAM) (PE 64314N) and airborne self-protection jammer (ASPJ) (PE 64226N) capabilities respectively into two F/A-18 validation aircraft. These integration programs are separate RDT&E efforts, which do not duplicate RDT&E efforts conducted by the AMRAAM program office.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Development Center, Warminster, PA; Naval Air Engineering Center, Lakehurst, NJ; Naval Air Propulsion Center, Trenton, NJ; Naval Ordnance Station, Indian Head, MD; Naval Weapons Center, China Lake, CA; Naval Weapons Engineering Support Activity, Washington, DC; Pacific Missile Test Center, Point Mugu, CA; Naval Air Test Center, Patuxent River, MD; Naval Research Laboratory, Washington, DC. CONTRACTORS: McDonnell Aircraft Company, St. Louis, MO (Airframe and Weapon System Integration); General Electric Company, Lynn, MA (F-404 Engine); Hughes Aircraft Company, Culver City, CA (Radar subcontractor to McDonnell); Northrop Aircraft Division, Hawthorne, CA (center/aft fuselage subcontractor to McDonnell).

Program Element: 24136N Title: F/A-18 Squadrons

C. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W1662, F/A-18 Improvements:

1. (U) Description: The F/A-18 is missionized in fighter and attack squadrons through selected use of external equipment to perform either fighter or attack missions. The capabilities of the F/A-18 weapon system can be upgraded to accommodate and incorporate new or enhanced weapons as well as advances in technology to respond effectively to emerging future threats. Continued development capability is required to successfully integrate the F/A-18 weapon system into the fleet. Additionally, continued improvements in reliability and maintainability are necessary to ensure maximum benefit is achieved through reduced cost of ownership and to provide enhanced availability. The F/A-18 Naval Strike Fighter program transitioned from full-scale engineering development to operational systems development during FY 1983. As F/A-18 squadrons report discrepancies and requirements, a continuing capability is needed to perform post-FSD technical evaluations, investigative flight testing and software support, and incorporate pre-planned product improvements (i.e. capability enhancements) to ensure the F/A-18's ability to fulfill assigned roles against emerging threats. Navy Pre-Planned Product Improvement is not intended to fund deficiency correction/baseline maintenance activities but to support the requirement for development of enhanced effectiveness stimulated by new and maturing technologies and growth in adversary effectiveness.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Completed evaluation of vertical tail modification, flutter evaluation, weapon upgrade and icing test.
- o Continued baseline flight testing at Naval Air Test Center, Patuxent River MD. and Naval Weapons Center, China Lake, CA. centered around Fleet-reported problems and recommended improvements.
- o Continued field activity effort in analytical testing and evaluation of flight test data, engineering analysis and software development.
- o Continued effort required for equipment modification, missile and missile launcher ground and flight tests, and engineering support for the integration of the advanced medium range air-to-air missile (AMRAAM) into two F/A-18 aircraft.
- o Continued laser target designator/ranger development.

Program Element: 24136N Title: F/A-18 Squadrons

- o Contractor structural testing and engineering design analysis centering around fatigue and static testing of the main landing gear production axle, main landing gear components, production stabilizers, vertical tail, aircraft pylons and aircraft fuselage.

- o Commenced engineering effort on night attack modification.

b. (U) FY 1987 Program:

- o Continue baseline flight testing at Navy test centers centering around fleet-reported problems, engineering analysis conducted by other Navy field activities, and aeronautical design improvements developed by the contractors in response to Navy component improvement efforts.

- o Analyze data from Navy flight testing and operational flights and initiate appropriate software modification/development.

- o Study and define requirements for multi-sensor correlation and tracking.

- o Integrate and test new antenna technologies to improve EW aircraft effectiveness.

- o Continue contractor and field actitity effort to integrate AMRAAM into two F/A-18 aircraft.

- o Investigate software algorithms to improve specific fuel consumption.

- o Contractor investigation of aeronautical design modifications/changes to the F/A-18 fuselage, and any structural deficiencies identified during the initial deployments of the F/A-18 aircraft.

- o Conduct contractor engineering analysis in the areas of nose wheel lift-off improvements, TF stability and control improvements, and ground proximity warning system.

- o Continue development and operational testing of the night attack modification.

- o Begin effort to integrate On-Board Oxygen Generating System (OBOGS) on F/A-18.

c. (U) FY 1988 Planned Program:

- o Continue baseline flight testing at Navy test centers centering around fleet-reported problems,

engineering analysis conducted by other Navy field activities, and aeronautical design improvements developed by the contractors in response to Navy component improvement efforts.

- o Analyze data from Navy flight testing and operational flights and initiate appropriate software modification/development.
- o Integrate and test new antenna technologies to improve EW aircraft effectiveness.
- o Contractor investigation of aeronautical design modifications/changes to the F/A-18 fuselage, and any structural deficiences identified during deployments of the F/A-18 aircraft.
- o Conduct technical and operational evaluations of a night attack configured F/A-18.
- o Continue engineering effort to develop an approach for incorporation of a ground proximity warning system (GPWS) in the F/A-18.
- o Conclude contractor effort to integrate AMRAAM into two F/A-18 aircraft.

d. (U) FY 1989 Planned Program:

- o Continue baseline flight testing at Navy test centers centering around fleet-reported problems, engineering analysis conducted by other Navy field activities, and aeronautical design improvements developed by the contractors in response to Navy component improvement efforts.
- o Analyze data from Navy flight testing and operational flights and initiate appropriate software modification/development.
- o Contractor investigation of aeronautical design modifications/changes to the F/A-18 fuselage, and any structural deficiences identified during deployments of the F/A-18 aircraft.
- o Continue effort to integrate GPWS in an F/A-18 aircraft.

e. (U) Program to Completion:

- o Continue baseline flight testing at Navy test centers centering around fleet-reported problems, engineering analysis conducted by other Navy field activities, and aeronautical design improvements developed by the contractors in response to Navy component improvement efforts.

Program Element: 24136N

Title: F/A-18 Squadrons

- o Analyze data from Navy flight testing and operational flights and initiate appropriate software modification/development.
- o Continue contractor investigation of aeronautical design modifications/changes to the F/A-18 fuselage, and any structural deficiences identified during deployments of the F/A-18 aircraft.
- o Conclude integration of GPWS in an F/A-18 aircraft.

f. (U) Major Milestones: Not applicable.

A. (U) Development Test and Evaluation (DT&E)

1. (U) Test Programs for Defense System Acquisition Review Council (DSARC) Review:

(a) (U) The following tests were completed prior to DSARC III (Fighter):

(1) Firing of AIM-7 and AIM-9 missiles at an airborne target.
(2) Radar operations during gun firing.
(3) Evaluation of controls, displays, radar and fire control systems integration during air-to-surface attack operations.

(b) (U) As a result of the June 1981 DSARC review, full production for the F/A-18 fighter was approved. DSARC III (Attack) was completed 8 December 1982, and production of the F/A-18 to fill the light attack aircraft inventory requirements was authorized. The DSARC was concerned that timely development and operational qualification of an Electronic Warfare (EW) suite, HARM missile integration, and nuclear weapons would occur. This testing was completed April 1984 for nuclear weapons and in July 1985 for the HARM/EW suite.

2. (U) Laboratory Test Program:

Structural and fatigue tests were comprehensive with major components satisfactorily tested to four fatigue lifetimes and to 150% of static design limit load. Discrepancies that were revealed have been corrected, and a redesign of the Environmental Control System was implemented to improve the maintainability and producibility of the airplane.

3. (U) F404-GE-400 Engine Test Program:

The Preliminary Flight Rating Tests, Military Qualification Tests and Simulated Mission Evaluation Test were completed on schedule. The engine thrust and specific fuel consumption have met or exceeded specification for most of the operational envelope. Airframe/engine compatibility has been outstanding as evidenced by the demonstration of stall margin far exceeding specification requirement. Primary engine concern was the failure of a low pressure turbine disc in September 1980. Analysis indicated that the primary fracture was in a preproduction low pressure turbine. The turbine disc material was replaced in production aircraft with (DA Inco 718) to provide a stronger material.

4. (U) Technical Evaluation (TECHEVAL)

Prior to TECHEVAL, five Navy Preliminary Evaluations (NPE) were successfully completed. During TECHEVAL, 118 flights were flown primarily to assess attack systems. TECHEVAL was completed and the aircraft was certified as ready for OPEVAL in April 1982.

5. (U) Final Board of Inspection and Survey (INSURV) trials were completed in December 1982.

6. (U) Nuclear Weapon INSURV trials were completed in April 1984.

B. (U) Operational Test and Evaluation

1. (U) Initial Operational Test and Evaluation (OT-II)

(a) (U) COMOPTEVFOR monitored all DT&E. OPTEVFOR pilots participated in one radar/avionics Navy Preliminary Assessment (NPA) in the T-39 test bed, and one early Navy Preliminary Evaluation (NPE) in 1979. A two-week initial OT&E (IOT&E) period was conducted in March 1980. A four-month independent IOT&E completed in February 1981 was the first opportunity for organizational maintenance by military personnel. AIRTEVRON FOUR conducted AIM-7 and AIM-9 missile firings at Pacific Missile Test Center and Naval Weapons Center as part of the integrated Navy missile system evaluation program. An Operational Evaluation (OPEVAL) was conducted from early May to early October 1982 at various sites throughout the country.

(b) (U) No valid assessment of the F/A-18 weapon system could be made during the two week Initial Operational Test and Evaluation (IOT&E) in March 1980 because of incomplete system development and a restricted flight envelope. From October 1980 to February 1981, OPTEVFOR pilots flew 257 sorties for 357 flight hours in two Full Scale Development (FSD) and four pilot production airplanes from the test site at Patuxent River. Organizational maintenance on the pilot production airplanes was conducted by personnel from VX-4 and VX-5 who had completed the contractor's maintenance training program. One pilot production airplane was lost in an unrecoverable spin in November 1980, and testing was suspended until all airplanes had a positive spin recovery mode installed. Few attack test objectives were achieved because of airplane and weapon system immaturity, limited weapons carriage capabilities, and inadequate targets/ranges/airspace within reasonable range of Patuxent River.

(c) (U) OPEVAL was conducted from 3 May to 4 October 1982 by a composite test squadron comprised of 17 pilots from VX-5 and VX-4. A total of ten airplanes flew 1235 OPEVAL sorties for 1619 flight hours. Only four of the ten OPEVAL airplanes were production representative. They accumulated 459 sorties for 641 of the 1619 total flight hours. These four airplanes were used during the eight days embarked in USS Constellation. The lack of an Electronc Warfare (EW) suite and clearances for many Navy/Marine Corps ordnance items were major limitations to scope. The weapon system was found to be potentially operationally effective in fighter and attack mission areas. It was considered not operationally suitable because of unsafe characteristics of the personal parachute. The major recommendations were to resolve the parachute problem and develop and install an EW suite. Additionally, a recommendation to either increase F/A-18 fuel capacity or increase embarked airwing tanking assets prior to deploying it in the VA role was made.

2. (U) Follow-on Operational Test and Evaluation (OT-III)

(a) (U) In September 1983, Commander, Operational Test and Evaluation Force (COMOPTEVFOR) conducted F/A-18 power Projection Scenarios flown from NAS Point Mugu by a force comprised of aircraft and pilots from VX-4, VX-5, VFA-125, and VMFA-314. Three scenarios - coastal airfield, war-at-sea, deep interdiction were flown twice each, against opposed targets. Results confirmed OPEVAL (OT-II) data, demonstrating strike mission radius is dependent on mission profile, strike composition, ordnance carried, target area defenses and tactics employed. OPEVAL fuel consumption data were validated. Correction of some OPEVAL discrepancies were noted. COMOPTEVFOR ltr ser S72 of 31 October 1983 is the first partial report of Project 201-OT-III.

(b) (U) In July 1984, COMOPTEVFOR conducted an operational assessment of a stand alone High Speed Antiradiation Missile (HARM) with the F/A-18. A HARM was successfully fired in target of opportunity mode. The stand alone HARM was considered potentially operationally effective on the F/A-18.

(c) (U) In October 1984, COMOPTEVFOR completed an evaluation of F/A-18 integration into an embarked airwing. Four F/A-18s from VX-4/5 embarked on CV-64 along with other squadrons of CVW-14 during July 1984. Numerous exercises were flown in conjunction with the airwing. COMOPTEVFOR ltr ser 50/C276 of 4 Oct 84 and ltr Ser 50/S72 of 4 Oct 84 comprise the second partial report of CNO Project 201-OT-III. This report stated that production F/A-18s are capable of operating as a part of an embarked Carrier Air Wing (CVW) that the Non-Cooperative Target Recognition (NCTR) had potential to be operationally effective, and that the ECCM features of F/A-18 air-to-air radar modes were effective. It also stated that three outstanding OPEVAL discrepancies (excessive wind-over-deck requirement for catapult launch, wing oscillation/wing flap lockout, and no inflight alignment capability) were resolved.

(d) (U) In August 1985, COMOPTEVFOR completed an evaluation of the F/A-18 integrated EW suite/HARM system. Two fully equipped F/A-18s flew about 250 sorties and five HARM missiles were fired; COMOPTEVFOR ltr of 09 Aug 1985 reported the results of this evaluation. This reports that the integrated system was potentially operationally effective but not operationally suitable. Fleet introduction was not recommended until the systems were logistically supportable. At present the EW suite has Test Program Set (TPS)/Interim "Suitcase" Tester Support; full TPS support will be available by late FY87. TPS support for the HARM system is under development.

C. (U) Systems Characteristics

1. (U) Lot V Production (FY81 Procurement) Milestones Defense System Acquisition Review Council (DSARC) III (Fighter) (June 81)

Milestones, objectives achieved and parameters demonstrated with respect to operational characteristics and not covered in A and B above are summarized as follows:

| (U) MILESTONE | | PARAMETER | | OBJECTIVE | DEMO PERF |
|---|---|---|---|---|---|
| Demonstrate potential operational effectiveness and operational suitability in those fighter mission areas authorized for evaluation in Phase OT-IIF. | o | (U) | Speed | | |
| | | (1) | (C) At Sea Level, Combat Weight (Mach) | | |
| | | (2) | (C) At Altitude, Combat Weight (Mach) | | |
| | | (3) | (U) VPA Min, 6,000 lbs. of fuel and/or releaseable stores (kt) | 132 | 134 CH-C1 |
| | o | (U) | Radius (NM) | | |
| | | (1) | (U) Fighter Escort, Internal Fuel | 400 | 362 CH-C2 |
| | | (2) | (C) Strike Mission | | |
| | o | (U) | Combat Ceiling VF (ft) | | |
| | | (1) | (C) Maximum Thrust | | |
| | | (2) | (U) Military Thrust | 45,000 | 48,000 |
| | o | (U) | Min. Wind Over Deck Requirements VF (kt) | | |
| | | (1) | Catapult, VF take-off gross weight | 0 | -10 |
| | | (2) | Landing, 6,000 lbs. of fuel and releaseable stores | 0 | 5 |
| | o | (U) | Acceleration, Max Power (Sec) | | |
| | | (1) | (C) M=0.8 to 1.6 @ 35,000 ft | | |
| | | (2) | (C) M-0.8 to 1.2 @ 35,000 ft | | |
| | o | (U) | Rate of Climb, at S/L Single Engine PA Configuration VF (ft/min) | | |
| | | (U) | SDLM (Standard Depot Level Maintenance)(Mos) | 48 | |
| | | (U) | Freefall Weapons Delivery System Accuracy- (Mils) | | |
| | o | (U) | Air-to-Air Radar Detection Range | | |
| | | (1) | (C) (lookdown, R90, RWS, 5m$^2$ rget) - (NM) | | |
| | | (2) | (C) (lookdown, R90, VS 5m$^2$ target) - (NM) | | |
| Demonstrate achievement of Integrated Planning Summary Appendix | o | (U) | Mission Reliability, VF @ 2,500 Hr (%) | 0.7 | 0.89 |
| | o | (U) | System Maintenance VF | | |
| | | (1) | Mean Flight Hours Between Failure, Fighter Configuration Mature | 2.4 (goal) | 2.40* |

| | | | | |
|---|---|---|---|---|
| Reliability and Maintainability values. | (2) | Organizational Level Unscheduled Direct Maintenance Manhours per Flight Hour VF @ 2,500 Hrs. | 5 (goal) | 5.93* |
| | (3) | Direct Maintenance Manhours per flight hour (O Level-Unscheduled) | 7.0 | 6.4 Fleetwide***<br>4.4 Operational*** |
| | (4) | BIT Detection Rate | 90% | 60%** |
| | (5) | BIT Isolation Rate | 95% | 92.3%** |
| | (6) | BIT False Indication Rate | 20% | 28%** |

* LOTS V and VI, CY-1983 F&TF combined
** LOTS VI (VFA 25/113) DEC 83 - AUG 84, LOT VII (VFA 131) OCT 84 - JAN 85
*** JUL 85 - JUN 86

2. (U) Lot V: Production (FY82 Procurement) Milestones Defense System Acquisition Review Council DSARC III;A) Full Production Decision (Nov 82)

Milestones, objectives achieved and parameters demonstrated with respect to operational characteristics and not covered in A or B above are summarized as follows:

| Milestones | Objectives/Parameters Achieved |
|---|---|
| Evaluate flying qualities for the conduct of the air-to-ground mission with VA sensors installed. | See Section C Paragraph 1 |
| Demonstrate Decision Coordinating Paper performance characteristics for the air-to-ground mission. | See Section C Paragraph 1 |
| Evaluate fire control system performance to conduct the air-to-ground mission with attack sensors. | See Section C Paragraph 1 |
| Demonstrate achievement of Integrated Planning Summary Appendix C Reliability and Maintainability values. | See Section C Paragraph 1 |

3. (U) The F/A-18 Program Review Decision Memorandum of 17 March 1983 set forth a requirement for further operational testing and evaluation to ensure that the F/A-18 aircraft carrier launch and recovery limitations noted in the OPEVAL have been satisfactorily corrected in production aircraft. The results of this additional OPEVAL testing were scheduled for presentation to DSARC principals in February 1985. This briefing was cancelled because no OT&E issues remained open to discussion.

4. (U) The 17 March Program Review Decision also specified preparation of a plan for independent follow-on test and evaluation of Automatic Test Equipment and the Test Program Set (ATE/TPS). The evaluation of the ATE/TPS is an ongoing program, initially under the cognizance of AIMSO using the Independent Assessment Team (IAT) during CY 1984-1986 and will be continued by the F/A-18 Avionics Maintenance Evaluation (FAME) under NAVAIR 410. The Decision Memorandum directed that special attention be focused on development and operational qualification of an EW suite, HARM integration, and nuclear weapon capability. The EW suite/HARM integration was completed in August 1985; nuclear certification was received in November 1984.

5. (U) The F/A-18/HARM/EW suite integration test program verified integration of proven HARM missile/ALR-67/ALQ-1268 systems with F/A-18 aircraft and associated avionic subsystems. Operational and technical characteristics, reliability and maintainability thresholds are contained in each System Test and Evaluation Master Plan (TEMP) which are identified as follows:

| | | |
|---|---|---|
| HARM TEMP | J217 | 5 November 1982 |
| ALR-67 TEMP | 521 | 15 January 1981 |
| ALQ-1268 TEMP | 421-1 | 28 July 1981 |

F/A-18/HARM/EW SUITE operational evaluation was completed in August 1985.

D. (U) T&E Activity (Past 12 Months)

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| F/A-18 HARM/EW | Oct 84 | Dec 84 - Aug 85 | FOT&E |
| F/A-18 LDT | Feb 85 | Aug 85 - May 86 | FOT&E |
| F/A-18 FLIR | Feb 85 | Aug 86 - Jan 87 | FOT&E |
| Software | May 86 | Jun 86 - Sep 86 | 85 X OFPs |
| HARPOON | Feb 86 | Jul 86 | OT&E Los Launch |
| AMRAAM | Nov 85 | Jul 86 | DT&E First Launch |
| WALLE[illegible] | Oct 85 | May 86 | WALLEYE I Data Link in Deficiency |
| GATOR | May 86 | May 86 | DT/OT |

(U) T&E Activity (Next 12 Months)

| Event | Planned Start Date | Actual Date | Remarks |
|---|---|---|---|
| ECS | Sep 86 | Aug 86 | ECP 35 |
| MAVERICK | Sep 86<br>Jun 87 | Jun 86<br>- | Laser (OT&E)<br>$I^2R$ (OT&E) |
| Software | Nov 86<br>May 87 | -<br>- | 85 X plus OFP (OT&E/OT&E)<br>87 X OFPs (OT&E) |
| ASPJ | Nov 86 | - | Initial Evaluation (DT&E) |

| Event | Planned Start Date | Actual Date | Remarks |
|---|---|---|---|
| AMRAAM | Nov 86 | - | Tactical Launches (DT&E) |
| WALLEYE II | Jan 87 | - | Secure Data Link (OT&E) |
| Mines | Feb 87 | - | Quickstrike (DT&E/OT&E) |
| LTD/R | Jun 87 | | DT&E |

E. (U) Program T&E Documentation - OT&E

1. OPTEVFOR Evaluation Report of F/A-18 (201-OT-IIF) 16 Jun 1981
2. OPTEVFOR OPEVAL Report of F/A-18 (201-OT-IIH) 21 Jul 1983
3. OPTEVFOR Evaluation Report of F/A 18 Weapons Systems First Partial Report of 201-OT-III dtd 31 Oct 1984
4. COMOPTEVFOR msg 111840Z Jul 84 Subj: "Quicklook of Operational Effectiveness Assessment of Stand Alone HARM Weapon Employment on the F/A-18 airplane amended by COMOPTEVFOR msg 162015Z Aug 84."
5. TEMP No. 201 (Rev 1) F/A-18 Improvements signed 28 June 1985.
6. COMOPTEVFOR ltr of 09 Aug 1985.
7. TEMP No. 201-1 F/A-18 (ECP-178) started in review September 1985 (Smooth in review December 1986).

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 24152N
Title: Early Warning Aircraft Squadrons
DoD Mission Area: 353 - Naval Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thouaands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Eatimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 22,106 | 32,957 | 33,369 | 24,852 | Continuing | Continuing |
| WO463 | Airborne Early Warning Carrier Based Aircraft E-2C | 22,106 | 32,957 | 33,369 | 24,852 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides preplanned product improvements for the evolution of E2C aircraft capability in support of Naval Warfare command and control requirements. It funds development for the modification/replacement of selected weapon replaceable assemblies of currently installed E2C subsystems. These modifications will enable the E2C to operate in the presence of electronic countermeasures and to more completely exploit threat RF emisaions. These expanded capabilities will permit offensive weapons systems to be more effective in countering the tactical threat thus enhancing the Navy's warfighting capability.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary for Project WO463 are as follows: in FY 1986, a decrease of 1,463 is the result of GRH and Department program/budget adjustments; in FY 1987, a decrease of 1,497 is the result of Congressional action; in FY 1988, a decrease of 30,076 is the result of Department program/budget adjustments.

Program Element: 24152N Title: Early Warning Aircraft Squadrons

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 34,396 | 23,569 | 34,454 | 63,445 | Continuing | Continuing |
| WO463 | Airborne Early Warning Carrier Based Aircraft E-2C | 34,396 | 23,569 | 34,454 | 63,445 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Aircraft Procurement, Navy * (41A1) | 47,000 | 53,600 | 60,300 | 79,600 | 664,700 | 905,200 |

* Funds reflect APN 1, 5, and 6 for HSP, and UDP Group I and II.

E. (U) RELATED ACTIVITIES: Program Element 62721N, Command and Control Technology for Data Processing Improvements, and Program Element 62712N, Surface/Aerospace Target Surveillance Technology, for radar system improvements.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Test Center, Patuxent, MD; Naval Research Laboratory, Washington, DC; Fleet Combat Direction Systems Support Activity, San Diego, CA; Naval Air Development Center, Warminster, PA. CONTRACTORS: Grumman Aerospace Corporation, Bethpage, NY; General Electric, Utica, NY.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project WO463, Airborne Early Warning Carrier Based Aircraft E-2C:

1. (U) Description: The E2C is an all-weather, carrier-based airborne early warning aircraft, with a crew of five. This weapon system extends the task force defense perimeter by providing early warning of approaching enemy units (surface and air),

Program Element: 24152N Title: Early Warning Aircraft Squadrons

vectoring of interceptors into attack position, and providing air and surface situation data to other fleet elements. In addition, the E2C provides atrike and traffic control, search and rescue control, communications relay, and automatic tactical data exchange. The E2C is projected to be a viable fleet unit through 2000. Based on analysis of projected ECM and target threat to United States aea control forces, a research and development program was initiated to provide (1) low sidelobe antenna for the APS-125 radar subsystems, (2) High Speed Processor for the OL77/ASQ Central Computer Programmer, (3) APS-125 radar modifications to optimize surface and airborne target detection, (4) extended radar detection range, and (5) new software tactical program to fully integrate hardware improvements. The improvements are compoaed of Update Group I and Group II. Group I consists of the high speed processor (HSP) and radar modifications. The HSP provides larger processing capability for the central computer. The Group I radar provides for increased surface ship target detection and enhanced electronic counter-counter measures (ECCM) for the radar. Group II will provide the radar with extended range, environmental processing, blind speed elimination and automatic processing of long pulse video. RDT&E units are being procured for integration, qualification and reliability testing during Development Test and Evaluation, and Operational Test and Evaluation of the applicable weapon replaceable assemblies and software.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Transitioned Group I hardware to production.

° Commenced flight teating of Group II development hardware.

° Conducted Navy flight evaluation of Group II, DT-IIA/OT-IIA.

b. (U) FY 1987 Program:

° Commence development of new tactical software.

° Continue flight testing and integration of Group II hardware.

° Conduct second Navy flight evaluation of Group II, DT-IIB/OT-IIB.

° Continue flight testing and integration of Group I hardware/software and verification of correction of previously identified discrepancies, DT-IIB, D-2/OT-IIB.

Program Element: 24152N Title: Early Warning Aircraft Squadrons

c. (U) FY 1988 Planned Program

° Complete flight and lab testing of Group I software.

° Conduct DT-II-E, Group I software selloff.

° Conduct DT-II-F/DT-III-A (TECHEVAL/BIS) of Group I.

° Continue flight testing and integration of Group II hardware.

d. (U) FY 1989 Planned Program::

° Continue weapon system integration ground and flight testing.

° Conduct Operational Evaluation, OT-II-C, of Group I.

° Continue flight testing and integration of Group II hardware.

° Conduct third Navy flight evaluation of Group II, DT-IIC/OT-IIC.

e. (U) Program to Completion:

° Complete weapon system integration ground and flight testing.

° Certify Group II tactical program software to acquire maximum capability from hardware and reduce flight crew operator workload, DT-IID.

° Conduct technical and operational evaluations of Group II.

Program Element: 24152N

Title: Early Warning Aircraft Squadrons

f. (U) Major Milestones:

| | MILESTONE | | | DATE |
|---|---|---|---|---|
| 1. | UDP I | | MS III A | QTR 1/FY86 |
| 2. | UDP I | | MS III B | QTR 1/FY88 |
| 3. | UDP I | Complete | DT | QTR 4/FY88 |
| 4. | UDP I | | MS III C | QTR 1/FY89 |
| 5. | UDP I | Complete | OT | QTR 4/FY89 |
| 6. | UDP I | | MS III D | QTR 1/FY90 |
| 7. | UDP II | | MS IIIA | QTR 1/FY88 |
| 8. | UDP II | | MS IIIB | QTR 2/FY89 |
| 9. | UDP II | | MS IIIC | QTR 2/FY90 |
| 10. | UDP II | Complete | DT | QTR 4/FY90 |
| 11. | UDP II | Complete | OT | QTR 3/FY91 |
| 12. | UDP II | | MS IIID | QTR 4/FY91 |

E-2C

I. (U) TEST AND EVALUATION DATA

A. (U) Development, Test and Evaluation

1. (U) Navy Preliminary Evaluation (NPE) I was conducted on prototype E-2C systems in January and February 1972 to provide an initial look at the avionics to identify gross deficiencies to allow for early correction and determination of readiness for NPE II.

2. (U) NPE II was conducted in November 1972 using prototype E-2C systems to evaluate changes resulting from NPE I and to determine readiness for Board of Inspection and Survey (BIS).

3. (U) On site BIS trials at Naval Air Test Center (NATC) Patuxent River were conducted April - November 1973 on production E-2C aircraft. The purpose was to evaluate specification compliance, system performance and typical mission suitability.

4. (U) Advanced Radar Processing System (ARPS) Navy Technical Evaluation (NTE) was conducted using a production system from 21 June 1977 to 16 September 1977 to verify the production installation and confirm readiness for Operational Evaluation (OPEVAL).

5. (U) Total Radiation Aperture Control-Antenna (TRAC-A) completed DT/OT testing in June 1983 and is in production.

6. (U) DT-IIC/OT-IIA completed on Update Development Program (UDP) Group I in August 1985. The UDP is divided into Groups I and II. Group I radar provides for increased ship target detection and enhanced electronic counter-counter measures (ECCM) for the radar. Group II will provide the radar with extended range, environmental processing, blind speed elimination and automatic processing of long pulse video.

(a) (U) NAVAIRTESTCEN recommendation: "Within the scope of this test, the AN/APS-139 UDP Group I, Part I hardware demonstrated excellent potential for the AEW/SSSC mission. Within the scope of the test, recommend continuation of the acquisition cycle for UDP Group I hardware to include approval for limited production."

(b) (U) NAVAIRTESTCEN specifics:

(1) (U)

(2) (U)

(3) (U)

(4) (U)

(5) (U) Twelve Board of Inspection and Survey (INSURV) yellow sheet reports from previous testing recommended closed.

(6) (U) INSURV yellow sheet reports from previous testing downgraded.

(7) (U) Eight Part II INSURV yellow sheet reports identified.

B. (U) Operational Test and Evaluation. The following subparagraphs discuss discrete OT&E (operational test and evaluation) programs involving the E-2C aircraft.

E-2C

1. (U) E-2C aircraft. IOT&E by Commander, Operational Test & Evaluation Force (COMOPTEVFOR) was conducted concurrently with NPE-II in November 1972. An OPEVAL of the E-2C was conducted by COMOPTEVFOR from June to September 1974. The E-2C was operationally effective

it was operationally suitable.

(a) (U) Initial operational test and evaluation (IOT&E) by COMOPTEVFOR, conducted concurrently with NPE-II in November 1972, consisted of 20 flights (77 flight hours) under operational conditions. Significant discrepancies have been corrected.

(b) (U) From June to September 1974 (after full production was underway) COMOPTEVFOR conducted an OPEVAL of the E-2C, utilizing fleet aircraft for 51 flights (173 flight hours).

(1) (U) The E-2C is operationally effective

(2) (U)

(3) (U) The E-2C is operationally suitable.

(4) (U) The E-2C represents a quantum improvement over earlier models in capability, mission reliability, and overall performance.

(c) (U) Because of tactical aircraft non-availability, only limited testing was accomplished in the areas of: (1) E-2C interoperability with F-14/S-3A; (2) strike control; and (3) surface/subsurface surveillance coordination. The requirement for RDT&E has been satisfied by the ARPS OPEVAL (para. 2.c) where the E-2C (with ARPS) demonstrated interoperability.

2. (U) Advanced Radar Processing System (ARPS).

(a) (U) ARPS was developed to provide an Electronic Counter Countermeasures (ECCM) capability for the E-2C radar and provide increased radar performance overland. ARPS was a major modification to the APS-120 radar and was designated the APS-125. IOT&E conducted during NPE's determined that Advanced Radar Processing System (ARPS) was operationally effective and had the potential to become operationally suitable. Authority for Limited Production was recommended.

(1) (U) It was concluded that ARPS is operationally effective and has potential to become operationally suitable.

(2) (U) It was recommended that development of ARPS continue, and that Provisional Approval for Service Use be granted for incorporation of ARPS in new E-2C aircraft.

(b) (U) OT-III (OPEVAL) of ARPS was conducted from February to April 1978 with VAW-125 embarked in USS JOHN F. KENNEDY and VAW-123 based at Naval Air Station (NAS) Norfolk (overland phase). Commander, Operational Test & Evaluation Force (COMOPTEVFOR) conducted the Operational Evaluation (OPEVAL) utilizing fleet aircraft in carrier type training, fleet exercises and training flights. The OPEVAL consisted of a total of 42 flights (130 flight hours). One significant performance deficiency noted during OT-II that had not been corrected for OPEVAL still exists:

(c) (U) Conclusions of OPEVAL were:

(1) (U) ARPS is operationally effective.

(2) (U)

(3) (U) ARPS is capable of automatic detection and tracking of targets

(4) (U) ARPS is operationally suitable.

(d) (U) Upon completion of the OPEVAL, COMOPTEVFOR made the following recommendations to continued development of the ARPS:

(1) (U) Investigate alternative solutions

(2) (U) Provide operator alert when system detection is degraded for any reason.

(3) (U) Provide a rapid means to clear Detector Processor alerts without using master power reset.

(4) (U) To improve fault detection and isolation, provide a continuous indication of performance

(5) (U) Expedite introduction of the ARPS Tactical Trainer.

(6) (U) Increase the processing capability of the OL-77 Airborne System, Special Purpose Computer (ASQ) computer.

(7) (U)

(8) (U)

(9) (U) Conduct follow-on operational test and evaluation to test changes recommended above and production IV software.

(10) (U) Investigate and correct suitability problems

(e) (U) An E-2C Advanced Radar Processing System (ARPS) tactics guide 280-1-78 was published in Nov 78 to provide fleet users with recommended procedures developed during Operational Test and Evaluation (OT&E).

3. (U) Total Radiation Aperture Control-Antenna (TRAC-A). TRAC-A was developed to improve the Electronic Counter Countermeasures (ECCM) capabilities of the E-2C. TRAC-A is being incorporated in new production E-2Cs and is being retrofitted into previously delivered aircraft. The E-2C radar incorporating TRAC-A and associated Weapon Replaceable Assembly (WRA) changes is designated the APS-138.

(a) (U) Combined Development Test/Operational Test (DT/OT) on TRAC-A Engineering Development Model (EDM) 2 was held at NAVAIRTESTCEN from 19 April - 12 June 1982.

(1) (U) Conclusions of the DT/OT were:

a. (U) Within limitations to scope, TRAC-A is essentially equivalent to the current fleet antenna in performance with some potential improvement in maintainability and availability.

b. (U) Planned improvements over fleet equipment were not noted in this testing.

c. (U) As measured against current fleet equipment, TRAC-A has the potential to be operationally effective and operationally suitable.

(2) (U) Upon completion of the DT/OT Commander, Operational Test & Evaluation Force (COMOPTEVFOR) made the following recommendations:

E-2C

a. (U) The limited production of TRAC-A proposed in (Confidential) PMA-231 ltr Ser 82-90 of 13 Jul 82, does not exceed the minimum performance required to meet new aircraft procurement.

b. (U) Based continued production of TRAC-A on successful demonstration, during a follow-on test and evaluation period, of the following:

1. (U) Broad-band TRAC-A in all 10 channels. Main beam size near and far zone sidelobe amplitude, and Voltage Standing Wave Ratio (VSWR) must be within specification tolerances.

2. (U) Matching TRAC-A's main beam gain to fleet ARPS operational performance levels across the 10-channel operating frequency band.

3. (U)

4. (U) Incorporating the changes to rotary joint removal/replacement procedures that were derived during the maintainability demonstration into future work packages for production units.

5. (U) Validating Integrated Logistic Support Plan (ILSP), Navy Training Plan (NTP), and other logistic support documentation to ensure fleet supportability of TRAC-A.

6. (U) Verifying structural integrity of the new rotodome structure and antenna pattern stability in the E-2C operating environment by successfully completing carrier suitability testing of a production configuration rotodome.

(b) (U) DT/OT on the first two production TRAC-A's was completed in June 1983.

(1) (U) Conclusions of the OT were:

a. (U) The E-2C is operationally effective

b. (U) The E-2C with a production Total Radiation Aperture Control-Antenna (TRAC-A)

c. (U) The E-2C with a production TRAC-A antenna is operationally effective

d. (U) The E-2C with a production TRAC-A

e. (U) The E-2C with a production TRAC-A has the potential to be operationally suitable; however, the excessive weight of the TRAC-A in conjunction with any increases from planned additions to the E-2C (i.e., Project 760 Group I, Group II, and Joint Tactical Information Distribution System (JTIDS)), could have significant impact on carrier suitability.

f. (U) The operational effectiveness and operational suitability findings support a recommendation for continued limited production TRAC-A.

(2) (U) Upon completion of the Development Test/Operational Test (DT/OT) Commander, Operational Test & Evaluation Force (COMOPTEVFOR) made the following recommendations:

E-2C

a. (U) Approve TRAC-A for continued limited fleet introduction.

b. (U) Do not approve TRAC-A for full fleet introduction until corrections to the following deficiencies have been developed, incorporated, and verified in follow-on operational test and evaluation (FOT&E), including suitability testing in the carrier environment (i.e., additional catapult shots and arrested landings):

1. (U)

2. (U) Incomplete Integrated Logistic Support Plan.

3. (U) Excessive Voltage Standing Wave Ratio (VSWR).

4. (U) Inadequate reliability of the TRAC-A.

5. (U) Excessive TRAC-A weight.

c. (U) Determine through EMPASS testing if Emissions Control (EMCON) restrictions concerning the operation of the radar in standby for TRAC-A equipped E-2Cs can be removed.

4. (U) Planned program improvements include radar and computer modifications along with associated software update which will enhance the E-2C weapon system. The Update Development Program (UDP) is divided into Group I and Group II. Group I is scheduled for TECHEVAL in 1988 and OPEVAL in 1989 and provides for increased surface ship target detection and enhanced ECCM for the radar. Group II is scheduled for TECHEVAL in 1990 and OPEVAL in 1991 and will provide the radar with extended range, environmental processing, blind speed elimination and automatic processing of long pulse video. The Group I OPEVAL is planned to be a concurrent test with the T56-A-427 engine which is covered by a separate TEMP.

(a) (U) DT-IIC/OT-IIA completed on UDP Group I in August 1985.

(1) (U) Commander, Operational Test and Evaluation Force (COMOPTEVFOR) conclusions: Based on available data and within the constraints imposed by limitations to scope:

a. (U) Update Development Program (UDP) Group I has the potential to be operationally effective.

b. (U) UDP Group I has the potential to be operationally suitable.

c. (U) UDP Group I operational effectiveness and operational suitability finding, , The following items should be corrected (and corrections verified as the Chief of Naval Operations (CNO) may direct) in the systems so produced.

1. (U)

2. (U) Provide protection for the High Speed Processor (HSP) from power surges or power interruptions.

3. (U)

(2) (U) COMOPTEVFOR recommendations:

a. (U) Approve for limited fleet introduction upon completion of the following:

1. (U) Conduct OT-IIB to verify correction of:

(a) (U)

(b) (U)

2. (U)

3. (U)

4. (U)

5. (U)

6. (U)

b. (U)

c. (U)

d. (U)

e. (U) For future testing,

C. (U) System Characteristics

| | | OBJECTIVE | DEMONSTRATED PERFORMANCE |
|---|---|---|---|
| (U) | Radar detection range (AN/APS-120) | | |
| (U) | (a) overland (A-6 target) | | |
| (U) | (b) overwater (A-6 target) (AN/APS-125) | | |
| (U) | (a) overland (A-6 target) | | |
| (U) | (b) overwater (A-6 target) | | |
| (U) | Passive Detection System | | |
| (U) | (a) range | | |
| (U) | (b) azimuth | 360 deg. | 360 deg. |
| (U) | Take-off weight | 51,535 | 51,878 |

| | | DT | OT |
|---|---|---|---|
| (U) | Radar detection range (AN/APS-138/9 with TRAC-A antenna) | | |
| (U) | Overland | | |
| (U) | Overwater | | |
| (U) | Nearland | | |
| (U) | Overwater 1 Wide Band Jammer Far Zone | | |
| (U) | Overwater 2 Wide Band Jammers Far Zone | | |

(U) Overwater 1 Wide Band
Jammer Near Zone
(U) Overwater 2 Wide Band
Jammers Near Zone
(U) Overland 1 Wide Band
Jammer Near Zone
Note: All detection parameters based on 50% probability of detection point. APS-139 performance will be demonstrated during FY 87.

D. (U) Current T&E Activity.

| | | T&E Activity (Past 12 Months) | |
|---|---|---|---|
| Event | Planned Date | Actual Date | Remarks |
| DT-IIA/OT-IIA (UDP Group II) | Feb - Oct 86 | Feb - Oct 86 | Testing completed. Results pending. |
| | | **T&E Activity (Next 12 Months)** | |
| Event | Planned Date | Actual Date | Remarks |
| DT-IID/OT-IIB (UDP Group I) | Mar - May 87 | - - | Verify correction of discrepancies and continuing ALP |
| DT-IIB/OT-IIB (UDP Group II) | Aug - Sep 87 | - - | Verify correction of discrepancies and continuing ALP. |

E. (U) Program Documentation

DCP No. 26 Revision of 24 June 1971
NDCP W-0463-AA approved 27 Sep 1984
TEMP 760 Revision 1 approved 15 Oct 1985, Revision 2 in process.

NAVAIRTESTCEN REPORTS

1. FT-38-74, CONFIDENTIAL, NATC Technical Report, Final Report BIS 21295, Flying Qualities and Performance Trials of the Model E-2C Airplane, May 1974

2. WST-C20R-74, CONFIDENTIAL, NATC Technical Report, Third Report (Final), Services Acceptance Trials of the E-2C Airplane, 30 May 1974

3. ST-C47R-74, CONFIDENTIAL, NATC Technical Report, Service Suitability Trials of the E-2C Airplane, 6 June 1974

4. AT-S1R-76, SECRET, NATC Technical Report (Final), Naval Technical Evaluation of the AN/APS-125 Advanced Radar Processing System Installed in the E-2C Airplane, 23 March 1978

5. AT-S6R-83, SECRET, NATC First Interim Report, TRAC-A, DT-IIIB, 272033Z APR 83

6. AT-[illegible]P-83, UNCLASSIFIED, NATC, Second Interim Report, TRAC-A, DT-IIIB, 121804Z MAY 83

7. AT-58P-83, SECRET, NATC Final Message Report, TRAC-A DT-IIIB, 241616Z JUN 83

8. AT-53R-85, SECRET, NATC Quick Response Report UDP Group I Part I, 11 Mar 85

9. AT-SAR-84, SECRET, NATC Technical Report, Developmental Test IIB, Group I, Part I, 15 July 1985

10. AT-S5R-85, SECRET, NATC Quick Response Report UDP Group I Part I, DT-IIC Part II Second Interim Report, 23 Aug 85

11. AT-S6R-85, SECRET, NATC Technical Report (Final), Navy Technical Evaluation (NTE) of the APS-138 radar system as installed in the E-2C airplane, 30 October 1985

12. AT-S1R-86, SECRET, NATC Technical Report, Developmental Test IIC of the Update Development Program Group I, Part 1 as installed in the E-2C airplane, 23 April 1986

COMOPTEVFOR REPORTS

1. SECRET, COTF Evaluation Report, First Partial Report on Project C/V 22, Conduct a concurrent evaluation of the E-2C Weapon System, Ser S32, 19 Apr 73

2. SECRET, COTF Evaluation Report, Second Partial Report on Project C/V 22, Concurrent evaluation of the E-2C Weapons Systems, Ser S29, 01 Apr 76

3. SECRET, COTF Evaluation Report, Initial Operational Report on CNO Project 152-OT-II, (E-2C ARPS), Ser S81, 01 Sep 76

4. SECRET, COTF Evaluation Report, Operational Evaluation of the E-2C Advanced Radar Processing System, Ser S55, 25 Jul 78

5. UNCLASSIFIED, COTF Evaluation Report, Operational Evaluation of the High Speed Processor for the E-2C Update, Ser 792, 09 May 80

6. SECRET, COTF Evaluation Report, Operational Evaluation of the E-2C Total Radiation Aperture Control Antenna, Ser S60, 09 Nov 82

7. SECRET, COTF Evaluation Report Operational Evaluation of the E-2C Total Radiation Aperture Control Antenna, Ser S73, 01 Nov 83

8. SECRET, COTF Quick Look Report, Initial Operational Assessment of CNO Proj 760-OT-IIA E-2C Update Development Program Group I, 201400Z SEP 85

9. SECRET, COTF Evaluation Report, Operational Assessment of CNO Project 760 Update Development Program (UDP) Group I (OT-IIA), Ser 553/S110, 23 Dec 1985

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 24161N
DoD Mission Area: 235 Naval Warfare Support

Title: Aviation Support CVW
Budget Activity: 4 Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 1,555 | 970 | 7,303 | 9,999 | 0 | 36,468 |
| W1633 | Aerial Refueling Store | 1,555 | 0 | 0 | 0 | 0 | 18,196 |
| W1924 | External Drop Tank | 0 | 970 | 7,303 | 9,999 | 0 | 18,272 |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: (W1633) Existing Douglas D704 and Sargent-Fletcher Model 31-300 Aerial Refueling Stores are marginally capable of satisfying current operational demands due to poor maintainability and reliability. These units, procured in the late 1950's and early 1960's, are nearing the completion of a useful service life as reflected in their inordinately low availability (50 to 70 percent non-ready for issue), high spare and repair parts demand and high maintenance man-hours per flight hour. The existing state of store readiness provides only marginal capability, will not meet projected needs, and creates a potential for tactical aircraft losses. The most practical solution to this problem is the development of a new store employing current technology. The new store will be employed on carrier-deployed combat aircraft to supplement the refueling capability of dedicated tankers. Aircraft configured with the store will be capable of refueling all carrier-based tactical aircraft. They will be used to provide fuel on demand during normal carrier launch and recovery evolutions, either as airborne refuelers for cyclic operations, or on-deck alert for unplanned in-flight fuel requirements.

(W1924) To provide fleet sustainability through a new external fuel tank of approximately 330 gallon capacity that is directed primarily towards needs in AAW and Strike warfare. Specific deficiencies being addressed by this effort include a reliable high density stowage fuel tank design that will increase the quantities of external fuel tanks aboard ship, while minimizing the impact on space and personnel. In developing a war reserve of external fuel tanks it is desirable that these tanks be as inexpensive as possible so that sufficient quantities can be procured to meet the anticipated jettison rates. The current shortage of fuel tanks adversely impact AAW and Strike missions. This tank will interface with the A-6, S-3 and F/A-18 and will be operational by 1991.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The change between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary is as follows. Project W1924; the 1,251 decrease in FY

Program Element: 24161N Title: Aviation Support CVW

1987 is the result of Congressional action and adjustments. Project W1633; the 202 decreaae in FY 1986 is due to GRH and Department program/budget adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 3,019 | 1,757 | 2,221 | 7,466 | 12,318 | 38,903 |
| W1633 | Aerial Refueling Store | 3,019 | 1,757 | 0 | 0 | 0 | 16,898 |
| W1924 | External Fuel Tank | 0 | 0 | 2,221 | 7,466 | 12,318 | 22,005 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Eatimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Aircraft Procurement, Navy: | | | | | | |
| Funds APN/BA7-310720 | 40,883 | 35,196 | 41,969 | 0 | 84,000 | 237,048 |
| Quantities | 100 | 100 | 100 | 0 | 240 | 690 |
| Aircraft Procurement, Navy: | | | | | | |
| Funds APN/BA7-310720 | 0 | 0 | 0 | 14,400 | 60,000 | 88,800 |
| Quantitiea | 0 | 0 | 0 | 2,167 | 9,600 | 11,167 |

E. (U) RELATED ACTIVITIES: Ongoing efforts in the aerial refueling area include KC-10A and KC-135 update programs. Each of these aircraft plan the incorporation of a hose reel assembly to facilitate aerial refueling of probe-equipped receiver aircraft. These efforts are the following: Navy Aircraft Interoperability with the KC-10A, Aircraft Flight Test General Program, Program Element 25663N; and Navy Evaluation of KC-135 Prototype Hose and Drogue Aerial Refueling Stores, Aircraft Flight Test General Program, Program Element 25663N. The technology for the new aerial refueling store ia being incorporated into the D-704 with FY 1986 APN-7 War Consumablea Line Item funds at the Naval Air Rework Facility, Alameda CA. Thia program will provide for reliability and maintainability improvementa to extend the life of the present store and will help sustain the inventory level until the new store enters the fleet. (W1924) All emerging technology will be fully investigated for high density shipboard storage and disposibility. Companion efforts underway by NAVSUP/NAVAIR and the Naval Postgraduate School will be closely monitored.

Program Element: 24161N Title: Aviation Support CVW

F. (U) WORK PERFORMED BY: Naval Air Development Center, Warminster, PA; Naval Air Propulsion Center, Trenton, NJ; Naval Air Engineering Center, Lakehurst NJ; Naval Air Test Center, Patuxent River, MD; and Air Test and Evaluation Squadron Five, China Lake, CA. CONTRACTORS: Sargent-Fletcher Company, El Monte, CA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W1633, Aerial Refueling Store:

1. (U) Description: Existing Aerial Refueling stores have been in aervice for 25 years and their inventory level will no longer sustain deployed carriers, maintenance pipeline and training requirementa. Aerial refueling store-equipped aircraft will be required to provide surge and backup refueling capabilities through the late 1990'a. The project provides for a new store that will be compatible with all current store-equipped aircraft.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

o Completed Navy Technical Evaluation (Nov 1985).

o Completed Initial Operational Test and Evaluation (Nov 1985).

o Approval for Limited Production (Mar 1986).

o Completed contractor preproduction tests (Jun 1986).

o Exercised production option for firat production quantity (Apr 1986).

b. (U) FY 1987 Program:

o Complete OPEVAL (Feb 87).

o Approval for full production (May 1987).

o Exercise second production option (Jun 1987).

Program Element: 24161N Title: Aviation Support CVW

c. (U) FY 1988 Planned Program: Not Applicable.

(U) Project W1924, External Fuel Tanks:

1. (U) Deacription: This effort will develop a low-cost external fuel tank for tactical aircraft that minimizes adverse shipbosrd impact on space and personnel. Existing external fuel tanks are in short supply which probibits combat or emergency jettison. Current tanks are of such large size and shape as to limit the number carried onboard an aircraft carrier.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

o Obtained SECNAV memorandum directing the development program (Oct 1986).

b. (U) FY 1987 Program:

o Issue contracts for demonstration and validation of concept (Aug 1987).

c. (U) FY 1988 Planned Program:

o Exercise FSED contract opt on (Apr 1988).

d. (U) FY 1989 Planned Program:

o Initiate contractor testing.

o TECHEVAL and OPEVAL (Mar 1989).

o Obtsin approval for production (Sep 1989).

o Exercise production option (Sep 1989).

e. (U) Program to Completion: Not Applicable.

H. (U) PROJECT OVER $10 MILLION 1N FY 1988/89· Not Arplicable.

Program Element: 24161N

Title: Aviation Support CVW

K. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 24163N
Title: Fleet Telecommunications (Tactical)
DoD Mission Area: 345 - Tactical Communications
Budget Activity: 4 - Tactical Program

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 28,282 | 10,954 | 8,219 | 1,405 | 5,229 | 69,792 |
| W0661 | Combination Radio | 10,029 | 10,954 | 8,219 | 1,405 | 5,229 | 69,792 |
| X0695[1] | High Frequency Anti-Jam | 9,123 | - | - | - | - | - |
| X0725[2] | Communication Automation | 9,130 | - | - | - | - | - |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

[1] Project X0695 is funded in Program Element 64232N commencing in FY 1987.

[2] Project X0725 is funded in Program Element 63783N in FY 1987 only; then in Program Element 64232N in FY 1988 and out.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Included in this program element are the development of anti-jam radios, antennas, VHF Relay Pallet and integration of U.S. Army ECCM radio into Navy ships. Developments will significantly improve the Navy's ability to maintain reliable communications in a hostile environment. Such capability is essential to effective command and control and support of mobile military forces.

C. (U) COMPARISON WITH THE 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: In FY-86, an increase in Project W0661 of 4,039 is due to department program/budget adjustments; a decrease of 13,613 in Project X0695 is due to a GRH adjustment and department program/budget adjustments. In FY-87, a decrease of 33,857 in Project X0695 is the result of department program/budget adjustments which transfer the project to PE 64232N; a decrease of 18,835 in Project X0725 is due to department program/budget adjustments which transfer the project to PE 63783N. In FY-88, a net increase of 6,111 in Project W0661 is due to department program/budget adjustments and a NIF rate adjustment.

Program Element: 24163N

Title: Fleet Telecommunications (Tactical)

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 43,122 | 38,561 | 63,733 | 95,211 | 113,737 | 467,005 |
| W0661 | Combination Radio | 5,924 | 5,990 | 11,041 | 2,108 | 7,233 | 60,328 |
| X0695 | High Frequency Anti-Jam Program | 21,975 | 22,736 | 33,857 | 81,197 | 99,947 | 322,416 |
| X0725 | Communication Automation | 15,223 | 9,835 | 18,835 | 11,906 | 6,557 | 84,261 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| OPN | 42,393 | 43,738 | 0 | 0 | Continuing | Continuing |
| APN-5(UHF Relay POD) | 3,149 | 6,547 | 0 | 0 | Continuing | 15,287 |

E. (U) RELATED ACTIVITIES: The projects within this element are complementary, not duplicative, of other Navy communications development and improvement efforts and to joint service efforts such as Tri-Service Joint Tactical Communications Program (PE 28010N) and Joint Tactical Information Distribution System (Program Element 25604N) which are being developed for separate needs and requirements. The Army Single Channel Ground and Airborne Radio System and the Air Force "HAVE QUICK" activities both provide basis and input to the ARC-182 Combination Radio.

F. (U) WORK PERFORMED BY: IN-HOUSE: Space and Naval Warfare Systems Command, Washington, DC; Naval Electronic Systems Engineering Centers, Portsmouth, VA, Vallejo, CA. and Charleston, SC; Naval Air Systems Command, Washington, DC; Naval Research Laboratory, Washington, DC; Naval Ocean Systems Center, San Diego, CA; Naval Air Development Center, Warminster, PA; Pacific Missile Test

Program Element: 24163N Title: Fleet Telecommunications (Tactical)

Center, Pt. Mugu, CA; Naval Surface Weapons Center, White Oak, Silver Spring, MD; Naval Air Test Center Patuxent, MD.; Naval Avionics Center Indianapolis, IN.; Naval Telecommunications System Integration Center, Washington, D.C. and Naval Underwater Systems Center, New London, CT. CONTRACTORS: Litton Data Systems, Van Nuys, CA; Xetron, Inc., Cincinnati, OH; Grumman Aerospace Corp., Bethpage, Long Island, NY; Rockwell International Corp., Collins Telecommunications Products Division, Cedar Rapids, IA, & Anaheim, CA; MITRE Corp., McLean, VA; GTE, Needham, MA; and Westinghouse, Baltimore, MD.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable

(U) Project W0661, Combination Radio:

1. (U) Description: The AN/ARC-182 Combination Radio provides tactical aircraft with a small, securable, combination radio system. The system is composed of low and high power Very High Frequency/Frequency Modulation (FM), Very High Frequency/Amplitude Modulation (AM), Ultra High Frequency/FM and Ultra High Frequency/AM voice radios, aircraft frequency hopping filters and broadband aircraft antennas. Capabilities of securable and

The system's communications functions will provide the elements of timeliness and assured tactical coordination through direct airborne communications essential to combat forces of the U.S. Navy, Marine Corps, Army and Air Force, as well as allied forces. The Army's Single Channel Ground and Airborne Radio System will also be adapted for shipboard use by COMSPAWARSYSCOM. In addition, an Ultra High Frequency airborne relay pod and Very High Frequency relay pallet and a digital communications terminal compatible with SINCGARS to meet fleet requirements for inter/intra battle group limited range of intercept command, control and communications will be developed. The communications to be retransmitted and received include voice/teletype and data link channels. The Ultra High Frequency relay pod is a Rapid Development Capability project contained within the AN/ARC-182 program, and utilizes four basic AN/ARC-182 radios and two AN/ARC-182 radios modified for Link 11 capability.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Completed HAVE QUICK OPEVAL.

° Continued development of Ultra High Frequency/Very High Frequency Electronic Counter Countermeasures radio system and smart modem to be interoperable with HAVE QUICK, HAVE QUICK II and with Single Channel Ground and Airborne Radio System(s).

° Continued acceptance of production basic ARC-182 radios and conducted follow on test and evaluation for new user aircraft.

° Completed development and operational test and evaluation of the Ultra High Frequency Relay Pod, and commenced procurement of the pods.

b. (U) FY 1987 Program:

° Continue development of Electronic Counter Countermeasures (ECCM) radio system and smart modem to prepare for development test and evaluation, continue software development of ECCM waveforms.

° Complete procurement of Ultra High Frequency Relay Pods.

° Commence installation system design for U.S. Army SINCGARS Radio, VHF Relay Pallet, and Digital Communications Terminal for surface ship applications.

c. (U) FY 1988 Planned Program:

° Initiate TECHEVAL testing of the ARC-182 combined HAVE QUICK/Single Channel Ground and Airborne (SINCGARS) ECCM system.

° Continue installation system design for US Army SINCGARS radio, VHF Relay Pallet and Digital Communications Terminal application on surface ships.

d. (U) FY 1989 Planned Program:

° Complete TECHEVAL of ARC-182 combined HAVE QUICK/SINCGARS ECCM system.

° Initiate and complete OPEVAL of ARC-182 combined HAVE QUICK/SINCGARS ECCM system.

° Obtain approval for production of ARC-182 combined HAVE QUICK/SINCGARS ECCM radios for aircraft.

° Continue shipboard SINCGARS installation design, conduct OPEVAL and obtain production approval.

° Continue VHF Relay Pallet development using SINGCARS Radio, and Digital Communications Terminal software development. Obtain production approval.

Program Element: 24163N Title: Fleet Telecommunications (Tactical)

e. (U) Program To Completion:

- Begin Preplanned Product Improvement to the ARC-182 ECCM applications to ensure joint interoperability.
- Commence procurement of combined HAVE QUICK/SINCGARS radios for aircraft and SINCGARS ECCM radio for surface ships.

continue procurement of ARC-182 ECCM radios for Aircraft.

- Commence procurement of SINGCARS capable VHF Relay Pallet and Digital Communications Terminal

f. (U) Major Milestones:

| Milestone | Date |
|---|---|
| AN/ARC-182 ECCM | |
| Milestone II | 7/85 |
| OPEVAL Completion | 3Q FY89 |
| Milestone III | 1Q FY90 |
| IOC | 4Q FY90 |
| SHIP SINCGARS/VHF RELAY PALLET/DIGITAL COMMUNICATIONS TERMINAL | |
| OPEVAL Completion | 3Q FY89 |
| Milestone III | 4Q FY89 |
| IOC | 4Q FY9[illegible] |

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 24311N
Title: Undersea Surveillance Systems
DoD Mission Area: 237 - Naval Warfare Surveillance and Reconnaissance
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 40,911 | 22,549 | 30,576 | 43,412 | Continuing | Continuing |
| X0763 | Integrated Undersea Surveillance System (IUSS) Design and Assessment | 8,077 | 0 | 0 | 0 | N/A | N/A |
| X0766 | Integrated Undersea Surveillance System (IUSS) Development | 14,880 | 22,549 | 30,576 | 43,412 | Continuing | Continuing |
| X1938 | Battle Group Quick Reaction Surveillance System (BGQRSS) | 17,954 | 0 | 0 | 0 | N/A | 17,954 |

The above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED:

This program provides for the design and development of: the shore based acoustic signal processing systems; the intra-system acoustic and data handling/transmission systems; the underwater electronic and cable technology as they relate to improving IUSS sensitivity and performance; and, the Reduced Diameter Array (RDA) being developed to the Surveillance Towed Array Sensor System (SURTASS). Funding for the Fixed Distributed System (FDS) shore signal processing system was consolidated into PE 63784N, X1312 by Department action.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: For Project X0766: the FY 1986 total decrease of -4,830 is due to a -1,030 Graham-Rudman-Hollings decrement and a -3,800 decrease due to Department budget action; the FY 1987 total decrease of -11,649 reflects the and Departmental adjustments -10,000 and a Congressional adjustment -1,649. The FY 1988 decrease -8,035 is a Department adjustment reflecting the FDS PE consolidation. For Project

Program Element: 24311N Title: Undersea Surveillance Systems

X1938, the FY 1986 decrease of -2,046 is due to the Graham-Rudman-Hollings reduction -1,046 and a Department program/budget adjustment -1,000.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 31,917 | 48,232 | 34,198 | 38,611 | Continuing | Continuing |
| X0763 | Integrated Undersea Surveillance System (IUSS) Design and Assessment | 9,938 | 8,522 | 0 | 0 | 0 | N/A |
| X0765 | LINK HEMLOCK | 395 | 0 | 0 | 0 | 0 | N/A |
| X0766 | Integrated Undersea Surveillance System (IUSS) Detection and Classification System Development | 21,584 | 19,710 | 34,198 | 38,611 | Continuing | Continuing |
| X01938 | Battle Group Quick Reaction Surveillance System (BQRSS) | 0 | 20,000 | 0 | 0 | 0 | 20,000 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Other Procurements, Navy Funds (332225) | 80,951 | 83,183 | 55,525 | 35,077 | Continuing | Continuing |
| Quantities* | | | | | | |
| Military Construction | 5,760 | 10,000 | 0 | 0 | Continuing | Continuing |

* A quantity cannot be specified since there is no one subsystem or system component item that characterizes the mix of hardware and equipments included in SOSUS backfit and future deployments/procurements.

E. (U) RELATED ACTIVITIES: Program Element 63784N, Anti-Submarine Warfare Surveillance, Fixed Distributed System (FDS), and Program Element 24313N, Surveillance Towed Array Sensor System (SURTASS) : these programs provide research and development for additional fixed system and mobile sensors for the Integrated Undersea Surveillance System (IUSS). Program Element 63785N, ASW Environmental Acoustic Support (AEAS), provides environmental acoustic support through at-sea measurements and acoustic modeling.

Program Element: 24311N Title: Undersea Surveillance Systems

Program Element 63747N, Advanced ASW Technology, provides for an increase in Active Adjunct development efforts for the CNO's Urgent ASW Initiative Program (CUARP).

F. (U) WORK PERFORMED BY: IN HOUSE: Space and Naval Warfare Systems Command, Washington, DC; Naval Ocean Systems Center, San Diego, CA (lead laboratory); Naval Research Laboratory, Washington, DC; and Naval Electronic Systems Engineering Activities, St. Inigoes, MD. CONTRACTORS: TRW Systems, McLean, VA and AT&T Technologies Inc., Greensboro, NC.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/1989: Not Applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/1989:

(U) Project X0766, Integrated Undersea Surveillance System (IUSS) Development:

1. (U) Description: This project provides (1) application of state-of-the-art computer and display technology to the development of signal and data processing subsystems and techniques in the following SOSUS areas: (a) real time signal processing (including (b) the distribution and transfer of acoustic data from collection subsystems to processing subsystems; (c) recall and follow-up processing of real time data; (d) development of

(4) training equipments for the Fleet ASW Centers and the Readiness Training Facility, Dam Neck, VA, training courseware and software; and (6) independent Navy test and evaluation of IUSS subsystems including BGQRSS.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Tested

(This effort transfers to PE 63784N in FY 1987).

° Initiated system specification for

(This effort transfers to PE 63784N in FY 1987).

Program Element: 24311N Title: Undersea Surveillance Systems

- Conducted tasks in conjunction with the effort described in PE 63747N (Advanced ASW Technology), including:
  - Specified subsystem development.
  - Completed system specification for
  - Initiated procurement for
  - Conducted at-sea test of
- Initiated software development for the Wide Band Acoustic Recall (WBAR) to
- Completed test and evaluation for the Integrated Acoustic Display (IAD), Multiple Flexible Analysis Displays (MILTIFLADS) and Computer Interface Cabinet (CIC) capability.
- Completed factory acceptance testing for the Interarray Processor II/Acoustic Display Console (IAP II/ADC) upgrade.
- Completed analysis of long term noise data for site 4421.
- Completed identification of
- Completed Navy testing for Integrated Acoustic Display (IAD) and Wide Band Acoustic Recall (WBAR) upgrade.
- Initiated a series of controlled experiments (This effort transfers to PE 63784N in FY 87.)

b. (U) FY 1987 Program:

- Complete analysis of or current and projected threats.
- Initiate development of prototype signal characterization algorithms.
- Complete IAD/WBAR subsystem developments.
- Complete the Acoustic Display Console (ADC) and IUSS training curriculum developments.
- Continue
- Continue IUSS integration and system design transition planning to develop requirements and specifications for integration at the Naval Ocean Processing Facilities.
- Complete the design for the
- Complete the requirements definition and design for a system to

c. (U) FY 1988 Planned Program:

- Initiate
- 
- Install
- Continue the
- Continue system developments related to efforts in PE 63747N (Advanced ASW Technology).

Program Element: 24311N

Title: Undersea Surveillance Systems

d. (U) FY 1989 Planned Program:

- Complete
- Continue using demonstrated technologies from PE 53747N (Advanced ASW Technology).

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones:

| | Milestone | Date |
|---|---|---|
| 1. | System Specification | January 1986 |
| 2. | Award Follow-on IUSS Improvement R&D Contract | January 1987 |
| 3. | IAP II/Acoustic Display Console Testing | December 1987 |
| 4. | | |
| 5. | | |
| 6. | SURTASS MS II | November 1989 |
| 7. | Sea Trials and Data Analysis | October 1989 |
| 8 | System EDM Specification | September 1990 |

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 24313N
DoD Mission Area: 233 - Anti-Submarine Warfare

Title: Ship-Towed Array Surveillance Systems
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/1989 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 1,884 | 5,552 | 6,226 | 4,447 | Continuing | Continuing |
| XO758 | Surveillance Towed Array Sensor System (SURTASS) | 1,884 | 5,552 | 6,226 | 4,447 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Prior to FY 1984, this program provided for the initial development of a Surveillance Towed Array Sensor. Now operational, the Surveillance Towed Array Sensor System provides a mobile, long range, passive undersea surveillance capability against current and projected threat submarines, and flexibility in expanding present undersea surveillance operations supporting tactical anti-submarine warfare forces. In FY 1984, the Block Upgrade Program commenced to

The Block Upgrade Program contains

passive target classification capability and provide growth for processing low frequency active sonar as an enhancement to passive

These improvements will enable the Surveillance Towed Array Sensor System to provide greatly improved support to tactical anti-submarine warfare forces.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) There were no significant changes between FY 1987 Descriptive Summary and that shown in this Descriptive Summary.

Program Element: 24313N Title: Ship-Towed Array Surveillance Systems

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 3,731 | 1,993 | 5,833 | 6,356 | 11,586 | 138,035 |
| X0758 | Surveillance Towed Array Sensor | 3,731 | 1,993 | 5,833 | 6,356 | 11,586 | 138,035 |

D. (U) OTHER FY 1988/1989 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| SCN (T-AGOS Monohull/Swath) | | | | | | |
| (Total Ship FY TOA) | 109,460 | 148,100 | 166,200 | 174,000 | 123,700 | 1,545,755 |
| Quantity | (2) | (3) | (3) | (3) | (3) | (31) |
| OPN (332237) | 14,613 | 19,750 | 21,340 | 21,549 | Continuing | Continuing |

E. (U) RELATED ACTIVITIES: Program Element 24311N, Undersea Surveillance System, provides shore signal and information processing. Program Element 63785N, ASW Environmental Acoustic Support provides acoustic data and modeling support and testing of modified arrays. Program Element 33109N, Satellite Communications, provides for the development of the satellite terminal.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Ocean Systems Center, San Diego, CA (Lead Laboratory). CONTRACTORS: Hughes Aircraft Company, Fullerton, CA; and TRW Systems, McLean, VA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/1989:

(C) Project X0758, Surveillance Towed Array Sensor:

1. (C) Description: This project will develop improvements in signal processing for the Surveillance Towed Array Sensor to provide increases in the capability for long range, passive surveillance against threat submarines. These improvements will provide improved target classification capability To provide the increased signal processing, the AN/UYS-2 Enhanced Modular Signal Processor will be incorporated.

Program Element: 24313N Title: Ship-Towed Array Surveillance Systems

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Completed System Operational Design (SOD)
° Completed System Requirement Review (SRR)
° Initiated Program Performance and Interface Design Specification

b. (U) FY 1987 Program:

° Complete Preliminary Design Reviw (PDR)
° Initiate hardwsre and software architecture design
° Initiate Program and Database Desigr Specification

c. (U) FY 1988 Planned Program:

° Complete Critical Design Review (CDR) and Software Detailed Design Review (SDDR)
° Complete architecture design
° Complete software coding
° Complete parameter test
° Initiste system integration

d. (U) FY 1989 Planned Program:

° Comple'.e system integration

e. (U) Program to Completion:

° Complete efforts under the follow-on product improvement program including designing, coding and unit testing computer software and installing hardware.
° Field test the Enhanced Modular Signal Processor (AN/UYS-2).
° Perform developmental and operational testing of the SURTASS Block Upgrade package.
° Conduct OPEVAL in aboard s fleet SURTASS/T-AGOS platform.

Program Element: 24313N

Title: Ship-Towed Array Surveillance Systems

f. (C) Major Milestones:

| Milestone | Date |
|---|---|
| 1. Milestone II Sponsor Program Review | 15 JAN 1986 |
| 2. Complete certification testing and TECHEVAL | FY 1990 |
| 3. Complete OPEVAL | FY 1991 |
| 4. Milestone III Sponsor Program Review | FY 1992/1Q |
| 5. IOC | |

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/1989: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 24571N
Title: Special Projects
DoD Mission Area: 235 - Naval Warfare Support
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 15,405 | 9,640 | 13,978 | 7,465 | Continuing | Continuing |
| W0431 | Tactical Aircrew Combat Training System | 3,068 | 2,297 | 4,926 | 5,373 | Continuing | Continuing |
| W1414 | Integrated Air Warfare Training Complex (Fallon) | 12,337 | 4,868 | 4,921 | 0 | 0 | 67,259 |
| X1823* | Enhanced Naval Warfare Gaming System | (4,965) | 2,475 | 4,131 | 2,092 | Continuing | Continuing |

* X1823 in PE 64703N prior to FY 1987.

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program develops advanced state-of-the-art instrumentation systems to support fleet proficiency training and tactics assessment. Tactical Aircrew Combat Training System (TACTS) capabilities support the Naval Strike Warfare Center (NSWC) and Strike Warfare Initiatives Program including extending the current training capability in air-to-air combat to other phases of air warfare; e.g., air-to-surface and defense suppression, to provide comprehensive interfaces with additional tactical aircraft, and to include realistic electronic warfare simulation in all training exercises. A complementary development employing advanced technology was initiated in FY 1982 to provide a modern instrumented range at Naval Air Station, Fallon, Nevada for graduate training of Navy and Marine Corps squadrons ranging from single aircrew to full carrier air wing exercises. This project has been identified by the Secretary of the Navy as the priority training range requirement necessary to apply lessons learned in Vietnam and Lebanon which are required to avoid repetition of high attrition in future conflicts. The Enhanced Naval Warfare Gaming System (ENWGS) is a CNO directed effort to enhance the existing Naval Warfare Gaming System (NWGS) installed at the Naval War College in Newport, Rhode Island. ENWGS will consist of three host sites and four host-dependent remote sites capable of conducting a wide range of simulated war games from battle group/theater level scenarios to global conflict. ENWGS will satisfy the requirement to provide NO-RISK battle group/battle force warfare training for senior naval officers while supporting operational forces in the development of tactics and execution of the Maritime strategy.

Program Element: 24571N Title: Special Projects

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: In Project W0431: in FY 1987, a decrease of 3,127 is the result of Department program/budget adjustments and Congressional action and adjustments; in FY 1988, a decrease of 3,836 is the result of Department program/budget adjustments. In Project W1414: the decrease of 1,635 in FY 1986 is the result of GRH and Department program/budget adjustments; in FY 1988, the decrease of 725 is the result of Department program/budget adjustments. Project X1823 is a transfer from PE 64703, Personnel, Training, Simulation and Human Factors to PE 24571. In Project X1823: the FY 1986 decrease of 835 is the result of Department program/budget adjustments; in FY 1987, the decrease of 2,145 was due to Congressional action.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 18,664 | 16,982 | 10,500 | 14,408 | Continuing | Continuing |
| W0431 | Tactical Aircrew Combat Training System | 3,146 | 3,010 | 5,424 | 8,762 | Continuing | Continuing |
| W1414 | Integrated Air Warfare Training Complex (Fallon) | 15,518 | 13,972 | 5,076 | 5,646 | Continuing | Continuing |
| X1823* | Enhanced Naval Warfare Gaming System | (3,912) | (5,800) | (4,620) | (4,527) | Continuing | Continuing |

* From PE 64703N

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Aircraft Procurement, Navy (47C6) | 9,408 | 9,500 | 13,460 | 11,080 | Continuing | Continuing |
| Other Procurement, Navy (43SC) | 43,157 | 6,100 | 10,039 | 7,008 | Continuing | Continuing |

E. (U) RELATED ACTIVITIES: The first TACTS was originally developed as an Air Combat Maneuvering Range (ACMR) between FY 1970 and FY 1974, and is now operational at Yuma, AZ. A second system has been installed on the East Coast off Cape Hatteras, NC. Similar systems have been procured by the Navy at Fallon, NV, and the United States Air Force at Nellis Air Force Base, NV; Tyndall Air Force Base, FL; Luke Air Force Base, AZ; Holloman Air Force Base, NM; and in the Mediterranean (Med.). The Navy plans additional

Program Element: 24571N Title: Special Projects

systems at Cherry Point, NC and Charleston, SC and the Air Force plans an additional system in the vicinity of Southern Florida. All USN and USAF ranges are joint use. At Fallon, NV, the existing electronic warfare range instrumentation systems will interface with TACTS. Battle Force In-port Trainer, Battle Force Tactical Trainer, Range Applications Joint Program Office for Global Positioning Systems for DoD ranges, and the Joint Tactical Information Distribution System perform technical work related to the ASCTS.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Weapons Center, China Lake, CA; Naval Air Development Center, Warminster, PA; Fleet Analysis Center, Corona, CA; Naval Air Test Center, Patuxent River, MD; Naval Electronic Systems Engineering Center, Portsmouth, VA; Naval Ocean Systems Center, San Diego, CA; CONTRACTORS: Cubic Corporation, San Diego, CA; SRI International, Menlo Park, CA; Spectrum Research Systems, Newport Beach, VA; Value Systems Engineering, Alexandria, VA; Hughes Aircraft Co., Canoga Park, CA; Litton Corporation, Sunnyvale, CA; Computer Sciences Corporation, Moorestown, NJ; Booze-Allen and Hamilton, Inc., Bethesda, MD.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project WO431, Tactical Aircrew Combat Training System:

1. (U) Description: This project provides for the design and development of an advanced state-of-the-art Tactical Aircrew Combat Training System (TACTS) to include: (1) full strike capability for advanced tactical training including war-at-sea, (2) the capability of interfacing the F/A-18A and future aircraft weapon system data bus to the TACTS Aircraft Instrumentation Subsystem Internal, (3) the capability to present realistic computer generated electronic warfare threats and evaluate aircrew performance in a dense electronic warfare environment, and (4) the implementation of simulation models for additional air-to-air, surface-to-air, and air-to-ground weapon systems.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Initiated encryption development program to support future Electronic Warfare (EW) training objectives.

° Continued advanced development efforts to support an all mode AIM-54 (PHOENIX) training capability.

° Conducted ship interface demonstration feasibility test.

b. (U) FY 1987 Program:

° Initiate war-at-sea capability.

° Initiate development of a flight-line test set.

Program Element: 24571N Title: Special Projects

° Complete the ALR-45F/67 Radar Warning Receiver (RWR) software interface development.

° Initiate development of an aircraft Defensive Electronic Countermeasure (DECM) training capability.

° Continue advanced development efforts to support full AIM-54 (PHOENIX) training capability.

° Continue encryption development efforts.

° Provide additional blue and orange weapon/EW simulations.

c. (U) FY 1988 Planned Program:

° Continue development and testing of a war-at-sea capability.

° Initiate development efforts to support EA-6B, AGM-84 (HARPOON) and AGM-88A (HARM) training capability.

° Conduct testing of encryption, RWR, and AIM-54 interface.

° Provide new weapon/EW simulations.

° Develop TACTS Instructional Enhancements in response to OR # 028-95-87.

d. (U) FY 1989 Planned Program:

° Conduct testing of the EA-6B, AGM-88A, and AGM-84 training capability.

° Initiate interface for the F-14D, A-6F and AV-8B aircraft.

° Initiate tracking interface requirements for using the Global Positioning System.

° Initiate a Product Improvement Program for TACTS.

e. (U) Program to Completion: The TACTS is a continuing program to develop simulations/stimulations for new weapons/EW capabilities as they are defined and/or refined. Weapons simulation and EW computer generated threats need to be continuously incorporated into the TACTS in order to provide realistic aircrew training.

Program Element: 24571N Title: Special Projects

(U) Project W1414, Integrated Air Warfare Training Complex (Fallon):

1. (U) Description: The TACTS portion of the Fallon Integrated Air Warfare Training Complex is a state-of-the-art, computer-driven, advanced technology range instrumentation system designed to provide advanced tactical training for operational aircrews. Training will be provided for either simultaneous or individual operations in air combat maneuvering, tactical no-drop bomb scoring, defense suppression and electronic warfare. The system is comprised of four basic subsystems: (a) Aircraft Instrumentation Subsystem (AIS), (b) Computation and Control Subsystem (CCS), (c) Display and Debrief Subsystem (DDS), (d) Tracking Instrumentation Subsystem (TIS). These subsystems, with appropriate communications, microwave links, and remotely operated master station radios, are integrated to provide an instrumentation system capable of tracking 36 high-activity aircraft. Fallon TACTS is the prototype for all future Navy TACTS systems.

(U) The AIS consists of pod-mounted equipment and/or the internally-carried AIS for the F/A-18A aircraft.

(U) The CCS equipment is based on state-of-the-art Perkin-Elmer 3250 computers and supporting peripheral equipment: equipment determined to be three times faster, have more capability, and provide for easier expansion than other existing TACTS computer sets.

(U) The DDS uses advanced technology, multicolored, multifunction large screen displays and consoles. These consoles provide three dimensional displays, engineering data and aircraft launch modes for weapons delivery and air combat maneuvering.

(U) The TIS is comprised of solar-powered, remote data collection and relay stations strategically located throughout the 30 X 50 nautical mile range area. These devices communicate data to and from properly equipped participant aircraft, and relay the transmitted data via the remotely controlled master station and microwave link to the Computation and Control, and Display and Debrief Subsystems.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Initiated incorporation of the Facility Air Control Tracking Systems (FACTS).

° Initiated DDS disk based system.

° Initiated integration of the Laser Training System.

° Incorporated DDS display enhancements.

° Incorporated limited war-at-sea capability for the OCEANA TACTS range.

Program Element: 24571N

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- Continued interface development for a destroyed target marking system.
- Initiated the NIKE Radar Interface.
- Initiated expansion of Fallon Supersonic Operations Area and additional ground target sites.

b. (U) FY 1987 Program:

- Initiate relocation of Fallon TACTS equipment into the planned NAVSTRWARCEN Applied Instruction Building (P-265).
- Procure diagnostics software documentation.
- Integrate unmanned EW threat emitters into TACTS.
- Incorporate multiple aircraft ordnance software simulations.
- Provide additional Integrated Air Defense System simulations.
- Initiate Link 11 interface.
- Procure additional TIS Remote Units.

c. (U) FY 1988 Planned Program:

- Incorporation of additional unmanned threat emitters.
- Complete Link 11 interface.
- Incorporation of additional air-to-air and air-to-surface weapons simulations.
- Incorporation of the disk based DDS upgrade.
- Completion of the relocation of TACTS equipment into the P-265 building.

d. (U) FY 1989 Planned Program: Not Applicable.

e. (U) Program to Completion: Not Applicable.

Program Element: 24571N Title: Special Projects

(U) Project X1823, Enhanced Naval Warfare Gaming System:

1. (U) Description: The Enhanced Naval Warfare Gaming System will provide realistic Battle Group-level training for senior Naval Officers and their staffs, and support the Tactical Warfare Training Curriculum at the Tactical Training Groups. As an operational and educational tool, the Enhanced Naval Warfare Gaming System will focus on strategy and tactical development, operational planning, wargaming and decision making, tactics evaluation, and post-exercise analysis. This system will optimize Battle Group/Battle Force training and combat readiness during anticipated fiscal austerity and reduced operational tempo. These capabilities are not available in any other system. This program enhances the existing Naval Warfare Gaming System to support the needs and objectives of the CNO, Fleet Commanders (FLTCINCS), Naval War College, Tactical Training Groups, Atlantic and Pacific, and the Naval Postgraduate School. Three host sites (the Naval War College and the Tactical Training Groups, Atlantic and Pacific) will be capable of stand-alone operation, and interface with four host-dependent remote sites (the FLTCINCs and the Naval Postgraduate School).

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Completed procurement and installed Enhanced Naval Warfare Gaming System hardware.
- o Installed two of three host sites' hardware.
- o Enhanced Naval Warfare Gaming System software delivered to the Government and host sites.

b. (U) FY 1987 Program:

- o Initial Operational Capability (IOC) will occur. IOC is defined as first release of the operational system to the training sites: Tactical Training Groups, Atlantic and Pacific, and the Naval War College.
- o Complete hardware delivery to both host and remotes sites.
- o Continue development of Release 2 computer software.

c. (U) FY 1988 Planned Program:

- o Delivery to Government and host sites of Release 2 computer software.
- o Begin development of Release 3 software.

Program Element: 24571N Title: Special Projects

d. (U) FY 1989 Program:

- o Delivery to Government and host sites of Release 3 computer software.
- o Continue software development and enhancements.
- o Begin research on new system architecture for the Enhanced Naval Warfare Gaming System.

e. (U) Program to Completion:

- o Continue evolutionary software development to meet refined operational requirements.
- o Procure hardware and software based on the new system architecture developed in FY 1989.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 24573N
Title: Navy Cover and Deception Program
DoD Mission Area: 374 - Multi-Mission, Technology and Support
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 16,643 | 9,766 | 6,762 | 5,392 | Continuing | Continuing |
| X0805 | Shipborne Cover and Deception | 1,245 | 1,700 | 6,762 | 5,392 | Continuing | Continuing |
| S0849 | Offboard Cover and Deception * | 15,398 | 8,066 | 0 | 0 | 0 | 89,474 |

* Project X0849 became S0849 in FY87 as the result of project transfer to the Naval Sea Systems Command.

The above funding includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides equipments, devices, systems and techniques

This program provides an offensive and defensive electronic warfare capability to provide force multipliers at the battle force level. Sub-projects within this item are: (1) Project X0805: Shipborne Cover and Deception develops shipboard systems. Included are (a) van-deployable simulators (AN/SSQ-74), (b) ship-towed acoustic simulator (AN/SLQ-33), (c) permanently installed (AN/SLQ-34), and (d) product improvements to keep these equipments/systems current with threat changes; and (2) Project X0849: Offboard Cover and Deception develops a family of expendable simulators Included are: (a)

simulator (e) Macro Scenario Generator System/Planning Analysis Coordination Module (MACS/PACM) which is a force level planning system providing support to all cover and deception operations, and (f) product improvements to keep these devices current with threat changes.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: Project X0805 - the decrease of $2,333 in FY 1986, was the result of Department Budget Adjustment. The decrease of 1,032 in FY 87 was the result of Department/ Program Budget Adjustments (900) and Congressional adjustment (132). Project X0849 - the decrease of 4,811 in FY 1986 represents GRH

Program Element: 24573N Title: Navy Cover and Deception Program

Adjustment of 1,325 and 3,486 due to cancellation of the Simulator which was determined not to be required The decrease of 4,268 in FY 1987 is the result of Department program/budget adjustment and a Congressional adjustment. The decrease of 12,525 in FY 1988, results from the cancellation of the Simulator, restructuring of program objectives and the elimination of the requirements to develop and certify the flight bodies and power sources associated with these simulators.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Eatimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 23,185 | 23,787 | 15,066 | 19,500 | 95,786 | 259,899 |
| X0805 | Shipborne Cover and Deception | 3,972 | 3,578 | 2,732 | 6,975 | 31,704 | 87,051 |
| X0849 | Offboard Deception Devices | 19,213 | 20,209 | 12,334 | 12,525 | 64,082 | 172,848 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| OPN | TOTAL FOR PROGRAM ELEMENT | 21,622 | 22,554 | 33,681 | 32,117 | Continuing | Continuing |
| X0805 | Shipborne Cover and Deception (2340) | 4,586 | 0 | 0 | 4,787 | Continuing | Continuing |
| X0849 | Offboard Deception Devices (2342) | 17,036 | 22,554 | 33,681 | 27,330 | Continuing | Continuing |

E. (U) RELATED ACTIVITIES: Program Element 24576N (Project X1370) Counter-Targeting/Counter-Surveillance Expendables; Program Element 24576N (Project X1794) Counter Communications; Program Element 24576N (Project X1795) Command, Control and Communications Countermeasures Decision Aiding; Program Element 64573N (Project X0954) Shipboard EW Improvement.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Surface Weapons Center, Dahlgren Laboratory, Dahlgren, VA: Naval Research Laboratory Wash., D.C., Naval Ocean System Center, San Diego, CA., Naval Weapons Support Center, Crane, IN. CONTRACTORS: Honeywell, Inc., Seattle, WA; Raytheon Co., Waltham, MA.; Magnavox, Fort Wayne, Indiana, and various higher level classification contractors.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

Program Element: 24573N Title: Navy Cover and Deception Program

(U) Project X0805, Shipborne Cover and Deception System:

1. (U) Description: This project provides for the design, development, fabrication, test and evaluation, associated life-cycle items, and Engineering Development Models (EDM) for shipborne cover and deception equipments, devices, systems and techniques. Individual efforts include: (a) van-deployable simulators (AN/SSQ-74), (b) ship towed acoustic simulator (AN/SLQ-33), (U) permanently installed AN/SLQ-34), and (d) product improvements to keep these equipments/systems current with threat changes.

a. (U) FY 1986 Program:

- Complete development of the Simulator.

b. (U) FY 1987 Program:

- Initiate specification development for AN/SSQ-74 van-deployable simulator modernization.
- Initiate specification development for AN/SLQ-33 pre-planned product improvements

c. (U) FY 1988 Planned Program:

- Complete specification developement for AN/SSQ-74 van-deployable simulator modernization.
- Complete specification development for AN/SLQ-33 P$^3$I.
- Commence design/development of the AN/SSQ-74 van deployable imulator modernization.
- Commence design/development of P3I for the AN/SLQ-33.

d. (U) FY 1989 Planned Program:

- Continue desigr/development of AN/SSQ-74.
- Continue development of P3I for the AN/SLQ-33.

e. (U) Program to Completion:

Program Element: 24573N

Title: Navy Cover and Deception Program

o This is a continuing program.

H. (U) PROJECT OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 24575N
Title: Electronic Warfare Readiness Support
DoD Mission Ares: 374 - Multimission, Technology and Support
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 5,859 | 2,049 | 6,458 | 6,168 | Continuing | Continuing |
| X0898 | Fleet Electronic Warfare Support Group | 5,500 | 1,168 | 4,300 | 3,802 | Continuing | Continuing |
| X1742 | EW Readiness Support* | 359 | * | * | * | * | * |
| R1882 | Data Link Vulnerability** | ** | 881 | 2,158 | 2,366 | Continuing | Continuing |

As this is a continuing program, the above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

* Project X1742 transfers to Program Element 63594N/X1922 in FY 1987.
** Project R1882 was funded for FY 1986 in Program Element 65866N/X1822.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program develops: (1) Fleet Electronic Warfare Support Group (FEWSG) operational systems that simulate hostile electronic countermeasures and other selected electronic weapons to exercise fleet capsbilities in the areas of command and control, anti-air warfare, anti-surface warfare and electronic warfare. FEWSG capability supports both resesrch and development and fleet readiness by providing a realistic hostile electromagnetic environment during technical and operational evaluations of developmental systems as well as during fleet exercises; and (2) Data Link Vulnerability (DVAL) assessment methodology for Navy electronic or electromagnetic dependent systems in development. DVAL will identify methods for reducing system vulnerabilities to hostile exploitation. Program applications will produce systems resistant to electronic countermeasures (ECM) and save money by ensuring that electronic counter-countermeasures (ECCM) are incorporated during development.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: Project X0898 was decreased 2283 in FY 1988 because of Department Program and Budget adjustments. Project X1742 was decreased 1,440 in FY 1986 due to program restructure in support of emergent requirements. In FY 1987, Project R1882 was decreased by 1428 because of Department Program and Budget Adjustments.

Program Element: 24575N Title: Electronic Warfare Readiness Support

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 8,311 | 7,067 | 4,421 | 8,786 | Continuing | Continuing |
| X0898 | Fleet EW Support Group | 4,335 | 5,268 | 2,112 | 6,583 | Continuing | Continuing |
| X1742 | EW Readiness Support * | 3,976 | 1,799 | * | * | * | * |
| R1882 | Data Link Vulnerability ** | 0 | ** | 2,309 | 2,203 | Continuing | Continuing |

* Project X1742 transferred to Program Element 63594N/X1922 in FY 1987.
** Project R1882 was new start in FY 1986 and was funded in Program Element 65866N/X1822.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: Project X0898 supports Program Element 64573N, Shipboard Electronic Warfare Improvements, by providing the environment for testing and evaluating improvements to electronic countermeasures systems and providing electronic warfare environment for fleet exercises. Project R1882 supports all Navy electronic or electromagnetic dependent systems in development.

F. (U) WORK PERFORMED BY: (Project X0898) IN-HOUSE: Naval Avionics Center, Indianapolis, IN; Pacific Missile Test Center, Pt. Mugu, CA; Naval Electronic Systems Engineering Center, Portsmouth, VA; Naval Research Laboratory, Washington, D.C; Naval Air Rework Facility, Alameda, CA; and Naval Surface Weapons Center, Dahlgren, VA. CONTRACTORS: Design Engineering Laboratories, Inc., Torrance, CA; Electrospace Systems, Inc., Richardson, TX; McDonnell Douglas, Tulsa, OK; Scientific Communications, Inc., Garland, TX; and Watkins-Johnson, San Jose, CA. (Project R1882) IN-HOUSE: Naval Security Group, Washington, DC; Naval Air Teat Center, Patuxent River, MD; and Naval Research Laboratory, Washington, DC. CONTRACTORS: Applied Physics Laboratory, Johns Hopkins University, Laurel, MD.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project X0898, Fleet Electronic Warfare Support Group (FEWSG):

Program Element: 24575N Title: Electroni. Warfare Readiness Support

1. (U) Description: By developing systems and equipment for FEWSG, this project provides the only capability in the U.S. Navy to create a realistic hostile electronic warfare (EW) environment for training fleet units and developing at-sea EW tactics. These assets are also used for evaluating new shipboard radar and EW systems. FEWSG assets include tactical EW (VAQ) squadrons of high speed aircraft with special pods and avionics, long range aircraft with jamming, simulator, and command and control equipment, and ship and shore based vans with special EW capabilities.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Completed integration and testing of the of the AN/ALT-40(V) airborne jammer for incorporation into the FEWSG Airborne Electronic Warfare System (FAEWS).

° Continued development of software for the FAEWS.

° Attained initial operational capability of the AN/ALQ-170(V)1.

° Continued development of the AN/ULQ-18(V) engineering development model.

b. (U) FY 1987 Program:

° Complete hardware/software systems interfaces for the FAEWS.

° Conduct operational and technical evaluation of the AN/ULQ-18(V).

° Conduct studies to replace obsolescent air platforms employed by FEWSG.

° Attain initial operational capability of the AN/ALQ-170(V)2.

c. (U) FY 1988 Planned Program:

° Initiate development of the hybrid anti-ship missile simulation system.

° Initiate development of the hybrid radio frequency/anti-radiation missile (RF/ARM) anti-ship missile simulation system.

Program Element: 24575N Title: Electronic Warfare Readiness Support

° Initiate power/antenna improvements for the AN/ULQ-13(V).

d. (U) FY 1989 Planned Program:

° Continue power/antenna improvements for the AN/ULQ-13(V).

e. (U) Program to Completion: This is a continuing program.

(U) Project R1882, Data Link Vulnerability (DVAL):

1. (U) Description: DVAL is an OSD directed continuing program to fully incorporate electronic counter-countermeasures (ECCM) in all Navy electronic, electromagnetic, and electro-optic/infrared systems during engineering design. DVAL will evaluate ECCM effectiveness in those systems during system testing and validate the results during operational test and evaluation. This is accomplished through application of a detailed technical assessment methodology with the purpose being to identify methods to reduce a system's vulnerabilities to hostile EW electronic countermeasures (ECM) and electronic warfare support measures (ESM). Currently, there are four on-going assessments and four additional programs designated by CNO for application of the DVAL methodology. Full implementation of the DVAL program will improve the Navy's warfighting capability by providing EW "hardened" systems and a greater understanding of system EW limitations and vulnerabilities. Additionally, DVAL will save money by reducing costly backfit fixes. The DVAL program will also track systems through their lifecycles with an eye on emergent threats and changes in vulnerabilities resulting from system modifications.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: (Funded under 65866N).

° Initiated a Memorandum of Understanding (MOU) to be signed by Air Force/Army/Navy to coordinate Joint Service assessments.

° Initiated assessment of the High Frequency Anti-Jam (HFAJ) communications data link.

° Initiated assessment of MILSTAR EHF SATCOM Link.

° Initiated assessment of the MK-XV Identification Friend or Foe (IFF) system.

° Initiated assessment of the Joint Tactical Information Distribution System (JTIDS).

Program Element: 24575N Title: Electronic Warfare Readiness Support

° Identified special test equipment requirements and initiated procurement.

° Determined requirements for additional facilities and personnel.

b. (U) FY 1987 Program:

° Continue acquisition of special test equipment.

c. (U) FY 1988 Planned Program:

° Complete acquisition of special test equipment.

° Initiate assessments of HFAJ, MILSTAR EHF SATCOM, MK-XV IFF, JTIDS.

° Initiate new program assessments as assigned by CNO.

d. (U) FY 1989 Planned Program:

° Continue assessments of HFAJ, MILSTAR EHF SATCOM, MK-XV, JTIDS.

° Initiate developments in support of DVAL range tests and measurements.

° Initiate new assessments as tasked by CNO.

e. (U) Program to Completion: This is a continuing program.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 24576N
Title: Counter Command Control Communications Development
DoD Mission Area: 372 - Escort, Stand-Off and Counter C³
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 22,441 | 9,548 | 9,797 | 12,847 | Continuing | Continuing |
| S1370 | Counter-Targeting/Counter-Surveillance Expendables | 5,395 | 459 | 99 | 2,135 | Continuing | Continuing |
| X1794 | Counter Communications | 9,610 | 4,309 | 7,151 | 5,950 | Continuing | Continuing |
| X1795 | Command, Control and Communications Countermeasures Decision Aiding* | 7,436 | 4,780 | 2,547 | 4,762 | Continuing | Continuing |

* Project X1795 transfers to PE 64230N Project X1979 in FY 88 and is reflected in the appropriate RDT&E Descriptive Summary.

As this is a continuing program, the above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through 1989 only.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program is a continuing effort to develop countermeasures to shipboard, airborne and land-based command, control, and communications ($C^3$) systems which are used for targeting, surveillance, against U.S. Navy tactical forces. Sub-projects within this item are: (1) Project S1370: (a) Active Electronic Buoy (AEB) - expendable, airborne or shipboard-launched device

(2) Project X1794: (a)

and (c) Landbased Countermeasures (LCM) -

and (3) Project X1795: (a) Electronic Warfare Coordination Module (EWCM) - software module(s) and hardware to aid Battle Group Staff in tasking Battle Group Electronic Warfare assets, maintaining a current data base of status of resources, and aiding in evaluating effectiveness of assigned Electronic Warfare resources (FY 1986 and FY 1987 only; in FY 88 EWCM transfers to P.E. 64230N, Project X1979), and (b) Countermeasures Assessment Simulator (CMAS) - provides an interactive $C^3/C^3CM$ modeling and data base capability to assess countermeasures effectiveness.

Program Element: 24576N Title: Counter Command Control Communications Development

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: Project S1370 - The increase of 2,967 in FY 1986 was due to cost growth for the Active Electronic Buoy full scale development contract. Project X1794 - The decrease of 7,368 in FY 1987 is the result of Congressional Action (5,674) and Adjustment (394); and Department Program/Budget Adjustment (1300). The decrease of 12,550 in FY 1988 is the result of: (a) delaying the start of Landbased Countermeasures due to higher priority projects and (b) restructure of the SCCM project. Project X1795 - The decrease of 2,100 in FY 1986 was the result of Department Budget Adjustment and GRH Adjustment. The decrease of 7,022 in FY 1987 is the result of Department Program/Budget Adjustment (5,700); Congressional Action (1,000) and Adjustment (322). The decrease of 2,767 in FY 1988 was the result of transferring EWCM from this project to P.E. 64230N, project X1979 (reflected in the appropriate RDDS) and Department Program Adjustment.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 27,371 | 22,320 | 23,952 | 25,109 | Continuing | Continuing |
| S1370 | $C^3CM$ Development | 5,123 | 2,428 | 473 | 94 | Continuing | Continuing |
| X1794 | Counter Communications | 11,436 | 10,356 | 11,677 | 19,701 | Continuing | Continuing |
| X1795 | Command, Control and Communications Countermeasures Decision Aiding | 10,812 | 9,536 | 11,802 | 5,314 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | FY 1990 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|---|
| | Other Procurement, Navy | | | | | | | |
| S1370 | AEB Funds (33234600) | 0 | 52,640 | 0 | 52,735 | 61,667 | Continuing | Continuing |
| | Quantity | 0 | 700 | 0 | 1,126 | 1,375 | Continuing | Continuing |
| X1794 | LCM Funds (33234600) | 0 | 0 | 0 | 0 | 0 | 42,600 | 42,600 |
| | Quantity | 0 | 0 | 0 | 0 | 0 | 2 | 2 |
| | PCM Funds | 0 | 0 | 0 | 0 | 21,873 | 41,957 | 63,830 |
| | Quantity | 0 | 0 | 0 | 0 | 42 | 80 | 122 |

Program Element: 24576N Title: Counter Command Control Communications Development

E. (U) RELATED ACTIVITIES: Program Element 24573N (Project X0805) Shipboard Cover and Deception, Program Element 24573N (Project X0849) Offboard Cover and Deception, Program Element 64230N (Project X1979) Warfare Support Systems and Program Element 64573N (Project X0954) Shipboard Electronic Warfare Improvements.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Research Laboratory, Washington, DC., Naval Surface Weapons Center, Dahlgren Laboratory, Dahlgren, VA; Naval Surface Weapons Center, White Oak Laboratory, Silver Spring, MD; Naval Weapons Support Center, Crane, IN; Naval Ocean Systems Center, San Diego, CA. CONTRACTORS: Sperry Systems, Reston, VA; E-Systems Melpar, Vienna, VA; Hughes Aircraft Corp., Fullerton, CA; Litton, College Park, MD; Sanders, Nashua, N.H., Dalmo Victor, Belmont, CA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project S1370, Counter-Targeting/Counter-Surveillance Expendables:

1. (U) This project provides for the design, development, procurement, fabrication, test and evaluation, associated life-cycle items, and Engineering Development Models (EDM) for Counter-Targeting/Counter-Surveillance Expendables. Individual efforts include: (a) Active Electronic Buoy which is an expendable airborne or shipboard launched device comprised of an active radar transponder in the and (b) Advanced Multi-Purpose Decoy is an expendable which will counter surveillance and targeting radars and advanced anti-ship cruise missile seeker threats of the 1990s.

2. (U) Program Accomplishments and Future Effort:

a. (U) FY 1986 Program:

° Continued full scale engineering development of the Active Electronic Buoy.

b. (U) FY 1987 Program:

° Complete operational evaluation (OPEVAL) testing of the Active Electronic Buoy.

c. (U) FY 1988 Planned Program:

° Obtain approval for full production of the Active Electronic Buoy.

° Initiate development of cost reduction improvements for the Active Electronic Buoy.

d. (U) FY 1989 Planned Program:

Program Element: 24576N Title: Counter Command Control Communications Development

° Initiate advanced development of the

c. (U) Program to Completion: This is a continuing program.

° Develop, test, and evaluate the

(U) Project X1794, Counter Communications:

1. (U) Description: This program provides for the design, development, procurement, fabrication, test, and evaluation and associated life-cycle items for Counter-Communications systems. Individual efforts include: (a) PROFORMA Countermeasures which counter formated $C^3$ and combat direction functions, (b) Landbased Countermeasures and (c) Shipboard Communication Countermeasures (SCCM) which counter adversary to prevent targeting of friendly communication and weapons systems.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Complete design and validation efforts for PROFORMA Countermeasures (PCM).

b. (U) FY 1987 Program:

° Award Detail Design Contract.

° Initiate detailed design and integration efforts for PROFORMA Countermeasures (PCM).

° Conduct PCM System Design Review (SDR).

c. (U) FY 1988 Planned Program:

° Order Long Lead time standard Navy Hardware for Engineering Development Module (EDM) for PCM.

° Initiate Full Scale Engineering Development for PROFORMA Countermeasures (PCM).

° Conduct PCM Critical Design Review (CDR).

Program Element: 24576N Title: Counter Command Control Communications Development

d. (U) FY 1989 Planned Program:

° Complete development and integration of capability into Advanced Capability (ADVCAP) EA-6B Aircraft.

° Initiate design and validation of high risk items.

e. (U) Program to Completion: This is a continuing program.

° Complete test and evaluation of (FY 1991).

° Commence development (FY 1990).

° Complete development, test and evaluation.

(U) Project X1795, Command, Control and Communications Countermeasures Decision Aiding:

1. (U) Description: This project provides for the design, development, fabrication, test and evaluation, associated life-cycle items, and the Full Scale Engineering Development Model of the Electronic Warfare Coordination Module (EWCM) System and Countermeasures Assessment Simulator (CMAS). The EWCM will function as a coordination system to be used by Battle Group (BG) Staff for aiding in: (a) tasking Battle Group EW assets to prevent duplication of threat and weapons targeting, (b) maintaining current data base of status of EW and $C^3CM$ resources and capabilities, and (c) aiding in evaluating effectiveness of assigned EW resources. Additionally, this item provides for front end engineering and specification of Battle Group decision aiding enhancements and necessary modification developments and project support functions for the various line items in this project. The CMAS will perform analysis of actual and hypothetical EW and $C^3CM$ systems, techniques and tactics in a secure environment to facilitate employment of these systems in the tactical environment at sea.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Continued EWCM preliminary system design.

° Awarded EWCM detailed design contract.

b. (U) FY 1987 Program:

Program Element: 24576N Title: Counter Command Control Communications Development

° Conduct EWCM System Design Review (SDR).

° Conduct EWCM Preliminary Design Review (PDR).

° Order EWCM long-lead time standard Navy hardware for Engineering Development Module (EDM).

° Participate in design options for integration with the Afloat Correlation System (ACS).

c. (U) FY 1988 Planned Program:

° EWCM Program shifts to Warfare Support Systems, Program Element 64230N, Project X1979.

° Continue development of CMAS.

d. (U) FY 1989 Planned Program:

° Complete CMAS Phase II model efforts.

e. (U) Program to Completion: This is a continuing program.

° Operate and update CMAS for evolution of adversary $C^3$.

° CMAS is developing a single software set for $C^3$ modeling, it is a lab effort only with no hardware development.

H. (U) PROJECT OVER $10 MILLION IN FY 88/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 25601N
Title: HARM Improvement
DoD Mission Area: 232 - Amphibious, Strike, Anti-Surface Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 5,631 | 2,234 | 0 | 0 | 0 | 18,656 |
| W1780 | High Speed Anti-Radiation Missile Improvement | 5,631 | 2,234 | 0 | 0 | 0 | 18,656 |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: High Speed Anti-Radiation Missile (HARM) was approved for full scale production at DSARC III in March 1983. HARM is an air-to-surface missile used by attacking aircraft to suppress or destroy enemy radar installations engaged in directing anti-aircraft missiles and artillery. It replaces the SHRIKE and STANDARD ARM anti-radiation missiles. A joint Navy/Air Force improvement program was initiated in FY 1983 to correct deficiencies noted in operational testing, to address areas of cost reduction, and to conduct threat-related analyses.

C. (U) EXPLANATION OF CANCELLATION: The Program was cancelled by a program/budget decision to place resources in higher priority programs

TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation (DT&E)

a. (U) Advanced Development (Government) 1972 - 1974. HARM was initiated in 1972 under program management of the Naval Air Systems Command. The initial advanced development effort was conducted at Naval Weapons Center, China Lake, CA to determine significant design features and to select alternate missile and avionics component approaches capable of achieving performance objectives. Thirteen test missiles were launched to gather missile aerodynamic data, validate airframe control and stability and demonstrate guidance performance. Two avionics configurations were evaluated for threat identification, hand-off and reaction time capability. All test objectives were met. Problems noted and corrective actions taken are listed below.

| Problem | Corrective Action |
|---|---|
| Roll control limitation. | Wing deflection reduced transonic speeds. |
| Slow reaction time. | Incorporated parallel processor. |

b. (U) Advanced Development (Contractor) 1974 - 1978. In 1974, Texas Instruments was selected as the Weapon System Integration Contractor and was awarded a contract for development of the HARM Weapon System. During this phase of the program, TI delivered 16 missiles and 4 avionics units for test and evaluation. The DT&E program conducted by the Naval Weapons Center (NWC) successfully demonstrated missile aerodynamic stability, reduced smoke motor, guidance capability, flex logic operation, avionics hand-off/interface and system reaction time. All advanced development test objectives were met. Problems noted and corrective actions are listed below.

| Problem | Corrective Action |
|---|---|
| Aerodynamic heating | Use of stainless steel wings and fins vs aluminum. |
| Increased missile weight (807 lbs vs 730 lbs) | Weight reduced to cost-effective operationally acceptable level of 780 lbs. |
| Internal heating limiting missile "on" time | Use of internal heat diodes. |
| Tracking bias induced from operation of shutter/attenuator | Software/hardware modification |

c. (U) Expanded Capability (EXCAP) 1977. In March 1977, TI was directed to initiate a program to extend HARM frequency coverage and improve maneuverability. The first EXCAP demonstration missile was delivered in August 1977. A total of three EXCAP seekers were successfully tested and evaluated in the laboratory and captive flown on TA-4J and A-7 aircraft. Problems noted and corrective actions taken are listed below.

| Problem | Corrective Action |
|---|---|
| Sensitivity of Seeker | Addition of filters and amplifiers |
| High frequency radome performance | Radome redesigned |

d. (U) Full Scale Engineering Development (1978 - 1981)

(1) (U) Prototype Missiles. Of the twenty-seven missiles (23 guided and 4 unguided) which were delivered during the prototype phase, 15 had full EXCAP capability. The prototype hardware was subjected to ground engineering tests, captive flight tests and firing tests. Objectives included acquisition and track of various target signatures in five operational scenarios, and verification of hazard free performance to aircraft and handling personnel. A satisfactory preliminary indication of operational effectiveness and suitability was obtained from the Navy and Air Force operational testing organizations. HARM capability with the Navy A-7E and the Air Force F-4G aircraft was demonstrated.

(U) A total of 18 firings (16 guided and 2 unguided missiles) comprising the DT/OT-IIA of HARM was completed on 31 October 1980 with complete successes, partial successes, and failures. The failures have been traced to specific components and corrective action was taken. The partial Problems noted and corrected are listed below.

| Problem | Corrective Action |
|---|---|
| Interface with ALR-45F Radar Warning Receiver (RWR) | Increased memory capacity of RWR. |
| Multipath Reflections | Software/Hardware modification. |
| 8K memory capacity saturation | Increased missile memory |
| Microwave Circuit Board Producibility | Contractor reviewed fabrication techniques and increased quality control. |
| High Frequency Field of View Non-linearity | |
| Target selectivity ("SKIP") | Effort commenced on software mod |

(2) (U) Pilot Production Missiles - Forty-five missiles were utilized for a Navy TECHEVAL, the Navy OPEVAL, and the Air Force IOT&E. Navy TECHEVAL, which began on 4 May 1981 at the Pacific Missile Test Center (PMTC), evaluated pilot production missiles, avionics and peculiar ground support equipment, and certified readiness of the system to enter operational evaluation. Information from Navy Technical Evaluation captive-carry flights, reliability testing, environmental testing and five live firings showed that the HARM system met all performance thresholds except reliability. A first article configuration inspection validated the contractor's competitive production data package. Pilot production hardware was representative of the production missile configuration, although fabricated with low rate production tooling and test equipment.

2. (U) Operational Test and Evaluation (OT&E)

a. (U) Joint Initial Operational Testing began in January 1979 with Navy and Air Force independent test agencies participating in combined DT/OT-IIA. This early involvement of OT with DT was to offset the risks involved in a concurrent program. Of the 18 firings, 12 were fired by OT pilots. The OT&E objectives of phase IIA were to assess the potential operational effectiveness and suitability of HARM through its demonstrated performance in five operational scenarios employing its three modes of operation.

(U) COMOPTEVFOR's test agency, VX-5, flew 19 captive-carry flights and fired four of the prototype guided missiles. A prototype HARM configured A-7E was used for Navy testing and AFOTEC utilized the F-4G "Wild Weasel" aircraft for Air Force testing. An assessment of HARM's potential operational effectiveness and operational suitability was presented at DNSARC IIB on 7 November 1980. The readiness to proceed into FY-81 initial production was concurred in by the principals and by subsequent OSD review.

b. (U) Thirty-four operational test firings and 1972.2 hours of captive flight testing were conducted in two essentially equal phases between November 1981 and November 1982. The first phase (OT-IIB) tested a baseline configuration of the software and was concluded in September 1982 with free flight successes in attempted firings. The primary concern of the Air Force was to make the missile as to the target it was attacking. The primary concern of the Navy was to make the system. On 30 June 1982, the VCNO was briefed on the status of the HARM program, including results of the interim operational tests. It was determined that reliability and performance trends were sufficiently positive to allow an assembly rate increase to 25 per month. Phase II testing was concluded on 5 November 1982 with free flight successes in, attempted firings using software which can utilize range to the target when known.

c. (U) The major concerns of OPTEVFOR and AFOTEC were the following deficiencies:

of operational testing were presented to a DSARC III on 30 March 1983, resulting in approval for full production. DSARC III also approved a correction of deficiencies program for the HARM weapon system.

d. (U) The Program Manager's deficiency correction plan addresses deficiencies listed in the previous paragraph. A limited FOT&E began on 2 April 1984 by AFOTEC with the first block of FY-82 production and avionics to verify production missile effectiveness, refine tactical doctrine, and evaluate missile reliability. This limited FOT&E was completed in December 1984. Full FOT&E is still underway.

e. (U) F/A-18 HARM NTE was completed June 1984 and demonstrated successful integration of the aircraft, missile, and associated avionics (CLC and radar warning receiver). Urgent requirement for first F/A-18 operational deployment required an abbreviated operational assessment which was successfully completed July 1984 and provided basis for ALP of CLC. FOT&E began Feb 1985. HARM missile software was , and FOT&E was completed in July 1985. The integration of the HARM system on the F/A-18 is discussed in the F/A-18 weapon system TEMP 201.

f. (U) Concurrent with HARM improvement efforts during 1986 the HARM weapon system has been undergoing integration testing as part of the weapon system package for the EA-6B aircraft. Interim HARM capability for EA-6B was directed in Jan 1985 and is discussed in EA-6B TEMP 1175. An abbreviated (two firings) operational assessment was completed in June 1986

3. (U) System Characteristics

| Operational | Milestone IIB Threshold | Milestone III Threshold 1/ | Demonstrated |
|---|---|---|---|
| (U) Frequency Coverage (Band) | | | |
| Min/Max Range (nmi) level launch | | | |
| (U) from 500' AGL | | | |
| (U) 5,000' AGL | | | |
| (U) 15,000' AGL | | | |
| (U) 30,000' AGL | | | |
| Carriage/Launch Envelope | | | |
| (U) Altitude (MSL) | | | |
| (U) Speed (Mach) | | | |
| (U) Pitch (degrees) | | | |
| (U) Off-Axis (degrees) | | | |
| Lethality | | | |
| (U) Median CPA (ft) | | | |

| | | | |
|---|---|---|---|
| Environments | | | |
| (U) | ECM | Assess | Assess |
| (U) | Multi-path | Assess | Assess |
| Reliability | | | |
| (U) | System | Assess | |
| (U) | Avionics | Assess | |
| (U) | Missile | | |
| | (U) Captive | Assess | |
| | (U) Free Flight | Assess | |
| (U) | BIT | | |
| | (U) System | Assess | |

1/ (U) Milestone III Recommended Threshold of DCP-938 dtd 1 Dec 82.
2/ (U) if aircraft pitches up.

4. Current T&E Activity

| Event | Planned Date | T&E Activity (Past 12 Months) Actual Date | Remarks |
|---|---|---|---|
| A-6E SWIP HARM Integration (DTE) | All 1986 | All 1986 | Testing delayed due to A-6E aircraft interface problems, and a higher SECNAV priority to establish an urgent EA-6B HARM capability. |
| Others (A-7E OFP F-4G OFP, F/A-18 OFP, PRAT, ALQ-162, Special Weapons separation, etc.) | All 1986 | All 1986 | HARM support of other testing. |
| FY-84 Software Evaluation (DT-IIIB) | Jan - Apr 1985 | Jan 85-Jan 86 | Six firings (two each from A-7E, F-4G, and F/A-18) to certify FY-84 software upgrade ready for FOT&E (OT-IIIB). |
| EA-6B Interim HARM (DT/OT) | Mar - Jun 1986 | Mar 86-Jun 86 | Establish interim EA-6B/HARM capability in FY-86 |

T&E Activity (Next 12 Months)

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| (U) F/A-18 OT-III (FOT&E) HARM/ PHALANX | | | |
| (U) Navy OT-IIIA/B (FOT&E) | | | |
| (U) Air Force OT-IIIB (FOT&E) | | | |
| (U) A-6E SWIP | | | |

5. (U) Program Documentation

| Date | Title | Serial No. |
|---|---|---|
| 6 October 1980 | AGM-88A Quick Look Final Report | AFOTEC |
| January 1981 | HARM (AGM-88) AF Preliminary Evaluation | AFOTEC Final Report, January 1981 |
| 14 May 1981 | HARM DSU-19/B Target Detector Countermeasures Field Test Report | OTD-TR-3-81 JT&E, White Sands |
| 14 July 1981 | OPEVAL Report (J217-OT-IIA) | COMOPTEVFOR ltr Ser S33 of 14 July 1981 |
| 28 May 1982 | Interim Report of HARM (AGM-88A) OPEVAL (U) | COMOPTEVFOR Norfolk VA secret msg P282000Z May 82 (NOTAL) |
| 28 May 1982 | Interim Report on Phase I of the AGM-88A (HARM) IOT&E (U) | AFOTEC secret msg 281650Z May 82 (NOTAL) |
| 23 Nov 1982 | Quick Look (Final) Report on the HARM IOT&E (U) | AFOTEC secret msg 231812Z Nov 82 |

| | | |
|---|---|---|
| 24 Nov 1982 | Quick Look Report on OPEVAL of HARM (U) | COMOPTEVFOR secret msgs 241240Z and 241241Z Nov 82 |
| April 1983 | AGM-88A HARM initial Operational Test and Evaluaition, Final Report | AFOTEC Project No. 81-109 of Apr 83 |
| 10 Jun 1983 | OPTEVFOR Evaluation Report AGM-88 HARM | COMOPTEVFOR ltr Ser S40 of 10 Jun 83 |
| 13 Jun 1984 | Interim Report on Technical Evaluation of AGM-88A (HARM) Integration on F/A-18 | NATC msg 131511Z Jun 84 |
| 15 Jun 1984 | F/A-18/HARM Integration OPEVAL Recommendations | NWC msg 152334Z Jun 84 |
| 11 Jul 1984 | Quick-Look Report of operational effectiveness of the stand alone HARM weapon employment on the F/A-18. (CLC evaluation) | COMOPTEVFOR msg 111840Z Jul 84 |
| 9 Aug 1984 | HARM CLC OP Assessment Review | NWC msg 092153Z Aug 1984 |
| 12 Dec 1984 | Test and Evaluation Plan No. M217-2 signed by COMOPTEVFOR and COMNAVAIRSYSCOM forwarded to CNO for review and approval. | NAVAIR ltr 6201C/C318 12 Dec 1984 |
| 17 Dec 1984 | Quick-look Report of Limited FOT&E | AFOTEC msg 172030Z Dec 84 |
| 22 Jan 1985 | HARM Capability for USS Ranger/Kennedy | CNO msg 222055Z Jan 85 |
| 9 Aug 1985 | Follow-on operational evaluation of the integrated electronic warfare (EW) suite/high speed antiradiation missile (HARM) system in the F/A-18. | COMOPTEVFOR ltr Ser 521/S67 of 9 Aug 1985 |
| 13 Feb 1986 | Quick-look Technical Assessment of FY-84 Software Evaluation (OT-III B) | NWC ltr 4850 Ser 3506/1803 of 13 Feb 86 |
| 7 Aug 1986 | EA-6B Interim HARM Integration | COMOPTEVFOR msg 072225Z Aug 86 |

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 25620N
DoD Mission Area: 233 - Anti-Submarine Warfare

Title: Anti-Submarine Warfare Combat System Integration
Budget Activity: 4 - Tactical Program

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 8,648 | 14,638 | 14,399 | 14,931 | 182,858 | 331,480 |
| S0896 | Anti-Submarine Warfare Combat System Integration | 8,648 | 14,638 | 14,399 | 14,931 | 182,858 | 331,480 |

The above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Introduction of the AN/SQQ-89(V), Surface Anti-Submarine Combat System (composed of the Underwater Fire Control System (UFCS) MK 116 MODs 6/7/8, AN/SQR-19 Tactical Towed Array Sonar, AN/SQS-53B hull sonar, and the AN/SQQ-28 Light Airborne Multipurpose System (LAMPS) MK III signal processor) in surface ships will generate large numbers of passive and active contacts. An integrated ASW Control System is required to effectively correlate, classify, track, etc., contacts from initial detection to effective and expeditious threat engagement. This program element develops sensor integration and display sharing software applicable to FFG 7, DD 963, and CG 47 Class ships and the computer based MK 116 Mod 5/6/8 ASW Control System applicable to DD 963, DDG 993 and CG 47 Class ships. Timely development of the ASW Control System is essential to ensure the effective utilization of new sensor systems. Without such an automated system,

C (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 87 Descriptive Summary and that shown in this Descriptive Summary are as follows: In FY 1986, a decrease of -1,743 was due to GRH adjustment and Department program/budget adjustments; in FY 1987 a decrease of -2,771 is due to Congressional actions/ adjustments; in FY 1988 a decrease of -5,133 is due to Department program/budget adjustment.

Program Element: 25620N Title: Anti-Submarine Warfare Combat System Integration

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 11,833 | 10,391 | 17,409 | 19,532 | 157,335 | 300,673 |
| S0896 | Anti-Submarine Warfare Combat System Integration | 11,833 | 10,391 | 17,409 | 19,532 | 157,335 | 300,673 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| OPN | 20,694 | 40,929 | * | * | * | * |
| SCN Quantity+ | 16,916 | 0 | 0 | 0 | 0 | 91,418 |

* OPN funding for Underwater Fire Control System MK 116 ASW Control System has been subsumed into the AN/SQQ-89 SCN (Subhead 8219) OPN (2136) procurement line.

+ OPN funds support procurement of equipment for product improvements, and ASW Control System equipment and AN/SQQ-89 On-Board Trainers. Therefore, quantity per year cannot be summarized as a single entry.

E. (U) RELATED ACTIVITIES: Program Element 64212N, Project WO474, Light Airborne Multi-Purpose System MK III: development of an Anti-Submarine Warfare helicopter for deployment with surface ships. Program Element 64713N, Project S0234, Tactical Towed Array Sonar AN/SQR-19: development of towed array sonars for surface ship tactical use. Program Element 64575N, Project S1451 AN/SQS-53C: modernization of the surface ship hull-mounted AN/SQS-53A/B sonar. These three projects develop the sensor subsystems of the AN/SQQ-89. The Underwater Fire Control System MK 116 Mod 5/6/8 (ASW Control System) subsystem of the AN/SQQ-89 receives data from the sensors, produces a coordinated tactical display for dissemination, command and prosecution of threats with ASW weapons. Program Element 64713N, Project S1916, ASW Systems Improvement: develops upgrades to the sensors to counter recently identified threat improvements, including reductions in radiated noise.

Program Element: 25620N Title: Anti-Submarine Warfare Combat System Integration

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Sea Systems Command, Washington, DC; Naval Underwater Systems Center, New London Laboratory, New London, CT; Naval Ocean Systems Center, San Diego, CA (Lead Laboratory); Naval Surface Weapons Center, White Oak, MD; and Naval Sea Combat Systems Engineering Station, Norfolk, VA. CONTRACTORS: EG&G Washington Analytical Services Center, Inc., Rockville, MD; TRACOR, Inc., Rockville, MD; Hughes Aircraft Company, Fullerton, CA; General Electric Company, Syracuse, NY; Sciences Application Incorporated, San Diego, CA; Sperry-Univac, Minneapolis, MN; and Integrated Systems Analysts, Inc., Arlington, VA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project S0896, ASW Combat System Integration:

1. (U) Description: Acoustic sensor integration efforts were initiated during FY 1976 under Program Element 25623N, Surface Ship Sonar Modernization, to define an approach for sharing common hardware among the following programs: AN/SQR-19 Tactical Towed Array Sonar, AN/SQS-53B Sonar, and AN/SQQ-28 Light Airborne Multi-Purpose System Shipboard Electronics System. These efforts provided a basis for developing integration to make maximum use of the increased quantity and quality of target data which would be available from anti-submarine warfare surface ship sensors, i.e., AN/SQR-19, AN/SQQ-28 Light Airborne Multi-Purpose System MK III shipboard electronics system, and AN/SQS-53B/C Sonar. These studies resulted in the definition of a display sharing development effort which provided for a reduction in the number of sensor system display consoles (from 5 to 4) required for the conduct of coordinated multi-sensor systems, resulted in the definition of the ASW Control System MK 116 Mod 5/6/8 to provide necessary computer and display resources for passive data management while interfacing with, but having minimal functional impact on, the Combat Direction System programs. Sensor improvement under development will continue to be integrated into the Anti-Submarine Warfare Control System. Display sharing and Anti-Submarine Warfare Control System capabilities for existing sensors and developmental sensor systems are being developed under this project.

2. (U) Program Accomplishments And Future Efforts:

a. (U) FY 1986 Program:

" Continued Anti-Submarine Warfare Control System Mod 5 computer program technical/operational evaluation with full AN/SQQ-89 Anti-Submarine Warfare Combat Suite sensor capabilities.

Program Element: 25620N Title: Anti-Submarine Warfare Combat System Integration

- ° Conducted DD 963 Class Mod 6 integration testing and begin ASW Control System installations on DD 963/CG 47 Class ships concurrent with installations of AN/SQR-19, AN/SQS-53B and AN/SQQ-28 Light Airborne Multi-Purpose System MK III shipboard electronics systems.
- ° Began efforts to modify the ASW Control System for replacement of AN/UYK-7 computers with the AN/UYK-43B
- ° Conducted Anti-Submarine Warfare Control System life-cycle support.
- ° Maintained the AN/SQQ-89(V) Anti-Submarine Combat Suite baseline system at land-based integration test site.
- ° Established Anti-Submarine Warfare Combat System training capabilities concurrent with AN/SQQ-28 Light Airborne Multi-Purpose System MK III shipboard electronics, AN/SQR-19 towed array and AN/SQS-53 surface sonar training, resulting in AN/SQQ-89(V) Warfare Combat Suite coordinated shore training.
- ° Modified the ASW Control System to integrate AN/SQS-53C in support of the AN/SQS-53C TECH/OPEVAL in 1987.
- ° Began development of operator trainers for the Underwater Fire Control System MK 116 Mod 7/8 (ASW Control System).
- ° The Mod 7 is the ASW Control System configuration to be installed on DDG 51 class and Mod 8 is the ASW Control System with AN/UYK-43B upgrade to be installed on DD 963 Class.

b. (U) FY 1987 Program:

- ° Support AN/SQS-53C TECH/OPEVAL efforts.
- ° Continue Mod 8 development.
- ° Initiate efforts to modify the Underwater Fire Control System MK 116 MOD 8 Computer Program for non-Vertical Launch System configured DD 963 class ships.
- ° Initiate efforts to define ASW Control System upgrade requirements in support of the overall AN/SQQ-89 Upgrade.
- ° Initiate efforts to upgrade the Combat Direction System/ ASW Control System interface for Mod 5/6 systems (includes OS-411.2 changes).

Program Element: 25620N

Title: Anti-Submarine Warfare Combat System Integration

f. (U) Major Milestones: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 25633N
DoD Mission Area: 238 - Other Naval Warfare

Title: Aircraft Equipment Reliability/Maintenance Program
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 5,945 | 1,896 | 2,032 | 458 | Continuing | Continuing |
| W1041 | Aircraft Equipment Reliability/ Maintainability Program (AERMIP) | 5,945 | 1,896 | 2,032 | 458 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The AERMIP meets the continuing need for a product improvement program to enhance reliability and maintainability of in-service aircraft equipment, thus providing increased operational/material readiness of Fleet aircraft. High impact reliability and maintainability improvements to deficient avionics/nonavionic items, often Government-Furnished Equipment common to two or more aircraft models, is usually selected for development. Existing technology is used to design, fabricate, and test prototype modification kits, or test and select available substitute materials, parts, modules or subsystems, calculated to provide higher reliability of in-service aircraft equipment. This program provides non-recurring prerequisites for aircraft or equipment changes subsequently procured for in-service, installed and spares inventories. The flight hours accumulated in the operational environment by new aircraft incorporating new technology equipment and materials will disclose failures that were not forecast, but will require correction. This program is currently the only aviation program within the Navy which specifically addresses the reliability and maintainability of in-service aircraft equipment. This effort does not duplicate any other program initiatives for the various in-service aircraft, nor does it preclude any Pre-Planned Product Improvement ($P^3I$) efforts that the other programs may initiate.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the FY 1987 Descriptive Summary and that shown in this descriptive summary are as follows: In FY 1986, decreases of 412 for GRH adjustment and 1,200 for Department Budget Adjustment. In FY 1987, decreases of 161 for Congressional adjustment and 6,789 for Congressional action. In FY 1988, decrease of 7,809 for Department Program/Budget Adjustments.

Program Element: 25633N Title: Aircraft Equipment Reliability/Maintenance Program

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 7,556 | 7,557 | 8,846 | 9,841 | Continuing | Continuing |
| W1041 | Aircraft Equipment Reliability and Maintainability Improvement Program (AERMIP) | 7,556 | 7,557 | 8,846 | 9,841 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: Not Applicable.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Avionics Center, Indianapolis, IN; Naval Air Test Center, Patuxent River, MD; Naval Air Development Center, Warminster, PA; and Naval Air Rework Facility North Island, San Diego, CA. CONTRACTORS: Marconi Avionics Limited, Rochester, UK; AIRESEARCH Manufacturing Company, Torrance, CA; Teledyne Systems Company, Northridge, CA; and Hazeltine Corporation, Greenlawn, NY.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W1041, Aircraft Equipment Reliability and Maintainability Improvement Program:

1. (U) Description: This program was established in FY 1974 to achieve measured improvement in carrier aircraft operational readiness through carefully selected reliability and maintainability improvements. Scope was enlarged in 1978 to add land-based tactical aircraft. A serious deterrent to achieving desired levels of aircraft operational readiness is the low Mean-Flight-Hours-Between-Failures of many aircraft systems. Operational failure data are used to identify opportunities for product improvements to address excessive consumption of replacement parts and excessive maintenance man-hours. This program provides nonrecurring design, fabrication, and test of prototype modification kits and test and selection of industry available alternate replacement parts or materials. A major effort during FY 1987 and out-years is the continuing replacement of high failure rate portions of systems and equipments with highly reliable circuitry employing state-of-the-art components. Candidate avionics sets contain electromechanical modules, vacuum tube circuitry, or early solid-state components which have developed high failure rates or are no longer manufactured. They are usually high-cost items whose complete replacement with operationally equivalent, new production, state-of-the-art sets is economically not feasible. Modifications increase reliability, reduce piece-part count, maintenance manhours, spares requirements, life cycle costs and provide better parts commonality. This program does not fund procurement of modification kits or replacement equipment.

Program Element: 25633N Title: Aircraft Equipment Reliability/Maintenance Program

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Continued seven incrementally funded developments and helicopter-ship dynamic interface tests for expansion of operating wind envelopes.
- o Started improvements to AAU-19/A Counter-Drum Altimeters.

b. (U) FY 1987 Program:

- o Complete five prototype developments; i.e., OK-497/AI Communications Control Group (U/S-3A) and Pulse Decoders KY-651 and 651A/ARA-63 Receiving Decoding Group of Automatic Carrier Landing System (Multiple aircraft); SN-416 Synchronizer and SA-1568 Switch Amplifier improvements to the AN/APX-76 Interrogator (F-4S, F-14A, S-3A, P-3C, EP-3E, KC-130F/R, E-2B/C); the Dual Channel Standard Central Air Data Computer CPU-152/A (U/S-3A); and Ejection Seat chute initiators (A-7B/E, TA-7C, AV-8A/B).
- o Continue one incrementally funded task and dynamic interface tests.
- o Initiate additional reliability product improvements based on Fleet failure reports

c. (U) FY 1988 Program:

- o Complete three prototype developments; i.e., AAU-19/A Counter-Drum Altimeter; Airborne Navigational Converter CV-3914/ASN adapting the AN/ASN-130 or ASN-139 Inertial Navigation Set to the U/S-3; Improved Anti-skid Control Box (A-6E, KA-6D, EA-6A/B); and other short-term tasks initiated in FY 1987.
- o Continue incrementally funded developments and dynamic interface testing.
- o Initiate improvements to avionics sets, helicopter rotor and transmission systems, top-ten reported failure items and aircraft installed armament equipment.

d. (U) FY 1989 Program:

- o Complete scheduled prototype developments.

Program Element: 25633N Title: Aircraft Equipment Reliability/Maintenance Program

- o Continue incrementally funded developments and dynamic interface tests.
- o Initiate improvements to avionics sets, helicopter rotor and transmission systems, top-ten reported failure items and aircraft installed armament equipment.

4. (U) Program to Completion: This is a continuing program to improve Flee Readiness by design, fabrication and test of prototype corrections to newly identified reliability deficiencies.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 25658N
DoD Mission Area: 235 - Naval Warfare Support

Title: Laboratory Fleet Support
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 5,811 | 5,876 | 5,511 | 5,877 | Continuing | Continuing |
| X0834 | Laboratory Fleet Support | 5,811 | 5,876 | 5,511 | 5,877 | Continuing | Continuing |

As this is a continuing program, the above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Laboratory Fleet Support program is managed by the Navy Science Assistance Program (NSAP) office. It provides technology assistance to the Fleet by on-site support from Navy laboratories facilitating technical improvement of in-service systems to increase operational effectiveness. These efforts complement the RDT&E system by bringing available expertise and technology to bear on operational problems and demonstrating feasible solutions.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) Changes between the funding profile shown in FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: -335 in FY 1986 is a Gramm-Rudman-Hollings reduction, -180 in FY 1987 is due to Congressional adjustment, and -1,835 in FY 1988 is due to Department budget adjustment.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

Program Element: 25658N Title: Laboratory Fleet Support

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 6,326 | 6,146 | 6,056 | 7,346 | Continuing | Continuing |
| X0834 | Laboratory Fleet Support | 6,326 | 6,146 | 6,056 | 7,346 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: None

E. (U) RELATED ACTIVITIES: Navy Laboratory Independent Exploratory Development, Program Element 62936N (provides for short-term solution of fleet technical problems which effect readiness).

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Surface Weapons Center, Silver Spring, Maryland; Naval Ocean Systems Center, San Diego, CA; Naval Underwater Systems Center, Newport, RI; Naval Air Development Center, Warminster, PA; Naval Training Systems Center, Orlando, FL; Naval Research Laboratory, Washington, D.C.; Naval Oceanographic Office, Bay St. Louis, MS; Naval Weapons Center, China Lake, CA; David W. Taylor Naval Ship Research and Development Center, Bethesda, MD; Naval Civil Engineering Laboratory, Port Hueneme, CA; Naval Coastal Systems Center, Panama City, FL; Naval Surface Weapons Center, Dahlgren, VA; Navy Personnel Research and Development Center, San Diego, CA; Naval Environmental Prediction Research Facility, Monterey, CA; Naval Ocean Research and Development Activity, Bay St. Louis, MS; Naval Air Test Center, Patuxent River, MD; Pacific Missile Test Center, Pt. Mugu, CA; Naval Weapons Support Center, Crane, IN. CONTRACTORS: None OTHERS: Applied Research Laboratory, Pennsyvania State University, State College, Pennsylvania.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project X0834, Laboratory Fleet Support:

1. (U) Description: The primary goals of the Navy Science Assistance Program are to achieve time solutions to technical problems that impact the operational readiness of the Navy and Marine Corps and to ensure communications between the technology producer (RDT&E community) and the technology user (Navy and Marine Corps operating forces).

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Demonstrations of technological improvements to operational readiness included:

Program Element: 25658N Title: Laboratory Fleet Support

- 27 scientists and engineers were placed in Naval Fleet staffs as principal technical advisors and consultants.
- Continuous monitoring of submarine radiated noise to locate noise problems as they occur.
- Use of low-cost, commercially available remote vehicle for mine identification.
- Over-the-horizon targeting capability for ships using the SH-2 helicopter.
- Adaptation of acoustic ASW predictions to probabilistic situations.
- Test of CV weapons loadout model for changing mission requirements.
- Transmission of acoustic data from ship to patrol aircraft.

b. (U) FY 1987 Program:

- Respond to the continual flow of requests from the Fleet and Fleet Marine Forces.
- In situ systems for improving submarine acoustic readiness.
- Develop techniques for detecting hostile torpedoes with in situ equipment.
- Reduce hazard of landing SH-2 helicopters aboard ships
- Eliminate static discharge hazard during loading of CH-53 helicoptera
- Investigate automatic monitoring of acoustic sources
- Modify acoustic buoys for passive targeting
- Adapt air-to-surface weapons for use by patrol aircraft
- Reduce physiological degradation due to heat stress aboard shipa
- Support for 24 scientists and engineers at major Navy and Marine Corps operational commands as principal technical advisors and consultants.

c. (U) FY 1988 and 1989 Planned Program:

- Technical problem solution will continue on a quick reaction basis (since the program is reactive in nature the actual tasks cannot be predicted). Also, a field team of similiar size is expected to be deployed.

d. (U) Program Completion:

- This is a continuing program.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 25667N
Title: F-14 Upgrade
DoD Mission Area: 231 - Anti-Air Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 347,865 | 263,950 | 184,770 | 143,904 | 586,166 | 2,011,986 |
| W1408 | F-14D | 347,865 | 263,950 | 184,770 | 143,904 | 159,086 | 1,584,906 |
| ( | EMERGING TECHNOLOGY)* | 0 | 0 | 0 | 0 | (187,080) | (187,080) |
| ( | F-14 SQUADRONS)* | 0 | 0 | 0 | 0 | (240,000) | (240,000) |

* Displayed for information purposes only to reflect planned initiatives.

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides for operational improvement of Navy F-14 squadrons in order to counter the projected threat, in the most severe threat environment, through the year 2000 and beyond. The requirement exists for very high performance, long endurance, Fleet-Air-Defense aircraft with long range fire control/weapons system capability. While the F-14A/Phoenix Weapon System has proven operational capability against existing threats, significant improvements are required to make it a viable and effective counter to projected threats. The predominant threat to U.S. Naval Forces is the Soviet Union's large inventory of anti-ship cruise missiles (ASCM's) launched by long range bomber aircraft, escorted by increasing numbers of high speed, highly maneuverable tactical aircraft, some now containing a full look-down, shoot-down capability.

The large strides the Soviets have made in electronic countermeasures, low observable technology, sophisticated jamming techniques and are also adversely affecting

Program Element: 25667N Title: F-14 Upgrade

the capability of the F-14A/AWG-9 weapon system to successfully prosecute the Outer Air Battle. The F-14D, a major engine, radar, and avionics block upgrade to the F-14A, is essential to sustain combat effectiveness in this projected Anti-Air Warfare operating environment.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and this Descriptive Summary are as follows: In FY 1987, increases of 8,000 for Department Budget adjustment to return Project W1839 LWIRST funding to the baseline program and 3,950 for Department Program/Budget adjustment and a decrease of 8,421 for Congressional action. In FY 1988, increases of 17,623 for Department Program adjustments and 22,590 Department Budget adjustments, this action reflects return of Project W1839 LWIRST funding into the baseline F-14D program.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 276,655 | 347,865 | 268,421 | 156,657 | 442,330 | 1,539,068 |
| W0846 | Alternate Fighter Engine | 65,922 | 0 | 0 | 0 | 0 | 65,922 |
| W1408 | F-14 Upgrade | 210,733 | 347,865 | 260,421 | 144,557 | 408,830 | 1,419,546 |
| W1839 | LWIRST | 0 | 0 | 8,000 | 12,100 | 33,500 | 53,600 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Aircraft Procurement, Navy (41AN/AP) | 0 | 115,525 | 578,065 | 946,845 | 18,763,571 | 20,404,006 |
| Quantity | 0 | 0 | 7 | 12 | 508 | 527 |
| Milcon | 0 | 0 | 0 | 4,600 | 17,000 | 21,600 |

E. (U) RELATED ACTIVITIES: Development of Air Force Common Joint Tactical Information Distribution Systems (JTIDS) (Program Element 25604N and 64771D), Airborne Self-Protection Jammer (ASPJ) (Program Element 64226N) and the Advanced Medium Range Air-to-Air Missile Program (AMRAAM) (Program Element 64314N). Relationship with elements is explained under Section I.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Propulsion Center, Lakehurst, NJ; Naval Air Test Center, Patuxent River, MD; Pacific Missile Test Center, Point Mugu, CA; Naval Weapons Center, China Lake, CA; Naval Air Development Center, Warminster, PA;

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Naval Avionics Center, Indianapolis IN, Naval Aviation Engineering Center, Philadelphia, PA; Naval Aviation Logistics Center, Patuxent River, MD; Naval Air Rework Facility, Norfolk, VA, Naval Air Rework Facility, North Island, CA; Naval Training Engineering Center, Orlando, FL. CONTRACTORS: Grumman Aerospace Corporation, Long Island, NY. MAJOR SUBCONTRACTORS: General Electric, Evandale, OH and Hughes Aircraft Company, El Segundo, CA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W1408, F-14D:

1. (U) Description: This project provides for the design, development, integration and testing necessary to upgrade the existing F-14 weapons system. The improved aircraft, the F-14D, will increase capability in three major areas to sustain combat effectiveness in the projected anti-air warfare operating environment. The three major upgrade areas are: new engine, new digital avionics and an upgraded radar. The new engine will increase required tactical flexibility against advanced threat aircraft and correct significant safety problems associated with the present TF-30 engine. New digitized avionics will enable operational compatibility with other fleet units by incorporation of DOD directed programs and will increase aircrew effectiveness in high density operations. An upgraded radar will ensure a multi-target, multi-shot capability in the more severe electronic countermeasures environment now projected. These changes will yield significant improvements in capability and performance as well as reliability and maintainability, and will facilitate the total integration and exploitation of related programs i.e., Air Force Common Joint Tactical Identification System (JTIDS), Advanced Self-Protection Jammer (ASPJ) and Infrared Search and Track System (IRST). A pre-deployment (primarily software) update which includes HARM, HARPOON, AMRAAM, ALR-67, Medium PRF, and ECCM improvements is planned for incorporation prior to the first deployment. This program permitted production incorporation in FY 1986 (first delivery November 1987) of the upgraded engine F-14 aircraft (designated the F-14A (PLUS)) and limited production of the F-14D commencing March 1990.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Commenced engine flight testing on aircraft #7 which included engine calibrations and initial performance checks. Continued engine development and integration. Continued software coding and testing. Continued engine, avionics, radar hardware design and fabrication. Continued avionics and radar hardware/software integration and development. Continued integrated logistics support and planning and analyses. Continued Roofhouse and Avionics Demonstration Laboratory (ADL) upgrades. Initiated the design and modifications to the five test vehicles (F-14A's) in preparation for flight testing commencing 2nd Qtr FY 1988. Completed trainer specification. Released trainer Request for Proposal (RFP).

Program Element: 25667N Title: F-14 Upgrade

b. (U) FY 1987 Program: Continue engine integration testing to include: ASMET testing, R&M demonstration, Calibration/Performance/Loads Demonstration/Hi Alpha testing. Conduct Navy evaluations for the engines DT-IIA/B/C. Complete radar/avionics design and fabrication. Continue software coding and testing. Continue avionics and radar hardware/software integration and development. Continue integrated logistics support and planning and analyses. Complete Roofhouse and Avionic Demonstration Laboratory (ADL) upgrades. Continue test vehicle modifications. Commence TA-3B radar test bed flights to demonstrate TWS, PDSTT and weapons support. Commence HARM/HARPOON, AMRAAM, ALR-67 integration development.

c. (U) FY 1988 Planned Program: Conduct production readiness review for long lead funds for 7 pilot production F-14D aircraft. F-14A (PLUS) development completed. First F-14A (PLUS) delivers November 1987. Continue avionics hardware and software integration testing. Integrate Grumman software tapes. Commence radar/avionics flight testing (Jan 88) to include communications navigation instrumentation (CNI) displays, radar lock on modes, radar/stores management system (SMS) integration. Conduct DT/OT-IIA and B. Conduct NPDM IIIA for limited production decision for 7 F-14D aircraft. Conduct NPDM IIIB for limited production decision for 12 F-14D aircraft.

d. (U) FY 1989 Planned Program: Continue avionics and radar hardware/software integration and development. Conduct TA-3B radar support flights. Integrate Grumman software tape updates with increased capabilities. Continue flight testing to demonstrate: ECCM improvements, mixed missile launch, fault isolation, IRST/TCS/JTIDS/ALR-67/ASPJ operation, full radar modes/ NCTR, additional live weapons firing (PMTC). Conduct DT/OT IIC. Conduct NPDM IIIC for limited production decision for 19 F-14D aircraft.

e. (U) Program to Completion: Integrate final Grumman software tapes. Continue flight testing to complete demonstration of fully integrated engine, avionics, and radar upgrade. First F-14D production aircraft delivery in March 1990. Tests performed by prime contractor, radar contractor and other equipment suppliers will involve hardware performance (bench tests), flight worthiness, qualification, test, analyze and fix, and subsystem integration. Incremental software, Program Design Reviews and Critical Design Reviews will provide the Navy with the status of the software development process. As hardware and software development matures, total system integration will be achieved. Technical liaison with the Department of Defense directed programs will be accomplished throughout full-scale development to assure that the F-14D weapon system design is fully compatible with Air Force Common Joint Tactical Information Distribution System (JTIDS), ALR-67, Airborne Self-Protection Jammer, and Infrared Search and Track System. These systems will be integrated depending upon equipment availability. Throughout, Full Scale Development planning and analysis for logistic support will be conducted. Conduct DT-IID (TECHEVAL) and OT-IID (OPEVAL). Conduct NPDM IIID for full production decision.

Project - Emerging Technology reflects recognized requirement to integrate/insert new developing technology into the baseline F-14D configuration. Planned initiatives include Multi-sensor correlation, HARM/HARPOON weapon integration and possible low observable technology. Project - F-14 Squadrons reflects the long-term reoccurring P$^3$I initiatives required to allow upgrade to systems currently in development for system incorporation. These would include: IRST, advanced air-to-air weapons, additional radar upgrades and avionics systems improvments.

Program Element: 25667N Title: F-14 Upgrade

f. (U) Major Milestones:

| Milestone | Date |
|---|---|
| 1. Full Scale Development Contract Award | July 1984 |
| 2. Milestone II | March 1985 |
| 3. Contractor Development Testing | |
| First Flight (F110-400) | September 1986 |
| First Flight (Avionics/Radar) | January 1988 |
| 4. First Production F-14A (PLUS) | November 1987 |
| 5. Operational Evaluation (OPEVAL) | June 1990 |
| 6. First Production F-14D | |

I. (U) TEST AND EVALUATION DATA:

F-14 TEST DATA

A. (U) Development Test and Evaluation

1. (U) First flight of the F-14A took place in December 1970. Initial Operational Capability (first operational squadron) was in December 1973 after a series of contractor tests, Navy Preliminary Evaluations, and a Board of Inspection and Survey initial trials phase. The AWG-9 radar and AIM-54A PHOENIX missile have successfully performed their functions during firings at single and multiple targets within a large variety of flight geometries.

2. (U) The F-14A has been and is still today subject to operability and safety of flight deficiencies due to the stall margin of the Pratt and Whitney TF 30 engine. Approximately one in four of all F-14A accidents have been engine related. Satisfactory resolution of the stall margin problem requires a major redesign of the compressor section of the engine. Aircrews have been instructed to avoid flight regimes/engine operations which are prone to engine stalls. Engine bleeds (with associated thrust loss) have been incorporated to improve stall margin. A decision has been made by the Secretary of the Navy to resolve the operability problem through installation of the General Electric F110-400 engine in the FY-86 and subsequent F-14 production aircraft. A limited engine retrofit program is also planned.

3. (U) The F-14A was designed in the 1960s to counter the threat of the 1970s and 1980s. To successfully counter the projected threat of the 1990s and beyond a major weapon system upgrade was initiated to increase the operational capability of the F-14. Incorporation of F110-GE-400 engines will provide substantially improved aircraft performance, safety and operability. Procurement of F-14A(PLUS) aircraft (F-14 aircraft with the new engines) commenced in FY-86. Incorporation of an improved radar, using U.S. Air Force F-15 technology, and digital avionics will provide significantly increased capabilities, particularly in an electronic countermeasures environment. Initial procurement of F-14D aircraft, incorporating the new engines, radar and avionics, is planned for mid FY-88.

B. (U) Operational Test and Evaluation (OT&E)

1. (U) Operational test involvement by COMOPTEVFOR during the development phase was limited because the time frame was prior to establishment of current early OT&E policy incorporated in OPNAVINST 3960.10 series. However, a series of eleven partial OPEVAL's in diacrete phases were conducted from May 1977 to October 1979 after the F-14A was in production. COMOPTEVFOR concluded the F-14A weapons system significantly increased the existing capabilities of naval aviation. Some of the significant discrepancies cited in weapons system were:

| C. (U) Operational/Technical Characteristics | Objectives | Performance |
|---|---|---|
| (U) Fighter Escort Mission Radius (N.M.) | | |
| (U) Sustained Load Factor, .9M 35K (g) | 2.77 | 2.18 |
| (U) Acceleration .8M to 1.8M (minutes) | 2.04 | 2.19 |
| (U) Empty Weight (lbs) | 35,979 | 40,422 1/ |
| (U) AWG-9 Max Detection/Track (5M$^2$ tgt) (N.M.) | | |

1/ The F-14A experienced about an 8.3% weight growth from design go-ahead through 1st Quarter FY-80. At this point in development the F-4 had experienced 15.4% weight growth.

D. (U) Current Test and Evaluation Activity

T&E Activity (Past 12 Months)

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| F-14A(PLUS) First Flight | AUG 86 | 29 SEP 86 | Excellent results. Subsequent joint contractor/Navy testing evaluated the following engine development areas: performance measurements, throttle transients, flutter, calibrations, vibration, heat exchanger, fire warning, airstart envelope, augmentor and automatic power compensator (APC). |

T&E Activity (Next 12 Months)

| Event | Planned Date | Remarks |
|---|---|---|
| DT-IIA (F-14A(PLUS)) | FEB 87 | Formal evaluation of engine development parameters/areas listed above. To be conducted at Calverton, N.Y. |
| DT-IIB (F-14A(PLUS)) | APR 87 | Evaluation of Single Engine performance, environmental control system, airstarts. |

| | | |
|---|---|---|
| DT-11C (F-14A(PLUS)) | JUL 87 | Evaluation of Dual Chin Pod and carrier suitability. |
| DT/OT-11A (Radar) (TA-3B) | DEC 87 | Radar flight tests to demonstrate controls and displays, PDS and RWS modes, and BIST. |
| DT/OT-11A (Avionics) (F-14D) | JAN 88 | Avionics flight tests to demonstrate communications, navigation and identification functions and system integration. |

E. (U) Program Documentation

1. (U) COMOPTEVFOR PROJECT REPORTS

| Date | Title | Serial No. |
|---|---|---|
| 05 May 77 | OPEVAL of the F-14A/PHOENIX Weapons System | C154 |
| 18 Aug 77 | OPEVAL of the F-14A/PHOENIX Weapons System | S96 |
| 31 Aug 77 | OPEVAL of the F-14A/PHOENIX Weapons System | S103 |
| 30 Sep 77 | OPEVAL of the F-14A/PHOENIX Weapons System | S126 |
| 11 Oct 77 | OPEVAL of the F-14A/PHOENIX Weapons System | S128 |
| 12 Oct 77 | OPEVAL of the F-14A/PHOENIX Weapons System | S130 |
| 19 Dec 77 | OPEVAL of the F-14A/PHOENIX Weapons System | S152 |
| 23 Dec 77 | OPEVAL of the F-14A/PHOENIX Weapons System | S158 |
| 11 Jan 78 | OPEVAL of the F-14A/PHOENIX Weapons System | S5 |
| 01 Mar 78 | OPEVAL of the F-14A/PHOENIX Weapons System | C76 |

| | | |
|---|---|---|
| 07 Jun 82 | Follow-on OPEVAL of the F-14A M-61A1 Gun and Real-Time Gunsight | C135 |
| 31 Aug 82 | Second Navy Preliminary Evaluation of AWG-9 Update System (Block 5/200B) | S221 |
| 08 Feb 83 | Initial Operational Evaluation AWG-9 Update | S09 |

2. (U) PMTC TECHNICAL REPORTS (FINAL)

| | | |
|---|---|---|
| 29 May 81 | AWG-9 Update Navy Preliminary Evaluation Final Report | C273 |
| 11 Jan 83 | AWG-9 Update Second Navy Prreliminary Evaluation Final Report | S-14 |

3. (U) F-14D TEMP HAS BEEN APPROVED BY SECNAV, AWAITING AAPPROVAL BY OSD FOLLOWING NAVY/OPTEVFOR REVISION INCORPORATING OSD COMMENTS.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 2567ON
DoD Mission Area: 323 - TIARA for Tactical Warfare

Title: Tactical Intelligence Processing
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 1,375 | 2,396 | 2,081 | 2,155 | Continuing | Continuing |
| W0521 | Shipboard Tactical Intelligence Proc. | 1,375 | 2,396 | 2,081 | 2,155 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work or development phases through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This project studies and evaluates potential updates for the Intelligence Centers aboard aircraft carriers, amphibious command ships, and amphibious assault ships in order to meet fleet requirements. Updates investigated include developments in software, data bases and integration plans to support new intelligence readiness requirements for the sea control and power projection roles and hardware to replace the 20-year-old computers and peripherals now installed. This project directly contributes to the ability of 28 different ships/stations to meet their responsiblities in support of fleet users of intelligence information.

C. (U) COMPARISON WITH THE FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The differences between the funding profile contained in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: In FY 1987, an increase of 236 is the result of Department program/budget adjustments and a Congressional adjustment.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 2,026 | 1,454 | 2,160 | 2,128 | Continuing | Continuing |
| W0521 | Shipboard Tactical Intelligence Processing | 2,026 | 1,454 | 2,160 | 2,128 | Continuing | Continuing |

Program Element: 25670N Title: Tactical Intelligence Processing

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Other Procurement, Navy: (2433) | 14,694 | 9,595 | 10,299 | 10,950 | Continuing | Continuing |

E. (U) RELATED ACTIVITIES: Marine Corps Command/Control/Communication System, Program Element 26626M, Project C0062. Marine Air/Ground Intelligence System, uses same basic data and similar analysis as in the Aircraft Carrier Center and a close working relationship has been established with the Marine Air/Ground Intelligence System project to assure compatibility and non-duplication of development effort; Navy Command and Control System, System Engineering and Integration, PE 63763N. There is no unnecessary duplication of effort within the Navy or the Department of Defense.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Electronic Systems Engineering Activity Detachment, Philadelphia, PA, and Naval Surface Weapons Center, Dahlgren, VA. CONTRACTORS: Planning Research Corporation, McLean, VA; Aeroneutronic-Ford, Palo Alto, CA; Martin Marietta, Denver, CO; Bendix Inc., Mishawaka, IN; Northrop Corporation, Hawthorne, Ca; Sperry, St. Paul, MN.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W0521, Shipboard Tactical Intelligence Processing:

1. (U) Description: The Aircraft Carrier Intelligence Center, a subsystem of the Naval Intelligence Processing System, became operational in 1962 to provide intelligence required by operational commanders. Since then Intelligence Centers have been added to LCC's, LHA's, and LHD's (now under construction). These centers have had little developmental improvement, despite Commanders' demands for more and better intelligence information. Increased requirements have caused the CV Intelligence Center's data base to expand ten-fold to accommodate strike warfare information, amphibious intelligence, increased data flow from new reconnaissance systems and flag support for the sea control mission. Concurrent with data base expansion has come requirements to provide more timely intelligence in varied forms/formats to additional users throughout the task group. Miltiple developments are required to satisfy these requirements and to maintain state-of-the-art performance in the Intelligence Centers. They include hardware, software and system developments oriented toward providing timely support to commanders in balance with the spread of the threats.

Program Element: 25670N Title: Tactical Intelligence Processing

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Assessed computer programs for use with the graphic plotter.

° Continued study of software and data base requirements to support sea control and power projection missions with intelligence support.

° Completed development of the Fleet Imagery Support Terminal. Initiate Operational Test and Evaluation to obtain Approval for Full Production (AFP) decision.

° Initiated a study of storage and retrieval techniques and equipment for use with the shipboard Intelligence Closed Circuit Television Distribution System.

b. (U) FY 1987 Program:

° Complete the computer program study started in FY-86 for the graphic plotter for use in the amphibious ship intelligence centers, i.e. LHA-IC, LCC-IC, LHD-IC.

° Investigate a means to allow the shipboard intelligence centers to accommodate direct digital interfaces with other shipboard command and control systems, i.e. Tactical Flag Command Center (TFCC), Afloat Correlation System (ACS) and Advanced Combat Direction System (ACDS).

° Complete efforts in the storage and retrieval of imagery for the shipboard Intelligence Closed Circuit Television System.

° Provide and execute a plan to modify shipboard intelligence center software to use the DOD mandated JINTACCS (Joint Interoperability of Tactical Command and Control Systems) message standards.

° Initiate engineering to test the ability of the Fleet Imagery Support Terminal (FIST) to work with national and other service image distribution systems.

° Conduct engineering required to test the FIST program with the shipboard CCTV system for storage and distribution requirements.

Program Element: 25670N Title: Tactical Intelligence Processing

c. (U) FY 1988 Planned Program:

° Continue effort to allow the shipboard intelligence centers to support other shipboard command and control systems, e.g. Tactical Flag Command Center (TFCC), Afloat Correlation System (ACS), Electronic Warfare Coordinator's Module (EWCM) and Advanced Combat Direction System (ACDS).

° Continue execution of a plan to transition maintenance of the intelligence data base to use of the Joint Interoperability of Tactical Command and Control System (JINTACCS) message standards.

° Design an interface between the tactical intelligence centers afloat with the Defense Intelligence Agency data base via the Special Compartmented Intelligence (SCI) network.

° Develop changes to the intelligence centers to process and analyze information from new reconnaissance sensors in order to support the embarked air wing power projection mission.

° Continue development of the Fleet Imagery Support Terminal enhancements to utilize national source imagery and to interact with the shipboard closed circuit television storage and distribution system.

° Develop software, hardware and procedures to permit afloat intelligence centers to process the DIA Military Intelligence Integrated Data System/Integrated Data Base (MIIDS/IDB) structure using intelligence standard data base management systems and query languages.

d. (U) FY 1989 Planned Program:

° Complete shore based testing of the ability to integrate intelligence with other command and control systems.

° Conduct shorebased testing of an intelligence interface between tactical intelligence centers afloat and the DoD Intelligence Information System.

° Continue efforts in exploring means to process and analyze intelligence information from new sensors.

° Continue development of software, hardware and procedures to permit afloat intelligence centers to process the DIA Military Intelligence Integrated Data System/Integrated Data Base (MIIDS/IDB) structure using intelligence standard data base management systems and query languages.

Program Element: 25679N

Title: Tactical Intelligence Processing

° Investigate means to support micro-processors in the Battle Force Information Management architecture with a satisfactory intelligence data base.

° Assess the adequacy and/or need for enhancements to optical processing and storage for use with the CCTV systems, electro-optic processing and video transfer of imagery, shore-to-ship and ship-to-ship.

e. (U) Program to Completion:

° This is a continuing program.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 25674N
Title: Electronic Warfare Counter Response
DoD Mission Area: 372 - Escort, Stand-off and Counter C3
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 81,179 | 50,104 | 54,613 | 26,523 | Continuing | Continuing |
| W0556 | Electronic Warfare Counter Response | 76,227 | 48,297 | 51,879 | 26,523 | Continuing | Continuing |
| W1747 | EA-6B HARM Integration | 4,952 | 1,807 | 2,734 | 0 | 0 | 9,493 |

As this is a continuing program, the above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989 only.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element funds the continuing development and/or integration of all electronic warfare systems for the EA-6B tactical support aircraft. Major efforts include the development and integration of a new Advanced Capability (ADVCAP) Receiver Processor Group (RPG) and the integration of a communications jamming capability into the EA-6B. These efforts provide for the electronic countermeasure response to new generation/advanced threat weapon systems which are expanding in frequency, density and technical complexity. The EA-6B weapons system is designed for airborne detection and jamming of enemy command and control systems and radars associated with targeting, surveillance, anti-aircraft artillery, and air-to-surface, surface-to-surface and surface-to-air missiles. It will support carrier and advance based tactical aircraft operations in dense radar-controlled environments throughout the service life of the EA-6B. Integration of the AGM-88 HARM into the EA-6B, to improve selective anti-radiation missile targeting, is also contained within this program element.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) Project W1747 is increased 2,993 in FY 1986 and decreased 3,810 FY 1988 as a result of cost benefits from the SECNAV directed accelerated HARM integration program and inflation adjustments. The reduction of 6,819 in FY 1987 was from Congressional Action and Department Budget Adjustments. Congressional Action reduced project W0556 by 12,785 in FY 1987.

Program Element: 25674N Title: Electronic Warfare Counter Response

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 35,804 | 78,186 | 69,708 | 58,509 | Continuing | Continuing |
| W0556 | Electronic Warfare Counter Response | 35,804 | 76,227 | 61,082 | 51,965 | Continuing | Continuing |
| W1747 | EA-6B HARM Integration | 0 | 1,959 | 8,626 | 6,544 | 0 | 17,129 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: Air Force EF-111 under program element 64220F incorporates a variant of the ALQ-99 tactical jamming system. The integration into the EA-6B ADVCAP of a Tactical Command and Control Communications Countermeasures System, being developed under Program Element 64224N, Airborne Electronic Warfare Engineering, is funded by this program element. There is no unnecessary duplication of effort between this program and others within the Navy or the Department of Defense.

F. (U) WORK PERFORMED BY: IN HOUSE: Pacific Missile Test Center, Point Mugu, CA.; Naval Air Test Center, Patuxent River, MD; Naval Weapons Center, China Lake, CA; Naval Research Laboratory, Washington, DC; Naval Air Development Center, Warminster, PA; and Naval Avionics Center, Indianapolis, IN. CONTRACTORS: Grumman Aerospace Corporation, Bethpage, NY; Eaton Corporation, Deer Park, NY; Raytheon Corporation, Goleta, CA; Litton Amecon, College Park, MD; Applied Physics Laboratory, Laurel, MD; Sanders Associates, Nashua, NH; Teledyne Systems, Northridge, CA; Texas Instruments, Colorado Springs, CO; Texas Instruments, Ridgecrest, CA; Teledyne Microwave, Sunnyvale. CA; and five others.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W1747, EA-6B HARM Integration:

1. (U) Description: This project provides the integration efforts to improve selective anti-radiation missile targeting by integrating the AGM-88 HARM into the EA-6B weapon system. Major improvement in capability to be achieved is a higher probability of kill on the target radar sites.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

Program Element: 25674N Title: Electronic Warfare Counter Response

° Initiated production HARM integration program.

° Completed interim HARM integration for ICAP-II.

° Developed hardware integration approach and investigated tactical utilization.

b. (U) FY 1987 Program:

° Commence prototype HARM integration and installation study.

° Complete hardware qualification testing.

c. (U) FY 1988 Planned Program:

° Complete full scale development and flight test in EA-6B improved capability II (ICAP II).

(U) FY 1989 Planned Program: Not applicable

e. (U) Program to Completion: Not applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project WO556, Electronic Warfare Counter Response:

1. (U) Description: This project provides for the incorporation of electronic warfare equipment in tactical support aircraft (EA-6B) to provide an electronic countermeasures response to new threat systems. This is accomplished by continuing development and testing of the first comprehensive update of the EA-6B passive detection system to counter the migration of threat systems and the proliferation of systems of the current EA-6B tactical jamming system. This Advanced Capability (ADVCAP) receiver-processor-group (RPG) will counter in dense signal environments. The RPG will provide a reception capability and reduce jammer response times. This program also provides for integration of a Tactical Command and Control Communications

Program Element: 25674N Title: Electronic Warfare Counter Response

Countermeasures System in the EA-6B aircraft. Full scale development of the ADVCAP RPG began with Milestone II in February 1983 and subsequent development contract awards. The contract consists of three elements: Full Scale Development of the RPG engineering development models; development of the Integrated Logistics Support elements; and integration of the RPG and a communications jammer into the EA-6B.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Continued ADVCAP full scale engineering under firm fixed price contract.

° Fabricated the engineering development models.

° Commenced software development.

° Commenced integrated logistic support development.

° Commenced test bed aircraft modification/fabrication.

b. (U) FY 1987 Program:

° Deliver EA-6B ADVCAP RPG engineering development models.

° Conduct qualification tests and electromagnetic compatibility tests.

c. (U) FY 1988 Planned Program:

° Conduct reliability development and weapon replaceable assembly maintainability demonstration.

° Conduct other associated developmental tests, continue integration, logistics support development and test bed aircraft final assembly.

d. (U) FY 1989 Planned Program:

° Continue integration on EA-6B.

Program Element: 25674N Title: Electronic Warfare Counter Response

° Continue logistics support development.

° Conduct contractor flight tests.

° Continue software development.

e. (U) Program to Completion:

° Conduct software integration tests.

° Conduct initial Navy technical evaluation of ADVCAP RPG and ALQ-149.

° Continue integration on EA-6B.

° Continue logistics support development.

° Conduct contractor flight tests.

° Continue software development.

° Conduct initial operational test and evaluation leading to limited production decision.

° Completion of the technical and operational evaluation will support the rate production (M/S IIIB) decision programmed to occur in FY-91.

f. (U) Major Milestones:

| MILESTONE | DATE |
|---|---|
| 1. M/S II (FSED) | |
| 2. TECHEVAL | |
| 3. OPEVAL | |
| 4. M/S IIIA (Limited Production) | |

Program Element: 25674N

Title: Electronic Warfare Counter Response

5. M/S IIIB (Full Rate Production)
6. IOC

I. (U) TEST AND EVALUATION DATA: Attached

TEST DATA

A. (U) Development, Test and Evaluation.

1. (U) Development Test and Evaluation of the EA-6B is conducted by Navy aircrew and ground maintenance personnel assigned to the Naval Air Test Center (NAVAIRTESTCEN), Patuxent River, MD.

2. (U) The Navy Preliminary Evaluation (NPE I) was conducted in December 1968 utilizing an aerodynamic prototype aircraft. NPE II was conducted to revaluate corrections to NPE I deficiencies and resulted in satisfactory correction of all deficiencies except two items, which have subsequently been corrected.

3. (U) Navy Preliminary Evaluation III (NPE III) was conducted between 16 February and 6 March 1970 to determine the readiness of the avionics systems for the Board of Inspection and Survey (BIS) trials. All tests were conducted at the contractor's facility, Grumman Aerospace Corporation (GAC), Calverton, New York. The electrical, communications, navigation and identification systems functioned properly. The Tactical Jamming System (TJS) was capable of performing the basic functions of signal reception, processing the subsequent transmitter assignment, and radiation. Deficiencies causing inconsistant system operation were corrected prior to aircraft acceptance for BIS trials.

4. (U) The Flying Qualities and Performance Trials of the EA-6B aircraft, established by the BIS, were conducted at the NAVAIRTESTCEN from 1 May 1970 to 11 August 1971. The Navy Technical Evaluation (NTE) was conducted simultaneously with the performance trials. Eighty-four flights for a total of 174.6 flight hours were flown. The purpose of the trials was to evaluate the EA-6B aircraft for the tactical electronic countermeasure (ECM) mission and to determine specification compliance.

5. (U) The Navy Preliminary Evaluation (NPE) of the EA-6B Expanded Capability (EXCAP) Avionics System was conducted 1 to 8 August 1972 at Calverton, New York, by a team composed of personnel from NAVAIRTESTCEN and Air Test and Evaluation Squadron FIVE (VX-5). The purpose of the NPE was to define system deficiencies which would degrade performance of the tactical jamming mission and to ascertain whether the

EXCAP would be capable of undergoing subsequent BIS trials. In addition, certain IOT&E requirements were completed during NPE. The EXCAP system demonstrated an improved and expanded capability over present production systems.

6. (U) The BIS trials on the Expanded Capability version of the Tactical Jamming System were conducted at the NAVAIRTESTCEN from 14 May 1975 to 6 November 1975. The purpose of the BIS was to evaluate the Expanded Capability of the EA-6B for the tactical ECM mission and to determine specification compliance. Discrepancies identified were corrected.

7. (U) The Navy Preliminary Evaluation (NPE) of the EA-6B Improved Capability (ICAP) Avionics System was conducted between October 1975 and January 1976 at the contractor's facility, Calverton, New York, by a team supervised by NAVAIRTESTCEN which included participation by VX-5. The ICAP system satisfactorily demonstrated the desired improvements designed into the ICAP version.

8. (U) The Navy Technical Evaluation (NTE) of the ICAP System was conducted from April to August 1976 at NAVAIRTESTCEN. One hundred-two flights were flown. Discrepancy reports were prepared and corrective action taken.

9. (U) The Navy Preliminary Evaluations (NPE) I and II on the Improved Capability II (ICAP II) Avionics System were conducted from 17 - 25 November 80 and 15 - 29 June 81 respectively. The flights were conducted at the contractor's facility, Calverton, New York, by a team supervised by NAVAIRTESTCEN which included participation by VX-5. NPE II verified that the majority of discrepancies discovered in Navy Preliminary Evaluation (NPE I) were corrected. The Improved Capability (ICAP II) System demonstrated a significant improvement over the ICAP System.

10. (U) The ICAP II Board of Inspection & Survey BIS/TECHEVAL commenced 11 January 1982 and was successfully completed 8 April 1982 with the recommendation to commence operational evaluation (OPEVAL). Reliability and maintainability data gathered includes greater than 294 hours mean time between failures (MTBF) (no failures) for all ICAP II equipment except the Universal Exciter, which was 53 hours. Discrepancies reported were all minor and the majority will be corrected in production. The ICAP-II Tactical

Jamming System (TJS) exhibited excellent potential for the tactical jamming mission and was a significant improvement over the mission capability of the earlier ICAP system. TECHEVAL of the ASN-123 System and the ASN-130 inertial navigation system into the EA-6B was conducted from 8 February - 11 April 1983. No significant problems were encountered and a recommendation was made to commence OPEVAL.

11. (U) Final BIS trials for ICAP II were conducted 1 June - 31 July 1984. The aircraft was recommended for FOT&E as having excellent potential to perform the Tactical Electronic Warfare mission. Additional reliability data on the Universal Exciter was gathered concurrently with Follow-on Test & Evaluation (FOT&E).

12. (U) DT Testing for interim HARM on EA-6B was successfully completed in July 1986.

13. (U) The Naval Air Systems Command (PMA-234) is the EA-6B program manager.

B. (U) Operational Test and Evaluation

1. (U) The EA-6B program preceded DOD and Navy test and evaluation policies which are now incorporated in DOD Directive 5000.3 and OPNAVINST 3960.10.

2. (U) Operational Test and Evaluation is conducted by Navy aircrew assigned to VX-5 under the guidance of Commander Operational Test & Evaluation Force (COMOPTEVFOR). Maintenance is performed by Navy technicians assigned to the fleet squadrons at Naval Air Station (NAS) Whidbey Island, Washington.

3. (U) The Navy Operational Evaluation (OPEVAL) of the EA-6B Tactical Jamming aircraft consisted of four phases. Phase I was a quick reaction, limited scope OPEVAL conducted from May to October 1971. Its primary purpose was to provide the first deploying squadrons with information relating to the capabilities/limitations and tactical employment of the aircraft. Phase II was established to accomplish those testing goals not achieved during the compressed time frame of Phase I. Flight testing was done in incremental fashion from January 1972 to May 1973. Its purpose was to determine the operational effectiveness of the basic EA-6B against various threat radar and missile systems not tested during Phase I. It was found that the basic EA-6B was operationally effective within the constraints of its frequency capability but was subject to several limitations.

4. (U) Phase III was a two part operational evaluation of the EA-6B Expanded Capability (EXCAP) aircraft. Initial operational test and evaluation (OT&E) was conducted at the contractor's facility during the developmental test cycle from June 1972 to February 1973. On-site observers witnessed operationally significant testing and analyzed test results in order to provide an early assessment of the EXCAP Tactical Jamming System. Three partial reports were published in 1972 and 1973. The second part of Phase III consisted of analytical study efforts and flight testing conducted by Air Test and Evaluation Squadron FIVE (VX-5). This effort was accomplished incrementally over a 17 month period from July 1973 to November 1974 and primarily addressed new band capabilities and their effectiveness against land and sea threats. Major test results, promulgated in the PHASE III final report, recommended that exciters for bands 5/6, 7, 8 and 9 tactical jamming pods be approved for service use. OPEVAL of the incorporation of the ASN-130 inertial navigation system and the ASN-123 display system was conducted 12-24 April 1983. No significant problems were discovered. The final report was released by OPTEVFOR on 7 July 1983 and recommended approval for full production.

5. (U) Phase IV was assigned by Chief of Naval Operations (CNO) in September 1974 to make operational assessment of EA-6B Improved Capability (ICAP) peculiar capabilities and equipment, and to develop tactics for optimum employment of the ICAP Tactical Jamming System. Phase IV included follow-on tests and evaluation deemed necessary to continue tactics development for all EA-6B models. ICAP OPEVAL, conducted by VX-5, commenced in October 1976. It was terminated in February 1977 due to software deficiencies. Subsequently, it was rescheduled and completed in September 1977. Two reports were written by COMOPTEVFOR regarding Phase IV assessment of ICAP. The first report, dated 17 May 1978, estimated that the EA-6B ICAP aircraft possessed minimum acceptable effectiveness for typical operational missions. The second report dated 7 March 1979 concluded that the EA-6B ICAP has the potential to be operationally suitable.

6. (U) Numerous evaluations have been conducted and reports have been published by COMOPTEVFOR on EA-6B tactics and effectiveness against specific threat systems.

7. (U) An initial operational test of the ICAP II system was completed 23 July 1981. Test results indicated the system had the potential to be operationally effective and suitable. COMOPTEVFOR recommended provisional approval for service use (PASU) for ICAP II which was granted on 19 April 1982. OPEVAL for ICAP II commenced in May 1982 and was completed 26 July 1982. The final report concluded that the ICAP II EA-6B

configuration was operationelly effective and potentially operationally suitable. COMOPTEVFOR recommended an extension of the previously granted approval for limited production (formally PASU). OPEVAL of the ASW-125 display system and the ASN-130 inertial navigation system was conducted 12-24 April 1985. The final report by OPTEVFOR recommended approval for full production but not fleet introduction until deficiencies were corrected. These deficiencies were corrected and tested during ICAP II OT-III which was conducted from August 1984 to May 1985. COMOPTEVFOR concluded that the EA-6B ICAP II system is operationally effective and potentially operationally suitable. Limited fleet introduction was recommended. Reorganizing approval for full production was granted.

8. (U) An operational assessment of interim HARM on the EA-6B was successfully completed July 1986.

C. (U) SYSTEM CHARACTERISTICS

1. (U) Operational

a. Speed (Kts)
   (1) Max at Sea Level
   (2) Stall Speed (Power Approach)
b. Specific Range at Optimum Altitude (NM/lb)
c. Takeoff Distance (over 50' obstacle) (ft)
d. Radius/Range (Combat) (NM)
e. Combat Ceiling Altitude (ft)
f. Mission Reliability
g. Maintainability
   (1) Standard Depot Level Maintenance (SDLM) cycle (month)
   (2) Maintenance Man-Hours per Flight Hour
h. Weight (Takeoff) (lb) (Carrier)
i. Dimensions (Length/Span) (ft)

2. (U) Technical (Electronic Warfare System)

a. Average Radiated Power (WATT/MHZ)
Band 1
Band 2
Band 4
Band 5/6
Band 7
Band 8
Band 9

b. DF Accuracy (Deg. Error)
Band 1
Band 2
Band 4
Band 5/6
Band 7
Band 8
Band 9

D. (U) Current Test and Evaluation Activity

T&E ACTIVITY (PAST 12 MONTHS)

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| Interim HARM on ICAP II | Feb 86 - July 86 | Feb 86 - July 86 | COMPLETE - Recommendation for interim capability submitted. |

T&E Activity (Next 12 Months)

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| ICAP II Block 86/HARM | Jan - Jun 88 | | |

8. (U) Program Documentation

DEVELOPMENT AND TEST PROJECT REPORTS

| Date | Title | Serial No. |
|---|---|---|
| 1968 | EA-6B | WST-0016R-68 |

CONOPTEVFOR PROJECT REPORTS (CONTINUED)

| Date | Title | Serial No. |
|---|---|---|
| 1970 | BIS EA-6B | WST-00016R-70 |
| 1971 | EA-6B | WST-004R-71 |
| 1971 | BIS EA-6B | WST-0023R-71 |
| 1972 | NPE EA-6B | WST-0024R-72 |
| 3' MAY 19,4 | EXCAP EA-6B | WST-S9R-74 |
| 5 NOVEMBER 1975 | NPE EA-6B ICAP/ALQ-99 TJS | SA-70R-75 |
| 16 APRIL 1976 | NPE ICAP ALQ-99 TJS | SA-C10R-76 |
| 08 NOVEMBER 1977 | SERVICE ACCEPTANCE TRIALS & TECH EVAL OF ICAP EA-6B; FINAL REPORT | S58 |
| 08 NOVEMBER 1977 | EA-6B ICAP BIS | SA-S5R-77 |
| 24 MARCH 1979 | SERVICE ACCEPTANCE TRIALS & TECH EVAL OF ICAP EA-6B; FINAL REPORT | 506G1/5351006 |
| 26 AUGUST 1981 | NAVY PREL EVAL OF AN/ALQ99 SYS IN EA-6B ICAP II AIRPLANE | SY-S72R-81 |
| 9 MARCH 1982 | NAVY PREL EVAL OF AN/ALQ99 SYS IN EA-6B ICAP II AIRPLANE | SY-S34-82 |

| | | |
|---|---|---|
| 21 SEPTEMBER 1982 | ICAP II INITIAL TRIALS PHASE & NAVY TECH EVAL OF SERVICE ACCEPTANCE TRIALS, PROJ BIS 21523 FINAL REPORT | S2 |
| 4 AUGUST 1983 | BIS REPORT ICAP II | SY-S54H-82 |
| 30 MARCH 1984 | EA-6B ICAP II TEST AND EVALUATION MASTER PLAN | TEMP 591 |
| 17 AUGUST 1984 | BIS REPORT (PRELIMINARY) - ICAP II | SY-C29R-84 |
| 02 May 72 | OPEVAL of the EA-6B Tactical Electronic Warfare Aircraft (PH I) | 0053 |
| 21 Sep 72 | OPEVAL of the EA-6B Tactical Electronic Warfare Aircraft (PH III) | 0079 |
| 28 Feb 73 | Initial Operational Test and Evaluation of the EA-6B (EXCAP) Tactical Electronic Warfare Aircraft (PH III) | S17 |
| 06 Jun 73 | Initial Operational Test and Evaluation of the EA-6B EXCAP Tactical Electronic Warfare Aircraft (PH III) | S47 |

COMOPTEVFOR PROJECT REPORTS (CONTINUED)

| Date | Title | Serial No. |
|---|---|---|
| 04 Apr 74 | OPEVAL of the EA-6B Tactical Electronic Warfare Aircraft (PH II) | S22 |
| 06 Jul 76 | OPEVAL of the EA-6B EXCAP (Expanded Capability) Tactical Electronic Warfare Aircraft (PH III) | S62 |
| 07 Jul 77 | OPEVAL Effectiveness EA-6B Tactical Jamming System Against Missile Beacon Tracking Channel SA-3 | S67 |
| 17 May 78 | OPEVAL of the EA-6B ICAP Aircraft | S38 |
| 07 Mar 79 | OPEVAL of the EA-6B ICAP Aircraft | 279 |
| 24 Aug 81 | Initial Operational Test and Evaluation of EA-6B ICAP II | N/A |
| 16 Dec 82 | Operational Evaluation of the EA-6B ICAP II (Improved Capability II) Airplane | S77 |
| 08 Jun 83 | OPEVAL of EA-6B ICAP II (Discrepancy Reports) | C170 |
| 07 Jul 83 | OPEVAL of ECP-367 for EA-6B ICAP-I | 967 |
| 05 Jul 85 | Follow on Operational/Evaluation of the EA-6B ICAP II (Improved Capability) Aircraft | S53 |

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 25675N
DOD Mission Area: 233 - Anti-Submarine Warfare

Title: Operational Reactor Development
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 12,025 | 18,310 | 35,497 | 39,587 | Continuing | Continuing |
| S1303 | Operational Reactor Development | 12,025 | 18,310 | 35,497 | 39,587 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: A growing amount of the Naval Nuclear Propulsion Program's research and development effort is directed toward improvements to existing nuclear propulsion plants. This program element provides for testing, evaluating, modifying, and improving components and systems for operating reactor plants. This effort is necessary to ensure the continued safe and reliable operation of naval nuclear propulsion plants. Beginning in FY 1988, work is being transferred into Operational Reactor Development from two other program elements. The nuclear propulsion work in TRIDENT (PE 11278N) has become generic enough in nature that it should properly be funded under Operational Reactor Development (less component development which will go to PE 63570N). Accordingly, TRIDENT (PE 11278N) is reduced by the value of the transferred nuclear propulsion work. Secondly, to better categorize nuclear refueling and servicing equipment development work, this work and associated funding is being transferred from Advanced Nuclear Reactor Components and Systems Development (PE 63570N) into this program element.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: The increase of +12,752 in FY 1988 is due to the transfer of effort and funds from TRIDENT (PE 11278N) and Advanced Nuclear Reactor Components and Systems Development (PE 63570N, Project S1758).

Program Element: 25675N

Title: Operational Reactor Development

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 12,791 | 12,719 | 18,872 | 22,745 | Continuing | Continuing |
| S1303 | Operational Reactor Development | 12,791 | 12,719 | 18,872 | 22,745 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: Work conducted under this program element is closely coordinated with other naval nuclear propulsion research and development program elements (PE 62324N, Nuclear Propulsion Technology, and PE 63570N, Advanced Nuclear Reactor Components and Systems Development) and with research and development work on nuclear reactor plants conducted by the Department of Energy.

F. (U) WORK PERFORMED BY: CONTRACTORS: Westinghouse Electric Corporation, Bettis Atomic Power Laboratory and Plant Apparatus Division, Pittsburgh, PA; General Electric Company, Knolls Atomic Power Laboratory and Machinery Apparatus Operation, Schenectady, NY.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project S1303, Operational Reactor Development:

1. (U) Description: This program encompasses the growing effort to test, evaluate, modify, and improve syatems and components in operational reactor plants.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Analyzed reactor component performance, evaluated operational data, and continued thermal and hydraulic analyses of various reactor plants to ensure continued safe and reliable operation.

Program Element: 25675N Title: Operational Reactor Development

° Continued thermal and hydraulic core analyses of various reactors to ensure operating performance is within design limits.
° Carried out thermal and hydraulic testing and analysis of D2W reactors for backfitting into

° Analyzed and tested structural hardware to ensure safe and reliable operation.
° Conducted autoclave and shock testing of lead unit modified stator to be used with control rod drive mechanism.
- Incorporated revised head area components for modified stator into power unit design.
- Continued design engineering for control rod drive mechanism.
° Continued testing of reactor components to characterize stress corrosion.
° Conducted design reviews of various reactor systems and components to resolve emergent problems.
° Initiated work on improved testing devices for

b. (U) FY 1987 Program:

° Resolve design issues, evaluate engineering tests, and provide thermal and hydraulic analyses of various reactor plants and components to ensure continued reliability.
° Analyze core thermal and hydraulic performance of various operating reactor plants to ensure thermal design limits are not exceeded during core lifetime.
° Continue testing to ensure the reactor will be compatible with existing ship design.
° Continue structural testing of components and hardware to ensure integrity during core life.
° Continue work on a modified stator to power control rod drive mechanism.
- Complete shock testing of lead units.
- Continue design effort to adapt control rod drive mechanisms.
° Correlate component and shipboard noise data to ensure prototypic tests of components.
° Continue testing of reactor components and materials to identify potential stress corrosion cracking concerns in reactor plants.
° Develop and test improved and ultrasonic test inspection methods, and new technology for processing test signals.
° Develop reactor plant noise test procedures and transmission evaluation methods to eliminate unacceptable noise sources.

c. (U) FY 1988 Planned Program:

° Resolve emergent system and component deficiencies identified through testing and operational data for all classes of nuclear powered submarines and surface ships.

° Perform prototypic testing of reactor plant systems and components to confirm reliable operation and design performance standards.

° Design and develop reactor, servicing and equipment and methods to support refuelings and overhauls of naval nuclear propulsion plants. Efforts include:

- Preparation of D2W reactor servicing procedures and performing D2W refueling system checkout.
- Continuing design effort for S8G prototype and shipboard refuelings.
- Beginning design effort for refueling procedures for use with SSN 688 Class submarines.
- Continuing design effort to support A1W refueling and performing system checkout and acceptance testing of the waterborne expended fuel container.
- Providing designs for nuclear fuel and irradiated core component shipping containers.

° Perform thermal, hydraulic, and mechanical analyses to evaluate reactor and reactor component performance to ensure that thermal design limits are not exceeded during lifetime of operating reactor plants. Work includes thermal/hydraulic analyses to:

- Evaluate reactor
- Provide impact assessments to support reactor plant equipment and design changes.
- Support reactor operating life extensions.

° Continue stress, vibration, and brittle fracture analyses of core reactor hardware.

° Continue modified stator development for the control rod drive mechanism to further improve reliability and to reduce maintenance costs.

° Conduct modified stator life cycle testing in a prototypic environment to confirm design.

° Continue work on improved eddy current testing and inspection techniques.

° Provide noise test procedures and methods for conducting noise diagnostic tests on operating ships, support shipboard noise tests and evaluate mechanical design problems, and perform noise tests on operating reactor plants.

° Develop new chemical cleaning process to

° Design and test valve improvements to correct operational problems.

d. (U) FY 1989 Planned Program:

° Resolve emergent system and component deficiencies identified through testing and operational data for all nuclear powered warships.

° Conduct prototypic testing of reactor plant systems and components to ensure reliable operation and design conformance.

Program Element: 25675N Title: Operational Reactor Development

- ° Develop reactor servicing and annealing equipment and methods for naval nuclear propulsion plants.
- ° Perform thermal, hydraulic, and mechanical analyses to evaluate reactor and reactor component performance.
- ° Continue stress, vibration, and brittle fracture analyses.
- ° Continue modified stator development and testing.
- ° Develop noise tests and support noise reduction efforts for operating ships.
- ° Continue development of steam generator tube inspection techniques and steam generator cleaning methods.
- ° Develop corrections to operational valve problems.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones: Not Applicable

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 26313M
DoD Mission Area: 345 - Tactical Communications

Title: Marine Corps Telecommunications
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 5,772 | 7,658 | 8,306 | 8,895 | Continuing | Continuing |
| C0040 | Satellite Communications Equipment | 272 | 824 | * | * | * | * |
| C0043 | Landing Force Integrated Communications Systems Implementation | 390 | ** | ** | ** | ** | ** |
| C0048 | Communications Terminal Improvements | 5,110 | 3,969 | 3,054 | 4,114 | Continuing | Continuing |
| C1931 | Communications Ancillary Equipment | 0 | 2,865 | 1,238 | 1,121 | Continuing | Continuing |
| C1975 | Tactical Communications Center | 0 | 0 | 4,014 | 3,660 | Continuing | Continuing |

* Funding consolidated into C1931, Communications Ancillary Equipment in this program element in FY 1988 and beyond.
** Funding line for Landing Force Integrated Communications Systems Implementation, Project C0043, will be terminated in FY 1987 and beyond.

As this is a continuing program, the above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for the development and improvement of Marine Corps ground telecommunications items not being developed within the chartered responsibilities of the Joint Tactical Communications Agency. Equipments developed within this program support the mission area of command and control and are those equipments upon which command and control is totally dependent.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: Satellite Communications Equipment: The FY 1897 decrease of 552 is due to undistributed Congressional reductions to this program element. Communications Terminal

Program Element: 26313M Title: Marine Corps Telecommunications

Improvements: The FY 1986 increase of 2,181 is due to acceleration of development for the Tactical Communications Center, a Marine Corps Combat telecommunications warfighting deficiency. The FY 1987 decrease of 3,350 is due to undistributed Congressional reductions to this program element. The FY 1988 decrease of 2,945 is due to increased cost specificity for estimates of product improvements to these equipments. Communications Ancilliary Equipment: The FY 1988 decrease of 2,895 is due to display of the Tactical Communciations Center as a separate line item beginning in FY 1988. Tactical Communications Center: A separate line item in FY 1988 for a hardware improvement previously contained in C0048, Transmission Subsystem Improvements in this program element.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 6,514 | 3,387 | 11,644 | 14,559 | Continuing | Continuing |
| C0040 | Satellite Communications Equipment | 240 | 278 | 1,376 | 4,427 | Continuing | Continuing |
| C0043 | Landing Force Integrated Communications Systems Implementation | 604 | 380 | * | * | * | * |
| C0048 | Communications Terminal Improvements | 5,670 | 2,929 | 7,319 | 5,999 | Continuing | Continuing |
| C1931 | Communications Ancillary Equipment | 0 | 0 | 2,949 | 4,133 | Continuing | Continuing |

* Funding line for Landing Force Integrated Communications Systems Implementation, Project C0043, will be terminated in FY 1987 and beyond.

** New project line with efforts formerly contained in C0048, Communications Terminals Improvements. Separate program status for cost and Congressional oversight.

As this is a continuing program, the above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1988 only.

Program Element: 26313M Title: Marine Corps Telecommunications

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| C0040 | Satellite Communications Equipment | | | | | | |
| | AN/TSC-96 Modification | - | - | - | 1,703 | - | 1,760 |
| | (qty) (RON 140132) | - | - | - | (10) | - | (10) |
| C0048 | Communications Terminal Improvements | | | | | | |
| | AN/PSC-2 (Digital Communications Terminal | - | 7,574 | 17,316 | 24,201 | - | TBD |
| | (qty) (RON 041703) | - | (260) | (581) | (873) | - | TBD |
| | AN/PRC-104, AN/GRC-139A, AN/MRC-138 Anti-Jam Mod | - | - | - | 7,653 | TBD | TBD |
| | (qty) (RON 047239) | - | - | - | (592) | TBD | TBD |
| | SINCGARS | - | - | - | - | TBD | TBD |
| | (qty) (RON 043638) | - | - | - | - | TBD | TBD |
| | Linear Power Amplifier/Multicoupler | - | - | - | - | TBD | TBD |
| | (qty (RON 041098) | - | - | - | - | TBD | TBD |
| | ANDVT TACTERM | 1,476 | 2,681 | 2,420 | 2,691 | TBD | TBD |
| | (qty) (RON 041248) | (34) | (75) | (75) | (75) | TBD | TBD |
| C1931 | Communications Ancilliary Equipment | | | | | | |
| | AN/MSC-63A Tactical Comm Center | - | - | 9,887 | 10,167 | TBD | TBD |
| | (qty) (RON 041113) | - | - | (12) | (12) | TBD | TBD |
| | Reproduction/Distribution Facility | 3,745 | - | - | - | TBD | TBD |
| | (qty) (RON 041113) | (41) | - | - | - | TBD | TBD |

*TDE CONSISTS OF VARIOUS QUANTITIES OF 3 DIFFERENT COMPONENTS.

E. (U) RELATED ACTIVITIES: U.S. Marine Corps project Tactical Satellite Communications Equipment is related to Navy Program Element 33109N, Satellite Communications, Army Program Element 33142A, Satellite Communication Ground System and Air Force Program Element 63431F, Advance Space Communications. The Navy equipment was shelterized for use in the field and the Army project is being monitored and influenced to ensure USMC requirements are met. USMC project Communications Terminal Improvement

is related to Navy Program Element 33401N, Communication Security. The U.S. Marine Corps is participating jointly with each of the other Services and the National Security Agency in developing secure voice equipment.

F. (U) WORK PERFORMED BY: IN-HOUSE: Electromagnetic Compatibility Analysis Center, Annapolis, MD; Naval Ocean Systems Center, San Diego, CA; Naval Electronic Systems Engineering Center, Vallejo, CA; Naval Avionics Facility, Indianapolis, IN; Naval Electronics System Security Engineering Center, Washington, DC; MCLB, Albany, GA; MCLB, Barstow, CA. CONTRACTORS: Cincinnati Electronics Company, Cincinnati, OH; Hughes Aircraft, Fullerton, CA; Magnavox Company, Fort Wayne, IN & Torrance, CA; Litton Data Systems, Van Nuys, CA; National Security Agency, Fort Meade, MD; Harris Corporation, Rochester, NY; and Collins Radio Group, Cedar Rapids, IA., PACER Systems, Inc., Chippewa Falls, WI.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Projects C0040, Satellite Communications Equipment:

1. (U) Description: This project will monitor and influence the development of tactical Ultra High Frequency, Super High Frequency and Extremely High Frequency satellite communication terminals for the Fleet Marine Forces.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Completed a Manpower/Training Impact Analysis for the Single Channel Objective Tactical Terminal use in Milstar Network.
- Identified, evaluated and recommended to the Commandant of the Marine Corps new Test, Measurement, and Diagnostic Equipment/Automated Test Equipment systems required to support satellite equipment.
- Continued AN/TSC-96, Satellite Communications Terminal, product improvement (design/develop prototype).
- Completed Manpower/Training Impact Analysis for Single Channel Objective Tactical Terminal use in Milstar networks.
- Continued studies associated with Single Channel Objective Tactical Terminal (link and network analysis).
- Monitored other service satellite programs of potential interest to the Marine Corps.

b. (U) FY 1987 Program:

- Continue to monitor other service programs for tactical Ultra High Frequency/Super High Frequency/ Extremely High Frequency satellite communications terminals for the Fleet Marine Force.
- Continue studies associated with Single Channel Objective Tactical Terminal use in Milstar Networks.
- Continue AN/TSC-96, Satellite Communications Terminal, Product Improvement (Build/Test prototype)
- Prepare to participate in Army operational testing of Single Channel Objective Tactical Terminals.
- Investigate the modification (embedded crypto and advanced narrowband digital voice terminal compatibility) of a fielded ultra high frequency manpack radio.

c. (U) FY 1988 Planned Program:

- Consolidate this effort into C1931, Communications Ancilliary Equipment in this program element.

(U) Project C0048, Communications Terminal Improvements:

1. (U) Description: This project develops/monitors new items in the areas of High Frequency/Very High Frequency/Ultra High Frequency radio, system integration, multi-channel transmission systems. This program also provides support for tasks not incorporated under ongoing projects, and ensures that during development of communication-electronic equipment, precautions are taken to prevent the equipment from causing or being the victim of radio interference when deployed. Finally, this program develops/monitors new items of communications terminal equipment to support the communication of record and data traffic for all tactical users with emphasis on the Tactical Communications Center.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Determined the suitability and operational capabilities of the Naval Ocean Systems Center developed antenna, High Frequency Long-Haul Antenna, and the steerable Null Processor Group (OL-275/VRC).
- Tested/evaluated/approved for service use the AN/PRC-113 radios.

Program Element: 26313M Title: Marine Corps Telecommunications

- Contracted for procurement of the AN/GRC-171A(V)2 Ultra High Frequency Radio for HAVE QUICK modification test and evaluation.
- Continued procurement of AN/PRC-68 radio.
- Provided electromagnetic compatibility support not directly attributable to HAVE QUICK testing and other non-specific projects.
- Commenced fabrication of and (first article testing) OE-334 after approval for service use.
- Continued to identify potential problems and recommend corrective action for the Marine Air Command and Control Shelterized Radio System (OE-334).
- Developed a variety of equipment interfaces for the AN/UGC-74 teletype to provide a near-term Tactical Communications Center capability and supported and tested the UGC-74 bubble memory modification.
- Conducted maturity developmental testing for Single Channel Ground-Air Radio system.
- Developed two test pre-production models of a tactical communication center reproduction/distribution facility.
- Implemented product improvement to the software for the AN/PSC-2 Digital Communications Terminal, AN/UCC-74,Teletype.
- Developed and initiated testing of RC-292 very-high frequency antenna for broadband application.
- Fielded an AN/TRQ-35 tactical frequency management system.
- Completed the design and testing of AN/UGC-74 teletype equipment interfaces.
- Initiated and developed a very high frequency multicoupler capability for vehicular and mobile applications.
- Completed the tactical communication center reproduction/distribution facility test and final pre-production design.
- Conducted first article test of OE-334/TRC, Shelterized Radio System, and proceeded to full scale production.
- Monitored frequency hopping enhancements to existing ultra high frequency radios and developed handbooks for those radios.

Program Element: 26313M Title: Marine Corps Telecommunications

- Completed development of new communication protocol and messages for the AN/PSC-2, Digital Communications Terminal.
- Completed testing of the RC-292 antenna modification and incorporated changes proposed by test.
- Initiated development of AN/MRC-139, Digital Wideband Transmission System.
- Continued testing and evaluation of tactical antennas.
- AN/MSC-63A tasks conducted under this project number described under project number C1975, this program element.

b. (U) FY 1987 Program:

- Initiate efforts to obtain a Global Positioning Satellite timing source for Marine Corps HAVE QUICK II (ECCM) capable ultra high frequency radios.
- Test the HAVE QUICK portion of the AN/GRC-171A(V)2, Ultra High Frequency Radio, and field the system.
- Perform FOT&E and field the steerable Null Processor Group (CL-275/VRC).
- Continue development efforts to incorporate ECCM capability in high frequency radios.
- Proceed to production of the AN/GRC-171 A(V) 4 HAVE QUICK capable, ultra high frequency radio.
- Contract for prototype AN/MRC-139's, Digital Wideband Transmission System.
- Field the AN/PRC-113 and AN/VRC-83 Ultra High Frequency Radios.
- Complete Digital Communications Terminal protocol enhancements.
- Initiate development efforts for an automated frequency management and CEDI system.

c. (U) FY 1988 Planned Program:

- Contract for prototype AN/TRC-120 High Frequency Communications Centrals.
- Complete development and operational testing of Short Term Anti-Jam in the High Frequency Anti-Jamming Program.
- Field the AN/GRC-171 A(V)4 HAVE QUICK Radio.

Program Element: 26313M Title: Marine Corps Telecommunications

- Accept delivery of AN/MRC-139, Digital Wideband Transmission System Prototypes.
- Conduct AN/MRC-139 Developmental/Operational Testing.
- Continue development efforts to obtain a Global Positioning System time source for Ultra High Frequency Anti-Jamming Radios.

d. (U) FY 1989 Planned Program:

- Achieve approval for service use for AN/MRC-139, Digital Wideband Transmission System.
- Continue development efforts for an automated frequency management and CEDI System.
- Initiate very high frequency multicoupler test and integration efforts within the Marine Corps command and control systems.
- Conduct Developmental/Operational Testing of AN.TSC-120 High Frequency Communications Centrals.

e. (U) Program to Completion: This is a continuing program.

(U) Project C1931, Communications Ancillary Equipment:

1. (U) Description: This project provides research and development in communications security frequency requirements and management, and the improvement of tactical radio ancillaries.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Completed development of prototypes of field expedient antenna kits for very high frequency and high frequency radios.
- Conducted operational test and evaluation of first article OE-334, Shelterized Radio System.

Program Element: 26313M

Title: Marine Corps Telecommunications

b. (U) FY 1987 Program:

- o Assemble the first production unit of the OE-334, Shelterized Radio System.
- o Continue development of the command, control, and communications information system.
- o Initiate program documentation for field expedient antenna kits for Marine Corps Very High and High Frequency radios.
- o Initiate and develop very high frequency and high frequency multicoupler capability for vehicular and mobile applications.
- o AN/MSC-63A, Tactical Communications Center tasks described under Project C1975 this program element.
- o Transition Tactical Communications Center subproject to Project C1975, a separate line item in this program element.

c. (U) FY 1988 Planned Program:

- o Begin developmental efforts of a 30-88 megahertz vehicular wideband Frequency Hopping Antenna.
- o Field the OE-334, Shelterized Radio System.
- o Continue testing and development of Field Expedient Antenna kits.

d. (U) FY 1989 Planned Program:

- o Continue testing and evaluation of Field Expedient Antenna kits.
- o Continue development of the vehiclar wideband frequency hopping antenna.

e. (U) Program to Completion: This is a continuing program.

Program Element: 26313M Title: Marine Corps Telecommunications

(U) C1975, Tactical Communications Center

1. (U) Description: This project will develop operational software, training and maintenance programs in support of the AN/MSC-63A, Tactical Communication Center, building on the technological base of the AN/MSC-63A, special security communication center, developed for intelligence. This is a modification of an off-the-shelf intelligence system for general service record message traffic. This system replaces the AN/TYC-5A and the AN/TGC-37.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o This program was contained in project C0048, Communications Terminal Improvements in this program element.
- o Initiated a new software program for the AN/MSC-63A, Tactical Communications Center, to provide a tactical communication center capability.
- o Completed construction of two prototype systems.
- o Continued software independent verification and validation.

b. (U) FY 1987 Program:

- o This program was contained in project C1931, Communications Ancillary Equipment in this program element.
- o Conduct development/operational tests for the AN/MSC-63A, Tactical Communication Center.
- o Continue software independent verification and validation.
- o Conduct environmental testing of hardware.
- o Obtain limited production decision to purchase long term lead items of GFE in FY 1988.
- o Initiate Communication Simulation block upgrade.
- o Initiate Tri-Tac Mode VI block upgrade.
- o Develop a Staff Users Guide Manual.

c. (U) FY 1988 Planned Program:

- o Complete software and system-level testing.
- o Complete operational testing.
- o Continue Communication Simulation block upgrade.
- o Continue Tri-Tac Mode VI block upgrade.
- o Continue software development verification and validation.

d. (U) FY 1989 Planned Program:

- o Full production decision.
- o Initiate software pre-planned product improvements.
- o Continue software independent verification and validation.

e. (U) Program to Completion: This is a continuing program.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 26623M
DOD Mission Area: 212 - Indirect Fire Support
211 - Direct Fire Combat

Title: Marine Corps Ground Combat/Supporting Arms Systems (Operational Systems)
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 39,224 | 58,156 | 56,485 | 44,136 | Continuing | Continuing |
| C0010 | Shoulder-Launched Multipurpose Assault Weapons | 16,056 | 4,089 | 7,424 | 2,309 | Continuing | Continuing |
| C0018 | Fire Support Systems Product Improvements | 263 | 1,894 | 748 | 1,430 | Continuing | Continuing |
| C0021 | Assault Amphibious Vehicle 7A1 Product Improvement Program | 3,943 | 10,717 | 15,597 | 19,113 | Continuing | Continuing |
| C0027 | Modular Universal Laser Equipment | 524 | ** | ** | ** | - | - |
| C0085 | Amphibious Reconnaissance Equipment | 909 | 2,537 | *** | *** | Continuing | Continuing |
| C1120 | Air Defense Missile Systems | 7,600 | 2,468 | 1,63[illegible] | 1,828 | Continuing | Continuing |
| C1555 | Light Armored Vehicle-Product Improvement**** | (13679) | 24,188 | 6,437 | 7,057 | Continuing | Continuing |
| C1763 | Amphibious Armor Systems Product Improvement Program | 2,016 | 939 | 1,147 | 17 | Continuing | Continuing |
| C1901 | Marine Corps Ground Weapons Product Improvement | 6,663 | 11,324 | 23,493 | 12,382 | Continuing | Continuing |
| C1908 | Joint Munitions Testing | 1,250 | 0 | * | * | Continuing | Continuing |
| C1960 | Light Armored Vehicle - Air Defense | 0 | 0 | **** (16,035) | **** (15,267) | Continuing | Continuing |

* Terminated
** Project efforts and funding consolidated under C0018, Fire Support Systems in this Program Element for FY 1987.
*** Project moved to Program Element 26624M and renamed Combat Support in FY 1988 and beyond.
**** Funded in Program Element 64656M, Light Armored Vehicle.

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

Program Element: 26623M

Title: Marine Corps Ground Combat/Supporting Arms Systems (Operational Systems)

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides funds to ensure that modifications and improvements are initiated in response to field identified discrepancies and that capability enhancements are developed for existing ground combat and supporting arms weapons systems and equipment.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profiles shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: Shoulder-Launched Multipurpose Assault Weapon: The FY 1988 increase of 3,243 is due to FY 1986 competitive contractual delays associated with engineering development of the heavy metal liner, high explosive anti-armor round. These funds were reprogrammed to other critical Marine Corps deficiencies. Fire Support System Product Improvement: The FY 1986 decrease of 1,267 and the FY 1988 decrease of 2,110 resulted from a delay in the General Support Rocket System test and evaluation and the planned product improvements for the AN/TPQ 36 radar and M109 Howitzers. The FY 1987 decrease of 573 is due to Congressional undistributed reductions to this program element. Assault Amphibious Vehicle 7A1 Product Improvement Program: The FY 1987 decrease of 1,575 is due to Congressional undistributed reductions to this program element. The FY 1988 increase of 3,445 is due to a FY 1985 Marine Corps decision to terminate the Landing Vehicle Tracked (Experimental) program and extend the service life of the current Assault Amphibious Vehicle 7A1 until FY 2000. Product improvements ensure that required combat capabilities for the vehicle through the 1990's are being initiated. These are discussed in detail in the project effort descriptions. Amphibious Reconnaissance Equipment: The FY 1986 decrease of 1,003 is due to the Marine Corps decision to utilize a non-developmental item approach for the acoustic detection system. Air Defense Missile Systems: The FY 1986 increase of 2,815 is due to joint Army/Marine HAWK delay of the FY 1985 program due to Sergeant York Divad test range priority utilization. These scheduled HAWK efforts were completed in FY 1986. The FY 1987 decrease of 420 is due to Congressional undistributed reductions to this program element. The FY 1988 decrease of 2,711 results from a Marine Corps decision not to pursue additional HAWK product improvements but to address Mobile Surface to Air Missile Systems as a future replacement for the HAWK system. Light Armored Vehicle: The FY 1986 decrease of 3,123 is due to a Marine Corps decision to complete 75mm assault gun, ammunition development and terminate the Light Armored Vehicle-Assault Gun prototype program in FY 1987. The FY 1987 decrease of 5,288 is due to Congressional undistributed reductions to this program element. The FY 1988 decrease of 14,326 is due to the separation of the Light Armored Vehicle project into two efforts, this project C1555 Light Armored Vehicle (Product Improvement Program), and C1960, Light Armored Vehicle-Air Defense. Additionally, Light Armored Vehicle-Assault Gun efforts were terminated in FY 1988 based upon a Marine Corps warfighting analysis recommending acceleration of the more critical air defense efforts. Amphibious Armor Systems (Product Improvement Program): The Marine Corps has determined that as an acquisition goal, a single fleet of tanks will be sought, comprised of the M1A1. The FY 1986 increase of 1,613 results from amphibious unique salt water testing of the M1A1 engine (AGT-1500). The FY 1988 increase of 663 supports USMC unique development and testing of amphibious environment items that include the M1A1 deepwater fording kit and tank-infantry telephone. Marine Corps Ground Weaponry Product Improvement: An effort to improve the capabilities of the DRAGON anti-armor weapon system was initiated in FY 1986. The FY 1986 decrease of 2,177 is due to delays in contract definitization for anti-armor weapons systems. The FY 1987 decrease of 1,637 is due to Congressional undistributed reductions to this program element. The FY 1988 increase of 15,501 reflects a continuation of program costs delayed in FY 1986, and a FY 1985 Navy program

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decision to accelerate rocket motor and tracker improvements related to weapons system range, time-of-flight, and gunner survivability. This acceleration will lower total procurement costs. This project also includes the Joint Service Small Arms Program beginning in FY 1987, and in FY 1988, Infantry Mortars, AN/TPQ-36 Counter Battery Radar, Joint Munitions Testing, Modular Universal Laser Equipment and the General Support Rocket System. Joint Munitions Testing: This program is a new start in FY 1986 initiated by the Joint Munitions Council. The FY 1986 decrease of 1,855 supports creation of a database for analysis of live fire test results. FY 1988 and FY 1989 funds were decreased to -0- in response to DoD budget adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 17,480 | 41,800 | 67,934 | 54,640 | Continuing | Continuing |
| C0010 | Shoulder-Launched Multipurpose Assault Weapons | 1,305 | 16,704 | 4,267 | 4,181 | Continuing | Continuing |
| C0018 | Fire Support Systems Product Improvements | 797 | 1,530 | 2,467 | 2,858 | Continuing | Continuing |
| C0021 | Assault Amphibious Vehicle 7A1 Product Improvement Program* | 7,637 | 4,035 | 12,292 | 12,152 | Continuing | Continuing |
| C0027 | Modular Universal Laser Equipment | 0 | 486 | ** | ** | - | - |
| C0085 | Amphibious Reconnaissance Equipment | 684 | 1,912 | 2,615 | 1,860 | Continuing | Continuing |
| C1120 | Air Defense Missile Systems | 5,192 | 4,785 | 2,888 | 4,350 | Continuing | Continuing |
| C1555 | Light Armored Vehicle | ***(8778) | ***(16802) | 29,476 | 20,763 | Continuing | Continuing |
| C1763 | Amphibious Armor Systems Product Improvement Program | **** | 403 | 968 | 484 | Continuing | Continuing |
| C1901 | Marine Corps Ground Weaponry Product Improvement | 1,865 | 8,340 | 12,961 | 7,992 | Continuing | Continuing |
| C1908 | Joint Munitions Testing | ***** | 3,105 | 0 | 0 | Continuing | Continuing |

* Project titled Landing Vehicles Tracked in FY 1986 and prior years.
** Project efforts and funding consolidated under C0018, Fire Support Systems in this Program Element for FY 1987 and beyond.
*** Funded in Program Element 64656M, Light Armored Vehicle.
**** FY 1985 funds request for M-60 Product Improvement deleted by the Congress.
***** Joint program initiated by Secretary of Defense in FY 1986.

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D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Procurement Marine Corps

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| 00010 | Shoulder-Launched Multipurpose Assault Weapon, Launchers (SMAW) | | | | | | |
| | Rocket, 83mm (HE) (SMAW) | 4,410 | - | - | - | TBD | TBD |
| | (qty) (RON 027253) | (535) | - | - | - | TBD | TBD |
| 00018 | Artillery Computer System | | | | | | |
| | Battery Computer System, AN/GYK-29 | 21,949 | - | - | - | - | 32,345 |
| | (qty) (RON 020272) | (148) | - | - | - | - | (166) |
| 00021 | Assault Amphibious Vehicle 7A1 Program | | | | | | |
| | AAV7A1 PIP | - | 14,268 | 21,702 | 47,828 | 32,542 | TBD |
| | (qty) (RON 022421) | - | - | - | - | - | - |
| | AAV Applique Armor | - | 5,268 | - | 10,858 | 14,183 | 30,309 |
| | (qty) (RON 027231) | - | (189) | - | (476) | (660) | (1325) |
| | AAV Automatic Fire Sensing and Suppression | - | - | 2,349 | 3,013 | 7,050 | 12,412 |
| | System (qty) (RON 022421) | - | - | (250) | (350) | (819) | (1419) |
| | AAV Upgunned Weapons Station | - | 7,500 | 17,178 | 31,815 | 6,749 | 63,242 |
| | (qty) (RON 022421) | - | (100) | (230) | (490) | (87) | (907) |
| | AAV Bow Plane | - | 1,500 | 2,175 | 2,142 | 2,115 | 7,932 |
| | (qty) (RON 022421) | - | (189) | (350) | (360) | (360) | (1259) |
| | AAV Transmission/Auxillary Steering Unit | - | - | - | - | 34,935 | 34,935 |
| | (qty) (RON 022421) | - | - | - | - | (1323) | (1323) |
| | Thermal Sight | - | - | - | - | 73,622 | 73,622 |
| | (qty) (RON 022421) | - | - | - | - | (1153) | (1153) |
| | Infantry Weapons Mount | - | - | - | - | 4,351 | 4,351 |
| | (qty) (RON 022421) | - | - | - | - | (1153) | (1153) |
| | NBC Protection System | - | - | - | - | 80,036 | 80,036 |
| | (qty) (RON 022421) | - | - | - | - | (1153) | (1153) |
| | Advanced Propulsion System | - | - | - | - | 151,781 | 151,781 |
| | (qty) (RON 022421) | - | - | - | - | (1323) | (1323) |
| | AAVE7A1 | - | - | - | - | 136,583 | 136,583 |
| | (qty) (RON 022421) | - | - | - | - | (96) | (96) |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 00085 | Amphibious Reconnaissance System | | | | | | |
| | Inflatable Boat, Small | - | - | 759 | 621 | TBD | TBD |
| | (qty) (RON 969504) | - | - | (143) | (114) | TBD | TBD |
| | Outboard Motor | - | - | 246 | - | TBD | TBD |
| | (qty) (RON 969504) | - | - | (80) | - | TBD | TBD |
| C1120 | Air Defense Missile Systems | | | | | | |
| | HAWK Missile Modifications | 38,411 | 23,169 | 30,129 | 4,129 | TBD | TBD |
| | (qty) (RON 035401) | - | - | - | - | N/A | N/A |
| | Early Warning Device | - | - | - | 3,544 | TBD | TBD |
| | (qty) (RON 142576) | - | - | - | (26) | TBD | TBD |
| C1763 | Amphibious Armor Systems Product Improvement Program | | | | | | |
| | M1A1 Tank | - | - | 1,144 | 159,295 | TBD | TBD |
| | (qty) (RON 028091) | - | - | - | - | TBD | TBD |
| | Advance Procurement | - | - | 24,441 | 37,230 | TBD | TBD |
| | QTY (RON 028141) | - | - | - | - | TBD | TBD |
| C1901 | Marine Corps Ground Weaponry PIP | | | | | | |
| | Machine Gun, Light Squad Automatic M249 (SAW) | - | 2,740 | 3,029 | 1,769 | TBD | TBD |
| | (qty) (RON 021113) | - | (1000) | (1039) | (572) | TBD | TBD |
| | Rifle (5.56mm M16A2-Improved) | 11,193 | 7,865 | 8,859 | 5,119 | TBD | TBD |
| | (qty) (RON 021123) | (22505) | (16920) | (16652) | (9427) | TBD | TBD |
| | Pistol, 9mm, Auto Personal Defense Weapon | 2,296 | 4,532 | 5,191 | 3,230 | TBD | TBD |
| | (qty) (RON 020463) | (10000) | (22181) | (22182) | (13589) | TBD | TBD |
| | Machine Gun (MK-19) 40mm | 1,200 | 1,012 | 3,587 | 4,675 | TBD | TBD |
| | (qty) (RON 021173) | (103) | (189) | (415) | (497) | TBD | TBD |
| | Dragon Warhead (PIP) | - | - | 7,890 | 9,748 | TBD | TBD |
| | (qty) (RON 038051) | - | - | (4259) | (5258) | TBD | TBD |
| | I-81 Mortar | - | 7,467 | 5,262 | - | TBD | TBD |
| | (qty) (RON 022033) | - | (350) | (264) | - | TBD | TBD |
| | XM-4 Carbine | - | - | 1,005 | 2,989 | TBD | TBD |
| | (qty) (RON 021143) | - | - | (1500) | (5000) | TBD | TBD |
| | Infantry Weapons Mod | - | - | 100 | 100 | TBD | TBD |
| | (qty) | - | - | (1000) | (1000) | TBD | TBD |

E. (U) RELATED ACTIVITIES: The projects within this program relate to all similar existing and developing systems.

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F. (U) WORK PERFORMED BY: IN-HOUSE: Marine Corps Development and Education Command, Quantico, VA; Marine Corps Tactical System Support Activity, Camp Pendleton, CA; Space and Naval Warfare Systems Command, Washington, DC; Naval Weapons Center, China Lake, CA; U.S. Army Missile Command, Redstone Arsenal, AL; Naval Sea Systems Command, Washington, D.C.; Naval Coastal Systems Center, Panama City, FL; and U.S. Army Tank Automotive Command, Warren, MI; Naval Surface Weapons Center, Dahlgren, VA; U.S. Army Armament Research and Development Command, Dover, NJ CONTRACTORS: Raytheon Company, Bedford, MA; General Dynamics, Pomona, CA; Brunswick Corporation, Costa Mesa, CA; FMC Corporation, San Jose, CA; Litton Industries, Van Nuys, CA; and McDonnell Douglas Astronautics Company, Titusville, FL; Colt Industries, Hartford, CT.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project C0010, Shoulder-Launched Multipurpose Assault Weapon:

1. (U) Description: This Marine Corps program developed a lightweight, portable assault weapon capable of breaching or destroying masonry and earth/timber defensive positions and neutralizing personnel. Presently there is no other weapon in our inventory to accomplish this task. Increased emphasis on the strategic importance of large population centers indicates the likelihood for combat in built-up areas during any major conflict in the future. Military operations in urban terrain will require increased use of this weapon. The weapon will be employed on the battlefield against bunkers or in urban combat against masonry strong points. Additionally, continued development of a family of warheads is required to meet other urban terrain combat requirements including defeat of armored vehicles and neutralization of troop concentrations.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Continued to field the Shoulder-Launched Multipurpose Assault Weapon.
- o Initiated improvements to the launcher system.
- o Continued engineering development of preplanned product improvements to the launcher, and development of a family of warheads which will be fired from the launcher.
- o Commenced development of the heavy metal and copper liner high explosive anti-armor warhead.
- o Initiated engineering development of preplanned product improvements to the launcher.

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b. (U) FY 1987 Program:

- o Continue engineering development of a family of warheads to include the copper liner and heavy metal high explosive anti-armor projectiles.
- o Continue preplanned product improvements to the launcher and warhead design as required.
- o Milestone III High Explosive Anti-Armor (Copper Liner).

c. (U) FY 1988 Planned Program:

- o Complete development of the heavy metal high explosive anti-armor.
- o Continue preplanned product improvements to the launcher.

d. (U) FY 1989 Planned Program:

- o Continue preplanned product improvements to the launcher.

e. (U) Program to Completion:

- o Continue preplanned product improvements as necessary.

(U) Project C0018, Fire Support System (Product Improvements):

1. (U) Description: This program conducts independent development and product improvement of Marine Corps fire support equipment and weapons. It will also monitor and/or participate in the fire support development programs of other services. This includes artillery and rocket weapon systems munitions, survey/meteorological equipment, target and training devices.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Conducted Battery Computer Systems Follow-On Test and Evaluation as required.
- o Conducted a Fire Support Systems Interoperability Study, e.g., Battery Computer System, Digital Communications Terminal, etc.

- o Participated with U.S. Army in Back-up Computer System Product Improvement.
- o Repackaged Lithium Dinolchloride battery to adapt to Modular Universal Laser Equipment.

b. (U) FY 1987 Program:

- o Continue Fire Support System Interoperability Study.
- o Complete Independent Verification and Validation of the Battery Computer System/Digital Communications Terminal Interface and prepare for developmental and operational testing, if required.
- o Incorporate Modular Universal Laser Equipment product improvement efforts under this project line.
- o Monitor and/or participate in U.S. Army Fire Support System Programs, e.g., M109 Howitzer Improvements Program, target acquistion device, survey/metrological improvements, etc.
- o Complete adaptation of lithium dinolchloride battery for Modular Universal Laser Equipment.

c. (U) FY 1988 Planned Program:

- o Conduct Fire Support System Interoperability Operational Testing and Evaluation.
- o Begin evaluation of candidates for general support rocket system equipment.
- o Participate in and/or monitor U.S. Army Fire Support System Programs.

d. (U) FY 1989 Planned Program:

- o Conduct shipboard compatibility testing of Multiple Launch Rocket System.
- o Develop laser hardened lens for Modular Universal Laser Equipment.
- o Complete product improvement of pulse repetition coding for Modular Universal Laser Equipment.
- o Participate in and/or monitor U.S. Army Fire Support Systems programs (AN/TPQ-36 mod and lightweight Meteorological Data System ).

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e. (U) Program to Completion:

- o Complete any testing and evaluation to support fielding of Multiple Launch Rocket System.
- o Continue participation and/or monitor U.S. Army Fire Support Systems Programs.

(U) Project C112D, Air Defense Missile Systems:

1. (U) Description: This program provides for hardware and software improvements to the HAWK surface-to-air missile system. This includes efforts to improve tactical digital interface compatibility between HAWK and other agencies of the Marine Corps Tactical Air Command and Control System and other services involved in Joint Tactical Air Operations. This program includes Marine Corps participation in joint efforts to develop a replacement for HAWK. The program also supports developmental efforts to improve Marine Corps lightweight air defense missile systems. This includes joint development of product improvements to the Stinger weapons system itself and development of new equipment for our Low Altitude Air Defense units.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Completed development and commenced evaluation of HAWK Phase III/Battery Compatibility software.
- o Completed Developmental Testing and Operational Testing II of HAWK Phase III/Battery Compatibility modifications and product improvements.
- o Continued efforts to develop modifications for HAWK equipments to ensure survivability in high threat environment.
- o Continued efforts to identify a surface-to-air weapons system to replace HAWK in the late 1990's to fulfill the mobile surface-to-air missile system requirement.
- o Began lightweight early warning detection device program for low altitude air defense units.
- o Participated with U.S. Army in development of Stinger night sight.

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b. (U) FY 1987 Program:

- o Continue to update software and correct deficiencies identified during operational testing of HAWK Phase III/Battery Compatibility modifications.
- o Continue Program for lightweight early warning detection device for forward area air defense units.
- o Continue to participate with U.S. Army in development of a Stinger night sight.
- o Participate in U.S. Army selection of pedestal mounted stinger for potential mobile low altitude air defense system for our low altitude air defense units.
- o Continue efforts to identify a surface-to-air weapons system to replace HAWK in the late 1990's to fulfill the mobile surface-to-air missile system requirement.

c. (U) FY 1988 Planned Program:

- o Complete Developmental Testing/Operational Testing II of lightweight early warning detection device for our low altitude air defense units.
- o Participate with U.S. Army in developmental testing of a Stinger night sight.
- o Continue development of a mobile low altitude air defense system.
- o Participate with other services and NATO in development of a surface-to-air weapons system to replace HAWK in the late 1990's to fulfill the mobile surface-to-air missile system requirement.

d. (U) FY 1989 Planned Program:

- o Begin developmental efforts associated with mobility and survivability modifications to the Phase III HAWK Weapons System.
- o Begin development of a product improvement to the HAWK tracking adjunct sytem to provide a day and night capability.
- o Participate with U.S. Army in developmental and operational testing of the Stinger night sight.

- o Participate in final developmental and operational testing phase of the U.S. Army pedestal mounted Stinger program to fulfill Marine Corps requirement for a mobile low altitude air defense system.
- o Participate with other Services' and NATO in development of a surface-to-air weapons system to replace HAWK in the late 1990's to fulfill the mobile surface-to-air weapons system requirement.

e. (U) Program to Completion

- o This is a continuing program.

(U) Project C1555 LIGHT ARMORED VEHICLE (LAV)

1. (U) DESCRIPTION (Requirement and Project): This program is an acquisition effort directed toward the acquisition of modified "off the shelf" light armored vehicles which will be product improved and be used a number of mission roles. These armor-protected, swimmable, helicopter transportable vehicles will increase the mobility and firepower of the Marine Corps ground combat elements.

2. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

a. (U) FY 1986 Program:

- o Completed testing of anti-tank, mortar, logistics and recovery vehicles.
- o Continued testing of command/control vehicles.
- o Initiated first product improvement: night sight for Light Armored Vehicle-25 to better match effective range of M242 25MM chain gun.
- o Milestone II approval for Light Armored Vehicle - Air Defense.
- o Continued jointly with the U.S. Army and U.S Air Force hypervelocity missle demonstration and validation as a far-term anti-tank armament.

b. (U) FY 1987 Planned Program:

- o Evaluate proposed product improvements to the fielded mission role vehicles.

- o Complete testing of command/control vehicle.
- o Contract for Light Armored Vehicle Defense (LAV-AD) prototypes. Select up to two contractors to each develop two prototypes.
- o Continue 75mm automatic cannon and ammunition development and foreign cannon evaluations.
- o Continue jointly with the U.S. Army and U.S. Air Force hypervelocity missile demonstration and validation as a far-term anti-tank armament.
- o Select up to two contractors to develop Light Armored Vehicle Air - Defense prototypes.

c. (U) FY 1988 Planned Program:

- o Continue to evaluate proposed product improvements to the fielded mission role vehicles.
- o Test competitive night sights for the Light Armored Vehicle-25.

d. (U) FY 1989 Planned Program:

- o Continue to evaluate proposed product improvements to the fielded mission role vehicle.

e. (U) Program to Completion:

- o Source selection for Light Armored Vehicle-25 night sight.
- o Continue Hypervelocity Missile system full-scale development jointly with the U.S. Army.

(U) Project C7763, Amphibious Armor Systems Product Improvement:

1. (U) Description: The current Marine Corps tanks (M60A1 RISE/PASSIVE) have not been upgraded to a state-of-the-art level and are vulnerable to the current threat. As a result of a recent Marine Corps Long Range Armor, Anti-Armor, Fire Support, and Combat Mobility Requirements and Programs Study it was determined that the Marine Corps should, as an acquisition goal, seek a single fleet of tanks comprised of the M1A1. To this end a procurement decision was made at the recommendation of a Marine Corps systems Acquisition Review Council conducted in late 1984. This program will allow the Marine Corps to develop, test, and evaluate those USMC operational requirements of the M1A1 tanks unique to amphibious operations, a deepwater fording kit and a

tank-infantry telephone. The current M88A1 tank retriever will need to be product improved (M88AX) to maintain capabilities with the transistion to the M1A1 tank. Limited M88A1 R&D will be conducted for USMC unique amphibious operational concerns.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Participated in U.S. Army developmental testing and operational testing of the M1A1 tank.
- o Completed USMC unique testing requirements of M60A1 applique armor.
- o Completed Milestone III, procurement decision of M60A1 applique armor.
- o Conducted Marine Corps unique amphibious testing of the M1A1.
- o Continued to evaluate critical cost effective options to selectively improve the operational capability of the M60A1 tank during transition to the M1A1 tank.
- o Continued to develop a deepwater fording kit and tank-infantry telephone for the M1A1 tank.

b. (U) The FY 1987 Program:

- o Continue the deepwater fording kit, tank-infantry telephone and amphibious ship tie downs development.
- o Conclude unique amphibious testing of the M1A1 tank.
- o Prepare for fielding of the M1A1 tank.
- o Conduct Marine Corps unique amphibious testing for the M1A1 track width mine plow and adaptability to the M60A1 tank during transition to the M1A1 tank.
- o Continue to evaluate critical improvements to the M60A1 tank during transition to the M1A1 tank.

c. (U) FY 1988 Planned Program:

- o Complete development work on the deep water fording kit, the tank/infantry phone and amphibious ship tie-downs for the M1A1 tank.

o Continue to evaluate U.S. Army Block Improvement Program.

d. (U) FY 1989 Planned Program:

o Initiate Marine unique testing of the M88AX tank retriever.

o Continue to evaluate U.S. Army Block Improvement Program.

e. (U) Program to Completion:

o This is a continuing program.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project C0021, Assault Amphibious Vehicle 7A1 Product Improvement Program:

1. (U) Description: This program provides the Marine Corps with the capability to conduct surface-borne amphibious assaults by keeping the present amphibious vehicle effective until a follow-on vehicle becomes operational in 2000. This preplanned product improvement program will commence with the development, fabrication and testing of applique armor kits, a vehicle automatic fire sensing and suppression system and a transmission/hydrostatic steer unit improvement and testing of the upgunned 40mm/50 caliber armament station, and a bow plane. In addition, this program commences development of nuclear, biological, and chemical monitor, survey, alarm and defense systems.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

o Continued preplanned product improvements.

o Commenced analysis of collective nuclear/biological/chemical sensing and protection system.

o Continued to develop and test the automatic fire sensing/suppression system.

o Completed fabrication of applique armor kits for full scale development, conducted a milestone III A and continued Applique Armor Kits testing.

o Made a milestone III decision to procure the bow plane.

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- o Continued evaluation of infantry weapons mount kit.
- o Continued to evaluate engineering change proposals, modification instructions, technical instructions at the Amphibian Vehicle Test Branch.
- o Commenced development of an Assault Amphibious Vehicle Engineer 7A1.
- o Continued a feasibility study on the potential of an Assault Amphibious Engineer 7A1.

b. (U) FY 1987 Program:

- o Continue feasibility analysis of the Assault Amphibious Vehicle Engineer 7A1.
- o Complete acquisition decisions (Milestone III B) concerning first procurement of applique armor kits.
- o Begin development of a collective nuclear, biological and chemical alarm and protection system.
- o Initiate Upgunned Weapon Station improved night sight evaluation.
- o Continue to elevate engineering change proposals, modification instructions, and technical instructions at the Amphibian Vehicle Test Branch.
- o Initiate research and development for follow-on procurements of Enhanced Applique Armor Kit (EAAK).

c. (U) FY 1988 Planned Program:

- o Continue development of collective nuclear, biological and chemical detection/protection system.
- o Continue development of Assault Amphibious Vehicle Engineer 7A1.
- o Continue Upgunned Weapon Station improved night sight research and development.
- o Conduct testing of enhanced applique armor kits for follow-on procurements.

d. (U) FY 1989 Planned Program:

o Continue development of collective nuclear, biological and chemical detection/protection system.

o Continue development of Assault Amphibious Vehicle Engineer 7A1.

o Complete Upgunned Weapon Station improved night sight research and development.

o Complete testing of enhanced applique armor kits.

e. (U) Program to Completion:

o This is a continuing program.

f. (U) Major Milestones:

| | Milestone | Date |
|---|---|---|
| 1. | Enhanced Applique Armor Kit | FY 1989 |
| 2. | Night Sight upgrade | FY 1989 |
| 3. | Collective NBC System | FY 1990 |
| 4. | Assault Amphibious Vehicle Engineer 7A1 | FY 1991 |

(U) Project C1901, Marine Corps Ground Weaponry Product Improvement:

1. (U) Description: Monitor or participate in Congressionally directed and other service programs relating to ground combat weaponry and ancillary equipment. This includes munitions, artillery and naval gunfire weapons, tank and anti-tank weapon systems, and infantry weapons. The program element provides for monitoring the results of national and international ground weaponry program developments. Beginning in FY 1987, this program also manages and administers the development of small arms weapons systems required by the services. The objective is to harmonize joint service requirements, coordinate development activities, reduce cost, and improve the efficiency of the material acquisition process.

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2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Received Congressional funding and direction to product improve the man-portable, anti-tank Dragon weapon system.
- o Initiated a competitive request for proposals to improve the warhead penetration, combine and reduce the weight of the day and night trackers, and improve the rocket motor capability, e.g., reduce time flight, increase range, and gunner survivability of the Dragon.
- o Awarded a competitive contract to accomplish the Dragon improvement.

b. (U) FY 1987 Program:

- o Award option to existing contract for development of a countermeasure hardened, combined day-night tracker and rocket motor improvements for the Dragon anti-armor system.
- o Incorporate the consolidation of Joint Service Small Arms Program developments.
- o Pursue/monitor anti-tank weapons, tank developments, and extended range munitions under development by other services/industry through the Joint Service Small Arms Program.
- o Continue to investigate hypervelocity munitions.
- o Initiate improvements and developments that capitalize on state-of-the-art emerging weaponry technologies.
- o Continue efforts related to development of the Advanced Combat Rifle System.
- o Continue to support improved armor piercing ammunition, lightweight general purpose heavy machine gun development, improved 40mm ammunition, improved sights and fire control devices, for the MK19 MOD 3.

c. (U) FY 1988 Planned Program:

- o Commence retrofit and redistribution of improved Dragon warhead.
- o Continue development of a countermeasure hardened, combined day-night tracker and rocket motor improvements for the Dragon.

- o Pursue/monitor antiarmor weapons, tank developments, and extended range munitions under development by other Services/Industry through Joint Services Small Arms programs.
- o Continue to monitor medium and heavy anti-armor efforts.
- o Continue to investigate/monitor hypervelocity munitions.
- o Initiate improvements and developments that capitalize on state of the art technologies.
- o Continue to participate and support Joint Service Small Arms Programs.

d. (U) FY 1989 Planned Program:

- o Commence retrofit and redistribution of improved Dragon warhead.
- o Continue development of a countermeasure hardened, combined day-night tracker and rocket motor improvements for the Dragon.
- o Pursue/monitor antiarmor weapons, tank developments, and extended range munitions under development by other Services/Industry through Joint Services Small Arms programs.
- o Continue to monitor medium and heavy anti-armor efforts.
- o Continue to investigate/monitor hypervelocity munitions.
- o Initiate improvements and developments that capitalize on state of the art technologies.
- o Continue to participate and support Joint Service Small Arms Programs.

e. (U) Program to Completion:

- o Medium anti-armor developments to completion.
- o Hypervelocity munitions developments to completion.
- o Emerging small arms technologies to completion.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 26624M
DoD Mission Area: 215 - Land Warfare Support

Title: Marine Corps Combat Services Support (Operational Systems)
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 1,021 | 2,473 | 4,996 | 2,559 | Continuing | Continuing |
| C0076 | Combat Service Support Product Improvement | 712 | 1,564 | 1,861 | 2,016 | Continuing | Continuing |
| C0081 | Tactical Vehicle Fleet Product Improvement* | 38 | 861 | ** | ** | Continuing | Continuing |
| C0084 | Marine Corps Combat Clothing and Equipment | 136 | *** | *** | *** | *** | *** |
| C0085 | Combat Support **** | | | 3,135 | 543 | Continuing | Continuing |
| C0869 | Marine Corps Tactical Deception ** | 70 | 48 | ***** | ***** | Continuing | Continuing |
| C0939 | Marine Corps Container Systems Improvements | 65 | ** | ** | ** | ** | ** |

* In FY 1986 this project was titled Expeditionary Shelter System.
** Funding consolidated in C0076, Combat Service Support Product Improvements.
*** Funding consolidated in C0079, Marine Corps Combat Logistics Support, Program Element 64717M, Marine Corps Combat Service Support (Engineering).
**** In FY 1986, this project was titled Marine Corps Amphibious Reconnaissance Equipment and funded in Program Element 26623M, Marine Corps Ground Combat/Supporting Arms (Operational Systems).
***** Funding consolidated in C0085, Combat Support in this Program Element.

As this is a continuing program, the above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: There is a continuing requirement to update and improve the performance capabilities of fielded combat service support equipment. The research, development, test and evaluation funds will provide for the product improvement of bulk fuel equipment, utilities equipment, logistics equipment, shelters, engineering survey sets, office machines, earthmoving equipment, tool sets, maintenance shops and tactical motor transport vehicles. State-of-the-art advancements in a camouflage and tactical deception hardware and techniques will be monitored. Current equipment will be modified as appropriate and camouflage and deception items procured as approved.

Program Element: 26624M

Title: Marine Corps Combat Services Support (Operational Systems)

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: Combat Service Support Product Improvement: The FY 1986 decrease of 89 and the FY 1988 decrease of 718 are due to accelerated completion of product improvements to operational systems and a restructure of combat service support efforts to utilize both emerging and modern off-the-shelf technology. Tactical Vehicle Fleet Product Improvement: The FY 1986 decrease of 205 is due to accelerated completion of product improvements by joint service programs and increased utilization of U.S. Army amphibious compatible improvements. Combat Support: The Fy 1986 decrease of 1,003 is due to a non-developmental item strategy for the acoustic detection system. The FY 1988 increase of 1,275 is due to development acceleration of the Small Unit Navigation System. Marine Corps Tactical Deception: The FY 1986 decrease of 103 was due to a lower cost non-developmental item approach. Marine Corps Container Systems Improvements: The FY 1986 decrease of 20 is due to utilization of other service developed, amphibious compatible improvements.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 2,825 | 1,449 | 2,548 | 3,857 | Continuing | Continuing |
| C0076 | Combat Service Support Product Improvement | 1,704 | 801 | 1,612 | 2,579 | Continuing | Continuing |
| C0081 | Tactical Vehicle Fleet Product Improvement* | 686 | 243 | 887 | 1,199 | Continuing | Continuing |
| C0084 | Marine Corps Combat Clothing and Equipment | 335 | 147 | *** | *** | - | - |
| C0869 | Marine Corps Tactical Deception** | 15 | 173 | 49 | 79 | Continuing | Continuing |
| C0939 | Marine Corps Container Systems Improvements | 85 | 85 | *** | *** | - | - |

* In FY 1986 this project was titled Expeditionary Shelter System.
** In FY 1986, this project was titled Marine Corps Camouflage Technology.
*** In FY 1987 and beyond, consolidated (funded) in C0079, Marine Corps Combat Logistics Support, Program Element 64717M, Marine Corps Combat Service Support (Engineering).

As this is a continuing program, the above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1988 only.

Program Element: 26624M

Title: Marine Corps Combat Services Support (Operational Systems)

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | | | | | | |
| 00076 | Combat Service Support Product Improvement | | | | | | |
| | Container Family | 900 | - | 3,002 | 14,982 | TBD | TBD |
| | (qty) (RON 066013) | - | - | (1859) | (13730) | TBD | TBD |
| | Topographic Reproduction | - | - | - | 4,882 | TBD | TBD |
| | (qty) (RON 067141) | - | - | - | (11) | TBD | TBD |
| | Topographic Mapping System | - | - | 908 | - | TBD | TBD |
| | (qty) (RON 067301) | - | - | (2) | - | TBD | TBD |
| | Container Handler | - | - | 8,118 | - | TBD | TBD |
| | (qty) (RON 0630'1) | - | - | (35) | - | TBD | TBD |
| | Material Handling Equipment | 1,351 | 309 | 2,290 | 2,199 | TBD | TBD |
| | (qty) (RON 067262) | - | - | - | - | TBD | TBD |
| 00085A | Small Unit Navigation System | - | - | - | - | TBD | TBD |
| | (qty) (RON 146288) | - | - | - | - | TBD | TBD |

E. (U) RELATED ACTIVITIES: Combat Service Support Product Improvement: U.S. Army Air Mobility Research and Development Command efforts (Program Element 642041) with helicopter slings; U.S. Naval Civil Engineering Laboratories efforts (Program Element 63719N) in Material Handling Equipment for Amphibious Logistics Support Ashore; Mobility Equipment Research and Development Command joint development of forklift modifications (Program Element 64713A). Marine Corps Combat Clothing and Equipment: U.S. Army Natick Laboratories developments in fabric/webbing material (Program Element 62723A); Joint Service efforts on the Battle/Dress Uniform (Program Element 64713A). Tactical Vehicle Fleet: U.S. Army Mobility Equipment Research and Development Command activities.

F. (U) WORK PERFORMED BY: IN-HOUSE: Marine Corps Development and Education Command, Quantico, VA; Combat Service Support Product Improvement; Naval Civil Engineering Laboratory, Port Hueneme, CA; Tactical Vehicle Fleet Product Improvement: Mobility Engineering Research and Development Command, Ft. Belvoir, VA; Clothing and Equipment; U.S. Army Natick Laboratories, Natick, MA; Tactical Vehicle Fleet Product Improvement; U.S. Army Tank-Automotive Command, Warren, MI.

Program Element: 26624M

Title: Marine Corps Combat Services Support (Operational Systems)

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project C0076, Combat Service Support Product Improvement:

1. (U) Description: This program continually evaluates approved-for-service-use combat service support equipment for improvements which will extend useful service life, modifications which will improve efficiency, and for state-of-the-art changes which will enhance equipment capabilities. For example, evaluation of a family of rigid and knockdown shelters and a family of intermediate sized containers which have been approved by the Joint Committee on Tactical Shelters and are a part of the DOD standard family of tactical shelters. Both the shelters and the containers are designed to meet international dimensional standards of the International Standards Organization which will accommodate both tactical and strategic modes of transportation, especially the container-oriented merchant fleet. In FY 88 and beyond this project includes tactical vehicle fleet product improvement, which provides the optimum mix of tactical motor transport vehicles and support equipment for Fleet Marine Force employment; provides for transportation of dimensionally standard loads in view of containership realities of the midrange period; and reduces types of vehicles requiring maintenance support. In FY 88 and beyond this project includes container systems, a family of dimensionally standardized tactical containers which will comply with current DoD instructions for container supported distribution systems and which will be compatible with standards for intermodal transportation.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Continued evaluation of current combat service support equipment and alterations required for interface with dimensionally standard loads.
- o Continued evaluation of document destructors and visual graphics equipment.
- o Completed evaluation of photomapping and drafting equipment.
- o Conducted 5-ton product improvement program materials handling equipment for cargo handling/snow plow, 5-Ton product improvement program final report. Developed high mobility multipurpose wheeled vehicle improved weapon station ballistics protection.
- o Conducted corrosion control; depot rebuild procedures, new technology investigation.
- o Conducted development test/initial operational test and evaluation of motor transport support items, maintenance shop system, and modernization support items.

Program Element: 26624M

Title: Marine Corps Combat Services Support (Operational Systems)

- o Evaluated commercial motor transport items for suitability as members of the Tactical Vehicle Fleet.
- o Initialed production test/final report for the Logistics Vehicle System.
- o Prepared for Logistics Vehicle System fielding.
- o Completed testing of tool kit, prepared technical data package, issued test report.
- o Conducted development of the Tactical Bulk Fuel Delivery Sub-system for the Light Armored Vehicle (Logistics) and Assualt Amphibious Vehicle-7A1 (Logistics).
- o Completed development/operational testing of survey set and reproduction van set.
- o Completed the testing of an on-board crane for the M939 series vehicles as an ammunition handling device.

b. (U) FY 1987 Program:

- o Conduct product improvement and evaluation of tool kits for engineer battalions, specifically pioneer tool kits for engineer squad and platoon.
- o Evaluate 55 gallon drum handling attachment for forklifts.
- o Conduct evaluation of large tire change systems.
- o Continue product improvements on rigid/knockdown shelters with emphasis on Nuclear/Biological/Chemical survivability characteristics.
- o Continue product improvements on containers with emphasis on interior configurations, intermodal characteristics, and International Standards Ogranization arraying features.
- o Monitor other Services' rigid shelters program.
- o Evaluate product improvement to the fielded reproduction van and shelterized Topographic Mapping and Survey Sets.
- o Product improve the SIXCON electric pump.

- o Complete development of the Tactical Bulk Fuel Delivery sub-system for the Light Armored Vehicle (Logistics) and the Assault Amphibious Vehicle-7A1 (Logistics).
- o Begin product improvement of the 20,000 gallon fabric tank.
- o Initiate effort to product improve helicopter external lift equipments and procedures.
- o Evaluate feasibility and affordability of a floatation system capable of floating the medium girder bridge (International Standards Orgainization compatibility required).
- o Initiate product improvement program to product improve current tentage to match USMC soft shelter Required Operational Capability (ROC).

c. (U) FY 1988 Planned Program:

- o Conduct developmental/operational testing of Logistics Vehicle System Rearbody Unit MK18/19.
- o Conduct developmental/operational testing of 5-ton International Standards Organization bed configuration.
- o Continue development of product improvements for Logistics Vehicle System High Mobility Multipurpose Vehicle, and 5-ton truck.
- o Continue development of product improvement of helicopter external lift equipments and procedures.
- o Evaluate commercially available mapping/drafting and office equipment.
- o Continue to provide support to all other surveys and DoD programs in product improvement of mapping, charting and office equipment.
- o Continue to evaluate a floatation system capable of floating the medium girder bridge (International Standards Organization compatibility required).
- o Develop a kit to provide operator protection from small arms/fragmentation while on earthmoving equipment.
- o Evaluate commercial batteries to replace Military Standard Batteries in engineer/Motor transport vehicles.

Program Element: 26624M

Title: Marine Corps Combat Services Support (Operational Systems)

- o Complete the product improvement of the 20,000 gallon fabric tank.
- o Continue utilities equipment product improvement.
- o Continue design, test, and evaluation of product improvements for intermediate sized container family.
- o Continue design test, and evaluation of product improvements for rigid/knockdown shelter family.
- o Monitor other Services' rigid shelters program.
- o Complete development efforts to improve current tentage to meet USMC soft shelter ROC.
- o Continue to develop corrosion control technology to enhance effectiveness and service life.

d. (U) FY 1989 Planned Program:

- o Continue product improvements for intermediate size container family and for rigid/knockdown shelter family.
- o Continue to evaluate and improve bulk fuel equipment which requires product improvements.
- o Continue product improvement of utilities equipment.
- o Monitor other Services' rigid shelter program.
- o Continue development of product improvements for Logistics Vehicle System, High Mobility Multipurpose Vehicle and 5-ton truck.
- o Continue product improvements on helicopter external lift equipment and procedures.
- o Continue evaluation of commercial mapping/drafting and office equipment.
- o Continue evaluation of medium girder bridge floatation system.
- o Continue development of hardening kits to provide combat service support vehicle operator protection from small arms fragmentation.

Program Element: 26624M

Title: Marine Corps Combat Services Support (Operational Systems)

o Continue to develop corrosion control technology to enhance equipment effectiveness and service life.

e. (U) Program to Completion:

o This is a continuing program.

(U) Project C0085, Combat Support:

1. (U) Description: The Marine Corps continuously monitors commercial and other Service developments in specialized equipment having potential reconnaissance applications. Present and projected development objectives include: A Small Inflatable Boat/Silenced Propulsion System and Waterproof Bags (equipment and weapons) for surface reconnaissance team operations; a Small Unit Navigation System to allow accurate reconnaissance team navigation during airborne or waterborne operations and improved SCUBA equipment. This project provides funding for a variety of small projects that are not easily categorized under a major project title. It includes amphibious reconnaissance equipment, cold weather equipment and in FY88 Tactical Deception.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

o Continued development of the Small Unit Navigation System (to Milestone II) as a project initiated by the Defense Advanced Research Projects Agency to downsize the NAVSTAR Global Positioning System Manpack unit.

o Monitored U.S. Army and other Service developments in cold weather equipment.

o Continued to monitor other Service specialized equipment efforts.

o Searched for suitable replacement for small inflatable boat.

o Continued to monitor other Service specialized equipment efforts.

o Waterproofed equipment bags evaluated.

Program Element: 26624M

Title: Marine Corps Combat Services Support (Operational Systems)

b. (U) FY 1987 Program:

- o Explore potential for non-developmental items for enhanced listening devices for reconnaissance teams.
- o Continue development of the Small Unit Navigation System prototype.
- o Continue to monitor other Service specialized equipment efforts to include amphibious reconnaissance and cold weather equipment.

c. (U) FY 1988 Planned Program:

- o Testing of Small Unit Navigation System.
- o Continue development of Acoustic Detection System contingent on Milestone II approval.
- o Continue to monitor other Service specialized equipment efforts.
- o Continue development of the Small Unit Navigation Systems to include test and evaluation of prototype systems.
- o Testing and development of Multispectral Close Combat Decoys, Communications Simulators and other deception devices.
- o Continue to monitor other Service and industry developments in tactical deception.

d. (U) FY 1989 Planned Program:

- o Continue to monitor other Service specialized equipment efforts.
- o Fund final development and operational testing of the Small Unit Navigation System.
- o Continue to monitor other Service specialized equipment developments.
- o Continue to monitor other Service and industry tactical deception efforts.
- o Testing and development of radar, thermal and visual target generators and signature suppression devices and materials.

Program Element: 26624M

Title: Marine Corps Combat Services Support (Operational Systems)

e. (U) Program to Completion:

o This is a continuing program.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 26625M
DoD Mission Area: 374 - Multi-Mission, Technology and Support

Title: Marine Corps Intelligence/Electronics Warfare Systems (Operational Systems)
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 4,625 | 21,771 | 15,299 | 32,725 | Continuing | Continuing |
| C0060 | Forward Pass | 1,481 | 1,114 | * | * | Continuing | Continuing |
| C0062 | Intelligence Analysis System | **(7564) | 5,935 | 3,249 | 4,094 | Continuing | Continuing |
| C0066 | Communications and Non-Communications Electronic Countermeasures | ***(3361) | 3,288 | 1,254 | 1,180 | Continuing | Continuing |
| C0937 | Mobile Electronic Warfare Support System | 3,144 | **** | 0 | 0 | - | -- |
| C1296 | All Source Imagery Processor | ***(6218) | ***(7130) | ***(12077) | 9,631 | Continuing | Continuing |
| C1297 | Tactical Remote Sensor System | ***(2273) | 4,589 | 7,018 | 4,313 | Continuing | Continuing |
| C1928 | Tactical Electronic Reconnaissance Processing and Evaluation System | ***** | 6,845 | 2,798 | 11,542 | 12,840 | 51,302 |
| C1961 | Mobile Electronic Warfare Support System | ****** | **** | 980 | 1,965 | Continuing | Continuing |

* Funding consolidated in C1297, Tactical Remote Sensor System.
** Funded in Program Element 26626M, Marine Corps Command Control and Communications Systems (Operational Systems).
*** Funded in Program Element 64718M, Marine Corps Intelligence/Electronic Warfare Systems (Engineering).
**** Consolidated into project C0066, Communications and Non-Communications Electronic Countermeasures, Program Element 26625M, in FY 1987 only.
***** Funded in project C0062, Intelligence Analysis System in this Program Element.
****** Funded in this Program Element under project C0937, Mobile Electronic Warfare Support System.

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This Program Element provides RDT&E funds for the operational systems development of Marine Corps intelligence/electronic warfare equipment that will complement current and future sensors, systems, and data evaluations required for the support of operating forces.

Program Element: 26625M

Title: Marine Corps Intelligence/Electronics Warfare Systems (Operational Systems)

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this descriptive summary are as follows: Forward Pass: The FY 1986 increase of 995 is due to acceleration of development for ground-to-air linkage with tactical remote sensor systems. Intelligence Analysis System: The FY 1987 decrease of 1,584 is due to a Congressional undistributed reduction to the program element. The FY 1988 decrease of 4,746 is due to programmatic restructure and refinement for incrementally funded cost estimates. Communications and Non-Communications Electronic Countermeasures: The FY 1988 decrease of 5,614 is due to separate listing of funding for the Mobile Electronic Warfare Support System. This separation is in consonance with Congressional guidance to provide visibility for critical line items. Mobile Electronic Warfare Support System: The FY 1986 increase of 2,467 was due to acceleration of communications and jamming electronic equipment integration into the vehicle chassis. Tactical Remote Sensor System: The FY 1986 increase of 250 is due to delays in new contract awards. The FY 1988 increase of 1,348 incrementally replaces those funds reduced in FY 1986. Tactical Electronic Reconnaissance Processing and Evaluation System: The FY 1987 decrease of 1,019 is due to a Congressional undistributed reduction to the program element. The FY 1988 decrease of 399 is due to better cost estimates to design, fabricate and integrate a data link system for air platform/ground receiver use.

(U) FUNDING AS REFLECTED IN THE 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 888 | 1,163 | 24,822 | 24,149 | Continuing | Continuing |
| C0060 | Forward Pass | 888 | 486 | 1,148 | 419 | Continuing | Continuing |
| C0062 | Intelligence Analysis System (IAS) | *(6648) | *(7414) | 7,519 | 7,995 | Continuing | Continuing |
| C0066 | Communications and Non-Communications Electronic Countermeasures | **(1890) | ***(2827) | 3,504 | 6,868 | Continuing | Continuing |
| C0937 | Mobile Electronic Warfare Support System | *(1842) | 677 | **** | **** | - | - |
| C1296 | All Source Imagery Processor | *(1849) | ***(6223) | ***(7492) | ***(10,429) | * | * |
| C1297 | Tactical Remote Sensor System (TRSS) | *(9419) | ***(2023) | 4,787 | 5,670 | Continuing | Continuing |
| C1928 | Tactical Electronic Reconnaissance Processing and Evaluation System | 0 | 0 | 7,864 | 3,197 | Continuing | Continuing |

* Funded in Program Element 26626M, Marine Corps Command Control and Communications Systems (Operational System).
** Funded in Program Element 63730M, Marine Corps Intelligence/Electronic Warfare Systems (Advanced).
*** Funded in Program Element 64718M, Marine Corps Intelligence/Electronic Warfare Systems (Engineering).
**** Consolidated into project C0066, Communications and Non-Communications Electronic Countermeasures, this Program Element.

Program Element: 26625M

Title: Marine Corps Intelligence/Electronics Warfare Systems (Operational Systems)

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1987 only.

D. (U) OTHER FY 1986/89 APPROPRIATION FUNDS:

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| C0066 | Communications and Non-Communications Electronic Countermeasures | | | | | | |
| | Mobile Electronic Warfare Support System | - | 15,367 | - | - | TBD | TBD |
| | (qty) (RCN 143466) | - | (12) | - | - | TBD | TBD |
| | VHF/UHF Communications Electronics | - | - | - | - | TBD | TBD |
| | Contermeasures (qty) (RCN 040376) | - | - | - | - | TBD | TBD |

E. (U) RELATED ACTIVITIES: Not applicable.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Development Center, Warminster, PA.; Naval Avionics Center, Indianapolis, IN.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project C0060, Forward Pass: In FY 1988 and beyond this effort is funded as a subproject of C1297, Tactical Remote Sensor Systems in this Program Element.

(U) Project C0062, Intelligence Analysis System

1. (U) Description: This project supports improvements in the Intelligence Analysis Center to correct deficiencies identified during development. Principal deficiencies are the query response unit, teletypewriter, plotter, and software programs to identify map parameters and message retrieval.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

o Maintained software configuration management.

Program Element: 26625M

Title: Marine Corps Intelligence/Electronics Warfare Systems (Operational Systems)

- o Modified software for better message handling and routing.
- o Procured lower echelon hardware, mini-micro computers, for tactical intelligence management processing and dissemination.
- o Developed system design improvements for new software release.
- o Commenced development of a standard tactical area file.
- o Commenced development of intelligence analyst scratch pads.
- o Commenced development of map digitalization/cathode ray tube presentation capability.
- o Commenced development of intelligence analyst decision aids.
- o Initiated development of a lower echelon intelligence processing and dissemination capability.
- o Continued development of software for a lower echelon intelligence processing and dissemination capability with stand alone mini-micro computers for tactical intelligence management systems.
- o Implemented the AUTODIN Mode I - Mode VII communication protocol, compartmented-mode processing and all-source collection management.

b. (U) FY 1987 Program:

- o Transfer efforts for the Tactical Electronic Reconnaissance Processing and Evaluation System to an independent line in the program element.
- o Develop specifications for a smaller intelligence analysis center which has greater mobility and logistical supportability.
- o Complete and issue Software Release III, which will process Joint Interoperability of Tactical Command and Control Systems formatted messages, to the operating force.
- o Conduct operational test and evaluation of a lower echelon intelligence processing and dissemination capability.

Program Element: 26625M

Title: Marine Corps Intelligence/Electronics Warfare Systems (Operational Systems)

c. (U) FY 1988 Planned Program:

- o Investigate replacement main frame computers which are smaller, lighter in weight and have increased Automated Data Processing capabilities.
- o Investigate ADA software programming.
- o Investigate communication requirements for DoD IIA interface.

d. (U) FY 1989 Planned Program:

- o Draft requirements for Intelligence Analysis Center III.
- o Begin development of down-sized shelter configuration.
- o Draft mobility specification for Intelligence Analysis Center II

e. (U) Program to Completion:

- o Continue to develop a smaller intelligence analysis center with improved computer suite, mobility, and logistical supportability.

(U) Project C0066, Communications and Non-Communications Electronic Countermeasures Systems:

1. (U) Description: The goal of this program is to satisfy the continuing requirement for Communications and Non-Communications Electronic Countermeasures Systems which will provide the Marine Corps the ability to jam/deceive enemy transmitters and radars. A standoff communications jammer is required which will jam VHF and UHF tactical transmitters. This jammer will be the replacement for the currently fielded AN/ULQ-19 Jammer. A similar requirement exists to field a system capable of jamming high frequency transmitters. The Marine Corps also must be capable of jamming or deceiving counter-mortar/counter-battery, combat surveillance, target acquisition and certain other ground based radars.

Program Element: 26625M

Title: Marine Corps Intelligence/Electronics Warfare Systems (Operational Systems)

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

o Continued and accelerated advanced development of an expendable jammer (Expendable Drone).

o Prepared documentation for Milestone I for Communication Electronics Counter Measures Set (very high/ultra high frequency).

o Submitted request for information of available very high frequency/ultra high frequency and high frequency communication electronics countermeasures sets (jammers).

b. (U) FY 1987 Program:

o Submit request for proposals concerning very high frequency/ultra high frequency jammers.

c. (U) FY 1988 Planned Program:

o Conduct source selection of very high frequency/ultra high frequency jammers.

o Issue request for proposal dealing with high frequency jammers.

d. (U) FY 1989 Planned Program:

o Complete Milestone III and obtain production decision for very high frequency/ultra high frequency jammers.

o Conduct source selection of high frequency jammers.

e. (U) Program to Completion:

o Complete Milestone III and obtain production decision of high frequency jammers.

(U) Project C1297, Tactical Remote Sensor System:

1. (U) Description: This system is an unattended ground sensor capable of detection of movement during amphibious operations and follow-on operations ashore. The set of equipment consists of hand emplaced and air delivered sensors, monitors, and radio relays.

Program Element: 26625M

Title: Marine Corps Intelligence/Electronics Warfare Systems (Operational Systems)

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Completed fabrication of a disposable seismic intrusion detector.
- o Initiated investigation into interface with the Intelligence Analysis Center.
- o Commenced fabrication of system relays and monitors.
- o Corrected discrepancies discovered during developmental and operational testing.
- o Commenced design and fabrication of engineering development models for Phase V equipment.
- o Prepared for Developmental and Operational Testing I of the Tactical Remote Sensor System.

b. (U) FY 1987 Program:

- o Conduct Developmental and Operational Testing I and complete documentation for Marine Corps Systems Acquisition Review Council II decision of the Tactical Remote Sensor System.
- o Prepare a threat analysis update to cost alternatives of sensor systems.

c. (U) FY 1988 Planned Program:

- o Conduct Development and Operational Testing II and complete documentation for procurement decision of the Tactical Remote Sensor System.
- o Continue integrated logistic support documentation of the Tactical Remote Sensor System.

d. (U) FY 1989 Planned Program:

- o Conduct factory training for fielding of the Tactical Remote Sensor System.
- o Complete integrated logistic support documentation of the Tactical Remote Sensor System.

Program Element: 26625M

Title: Marine Corps Intelligence/Electronics Warfare Systems (Operational Systems)

e. (U) Program to Completion:

- o Continue to develop additional types of sensing devices to improve USMC Tactical Remote Sensor System capabilities.

(U) Project C1928, Tactical Electronic Reconnaissance Processing and Evaluation System:

1. (U) Description: This is a portion of the Marine Air Ground Intelligence System previously funded under the Intelligence Analysis System. This effort was initiated as a separate line item in FY 1987 for Navy and Marine Corps Management. This system currently provides electronic signals from aviation reconnaissance data to the Marine Air Ground Task Force via the Marine Air Ground Intelligence System. Without upgrade this ceases to support intelligence efforts in FY 1988.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Received funding as a portion of the Intelligence Analysis System project C0062 in this Program Element.
- o Initiated an upgrade to the existing system to replace the current CP808 computer with a Navy standard UYK-43 computer.
- o Awarded a competitive contract to develop software and system integration.
- o Continued development of software and systems integration.

b. (U) FY 1987 Program:

- o Fund as a separate line item.
- o Complete development of software and systems integration.
- o Commence integration of the TADIXS-B Tactical Receive Equipment software into the Tactical Electronic Reconnaissance Processing and Evaluation System.
- o Support the Tactical Electronic Reconnaisance Processing and Evaluation System software support activity.

Program Element: 26625M

Title: Marine Corps Intelligence/Electronics Warfare Systems (Operational Systems)

c. (U) FY 1988 Planned Program:

- o Prepare detailed test plan for phase II Operational Testing.
- o Conduct phase II Operational Testing.
- o Achieve Initial Operational Capability phase II for the Tactical Electronic Reconnaisance Processing and Evaluation System.

d. (U) FY 1989 Planned Program:

- o Initiate block upgrade.
- o Integrate automated interfaces within external systems.
- o Continue enhancements to maintain compatibility with EA6-B aircraft.

e. (U) Program to Completion:

- o Complete block 3 upgrade.
- o Complete enhancements enabling compatibility with EA6-B aircraft.

(U) C1961, Mobile Electronic Warfare Support System

1. (U) Description: This is an electronic warfare suite of equipment designed to fit in a highly mobile tactical vehicle. It will provide the ground commander with a mobile electronic warfare system capable of operating in a variety of tactical situations. The electronic warfare suite will be modular in design to facilitate quick installation and removal. It will detect, locate and degrade enemy tactical AM and FM radio communications.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o This program was contained in project C0937, Title: Mobile Electronic Warfare Support System.

Program Element: 26625M

Title: Marine Corps Intelligence/Electronics Warfare Systems (Operational Systems)

b. (U) FY 1987 Program:

- o This program will be contained in project C0066, Title: Communications and Non-Communications Electronic Counter measures systems.

c. (U) FY 1988 Planned Program:

- o Survey technology for systems upgrades providing enhanced frequency coverage.
- o Survey technology for systems upgrades providing enhanced system mobility.
- o Incorporate vehicle upgrades being conducted under the Light Armored Vehicle program that are applicable to the Mobile Electronic Warfare Support System vehicle.

d. (U) FY 1989 Planned Program:

- o Evaluate systems providing expanded frequency coverage.
- o Evaluate systems providing enhanced system mobility.
- o Continue vehicle upgrades as identified.

e. (U) Program to Completion:

- o Incorporate upgrades to system for extended frequency coverage.
- o Incorporate upgrade to system for enhanced mobility.
- o Continue vehicle upgrades as identified.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 26626M
DoD Mission Area: 351-Land Warfare

Title: Marine Corps Command/Control/Communications Systems (Operational Systems)
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 32,081 | 24,950 | 25,164 | 25,063 | Continuing | Continuing |
| C0036 | Marine Corps Command and Control Systems* | 7,108 | 7,401 | 7,160 | 7,340 | Continuing | Continuing |
| C0038 | Tactical Air Operations Module | 3,387 | ** | ** | ** | - | - |
| C0042 | Position Location Reporting System | 3,149 | 3,754 | *** | *** | Continuing | Continuing |
| C0045 | Tactical Systems Inter/Intraoperability Program | 2,465 | 3,185 | 3,422 | 6,415 | Continuing | Continuing |
| C0052 | NAVSTAR Global Positioning System | 13 | 58 | *** | *** | Continuing | Continuing |
| C0062 | Intelligence Analysis Center Product Improvement Program | 7,564 | ****(5935) | **** | **** | Continuing | Continuing |
| C0103 | Marine Air Command and Control Systems Operational Development | 2,975 | 3,854 | 4,205 | 6,073 | Continuing | Continuing |
| C1067 | Aviation Radar Product Improvement Program | 2,656 | 2,244 | 6,152 | 3,901 | Continuing | Continuing |
| C1443 | Training Devices/Simulators Program | 2,764 | 4,454 | 4,225 | 1,334 | Continuing | Continuing |

* Renamed in FY 1988 from Marine Integrated Fire and Air Support System.
** Funds consolidated in Project C0103, Marine Air Command and Control Systems (Operational Systems).
*** Funding consolidated in C0036, Marine Corps Command and Control Systems.
**** Funded in Program Element 26625M, Marine Corps Intelligence/Electronic Warfare Systems (Operational System).

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

Program Element: 26626M

Title: Marine Corps Command/Control/Communications Systems (Operational Systems)

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides funds for the further development of operational Marine command, control and communications systems. Efforts will be directed toward achieving inter/intraoperability and total integration of tactical command, control and communications systems and related subsystems. Individual system modification and enhancements are initiated as part of this project.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this descriptive summary are as follows: Marine Corps Command Control Systems: The FY 1988 decrease of 1,625 reflects a Marine Corps decision to consolidate the Tactical Combat Operations project, Position Location Reporting System and the NAVSTAR Ground Positioning System within this project line. Tactical Air Operations Module: This project was consolidated into CO103, Marine Air Ground and Communications (Operational Systems) in this Program Element. Position Location Reporting System: The FY 1986 decrease of 785 is due to delays required by reliability testing. The FY 1987 decrease of 1,598 is due to Congressional undistributed reductions to this program element. Tactical Systems Inter/Intraoperability Program: The FY 1986 decrease of 5,108 results from delays in contracting interoperability efforts. The FY 1987 decrease of 6,490 is due to Congressional undistributed reductions to this program element. The FY 1988 decrease of 10,180 results from less than previously estimated costs and for delays in planned intra/interoperability studies while awaiting subject systems maturity. NAVSTAR Global Positioning System: The FY 1986 decrease of 49 is due to program maturity impact on program management costs. This project was consolidated into Marine Corps Command and Control Systems in FY 1988. Intelligence Analysis Center Product Improvement Program: This project is compared and described in Program Element 26625M, Marine Corps Intelligence/Electronic Warfare Systems (Operational Systems). Marine Air Command and Control Systems Operational Development: The FY 1986 decrease of 366 results from changes in improvement strategy from development to non-development item approach. The FY 1987 decrease of 2,165 is due to Congressional undistributed reductions to this program element. The FY 1988 decrease of 2,168 is due to Joint Tactical Information Distribution System Tactical Data Link-J integration into the Tactical Air Operations Module (AN/TYQ-23). Aviation Radar Product Improvement: The FY 1986 decrease of 1,095 and the FY 1987 decrease of 2,964 is due to Congressional undistributed reductions to this program element. The FY 1988 decrease of 1,076 is due to a refinement in scope of effort for radar product improvements. Training Devices/Simulators Product Improvement: The FY 1987 decrease of 1,422 is due to Congressional undistributed reductions to this program element. The FY 1988 increase of 895 results from a product improvement acceleration for the Tactical Warfare Simulation Evaluation and Analysis System. A standard Navy UYK-43 Computer will be incorporated into the system to accommodate the Integrated Maneuver Control function software.

Program Element: 26626M

Title: Marine Corps Command/Control/Communications Systems (Operational Systems)

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 20,710 | 39,064 | 39,925 | 57,999 | Continuing | Continuing |
| C0036 | Marine Integrated Fire and Air Support System | *(11,779) | 7,344 | 7,737 | 8,785 | Continuing | Continuing |
| C0037 | Tactical Combat Operations | *(1,481) | *(1,830) | *(4,249) | 11,343 | Continuing | Continuing |
| C0038 | Tactical Air Operations Module | **(5,493) | 3,106 | *** | *** | - | - |
| C0042 | Position Location Reporting System | *(6,454) | 3,934 | 5,352 | 7,285 | Continuing | Continuing |
| C0045 | Tactical Systems Inter/Intraoperability Program | 2,633 | 7,573 | 9,675 | 13,602 | Continuing | Continuing |
| C0052 | NAVSTAR Global Positioning System Improvement Program | 118 | 62 | 58 | 53 | Continuing | Continuing |
| C0062 | Intelligence Analysis Center Product Improvement Program | 6,648 | 7,414 | ****(7519) | ****(7995) | Continuing | Continuing |
| C0103 | Marine Air Command and Control Systems Operational Development | 4,217 | 3,341 | 6,019 | 6,373 | Continuing | Continuing |
| C1067 | Aviation Radar Product Improvement Program | 4,616 | 3,752 | 5,208 | 7,228 | Continuing | Continuing |
| C1443 | Training Devices/Simulators Product Improvement | 2,478 | 2,538 | 5,876 | 3,330 | Continuing | Continuing |

* Funded in Program Element 64719M, Marine Corps Command/Control/Communications Systems (Engineering).
** Funded in Program Element 64720M, Tactical Air Operations Module.
*** Funds consolidated in Project C0103, Marine Air Command and Control Systems (Operational Systems).
**** Funded in Program Element 26625M, Marine Corps Intelligence/Electronic Warfare Systems (Operational System).

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1988 only.

Program Element: 26626M

Title: Marine Corps Command/Control/Communications Systems (Operational Systems)

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | | | | | | |
| C0036 | Marine Corps C2 System | | | | | | |
| | Marine Integrated Fire and Air Support System | - | - | - | 40,000 | TBD | TBD |
| | (qty) (RON 140024) | - | - | - | - | TBD | TBD |
| C0038 | Tactical Air Operations Module AN/TYQ-23 | 67,273 | 50,459 | 71,623 | 65,683 | 191,808 | 446,846 |
| | (qty) (RON 140034) | (2) | (5) | (9) | (8) | (27) | (51) |
| C0042 | Position Location Reporting System | 43,460 | 0 | - | 31,613 | 65,375 | 140,448 |
| | (qty) (RON 140014) | (2) | 0 | - | (2) | (4) | (8) |
| C0052 | NAVSTAR Global Positioning System | | | | | | |
| | Manpack Radios & Equipment | 11,937 | 2,662 | - | - | TBD | TBD |
| | (qty) (RON 049001) | - | - | - | - | TBD | TBD |
| C0103 | Marine Air Command and Control Systems Operational Development | | | | | | |
| | Tactical Air Operations Central AN/TYQ-2 | 866 | - | - | - | TBD | TBD |
| | (qty) (RON 147239) | - | - | - | - | TBD | TBD |
| C1067 | Aviation Radar Product Improvement | | | | | | |
| | Radar Set AN/TPS-32 Decoys | - | - | - | 8,230 | 10,700 | TBD |
| | (qty) (RON 142235) | - | - | - | (4) | (6) | TBD |
| | Radar Set AN/TPS-59 MOD | - | - | 4,908 | - | TBD | TBD |
| | (qty) (RON 147239) | - | - | (11) | - | TBD | TBD |
| | Radar Set AN/TPS-32 MOD | - | 2,124 | 2,025 | 3,100 | TBD | TBD |
| | (qty) (RNC 147239) | - | (6) | (6) | (12) | TBD | TBD |
| | Radar Set AN/TPS-63 MOD | 1,477 | - | 5,681 | 3,140 | TBD | TBD |
| | (qty) (RON 147239) | (4) | - | (18) | (24) | TBD | TBD |
| C1443 | Training Devices and Simulators (Product Improvement) | | | | | | |
| | Tactical Warfare Simulation, Evaluation and Analysis System | - | - | - | 6,554 | TBD | TBD |
| | (qty) (RON 040278) | - | - | - | (4) | TBD | TBD |
| | Precision Gunnery Training System | - | - | 2,836 | 4,580 | TBD | TBD |
| | (qty) (RON 64453) | - | - | (34) | (50) | TBD | TBD |
| | Combined Arms Staff Trainer | - | - | - | 3,102 | TBD | TBD |
| | (qty) (RON 64453) | - | - | - | (2) | TBD | TBD |

| | | | | | | |
|---|---|---|---|---|---|---|
| Manual Wargames (qty) (RON 64453) | 300 (64) | 340 (40) | 412 (107) | 351 (127) | TBD TBD | TBD TBD |

E. (U) RELATED ACTIVITIES: U. S. Army; Battalion Automated Battle Simulation, Brigade Automated Simulation Exercise, Battle Simulation, ARTBASS, Multiple Integrated Laser Engagement System, Individual Remote Target System, Armor Remote Target System, Army Instructional Management System. U. S. Navy; Electronic Warfare Simulation developments, SMOKEY SAM, Battle Group Tactical Trainer, Versatile Training Systems.

F. (U) WORK PERFORMED BY: IN-HOUSE: Marine Corps Development and Education Command, Quantico, VA; Marine Corps Tactical Systems Support Activity, Marine Corps Base, Camp Pendleton, CA; Naval Space and Weapons Command, Washington, DC; Naval Ocean Systems Center, San Diego, CA; U.S. Air Force Tactical Intelligence Systems Directorate, Hanscom AFB, MA: Naval Surface Weapons Center, Dahlgren, VA; Naval Training Systems Center, Orlando, FL; Combat Surveillance and Target Acquisition Lab, Ft. Monmouth, NJ. CONTRACTORS: Litton Industries, Van Nuys, CA; Westinghouse, Baltimore, MD; Systems Development Corp., McLean, VA; Computer Science Corporation, San Diego, CA; Sierra Research Corp., Buffalo, NY; General Electric Corp., Syracuse, NY; Hughes Aircraft Co., Fullerton, CA, and ITT Gilfillan, Van Nuys, CA; Norden Systems, Norwalk, CT; MITRE Corp., McLean, VA; Advanced Technology, McLean, VA, SCI Technology, Inc., Huntsville, AL and Comptek Research, Buffalo, NY.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project C0036, Marine Corps C2 Systems:

1. (U) Description: This project includes Marine Integrated Fire and Air Support System, the Tactical Combat Operations System, the Position Location Reporting System and NAVSTAR Global Positioning System. Marine Integrated Fire and Air Support System is a selectively automated tactical command and control system for the integration of mortars, artillery, naval gunfire and direct air support assets to achieve more effective and responsive fire support for ground maneuver forces. It is designed to support a complete Marine Air Ground Task Force, and will be located at the headquarters of the Marine Air Ground Task Force, division, infantry and artillery regiments/battalions. Remote firing units and observer teams will interface directly with the Marine Integrated Fire and Air Support System using the Digital Communications Terminal equipment. Tactical Combat Operations System is a tactical command and control system which will assist Marine Air Ground Task Force commanders in the performance of their planning operations and tactical intelligence functions. It is designed to support a complete Marine Air Ground Task Force and will be located in all combat units down to squadron/battalion level. Position Location Reporting System is an active system which maintains electronic tracks on manpack, vehicle and aircraft position location reporting systems user units. Global

Program Element: 26626M

Title: Marine Corps Command/Control/Communications Systems (Operational Systems)

Positioning System is a passive electronic system used to locate reference points utilized by Position Location Reporting System. In FY 1988 and beyond this project includes three efforts which were formerly separate project lines. They are: 1. Downsizing of the master station for Position Location Reporting System, a joint Army/Marine Corps program to automatically provide accurate (ground within 15-30 meters; air within 25-100 meters), real-time, navigation information and position location and identification of friendly combat elements automatically to the tactical commander to facilitate better maneuver control and more effective fire and air support. 2. Evaluation of the manpack version of NAVSTAR Global Positioning System, a space-based radio navigation system that provides equipped users the capability to determine absolute, three dimensional position, velocity and reference time around the globe. (DoD directed joint program with U.S. Air Force as executive agency). 3. Evaluation of the Tactical Combat Operations System, an automated system which will assist Marine Commanders and their staffs as they execute real-time command and control functions of Combat Operations.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Completed engineering development model fabrication of the Marine Integrated Fire and Air Support System.
- o Continued Developmental Testing II of the Marine Integrated Fire and Air Support System.
- o Commenced preparation for Operational Testing-II.
- o Commenced preparations for the production decision of the Marine Integrated Fire and Air Support System.
- o Commenced development of interfaces that were deferred from the Marine Integrated Fire and Air Support System engineering development model.
- o Refined engineer development model hardware for production of the Marine Integrated Fire and Air Support System.

b. (U) FY 1987 Program:

- o Commence Operational Testing II of the Marine Integrated Fire and Air Support System.
- o Analyze Operational Testing II results, and corresponding recommended changes of the Marine Integrated Fire and Air Support System.
- o Commence improvements to the system that result from testing of the Marine Integrated Fire and Air Support System.

Program Element: 26626M

Title: Marine Corps Command/Control/Communications Systems (Operational Systems)

- o Continue preparations for the production decision and effort of the Marine Integrated Fire and Air Support System.
- o Conduct Marine Corps Program Decision Meeting III of the Marine Integrated Fire and Air Support System.
- o Continue development of the deferred interfaces with associated tactical command/control/communications systems of the Marine Integrated Fire and Air Support System.
- o Evaluate and incorporate recommended changes from Operational Test II for production of the Marine Integrated Fire and Air Support System.
- o Continue refinement of hardware for production of the Marine Integrated Fire and Air Support System.
- o Continue preparation for the production effort of the Marine Integrated Fire and Air Support System.

c. (U) FY 1988 Planned Program:

- o Continue development of the deferred interfaces with associated tactical command/control/communication systems of the Marine Integrated Fire and Air Support System.
- o Continue to evaluate and incorporate changes from Operational Test II for production of the Marine Integrated Fire and Air Support System.
- o Continue preparation for the production effort of the Position Location Reporting System.
- o Accept the first system of the follow-on Position Location Reporting System buy.
- o Monitor Operational Test II of NAVSTAR Global Positioning System manpack terminals.

d. (U) FY 1989 Planned Program:

- o Complete planned deferred capability engineering for incorporation into Marine Integrated Fire and Air Support production base line.
- o Participate in NAVSTAR Global Positioning System in multi-service operational test and evaluation.

Program Element: 26626M

Title: Marine Corps Command/Control/Communications Systems (Operational Systems)

- o Prepare for Marine Corps Program Decision Meeting IIIB decision to begin procurement of the NAVSTAR Global Positioning System Manpacks.

e. (U) Program to Completion:

- o This is a continuing program.

(U) Project C0045, Tactical Systems Inter/Intraoperability Program:

1. (U) Description: This project assures that Marine Corps tactical command and control systems are interoperable with other services and allied systems in joint and combined operations, and interoperable among themselves to the degree required by approved Department of Defense guidance and validated Marine Corps operational requirements.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Drafted Marine Corps Interoperability Management Plan.
- o Initiated Interoperability test program development.
- o Continued to emphasize NATO interoperability, and US Marine Corps/US Navy interoperability.
- o Published updated Marine Corps Technical Interface Concepts and Technical Interface Design Plan documents.
- o Published updated Marine Corps Message Element Dictionary.
- o Continued development of a Position Location Reporting System and Marine Integrated Fire and Air Support System interface.
- o USMC participated in Joint Tactical Command/Control/Communications Central Data Base System.
- o Continued intra/interoperability configuration management of Marine Corps, Joint and Allied Standards.
- o Established protocol test bed.

Program Element: 26626M

Title: Marine Corps Command/Control/Communications Systems (Operational Systems)

- o Continued support of NATO working groups.
- o Continued development of USMC interoperability data base.

b. (U) FY 1987 Program:

- o Continue revision of Marine Corps Technical Interface Concepts and Technical Interface Design Plan documents.
- o Implement interoperability testing.
- o Continue to develop Marine Corps interoperability standards.
- o Continue the development of the interoperability database.
- o Continue to emphasize NATO interoperability.
- o Continue configuration management of Marine Corps, Joint and Allied standards.

c. (U) FY 1988 Planned Program:

- o Implement Marine Corps Interoperability Database
- o Continue interoperability testing.
- o Continue to develop Marine Corps interoperability standards.
- o Continue configuration management of Marine Corps, Joint, and Allied standards.

d. (U) FY 1989 Planned Program:

- o Continue interoperability testing.
- o Continue to develop Marine Corps interoperability standards.
- o Continue configuration management of Marine Corps, Joint, and Allied standards.

Program Element: 26626M

Title: Marine Corps Command/Control/Communications Systems (Operational Systems)

e. (U) Program to Completion:

- This is a continuing program.

(U) Project C0103, Marine Air Command and Control Systems Operational Development:

1. (U) Description: This project provides support for the Marine Air Command Control System to ensure that it achieves interoperability and compatibility both within the Marine Corps and in Joint/Allied operations.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Continued Tactical Air Command and Control development for growth to AN/TYQ-23 Tactical Air Operation Module inter/intraoperability.
- Maintained engineering change proposals development for other Marine Air Command and Control Systems (i.e., TYQ-1, TYQ-2, TYQ-3A).
- Maintained other system support as required.
- Continued hardware and software upgrade in support of the AN/TYQ-3A Tactical Data Communications Central.
- Continued a product improvement program for the Tactical Air Command Center.
- Continued interoperability upgrade of the AN/TYQ-23 Tactical Air Operations Module.
- Initiated effort to improve the Direct Air Support Center.
- Instituted block upgrades to ensure interoperability among Marine Air Command and Control Systems and between the Marine Air Command and Control System and other services, including NATO.

b. (U) FY 1987 Program:

- Maintain other system support as required.

Program Element: 26626M

Title: Marine Corps Command/Control/Communications Systems (Operational Systems)

- Initiate efforts to reduce the systems infrared emissions and signature of Marine Air Command and Control Systems.
- Continue block software upgrade in support of Marine Air Command and Control fielded systems.
- Continue preplanned product improvement of the AN/TPB-1D Radar Course Directing Central.
- Transition Tactical Air Command Center upgrades through a product improvement program into a separate line item, C1929, Advanced Tactical Air Command Central in Program Element 64719M, Marine Corps Command/Control/Communications Systems (Operational Systems).
- Continue efforts to upgrade and improve the Direct Air Support Center equipment.
- Continue hardware and software upgrade of fielded systems to meet current threat by improving nuclear, biological and chemical defense capabilities.
- Correct deficiencies discovered during field tests/usage of the Tactical Air Operations Module, AN/TYQ-23 Tactical Air Operations Module.

c. (U) FY 1988 Planned Program:

- Continue block software upgrades in support of fielded system.
- Continue correction of deficiencies discovered during field tests/usage of the AN/TYQ-23 Tactical Air Operations Module.
- Continue block interoperability upgrades for fielded systems (i.e., AN/TYQ-3A Tactical Data Communications Central).
- Begin integration of Joint Tactical Information Distribution System and anti-jam High Frequency Radio equipment into AN/TYQ-23 Tactical Air Operations Module.

d. (U) FY 1989 Planned Program:

- o Continue block software upgrades in support of fielded systems.
- o Continue block interoperability upgrades for fielded systems.
- o Continue Joint Tactical Information Distribution System/High Frequency Anti-Jam Radio integration into AN/TYQ-23 Tactical Air Operations Module.
- o Continue correction of deficiencies discovered during test/usage of the AN/TYQ-23 Tactical Air Operations Module.

e. (U) Program to Completion:

- o Continue block interoperability upgrades for fielded systems.
- o Complete Joint Tactical Information Distribution System/High Frequency anti-jam integration into AN/TYQ-23 Tactical Air Operations Module.
- o Continue block software upgrades in support of fielded systems.

(U) Project C1067, Aviation Radar Product Improvement:

1. (U) Description: This project ensures that modifications, improvements, and actions in response to field identified discrepancies are developed for existing radars and associated equipments. It also ensures that electronics counter-counter measures and anti-anti radiation missile capability for existing and developing radar systems are defined and developed.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Continued to identify required change/mods to production and fielded system with the emphasis on AN/TPS-32, AN/TPS-63, and AN/TPS-59 radars, as well as radar remoting and anti-radiation missile efforts to optimize radar and Tactical Air Operations Module survivability.
- o Completed AN/TPS-59 radar decoy testing.
- o Completed AN/TPS-32 radar decoy development.

Program Element: 26626M

Title: Marine Corps Command/Control/Communications Systems (Operational Systems)

- Initiated AN/TPS-59 radar product improvement to increase the performance in a high-threat, high-clutter environment.
- Tested AN/TPS-32 radar decoys.
- Improved electronic counter-counter measures performance of all radars.
- Improved design for the reliability for AN/TPS-32 radar transmitter control unit and receiver synthesizer.
- Continued AN/TPS-63 Product Improvement of solid state transmitter components to achieve improved reliability and maintainability.

b. (U) FY 1987 Program:

- Design modifications for the reliability, adaptability and maintainability of the AN/TPS-32 radar receiver.
- Continue improvements on a spectrum analyzer to reduce electronic countermeasure vulnerability of the AN/TPS-59 radar.
- Plan for design of a new ultra-low sidelobe antenna for operation in a high threat environment by the AN/TPS-63 radar.
- Continue development of solid state transmitter components to improve the reliability of the AN/TPS-63 radar.

c. (U) FY 1988 Planned Program:

- Identify and integrate a non-developmental item display console into the AN/TPS-32 radar.
- Continue to develop the spectrum analyzer to reduce electronic countermeasure vulnerability of the AN/TPS-59 radar.

d. (U) FY 1989 Planned Program:

- Continue development of the receiver modification to the AN/TPS-32 radar.
- Begin development of the energy management track-while-scan ground control interface upgrade to the AN/TPS-59 radar.

- Begin development of a solid state transmitter for the AN/TPS-63 radar.

e. (U) Program to Completion:

- Complete anti-radiation missle defense system for the AN/TPS-59 and AN/TPS-32 radars.
- Complete reliability, adaptability and maintainability improvements to the AN/TPS-32 and AN/TPS-63 radars.
- Complete development, production, and fielding of electronic counter-counter measures enhancements to AN/TPS-63, AN/TPS-32, and AN/TPS-59 radars.

(U) Project C1443, Training Devices/Simulators (Product Improvement).

1. (U) Description: This project will continue the product improvement of the Tactical Warfare Simulation, Evaluation, and Analysis System and a family of manual wargame based tactical training systems designed to give unit commanders and staffs an opportunity to practice the tactical decisions they would make on a battlefield. It will also develop training devices and simulators which are not or cannot be developed in conjunction with a major end item such as the Combined Arms Staff Trainer and the Precision Gunnery Training System. Additionally, this is a continuing project that identifies methods and techniques to improve the effectiveness of training conducted throughout the Marine Corps.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Continued final prototype development of the battalion level wargame (STEELTHRUST).
- Conducted final prototype test of TANKER, the first occupational specialty game-based training system, and initiated production contract.
- Developed the functional characteristics of the Combined Arms Staff Trainer.
- Contracted for production of STEELTHRUST and TANKER.
- Continued software design and documentation for Tactical Warfare Simulation and Evaluation and Analysis System Integrated Maneuver Controller.

Program Element: 26626M

Title: Marine Corps Command/Control/Communications Systems (Operational Systems)

- o Conducted preliminary design review, completed program performance specifications, and initiated preliminary design specifications of Tactical Warfare Simulation, Evaluation, and Analysis System Integrated Maneuver Control (IMC).
- o Released request for proposal for the Precision Gunnery Training System: Contract with procurement options.
- o Awarded contract for the development of the Combined Arms Staff Trainer.

b. (U) FY 1987 Program:

- o Complete the Tactical Warfare Simulation Evaluation and Analysis System - Integrated Maneuver Controller (IMC) critical design review.
- o Conduct development/operational testing of Combined Arms Staff Trainer.
- o Conduct operational test of the Tactical Warfare Simulation, Evaluation and Analysis System automated display system.
- o Complete preliminary design specifications and conduct critical design review and develop test plan specifications for Tactical Warfare Simulation, Evaluation, and Analysis System Integrated Maneuver Control (IMC).
- o Award contract and conduct operational testing of the first article TOW Anti-Armor variant of the Precision Gunnery Training System.
- o Continue prototype development for production of TAOWAR and STEELTHRUST Amphibious variants.

c. (U) FY 1988 Planned Program:

- o Begin development of Tactical Warfare Simulation Evaluation and Analysis System interface with Marine Tactical Air Command and Control Systems.
- o Install initial Combined Arms Staff Trainer at Twentynine Palms, CA.
- o Initiate coding and testing of software for Tactical Warfare Simulation, Evaluation, and Analysis System Integrated Maneuver Control.

Program Element: 26626M

Title: Marine Corps Command/Control/Communications Systems (Operational Systems)

- o Initiate production contract for STEELTHRUST Amphibious variant.
- o Complete development of Marine Corps Manual Wargames.
- o Field Tactical Warfare Simulation Evaluation and Analysis System Integrated Maneuver Control software and install fourth equipment suite at Camp Butler.
- o Award contract for production of STEELTHRUST (Amphib), RIFLEMAN, and COMBAT ENGINEER.
- o Exercise production option for TOW variant of Precision Gunnery Training System.
- o Conduct developmental/operational testing of the first article DRAGON variant of the Precision Gunnery Training System.

d. (U) FY 1989 Planned Program:

- o Continue development of Tactical Warfare Simulation, Evaluation and Analysis System interface with Marine Tactical Air Command and Control Systems.
- o Award contract for additional Combined Arms Staff Trainers.
- o Begin development of Combined Arms Training System.
- o Exercise production option for the DRAGON variant of the Precision Gunnery Training System.

e. (U) Program to Completion:

- o This is a continuing program.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 27316N
DoD Mission Area: 244 - Defense Suppression

Title: Tacit Rainbow
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 0 | 0 | 14,689 | 5,896 | 3,951 | 24,536 |
| W2002 | Tacit Rainbow* | 0 | 0 | 14,689 | 5,896 | 3,951 | 24,536 |

* Funding for Navy peculiar requirements only. Air Force is lead service with development funding in PE 27316F.

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Services have an urgent need for a low-cost, programmable, airborne loitering system that can search out and attack emitting enemy radars and jammers. This system will provide commanders with a weapon that can defeat/suppress the enemy's ability to: (1) acquire and attack friendly forces and (2) jam friendly emitters. Both air and surface-launched variants will be developed with maximum component commonality between the variants being mandatory. The system will interface with existing and planned command, control, communications, and intelligence ($C^3I$) elements and be compatible with individual and joint Service employment concepts.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: Not Applicable.

Program Element: 27316N Title: Tacit Rainbow

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Weapon Procurement, Navy: | | | | | | |
| Funds | 0 | 0 | 0 | | | |
| Quantities* | 0 | 0 | 0 | | | |

* Air Force procurement will commence in FY 1988.

E. (U) RELATED ACTIVITIES: The Tacit Rainbow (TR) program is a tri-Service effort with the Air Force serving as the Executive Service and Army and Navy personnel integrated into a Joint System Program Office (JSPO). Air Force funding for Tacit Rainbow is provided under PE 27316F.

F. (U) WORK PERFORMED BY: IN HOUSE: The Tacit Rainbow development and acquisition program is managed by the Tacit Rainbow (JSPO) at the Aeronautical Systems Division, Wright-Patterson AFB, OH; Other government organizations include: Air Force Tactical Air Command, Langley Air Force Base, VA; Air Force Strategic Air Command, Offutt Air Force Base, NE; Air Force Logistics Command, Wright-Patterson, Air Force Base, OH; Warner Robbins Air Logistics Center, Warner Robbins Air Force Base, GA; Naval Air Systems Command, Washington DC; Naval Weapons Center, China Lake, CA; Army Material Command, Washington DC; Army Missile Systems, Redstone Arsenal, AL; Dugway Proving Ground, UT. CONTRACTORS: Northrop Corporation, Ventura Division, Thousand Oaks, CA, was selected as the prime contractor for full scale development and initial air-launch vehicle production. Additional contractors will be competitively selected for second-source air-vehicle production.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W2002, Tacit Rainbow:

1. (U) Description: The Tacit Rainbow development program will significantly increase the Services' capability to suppress enemy air defenses by producing a low-cost, programmable, airborne loitering system that can search out and attack emitting enemy radars and jammers. Air-launched Tacit Rainbow vehicles will be compatible with the Air Force B-52 aircraft, and

Program Element: 27316N Title: Tacit Rainbow

Air Force and Navy tactical aircraft (F-16, A-7, F/A-18, A-6E). Using simplified seeker and guidance techniques and state-of-the-art technology, this autonomous weapon system is designed to produce a viable emitter attack capability at a cost significantly less than other anti-radiation attack weapon systems. The Air Force has negotiated a $161M cost cap for completion of the full scale development contract. A unit production cost of $110,000 is anticipated based on a February 1986 Air Force/Navy estimate which was approved by OSD.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Not Applicable.

b. (U) FY 1987 Program: An air-launch vehicle Critical Design Review was conducted in October 1986. Contractor-conducted development flight tests will precede an Air Force/Navy combined Development Test and Evaluation/Initial Operational Test and Evaluation using the B-52 and A-6E aircraft. An improved vehicle seeker is in parallel development to meet a joint operational requirement to attack a larger number of target types.

c. (U) FY 1988 Planned Program: Complete the air-launch vehicle full scale development. Air Force and Navy combined Development Test and Evaluation/Initial Operational Test using the Air Force and Navy aircraft will be completed. The Air Force and Navy intend to procure air-launch vehicles, respectively. A low-rate-initial-production decision is planned An acquisition strategy will be developed which will provide for an air-launch vehicle production competition.

d. (U) FY 1989 Planned Program: Commence weapon system preplanned product improvements including expanded seeker capabilities and mission computer performance enhancements. The air-vehicle will be qualified on additional tactical aircraft (F/A-18 and A-7). Follow-on Operational Test and Evaluation will be conducted.

e. (U) Program to Completion: the first year of air-launch vehicle rate production. Air Force and Navy air-launch production will be completed respectively.

Program Element: 27316N Title: Tacit Rainbow

f. (U) Major Milestones:

| Milestone | Date |
|---|---|
| Air-Launch Milestones | |
| 1. (U) Milestone III | |
| 2. (U) Complete full scale development | |
| 3. (U) First Production Delivery | |
| 4. (U) Initial Operational Capability | |

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 28010M
DoD Mission Area: 345 - Tactical Communications

Title: Joint Tactical Communications Program
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 12,494 | 5,705 | 4,601 | 2,850 | Continuing | Continuing |
| C0049 | Unit Level Switches Product Improvement | 10,672 | 4,187 | 3,582 | 1,363 | Continuing | Continuing |
| C0065 | Marine Corps Unilateral TRI-TAC Test and Evaluation | 1,822 | 1,518 | 1,019 | 1,487 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Provides for the development of the TRI-TAC unit level switches and supporting technical control elements for which the Marine Corps has been designated the developing service by Assistant Secretary of Defense for Command, Control, Communications and Intelligence and further provides Marine Corps testing of Joint Tactical Communications Program equipments. Equipments developed within this program support the mission area of command and control and specifically support the switching requirements of the various subsystems within the Landing Force Integrated Communications System.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this descriptive summary are as follows: Unit Level Switches Product Improvement: The FY 1986 increase of 2,670 results from correction of DT/OT identified deficiencies. The FY 1987 decrease of 1,238 is due to Congressional reductions to slow Unit Level Circuit Switch planned product improvement efforts until after limited operational testing has been completed in FY 1987. The FY 1988 decrease of 6,075 is due to a FY 1985 and FY 1986 acceleration of the follow-on R&D program which was designed to correct testing deficiencies prior to commencement of production, significantly reducing the number of new interface requirements in the TRI-TAC architecture, and a providing a reassessment of

desired enhancements for the Unit Level Circuit Switch equipments. Marine Corps Unilateral TRI-TAC Test and Evaluation: The FY 1986 increase of 824 and the FY 1988 decrease of 1,663 are due to acceleration in the FY 1986 and FY 1987 of the full scale development phase of the Marine Corps' Fiber Optic Cable System. Four (4) 12-kilometer fiber optic links will be developed. The Fiber Optic Cable System will replace the CX-11230 cable system and will provide a significant enhancement in mobility.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 21,131 | 9,000 | 6,959 | 12,339 | Continuing | Continuing |
| C0049 | Unit Level Switches Product Improvement | 17,639 | 8,002 | 5,425 | 9,657 | Continuing | Continuing |
| C0056 | TRI-TAC Joint Testing Facility | 1,306 | *0 | *0 | *0 | * | * |
| C0065 | Marine Corps Unilateral TRITAC Test and Evaluation | 2,184 | 998 | 1,534 | 2,682 | Continuing | Continuing |

* Project C0056 (TRI-TAC Joint Testing Facility) funding for FY 1986 and beyond is transferred to the Joint Tactical Command, Control, and Communications Agency.

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1993 only.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| C0049 | Unit Level Switches | | | | | | |
| | ULCS, USMC AN/TTC-42 | - | 13,706 | 13,706 | 20,557 | TBD | TBD |
| | (qty) (RCN 041063) | - | (12) | (12) | (18) | TBD | TBD |
| | SB-3865 | 4,344 | 38,395 | 22,823 | 16,378 | TBD | TBD |
| | (qty) (RCN 041063) | (20) | (143) | (85) | (61) | TBD | TBD |

E. (U) RELATED ACTIVITIES: This effort is related to Program Element 28010A, Tri-Service Joint Tactical Communications Program, Army; Program Element 28010F, Tri-Service Joint Tactical Communications Program, Air Force; and PE 28010N, Tri-Service Joint Tactical Communications Program, Navy. National Security Agency is developing Communications Security equipment for the Unit Level Switch programs.

F. (U) WORK PERFORMED BY: IN-HOUSE: Space and Naval Warfare Electronic Systems Command, Washington, DC. CONTRACTORS: Calculon Corporation, Rockville, MD.; International Telephone and Telegraph, Defense Communications Division, Nutley, NJ.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) PROJECT C0049, UNIT LEVEL SWITCHES (Product Improvement):

1. (U) Description (Requirement and Project): The Marine Corps was tasked by Assistant Secretary of Defense, Command, Control, Communications and Intelligence, to develop and procure a Unit Level Circuit Switch to satisfy all service requirements. This development and acquisition program was further defined in instructions issued to the Marine Corps by the Director, TRI-TAC (JTC3A) The Unit Level Circuit Switch will extend, where required, the performance capabilities of the new large capacity switches, AN/TTC-39, and its associated Communications Security with the Switch Board - SB-3865, to the unit level. The Unit Level Message Switch development was assigned to the Marine Corps to provide automated message switching capabilities for all U.S. Armed Services.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Unit Level Circuit Switch/Message Switch

- o Continued follow-on R&D effort of Circuit Switch.
- o Continued full scale engineering development of the Message Switch.
- o Awarded production contract of Circuit Switch.
- o Commenced preparation for limited Operational Test II of AN/TTC-42 unit level circuit switch.

Program Element: 28010M Title: Joint Tactical Communications Program

b. (U) FY 1987 Planned Program: Unit Level Circuit Switch/Message Switch

- o Conduct engineering budgetary study of potential technological enhancements for FY 1991 block upgrade of Circuit Switch.
- o Conclude Full Scale Engineering Development for Unit Level Circuit Switch.
- o Conduct limited Operational Test II of the Unit level Circuit Switch.
- o Begin procurement of SB-3865 Tactical SwitchBoard.
- o Refurbish Full Scale Engineering Development model unit level message switches.
- o Conduct regression test of ULMS software.
- o Provide contractor operator training on Unit Level Message Switch prior to Operational Testing.
- o Conduct Developmental Testing and Operational Testing of the Unit Level Message Switch.
- o Conclude effort to identify final configuration of message switch.

c. (U) FY 1988 Planned Program: Unit Level Circuit Switch/Message Switch

- o Evaluate enhancements to Unit Level Circuit Switch.
- o Complete full scale engineering development of the message switch and procure reprocurement data package.
- o Evaluate potential technological enhancements with the Marine Corps for the unit level message switch.

d. (U) FY 1989 Planned Program: Unit Level Circuit Switch/Message Switch

- o Continue evaluation of potential technological and interoperability enhancements within the Marine Corps for the unit level circuit switch.
- o Complete preparation of Unit-Level message switch for competitive procurement.

- o Refurbish equipment as required for the Unit Level Message Switch.

e. (U) Program to Completion: Unit Level Circuit Switch.

- o Initial operational capability for Marine operational forces in FY 1990.
- o Submit request for proposal for Unit Level Message Switch.
- o Continue evaluation of potential technological and interoperability enhancements to Unit Level Message Switch.
- o Continue evaluation of additional product improvements to accommodate future data transmission requirements of the Marine Corps and enhance system interoperability.

(U) Project C0065, Marine Corps Participation in TRI-TAC Programs:

1. (U) Description: This program provides for technical writer support in the formulation of joint test plans, Marine Corps Development and Education Command testing of TRI-TAC equipment, transportation of Marines and Marine Corps peculiar test and evaluation equipment to the joint test bed for testing, development of a digital fiber optic cable system for the unit level switches, development of a fiber optic multiplexing system and development of a syscon/techcon for Marine tactical forces.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Provided technical support to U.S. Army Test and Evaluation Command during joint development testing to ensure that Marine Corps requirements were included in the joint service test and evaluation master plan of the single subscriber terminal.
- o Continued joint interoperability testing, to include Marine Corps peculiar communications/electronics equipment.
- o Continued full scale engineering development of digital fiber optic programs and evaluated a tactical throw-on-the-ground analog/digital applique unit for use with a fiber optic cable system.

- Continued participation in interoperability testing, to include Marine Corps peculiar communications/electronics equipment.
- Continued evaluation of syscon/techcon requirements.
- Continued evaluation of a tactical throw-on-the-ground analog digital and electro-optical fiber optic cable system.

b. (U) FY 1987 Program:

- Conclude full scale engineering development of digital fiber optic cable system, conduct a developmental/operational test and initiate correction of discrepancies discovered during testing.
- Monitor and evaluate selected joint tactical command, control and communications agency testing activities with potential Marine Corps impact.
- Continue planning for interoperability testing to include Marine Corps peculiar communication/electronic equipment.
- Evaluate and select a field test set that will determine attenuation of fiber optic cable assembly and locate (within 5 meters) a break in the line.
- Commence planning/development of tactical syscon/techcon.
- Continue development of a throw-on-the-ground analog/digital fiber optic multiplexing system.

c. (U) FY 1988 Planned Program:

- Conclude all full scale engineering development on digital and analog fiber optic cable systems for trunking.
- Begin evaluation of applique units (electro-optical converters) for fiber optic cable system.
- Continue development of tactical system control and technical control.
- Monitor and evaluate selected joint tactical command, control, and communications agency testing activities with potential Marine Corps impact.

d. (U) FY 1989 Planned Program:

- o Begin production of fiber optic applique (electro/optical converter).
- o Continue development of tactical system control and technical control.
- o Monitor and evaluate selected joint tactical command, control, and communications agency testing activities with potential Marine Corps impact.
- o Conclude Full Scale Engineering Development of Marine Corps Fiber Optic Multiplexing System.

e. (U) Program to Completion:

- o This is a continuing program.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63109N
DoD Mission Area: 374 C3 Protection/Multi-Mission, Technology and Support

Title: Integrated Aircraft Avionics
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Fstimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | - | 20,498 | 2,375 | 2,093 | Continuing | Continuing |
| W1953 | INEWS Adv Dev * | - | 13,950 | 0 | 0 | - | - |
| W1954 | ICNIA Adv Dev ** | - | 6,548 | 2,375 | 2,093 | Continuing | Continuing |

* In FY 1986 funding for this project included within PE 63206N Project W0638. In FY 1988 and 1989 funding is included in Air Force PE 63109F.

** In FY 1986 funding for monitoring Air Force and Army ICNIA development effort was included within PE 63217N Project W0446.

The above funding profile includes escalation and encompasses all work or development phases now planned or anticipated through FY 1989 only.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides funding for the advanced development of integrated aircraft avionics for Navy advanced aircraft and provides consolidated support for the Navy portion of the Integrated Electronic Warfare System (INEWS) and the Integrated Communications, Navigation, Identification Avionics (ICNIA) programs. INEWS/ICNIA are very innovative architectures based on Very High Speed Integrated Circuit (VHSIC) technology that allow for total integration of aircraft avionics systems, provides intelligent resource management of sensor data and countermeasures and affords substantial growth potential through addition rather than modification of avionic subsystems. The integration of avionic functions provides a dramatic decrease in the life cycle cost, complexity, size and weight of aircraft systems while significantly improving aircraft performance, survivability and readiness. The ability to integrate avionics functions is made possible by recent developments in VHSIC, microwave/millimeter wave, and electro-optic device technologies as well as by innovations in computer architecture, data transfer/storage device and electronic cooling/packaging techniques. The INEWS/ICNIA programs are joint, advanced technology development efforts designed to demonstrate the integration of electronic warfare and communication/navigation/IFF functions for application in future aircraft including the Navy Advanced Tactical Aircraft (ATA), the Air Force Advanced Tactical Fighter (ATF) and the Army LHX. Future projects will explore integration of all major core and mission avionics subsystems to demonstrate the substantial savings in life cycle costs to be gained through subsystems synergism and shared common hardware between systems and platforms.

Program Element: 63109N Title: Integrated Aircraft Avionics

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The significant changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows:

Project W1953, INEWS: Reduced 1,661 in FY 1987 due to Congressional adjustment; reduced 22,903 in FY 1988 due to Department program/budget adjustment. W1953 INEWS development funding for FY 1988 to completion was transferred to the Air Force, joint service lead program sponsor in PE 63109F.

Project W1954, ICNIA: Reduced 7,540 in FY 1988 due to Department budget and program adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | - | - | 22,484 | 27,818 | TBD | TBD |
| W1953 | INEWS Adv Dev | - | - | 15,611 | 22,903 | TBD | TBD |
| W1954 | ICNIA Adv Dev | - | - | 6,873 | 4,915 | TBD | TBD |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not applicable.

E. (U) RELATED ACTIVITIES: Electronic warfare advanced development efforts in Program Element 63206N (EW Advanced Development) contribute to and support INEWS development efforts. The Electronic Devices portion of Program Element 62234N (Support Systems Technology) has developed VHSIC devices, microwave/millimeter wave devices, surface acoustic wave devices and packaging technology being exploited in ICNIA and INEWS efforts. Program Element 62732N (Command Control and Communications Technology) has developed much of the radio frequency (RF) receiver technology used in ICNIA front-ends. Program Element 63217N, Project W0446 (Advanced Avionic Subsystems Technology) develops standard avionic modules, connectors, standard enclosures and integrated racks technology being exploited in modular avionic systems such as ICNIA/INEWS. Navy and joint services VHSIC/VHSIC insertion programs have demonstrated the signal processor/preprocessor hardware being used in ICNIA/INEWS. The Navy is currently completing the development of a VHSIC based communications signal processor under Program Element 62762N. The Air Force and Army are pursuing the development of ICNIA terminals under Program Element 63109F (INEWS/ICNIA Advanced Development) and Program Element 63207A respectively. The DoD/tri-service MIMIC Program is developing microwave/millimeter wave monolithic circuits for EW and communications systems under Program Element 63706D. Air Force INEWS efforts are supported by Program Element 63109F. There is no unnecessary duplication of effort within the Navy or the Department of Defense.

Program Element: 63109N Title: Integrated Aircraft Avionics

F. (U) WORK PERFORMED BY:

(U) Primary Contractors - INEWS: TRW, San Diego, CA; Sanders Assc., Nashua, NH; General Electric, Utica, NY; Westinghouse Electric Co, Baltimore, MD.

(U) Primary Contractors - ICNIA: TRW, San Diego, CA.; Rockwell/Collins, Cedar Rapids, IA; Singer Kearfott, Little Falls, NJ.

(U) IN-HOUSE: Naval Air Development Center, Warminster, PA; Naval Air Test Center, Patuxent River, MD; Naval Avionics Center, Indianapolis, IN; Naval Weapons Center, China Lake, CA; Pacific Missile Test Center, Point Mugu, CA; Naval Research Laboratory, Washington, DC; and Air Force Wright Aeronautical Laboratory, Wright-Patterson AFB, OH.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W1953, INEWS Advanced Development:

1. (U) Description: This project provides funding for the Air Force managed INEWS prime contract, development efforts to accommodate Navy unique ATA/mission requirements and Navy laboratory, engineering and test support. INEWS will provide a multi-spectral threat warning and countermeasure capability for the ATA and ATF. The totally integrated EW system will significantly raise aircrew EW situation awareness and mission effectiveness by employing advanced processing techniques and VHSIC technology which will automatically provide real time multi-sensor fusion, countermeasures response and weapons systems cuing in an easily comprehensible format. The INEWS prime mission equipment will include hardware and software to provide signal data processing, sensing, control and display interface, and countermeasures. The system will be developed in a modular fashion so as to easily accommodate the incorporation of later technological developments and be packageable for use in future aircraft.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: (program funded in PE 63206N, EW Advanced Development)

° Completed INEWS concept definition investigation (INEWS Phase 1A).

° Prepared for the Defense Acquisition Review Council (DSARC) Milestone 1 (Postponed until 4/87).

° Conducted down-selection to two Joint Venture contractor teams.

° Awarded INEWS Phase 1B demonstration/validation and risk reduction contract

Program Element: 63109N Title: Integrated Aircraft Avionics

b. (U) FY 1987 Program:

° Continue INEWS Phase IB demonstration/validation and risk reduction.

° Commence design and fabrication of a breadboard Integration System Facility (ISF).

° Commence INEWS software development.

° Commence Preliminary Full Scale Development (FSD) tasks.

° Prepare for Joint Requirements and Management Board (JRMB) Milestone I.

c. (U) FY 1988 Planned Program: (Program funded in Air Force PE 63109F)

° Continue Preliminary Full Scale Development tasks.

° Begin source selection for FSD (Phase 2).

° Prepare for JRMB Milestone II.

d. (U) FY 1989 Planned Program: (Program funded in Air Force PE 63109F)

° Participate with USAF in FSD.

Program Element: 63109N Title: Integrated Aircraft Avionics

f. (U) Major Milestones:

| MILESTONE | DATE |
|---|---|
| 1. MS I | FY 87/3 Qtr |
| 2. MS II | FY 88/4Q |
| 3. MS IIIA (lim prod) | FY 91/4Q |
| 4. MS IIIB (full prod) | FY 93/3Q |
| 5. IOC | FY 95/4Q |

(U) Project W1954, ICNIA Advanced Development:

1. (U) Description: This project develops a new family of modular communications, navigation and identification avionics equipment for future naval aircraft. The ICNIA program is a tri-service program with Air Force the designated executive service. The Air Force/Army program began in FY 1984 with the Navy joining the effort in FY 1986. All Navy funding in this project is for Navy unique waveforms and Navy development support only. Navy advanced development model (ADM) equipment will be a five or six function terminal including one or two Navy unique waveforms.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Initiated joint ICNIA development effort with Air Force/Army.

° Completed a memorandum of agreement with the Air Force.

b. (U) FY 1987 Program:

° Establish presence as full tri-service member in the ICNIA program.

° Develop Navy requirement documents and incorporate in contract.

° Begin development of software for unique Navy waveforms.

c. (U) FY 1988 Planned Program:

Program Element: 63109N Title: Integrated Aircraft Avionics

° Continue development of software for unique Navy waveforms.

° Participate in Air Force and Army DT&E.

d. (U) FY 1989 Planned Program:

° Participate in Air Force and Army DT&E.

° Commence fabrication of a Navy mini-ICNIA terminal.

e. (U) Program to Completion:

° Complete fabrication of Navy ICNIA terminal.

° Conduct test and evaluation of Navy ICNIA terminal including Navy unique waveforms.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63206N
Title: Electronic Warfare Advanced Development
DoD Mission Area: 371 - Self-Protection
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 46,012 | 27,718 | 62,350 | 46,821 | Continuing | Continuing |
| W0638 | Airborne Defensive Electronic Countermeasures | 26,167 | 12,392 | 36,829 | 28,644 | Continuing | Continuing |
| W0640 | Offboard Electronic Warfare | 19,845 | 11,824 | 21,712 | 14,262 | Continuing | Continuing |
| W1935 | Strike Electronic Warfare Simulator | (3,900*) | 3,502 | 3,809 | 3,915 | 0 | 17,126 |

* Funded in from Project W0602, 64255N in FY 1986, not included in total shown here.

As this is a continuing program, the above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides for advanced development efforts to ensure the combat survivability of tactical fixed and rotary wing aircraft through the development of self-protection systems to provide flight crews with: (1) threat warning of advanced threats to cue evasive maneuvers or activate jammers/deceptive repeaters to divert missile guidance radar and target trackers; and (2) offboard electronic warfare (EW) expendable systems which will decoy/jam the threat missile's guidance and cause the threat to be diverted to a safe miss distance. It also accommodates the development of the Strike EW Simulator (SEWS) and supports advanced technology demonstration and transition of EW projects for all Navy EW platforms. Efforts in this program element include coordinated and joint multi-service developments in Radar Frequency (RF), Electro-Optical (EO) and Infrared (IR) countermeasures. A joint Army, Navy and Air Force effort is ongoing to establish the Joint Airborne Expendable Decoy Office (JAEDO), scheduled to stand-up in July 1987. JAEDO will be charged with the development management of airborne expendable decoy systems.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: For W0638, in FY 1986 the decrease of 3,219 was the result of

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CRH and Department Program/Budget Adjustments. In FY 1988 , net increase in W0638 of 8,973 was due to a NIF rate adjustment and a Department Program/Budget Adjustment. For W0640 in FY 1986, the decrease of 4,808 was the result of CRH and Department Program/Budget Adjustments. In FY 1987 the decrease of 10,720 was due to Congressional action and adjustments and Department Program/Budget Adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 57,997 | 54,039 | 39,294 | 54,460 | Continuing | Continuing |
| W0638 | Airborne Defensive Electronic Countermeasures | 23,372 | 29,386 | 13,141 | 27,856 | Continuing | Continuing |
| W0640 | Offboard Electronic Warfare | 34,625 | 24,653 | 22,544 | 22,672 | Continuing | Continuing |
| W1935 | Strike Electronic Warfare Simulator | (2,000)* | (3,900)* | 3,609 | 3,932 | 4,893 | 18,334 |

* Transitions from Project W0602, 64255N in FY 1987.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Aviation support equipment-air launched ordnance (OPN)-Budget Activity (3):

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Estimated cost |
|---|---|---|---|---|---|---|
| OPN | 43,400 | 40,300 | 34,800 | 31,700 | Continuing | Continuing |
| Quantity | * | * | * | * | * | * |

* Quantities consist of all airborne EW Expendable Counter Measure Systems including Air-Launched Chaff, Infra-Red Flares and Expendable Jammers.

E. (U) RELATED ACTIVITIES: Air Force and Army related efforts are formally coordinated through the Joint Tactical Coordinating Group/Warning Receiver Countermeasures Subgroup and informally in various joint development planning meetings, exchange of project reports, and use of Test and Evaluation facilities. Joint/cooperative programs are underway in the areas of Radar Warning, Missile Detection Systems and countermeasures in accordance with the 1985 DoD EW Plan. This program element is coordinated with the Air Force Optical Countermeasure Program (Program Element 63743F) and the Army Optical Countermeasure Program

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(Program Element 65711A) to keep abreast of emerging technology and advanced development, and to avoid duplication of effort. Related efforts with the U.S. Air Force and the U.S. Army in the foreign material exploitation area are coordinated through the OSD sponaored Tri-Service CROSSBOW-S Committee, the Joint Coordinating Committee on Electronic Defense Syscems and through the mutual use of facilities. There is no unnecessary duplication of effort between this program and others within the Navy or the Department of Defenae.

F. (U) WORK PERFORMED BY: IN-HOUSE: Pacific Missile Test Center, Point Mugu, CA; Naval Research Laboratory, Washington, DC; Naval Weapons Center, China Lake, CA; Naval Air Test Center, Patuxent River, MD; Naval Air Development Center, Warminster, PA; Naval Avionics Center, Indianapolis, IN; Naval Ocean Systems Center, San Diego, CA; Naval Surface Weapons Center, Dahlgren, VA; and Naval Weapons Support Center, Crane, IN. CONTRACTORS: Sanders Associates, Inc., Nashua, NH; Applied Technology, Sunnyvale, CA; Lundy Electronics, Inc., Pompano Beach, FL; LORAL, Yonkers, NY; Rockwell International, Tulsa, OK; TRACOR, Austin, TX; Texas Instruments, Dallas, TX; Northrop, Rolling Meadows, IL; SEDCO, Long Island, NY; Loral Electro-Optical Syatems, Pasadena, CA; Honeywell Corp, Lexington, MA; Perkin Elmer Corp, Norwalk, CT; and Pacific Sierra Research Corporation, Santa Monica, CA, Grumman Aerospace Corp., Bethpage, N.Y.

C. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W1935, STRIKE EW SIMULATOR (SEWS):

1. (U) Description: This project develops the Strike Electronic Warfare Simulator (SEWS) which is a digital tactical airborne simulation model. It will provide a unique capability to determine performance effectiveness of proposed electronic warfare equipment, i.e., INEWS and electronic warfare equipment mixes (before design and construction) through evaluation of that equipment in computer simulated multi-threat, multi-electronic countermeasures environments which are expected to be encountered by sea control and force projection tactical aircraft (TACAIR) missions. Concurrently, it will provide an effective means of evaluating electronic countermeasures (ECM) tactics in support of strike warfare. The SEWS will be located at the Naval Weapons Center (NWC), China Lake, CA. Cost avoidance/reduction is obtained through mutual and cooperative use of Navy and Air Force exiating/new software developments under a memorandum of agreement.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Completed risk reduction demonstration of SEWS ability to simulate and measure ECM effectiveness of a multiple aircraft/ECM sortie against a limited threat environment.

° Conducted a proof-of-design, through comparison of results with live flight data.

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° Initiated Phase II software development, to support simulation of additional threats and scenarioa.

° conducted designs reviews with the INEWS Joint Venture Team (JVT) contractors to ensure INEWS digital model compatibility with SEWS.

b. (U) FY 1987 Program:

° Continue development support for the INEWS digital model.

° Complete Phase II software development effort.

° Demonstrate multiple aircraft/ECM versus a large threat simulation and measurement of effectiveness capability.

c. (U) FY 1988 Planned Program:

° Evaluate INEWS JVT system concepts and support the INEWS development.

° Complete Phase III software development to provide a simulation capability for the remaining planned threats, ECM equipment, and tactical scenarios capabilities.

d. (U) FY 1989 Planned Program:

° Conduct final demonstration of the SEWS' full system.

e. (U) Program to Completion: Program completed in FY 1989.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W0638, Airborne Defensive ECM:

1. (U) Description: This project provides the advanced development of radio frequency and electro-optical technology and ECM systems for increased fixed wing and helicopter aircraft and aircrew survivability. Specific components/equipments include: electro-optical countermeasures technique and laser countermeasures technique development; laboratory support for countermeasures (USA/USAF*); countermeasures techniques; AVR-2 Laser Warning Receiver for helos; electro-optical countermeasures (USA/USAF); integrated defensive avionics program (IDAP) - provides missile detection and the correct DECM

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response at the appropriate time. Laboratory support is provided to establish an organic software support capability to provide for development, integration and configuration control of reprogrammable electronic warfare system software.

*Joint/coordinated efforts with service as indicated in parenthesis.

2. (U) Program Accomplishments And Future Efforts:

b. (U) FY 1986 Program:

° Continued countermeasures jamming technique development.

° Continued electronic warfare equipment integration and organic software support capability for ALQ-126B, ALQ-162, ALR-45F and ALR-67.

° Continued definition of laser designator countermeasures.

° Continued system definition and risk reduction for Electro-Optical Countermeasures and system definition for tactical aircraft laser warning receiver.

° Commenced integrated defensive avionics program (IDAP) risk reduction for the A-6F.

° Completed concept definition phase of the joint Integrated Electronic Warfare System (INEWS) project (USAF). (INEWS advanced development is funded in PE 63109N, Integrated Aircraft Avionics, beginning in FY 1987.)

° Awarded INEWS risk reduction contract.

° Continued joint advanced development of laser range finder countermeasures with USAF.

° Continued investigation of techniques for radar warning receivers and jammers, including electronically erasable programmable read only memories (EEPROM) for the ALR-67 and ALQ-126B.

c. (U) FY 1987 Program:

° Continue system definition for active systems.

° Continue jamming techniques development.

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° Continue development of electronic warfare techniques.

° Continue electronic warfare equipment integration and organic software support capability.

° Continue development of increased frequency coverage and improvements in reliability/maintainability.

° Complete DT/OT II of AVR-2.

° Initiate incorporation of electronically erasable programmable read only memories (EEPROMs).

° Continue IDAP development. Investigate incorporation in F-14D and F/A-18 II.

° Perform test and evaluation of techniques for radar warning receivers and jammers.

c. (U) FY 1988 Planned Program:

° Incorporate techniques into radar warning receivers and jammers.

° Continue IDAP development and integration into A-6F.

° Complete system definition and prepare for engineering development of Electro-Optical countermeasures System and Laser Countermeasures System.

° Continue development of electronic warfare techniques.

° Continue development of increased frequency coverage and improvements to reliability/maintainability.

° Continue field reprogrammability efforts.

° Initiate changes to EWSSA to support EEPROMs.

d. (U) FY 1989 Planned Program:

° Install IDAP on A-6F testbed.

° Commence engineering development of system and system.

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° Continue development of electronic warfare techniques.

° Continue incorporation of techniques into radar warning receivers and jammers.

° Continue field reprogrammability efforts.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones:

| MILESTONE | DATE |
|---|---|
| AVR-2 Laser Warning Receiver | |
| M/S II (FSD) | |
| M/S III (Full Rate Production) | |
| IOC (First Deployed) | |
| Laser Warning Receiver for ALR-67A(V)2 | |
| M/S II (FSD) | |
| M/S III (Full Rate Production) | |
| IOC (First Deployed) | |
| Integrated Defensive Avionics Program (IDAP) | |
| M/S II (FSD) | |
| M/S IIIA (Limited Production) | |
| M/S IIIB (Full Rate Production) | |
| IOC (First Deployed) | |

(U) Project W0640, Offboard Electronic Warfare:

1. (U) Description: This project provides for the advanced development of radio frequency and infrared offboard electronic warfare systems and the development of infrared onboard countermeasure systems for Navy and Marine fixed wing and helicopter aircraft. This project increases aircrew and aircraft survivability through application of new and/or improved infrared, radio frequency, and flare technology as applied to expendables and associated dispensers for offboard countermeasures. Specific component/equipments include: Airborne Active Expendable Decoy (AAED); Generic Expendable (radio frequency continuous wave) Decoy (GEN-X); MJU-8A/B and MJU-20 airborne expendable flare decoy; AAR-47 missile warning receiver; fixed wing missile detection set; and Advanced Infrared Countermeasures systems.

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2. (U) Program Accomplishments And Future Efforts:

a. (U) FY 1986 Program:

° Completed test and evaluation of AAR-47 missile warning set.

° Continued development of multi-shot chaff cartridge.

° Continued improved flare development.

° Continued joint program with Air Force for advanced IR missile detection (Fly's Eye) system.

° Continued development of towed AAFD.

° Completed GEN-X advanced development.

b. (U) FY 1987 Program:

° Commence FSED development of the towed AAFD.

° Continue development of multi-shot chaff cartridge.

° Continue development of the MJU-8A/B airborne expendable flare decoy.

c. (U) FY 1988 Planned Program:

° Continue FSED and integration of the towed AAFD on the A-6F.

° Continue development of the advanced missile detection system with the U.S. Air Force.

° Continue development of airborne expendable decoys.

° Complete development of chaff multiple cartridge.

d. (U) FY 1989 Planned Program:

° Continue development of the advanced missile detection system.

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° Continue development of advanced IR Decoys.

° Commence engineering development of the MJU-20 Forward Flying Decoy Flare.

° Continue development of new 'improved dispensers.

° Install AAFD On A-6F testbed. Initiate DT on AAFD.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones:

| MILESTONE | DATE |
|---|---|
| AAED (Towed) | |
| M/S II (FSED) | FY 1987/3Q |
| M/S IIIA | FY 1990/4Q |
| M/S III (Full Rate Production) | FY 1991/4Q |
| IOC | |
| CHAFF MULTIPLE CARTRIDGE | |
| M/S II (FSED) | FY 1986/4Q |
| M/S III (Full Rate Production) | FY 1988/4Q |
| IOC | |
| AAR-47 Missile Warning Receiver | |
| M/S II (FSED) | FY 1982/4Q |
| M/S III (Full Rate Production) | FY 1987/1Q |
| IOC | |

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63207N
DoD Mission Area: 353 - Naval Warfare

Title: Air/Ocean Tactical Applications
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 6,613 | 4,286 | 13,971 | 15,909 | Continuing | Continuing |
| X0512 | Tactical Env. Support Sys. * | 2,382 | 0 | 0 | 0 | Continuing | Continuing |
| X0513 | Air-Ocean Prediction | 1,108 | 1,238 | 1,757 | 2,294 | Continuing | Continuing |
| X0514 | Air-Ocean Shipboard Measurement | 1,168 | 1,453 | 1,696 | 2,249 | Continuing | Continuing |
| X0527 | Remote Ocean Measurement System ** | 1,604 | 628 | 0 | 0 | Continuing | Continuing |
| X0948 | Precise Time & Time Interval | 351 | 967 | 1,816 | 2,648 | Continuing | Continuing |
| X2008 | Tactical Ocean Data Assimilation and Prediction | 0 | 0 | 8,702 | 8,718 | 0 | 17,420 |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

* Tactical Environmental Support System development transferred to PE 64230N, project X1752 as part of the Battle Force Command and Control ($BFC^2$) restructure.

** Remote Ocean Measurement System project transferred to PE 63704N, project X1596 in FY 1988 and out as part of project consolidation.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program comprises the Navy effort to provide a shipboard capability to optimize weapon and sensor performance as a function of the changing oceanographic and atmospheric environment. These projects will provide Battle Group, Surface Action Group and Amphibious Task Force command and control with timely environmental data allowing the commander to optimize the selection and employment of available weapons, sensors and platforms. The present shipboard environmental systems are outdated, slow, and incapable of meeting the weather and oceanographic data requirements of modern naval weapons systems and tactics. Precise Time and Time Interval will upgrade the Department of Defense

time reference standard and dissemination methods critical to meeting strategic missile system accuracy requirements and future Strategic Defense Initiatives, as well as satellite navigation improvements and development of jam-proof, secure communications. Tactical Ocean Data Assimilation and Prediction maximizes the effectiveness and availability of remotely sensed and conventional oceanographic data. Additionally, this work will exploit all possible data sources to improve the Navy's capability to provide tailored oceanographic support to Fleet and shorebased users.

C. (U) COMPARISON WITH THE FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: in FY 1986, an increase of 532 Department program/budget adjustments in project X0512 and a decrease of 472 GRH and Department program/budget adjustments in project X0514; in FY 1987, decreases of 2,031 in project X0512, 511 in project X0513, 195 in project X0514, and 430 in project X0948 are the result of GRH, Department program/budget adjustments, and Congressional adjustments/actions; in FY 1988, decreases of 1,688 in project X0512, 671 in project X0513, 785 in project X0514, 1,195 in project X0527, and 1,068 in project X0948 are the result of Department program/budget adjustments. In FY 1988, an increase of 8,702 in project X2008 is the result of Department program/budget adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 6,663 | 6,730 | 7,522 | 10,676 | Continuing | Continuing |
| X0512 | Tactical Env. Support Sys | 1,689 | 1,850 | 2,031 | 1,688 | Continuing | Continuing |
| X0513 | Air-Ocean Prediction | 1,429 | 1,172 | 1,749 | 2,428 | Continuing | Continuing |
| X0514 | Air-Ocean Shipboard Measurement | 1,736 | 1,640 | 1,648 | 2,481 | Continuing | Continuing |
| X0527 | Remote Ocean Measurement System | 1,505 | 1,697 | 697 | 1,195 | Continuing | Continuing |
| X0948 | Precise Time & Time Interval | 304 | 371 | 1,397 | 2,884 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not applicable.

E. (U) RELATED ACTIVITIES: Program Element 35160N, (Defense Meteorological Satellite Program); Program Element 64218N, (Air/Ocean Equipment Engineering); Program Element 63704N, (ASW Oceanography); Program Element 62455N, (Oceanographic and Atmospheric Support Technology).

Program Element: 63207N Title: Air-Ocean Tactical Applications

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Ocean Systems Center, San Diego, CA; Naval Oceanographic Office, Bay St. Louis, MS; Naval Environmental Prediction Research Facility, Monterey, CA; Naval Air Development Center, Warminster, PA; Naval Ocean Research and Development Activity, Bay St. Louis, MS; Naval Research Laboratory, Washington, DC; and Naval Observatory, Washington, D.C. and Naval Electronic Center, Vallejo, CA. CONTRACTORS: Lockheed, Huntsville, Alabama.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project X0512, Tactical Environmental Support System:

1.(U) Description: As enemy submarines become faster and quieter, and sensors become more capable, an accurate knowledge of the environment becomes increasingly critical to the success of offensive and defensive missions. Sensors and weapons must be wisely employed to exploit the environment; limitations potentially imposed by the environment must be avoided. This project develops a system to automatically ingest data from satellites, shore based facilities, and local measurements and to process the data into tactically relevent parameters and to distribute the results in the format needed by battle group commanders, tactical action officers, weapons systems, etc. Project exploits off-the-shelf computer hardware and existing Navy applications software to provide essential information at modest cost. Design uses modular hardware and software to meet new requirements with minimal future acquisition and life-cycle costs.

2.(U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Continued development of applications software for the Tactical Environmental Support System [TESS(3)].
- Developed TESS (3) interface requirements documentation.
- Developed TESS (3) acquisition support documentation.
- Prepared a Request For Proposal for the TESS (3) engineering development model (EDM).

b. (U) FY 1987 Program:

- TESS (3) funding transferred to PE 64230N, project X1752 as part of the Battle Force Command and Control ($BFC^2$) restructure.

Program Element: 63207N

Title: Air-Ocean Tactical Applications

(U) Project XO513, Air-Ocean Prediction:

1. (U) Description: This project provides for the design and development of a modern numerical prediction system to provide forecasts of atmospheric and oceanographic conditions to afloat and ashore Navy command and control to support tactical decision making. Output can tske the form of environmental variables or user-tailored tactical products. These serve as inputs to sssessments of air/ocean effects on wespon system performance. For example, the atmospheric winds and density forecast models produced by this project sre essential in order to achieve the stated accuracy capabilities of gunnery and missile weapons syrtems.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Developed techniques to merge satellite and sltimetry dsta into the Tropical Atmospheric Analysis.
- Implemented Northern Hemisphere Optimal Ocean Thermal Analysis.
- Implemented Greenland Sea/Norwegian Sea Thermal Structure Forecast Model.
- Assimilated operational ice analyses into Arctic Basin Ice Forecast Model; developed Barents Ses Ice Forecast Model.
- Completed enhanced Forward Looking Infrared Model.
- Began experimental testing of atmospheric global forecasting and analysis system.

b. (U) FY 1987 Program:

- Complete operational implementation of the Navsl Operational Global Atmospheric Prediction System (NOGAPS 3.0) spectral model version.
- Develop sltimeter data merge into Optimal Ocean Thermal Analysis.

- Implement Barents Sea Ice Forecast Model; develop East Greenland/Norwegian Sea Ice Forecast Model.
- Develop Surf and Acoustic Command and Control Graphics.
- Implement first-generation Global Ocean Circulation Model; begin Western Med Model.
- Implement satellite data merge techniques into the Tropical Atmospheric Analysis.
- Begin development of the Advanced Tropical Cyclone Model for the Navy-Air Force Joint Typhoon Warning Center (Western Pacific/Indian Oceans).
- Continue development of global 3-D Planetary Boundary Layer Model in support of fleet electro-optical systems.

c. (U) FY 1988 Planned Program:

- Begin development of second generation Global Ocean Circulation Model; implement Western Med Model.
- Evaluate and verify Advanced Tropical Cyclone Model.
- Implement East Greenland/Norwegian Sea Ice Model; develop Sea of Okhotsk Model.
- Evaluate and verify 3-D Planetary Layer Model.
- Implement the atmospheric global analysis-prediction model.

d. (U) FY 1989 Planned Program:

- Implement Advanced Tropical Cyclone Model.
- Continue development of second-generation Global Ocean Circulation Model; develop Indian Ocean Model.
- Implement Sea of Okhotsk Ice Forecast Model; develop Chukchi/Bering Sea Ice Model.

e. (U) Program to Completion:

° Integrate data from all available environmental satellites into the global/regional analysis/forecast models.

° Introduce fine mesh eddy-resolving global/regional ocean circulation model for ASW support.

° Development and implementation of a coupled air/ocean globel circulation model to improve forecast skill.

° This is a continuing program.

(U) Project X0514, Air-Ocean Shipboard Measurements:

1.(U) Description: This project provides for the development of airborne and shipboard sensors to measure the local atmospheric and oceanographic parameters essential to the optimum selection and employment of naval weapons systems, sensors and platforms. This data, coupled with satellite data, will provide the Battle Group Commanders with a data set to continuously monitor the changing atmospheric and oceanographic environment in their immediate vicinity, allowing them to optimize the selection of weapons, sensors and platforms.

2.(U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Completed advanced development of the baseline Shipboard Meteorological and Oceanographic Observing System (SMOOS).

° Prepared technical and business plans to transition SMOOS to engineering development.

° Completed demonstration of Raman Laser Radar (LIDAR) technology to remotely measure atmospheric profiles of water vapor and temperature.

b. (U) FY 1987 Program:

- Initiate SMOOS P³I to measure water vapor, precipitation, sea state, lightning, turbulence and sea surface temperature.
- Transition the advanced development baseline SMOOS to engineering development.

c. (U) FY 1988 Planned Program:

- Complete development and testing of an Infrared Extinction Sensor for the baseline SMOOS.
- Continue SMOOS P³I evaluation of sensors to measure water vapor, precipitation, sea state, lightning, and turbulence.
- Initiate development of an improved means to measure sea surface temperature for the baseline SMOOS.

d. (U) FY 1989 Planned Program:

- Complete development and testing of a SMOOS precipitation sensor.
- Begin advanced development of LIDAR Atmospheric Profiler (LAP) designed to continuously measure the atmospheric moisture, temperature and wind conditions around the Battle Group.

e. (U) Program to Completion:

- Complete Preplanned Product Improvement (P³I) program for the Shipboard Meteorological and Oceanographic Observing System (FY 1992).
- Transition LIDAR Atmospheric Profiler (LAP) to engineering development.
- This is a continuing program.

(U) Project X0527, Remote Ocean Measurement System:

1. (U) Description: This project serves three primary objectives: (1) to develop or assess atmospheric and oceanographic satellite sensor technology to meet specific Navy operational requirements, e.g., to support missile systems and

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anti-submarine warfare; (2) to develop processing algorithms to convert raw satellite data into atmospheric and oceanographic parameters; and (3) to provide ground-truth for operational spaceborne sensors to ensure that the measurements being made are valid.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Commenced development of a scatterometer algorithm to derive sea surface wind speed and direction needed to support at-sea aircraft operations and for cruise missile fire control.

° Developed the microwave radiometer algorithm to derive sea surface temperature through clouds in support of anti-submarine warfare operations.

° Began definition studies of advanced oceanographic remote sensing suite including new sensor technologies.

° Completed Geodetic/Geophysical Satellite (GEOSAT) altimeter validation.

b. (U) FY 1987 Program:

° Continue definition studies of advanced oceanographic remote sensing suite.

° Begin Multi-Channel Altimeter studies.

° Begin Synthetic Aperture Radar applications studies for use in ocean surface sensing.

c. (U) FY 1988 Planned Program:

° Remote Ocean Measurement System funding transferred to PE 63704N, project X1596.

(U) Project X0948, Precise Time and Time Interval:

1. (U) Description: Upgrade the accuracy of the Naval Observatory's Master Clock System (MCS) for DOD surface, subsurface, air and shore communications, navigation and time dissemination systems. Develop advanced detectors and an optical

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interferometer to study radio and optical sources used for precise timing. Establish a time station located at the Consolidated Space Operation Center (CSOC), Colorado Springs, CO. Develop a laser station for determination of earth rotation and polar motion.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Developed and tested one additional advanced frequency standard.
- Continued development of the very low frequency monitor portion of the Master Clock System.
- Developed operational plan for Consolidated Space Operations Center (CSOC) program.

b. (U) FY 1987 Program:

- Integrate and test additional hydrogen maser and other advanced standards.
- Conduct site survey and procure components for Consolidated Space Operations Center (CSOC) program.
- Develop charged couple device array for electronic position measurements for Light Detector development.
- Evaluate optical and infrared interferometry results from technology base programs.
- Develop estimated cost for the Very Long Baseline Interferometry (VLBI) program.

c. (U) FY 1988 Planned Program:

- Develop advanced frequency standard.
- Integrate hydrogen masers and advanced standards into Master Clock System.
- Test and evaluate critical components and assemble Consolidated Space Operations Center (CSOC) time station.

- Develop specialized camera for Light Detector System.
- Design Very Long Baseline Interometry (VLBI) system.

d. (U) FY 1989 Planned Program:

- Develop electronics for Very Long Baseline Interferometry (VLBI) system.
- Integrate specialized camera in various telescopes of Light Detector System.
- Develop telescopes for optical interferometer.
- Continue integration of advanced atandards and time algorithm development.
- Development of new frequency atandard.

e. (U) Program to Completion:

- Develop laser timing telescope and begin fabrication
- Complete optical interferometer installation (FY91).
- Develop telescope and trailers for Very Long Baseline Interferometry System.
- Continue testing of advanced frequency standards for Master Clock System.
- This is a continuing program.

(U) Project X2008, Tactical Ocean Data Aasimilation and Prediction:

1. (U) Description: The Navy operates in a hostile and potentially system degrading environment. As weapons and sensors become more sophisticated and complex, the marine environment has an ever increasing impact on sensor/weapon system performance. Inaccuracies and distortions induced by the ocean and atmosphere must be understood and meaaured and the resulting constraints minimized in system design and employment. Unless critical air/ocean parameters are both measured and intelligently considered in weapon or sensor selection, deployment and mode of tactical options, ineffective performance or total system failure

can result. The major deficiency in supporting tactical operations with analyses and predictions of the marine environment is the lack of accurate observations well-distributed in space and time of critical air/ocean parametera. While the quality of conventional measurement techniques may be improved, the quantity of conventional data collections will be limited by affordability. Spaceborne sensors can provide observations well distributed in space and time but improvements in the quality of these observations must be addressed. An observational network of sufficient resolution and density is realistically a consolidation of conventional and remotely sensed data. This project exploits all potential data sources, both foreign and domestic, to ensure the full potential of the Navy's weapon systems and platforms are realized.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1988 Planned Program:

° Detailed planning for exploitation of Defense Meteorological Satellite Program as means of obtaining oceanographic data.

° Assimilation modeling for all-source visual, infrared and altimeter data.

° Complete scatterometer processing algorithm.

b. (U) FY 1989 Planned Program:

° Exploit European Space Agency satellite data.

° Conduct Synthetic Aperature Radar processing and application studies.

° Initiate single station forecasting models.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

. ogram Element: 63208N
Title: T-45 TRAINING SYSTEM
DoD Mission Area: 476 - Training, Medical, and other General Personnel Activities
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 115,986 | 129,213 | 96,015 | 87,822 | 47,670 | 587,457 |
| W1142 | T-45TS | 115,986 | 129,213 | 96,015 | 87,822 | 47,670 | 587,457 |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The mission is to provide undergraduate jet pilot training for prospective carrier-based Navy/Marine Corps pilots, and selected international students to meet aircrew requirements in the 1990's and beyond. Projected T-2/TA-4 aircraft shortages due to attrition and service life expiration, as well as increasing operating and support costs, require development of a cost-effective replacement. The complementary aspects of flight training, (flight, simulation, and academics) are integrated to develop an effective, affordable and efficient system.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY : (Dollars in thousands) The change between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary is as follows: The decrease of 4,950 in FY 1987 is the result of Congressional action and Department program/budget adjustments. The increase of 1,436 in FY 1988 is a Department budget adjustment which restores a prior budget reduction against a firm-fixed price program.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 67,512 | 115,986 | 134,163 | 94,579 | 133,595 | 589,074 |
| W1142 | T-45TS | 67,512 | 115,986 | 134,163 | 94,579 | 133,595 | 589,074 |

Program Element: 63208N

Title: T-45 TRAINING SYSTEM

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Aircraft Procurement, Navy | | | | | | |
| Funds (43CH) | 0 | 56,374 | 383,583 | 432,941 | 3,316,003 | 4,188,901 |
| Quantities | 0 | 0 | 12 | 24 | 264 | 300 |

E. (U) RELATED ACTIVITIES: Aviation Life Support Systems (PE 64264N): T-45A development schedule is dependent on availability of ejection seats procured under the Navy Aircrew Common Ejection Seat (NACES) project for planned development flight test and production milestones.

F. (U) WORK PERFORMED BY: IN HOUSE: Lead Laboratory: Naval Air Development Center, Warminster, PA; Naval Training Support Center, Orlando, FL; Naval Air Propulsion Center, Trenton, NJ; Naval Air Test Center, Patuxent River, MD; Naval Air Engineering Center, Lakehurst, NJ; Chief of Naval Education and Training, Pensacola, FL; Naval Avionics Center, Indianapolis, IN; CONTRACTORS: Douglas Aircraft Company, Long Beach, CA; PRINCIPAL SUBCONTRACTORS: British Aerospace Limited, Kingston, England; Rolls Royce Ltd., Bristol, England; Sperry Systems, Reston, VA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W1142, T45TS:

1. (U) Description: As documented in the Mission Element Need Statement, a need exists to provide a cost-effective replacement of the present pilot training system to meet future requirements. An inadequate number of training aircraft will be available beginning in the late 1980's because of attrition and service life constraints. The Navy has explored alternatives for satisfying this need. Options ranging from maintaining existing trainer aircraft to acquisition of a totally new system have been examined and defined. Six parallel competitive contracts were awarded for industry exploration of alternatives in 1981. The training system based on the McDonnell Douglas derivative of the British Aerospace Hawk aircraft was awarded a Full Scale Engineering Development contract in October 1984. The program has been structured to achieve a balanced mix of aircraft, simulators and academic materials that will provide trained aviators equal to or better than those currently being produced, while minimizing acquisition and operating costs.

Program Element: 63208N

Title: T-45 TRAINING SYSTEM

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Continued system engineering and propulsion testing.

° Commenced fabrication/assembly of the R&D articles.

° Conducted logistic support analysis and development of technical and publication data.

° Continued development of ground training systems components (Operational Flight Trainer (OFT) simulator, academics, and Training Integration System (TIS)).

° Conducted T-45A Critical Design Reviews (CDR).

° Conducted Simulator Critical Design Review (CDR).

b. (U) FY 1987 Program:

° Design and fabrication of aircraft and simulators will be completed.

° Prime contractor will begin hardware system integration.

° Increased effort will be directed toward preparing for first flight (scheduled for early FY 1988) and associated T&E support.

c. (U) FY 1988 Planned Program:

° First flight of T-45A.

° Begin test and evaluation of two R&D aircraft.

° Establish maintenance capability.

° Update integrated logistics support plan.

° Conduct academics Critical Design Review (CDR).

° Begin Functional Configuration Audit (FCA).

d. (U) FY 1989 Planned Program:

° Conduct T-45A Sea Trials and TECHEVAL.

° In-plant acceptance test on TIS.

° Conduct OFT In-Plant Acceptance Test.

° Acquire ILS support.

e. (U) Program to Completion:

° Conduct aircraft OPEVAL.

° Acceptance of instructional flight trainer, academics, and TIS in plant.

° System validation at NAS Kingsville.

f. (U) Major Milestones:

| | MILESTONE | DATE |
|---|---|---|
| 1. | Mission Element Needs Statement Approval | June 1979 |
| 2. | DSARC I/II | Sept 1984 |
| 3. | FSED Contract Awarded | Oct 1984 |
| 4. | Completed A/C Preliminary Design Review | Jul 1985 |
| 5. | Completed A/C Critical Design Review | Jul 1986 |
| 6. | A/C First Flight | Dec 1987 |
| 7. | A/C Test & Evaluation | Dec 1987 - Nov 1989 |
| 8. | Complete OPEVAL | Mar 1990 |
| 9. | Initial Operational Capability (IOC) | Sep 1990 |

1. (U) TEST AND EVALUATION

(U) General Comments The Naval Undergraduate Jet Flight Training System (T45TS) is an integrated training system comprised of: aircraft, simulators, academics, training integration system (TIS) and contractor logistic support. McDonnell Douglas was chosen as prime contractor through a competitive source selection process. British Aerospace (BAe), Rolls Royce, and Sperry are the principal subcontractors assisting McDonnell Douglas. The T45TS DT&E plan was developed by making maximum use of applicable British T&E results and operational experience with the BAe Hawk.

1. (U) Development Test and Evaluation (DT&E)

(U) The T45TS Test Program will provide a technical evaluation of the characteristics of the T45TS through an integrated and extensive combined Navy and contractor DT&E effort. The program commenced Full Scale Engineering Development (FSED) with the signing of a letter contract on 2 October 1984. The integrated test schedule and the resource summary are described in the approved Test and Evaluation Master Plan (TEMP) No. 786, dated 19 November 1984, which is being updated. The T-45A aircraft development will utilize the Principal Site Testing concept at the Naval Air Test Center (NATC), Patuxent River, Md. after initial contractor tests at Yuma, Az. Integral to principal site testing is extensive participatory flying by NATC test pilots throughout the Contractor/Navy flight test program. Development of the ground based T45TS subsystems will be accomplished at appropriate contractor facilities. The T-45A aircraft DT&E will utilize a traditional aircraft development approach of dedicated Navy test phases, including sea trials, and Technical Evaluation (TECHEVAL). Additionally, two combined Development Test/Operational Test (DT/OT) test phases will be conducted to provide early operational assessments of the T45A aircraft. Board of Inspection and Survey (INSURV) (Aviation Member), will make independent technical assessments and will conduct DT-III in accordance with the schedule outlined in the TEMP. A T45TS Reliability and Maintainability (R&M) and logistic supportability development will be monitored and demonstrated. Logistics for the T45TS DT&E will be fully contractor supported as described in the TEMP. Three significant DT&E tests have been conducted to date. First, a 500 Hour Accelerated Simulated Mission Endurance Test (ASMET) was accomplished at Naval Air Propulsion Center (NAPC), Trenton, NJ, from 17 January to 6 April 1983, on a modified MK 861 Adour engine. The post test disassembly and inspection revealed a highly successful test with no major discrepancies. The Adour engine used in the ASMET is nearly identical to the planned T-45A engine which has been recently designated the F-405. Electromagnetic Interference (EMI) hardening, improved corrosion prevention, an engine condition monitoring system, and a manual back-up fuel control are the major changes to the ASMET engine which will be incorporated in the T-45A engine to improve its performance, reliability and durability in the carrier environment. Second, Rotary Balance Spin Model Wind Tunnel tests were conducted at NASA Langley from April to July 1984. These tests verified expected T-45A spin modes and recovery characteristics which are satisfactory for an intermediate/advanced trainer. Third, a fatigue and damage tolerance panel simulating lower wing skin of the T-45A was successfully tested. This test with applied loads representing severe service usage indicates that the redesigned lower wing skin has a safe failure mode, i.e. potential for visually detectable crack growth prior to complete failure.

(U) Major DT&E Schedule Milestones:

| | |
|---|---|
| (U) T-45A Aircraft: | |
| First Flight | Dec 87 |
| Contractor/Navy DT-II Flight Test Program | Jan 88 - Jul 89 |
| First Fatigue Life Completion | Jun 90 |
| TECHEVAL, DT-IIH | Sep - Oct 89 |
| DT-III INSURV Tests | Feb 91 and Oct - Nov 92 |
| (U) Simulators: In-Plant Acceptance Test | Aug - Oct 88 |
| (U) Academics: Computer Aided Instruction In-Plant Acceptance Test | Oct - Dec 88 |
| (U) Training Integration System: In-Plant Acceptance Test | Oct - Dec 88 |

2. (U) Operational Test and Evaluation (OT&E)

(U) Operational testing of the T-45A aircraft will be conducted by Commander, Operational Test and Evaluation Force (COMOPTEVFOR). System validation of the complete T45TS system, including the ground based subsystems will be conducted by Chief of Naval Education and Training. The T45TS system will be fully contractor supported through the FSED Phase.

(U) Major OT&E Schedule Milestones:

| | |
|---|---|
| T-45A Early IOT&E, OT IIA,B | Sep 88 and May 89 |
| T-45A OPEVAL, OT-IIC | Feb - Mar 90 |
| T45TS System Validation (SYSVAL) | Jul - Sep 90 |
| T45TS IOT&E of Ground Training Subsystem | Concurrent with in-plant acceptance tests |

3. (U) T45TS System Characteristics:

(U) The key T45TS system operational characteristic is that it must be capable of producing an annual Pilot Training Rate (PTR) of 600 pilots with a surge capability of up to 30%. The T45TS system must further accomplish this training with equipment which is more reliable, supportable, and cost effective to operate than the equipment used in the present intermediate and advanced jet training phases of the Navy Integrated Flight Training System (NIFTS).

(U) Aircraft Subsystem: Three hundred (300) T-45A aircraft will be procured. Two (2) instrumented T-45A flight test articles and two T-45A ground test articles will also be procured. The aircraft subsystems' detailed characteristics are included in the detailed specifications, and include, but are not limited to, the following thresholds.

| Characteristics | FSED Threshold | Production Threshold |
|---|---|---|
| Take-Off Gross Weight | 12,758 lbs | 12,758 lbs |
| Airframe Service Life | 14,400 hrs | 14,400 hrs |
| Service Ceiling (min) | 40,000 ft | 40,000 ft |
| Maximum Level Flight Speed (30,000 ft) | 0.8 MACH | 0.85 MACH |

| | | |
|---|---|---|
| Approach Speed | 125 kts | 125 kts |
| Substained Level Turn G | 3.4 g | 3.4 g |
| Maximum Range | 1,000 nm | 1,000 nm |
| Mean Flight Hours Between Failure | 2.2 hr | 3.2 hr |
| Direct Maintenance Man Hours/Flight Hour | 16.0 hr | 10.0 hr |
| Design Mission Capability | 85.0% | 85.0% |

(U) Simulator Subsystem: The simulator and associated equipments currently used to support T-2 and TA-4 training will be replaced by a 2F138 Operational Flight Trainer (OFT) and a 2F137 Instrument Flight Trainer (IFT). The IFT, in essence is an OFT without a visual cueing system. These devices will use existing technology developed for the F/A-18 simulator and will provide a substantial improvement in simulation performance over existing training command capabilities. Ten IFT simulators and 22 OFT simulators are planned. The development prototype simulator will eventually be delivered as one of the 22 OFT simulators. Detailed simulator characteristics are listed in the Simulator Subsystem Specification. The production availability threshold for the simulator sub-system is 95%.

(U) Academics Subsystem: The academics will encompass a mixture of classroom lectures, textbooks, workbooks, 4E10 Computer Assisted Instruction (CAI) training devices and other media which will be designed to facilitate a building block approach closely integrated with the simulator and flight training phases. Detailed academic characteristics are specified in the Academics Subsystem Specification. The prototype CAI device will be accepted in the plant. During production, CAI and other training equipment will be installed at the three training sites. The academics production availability threshold is 95%.

(U) Training Integration System: The 4E9 TIS training device facilitates efficient scheduling and use of all training assets, including instructors and students. Terminals will be installed at each of the training sites and at Chief of Naval Air Training (CNATRA) headquarters. The TIS will share central processing units (CPU's) with the CAI equipment. Detailed TIS characteristics are listed in the TIS Subsystems Specification. The TIS production availability threshold is 95%

4. (U) Current T&E Activity

| Event | T&E Activity (Past 12 Months) Planned Date | Actual Date |
|---|---|---|
| (U) Canopy & Min.Det.Cord.(MDC) | Jan 86 - May 86 | Jan 86 - May 86 |
| (U) Antenna | Aug 85 - Mar 86 | Aug 85 - Mar 86 |
| (U) WING/MLG Structure (Fatigue) | Aug 86 - Jan 87 | Aug 86 - Jan 87 |
| (U) Modified Hawk Flight Test Evaluation | Mar 86 - Apr 86 | Mar 86 - Apr 86 |

| Event | T&E Activity (Next 12 Months) |
|---|---|
| (U) Fatigue & Damage Tolerance (main landing gear fitting) | Aug 86 - Jan 87 |

| | |
|---|---|
| (U) Interseat Sequencing | Nov 86 - Feb 87 |
| (U) Onboard Oxygen Generating System (OBOGS) | Nov 86 - Mar 87 |
| (U) Drop Test (Landing Gear Calibration) | Feb 87 - May 87 |
| (U) Main Gear JIG Drop | Apr 87 - Sep 87 |
| (U) Landing Gear System | May 87 - Jun 87 |
| (U) Nose Gear JIG Drop | May 87 - Jul 87 |
| (U) Hydraulic System | Jun 87 - May 88 |
| (U) Stabilator To DES ULT | Jun 87 - Jul 87 |
| (U) Speed Brake | Jul 87 - Aug 87 |
| (U) Design Sink Speed | Jul 87 - Feb 88 |
| (U) Gear Door Activators | Oct 87 - Dec 87 |
| (U) Arresting Hook | Oct 87 - Sep 87 |
| (U) Gear/Oil/Flap interlocks | Nov 87 - Nov 87 |
| (U) Static Test (launch bar) | Nov 87 - Dec 87 |

5. (U) Program Documentation

(U) Adour 6002 - 492 Hour Accelerated Simulated Mission Endurance Test Report, Report No. E/AKS/78986, was submitted Sep 1983.

(U) An analysis of the High Angle of Attack Aerodynamics and Spins for the Navy T-45A Aircraft and Trainer, the Rotary Balance Wind Tunnel Test Report, was submitted Aug 1984.

(U) Naval Undergraduate Jet Flight Training System (T45TS) Test and Evaluation Master Plan (TEMP) No. 786, dated 19 November 1984, approved 21 March 1985. A revised TEMP has been submitted for review.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63216N
Title: Aviation Life Support Systems
DoD Mission Area: 225 - Air Warfare Support
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 1,786 | 3,762 | 3,621 | 8,683 | Continuing | Continuing |
| W0584 | Aircrew Protective Clothing and Devices | 1,786 | 851 | 1,902 | 5,889 | Continuing | Continuing |
| M0097 | Aircrew Impact Injury Prevention* | - | 2,911 | 1,719 | 2,794 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

* Project M0097 is an ongoing effort that transferred from PE 63706N in FY 1987.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports the development of integrated, advanced airborne life support systems designed to protect Navy/Marine Corps helicopter, fighter/attack and patrol/transport crews from natural and induced environmental/physiological stresses and hazards encountered during all aspects of military flight operations. These developments are designed to enhance specific mission performance while providing aircrew protection from inflight stresses such as acceleration or G forces, vibration, buffet, debilitating temperatures and harmful radiation. Protective clothing and devices related to inflight/underwater escape and postflight survival/rescue on land, or in sea, are developed for functional compatibility with inflight equipment.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands). The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: Project W0584 during FY 1986, was increased by 415 due to Department program adjustments; in FY1987, the decrease of 904 is the result of Congressional action and adjustments and Department program/budget adjustments. Project M0097: in FY 1987, the increase of 289 is the result of Congressional adjustments; in FY 1988, the decrease of 998 is the result of Department program/budget adjustments.

Program Element: 63216N Title: Aviation Life Support Systems

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 1,081 | 1,371 | 4,377 | 4,685 | Continuing | Continuing |
| WO584 | Aircrew Protective Clothing and Devices | 1,081 | 1,371 | 1,755 | 1,968 | Continuing | Continuing |
| M0097 | Aircrew Impact Injury Prevention* | 0 | 0 | 2,622 | 2,717 | Continuing | Continuing |

* Project M0097 is an on-going effort that transfers from PE 63706N in FY 1987.

D. (U) OTHER FY 1988 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: All aircrew life support projects are controlled for duplication and commonality by the Tri-Service Life Support Equipment Steering Committee, the Joint Environmental Working Group (Flight), and the Armed Services Biomedical Research, Evaluation and Management (ASBREM) Committee. Aerospace Flight Dynamics, PE 62201F; Biomedical Technology, PE 62233N; Air Vehicles, PE 62122N; Enhanced Fighter Maneuverability, PE 62702E (DARPA); Life Support Systems, PE 63231F (USAF); Aircrew Life Support Systems, PE 64264N; and Life Support Equipment, PE 64706F, all perform coordinated projects related to PE 63216N. Work in acceleration/impact is coordinated with work at the U.S. Air Force Armstrong Aeromedical Research Laboratory.

F. (U) WORK PERFORMED BY: IN-HOUSE: Lead laboratory is the Naval Air Development Center, Warminster, PA; Naval Medical Research Institute, Bethesda, MD; Naval Aerospace Medical Research Laboratory, Pensacola, Fl; and the Naval Bio-Dynamics Laboratory (NBDL), New Orleans, LA. OTHERS: Naval Air Engineering Center, Lakehurst, NJ; Naval Weapons Center, China Lake, CA; Naval Ordnance Station, Indian Head, MD; Naval Air Test Center, Patuxent River, MD; and Naval Dental Research Institute, Great Lakes, IL. CONTRACTORS: Grumman, Bethpage, NY; Moog-Carlton, Aurora, NY; MBS Systems, Norwalk, CT; Boeing Aerospace, Seattle, Wa. Scott Aviation, Sierra Madre, CA; American Optical, Southbridge, MA; Evaporated Coating, Huntington Valley, PA; Gentex Corp., Carbondale, PA; Aro Corp., Dayton, Ohio; Hughes Aircraft, Long Beach, CA; GTE Laboratories, Waltham, MA; Honeywell Inc., Minn, MN; and Barnes Eng. Co. Stamford, CT.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project WO584, Aircrew Protective Clothing and Devices:

Program Element: 63216N

Title: Aviation Life Support Systems

1. (U) Description: This project develops the functionally integrated system of protective clothing and equipment designed to ensure each crewman protection against natural and induced environmental or physiological hazards encountered during routine, combat, and emergency flight operations; as well as during escape, survival, and rescue operations.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Initiated multi-wavelength (Four specific wavelengths) aircrew laser eye protection program contracts for development of advanced systems.
- o Completed aircrew gliding escape system program.
- o Initiated Integrated Night Vision System (INVS) portion of Tactical Life Support System (TLSS) program.

b. (U) FY 1987 Program:

- o Finalize development of multi-wavelength laser eye protection system. Evaluate and select best system for transition to engineering development.
- o Initiate tactical life support system program adapting USAF system design for integration into Navy aircraft. Demonstrate/verify system performance (centrifuge environment).

c. (U) FY 1988 Planned Program:

- o Continue development of tactical life support system for Navy aircraft. Redesign for integration of improved seat-mounted restraint, personal floatation, anti-explosure protection, eye protection (laser, night vision, flash blindness).
- o Initiate advanced aircrew station program.
- o Complete multi-wavelength laser eye protection system.

d. (U) FY 1989 Planned Program:

- o Continue development of tactical life support system. Demonstrate/verify system concept.
- o Continue advanced crew station program. Design/fabricate full-scale, high-altitude cockpit capsule for dynamic flight simulation for proof of concept.
- o Initiate common fixed seats program (helo and non-ejection fixed wing aircraft).
- o Complete tactical life support system program.
- o Continue advanced crew station program.
- o Continue common fixed seat program.
- o Initiate VP/PC escape and survival program.

e. (U) FY 1990-1992 Program:

- o Complete tactical life support system program.
- o Continue advanced crew station program.
- o Continue common fixed seat program.
- o Initiate VP/VC escape and survival program.

(U) Project M0097, Aircrew Impact Injury Prevention:

1. (U) Description: This project is designed to develop human dynamic and injury-response models of acceleration impact, and determine the correlation of these dynamic responses with physiological effects and injuries. This information will be used to design, construct and validate mannequin and mathematical models of the human impact response. These products will then be used to evaluate human protective systems to prevent casualties resulting from aircraft crashes and ejections.

2. (U) Program Accomplishments and Future Efforts:

Program Element: 63216N

Title: Aviation Life Support Systems

a. (U) FY 1986 Program:

- o Continued development of the acceleration and impact biodynamic data bases.
- o Began quantitative comparison of the dynamic responses of the Hybrid III head-neck mannequin with human kinematic responses.

b. (U) FY 1987 Program:

- o Develop engineering specifications for the improved Hybrid III head-neck mannequin.
- o Begin development of improved Hybrid III prototype for head and neck.
- o Complete animal injury model for acceleration impact in the minus-x direction (forward deceleration/impact).

c. (U) FY 1988 Planned Program:

- o Complete development of the improved Hybrid III head-neck mannequin prototype.
- o Prepare a 3-dimensional model of the completed head-neck mannequin with a human dynamic response torso (joint Air Force-Navy program).

d. (U) FY 1989 Planned Program:

- o Collect data for the injury model on impact in other vector directions.
- o Prepare injury tolerance limits for head-neck motion.
- o Develop engineering specifications for an integrated head-neck-torso mannequin (joint Air Force-Navy program).

e. (U) Program To Completion: This a continuing program. Tasks planned include:

- o Fabricate a 3-dimensional, instrumented, biodynamically faithful mannequin (joint Air Force-Navy program).

Program Element: 63216N

Title: Aviation Life Support Systems

o Establish the minus-x acceleration/impact (forward deceleration) vector injury tolerance limits.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63220N
Title: Lift Fan Development
DoD Mission Area: 225 - Air Warfare Support
Budget Activity: 4 - Tactical Program

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 0 | 0 | 0 | 2,856 | Continuing | Continuing |
| W1689 | AMSS | 0 | 0 | 0 | 2,856 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Advanced Multimission Sensor System (AMSS) will provide improved surveillance of in the enlarged 21st century battle space. The at-sea tactical commander must be able to monitor wide-ocean areas using organic assets in order to execute the Maritime Strategy. The AMSS program is a concept development for an airborne system which integrates active and passive surveillance using multi-spectral sensors. Such organic capability is presently provided by the combined efforts of E-2C, EA-6B, S-3A, and EA-3B aircraft. Approaching platform obsolescence require more capable sensors be developed. Significant commonality and affordability benefits can be obtained by integrating several tactical sensors in a common airframe/engine aircraft. AMSS will allow more cost-effective production of new aircraft and reduce CV maintenance/support requirements by consolidating future CV airwings into a minimum number of aircraft.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: Not Applicable.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: Aircraft Weapon System/Subsystem technology base developments are being conducted under:

PE 63251N - Aircraft Systems (Advanced): Applicable development in the areas of integrated avionics, cockpit display, antenna and electrical systems, and carrier maintenance/supportability.

Program Element: 63220N

Title: Lift Fan Development

PE 62122N - Aircraft Technology: Applicable development in the areas of aerodynamics, structures, cockpit displays electrical systems, propulsion and personnel protection.

PE 62761N - Materials Technology: Applicable development in the area of aircraft and weapon composite and advanced metallic materials.

PE 63202N - Avionics: Applicable developments/demonstrations in Integrated Inertial Sensor Assembly.

PE 63109N - Integrated Aircraft Avionics: Applicable developments in electronic warfare and communications/navigation/identification systems.

F. (U) WORK PERFORMED BY: IN-HOUSE: Lead Laboratory is the Naval Air Development Center, Warminster, PA; OTHERS: Naval Air Engineering Center, Lakehurst, NJ; Naval Air Propulsion Center, Trenton, NJ; Naval Avionics Command, Indianapolis, IN. CONTRACTORS: None.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W1689, Advanced Multimission Sensor System:

1. (U) Description: A new advanced airborne sensor system will be required in the late 1990's to meet the mission needs currently fulfilled by the E-2C, EA-6B, S-3A and EA-3B aircraft. The approaching obsolescence of these weapons systems require increased sensor capability. The AMSS is a systems concept development program which will yield a system design definition. This development will use advanced aircraft technologies and systems where feasible. The goal of the AMSS program is to improve the Battle Group Commander's ability to extend multi-sensor and multi-spectral surveillance into the enlarged battle space of the 21st century.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Not Applicable.

b. (U) FY 1987 Program: Not Applicable.

c. (U) FY 1988 Planned Program: Not Applicable.

d. (U) FY 1989 Planned Program: Commence AMSS Concept Formulation Phase which will include:

- o Mission performance requirements and analysis.
- o System design concepts.
- o Airframe configuration development.
- o Propulsion - engine development.
- o Avionics - core systems and mission specific sensors.

e. (U) Program to Completion: This is a continuing program.

H. (U) PROJECTS OVER $10 MISSION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63228N
DoD Mission Area: 353 - Naval Warfare

Title: CV ASW Module
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 4,655 | 3,106 | 5,115 | 5,175 | Continuing | Continuing |
| S0517 | Aircraft Carrier Anti-Submarine Warfare Module | 4,655 | 3,106 | 5,115 | 5,175 | Continuing | Continuing |

The above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides for the continuing development of computer program/equipment improvements necessary to upgrade the aircraft carrier anti-submarine warfare module which provides the link in the aircraft carrier chain of command between air anti-submarine warfare weapon systems, the Navy Tactical Data System, and other elements of the carrier combat system. The principal objective is an increase in the ASW war fighting capability aboard aircraft carriers by providing for pre-mission, in-flight, and post-mission information exchange and coordination with the S-3 aircraft and the CV helicopter along with storage, correlation, processing analyses and display of anti-submarine warfare data as an integral part of the Combat Direction System.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The FY 1986 increase +678 is the net result of restoration of a Congressional adjustment +763 and increased cost of computer program development +197 offset by reductions for GRH adjustment -217 and Department Budget Adjustments -60. The FY 1987 decrease -1149 is due to Congressional adjustment and Department program/budget adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

Program Element: 63228N Title: CV ASW Module

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 5,240 | 3,977 | 4,255 | 5,281 | 17,146 | 79,758 |
| S0517 | Aircraft Carrier Anti-Submarine Warfare Module | 5,240 | 3,977 | 4,255 | 5,281 | 17,146 | 79,758 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| P1-77 | Procurement (OPN) (312247) | 29,473 | 27,894 | 17,401 | 9,713 | Continuing | Continuing |
| | (Quantity) Not Applicable - (Program involves updates to existing 19 CV-ASWM Systems) | | | | | | |

E. (U) RELATED ACTIVITIES: Program Element 64217N, S-3 Weapon System Improvement Program, and Program Element 64229N, CV Helo will be supported by the Module; Program Element 64711N, Project X0486, Anti-Submarine Warfare Operations Center, will use selected common hardware.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Development Center (lead laboratory), Warminster, PA. CONTRACTORS: Sperry-UNIVAC, St. Paul, MN; Hughes Aircraft, Fullerton, CA; and Rockwell International, Autonetics Division, Anaheim, CA; and Intermetrics, Inc., Warminster, PA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project S0517, Aircraft Carrier Anti-Submarine Warfare Module:

1. (U) Description: This project provides for the design and development of the CV-ASW Module computer program and equipment required to meet the Navy tactical operational requirement. A primary objective of this effort is the integration of the ASW function into the carrier Combat Direction System through expansion of ASW Module interfaces and a Combat Direction System/ASW Module display equipment upgrade.

Program Element: 63228N Title: CV ASW Module

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Began conversion of Model 4.1. computer program to run on AN/UYK-43.
° Began computer program TECHEVAL.
° Continued the restructuring of the CV-ASW Module hardware program to adopt the Navy standard AN/UYQ-21(V) Tactical Displays.
° Began development of the CV-ASWM capabilities necessary to meet the submarine threat of the post 1995 period.

b. (U) FY 1987 Program:

° Enhance interfaces with other combat system elements and develop an interface with CV-IC in order to increase the speed with which CV-ASWM exchanges tactical data.
° Deliver Model 4.1 computer program to CVN-69, 71.
° Continue conversion of the Model 4.1 computer program to run on AN/UKY-43.
° Continue development of CV-ASWM capabilities necessary to meet the submarine threat of the post 1995 period.

c. (U) FY 1988 Planned Program:

° Complete testing of models 4.2.1 and 5.1 computer software including TECHEVAL/OPEVAL.
° Prepare upgrade to software program to develop model 5.2 program.
° Continue development of interfaces with other combat system elements.
° Continue development of CV-ASWM capabilities necessary to meet the submarine threat of the post 1995 period.

d. (U) FY 1989 Planned Program:

° Develop model 5.2 program.
° Continue development of interfaces with other combat system elements.
° Study requirements for an advanced acoustic signal processor.
° Continue development of CV-ASWM capabilities necessary to meet the submarine threat of the post 1995 period.

e. (U) Program to Completion: The following activities are planned:

Program Element: 63228N Title: CV ASW Module

- ° Maintain Computer Program documentation configuration control.
- ° Upgrade Test and Evaluation Master Plan in preparation for TECHEVAL/OPEVAL.
- ° Conduct TECHEVAL/OPEVAL.
- ° Continue development of interfaces with other combat system elements.
- ° Continue development of CV-ASWM capabilities necessary to meet the submarine threat of the post 1995 period.
- ° Develop CV-ASWM computer program modifications to the Enhanced Modular Signal Processor (ESMP).

f (U) Program Major Milestones:

| Program | Milestones |
|---|---|
| Model 4.1 System | MS III 1Q/FY88 |
| Model 4.2 System | MS III 3Q/FY88 |
| Model 4.3 System | MS II 2Q/FY88 |

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63251N
Title: Aircraft Systems
DoD Mission Area: 225 - Air Warfare Support
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 9,495 | 0 | 0 | 0 | 0 | N/A |
| W0585 | Advanced Aircraft Systems | 9,495 | 0 | 0 | 0 | 0 | N/A |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides a means to define aircraft weapon system options for future Navy/Marine Corps mission needs in preparation for Department of Defense/Navy decisions required to establish line item aircraft development programs. It also provides a means for advanced development of aircraft weapon system technologies for future Navy/Marine Corps aircraft. Oblique wing technology will continue to be investigated in conjunction with related NASA programs.

C. (U) EXPLANATION OF CANCELLATION: Congressional action zeroed this program in FY 1987. The Program for FY 1988 and beyond was cancelled by a program/budget dec' ion to place resources in higher priority programs.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63254N
Title: Air Anti-Submarine Warfare
DoD Mission Area: 233 - Anti-Submarine Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 3,813 | 5,333 | 8,523 | 9,717 | Continuing | Continuing |
| W1292 | Advanced ASW Sensors and Processing | 3,813 | 5,333 | 8,523 | 9,717 | Continuing | Continuing |

The above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides improved air anti-submarine warfare platform effectiveness through development of advanced hardware and software associated with airborne acoustic systems, including sensors, processing, post-processing, data recording and display capabilities to meet the deeper diving, faster and quieter Soviet submarine threat of the 1990s.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) Project W1292 - FY 1986 was decreased -812 for Gramm-Rudman-Hollings and Department budget adjustments. FY 1987 was decreased by -3,798 for Congressional action and adjustments and Department program/budget adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 6,252 | 4,625 | 9,131 | 8,270 | Continuing | Continuing |
| W1292 | Advanced ASW Sensors and Processing | 6,252 | 4,625 | 9,131 | 8,270 | Continuing | Continuing |

Program Element: 63254N Title: Air Anti-Submarine Warfare

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable

E. (U) RELATED ACTIVITIES: Program Element 62711N, Undersea Target Surveillance Technology, provides for initial determination of feasibility of candidate technology approaches. Program Element 64261N, Acoustic Search Sensors, provides for engineering development of selected sensor systems and signal processing.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Development Center, Warminster, PA; Naval Ocean Systems Center, San Diego, CA; CONTRACTORS: (HLA) Magnavox, Fort Wayne, IN and Hazeltine, Braintree, MA; (AA) Lockheed, Burbank. CA; Sparton, Jackson, MI; Sippican, Marion, MA; Sanders, Nashua, NH.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W1292, Advanced ASW Sensors and Processing:

1. (U) Description: This project will provide improved air ASW mission effectiveness through development of advanced hardware and software associated with acoustic systems including sensors, processing, post processing, data record, and display. Key objectives are platform accommodation of advanced sensors; improved detection, classification, localization, tracking and increased capacity and flexibility to handle multi-sensor data loads. This project provides advanced development for both active and passive sensors, processing and displays. The focus of these sensor systems has expanded from the classical system and to develop concepts to exploit active transmissions from threat submarines. The Engineering Development of these projects is carried on in PE64261N when they transition from this Advanced Development stage.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Horizontal Line Array (HLA) - ADM testing and the hardware prime item specification is completed. HLA Active Receiver (ADAR) requirements included in HLA functional specifications.
° - Development of: in-buoy signal processing; software algorithms; operational concept, functional specification; platform integration impacts.
° Active Enhancement (AE) prototype hardware evaluated.
- Laboratory trainers and flight testing conducted to support Milestone II decision.
° Active Adjunct (AA) - System concepts/designs and acoustic receivers evaluated
° Tactical Arctic Sonobuoy (TAS) - Alternatives for ice penetration techniques investigated.

Program Element: 63254N Title: Air Anti-Submarine Warfare

b. (U) FY 1987 Program:

- ° - Continue in-buoy processing development. Select system development option. Transition to PE 64261, WO480.
- ° - Include bearing and FM algorithms in ADM units. Continuous Wave portion transitions to PE 64261, WO480.
- ° HLA/Air Deployed Active Receiver (ADAR) - Demonstration tests with in simulated search missions.
- ° Horizontal Line Array (HLA) - program transitions to FSED in PE 64261, WO480, Acoustic Search Sensors.
- ° Active Adjunct (AA) - System design to be developed in FSED will be selected. Selection of development options for localization missions.
- ° Tactical Arctic Sonobuoy (TAS) - Application of ice penetration techniques to specific sensors will be investigated.

c. (U) FY 1988 Planned Program:

- ° Air Deployable Active receiver (ADAR) - Processing/display sizing/coding to be performed. Analysis of test data.
- ° Active Enhancement (AE) - Evaluate other improvements (pulse shaping, depth determination, countermeasures).
- ° - Continue program (concept validation and test); complete software development; begin platform integration tests. Transitions to P.E. 64261N, Project WO480.
- ° Advanced Processing (AP) - Advanced processing for multiple sensors.
- ° Active Adjunct (AA) - Commence development of both avionics software and sonobuoy modifications.
- ° Initiate Development Options Papers for Advanced Active Sonobuoy (AAS), Improved Low Cost Sonobuoy (ILCS), and Improved Tactical Surveillance Sonobuoy (ITSS).
- ° Tactical Arctic Sonobuoy (TAS) - Selection of development options(s). Contract award(s) for ADM units.

d. (U) FY 1989 Planned Program:

- ° Air Deployable Active Receiver (ADAR) - System design to be developed in FSED will be selected.
- ° Tactical Arctic Sonobuoy (TAS) - ADM testing.
- ° Advanced Processing (AP) - Continuation of advanced processing for improved detection classification, localization, including countermeasures resistance.
- ° Prepare to award initial ADM contracts in FY 1990 for AAS, ILCS, and ITSS.
- ° Active Adjunct (AA) - System development continues.
- ° Active Enhancement (AE) - Demonstrated improvements, transition to PE 64261, WO480.

Program Element: 63254N Title: Air Anti-Submarine Warfare

e. (U) Program to Completion:

° This is a continuing project.
° All programs being developed under this project will potentially transition to PE 64261N, W0480 for Full Scale Engineering Development.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63256N Title: V-22A
DoD Mission Area: 265 - Amphibious, Strike, and Antisurface Warfare Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 525,249* | 0 | 3,988 | 17,909 | Continuing | Continuing |
| W1425* | V-22 OSPREY | 525,249* | 0 | 0 | 0 | 0 | * |
| W1971 | V-22/ASW CF | 0 | 0 | 3,988 | 17,909 | Continuing | Continuing |

* Project W1425 V-22 OSPREY changed from PE 63256N to 64262N in FY 1987 to reflect transition into 6.4 FSED effort.
The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The U. S. Navy has an urgent requirement in the mid-1990's for an aircraft to provide primary outer zone ASW protection and secondary surveillance and targeting support. The V-22 ASW variant will meet this need through its vertical and short takeoff and landing (VSTOL) capabilities and state-of-the-art weapons system. It will be capable of operating independently from and being supported by carriers and a variety of aviation capable ships. The tilt-rotor technology of the V-22 ASW variant provides performance, range, speed and operational flexibility which will enhance future ASW mission effectiveness. This aircraft will replace the S-3.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: Project W1425, in FY 1986 decrease of 30,306 for GRH adjustment and 2,071 for Department Budget adjustment and increase of 300 for Department Program/Budget adjustment. Project W1971 reflects funding for planned effort for the V-22 ASW variant.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY: Not Applicable.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: The V-22 is a joint service program with the Navy as Executive Service and Air Force participating. The Air Force will have a unique project line in the Air Force budget to support their unique development requirements. At this time the V-22 ASW Variant has singular application to the U. S. Navy only.

Program Element: 63256N Title: V-22A

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Development Center (Avionics Engineering) Warminster, PA; Naval Air Test Center (Operational Testing) Patuxent River, MD; Naval Avionics Center (Avionics Software) Indianapolis, IN.. CONTRACTORS: Airframe: Bell-Boeing, Fort Worth, TX; Engine: Allison Gas Turbine Division, General Motors Corp, Indianapolis, IN.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W1971 V-22 ASW CF:

1. (U) Description: The U. S. Navy has an urgent requirement in the mid-1990's for an aircraft to provide primary outer zone ASW protection and secondary surveillance and targeting support. The V-22 ASW variant will meet this need through its vertical and short takeoff and landing (VSTOL) capabilities and state-of-the-art weapons system. It will be capable of operating independently from and being supported by carriers and a variety of aviation capable ships. The tilt-rotor technology of the V-22 ASW variant provides performance, range, speed and operational flexibility which will enhance future ASW mission effectiveness. This aircraft will replace the S-3.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Compiled preliminary studies of mission configuration changes from a V-22 aircraft to a V-22 ASW variant aircraft.

b. (U) FY 1987 Program: Not Applicable.

c. (U) FY 1988 Planned Program:

- o Analyze alternative mission equipment packages.
- o Analyze external stores design alternatives.
- o Perform predesign engineering for crew station layout alternatives.

d. (U) FY 1989 Planned Program:

- o Perform preliminary design effort for mission configuration.

Program Element: 63256N Title: V-22A

e. (U) Program to Completion:

- o Award FSED contract for avionics integration and fuselage modification.
- o Configure two production V-22 airframes with ASW avionics and stores modifications.
- o Conduct TECH/OPEVAL.
- o Obtain Approval for Limited/Full Production.

f. (U) Major Milestones:

| | Milestone | Date |
|---|---|---|
| 1. | Milestone 0 | 1st Qtr FY 1988 |
| 2. | Milestone I | 1st Qtr FY 1988 |
| 3. | Milestone II | FY 1990 |
| 4. | Milestone IIIA | TBD |
| 5. | Milestone IIIB | TBD |

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63257N
Title: A-6F
DoD Mission Area: 223 - Close Air Support & Interdiction
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 235,412 | 170,950 | 124,023 | 78,097 | 19,536 | 717,502 |
| WI788 | A-6F | 235,412 | 170,950 | 124,023 | 78,097 | 19,536 | 717,502 |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The element provides for development of specific propulsion, airframe, and avionics improvements for the A-6E aircraft to enhance performance, reliability, maintainability, and survivability in the 1990's. Provides improvements for the A-6 aircraft to upgrade its current capabilities against the growing surface-to-air and air-to-air defensive threat through the remainder of this century, to increase its operational readiness, to improve survivability and to provide standoff targeting. The project includes development of a high resolution radar for standoff targeting, higher thrust engines, modern digital avionics, minor airframe improvements, and survivability/vulnerability enhancements resulting from lessons learned during the Libya operations. The Libya lessons learned will be incorporated under the first A-6F block improvement, Engineering Change Proposal (ECP) -1.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The significant changes between the funding shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: FY 1987 increase of 27,694 is the net result of Congressional action and adjustments and a Department budget adjustment, FY 1988 increase of 49,787 is due to a Department program adjustment. Both increases are for incorporation of the first A-6F block improvement, ECP-1.

Program Element: 63257N Title: A-6F

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 68,727 | 236,051 | 143,256 | 74,236 | 81,441 | 618,081 |
| W1788 | A-6F | 68,727 | 236,051 | 143,256 | 74,236 | 81,441 | 618,081 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Aircraft Procurement, Navy, A-6F: | | | | | | |
| Funds (41AC) | 0 | 123,642* | 839,477** | 854,289** | Continuing | Continuing |
| Quantities | 0 | 0 | 12 | 18 | 120 | 150 |

* A-6F only
** A-6E/F mixed

E. (U) RELATED ACTIVITIES: Program Element 24134N (A6 Squadron) contains the A-6E Weapons Integration development program which forms the baseline from which the A-6F is being developed and assures enhanced A-6E mission capabilities to meet the requirements of the 1990s.

F. (U) WORK PERFORMED BY: CONTRACTORS: Grumman Aerospace Corporation, Bethpage, NY; General Electric Company, Lynn, MA; United Technologies, Norden Division, Norfolk, CT. IN-HOUSE: Naval Air Development Center, Warminster, PA; Naval Air Propulsion Center, Trenton, NJ; Naval Weapons Center, China Lake, CA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

Program Element: 63257N Title: A-6F

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W1788, A-6F

1. (U) Description: The primary goal of this multifaceted effort is to improve fleet reliability, performance and survivability through use of improved avionics, propulsion and survivability technology to upgrade engines, radar, and other avionics subsystems. The effort is directed primarily towards needs in Antisurface Warfare and Strike Warfare. Specific capabilities being addressed by this effort include vulnerability, standoff capability and reliability/maintainability as identified in fleet reliability reports, DIA DST-1200F0597-82, October 1982, and TACAIR Warfare Assesaments. The threat being addressed is surface-to-air missiles, gunfire and hostile aircraft, which are projected to be operational in the post-1990 timeframe. This effort interfaces with F-14D which is undergoing simultaneous development, and must be available for production in FY 1988. Specific components to be developed under A-6F include radar and engines. Major improvements to be achieved are increased survivability, reliability/maintainability and improved operational capability. Special characteristics are high resolution radar for improved standoff targeting, higher thrust engines, modern digital avionics and minor airframe changes. Emergent technology has produced capability improvements not available at initiation of FSD. These include a night attack system, EW systems and others to be incorporated in initial production under the block title ECP-1.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Continued full scale development including critical design reviews of the aircraft, engine, radar, and mission computer software. Began ECP-1 concept formulation. FSED aircraft major component assembly commenced.

b. (U) FY 1987 Program: Complete assembly and delivery of four FSED aircraft. Conduct first flight, initial developmental testing and pilot production decision. Commence development and integration of ECP-1.

c. (U) FY 1988 Planned Program: Accept delivery of fifth FSD aircraft. Conduct flight tests to expand flight envelope, integrate radar and avionics, and verify mission computer software. First limited production Milestone IIIA decision will be reached in March 1988. Full scale development flight testing continues throughout the year.

d. (U) FY 1989 Planned Program: Conduct carrier suitability tests, TECHEVAL, and OPEVAL.

e. (U) Program to Completion: Completion of developmental testing, operational test and evaluation and full scale production decision in 1990. Conduct ECP-1 TECHEVAL and OPEVAL.

Program Element: 63257N Title: A-6F

f. (U) Major Milestones:

| | | Date |
|---|---|---|
| 1. | Department of the Navy Strategy Board Decision | 9 December 1982 |
| 2. | Secretary of the Navy Direction | 6 July 1983 |
| 3. | Full Scale Development Contract | 31 July 1984 |
| 4. | Prototype Fabrication | August 1984 - May 1987 |
| 5. | Developmental Test and Evaluation | May 1987 - June 1989 |
| 6. | Pilot Production Decision | March 1987 |
| 7. | Operational Test and Evaluation (Baseline) | June 1989 - March 1990 |
| | (ECP-1) | August 1990 - December 1990 |
| 8. | Approval for Limited Production | FY 1988/89 |
| 9. | Approval for Full Production | FY 1990 |
| 10. | Initial Operational Capability | |

I.(u) TEST AND EVALUATION DATA (U)

1. (U) Development Test and Evaluation

a. (U) Grumman Aerospace Corporation conducted the first flight of the prototype A-6E aircraft in fiscal year 1970. The prototype aircraft was an A-6A with a new microminiaturized radar, computer and weapons release system installed. Reliability/maintainability demonstration tests were successfully conducted on the new radar, computer and weapon release system and specifications were met. The flight test program confirmed system interface and the software computer program with no major deficiencies encountered. The fiscal year 1975 configuration included provisions for the Target Recognition Attack Multisensor (TRAM) system. TRAM is an electro-optical sensor package with a Forward Looking Infrared (FLIR) sensor, laser ranger and designator and a laser energy receiver. The TRAM system allows high resolution viewing of the target and the ability to execute self-contained delivery of laser guided weapons. TRAM equipment was procured for the last segment of fiscal year 1977 and subsequent aircraft. The system is also being backfitted into earlier production models as well as A-6E aircraft converted from the A-6A aircraft in the Conversion in Lieu of Procurement (CILOP) Program.

b. (U) A successful Navy Preliminary Evaluation (NPE) for the A-6E was conducted in 1971 and a Board of Inspection Survey (BIS) trial was conducted in 1972 (Model A-6E Aircraft Service Acceptance Trial, Project BIS Report 21293, Final Report, 11 June 1973). The A-6E aircraft was approved for service use on 22 December 1972.

c. (U) The TRAM configured A-6E successfully completed Development, Test and Evaluation (DT&E) trials in June 1976. Based upon the results of the DT&E and the Operational Test and Evaluation (OT&E), the A-6E TRAM was awarded Provisional Approval for Service Use (PASU) in July 1976. An initial Navy Technical Evaluation (TECHEVAL) of the A-6E TRAM Detecting and Ranging Set (DRS) began in July 1977 (A-6E TRAM TECHEVAL (OT-IIIB), Third Report (FINAL), 3 January 1979). A limited TECHEVAL for Reliability and Maintainability (R&M) was completed in August 1979. Approval for Service use (ASU) was granted in March 1980 and the system has been approved for full production.

d. (U) The A-6E Operational Flight Program (OFP) has been progressively updated. The last three operational versions, E120, E220 and E230, have been developed by the A-6 Weapon System Support Activity at the Naval Weapons Center, China Lake, California. Major improvements include revised weapon ballistics algorithms, updated inertial measurement unit alignment routines, additional system/visual weapon delivery modes, enhanced nuclear weapon capability, and system integration recently introduced weapon systems such as SKIPPER II, BIGEYE, GATOR, FMU-140 and BSU-85. E230 completed development testing in September 1985 and operational testing in May 1986 and was approved for fleet use in June 1986.

e. (U) The capability to carry and launch the AGM-84A HARPOON missile on the A-6E aircraft has been developed. This project combines the all weather anti-ship missile capability of HARPOON with the A-6E all weather carrier attack aircraft. Development testing has been completed.

f. (U) In June 1980, the Chief of Naval Operations approved the commencement of the Demonstration and Validation (D&V) phase of development for the A-6E All Weather Standoff Attack Control System (AWSACS) to provide improved radar resolution and processing for target classification from standoff ranges. After the D&V phase was satisfactorily completed, authority to enter full scale development was denied in March 1982 because of affordability considerations.

g. (U) Integration of the AGM-88A High Speed Anti-Radiation Missile (HARM) and the ALR-67 threat warning receiver was initiated in 1982. In 1983 A-6E HARM missile integration was expanded to include the AGM-65E Laser Maverick, AGM-65F Imaging Infrared Maverick, AGM-84D Block IC HARPOON and provisions for a Generic Air-to-Surface Missile (GASM). This program is referred to as the A-6E Systems/Weapons Integration Program (SWIP). SWIP Integration tasks conducted by Grumman Aerospace Corporation included development of a new missile command and launch system, digital multiplexed missile interfaces and extensive system software. The developmental E215 flight program was then merged by the Naval Weapon Center with the current fleet Operational Flight Program (OFP) (E230) to become E240. The new avionics hardware, software and OFP E240 will commence OT-IIC TECHEVAL phase in January 1987 in accordance with TEMP 828.

2. (U) Operational Test and Evaluation

a. (U) Operational Evaluation (OPEVAL) testing of the production configuration A-6E was completed in 1973 and concluded that the A-6E retained all the capabilities of the A-6A and achieved improved weapon system maintainability/reliability (Final Report of O.V-93 OPEVAL of the A-6E Attack Navigation System, 2 January 1974).

b. (U) Follow-on Operational Test and Evaluation (FOT&E) of the A-6E was assigned to VX-5. Project operations began in January 1975 and were completed in November 1975. Results, published in 1976, showed aerial mine delivery and the E-2.0 computer program to be operationally effective. The E-2.0 (BASIC), E-105 Carrier Airborne Inertial Navigation System (CAINS) E-110 (TRAM), E-120, E-220 and E-230 operational flight programs have now been tested and approved.

c. (U) Initial Operational Test and Evaluation (IOT&E) of the A-6E TRAM (Target Recognition and Attack Multisensor) system was conducted by VX-5 in two phases (OT-IIIA and OT-IIIB) from 1976 to 1979. The OT-IIIA testing phase was completed in early July 1976. COMOPTEVFOR concluded that the A-6E TRAM system was operationally effective and potentially operationally suitable, and recommended continued development, provisional approval for service use, limited production, and OPEVAL (OT-IIIB) of production representative systems. ATTRTEVRON FIVE commenced OT-IIIB testing on 10 September 1979 at NWC China Lake, CA, and completed flight testing on 16 November 1979. The OPEVAL report concluded that the A-6E TRAM was operationally effective and operationally suitable, and recommended approval for service use and full-scale production (OPEVAL of the A-6E TRAM System, 17 March 1980).

d. (U) In June 1980, an operational evaluation of an upgraded A-6E Target Recognition and Attack Multisensor (TRAM) Operational Flight Program (OFP) (E-110 plus Strike Attack Vectoring (SAV)) was conducted to test the improved operational capabilities. E-110 + SAV was determined to be operationally effective and release to TRAM configured A-6E aircraft was recommended. A follow-on test program to evaluate corrective action for the general loft accuracy problem concluded that E-110 + SAV provided reasonable weapon delivery accuracy in all delivery modes. Therefore, the Commander of Operational Test Forces (COMOPTEVFOR), in August 1980, recommended release of the E-110 + SAV OFP to all A-6E Carrier Airborne Inertial Navigation System (CAINS) and TRAM aircraft, but noted that TRAM A-6E aircraft tended to bomb long in loft delivery modes (primary war-at-sea delivery tactic) and recommended follow-up corrective action to eliminate this anomaly. This anomaly was corrected in the E-220 OFP released to the fleet in April 1984.

e. (U) An operational assessment of the A-6E TRAM/HARPOON missile integration, to determine the feasibility of an early deployment of the system, was conducted in July 1980. Test results indicated potential operational effectiveness of the A-6E TRAM/HARPOON; however, a comprehensive assessment of operational suitability was not possible. COMOPTEVFOR recommended early deployment of A-6E TRAM/HARPOON with extensive contractor support and development of a fix for an arming lanyard discrepancy. In June 1981, VX-5 completed Operational Evaluation (OPEVAL) of the A-6E TRAM/HARPOON integration. COMOPTEVFOR concluded that the A-6E HARPOON Weapon System is operationally effective in the anti-ship role and operationally suitable based on demonstrated system reliability and availability. On 10 September 1981, COMOPTEVFOR recommended approval of the A-6E HARPOON Weapon System for service use and production (OPEVAL of the A-6E HARPOON Weapon System, 10 September 1981). Extension of Approval for Service Use (ASU) was granted 20 January 1983.

f. (U) Follow-on Operational Test and Evaluation of th A-6E TRAM was assigned to VX-5. Project operations began in December 1981 and are continuing. An operational test and evaluation of the upgrade A-6E TRAM OFP, designated E120, was commenced by VX-5 in June 1982. Testing was suspended in April 1983 pending resolution of an apparent steering and weapon delivery accuracy problem, and resumed in October 1983. Testing was successfully completed and E-120/220 were introduced in the fleet in April 1984. Follow-on Test and Evaluation (FOT&E) on OFP E120-01/220-01 was successfully conducted by VX-5 in October 1984 to correct two software anomalies and was released to the fleet on 23 October 1984. FOT&E on OFP-E230 began in November 1985 and completed in May 1986. OFP-E230 was released to the fleet in July 1986. OT-IIA of the E240 System Weapons Integration Program (SWIP) configuration will commence in February 1987. OT-IIB will commence in June 1987 and complete in September 1987.

3. (U) System Characteristics -- A-GE TRAM

(U) Operational/Technical Characteristics

| Operational/Technical Characteristics | Objectives[1/] | Demonstrated Performance |
|---|---|---|
| Forward Looking IR (FLIR) Resolution (Narrow Field of View) | | |
| System Tracking Rates | | |
| Azimuth | | |
| Elevation | | |
| System Tracking Accuracy | | |
| Azimuth | | |
| Elevation | | |
| System Stabilization (with compensation) | | |
| Laser Range Accuracy | | |
| FLIR Range Performance (DD 931 Class, A/C alt 4000 ft) | | |
| Detection | | |
| Classificatron | | |
| Identification | | |
| Unguided Bombing Accuracy (1500 ft Altitude) | | |
| Laser Receiver Tracking Range | | |

| | | |
|---|---|---|
| Operational Reliability (ORS) | | |
| Probability | 85% | 91.4%2/<br>94.4%3/ |
| Mean Time Between Failure | 18.5 hrs | 33.2 hrs2/<br>45.3 hrs3/ |
| Maintainability (Operational Readiness Test) | 70% | 83.3%2/<br>100%3/ |
| Maintainabjlity (Fault Isolation Test) | 75% | 100%2/,3/ |

1/ Updated A-GE TRAM Naval Decision Coordinating Paper (NDCP WO629-TE dated 6 Dec 1978)
2/ Results of A-6E TRAM Navy Technical Evaluation (NTE)
3/ Results of A-GE TRAM Operatonal Test and Evaluation (OT&E)

4. (U) Current Test and Evaluation Activity

(U) T&E Activity (Past 12 Months)

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| A-6E TRAM Follow-on T&E (E230) | Oct 85 - Apr 86 | Nov 85 - May 86 | E230 released to fleet Jun 86 |

(U) T&E Activity (Next 12 Months)

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| E240 SWIP OT-IIC | Jan 87 - Aug 87 | | TECHEVAL |
| E240 SWIP OT-IIA | Feb 87 - May 87 | | IOT&E |
| E240 SWIP OT-IIB | Jun 87 - Sep 87 | | OPEVAL |

5. (U) Program Documentation

COMOPTEVFOR PROJECT REPORTS

| DATE | TITLE | SERIAL NO. |
|---|---|---|
| 2 Jan 74 | Final Report of O/V-93 OPEVAL of the A-6E Attack Navigation System | C1 |
| 18 Jun 76 | OPEVAL of the A-6E TRAM System | C240 |
| 2 Mar 77 | Initial Operational Evaluation of the A-6E TRAM System | C56 |
| 22 Jan 79 | OPEVAL of the E-11D Operational Flight Program for the A-6E CAINS and TRAM Aircraft | C22 |
| 17 Mar 80 | OPEVAL of the A-6E TRAM System | C74 |
| 10 Sep 81 | OPEVAL of the A-6E HARPOON Weapon System | C277 |
| 27 Jun 86 | OPTEVFOR Tactics Guide A-6E TRAM System E23J OFP | TZ 1031-01-86 |

DEVELOPMENT TEST REPORTS

| | | |
|---|---|---|
| 11 Jun 73 | Model A-6E Aircraft Service Acceptance Trial, Project BIS Report 21293, Final Report | |
| 19 Aug 76 | Nuclear Weapons Supplemental Report | Ser C41 |
| 3 Jan 79 | A-6E TRAM TECHEVAL (OT-IIIB), Third Report (FINAL) | SA-C14R-78 |
| 29 Nov 85 | A-6E E23D OFP Technical Description | NWC TM 5696 |

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63260N
DoD Mission Area: 234 - Mine Warfare

Title: Airborne Mine Countermeasures
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 11,411 | 10,680 | 8,975 | 12,322 | Continuing | Continuing |
| WO528 | Advanced Airborne Mine Countermeasures Equipment | 5,315 | 4,227 | 3,151 | 5,665 | Continuing | Continuing |
| WO529 | Airborne Minehunting System | 6,096 | 6,453 | 5,824 | 6,657 | Continuing | Continuing |

As this is a continuing program, the above funding includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Development of airborne mine countermeasures systems that are required to counter known and projected mine threats. Provides minesweeping capability against mines, a mechanical minesweeping capability against moored mines, and a capability to locate and neutralize mines, at greater area coverage rates than surface mine countermeasures platforms.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: The FY 1986 reduction -1,164 was caused by the GRH and Department program/budget adjustments. The FY 1988 reduction -6,134 was caused by Department program/budget and NIF rate adjustments.

Program Element: 63260N Title: Airborne Mine Countermeasures

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 15,306 | 12,575 | 11,565 | 15,109 | Continuing | Continuing |
| WO528 | Advanced Airborne Mine Countermeasures Equipment | 5,675 | 3,588 | 4,357 | 5,937 | Continuing | Continuing |
| WO529 | Airborne Minehunting System | 9,631 | 8,987 | 7,208 | 9,172 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| WO528 | Advanced Airborne MCM Equipment | | | | | | |
| WO529 | Airborne Minehunting System OPN (BA 3) (334248) | 17,868 | 17,421 | 14,390 | 24,335 | Continuing | Continuing |

E. (U) RELATED ACTIVITIES: Computer-aided detection/classification, cable fairing, and towed body technologies developed under Program Element 62315N Mine and Special Warfare Technology; Sonar technology developed under Program Element 63502N, Surface Mine Countermeasures, Project SO260, Minehunt and Project S1404, Neutralization.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Coastal Systems Center, Panama City, FL; David W. Taylor Naval Ship Research and Development Center, Bethesda, MD and Naval Surface Weapons Center, Dahlgren, VA. CONTRACTORS: EDO Government Products Division, College Point, NY; Tetra-Tech, Inc., San Diego, CA; and Lockheed Advanced Marine Systems, Santa Clara, CA.

Program Element: 63260N Title: Airborne Mine Countermeasures

C. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W0528, Advanced Airborne Mine Countermeasures Equipment:

1. (U) Description: In 1970, the Chief of Naval Operations made a decision to restructure the mine countermeasures force from one based solely on surface ships, to a force whose optimum performance is achieved with a mix of airborne and surface platforms, utilizing the best capability of each. The rapid speed of forward deployment and effectiveness of helicopter mine-sweeping have been proven in Haiphong, Suez, and the Red Sea and has led to a requirement to expand helicopter mine countermeasures from the early, shallow water, precursor sweep capability to a deeper and more effective capability to sweep moored mines,

Systems developed under this project include: AN/ALQ-166 Magnetic Sweep to sweep magnetic mines A/N37U-1 Controlled Depth Moored Sweep to increase sweep depth and reduce streaming time; AN/ASQ-182 Magnetic Environment Measurement Set to increase magnetic sweep efficiency and helicopter safety; Advanced Acoustic Sweep, including Pressure Acoustic Monitor,

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° AN/ALQ-166 - Continued Navy evaluation.
° A/N37U-1 - Continued technical evaluation.

b. (U) FY 1987 Program:

° AN/ALQ-166 - Complete Navy evaluation and complete design of changes.
° A/N37U-1 - Complete technical and operational evaluations.

c. (U) FY 1988 Planned Program:

° AN/ALQ-166 - Complete fabrication of changes and initiate technical evaluation.
° A/N37U-1 - Obtain Approval for Full Production.

d. (U) FY 1989 Planned Program:

° AN/ALQ-166 - Complete technical and operational evaluations.
° AN/ASQ-182 - Advertise and award contract for design and fabrication of Engineering Development Models.
° Advanced Acoustic Sweep - Advertise contract for design and fabrication of Advanced Development Models.

Program Element: 63260N Title: Airborne Mine Countermeasures

e. (U) Program to Completion: This is a continuing program which includes the following events:

| | MS II | OPEVAL | MS III | IOC |
|---|---|---|---|---|
| AN/ALQ-166 Mag Sweep | FY 78/1Q | FY 89/3Q | FY 90/1Q | |
| A/N37U-1 CDMS | FY 80/1Q | FY 87/4Q | FY 88/2Q | |
| AN/ASQ-182 MEMS | FY 89/1Q | FY 92/2Q | FY 92/4Q | |
| Advanced Acoustic Sweep | FY 93/1Q | FY 96/2Q | FY 97/1Q | |
| Marker/Reference Buoy | FY 91/1Q | FY 94/3Q | FY 95/1Q | |
| Rapid Deploy Mechanical Sweep | FY 91/1Q | FY 94/3Q | FY 95/1Q | |
| Global Positioning System | FY 91/2Q | FY 95/3Q | FY 96/1Q | |

(U) Project WO529, Airborne Minehunting System:

1. (U) Description: Development of airborne mine countermeasures systems to hunt, detect and neutralize bottom and moored mines. The Soviets possess pressure-combination mines

This project includes sonars for mine detection and classification, and systems for mine neutralization by explosive charge, with equipment designed to provide shallow and deep water minehunting and minefield reconnaissance capabilities against both bottom and moored mines. Systems being developed under this project are: Acoustic Tracking Device and Neutralization System to neutralize mines with a neutralization time AN/AQS-20 Sonar Mine Detecting Set (previously known as the Advanced Minehunting Reconnaissance System)

Bottom Survey System
Fixed Reconnaissance and Mine Search

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Acoustic Tracking Device and Neutralization - continued fabrication of operational test models and aircraft installation.
- AN/AQS-20 Sonar Mine Detecting Set - conducted critical Advanced Development tests.

Program Element: 63260N Title: Airborne Mine Countermeasures

b. (U) FY 1987 Program:

° Acoustic Tracking Device and Neutralization - conduct environmental tests, and preliminary explosive safety tests.
° AN/AQS-20 Sonar Mine Detecting Set - Prepare specifications, for competitive procurement of Advanced Development test models.

c. (U) FY 1988 Planned Program:

° Acoustic Tracking Device and Neutralization - Deliver operational test models and complete technical evaluation.
° AN/AQS-20 - Advertise and award contract and initiate design of Advanced Development Models.

d. (U) FY 1989 Planned Program:

° Acoustic Tracking Device and Neutralization - Complete operational evaluation and obtain Approval for Full Production.
° AN/AQS-20 - Complete fabrication and initial test of Advanced Development Models.

e. (U) Program to Completion: This is a continuing program which includes the following events:

| | MS II | OPEVAL | MS III | IOC |
|---|---|---|---|---|
| Acoustic Tracking Device/ Neutralization System | FY 82/1Q | FY 89/1Q | FY 89/3Q | |
| AQS-20 Sonar Mine Detecting System | FY 90/1Q | FY 93/3Q | FY 94/1Q | |
| Bottom Survey System | FY 90/1Q | FY 94/3Q | FY 95/1Q | |
| Fixed Recon & Mine Search | FY 94/3Q | FY 98/2Q | FY 99/1Q | |

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63261N
Title: Tactical Air Reconnaissance
DoD Mission Area: 323 - TIARA for Naval Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 5,850 | 22,865 | 8,570 | 8,631 | Continuing | Continuing |
| W0534 | Tactical Reconnaissance System | 2,256 | 4,274 | 8,570 | 8,631 | Continuing | Continuing |
| W1870* | Remotely Piloted Vehicles | 3,594 | 18,591 | | | | |

* Project W1870 transferred to program element 64511N, (Intelligence Systems) in FY 1988.

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Tactical Air Reconnaissance Program provides timely imagery intelligence to the tactical commander. Present systems provide such imagery from manned platforms using film-based sensors. The necessity to return to base and process the film delays analysis (interpretation). There is a need for timely tactical reconnaissance imagery (in real-time via data links) for manned platforms. Manned reconnaissance, with larger mission payloads, can provide both broad coverage and high resolution imagery at extended ranges from the tactical base. The aircrew provides flexibility to update navigation and adjust coverage for a target-of-opportunity. Present assets, F-14/TARPS (Tactical Air Reconnaissance Pod System) with U.S. Navy and the RF-4B with U.S. Marine Corps use film-based sensors. The RF-4B also has an imaging SLR (Side Looking Radar) and data link. The RF-4B is being replaced by the multi-mission F/A-18D(RC). A reconfigurable nose for the F/A-18 using film-based and electro-optic sensors has been demonstrated. Advanced electro-optic sensors will be added when developed by the U.S. Air Force Advanced Tactical Air Reconnaissance System (ATARS) program. A reconnaissance data-link pod will be added to ensure an all-weather, standoff, and data-link capability in the F/A-18D. Interservice sensor commonality and video imagery interoperability are primary program requirements.

Program Element: 63261N Title: Tactical Air Reconnaissance

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: in Project W0534, FY1987 was decreased by 4,234,within that dollar amount is a decrease of 2,000 due to Department program adjustments and a 2,234 decrease due to Congressional actions and adjustments; Project W1870 (Remotely Piloted Vehicles) in FY1987 was increased by 9,057, within that dollar amount is an increase of 11,057 due to Department program adjustment and a decrease of 2,000 due to congressional action and the decrease of 18,901 is due to the fact that Project W1870 was transferred to PE 64511N.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 8,663 | 2,207 | 18,042 | 27,705 | Continuing | Continuing |
| W0534 | Tactical Reconnaissance System | 8,663 | 2,207 | 8,508 | 8,804 | Continuing | Continuing |
| W1870 | Remotely Piloted Vehicles | 0 | (3,990)** | 9,534* | 18,901 | | |

* PE 63635M provides additional funding for Marine Corps requirements. **Below Threshold Reprogramming action.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

F. (U) RELATED ACTIVITIES:

Program Element 24136N, (F/A-18 Squadrons); Aircraft to receive reconnsiasance capability.

Program Element 26623M, (Joint Service Imagery Processing System); station receiving data-linked imagery from F/A-18D(RC).

Program Element 64511N, (Intelligence Systems); Complements manned reconnaissance in specialized threat acenario.

Program Element 64710F, (Tactical Reconnaissance); U.S. Air Force program developing advanced electro-optic sensors for integration into F/A-18D(RC) suite. A Memorandum of Agreement between the U.S. Air Force and the U.S. Navy to coordinate tactical reconnaissance development was signed 11 March 1985. The U.S. Air Force will lead in electro-optic sensor development, and the U.S. Navy will lead in concept definition of unmanned tactical reconnaissance vehicles. Coordination is maintained on a monthly basis between the two services, and there is no unnecessary duplication of effort.

Program Element: 63261N

Title: Tactical Air Reconnaissance

F. (U) WORK PERFORMED BY: IN-HOUSE: Lead Laboratory is the Naval Air Development Center, Warminster, PA; OTHERS: Test activities: Naval Air Test Center, Pstuxent River, MD; CONTRACTORS: McDonnell Aircraft Co., St. Louis, MO; Fairchild Space and Electronics Co., Germantown, MD; Goodyear Aerospace Co., Phoenix, AZ.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W0534, Tactical Reconnaissance System:

1. (U) Deacription: The purpose of this project is to introduce a real-time tactical reconnaissance capability into the U.S. Marine Corps multi-mission F/A-18D(RC). The existing U.S. Marine Corps RF-4B will be phaaed out. The existing film-based reconnaissance sensors will be replaced with electro-optic aensors and data linka for real-time transmission of imagery directly to the battle group or amphibious force commanders. A baaeline syatem uaing an exiating infrared line scanner converted to an electro-optic output and off-the-shelf tape recorder will be mounted internally. The exiating UPD-4 Side-Looking Radar and Data Link, now internal in the RF-4B, will be carried in a pod on the F/A-18D(RC). Growth provisiona for inclusion of advanced electro-optic sensors to be developed by the U.S. Air Force will be provided. Commonality and interoperability goals are being achieved through working groups and coordination meetings with related air and surface atation programs.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Completed sensor study of electro-optic reconnaissance equipment.
- o Formed working group with U.S. Air Force to coordinate development plans (U.S.N/U.S.A.F MOA of 11 March 1985).
- o Completed flight test evaluation of reconnaissance nose in F/A-18.
- o Installed engineering model ground station to receive electro-optic and SLR imagery.
- o Accepted Critical Design Review (CDR) and Sensor Control/Data Display Set (ASQ-XXX) for F/A-18.
- o Coordinated demonstrations of electro-optic equipments with U.S. Air Force to avoid duplication.
- o Planned Full Scale Development (FSD) activity to be initiated with FY 1987 funding.
- o Conducted flight test of new infrared lineacanner with low-alt/high-speed capability.
- o Initiated flight test of UPD-4 SLR and data link in pod on F/A-18.

b. (U) FY 1987 Program:

- o Complete flight test of UPD-4 SLR and data link in pod on F/A-18.

- o Initiate design of modification to aircraft provisions and software as necessary for incorporation of baseline electro-optic sensor suite, and UPD-4 SLR Pod with growth for advanced electro-optic systems for U.S. Marine Corps F/A-18D(RC).
- o Conduct flight and ground tests as necessary for configuration definition of the F/A-18D(RC).
- o Initiate logistic support and facility planning for complete system.
- o Participate with U.S. Air Force in specification and initiation of development of advanced electro-optic sensors.
- o Definitize U.S. Navy electro-optic reconnaissance program in concert with the U.S. Air Force.

c. (U) FY 1988 Planned Program:

- o Complete development of pod and interface elements for pod carriage of UPD-4 SLR and data link.
- o Update EDM ground station for reception of imagery from UPD-4.
- o Begin installation of aircraft provisions to accommodate reconnaissance package.
- o Initiate development of Video Management System (VMS) components for baseline electro-optic system.
- o Continue flight demonstrations of advanced electro-optic sensor prototypes.
- o Monitor development of advanced electro-optic sensors by U.S. Air Force. Approve Critical Design Review (CDR) of those sensors.

d. (U) FY 1989 Planned Program:

- o Conduct test and evaluation tests of the UPD-4 SLR and Data Link system.
- o Complete support equipment and logistic planning for UPD-4 SLR.
- o Complete development of VMS components for baseline electro-optic system.
- o Initiate production of VMS components for baseline electro-optic system.
- o Initiate development of operational procedures for employment of baseline EO and SLR systems.
- o Conduct unique T&E of advanced electro-optic sensors (EMI-EMV, supportability, etc.).

e. (U) Program to Completion:

- o Conduct test and evaluation of baseline electro-optic system and a real-time capability using data link from UPD-4 system and ADM ground station.
- o Initiate instructor training and complete support equipment and logistic planning for baseline electro-optic system. Add development models of advanced EO sensors to baseline systems and conduct T&E of unique U.S.N requirements.

Program Element: 63261N Title: Tactical Air Reconnaissance

- o Conduct OPEVAL of advanced EO sensors.
- o Initiate development of support equipment and logistic plans for advanced EO sensors. Initiate development of modifications to F-14/TARPS (Tactical Air Reconnaissance Pod System) to accept baseline and advanced electro-optic sensors.
- o Complete development of support equipment and logistics for advanced EO sensors. Complete modifications to TARPS and conduct operational T&E.
- o Introduce a real-time reconnaissance capability into U.S. Marine Corps and U.S. Navy squadrons.
- o This is a continuing program.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 6326/N
DoD Mission Area: 735 - Naval Warfare Support

Title: Aircraft Survivability and Vulnerability
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 13,162 | 11,925 | 15,342 | 18,569 | Continuing | Continuing |
| W0591 | Aircraft Survivability and Vulnerability | 4,082 | 6,437 | 6,066 | 8,244 | Continuing | Continuing |
| W0592 | Aircraft and Ordnance Safety | 3,305 | 3,833 | 3,839 | 3,823 | Continuing | Continuing |
| W1088 | Joint Technical Coordinating Group on Aircraft Survivability(JTCG/AS)* | 2,378 | - | - | - | - | - |
| W1277 | Nuclear Survivability Aircraft | 1,507 | 844 | 3,492 | 4,362 | Continuing | Continuing |
| S1819 | CV Aircraft Fire Suppression System | 1,890 | 811 | 1,945 | 2,140 | Continuing | Continuing |

* Project W1088 is combined with Project W0591 in FY 1987.

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 198?.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: In a war of attrition against numerically superior forces, U.S. Navy aircraft must be capable of engaging the target, returning to base and making repeated sorties until the enemy is destroyed or neutralized. This program addresses both the reduction in aircraft susceptibility to enemy threats and the reduction in aircraft systems vulnerabilities to the threat. In addition, current aircraft weapon systems are vulnerable in varying degrees to nuclear, biological, radiological, laser and microwave threats. The willingness of prospective enemy forces to use chemical warfare has been demonstrated. Soviet low-power laser capability is actual and threatens optical (eye) and electro-optical sensors onboard Naval aircraft. Development of high-power lasers is continuing and is a major threat of the 1990's. The RDT&E projects under this program element are an integral part of the overall Naval Air Combat Survivability program which includes specific weapon system survivability programs. This program element expands the survivability technology base and develops prototype hardware which is required to improve the survivability of these aircraft, develops Engineering Change Proposals, and ensures survivability

Program Element: 63262N Title: Aircraft Survivability and Vulnerability

is a design consideration during the design of new aircraft. There is a requirement to decrease the sensitivity of munitions to fire, shock and EMP. This program transitions "generic" insensitive munitions technology into air-launched munitions.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) Project W1277: in FY 1986, a decrease of 466 due to GRH and Department program/budget adjustment; in FY 1987, a decrease of 1755 is the result of Congressional action and adjustments as well as Department program/budget adjustments; in FY 1988 a decrease of 4,138 was due to Department program adjustments. Project S1819: This Project was scheduled for completion in FY 1988, however funding of 1,945 was added in FY 1988 as well as in the outyears because of the CV Flag-Level Steering Committee's requirement to continue research and development for improved CV Aircraft Fire Suppression Systems. Project W0591: in FY 1986,the increase of 724 was due to additional funding required during execution; in FY 1987,the decrease of 5,273 is the result of Congressional action and adjustments and Department program/budget adjustments; in FY 1988, a decrease of 4,617 is the result of Department NIF rate and program/budget adjustments. Project W0592: the 439 increase was due to additional funding required during execution. Project W1088: the decrease of 982 was due to Department program adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 19,609 | 13,622 | 19,054 | 22,287 | Continuing | Continuing |
| W0591 | Aircraft Survivability and Vulnerability | 3,890 | 3,358 | 11,710 | 10,683 | Continuing | Continuing |
| W0592 | Aircraft and Ordnance Safety | 2,740 | 2,866 | 3,833 | 3,974 | Continuing | Continuing |
| W1088 | Joint Technical Coordinating Group on Aircraft Survivability | 3,623 | 3,360 | * | * | Continuing | Continuing |
| W1277 | Nuclear Survivability Aircraft | 4,496 | 1,973 | 2,599 | 7,630 | Continuing | Continuing |
| S1819 | CV Aircraft Fire Suppression System | 4,860 | 2,065 | 912 | ** | 0 | 8,963 |

* Project W1088 is combined with Project W0591 in FY 1987.
**Project S1819 was transferred from PE 63514N (Shipboard Damage Control) in FY 1985 and is scheduled for completion in FY 1988.

Program Element: 63262N Title: Aircraft Survivability and Vulnerability

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: Aircraft Non-nuclear Survivability, Program Element 63244F, United States Air Force share of the Joint Technical Coordinating Group on Aircraft Survivability (JTCG/AS) Program; Joint Survivability Investigation, Program Element 63215A, United States Army share of the JTCG/AS Program. In addition, Projects WO591 and WO592 represent a well coordinated effort between the project office and all aircraft and ordnance development program offices, all advanced development aircraft and ordnance offices, and the Naval Air Systems Command/Naval Sea Systems Command fire fighting communities. Related efforts for Project W1277 are Program Element 11402N, Project X0793-01, TACAMO IVB ELEC-MAGN PULSE and Program Element 63514N, Project S1607, EMPRESS II. Both of these projects are developing in-house Navy EMP test and analysis capabilities.

F. (U) WORK PERFORMED BY: Project WO591: Naval Weapons Center, China Lake, CA (lead lab); Naval Air Development Center, Warminster, PA; Naval Surface Weapons Center, Silver Spring, MD and Dahlgren, VA; Naval Research Laboratory, Washington, DC; Naval Weapons Support Center, Crane, IN; Naval Weapons Evaluation Facility, Albuquerque NM; Naval Postgraduate School, Monterey, CA; Naval Air Test Center, Patuxent River, MD; Army, Air Force and NASA laboratories; Grumman Aerospace Corporation, Bethpage, NY., McDonnell Aircraft Company, St. Louis, Mo.

Project WO592: Naval Weapons Center, China Lake, CA; Naval Air Development Center, Warminster, PA; Naval Surface Weapons Center Dalhgren, VA and Indian Head, MD; Naval Weapons Support Center, Crane, IN; Naval Air Engineering Center, Lakehurst, NJ.

Project W1277: Naval Air Development Center, Warminster, PA (lead lab); Naval Surface Weapons Center, White Oak, MD; Naval Air Test Center, Patuxent River, MD; Naval Research Laboratory, Washington, DC.

Project S1918: Naval Surface Weapons Center, White Oak, MD; Naval Research Lab, Washington, DC; Naval Weapons Center, China Lake, CA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project WO592, Aircraft and Ordnance Safety:

1. (U) Description: Investigations of past flight deck fires aboard USS FORRESTAL (1967), USS ENTERPRISE (1969), and more recently, USS NIMITZ (1981) revealed that the major compounding factors were ordnance and aircraft response to the fire environment (fast cook-off). Additionally, CNO has directed all munitions carried aboard Navy ships also be insensitive to slow cook-off, bullet and fragment impact, EMP, and sympathetic detonation. This project identifies these hazards and applies technologies and techniques to reduce the hazards to required levels.

2. (U) Program Accomplishments and Future Efforts:

Program Element: 63262N Title: Aircraft Survivability and Vulnerability

a. (U) FY 1986 Program:

° Initiated development of Insensitive Munitions (IM) Master Plan.

° Demonstrated cook-off protection for HARM rocket motor.

° Completed 8000-psi hydraulic system lithium battery characterization and fire fighting techniques.

° Completed hazard analysis of the integral rocket ramjet.

° Continued development of metal fire extinguishment and ordnance cooling characterization.

b. (U) FY 1987 Program:

° Completion of ordnance cook-off improvement for land and sea mines, TOW missle and MK-46 torpedoes.

° Initiate HARM as the NAVAIR Insensitive Munition (IM) candidate weapon.

° Complete NAVAIR portion IM Master Plan.

° Initiate IM bomb fuze.

° Initiate development in advanced design concepts for future ordnance.

° Initiate a joint service/industry IM information center.

° Initiate a quantitative IM threat assessment.

° Initiate technology transition to reduce the probability of sympathetic explosions caused by fast cock-off.

° Initiate rocket improvement to preclude fast cook-off.

c. (U) FY 1988 Planned Program:

° Complete HARM IM work.

Program Element: 63262N Title: Aircraft Survivability and Vulnerability

° Complete ordnance cook-off improvement of Rockeye and Walleye.

° Complete Bomb fuxe IM improvement.

° Initiate fast cook-off protection development of aircraft, guns and fire bombs.

° Initiate IM container development.

° Continue advanced design concepts for future ordnance.

° Determine synergistic effects of IM technologies.

° Continue flight deck fire characterization.

° Continue IM technology demonstration/transition.

° Complete threat assessment.

° Complete hazard characterization involving smoldering combustion and metals.

° Complete characterization involving ordnance disposal and cooling.

d. (U) FY 1989 Planned Program:

° Initiate IM technology transition for air-to-air missiles.

° Continue Aircraft fire hazard work involving subsystems (flares, ejection seats, etc.).

° Initiate IM technology transition for submunitions.

° Complete ADC for internal shear vent technology for conventional rocket motors.

° Continue ADC for violence reduction techniques involving conventional rocket motors.

° Test fast cook-off protection development for rockets, fire bombs, and aircraft guns.

Program Element: 63262N Title: Aircraft Survivability and Vulnerability

° Continue transitioning technologies for other IM stimuli.

e. (U) Program to Completion: This is a continuing program.

(U) Project W1088, Joint Technical Coordinating Group on Aircraft Survivability (JTCG/AS):

1. (U) Description: This project coordinates individual service programs to increase the survivability of aeronautical systems in a non-nuclear threat environment, implements efforts to complement the services' survivability programs, and maintains close liaison with service levels to ensure that all survivability research and development data and systems criteria are made available to the developers of aircraft.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Demonstrated new tool steels to be too brittle for armor applications.

° Established the potential use of low silicon 4340 steel for armor.

° Developed engine front face RCS reduction concepts.

° Measured pressure loss across absorber shrouds.

° Uncovered a low tolerance to engine fuel ingestion for small engines.

° Demonstrated the ability of micro-electronics to adjust engine controls for a "get home" mode of operation applied to J79 turbojet engine.

° Developed F-404 dynamic damaged-engine computer model for use in Survivability Biased Engine Control (SUBEC) algorithms.

° Developed a braided insulator for flight control wire bundles which extends cable survivability in fuel fires from seconds to minutes.

° Discovered how to extend survival time of fiber optic control lines in a fuel fire to 30 plus minutes.

Program Element: 63262N Title: Aircraft Survivability and Vulnerability

° Developed design guide input to MIL-HDBK-336-2 on hi-pressure hydraulic and split surface micro processor driven flight control system incorporating armored compartments for major hydraulic components.

° Initiated development of a pyrotechnically pumped laser jammer.

° Established vulnerability of composite compression loaded structure to multiple fragment impacts.

° Established vulnerability of damaged surface composite structure to further airflow damage.

° Demonstrated feasibility of detecting ballistic (7.62mm) hits with a thin film transducer attached to full scale helicopter components.

° Enhanced the awareness among the Services of the threat potential of high-powered microwaves.

° Demonstrated that MIL-E-22285 specification was inadequate for HALON agent quantities for low pressure (high altitude) although adequate for high pressure (low altitude).

° Demonstrated that short pulses of Halon are more effective in extinguishing fuel fires than the current system.

° Completed updates to the Enhanced Surface-to-Air Missile Simulation (ESAMS) model with improved seeker, multipath, clutter and radar routines.

° Made major progress on development of Naval SAM models.

° Established a working agreement and mutual funding agreement for Naval threat simulation development with the NISC.

° Installed the laser threat model at Wright-Patterson AFB, OH.

° Acquired and checked the FSTC Gun Model for modification to replace the currently outdated gun model (P001).

° Developed a compatability model for MIA missile simulations.

° Completed a test series on penetration of multiple plate armor.

° Expanded the capability to analytically predict the near-field RF signature as seen by the fuze.

Program Element: 63262N Title: Aircraft Survivability and Vulnerability

- Identified our current capabilities and major shortfalls in analyzing aircraft survivability.
- Completed draft of a Fuel System Design Guide, a Structures Design Guide and a Structures MIL-SPEC all of which are to be published in FY87.

b. (U) FY 1987 Programs:

- Combined with Project W0591.

c. (U) FY 1988 Planned Program: Not Applicable.

d. (U) FY 1989 Planned Program: Not Applicable.

e. (U) Program to Completion: Not Applicable.

(U) Project W1277, Nuclear Survivability Aircraft (FAANTAEL):

1. (U) Description: This project is needed in order to comply with DoD Directive 4245.4 and OPNAVINST 3401.3 which require mission critical systems to be hardened to Electromagnetic Pulse (EMP) threat levels. The project improves fleet aircraft sustainability and force levels by conducting EMP assessments and develops EMP protection techniques. Specific deficiencies being addressed include aircraft susceptibility to EMP because of composite structures, digital fly-by-wire circuits, and integrated semi-conductor components. This project provides inputs to major improvement programs for current fleet aircraft (F-14, A-6, S-3) and production of new aircraft (F/A-18, V-22).

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Completed E-2B aircraft.
- Developed technology for fiber optic current sensors.
- Developed and procured upgraded EMP instrumentation for the NATC EMP simulator.

b. (U) FY 1987 Program:

Program Element: 63262N Title: Aircraft Survivability and Vulnerability

° Free field EMP Evaluation and Direct Drive of E-2C aircraft.

° Initiate VH-60, SH-60 and P-3C pretest analysis.

° Configure NATC instrumentation.

° Participate in F-14/AIM-54/AIM-7/AIM-9 EMP evaulation.

° Develop upgrade of EMP simulator.

c. (U) FY 1988 Planned Program:

° Test SH-60, VH-60 and initiate P-3C Test.

° Initiate F-14D and A-6F pretest analysis.

d. (U) FY 1989 Planned Program:

° Complete P-3C test.

° Test the F-14D.

° Initiate A-6F, EA-6B and CH-53 pretest anlysis.

e. (U) Program to Completion: Conduct full system electromagnetic pulse assessments of A-6F, EA-6B and CH-53; then continue with other Navy aircraft.

(U) Project S1819, CV Aircraft Fire Suppression System:

1. (U) Description: This project develops improved fire fighting systems for aircraft carriers.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Conducted fire truck mission analysis.

Program Element: 63762N Title: Aircraft Survivability and Vulnerability

° Continued development of the Remote Control Firefighting Platform.

° Continued AFFF Delivery System improvements.

° Completed JP-4/JP-5 mixture fire hazard analysis and testing.

b. (U) FY 1987 Program:

° Complete Fire Truck Mission Analysis.
° Full Scale Engineering Development of the Remote Control Firefighting Platform.
° Continue AFFF Delivery System Improvements.

c. (U) FY 1988 Planned Program:

° Final DT and OT&E of the Remote Control Firefighting Platform.
° Conduct new extinguishing agents and application techniques analysis.
° Conduct improved ordnance cooling analysis.

d. (U) FY 1989 Planned Program:

° Develop training techniques for the Remote Control Firefighting Platform.

° Conduct ordnance cooling testing.

° Conduct new agents and application technique testing.

e. (U) Program to Completion:

° Continue testing of new techniques.

(U) Project W0591, Aircraft Survivability and Vulnerability:

1. (U) Description: This project contains two principal survivability efforts for the Navy Combat Survivability Program. The first, Aircraft Survivability and Vulnerability, is the only Navy advanced development effort specifically oriented towards aircraft combat survivability. The second is the Navy portion of the Joint Technical Coordinating Group on Aircraft Survivability

Program Element: 63262N Title: Aircraft Survivability and Vulnerability

(JTCG/AS) which has been deleted from separate Project status and incorporated within this project beginning in FY-87. The Navy depends heavily on the methodology development efforts of the JTCG/AS which are used to determine survivability trade-offs of Naval and Marine Corps aircraft and to evaluate survivability specifications of new acquisition aircraft such as the V-22 and the next generation Navy tactical aircraft. The JTCG/AS portion of this project eliminates duplication of effort between the Services and is performed with additional funding from PE 63244F and PE 63215A. The Navy Combat Survivability portion of this project develops prototype hardware for incorporation on Navy/Marine Corps aircraft through Operational Safety Improvement Programs, Engineering Change Proposals, other modification programs, and during the design of new aircraft in order to enhance the survivability of aircraft in a combat environment. In FY 1988 and subsequent years the JTCG portion of PE63262N, PE63244F and PE63215A were combined into a joint DOD JTCG project (PE 65132D).

2. (U) Program Accomplishments and Future Efforts: Tactical paint schemes were developed for the F-14, F/A-18, F-4, RF-8, A-4, EA-6, A-7, SH-60, SH-2F and S-3 aircraft. These schemes, which reduce the visual detectability of the aircraft, are currently being used on the above aircraft. Low-IR reflective coatings, which reduce aircraft susceptibility to certain IR missiles, were developed and are currently being used on most Navy and Marine corps aircraft. An onboard nitrogen inerting system was developed to prevent fire and explosion on the fuel system. This system is currently being incorporated on the CH-53E. Future efforts include development of survivability technology to counter chemical, biological and radiological (CBR), nuclear and laser threats. A major effort will be undertaken to protect electro-optical sensors from low and moderate power lasers. Efforts will continue in the area of signature reduction of aircraft. Navy support to the JTCG/AS will emphasize survivability methodology development for use in prioritizing and determining the survivability requirements for future aircraft such as the ATA and next generation Navy tactical aircraft.

a. (U) FY 1986 Program:

- Expanded development work on OUTLAW PHANTOM to correct deficiencies identified during flight testing.
- Used OUTLAW PHANTOM technology to initiate design modification for another aircraft.
- Continued development of the all-composite jam resistant actuator and engine exhaust plume IR suppressor.
- Initiated OUTLAW AQUARIUM Program.

b. (U) FY 1987 Program:

- Complete development of the all-composite jam resistant actuator.
- Initiate design of an aircraft with OUTLAW PHANTOM technology. This program is designated OUTLAW KNIGHT.

Program Element: 63262N Title: Aircraft Survivability and Vulnerability

° Initiate major efforts in the development of survivability technology to reduce the vulnerability of electro-optical sensors to laser radiation.

° Initiate prototype development of a laser hardened sensor.

° Continue modification developments under the OUTLAW AQUARIUM Program.

° Flight test OUTLAW PHANTOM Aircraft.

° Pursue development of an On-Board Inerting Gas Generating Systems (OBIGGS) for tactical aircraft with the Air Force.

° Expand the testing of composite structures for survivability evaluations.

° Continue development of engine damage control routines for Survivability Biased Engine Controls (SUREC).

° Continue to improve thermal response times for flight control wire bundles.

° Continue to characterize non-US warhead fragments.

° Continue development of survivability trade-off methodologies.

° Initiate an advanced IR technology project (Navy/Air force effort).

c. (U) FY 1988 Planned Program:

° Initiate studies to incoroporate OUTLAW PHANTOM technology on other Navy aircraft.

° Flight test jam resistant actuator on F/A-18 aircraft.

° Continue to prototype laser hardened E-O sensors.

Program Element: 63262N Title: Aircraft Survivability and Vulnerability

d. (U) FY 1989 Planned Program:

° Continue to prototype laser hardened E-O sensors.

° Continue program to investigate OUTLAW PHANTOM technology on other aircraft.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones: Not Applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89 : Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63306N Title: Advanced A/L Air-to-Surface Missile System
DoD Mission Area: 232 - Amphibious, Strike, and Antisurface Warfare Budget Activity: 4- Tactical Program

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 9,433 | 29,656 | 37,446 | 26,724 | 55,093 | 158,352 |
| W1893 | Advanced Interdiction Weapon System (AIWS) | 9,433 | 970 | 2,762 | 8,524 | 55,093 | 76,782 |
| W1958 | Standoff Land Attack Missile (SLAM) | 0 | 18,984 | 32,584 | 17,000 | 0 | 68,568 |
| W2004 | New Skipper Upgrades | 0 | 9,702 | 2,100 | 1,200 | 0 | 13,002 |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides for the development of improved air-to-surface missile systems, bombs and practice ordnance. The Soviet Union has produced a highly significant and increasingly lethal land and naval air defense capability. Numerous in both quantity and variety, it provides air defense coverage over an extensive area and must be considered a formidable threat to U.S. Naval air operations for most potential naval warfare scenarios. The Navy must continue to improve the capabilities of its air warfare weaponry to cope with this threat. This effort will emphasize development of affordable conventional weapons of high terminal lethality as replacements for existing systems for use in high threat environments.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The significant changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows:

Project W1893, AIWS: Skipper funding in FY 1986 was carried in this project. Congressional action provided 10,000 in FY 1987 to continue these efforts but the project has been differentiated from the FY 1987 AIWS initiation by establishing W2004, New Skipper Upgrades. FY 1987 was reduced 3,939 by Congressional action and adjustments. FY 1988 was reduced 4,807 by Department budget and program adjustments.

Project W1958, SLAM: The FY 1986 reprogramming request to Congress for 11,700 was denied. FY 1987 was reduced 18,516 by Congressional action and adjustments. FY 1988 was increased 17,584 by Department budget and program adjustments to allow timely and viable development of SLAM.

Program Element: 63306N Title: Advanced A/L Air-to-Surface Missile System

Project W2004, New Skipper Upgrades: The 9,702 in FY 1987 reflects the establishment of this project with Congressional action and adjustments. The 2,100 in FY 1988 was established by a Department program/budget adjustment as the Laser Guided Training Round effort was shifted from W1893 where it was originally funded.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 0 | 21,692 | 42,409 | 22,569 | 47,330 | 134,000 |
| W1893 | AIWS | 0 | 9,992 | 4,909 | 7,569 | 47,330 | 69,800 |
| W1958 | SLAM | 0 | 11,700 | 37,500 | 15,000 | 0 | 64,200 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Weapon Procurement, Navy: | | | | | | |
| (Harpoon SLAM Variant) | | | | | | |
| Funds (42EH) * | 271,715 | 128,387 | 156,406 | 188,440 | 199,200 | 944,148 |
| Quantity * | 347 | 96 | 154 | 166 | 188 | 951 |
| * Amounts are total HARPOON WPN Budget; SLAM amounts are not separately identified. | | | | | | |
| Other Procurement, Navy : | | | | | | |
| TOTAL FOR PROGRAM ELEMENT | 66,180 | 44,841 | 85,303 | 87,472 | 128,547 | - |
| (Skipper) | | | | | | |
| Funds (43QL) | 30,220 | 38,497 | 77,077 | 76,143 | 91,000 | 349,937 |
| Quantity | 895 | 1226 | 3302 | 3666 | 3621 | - |
| (Laser Guided Bomb Kits) | | | | | | |
| Funds (43QS) | 25,960 | 6,344 | 8,226 | 11,329 | 37,547 | - |
| Quantity | 2109 | 216 | 555 | 979 | 2954 | - |

Program Element: 63306N Title: Advanced A/L Air-to-Surface Missile System

E. (U) RELATED ACTIVITIES: PE 63320N, Low Cost Anti-Radiation Seeker, is providing technology for the AIWS effort. PE 64609N, Bomb Fuze Improvement, is developing proximity fuzing for cluster munitions and a low cost, GPS initiated, inertial guidance unit. PE 63313, Maverick Production, program provides IIR MAVERICK seekers; PE 25645, Walleye Data Link Production, program provides data link components; PE 64778N, NAVSTAR, provides user navigation equipment.

F. (U) WORK PERFORMED BY: CONTRACTOR: McDonnell Douglas Astronautics Co., St Louis, MO; Hughes Aircraft Co., Tucson, AZ; and others to be determined. IN-HOUSE: Naval Weapons Center, China Lake, CA; Pacific Missile Test Center, Point Mugu, CA; Naval Avionics Center, Indianapolis, IN.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W1893, Advanced Interdiction Weapon System (AIWS):

1. (U) Description: This project will provide a weapon to be employed by aircraft to attack targets during day, night and adverse weather conditions. AIWS will have a launch and leave capability and provide several target kills per aircraft sortie. Design of AIWS will capitalize on aircraft sensor capabilities and minimize sophistication of the weapon. AIWS candidates will utilize low cost, off-the-shelf or other service/industry developed hardware as feasible. The weapon will be produced at recurring hardware unit costs (exclusive of the government furnished warhead) not to exceed $50,000 (FY 1985 dollars). This urgently needed capability will be achieved by taking advantage of recent advances in guidance and control technologies; low cost, kinematically efficient air vehicles incorporating composite construction; and prior initiatives in signature management. Pre-planned product improvement ($P^3I$) is a feature of the AIWS program. However, improvements will be incorporated within the $50,000 unit cost threshold. AIWS will provide a significant increase in strike warfare capability, including strike warfare weapon effectiveness, reduced aircraft vulnerability, and affordability to permit training expenditures to maintain combat crew efficiency and a strong inventory. Initial Operational Capability (IOC) is planned for

2. (U) Program Accomplishments and Future Efforts: FY 1986 funds were used for various efforts related to possible upgrades of Skipper or development of AIWS and were carried as W1893. Skipper Upgrade funds are carried as W2004 in FY 1987 and subsequent years and are discussed in the New Skipper Upgrades portion of this section.

a. (U) FY 1986 Program:

° Initiated evaluation of submunitions for possible use in a cluster AIWS or upgrade to Skipper, and joined with the Air Force in development and demonstration of dispensing techniques.

° Developed and analyzed adaptation of low cost antiradiation seeker technology for possible AIWS or Skipper applications, including tactical employment concept development.

Program Element: 63306N Title: Advanced A/L Air-to-Surface Missile System

° Supported development efforts for low cost terminal guidance - uncooled focal plane array infrared seeker with a view towards adaptability to AIWS or Skipper.

° Joined with the Air Force in development and demonstration of inertially guided munitions technology.

° Initiated a program to develop and procure a generic flight evaluation test vehicle ("Truck") to provide a recoverable/reusable means for inflight evaluation of seeker, guidance and control, navigation, data link and/or warhead proposals.

° Initiated development of a laser guided practice round.

° Continued development of the AIWS Operational Requirement in conjunction with guidance provided in the Navy Strike/ASUW Master Plan.

b. (U) FY 1987 Program:

° Secretary of the Navy decision providing AIWS Milestone I.

° Obtain approval of AIWS Operational Requirement.

° Issue AIWS Request for Proposal (RFP) to industry.

° Award AIWS Demonstration/Validation contracts.

c. (U) FY 1988 Planned Program:

° Continue AIWS Demonstration/Validation.

° Conduct first AIWS developmental tests.

d. (U) FY 1989 Planned Program:

° Continue AIWS Demonstration/Validation.

° Conduct AIWS developmental and operational tests.

Program Element: 63306N Title: Advanced A/L Air-to-Surface Missile System

e. (U) Program to Completion:

° Milestone II decision.

° Commence Full Scale Engineering Development.

° Conduct developmental and operational testing.

° Milestone III decision.

° Commence Production.

° Fleet introduction and Initial Operational Capability (IOC).

(U) Project W2004, New Skipper Upgrades:

1. (U) Description: This project is a result of an FY 1986 Congressional initiative to provide the Naval Strike Forces a near term, air-to-surface fighting capability with specific direction to develop a low cost, laser guided training bomb; in-house development of a cluster warhead; and the adaptation of a low cost antiradiation seeker to the AGM-123 Skipper weapon. The funds were carried as Project W1893, AIWS in FY 1986.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: See Project W1893.

b. (U) FY 1987 Program:

° Continue Full Scale Engineering Development (FSED) of the Laser Guided Training Round (LGTR).

° Continue evaluation of submunitions and dispensing techniques in conjunction with the Air Force.

° Continue development of a low cost radio frequency seeker.

° Continue development of low cost imaging terminal guidance technology - uncooled focal plane array.

° Continue procurement and support of the generic flight test vehicle ("Truck"), and commence testing of guidance and control and seeker proposals, etc. using this vehicle.

Program Element: 63306N Title: Advanced A/L Air-to-Surface Missile System

c. (U) FY 1988 Planned Program:

° Complete FSED of the LGTR.

° Continue procurement and utilization of "Truck".

° Complete evaluation of submunitions and dispensing techniques.

° Complete development of the uncooled focal plane array.

d. (U) FY 1989 Planned Program:

° Complete development and testing of LGTR.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W1958, Standoff Land Attack Missile (SLAM):

1. (U) Description:

Program Element: 63306N Title: Advanced A/L Air-to-Surface Missile System

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Operational Requirement approved.

° Vehicle and integration contractor selected.

° Secretary of the Navy decision directed program to proceed (SECNAV Memo dtd 20 May 1986).

b. (U) FY 1987 Program:

° Initiate ILS program.

° Begin subsystem integration and verification testing to include developmental captive flight testing.

° Prepare program management documents (TEMP, NDCP).

° Begin limited production of engineering development models and pilot production missiles.

c. (U) FY 1988 Planned Program:

° Complete captive flight testing.

° Conduct developmental free flight testing.

° Begin operational testing.

°

° Begin second limited production lot.

d. (U) FY 1989 Planned Program:

° Complete operational testing (1Q FY 1989).

° Conduct program review leading to approval for full production (AFP) decision (1Q CY 1989).

Program Element: 63306N

Title: Advanced A/L Air-to-Surface Missile System

e. (U) Program to Completion: Not Applicable

f. (U) Milestones:

| | |
|---|---|
| 1. Milestone IIIA (ALP) | 3Q FY 1986 |
| 2. DT-IIA | 1Q FY 1987 - 4Q FY 1988 |
| 3. Milestone IIIB | 4Q FY 1987 |
| 4. DT-IIB/OT-IIA | 4Q FY 1988 - 1Q FY 1989 |
| 5. OT-IIB | 2Q FY 1989 |
| 6. Milestone IIIC | 2Q FY 1989 |
| 7. IOC | |
| 8. Production Deliveries | FY 1989 - FY 1992 |

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63313N
Title: IRK Maverick
DoD Mission Area: 223 - Close Air Support and Interdiction
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 1,777 | 0 | 482 | 0 | 0 | 14,225 |
| W0302 | IIR | 1,777 | 0 | 482 | 0 | 0 | 14,225 |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Imaging Infrared Maverick and Laser Maverick provide the Navy and Marine Corps with precision-guided short range, line-of-sight, day-night missiles for close air support, interdiction and strike missions against land and sea targets. These missiles capitalize on the standoff targeting offered by aircraft Forward Looking Infrared and Angle Rate Bombing acquisition systems thus improving aircraft survivsbility in the high threat terminal defense environment.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and as shown in this Descriptive Summary are as follows: The increase in FY 1986 (1,777) is the result of Department budget adjustments; and the decrease in FY 1987 of (245) is the result of Congressional action. The Department intends to reprog'am minimum funds in FY87 to complete IOT&E for a limited production decision.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 2,380 | 0 | 245 | 492 | 0 | 25,001 |
| W0302 | Imaging Infrared Maverick | 418 | 0 | 245 | 492 | 0 | 10,703 |
| W0874 | Laser Maverick | 1,962 | 0 | 0 | 0 | 0 | 14,298 |

Program Element: 63313N Title: IRR MAVERICK

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 176,555 | 196,615 | 192,050 | 62,751 | 0 | Continuing |
| W0874 | Laser Maverick WPN ACCT# 26138M | 151,629 | 162.165 | 132,323 | 0 | 0 | 631,617 |
| | (Quantity) | (1500) | (1800) | (1291) | 0 | 0 | N/A |
| W0302 | IIR Maverick WPN ACCT# 24162N | 24,926 | 34,451 | 59,727 | 62,751 | Continuing | Continuing |
| | (Quantity) | (195) | (419) | (668) | (731) | | |

E. (U) RELATED ACTIVITIES: USAF Imaging Infrared Maverick, AGM-65D. The Air Force has been designated executive service for all Maverick missiles. Navy and Marine Corps are participating services.

F. (U) WORK PERFORMED BY: IN HOUSE: Naval Weapons Center, China Lake, CA; CONTRACTOR: Hughes Aircraft Co., Canoga Park, CA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W0302, Imaging Infrared Maverick:

1. (U) Description: The IIR Maverick (AGM-65F) air-to-ground missile will provide the Navy and Marine Corps with the day/night capability to attack land and sea targets from more survivable positions below or outside close-in enemy defense systems. The AGM-65F utilizes the USAF AGM-65D guidance section modified for optimum performance against ship targets and the 300 pound alternate warhead and out-of-line ignition used on Laser Maverick (AGM-65E).

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

o Initiated IOT&E (OT-IIA).

b. (U) FY 1987 Program:

o Complete IOT&E (OT-IIA).

o Obtain approval for limited production.

- o Correct discrepancies discovered in OT-IIA.
- o Initiate OPEVAL (OT-IIE) with initial production missiles.

c. (U) FY 1988 Planned Program:

- o Complete OT-IIB.
- o Obtain approval for full production.

d. (U) FY 1989 Planned Program: Not Applicable.

e. (U) Program to Completion: Not Applicable.

H. (U) PROJECT OVER $10 MILLION IN FY 1988/89: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63318N
DoD Mission Area: 231 - Anti-Air Warfare

Title: Advanced Air-to-Air/Surface-to-Air Missile
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 26,962 | 33,312 | 76,131 | 102,183 | 213,239 | 451,789 |
| S1912 | SAM Risk Closure (1) | 19,962 | 0 | 0 | 0 | 0 | 23,262 |
| X1632 | ASAM Concept Formulation | 4,523 | 0 | 0 | 0 | 0 | 8,513 |
| S1632 | AEGIS ER | 0 | 28,461 | 76,131 | 102,183 | 213,239 | 420,014 |
| W1671 | AAAM (2) | 2,477 | 4,851 | | | | |

(1) Project S1912, provided FY 1985/1986 funds to pursue critical engineering tasks prior to Department decision to proceed with AEGIS ER.
(2) Project W1671 moves to PE 63321N in FY 1988.

The above funding included out-year escalation and encompassess all work and development phases now planned or anticipated through 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The STANDARD Missile family of area defense missiles is the primary anti-air missile employed in the AEGIS, TERRIER and TARTAR weapon systems. This program element funds improvements to STANDARD Missile for use with AEGIS ships employing the Vertical Launching System. Included within this element are propulsion, guidance and control improvements which will extend STANDARD Missile engagement capability

The resulting extension of the STANDARD Missile engagement envelope will permit utilization of capability.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) Project X1632 was redesignated S1632 and renamed AEGIS ER for FY 1987 and out-years. Funds programmed in project X1913 were reapportioned between project S1632 and project W1671. Project W1671 has been transferred in FY 1988 to Program Element 63321N (ADVANCED AIR-TO-AIR MISSILE). The differences between the FY 1987 Descriptive Summary, and that shown in this Description Summary reflect total program restructuring.

Program Element: 63318N Title: Advanced Air-to-Air/Surface-to-Air Missile

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 7,290 | 25,000 | 79,728 | 126,804 | Continuing | Continuing |
| X1632 | ASAM Concep' Formulation | 3,990 | 4,300 | 0 | 0 | 0 | 32,773 |
| S1912 | SAM Risk Closure | 3,300 | 18,000 | 0 | 0 | 0 | 21,300 |
| W1671 | AAAM Concept Formulation | 0 | 2,700 | 0 | 0 | 0 | 2,700 |
| X19'3 | Advanced AAW System | 0 | 0 | 79,728 | 126,804 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: None.

E. (U) RELATED ACTIVITIES: Program Element 64366N, (STANDARD Missile Improvements); Program Element 64303N, (AEGIS Air Defense); Program Element 64353N, (Vertical launch System); Program Element 64372N, (New Threat Upgrade).

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Surface Weapons Center, Dahlgren, VA; Naval Weapons Center, China Lake, CA; Naval Ocean Systems Center, San Diego, CA; Naval Air Development Center, Warminster, PA; Naval Air Test Center, Patuxent River, MD; Pacific Missile Test Center, Point Mugu, CA. OTHERS: John Hopkins University, Applied Physics Laboratory, Laurel, MD. PRIME CONTRACTORS: Prime Contractors for AAAM/ASAM concept definition were selected competitively in May 1985 (Grumman Aerospace Corp., Bethpage, NY; Hughes Aircraft Co., Canoga Park, CA; Martin Marietta, Orlando, FL; McDonnell Douglas Astronautics, St. Louis, MO; Raytheon Co., Bedford, MA; General Dynamics (Pomona, CA). Some SAM Risk Closure items were directed to General Dynamics Corporation, Pomona Division, Pomona, CA. FY 1987 PRIME CONTRACTORS FOR AEGIS ER: General Dynamics, Pomona Division, Pomona, CA and Raytheon Co., Bedford, MA for GC&A. United Technologies Corp., Chemical Systems Division, San Jose, CA and Morton Thiokol Inc., Huntsville, AL as leader/follower for booster motor. Motorola, Government Systems Division, Scottsdale, AZ and a competitive follower to be determined for target detecting device.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: None.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

Program Element: 63318N Title: Advanced Air-to-Air/Surface-to-Air Missile

(U) Project S1632 AEGIS ER

1. (U) Description: The STANDARD Missile family of area defense missiles is the primary anti-air missile employed in the AEGIS, TERRIER and TAPTAR weapon systems. This program element funds improvements to STANDARD Missile for use with AEGIS ships employing the Vertical Launching System. Included within this element are propulsion, guidance and control improvements which will extend STANDARD Missile engagement capability

The resulting extension of the STANDARD Missile engagement envelope will permit utilization of capability.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: (Under PE 63318N ASAM/AAAM)

° Concept Definition addressed commonality, performance, risk, and cost.

° Conducted risk reduction experiments, provided data on radio frequency/electro-optical/infrared sensors, airborne passive ranging, and jam strobe resolution.

° A Development Options Paper was completed.

° A Navy Program Decision meeting was conducted for the ASAM/AAAM program which resulted in selection of AEGIS ER.

° The SAM Risk Closure project performed risk reduction efforts for a boosted variant of STANDARD Missile 2 (AEGIS ER) including initiation of preliminary booster design and development, model design and wind tunnel test and VLS/Booster compatibility test planning.

b. (U) FY 1987 Program:

° A competitive contract action will be initiated for AEGIS ER guidance, control and airframe design and development. FY 1987 contract award is planned.

° Booster development will continue with initial motor static ground tests scheduled for 3rd quarter FY 1987.

° Vertical Launch System/Booster compatibility tests will be completed.

° Missile canister design will be initiated.

° AEGIS system computer program modifications will be initiated.

Program Element: 63318N Title: Advanced Air-to-Air/Surface-to-Air Missile

° AEGIS ER preliminary wind tunnel tests will be conducted at Arnold Engineering Development Center to study missile booster separation and to obtain configuration trade-off data.

° Program documentation to support Milestone II go-head for AEGIS ER will be prepared.

c. (U) FY 1988 Planned Program:

° Booster Motor qualification ground tests will be started.

° Guidance, control and airframe design and development will proceed in preparation for FY 1989 Critical Design Review.

° Vertical Launch and AEGIS system modification efforts will continue.

d. (U) FY 1989 Planned Program:

° Booster qualification tests will be completed for lead contractor. Booster qualification test for follower contractor will be started.

° Round level preliminary design review will be completed.

° AEGIS and Vertical Launch System preliminary design review will be completed.

° Guidance, control and airframe contractors (leader and follower) continue development of the baseline design to support flight test round design release.

° Critical Design Reviews for the AEGIS ER Missile including AEGIS/Vertical Launch System modifications will be completed. Flight test round design will be released for fabrication.

e. (U) Program to Completion:

° Technical and Operational Evaluation testing is scheduled

° Approval for limited production (Milestone IIIA) is anticipated following initial development testing.

Program Element: 63318N

Title: Advanced Air-to-Air/Surface-to-Air Missile

° Initial Operational Capability (IOC) is expected

f. (U) Major Milestones:

| Milestone | Date |
|---|---|
| 1. Navy Program Decision Meeting | 4th Qtr FY 86 |
| 2. Milestone IIA | 1st Qtr FY 87 |
| 3. Milestone IIB | 2nd Qtr FY 87 |
| 4. Full scale engineering development contract award | 3rd Qtr FY 87 |
| 5. Preliminary Design Review | 1st Qtr FY 88 |
| 6. Critical Design Review | 2nd Qtr FY 89 |
| 7. Development Tests (WSMR) | |
| 8. Milestone IIIA (Approval for limited production) | |
| 9. Technical Evaluation Tests | |
| 10. Operational Evaluation Tests | |
| 11. Milestone IIIB (Approval for full production) | |
| 12. Initial Operational Capability | |

1. (U) TEST AND EVALUATION DATA: Not Applicable.

Y 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63319N
DoD Mission Area: 231 - Anti-Air Warfare

Title: NATO AAW Systems
Budget Activity: 4 - Tactical Systems

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | * | (18,500)* | 10,199 | 8,216 | Continuing | Continuing |
| S1973 | NATO AAW SYS | * | (18,500)* | 10,199 | 8,216 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

* Nunn Amendment funding under PE 63790N.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: New generation threat missiles are becoming increasingly difficult to detect and engage. These newer missiles, whether submarine launched at close range or those escaping destruction at midranges or in the outer air battle, will overcome or seriously stress the self defense systems of non-AAW escort, aircraft carrier, amphibious, and auxiliary ships by the year 2000. These threat missiles include much smaller, faster, and more maneuverable ASM's operating at very low altitudes which exceed the design capabilities of existing systems. This weapon system will provide the surveillance, control, and weapon support functions tailored to the threat, and also be re-configurable for integration with or implementation into the more capable AAW cruisers and destroyers. This program is planned to be a NATO co-operative project and will support the Secretary of the Navy's goal to transfer appropriate AEGIS technology to NATO navies.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: Not applicable.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: The following activities are closely coordinated to prevent unnecessary duplication of efforts. Program Element 63609N, (Conventional Fuze/Warhead Package); Program Element 64354N, (AIM/RIM-7M Product Improvement Program); Program Element 64358N, (Close-In Weapon System (PHALANX)); Program Element 64361N, (NATO SEASPARROW); Program Element 64369N, (5 Inch Rolling Airframe Missile (RAM)); Program Element 64508N, (SPS Improvement Program); Program Element 64608N, (I/R Search and Target Designation.)

Program Element: 63319N Title: NATO AAW Systems

F. (U) WORK PERFORMED BY: Competitive awards not yet commenced. Navsl Ses Systems Command is the responsible development organization.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Each of the aress of interest within this program element sre described as follows:

(U) Weapons System Engineering and Integration:

1. (U) Description: This project includes the preparation of weapon system level requirements/specifications definition for and selection of test facilities (contractor, laborstory, and/or government sites), support of critical experiments leading to initial system design criteria, and provides Naval Sea Systems Command with technical direction agent and laboratory support.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° TOR promulgated.

° Commenced preparation of NAVSEA technical development plan.

° Commenced chreat validation and assessment.
° Prepared Statement of Intent for NATO member consideration.

° Justification for Major System New Start (JMSNS) promulgated.

b. (U) FY 1987 Program:

° Enter into Statement of Intent (SOI) and Memorandum of Understanding (MOU) for initial (Phase I) efforts with one or more NATO countries.

° Prepare Development Options Paper (DOP), Systems Concept Paper (SCP), and Test and Evaluation Master Plan (TEMP) for Milestone I.

Program Element: 63319N Title: NATO AAW Systems

- Provide U.S. and NATO industry briefings on Request for Proposal (RFP) and AEGIS technology approach.
- Prepare preliminary system level requirements and specifications.
- Issue draft RFP for industry comment.
- Prepare draft version of Acquisition Plan.
- Commence cost and feasibility studies.
- Complete threat assessment and technical development plan.
- Establish Interim Land Based Test Site (LBTS).
- Conduct selected critical experiments.
- Commence NATO co-operative development efforts.
- Issue final RFP.
- Award contract for concept formulation studies with three industry teams.
- Continue assessment of vertical launched short range missile concepts started under Program Element 64361N, (NATO SEASPARROW).

c. (U) FY 1988 Planned Program:

- Milestone 1 in 1st Quarter.
- Enter into Phase II Memorandum of Agreement (MOA) with one or more NATO partners.
- Complete system and subsystem detailed specifications.
- Commence design of local AAW test sites.

Program Element: 63319N Title: NATO AAW Systems

° Plan for multi-band (EW, IR, EO) critical experiments demonstrating integration of dissimilar target detection devices in FY 1989.

° Continue critical experiments to evaluate risk areas (ILBTS).

° Evaluate information received from industry: determine functional allocation, system performance requirements, and operational techniques.

° Participate in NATO radar, missile definition projects that are system options.

° Continue NATO co-operative development efforts supporting NATO Staff Target.

° Continue cost and feasibility studies.

d. (U) FY 1989 Planned Program:

° Prepare Decision Coordinating Paper, NATO decision paper and update TEMP, Acquisition Plan, and Technical Development Plan for MILESTONE II in first quarter FY 1990.

° Finalize test site design.

° Support selected critical experiments.

° Update system specifications for delivery in FY 1990.

° Prepare subsystem prime item development specifications.

° Prepare and assemble material for competitive prototype development request for proposals.

° Continue NATO cooperative development efforts.

° Award contract for full-scale engineering development.

° Complete cost and feasibility studies.

Program Element: 63319N Title: NATO AAW Syatems

e. (U) Program to Completion: This is a continuing program.

° Complete test site design efforts in FY 1990, and place aite in operation second quarter FY 1993.

° Continue/complete joint NATO project.

° Complete detailed system and subsystem specifications in FY 1990.

° Complete critical design reviews of contractors by fourth quarter FY 1992.

° Perform test site technical and operational evaluation in FY 1994 and shipboard evaluation in FY 1995/6.

° Attain Milestone IIIA (Approval for Limited Production) first quarter FY 1996.

(U) Senaor Subsystem Development

1. (U) Deacription: This project includes the development of an integrated aensor suite comprised of radar(s), electronic support measures (ESM), infrared, and electro-optics that will detect, process, and track the smaller, faster, and lower altitude ASM threats of the year 2000 with the data rate and accuracy to allow intercepts at longer ranges, in greater numbers, and at lower altitudes.

2. (U) Program Accomplishmenta and Future Efforts:

a. (U) FY 1986 Program:

° Conducted comparative analyais of U.S. va NATO requirements.

° Conducted survey of industry for technology status of antennas, tranamittera, and receivera.

° Initiated laboratory involvement in appraiaal of engineering tradeoffs and alternatives.

b. (U) FY 1987 Program:

° Provide technical material for incorporation into DOP, SCP, and TEMP.

° Continue U.S. and NATO industry survey and laboratory involvement.

° Define equipment, or parts of equipments, for critical experimenta leading to design decisions.

Program Element: 63319N Title: NATO AAW Systems

° Support preparations for Milestone I in first quarter FY 1988.

° Support preparation of system level and interface requirements.

° Obtain agreement among NATO members as to common and differing requirements.

° Establish NATO working group.

c. (U) FY 1988 Planned Program:

° Attain Milestone I in 1st Quarter.

° Prepare detailed (preliminary) subsystem specification.

° Support preparation of preliminary weapon system specification.

° Perform and/or support performance of critical experiments involving threat detection/tracking.

° Evaluate information received from industry under system study contracts.

° Provide requirements for test site engineering.

° Perform ship class preliminary cost and feasibility studies.

° Continue industry survey and laboratory involvement.

d. (U) FY 1989 Planned Program:

° Support attaining Milestone II in FY 1991.

° Prepare for selection of contractors through open competition.

° Prepare prime item development specification.

° Support preparation of final weapon system specification.

* Perform critical experiment on threat detection devices.

e. (U) Program to Completion: This is a continuing program:

* Selection of engineering development model contractors through open competition in FY 1991.

* Commence full scale engineering development (Milestone II) in FY 1991.

* Deliver subsystem elements to test site in FY 1994.

* Integrate sensor to weapon system at test site in FY 1994.

* Perform at-sea Technical and Operational Evaluations (TECHEVAL and OPEVAL) in FY 1995/6.

* Attain Milestone IIIA (Approval for Limited Production) first quarter FY 1996.

(U) Weapon Control Subsystem Development:

1. (U) Description: This project includes the development and integration of a weapon control system integrated into the weapon system to enable minimum reaction time, automatic scheduling of response assets against threats, mid-course missile guidance commands, doctrine and use of man/machine responses, and effective decision methods in the real time threat environment. The effort includes development of high order language programs and associated documentation in accordance with DoD-STD-2167. This project is planned to be a NATO vice U.S. Navy directed project, under an equal share cooperative venture.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

* Commenced top level system concept studies.

b. (U) FY 1987 Program:

* Preliminary system concept discussions with NATO members.

* Draft U.S. Navy top level system requirements (preliminary).

° Survey Navy standard and commerically available processors and peripherals.

° Negotiate, draft and sign NATO Memorandum of Understanding.

c. (U) FY 1988 Planned Program:

° Define system concept.

° Attain Milestone I in first quarter.

° Prepare detailed (preliminary) subsystem specification.

° Evaluate and select processor and peripherals.

° Provide requirements for test site engineering.

° Support preparation of (preliminary) weapon system specification.

d. (U) FY 1989 Planned Program:

° Support attaining Milestone II in first quarter FY 1991.

° Support preparation of system definition and software requirements (New Start).

° Prepare for selection of contractors through open competition.

° Support preparation of prime item development specification.

° Support preparation of final weapon system specification.

e. (U) Program to Completion: This is a continuing program:

° Selection of engineering development model contractors through open competition in FY 1991.

° Commence full scale engineering development (Milestone II) in FY 1991.

- Prepare required software design details in FY 1991.
- Deliver software, processor, and peripherals to test site in FY 1994.
- Perform at-sea Technical and Operational Evaluations (TECHEVAL and OPEVAL) in FY 1995/6.
- Attain Milestone IIIA (Approved for Limited Production) first quarter FY 1996.

(U) Engagement Subsystem Development:

1. (U) Description: This project includes the possible development and definition, in conjunction with NATO partners, of a guided missile weapon system, including a short range missile, capable of illuminating threats, uplinking mid-course guidance commands, controlling multi-missile cells for independent delivery, and increased fire power against the small and lower altitude threat. This includes requisite software in accordance with DOD-STD-2167. Actual development plan will be subject to agreement with NATO partners; development may then be a NATO directed program.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Prepared plan for vertical launch compatibility demonstration.
- Commenced top level system concept studies.

b. (U) FY 1987 Program:

- Support and evaluate vertical launch compatibility demonstration.
- Negotiate, draft and sign Memorandum of Understanding with NATO members.
- Continue system concept studies with appropriate NATO inputs.
- Support preparation of preliminary top level system documentation.
- Survey industry for applicable missiles and missile technology.

c. (U) FY 1988 Planned Program:

° System concept defined.

° Attain Milestone I in first quarter.

° Prepare detailed (preliminary) subsystem specification.

° Complete missile and missile technology survey.

° Provide requirements for test site engineering.

° Commence missile round development specification.

° Commence system definition and software requirements.

d. (U) FY 1989 Planned Program:

° Prepare prime item development specification.

° Prepare for selection of contractors through open competition.

° Support preparation of final weapon system specification.

° Support attaining Milestone II in first quarter FY 1991.

e. (U) Program to Completion: This is a continuing program:

° Selection of engineering development model contractors through open competition in FY 1991.

° Commence full scale engineering development (Milestone II) in FY 1991.

° Prepare requisite software design details in FY 1991.

° Deliver equipment and flight test rounds to test sites in FY 1994.

Program Element: 63319N

Title: NATO AAW Systems

° Perform at-sea TECHEVAL and OPEVAL in FY 1995/6.

° Attain Milestone IIIA (Approval for Limited Production) first quarter FY 1996.

f. (U) MAJOR MILESTONES:

| Milestone | Date |
|---|---|
| 1. Milestone I | 1Q/FY 1988 |
| 2. Milestone II | 1Q/FY 1991 |
| 3. TECHEVAL/OPEVAL | FY 1995/6 |
| 4. Milestone IIIA | FY 1996 |

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63320N Title: Low Cost Anti-Radiation Seeker
DoD Mission Area: 232 - Amphibious, Strike, and Anti-surface Warfare Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 16,571 | 38,522 | 14,642 | 16,870 | TBD | TBD |
| W1807 | Low Cost Seeker * | 16,571 | 38,522 | 14,642 | 9,385 | TBD | TBD |
| W1934 | Dual Role ARM | 0 | 0 | 0 | 7,485 | TBD | TBD |

The above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

* Assumed 50/50 share with Air Force PE 63320F for FY 1986 through FY 1990.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Low Cost Seeker (LCS) Program supports the design and development of an alternate reduced-cost higher-reliability guidance section which meets or exceeds the operational requirements of the existing AGM-88B High Speed Anti-Radiation Missile (HARM) guidance section.

(U) The LCS Program adapts technology derived from the Anti-Radiation Projectile (ARP) Program and other advanced passive, radio-frequency (RF) guidance technologies to evolving Navy and Air Force requirements for anti-radiation guided missiles (ARM's). When applied to the design of ARM antenna and receiver subassemblies (seekers), such technology has the potential for substantially reducing parts count, reducing the number of electrical connections, reducing the design sensitivities to parts variations and assembly procedures; and allowing for more stringent packaging requirements. Resulting ARM missile guidance sections will, therefore, exhibit greater reliability and enhanced producibility at reduced cost.

(U) The Dual Role ARM (DRARM) is a technology spin-off of the LCS Program. The program will incorporate ARP technology into a new guidance section with a gimballed anti-radiation seeker for passive homing on airborne or surface target electromagnetic radiation. The new guidance section will be designed for use with the SPARROW or AMRAAM airframe. The resultant new medium-range missile, when integrated with avionics that allow rapid detection, identification, evaluation and hand-off, will provide Navy and Marine aircraft an all-weather weapon system for defense against enemy airborne and surface air defense systems.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The significant changes between the funding profiles shown in the FY 1987 Descriptive Summary and those shown in this Descriptive Summary are:

Program Element: 63320N Title: Low Cost Anti-Radiation Seeker

Project W1807, Low Cost Seeker. FY 1987 had a net increase of 23,818 as a result of Congressional action and adjustments. FY 1988 was decreased 2,251 by a NIF adjustment and Department budget and program adjustments. As directed by Congress the overall program management of this project has been recently shifted from the Naval Weapons Center to the Naval Air Systems Command. As part of this transition and in an effort to bring this project into consonance with current contracting directives which require the use of fixed-price contracts, the total program cost is in the process of revision.

Project W1934, Dual Role ARM. The reduction in FY 1988 of 9,873 was the result of Department budget and program adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 26,989 | 17,452 | 14,704 | 26,766 | 106,663 | 216,247 |
| W1807 | Low Cost Seeker * | 26,989 | 17,452 | 14,704 | 16,893 | 26,404 | 126,115 |
| W1934 | Dual Role Arm | 0 | 0 | 0 | 9,873 | 80,259 | 90,132 |

* Assumed 50/50 share with Air Force PE 63320F FY 1986 through FY 1990.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: Project W1807 is a joint Navy/Air Force funded project. High Speed Anti-Radiation Missile (HARM), AGM-88B, has been in production since FY 1981. Early technology investigations for gimballed seeker applications were accomplished under the ERASE project, Program Element 63303N and Naval Weapons Center, China Lake discretionary funding. Dual Role ARM technology development was initiated under ERASE project funding, in FY 1986.

F. (U) WORK PERFORMED BY:

W1807, Low Cost Seeker:

CONTRACTOR: Ford Aerospace and Communications Corporation, Newport Beach, CA and Raytheon Company, Lowell, MA.

Program Element: 63320N Title: Low Cost Anti-Radiation Seeker

IN-HOUSE: The Naval Weapons Center, China Lake, CA will be the lead development laboratory and the Naval Air Systems Command will provide overall program management as directed by Congress during the FY 1987 Appropriation process. The Naval Avionics Center, Indianapolis, IN will provide packaging and producibility support. Deputy program management will be provided by Eglin Air Force Base, FL.

W1934 Dual Role ARM: TBD

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) W1934 DUAL ROLE ARM:

1. (U) Description. The Dual Role ARM (DRARM) is a spin-off of the LCS project incorporating a gimballed seeker in a smaller diameter airframe and adding a dual role, air-to-air/air-to-ground capability. Brassboard seeker options will be developed and assessed under the ERASE advanced development program, leading to the preparation of a DRARM specification for a competitive full scale development solicitation. The seeker will be integrated into an existing airframe, either SPARROW or AMRAAM. Integration will require development of a new Target Detector/Fuze and an Inertial System for the selected missile.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: (Performed under ERASE Program funding):

- o Initial planning and investigation begun.
- o Tentative Operational Requirement approved.
- o Preliminary design and proof of concept testing begun.

b. (U) FY 1987 Program: (Performed under ERASE Program funding):

- o Continue minimum planning with emphasis on risk reduction.
- o Complete Development Options Paper analysis for preparation of Operational Requirement.
- o Approve Operational Requirement.
- o Initiate fabrication and testing of brassboard models for validation as funding permits.

Program Element: 63320N Title: Low Cost Anti-Radiation Seeker

c. (U) FY 1988 Planned Program: (Performed under ERASE Program funding):

o Complete testing of brassboard models.

o Prepare documentation for competitive Full Scale Development (FSD) solicitation.

d. (U) FY 1989 Planned Program:

o Award FSD contract.

o Initiate final design and fabrication of engineering development models.

e. (U) Program to Completion:

o Complete design and fabrication of engineering development models for testing.

o Integration of Dual Role ARM seeker into selected missile airframe.

o Completion of Technical and Operational Evaluation and Fabrication of Low-Rate-Initial Production units.

o Qualification of second, "follower", contractor prior to competitive solicitation for full production.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) W1807, LOW COST SEEKER:

1. (U) Description. This is a joint Navy/Air Force program to develop a low cost seeker for the HARM missile. The LCS Program adapts technology derived from the Anti-Radiation Projectile (ARP) program and other advanced passive RF guidance technologies. When applied to the design of ARM antenna and receiver subassemblies (seekers) such technology has the potential for substantially reducing hardware and software complexity. The resulting seeker will, therefore, exhibit greater reliability and enhanced producibility at substantially reduced cost. The need for accelerated development of LCS was expressed in the FY 1984 Appropriations Bill and subsequently supported by memoranda of the Under Secretary of Defense.

The Naval Weapons Center (NAVWEPCEN), China Lake, California will develop the electrical and functional design for LCS. Utilizing the NAVWPNCEN design, the development support contractors will develop independent packaging and producibility concepts and submit engineering models to the government for the initial evaluation. A single design approach will be selected for qualification testing and operational evaluation.

Program Element: 63320N Title: Low Cost Anti-Radiation Seeker

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Conducted Critical Design review of packaging and producibility concepts based on NAVWPNCEN provided design.
- o Initiated fabrication of Engineering Development Models.
- o Initiated development of Level 3 Technical Documentation Package (drawings and specifications).
- o Initiated design, procurement and fabrication of contractor special tooling and test equipment.
- o Completed functional baseline testing, DT-IIA.

b. (U) FY 1987 Program:

- o Complete fabrication of EDMs.
- o Initiate technical evaluation (DT-IIB/C).
- o Select best design approach and competitively select lead contractor for full scale development.
- o Conduct Milestone II review previously described as Critical Design Review II, and obtain approval to enter full scale development.
- o Initiate validation of Level 3 Documentation.
- o Conduct flight testing of brassboard models.
- o Conduct environmental qualification test.

c. (U) FY 1988 Planned Program:

- o Conduct Technical Evaluat on (DT-IIB/C) of Engineering Development Models.
- o Validate Level 3 Documentation.

Program Element: 63320N Title: Low Cost Anti-Radiation Seeker

- o Conduct Physical Configuration Audits (PCA).
- o Conduct environmental and reliability tests.
- o Procure/Fabricate Telemetry Sections for Operational Evaluation Tests.
- o Initiate long lead procurement and fabrication of pre-production prototype models.

d. (U) FY 1989 Planned Program:

- o Complete DT and OT captive-carry, flight and ground tests.
- o Complete logistics support tasks, technical manuals, provisioning lists, maintenance plans, training plans and equipment.
- o Air-launch 24 prototype models against simulated surface radar targets.
- o Prepare engineering change proposal to incorporate LCS into the AGM-88A (HARM) missile.
- o Conduct Milestone IIIA review and obtain release for Low Rate Initial Production (LRIP).

e. (U) Program to Completion:

- o Complete joint Navy/Air Force Operational Test and Evaluation.
- o Conduct Milestone IIIB review and obtain Approval for Full Production (AFP).

f. (U) Milestones:

| | |
|---|---|
| Critical Design Review #1 | Dec 1985 (Completed) |
| Critical Design Review #2 (Milestone II) | Aug 1987 |
| LRIP (Milestone IIIA) | Jan 1989 |
| AFP (Final ECP Approval)(Milestone IIIB) | Jan 1990 |

I. (U) Test and Evaluation Data. Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63321N
DoD Mission Area: 231 - Anti-Air Warfare

Title: Advanced Air-to-Air Missile (AAAM)
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | (26,962)* | (33,312)* | 34,619 | 87,592 | Continuing | Continuing |
| W1671 | AAAM | (2,477)[2] | (4,851)[2] | 34,619 | 87,592 | Continuing | Continuing |

* Concept definition of AAAM completed under PE 63318N. Total reflects all projects under PE 63318N in FY 1986/87.
[2] FY 1986/87 funding for Project W1671 under PE 63318N, compsrison paragraph (C) reflects project deltas only for FY 1986/87.

The above funding profile includes out-yesr escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This element supports the development of an sdvanced air-to-air missile as s follow-on replacement for the (AIM-54) PHOENIX. The advanced air-to-air missile will meet the Outer Air Battle threat of the mid to late 1990's and beyond.

In order to defeat this threat a balanced improvement in both "area and outer air battle" weapons is required. An improvement in a single region will not effectively counter the threat.

The advanced air-to-air missile will be compatible with the (F-14, F/A-18, A-6F, ATA/ATF, and F-15) and will be lighter in weight, both of which will greatly increase fire power in

Program Element: 63321N Title: Advanced Air-to-Air Missile (AAAM)

e outer air battle.

The program element will initiate a Demonstration and Validation (D&V) phase.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: In FY 1986, decrease of 223 is the result of Department Budget adjustment. In FY 1987, increase of 5,000 is the result of Congressional action and a decrease of 149 is for Congressional adjustment. FY 1988/89 funding reflects approval of "Major System New Start" and restructure of program for Demonstration and Validation phase of development.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 7,290 | 25,000 | 79,728 | 126,804 | Continuing | Continuing |
| X1632 | ASAM Concept Formulation | 3,990 | 4,300 | 0 | 0 | 0 | 32,773 |
| S1912 | SAM Risk Closure | 3,300 | 18,000 | 0 | 0 | 0 | 21,300 |
| X1671 | AAAM Concept Formulation | 0 | 2,700 | 0 | 0 | 0 | 2,700 |
| X1913 | Advanced AAW System | 0 | 0 | 79,728 | 126,804 | Continuing | Continuing |

Note: This funding profile reflected under PE 63318N in the FY 1987 submit.

D. (U) OTHER FY 1983/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: F-14 Upgrade, Program Element 25667N; Early Warning Aircraft Squadrons (E-2C), Program Element 24152N.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Development Center, Warminster, PA; Naval Weapons Center, China Lake, CA; Pacific Missile Test Center, Point Mugu, CA. PRIME CONTRACTORS: TBD.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

Program Element: 63321N Title: Advanced Air-to-Air Missile (AAAM)

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W1671 AAAM:

1. (U) Description: This project will implement the AAAM options selected to counter the Outer Air Battle threat of the mid-1990's and beyond.
Program plan provides for demonstrating and validating the performance to two or more technology options to ensure the most effective solution is available for development.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Concept Definition (CD) addressed commonality, performance, effectiveness, risk, and cost.
- o Risk reduction experiments provided data on radio frequency/electro-optical/infrared sensors, airborne passive ranging, and jam strobe resolution.
- o A Development Options Paper (DOP) was completed.
- o Milestone 0 and Major System New Start Approval.
- o Prepared for the Demonstration and Validation phase.

b. (U) FY 1987 Program:

- o Complete AAAM concept exploration phase.
- o Prepare for JRMB Milestone I decision.
- o Prepare for Demonstration and Validation phase, which will encompass risk reduction efforts in guidance, control and propulsion.
- o Solicitation, evaluation and source selection for D&V phase.

Program Element: 63321N Title: Advanced Air-to-Air Missile (AAAM)

c. (U) FY 1988 Planned Program:

- o Initiate AAAM D&V on weapon system, guidance, airframe, propulsion, and ordnance designs.
- o Fabricate guidance units and initiate testing.
- o Demonstrate dual spectrum terminal guidance in field tests.
- o Start fabrication of separation and control test vehicles.
- o Perform preliminary platform integration.

d. (U) FY 1989 Planned Program:

- o Continue guidance and propulsion tests.
- o Demonstrate hybrid bank-to-turn/skid-to-turn missile control techniques.
- o Validate dual spectrum guidance designs in free flight.
- o Conduct fuze encounter and warhead arena tests.
- o Prepare for Milestone II and FSED.

e. (U) Program to Completion:

- o Initiate Full Scale Engineering Development (FSED).
- o FSED completion in 1995.

f. (U) Major Milestones:

| Milestone | Date |
|---|---|
| 1. DOP | March 1986 |

Program Element: 63321N

Title: Advanced Air-to-Air Missile (AAAM)

| | | |
|---|---|---|
| 2. | Milestone 0 | December 1986 |
| 3. | Milestone I | September 1987 |
| 4. | Award D&V contracts | October 1987 |
| 5. | Milestone II | 3rd Qtr FY 1990 |
| 6. | Milestone IIIA | 3rd Qtr FY 1995 |
| 7. | Milestone IIIB | 3rd Qtr FY 1996 |

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E,N DESCRIPTIVE SUMMARY

Program Element: 63382N
DoD Mission Area: 231 - Anti-Air Warfare

Title: Battle Group Anti-Air Warfare Coordination
Budget Activity: 4 - Tactical Program

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 7,299 | 6,663 | 11,476 | 11,665 | 38,465 | 100,748 |
| S0324 | Battle Group Anti-Air Warfare Coordination | 7,299 | 6,663 | 11,476 | 11,665 | 38,465 | 100,748 |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Soviet Union's demonstrated ability to conduct a variety of high density air attacks against Battle Groups in ever-increasing hostile electromagnetic environments demands more effective coordination of Battle Group sensors and weapons. Navy Battle Groups are presently limited in their combat response by the timeliness, accuracy, completeness, and control of available targeting information which results in potentially ineffective weapons delivery. Some targets are not engaged at all, while other targets are engaged with multiple weapons, which leads to over-commitment of some units and under utilization of others. This program capitalizes on the superior radar surveillance, detection, and tracking along with display and decision system capabilities of the AEGIS Combat System which provide Battle Group fire control data and coordination to other ship and aircraft weapon systems. Near and long term objectives will be achieved in phases to produce higher degrees of battle coordination.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: in FY 1987, a decrease of 7,083 Congressional actions and adjustments, in FY 1988 a decrease of 6,435 Department program/budget adjustments.

Program Element: 63382N Title: Battle Group Anti-Air Warfare Coordination

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 7,674 | 7,720 | 13,746 | 17,911 | Continuing | Continuing |
| S0324 | Battle Croup Anti-Air Warfare Coordination | 7,674 | 7,720 | 13,746 | 17,911 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: Program Element 64303N (AECIS Area Air Defense), provides for the development of modificationa to the AECIS Weapon System; Program Element 64307N (AEGIS Combat System Engineering), relatea to engineering development of AECIS Combat Systems for the CG-47 class cruiaer baselines and the DDG-51 destroyer combat system; Program Element 63318N (AEGIS ER) relates to outer air battle development. Program Element 63519N (Tactical Data Systema), provides for common baseline computer programs for non-AECIS systems; and Program Element 63717N (Command and Control Systems (Advanced)) provides for development of communication links; Program Element 64771P (Tactical Information Data Systems) and Program Element 24152N (E-2C Development Upgrade).

F. (U) WORK PERFORMED BY: PRIME CONTRACTORS: Applied Physics Laboratory, Johns Hopkins University, Laurel MD, is the principal contractor. OTHERS: LOGICON, San Diego, CA; RCA, Mooreatown, NJ; ECI, St. Petersburg, FL; General Physica, Arlington, VA. IN HOUSE: Fleet Analysis Center, Corona, CA.

C. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable

H. (U) PROJECT OVER $10 MILLION IN FY 1988/89:

(U) Project, S0324, Battle Group Anti-Air Warfare Coordination:

1. (U) Description: This project was established to provide, and has already delivered, major improvementa in Battle Croup Anti-Warfare Coordination through effective dissemination of AEGIS capabilities. Theae objectives are being met in phases. Phase I provides for disseminstion of AEGIS data to achieve a coherent battle group air picture for all battle group units. This phase is nearly complete and has resulted in other Battle Croup unit improvements in detection capabilities as well as completion of several advanced development models. The Detection Data Converter for the AN/SPS-48 series radars on non-AEGIS shipa has been tested and deployed in fleet ships. The Surface Gridlock System is the result of development and testing of the Gridlock Demonatration Systems. Thia is now installed in TICONDEROGA class cruisers and has solved a twenty year old Battle Group Gridlock

problem. Development and at-sea testing of the Airborne Gridlock System in the E-2C is well underway and has been tested in correlation with the shipboard Gridlock System at-sea.

Phase II will concentrate on Force Control Items for Battle Group coordination of placing weapons on target. Specifically, this phase will enhance the Surface and Airborne Gridlock Systems by taking advantage of the Global Positioning System to establish accurate and reliable Geodetic Gridlock of the Battle Group, the next important step to achieve force weapons coordinstion. Additionally, this phase includes AEGIS Display System improvements to support the Battle Group Anti-Air Warfare Commander, definition of specifications for Force identification functions, and development of Force threat evaluation and weapon assignment architecture and algorithms.

Phase III encompasses an initial Cooperative Engagement capability that will allow the Combat Systems to exchange Fire Control Quality sensor data and the firing data required for remote launch of STANDARD Missile 2 series missiles. This technique has been test demonstrated between AEGIS and TERRIER equipped ships. The next phase will culminate with an experiment to use the AEGIS Combat Svstem to remotely fire snd guide a STANDARD Missile 2 Block II Missile from another Vertical Launching System equipped ship to intercept a target.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Conducted at-sea evaluation of the Airborne Gridlock Demonstration System with USS VINSON Battle Group.

° Transferred design and technology developed in the automatic gridlock systems into the AEGIS Combat System and to the Advanced Combat Direction System for non-AEGIS ships.

° Commenced experiments with Tactical Flag Commsnd Center in Command Conferencing of Tactical Planning displays.

° Continued transition of the Battle Group Anti-Air Warfare Display Group developments into specifications for AEGIS Display System Bsseline 4 development. .

° Commenced definition of algorithms and system development of the Cooperstive Engagement System, antennae snd Data Distribution System.

° Identified Advanced Technologies that may be useful in support of Anti-Air Wa-fare Coordination.

° Commenced development of simple Battle Group Threat Evaluation and Weapon Assignment models.

° Delivered gridlock algorithms for inclusion into non-AEGIS Anti-Air Warfare units.

b. (U) FY 1987 Program:

° Conduct follow-up model lab test of multisensor integration for force automatic identification using target dynamics, Electronic Support Measures data and Identification Friend or Foe.

° Test geodetic gridlock algorithms at-sea.

° Evaluate different advance display technologies to declutter the Battle Group picture as seen by the Anti-Air Warfare Commander and improve command decision capability.

° Conduct lab test with Tactical Flag Command Center lab models on transfer of command plans.

° Conduct feasibility study of using existing data links to conduct Standard Missile 2 remote launch experiments.

° Develop initial algorithms for Battle Group Threat Evaluation and Weapons Assignment lab tests.

c. (U) FY 1988 Planned Program:

° Investigate feasibility of integrating passive sensor capability into Automatic Gridlock System.

° Define all changes required for STANDARD Missile 2 remote launch experiment for 1990/1991 execution and subsequent fleet introduction.

° Integrate NAVSTAR Global Positioning System to achieve a geodetic (latitude/longitude reference) capability for integration of battle force and shore supplied threat data.

° Deliver computer program changes or interface requirements needed to conduct Force Identification using threat dynamics and Identification Friend or Foe.

° Conduct decluttering experiments at Combat System Engineering Development Sites or AEGIS Combat System Center, Wallops Island, VA.

Program Element: 63382N Title: Battle Group Anti-Air Warfare Coordination

° Conduct experiments using the force Trial Engagement Logics at Combat System Engineering Development Sites or AEGIS Combat System Center with fleet units or other labs emulating fleet units.

° Refine and test Battle Group Threat Evaluation Weapon System algorithms at-sea and lab test Force Doctrine Statements.

d. (U) FY 1989 Planned Program:

° Test Force Anti-Air Warfare doctrine statements at Combat System Engineering Development Sites or AEGIS Combat System Center.

° Demonstrate AEGIS to Tactical Flag Command Center command conferencing capability at-sea.

° Commence transition of command conferencing capability to production systems.

° Develop required interface designs and hardware to conduct a Remote Launch Engagement experiment.

° Transition manual trial engagement logic to decision identifications for personal computers currently used in the fleet for battle planning.

e. (U) Program to Completion: This is a continuing program which transitions designs and technology to engineering and production programs.

f. (U) Major Milestones:

| Milestones | Date |
|---|---|
| 1. Evaluate Automatic Gridlock Demonstration System with USS VINSON Battle Group at-sea | Aug 1986 |
| 2. Conduct Lab Test with Tactical Flag Command Center lab models | Jul 1987 |
| 3. Complete Cooperative Engagement Experiment Study | Oct 1987 |
| 4. Conduct display decluttering experiments at Combat System Engineering Development Sites or AEGIS Combat System Center, Wallops Island | Oct 1988 |
| 5. Transition force Identification computer program changes to AEGIS/Advanced Combat Direction System program | Nov 1988 |

Program Element: 63382N Title: Battle Group Anti-Air Warfare Coordination

| | | |
|---|---|---|
| 6. | Conduct experiment using the Force Trial Engagement Logic at Combat System Engineering Development Site or AEGIS Combat System Center, Wallops Island | Dec 1988 |
| 7. | Demonstrate AEGIS to Tactical Flag Command Center Command Conferencing capability at-sea | Apr 1989 |
| 8. | Transition force Identification Electronic Support Measure integration computer program changes to AEGIS/Advanced Combat Direction System programs | Nov 1989 |
| 9. | Transition advanced graphics specification to engineering development or production | Jun 1989 |
| 10. | Conduct remote launch engagement lab test | Jul 1989 |
| 11. | Deliver force Doctrine statements to AEGIS/Advanced Combat Direction System programs | Jan 1990 |
| 12. | Cooperstive Engagement equipment changes/specifications ready for Request for Proposal | Oct 1991 |

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63502N
Title: Surface Mine Countermeasures
DoD Mission Area: 234 - Mine Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/1989 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 20,548 | 15,495 | 15,339 | 11,876 | Continuing | Continuing |
| S0260 | Minehunt | 14,999 | 11,299 | 10,278 | 8,096 | Continuing | Continuing |
| S1233 | Mine Countermeasures Improvements | 4,168 | 3,245 | 2,466 | 1,177 | Continuing | Continuing |
| S1404 | Neutralization | 743 | 951 | 2,595 | 2,603 | Continuing | Continuing |
| S1597 | Surface Ship Magnetic Silencing | 638 | 0 | 0 | 0 | 0 | 2,628 |

This is a continuing program. The above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Development of surface mine countermeasures systems which will enable surface ships and submarines to operate with relative safety in navigable waters believed or known to be mined. Equipment is being developed for the combat systems of the MCM 1 and MHC Class ships to give them the capability to counter all mines!

Project S0260, Minehunting: Develops

Project S1233, Mine Countermeasures Improvement: Develops (1) AN/SSN-2 Precise Integrated Navigation System (PINS) to improve the safety and effectiveness of mine countermeasures operations; (2) a modular mechanical Single Ship Deep Sweep (SSDS) for moored mines; (3) a modular magnetic/acoustic influence sweep for use by mine countermeasure ships; (4) a Tactical Display System for MCM-1 class ships; and a mine countermeasures Tactical Environmental Data System to enhance the safety and effectiveness of MCM operations.

Program Element: 63502N

Title: Surface Mine Countermeasures

Project S1404, Neutralization: Develops (1) equipment which will enable the MCM/MHC ship platforms to cut the cables of moored mines or place destructive charges on bottom mines

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: The significant changes between the funding shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: The decrease -1,867 in FY 1986 reflects the GRH and Department program/budget adjustments. The -7,183 reduction in FY 87 was caused by Congressional actions and a Congressional adjustment and Department budget/program adjustment. The reduction in FY 1988 -13,167 resulted from the cancellation of project S1597 and Department program/budget and NIF rate adjustments which postponed development of improvements to the AN/SQQ-32 sonar.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 29,519 | 22,415 | 22,678 | 28,506 | Continuing | Continuing |
| S0260 | Minehunt | 19,280 | 10,739 | 11,718 | 12,793 | Continuing | Continuing |
| S1233 | Mine Countermeasures Improvements | 8,635 | 7,082 | 6,863 | 9,208 | Continuing | Continuing |
| S1404 | Neutralization | 204 | 3,896 | 2,861 | 4,159 | Continuing | Continuing |
| S1597 | Surface Ship Magnetic Silencing | 1,400 | 698 | 1,236 | 2,346 | Continuing | Continuing |

Program Element: 63502N

Title: Surface Mine Countermeasures

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| S0260 Minehunt | | | | | | |
| AN/SQQ-32 SCN | 35,708 | - | 33,798 | - | - | 69,506 |
| Qty | (2) | - | **(4) | | - | *(6) |
| OPN | - | - | - | - | TBD | TBD |
| Qty | - | - | - | - | (9) | (9) |

*Does not include MHC class ships
**Includes refurbishment of Engineering Development Model for Trainer

| | | | | | | |
|---|---|---|---|---|---|---|
| S1233 MCM Improvements | | | | | | |
| AN/SSN-2 SCN | 9,188 | - | 13,464 | - | - | 71,900 |
| Qty | (2) | - | (3) | - | - | *(15) |
| OPN | 561 | 200 | 300 | 684 | TBD | TBD |
| Qty | 0 | 0 | 0 | 0 | 0 | 0 |

*Includes one trainer and nine systems from prior years.

| | | | | | | |
|---|---|---|---|---|---|---|
| S1404 Neutralization | | | | | | |
| AN/SLQ-48 | | | | | | |
| SCN | *19,524 | 0 | *25,186 | - | - | 136,400 |
| Qty | (2) | (0) | (3) | - | - | **/***15 |
| OPN**** | 3,845 | 5,200 | 6,200 | 10,400 | TBD | TBD |
| Qty | | | | (1) | | (1) |

* Includes spare vehicle for each MCM ship
** Does not include MHC class ships
*** Includes ten systems from prior years/does not reflect spare vehicle
**** Includes vehicle procurements for depot overhaul replacements

Program Element: 63502N Title: Surface Mine Countermeasures

E. (U) RELATED ACTIVITIES: Sonar technologies developed under Program Element 62711N, Undersea Target Surveillance Technology, are being used in the development of the AN/SQQ-32 Minehunting Sonar. AN/SSN-? and AN/SQQ-32 will use the AN/UYK-44 computer developed for general U.S. Navy use. Program Element 63760N, Airborne Mine Countermeasures, is developing the Controlled Depth Moored sweep which will be adapted for surface ship use as the Single Ship Deep Sweep. The Modular Influence Minesweeping System may use the acoustic sweeping device being developed under program element 63760N, Airborne Mine Countermeasures. U.S. Marine Corps line charge development experiences may be used in the development of the Rapid Shallow Water Mine Clearance System.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Coastal Systems Center, Panama City, FL and Naval Ocean Systems Center, San Diego, CA (lead laboratories); Naval Surface Weapons Center, White Oak, MD and Dahlgren, VA., Naval Weapons Support Center, Crane, Indiana. CONTRACTORS: R.M. Vredenburg & Co., McLean, VA; Applied Research Laboratories, University of Texas, Austin, TX; Westinghouse Electric Corporation, Baltimore, MD; General Electric Co., Syracuse, NY; Honeywell Marine Systems, Seattle, WA; Magnavox, Torrance, CA; Raytheon Co., Portsmouth, RI; Sperry Corp., Reston, VA; TAI, Alexandria, VA; Dynatrend, Boston, MA; Unidynamics Laboratory, St. Louis; Thomson Sintra, Brest, France; Standard Telephone Cable, UK.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project S1733, Mine Countermeasures Improvements:

1. (U) Description: The effort under this project will improve the capability of the countermessures systems on mine countermeasures ships as follows: (1) Integrate the navigational data from commercially available navigational sensors, mine target data from the minehunting sonar, position data from the mine neutralization system, and other geographical/track data into the AN/SSN-? Precise Integrated Navigational System to be installed in the new MCM 1 Class ships for control of mine countermeasure operations; (?) adapt the airborne Controlled Depth Moored Sweep for modular use in MHC AND MCM 1 Class ships as the Single Ship Deep Sweep; (3) develop a modularized magnetic/acoustic influence minesweep system for use in MHC Class ships; (4) Develop an automated Tactical Display System for MCM-1 class ships; and (5) Develop a mine countermeasures Tactical Environmental Data System (MTEDS) to maximize the effectiveness and safety of mine countermeasures operations through use of environmental factors.

?. (U) Program Accomplishments and Future Efforts:

a. (U) In FY 1986:

° AN/SSN-?: completed initial operational test and evaluation (OT-IIA) of U1600 configured system. Received production approval for U1600 configuration. Initiated transition effort to AN/UYK-44 configured system.
° Modular Influence Minesweeping System: Assessed parameters required for system performance.

Program Element: 63502N

Title: Surface Mine Countermeasures

b. (U) FY 1987 program:

° AN/SSN-2: Complete DT-IIB and OT-IIB for AN/UYK-44 configured system. Initiate development of deferred software capability. Establish phase III configuration. Commence incorporation of GPS into system design.
° Achieve IOC with the delivery of MCM-1 using a refurbished EDM.

c. (U) FY 1988 Planned Program:

° AN/SSN-2: Continue development of phase III system.
° Single Ship Deep Sweep: Prepare for procurement of four Engineering Development Models.
° Modular Influence Minesweeping System: Prepare for procurement of three Engineering Development Models.

d. (U) FY 1989 Planned Program:

° AN/SSN-2: Start DT IIIC.
° Single Ship Deep Sweep: Award contract for procurement of four Engineering Development Models.
° Modular Influence Minesweeping System: Award contract for procurement of three Engineering Development models.
° Tactical Display System: Prepare for developmental and operational testing and develop technical data package for competitive procurement.

e. (U) Program to Completion:

° This is a continuing program which includes the following:

| | MS II | OPEVAL | MS III/A | IOC | MS IIIB | MS III C |
|---|---|---|---|---|---|---|
| AN/SSN-2 | FY81/1Q | FY86/1Q | FY87/3Q | | FY88/1Q | FY 90/3Q |
| SSDS | FY89/2Q | FY90/2Q | FY91/2Q | | FY 95/2Q | |
| MIMS | FY89/1Q | FY92/3Q | FY93/1Q | | | |
| Tactical Display | FY89/2Q | FY90/2Q | FY91/2Q | | | |
| MIEDS | FY90/2Q | FY94/1Q | FY94/4Q | | | |

Program Element: 63502N Title: Surface Mine Countermeasures

(U) Project S1404, Neutralization:

1. (U) Description: Develops equipment to neutralize moored and bottom mines. Consists of the AN/SLQ-48 Mine Neutralization System, a tethered, remotely-operated, TV and sonar equipped submersible which neutralizes mines previously located by the ship's minehunting sonar, by cutting the cable of moored mines or by placing an explosive charge alongside bottom mines; and the Rapid Shallow Water Mine Clearance System (RSWMCS) for clearing mines

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° AN/SLQ-48: Received extension of ALP for vehicles, electronic control consoles and umbilical cable. Separated handling systems from basic contract and awarded to Unidynamics St. Louis. Completed acoustic signature tests of vehicle.

b. (U) FY 1987 Program:

° AN/SLQ-48: Analyze the vehicle acoustic signature requirement versus the threat.

c. (U) FY 1988 Planned Program:

° AN/SLQ-48: Conduct a system shock test aboard MCM 3.
° Conduct operational testing of non-magnetic launch and recovery system in MCM-2.
° Conduct operational testing of engineering development model system in MCM-1.

d. (U) FY 1989 Planned Program:
° Commence development of electronmagnetic interference (EMI)-Hardened Umbilical cable to reduce system EMI vulnerability.
° AN/SLQ-48: Receive Approval for Full Production (AFP).
° Commence EMI-Hardening of Deck TV and control cousoles.
° Rapid Shallow Water Mine Clearance System: Award contract for Engineering Development Models.

Program Element: 63502N Title: Surface Mine Countermeasures

e. (U) Program to Completion: This is a continuing program which includes the following:

| | MS II | OPEVAL | MS III/A | IOC | MS IIIB |
|---|---|---|---|---|---|
| Mine Neutralization System | FY78/3Q | FY82/4Q | FY83/4Q | | FY88/4Q |
| Rapid Shallow Water Mine Clearance Syatem | FY89/1Q | FY94/4Q | FY95/1Q | | |

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project S0260, Minehunt:

1. (U) Description: Develops a surface ship advsnced minehunting sonar set which will enable surface mine countermeasure ships to detect and classify the modern moored and bottom minea to case depths and at standoff ranges which provide minimum threat to the ship. Currently available surface ship minehunting sonara The AN/SQQ-32 Advanced Minehunting Sonar Set will be capable of high search/classification speeds and is expected to have a significantly greater area coverage rate thsn its predecesaor, the AN/SQQ-30. The AN/SQQ-32 is deaigned for installation in MCM/MHC class ships, and will be more relisble, more easily maintained, and have an increased depth capability. When a mine has been detected, the ship will hover, hold the mine in the aonar beam, launch the Mine Neutralization Vehicle, and direct it toward the mine uaing output from the AN/SQQ-32 display and a dedicsted tracking syatem, until the sonar and underwater television located in the Mine Neutralization Vehicle acquire the mine for finsl localization and neutralization. Alao included in this project are a system to

2. (U) Program Accomplishments and Future Efforts

a. (U) FY 1986 Program:

° Completed factory assembly and test of the AN/SQQ-32 Engineering Development Model (EDM).
° Began in-water test at Lake Travis, Texas test facility.
° Collected in-water data and performed data analyses for technical/operational evaluation sites.

Program Element: 63502N

Title: Surface Mine Countermeasures

b. (U) FY 1987 Program:

° Complete in-water tests of AN/SQQ-32 Engineering Development Model (EDM) at Lake Travis.
° Install EDM in USS FIDELITY for test and evaluation.
° Complete in-water engineering tests of basis AN/SQQ-32.
° Complete Technical Evaluation of AN/SQQ-32 system.

c. (U) FY 1988 Planned Program:

° Conduct Operational Evaluation of AN/SQQ-32 system.
° Complete third Engineering Development Model.
° Conduct environmental and shock tests on AN/SQQ-32.
° Complete Level III drawings, provisioning documentation, and training material.
° Award contract to refurbish and modify one Engineering Development Model AN/SQQ-32 sonar for installation in MHC-1.
° Obtain Approval for Limited Production and award production contract for AN/SQQ-32.
° Begin correction of OPEVAL deficiencies.

d. (U) FY 1989 Planned Program:

° Complete correction of OPEVAL deficiencies on AN/SQQ-32.
° Obtain Approval for Full Production of AN/SQQ-32.

e. (U) Program to Completion: This is a continuing program which includes the following major milestones:

| | MSII | OPEVAL | MSIII A | IOC |
|---|---|---|---|---|
| AN/SQQ-32 Sonar | FY 87/4Q | FY 88/1Q | FY 88/2Q | |
| Buried Mine Detection System | FY 90/2Q | FY 96/2Q | FY 96/4Q | |
| Remote Mine Hunting System | FY 90/2Q | FY 97/2Q | FY 97/4Q | |

1. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63504N
DoD Mission Area: 233 - Anti Submarine Warfare

Title: Submarine ASW Developments (Advanced)
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 6,384 | 8,710 | 8,298 | 14,775 | Continuing | Continuing |
| S0223 | Sub Sonar Improvements (ADV) | 6,384 | 8,710 | 8,298 | 14,775 | Continuing | Continuing |

The above funding includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports the advanced development and testing of improvements to present and future integrated sonar, signal processing, and combat control systems in order to maintain clear acoustic and operational superiority over the high performance submarine and surface threat circa 1995-2020.

This program element provides for demonstrating the systems application of technologies to improve acoustic detection, target classification and localization, operability, and reliability. Upon successful demonstration, improvements are transitioned to full-scale development in other programs with minimal and identifiable risk.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: The FY 1986 decrease -4,626 is due to a GRH adjustment and Department budget adjustments. The FY 1987 decrease -2,399 is due to Congressional adjustments and Department program/budget adjustments. The FY 1988 decrease -7,404 is due to Department program/budget adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 13,946 | 11,010 | 11,109 | 10,702 | Continuing | Continuing |
| S0223 | Submarine Sonar Improvements (Advanced) | 13,946 | 11,010 | 11,109 | 10,702 | Continuing | Continuing |

Program Element: 63504N Title: Submarine ASW Developments (Advanced)

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable

E. (U) RELATED ACTIVITIES: Program Element 62314N, ASW Technology, provides technology for Combat Control System Improvements under this project. Program Element 62314N, ASW Technology, provides technologies of sonar transducers and arrays which are needed for the towed array efforts under this Program Element. PE 62314N also provides signal processing technologies, including automatic detection and classification, which are needed for the Transient Acoustic Processor, Multipath Ranging, and Multitarget Processing efforts under this program. This program, in turn, provides demonstrated concepts and improvements to several engineering development projects. Program Element 63562N, Project S1739, Submarine Arctic Warfare Development is a companion Advanced Development project with emphasis on Arctic efforts. Based on successful completion of advanced development under this program, the Submarine Active Detection Sonar and the Mine Detection and Avoidance Sonar (Program Element 24281N, Project S0239) was transferred to the AN/BSY-1 Combat System (Program Element 64524N, Project S1347). Demonstrated towed array improvements will transition to Program Element 64503N Project S0219, Submarine Sonar Improvements (Engineering), for full scale development.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Ocean Systems Center, San Diego, CA; Naval Underwater Systems Center, New London, CT, and Newport, RI; and Naval Research Laboratory, Washington, DC and Orlando, FL. Naval Underwater Systems Center is lead laboratory for all subprojects except Submarine Transducer Improvements (Naval Research Laboratory, Orlando, FL). There is no lead laboratory for the overall project. CONTRACTORS: General Electric Co., Syracuse, NY; International Business Machines, Manassas, VA; Analysis and Technology, North Stonington, CT; Ryan Computer Systems, Alexandria, VA; Applied Research Laboratory, University of Texas, Austin, TX; Scientific Atlanta, San Diego, CA; DDL-OMNI Engineering, McLean, VA; C&M, Inc., Old Saybrook, CT; EDO Corp., Salt Lake City, UT; Hewlett-Packard, Andover, MA; and SPS, INC., Waltham, MA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

H. (U) PROJECTS MORE THAN $10 MILLION IN FY 1988/89:

(U) Project S0223, Submarine ASW Improvements:

1. (U) Project Description: This project is the vehicle by which exploratory development efforts in submarine combat system technology are provided systems application and transitioned to full-scale development with minimal and identifiable risk. Improvements in sonar sensors, signal processing, and combat system techniques are required for U.S. attack submarines to conduct effective anti-submarine warfare against increasingly quiet and capable Soviet submarines of the future. Specifically, improved passive sonar arrays and advanced signal processing techniques are needed to allow long range detection, classification, and localization of extremely quiet threat submarines. Also, improved information processing and combat control techniques are required to provide contact management and targeting during multi-contact engagements. Included in the project: Submarine

Program Element: 63504N Title: Submarine ASW Developments (Advanced)

Transducer Improvements, Towed Array Improvement Program, Transient Acoustic Processor, Under-Ice Sonar, Multipath Processing, Target Motion Analysis Improvement Program, and others.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Continued advanced development in the following areas:

° Transducer Improvements.
- Completed the design specification for TR-317R transducers.
° Towed Array Improvements.
- Continued concept definition of the next generation towed array.
° Transient Acoustic Processing (TAP).
- Participated in Arctic Sea Test ICEX 1-86 in 2nd quarter.
° Target Motion Analysis Improvement Program (TMAIP).
- Continued development of TMAIP techniques.
° RANGEX Program.
- Analyzed data from RANGEX 1-85.
°

°

b. (U) FY 1987 Program: Continue advanced development in the following areas:

° Transducer Improvements.
- Continue FY-86 effort and verify design specification for TR-317R transducer.
- Start competitive procurement procedures for TR-317R.
- Begin development of
° Hull Array Improvements.

Program Element: 63504N Title: Submarine ASW Developments (Advanced)

- Continue testing SSN-to-SSN communications.

° Towed Array Improvements.
- Continue concept definition of next generation towed array.
- Continue development of critical items.
- Investigate towed array concept.

° Transient Acoustic Processing (TAP).
- Continue development of Advanced Development Model for TAP II Auto-Detect capability to demonstrate that

- Complete fabrication of portable TAP I system.

° Multipath Processing.
- Conduct sea testing of multipath ranging algorithms suitable for very short range scenarios.
- Begin development of multipath ranging algorithms for convergence zones and shallow water, and development of automation techniques to determine target range and depth.
- Initiate development of other promising techniques, such as narrowband interference patterns, to do multipath ranging.

° Under Ice Sonar.
- Start development of advanced under ice sonar to provide ice remote ahead and across track profiling, variable beam D/F fade ranging.

° RANGEX Program.
- Plan and conduct RANGEX 1-87, and analyze data in consultation with operating forces to validate the tactical effectiveness of emerging developments and improvements.
- Plan RANGEX 1-88.

c. ( ) FY 1988 Planned Program:

° Transducers.
- Continue development of facility and design specifications for AN/WLR-9.
- Complete WQC-2 design specification.

° Towed Array.
- Complete definition of technical requirements and developments.
- Continue development of towed array.
- Develop Advanced Development Model Specs.

Program Element: 63504N Title: Submarine ASW Developments (Advanced)

° Under Ice Sonar.
- Continue system analysis and design.
- Conduct sea test of experimental model
- Complete fabrication of experimental model.

° Transient Acoustic Processor.
- Complete development of TAP II Advanced Development Model.
- Start development of capability.

° Multipath Processing.
- Continue analysis of short range multipath test results.
- Conduct sea test of processing equipment in RANGEX 1-88.

° Target Motion Analysis Improvement Program.
- Conduct sea test and analyze results.

° RANGEX Program.
- Conduct analysis of data obtained in RANGEX 1-87.
- Conduct RANGEX 1-88.

d. (U) FY 1989 Planned Program:

° Transducers.
- Continue development of design specification and begin accelerated life testing of WLR-9.

° Towed Array.
- Continue development of towed array.
- Begin design of next generation Advanced Development Model.

° Under Ice Sonar.
- Analyze results of FY 1988 sea test.
- Develop specifications for Advanced Development Model.

° Transient acoustic processor.
- Continue development of Capability.
- Incorporate in Advanced Development Model.

° Multipath Processing.
- Complete analysis of FY 1988 sea test.
- Resume development of shallow water, long range, and narrowband algorithms.

Program Element: 63504N Title: Submarine ASW Developments (Advanced)

- Resume to development of computer-aided multipath
° Target Motion Analysis Improvement Program.
- Continue analysis of data from FY 88 sea test.
- Begin integration of multiple sensor algorithms incorporating zig detection, constraint, and solution quality.
° RANGEX Program.
- Continue to analyze data from RANGEX 1-88.
- Plan RANGEX 1-90 to assess tactical effectiveness of systems in development.
° Initiate development of concepts to present information to decision makers in ways that will increase effectiveness.
° Virtual Aperture Array.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones:

| Milestone | Date |
|---|---|
| 1. Towed Array Improvement | |
| - begin fabrication of Advanced Development Model | 1st Qtr FY-91 |
| 2. Under-ice Sonar | |
| - sea test of experimental model | 4th Qtr FY-88 |
| 3. Virtual Aperture Array | 3rd Qtr FY-94 |
| 4. Transient Acoustic Processor | |
| - begin transition to host system | 1st Qtr FY-90 |

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63506N
DoD Mission Area: 233 - Anti-Submarine Warfare

Title: Surface Ship Torpedo Defense
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 31,362 | 17,585 | 27,339 | 36,518 | 208,940 | 368,349 |
| S0225 | Surface Ship Torpedo Defense (SSTD) | 31,362 | 17,585 | 27,339 | 36,518 | 208,940 | 368,349 |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The capability of Soviet submarines and ships to employ anti-ship torpedoes presents a formidable threat to U.S. Navy surface ships. This threat includes a This program provides a Surface Ship Torpedo Defense capable of detecting and countering anti-surface ship torpedoes in order to improve ship survivability.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: In FY 1986, a decrease of -4,845 was due to GRH and Department program/budget adjustment; in FY 1987, a decrease of -19,323 from Department Budget adjustment and Congresaional adjustment and actions; in FY 1988, a decrease of -5,964 due to Department progam/budget adjustment.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 26,957 | 36,207 | 36,908 | 33,303 | 172,759 | 323,904 |
| S0225 | Surface Ship Torpedo Defense | 26,957 | 36,207 | 36,908 | 33,303 | 172,759 | 323,904 |

Program Element: 63506N

Title: Surface Ship Torpedo Defense

D. (U) OTHER FY 1988 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| OPN (BA 2) (332213) | | | | | | |
| Phase I | | 8,300 | 3,953 | | | 12,253 |
| Qty | | (26) | (12) | | | (38) |
| Phase II | | | | | 76,492 | 76,492 |
| Qty | | | | | (38) | (38) |
| AN/SLQ-25 (NIXIE) | 9,900 | 7,443 | | | | 17,343 |
| Qty | (44) | (34) | | | | (78) |
| Engineering Change Kits | | | 7,717 | 9,045 | | 16,762 |
| Qty | | | (153) | (157) | | (310) |
| Total | 9,900 | 15,743 | 11,670 | 9,045 | 76,492 | 122,850 |

E. (U) RELATED ACTIVITIES: Program Element 62734N is performing the exploratory development technical base effort in torpedo countermeasures and influence countermeasures. Program Element 62734N was initiated to conduct exploratory development leading to a demonstration of a limited, system which will destroy torpedoes approaching a ship in that area. The foregoing related activities are capable of enhancing the overall SSTD system's effectiveness and/or its applicability to a wider range of ship classes. However, these related activities do not constitute, individually or collectively, development of replaceable or substitutable components of the SSTD.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Coastal Systems Center, Panama City, FL; Naval Ocean Systems Center, San Diego, CA; Naval Underwater Systems Center, New London, CT; Naval Sea Combat System Engineering Station, Norfolk, VA; Naval Surface Weapons Center, White Oak, MD; Naval Undersea Warfare Engineering Station, Keyport, WA; Applied Physics Labortory, Seattle, WA; Applied Research Laboratory, State College, PA. CONTRACTORS: General Electric Company, Syracuse, NY and others to be determined.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project S0225, Surface Ship Torpedo Defense:

1. (U) Description: The objective of this program is to provide torpedo defense to surface ships. The program draws heavily from previous anti-surface ship torpedo defense projects and submarine torpedo countermeasure programs. The program is

Program Element: 63506N Title: Surface Ship Torpedo Defense

structured in phases to provide early

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Continued in-water testing of countermeasure components.
° Successfully completed
° Awarded a development contract for the acoustic detection/reaction subsystem for early study efforts.

b. (U) FY 1987 Planned Program:

° Conduct studies on concepts.
° Begin hardware design efforts for the towed sensor subsystem.
° Begin component test of the subsystem.
° Begin model testing of the at NSRDC.
° Begin development work on countermeasure.
° Begin hardware design efforts on the MK 46 Mod 5 torpedo modifications.
° Conduct in-water testing of the prototype
° Conduct in-water testing of the modified to evaluate concept.

c. (U) FY 1988 Planned Program:

d. (U) FY 1989 Planned Program:

e. (U) Program to Completion: This is a continuing program. Planned efforts include:

Program Element: 63506N

Title: Surface Ship Torpedo Defense

f. (U) Major Milestones:

| Milestone | Date |
|---|---|
| Phase I | |
| Contract Award (ECP) | |
| Phase II | |
| Milestone II | |
| Milestone III (ALP) | |
| Phase III | |
| Milestone I | |
| Milestone II (FSD) | |
| Milestone III (ALP) | |

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63509N
DoD Mission Area: 238 - Other Naval Warfare

Title: Shipboard Information Transfer System
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 0 | 0 | 0 | 4,017 | 29,279 | 33,296 |
| S1858 | Voice Multiplex System | 0 | 0 | 0 | 4,017 | 29,279 | 33,296 |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This element provides for the development of shipboard information (voice and data) transfer techniques and systems to improve ship design and construction in terms of reducing schedule and cost, plus increasing flexibility and survivability. Development will start on a fiber optics local area network-based digital Voice Multiplex System (VMS) to provide an integrated interior voice communications capability aboard ship. Benefits include reduced cost, increased information transfer speed and capacity, improved interior communications system survivability, increased reliability and increased design and installation flexibility.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) Not applicable.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY: Not applicable.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: Exploratory Development work in Program Element 62721N (Command and Control Technology), is addressing the technology base related to advanced multiplexing systems. Work being performed under Program Element 65111D (Foreign Weapons Evaluation - Ship Interior Voice $C^3$ System) supports this new start. There is no unnecessary duplication of effort within the Navy or the Department of Defense.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Sea Systems Command, Washington, D.C.; Naval Ocean Systems Center, San Diego, CA., (Lead Laboratory). CONTRACTORS: To be determined by competition.

Program Element: 63509N Title: Shipboard Information Transfer System

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project S1858, Voice Multiplex System:

1. (U) Description: Development of an integrated Interior Voice Communication System for all classes of Navy combatant ships. A modular, fiber optic local area network-based digital voice multiplex system will provide mission essential capabilities for rapid, accurate, reliable, and survivable voice communications between the required ships stations.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Not applicable.

b. (U) FY 1987 Program: Not applicable.

c. (U) FY 1988 Planned Program: Not applicable.

d. (U) FY 1989 Planned Program:

° Award competitive contract for design and fabrication of full-scale development model(s) to support test and evaluation.

e. (U) Program to Completion:

° Deliver full-scale development model(s)

° Install and checkout aboard test ship

° Conduct TECHEVAL

° Conduct OPEVAL

° Obtain Production Decision

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63512N
Title: Catapults
DoD Mission Area: 225 - Air Warfare Support
Budget Activity: 4 - Tactical Program

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 0 | 0 | 7,357 | 11,809 | Continuing | Continuing |
| W1722 | CV Weapons Elevator Improvement | 0 | 0 | 3,459 | 4,899 | Continuing | Continuing |
| W1723 | CV Launch and Recovery System | 0 | 0 | 3,898 | 5,266 | Continuing | Continuing |
| W1875 | EAF Matting | 0 | 0 | 0 | 1,644 | 0 | 1,644 |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program includes development of standardized, reliable, logistically supportable weapons elevator components, a Landing Signal Officer (LSO) Head-Up Display (HUD) for AV-8 operations on LHA/LHD/LPH class ships, application of closed loop control systems to the steam catapult and arresting gear, development of modernized command/communication/control systems for the steam catapult and arresting gear, development of an electromagnetic aircraft launcher, and development of new matting for V/STOL aircraft operations ashore. Payoffs include increased safety, reduced pilot workload, enhanced boarding rates, increased aircraft service life, force modernization, and reduced manning.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: Not Applicable.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 0 | 0 | 0 | 7,568 | Continuing | Continuing |
| W1722 | CV Weapon Elevator Improvement | 0 | 0 | 0 | 3,542 | Continuing | Continuing |
| W1723 | CV Launch and Recovery System | 0 | 0 | 0 | 4,026 | Continuing | Continuing |

Program Element: 63512N

Title: Catapults

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: PE 62122N, PE 62241N and Project W1723 of PE 63512N are exploratory and advanced development efforts, respectively, for upgrading and improving Navy launch and recovery systems technology.

F. (U) WORK PERFORMED BY:

W1722 CONTRACTOR: TBD. IN-HOUSE: Naval Ship Systems Engineering Station, Philadelphia, PA.

W1723 CONTRACTOR: TBD. IN-HOUSE: Naval Air Engineering Center, Lakehurst, NJ.

W1875 CONTRACTOR: TBD. IN-HOUSE: Naval Air Engineering Center, Lakehurst, NJ.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W1722, CV Weapons Elevator Improvement:

1. (U) Description: This project provides for the development, test, evaluation and documentation of standardized elevator components such as control systems, hydraulic power units, doors and hatches, safety devices, platform and hoist machinery. For aircraft carriers, emphasis will be placed on the improvement of elevator trunks, doors and hatches to upgrade watertight integrity, corrosion control, and development of lighter weight structures.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Not Applicable.

b. (U) FY 1987 Program: Not Applicable.

c. (U) FY 1988 Planned Program:

o Advanced Development Model (ADM) design and fabrication of lightweight structures and power systems.

d. (U) FY 1989 Planned Program:

o Design acceptance testing of ADM.

Program Element: 63512N Title: Catapults

e. (U) Program to Completion:

o Installation and testing of ADM under carrier operating conditions.

(U) Project W1723, CV Launch and Recovery Systems:

1. (U) Description: The steam catapult, developed in the early 1950s for launching jet aircraft from carriers, is still in operational use and through a series of improvements, possesses sufficient capacity to launch all foreseeable Fleet aircraft. The control system, which regulates all the operational aspects of the launch process, has not been modernized, is manpower intensive, operates in an open loop manner and has (infrequently) contributed to aircraft loss. The existing Mark 7 Arresting Gear Control stations have not been improved for many years, and as a result possess significant potential for human error which has resulted in aircraft and flight crew losses. The present day system employs sound powered phone transmissions, hand signals and hand held cards to convey aircraft type and weight data and arresting gear status. Aircraft weight setting, retraction after arrestment and cross-checking of the arresting engines is very manpower intensive and the potential for human error is great. The proposed closed loop control systems for the catapult and arresting gear will greatly improve their operation as well as their effectiveness. The LHA/LHD/LPH AV-8 LSO HUD will enable the LSO to more consistently evaluate the approach characteristics of the aircraft, detect potentially dangerous situations, and take effective action to prevent a landing accident. The stand-alone electromagnetic launcher will provide a mechanism for the launching of fixed wing aircraft with one-third the weight and volume of present steam catapults. The launcher will be capable of launching all present and foreseeable Navy aircraft under all aircraft launch scenarios and possess inherent survivability through redundant communications and controls, offer lower maintenance and reduced manning requirements, and be affordable.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Not Applicable.

b. (U) FY 1987 Program: Not Applicable.

c. (U) FY 1988 Planned Program:

o Advanced Development Model (ADM) design for Catapult Control System.

o ADM design for Arresting Gear Control System.

o Concept definition of LHA/LHD/LPH AV-8 LSO HUD and PRI-FLY workstation.

Program Element: 63512N Title: Catapults

d. (U) FY 1989 Planned Program:

o Fabrication of Catapult Control System ADM.

o Fabrication of Arresting Gear Control System ADM.

o ADM design for LHA/LHD/LPH AV-8 LSO HUD.

o ADM design of one half scale model of stand-alone electromagnetic launcher.

e. (U) Program to Completion:

o Fabrication of LHA/LHD/LPH AV-8 LSO HUD ADM.

o Fabrication of stand-alone electromagnetic launcher ADM.

o Installation, test, and evaluation of ADMs.

(U) Project W1875, EAF Matting:

1. (U) Description: The EAF matting presently available (AM-2) was developed for F-4 aircraft operations and is heavy and cumbersome. Lightweight (1/2 the weight of AM-2) and less voluminous (1/3 the volume of AM-2) matting will be developed for use with AV-8, V-22, and helicopters at V/STOL airfields ashore. Candidates under consideration include reinforced fiberglass polyvinyl used for runway bomb damage repair and prefabricated surfacing aluminum used by the United Kingdom for Harrier operations.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Not Applicable.

b. (U) FY 1987 Program: Not Applicable.

c. (U) FY 1988 Planned Program. Not Applicable.

d. (U) FY 1989 Planned Program:

o Procure sufficient matting of both types to construct a V/STOL landing site.

o Evaluate both types of matting under operational conditions.

e. (U) Program to completion: Not Applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63513N
Title: Shipboard Systems Component Development
DoD Mission Area: 238 - Other Naval Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 14,438 | 9,553 | 13,966 | 16,802 | Continuing | Continuing |
| S0382 | Shipboard Auxiliary Systems Development | 11,109 | 6,208 | 10,484 | 11,260 | Continuing | Continuing |
| S1712 | Hull, Mechanical and Electrical Improvement | 3,329 | 3,345 | 3,482 | 5,542 | Continuing | Continuing |

As this is a continuing program, the above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program develops machinery subsystems and component improvements for new ship construction and in some instances for backfit into the present fleet. Shipboard system component developments are aimed at providing the fleet with standardized/modularized systems possessing improved effectiveness, reliability, maintainability, and significant life cycle cost, size and weight savings. The program includes shipboard auxiliary systems, shipboard corrosion control, fiber optic engineering standards and specifications development, hull, mechanical and electrical equipment improvements and shipboard salvage techniques/equipment for ships, weapons and aircraft. Auxiliary machinery developments include high efficiency potable water production systems, single screw rotary oil-free air compressors, advanced concept pumps, propulsion auxiliaries, advanced piping system components, hull and deck machinery systems, air conditioning systems, air processing systems, electrical auxiliaries, improved electric distribution components, machinery control and monitoring systems. This program develops engineering standards and specifications for all fiber optic hardware and equipment necessary for critical shipboard systems. Shipboard corrosion control developments are concerned with production processes to improve life cycle costs of ships' components through improved corrosion and wear characteristics and improvements to reduce fleet maintenance in shipboard preservation. The program includes development and service testing of corrosion/wear/erosion/coating systems, nondestruction examination equipment/processes for inspection of coating systems, a Naval Shipyard corrosion control design/production handbook, and thermal spray coating information. This program also develops Navy Standard Underway Replenishment Equipment including: fueling at sea systems; dry cargo replenishment at sea systems; and intra-ship handling systems. The Hull, Mechanical and Electrical Improvement Program is concerned with the development of improved equipments which are small but critical components of Hull, Mechanical and Electrical systems. The emphasis is on short-term developments for immediate fleet application.

Program Element: 63513N Title: Shipboard Systems Component Development

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY : (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: For Project S0382, a decrease of 5,261 in FY 1987 is due to Department program and budget adjustments and a Congressional adjustment; a decrease of 4,793 in FY 1988 is due to Department program and budget adjustments and NIF rate adjustment. In Project S1712, the decrease of 412 in FY 1986 is due to Department program/budget adjustments and a GRH adjustment.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 13,192 | 15,145 | 14,917 | 18,959 | Continuing | Continuing |
| S0382 | Shipboard Auxiliary Systems Development | 10,637 | 11,404 | 11,469 | 15,277 | Continuing | Continuing |
| S1712 | Hull, Mechanical and Electrical Improvement | 2,555 | 3,741 | 3,448 | 3,682 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: Program Element 64567N (Ship Development (Engineering)), Program Element 63573N (Electric Drive), Program Element 62121N (Surface Ship Technology).

F. (U) WORK PERFORMED BY: IN-HOUSE: David W. Taylor Naval Ship Research and Development Center, Bethesda, MD; Naval Ship Systems Engineering Station, Philadelphia, PA; Naval Weapons Support Center, Crane, IN; Naval Civil Engineering Laboratory, Port Hueneme, CA; Naval Oceanographic Research and Development Laboratory, Bay St. Louis, MS; Norfolk Naval Shipboard, Portsmouth, VA; Puget Sound Naval Shipyard, WA: Pearl Harbor Naval Shipyard, HI; Mare Island Naval Shipyard, CA; Ships Intermediate Maintenance Activity, San Diego, CA; Ships Intermediate Maintenance Activity, Portsmouth, VA; Naval Research Laboratory, Washington, DC., Naval Ocean Systems Center, San Diego, Calif; Naval Surface Weapons Center, Dahlgren, VA; Metrology Engineering Center, Pomona, CA; and The National Bureau of Standards, Boulder, CO. CONTRACTORS: Worthington Division of Dresser Industries, Buffalo, NY; Hamilton Standard Division of United Technologies, Windsor Locks, CT; MECO Corporation, New Orleans, LA; Aqua Chem, Milwaukee, WI; York Engineering, York, PA; Westinghouse, Marine Technical Division, Pittsburgh, PA; Battelle Memorial Institute, Columbus, OH; Tracor Marine, Ft. Lauderdale, FL; and nineteen (19) others.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project S1712, Hull, Mechanical and Electrical Improvement:

Program Element: 63513N Title: Shipboard Systems Component Development

1. (U) Description: This project develops improved equipment which are small but critical components of shipboard hull, mechanical and electrical (HM&E) systems. The emphasis is on short-term developments for immediate fleet application. The component developments are critical to HM&E systems availability and are typically responsive to needs for component reliability and maintainability improvements identified in fleet readiness and H&ME conferences. Principal systems for which improved components will be developed include fluid systems, hull and deck machinery, and electrical equipment.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Initiated anti-flood air conditioning improvements on 25 ton system.

° Completed development of air conditioning oil migration trap.

° Continued development of air conditioning compressor unloading mechanism.

° Completed Brominator Improvement Program.

° Initiated laboratory evaluations of standardized non-asbestos propulsion shaft packing.

° Initiated standardized dehydrator development program.

° Installed improved development model cargo elevator door for shipboard evaluation.

° Initiated helicopter hangar door improvement program.

° Initiated non-asbestos brake liner development program for underway replenishment winches.

° Continued 400 Hertz power continuity improvement program.

° Continued laboratory evaluations of improved cooling systems for electrical equipment.

° Continued electric cable improvement studies.

° Initiated in-line voltage regulator improvements.

° Continued solid state frequency changer electromagnetic compatibility (EMC) improvement program.

Program Element: 63513N Title: Shipboard Systems Component Development

° Continued 60 Hertz power continuity improvement program.

° Initiated development of improved navigation lights.

b. (U) FY 1987 Program:

° Complete development of anti-flood air conditioning improvement for 25 ton system.

° Initiate laboratory evaluation and design studies of ventilation duct weather intake screens and baffles.

° Complete development of standardized non-asbestos propulsion shaft packing.

° Initiate evaluations of standardized dehydrator design.

° Complete shipboard evaluation of engineering development model cargo elevator door.

° Develop helicopter hangar door improvements for fleet evaluation.

° Initiate boat davit improvement program.

° Continue 400 Hertz power continuity improvement program.

° Continue laboratory evaluations of improved cooling systems for electrical equipment.

° Continue electric cable improvement studies.

° Initiate circuit breaker improvement program.

° Initiate development of maintenance free batteries.

° Continue 60 Hertz power continuity program.

° Continue development of improved navigation lights.

c. (U) FY 1988 Planned Program:

° Continue development of standardized dehydrator design.

Program Element: 63513N Title: Shipboard Systems Component Development

° Initiate development of improved purifier/filter systems for diesel lube oil.

° Complete helicopter hangar door improvement program.

° Initiste shock analyses of deck hold down systems.

° Continue boat davit improvement program.

° Initiate development of welded anchor chain fittings and non-magnetic welded anchor chain.

° Complete laboratory evaluations of improved cooling systems for electrical equipment.

° Complete electric cable improvement studies.

° Complete in-line voltage regulator improvement investigations.

° Continue circuit breaker improvement program.

° Continue 60 Hertz power continuity program.

d. (U) FY 1989 Planned Program:

° Initiate development of seawater cooling coils for machinery spaces.

° Initiate development of gravity cooling coils for weapons/ordnance spaces.

° Complete development of standardized dehydrator design.

° Continue development of improved purifier/filter systems for diesel lube oil.

° Initiate development of improved pressure seal rings for high temperature and high pressure steam valves.

° Initiate forced draft blower control valve improvement program

° Complete shock analyses and evaluation of deck hold down systems.

° Initiate shock analyses of lifeboat and windlass deck systems.

Program Element: 63513N Title: Shipboard Systems Component Development

° Complete boat davit improvement program.

° Continue development of welded and non-magnetic anchor chain and fittings.

° Continue circuit breaker improvements.

° Complete maintenance free battery program.

° Complete 400 Hertz power continuity improvement program.

° Complete development of improved navigation lights.

° Continue 60 Hertz power continuity program

e. (U) Program to completion: This is a continuing program.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project S0382, Shipboard Auxiliary System Development

1. (U) Description: This project develops shipboard auxiliary components and systems including compressed air and fresh water production systems, advanced pumps, air conditioning and air processing systems, hydraulic systems, propulsion and electric auxiliaries, hull and deck machinery, and other advanced equipment. Emphasis is on developing auxiliary machinery which will not only improve performance reliability and maintainability, but will also result in size, weight and/or life cycle cost savings. In FY 1985, Project S1417, Shipboard Corrosion Control, was integrated into this project. This program's objective is to reduce life cycle costs of ships' components through improved corrosion/wear characteristics, and significantly reduce ships' force and maintenance personnel manhours due to corrosion and includes development and service testing of corrosion/wear/erosion/coating systems; coatings nondestruction examination equipment/processes; Naval Shipyard corrosion control design/production handbook; and thermal spray coating information. In FY 1986, work previously accomplished under Project S0398, Underway Replenishment from P.E. 63705N was added to this project. This project provides for the advanced development of specialized equipment required to replenish surface ships at sea with fuel, ammunition, food and supplies vital to maintaining the Fleet at sea. In FY 1986, a program was added to expedite the development of fiber optics engineering standards and specifications for fiber optics hardware and equipment necessary to make up crtical shipboard systems. Standardized fiber optic equipment/systems will provide significant weight and space savings, improved reliability, maintainability and survivability. Representative of the type of auxiliary equipment items under development in Project S0382 are a reverse osmosis desalinator which is significantly smaller in size and weight than a conventional distilling plant and can produce twice as much fresh water; a highly reliable low pressure, waterflooded, screw type, air compressor which is less than one half of the volume and weight of the conventional piston type compressor now used aboard ships and which requires less than one half the number of parts for logistic support. This project

Program Element: 63513N Title: Shipboard Systems Component Development

includes development of electric auxiliaries for correcting design and logistic support costs in future shipboard machinery systems, and for correcting problems associated with waste heat supplied steam systems in DD 963 Class ships. The project develops advanced electrical components for improvements in ship service power systems. The scope of equipment developments include power generation, conditioning, distribution and protection components and improved electrical auxiliaries instrumentation and controls. Principal electrical system development thrusts are greater component survivability and maintainability, improved continuity of power to vital loads, and better inherent power-quality compatibility between generation/distribution systems and user equipments. Navy salvage techniques and equipment are relatively unchanged from those developed during World War II. The inadequacies of such obsolescence under conditions of increasing salvage problems posed by the increased size and sophistication of combatants and support ships requires development of new shipboard salvage systems and equipment. In addition, Navy is now required to salvage lost aircraft and weaponry. Salvage equipment developments include buoyancy generation, salvage work systems, dewatering, and lifting systems.

2. (U) Program Accomplishments And Future Efforts:

a. (U) FY 1986 Program:

° Completed laboratory evaluation and shipboard installation (USS STUMP) of MIL SPEC 12,000 gallon per day reverse osmosis desalinator.

° Completed Technical Evaluation (TECHEVAL) and commenced Operational Evaluation (OPEVAL) (USS SCOTT) of low pressure single screw air compressor.

° Continued design of rotary 3,000 psi MIL-SPEC prototype air compressor.

° Completed design and fabrication of prototype nitrogen generator.

° Completed fabrication and initiated laboratory evaluation of prototype single-screw fuel pump.

° Completed at sea testing of pre-prototype fuel purifier for hydrofoil patrol boats (PHM) and issued RFP for design and fabrication of MIL-SPEC prototype.

° Completed composite material brine pump specification and fabrication, developed requirements for a standard family design contract, and continued shipboard evaluation.

° Completed design and fabrication of advanced Navy standard MIL-SPEC, variable capacity fire pump.

° Completed evaluation of state-of-art disinfection system.

Program Element: 63513N Title: Shipboard Systems Component Development

- Continued OPEVAL of vertical package conveyor and obtained Approval for Limited Production.
- Initiated development of prototype fiber optic ayatems used in eatablishing hardware standards and specifications.
- Completed fiber optic prototype systems performance design.
- Initiated fiber optic system engineering deaign.
- Developed an extenaive data base on current and proposed fiber optic standarda/specifications and off-the-shelf hardware.
- Completed initial operational evaluation of standard winches, aliding blocks, and tenaioners, received Approval for Limited Production.
- Initiated standard helicopter hangar door program.
- Continued laboratory evaluation of experimental 100 kw scale model, variable speed, constant-frequency ship service generator.
- Completed detail design and fabrication of components for experimental-model Navy atandard steering system and commenced laboratory evaluation.
- Completed specifications for variable speed controller for auxiliary equipment electric motors.
- Completed successful shock teating of thermal aprayed components in main feed pump.
- Awarded contract for prototype current limiting protector for 60 Hertz bus-tie circuits.
- Fastener coatings under MIL S-81751 successfully passed laboratory ahock and vibration testing.
- Completed specifications for advanced prototype circuit breaker.
- Initiated development of salvage lift systems.
- Initiated development of salvage work syatems.

b. (U) FY 1987 Program:

Program Element: 63513N Title: Shipboard Systems Component Development

- Initiate TECHEVAL of 12,000 gallon per day reverse osmosis desalinator.
- Initiate evaluation of non-cryogenic nitrogen generator.
- Issue RFP for pre-production single-screw type fuel/oil pump.
- Complete laboratory evaluation of prototype variable capacity fire pump.
- Issue RFP for design and fabrication of standard family composite centrifugal pumps.
- Award contract and initiate design for MIL-SPEC prototype circuit breakers incorporating solid state sensing elements.
- Initiate construction of demonstration model for prototype integrated rapid response electrical system controls.
- Complete design and begin fabrication and laboratory evaluation of prototype current limiting protector for 60 Hz bus-tie circuits.
- Initiate repair/restoration of babbitt bearings with thermal spray coatings.
- Complete specifications for solid state ramp motor starter for auxiliary equipment electrical motors.
- Complete construction and laboratory evaluation of advanced development model Navy standard steering system.
- Complete OPEVAL of vertical package conveyor.
- Complete OPEVAL of standard family of underway replenishment equipment.
- Design, fabricate and start laboratory evaluation of standard helicopter hangar door.
- Continue development of salvage lift systems.
- Continue development of salvage work systems.
- Issue upgraded MIL STD 1687 for repair/refurbishment of thermal spray machinery castings.

c. (U) FY 1988 Planned Program:

Program Element: 63513N Title: Shipboard Systems Component Development

- Initiate development of high power no-break power supply to ensure uninterrupted power to major vital 60 Hz electrical loads during generator/bus transfers.
- Obtain Approval for Full Production of 12,000 GPD reverse osmosis desalinator.
- Complete design for 3000 psi MIL-SPEC prototype rotary air compressor.
- Issue RFP for MIL-SPEC non-cryogenic nitrogen generator.
- Award contract for pre-production single-screw type fuel/oil pump.
- Initiate shipboard evaluation of variable capacity fire pump.
- Complete design and fabrication of standard family composite centrifugal pumps.
- Initiate development of advanced high efficiency air conditioning plant.
- Issue procurement specifications for infrared non-destructive evaluation (NDE) equipment for thermal spray machinery coatings.
- Initiate laboratory evaluation of prototype MIL-SPEC circuit breakers incorporating solid state sensing elements.
- Complete laboratory evaluation of 100 KW scale model variable speed, constant frequency ship service generator and complete full scale design of prototype 2500 KW machine.
- Continue ship monitoring of dynamic hull potential cell.
- Initiate laboratory evaluation of prototype current limiting protector for 60 Hz bus-tie circuits.
- Award contract for design of prototype ship service power switchboard incorporating improved shock resistance, improved bus bar connections, and forced draft cooling.
- Initiate development of components for direct distribution of DC power to major electronic loads.
- Transition Navy standard steering system to DDG-51 shipbuilding program.
- Initiate investigation of underwater repair compounds for air conditioning systems.

Program Element: 63513N Title: Shipboard Systems Component Development

° Receive Approval for Full Production for vertical package conveyor.

° Complete shock testing and receive Approval for Full Production for standard family of underway replenishment equipment.

° Start TECHEVAL of standard helicopter hangar door.

° Initiate lightweight cargo elevator door program

° Continue development of salvage lift systems.

° Continue development of salvage work systems.

d. (U) FY 1989 Planned Program:

° Complete fabrication of 3000 psi MIL-SPEC prototype rotary air compressor.

° Award contract for MIL-SPEC non-cryogenic nitrogen generator.

° Design and fabricate MIL-SPEC single-screw type fuel/oil pump.

° Initiate TECHEVAL of variable capacity fire pump.

° Conduct Laboratory Evaluation (LABEVAL) of standard family composite centrifugal pumps.

° Continue development of Advanced high efficiency airconditioning plant.

° Initiate OPEVAL of MIL-SPEC circuit breakers incorporating solid state sensing elements.

° Issue upgraded powder coating specifications for corrosion control applications.

° Issue upgraded specification for replacement of F-111 equipment enamel.

° Initiate design and fabrication of prototype high power no-break power supply to ensure uninterrupted power to major vital 60 Hz electrical loads during generator/bus transfers.

° Award contract and initiate fabrication of pre-production prototype 2500 KW variable speed, constant frequency ship service power system.

Program Element: 63513N Title: Shipboard Systems Component Development

- Initiate OPEVAL of 60 Hz bus-tie current limiting protector.
- Complete fabrication and initiate laboratory evaluation of fast acting bus transfer switch.
- Complete design of prototype improved ship service power switchboard incorporating improved shock resistance, improved bus bar connections, and forced draft cooling.
- Complete system design for direct distribution of DC power to major electronic loads.
- Conduct OPEVAL of standard helicopter hangar door.
- Design and fabricate protoytpe lightweight cargo elevator door.
- Continue development of salvage lift systems.
- Continue development of salvage work systems.
- Initiate high capacity (1,000 lb) underway replenishment system development.
- Initiate evaluation of composites for corrosion control applications.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones: Not Applicable

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63514N
DoD Mission Area: 238 - Other Naval Warfare

Title: Ship Combat Survivability
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 21,437 | 26,630 | 29,426 | 36,298 | Continuing | Continuing |
| S0384 | Ship Survivability (Adv) | 7,712 | 11,755 | 13,109 | 19,491 | Continuing | Continuing |
| S1121 | Personnel Protection | 3,670 | 2,882 | 4,894 | 5,181 | Continuing | Continuing |
| S1565 | Ship Damage Control | 4,524 | 6,476 | 5,782 | 6,093 | Continuing | Continuing |
| S1607 | EMPRESS II | 6,031 | 5,517 | 5,641 | 5,533 | 4,737 | 40,129 |

As this is a continuing program, the above funding profile includes outyear escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program covers the advanced development of equipment, systems, and engineering data and full scale weapons effects simulation that will provide protection of ships and their embarked personnel from conventional, nuclear, chemical or biological weapon effects and enable the ship to continue performing assigned combat missions at an effective level. This program also covers the development of systems, equipment and engineering data to protect embarked personnel from effects of fire, smoke, and lethal environments created by peacetime accidents and the development of fire protection and damage control capabilities necessary to limit, control and correct wartime and peacetime casualty situations.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 President's Budget and that shown in this Descriptive Summary are as follows:

(U) Project S0384, Ship Survivability: Funds were reduced 4,067 in FY 1986 due to Department program/budget adjustments and a GRH adjustment. A reduction of 12,724 in FY 1987 is the result of Congressional action and adjustments and Department program/budget adjustments. Reduction of 19,977 in FY 1988 is the result of Department program and budget adjustments.

(U) Project S1121, Personnel Protection: Funds were reduced 1,209 in FY 1986 due to Department budget program adjustments and a GRH adjustment. A reduction of 744 in FY 1987 is the result of Congressional action and adjustment.

Program Element: 63514N Title: Ship Combat Survivability

Project S1607, EMPRESS II: Increases of 2,750 in FY 1986 and 3,638 in FY 1988 are the result of Department program and budget adjustments and a GRH adjustment for FY 1986. The total estimated cost listed above reflects only PE 63514, Project S1607 funding.

Project S1565, Ship Damage Control: Funds were increased 563 in FY 1986 due to Department program/budget adjustments and a GRH adjustment. A reduction of 1,484 in FY 1987 is the result of Congressional action and adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 18,662 | 23,400 | 41,861 | 46,306 | Continuing | Continuing |
| S0384 | Ship Survivability (Adv) | 6,481 | 11,279 | 24,479 | 33,086 | Continuing | Continuing |
| S1121 | Personnel Protection | 2,593 | 4,879 | 3,626 | 5,124 | Continuing | Continuing |
| S1565 | Ship Damage Control | 3,977 | 3,961 | 7,960 | 6,093 | Continuing | Continuing |
| S1607 | EMPRESS II | 5,611 | 3,281 | 5,796 | 2,003 | 5,235 | 43,129 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Total Additional to Completion | Estimated Cost |
|---|---|---|---|---|---|---|
| Procurement (OPN) S1565 Various Items | 10,501 | 12,501 | 4,300 | 5,520 | 30,720 | 93,905 |

E. (U) RELATED ACTIVITIES: Program Element (62121N Surface Ship Technology) provides technology input to various tasks under this program. Program Element 64516N (Ship Survivability Engineering) covers survivability related equipment engineering development; Program Element 62233N (Mission Support) provides Chemical, Biological and Radiological (CBR) Defense technology input to this program; Program Element 63634N (Tactical Nuclear Warfare) and DNA funds provide technology support for this program. Program Element 64506N (BR/CW Countermeasures) is the engineering development program for CBR tasks under this program.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Research Laboratory, Washington, DC; David W. Taylor Naval Ship Research and Development Center, Bethesda, MD; Naval Surface Weapons Center, White Oak Laboratory, Bethesda, MD; Naval Surface Weapons Center,

Program Element: 63514N Title: Ship Combat Survivability

CA; Naval Clothing and Textile Research Facility, Natick, MA; Naval Air Engineering Center, Lakehurst, NJ; Chemical Research and Development Center, Edgewood, MD. CONTRACTORS: SRI International, Menlo Park, CA; Maxwell Laboratories, Inc., San Diego, CA; Jaycor, Inc., Woodland Hills, CA; ARL, Arlington, VA; EG&G, Rockville, MD; PRC, Mclean, VA; Rockwell International Corporation, Anaheim, CA; Hughes Associates, Inc., Wheaton, MD; Planning Research Corporation, McLean, VA; Sterling Systems, Inc., McLean, VA; Advanced Technology, Inc., Vienna, VA; Pacer Systems, Inc., Billerica, MA; Sachs-Freeman, Landover, MD; ECO, Inc., Annapolis, MD.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project S1121, Peraonnel Protection:

1. (U) Deacription: This project provides for design and development of shipboard personnel protective clothing and equipment to protect ship's complement from effects of hostile actions and peacetime accidents.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Continued development of fire fighting equipment (fire fighter suit, gloves, helmet).

° Continued development of fire retardant anti-flash clothing.

° Continued development of flight deck and hangar deck clothing.

° Commenced development of new firefighter breathing apparatus.

° Completed Operational Evaluation (OPEVAL) of naval battle helmet, auto-inflatable utility life preserver, and naval flak vest.

° Continued development of cold weather ensemble.

° Continued development of ballistic face shield.

° Continued development of anti-exposure suit.

Program Element: 63514N Title: Ship Combat Survivability

b. (U) FY 1987 Program:

° Transition fire fighting equipment to production (suit & gloves).

° Transition anti-flash clothing to production.

° Transition naval battle helmet, auto-inflatable utility life preserver, and naval flak vest to production.

° Transition firefighting clothing to production.

° Commence development of Explosive Ordnance Disposal (EOD) protective clothing.

° Continue development of cold weather ensemble.

° Continue development of anti-exposure suit.

c. (U) FY 1988 Planned Program:

° Continue development of anti-exposure suit.

° Continue development of cold weather ensemble.

° Continue development of firefighter breathing apparatus.

° Continue development of flight deck and hangar deck clothing.

° Continue development of Explosive Ordnance Disposal (EOD) protective clothing.

° Initial Operational Capability (IOC) of fire fighting equipment (suit and gloves).

° IOC of ballistic face sheild.

° IOC of anti-flash clothing.

d. (U) FY 1989 Planned Program:

° Transition fire fighting equipment (helmet) to production.

Program Element: 63514N Title: Ship Combat Survivability

° Continue development of firefighter breathing apparatus.

° IOC of anti-exposure suit.

° IOC of cold weather ensemble.

° Transition development items to In-Service Engineering Agent (ISEA).

e. (U) Program to Completion: This is a continuing program.

(U) Project S1565, Ship Damage Control:

1. (U) Description: This project develops damage control systems and equipment including fire detection and suppression systems and provides systems and equipment for reconfiguration of vital ship systems for casualty control. The project improves fleet readiness and combat survivability by providing for more rapid detection and control of damage and restoration of vital functions.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Completed testing and initiated procurement of interim Navy Firefighters Thermal Imager (NFTI).

° Completed testing of improved time delay device for machinery space Halon fire extinguishing system.

° Conducted tests on new fire protection system for electronic equipment.

° Completed initial planning for full scale fire test facility (Ex-SHADWELL) and towed ship to Mobile, AL for refurbishment. Project transferred to PE 64516N.

° Completed MILSPEC for fire resistant blankets and linens.

° Completed first revision of MILSTD 1623 to reduce hazards of fire for shipboard outfittings and furnishings.

° Completed NSTM revision regarding the allowable number of recoats for Navy paints to reduce fire hazard.

Program Element: 63514N Title: Ship Combat Survivability

- Initiated fire toxicity testing of gas turbine lube oils.
- Published toxicity protocol - National Academy of Science.
- Initiated shipboard tests of prototype acoustic hardware using the hull for damage control communications (DC HULLCOM).
- Formulated concept design for damage control information system.
- Prepared specification for an upgraded, boom-like version of the H-200/U Sound-Powered Headset.

b. (U) FY 1987 Program:

- IOC of floodlight and interim helmet-mounted light.
- Complete tests on DC equipment improvements such as smoke curtains, smoke generator and pipe patch kit.
- Initiate procurement of ADM for portable power and pumping system.
- Initiate development of proportioner for low concentration AFFF.
- Develop design criteria for fire protection system for electronic equipment.
- Complete procurement of instrumentation for the small scale test facility for evaluating flammability and smoke generation characteristics of candidate shipboard outfitting and habitability materials.
- IOC of fire resistant blankets and linens.
- Update MILSTD 1623 to include results of fire tests on shipboard outfittings and furnishings.
- Initiate assessment of effect of low levels of fire toxicity products on human performance under controlled laboratory conditions.
- Initiate assessment of fire toxicity of gas turbine lube oils.
- Initiate development of wire-free damage control communications system for CV/CVN, LHA, LSD & LHD Class ships.

Program Element: 63514N Title: Ship Combat Survivability

° Complete transducer development and validation of design parameters for acoustic hardware for DC HULLCOM project.

° Complete shipboard evaluations of two commercially available DC information systems, SNIPE and BALLAST.

° IOC of H-200/U Sound Powered Headset.

° Develop MILSPEC for an improved Oxygen Breathing Apparatus (OBA) voice amplifier.

c. (U) FY 1988 Planned Program:

° Complete testing of helmet light, standard rechargeable power pack and recharge system.

° Develop procurement spec for thermal arc cutting device.

° Conduct evaluation of high expansion foam for machinery space application.

° Initiate testing of anti-corrosion additives for Halon.

° Initiate testing of ADM for portable power and pumping system.

° Develop MILSPEC for fire protection system for electronics cabinet.

° Conduct flammability tests on shipboard outfittings and furnishings at small scale test facility.

° Complete assessment of fire toxicity of gas turbine lube oils.

° Initiate bio-assay studies of effect of low levels of fire toxicity products on human performance.

° Initiate developmental testing of ADM of a wire-free damage control communication system for CV/CVN, LHA, LSD, and LHD class ships.

° Complete evaluation of ADM of hull communications system (HULLCOM), prepare EDM specification and transfer to PE 64516N.

° Develop design guidance and specification for DC management system for DDG 51 class.

Program Element: 63514N Title: Ship Combat Survivability

° Complete TECHEVAL OBA Voice Amplifier.

d. (U) FY 1989 Planned Program:

° Continue bio-assay studies of effect of fire toxicity products on human performance under controlled laboratory conditions.

° Update MILSTD 1623 to include results from testing of shipboard outfittings and furnishings at small scale test facility.

° IOC of OBA Voice Amplifier.

° Complete evaluations of solid AFFF cartridge for 1½" hose and of static spark ignition of shipboard fuels.

° Complete testing of ADM for portable power and pumping system and transition to PE 64516N.

e. (U) Program to Completion: This is a continuing program.

(U) Project S1607, EMPRESS II - (Electromagnetic Pulse Radiation Environment Simulator for Ships).

1. (U) Description: This program will develop the EMPRESS II full threat level Electro Magnetic Pulse (EMP) simulator for assessing, validating, and maintaining EMP hardness of surface ships. This capability does not currently exist and, because of the complex characteristics of EMP/system interaction, cannot be mathematically modeled.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Continued support system equipment installation.

° Continued development of antenna resistor assembly.

° Completed critical design review of data processing system.

° Commenced pulser systems integration.

Program Element: 63514N Title: Ship Combat Survivability

° Commenced command and control systems integration.

° Commenced antenna support structure fabrication.

° Commenced fabrication of Data Acquisition and Processing System (DAAPS #1).

b. (U) FY 1987 Program:

° Complete vessel support system equipment installation.

° Complete antenna resistor assembly.

° Complete antenna support structure fabrication.

° Complete antenna installation.

° Continue fabrication of Data Acquisition and Processing System (DAAPS #1).

° Complete pulser system integration.

° Commence command and control systems integration.

c. (U) FY 1988 Planned Program:

° Continue fabrication of Data Acquisition and Processing System (DAAPS #1).

° Complete conducting of Pulser Transmitter Developmental Tests; Complete (Phase I) evaluations.

° Complete receiver systems Developmental Test and Evaluation (Phase I).

° Commence Operational Test and Evaluation Trials (Phase I).

d. (U) FY 1989 Planned Program:

° Complete fabrication of Data Acquisition and Processing System (DAAPS #1).

° Commence fabrication of DAAPS #2 and #3.

Program Element: 63514N Title: Ship Combat Survivability

° Complete Operational Test and Evaluation Trials (Phase I).

e. (U) Program to Completion: The completion of the EMPRESS II Project consists of completing the fabrication of DAAPS #2 and #3, completing the acceptance testing of the EMPRESS II facility, achieving initial operational capability, and the testing of first ship with the EMPRESS II facility.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89

(U) Project S0384, Ship Survivability (Adv)

1. (U) Description: This project develops technology that reduces the vulnerability and susceptibility of ship mission systems to threat weapon effects. The intent is that successive ship classes will have a greater inherent survivability to threat weapons than previous classes. The preliminary focus is on new construction; however, priority is given to affordable technology that can improve the survivability of ships now in commission to threat weapon inventories. Project S0384 improves survivability by developing technology to minimize exposure to weapon effects by controlling non-acoustic signatures, providing early detection of weapon effects, intrinsic insensitivity to weapon effects, providing for useful levels of mission capability in damaged states, and quick equipment recovery from battle damage. Weapon effects include fragmentation, blast, heat, radiation, shock, and toxicity as well as secondary effects, i.e., fire, flooding and smoke. The fabrication of developmental hardware and full scale demonstrations provide the engineering base for subsequent application to specific equipment, systems and ship structures. Approaches include redundancy/separation, armoring, arrangement/compartmentation, miniaturization, damage tolerant system architecture of equipment/systems, early detection of effects, repairability/decontamination, environmental isolation control of signatures to make ships less observable or less unique. This project responds to HR10, USC 7281 of OCT 1981, DODINST 4245.4 of SEP 1983 (Acquisition of Nuclear Survivable Systems), the Naval Electronics Warfare Advisory Group Five Year R&D Plan (FEB 1982), and the Joint Service Agreement on CW/B Defense Research, Development & Acquisition (JUL 1984).

2.

a. (U) FY 1986 Program

° (U) Nuclear Weapon Effects Protection
- Prepared hardening guidance recommendations for ships with large apertures
- Developed test methods for Electro Magnetic Pulse (EMP) protection of ship topside power cables.
- Developed portable test equipment for evaluation/maintenance of EMP hardness in critical systems.
- Initiated development of ordnance EMP protection techniques and devices; continued limited ordnance EMP testing; continued development of EMP certification for ordnance.

Program Element: 63514N Title: Ship Combat Survivability

- Completed draft specification modifications for silicon controlled rectifiers for shipboard use in high power electronics.
- Initiated evaluation of 20 ton underwater shock simulator.
- Initiated design of a 5 ton airblast induced shock (ABIS) simulator.

* (U) Non-acoustic Signature Control
- This project is of a higher classification. Project efforts are included in

* (U) Conventional Weapon Effects Protection
- Initiated contact and internal detonation testing of ship hull structural hardening concepts.

* (U) Passive Fire Protection, Electrical Cable Initiatives
- Initiated development of fire hardened multiple cable bulkhead penetration specifications.
- Conducted evaluation of selected fire barrier materials.
- Completed development of fire hazard criteria for improved shipboard electrical cables.

* (U) Chemical/Biological/Radiological (CBR)
- Initiated advanced development of Chemical/Biological/Radiological (CBR) protective materials and decontaminant coatings.
- Continued assessment of advanced air capable ship and land based aircraft ground crew Chemical/Biological/Radiological (CBR) protective clothing and decontamination equipment.
- Continued evaluation of advanced Collective Protection System (CPS) filtration system technologies.

* (U) Cold Weather/Arctic Operations
- Initiate cold weather ships program; conducted technical symposium on cold weather operations.
- Utilized Coast Guard icebreaker to establish cold weather limitations of surface ships.

b.

* (U) Nuclear Weapon Effects Protection
- Initiate development of aircraft-to-ship umbilical cable and topside power outlet terminal protection.
- Investigate ships with apertures resembling wave guides.
- Continue EMP testing of selected ordnance items; continue development of EMP certification criteria and procedures.

Program Element: 63514N Title: Ship Combat Survivability

- Initiate development of ordnance design guidance manual for EMP hardening.
- Complete ordnance engineering of new development ordnance; complete EMP assessment of explosives and propellants.
- Initiate certification equipment procurement and integration for ordnance EMP hardening.
- Initiate planning and analysis for ship trial at the electromagnetic pulse radiation environment simulator for ships (EMPRESS II).

* (U) Conventional Weapon Effects Protection
  - Conduct blast testing of candidate hardened bulkhead and shell structure connections.
  -
  - Initiate hardened composite superstructure development; initiate structural and material performance payoff studies.
  - Initiate development of hardened combat system electrical power control and distribution systems.
  - Initiate development of auxiliary module for the HM&E/combat systems architecture interface assessment model.

* (U) Passive Fire Protection, Electrical Cable Initiatives
  - Initiate development of improved fire hardened cable prototypes.
  - Continue development of fire hardened cable coating (barrier) systems.
  - Complete quantitative measurements of cable fire hazards (flammability, toxicity, corrosivity, and smoke generation); initiate modification of fire test measuring devices.
  - Complete development of multiple cable penetration specification; revise specification for fire hardened cable sealant components.

* (U) Chemical/Biological/Radiological (CBR) Effects Protection
  - Continue decontamination requirement definition for ships, aircraft and shore bases.
  - Initiate assessment of inherent shipboard contaminants.
  - Initiate evaluation of air/ship interface.
  - Initiate assessment of automatic liquid agent detector for shipboard application.
  - Continue joint (with Army) development of pressure swing absorption for shipboard application.
  - Initiate advanced development of integration of detection and warning systems.
  - Continue joint service advanced development of impermeable suit with cooling.

* (U) Cold Weather/Arctic Operations
  - Investigate ship systems operability in cold weather environment.
  - Plan ship icing experiment.

Program Element: 63514N Title: Ship Combat Survivability

c. (U) FY 1981 Planned Program

° (U) Nuclear Weapon Effects Protection
- Develop EMP hardened aircraft umbilical cables and design development of EMP hardened power outlets and connectors.
- Develop EMP hardening recommendations for ships with large aperture vulnerability.
- Complete development of ordnance EMP test techniques and equipment.
- Continue EMP vulnerability assessments and testing of selected ordnance and explosive devices.
- Continue acquisition and integration of EMP ordnance certification equipment.
- Complete development of ordnance design guidance manual for EMP hardening.
- Begin laboratory and field testing of terminal protection devices for EMP hardening of electronic equipment and systems.
- Prepare ship for first EMPRESS II trial.

° (U) Conventional Weapon Effects Protection
- Continue preliminary testing, design development and trade-off studies for composite topside structures incorporating various survivability characteristics (i.e., armor, signature, structure, fire resistance).
- Complete internal explosion damage resistance tests and assessments of baseline and hardened compartment structures and connectors.
- Continue development of hardened electrical control and power distributive systems for combat systems and equipment.
- Initiate development of control systems module for the HM&E/Combat Systems Architecture Interface Assessment Model.
- Initiate development of a Damage Control Process Model (DCPM) to include effects of flooding, smoke and damage restoration.

° (U) Passive Fire Protection, Electrical Cable Initiatives
- Continue development of improved cables; initiate improved cable fire testing.
- Complete development of installation specification for fire hardened cable bulkhead penetrator and sealants and non-water tight packing.
- Conduct whole cable fire tests to establish quantitative fire hazard criteria for use in upgrading current electrical cable specifications.
- Complete modifications to cable fire test measuring devices.
- Conduct full scale testing of fire hardened cable coating systems.

Program Element: 63514N Title: Ship Combat Survivability

° (U) Chemical/Biological/Radiological (CBR)
- Continue evaluation of air/ship interface requirements.
- Continue asseaament of inherent shipboard contaminants.
- Continue joint service advanced development of impermeable suit with cooling.
- Continue advanced development of improved decontaminants, materials and procedures.
- Continue advanced development of automatic liquid agent detector to full scale engineering development.
- Complete joint (with Army) advanced development of pressure swing absorption for shipboard application.
- Continue advanced development of integration of detection and warning systems.

° (U) Cold Weather/Arctic Operations
- Conduct combatant ship operations.
- Establish personnel training aids.
- Initiate development of ship system and weather protection/operation recommendations.

d. (U) FY 1989 PLANNED PROGRAM

° (U) Nuclear Weapon Effects Protection
- Demonstrate EMP hardened design of topside power outlets.
- Continue development of certification procedures and verification equipment acquisition for hardening of ordnance to EMP effects.
- Complete EMP testing of ordnance items and explosive devices.
- Conduct first ship trial at EMPRESS II.

° (U) Conventional Weapon Effects Protection
- Construct and evaluate integrated topside composite structural panels and modules.
- Complete analysis and develop design documentation for hardening of ship's hull structure, compartments and connections.
- Complete development of computer assessment code and associated documentation to incorporate survivability enhancement factors into the ship design process (electrical, auxiliary and ship control systems).
- Continue development of hardened combat system electrical power control and distributive systems.
- Validate components of the Damage Control Process Model (DCPM); expand model to include effects of flooding, smoke, and damage restoration.

Program Elcmcnt: 63514N Title: Ship Combat Survivability

° (U) Passive Fire Protection, Electrical Cable Initiatives
- Complete development of specifications for fire resistant backfit protective cable coatings.
- Complete whole cable fire tests and develop criteria for fire hazard parameters to be incorporated into electrical cable MIL-SPECs.
- Complete evaluation and development of improved fire hardened cables and revisions to associated MIL-SPEC's.
- Complete MIL-SPEC modifications for cable sealant and bulkhead cable packing materials.

° (U) Chemical/Biological/Radiological (CBR)
- Initiate assessment of methodologies for remote detection and identification of toxic chemicals and biological agents.
- Initiate advanced development of advanced permeable suit.
- Complete advanced development of pressure swing absorption for shipboard application.
- Initiate advanced development of internal monitoring of chemical agent vapors and aerosols.
- Complete advanced development of shipboard chemical liquid agent detector and make transition to engineering development.

° (U) Cold Weather/Arctic Operations
- Complete development of recommendations for operational systems and techniques to improve ship service power and aircraft support systems under icing/arctic weather conditions, develop operational guidelines for new and future construction ships.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones: Project S0384

| Milestone | Date |
|---|---|
| 1. (U) Nuclear Weapon Effects Protection | |
| - Determine Electro Magnetic Pulse (EMP) vulnerability of propellant and explosives in shipboard ordnance. | FY 1987 |
| - Demonstrate the shielded grounding adaptor (SGA) tester | FY 1987 |
| - Evaluate technologies that show promise for hardening radars and electromagnetic sensors against nuclear and conventional weapon effects. | FY 1990 |
| - Publish design guidance for EMP hardened ordnance. | FY 1987 |
| - Conduct first ship trial at EMPRESS II | FY 1989 |
| - Complete validation testing of EMP hardening for existing ordnance. | FY 1989 |
| - Demonstrate technology for closing off apertures to EMP threat. | FY 1991 |

Program Element: 63514N Title: Ship Combat Survivability

2. (U) Conventional Weapon Effects Protection

| | |
|---|---|
| - Validate an electrical system module for the hull, mechanical and electrical (HM&E)/combat system architecture interface assessment model. | FY 1987 |
| - Demonstrate technology for hardened and reconfigurable optical surveillance systems and command and control systems. | FY 1992/1993 |
| - Demonstrate the electrical systems module of the HM&E/combat systems architecture interface assessment model. | FY 1987 |
| - Identify significant payoff survivability improvement in propulsion and HME systems and equipment using high density technology. | FY 1990 |
| - Begin preparation of technical data base on damage mechanisms due to effects of advanced weapons. | FY 1990 |
| - Validate HM&E/combat system architecture interface assessment model modules (electrical, auxiliary and control systems). | FY 1989 |
| - Complete validation of hull structural design concepts to resist internal blast. | FY 1989 |
| - Evaluate coatings to protect electrical components from airborne conductive materials. | FY 1990 |
| - Promulgate hull structural design guidelines and practices. | FY 1990 |
| - Conduct full scale demonstration of survivable design deckhouse. | FY 1990 |
| - Complete test and evaluation of Advanced Development Models (ADMs) for high density propulsion and auxiliary equipment. | FY 1995 |
| - Validate a modified version of the ship vulnerability model (SVM) incorporating codes for spread of secondary damage due to fire, smoke, flooding and Chemical/ Biological/Radiological (CBR) weapon effects. | FY 1989 |
| - Demonstrate technology for automated reconfigurable combat system electrical power management and control. | FY 1990 |

Program Element: 63514N Title: Ship Combat Survivability

3. (U) Passive Fire Protection, Electrical Cable Initiatives
   - Complete test and evaluation of commercially available fire protection cable coatings. FY 1987
   - Define technical characteristics of fire tolerant multiple cable bulkhead sealant compounds. FY 1987
   - Complete fire hazard evaluations of existing shipboard electrical cables. FY 1987
   - Develop test methods and criteria (flammability, smoke generation, toxicity and corrosive combustion products) for whole cable testing. FY 1990
   - Recommend modifications to MIL-SPEC for cable fire testing. FY 1988
   - Complete Navy acceptance tests of fire hardened cable coating systems. FY 1989

4. (U) Chemical/Biological/Radiological (CBR)
   - Complete advanced development of impermeable protective suit with cooling. FY 1989
   - Complete advanced development of soft shelter for NBG/NCF. FY 1989
   - Complete advanced development of pressure swing adsorption. FY 1989
   - Complete advanced development of hardened permeable protective suit. FY 1989
   - Complete advanced development of detection and warning integration. FY 1990
   - Complete advanced development of aircraft decontamination equipment for use by air capable ship and land based ground crews. FY 1989
   - Complete advanced development of stabilized peroxide decontaminant. FY 1988
   - Complete advanced development of automatic liquid agent detector. FY 1989
   - Complete advanced development of internal CB monitoring network. FY 1992

5. (U) Cold Weather/Arctic Operations
   - Conduct ship icing experiment FY 1988
   - Update fleet cold weather documents FY 1989
   - Report-ship operation limitations in cold weather FY 1989
   - Report-near-term ship system improvements FY 1991
   - Report-recommendations for new ship designs FY 1992

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63522N
Title: Submarine Arctic Warfare Support Equipment Program
DoD Mission Area: 323 - Tisra For Naval Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 7,911 | 2,804 | 2,008 | 3,474 | Continuing | Continuing |
| S0770 | Advanced Submarine Surveillance Support Program | 1,575 | 2,804 | 2,008 | 3,474 | Continuing | Continuing |
| S1739 | Submarine Arctic Warfare Development | 6,336 | * | * | * | * | * |

* Project S1739 transferred to PE 63562N in FY 1987.

The above funding profile includes out-year escalation and encompasaes all work and development phaaes now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Investigate new techniquea, technologiea, and algorithma for application to improve submarine Electronic Support Measurea (ESM) equipment and procedurea. The increased ESM capability is needed to allow submarines to effectively operate in the increasingly dense and sophisticated electronic warfare environment. These efforta include improved threat warning, increased organic support for over-the-horizon targeting (OTHT) of submarine launched cruise missiles, and expanded tactical reconnaiasance capability.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The differences between the FY 1987 Descriptive Summary and this Descriptive Summary are as follows: The decreaae of -1,534 in FY 1986 is due to a GRH adjustment and Department program/budget adjustments. The decrease of -1,134 in FY 1988 is due to delay in start of AN/WLQ-( ) ESM ayatem development to FY 1989. This change reflects Department program/budget adjuatment.

Program Element: 63522N Title: Submarine Arctic Warfare Support Equipment Program

(U) FUNDING AS REFLECTED IN THE FY 1987 PRESIDENT'S BUDGET:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 9,672 | 9,445 | 2,946 | 3,142 | Continuing | Continuing |
| X0770 | Advanced Submarine Surveillance Support Program | 2,159 | 1,878 | 2,946 | 3,142 | Continuing | Continuing |
| S1739 | Submarine Arctic Warfare Development | 7,513 | 7,567 | * | * | * | * |

* Project S1739 tranfers to PE 63562N in FY 1987.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: None.

E. (U) RELATED ACTIVITIES: This program dovetails with the developments in Program Element 64515N, Submarine Surveillance Support Program. Close monitoring of other defense and federal agencies is conducted by the Chief of Naval Operations, Assistant Secretary of the Navy (Research, Engineering and Systems), and Under Secretary of Defense for Research and Engineering to take advantage of all available technology and to prevent unnecessary duplication of effort within the Navy or Department of Defense.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Underwater Systems Center, New London, CT, and Newport, RI; Naval Research Laboratory, Washington, D.C.

G (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project S0770, Advanced Surveillance Support Program:

1. (U) Description: Continuing program to investigate new techniques, technologies, and algorithms for application to improve existing and future submarine Electronic Support Measures (ESM) equipment and procedures. The increased ESM capability is needed to allow submarines to effectively operate in an increasingly dense and sophisticated electronic environment. These improvements include better threat warning, improved organic support for over-the-horizon targeting of submarine launched cruise missiles, and expanded tactical reconnaissance capability.

Program Element: 63522N Title: Submarine Arctic Warfare Support Equipment Program

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Continued work on improved radar cross-section reduction material to reduce submarine detectability.
° Continued work on an advanced receiver for extended frequency coverage.
° Initiated definition of requirements for an advanced multi-sensor antenna with extended frequency coverage.
° Initiated development of detection and recognition algorithms for extended frequencies using advanced modulation techniques.
° Initiated development of very high speed data transfer techniques for RF and digital data distribution.

b. (U) FY 1987 Program:

° Continue/complete efforts of 1986 program.
° Begin studies/modeling efforts in the following areas in preparation for WLQ-() development:
- Dense receiver packaging techniques.
- Advanced signal detection and processing hardware.
- RF digitizing of data transfer hardware to support extended frequency coverage.
- Digital data distribution hardware necessary to support extended frequency coverage.
- Radar cross-section reduction techniques to include mast shaping and mast fabrication materials which do not require coatings.
- Algorithms and techniques to correlate ESM system data with off-board information for OTHT.

c. (U) FY 1988 Planned Program:

° Develop and build ESM algorithms and techniques for millimeter wave signals, missile targeting, and tactical support.
° Develop a design for a reduced radar cross-section antenna.
° Continue radar cross-section reduction techniques.

Program Element: 63522N Title: Submarine Arctic Warfare Support Equipment Program

d. (U) FY 1989 Planned Program:

- ° Test and validate ESM algorithms and techniques for millimeter wave signals, missile targeting, and tactical support.
- ° Build a reduced radar cross-section antenna.
- ° Develop and build ESM algorithms and techniques for spread-spectrum signals.

e. (U) Program to Completion: This is a continuing program.

- ° Complete ESM algorithms and techniques for millimeter wave signals, missile targeting, and tactical support.
- ° Test and validate a reduced radar cross-section antenna.
- ° Test and validate ESM algorithms and techniques for spread-spectrum signals.
- ° Define requirements for future complex, exotic signals in a dense signal environment.
- ° Complete reduced radar cross-section antenna.
- ° Complete ESM algorithms and techniques for spread-spectrum signals.
- ° Develop techniques for processing future complex, exotic signals.
- ° Build algorithms and techniques for procesaing and displaying future complex, exotic signals.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63525N
Title: Pilot Fish
DoD Mission Ares: 235 - Naval Wsrfare Support
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PPOJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Totsl Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 91,836 | 71,841 | 74,459 | 59,851 | N/A | N/A |
| T0428 | Pilot Fish | 91,836 | 71,841 | 74,459 | 59,851 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of s higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63527N
DoD Mission Area: 235 - Naval Warfare Support

Title: Retract Larch
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 0 | 0 | 92,886 | 228,905 | N/A | N/A |
| R1965 | Retract Larch | 0 | 0 | 92,886 | 228,905 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63528N
DoD Mission Area: 233 - Anti-Submarine Warfare

Title: Non-Acoustic Anti-Submarine Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 20,324 | 20,255 | 20,397 | 20,818 | Continuing | Continuing |
| X0967 | Non-Acoustic Anti-Submarine Warfare | 20,324 | 20,255 | 20,397 | 20,818 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Continuing advances in Soviet submarine technology and reduce the effectiveness of U.S. Anti-Submarine Warfare forces. Current ASW forces rely primarily on acoustic technology in the detection and tracking of submarines. Developments in the technologies related to Non-Acoustic Anti-Submarine Warfare can potentially augment the Anti-Submarine Warfare capabilities of U.S. forces. The purpose of this program is to ensure that Non-Acoustic Anti-Submarine Warfare concepts are properly evaluated and exploited. This program monitors

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The differences between the funding profile shown in the FY 1987 Descriptive Summary and this Descriptive Summary are as follows: The decrease of -1,280 in FY 1986 is the result of GRH and Department program adjustments. The decrease of -5,884 in FY 1987 is the result of Congressional action and adjustments and Department program/budget adjustments. The decrease of -3,819 in FY 1988 is the result of a Department program/budget adjustments.

Program Element: 63528N Title: Non-Acoustic Anti-Submarine Warfare

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 22,204 | 21,604 | 26,139 | 24,216 | Continuing | Continuing |
| X0967 | Non-Acoustic Anti-Submarine Warfare | 22,204 | 21,604 | 26,139 | 24,216 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: This program draws heavily on the non-acoustic work already accomplished and continuing

consists of top level management of all related non-acoustic anti-submarine warfare activities and reviews all efforts in the field of non-acoustics to ensure that promising efforts are pursued and redundant efforts are avoided. The committee

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Underwater Systems Center, Newport, RI (Lead Lab); Naval Air Development Center, Warminster, PA; Naval Research Laboratory, Washington, DC; U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH. CONTRACTORS: Applied Physics Laboratory/Johns Hopkins University, Laurel, MD; TRW Space Systems, Redondo Beach, CA; Arete Associates, Sherman Oaks, CA; Dynamics Technology, Inc., Torrance, CA; General Physics Corp., Columbia, MD; Electric Boat Division, General Dynamics Corp., Groton, CT; Interstate Electronics Corp., Anaheim, CA; KLD Associates, Huntington, NY; ORI, Inc., Rockville, MD; Pacific Sierra Research Corp., Santa Monica, CA; MITRE Corp., McLean, VA; Sonalysts, Inc., Waterford, Ct; D.H. Wagner Associates, Paoli, PA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project S0967, Non-Acoustic Anti-Submarine Warfare

1. (U) Description: Non-acoustic technology provides a potential adjunct for ASW forces to counter the strategic and

general purpose submarine forces of an adversary. The occurrence of non-acoustic phenomena may be classified into categories based on the underlying physics which describe the generation of the observable phenomena.

The understanding of these phenomena and their detection lies in the forefront of science and technology and is developed within the areas of

Because of the emerging and dynamic nature of non-acoustics, it is essential to continuously monitor and assess technical progress and capability. Furthermore, those techniques with sufficient maturity and merit must be evaluated in the context of an advanced development program in order to determine their military utility. The intent of this program is to exploit non-acoustic technology as a potential solution to the current and future ASW requirements of the Navy.

2. (U) Program Accomplishments And Future Efforts:

a. (U) FY 1986 Program:

b. (U) FY 1987 Program:

Program Element: 63578N

Title: Non-Acoustic Anti-Submarine Warfare

c. (U) FY 1988 Planned Program:

d. (U) FY 1989 Planned Program:

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones: Not Applicable

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/1989 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63529N
Title: Advanced Anti-Submarine Warfare Target
DoD Mission Area: 233 - Anti-Submarine Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/1989 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 8,199 | 10,263 | 13,670 | 11,529 | 90,502 | 159,939 |
| S0968 | Advanced Anti-Submarine Warfare Target | 1,468 | 6,705 | 3,861 | 967 | 66,062 | 99,009 |
| S1017 | Expendable Mobile ASW Training Target | 3,924 | 1,058 | 0 | 0 | 0 | *10,812 |
| S1955 | Fast/Deep Prototype Target | 2,807 | 2,500 | 9,809 | 10,562 | 24,440 | 50,118 |

* Includes 4,220 funded under Project 1017 in P.E. 64703N prior to FY 1984. Transferred to this P.E. per Congressional direction.

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Advanced ASW Target Program is an upgrade develcpment to the current fleet ASW Training Target MK-30 Mod 1. The Advanced ASW Target and its associated support equipment will realistically simulate the submarine threat postulated for the 1990s. The Advanced ASW Target will be an underwater vehicle capable of duplicating acoustic and the dynamic characteristics of current and future threat submarinea. Such a mobile target does not currently exist, but is required to provide the needed degree of threat realism for fleet training, including operational readiness evaluations. The primary mission of the target is the training of fleet personnel, with a secondary mission of follow-on test and evaluation of advanced weapons subsequent to their delivery to the fleet. Targets MK-30 Mod 1 and MK-27 Mod 0 are presently in the Navy's inventory, but they cannot provide the degree of threat realism required nor are their design characteristics compatible with new

Program Element: 63529N Title: Advanced Anti-Submarine Warfare Target

advanced sensor and weapon syatems. This program will develop modifications on an incremental basis to the Target MK-30 Mod 1 which will be recoverable, reusable, designed for high reliability, and easily maintainable in order to support a 2400 per year in-water run rate on a cost effective basis. The Upgrade MK 30 Mod 1 is intended for use on the Navy's instrumented 3-D underwater tracking ranges. Project S1017 of this PE develops the MK 39 Expendable Mobile ASW Training Target (EMATT). EMATT is a less capable, open ocean (anytime, snywhere) expendable training target. The MK 39 will provide an air anti-submarine warfare (ASW) training capability and enhanced capability for aurface ASW forces currently using the MK 38, the only expendable training target in inventory The MK 39 Expendable Mobile ASW Training Target provides increased control of speed, course, and depth, as well aa magnetic and aaly atimulation, increased endurance, and expanded acoustic capability. It can be deployed from air and aurface platforms. The Faat/Deep Prototype Target, being developed in Project S1955, will provide a single vehicle with capability for threat simulation for MK 48 Advanced Capability Torpedo and MK 50 Advanced Lightweight Torpedo demonstration and evaluation. No present Navy test facility can provide this type of in situ testing.

The prototype target will use existing electro-acoustical hardware, MK 48 shells and structures, and a state of the art technology Advanced Stored Chemical Energy Propulaion System (ADSCEPS) engine to provide a high speed, deep depth capability. The prototype target will be evaluated at-sea in FY 1988 for further development with a modular approach which combines the field supportable electro-acoustic hardwsre of the Advanced ASW target with the propulsion system of the prototype. Thia concept is intended to provide a very cspable teat snd evaluation target possessing a high degree of commonality with the Advanced ASW target. This project (S1955) will also provide for an improvement of simulation capabilities designed to counter the fast/deep threat.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile ahown in the FY 1987 Deacriptive Summary and thst ahown in this Descriptive Summary are as follows: In FY 86, a decreaae of -943 due to GRH and Department budget adjustments; in FY 88 the decrease of -3,534 is due to a Department program/budget adjustment.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 12,925 | 9,142 | 10,282 | 17,204 | 76,067 | 147,578 |
| S0968 | Advanced Anti-Submarine Warfare Target | 10,110 | 6,788 | 9,190 | 17,204 | 76,067 | 137,354 |
| S1017 | Expendable Mobile ASW Training Target | 2,815 | 2,354 | 1,092 | 0 | 0 | 10,224 |

Program Element: 63579N Title: Advanced Anti-Submarine Warfare Target

D. (U) OTHER FY 1988/1989 APPROPRIATION FUNDS: None

E. (U) RELATED ACTIVITIES: For S1955: Program Element 64670N, MK-50 Torpedo, which is developing a lightweight torpedo with performance characteristics which will counter the predicted submarine threat and Program Element 64675N, MK-48 Advanced Capability Torpedo, which is developing upgrades to the MK-48 heavyweight torpedo for the same reason. For S0968, numerous air, surface and subsurface ASW Sonar/sensor programs and inservice MK 48 and MK 46 Torpedo programs. For S1017 the inservice MK-46 torpedo, Active and Passive Sonobuoys and ASW surface ship sonars.

F. (U) WORK PERFORMED BY: IN-HOUSE: For Project S0968, S1017, and S1955 Naval Sea Systems Command, Washington, DC; Naval Underwater Systems Center, Newport, RI (lead laboratory). CONTRACTOR: For S0968: Prime Contractor: Goodyear Aerospace Corp., Akron, Ohio; Principal Subcontractors: Raytheon Corp., Portsmouth, RI; Bendix Corp., Teterboro, NJ; Sundstrand, Redmond, WA; For S1955: Prime Contractor: Applied Physics Laboratory, Pennsylvania State College, State College, PA. For S1017: Prime Contractor: Sippican Ocean Systems Inc., Marion, MA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project S1017, Expendable Mobile ASW Training Target:

1. (U) Description: The MK 39 is being developed to meet a fleet requirement for an expendable, open ocean, mobile target system for use by all surface and airborne ASW platforms. The air deployment capability does not exist in the current MK-38 target inventory. The Expendable Mobile ASW Training Target will also provide increased dynamic capability, programmed run capability, acoustic compatibility with all Fleet surface ship and air platform sonars/sonobuoys, and Magnetic Anomaly Detector (MAD) simulation.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Battery safety certified.
° Active acoustic response/passive signature demonstrated.
° Hydrodynamic prototype vehicles completed 52 in-water runs demonstrating heading and depth control and MAD wire release and tow capability.

b. (U) FY 1987 Program:

° Complete TECHEVAL.
° Conduct critical design review.

Program Element: 63529N Title: Advanced Anti-Submarine Warfare Target

- ° Prepare to transition to production with proven technology.
- ° Identify preplanned product improvements.
- ° Complete program.

c. (U) FY 1988 Planned Program: Not applicable.

d. (U) FY 1989 Planned Program: Not applicable.

e. (U) Program to Completion: Not applicable.

(U) Project S0968, Advanced Anti-Submarine Warfare Target:

1. (U) Description: The present submarine threat is simulated by the Mobile Targets MK-27 Mod 0 and MK-30 Mod 1 for ASW fleet training and sensor and weapons follow-on evaluations. Future submarine threats are characterized as being faster, deeper and quieter. To counter this threat new ASW weapons such as the MK 48 Advanced Capability torpedo and MK 50 Advanced Lightweight torpedo are now in development. Concurrently, development of an Advanced ASW Target is necessary to provide a training target compatible with these advanced weapons. This program will incrementally develop modifications to the Target MK-30 Mod 1 which will be acoustically and functionally capable of exercising and evaluating new acoustic weapons and sensors. Included in first increment (Block 1) modifications are an upgraded acoustic signal processor, power amplifier, and towed array which introduce new target capabilities

The Block 1 electro-acoustic modifications will be developed in the Fast/Deep Prototype target project (S1955) and backfitted into the Advanced ASW target. Included in the second increment (Block 2) development are modifications to the guidance and control subsystem for increased dynamic maneuvers, a new recording subsystem for increased data recording, and new test equipment for target maintenance. The targets produced during development are required to support technical and operational evaluation prior to a production decision.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- ° Completed Systems Design Review (Jan 86) to validate system specifications and prime contractor's conceptual design.
- ° Redirected program slowdown (Mar 86) due to Congressional direction to initiate Fast/Deep Prototype Target within same PE.
- ° Conducted Preliminary Design Review (Sep 86) to validate subsystem design and initiate bread/brassboard fabrication.

Program Element: 63529N

Title: Advanced Anti-Submarine Warfare Target

b. (U) FY 1987 Program:

- Fabricate and test breadboard/brassboard hardware for Advanced ASW Target.
- Complete software and hardware design/conduct Critical Design Review to validate that the detailed design satisfies performance requirements for the Advanced ASW Target.
- Integrate target and perform total target land-based system tests for Advanced ASW Target.

c. (U) FY 1988 Planned Program:

- Initiate fabrication of workshop test and handling equipment for electro-acoustic subsystem development models being developed under project S1955.

d. (U) FY 1989 Planned Program:

- Initiate environmental, reliability and maintainability testing of electro-acoustic subsystem development models being developed under project S1955.

e. (U) Program to Completion:

- Conduct systems integration and assembly factory testing.
- Conduct vehicle factory acceptance tests.
- Conduct contractor in-water prototype vehicle contractor testing.
- Conduct Navy Technical and Operational Evaluation.
- Conduct Milestone III review for approval to initiate production (FY 92).
- Assess need and feasibility for second increment of advanced target upgrade.

Program Element: 63529N

Title: Advanced Anti-Submarine Warfare Target

H. (U) PROJECT OVER $10 MILLION IN FY 1988/89:

(U) Project S1955, Fast/Deep Target:

1. (U) Description: This project accelerates the development of an Advanced Stored Chemical Energy Propulsion System (ADSCEPS) for the Fast/Deep Prototype Target and completes the electro-acoustics subsystem development required for both the Block 1 upgrade of the Advanced ASW target and any follow-on test and evaluation target to the prototype.

This program was created by Congressional direction in FY 1986 and financed with $3.0M taken from project S0968. It is a rapid development project, which is to complete in 1987, making maximum use of existing target components. The Fast/Deep Prototype Target will be required to support the MK-50 Advanced Lightweight Torpedo and the MK-48 Advanced Capability torpedo testing. Upon completion of the Fast/Deep Prototype Target, providing satisfactory proof of concepts, this Fast/Deep propulsion capability can be incorporated into a variant of the Advanced ASW Target S0968 for test and evaluation as well as training. This project will also provide for an improvement to the Navy's simulation capabilities which will assist in countering the Fast/Deep threat.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Initiated Fast/Deep Prototype Target program.
- Initiated Fast/Deep Prototype Target payload design, interface specifications development and overall target integration.
- Initiated Fast/Deep Prototype Target power plant and propulsor design.

b. (U) FY 1987 Program:

- Conduct in-water testing of Fast/Deep Prototype target.
- Evaluate Fast/Deep Prototype Target testing.
- Complete Fast/Deep Prototype Target development.

c. (U) FY 1988 Program:

- Following completion of Fast/Deep Prototype target at-sea evaluation, assess need and feasibility of providing modular Fast/Deep propulsion system to training/test and evaluation targets.
- Initiate fabrication of components for three advanced electro-acoustic target subsystem development models.

Program Element: 63529N Title: Advanced Anti-Submarine Warfare Target

° Conduct software coding and checkout of electro-acoustic developmental models.
° Initiate simulator upgrade program designed to counter Fast/Deep threat.

d. (U) FY 1989 Program:

° Continue fabrication of advanced electro-acoustic subsystem developmental models.
° Conduct software module testing and integration.
° Assuming satisfactory proof of content and continued demonstration of need for follow-on target, commence development of modularized Fast Deep training/test and evaluation target.
° Continue simulator upgrade program designed to counter Fast/Deep threat.

e. (U) Program to Completion:

° Complete fabrication of advanced electro-acoustic subsystem development models.
° Complete development of modularized follow-on training/test and evaluation target with IOC planned for FY 1994.
° Complete simulator upgrade program designed to counter Fast/Deep threat with IOC planned for FY 1994.

f. (U) Major Milestones: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63536N
Title: Retract Juniper
DoD Mission Area: 735 - Naval Warfare Support
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 15,636 | 23,125 | 30,672 | 38,322 | N/A | N/A |
| R1861 | Retract Juniper | 15,636 | 23,125 | 30,672 | 38,322 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63542N
DoD Mission Area: 235 - Naval Warfare Support

Title: Radiological Control
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 2,002 | 1,261 | 2,925 | 3,341 | Continuing | Continuing |
| S1825 | Radiological Controls | 176 | 97 | 176 | 179 | Continuing | Continuing |
| S1830 | Radiac Development | 1,826 | 1,164 | 2,749 | 3,162 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Present RADIAC instrumentation is based largely on obsolete electronic technology and incurs expensive calibration and maintenance costs. New requirements for the measurement of lower tritium and neutron levels necessitate the development of modernized instrumentation. The new RADIAC instruments, using microprocessor technology, will reduce operational costs by more than 50% (saving more than $4.5 million per year starting in FY 91) and produce a savings-to-investment ratio of at least five to one. This program has resulted in the successful development of an improved continuous radioactive air particle detector (the 1M-239/WDQ), now in full production, and providing vitally needed advances in performance reliability and maintainability required for nuclear powered ships. The program is critical to joint-service radiation safety initiatives within DoD and has been coordinated with Army, Air Force, and Defense Nuclear Agency personnel to achieve the maximum cross-service applicability. This program also provides required improvements in nuclear weapon intrinsic (gamma and neutron) shielding determinations, in mixed-field (gamma and neutron) dosimetry and in neutron measurement to ensure safety and health of personnel.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: The changes between the FY 1987 Descriptive Summary and this Descriptive Summary are as follows: Project S1830: The decrease of -1,259 in FY 87 is the result of Congressional action and adjustments. Project S1825: The decrease of -72 in FY 87 is the result of Congressional action and adjustments.

Program Element: 63542N Title: Radiological Control

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 1,659 | 2,140 | 2,592 | 3,005 | Continuing | Continuing |
| S1825 | Radiological Controls | 188 | 190 | 169 | 181 | Continuing | Continuing |
| X1830 | Radiac Development | 1,471 | 1,950 | 2,423 | 2,824 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Radiological Controls OPN (310987) | 1,440 | 227 | 344 | 455 | Continuing | Continuing |
| Radiac Procurement OPN (312920) | 8,065 | 7,931 | 7,599 | 6,313 | Continuing | Continuing |

E. (U) RELATED ACTIVITIES: Program Element 62764N, (Chemical, Biological, and Radiological Defense Technology) conducts exploratory development of detectors and technology to be used by Project S1830.

F. (U) WORK PERFORMED BY: Project S1825: IN-HOUSE: Naval Surface Weapons Center, White Oak Laboratory, Silver Spring, MD; Naval Research Laboratory, Washington, DC. Project S1830: IN-HOUSE: Naval Surface Weapons Center, Dahlgren, VA; White Oak Laboratory, Silver Spring, MD; Department of Energy, Oak Ridge National Laboratory, Oak Ridge, TN; Department of Energy, Los Alamos National Laboratory, Los Alamos, NM. CONTRACTORS: Science Applications Inc., La Jolla, CA; and Maryland University, College Park MD.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project S1825, Radiological Controls:

1. (U) Description: The Nuclear Weapons Radiological Controls Program was established to reduce the ionizing radiation dose to personnel from nuclear weapons handling, stowage and maintenance. To achieve this result without impairing operations, the program must obtain better knowledge of the mixed radiation fields present, devise better calculation methodologies to predict radiation levels from new weapons systems, and obtain better knowledge of shielding parameters to be incorporated into new construction (including new candidate shielding materials). Also, improved personnel dosimetry devices for the measurement of low levels of radiation exposure in mixed gamma and neutron fields are required in order to keep exposures as low as reasonably achievable and to document personnel exposures more accurately in Navy ships and activities.

Program Element: 63542N Title: Radiological Control

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Continued neutron spectral measurement improvements.
- Continued development of improved calculational methodologies for shielding and new weapons systems evaluations.
- Completed computer code improvement for calculation of mixed gamma and neutron dose from weapons intrinsic radiation suitable for application to the shipboard environment.
- Continued development of an accurate, locally-readable (field) dosimetry system for use in mixed gamma and neutron fields.
- Continued re-evaluation of existing and planned integral ship shielding based on neutron quality factor change.

b. (U) FY 1987 Program:

- Continue shielding developments for carriers and evaluation of new technologies for possible incorporation into dosimeter development.
- Personnel dosimetry and neutron measurement will receive major emphasis as a result of changes in Federal regulations which increase the quality factor for calculation of neutron exposure and reduces overall exposure limits.

c. (U) FY 1988 Planned Program:

- Continue review and development of existing and planned ship shielding based on neutron quality factor change.
- Continue review and development of state of the art personnel dosimetry and neutron measurement instrumentation, including new efforts specifically oriented toward proper measurement of the deep dose equivalent value stipulated in proposed federal radiation protection standards.

d. (U) FY 1989 Planned Program:

- Continue review and development of existing and planned ship shielding, considering new weapons system evaluations and neutron quality factor changes.
- Continue review and development of state-of-the-art personnel dosimetry and neutron measurement instrumentation with emphasis on the measurement of deep dose equivalent.

e. (U) Program to Completion: This is a continuing program.

Program Element: 63542N Title: Radiological Control

(U) Project S1830, Radiac Development:

1. (U) Description: Present radiation safety instrumentation (RADIAC) is largely based on obsolete electronic technology. Because of this, a very large variety of single-purpose RADIAC instruments requiring costly manual repair and calibration are now in service. Also, new instruments are needed to ensure that Navy operations continue to comply with radiation safety standards established by national and international authorities. The very powerful capabilities of microproceasor electronics has made it possible to solve many of these problems. When fully implemented, microprocessor technology will reault in a RADIAC procurement cost savings of not less than 20% and a calibration and maintenance cost advantage of over 50% ($4.5 million per year) compared to current costs for portable RADIAC instruments while aimultaneouly providing large improvementa in sensitivity, reliability and utility. The Radiological Controls program takes advantage of this technology to:

2. (U)Program Accomplishments and Future Efforts:

° Permit a many-fold reduction in the variety of instruments (RADIAC) which are largely based on obsolete electronic technology.
° Produce instruments that can be calibrated automatically in minutes instead of manually in houra.
° Produce instruments possessing the best possible sensitivity, accuracy, reliability and crosa-service applicability.

a. (U) FY 1986 Program:

° Began advanced design of the Multifunction RADIAC instrument for uae in nuclear weapona accident situations, emergency response and battlefield survey applications.
° Developed breadboard model of the Wide-Range RADIAC instrument for precise measurement of radiation in nuclear proplusion and industrial applications to replace over twenty different instrumenta preaently used in this service.
° Began conceptual design of an underwater RADIAC instrument for use by divera for which there ia no exiating suitable instrument.
° Continued design of an automated RADIAC calibration and diagnostics system (ARCADES) to permit rapid, cost effective calibration and repair of the Multifunction, Wide-Range and other new generation RADIAC inatruments.

b. (U) FY 1987 Program:

° Develop ARCADES prototype.
° Build 5 Wide-Range Radiac prototypes.
° Continue advanced design of Multifunction Radiac.
° Initiate conceptual design of Neutron Dosimeter/Laser Heated TLD radiation dosimetry system to meet current needs for a modern, single, all-Navy dosimetry system and to meet need for an accurate neutron dosimeter required by more stringent international neutron personnel radiation exposure standards. This task is coordinated with efforts in Project S1825 (Radiological Controls).

Program Element: 63542N Title: Radiological Control

c. (U) FY 1988 Planned Program:

- Begin breadboard design for Underwater Radiac.
- Begin Advanced Development of ARCADES.
- Begin Advanced Development of Wide-Range RADIAC (simultaneous development by two contractors).
- Complete Advanced Development of Multifunction RADIAC.
- Begin conceptual design of alpha and neutron probes for Wide-Range Radiac.
- Begin initial development of a small alarming dosimeter for use by Explosives Ordnance Disposal (EOD) personnel to alert them to the presence of radiation.
- Begin advanced development of Neutron Dosimeter/Laser Heated TLD.

d. (U) FY 1989 Planned Program:

- Continue Advanced Development of ARCADES and Wide-Range RADIAC.
- Begin Full Scale Engineering Development of Multifunction RADIAC.
- Continue design of alpha and neutron probes for Wide-Range RADIAC.
- Begin advanced development model of EOD dosimeter.
- Begin conceptual design of a new tritium monitor having a ten-fold greater sensitivity than existing instruments. Greater sensitivity is needed to ensure continued compliance with the most recent safety standards established for this radionuclide
- Continue advanced development of Neutron Dosimeter/Laser Heated TLD.

e. (U) Program to Completion: This is a continuing program.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63550N
Title: Link Dogwood
DoD Mission Area: 235 - Naval Warfare Support
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 23,815 | 2,000 | 0 | 0 | N/A | N/A |
| R1817 | Link Dogwood | 23,815 | 2,000 | 0 | 0 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63553N
DoD Mission Area: 233 - Anti-Submarine Warfare

Title: Surface Anti-Submarine Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 15,156 | 19,336 | 21,073 | 31,100 | Continuing | Continuing |
| S0229 | Surface Ship Silencing | 2,031 | 4,283 | 5,105 | 5,976 | Continuing | Continuing |
| S1704 | ASW Advanced Development | 13,125 | 15,053 | 15,968 | 25,124 | Continuing | Continuing |

As this is a continuing program, the above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program develops anti-submarine warfare improvements for surface ships with an ASW mission and silencing improvements for all surface ships. Ongoing efforts focus on the development of cost effective means for reducing the to enable optimum use of present and future sonar systems, and development of methods to particularly at higher operating speeds. The program also provides for the advanced development of technology for ongoing surface ship ASW system improvement programs, and supports developments for the CNO's Urgent ASW R&D Program in active sonar classification.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are a follows: Project S1704: In FY 1986, a reduction of -1,414 for GRH adjustments and Department program/budget adjustments; in FY 1987, a reduction of 3,011 for Congressional adjustment/action and in FY 1988, -4,247 reduction due to Depsrtment program/budget adjustment. Project S0229: In FY 1988, a reduction of 5,919 due to Department budget/program adjustments.

Program Element: 63553N

Title: Surface Anti-Submarine Warfare

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 17,252 | 16,728 | 23,168 | 31,239 | Continuing | Continuing |
| S0229 | Surface Ship Silencing | 2,729 | 2,189 | 5,104 | 11,024 | Continuing | Continuing |
| S1704 | ASW Advanced Development | 14,523 | 14,539 | 18,064 | 20,215 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| Other Procurement BA-1/PE/Line Item | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Coat |
|---|---|---|---|---|---|---|
| 24225Q 330943 | 1,379 | 6,925 | 11,531 | 13,945 | Continuing | Continuing |

E. (U) RELATED ACTIVITIES: Program Element 62121N and 62323N, Ship and Submarine Technology - Development of acoustic silencing technology and Program Element 25634N, Submarine Silencing - Development of noise reduction technology for submarines.

F. (U) WORK PERFORMED BY: IN-HOUSE: Project S0229: David Taylor Naval Ship Research and Development Center, Carderock, MD; Naval Underwater Systems Center, New London, CT; Pennsylvania State University Applied Research Lab, State College, PA; Epoch Engineering, Gaithersburg, MD. Project S1704: Naval Ocean Systems Center, San Diego CA; Naval Underwater Systema Center, New London, CT; Naval Oceanographic Research and Development Activity, Bay St. Louis, MS; Naval Research Laboratory, Orlando, FL; Applied Physics Labotratory, Johns Hopkins University, Laurel, MD; Applied Research Laboratory, University of Texas, Austin, TX.

Program Element: 63553N Title: Surface Anti-Submarine Warfare

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project SO229, Surface Ship Silencing:

1. (U) Description: This project improves surface ship anti-submarine warfare performance and survivability, particularly at higher operating speeds, by developing cost effective means of reducing sonar self-noise and radiated noise. Adaptation of technology developed in the Submarine Silencing Program (Program Element 25634N) and commonality across ship classes are stressed.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Completed initial DD 963/993 class quieting design studies and initiated at-sea evaluations of quieting improvements.
° Continued development of hull decoupling systems for ASW ships.
° Continued development of low noise propulsor.
° Completed analysis of FFG 39 (DOYLE) diagnostic evaluation and initiated FFG-7 specific quieting improvements.
° Initiated hull decoupling efforts for non-ASW ships.

b. (U) FY 1987 Program:

° Develop diagnostic evaluation plan for CG-47 class.
° Continue specific DD-963/993 and FFG 7 quieting design studies and at-sea evaluations.
° Initiate hull decoupling, low noise propulsor and AN/SQS-53C baffle follow-on development efforts.
° Initiate compound air masker system (CAMS) engineering development to support full-scale operational evaluation.
° Initiate airborne quieting efforts.

c. (U) FY 1988 Planned Program

° Continue FFG 7 and DD 963 class quieting improvements.
° Conduct CG 47 class diagnostic trial and initiate class specific acoustic developments.
° Continue developments for compound air masker system (CAMS), quiet propulsor and airborne quieting.

Program Element: 63553N Title: Surface Anti-Submarine Warfare

d. (U) FY 1989 Planned Program:

- ° Continue CG 47 class sonar self-noise and radiated noise quieting and sonar tangential baffle development.
- ° Complete acoustic diagnostic evaluation and analysis of CG 47 and DDG 51 class ships.
- ° Start quiet propulsor development feasibility investigations.
- ° Start full-scale evaluations.
- ° Start compound air masker system (CAMS) detailed design for CG/CGN Class.
- ° Start air system improvement design studies and evaluations.
- ° Continue investigations to support identification and prioritization of airborne requirements.

e. (U) Program to Completion:

- ° This is a continuing program.
- ° Complete detail planning for outyear efforts emphasizing CG 47 quieting, application of combined air masker system (CAMS) on CGN 38 class ships, acoustic quieting of battle group high value units (i.e., CV/CVNs, BBs, and AOR/AFS/AOEs), and the acoustic quieting of MCM/MHC ships.
- ° Complete at-sea demonstration of compound air masker systems (CAMS) on CG/CGN combatant.
- ° Develop, install and evaluate compound air masker system (CAMS) installation on a MLSF or Amphibioua platform.
- ° Complete at-sea demonatration and analysis of alternative hull decoupling systems, low noise propulsor systems, and array quieting in consort with projects such as the surface ship torpedo defense (SSTD) project and the surface ship ASW Advanced Development aonar project.
- ° Initiate developments for compound air masker system (CAMS) applicationa, with emphasis on quieting Non-ASW Combatants, MLSF ships, Amphibious ships, and specialized ships.
- ° Continue acoustic quieting developmenta for new construction ships.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project S1704, ASW Advanced Development:

1. (U) Deacription: Project provides for the advanced development of technology to support surface ship ASW system upgrades to counter the new, quieter, Soviet submarine threat. The primary focus of technology transition will be the AN/SQQ-89 Improvement Program. The technologies to be investigated include a which will be an array of

transducers mounted in the bow of the ship to,

Improved signal and contsct dsta processing techniques will be developed to ensure that the resultant high gains can be utilized by system operators.

2. (U) Program Accomplishments and Future Efforts:

a. (C) FY 1986 Program:

° Integrated Processing Demonstration System (IPDS), upon which processing functions will be evaluated was installed snd brought on line at the Naval Underwater Systems Center.
° Evsluations of four new completed; data to be used in the evaluation of concepts.
° Critical messurements of reverberation and submarine target strengths processed and analyzed.
° Completed tow body tests at David Taylor Naval Ship Research and Development Center model basin.
° Conducted measurements at Atlantic Underwater Test and Evaluation Center of dynamic line motion for future element location system development.

b. (C) FY 1987 Programs:

° Conduct element location snd self noise tests.
° Awsrd contrsct for a reconfigurable evsluation system.
° Complete final design for reconfigurable evaluation system.
° Complete softwsre tests of Single Target Classifier (STC) algorithm for active classification improvements and install st IPDS for lab evaluation.
° Conduct csvitstion and hull absorption tests.
° Conduct volumetric srray tests and habitability investigation.
° Conduct st-ses testing of towed vertical array.
° Awarć contracts for partial arrays.

Program Element: 63553N Title: Surface Anti-Submarine Warfare

c. (U) FY 1988 Planned Program:

° Complete factory acceptance tests for reconfigurable evaluation system.
° Install reconfigurable evaluation system in a Navy ship and conduct sea acceptance tests.
° Complete fabrication of an partial array.
° Complete design and fabrication of a test fixture for
° Complete design and fabrication of a cavitation test fixture for
° Commence lake test of test fixture.
° Complete STC evaluation for active sonar classification.

d. (U) FY 1989 Planned Program:

° Conduct sea tests and evaluation of reconfigurable evaluation system.
° Initiate AN/SQQ-89I/BGMS receiver development.
° Conduct lake test of cavitation test fixture for
° Initiate AN/SQQ-89I/BGMS transmitter development.
° Integrate and evaluate clues developed for classification.
° Develop extended range clues for classification.

e. (U) Program to Completion:

° This is a continuing program.

f. (U) Major Milestones: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63560N
DoD Mission Area: 233 - Anti-Submarine Warfare

Title: Submarine Hull Array Development (Advanced)
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | FY 1990 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 7,783 | 8,615 | 0 | 0 | 0 | 0 | 184,284 |
| S0222 | Submarine Hull Array Development (Advanced)* | 4,718 | 3,764 | 0 | 0 | 0 | 0 | 165,211 |
| S1305 | Advanced Conformal Submarine Acoustic Sensor** | 3,065 | 0 | 0 | 0 | 0 | 0 | 14,222 |
| R1305 | Advanced Conformal Submarine Acoustic Sensor | 0 | 4,851 | 0 | 0 | 0 | 0 | 4,851 |

* Transitioned to PE 64524N, Project S1941 in FY 1988.
** Project S1305 transitions to R1305 in FY 1987.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program is for advanced development of hull-mounted sonar arrays for attack submarines. Improved passive and active arrays are needed to allow sonar detection and localization of Soviet submarines, both those currently deployed and those expected in the future. The Submarine Hull Array Development program includes the Wide Aperture Array (WAA) advanced development model which will validate the external array technology currently planned for use in the engineering development of the WAA. This array will provide long range passive detection and rapid passive ranging of current and future Soviet threat submarines and is planned for installation
The WAA (advanced) development is complete in FY 1987. Engineering development of the WAA will continue under PE 64524N, Project S1941 (FY 89 Submarine Combat System). The Advanced Conformal Submarine Acoustic Sensor (ACSAS) will utilize advancements in external array technology and greater size to provide long range active and passive detection and localization of Soviet threat submarines

C. (U) EXPLANATION OF CANCELLATION OR DEFERRAL: Project S0222: Engineering Development of WAA continued under Program Element 64524N, Project S1941 (FY 89 Submarine Combat System). Project S1305: The ACSAS program has been cancelled in FY 1988 and beyond due to Navy program decisions.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63562N
DoD Mission Area: 233 - Anti-Submarine Warfare

Title: Submarine Tactical Warfare Systems (Advanced)
Budget Activity: 4 - Tactical Programs

A.

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 20,356 | 9,759 | 9,035 | 9,410 | Continuing | Continuing |
| S1739 | Submarine Arctic Warfare Development | **(6,336) | 9,759 | 9,035 | 9,410 | Continuing | Continuing |
| S0221 | Target Strength Reduction | 11,110 | * | * | * | * | * |
| S0320 | Submarine Weapons Stowage/Launch | 9,246 | * | * | * | * | * |

* Transferred to PE 64561N
** Transferred from PE 63522N in FY 1987. FY 1986 funding shown for information only and is not included in the total.

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides the development to advance the capability of submarines to conduct warfare in the Arctic, including ASW, tactical surveillance, and other submarine support missions. Improved systems are needed This program responds

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: Project S1739: The FY 1986 reduction -1,231 is the result of a GRH adjustment and Department program/budget adjustments. Project S0221: The FY 1986 reduction of -2,202 is the result of a GRH adjustment and Department program/budget adjustments.

Program Element: 63562N Title: Submarine Tactical Warfare Syatems (Advanced)

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Eatimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 17,555 | 23,118 | 10,689 | 9,344 | Continuing | Continuing |
| S1739 | Submarine Arctic Warfare Development | **(7,513) | **(7,567) | 10,689 | 9,344 | Continuing | Continuing |
| S0221 | Target Strength Reduction | 12,515 | 13,312 | * | * | * | * |
| S0320 | Submarine Weapona Stowage/Launch | 5,040 | 9,806 | * | * | * | * |

* Transferred to PE 64561N
** Tranaferred from PE 63527N in FY 1987. FY 1985 and FY 1986 funding shown for information only and is not included in the total.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable

E. (U) RELATED ACTIVITIES: Program Element 62711N, Arctic Sonar Project; Program Element 62759N, Polar Ocean Acoustic Support/Arctic Undersea Warfare Environmental Support Project; Program Element 62543N, Vehicle Structurea Project; and support from these three exploratory development areas are needed for the Arctic advanced development efforta in this project Program Element 63504N, Project S0223 Submarine ASW Improvementa (Advanced) is a companion advanced development project with emphasis on non-Arctic efforts. Program Element 64503N, Project S0219 Submarine Sonar Improvements (Engineering), and Program Element 24281N, Project S0239 Mine Detection and Avoidance Sonar are engineering development projects Program Element 63569N, Advanced Submarine Development, will incorporate inputs on from this project for the

F. (U) WORK PERFORMED BY: IN-HOUSE: Arctic Submarine Laboratory, Naval Ocean Syatema Center, San Diego, Ca; Naval Postgraduate School, Monterey, Ca; Naval Reaearch Laboratory, Washington, DC; Naval Surface Weapona Center, White Oak Laboratory, Silver Spring, MD; Naval Underwater Systems Center, Newport, RI; David Taylor Naval Ship Reaearch and Development Center, Carderock, MD; Naval Ocean Research and Development Activity, Bay St. Louis, MS; Naval Coastal Systems Center, Panama City, FL. CONTRACTORS: Polar Research Laboratory, Santa Barbara, CA; Applied Physics Laboratory, Univeraity of Washington, Seattle, WA; Integrated Systems Analysts, Inc., Arlington, VA; Analysis and Technology Inc., North Stonington, CT; IDC Corporation, Palo Alto, CA; Applied Research Laboratory, University of Texas, Austin, TX; Casde Corporation, Alexandria, VA; and others. .

Program Element: 63562N Title: Submarine Tactical Warfare Systems (Advanced)

C. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project S1739, Submarine Arctic Warfare Development:

1. (U) Description: This program and in the event of actual warfare, to conduct combat missions under the ice. This program provides for the consolidation of resources, services, and management of many different efforts in the advanced development of submarine systems essential to Arctic warfare. It will assess submarine combat systems capabilities and effectiveness, including sensors, combat control and countermeasures. It will conduct

It will establish a land-based Arctic simulator for testing the ice-penetrating ability of submarine structures. It will provide the design inputs for new and existing submarine hulls and the structural inputs to operational guidelines for routine and emergency breakthroughs from under the ice.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Provided coordination, planning and technical support for

b. (U) FY 1987 Program:

Program Element: 63562N Title: Submarine Tactical Warfare Systems (Advanced)

c. (U) FY 1988 Planned Program:

- o
- o
- o
- o
- o
- o

d. (U) FY 1989 Planned Program

- o
- o
- o
- o
- o
- o

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones: This is a Non-Acquisition program.

| Milestones | Date |
|---|---|
| 1. | |
| 2. | |
| 3. | |
| 4. | |

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63564N
Title: Ship Development
DoD Mission Area: 238 - Other Naval Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 15,157 | 10,219 | 10,379 | 11,266 | Continuing | Continuing |
| S0408 | Ship Development (Advanced) | 12,229 | 10,219 | 10,379 | 11,266 | Continuing | Continuing |
| X1896 | EMSEDE | 2,928 | 0 | 0 | 0 | 0 | 7,810 |
| S1379 | Ship Sys Eng Stand* | 1,353* | 0 | 0 | 0 | 0 | 9,862 |

As this is a continuing program, the above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

* Project S1379 was funded in Program Element 63562N in FY 1986 and prior years.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Performs first three phases of design (Advanced Concepts Studies, Feasibility, and Preliminary Design) for new ships in the Navy's Shipbuilding Program. Develops the data required by government naval architects and marine engineers for the design of ships in the Navy's Shipbuilding Program. Develops and evaluates unconventional hull form concepts suitable for future acquisition progress. The goal of this project is to allow ships to be designed at reduced cost, manning and increased producibility and a greater degree of capability to utilize the latest technology.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the 1987 President's Budget and that shown in the Descriptive Summary are as follows:

Project S0408: A decrease of 4,512 in FY 1987 is due to Congressional action and adjustments. A decrease of 8,172 in FY 1988 is due to Department program and budget adjustments and NIF rate adjustment.

Project X1896: An increase of 1,946 in FY 1986 is due to a Department budget adjustment and GRH adjustment. A decrease of 4,881 in FY 1987 is the result of Congressional action. A decrease of 13,874 in FY 1988 is the result of a Department program adjustment.

Program Element: 63564N Title: Ship Development

Project S1379: A decrease of 1,347 in FY 1986 is result of Department program and budget adjustments and a GRH adjustment. A decrease of 1,994 in FY 1987 is the result of Congressional action. A decrease of 2,000 in FY 1988 is the result of a Department program adjustment.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 13,989 | 13,562 | 21,606 | 34,425 | Continuing | Continuing |
| S0408 | Ship Development (Advanced) | 13,929 | 12,580 | 14,731 | 18,551 | Continuing | Continuing |
| X1896 | FMSEDE | 0 | 982 | 4,881 | 13,874 | Continuing | Continuing |
| S1379 | Ship Sys Eng Stand* | 4,080* | 2,700* | 1,944 | 2,000 | Continuing | Continuing |
| S1705 | Alt Hull Forms | 60 | 0 | 0 | 0 | - | - |

* Project S1379 was funded in Program Element 63532N in FY 1986 and prior years.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: Program Element 63561N (Advanced Submarine Systems Development); Program Element 64567N (Ship Development (Engineering)); Program Element 63569N (Attack Submarine Development).

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Coastal System Center, Panama City, FL; Naval Ocean Engineering Center, San Diego, CA; Naval Surface Weapons Center, White Oak, Silver Spring, MD; David W. Taylor Naval Ship Research and Development Center, Bethesda, MD; and others. CONTRACTORS: Rockwell International, Arlington, VA; Designers and Planners, Arlington, VA; Softech, Waltham, MA; Martin-Marietta, Baltimore, MD; FMC Corp., Minneapolis, MN; and others.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) PROJECT S1379, SHIP SYSTEM ENGINEERING STANDARDS (SSES):

1. (U) Description : The SES Program's concept is based on the use of interchangeable modules (e.g., weapons, electronics, and aviation support) with standard platform interfaces. The first application of the program is the A and B-size weapon modules (VLS) aboard the DDG-51. The program provides improvements over the conventional shipbuilding method in the following areas: The standard platform allows economy of scale and permits improved logistics support; shipyard producibility and productivity is enhanced because of the ability to pretest the modules prior to installation aboard ships; ability to pre-outfit the zone compartments (e.g. painting, piping, cabling) without interference of equipment installations. Although Project S1379 is terminated in FY 1987, modularity developments will continue concurrent with specific ship designs developed under Project S0408.

Program Element: 63564N Title: Ship Development

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Perform under Program Element 63532N, Project S1379 in FY 1986. Accomplishments included:

° Developed an "A" size Aviation Support Facility mock-up.

° Developed a draft generic sonar system standard.

° Performed engineering, test, and validation tasks leading to the implementation of Ship Systems Engineering Standards to support the DDG 51 Class.

b. (U) FY 1987 Program:

° No work planned in this project in FY 1987. Modularity developments will continue within specific ship designs developed under Project S0408.

c. (U) FY 1989 Planned Program: Not applicable.

d. (U) FY 1989 Planned Program: Not applicable.

e. (U) Program to Complete: Not applicable.

H. (U) PROJECT OVER $10 MILLION FY 1988/89:

(U) Project S0408, Ship Development (Advanced)

1. (U) Description: The purpose of this project is to accomplish the first three phases in the development of new surface ship designs for the Navy's Shipbuilding Program. During the first phase, Advanced Concepts Studies, requirements for future ship types are determined early so that related development of components, subsystems, and platforms will be compatible with these requirements. The second phase, Feasibility, commences at least three years prior to the award of the contract for construction of the lead ship. During this phase, a technical effort is undertaken, in response to stated military requirements, to correct shortfalls in the capabilities of current ships, to establish alternative ship types which will provide a range of performance capabilities and to establish principal characteristics such as length, displacement, speed, propulsion type, major weapons systems, sensors, etc., and comparative acquisition costs. The third phase, Preliminary Design, commences at least two years prior to the award of lead ship contract. During this phase the alternatives chosen from the Feasibility Design Phase are developed and further refined to establish top level requirements and specifications which uniquely define performance characteristics, including payload, and which provide the basis for budget quality estimates of ship acquisition costs. This program also develops data and tools needed by government naval architects and marine engineers to design ships in the Navy's

Program Element: 63564N Title: Ship Development

Shipbuilding Program. Surface Ship Continuing Concept Formulation (CONFORM) develops whole ship concepts to meet future requirements and identifies technology needs for their development. Its major emphasis is the identification of feasible ship designs through the integration of mission requirements and technology developments early in the whole ship planning and acquisition process. Results are used to identify candidate ships to meet the requirements of the Extended Planning Annex (EPA) period and beyond and to recommend the R&D programs and priorities which are needed to support these requirements. Commencing in FY 1988, the scope of this project will expand to include development of methods to evaluate and improve ship structure reliability and fitness-for-service, leading to lighter more affordable and more maintenance free structures. Computer supported design transitions to O&MN in FY 1988.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Accelerated U.S. review of NATO Frigate Feasibility Study which is similar to a U.S. Preliminary Design.

° The Surface Ship Continuing Concept Formulation (CONFORM) task area developed seven exploratory level ship design studies as follows: continuing baseline cruiser, variable mission air platform, gunfire support ship, landing ship combat support, high speed salvage rescue tug, NATO anti-submarine corvettes (Surface Effect Ship (SES) and hydrofoil configurations).

° Computer Supported Design projects included initial integration of computer programs to form a ship design system with a single, common integrated data base; ship hull arrangements programs; upgrade of ship synthesis models; machinery design programs; combat system performance analysis models; and a revision of ship weight estimating methods.

° Continued analytical tool development (other than computer supported design).

° Initiated exploratory studies of a Future Frigate (FFX) with an advanced ASW suite. Both a monohull and a Small Waterplane Area, Twin Hull (SWATH) configuration were developed.

° Commenced Patrol Combatant Multi-Mission (PXM) feasibility studies.

° The Reverse Technology Transfer (RTT) Program conducted a comparative design analyses of Soviet and free world (including U.S.) mine countermeasure ships; made surveys of existing and near-future foreign ship subsystems and technologies for FY 1987 analysis.

Program Element: 63564N Title: Ship Development

° Identified, categorized and analyzed performance shortfalls for ASW Helicopter Operation, Missile Underway Replenishment (UNREP) and other combat capabilities in the northern latitudes.

° Commenced program to investigate advanced Surface Effect Ship (SES) ride control.

b. (U) FY 1987 Program:

° Continue Surface Combatant, sonar support investigation, integrated ship machinery system definition studies, and exploratory ship designs.

° Conduct NATO feasibility and various trade-off studies.

° The Surface Ship Continuing Concept Formulation (CONFORM) task area will complete five advanced ship design alternatives for fleet requirements in the years beyond the Five Year Defense Plan. Studies will include combatant, amphibious, logistics, and special mission whole ship designs.

° Computer Supported Design (CSD) will expand the design of the integrated data base started in FY 1984 to include ships' equipment information; Version 11 of the integrated CSD ship design system will become operational; ship synthesis models will start to be standardized, several machinery design programs will be completed; and the combat system topside model will be completed. CSD design tools will be actively used on DDG-51 and SSN-21 design projects.

° Evaluate near-term, emerging new concepts to reduce cost, manning, weight and volume.

° Initiate effort to improve basic technical foundation supporting ship design capability through improvements to design standards documentation, analysis of existing design data, and creation of both hard copy and electronic data bases.

° The Reverse Technology Transfer (RTT) Program will undertake a comparative design analysis of Soviet and free-world (including U.S.) destroyers; make surveys of existing and near future foreign ship subsystems and technologies for FY 1988 analysis; and assess several promising foreign systems and technologies from the FY 1986 surveys. The Wing in Ground Effect analysis will be completed along with the frigate comparative analysis initiated in FY 1985.

° Identify potential system improvements and assess relative performance improvements for ASW helicopter operations, missile UNREP and other combat capabilities in the northern latitudes. Begin model testing as required.

Program Element: 63564N Title: Ship Development

° Analyze Arctic operations employing hovercraft.

° Improve structural design capabilities for SWATH ships.

c. (U) FY 1988 Planned Program:

° The Surface Ship Continuing Concept Formulation (CONFORM) task area will again complete four to five advanced ship design alternatives for fleet requirements in the years beyond the Five Year Defense Plan. Studies will include combatant, amphibious, rapid deployment force, logistics, and mine warfare whole ship designs. Both monohull and advanced hull forms will be developed, where appropriate, to provide a comparative basis for funding decisions relative to new ship concepts and technologies.

° Define, develop, and demonstrate key subsystem technologies for SWATH ships and other alternative hull forms such as hydrofoils and hovercraft, including both air cushion and surface effect ship types.

° Evaluate near term emerging new concepts for cost, manning and weight reduction.

° The Reverse Technology Transfer (RTT) Program will conduct a comparative design analysis of Soviet and free-world (including U.S.) aircraft carriers and make surveys of existing and near future foreign ship subsystems and technologies for FY 1989 analysis. Assessments of promising foreign subsystems and technologies, identified in FY 1987, will also be conducted.

° Complete performance assessment of lightweight structure concepts for new ship designs. Complete assessment of ship structures containing defects and finalize testing program to correct those deficiencies.

° Develop and model test improvement concepts; design and fabricate test sets of improvement concepts for ASW helicopter operations and missile UNREP in the northern latitudes.

d. (U) FY 1989 Planned Program:

° The Surface Ship Continuing Concept Formulation (CONFORM) task area will complete four to five advanced ship design alternatives for fleet requirements in the years beyond the Five Year Defense Plan. Studies will include combatant, amphibious, logistics, mine warfare and special whole ship designs. Both monohull and advanced hull forms will be developed where appropriate.

° The Reverse Technology Transfer (RTT) Program will conduct a comparative design analysis of Soviet and free-world (including U.S.) amphibious ships and make surveys of existing and near future foreign ship

subsystems and technologies for FY 1990 analysis. Assessments of promising foreign subsystems and technologies, identified in FY 1988, will also be conducted.

° Complete validated structural inspection and repair criteria for existing structures with defects. Commence structural component fabrication and testing for lightweight structural concepts.

° Continue model tests and perform testing of improved concepts for ASW helicopter operations and missile UNREP in the northern latitudes.

° Develop plan for full scale demonstration of Arctic hovercraft.

° Report on method to integrate a digital autopilot for PHM Hydrofoil Collision Avoidance and Tracking System.

° Continue definition, development, and demonstration of key subsystem technologies for SWATH ships and other alternative hull forms.

° Evaluate near term emerging new concepts for cost, manning and weight reduction.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones: Not Applicable

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63561N
DOD Mission Area: 28 - Other Naval Warfare

Title: Surface Ship Navigation System
Budget Activity: 4 - Tactical Program

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING). (Dollars in Thousands)

| Project No. | Title | FY 1987 Actual | FY 1988 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 929 | 940 | 0 | 0 | 0 | 1,869 |
| S1833 | Ship Inertial Navigation System | 929 | 940 | 0 | 0 | 0 | 1,869 |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program pursues navigation system development aimed at providing improved shipboard self-contained world-wide inertial navigation capability. This capability will meet the requirements of long range sea launched missile systems, battle group operations, over-the-horizon targeting and other tactical missions.

C. (U) EXPLANATION OF CANCELLATION: Department program/budget adjustment. Navy will use FY 1987 resources to explore alternatives to meet the immediate need to find a replacement for antiquated inertial navigation systems or extended range missile firing platforms. The alternative selected will incorporate ring laser gyro technology.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63569N
DoD Mission Area: 233 - Anti-Submarine Warfare

Title: Attack Submarine Development
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 34,302 | 0 | 12,899 | 24,028 | Continuing | Continuing |
| S1974 | Advanced Submarine Technology | 0 | 0 | 12,899 | 24,028 | Continuing | Continuing |
| S1255 | Advanced Submarine Technology | 28,966 | * | * | * | * | * |
| S1570 | SSN 688 Class Development | 5,336 | 0 | ** | ** | ** | ** |

* Transferred to PE 64561N, Project S1946 in FY 1987.
** Transfers to Project S1974 in FY 1988.

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The principal challenge to the U.S. Navy is the extensive and continually improving Soviet submarine and surface force. This program will provide the advanced submarine technology required to counter, in the future, this ever increasing threat. It will transition technology developed under the 6.2 R&D Submarine Technology block programs. The program will develop the for future submarine classes forward fit with the benefit of backfit capability. These developments will directly support the attack submarine mission to

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The differences between the FY 1987 Descriptive Summary and this Descriptive Summary are as follows: Because of the tranisitive state of Projects S1255 and S1570, and the fact that Project S1974 was created subsequent to the FY 1987 Descriptive Summary submission, no direct comparison can be made on the project level. The overall increase of +2,800 in FY 1986 is the result of Department program/budget adjustments partially offset by a GRH adjustment. The decrease of -3,931 in FY 1987 is the result of Congressional action. The increase of +8,963 in FY 1988 is the result of Department program/budget adjustments.

Program Element: 63569N Title: Attack Submarine Development

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 21,100 | 31,502 | 3,931 | 3,936 | Continuing | Continuing |
| S1755 | Advanced Submarine Technology | 17,990 | 31,502 | * | * | | |
| S1570 | SSN 688 Class Development | 3,110 | 0 | 3,931 | 3,936 | Continuing | Continuing |

*Transferred to PE 64561N, Project S1946 in FY 1987.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not applicable.

E. (U) RELATED ACTIVITIES: Most submarine-related RDT&E programs will provide inputs into Program Element 63569N in the form of new technologies, systems and components that can be used in future Attack Submarine classes. The most important of the related Program Elements is 64561N (SSN 21 Development). Program Elements 64524N (Submarine Combat System Development), 64502N (Submarine Communications), 63570N (Advanced Nuclear Reactor), and 64567N (Ship Sub System Development/LBTS) are also related to this Program Element. The 6.2 R&D programs in the Submarine Technology block program will transition into this element.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Ship Research and Development Center, Bethesda and Annapolis, MD; Naval Underwater Systems Center, Newport, RI; Naval Research Laboratory, Washington, DC; Naval Ship Systems Engineering Station, Philadelphia, PA; Mare Island Naval Shipyard, Vallejo, CA; and Naval Ocean Systems Center, San Diego, CA. CONTRACTORS: General Dynamics, Electric Boat Division, Groton, CT; Newport News Shipbuilding, Newport News, VA; Penn State University, Applied Physics Laboratory, University Park, PA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not applicable.

Program Element: 63569N

Title: Attack Submarine Development

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project S1974, Advanced Submarine Technology:

1. (U) Description Project S1974, Advanced Submarine Technology, will develop the technological advancements required to

This project will involve the development of a wide range of subsystems and improvements, including

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Not applicable.

b. (U) FY 1987 Program: Not applicable.

c. (U) FY 1988 Planned Program:

Program Element: 63569N

Title: Attack Submarine Development

d. (U) FY 1989 Planned Program:

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63570N
DOD Mission Area: 238 - Other Naval Warfare

Title: Advanced Nuclear Reactor Components and Systems Development
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 113,616 | 93,175 | 91,360 | 87,617 | Continuing | Continuing |
| S1758 | Reactor Components and Systems Development | 25,600 | 34,054 | 40,386 | 42,377 | Continuing | Continuing |
| S1914 | S6W Nuclear Propulsion Plant | 88,016 | 59,121 | 50,974 | 45,240 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Naval Nuclear Propulsion Program is an integrated research and development program which encompasses both Department of the Navy and Department of Energy research and development funds. The intent of the research and development effort is to develop safe, reliable, high performance, long life, nuclear propulsion plants and components. This element is directed toward the advanced design, development, and testing of new and improved components and their related systems for use in new and existing naval nuclear propulsion plants. The work is in the areas of reactor equipment, fluid transfer equipment, chemistry, instrumentation and control, and radiation shielding. This element also includes work to develop a nuclear propulsion plant for the new SEAWOLF class attack submarine.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown on the FY 1987 Descriptive Summary and this Descriptive Summary are as follows: Project S1758: decrease of -1,575 in FY 86 is the result of a GRH adjustment and Department program/budget adjustments. The decrease of -1,045 in FY 87 is the result of Congressional adjustments. The increase of +2,351 in FY 88 is a results of reductions from Department program/budget adjustments and increase from transfer of efforts and funds from PE 11228N, TRIDENT and PE 63578N, A4W/A1G Nuclear Propulsion Plant. Project S1914: The decrease of -4,984 in FY 86 is the result of a GRH adjustment and Department program/budget adjustments. The decrease of -1,817 in FY 87 is the result of Congressional adjustments.

Program Element: 63570N Title: Advanced Nuclear Reactor Components and Systems Development

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 70,803 | 120,175 | 96,037 | 89,157 | Continuing | Continuing |
| S1758 | Reactor Components and Systems Development | 70,803 | 27,175 | 35,099 | 38,035 | Continuing | Continuing |
| S1914 | S6W Nuclear Propulsion Plant | - | 93,000 | 60,938 | 51,122 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: The SSN 21 Class Selected Acquisition Report identifies other appropriation funding provided in support of the SSN 21 Class nuclear powered attack submarine.

E. (U) RELATED ACTIVITIES: Work conducted under this program element is closely coordinated with other naval nuclear propulsion research and development program elements (PE 62324N, Nuclear Propulsion Technology and PE 25675N, Operational Reactor Development) and with research and development work on nuclear reactor plants conducted by the Department of Energy.

F. (U) WORK PERFORMED BY: CONTRACTORS: Westinghouse Electric Corporation, Bettis Atomic Power Laboratory and Plant Apparatus Division, Pittsburgh, PA, and General Electric Company, Knolls Atomic Power Laboratory and Machinery Apparatus Operation, Schenectady, NY.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project S1758, Reactor Components and Systems Development

1. (U) Description: The objective of this research and development effort is to develop safe, reliable, high performance, long life, nuclear propulsion plants and components. This project provides for the design, development, and testing of new and improved reactor components and systems for use in all types of naval nuclear propulsion plants. Work under this project principally involves efforts in the pump, valve, instrumentation and control, heat transfer, chemistry and shielding areas. Much of the work is common to several types of reactor plant components and systems. In FY 1988, work is being transferred into the Reactor Components and Systems Development project from program elements 11728N (TRIDENT) and 63578N (A4W/A1G). The nuclear propulsion component work in TRIDENT and all work under A4W/A1G has become generic enough in nature to be properly funded under Reactor Components and Systems Development. Accordingly, PE 11728N will be reduced by the value of the transferred nuclear

Program Element: 63570N Title: Advanced Nuclear Reactor Components and Systems Development

propulsion component work and PE 63578N will be eliminated. Also, nuclear refueling and servicing equipment development will be transferred to PE 25675N (Operational Reactor Development) in FY 1988 to better categorize that development work.

7. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Work continued on improving plant components with particular emphasis on heat transfer components. The goal is to increase reliability and performance. Work included:
  - ° Solving various problems.
  - ° Initiating development of to reduce steam generator
  - ° Developing and testing analytical models to predict and evaluate steam generator
  - ° Using shock test data to develop steam generator design improvements.
  - ° Continuing steam generator thermal and hydraulic performance tests.
- Continued evaluation of chemical and radiochemical effects on component material to determine ways to prevent corrosion. Work included:
  - ° Conducting tests to evaluate a oxygen scavenger for possible use in a high performance steam generator.
  - ° Developing a ship's force cleaning program to ensure continued steam generator performance.
  - ° Commencing a test of a new corrosion control additive which, if successful, will reduce the need for expensive steam generator chemical cleanings.
  - ° Conducting model boiler tests of simplified, less costly steam generator cleaning methods.
  - ° Developing new ways to reduce radiation buildup in reactor plant equipment.
  - ° Conducting accelerated life tests of steam generator tubing material to evaluate the effects of various thermal, hydraulic and chemical conditions on material performance.
  - ° Testing new secondary water chemistry control methods to minimize steam generator tube degradation.
  - ° Improving methods for predicting corrosion product deposits on reactor plant equipment.
- Continued design and development of fluid transfer and control equipment including pumps, valves and auxiliary components. Conducted various tests to evaluate and improve performance and reliability, and to ensure satisfactory operation of these components. Work included:
  - ° Examining instrumented test results to determine mechanisms, and to qualify prediction methods.
  - ° Continuing flow tests and inspections to improve valve designs.
  - ° Developing means to reduce noise sources in pumps.
  - ° Preliminary screening tests to find an alternate for material currently in use in pump bearings.

Program Element: 63570N Title: Advsnced Nuclear Reactor Components and Systems Development

- Continued development of shielding designs to further reduce personnel radiation exposure. Focus is directed towsrd reducing rsdistion levels, easing shielding installation, and weight minimization. Work included:
  - ° Continuing evsluation of long term shielding materisls performance.
  - ° Anslyzing new and modified shielding designs as part of the effort to ensure adequste rsdiological precautions.
  - ° Continuing development of new shield material, with emphasis on better manufacturing methods. Began performance evalustion of new material under opersting plant conditions.
- Continued work on resctor servicing equipment and methods, including shipping containers for irradiated structural components to ensure continued safe servicing operations. Work included:
  - ° Develoning the rciueling equipment required to install new, cores in existing submarines and surface ships, including technical requirements for CGN refueling equipment.
  - ° Finalizing new shipping container design to ensure safe transport of fuel, spent fuel, and large irradiated components.

b. (U) FY 1987 Program:

- Continue design snd development of new and improved heat transfer equipment to: advance reliability and performance, improve understanding of component materisl degradation mechanisms, Work includes:
  - ° Developing and implementing solution: in steam generator designs.
  - ° Continuing to desig: to reduce steam generstor
  - ° Continuing evsluation of steam generator shock test dsts and establishing design changes to improve shock resistance.
  - ° Continuing steam generator thermal and hydraulic performance tests.
- Evsluate reactor plant material and coolant behavior, both chemical and radiochemical, to develop ways to minimize corrosion. Improve steam generator water chemistry control. Work includes:
  - ° Continuing qualification testing of alternate steam generator oxygen scavengers.
  - ° Continuing tests of new additives.
  - ° Comparing test data to operating data to qualify predictive models and initiating additional tests to resolve uncertainties.
  - ° Continuing test program to determine optimum secondary water chemistry control methods to reduce steam generator tube degradation.
  - ° Continuing accelerated steam generator tests to determine thermal, hydraulic and chemical variables. The data will lead to better prediction methods.
  - ° Developing better ways to reduce radiation buildup.
  - ° Using prediction techniques to assess plant performance.

Program Element: 63570N Title: Advanced Nuclear Reactor Components and Systems Development

° Continuing to develop ship's force cleaning requirements to , and improve steam generator performance.

- Design, develop and test fluid transfer and control equipment. This equipment includes pumps, valves, and auxiliary components. In addition to enhancing performance, particular emphasis is given to applying new features. Work includes:
  ° Continuing life flow testing and evaluations to confirm wear predictiona and check valve design performance.
  ° Continuing design and tests of potential main coolant pump modifications to improve reliability.
  ° Drafting a design manual for uae in applying featurea.
  ° Fabricating and testing bearings to determine new material suitability.
  ° Working on second generation control equipment.
  ° Initiating development of a steam plant valve
  ° Conducting tests in prototypic environments to evaluate performance and reliability of various components.
- Develop shielding designs for reactor plants, refueling equipment, and shipping containers to further reduce radiation exposure levels. Work includes:
  ° Continuing evaluation of long term shielding material performance.
  ° Analyzing new and modified shielding designs as part of the effort to ensure adequate radiological precautions.
- Continuing design and development of reactor aervicing equipment.

c. (U) FY 1988 Planned Program:

- Continue design and development of advanced heat transfer equipment to improve reliability and performance. Work will include:
  ° Continuing evaluation of ahock test data to determine how to improve ateam generator shock reaistance.
  ° Continuing to develop and test to reduce ateam generator
  ° Initiating design of large scale engineering test unit to apply advanced heat exchanger concepta that will improve heat transfer capability
  ° Continuing development of new heat transfer concepts to provide improved capability and better reliability with a reduction in plant weight, volume and corroaion.
  ° Continuing steam generator thermal and hydraulic tests to obtain performance data.
  ° Continuing steam generator component tests to develop improved solutions.
  ° Developing a manufacturing proceas for an advanced steam generator.
- Evaluating the effects of chemical and radiochemical coolant behavior on reactor plant components and materiala. Work will include:
  ° Continuing to test and evaluate chemical corrosior inhibitors for possible plant applicationa.
  ° Continuing accelerated testing to determine optimum steam generator chemistry control methods.

Program Element: 63570N Title: Advanced Nuclear Reactor Components and Systems Development

° Evaluating various thermal, hydraulic and chemical parameters to determine effects on steam generator

- Design, develop and test plant components, including pumps, valves, and auxiliary equipment. Design efforts will emphasize reductions in component , Work will include:
  ° Continuing to evaluate main coolant pumps and valves and wear conditions.
  ° Continuing tests and evaluations in prototypic environments to determine component reliability and performance.
  ° Conducting tests of advanced pump concepts.
  ° Continuing drafting of a design manual for main coolant pumps.
  ° Continuing tests of alternate bearing material.
  ° Continuing development of a steam plant valve
- Design, develop and test instrumentation equipment to improve ease of operations and incorporate state-of-the-art advances being made in electronic technology. Work will include:
  ° Developing advanced design pressure and temperature monitoring systems to increase operator ability to recognize and respond to plant casualties and abnormal situations.
  ° Developing reactor plant fluid level indication and control equipment using current microprocessor and sensor technology to obtain better reliability and improved operation.
  ° Testing new instrumentation and control equipment.
  ° Qualifying systems to improve overall system performance during adverse ship operating conditions.
  ° Developing reactor control power supplies, which utilize state-of-the-art semiconductors devised to improve overall plant reliability
- Developing and testing of shielding designs and materials to minimize radiation effects.

d. (U) FY 1989 Planned Program:

- Continue to design, develop and test new and improved heat transfer equipment to improve reliability and performance and meet new requirements. Work will include:
  ° Continuing efforts to design and develop an engineering test unit that will utilize advanced concepts to improve heat transfer capability, reduce plant weight
  °
  ° evaluation of tests on new design steam generators.
- Continuing to evaluate the chemical and radiochemical behavior of reactor plant system coolant to determine causes of and ways to prevent corrosion in the system.
- Continuing to design, develop and test fluid transfer equipment, including pumps, valves and auxillary equipment, and incorporate the latest technical advances

Program Element: 63570N Title: Advanced Nuclear Reactor Componenta and Systema Development

- Continuing to develop and test new instrumentation and control equipment, incorporating the latest in electronic technology. Work will include:
  - ° Testing will evaluate pressure and temperature monitoring systems.
  - ° Continuing efforts to develop reactor plant fluid level indication and control equipment.
  - ° Continuing efforts to develop reactor power aupplies.
  - ° Testing of reactor plant/steam plant control systems.
- Continuing the design and development efforts in shielding to improve personnel protection and minimize radiation output levels.

e. (U) Program to Completion: Thia is s continuing program.

f. (U) Major Milestones: Not applicable.

(U) Project S1914, S6W Nuclear Propulsion Plant

1. (U) Description: This project is developing the nuclear propulsion plant for a new attack submarine (SEAWOLF). Efforts are directed toward design, development, and testing in the areas of pumps, instrumentation and control equipment, valves, heat transfer equipment, ahielding, and component arrangements. A key objective is to meet stringent noise goals so the new attack submarine will have an acoustic advantage over Soviet submarines well into the next century. To accomplish this requires applying new quieting features throughout the plant. Alao, the propulsion plant weight will be reduceo to achieve the overail displacement goal. This requirea the application of new, high strength material to major components, piping, and foundations.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Development of new hest transfer components continued as a major effort. New, stronger materials are being used to reduce component and foundation weight while still meeting all performance and shock requirements for the new plant. Work included:
  - ° Initiating detailed design and continuing development of a steam generator, incorporating new design equipment and other features
  - ° Continuing development of a primary plant pressurizer.
  - ° Refining development of a new material for pressurizers and steam generators to reduce component and foundation weight and enhance fracture toughness.

Program Element: 63570N Title: Advanced Nuclear Reactor Components and Systems Development

° Continuing to develop purification system components to reduce weight, shielding requirements, and hydraulic pumping power.
° Continuing development of a fresh water/sea water heat exchanger using higher strength materials to reduce component weight and corrosion concerns.

- Improvements in fluid transfer and control equipment, including pumps, valves, and auxiliary components, to enhance plant performance. Work included:
  ° Continuing the manufacture of main coolant pump test units for engineering and shock tests to prove the design adequacy.
  ° Continuing the design and development of main steam valves made of a higher strength material.
  ° Continuing development of new swing check valves and valves to provide state-of-the-art equipment.
  ° Developing methods for prototypic testing of valves.
  ° Continuing to design and develop for various fluid systems to provide improved flow monitoring.
- Continued work on new instrumentation equipment with emphasis on upgrading reliability and performance. Work included:
  ° Developing advanced design plant instrumentation, monitoring, and protection equipment.
  ° Continuing development of reactor plant control systems and equipment to meet new plant requirements.
  ° Initiating the design and development of new concept primary nuclear instrumentation equipment.
- Continuing development of shielding to minimize weight and ensure personnel radiation exposure will be within established limitations. Work included:
  ° Developing conceptual shield design for the new propulsion plant.
  ° Continuing investigation into the use of advanced shielding material.
- Continuing design of propulsion plant systems and arrangements to minimize noise and weight, and continuing fabricating prototypic plant mock ups and components. Work included:
  ° Continuing propulsion plant mock up fabrication to confirm the design adequacy of component and system arrangements prior to ship construction.
  ° Developing and performing dynamic shock analyses of plant components and foundations to verify adequacy for shock.
  ° Continuing to evaluate and refine plant design features, prospective operating conditions, component foundations, and weight reduction features to establish optimum foundation designs and component/system design features that minimize overall machinery weights and reduce component shock loadings.
  ° Evaluating and testing system and component design features to minimize noise generating mechanisms within new plant components and noise transmission through structures.
  ° Developing plant fluid and mechanical systems schematics depicting components, valves, tanks, pipe sizes, and instrumentation, and analyze expected systems performance under operating and transient conditions.

Progrsm Element: 63570N Title: Advanced Nuclear Reactor Components and Systems Development

° Establishing fluid system component size and design data for fabrication of mock-up components and for component fabrication.
° Establishing functional requirements and preparing preliminary system descriptions for main and auxiliary steam, feed, condensate, main and auxiliary sea water, propulsion plant fresh water, and other primary and secondsry propulsion plant systems.
° Continuing to confirm that plant features are compstible with radiated noise objectives.
° Maintaining an adequste weight control program including monitoring the status of weight and margin and any growth trends; evaluating increases in component weights and considering alternative designs and arrangements to reduce reactor plant weight.
° Continuing design of various plant components, such as a main condenser, main feed pump, auxiliary sea water pump, main condensate pump, and propulsion plant fresh water pump.
° Carrying out analysis and design work for lead ship reactor arrangement.
° Continuing finite element model development, analysis, and optimization for reasonance avoidance in propulsion plant structures and piping.
° Continuing design and construction of a engine room and reactor compartment hull and major structures, components, and piping to support propulsion plant acoustic design for resonance avoidance.
° Developing a reactor servicing plan snd identifying those pieces of servicing equipment that will need to be designed to support refueling and servicing the new design attack submarine.

b. (U) FY 1987 Program:

- Continue development of new heat transfer components using stronger materials to reduce component weight. Work includes:
  ° Continuing the design and development of a new higher performance steam generator which is lighter in weight and higher in performance.
  ° Performing full-scale testing in a steam and water environment of the initial steam generator steam drum arrangement.
  ° Carrying out the detailed design of the pressurizer and purification system heat exchanger.
  ° Continuing to develop advanced materials to improve strength and confirm fracture toughness considerations for S6W steam generator components and pressurizers.
- Fluid transfer and control equipment development will continue in order to provide for higher performance. Work includes:
  ° Continuing development of an improved main coolant pump design, and manufacture of test units.
  ° Performing engineering tests of main coolant pumps to provide shock qualification.

Program Element: 63570N Title: Advanced Nuclear Resctor Components and Systems Development

° Continuing development of new swing check valves and valves to ensure they meet noise criteria.
° Manufacturing to support prototypic loop testing.

- New instrumentation equipment will provide greater equipment performsnce and relisbility and oversll plant capability through the use of the latest developments in electronic technology. Work includes:
  ° Continuing the design of propulsion plant monitoring, control, indication and protection equipment.
  ° Continuing the design and beginning fabrication of primary nuclear instrumentation equipment.
  ° Initiating design of rod control equipment.
- Continuing development of the shield design and adapting new materials shown to be technically acceptsble.
- Continuing design efforts for new propulsion plsnt systems and arrangements as well as refining requirements for various systems and components. Work includes:
  ° Completing construction of the propulsion plant mockup to establish arrangement constraints and confirm component designs. Continue construction of the propulsion plant mockup to establish arrsngement details.
  ° Evaluating and refining propulsion plant design feature requirements, tentative operating conditions, and weight reduction objectives.
  ° Determining the reactor plant arrangement layout.
  ° Continuing the design of the reactor plant fluid systems.
  ° Continuing the design of fluid svstem long-lead time components.
  ° Completing construction and initiating tests to evaluate reactor plant design and confirm compliance with ship noise goals. Comparing test results with analytical results to develop modifications as necessary.
  ° Developing new reactor servicing equipment and methods to support the new design attack submarine.

c. (U) FY 1988 Planned Program

- Develop and test heat transfer components. Work will include:
  ° Continuing detailed design and development of a steam generator.
  ° Testing to evaluste performance under simulated shipboard environments.
  ° Completing fracture toughness testing of advanced materials to confirm structural integrity of pressurizer and steam generator.
- Development of fluid transfer and concrol equipment. Work will include:
  ° Continuing development and conducting engineering tests of main coolant pumps to assure the units meet all specifications and functional requirements.
  ° Continuing to perform shock testing of main coolant pumps.

Program Element: 63570N Title: Advanced Nuclear Reactor Components and Systems Development

° Conducting engineering tests of new swing check valves and valves. Perform test of swing check valves.

- Continue development of instrumentation equipment. Work will include:
  ° Completing design and conducting fabrication of rod control equipment.
  ° Continuing development and conducting tests of plant monitoring, control, indication and protection equipment.
  ° Completing fabrication and conducting tests of primary nuclear instrumentation equipment.
- Continue design and development of reactor plant shielding to provide a detailed primary and secondary shielding design for ship construction.
- Continue to refine propulsion plant detailed design to determine optimum component and system arrangement requirements. Work will include:
  ° Continuing construction of the propulsion plant mockup to establish arrangement details.
  ° Continuing the design of the reactor plant fluid systems and components.
  ° Developing detailed design of reactor plant.
  ° Completing evaluation of testing to confirm accuracy of foundation design studies.
  ° Developing reactor and power plant servicing equipment.
  ° Continuing development of reactor operating procedures.

d. (U) FY 1989 Planned Program:

- Continue the designing and testing of heat exchanger components including steam generator, purification system heat exchanger, and pressurizer.
- Continue testing of fluid transfer and control equipment. Test, inspect and analyze main coolant pumps, check valves and valves to determine the effects of full flow testing

- Conduct testing of advanced instrumentation equipment. Work will include:
  ° Conducting tests of plant indication, protection, monitoring and control equipment.
  ° Continuing tests of primary nuclear instrumentation equipment.
- Refine reactor plant detailed design features, and operating procedures. Develop reactor plant test procedures and perform test analyses. Continue reactor and propulsion plant acoustic design efforts to support final foundation design decisions. Work will include:
  ° Continuing to perform the detailed design for the reactor plant arrangement.
  ° Monitoring acoustic testing of component designs to ensure they meet ship noise goals
  ° Continuing development of test procedures.
  ° Monitoring fabrication and testing of fluid system components.

Program Element: 63570N Title: Advanced Nuclear Reactor Components and Systems Development

° Developing reactor servicing equipment to support the new design attack submarine.
- Continue design and development of reactor plant shielding.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63571N
Title: Physical Security
DoD Mission Area: 205 - Physical Security Systems
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 3,433 | 5,507 | 8,699 | 6,479 | 37,760 | 102,006 |
| S0812 | Nuclear Weapons Security | 3,433 | 5,507 | 8,699 | 6,479 | 37,760 | 102,006 |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Current intelligence estimates show an ever-increasing terrorist threat to nuclear and high value Navy facilities. Existing shipboard security depends, in part, upon guards (response forces) and upon barrier or intrusion-detection technology. These aging devices require continually increased maintenance and provide This element develops a physical security system capable of detecting, classifying and providing a response to threats targeting Navy assets in order to deny its use in combat or cause political damage to U.S. interests. The shipboard system will be compatible with and integrated into the ship's total physical security system. This program element includes all measures, technical and procedural, for the improvement of shipboard nuclear weapons and general security. The first Shipboard Nuclear Weapon Security system, Level 1, includes the MK 1 Magazine Security System and the MK 4 Protected Voice Portable Communication System. The next improvement, Level 2, adds mooring line sensors, video monitoring and control systems. The Level 3 system includes swimmer detection, personnel tracking, panoramic motion and other detectors. These shipboard systems permit detection of both on- and off-board intruders. The Waterside Security System addresses harbors and shoreline security. In May 1985, the Secretary of Defense transferred responsibility for waterside security research and development from the Air Force to the Navy. This project will develop Waterside Security Systems to provide security around waterside perimeters, pier facilities and moored ships. Also included is the development of improved locks and barriers for enhanced security at shore installations. This work provides for security throughout the logistical movement sequence of valuable assets such as munitions.

Program Element: 63571N Title: Physical Security

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: The changes between the funding profile shown in the FY 1987 President's Budget and that shown in this Descriptive Summary is a FY 1987 decrease of 2,179 due to Congressional action adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 5,093 | 3,690 | 7,686 | 8,533 | 30,882 | 85,878 |
| SO812 | Nuclear Weapons Security | 5,093 | 3,690 | 7,686 | 8,533 | 30,882 | 85,878 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| OTHER PROCUREMENT, NAVY | | | | | | |
| Physical Security Equip. (OPN BA-7 P-1 Line Item No. 312) 338128 | | | | | | |
| Shipboard Nuclear Weapon Security | 1,986 | 2,000 | 20,763 | 19,997 | 412,341 | 458,662 |
| Quantities (mag alarm/ratio) | 0/19 | 0/20 | 0/204 | 30/113 | 130/56 | |
| Waterside Security | 0 | 0 | 0 | 8,768 | 82,300 | 101,000 |
| Quantities (security systems) | 0 | 0 | 0 | 2 | 35 | |

E. (U) RELATED ACTIVITIES: Project SO812, Nuclear Weapons Security: The engineering development phase of this program is sponsored under Program Element 64563N, Physical Security (Engineering). The first shipboard components (detectors, alarms and controls) are being designed, fabricated and readied for Technical Evaluation, Operational Evaluation and Approval for Full Production. To support the early introduction of equipment to the fleet, PE 78017N, Maintenance and Support Activities, will improve the shipboard internal security force communications and alarm control panel with secure voice radios and more secure panel doors. Secure voice radio installation costs are FMP funded. In September 1985, demonstration tests of upgrades for waterside security were initiated at Submarine Base Bangor. Results from these tests have provided direction for the development

Program Element: 63571N Title: Physical Security

plans for new work. To avoid duplication, this tri-service effort is coordinated with Physical Security Equipment Action Group in the Office of the Under Secretary of Defense for Research and Engineering, Air Force Physical Security Systems Directorate, Army Program for Physical Security Equipment, Defense Nuclear Agency and the Chief of Naval Operations.

F. (U) WORK PERFORMED BY: Project S0812, Nuclear Weapons Security: IN-HOUSE: Naval Surface Weapons Center, White Oak Laboratory, Silver Spring, MD; Naval Ocean Systems Center, San Diego, CA; Naval Civil Engineering Lab, Port Hueneme, CA. OTHERS: Navy Personnel Research and Development Center, San Diego, CA; Naval Coastal Systems Center, Panama City, FL; Naval Weapons Support Center, Crane, IN and Naval Ocean Systems Center, San Diego, CA. CONTRACTORS: RCA Corporation, Somerville, NJ and Camden, NJ; Westinghouse, Madison, PA; Vitro, Silver Spring, MD; ISA, Arlington, VA; MILCOM, Norfolk, VA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

(U) Project S0812, Nuclear Weapons Security:

1. (U) Description: This program counters world-wide terrorist threats against ships and nuclear weapons. Existing security depends upon guards, simple electrical circuits, locks, and hasps. These devices,

A substantial and successful effort has gone into development of more sophisticated physical security devices for land-based applications. None of this earlier DoD/USAF effort tested the technology in the shipboard environment, and only recently applied it to waterside security.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° MK 4 Shipboard Portable Communication System.
- Moved into full scale development.

° MK 1 Magazine Security System.
- Moved into full scale development.

° Shipboard Nuclear Weapons Security Level II System.
- Completed system requirements specification.
- Completed work breakdown structure and task statements to carry Level II to approval for production.
- Wrote statements of work and contract for detailed design and fabrication of advanced development models.

Program Element: 63571N Title: Physical Security

° Shipboard Nuclear Weapons Security Level III System.
- Completed Submarine Security Concept.
- Designed, built and tested advanced intrustion sensors.

° Other FY 1986 Accomplishments.
- Completed Waterside Security System demonstration.
- Initiated Waterside Security System development.
- Revised Test and Evaluation Master Plan and Navy Training Plan.

b. (U) FY 1987 Program:

° Shipboard Nuclear Weapons Security Level II System.
- Complete Level II risk management program.
- Complete Level II advanced development model design.
- Complete Level II system software.
- Start Level II advanced development model fabrication.

° Shipboard Nuclear Weapons Security Level III System.
- Maintain Navy Training Plan.

° Waterside Security System
- Initiate command and control software development.
- Commence automatic sonar detection and alert capability development.

c. (U) FY 1988 Planned Program:

° Shipboard Nuclear Weapons Security Level II System.
- Complete fabrication of advanced development models.
- Complete laboratory and shipboard tests of advanced development models.
- Start design of engineering development models.

° Shipboard Nuclear Weapon Security Level III System.
- Complete testing of prototype Submarine Security System.
- Test Level II System with Level III sensors.
- Complete vertical launch system (VLS) and armored box launch (ABL) security system prototypes.

Program Element: 63571N Title: Physical Security

° Waterside Security System
- Continue command and control software development.
- Continue automatic sonar detection and alert capability development.

d. (U) FY 1989 Planned Program:

° Shipboard Nuclear Weapon Security Level II System.
- Move into full scale development.

° Shipboard Nuclear Weapon Security Level III System.
- Move Submarine Security System into full scale development.
- Move all Level III System sensors into full scale development.
- Integrate VLS and ABL security suites with the Level II System.

° Waterside Security System
- Continue command and control software and automatic sonar detection capability developments.

e. (U) Programs to Completion:

° Transition secure structure advanced development models (barriers and locks) to engineering development in FY 1990.

° This is a continuing program.

f. (U) Major Milestones:

| MILESTONES | DATE |
|---|---|
| 1. Award control console advanced development model contract for Waterside Security System. | FY88/1Q |
| 2. Complete Shipboard Nuclear Weapon Security Level II advanced development model phase. | FY88/4Q |
| 3. Complete Shipboard Nuclear Weapon Security Level III advanced development model phase. | FY89/4Q |

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63576N
Title: Chalk Eagle
DoD Mission Area: 237 - Naval Warfare Surveillance & Reconnaissance
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 66,904 | 75,628 | 89.451 | 99,631 | N/A | N/A |
| R1578 | Chalk Eagle | 66,904 | 75,628 | 89,451 | 99,631 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63577N Title: Shipboard Laser Weaponry
DoD Mission Area: 232 Amphibious, Strike And Anti-Surface Warfare Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 0 | 0 | 1,432 | 2,874 | Continuing | Continuing |
| S1920 | MEDUSA Technology Demo | 0 | 0 | 1,432 | 2,874 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED:

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) Not applicable.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: None.

E. (U) RELATED ACTIVITIES: None.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Surface Weapons Center, Dahlgren, VA; Naval Air Development Center, Warminster, PA; Naval Research Laboratory, Washington, D.C. CONTRACTORS: To be determined.

Program Element: 63577N Title: Shipboard Laser Weaponry

C. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project X1920, MEDUSA Feasibility Demonstration:

1. (U) Description:

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Not applicable.

b. (U) FY 1987 Program: Not applicable.

c. (U) FY 1988 Planned Program:

° A feasibility demonstration program will be established to assess performance and safety of Results will provide a foundation for subsequent engineering design.

° Complete design of an advanced technologies demonstration system.

° Fabricate the advanced technologies demonstration system for use in system performance and safety tests.

d. (U) FY 1989 Planned Program:

° Conduct tests to investigate

° Investigate methods for establishing accurate target acquisition and tracking.

° Investigate methods to reduce system susceptibility to countermeasures.

° Investigate

° Complete test reports and initiate system design specifications.

Program Element: 63577N Title: Shipboard Laser Weaponry

e. (U) Program to Completion:

° This Technology Demonstration concludes in FY 1990. If the feasibility demonstration is successful, plans are to proceed to full-scale engineering development starting in FY 1990.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63578N
DoD Mission Area: 238 - Other Naval Warfare

Title: A4W/A1G Nuclear Propulsion Plant
Budget Activity 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 3,145 | 3,308 | - | - | 0 | 196,600 |
| S0387 | A4W/A1G Aircraft Carrier Type Dual Reactor Nuclear Propulsion Plant | 3,145 | 3,308 | - | - | 0 | 196,600 |

b. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element is an integral part of a joint Navy/Department of Energy effort directed towards testing, improving, and evaluating a two-reactor plant for use in NIMITZ Class aircraft carriers. Advances in the reliability and performance of these plants are vital to the accomplishment of the Navy's mission.

C. (U) EXPLANATION OF CANCELLATION OR DEFERRAL: The A4W/A1G development effort has reached the point where the work is becoming generic in nature and therefore applicable to both A4W and other types of nuclear propulsion plants. Consequently, this vital work beginning in FY 1988 will be funded under the existing program element Advanced Nuclear Reactor Components and Systems Development, P.E. 63570N, Project S1258.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63582N
DoD Mission Area: 239 - Naval Unassigned

Title: Combat System Integration
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 19,978 | 14,362 | 10,109 | 10,467 | Continuing | Continuing |
| S0164 | Combat Systems Integration | 19,978 | 14,362 | 10,109 | 10,467 | Continuing | Continuing |

The above funding includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B.(U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program assembles and tests Combat Direction System software in a land based test site before installation on a combat ship. This allows complete testing of the software with actual or simulated weapons and sensors to ensure the program is fully operational when delivered to the ship. Past experience has proven this is a vital step in guaranteeing the reliability of a ships combat capability. Included in this engineering process is the coordination and configuration control of computer program development and testing. This project provides for the integration and testing of modifications to in-service surface ship system computer programs required to effectively employ the warfighting systems of new and upgraded weapons and sensors.

C. (U) COMPARISON WITH THE FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: In FY 1986, a decrease of 1,984 is due to GRH and Department program/budget adjustments. In FY 1987, a decrease of 9,689 is due to a Congressional action and adjustments and Department program/budget adjustments. In FY 1988, a decrease of 15,751 was due to a Department program/budget adjustment which transferred part of the effort to PE 64518N, and a NIF rate adjustment.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 20,436 | 21,962 | 24,051 | 25,860 | Continuing | Continuing |
| S0164 | Combat System Integration | 20,436 | 21,962 | 24,051 | 25,860 | Continuing | Continuing |

Program Element: 63582N Title: Combat System Integration

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

F. (U) RELATED ACTIVITIES: This program performs technical integration and engineering evaluation of combat systems and combat system design concepts in order that integration concepts developed under multiple efforts can be efficiently and effectively applied to ship combat system modernization and upgrade. Related activities are: PE 24221N, Light Airborne Multi-Purpose System MK III for FFG and CG 47; and PE 64361N, NATO SEA SPARROW. Computer programs for which interfaces are developed and tested at the Integrated Combat System Test Facility are produced under the following programs: PE 64372N, New Threat Upgrade; PE 64508N, Radar Surveillance Equipment; PE 25620N, ASW Combat System Integration; PE 64367N, TOMAHAWK Missile System; and PE 24221N, Light Airborne Multi-Purpose System MK III. In addition, Navy Tactical Data System computer program changes are developed under PE 64518N, Combat Information Center Conversion; PE 64369N, 5" Rolling Airframe Missile; PE 64231N, Tactical Command Centers.

F. (U) WORK PERFORMED BY: Project S0164, IN-HOUSE: Naval Surface Weapons Center, Dahlgren, VA; Fleet Combat Direction System Support Activity, Dam Neck, VA and San Diego, CA; Integrated Combat System Test Facility, San Diego, CA; Naval Surface Weapon Systems Engineering Station, Port Hueneme, CA; Naval Ocean Systems Center, San Diego, CA; Naval Air Development Center, Warminster, PA; and NAVSEA Combat Systems Engineering Station, Norfolk, VA. CONTRACTORS: Automation Industries, Incorporated, Vitro Lat, Silver Spring, MD; Sperry UNIVAC, Saint Paul, MN; Raytheon Electronics Systems Division, Goleta, CA; Advanced Technology Incorporated, Reston, VA; and The Johns Hopkins University, Applied Physics Laboratory, Laurel, MD.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project S0164, Combat System Integration

1. (U) Description: Efforts under this project test responsive combat system computer program interfaces to effectively employ new and upgraded weapon and sensor systems. Navy Tactical Data System programs modified to implement the digital interfaces with the new systems and interfacing combat system computer programs are assembled at the Integrated Combat System Integrated Test Facility for integration testing prior to initial Fleet introduction. Overall Combat System Operability Tests for in-service ship class combat system computer programs are developed and tested. Combat system level configuration control is continued by updates of the Surface Ship Combat System Master Plan which authorizes the current and future baselines for each ship class.

Program Element: 63582N Title: Combat System Integration

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Completed development and testing of AN/SLQ-32(V)3 Electronic Warfare System computer program.

° Completed development and initiated Integrated Combat System Test Facility testing of new Naval Tactical Data System computer program digital interfaces. These interfaces include: New Threat Upgrade systems and AN/SLQ-32(V)3 Electronic Warfare System in CG 16/26 Class; and Anti-Submarine Warfare Control System, Light Airborne Multi-purpose System MK III and Integrated Target Acquisition/Improved Point Defense in DD 963 Class.

° Continued development of new capabilities in Naval Tactical Data System computer programs for digital interfaces. Improvements include plans for New Threat Upgrade systems, HARPOON 1C Surface Missile System and AN/SLQ-32(V)3 Electronic Warfare System integration in CGN 38 Class (FY 1989); New Threat Upgrade Systems, AN/SLQ-32(V)2 Electronic Warfare System and HARPOON 1C Surface Missile System integration in DDG 993 Class (FY 1987-88); and Anti-Submarine Module, TPX-42, and NATO Sea Sparrow Missile Systems programs in CV/CVN Classes.

° Initiated development of new capabilities in Naval Tactical Data System computer programs with digital interfaces. These interfaces include: Shipboard Gridlock System/Automatic Correlation and HARPOON 1C Surface Missile System integration in CG 16/26 Class (FY 1988); Electronic Warfare Control System, Navigation Similar Source Integration System and Ship Central Identification, Friend or Foe System integration in DD 963 and CV/CVN Classes (FY 1991-1992).

° Continued modification of the Integrated Combat System Test Facility test bed for FY 1987-1989 testing of DD 963, DDG 993 and CG 26 Class combat system upgrades.

° Updated the Surface Ship Combat System Master Plan.

b. (U) FY 1987 Program:

° Complete testing of new Naval Tactical Data System computer program digital interfaces including: New Threat Upgrade systems and AN/SLQ-32(V)3 Electronic Warfare System in CG 16/26 Class; and Anti-Submarine Warfare Control System, Light Airborne Multi-Purpose System Mark III and Integrated Target Acquisition System/Improved Point Defense Missile System in DD 963 Class.

Program Element: 63582N Title: Combat System Integration

° Complete development and initiate Integrated Combat System Test Facility testing of new Naval Tactical Data System computer program digital interfaces New Threat Upgrade Systems, AN/SLQ-32(V)2 Electronic Warfare System and HARPOON IC Surface Missile System in DDG 993 Class; and Anti-Submarine Module, TPX-42 and NATO Sea Sparrow Missile Systems programs in CV/CVN Classes.

° Initiate development of new Overall Combat Systems Operability Test procedures for upgraded CG 16/26, CGN 38, CV/CVN, DD 963 and DDG 993 Class Combat Systems.

° Initiate development of new capabilities in Naval Tactical Data System computer programs with digital interfaces with Harpoon IC Surface Missile System, OUTBOARD II and Combat DF in DD 963 Class (FY 1990); and Light Airborne Multi-Purpose System MK III in DDG 993 Class.

° Continue all other FY 1986 developmental efforts for new capabilities in Naval Tactical Data System computer programs for digital interfaces with systems in CGN 38, CG 16/26, and DDG 993 Classes.

° Continue modification of the Integrated Combat System Test Facility test bed for 1988-1990 testing of CG 16/26, CGN 38, CV/CVN, DD 963 and DDG 993 Class combat system upgrades.

° Update the Surface Ship Combat System Master Plan.

c. (U) FY 1988 Planned Program:

° Complete testing of new Naval Tactical Data System computer program digital interfaces with New Threat Upgrade Systems, AN/SLQ-32(V)2 Electronic Warfare System and HARPOON IC Surface Missile System in DDG 993 Class; and Shipboard Gridlock System with Auto Correlation in CG 16/26 Class.

° Commence development of test procedures and modifications to Integrated Combat System Test Facility in preparation for FY 1990-1991 integration testing for Advanced Combat Direction System, Block 1 digital interfaces with new systems including Command and Control Processor, Afloat Correlation System, Outboard II, Officer in Tactical Command Information Exchange System and Ships Signals Exploitation Space and with existing shipboard systems in CG 16/36, CGN 38 and CV/CVN Classes.

° Continue development of new Overall Combat System Operability Test procedures for upgraded CG 16/26, CGN 38, CV/CVN and DD 993 Class Combat Systems.

° Continue test preparation and modification of Integrated Combat System Test Facility test bed for FY 1989-1991 testing of CGN 36, CGN 38, CV/CVN, DD 963, DDG 993 and LHD 1 combat systems upgrades.

° Update the Surface Ship Combat System Master Plan.

Program Element: 63582N Title: Combat System Integration

d. (U) FY 1989 Planned Program:

° Complete testing of new Naval Tactical Data System computer program digital interfaces with New Threat Upgrade systems, AN/SLQ-32(V)3 Electronic Warfare System and HARPOON 1C Surface Missile System in CGN 38 Class; Light Airborne Multi-Purpose System MK III in DDG 993 Class; and SYS-2 Integrated Automatic Detection and Tracking System with Target Acquisition System in CV/CVN Classes.

° Continue development of test procedures and modifications to Integrated Combat System Test Facility in preparation for FY 1990-1991 integration testing for Advanced Combat Direction System, Block 1 digital interfaces.

° Continue development of new Overall Combat System Operability Test procedures for upgraded CGN 38 and DD 993 Class Combat System. Initiate development of procedures for CGN 36 and LHA 1 Classes.

° Continue test preparation and modification of Integrated Combat System Test Facility test bed for FY 1990-1991 testing of CGN 36, CV/CVN, DD 963, DDG 993 and LHD 1 combat systems upgrades.

° Update the Surface Ship Combat System Master Plan.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63591N
DoD Mission Area: 113 - Airborne Strike

Title: Joint Advanced Systems
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousanda)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 0 | 128,499 | 231,550 | 236,620 | N/A | N/A |
| R1859 | Joint Advanced Systems | 0 | 128,499 | 231,550 | 236,620 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63601N
Title: Mine Development
DoD Mission Area: 234 - Mine Warfare
Budget Activity: 4 - Tactical Program

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 4,222 | 12,808 | 17,382 | 29,523 | Continuing | Continuing |
| S1556 | New Generation Mines | 4,222 | 4,887 | 12,696 | 19,771 | Continuing | Continuing |
| S1917 | RECO | 0 | 3,240 | 4,686 | 9,752 | Continuing | Continuing |
| S1932 | CHARGER GOLD | 0 | 4,681 | 0 | 0 | N/A | N/A |

The above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides for the development of new mines, mine systems, and major improvements to existing mine systems necessary to meet the Navy's requirement for mine warfare against evolving targets into the 21st century.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: The significant changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: New Generation Mines was reduced -1,687 in FY 87 by Congressional and Department program/budget adjustments, -3,419 in FY 1988 by Department program/budget adjustments in anticipation of savings to be caused by the collaborative U.S./U.K. effort on this project, and a Department NIF rate adjustment. PECO was reduced -726 in FY 88 by a Department budget/program adjustment and NIF rate adjustment. CHARGER GOLD, a program of higher classification, will be terminated after FY 1987.

Program Element: 63609N Title: Mine Development

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 665 | 4,436 | 14,836 | 26,450 | TBD | TBD |
| S1556 | New Generation Mines | 665 | 4,436 | 6,574 | 16,115 | 160,659 | 197,000 |
| S1917 | RECO | 0 | 0 | 3,343 | 5,412 | 48,935 | 60,846 |
| S1932 | CHARGER GOLD | 0 | 0 | 4,919 | 4,923 | TBD | TBD |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: None.

E. (U) RELATED ACTIVITIES: Exploratory development projects under PE 62315N involve a number of efforts with mine components and mine warfare support and include the Mine, Electrochemistry (power sources), and Explosives Block programs at NAVSWC, White Oak. The Surface Minelaying project, not yet assigned to a program element, will complement the New Generation Mines delivery analysis. Mine Development (Engineering) under PE 64601N includes several mine component and minefield planning and analysis tasks that will also complement the data base resulting from the New Generation Mines study. New Generation Mines will use insensitive munitions developed under PE 63609N.

F. (U) WORK PERFORMED BY: IN HOUSE: Naval Surface Weapons Center, White Oak Laboratory, Silver Spring, MD; Naval Coastal Systems Center, Panama City, FL; CONTRACTORS: British Aerospace, Felton, England; Marconi Underwater Systems Ltd, Hampshire, England; Goodyear Aerospace Corp., Akron, OH; Honeywell Inc., Hopkins, MN.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project S1917, RECO:

1. (U) Description: Develops equipment

Program Element: 63601N Title: Mine Development

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Not Applicable.

b. (U) FY 1987 Program: Begin Advanced Development; identify development contractors.

c. (U) FY 1988 Planned Program: Continue Advanced Development and complete development specifications for receivers; begin Full-Scale Development for receivers.

d. (U) FY 1989 Planned Program:

- Complete development specifications for transmitters and mine interfaces.
- Begin Full-Scale Development for transmitters and mine interfaces.
- Conduct Advanced Development Model tests of receivers.

e. (U) Program to Completion: This is a continuing program which includes the following events:

| MS II | OPEVAL | MS III | IOC |
|---|---|---|---|
| 89/4Q | 92/1Q | 92/3Q | 95/1Q |

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project S1556, New Generation Mines:

1. (U) Description: Develops a new offensive mine

a. (U) FY 1986 Program:

- UK awarded contracts to two contractors for extended feasibility studies.
- Initiated Data Base Expansion program. Data Base Expansion contracts were awarded to two U.S. contractors to help define early performance/interface issues and reduce development risks.

Program Element: 63601N Title: Mine Development

° Improved data base by test analysis and cost/risk reduction tasks.
° Implemented plans for joint development.
° U.S./U.K. memorandum of Understanding (MOU) was signed 25 September 1986.

b. (U) FY 1987 Program:

° Continue Data Base Expansion program.
° Design, build and test acoustic arrays.
° Evaluate extended feasibility study and make cost/performance tradeoffs.
° Evaluate a method for tactically deploying the Advanced Sea Mine by air.

c. (U) FY 1988 Planned Program:

° Achieve Milestone I.
° Test subsystems and analyze data.
° Conduct System Requirements Review during project definition phase.
° Jointly test contractor's acoustic arrays in water.
° Develop performance tests for Full-Scale Engineering Development.
° Joint Project Office will award contracts to two companies for Project Definition.

d. (U) FY 1989 Planned Program:

° Complete data base expansion program.
° Continue to monitor U.K. development and conduct system/subsystem tests.
° Continue project definition advanced development phase.
° Conduct national testing/evaluation required to support project definition.
° Continue joint U.S./U.K. project management of the program.

e. (U) Program to Completion: Monitor U.K. Full-Scale Engineering Development and conduct required acceptance tests for Advanced Sea Mine with IOC in the mid 1990s.

f. (U) Major Milestones: This program is a cooperative development between the U.S. and the U.K. Projected major milestones: are Milestone I in FY 88, Milestone II In FY 91, Milestone III

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63602N
Title: Chalk Pine
DoD Mission Area: 237 - Naval Warfare Surveillance & Reconnaissance
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 0 | 42,408 | 189,495 | 273,744 | N/A | N/A |
| P1950 | Chalk Pine | 0 | 42,408 | 189,495 | 273,744 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63609N Title: Conventional Munitions

DoD Mission Area: 232 - Amphibious, Strike and Anti-surface Warfare Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Total Additional Cost | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 19,393 | 29,697 | 34,014 | 36,902 | Continuing | Continuing |
| S0363 | Insensitive Munitions Advanced Development | 12,731 | 18,983 | 24,710 | 26,919 | Continuing | Continuing |
| S1821 | Conventional Fuze/Warhead Package | 6,662 | 10,714 | 9,304 | 9,983 | Continuing | Continuing |

As this is a continuing program, the above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Insensitive Munitions (IM): Most Navy munitions react violently when exposed to unplanned stimuli such as fire, shock and bullet impact, thus presenting a great hazard to ships, aircraft, and personnel. This program will provide, validate and transition technology to enable production of munitions insensitive to these stimuli with no reduction in combat performance and meet the CNO goal, as expressed in OPNAVINST 8010.13A, of transitioning to insensitive munitions by 1995. The IM Advanced Development program is the Navy's focused effort on propellants/propulsion units, explosives/warheads/fuzes, and pyrotechnics to reduce the severity of cookoff and bullet/fragment impact reactions, minimizing probability for sympathetic detonation both in normal storage and in use, increasing ship survivability and satisfying performance and readiness requirements. Each technology area is divided into sub tasks addressing specific munition/munition class IM deficiencies. Energetic materials producibility is demonstrated to assure national capability to produce and load munitions systems. The program is being closely coordinated with all other services to eliminate redundant efforts and maximize efficiency. A joint Service IM requirement has been developed. Insensitive munitions developments and requirements are coordinated with NATO and other allied countries to assure interoperability and maximize logistic and cost advantages in materials development. Fifty three munitions/munitions classes: Harpoon, Tomahawk, RAM, Maverick, Phoenix, HARM, Sidewinder, Penguin, 76mm, Hellfire, AMRAAM, SPARROW, etc. depend on this program to render them insensitive.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY : (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: in Project S0363 in FY 1987 a

Program Element: 63609N Title: Conventional Munitions

decrease of 4,716 Congressional action and adjustments, and in FY 1988 an increase of 2,346 is due to Department program/budget and NIF rate adjustments. These increases are the result of significant Department increases in insensitive munitions transition funding by warfare sponsors. In Project S1821 in FY 1986 a decrease of 3,349 GRH and Department program/budget adjustments, in FY 1987 a decrease of 6,469 Congressional action and adjustments, and in FY 1988 a decrease of 7,617 Department program/budget adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY :

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 12,233 | 21,924 | 40,882 | 39,285 | Continuing | Continuing |
| S0363 | Insensitive Munitions Advanced Development | 5,720 | 11,913 | 23,699 | 22,364 | Continuing | Continuing |
| S1821 | Conventional Fuze/Warhead Package | 6,513 | 10,011 | 17,183 | 16,921 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: Related programs are: PE 61153N (Defense Research Sciences (energetic materials research)), PE 62111N (AAW/ASUW Technology) (insensitive propellants)), and (warhead vulnerability and insensitive fuze designs)), and PE 62315N (Mine and Special Warfare) (explosives development and safety)). PE 63262N (Aircraft Ordnance and Safety), develops cookoff improvement technology for air weapons. Advanced development programs are: PE 64602N (Naval Gunnery Improvement LOVA - 76mm and 5"/54 (insensitive gun propellant)), PE 64603N (Unguided Conventional Aircraft Weapons (bomb qualification with PBX explosive)), and PE 64609N (Bomb/Fuze Improvement (bomb improvement with PBX booster and main charge)). Cooperative technology transfer efforts with all weapons project offices are in progress. Close liaison is maintained with PE 63514N (Shipboard Damage Control Program). Development program technology has been provided to the other services with Navy as the lead service, for insensitive munition development. Examples of cooperative actions currently ongoing are Air Force bomb and Army propellant projects. Activities relating to the Conventional Fuze Warhead Package are: Previously identified 6.2 efforts (Undersea Warfare Weaponry Technology), PE 64603N (Bomb Improvement Program), PE 64602N (Gun Ammunition Improvement Program), PE 63609N (Conventional Munitions/Insensitive Munitions Advanced Development), PE 64369N (ROLLING AIRFRAME Missile), and PE 64354N (SPARROW Missile).

F. (U) WORK PERFORMED BY: For Insensitive Munitions: Work is performed in-house with major participation by Naval Surface Weapons Center, Dahlgren, VA; Naval Weapons Center, China Lake, CA; Naval Weapons Station, Yorktown, VA; Naval Ordnance Station, Indian Head, MD; Naval Weapons Support Center, Crane, IN; Naval Weapons Station Earle, Colts Neck, NJ.

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For Conventional Fuze Warhead Package: In House: Naval Surface Weapons Center, Dahlgren, VA; and Naval Weapons Center, China Lake, CA. CONTRACTORS: General Dynamics, Pomona, CA; Raytheon, New Bedford, MA; Santa Barbara Research, Santa Barbara, CA, and Motorola, Scotsdale, AZ.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project S0363 Insensitive Muntions Advanced Development

1. (U) Description: Many Navy munitions react violently (detonate) when exposed to unplanned stimuli such as fire, fragment and bullet impact, shaped charge impact, and shock. In transportation or shipboard storage configurations, the detonation will usually be transfered to nearby munitions, resulting in mass detonation of a storage area, ship magazine, or launcher. This sequence of events leads to loss of ship/combat capability and lives. This project addresses that critical problem by providing validated technology to weapon developers for design and fabrication of munition systems that are insensitive to unplanned stimuli with no reduction in system performance. It addresses a CNO policy for complete transition to insensitive munitions by 1995. Energetic materials and design concepts for propulsion, fuzes, warheads, and pyrotechnics are available from exploratory development programs. Although preliminary testing indicates a marked improvement in insensitivity and performance over existing systems, advanced development is required before technology is useful to weapon designers. This project provides for advanced development of insensitive high performance explosives, propellants, and pyrotechnics that burn rather than detonate. Rocket motor, case, warhead, and fuze hardware design are optimized to further reduce reaction violence.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Developed Data Base for Navy munitions per Navy Technical Requirements.
- Developed plans to expand the program into an insensitive munitions technology program. Published plans for expanded program.
- Completed large-scale safety/vulnerability and performance testing of underwater explosives for torpedoes, mines, and destructors.
- Completed large-scale safety testing of a more producible explosive for SIDEWINDER and a deformable explosive for a selectively aimable warhead for STANDARD Missile.

Program Element: 63609N Title: Conventional Munitions

° Completed advanced development on PBXW-7 cook-off resistant booster.

° Conducted ballistic tests against armor materials for various warheads.

° Started design of Thermal Active Intervention Systems.

° Initiated advanced development of insensitive warhead and rocket motor for PENGUIN.

° Completed first phase of large scale safety/vulnerability testing of Low Vulnerability propellant.

° Selected three test bed rocket motor cases and five propellant formulations for advanced development studies.

° Demonstrated thermal battery cook-off to initiate mitigating devices requiring an electrical signal.

° Conducted assessment of pyrotechnics for insensitive munitions compliance.

b. (U) FY 1987 Program:

° Complete list of Navy priorities for munition fixes.

° Continue validation and short-fall analysis of POA&Ms submitted by program offices.

° Conduct safety and vulnerability tests on high performance explosives PBXW-9 and PBXC-126.

° Complete advanced development of PBXM-115, PBXM-103 and PBXC-121 explosives.

° Select final compositions for very insensitive explosives for large warheads and GP-bombs.

° Identify an insensitive explosive for Zuni, Hellfire and Advanced Cluster Munitions.

° Evaluate feasibility of binary and non-aqueous slurry explosives for IM applications.

° Recommend reactive case warhead designs.

° Recommend composite materials for warhead designs.

Program Element: 63609N Title: Conventional Munitions

° Select candidate armor materials for warhead designs.

° Initiate methods to predict the following: warhead behavior to stimuli; materials characterization; effects of generic warhead case concepts to minimize sympathetic detonation; effects of advanced initiation technology to reduce the sensitivity between stimuli and warhead/fuze systems and between booster and warhead.

° Complete advanced development of insensitive rocket motor and warhead for PENGUIN.

° Complete large scale testing of LOVA gun propellants.

° Initiate large scale safety/vulnerability testing of generic rocket motor designs.

° Evaluate mitigation devices to reduce munitions reaction violence during cook-off.

° Initiate methods to predict motor reaction violence to stimuli.

° Investigate mechanical energy input threat reduction with work on cases and liners combined with use of insensitive explosives. Protection from thermal input threats will be developed using both passive (e.g. strip laminate cases) and active concepts.

° Load and test-fire conventional propellants in generic motor cases.

° Start fabrication of mitigation devices and hybrid motor cases.

° Start advanced propellant scale-up work.

° Vulnerability assessment of pyrotechnics and cartridge and propellant actuated device.

° Test improved decoy and colored flares.

c. (U) FY 1988 Planned Program: Plans in the various technology areas are as follows:

° All of the warhead/fuze work in FY 1986 will be continued through FY 1987 and FY 1988 with major technology output expected to be available to weapon developers in FY 1988 and FY 1989.

Program Element: 63609N Title: Conventional Munitions

° Continue validation and short-fall analysis of POA&MS and update munitions data base.

° Start advanced development of high energy PBXW-119.

° Assist in the qualification of new explosive for Wide Area Missile.

° Complete large-scale/performance testing of PBXW-9/C-126 and PBXC-13/203.

° Limited large scale performance testing of nonaluminized AFX-108 explosive for large volume fragmenting warheads.

° Pilot plant scale-up and safety testing of insensitive melt-cast PBX's for large warheads and GP bombs.

° Continue development of predictive methods, documentation, new explosives processing techniques, continuous processing and injection molding pilot plant scale-up of high-energy PBX's, and underwater explosives testing and analysis.

° Test full-scale reactive case warheads and recommend advanced reactive case warhead design.

° Complete development of Thermal Active Intervention Systems technology.

° Initiate vulnerability tests of mitigation designs for slow cookoff, fragment and schok impact, etc.

° Continue development of hazard testing of test bed rocket motor, high performance, insensitive propellant scale-up, propellant vulnerability characterization, insensitive propulsion predictive methods, and improved gun propellants. (Much of the first generation technology for insensitive propulsion will be completed in FY 1988).

° Develop venting/pressure relief devices and insensitive fuzing for high-priority pyrotechnics munitions.

° Verification testing of technology improvements for pyrotechnics and cartridge and propellant actuated devices.

° Develop packaging alternatives for additional weapons as required by assessment.

d. (U) FY 1989 Planned Program: Plans in the various technology areas are as follows:

Program Element: 63609N Title: Conventional Munitions

- Continue validation and short-fall analysis of POA&Ms and update munitions data base.
- Complete large scale safety testing of insensitive melt-cast PBXs for large warheads and GP-bombs.
- Complete demonstration of reactive case design and transition to munitions developer.
- Demonstrate advanced initiation systems for warheads.
- Complete large scale vulnerability testing of advanced Navy propellants.
- Perform preliminary vulnerabilty tests on advanced propulsion concepts.
- Continue verification testing of technology improvements for pyrotechnics and cartridge and propellant actuated devices.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones: Complete development and testing of the following insensitive munition efforts for transition to engineering development:

| | Milestone | Date |
|---|---|---|
| 1. | Improved underwater explosive | FY 1987 (fourth quarter) |
| 2. | Deformable explosive for directional warheads | FY 1987 (fourth quarter) |
| 3. | Insensitive rocket motor and warhead for PENGUIN | FY 1987 (fourth quarter) |
| 4. | High output insensitive axial boosters for missile warheads | FY 1988 (fourth quarter) |
| 5. | LOVA Gun Propellant | FY 1988 (fourth quarter) |
| 6. | Explosive with improved producibilty | FY 1989 (fourth quarter) |
| 7. | Composite and armored warheads | FY 1989 (second quarter) |
| 8. | High performance explosive for shaped charge warheads | FY 1989 (fourth quarter) |
| 9. | Non-aluminized PBX for missile warheads | FY 1989 (fourth quarter) |
| 10. | Explosive with improved air-blast characteristics | FY 1990 (fourth quarter) |
| 11. | High energy explosives for shaped charge | |

Program Element: 63609N Title: Conventional Munitions

| | | |
|---|---|---|
| | applications | FY 1989 (fourth quarter) |
| 12. | High output insensitive radial boosters for missile warheads | FY 1989 (fourth quarter) |
| 13. | Slow Cookoff mitigating device | FY 1989 (fourth quarter) |
| 14. | Insensitive rocket motor concept | FY 1989 (fourth quarter) |
| 15. | New fuzing/detonator concept | FY 1990 (fourth quarter) |
| 16. | Reactive case warhead | FY 1990 (second quarter) |
| 17. | Large scale testing of advanced propellants | FY 1990 (fourth quarter) |
| 18. | Melt cast insensitive explosives for large missile warheads and GP-bombs | FY 1990 (fourth quarter) |

(U) Project S1821 Conventional Fuze/Warhead Package:

1. (U) Description: The Navy requires improved lethality for air and surface launched ordnance to defeat advanced threats. Current specific requirements and initiatives to address them include: defeat anti-ship missiles attacking at extremely low altitudes; product improve SPARROW missile fuzing; develop the EX-412 mid-range IR fuze for ROLLING AIRFRAME Missile (RAM) to defeat existing and near-term low-altitude threats; demonstrate fuzing solutions to defeat advanced low-altitude threats in the year 2000 and beyond; develop and demonstrate advanced missile fuzing systems to defeat low-observable targets of the year 2000 and beyond; demonstrate the performance and insensitivity improvements of reactive case warheads over conventional warheads; develop and demonstrate a single multi-function projectile fuze to optimize performance and operational flexibility while reducing logistics costs. This project will, in future years, also provide the vehicle to address new requirements by transitioning matured potential fuze and warhead technology from conceptual developments into engineering development with minimum technical and financial risk.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Designed fabricated and successfully tested SPARROW fuze brassboard at the encounter simulation laboratory and in captive carry tests.

° Designed and fabricated SPARROW fuze test set.

° Developed and evaluated SPARROW guidance algorithms.

Program Element: 63609N Title: Conventional Munitions

- Completed SPARROW low altitude Product Improvement Program (PIP) Documentation.
- RAM EX-412 Fuze Development group initiated design of critical signal processing schemes and awarded contracts for detectors, filters and coolers for inclusion in the in-house Naval Weapons Center, China Lake, CA, fuze brassboard design. In addition, two parallel contracts have been awarded for industry brassboard designs.
- Generic low altitude fuze RF target data measurements and sea clutter measurements were conducted.
- Signatures measurements and analysis program were continued for the low observable fuze.
- Breadboard advanced development contract was completed by Motorola and in-house advanced development was continued for the multi-function projectile fuze.
- Laboratory reactive case warhead material output tests were conducted and initial penetration configurations were designed.

b. (U) FY 1987 Program:

- The SPARROW low altitude fuzing PIP Full Scale Engineering Development (FSED) contract will be awarded in the third quarter. The contractor will conduct producibility engineering of the government furnished design disclosure package and fabricate 28 low altitude capable guidance sections for test and evaluation.
- RAM EX-412 mid-range IR fuze design and evaluation will continue at Naval Weapons Center and component contractors.
- In-house design efforts of a far-term solution to defeat advanced low altitude threats of the year 2000 and beyond will complete target/clutter discrimination measurements and algorithms and initiate hardware design of a multimode RF/IR fuze.
- Development of analytical models using ray tracing techniques will continue in the low observable fuzing project. Tests of fuzing performance against low observable models will be conducted at the encounter simulation laboratory, Naval Weapons Center.
- Multi-function projectile fuze advanced development will evaluate the Phase I brassboards at Naval Surface Weapons Center and fabricate Phase II brassboards at Motorola.

Program Element: 63609N Title: Conventional Munitions

° The reactive case warhead project will complete evaluation of candidate materials for optimum lethality and functioning as an insensitive munition.

c. (U) FY 1988 Planned Program:

° Technical Evaluation (TECHEVAL) will be conducted on the SPARROW low-altitude fusing PIP.

° The RAM low-altitude EX-412 fuze project will award two advanced development contracts to design and initiate fabrication of advanced development brassboards.

° The generic low-altitude fuze project will develop hardware for the multimode RF/IR fuze.

° Development of advanced fuze concepts will continue for low-observable fuzing.

° The multi-function projectile fuze advanced development project will evaluate Phase II brassboards at Naval Surface Weapons Center and fabricate Phase III brassboards at Motorola.

° The reactive case warhead project will design and fabricate demonstration hardware.

d. (U) FY 1989 Planned Program:

° Operational Evaluation (OPEVAL) will be conducted for the SPARROW Low Altitude Fuzing PIP.

° The RAM Low Altitude EX-412 Fuze will complete advanced development.

° The Generic Low Altitude Fuze project will fabricate fuze prototypes.

° The Low Observables Fuze project will fabricate prototypes.

° The Multi-Function Fuze project will complete Advanced Development and prepare for transition to FSED.

° The Reactive Case Warhead project will complete fabrication of demonstration hardware.

° Transition multi-function projectile fuze to FSED.

e. (U) Program to Completion:

Program Element: 63609N Title: Conventional Munitions

- Complete SPARROW low-altitude PIP through IOC in FY 1990.
- Demonstrate reactive case warhead hardware effectiveness in FY 1990.
- Complete RAM EX-412 fuze development through IOC in FY 1992.
- Demonstrate generic low-altitude fuze hardware in FY 1991.
- Demonstrate low-observable fuze hardware in FY 1992.
- Initiate new advanced development and demonstration ordnance tasks as required.

f. (U) Major Milestones:

| | Milestone II | Milestone IIIA | Milestone IIIB | IOC |
|---|---|---|---|---|
| SPARROW Low Altitude Fuze PIP | FY 86/4Q | FY 89/4Q | FY 90/4Q | FY 90/3Q |
| RAM EX-412 Fuze | FY 89/4Q | FY 91/3Q | FY 92/4Q | FY 92/4Q |

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63610N
Title: Advanced Warhead Development
DoD Mission Area: 233 Anti-Submarine Warfare
Budget Activity: 4-Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | - | - | - | 7,686 | Continuing | Continuing |
| S1873 | Advanced Warhead Development | - | - | - | 7,686 | Continuing | Continuing |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program is designed to examine possible future improvements to the MK 50 Torpedo warhead

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: In FY 87, a decrease of 7,434 due to Congressional action; in FY 88 a decrease of 11,749 due to Department program and budget adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 3,140 | - | 7,434 | 11,749 | Continuing | Continuing |
| S1873 | MK 50 Torpedo | 3,140 | - | 7,434 | 11,749 | Continuing | Continuing |

Program Element: 63610N Title: Advanced Warhead Development

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: None.

E. (U) RELATED ACTIVITIES: Program Element 64610N, Torpedo MK 50 - Provides for full-scale development of the Torpedo MK 50. Program Element 62633N, Technology Development - provides for investigation, using diagnostic and analytical methods and equipments, of new underwater warhead concepts.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Surface Weapons Center, White Oak, Silver Spring, MD. CONTRACTORS: To be determined.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable

(U) Project S1873, Advanced Warhead Development:

1. (U) Project Description: Project S1873, Advanced Warhead Development was a new start in FY 85. This project provides for research into possible future improvements The effort will explore existing as well as emerging technologies to conceptually develop improvements to the MK 50 Torpedo warhead during its life span.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Program delayed due to Congressional action.

b. (U) FY 1987 Program:

° Program delayed due to pending Congressional action.

c. (U) FY 1988 Planned Program:

° Program delayed due to Navy priority shift.

d. (U) FY 1989 Planned Program:

° Continue design trade-off studies.
° Begin lay out of "weaponizable" and Follow Through (FT) designs.

Program Element: 63610N Title: Advanced Warhead Development

- Continue fabrication of deformation targets.
- Continue development of analytic capability in the areas of damage assessment (i.e., warhead-target coupling) and lethality analysis.
- Make preliminary analytic deformation/rupture and other target and warhead coupling predictions.

e. (U) Program to Completion:

- Decision to proceed, FY 1990, for further warhead development.

f. (U) Major Milestones: Not Applicable.

g. (U) Explanation of Milestone Changes: Not Applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63611M
DoD Mission Area: 211 - Direct Fire Combat

Title: Marine Corps Assault Vehicles, (Advanced)
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 4,204 | 8,535 | 12,206 | 13,497 | Continuing | Continuing |
| C1293 | Stratified Charge Rotary Engine | 4,204 | 8,535 | 12,206 | 13,497 | Continuing | 81,873 |

As this is a continuing program the above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides advanced development funds to design, demonstrate, and validate selected wheeled and tracked vehicles and engines which will meet the firepower and mobility requirements for amphibious operations and subsequent operations ashore in the 1990's.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this descriptive summary are as follows: Stratified Charge Rotary Engine: The FY 1986 decrease of 6,203 resulted from FY 1985 program initiation delays which precluded execution of all appropriated FY 1986 funds. The FY 1987 decrease of 2,470 was due to Congressional undistributed reductions. The FY 1988 decrease of 1,115 is due to delays in hiring engineers for the John Deere facility in Woodridge, NJ.

Program Element: 63611M

Title: Marine Corps Assault Vehicles, (Advanced)

2. (U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 14,499 | 10,407 | 11,005 | 13,321 | Continuing | Continuing |
| C0016 | Mobile Protected Gun System | 10,983 | 0 | 0 | 0 | - | - |
| C0020 | Landing Vehicle Tracked (Experimental) | 2,023 | 0 | 0 | 0 | - | - |
| C1293 | Stratified Charge Rotary Engine | 1,493 | 10,407 | 11,005 | 13,321 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1985 only for Project C0016 and Project C0020.

D. (U) OTHER FY 1988/89 APPROPRIATIONS FUNDS: Not applicable.

E. (U) RELATED ACTIVITIES: Mobile Protected Gun System: This effort was integrated into the Light Armored Vehicle program in C1555 in FY 1986. Landing Vehicle Tracked (Experimental): This terminated program was related to the Marine Corps Assault Amphibious Vehicle 7A1 program (Program Element 26623M) in that the Landing Vehicle Tracked (Experimental) was a mission element need statement follow-on replacement alternative. Stratified Charge Rotary Engine: This program is related to tracked and wheeled vehicle developments and product improvements initiated in the 1990's when a lightweight, high-horsepower, multifuel engine is required.

F. (U) WORK PERFORMED BY: Stratified Charge Rotary Engine: CONTRACTORS: John Deere Technologies International, Inc., Wood-Ridge, NJ; IN-HOUSE: Naval Sea Systems Command, Washington, DC.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project C1293, Stratified Charge Rotary Engine:

1. (U) Description: This project is a Congressional initiative to develop a stratified charge rotary engine for effective application in future military systems. Previous program prototypes will be modified and new engines developed. Specific advantages available with this engine family are a wide variety of DoD applications, increased power density, improved power/response, wider fuel tolerance, improved reliability, availability, maintainability, durability and reduced life cycle

Program Element: 63611M Title: Marine Corps Assault Vehicles, (Advanced)

costs. The engine will satisfy specific DoD multi-service needs in such applications as shipboard generator sets, amphibious/land tracked vehicles and fighting/tactical vehicles.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o John Deere Technologies, International under the demonstration and validation contract, began design efforts.
- o Modified and tested previous program prototypes.

b. (U) FY 1987 Program:

- o Design, fabricate and evaluate the development design, two-rotor, 350 cubic inch stratified charge rotary engine.
- o Continue to test previous program prototypes.
- o Prepare development design unit drawings for a two-rotor, turbocharged engine, (350 cubic inches per rotor), 750 horsepower, 3,600 revolutions per minute rated output.

c. (U) FY 1988 Planned Program:

- o Develop two rotor, 350 cubic inch, turbocharged 750 horsepower rotary engines and continue demonstration and validation.
- o Develop reliability, availability, maintainability and durability data.
- o Complete integrated logistic support plan.
- o Deliver two engines for Government developmental testing.

d. (U) FY 1989 Planned Program:

- o Commence full scale engineering development phase.

Program Element: 63611M

Title: Marine Corps Assault Vehicles, (Advanced)

- o Identify candidate end item applications for engine integration.
- o Pursue engine component modularity to achieve a family of engines.
- o Commence end item application integration efforts.

e. (U) Program to Completion: Initiate reliability engineering (growth), durability, performance and environmental testing of the rotary engine. Conduct a 400 hour NATO cyclic endurance test.

f. (U) Major Milestones:

| Milestone | DATE |
|---|---|
| 1. Milestone I | FY 1982 |
| 2. Milestone II | FY 1988 |
| 3. Milestone III | FY 1991 |
| 4. Initial Operational Capability | Dependent upon test vehicle platform, i.e., Advanced Amphibious Assault Vehicle, motor transportation trucks, or shipboard/ground generators, or current Amphibious Vehicle. |

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63634N
DOD Mission Area: 189 - Theater Wide Nuclear Warfare

Title: Tactical Nuclear Weapons Development
Budget Activity: 4 - Tactical Program

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 7,155 | 7,676 | 11,499 | 19,375 | Continuing | Continuing |
| S0342 | Tactical Nuclear Development | 7,155 | 7,676 | 11,499 | 19,375 | Continuing | Continuing |

As this is a continuing program, the above funding includes out-year escalation and encompasses all work or development phases now planned or anticipsted through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This element provides the required Phase 1 (Weapon Conception), Phase 2 (Technical Feasibility), Phase 2A (Design Definition and Cost Study), Phase 3 (Engineering Development), and other development phase efforts to support modernization of Navy and Marine Corps tactical nuclear weapons. These nuclear weapon acquisition phases are, by joint Department of Energy - Department of Defense agreement, mandatory to nuclear weapon engineering development. These nuclear weapon acquisition phases will support the Chief of Naval Operations and Joint Chiefs of Staff directed modernization program Additionally, research and development efforts to establish and maintain the tactical nuclear warfare technical base are supported. The ship assessment program will continue the development of the EMPRESS II Electromagnetic Pulse freefield simulator for assessing, validating, and maintaining Electromagnetic Pulse hardness of surface ships. In addition, the Navy-Defense Nuclear Agency Technical Advisory Group (TAG-1) will continue the evaluation and assessment of current Electromagnetic Pulse hardening practice with respect to criteria, engineering practices, and methodology for hardening.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: In FY 1986, a decrease of -605 is a Department budget program adjustment, a NIF rate adjustment; in FY 1987, a decrease of -7,475 is the result of Congressional actions and adjustments; in FY 1988, decrease of -10,715 is a result of Department program and budget adjustments.

Program Element: 63634N Title: Tactical Nuclear Weapons Development

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 7,012 | 7,760 | 15,151 | 22,214 | Continuing | Continuing |
| S0342 | Tactical Nuclear Development | 7,012 | 7,760 | 15,151 | 22,214 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable

E. (U) RELATED ACTIVITIES: Program Element 63367N (SEA LANCE) and Program Element 64603N (Project W1844-Bomb Dummy Unit and A/C Interface) support the planning preparations and production engineering phase for new tactical weapons. Program Element 63514N (Project S1607-Shipboard Damage Control) funds the hardware development and production of EMPRESS II, and (Project S0384-Ship Survivability (Advanced)) supports EMP platform hardening as well as EMPRESS II tests of selected ships.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Surface Weapons Center, White Oak, Silver Spring, MD; Naval Underwater Systems Center, Newport, RI.; Naval Weapons Evaluation Facility, Albuquerque, NM; Atlantic Division, Naval Facilities Engineering Command; Naval Sea Systems Command; Defense Nuclear Agency, Washington, DC. CONTRACTOR: Maxwell Laboratories, Inc., San Diego, CA; EG&G, Rockville, MD, Los Alamos Technical Associates, Inc, Los Alamos, NM; University of Maryland (Center for Environmental and Estuarine Studies) Horn Point, MD.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project S0342, Tactical Nuclear Development:

1. (U) Description: This project provides the necessary work effort to support the Joint Chiefs of Staff and the Chief of Naval Operations directed modernization of Navy-Marine Corps theater nuclear force weapons. These efforts are required by joint Department of Energy - Department of Defense agreement and are prerequisites to nuclear weapons engineering development. Projects involve weapon conception, feasibility determination, and cost analyses for tactical weapon developments. Tasks also include efforts related to weapons effectiveness, weapon/platform/facility survivability, and weapons support and employment.

Program Element: 63634N Title: Tactical Nuclear Weapons Development

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° SEA LANCE Nuclear Depth Bomb (NDB)
- Completed the Phase 2A Design Definition and Cost Study.
- Continued water-entry testing.
- Completed Design and Validation (D&V) and BXX/NDB Phase 2A Integrated Logistics Support Plan (ILSP).
- Initiated Full Scale Development Phase (FSD) and BXX/NDB Phase 3 ILSP.

° Air-Delivered Nuclear Depth/Strike Bomb (NDSB):
- Began Phase 2A Design Definition and Cost Study.
- Continued conceptual ILSP development.

° Navy/USMC XM785/W82 Projectile
- Completed conceptual ILSP.
- Completed Phase 3 ILSP.
- Initiated Phase 4.

° EMPRESS II Electromagnetic Pulse Simulator
- Continued construction of 7.0 MV EMP Pulser.
- Completed acute marine biota experiments. Commenced sub-lethal marine biota experiments.
- Continue environmental impact statement process.

° Nuclear Survivability and Vulnerability
- Validated surface ship translational velocity computer codes.
- Continued to develop submarine translational velocity computer codes.
- Continued to develop vulnerability assessments and design improvement guidelines for hardened guidance computers and target detection devices.
- Continued development of the Navy-Marine Corps master list of Mission Critical Systems or Mission Essential Equipment for all platforms and systems.
- Continued development of standards and specifications for hardening all combat platforms to nuclear environments.
- Initiated assessment of the CG-47 class ship for EMP vulnerability.
- Continued development of nuclear survivability criteria for ships, submarines, aircraft, shore facilities, FMF material, missiles, and communications.

Program Element: 63634N Title: Tactical Nuclear Weapons Development

- Initiated Hardness Assurance, Maintenance and Surveillance (HAMS) planning guidelines for aircraft.
- Initiated EMP test planning.

° Miscellaneous
- Continued to develop and model Nuclear AAW battle management simulations.
- Continued to develop target-oriented tactical decision aids.

° Deferred
- SEA LANCE NDB Phase 3 Engineering Development.
- Development of Navy Unauthorized Launch Analysis (ULA) guideline instruction/handbook.
- Development of MIL-Standard Software Nuclear Simulations (SNSA) and procedural instruction for software

° Terminated
- Naval Nuclear Warfare Simulation support.
- SM-2(N) development.

b. (U) FY 1987 Program:

° Air-Delivered Nuclear Depth/Strike Bomb (NDSB)
- Complete Phase 2A Design Definition and Cost Study.
- Complete conceptual ILSP development.
- Initiate Phase 3 Engineering Development.
- Initiate Phase 3 Navy/USMC ILSP development.

° Navy/USMC XM785/W82 Projectile
- Continue Phase 4 ILSP development.
- Continue Phase 4 production engineering.

° B61 Bomb Stockpile Improvement Program (SIP).
- Develop Military Characteristics and Stockpile-to-Target sequence.
- Initiate Phase 3 engineering development.
- Initiate Phase 3 ILSP development.

Program Element: 63634N Title: Tactical Nuclear Weapons Development

° EMPRESS II Electromagnetic Pulse Simulator
- Complete construction of pulser.
- Complete non-pulsing subsystem tests.
- Complete sub-lethal marine biota experiments. Provide detailed plan for field observation and sampling.
- Complete environmental impact statement process.

° Nuclear Survivability and Vulnerability
- Complete data base for ship and submarine safe standoff ranges from underwater detonations.
- Continue to develop vulnerability assessments and design improvement guidelines for hardened guidance computers and target detection devices.
- Continue EMP vulnerability assessments of surface combatants (CG-47, DD-963).
- Initiate revised survivability criteria based on updated nuclear threat environment.
- Initiate development of standards and specifications for hardening all combat platforms to nuclear environments.
- Initiate EMP hardened prototyping of topside equipment (CG-47, DD-963).
- Initiate EMP vulnerability assessment of precursor test ship.
- Continue EMP ship test planning.

° Miscellaneous
- Update consolidated logistics data base for SEA LANCE, XM785/W82, and NDSB.
- Initiate development of Navy unauthorized launch analysis guideline instruction handbook.

° Deferred
- SEA LANCE Phase 3 engineering development.
- SEA LANCE shock and water entry testing.
- Nuclear battle management simulations.
- Development of MIL-STD Software Nuclear Safety Analysis (SNSA).

c. (U) FY 1988 Planned Program:

° Air-Delivered Nuclear Depth/Strike Bomb (NDSB)
- Continue Phase 3 ILSP developments.
- Continue Phase 3 engineering development.

° Navy/USMC XM785/W82 Projectile
- Continue Phase 4 ILSP development.
- Continue Phase 4 production engineering.

Program Element: 63634N Title: Tactical Nuclear Weapons Development

° B61 Bomb Stockpile Improvement Program (SIP).
- Continue Phase 3 engineering development.
- Continue Phase 3 ILSP development.

° Nuclear Survivability and Vulnerability
- Update data base for ship and submarine safe standoff ranges from underwater detonations.
- Continue to develop vulnerability assessments and design improvement guidelines for hardened guidance computers and target detecting devices.
- Continue planning for first EMP ship test.
- Continue EMP vulnerability assesaments of surface combatants.
- Initiate EMP vulnerability assessment of aircraft carriers.
- Initiate development of EMP test plans for follow-on ship classes.
- Initiate development of ship alterations and ordnance alterations to harden ships for testing at EMPRESS II.
- Begin planning for Navy shipboard equipment tests at DNA blast/thermal test site.
- Con ue development of standards and specifications for hardening all combat ships to nuclear environments.
- iate transient radiation effects on electronics (TREE) assessments of shipboard equipment.

° Miscellaneous
- Continue consolidated logistics data base update for developmental bombs and warheads.
- Continue to develop and model nuclear battle simulations.
- Continue to develop target oriented tactical decision aids.
- Continue to develop unauthorized launch analysis guidelines.
- Continue development of MIL-Standard Software Nuclear Safety Analysis and procedures.
- Initiate Phase 1 Concept Definition Studies for new technology nuclear warheads.
- Initiate technology base analyses/studies for hardening nuclear weapons effects, and Arctic warfare.

d. FY 1989 Planned Program:

° Air-Delivered Nuclear Depth/Strike bomb (NDSB)
° Continue Phase 3 engineering development.
- Continue Phase 3 ILSP development.

° Navy/USMC XM785/W82 Projectile
- Complete Phase 4 ILSP development.
- Complete Phase 4 engineering development.
- Initiate ILSP update.

Program Element: 63634N Title: Tactical Nuclear Weapons Development

° B61 Bomb Stockpile Improvement Program (SIP).
- Continue Phase 3 engineering development.
- Continue Phase 3 ILSP development.

° Nuclear Survivability and Vulnerability
- Update data base for ship and submarine safe standoff ranges from underwater detonations.
- Continue to develop vulnerability assessments and design improvement guidelines for hardened guidance computers and target detecting devices.
- Conduct blast and thermal test of DDG 51 topside equipment at DNA field test site..
- Begin assessing the vulnerability of shipboard equipment due for major upgrade.
- Continue development of standards and specifications for hardening all combat platforms to nuclear environments.
- Continue EMP vulnerability assessment for surface ships and aircraft carriers.
- Continue preparation for first EMPRESS test.

° Miscellaneous
- Continue Phase 1 Concept Studies for new technology nuclear warheads.
- Complete consolidated ILS logistics data base for TNW weaponry.
- Initiate ILS study for TNW maritime support in TNW environment.
- Continue to develop and model nuclear battle simulators.
- Continue to develop target-oriented tactical decision aids.
- Complete unauthorized launch analysis guidelines.
- Complete MIL-STD Software Nuclear Safety Analysis and procedures.
- Continue technology base analyses and studies.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones:

| Milestone: | Date |
|---|---|
| 1. SEA LANCE Phase 2A Complete | 86/02 |
| 2. Air Delivered NDSB Phase 2A Start | 86/02 |
| 3. B61 Bomb SIP | 87/03 |
| 4. Air Delivered NDSB Phase 3 Start | 87/03 |
| 5. Complete XM785/W82 Phase 4 | 89/04 |
| 6. Initiate XM785/W82 | |



I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63635M
DoD Mission Area: 211 - Direct Fire Combat

Title: Marine Corps Ground Combat/Supporting Arms Systems (Advanced)
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 16,022 | 14,561 | 7,926 | 9,410 | Continuing | Continuing |
| C0011 | Marine Corps Ground Weaponry | 1,743 | * | * | * | Continuing | Continuing |
| C0014 | Joint Service Small Arms Program | 2,745 | * | * | * | Continuing | Continuing |
| C1598 | Nuclear/Biological/Chemical Equipment | 1,341 | 2,493 | 2,579 | 2,718 | Continuing | Continuing |
| C1699 | Remotely Piloted Vehicles | 10,193 | 12,068 | **(4,648) | **(4,939) | Continuing | Continuing |
| C1963 | Hypervelocity Missile | 0 | 0 | 1,559 | 2,548 | Continuing | Continuing |
| C1964 | Anti-Armor (Fire & Forget) | 0 | 0 | 980 | 1,449 | Continuing | Continuing |
| C1981 | Ground Air Telerobotics Systems | 0 | 0 | 2,808 | 2,695 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

* Funding consolidated in C19C1, Ground Weaponry Product Improvement Program, Program Element 26623M, Marine Corps Ground Combat/Supporting Arms (Operational Systems) in FY 1987 and beyond.
** Funded in Program Element 64657M, Marine Corps Ground Combat Supporting Arms Systems (Engineering).

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element includes Research, Development, Test and Evaluation efforts for the advanced development of Marine Corps equipment, weapons and support systems required for the conduct of close combat and fire support and the provision of battlefield mobility.

Program Element: 63635M

Title: Marine Corps Ground Combat/Supporting Arms Systems (Advanced)

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: Marine Corps Ground Weaponry: The FY 1986 increase of 1,669 is due to acceleration of the Dragon warhead improvement effort. Nuclear/Biological/Chemical Equipment: The FY 1986 decrease of 650 and the FY 1988 decrease of 938 is due to less than anticipated costs associated with Marine Corps participation in NBC RDT&E efforts of other Services. Remotely Piloted Vehicle: The FY 1986 increase of 1,726 is due to continued acceleration of the short range vehicle ground support equipment development and associated logistical support analyses and plans development. The FY 1987 decrease of 3,611 was due to a Congressional reduction. Hypervelocity Missile: This joint development was contained in FY1987 and prior years in the Light Armored Vehicle Project, C1555 in Program Element 26623M, Marine Corps Ground Combat/Supporting Arms (Operational Systems). Anti Armor (Fire and Forget): This project was contained in FY 1987 and prior in C1901, Ground Weaponry Product Improvement in program element 26623M, Marine Corps Ground Combat/Supporting Arms/Operational Systems). Ground Air Telerobotics System: In FY 1987 and prior years, this effort was contained in C1699, Remotely Piloted Vehicles in this program element.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 5,741 | 13,126 | 18,249 | 12,252 | Continuing | Continuing |
| C0011 | Marine Corps Ground Weaponry | 193 | 74 | * | * | Continuing | Continuing |
| C0014 | Joint Service Small Arms Program | 2,130 | 2,594 | * | * | Continuing | Continuing |
| C1598 | Nuclear/Biological/Chemical Equipment | 780 | 1,991 | 2,570 | 3,517 | Continuing | Continuing |
| C1699 | Remotely Piloted Vehicles | 2,638 | 8,467 | 15,679 | 8,735 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATIONS FUNDS: Procurement Marine Corps

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| C1598 | M8A1 Chemical Agent Alarm Set | 1,764 | - | 916 | 1,444 | TBD | TBD |
| | (qty) (RON 68953) | (778) | - | (386) | (607) | TBD | TBD |
| | Lightweight Decon System | - | - | 3,409 | 3,630 | TBD | TBD |
| | (Qty) (RON 061393) | - | - | (276) | (282) | TBD | TBD |
| | Chemical Agent Monitor | - | - | - | 204 | TBD | TBD |
| | (Qty) (RON 68963) | - | - | - | (38) | TBD | TBD |

Program Element: 63635M Title: Marine Corps Ground Combat/Supporting Arms Systems (Advanced)

E. (U) RELATED ACTIVITIES: Remotely Piloted Vehicles: U.S. Army and foreign remotely piloted vehicle programs.

F. (U) WORK PERFORMED BY: Marine Corps Ground Weaponry: IN-HOUSE: Marine Corps Development and Education Command, Quantico, VA; Naval Surface Weapons Center, Dahlgren, VA; Army Test and Evaluation Command, Aberdeen Proving Ground, MD; U.S. Army Missile Command, Redstone Arsenal, AL. Joint Service Small Arms Program: IN-HOUSE: Small Caliber and Fire Control Laboratory, Picatinny Arsenal, Dover, NJ. CONTRACTOR: Olin Winchester Group, East Alton, IL. Nuclear/Biological/Chemical Equipment: IN-HOUSE: Marine Corps Development and Education Command, Quantico, VA; Naval Surface Weapons Center, Dahlgren, VA; U. S. Army Chemical Research and Development Engineering Center, Aberdeen Proving Ground, MD; U.S. Army Natick Research and Development Engineering Center, Natick, MA. CONTRACTOR: To Be Determined. Remotely Piloted Vehicles (RPV): IN-HOUSE: Naval Air Systems Command (PMA-263) Washington, DC; Naval Air Development Center, Warminster, PA; and Defense Advanced Research Project Agency, Washington, D.C. Robotics: IN-HOUSE: Marine Corps Development and Education Command, Quantico VA; Naval Ocean Systems Command, Honolulu, HI.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project C1598, Nuclear/Biological/Chemical Equipment:

1. (U) Description: This program supports research, development, testing and evaluation necessary to jointly develop items of equipment with the U.S. Army and other services. Marine Corps efforts concentrate on characteristics unique to the Marine Corps amphibious mission.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Monitored and participated in the Nuclear, Biological, and Chemical Equipment research, development, test and evaluation efforts of other Services with particular emphasis on the Chemical Agent Monitoring System, Enhanced Chemical Protective Suit and improved protective mask.
- Conducted independent testing and evaluation of other Services Nuclear, Biological, and Chemical Defense Equipment.
- Participated in Joint Service Program Reviews and conducted a Marine Corps Nuclear, Biological, and Chemical Defense Conference.

Program Element: 63635M

Title: Marine Corps Ground Combat/Supporting Arms Systems (Advanced)

b. (U) FY 1987 Program:

- o Participate in Joint Service Review Group program reviews.
- o Continue to evaluate and participate in other services' Nuclear, Biological, and Chemical research and development efforts.
- o Continue research, development, test and evaluation in the following areas: directed energy weapon countermeasures, remote-area detectors, vehicle and shelter detectors, individual protective equipment, collective protection systems, and improved decontamination systems.

c. (U) FY 1988 Planned Program:

- o Participate with the U.S. Army in development of advanced individual protection equipment, improved and remote chemical agent detectors, and personnel/casualty decontamination systems.
- o Participate with the U.S. Army in development of a family of collective protection shelters and accessory kits.
- o Participate with the U.S. Army in development of improved radiac instruments, smoke and obscuration devices, directed energy devices and directed energy counter measures.

d. (U) FY 1989 Planned Program:

- o Participate with U.S. Army in development of advanced individual protection equipment, improved and remote chemical agent detectors, and automated chemical agent warning and reconnaissance systems.
- o Continue with joint development of a family of collective protection shelters, improved radiac devices, and smoke and obscuration devices.
- o Continue with development of directed energy devices and directed energy weapon countermeasures.

e. (U) Program to Completion:

- o Complete development of advanced individual protective equipment, improved chemical agent detectors and radiac devices, and chemical agent automated warning and reconnaissance systems.
- o Complete development of directed energy devices and directed energy weapon counter measures.

Program Element: 63635M

Title: Marine Corps Ground Combat/Supporting Arms Systems (Advanced)

(U) Project C1963, Hypervelocity Missile:

1. (U) Description: This project will provide a vehicle mounted guided missile system capable of defeating frontally, and at extended ranges, all threat main battle tanks into the 21st century. The Hypervelocity Missile will replace the TOW Weapon system on the Light Armored Vehicle-Anti Tank Vehicle.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Contract awarded for 12 Hypervelocity Missiles for Joint USA, USAF and USMC Demonstration.

b. (U) FY 1987 Program:

- o Hypervelocity Missile demonstration preparation.

c. (U) FY 1988 Planned Program:

- o Hypervelocity Missile demonstration.
- o Milestone II Decision to enter full scale engineering development.

d. (U) FY 1989 Planned Program:

- o Commence full-scale engineering development.
- o Start integration of Hypervelocity Missile in Light Armored Vehicle-Anti Tank.

e. (U) Program to Completion:

- o Complete Hypervelocity Missile full scale engineering development.
- o Complete developmental and operational tests.
- o Complete and test Hypervelocity Missile integration on Light Armored Vehicle-Anti Tank.

Program Element: 63635M

Title: Marine Corps Ground Combat/Supporting Arms Systems (Advanced)

(U) C1964, Anti-Armor (Fire and Forget)

1. (U) Description: This project will provide for Marine Corps participation in the Army's Advanced Antitank Weapon system - Medium (AAWS-M) development program. It will provide support to a deputy program manager at the Army's Missile Command, and any unique Marine Corps developmental requirements.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o This program received no Marine Corps funds. Advanced Antitank Weapon System-Medium is a joint program new start in FY 1986 funded initially by the Army alone.
- o A contract was awarded to a maximum of four responders for participation in a technology demonstration lasting 27 months.

b. (U) FY 1987 Program:

- o This program will be funded by the Army only in FY 1987.

c. (U) FY 1988 Planned Program:

- o Commence funding a small portion of the Advanced Antitank Weapon System-Medium RDT&E requirement primarily to support the Marine Corps peculiar needs in the program.

d. (U) FY 1989 Planned Program:

- o Continue funding Marine Corps participation in the program.

e. (U) Program to Completion:

- o Continue to fund Marine Corps participation in the program.

(U) C1981, Ground-Air Telerobotics System (GATERS)

1. (U) Description: This project will develop prototype systems to include a Teleoperated Vehicle (TOV) and Airborne Remotely Operated Device (ARCD) for operational testing and field evaluation by the FMF during FY 1988 and FY 1989.

Program Element: 63635M

Title: Marine Corps Ground Combat/Supporting Arms Systems (Advanced)

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o This program was contained in project C1699, Title: Remotely Piloted Vehicles.
- o Program initiation/Program Manager authorized at Marine Corps Development Center.
- o Ground-Air Telerobotics System program development organization established and Naval Ocean Systems Center (Hawaii Lab) designated principal development activity.
- o Sandia National LABS designated primary developer of Airborne Remotely Operated Device.
- o Naval Ocean Systems Center (Hawaii Lab) designated primary developer of the Teleoperated Vehicle.

b. (U) FY 1987 Program:

- o This program was contained in project C1699, Title: Remotely Piloted Vehicles.
- o Milestone I/Required Operational Capability approval 1st quarter.
- o Commence demonstration and validation phase.
- o Complete Teleoperated Vehicle/Airborne Remotely Operated Device subsystem integration.
- o Complete fabrication of Teleoperated Vehicle/Airborne Remotely Operated Device Prototypes.

c. (U) FY 1988 Planned Program:

- o Commence combined developmental Testing-I/Operational Testing-I for Teleoperated Vehicle and Airborne Remotely Operated Device.
- o Commence field evaluation.

d. (U) FY 1989 Planned Program:

- o Fleet Marine Force field evaluation continued (Teleoperated Vehicle/Airborne Remotely Operated Device).

Program Element: 63635M Title: Marine Corps Ground Combat/Supporting Arms Systems (Advanced)

- o Developmental Test I/Operational Test I continued.
- o Require Operational Capability validated for Teleoperated Vehicle/Airborne Remotely Operated Device.
- o Preparation for Milestone II: Full scale engineer development decision to include go ahead for limited production during FY91 and FY92.

e. (U) Program to Completion:

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63654N
Title: Joint Service Explosive Ordnance Development (Advanced)
DoD Mission Area: 303 - Special Operations Forces
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 10,700 | 13,658 | 11,643 | 12,412 | Continuing | Continuing |
| S0377 | Explosive Ordnance Disposal Procedures | 7,774 | 10,396 | 8,341 | 9,933 | Continuing | Continuing |
| S1317 | Explosive Ordnance Disposal Diving Systems | 2,926 | 3,262 | 3,302 | 2,479 | Continuing | Continuing |

As this is a continuing program, the above funding includes out-year escalation and encompasses all work or development phaaes now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Provides for the development of Exploaive Ordnance Disposal tools and equipment for use by all military services. The responsibility is assigned to the Navy as single service manager, by Department of Defense Directive 5160.67 of 24 November 1971, for management of the Joint Service Explosive Ordnance Diaposal Research and Development Program. The mission of Explosive Ordnance Disposal units is the detection, identification, rendering safe, recovery, field and laboratory evaluation, snd final disposal of unexploded nuclear, conventional (including improvised exploaive devices), chemical, and biological munitions. Increasing types of foreign and domestic weapons neceaaitate a continuing development program to provide Explosive Ordnance Disposal personnel of all military servicea with the special equipment and tools required to support this mission. This program also provides life support related equipment and remotely operated vehicles necessary to aupport the performance of Navy Explosive Ordnance Disposal tasks underwater. This equipment must have inherently low acoustic and magnetic signatures in order to allow the Explosive Ordnance Disposal technician to safely approach, render aafe and dispose of underwater ordnance.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The significant changea between the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are the reduction in FY 1986 -1,877 caused by a Department budget/program adjustments and the GRH sdjustment, the reduction in FY 1987 -1,133 caused by Congressional actions and adjustments, the reduction of -1,759 in FY 1988 caused by Department budget/program and NIF rate adjustments.

Program Element: 63654N Title: Joint Service Explosive Ordnance Development (Advanced)

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 7,110 | 12,577 | 14,791 | 13,402 | Continuing | Continuing |
| S0377 | Explosive Ordnance Disposal Procedures | 7,110 | 9,392 | 11,427 | 9,908 | Continuing | Continuing |
| S1317 | Explosive Ordnance Disposal Diving Systems | * | 3,185 | 3,364 | 3,494 | Continuing | Continuing |

* Project S1317 transferred from Program Element 63722N, Naval Special Warfare, starting in FY 1986.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not applicable

E. (U) RELATED ACTIVITIES: Program Element 64654N, Joint Service Explosive Ordnance Disposal Development (Engineering), provides for the integration of specialized tools and equipment into specific procedures required for individual weapons and ordnance items.

F. (U) WORK PERFORMED BY: Project S0377 IN-HOUSE: - Naval Explosive Ordnance Disposal Technology Center (lead laboratory), Indian Head, MD. CONTRACTORS: Foster-Miller Associates, Inc., Waltham, MA.; CACI, Arlington, VA; and Hanlon Industries, Inc., Euclid, OH. Project S1317 - IN-HOUSE: Naval Coastal Systems Center, Panama City, FL; Naval Surface Weapons Center, Dahlgren, VA and White Oak, MD; Naval Ocean Systems Center, San Diego, CA; Naval Explosive Ordnance Disposal Technology Center, Indian Head, MD; Navy Experimental Diving Unit, Panama City, FL. CONTRACTORS: Rexnord Inc., Malvern, PA; Diving Unlimited, San Diego, CA;

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project S1317, Explosive Ordnance Disposal Diving Systems:

1. (U) Description: Development of life support diving equipment and remote vehicles to support Explosive Ordnance Disposal underwater operations The equipment must have inherently low acoustic and magnetic signatures in order to allow the Explosive Ordnance Disposal technician to safely approach, render safe, and dispose of underwater ordnance.

Program Element: 63654N Title: Joint Service Explosive Ordnance Development (Advanced)

2. (U) Program Accomplishments and Future Efforts:

a. FY 1986 Program:

° Completed Developmental Testing of Remotely Operated Vehicle.
° Continued detail design of Explosive Ordnance Disposal Support Craft.
° Continued Neutralization Charge engineering effort.
° Evaluated prototypes of Divers Timer/Depth Gauge and Underwater Decompression Computer.
° Continued Chemical Warfare Protective Diving Suit Development.

b. (U) FY 1987 Program:

° Continue Engineering Effort of the Remotely Operated Vehicle.
° Begin Full Scale Development of the Neutralization Charge engineering effort.
° Continue Chemical Warfare Protective Diving Suit Engineering Development.
° Complete Developmental Testing of Diver's Timer/Depth Gauge and Underwater Decompression Computer.
° Complete Technical Data Package (TDP) for Explosive Ordnance Disposal Support Craft.

c. (U) FY 1988 Program:

° Continue Full Scale and Engineering Development of ongoing subprojects.
° Conduct OPEVAL for Diver's Timer/Depth Guage.
° Conduct OPEVAL for Underwater Decompression Computer.
° Conduct TECHEVAL for the Neutralization Charge.

d. (U) FY 1989 Program:

° Conduct OPEVAL for the Neutralization Charge.
° Conduct OPEVAL for the Chemical Warfare Protective Diving Suit.
° Conduct TECHEVAL for the Remotely Operated Vehicle (ROV).

e. (U) Program to Completion: This is a continuing program.

Program Element: 63654N Title: Joint Service Explosive Ordnance Development (Advanced)

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project S0377, Explosive Ordnance Disposal Procedures:

1. (U) Description: Provide Explosive Ordnance Disposal personnel of all military services with the specialized equipment and tools required to support their mission of detection, location, identification, rendering safe, recovery, field and laboratory evaluation, and final disposal of nuclear, conventional chemical, and biological munitions, including improvised explosive devices.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Completed Operational Evaluation of two systems which will significantly enhance personnel safety, render safe mechanical fuzes, and locate ordnance underwater.
- Continued design/development on a terrorist explosive device countermeasures program.

b. (U) FY 1987 Program:

- Continue full scale development of systems required to: (a) clear large numbers of munitions from forward NATO airbases; (b) render safe/neutralize unexploded ordnance (c) rapidly locate impacted/unexploded ordnance underground or underwater; and (d) provide a basic robotic capability to significantly enhance safety.
- Complete Operational Evaluation for one system to improve the ability to locate ordnance underwater.
- Obtain Approval for Full Production for three systems used to: a) render safe mechanical fuzes; b) locate ordnance underwater; and c) improve the ability to locate ordnance underwater.

c. (U) FY 1988 Planned Program:

- Complete Operational Evaluation of a system used to penetrate the case of ordnance and Mechanical Trepanner for mechanical access capability for analysis and evaluation of ordnance.
- Increase capability to identify, detect, and render safe sophisticated terrorist explosive devices.
- Continue development of system to sweep large areas and initiate magnetic influence fuzed ordnance targeted against aircraft on runways.

d. (U) FY 1989 Planned Program:

- Continue full scale and engineering development of ongoing subprojects.
- Obtain Approval for Full Production of a system to locate buried ordnance underwater.

Program Element: 63654N

Title: Joint Service Explosive Ordnance Development (Advanced)

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63702N
DoD Mission Area: 235 - Naval Warfare Support

Title: Ocean Engineering Systems Development
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 1,243 | 1,374 | 1,503 | 1,901 | Continuing | Continuing |
| S0394 | Shallow Depth Diving Equipment | 1,243 | 1,374 | 1,503 | 1,901 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program develops systems to support conventional diver operations from surface platforms to depths of 450 feet. Diver operations include ship husbandry, salvage/recovery and submarine rescue operations to support National, as well as Navy needs around the world. Modern certifiable diving systems which ensure optimum diver safety and allow maximum work efficiency are needed to replace current antiquated systems.

C. (U) COMPARISON WITH THE FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) Not Significant.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 1,627 | 1,349 | 1,417 | 1,393 | Continuing | Continuing |
| S0394 | Shallow Depth Diving Equipment | 1,627 | 1,349 | 1,417 | 1,393 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: (Dollars in Thousands)

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Other Procurement, Navy: | | | | | | |
| Funds (1130) | 812 | 3,000 | 3,000 | 5,000 | 19,000 | 30,812 |
| Quantities (Diving System Module) | 1 | 3 | 3 | 5 | 19 | |

Program Element: 63702N Title: Ocean Engineering Systems Development

E. (U) RELATED ACTIVITIES: Program Element 63713N, Ocean Engineering Technology Development, funds the development of deep ocean underwater search and observation systems, diver tools/equipments and diver medical technology.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Civil Engineering Laboratory; Port Hueneme, CA; Naval Ocean Systems Center, San Diego, CA; Naval Coastal Systems Center, Panama City, FL; Navy Experimental Diving Unit, Panama City, FL. CONTRACTORS: United Technologies, East Hartford, CT; Battelle Memorial Institute, Columbus, OH.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project S0394, Shallow Depth Diving Equipment:

1. (U) Description: This project provides for the development of U.S. Navy diver life support equipment and diver tools necessary to perform such shallow underwater tasks as salvage, recovery, inspection, ship husbandry and repair, rescue and object emplacement. Specifically, this project develops the first U.S. Navy certified Standard Diving System Module for diving operations to 170 feet; develops the Lightweight Dive System to improve operations in confined spaces to depths of 60 feet; and develops the Conventional Dive System to improve mobility, communications, and endurance during work operations to 450 feet.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Completed technical evaluation of the Standard Diving System Module.

° Completed operational evaluation of the Standard Diving System Module.

° Obtained production decision (Milestone IIIA) for Standard Diving System Module.

° Operational requirement for Lightweight Diving System was issued June 1986 (OR 108-02-87)

° Completed performance specifications for prototype Lightweight Dive System.

° Operational requirement for Conventional Diving System was issued June 1986 (OR 102-02-87)

° Completed configuration analysis of Conventional Dive System.

Program Element: 63702N Title: Ocean Engineering Systems Development

b. (U) FY 1987 Program:

- Complete Navy provisional certification of Lightweight Dive System prototype.
- Complete manned testing of prototype Lightweight Dive System.
- Issue Test and Evaluation Master Plans (TEMP) for the Lightweight Dive System and the Conventional Dive System.
- Complete Lightweight Dive System procurement specifications for Teat and Evaluation unit procurement.
- Complete prototype dive helmet for Conventional Dive System.
- Initiate laboratory testing of Conventional Dive System components.

c. (U) FY 1988 Planned Program:

- Complete Technical Evaluation of Lightweight Dive System.
- Complete Operational Evaluation of Lightweight Dive System.
- Define configuration of Conventional Dive System and initiate configuration control.
- Continue laboratory testing of Conventional Dive System components.

d. (U) FY 1989 Planned Program:

- Complete Lightweight Dive System development and obtain approval for acquisition.
- Initiate manned testing of Conventional Dive System.

e. (U) Program to Completion: This is a continuing program.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63704N
DoD Mission Area: 422-Mapping, Charting and Geodesy

Title: ASW Oceanography
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 11,219 | 9,368 | 7,430 | 10,120 | Continuing | Continuing |
| R0118 | Ocean Measurement Sensors | 7,310 | 5,141 | 1,890 | 2,597 | Continuing | Continuing |
| R1299 | Ocean Measurements Techniques | 1,884 | 2,332 | 1,419 | 1,588 | Continuing | Continuing |
| X1596 | Satellite Applications and Technology | 2,025 | 1,895 | 2,823 | 4,167 | Continuing | Continuing |
| R1987 | Mapping, Charting and Geodesy Techniques | 0 | 0 | 1,298 | 1,768 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program develops highly specialized, ultra-high resolution oceanographic instrumentation and techniques to measure acoustic and non-acoustic anti-submarine warfare ocean parameters. The Ocean Measurement Sensors project also includes the Navy's only program directed toward multi-sensor ASW acoustic performance prediction capability in support of low frequency active systems in a Battle Group Multi-static Sonar scenario. This program also develops techniques to analyze and display the measured data to support Naval oceanographic survey, oceanographic reconnaissance, and Fleet command requirements for ASW and submarine operations. This program is the principal source of advanced technology for Naval ocesnographic survey support for application of space-sensor-derived oceanographic data to Naval tactical applications; and for transitioning oceanographic data from forward operating areas into Navy operational oceanographic support products. The Mapping, Charting and Geodesy project will address the needs of the Fleet for greater accuracies and densities of geophysical data to support the more advanced weapon systems and navigation systems being introduced to the Fleet. The Satellite Applications and Technology project, X1595, is a combination and renaming of two projects (63207N, X0527 and 63704N, X1596) beginning in FY 1988 involved with the development of algorithms to process and display remotely sensed satellite data.

Program Element: 63704N Title: ASW Oceanography

C. (U) COMPARISON WITH THE FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: in FY 1986, a decrease of 281 in project X1596 for GRH and Department budget adjustments; in FY 1987, an increase of 2,892 in project R0118 is the result of Congressional action; a decrease of 517 in project X1596 is the result of Department program/budget and Congressional adjustments; in FY 1988, a decrease of 1,301 in project R1299 is the result of Department program/budget adjustments; an increase of 1,298 in project R1987 is the result of Department program adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 3,708 | 11,875 | 7,065 | 8,572 | Continuing | Continuing |
| R0118 | Ocean Measurement Sensors | 1,280 | 7,717 | 2,249 | 2,832 | Continuing | Continuing |
| R1299 | Ocean Measurement Techniques | 1,080 | 1,852 | 2,404 | 2,720 | Continuing | Continuing |
| X1596 | Satellite Oceanographic Tactical Applications | 1,348 | 2,306 | 2,412 | 3,020 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable

E. (U) RELATED ACTIVITIES: Program Element 61153N, Defense Research Sciences; Program Element 62435N, Ocean and Atmospheric Support Technology; Program Element 35112N, Oceanography; Program Element 65853N, Acoustic and Non-Acoustic Analysis Support; Program Element 11224N, SSBN Security; and Program Element 31327N, Technology, Reconnaissance, and Surveillance; Program Element 35111N, Weather Service; Program Element 63207N, Air-Ocean Tactical Applications; Program Element 35160N, Defense Meteorological Satellite Program; Program Element 63785N, ASW Environmental Acoustic Support.

F.(U) WORK PERFORMED BY: IN-HOUSE: Naval Ocean Research and Development Activity, Bay St. Louis, MS; Naval Ocean Systems Center, San Diego, CA; Naval Environmental Prediction Research Facility, Monterey, CA; Naval Postgraduate School, Monterey, CA; and Naval Research Laboratory, Washington, DC. CONTRACTORS: Applied Physics Laboratory, University of Washington, Seattle, WA;

Program Element: 63704N

Title: ASW Oceanography

Science Applications International Corporation, McLean, VA ; Johns Hopkins University, Baltimore, MD; Applied Physics Laboratory, Johns Hopkins University, Laurel MD; Scripps Institute of Oceanography, San Diego, CA; Marine Environments, Inc., Washington, DC.; Computer Science Corporation, Bay St. Louis, MS; Jet Propulsion Laboratory, Pasadena, CA; University of California at Santa Barbara, Santa Barbara, CA; University of California at Berkeley, Berkeley, CA; and Applied Physics Laboratory, University of Texas at Austin, Austin, TX; Planning Systems, Inc., McLean, VA; and University of Colorado, Boulder, CO.

G.(U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project RO118, Ocean Measurement Sensors:

1. (U) Description: This project supports advanced development of non-acoustic anti-submarine warfare oceanographic sensors in response to Navy requirements. The project is explicitly designed to transition promising technology to system engineering development for Naval oceanographic survey operations or where appropriate.

It also includes the "Naval Oceanography Program", initiated by Congressional action as a FY 1986 new start; this program's goal is "to analyze and model the three dimensional acoustic field on a local and regional basis..." "A task force commander would use such a model to optimize the distribution of anti-submarine warfare ships, submarines, aircraft and integrated undersea surveillance system assets in an anti-submarine warfare squadron or Battle Group multi-static sonar scenario."

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Evaluated data from Arctic ice thickness measurement system test; selected optimum system for future Fleet use;

- Completed ship survey underwater instrument towed body evaluation for non-acoustic ASW application and began modification for Naval Oceanographic Office survey operations.

- Completed design, test, and construction

Program Element: 63704N Title: ASW Oceanography

° Initiated "Naval Oceanography Program" to develop Navy 3-dimensional acoustic modeling capability in support of Battle Group and ASW squadron operations; range dependent acoustic model evaluation conducted; secure software development facility established.

b. (U) FY 1987 Program:

° Ground truth the selected Arctic ice thickness measurement system.

° Conduct tests of rapid profiling bioluminescence sensor in conjunction with a submarine exercise.

° Complete development of seagoing turbulence measurement sensor for non-acoustic ASW use.

° Complete development of non-acoustic ASW optical sensor suites for shipboard use.

° Initiate development of towed bioluminescence sensor for non-acoustic ASW measurements.

° Initiate development of integrated non-acoustic ASW sensor suite for submarine mount to collect environmental data.

° Complete design and test for submarine-launched expendable conductivity-temperature probe for non-acoustic ASW use.

° Continue development of three dimensional acoustic model.

c. (U) FY 1988 Planned Program:

° Continue integrated non-acoustic ASW sensor suite development for submarines.

° Continue development of towed bioluminescence sensor.

° Initiate sub-surface ice thickness measurement system for use from submarines.

Program Element: 63704N

Title: ASW Oceanography

° Initiate line sensor development for internal wave measurement for non-acoustic ASW.

d. (U) FY 1989 Planned Program:

° Complete towed bioluminescence sensor.

° Complete sub-surface ice thickness measurement system.

° Continue integrated non-acoustic ASW sensor suite development and testing.

e. (U) Program to Completion:

° This is a continuing program.

(U) Project R1299, Ocean Measurement Techniques:

1. (U) Description: Through a blend of systems analysis, technical research and development and laboratory/at-sea testing, this project provides for the advanced development of improved or new techniques for: non-acoustic and oceanographic survey methods; advanced data reduction, analysis, archiving, and presentation; and applied oceanographic products.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Demonstrated beach surf forecast improvements for amphibious landing support on the Tactical Environmental Support System.

° Conducted surface wave model comparison (Army, Navy, Canadian, NOAA) for oceanographic predictions.

° Initiated Master Oceanographic Observational Data System update for Fleet ASW and non-acoustic ASW communities.

Program Element: 63704N

Title: ASW Oceanography

- Performed Phase I model evaluation of Polar Ice Prediction System (PIPS) ice forecasting model.
- Continue hydrodynamic noise model development.

b. (U) FY 1987 Program:

- Test and evaluate in a Fleet operation, a version of surf prediction model for the Tactical Environmental Support System.
- Begin development of empirical ice models for Arctic operational support.
- Complete automated operational data displays for Fleet shipboard use.
- Complete surface wave model comparison; begin regional surface wave model evaluation.
- Continue hydrodynamic noise model development.

c. (U) FY 1988 Planned Program:

- Complete hydrodynamic noise model.
- Continue empirical ice model work.

Program Element: 63704N

Title: ASW Oceanography

d. (U) FY 1989 Planned Program:

- Complete empirical ice model development.
- Conduct fine microscale survey technique applications study.
-

e. (U) Program to Completion:

- This is a continuing program.

(U) Project X1596, Satellite Applications and Technology

1. (U) Description: This project uses data observed from a number of satellite sensors to develop tailored tactical products to support a variety of naval warfare requirements. These software based systems produce digital and graphic displays of atmospheric and oceanographic phenomena. As an example, certain sea surface phenomena observed from environmental satellites are processed and displayed in a format to enable the fleet to employ sensors, weapon systems and platforms to minimize the effects of these phenomena, thereby optimizing tactical performance. Additionally, this project (1) develops and assesses atmospheric and oceanographic satellite sensor technology to meet specific Navy operational requirements; (2) develops processing algorithms to convert raw satellite data into atmospheric and oceanographic parameters; and (3) provides ground truth for operational spaceborne sensors to ensure that the measurements being made are valid.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Continued the demonstration of the Geodetic/Geophysical Satellite (GEOSAT) altimeter data for useful oceanographic products and began the software transition to the Navy's operational oceanographic data analysis/forecast center.
- Evaluated the impact of satellite-measured sea surface temperature on Navy's Extended Ocean Thermal Structure products.
- Continued to develop application of satellite-derived data for the Arctic

Program Element: 63704N Title: ASW Oceanography

- Continued to develop global applications of satellite-derived data (e.g., rain rate, high wind areas, aerosols, visibility) for electro-optical weapons and sensors employment.

b. (U) FY 1987 Program:

- Continue the demonstration of the Geodetic/Geophysical Satellite (GEOSAT) altimeter data processing techniques and complete the software transition to the Navy's operational oceanographic data analysis/forecast center.
- Transition selected software modules to regional operational sites and formalize software modules for transition to shipboard systems to process satellite-derived oceanographic and atmospheric data.
- Conduct validation of the Defense Meteorological Satellite Program microwave imager wind and ice data in operational models.
- Continue development of satellite-derived environmental data assimilation and applications techniques.
- Develop automated techniques to assimilate all-source visual, infrared, and microwave data into a single dynamic model to identify tactically significant oceanographic phenomena.
- Develop expanded applications of satellite-derived data for shipboard use.

c. (U) FY 1988 Planned Program:

- Continue the demonstration of the Geodetic/Geophysical Satellite (GEOSAT) altimeter data processing techniques.
- Continue development of satellite data assimilation and applications techniques.
- Begin development of next generation ocean thermal analysis techniques.
- Begin applications software development to exploit newly available satellites.

Program Element: 63704N Title: ASW Oceanography

- Continue Synthetic Aperture Radar application studies.
- Continue advanced oceanographic remote sensing suite studies.
- Continue multi-channel altimeter studies.
- Begin Atmospheric Light Detection and Ranging (LIDAR) application studies.

d. (U) Fy 1989 Planned Program:

- Complete the demonstration of the Geodetic/Geophysical Satellite (GEOSAT) altimeter data processing technique.
- Integrate algorithms and other software to test and evaluate satellite and ground station data gathering and processing systems.
- Continue development of next generation ocean thermal analysis techniques.
- Continue developing exploitation techniques for newly available satellite data.
- Begin development of expert system techniques for processing environmental data.
- Continue development of satellite data assimilation and application techniques.

e. (U) Program to Completion:

- Complete development of next generation ocean thermal analysis techniques (FY 1992).
- Continue exploitation techniques for newly available satellite data.
- Continue development of expert system techniques for processing environmental data.

Program Element: 63704N Title: ASW Oceanography

- Continue development of satellite data assimilation and applications techniques.
- Complete Synthetic Aperture Radar studies.
- Continue multi-channel altimeter and LIDAR studies.
- Transition advanced sensor studies to sensor development.
- This is a continuing program.

(U) Project R1987, Mapping, Charting and Geodesy Techniques:

1. (U) Description: The purpose of this project is to address Navy requirements for improvements in: (a) coastal ocean optics, (b) coastal tide measurements, (c) marine geophysics (magnetics and gravity), (d) geodetic data analysis, management and display techniques, (e) bathymetric survey systems and techniques and (f) geodesy. With an existing 300 shipyear shortfall in accessible, coastal hydrographic survey requirements to be satisfied, new technological approaches are necessary to survey faster, better and cheaper.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: (from project R1299)

- Completed conceptual design for space magnetometer
- Completed report on Navy requirements for digital mapping, charting, and geodesy products for all systems under development

b. (U) FY 1987 Program: (from project R1299)

- Design space magnetometer ground link station.
- Evaluate new Defense Mapping Agency (DMA) digital product; World Vector Shoreline.
- Design study report for digital mapping, charting, and geodesy product testbed.

Program Element: 63704N Title: ASW Oceanography

c. (U) FY 1988 Planned Program:

- Launch prototype magnetometer.
- Develop interactive graphics display console and workstation for digital testbed.
- Evaluate the Arctic mapping, charting, and geodesy data collection options.
- Start identifying potential methods of remote tidal measurements.

d. (U) FY 1989 Planned Program:

- Refine magnetometer downlink station software.
- Integrate Global Positioning System (GPS) attitude measurement into magnetometer.
- Issue request for proposal for stereo multi-spectral scanner bathymetric sensor.
- Develop Image Processing work station to process the multispectral scanner data collected by the Airborne Bathymetric Survey (ABS) system.
- Continue study of potential methods of remote tidal measurements.

e. (U) Program to Completion:

- Launch final design magnetometer.
- Test airborne Arctic survey instrument.
- Test remote tidal measurements technique.

H. (U) PROJECTS MORE THAN $10 MILLION IN FY-88/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63708N
DoD Mission Area: 233 - Anti-Submarine Warfare

Title: Anti-Submarine Warfare Signal Processing
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 15,451 | 15,812 | 18,431 | 13,851 | Continuing | Continuing |
| W0490 | Project BEARTRAP | 7,598 | 8,868 | 11,074 | 5,022 | Continuing | Continuing |
| X0821 | Advanced Acoustic Processing | 3,747 | 1,579 | 1,388 | 1,576 | Continuing | Continuing |
| S0823 | Acoustic Performance Prediction | 4,106 | 5,365 | 5,969 | 7,253 | Continuing | Continuing |

As this is a continuing program, the above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipsted through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Anti-Submarine Warfare Signal Processing program is responsive to fleet requirements for improved ASW capability to counter the existing and projected submarine threat. The BEARTRAP project provides for the collection of active and passive submarine acoustic intelligence. The Advanced Acoustic Processing project independently evaluates Anti-Submarine Warfare signal processing systems aboard tactical air, surface and subsurface platforms. This evaluation is used to reduce redundant development efforts and permits technology transfer among advanced development, platform-related signal processing programs. The Acoustic Performance Prediction project develops computer-based, on-board capabilities that provide acoustic sensor performance predictions and mode selection guidance for all tactical ASW platforms (aircraft, surface ship, submarine) based on in-situ measurements and new/updated environmental data bases. Fleet operators require this information due to the increasing complexity of modern ASW weapons systems. The optimal tactical employment of these systems is based on knowledge of the effects of present environmental acoustic conditions. This project enables the fleet to obtain the full performance potential of their complex at-sea ASW systems by extending threat detection and counter-detection ranges, and maximizing overall ASW platform capability in all geographic areas, including the Arctic.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 President's Budget and that shown in this Descriptive Summary are as follows: Project W0490: FY 1986 funds decreased -768 due to Gramm-Rudman-Hollings and other Department budget/program reductions. FY 1987 decreased -1,262 for Congressional adjustment and Department program/budget adjustment. Project X0821: FY 1986 increase of +2,640 is due to a Department program adjustment for the CNO's Urgent ASW R&D Program Advanced Technology Demonstration. FY 1987 reduction of -203 is due to a Department budget

Program Element: 63708N Title: Anti-Submarine Warfare Signal Processing

adjustment of -150 and a Congressional adjustment of -53. The reduction of -547 in FY 1988 is due to Department program/budget and NIF rate adjustments. Project S0823: FY 1987 decrease of -711 is due to a Departmental budget/program adjustment of -509 and a Congressional adjustment of -202. FY 1988 decrease of -2,320 reflects Department budget/program adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 18,171 | 13,951 | 17,988 | 21,729 | Continuing | Continuing |
| W0490 | Project BEARTRAP | 4,879 | 8,366 | 10,130 | 11,505 | Continuing | Continuing |
| X0821 | Advanced Acoustic Processing | 8,891 | 1,107 | 1,782 | 1,935 | Continuing | Continuing |
| S0823 | Acoustic Performance Prediction | 4,401 | 4,478 | 6,076 | 8,289 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not applicable.

E. (U) RELATED ACTIVITIES: Project W0490 provides calibrated active threat target data to support torpedo sonar development and threat verification for advanced active sensor development, and provides passive sound pressure level data to support threat estimates used in improving ASW sensors for Program Elements: 63529N Advanced ASW target, 63553N Surface ASW, 64713N Surface ASW Sys Imp., 63619N, MK 48 Advanced Capabilities; 63610N, Advanced Lightweight Torpedo; 63254N, Air ASW (Advanced Sensors); 64261N, Acoustic Search Sensors (Engineering Project X0821 provides for development of advanced acoustic processing capabilities for various air, surface, submarine, and surveillance platform applications for Program Elements: 24311N, Undersea Surveillance System; 64503N, Submarine Sonar Development; 64219N, Airborne Anti-Submarine Warfare Development; 64713N, Tactical Towed Array Sonar; 64524N, Submarine Advanced Combat System Development; 64217N, S-3B: Project S0823 provides acoustic performance models/algorithms and undersea warfare system performance predictions for integration into a platform system for Program Elements: 63207N, Tactical Environmental Support Systems; 64575N, AN/SQS-53C; 25620N, Anti-Submarine Warfare Combat Systems Integration; 64524N, SUBACS (Eng); 64713N, TACTAS; 64503N Submarine Sonar Development (Eng), 64562N Submarine Tactical Warfare Systems (Eng); 64713N Surface ASW System Improvements.

F. (U) WORK PERFORMED BY: IN-HOUSE: For Project W0490: Naval Air Development Center, Warminster, PA (Lead laboratory); Naval Air Test Center, Patuxent, MD; Naval Surface Weapons Center, White Oak, MD; Naval Weapons Support Center, Crane, IN; Naval Avionics Center, Indianapolis, IN. CONTRACTORS: TRACOR, Austin, TX; Precision/Echo, Santa Clara, CA; Honeywell, Inc., Denver, CO; Spartan Electronics, Jackson, MI; Magnavox Corp., Fort Wayne, IN; United Technology Norden System, Milville, NY; Digital Equipment Corp., Landover, MD; Numerix Corp., Newton, MA; Ramtek Corp., Napa, CA; Planning System, Inc., McLean, VA; SixdB, Inc.,

Program Element: 63708N Title: Anti-Submarine Warfare Signal Processing

Davidsonville, MD. For Project X0821: IN-HOUSE: Naval Surface Weapons Center, White Oak, MD (Lead Laboratory); Naval Underwater Systems Center, New London, CT; Naval Air Development Center, Warminster, PA. CONTRACTORS: TRW Systems, McLean, VA; General Electric Co., Inc., Syracuse, NY; The Energystics Corp., Arlington, VA; EG&G Corp., Arlington, VA; TRACOR, Inc., Austin, TX. For Project S0823: IN-HOUSE: Naval Underwater Systems Center, Newport, RI (Lead Laboratory); Naval Ocean Research and Development Activity, Bay St. Louis, MS; Naval Ocesnographic Office, Bay St. Louis, MS. CONTRACTORS: Analysis and Technology, North Stonington, CT; Applied Physics Laboratory, Johns Hopkins University, Laurel, MD; Sonalysts Inc., Waterford, CT.

C. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project X0821, Advanced Acoustic Processing:

1. (U) Description: As tactical platform signal processing systems have increased in data throughput and complexity, it has become necessary to ensure that their performance be validated by an independent technical review. This project evaluates anti-submarine warfare acoustic signal and post processing systems for detection, classification and contribution to localization performance using acoustic data sets. Efficient operator interaction with the hybrid hardware/software acoustic sensor system is developed so that a less skilled operator, assisted by the computer, is able to perform as well an an experienced operator. Advanced acoustic processing tasks associated with broadband arrays, distributed broadband processing, low frequency active adjunct and active classification are in support of the focused CNO's Urgent ASW R&D Program and in FY 87 transition to PE 63747N, Project X1933 ASW Advanced Technology Demonstration.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Validsted Airborne Anti-Submarine Warfare Automatic Detection/Computer Assisted Classificstion systems.
° Testing continued on the AN/SQR-18, the AN/SQR-19 and in support of Major System Mode 11 software development for the Advanced Signal Processor (UYS-1).
° Testing continued on submarine signal processing systems.
° Initial testing of broadband sonobuoy system conducted.

b. (U) FY 1987 Program:

° Initiation of tests of active systems for sonobuoys and surface ships.
° Continuation of the testing of the AN/SQR-18, AN/SQR-19 snd Major System Mode 11.
° Continuation of testing of Submarine Towed Array Systems, BQQ-5C.

Program Element: 63708N Title: Anti-Submarine Warfare Signal Processing

c. (U) FY 1988 Planned Program:

° Conduct performance tests of operational surface ship and submarine aonar syatems to provide a baseline for evaluation of system improvements.

d. (U) FY 1989 Planned Program

° Continuation of testing of ASW signal processing syatems in development.

e. (U) Program to Completion:

° This is a continuing program, efforts will continue to support required system modifications identified during baseline testing.

(U) Project S0823, Acoustic Performance Prediction (APP):

1. (U) Description: To achieve the full performance potential of undersea warfare syatems, fleet operators and commanders must be provided with accurate, real-time estimates of performance based on local and future environmental conditions. System complexity requires the use of these predictions to select optimum operating modes and ayatem/auite lineup and to evaluate various sensor employment alternatives. This requirement will be met by integrating into both afloat and ashore aystems an Acoustic Performance Prediction capability for surface ships (including aircraft carriers), submarines and Anti-Submarine Warfare Operations Centers (ASWOC). Acoustic Performance Prediction computer aoftware, tailored to the apecific needs of the operational user, uses measured in-situ acoustic/environmental data, supplemented by new/updated hiatorical data bases and sensor/target characteristics to yield system and suite performance predictions, counter-detection estimates and sonar mode aelection guidance.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Development and laboratory/sea testing (including Arctic) of surface ship and submarine undersea warfare prediction and suite line-up products continued.
° Completed development and testing of Acoustic Performance Prediction (APP) products for the SQR-19 and LAMPS MK III systems aboard USS CURTS (FFG-38).
° Completed development and testing of Acoustic Performance Prediction (APP) products for Integrated Carrier ASW Prediction System (ICAPS) (SYK-1) upgrade.

Program Element: 63708N Title: Anti-Submarine Warfare Signal Processing

- Completed development of initial Acoustic Performance Prediction (APP) products for Navy Standard Tactical Desk-Top Computer for the Submarine Fleet Mission Program Library (SFMPL).
- Developed Arctic-related Acoustic Performance Prediction (APP) products and tested them during ICEX 1-86.
- Completed development and testing of acoustic prediction products and suite line-up guidance for the SQS-53C.
- Completed specifications of Acoustic Performance Prediction and suite line-up requirements for BSY-1 FY 89 Combst System.

b. (U) FY 1987 Program:

- Laboratory/sea testing and delivery of improved Acoustic Performance Prediction packages for the UYQ-25 upgrade to support the NON-SQQ-89 Combst Systems (FF 1052s, CG-26s, etc.).
- Begin development of Acoustic Performance Prediction (APP) products for the ASW squadron, and Battle Group/Fleet Commanders.
- Update/improve existing models and data bases necessitated by air, surface, subsurface ASW system/sensor improvements and evolving fleet operational tactics.
- Begin development of ASW wespon-related Acoustic Performance Prediction (APP) products.
- Development/delivery of Acoustic Performance Prediction (APP) products for use in the Fleet Mission Progrsm Library (FMPL).
- Develop and test Arctic Acoustic Performance Prediction (APP) package for submarine use in ICEX 1-88.
- Evsluation and update of ICAPS, Sonar In-situ Mode Assessment System (SIMAS), and SFMPL, based on fleet operational experience.
- Begin development of prediction package for Surface Ship Advanced Combat System.
- Begin development of acoustic prediction package for pre-TRIDENT SSBNs.

c. (U) FY 1988 Planned Program:

- Continue development/testing of BQQ-5, BQQ-6 and Submarine Advanced Combat System APP products.
- Continue acoustic performance prediction package development for the pre-TRIDENT SSBN and torpedo development and testing.
- Deliver improved Submsrine Advanced Combat System SFMPL software package for implementation.
- Complete development of SIMAS (UYQ-25) and ICAPS (SYK-1) systems improvements generated as a result of fleet resl-time operational feedback.
- Continue development and st-sea testing of the performance prediction package for the Surface Ship Advanced Combat System.

Program Element: 63708N Title: Anti-Submarine Warfare Signal Processing

° Continue development and testing of undersea warfare system performance prediction products for the ASW Squadron, and Battle Group/Fleet Commanders.

d. (U) FY 1989 Planned Program:

° Complete testing of SIMAS and ICAPS upgrade acoustic software prediction improvements.
° Continue development and testing of weapon and acoustic warfare products.
° Complete development and testing of products for BSY-( )/FY 89 Combat System.
° Complete development and at-sea testing of products for Surface Ship Advanced Combat syatem.

e. (U) Program to Completion:

° This is a continuing program.
° Emphasis will shift to development, incorporation and evaluation of Acoustic Performance Prediction software for new submarine, surface ship and air ASW systems.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W0490, BEARTRAP:

1. (U) Description:

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Completed installation of the BEARTRAP system in a P-3C Update III aircraft.
° Installed BEARTRAP capability with improved recording systems in one additional Update II aircraft.

Program Element: 63708N Title: Anti-Submarine Warfare Signal Processing

- Started installation of
- Continued
  at a reduced level due to Gramm-Rudman-Hollings reductions.
- Integrated operational software upgrades in BEARTRAP aircraft.
- Completed delivery of shore-based for use in designated ASW Operations Centers.
- Built two portable data recording systems for use during Pony Express operations.

b. (U) FY 1987 Program:

- Develop capability for P-3C Update III.
- Install

- Install in BEARTRAP P-3C aircraft.
- Continue to update BEARTRAP tactical and operational software.
- Continue

c. (U) FY 1988 Planned Program:

- Install new hardware and software in three ASW Operations Centers.
- Install in three additional BEARTRAP P-3C aircraft.
- Develop improved Digital Signal Recording capabilities for BEARTRAP data collection.
- Continue to update BEARTRAP tactical and operational software.
- Continue

- Develop integrated DMP collection systems for P-3C UPDATE III aircraft.
- Develop updated microprocessor based systems for applications in BEARTRAP aircraft.
- Commence development of BEARTRAP capabilities for integration into P-3C UPDATE IV aircraft.

d. (U) FY 1989 Planned Program:

Program Element: 63708N Title: Anti-Submarine Warfare Signal Processing

° Support hardware and software improvements in upgraded ASW Operations Centers.
° Install in two additional BEARTRAP aircraft.
° Install improved Digital Signal Recording capabilities for BEARTRAP data collection.
° Continue to update BEARTRAP tactical and operational software.
° Continue

° Install systems for P-3C UPDATE III aircraft.
° Install updated microprocessor based systems applications in BEARTRAP aircraft.
° Continue development of BEARTRAP capabilities for integration into P-3C UPDATE IV aircraft.

e. (U) Program to Completion:

° This is a continuing program.

f. (U) Major Milestones:

| Milestone | Date |
|---|---|

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63709N
DoD Mission Area: 235 - Naval Warfare Support

Title: Advanced Marine Biological Systems
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 5,032 | 5,224 | 5,711 | 6,286 | Continuing | Continuing |
| SO214 | Advanced Marine Biological Systems | 5,032 | 5,224 | 5,711 | 6,286 | Continuing | Continuing |

As this is a continuing program, the above funding includes out-year escalation and encompassea all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Program requirementa are to train marine mammals and develop associated hardware, to identify those naval operations wherein the use of marine mammals is poasible, and to test the feasibility, determine the military worth, and establish the optimum characteristics of such utilization.

At present, three systems are in the fleet. The MK-5 Pingered Object Recovery System (formerly QUICK FIND, an unclaasified system used to recover torpedoes with California Sea Lions), and the MK-7 Swimmer Detection and Neutralization System (formerly SHORT TIME, have completed their development cycle, are Approved for Service Use and are operationally deployed. A third system, the MK-18 Mine Detection and Neutralization System (formerly LINEAR SWEEP), has received Proviaional Approval for Service Use and ia operationally deployed

C. (U) COMPARISON WITH 1987 DESCRIPTIVE SUMMARY: The significant difference between this Deacriptive Summary and the 1987 Deacriptive Summary is the reduction of -1,159 in FY 1988 caused by Department program/budget and NIF adjustments.

Program Element: 63709N Title: Advanced Marine Biological Systems

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 6,382 | 5,409 | 5,385 | 6,870 | Continuing | Continuing |
| SO214 | Advanced Marine Biological Systems | 6,382 | 5,409 | 5,385 | 6,870 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable

E. (U) RELATED ACTIVITIES: Marine mammal research is being conducted under P.E. 61153N; exploratory development under P.E. 62435N.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Ocean Systems Center, San Diego, CA; (Lead laboratory); Naval Surface Weapons Center, White Oak Laboratory, Silver Spring, MD. CONTRACTORS: B-K Dynamics Inc., San Diego, CA; Systems Engineering Analysis Company, Kailua, HI; Dynamic Systems Incorporated, McLean, VA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project SO214, Advanced Marine Biological Systems:

1. (U) Description:

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

Program Element: 63709N

Title: Advanced Marine Biological Systems

b. (U) FY 1987 Program:

c (U) FY 1988 Planned Program:

Program Element: 63709N

Title: Advanced Marine Biological Systems

d. (U) FY 1989 Planned Program

e. (U) Program to Completion: This is a continuing program which includes the following:

| | MS II | OPEVAL | MS III | IOC |
|---|---|---|---|---|
| MK-18 Mod 1 System | FY 84/4Q | FY 87/3Q | FY 87/4Q | FY 88/1Q |
| MK-3 Mod 0 System | FY 85/4Q | FY 88/1Q | FY 88/2Q | FY 88/2Q |
| MK-98 Accessory Set | FY 86/4Q | FY 90/1Q | FY 90/2Q | FY 90/2Q |
| EX-4 Mod 0 System | FY 87/3Q | FY 90/1Q | FY 90/2Q | FY 90/2Q |

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63711N
Title: Fleet Tactical Development and Evaluation Program
DoD Mission Area: 235 - Naval Warfare Support
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 1,888 | 3,949 | 4,800 | 6,127 | Continuing | Continuing |
| R0138 | Tactical Development Support | 1,888 | 3,949 | 4,800 | 6,127 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides the only funding for the Navy's system for collection, reconstruction and analysis of fleet operational data elements during exercise and real-world operational events; provides a central library of tactical information, lessons learned and proposed tactics, and reproduces and distributes tactical decision aid computer software. The capability to automate tactical information for rapid retrieval in a multi-threat environment is under development. Accurate reconstruction and analysis of operational performance is absolutely necessary for accurate development of tactics to improve warfighting capability.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) A FY 1987 decrease of 700 is due to Congressional adjustments and a FY 1988 decrease of 2,036 is due to department program adjustments and a department program/budget adjustment.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 5,301 | 1,999 | 4,649 | 6,836 | Continuing | Continuing |
| R0138 | Tactical Development Support | 5,301 | 1,999 | 4,649 | 6,836 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

Program Element: 63711N Title: Fleet Tactical Development and Evaluation Program

E. (U) RELATED ACTIVITIES: Equipments and software developed and maintained, and direct fleet operations support, provided by this program supports tactical development and evaluation conducted under Program Element 65155N, Fleet Tactical Development and Evaluation. It also provides accurate data upon which Fleet Commanders can base tactical and readiness conclusions, which are the basis for corrective actions. It provides significant reduction in otherwise man-intensive efforts required for data collection and processing during and after exercises and real-world operational events.

F. (U) WORK PERFORMED BY:

(a) In House: Navy Tactical Support Activity, Silver Spring, MD
(b) Laboratory: Naval Surface Weapons Center, Silver Spring, MD
(c) Contractors: Integrated Systems Analysis, Washington DC; General Physics Corporation, Columbia, MD., and United Information Systems, Silver Spring, MD.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project R0138, Tactical Development Support:

1. (U) Description. This project supports development, enhancement, and maintenance of automatic data collection devices; maintains 11 Fleet mainframe computer reconstruction systems (Tactical Information Management Systems) and the Fleet Tactical Library (Navy sole repository of tactical information and lessons learned) and reproduces and distributes Tactical Decision Aid Computer software. Automatic Data Collection and reconstruction systems are vital to reconstruction and analysis of operational and exercise data and directly support tactical and other operational initiatives. Automatic devices produce more accurate data and permit personnel to perform their assigned operational duties. Analysis of the gathered data provides the basis for the development of new and/or improved tactics. Maintenance of the Fleet Tactical Library (7,000 documents) entails processing, filing and reproducing extensive (average 500 yearly) incoming tactical information and lessons learned data, and responding to Fleet requests (average 1,000 yearly) for that information and data. Navy Tactical Decision Aid Computer software is reproduced, analyzed, quality controlled and distributed to Fleet users.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Provided developmental and maintenance support to 11 Fleet Tactical Information Management System (TIMS) computer installations.

- Installed/deinstalled 150 portable data collection devices on ships and aircraft (several per exercise/operation) in support of 52 Fleet exercises/operations.

- o Continued reconstruction standardization effort.
- o Continued enhancing TIMS computer software.
- o Fleet Tactical Library expanded to include observed tactical procedures from potential adversaries.
- o Expanded computer automated tactical decision aids development, reproduction and Fleet distribution.

b. (U) FY 1987 Program:

- o Continue direct fleet support through maintaining eleven TIMS computer systems, providing exercise installation and removal data collection of devices, and further improving those systems and devices.
- o Maintain and further expand Fleet Tactical Library (FTL) responsiveness to Fleet requests for tactical documentation.
- o Continue providing computer software development, validation, documentation, reproduction and distribution.
- o Continue enhancement of automated reconstruction systems and data collection devices to meet fleet exercises and operational needs.

c. (U) FY 1988 Planned Program:

- o Continue FY-1987 program (TIMS, FTL, software programs, reconstruction systems and associated data collection devices) expanding support and development of new systems and methods for computer software supporting warfighting and for collection and reconstruction in support of assessing performance, readiness and developing new or improved tactics.

d. (U) FY 1989 Planned Program:

- o Continue the FY-1988 planned program, expanding and upgrading hardware and software support.

e. (U) Program to Completion: This is a continuing program.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63713N
DoD Mission Area: 238 - Other Naval Warfare

Title: Ocean Engineering Technology Development
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 12,208 | 12,920 | 13,661 | 16,108 | Continuing | Continuing |
| M0099 | Deep Submergence Biomedical Development | 5,714 | 5,801 | 6,157 | 7,405 | Continuing | Continuing |
| S0396 | Deep Depth Diving | 922 | 1,525 | 1,463 | 2,180 | Continuing | Continuing |
| S0397 | Deep Ocean Technology | 5,572 | 5,594 | 6,041 | 6,523 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program develops the medical technology and the diver life support equipment and tools to permit manned and unmanned underwater operations to depths of 20,000 feet. The hostile use of the seabed; the vulnerability of offshore economic assets; and the loss of or compromise of hazardous and/or sensitive material in the deep oceans are considered in the mission areas of search, location, rescue, recovery, salvage, underwater construction and protection of offshore assets. Developments in this program will enable the U.S. Navy to overcome deficiencies which constrain deep ocean operations in the above mission areas

C. (U) COMPARISON WITH THE FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: in FY 1986, a decrease of 410 GRH and Department program/budget adjustments in project S0396; in FY 1987, a decrease of 1,543 in project M0099, 407 in project S0396 and 1,503 in project S0397 are the result of Congressional action and adjustments; in FY 1988, a decrease of 1,707 in project M0099, 592 in project S0396 and 1,840 in project S0397 are the result of Department program/budget adjustments.

Program Element: 63713N Title: Ocean Engineering Technology Development

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 17,233 | 13,086 | 16,373 | 17,800 | Continuing | Continuing |
| M0099 | Deep Submergence Biomedical Development | 5.954 | 6,044 | 7,344 | 7,864 | Continuing | Continuing |
| S0396 | Deep Depth Diving | 2,570 | 1,332 | 1,932 | 2,055 | Continuing | Continuing |
| S0397 | Deep Ocean Technology | 8,709 | 5,710 | 7,097 | 7,881 | Continuing | Continuing |

D.(U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E.(U) RELATED ACTIVITIES: Program Elements 63702N, Ocean Engineering Systems Development; 63706N, Medical Development (Advanced); 63722N, Naval Special Warfare; 62756N, Biomedical Technology; 63794N, Anti-Submarine Warfare Surveillance; 24561N, Man-In-The-Sea Program.

F.(U) WORK PERFORMED BY: IN-HOUSE: Naval Medical Research Institute, Bethesda,MD (lead); Naval Coastal Systems Laboratory, Panama City, FL; David W. Taylor Naval Ship Research and Development Center, Bethesda, MD; Naval Underwater Systems Center, Newport, RI; Naval Submarine Medical Research Laboratory, Groton, CT; Naval Ocean Systems Center, San Diego, CA. CONTRACTORS: Southwest Research Institute, San Antonio, TX; University of Pennsylvania, Philadelphia, PA; Duke University, Durham, NC; State University of New York, Buffalo, NY; Undersea Medical Society, Bethesda, MD; Rochester Inc., Culpepper, VA., Undersea Medical Society, Bethesda, Md.

G.(U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project M0099, Deep Submergence Biomedical Development:

1. (U) Description: The objectives of this project are to provide biomedical technology to support all Navy manned diving operations, to increase the safety and effectiveness of divers at current operational depths, and to provide physiological information which will allow useful work to be performed at deeper depths for longer periods of time.

Program Element: 63713N Title: Ocean Engineering Technology Development

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Completed trial of the effect of varied inspired oxygen concentrations on no-decompression diving.

° Developed an algorithm for Decompression Sickness (DCS) risk in single air dives.

° Produced equal risk air decompression tables.

° Showed that lung injury in Decompression Sickness (DCS) is similar to "shock lung", implicating white blood cells as a cause of injury.

° Began a trial of the drug combination of superoxide dismutase, heparin and catalase in the treatment of Decompression Sickness (DCS).

° Demonstrated that breathing helium-oxygen during the treatment of Decompression Sickness (DCS) resulting from an air dive worsened the obstruction of blood vessels in the lungs.

° Developed a physical fitness program specific to the needs of research saturation diving.

° Established a laboratory for diving gas purity analysis.

° Developed a new simple model for predicting lung oxygen toxicity.

° Determined that the severe rise in blood pressure following air embolism may be responsible for secondary deterioration of brain function.

° Demonstrated that the use of a common drug (Lidocaine) improves recovery of brain function after air embolism.

b. (U) FY 1987 Program:

° Complete development of maximum ascent limits for pressurized submarine rescue.

° Complete determination of effects of pulmonary oxygen toxicity on Decompression Sickness (DCS).

° Complete determination of inert gas solubilities in animal tissues.

° Complete assessment of high frequency ventilation in diving operations.

° Complete comprehensive diver health survey.

° Define the optimal oxygen concentration and gas density for work at depths to 200 feet.

° Deliver interim design criteria for underwater breathing apparatus to Naval Sea Systems Command.

° Define the cause of secondary deterioration of brain function following air embolism.

° Determine the need for steroids in the treatment of spinal cord Decompression Sickness (DCS).

c. (U) FY 1988 Planned Program:

° Deliver guidelines for achieving optimal cardiovascular fitness for underwater work.

° Provide new decompression tables for nitrogen-oxygen diving.

° Define optimum gas mixtures for exercise and decompression enhancement.

° Produce guidelines for diver thermal protection and prevention of respiratory heat loss.

° Provide recommendations for emergency treatment of Decompression Sickness (DCS) and air embolism in environments far from decompression facilities.

° Provide quantitative predictions for the incidence of central nervous system oxygen toxicity.

° Provide optimal intermittency schedules for use in oxygen exposures.

d. (U) FY 1989 Planned Program:

° Provide comprehensive estimate of likelihood for cardiac arrhythmias to occur at depth.

° Provide handbook for chamber contamination monitoring, control, and decontamination.

Program Element: 63713N Title: Ocean Engineering Technology Development

° Develop final predictive equations describing respiratory heat exchange and regional convective heat loss at depth.

° Report on human trials of new agents for use in treating Decompression Sickness (DCS).

° Report on human trials using evoked potential systems for monitoring divers for symptoms of the High Pressure Nervous Syndrome.

e. (U) Program to Completion: This is a continuing Program.

(U) Project S0396, Deep Depth Diving:

1. (U) Description: This project develops deep depth diving life support equipment and diver tools to safely support Navy divers performing: (a) construction, maintenance, and repair of underwater facilities; (b) salvage; (c) search for and recovery of objects of military importance; and (d) Navy projects requiring saturated diving to depths of 1,000 feet, and one-man, one-atmosphere diving to depths of 2,000 feet.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Operational Requirement for Navy One Man, One Atmosphere Diving System (NOMOADS) issued August 1986.

° Completed unmanned reliability testing of the MK 14 Closed Circuit Saturation Diving System (CCSDS).

° Completed manned saturation dive of MK 14 Closed Circuit Saturation Diving System (CCSDS) in the Ocean Simulation Facility at the Navy Experimental Diving Unit.

° Completed preparation to install MK 14 Closed Circuit Saturation Diving System (CCSDS) aboard ASP 22 Deep Dive System for open sea technical evaluation and operational evaluation.

° Continued development of MK 14 Closed Circuit Saturation Diving System (CCSDS) documentation and supportability package.

° Issued Program Change Approval Document (PCAD) to suspend further development of MK 14 (Mod 0) Closed Circuit Saturation Diving System (CCSDS) because of unavailability of surface support platform from which technical and operational testing was to be conducted.

Program Element: 63713N Title: Ocean Engineering Technology Development

b. (U) FY 1987 Program:

° Issue Test and Evaluation Master Plan (TEMP) for Navy One Man, One Atmosphere Diving System (NOMOADS)

° Fstablish certification for Navy One Man, One Atmosphere Diving System units 21 and 22.

° Conduct design analysis of critical components of Navy One Man, One Atmosphere Diving System.

° Conduct material/structure testing of Navy One-Man, One-Atmosphere Diving System (NOMOADS) graphite composite pressure hull.

c. (U) FY 1988 Planned Program:

° Conduct system tests on Development Model of Navy One Man, One Atmoshpher Diving System

° Issue draft Acquisition Plan, Training Plan and Integrated Logistics Support Plan for Navy One Man, ONe Atmosphere Diving System.

° Complete Test and Evaluation Master Plan for the Navy One-Man, One-Atmosphere Diving System (NOMOADS).

° Initiate unmanned reliability testing of the NOMOADS.

d. (U) FY 1989 Planned Program:

° Complete unmanned reliability testing of the Navy One Man, One Atmosphere Diving System (NOMOADS).

° Initiate certification planning for the NOMOADS.

° initiate procurement of Engineering Development/Advanced Development models of the NOMOADS.

e. (U) Program to Completion:

° Conduct manned testing of the Navy One Man, One Atmosphere Diving System (NOMOADS) in FY 1990

° Complete technical evaluation of Navy One Man, One Atmosphere Diving System in FY 1991

° Complete operational evaluation of the Navy One-Man, One-Atmosphere Diving System in FY 1992.

° This is a continuing program.

Program Element: 63713N

Title: Ocean Engineering Technology Development

(U) Project S0397, Deep Ocean Technology:

1. (U) Description: The U.S. Navy, in order to fulfill its mission, is required to operate in any ocean at any depth. Operations which must be performed at deep depths include: search, surveillance, emplacement, salvage/recovery, explosive ordnance disposal, and military oceanography. The systems that are necessary to support these deep ocean operations include: manned and unmanned submersible vehicles, underwater work systems, and surface support. To develop reliable and safe operational systems for deep depths (to 20,000 feet and greater) requires the exploitation of the most advanced technology. The objective of this project is to identify and advance critical technologies required in order for the Navy to function effectively in the deep ocean environment.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Operational Requirement for Advanced Tethered Vehicle (ATV) issued June 1986.
- Operational Requirement for Advanced Unmanned Search System (AUSS) issued June 1986.
- Completed at-sea acceptance testing of the Advanced Manueverable Underwater Viewing System with the Deep Submergence Vehicle ALVIN and achieve initial operational capability.
- Completed development of the Advanced Tethered Vehicle's 20,000 foot fiber-optic tether.
- Conducted open-ocean, untethered test of the Advanced Unmanned Search System.

b. (U) FY 1987 Program:

- Initiate development testing of the Advanced Tethered Vehicle with fiber-optic tether.
- Issue Test and Evaluation Master Plans (TEMP) for the Advanced Tethered Vehicle and the Advanced Unmanned Search System.
- Complete acoustic data link tests for transmission of sensor data from/to depths of 20,000 feet.
- Conduct search simulation with the Advanced Unmanned Search System.
- Initiate development of work system (manipulator, grabber and tools) for the Advanced Tethered Vehicle.

Program Element: 63713N Title: Ocean Engineering Technology Development

c. (U) FY 1988 Planned Program:

° Complete work suite for Advanced Tethered Vehicle.

° Conduct Advanced Tethered Vehicle at-sea operational dives to 20,000 feet.

° Initiate at-sea testing of the Advanced Unmanned Search System to depths of 20,000 feet.

° Initiate training of fleet operators on Advanced Tethered Vehicle.

° Initiate integrated deck handling system for Advanced Unmanned Search System and Advanced Tethered Vehicle.

d. (U) FY 1989 Planned Program:

° Accomplish initial operational capability of the Advanced Tethered Vehicle.

° Complete integrated deck handling system.

° Complete development testing of Advanced Unmanned Search System.

e. (U) Program to Completion:

° Complete turn-over of Advanced Tethered Vehicle to the fleet in FY 1991.

° Complete turn-over of Advanced Unmanned Search System to the fleet in FY 1992.

° This is a continuing program.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63719N
Title: Container Offloading and Transfer System (COTS)
DoD Mission Area: 264 - Intermodal Transfer/Port Operations/Air Drop
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 1,492 | 2,811 | 1,528 | 0 | 0 | 36,611 |
| YO816 | Container Offloading and Transfer System | 1,492 | 2,811 | 1,528 | 0 | 0 | 36,611 |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Strategic Sealift program includes sealift for the deployment of Maritime Prepositioning Ships, Army Divisions, and the Marine Assault Follow-On Echelons. It requires the utilization of available commercial shipping assets. Given the possibility we may not capture a fully operational high volume port to land these large contingency and sustaining forces, means of offloading commercial shipping over the shore or in an austere port must be available. This project develops components to move cargo over an unimproved beach. Project interfaces with Marine Corps and Army systems. Development has been completed and AFP has been granted for Powered Causeways (CSP), Sideloadable Warping Tug (SLWT), Elevated Causeway (ELCAS) and Roll-On Roll-Off (RO/RO) Facility. Development was started in FY 85 on ELCAS rapid casualty repair (RESTORE). RESTORE provides a rapid means of bridging up to two sections (180') of ELCAS or 160' of Cantilevered Elevated Causeway (CANTELCAS), which could be damaged by storm, accident or enemy action.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) A decrease of 2,791 in FY 1987 is the result of Congressional actions and adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 1,458 | 1,512 | 5,602 | 1,673 | 0 | 41,201 |
| YO816 | Container Offloading and Transfer System | 1,458 | 1,512 | 5,602 | 1,673 | 0 | 41,201 |

Program Element: 63719N Title: Container Offloading and Transfer System (COTS)

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not applicable

E. (U) RELATED ACTIVITIES: Auxiliary Crane Ship Project of Program Element 63726N (Merchant Ship Naval Augmentation Program), which is considering further development of crane motion compensation devices formerly under COTS. Program Element 63635M, (USMC Field Logistic System), which interfaces on shore with components developed by this project. There is no unnecessary duplication of effort within the Navy or the Department of Defense.

F. (U) WORK PERFORMED BY: IN-HOUSE: Lead Laboratory is the Naval Civil Engineering Laboratory, Port Hueneme, CA. OTHERS: David W. Taylor Naval Ship Research and Development Center, Bethesda, MD; Naval Ordnance Station, Indian Head, MD; Naval Sea Systems Command, Washington, DC; Naval Weapons Handling Center, Earle, NJ; and Norfolk Naval Shipyard, Portsmouth, VA. CONTRACTORS: Fairey Engineering Limited, Stockport, Cheshire, England.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project YO816, Container Offloading and Transfer System:

1. (U) Description: Amphibious resupply operations will be conducted in areas where developed port facilities are either non-existent or war-damaged. This project provides essential hardware and techniques to transfer containerized, bulk cargo, and rolling stock, over-the-beach from modern commercial ships moored offshore. The development includes: Elevated Causeways and RESTORE, a means of rapidly bridging up to 180' of the Elevated Causeway or 160' of CANTILEVERED Elevated Causeway which could be damaged by storm, accident or enemy action.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Designed Elevated Causeway casualty repair hardware test articles.

b. (U) FY 1987 Program:

° Conduct engineering validation tests on Elevated Causeway casualty repair hardware.

° Design/fabricate ELCAS RESTORE 100' Span.

° Developmental Test (DT IA) on modules and 100' span using ELCAS.

° Prepare integrated logistics support documentation and drawings for CANTELCAS RESTORE.

Program Element: 63719N Title: Container Offloading and Transfer System (COTS)

c. (U) FY 1988 Planned Program:

° Design/fabricate CANTELCAS RESTORE 160' span.

° Developmental Test (DT IB) on modules and 100' span.

° Developmental Test (DT IC) on modules and 160' span using ELCAS.

° Start Developmental Test (DT ID) on fatigue failure of 100' span.

d. (U) FY 1989 Planned Program: Not applicable.

e. (U) Program to Completion: Not applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63722N
DoD Mission Area: 307 - Special Operations Forces

Title: Naval Special Warfare
Budget Activity: 4-Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 10,149 | 20,848 | 19,943 | 20,706 | Continuing | Continuing |
| SO416 | SEAL Weapons System | 2,748 | 5,939 | 6,121 | 6,184 | Continuing | Continuing |
| SO417 | SEAL Support System | 2,179 | 12,212 | 9,466 | 10,372 | Continuing | Continuing |
| SO418 | Classified Project | 3,200 | 0 | 0 | 0 | 0 | 3,200 |
| S1684 | Special Warfare Combatant Craft | 2,022 | 2,697 | 4,356 | 4,150 | Continuing | Continuing |

The above funding profile includea out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Develops weapons, life-aupport, C³I, miaaion aupport equipment and mobility systems for Naval Special Warfare Forcea (SEAL/SDV Teams and Special Boat Squardrons). Thia is required to enhance Maritime Special Operations in support of Fleet or Joint Commanders which may include the following tactical miasions: reconnaissance, surveillance, ship attack, direct action, unconventional warfare and This element includes three projects: (1) SEAL Weapons System: a family of specialized weapons and accessories which includes explosive demolition charges, a variety of firing devices, standoff weapons, small arms and ammunition; (2) SEAL Support System: four categories of Equipment (mobility, life support, C³I and misaion aupport) which include SEAL Delivery Vehicles, aubmarine Dry Deck Sheltera, swimmer propulsion units, navigation systems, underwater breathing apparatus, diver thermal protection, communications enhancements, mission analysis, MCM equipment and mission simulators; (3) Special Warfare Combatant Craft: a series of Maritime Support Craft ranging from the Special Warfare Craft Medium (SWCM) through special purpose craft (High Speed Boat) to Combat Raiding Craft (CRRC). This program makes maximum use of the Foreign Weapons Evaluation Program (FWEP), Special Operationa, Special Technology Program (SOSTP), and a recently approved CNO acquisition policy for Special Warfare equipment, all of which encourage the rapid development of Special Warfare equipment and the use of suitably modified off-the-shelf equipment, where appropriate.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: The Navy Special Warfare Program budget was significantly increased in all years because of a desire to accelerate improvement of the Navy'a ability to deal and low intensity conflict. Specific modifications were: +3,433 in FY 1986 caused by a combination of GRH and Department program/budget adjustments, which

Program Element: 63722N Title: Naval Special Warfare

created a one year project +5,211 in FY 1987 caused by Congressional and Department program/budget adjustments; +4,684 in FY 1988 caused by Department program/budget and NIF rate adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 8,114 | 6,716 | 15,637 | 15,259 | Continuing | Continuing |
| S0416 | SEAL Weapons System | 2,858 | 2,812 | 6,122 | 5,804 | Continuing | Continuing |
| S0417 | SEAL Support System | 2,035 | 2,501 | 6,654 | 6,146 | Continuing | Continuing |
| S1317 | Explosive Ordnance Disposal Diving Systems | 1,443 | * | | | | |
| S1684 | Special Warfare Combatant Craft | 1,778 | 1,403 | 2,861 | 3,309 | Continuing | Continuing |

* Project S1317 transferred to Program Element 63654N, Joint Service Explosive Ordnance Disposal Development (Adv), starting in FY 1986.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| S0416 | SEAL Weapons System | | | | | | |
| | OPN BA-4 Line Item 335515 | 791 | 847 | 2,120 | 3,114 | Continuing | Continuing |
| | WPN BA-3 Line Item 303233 | 1,431 | 3,526 | 1,370 | 2,200 | Continuing | Continuing |
| S0417 | SEAL Support System | | | | | | |
| | OPN BA-1 Line Item 331140 | 27,992 | 23,662 | 37,663 | 40,803 | Continuing | Continuing |
| S1684 | Special Warfare Combatant Craft | | | | | | |
| | SCN | 0 | 19,600 | 21,000 | 0 | | |

F. (U) RELATED ACTIVITIES: Program Element 62734N, exploratory development in SEAL weapons. Program Element 64601N, Mine Development (Engineering), Project S0267, Mine Improvements, provides technology base necessary for development of SEAL weapons and support systems.

Program Element: 63722N Title: Naval Special Warfare

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Coastal Systems Center, Panama City, FL; Naval Surface Weapons Center, White Oak, MD; Naval Weapons Support Center, Crane, IN; Naval Surface Weapons Center, Dahlgren, VA; Naval Undersea Warfare Engineering Station, Keyport, WA; David Taylor Naval Ship Reaearch and Development Center, Bethesda, MD and Carderock, MD; NAVSEA Combat Systems Engineering Station, Norfolk, VA; Naval Weapons Center, China Lake, CA; Naval Electronics Systems Engineering Activity, St. Inigoes, MD; Naval Research Laboratory, Washington, DC. CONTRACTORS: Ametek-Straza, Santa Barbara, CA; Diving Unlimited, Incorporated, San Diego, CA; RMI Inc. of National City, CA; S-TRON, Belmont, CA; Newport News Shipbuilding, Newport News, VA; and Resource Consultants Inc., Arlington, VA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project SO41o, SEAL Weapons System:

1. (U) Description: Develops unique weapons and ordnance equipment for use by Naval Special Warfare Forces (SEAL and SDV Teams). Weapons are employed during beach obstacle clearance, underwater ship attacks and direct action miasions. This project includes firing devices, demolition charges, guided missile aystems, equipment canisters, marker beacons, hand weapona and ammunition, limpet mines, distress signals and individual combat equipment. To date, 33 items have been developed including the Standoff Weapon Assembly MK-32, a modified MK-37 torpedo launched from a MK IX SEAL Delivery Vehicle against surface ships; anti-ship and modular limpets; and time delay, radio frequency, and acoustic firing systems. This project has been expanded in response to Secretary of Defense direction to revitalize the Special Operations Forces (SOF) of all the military services against the current threat.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Progra

- Continued design and testing of Underwater Demolition Weapon (UDW) EX-33; a 1200 lb explosive charge with target sensing firing device for use against major or nested (ship) targeta.
- Conducted in-water rendezvous/recovery tests of SEAL Equipment Canister utilizing fleet personnel aervices.
- Completed engineering tests of smoke/flare distress aignals and procured TECHEVAL units.
- Expanded RF/Acoustic Transponder test requirements to include initiation from P-3 & C-130E aircraft.
- Conducted Standoff Weapon Asaembly MK 32 factory training prior to fleet introduction.
- Conducted successful land and underwater field testa on Sympathetic Firing Device using live explosive control and target charges.
- Commenced Advanced ASW Limpet Project.

Program Element: 63722N Title: Naval Special Warfare

b. (U) FY 1987 Program:

° Initiate Radio Firing Device, Anti-Disturbance Device and Absolute Time Firing Device projects.
° Achieve Milestone II for Advanced ASW Limpet, Absolute Time Firing Device, Anti-Disturbance Device/(basic), Underwater Demolition Weapon and Radio Firing Device.
° Complete evaluation of Radio Frequency/Acoustic Transponder and SEAL Equipment Canister.
° Achieve fleet introduction of Standoff Weapon Assembly MK-32.
° Achieve Milestone III for SEAL Equipment Canister and Swimmer Distress Signals.

c. (U) FY 1988 Planned Program:

° Initiste and achieve Milestone II for Charge Attachment System, Fiber Optic Guided Missile (a Navy Special Warfare adaptation of an existing Army missile), Miniaturized Firing Device and Antiship Mortar Round.
° Complete evaluation of Advanced ASW Limpet, basic Underwster Demolition Weapon, Charge Attachment System, Absolute Time Firing Device, Sympathetic Firing Device, Anti-Disturbance Device, Miniaturized Firing Device, Radio Firing Device and Navy Special Warfare Standoff Missile System (adaptation of current missile system like Hellfire for protection of Navy Special Warfare surface combatants).
° Achieve IOC for Swimmer Distress Signals, Sympathetic Firing Device, Absolute Time Firing Device, Anti-Disturbance Firing Device, SEAL Equipment Canister and Radio Frequency/Acoustic Transponder.

d. (U) FY 1989 Planned Program:

° Complete evaluation of Fiber Optic Guided Missile.
° Achieve Milestone III for Charge Attachment System and Antiship Mortar Round.
° Achieve IOC for Advanced ASW Limpet, (basic) Underwater Demolition Weapon, Miniaturized Firing Device, Radio Firing Device, Navy Special Warfare Standoff Missile and Charge Attachment Systems.

e. (U) Program to Completion: This is a continuing program which includes the following:

| | MS II | OPEVAL | MS III | IOC |
|---|---|---|---|---|
| Underwater Demolition Weapon | FY 87/4Q | FY 88/3Q | FY 88/4Q | FY 89/3Q |
| SEAL Equipment Canister | FY 86/4Q | FY 87/4Q | FY 87/4Q | FY 88/2Q |
| Absolute Time Firing Device | FY 87/2Q | FY 88/1Q | FY 88/2Q | FY 88/4Q |
| Swimmer Distress Signals | FY 83/1Q | N/A | FY 87/2Q | FY 88/1Q |
| Sympathetic Firing Device | FY 83/1Q | FY 88/1Q | FY 88/2Q | FY 88/2Q |
| Radio Frequency/Acoustic Trans. | FY 81/2Q | FY 87/4Q | FY 88/1Q | FY 88/2Q |
| Advanced ASW Limpet | FY 87/1Q | FY 88/1Q | FY 88/3Q | FY 89/1Q |

Program Element: 63722N Title: Naval Special Warfare

| | | | | |
|---|---|---|---|---|
| Anti-Disturbsnce Device | FY 87/2Q | FY 88/1Q | FY 88/2Q | FY 88/4Q |
| NSW Standoff Missile System | N/A | N/A | FY 88/4Q | FY 89/1Q |
| Miniaturized Firing Device | FY 88/2Q | FY 88/4Q | FY 88/4Q | FY 89/2Q |
| Charge Attachment System | FY 88/2Q | N/A | FY 89/1Q | FY 89/2Q |
| Radio Firing Device | FY 87/3Q | FY 88/3Q | FY 88/4Q | FY 89/2Q |
| Anti-Ship Mortar Round | FY 88/2Q | N/A | FY 89/1Q | FY 89/2Q |
| Fiber Optic Guided Missile | FY 88/2Q | FY 89/4Q | FY 90/2Q | FY 90/3Q |
| Small Arms/Ammunition | N/A | N/A | N/A | N/A |

(U) Project S1684, Special Warfare Combatsnt Craft:

1. (U) Description: Develops specialized combatant craft and unique associsted equipment and systems which can operate in shallow water, riverine areas, coastal approaches, and the open ocean in sea states 1-5. Such crsft must be capable of extended mission, low probability of detection operations in support of Naval Specisl Warfare Forces. Efforts include: analysis, material development and tests to develop techniques to minimize radar and acoustic signatures and observabi'ity, adsptation of weapons to mininize vulnerability to counter-action, passive ESM monitors, specialized ECM equipment, bi-ststic radar; and tactical deception measures to counter hostile surface and air threats.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- ° Conducted studies to reduce Surface Warfare Craft Medium (SWCM) detectability characteristics (e.g., radar, infrared, acoustic signatures).
- ° Continued development of the MK 43 MOD 0 In-ared Visual Imaging Surveillance Sight (IVISS).
- ° Initiated studies to develop mobility for Special Warfare Craft Medium, and other Special Warfare craft using Merchsnt Ship Naval Auxiliary Program (MSNAP) or other platforms.

b. (U) FY 1987 Program:

- ° Integrate link - 11 (receive only) into Special Weapons Craft Medium Combat System. (In primary construction contract).
- ° Continue craft improvement studies to include craft detectability characteristics reduction and performance improvement.
- ° Investigate development of sinkable/recoverable combatant rubber raiding craft.
- ° Initiate upgrading the IVISS to a Fire Control System.

Program Element: 63722N Title: Naval Special Warfare

° Initiate application of the SEA VULCAN 25 Rapid Fire Gun Mount to Special Warfare Craft.
° Procure and test experimental Combat Rubber Raiding Craft (CRRC) platforms.

c. (U) FY 1988 Planned Program:

° Investigate acquiaition of a High Speed (intercept) Boat for use in low viaibility operation/conflicta.
° Provide Merchant Ship Naval Auxiliary Program modules for Special Warfare Craft, Medium.
° Continue Special Warfare Craft improvements initiated in FY 87.
° Initiate Navy Special Warfare Standoff Missile application for Special Warfare Craft, Medium.
° Continue integration of Link-11 receive only capability.
° Complete testing of experimental CRRC platforms.
° Investigate acquisition of High Speed (intercept) boat for use in low visibility operational conflicts.

d. (U) FY 1989 Planned Program:

° Continue Special Warfare Craft Improvements to include craft detectability characteriatics reduction, and combat systems upgrades.
° Continue development of High Speed Boats.
° Continue development of Navy Special Warfare Standoff Missile System inatallations.
° Continue development of Combat Rubber Raiding Craft.
° Test installation of the SEA VULCAN 25 Rapid Fire Gun mount with the upgraded Infrared Visual Imaging Surveillance Sight (IVISS) gun control system on first of class Surface Warfare Craft, Medium in preparation for developmental and operational testing.

e. (U) Program to Completion: This is a continuing program which includes the following:

| | MS II Lead Craft | OPEVAL | MS III | IOC |
|---|---|---|---|---|
| Combat Rubber Raiding Craft | N/A | --- | FY 88/2Q | FY 89/1Q |
| High Speed Boat | --- | FY 88/1Q | FY 88/2Q | FY 89/4Q |
| Special Warfare Craft, Medium (including IVISS) | FY 84/2Q | FY 89/4Q | FY 90/1Q | FY 90/2Q |

Program Element: 63722N Title: Naval Special Warfare

H. (U) PROJECTS OVER $10 MILLION IN FY 88/89:

(U) Project S0417, SEAL Support System:

1. (U) Description: Develops unique support equipment for use by Naval Special Warfare Forces (SEAL and SDV Teams). Items are used during the conduct of hydrographic/inland reconnaissance, beach obstacle clearance, underwater ship attack, and direct-action missions. Items include: SEAL Delivery Vehicle (SDV)/Submarine Dry Deck Shelter (DDS) improvements;

Swimmer Propulsion Unit (SPU to improve effective range of combat swimmers); Advanced SEAL Delivery System (ASDS); SDV Helicopter Transport System (SDV-HTS); Diver Active Thermal Protection (DATP-for cold water combat swimmer missions); Advanced Underwater Breathing Apparatus (AUBA-for increased combat swimmer endurance); Full Face Mask-Heads Up Display (FFM/HUDS - which improves existing FFM, and will be compatible with AUBA and DATP while alao providing night vision capability); LAR V extension studies (to improve duration of existing dive profiles); Biomedical Research (to examine physiological, medical and human engineering factors to better train/prepart SEALs for improved miasion success); Underwater Target Tag (to track selected targets); Tactical Jammers (to NSW Mine Counter Measures (to include threat assessments, Portable Object Locating Sonar (POLS) and other equip ·t enhancements for improved combat swimmer reconnaissance); Environmental Analysis (to monitor NAVOCEANO studies and establis· :nvironmental models to forecast operational conditions); NSW Mission Simulators and Planning Aida. Program has been accelerated and expanded in response to Secretary of Defense direction to revitalize the special Operations Forces of all the military services.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Investigated improvements of components.
° Investigated improvements to Dry Deck Shelter and monitoring of atmosphere and operations for host ship control.
° Continued development of Portable Object Locating Sonar advanced development model.
° Began development of Diver Active Thermal Protection, Advanced Underwater Breathing Apparatus and Full Face Mask under Special Operations Special Technology Program.
° Initiated SEAL medical and physiological studies.

Program Element: 63722N Title: Naval Special Warfare

b. (U) FY 1987 Program:

° Conduct non-acquisition studies for
° Conduct Swimmer Propulsion Unit market survey, adaptive engineering and testing.
° Begin Advanced SEAL Delivery System (ASDS) development.
° Continue development of Diver Active Thermal Protection and Advanced Underwater Breathing Apparatus.
° Continue development and commence testing of Full Face Mask.
° Conduct LAR V studies.
° Continue SEAL medical and physiological studies.
° Conduct market survey and begin testing of at-sea Paasive Navigation System, Underwater Target Tag and Tactical Jammer as part of the Navy Special Warfare (NSW) Rapid Development Program.
° Conduct mine countermeasure (MCM) threat aassessment.
° Monitor environmental model studies.
° Design, test, deliver equipment storage containers for use in conjunction with Dry Deck Shelter operations.
° Investigate and initiate development of Naval Special Warfare (NSW) miasion planners/aimulators.
° Continue mission analysis studies.
° Develop prototype Laser Disc Training Aid.

c. (U) FY 1988 Planned Program:

° Continue non-acquisition studies for improvement.
° Finish evaluation of Swimmer Propulsion Unit.
° Continue Advanced Seal Delivery System development.
° Continue development of Advanced Underwater Breathing Apparatus.
° Continue development and commence testing of Diver Active Thermal Protection.
° Continue testing and follow-on development of Full Face Mask.
° Continue SEAL medical and physiological studies.
° Finish evaluation of Passive At-Sea Navigation System, Underwater Target Tag and Tactical Jammer and obtain Approval for Navy Use.
° Deliver MCM threat assessment.
° Continue to monitor environmental model studies.
° Continue development of Navy Special Warfare mission planners/simulators.
° Deliver interactive Laser Disc Trainer to fleet for evaluation.
° Establish preproduction equipment requirements for Portable Object Location Sonar.
° Continue mission analysis studies.

Program Element: 63722N Title: Naval Special Warfare

d. (U) FY 1989 Planned Program:

- ° Finalize improved design concepts for
- ° Finish Development Options Paper for Advanced SEAL Delivery System.
- ° Continue development and commence testing of Advanced Underwater Breathing Apparatus.
- ° Continue development and commence testing of Diver Active Thermal Protection.
- ° Finish evaluation and deliver Full Face Mask.
- ° Initiate design of SEAL Delivery Vehicle Helicopter Transportation System.
- ° Investigate design for advanced jammer.
- ° Continue development of NSW mission planners/simulators.
- ° Continue preproduction Portable Object Location Sonar development.
- ° Continue mission analysis studies.

e. (U) Program to Completion: This is a continuing program which includes the following.

| | MS II | OPEVAL | MS III | IOC |
|---|---|---|---|---|
| Diver Active Thermal Protection | FY 87/4Q | FY 89/1Q | FY 89/3Q | FY 90/2Q |
| Advanced Underwater Breathing Apparatus | FY 88/4Q | FY 91/1Q | FY 91/3Q | FY 92/4Q |
| Portable Object Locating Sonar | FY 89/1Q | FY 90/3Q | FY 91/3Q | FY 92/2Q |
| Advanced SEAL Delivery System | FY 92/3Q | FY 96/1Q | FY 97/1Q | FY 98/2Q |
| SDV Helo Transport System | FY 90/4Q | FY 92/3Q | FY 92/4Q | FY 94/2Q |
| Advanced Jammer | FY 90/1Q | FY 92/3Q | FY 93/2Q | FY 94/3Q |

The following programs will be initiated/managed under the accelerated research, development and acquisition policy authorized for Navy Special Warfare:

| | PROGRAM INITIATION | TECH/OPEVAL | IOC |
|---|---|---|---|
| Containers | FY 87/1Q | FY 87/3Q | FY 87/4Q |
| Passive At-Sea Rendezvous/Navigation System | FY 87/4Q | FY 87/4Q | FY 88/3Q |
| Underwater Target Tag | FY 87/4Q | FY 87/4Q | FY 88/3Q |
| Swimmer Propulsion Unit | FY 87/1Q | FY 88/3Q | FY 89/1Q |
| Full Face Mask | FY 87/3Q | FY 88/2Q | FY 89/2Q |

Program Element: 63722N

Title: Naval Special Warfare

The following non-acquistion studies are being conducted in support of NSW:

MK VIII SEAL Delivery Vehicle Improvements
SEAL Medical/Physiology Enhancements
MCM Threat Assessment
LAR V Extension
Mission/Engagement Analysis
Navy Special Warfare Simulators

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63724N
Title: Navy Energy Program (Advanced)
DoD Mission Area: 480 - RDT&E Facilities/Management
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 16,733 | 15,678 | 7,721 | 8,839 | Continuing | Continuing |
| R0829 | Energy Conservation (Advanced) | 7,272 | 6,740 | 3,377 | 4,149 | Continuing | Continuing |
| R0838 | Mobility Fuels (Advanced) | 9,461 | 8,938 | 4,344 | 4,690 | Continuing | Continuing |

As this is a continuing program, the above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports projects to evaluate, adapt, and develop energy related technology for ship, aircraft, and land based operations to: (a) increase fuel-related weapon system capabilities such as range, endurance, and time on station; (b) conserve energy and reduce energy costs; (c) develop a capability to use a wider variety of ship and aircraft fuels without affecting equipment performance or reliability (e.g., fuels with less tightly controlled properties and/or commercial grade fuels, and fuels derived from a wider variety of crude sources); and (d) reduce Navy shore facilities dependence on petroleum fuels and reduce costs by pursuing energy technology efforts to apply alternate and advanced energy technologies to specific Navy shore facilities. This program is essential to the accomplishment of Navy Fleet-wide energy conservation goals. If achieved, these goals will reduce Navy fuel costs by $200M per year in FY 1990 and $380M per year in FY 1995 assuming $1 per gallon fuel prices in those years. This program will therefore pay for itself several times over.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: Project R0829 - in FY 1988, a decrease of 4408 is the result of Department program adjustments (4313), Department NIF rate adjustments, and Department program/budget adjustments; Project R0838 - in FY 1988 a decrease of 6699 is the result of Department program/budget adjustments (6687) and Department NIF rate adjustments.

Program Element: 63724N Title: Navy Energy Program (Advanced)

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 20,001 | 18,310 | 16,833 | 18,828 | Continuing | Continuing |
| R0829 | Energy Conservation (Advanced) | 8,655 | 7,992 | 7,479 | 7,785 | Continuing | Continuing |
| R0838 | Mobility Fuels (Advanced) | 11,346 | 10,318 | 9,354 | 11,043 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATIONS FUNDS: Not Applicable

E. (U) RELATED ACTIVITIES: Program Element 64710N, Navy Energy Program (Engineering), and Program Element 62233N, Mobility Fuels Technology Program. Efforts are in consonance with programs in other services and are coordinated through informal exchanges of information as well as formal technical advisory groups, working groups, committees, joint memoranda of understanding and/or joint service agreements. There is no unnecessary duplication of effort within the Navy or Department of Defense.

F. (U) WORK PERFORMED BY: IN-HOUSE: David W. Taylor Naval Ship Research and Development Center, Annapolis, MD; Naval Air Development Center, Warminster, PA; Naval Air Propulsion Center, Trenton, NJ; Naval Civil Engineering Laboratory, Port Hueneme, CA; Naval Weapons Center, China Lake, CA; Naval Ship Systems Engineering Station, Philadelphia, PA; and Naval Air Engineering Center, Lakehurst, NJ. CONTRACTORS: Detroit Diesel Allison, Indianapolis, IN; General Electric Corporation, Cincinnati, and Avondale, OH; Lockheed California Co., Burbank, CA: McDonnell Douglas, St. Louis, MO; Boeing, Seattle, WA; Pratt & Whitney, Palm Beach, FL; Teledyne Inet, Torrance, CA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) PROJECT R0829 ENERGY CONSERVATION (ADV):

1. (U) Description: This project improves the energy efficiency of naval systems and thereby contributes to improved fleet sustainability and performance (e.g., increased range, time on station, etc.), increased combat capability, and reduced cost. As currently funded, the overall Navy Energy R&D Program, of which this project is a part, will reduce the Navy's fuel costs by $200M per year by 1990 and $380M per year by 1995 assuming $1 per gallon fuel prices in those years.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

Program Element: 63724N Title: Navy Energy Program (Advanced)

SHIPBOARD CONSERVATION:

- To support organotin antifouling paint development and assessment, completed background level organotin measurements in Navy harbors.
- Studied effects of organotin in the environment.
- Designed high-efficiency single-screw and centrifugal compressors for air conditioning plants.
- Developed prototype Battery Energy Storage System (BESS) for emergency electrical power.

AIRCRAFT CONSERVATION:

- Tested Modern Technology Demonstrator Engines (Army/Navy joint effort) over flight envelopes of P-3, C-130, CH-47, V-22 aircraft.
- Defined fuel efficiency improvement package for F-404 engine.
- Developed fuel efficient aircraft subsystems - e.g., Avionics Power Supply.
- Performed TECHEVAL/OPEVAL for improved wind-over-deck airspeed sensor for aircraft carriers.

FACILITIES CONSERVATION:

- Designed hybrid photovoltaic/wind energy conversion system to provide power in support of Tactical Aircrew Combat Training System (TACTS).
- Continued geothermal reservoir analysis at several sites including China Lake, Fallon, Lualualei, Adak.
- Designed for procurement and test and evaluation photovoltaic power systems (29 Palms, and China Lake), and solar heating/cooling systems (several sites).
- Continued assessment of small cogeneration systems, and low temperature solar systems.

b. (U) FY 1987 Program:

SHIPBOARD CONSERVATION:

- Continue harbor monitoring of organotin. Continue studies supportive of EPA special review of the environmental risk of using orgsnotin anti-fouling paints.
- Continue centrifugal compressor and control system designs for high efficiency air conditioning.
- Continue laboratory scale development of battery energy storage system.

AIRCRAFT CONSERVATION:

- Assess Modern Technology Demonstrator Engine test results (configured as turboprop).
- Initiate F-404 engine fuel efficiency improvement hardware development.
- Complete ground demonstration of Lightweight Hydraulic System for future aircraft.
- Continue efficient Avionics Power Supply development.

Program Element: 63724N Title: Navy Energy Program (Advanced)

FACILITIES CONSERVATION:

° Initiate Efficiency Improvement for Boiler Systems to achieve minimum of 5% increase in boiler efficiency Navywide.
° Continue assessment of installation of small cogeneration systems to provide continuous and emergency power to facilities, especially Navy hospitals.

° Continue assessment of geothermal reservoir analyses (several Navy sites), alternately fueled vehicles and coal combustion techniques.

° Continue development of hybrid photovoltaic/wind energy system to provide power in support of offshore Tactical Aircrew Combat Training System (TACTS).

c. (U) FY 1988 Planned Program:

SHIPBOARD CONSERVATION:

° Continue organotin harbor monitoring
° Complete studies on the effects of organotin in the environment.
° Continue air conditioning control system designs/evaluate benefits of variable speed drive.
° Continue development of advanced centrifugal and single screw air conditioning compressors.
° Perform new ship hydrodynamic design analyses.
° Continue development of battery energy storage system.

AIRCRAFT CONSERVATION:

° Demonstrate F-404 engine efficiency improvements.
° Complete Avionics Power Supply development.
° Define program to adapt Closed Loop Environmental Control System (CLECS) technology to fighter/attack aircraft.

FACILITIES CONSERVATION:

° Assess geothermal reservoir analyses (29 Palms, Fallon, Lualualei) to select high payback potential reservoirs for private sector financing/development.

° Initiate Amorphous Transformer technology assessment to replace conventional transformers so as to reduce electric power demands and cooling loads.

Program Element: 63724N Title: Navy Energy Program (Advanced)

- Complete Steam Line System Upgrade project to produce a steam line system planning manual to reduce steam system losses in facilities Navywide.

- Continue development of hybrid protovoltaic/wind electric power generation systems for remote locations (magazines) and intrusion detection systems.

d. (U) FY 1989 Planned Program:

SHIPBOARD CONSERVATION:

- Complete centrifugal compressor design/continue control system development.
- Perform new ship hydrodynamic design analyses.
- Prepare to test Variable Speed Constant Frequency derivation of electrical power from main propulsion plant.

AIRCRAFT CONSERVATION:

- Complete F404 engine efficiency improvement project.
- Begin development of Closed Loop Environmental Control System for tactical aircraft.
- Develop improved efficiency aircraft electromechanical and avionic systems.

FACILITIES CONSERVATION:

- Complete Efficiency Improvement for Boiler Systems and Boiler Fuel Source Planning System to select alternate boiler fuels, to include coal, coal slurry, refuse-derived fuels and others.
- Initiate Solar Responsive Roof/Wall Coverings project to adapt facilities surface finishes for the reflection or absorption of solar thermal radiation.
- Continue assessment of small cogeneration systems, photovoltaic/solar/wind hybrid power systems, improving heating and air conditioning controls systems.
- Continue to assess high payback potential geothermal reservoirs under Naval shore installations (Pickel Meadows, Adak, 29 Palms).

e. (U) Program to Completion: This is a continuing program. In FY 1990 - FY 1992 planned tasks include:

- Continued development of more efficient ship machinery and hull systems.
- Continued development of more efficient aircraft subsystems and fuel use management aids.
- Continued assessment of new energy technologies for application to Naval facilities.

Program Element: 63724N Title: Navy Energy Program (Advanced)

(U) PROJECT R0838, MOBILITY FUELS/ADVANCED:

1. (U) DESCRIPTION: This project is designed to reduce the impact on Navy operations of degrading fuel quality, supply interruptions and rapid changes in fuel cost. Recent trends in fuel quality have affected ship and aircraft performance and reliability; i.e., bulk fuel storage instability, filter clogging in ships, fuel control valve malfunction in aircraft and thermal instability in ship and aircraft gas turbines. This project is developing: (1) a capability to operate on a wider variety of fuels (i.e., fuels with less tightly controlled properties and/or commercial grade fuels); (2) a capability to operate on the lower quality fuels that are currently entering the supply system, without compromising system performance and reliability, and (3) revised military fuel specifications which will ensure the procurement of good quality fuels independent of the crude source or refinery process. This project is developing recommendations for revised fuel procurement specifications (derived from current equipment fuel property requirements), procurement waiver rationale, emergency fuel usage guidelines, and will identify and recommend changes for equipment designs which are fuel property intolerant. This project is part of a joint service program and is coordinated with DOE, NASA, and Industry.

2. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

a. (U) FY 1986 Program:

- Completed Simulated Mission Endurance Tests on the F-18/F404 engine with relaxed specification fuels to define acceptable fuel property limits.
- Completed 1000 hour tests on the F402 and F404 engine fuel controls with relaxed specification fuels that validated lubricity and peroxide additive requirements and levels.
- Successfully completed 248 hour endurance test on a high-speed diesel engine with recycled Naval Distillate to validate specification acceptance.
- Developed 3-D computer model of aircraft fuel cold flow behavior in fuel tanks to guide fuel freeze point selection.

b. (U) FY 1987 Program:

- Data from fuel property evaluations, additive tests, and engine fuel tolerance testing will be used to recommend JP-5 and F-76 fuel specification modifications to solve current ship and aircraft fuel related performance and reliability problems.
- Marine diesel engine testing will continue with long term durability tests.
- Initiate fuel effects test series with AV-8B/F402 engine instrumented combustor tests.
- Utilize flight and wind tunnel test data to verify 3-D computer model for aircraft fuel cold flow behavior and allow a revised freeze point for JP-5 fuel to be recommended.

Program Element: 63724N Title: Navy Energy Program (Advanced)

c. (U) FY 1988 Program:

- Fuel property evaluations and ship/aircraft engine system testing will continue with an emphasis on providing data to recommend changes to relax features of the JP-5 and F-76 fuel specifications that are unnecessarily restrictive, and to determine the effect of using non-standard fuels on hardware reliability and performance.
- Initiate fuel effects performance testing of the F402 instrumented engine at simulated altitude conditions.
- Recommend revised JP-5 fuel freeze point for inclusion in the specification.
- Continue LM-2500 and DDA 501K17 engine combustor rig performance and 1000 hour durability testing.
- Continue high-speed diesel performance and 1000 hour durability testing.

d. (U) FY 1989 Program:

- The JP-5 and F-76 fuel specifications will be revised to be independent of petroleum crude type and refinery processing.
- Emergency fuel usage guidelines will be under development for use worldwide, under both peacetime and wartime situations.
- Fuel procurement waiver rationale will be under development from the fuel property/engine requirement correlations derived for the specification revision.
- Complete LM 2500 and DDA 501K17 engine combustor rig performance and 1000 hour durability testing.
- Complete high speed diesel performance and 1000 hour durability testing.

e. (U) PROGRAM TO COMPLETION: This is a continuing program. In FY 1990 - FY 1992 planned tasks include work on fuel property/engine hardware performance and reliability effects which will be used to recommend changes to new hardware to make them more fuel quality tolerant and provide the Navy with the new fuel use options such as, (a) a single fuel for all mobile equipment to provide logistics benefits, (b) a higher density aircraft fuel to increase range and endurance, and (c) high performance aircraft fuels to allow large performance improvements for future designs (e.g., 15% - 20%).

H. (U) PROJECT OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63725N
Title: Facilities Improvement
DoD Mission Area: 235 - Naval Warfare Support
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 7,700 | 8,209 | 9,957 | 4,185 | Continuing | Continuing |
| Y0995 | Naval Facilities Systems | 3,512 | 4,039 | 5,388 | 1,328 | Continuing | Continuing |
| Y1316 | Improved Methods/Mat'ls for Real Property Mgt | 1,760 | 2,133 | 2,209 | 1,502 | Continuing | Continuing |
| Y1606 | Naval Construction Forces Technology/Tools | 2,428 | 2,037 | 2,360 | 1,355 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides test validated data on new materials, equipment, components, procedures and facility concepts that show potential for improving the effectiveness and economy of naval facilities and the Naval Construction Forces. This engineering and operational data are required for the systematic transition of new facility technology based concepts and products to military construction, operations, maintenance, and procurement programs. The Naval Facilities System project (Y0995) will provide new facility concepts and products to support new generation fleet systems (ships, aircraft, weapons, etc.) and equipment/procedures to assess the condition of the Navy's aging physical plant. The Improved Materials for Real Property Management project (Y1316) will provide new materials and techniques to reduce the spiraling O&M,N costs associated with Real Property Maintenance Activities (RPMA). The Naval Construction Forces Technology/Tools project (Y1606) will provide construction tools and techniques to allow the Naval Construction Forces to operate in a high residual threat, post-attack environment, and to support forward bases and amphibious operations.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile of the FY 1987 Presidents's Budget and that shown in this Descriptive Summary are as follows: Project Y0995: -590 in FY 1987 due to Congressional action and adjustment. Project Y1316: -365 in FY 1987 due to Congressional action and adjustment; -388 in FY 1988 due to department program/budget adjustments and NIF rate adjustment. Project Y1606: +625 in FY 1986 due to department budget adjustment, program/budget adjustment, and GRH reduction; -312 in FY 1987 due to Congressional action and adjustment.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

Program Element: 63725N Title: Facilities Improvement

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 8,899 | 7,258 | 9,476 | 10,600 | Continuing | Continuing |
| Y0995 | Naval Facilities Systems | 3,947 | 3,544 | 4,629 | 5,566 | Continuing | Continuing |
| Y1316 | Improved Methods/Mat'ls for Real Property Mgt | 2,576 | 1,911 | 2,498 | 2,597 | Continuing | Continuing |
| Y1606 | Naval Construction Forces Technology/Tools | 2,376 | 1,803 | 2,349 | 2,437 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable

E. (U) RELATED ACTIVITIES:

Project Y0995: Technology based products from Logistics Technology in PE62233N are systematically transitioned to this project. This work is closely coordinated with Army work in PE62719A, PE62730A, and PE63724A. Work on Aviation Engine Test Facilities is complemented by air and noise emissions support work included in PE63721N. Coordination is done through the Joint Service Civil Engineering Research and Development Coordinating Group (JSCERDCG).

Project Y1316: Technology based products from material technology in PE62234N, Systems Support Technology, are systematically transitioned to this project. It is closely coordinated with Air Force PE63723F and PE64708F on Airfield Pavement.

Project Y1606: The lightweight water drill is being developed and funded jointly by the Navy and Marine Corps (PE63729M) for future joint acquisition. The runway crater repair fiberglass reinforced plastic panel is closely coordinated with Air Force (PE63723F and PE64708F) through the JSCE DCG Airfield Damage Repair Subcommittee. The construction planning and control system for the construction battalions is coordinated with the Marine Corps Amphibious Objective Area Land Management System project (PE63729M and PE64717M).

F. (U) WORK PERFORMED BY: IN HOUSE: Lead laboratory is the Naval Civil Engineering Laboratory, Port Hueneme, CA. Others: Naval Surface Weapons Center, Dahlgren, VA; Naval Weapons Center, China Lake, CA; National Bureau of Standards, Gaithersburg, MD; Contractors: Mission Research Corporation, Santa Barbara, CA; Southwest Research Institute, San Antonio, TX; ABAM Engineering, Federal Way, WA; BPM Corporation, McLean, VA; Sigma Research, Redmond, WA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY-1988/89:

(U) Project Y0995, Naval Facilities Systems

Program Element: 63725N

Title: Facilities Improvement

1. New generation fleet systems (ships, aircraft, missiles, etc.), environmental regulations, and security requirements are creating new demands on the Navy's aging shore establishment and MILCON program. This project provides for the development of facilities concepts, components, equipment and procedures to: (1) reduce existing explosive safety violations and meet the demands of new missile systems; (2) improve the security of facilities; (3) assure quality of new constructions and asaess the condition of existing facilities, (4) meet the berthing requirements of Navy ships of the 1990's and (5) meet the increasing requirements of aircraft gas turbine engine test facilities.

2. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS

a. (U) FY 1986 Program:

- Completed development of isokinetic sampling device. As an integral part of the steam purity monitoring system, this device ensures that steam provided to ships meets specifications and reduces annual operational costs for monitoring by 50%.
- Completed development of a 2-D computer-based planning model for locating pier utilities connections and mooring hardware. This model is compatible with the Navy's graphic engineering and mapping system (GEMS) and will significantly increase efficiency of pier designs and reviews.
- Completed developmental tests on power conditioning equipment for improving quality of shore to ship power.
- Initiated operational testing on intruder resistant magazines and personnel doors.
- Completed operational tests on a computer aided model for determining the appropriate level of facility security.
- Completed development of blast resistant windows.
- Completed development of a STANDARD missile test cell that can be sited adjacent to occupied production building.
- Completed development and initiated operational testing of aenaors to determine the condition of underwater steel and concrete structures.
- Tested application methods for lining refractory concrete panels in aviation engine test facilities.
- Initiated development of mathematical simulation model for air flow and performance of aviation engine test facility.
- Completed test plan for hush house fire protection systems.
- Continued aerothermal testing and analyses for test cells and hush houses.

b. (U) FY 1987 Program:

- Complete development of a 3-D planning, design, and operations support computer model for optimizing pier deck elevation, pier utilities, and ship berthing plan for a given port. This is an extension of the 2-D model completed in 1986.
- Design and initiate field tests to establish lighting criteria for piers to meet safety and security

requirements.

- Initiate development of new mooring and handling equipment for special hull treatment currently being installed on submarines.
- Complete development of intruder resistant magazines and personnel doors.
- Complete development of a computer aided model for determining the appropriate level of facility security.
- Continue testing to develop design criteria for misaile test cells to handle the explosive charges of other existing and planned missiles. Plans are to develop 5 standard designs for missile test cells.
- Initiate development of ammunition storage magazines for missiles.
- Complete operational testing of sensors to determine the condition of underwater concrete and steel structures.
- Initiate testing to develop pavement evaluation standards.
- Complete aerothermal testing and analyses for aviation engine test cells and hush houses.
- Conduct half acale refractory concrete panel tests in dimulated aviation engine test cell environment.
- Determine performance and cost advantage of rectangular augmentor tube concept.

c. (U) FY 1988 Planned Program:

- Complete field tests to determine criteria for pier lighting.
- Complete development tests on a mooring and handling unit for berthing special hull treated submarine.
- Initiate development of hardware and techniques for reducing the cost of providing shore steam to ships.
- Complete development of a missile teat cell for HARPOON, SIDEWINDER, HARM missiles.
- Complete development tests on an ammunition storage magazine for missiles.
- Complete development of sensora to assess condition of underwater concrete and steel structures.
- Complete testing and prepare user selection guide for evaluation standards for pavements.
- Complete full scale refractory concrete panel tests in aviation engine test cells.
- Deliver an interim design package for aviation engine test facilities and transition to engineering development.

d. (U) FY 1989 Planned Program:

- Complete development of criteria for pier lighting.
- Complete development of a mooring and handling unit ior berthing submarines.
- Initiate developmental testing of reverse osmosis concepts for providing boiler feedwater makeup for shore steam plants.
- Initiate development of design concepts for improving existing piers to meet the demands of the fleet
- Complete development of missile test cells for Walleye missiles.
- Complete design and initiate operational test on an ammunition storage magazine for missiles.
- Initiate development of a detection system for locating underground utilities and obstacles.

Program Element: 63725N Title: Facilities Improvement

e. (U) Program To Completion: This is a continuing program.

(U) Project Y1316 , Improved Methods and Materials for Real Property Management

1. (U) Description: Many new materials become available each year having a potential for reducing life cycle cost of facilities. Designers often cannot use these products until their benefits have been demonstrated. Industry does not provide the data required to produce competitive non-proprietary procurement specifications. This project will provide materials performance test data and life cycle cost data for high investment/risk areas such as airfield concrete pavements, waterfront components, HEMP/TEMPEST shielding for facilities, siltation of berths, membrane roofs, coating, etc.

2. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS

a. (U) FY 1986 Program:

- Complete field tests on resilient foam filled fenders to obtain performance data for competitive procurement specifications.
- Complete developmental tests on prestressed concrete piles for fender systems. Based on these tests an interim specification will be prepared.
- Continue field tests on newly emerging single ply roof systems to resolve conflicting views on performance and coats to enable the preparation of competitive specifications.
- Complete operational tests on refractory concrete for airfield pavement to resist the effect of V/STOL aircraft.
- Continue fatigue tests to obtain long term reliability data on synthetic lines for mooring offshore structures.
- Initiate operational test on scour jet array device and complete development tests on vortex foil and curtain barrier devices for sedimentation control.
- Complete development of concrete designs for magnetic silencing facilities.

b. (U) FY 1987 Program

- Complete development of foam filled fenders.
- Initiate operational tests on prestressed concrete piles.
- Continue field tests on single ply roofing system.
- Complete development of refractory concrete designs for airfield pavement for V/STOL aircraft.
- Complete development of fatigue data on synthetic lines for mooring offshore structures.
- Complete operstional tests on acour jet arrsy device for sedimentation control.
- Initiate operational tests on vortex foil device for sedimentation control.

Program Element: 63725N Title: Facilities Improvement

- ° Conduct field tests to determine feasibility of venting canal at Mayport.
- ° Initiate development of reflective floor coatings for aircraft maintenance hangars.

c. (U) FY 1988 Planned Program:

- ° Continue operational tests on prestressed concrete pile/fender.
- ° Continue field tests on single ply roofing system.
- ° Complete development of scour jet array device for sedimentation control.
- ° Complete operational tests on vortex foil device for sedimentstion control.
- ° Initiate operational tests on curtain barrier device.
- ° Complete development of a venting canal design at Mayport.
- ° Initiate field tests on joint sealants to resolve conflicting views on performance.
- ° Conduct field tests on reflective floor coatings.

d. (U) FY 1989 Planned Program:

- ° Complete development of prestressed concrete piles for fender applicatons.
- ° Complete development of performance dsta for preparing specification on single ply roofing system.
- ° Complete development of vortex foil device for controlling sedimentation.
- ° Complete operational tests on curtain barrier device.
- ° Continue field tests f joint sealants.
- ° Initiate development of validation test procedures for power line filters to protect against high altitude electromagnetic pulse from nuclear weapons.
- ° Complete operationsl tests on reflective floor coatings.

e. (U) Program to Completion: This is a continuing program.

(U) Project Y1606, Naval Construction Forces Technology Tools

1. (U) Description: This project provides new or improved construction capabilities for construction equipment computerized construction planning models, underwater tools and equipment and productivity enhancing construction methods. The objective is to increase Seabee productivity by 100%.

2. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS

a. (U) FY 1986 Program:

Program Element: 63725N Title: Facilities Improvement

- P-3 expeditionary hangar relocated from Point Mugu to Point Hueneme for longevity tests.
- Construction planning and control models demonstrated on the IBM PC/AT micro.
- Submitted procurement data package for the seawater powered hydraulic system.
- Performed diver test of an underwater navigation system.
- Prepared arctic construction requirements documents for FY87 underwater tool testing and FY88 start of new tool development.
- Planned final testing of rapid runway repair fiberglass panels by Seabees delayed until new fiberglass reinforced plastic panels are received (FY88).

b. (U) FY 1987 Program

- Complete development of Seawater Powered Hydraulic System
- Complete testing of and deliver the acquisition data package for the ISO/air transportable water drill.
- Conduct operational tests of the construction planning system (V/STOL runway).
- Finalize deliverable documents for P-3 hanger.

c. (U) FY 1988 Planned Program:

- Complete work on ground fault interruption for diver safety.
- Complete work on underwater electric field detector for divers.
- Start work on methods for rapid repair of damaged piers and waterfront facilities.
- Initiate development of methods for the rapid restoration of war damaged utilities such as fuel, electrical power, and water.
- Complete development of the diver modular construction platform.
- Begin development of a submersible electrical powered pump for operation of seawater hydraulic tools.
- Conduct tests of diver tools and equipment in the Arctic environment.
- Complete development of the buried pipe and chain locator.
- Initiate specification development of airfield damage repair requirement.

d. (U) FY 1989 Planned Program:

- Completion of testing of injection molded runway repair panels by the Seabees.
- Complete the diver survey system (complementary to diver navigation system).
- Complete work on a small power source for seawater hydraulic tools.
- Complete development of diver lift system.

e. (U) Program to Completion: This is a continuing program.

Program Element: 63725N Title: Facilities Improvement

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63726N
Title: Merchant Ship Naval Augmentation Program
DoD Mission Area: 262 - Intertheater Sealift
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 5,299 | 0 | 3,006 | 3,530 | Continuing | Continuing |
| SO378 | Merchant Ship Naval Augmentation Program (MSNAP) | 5,299 | 0 | 3,006 | 3,530 | Continuing | Continuing |

As this is a continuing program, the above funding profile includes outyear escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: MSNAP develops prototypes and tests components and systems to equip merchant ships to perform tasks in support of the Strategic Sealift mission. The mission areas include point-to-point sealift, fleet support, and underway replenishment (UNREP). MSNAP has already transitioned several items to production, including the Auxiliary Crane Ship (T-ACS), Modular UNREP stations, SEASHEDS and FLATRACKS. Equipment is presently being installed in ships of the Ready Reserve Force (RRF). Military Sealift Command tankers are being fitted with the modular fuel UNREP stations. Priority tasks requiring action are to provide more advanced UNREP systems; containership modification devices for below deck personnel, cargo handling, and operational functions in lieu of container stowage; mooring systems; ship survivability improvements including firefighting, and improved cargo handling hardware and software. These initiatives are critical to the Navy's successful use of both government-owned RRF and U.S. Flag merchant ships to support deployed forces in times of national emergency.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) A decrease of 6,014 in FY-1987 is due to Congressional action. FY-1988 funding was reduced by 2,033 due to Department program/budget adjustments.

Program Element: 63726N Title: Merchant Ship Naval Augmentation Program

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 5,482 | 5,737 | 6,014 | 5,039 | Continuing | Continuing |
| S0378 | Merchant Ship Naval Augmentation Program | 5,482 | 5,737 | 6,014 | 5,039 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| OPN Funds (Sealift Support Equipment) | 60,300 | 70,277 | 56,847 | 50,451 | Continuing | Continuing |

* The OPN line funds several separate procurements presently including: SEASHEDS, FLATRACKS, containership stowage adapters, modular refueling, and modular underway replenishment (UNREP) delivery systems.

E. (U) RELATED ACTIVITIES: PE 63719N (Container Offloading and Transfer System); PE 63635M (USMC Field Logistic System); PE 62760N (Logistics Technology). The MSNAP program is the only program which develops systems for the Sealift Enhancement Features (SEF) portion of the Strategic Sealift Program.

F. (U) WORK PERFORMED BY: In-house developing organizations are the Naval Coastal Systems Center, Panama City, FL; Navy Weapons Handling Center, Colts's Neck, NJ; and the Naval Ship Weapons System Engineering Station, Port Hueneme, CA. Other Government Agencies participating include the Maritime Administration and the Military Sealift Command. Contractors include: TITAN Inc., Montgomeryville, PA; Giannotti and Assoc. Inc., Annapolis, MD; M. Rosenblatt & Sons, New York, NY; G. G. Sharp Inc., N.Y., N.Y.; and TRW, Washington, D.C.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project S0378, Merchant Ship Naval Augmentation Program:

1. (U) Description: The Strategic Sealift Program urgently requires the products of this project. The Strategic Sealift resources provided by regular fleet units and the Military Sealift Command nucleus fleet are inadequate. The Merchant Ship Naval

Program Element: 63726N Title: Merchant Ship Naval Augmentation Program

Augmentation Program (MSNAP) is oriented toward improving the effectiveness of merchant ships to augment these sources. The augmentation systems are applicable to the Ready Reserve Force (RRF), the U.S. Flag fleet, and the ships of allied nations. Products now in the final stages of transition to production are modular Underway Replenishment (UNREP) sending stations. There are two versions based on the same common support module. One station is for fuel and the other for dry stores. They enable a merchant tanker or freighter to replenish Navy combatant ships. The Containership Strikeup System (CSUS) is a modular elevator that will deliver palletized cargo from the holds of a containership outfitted with SEASHEDS and FLATRACKS to the weather deck for further transfer. The Crane Enhanced Containership (CEC) is a concept being developed to provide a non-self-sustaining containership with a measure of self-unloading capability. The merchantship survivablity initiative will develop modular or readily installed systems to increase the ships' survivability through increased passive measures such as improved damage control and active systems to counter the submarine and missile threats. The Terminal Operations Management Systems (TOMS) will develop integrated systems to provide efficient control and continuity in the delivery of dry cargo, POL, equipment and personnel from ships offloading in the stream to sites ashore. Other developments include a salvage and mooring system, a Modularized Mobile Repair System (MMRS), and systems for cold weather operations and Assault Follow-On Echelon (AFOE) support. Outyear efforts in this continuing program will be initiated in response to changes in Strategic Sealift resources (RRF acquisitions, composition of the U.S. Flag Fleet) and new mission tasks.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

* Completed Crane Enhanced Containership (CEC) ship system prototype design.

* Completed analysis of use of Semi-Submersible Ships.

* Initiated development of cold weather operation systems.

* Completed detailed design of the prototype strikeup system.

* Initiated Assault Follow-On Echelon (AFOE) Terminal Operation Management System (TOMS) Development.

* Continued development of Modular Mobile Repair System (MMRS).

* Initiated development of Modular Helo Vertical Replenishment (VERTREP) Systems.

* Completed Omni-Directional Ordnance Handler Detailed Design.

b. (U) FY 1987 Program:

Program Element: 63726N Title: Merchant Ship Naval Augmentation Program

- Demonstrate prototype strikeup system. (FY-1986 contract action).
- At-sea demonstration of CONSOL Vertical Replenishment (VERTREP) System (FY-1986 contract action).
- Demonstrate Modular Mobile Repair Systems. (FY-1986 contract action).
- Continue development and demonstration of selected Terminal Operation Management System (TOMS) functions. (FY-1986 contract action).

c. (U) FY 1988 Planned Program:

- Perform detail design of heating, access, and ventilation unit of the Habitability and Utility Support System (HUSS).
- Continue development of new Modular Mobile Repair System (MMRS) capabilities.
- Complete VERTREP Module development.
- Develop limited modular ship survivability damage control system.
- Continue development of survivability features for merchant ships.
- Development of Cold Weather Operations Systems - Demonstration of selected features.
- Initiate design of small craft refueling system for AFOE utility craft.
- Complete development and demonstration of Terminal Operation Management System (TOMS).
- Evaluate low-cost UNREP systems.

d. (U) FY 1989 Planned Program:

- Continue development of Habitability and Utility Support System (HUSS).
- Demonstrate additional cold weather features
- Initiate design of transportable accommodations complex.

Program Element: 63726N Title: Merchant Ship Naval Augmentation Program

° Initiate development of cargo lift system for breakbulk ships.

e. (U) Program to Completion: This is a continuing program which will consist of follow-on systems development such as:

° The full-size MMRS configuration will be completed.

° Development of a small craft piloting and navigation aid system.

° Variations of the survivability system will be tested and transition to production.

° Demonstration and evaluation of Habitability and Utility Support System (HUSS).

° The cold weather features will complete demonstration and transition to production.

° Third generation low-cost UNREP systems.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63729M
Title: Marine Corps Combat Services Support (Advanced)
DoD Mission Area: 216 - Intra Theater Land Transportation
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 11,064 | 13,287 | 13,373 | 24,418 | Continuing | Continuing |
| C0077 | Mine Warfare (Advanced) | 8,989 | 10,199 | 1,707 | 3,406 | Continuing | Continuing |
| C0078 | Combat Service Support (Advanced) | 717 | 2,015 | 1,419 | 3,388 | Continuing | Continuing |
| C0082 | Aviation Support Material and Equipment | 1,358 | 1,073 | 2,512 | 1,214 | Continuing | Continuing |
| C1966 | Surf Zone Container Handler | 0 | 0 | 784 | 1,768 | Continuing | Continuing |
| C1967 | Mine Clearing (Advanced) | 0 | 0 | 1,468 | 2,457 | Continuing | Continuing |
| C1968 | Mine Detection System (Advanced) | 0 | 0 | 2,055 | 4,716 | Continuing | Continuing |
| C1969 | Mine Neutralization Equipment | 0 | 0 | 2,938 | 5,993 | Continuing | Continuing |
| C1983 | Tactical Fuel Systems | 0 | 0 | 490 | 1,476 | Continuing | Continuing |

* Funded in Program Element 64717M, Marine Corps Combat Service Support (Engineering) during the years in parenthesis.

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This Program Element provides funds for the advanced development of Marine Corps equipment needed for the supply, maintenance, motor transport, engineer, and service support of operating forces.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: Mine Warfare (Advanced): The FY 1986 increase of 1,610 resulted from an accelerated development strategy to purchase additional lots of rounds to accumulate required ballistics data for development of fire control computer algorithms. The FY 1987 decrease of 1,919 was due to undistributed Congressional reductions. The FY 1988 decrease of 14,162 resulted from the separation out additional line items of funding for C1966 Surf Zone Mine Clearing; C1967 Mine Clearing (Advanced); C1968 Mine Detection (Advanced) and C1969, Mine Neutralization Equipment. Combat Service Support (Advanced): The FY 1986 decrease of 996 resulted from a change in acquisition strategy to a

Program Element: 63729M

Title: Marine Corps Combat Services Support (Advanced)

non-developmental item approach. The FY 1987 decrease of 412 was due to undistributed Congressional reductions. The FY 1988 decrease of 3,305 due to the separation of C1983 Tactical Fuel Systems and C1966, Surf Zone Container Handler in this program element. Aviation Support Material and Equipment: The FY 1986 increase of 1,109 is due to acceleration of the ground Tactical Data Communications for the AN/PPN-19 Radar Target Data Communicator. The FY 1987 decrease of 239 was due to undistributed Congressional reductions. The FY 1988 increase of 1,119 provides: (1) additional funding for completion of full scale engineering and test and evaluation of the ground portion of the AN/PPN-19 Radar Transponder Beacon Tactical Data Communications (TDC) system and testing. Surf Zone Container Handler: A FY 1988 separate line item from C0077, Combat Service Support (Advanced) in this program element. Mine Detection System (Advanced): A FY 1988 separate line item from C0077, Mine Warfare (Advanced) in this program element. Mine Neutralization Equipment: A FY 1988 separate line item from C0077, Mine Warfare (Advanced) in this program element. Tactical Fuel Systems: A FY 1988 separate line item from C0078, Combat Service Support (Advanced) in this program element.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 8,387 | 9,341 | 15,857 | 21,986 | Continuing | Continuing |
| C0077 | Mine Warfare (Advanced) | 7,104 | 7,379 | 12,118 | 15,869 | Continuing | Continuing |
| C0078 | Combat Logistics Support (Advanced) | 271 | 1,713 | 2,427 | 4,724 | Continuing | Continuing |
| C0082 | Aviation Support Material and Equipment | 1,012 | 249 | 1,312 | 1,393 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1988 only.

D. (U) OTHER FY 1988/89 APPROPRIATIONS FUNDS:

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| C0078 | Combat Logistics Support (Advanced) | | | | | | |
| | Tractor, RT, Art Steer | - | 29,069 | 28,503 | - | - | TBD |
| | (qty) (RON 062371) | - | (300) | (318) | - | - | TBD |
| | Forklift Attachment, 10,000 lb. | - | 6,900 | 2,877 | 27,800 | - | TBD |
| | (qty) (RON 063031) | - | (300) | (130) | - | - | TBD |

Program Element: 63729M Title: Marine Corps Combat Services Support (Advanced)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Container Handler, Rough Terrain, 50,000 lbs | 6,230 | - | 8,118 | - | TBD | TBD |
| | (qty) (RON 63041) | (27) | - | (35) | - | TBD | TBD |
| C0082 | Aviation Support Material and Equipment | | | | | | |
| | AN/PPN-19 Radar Target Data Communicator | - | - | - | 2,680 | TBD | TBD |
| | (qty) (RON 147239) | - | - | - | (154) | TBD | TBD |
| | Computer Aided Mission Planning System | - | - | - | 3,607 | 3,653 | 7,260 |
| | (qty) (RON 141868) | - | - | - | (12) | (12) | (24) |

E. (U) RELATED ACTIVITIES: U.S. Army Program Element 63104A, on Fuels/Lubricant Development; U.S. Army Program Element 63210A on Aircraft Power/Propulsion; U.S. Army Program Element 64204A on Air Mobility Support Equipment; U.S. Army Program Element 63602A and 63606A (Land Mine Warfare); U.S. Army Program Element 63621A (Vehicle Componentry).

F. (U) WORK PERFORMED BY: IN-HOUSE: Marine Corps Development and Education Command, Quantico, VA; U.S. Army Tank and Automotive Command, Warren, MI; Marine Corps Logistics Base, Albany, GA; Naval Sea Systems Command, Washington, DC; Naval Civil Engineering Laboratory, Port Hueneme, CA; Naval Coastal Systems Center, Panama City, FL. CONTRACTORS: Brunswick Corporation, Marion, VA; Oshkosh Truck Corporation, Oshkosh, WI; Motorola, Incorporated, Tempe, AZ; and Syracuse Research Corporation, Syracuse, NY; FMC Division Northern Ordnance Division, Minneapolis, MN; and Honeywill Inc, Minneapolis, MN.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project C0078, Combat Logistics Support:

1. (U) Description: This program is to provide the Fleet Marine Forces with service support heavy engineering (earth moving) equipment and material handling equipment; water purification, electric power distribution, soft maintenance shelters and bulk fuel systems, provide standardized portable maintenance shops, and overhead protective construction material. This program will research and develop these and like items in the advanced development stage.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Completed advanced development of a 1,200 gallons per hour reverse osmosis unit.

Program Element: 63729M

Title: Marine Corps Combat Services Support (Advanced)

b. (U) FY 1987 Program:

- o Initiate advanced development of medium tension structures for maintenance shelters in the amphibious objective area.

c. (U) FY 1988 Planned Program:

- o Monitor Army Development of Medium Tactical Vehicles.
- o Initiate development of a software system to provide rapid planning of support facilities (roads, airfields, etc) in the objective area to operate the use of available engineer personnel equipment.
- o Continue development of medium soft shelters for intermediate level maintenance, supply and aviation requirements.
- o Monitor other service efforts to adopt a nontactical general purpose vehicle.

d. (U) FY 1989 Planned Program:

- o Monitor Army Development of Medium Tactical Vehicles.
- o Develop a kit for Marine Corps bulldozers which will allow smaller sized equipment to perform selected missions normally performed by larger equipment.
- o Continue the development of the software system for facilities and land management in the amphibious objective area.
- o Complete advanced development of soft shelters for intermediate level maintenance, supply, and aviation requirements.
- o Continue to monitor adaptation of nontactical general purpose vehicles.
- o Initiate advanced development of an enhanced logistic system for Marine Corps use.

Program Element: 63729M

Title: Marine Corps Combat Services Support (Advanced)

e. (U) Program to Completion:

- This is a continuing program.

(U) Project C0082, Aviation Support Material and Equipment:

1. (U) Description: This project supports Marine Corps efforts to improve aviation operational capabilities through participation in other service development, service developed equipment, or development and evaluation of aviation associated equipment not available elsewhere.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Directed Marine Corps efforts associated with the development of the ground Tactical Data Communications for the AN/PPN-19 Radar Target Data Communicator.
- Continued operational test and evaluation of Marine Air Traffic Control and Landing System and Marine Air Traffic Control Squadron Equipment.
- Continued to investigate helicopter external sling-load configurations and equipment.
- Continued to participate in the Joint Services Advanced Vertical Lift Aircraft Program.
- Completed testing of the shipboard AN/TPN-30 Remote Area Approach and Landing System.
- Continued participation in other Service developments of aviation systems/equipment.
- Completed Initial Operational Test and Evaluation of Marine Air Traffic control and landing system equipment software modifications.
- Evaluated helicopter external sling-load equipment to reduce ground loading personnel static electrical shock.
- Continued participation in other service developments of aviation systems and equipment.

Program Element: 63729M

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b. (U) FY 1987 Program:

- Complete testing of any software modifications to the Marine Air Traffic Control and Landing System directed as a result of the operational readiness evaluation.
- Complete development and prepare for fielding Tactical Data Communications improvement to the AN/PPN-19 Radar Target Data Communicator which provides enhanced operational capability of two-way data link communications between aircraft and Forward Air Controller to conduct All-Weather Close Air Support in a hostile Electronic Warfare environment.
- Continue participation in other service developments of aviation systems and equipment.
- Select and approve for service use improvements to helicopter external-load slings and shackles configurations.

c. (U) FY 1988 Planned Program:

- Complete development and operational testing of the tactical data communications to the AN/PPN-19 Radar Target Data Communicator.
- Commence advanced development of an infra-red beacon capability for the AN/PPN-19 Multi-function Radar Transponder Beacon (MRTB).

(U) Project C0077, Mine Warfare:

1. (U) Description: This program provides the Marine Corps with an amphibious capability to breach minefields. The system must be compatible with existing equipment normally used in an amphibious assault, and be able to shoot on the move.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Conducted advanced design of advanced development of fuel air explosive warheads and launcher mechanisms.
- Continued efforts to determine suitability of other minefield breaching techniques.
- Fabricated prototype warhead and launcher.

Program Element: 63729M

Title: Marine Corps Combat Services Support (Advanced)

- o Commenced developmental testing of the Catapult Launched Fuel Air Explosive warhead, launchers and fire control mechanisms.
- o Continued to monitor mine dispensing modules for use with tracked/wheeled vehicles to emplace scatterable mines.

b. (U) FY 1987 Program:

- o Analyze fuel-air cloud patterns and alternatives to enhance effectiveness.
- o Conduct RDT&E efforts to determine suitability of other minefield breaching techniques in the amphibious assault including fuel-air explosives and alternate mine neutralization systems.
- o Deliver Catapult Launched Fuel-Air Explosive warheads, launchers and firing mechanisms.
- o Initiate advanced development of the Assault Amphibious Vehicle mine plow system.
- o Initiate advanced development of the Antipersonnel Obstacle Breaching System (APOBS) to replace bangelore torpedoes.
- o Initiate advanced development of Assault Amphibious Vehicle/Light Armored Vehicle minefield marking system.
- o Initiate advanced development of the advanced portable mine detector.

c. (U) FY 1988 Planned Program:

- o Transition Catapult Launched Fuel-Air Explosive system to full scale development.
- o Accelarate prototype fabrication of Catapult Launched Fuel-Air Explosive fire control, and launcher system hardware.
- o Conduct accuracy testing of warheads to determine fuel air explosive cloud pattern effectiveness.
- o Conduct Developmental Test I (DT I).
- o Continue advanced development of the Minefield Marking System for Amphibious Assault operations.

Program Element: 63729M

Title: Marine Corps Combat Services Support (Advanced)

- o Continue Assault Amphibious Vehicle mine plow design and fabricate and assembly test hardware.
- o Initiate design of Assault Amphibious Vehicle/Light Armored Vehicle minefield marking system and conduct concept effectiveness testing.

d. (U) FY 1989 Planned Program:

- o Continue design and test of Assault Amphibious Vehicle/Light Armored Vehicle minefield marking system. Fabricate and assemble development and operational test hardware. Initiate developmental test.
- o Transition shape charge Anti-Mine Munition Warhead from Exploratory Development to Advanced Development.

e. (U) Program to Completion:

- o Continue mine warfare systems development development testing/operational testing.

(U) C1966 Surf Zone Container Handler

1. (U) Description: This project will develop a system to rapidly transfer, transport and stack International Standards Organization containers in the objective area, and develop a system that identifies and tracks a container contents from origin to destination.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Exploratory development of a Surf Zone Container Handler.

b. (U) FY 1987 Program:

- o Continued exploratory development of the Surf Zone Container Handler.

c. (U) FY 1988 Planned Program:

- o Transition Surf Zone Container Handler to Advanced Development.

- o Equipment and power train modeling.
- o Prototype fabrication.
- o Modeling of container tracking.

d. (U) FY 1989 Planned Program:

- o Development Test I.
- o Develop prototype tracking system.
- o Integrated logistic support planning.

e. (U) Program to Completion:

- o Operational Test II.
- o Developmental test/operational test of Container Tracking System.
- o Level II and III Design
- o Final integrated logistic support planning level III drawings, cost operatical effectiveness analysis.

(U) C1968 Mine Detection System (Advanced)

1. (U) Description: This project will test and evaluate existing systems to detect mines and study new technology for new detection systems.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o This program is in exploratory development.

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Title: Marine Corps Combat Services Support (Advanced)

b. (U) FY 1987 Program:

- o This program is in exploratory development.

c. (U) FY 1988 Planned Program:

- o Transition Portable Mine Detection to Advanced Development.

d. (U) FY 1989 Planned Program:

- o Transition a forward (stand-off) mine detector system for mounting on USMC tactical equipment from exploratory development.
- o Continue Advanced Development of Portable Mine Detector.

e. (U) Program to Completion:

- o Complete Advanced Development of Portable Mine Detector.
- o Complete advanced development of forward (stand-off) mine detector system and transition to full scale engineering development.
- o Initiate Advanced Development of airborne mine detection laser system to detect mines in the surf and buried on the beach.

(U) C1967 Mine Clearing (Advanced)

1. (U) Description: This program will test and evaluate existing systems to clear mine fields and study new technology for application to existing systems or development of new systems.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o This program is in exploratory development.

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b. (U) FY 1987 Program:

- o This program is in Exploratory Development.

c. (U) FY 1988 Planned Program:

- o Initiate advanced development of an advanced line charge system to address insensitive munition requirements.
- o Study feasibility of using other host vehicles for line charge deployment.

d. (U) FY 1989 Planned Program:

- o Development Test on advanced line charge system, to include delivery system.

e. (U) Program to Completion:

- o Operational Test on advanced line charge, propulsion system, and host vehicle linkage.

(U) C1969 Mine Neutralization Equipment

1. (U) Description: This program will test and evaluate existing mine neutralization systems both individual, vehicle, and study new technology for mine neutralization applications.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o This program is in exploratory development.

b. (U) FY 1987 Program:

- o This program is contained in project C0077, Mine and Boobytrap Countermeasures (Advanced).

Program Element: 63729M

Title: Marine Corps Combat Services Support (Advanced)

c. (U) FY 1988 Program:

- Continue Advanced Development of the Anti-Personnel Obstacle Breaching System (APOBS) to include development, testing and certification.

d. (U) FY 1989 Program:

- Complete Advanced Development of the Antipersonnel Obstacle Breaching System (APOBS) to include operational testing.
- Complete Advanced Development of the Track Width Mine Plow for the Assault Amphibious Vehicle.

e. (U) Program to Completion:

- Complete Engineering Development of the Antipersonnel Obstacle Breaching System.
- Complete Engineering Devleopment of the Assault Amphibious Vehicle Mine Plow.

(U) C1983 Tactical Fuel Systems

1. (U) Description: This project will develop an improved tactical fuel handling system which will provide the Marine Corps with the capability to support the Marine Air-Ground Task Force with fuel during amphibious assaults and subsequent operations ashore through the year 2000. This program will adress the forward (battle field) movement of fuel to support forward combat elements.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: This program in exploratory development.

b. (U) FY 1987 Program: This program in exploratory development.

c. (U) FY 1988 Planned Program:

- Initiate Advanced Development for the Tactical Fuel System for year 2000.

Program Element: 63729M

Title: Marine Corps Combat Services Support (Advanced)

- o Award Contract for the Fuel Additive Subsystem to permit the control and injection of additives to the fuel for use by the Marine Corps Air Wing.
- o Prepare the Preliminary Integrated Logistic Support Plan for the Fuel Additive Subsystem.
- o Prepare the Development Test-I test plan for the Fuel Additive Subsystem.

d. (U) FY 1989 Planned Program:

- o Continue the Advanced Development of the Fuel Additive Subsystem, to include prototype fabrication, Development Test-I, update of the Integrated Logistics Support Plan, preparation of the Operational Test-I Plan.

e. (U) Program to Completion:

- o Transition to Engineering Development and complete the development of the Tactical Fuel System for year 2000.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&F DESCRIPTIVE SUMMARY

Program Element: 63734N
Title: Defense Suppression
DoD Mission Area: 374 - C³ Protection/Multimission, TECH & SPT
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 5,504 | 11,831 | 4,546 | 4,524 | N/A | N/A |
| R1804 | Chalk Coral | 5,504 | 11,831 | 4,546 | 4,524 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63737N
Title: Link Hazel
DoD Mission Area: 238 - Other Naval Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 23,105 | 17,043 | 11,500 | 6,800 | N/A | N/A |
| R1679 | Link Hazel | 23,105 | 17,043 | 11,500 | 6,800 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63740N Title: Link Laurel
DoD Mission Area: 237 - Naval Warfare Surveillance & Reconnaissance Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 32,956 | 42,166 | 53,843 | 59,672 | N/A | N/A |
| R1892 | Link Laurel | 32,956 | 42,166 | 53,843 | 59,672 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63744N Title: Link Spruce
DoD Mission Area: 237 - Naval Warfare Surveillance & Reconnaissance Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thouaanda)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 33,090 | 67,743 | 283,855 | 311,707 | N/A | N/A |
| R1903 | Link Spruce | 33,090 | 67,743 | 283,855 | 311,707 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63746N
Title: Retract Maple
DoD Mission Area: 237 - Naval Warfare Surveillance & Reconnaissance
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 9,675 | 55,575 | 65,028 | 50,897 | N/A | N/A |
| R1906 | Retract Maple | 9,675 | 55,575 | 65,028 | 50,897 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63748N
Title: Link Plumeria
DoD Mission Area: 237 - Naval Warfare Surveillance & Reconnaissance
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 0 | 0 | 14,080 | 11,529 | N/A | N/A |
| R1978 | Link Plumeria | 0 | 0 | 14,080 | 11,529 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program sre of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63750N
Title: Chalk Weed
DoD Mission Area: 237 - Naval Warfare Surveillance & Reconnaissance
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 0 | 0 | 8,819 | 10,014 | N/A | N/A |
| R1994 | CHALK WEED | 0 | 0 | 8,819 | 10,014 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63751N
Title: Retract Elm
DoD Mission Area: 237 - Naval Warfare Surveillance & Reconnaissance
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 0 | 0 | 39,041 | 41,039 | N/A | N/A |
| R2003 | Retract Elm | 0 | 0 | 39,041 | 41,039 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63752N
Title: Chalk Poinsettia
DoD Mission Area: 237 - Naval Warfare Surveillance & Reconnaissance
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 0 | 0 | 15,000 | 25,000 | N/A | N/A |
| R2005 | Chalk Poinsettia | 0 | 0 | 15,000 | 25,000 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63764N Title: Link Evergreen
DoD Mission Area: 237 - Naval Warfare Surveillance & Reconnaissance Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 0 | 0 | 74,228 | 118,338 | N/A | N/A |
| R1972 | Link Evergreen | 0 | 0 | 74,228 | 118,338 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63784N
DoD Mission Area: 233 - Anti-Submarine Warfare

Title: Fixed Distribution Systems
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 16,268 | 33,301 | 75,997 | 112,039 | 408,778 | 678,747 |
| X1312 | Fixed Distributed System | 16,268 | 33,301 | 75,997 | 112,039 | 408,778 | 678,747 |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Integrated Undersea Surveillance System (IUSS) provides

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows. In FY 1986, the decrease of -1125 reflects the Gramm-Rudman-Hollings reduction. Funding for the Fixed Distributed System (FDS) underwater and shore processing systems were

Program Element: 63784N Title: Fixed Distribution Systems

consolidated into PE 63784N, X1312, based on a Department program adjustment. The FY 1987 increase of +7,319 reflects the net effect of Congressional action and adjustments and PE consolidation. The FY 1988 increase +23,336 reflects and Department program/budget adjustments to fully fund the program to meet scheduled fleet introduction.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 12,397 | 17,393 | 25,982 | 52,661 | 390,341 | 491,477 |
| X1312 | Fixed Distributed System | 12,397 | 17,393 | 25,982 | 52,661 | 390,341 | 491,477 |

D. (U) OTHER FY 1988/1989 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| MILCON | 0 | 0 | 0 | 0 | 2,800 | 2,800 |

E. (U) RELATED ACTIVITIES: Undersea Surveillance Systems, Program Element 24311N, which contains the shore processing subsystem development of the Fixed Distributed System through FY 1986.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Ocean Systems Center, San Diego, CA. CONTRACTORS: AT&T Technologies, Inc., Greensboro, NC; TRW, Inc., McLean, VA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/1989: Not applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/1989:

(U) Project X1312, Fixed Distributed System:

1. (U) Description: Project X1312 includes the design, development, integration, test and deployment

Program Element: 63784N Title: Fixed Distribution Systems

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Completed first Advanced Development Model (ADM) fabrication and testing of FDS underwater multiplexer/repeater.
° Initiated first ADM sensor and cable survivability testing.
° Initiated fabrication of

°
° Completed
° Conducted testing or
° Developed CRT display system for studying FDS field management issues in FDS test bed.
° Conducted DT-1 interim performance testing utilizing the FDS test bed to measure performance of

b. (U) FY 1987 Program:

° Continue design fabrication and testing of electro-optic devices and seals for the Advanced Development Models (ADMs).
° Initiate development of hardware and software to support planned to be tested on the FDS test bed in FY 88 for potential reduction in personnel required to operate a distributed sensor field.
° Conduct for use in collecting ambient noise data for FDS.
° Design, fabricate, test and evaluate fiber optic trunk and
° Complete fiber optic trunk cable survivability testing.
° Initiate development of specifications for FDS system architecture

° Continue study of
° Conduct DT-1 performance validation testing utilizing the FDS test bed.
° Conduct testing on issues related to managing data/information flow for a

Program Element: 63784N Title: Fixed Distribution Systems

° Identify critical parameters affecting man loading for each functional component of a distributed field processing system.

c. (U) FY 1988 Planned Program:

° Complete Advanced Development Model (ADM) fabrication and test.
° Complete
° Establish payout procedures for fiber optic cable, repeater and cluster and complete platform interface specification for cable loading and storage.
° Prepare report defining measures of effectiveness (MOEs) for field management aspects of FDS shore processing system.
° Conduct test bed testing of to assess impact on manpower required to operate FDS.
° Initiate procurement of long lead components for prototype hardware.
° Continue for use in FDS ambient noise data collection.
° Initiate underwater electronic facility phase-up.
° Initiate a source selection plan to select a follower company for undersea electronics production.
° Complete development of hardware and software to support planned to be tested in the FDS test bed in FY 88 for potential reduction in personnel required to operate the distributed sensor field.
° Complete development of specifications for FDS system architecture.

d. (U) FY 1989 Planned Program:

° Complete Advanced Development Model (ADM) evaluation.
° Prepare report defining MOEs for of FDS shore processing system.
° Complete development.
° Conduct mechanical sea trial.
° Prepare updated system specifications to be included in the RFP for FDS shore processing development and release RFP.
° Begin fabrication of electronic hardware.
° Begin fabrication of and test hardware.
° Complete verification of underwater hardware installation and repair techniques.
° Begin testing EMSP software development issues using Engineering Development Model (EDM) EMSP delivered at AT&T Bell Labs by PMS 412 EMSP development program.

Program Element: 63784N Title: Fixed Distribution Systems

° Continue development of the FDS shore processing subsystem by completing

e. (U) Program to Completion:

° Award shore processing system Full Scale Engineering Development (FSED) contract.
° Release final design specifications.
° Conduct electrical sea trial.
° Complete prototype system evaluation.
° Complete fabrication of
° Complete fabrication of
° Complete fabrication of and test hardware.
° Complete fabrication of underwater hardware model by follower and conduct testing.
°

f. (U) Major Milestones:

| Milestone | Date |
|---|---|
| 1. Demonstration and Validation (D&V) Phase, DNSARC I Approved | 13 May 86 |
| 2. Full Scale Engineering Development (FSED) Phase, JMRB II | 4Q/FY 88 |
| 3. | |
| 4. JRMB III | 2Q/FY 95 |

Program Element: 63784N Title: ASW Surveillance (FDS)

(U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation (DT&E):

(U) DT&E Conducted: DT-1A Phase I, Detection Performance Evaluation, was conducted during the time period. The detection performance of candidate algorithms was measured for the configurations deployed in the FDS Test Bed utilizing the service of an

(U) DT&E Test Schedule:

(U) DT-1A (FDS Test Bed)

Phase 1 Detection Performance Evaluation
Phase 2 Detection Demonstration
Phase 3 System Concept Validation

(U) DT-1B Sea Test of Undersea ADM Hardware

(U) DT-2A Sea Test of Underwater System Hardware

Phase 1 Mechanical Validation
Phase 2 Electro/Optic/Acoustic Validation

(U) DT-2B System Deep Sea Demonstration

(U) TECHEVAL

(U) Difference between article tested and article procured: DT-1A testing, using the FDS Test Bed, is accomplished by using existing off-the-shelf hardware. The test bed contains various sized

for R&D of FDS algorithms. The test bed is used as the principle system for demonstrating and validating the FDS concept. Development of underwater hardware is independent from the shore processing hardware. Development testing of the underwater hardware will be DT-1B through DT-IIB. The shore mil-standard processing hardware is developed and tested in military standard computer development programs. Integrated testing of the underwater and shore subsystems will occur in DT-IIC.

Important sub-systems not tested and probable impact on test results.

- None.

Important discrepancies or deficiencies found and corrective action taken.

- None found to date.

Summary of technical performance demonstrated during DT&E including reliability and maintainability.

- Data from first phase of development testing (DT-1A phase 1) is currently undergoing processing and is not yet available. (Projected availability date Mar 87).

Department of the Navy Program Manager and development contractors.

- Space and Naval Warfare Systems Command - Program Manager.
- AT&T - Primary development contractor.

Identify the agency responsible for the DT&E independent evaluation and personnel operating and maintaining the system.

- DT-1A testing is being conducted by the Naval Ocean Systems Center (NOSC) and Space and Naval Warfare Systems Command (SPAWAR) personnel with OPTEVFOR observers.

2. (U) Operational Test and Evaluation (OT&E): Operational Test and Evaluation will be conducted utilizing the FDS test bed to verify operational suitability and estimate program progress. The FDS test bed will also be used on the EDM system to evaluate operational effectiveness. Data will be developed relative to pre-established operational effectiveness and operational suitability issues. The EDM articles tested will be essentially the same as those to be procured; all subsystems will be tested. No OT&E testing has been initiated to date.

3. (U) System Characteristics:

a. (U) Required Operational Characteristics:

| CHARACTERISTICS | THRESHOLD | DEMONSTRATED PERFORMANCE |
|---|---|---|
| System Availability | 98% | Milestone I approved 13 May 1986, no operational testing conducted to date. |
| Reliability (MTBF)<br>(Shore End)<br>(Underwater System) | $\geq$ 500 Hours<br>8 years | |
| Maintainability<br>(Shore End)<br>(Underwater System) | $\leq$ 3 Hours<br>Not addressed since MTBF is 8 years | |

(U) Thresholds concerning probability of probability of and probability of will be provided by OPNAV in a future Test and Evaluation Master Plan (TEMP) update.

b. (U) Required Technical Characteristics:

| CHARACTERISTICS | THRESHOLD | DEMONSTRATED PERFORMANCE |
|---|---|---|
| (U) Detection Probability | | Testing on this parameter will will not occur until the EDM system is fabricated and installed. |

(U) Thresholds concerning probability of will be provided by OPNAV in a future Test and Evaluation Master Plan (TEMP) update.
DT-1A Phase I data concerning these parameters is currently undergoing processing and is not yet available.

4. (U) Current Test and Evaluation Activity:

a. (U) T&E Activity (Past 12 Months):

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| (U) Interim Performance Testing | | | Data being analyzed to assess detection performance. |

b. (U) T&E Activity (Next 12 months)

| Event | Planned Date | Remarks |
|---|---|---|
| (U) Performance Validation Test | | |
| (U) Hardware Sea Test | | |

5. (U) Program Documentation:

| | |
|---|---|
| NDCP | Approved 13 May 1986 |
| TEMP | Approved 13 May 1986 |
| ILSP | Approved January 1986 |
| Test Reports | Development Test Data still being analyzed, no reports issued to date. |

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63785N
DoD Mission Area: 233 - Anti-Submarine Warfare

Title: Anti-Submarine Warfare Environmental Acoustic Support (AEAS)
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 14,745 | 10,708 | 13,495 | 13,920 | Continuing | Continuing |
| R0120 | AEAS Ocean Measurement and Modeling Program | 14,745 | 10,708 | 13,495 | 13,920 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Because of the quieter and more elusive Soviet submarine threat, and the escalating costs of increasingly sophisticated and complex ASW systems to detect and localize the threat, there is a continuing need to minimize the degrading effects of the ocean environment on weapon system performance and to, in fact, enhance that performance through knowledge of the ocean medium. The ASW Environmental Acoustic Support (AEAS) Program is dedicated to continuing improvement of ASW system design, development, deployment and operation through better understanding of the environmental and acoustic properties of the world's oceans. It provides data sets and computer prediction products to both the system design communities and operational fleet units.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: The reduction of -935 in FY 1986 is due to Gramm-Rudman-Hollings and Department program/budget adjustments. The reduction of -2,056 in FY 1987 is due to Congressional adjustments and Department program/budget adjustments. The FY 1988 reduction of -1,983 is due to Department program/budget adjustments.

Program Element: 63785N

Title: Anti-Submarine Warfare Environmental Acoustic Support AEAS)

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 8,680 | 15,680 | 12,764 | 15,478 | Continuing | Continuing |
| R0120 | AEAS Ocean Measurement and Modeling Program | 8,680 | 15,680 | 12,764 | 15,478 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not applicable.

E. (U) RELATED ACTIVITIES: AEAS provides environmental acoustic support to, and is involved in joint activities with a number of Navy projects. The most significant of these are: 24311N, Undersea Surveillance System; 63784N, ASW Surveillance; 63254N, Air ASW; 63553N, Surface ASW; 63708N, ASW Signal Processing; 64713N, Tactical Towed Array Sonars; 63601N, Mine Development; 64503N, Submarine Sonar Development; 63502N, Surface Mine Countermeasures; 63522N, Submarine Arctic Warfare Support; 62435N, Ocean and Atmospheric Support Technology. The AEAS Program was the principal coordinating activity for the major FY 1986 Arctic exercise that involved many of the above programs.

F. (U) WORK PERFORMED BY: IN-HOUSE: Office of Naval Research, Arlington, VA; Office of Naval Research Detachment, Bay St. Louis, MS; Naval Ocean Research and Development Activity, Bay St. Louis, MS; Naval Research Laboratory, Washington, DC; Naval Ocean Systems Center, San Diego, CA; Naval Underwater Systems Center, New London, CT; Naval Air Development Center, Warminster, PA. CONTRACTORS: University of Texas, Applied Research Laboratory, Austin, TX; Planning Systems Incorporated, Slidell, LA and McLean, VA; ODSI Defense Systems Incorporated, Rockville, MD; Science Applications International Corporation, McLean, VA; Rockwell International, Autonetics Marine System Division, Anaheim, CA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project R0120, AEAS Ocean Measurement and Modeling Program:

1. (U) Description: This project provides environmental acoustic system predictive capability and data essential to optimize the design, development and performance of undersea acoustic surveillance and tactical ASW systems, thus extending threat detection ranges, increasing time to enemy counterdetection and enhancing ASW platform survivability. It conducts undersea environmental/acoustic measurements, develops computer prediction products and measurement instrumentation, and performs data

Program Element: 63785N

Title: Anti-Submarine Warfare Environmental Acoustic Support AEAS)

banking and analyses in support of ASW systems. The project's technical goal is for the continuing improvement of ASW system design, development, deployment and operation through better understanding and predictive capability for environmental/acoustic characteristics.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Transitioned environmental/acoustic data bases and sonar prediction models to Naval Oceanographic Office, Fleet Numerical Oceanography Center, and system users.

° Delayed Arctic data reduction and analysis to FY 1987.

b. (U) FY 1987 Program:

°

° Initiate major computer numerical modeling effort for range-varying environments, shallow water and mine warfare.
° Prepare the SPARS numerical model for transition to the Space and Naval Warfare Systems Command in support of fixed and mobile surveillance systems.

Program Element: 63785N

Title: Anti-Submarine Warfare Environmental Acoustic Support AEAS)

c. (U) FY 1988 Planned Program:

In conjunction with Naval Sea Systems Command and Space and Naval Warfare Systems Command. Test new techniques. Assess operational system performance in peripheral seas.

- Transition SPARS model to Space and Naval Warfare Systems Command.
- Deliver range-varying environment and shallow water numerical modeling products to the fleet and system designers.
- 
- Expand mine warfare data base development for selected ports and model development for selected mines and countermeasures.
- Continue data collection and analysis efforts for surveillance systems being developed by the Space and Naval Warfare Systems Command.

d. (U) FY 1989 Planned Program:

- Continue to deliver range-varying environment and shallow water modeling products to the fleet and system designers.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones: Not applicable.

1. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63787N
DoD Mission Area: 235 - Naval Warfare Support

Title: Special Processes
Budget Activity: 4 - Tactical Programs

A (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 50,828 | 38,775 | 40,423 | 38,173 | N/A | N/A |
| T0116 | Linear Tank | 50,828 | 38,775 | 40,423 | 38,173 | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Details of this program are of a higher classification and of limited access.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64203N
Title: Standard Avionics Development
DoD Mission Area: 238 - Other Naval Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 14,150 | 11,819 | 16,836 | 17,445 | Continuing | Continuing |
| W0572 | Joint Services/ Navy Standard Avionics Components and Subsystems | 4,227 | 3,677 | 9,463 | 10,654 | Continuing | Continuing |
| W0845 | AN/AYK-14(V) | 4,740 | 1,156 | 3,685 | 5,804 | Continuing | Continuing |
| W1630 | Carrier Aircraft Inertial Navigation System II | 5,183 | 6,986 | 3,688 | 987 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element contains three (3) standard development efforts:

First, the Joint Services/Navy Standard Avionics Components and Subsystems (AVCS) is a multi-task project which develops standard (less than major) avionics for multi-aircraft application. The major objective is to reduce avionics proliferation and total ownership cost by developing affordable, standard avionics which maximize combat readiness, and increase reliability and interoperability. AVCS also supports the Joint Services Review Committee on Avionics Standardization to develop interservice standard avionics. AVCS includes efforts to identify future user needs, and develop standard, life cycle cost effective equipment.

Second, the AN/AYK-14(V) project provides for the development and production of a Navy Standard Airborne Computer capable of satisfying the airborne digital computer requirements well into the 1990's. The project is an outgrowth of the requirement to reduce the proliferation of functionally similar but logistically unique CFE computer systems by developing a standard design, flexible enough to permit its use in a wide variety of applications. As a result, total hardware and support software can be standard Government Furnished Equipment (GFE) resulting in greatly reduced life cycle costs. Design flexibility also allows for technology infusion necessary to keep pace with expanding fleet operational requirement. The AN/AYK-14(V) is supplied as GFE to vital navy weapons systems including the F/A-18, F-14D, A-6F, V-22, AV-8B, E-2C, EA-6B, SH-60B, ACLS, and MK-50 torpedo.

Program Element: 64203N Title: Standard Avionics Development

Third, the Carrier Aircraft Inertial Navigation System II (CAINS II) project provides for the design, development, test, evaluation and qualification of the Navy's next generation standard CAINS. The primary goal of the CAINS II project is to improve fleet performance and reduce system operation and support costs through the application of LASER Gyro sensor technology to replace current aging conventional electromechanical sensor technology in CAINS and to improve passive carrier operations by development of a Covert CAINS Alignment Link. The CAINS effort is directed toward the needs and requirements of all carrier based fixed wing and rotary wing aircraft involved in ASW, AAW, and Strike Warfare.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The significant changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are:

W0572: The FY 1986 net increase of 1,411 is the result of a GRH adjustment and Department program and program/budget adjustments to cover costs of changes required for the Standard Attitude and Heading Reference System (SAHRS), used by the V-22. The FY 1987 decrease of 7,001 is due to Congressional action and adjustments. The FY 1988 decrease of 2,345 was due to Department program and budget adjustments.

W0845: The decrease of 1,513 in FY 1986 was due to GRH and Department program and budget adjustments. The primary Department adjustments were within the Program Element to cover other project requirements. The FY 1987 decrease of 4,858 is due to Congressional action and adjustments and Department program/budget adjustments. The FY 1988 decrease of 3,514 is due to Department program/budget adjustment.

W1630: The FY 1987 increase of 4,246 is due to Congressional action (with Department program/budget adjustments and Congressional adjustments) to allow for second source development of Cains II. The FY 1988 decrease of 10,119 reflects primarily the Department program adjustment decision to delete the contingency CAINS II second source development effort in FY 1988 since both development contractors appear to be developing satisfactory equipment that can be competed head-to-head in production and the decision to delay of the Covert Alignment Link full scale development and the P$^3$I effort by one year. There were also relatively minor NIF and Department budget adjustments.

Program Element: 64203N Title: Standard Avionics Development

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 12,861 | 14,668 | 19,432 | 32,814 | Continuing | Continuing |
| W0572 | Joint Services/ Navy Standard Avionics Components and Subsystems | 4,365 | 2,816 | 10,678 | 11,808 | Continuing | Continuing |
| W0845 | AN/AYK-14(V) | 5,167 | 6,253 | 6,014 | 7,199 | Continuing | Continuing |
| W1630 | Carrier Aircraft Inertial Navigation System II | 3,329 | 5,599 | 2,740 | 13,807 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES:

(U) W0572 Joint Services/Navy Standard Avionics Components and Subsystems: A tri-service Memorandum of Agreement exists to promote joint development of standard avionics components and subsystems. The Navy has identified W0572 to promote interservice standardization activities. Currently the Joint USAF/USN Standard Central Air Data Computer (SCADC) has received Approval for Production (AFP). Development of the Joint Service Standard Attitude Heading Reference System (SAHRS) continues.

(U) W0845 AN/AYK-14(V): This effort is coordinated with the Navy Shipboard Standard Computer Project Office to ensure compatibility of the Common Machine Transferable Support Software. To coordinate Navy standard embedded computer resources, this project interfaces with the Tactical Embedded Computer Resources Project Office. Additionally, to align Department of Defense AN/AYK-14(V) initiatives on Very High Speed Integrated Circuit (VHSIC) technology, this project coordinates efforts with the Naval Air Systems Command Advanced Development Project Office and the Navy VHSIC Office.

(U) W1630 Carrier Aircraft Inertial Navigation System II: The CAINS II project transition LASER Gyro technology developed under Program Element 63702N, Project W0525, Advanced Technology Demonstration LASER Gyro. Development of the Covert CAINS Alignment Link will be based on information gained from technology evaluations of Ultra High Frequency (UHF), Infrared (IR), Ultra Violet (UV) and, Extremely High Frequency (EHF) performed by the Navy. The P$^3$I effort beginning in FY 1991, transitions advanced sensor technology being developed under Program Element 63202N, Project W0525.

(U) Related activities for each of these programs are complementary in nature. As a result, there is no unnecessary duplication of effort within the Navy or the Department of Defense.

Program Element: 64203N Title: Standard Avionics Development

F. (U) WORK PERFORMED BY:

W0572: CONTRACTORS: Magnavox Defense Systems, Fort Wayne, IN; The Singer Company, Kerfott Division, Little Falls, NJ; Northrop Precision Products Division Boston, MA. IN-HOUSE: Naval Avionics Center, Indianapolis, IN; Naval Air Development Center, Warminster, PA; Naval Air Test Center, Patuxent River, MD.

W0845: CONTRACTORS: Control Data Corporation, Minneapolis, MN; Sperry Systems, St. Paul, MN; Sperry Systems, Pueblo, CO. IN-HOUSE: Naval Avionics Center, Indianapolis, IN, (lead lab); Naval Air Development Center, Warminster, PA; Naval Air Test Center, Patuxent River, MD.

W1630: CONTRACTORS: Litton Aerospace, Woodland Hills, CA; The Singer Company, Kearfott Division, Little Falls, NJ. IN-HOUSE: Naval Avionics Center, Indianapolis IN; Naval Air Development Center, Warminster, PA; Naval Ocean Systems Center, San Diego, CA; Naval Air Test Center, Patuxent River, MD; Naval Surface Weapons Center, Silver Spring, MD.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) W0845 AN/AYK-14(V):

1. (U) Description: Because of the continually increasing demand for improved capabilities of Navy weapon systems and the rapid advances in Microelectronic Technology which allow these capabilities to be met, the Navy Standard Airborne Digital Computer, AN/AYK-14(V), as it exists today is unable to meet the majority of identified TACAIR needs beyond 1985. This effort provides preplanned product improvements ($P^3I$) to the AN/AYK-14(V) to respond to new and urgent user operational requirements for F/A-18, V-22, F-14D, A-6F, AV-8B and MK-50. In addition, upgrades to these and other major weapons systems in the late 1980's and early 1990's will again exceed processing capabilities. For this reason, a VHSIC insertion effort is proceeding to provide additional AN/AYK-14(V) processing and memory capability and allow cost effective upgrades to the processing capabilities of current AN/AYK-14(V) based aircraft systems. Continuation of the $P^3I$ and VHSIC insertion efforts for AN/AYK-14(V) are essential if it is to meet future operational needs.

2. (U) Program Accomplishment and Future Effort:

a. (U) FY 1986 Program: Development, test, evaluation, and qualification of $P^3I$ Engineering Development Model (EDM) hardware; continued delivery of $P^3I$ EDM and preproduction hardware to users; qualification and baseline of Memory Subsystem Module (MSSM) module; development and delivery of MSSM preproduction models; tested and delivered final version of Machine Transferable Support Software (MTASS) for $P^3I$; awarded FSED contract for design and development of VHSIC processor module.

b. (U) FY 1987 Program: Continue Navy test program and baseline $P^3I$ hardware including Programmable Memory Module (PMM), continue delivery of $P^3I$ hardware to users; continue development of VHSIC processor module; commence development of high density semiconductor memory module.

Program Element: 64203N Title: Standard Avionics Development

c. (U) FY 1988 Planned Program: Complete Navy test program of P$^3$I hardware; deliver and begin test of high density semi-conductor memory module; deliver and begin test of first VHSIC development modules; initiate analysis of follow-on efforts for state-of-the-art technology infusion for AN/AYK-14(V) users.

d. (U) FY 1989 Planned Program: Continue development testing of VHSIC modules; complete test of high density semi-conductor memory module; begin development of additional, state-of-the-art technology infusion efforts.

e. (U) Program to Completion: This is a continuing program. Provide for development modules required to meet requirements of AN/AYK-14(V) users through technology infusion efforts. VHSIC development will be completed in FY 1990.

f. (U) Major Milestones:

- o P$^3$I MS II 1Q/FY 1983
- o P$^3$I TECHEVAL 2Q/FY 1987
- o P$^3$I MS III 3Q/FY 1987
- o VHSIC MS II 3Q/FY 1986
- o VHSIC TECHEVAL 3Q/FY 1989 - 4Q/FY 1990
- o VHSIC MS III 1Q/FY 1991

(U) W1630 Carrier Aircraft Inertial Navigation System II:

1. (U) Description: Current operational Carrier Aircraft Inertial Navigation Systems, such as the CAINS I (AN/ASN-92), have deficiencies which impact both fleet readiness and the cost of ownership. The CAINS II will provide the Navy with the opportunity of improving both fleet readiness and reducing inertial system life cycle costs through the application of strapdown sensor technology. Improvements in reliability, alignment times and system cost are associated with the inherent characteristics of Ring LASER technology. The CAINS II will be a completely digital system using low cost, high speed micro-processors for computing aircraft attitude, heading, velocity, and position information. The Ring LASER Gyro technology exhibits significant advantages over the conventional "spinning wheel" gyros in characteristics such as reaction time, calibration stability, environmental insensitivity, reliability, and dormancy (shelf life). These advantages make it possible to: 1) enhance reliability by an order of magnitude, 2) reduce alignment times by as much as 50 percent and 3) achieve a reduction in logistic support costs as compared to the AN/ASN-92 system. This project will also develop a data link for covert alignment of aircraft at sea on a carrier.

2. (U) Program Accomplishments and Future Effort:

a. (U) FY 1986 Program: Began acceptance/delivery of FSED hardware.

Program Element: 64203N Title: Standard Avionics Development

b. (U) FY 1987 Program: Commence and complete Design Approval Testing (DAT), performed by the contractors. Complete Navy Lab test and evaluation and system integration. Commence and complete Navy TECHEVAL and commence OPEVAL testing.

c. (U) FY 1988 Planned Program: Complete OPEVAL and obtain an Approval For Full Production (AFP) for the CAINS II system.

d. (U) FY 1989 Planned Program: Initiate development of the CAINS Covert Alignment Link and initiate the CAINS P$^3$I development effort.

e. (U) Program to Completion: Complete development, laboratory and TECH/OPEVAL testing to obtain Approval for Full Production (AFP) for the covert link and complete the P$^3$I CAINS II system development efforts.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) WO572 Joint Services/Navy Standard Avionics Components and Subsystems:

1. (U) Description: A growing concern in Naval Aviation is the proliferation of unique avionic equipment that increases with each new or modified aircraft. This proliferation of unique Contractor Furnished Equipment (CFE), due to non-availsbility of off-the-shelf Government Furnished Equipment (GFE), has resulted in a growing cost burden in the areas of development, procurement, logistics, and maintenance. To addreas this concern, the Joint Services/Navy Standard Avionics Components and Subsystems program provides for the timely development of families of Government Furnished Equipment, supportive of, but separate from, major aircraft weapon system acquisitions and common to multiple aircraft types. This project is of a continuing nature with new development efforts continually being identified and undertaken. Navy participation in the Joint Services Review Committee (JSRC) on Avionics Components and Subsystems continues to identify and fund joint engineering developments.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Expanded Approval for Production (AFP) on the Standard Central Air Data Computer (SCADC) to additional aircraft. Continued competitive development of the Joint Service Standard Attitude Heading Reference System (SAHRS). Defined SAHRS design changes required for use on the V-22. Conducted Critical Design Reviews on both SAHRS contractors.

b. (U) FY 1987 Program: Begin delivery of Standard Attitude Heading Reference System (SAHRS) FSED Hardware. Design Approval Testing (DAT) will be performed by the SAHRS Contractors. Begin Navy laboratory,system integration, and TECHEVAL/OPEVAL testing on SAHRS.

c. (U) FY 1988 Planned Program: Complete TECHEVAL/OPEVAL on SAHRS and obtain approval for limited production. Award contracts and commence development of a Tactical Ground Proximity Warning System (GPWS), Standard Compass System (SCS), and Standard Flight Control System (SFCS).

Program Element: 64203N Title: Standard Avionics Development

d. (U) FY 1989 Planned Program: Continue development and begin test of the Tactical Ground Proximity Warning System (GPWS), Standard Flight Control System (SFCS), and Standard Compass System. Award contract and begin development of Downed Aircrewman Locating System (DALS). Approve Standard Attitude Heading Reference System (SAHRs) for full production.

e. (U) Program to Completion: Complete development and obtain approval for production of GPWS, SCS and DALS. Commence development of laser altimeter. This is a continuing effort in coordination with the USAF/USA to identify and develop standard avionics components and subsystems.

f. (U) Major Milestones:

| WO572: | SAHRS | GPWS* | | | DALS | SFCS | SCS |
|---|---|---|---|---|---|---|---|
| | | Cat. I | Cat. II | Cat. III | | | |
| Contract (MS II) | 02/85 | 03/88 | 03/88 | 10/88 | 10/88 | 10/87 | 10/87 |
| AFP (MS III) | 12/88 | 09/90 | 04/91 | 03/92 | 10/91 | 11/91 | 09/90 |
| IOC | 01/90 | 05/91 | 12/92 | 03/93 | 10/92 | 10/92 | 09/91 |

* Cat. I - Transport, early warning and patrol aircraft; Cat. II - Fighter and attack aircraft; Cat. III - Helicopters.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64211N
Title: Identification, Friend or Foe Systems Development
DoD Mission Area: 344 - Tactical Command and Control
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 18,833 | 22,474 | 36,201 | 33,866 | Continuing | Continuing |
| W0676 | Improved Identification Development | 5,316 | 8,938 | 9,924 | 17,122 | Continuing | Continuing |
| W1253 | Combat Identification System | 13,517 | 13,536 | 26,277 | 16,744 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Reliable and secure positive identification systems are essential elements of battle management in the naval environment. In addition to distinguishing friend from foe for weapons employment, the Navy requires Identification Friend or Foe (IFF) systems for battle group air defense management and air traffic control. These IFF systems must be both tri-service and NATO interoperable to prevent fratricide in joint and allied operations. The current IFF system (MK XII IFF), a cooperative (question and answer) system, is twenty years old, unreliable, susceptible to counter-measures, and increasingly unsupportable as the technology of this system approaches obsolescence. An upgraded, improved cooperative system is required. The resolution of the identification problem is multi-faceted and includes information received from several sensor sources (both cooperative and non-cooperative systems). This element addresses the need for new and/or improved systems The Combat Identification System (CIS) program covers the development of a new cooperative identification system (MK XV) that is both Tri-Service and NATO interoperable. Through FY 1987, funding in this project includes the Navy share of the Tri-Service "core" program (basic hardware) as well as Navy unique requirements (system cost and effectiveness analyses, system integration in Navy ships and aircraft, and Navy test and evaluation). FY 1988 and later funding is only for Navy unique requirements. The Improved Identification Development program covers the ongoing performance and reliability improvements to the existing MK XII IFF system (anticipated life expectancy into the 1990's and beyond on selected platforms). This effort will develop modifications to improve reliability, enhance operational performance and reduce system susceptibility to hostile countermeasures. The program also includes the development of new passive foe identification techniques including Non-cooperative Target Recognition (NCTR) techniques and the "Retract Sky" program, which are being developed jointly with the other services, and a shipboard Inverse Synthetic Aperture Radar (ISAR) for increased detection range and stand-off classification of surface targets. The program

Program Element: 64211N Title: Identification, Friend or Foe Systems Development

provides for development of a Central IFF (CIFF) system using multiple shipboard sensor correlation and expert processing techniques to discern friend from foe in a local battle group environment.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows:

Project W0676:

- In FY 1986, a decrease of 1,755 is the result of GRH and Department program/budget.
- In FY 1988, a decrease of 2,243 is the result of Department program/budget adjustments.

Project W1253:

- In FY 1986, an increase of 3,447 is the result of GRH (-549) and Department program/budget adjustments (+3,996) to fund Navy share of core program.
- In FY 1988, a decrease of 16,968 is the result of transfer of core funding to the Air Force (11,600) and other Department program/budget adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 10,811 | 17,141 | 23,449 | 55,412 | Continuing | Continuing |
| W0676 | Improved ID Development | 6,418 | 7,071 | 9,338 | 12,167 | Continuing | Continuing |
| W1253 | Combat ID System | 4,393 | 10,070 | 14,111 | 43,245 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

Program Element: 64211N

Title: Identification, Friend or Foe Systems Development

OTHER PROCUREMENT, NAVY (BA-2)

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| MK XII AIMS IFF-332851(Total) | 2,737 | 8,664 | 16,491 | 32,654 | Continuing | Continuing |
| AN/UPM-149/150 Test Sets | 0 | 4,500 | 4,640 | 4,761 | Continuing | Continuing |
| MISC IFF Improvements | 2,603 | 2,711 | 4,261 | 7,089 | Continuing | Continuing |
| Quantity | various | various | various | various | Continuing | Continuing |
| IFF Wideband Antenna | 0 | 0 | 1,875 | 1,232 | Continuing | Continuing |
| AN/UPX-30 (CIFF), Antenna | 0 | 0 | 0 | 7,784 | Continuing | Continuing |
| MK XV CIS (long lead) | 0 | 0 | 0 | 0 | Continuing | Continuing |

E. (U) RELATED ACTIVITIES: In FY 1987 the Navy will lead two tri-service identification programs which will be based on existing Navy programs. Direction comes from the Joint Requirements Oversight Council. Programs include the Tri-Service Target ID Program (TRITIP), based on the Navy ARTIS program and a tri-service "Retract Sky" program. Execution will be determined in tri-service Memoranda of Agreement (MOA) which will define funding, manpower and scope of work requirements. Intent of effort is to pool resources and eliminate duplication within the Navy or Department of Defense.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Research Laboratory, Washington, D.C.; Naval Ocean Systems Center, San Diego, CA; Naval Avionics Center, Indianapolis, IN; Naval Electronics Systems Engineering Activity, St. Inigoes, MD; Naval Air Development Center, Warminster, PA: Naval Air Test Center, Lexington Park, MD. CONTRACTORS: Allied/Bendix Corporation, Towson, MD; Hazeltine Corporation, Greenlawn, NY; Texas Instruments Inc., Dallas, TX; Scope, Inc., Reston, VA.; Hughes Aircraft Corp., El Segundo, CA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W0676, Improved ID Development:

Program Element: 64211N Title: Identification, Friend or Foe Systems Development

(U) Description: This project provides for the design and development of modifications necessary to improve the performance and reliability of existing MK XII equipment and reduce the electronic countermeasures vulnerability of MK XII systems, and provides for integration of IFF systems into airborne and shipborne weapons and communications systems. This project also includes several sub-projects which are intended to improve the Navy's overall friend and foe identification capability. They are:

- Central IFF (CIFF) is a multi-sensor processor for ships which accepts ID data from different sources, including Foe ID, correlates it and provides an integrated picture to the evaluator, thus increasing the degree of confidence in a friend or foe evaluation. It also allows use of only one IFF interrogator per ship whereas before there was one per radar. It is compatible with both the existing MK XII and the design of the new MK XV IFF.

- The Advanced Radar Target Identification System (ARTIS) interprets radar modulations to identify targets and has been in advanced development since FY 1984. ARTIS is the basic project upon which a Navy lead, tri-service target identification program (TRITIP) will be based, commencing in FY 1987.

- Other projects in WO676 include a Wide Band Antenna for ships, a Portable IFF Test Set for general ship use, a Mode 4 Evaluator for use in the E-2C aircraft, the Inverse Synthetic Aperture Radar (ISAR) for shipboard applications, and extensive T&E at Pacific Missile Test Center (PMTC). Also included is the "Retract Sky" program (an IFF enhancement system). "Retract Sky" is the basic project upon which a Navy lead, tri-service IFF enhancement system program will be based, commencing in FY 1987.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Continued development of CIFF.
- Started T&E of ARTIS advanced development model.
- Continued development of the Wide Band Antenna.
- Published T&E results from Portable IFF Test Set and the E-2C Mode 4 Evaluator.
- Continued "Retract Sky" flights and data analysis.
- Installed, tested and deployed an engineering development model (EDM) ISAR unit on board a deploying CGN.

b. (U) FY 1987 Planned Program:

Program Element: 64211N Title: Identification, Friend or Foe Systems Development

- Complete development of CIFF; prepare for a production decision.
- Commence full scale engineering development of ARTIS; fold Air Force and Army signal modulation programs into ARTIS effort. Promulgate Memorandum of Understanding.
- Award full scale development contract for the Wide Band Antenna.
- Commence production of Portable IFF Test Set and E-2C Mode 4 Evaluator.
- Prepare advanced development model specifications for "Retract Sky" hardware; fold Air Force and Army IFF enhancement efforts into Navy "Retract Sky" program. Promulgate Memorandum of Understanding.
- Commence Program Development of Surface ISAR; evaluate data from EDM deployment.

c. (U) FY 1988 Planned Program:

- Commence CIFF T&E.
- Complete full scale development of ARTIS and plan for production.
- Complete T&E of the Wide Band Antenna.
- Commence full scale development of ISAR.
- Commence advanced development and demonstration/validation (D/V) of the "Retract Sky" hardware.

d. (U) FY 1989 Planned Program:

- Complete CIFF T&E and commence limited production.
- Obtain production approval of ARTIS.
- Continue full scale development of ISAR and obtain approval for limited production.
- Begin production of Wide Band Antenna.

e. (U) Program to Completion: This is a continuing program. Planned efforts include:

- Install Wide Band Antennas in ships.
- Complete development and test and evaluation of ISAR; obtain full production approval for ISAR.
- Obtain full production approval for CIFF.
- Continue development of non-cooperative target recognition (NCTR) equipment; investigate electro-optic (E/O) identification, passive NCTR (PNCTR) techniques, etc.

f. (U) Milestones:

| | |
|---|---|
| CIFF MS III | FY 1989 |
| ARTIS MS III | FY 1989 |

Program Element: 64211N Title: Identification, Friend or Foe Systems Development

| | |
|---|---|
| Wide Band Antenna MS III | FY 1988 |
| MK XII IFF Test Set MS III | FY 1987 |
| E2C Mode 4 Evaluator MS III | FY 1987 |
| ISAR MS III | FY 1989 |
| Retract Sky MS III | FY 1991 |

(U) Project W1253, Combat Identification System:

1. (U) Description: The MK XV Combat Identification System is a Tri-Service, NATO-interoperable, OSD-directed project under Air Force lead. MK XV will be the form, fit and function replacement for the present MK X/XII IFF which is now over 20 years old and has certain deficiencies to be corrected in MK XV. The project provides the Navy's share of funds to the Air Force for the tri-service "core" development effort in FY 1987 and prior (FY 1988 and subsequent year funds were transferred to the Air Force) and also provides funds for the design, development, analysis and test of Navy "unique" integration for ships, submarines, aircraft, and shore facilities.

2. Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Continued tri-service evaluation of contractor hardware.
- Continued cost analysis.
- Continued logistic support planning.
- Continued Navy integration studies.
- Continued development and initiated testing and evaluation of MARK XV brassboard equipment.
- Integrated NATO requirements into the overall MARK XV program.

b. (U) FY 1987 Planned Program:

- Complete demonstration and validation phase and the delivery of MK XV development equipment from both contractors.
- Commence test and evaluation of MK XV development equipment at Air Force and Navy Facilities.
- Commence preparation/drafting of full scale development specifications.
- Commence preparations for Milestone II.

c. (U) FY 1988 Planned Program:

Program Element: 64211N Title: Identification, Friend or Foe Systems Development

- Complete D/V phase, prepare for Milestone II, begin full scale development second quarter FY 1988.
- Commence NATO participation in full scale development.
- Prepare for TECHEVAL/OPEVAL.
- Commence preparations for Milestone III.

d. (U) FY 1989 Program :

- Continue full scale development.
- Continue NATO participation in full scale development.
- Continue preprations for TECHEVAL/OPEVAL and Milestone III
- Prepare platform integration contracts.

e. (U) Program to Completion:

- This program is intended to reach IOC In FY 1992. Full production approval targeted for FY 1991.

f. (U) Major Milestones:

| Milestones: | |
|---|---|
| I | July 1984 |
| II | March 1988 |
| III | March 1991 |

I. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation (DT&E): The MARK XV Identification, Friend or Foe Program passed DSARC I on 24 July 1984. JRMB II is scheduled for March 1988. Testing performed to date has been on models produced under advanced development contracts with Texas Instruments and Bendix. Various acceptance and qualification tests have been conducted on individual system items by both contractors and have been monitored by government personnel. Accepted items will undergo full Development Test and Evaluation commencing December 1986. The agency responsible for MARK XV core program DT&E is the U.S. Air Force 4950th Test Wing, supported by Naval Air Test Center. Independent Navy peculiar testing will be conducted by Naval Air Test Center, supported by Naval Electronics Systems Engineering Activity. During DT&E, lab tests will be conducted on accepted items by both contractors, monitored by government personnel. Flight tests begin in February 1987 by the 4950th Test Wing and transition to Naval Air Test Center in mid-March 1987. Navy unique tests commence in June 1987. Test reports from Bendix and Texas Instruments testing are due in July and August 1987; 4950th Test Wing Report is due in October 1987.

Program Element: 64211N Title: Identification, Friend or Foe Systems Development

After transition to full scale development, DT&E lab testing is scheduled for the first three quarters of FY 1991. DT&E flight tests commence in the third quarter of FY 1991 and are scheduled to complete at the end of the first quarter of FY 1992. Responsible agencies for DT&E in full scale development are the same as for advanced development listed above.

2. (U) Operational Test and Evaluation (OT&E): As part of the full scale development program, operational testing for the MARK XV core program is scheduled to commence in the first quarter of FY 1992 and complete during the second quarter of FY 1993. Service follow-on operational test and evaluation will commence in the first quarter of FY 1993. Air Force Operation Test and Evaluation Center (AFOTEC) is responsible for MARK XV core program operational test, supported by Operational Test and Evaluation Force (OPTEVFOR) for the Navy. OPTEVFOR is responsible for Navy unique operational testing. Articles tested will be production representative units.

3. (U) Systems Characteristics: The MARK XV system is currently in the Demonstration/Validation phase. Required key operational performance functions are contained in the most recent MARK XV System Concept Paper (SECRET). During the D/V phase, test data results will be compared with the operational performance requirements. The results of the comparison will be used to assess the potential system performance prior to a Milestone II decision. To be operationally effective, the MARK XV system must have the following characteristics: NATO and interservice interoperability; feasibility and compatibility of Time and Code Distribution (TCD) schemes for interservice and NATO operations; high confidence identification of friends in benign and ECM environments; compatibility with weapon systems and sensor envelopes; security against deception and exploitation; and interoperability with the current MARK XII system and the civil ATCRBS, the future Mode S and MATC functions.

4. (U) Current T&E Activity:

T&E Activity (Past 12 Months)

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| TEMP rewritten | Jun 86 | Jul 86 | The tri-service TEMP for MARK XV has been coordinated through all services and is currently awaiting HQ AFSC/TE approval. |

Program Element: 64211N

Title: Identification, Friend or Foe Systems Development

T&E Activity (Next 12 Months)

| Event | Planned Date | Remarks |
|---|---|---|
| DT&E Lab Test | Dec 86 - Mar 87 | Conducted by Bendix and Texas Instruments Corporation and observed by representatives of NESEA and NOSC respectively. |
| DT&E Flight Test | Mar 87 - Jun 87 | Performed by 4950th USAF Test Wing and NATC. Data reduction by NRL and NATC. |
| Interoperability Testing | Mar 87 - Apr 87 | To be performed at either WPAFB or NATC. NATC, NESEA and NRL will participate. |
| Plug Compatibility | May 87 | Aircraft transponder testing will be conducted by NATC. NESEA will do similar testing for shipboard interrogators. |
| Navy Unique | Jun 87 - Aug 87 | Accomplishes testing required by USN and not included in core testing program.<br>- Verification of embedded MK XII AIMS (NRL).<br>- Preliminary shipboard integration testing (NESEA and NOSC).<br>- Multipath propagation over water (NATC). |

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64212N
DoD Mission Area: 233 - Anti-Submarine Warfare

Title: Light Airborne Multi-Purpose System
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 17,155 | 18,882 | 16,920 | 6,171 | Continuing | TBD |
| W1707 | Light Airborne Multi-Purpose System MK III Improvement | 1,681 | 1,935 | 3,964 | 1,986 | Continuing | TBD |
| W1902 | PENGUIN Anti-Ship Missile System Integration | 15,474 | 16,947 | 12,956 | 4,185 | 0 | 70,046 |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Light Airborne Multi-Purpose System MK III is a computer integrated ship/helicopter system that dramatically increases the effectiveness of surface combatants. It is optimized for anti-submarine warfare and has secondary missions of anti-ship surveillance and targeting, search and rescue, medical evacuation, vertical replenishment and communications relay. For ASW, the helicopter provides a remote platform for deployment of sonobuoys and torpedoes and processing of acoustic and non-acoustic sensor information. For anti-ship surveillance and targeting, the helicopter serves as an elevated platform for radar and electronic support measures and will carry missiles. The ship, through a directional data link, provides sensor processing, command and control, and integrates all Light Airborne Multi-Purpose System information gained from system sensors. The ship also provides the Recovery Assist, Securing and Traversing System as well as visual landing aids, and maintenance/support facilities for the aircraft. The Penguin Missile System is a short range, air-to-surface, anti-ship missile system to be operated from the LAMPS MK III SH-60B helicopter. The MK 2 Mod 7 Penguin Helicopter Launched, Anti-Ship Missile (HLASM) is a modification of the surface launched MK 2 Mod 3 missile. The missile is an autonomous weapon which is controlled by an infrared countermeasures resistant seeker that is automatically activated when the missile reaches a preset range from the predicted position of the target. Penguin missile integration into the SH-60B involves development work by the airframe manufacturer and the systems integrator.

Program Element: 64217N Title: Light Airborne Multi-Purpose System MK III

C. (U) COMPARISON WITH THE 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) FY 1986 W1707 was increased by +1,681 due to a Department budget adjustment and FY 1988 W1707 was increased by +3,479 reflects a Department program and budget adjustment and NIF rate adjustment to fund the integration of a 99 channel sonobuoy receiver, the MK 50 torpedo, and flight incident recorder into the LAMPS MK III. FY 1986 W1902 was increased by +1,429 for Department budget adjustment and GRH adjustment. In FY 88, W1902 was increased +2,837 for Department program/budget adjustment.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 11,333 | 14,045 | 19,712 | 10,604 | 4,494 | 69,224 |
| | Quantity (Test and Evaluation) | | | | | | |
| W1707 | Light Airborne Multi-Purpose System Improvement | *11,333 | 0 | 1,994 | 485 | - | 2,479 |
| W1902 | PENGUIN Anti-Ship Missile System | 0 | 14,045 | 17,718 | 10,119 | 4,494 | 66,700 |

*FY 85 funds in W1707 were obligated for Penguin Missile Program.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| *SH-60B Aircraft Procurement, Navy (APN-1/6) | 269,204 | 229,427 | 148,531 | 168,296 | 1,279,160 | 4,586,314 |
| Quantity | (18) | (17) | (6) | (6) | (55) | (204) |
| Other Procurement, Navy | 49,519 | 32,023 | 31,298 | 27,611 | 11,217 | 393,466 |
| Weapons Procurement, Navy (PENGUIN) | 0 | 0 | 3,563 | 38,012 | 74,005 | 115,580 |
| Quantity | | | (0) | (64) | (129) | (193) |

*Costs for related ship systems currently programmed at approximately $470.4M. Cost breakdown by year is reflected in Shipbuilding and Conversion, Navy appropriations under ship acquisition program elements.

Program Element: 64212N Title: Light Airborne Multi-Purpose System MK III

E. (U) RELATED ACTIVITIES: Program Element 64206A, UH-60A BLACKHAWK (Utility Tactical Transport Aircraft System), a derivative of which has been selected for the Light Airborne Multi-Purpose System MK III airframe. Program Element 64753F, HH-60D, NIGHTHAWK (Combat Rescue/Special Operations helicopter), is an Air Force derivative of the UH-60A airframe and the SH-60B engine. Program Element 64750A, EH-60A QUICKFIX and Program Element 64748A, EH-60B Stand-Off Target Acquisition System, are derivatives of the BLACKHAWK airframe. Program Elements 64203N, AN/AYK-14 Standard Airborne Computer; 64266N, AN/UYS-1 Advanced Signal Processor; 64518N, AN/UYQ-21 Tactical Data System; will be used in Light Airborne Multi-Purpose System MK III. Program Element 64713N, AN/SQR-19 Tactical Towed Array Sonar, will be used in conjunction with the Light Airborne Multi-Purpose System MK III. Program Elements 24224N, SH-60B SEAHAWK provides for product improvements of airframe, engines and flight subsystems. Program Element 64229N, CV IZ Helo shares the same engines and airframe components with the LAMPS MK III.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Development Center, Warminster, PA, (Lead Laboratory-LAMPS MK III); Naval Air Engineering Center, Lakehurst, NJ; Fleet Combat Direction Systems Support Activity, Dam Neck, VA; Naval Underwater Systems Center, New London, CT; Naval Air Test Center, Patuxent River, MD; Naval Avionics Center, Indianapolis, IN; Naval Weapons Center, China Lake, CA (Lead Laboratory-PENGUIN); Pacific Missile Test Center, Point Mugu, CA; Naval Surface Weapons Center, Dahlgren, VA; Naval Ordnance Station, Indian Head, MD. CONTRACTORS: International Business Machines, Owego, NY (Light Airborne Multi-Purpose System MK III System Prime); Sikorsky, Stratford, CT (Air Vehicle); General Electric, Lynn, MA (Engine); Canadian Commercial Corporation (DAF Indal), Ottawa, Canada (Recovery Assist, Securing and Traversing System). Kongsberg Vaapenfabrikk Ltd., Kongsberg, Norway (Penguin Missile).

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W1707, LAMPS MK III Improvement

1. (U) Description: The primary goal of this improvement effort is to upgrade the sonobuoy receiver capability from 31 to 99 channels, to integrate the system requirements of the MK 50 Advanced Lightweight Torpedo into the LAMPS MK III air vehicle, and to incorporate a flight incident recorder with sufficient information for flight simulator reconstruction of a mishap as required for the SH-60B. The 99 channel receiver will be a form fit replacement for the current receiver. New capabilities include the ability to fully use the new 99 channel sonobuoys, which are planned to be in fleet inventory, a MIL-STD-1553B data bus interface and greater tactical flexibility. The On-Top Position Indicator will also be replaced by an R-1651/ARA( ) 99 channel capable system with a broad band antenna. The MK-50 incorporation requires the provisions of heater circuits to the weapon pylons and modification of the AN/ASQ-165 Armament Control Indicator Set which is currently in use to pre-set the MK-46 Torpedo. Operational software changes will also be necessary to provide accurate trajectory predictions in computing water entry and release points prior to launch. The MK-50 is due to replace the MK-46 Torpedo.

Program Element: 64212N Title: Light Airborne Multi-Purpose System MK III

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program

° Initiated engineering effort and awarded development contract leading to integration of 99 channel sonobuoy receiver.
° Initiated development and awarded development contract of the MK 50 torpedo capability into the LAMPS MK III SH-60B weapon system.

b. (U) FY 1987 Program:

° Begin 99 channel sonobuoy receiver installation and system integration testing.
° Begin MK 50 integration testing to include software compatibility checks.

c. (U) FY 1988 Program:

° Combined Development Testing/Operational Testing is scheduled for the MK 50 and the 99 channel sonobuoy receiver. TECHEVAL is to identify technical deficiencies and determine whether the design meets technical specifications. OPEVAL will determine operational suitability of the systems.
° Commence development integration of deployable flight incident recorder capable of simulator reconstruction of future SH-60B mishaps.

d. (U) FY 1989 Program:

° Continue contractor development and integration of the SH-60B flight incident recorder.

e. (U) Program To Completion:

° Development and integration of a deployable flight incident recorder will continue in FY 1989 and complete in FY 1990.

° Future plans include initiation of programs for a classification sensor, a detect/protect capability against anti-air missiles, an acoustic upgrade to include broadband processing and advanced digital buoys, radar processing and night vision goggle cockpit compatibility.

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Title: Light Airborne Multi-Purpose System MK III

f. (U) MAJOR MILESTONE

| | DATE |
|---|---|
| **99 Channel Sonobuoy Receiver** | |
| 1. Receive proposals | Jul 1985 |
| 2. Award Development Contract | Apr 1986 |
| 3. Complete integration testing | Oct 1987 |
| 4. Program Review for Long Lead | Mar 1988 |
| 5. Complete Flight Testing (OT-II) | Jun 1988 |
| 6. Award Contract for Production | Nov 1989 |
| 7. | |
| **ALWT (MK 50 Torpedo)** | |
| 1. Receive Proposals | Jul 1985 |
| 2. Award Development Contract | Apr 1986 |
| 3. Complete Integration Testing | Oct 1987 |
| 4. Program Review for Long Lead | Mar 1988 |
| 5. Complete Flight Testing (OT-II) | Jun 1988 |
| 6. Award Contract for Production | Nov 1989 |
| 7. | |

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W1902, Penguin Integration

1. (U) Description: The PENGUIN Missile is currently in service with several NATO countries as a surface-to-surface and air-to-surface, anti-ship weapon. It has been successfully test fired from a patrol boat and a high speed aircraft, the F-16. This program will modify the patrol boat PENGUIN Missile for launch from a helicopter, modify the motor and warhead to meet U.S. Navy insensitive munitions requirements and modify the SH-60B helicopters to provide carriage and launch capabilities. This program will provide 28 missile installation kits for 33 ships to service any of 115 missile capable SH-60B helicopters.

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a. (U) FY 1986 Program:

° Began testing of PENGUIN airframes, mission system modifications and avionics weapons system modification.
° Aircraft provisioning contract awarded to IBM and Sikorsky.

b. (U) FY 1987 Program:
° Begin captive carriage of PENGUIN missile on a rotary wing aircraft.
° Continue integration and testing for PENGUIN missile.
° Continue aircraft integration and provisioning for PENGUIN capability.
° Complete DT/OT IIA testing.

c. (U) FY 1988 Program:

° Complete test of ship shipalt installation.
° Complete aircraft modification.
° Program review in 2Q/FY 88 to execute long lead production contract for missile, aircraft mods and shipalt.
° Complete OT-IIC testing.

d. (U) FY 1989 Program:

° Complete OT III missile system testing.
° Planned completion of R&D program.

e. (U) Program to Completion: Complete test ship shipalt installation. Complete aircraft modification and continue captive flight/separation/jettison testing.

f. (U) Major Milestones:

| PENGUIN Missile | Date |
|---|---|

Program Element: 64212N

Title: Light Airborne Multi-Purpose System MK III

| | | |
|---|---|---|
| 1. | DT/OT IIA Testing | 3Q/FY 87 |
| 2. | Program Review | 2Q/FY 88 |
| 3. | Long Lead Procurement | 3Q/FY 88 |
| 4. | OT IIC | 4Q/FY 88 |
| 5. | Procure Ship Alteration Lots | 4Q/FY 88 |
| 6. | MS III | 1Q/FY 89 |
| 7. | Commence Installation | |
| 8. | Initial Operational Capability | |

I. (U) TEST AND EVALUATION DATA:

J. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation: Light Airborne Multi-Purpose System (LAMPS) MK III full scale development testing progressed from laboratory and bench tests, through individual systems tests, through total systems testing using the Light Airborne Multi-Purpose System Land Base Test Site (LLBTS) and Mobile Ship Ground Station (MSGS), to, in CY 1981 and 1982, at-sea tests including participation in a major fleet exercise. The five pre-production SH-60B aircraft accumulated over 3000 accident free flight hours. The vast majority of this time was flown by Navy crews in the four mission equipped pre-production aircraft. Over 170 days were spent deployed aboard the USS MCINERNEY (FFG-8). Over 600 at-sea flight hours and over 1000 shipboard landings were accumulated. The Light Airborne Multi-Purpose System MK III weapon system was tested in a wide range of primary and secondary mission scenarios, including ASW against a variety of fleet submarines. Development and operational test results are presented in the following paragraphs.

(a. (U) The Light Airborne Multi-Purpose System MK III full scale development test and evaluation program used five SH-60B SEAHAWKS, three Helicopter Landing Systems (HLS), three Light Airborne Multi-Purpose System MK III ship electronic sets and the Light Airborne Multi-Purpose System MK III configured test ship, the USS MCINERNEY (FFG-8).

b. (U) A firm basis to continue Light Airborne Multi-Purpose System MK III development was provided by Operational Test (OT)-IB[a](H-2/Short Range (SR)) and Operational Test-IC (H-3/Extended Mission (EM)) testing under CNO Project-189 (formerly X/C-5). H-2/Short Range test results and H-3/Extended Mission testing were highly successful and the results were provided at Defense Systems Acquisition Review Council (DSARC) Milestones IIB and IIC respectively.

c. (U) Development Test (DT)-IIA was dedicated to testing the integration of the hardware and software of the newly developed/improved Light Airborne Multi-Purpose System MK III equipments into their respective airborne and shipboard systems and insuring that the effectiveness of the operator-equipment interface in its operating environment was not a limiting factor in system performance. The Light Airborne Multi-Purpose System MK III Land Based Test Site then combined the airborne avionics laboratory and the ship electronics laboratory and was used for system integration and Proof of Compliance (POC) testing.

d. (U) Development Test II was dedicated to extensive laboratory, flight and shipboard testing of various Light Airborne Multi-Purpose System MK III subsystems as well as integrated testing of the entire Light Airborne Multi-Purpose System MK III weapon system. Five pre-production prototype SH-60B helicopters and one Light Airborne Multi-Purpose System MK III equipped FFG-7 class ship, as well as various land based test sites and facilities, were used during this phase of testing. Each of the major Navy and contractor demonstrations conducted is described in some detail below.

e. (U) The first weapon system demonstration was conducted at the Light Airborne Multi-Purpose System MK III Land Based Test Site. This demonstrated that the avionics and ship electronics were ready for installation in the aircraft and the ship respectively, and that the software was mature enough to permit the weapon system to advance to flight testing.

f. (U) Navy Preliminary Evaluation (NPE)-IA was conducted at Sikorsky's West Palm Beach Test Facility, using an instrumented SH-60B. The primary purposes of this Navy Preliminary Evaluation were to evaluate the flying qualities and performance of the SH-60B and a proposed flight envelope. This Navy Preliminary Evaluation showed that the SH-60B was ready for testing at sea.

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[a]In accordance with the 1980 revision of DOD Instruction 5000.3 and OPNAV Instruction (OPNAVINST) 3960.10A all test phases have been renumbered.

g. (U) The Hard Landing demonstration was conducted at Naval Air Test Center (NATC) using an instrumented SH-60B. The objective of this demonstration was to verify the capability of the landing gear system and the airframe to withstand stresses imposed during landings. Results included: a vertical landing speed of 10.2 Feet Per Second (FPS), with roll angles up to 6°; aircraft stability in multi-azimuthal landings on a 9° slope; and excellent response in the hard landing. This demonstrated that the aircraft was structurally ready for at-sea operations.

h. (U) Navy Preliminary Evaluation-IN was conducted at Naval Air Test Center using a mission configured SH-60B. The primary objective of this Navy Preliminary Evaluation was to evaluate the aircraft under night and instrument meteorological conditions. This evaluation showed that the aircraft was ready for all weather operations.

i. (U) Navy Preliminary Evaluation-IB was conducted at Naval Air Engineering Center (NAEC) using an instrumented SH-60-B. The objectives of this evaluation were to determine the maturity of the Helicoptar Landing System and to evaluate the compatibility of the SH-60B SEAHAWK and the Helicopter Landing System in preparation for the Helicopter Landing System Technical Evaluation (TECHEVAL) at sea. This Navy Preliminary Evaluation showed that dynamic response and centering of the aircraft during recovery assist landing, and the visual landing aids configuration were excellent. This Navy Preliminary Evaluation demonstrated that the Helicopter Landing System was ready for at-sea Technical Evaluation.

j. (U) The System Prime Contractor's Weapon System demonstration was conducted at Naval Air Test Center using three mission configured SH-60B aircraft and the Mobile Ship Ground Station, which contained the Light Airborne Multi-Purpose System MK III ship electronics. The objectives of this demonstration were to verify that the Light Airborne Multi-Purpose System MK III weapon system was ready for testing at sea, to demonstrate compliance of the weapon system with International Business Machines (IBM) contract specifications, and to provide an early look at the system's operational suitability. This demonstration verified that the Light Airborne Multi-Purpose System MK III weapon system was ready for testing at sea.

k. (U) Navy Preliminary Evaluation-IC (Flying Qualities Phase) was conducted at Sikorsky's West Palm Beach Facility using an instrumented SH-60B. The primary objective of the Navy Preliminary Evaluation was to evaluate the SH-60B's flying qualities with the proposed final Programmable Read Only Memory (PROM) installed in the Automatic Flight Control System (AFCS). This evaluation concluded that the flying qualities of the SH-60B helicopter would enable the weapon system to perform the ASW and Anti-Ship Surveillance and Targeting (ASST) missions.

l. (U) Navy Preliminary Evaluation-IC (Performance Phase) was conducted at the Sikorsky West Palm Beach Flight Test Facility using an instrumented SH-60B. The primary objective of this Navy Preliminary Evaluation was to evaluate the SH-60B aircraft performance in level flight, in a hover, and during climbs and autorotations. The performance of the SH-60B helicopter demonstrated excellent potential to perform the Light Airborne Multi-Purpose System MK III mission.

m. (U) Dynamic FFG-8/SH-60B Interface Tests were conducted at sea on board the USS MCINERNEY using an instrumented SH-60B and Helicopter Landing System installed in the ship. The primary objectives of this test period were to develop a SH-60B/FFG-8 flight envelope, and to evaluate the Helicopter Landing System during recovery assist, manuevering and straightening, and traversing operations. Additional objectives were to evaluate technical characteristics of the Helicopter Landing System during helicoptar launch, recovery, and deck handling operations in sea conditions of up to 10 foot wave height, 28 knot true winds, and ship motion of 6° pitch and 26° roll. This test demonstrated that the SH-60B could perform its assigned missions within the flight envelope developed for the FFG-8, under wind and sea conditions as described above. The Horizon Reference Set (HRS) on the FFG-8 was also evaluated as a significant aid to the pilots in position keeping during Recovery Assist, Securing and Traversing (RAST) recovery assist landings aboard ship.

n. (U) A Maintenance Engineering Inspection (MEI) was conducted at Naval Air Test Center using a mission equipped SH-60B and a simulated FFG-7 class hangar. The primary objective of this test was to determine if Navy personnel could perform the necessary maintenance functions to support the SH-60B at sea, on board a FFG-7 class ship, by following maintenance procedures described in Navy maintenance publications. This test demonstrated the ability of Navy maintenance personnel to perform these functions.

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o. (U) Navy Preliminary Evaluation II (Shore) was conducted at Naval Air Test Center using two mission configured SH-60B Helicopters and Mobil Ship Ground Station. The objectives of this test period were to evaluate acoustic, radar, navigation, and ordnance systems as well as data link performance. From this evaluation it was concluded that the SH-60B aircraft had the potential to perform the Light Airborne Multi-Purpose System MK III missions.

p. (U) Navy Preliminary Evaluation II (Sea) was conducted at the Atlantic Undersea Test and Evaluation Center (AUTEC) using two mission configured SH-60B aircraft embarked aboard USS MCINERNEY. The primary objective of this test was to determine the ability of the Light Airborne Multi-Purpose System MK III weapon system subsystems to perform their necessary functions. This test evaluated the ability of all Light Airborne Multi-Purpose System MK III subsystems to function individually and collectively. The Light Airborne Multi-Purpose System MK III weapon system demonstrated this capability by successfully prosecuting a variety of submarine target threats.

q. (U) The next portion of the Light Airborne Multi-Purpose System MK III weapon system At-Sea Technical Evaluation was conducted in an open ocean environment using two SH-60B helicopters embarked aboard the USS MCINERNEY. The objective of this test was to demonstrate the ability of the Light Airborne Multi-Purpose System MK III weapon system to perform its ASW mission in accordance with the thresholds listed in Decision Coordinating Paper (DCP)-85. The Light Airborne Multi-Purpose System MK III weapon system demonstrated its ability to successfully prosecute a second generation submarine threat at ranges of from the Light Airborne Multi-Purpose System ship with areas of uncertainty of up to

r. (U) Mission Profile Qualification Tests (MPQTs) were conducted at Naval Air Test Center. These tests included over 200 flight hours at typical mission profiles in order to obtain Navy reliability and maintainability data.

s. (U) Structural demonstrations and final Hard Landing demonstrations were conducted to demonstrate that the SH-60B aircraft can meet all performance and flying qualities specifications.

t. (U) System Prime Contractor Environmental demonstrations were conducted on a mission configured aircraft to measure the effects of temperatures, noise and vibrations on the aircraft avionics.

u. (U) Navy Preliminary Evaluation III was conducted both ashore (at Naval Air Test Center) and at sea (aboard MCINERNEY) to review the performance of all aircraft, engine avionics and shipboard subsystems as well as performance of the entire Light Airborne Multi-Purpose System MK III integrated system. Additionally, Navy Preliminary Evaluation III evaluated the effectiveness of necessary system changes/updates identified during Operational Test(OT)-IIA. Over 100 flight hours were flown during the course of Navy Preliminary Evaluation III. At-sea evolutions included a number of ASW and Anti-Ship Surveillance and Targeting scenarios. Successful torpedo drops were made during ASW events. Navy Preliminary Evaluation-III constituted a successful full dress rehearsal prior to Operational Evaluation.

v. (U) May 1982 - June 1983, Development Testing. As a consequence of deficiencies discovered during developmental and operational testing, corrections have been developed and demonstrated during a follow-on testing phase. OSD guidance in the Decision Memorandum for LAMPS MK III DSARC held in June 1982 has been complied with as follows:

- AN/ALQ-142 ESM validation testing was conducted prior to Phase II long lead procurement.
- An Avionics Maintenance Test Program (AMTP) task force was formed and necessary deficiency corrections were identified, implemented and tested to ensure adequate diagnostic capabilities were met.
- MAD maneuver noise, sensitivity and display improvements have been incorporated and were evaluated in August/September 1982. The results demonstrated that performance improvements of the ASQ-81(V) was comparable to that currently being achieved with the same system fitted to the SH-2 and SH-3 helicopters.
- Tests conducted with the Acoustic Target Tracker (ATT) have demonstrated a mature ASW capability with a reduction in operator workload.
- As a result of deficiency corrections which have been incorporated, a mature system goal of 2.0 MFHBF is expected to be achieved in the Lot I aircraft, well ahead of the planned DCP 85 date of 1988.

w. (U) DT-III Testing commenced in Mar 84. Functional tests included communications, Data Link, Radar IFF, Acoustics and ESM. Tests were performed at NATC Patuxent River with FFG-36. Additional testing of corrections software deficiencies was conducted in Jan 84. DT-III testing has included Icing Trials and results of these tests will be forthcoming.

2. (U) Operational Test and Evaluation (OT&E)

a. (U) Operational Test and Evaluation (Operational Test-IIA and Operational Test-IIB) objectives were to determine the Light Airborne Multi-Purpose System MK III weapon system's operational performance (operational effectiveness and operational suitability) in a realistic operational environment against targets representative of the threat. Recovery Assist, Securing and Traversing Operational Evaluation-IIB was conducted concurrently with the at-sea portion of Light Airborne Multi-Purpose System Operational Test-IIA.

b. (U) Operational Test-IIA was conducted ashore and at sea from 1 May to 30 June 1981 using two pre-production prototype mission equipped SH-60B aircraft. Two at-sea periods, 23 May - 3 June 1981 and 10-18 June 1981 were conducted aboard USS MCINERNEY (FFG-8) in the Bermuda operating area. USS FINBACK (SSN-670) provided seven days of dedicated services and USS GARCIA (FF-1040) equipped with towed array sonar provided five days of simulated Tactical Towed Array Sonar (TACTAS) services. A total of 200.9 hours was flown.

c. (U) Operational Test-IIB was conducted ashore and at sea from 1 Oct 81 - 11 Feb 82. During the period 21-28 Oct 81, Naval Air Test Center and Air Test Evaluation Squadron One (VX-1) conducted joint Development Test/Operational Test of the Recovery Assist, Securing and Traversing system aboard MCINERNEY prior to commencement of Light Airborne Multi-Purpose System MK III Operational Evaluation on 3 Nov 81. During 2-23 Nov 81 a two helicopter detachment aboard MCINERNEY participated in Readiness Exercise 1-81, conducted AN/ALQ-142 Electronic Warfare Support Measures range tests at the Atlantic Fleet Weapons Training Facility and ASW operations with USS RICHARD RUSSEL (SSN-687). During 4-7 Dec 81 a two helicopter detachment conducted sea state five cold weather operations aboard MCINERNEY. During the period from 18-31 Jan 82 a two helicopter detachment aboard MCINERNEY conducted Electronic Warfare Support Measures range tests, ASW operations with USS JACKSONVILLE (SSN-699), and Anti-Ship Surveillance and Targeting operations with USS SAMUEL ELLIOT MORISON (FFG-13). A total of 391.5 flight hours was flown in Operational Test-IIB.

(1) (U) Operational Evaluation Conclusions:

(a) (U) The Light Airborne Multi-Purpose System MK III weapon system has the potential to be operationally effective based on demonstrated ASW capability.

(b) (U) The Light Airborne Multi-Purpose System MK III weapon system has the potential to be operationally suitable, based on demonstrated probability of mission success, maintainability, and operational availability.

(c) (U) The following items enhanced mission performance and represented significant improvement in helicopter/ship ASW:

1 Capability of Light Airborne Multi-Purpose System MK III to redetect and localize threat representative targets;
2 Light Airborne Multi-Purpose System MK III capability of the SH-60B to conduct flight operations from FFG-7 class ships in sea states through 5, and to conduct ASW operations in sea states through 4;
3 SH-60B range and endurance;
4 Shipboard electromi performance and reliability;
5 SH-60B automatic approach, hover and depart capabilities;
6 Light Airborne Multi-Purpose System MK III communications relay capability;
7 SH-60B AN/APS-124 radar performance;
8 T700-GE-401 jet engine performance and reliability.

(2) (U) Operational Evaluation Recommendations:

(a) (U) Continue approval for limited production (limited fleet introduction).

(b) (U) Proceed with planned production of the SH-60B aircraft and shipboard equipment subject to:

1 Continuing aggressive shore-based Development/Operational Test-IIIA to verify correction of identified deficiencies:

2 Conducting Operational Test-IIIB with the earliest fleet representative SH-60B, and a fully integrated Light Airborne Multi-Purpose System MK III ship, to support production approval (full fleet introduction).

(c) (U) Adopt the modified sparing list.

(d) (U) Develop and procure Light Airborne Multi-Purpose System Mk III System trainers in sufficient time to support fleet introduction.

(e) (U) Correct specific deficiencies delineated in the Operational Evaluation report prior to the Initial Operating Capabilty date.

d. (U) Operational Test-IIIA was conducted ashore from 1 May 1982 - 28 Feb 1983. Combined DT/OT testing consisted of monitoring some corrections incorporated as a result of discrepancies identified during OPEVAL. Major areas reviewed included the Rescue Hoist, Helo Vibrations, Software Discrepancies and Laboratory Demonstrations of the Accoustic Target Tracker (ATT).

e. (U) FFG-36 Special Board of Inspection and Survey (INSURV) Trials for LAMPS MK III were conducted 9-12 Oct 84. The Board found the LAMPS Ship/Air Combat System has successfully demonstrated the ability to perform the ASW mission, with operator compensation, the Anti-Ship Surveillance and Targeting (ASST) mission, and the LAMPS III System has awesome potential for expanding the combat capability of the FFG-7 Class Ship.

f. (U) OT-IIIB was conducted from 1 July through 22 September 1984, using AIRTEVRON ONE Lot I and Lot II production aircraft on board USS Underwood (FFG-36). [redacted] as a result, COMOPTEVFOR required an additional phase of OT-IIIB. The additional phase was conducted from 4-26 February 1985, using AIRTEVRON ONE Lot I and Lot II aircraft on board USS Underwood. A total of 78.6 mission flight hours were flown during this period. ASW range testing was conducted at AUTEC from 4-11 February 1985. A total of 46 mission hours were flown against augmented U.S. nuclear submarines. EW range testing was conducted 15-19 February 1985 at Atlantic Fleet Weapons Training Facility (AFWTF). A total of 28 mission hours were flown, operating with Electronic Warfare Support Measures (ESM) emitter vans and jammer vans simulating a hostile radio frequency environment. The open-ocean portion of the additional OT-IIIB phase was terminated on 23 February 1985, when the AIRTEVRON aircraft was lost at sea.

(1) (U) Conclusions

(a) (U) The LAMPS MK III Weapons System is operationally effective for ASST.

(b) (U) The LAMPS MK III Weapon System is potentially operationally effective for ASW (open-ocean ASW operational effectiveness was not determined).

(c) (U) The LAMPS MK III Weapons System is operationally suitable.

(d) (U) Operational effectiveness and operational suitability findings support a recommendation for limited production.

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(2) (U) Recommendations

(a) (U) Approve the LAMPS MK III Weapon System for limited fleet introduction.

(b) (U) As a prerequisite to approval for full fleet introduction, conduct OT-IIIC to:

g. (U) Follow-on Operational Test and Evaluation:

(U) CNO letter Ser 981E1/5U354730 of 31 July 1985 recommended that OT-IIIC be combined with operational testing of other systems related to LAMPS MK III. COMOPTEVFOR is planning to complete OT-IIIC in conjunction with CNO projects 168-2, 179-5 and 802-2, during July - September 1987. A service approved TEMP revision will be submitted to OSD early FY 87.

3. (U) System Characteristics

(U) The Light Airborne Multi-Purpose System MK III has been developed to meet mission requirements for anti-submarine warfare and anti-ship surveillance and targeting. The Light Airborne Multi-Purpose System MK III helicopter (SH-60B) is a derivative of the Army BLACK HAWK (UH-60A). SH-60B helicopters are designed to operate from FFG-7, DD-963, DDG-993, and CG-47 classes of ships. The following characteristics, updated to reflect Secretary of Defense Decision Memorandum of 24 November 1981, apply to the MK III system and represent the latest information available:

| System Characteristics | Milestone III Threshold | Demonstrated (Note 1) |
|---|---|---|
| a. (U) Light Airborne Multi-Purpose System | | |
| (1) (U) Missions | | |
| Primary - Anti-Submarine Warfare | | |
| Pr (Probability of redetection and classification given valid trigger) | | |
| Pa (Probability of attack criteria to within 800 yards given localization) | | |
| Pl (Probability of localization to within 3 nautical miles given correct classification) | | |

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| | Milestone III Threshold | Demonstrated (Note 1) |
|---|---|---|
| **Secondary - Anti-Ship Surveillance and Targeting** | | |
| Pd (Probability of detection) | | (Note 2) |
| Pc (Probability of correct classification) | | (Note 2) |
| Pt (Probability of over-the-horizon targeting) | | (Note 2) |
| DRA (Detection Range Advantage) | | N/E (Note 3) |
| **Other Secondary** | | |
| Search and Rescue | | Demonstrated |
| Vertical Replenishment | | N/E (Note 3) |
| Medical Evacuation | | Demonstrated |
| Communications Relay | | Demonstrated |
| (2) (U) Operating Capability (Sea State) | 4 | 4 |
| (3) (U) Aircraft Performance - Endurance ASW 100 nautical miles (Hours) | | |
| Anti-Ship Surveillance and Targeting 40 nautical miles (Hours) | | |
| (4) (U) Helicopter Dash Speed (knots) | 125 | 150 |
| (5) (U) Radar Detection Range (nautical miles) Surface Threat Cross Section (60 square meters) | | 3) |
| (1500 square meters) | | 3) |
| (6) (U) Navigation Accuracy (Distance from ship) | | |
| @ 35 nautical miles | | 3) |
| @ 70 nautical miles | | 3) |
| @100 nautical miles | | 3) |

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| System Characteristics | Milestone III Threshold | Demonstrated (Note 1) |
|---|---|---|
| b. (U) Availability, Reliability and Maintainability | | |
| (1) (U) Operational Availability | | |
| Total System (%) | 76 | |
| (2) (U) Reliability | | |
| ASW Probability of Success Total System (%) | 88 | (Note 2) |
| Anti-Ship Surveillance and Targeting Probability of Success Total System | 85 | Note 2) |
| Mean Flight Hours Between Failures SH-60B SEAHAWK (Air Vehicle and Avionics) | 1.5 | 4.9 hrs |
| Mean Time Between Failures Ship Electronics | 70 | 148 |
| (3) (U) Maintainability | | |
| Mean Time to Repair (Hours) (Elapsed Maintenance Time/Maintenance Action) | | |
| Air Vehicle | 2.0 | 1.3 |
| Avionics | 1.0 | 1.5 |
| Ship Electronics | 2.5 | 0.15 |
| Direct Maintenance Manhours/Flight Hour | | |
| Avionics (Unscheduled) | 0.8 | 0.10 |
| Helicopter (Unscheduled) | 4.0 | 2.80 |
| Support Actions | 8.0 | 6.10 |
| Helicopter (Scheduled) | 3.1 | 2.60 |
| SH-60B (O-Level Total) | 15.9 | 11.60 |
| Probability of Fault Detection | | |
| Avionics | 85 | 6 of 6 (Note 2) |
| Ship Electronics | 80 | 3 of 3 (Note 2) |
| Probability of Fault Isolation | | |
| Avionics | 85 | 3 of 6 (Note 2) |
| Ship Electronics | 80 | 3 of 3 (Note 2) |

NOTES (U)

1.(U) Demonstrated results based on OT-IIIB testing as reported in COMOPTEVFOR Ser 412/C187 of 02 July 1985.

2.(U) Data sample size insufficient to yield statistically significant results. Therefore, results are reported as outcomes rather than probabilities.

3.(U) Indicates not evaluated (N/E) during this phase of operational testing.

4. (U) Current T&E Activity

T&E Activity (Past 12 Months)

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| OT-IIIB (Continuation) | Feb 86 - May 86 | Feb 86 - May 86 | - A/C Icing Trials |

T&E Activity (Next 12 Months)

| Event | Planned Date | Remarks |
|---|---|---|
| OT-IIIC | Jul 87 - Sep 87 | - Determine Open-ocean ASW effectiveness |
| Penguin Missile Integration Initial Testing | Commence Oct 86 - Ongoing | - Penguin |
| MK 50 Torpedo; 99 Channel Sonobuoy Receiver | Commence Oct 86 - Ongoing | - $P^3I$ Program |

5. (U) Program Documentation

| | | |
|---|---|---|
| Phase I Navy Preliminary Evaluation-1A of the SH-60B Helicopter Preliminary Report | NAVAIR-80 | 13 Aug 80 |
| First Interim Report - Phase I Navy Preliminary Evaluation-1A | NAVAIR-81 | 29 May 81 |
| Light Airborne Multi-Purpose System MK III Test & Evaluation, Phase I, Navy Preliminary Evaluation-IB of SH-60B Helicopter | NAVAIR-80 | 14 Oct 80 |
| Second Interim Report - Navy Preliminary Evaluation-IB - (Final) | NAVAIR-81 | 16 Jun 81 |
| Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase I, SH-60B/FFG-8 Shipboard Envelope Development/Recovery Assist, Securing and Traversing Technical Evaluation | NAVAIR-81 | 9 Mar 81 |

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|---|---|---|
| Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase I, Navy Preliminary Evaluation-IB of SH-60B Helicopter | RW-37R-80 | 2 Oct 80 |
| Final Report, Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase I, Navy Preliminary Evaluation-IB, & SH-60B/FFG-8 Shipboard Envelope Development/Recovery Assist, Securing and Traversing Technical Evaluation | RW-30R-81 | 14 Sep 81 |
| Final Report, Light Airborne Multi-Purpose System MK III Test and Evaluation Phase I, Navy Preliminary Evaluation-IB & SH-60B/FFG-8 Shipboard Envelope Development/Recovery Assist, Securing and Traversing Technical Evaluation | RW-30RE-81 | 16 Nov 81 |
| Light Airborne Milti-Purpose System MK III Test and Evaluation, Phase I, (Navy Preliminary Evaluation-IC, Flying Qualities) of the SH-60B Helicopter | RW-1R-81 | 19 Jan 81 |
| Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase I, (Naval Preliminary Evaluation-IC - Performance) of the SH-60B Helicopter | RW-12R-81 | 11 Mar 81 |
| Final Report, Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase I, Navy Preliminary Evaluation-IC of the SH-60B Helicopter | RW-31R-81 | 27 Oct 81 |
| At-Sea Technical Evaluation Report #6186881000 | International Business Machines CDC | 15 Jul 81 |
| Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase I, Special Purpose Test Preliminary for Light Airborne Multi-Purpose System MK III - 1st Interim (Preliminary) | RW-41R-80 | 28 Oct 80 |
| Second Interim Report - Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase I, Special Purpose Test for the Light Airborne Multi-Purpose System MK III | RW-C4R-80 | 23 Jan 81 |
| Light Airborne Multi-Purposes System MK III Test and Evaluation, Phase I, Spec. Purpose Test for Light Airborne Multi-Purpose System MK III - 3rd Interim (Preliminary) | RW-5R-81 | 30 Jan 81 |
| Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase I, SH-60B Initial Hard-Landing Demonstration | RW-20R-81 | 4 Jun 81 |
| Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase I, SH-60B/T700-GE401 Propulsion System Demonstration | RW-10R-81 | 18 Jun 81 |
| Req. for Performance Verification of Radio Frequency Preamplifier/Signal Distribution Provision in AN/ARR-075 Sonobuoy Receivers | RW-25R-81 | 7 Jul 81 |
| Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase I, Witness of Air Vehicle Environmental Control System Demonstration | RW-40R-80 | 26 Jun 81 |
| Final Report - Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase II, Navy Preliminary Evaluation-II for Light Airborne Multi-Purpose System MK III | RW-C4R-81 | 30 Jun 81 |

Program Element: 64212N

Title: Light Airborne Multi-Purpose System MK III

| | | |
|---|---|---|
| Naval Air Test Center (NAVAIRTESTCEN) Test and Evaluation, Phase I, Light Airborne Multi-Purpose System MK III Full Scale Development, Program Summary Report | RW-8R-81 | 19 Jun 81 |
| Phase II (Navy Preliminary Evaluation-II) of the Light Airborne Multi-Purpose MK III Ship/Air Weapon System (At-Sea Tests) | RW-C3R-81 | 4 May |
| Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase II, Navy Preliminary Evaluation-II for Light Airborne Multi-Purpose MK III, Final Report | RW-C4RE-81 | 30 Oct 81 |
| Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase II, Navy Preliminary Evaluation-II (Shore) | RW-13R-81 | 30 Mar 81 |
| Final Report, Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase II, Navy Preliminary Evaluation-II for Light Airborne Multi-Purpose System MK III | RW-C4R-81 | 30 Jun 81 |
| Naval Air Test Center (NAVAIRTESTCEN) Test and Evaluation, Phase II, Summary Report for Light Airborne Multi-Purpose System MK III | RW-48R-81 | 2 Nov 81 |
| Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase III, Navy Preliminary Evaluation-III for Light Airborne Multi-Purpose System MK III 2nd Interim (Preliminary) | RW-53R-81 | 26 Oct 81 |
| Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase III, Navy Preliminary Evaluation-III for Light Airborne Multi-Purpose System MK III | RW-C5R-81 | 18 Sep 81 |
| Third Interim Report - Light Airborne Multi-Purpose System MK III Test and Evaluation, Phase III, Navy Preliminary Evaluation-III for Light Airborne Multi-Purpose System MK III | RW-C6R-81 | 9 Feb 81 |
| Commander Operational Test and Evaluation Force (COMOPTEVFOR) Quicklook Report of Initial Operational Test and Evaluation of Light Airborne Multi-Purpose System MK III Weapon System | Message DTG 081750ZJUL81 | 10 Jul 81 |
| Commander Operational Test and Evaluation Force Quicklook Report, Operational Evaluation of Light Airborne Multi-Purpose System MK III Weapon System | Message DTG 241500ZFEB83 | 24 Feb 82 |
| Operational Evaluation of Recovery Assist, Securing and Traversing System | Ser 753 | 14 Jun 82 |
| Commander Operational Test and Evaluation Force Evaluation Report, Light Airborne Multi-Purpose System MK III Weapons System | Ser C158 | 29 Jun 82 |
| Quick Response Report LAMPS MK III Ship/Air Weapon System, Special INSURV Trials | RW-98R-84 | 13 Nov 84 |
| Special LAMPS MK III Trial of USS Underwood (FFG-36) | | 10 Dec 84 |
| Commander Operational Test and Evaluation Force Report, Follow-on Operational Evaluation of the LAMPS MK III Weapons System | Ser 412/C187 | 2 Jul 85 |

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64213N
DoD Mission Area: 265 - Intra-theater Airlift

Title: Helicopter Development
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 11,337 | 5,800 | 11,226 | 12,595 | Continuing | Continuing |
| WO901 | Helicopter Night Vision System * | 11,049 | 5,800 | 0 | 0 | -- | -- |
| W1378 | AH-1 Aircraft | 288 | 0 | 11,226 | 12,595 | Continuing | Continuing |

* Project WO901 HNVS moved to PE 64260N CH/MH-53E in FY 1988 and out.

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This is a multifacted modernization program. Major components to be developed, integrated and qualified on the AH-1 aircraft are: 1) a turreted day/night Forward Looking Infrared (FLIR) equipped targeting system; 2) an additional wing tip air-to-air missile station for self protection and reactive Anti-Radiation Missile (ARM) capability; 3) STINGER Air-to-Air Missile SYSTEM. When integrated these components will provide expanded weapon system capability, accuracy and mission effectiveness.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and this Descriptive Summary are as follows:
Project WO901, FY 1986 increase of 5,707 for Department Budget adjustment and decrease of 424 for GRH adjustment. In FY 1987, decrease of 665 for Congressional adjustment. FY 1988 funding of 4,915 transferred to PE 64260N.
Project W1378, in FY 1986, increase of 288 for Department Budget adjustment and in FY 1987 decrease of 4,619 for Congressional action. In FY 1988, increase of 3,980 for Department Program adjustment and decrease of 587 for Department Program/Budget adjustment.

Program Element: 64213N Title: Helicopter Development

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 16,158 | 5,766 | 11,084 | 12,748 | Continuing | Continuing |
| W0901 | Helicopter Night Vision System | 5,577 | 5,766 | 6,465 | 4,915 | 0 | 61,337 |
| W1378 | AH-1 Aircraft | 6,662 | 0 | 4,619 | 7,833 | Continuing | Continuing |
| W1577 | Crown Helicopter | 1,727 | 0 | 0 | 0 | 0 | 7,518 |
| W1792 | Helicopter Engine Enhancement | 2,192 | 0 | 0 | 0 | 0 | 17,222 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Aircraft Procurement, Navy (45B1) | | | | | | |
| APN-5 Hellfire Retrofit | 11,068 | 0 | 0 | 0 | 0 | 19,353 |
| APN-5 Engine Retrofit | 24,470 | 0 | 0 | 0 | 0 | 44,449 |
| APN-5 AH-1 Block Upgrade | 0 | 30,838 | 27,976 | 32,930 | 12,771 | 104,523 |
| APN-5 AH-1 Night Targeting Systems | 0 | 0 | 0 | 10,000 | 14,357 | |

E. (U) RELATED ACTIVITIES: Navy Hellfire missile test and evaluation was conducted under Program Element 64371N. The Army is qualifying an M-65 based night targeting system adapted to the AH-1S and the U. S. Army mission (PE 23744A, Proj D176). There is no unnecessary duplication of effort within the Navy or the Department of Defense.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Development Center, Warminster, PA; Naval Air Test Center, Patuxent River,MD; Naval Air Engineering Center, Lakehurst, NJ; Naval Air Propulsion Center, Trenton, NJ; Naval Weapons Center, China Lake, CA. CONTRACTOR: AH-1: Bell Helicopter Textron, Fort Worth, TX; Boeing Vertol Company, Philadelphia, PA; Collins Radio Division, Rockwell International, Cedar Rapids, IA; Hughes Aircraft Company, Culver City, CA; General Electric Co., Lynn, MA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

Program Element: 64213N Title: Helicopter Development

H. (U) PROJECT OVER $10 MILLION IN FY 1988/89.

(U) Project W1378, AH-1 Aircraft

1. (U) Description: This project funds: 1) Turreted day/night FLIR targeting system which enables combat operations in adverse weather conditions and at night beginning in FY 1987. This system will incorporate targeting for the TOW/TOW II missile, HELLFIRE missile and the turreted gun; Laser range finder/designator and day/night sensors with appropriate stabilization/target tracking capabilities. 2) Wing tip station for reactive ARM (SIDEARM) and air-to-air defensive weapons (AIM-9) beginning in FY 1990. 3) Integration of the STINGER missile system into the AH-1W for air-to-air defense. The Navy conducted a survey of U. S. industries capable of accomplishing the targeting portion of the modernization program and an evaluation of off-shore companies through our Foreign Weapons Evaluation program. It was determined that a night targeting system designed by Israel Aircraft Industries, Limited could provide the most cost effective solution for both countries while also meeting the Initial Operational Capability (IOC) requirements. The system is a highly refined second generation design derived from an existing Israeli attack helicopter targeting system. Discussions between the Department and the Government of Israel (GOI) have determined that a collaborative effort to co-develop and co-produce the system would be beneficial to both countries. Cost sharing between the two governments would be on a one-third GOI and two-thirds Department ratio during the development and integration phases. Non-recurring production costs would be shared on a like ratio, but equipment, installation, unique requirements and deliverable costs would be borne individually by each country. It is planned that this effort will be structured so that either country could proceed with production without the participation of the other.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Funding reflects directed requirement to conduct an Operational Assessment of the potential capability to incorporate STINGER missiles on aircraft.

b. (U) FY 1987 Program: Not Applicable.

c. (U) FY 1988 Planned Program:

- o Complete development specification for FLIR and aircraft integration.
- o Complete statement of work for FLIR development and aircraft integration.
- o Release RFP for competitive contract for FSED and production options.
- o Commence integrated logistics support analyses and planning.

Program Element: 64213N Title: Helicopter Development

- o Design FLIR/aircraft interface and begin fabrication of day/night targeting FSED Engineering Development model (EDM).

- o Procure test articles for Night Targeting EDM development.

d. (U) FY 1989 Planned Program:

- o Execute development, fabrication, integration, test and evaluation and production contracts for wing tip missile station/STINGER air-to-air missile capability. This effort is a P$^3$I initiative and completes in 1989.

- o Complete fabrication and integration of Night Targeting EDM in AH-1 aircraft.

- o Conduct contractor ground and flight testing and begin Navy Technical evaluation for Night Targeting.

e. (U) Program to Completion:

- o Complete Navy TECHEVAL and conduct OPEVAL.

- o Complete Integrated Logistics Support (ILS) analysis and plan.

- o Conduct Navy Program Decision Milestone (NPDM) for Approval for Full Production decision and production installation in AH-1 aircraft.

- o Execute contracts for fabrication, integration, test and evaluation and production decisions for wing tip missile capability. This effort is a P$^3$I initiative and completes in FY 1992.

f. (U) Major Milestones

| Milestones | Date |
|---|---|
| Day/Night Targeting FLIR | |
| 1. Issue competitive contract for FSED | FY 1988 |
| 2. Fabricate EDM | FY 1988-89 |
| 3. DT/TECHEVAL | FY 1991 |
| 4. OPEVAL | FY 1991 |
| 5. Milestone III | FY 1991 |

Program Element: 64213N

Title: Helicopter Development

| Milestones | Date |
|---|---|
| **Wing-tip Station/STINGER Air-to-Air Missile system** | |
| 1. Execute contracts for P$^3$I effort | FY 1989 |
| 2. Fabricate EDM and conduct integration | FY 1990 |
| 3. DT/TECHEVAL | FY 1991 |
| 4. OPEVAL | FY 1991 |
| 5. Milestone III | FY 1991 |

I. (U) TEST AND EVALUATION DATA:

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64214N
DoD Mission Area: 223 - Close Air Support and Interdiction

Title: AV-8B Aircraft (Engineering)
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 65,300 | 44,508 | 13,052 | 11,404 | 33,907 | 1,383,866 |
| WO652 | AV-8B | 65,300 | 44,508 | 13,052 | 11,404 | 33,907 | 1,383,866 |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The AV-8B will meet the Marine Corps requirements for a light attack aircraft to provide responsive offensive air power that can operate from austere forward sites in direct support of ground forces. The AV-8B is an improved vectored thrust aircraft based on the AV-8A concept and powered by the F402-RR-406 engine that has up to twice the range or payload of the AV-8A/C. It combines aerodynamic improvements with the Angle Rate Bombing System for increased weapon delivery accuracy and a new stability augmentation system to reduce pilot workload providing a more capable and reliable light attack aircraft. A two-seat training version designated the TAV-8B and an increased night attack capability for the AV-8B are being developed.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are: In FY 1987, decreases of 3,731 for Congressional adjustment and 400 for Department Program/Budget adjustments. In FY 1988, decrease of 7,406 for Department Program/Budget adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 61,308 | 65,300 | 48,639 | 20,458 | 44,350 | 1,366,704 |
| WO652 | AV-8B | 61,308 | 65,300 | 48,639 | 20,458 | 44,350 | 1,366,704 |

Program Element: 64214N Title: AV-8B (Engineering)

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Aircraft Procurement, Navy (41CC/AK/46JC) | 724,734 | 623,284 | 582,343 | 649,126 | 1,444,087 | 7,958,800 |
| (Quantity) | 46 | 42 | 32 | 32 | 84 | 328 |

E. (U) RELATED ACTIVITIES: Not Applicable.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Test Center, Patuxent River, MD; Naval Weapons Center, China Lake, CA; Naval Air Development Center, Warminster, PA. CONTRACTORS: McDonnell Douglas Corporation, Saint Louis, MO, with subcontract to British Aerospace, Ltd., Kingston, England; Rolls Royce, Bristol, Englsnd.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

H. (U) PROJECT OVER $10 MILLION IN FY 1988/89:

(U) Project WO652, AV-8B:

1. (U) Description: Improved vectored thrust V/STOL aircraft for USMC units based on AV-8A aircraft concept powered by the F402-RR-406 engine. The AV-8B will improve the range/payload performance over the AV-8A and will feature improved reliability and maintainability. TAV-8B is a two place derivative for pilot training. A Night Attack system developed in cooperation with the UK will be incorporated in the AV-8B which will increase its operational suitability and effectiveness.

2. (U) Program Accomplishments and Future Efforts

a. (U) FY 1986 Program:

AV-8B

- o Completed flight evaluation of -406 production configuration engine to include TECHEVAL.
- o Performed TECHEVAL of digital electronic engine fuel control and began expanded envelope testing.
- o Completed development of training simulators.

Program Element: 64214N Title: AV-8B (Engineering)

- o Continued correction of deficiencies resulting from TECHEVAL/OPEVAL to expand weapons envelope.
- o Commenced Electronic Warfare suite integration.
- o Completed ship interface testing.

TAV-8B

- o Continued development to include completion of Sequencing and Divergence Sled Tests. Completed Sled Test DT/OT.
- o Completed major assembly of fuselage in preparation of RAMP acceptance.

AV-8B NIGHT ATTACK

- o Finalized agreement with the United Kingdom (UK) on the extent of commonality between the AV-8B and the GR-MK5 and reached agreement on the amount of funding for this common effort.
- o Continued development with first flight planned late in FY 1987.
- o Conducted Preliminary Design Review and Simulator evaluations.
- o Commenced production aircraft fabrication and installations.

b. (U) FY 1987 Program

AV-8B

- o Complete AV-8B engine/fuel control flight tests.
- o Continue weapons envelope expansion.

TAV-8B

- o Complete ramp operations and conduct first flight of the TAV-8B.
- o Complete laboratory development tests including structural, dynamics and flight simulation.

Program Element: 64214N Title: AV-8B (Engineering)

- o Begin contractor and Navy Flight tests.
- o Conduct fleet introduction evaluation at VMAT-203, MCAS Cherry Point, NC.

AV-8B NIGHT ATTACK

- o Sign Firm Fixed Price contract with prime contractor McDonnell Aircraft Co..
- o Complete engineering design and equipment deliveries to MCAIR.
- o Complete avionics laboratory test and manned flight simulation.
- o Conduct major assembly, complete ramp operations, and conduct first flight.
- o Initiate Navy development flight testing.

c. (U) FY 1988 Planned Program:

AV-8B:

- o Close out AV-8B development contract.
- o Complete shipbosrd suitability and interface testing.
- o Continue weapons integration/envelope expansion.

TAV-8B:

- o Complete structures and systems avionics development flight testing.
- o Complete Navy development testing and Fleet introduction weapons evaluation at VMAT-203, MCAS, Cherry Point, NC.

AV-8B Night Attack:

- o Complete development and flight testing.
- o Conduct operational flight testing.

Program Element: 64214N Title: AV-8B (Engineering)

d. (U) FY 1989 Planned Program:

- o Initiate and continue development of corrections resulting from TAV-8B and Night Attack flight testing.
- o Continue on-going P³I initiatives.

e. (U) Program to Completion:

- o Evaluate and conduct P³I such as a digital communications terminal (DCT) and the imaging infrared Maverick missile.
- o Complete TAV-8B and Night Attack deficiency correction testing.

f (U) Major Milestones:

| MILESTONE | DATE |
|---|---|
| 1. Award of Night Attack FSD Contract | December 1986 |
| 2. TAV-8B First Flight | October 1986 |
| 3. Night Attack First Flight | June 1987 |
| 4. Fleet Delivery of TAV-8B | July 1987 |
| 5. Night Attack Technical Evaluation (Complete) | September 1987 |
| 6. TAV-8B Technical Evaluation (Complete) | December 1987 |
| 7. Night Attack Operational Testing (Complete) | November 1987 |
| 8. TAV-8B Operational Testing (Complete) | November 1987 |
| 9. TAV-8B IOC | July 1988 |
| 10. Night Attack IOC | June 1990 |

I. (U) TEST AND EVALUATION DATA:

Program Element 64214N Title: AV-8B Development

AV-8B

J. (U) Development Test and Evaluation (DT&E)

a. (U) Joint Contractor/Navy DT&E provides an AV-8B Test Program evaluating technical characteristics. NATC is the principal site for Contractor and Navy DT&E.

b. (U) The March 1976 DSARC I directed a Flight Demonstration Program (FDP) to validate technical aspects of the AV-8B. Two AV-8A's were modified into prototype YAV-8B's. The YAV-8B is aerodynamically representative of the AV-8B but does not contain all planned avionics or systems modifications. Basic aerodynamic differences between the AV-8A and AV-8B including NASA developed super critical high lift composite wing, leading edge root extension, engine inlet modification, and lift improvement devices were tested in the FDP. Maximum weight VTO and STO, sustained "G", and clean and loaded cruise performance characteristics were demonstrated to support a decision to proceed with AV-8B Full Scale Development (FSD).

c. (U) The AV-8B Full Scale Development (FSD) Program Test and Evaluation Master Plan (TEMP) was approved on 9 June 1982 and updated on 16 August 1984. To minimize duplication, the FSD Program utilizes FDP Validation Phase results wherever possible. Laboratory and ground tests include over 13,000 wind tunnel hours, complete (static, drop, and fatigue) structural qualification, manned flight simulation, and functional avionics integration including cockpit mockup. FSD flight tests have been conducted using one YAV-8B, four FSD AV-8B's and two pilot production aircraft as required. FSD aircraft flew 2288 hours in 2157 sorties to complete eleven (11) Navy Developmental Test and Evaluation periods. TEMP defined reliability and maintenance thresholds were monitored throughout FSD. Technical testing also included: wing and fuselage static loads, ground vibration testing, maintenance engineering inspection, electromagnetic compatibility, wind tunnel, canopy/ejection seat, systems integration (software/hardware), fatigue loads (two lifetimes) high angle of attack (HAOA) and major contractor ground and flight demonstration tests. Milestone IIIB was supported by approximately 125 aircraft flight test months which concluded with the final TECHEVAL in the fall of 1984.

d. (U) FSD testing for the AV-8B is complete. DT-III mission systems testing is ongoing in the area of expanded weapons development, carriage, release, separation and control. Seven hundred twenty-three AV-8B final development phase flights have been flown as of 30 September 1986 for a total of 828.5 hours. Additional DT-III tasks include Digital Electronic Fuel Control tests, High Mach Roll Off tests, All Weather Landing System evaluations, Visual Landing Aid tests aboard LHA class type ships. Future significant DT&E for the AV-8B Program includes; (1) Contractor/Navy DT-III activity to include modification of an AV-8B to a two seat trainer version (designated the TAV-8B) and development, integration, and modification of a production AV-8B aircraft to include a Night Attack capability.

Program Element 64214N

Title: AV-8B Development

AV-8B

K. (U) Operational Test and Evaluation (OT&E)

a. (U) OT&E is conducted by Commander Test and Evaluation Force (COMOPTEVFOR). OT&E supports AV-8B Acquisition Strategy by providing test evaluations related to established thresholds for Major Milestones.

b. (U) The FDP was conducted as combined DT/OT-I. OT-I was completed in July 1979. As compared to the AV-8A, COMOPTEVFOR assessed YAV-8B flight performance in the attack mission profile and V/STOL handling qualities to be potentially operationally effective. Analysis of contractor data showed MFHBF rates of 3.0 and 3.2 hours during NPE-I and II. The comparable AV-8A rate was 1.5 hours. Assessment of contractor maintenance data indicated the YAV-8B to be potentially operationally suitable.

c. (U) OT-IIB was conducted in three phases. Phases I and II supported the August 1983 IIIA DNSARC. Using FSD AV-8B's, Phase I was completed in September 1982. It accumulated 46.7 flight hours during 32 sorties evaluating AV-8B potential capabilities in CAS, tactical performance and VSTOL handling. Phase II was completed in July 1983. It accumulated 24.7 flight hours during 16 sorties assessing AV-8B potential capabilities in CAS/Interdiction in a low altitude high threat environment. Maintenance and logistic support were contractor furnished during Phases I and II. Phase III was completed in December 1983. It evaluated GAU-12 25mm Gun System capabilities and aircraft improvements incorporated during FSD. Maintenance and logistic support were contractor furnished during Phases I, II and III.

d. (U) OT-IIC (OPEVAL) was conducted in two phases: Phase I (Air to Ground) commenced 31 August 1984 and completed 5 February 1985. Phase II (Air to Air) commenced 15 February 1985 and completed 30 March 1985. Each phase was conducted using two Low Rate Initial Production (LRIP) aircraft. OPEVAL, supported by USMC maintenance, assessed AV-8B capabilities in realistic operational scenarious including shipboard operations. A Phase I Quick Look Report (Confidential) was published by COMOPTEVFOR in March 1985. The report was very positive and in Admiral Carter's words, "was the best OPEVAL he had conducted in his nearly three years as COMOPTEVFOR:. OPEVAL supported Milestone IIIB (May 1985) and completed FSD OT&E (OT-II). There are no high risk areas, critical technical issues, or critical operational issues remaining from FSD and OPEVAL. DT-III/OT-III is ongoing for full avionics suite integration including EW and shipboard compatibility plus aircraft and weapons delivery envelope expansion.

e. (U) Future significant OT&E in the AV-8B program includes operational testing by COMOPTEVFOR of the AGM-65 (Laser Maverick) missile on the AV-8B, EW (Electronic Warfare) testing, Digital Electronic Fuel Control testing and testing of the TAV-8B and the Night Attack modifications to the AV-8B. Laser Maverick OT&E was restarted in November 1986 with ancipated completion in January 1987.

Program Element 64214M Title: AV-8B Development

AV-8B

L. (U) System Characteristics

| (U) Operational/Characteristics | Technical Objective | Demonstrated Performance | |
|---|---|---|---|
| Overall Length | 46.33 ft. | 46.33 ft. | |
| Overall Wing Span | 30.33 ft. | 30.33 ft. | |
| Overall Height | 11.65 | 11.65 ft. | |
| Maximum VTO Weight | 18,860 | 18,935 | 1/ |
| Mission Reliability | .80 | .88 | 2/ |
| Maintainability DMMH/FH | 18.0 hrs. | 17.1 hrs | 2/ |

Notes: 1/ SUBINSERV Pax River (C) msg 241500Z Jul 84
2/ COMOPTEVFOR (C) AV-8B OPEVAL Final Evaluation Report Jun 85

M. (U) Current T&E Activity

(U) Past 12 Months

| | Planned Date | Actual Date |
|---|---|---|
| Complete AGM-65E Integration | Nov 85 | Oct 85 |
| Complete ALR-67 Integration | Dec 85 | Apr 86 |
| Digital Electronic Fuel Control TECHEVAL Complete | Sep 86 | Aug 86 |
| Complete TAV-8B Seat Service Release Tests | Sep 86 | Sep 86 |
| TAV-8B First Flight | Dec 86 | Oct 86 |
| Visual Landing Aids Eval Complete | Oct 86 | Oct 86 |
| Ship Suitability Eval Complete | Oct 86 | Oct 86 |

Program Element 64214N

Title: AV-8B Development

AV-8B

(U) Next 12 Months

| | |
|---|---|
| Commence ALR-67/ALQ-164 OPEVAL | Nov 86 |
| Commence AGM-65E OPEVAL | Nov 86 |
| Shipboard Inertial Alignment Capability Test Compl | Dec 86 |
| Night Attack First Flight | Jun 87 |
| Commence TAV-8B OT&E | Jul 87 |
| Commence Night Attack TECHEVAL | Aug 87 |

M. (U) Program Documentation:

COMOPTEVFOR PROJECT REPORTS

| DATE | TITLE | SERIAL NO. |
|---|---|---|
| 20 Jan 83 | OT-IIB Phase I OPTEVFOR Evaluation Report AV-8 Aircraft (195-OT-IIB) | C13 |
| 4 Jul 83 | OT-IIB Phase II COMOPTEVFOR 041300Z Jul 83 | |
| 21 Jul 83 | OT-IIB Phase II COMOPTEVFOR 211735Z Jul 83 | |
| 6 Aug 84 | TEMP 195 signed by ASN(RE&S). Next planned update 2nd qtr. FY-87. | |
| 11 Mar 85 | OT-IIC Phase I COMOPTEVFOR 112342Z Mar 85 | |
| 26 Jun 85 | OPEVAL Report COMOPTEVFOR ltr 3960 (Conf.) (195-OT-IIC). | C177 |

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64215N
DoD Mission Area: 475 - Central Supply and Maintenance

Title: Support Equipment
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 16,921 | 26,364 | 72,942 | 64,307 | Continuing | Continuing |
| W0601 | Aircraft Handling and Servicing Equipment | 4,632 | 0 | 0 | 0 | Continuing | Continuing |
| W0852 | Consolidated Automated Support System | 10,443 | 21,871 | 68,513 | 61,110 | Continuing | Continuing |
| S1857 | Calibration Standards | 1,846 | 4,493 | 4,429 | 3,197 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Aircraft Handling and Servicing Equipment, Aviation Engine Test Facility, and Consolidated Automated Support System projects provide for technology update and full-scale development of Naval Aviation support equipment systems. These systems are required for operational and maintenance support to improve the readiness of all aircraft, propulsion, avionics, and armament systems at all maintenance levels: organizational, intermediate, and depot. The Metrology Calibration Standards R&D project is a Navy-wide program to develop required field level calibration standards (hardware) in all major measurement technology areas and parameters. This project will develop engineering development models and prototypes from which procurement specifications will be written. These specifications will be used by SYSCOM and Service calibration managers to procure field level calibration standards. The requirement for this effort is reflected in SECNAVINST 4355.11C.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows:
Project W0852, in FY 1986, decreases of 582 for GRH adjustment, 2,127 for Department Budget adjustment, 109 for Department Program/Budget adjustment. In FY 1987, decreases of 1,075 for Congressional adjustment and 7,492 for Congressional action. In FY 1988 increase of 5,178 for Department Program adjustment, and decreases of 1,970 for Department Program/Budget adjustment, 817 for Department Budget adjustment and 36 for Department NIF Rate adjustment.
Project W1748, in FY 1988 decrease of 4,579 for Department Program adjustment for support of higher priority programs.

Program Element: 64215N Title: Support Equipment

Project S1857, in FY 1987, increase of 2,439 Congressional adjustments. In FY 1988, increase of 1,067 reflects Department Program /Budget adjustment and Department NIF Rate adjustment.
Project Y1842, in FY 1988, decrease of 5,570 reflects Department Program adjustment and support of higher priority programs.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 12,067 | 20,105 | 32,492 | 79,669 | Continuing | Continuing |
| WO601 | Aircraft Handling and Servicing Equipment | 3,110 | 4,910 | 0 | 0 | Continuing | Continuing |
| WO852 | Consolidated Automated Support System (CASS) | 8,957 | 13,261 | 30,438 | 66,158 | 184,900 | 308,469 |
| X1857 | Calibration Standards | 0 | 1,934 | 2,054 | 3,362 | Continuing | Continuing |
| W1748 | GSE Calibrstion | 0 | 0 | 0 | 4,579 | Continuing | Continuing |
| Y1842 | Aviation Engine Test Facility | 0 | 0 | 0 | 5,570 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: For Project X1857 the individual projects encompassed in this program are a Navy lead responsibility as part of a coordinated Army and Air Force effort endorsed, supported and directed by the Joint Logistics Commanders (JLC). There is no unnecessary duplication of effort within the Navy or the Department of Defense.

F. (U) WORK PERFORMED BY: IN-HOUSE: Lead Field Activity for Support Equipment is the Naval Air Engineering Center, Lakehurst, NJ; Others are Naval Air Development Center, Warminster, PA; Naval Air Logistics Center, Patuxent River, MD; Naval Air Test Center, Patuxent River, MD; Metrology Engineering Center, Pomona, CA; National Bureau of Standards, Washington D.C; Naval Research Laboratory, Washington D.C; Navy Primary Standards Laboratory, San Diego, CA; Naval Surface Weapons Center, Dahlgren, VA; and Pacific Missile Test Center, Pt Mugu, CA.

CONTRACTORS: Northern Research Corp., Woburn, MA; Coastal Marine Research, Toms River, NJ; Northwestern Motor Corp., Eclair, WI; For the CASS, General Electric Co., Huntsville, AL.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

Program Element: 64215N

Title: Support Equipment

(U) Project W0601, Aircraft Handling and Servicing Equipment:

1. (U) Description: This project is composed of a multitude of smaller sub-projects dedicated to technology investigation in the area of aircraft common support equipment. Common support equipment is ground support equipment such as mobile electric generators, tow tractors, composite materials inspection units, jet aircraft starting units and engine test systems which have multiple weapon system application. The project is on-going pre-planned product improvement ($P^3I$) efforts to ensure technology improvements in common test equipment keep pace with the state-of-the-art and thereby prevent adverse readiness impact, as newer and more sophisticated aircraft weapon systems are introduced into the Fleet.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: The following sub-projects completed:

- o A/E 37T-24 Engine Adapter Assembly (T400)
- o A/W 37T-1 Test System modification (T58)
- o Dynamic Engine Simulator
- o TA-12 Tow Tractor

b. (U) FY 1987 Program: Not Applicable.

c. (U) FY 1988 Planned Program: Not Applicable.

d. (U) FY 1989 Planned Program: Not Applicable.

e. (U) Program to Completion: The following sub-projects will be initiated:

- o Thermography Non Destructive Investigation (NDI)
- o Ultrasonic NDI
- o Universal Engine Test Set (ETS)
- o Gas Path Analysis Test Set

Program Element: 64215N

Title: Support Equipment

- Filmless Radiography

(U) Project X1857 Calibration Standards:

1. (U) Description: This project in Metrology RDT&E will carry out the engineering development of standards (hardware), measurement capabilities and techniques required to support: (1) the millimeter wave requirements for MILSTAR (a satellite communications system), the AN/SLQ-32 and the WLR-8, and (2) the fiber optic missile guidance and avionics data link requirements in the AV-8B aircraft and shipboard communications network. This project's tasks are the Navy's lead service responsibilities as part of a Tri-Service metrology R&D program directed by the Joint Logistics Commanders.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: The following sub-projects were initiated:

- Microwave/Millimeter Wave - development of power-attenuation standard for 18 - 60 GHZ and Signal Generator Calibrator in the 18 - 60 GHz range.
- Electro-Optics - development of a Modular Fiber Optic Calibrator (1300 Nanometer); a Automated Modular Laser Calibrator; and an Imaging IR Cal System (8 - 14 microns)
- Systems Metrology - development of a Multi-Function Meter Calibrator.
- Electrical - Electronic - development of an Advanced Meter Calibrator and an AC voltage standard.
- Automated Metrology - development of a Modular Calibration Interface Device (DC to 10 MHz).
- Analytical Metrology - development of a Calibration Interval Assessment Analysis.

b. (U) FY 1987 Program: The output of this project will be design specifications and prototype calibration standards (hardware) in support of laser, fiber optic and IR systems, Millimeter wave equipment and Automatic test equipment. Calibration standards (hardware) will be developed for Fleet use at the intermediate and organizational level. The following technology areas will continue, complete or initiate development efforts:

- Microwave/Millimeter Wave - Continue.
- Electro-Optics - Complete Imaging IR calibration system.
  Initiate development of an Automated Modular Fiber Optic Calibrator (1300 Nanometer).

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- o Electrical - Electronics - Continue.
- o Automated Metrology - Continue.
- o Analytical Metrology - Continue.
- o Systems Metrology - Initiate the Advanced Controller development projects.

c. (U) FY 1988 Planned Program: The following subprojects will either be completed or initiated:

- o Electro-Optical - Complete development of the Automated Modular Fiber-optic Calibrator (1300 Nano Meter). Initiate development of the Advanced Modular Laser Calibrator. Begin development of a Quasi-Optical Calibration System (110-340 GHz). Begin development of the Advanced Imaging IR Calibration System (3 to 5 microns).
- o Microwave/Millimeter Wave - Complete development of a Signal Generator Calibrator with frequency capability in the 18 - 60 GHz range. Begin development of a Communication System Noise Calibrator. Complete development of the power-attenuation standard with frequency capability extended to the 18 - 60 GHz range. Begin development of an Attenuation and Phase Noise Calibration System to 60 GHz. Begin development of a Signal Generator Calibrator and power-attenuation standard extension (60 to 110 GHz). Begin development of an EMI-/EMP Probe Calibrator.
- o Electrical/Electronic - Begin development of a High Accuracy DC Voltage Standard. Complete development of an Advanced Meter Calibrator. Complete development of a High Accuracy AC Voltage Standard (Accuracy to 50 PPM).
- o Physical-Mechanical - Begin development of Liguid Flow Calibration Systems 1 to 1000 gpm and 1000 to 4500 gpm. Begin development of a Pressure Calibration System (0 - 2000 psi).
- o Automated Metrology - Complete development of a Modular Calibration Interface Device (DC to 10 MHz). Begin development of Calibration Strategies for Automated Test Equipment (ATE). Begin development of a Modular Calibration Device (10 MHZ to 18 GHz).
- o Analytical Metrology - Begin development of a Program Operations Analysis Model and Equipment Reliability Analysis Model.
- o Systems Metrology - Complete development of the Advsnced Instrument Controller.

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d. (U) FY 1989 Planned Program: The following will be completed or continued:

- Electro-Optical - Second year of a three effort to develop a Quasi-Optical Calibration System capability. Continue development of an Advanced Modular Laser Calibrator and Advanced Imaging IR Calibration System.
- Microwave/Millimeter Wave - Continue.
- Automated Metrology - Continue.
- Electrical - Electronic - Begin development of an AC Voltage Standard (25 ppm) and an Arbitrary Waveform Calibrator.
- Analytical Metrology - Complete the Calibration Interval Assessment Analysis. Complete Program Operations Analysis and Equipment Reliability Analysis Models.

e. (U) Program to Completion:

- In FY 1990, final year of a three-year effort to develop a Quasi-Optical Calibration capability. Delivery of a prototype standard operating in the 200 - 340 GHz range is expected at the end of this year.
- In FY 1991 and 1992, funding will transition Electro-Optical; Microwave-Millimeter Wave; Electrical-Electronic; Physical-Mechanical; Automated metrology; Analytical metrology; and Systems metrology technology developed into models and prototypes from which procurement specifications can be written.

H. (U) PROJECT OVER $10 MILLION IN FY 1988/89:

(U) Project W0852, Consolidated Automated Support System:

1. (U) Description: This project will design and develop modularly constructed automated test equipment with computer-assisted, multi-functional capability based on standardized hardware and software elements. It evolved in response to Fleet Commanders expressed concerns regarding serious deficiencies in existing automatic test equipment and the recommendations of an extensive 1976 SECNAV Study report on test equipment. Program objectives are: (1) increase material readiness; (2) reduce life cycle costs through standardization of equipment and all logistics elements; (3) improve tester sustainability at depot and intermediate (including aircraft carriers) maintenance levels; (4) reduce proliferation of unique test equipment, and (5) provide Navy-wide test capability for existing and future avionic/electronic support requirements. With test stations that can be easily configured to satisfy different test requirements (i.e., electro-optical, radio frequency, laser, infrared, inertial navigation, etc.) and design provisions which permit modification to meet the demands of future technology, this tester system will increase

repair facility throughput capability, reduce spare parts and personnel training requirements, and significantly reduce the space required for avionics testing in the critically space limited Navy aircraft carriers. The project was initially structured to provide test support for five Navy Weapon systems. In March 1983, its scope was expanded to include support for all Navy tactical aircraft and their associated aircraft carriers and shore bases. In March 1985, SECNAV directed further expansion of the CASS scope to include ATE support for all Navy electronics applications. The acquisition strategy included a competition between two contractor teams to develop detailed designs which were evaluated during a Critical Design Review (CDR) in early FY 87. The selected design will be developed during FSED by General Electric Co. with a teaming arrangement. The second team member, Honeywell Corp. will be qualified as a second production source during FSED and each annual production lot subsequent to a limited production release will be competitively awarded between the two sources.

2. (U) Program Accomplishments and Future Efforts

a. (U) FY 1986 Program:

- o Continued competitive engineering design effort by the two contractors. Industry firms submitted proposals for FSED phase.
- o Continued experimental work and demonstrations to aid in the selection of a design at Critical Design Review (CDR).
- o Conducted Government evaluation of the FSED proposals.

b. (U) FY 1987 Program:

- o Conduct CDR and complete evaluation of industry FSED proposals. Present program to NPDM for Milestone II approval.
- o Award FFP FSED contract with three years of FFP production options to General Electric Co.
- o Commence FSED.

c. (U) FY 1988 Planned Program:

- o Assembly and integration of Engineering Development Models will be completed.
- o Assembly and integration of pre-production models commences. DT-IIA starts.
- o Preliminary and detailed design occurs for test program sets.

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- o Preliminary product baseline is established.

d. (U) FY 1989 Planned Program:

- o Complete assembly and integration of pre-production models.
- o Conduct 1st Article Verification testing.
- o Conduct Physical Configuration Audit.
- o Conduct DT-IIB, DT-IIC, and OT-IIA.

e. (U) Program to Completion:

- o Complete support of support Operational Test Program sets.
- o Complete Technical and Operational Evaluation testing.
- o Complete Integrated Logistics Support Evaluation. Obtain approval for limited and full production.
- o Commence weapon system test program set development at contractor sites. Limited production units will be required for Weapon System test program set integration.
- o Commence Pre-planned Product Improvement ($P^3I$). Among the basic concepts of CASS will be the ability to insert new technology without impacting application software, and ease of reconfiguration to adapt to changes in airwing mix or weapon system modification thereby avoiding obsolescence and the need for a new tester. A $P^3I$ effort will be established as a separate project at the completion of FSED.

f. (U) Major Milestones:

| Milestones | Dates |
|---|---|
| 1. Start Pre-Full Scale Engineering Development (FSED) Phase | 4th Qtr FY 1985 |
| 2. Pre-FSED Critical Design Review | 1st Qtr FY 1987 |
| 3. Milestone II NPDM | 1st Qtr FY 1987 |
| 4. TECHEVAL/DT-IIC | 4th Qtr FY 1989 |

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| Milestones | Dates |
|---|---|
| 5. OPEVAL/OT-IIA | 4th Qtr FY 1989 |
| 6. Milestone IIIA/Approval for Limited Production (ALP) | 2nd Qtr FY 1990 |
| 7. OPEVAL/OT-IIB | 4th Qtr FY 1990 |
| 8. Milestone IIIB/Approval for Full Production (AFP) | 2nd Qtr FY 1991 |
| 9. Test Program Set development | 3rd Qtr FY 1991 |
| 10. FOT&E | TBD |
| 11. System Capability Date (SCD) | 3rd Qtr FY 1992 |

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64219N
Title: Airborne Anti-Submarine Warfare Developments
DoD Mission Area: 233 - Anti-Submarine Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 4,693 | 1,228 | 0 | 0 | Continuing | Continuing |
| WO485 | Carrier ASW Helicopter Avionics Improvement Program | 2,295 | 1,228 | 0 | 0 | Continuing | Continuing |
| W1442 | SH-2 Reliability Readiness Improvement | 2,398 | 0 | 0 | 0 | 0 | 37,544 |

The above funding profile includes out year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides improvements in maintainability, reliability, and performance in current airborne ASW platforms. These projects will upgrade the primary sensor of the Carrier Inner Zone Anti-Submarine Warfare Helicopter (CV IZ Helo) through new sensor technology to increase active and passive detection capability against threat submarines. They will also provide cost effective improvements to increase readiness of the SH-2F LAMPS MK I weapon system.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and this Descriptive Summary are as follows: Program WO485 was reduced -2,528 in FY 1986 to accomodate a GRH adjustment and Department budget/program adjustments. The FY 1987 was reduced by -1,038 for Department budget/program adjustment and Congressional adjustment. The FY 1988 reduction of -5,512 reflected a Department budget/program adjustment. Program W1442 was increased +1,620 in FY 1986 to reflect Department budget/program adjustments and a GRH adjustment.

Program Element: 64219N Title: Airborne Anti-Submarine Warfare Development

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 25,349 | 5,601 | 2,266 | 5,512 | 57,988 | 63,200 |
| W0485 | Carrier ASW Helicopter Avionics Improvement Program | 5,478 | 4,823 | 2,266 | 5,512 | 57,988 | 63,200 |
| W1442 | SH-2 Reliability Readiness Improvement | 13,879 | 778 | 0 | 0 | 0 | 0 |
| W0486 | Anti-Submarine Warfare Operation | 5,992 | * | * | * | | |

* Project W0486, Anti-Submarine Warfare Operations Center transferred to PE 64711N in FY 1985.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| W1442 | | | | | | |
| Aircraft Procurements (SH-2): | | | | | | |
| Funds (APN-1) | 61,121 | 52,798 | | | 0 | N/A |
| Quantity | (6) | (6) | (0) | (0) | (0) | |

W0485
Other Procurements: Procured as Contractor Furnished Equipment under CV Inner Zone ASW Helo under PE 24243N.

E. (U) RELATED ACTIVITIES: Program Element 64229N, Carrier Inner Zone ASW Helicopter, provides the platform in which the improved AQS-13F sonar and the Advanced Lightweight Sonar (ALWS) will be installed.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Development Center, Warminster, PA; Naval Air Test Center and Naval Aviation Logistics Center, Patuxent River, MD; Naval Weapons Engineering Support Activity, Washington, DC; Naval Air Engineering Center, Lakehurst, NJ; Naval Avionics Center, Indianapolis, IN; Naval Surface Weapons Center, Dahlgren, VA; Naval Training Equipment Center, Orlando, FL; and Naval Engineering Support Office (NESO), North Island, CA; CONTRACTORS: Allied Corporation, Bendix

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Oceanics Division, Sylmar, CA (Sonar Contractor); Sikorsky Aircraft Division, Stratford, CT (Prime SH-60F Contractor); KAMAN Aerospace of Bloomfield, CT; and Teledyne Systems Company, Northridge, CA, (Avionics Integrator).

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W0485, CV AVIONICS IMPROVEMENT PROGRAM (ALWS):

1. (U) Description: This project provides an upgraded primary sensor (sonar) for use in the SH-60F CV Helo which will provide greater range. The upgraded sensor is needed in order to counter the Soviet submarine threat. This project consists of two parts - the introduction of the AQS-13F sonar for the SH-60F CV Helo and the development of the ALWS to replace the AQS-13F to meet the projected threat. The ALWS will be developed such that it will be compatible for installation in the SH-60B and SV-22.

2. (U) Program Accomplishments and Future Efforts:

a. (U) The FY 1986 Program:

- AQS-13F - Conducted Navy Technical and Operational Tests on SH-60B with Engineering Development Model (EDM) AQS-13F sonar installed.
- ALWS - Updated ALWS specifications and SOW to reflect RFI responses from Industry.
- ALWS release Request for Information (RFI) to Industry for written estimates of program design criteria and schedule. Responses were at no cost to Government.

b. (U) FY 1987 Program:

- Monitor ongoing testing and review testing results from related program element 64229N, Carrier Inner Zone ASW Helicopter (SH-60F).
- The AQS-13F development effort under this project will be completed in FY 1987.

c. (U) FY 1988 Planned Program:

- ALWS - See program to completion.

d. (U) FY 1989 Planned Program:

- ALWS - See program to completion.

Program Element: 64219N Title: Airborne Anti-Submarine Warfare Development

e. (U) Program to Completion:

° ALWS - Release RFP to Industry; evaluate proposals, determine competitive range and complete technical discussions.

(U) Project W1442, SH-? Reliability Reliability Readiness Improvement: The T700 integration program will complete the R&D phase with the qualification of the drive train components. This action will complete the W1442 program.

1. (U) FY 1986 Program:

° Completed tests of drive train qualification and complete Navy test of Readiness Improvement Program.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64221N
DoD Mission Area: 233 - Anti-Submarine Warfare

Title: P-3 Modernization Program
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 29,542 | 54,441 | 126,902 | 152,145 | Continuing | Continuing |
| W1149 | Electronic Support Measures Systems Improvement | 3,201 | 1,034 | 0 | 0 | 0 | 50,425 |
| W1152 | Advanced Signal Processor Systems Integration | 10,055 | 5,330 | 5,054 | 5,209 | Continuing | Continuing |
| W1588 | P-3 UPDATE IV Avionics* | 16,286 | 48,077 | 108,037 | 108,409 | 76,971 | 330,731 |
| W1926 | P-3G | 0 | 0 | 13,811 | 38,527 | 77,048 | 129,386 |

The above funding includes out year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program is the most cost effective alternative to upgrade the P-3 force to counter the quieter, faster, Soviet submarine threat. The present P-3C avionics suite does not have the war fighting capability to counter the emerging threat. This program provides upgrades to the aircraft defensive and offensive systems to enhance the P-3C's surface and subsurface tracking, classification, and attack capability. It provides for improved battle group support through upgraded Electronic Support Measures, communications, radar and growth capability. This program will give a significantly increased flexibility through a distributed bus architecture that allows significantly increased processing power while accepting high data rate sensors, provides work load sharing among crew stations, as well as allowing for ease of incorporation of future sensors, and improves aircraft survivability in an increasing hostile environment through greater standoff targeting and classification ranges, as well as an improved early alert to a broad range of emerging threat sensors. It also provides improvements to the range, survivability, maintainability and payload capabilities of the P-3 airframe.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: W1152 was decreased -2,265 in FY 88 due to Department budget/program adjustments. W1588 (UIV) was decreased in FY 1986 -2,613 due to Gramm-Rudman-Hollings and Department program/budget adjustments. In FY 87, W1588 was reduced -22,316 due to Congressional action and adjustments and Department program/budget adjustments and was increased in FY 1988 by +32,952 by Department program/budget adjustments and NIF rate

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adjustments. Project W1926 was decreased -19,667 in FY 87 due to Congressional action, and increased in FY 88 by +13,811 to fund the P-3G program.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 24,944 | 33,110 | 96,877 | 82,404 | 332,470 | 775,691 |
| W1149 | Electronic Support Measures Systems Improvements | 8,608 | 3,432 | 1,066 | 0 | 0 | 50,668 |
| W1150 | Communications Integration | 8,391 | * | * | * | | 37,559 |
| W1152 | Advanced Signal Processor Systems Integration | 6,705 | 10,779 | 5,751 | 7,319 | 24,796 | 84,398 |
| W1588 | P-3 UPDATE IV Avionics | 0 | 18,899 | 70,393 | 75,085 | 297,674 | 486,432 |
| W1656 | Radar System Improvements | 1,240 | * | * | * | | 116,683 |
| W1926 | P-3G | 0 | 0 | 19,667 | TBD | TBD | TBD |

*W1150 and W1656 were combined into W1588 P-3C Update IV in 1986.

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Aircraft Procurement, Navy | | | | | | |
| Advanced Signal Processor | 267,964 | 0 | 103,847 | 132,260 | 0 | 524,973 |
| Integration, APN, B.A.5 | (48) | (0) | (22) | (27) | (0) | (97) |
| Quantities | | | | | | |

E. (U) RELATED ACTIVITIES: Program Element 64261N, Acoustic Search Sensors (Air Common Acoustic Processing), is developing processor software for advanced sonobuoys. Program Element 64217N, S-3 Weapons System Improvement Program, is developing imaging capability into the AN/APS-116 Radar. Program Element 64507N, EMSP is developing the acoustic signal processor.

F. (U) WORK PERFORMED BY: IN-HOUSE: Lead laboratory is the Naval Air Development Center, Warminster, Pa. OTHERS: Naval Air Test Center, Patuxent River, MD. CONTRACTORS: IBM, Manassas, VA; Lockheed California Company, Burbank, CA; General Electric Company, Utica, NY; Boeing Aerospace Company, Seattle, WA; Computer Sciences Corporation, Warminster, PA.

Program Element: 64221N Title: P-3 Modernization Program

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W1152, Advanced Signal Processor Software Integration:

1. (U) Description: This project provides the P-3C with an improved acoustic system that will process more advanced active and passive sonobuoys and maintain pace with the emerging threat. This project will continue software development, integration and testing in the Navy standard acoustic processor (Advanced Signal Processor (ASP)) and ancillary equipment in the P-3C Update III. It will increase the operational capability of the ASP by integrating the sequel hardware/software configuration with Passive Tracking Algorithms (PTA), Broadband, a 32 channel half-bandwidth capability (Channel Expansion), 99 channel on-line sonobuoy radio frequency monitor capability and provide for integration of advanced sonobuoys, which are contained in the modular software design Airborne Common Acoustic Processing (ACAP), into the P-3C Advanced Signal Processor and CP-901 Tactical Computer.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

Completed -
- P-3C Update III 32 Channel Expansion implementation and QA
- ASP Commandable Manual Entry Panel integration testing
- ASP System Controller Software implementation and testing
- Dual analog tape recorder and sonobuoy receiver integration tests.

b. (U) FY 1987 Program:

- Channel Expansion and ACAP Build 4 DT/OT to be conducted Feb-Aug 1987.
- ACAP Build 5, ERAPS (Expendable Reliable Acoustic Path Sonobuoy) software, requirements definition and start of software implementation.
- Integration of ACAP Build 4 software into ASP hardware.
- Develop the processing for advanced sensors for future updates of the ACAP software.

c. (U) FY 1988 Planned Program:

- Minor acoustic software improvements
- Update III Channel Expansion (CHEX) software deficiency corrections.
- Define designs for incorporating advanced sensors and acoustic algorithms.

Program Element: 64221N Title: P-3 Modernization Program

d. (U) FY 1989 Planned Program:

- Minor acoustic software improvements.
- Implement software for incorporating advanced sensors and acoustic algorithms.

e. (U) Program to Completion:

- Software implementation of advanced sensors into P-3C Update III (This effort will continue as these sensors reach maturity through the ALP/AFP process).
- Program will continue to provide the necessary software support for the fleet P-3 programmable acoustic processors.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W1588, P-3 UPDATE IV Avionics Program

1. (U) Description: This project upgrades the avionics (acoustic and non-acoustic) suite of the P-3 aircraft to provide the required capability necessary to combat the faster, quieter Soviet Submarine. This capability is obtained by integrating existing and developing sensors into a distributed system architecture with upgraded displays and controls. The resulting configuration will decrease the existing operator workload, and improve operational effectiveness by increasing ease of data handling and reliability. It will also significantly increase the acoustic processing capacity of the aircraft by integrating the Enhanced Modular Signal Processor (EMSP) into the data bus system. (W1150, Communications Integration and W1656, Radar System Improvements are incorporated into W1588 in FY 1986).

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Update IV Avionics Demonstration and Evaluation contract awarded Nov 1985.
- Update IV IDR and PDR conducted for both Phase I contractors.

b. (U) FY 1987 Program:

- Navy to evaluate contractor demonstrations and proposals for FSED (Phase II).
- Award contract for engineering development.

Program Element: 64221N Title: P-3 Modernization Program

c. (U) FY 1988 Planned Program:

* Continue development of Update IV avionics system.
* Perform trial installation of Update IV avionics kit.

d. (U) FY 1989 Planned Program:

* Conduct DT-IIA/OT-IIA
* Obtain Approval for Limited Production and award production contract.

e. (U) Program to Completion:

* Conduct TECHEVAL/OPEVAL for Update IV avionics suite
* Obtain Approval for Full Production in FY 1990.
* Achieve Initial Operating Capability in

f. (U) Major Milestones:

| | | |
|---|---|---|
| 1. | DNSARC Milestone I approval | Nov 1984 |
| 2. | Contractor Demonstration Phase RFP release | Feb 1985 |
| 3. | Contractor Demonstration Proposals Received | Jul 1985 |
| 4. | Contractor Demonstration Contract Award | Nov 1985 |
| 5. | FSED RFP Release | Aug 1986 |
| 6. | FSED Proposals Received | Oct 1986 |
| 7. | Contractor Demonstration | Oct 1986 |
| 8. | Contractor Demonstration Evaluation | Nov 1986 |
| 9. | FSED Contract Award | Mar 1987 |
| 10. | ALP | Aug 1989 |
| 11. | Production Contract Award | Sep 1989 |
| 12. | Technical Evaluation | Feb 1990 |
| 13. | Operational Testing | Jul 1990 |
| 14. | Initial Operating Capability | |

Program Element: 64221N Title: P-3 Modernization Program

(U) Project W1926, P-3C

1. (U) Program Description: In order for the VP forces to maintain pace with a continually improving threat and an increasing number and type of missions, an improved airframe with greater range, survivability and maintainability, increased payload, and state-of-the-art acoustic and non-acoustic sensors is required. The current P-3 UPDATE IV Avionics program provides the necessary upgrading to the acoustic data processing system and non-acoustic sensors. These features will provide the baseline for the avionics package for the P-3C aircraft that will incorporate necessary aircraft system improvements and replace the P-3C.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Not applicable.

b. (U) FY 1987 Program: Not applicable.

c. (U) FY 1988 Planned Program:

- Award contract for P-3C development and production options.
- GFE P-3C airframe to contractor.
- GFI airframe date and Update IV data to contractor.
- Conduct preliminary design review.
- Continue development, fabrication and manufacture of prototype airframe.
- Conduct critical design review.
- Award Advance Acquisition Contract - FY 89.

d. (U) FY 1989 Planned Program:

- Conduct Production readiness reviews.
- Conduct final design review.
- Conduct production readiness reviews.

e. (U) Program to Completion:

- Conduct TECHEVAL/OPEVAL in FY 1991.
- Obtain Approval for Full Production in FY 1991.

Program Element: 64221N

Title: P-3 Modernization Program

* Perform DT-III/BIS/OT-III in FY 1992.
* Achieve Initial Operating Capability in

f. (U) Major Milestones:

| | | |
|---|---|---|
| 1. | RFP Release for prototype development | Apr 1987 |
| 2. | Contractor proposals received | Jun 1987 |
| 3. | Contract award | Oct 1987 |
| 4. | DT-IIA/OT-IIA (commence) | Aug 1989 |
| 5. | ALP | Jan 1990 |
| 6. | TECHEVAL (commence) | Mar 1991 |
| 7. | OPEVAL (commence) | May 1991 |
| 8. | AFP | Oct 1991 |
| 9. | IOC | |

I. (U) TEST AND EVALUATION DATA:

TEST AND EVALUATION DATA

A. (U) Development test and Evaluation

1. (U) The P-3C Weapons System was developed during Project AMEW, which ran from 1962 through 1968. This project included the evaluation of hardware and software aspects of black boxes, sensors, and functional integration techniques. During this program, laboratory system/mock-ups were used to prove conceptual feasibility, and flight test bed systems were used to define requirements and test concepts. Activities involved were the Naval Air Test Center (NATC), Patuxent River, Maryland, and the Naval Air Development Center (NADC), Warminster, Pennsylvania.

2. (U) From 1968 through 1970, the YP-3C (a contractor testing prototype of the P-3C) was flown by crews from Lockheed, NATC, and Commander Operational test and Evaluation Force (COMOPTEVFOR) for the purpose of conducting performance tests of the weapons system and individual subsystems. Reliability problems were identified in the Inertial Navigation System and the Doppler Navigator. During the same time frame, Lockheed and NATC crews performed system and subsystem maintainability demonstrations on avionic and weapon system equipments. This phase of the program demonstrated the ability of Navy technicians to maintain equipment under simulated operational conditions, using contractor developed training procedures and support equipment. It also led to identification of the requirement for significant improvements in computer-controlled diagnostic programs.

3. (U) In the 1969-1970 time frame, crews from NATC and the Naval Weapons Evaluation Facility (NWEF) conducted service suitability flights aboard two modified production P-3Cs. Problems were investigated in the areas of High Frequency (HF) communications, inertial navigation, and doppler navigation. A Production Improvement Program designed to update the capabilities of the weapon system was commenced in 1969 and continues through the present. Under this program Navy developed hardware and software improvements, verified by NATC in the YP-3C, are being incorporated in a time-phased updated version of production P-3C aircraft. These improvements involve major advances in maintainability and reliability as well as growth in capability.

4. (U) A major modification to the P-3C Weapons System took place with the fleet introduction of Update I in April 1975. This change included the addition of 392,000 words of memory to the data processing system, an OMEGA navigation system, an additional tactical display for the sensor station operators and an improved acoustic processing system. These improvements were integrated into the aircraft through software developed by NADC. Significant increases were obtained in reliability and maintainability; the latter through an improved software diagnostic program to allow crew members increased fault isolation capability. Navy Technical Evaluation (NTE) was conducted in FY-74, the Follow-On Operational test and Evaluation (FOT&E) in late FY-75 and the first quarter of FY-76.

5. (U) The P-3C Update II was the next major modifications to occur. The Update II included a Sonobuoy Reference System (SRS) capable of providing accurate tactical plots of sonobuoy fields in the water, an Infra-Red Detection System (IRDS) which provided low visibility and night detection capability, the HARPOON air-to-surface missile system, and improved wideband acoustic tape recorder. Delivery of the first production Update II aircraft was in August 1977. All Update II peculiar systems were supplied as Government Furnished Equipment (GFE) with Lockheed providing hardware integration and NADC integrating the system's software. The Update II design has increased system capabilities in the areas of acoustic post-processing, man-machine interface, and maintainability. NIE was conducted on the IRDS and HARPOON systems separately from the P-3C Update II tests. The Update II NIE was concerned with the SRS and software integration of all systems and commenced in FY-77. Unsatisfactory results prompted the extension of testing through FY-78 for successful completion.

6. (U) As a result of CONOPTEVFOR recommendation that the AN/AUA 7(V)4 Directional Frequency and Ranging (DIFAR) should have three verniers vice a single vernier, the equipment was modified commencing in January 1979 to include this new capability which increases the acoustic sensor operator's recognition and classification capabilities. It was designated the AQA-7A(V)6/7. A follow-on modification includes an update to the control panel and bearing computer for improved man-machine interface. This hardware change to the system AQA-7A(V)10/11/12 commenced in March 1984 with all software changes integrated in the J4.6 program which has been successfully tested by NATC and underwent successful Operational Evaluation (OPEVAL) (September-December 1984). The final phase of J4.6 OPEVAL was the demonstration of Anti-Submarine Warfare Operational Center (ASWOC) interoperability with the ASWOC 4.2.6 program in November 1985.

7. (U) The third major modification to the P-3C was the Update III. This modification includes extensive redesign of the acoustic sensor capabilities by inclusion of the Single Advanced Signal Processor (SASP), the Advanced Sonobuoy Communications Link (ASCL), the Adaptive Controlled Phased Array (ACPA), and the Acoustic Test Signal Generator (ATSG). The new systems will enhance reception of sonobuoy signal transmissions, provided calibrated signals, and enable efficient management of software programs and acoustic data retrieval. Lockheed and NADC act as managers of hardware and software integration, respectively. Navy Preliminary Evaluation (NPE) was completed in mid FY-78 and was followed by OT-IT testing of the Advanced Developmental Model (ADM). OT-IT testing was completed in February 1979. NIE testing commenced in March 1981, followed by OTE in September 1981. Provisional Approval for Service Use (PASU) was granted on 6 July 1982 due to interoperability and SASP software freeze-up deficiencies identified during testing. Follow-on verification and validation of deficiency correction (OT-IIIB) was conducted 1 February 1983 - 15 April 1983. OT-IIIC testing was conducted 16 April 1984 - 22 May 1984. The SASP freeze deficiency was closed. The ASWOC acoustic replay deficiency was closed. Approval for Limited Production (ALP) for 18 aircraft was granted on 31 December 1984 with only those portions of the Adaptive Controlled Phased Array (ACPA) antenna required for signal flow. ASWOC Digital Data Extraction will be demonstrated by November 1985. Approval for Full Production (AFP) for P-3C Update III (less ACPA) was requested December 1985.

8. (U) I4.6.1 started TECHEVAL March 1985 and was completed in October 1985. Completion was delayed due to NATC aircraft and personnel shortages and I4.6.1 stability problems. A rehabilitated I4.6.1 concluded TECHEVAL in October 1986 and will start OPEVAL in November 1986.

9. (U) NATC evaluated the implementation of the Broadband algorithm in the AQA-7(A)I3/I4/I5 during DT-IIB testing 3 January 1985 - 16 July 1985 on a P-3C Non-Update (NUD) using J4.6B developmental software. NATC quick response report AT-C8R-85 dated 28 August 1985 reported satisfactory technical characteristics for detecting and tracking a target but noted four part 1 tactical deficiencies.

10. (U) The Electronic Support Measures (ESM) System Improvements Project integrates the ALR-77 ESM system into the P-3C to provide improved frequency coverage, bearing accuracy, and threat warning. System features include multiple/complex signal processing, emitter to platform correlation, and bearing accuracy to support Bearing-Only-Launch (BOL) HARPOON missile targeting. The improved ESM system also includes the P-3's first implementation of the AYK-14 Navy standard airborne computer as an ESM post processor. MYP is scheduled to begin in August 1986.

11. (U) The Navy will award an FY-88 Full Scale Engineering Development (FSED) contract for the P-3G aircraft in order to modernize the P-3C through re-engining, plus incorporation of Update IV mission avionics, elongation of the bomb bay, plus incorporation of various reliability, maintainability, survivability and vulnerability enhancements.

B. (C) Operational Test and Evaluation

1. (C) OT&E Accomplished to Date: Due to the integrated nature of its weapon system, the P-3C has been subjected to the concept of full systems testing under operational conditions throughout its development.

(a) (C) During 1963-1969, three test vehicles NP-3A (Mod 1 AMEW System), P-3B (Mod 3 AMEW System), and YP-3C were subject to realistic operational test which included participation in fleet exercises. The Mod 1 and Mod 3 systems were tested with the then current fleet systems to measure operational effectiveness relative to existing systems. This test phase was conducted to permit the orderly development of the AMEW concept from conceptual test through functional prototype and preproduction design verification. Tests were conducted by Air Test and Evaluation Squadron (AIRTEVRON) One (VX-1) under the direction of COMOPTEVFOR. The Mod 1 system validated the digital Anti-Submarine Warfare (ASW) System concept during an ASW mission which proved to be more effective than a fleet P-3A. In addition, continued operational testing of the Mod 3 system during ASW missions proved more effective than operating P-3B systems. The YP-3C was periodically subjected to Navy operational tests during the contractor's flight test program to ensure gains made in the Mod 1 and Mod 3 were maintained and improved in production systems.

(b) (U) During the period May 1969 to July 1973, COMOPTEVFOR conducted OPEVAL of the P-3C Weapons System under Chief of Naval Operations (CNO) Project O/V 77. Based on the results of OPEVAL, COMOPTEVFOR concluded that the P-3C Weapons System was operationally effective and operationally suitable.

(c) (U) In November 1974, FOT&E of the P-3C Weapons System was assigned to COMOPTEVFOR under CNO Project F/V 270. In part, the project charged COMOPTEVFOR with providing a continuing appraisal of the operational effectiveness and operational suitability of the system and associated subsystems. This included validation of the correction of deficiencies, evaluation of performance of newly introduced subsystems, and the refinement of tactical doctrine.

(1) (U) Task I, under CNO Project F/V 270, was a side-by-side comparison of a production AQA-7(V) with an improved AQA-7(V) Engineering Development Model (EDM). COMOPTEVFOR reported the results of this testing in June 1975 and stated that it was more reliable than the AQA-7(V). Therefore, COMOPTEVFOR recommended that the intended production version (AQA-7(V)4/5) of the EDM be considered for incorporation in future P-3C procurements.

(2) (U) Task II of CNO Project F/V 270 commenced operations in March 1975 to verify the operational effectiveness and operational suitability of the P-3C Update I Weapons System. Project operations were delayed several months (August-November 1975) while awaiting correction of software deficiencies.

COMOPTEVFOR reported the results of Update I testing in September 1976 concluding, in part, In 1977 COMOPTEVFOR conducted testing to verify that P-3C Update I operational effectiveness and operational suitability, as reported in September 1976, had been upgraded by the incorporation of 17 Reliability Improvement Program (RIP) changes in the AQA-7(V)4 acoustic processor. COMOPTEVFOR recommended in January 1977 that the AQA-7(V)4 incorporating 17 RIP changes be approved for service use. Approval for Service Use (ASU) was granted by CNO in March 1977.

(d) (U) During the period July to December 1977, COMOPTEVFOR conducted an OPEVAL of the AN/AAS-36 IRDS in a standard P-3C aircraft with no CP-901 interface. COMOPTEVFOR recommended the system be granted PASU until discrepancies encountered during OPEVAL were corrected. In May 1979, following actions initiated by COMNAVAIRSYSCOM to correct the IRDS discrepancies, COMOPTEVFOR recommended that the system be approved for service use. ASU was granted by CNO in July 1979.

(e) (U) During the period November 1978 to June 1979, COMOPTEVFOR conducted an OPEVAL of the P-3C Update II Weapons System under CNO Project 155-2. Originally scheduled from December 1977 to March 1978, OPEVAL had been delayed because the accuracy of the SRS did not meet Test and Evaluation Master Plan (TEMP) requirements during TECHEVAL. The objectives were to evaluate the operational effectiveness and operational suitability of the P-3C Update II aircraft. OPEVAL flight operations were completed in June 1980 and an evaluation report was distributed in June 1980. The P-3C Update II Weapons System was determined to have the potential to be operationally effective and operationally suitable after correction of IRDS deficiencies and completion of follow-on OT&E. COMOPTEVFOR reported preliminary results of the SRS in July 1979, concluding that the SRS is operationally effective and has the potential to be operationally suitable as installed in the P-3C Update II aircraft. COMOPTEVFOR recommended PASU with ASU recommended following rectification of antenna corrosion difficulties. These corrections were made and ASU for the SRS was granted in November 1979. COMOPTEVFOR recommended follow-on OT&E be conducted on the P-3C Update II prior to granting full ASU for the total weapon system in the final evaluation report.

(f) (U) During the period November 1978 to March 1979, COMOPTEVFOR conducted a preliminary phase of Initial Operational Test and Evaluation (IOT&E) with the P-3C Update III aircraft, performed under CNO Project 155-3. The aircraft under test had an ADM version of the Update III avionics suite installed. The purpose of the evaluation was to assess the potential operational effectiveness and operational suitability of the weapon system. Specific objectives were to assess the P-3C Update III's potential to detect, classify, localize and attack submarines representative of a 1980s threat, using Advanced Signal Processor (ASP) derived contact data; assess potential performance of the P-3C Update III in operations from fleet VP deployment sites; and assess the potential mission reliability, maintainability, operational availability, logistic supportability, and interoperability of the P-3C weapons system in an operational environment. The COMOPTEVFOR evaluation report was distributed in December 1979 recommending continuation of Full Scale Development (FSD) of the P-3C Update III Weapons System.

(g) (U) FOT&E of the P-3C Update II commenced in April 1981 to provide a continuing appraisal of the operational effectiveness and operational suitability of the weapon system. Specific objectives of the effectiveness evaluation were to determine the capability of the P-3C Update II to:

Specific objectives of the suitability evaluation were to determine reliability, maintainability, availability, compatibility, interoperability and adequacy of training, human factors and safety. COMOPTEVFOR concluded the P-3C Update II is potentially operationally effective and potentially operationally suitable. The COMOPTEVFOR evaluation report published in May 1982 recommended continued provisional ASU and additional

FOT&E. COMOPTEVFOR recommends the following correction of identified deficiencies.

(h) (U) The OPEVAL for the P-3C Update III was conducted by COMOPTEVFOR from September 1981 through January 1982 under CNO Project 155-3. The test aircraft included the full service test model ASW avionics improvement systems. Specific objectives of the test were: [redacted] evasive targets representative of the late 1980s-1990s threats in all areas including those containing Electronic Countermeasures (ECM) activity; 2) the capability to operate from deployment sites; 3) determine the capability of Integrated Acoustic Communications System (IACS) to receive tonal signals using the SASP; and to 4) assess survivability aspects as listed in paragraph (7) above. -COMOPTEVFOR concluded that P-3C Update III ASW avionics improvements were operationally effective and have the potential to be operationally suitable. The COMOPTEVFOR evaluation report published in May 1982 recommended that the P-3C Update III be PASU and FOT&E. Specific recommendations to correct identified deficiencies included: 1) correct SASP "freeze-up" problems; 2) correct ASWOC acoustic replay deficiencies; and 3) correct STS reliability and improve logistic supportability PASU was granted on 6 July 1982.

(i) (U) FOT&E of the P-3C Update III commenced in April 1983. Specific objectives of OT-IIA were to: 1) expand tactics development with emphasis on the use of SASP and ACPA; 2) verify correction of deficiencies identified during OT-IIC; 3) verify interoperability with LAMPS and NTDS; 4) verify suitability of the Mean Time to Repair (MTTR) for Digital Magnetic Tape Set (DMTS) and AISG; and 5) verify the capability to modify the System Test Program (STP). The COMOPTEVFOR evaluation report published in February 1984 concluded the P-3C Update III is operationally effective, except for ACPA and potentially operationally suitable, except for ACPA. The findings supported a recommendation for one additional year of continued limited production except for ACPA. Specific recommendations included: 1) do not approve ACPA for fleet introduction but continue devetopment; 2) correct SASP freeze problems; 3) correct acoustic recording replay deficiencies; 4) correct STP deficiencies; 5) improve reliability of sensor station Multi-Purpose Displays (MPDs); and 6) conduct FOT&E to verify correction of deficiencies and complete testing of partially resolved operational issues. OT-IIIB of the P-3C Update III was conducted from 21 June to 6 September 1984 using the first production P-3C Update III BUNO 161762. OT-IIIC testing was conducted from 7-15 September 1984. COMOPTEVFOR concluded that the P-3C Update III is operationally effective and potentially operationally suitable; that it not be approved for full fleet introduction until after correction of ASWOC acoustic replay deficiencies and that ACPA is not recommended for fleet introduction. ASWOC interoperability was demonstrated to COMOPTEVFOR in November-December 1985 and Update III received AFP in January 1986.

(U) (U) AQA-7 Broadband was put in deficiency status in June 1986 by COMOPTEVFOR.

2. (U) OT&E to be Accomplished in Future: Update III OT&E efforts will include I4.6.1 OPEVAL and fleet release in the

(U) COMOPTEVFOR (VX-1) will be conducting Update IV OT-IIA testing during the late spring and early summer of FY-89. This testing will follow OT-IIA testing conducted by NADC and OT-IIB testing conducted by NATC. This testing is necessary to obtain ALP of four of 201 P-3 Update IV avionic systems. COMOPTEVFOR (VX-1) will be conducting OT-IIB testing (OPEVAL) during the Spring of 1989. This testing will precede the decision for full production of the remaining 201 avionic systems.

(U) Initial OT&E for the P-3G Program will commence in FY-90. This testing which provides a recommendation for milestone IIIA (ALP) will utilize the development prototype test aircraft and evaluate the various modifications incorporated into the P-3G design. OPEVAL will commence in FY-91 upon delivery of the first production P-3G aircraft with the Update IV mission avionics package. Subsequently, follow-on OT&E will be conducted on the second lot of production P-3G aircraft.

3. (U) Current T&E Activity (Past 12 Months):

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| OPEVAL | May 86-Jul 86 | May 86-Jun 86 | |
| TECHEVAL | Oct 86-Present | Oct 86-Present | |
| TECHEVAL | Jul 86-Nov 86 | Jul 86-Oct 86 | |
| TECHEVAL | Jul 86-Oct 86 | Jul 86-Oct 86 | |

(U) Future T&E Activity (Next 12 Months)

| | |
|---|---|
| OPEVAL | Nov 86-Feb 87 |
| TECHEVAL | |
| OPEVAL | |
| OPEVAL | |
| D&V | |
| DT/OTIIA | |
| DT/OTIIB | |
| DT III/BIS/OTIII | |

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64224N
Title: Airborne Electronic Warfare Engineering
DoD Mission Area: 371 - Self Protection
Budget Activity: 4-Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 48,732 | 30,313 | 32,010 | 37,384 | Continuing | Continuing |
| W0617 | Tactical Airborne Adaptive ECM | 48,732 | 30,313 | 16,531 | 14,075 | Continuing | Continuing |
| W1988 | ALR-67 Upgrades | -- | -- | 15,479 | 23,309 | 19,678 | 58,466 |

As this is a continuing program, the above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989 only.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides funds for the engineering development of tactical fixed and rotary wing aircraft electronic warfare systems including radar warning receivers, and countermeasures systems to jam, deceive and warn of existing and advanced threats. Without the development of a countermeasures capability (aircraft self-protection), and the continual countermeasures upgrade in concert with threat advances, combat losses would reach unacceptable proportions.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: The decrease of 7,364 in FY 1986 is the result of GRH and Department Budget Program Adjustments. In FY 1987 the decrease of 25,660 is the result of Congressional Action and Adjustments and Department Program Budget Adjustments. In FY 1988 the net decrease of 9,791 is the result of NIF Rate and Department Program and Budget Adjustments. In FY 1988 Funds from W0617 which support the development of the ALR-67 Advanced Special Receiver (ASR), +15,479, are transferred to the project W1988, ALR-67 Upgradea.

Program Element: 64224N Title: Airborne Electronic Warfare Engineering

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 42,072 | 56,096 | 55,973 | 41,801 | Continuing | Continuing |
| WO617 | Tactical Airborne Adaptive ECM | 42,072 | 56,096 | 55,973 | 41,801 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: radar warning receiver efforts are coordinated by a US Air Force 1983 Memorandum of Agreement. Other related warning receiver efforts are coordinated with the US Air Force in accordance with an ALR-67/ALR-74 1982 Memorandum of Agreement. The ALQ-162 program has a 1981 Memorandum of Agreement with the US Army. The ALQ-149 developed in this program will be integrated with the EA-6B ALQ-99 under Program Element 25674N, EW Counter Response. The APR-39A(V)2 effort is a joint/cooperative program with the U.S. Army. Advanced development efforts for systems in this program are conducted in Program Element 63206N, Electronic Warfare Advanced Development. There is no unncessary duplication of effort between this program and others within the Navy or the Department of Defense.

F. (U) WORK PERFORMED BY: IN HOUSE: Pacific Missile Test Center, Point Mugu, CA.; Naval Air Test Center, Patuxent River, MD; Naval Avionics Center, Indianapolis, IN; Naval Weapons Center, China Lake, CA; Naval Research Laboratory, Washington, DC; Naval Ocean Systems Center, San Diego, CA; Naval Air Development Center, Warminster, PA; and Naval Surface Weapons Center, Dahlgren, VA. Contractors: Northrop, Rolling Meadows, IL; ITT (Avionics) Nutley, NJ; Applied Technology, Sunnyvale, CA; and Sanders Associates, Nashua, NH.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project WO617, Tactical Airborne Adaptive ECM:

1. (U) Description: This project increases aircrew and aircraft survivability through upgrade to existing and acquisition of new self-protection countermeasures, advanced technology receiver systems and communications countermeasures. Components, equipments, or devices addressed under this project are the ALQ-162(V)1 countermeasures set, the ALQ-XXX Fast Electronic Nulling Continuous Error Repeater (FENCER) system to counter systems, and Generic

Program Element: 64224N Title: Airborne Electronic Warfare Engineering

Expendable (GENEX) decoy to counter systems. The Joint Army/Navy APR-39A(V)2 uses a digital processing upgrade to detect The ALQ-149 tactical C3 countermeasures receiver and a modified ALQ-99 transmitter and exciter replaces the ALQ-92 jammer, which has been removed from service in the EA-6B electronic countermeasures aircraft. This will provide a capability to identify signals in the and jam signals in the band. ALQ-149 and associated upgrade will be software programmable, compatible with other on board avionic systems and counter radar threats in the The ALQ-149 is in full scale engineering development.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Continued OT&E on the ALQ-162

° Completed the ALQ-162(V)1 technical installation verification test in the A-4M.

° Continued ALQ-162 upgrade and modifications

° Continued system requirements definition of electronic countermeasures system.

° Tested pulse doppler improvements and transitioned from a firmware to a software reprogrammable capability for the ALQ-162

° Continued testing of improvements to DECM techniques.

° Incorporate firmware/software conversion technique into the ALQ-162.

° Continued ALQ-149 tactical $C^3$ countermeasures system full-scale engineering development.

° Initiated FENCER integration/installation study.

° Terminated the APR-39A(V)1 program. Commenced joint development of APR-39A(V)2 with U.S. Army.

b. (U) FY 1987 Program:

° Complete OT&E on the ALQ-162

Program Element: 64224N Title: Airborne Electronic Warfare Engineering

- Continue the full scale engineering development of the ALQ-149 for the EA-6B aircraft.
- Award full scale engineering development contract for the ALR-67A(V)2 ASR.
- Award FSED contract for APR-39A(V)2.
- Commence full scale enginering development of GENEX expendable jammer.

c. (U) FY 1988 Planned Program:

- Continue the full scale engineering development of the ALQ-149 for the EA-6B aircraft.
- Continue FSED of the APR-39(V)2.
- Continue FSED of GENEX.

d. (U) FY 1989 Planned Program:

- Commence DT/OT of the APR-39A(V)2.
- Continue FSED of GENEX
- Complete DT/OT of ALQ-149.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones:

| MILESTONE | DATE |
|---|---|
| ALQ-162(V)1 CW Countermeasures Set | |
| M/S II FSED | FY-79/3Q |
| M/S IIIA | FY-85/3Q |
| M/S IIIB | FY-87/3Q |
| IOC | |

Program Element: 64224N Title: Airborne Electronic Warfare Engineering

| | |
|---|---|
| ALQ-149 Tactical $C^3$ Countermeasures System | |
| M/S II FSED | FY-82/3Q |
| M/S IIIA | FY-89/4Q |
| M/S IIIB | FY-91/4Q |
| IOC | |
| | |
| GENEX | |
| M/S II FSED | FY-87/2Q |
| M/S IIIA | FY-90/1Q |
| M/S IIIB | FY-90/3Q |
| IOC | |

(U) Project W1988, ALR-67 Upgrades:

1. (U) Description: This project develops common upgrades for the Navy ALR-67 and the Air Force ALR-74 Radar Warning Receivers (RWR) in accordance with the 1982 Navy/Air Force RWR MOA and the 1985 DOD EW Plan. Specific upgrades are an advanced processor and frequency extension into the band for the ALR-67 Advanced Special Receiver (ASR) which is required for effective RWR functions in the threat environment of the 1990's. Possible future incorporation of a apability will be investigated.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Not Applicable.

b. (U) FY 1987 Program: Not Applicable.

c. (U) FY 1988 Planned Program: Continue full scale engineering development (FSED) of the ALR-67A(V)2 upgrade.

d. (U) FY 1989 Planned Program: Complete FSED fabrication of ALR-67A(V)2 upgrade.

e. (U) Program to Completion: Proceed to approval for limited production in FY 1991 and full production decision in FY 1992.

Program Element: 64224N

Title: Airborne Electronic Warfare Engineering

f. (V) Major Milestones:

| Milestone: | Date |
|---|---|
| ALR-67A(V)2 Advanced Special Receiver | |
| M/S II FSED | |
| M/S IIIA | |
| M/S IIIB | |
| IOC | |

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64226N

Title: Airborne Self-Protection Jammer

DoD Mission Area: 371 - Self-Protection

Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 19,769 | 27,195 | 16,427 | 6,324 | 53,938 | 362,750 |
| W0619 | Airborne Self-Protection Jammer Common Development | 7,270 | 11,279 | 2,246 | 0 | 0 | 116,820 |
| W1481 | Airborne Self-Protection Jammer Support Equipment and Technology | 3,452 | 6,629 | 0 | 0 | 0 | 51,210 |
| W1482 | Airborne Self-Protection Jammer Aircraft Integration | 8,847 | 9,287 | 14,181 | 5,325 | 8,308 | 119,420 |
| W1728 | ASPJ Improvements | 0 | 0 | 0 | 999 | 50,632 | 74,440 |

The above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989. U.S. Air Force funding for ASPJ is reported under Program Element 64737F.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Airborne Self-Protection Jammer (ASPJ), designated AN/ALQ-165, is a joint Navy and Air Force program to develop a defensive electromagnetic countermeasure system for self-protection of tactical aircraft (F/A-18, F-14, A-6, AV-8B, and USAF F-16) to increase their probability of mission success and survivability when confronted by modern diversified radar-controlled weapon systems. The resulting system is to be flexible and compatible with integrated system concepts, capable of installation in existing aircraft, and software reprogrammable to keep pace with the changing threat. Additionally, an ASPJ pod installation is being developed for the AV-8B. The program also includes development of support equipment, alternate technology, and aircraft integration.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: In FY 1986, Project W1482 was decreased by 1,089 as a result of GRH and Department budget adjustments. In FY-87 the funding profile was increased by 17,300 to support

Program Element: 64226N Title: Airborne Self-Protection Jammer

integration of the ASPJ into the F/A-18, F-14 and AV-8B aircraft (W0619, 5000; W1481, 4000; W1482, 8300). Part of the increase (10,600) was the result of an administrative error. In FY 1988 Department Program and budget adjustments increased net funding by 4,396 to accomodate program slips and support the F-14D, level of effort, firm-fixed priced integration contract (W0619 increased by 2,246; W1482 increased by 11,028; W1728 decreased by 8,978 delaying start of planned improvements to FY 1989).

(U) FUNDING AS REFLECTED IN THE FY 1987 PRESIDENT'S BUDGET:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 36,007 | 20,796 | 19,947 | 12,131 | Continuing | Continuing |
| W0619 | Airborne Self-Protection Jammer Common Development | 8,704 | 7,478 | 6,373 | 0 | 0 | 105,825 |
| W1481 | Airborne Self-Protection Jammer Support Equipment and Technology | 5,629 | 3,382 | 3,712 | 0 | 0 | 48,302 |
| W1482 | Airborne Self-Protection Jammer Aircraft Integration | 21,674 | 9,936 | 9,862 | 3,153 | 5,940 | 95,743 |
| W1728 | ASPJ Improvements | 0 | 0 | 0 | 8,978 | Continuing | Continuing |
| | Quantity (Development Test and Evaluation/Operational Test and Evaluation) | | | | | | 12 ASPJ/6 CPMS* |

* 12 Airborne Self-Protection Jammers (Joint program funded by U. S. Navy and U.S. Air Force) and 6 Comprehensive Power Management Systems (U. S. Air Force unique effort funded by U. S. Air Force).

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable

E. (U) RELATED ACTIVITIES: The advanced development model phase of this project was funded under Airborne Electronic Warfare Equipment, Program Element 63206N. The ALR-67 Radar Warning Receiver is being interfaced with the ALQ-165. Air Force funding for ASPJ development is contained in Program Element 64737F. There is no unnecessary duplication of effort between this program and others within the Navy or the Department of Defense.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Research Laboratory, Washington, DC; Naval Air Test Center, Patuxent River, MD; Pacific Misaile Test Center, Point Mugu, CA; Naval Weapons Center, China Lake, CA; Aeronautical Systems Division, Wright-Patterson Air Force Base, Dayton, OH; 3246TH Test Wing, Eglin Air Force Base, Ft Walton Beach, Fl; and Warner-Robins Air Logistics Center, Warner-Robins, GA. CONTRACTORS: Prime contractor is the Joint Venture of ITT, Avionics Division, Nutley, NJ, and Westinghouse,

Program Element: 64226N Title: Airborne Self-Protection Jammer

Baltimore, MD with the Joint Venture Headquarters in Nutley, NJ; Grumman Aerospace Corporation, Bethpage, Long Island, NY; McDonnell Douglas Corporation, St. Louis, MO; General Dynamics Corporation, Fort Worth, TX.; and Honeywell Inc, Minneapolis, MN.

C. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W0619, Airborne Self-Protection Jammer Common Development:

1. (U) Description: This project funds the Navy's share of the joint Navy/Air Force common development of the Airborne Self-Protection Jammer.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Completed delivery of ASPJ prototype systems.
- Completed ASPJ system specification verification and laborstory threat simulation testing at the Pacific Missile Test Center. (Laboratory test at PMTC and AFEWES provided excellent results. ASPJ met or exceeded performance criteria for technical selection and effectiveness, threat prioritization, and effective operstion in a realistic multiple threat environment.)
- Began laboratory stress testing at contractor facility.
- Conducted ASPJ laboratory development testing at the Air Force Electronic Warfare Environmental Simulator.

b. (U) FY 1987 Program:

- Continue ASPJ optimization laboratory testing at PMTC.
- Continue required laborstory testing (environmental, electromagnetic interference, reliability development tests, etc) at Navy and Air Force field activities and contractor facilities.

c. (U) FY 1988 Planned Program:

- Complete funding requirements for the Navy's share of common test and evaluation provisions.

Program Element: 64226N Title: Airborne Self-Protection Jammer

- Complete common laboratory testing and reliability development tests.
- Begin reliability qualification test.

d. (U) FY 1989 Planned Program: Not applicable.

e. (U) Program to Completion: Not applicable.

(U) Project W1728, Airborne Self-Protection Jammer Improvements

1. (U) Description: This project will investigate, develop and incorporate ASPJ hardware and software combat capability improvements. The program will investigate certain maturing technologies and electronic countermeasures techniques to detect emerging threat capabilities using robust techniques, digital RF memory improvements, special processing and other advanced techniques. Block improvements to production systems will begin in FY 1992 by government-directed Engineering Change Proposals (ECPs). The funding profile depicts the Navy's share of common USN/USAF improvements.

a. (U) FY 1986 Program: Not applicable.

b. (U) FY 1987 Program: Not applicable.

c. (U) FY 1988 Planned Program: Not applicable.

d. (U) FY 1989 Planned Program:

- Contract award and preliminary engineering feasibility studies.

e. (U) Program to Completion:

- Begin major effort for improvement program.
- Develop hardware and software improvements.
- Conduct feasibility demonstration.
- Conduct ECP kit verification and validation.

Program Element: 64226N Title: Airborne Self-Protection Jammer

- In FY 1992, issue ECP-1 to incorporate improvement program changes in production systems.
- Continue software studies and upgrades for future improvements.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W1482, Airborne Self-Protection Jammer Aircraft Integration:

1. (U) Description: This project supports the integration of the Airborne Self-Protection Jammer (AN/ALQ-165) with Navy tactical aircraft (F/A-18, F-14, A-6, and AV-8B). It also supports the Developmental and Operational Test and Evaluation programs which must be successfully completed prior to approval for Production Verification and the Approval for Limited Production and Approval for Full Production decisions by the Navy/Air Force System Acquisition Review Council (N/AFSARC). This process is required to provide the fleet with a fully tested, reliable defensive electronic countermeasures suite that will increase the survivability of tactical aircraft and aircrews and enhance the probability of mission success in a high threat radar controlled weapon system environment.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Completed laboratory and on-aircraft integration of ASPJ with the F/A-18.
- Continued prototype engineering programs in the A-6, AV-8B and F-14D.
- Began ASPJ integration in the A-6 aircraft.
- Started Developmental Test and Evaluation (DT&E) ground and flight tests in the F/A-18.

b. (U) FY 1987 Program:

- Continue ASPJ prototype engineering programs in the F-14D A-6 and AV-8B.
- Complete ASPJ DT&E in the F/A-18.
- Commence OT&E F/A-18

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c. (U) FY 1988 Planned Program:

* Continue ASPJ prototype engineering in the F-14D, A-6 and AV-8B.

d. (U) FY 1989 Planned Program:

* Complete OT&E F/A-18.

e. (U) Program to Completion: This program is funded through FY 1991. By that time, ASPJ integration and Development/Operational Test and Evaluation programs in the F/A-18, will have been completed.

f. (U) Major Milestones:

| Milestones | Date |
|---|---|
| 1. DoD System Acquisition Review Council, DSARC II | July 1979 |
| 2. Associate Contractor Agreements | June 1980 |
| 3. Complete Design Specifications, F/A-18 | August 1981 |
| 4. Commence Aircraft Integration Design, F/A-18 | April 1982 |
| 5. Commence ASPJ Prototype Deliveries | October 1983 |
| 6. Commence F/A-18 Aircraft Integration | October 1984 |
| 7. Commence F/A-18 Developmental Test and Evaluation | August 1986 |
| 8. Joint Resources and Management Board (JRMB) Program Review | November 1986 |
| 9. Commence Operational Test and Evaluation | July 1987 |
| 10. Complete Developmental and Operational Test and Evaluation | February 1990 |
| 11. Navy/Air Force JRMB for Production Decision | July 1990 |

I. (U) TEST AND EVALUATION DATA:

1. Development Test and Evaluation (U) An Advanced Development Model of the Airborne Self-Protection Jammer was assembled by the Naval Research Laboratory. It underwent integration and concept testing in 1975-78. These tests demonstrated the feasibility of the dual-mode power amplifiers, software reprogrammability and Radar Warning Receiver interface operations. Further testing at the Pacific Missile Test Center Tactical Environment Simulator, the Naval Weapons Center Electronic Warfare Threat Environment Simulator, and technique testing at the Air Force Electronic Warfare Evaluation Simulator demonstrated the system concept and techniques effectiveness against specific threat systems. The Advanced Development Model was not flyable and bears little physical resemblance to the Prototype Model of the Airborne Self-Protection Jammer. Delivery of the first Prototype Model, took

Program Element: 64226N Title: Airborne Self-Protection Jammer

place in October 1983. The development contractors are the Joint Venture of ITT, Nutley, NJ, and Westinghouse, Baltimore, MD. Delivery of the twelve prototype models to be used for testing was completed in May 1986. Testing to be completed within the full scale development contract includes laboratory and simulation testing and a test, analyze and fix program consisting of 3,000 hours of reliability development testing followed by 1500 hours of reliability qualification testing. Environmental and test program set testing have commenced. System Integration Laboratory and initial aircraft integration activities were completed in September, 1985 on the Air Force F-16 at General Dynamics, Ft. Worth, TX and in July 1986 on the Navy F/A-18 at McDonnell-Douglas, St. Louis, MO. The prototype models have been installed in the F/A-18 and the F-16 which are the lead airplanes for Development Test and Evaluation (DT&E). DT laboratory testing in the Air Force Electronic Warfare Evaluation Simulator was successfully completed in June 1986. Jam-to-Signal flight tests in the F/A-18 were flown at the Naval Air Test Center (NATC) in August-September 1986. Engineering test flights in the F-16 were completed at Eglin AFB, FL in November 1986. Flight testing in both aircraft will follow at Eglin Air Force Base, FL (F-16) and at the Naval Weapons Center, China Lake, CA (F/A-18). The Joint Service Program Manager is PMA-272. Since this is a Joint Navy/Air Force Systems Command, activities to be used in DT&E include the Naval Air Test Center, Naval Weapon Center, Pacific Missile Test Center, Air Force Electronic Warfare Evaluation Simulator and the Air Force Systems Command Armament Division. Both Navy and Air Force personnel will operate the system. The Navy Operational Test and Evaluation Force and the Air Force Operational Test and Evaluation Center (AFOTEC) will monitor development testing to eliminate redundant operational tests.

2. Operational Test and Evaluation: (U) The Operational Test and Evaluation Force and the Air Force Operational Test and Evaluation Center independently reviewed tests on the Advanced Developmental Model, March 1977 - August 1978, which paved the way for Full Scale Development. They have also monitored contractor and government development testing. In order to accelerate the test program and minimize delay in the production schedule, early DT&E will be combined with the last phase of DT&E starting in May 1987. Fully dedicated operational Test and Evaluation will begin around July 1987 by AFOTEC and the Navy Operational Test and Evaluation Force. Prototype Models of the Airborne Self-Protection Jammer will be installed in the Navy F/A-18 and the Air Force F-16 which are the lead aircraft for both development and operational testing. Operational testing will evaluate the system configurations in the aircraft with respect to the operational capability requirements when employed in an operationally realistic environment. Due to flight test range restrictions, including security, maximum use will be made of performance data to correlate flight test performance with an assessment of operational effectiveness, particularly against certain advanced emitters. The ability of the Airborne Self-Protection Jammer to respond through software reprogrammability and to interface with radar warning receivers will also be evaluated. Completion of the Operational Evaluation, about February 1988 will provide the basis for a recommendation by Commander, Operational Test and Evaluation Force, regarding Fleet Introduction in the F/A-18 and by AFOTEC regarding production for the F-16. Follow-on testing will be conducted to evaluate installation of ASPJ in a pod for the AV-8B. F-14D and A-6 testing will be incorporated as part of the block upgrading of these airframes. Test facilities include the Tactical Environment Simulator at Point Mugu, CA, the Electronic Warfare Threat Environment Simulator at China Like, CA, the Air Force Electronic Warfare Evaluation Simulator at Fort Worth, TX, and the test ranges at Eglin Air Force Base, FL, and China Lake, CA.

Program Element: 64226N Title: Airborne Self-Protection Jammer

3. Systems Characteristics: (U)

a. (U) The following items are to be demonstrated by the developing agency/contractor.

| Performance | Thresholds | Verified T |
|---|---|---|
| Frequency Coverage (GHz) | | yes |
| Threat Capacity, Simultaneous Emitters | | yes |
| Pulse Density (pps) | | yes |
| Output Peak Power | | yes |
| Output Continuous Wave Power | | yes |
| Pulse Duty Cycle | | yes |
| Response Time (seconds) | | |
| Operational Availability | | |
| Mission Reliability | | |
| Maintenance Demand (Mean Flight Hours Between Maintenance Action [Hours]) | | |
| Direct Maintenance Manhours/Maintenance Action (Hours) | | |
| Logistics Demand (Mean Flight Hours between repair (Hours) | | |

b. (U) The prototype models have been delivered and development testing has commenced.

4. Current T&E Activity: (U)

Test and Evaluation Activity (Past 12 Months)

| Events | Planned Date (Start) | Actual Date (Start) | Remarks |
|---|---|---|---|
| AFEWES DT LAB TEST | Dec 85 | Mar 86 | Initial test completed Jun 1986 additional test planned for May 1987. |
| F/A-18/F-16 DT&E | Oct 85 | Oct 86 | DT Flight test started in Jan 1987. |
| A-6 Integration | Mar 86 | Aug 86 | Ongoing. |
| F-14 Integration | May 86 | Aug 86 | Ongoing. |

Test and Evaluation Activity (Next 12 Months)

Program Element: 64226N

Title: Airborne Self-Protection Jammer

| Events | Planned Date (Start) | Remarks |
|---|---|---|
| F/A-18/F-16 OT&E | Aug 87 | |
| AFEWES | Jul 87 | Preliminary operational assessment to support limited production decision |

5. Program Documentation:

The current TEMP J082, dated March 1981, was approved June 1981. A revision to TEMP J082 is in coordination and is scheduled for approval March 1987. The current DCP 171-II was approved January 1981. A revision is in coordination and scheduled for approval March 1987.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64229M
Title: Carrier Inner-Zone ASW Helicopter
DoD Mission Area: 233 - Anti-Submarine Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 11,639 | 3,975 | 581 | 0 | -- | 35,295 |
| W1810 | CV IZ ASW Helicopter | 11,639 | 3,975 | 581 | 0 | -- | 35,295 |

The above funding profile includes out-yesr escalation and encompasses all work or development phases now planned or anticipated.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program will provide Carrier (CV) battle groups with quick reaction Anti-Submarine Warfare (ASW) protection in the inner-zone using manned SH-60F helicopters equipped with an improved AQS-13F dipping sonar. Starting in FY 1989, the SH-60F will replace the existing SH-3H ASW helicopters which are becoming insufficient in number and capability to counter the increasing Soviet submarine threat to the CV battle group. Other missions which the SH-60F will perform are Anti-Air Warfare (Chaff); Command, Control, and Communication; Logistics, Fleet Support Operstions (including plane guard, MEDEVAC, and search and rescue); Non-Combat Operations, and Surveillance.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands). The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: FY 1987 -4,087 Congressional action and adjustments; FY 1988, +581 Department budget/program adjustment and NIF rate adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 19,100 | 12,389 | 8,062 | 0 | -- | 39,551 |
| W1810 | Carrier Inner-Zone ASW Helicopter | 19,100 | 12,389 | 8,062 | 0 | -- | 39,551 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

Program Element: 64229N Title: Carrier Inner-Zone ASW Helicopter

| Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Aircraft Procurement (SH-60F) | | | | | | |
| Funds APN-1 | 28,402 | 144,109 | 319,434 | 356,821 | 2,184,433 | 3,033,199 |
| Funds APN-6 | -- | 11,204 | 21,291 | 24,416 | 81,615 | 138,526 |
| Quantity | | (7) | (18) | (18) | (132) | (175) |

E. (U) RELATED ACTIVITIES: Program Element 64206A, UH-60A BLACK HAWK (Utility Tactical Aircraft System), a derivative of which has been selected for the Light Airborne Multi-Purpose System MK III airframe. Program Element 64212N, SH-60B SEAHAWK (LAMPS MK III), the parent aircraft (for airframe and engines) of the SH-60F Carrier Inner-Zone ASW Helicopters. Program Element 64219N, CV Helo Avionics Improvement Program, improves the AQS-13E dipping sonar to the AQS-13F model and will develop the Advanced Light Weight Sonar (ALWS), a P$^3$I replacement of the AQS-13F. Program Element 63610N, Advanced Light Weight Torpedo (MK 50) program, provides the latest ASW weapon for the SH-60F.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Development Center, Warminster, PA (Lead Laboratory); Naval Air Test Center and Naval Aviation Logistics Center, Patuxent River, MD; Naval Weapons Engineering Support Activity, Washington, DC; Naval Air Engineering Center, Lakehurst, NJ; Naval Avionics Center, Indianapolis, IN; Naval Surface Weapons Center, Dahlgren, VA; Naval Training Equipment Center, Orlando, FL; Naval Engineering Support Office, North Island, CA; and Naval Engineering Support Office, Pensacola, FL; CONTRACTORS: Sikorsky Aircraft Division, Stratford, CT (Prime Contractor and Air Vehicle supplier); Allied Corporation, Bendix Oceanics division, Sylmar, CA, Subcontractor for Dipping Sonar, Teledyne Systems Corp., Northridge, Ca., Subcontractor for Avionics Integration.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W1810, Carrier Inner-Zone ASW Helicopter:

1. (U) Description: The Carrier Inner-Zone Anti-Submarine Warfare helicopter will be the SH-60F aircraft with the improved AQS-13F dipping sonar. It will replace the existing SH-3H CV Anti-Submarine Warfare helicopters which are becoming insufficient in number and capability to counter the increasing Soviet submarine threat to the CV battle group. The SH-60F will be a derivative of the SH-60B consisting of virtually the same airframe and drive train with a new avionics suite. This avionics suite will consist of communications, navigation, data handling, armament and an improved dipping sonar (AQS-13F), and integrated via a data bus. A contract with Not to Exceed (NTE) prices for Firm Fixed Price (FFP) development and options for 5 lots of FFP production was signed 28 February 1985. The total planned production progra

Program Element: 64229N Title: Carrier Inner-Zone ASW Helicopter

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° Define development.

° Award Long Lead (LL) contracts for Lots 1 and 2 production (7 aircraft).

° Finish contractor testing of the Hardware Software Integration Facility (HSIF) basic equipment and begin integration with Naval Avionics Center monitoring.

° Continue airframe modification of two aircraft on the SH-60B production line to the SH-60F configuration.

° Complete engineering development tests on modified YSH-60B.

b. (U) FY 1987 Program:

° Define production Lots I and II contract.

° Award Long Lead (LL) contracts for Lot 3.

° Finish HSIF integration, complete avionics development and demonstration of HSIF to government.

° Complete assembly of two SH-60F aircraft (Lot 1) and conduct contractor flight tests.

° Deliver Lot 1 aircraft and start Navy technical tests.

c. (U) FY 1988 Planned Program:

° Continue Navy technical tests and perform Operational Evaluation using first and second production aircraft.

° Award Lot 3 contract and Long Lead contract for Lot 4.

° Approval for Full Production (AFP) (Milestone III) occurs in FY 1988.

d. (U) FY 1989 Planned Program: Not applicable.

Program Element: 64229N Title: Carrier Inner-Zone ASW Helicopter

e. (U) Program to Completion:

- Complete Navy Technical testing and complete Navy Operational Testing.
- Receive Approval for Full Production, award production contracts, and continue deliveries of production aircraft.
- Additional technical and Follow-on Operational Test and Evaluation will be scheduled as required.

f. (U) Major Milestones:

| Milestones | Date |
|---|---|
| 1. Award Production Lots 1 and 2 Long Lead (LL) Contracts | January 1986 |
| 2. Award Production Lots 1 and 2 (7 aircraft) and Lot 3 LL Contract | March 1987 |
| 3. Operational Evaluation | December 1987 |
| 4. Milestone III | March 1988 |
| 5. Award Production Lot 3 and Lot 4 LL Contract | April 1988 |
| 6. Award Production Lot 4 and Lot 5 LL Contract | January 1989 |
| 7. Initial Operational Capability (IOC) | |
| 8. Award Production Lot 5 and Lot 6 LL Contract | January 1990 |
| 9. Award Production Lot 6 and Lot 7 LL Contract | January 1991 |
| 10. Award Production Lot 7 and Lot 8 LL Contract | January 1992 |
| 11. Award Production Lot 8 Contract | January 1993 |

H. (U) PROJECT OVER $10 MILLION IN FY 1988/89: Not applicable.

I. (U) TEST AND EVALUATION DATA:

Program Element: 642298 Title: CV ASW Innerzone Helicopter

J. (U) TEST AND EVALUATION DATA:

1. Development Test and Evaluation (DT&E)

a. (U) Extensive DT&E has been completed on the SH-60B air vehicle incident to development of the UH-60A BLACK HAWK and the SH-60B SEAHAWK. Maximum utilization will be made of the data obtained during this testing to minimize test requirements in development of the CV Helo. The CV Helo program manager is PMA-266.

b. (U) DT-IIA Apr 1985 - Dec 1986. Contractor tests on the SH-60B design. Bench tests ensured that avionics system performance and integration, including the sonar, have satisfactorily matured and are ready for incorporation in the SH-60 .

c. (U) DT-IIB Apr 1985 - Feb 1986. Tests by Sikorsky in a modified SH-60B prototype test bed helicopter on the Automatic Flight Control System (AFCS) and AQS-13F sonar. (This effort is funded under PE64219N and is shown for continuity. The AQS-13F has been restructured into PE642298). Tests successfully completed. Aircraft transferred to NATC Mar 86.

d. (U) DT-IIC Mar 1986 - July 1986. Tests by the Naval Air Test Center and Naval Surface Weapons Center to evaluate the AFCS and AQS-13F sonar in the SH-60B test bed helicopter. AFCS demonstrated several enhancing characteristics with respect to performing CV Innerzone ASW mission (NATC Report No. RW-868-86 dated 12 Aug 86). AQS-13F demonstrated enhanced capability for the conduct of innerzone ASW (NATC Report No. RW-888-86 dated 29 Aug 86). Continued development was recommended for both systems.

e. (U) DT-IID Jan 1987 - Jun 1987. Tests by Sikorsky in a production SH-60F to evaluate airframe changes, the AQS-13F sonar and avionics systems integration and performance.

f. (U) DT-IIE July 1987 - Jan 1988. Tests by the Naval Air Test Center to evaluate the ability of the SH-60F to meet technical thresholds.

g. (U) DT-IIF Feb 1988 - May 1988. Tests by the Naval Air Test Center to establish technical maturity of the SH-60F and to verify correction of discrepancies discovered in previous testing phases.

h. (U) DT-III Jan 1990 - Mar 1990. Tests by the Board of Inspection and Survey using two aircraft from the third production lot to evaluate SH-60F capabilities and correction of discrepancies.

2. Operational Test and Evaluation (OT&E)

a. (U) OT-IIA Aug - Sep 1986. Independent tests by Commander, Operational Test and Evaluation Force (COMOPTEVFOR) of the SH-60B test bed to assess

[illegible] COMOPTEVFOR Quick Look Report (COMOPTEVFOR Norfolk, VA 1415402 Oct 86) indicates CV Helo has potential to be operationally effective and suitable. Findings support a recommendation for continued development of the CV Helo.

b. (U) OT-IIB Oct - Nov 1987. Combined tests by COMOPTEVFOR and NAVAIRTESTCEN. using two fully integrated SH-60F helicopters, as Organizational level system maintenance will be performed by the Navy.

c. (U) OT-IIC (OPEVAL) Nov - Dec 1987. In independent tests, COMOPTEVFOR will determine _ of two fully integrated SH-60F helicopters in support of a recommendation regarding fleet introduction. Organizational level system maintenance will be performed by the Navy.

d. (U) OT-III Aug Dec 1988. COMOPTEVFOR will

e. (U) OT-IV. TBD.

Program Element: 64229M

Title: CV ASW Innersone Helicopter

3. (U) System Characteristics

e. (U) DT&E Thresholds.

| Air Vehicle | Parameter | Thresholds | Notes |
|---|---|---|---|
| Endurance | ASW mission | | 1,2 |
| Speed | Dash speed | | 2,3 |
| Size | CV spotting factor | | 4 |
| **Mission System** | **Parameter** | | **Notes** |
| AQS-13F | Range Accuracy | | |
| | Bearing Accuracy (S/N = 10db) | | |
| | Source level | | 5 |
| | Minimum detectable S/N ratio | | 6 |
| **BAM** | **Parameter** | | |
| Weapon System | Elapsed Maintenance Time per Maintenance Action | | |
| | Mission Capable Rate | | |
| | Full Mission Capable Rate | | |

Notes: (1) (U) ASW Configuration (crew of 4, 2 Mk 50 torpedoes, one external fuel tank, and 8 sonobuoys), 40% time in hover

(2) (U) Sea level, tropical day, no wind

(3) (U) ASW gross weight and configuration, maximum continuous power

(4) (U) Folded; relative to A-7 airplane

(5) (U)

(6) (U)

Program Element: 64229M

Title: CV ASW Innersono Helicopter

b. (U) OT&E Thresholds

**Effectiveness**

| Parameters | Thresholds | Notes |
|---|---|---|
| Time to launch | | |
| Condition I | | 1 |
| Condition II | | 2 |
| Condition III | | 3 |
| Maximum Sea State Operating Capability | | |
| Probability of detection, given detectability | | 4 |
| Probability of redetection | | 5 |

Submarine
Speed of Advance
(kt)

| | | |
|---|---|---|
| Probability of correct classification (sub or non-sub) given detection | | |
| Time to attack after correct classification | | |
| Probability of proper weapon placement given correct classification | | |
| Time to reattack | | |
| Probability of proper weapon placement during reattack | | |
| Time from launch to first dip at 50 nm from CV | | 6 |
| Time to relocate between dip stations 50 nm apart | | 6 |
| Minimum time on station | | 7 |

Program Element: 64259M

Title: CV ASW Innerzone Helicopter

(U) Suitability

Reliability

SH-60F HELICOPTER SYSTEM

| | | |
|---|---|---|
| Probability of completing a 4 hour mission without a critical or major failure | 0.8 | 8 |
| Mean flight hours between critical or major failure | 18 | 8 |

AN-AQS-13F SONAR SUBSYSTEM

| | | |
|---|---|---|
| Probability of completing a 4 hour mission without a critical or major failure | 0.88 | 8 |
| Mean flight hours between critical or major failure | 30 | 8 |

Maintainability

SH-60F HELICOPTER SYSTEM

| | | |
|---|---|---|
| Mean time to repair (airframe) | 2.0 hrs | |
| Mean time to repair (engine) | 4.8 hrs | |
| Mean time to repair (avionics) | 1.0 hrs | |
| Mean time to repair (sonar) | 3.0 hrs | |
| Direct maintenance manhours per flight hour | 16 | |

Availability

| | | |
|---|---|---|
| Ao | 0.8 | 9 |

Notes: General. All effectiveness probabilities assume an operable aircraft.

1. (U) Condition I. The aircraft shall be spotted for immediate launch. It shall be headed into the relative wind, with rotor blades spread, starting equipment plugged in, and a Landing Signalman Enlisted (LSE), starting crewman, plane captain, and required plane handlers standing by. Unless otherwise directed by the aircraft handling officer, at least four tiedowns shall be attached to the aircraft. The flight crew shall be ready for launch in all respects, with all personnel equipment attached and adjusted as in flight. When the air officer passes the word to stand by to launch the Condition I helicopter(s), engines shall be started without further instructions; however, rotor engagement and launch shall be positively controlled by PRI-FLY.

2. (U) Condition II. The same conditions apply as for condition I, except that flight crews shall stand by in the ready room.

3. (U) Condition III. Main rotor blades may be folded and the aircraft need not be in position for immediate launch; however, it must be parked so as to allow direct access to a suitable launch spot. A towbar shall be attached to the aircraft and a specific LSE, tractor driver, handling crew, and starting crewman shall be designated and assigned to each helicopter. These personnel must be thoroughly briefed so that when the order is given to prepare to launch, the aircraft can be safely and expeditiously moved into position and readied for launch. Flight crews should be briefed for launch and be standing by in a designated location.

4. (U) The probability of detection (Pd) threshold is stated for a Tactical Sonar Range. TSR is the predicted range of the AQS-13F sonar based on environmental conditions and target strength. The CVBG maximum speed of advance (SOA) is 15 kts, and the threat submarine's maximum approach speed is 15 kts. As TSR changes, the screen position will be adjusted to maintain the same Pd.

5. (U) The probability of redetection thresholds are stated for a submarine SOA. relative to datum. as shown in the table. These probability of redetection values are for a 120° containment sector from the datum. Time late is measured from the time contact is lost.

6. (U) Sea level, tropical day, ASW configuration, ASW gross weight, transiting at maximum continuous power, no wind.

7. (U) Time-on station does not include transit time to and from CV. 50% of on-station time is spent in no wind hovering operations.

8. (U) A critical failure is defined as a failure which causes mission abort. Major failure is defined as a failure resulting in significant mission degradation.

9. (U) Operational Availability will be computed as uptime divided by uptime plus downtime.

4. (U) Current T&E Activity.

T&E Activity (Past 12 Months)

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| DT-IIA (continued) | Jan 1986 - Dec 1986 | Same | - Hardware/Software Integration Facility (HSIF) Bench tests started to verify interfaces, integrate and validate avionics integration. Complete avionics demonstration to ensure avionics system and sonar are ready for incorporation in the SH-60F. |
| DT-IIB | Apr 1985 - Feb 1986 | Same | - Contractor Flight Tests completed in modified SH-60B prototype of the Automatic Flight Control System (AFCS) and AQS-13F sonar. |
| DT-IIC | Mar 1986 - Jul 1986 | Same | - Naval Air Test Center (NATC) and Naval Surface Weapons Center (NSWS) evaluate Automatic Flight Control System (AFCS) and AQS-13F sonar installed in SH-60B test bed aircraft. |
| OT-IIA | Aug 1986 - Sep 1986 | Same | - Independent test by COMOPTEVFOR of SH-60B test bed aircraft to assess the potential operational effectiveness and potential operational suitability, develop tactics, estimate program progress and identify operational issues. |

Program Element: 64229M

Title: CV ASW Innerzone Helicopter

T&E Activity (Next 12 Months)

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| DT-II-D | Jan 1987 - Jun 1987 | | - Contractor test on first two production SH-60Fs. Evaluate AFCS, AQS-13F sonar and mission avionics system integration and performance. |
| DT-IIE/ OT-IIB | Jul 1987 - Jan 1988 | | - Combined NATC/VX-1 tests on first two production SH-60Fs to evaluate the ability of SH-60F to meet technical and operational thresholds. |
| OT-IIC | Nov 1987 - Dec 1987 | | - SH-60F OPEVAL |

5. (U) Program Documentation. CV Innerzone ASW Helicopter Test and Evaluation Master Plan (TEMP) No. 945 approved 13 February 1985. Currently being reviewed for update.

(U) CV Helo Acquisition Strategy Paper No. AAF-01-1-30 approved by Chief of Naval Material on 27 Aug 1984. Being updated to an acquisition plan currently in review.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64252N
Title: Aircraft Propulsion (Engineering)
DoD Mission Area: 225 - Air Warfare Support
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 44,566 | 23,975 | 289 | 1,999 | 3,525* | 107,448 |
| W1731 | T56/M71 Engine Improvement Program | 44,566 | 23,975 | 289 | 1,999 | 3,525* | 107,448 |

*Navy reprogramming action in process.

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports the development of a derivative T56 turbo-propeller engine capable of meeting the safety and operational needs of the E-2C aircraft. Without an increase in power and a reduction in fuel consumption, the planned increases in aircraft gross weight will have a significant impact on the operational capabilities of the E-2C community. The program provides for: (1) limited development and demonstration of potential aircraft engine performance improvements through adaptation of new technologies to existing engine design, and (2) for the development and qualification of such improvements to answer new operational requirements. The current T56 project is a full scale development and qualification program structured to meet present and future aircraft needs.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY : (Dollars in Thousands) The changes between the funding profile in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: in FY 1987, a decrease of 3,525 is the result of Congressional action and adjustments. The 1,999 in FY 1989 is required to complete the Operational Evaluation (OPEVAL) of the engine/airframe integration, and is within the Secretary of the Navy directed program ceiling.

Program Element: 64252N Title: AIRCRAFT PROPULSION ENGINEERING

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 23,774 | 44,566 | 27,500 | 300 | 0 | 107,850 |
| W1731 | T56/M71 Engine Improvement Program | 23,774 | 44,566 | 27,500 | 300 | 0 | 107,850 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: Supplementary technology is provided by Program Element 63210N, Advanced Aircraft Propulsion Systems.

F. (U) WORK PERFORMED BY: CONTRACTORS: Allison Gas Turbine Division, Indianapolis, IN.; Grumman Aerospace Corporation, Bethpage, N.Y.; Hamilton Standard Corporation, Windsor Locks, CT.; IN HOUSE: Naval Air Systems Command, Washington, D.C.; Naval Air Propulsion Center, Trenton, N.J.; Naval Air Test Center, Patuxent River, MD.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W1731, T56/M71 Engine Improvement Program:

1. (U) Description: E-2C airframe and avionics improvements, and the corresponding increase in aircraft gross weight, necessitate the need for more power throughout the E-2C's mission profile and a decrease in specific fuel consumption. These requirements must be met in order to maintain existing endurance and altitude profiles as well as a safety margin when operating in a single engine configuration, hot day environment, at take-off conditions. The improved T56/M71 engine (Navy designation T56-A-427) will satisfy all present and future E-2C requirements for performance, fuel economy, and altitude capability.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- 3240 engine test hours completed. Fixed price letter contract definitized in June; full scale development continued.
- Development engines installed for ground testing.

Program Element: 64252N Title: AIRCRAFT PROPULSION ENGINEERING

° Flight testing commenced in April.

° Completed required Navy DT and OT to support initial request for Approval for Limited Production.

° Approved engine for limited production (2 installs, 2 spares).

b. (U) FY 1987 Program:

° Complete production release endurance testing.

° Refurbish flight test engines to production configuration.

° Conduct required Navy Development DT and OT Operational testing to support request for Approval for Limited Production.

° Commence Navy Technical Evaluation at the Naval Air Test Center. Verify flight envelope, evaluate flying qualities and performance, demonstrate shore based carrier suitability.

° Approve engine for limited production (12 installs, 1 spare, 1 trainer).

° Complete full scale engine accelerated mission endurance qualification testing and corrosion testing.

° Commence delivery of limited production engines.

c. (U) FY 1988 Planned Program:

° Complete Navy Technical Evaluation.

° Deliver first production aircraft.

° Conduct EMC, EMV and EMI testing.

° Demonstrate ship board carrier suitability.

° Correct revealed deficiencies.

° Conduct 10-20 flight hours of full envelope flight tests.

Program Element: 64252N Title: AIRCRAFT PROPULSION ENGINEERING

d. (U) FY 1989 Planned Program:

- Conduct 50 Catapults and Arrestments with production engines.
- Commence Operational Evaluation (OPEVAL).
- Conduct 6 months of operations with 300 to 450 flight hours ashore and afloat.
- Approve Engine for Full Production.

e. (U) Program to Completion:

- Complete final phase flight testing.
- Correct revealed deficiencies.
- Transfer engine monitoring to Program Element 64268N, Aircraft Engine Component Improvement Program.

f. (U) Major Milestones:

| | |
|---|---|
| (1) Letter Contract Awarded | August 1984 |
| (2) Preliminary Flight Rating Test | November 1985 |
| (3) Definitized Contract | April 1986 |
| (4) TECHEVAL (Phase I) | May-June 1987 |
| (5) Commence Limited Production Engine Deliveries | June 1987 |
| (6) TECHEVAL (Phase II) | March-June 1988 |
| (7) OPEVAL | Jan-July 1989 |
| (8) Approved for Full Production | September 1989 |

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64255N
Title: Electronic Warfare Simulator Development
DoD Mission Area: 454 Other Test And Evaluation Support
Budget Activity: 4-Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 34,705 | 37,981 | 41,103 | 43,401 | Continuing | Continuing |
| W0602 | ELECTRONIC WARFARE ENVIRONMENT SIMULATION (ECHO) | 24,156 | 24,799 | 27,065 | 29,642 | Continuing | Continuing |
| X0672 | Effectiveness of Navy Electronic Warfare | 7,732 | 7,853 | 9,010 | 10,036 | Continuing | Continuing |
| W1778 | Closed Loop Test Capability | 2,817 | 5,329 | 5,028 | 3,723 | 0 | 26,756 |

The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program consolidates the design, fabrication and integration of naval threat radar simulators in one program element for increased managerial emphasis and coordination. These efforts will provide for more realistic operational test and evaluation of Electronic Warfare (EW) warning, defense, and countermeasures systems in accordance with General Accounting Office and Congressional recommendations. These developments support flight range test and evaluation of airborne EW systems at the Electronic Warfare Threat Environment Simulation complex at the Naval Weapons Center, China Lake, CA and EW system component test and evaluation at the Tactical Environment Simulation (TES) Laboratory at the Pacific Missile Test Center, Pt. Mugu, CA. They also provide secure, high quality test and evaluation of EW systems' critical aircraft installation effects through closed loop radar simulations at the Naval Air Test Center, Patuxent River, MD. The program supports test and evaluation of surface ship EW systems through development of anti-ship capable missile threat and associated targeting platform simulators and other EW systems effectiveness evaluations in the Effectiveness of Navy Electronic Warfare Systems project.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) In FY 1986, Project W0602 was increased 631 to support a strike electronic warfare digital simulation risk reduction; in FY 1987 W0602 was reduced by 9047 due to Congressional action and adjustments and Department program/budget adjustments; in FY 1988 a decrease by 8,598 is the result of Department program and budget adjustments. Project X0672 was decreased in FY 1987 by 4,406 by Congressional action and adjustments and Department budget/program adjustments; and in FY 1988 by 7,753 by Department budget/program adjustments. Project W1778 was decreased 740 in FY 1986 due to GRH and Department budget adjustment, and 671 in FY 1988 by Department program/budget adjustments and NIF rate adjustment.

Program Element: 64255N Title: Electronic Warfare Simulator Development

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 22,148 | 35,260 | 51,896 | 58,125 | Continuing | Continuing |
| W0602 | Electronic Warfare Environment Simulation | 10,342 | 23,525 | 33,846 | 35,663 | Continuing | Continuing |
| X0672 | Effectiveness of Navy Electronic Warfare Systems (ENEWS) | 7,906 | 8,178 | 12,259 | 16,763 | Continuing | Continuing |
| W1778 | Closed Loop Test Capability | 3,900 | 3,557 | 5,791 | 5,699 | 4,409 | 29,115 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: None

E. (U) RELATED ACTIVITIES: All Services use the facilities supported by this program. Related Air Force and Army efforts are coordinated through the OSD sponsored Tri-Service CROSSBOW-S Committee, the Joint Executive Committee on Air Defense Threat Simulators (EXCOM) and the Joint Coordinating Committee on Electronic Defense Systems. Support is provided to Program Element 64208 (Training Range Instrumentation and Systems Development), Program Element 24575N (Electronic Warfare Support), and Program Element 64573N (Shipboard Electronic Warfare Improvements). Specialized support is provided for development testing of new and/or improved systems modifications, for Fleet exercises/training and the Navy training community. There is no duplication of effort between this program and others within the Navy or the Department of Defense.

F. (U) WORK PERFORMED BY: (Project W0602) In-House: Naval Weapons Center, China Lake, CA (lead laboratory) and Pacific Missile Test Center, Point Mugu, CA. CONTRACTORS: RCA, Moorestown, NJ; Electronic Warfare Associates, Ridgecrest, CA; General Dynamics, Pomona, CA; EG&G, Ridgecrest, CA; Hughes, Fullerton, CA; and General Dynamics, Fort Worth, TX; Ford Aerospace. (Project W1778) In-House: Naval Air Test Center, Patuxent River, MD, (lead laboratory); Naval Weapons Center, China Lake, CA. CONTRACTORS: RCA, Moorestown, NJ; and Georgia Institute of Technology, Atlanta, GA; (Project X0672) In-House: Space and Naval Warfare Systems Command, Washington, DC; Naval Research Laboratory, Washington, DC (lead laboratory); Naval Sea Systems Command, Washington, DC; Naval Electronic Systems Engineering Center, Portsmouth, VA; Naval Surface Weapons Center, Dahlgren, VA; Naval Avionics Center, Indianapolis, IN; CONTRACTORS: Raytheon Corporation, Bedford, MA; Control Data Corporation, Arlington, VA; Westinghouse,

Program Element: 64255N Title: Electronic Warfare Simulator Development

Inc., Baltimore, MD; Lockheed Aircraft Company, Burbank, CA; Digital Equipment Corporation, Nashua, NH; QUEST, Inc., McLean, VA; Locus, Inc., State College, PA; Applied Physics Laboratory, Laurel, MD.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W1778, Closed Loop Test Capability:

1. (U) Description: This project improves fleet tactical aircraft survivability by providing a secure, closed-loop radar simulation capability to determine the effectiveness of EW and electronic countermeasures (ECM) systems installed in host aircraft. This capability will enable the test and evaluation of tactical aircraft EW equipments against simulated hostile weapons systems environments in a secure anechoic chamber large enough for tactical aircraft. By operating a complete weapons system in a tightly controlled scenario, mutual interference between the jammer and the rest of the weapons system can be readily determined and degradation as a result of integration inadequacies can be assessed. Primary simulation will be provided by the CROSSBOW-S Generic Radar which will simulate naval missile systems and will be coordinated with the EW Integrated Systems Test Laboratory at the Naval Air Test Center. System development requirements are coordinated through the Navy tri-center (Naval Air Test Center/Pacific Missile Test Center/Naval Weapons Center) simulator development concept for complementary support, cost reduction and increased test effectiveness. Major improvements in the capabilities to be achieved are a reduction of aircraft flight hours, elimination of uncontrolled variables in testing, and greater security for developing and testing sensitive jamming equipment and techniques.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Continued closed loop test capability development.
- Began missile simulation development and scenario control.

b. (U) FY 1987 Program:

- Continue missile simulation development and scenario control.
- Continue installation support, software integration of closed loop test simulator.
- Begin development of Radio Frequency (RF) Background Generator.

Program Element: 64255N Title: Electronic Warfare Simulator Development

c. (U) FY 1988 Planned Program:

- Begin development of Radio Frequency (RF) Background Generator.
- Participate in modification efforts for the CROSSBOW-S Generic Radar.
- Complete initial missile simulation development
- Complete frequency simulation and scenario control.

d. (U) FY 1989 Planned Program:

- Complete development, fabrication and installation of:
  - missile system emulator
  - CROSSBOW-S Generic Radar modification
  - RF Background Generator.

e. (U) Program to Completion: Not applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W0602, Electronic Warfare Environment Simulation (ECHO):

1. (U) Description: Project W0602 provides for the development of the Integrated Naval Air Defense Simulation (INADS) complex for flight test and evaluation of airborne EW equipment and tactics development at the Electronic Warfare Environment Simulation (ECHO) range at NWC, China Lake, CA and associated laboratory test equipment for EW component test at the Tactical Environment Simulation (TES) Laboratory at the Pacific Missile Test Center (PMTC), Point Mugu, CA. INADS upgrades will provide a realistic naval threat environment representing integrated networks and associated platform gun systems. This effort is required by and interfaces with HARM, ALR-67, ALQ-126B, ALQ-162, ALQ-165, EA-6B Advanced Capability (ADVCAP), Integrated Defensive Avionics Program (IDAP), expendable jammers and decoys as well as other EW systems which achieve initial operational capability (IOC) through 1995. System development requirements are coordinated through the Navy tri-center (NATC, PMTC, NWC) simulator development concept for mutual support, cost reduction and increased test effectiveness. Specific

Program Element: 64255N Title: Electronic Warfare Simulator Development

components to be developed include the CROSSBOW-S Generic Radar

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY-1986 Program:

- Continued development of semi-active/Track Via Missile (TVM) test system including search, track and guidance radar simulation at the Pacific Missile Test Center.
- Initiated procurement for Flycatcher radar.
- Incorporated modification into CROSSBOW-S Generic Radar.

b. (U) FY-1987 Program:

- Complete Flycatcher procurement.
- Commence development of two early warning acquisition radar simulators.
- Commence development of integrated networks and associated gun systems.

c. (U) FY-1988 Planned Program:

- Complete semi-active/TVM test system and CROSSBOW-S Generic Radar modification.
- Continue development of acquisition and command, control and communication simulators.
- Complete Flycatcher integration into range.

d. (U) FY-1989 Planned Program:

- Complete development of two early warning acquisition radar simulators.

Program Element: 64255N Title: Electronic Warfare Simulator Development

- Commence development of Second Crossbow-Generic Radar.
- Commence development of J-Band Emitter Simulstor.
- Commence development of E-Band early warning acquisition radar simulator.
- Commence development of Threat Jammer Emitter Simulstors.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones: Not applicable.

(U) Project X0672, Effectiveness of Navy Electronic Warfare Systems (ENEWS):

1. (U) Description: This project provides a capsbility for the Navy to evaluate the effectiveness of shipboard electronic warfare systems to counter anti-ship missile threats and associated targeting platforms. This capability is accomplished through the development of flyable instrumented simulators repreaentative of anti-ship missile threats, laboratory simulation facilities utilizing hardware seekers in anechoic chambers in connection with computers to simulate threat missile flight profiles and their response to electronic countermeasures techniques, and large scale tactical engagement computer simulation capabilities. This project provides coat effective teating capabilities and intelligence updates to evaluate tactical response to rapidly improving anti-ship missile threats.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Completed development of interactive scenario generator.
- Continued development of Weapon System and missile simulators.
- Completed acceptance testing and achieved initial operational capability of simulator.
- Commenced development of IR Seeker simulator.

Program Element: 64255N

Title: Electronic Warfare Simulator Development

b. (U) FY 1987 Program:

- Continue digital systems integration with Coordinated Electronic Warfare Simulation Laboratory.
- Maintain existing simulation assets.
- Perform intelligence updates.
- Commence development of missile simulator.
- Complete development of automatic television tracking system and electronic support measures referee receiver system for use aboard the EP-3B flying laboratory during TECHEVALs and OPEVALs.
- Continue System, and missile simulator developments.
- Continue development of IR Seeker simulator.

c. (U) FY 1988 Planned Program:

- Incorporate decoy/electronic countermeasures module and inner defense zone model into scenario generator.
- Commence development of electronic warfare systems performance monitor capability.
- Continue digital systems integration with Coordinated Electronic Warfare Laboratory.
- Maintain existing simulation asseta.
- Perform intelligence updates
- Continue missile simulator developments.

Program Element: 64255N Title: Electronic Warfare Simulator Development

- Continue IR Seeker and RF/IR hybrid simulator developments.

d. (U) FY 1989 Planned Program:

- Continue development of electronic warfare systems performance monitor capability.
- Continue digital systems integration with Coordinated Electronic Warfare Laboratory.
- Maintain existing simulation assets.
- Perform intelligence updates.
- Continue missile simulator developments.
- Continue IR Seeker and RF/IR hybrid simulator developments.

d. (U) Program to Completion: This is a continuing program.

e. (U) Milestones: Not applicable.

I. (U) Test and Evaluation Data: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64260N
Title: C/MH-53E
DoD Mission Area: 265 - Intra-theater Airlift
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 1,946 | 1,563 | 20,124 | 9,228 | 45,413 | 212,598 |
| W0901 | Helicopter Night Vision System | * | * | 4,803 | 0 | 0 | 58,413 |
| W1109 | C/MH-53 | 1,946 | 1,563 | 15,321 | 9,228 | 45,413 | 154,185 |

* Project W0901 funded in PE 64213N in FY 1986/87. The above funding profile includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED:

(U) The Helicopter Night Vision System (HNVS) provides an infrared night vision system for the Marine Corps CH-53E transport and the Navy MH-53E minesweeping helicopters. The present Marine and Navy helicopters' ability to perform amphibious warfare and tactical minesweeping operations is severely restricted by the lack of night/low visibility capability. This project will allow transport and minesweeping helicopters to operate at low altitude and at near daylight airspeeds at night and during periods of reduced visibility. This program also supports MH-53E development, a helicopter needed by the Navy to fill a major deficiency in our ability to counter the Soviet Block mine warfare capability. The MH-53E will have a maximum tow tension capacity double that of the deployed RH-53D, and 30 to 50 percent increased on-station time. These attributes will make the MH-53E a significantly more effective mine countermeasures aircraft. The MH-53E will also have an enhanced utility mission capability as well as a Night Vision System which will incorporate the U.S. Army developed Pilot Night Vision System (PNVS). Development of a composite main rotor blade (CMRB)for both the CH and MH-53E begins in FY 1987. A CMRB will greatly enhance CH/MH-53E safety, survivability, reliability and maintainability. It will provide unlimited spar crack propagation, unlimited fatigue life, increased aircraft mean time between aborts, and increased ballistic tolerance. Additionally, efforts begin on the T64-GE-416 engine enhancement. This upgrade will provide the MH-53E with the capability to hover out of ground effect in a one engine out emergency situation at mission gross weights for two minutes and then fly for one hour to effect a safe landing. This effort will correct an OPEVAL deficiency.

Program Element: 64260N

Title: C/MH-53E

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are: Project W1109, in FY 1986, increase of 928 for Department Budget adjustment and decreases of 119 for GRH adjustment and 40 for Department Program/Budget adjustment. In FY 1987, decreases of 48 for Congressional adjustment and 1,853 for Congressional action. In FY 1988, increase of 7,000 for Department Budget adjustment and decreases of 413 for Department Program/Budget adjustment, 15 for Department Program adjustment. Project W0901 added to this Program element in FY 1988.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 15,043 | 1,177 | 3,464 | 8,749 | 41,100 | 141,433 |
| W1109 | CH/MH-53E | 15,043 | 1,177 | 3,464 | 8,749 | 41,100 | 141,433 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Aircraft Procurement, Navy (41CK/CL) | 247,445 | 219,934 | 240,047 | 211,442 | 188,838 | TBD |
| Quantity | 14 | 14 | 14 | 14 | 4 | TBD |
| MILCON (PE 24696N) | 0 | 0 | 3.1 | 0 | | 3.1 |

E. (U) RELATED ACTIVITIES: DOD Common Module Forward Looking Infrared, Program Element 63710A, developed the leading technology employed in night vision systems; Army Advanced Attack Helicopter Program, Program Element 64207A, provided the Pilot Night Vision System and infrared sensors for a classified program which is incorporated into the CH/MH-53E Helicopter Night Vision System. Program Element 23744A is providing preproduction program improvement for the PNVS.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Test Center, Patuxent River, MD; Naval Coastal Systems Center, Panama City, FL; Operational Test and Evaluation Force, Norfolk, VA: CONTRACTORS: CH/MH-53E, Sikorsky Aircraft Division of United Technologies Corporation, Stratford, CT; Indiana Gearworks, Indianapolis, IN; OZONE, Ozone Park, NY; FENN, Newington, CT; Weiman Gordon, Worchester, MA. NNVS: Sikorsky Aircraft Division of United Technologies, Stratford CT; Martin Marietta, Orlando, FL; Sperry Corporation, Albuquerque, NM; Mark IV/FCD Corporation, Hamden, CT; Northrop Corporation, Anaheim, CA; Honeywell Inc., Minneapolis, MN; Hughes Optical Products, Inc., Chicago, IL; Varian, Palo Alto, CA; ITT Corp., Roanoke, VA.

Program Element: 64260N Title: CH/MH-53E

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project W0901, Helo Night Vision System (HNVS):

1. (U) Description: The primary goal of the HNVS effort is to improve fleet capability through the use of existing IR technology. The effort is directed primarily towards needs in amphibious and mine warfare areas. Specific deficiencies being addressed include an enhanced capability to operate low-level at night or in reduced visibility as identified in a 1977 Operational Requirement. The threat being addressed is enemy night warfare; major improvements in capability to be achieved are to provide a night and low visibility capability that does not presently exist. Specific components to be developed under this effort include an interface electronics unit and control unit which are necessary to integrate the AN/AAQ-11 Pilot Night Vision Sensor (PNVS) into the C/MH-53E. HNVS integration will provide up to a 90% improvement in helicopter night/all weather tactical capability for low altitude flights to avoid detection and ground-to-air weapons, and will enhance transport, assault, VOD and mine sweeping operations during periods of reduced visibility. The Army developed AH-64 AN/AAQ-11 is the only off-the-shelf infrared sensor in production which is suitable for the H-53 application and is being procured in accordance with Congressional guidance to use only existing systems. This effort interfaces with AN/AVS-6 Aviator's Night Vision Goggles which became operational in 1986.

2. (U) Program Accomplishments and Future Efforts: (From PE 64213N FY 1986 and FY 1987)

a. (U) FY 1986 Program: Under a Basic Ordering Agreement with Sikorsky Aircraft Company initial system design and integration studies were conducted to determine the modifications required to install the HNVS into the CH-53E.

- o Conducted Human Engineering, installation design/configuration and preliminary logistics support analysis.
- o Awarded the CH-53E HNVS FSED contract to prime contractor (Sikorsky) in June 1986. Prime will award subcontractor efforts to integrate HNVS.

b. (U) FY 1987 Program:

- o Complete aircraft modification detail design.
- o Complete component fabrication and assembly.

c. (U) FY 1988 Planned Program:

- o Complete aircraft modification and installation of HNVS in CH-53E.
- o Complete contractor ground and flight testing.

Program Element: 64260N Title: CH/MH-53E

- o Validate integrated logistics support (ILS) concept.

d. (U) FY 1989 Planned Program: Due to program restructure requirement identified after Navy Budget submission.

- o Complete Navy TECHEVAL and OPEVAL.

e. (U) Program to Completion:

- o Approval for Full Production (AFP) will be requested for HNVS installation.
- o Follow-on test and evaluation (FOT&E) will be conducted to fully evaluate HNVS for MH-53E missions.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W1109, CH/MH-53E:

1. (U) Description: The MH-53E will have significantly enhanced AMCM capability over the presently employed RH-53D. It will be able to clear mine fields more quickly and effectively for longer periods of time due to its ability to tow the heavier but more effective mine countermeasures equipment now under development. These new mine countermeasures systems cannot be fully employed by the RH-53D and are required to effectively counter Soviet mines. AMCM development completed in FY 1986. The MH-53E will also have an enhanced utility and special mission capsbility as well as a Night Vision System which will incorporate the U.S. Army developed Pilot Night Vision System (PNVS). Beginning in FY 1987, a composite main rotor blade (CMRB) will be developed which will greatly enhance CH/MH-53E safety, survivisbility, reliability and maintainability. It will provide unlimited spar crack propagation time, unlimited fatigue life, increased aircraft mean time between aborts, and increased ballistic tolerance. Additionally,efforts begin on development of the T64-GE-416 engine enhancement. This upgrade will provide the MH-53E the capability to hover out of ground effect in a one-engine-out emergency situation at mission gross weights for two minutes and then fly for one hour to effect a safe landing. This effort corrects an OPEVAL deficiency.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program: Completed development of MH-53E helicopter mission systems. Navy Technical Evaluation (DT-IID) and OPEVAL (OT-IIB) have been completed.

- o Approval for Limited Production (ALP) decision for four MH-53E helicopters was obtained.

Program Element: 64260N Title: CH/MH-53E

b. (U) FY 1987 Program:

- o Night Vision System Integration
- o Award contract for GE-T64 engine enhancement.
- o Develop specification for Composite Main Rotor Blade (CMRB).

c. (U) FY 1988 Planned Program:

- o Award competitive contract for CMRB.
- o Preliminary fabrication and test of CMRB.
- o Commence engine and engine/airframe interface testing.

d. (U) FY 1989 Planned Program:

- o Prototype design and preliminary testing of CMRB.

e. (U) Program to Completion: Conduct qualification program; Navy TECHEVAL and OPEVAL of CMRB.

f. (U) Major Milestones:

| | Milestone | Date |
|---|---|---|
| 1. | Contract Awsrd for CMRB | FY 1988 |
| 2. | Contract Award for T64-GE-416 Engine Enhancement | FY 1988 |
| 3. | TECHEVAL/OPEVAL for T64-GE-416 Engine | FY 1990 |
| 4. | TECHEVAL/OPEVAL for CMRB | FY 1992 |

I. (U) TEST AND EVALUATION DATA:

Test and Evaluation Data

A. Development Test and Evaluation (DT&E)

1. The CH-53E and MH-53E aircraft are managed by the Naval Air Systems Command (PMA-261). The CH-53E is an improved/growth version of the Navy/Marine H-53A/D Transport Helicopters. It features a third engine, a larger diameter rotor, seven versus six main rotor blades, an uprated main transmission, and a greater maximum gross weight and payload capability. Maximum payload is 16 tons for the CH-53E vice 8 tons for the earlier H-53A/D aircraft. The prime contractor is Sikorsky Aircraft Division of United Technologies Corporaton. The CH-53E received Approval for Service Use (ASU) in April 1982 and is currently in full production. It is employed by both Marine Corps and Navy Fleet Units. A variant of the H-53E is currently in production for use as a mine-countermeasures aircraft. The revised aircraft, known as the MH-53E, is configured with greater fuel capacity, an enhanced automatic flight control system, a more rugged tail rotor, a modified rear ramp, a tow boom and other provisions required for the mine-countermeasures mission. The main rotor, engines, transmissions, and basic airframe of the MH-53E are essentially the same as for the CH-53E.

2. The Development Test and Evaluation (DT&E) program for the CH-53E was segmented into three distinct phases: tests of a prototype aircraft, tests of preproduction articles and tests of initial production articles. Extensive contractor and Navy technical testing was performed in each of the developmental phases. Testing included Navy Preliminary Evaluations (NPEs) performed on prototype and preproduction aircraft, detailed Naval Technical Evaluations (NTEs/TECHEVAL) also performed on prototype and preproduction aircraft and Navy Board of Inspection and Survey (BIS) Trials performed on both preproduction and initial production aircraft. The final phase of BIS testing was completed in December 1982 with no major discrepancies noted.

3. Initial contractor testing of the MH configured H-53E started September 1983. Three phases of Navy DT&E are planned. The first phase of Navy testing was successfully completed in July 1984. The testing was conducted to assess the MH-53E readiness for limited production. An Approval for Limited Production decision (Milestone IIIA) was achieved in March 1985. The second phase of Navy testing (TECHEVAL) started in June 1985 and completed in November 1985, leading to the milestone IIIB production decision in November 1986. An additional third phase of testing will be performed, under the direction/monitoring of the Navy Board of Inspection and Survey (BIS) on two production aircraft to ensure that the production systems operate properly, to verify that corrections for deficiencies noted during TECHEVAL/OPEVAL are properly implemented in production aircraft and to validate new/revised production support equipment and repair procedures.

B. Operational Test and Evaluation (OT&E)

1. Commander Operational Test and Evaluation Force (COMOPTEVFOR) actively participated in all phases of the CH-53E development program for the purpose of determining military utility, operational effectiveness and operational suitability of the aircraft. COMOPTEVFOR representatives closely monitored contractor tests and evaluation and participated in Navy program technical reviews and DT&E. Two phases of operational testing were conducted on prototype and preproduction articles prior to

Provisional Approval for Service Use (PASU) and release to limited production in January 1979. Operational Evaluation (OPEVAL) followed release to limited production and was completed in May 1979. All operational reliability, availability, and maintainability thresholds were met or surpassed. COMOPTEVFOR concluded that the CH-53E is operationally suitable and, when not encountering exhaust gas re-ingestion (EGR), is operationally effective. Approval for Service Use was recommended only after elimination of significant EGR and verification of fixes by operational testing. Contractor improvements were installed and subsequent testing demonstrated a significant 67 percent to 84 percent reduction in EGR. Demonstration of the improvements was witnessed and verified by BIS and COMOPTEVFOR representatives. Approval for service use of the CH-53E was subsequently granted on 15 April 1980.

2. COMOPTEVFOR initiated Follow-on Operational Tests and Evaluation (FOT&E) of the production CH-53E in August 1981. Testing was conducted by Marine Helicopter Squadron One (HMX-1) to assess operational effectiveness and suitability of the production CH-53E and to verify corrective actions made as a result of recommendations from OPEVAL. FOT&E (OT-IIIA) was terminated 16 June 1983. Several planned demonstrations (hot weather performance, two-point external cargo lift and maximum airspeed) were not completed due to flight envelope restrictions. All restrictions were lifted and FOT&E (OT-IIIB) was completed in July 1985. COMOPTEVFOR found that the CH-53E is operationally effective and operationally suitable. The self retrieval lifting device currently is in development at Sikorsky. Additional effort is completed. OT-IIIB - two deficiencies a) relocate CO/hook indicator will not be accomplished as there is no place to relocate it to. b) The NATOPS changes were not made because the OT-IIIB report was released after the NATOPS conference. The changes will be reviewed at the next NATOPS conference in spring 1987.

3. Several phases of operational testing are planned for the MH-53E. The first phase (OT-IIA) was completed in July 1984. The COMOPTEVFOR test agencies are Air Test and Evaluation Squadron One (VX-1) and Helicopter Mine Countermeasures Squadron Twelve (HM-12). The objectives of OT-IIA were to assess the operational effectiveness and operational suitability of the MH-53E Helicopter, and its readiness for Limited Production. The MH-53E prototype met those objectives and received Approval for Limited Production (ALP) in March 1985. The second phase (OPEVAL) commenced in January 1986 and completed in April 1986. The test results cited nine deficiencies requiring resolution prior to full production. A second limitited production decision for four aircraft was made in November 1986, with additional testing scheduled for May/June 1987 to assess deficiency corrections. Subsequent FOT&E will be scheduled as required.

C. System Characteristics

1. Performance

| | Objective | Demonstrated |
|---|---|---|
| Payload, External, 50 NM radius<br>S/L 90 deg F, HIGE (20 min fuel reserve) | 16 tons (CH) (Note 1)<br>14 tons (MH) | 16 tons (CH) (Notes 4&5)<br>14 tons (MH) (Note 6) |
| Payload, Internal Payload<br>Internal fuel, 3000' MSL 91.5 deg F, HOGE | 8 tons (CH)<br>4 tons (MH) | 8 tons (CH) (Notes 1&5)<br>4 tons (MH) (Note 6) |
| Range (NM) Internal Payload (<br>(1,000 cu. ft cargo not to exceed gross weight limits)<br>w/full internal and full external aux. fuel tanks<br>(10% reserve) | 500 (CH) | 500 (CH) |

| | | |
|---|---|---|
| Time on Station (hours) | 3.0 (MH) | 3.2 (MH) (Note 6) |
| Tow Tension (lbs) | 30,000 (MH) | 30,000 (MH) (Note 7) |
| Maximum gross weight w/external payload, HIGE, SL/90 deg F (lbs) | 73,500 (CH) | 75,100 (CH) (Note 3) |
| Speed (KTS) VMAX (kts level flt, max continuous power SL) | | |
| 46.5K lbs GW (internal) | 170 (CH) | 170 (CH) (Note 2) |
| 70 K lbs GW (external) | 100 (CH) | 125 (CH) |

2. Reliability/Maintainability Goals/Availability Goals

| | | |
|---|---|---|
| Mission Reliability (1 hr mission) | .88 (CH) | .88 (CH) (Note 4) |
| (4 hr mission) | .59 (MH) | 0.79 (MH) (Note 6) |
| Mean Flight Hours Between Failures | 7.82 (CH) | 7.82 (CH) (Note 4) |
| | 7.6 (MH) | 14.3 (MH) (Note 6) |
| DMMH/FH (organizational corrective) | 9.5 (CH) | 7.72 (CH) (Note 4) |
| (total) | 21.0 (MH) | 19.1 (MH) (Note 6) |
| Operational Availability | .76 (MH) | 0.48 (MH) (Note 6) |
| Mean Time to Repair | 2.1 Hrs (MH) | 2.1 (MH) (Note 6) |
| Mission Capability | | |
| Conversion Time | 4.0 Hrs (MH) | 3.5 hrs (MH) (Note 6) |
| Turn-around Time | .8 Hrs (MH) | 0.8 hrs (MH) (Note 6) |

Notes:
1. Approved Program
2. Demonstrated during OT-IIIA
3. Demonstrated during NPE I. (The objective for above criteria was initially 69,750 lbs. To achieve mission capability, the gross weight was subsequently increased to 73,500 lbs. in the approved DCP #94 of 14 Feb 1978).
4. Demonstrated during OT-IIIA (Required gross weight increase to ensure 20 min. fuel reserve; gross weight increase verified as a result of uprated transmission qualification.)
5. Demonstrated during OT-IIIB utilizing the CNO approval NATOPS "Quick Strip Ship" Checklist.
6. Demonstrated during OT-IIB.
7. Demonstrated during DT-IIA, DT-IIB, DT-IIC, DT-IID

D. Current T&E Activity

T&E Activity (Past 12 Months)

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| Approval for Limited Production (MH-53E) | OCT 86 | NOV 86 | |
| MH-53E Operational Evaluation (OT-IIB) | Jan-Apr 86 | Apr 86 | Comoptevfor Report 3960 of 6 Oct 1986 |

T&E Activity (Next 12 Months)

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| MH-53E FOT&E (OT-IIIA) | MAY/JUNE 87 | TBD | Evaluate Opeval Deficiency Corrections |
| FOT&E for C-5A transportability certification | Jul 87 | TBD | Concurrent with OT-IIIA |

E. Program Documentation

1. CH-53E

| Event | Report No. | Date |
|---|---|---|
| NPE | NATC FT-23R-75 | 14 Mar 75 |
| | NATC RW-8R-76 | 27 Feb 76 |
| | NATC RW-63R-76 | 30 Dec 76 |
| BIS-ITP | NATC RW-15R-77 | 30 Aug 77 |
| NTE | NATC RW-15R-78 | 23 May 78 |
| | NATC RW-5R-79 | 23 Apr 79 |
| BIS-FTP | NATC RW-43R-81 | 18 Sep 81 |
| OT-IIA | COMOPTEVFOR 522 | 21 May 7 |
| OT-IIB | COMOPTEVFOR 1278 | 17 Dec 76 |
| OT-IIIA/Now IIA | COMOPTEVFOR 5121 | 2 Sep 77 |
| OT-IIIB/Now IIB | COMOPTEVFOR 364 | 10 Apr 78 |

2. MH-53E

| Event | Report No. | Date |
|---|---|---|
| OT-IIA | COMOPTEVFOR 813-OT-IIA Ser 412/1839 | 20 Nov 84 |
| | COMOPTEVFOR MSG 182030Z MAR 85 | |
| DT-IIB | NATC RW-100R-84 | 18 Mar 85 |
| DT-IID | NATC RW-57R-85 (Interim Report) | 12 Aug 85 |
| | NATC RW-77R-85 (Interim Report) | 11 Oct 85 |
| | NATC RW-105R-85 (Interim Report) | 19 Nov 85 |
| | NATC RW-115R-85 (Interim Report) | 27 Feb 86 |
| | NATC RW-23R-85 (Interim Report) | 12 Mar 86 |
| OT-IIB | COMOPTEVFOR RPT 3960, SER 413/1357 | 6 OCT 86 |

Test and Evaluation Master Plan No. 813 MH-53E SEA DRAGON dated 25 Mar 1985

| | | |
|---|---|---|
| OT-IIIC/New IIC | CNOPTEVFOR 1569 | 23 Nov 79 |
| OT-IIIA | CNOPTEVFOR 1060 | 5 Aug 83 |
| OT-IIIB | CNOPTEVFOR 3960-12 | 1 Aug 85 |

Test and Evaluation Master Plan No. 174 CH-53E SUPERSTALLION
dated 8 Jan 1985

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64261N
DoD Mission Area: 233 - Anti-Submarine Warfare

Title: Acoustic Search Sensors (Engineering)
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 27,816 | 34,555 | 47,859 | 55,385 | Continuing | Continuing |
| W0478 | Expendable, Reliable Acoustic Path Sonobuoy | 14,198 | 0 | 4,457 | 4,463 | 21,080 | 103,837 |
| W0480 | ASW Sensors and Processing | 5,356 | 23,790 | 3,753 | 1,243 | Continuing | Continuing |
| W1624 | Broadband Acoustic Systems | 8,262 | 10,765 | 15,336 | 12,079 | Continuing | Continuing |
| W2000 | Horizontal Line Array | * | * | 11,250 | 20,300 | 59,300 | 107,490 |
| W2001 | Tactical Surveillance Sonobuoy | * | * | 13,063 | 17,300 | 38,460 | 76,300 |

*Projects W2000 and W2001 were previously funded under W0480 prior to FY 1988.

The above funding includes out-year escalation and encompasses all work or development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for the engineering development of air acoustic search sensors to: (1) ensure a submarine prosecution capability is maintained against the quiet submarine threat of the 1990s and 2000s, (2) improve cost and operational effectiveness, (3) improve logistics support, airborne avionics, and software for advanced sonobuoys.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and this Descriptive Summary are as follows: Project W0478 - FY 1986 was reduced by 1,023 for G-R-H and Department budget adjustment. FY 1987 was zeroed by Congressional actions. FY 1988 was reduced 5,213 due to Department program/budget adjustments and NIF adjustments. Project W0480 and the title of the project has been changed to more accurately reflect the project goals. FY 1987 was reduced 1,466 by Congressional adjustment. In FY 1988, two subprojects were broken out of W0480, Tactical Surveillance Sonobuoy (W2001) and Horizontal Line Array (W2000), and given separate project numbers. W0480 was reduced 29,414 due to Departmental program adjustments to fund the project lines W2000 and W2001 (+11,250 and +1,306 respectively).

Program Element: 64261N Title: Acoustic Search Sensors (Engineering)

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 22,803 | 30,146 | 56,761 | 58,832 | Continuing | Continuing |
| W0478 | Expendable, Reliable Acoustic Path Sonobuoy (ERAPS) | 9,555 | 15,221 | 19,942 | 9,670 | 3,817 | 103,837 |
| W0480 | Passive Advanced Sonobuoy | 6,498 | 5,742 | 25,256 | 33,167 | Continuing | Continuing |
| W1624 | Broadband Acoustic Systems | 6,750 | 9,183 | 11,563 | 15,995 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Estimated Cost |
|---|---|---|---|---|---|---|---|
| W0478 | Expendable, Reliable Acoustic Path Sonobuoy (ERAPS) | | | | | | |
| | Procurement (OPN) | | 0 | 0 | 0 | Continuing | Continuing |
| | (Quantity) (each) | | | 0 | 0 | Continuing | Continuing |
| W1624 | Low Cost Sonobuoy (LCS) | | | | | | |
| | Procurement (OPN) | 41,527 | 0 | 33,958 | 31,869 | Continuing | Continuing |
| | (Quantity) (each) | 100,000 | 0 | 200,000 | 400,000 | | |

E. (U) RELATED ACTIVITIES: Program Element 62711N, Undersea Target Surveillance Technology; Program Element 63254N, Air Anti-Submarine Warfare; and Program Element 63708N, Advanced Acoustic Processing (detection algorithm development); Program Element 64217N, S-3 Weapon System Improvement Program; Program Element 64221N, P-3 Modernization; and Program Element 64212N, Light Airborne Multi-Purpose System MK III.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Development Center, Warminster, PA; Naval Surface Weapons Center, White Oak, MD; Naval Ocean Systems Center, San Diego, CA; Naval Avionics Center, Indianapolis, IN; Naval Weapons Support Center, Crane, IN; Naval Air Test Center, Patuxent River, MD; Naval Training Systems Center, Orlando, FL; Naval Air Engineering Center, Lakehurst, NJ; Naval Weapons Station, Earle, Colts Neck, NJ. CONTRACTORS: Magnavox, Ft. Wayne IN; Hazeltine, Braintree, MA; Bendix Oceanics,

Program Element: 64261N Title: Acoustic Search Sensors (Engineering)

Silmar CA., Sippican Ocean System, Marion, MA; Sparton, Jackson; MI. IBM, Manassas, VA; Applied Research Laboratory, University of Texas, Austin, TX; Lockheed, Burbank, CA; Boeing, Seattle, WA.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project WO478, Expendable, Reliable Acoustic Path Sonobuoy:

1. (U) Description: The AN/SSQ-75 Sonobuoy is an active (localization) sensor for use by anti-submarine warfare aircraft. It is designed to use the long range acoustic propagation mode known as the reliable acoustic path (RAP) and provides the air anti-submarine warfare forces the option to conduct active (small area) search for a submarine that is undetectable by passive acoustic sensors or rapid localization to attack of submarines detected by other sensors. The active detection ranges will be significantly greater than those experienced with today's active sonobuoys. The sonobuoy is deployed The detection is gained by a low frequency, high power transmitted pulse and a volumetric receiving array. Range, bearing and doppler are obtained. To perform required tests, 50 engineering development models and approximately 150 service test models for Navy Technical Evaluation/Initial Operational Test and Evaluation are required.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Preliminary signal processing software coding was completed.
- High data rate telemetry over varying length of the sea cable was demonstrated.
- Reliability and producibility design corrections were identified.
- Safe P-3 air carriage and delivery was demonstrated.

b. (U) FY 1987 Planned Program:

- Restructure project in accordance with Congressional guidance.
- New specification to reduce risk and production unit cost.
- Prepare for contract award in FY 1988.

Program Element: 64261N Title: Acoustic Search Sensors (Engineering)

c. (U) FY 1988 Planned Program:

* Award FSED Completion Contract.
* Logistics and training will be evaluated for adequacy.

d. (U) FY 1989 Planned Program:

* Conduct performance demonstrations.

e. (U) Program to Completion:

* DT/OT-IIA conducted FY 90/91. *ALP in FY 1992.
* OT-IIB conducted FY 94. *AFP in FY 1994.

f. (U) Major Milestones:

| Program | Milestone IIIA (ALP) | Milestone IIIB (AFP) | IOC |
|---|---|---|---|
| ERAPS | *FY 92/1Q | FY 94/4Q | |

* Preliminary Milestones subject to submittal to Congressional Committees of restructured project in FY 1987.

(U) Project W0480, Acoustic Sensors and Processing:

1. (U) Description: Provide improved air ASW mission effectiveness through engineering development of hardware and software associated with acoustic systems including sensors, processing, post-processing, data recording, and display for air ASW platforms to combat the quieter, faster Soviet submarine threat. Key objectives are: improved detection, classification, localization and tracking; increased capacity and flexibility to handle multi-sensor data. The project will develop sonobuoy systems to improve airborne detection and localization/attack capability against the advanced new threat. This project will examine long range tactical sensors to provide ASW aircraft a balanced capability to detect Higher gain vertical line array, will be developed to provide a force multiplication to meet the threat of the 1990's.

2. (U) Program Accomplishments and Future Efforts:

Program Element: 64261N

Title: Acoustic Search Sensors (Engineering)

a. (U) FY 1986 Program:

- Tactical Surveillance Sonobuoy (TSS). System definition and functional specifications completed. Subsystem trade-off study contracts initiated. (TSS now under W2001).
- Horizontal Line Array (HLA). Hardware specification completed. Successful at-sea performance demonstrations. Design selected for engineering development contract. (HLA now under W2000).

b. (U) FY 1987 Program:

- Tactical Surveillance Sonobuoy. Critical subassemblies will be designed and fabricated in the baseline TSS FSED. Functional design of enhanced baseline TSS will be done. (TSS now under W2001).
- Horizontal Line Array. The system design will be completed and the engineering development models fabrication will be initiated. Coding and testing of the software will begin. (HLA now under W2000). Modify existing AQA 7 Broadband contract to include Develop test plans and initial ILS plan.

c. (U) FY 1988 Planned Program

- Acoustic Intercept System. Sonobuoy and avionics development transitions to this element from PE 63254N, W1292.
- System Integration. Integration of and with other components required for total platform integration will be initiated.

d. (U) FY 1989 Planned Program:

- Active Enhancements (AE) - Demonstrated improvements transition to this element from PE 63254N, W1292. DT/OT II testing for ALP.
- Systems Integration. Complete aircraft interface specifications.

e. (U) Program to Completion:

- This is a continuing program element, projects from PE 63254N, Project W1292 will transition to this program.
- Tactical Arctic Sonobuoy (TAS) - Transitions to this element from PE 63254N, W1292.

Program Element: 64261N Title: Acoustic Search Sensors (Engineering)

* Full scale development of the Advanced Active Sonobuoy (AAS) and Improved Low Cost Sonobuoy (ILCS) will be conducted under this element after feasibility demonstrations under PE 63254N, W1292.

f. (U) Major Milestones:

| Milestones | Milestone II (Begin FSED) | Milestone III (ALP) | IOC (with ALP units) |
|---|---|---|---|
| AIS (Buoy) | FY 88/1Q | FY 89/3Q | |

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W2001, Tactical Surveillance Sonobuoy (TSS):

1. (U) Description: The Tactical Surveillance Sonobuoy (TSS) system is designed for large area search and detection of 1990s nuclear and diesel submarines. System consists of an expendable A-sized sonobuoy with trigger-controlled data storage capability, faster than real-time play-back mode, a minimum 5-day in-water life, and associated avionics. The data storage/playback capability is used to provide a "force multiplier effect" which allows one aircraft to cover significantly larger areas than can be monitored with real-time sonobuoys.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

* System definition and functional specifications completed.
* Subsystem trade-off study contracts initiated.

b. (U) FY 1987 Program:

* Critical subassemblies will be designed and fabricated in the baseline TSS FSED.
* Functional design of enhanced baseline TSS will be done.

c. (U) FY 1988 Planned Program:

* Testing of the baseline TSS engineering development models.

Program Element: 64261N Title: Acoustic Search Sensors (Engineering)

° Enhanced baseline functional design and total system design will be initiated.
° System Integration. Integration of TSS with other components required for total platform integration will be initiated.

d. (U) FY 1989 Planned Program:

° Engineering tests complete, procure units for TECHEVAL/OPEVAL.
° Systems Integration. Complete aircraft interface specifications.

e. (U) Program to Completion:

° TECHEVAL/OPEVAL for the sonobuoy will commence in FY 1990, and full aircraft system TECHEVAL/OPEVAL will be initiated for FY 1992.

f. (U) Major Milestones:

| Milestones | Milestone II (Begin FSED) | Milestone III (ALP) | IOC (with ALP units) |
|---|---|---|---|
| TSS | FY 87/2Q | FY 91/1Q | |

(U) Project W2000, Horizontal Line Array (HLA)

1. Description: The HLA sonobuoy is an expendable air launched sensor utilized by ASW aircraft to achieve long range acoustic detection of submarine targets in large search areas. HLA consists of a self-tensioning horizontal line array of passive hydrophones and is designed to transmit multiplexed digital acoustic data to the aircraft for processing. HLA Air Deployable Active Reciever (HLA/ADAR) utilizes the HLA sonobuoy with modified avionics as a multi-static active receiver for use with ship-deployed sources. The primary goal is detection and localization of submarines in all environments in the 1990-2000 timeframe.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

° HLA hardware specification completed. Successful at-sea performance demonstrations. Design selected for engineering development.

Program Element: 64261N

Title: Acoustic Search Sensors (Engineering)

b. (U) FY 1987 Program:

- The HLA system design will be completed and the engineering development models fabrication will be initiated. Coding and testing of the software will begin.

c. (U) FY 1988 Planned Program:

- Testing of HLA engineering development models. Initial software delivery will be made for use in testing with test bed aircraft.
- System Integration: HLA integration with other components required for total platform integration will be initiated.
- Functional specifications for HLA/ADAR avionics and interface modifications.

d. (U) FY 1989 Planned Program:

- Continue testing of engineering models.
- System integration. Complete aircraft interface specifications.
- Initiate avionics software implementation for HLA/ADAR.

e. (U) Program to Completion:

- TECHEVAL/OPEVAL for the HLA sonobuoy in FY 1991, HLA/ADAR in FY 1992 and full aircraft systems TECHEVAL/OPEVAL initiated in FY 1993.

f. (U) Major Milestones:

| Milestones | Milestone II (Begin FSED) | Milestone III (AIP) | IOC (with ALP units) |
|---|---|---|---|
| HLA | FY 1987/3Q | FY 1992/4Q | |
| HLA/ADAR | FY 1988/4Q | FY 1992/4Q | |

Program Element: 64261N Title: Acoustic Search Sensors (Engineering)

(U) Project W1624, Broadband Acoustic System:

1. (U) Description: (Project W1624, Broadband Acoustic System). Develop passive sonobuoys and processing to detect and localize quiet threat submarines by exploiting their broadband acoustic signals. Since current air ASW acoustic systems are optimized for acoustic signature detection, this effort will provide a more balanced, and therefore less vulnerable, passive acoustic detection capability. Broadband processing techniques for use with current passive sonobuoys are being developed for incorporation into the AN/AQA-7 acoustic processor (P-3 aircraft) and for software update of the AN/UYS-1 Advanced Signal Processor (P-3C, S-3B and LAMPS MK III aircraft). Sonobuoy developments are addressing alerting sonobuoys to employ a high density field concept for initial detection of quiet targets in barriers or screens or for small area search. The sonobuoy developments will pursue sensor designs compatible with the evolving threat and will use advanced manufacturing technology to produce an alerting sonobuoy at significantly reduced costs (Low Cost Sonobuoy).

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- Continued development for fabrication and test of the LCS system.
- Initial LCS developmental tests (DT) and operational tests (OT) conducted with submarine targets performed as predicted.
- Work continued on techniques to reduce false alarms, develop launcher containers, and develop an aircraft scanning capability.
- In Broadband Acoustic Syatems (initiated in Advanced ASW Avionics, PE 63254N, Project W1292), efforts were initiated to develop broadband alert processing to support the LCS system, AN/AQA-7(V) broadband correlation, and design and production of LCS.

b. (U) FY 1987 Program:

- Further testing with initial pilot production LCS assets to develop optimum tactical utilization.
- Additional initial operational evaluation will be conducted to demonstrate reliability improvements that significantly reduce false alarm rate that was found to be unacceptable.
- and low cost sonobuoy system developments and evaluation will be incorporated in design specifications leading to advanced and enhanced LCS capability.
- Development of common P-3/S-3 scanner for the Low Cost Sonobuoy System will continue and EDMs will be delivered for testing and commencement of platform software integration efforts.

Program Element: 64261N Title: Acoustic Search Sensors (Engineering)

- The AN/AQA-7 broadband correlation processing OPEVAL for AFP will be completed under PE 64221N, (P-3 MOD).

c. (U) FY 1988 Planned Program:

- The TECHEVAL/OPEVAL of the Low Cost Sonobuoy System (sensor, launcher avionics) avionics development will be conducted.
- Pre-planned product improvements will continue in development and test.
- Competition for design of the advanced low cost sonobuoy system will be conducted.
- processing algorithms from CUARP will be applied to air ASW acoustic sensors.

d. (U) FY 1989 Planned Program:

- Advanced low cost sonobuoy designs will be fabricated for test and evaluation.
- Avionics and launcher interface and integration will be defined.
- processing for all acoustic sensors will be continued.

e. (U) Program to Completion:

- Develop, evaluate, and demonstrate the capability for advanced processing and sensors.
- TECHEVAL/OPEVAL of the advanced LCS capability will be conducted.
- Processing and display development will be continued for advanced sensors to obtain minimum operator workload with maximum data flow.
- Software development in the UYS-1 will be completed.

f. (U) Milestones:

| | Milestone II (Begin FSED) | Milestone III (AFP) | IOC |
|---|---|---|---|
| AQA-7 | FY 82/4Q | Transferred to PE 64221N | |
| Low Cost Sonobuoy | FY 83/4Q | FY 89/1Q | |
| UYS-1 S/W (Correlation) | FY 83/1Q | Transferred to PE 64221N | |
| LCS System/Avionics | FY 83/4Q | FY 88/1Q | |

I. (U) TEST AND EVALUATION DATA: Not Applicable

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64262N*
DoD Mission Area: 265 - Intratheater Airlift
Title: V-22
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 525,249[2] | 422,671 | 465,662 | 306,677 | 481,805 | 2,500,700[3] |
| W1425 | V-22 OSPREY | 525,249[2] | 422,671 | 465,662 | 306,677 | 481,805 | 2,500,700[3] |

* Project W1425, V-22 OSPREY changed from 63256N to 64262N in FY 1987 submission to reflect transition into 6.4 FSED effort.
[2] Funding is in PE 63256N through FY 1986. V-22 ASW Variant funding is reflected in PE 63256N.
[3] V-22 is capped at $2.5B for RDT&E. Total estimated cost includes 29,900 expended under PE 64222A in FY-83 and reflects a below threshold reprogramming of 300 for ASW study effort in FY 1986.

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The V-22 program is designed to provide an aircraft to meet the amphibious/vertical assault needs of the Marine Corps, the Combat Search and Rescue (CSAR) needs of the Navy, and the Special Operations (SOF) needs of the Air Force. The V-22 will be capable of flying over 2000 nautical miles without refueling. This gives the Services the advantage of a VSTOL aircraft that can rapidly self-deploy to any location in the world.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: In FY 1987, increase of 35,800 for Congressional action. In FY 1988, decreases of 17,425 for Department Program/Budget adjustments.

Program Element: 64262N Title: V-22

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 177,270 | 557,326 | 386,871 | 483,087 | 772,946 | 2,500,400 |
| W1425 | V-22 OSPREY | 177,270 | 557,326 | 386,871 | 483,087 | 772,946 | 2,500,400 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| Aircraft Procurement, Navy (N/A) | 0 | 0 | 0 | 350,744 | Continuing | Continuing |
| Quantity | 0 | 0 | 0 | 0 | Continuing | Continuing |

E. (U) RELATED ACTIVITIES: The V-22 is a joint service program with the Navy as Executive Service and Army and Air Force participating. The Army and Air Force will have a unique project line in their budgets.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Development Center (Avionics Engineering) Warminster, PA; Naval Air Test Center (Operational Testing) Patuxent River, MD; Naval Avionics Center (Avionics Software) Indianapolis, IN.. CONTRACTORS: Bell-Boeing (Air Vehicle) Fort Worth, TX; Allison Gas Turbine Division, General Motors Corp, Indianapolis, IN. (Enginea).

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project W1425, V-22 Osprey:

1. (U) Description: The V-22 Osprey is a Department of the Navy program for the purpose of developing, testing, evaluating, procuring and fielding a tilt-rotor, vertical takeoff and landing aircraft for Joint Service application. The V-22 will replace the CH-46 and the CH-53 A/D aircraft in the Marine Corps, the HH-3A in the Navy, and supplement the MC-130 aircraft in the Air Force. Although not a participant in the FSED of the V-22, the Army has a stated requirement that it will procure the USMC medium lift version for that services use. The program is in FSED under Fixed Price type contract with the Research and Development funding capped at $2.5B and negotiated not-to-exceed prices for the first four production lots.

Program Element: 64262N Title: V-22

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

- o Milestone II DSARC decision for entry into FSED was approved in April 1986.
- o Full Scale Engineering Development (FSED) contract signed which provides for the development, test and evaluation, and logistics/production planning of the aircraft.
- o A FSED contract was awarded for the development of the production engine based on a competitive solicitation.
- o Commenced the manufacturing and assembly of six flight test and three ground test articles plus the related systems test and evaluation and systems engineering effort.
- o Initiated design, development, fabrication, and assembly of test engines and began engine qualification testing.
- o Procured long lead material for non-flight qualified engines.

b. (U) FY 1987 Program:

- o Continue fabrication and assembly of flight and ground test articles.
- o Continue fabrication and qualification of the engine.

c. (U) FY 1988 Planned Program:

- o Flight preparation begins for aircraft numbers one through four.
- o First flight is scheduled for June 1988.

d. (U) FY 1989 Planned Program:

- o Begin shipboard trials.
- o Development and operational testing is to be conducted at both the contractors' sites and at the Naval Air Test Center, Patuxent River, MD.

Program Element: 64262N Title: V-22

- o Advanced acquisition for V-22 pilot production.
- o Flight preparation begins for aircraft numbers five and six.

e. (U) Program to Completion:

- o Milestone IIIA is scheduled for Approval for Limited Production (ALP).
- o Complete DT-1IE/OT-IIB testing.
- o Complete DT/OT-IIC testing August 1991.

f. (U) Major Milestones:

| Milestone | Date |
|---|---|
| 1. Milestone 0 | December 1981 |
| 2. Milestone I | December 1982 |
| 3. Preliminary Design Contract Award | April 1983 |
| 4. Milestone II | April 1986 |
| 5. Full Scale Development Contract Award | May 1986 |
| 6. Production Contract Award (Adv Acq) | January 1989 |
| 7. OT-IIA (Complete) | August 1989 |
| 8. Milestone IIIA | December 1989 |
| 9. OT-IIB (Complete) | August 1990 |
| 10. Milestone IIIB (Limited Prod) | December 1990 |
| 11. OT-IIC (Complete) | August 1991 |
| 12. Milestone IIIC (Full Prod) | December 1991 |
| 13. First Fleet Deliveries | December 1991 |
| 14. IOC (5 Aircraft Training Detachment) | 1992 |

I. (U) TEST AND EVALUATION DATA:

Program Element: 64262N Title: V-22 Osprey

I. (U) TEST AND EVALUATION DATA:

1. Development Test and Evaluation (DT&E):

a. DT-O. During the period February through April 1982, a Joint Technical Assessment (JTA) of potential V-22 design approaches was conducted. From that JTA, the tilt-rotor concept was concluded to offer the most effective design approach. This concept has been demonstrated with 700 flight hours by the NASA/Army XV-15 technology demonstrator.

b. DT-I. During the period December 1983 through August 1986, large and small scale wind tunnel models, mockups, and piloted simulations were used extensively.

c. DT-II. Period of development testing for full scale development (August 1986 through February 1992). Government flight test periods are as follows:

(1) DT-IIA. (January 1989). Tests will be conducted at Bell Helicopter Textron in Fort Worth Texas to verify initial contractor data on flying qualities and performance.

(2) DT-IIB. (May 1989). Forty flight test hours will be conducted on FSD aircraft to verify contractor results of propulsion, flight control and automatic flight control system testing and to develop preliminary envelope clearance and a flight envelope for at sea operations.

(3) DT-IIC. (October 1989). Fifty flight test hours will be conducted to verify shipboard compatibility.

(4) DT-IID. (January 1990). Thirty flight test hours will be conducted to examine the full flight envelope and the full flight control and automatic flight control systems.

(5) DT-IIE. (March 1990). Thirty flight test hours will be conducted to examine the initial avionics and missions systems.

(6) DT-IIF. (November 1990). TECHEVAL will be conducted for 120 hours to examine all flight and mission capabilities as required in the V-22 detailed specification.

d. DT-III. (TBD). The Aviation Board of Inspection and Survey will monitor the V-22 developmental program.

2. Operational Test and Evaluation (OT&E):

a. OT-IIA. (July 1989). This test will assess the potential operational effectiveness and potential operational suitability of the basic aircraft. Approximately 100 hours will be flown on two aircraft from various airfields and ships by COMOPTEVFOR (HMX-1 and VX-5).

b. OT-IIB. (June 1990). OT-IIB will be conducted in three phases: Phase I will consist of weapons delivery operations to evaluate all weapons against ground and air targets. Phase II will consist of amphibious operations using all available platforms and will include evaluating V-22 as an integral part of an amphibious task force. Phase III will consist of shore-based operations for a period of approximately four weeks.

c. OT-IIC OPEVAL. (March 1991). OT-IIC will determine the operational effectiveness and operational suitability of the V-22 and its readiness for fleet introduction. Emphasis will be on improved performance and maintenance. OT-IIC will be conducted in three phases: Phase I will evaluate amphibious operations and applicable Navy missions. Phase II will be conducted to evaluate land-based Marine Corps missions in a cold weather environment. Phase III will evaluate USMC/USN missions profiles in a high altitude hot weather environment.

d. OT-III. (TBD). OT-III will be conducted as required to verify correction of deficiencies, complete deferred or incomplete OT&E, and to continue tactics development.

e. OT-IV. (TBD). OT-IV will be conducted on production aircraft to validate operational effectiveness and operational suitability.

3. System Characteristics:

| a. Technical | Approved Program | Demonstrated Performance |
|---|---|---|
| Length, ft Folded/Unfolded | 62.24/57.33 | |
| Width, ft Folded/Unfolded | 18.42/83.83 | |
| Height, ft Folded/Unfolded | 17.98/21.73 | |
| Empty Weight, lbs | 31,786 | |
| **b. Operational** | | |
| Readiness, mun capability rate (% MC) | 70 | |
| Mission Complete Probability, Rate (MFHBMA - Design Controllable) | 98 | |
| Direct Maintenance Man-Hours per Flight Hour, Design Controllable: | | |
| O Level, Unscheduled (Corrective) | 7.0 | |
| O Level, Scheduled (Preventive) | 2.5 | |
| World-wide Self-Deployment, nm (minimum distance) | 2100 | |
| Continuous Cruise Speed, kts | 250 | |
| Dash Speed, kts | 275 | |
| Instantaneous G-Loading (+/-) | +4.0/-1.0 | |
| Troop Capacity | 24 | |
| External Cargo, lbs | 10,000 | |

4. Current T&E Activity:

T&E Activity (Past 12 Months)

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| DT-I | Dec 1983 - Aug 1986 | Dec 1983 - Aug 1986 | DT-I testing included: Wind tunnel verification of aerodynamic design, mockups to evaluate the design adequacy, critical structural element demonstrations, cutouts and piloted simulations, and design trade-off studies. |

T&E Activity (Next 12 Months)

| Event | Planned Date | Actual Date | Remarks |
|---|---|---|---|
| None | | | |

5. Program Documentation:

| | |
|---|---|
| Decision Coordinating Paper | Approved May 1986 |
| Acquisition Plan (A62-37-1-40) | Approved July 1986 |
| Test and Evaluation Master Plan (TEMP), M960 | Approved July 1986. |

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64264N
Title: Aviation Life Support Systems
DoD Mission Area: 225 - Air Warfare Support
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 25,038 | 24,099 | 22,308 | 18,905 | Continuing | Continuing |
| WO606 | Aviation Personnel Life Support Systems | 25,038 | 24,099 | 22,308 | 18,905 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides the engineering development, technical evaluation, and initial operational test and evaluation of a family of Aircrew Life Support Equipment for naval aircraft weapons systems. It includes the integrated assemblages of components and techniques required to assure aircrew and passengers the most effective inflight environment, inflight escape capability, and emergency protection and survival provisions. This program element accomplishes the transition of life support equipment from advanced development to engineering development followed by approval for production.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary is as follows: In FY 1986, the decrease of 2380 is the result of GRH and Department program/budget adjustments; in FY 1987 the decrease of 5,606 is the result of Congressional adjustment and Department program/budget adjustments; and in FY 1988, the decrease of 9327 is the result of Department program/budget adjustments.

Program Element: 64264N Title: Aviation Life Support Systems

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 10,712 | 27,418 | 29,705 | 31,635 | Continuing | Continuing |
| WO606 | Aviation Personnel Life Support Systems | 10,712 | 27,418 | 29,705 | 31,635 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| APN-5 | SEAHARS VAR. | 2,195 | - | - | - | | 2,195 |
| | HELO CBR VAR. | 506 | 2,532 | - | - | | 3,038 |
| | A-7 SEAT 4-LINE REL. | - | 378 | 186 | 180 | 80 | 824 |
| | RSSK 7 REPLACEMENT | 1,686 | 876 | - | - | | 1,649 |
| APN-6 | HELO CBR | 26 | 80 | - | - | | 106 |
| OPN | HELO CBR | 4,474 | 13,502 | 0 | 0 | | 17,976 |
| | PRC-125 SAR RADIO | 2,181 | 231 | 236 | 244 | 250 | 3,144 |
| | PRC-90-1 ANNUAL REPL | 1,470 | 1,527 | 1,573 | 1,614 | 1,653 | 7,837 |
| | PRC-90-1 GFM CASING | 6,222 | - | - | - | | 6,222 |
| | SUPPORT EQUIPMENT | 371 | 100 | - | 1,300 | 700 | 2,471 |
| | PRODUCTION ENGR | 1,015 | 557 | 400 | 1,050 | 750 | 3,772 |
| | ILS | 696 | 399 | 50 | 900 | 700 | 2,745 |

E. (U) RELATED ACTIVITIES: Program Element 62122N, Aircraft Technology; Program Element 62233N, Mission Support Technology; Program Element 62234N, Mission Support Technology; Program Element 63216N, Aviation Life Support Systems. Related Air Force efforts, supported by Program Element 64706F, Life Support Equipment, are coordinated through the Tri-Service Life Support Equipment Steering Committee.

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Air Development Center, Warminster, PA; Naval Ordnance Station, Indian Head, MD; Naval Air Test Center, Patuxent River, MD; Naval Weapons Center, China Lake, CA; and Naval Avionics Center, Indianapolis, IN. CONTRACTORS: Martin-Baker Aircraft Co., Ltd, Higher Denham, near Uxbridge, Middlesex, England; Crumman Aerospace Corporation,

Program Element: 64264N Title: Aviation Life Support Systems

Berhpage, Long Island, NY; McDonnell Aircraft Company, St. Louis, MO; Douglas Aircraft Co., Long Beach, CA; Negretti & Zambra (Aviation) Ltd., Essex, England and others to be determined.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) Project WO606, Aviation Personnel Life Support Systems:

1. (U) Description: This project provides maximum functional capability of aircrews during normal missions and also provides a means to enhance safe and reliable escape, descent, survival, and recovery in combat and peacetime emergency situations. This continuing project provides for the conduct of necessary engineering development, test and evaluation, and initial operational test and evluation of Aviation Personnel Life Support Systems. This project accomplishes the transition of life support systems from advanced development to completion of full scale development to demonstrate that the design meets necessary operational requirement prior to the first major production decision.

(U) Major sub-projects under this project are:

(a) Navy Aircrew Common Ejection Seat (NACES): The NACES program objective is to competitively select one ejection seat design as the common Navy seat for the F/A-18A, F/A-18B, T-45. F-14D, and A-6F aircraft. The NACES will be designed, developed, and qualified as a state-of-the-art, open type ejection seat compatible with the various aircraft aircrew stations and will interface with the existing aircraft escape system. A leader-follower concept will be implemented to obtain two qualified seat producers for future competitive acquisition of annual production requirements. In addition, a pre-planned product improvement ($P^3I$) program and a government furnished equipment (GFE) breakout of high value consumables will be initiated to further reduce life cycle costs (LCC).

(b) Chemical/Biological/Radiological Flight Protective System (Helicopter) (CBR HELO): USN/USMC aircrew personnel are not equipped for sustained operations in a CBR environment. Aircrew capability to operate effectively in an environment degraded by an actual or anticipated CBR attack must be improved. The present standard issue of personal protective clothing and equipment for aircrew and air embarked personnel does not afford the required protection from the predicted CBR environment. The eye and respiratory portions of the head are most vulnerable to CBR penetration and are the most complex for achieving protection from a technical and user acceptability standpoint. Analysis to date has indicated that the UK-developed AR-5 respirator is the only near term candidate device that meets all the requirements specified for helo aircraft. The USMC helicopter community has been assigned highest priority for improved CBR protection capability. Approval for Limited Production (ALP) was granted in January 1986.

(c) On-Board Oxygen Generation System (OBOGS) Improvements: An engineering development program is underway to introduce the OBOGS system into tactical naval aircraft with the AV-8 "Harrier" being the first aircraft designated for its application.

Program Element: 64264N Title: Aviation Life Support Systems

Approval for full production (AFP) has been granted for the AV-8B, and the pilot, limited production, and production aircraft have the OBOGS system integrated. This program will provide engineering and technical support for efforts complementary to the engineering development program. Specific efforts include update of plans/documentation and data, development of subsystem components and hardware, and inter-service coordination. A follow-on contract for multi-station concentrator testing will be awarded. The fluidic monitor development effort, which is geared to correct OBOGS monitor deficiencies found in Operational Test and Evaluation (OPEVAL), will continue.

(d) Naval Aircrew Chemical and Biological Warfare Defense System (NACBWDS): The USN/USMC are required by SECNAVINST (S) 5430.86 and OPNAVINST (S) 3400.10C to sustain operations in a chemically or biologically (CB) contaminated environment. Current and future warfare scenarios indicate an increased probability that CB agents will be used. To satisfy these requirements, a CBW protection system must be developed to provide whole body protection to Naval Aircrews. This system will consist of two subsystems: A head, eye, respiratory protection system and a CBW protective clothing ensemble. The USAF has been designated by the Joint Logistics Command (JLC) as lead service in the development of aircraft CBW protection.

(e) Advanced Technology Cockpit (ATC): Today's cockpit design and layout is fundamentally the same as it has been for the last 30 years. Controls, displays and ejection seats are configured in the cockpit after airframe constraints are imposed on the geometry. New threats concentrating on high levels of acceleration/rates of onset create the possibility of instantaneous inflight loss of consciousness, and loading of various cardio/respiratory functions where the aircrewman becomes the weakest link. To overcome/limit the impact of the human element provides new challenges in cockpit design.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

NACES

- o Initiated component and subsystem design verification tests.
- o Initiated component and subsystem qualification tests.
- o Solicited request for quote for follower production efforts of the Leader/Follower concept.
- o Selected follower.

Helicopter Emergency Egress Device (HEED)

- o Completed technical data packages.

Program Element: 64264N Title: Aviation Life Support Systems

- o Developed operator maintenance training package.
- o Performed OPEVAL
- o Granted AFP.

CBR (HELO)

- o Product Improvements:
  - Rip-away face plate.
  - Quick disconnect.
  - Rechargeable battery.
  - Glasses.
- o Performed OPEVAL.
- o Granted ALP.

NACBWDS

- o Developed specification requirements.
- o Interfaced with USAF NAERP program.

OBOGS

- o Evaluated prototype sensor tip feasibility.
- o Prepared solicitation for multi-man FY 1988 procurement.

STATE-OF-THE-ART SURVIVAL ITEMS

- o Reviewed and evaluated survival items that are currently being used by other services and NATO countries which can easily be adopted for naval service use.

Program Element: 64264N Title: Aviation Life Support Systems

Mini-raft backpack

- o Completed OPEVAL and obtained Approval for Full Production.
- o Submitted technical data package.

Quick Donning Anti-Exposure Coverall (CWU-60/P)

- o Finalization of:
  - NAVAIR 13-1-6.7 Aircrew Personal Equipment Manual with Verification.
  - Design change notice.
- o Completed fleet indoctrination and transition to fleet support.
- o Conducted OPEVAL and obtained Approval for Full Production.

b. (U) FY 1987 Program:

NACES - Conduct the following:

- F/A-18A full syster qualification testing.
- F/A-18B full system qualification testing.
- Component and subsystem qualification testing.
- T-45 and A-6F component and subsystem qualification testing.
- T-45 and A-6F design verification testing.
- ALP for NACES/F/A-18.
- Initiate survivability harness improvements.

CBR HELO

Program Element: 64264M Title: Aviation Life Support Systems

o Perform follow-on test and evaluation of improvements recommended during OPEVAL.

NACBWDS

o Monitoring Air Force efforts to define Navy peculiar requirements.

o Complete Test and Evaluation Master Plan.

o Development tests of alternative designs.

ADVANCED TECHNOLOGY COCKPIT

o Development of requirements for solicitation.

o Prepare program and acquisition plans.

c. (U) FY 1988 Planned Program:

NACES

o NACES/F/A-18 - Approval for Full Production.

o Development system testing for T-45, A-6F, F-14D.

o Follower certification testing (Phase I).

o Continue survivability improvements.

NACBWDS

o Complete development testing.

ADVANCED TECHNOLOGY COCKPIT

o Evaluate proposals.

OBOGS IMPROVEMENTS

Program Element: 64264N Title: Aviation Life Support Systems

- o Evaluate proposals for multi-man system and award contract.
- o Make decision to continue with either monitor or sensor tip improvements.

LASER EYE PROTECTION

- o Prepare multi-wavelength (Four specific wavelengths) design for technical/operational evaluation for existing threats.
- o Prepare logistics plan.

STATE-OF-THE-ART SURVIVAL ITEMS

- o Develop specifications for requirements that could not be satisfied by the review of NATO countries and other services survival items.
- o Prepare TOR.

CARRIER ON-BOARD DELIVERY/VERTICAL ON-BOARD DELIVERY (COD/VOD) PASSENGER ANTI-EXPOSURE PROTECTION

- o Procure and perform preliminary evaluation of off-the-shelf garments.
- o Develop logistics requirements.

d. (U) FY 1989 Planned Program:

NACES

- o Operational testing on T-45, A-6F, F-14D.
- o Follower certification testing Phase II.
- o Complete survivability improvements P$^3$I.

COD/VOD PASSENGER PROTECTION

- o Perform development tests on candidate garments.
- o Initiate OPEVAL.

Program Element: 64264N Title: Aviation Life Support Systems

STATE-OF-THE-ART SURVIVAL ITEMS

- o Prepare solicitation for procurement of development items.
- o Evaluate proposals and make selection.

NACBWDS

- o Complete OPEVAL.
- o Obtain AFP.

ADVANCED TECHNOLOGY COCKPIT

- o Award contract.
- o Test and evaluation of alternative sub-assemblies.

OBOGS IMPROVEMENTS

- o Complete development testing.
- o FOT&E of monitor or sensor tip and multi-man systems.

LASER PROTECTION

- o Obtain AFP for multi-wavelength system (near term solution).
- o Monitor USA/USAF efforts on protection from future threats (long-term solution).

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones:

| NACES Date |
|---|

Program Element: 64264N

Title: Aviation Life Support Systems

| | |
|---|---|
| 1. Issue request for quote | Apr 84 |
| 2. Award contract | May 85 |
| 3. Engineering | May 85 - Oct 86 |
| 4. Seat and component tests | Sep 85 - Aug 87 |
| 5. Issue follower request for quote | Feb 86 |
| 6. Order long lead items | May 86 |
| 7. Order production seats | Dec 86 |
| 8. Award follower contract | Jul 86 |
| 9. Commence OPEVAL | Mar 87 |
| 10. Deliver production seats | May 87 - May 89 |
| 11. F/A-18 system AFP | Sep 87 |
| 12. F-14D and A-6F AFP | Apr 88 |
| 13. Follower Production | Apr 88 |
| 14. GFE consumable breakout | Jul 88 |

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64268N

Title: Aircraft Engine Component Improvement Program

DoD Mission Area: 225 - Air Warfare Support

Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 51,076 | 43,319 | 35,832 | 37,267 | Continuing | Continuing |
| W1355 | A/C Eng. Comp. Imp. Prog. | 51,076 | 43,319 | 35,832 | 37,267 | Continuing | Continuing |

The above funding profile includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Aircraft Engine Component Improvement Program (CIP) provides in-service engineering support for all Navy aircraft engines, transmissions, propellers, starters, auxiliary power units, electrical generating syatems, fuel systems and fuels and lubricants. The effort is needed because exposure of complex, high-tech engine syatems to the operational environment inevitably results in unforseen problems, which if not resolved, result in either safety or readiness degradation. It is a tri-service, jointly funded program which includes cost sharing with commercial and foreign users, where applicable.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: in FY 1986, the decrease of 10,458 is the result of GRH and Department program/budget adjuatments; in FY 1987, the decrease of 21,864 is a result of Congressional action and adjustments; in FY 1988, the decrease of 34,544 is the result of Department NIF rate and program/budget adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 78,262 | 61,534 | 65,183 | 70,876 | Continuing | Continuing |
| W1355 | A/C Eng. Comp. Imp. Prog. | 78,262 | 61,534 | 65,183 | 70,876 | Continuing | Continuing |

Program Element: 64268N Title: Aircraft Engine Component Improvement Program

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: Not Applicable.

F. (U) WORK PERFORMED BY: IN-HOUSE: Lead laboratory is the Naval Air Propulsion Center, Trenton, NJ. OTHERS: Naval Air Test Center, Patuxent River, MD; Naval Air Development Center, Warminster, PA; Naval Weapon Support Center, Crane, IN; Naval Research Laboratory, Washington, DC; and Naval Ship Research Development Center, Carderock, MD. CONTRACTORS: Allison Gas Turbine Operation, Indianapolis, IN; General Electric Company, Lynn, MA, and Evendale, OH; Garrett Turbine Engine Co., Phoenix, AZ; Pratt and Whitney Aircraft of Canada, Limited, Montreal, Canada; Pratt and Whitney Aircraft Group, West Palm Beach, FL; Rolls Royce, London, England; Turbo Mach, IRC, San Diego, CA; Bendix Corporation, Utica, NY; Hamilton Standard Division, Windsor Locks, CT; Lucas, Englewood, NJ; and Williams International, Walled Lake, MI.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89: Not Applicable.

H. (U) PROJECTS OVER $10 MILLION IN FY 1988/89:

(U) PROJECT W1355, AIRCRAFT ENGINE COMPONENT IMPROVEMENT PROGRAM:

1. (U) Description: The CIP is designed to apply engineering support resources (analysis, test, design/development, etc.) in direct response to fleet needs. Fleet problems are identified through evaluation of operational data and direct input from operational and maintenance units. Problems manifest themselves in many ways, the most common are: in-flight hardware failure, lost readiness due to low reliability and excessive maintenance support costs. The Navy monitors the "Health of the Fleet" by analyzing 10 reliability, maintainability and supportability parameters: mean-time-between-failure, mean-time-between maintenance-actions, aborts, engine caused aborts, engine removals, engine caused removals, maintenance index, mean time to repair, not mission capable, and component removals. Threshold values and trending are used to trigger analysis action. Solutions are provided as design modifications, life limits, inspection limits, repair procedures, maintenance procedures, source qualification, operating limits, etc.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

(U) F404 engine:

o An $8K per engine cost savings and a 6 pound weight reduction were achieved by changing the material of the compressor outer duct from titanium to composites.

Program Element: 64268N

Title: Aircraft Engine Component Improvement Program

- Redesigned the power level control and fuel flow transmitter to increase the reliability of both parts.

- The service life of the low pressure turbine was increased from 2,400 to 4,000 hours by revising the disk bore seal dimension and adding a new seal ring. Prior to this redesign, every rotor disassembled at depot showed wear that had to be repaired; creating a shortage of low pressure turbines which impacted fleet readiness.

(U) J52 engine:

- Completed action on redesigned compressor seals which reduce compressor stalls and improve all the "Health of the Fleet" parameters.

- Compressor stator stiffening rings were redesigned to reduce a high failure rate, thereby increasing reliability, supportability and availability while reducing maintenance man-hours.

- Completed engineering analysis that established wearout rates and forecast requirements for tired iron recovery program.

- Established low-cycle fatigue lives for most rotating parts.

(U) F402 engine:

- Increased the life of the inlet guide vane pressure return pipe by 50 percent.

- Completed engineering verification of high-time engine life by running a 300 hour accelerated simulated mission endurance test. This lead-the-fleet program provides added confidence to new -406 fleet engines which are approaching 100 hours.

- Continued development and testing of a high pressure turbine single crystal blade and new nozzle guide vane which will eliminate the need for replacement at 500 hours.

(U) T700 engine:

- Increased life limits were substantiated on major engine parts which will reduce life cycle costs and engine removal rates. This was accomplished through a life management program.

- Combat readiness was enhanced through a reduction in engine-caused aborts and removal rates by increasing the engine performance margin by 4%.

Program Element: 64268N Title: Aircraft Engine Component Improvement Program

(U) TF30 engine:

- o Increased the life of the outer combustion case transition duct by 100%.
- o Engine-caused aborts were reduced by changing the configuration of the afterburner manifold nut and eliminating a safety of flight problem with fuel leakage.

(U) Other engines: Similar accomplishments were obtained for the other engines supported by the CIP program. Specific benefits were related to safety and readiness problems, specification performance, redesign of low reliability parts, forecasting hardware wearout rates, and development and qualification of design changes and repair procedures.

b. (U) FY 1987 Program: The CIP will provide engineering support for all engines and related hardware in the Navy inventory. Tasks planned for FY 1987 include the following known problems:

(U) F404 engine:

- o Redesign of the variable exhaust nozzle (VEN) will be completed. The new parts will reduce non-mission capable hours and component removal rates. The old design contributed to more than 30 percent of the maintenance actions and 16 percent of the maintenance man-hours charged against the engine.
- o Complete qualification testing of a redesigned after retainer plate which will eliminate a cracking problem (11 to date). Cracked plates contribute to lower turbine disk life.
- o Initiate engineering redesign to provide increased stiffness in the afterburner liner. There have been 6 operational incidents, 2 of which resulted in power losses.
- o Complete testing of an improved material for the number 4 bearing. The new material will minimize failures and could result in $48 million dollar savings over 20 years. There have been 8 bearing failures and the potential exists for in-flight power loss.

(U) J52 engine:

- o Initiate a program to correct deceleration hang-up of the fuel control which has contributed to engine caused aborts and high fuel control failure rates.
- o Develop a revised mid-compressor bleed system control which will increase the engine stall margin, positively affecting all the "Health of the Fleet" parameters.

- o Initiate efforts to define LCF lives for static structures.

(U) F402 engine:

- o Complete qualification of the turbine single crystal blade and nozzle guide vane.
- o Conduct an extensive analysis of the fuel control to identify aircraft handling problems and reduce the high maintenance index.

(U) T700 engine:

- o Redesign turbine nozzle air seals and blades to reduce field performance deterioration.
- o Initiate a program to reduce engine removals caused by foreign object damage. The stage one blisk will be redesigned to increase compressor efficiency and tolerate more foreign object and sand erosion damage.

(U) TF30 engine:

- o Installation of a new first stage turbine nozzle guide vane will increase scheduled hot section inspection interval from 605 to 750 hours. The abort rate will be reduced by eliminating turbine damage due to vane burn through.
- o The maintenance index (MMH/EFH) will be decreased by the introduction of a new fourth stage turbine outer airseal which eliminates/minimizes blade knife edge seal wear.
- o An increase in mean-time-between-failures will result from a redesigned second stage turbine shroud. A material and configuration change addresses a blade shroud looseness problem which can lead to blade failure due to high vibratory stresses.

(U) Other engines: CIP programs for other engines are directed toward the resolution of service revealed problems with the primary emphasis on correction of all safety of flight problems. Development of repair procedures or work arounds to prevent overhaul line stoppage and maintain logistic support for the engines will be accomplished. Testing will be accomplished to verify fixes and repair procedures.

c. (U) FY 1988 Planned Program: Some prior year tasks will be carried into FY 1988, as the time required to redesign and qualify parts made from castings and forgings takes more than one year to complete. Tasks planned for FY 1988 include the following known problems:

Program Element: 64268N Title: Aircraft Engine Component Improvement Program

(U) F404 Engine:

- o Conduct accelersted mission testing to determine lives of rotating parts. Identify failure modes of high-pressure turbine blades above current 2000 hour limit.
- o Reduce the frequency of afterburner module removals by increasing flame holder life to 2,000 hours via material and design changes.
- o Redesign auxiliary gearbox bearings to prevent outer-race rotation which results in lubrication system contamination.
- o Extend the life of the combustor case by introduction of new materials.
- o Conduct engineering analysis to determine methods of improving combuster deceleration flameout margin.
- o Extend life and reduce cost of low-pressure turbine driveshaft via material and design change.
- o Conduct Repair Engineering Program.

(U) J52 Engine:

- o Complete low-cycle fatigue life analysis of static structures.
- o Perform repair engineering and investigate service problems as necessary.

(U) F402 Engine:

- o Conduct accelerated simulated mission endurance testing to detect problems or defects on the F402-406 design before Fleet use.
- o Eliminate 2nd stage low pressure compressor disc cracking via material and design change.
- o Eliminate turbine casing bolt failure via material and design change.
- o Eliminate No. 4 bearing oil scavenge failures via material and design change.
- o Redesign inlet guide vane dust cover to prevent cracking.

Program Element: 64268N Title: Aircraft Engine Component Improvement Program

- o Reduce 1st and 2nd stage low-pressure turbine shroud blade wear via material and design change.
- o Provide increased bleed air for auxilisry systems usage.

(U) TF30 Engine:

- o Investigate and correct compressor stator vane failures. Goal is to increase scheduled removsl interval from 1600 to 2400 hours.
- o Evaluate engine deterioration caused by fan blade and fan inlet case necks, main fuel pump and fuel control leaks, gearbox leaks, No. 4 bearing failures and afterburner nozzle segment distress.
- o Develop repair procedures for the afterburner, low pressure turbine knife edge seals and outer air seals, vanes and other areas as required.

(U) T700 Engine:

- o Continue program to reduce foreign object damage related engine removals.
- o Initiate program to update life predictions and wearout forecasting.
- o Continue life snalysis/management program to update projected life limits and wearout rates.

(U) F110 and T56-427 Engines: These two engines enter operational status in FY 1988. Aggressive mission testing is planned to provide early detection of deficiencies, minimize service problems and extend initial parts lives. Investigation and correction of problems revealed in Fleet use will commence.

(U) Other engines: CIP programs for other engines are directed toward the resolution of service revealed problems with the primary emphasis on correction of all safety of flight problems. Development of repair procedures or work arounds to prevent overhaul line stoppage and maintain logistic support for the engines will be accomplished. Testing will be accomplished to verify fixes and repair procedures.

c. FY 1989 Planned Program: The FY 1989 program will include problems that are uncovered during the next 24-28 months through analysis of the "Health of the Fleet" parameters. Tasks will include:

- o Improve engine reliability and maintainability by improving on the design of marginal components.

Program Element: 64268N

Title: Aircraft Engine Component Improvement Program

- o Maintain engine specification requirements.
- o Provide early disclosure of weaknesses that would limit engine life and would normally appear only after extended service operation.
- o Reduce maintenance and spare part cost through the review, evaluation and introduction of repair techniques.
- o Reduce/eliminate causes of engine performance deterioration

e. (U) Program to completion: This is a continuing program. Many fleet engines are out of production (TF41, TF30, J79, T400, T58, TF34, etc.) and out of contractor warranty. CIP is the only source of funds to resolve failure modes and ensure combat readiness is maintained. In addition, new production engines (F110, T406, T56-427, F405) will enter the CIP umbrella within the FYDP, and funding must be provided to support these engines.

f. (U) Major Milestones: Not Applicable.

I. (U) TEST AND EVALUATION DATA: Not Applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64301N
Title: MK-92 Fire Control System Upgrade
DoD Mission Area: 231 - Anti-Air Warfare
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 11,436 | 3,762 | 3,516 | 2,974 | Continuing | Continuing |
| S0179 | MK92 Fire Control System Upgrade | 11,436 | 3,762 | 3,516 | 2,974 | Continuing | Continuing |

The above funding profile includes out year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element develops improvements to the MK 92 Fire Control System installed in 51 FFG-7 class frigates, six PHM-1 class missile patrol hydrofoils and 25 U.S. Coast Guard cutters.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: in FY 1986, a decrease of 1,718 is the result of GRH and Department program/budget adjustments; in FY 1987, a decrease of 4,046 is the result of Congressional actions and adjustments; in FY 1988, a decrease of 9,200 is the result of Department program/budget adjustments.

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 15,352 | 13,154 | 7,808 | 12,716 | Continuing | Continuing |
| S0179 | MK92 Fire Control System Upgrade | 15,352 | 13,154 | 7,808 | 12,716 | Continuing | Continuing |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS: Not Applicable.

E. (U) RELATED ACTIVITIES: PE 24294N, Guided Missile Frigate; PE 64366N, Standard Missile Improvements; PE 24229Q, SM-2(MR) Block II missile; PE 63382N, Battle Group Anti-Air Warfare Coordination; PE 64372N, New Threat Upgrade.

Program Element: 64301N Title: MK-92 Fire Control System Upgrade

F. (U) WORK PERFORMED BY: IN-HOUSE: Naval Surface Weapons Center, Dahlgren, VA; Naval Ship Weapon Systems Engineering Station, Port Hueneme, CA. CONTRACTORS: Sperry Corporation, Great Neck, NY is the prime contractor. OTHERS: Johns Hopkins University, Applied Physics Laboratory, Laurel, MD; Automation Industries, Vitro Laboratories Division, Silver Spring, MD.

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project S0179, MK 92 Fire Control System Upgrade

1. (U) Description: The MK 92 Upgrade consists of two parts:

a. (U) Completion of the MK 92 PHASE II (CORT) Program and implementation in FFG 61. Design of a Coherent Receiver/Transmitter (CORT) to improve MK 92 performance in adverse weather and electronic countermeasures environment began in FY 1982. An Engineering Development Model (EDM) was designed and fabricated. This EDM successfully completed environmental testing and acceptance testing in FY 1985. Land based developmental testing was completed in December 1985 and at-sea developmental testing completed in September 1986. At-sea operational testing of the EDM was completed during November 1986. FCS MK 92 MOD 6 configuration resulting from this development will be integrated with other elements of the FFG 61 Combat System Configuration, i.e., AN/SPS-49(V)5, AN/SPS-55, AN/SYS-2(V), Weapons System Processor (WSP) and Weapons Alternate Processor (WAP) Computer Programs, during FY 87 and FY 88. Deficiencies discovered during at-sea testing of the FCS MK 92 MOD 6 (EDM) will also be corrected during this time period.

b. (U) Reliability, Maintainability and Availability (RMA) modifications will be developed to improve the system reliability, maintainability and availability of the FCS MK 92 MOD 2 and other configurations. Equipment involved in these improvements will be the Antenna Systems, Weapons Control Consoles, Servo Control Cabinet (SCC) and other peripheral equipment. This part of the program will resolve problems reported by the fleet as high failure items. The development of these modifications will be started during FY 90.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

MK 92 CORT Development

- Completed at-sea development testing of Coherent Receiver-Transmitter (CORT)
- Continued at-sea operational testing through remainder of FY 86.

Program Element: 64301N Title: MK-92 Fire Control System Upgrade

b. (U) FY 1987 Planned Program:

CORT Development/Implementation in FFG-61.

- Complete operstional testing and obtain approval for Limited Production.
- Remove MK 92 CORT EDM from FFG-15 and install at Combat Systems Test Center MacArthur Field to support FFG-61 integration testing.
- Correction of testing deficiencies identified during land based and at-sea development testing and at-sea operational testing.
- Complete development of computer programs for MK 92 and WSP/WAP Baseline 8.
- Complete stand alone testing of these computer programs.
- Initiate integration testing of MK 92, AN/SPS-49, SYS-2(V) and WSP/WAP Baseline 8. (Combat Systems Integration).

c. (U) FY 1988 Planned Program:

MK 92 CORT Implementation in FFG-61.

- Continue development and testing of design corrections resulting from developmental and operational testing to be incorporsted during FFG-61 Post Shakedown Availability.
- Continue combat system integration testing for FFG-61.
- Initiate planning for DT III/OT III in FFG-61.
- Provide computer programs to support FFG-61.

d. (U) FY 1989 Planned Program:

CORT Implementation of FFG-61 AAW Integration:

- Support certification of AAW computer programs for FFG-61.
- Provide computer programs to support an integrated FFG-61 AAW Combat System at Final Contract Trials.
- Complete development and testing of design corrections resulting from development and operational testing.
- Initiate DT III shipboard testing in FFG-61.

e. (U) Program to Completion:

This is a continuing program. Work on RMA upgrades is planned to start in FY 1990.

Program Element: 64301N

Title: MK-92 Fire Control System Upgrade

f. (U) Major Milestones:

| | |
|---|---|
| CORT Development/FFG-61 Implementation. | |
| DT-IIA Complete | FY87/1Q |
| FFG-15 Restoration | FY87/1Q |
| Weapons Control Processor/ Software Change Proposal/ SYS-2 Development Complete | FY87/4Q |
| Combat System Integration Complete | FY88/1Q |

H. (U) PROJECTS GREATER THAN $10 MILLION IN FY 1988 89: Not applicable.

I. (U) TEST AND EVALUATION DATA: Not applicable.

FY 1988/89 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64303N
DoD Mission Area: 231 - Anti-Air Warfare

Title: AEGIS Area Air Defense
Budget Activity: 4 - Tactical Programs

A. (U) FY 1988/89 RESOURCES (PROJECT LISTING): (Dollars in Thousands)

| Project No. | Title | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 7,883 | 4,104 | 7,384 | 9,267 | 29,384 | 82,919 |
| S1776 | AEGIS Weapon System Mods | 7,883 | 4,104 | 7,384 | 9,267 | 29,384 | 82,919 |

The above funding includes out-year escalation and encompasses all work and development phases now planned or anticipated through FY 1989.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for modifications to the AEGIS Weapon System MK-7 and integration of the Vertical Launching System, MK 41, into the AEGIS Weapon System. Additionally, development for operational support of the crew and AEGIS unique equipment is required to maintain currency with CG 47 Baseline Upgrades in Program Element 64307N, Project S1447 and introduction of DDG 51, Program Element 64307N, Projects S1337 and S1937. Prior funding in this program provided for the original development of the AEGIS shipboard area air defense system to provide the quick reaction time, high firepower, continuous weapons availability and immunity to electronic countermeasures necessary to protect the Battle Group in the face of the growing Soviet threat. Funds currently budgeted provide for development of updates to the AEGIS Weapon System, particularly the AN/SPY-1A radar system; development of an Automatic Test Set for isolating faults, testing printed circuit boards and an analog chassis to be resident at an AEGIS-unique depot and development of Part Task Trainers to facilitate AEGIS crew training. The funds for the MK-41 Vertical Launching System provides for design and development of modifications necessary for compatibility with the newer baselines of the AEGIS Weapon System and include the introduction of AN/UYK-44 computers in the MK 41.

C. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (Dollars in Thousands) The changes between the funding profile shown in the FY 1987 Descriptive Summary and that shown in this Descriptive Summary are as follows: in FY 1986 a reduction of 2,771 GRH and Department budget adjustments. Resource changes reflect inclusion of funds from PE 64353N (Vertical Launching System) starting in FY 1988.

Program Element: 64303N Title: AEGIS Area Air Defense

(U) FUNDING AS REFLECTED IN THE FY 1987 DESCRIPTIVE SUMMARY:

| Project No. | Title | FY 1985 Actual | FY 1986 Estimate | FY 1987 Estimate | FY 1988 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | TOTAL FOR PROGRAM ELEMENT | 12,654 | 10,654 | 4,312 | 6,822 | 30,068 | 76,721 |
| S1776 | AEGIS Weapon System Mods | 12,654 | 10,654 | 4,312 | 6,822 | 30,068 | 76,721 |

D. (U) OTHER FY 1988/89 APPROPRIATION FUNDS:

| | FY 1986 Actual | FY 1987 Estimate | FY 1988 Estimate | FY 1989 Estimate | Additional to Completion | Total Estimated Cost |
|---|---|---|---|---|---|---|
| SCN (AEGIS CG-47) | 2,633,500 | 2,868,600 | 2,141,000 | 1,974,400 | 1,048,968 | 25,864,400 |
| (Quantity) | (3) | (3) | (2) | (2) | (1) | (27) |
| SCN (DDG 51) | 104,100 | 1,730,400 | 2,281,500 | 2,325,300 | 17,337,800 | 24,809,500 |
| (Quantity) | | (2) | (3) | (3) | (20) | (29) |
| MILCON | | | | | | |
| P-711 (NESEA) | 4,650 | | | | | |
| P-314 (ACSC) | | | 15,000 | | | |
| P-214 (AEC) | | | | 9,000 | | |
| P-195 (AEC) | | 3,000 | | | | |
| P-199 (ACC) | | 3,800 | | | | |
| P-231 (PSF) | | 5,500 | | | | |
| P-238 (BEO) | | | 4,900 | | | |

E. (U) RELATED ACTIVITIES: Program Element 64307N (CG 47 Product Improvement), relates to Engineering Development of AEGIS Combat System; Program Element 63382N (Battle Group Anti-Air Warfare Coordination), relates to increased coordinstion of Battle Group Anti-Air Defensea; Program Element 64366N (STANDARD Missile Improvements) and Program Element 63318N (AEGIS ER) relate to missile development for the AEGIS Weapon System.

F. (U) WORK PERFORMED BY: Contractors: RCA, Moorestown, NJ; Martin Marietta Baltimore Aerospace, Baltimore, MD; and FMC Northern Ordnance Division, Minneapolis, MN. Others: General Dynamics/Convair, San Diego, CA; General Dynamics/Pomona, Pomona, CA; Johns Hopkins University, Applied Physics Laboratory, Laurel, MD; McDonnell Douglas Astronautics Corporation, St. Louis, MD; TECHMATICS, Arlington, VA; VITRO Laborstory/Automatic Industries, Silver Spring, MD. In-House: Naval Surface Weapons Center, Dahlgren, VA; Naval Training Engineering Center, Norfolk, VA; Naval Ship Weapon Systems Engineering Station, Port Hueneme, CA; Fleet Analysis Center, Corona, CA.

Program Element: 64303N Title: AEGIS Area Air Defense

G. (U) PROJECTS LESS THAN $10 MILLION IN FY 1988/89:

(U) Project S1776, AEGIS Weapon System Mods:

1. (U) Description: The Fleet of the 1980's and beyond must be capable of operating in a highly sophisticated, multi-threat environment characterized by coordinated saturation attacks of long-range, anti-ship missiles launched under cover of massive electronic countermeasures. The requirement to meet this challenge was recognized in the 1960's. In December 1969, the Navy awarded a contract to RCA to engineer and test a third generation advanced Anti-Air Warfare Missile System now known as the AEGIS Weapon System. Today, the AEGIS Weapon System is a high-performance Area Air Defense System which features faster reaction, higher firepower, longer range and improved reliability and performance over its predecessors. The heart of the system is the AN/SPY-1A radar, a multi-function, phased array radar which automatically detects the target, provides target tracking solutions, and transmits midcourse guidance commands to STANDARD Missiles in flight. AEGIS Weapon Systems are currently in production and programmed for twenty-seven CG-47 and twenty-nine DDG-51 class ships. This project was initiated in FY 1984 when engineering learned in the development of the AN/SPY-1B Radar provided the opportunity to engineer ORDALTS for the AN/SPY-1A Radar to improve its performance. Also provided is the operation and maintenance of the AEGIS Engineering Model in USS NORTON SOUND until planned decommissioning in FY 1987 and development of equipment for AEGIS shore-based depots and training sites. The Vertical Launching System provides for the design and development of the modifications necessary to the MK-41 Vertical Launching System design for compatibility with the AEGIS fire control systems and current and future generation missiles. The program includes computer programs, electronic modules and mechnical system upgrades, and compatibility testing at land based development sites prior to fleet delivery. Previous efforts were funded under Program Element 64353N, Project S1004, and provided for development of equipment and computer program modifications to adapt the Vertical Launching System to STANDARD Missile 2 (Medium Range) Block II and the AEGIS Weapon System.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1986 Program:

* Continued design and engineering of the fire control system power supply voltage tolerance increase.

* Completed additional Fire Control System upgrade studies for the Cross Field Amplifier tube, Solid State modulator, and adaptive quadrature alignment.

* Continued support of AEGIS Engineering Model-1 in USS NORTON SOUND to accommodate testing for AEGIS, Vertical Launch, STANDARD Missile, and TOMAHAWK Weapon Systems.

* Continued development of Depot Automatic Test Set computer programs consistent with CG-47 and DDG-51 AEGIS Weapon System upgrades.

Program Element: 64303N Title: AEGIS Area Air Defense

- Continued development of the Radar Supervisor Controller Environment Trainer.
- Installed AN/SPY-1A Radar Trainer and continued assessment of other Part Task Trainers to supplement AEGIS Combat System training in the AEGIS Education Center at Dahlgren, VA.
- Completed development of course software for use in the AEGIS Combat System Interface Trainer.

b. (U) FY 1987 Program:

- Continue support USS NORTON SOUND through the first quarter, FY 1987.
- Complete design and engineering of the Fire Control System transmitter ORDALT for the switch tube and modulator.
- Begin AN/SPY-1 ORDALT designs for the SPY transmitter and signal processor.
- Complete development of Depot Automatic Test Set computer programs consistent with AEGIS Weapon System modification upgrades.
- Complete development of the Radar Supervisor Controller Environmental Trainer and analysis of Stressed Operator Part Task Trainer requirements.

c. (U) FY 1988 Planned Program:

- Complete design and engineering of the AN/SPY-1 transmitter switch tube and signal processor Moving Target Indicator Upgrade.
- Continue design and engineering of the signal processor sidelobe guardband filters.
- Complete installation and test of the Fire Control System power supply.
- Start Vertical Launching System integration testing with CG-47 Baseline 3 and DDG 51 Flight 1 computer programs at the Combat System Engineering Development Site, Moorestown, NJ, Naval Surface Weapons Center, Dahlgren, VA, and Integrated Combat System Test Facility.
- Begin Vertical Launching System computer program safety analysis using the AN/UYK-44 computer.

Program Element: 64303N Title: AEGIS Area Air Defense

- Continue development of AN/UYK-44 capable Advanced Interface Driver Simulator and begin system integration testing at Martin Marietta Baltimore Aerospace.

d. (U) FY 1989 Program:

- Begin installation and test of signal processor sidelobe guardbands.
- Complete integration and test of the AN/SPY-1 trsnsmitter switch tube and signal processor Moving Target Indicator upgrades.
- Complete for initial delivery, design and development efforts for transition of the Vertical Launching System to AN/UYK-44 computers.
- Conduct final AN/UYK-44 integration testing with AEGIS, TOMAHAWK, and the Anti-Submarine Warfare Control System for initisl delivery of AN/UYK-44 computer programs.
- Complete development and testing of the AN/UYK-44 capable advanced Interface Driver Simulator.
- Continue Computer Program Nuclear Safety Analysis for AN/UYK-44 computer program.
- Continue development of Vertical Launching System Shipboard Interface Upgrades including Phase III Canister Safe and Enable Switch development.

e. (U) Program to Completion: This is a continuing program.

f. (U) Major Milestones:

| | Milestone | Date |
|---|---|---|
| 1. | Decommission USS NORTON SOUND | Dec 1986 |
| 2. | Complete AEGIS Combat System Interface Trainer | Aug 1987 |
| 3. | Complete Depot Automatic Test Set computer programs | Mar 1988 |
| 4. | Complete and install Radar Supervisor Controller Stress Trsiner | Jul 1988 |
| 5. | Begin Vertical Launching System Integration Tests | TBD |
| 6. | Begin Vertical Launching System Safety analysis | TBD |

H. (U) PROJECT OVER $10 MILLION IN FY 1988/89: Not Applicable

I. (U) TEST AND EVALUATION DATA: Not Applicable.