DEPARTMENT OF THE NAVY
FISCAL YEAR (FY) 2000/2001 BIENNIAL BUDGET ESTIMATES



19990505 028

JUSTIFICATION OF ESTIMATES
FEBRUARY 1999

RESEARCH, DEVELOPMENT, TEST & EVALUATION, NAVY
BUDGET ACTIVITY 4

DTIC QUALITY INSPECTED 4

DISTRIBUTION STATEMENT A
Approved for
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Department of the Navy
FY 2000 RDT&E Program

Exhibit R-1

APPROPRIATION: 1319n Research, Development, Test and Evaluation, Navy

DATE: February 1999

R-1 Line Number	Program Element Number	Item Nomenclature	Budget Activity	Thousands of Dollars FY 1998	FY 1999	FY 2000	Security Classification
30	0603207N	Air/Ocean Tactical Application	4	25,829	25,643	30,109	U
31	0603216N	Aviation Survivability	4	15,359	11,103	7,280	U
32	0603254N	ASW Systems Development	4	23,263	25,872	17,780	U
		(R2/R3 Materials provided in Classified Budget Book)					
33	0603261N	Tactical Airborne Reconnaissance	4	12,874	1,474	1,975	U
34	0603382N	Adv Combat System Technology	4	4,813	6,634	6,828	U
35	0603502N	Surface & Shallow Water Mine Countermeasures	4	70,143	88,211	82,465	U
36	0603504N	Adv Submarine Combat Systems Dev	4	58,849	67,766	-	U
		(R2/R3 Materials included in Classified Budget Book)					
37	0603506N	Surface Ship Torpedo Defense	4	-	4,989	640	
38	0603512N	Carrier Systems Development	4	54,046	109,208	142,783	U
39	0603513N	Shipboard System Component Dev	4	56,961	100,748	108,334	U
40	0603514N	Ship Combat Survivability	4	2,201	-	-	U
41	0603525N	PILOT FISH	4	114,648	116,393	94,085	U
		(Classified -- Material Not Available)					
42	0603527N	RETRACT LARCH	4	-	-	7,834	
		(Classified -- Material Not Available)					
43	0603536N	RETRACT JUNIPER	4	9,365	11,030	5,983	U
		(Classified -- Material Not Available)					
44	0603542N	Radiological Control	4	2,863	3,587	605	U
45	0603553N	Surface ASW	4	3,738	1,075	2,949	U
46	0603561N	Advanced Submarine System Dev	4	106,790	60,321	115,767	U
47	0603562N	Submarine Tactical Warfare Sys	4	3,950	4,517	4,667	U
48	0603563N	Ship Concept Advanced Design	4	5,264	7,077	5,318	U
49	0603564N	Ship Prelim Design & Feasibility Studies	4	17,721	8,929	12,012	U
50	0603570N	Advanced Nuclear Power Systems	4	121,590	118,067	146,208	U
		(R2/R3 Materials included in Classified Budget Book)					
51	0603573N	Adv Surface Machinery Systems	4	29,514	24,344	17,727	U
52	0603576N	CHALK EAGLE	4	130,232	121,316	95,329	U
		(Classified -- Material Not Available)					
53	0603582N	Combat System Integration	4	11,059	21,774	46,740	U

Department of the Navy
FY 2000 RDT&E Program

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54	0603609N	Conventional Munitions	4	36,870	40,596	34,309	U
55	0603611M	Marine Corps Assault Vehicles	4	67,202	103,966	94,843	U
56	0603612M	MC Mine Countermeasures	4	-	1,953		U
57	0603635M	MC Ground Combat/Support System	4	41,118	54,251	42,654	U
58	0603654N	Jt Serv Explosive Ordnance Dev	4	10,142	10,458	11,168	U
59	0603658N	Cooperative Engagement Capability	4	200,512	200,635	114,931	U
60	0603713N	Ocean Engineering Development	4	9,953	15,219	16,813	U
61	0603721N	Environmental Protection	4	50,718	71,170	70,793	U
62	0603724N	Navy Energy Program	4	4,005	4,571	4,984	U
63	0603725N	Facilities Improvement	4	6,387	1,853	1,985	U
64	0603734N	CHALK CORAL (Classified -- Material Not Available)	4	90,767	97,251	42,707	U
65	0603739N	Navy Logistic Productivity (Prior Year Only -- R2/R3 Not Required)	4	-	2,993	-	
66	0603746N	RETRACT MAPLE (Classified -- Material Not Available)	4	111,723	115,198	122,217	U
67	0603748N	LINK PLUMERIA (Classified -- Material Not Available)	4	32,489	21,775	48,254	U
68	0603751N	RETRACT ELM (Classified -- Material Not Available)	4	20,619	19,415	19,535	U
69	0603755N	Ship Self Defense	4	9,253	12,120	5,654	U
70	0603764N	LINK EVERGREEN (Classified -- Material Not Available)		-	-	7,879	
71	0603787N	Special Processes (Classified -- Material Not Available)	4	82,074	81,490	69,332	U
72	0603790N	NATO Research and Development	4	5,526	8,852	5,461	U
73	0603795N	Guns Weapons System Technology	4	61,282	78,858	101,489	U
74	0603800N	Joint Adv Strike Technology Program	4	448,236	468,509	241,238	U
75	0603851M	Non -Lethal Warfare Dem/Val	4	16,073	34,512	23,277	U
76	0603857N	All Service Combat ID Eval Team (ASCIET)	4	-	-	13,027	
77	0603860N	JPALS	4	2,825	-	-	U
78	0603889N	Counterdrug RDT&E (Prior Year Only -- R2/R3 Not Required)	4	15,883	-	-	
79	0604327N	Hard and Deeply Buried Target Defeat System	4	4,582	2,993	4,924	U
80	0604707N	SEW Architecture/Eng Support	4	12,860	19,804	35,170	U
		Total Demonstration and Validation (Dem/Val)		2,222,171	2,408,520	2,086,062	

Department of the Navy
FY 2000 RDT&E Program
Alphabetic Listing

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50	0603570N	Advanced Nuclear Power Systems	4	121,590	118,067	146,208	U
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46	0603561N	Advanced Submarine System Dev	4	106,790	60,321	115,767	U
30	0603207N	Air/Ocean Tactical Application	4	25,829	25,643	30,109	U
76	0603857N	All Service Combat ID Eval Team (ASCIET)	4	-	-	13,027	
32	0603254N	ASW Systems Development	4	23,263	25,872	17,780	U
		(R2/R3 Materials provided in Classified Budget Book)					
31	0603216N	Aviation Survivability	4	15,359	11,103	7,280	U
64	0603734N	CHALK CORAL	4	90,767	97,251	42,707	U
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52	0603576N	CHALK EAGLE	4	130,232	121,316	95,329	U
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38	0603512N	Carrier Systems Development	4	54,046	109,208	142,783	U
53	0603582N	Combat System Integration	4	11,059	21,774	46,740	U
78	0603889N	Counterdrug RDT&E	4	15,883	-	-	
		(Prior Year Only -- R2/R3 Not Required)					
61	0603721N	Environmental Protection	4	50,718	71,170	70,793	U
63	0603725N	Facilities Improvement	4	6,387	1,853	1,985	U
79	0604327N	Hard and Deeply Buried Target Defeat System	4	4,582	2,993	4,924	U
74	0603800N	Joint Adv Strike Technology Program	4	448,236	468,509	241,238	U
77	0603860N	JPALS	4	2,825	-	-	U
58	0603654N	Jt Serv Explosive Ordnance Dev	4	10,142	10,458	11,168	U
73	0603795N	Guns Weapons System Technology	4	61,282	78,858	101,489	U
70	0603764N	LINK EVERGREEN		-	-	7,879	
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67	0603748N	LINK PLUMERIA	4	32,489	21,775	48,254	U
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56	0603612M	MC Mine Countermeasures	4	-	1,953		U
72	0603790N	NATO Research and Development	4	5,526	8,852	5,461	U
62	0603724N	Navy Energy Program	4	4,005	4,571	4,984	U
65	0603739N	Navy Logistic Productivity	4	-	2,993	-	
		(Prior Year Only -- R2/R3 Not Required)					
75	0603851M	Non -Lethal Warfare Dem/Val	4	16,073	34,512	23,277	U

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68	0603751N	RETRACT ELM	4	20,619	19,415	19,535	U
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43	0603536N	RETRACT JUNIPER	4	9,365	11,030	5,983	U
		(Classified -- Material Not Available)					
42	0603527N	RETRACT LARCH	4	-	-	7,834	
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69	0603755N	Ship Self Defense	4	9,253	12,120	5,654	U
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71	0603787N	Special Processes	4	82,074	81,490	69,332	U
47	0603562N	Submarine Tactical Warfare Sys	4	3,950	4,517	4,667	U
35	0603502N	Surface & Shallow Water Mine Countermeasures	4	70,143	88,211	82,465	U
45	0603553N	Surface ASW	4	3,738	1,075	2,949	U
37	0603506N	Surface Ship Torpedo Defense	4	-	4,989	640	
33	0603261N	Tactical Airborne Reconnaissance	4	12,874	1,474	1,975	U
		Total Demonstration and Validation (Dem/Val)		2,222,171	2,408,520	2,086,062	

Comparison of FY 1998 Financing as reflected in FY 1999 Budget with 1998 Financing as Shown in the FY 2000 Budget

($ In Thousands)

	Financing per FY 1999 Budget	Financing Per FY 2000 Budget	Increase (+) or Decrease (-)
Program Requirements (Service Account)	7,879,912	7,887,810	+7,898
Program Requirements (Reimbursable)	110,000	163,008	+53,008
Appropriation (Adjusted)	**7,989,912**	**8,050,818**	**+60,906**

Explanation of Changes in Financing
($ in Thousands)

The Fiscal Year 1998 program has changed since the presentation of the FY 1999 budget as noted below:

1. Program Requirements (Total). There has been a net increase to the appropriation (adjusted) of +$60,906 as a result of changes in program requirements as noted below.

2. Program Requirements (Service Account). There has been a net increase to the appropriation (adjusted) of +$7,898, resulting from various changes in program requirements. These changes included recissions reflected in the FY 99 DoD Appropriations Act (-$20,500), Line Item Veto Restorals (+$6,000), and other Congressional Actions (-$8,000). A number of Internal Reprogrammings were effected which reclassified funding between DoN appropriations to more properly align them into the correct programs for execution: Medical Research Projects (-$7,278), Tactical Tomahawk (+$19,600), PMRF Sensors (-$4,852), F/A-18 (-$14,855), and ASW Combat System Integration (+$5,861). Additionally, other transfers included Overseas Contingency Operations (+$7,500) and Counterdrug Operations (+$15,613).

3. Program Requirements (Reimbursable). There has been a net increase to the appropriation of $53,008, as a result of changes in reimbursable program requirements.

Comparison of FY 1998 Program Requirements as reflected in the FY 1999 Budget with FY 1998 Program Requirements as shown in the FY 2000 Budget

Summary of Requirements ($ in Thousands)

	Total Program Requirements per FY 1999 Budget	**Total Program Requirements per FY 2000 Budget**	**Increase (+) or Decrease (-)**
01 – Basic Research	338,743	331,444	-7,299
02 – Applied Research	493,622	467,359	-26,263
03 – Advanced Technology Development	514,781	518,617	+3,836
04 – Demonstration and Validation (DEM/VAL)	2,219,002	2,222,171	+3,169
05 – Engineering and Manufacturing Development (EMD)	2,227,348	2,153,289	-74,059
06 – RDTE Management Support	551,033	677,567	+126,534
07 – Operational Systems Development	1,535,383	1,517,363	-18,020
Total Fiscal Year Program	**7,879,912**	**7,887,810**	**+7,898**

Explanation by Budget Activity
($ in Thousands)

01. Basic Research (-$7,299) - Changes to this budget activity resulted from a transfer to support the Small Business Innovative Research (SBIR) program (-$6,086) and other changes in program requirements which required minor reprogrammings (-$1,213).

02. Applied Research (-$26,263) - Changes to this budget activity resulted from a transfer to support the Small Business Innovative Research (SBIR) program (-$8,125), other changes in program requirements which required minor reprogrammings (-$21,118) and the override by Congress of a line item veto for Terfenol-D (+$3,000).

03. Advanced Technology Development (+$3,836) - Changes to this budget activity resulted from a transfer to support the Small Business Innovative Research (SBIR) program (-$3,897), other changes in program requirements which required minor reprogrammings (-$12,011), the override of a line item veto for COTS Airguns (+$3,000), and the transfer of Medical Research program funds to the Army (-$7,278).

04. Demonstration and Validation (DEM/VAL) (+$3,169) - Changes to this budget activity resulted from a transfer to support the Small Business Innovative Research (SBIR) program (-$29,846), reductions reflected on the FY 1999 DoD Appropriations Act Rescission for VECTOR (-$3,000), and other changes in program requirements which required minor reprogrammings, budget activity realignments and accounting updates (+$36,015).

05. Engineering and Manufacturing Development (EMD) (-$74,059) - Changes to this budget activity resulted from a transfer to support the Small Business Innovative Research (SBIR) program (-$56,113), transfers to support the Counterdrug Program (+$15,613), other changes in program requirements which required minor reprogrammings, budget activity realignments and accounting updates (-$26,019), a transfer to Defense Health Program and the Boy Scouts per a Congressional Supplemental (-$5,000) and Federal Technology (-$40), and a FY 1999 DoD Appropriation Act rescissions for Lightweight Torpedo (-$1,500) and Navigation/ID Systems (-$1,000).

06. RDTE Management Support (+$126,534) - Changes to this budget activity resulted from a transfer to support the Small Business Innovative Research (SBIR) program (+$120,551), other changes in program requirements which required minor reprogrammings, budget activity realignments and accounting updates (+$5,747) and a transfer for Federal Technology (+$236).

07. Operational Systems Development (-$18,020) - Changes to this budget activity resulted from a transfer to support the Small Business Innovative Research (SBIR) program (-$16,484), other changes in program requirements which required minor reprogrammings, budget activity realignments and accounting updates (-$14,697), and transfers and major reprogrammings for Overseas Contingency Operations (+$7,500), PMRF Sensors (-$4,852), Tactical Tomahawk (+$19,600), Surface ASW Combat Integration (+$5,861), F/A-18 (-$14,855), and Federal Technology Transfer (-$93).

Comparison of FY 1999 Financing as reflected in FY 1999 Budget with 1999 Financing as Shown in the FY 2000 Budget

($ In Thousands)

	Financing per FY 1999 Budget	Financing Per FY 2000 Budget	Increase (+) or Decrease (-)
Program Requirements (Service Account)	8,108,923	8,660,809	+551,886
Program Requirements (Reimbursable)	110,000	150,000	+40,000
Appropriation (Adjusted)	**8,218,923**	**8,810,809**	**+591,886**

Explanation of Changes in Financing
($ in Thousands)

The Fiscal Year 1999 program has changed since the presentation of the FY 2000 budget as noted below:

1. Program Requirements (Total). There has been a net increase to the appropriation (adjusted) of +$591,886, as a result of changes in program requirements as noted below.

2. Program Requirements (Service Account). There has been a net increase to the appropriation (adjusted) of +$551,886, resulting from changes in program requirements as a result of Congressional appropriation changes in the FY 1999 DoD Appropriations Act. These changes included: an undistributed reduction for Federally Financed Research and Development Centers (FFRDC)(-$4,264)(Section 8034), an undistributed reduction for Contract Advisory and Assistance Services (CAAS)(-$50,000)(Section 8054), a general reduction for revised economic assumptions (lower inflation rate)(-$20,000)(Section 8108), and a general undistributed reduction for civilian personnel underexecution (-$5,000). Specific FY 1999 Congressional adjustments (to start, continue, discontinue, reduce or earmark 177 specific initiatives, including transfers) resulted in a net increase of +$584,726. Also, appropriation changes include the following reprogrammings, which require Congressional prior approval: ASW & Other Helo Development (CH-60) (+$9,352); Surface and Shallow Water Mines (+$8,980); Combat Systems Integration (+$12,526); Ship Self Defense (+12,672); partially financed by a reduction to Depot Maintenance (-$11,006). Additionally, FY 1999 includes a transfer for the USACOM Joint Experiments program (+$15,900), managed by the Navy as DoD executive agent.

3. Program Requirements (Reimbursable). There has been a net increase to the appropriation of +$40,000, as a result of changes in reimbursable program requirements (+$40,000).

Comparison of FY 1999 Program Requirements as reflected in the FY 1999 Budget with FY 1999 Program Requirements as shown in the FY 2000 Budget

Summary of Requirements ($ in Thousands)

	Total Program Requirements per FY 1999 Budget	Total Program Requirements per FY 2000 Budget	Increase (+) or Decrease (-)
01 – Basic Research	362,679	361,499	-1,180
02 – Applied Research	524,723	566,801	+42,078
03 – Advanced Technology Development	460,725	593,176	+132,451
04 – Demonstration and Validation (DEM/VAL)	2,358,359	2,408,520	+50,161
05 – Engineering and Manufacturing Development (EMD)	2,063,281	2,199,737	+136,456
06 – RDTE Management Support	616,973	598,664	-18,309
07 – Operational Systems Development	1,722,183	1,932,412	+210,229
Total Fiscal Year Program	**8,108,923**	**8,660,809**	**+551,886**

Explanation by Budget Activity
($ in Thousands)

01. Basic Research (-$1,180) - Changes to this budget activity resulted from the following Congressional undistributed reductions reflected in the FY 1999 DoD Appropriations Act. These changes included: an undistributed reduction for Federally Financed Research and Development Centers (FFRDC)(-$7)(Section 8034), an undistributed reduction for civilian personnel underexecution (-$338), and a general reduction for revised economic assumptions (lower inflation rate)(-$835)(Section 8108).

02. Applied Research (+$42,078) - Changes to this budget activity resulted from the following Congressional undistributed reductions reflected in the FY 1999 DoD Appropriations Act. These changes included: an undistributed reduction for Federally Financed Research and Development Centers (FFRDC)(-$130)(Section 8034), an undistributed

reduction for Contract Advisory and Assistance Services (CAAS)(-$1,755)(Section 8054), an undistributed reduction for civilian personnel underexecution (-$724), and a general reduction for revised economic assumptions (lower inflation rate)(-$1,313)(Section 8108). Specific FY 1999 Congressional adjustments (to start, continue, discontinue, reduce or earmark 31 specific initiatives, including transfers) resulted in a net increase of +$46,000.

03. Advanced Technology Development (+$132,451) - Changes to this budget activity resulted from the following Congressional undistributed reductions reflected in the FY 1999 DoD Appropriations Act. These changes included: an undistributed reduction for Federally Financed Research and Development Centers (FFRDC)(-$146)(Section 8034), an undistributed reduction for Contract Advisory and Assistance Services (CAAS)(-$1,571)(Section 8054), an undistributed reduction for civilian personnel underexecution (-$516), and a general reduction for revised economic assumptions (lower inflation rate)(-$1,316)(Section 8108). Specific FY 1999 Congressional adjustments (to start, continue, discontinue, reduce or earmark 33 specific initiatives, including transfers) resulted in a net increase of +$113,100. Additionally, FY 1999 includes a transfer for the USACOM Joint Experiments program (+$15,900), managed by the Navy as DoD executive agent. Last, the FY 1999 program is increased by +$7,000 to fully fund the VECTOR program.

04. Demonstration and Validation (DEM/VAL) (+$50,161) - Changes to this budget activity resulted from the following Congressional undistributed reductions reflected in the FY 1999 DoD Appropriations Act. These changes included: an undistributed reduction for Federally Financed Research and Development Centers (FFRDC)(-$1,228)(Section 8034), an undistributed reduction for Contract Advisory and Assistance Services (CAAS)(-$5,650)(Section 8054), an undistributed reduction for civilian personnel underexecution (-$1,234), and a general reduction for revised economic assumptions (lower inflation rate)(-$5,550)(Section 8108). Specific FY 1999 Congressional adjustments (to start, continue, discontinue, reduce or earmark 46 specific initiatives, including transfers) resulted in a net increase of +$55,101. Also, appropriation changes include the following reprogrammings, which require Congressional prior approval: Surface and Shallow Water Mines (+$8,980); Combat Systems Integration (+$12,526); and CEC (+15,000); partially financed by a reduction to Gun Weapons Systems Technology (-$11,301) and Hardened Target Munitions (-$9,827). Additionally, changes in program requirements required minor reprogrammings (-$6,656).

05. Engineering and Manufacturing Development (EMD) (+$136,456) - Changes to this budget activity resulted from the following Congressional undistributed reductions reflected in the FY 1999 DoD Appropriations Act. These changes included: an undistributed reduction for Federally Financed Research and Development Centers (FFRDC)(-$151) (Section 8034), an undistributed reduction for Contract Advisory and Assistance Services (CAAS)(-$23,648)(Section 8054), an undistributed reduction for civilian personnel underexecution (-$878) and a general reduction for revised economic assumptions (lower inflation rate) (-$5,065)(Section 8108). Specific FY 1999 Congressional adjustments (to

start, continue, discontinue, reduce or earmark 41 specific initiatives, including transfers) resulted in a net increase of +$136,979. Also, appropriation changes include the following reprogrammings, which require Congressional prior approval: AEGIS Combat System Improvements (-$5,050); AEGIS Combat Systems Engineering (+$24,300); AV-8B Aircraft (Engineering) (-$9,615); ASW and Other Helo Developments (+$9,352); and Ship Self-Defense (+$12,672). Additionally, changes in program requirements required minor reprogrammings (-$1,440).

06. RDTE Management Support (-$18,309) - Changes to this budget activity resulted from the following Congressional undistributed reductions reflected in the FY 1999 DoD Appropriations Act. These changes included: an undistributed reduction for Federally Financed Research and Development Centers (FFRDC)(-$2,292)(Section 8034), an undistributed reduction for Contract Advisory and Assistance Services (CAAS)(-$3,338)(Section 8054), an undistributed reduction for civilian personnel underexecution (-$485) and a general reduction for revised economic assumptions (lower inflation rate)(-$1,394)(Section 8108). Specific FY 1999 Congressional adjustments (to start, continue, discontinue, reduce or earmark 10 specific initiatives, including transfers) resulted in a net decrease of -$10,800.

07. Operational Systems Development (+$210,229) - Changes to this budget activity resulted from the following Congressional undistributed reductions reflected in the FY 1999 DoD Appropriations Act. These changes included: an undistributed reduction for Federally Financed Research and Development Centers (FFRDC)(-$310)(Section 8034), an undistributed reduction for Contract Advisory and Assistance Services (CAAS)(-$14,038)(Section 8054), an undistributed reduction for civilian personnel underexecution (-$825) and a general reduction for revised economic assumptions (lower inflation rate)(-$4,527)(Section 8108). Specific FY 1999 Congressional adjustments (to start, continue, discontinue, reduce or earmark 27 specific initiatives, including transfers) resulted in a net increase of +$243,346. Also, appropriation changes include the following reprogrammings, which require Congressional prior approval: Depot Maintenance -$10,922. Additionally, changes in program requirements required minor reprogrammings (-$2,495).

EXHIBIT R-2, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603207N
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications

(U) COST: (Dollars in Thousands)

PROJECT NUMBER & Title	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	To Complete	Total Program
X2341 METOC Data Acquisition	8,353	7,517	8,669	8,892	9,100	10,276	10,501	10,735	CONT.	CONT.
X2342 METOC Data Assimilation and Modeling	9,590	10,292	12,289	12,702	13,083	12,514	12,814	13,127	CONT.	CONT.
X2343 Tactical METOC Applications	6,729	6,522	7,707	7,817	7,975	8,457	8,657	8,858	CONT.	CONT.
X2344 Precise Timing and Astrometry	1,157	1,312	1,444	1,474	1,498	1,525	1,557	1,590	CONT.	CONT.
TOTAL	25,829	25,643	30,109	30,885	31,656	32,772	33,529	34,310	CONT.	CONT.

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BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603207N
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications

(U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:

The Air Ocean Tactical Applications (AOTA) Program Element is specifically tailored to emphasize techniques which expand knowledge and improve understanding of the meteorological and oceanographic (METOC) environment and its impact on combat systems performance. AOTA focuses on shallow water and other harsh environments, and regional conflict and crisis response scenarios. Projects in this program element develop atmospheric and oceanographic data assimilation techniques, forecast models, data base management systems and associated software for use in both mainframe and tactical scale computers. Global Geospatial Information and Services efforts within this program address the bathymetric and gravimetric needs of the Navy. Also developed are algorithms to process remotely sensed satellite data for integration into other systems and tactical applications. In addition, the projects provide for demonstration and validation of specialized METOC instrumentation and measurement techniques, new sensors, communications and interfaces. Included are techniques to assess, predict and enhance the performance of current and proposed undersea surveillance, tactical and mine warfare and weapons systems. AOTA METOC products are tailored for, and will be incorporated into the Global Command and Control System/Maritime (GCCS/M) and/or onboard combat systems to provide accurate operational system performance predictions. These METOC products will also be incorporated into fleet trainers to provide realistic environments in support of warfare simulations. Finally, this project upgrades the accuracy of the U.S. Naval Observatory's Master Clock system; develops near-real-time earth orientation predictions; develops very precise determination of positions of both faint and bright stars; and supports satellite tracking and space debris studies.

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under DEMONSTRATION & VALIDATION because it develops and integrates hardware for experimental test related to specific ship or aircraft applications.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2341
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Acquisition

PROJECT NUMBER & Title	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	To Complete	Total Program
X2341 METOC Data Acquisition										
	8,353	7,517	8,669	8,892	9,100	10,276	10,501	10,735	CONT.	CONT.

Note: This project is the consolidation of projects X0118, X1987, X0514 and the Data Collection/Inversion portion of X0120.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The major thrust of the meteorology and oceanography (METOC) Data Acquisition Project is to develop, demonstrate, and validate METOC data collection methods and sensors, and to evolve the ability to provide timely and accurate METOC data and products to the Tactical Commander. As the emphasis on Naval Warfare has evolved from blue water operations to the littoral and hinterland battlespace, METOC data requirements have likewise evolved. The littoral and hinterland regions are extremely dynamic and complex, characterized by strong and highly variable oceanographic and atmospheric conditions. As a result, the need to accurately characterize these parameters is more crucial than ever in planning and executing Amphibious Warfare, Mine Warfare, Special Operations, Anti-Submarine Warfare, and Strike Warfare operations. Routinely available data sources, such as climatology, oceanographic and meteorological numerical models, and satellite remote sensing are inadequate to support these warfare areas in the littoral and hinterland regions. Current operational sensors, such as the standard balloon launched radiosonde, are deployed from platforms which are frequently located great distances from the area of interest. The principal challenge is to provide a means for the collection and dissemination of METOC data in highly variable and dynamic littoral environmental conditions or in denied, remote or inaccessible areas over extended periods of time. The principal goals of this project are to: 1) Provide the means to rapidly and automatically acquire a broad array of METOC data using both off-board and on-board sensors; 2) provide an on-scene assessment capability for the tactical commander; 3) provide the tactical commander with real-time METOC data and products for operational use; 4) demonstrate and validate the use of tactical workstations and desktop computers for processing and display of METOC data and products using latest networking technologies; 5) demonstrate and validate techniques which employ data compression, connectivity and interface technologies to ingest, store, process, distribute and display these METOC data and products; 6) develop new charting and bathymetric survey techniques necessary to reduce the existing 300 ship year shortfall in coastal hydrographic survey requirements; and, 7) develop an expanded database for predictive METOC models in areas of potential interest.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2341
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Acquisition

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:

- (U) ($1,839) Performed assessment of temporal/spatial variability of littoral environments, and assessed various inversion and assimilation techniques to obtain ocean/atmosphere temporal/spatial variability of littoral environments. Continued Integration of MEASURE Interface Processor (MIP) into airborne unmanned vehicles (UAV's). Developed Battlespace characterization techniques to measure environmental data in-situ and transmit to Fleet assets.
- (U) ($868) Continued Airborne Combat Data Collection via fleet assets.
- (U) ($820) Continued sensor developments for ROV/AUV assume incremental vehicle size reductions requiring yearly sensor miniaturization.
- (U) ($346) Continued sensor integration and development of UAV sensors in Pioneer Vehicle.
- (U) ($600) Continued hinterland clandestine micro sensor.
- (U) ($304) Completed A-sized self mooring clandestine buoy.
- (U) ($574) Take delivery of RMS vehicle. Continued instrumentation design and began demonstration and validation of joint RMS vehicle for remote littoral bathymetry/mine hunting.
- (U) ($712) Continued development of airborne laser bathymetry techniques from fixed wing aircraft for crisis response.
- (U) ($617) Continued information management and DMAP functions.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2341
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Acquisition

- (U) ($611) Continued development of data connectivity with the JSOW and Aegis C2 systems. Began data connectivity with next-generation Tomahawk and Mine Countermeasures mission planning systems.
- (U) ($300) Continued test and evaluation of non-developmental items in support of data connectivity visualization, interfaces and C2 systems.
- (U) ($729) Began development of next-generation SMOOS(R)/MORIAH sensors.
- (U) ($33) Developed and updated Naval Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) implementation guidance. Developed and updated Naval C4ISR mission to incorporate an overarching operational, systems, technical and information architecture. Conducted associated C4ISR analyses and studies.

2. (U) FY 1999 PLAN:

- (U) ($900) Continue Airborne Combat Data Collection via fleet assets.
- (U) ($976) Continue sensor developments for ROV/AUV, and Initiate sensor integration and development of UAV sensors in Tier II Plus Vehicles.
- (U) ($377) Complete hinterland clandestine micro sensors.
- (U) ($1,054) Continue assessments of temporal and spatial variability of littoral environments for acoustic data inversion.
- (U) ($850) Initiate dem/val of METOC Air, Surface, Undersea Reconnaissance Equipment (MEASURE), and continue development of next-generation sensors for SMOOS(R)/MORIAH..

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2341
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Acquisition

- (U) ($800) Complete data connectivity with the Aegis C2 system and the Mine Countermeasures mission planning system. Continue development of data connectivity with the next generation Tomahawk mission planning system and the Global Command and Control System/Maritime (GCCS/M).
- (U) ($375) Complete test and evaluation of non-developmental items in support of data connectivity visualization, interfaces and C2 systems.
- (U) ($375) Begin development of advanced aerosol measurement techniques.
- (U) ($542) Continue instrumentation demonstration and validation of joint RMS vehicle for remote littoral bathymetry/mine hunting.
- (U) ($627) Complete development of airborne laser bathymetry techniques from fixed wing aircraft for crisis response.
- (U) ($641) Continue information management and DMAP functions.

3. (U) FY 2000 PLAN:

- (U) ($950) Continue Airborne Combat Data Collection via fleet assets.
- (U) ($1,696) Continue sensor developments for ROV/AUV, and continue sensor integration and development of UAV sensors in Tier II Plus Vehicles.
- (U) ($1,150) Continue assessments of temporal and spatial variability of littoral environments for acoustic data inversion.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2341
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Acquisition

- (U) ($1,480) Continue development of next-generation sensors for MEASURE, SMOOS(R)/MORIAH and aerosol measurements.
- (U) ($1,588) Continue development of data connectivity with the next generation Tomahawk mission planning system and GCCS/M. Begin development of data connectivity with the next generation Tactical Air Mission Planning System (TAMPS 7.0)
- (U) ($1,005) Complete instrumentation demonstration and validation of joint RMS vehicle for remote littoral bathymetry/mine hunting.
- (U) ($800) Continue information management and DMAP functions.

B. (U) PROGRAM CHANGE SUMMARY:

(U) CHANGE SUMMARY EXPLANATION:

(U) Funding: FY 1998: (+$8,353K) FY-00 comparability adjustments.

FY 1999: (-$18K) Revised economic assumptions, (-$5K) civilian personnel under-execution, (-$86K) contract advisory and assistance services, and (-$900K) FY-99 Congressional cut for excessive budget growth.

FY 2000: (+$33K) NWCF rates, (+$11K) civilian pay rates, (-$125K) non pay inflation, (-$2K) working capital - NAWC, and (-$8K) inflation reduction.

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

(U) RELATED RDT&E: PE 0604218N, Air/Ocean Equipment Engineering - AN/SMQ-11 satellite receiver/recorder system

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2341
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Acquisition

engineering to receive data from DMSP onboard selected ships and shore sites.

D. (U) ACQUISITION STRATEGY: Not applicable

Exhibit R-3 Cost Analysis (page 1)								Date: February 99				
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA5			PROGRAM ELEMENT: 0603207N					PROJECT NAME AND NUMBER: X2341 METOC DATA ACQUISITION				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total FY98 +PY Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Product Development	WX	NRL	0	3,041	N/A	4,008	N/A	N/A	N/A	CONT	CONT	
	WX	NAWC-AD Lake	0	770	N/A	350	N/A	N/A	N/A	CONT	CONT	
	CP	SSA	0	1,500	N/A	1,500	N/A	N/A	N/A	CONT	CONT	
	N/A	MISC	0	1,681	N/A	2,186	N/A	N/A	N/A	CONT	CONT	
Subtotal Product Development			0	6,992	NA	8,044	NA	N/A	N/A	CONT	CONT	
Remarks:												
Support	CP	SSA	0	525	N/A	625	N/A	N/A	N/A	CONT	CONT	
Subtotal Support			0	525	N/A	625	N/A	N/A	N/A	CONT	CONT	
Remarks												
Exhibit R-3 Cost Analysis (page 2)								Date: February 99				

APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA5			PROGRAM ELEMENT: 0603207N					PROJECT NAME AND NUMBER: X2341 METOC DATA ACQUISITION				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total FY98 +PY Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal T&E												
Remarks												
Subtotal Management												
Remarks												
Total Cost			0	7,517	N/A	8,669	N/A	N/A	N/A	CONT	CONT	
Remarks												

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2342
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Assimilation and Modeling

(U) COST (Dollars in thousands)

PROJECT NUMBER & Title	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	To Complete	Total Program
X2342 METOC Data Assimilation and Modeling.	9,590	10,292	12,289	12,702	13,083	12,514	12,814	13,127	CONT.	CONT.

Note: This project is the consolidation of X0513, X0523, X1596, X2017 and the Modeling and Assimilation portions of projects X2008 and X0120.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The meteorological and oceanographic (METOC) Data Assimilation Project is a multi-faceted program which includes: 1) development, demonstration and validation of atmospheric and oceanographic data assimilation techniques, forecast models, database management systems, and associated software for use in both mainframe and tactical scale computers. Included are numerical oceanographic and atmospheric models for the Large Scale Computers at the Navy Fleet Numerical Meteorology and Oceanography Center, Monterey, CA and the Naval Oceanographic Office, Stennis Space Center, MS. These models, combined with a global communications network for data acquisition and distribution, form a prediction system which provides METOC data and products necessary to support naval operations worldwide in virtually every mission area; 2) other models, which focus on ocean thermal structure and circulation, and surf and tide prediction; 3) techniques to process and manage satellite remotely-sensed environmental data at Oceanography Centers ashore and on ships equipped with the AN/SMQ-11 satellite receiver/recorder. These techniques allow for the integration and tactical application of significant oceanographic and atmospheric data derived from satellite-borne sensors. Included are techniques and algorithms for the processing of sensor measurements, conversion of raw signal data to geophysical information, analysis schemes encompassing Artificial Intelligence and Expert Systems, and other satellite data applications and field validation of end products; and, 4) a family of acoustic system performance models beginning with active system models and databases in the low-, mid-, and high-frequency regimes and culminating with high fidelity simulation products. As weapons and sensors become more sophisticated and complex, the marine environment has an increasingly significant impact on system performance. Operational limitations induced by the ocean and atmosphere must be understood, and the resulting constraints on mission effectiveness and system employment minimized. Hence, the operating forces require more accurate worldwide forecasts of METOC conditions with increased temporal and spatial resolution. An additional challenge is posed by the emergence of new satellite sensors, which are continually adding new sources of disparate data types. In order to fully exploit this dynamic and massive volume of data, modern data base management

systems (DBMS) are required, and must be tailored for individual computer configurations. Improved representation of smaller-scale phenomena, particularly in the littoral, is also an important consideration.

U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:

- (U) ($1,490) Continued integration of ocean and atmosphere environmental effects on battlespace platforms, weapons and sensor systems, including simulation for mission rehearsal, training and analysis. Continued assessment of Navy system performance in surrogate environment. Developed data inversion measurement and test plans and identified fleet assets required for test conduct.

- (U) ($1,051) Completed development of clutter prediction model, continued development of high frequency bottom/loss scatter model/database, continued development of shallow water geoacoustic inversion algorithms using real-time data, continued development of broadband prediction model for Fleet use, began development of an Operational Sensitivity model to predict the sensitivity of system performance to environmental factors, and began development of improvements to mine warfare acoustic models.

- (U) ($100) Began extending LFBL from the 50 M contour water depth to very shallow water.

- (U) ($259) Performed independent verification and validation of models being developed and upgraded.

- (U) ($1,061) Continued development of MPP version of NOGAPS, the advanced aerosol model, and the shipboard version of the tactical scale nested model .

- (U) ($194) Began development of next-generation tropical cyclone forecast system.

- (U) ($250) Began development of Arabian Gulf/Arabian Sea ocean model.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2342
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Assimilation and Modeling

- (U) ($675) Completed development of capabilities to assimilate and quality control METOC data from satellite sensors and conventional data sources using 3D variational techniques. Began to apply 4D variational techniques.
- (U) ($1,305) Completed development of expert systems for satellite oceanographic and atmospheric feature analysis, and began development of SSM/IS atmospheric algorithms.
- (U) ($1,180) Completed transition of Ocean Color sensor and scatterometer data operational capability. Completed development and began transition of new algorithms for SAR and altimetry data. Continued development and transition of new algorithms for Ocean Color sensors and scatterometer.
- (U) ($175) Began evaluation of aviation impact variables satellite product.
- (U) ($225) Completed airborne vs. satellite validation of SAR ocean feature analysis.
- (U) ($325) Continued fleet exercise participation for validation of algorithms.
- (U) ($668) Completed development of surf/tide models. Continued development of coastal and enclosed basin tactical scale oceanographic models for selected geographical locations in response to emergent requirements.
- (U) ($500) Began development of a shipboard shallow water ocean circulation model and an automated graphical application for tactical data visualization.
- (U) ($132) Developed and updated Naval Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) implementation guidance. Developed and updated Naval C4ISR mission to incorporate an overarching operational, systems, technical and information architecture. Conducted associated C4ISR analyses and studies.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2342
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Assimilation and Modeling

2. (U) FY 1999 PLAN:

- (U) ($858) Continue modeling and simulation of atmosphere and ocean environmental effects on Navy systems.
- (U) ($1,104) Complete development of advanced aerosol model and begin dem/val of techniques for coupled air/ocean data assimilation.
- (U) ($400) Participate in selected fleet exercises and demonstrations.
- (U) ($700) Continue development of MPP version of NOGAPS and the shipboard version of tactical scale nested model for operational use.
- (U) ($760) Continue development of next-generation tropical cyclone forecast model and the Arabian Gulf/Arabian ocean model.
- (U) ($603) Continue development of capabilities to assimilate and quality control METOC data from satellite sensors and conventional data sources using 4D variational techniques.
- (U) ($1,000) Complete development of SSM/IS atmospheric algorithms and transition of new algorithms for SAR and altimetry data.
- (U) ($250) Continue evaluation of aviation impact variables satellite product.
- (U) ($1,000) Begin development of techniques for bathymetry and surf zone and high resolution micro-topography algorithms and automated objective processing in the littoral..
- (U) ($581) Continue development of coastal and enclosed basin tactical scale oceanographic models for selected geographical locations in response to emergent requirements.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2342
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Assimilation and Modeling

- (U) ($650) Continue development of shipboard shallow water ocean circulation model and automated graphical applications for tactical data visualization.
- (U) ($663) Begin development of next generation tide and surf models.
- (U) ($975) Continue the development of mid-frequency bottom loss/bottom scatter models and databases for shallow water environments IAW guidance provided by the Acoustic Modeling Advisory Panel.
- (U) ($748) Continue the verification and validation of products and data assimilation techniques developed for fleet applications.

3. (U) FY 2000 PLAN:

- (U) ($1,288) Continue modeling and simulation of atmosphere and ocean environmental effects on Navy systems.
- (U) ($1,233) Continue developments of techniques for coupled air/ocean data assimilation.
- (U) ($400) Participate in selected fleet exercises and demonstrations.
- (U) ($925) Complete development of MPP version of NOGAPS and the shipboard version of tactical scale nested model for operational use.
- (U) ($1,253) Begin development of next generation high resolution coupled air/ocean forecast models.
- (U) ($1,400) Complete development of next-generation tropical cyclone forecast model and the Arabian Gulf/Arabian ocean model. Continue development of coastal and enclosed basin tactical scale oceanographic models for selected geographical locations in response to emergent requirements.
- (U) ($1,165) Continue development of capabilities to assimilate and quality control METOC data from satellite sensors and conventional data sources using 4D variational techniques.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2342
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Assimilation and Modeling

- (U) ($250) Complete evaluation of aviation impact variables satellite product.
- (U) ($1,250) Continue development of techniques for bathymetry and surf zone and high resolution micro-topography algorithms and automated objective processing in the littoral.
- (U) ($1,285) Continue development of shipboard shallow water ocean circulation model, next generation tide and surf models, and automated graphical applications for tactical data visualization.
- (U) ($1,025) Continue the development of mid-frequency bottom loss/bottom scatter models and databases for shallow water environments IAW guidance provided by the Acoustic Modeling Advisory Panel.
- (U) ($815) Continue the verification and validation of products and data assimilation techniques developed for fleet applications.

(U) PROGRAM CHANGE SUMMARY:

(U) CHANGE SUMMARY EXPLANATION:

(U) Funding: FY 1998: (+$9,590K) FY-00 comparability adjustments.

FY 1999: (-$24K) Revised economic assumptions, (-$18K) civilian personnel under-execution, and (-$1,200K) FY-99 Congressional cut for excessive budget growth.

FY 2000: (+$159K) NWCF rates, (+$52K) civilian pay rates, (-$178K) non pay inflation, (-$4K) working capital - NAWC, and (-$12K) inflation reduction.

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2342
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: METOC Data Assimilation and Modeling

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

D. (U) ACQUISITION STRATEGY: Not applicable.

Exhibit R-3 Cost Analysis (page 1)								Date: February 99				
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/5A5		PROGRAM ELEMENT:0603207N						PROJECT NAME AND NUMBER: X2342 METOC ASSIMILATION AND MODELING				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total FY98 +PY Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Product Development	WX	NRL	0	7,070	N/A	8,709	N/A	N/A	N/A	CONT	CONT	
	WX	NAWC-WD, PM	0	380	N/A	400	N/A	N/A	N/A	CONT	CONT	
	N/A	MISC	0	2,717	N/A	3,030	N/A	N/A	N/A	CONT	CONT	
Subtotal Product Development			0	10,167	N/A	12,139	N/A	N/A	N/A	CONT	CONT	
Remarks:												
Support	CP	SSA	0	125	N/A	150	N/A	N/A	N/A	CONT	CONT	
Subtotal Support			0	125	N/A	150	N/A	N/A	N/A	CONT	CONT	
Remarks												

Exhibit R-3 Cost Analysis (page 2)								Date: February 99				
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/5A5		PROGRAM ELEMENT:0603207N						PROJECT NAME AND NUMBER: X2342 METOC ASSIMILATION AND MODELING				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total FY98 +PY Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal T&E												
Remarks												
Subtotal Management												
Remarks												
Total Cost			0	10,292	N/A	12,289	N/A	N/A	N/A	CONT	CONT	
Remarks												

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2343
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: Tactical METOC Applications

(U) COST (Dollars in thousands)

PROJECT NUMBER & Title	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	To Complete	Total Program
X2343 Tactical METOC Applications	6,729	6,522	7,707	7,817	7,975	8,457	8,657	8,858	CONT.	CONT.

Note: This project is the consolidation of project X0823 (PE 0603785N) and the METOC Decision Aids portion of X2008.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The METOC Data Applications project is a continuing effort to develop and field state-of-the-art software capabilities that provide sensor, communication, and weapon system performance assessments across the full spectrum of open ocean and littoral operating environments. These assessments allow mission planners and warfighters, from the unit to theater level, to tactically optimize sensor employment on airborne, surface, and subsurface platforms in support of all Naval Composite Warfare mission areas including Undersea Warfare (USW), Anti-Submarine Warfare (ASW), Mine Warfare (MIW), Amphibious Warfare (AMW), Anti-Surface Warfare (ASUW), Anti-Air Warfare (AAW), Strike Warfare (STW), and Special Warfare. Emphasis is placed on products to support littoral and regional conflict scenarios. Performance assessments leading to improvements in tactical control are conducted through a two-tiered approach: 1) METOC Decision Aids (MDAs); and, 2) Tactical Decision Aids (TDAs). MDAs consist of a series of analysis tools which characterize the electromagnetic (EM), electro-optical (EO), atmospheric, oceanographic, and acoustical properties of the battlespace based on the best environmental scene description available at the time (i.e., some combination of historical and/or real-time (or near real-time) in-situ data. TDAs, also developed under this project, then use this information to predict how various weapons and sensor systems will perform given the current METOC conditions, and present these predictions in various tabular and graphic formats used by mission planners and combat/weapon system operators to develop ASW and MIW search and localization plans, USW/AAW/ASUW screens, STW profiles, AMW ingress and egress points, and other considerations. Project X2343 MDAs and TDAs use data obtained by sensors developed in Project X2341 (METOC Data Acquisition) and assimilated by software produced by Project X2342 (METOC Data Assimilation and Modeling), also contained in this Program Element. They also used data obtained through direct interfaces to the combat systems. A current emphasis area of the project is the development of new combat system and mine warfare performance prediction and MDA/TDA capabilities required to characterize and/or predict sensor and weapons system performance in the highly complex littoral environments in support of regional conflict scenarios. It addresses multi-warfare areas, particularly Mine Warfare, shallow water ASW, and missile and air defense/strike capabilities.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2343
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: Tactical METOC Applications

1. (U) FY 1998 ACCOMPLISHMENTS:

- (U) ($1,891) Developed performance prediction capability for additional Electro-Magnetic/Electro-Optic sensors. Addressed new sensor suites scheduled for incorporation on New Attack Submarine (NSSN), SQQ-89 Block III Ships and LAMPS helicopter upgrades (SH-60R). Incorporated new capability based on Shipboard Tactical Atmospheric Forecast Capability (STAFC) developments and in-situ/remote measurement techniques. Evaluated at-sea.

- (U) ($2,014) Initiated development of sensor performance prediction and employment TDAs which address new generation undersea warfare systems (Airborne Low Frequency Sonar (ALFS), Towed Active Receive Subsystem (TARS), High Frequency Sonar Program (HFSP)). Maximized use of in-situ collected environmental data fused with synoptic data. Ensured connectivity to both organic combat system and remote sites in support of Joint Littoral Operations. Integrated into platform ADMs and evaluated at-sea.

- (U) ($957) Based on submarine security and survivability developments, initiated development of automated vulnerability assessment tactical decision aid capabilities and integrated them with emerging COTS combat systems. Updated automatic event triggering capabilities based on evaluation of previous years efforts. Integrated into platform ADMs and evaluated at-sea.

- (U) ($1,269) Developed atmospheric and oceanographic data acquisition and application capabilities. Provided real time capability to utilize environmental parameters and distribute these to other Fleet combatants and shore sites. Supported Oceanographer of the Navy's Battlespace METOC Data Acquisition, Assimilation and Application strategy. Tested initial implementation at-sea.

- (U) ($588) Continued development of surface to air and surface to surface EO model. Began development of Advanced Refractive Effects Prediction System (AREPS) .

- (U) ($10) Developed and updated Naval Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) implementation guidance. Developed and updated Naval C4ISR mission to incorporate an overarching operational, systems, technical and information architecture. Conducted associated C4ISR analyses and studies.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2343
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: Tactical METOC Applications

2. (U) FY 1999 PLAN:

- (U) ($815) Complete development of surface to air and surface to surface EO model. Continue development of AREPS.
- (U) ($2,242) Incorporate prototype Mine Warfare tactical decision aids in baseline surface ship, air and submarine performance prediction systems. Maximize littoral operation support by ensuring interoperability of system via existing Fleet communication mechanisms.
- (U) ($1,363) Complete development of initial sensor prediction capabilities for acoustic and non-acoustic sensors scheduled to be installed on Fleet combatants. Apply advanced COTS visualization techniques to facilitate operator understanding of complex littoral environmental effects on sensor performance. Integrate into appropriate platform ADM's. Perform at-sea evaluation of new capabilities.
- (U) ($1,050) Integrate platform vulnerability assessment TDA into surface ship, submarine and air ADM's to perform vulnerability assessment for acoustic and non-acoustic sensors and weapons. Evaluate functionality during at-sea tests.
- (U) ($1,052) Incorporate additional environmental sensor interface capabilities to allow for real time monitoring and measurement of key environmental parameters in support of the Oceanographer of the Navy's Battlespace METOC Data Acquisition, Assimilation and Applications strategy. Implement in the platform ADM's and evaluate at-sea.

3. (U) FY 2000 PLAN:

- (U) ($915) Continue development of AREPS and begin development of next generation Electro-optical decision aids.
- (U) ($2,777) Continue to incorporate prototype Mine Warfare tactical decision aids in baseline surface ship, air and submarine performance prediction systems. Continue to maximize littoral operation support by ensuring interoperability of system via existing Fleet communication mechanisms.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2343
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: Tactical METOC Applications

- (U) ($1,625) Continue to apply advanced COTS visualization techniques to facilitate operator understanding of complex littoral environmental effects on sensor performance and integrate into appropriate platform ADM's. Perform at-sea evaluation of new capabilities.

- (U) ($1,240) Continue to integrate platform vulnerability assessment TDA into surface ship, submarine and air ADM's to perform vulnerability assessment for acoustic and non-acoustic sensors and weapons. Evaluate functionality during at-sea tests.

- (U) ($1,150) Continue to incorporate additional environmental sensor interface capabilities to allow for real time monitoring and measurement of key environmental parameters in support of the Oceanographer of the Navy's Battlespace METOC Data Acquisition, Assimilation and Applications strategy. Implement in the platform ADM's and evaluate at-sea.

B. (U) PROGRAM CHANGE SUMMARY:

(U) CHANGE SUMMARY EXPLANATION:

Funding: FY 1998: (+$6,729K) FY-00 comparability adjustments.

FY 1999: (-$15K) Revised economic assumptions, (-$12K) civilian personnel under-execution, and (-$750K) FY-99 Congressional cut for excessive budget growth.

FY 2000: (+$53K) NWCF rates, (+$33K) civilian pay rates, (-$112K) non pay inflation, and (-$7K) inflation reduction.

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

(U) RELATED RDT&E: PE 0604218N (Air/Ocean Equipment Engineering). TESS/NITES will incorporate METOC data applications.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2343
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: Tactical METOC Applications

D. (U) ACQUISITION STRATEGY: Not applicable.

Exhibit R-3 Cost Analysis (page 1)								Date: February 99				
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA5		PROGRAM ELEMENT:0603207N						PROJECT NAME AND NUMBER: X2343 METOC APPLICATIONS				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total FY98 +PY Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Product Development	WX	NUWC	0	675	N/A	725	N/A	N/A	N/A	CONT	CONT	
	WX	SSC SD	0	360	N/A	360	N/A	N/A	N/A	CONT	CONT	
	WX	NRL	0	300	N/A	300	N/A	N/A	N/A	CONT	CONT	
	CP	IPD	0	3,123	N/A	4,000	N/A	N/A	N/A	CONT	CONT	
	CP	LOCKHEED	0	500	N/A	553	N/A	N/A	N/A	CONT	CONT	
	N/A	MISC	0	1,264	N/A	1,469	N/A	N/A	N/A	CONT	CONT	
Subtotal Product Development			0	6,222	N/A	7,407	N/A	N/A	N/A	CONT	CONT	
Remarks:												
Support	CP	IPD	0	300	N/A	300	N/A	N/A	N/A	CONT	CONT	
Subtotal Support			0	300	N/A	300	N/A	N/A	N/A	CONT	CONT	
Remarks												

Exhibit R-3 Cost Analysis (page 2)								Date: February 99				
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA5		PROGRAM ELEMENT:0603207N						PROJECT NAME AND NUMBER: X2343 METOC APPLICATIONS				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total FY98 +PY Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal T&E												
Remarks												
Subtotal Management												
Remarks												
Total Cost			0	6,522	N/A	7,707	N/A	N/A	N/A	CONT	CONT	
Remarks												

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2344
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: Precise Timing and Astrometry

(U) COST (Dollars in thousands)

PROJECT NUMBER & Title	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	To Complete	Total Program
X2344 Precise Timing and Astrometry (formerly project X0948).	1,157	1,312	1,444	1,474	1,498	1,525	1,557	1,590	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The major thrusts of the Precise Timing and Astrometry Project in direct support of the U.S. Naval Observatory (USNO) are to: 1) address DoD requirements for needed increases in positioning accuracies of modern weapons systems by the determination of star positions (including objects at other than optical wavelengths) and the stellar inertial reference system (to which all navigation, guidance, and positioning systems are ultimately referred); 2) develop techniques for the prediction of the Earth's instantaneous orientation with respect to the stellar inertial reference system; 3) oversee the determination and dissemination of precise time information using the Navy/DoD Master Clock System and precise time distribution networks; and, 4) develop advanced electronic light detectors and interferometry in the optical and infrared wavelength regions for very precise determination of the positions of both faint and bright stars, satellite tracking, and space debris studies. DoD Instruction 5000.2 assigns to the Navy the responsibility for coordinating Precise Time and Time Interval (PTTI) requirements and for maintaining a PTTI reference standard (astronomical and atomic) for use by all DoD Services, Federal agencies, and related scientific laboratories. The Navy is also responsible for providing astronomical data for navigation, positioning, and guidance, including space. Some operational and many emerging requirements surpass current support capabilities. In response to these DoD requirements, this project transitions Research (6.1) and Exploratory Development (6.2) efforts, as well as developments in the civilian sector, into the operational capabilities and products of the USNO.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1.(U) FY 1998 ACCOMPLISHMENTS:

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2344
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: Precise Timing and Astrometry

- (U) ($126) Continued evaluation of time transfer capabilities via fiber optic network.
- (U) ($150) Completed demonstration of GPS for UTI/Polar Motion.
- (U) ($321) Continued demonstration of large scale CCD array for electronic astrography.
- (U) ($367) Completed prototype optical interferometer astrometry demonstration.
- (U) ($170) Began 2 micron measurement capability demonstration for the interferometer.
- (U) ($23) Developed and updated Naval Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) implementation guidance. Developed and updated Naval C4ISR mission to incorporate an overarching operational, systems, technical and information architecture. Conducted associated C4ISR analyses and studies.

2. (U) FY 1999 PLAN:

- (U) ($307) Complete evaluation of time transfer capabilities via fiber optic network and begin GPS time transfer capability.
- (U) ($270) Initiate evaluation of cesium fountain clock and VLBI/GPS demonstration for earth orientation parameters.
- (U) ($510) Complete 2 micron measurement capability demonstration over large angles and demonstration of large scale CCD arrays.
- (U) ($225) Initiate InSb (Indium-Antimony) detector survey.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2344
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: Precise Timing and Astrometry

3. (U) FY 2000 PLAN:

- (U) ($500) Continue evaluation of GPS time transfer capability.
- (U) ($548) Continue evaluation of cesium fountain clock and VLBI/GPS demonstration for earth orientation parameters.
- (U) ($396) Continue InSb (Indium-Antimony) detector survey.

B. (U) PROGRAM CHANGE SUMMARY:

(U) CHANGE SUMMARY EXPLANATION:

Funding: FY 1998: (+$1,157K) FY-00 comparability adjustments.

FY 1999: (-$3K) Revised economic assumptions and (-$150K) FY-99 Congressional cut for excessive budget growth.

FY 2000: (-$21K) non pay inflation, and (-$1K) inflation reduction.

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

(U) RELATED RDT&E: None

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET Date: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603207N PROJECT NUMBER: X2344
PROGRAM ELEMENT TITLE: Air/Ocean Tactical Applications PROJECT TITLE: Precise Timing and Astrometry

D. (U) ACQUISITION STRATEGY: Not applicable.

Exhibit R-3 Cost Analysis (page 1)								Date: February 99				
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA5		PROGRAM ELEMENT: 0603207N						PROJECT NAME AND NUMBER: X2344 PRECISE TIMING AND ASTROMETRY				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total FY98 +PY Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Product Development	WX	NAVAL OBSERV	0	1,312	N/A	1,444	N/A	N/A	N/A	CONT	CONT	
Subtotal Product Development			0	1,312	N/A	1,444	N/A	N/A	N/A	CONT	CONT	
Remarks:												
Subtotal Support												
Remarks												

Exhibit R-3 Cost Analysis (page 2)								Date: February 99				
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA5			PROGRAM ELEMENT: 0603207N					PROJECT NAME AND NUMBER: X2344 PRECISE TIMING AND ASTROMETRY				
Cost Categories	Contract Method & Type	Performing Activity & Location	Total FY98 +PY Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal T&E												
Remarks												
Subtotal Management												
Remarks												
Total Cost			0	1,312	N/A	1,444	N/A	N/A	N/A	CONT	CONT	
Remarks												

EXHIBIT R-2, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603216N
PROGRAM ELEMENT TITLE: Aviation Survivability

(U) COST: (Dollars in Thousands)

Project Number & Title	FY 1998 Budget	FY 1999 Budget	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	To Complete	Total Program
W0584 Aircrew Protective Clothing & Devices	10,906*	7,033*	2,695	2,914	3,017	3,093	3,184	3,271	CONT.	CONT.
W0591 Aircraft Survivability Vulnerability & Safety	2,126	1,505	1,878	1,932	1,972	2,016	2,069	2,118	CONT.	CONT.
W0592 A/C & Ordnance Safety	1,243	1,723	1,725	1,799	1,845	1,894	1,949	2,000	CONT.	CONT.
W1819 Carrier Vehicle Aircraft Fire Suppression System	1,084	842	982	1,022	1,050	1,081	1,114	1,144	CONT.	CONT.
TOTAL	15,359	11,103	7,280	7,667	7,884	8,084	8,316	8,533	CONT.	CONT.

Quantity of RDT&E Articles : Not Applicable

(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: Aviation Survivability addresses the issues of aircrew and platform survivability, focusing on enhancing overall opportunity for aircrew and platform protection and enhanced performance. The capabilities addressed under this program element counter emerging threats of next generation operational weapons systems and enhance combat effectiveness in future operational mission scenarios.

(U) Aircrew Protective Clothing and Devices develops, demonstrates and validates technology options that enhance aircrew capability to perform assigned missions. In addition, this project ensures aircrew 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, following loss of aircraft.

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603216N
PROGRAM ELEMENT TITLE: Aviation Survivability

(U) The three remaining projects focus on platform survivability, addressing the reductions in aircraft susceptibility to enemy and non-combat threats, as well as aircraft vulnerabilities to conventional, nuclear, chemical, biological, radiological and directed energy weapons. The Aircraft Survivability, Vulnerability and Safety project expands the survivability technology base and develops prototype hardware which is required to improve the survivability of Naval aircraft. Aircraft and Ordnance Safety transitions generic insensitive munitions technology to Navy and Marine Corps air weapons, ensuring that they are insensitive to fast cook-off, slow cook-off, bullet and fragment impact and sympathetic detonation. Carrier Aircraft Fire Suppression Systems develop improved firefighting systems and fire protective measures for aircraft carriers.

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under DEMONSTRATION and VALIDATION because it develops and integrates hardware for experimental tests related to specific ship or aircraft applications.

*FY-98 budget includes a Congressional add of $8.586K for the Navy Integrated Day/Night All-Weather Display Helmet, and for Visualization Architecture and Technology executed under project W2385. FY-99 budget includes a Congressional add of $998K for Escape System Dynamic Flow, and $1.995K for the Helicopter Aircrew Integrated Life Support System (HAILSS) executed under projects W2604 and W2605 respectively.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET PROJECT JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 4 | PROGRAM ELEMENT: 0603216N | PROGRAM ELEMENT TITLE: Aviation Survivability | PROJECT NUMBER: W0584 | PROJECT TITLE: Aircrew Protective Clothing & Devices

(U) COST: (Dollars in Thousands)

Project Number & Title	FY 1998 Budget	FY 1999 Budget	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	To Complete	Total Program
W0584 Aircrew Protective Clothing & Devices	10,906*	7,033*	2,695	2,914	3,017	3,093	3,184	3,271	CONT.	CONT.
TOTAL	10,906	7,033	2,695	2,914	3,017	3,093	3,184	3,271	CONT.	CONT.

Quantity of RDT&E Articles

(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: Project W0584 develops, demonstrates, and validates technology options for integrated aircrew emergency and life support systems designed to enhance mission effectiveness, in-flight protection and survivability. The project covers fixed and rotary wing life support equipment, advanced helmet vision systems, escape systems technology, crew centered cockpit design, and cockpit integration programs. It responds to a number of operational requirements documents, including OR# 210-05-88 for Chemical and Biological (CB) Protection, OR# 099-05-087 for Laser Eye Protection, and the joint Air Force/Navy (CAF 208-93) for an Aerospace Control Helmet Mounted Cueing System. In 1996, the various sub-projects were restructured into a combined Advanced Technology Crew Station (ATCS) and Advanced Integrated Life Support System (AILSS) program. This project is validated by two Non-Acquisition Program Development Documents (NAPPDs) -- one for an Advanced Technology Crew Station (ATCS), and the other for AILSS.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. FY 1998 ACCOMPLISHMENTS:

- (U) ($1,884) Initiated Advance Technology Escape System (ATES) using controllable propulsion (Fourth Generation Escape System).
- (U) ($ 436) Completed flight test of the Helicopter Aircrew Integrated Life Support System (HAILSS)/AILSS/Air Warrior (AW) system.
- (U) ($5,752) Completed integration and flight test of the Navy's day/night all-weather display helmet (CRUSADER). Begin camera upgrade, frequency agile laser eye protection non-linear materials development, and research directed towards risk mitigation (e.g. head/neck moment of inertia).
- (U) ($2,834) Developed/extended baseline 3D Visualization Architecture Technology (VAT) to smaller groups, began interactive visualization networking.

BUDGET ACTIVITY: 4 | PROGRAM ELEMENT: 0603216N | PROGRAM ELEMENT TITLE: Aviation Survivability | PROJECT NUMBER: W0584 | PROJECT TITLE: Aircrew Protective Clothing & Devices

2. FY 1999 PLAN:

- (U) ($2,050) Continue development of ATES using controllable propulsion (Fourth Generation Escape System).
- (U) ($481) Begin development of Smart Advanced Integrated Life Support System (SAILSS) (referred to as Smart Adaptive Mission Support System (SAMSS) in the FY 99 PRESBUDG).
- (U) ($836) Continue development of frequency agile laser eye protection, including non-linear materials development and demonstration. Frequency agile laser eye protection has application to both AILSS and to CRUSADER day/night helmet development, covered under the AILSS and ATCS NAPDD's, respectively.
- (U) ($623) As a part of the Advanced Helmet Vision System (AHVS) all weather day/night display helmet, initiate upgrade from CRUSADER day only helmet mounted display system to day/night all weather helmet mounted display system.
- (U) ($974) Begin development of the laminar flow ejection tower test facility.
- (U) ($1,945) Continue development of HAILSS with emphasis on cooling and laser eye protection.
- (U) ($124) Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

3. FY 2000 PLAN:

- (U) ($997) Continue ATES using controllable propulsion (Fourth Generation Escape System). Begin component integration.
- (U) ($300) AHVS - complete head/neck weight moments of inertia studies.
- (U) ($300) Continue enhanced resolution development for Crusader day/night all weather helmet mounted display system.
- (U) ($500) Continue the Smart Advanced Integrated Life Support System (SAILSS).
- (U) ($500) Continue development of non-linear materials for frequency agile laser eye protection.
- (U) ($98) Extend (VAT) to single user virtual image display.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET PROJECT JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 4 **PROGRAM ELEMENT: 0603216N** **PROGRAM ELEMENT TITLE: Aviation Survivability**

PROJECT NUMBER: W0584 **PROJECT TITLE: Aircrew Protective Clothing & Devices**

(U) B. PROGRAM CHANGE SUMMARY

	FY 1998	FY 1999	FY 2000
(U) FY 1999 President's Budget:	11,981	4,077	2,881
(U) Appropriated Value:	11,981	4,077	
(U) Adjustments from FY99 PRESBUDG:	-1,075	+2,956	-186
(U) FY 2000 President's Budget Submit:	10,906	7,033	2,695

CHANGE SUMMARY EXPLANATION:

(U) Funding: The FY98 program adjustment of -$1,075 thousand reflects -$323 thousand for SBIR assessment, -$752 thousand for BTR-98-33 to support the Center for Interdisciplinary Remotely Piloted Aircraft Studies (CIRPAS). The FY99 increase reflects a congressional add of $3,000 thousand with a decrease of -$22 thousand for Contract Advisory and Assistance Services, and -$22 thousand for minor economic adjustments. The FY00 decrease of -$186 thousand reflects -$129 thousand to fully fund the Major Range & Test Facility Base (MRTFB) institutional funding, -$13 thousand for Navy Working Capital Fund (NWCF) rate adjustments, and -$44 thousand for minor economic adjustments.

(U) Schedule: Not Applicable
(U) Technical: Not Applicable

DATE: February 1999

BUDGET ACTIVITY: 4 **PROGRAM ELEMENT: 0603216N** **PROGRAM ELEMENT TITLE: Aviation Survivability** **PROJECT NUMBER: W0584** **PROJECT TITLE: Aircrew Protective Clothing & Devices**

(U) C. OTHER PROGRAM FUNDING SUMMARY:

Related RDT&E

(U) PE 0602201F (Aerospace Flight Dynamics)
(U) PE 0602233N (Mission Support Equipment)
(U) PE 0604264N (Aircrew Systems Development)
(U) PE 0604706F (Life Support Systems)
(U) PE 0603231F (Crew Systems and Personal Protection Technology)

(U) D. ACQUISITION STRATEGY: Not Applicable

(U) E. SCHEDULE PROFILE

(U) Program Milestones	FY 1998	FY 1999	FY 2000	To Complete
4th Gen Escape (ATES) & controllable propulsion	Initiated 1st Q	Continue	Begin Component Integration	1Q/02
Crusader Day/Night All Weather Display System	Initiated 2nd Q	Continue	Continue	4th Q/01

DATE: February 1999

BUDGET ACTIVITY: 4 **PROGRAM ELEMENT: 0603216N**
PROGRAM ELEMENT TITLE: Aviation Survivability
PROJECT NUMBER: W0584
PROJECT TITLE: Aircrew Protective Clothing & Devices

(U) E. SCHEDULE PROFILE (Cont'd)

	FY 1998	FY 1999	FY 2000	To Complete
(U) Program Milestones (Cont'd)				
VAT (Networking)	Initiated 2nd Q			Continue
VAT (Single User)			Initiate 1st Q	Continue
Frequency Agile Laser Eye Protection (non-linear materials)	Initiated 4th Q	Continue	Continue	Complete Tech Demo 4th Q
SAILSS		Initiate 1st Q	Continue	Continue
(U) Engineering Milestones				
(U) T&E Milestones				
Crusader **day only** system DT-1	Completed 4TH Q			
Crusader **day/night** system DT-1		Initiate 4th Q	Complete	
HAILSS/AILSS/AW flight test	Initiated 1st Q Completed 4th Q			

(U) Contract Milestones: Not applicable.

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603216N

PROJECT NUMBER: W0584

PROJECT TITLE: Aircrew Protective Clothing & Devices

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total Prior Yrs Cost	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Miscellaneous	WX	NAWCAD PAX	13,134	2,380	Various	1,192	Various	CONT.	CONT.	
Miscellaneous	Various	Various	10,765	0	Various	0				
McDonnell Douglas			1,325							
Boeing			1,660							
Subtotal Product Development			**26,884**	**2,380**		**1,192**		**CONT.**	**CONT.**	
Remarks										
Miscellaneous	WX	Various	322	430	Various	305	Various	CONT.	CONT.	
Subtotal Support			**322**	**430**		**305**		**CONT.**	**CONT.**	
Remarks										

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS

DATE: February 1999

BUDGET ACTIVITY: 4 | PROGRAM ELEMENT: 0603216N | PROJECT NUMBER: W0584 | PROJECT TITLE: Aircrew Protective Clothing & Devices

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total Prior Yrs Cost	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Miscellaneous developmental test & evaluation	Various	Various	1869	4089	Various	1188	Various	CONT.	CONT.	
Subtotal Test & Evaluation			**1869**	**4089**		**1188**		**CONT.**	**CONT.**	
Remarks										
Travel		Various	65	10	N/A	10	N/A	N/A.	N/A	
Subtotal Management			**65**	**10**		**10**		**0**	**0**	
Remarks										
SBIR assessment				**124**						
Total Cost			**29,140***	**7,033**		**2,695**		**CONT.**	**CONT.**	

* TOTAL PRIOR YEARS COST TOTALS INCLUDE THE FY96 & PRIOR, FY97 ACTUAL COLUMNS FROM THE FY99 PRESIDENT'S BUDGET R-3 AND THE FY98 CURRENT CONTROLS.

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603216N
PROGRAM ELEMENT TITLE: Aviation Survivability

PROJECT NUMBER: W0591
PROJECT TITLE: Aircraft Survivability Vulnerability & Safety

(U) COST: (Dollars in Thousands)

Project Number & Title	FY 1998 Budget	FY 1999 Budget	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	To Complete	Total Program
W0591 Aircraft Survivability Vulnerability & Safety										
	2,126	1,505	1,878	1,932	1,972	2,016	2,069	2,118	CONT.	CONT.
TOTAL	2,126	1,505	1,878	1,932	1,972	2,016	2,069	2,118	CONT.	CONT.

Quantity of RDT&E Articles

(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: Aircraft Survivability, Vulnerability and Safety. This project develops prototype hardware to improve the survivability of Navy and Marine Corps aircraft. This project addresses the likelihood of an aircraft being hit (susceptibility) and the probability of a kill if the aircraft is hit (vulnerability). Types of programs funded under this project include signature reduction efforts, subsystem and component hardening and development of fire and explosion suppression techniques for fuel systems. Beginning in fiscal year 1996 Chemical and Biological efforts were consolidated under OSD program element 0603384D (Chemical and Biological Defense (Advanced Development)).

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. FY 1998 ACCOMPLISHMENTS:

- (U) ($1,785) Continued the development of a rotary wing Infrared (IR) signature suppression program.
- (U) ($131) Continued the development of RDT&E master plan update.
- (U) ($70) Initiated data population of the Aircraft Survivability Database
- (U) ($140) Continued current development of Survivability Analysis Methodology .

DATE: February 1999

BUDGET ACTIVITY: 4 **PROGRAM ELEMENT: 0603216N** **PROGRAM ELEMENT TITLE: Aviation Survivability**

PROJECT NUMBER: W0591 **PROJECT TITLE: Aircraft Survivability Vulnerability & Safety**

2. FY 1999 PLAN:

- (U) ($1,242) Continue the development of a rotary wing IR survivability signature suppression program (complete prototype ground test).
- (U) ($10) Complete the development of RDT&E master plan (will be updated bi-annually).
- (U) ($30) Continue data population of Aircraft Survivability Database.
- (U) ($196) Continue current Survivability Analysis Methodology development, to include a Survivability Analysis Methodology Roadmap for USN/USMC.
- (U) ($27) Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

3. FY 2000 PLAN:

- (U) ($1,558) Continue the development of a rotary wing IR survivability signature suppression program (initiate flight test).
- (U) ($50) Continue uninhabited aerial vehicle (UAV) survivability program; focus on trade study/cost analysis.
- (U) ($70) Annual update of Aircraft Survivability Database.
- (U) ($200) Continue development of Survivability Analysis Methodology (based on FY99 roadmap).

DATE: February 1999

BUDGET ACTIVITY: 4 **PROGRAM ELEMENT: 0603216N** **PROJECT NUMBER: W0591**
PROGRAM ELEMENT TITLE: Aviation Survivability **PROJECT TITLE: Aircraft Survivability Vulnerability & Safety**

(U) B. PROGRAM CHANGE SUMMARY

	FY 1998	FY 1999	FY 2000
(U) FY 1999 President's Budget:	2,118	1,509	1,909
(U) Appropriated Value:	2,118	1,509	
(U) Adjustments from FY99 PRESBUDG:	+8	-4	-31
(U) FY 2000 President's Budget Submit:	2,126	1,505	1,878

CHANGE SUMMARY EXPLANATION:

(U) Funding: The FY98 program adjustment reflects an increase of $31 thousand due to reprogramming, and a -$23 thousand decrease for the SBIR assessment. The FY99 decrease of -$4 thousand reflects minor economic adjustments. The FY00 decrease of -$31 thousand reflects -$2 thousand for Navy Working Capital Fund (NWCF) rate adjustments, and -$29 thousand for minor economic adjustments.

(U) Schedule: Not applicable

(U) Technical: Not applicable

(U) C. OTHER PROGRAM FUNDING SUMMARY: Not applicable

DATE: February 1999

BUDGET ACTIVITY: 4 **PROGRAM ELEMENT: 0603216N** **PROGRAM ELEMENT TITLE: Aviation Survivability**

PROJECT NUMBER: W0591 **PROJECT TITLE: Aircraft Survivability Vulnerability & Safety**

Related RDT&E

(U) PE 0605132D (Joint Technical Coordinating Group on Aircraft Survivability)
(U) PE 0603384D (Chemical/Biological Defense (Advanced Development)

(U) D. ACQUISITION STRATEGY: Not Applicable.

(U) E. SCHEDULE PROFILE:

	FY 1998	FY 1999	FY 2000	To Complete
(U) Program Milestones				
UAV survivability trade study			Initiate 1st Q	Complete 3rd Q/01
(U) Engineering Milestones				
IR Signature Requirements Review	Completed 3rd Q			
(U) T&E Milestones				
IR Suppressor ground test		Complete 4th Q		
IR Suppressor flight test			Initiate 4th Q	Complete 2nd Q/01

(U) Contract Milestones: Not applicable

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603216N

PROJECT NUMBER: W0591

PROJECT TITLE: AIRCRAFT SURV VUL & SAFETY

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total Prior Yrs Cost	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Miscellaneous	WX	Various	5115	470	Various	344	Various	CONT.	CONT.	
Primary hardware development	SS/CPFF	SIKORSKY Connecticut	635	877	Oct 98	1000	Oct 99	3226	3226	3226
Primary hardware development	SS/CPFF	Bell Helicopter Ft. Worth, TX	1307							
Subtotal Project Development			**7057**	**1347**		**1344**		**CONT.**	**CONT.**	
Remarks										
Miscellaneous	WX					150	Various	CONT.	CONT.	
Subtotal Support			**0**	**0**		**150**		**CONT.**	**CONT.**	
Remarks										

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603216N PROJECT NUMBER: W0591
PROJECT TITLE: AIRCRAFT SURV VUL & SAFETY

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total Prior Yrs Cost	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Miscellaneous	Various	Various	770	121	N/A	374	Various	CONT.	CONT.	
Subtotal Test & Evaluation			**770**	**121**		**374**		**CONT.**	**CONT.**	
Remarks										
Travel			165	10	N/A	10	N/A	CONT.	CONT.	
Subtotal Management			**165**	**10**		**10**		**CONT.**	**CONT.**	
Remarks										
SBIR assessment				**27**						
Total Cost			**7992***	**1505**		**1878**		**CONT.**	**CONT.**	

*** TOTAL PRIOR YEARS COST TOTALS INCLUDE THE FY96 & PRIOR, FY97 ACTUAL COLUMNS FROM THE FY99 PRESIDENT'S BUDGET R-3 AND THE FY98 CURRENT CONTROLS.**

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET PROJECT JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 4 | PROGRAM ELEMENT: 0603216N | PROGRAM ELEMENT TITLE: Aviation Survivability | PROJECT NUMBER: W0592 | PROJECT TITLE: A/C & Ordnance Safety

(U) COST: (Dollars in Thousands)

Project Number & Title	FY 1998 Budget	FY 1999 Budget	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	To Complete	Total Program
W0592 A/C & Ordnance Safety	1,243	1,723	1,725	1,799	1,845	1,894	1,949	2,000	CONT.	CONT.
TOTAL	1,243	1,723	1,725	1,799	1,845	1,894	1,949	2,000	CONT.	CONT.

Quantity of RDT&E Articles

(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project transitions Insensitive Munitions (IM) technology from IM Advanced Development (generic technology) to Air Weapon Systems to comply with Chief of Naval Operations direction that all munitions carried aboard Navy ships be insensitive to fast cook-off (FCO), slow cook-off (SCO), bullet and fragment impact (BI and FI), and sympathetic detonation (SD).

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:

- (U) ($310) Fabricated composite case for Hydro-burst testing of 2.75-inch rocket motor.
- (U) ($474) Completed evaluation of IM technology for Joint Standoff Weapon (JSOW) (Unitary) and Advanced Anti-Radiation Missile (ARM).
- (U) ($459) Completed loading of High Performance Air to Missile (HPAAM) Hydroxyl Terminated Polyether (HTPE) propellant in 6-inch diameter composite case motors.

DATE: February 1999

BUDGET ACTIVITY: 4 | PROGRAM ELEMENT: 0603216N | PROGRAM ELEMENT TITLE: Aviation Survivability | PROJECT NUMBER: W0592 | PROJECT TITLE: A/C &Ordnance Safety

2. (U) FY 1999 PLAN:

- (U) ($278) Load composite cases, conduct IM and performance testing of 2.75-inch rocket motor.
- (U) ($481) Building on IM technology developed under the JSOW Unitary, address sympathetic detonation/containment to tandem warheads.
- (U) ($964) Continue full scale IM tests and static firings of High Performance Air to Missile (HPAAM) Hydroxyl Terminated Polyether (HTPE) propellant in 6-inch diameter composite case motors.

3. (U) FY 2000 PLAN:

- (U) ($338) Demonstrate manufacturability of 2.75-inch rocket motor.
- (U) ($434) Continue evaluation of IM technology to validate tandem warhead containment models.
- (U) ($953) Complete IM tests and static firings of rocket motors for High Performance 6-inch Rocket IM Support. Perform flight testing of AIM9X/Sidewinder composite rocket motor.

(U) B. PROGRAM CHANGE SUMMARY

	FY 1998	FY 1999	FY 2000
(U) FY 1999 President's Budget:	1,252	1,732	1,759
(U) Appropriated Value:	1,252	1,732	
(U) Adjustments from President's Budget:	-9	-9	-34
(U) FY 2000 President's Budget Submit:	1,243	1,723	1,725

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET PROJECT JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603216N
PROGRAM ELEMENT TITLE: Aviation Survivability

PROJECT NUMBER: W0592
PROJECT TITLE: A/C & Ordnance Safety

CHANGE SUMMARY EXPLANATION:

(U) Funding: FY1998 reflects a net decrease of -$9 thousand as a result of minor program adjustments. FY1999 reflects a net decrease of -$9 thousand as a result of revised economic adjustments. FY2000 reflects a net decrease of -$34 thousand consisting of -$18 thousand for Navy Working Capital Fund (NWCF) rate adjustments and -$16 thousand for minor program adjustments.

(U) Schedule: Not applicable

(U) Technical: Not applicable

(U) C. OTHER PROGRAM FUNDING SUMMARY: Not applicable

Related RDT&E: PE 0604802A
PE 0603609N

(U) D. ACQUISITION STRATEGY: This is a non-ACAT program with no specific acquisition strategies.

(U) E. SCHEDULE PROFILE: Not applicable

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603216N

PROJECT NUMBER: W0592

PROJECT TITLE: A/C & Ordnance Safety

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total Prior Yrs Cost	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Systems Engineering	WX	NAWC WD China Lake	9,293	1,703	10/98	1,705	10/99	CONT.	CONT.	
Subtotal Product Development			**9,293**	**1,703**		**1,705**		**CONT.**	**CONT.**	
Remarks										
Subtotal Support			**0**	**0**		**0**		**0**	**0**	
Remarks										
Subtotal Test & Evaluation			**0**	**0**		**0**		**0**	**0**	
Remarks										
Miscellaneous	WX	NAWCAD PAX	10	20	10/98	20	10/99	CONT.	CONT.	
Subtotal Management			**10**	**20**		**20**		**CONT.**	**CONT.**	
Remarks										
Total Cost			**9,303**	**1,723**		**1,725**		**CONT.**	**CONT.**	

DATE: February 1999

BUDGET ACTIVITY: 4 | **PROGRAM ELEMENT: 0603216N** | **PROGRAM ELEMENT TITLE: Aviation Survivability** | **PROJECT NUMBER: W1819** | **PROJECT TITLE: CV A/C Fire Suppression System**

(U) COST: (Dollars in Thousands)

Project Number & Title	FY 1998 Budget	FY 1999 Budget	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	To Complete	Total Program
W1819 Carrier Vehicle Aircraft Fire Suppression System										
	1,084	842	982	1,022	1,050	1,081	1,114	1,144	CONT.	CONT.
TOTAL	**1,084**	**842**	**982**	**1,022**	**1,050**	**1,081**	**1,114**	**1,144**	**CONT.**	**CONT.**

Quantity of RDT&E Articles

(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project develops improved firefighting systems and fire protective measures for aircraft related fires on aircraft carriers, including assessment of fire properties, definition of fire threats, improvements to firefighting agents and delivery systems, fire detection and suppression system performance evaluations, and firefighter training improvements

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. FY 1998 ACCOMPLISHMENTS:

- (U) ($302) Continued development of ordnance cooling requirements; established updated ordnance inventory, incorporated ordnance evaluation provisions in fire testing, developed instrumentation requirements, evaluated relative effect of varying cooling techniques.
- (U) ($378) Finalized overhaul of environmentally safe fire testing facility; finished test site refurbishment, maintained compliant permit status, incorporation and operational testing of water and fuel delivery systems, optimized instrumentation provisions and ensured functionality, designed and constructed simulated engine test article, conducted baseline fire testing to qualify facility.
- (U) ($228) Commenced fire testing of agents, equipment, aircraft and ordnance materials; performance evaluation of compressed nitrogen foam system, OPEVAL of modified twin agent unit, conducted full scale aircraft engine fire testing (damage assessment, test standard, operational methodologies, handheld performance, flight line extinguishers).

DATE: February 1999

BUDGET ACTIVITY: 4 | **PROGRAM ELEMENT: 0603216N** | **PROGRAM ELEMENT TITLE: Aviation Survivability** | **PROJECT NUMBER: W1819** | **PROJECT TITLE: CV A/C Fire Suppression System**

1. FY 1998 ACCOMPLISHMENTS: (CONT)

- (U) ($176) Initiated development of flight deck imaging system; evaluated need for enhancement, formulated preliminary system requirements.

2. FY 1999 PLAN:

- (U) ($89) Complete evaluation of ordnance cooling requirements; remain current on ordnance inventory, conduct full scale fire testing of dummy ordnance (assess defined threat to individual components, evaluate impact of various fire fighting techniques and equipment).
- (U) ($402) Upgrade capabilities of environmentally safe fire test facility; maintain compliant permit status, design and construct test article provisions for conducting wheel/brake, electrical, 2D/3D, spill, and mass conflagration evaluations.
- (U) ($100) Continue fire testing of agents, equipment, aircraft and ordnance materials; finalize engine fire testing, commence wheel/brake and electrical full scale testing (assess collateral damage, conduct comparative systems testing, develop test standards, optimize operational methodologies).
- (U) ($245) Complete development of flight deck imaging system; develop system designs for comparative testing, secure test articles, develop pass/fail criteria.
- (U) ($6) Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

3. FY 2000 PLAN:

- (U) ($542) Conduct testing of fire test standards for wheel/brake, electrical, and spill fires. Identify critical test parameters and provide adequate instrumentation for testing. Manufacture details for fire threat simulators with adequate test repeatability provisions. Conduct full scale, fleet representative fire testing to evaluate relative performance of available and developmental extinguishing systems.
- (U) ($160) Enhance the Mobile Aircraft Fire Fighting Training Device by evaluating options to propane fuel. Conduct live fire training demonstrations. Incorporate system upgrades based on fleet responses. Establish zoning criteria to maximize fleet personnel training opportunities.

DATE: February 1999

BUDGET ACTIVITY: 4 | PROGRAM ELEMENT: 0603216N | PROGRAM ELEMENT TITLE: Aviation Survivability | PROJECT NUMBER: W1819 | PROJECT TITLE: CV A/C Fire Suppression System

3. FY 2000 PLAN: (CONT)

- (U) ($280) Continue carrier reduced manning studies. Evaluate potential negative safety impact of reduced manning of Navy ships relative to current level of onboard fire fighting provisions. Ensure adequate fire fighting provisions are maintained through evaluation of systems hardware enhancements, development of novel fire fighting approaches, and optimized personnel emergency procedures. Assess opportunities for overall improvement in shipboard handling of fire emergencies.

(U) B. PROGRAM CHANGE SUMMARY

	FY 1998	FY 1999	FY 2000
(U) FY 1999 President's Budget:	1,096	846	987
(U) Appropriated Value:	1,096	846	
(U) Adjustments from DON Budget:	-12	-4	-5
(U) FY 2000 OSD Budget Submit:	1,084	842	982

CHANGE SUMMARY EXPLANATION:

(U) The net decrease in FY98 is due to a reprogramming of -$12 thousand. The FY99 decrease of -$4 thousand is for economic adjustments. The net decrease of -$5 thousand in FY 2000 denotes +$4 thousand for Navy Working Capital Fund (NWCF) and -$9 thousand for economic adjustments.

(U) Schedule: Not applicable

(U) Technical: Not applicable

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603216N
PROGRAM ELEMENT TITLE: Aviation Survivability

PROJECT NUMBER: W1819
PROJECT TITLE: CV A/C Fire Suppression System

(U) C. OTHER PROGRAM FUNDING SUMMARY: Not Applicable.

Related RDT&E: Not applicable

(U) D. ACQUISITION STRATEGY: Not Applicable.

(U) E. SCHEDULE PROFILE: Not Applicable.

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603216N

PROJECT NUMBER: W1819

PROJECT TITLE: CV A/C Fire Suppression

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total Prior Yrs Cost	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Misc	WX	MISC	4618	647	Various	170	Various	CONT.	CONT.	
Subtotal Product Development			**4618**	**647**		**170**		**CONT.**	**CONT.**	
Remarks										
Miscellaneous	WX	MISC	1104	0		280	Various	CONT.	CONT.	
Subtotal Support			**1104**	**0**		**280**		**CONT.**	**CONT.**	
Miscellaneous	WX	MISC	2238	179	Various	522	Various	CONT.	CONT.	
Subtotal Test & Evaluation			**2238**	**179**		**522**		**0**	**0**	
Remarks										
Travel	WX	NAWCAD PAX	25	10	Various	10	Various	CONT.	CONT.	
Subtotal Management			**25**	**10**		**10**		**CONT.**	**CONT.**	
SBIR Assessment				6						
Remarks										
Total Cost			**7,985**	**842**		**982**		**CONT.**	**CONT.**	

EXHIBIT R-2, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603261N
PROGRAM ELEMENT TITLE: Tactical Airborne Reconnaissance

(U) COST: (Dollars in Thousands)

Project Number & Title	FY 1998 Budget	FY 1999 Budget	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	To Complete	Total Program
A2467 Tactical UAV CONOPS Research	0	0	1,975	1,981	1,986	1,989	1,992	1,997	CONT.	CONT.
E0534 Tactical Reconnaissance System	12,874	1,474	0	0	0	0	0	0	0	220,456
TOTAL	12,874	1,474	1,975	1,981	1,986	1,989	1,992	1,997	CONT.	CONT.

(A) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program provides for the development of studies, analyses and demonstrations for Tactical Unmanned Aerial Vehicle (TUAV) concept of operation (CONOP) development. Additionally, in Fiscal years 1998 and 1999 this program allowed development of systems to provide timely and accurate imagery intelligence for the U.S. Marine Corps. Specifically:

- TUAV CONOPS Research: The efforts supported under this program provide studies of concept of operations using maritime tactical unmanned aerial vehicles.

- F/A –18D Tactical Reconnaissance System: The F/A-18D Tactical Reconnaissance System will replace the RF-4B which was phased out in 1990. Electro-Optical, Infrared and Synthetic Aperture Radar (SAR) sensors will provide high resolution imagery in all weather conditions, day or night at low, medium or high altitude over flight or stand off ranges. Imagery data is digitally recorded and can be data linked in near real-time and/or returned to base for playback, analysis, processing, and storage.

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under DEMONSTRATION & VALIDATION because it develops and integrates hardware and technologies for experimental test related to specific ship or aircraft applications.

DATE: February 1999

BUDGET ACTIVITY: 4 **PROGRAM ELEMENT: 0603261N** **PROJECT NUMBER: A2467**
PROGRAM ELEMENT TITLE: Tactical Airborne Reconnaissance **PROJECT TITLE: TUAV CONOPS Research**

U) COST: (Dollars in Thousands)

Project Number & Title	FY 1998 Budget	FY 1999 Budget	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	To Complete	Total Program
A2467 TUAV CONOPS RESEARCH										
TOTAL	0	0	1,975	1,981	1,986	1,989	1,992	1,997	CONT.	CONT.

(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program provides funding for concept of operation (CONOP) development, research and studies in the integration of tactical unmanned aerial vehicles into Naval Strike Warfare. This program is funded under DEMONSTRATION & VALIDATION because it develops and integrates hardware and technologies for experimental test related to specific ship or aircraft applications.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

Previous Accomplishments: This is a new start effort.

1. FY 2000 Plan:

   - (U) ($1,975) Initiate studies and demonstrations for CONOP development into Naval Strike Warfare.

\

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603261N
PROGRAM ELEMENT TITLE: Tactical Airborne Reconnaissance

PROJECT NUMBER: A2467
PROJECT TITLE: TUAV CONOPS Research

(U) B. PROGRAM CHANGE SUMMARY

	FY 1998	FY 1999	FY 2000
(U) FY 1999 President's Budget:	0	0	0
(U) Appropriated Value:			
(U) Adjustments from Pres Budget:			+1,975
(U) FY 2000 President'sBudget Submit:			1,975

CHANGE SUMMARY EXPLANATION:

(U) Funding: Navy provided funding in POM 00.
(U) Schedule: Not Applicable.
(U) Technical: Not Applicable.

(U) C. OTHER PROGRAM FUNDING SUMMARY: Not applicable.

(U) D. ACQUISITION STRATEGY: Not Applicable.

(U) E. SCHEDULE PROFILE: Not Applicable.

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603261N
PROGRAM ELEMENT TITLE: TACTICAL AIRBORNE RECONNAISSANCE

PROJECT NUMBER: A2467
PROJECT TITLE: TUAV CONOPS RESEARCH

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total Prior Yrs Cost	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Project Development Organizations										
Naval Postgraduate School (NPS)	WX	NPS, Monterey, CA				1,778		CONT.	CONT.	
NSAWC	WR	NSAWC Fallon,NV				197		CONT.	CONT.	
Subtotal Project Development						**1,975**		**CONT.**	**CONT.**	

Remarks:

Support Organizations

Subtotal Support

Remarks:

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603261N

PROGRAM ELEMENT TITLE: TACTICAL AIRBORNE RECONNAISSANCE

PROJECT NUMBER: A2467

PROJECT TITLE: TUAV CONOPS RESEARCH

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total Prior Yrs Cost	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Test & Evaluation Organizations										
Subtotal Test & Evaluation										
Remarks:										
Management Organizations										
Subtotal Management										
Remarks:										
Total Cost			0	0		1,975		CONT.	CONT.	

DATE: February 1999

BUDGET ACTIVITY: 4 **PROGRAM ELEMENT: 0603261N** **PROJECT NUMBER: E0534**
PROGRAM ELEMENT TITLE: Tactical Airborne Reconnaissance **PROJECT TITLE: Tactical Reconnaissance System**

U) COST: (Dollars in Thousands)

Project Number & Title	FY 1998 Budget	FY 1999 Budget	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	To Complete	Total Program
E0534 Tactical Reconnaissance System										
TOTAL	**12,874**	**1,474**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**220,456**

(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The Tactical Airborne Reconnaissance Program develops systems to provide timely and accurate imagery intelligence for the U.S. Marine Corps. The F/A-18D Tactical Reconnaissance System will replace the RF-4B that was phased out in 1990. Electro-Optical, Infrared and Synthetic Aperture Radar (SAR) sensors will provide high resolution imagery in all weather conditions, day or night at low, medium or high altitude over flight or stand off ranges. Imagery data is digitally recorded and can be data linked in near real-time and/or returned to base for playback, analysis, processing, and storage.

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under DEMONSTRATION & VALIDATION because it develops and integrates hardware for experimental test related to specific ship or aircraft applications.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. FY 1998 ACCOMPLISHMENTS:

- (U) ($9,250) Continue development and integration of the F/A-18 Tactical Reconnaissance System.
- (U) ($3,020) Continue Advanced Tactical Airborne Reconnaissance System (ATARS) and Radar Upgrade (RUG) II development testing with data link and Operational Flight Program (OFP) 13C. Continue in-house technical support.
- (U) ($604) Continue in-house engineering support.

2. FY 1999 PLAN:

- (U) ($1,211) Complete system Operational Evaluation. Conduct program review for full rate production decision. Continue in-house technical support.
- (U) ($247) Continue in-house technical support.

BUDGET ACTIVITY: 4 **PROGRAM ELEMENT: 0603261N** **PROJECT NUMBER: E0534**
PROGRAM ELEMENT TITLE: Tactical Airborne Reconnaissance **PROJECT TITLE: Tactical Reconnaissance System**

- (U) ($16) Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

(U) B. PROGRAM CHANGE SUMMARY

	FY 1998	FY 1999	FY 2000
(U) FY 1999 President's Budget:	10,262	1,479	0
(U) Appropriated Value:	10,607	1,479	0
(U) Adjustments from President's Budget:	2,612	-5	0
(U) FY 2000/2001 President's Budget Submit:	12,874	1,474	0

CHANGE SUMMARY EXPLANATION:

(U) Funding: FY 1998 consists of a $2,000 thousand increase for Navy reprioritization, a $951 thousand increase for payback of funds for the F/A-18E/F $26M shortfall, a decrease of $332 thousand for a Small Business Innovation Research (SBIR) reduction and a decrease of $7 thousand for other OSD adjustments. The FY 1999 change consists of a decrease of $3 thousand for revised economic assumptions and a decrease of $2 thousand for personnel under execution.

(U) Schedule: Due to technical issues addressed below, the completion of software enhancements, OPEVAL, the Full Rate Production decision and the Full Rate Production contract award have slipped.

(U) Technical: Software maturity and hardware reliability growth has not progressed at the expected rate to meet original milestones.

BUDGET ACTIVITY: 4 **PROGRAM ELEMENT: 0603261N** **PROJECT NUMBER: E0534**
PROGRAM ELEMENT TITLE: Tactical Airborne Reconnaissance **PROJECT TITLE: Tactical Reconnaissance System**

(U) C. OTHER PROGRAM FUNDING SUMMARY

Appn	FY 1998 Budget	FY 1999 Budget	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	To Complete
APN-5									
C/D	**58,230**	**42,134**	**56,151**	**24,337**	**0**	**0**	**0**	**0**	**12,723**

Related RDT&E: Not Applicable

(U) D. ACQUISITION STRATEGY: Currently on contract for LRIP-2, which is a sole source contract with Boeing.

(U) E. SCHEDULE PROFILE:

	FY 1998	FY 1999	FY 2000	FY 2001
(U) Program Milestones	1Q/PROGRAM REVIEW FOR LRIP II	4Q/FULL RATE PRODUCTION DECISION		
(U) Engineering Milestones		3Q/COMPLETE SOFTWARE ENHANCEMENTS		
(U) T&E Milestones	4Q/PRODUCTION VERIFICATION FLIGHT TEST	4Q/ OPEVAL		
(U) Contract Milestones	2Q/LRIP II CONTRACT AWARD	4Q/FRP CONTRACT AWARD		

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
RDT&E1319/Budget Activity 4	Advanced Combat System Technology, PE0603382N

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total P.E. Cost	4.81	6.63	6.83	12.04	14.44	14.70	15.00	15.33	CONT.	CONT.
Advanced Combat System Technology/K0324	4.81	6.63	6.83	12.04	14.44	14.70	15.00	15.33	CONT.	CONT.
Quantity of RDT&E Articles & cost	Not Applicable									

A. Mission Description and Budget Item Justification

This line item funds studies and experiments which will be conducted in distributed computer architecture, radar technology, and Tactical Informational Management Concepts to mature them to transition candidates for introduction into the AEGIS Weapon System. This program will take a disciplined systems engineering approach to find how these advances can be integrated into the AEGIS system and subsequent combat systems, and to plan combat system baseline upgrade schedules. Fully Distributed Computing Architecture is the first advanced development effort, leveraging the joint AEGIS/Defense Advanced Research Projects Agency (DARPA) High Performance Distributive Computing (Hiper-D) technology effort. It implements the results of distributed processing advances to replace the current AEGIS Combat System architecture with an open, distributed architecture. Radar studies are also being conducted to identify state-of-the-art technology options for the next generation radar. Complex Tactical Information Management of the flow and display of tactical information through the "detect-control-engage" process to better support the operator/decision maker will be a significant priority of this task. These advanced technologies are candidate systems for future baseline upgrades.

FY98 ACCOMPLISHMENTS:

- ($0.56) Conducted system engineering experiments with COTS/DARPA computer technologies to assess their readiness and maturity for transitioning into AEGIS Combat System production baselines built on open system computing principles.
- ($2.65) Completed prototyping and re-engineering activities of AEGIS Weapon System computer programs focusing on the Baseline 7 computer architecture issues associated with the FY98 integrated demonstration.
- ($1.10) Conducted an integrated demonstration at the computing test bed that incorporated enhanced computing architecture technology with respect to information transfer, open system design, processing, support software, and related areas. Developed an early engineering design for ship information transfer capability.
- ($0.50) Continued development of AEGIS Weapon System architecture and performance models using prototype modeling tools, multi-sensor coordination and advanced tactical information management.

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
RDT&E1319/Budget Activity 4	Advanced Combat System Technology, PE0603382N

FY99 PLAN:

- ($2.00) Conduct studies concerning the feasibility of applying Visualization Architecture and Technology (VAT) concepts to shipboard use.
- ($1.00) Continue system engineering experiments with currently emerging COTS/DARPA computer technologies to assess improvements in upgrades against previously identified shortfalls. Feedback any existing shortfalls for future enhancements. Work within the commercial standards communities to address the shortfalls in computing capabilities for Navy applications.
- ($1.36) Conduct an integrated demonstration in the computing testbed of selected AEGIS Weapon System capabilities focused on initial QoS (Quality of Service) functionality in the middleware domain. Demonstrate an initial integrated set of common engineering services for the information infrastructure, including the addition of another warfighting or other shipboard information/control system. Also demonstrate initial middleware capabilities within the Common CDS (Combat Direction System) functional areas that support object-oriented computer program architectures.
- ($1.00) Initiate risk reduction experiments focused on middleware issues associated with object-oriented computer program architectures with an initial target of Common CDS capability for AEGIS combat systems. Assess maturity and transition potential of available or emerging technologies into AEGIS Baseline development efforts on Baseline 6 Phase III and 7 Phase I.
- ($1.13) Enhance AEGIS Weapon System architecture and performance models using prototype modeling tools, multi-sensor coordination, and advanced tactical information management concepts. Develop and validate enhanced certification techniques that are applicable to the enhanced computing architecture prototyped in FY98.
- ($0.14) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

FY00 PLAN:

- ($1.13) Continue system engineering experiments with currently emerging COTS/DARPA computer technologies to assess improvements in upgrades against previously identified shortfalls. Feedback any existing shortfalls for future enhancements. Work within the commercial standards communities to address the shortfalls in computing capabilities for Navy applications.
- ($3.50) Conduct an integrated demonstration in the computing testbed of selected AEGIS Weapon System capabilities focused on second phase QoS functionality in the middleware domain. Assess and validate the available certification techniques applicable within the Common CDS functional areas that support object-oriented computer program architectures.
- ($1.20) Initiate transition efforts of lessons learned in the FY99 middleware risk reduction experiments targeted at the Common CDS capability for AEGIS combat systems. Work with the Baseline development teams to identify remaining or emerging issues associated with transition to Baseline 6 Phase III and Baseline 7 Phase I for middleware capabilities.
- ($1.00) Validate the performance modeling tools against the existing prototype capabilities in the computing testbed.

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
RDT&E1319/Budget Activity 4	Advanced Combat System Technology, PE0603382N

A. Program Change Summary:

	FY 1998	FY 1999	FY 2000
FY 1999 President's Budget:	5.08	8.65	8.15
Appropriated Value:	5.23	6.65	
Adjustment to FY 1998 Appropriated Value/			
FY 1999 President's Budget:	-0.27	-2.02	-1.32
FY 2000 PRES Budget Submit:	4.81	6.63	6.83

Funding: FY 1998 change due to SBIR Reduction and minor pricing adjustments. FY1999 change due to Congressional reduction and minor pricing adjustments. FY 2000 changes due to shifting Navy priorities.

Schedule: FY1999-FY2000 funding reductions prevent completion of some risk reduction tasks. Failure to accomplish all risk reduction initiatives could impact Baseline 6 Phase III and Baseline 7 Phase I schedules.

Technical: Decrease in scope of critical risk reduction efforts required for Baseline 6 Phase III and Baseline 7 Phase I increases risk to development of these baselines.

B. Other Program Funding Summary

0604307N	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
R-1 No. 96	110.14	182.48	204.48	192.27	178.69	142.84	114.45	95.83	CONT.	CONT.

Budget Activity 5
Appropriation No. 1319
AEGIS Combat System Engineering

C. Acquisition Strategy: Risk reduction efforts are lead by NSWC, DD, the AEGIS Combat System ISEA. Results are transitioned to industry for cost and risk mitigation in the production of AEGIS Combat Systems.

D. Schedule Profile: Not Applicable

Exhibit R-3 Cost Analysis		Date: February 1999
RDT&E 1319/Budget Activity 4	Advanced Combat System Technology, PE0603382N	Advanced Combat System Technology, K0324

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Ancillary Hardware Development Miscellaneous				0.32		0.38		CONT.	CONT.	CONT.
Systems Engineering	SC/CPFF	Applied Physics Lab, Baltimore, MD	5.85	1.00	11/98	1.13	11/99	CONT.	CONT.	CONT.
	SS/CPFF	Lockheed Martin, Moorestown, NJ	0.00	0.76	3/95	1.03	3/95	CONT.	CONT.	CONT.
	WR	Naval Surface Warfare Center, Dahlgren, VA	8.21	1.45	12/98	3.72	12/99	CONT.	CONT.	CONT.
	WR	Naval Air Warfare Center, Aircraft Division, St. Inigoes, MD.	0.00	2.00	3/99	0.00				
Subtotal Product Development			14.06	5.53		6.26		CONT.	CONT.	CONT.
Software Development Miscellaneous			0.07	0.34	VARIOUS	0.11	VARIOUS	CONT.	CONT.	CONT.
Configuration Management Miscellaneous			0.05	0.24	VARIOUS	0.26	VARIOUS	CONT.	CONT.	CONT.
Technical Data Miscellaneous			0.03	0.20	VARIOUS	0.20	VARIOUS	CONT.	CONT.	CONT.
Subtotal Support			0.15	0.78		0.57		CONT.	CONT.	CONT.

Exhibit R-3 Cost Analysis		Date: February 1999
RDT&E 1319/Budget Activity 4	Advanced Combat System Technology, PE0603382N	Advanced Combat System Technology, K0324

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation Miscellaneous			0.00	0.32		0.00		CONT.	CONT.	CONT.
Subtotal T&E			0.00	0.32		0.00		CONT.	CONT.	CONT.
Subtotal Management Support										
Total Cost			14.21	6.63		6.83		CONT.	CONT.	CONT.

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RESEARCH, DEVELOPMENT, TEST& EVALUATION, NAVY/BA-4	R-1 ITEM NOMENCLATURE: .Surface & Shallow Water Mine Countermeasures/0603502N

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total P.E. Cost	70.143	88.211	82.465	89.610	69.063	42.309	61.542	67.824	N/A	
Remote Minehunting Systems Q0260/Q2387	16.607	26.767	35.231	42.018	25.425	11.394	17.339	17.355	N/A	N/A
Integrated Combat Weapons Systems Q1233/Q2388	10.264	11.725	5.011	7.929	5.982	3.471	3.476	3.481	N/A	N/A
Assault Breaching Systems Q2131	23.957	28.321	15.298	15.689	15.954	10.083	29.350	35.912	CONT.	CONT.
Unmanned Underwater Vehicle V2094	19.315	21.398	26.925	23.974	21.702	17.361	11.377	11.076	CONT.	CONT.
Quantity of RDT&E Articles & cost		1-NMRS				1-LMRS				

A. Mission Description and Budget Item Justification: The program provides for developments to combat the threat of known and projected foreign mines against U.S. Naval and merchant shipping in harbors, channels, choke points, sea lines of communications and amphibious and other fleet operating areas. It develops: (1) systems and support for systems which will detect, localize and classify moored, bottom, and close-tethered mines for use in Mine Countermeasure (MCM) MCM-1 Class, Mine Hunter Coastal (MHC) MHC-51 Class, and other surface ships; (2) systems for detection, neutralizing and sweeping mines from shallow water, very shallow water, surf zones, and beach landing craft zones in support of amphibious operations; (3) the integration and improvement of the combat system suite on MCM and MHC ships; (4) near-term and long-term Unmanned Undersea Vehicle (UUV) systems for clandestine mine reconnaissance.

B. Program Change Summary:

	FY 1998	FY 1999	FY 2000
FY 1999 President's Budget:	71.146	73.491	76.109
Appropriated Value:	73.174	80.491	
Adjustment to FY 1998 Appropriated Value/ & FY 1999 President's Budget:	(3.031)	7.720	6.356
FY 2000 President's Budget Submit:	70.143	88.211	82.465

Funding: FY98: : Congressional Undistributed Reductions (-$1.880) and SBIR Reductions (-$1.151); FY99: (-$1.260) General Reductions, (+$8.980) RMS; FY00: (-$1.032) General Reductions, (-$.080) Inflation reduction, (+$10.449) RMS restructure, (+$7.300) Organic MCM, (-$8.575) ICWS, (-$1.706) Misc. Adjustments;

Schedule: RMS – RMS (V)4 MSII will occur in 2Q/99 and RMS (V)4 MSIII will occur in 3Q/04.

Technical: Not Applicable.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RESEARCH, DEVELOPMENT, TEST& EVALUATION, NAVY/BA-4	Program Element Name & No. Surface & Shallow Water Mine Countermeasures/0603502N	Project Name and Number. Remote Minehunting Systems/Q0260

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	16.607	26.767	35.231	42.018	25.425	11.394	17.339	17.355	N/A	N/A
RDT&E Articles Qty										

A. Mission Description and Budget Item Justification: The Remote Minehunting Systems (RMS) Program develops a new remotely operated minehunting system for surface ships. This effort includes development of a remote vehicle, mine-hunting sensors, mission command and control, and integration into the DDG-51 Class Flight IIA Baseline 7 and AN/SQQ-89(V)15 Undersea Warfare Combat System.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS

- (U) ($8.102) Continue development and testing of RMS system (V)3.
- (U) ($7.655) Established design budget interface control documents for DDG-51 Flight IIA integration.
- (U) ($ .850) Prepared documentation for Milestone II and procurement package for RMS (V)4 contract.

2. (U) FY 1999 PLAN

- (U) ($ 4.500) Close out RMS (V)3 effort.
- (U) ($ .525) Complete all documentation and conduct Milestone II.
- (U) ($21.405) Begin development of RMS (V)4 to procure Engineering Development Models (EDMs) including new sensor development.
- (U) ($ .337) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLAN

- (U) ($14.397) Continue development and testing of the RMS EDMs.
- (U) ($18.543) Continue development of new sensor suite.
- (U) ($ 2.291) Begin DDG51 Flight IIA ship integration.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RESEARCH, DEVELOPMENT, TEST& EVALUATION, NAVY/BA-4	Program Element Name & No. Surface & Shallow Water Mine Countermeasures/0603502N	Project Name and Number. Remote Minehunting Systems/Q0260

B. Other Program Funding Summary

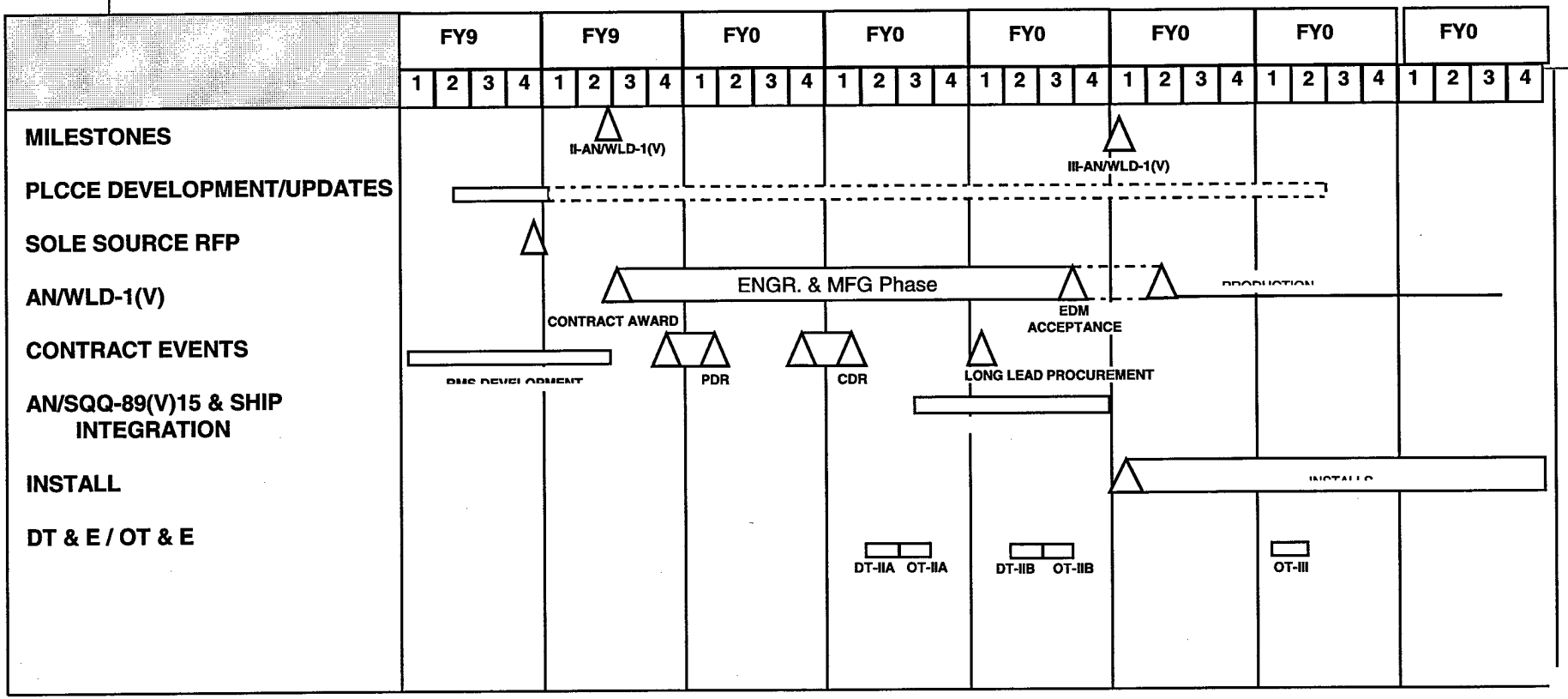
	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
RMS Contingency Systems OPN LI#262200	-0-	-0-	-0-	-0-	62.923	54.190	52.570	39.139	CONT.	CONT.

C. Acquisition Strategy: For the AN/WLD-1(V) (RMS (V)4), the government plans to issue a sole source contract to Lockheed Martin. The government will work with the contractor in an IPT environment to refine the specification, Statement of Work, and Request for Proposal (RFP) for the sensor suite sub-contracts. The IPT pricing will validate the cost estimates against Navy requirements. The government intends to pursue commonality between the AN/AQS-20 and the AN/WLD-1(V). The AN/WLD-1(V) contract procurement plan is for the development of one (1) EDM with an option for a second EDM, system interactive electronic technical manual (IETM), provisioning data, technical drawings and data, engineering services. The AN/WLD-1(V) contract will be a negotiated Cost Plus Incentive Fee with performance and cost incentives for the basic effort and the options associated with the development effort.

C. Schedule Profile: See Attached.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RESEARCH, DEVELOPMENT, TEST& EVALUATION, NAVY/BA-4	Program Element Name & No. Surface & Shallow Water Mine Countermeasures/0603502N	Project Name and Number. Remote Minehunting Systems/Q0260

RMS FY99 PROGRAM SCHEDULE



PDR-Preliminary Design Review – Parts that impact the ship integration must be completed at start of PDR.
CDR-Critical Design Review – Parts that impact the ship integration must be completed at start of CDR.
LRIP-Low Rate Initial Production
DT&E – Developmental Test and Evaluation
OT&E – Operational Test and Evaluation

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N, BA-4	PROGRAM ELEMENT NAME AND NUMBER: Surface & Shallow Water Mine Countermeasures, 0603502N	PROJECT NAME AND NUMBER: Remote Minehunting Systems, Q0260

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	C/CPAF	Lockheed Martin	21.8	3.5								
Primary Hardware Development	C/CPAF	TBD		12.2	TBD	18.1	TBD			CONT.	CONT.	N/A
Primary Hardware Development	SS/BOA	Raytheon	2.1									
Primary Hardware Development	WR	NSWC, CSS	81.1	.6	N/A	2.5	N/A			CONT.	CONT.	N/A
Primary Hardware Development	WR	NUWC, Keyport	.5									
Primary Hardware Development	SS/PR	ARL/UT	2.2									
Ancillary Engineering												
Licenses												
Tooling												
GFE												
Award Fees			4.8	1.6	N/A	2.8	N/A			CONT.	CONT.	N/A
Subtotal Product Development			112.5	17.9		23.4						
Remarks:												
Development Support Equipment	C/CPFF	TBD										
Software Development	C/CPFF	Lockheed Martin	2.3									
Software Development	C/CPFF	TBD		2.9	TBD	3.7	TBD			CONT.	CONT.	N/A
Training Development												
Integrated Logistics Support	WR	NSWC, CSS		1.1	N/A	1.3	N/A			CONT.	CONT.	N/A
Technical Data												
GFE												
Subtotal Support			2.3	4.0		5.0						

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N, BA-4	PROGRAM ELEMENT NAME AND NUMBER: Surface & Shallow Water Mine Countermeasures, 0603502N	PROJECT NAME AND NUMBER: Remote Minehunting Systems, Q0260

Remarks:

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	Fy00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	C/CPAF	Lockheed Martin	3.0									
Developmental Test & Evaluation	C/CPFF	TBD		1.2	TBD	1.6	TBD			CONT.	CONT.	N/A
Developmental Test & Evaluation	WR	NSWC, CSS	12.2	.6	N/A	.6	N/A			CONT.	CONT.	N/A
Developmental Test & Evaluation	SS/PR	ARL/UT	.07									
Developmental Test & Evaluation	Various	Various	.1									
Operational Test & Evaluation												
Tooling												
GFE												
Subtotal T&E			15.4	1.8		2.2						
Remarks:												
Contractor Engineering Support												
Government Engineering Support	WR	NSWC, CSS	18.1	1.8	N/A	2.5	N/A			CONT.	CONT.	N/A
Government Engineering Support	Various	Various	14.5									
Program Management Support	Various	Various		1.2	N/A	2.0	N/A			CONT.	CONT.	N/A
Program Management Personnel												
Travel	Various	NAVSEA		.06	N/A	.06	N/A			CONT.	CONT.	N/A
Labor (Research Personnel)												
Overhead												
Subtotal Management			32.6	3.1		4.6						

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N, BA-4	PROGRAM ELEMENT NAME AND NUMBER: Surface & Shallow Water Mine Countermeasures, 0603502N	PROJECT NAME AND NUMBER: Remote Minehunting Systems, Q0260

Remarks:												
Total Cost			162.8	26.8		35.2						
Remarks:												

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4	Program Element Name & No: Surface & Shallow Water Mine Countermeasures, 0603502N.	Project Name and Number: Integrated Combat Weapons Systems/Q1233.

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	3.193	11.725	5.011	7.929	5.982	3.471	3.476	3.481	N/A	44.273
RDT&E Articles Qty										

Mission Description and Budget Item Justification: (1) Closed Loop Degaussing (CLDG) to improve survivability of mine countermeasures ships; (2) ICWS is a series of major, incremental block upgrades to the current combat systems. It provides the MCM/MHC Class Ships an affordable and fully integrated combat weapons system, which will improve mission execution efficiency, dramatically reduce life-cycle costs, and facilitate changes to meet future mission requirements. (3) Medal is a software segment on the Global Command and Control System – Maritime (GCCS-M). MEDAL provides mine and warfare planning and evaluation tools and databases to the MCM Commander. C4I connectivity to the rest of the fleet is provided through GCCS-M. Design and implement MIW C4I Surveillance and Reconnaissance (C4ISR) architecture to fully integrate and optimize organic and dedicated systems within the Navy's C4ISR architecture.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS

(U) CLDG
- (U) ($ .800) Completed TECHEVAL.
- (U) ($ .200) Started OPEVAL.
- (U) ($ .295) Prepared for Milestone III.

(U) ICWS.
- (U) ($ .496) Completed architecture study, life cycle cost model, and preliminary design for integrated system.

(U) MEDAL
- (U) ($ .346) Development of tactical algorithms for Build 7.
- (U) ($ .100) Systems engineering.
- (U) ($ .231) Build 6 test and evaluation.
- (U) ($ .725) Configuration Minefield Theory Analysis.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4	Program Element Name & No: Surface & Shallow Water Mine Countermeasures, 0603502N.	Project Name and Number: Integrated Combat Weapons Systems/Q1233.

2. (U) FY 1999 PLAN

(U) CLDG
- (U) ($1.592) Complete OPEVAL. TECHEVAL and OPEVAL have been extended to accommodate ship schedule and ascertain whether range frequency threshold and goal have been met.
- (U) ($ .100) Complete all documentation required for MSIII.
- (U) ($ .103) Conduct MSIII.

(U) ICWS
- (U) ($ .590) Complete integration of unique SQQ-32 trainer functionality into SSQ-94 trainer.
- (U) ($ .170) Develop in-depth MNV signature knowledge and begin development of silencing modifications.
- (U) ($ .250) Complete tasks associated with SLQ-48 obsolescence issues to reduce life-cycle costs.
- (U) ($3.365) Conduct software design/code/test and hardware design/fabrication for sonar subsystem.

(U) MEDAL
- (U) ($ .250) Build 7 test and evaluation.
- (U) ($ .250) Build 8 platform conversion.
- (U) ($1.979) Begin development of Build 8 Core capabilities, tactical algorithms and software upgrades.
- (U) ($1.747) Define/develop Build 9.
- (U) ($ .315) Systems Engineering
- (U) ($ .214) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

(U) MCS/MCM Ship Studies
- (U) ($ .500) Initiate study of alternatives to replace or retain MCS-12 (USS INCHON) as the only fleet mine countermeasures support ship.
- (U) ($ .300) Initiate study of alternatives for follow-on class of surface mine countermeasures ships.3.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4	Program Element Name & No: Surface & Shallow Water Mine Countermeasures, 0603502N.	Project Name and Number: Integrated Combat Weapons Systems/Q1233.

2. (U) FY 2000 PLAN

(U) MEDAL
- (U) ($ .300) Build 8 test and evaluation.
- (U) ($1.045) Complete Build 9 development.
- (U) ($ .166) Build 10 core capabilities definition.

(U) ORGANIC MCM C4I
- (U) ($1.700) Develop MIW C4ISR data requirements for data fusion file format, structure and transmission requirements for (organic/dedicated) MIW systems.
- (U) ($1.800) Develop and conduct MOD/SIM to optimize organic and dedicated systems.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4	Program Element Name & No: Surface & Shallow Water Mine Countermeasures, 0603502N.	Project Name and Number: Integrated Combat Weapons Systems/Q1233.

B. Other Program Funding Summary

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
(U) OPN (CLDG)										
Line 262200	-0-	2.893	3.050	4.998	5.455	3.367	3.473	3.523	CONT.	CONT.
(U) OPN (ICWS)										
Line 262200	-0-	9.625	10.516	5.101	6.896	4.637	3.922	4.075	CONT.	CONT.

C. Acquisition Strategy: As a series of major incremental upgrades to the current systems, the original equipment manufacturers have teamed to develop the changes. FY 98 tasks are being accomplished under existing BOAs. MEDAL is an evolutionary program with a development cycle of one year per software build.

D. Schedule Profile: See Attached.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4	Program Element Name & No: Surface & Shallow Water Mine Countermeasures, 0603502N.	Project Name and Number: Integrated Combat Weapons Systems/Q1233.

ICWS

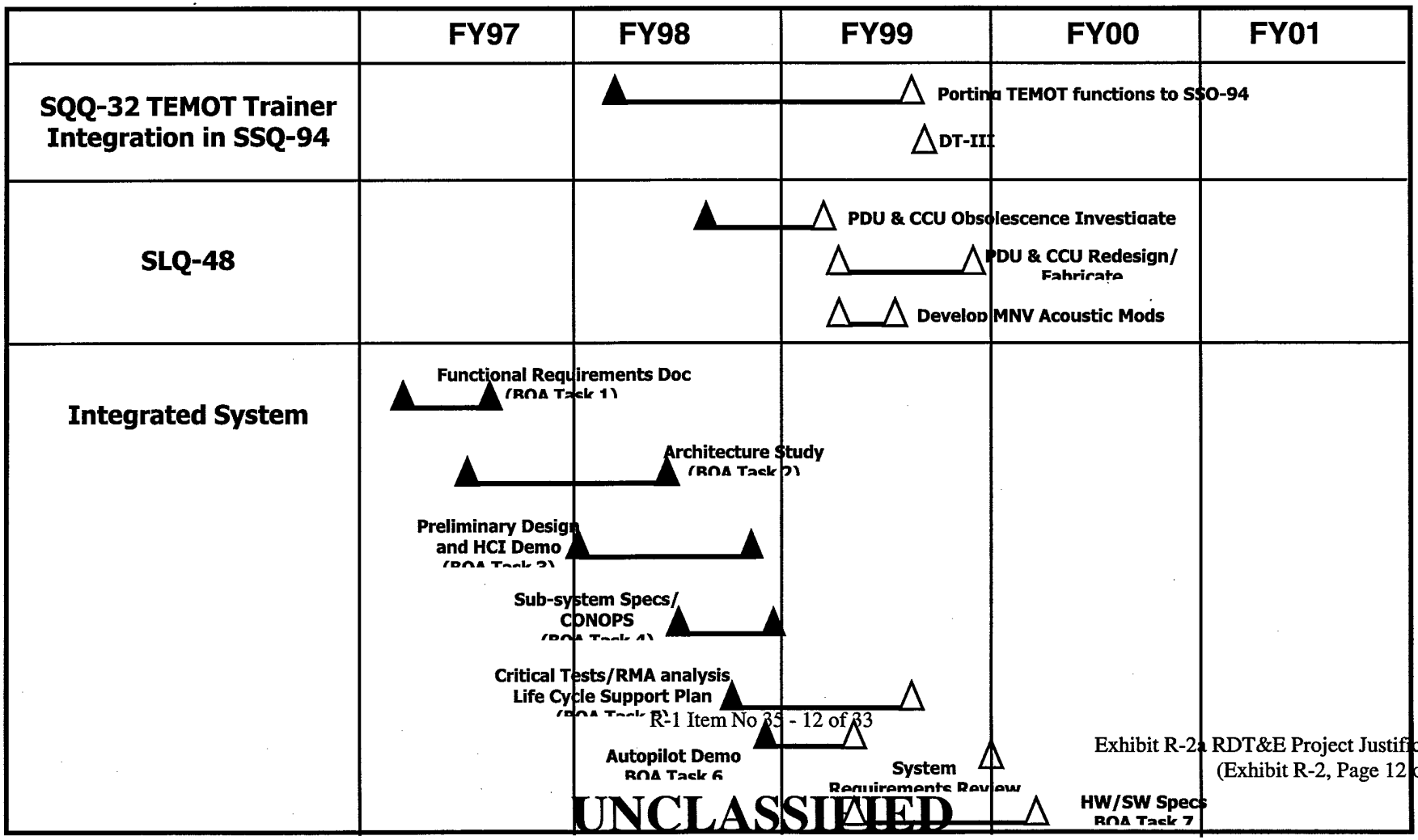


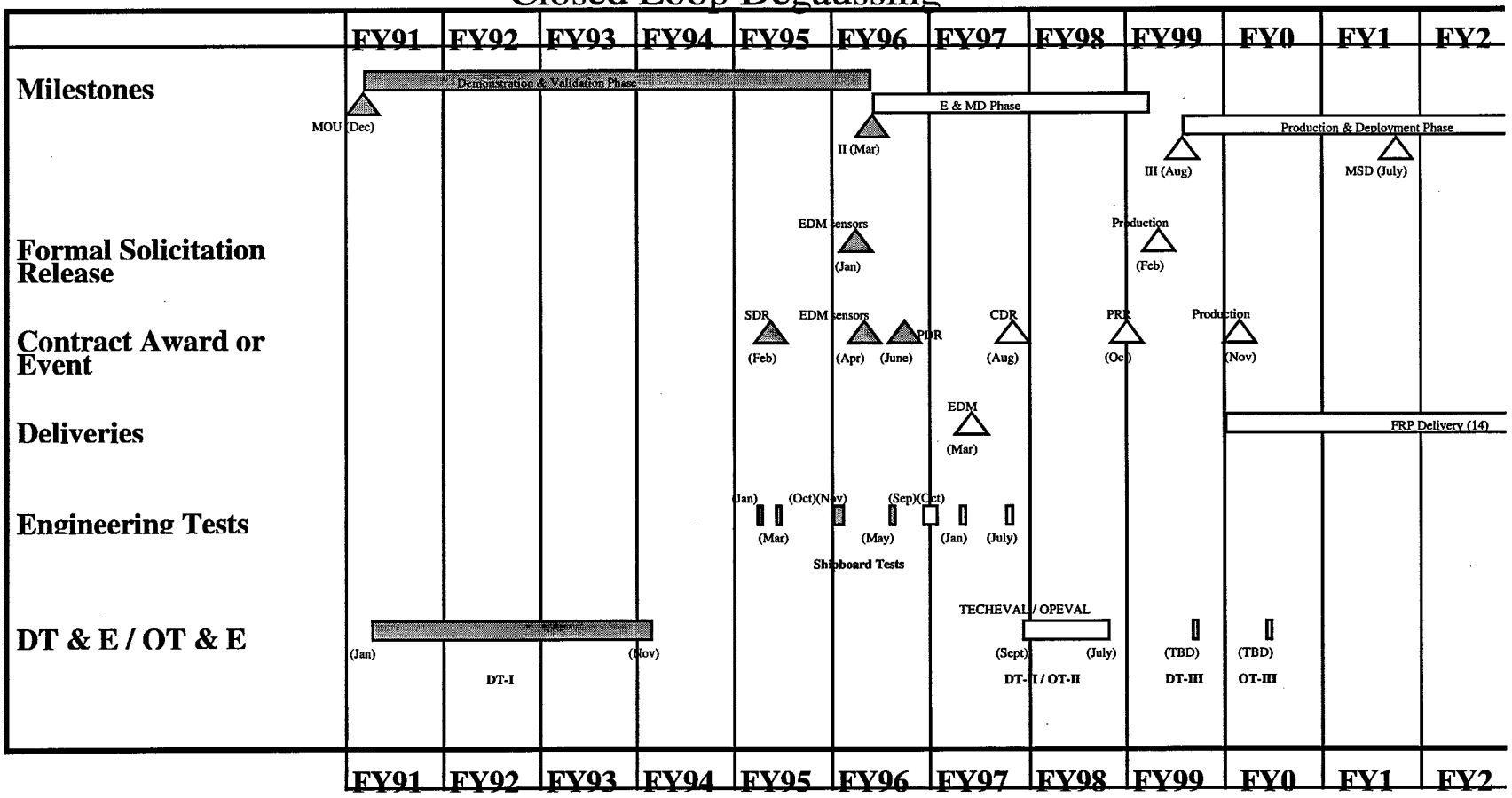
Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4	Program Element Name & No: Surface & Shallow Water Mine Countermeasures, 0603502N.	Project Name and Number: Integrated Combat Weapons Systems/Q1233.

MEDAL

	FY97	FY98	FY99	FY00	FY01
Develop, test, and field sequential Builds of MEDAL with increased capabilities	▲Build 5	Build 6△	Build 7 △	Build 8△	△Build 9 Build 10△

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4	Program Element Name & No: Surface & Shallow Water Mine Countermeasures, 0603502N.	Project Name and Number: Integrated Combat Weapons Systems/Q1233.

Closed Loop Degaussing



NOTES:

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/BA-4	Program Element Name & No: Surface & Shallow Water Mine Countermeasures, 0603502N.	Project Name and Number: Integrated Combat Weapons Systems/Q1233.

ORGANIC MCM C^{4}I

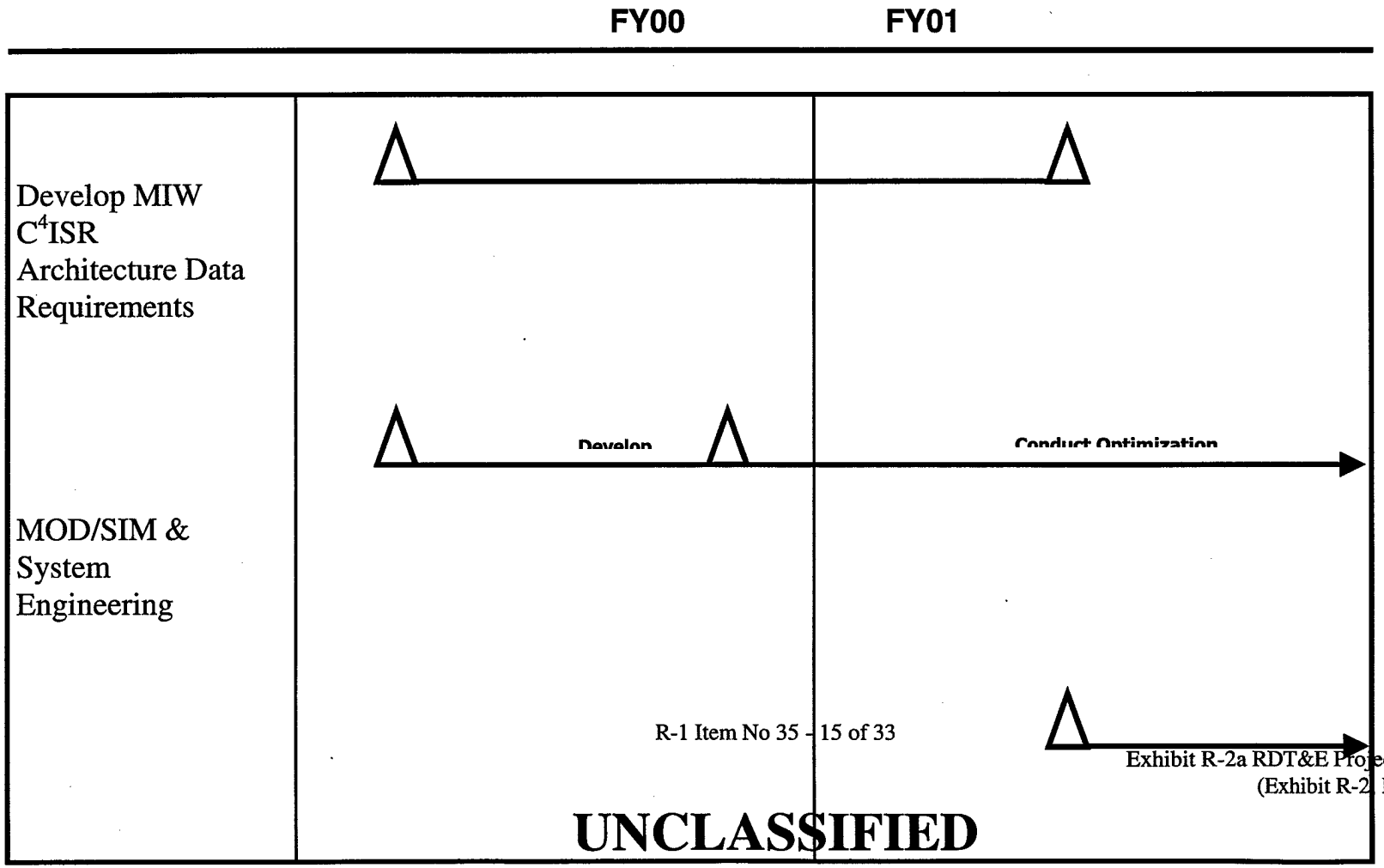


Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N	Program Element Name & No. Surface & Shallow Water Mine Countermeasures/ 0603502N	Project Name and Number. Integrated Combat Weapons Systems/Q1233

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	CPAF	Raytheon		1.0	1st Qtr							
Ancillary Hardware Development												
Systems Engineering	Various	NSWC, CD/ NRAD, SD	.1	2.6	1st Qtr	1.7	1st Qtr			CONT.	CONT.	N/A
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development			.1	3.6		1.7						
Remarks:												
Development Support Equipment												
Software Development	Various	NSWC, CSS	.3	5.1	1st Qtr	2.1	1st Qtr	2.6	Qtr	CONT.	CONT.	N/A
Training Development	Various	NSWC, CD		.05	N/A	.2		.2				
Integrated Logistics Support	CPAF	Raytheon, RI		.4		.2		.2				
Configuration Management	Various	Various		.2	N/A	.1		.2				
Technical Data	Various	Various		.4	N/A							
GFE												
Subtotal Support			.3	6.2		2.6		3.2				
Remarks:												

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	Fy00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	CPFF	SAIC, VA	.2	.3	1st Qtr	.3	1st Qtr			CONT.	CONT.	N/A
Operational Test & Evaluation	WR	NSWC, CD		.6	N/A							

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N	Program Element Name & No. Surface & Shallow Water Mine Countermeasures/ 0603502N	Project Name and Number. Integrated Combat Weapons Systems/Q1233

Tooling												
GFE												
Subtotal T&E			.2	.9		.3						
Remarks:												
Contractor Engineering Support	WR	NSWC, CD/CSS		.1	N/A	.1						
Government Engineering Support	WR	NSWC, CSS		.5	N/A	.2						
Program Management Support	WR	NSWC, CSS/NUWC		.3	N/A	.1	N/A			CONT.	CONT.	N/A
Program Management Personnel												
Travel				.1								
Labor (Research Personnel)												
Overhead												
Subtotal Management				1.0		.4						
Remarks:												
Total Cost			.6	11.7		5.0						
Remarks:												

Exhibit R-2a, RDT&E, N Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA-4	Program Element Name & No. Surface & Shallow Water Countermeasures/0603502N	Project Name and Number. Assault Breaching Systems/Q2131

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	23.957	28.321	15.298	15.689	15.954	10.083	29.350	35.912	CONT.	CONT.
RDT&E Articles Qty										

A. A. Mission Description and Budget Item Justification: This program provides for a combination of joint US Marine Corps and US Navy projects planned to counter the threat to amphibious landing forces from known and projected foreign land and sea mines and obstacles in the shallow water, very shallow water and surf zone approaches to amphibious assault areas. It develops systems for mine sweeping and explosive mine clearance. Included are the Distributed Explosives Technology (DET), Shallow Water Assault Breach System (SABRE) and follow-on P3I efforts. Beginning FY 98 includes transition of an ongoing Advanced Technology Demonstration Systems (ATDS) – Explosive Neutralization (EN) to an acquisition program.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS

(U) DET

- (U) ($5.264) Completed fabrication of DT-IIB/OT-II systems.
- (U) ($ .893) Completed Landing Craft Air Cushion (LCAC) integration.
- (U) ($2.513) Continued DT-II.
- (U) ($3.393) Began Safety tests
- (U) ($ .225) Began system procurement preparation
- (U) ($ .238) Began OT-II

(U) SABRE

- (U) ($1.600) Continued fabrication of DT-IIB/OT-II systems.
- (U) ($2.650) Began DT-II
- (U) ($1.211) Began OT-II
- (U) ($ .565) Began system procurement preparation.
- (U) ($ .800) Began System test.
- (U) ($ .685) Complete system integration with LCAC.

(U) EN

- (U) ($ .250) Complete P3I Cost analysis and development planning.
- (U) ($1.117) Complete LCAC integration tests
- (U) ($2.553) Begin Autonomous craft controller component procurement and testing.

Exhibit R-2a, RDT&E, N Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA-4	Program Element Name & No. Surface & Shallow Water Countermeasures/0603502N	Project Name and Number. Assault Breaching Systems/Q2131

2. (U) FY 1999 PLAN
(U) DET
- (U) ($2.338) Complete DT-II.
- (U) ($1.500) Complete safety testing.
- (U) ($1.249) Complete system procurement preparation.
- (U) ($1.938) Conduct OT-II
- (U) ($ .262) MSIII.

(U) SABRE
- (U) ($1.050) Complete safety testing.
- (U) ($ .431) Complete DT-II
- (U) ($ .375) Complete system procurement preparation.
- (U) ($1.475) Conduct OT-II
- (U) ($ .262) MSIII.

(U) EN
- (U) ($4.373) Begin Surf Zone Array (SZA) P3I development
- (U) ($3.262) Begin Line Charge (LC) P3I development
- (U) ($3.857) Begin Fire Control System (FCS) development.
- (U) ($5.700) SABRE Fuze upgrade.
- (U) ($ .190) Complete Autonomous controller development.
- (U) ($ .059) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLAN
(U) EN
- (U) ($6.289) Continue SZA P3I development and engineering tests.
- (U) ($5.486) Continue LC P3I development and engineering tests.
- (U) ($3.523) Continue FCS development and engineering tests.

Exhibit R-2a, RDT&E, N Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA-4	Program Element Name & No. Surface & Shallow Water Countermeasures/0603502N	Project Name and Number. Assault Breaching Systems/Q2131

B. Other Program Funding Summary

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
OPN #262400	-0-	8.876	18.813	18.871	29.066	20.519	13.835	8.730	CONT.	CONT.

C. Acquisition Strategy: Complete development of DET, SABRE and the Auto Pilot task of EN and transition to production in FY99. Improve the capabilities of DET and SABRE by developing the Surf Zone Array (SZA), Line Charge (LC), and the Fire Control System (FCS) tasks of EN.

D. Schedule Profile

Exhibit R-2a, RDT&E, N Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA-4	Program Element Name & No. Surface & Shallow Water Countermeasures/0603502N	Project Name and Number. Assault Breaching Systems/Q2131

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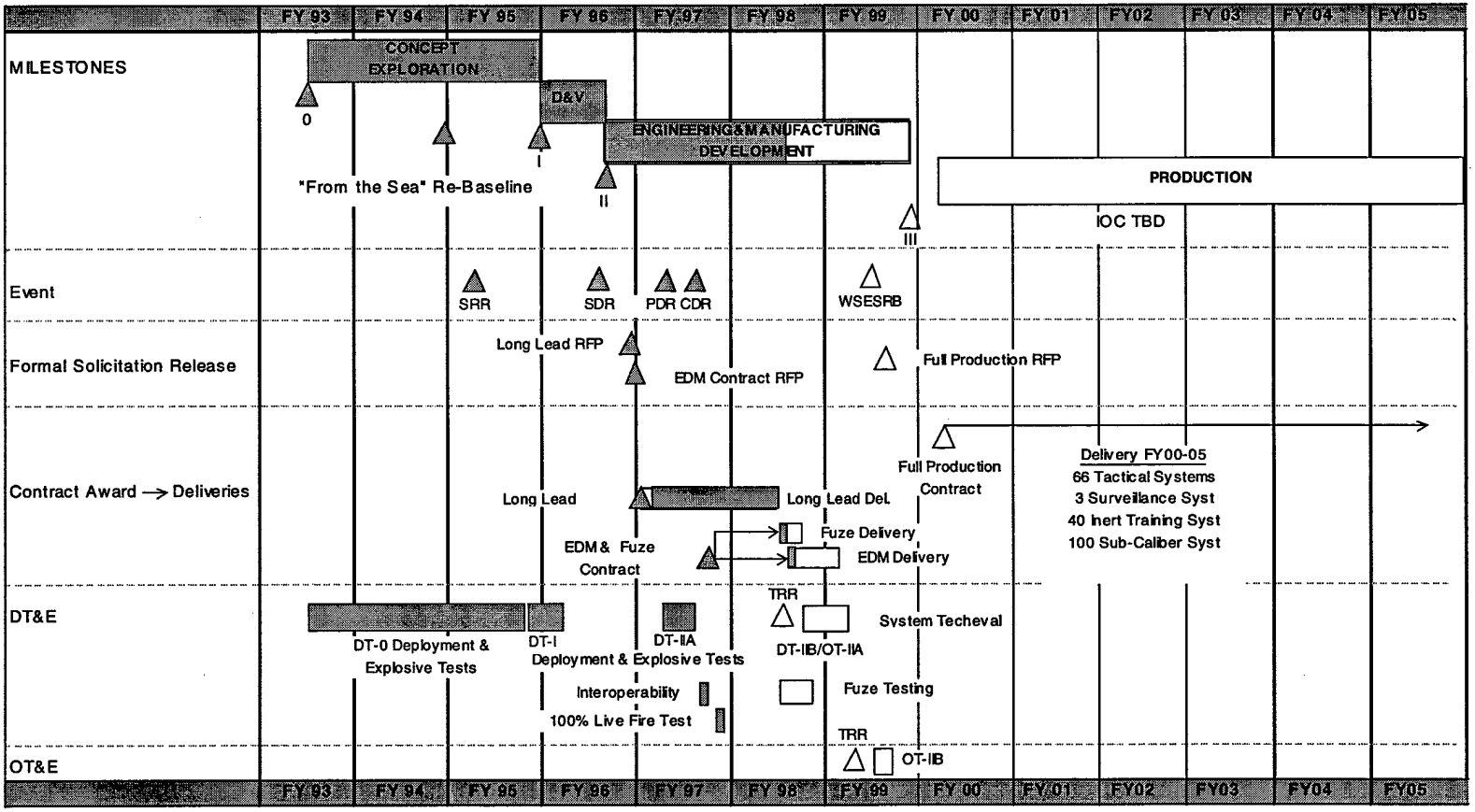


Exhibit R-2a, RDT&E, N Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA-4	Program Element Name & No. Surface & Shallow Water Countermeasures/0603502N	Project Name and Number. Assault Breaching Systems/Q2131

SABRE

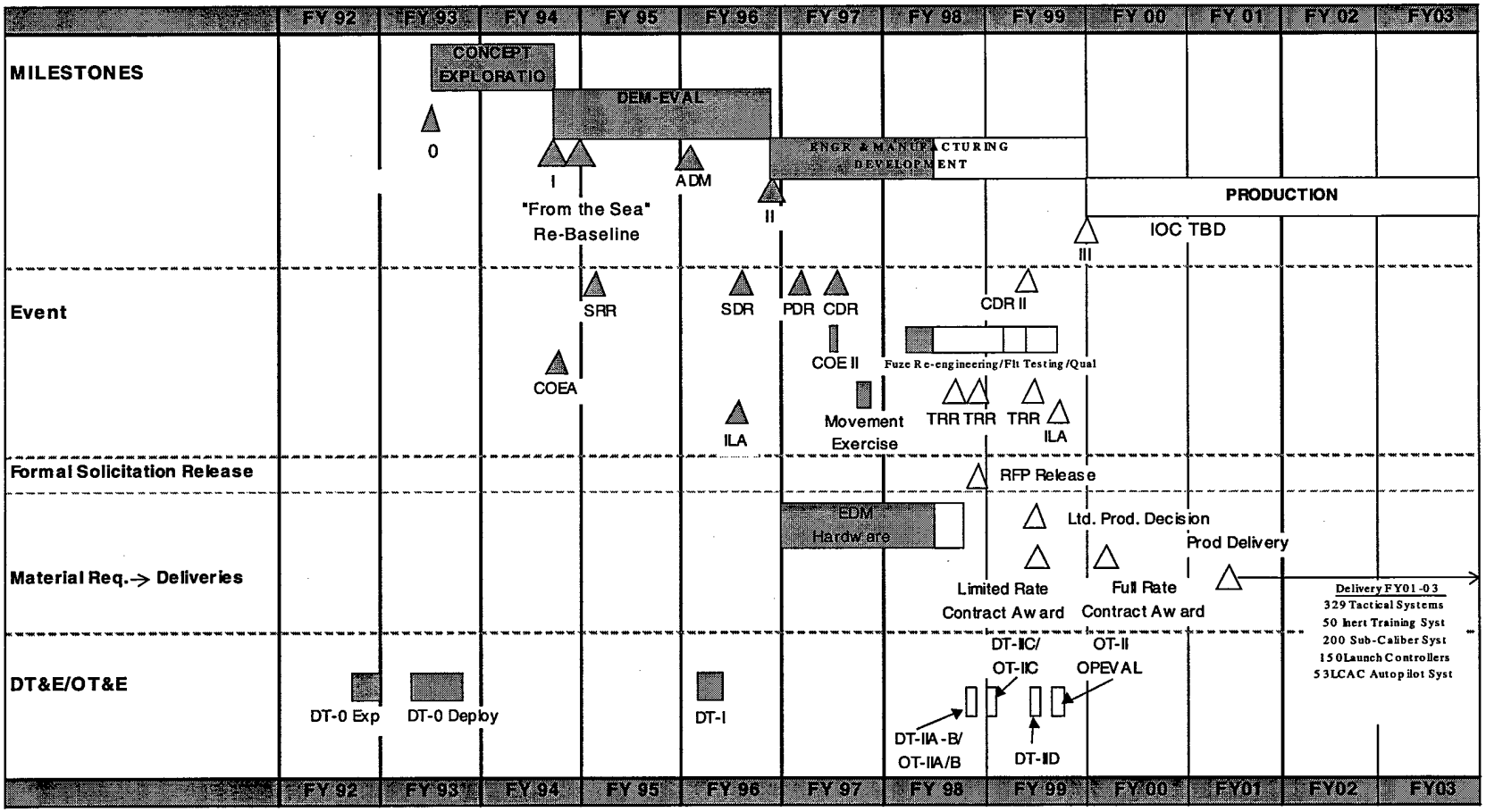


Exhibit R-2a, RDT&E, N Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA-4	Program Element Name & No. Surface & Shallow Water Countermeasures/0603502N	Project Name and Number. Assault Breaching Systems/Q2131

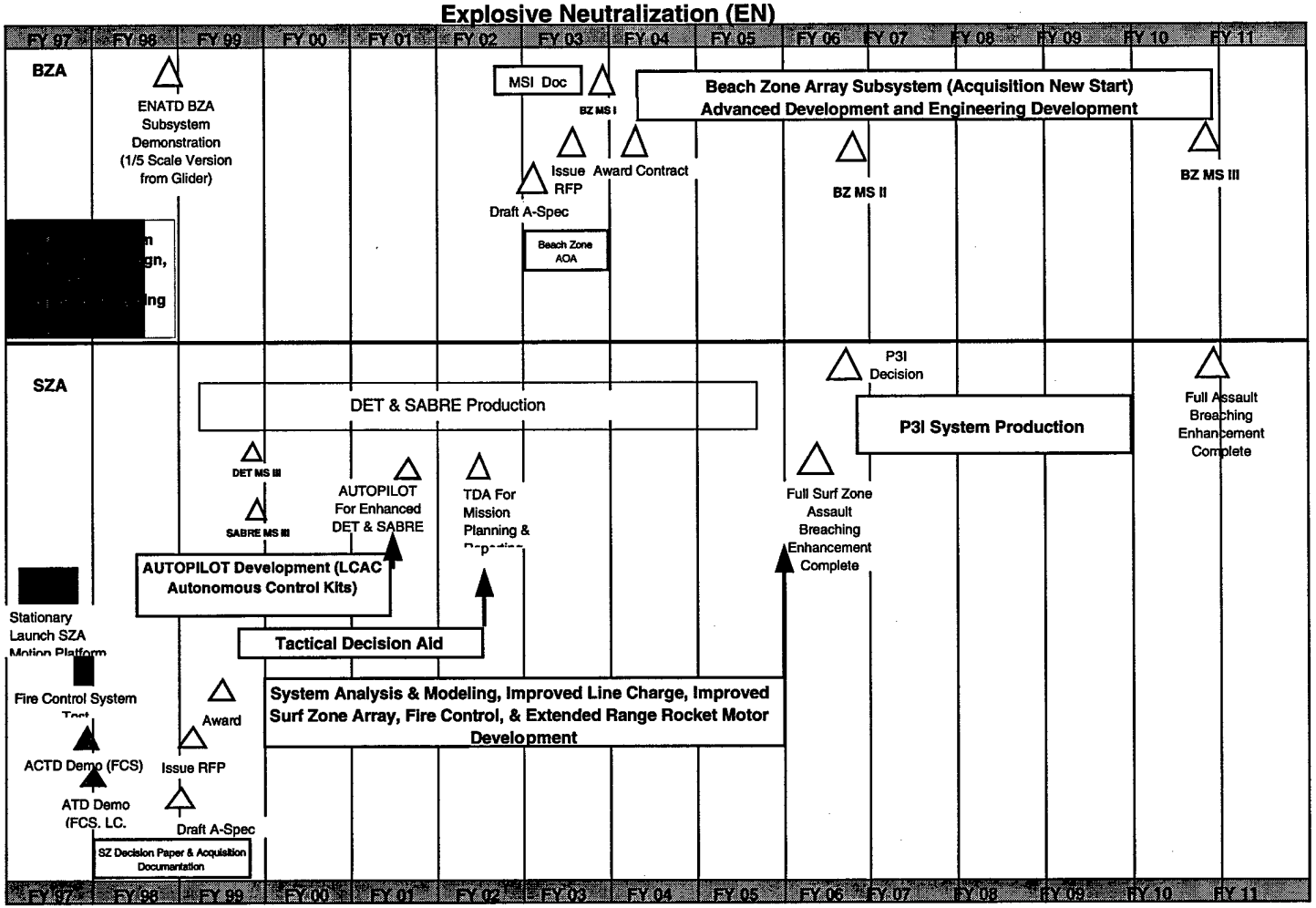


Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA-4	Program Element Name & No. Surface & Shallow Water Countermeasures/0603502N	Project Name and Number. Assault Breaching Systems/Q2131

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	WR	IH, CSS, TBD	40.2	8.9	N/A	6.3	N/A			CONT.	CONT.	N/A
Ancillary Hardware Development	WR	IH, CSS, TBD	7.1	1.0	N/A	.5	N/A			CONT.	CONT.	N/A
Systems Engineering	WR	IH, CSS	13.0	2.0	N/A	.5	N/A			CONT.	CONT.	N/A
Licenses	WR	N/A	.8	0		0						
Tooling	WR	IH, CSS, TBD	.8	.08	N/A	.2	N/A			CONT.	CONT.	N/A
GFE	WR	IH, CSS	2.6	.5	N/A	1.4	N/A			CONT.	CONT.	N/A
Award Fees	N/A	N/A	.5	0		0						
Subtotal Product Development			65.0	12.5		8.9						
Remarks: This is a combination of DET, SABRE and EN P3I work for FY99. There is more than one performing activity for most cost categories.												
Development Support Equipment	WR	IH, CSS, TBD	9.5	2.1	N/A	1.0	N/A			CONT.	CONT.	N/A
Software Development	WR	CSS	5.0	3.3	N/A	1.3	N/A			CONT.	CONT.	N/A
Training Development	WR	IH, CSS	1.5	.5	N/A	.3	N/A			CONT.	CONT.	N/A
Integrated Logistics Support	WR	IH, CSS	1.5	.6	N/A	.2	N/A			CONT.	CONT.	N/A
Configuration Management	WR	IH, CSS	1.5	1.9	N/A	.3	N/A			CONT.	CONT.	N/A
Technical Data	WR	IH, CSS	.8	1.5	N/A	1.1	N/A			CONT.	CONT.	N/A
GFE	WR	IH, CSS	.2	.2	N/A	.1	N/A					N/A
Subtotal Support			20.0	10.1	N/A	4.3	N/A			CONT.	CONT.	N/A
Remarks:												

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E, N/BA-4	Program Element Name & No. Surface & Shallow Water Countermeasures/0603502N	Project Name and Number. Assault Breaching Systems/Q2131

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	Fy00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	IH, CSS, TBD	19.5	1.4	N/A	.85	N/A			CONT.	CONT.	N/A
Operational Test & Evaluation	WR	IH, CSS, TBD	7.0	1.0	N/A	.1	N/A			CONT.	CONT.	N/A
Tooling	WR	IH, CSS, TBD	.5	.2	N/A	.1	N/A			CONT.	CONT.	N/A
GFE	WR	IH, CSS, TBD	.3	.1	N/A	.05	N/A			CONT.	CONT.	N/A
Subtotal T&E			27.3	2.7		1.1						
Remarks:												
Contractor Engineering Support	WR	IH, CSS, TBD	2.0	.2	N/A	.1	N/A			CONT.	CONT.	N/A
Government Engineering Support	WR	IH, CSS	5.0	1.0	N/A	.2	N/A			CONT.	CONT.	N/A
Program Management Support	WR	IH, CSS	2.0	.5	N/A	.2	N/A			CONT.	CONT.	N/A
Program Management Personnel	WR	IH, CSS, NAVSEA	5.2	1.2	N/A	.4	N/A			CONT.	CONT.	N/A
Travel	WR	NAVSEA	.6	.1	N/A	.1	N/A			CONT.	CONT.	N/A
Labor (Research Personnel)	N/A	N/A	0	0		0						
Overhead	N/A	N/A	0	0		0						
Subtotal Management			14.8	3.0		1.0						
Remarks:												
Total Cost			127.2	28.3		15.3						
Remarks:												

Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E/4	Program Element Name & No. Surface and Shallow Water Mine Countermeasures Program Element (PE) 0603502N	Project Name and Number. Unmanned Underwater Vehicle V2094	

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	19.315	21.398	26.925	23.974	21.702	17.361	11.377	11.076	CONT.	CONT.
RDT&E Articles Qty		1-NMRS				1-LMRS				

A. Mission Description and Budget Item Justification:

This project was completely restructured in FY 1994 in response to Congressional direction provided in the FY 1994 DOD Appropriations Act. Specifically, the office of the Secretary of Defense and the Navy were directed to (1) establish priorities among various proposed UUV programs, (2) focus on near-term mine countermeasures issues, and (3) establish affordable, cost-effective programs. The Navy developed an overall UUV Program Plan, which was approved by ASN(RD&A) June 1994, endorsed by USD(A&T) and forwarded to Congress to support FY 1995 budget deliberations.

The UUV Program Plan establishes a clandestine, near-term mine reconnaissance capability as the Navy's top UUV priority; a long term-mine reconnaissance system as priority two; the conduct of surveillance, intelligence and tactical oceanography missions as priority three; and exploring advanced UUV designs for the future as priority four. FY 1995 Congressional language complimented the Navy Plan and fully supported priorities one and two starting in FY 1995.

The UUV project funds development of the first three priorities of the UUV Program Plan. The Near-Term Mine Reconnaissance System (NMRS) will be a minehunting UUV system launched and recovered from an SSN-688 class submarine and will be capable of mine detection, classification, and localization. One NMRS Operational Prototype (OP) system will be delivered to the Fleet in FY 1999. No further production of the NMRS is planned. Since the NMRS is viewed as a stop-gap capability with a life expectancy of approximately 6 years, the Long-Term Mine Reconnaissance System (LMRS) will be developed to provide a robust, long-term Fleet capability to conduct clandestine minefield reconnaissance. The first LMRS will replace the NMRS as the NMRS is retired and several Long-Term Mine Reconnaissance Systems will be procured beginning in FY 2003. The Navy's third priority is the conduct of surveillance, intelligence and tactical oceanography. To meet this requirement the Navy will develop a Mission Reconfigurable UUV (MRUUV) system that is capable of being reconfigured to perform many different missions. This system will use the same vehicle energy section and structure, but replace the payload with sensors appropriate to meet specific mission requirements.

The Near-Term Mine Reconnaissance System (NMRS) program will design develop and test one operational prototype system. The system will be tested in FY98 and FY99. At the conclusion of testing, the NMRS will be delivered to the Fleet and will remain in Fleet use until delivery of the first LMRS.

The Long-Term Mine Reconnaissance System (LMRS) is currently in development. The fabrication of a prototype system will begin in FY01. This prototype system will support test and evaluation, and then in FY03 will transition to fleet operations.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E/4	Program Element Name & No. Surface and Shallow Water Mine Countermeasures Program Element (PE) 0603502N	Project Name and Number. Unmanned Underwater Vehicle V2094

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 Accomplishments:

- (U) (9.003) Priority 1 (NMRS): Completed factory testing and system integration. Conducted at-sea testing of NMRS. Began preparations for Operation and Support activities of the Prototype system.
- (U) (10.312) Priority 2 (LMRS): Awarded and executed two Detailed Design contracts. Conducted product development risk mitigation.

1. (U) FY 1999 Plan:

- (U) (7.133) Priority 1 (NMRS): Complete SSN testing. Achieve Initial Operational Capability (IOC). Deliver NMRS to Fleet for operational use. Complete preparations for Operation and Support of the Prototype System.
- (U) (13.816) Priority 2 (LMRS): Complete LMRS Detailed Design and conduct the LMRS Critical Design Review. Commence preparations for award of the LMRS Development Phase contract. Conduct product development risk mitigation.

(U) ($ .449) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

1. (U) FY 2000 Plan:

- (U) (2.215) Priority 1 (NMRS): Begin Operation and Support of the prototype system.
- (U) (24.71) Priority 2 (LMRS): Award development contract and begin development phase.

1. (U) FY 2001 Plan:

- (U) (2.229) Priority 1 (NMRS): Continue Operation and Support of the prototype system.
- (U) (21.745) Priority 2 (LMRS): Continue development phase and begin fabrication of prototype system.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E/4	Program Element Name & No. Surface and Shallow Water Mine Countermeasures Program Element (PE) 0603502N	Project Name and Number. Unmanned Underwater Vehicle V2094

B. Other Program Funding Summary:

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
OPN PE 0204281N; Line Item 217100	0	0	0	0	0	25.273	53.300	49.022	CONT.	CONT.
OMN PE 0204281N										
1B2B	0	0	0	0	0	.700	5.700	6.400	CONT.	CONT.
1D3D	0	0	2.305	2.086	2.439	-.025	-.027	-.029	CONT.	CONT.

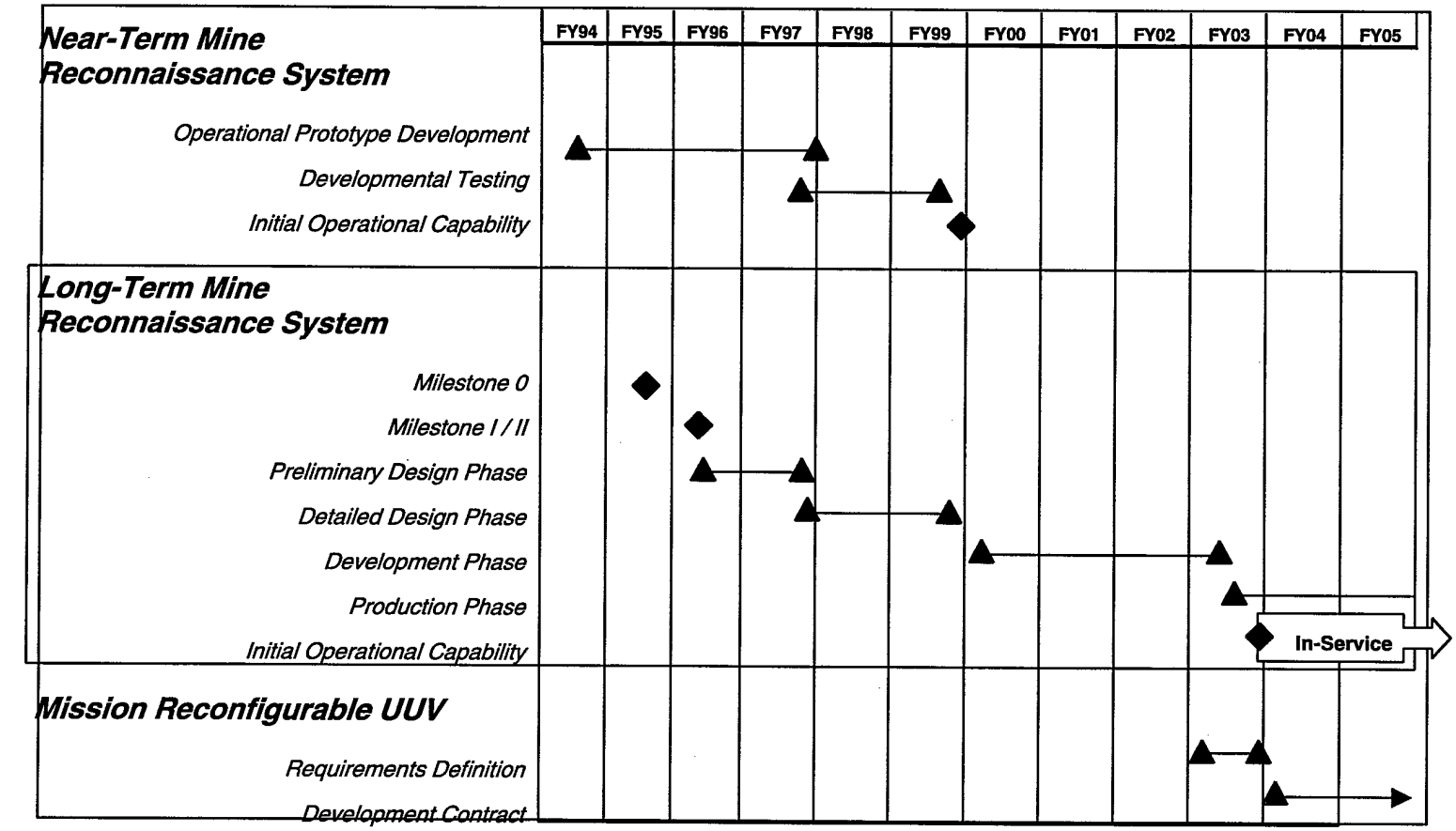
Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E/4	Program Element Name & No. Surface and Shallow Water Mine Countermeasures Program Element (PE) 0603502N	Project Name and Number. Unmanned Underwater Vehicle V2094	

C. Acquisition Strategy: One Operational Prototype NMRS is under procurement via sole source contract. No further NMRS production is planned. The LMRS acquisition strategy is structured to maximize competition during system development. In FY97 three one year contracts were awarded for development of a preliminary design. In early FY98, two of the preliminary design contractors were selected to continue development through a critical design review. Selection of these two contractors was based primarily on the contractor's performance during the preliminary design contract. In early FY00, one of these two contractors will be selected to complete the LMRS design, fabricate a prototype system and support in-water testing. Procurement of the LMRS will be sole source to the final development contractor. A competitive procurement is not cost effective due to the limited (6-12) number of systems planned for procurement.

The MRUUV project will use competitive procurement to award an RDT&E contract for the development and prototyping of the system. Procurement and operation is not planned within the FYDP.

D. Schedule Profile: See next page.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E/4	Program Element Name & No. Surface and Shallow Water Mine Countermeasures Program Element (PE) 0603502N	Project Name and Number. Unmanned Underwater Vehicle V2094



A-0639

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E/4	PROGRAM ELEMENT NAME AND NUMBER: Surface and Shallow Water Mine Countermeasure 0603502N	PROJECT NAME AND NUMBER Unmanned Underwater Vehicle V2094

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development (NMRS)	SS/CPAF	NGC	44.554	1.598		0				0	46.152	50.478
Primary Hardware Development (LMRS) Detailed Design Contract Development Contract	 CPAF CPAF	NGC and Boeing North America	19.876 0	11.733 0	N/A# N/A#	0 21.911	N/A# 11/99			0 CONT.	31.609 CONT.	33.089 CONT.
System Maintenance (NMRS)	SS/CP	NGC	1.987	2.562	N/A#	.914	03/00			CONT.	CONT.	CONT.
Ancillary Hardware Development												
Systems Engineering												
Licenses												
Tooling												
GFE												
Award Fees**(NMRS)			3.047	.864	N/A		N/A				3.911	
Award Fees *(LMRS)			.575	.390	N/A		N/A				.965	
Subtotal Product Development			70.039	17.147		22.825				CONT.	CONT.	

Remarks: : * Actual award fee awarded in FY98; award fee pool amount for FY99.
The award fee structure for the final design contract (award 11/99) has not been determined.
** Actual award Fee awarded through award fee Period 10; award fee Pool amount for Period 11.

Multi-year contracts incrementally funded; therefore, Award Date is N/A.

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E/4	PROGRAM ELEMENT NAME AND NUMBER: Surface and Shallow Water Mine Countermeasure 0603502N	PROJECT NAME AND NUMBER Unmanned Underwater Vehicle V2094

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support												
Remarks:												

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	Fy00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation												
Operational Test & Evaluation												
Tooling												
GFE												
Subtotal T&E												
Remarks:												

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E/4	PROGRAM ELEMENT NAME AND NUMBER: Surface and Shallow Water Mine Countermeasure 0603502N	PROJECT NAME AND NUMBER Unmanned Underwater Vehicle V2094

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Contractor Engineering Support	CPFF	JHU/APL & ARL/UT	4.808	.396	N/A*	.470	N/A			CONT.	CONT.	
Government Engineering Support	WR	Various	10.621	3.179	N/A	2.948	N/A			CONT.	CONT.	
Program Management Support	Various	Various	2.460	.636	N/A	.666	N/A			CONT.	CONT.	
Program Management Personnel												
Travel				.040	N/A	.042	N/A			CONT.	CONT.	
Labor (Research Personnel)												
Overhead												
Subtotal Management			17.889	4.251		4.126				CONT.	CONT.	
Remarks * Multi-year contracts incrementally funded; therefore; Award Date is N/A.												
Total Cost			87.928	21.398		26.951				CONT.	CONT.	

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	R-1 ITEM NOMENCLATURE Program Element (PE) Name and No.: Surface Ship Torpedo Defense / 0603506N

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total P.E. Cost	0.0	5.0	0.640	0.0	0.0	0.0	0.0	0.0	CONT.	CONT.
Joint US /UK Surface Ship Torpedo Defense – V2045	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	CONT.	CONT.
Surface Ship Torpedo Defense – V0225	0.0	0.0	0.640	0.0	0.0	0.0	0.0	0.0	CONT.	CONT.
Quantity of RDT&E Articles & cost										

A. Mission Description and Budget Item Justification: Project V2045 continues a joint collaborative program with the United Kingdom to develop promising technologies identified during the recent demonstration / validation phase of the program, such as the mobile expendable acoustic decoy, concept one countermeasures, improved torpedo detection classification and localization, and improved performance of the AN/SLQ-25A in shallow water/littoral regions. Project V0225 continues the AN/SLQ-25A winch and tow upgrade efforts.

1. FY 1998 ACCOMPLISHMENTS:
   - (U) ($0)

2. FY 1999 PLAN:
   - (U) ($2.363) Develop an AN/SLQ-25A Winch and Tow Upgrade ECP to Improve Performance in Littoral, Shallow Water Operations.
   - (U) ($0.900) Complete the Mobile Expendable Acoustic Countermeasure (MSCAD) D&V Development by conducting an end-to-end In-Water Demonstration Test.
   - (U) ($0.750) Develop a structured, impartial evaluation system and evaluate Promising Technologies to Improve the Performance of the Detection classification, and Localization (DCL) Processing Component of Surface Ship Torpedo Defense. The Technologies Selected will be Available for Implementation into the DCL (TRAFS) Component of the AN/SQQ-89 System.
   - (U) ($0.850) Conduct Large Deck Ship Study to Evaluate Present and Potential Concepts and Technologies (ASN (RD&A) Memo Dated APR 20, 1998). These Concepts May Be Used to Force Applications Which Would Focus on the Protection of Large Deck Ships Against Torpedo Attacks. Conduct Studies of Area Torpedo Defense Concepts. Develop an improved scattering mechanism for Concept 1 countermeasure.
   - (U) ($0.126) Portion of Extramural Program is Reserved for Small Business Innovation Research Assessment in Accordance with 15 USC 638.

3. FY 2000 PLAN:
   - (U) ($.640) Follow-On to AN/SLQ-25A Winch and Tow Upgrade Efforts.

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	R-1 ITEM NOMENCLATURE Program Element (PE) Name and No.: Surface Ship Torpedo Defense / 0603506N

B. Program Change Summary:

	FY 1998	FY 1999	FY 2000	FY 2001
FY 1999 President's Budget:	0	0	0	0
Appropriated Value:		5.000	.650	
Adjustment to FY 1998 Appropriated Value/ FY 1999 President's Budget:				
a) Revised Economic Assumptions/inflation		-.011	-.010	
FY 2000 PRES Budget Submit:	0	4.989	.640	0

Funding: FY 1998: Not Applicable
FY 1999: Revised Economic Assumptions (-$.011)
FY 2000: Inflation (-.010)
FY 2001: Not Applicable

Schedule: Not Applicable

Technical: Not Applicable

C. Other Program Funding Summary:

OPN BLI: 217600/217605
Undersea Warfare Support Equipment

FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
.382	.833	1.240	0	0	0	.949	0	CONT.	CONT.

D. Acquisition Strategy: Not Applicable

E. Schedule Profile: Not Applicable

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	R-1 ITEM NOMENCLATURE Program Element (PE) Name and No.: Surface Ship Torpedo Defense / 0603506N

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Exhibit R-2 RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E/BA4	R-1 ITEM NOMENCLATURE Carrier Systems Development – 0603512N

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total P.E. Cost	54.046	109.208	142.783	138.976	147.753	60.476	69.275	64.142	Cont.	Cont.
S1722 CV Weapons Elevator Improvements	.821	1.005	1.026	1.051	1.080	1.108	1.141	1.169	Cont.	Cont.
42208 Future CV R&D	15.020	19.384	111.694	115.039	130.171	56.814	62.909	57.735	Cont.	Cont.
42678 CVN Technology Insertion	0	49.885	0	0	0	0	0	0	0	49.885
S2693 Carrier Systems Definition	31.124	35.159	24.665	14.546	13.278	0	0	0	Cont.	Cont.
W1723 CV Launch & Recovery Systems	3.107	2.609	1.839	4.067	2.331	2.554	5.225	5.238	Cont.	Cont.
W2269 EAF Matting	3.974	1.166	3.559	4.273	.893	0	0	0	0	17.596
Quantity of RDT&E Articles & cost										

A. Mission Description and Budget Item Justification: This Navy unique program addresses all technology areas associated with Navy/Marine Corps aircraft operations aboard ships. The program includes:

(U) (S1722) – Development of standardized, supportable and maintainable aircraft carrier weapons elevators components

(U) (42208 formerly 22208) – Development of ship hull, mechanical, electrical, aviation and combat support systems, subsystems and components to significantly improve aircraft carrier affordability, survivability and operational capabilities and to meet the requirements of existing and pending regulations and statues critical to the operation of existing and future aircraft carriers.

(U) (42678) – Development of technologies for transition from CVN 77 to CVNX, for demonstrating enhanced capabilities for CVNX, and for mitigating CVNX cost or technical risk.

Exhibit R-2 RDT&E Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E/BA4	R-1 ITEM NOMENCLATURE Carrier Systems Development – 0603512N	

(U) (S2693 formerly PE 0603564N/22300) – Supports post Milestone 0 ship system technical definition and initial cost estimates through studies for various ship alternatives being considered in the Analysis of Alternatives (AOA). This project supports interim Operational Requirements Document (ORD) preparation and develops the primary supporting documentation for Milestone I decisions.

(U) (W1723) – Development of all systems required to provide approach and landing guidance and control, recovery, service, support and launch aircraft operating onto or from ships. Payoffs include increased safety, greater sortie generation rates, enhanced aircraft boarding rates, reduced manning, increased aircraft service life and fleet modernization.

(U) (W2269) – Development of lightweight mat and expeditionary arresting gear for use at Marine Corps Expeditionary Airfields (EAF).

Exhibit R-2 RDT&E Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E/BA4	R-1 ITEM NOMENCLATURE Carrier Systems Development – 0603512N	

B. Program Change Summary:

	FY 1998	FY 1999	FY 2000
FY 1999 President's Budget	19.976	154.307	174.033
Appropriated Value:	98.587	74.307	
Adjustment to FY 1998/99 Appropriated Value/			
FY 1999 President's Budget:			
a. Various Adjustments	+30.238	-45.099	+28.003
b. Congressional Adjustments	-78.611		
c. BTR	+ 3.832		
d. Program Adjustments			-59.253
FY 2000 President's Budget Submit	54.046	109.208	142.783

Funding: FY98 change (31.110) FY99 change (-45.009) and FY00 change (28.003) due to CVX programmatic adjustments, realignment of various carrier projects, inflation adjustments, competitive sourcing savings associated with consolidation of service contracting efforts, and NAVAIR internal realignment.

Schedule: FY 98 decrease caused delay in ATL DEMVAL award to 2QFY99 and delay of Armor and ATL PDR to FY2000.

Technical: Not applicable.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. CV Weapons Elevator Improvements S1722

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	.821	1.005	1.026	1.051	1.080	1.108	1.141	1.169	Cont.	Cont.
RDT&E Articles Qty										

A. Mission Description and Budget Item Justification

This project provides for advanced development, fabrication, test, evaluation and documentation of standardized aircraft carrier weapons elevators components such as control systems, hoist machinery, doors and hatches. Emphasis is placed on the reduction of total ownership cost, improvement of safety, reliability, maintainability and watertight integrity and weight reduction.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

- FY 1998 ACCOMPLISHMENTS:
  - (U) ($.100) – Completed Variable Speed Drive Performance Spec Report.
  - (U) ($.226) – Developed imbedded sensors for monitoring elevator equipment condition.
  - (U) ($.070) – Completed remote sensor tests.
  - (U) ($.200) – Procured linear actuating system for elevator doors at LBES.
  - (U) ($.050) – Completed EMI test.
  - (U) ($.074) – Conducted investigation of alternative elevator overspeed governor designs.
  - (U) ($.101) – Tested wire rope coatings to prevent internal corrosion at termination.

- FY 1999 PLAN:
  - (U) ($.394) – Conduct investigation and engineering analysis for integration of multiple elevator controllers into Control Net.
  - (U) ($.250) – Continue development, procurement and test of alternative elevator overspeed governors.
  - (U) ($.210) – Complete development, procurement and testing of imbedded sensors in conjunction with PLC.
  - (U) ($.150) – Complete linear actuator tests.

(U) ($.001) – Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. CV Weapons Elevator Improvements S1722

• FY 2000 PLAN:

(U) ($.300) – Complete Linear Drive Ropeless Elevator Research.

(U) ($.334) – Develop Intelligent Controls for Multiple Car Systems.

(U) ($.392) – Complete Design for Scale Model Ropeless Elevator.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. CV Weapons Elevator Improvements S1722

B. Other Program Funding Summary: Not applicable

C. Acquisition Strategy: Not applicable

D. Schedule Profile.

	FY 1998	FY 1999	FY 2000	To Complete
Program Milestones	4Q Complete Variable Speed Drive Performance Spec	2Q Complete Multiple PLC Investigations	4Q Complete Design for Model Ropeless Elevator	3Q Build Scale Model Looped elevator Investigate the Reconfigured Power supplies
Engineering Milestones	4Q Complete Imbedded Sensor Research	1Q Complete Alternate Overspeed Governor Research	2Q Complete Linear Drive Ropeless Elevator Research 3Q Develop Intelligent Controls for Multiple Car Systems	4Q Test scale model Looped elevator Design Full Scale Looped elevator w/ advanced actuators
T&E Milestones	3Q Complete Remote Sensor Test 2Q Complete EMI Test	4Q Complete Imbedded Sensor Test 3Q Complete Linear Actuator Test 4Q Complete Alternative Overspeed Governor Rest		
Contract Milestones	4Q Procure Linear Actuator	2Q Procure Overspeed Governor		

Exhibit R-3, RDT&E Project Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. CV Weapons Elevator Improvements S1722

2Q Procure Imbedded SensorsCost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	WR	NSWC Phila		.755	12/99	1.026	12/99	.		Cont.	Cont.	N/A
Ancillary Hardware Development		Misc	.821									
Systems Engineering												
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development			.821	.755		1.026		.		Cont.	Cont.	N/A
Remarks:												
Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support			N/A	N/A		N/A				N/A	N/A	N/A
Remarks:												
Developmental Test & Evaluation	WR	NSWC Phila	0	.250	12/98	0				Cont.	Cont.	N/A
Operational Test & Evaluation												
Tooling												
GFE												

Exhibit R-3, RDT&E Project Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. CV Weapons Elevator Improvements S1722

Subtotal T&E			0	.250		0				Cont.	Cont.	N/A
Remarks:												
Contractor Engineering Support												
Government Engineering Support												
Program Management Support												
Program Management Personnel												
Travel												
Labor (Research Personnel)												
Overhead												
Subtotal Management			N/A	N/A		N/A				N/A	N/A	
Remarks:												
Total Cost			.821	1.005		1.026				Cont.	Cont.	
Remarks:												

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. Future Carrier R&D- 42208

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	15.020	19.384	111.694	115.039	130.171	56.814	62.909	57.735	Cont.	Cont.
RDT&E Articles Qty										

A. Mission Description and Budget Item Justification

This project provides for the development of aircraft carrier specific technologies, the infusion of the surface ship technology base into existing and future aircraft carriers and the potential realization of subsystem design capabilities not currently feasible. This project transitions the most promising technologies from the Navy technology base, other government laboratories, and the private sector into specific advanced development efforts. All systems developed in this project have the potential to support emerging requirements and other promising systems technologies for insertion into new aircraft carrier designs. The emphasis is directed toward developing ship hull, mechanical, propulsion, electrical, aviation and combat support systems, sub-systems and components to significantly improve aircraft carrier affordability, survivability, and operational capabilities and to meet the requirements of existing and pending regulations and statutes critical to the operation of future aircraft carriers.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

• FY 1998 ACCOMPLISHMENTS:

(U) ($1.706) – Continued development of advanced aircraft launch alternatives including an Advanced Technology Aircraft Launcher (ATL), flight deck aviation support such as ski jump integration, development of an integrated rapid aircraft turnaround capability to reduce manpower on the flight deck, and development of an Aviation Weapons Information Management System for incorporation on current and future aircraft carriers.

(U) ($10.959) – Commenced propulsion plant assessments including nuclear and conventional power generation, integrated machinery controls, integrated electric power systems and advanced auxiliary systems.

(U) ($1.000) – Commenced development of advanced passive survivability concepts including armor, underbottom, side protection systems and carrier-suitable, pro-active, tactical and damage response systems for incorporation on current and future aircraft carriers.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. Future Carrier R&D- 42208

(U) ($1.355) – Assessed emerging technologies to enable significant reductions in manpower requirements and incorporate on current and future aircraft carriers.

• FY 1999 PLAN:

Propulsion Plant Development

(U) ($1.600) Develop preliminary propulsion plant functional requirements. Commence development of plant component arrangements, including size and weight of structural members and required shielding. Initiate sizing of major plant component foundations.

(U) ($2.000) Initiate early stages of heat exchanger detailed design, including shock and sizing analyses, to reduce weight and cost while meeting power output requirements.

(U) ($1.500) Develop initial fluid system functional requirements. Begin developing fluid system schematics, descriptions and diagrams. Undertake preliminary main coolant pump hydraulic motor design.

(U) ($1.600) Start description of functional requirements for instrumentation and control systems and equipment. Begin developing advanced propulsion plant control and automation schemes with analysis of manpower cost.

(U) ($4.194) Determine preliminary electric system functional requirements. Perform electrical plant computer modeling and analysis. Establish turbine generator power rating and voltage, and do conceptual design. Initiate development of procurement specifications. Identify electric plant interface constraints and being refining layout concepts to ensure compatibility with NIMITZ hull form.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. Future Carrier R&D- 42208

(U) ($3.200) Develop preliminary steam plant performance and functional requirements. Establish structural member sizes for major steam plant component foundations. Identify steam plant interface constraints and begin refining layout concepts to ensure compatibility with the NIMITZ hull form.

(U) ($4.800) Begin identifying potential impacts of new propulsion plant systems on hull and watertight bulkhead penetrations. Begin developing and integrating non-propulsion mechanical systems with the propulsion plant including water purification; potable water; fire main and other fire fighting systems; heating, ventilation, and air conditioning; and ship service air systems. Assess preliminary sizing of emergency generator support systems.

(U) ($.490) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

• FY 2000 PLAN:

(U) ($45.300)-Non- Nuclear Propulsion Plant Development

(U) ($15.900) Begin preliminary turbine generator design, develop testing requirements and identify required testing capabilities for a prototype unit. Produce turbine generator schematic diagrams identifying all ship and system connections..

(U) ($5.800) Integrate steam and electric plant equipment with non-propulsion equipment layouts. Determine major system requirements and performance criteria and provide information for the integrated product model. Establish non-propulsion systems interface requirements with propulsion plant and power distribution systems.

(U) ($7.000) Continue developing enhancements to the product data management software and prototype automated workflow for construction deliverables. Develop design analysis features required for propulsion plan design development.

(U) ($16.600) Begin developing conceptual designs for optimized mechanical and electrical systems that interface with the propulsion plant. Establish interface controls between propulsion and non-propulsion equipment. Develop optimal volume and weight requirements for these mechanical and electrical systems. Establish layout of doors, ladders, passageways, hatches, and escape trunks integrated with the optimal propulsion plant.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. Future Carrier R&D- 42208

(U) ($39.000) – Aircraft Launch, Recovery & Support – Advanced Technology Launcher (ATL) Program Definition and Risk Reduction (PDRR) phase. Develop two, prototype, full size, fully integrated, reduced length, launcher systems. Validate System Specification. Initiate system engineering, technology assessment, and risk mitigation efforts. Conduct candidate energy storage, power electronics, control system and launch engine technology testing. Complete System Design Review and allocate Configuration Item performance requirements. Develop Configuration Item performance specifications. Complete Preliminary Design Review, initiate detailed design and development of product specifications. Initiate development of ATL Test Facility. Conduct site surveys and environmental impact studies. Identify facility and utility requirements. Complete architectural and engineering design. Initiate site construction. Initiate ATL Ship Integration Effort. Identify space and service allocation requirements for integration in CVN-68 class baseline hull. Prepare preliminary arrangement drawings identifying structural and arrangements impacts. Develop other hull, mechanical, and electrical system requirements.

(U) ($9.794) – Battle Damage Prevention & Recovery Initiate development of Upgraded Armor Protection System – Littoral (UAPS - Littoral), Dynamic Armor Protection System (DAPS), Underwater Protection System (UWPS), and New Torpedo / Mine Side Protection System (New T/MSPS). Define threats and design goals. Develop preliminary system designs and determine installation feasibility within ship concept designs. Develop plans for procurement and development of scaled test components. Prepare test facilities for small scale testing. Commence refinement of analytical capabilities. Improve Hull Girder analytic capability as part of Weapons Damage & Residual Strength analysis. Define design, producibility and material property goals for General Protective Plate and Advanced Shock Isolation of Equipment. Develop performance requirements for Advanced Damage Control System (ADCS). Commence fire vulnerability study in support of initiatives targeted at reducing operation and support costs of related systems. Commence development of enhanced damage control and firefighting concepts. Characterize topside threats for Topside Survivability. Characterize threats and evaluate use of explosive load reduction and anti-fratricide shielding protection techniques in support of Sympathetic Detonation Suppression System (SDSS) development. Commence development of improved weapons effects codes for Advanced Survivability Assessment Model (ASAP) and the application of finite element and hydro codes to provide enhanced modeling and simulation support for development of advanced passive survivability features.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. Future Carrier R&D- 42208

(U) ($2.200) – Manpower and Material Support – Initiate development of manpower and material support alternatives to achieve manpower reductions and total ownership cost savings. Included will be the development of advanced robotics for ship systems and components operation, maintenance and material handling in the areas of combat and intelligence, logistics and HMR&E. A standardized open system architecture approach will be incorporated into system and component development.

(U) ($10.400) - Combat and Intelligence Systems – Complete Phase II competitive solicitation for Combat Systems Integration concepts and design process. Continue monitoring improvements targeted at reducing the operational and support costs of the ship's war fighting systems. Initiatives remain focused on reducing the number of systems through the use of "multi-function" radars and flat planar antenna arrays, data exchange across operational areas, data fusion, and integrated displays for operators. Complete trade studies, including those that result in cost reductions without degrading operational performance into the design development. Evaluate and complete competitive Combat Systems Integration design development and integrate into the ship contract data package. Commence Phase III Design Refinement. Refine Combat Systems Integration design and integrate into the ship design.

(U) ($5.000) – Systems Development – Support CVNX Engineering Team for design, engineering and interoperability analysis to support Milestone I. Also support for Requirements and AOA Teams for TOC reductions/analysis, survivability analysis and CVNX Advanced Launch & Recovery, and trade studies and Lethality Studies (ORD Specific). Provide acquisition planning support.

B. Other Program Funding Summary	To	Total

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. Future Carrier R&D- 42208

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Complete	Cost
Related RDT&E:										
0604567N/42301 CV Contract Design										
CVN-77	16.453	38.215	34.866	39.248	26.358	9.649	11.539	13.386	CONT	CONT
CVNX						15.000	15.000	15.000		
Related SCN:										
200100 Carrier Replacement Program										
	48.737	123.665	751.540	3,950.576	147.615	434.183	1,337.250	131.533	CONT	CONT

C. Acquisition Strategy: The Carrier acquisition strategy for CVN77 and follow hulls will be acquired/managed using a phased technology insertion or "evolutionary" strategy. Technologies will include island redesign (topside) on CVN77, new propulsion plant on CVX-1, and hull, distributive systems and functional arrangements on the CVX-2. On each hull, core capabilities will be maintained and Total Ownership Costs will be reduced in accordance with Carrier goals. As with past NIMITZ class carriers, the CVN77 will be awarded as a sole source FPIF contract to Newport News Shipbuilding. For CVX-1 and future hulls, various contracting methods are being considered.

D. Schedule Profile:

	FY 1998	FY 1999	FY 2000
Program Milestones		CVX: 1Q AoA PART II	CVX: 2Q MS1
Engineering Milestones			
T&E Milestones			
Contract Milestones			

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract

Exhibit R-3 RDT&E Project Cost Analysis			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. Future Carrier R&D- 42208	

Primary Hardware Development												
Aircraft Launch, Recovery & Support	CPAF	TBD	0	0	N/A	13.913	11/99			50.337	64.250	64.250
	CPAF	TBD	0	0	N/A	13.913	11/99			132.739	146.652	64.250
	WR	NAWC Lakehurst NJ	2.711	0	N/A	0	0			0	2.711	
Battle Damage & Recovery	WR	NSWC/CD, MD	1.000	0	N/A	4.644	11/99			94.651	100.295	100.295
	WR	APG, MD		0	N/A	1.250	11/99			16.075	17.325	17.325
	ACES	NNS,VA		0	N/A	1.500	11/99			21.250	22.750	22.750
	C	U of Texas, TX		0	N/A	1.200	11/99			6.200	7.400	7.400
	C	Miscellaneous	1.511	0	12/98	1.200	11/99			Cont.	Cont.	Cont.
Propulsion Plant Development	SS,CPFP	BETTIS, PA	9.000	19.384	11/98	0	N/A			0	28.384	28.384
	C	NNS, VA				45.300	11/99			Cont.	Cont.	Cont.
	Various	Miscellaneous	2.299	0		0	N/A			0	2.299	
Manpower & Material Support	WR	NSWC/CD/MD				2.200	11/99			Cont	Cont.	Cont.
	Various	Miscellaneous	2.298	0		0	N/A			0	2.298	
Systems Development	Various	Miscellaneous				5.000	11/99			Cont.	Cont	Cont.
Combat & Intelligence Systems	C	NNS, VA				10.400	11/99			0	10.400	
Systems Engineering												
Aircraft Launch, Recovery & Support	ACES	NNS,VA				3.000	11/99			67.000	70.000	
	WR	NAWC/LK, NJ				2.400	11/99			25.680	28.080	
	Various	Miscellaneous				.774	11/99			8.283	9.056	
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development			18.819	19.384		106.694				Cont.	Cont.	Cont.

Exhibit R-3 RDT&E Project Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. Future Carrier R&D- 42208

Remarks: The acquisition strategy calls for competitive development of 2 prototype systems. Each contract is budgeted at $64.25M. Following a "shoot-off" between prototypes, one system will be chosen for further development for installation in CVNX 1. The second phase of the development effort is budgeted at $82.402M, and is reflected in the Cost to Complete and Total Cost of the second contract. $70M is budgeted for ship system integration. Pending selection of the CVNX 1 shipbuilder, this effort will be conducted by NNS under the existing ACES contract. In addition to NAWCADLKE, the Volpe Center (DOT), and the Argonne National Lab (DOE) will provide technical support.

Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support			N/A	N/A		N/A				N/A	N/A	N/A
Remarks:												
Developmental Test & Evaluation Aircraft Launch, Recovery & Support	CFAF WR	Miscellaneous NAWC/LK, NJ				5.000	11/99			3.000 22.600	13.000 22.600	
Operational Test & Evaluation Aircraft Launch, Recovery & Support	WR	NAWC/LK, NJ								12.500	12.500	
Tooling												
GFE												
Subtotal T&E			N/A	N/A		5.000				43.100	48.100	N/A
Remarks:												
Contractor Engineering Support												
Government Engineering Support												
Program Management Support												
Program Management Personnel												

Exhibit R-3 RDT&E Project Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. Future Carrier R&D- 42208

Travel												
Labor (Research Personnel)												
Overhead												
Subtotal Management			N/A	N/A		N/A				N/A	N/A	N/A
Remarks:												
Total Cost			18.819	19.384		111.694				Cont.	Cont.	N/A
Remarks:												

Exhibit R-2a RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. CVN Technology Insertion - 42678

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	0	49.885	0	0	0	0	0	0	0	49.885
RDT&E Articles Qty	0	0	0	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification:

This one year project was established to fund the research, development, test, and evaluation, and for acquisition of technologies for use in the CVN 77 aircraft carrier program. Specifically, the technologies funded are those which transition from the CVN 77 aircraft carrier program to the CVNX aircraft carrier program, that demonstrate enhanced capabilities for the CVNX aircraft carrier program, and that mitigate the cost or technical risks of that program.

- FY 1998 ACCOMPLISHMENTS

Not Applicable

- FY 1999 PLAN

(U) ($1.259) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

(U) ($14.587) Establish contractor and management interface to the integrated product data environment to coordinate design development and manufacturing processes to achieve life cycle cost reductions. Establish data transfer protocols for the exchange of design data between shipyards. Develop product data management software for propulsion plant design and analyze data. Identify advanced analysis capabilities required for design development and begin testing product modeling software.

(U) ($18.187) Complete functional requirement documents for command and control, weapons and sensors, external communications, mission planning,

Exhibit R-2a RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. CVN Technology Insertion - 42678

computing architecture, ship interface boundaries, and test and evaluation. Identify and commence trade studies intended to reduce cost without degrading operational performance. Commence Phase II; completing competitive solicitation and evaluation of solicitations to determine final two proposed integrators. Continue Combat Systems Integration concepts and design process. Identify updates to CVN 77 Contract Design ILS/Configuration Management Plan.

(U) ($15.852) Support CVNX Engineering Team for design, engineering and interoperability analysis to support Milestone I. Also support for Requirements and AOA Teams for TOC reductions/analysis, survivability analysis and CVNX Advanced Launch & Recovery, and trade studies and Lethality Studies (ORD Specific). Provide acquisition planning support.

- FY 2000 PLAN – Not applicable.

B. Other Program Funding Summary

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Complete
Related RDT&E:									
0604567N/42301 CV Contract Design									
CVN-77	16.453	38.215	34.866	39.248	26.358	9.649	11.539	13.386	CONT
CVNX						15.000	15.000	15.000	
Related SCN:									
200100 Carrier Replacement Program	48.737	123.665	751.540	3,950.576	147.615	434.183	1,337.250	131.533	CONT

Exhibit R-2a RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. CVN Technology Insertion - 42678

C. Acquisition Strategy:

The Carrier acquisition strategy for CVN77 and follow hulls will be acquired/managed using a phased technology insertion or "evolutionary" strategy. Technologies will include island redesign (topside) on CVN77, new propulsion plant on CVX-1, and hull, distributive systems and functional arrangements on the CVX-2. On each hull, core capabilities will be maintained and Total Ownership Costs will be reduced in accordance with Carrier goals. As with past NIMITZ class carriers, the CVN77 will be awarded as a sole source FPIF contract to Newport News Shipbuilding. For CVX-1 and future hulls, various contracting methods are being considered.

D. Schedule Profile:

	FY 1998	FY 1999	FY 2000
Program Milestones		CVX: 1Q AoA PART II	CVX: 2Q MS1
Engineering Milestones			
T&E Milestones			
Contract Milestones			

Exhibit R-3 RDT&E Project Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. CVN Technology Insertion - 42678

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development												
	C	AME, Arl Va		2.000	01/99							
	C	JJMA, Arl Va		2.000	01/99							
	C	NNS, Va		18.500	01/99							
	WR	NSWC CD Va		4.200	01/99							
	WR	NAWC Lake Va		2.500	01/99							
	SS,CPFP	BETTIS, Pa		14.587	01/99							
	C	Contractor, Various		3.913	01/99							
	WR	Navy Field, Various		2.185	01/99							
Ancillary Hardware Development												
Systems Engineering												
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development				49.885		0				0	49.885	

Exhibit R-3 RDT&E Project Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. CVN Technology Insertion - 42678

Remarks:

Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support												

Remarks

Exhibit R-3 Cost Analysis (page 2)		Date: February 1999

Exhibit R-3 RDT&E Project Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. CVN Technology Insertion - 42678

APPROPRIATION/BUDGET ACTIVITY		PROGRAM ELEMENT NAME AND NUMBER					PROJECT NAME AND NUMBER					
Cost Categories (Tailor to WBS or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99Cost	FY 99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation												
Operational Test & Evaluation												
Tooling												
GFE												
Subtotal T&E												
Remarks												
Contractor Engineering Support												
Government Engineering Support												
Program Management Support												
Program Management Personnel												
Travel												
Labor (Research Personnel)												
Overhead												
Subtotal Management												

Exhibit R-3 RDT&E Project Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. CVN Technology Insertion - 42678

Remarks												
Total Cost				49.885						0	49.9	
Remarks												

Exhibit R-2a RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. Carrier Systems Definition – S2693

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
S2693 CV Systems Definition	31.124	35.159	24.665	14.546	13.278	0	0	0	Cont.	Cont.
Qty of RDT&E Articles & cost	0	0	0	0	0	0	0	0	0	0

A. (U) Mission Description and Budget Item Justification: This project performs the Ship Feasibility Studies required after Milestone 0 (MS 0) to address a specific Mission Needs Statement (MNS) and support the Analysis of Alternatives (AOA) for the Future Carrier (CVX) Program; performs impact studies of aircraft/air wing composition, propulsion, hull alternatives, combat systems, machinery and electrical subsystems, and cost on CVX designs, supports the development of the Operational Requirements Document (ORD) and other documentation required at Milestone I. Completion of this phase allows review and approval, at Milestone I, to transfer a ship program to the Contract Design Program Element 0604567N. Ship Feasibility Study products include a description of the alternative ships' principal characteristics and mission critical subsystems, weight estimates, general arrangement sketches, technical risk assessments, and Class F cost estimates. The objective is to provide the decision-makers with feasible, affordable alternatives.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1998 ACCOMPLISHMENTS:

- (U) ($26.864) Began and completed various aircraft carrier related studies to support ORD development and other documents for the Milestone 1 decision for the CVX. Studies were conducted, but not limited to, the following areas: logistics, propulsion, flight deck, auxiliary systems, combat systems and ship concepts.

- (U) ($1.500) Utilized existing and development commercial and government hardware and software, and developed interfaces where required, to enable rapid visualization and analysis of future carrier systems and ship concepts through development of virtual prototypes.

- (U) ($2.760) Provided CVX AOA engineering and cost estimating support.

Exhibit R-2a RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. Carrier Systems Definition – S2693

FY 1999 PLAN

(U) ($.655) Portion of extramural program is reserved for Small Business Innovative Research assessment in accordance with 15 USC 638.

(U) ($29.372) Identify and evaluate propulsion plant functional and manning requirements, perform conceptual studies and analyze component arrangements. Evaluate possible turbine generator power ratings and voltages, identify performance requirements, and establish conceptual designs. Develop electric and steam plant weight and volume estimates and determine impacts on stability and survivability. Assess preliminary sizing of emergency generator support systems and major propulsion plant component foundations. Evaluate shock and sizing analyses of heat exchanger designs. Review possible instrumentation and control systems and equipment. Identify interface constraints and begin refining layout concepts to ensure compatibility with the NIMITZ hull form. Identify and assess potential impacts of new propulsion plant systems on hull and watertight bulkhead penetrations. Identify non-propulsion mechanical system concepts to be developed and integrated with the propulsion plant.

(U) ($5.132) Support CVNX Engineering Team for design, engineering and interoperability analysis to support Milestone I. Also support for Requirements and AOA Teams for TOC reductions/analysis, survivability analysis and CVNX Advanced Launch & Recovery, and trade studies and Lethality Studies (ORD Specific). Provide acquisition planning support.

FY 2000 PLAN

(U) ($13.190) Conduct ORD level requirements definition, industrial capability assessments, risk assessment and management, schedule development and tracking, and threat assessments necessary to insure a coordinated acquisition effort. Develop an Integrated Master Plan. Develop the Test and Evaluation Master Plan. Develop logistics requirements including integrated logistics assessments, maintenance planning, supportability analysis, logistics process improvements, computer resource requirements analysis, and manpower/workload assessments. Develop cost model and baseline cost estimate.

(U) ($11.475) Conduct engineering effort associated with the CVNX 2 Ship Development phase to develop ship requirements and definition at the total system level. Conduct trade studies to support total ship definition including baseline design/build budget and baseline cost estimate. Further develop IPPD.

Exhibit R-2a RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. Carrier Systems Definition – S2693

B. Other Program Funding Summary

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Complete	Cost	
Related RDT&E:											
0604567N/42301 CV Contract Design											
CVN-77		16.453	38.215	34.866	39.248	26.358	9.649	11.539	13.386	CONT	CONT
CVNX							15.000	15.000	15.000		
Related SCN:											
200100 Carrier Replacement Program		48.737	123.665	751.540	3,950.576	147.615	434.183	1,337.250	131.533	CONT	CONT

C. Acquisition Strategy:

The Carrier acquisition strategy for CVN77 and follow hulls will be acquired/managed using a phased technology insertion or "evolutionary" strategy. Technologies will include island redesign (topside) on CVN77, new propulsion plant on CVX-1, and hull, distributive systems and functional arrangements on the CVX-2. On each hull, core capabilities will be maintained and Total Ownership Costs will be reduced in accordance with Carrier goals. As with past NIMITZ class carriers, the CVN77 will be awarded as a sole source FPIF contract to Newport News Shipbuilding. For CVX-1 and future hulls, various contracting methods are being considered.

D. Schedule Profile:

Exhibit R-2a RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. Carrier Systems Definition – S2693

	FY 1998	FY 1999	FY 2000
Program Milestones		CVX: 1Q AoA PART II	CVX: 2Q MS1
Engineering Milestones			
T&E Milestones			
Contract Milestones			

Exhibit R-3 RDT&E Project Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	Program Element Name & No. Carrier Systems Development- 0603512N	Project Name and Number. Carrier Systems Definition – S2693

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Product Development	SS, CPFP	BETTIS, PA	6.000	29.372	11/98	0				0	35.372	
		AME, VA	4.800	2.051	02/99	2.000	11/99			Cont.	Cont.	
	C, CPFF	JJMA, VA	5.200	1.000	02/99	1.000	11/99			Cont.	Cont.	
	C, CPFF	NSWC/CD, MD	3.000	0	-----	1.000	11/99			Cont.	Cont.	
	WR	NSWC/DD, VA	1.500	0	-----	1.000	11/99			Cont.	Cont.	
	WR	Miscellaneous	10.624	.503	02/99	2.000	11/99			Cont.	Cont.	
	Various	Miscellaneous		2.233	02/99	2.665	11/99			Cont.	Cont.	
	C	NNS				15.000	11/99			Cont.	Cont.	
Subtotal Product Development			31.124	35.159		24.665				Cont.	Cont.	N/A
Remarks:												
Support: Not applicable.												
Subtotal Support			N/A	N/A		N/A		N/A		N/A	N/A	N/A
Remarks:												
T&E: Not applicable												
Subtotal T&E			N/A	N/A		N/A		N/A		N/A	N/A	N/A
Remarks:												
Management: Not applicable												
Subtotal Management			N/A	N/A		N/A		N/A		N/A	N/A	N/A
Remarks:												
Total Cost			31.124	35.159		24.665		14.546		Cont.	Cont.	N/A

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/BA 4	Program Element Name & No. Carrier Systems Development – 0603512N	Project Name and Number. Future CV Launch & Recovery Systems, W1723

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
W1723 CV Launch and Recovery Systems	3.107	2.609	1.839	4.067	2.331	2.554	5.225	5.238	Cont.	Cont.
Quantity of RDT&E Articles & cost	(2)			(1)						

A. Mission Description and Budget Item Justification: This project addresses the Program Definition and Risk Reduction Phase of advanced systems to meet Navy unique shipboard operational requirements. This program is funded under PS&RR because it encompasses feasibility and advanced development of new end-items prior to engineering and manufacturing development. This program includes the PD&RR phase of advanced optical, Electro-optical and laser tracking, approach and landing control and guidance systems; and air operations reporting systems for pilots, Landing Signals Officers (LSOs), and ship's force such as:

The Virtual Imaging System for Approach and Landing (VISUAL) will provide ship's force, LSOs, and the pilots with enhanced images of the aircraft and ship in low visibility and night conditions.

The Shipboard Optical Landing System (SOLS) will provide advanced visual landing aids (VLA) for fixed wing, rotary wing and Vertical/Short Take-Off and Landing (VSTOL) aircraft, so that pilots can fly safer and more accurate approaches to all classes of ships.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

• FY 1998 ACCOMPLISHMENTS:

(U) ($3.107) Continued design and integration of the VISUAL technology demonstration program and conducted technology demonstrations and evaluations of critical component, using the CV/CVN and LHA/LHD advanced development models (ADM). Continued user and industry involvement in the VISUAL development process. Conducted a Systems Design Review (SDR) and a Preliminary Design Review (PDR). Produced a draft system performance specification that will become the basis for engineering development model (EDM) request for proposals (RFP). Provided engineering and management support to the program. CV/CVN and LHA/LHD VISUAL ADMs funded under this subproject.

• FY 1999 PLAN:

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/BA 4	Program Element Name & No. Carrier Systems Development – 0603512N	Project Name and Number. Future CV Launch & Recovery Systems, W1723

(U) ($2.609) Continue design and integration of the VISUAL technology demonstration program and continue critical component demonstration and evaluations. Prepare documentation for a Milestone II decision to proceed to the E&MD Phase. Issue the EDM RFP, evaluate proposals, and select the EDM integration contractor. Provide engineering and management support to the program, particularly for the transition from the PD&RR phase to the E&MD phase of the program.

• FY 2000 PLAN:

(U) ($1.839) Continue milestone II decision to proceed to the Engineering and Manufacturing Development (E&MD) phase. Award contract to initiate the design and integration of the VISUAL EDMs. Continue critical component demonstration and evaluations of emerging technologies in support of the VISUAL EDM contractor. Provide engineering and management support to the program, particularly for the transition from the PD&RR phase to the E&MD phase of the program.

B. Other Program Funding Summary

Related RDT&E	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
P.E. 0602122N (Aircraft Technology)										
P.E. 0604512N (Shipboard Aviation Systems)										

C. Acquisition Strategy: VISUAL is a Commercial Off The Shelf (COTS) procurement. The Navy is preparing a performance specification and will competitively award a fixed-price contract to deliver EDMs, with fixed-price production options.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/BA 4	Program Element Name & No. Carrier Systems Development – 0603512N	Project Name and Number. Future CV Launch & Recovery Systems, W1723

D. Schedule Profile:

	FY 1998	FY 1999	FY 2000
Program Milestones		VISUAL: 4Q MSII	
Engineering Milestones	VISUAL: 1Q SDR VISUAL: 2Q SDR	VISUAL: 2Q RFP VISUAL: 4Q PDR	
T&E Milestones		CV/CVN VISUAL (05/98) LHD/LHA VISUAL (08/98)	
Contract Milestones			VISUAL EDM: 1Q EDM Awd

Exhibit R-3, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/BA 4	Program Element Name & No. Carrier Systems Development – 0603512N	Project Name and Number. CV Launch & Recovery – W1723

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	Wx	NAWCAD, LKE	19.532	2.609	10/01/98	1.839	10/01/99			Cont.	Cont.	
Ancillary Hardware Development	CPFF	KAMAN EM	4.900	0		0				0	4.900	
Systems Engineering												
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development			24.432	2.609		1.839				Cont.	Cont.	
Remarks:												
Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support			N/A	N/A		N/A				N/A	N/A	
Remarks:												
Developmental Test & Evaluation												
Operational Test & Evaluation												
Tooling												
GFE												
Subtotal T&E			N/A	N/A		N/A				N/A	N/A	
Remarks:												
Contractor Engineering Support												
Government Engineering Support												
Program Management Support												
Program Management Personnel												
Travel												
Labor (Research Personnel)												
Overhead												
Subtotal Management			N/A	N/A		N/A				N/A	N/A	

Exhibit R-3, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/BA 4	Program Element Name & No. Carrier Systems Development – 0603512N	Project Name and Number. CV Launch & Recovery – W1723	

Remarks:												
Total Cost			24.432	2.609		1.839				Cont.	Cont.	
Remarks:												

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/BA 4	Program Element Name & No. Carrier Systems Development – 0603512N	Project Name and Number. EAF Matting W2269

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
W2269 EAF Matting	3.974	1.166	3.559	4.273	.893	0	0	0	0	17.639
RDT&E Articles Qty			2							

A. Mission Description and Budget Item Justification: This project addresses the Demonstration and Validation (DEMVAL) of lightweight airfield mat and expeditionary arresting gear to meet naval aviation unique Expeditionary Airfield (EAF) operational requirements, including transportability requirements on Maritime Prepositioning Ships (MPS).

The currently deployed EAF mat (AM-2) was developed for heavy fighter (such as the F-4) operations and is cumbersome to deploy. Lightweight (1/2 the weight of AM-2), less voluminous (1/2 the volume of AM-2), and easier to install (five days vice fifteen days to install a complete airfield) mat material may be technically feasible and commercially available, but must be evaluated for use with current type/model/series naval and Air Mobility Command (AMC) aircraft at conventional and Vertical and Short Take-off and Landing (VSTOL) airfields ashore. Candidate mat materials under consideration include reinforced synthetic composite materials and polyvinyl fiberglass. These mat materials will be configured and evaluated under Marine Corps operational scenarios.

The expeditionary arresting gear program will provide the Marine Corps with the capability to conduct short span arrestments of designated Navy and Marine Corps tail hook equipped aircraft in the expeditionary environment. The current arresting gear (M-21) cannot be adapted to operate on short span (100 feet or less) surfaces and is incapable of arresting the current inventory under casualty (no flaps or half flap) conditions. Installation of the M-21 required 24 hours, extensive excavation, and heavy support equipment. The M-21 has inadequate reliability and several replacement components are no longer produced. The replacement gear will provide air transportability, rapid setup, full inventory operational compatibility under all arrestment conditions, and adequate operational reliability. Two prototype systems will be built under this project.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

- FY 1998 ACCOMPLISHMENTS:

(U) ($3.974) Developed and validated high fidelity dynamic component simulation. Evaluated alternative energy absorber configurations, sheave dampers, and dual modulus tape constructions. Completed system level performance specification. Solicited and awarded a contract for design and fabrication of demonstration systems.

- FY 1999 PLAN:

(U) ($1.163) Evaluate alternative anchoring systems. Design and initiate fabrication of prototype arresting gear.

(U) ($.003) Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

- FY 2000 PLAN:

(U) ($3.559) Complete fabrication of two prototype systems and initiate performance testing with deadloads.

Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/BA 4	Program Element Name & No. Carrier Systems Development – 0603512N	Project Name and Number. EAF Matting W2269	

B. Other Program Funding Summary

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete
EAF OPN (PE 0206139M)	0	0	0	0	5.435	6.443	6.532	6.731	0

Related RDT&E: N/A

C. Acquisition Strategy: The advanced lightweight mat acquisition strategy envisions the solicitation of candidate material panels from commercial sources for evaluation in the laboratory and in the operational environment. Upon qualification of a viable material, limited production quantities will be procured for full scale environmental, performance, and operational testing. Production quantities will be procured from the commercial source in accordance with Marine Corps priorities.

The arresting gear acquisition strategy is predicated on the creation of a fully integrated team consisting of Navy and contractor personnel. Initial technology development and system design efforts will be shared between the partners. The commercial partner will take the lead in the prototype manufacturing effort; the Navy partner will lead the test effort; and the commercial partner will ultimately be tasked with system production.

Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/BA 4	Program Element Name & No. Carrier Systems Development – 0603512N	Project Name and Number. EAF Matting W2269	

D. Schedule Profile

	FY 1998	FY 1999	FY 2000	To Complete
Program Milestones	A/G M/S I 3Q			
Engineering Milestones		A/G PDR 1Q CDR 4Q	A/G 2 Proto 4Q	
T&E Milestones				A/G DT 1Q-3Q
Contract Milestones	A/G RFP 1Q Award 3Q			

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT/BA 4	PROGRAM ELEMENT NAME AND NUMBER Carrier Systems Development – 0603512N	PROJECT NAME AND NUMBER EAF Matting – W2269

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	CPAF	ESCO	3.247	.974	06/98	2.884	06/98			1.985	9.116	9.106
Ancillary Hardware Development	WX	NAWCADLKE	4.460	.107	10/98	.585	10/99			3.111	8.263	N/A
Systems Engineering												
Licenses												
Tooling												
GFE												
Award Fees	CPAF	ESCO		.035		.090		.		.067	.192	.192
Subtotal Product Development			7.707	1.116		3.559				5.163	17.571	9.298
Remarks: ESCO contract has a total estimated cost of $9,397.677; a base fee of $281.920; and an award fee of $281. 920. No fee has been awarded to date under this contract.												
Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support			N/A	N/A		N/A				N/A	N/A	N/A
Remarks:												
Developmental Test & Evaluation												
Operational Test & Evaluation												
Tooling												
GFE												
Subtotal T&E			N/A	N/A		N/A				N/A	N/A	N/A
Remarks:												
Contractor Engineering Support												

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT/BA 4	PROGRAM ELEMENT NAME AND NUMBER Carrier Systems Development – 0603512N	PROJECT NAME AND NUMBER EAF Matting – W2269

Government Engineering Support												
Program Management Support												
Program Management Personnel												
Travel												
Labor (Research Personnel)												
Overhead												
Subtotal Management			N/A	N/A		N/A				N/A	N/A	
Remarks:												
Total Cost			7.707	1.116		3.559				5.163	17.571	
Remarks:												

Exhibit R-2, RDT&E Budget Item Justification									Date: February 1999	
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/BUDGET ACTIVITY 4					R-1 ITEM NOMENCLATURE: Shipboard System Component Development/PE 0603513N					
COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total PE Cost	56.961	100.748	108.334	114.643	135.178	110.292	101.859	93.316	Continuing	Continuing
AGS-Advanced Gun System /32467	0	15.134 (1)	28.705	29.315	38.827	35.832	35.396	28.212	Continuing	Continuing
Undersea Warfare (USW)/32468	1.700	10.667 (2)	15.527	21.170	25.694	20.830	16.941	16.924	Continuing	Continuing
Shipboard Auxiliary System Development/S0382	0	0.777	(3)	0	0	0	0	0		
Consolidated Hull, Mechanical & Electrical Improvement (HM&E)/32469	23.946	24.867 (4)	24.647	23.064	28.123	26.472	26.941	27.331	Continuing	Continuing
HM&E Improvement/S1712	0	1.028	(5)	0	0	0	0	0		
Integrated Topside Design (ITD)/32470	10.454	13.348 (5)	13.732	15.054	18.899	14.977	15.319	15.670	Continuing	Continuing
Shipboard Sys Compnt Dev/S2608	0	0.998	0	0	0	0	0	0	0	0.998
Direct Carbonate Fuel Cell/S2390	3.301	0	0	0	0	0	0	0	0	3.301
Integrated Power Systems (IPS)/32471	17.560	33.929 (6)	25.723	26.040	23.635	12.181	7.262	5.179	Continuing	Continuing
Quantity of RDT&E Articles & Cost	0	0	0	0	0	*1/TBD	*2/TBD	0		

Note (1) (U) FY 1999 funds were budgeted and executed under PE 0603795N/Project K2323 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603795N/Project K2323 transitioned into PE 0603513N/Project 32467 in FY 2000 and out.

Note (2) (U) FY 1998 and FY 1999 funds were budgeted and executed under PE 0603553N/Project V1704 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603553N/Project V1704 (except Distant Thunder) transitioned into PE 0603513N/Project 32468 in FY 2000 and out.

Note (3) (U) FY 1998 FY 1999 funds were budgeted and executed under PE 0603513N/Project S0382 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603513N/Project S0382 transitioned into PE 0603513N/Project 32469 in FY 2000 and out.

Note (4) (U) FY 1998 and FY 1999 funds were budgeted and executed under PE 0603513N/Project S0382, PE 0603514N/Project S0384, PE 0603514N/Project S1565, and PE 0603563N/Project S2196 (only Affordability Through Commonality) as displayed in the FY99 President's Budget exhibits. Funds from PE 0603513N/Project S0382, PE 0603514N/Project S0384, PE 0603514N/Project S1565, and PE 0603563N/Project S2196 (only Affordability Through Commonality) transitioned into PE 0603513N/Project 32469 in FY 2000 and out.

Note (5) (U) FY 1998 FY 1999 funds were budgeted and executed under PE 0603513N/Project S1712 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603513N/Project S1712 transitioned into PE 0603513N/Project 32470 in FY 2000 and out.

Note (6) (U) FY 1998 and FY 1999 funds were budgeted and executed under PE 0603573N/Project S1314 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603573N/Project S1314 (only Integrated Power System) transitioned into PE 0603513N/Project 32471 in FY 2000 and out.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This Program Element (PE) has been modified in FY 2000 and out to focus on DD 21 associated systems development. Specific DD 21 associated systems development efforts that have been realigned under this PE include: the Advanced Gun Systems (formerly the Vertical Gun for Advanced Ships); Undersea Warfare; Integrated Topside Design; and Integrated Power Systems. In addition, a number of HM&E development tasks have been incorporated into a consolidated HM&E Project (32469) focused on DD 21.

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/BUDGET ACTIVITY 4	R-1 ITEM NOMENCLATURE: Shipboard System Component Development/PE 0603513N

(U) This PE now provides funds for the development of the DD 21 Class of U. S. Navy surface combatants and its components. The mission of the DD 21 class is to provide affordable credible independent forward presence/deterrence and operate as an integral part of Naval, Joint or Combined Maritime Forces. DD 21 will provide an advanced level of land attack in support of the ground campaign and contribute to Naval, Joint or Combined battlespace dominance in littoral operations. It will establish and maintain surface and sub-surface superiority, provide local air defense, and will incorporate signature reduction to operate in all threat environments. DD 21 will have seamless Joint Interoperability to integrate all source information for battlespace awareness and weapons direction.

* (U) For explanation of Test Articles see Projects 32467 and 32470.

B. (U) PROGRAM CHANGE SUMMARY:

	FY 1998	FY 1999	FY 2000
(U) FY 1999 President's Budget	22.022	27.725	25.170
(U) Appropriated Value	22.694		
(U) Adjustments to FY 1998 Appropriated Value/FY 1999 President's Budget	+34.267	+73.023	+83.164
(U) FY 2000 President's Budget Submit	56.961	100.748	108.334

(U) Funding:

(U) The FY 1998 net increase of $34.267M reflects decreases for Small Business Innovative Research (-$0.249M), a Below Threshold Reprogramming for HM&E Improvements (-$1.000M), a general undistributed reduction (-$0.008M), and Comparability Adjustment (+$35.524M).

(U) The FY 1999 net increase of $73.023M is due to comparability adjustments (+$74.914M) and Small Business Innovative Research (-$1.891

(U) The FY 2000 net increase of $83.164M reflects a number of realignments into this PE: Elements of Consolidated HM&E not previously addressed in this PE (+$15.413M), IUSW (+$15.792M), Advanced Gun System (formerly Vertical Gun Advanced Ship) (+$39.138M) and Integrated Power Systems (+26.100M) as well as funds for a NWCF rate increase (+$0.323M). Along with these realignments were reductions for Consolidated HM&E (-$4.000M), Advanced Gun System (-$10.000M), competitive sourcing savings associated with consolidation of service contracting efforts (-$0.140M) and miscellaneous adjustments (+$0.538).

(U) Schedule: N/A

(U) Technical Parameters: N/A

Exhibit R-2a, RDT&E Project Justification									Date: February 1999	
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4		PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N						PROJECT NAME AND NUMBER: AGS-Advanced Gun System/32467		
COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	0	15.134 (1)	28.705	29.315	38.827	35.832	35.396	28.212	Continuing	Continuing
RDT&E Articles Qty	0	0	0	0	0	1	0	0	Continuing	Continuing

Note (1) (U) FY 1999 funds were budgeted and executed under PE 0603795N/Project K2323 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603795N/Project K2323 transitioned into PE 0603513N/Project 32467 in FY 2000 and out.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: These funds provide for the development of the Advanced Gun System (AGS) associated with the development of DD 21. The Advanced Gun System is a major caliber gun system for the U.S. Navy next generation destroyer. The Advanced Gun System will consist of one or more major caliber guns, an automated ammunition handling system and a family of projectiles. The Advanced Gun System will as a minimum meet the DD 21 Naval Surface Fire Support (NSFS) and Surface Dominance Missions as assigned to the gun system. The Advanced Gun System will meet the DD 21 low radar cross-section requirements, either through below deck orientation and/or materials/ shaping of above decks structures. The system will provide a high rate of fire (12+ rounds per minute) along with a deep magazine and rapid re-supply to meet the U.S. Marine Corps 24 hour operational requirements. First Test Article will be fabricated in FY 2003 to support land-based gun systems testing and combat system integration risk reduction efforts.

1. (U) FY 1998 ACCOMPLISHMENTS
   - (U) N/A

2. (U) FY 1999 PLAN
   - (U) ($12.000) Conduct Phase I Advanced Gun System (AGS) concept formulation and begin Phase II prototype development.
   - (U) ($ 0.770) Conduct Comparison of Concepts (limited AOA) to include gun alternatives and comparison to missile options.
   - (U) ($ 1.982) Define AGS operational environment.
   - (U) ($0.382) Portion of extramural program is reserved for Small Business Innovative Research assessment in accordance with 15 USC 638

3. (U) FY 2000 PLAN
   - (U) ($4.784) Complete Concept Formulation phase (Phase II).
   - (U) ($20.874) Initiate subsystem demonstration phase (Phase III).
   - (U) ($2.000) Refine Operational Environment for the Advanced Gun System.
   - (U) ($1.047) Develop Verification and Validation tools.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: AGS-Advanced Gun System/32467

B. (U) OTHER PROGRAM FUNDING SUMMARY:

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
SC-21 Total Ship Systems Engineering/PE 0604300N	58.548	125.964	162.056	250.719	259.629	255.326	283.413	271.857	Continuing	Continuing

C. (U) ACQUISITION STRATEGY:

(U) The Navy will conduct a comparison of concepts for the DD 21 Advanced Gun System. The Advanced Gun System will be acquired in conjunction with the DD 21 development schedule. Initial phases will be conducted under section 845/804 other transaction authority. Initial phases include: Phase I – Concept Formulation, Phase II - Initial Prototype Development, Phase III - Subsystem Testing and Validation. Later phases may be accomplished using FAR/DFAR acquisition.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: AGS-Advanced Gun System/32467

D. (U) SCHEDULE PROFILE:

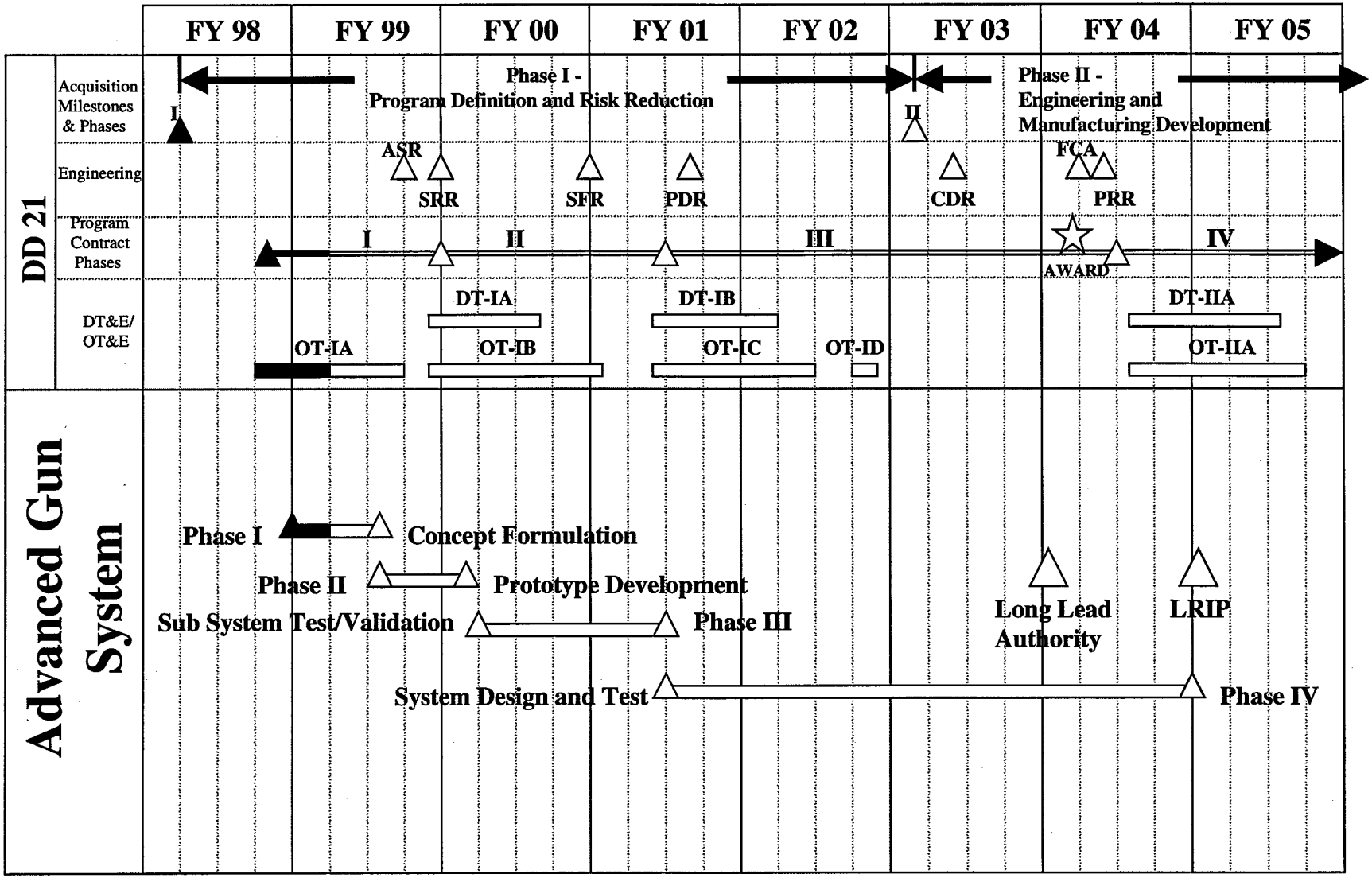


Exhibit R-3, Cost Analysis (page 1)										Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/ Budget Activity 4			PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/ PE0603513N					PROJECT NAME AND NUMBER: AGS-Advanced Gun System/32467		
Cost Categories (Tailor to WBS, or System / Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	Section 845/804	DD 21 Industry Teams	0	12.000	2/99	4.874	10/99			
	Section 845/804	DD 21 Industry Teams	0	0		20.874	01/00	Continuing	Continuing	
Subtotal Product Development			**0**	**12.000**		**25.748**		**Continuing**	**Continuing**	
Remarks:										
Subtotal Support			**0**	**0**		**0**				
Remarks:										

Exhibit R-3, Cost Analysis (page 2)								Date: February 1999		
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/ Budget Activity Four			PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/ PE0603513N					PROJECT NAME AND NUMBER: AGS-Advanced Gun System/32467		
Cost Categories (Tailor to WBS or System / Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal T&E			**0**	**0**		**0**				
Remarks: (U) No developmental or operational evaluation is scheduled during this period.										
Government Engineering Support	WR	NSWC DD Dahlgren, VA	0	0.585	1QFY99	1.613	1QFY00	Continuing	Continuing	
	WR	NSWC PHD Pt Hueneme, CA	0	0.475	1QFY99	0.661	1QFY00	Continuing	Continuing	
	WR	NSWC IH Indian Head, MD	0	0.105	1QFY99	0.336	1QFY00	Continuing	Continuing	
	WR	NSWC CD Bethesda, MD	0	0.100	1QFY99	0.226	1QFY00	Continuing	Continuing	
	WR	SSCSD San Diego, CA	0	0.170	1QFY99	0.121	1QFY00	Continuing	Continuing	
	TBD	Various	0	1.699	2QFY99	0	N/A			
Subtotal Management			**0**	**3.134**		**2.957**		**Continuing**	**Continuing**	
Remarks:										
Total Cost			**0**	**15.134**		**28.705**		**Continuing**	**Continuing**	
Remarks:										

Exhibit R-2a, RDT&E Project Justification									Date: February 1999	
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4		PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N					PROJECT NAME AND NUMBER: Undersea Warfare (USW)/32468			
COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	1.700	10.667 (1)	15.527	21.170	25.694	20.830	16.941	16.924	Continuing	Continuing
RDT&E Articles Qty									Continuing	Continuing

Note (1) (U) FY 1998 and FY 1999 funds were budgeted and executed under PE 0603553N/Project V1704 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603553N/Project V1704 (except Distant Thunder) transitioned into PE 0603513N/Project 32468 in FY 2000 and out.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The undersea warfare (USW) project provides advanced development demonstration and validation of technology for potential surface sonar and combat system application in conjunction with submarine efforts. Efforts focus on resolution of technical issues associated with providing capability against the year 2000 and beyond threat with emphasis on shallow water/littoral area USW and on Demonstration and Validation (DEM/VAL) of DD 21 Integrated Undersea Warfare (IUSW-21) concepts and technology. Key technology areas being investigated include: improvements in signal processing, advanced information processing, and multi-sensor data fusion to improve target detection and classification performance and reduce system manning requirements; and towed array, hull array and transducer technology to improve multi-static operation and in-stride mine avoidance. FY 2000 and subsequent efforts will focus on major technological and performance thrusts for DD 21 USW, which will define surface combatant USW capability for the Navy in the next century. These efforts will continue beyond DD 21 and provide improvements that apply across surface ship USW platforms. This project is funded as DEM/VAL because it develops and integrates hardware for experimental tests related to specific ship or aircraft applications.

1. (U) FY 1998 ACCOMPLISHMENTS
   - (U) ($1.700) IUSW-21 Requirements: Developed top level requirements for IUSW-21 Advanced Development Model (ADM) based on DD-21 performance requirements. Developed top level IUSW-21 concept of operations and performed functional decomposition to identify opportunities for manning reductions. Performed technology assessment in support of functional decomposition and required manning reductions.

2. (U) FY 1999 PLAN
   - (U) ($2.000) Begin Concept Development for DD 21 Undersea Warfare, including risk mitigation plans and support for a Demonstration/Validation program to mitigate risk.
   - (U) ($7.057) IUSW-21 BAA Risk Mitigation: Evaluate responses to a Broad Agency Announcement and competitively award contracts & tasks to contractors, government/university labs to mitigate risks associated with DD-21 USW system development. Risk mitigation will address improvements in signal processing, advanced information processing, and multi-sensor data fusion to improve target detection and classification performance and reduce system manning requirements; and hull array and transducer technology to improve broad-band operation and in-stride mine avoidance.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Undersea Warfare (USW)/32468

- (U) ($1.368) IUSW-21 Systems Engineering: Complete IUSW-21 functional and operator task decomposition, identify technologies to be used to mitigate risks, establish Dem/Val environment, oversee risk mitigation effort, and conduct Dem/Val of products resulting from BAAs.
- (U) ($0.242) Portion of extramural program is reserved for Small Business Innovative Research assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLAN

- (U) ($5.242) Begin IUSW-21 prototype development. Develop DD 21 USW concept and risk mitigation plan. Participate in IUSW peer group and evaluate USW technologies.
- (U) ($9.068) IUSW-21 Risk mitigation. Evaluate response to a Broad Agency Announcement (BAA) and competitively award contracts and tasks to industry/University/Government labs to provide risk mitigation for DD 21 USW activities. Continue to advance technology using BAAs and Build-Test-Build process to further define advanced information processing, broadband signal processing, hull array technology including high frequency (HF) and broadband multi frequency (MF), and integrated stern risk mitigation efforts.
- (U) ($1.217) IUSW-21 Systems Engineering. Review competing DD 21 Industry Teams USW risk mitigation plans and determine scope of future BAA technology efforts. Provide review of on going BAA efforts. Participate in IUSW-21 peer group and evaluate USW technologies for incorporation to the DD 21 Industry Teams.

B. (U) OTHER PROGRAM FUNDING SUMMARY:

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
SC-21 Total Ship Systems Engineering/PE 0604300N	58.548	125.964	162.056	250.719	259.629	255.326	283.413	271.857	Continuing	Continuing

C. (U) ACQUISITION STRATEGY:

(U) In Contracting Phase I and II, DD 21 will use Section 845/804 agreement authority for the efforts conducted by the DD 21 Industry Teams. Broad Agency Announcements (BAAs) will be competitively awarded annually to further refine advanced information processing, broadband signal processing, hull array technology, and integrated stern mitigation and to provide further risk mitigation for DD 21 USW activities. In Contract Phase III responsibility for IUSW-21 development will be with the DD 21 Industry Teams.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Undersea Warfare (USW)/32468

D. (U) SCHEDULE PROFILE:

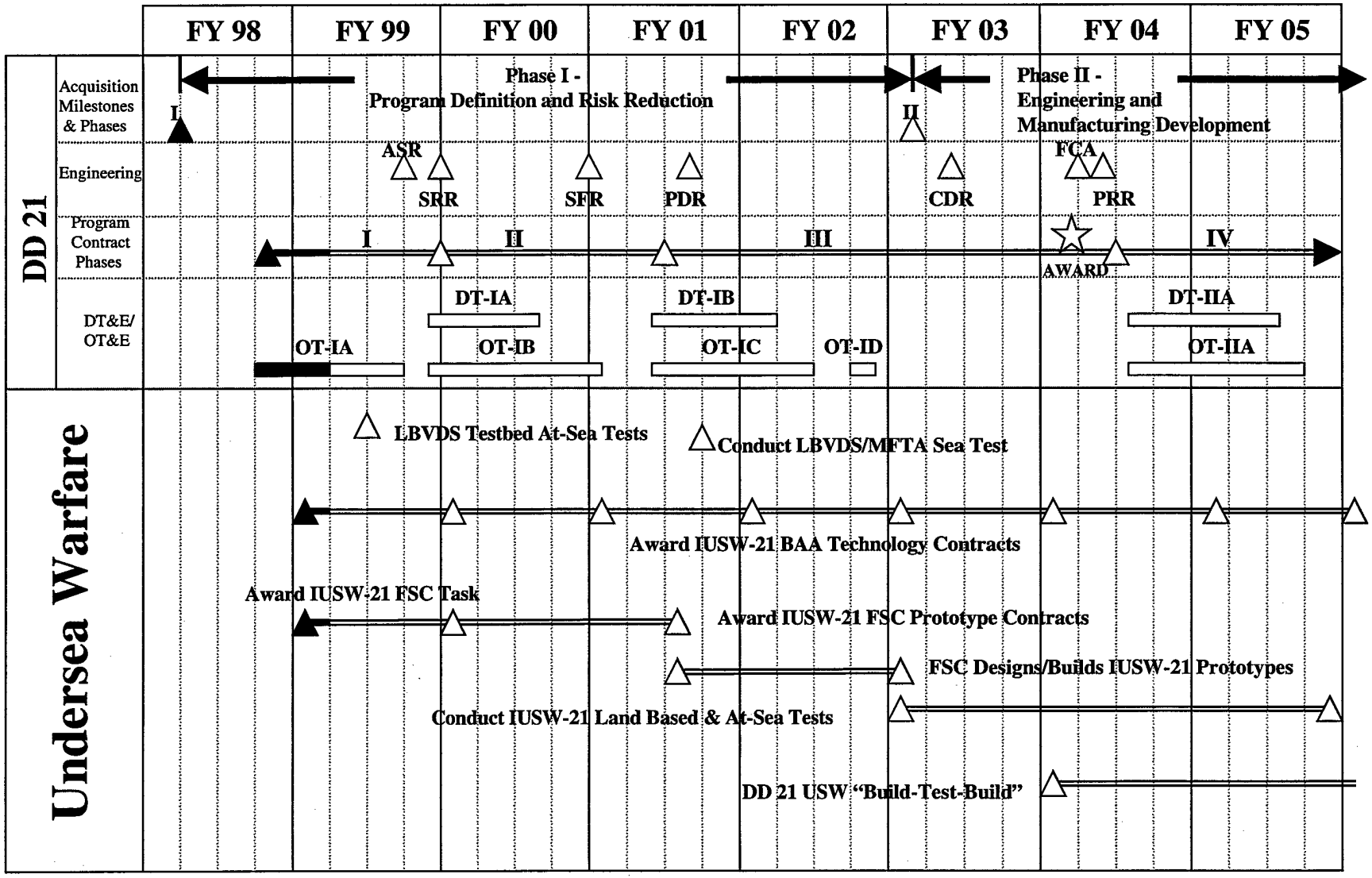


Exhibit R-3, Cost Analysis (page 1)											Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/ Budget Activity 4			PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/ PE0603513N								PROJECT NAME AND NUMBER: Undersea Warfare (USW)/32468
Cost Categories (Tailor to WBS, or System / Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	Cost To Complete	Total Cost	Target Value of Contract	
Primary Hardware Development	Sect 845/804	DD 21 Industry Teams	0	2.000	11/98	5.242	10/99	Continuing	Continuing		
	BAA/CPFF	Competition	0	7.057	2QFY99	9.068	Various	Continuing	Continuing		
Subtotal Product Development			**0**	**9.057**		**14.310**		**Continuing**	**Continuing**		
Remarks:											
Technical Data	WR	NUWC/N Newport, RI	1.000	0.550	1QFY99	0.291	1QFY00	Continuing	Continuing		
	WR	NSWC DD Dahlgren, VA	0.200	0.075	1QFY99	0.076	1QFY00	Continuing	Continuing		
	SS/CPFF	APL/JHU Laurel, MD	0.400	0.162	1QFY99	0.150	1QFY00	Continuing	Continuing		
	SS/CPFF	APL/UW Seattle, WA	0	0.150	1QFY99	0.150	1QFY00	Continuing	Continuing		
	SS/CPFF	ARL/UT College Sta., TX	0	0.150	1QFY99	0.150	1QFY00	Continuing	Continuing		
	SS/CPFF	ARL/PSU State College,PA	0	0.150	1QFY99	0.150	1QFY00	Continuing	Continuing		
	C/CPFF	DSR Arlington, VA	0	0	N/A	0.050	1QFY00	Continuing	Continuing		
Subtotal Support			**1.600**	**1.237**		**1.017**		**Continuing**	**Continuing**		
Remarks:											

Exhibit R-3, Cost Analysis (page 2)										
							Date: February 1999			
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/ Budget Activity 4			PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/ PE0603513N				PROJECT NAME AND NUMBER: Undersea Warfare (USW)/32468			
Cost Categories (Tailor to WBS or System / Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal T&E			**0**	**0**		**0**		**Continuing**	**Continuing**	
Remarks:										
Program Management Support	GSA	Techmatics Arlington, VA	0.100	0.200	1QFY99	0.200	1QFY00	Continuing	Continuing	
Miscellaneous	PD/WR	Various	0	0.173	Various	0	Various	Continuing	Continuing	
Subtotal Management			**0.100**	**0.373**		**0.200**		**Continuing**	**Continuing**	
Remarks:										
Total Cost			**1.700**	**10.667**		**15.527**		**Continuing**	**Continuing**	
Remarks:										

Exhibit R-2a, RDT&E Project Justification								Date: February 1999	
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4		PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N				PROJECT NAME AND NUMBER: Consolidated Hull, Mechanical & Electrical Improvements (HM&E)/32469			
COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	23.946	24.867 (1)	24.647	23.064	28.123	26.472	26.941	27.331	Continuing	Continuing
RDT&E Articles Qty	0	0	0	0	0	0	0	0	Continuing	Continuing

Note (1)) (U) FY 1998 and FY 1999 funds were budgeted and executed under PE 0603513N/Project S0382, PE 0603514N/Project S0384, PE 0603514N/ Project S1565, and PE 0603563N/Project S2196 (only Affordability Through Commonality) as displayed in the FY99 Presidents Budget exhibits. Funds from PE 0603513N/Project S0382, PE 0603514N/Project S0384, PE 0603514N/Project S1565, and PE 0603563N/Project S2196 (only Affordability Through Commonality) transitioned into PE 0603513N/Project 32469 in FY 2000 and out.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project supports the advanced development of DD-21 HM&E ship survivability, auxiliary machinery, and affordability through commonality technologies and systems that will enable DD-21 survivability, manning, and life cycle cost goals to be met. The products developed under this project also support the existing fleet and other ship acquisition programs. Note that the efforts under this project were previously supported by four separate projects (See Note 1) and were consolidated to facilitate an integrated system development approach that ensures all design considerations are addressed. The following provides a mission description for each development area (i.e., survivability, auxiliary, and affordability):

(U) Survivability: The survivability area supports development of systems and protection concepts that reduce vulnerability to conventional weapons and peacetime accidents and enable, under reduced manning conditions, a rapid recovery of mission capability. Development categories include damage control computer-based systems that provide for rapid systems restoration, fire protection devices that improve probability of survival with a reduced crew ship, and ship protection concepts that reduce magazine and commercial equipment vulnerability.

(U) Auxiliary: For existing and future ships, this funding: 1) improves reliability/maintainability of fluid, electrical, and mechanical systems and 2) support reduced manning through automation of operational, maintenance, and day-to-day functions traditionally performed by the crew, and supports development of auxiliary systems to reduce ship magnetic signature and vulnerability to mines.

(U) Affordability Through Commonality: The affordability through commonality program develops, demonstrates, and validates architectures, technologies, and concepts that reduce total ownership cost of existing and future ship, especially future surface combatants. Focus areas are total ship open system architectures; total ownership cost methods and modeling; use of ownership cost reduction best practices from industry and other services; cost effective equipment selection, maintenance; and logistics support, and best value enabling and innovative technologies for total ownership cost reduction.

1. (U) FY 1998 ACCOMPLISHMENTS

(U) SURVIVABILITY:

- (U) ($ 8.450) Continued development of Advanced Ship Shock Isolation Systems (ASSIST) for protecting commercial electronic and machinery equipment and sensitive munitions from underwater explosion (UNDEX) induced shock. Fabricated a prototype ASSIST machinery mount;

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Consolidated HM&E/32469

developed design drawings. Initiated full-scale proof-of-concept demonstration tests employing ASSIST mounts and raft. Continued development of Integrated Magazine Protection System (IMPS) technologies. Conducted full scale IMPS demonstration and initiated scaled proof-of-concept IMPS demonstration tests. Integrated the Real Time Stability Status (RTSS) software module with the Damage Control System (DCS) to allow stability data to be presented from DCS consoles; and initiated fleet evaluation aboard USS RUSHMORE. Initiated development of an on-line training capability for the DCS structural assessment module and incorporated software modifications based on lessons learned. Initiated shipboard demonstration of DCS firemain reconfiguration management module. Initiated conversion of the Damage Control Assessment Management System (DCAMS) software module. Initiated weapons effects demonstrations of the ability of HM&E services to automatically isolate, reconfigure and affect the appropriate DC response (e.g. initiate fire suppression) following damage. Initiated fleet evaluations aboard the ex-USS to demonstrate the effectiveness of alternative reduced manning damage control concepts/architectures in responding to a major casualty. Completed interactive training system for the Repair Locker Leader and Damage Control Assistant. Continued development of the time-dependent, computer-based Advanced Survivability Assessment Program (ASAP) for use in evaluating ship designs. Continued development of ASAP fire and smoke model. Developed software architecture to allow models to operate in a time dependent manner. Conducted evaluation of self-contained water mist fire extinguishing systems for protecting flammable liquid storage spaces.

(U) AUXILIARY SYSTEMS:

- (U) ($6.796) Continued development of advanced HM&E machinery and systems to reduce operational manning and eliminate at-sea maintenance. Conducted laboratory evaluations and demonstrated proof of concept for reduced manning of auxiliary machinery and systems architectures. Initiated the development of design tools to minimize the need for full-scale land based demonstrations of other auxiliary systems. Continued development of Power Electronic Building Block (PEBB) modules, Polymer Current Limiters (PCL), alternative cells for the Electrolytic Disinfectant Generator (EDG), and seals for composite pumps. Obtained Milestone III approval for EDG and composite pumps. Completed LABEVAL of auxiliary multi functional PEBB based power module (AMF PM) and concurrent engineering of design to improve performance. Continued Shipeval of Ground Fault Limiters (GFL) and prepared performance specifications for Fleet applications. Conducted Labeval of 50/100 ampere single phase PCL fuse replacements. Developed eddy current field measurement capability for surface combatants and completed test aboard LPD 17 physical magnetic model under various load conditions. ($0.915M used to forward finance FY 1998 program due to the termination of fiber optics). Continued development of the Transient Analysis Model for POSSE and continued development of the Under Water Closed Circuit Blasting System. Initiated development of the Remotely Operated Vehicle (ROV) Power System. Continued fuel cell development for ship service power applications Initiated conceptual design of baseline Molten Carbonate Fuel Cell (MCFC) including small scale screening for shock, vibration, salt and sulfur tolerance. Modified ERC contract to conduct additional preliminary design work and operate 50 KW reduced scale demonstrator with congressional plus-up in Project S2390.

(U) AFFORDABILITY THROUGH COMMONALITY:

- (U) ($8.700) Affordability Through Commonality (ATC): Developed, demonstrated, and validated architectures, technologies, and concepts that reduce total ownership costs for the future fleet. Identified areas/methods for common, fleet-wide methods to improve life cycle affordability of future naval ships and shipboard systems. Where feasible, backfit to existing ships was pursued. Focus of these efforts was the 21st century surface combatant (SC 21), future carrier CVN(X), and other ships in the SCN plan.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Consolidated HM&E/32469

- (U) Total Ship Modular Open Systems Architecture: Initiated development of a common open systems total ship architectures for HM&E systems, C4I systems, and combat systems including interface standards for modular ship systems. Developed first cut at systems architectures that can utilize commercial processes and/or commercial-off-the-shelf (COTS) equipment and materials. Performed producibility, operational, and cost analysis of this ship architecture. Refined zonal distributed systems architectures for HVAC, firemain, and other auxiliary/support systems for a total ship open system architecture. Incorporated requirements for dedicated serviceways for zonal distributed and other support systems in ship open architecture. Developed plans and Navy-Industry team approach to define Weapons / Topside / Electronic Zones definition & interface standards for combat systems and C4I, and to develop module to ship, module to module, and intra-module interface standards for hull, mechanical & electrical systems. Supported integration of distributed computing plant schematic architecture into the physical architecture of modular ship architecture. Supported NAVSEA Professor of Ship Production research grant to incorporate world class ship production processes and practices into naval ships.
- (U) Future Surface Combatant Cost Modeling: Supported cost modeling and cost analysis for DD 21. Collected and analyzed cost data of shipbuilders for development of activity cost factors for surface combatant type ships. Updated database of cost-benefit studies done and the sources of the cost data. Analyzed the cost benefits of architectures, technologies, and concepts.
- (U) Use of Ownership Cost Reduction Best Practices from Industry & Other Services: Gathered a database of affordability best practices, lessons learned, and other information on ownership cost reduction technologies, and concepts.
- (U) Cost Effective Equipment Selection, Maintenance, and Logistics Support: Developed methods and practices for more cost-effective shipboard equipment selection. Updated equipment selection tool to utilize world wide web links to existing Navy and commercial equipment databases. Analyzed potential across programs common equipment buy and engineering support for resolution of common buy issues. Began development of equipment selection processes including use of COTS equipment. Provided equipment selection engineering support, lessons learned and practices to on going ship programs. Began benchmarking of commercial logistics support concepts.
- (U) Best Value Enabling and Innovative Technologies for Total Ownership Cost Reduction: Examined potential commercial technologies to provide more affordable solutions to shipboard functional requirements and/or reduced maintenance and modernization costs. Surveyed industry and other sources for modularity enabling technologies. Revised concept for food service (galley) modules, ventilation and chilled water HVAC modules, and ship auxiliary systems. Purchased and installed commercial food service equipment for shipboard demonstration and evaluation. Supported prototype evaluations for ships under construction (such as DDG 51 class and LPD 17 class) and modernization (CVN 68 class) for habitability common modules, and commercial furniture for offices and berthing. Demonstrated and evaluated commercial lighting systems - sulfur fusion light with light tube, and fiber optic lighting applications. Developed concepts for mission element modules that would be used across different systems/spaces that have rapidly changing equipment especially electronics. Developed radio communication modularity concepts and potential means to integrate them within the ship. Developed modular packaging concepts for Concentric Canister Launcher (CCL). Supported modular horizontal CCL concept revision, testing of electronics breadboard using commercial components, and demonstration testing. Developed and tested Shipboard Modular Architecture and Reconfiguration Technology (SMART) deck modular track/hold down systems and compartment support systems (i.e. modular electrical connections) for use in mounting standardized and modular equipment aboard ships in C4I and other types of spaces to reduce the costs of future modernization.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Consolidated HM&E/32469

2. (U) FY 1999 PLAN:

(U) SURVIVABILITY:

- (U) ($7.461) Conduct full scale UNDEX shock proof-of-concept demonstration test of ASSIST machinery mount and raft. Conduct DD 21 ship/ system integration design assessments and finalize machinery mount/ design requirements. Initiate ASSIST planning for DD 21 applicable demonstration employing mount, raft and machinery. Conduct full scale demonstration tests of the effectiveness of anti-fratricide shielding and scaled proof-of-concept IMPS demonstration tests for multiple warheads. Conduct DD 21 applicable ship/ launcher integration studies. Initiate planning for all-up full scale proof-of-concept demonstration employing multiple missiles, launcher, anti-fratricide shielding and water suppression. Complete RTSS Fleet evaluation aboard the USS Rushmore. Initiate development of a predictive stability algorithm for the RTSS software module that determines long term stability conditions based on flooding rates. Complete shipboard demonstration of DCS firemain reconfiguration management module. Complete fleet evaluations aboard the ex-USS SHADWELL to demonstrate the effectiveness of alternative reduced manning concepts. Initiate fleet evaluations aboard the ex-USS SHADWELL in support of developing shipboard procedures for firefighting in a chemical, biological, and radiological (CBR) environment. Conduct full scale weapon effects demonstrations of automated fire suppression system. Develop automated chilled water isolation and reconfiguration system options. Continue development of the ASAP fire and smoke model and initiate development of a crew casualty/damage control model. Initiate development of firefighting devices/systems that provide for remote control of a firehose nozzle enabling sustained operations in a reduced manning environment. Conduct survey of commercial robotic firefighting devices, develop operational requirements and initiate prototype system design.

(U) AUXILIARY SYSTEMS:

- (U) ($9.394) Continue development of advanced HM&E machinery and systems architectures to reduce manning and eliminate at-sea maintenance. Complete low pressure air system full scale demonstration with Component Level Intelligent Distributed Control (CLIDC) system. Initiate laboratory demonstration of automated chilled water and other auxiliary systems with CLIDC systems Continue development of PCL, GFL, and PEBB based AMF PM. Complete GFL algorithm development, SHIPEVAL and implementation. Complete design, fabrication and LABEVAL of 100 ampere, single phase PCL for fuse replacement. Initiate PCL design for 3 phase fuse replacement. Complete evaluation/upgrade of AMF PM brassboard and establish requirements for prototype. Continue concurrent engineering and cost analysis for AMF PM. Initiate development of a magnetic, onboard, self-monitoring, control system (CLDG) for steel hulled surface combatants including onboard sensor suites and control algorithms. Specify and initiate procurement of CLDG components. Complete development of the Underwater Closed Circuit Blasting System. Continue development of the ROV Power System. Complete development of the Transient Analysis Model for POSSE. Continue development of fuel cells for ship service power applications. Continue MCFC 2500 KW conceptual design and trade off analysis.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Consolidated HM&E/32469

(U) AFFORDABILITY THROUGH COMMONALITY:

- (U) ($7.676) Affordability Through Commonality: Continue to develop, demonstrate, and validate architectures, technologies, and concepts that reduce total ownership costs for the future fleet. Identify areas/methods for common, fleet-wide means to improve life cycle affordability of future naval ships and shipboard systems. Where feasible, backfit to existing ships will be pursued. Focus these efforts on applications for on-going ship programs (DDG 51, DD21, CVN77, CVN(X)) and other ships in the SCN plan.
  - (U) Total Ship Modular Open Systems Architecture: Continue multi-year Navy-Industry effort to develop a total ship open systems architecture. This architecture will feature defined modules and zones for weapons, sensors & electronics as well as hull, mechanical & electrical (HM&E) equipment with zonal distributed systems for ship-wide support systems such as fire fighting, heating, ventilation, air conditioning, and equipment cooling. Develop total ship modular open systems architecture requirements for surface combatants. Draft performance specifications and other requirements for this modular open systems architecture, including common interfaces. Perform operational, survivability, and cost analysis of this ship architecture. Begin to define module to ship, module to module, and intra-module interface standards for hull, mechanical, and electrical systems, adaptable to zonal and other advanced distributive systems concepts, and with applicability across the fleet. Evaluate and use industry interface standards where available. Conduct studies/analyses of promising alternative distributed systems concepts, including assessment of survivability and ship operations. Support integration of distributed computing plant schematic architecture into the physical architecture of modular ship architecture. Evaluate impact of commonality architecture and zonal distributed systems on ship production costs and build strategy, including; scheduling, fabrication, erection, outfitting, and testing. Support NAVSEA Professor of Ship Production research grant to incorporate world class ship production processes and practices into naval ships.
  - (U) Future Surface Combatant Cost Modeling: Collect and analyze shipbuilders cost data for development of activity cost factors for surface combatant type ships. Analyze cost benefits of architectures, technologies, and concepts. Update database of cost-benefit studies done and the sources of the cost data.
  - (U) Use of Ownership Cost Reduction Best Practices from Industry & Other Services: Benchmark affordability/ life cycle cost reduction best practices from industry & other services. Adapt affordability best practices for naval fleet / ship use.
  - (U) Cost Effective Equipment Selection, Maintenance, and Logistics Support: Develop engineering tools, criteria, and methods for cost effective selection. Update equipment selection tool links to commercial equipment databases. Transfer lessons learned and adapt the across acquisition program common equipment buy to ongoing ship acquisition programs. Develop equipment selection processes including use of COTS equipment. Equipment selection support to on-going ship design / acquisition programs. Gather and transfer equipment selection lessons learned and practices to on-going ship programs Complete benchmarking of commercial logistics support concepts. Analyze the cost-benefit and performance of commercial logistics support concepts.
  - (U) Best Value Enabling and Innovative Technologies for Total Ownership Cost Reduction: Examine, adapt, demonstrate and evaluate potential commercial technologies to provide more affordable solutions to shipboard functional requirements and or reduced maintenance and modernization costs. Develop galley of the future module concept design using commercial food preparation technologies. Complete engineering effort for prototype evaluation of habitability common modules, and commercial furniture on ships under construction (such as DDG 51 class and LPD 17 class), and modernization (CVN 68 class). Modular packaging systems engineering and concept development for

Concentric Canister Launcher (CCL) in support of at-sea demonstration. Complete development and testing on Shipboard Modular Architecture and Reconfiguration Technology (SMART) deck modular track/hold down systems. Continue to develop SMART compartment support systems and concepts, including modular reconfigurable electrical connections and concepts for rapidly reconfigurable ventilation. Assessment of incorporation of SMART deck system and concepts in prototype Combat Information Centers (CIC) for the future to demonstrate greatly reduced installation and upgrade / modernization costs. Support C4I modularity especially the use of standard commercial 'racks' and interfaces for radio communication equipment. Complete development of radio communication modularity using commercial equipment and open system standards. Work to backfit these on ships under construction and in modernization.

(U) ($0.336) Portion of extramural program is reserved for Small Business Innovative Research assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLAN:

(U) SURVIVABILITY:

- (U) ($6.553) Continue development of the Real-Time Stability System (RTSS) predictive stability software. Complete fleet evaluation aboard the ex-USS Shadwell in support of developing firefighting procedures in a chemical, biological, and radiological environment. Initiate full scale weapons effects testing of alternative total ship computing plant architectures to demonstrate initialization of software applications on undamaged computers to support continued, uninterruptible operation of mission critical functions. Continue development of the time-dependent, computer-based ASAP for use in evaluating ship designs. Complete development of the ASAP fire and smoke model and continue development of the crew casualty/ damage control model. Continue development of firefighting devices/ systems that provide for remote control of a nozzle enabling sustained operations in a reduced manning environment. Complete system design and initiate prototype construction. Continue development of ASSIST. Initiate construction of DD 21 applicable ASSIST machinery concepts. Initiate design of ASSIST mounts for protecting sensitive munitions stowed in vertical launchers and bulk magazines. Continue development of IMPS technologies. Initiate construction of full scale IMPS models.

(U) AUXILIARY SYSTEMS:

- (U) ($11.593) Along with DD 21 industry teams, develop alternative machinery system architectures to reduce manning and eliminate at-sea maintenance of shipboard auxiliary systems; validate design tools and produce simulations of alternative architectures/machinery systems for DD-21. Award contract for prototype AMF PM for IPS auxiliary machinery applications. Continue development of 3 Phase PCL fuse replacement. Complete CLDG sensor development and procurement; conduct full-scale CLDG ranging tests. Complete development of conceptual/preliminary designs of 2.5 megawatt (MW) Ship Service Fuel Cell Power Module and initiate detailed design of 0.5 MW reduced scale demonstrator. Complete subscale stack and reformer risk reduction demonstrations. Initiate development of the Improved Shaft Coating System. Initiate development of the Smart Tow Monitoring System. Complete development of the ROV Power System.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Consolidated HM&E/32469

(U) AFFORDABILITY THROUGH COMMONALITY:

- (U) ($3.101) Total Ship Modular Open Systems Architecture: Continue Navy-Industry effort to develop, demonstrate, validate and implement fleet-wide open systems architectures (OSA) and non-proprietary standard interfaces. This architecture will feature weapon, sensor & electronic - modules and zones as well as hull, mechanical & electrical (HM&E) equipment with zonal distributed systems for ship-wide support systems such as fire fighting, heating, ventilation, air conditioning, and equipment cooling. The OSA will employ commercial processes and commercial off the shelf material and equipment to the greatest extent practicable.
  - Continue development of detailed, fleet-wide standard interfaces for an OSA chilled water module. Initiate fabrication of an OSA chilled water module and associated standard interface for demonstrating and evaluating effectiveness of OSA technology for meeting the requirements of Naval shipboard operational environment.
  - Continue development of detailed development of an OSA HVAC system for a shipboard C4I space arranged with SMART deck reconfigurable foundation system. Initiate fabrication of prototype SMART Space including HVAC system, to demonstrate and validate effectiveness of SMART OSA technologies for meeting requirements of the Naval Shipboard operational environment.
  - Continue development and / or adaptation of technology concepts for non-proprietary OSA standard interface enablers. These 'enablers' will allow the use of COTS components from multiple vendors to meet Navy unique environmental requirements without modification.
- (U) ($0.500) Total Ownership Cost Methods & Modeling: Develop Product Oriented Design and Construction (PODAC) cost model estimating ratios for shipbuilding intermediate products, parametric scaleable systems, and shipboard equipment for surface combatant ships. Analyze cost benefits of architectures, technologies, and concepts.
- (U) ($0.400) Cost Effective Equipment Selection, Maintenance, and Logistics Support: Continue development, demonstration, validation and implementation of SAVEPRO and SEALINK engineering tools for Fleet-wide cost effective equipment selection and expand these tools to include commercial market. Provide equipment selection support to on-going ship design / acquisition programs, including lessons learned.
- (U) ($2.500) Best Value Enabling and Innovative Technologies for Total Ownership Cost Reduction: Investigate and evaluate commercial technologies for potential to provide more affordable solutions to Naval shipboard functional requirements and/or reduced maintenance and modernization costs. These efforts include continued systems engineering and ship integration efforts in support of; Concentri c Canister Launcher (CCL) at-sea demonstration, Commercial material handling and management technologies development and Galley of the Future concepts. Efforts will also include completion of habitability common modules and commercial furniture for offices and berthing, commercial sulfur lighting with advanced distribution systems, and the advanced embarkation / debarkation system. Foster the transition of these technologies and concepts to on-going ship design and acquisition programs.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Consolidated HM&E/32469

B. (U) OTHER PROGRAM FUNDING SUMMARY:

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
SC-21 Total Ship Systems Engineering/PE 0604300N	58.548	125.964	162.056	250.719	259.629	255.326	283.413	271.857	Continuing	Continuing

C. (U) ACQUISITION STRATEGY:

(U) These development efforts were realigned into this project in an effort to consolidate related DD 21 RDT&E efforts and will be transitioned into the DD 21 acquisition strategy in FY 2000 and out.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Consolidated HM&E/32469

D. (U) SCHEDULE PROFILE:

FY 1998	FY 1999	FY 2000
SURVIVABILITY		
4Q ASSIST Machinery Mount / Design	4Q DD 21 Machinery Integration Study	4Q CBR Firefighting Proced
3Q IMPS Single Warhead Test	4Q DD 21 IMPS Ship Integration Study	4Q Remote Control Firefighting Design
4Q ASAP Time Dependent Software	1Q ASSIST UNDEX Machinery Mount Shock Tests	
4Q DCS Structural Software Module	3Q IMPS Demonstration	
4Q Self-Contained Water Mist Evaluations	4Q DCAMS Windows NT Software	
	4Q DCS Structural Training Software	
	3Q Remote Control Firefighting Operational Requirements	
	4Q Reduced Manning Option Evaluations	
	4Q Firemain Reconfiguration Shipboard Demonstration	
	3Q Automated Fire Suppression Demonstrations	

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Consolidated HM&E/32469

FY 1998	FY 1999	FY 2000
AUXILIARY SYSTEMS		
Auxiliary Systems		
3Q EDG MS III 4Q Comp Pump MS III 4Q LABEVAL PCL (10) 4Q LABEVAL AMF PM EDM	4Q Complete GFL SHIPEVAL 4Q GFL Specification 4Q Prototype AMF PM Requirements 4Q LABEVAL PCL	4Q AMF PM Labeval Compl
Salvage		
2Q Initiate ROV Power System Dev.	4Q Complete UW Closed Cir. Blast Sys. 4Q Complete Transient Analysis Model	1Q Initiate Improved Shaft Coating System 2Q Initiate Smart Tow Monitoring System 4Q Complete ROV Power System
Fuel Cell		
4Q MCFC 2.5 MW Concept Design Interim Report	4Q PEM FC Concept Design 4Q MCFC Concept Design	1Q Reduced Scale Risk Reduction Demos 1Q PEM FC Preliminary Design 1Q MCFC Preliminary Design 4Q .5 MW Reduced Scale Demo Design
Magnetic Silencing		
4Q LPD 17 Model Complete 4Q Eddy Current Measurement Capability for Surface Ship	1Q Advanced Deg ATD transitions to Surface Combatants 4Q CLIDG System for Surface Combatants Defined	3Q CLDG Ranging of CLDG 4Q CLDG Sensor Dev Complete
Advanced Auxiliaries		
4Q LP Air & Chilled Water LABEVAL Proof of Concept 4Q Complete DDG-51 Chilled Water & LP Air Simulation Model	2Q Complete LP Air LABEVAL 4Q Demo Functional Control System Design 4Q Validate Chilled Water Fluid Simulation	4Q New Sys Arch Concepts to Support Reduced Manning 4Q Val Chilled Water Sim & Design Tools

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Consolidated HM&E/32469

FY 1998	FY 1999	FY 2000
AFFORDABILITY THROUGH COMMONALITY Integrated Joiner Bulkhead System Complete 4Q Radio Communication Modular Equipment Stds. 4Q HM&E Open Systems Interface Standards Development Plan 4Q Combat Systems Zone & Interface Standards Development Plan 4Q	Modular Food Service Level II Design 4Q C4I Modularity Distributed Systems Prototype 4Q Open Systems Interface Definitions for HVAC and CW 4Q Zonal HVAC Distributed System Open Systems Concept Design 4Q Surface Combatant Open Ship Systems Arch. GBS Phase II 4Q	Commercial Furniture For Offices/Berthing Complete 4Q Draft Performance Specification For Open Systems Architectures HVAC & CW Demonstrator 1Q Initiate Fabrication Opens System Architecture Chill Water Demonstrator 3Q PODAC Cost Model Cost Estimating Relationships for surface combatants 4Q Advanced Embarkation/ Debarkation System Complete 4Q

Exhibit R-3, Cost Analysis (page 1)								Date: February 1999		
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/ Budget Activity 4			PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/ PE0603513N					PROJECT NAME AND NUMBER: Consolidated Hull, Mechanical & Electrical Improvement (HM&E)/32469		
Cost Categories (Tailor to WBS, or System / Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	Cost To Complete	Total Cost	Target Value of Contract
SURVIVABILITY										
Product Development	Section 845/804	DD 21 Industry Teams	0	2.020	11/98	5.043	10/99	Continuing	Continuing	N/A
	WR	NSWC CD Bethesda, MD	3.332	3.291	Various	0.500	Various	Continuing	Continuing	N/A
	Various	Other Govt Activities	3.018	1.500	Various	0.578	Various	Continuing	Continuing	N/A
	Various	Other Contractors	2.100	0.752	Various	0.432	Various	Continuing	Continuing	N/A
Subtotal Survivability			**8.450**	**7.563**		**6.553**		**Continuing**	**Continuing**	
Remarks:										
AFORDABILITY THROUGH COMMONALITY										
Engineering Development, Demonstration & Evaluation	Section 845/804	DD 21 Industry Teams	0	2.500	11/98	5.008	10/99	Continuing	Continuing	N/A
	WR	NSWC CD Bethesda, MD	2.795	1.945	Various	0.700	10/99	Continuing	Continuing	N/A
	RC	NSWC CD Bethesda, MD	1.145	0.760	Various	0	N/A	Continuing	Continuing	N/A
	Various	Other Govt Activities	1.129	1.020	Various	0.200	10/99	Continuing	Continuing	N/A
	C/CPFF	AME Arlington, VA	1.690	0.775	2QFY99	0	N/A	Continuing	Continuing	N/A
	Various	Other Contractors	1.941	0.789	Various	0.593	Various	Continuing	Continuing	N/A
Subtotal ATC			**8.700**	**7.789**		**6.501**		**Continuing**	**Continuing**	
Remarks:										

Exhibit R-3, Cost Analysis (page 2)								Date: February 1999		
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/ Budget Activity 4			PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/ PE0604513N					PROJECT NAME AND NUMBER: Consolidated Hull, Mechanical & Electrical Improvement (HM&E)/32469		
Cost Categories (Tailor to WBS or System / Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	Cost To Complete	Total Cost	Target Value of Contract
AUXILIARY SYSTEMS										
Product Development	Sect 845/804	DD 21 Industry Teams	0	4.950	11/98	8.232	10/99	Continuing	Continuing	N/A
	WR	NSWC CD Bethesda, MD	5.481	3.595	11/98	2.361	Various	Continuing	Continuing	N/A
	Various	Other Govt Activities	0.751	0	N/A	0	N/A	Continuing	Continuing	N/A
	Various	Other Contractors	0.564	0.970	Various	1.000	Various	Continuing	Continuing	N/A
Subtotal Auxiliary Systems			**6.796**	**9.515**		**11.593**		**Continuing**	**Continuing**	
Remarks:										
Total Cost			**23.946**	**24.867**		**24.647**		**Continuing**	**Continuing**	
Remarks:										

Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Integrated Topside Design (ITD)/32470	

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	10.454	13.348 (1)	13.732	15.054	18.899	14.977	15.319	15.670	Continuing	Continuing
RDT&E Articles Qty	0	0	0	0	0	0	2	0	Continuing	Continuing

Note (1) (U) FY 1998 and FY 1999 funds were budgeted and executed under PE 0603513N/Project S1712 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603513N/Project S1712 transitioned into PE 0603513N/Project 32470 in FY 2000 and out.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project develops and integrates the necessary technologies to achieve a total integrated topside design focused on DD 21 and future surface combatant ships. Technology areas including topside signature control, sensor and antenna integration, weapon system integration, HM&E integration, related decision-making tools, and composite materials will be addressed. Other stand alone technology programs will be synergistically integrated with this topside design integration effort to assure total ship systems integration for future ship design efforts. Surface combatants will need an added (stealth) layer of defense to support hardkill and softkill systems in defeating future threats. Composite materials will also be considered for their corrosion control, reduced maintenance, and reduced manning attributes. This project also develops improved equipments that are small but critical components of non-propulsion HM&E systems. This program is directed toward improved affordability, performance, reduced life cycle cost, reliability and maintainability, signature reduction, standardization, and weight and manning reductions for the existing and future fleet. RDT&E test articles will be used to demonstrate the producibility, cost and performance of low observable ITD concepts.

1. (U) FY 1998 ACCOMPLISHMENTS
   - (U) ($8.354) Identified common platform for integrated topside design toolset implementation. Initiated development of integrated topside design toolset. Initiated systems engineering study to identify and prioritize design concepts for integrated topside HM&E prototype components. Developed draft composite design procedures. Initiated validation of statistical allowables for composite materials, validation of composite joint design procedures, and updated the PC based composite materials database. Improved Radar Target Signature (RTS) Code and assessed IRENE and SHIPIR infrared (IR) signature codes. Initiated scale modeling signature assessments. Determined environmental effects relative to improvements needed for Cruise Missile engagement simulations.
   - (U) ($1.196) Supported risk reduction engineering studies for the transition of Advanced Enclosed Mast/Sensor (AEM/S) System to LPD-17 topside. Conducted at-sea performance assessments of AEM/S on USS Arthur Radford.
   - (U) ($0.904) Continued development of affordable mechanical and electrical machinery including feasibility study of commercial ship service genset and pump seal technology. Awarded trade off analysis contract to Solar Industries for genset trade off analysis. Received Phase I report from Allison. Completed qualification of 12-inch glass reinforced plastic (GRP) 2-way ball valve and issued manufacturing drawing and ILS package for family of ball valves up to 12 inches. Initiated qualification of 3-way ball valve prototypes.

2. (U) FY 1999 PLAN
   - (U) ($8.604) Continue development and validation of composite material design procedures and revision of the PC based composite materials database. Evaluate composite materials for their corrosion control and reduced maintenance attributes. Continue scale modeling signature assessments. Continue development of radar cross section (RCS), Infrared (IR), and electronic warfare (EW) prediction codes. Begin development of improved baseline EM ENGINEERING toolset. Support transition of AEM/S system to LPD-17 topside.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Integrated Topside Design (ITD)/32470

- (U) ($4.515) Develop a modeling and simulation plan and a risk reduction plan for integrated topside design (ITD) activities. Initiate risk reduction test in support of DD 21 Industry Team ITD risk reduction plan.
- (U) ($0.229) Portion of extramural program is reserved for Small Business Innovative Research assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLAN
- (U) ($2.929) Continue development of improved baseline EM ENGINEERING toolset. Continue validation of composite material design procedures and revision of the PC-based composite materials database. Evaluate composite materials for their corrosion control and reduced maintenance attributes. Continue development of radar cross section (RCS), infrared (IR), and electronic warfare (EW) prediction codes. Develop Infrared Signature Database Update. Validate and publish LO Model scaling techniques.
- (U) ($9.803) Initiate execution of ITD risk reduction plan by DD 21 Industry Teams.
- (U) ($1.000) Continue development of heat pipe based bleed air heat exchanger and affordable HM&E machinery for existing and future fleet.

B. (U) OTHER PROGRAM FUNDING SUMMARY:

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
SC-21 Total Ship Systems Engineering/PE 0604300N	58.548	125.964	162.056	250.719	259.629	255.326	283.413	271.857	Continuing	Continuing

C. (U) ACQUISITION STRATEGY:

(U) These development efforts were realigned into this project in an effort to consolidate related DD 21 RDT&E efforts and will be transitioned into the DD 21 acquisition strategy in FY 2000 and out.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Integrated Topside Design (ITD)/32470

D. (U) SCHEDULE PROFILE:

PROGRAM MILESTONES

FY 1998	FY 1999	FY 2000
2Q 2-Way Ball Valve Design 4Q Comp Joint Design Procedures 4Q LPD 17 AEM/S Design 4Q At-Sea AEM/S Evaluation 4Q Comp Fire Performance Requirements 4Q Improved RTS Code 4Q Signatures Trade Off Analysis	2Q C_Missile Update 4Q RCS Medium Scale Model Test Results 4Q Final LPD 17 Mast EM/Signature/Structural Design 4Q EM Engineering Baseline Upgrade 4Q Complete Structural Design Guide 4Q ITD M&S and Risk Reduction Plans 2Q Solar Conceptual Design Data 4Q Gen Set Complete 4Q 3 Way Ball Valve Drawing and ILS Packsage 4Q Allison Conceptual Design Data	2Q C_Missile Update 4Q Comp Structural Design Guide Update 4Q EM Engineering Baseline Upgrade 4Q IRDatabase Updates

Exhibit R-3, Cost Analysis (page 1)					Date: February 1999					
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/ Budget Activity 4			PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/ PE0603513N			PROJECT NAME AND NUMBER: Integrated Topside Design/32470				
Cost Categories (Tailor to WBS, or System / Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	Sect 845/804	DD 21 Industry Teams	0	4.515	11/98	9.803	10/99	Continuing	Continuing	
Subtotal Product Development			**0**	**4.515**		**9.803**		Continuing	Continuing	
Remarks										
Engineering Support	WR	NSWC CD Bethesda, MD	5.532	4.317	1QFY99	2.258	1QFY00	Continuing	Continuing	
	WR	NRL Suitland, MD	1.005	1.104	1QFY99	0.622	1QFY00	Continuing	Continuing	
	WR	Various Navy Labs	0.120	0.450	1QFY99	0.225	1QFY00	Continuing	Continuing	
	RC	NAVLOGCTR PA	0	0.870	1QFY99	0.450	1QFY00	Continuing	Continuing	
	Various	Various	2.054	1.307	1QFY99	0.199	1QFY00	Continuing	Continuing	
Software Development	C/CPFF	TBD	1.508	0.640	2QFY99	0.175	1QFY00	Continuing	Continuing	
	MP	JSC Annapolis, MD	0.210	0.145	1QFY99	0	N/A	Continuing	Continuing	
Subtotal Support			**10.429**	**8.833**		**3.929**		**Continuing**	**Continuing**	
Remarks:										

Exhibit R-3, Cost Analysis (page 2)										
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/ Budget Activity 4			PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/ PE0604513N					Date: February 1999 PROJECT NAME AND NUMBER: Integrated Topside Design/32470		
Cost Categories (Tailor to WBS or System / Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal T&E			**0**	**0**		**0**		**Continuing**	**Continuing**	
Remarks:										
Miscellaneous	Various	Various	0.025	0		0		Continuing	Continuing	
Subtotal Management			**0.025**	**0**		**0**		**Continuing**	**Continuing**	
Remarks:										
Total Cost			**10.454**	**13.348**		**13.732**		Continuing	Continuing	
Remarks:										

Exhibit R-2a, RDT&E Project Justification								Date: February 1999		
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4		PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N					PROJECT NAME AND NUMBER: Integrated Power Systems (IPS)/32471			
COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	17.560	33.929 (1)	25.723	26.040	23.635	12.181	7.262	5.179	Continuing	Continuing
RDT&E Articles Qty	0	0	0	0	0	0	0	0	Continuing	Continuing

Note (1) (U) FY 1998 and FY 1999 funds were budgeted and executed under PE 0603573N/Project S1314 as displayed in the FY99 President's Budget exhibits. Funds from PE 0603573N/Project S1314 (only Integrated Power Systems) transitioned into PE 0603513N/Project 32471 in FY 2000 and out.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project supports the Integrated Power Systems (IPS) program. IPS provides total ship electric power, including electric propulsion, power conversion and distribution, and mission load interfaces to the electric power system. IPS supports multiple ship class applications for future surface ships, with DD21 being the primary ship application target. The goals of the IPS are to reduce acquisition and operating costs of naval ships and increase military effectiveness. These goals are to be accomplished by leveraging investments in technologies that will be usable by both military and commercial sectors.

(U) IPS has the potential to revolutionize the design, construction and operation of U.S. naval ships by using electricity as the primary energy transfer medium aboard ship. The flexibility of electric power transmission allows power generating modules with various power ratings to be connected to propulsion loads and ship service in any arrangement that supports the ship's mission at lowest overall cost. Systems engineering in IPS is focused on increasing the commonality of components used across ship types and in developing modules which will be integral with standardization, zonal system architectures, and generic shipbuilding strategies. The purpose of increased commonality is to reduce the total cost of ship ownership by using common modules composed of standard components and/or standard interfaces.

(U) IPS addresses ship platform program goals through: reduced ship acquisition cost through integration of propulsion and ship's service prime movers; lower ship operational costs resulting from more flexible operating characteristics and more efficient components; reduced ship construction costs by allowing more extensive modular construction of power generation, distribution, and loads if desired; improved ship survivability and reduced vulnerability through increased arrangement flexibility and improved electrical system survivability; reduced manning through improved power management systems and reduced on-board maintenance requirements; improved ship signature characteristics, if required; improved design adaptability to meet future requirements of multiple ship types or missions; integrating power management and protection by fully utilizing the power electronics in the system to perform fault protection as well as power conversion and load management functions; simplified technology insertion which allows new technologies to be installed within IPS much more inexpensively than presently possible; and, reduced machinery system acquisition costs through utilization of commercially shared technologies and components. The efforts in this project are divided into three major areas as follows:

- (U) System development: IPS development consists of the efforts necessary to develop and demonstrate warfighting and cost reduction requirements, as well as related risk reduction for ship platform applications.

- (U) At Sea Testing: At Sea Testing of IPS subsystems and components will be conducted on the Trimaran Demonstrator developed and built under a US/UK cooperative Memorandum of Understanding (MOU) signed 3 September 1997. Initial testing on the Trimaran will focus on Naval Architectural and sea-keeping aspects of the Trimaran hull form. The Trimaran is being constructed initially with a commercial electric drive system as well as provisions for fitting IPS components. An opportunity for the US to backfit IPS components and conduct at sea testing is built into the MOU.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Integrated Power Systems (IPS)/32471

The US financial contribution to the MOU is also funded from this project. A contract for construction of the demonstrator was awarded in July, 1998. The efforts in this project support the at sea testing on the Trimaran Demonstrator.

- (U) Mission Load Interfaces: Studies have shown that significant opportunities exist to reduce the cost and improve the performance of combat and auxiliary systems by providing the type and quantity of power required directly to the user system. Traditional methods provide standard power and require individual users to perform multiple conversions and conditioning steps prior to use. The efforts in this project provide for initial studies, development, and testing.

1. (U) FY 1998 ACCOMPLISHMENTS:
   - (U) ($ 2.900) Continued Full Scale Advanced Development (FSAD) Land Based Engineering Site (LBES) site preparations including: completed INCO of generator/lube oil subsystems, power distribution and SSDS equipment; completed integration of engine/generator.
   - (U) ($11.760) Continued development of IPS including: Completed generator subsystem, and power distribution subsystems fabrication and factory acceptance testing (FAT); completed propulsion motor/converter subsystem fabrication; completed modifications to functional equivalent modules including ship service inverter modules, ship service converter modules and DC power supply; completed IPS power management code and test; completed FSAD Simulation/Stimulation (SIM/STIM) system integration and test; took delivery of generator and power distribution subsystems; conducted FSAD pre-LBES testing.
   - (U) ($ 2.900) Perform life cycle costing, producibility studies, manning studies, module development, systems integration, and architecture design and other IPS efforts.

2. (U) FY 1999 PLAN:
   - (U) ($26.627) Systems Development: Continue development of IPS. In conjunction with DD21 industry teams: develop IPS architecture concept options based on industry specific approaches to DD21 design; evaluate alternative ship's service distribution concepts to determine potential cost effective solutions for further development; and, begin combat systems interface studies to determine areas where combat system performance can be improved or where cost can be reduced by providing tailored power interfaces. Complete factory acceptance testing (FAT) of the propulsion motor/converter. Take delivery of Ship Service Distribution System (SSDS) equipment and propulsion motor/converter. Complete Installation and Checkout (INCO) of propulsion motor/converter. Complete integration of all advanced development equipment. Conduct advanced development testing at the Land Based Engineering Site at NSWC Philadelphia to: verify and characterize individual component performance; verify that system design requirements are met and validate design tools; verify that requirements for power quality are met throughout the advanced development system; characterize system interfaces for use in future performance/interface specifications; and validate the distributed control system architecture, system design, and performance; demonstrate various operational modes, incorporate multi workstation control and automated reconfiguration. Provide testing feedback to DD 21 design teams. Conduct an Early Operational Assessment (EOA) by COMOPTEVFOR.
   - (U) ($ 4.400) At Sea Testing: Note: At sea testing of IPS subsystems and components will be conducted on the Trimaran Demonstrator developed and built under a US/UK cooperative MOU. Begin system analysis, preliminary design; and, procurement of IPS hardware for Trimaran at sea demonstration.
   - (U) ($ 2.200) Mission Load Interfaces: Commence assessment of C4I electronic load interfaces. Commence development of variable speed drive motor controller for auxiliary applications. Commence development of direct current power supply to combat systems/survivability demonstration to show improved performance and potential to reduce combat system costs.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Integrated Power Systems (IPS)/32471

- (U) ($0.702) Portion of extramural program is reserved for Small Business Innovative Research assessment in accordance with 15USC 638.

3. (U) FY 2000 PLAN:
   - (U) ($23.553) Systems Development: Continue IPS design, development, and integration including performance analysis and testing, modeling and simulation, life cycle cost analysis, producibility studies, manning studies, module development, ship integration, architecture design and related efforts. Continue support for DD 21 development and design efforts as well as support for other ship platforms. Continue advanced development testing at NSWC, Philadelphia PA, including controls and power management upgrades. Demonstrate the survivability and zonal isolation/fight through features of the advanced development system including replacing the reduced scale functional equivalent modules used for initial testing with full scale modules; demonstrate automated system reconfiguration and start up. Start acoustics testing of the IPS FSAD motor, LBES SSDS enhancements. Continue propulsion motor analysis using the reduced scale Laboratory Drive Motor.
   - (U) ($ 0.850) At Sea Testing: Note: At sea testing of IPS subsystems and components will be conducted on the Trimaran Demonstrator developed and built under a US/UK cooperative MOU. Begin detailed development and design of the Trimaran IPS configuration for at-sea testing. Begin development of IPS control system modifications for use during at sea testing.
   - (U) ($ 1.320) Mission Load Interfaces: Continue development of direct current power supply to combat systems/survivability demonstration to show improved performance and potential to reduce combat system costs. Continue development of variable speed drive motor controller for auxiliary applications.

B. (U) OTHER PROGRAM FUNDING SUMMARY:

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
SC-21 Total Ship Systems Engineering/PE 0604300N	58.548	125.964	162.056	250.719	259.629	255.326	283.413	271.857	Continuing	Continuing

C. (U) ACQUISITION STRATEGY:

(U) IPS is a candidate system for DD-21 and all other future surface ships.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/Budget Activity 4	PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/PE 0603513N	PROJECT NAME AND NUMBER: Integrated Power Systems (IPS)/32471

D. (U) SCHEDULE PROFILE:

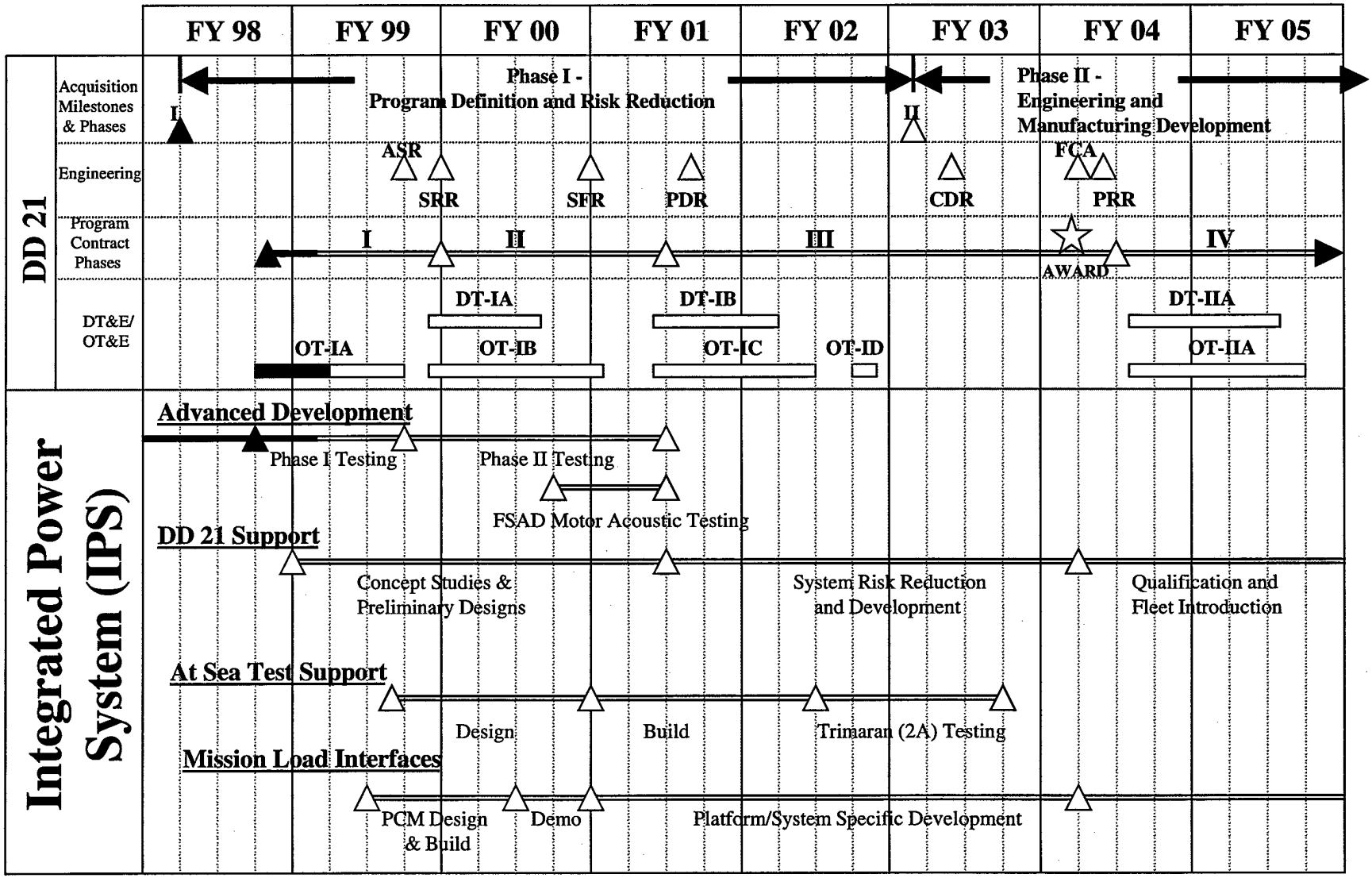


Exhibit R-3, Cost Analysis (page 1)									Date: February 1999		
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/ Budget Activity 4			PROGRAM ELEMENT NAME AND NUMBER: Shipboard System Component Development/ PE0603513N						PROJECT NAME AND NUMBER: Integrated Power System (IPS)/32471		
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	Cost To Complete	Total Cost	Target Value of Contract	
Primary Hardware Development	C/CPAF	Lockheed Martin Corp., Syracuse, NY	9.417	8.853	1QFY99	6.500	1QFY00	Continuing	Continuing		
	Section 845/804	DD21 Industry Teams	0	0.800	1QFY99	4.258	10/99	Continuing	Continuing		
	C/CPAF	DC Power Conversion Module	0	0	N/A	1.050	1QFY00	Continuing	Continuing		
	S/FFP	Trimaran – DERA,UK	0	0.200	2QFY99	0.250	1QFY00	Continuing	Continuing		
	C/CPAF	Power Systems Group Anaheim, CA	0.071	1.200	2QFY99	0.500	1QFY00	Continuing	Continuing		
	MISC	Contractors	1.089	2.882	1QFY99	1.040	1QFY00	Continuing	Continuing		
	MISC	Other Government Activities	0.002	0.200	1QFY99	0.100	1QFY00	Continuing	Continuing		
	WR	NSWC/A, MD	3.030	3.370	1QFY99	1.961	1QFY00	Continuing	Continuing		
	S/FFP	Power Systems Group Anaheim, CA	0	8.500	2QFY99	6.500	1QFY00	Continuing	Continuing		
	TBD	Electric Drive Component Studies	0	2.500	2QFY99	0	N/A	Continuing	Continuing		
Award Fees	C/CPAF	Lockheed Martin Corp., Syracuse, NY	0.801	1.024	2QFY99	TBD		Continuing	Continuing		
Subtotal Product Development			**14.410**	**29.529**		**22.223**		**Continuing**	**Continuing**		
Remarks:											
Subtotal Support			**0**	**0**		**0**					
Remarks:											

Exhibit R-3, Cost Analysis (page 2)		Date: February 1999

APPROPRIATION/BUDGET ACTIVITY:	PROGRAM ELEMENT NAME AND NUMBER:	PROJECT NAME AND NUMBER:
RDT&E,N/ Budget Activity 4	Shipboard System Component Development/ PE0603513N	Integrated Power System (IPS)/32471

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NSWC CD Philadelphia, PA	3.050	4.300	12/98	3.50	1QFY00	Continuing	Continuing	
Subtotal T&E			**3.050**	**4.300**		**3.50**		**Continuing**	**Continuing**	
Remarks:										
Miscellaneous	Various	Various	0.100	0.100	1QFY99	0	N/A	Continuing	Continuing	
Subtotal Management			**0.100**	**0.100**		**0**		**Continuing**	**Continuing**	
Remarks:										
Total Cost			**17.560**	**33.929**		**25.723**		**Continuing**	**Continuing**	
Remarks:										

Exhibit R-2, RDT&E Budget Item Justification									Date: February 1999	
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/BUDGET ACTIVITY 4					R-1 ITEM NOMENCLATURE: Shipboard Combat Survivability/PE 0603514N					
COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total PE Cost	0	0	0	0	0	0	0	0	N/A	N/A
Combat Survivability Design / S0384	0	0	0	0	0	0	0	0	N/A	N/A
Fire Protection/DC Systems / S1565	0	0	0	0	0	0	0	0	N/A	N/A
Note: (U) Funds in PE 0603514N, Projects S0384 and S1565 transitioned to PE 0603513N, Project 32469 (Consolidated HM&E).										

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, 4	R-1 ITEM NOMENCLATURE Program Element (PE) Name and No. Radiological Control/0603542N

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total P.E. Cost	2.863	3.587	.605	.573	.569	.648	.631	.615	CONT.	CONT.
RADIAC Development/S1830	2.863	3.587	.605	.573	.569	.648	.631	.615	CONT.	CONT.
Project B Name/No. & subtotal cost										
Project C Name/No. & subtotal cost										
Quantity of RDT&E Articles & cost										

A. Mission Description and Budget Item Justification:

Project S1830 coordinates all Navy efforts for the development of nuclear radiation detection devices in direct support of the Navy Nuclear Propulsion Program and other users by providing accurate, reliable Health Physics instrumentation at the lowest possible life cycle cost. Reliable radiation monitoring instruments are needed to ensure the radiological safety of Navy personnel. This includes hand-held RADIAC meters, personnel dose measurement devices, and area monitors used to measure radiation fields. The Navy Dosimetry System will be able to meet new NRC regulations and will provide sensitive measurements down to the levels required for all new and imminent health and safety requirements. The Multifunction RADIAC will cut calibration costs by up to 75% and reduce the requirements for spare parts by 85% by replacing over 16 different models of obsolete equipment. This project has a 5 to 1 payback ratio. New requirements for the measurement of lower neutron levels necessitate the development of modernized instrumentation. 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. All OR's issued 25 Aug 1987.

Multifunction RADIAC (MFR), OR #176-04-86
Navy Dosimetry System, OR #180-04-87
Neutron Dosimetry System, OR #179-04-87
Automated RADIAC Calibration and Diagnostics System, OR #175-04-86
Underwater RADIAC System, OR #178-04-88
Wide Range Survey Meter, OR #177-04-87
Tritium Monitors, OR #182-04-89
EOD Personal Dosimeter, OR #181-04-87 (Updated 09 MAR 95 as 392-04-95)

FY1998 ACCOMPLISHMENTS:

- (U) ($2.098) Continued development and enhancements of Navy Dosimetry System.
- (U) ($ .454) Continued development of MFR extendable probe, directional gamma probe, alpha probe, and compact neutron probe.
- (U) ($ .209) Continued development of Underwater RADIAC System.
- (U) ($ .102) Continued development of Casualty Dosimeter.

FY 1999 PLAN:

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, 4	R-1 ITEM NOMENCLATURE Program Element (PE) Name and No. Radiological Control/0603542N

- (U) ($1.149) Continue development and begin testing of Navy Dosimetry System.
- (U) ($ 1.472) Complete development of MFR extendable probe, directional gamma probe, and alpha probe. Continue development of compact neutron probe. Begin MFR control unit and MFR frisker station development.
- (U) ($ .155) Complete development of Underwater RADIAC.
- (U) ($ .214) Complete development of Casualty Dosimeter.
- (U) ($ .550) Begin enhancements to Air Particle Detectors.
- (U) ($ .047) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

FY 2000 PLAN:

- (U) ($ .305) Complete the development of Navy Dosimetry System.
- (U) ($ .300) Complete the development of MFR compact neutron probe. Begin development of Radiography probe. Continue MFR control unit enhancements and complete Frisker Station.

B. Program Change Summary:

	FY 1998	FY 1999	FY 2000
(U) FY 1999 President's Budget:	2.940	3.600	3.603
(U) Appropriated Value:	3.030	3.600	
(U) Adjustment to FY 1998 Appropriated Value/ FY 1999 President's Budget:			
a. SBIR	-.053		
b. Federal Technology Transfer	-.001		
c. Congressional Undistributed Reductions	-.090		
d. RADCON Program Realignment			-3.000
e. Minor Pricing Adjustment	-.023	-.013	+.002
(U) FY 2000/01 PRES Budget Submit:	2.863	3.587	.605

Change Summary Explanation:

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, 4	R-1 ITEM NOMENCLATURE Program Element (PE) Name and No. Radiological Control/0603542N

Funding: FY 98 changes are due to the Small Business Innovative Research assessment (-$.053M), Federal Technology Transfer (-$.001M), Congressional Undistributed Reductions (-$.090M), and minor pricing adjustments (-$.023M). FY 99 changes are due to minor pricing adjustments (-$.013). FY 00 changes are due to RADCON Program Realignment (-$3.0M) and minor pricing adjustment (+$.002).

Schedule: Not applicable.
Technical: Not applicable.

C. Other Program Funding Summary:

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
OPN Line 292000	6.158	4.018	7.778	8.429	7.973	8.304	8.820	8.821	CONT.	CONT.

D. Acquisition Strategy:

Development efforts are being focused on evaluation, modification (as required to meet operational requirements), and adaptation of Commercial Off-The-Shelf technology in order to minimize total ownership costs. To the maximum extent possible new contracts are targeted for fixed price efforts to control development cost.

E. Schedule Profile:

Dosimetry System
Delivery of Advance Development Systems – 6/99
Completion of Testing – 10/99
Milestone III Decision – 01/00
Initial Operational Capability – 8/01
MFR Enhancements/Probe Development
Delivery of Prototypes for Extendable Probe (EP) – 1/99
Completion of Testing for EP – 4/99
Production Contract Awarded for EP – 7/99
Delivery of Prototypes for Directional Gamma Probe (DGP) – 4/99
Completion of Testing for DGP – 7/99
Production Contract Awarded for DGP – 9/99
Award Development Contract for MFR Control Unit Enhancement – 5/99
Delivery of MFR Control Unit Prototypes for testing – 12/99
Completion of Testing of MFR Control Unit Prototypes – 2/00

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, 4	R-1 ITEM NOMENCLATURE Program Element (PE) Name and No. Radiological Control/0603542N

- Award Contract for Frisker Station Development – 3/99
- Delivery of Frisker Station – 6/99
- Completion of Testing of Frisker Station – 9/99
- Delivery of Alpha Probe Samples for testing – 4/99
- Completion of Testing of Alpha Probe – 7/99
- Production Contract Award for Alpha Probe – 9/99
- Delivery of Neutron Probe Samples for testing – 6/99
- Completion of Testing of Neutron Probe – 9/99
- Production Contract Award for Neutron Probe – 11/99

Underwater RADIAC

- Delivery of Prototypes for Testing – 7/98
- Completion of Testing – 2/99
- Milestone II/III – 5/99
- Initial Operational Capability – 12/99

Casualty Dosimeter

- Complete SBIR Phase II Testing – 1/99

IM-239 Enhancements

- Award Enhancement Contract – 6/99
- Delivery of Test Samples – 3/00
- Test and Evaluation Complete 6/00

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, 4	PROGRAM ELEMENT NAME AND NUMBER Radiological Control – 0603542N	PROJECT NAME AND NUMBER RADIAC Development Project – S1830

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development Dosimetry System	C/FP	Various *(See Remarks below)	8.464	.228	6/99	0	--	0		CONT.	CONT.	
Primary Hardware Development Miscellaneous	C/FP	Various	5.212	1.598	Various	.145	Various	0		CONT.	CONT.	
Subtotal Product Development			13.676	1.826		.145		0		CONT.	CONT.	
Remarks: * Prior to 8/96 –International Sensor Technology, Pullman, Washington 12/96 – 7/98 –Keithley Radiation Measurements, Cleveland, Ohio Follow-on Contract will be competed												
Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support												
Remarks: Not Applicable												

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, 4	PROGRAM ELEMENT NAME AND NUMBER Radiological Control – 0603542N	PROJECT NAME AND NUMBER RADIAC Development Project – S1830

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation -Miscellaneous	WR	Various	2.994	.568	10/98	.149	10/99	0		CONT.	CONT.	
Subtotal T&E			2.994	.568		.149		0		CONT.	CONT.	
Remarks:												
Government Engineering Support	WR	Various	4.716	.568	10/98	.151	10/99	0		CONT.	CONT.	
Program Management Support	WR	Various	4.717	.568	10/98	.150	10/99	0		CONT.	CONT.	
Travel				.010	11/98	.010	11/99	0		CONT.	CONT.	
Subtotal Management			9.433	1.146		.311		.328		CONT.	CONT.	
Remarks:												
Total Cost			26.103	3.540		.605		.573		CONT.	CONT.	
Remarks:												

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: **RDT&E,N/B.A.-4**	R-1 ITEM NOMENCLATURE PE 0603553N Surface ASW / V1704 ASW Advanced Development

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
P.E. #0603553N Surface ASW	$ 3.738	$ 1.075	$ 2.949	$ 2.963	$ 3.007	$ 3.049	$ 3.094	$ 3.139	Continuous	Continuous
V1704 ASW Advanced Dev	$ 3.738	$ 1.075	$ 2.949	$ 2.963	$ 3.007	$ 3.049	$ 3.094	$ 3.139	Continuous	Continuous
Quantity of RDT&E Articles & cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

A. Mission Description and Budget Item Justification: The ASW Advanced Development project provides advanced development demonstration and validation of technology for potential surface sonar and combat system applications. Efforts focus on resolution of technical issues associated with providing capability against the Year 2005 and beyond threat with emphasis on shallow water/littoral area USW and on dem/val of Undersea Warfare (USW) concepts and technology. Key technology areas investigated include active sonar transmissions, signal and advanced processing, active sonar classification, towed and hull arrays and transducer technology, multi-static sonar, and multi-sensor data fusion. The development of a mid-frequency Towed Active Receive Subsystem (TARS) prototype which will function as a deep receiver adjunct for the AN/SQS-53C transmitter providing significantly enhanced submarine detection performance against deep submarine targets will complete in FY1999 and transition to the AN/SQQ-89 program. In FY2000 this Program Element 0603553N, has been increased to support Multi-Static Sonar efforts associated with the Distant Thunder program in order to transition from a DARPA program into the Navy Impulsive Low Frequency Active Multi-Static ASW Program. This project conducts advanced development and testing of active multi-static acoustic concepts. The concept development is directed at providing surface ships combat groups with the capability of detection, classification, and localization of quiet threat submarines in difficult acoustic environments associated with Littoral waters. The project concentrates on the development of acoustic processor algorithms and information sharing technologies to develop a coordinated multi-static acoustic picture employing distributed sensors and active sources.

FY 1998 Accomplishments:

- ($3.738) TARS: Completed TARS wet end installation and conducted TARS array at-sea tactical system demonstration. Performed post sea test data analysis and provided initial support for transition to MFTA under PMS411 for FY99.

FY 1999 Plan:

- ($1.048) TARS: Complete TARS test and evaluation program and complete the transition of this technology to the AN/SQQ-89 Multi-Functional Towed Array (MFTA).
- ($0.027) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

FY 2000 Plan:

- ($2.949) Distant Thunder: Assess spectrum of multi-static algorithms and select desirable performance specifications. Improve acoustic processors and communication schemes. Participate in sea tests (SHAREMS) to collect multi-static processors/communication systems data and environmental acoustic data and analyze system performance.

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: **RDT&E,N/B.A.-4**	R-1 ITEM NOMENCLATURE PE 0603553N Surface ASW / V1704 ASW Advanced Development

B. **Program Change Summary**:

	FY 1998	FY 1999	FY 2000
FY 1999 President's Budget:	$ 5.491	$ 11.871	$ 15.792
Appropriated Value:	$ 5.704	$ 11.871	
Adjustment to FY 1998 Appropriated Value/ FY 1999 President's Budget:			
a. SBIR Reduction	-.065	.000	.000
b. Federal Technology Transfer	-.001	.000	.000
c. Congressional Undistributed Reductions	+.027	.000	.000
d. Sponsor Realign IUSW-21 under PEO DD-21	-1.700	-10.794	-15.792
e. Sponsor Distant Thunder Addition	.000	.000	+ 3,000
f. Competitive Sourcing Savings Adjustment	.000	.000	-.005
g. DD1002: April 1998 Update	-.014	.000	.000
h. Contract Advisory Assistance Services	.000	-.102	.000
i. NAVSEA PEO Restructure/Comp Adjust	.000	+.127	.000
j. Revised Economic Assumptions	.000	-.027	.000
k. Inflation Reduction	.000	.000	-.046
FY 2000 PRES Budget Submit:	$ 3.738	$ 1.075	$ 2.949

Funding: **FY98** - Reductions from the FY98 Appropriated Value are due to SBIR reduction (-$.065), Federal Technology Transfer (-$.001), Minor Pricing Adjustment (+$.027), Reductions (-$1.700) are due to the realignment of IUSW-21 program under PEO DD-21, and DD1002: April 1998 Update (-$.014). **FY99** - Reductions (-$10.794) are due to the realignment of IUSW-21 program under PEO DD-21 PE 0603513N/Project 32468, contract advisory assistance services (-$.102), (+$.127) resulted from NAVSEA PEO restructuring, revised economic assumptions (-$.027).).. **FY00** - Reductions (-$15.792) are due to the realignment of IUSW-21 program under PEO DD-21 PE 0603513N/Project 32468, increase of (+$3.000) is due to the addition of funds associated with the DARPA transition of the Distant Thunder program into Dem/Val, competitive sourcing savings associated with consolidation of service contracting efforts (-$.005), and decreases for Inflation Reduction of (-$.046).

Schedule: N/A

Technical: N/A

C. **Other Program Funding Summary**:

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: **RDT&E,N/B.A.-4**	R-1 ITEM NOMENCLATURE PE 0603553N Surface ASW / V1704 ASW Advanced Development

FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
Not Applicable									

Related RDT&E:
PE 0205620N (Surface ASW Combat Systems Integration)
PE 0602121N (Surface Ship & Submarine HM&E Technology)
PE 0603504N (Advanced Submarine Combat Systems Development)
PE 0603513N (DD-21 Associated System Development)
PE 0603561N (Advanced Submarine System Development)
PE 0603747N (Undersea Warfare Advanced Technology)

D. **Acquisition Strategy**: Plan to continue competitively awarded contract(s).

E. **Schedule Profile**: See attached Schedule

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: **RDT&E,N/B.A.-4**	R-1 ITEM NOMENCLATURE PE 0603553N Surface ASW / V1704 ASW Advanced Development

TARS / DISTANT THUNDER

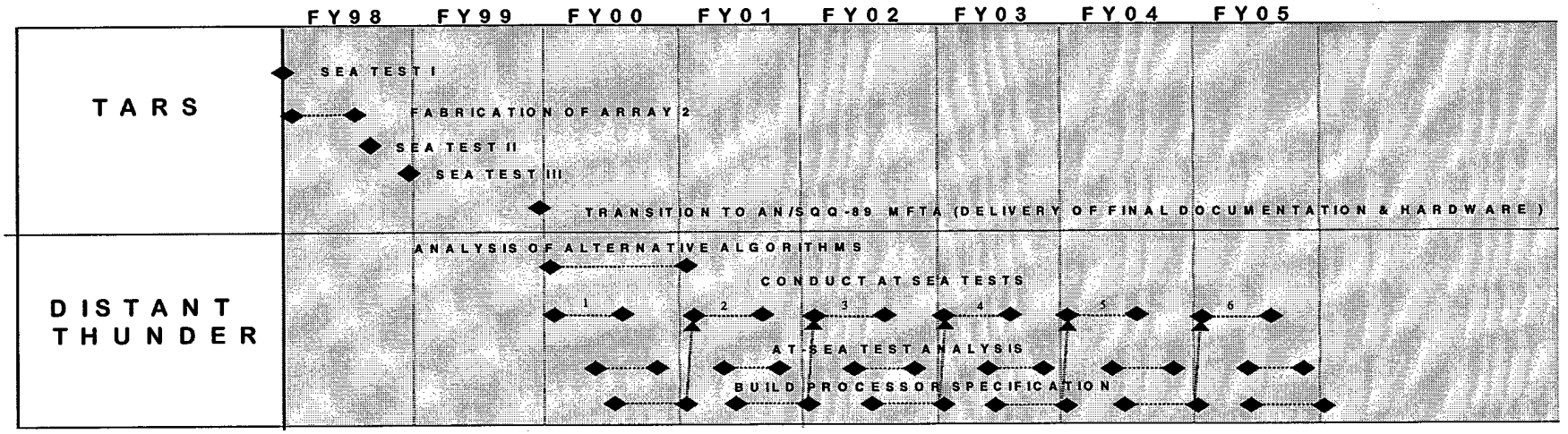


Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/B.A.-4	PROGRAM ELEMENT NAME AND NUMBER Surface ASW/PE # 0603553N	PROJECT NAME AND NUMBER ASW Advanced Development/V1704

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
TARS Product Development	C/CPFF	Lockheed Martin, NY	1.775	.050	11/98	.000	-	.000	-	.000	1.825	
TARS Product Development	C/CPFF	DSR, VA	.020	.000	-	.000	-	.000	-	.000	.020	
TARS Product Development	WR	NUWC/Newport, RI	9.597	.250	10/98	.000	-	.000	-	.000	9.847	
Product Development	WR	Various	4.821	.000	-	.000	-	.000	-	.000		
Product Development	CPFF	Various	3.350	.000	-	.000	-	.000	-	.000		
Product Development	Various	NUWC/Newport, RI	34.557	.000	-	.000	-	.000	-	.000		
Multi-Static (Distant Thunder) Algorithm Development	CPFF	BBN	-	-	-	.300	11/99	.300	11/00	Cont.	Cont.	
Multi-Static (Distant Thunder) System Architecture Development	WR	NUWC/Newport, RI	-	-	-	.200	10/99	.200	10/00	Cont.	Cont.	
Multi-Static (Distant Thunder) System Architecture Development	WR	NSWC/Dahlgren, VA	-	-	-	.200	10/99	.516	10/00	Cont.	Cont.	
Subtotal Product Development			54.310	.300		.700		1.016				
Remarks:												
TARS Support	WR	NUWC/Newport, RI	3.700	.300	10/98	.000	-	.000	-	.000	4.000	
Multi-Static (Distant Thunder) Algorithm Assessment/Improv	CPFF	BBN	-	-	-	.300	11/99	.000	11/00	Cont.	Cont.	
Multi-Static (Distant Thunder) Performance Assessment	SS/CPFF	APL/JHU, MD	-	-	-	.300	11/99	.300	11/00	Cont.	Cont.	
Multi-Static (Distant Thunder) Analysis of Alternatives	MIPR	US Army/Mitre	-	-	-	.150	11/99	.150	11/00	Cont.	Cont.	
Subtotal Support			5.190	.300		.750		.450				

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/B.A.-4	PROGRAM ELEMENT NAME AND NUMBER Surface ASW/PE # 0603553N	PROJECT NAME AND NUMBER ASW Advanced Development/V1704

Remarks

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total Pys Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
TARS Developmental T&E	WR	NUWC/Newport, RI	1.150	.300	10/98	.000	-	.000	-	.000	1.450	
Distant Thunder Developmental T&E and Evaluation	CPFF	BBN	-	-	-	.704	11/99	.746	11/00	Cont.	Cont.	
Distant Thunder Developmental T&E and Evaluation	SS/CPFF	APL/JHU, MD	-	-	-	.500	11/99	.500	11/00	Cont.	Cont.	
Distant Thunder Developmental T&E and Evaluation	WR	NAWC/Pax River, MD	-	-	-	.200	10/99	.200	10/00	Cont.	Cont.	
Subtotal T&E			1.150	.300		1.404		1.446				
Remarks:												
Management Support	Various	Various	.870	.000	-	.000	-	.000	-	.000	.870	
TARS/Distant Thunder Program Management Support	C/CPFF	Misc / Stanley Associates, VA	.270	.130	11/98	.050	11/99	.026	11/00	Cont.	Cont.	
TARS/Distant Thunder Travel	PD/WR	PEO(USW)/ASTO & Others	.080	.045	10/98	.045	10/99	.025	10/00	Cont.	Cont.	
Subtotal Management			1.240	.175		.095		.051				

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/B.A.-4	PROGRAM ELEMENT NAME AND NUMBER Surface ASW/PE # 0603553N	PROJECT NAME AND NUMBER ASW Advanced Development/V1704

Remarks:												
Total Cost			61.890	1.075		2.949		2.963		Cont.	Cont.	
Remarks:												

Exhibit R-2, Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY R&D BA - 4	Program Element Name and Number Advanced Submarine Systems Development PE 0603561N	R-1 Nomenclature S2033/V0223 - Advanced Submarine Systems Development

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total P.E. Cost	106.8	60.3	115.8	114.9	122.3	120.5	126.8	118.7	Cont.	Cont.
Adv. Sub. Systems Dev. S2033	54.7	60.3	44.1	46.6	55.9	56.3	60.5	57.5	Cont.	Cont.
Submarine Technology S2391	52.1	0	0	0	0	0	0	0	0	0
Adv. Sub. Combt Sys. Dev. V0223	0	0	71.6	68.3	66.5	64.2	66.3	61.2	Cont.	Cont.

A. Mission Description and Budget Item Justification:

This RDT&E Budget line was restructured by Issue #66765 NAVSEA Restructure to transfer all the RDT&E funds from PE 0603504N/V0223 Advanced Submarine Combat Systems Development into PE 0603561N under Project V0223 for FY2000 and out.

(U) This program supports innovative research and development in submarine technologies and the subsequent evaluation, demonstration, and validation for submarine platforms. It will increase the submarine technology base and provide subsystem design options not currently feasible.

(U) Project Unit S2033: The Advanced Submarine Research & Development Office identifies the most promising and emerging technologies for NSSN and other submarine platform insertion and transitions them into specific demonstration/validation efforts. The program element is non-ACAT and transitions technologies developed by Navy technology bases, the private sector, and the Defense Advanced Research Projects Agency Tactical Technology Office. Advanced systems developed under this program have potential for backfit into existing classes of submarines, supporting emerging requirements, and systems technology insertion into future submarine designs. Research and development investment factors used to select these technologies include: economic environment and return on investment; mission enhancement; and safety and survivability. The program office also supports three Information Exchange Programs, two with the United Kingdom, (one on submarine electromagnetic silencing and the second on submarine platform equipment, systems, and hull technology); and one with Australia (on air-independent propulsion and power for conventional submarines, manned submersibles, and unmanned underwater vehicles); operates the Large Scale Vehicle to provide at-sea test capability for propulsor, acoustic and non-acoustic signature reduction, remote vehicle R&D, and large scale hydrodynamic experimentation; operates the Hydrodynamic/Hydroacoustic Technology Center to enhance the Navy's ability to accurately, computationally predict hydrodynamic and hydroacoustic performance of submerged bodies; operates and supports the Intermediate Scale Measurement System; and provides life cycle support for the R&D Submarine modifications. In addition, the program is designing and constructing a second large scale vehicle, the LSV2, expressly for Virginia class technology insertion demonstrations.

This Program has been structured to support near term Virginia class insertion as well as core technologies in Hydrodynamics/Hydroacoustics, Affordability, and Stealth.

(U) Project S2391 is authorized by Congress to pursue a Large-Scale Vehicle (LSV) demonstrator that is not limited to form or single hull design and issue a competitive solicitation to all responsible sources for such a demonstrator. To avoid costly oversights and conflicts between the LSV builder and the technology providers, the Secretary of the Navy has ensured that the Virginia class shipbuilders are participating in the process of including new technologies into the LSV.

Exhibit R-2, Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY R&D BA - 4	Program Element Name and Number Advanced Submarine Systems Development PE 0603561N	R-1 Nomenclature S2033/V0223 - Advanced Submarine Systems Development

(U) Project Unit V0223: This non-acquisition (Non-ACAT) program supports the Navy Submarine Acoustic Superiority and Technology Insertion Initiatives through the application of advanced development and testing of improvements to present and future sonar and combat control systems. The goal is to address the technology challenges that marginalize tactical control in littoral and open ocean environments during the performance of a variety of missions including peacetime engagement, surveillance, deterrence, regional sea denial, precision strike, task group support, and ground warfare support. Prototype hardware and/or software systems are developed to demonstrate technologically promising system concepts in Laboratory and at-sea submarine environments. Technology areas specific to this program include transducers, hull-mounted and towed arrays, on-board monostatic and bistatic sonar signal processing, target motion analysis (TMA), multiple contact processing and test and evaluation. This program is funded under demonstration and validation because it develops and integrates hardware for experimental test related to specific ship and aircraft applications.

B. (U) Program Change Summary:

	FY 1998	FY 1999	FY 2000
FY 1999 President's Budget:	110.6	60.5	60.0
Appropriated Value:	110.6	60.5	
Adjustment to FY 1998 /1999 Appropriated Value/1999 President's budget			
a. Level fund advanced technology			-7.6
b. Level fund advanced submarine technology			-37.4
c. Buyback advanced submarine technology			10.0
d. Advanced submarine technology adjustment			7.7
Project Unit: S2033			
e. FY98 SBIR	-2.3		
f. FY 1998 BTR	-1.0		
f. Outsourcing cuts			-.06
h. NWCF rates – Naval Undersea Warfare			.04
i. NWCF rates – Naval Surface Warfare Cen			.2
j. DD1002: April 1998 Update	-.1		
k. BTR Issue	-.4		
l. Sec. 8108 Revised Economic Assumption		-.1	
m. Civilian Personnel Under Execute		-.1	
n. PDB 606: Civilian Pay Rates			0.1
o. PBD 752: USN 18 List			25.0
p. PBD 604: Non pay inflation			-0.8
q. Addition inflation reduction			-0.05
r. PBD 752: FY00 ADS Adjustment			-7.0
s. Advanced Sub Technology adjust			-6.0
t.. NAVSEA Restructure			+71.6
FY 2000 PRES Budget Submit:	106.8	60.3	115.8

Exhibit R-2, Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY R&D BA - 4	Program Element Name and Number Advanced Submarine Systems Development PE 0603561N	R-1 Nomenclature S2033/V0223 - Advanced Submarine Systems Development

(U) Change Summary Explanation

Funding: FY98 adjustments from the FY99 President's Budget include -$2.3M for SBIR, -$1.02M for a below threshold reprogramming and -$.001M for a Federal Technology transfer. FY99 was decreased by $.2M for revised economic assumptions and civilian personnel under execution. FY00 decreased by $7.6M to level fund advanced technology and -$37.4M to level fund advanced submarine technology. FY00 also increased by $10.0M to buyback advanced submarine technology and $7.7M for an advanced submarine technology adjustment. FY00 also increased by $.2M for minor pricing adjustments. Navy Working Capital Funds increased FY00 by $.2M. PBD 752 increased the line by $25M while an ADS adjustment under the same PBD decreased the line by $7M. FY00 was decreased by $6M for an Advanced Submarine Technology adjustment.

Schedule: Not applicable.

Technical: Proceed with the Category II Core Technologies as identified in Secretary of Defense Report on Nuclear Attack Submarine Procurement and Submarine Technology.

Exhibit R-2a, RDT&E Project Justification	Date: February 1999

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Adv. Sub. Systems Dev. S2033	54.7	60.3	44.1	46.6	55.9	56.3	60.5	57.5	Cont.	Cont.

A. Mission Description and Budget Item Justification:

(U) This program supports innovative research and development in submarine technologies and the subsequent evaluation, demonstration, and validation for submarine platforms. It will increase the submarine technology base and provide subsystem design options not currently feasible.

(U) Project Unit S2033: The Advanced Submarine Research & Development Office identifies the most promising and emerging technologies for NSSN and other submarine platform insertion and transitions them into specific demonstration/validation efforts. The program element is non-ACAT and transitions technologies developed by Navy technology bases, the private sector, and the Defense Advanced Research Projects Agency Tactical Technology Office. Advanced systems developed under this program have potential for backfit into existing classes of submarines, supporting emerging requirements, and systems technology insertion into future submarine designs. Research and development investment factors used to select these technologies include: economic environment and return on investment; mission enhancement; and safety and survivability. The program office also supports three Information Exchange Programs, two with the United Kingdom, (one on submarine electromagnetic silencing and the second on submarine platform equipment, systems, and hull technology); and one with Australia (on air-independent propulsion and power for conventional submarines, manned submersibles, and unmanned underwater vehicles); operates the Large Scale Vehicle to provide at-sea test capability for propulsor, acoustic and non-acoustic signature reduction, remote vehicle R&D, and large scale hydrodynamic experimentation; operates the Hydrodynamic/Hydroacoustic Technology Center to enhance the Navy's ability to accurately, computationally predict hydrodynamic and hydroacoustic performance of submerged bodies; operates and supports the Intermediate Scale Measurement System; and provides life cycle support for the R&D Submarine modifications. In addition, the program is designing and constructing a second large scale vehicle, the LSV2, expressly for Virginia class technology insertion demonstrations.

This Program has been structured to support near term Virginia class insertion as well as core technologies in Hydrodynamics/Hydroacoustics, Affordability, and Stealth.

(U) Program Accomplishments and Plans:

(U) FY 1998 Accomplishments (S2033):

- (U) ($14.7M) Stealth: Supported the Advanced Submarine Propulsion System (ASPS) including research and development into propulsor systems (Wet) and internal systems (Dry). Development of Internal Transmission Paths, Hull Coatings, and Advanced Electromagnetic Silencing.
- (U) ($9M) Hydrodynamics/Hydroacoustics: Continued development of elements of Integrated Computational Design Environment and analysis of hydrodynamic and hydroacoustic submarine performance. Developed and demonstrated techniques to improve hydrodynamic performance of submarines through modification flow and lift characteristics.
- (U) ($27.5) Infrastructure: Continued operations and support for the Large-Scale Vehicle, Hydroacoustic/Hydrodynamic Test Center (HTC), Intermediate Scale Measurement (ISMS), ARD Range Upgrade, SSN Security, Advanced Submarine Technology Office (ASTO), R&D Submarine, Mission & Future Design/Hull & Mechanical Conform studies and New Technology Assessment. In the LSV program, conducted unmanned undersea vehicle support experiments for the Virginia class propulsor project, and conducted experiments for the Advanced hybrid Propulsor Project. In the H/HTC, completed hardware/software maintenance and hardware upgrades. In the ISMS, conducted experiments involving target strength measurements of advanced submersible vehicles. Initiated necessary upgrades to the LSV acoustic range.
- (U) ($3.5M) Total Ownership Cost/Affordability: Continue demonstration and validation of the Elastomeric Ejection System (EES) for insertion into the Virginia class.

(U) FY 1999 Plan:

- (U) ($8.2M) Stealth: Continue development of Advanced Submarine Propulsor technologies, Internal Transmission Paths, Hull Radiation and Echo formation (Advanced Coating), Advanced EM Silencing, Signature Characterization and Monitoring and Experimental Tools.
- (U) ($10.3M) Hydrodynamics/hydroacoustics: Continue development of elements of Integrated Computational Design Environment analysis of hydrodynamic and hydroacoustic submarine performance. Develop and demonstrate techniques to improve hydrodynamic performance of submarines through modification of flow and lift characteristics. Development of the Advanced Sail. Initiated transition of NASA's virtual wind tunnel to development of a virtual water tunnel.
- (U) ($33.6M) Infrastructure: Continue operations and support for the Large Scale Vehicle, H/HTC, ISMS, R&D submarine, Mission and Future Design/Hull & Mechanical Conform studies and New Technology Assessment. Continue design and construction of the Large Scale Vehicle 2 (LSV 2).
- (U) ($7.2M) Total Ownership Cost/Affordability: Continue research and development of EES for insertion into the Virginia class.
- (U) ($.997M) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

(U) FY 2000 Plan:

- (U) ($6M) Stealth: Continue development of Advanced Submarine Propulsor technologies, Internal Transmission Paths, Advanced EM Silencing, Signature Characterization and Monitoring, and experimental tools.
- (U) ($15.2M) Hydrodynamics/Hydroacoustics: Continue development of elements of Integrated Computational Design Environment analysis of hydrodynamic and hydroacoustic submarine performance. Developed and demonstrated techniques to improve hyrodynamic performance of submarines through modification of flow and lift characteristics. Complete demonstration/validation of the Advanced Sail. Continue development of the Advanced Seawater pump.
- (U) ($20M) Infrastructure: Continue operations and support for the Large Scale Vehicle, H/HTC, ISMS, R&D submarine, Mission & Future Design/Hull & Mechanical Conform studies and New Technology Assessment. Continued design and construction of the LSV 2.
- (U) ($2.9M) Total Ownership Cost/Affordability: Complete demonstration/validation of EES and transition to Virginia class PE.

B. (U) Other Program Funding Summary: additional $50M of SEALIFT National Defense funds was appropriated in FY97, authorized in FY98 for LSV development.

(U) Related RDT&E: Not applicable

C. (U) Acquisition Strategy: Not applicable.

D. (U) Schedule Profile:

	FY 1998	FY 1999	FY 2000
Program Milestones	Complete ASPS concepts. Conduct LSV Propulsor testing For SEAWOLF propulsor Development/improvement program	Advanced coating effort deferred to FY02 Advanced Decks & mounts effort restructured	Complete demonstration/ Validation of advanced sail, transitioned to Virginia class PE
Engineering Milestones	Complete EES 1st generation elastomeric disk life cycle test Design and fab prototype Advanced Sail & test instrumentation Completed initial phase of development of enabling component and analytical techniques needed for main propulsion electric drives Complete concept design for LSV 2 Deliver full length composite shaft Completed 1st design option for LSV 2 coating	Complete 2nd design option for LSV 2 coating Complete design of Adv. Mount and Hull attachment Closeout and final documentation for development of enabling component and analytical techniques needed for Electric Drive Begin construction of LSV 2 modules. Begin manufacture of Advanced Seawater Pump Complete 2nd design option of LSV 2 coating	Complete construction of LSV 2 modules Assemble LSV 2 modules at Lake Pend Oreille Complete manufacture of Advanced Seawater Pump Complete EES EDM equipment fabrication Initiate adv. Truss/deck design, continue shock mount testing, test air mount design Initiate prototype design of flow mgmt.

Exhibit R-2a, RDT&E Project Justification	Date: February 1999

Project Unit: S2033

	FY 1998	FY 1999	FY 2000
		Complete design of Adv. Mount and Hull attachment.	
T&E Milestones	Conduct SAS Sea Test II	Conduct evaluation of prototype Adv. Sail	Begin in-water acceptance testing of LSV 2
		Begin testing of 2nd gen. Elastomer Disk for life cycle and aging	Complete EES 2nd generation disk life cycle aging test
		Conduct pass/fail test for flow mgmt.	Complete EES 2nd generation disk shock test Conduct hydroacoustic evaluation of Advanced Sail prototype Complete 2nd gen. Elastomer Disk Life cycle and aging tests Begin EES EDM equipment testing
			Conduct testing of Advanced Seawater Pump
			Weapons effect testing of Advanced decks & mounts
Contract Milestones		Award LSV 2 detailed design/ build contract	
		Award concept formulation contract	
		Award Virtual Water Tunnel contract	

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY R&D BA-4	PROGRAM ELEMENT NAME AND NUMBER ADVANCED SUBMARINE SYSTEMS DEVELOPMENT 0603561N	PROJECT NAME AND NUMBER S2033

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	S/CPFF	NNS Newprt New,Va	40.4	1.0	12/98	2.2	12/99			Cont.	Cont.	67.8
	S/CPIF	NNS Newprt New,Va	0	20.8	10/98					0	20.8	80
	S/CPFF	EB Groton, Conn.	43.9	6.8	12/98	4.1	12/99			Cont.	Cont.	37.3
	WR	NSWC Bethesda, MD	112.9	3.1	10/98	8.75	10/99			Cont.	Cont.	
	S/CPFF	ARL/PSU Penn.	30.1			1.0	01/00			Cont.	Cont.	
	WR	NUWC Newport RI	66.5	.6	10/98	.6	10/99			Cont.	Cont.	
	S/CPFF	KAPL Schenectady, NY	0	7.2	02/99	0				Cont.	Cont.	
	TBD	TBD		1.6		11.9				Cont.	Cont.	
Subtotal Product Development			293.8	41.1		28.55						

Remarks: (S2033)
TBD is due to emerging technologies.
EB's PY cost is greater than total value of contract due to a new contract award.

Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support												

Remarks: (S2033)

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY R&D BA-4	PROGRAM ELEMENT NAME AND NUMBER ADVANCED SUBMARINE SYSTEMS DEVELOPMENT 0603561N	PROJECT NAME AND NUMBER S2033

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	Fy00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NSWC Bethesda, MD	16.6	3.8	10/98	3.0	10/99			Cont.	Cont.	
	S/CPFF	NNS Norfolk, VA	0	.6	12/98	.4	12/99			Cont.	Cont.	67.8
	S/CPFF	EB Groton, Conn.	15.9	.2	12/98	.2	12/99			Cont.	Cont.	37.3
Subtotal T&E			32.5	4.6		3.6						
Remarks: (S2033)												
Contractor Engineering Support	S/CPFF	NNS Norfolk, VA	1.7	.95	12/98	.9	12/99					67.8
Contractor Engineering Support	S/CPFF	EB Groton, Conn.	1.7	1.0	12/98							37.3
Contractor Engineering Support	S/CPFF	DARPA Fairfax, VA		3.0	12/98						3.0	3.0
Government Engineering Support	WR	NSWC Bethesda, MD	1.0	9.6	10/98	11.0	10/99			Cont.	Cont.	
Travel		NAVSEA	.4	.05		.05						
Subtotal Management			4.8	14.6		11.95						
Remarks: (S2033)												
Total Cost			331.1	60.3		44.1						

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Adv. Sub. Systems Dev. V0223	0.0	0.0	71.6	68.3	66.5	64.2	66.3	61.2	Cont.	Cont.

A. Mission Description and Budget Item Justification:

(U) This program supports innovative research and development in submarine technologies and the subsequent evaluation, demonstration, and validation for submarine platforms. It will increase the submarine technology base and provide subsystem design options not currently feasible.

(U) Project Unit V0223: This non-acquisition (Non-ACAT) program supports the Navy Submarine Acoustic Superiority and Technology Insertion Initiatives through the application of advanced development and testing of improvements to present and future sonar and combat control systems. The goal is to address the technology challenges that marginalize tactical control in littoral and open ocean environments during the performance of a variety of missions including peacetime engagement, surveillance, deterrence, regional sea denial, precision strike, task group support, and ground warfare support. Prototype hardware and/or software systems are developed to demonstrate technologically promising system concepts in Laboratory and at-sea submarine environments. Technology areas specific to this program include transducers, hull-mounted and towed arrays, on-board monostatic and bistatic sonar signal processing, target motion analysis (TMA), multiple contact processing and test and evaluation. This program is funded under demonstration and validation because it develops and integrates hardware for experimental test related to specific ship and aircraft applications.

(U) Accomplishments and Plans:

FY 2000 Plan (V0223):

- **($8.200) Advanced Tactical Control** – Begin development of Tactical Control Build 2 software. Further define functional priorities and initiate development of 3D tactical scene rendering, improved use of ARCI data and integrated vulnerability information management. Conduct at-sea evaluation. Develop performance quantification metrics and data collection, storage and analysis methodologies.. Develop and deliver SFMPL 6.2. Identify potential information management solutions from DARPA, ONR, industry and academia. Evaluate for inclusion in Tactical Control Builds.
- **($37.500) Advanced Sonar System and Processing** – Complete APB 99 sea test and transition to ARCI Phase III. Complete development and integration, conduct performance assessment and initiate transition of APB 00 to Rapid COTS Insertion effort NSSN. Continue development of APB 01 including concurrent treatment of LF, MF and HF, continued automation enhancements, matched field localization, passive torpedo alertment, extension of 3-line MLTA processing, defensive multi-static, signal processing extensions for beamformerless detection and improved OMI.
- **($6.432) Advanced Towed Arrays** - Continue 3-line array development. Complete fabrication of 1-line array. Develop NTMLTA signal processing design. Conduct 1-line lake test and Critical Item Tests. Complete 3-line ADM design. Conduct 3-line ADM CDR.
- **($11.800) Advanced Hull Arrays** – Continue development of CAVES technology. Conduct CAVES Pre-SRA sea test and perform data analysis. Install CAVES Patch arrays on USS Providence. Conduct Post-SRA Sea Test. Continue planning for integration of CAVES technology with other Hull arrays. Perform CAVES Outer decoupler buckling experiment. Initiate update of noise audit model. Investigate impact of outer decoupler on inner decoupler. Initiate CACTISS III test planning. Initiate CAVES WAA transition planning. Initiate conformal array technology in conjunction with Advanced Sail to maintain current capability. Initiate Integrated Conformal Array technology to replace spherical array, HF sail array, and HF chin array. Develop Noise Audit Model for Integrated Conformal Array. Initiate planning for FY04 Lake Test/Demonstration and FY05 Sea Test/Demonstration. Design Bow Dome for demonstration tests. Initiate sensor development. Initiate acoustic source development. Initiate processor software development.
- **($7.200) High Frequency Sonar Program** - Complete development, evaluation and testing of Build 2+ build and transition and integration into ARCI program. Complete Test bed upgrades. Initiate integration of ACOMMS processing and hardware into HF suite. Continue sail and conformal array studies. Continue processing improvements

for HF APB 01 including bottom and target mapping, ASW improvements, bottom tracking and navigation, and adaptive signal design. Initiate processing improvements to support LMRS precision mapping efforts.

- **($.500) Test and Evaluation** – Conduct Towed Array APB lake test. Continue at-sea data gathering program. Initiate planning for HF APB Sea Test.

B. **Other Program Funding Summary**: Not Applicable

To Total

(U Related RDT&E: Not Applicable.

C. **Acquisition Strategy**: Plan to use competitively awarded contracts from Broad Agency Announcement (BAA) solicitations.

D. **Schedule Profile**:

FY 1998 FY 1999 FY2000

	PE # 0603504N		PE # 0603561N/V0223
Program Milestones	1Q - Transition CAVES Program to PE 0603504N 2Q - Transition 3-Line MLTA program to ASTO 3Q - Transition TA-APB98 to ARCI 3Q – TCP IPT established	2Q - Delivered Range Dependent Search capability to SFMPL 3Q – Transition TA- APB99 to ARCI 4Q – Transition TCP Bld 1 1Q – CAVES MANTECH (ONR Funded) Start	3Q - Complete TCP APB-2 2Q - SFMPL 6.2 Complete 3Q - Transition TA-APB00 & HF APB99 to ARCI
Engineering Milestones	2Q – Initiate HF APB 00 4Q – TSOA Integration Completed 2Q- Initiate TA- APB99 Evaluation	1Q - Initiate TA-APB00 1Q – Initiate TCP APB2 2Q – Complete TSOA 2Q - MLTA 1-Line CDR 3Q - Deliver TCP Build 1	1Q – Initiate TA-APB02 1Q - Deliver SFMPL 6.1 4Q - MLTA 3-Line CDR
Test & Evaluation Milestones	2Q – HFSP Sea Test 3Q – TA-APB-98 Sea Test 3Q – CAVES Fabrication & Installation 3Q - Shipboard Tactical Information System Test	2Q- 2Q – CACTISS II Test 3Q – TA-APB99 Sea Test	3Q - HF APB99 Sea Test 3Q – TA-APB00 Sea Test 3Q - TCP APB-1 Sea Test 3Q - CAVES Sea Test 3Q - MLTA 1-Line Lake Test

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY R&D BA-4	PROGRAM ELEMENT NAME AND NUMBER ADVANCED SUBMARINE SYSTEMS DEVELOPMENT 0603561N	PROJECT NAME AND NUMBER V0223

Categories Product Development	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Product Development	WR	NUWC/Newport, RI	.000	.000	-	29.620	10/99			Contin	Contin	
Product Development	RCP	NUWC/Newport, RI	.000	.000	-	.000	-			Contin	Contin	
Product Development	WR	NRL/Washington	.000	.000	-	1.962	10/99			Contin	Contin	
Product Development	RCP	NRL/Washington	.000	.000	-	.000	-			Contin	Contin	
Product Development	WR	NSWC/Carderock, MD	.000	.000	-	1.308	10/99			Contin	Contin	
Product Development	RCP	NSWC/Carderock, MD - AMSI	.000	.000	-	.000	-			Contin	Contin	
Product Development	WR	NCCOSC/San Diego, CA	.000	.000	-	.150	10/99			Contin	Contin	
Product Development	RCP	NCCOSC/San Diego, CA - Litton	.000	.000	-	.000	-			Contin	Contin	
Product Development	WR	NSMRL	.000	.000	-	.000	-			Contin	Contin	
Product Development	RCP	NSMA	.000	.000	-	.180	03/00			Contin	Contin	
Product Development	WR	NUWC/Keyport, HI	.000	.000	-	.100	10/99			Contin	Contin	
Product Development	MIPR	U.S. Army/MITRE	.000	.000	-	2.000	12/99			Contin	Contin	
Product Development	MIPR	U.S. Air Force/MIT Lincoln Labs	.000	.000	-	.800	12/99			Contin	Contin	
Product Development	RCP	ONR/MCCI	.000	.000	-	1.400	01/00			Contin	Contin	
Product Development	RCP	ONR/University of California	.000	.000	-	.000	-			Contin	Contin	
Product Development	RCP	ONR/BBN	.000	.000	-	.000	-			Contin	Contin	
Product Development	RCP	ONR/GTRI	.000	.000	-	1.986	12/99			Contin	Contin	
Product Development	SS/CPFF	APL/JHU, MD	.000	.000	-	5.207	12/99			Contin	Contin	
Product Development	SS/CPFF	APL/UW, WA	.000	.000	-	.000	-			Contin	Contin	
Product Development	SS/CPFF	ARL/UT, TX	.000	.000	-	9.200	12/99			Contin	Contin	
Product Development	SS/CPFF	ARL/PSU, PA	.000	.000	-	.315	12/99			Contin	Contin	
Product Development	MD	ARL/PSU, PA	.000	.000	-	.130	01/00			Contin	Contin	

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY R&D BA-4	PROGRAM ELEMENT NAME AND NUMBER ADVANCED SUBMARINE SYSTEMS DEVELOPMENT 0603561N	PROJECT NAME AND NUMBER V0223

Cost Categories Product Development	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Product Development	PD	NAVAIR Pax River /NSWC Indian Hd	.000	.000	-	.000	-			Contin	Contin	
Product Development	WR	SPAWAR, CA	.000	.000	-	.100	10/99			Contin	Contin	
Product Development	C/FP	DSI, VA	.000	.000	-	.000	-			Contin	Contin	
Product Development	C/CPFF	DSR, VA	.000	.000	-	7.000	12/99			Contin	Contin	
Product Development	C/CPFF	TWD Associate, VA	.000	.000	-	.000	-			Contin	Contin	
Product Development		Electric Boat, CT	.000	.000	-	.000	-			Contin	Contin	
Product Development	CPFF	Newport News Shipyard, VA	.000	.000	-	.000	-			Contin	Contin	
Product Development	C/CPFF	Systems Planning Analysis, VA	.000	.000	-	.000	-			Contin	Contin	
Product Development	MIPR	DARPA, VA	.000	.000	-	.000	-			Contin	Contin	
BAAs	C/CPFF	Various	.000	.000	-	2.349	Various			Contin	Contin	
Advanced Towed Array BAA	C/CPFF	Lockheed Martin, NY	.000	.000	-	1.200	12/99			Contin	Contin	
Product Development	Various	Various	.000	.000	-	5.125	Various			Contin	Contin	
Subtotal Product Development			.000	.000		70.132				Contin	Contin	

Remarks: (V0223)

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY R&D BA-4	PROGRAM ELEMENT NAME AND NUMBER ADVANCED SUBMARINE SYSTEMS DEVELOPMENT 0603561N	PROJECT NAME AND NUMBER V0223

Cost Categories Support	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support			.000	.000		.000		.000		Contin	Contin	

Remarks: (V0223)
This is a Non Acquisition Program which therefore includes no indirect support costs.

Cost Categories Test and Evaluation	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NUWC/Newport, RI	.000	.000	-	.450	10/99			Contin	Contin	
Developmental Test & Evaluation	Various	Various	.000	.000	-	.050	Various			Contin	Contin	
Operational Test & Evaluation												
Tooling												
GFE												
Subtotal T&E			.000	.000		.500				Contin	Contin	

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY R&D BA-4	PROGRAM ELEMENT NAME AND NUMBER ADVANCED SUBMARINE SYSTEMS DEVELOPMENT 0603561N	PROJECT NAME AND NUMBER V0223

Remarks: (V0223)

Cost Categories Management	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPFF	Integrated Product Decision, CT	.000	.000	-	.000	-			Contin	Contin	
Program Management Support	C/CPFF	Stanley Associates, VA	.000	.000	-	.900	12/99			Contin	Contin	
Program Management Support	Various	Various	.000	.000	-	.100	Various			Contin	Contin	
Subtotal Management			.000	.000		1.000				Contin	Contin	
Remarks: (V0223)												
Total cost			.000	.000		71.632				Contin	Contin	

Remarks: (V0223)

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY **RDT&E,N/4**	R-1 ITEM NOMENCLATURE **Submarine Tactical Warfare Systems/0603562N**

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total PE Cost	4.0	4.5	4.7	4.3	5.4	5.7	5.8	5.9	Continuing	Continuing
F0770/Advanced Sub. Spt. Equipment	1.8	2.5	2.3	2.4	3.3	3.4	3.5	3.6	Continuing	Continuing
V1739/Sub. Special Ops Spt. Devel.	2.2	2.1	2.3	1.9	2.1	2.3	2.3	2.4	Continuing	Continuing
Quantity of RDT&E Articles & cost	4/3.1	3/3.3	2/2.4	2/2.6	3/3.4	3/3.2	2/2.4	1 /2.5	Continuing	Continuing

A. (U) Mission Description and Budget Item Justification: The Submarine Tactical Warfare Systems program element is comprised of the Advanced Submarine Support Equipment Program and the Submarine Special Operations Support Development Program. The overall goal of the program is to improve submarine operational effectiveness through the development of advanced Research and Development (R& D) and Electronic Support Measures (ESM) technologies. The goal of the Advanced Submarine Support Equipment Program (ASSEP) is to increase submarine operational effectiveness through improvements in electronic warfare (i. e., threat warning, over-the-horizon targeting, and expanded tactical reconnaissance) and electronic imaging. A continuing need exists to improve submarine capabilities in the increasingly dense and sophisticated electromagnetic environment caused by the proliferation of complex radar, communications, and navigation equipment of potential adversaries. The Submarine Special Operations Support Development program responds to the increased threat of Naval activity in the Littorals and the continuing threat of submarine and surface ship activity in regions of the world through the development of advanced submarine R& D technology to provide improved operational capability in shallow water regions. Particular emphasis is placed in the areas of sonar operability and maintainability, Littoral operations, mine warfare, tactical surveillance, and other submarine support missions. Efforts include assessment of combat system effectiveness, development of Arctic shallow water specific improvements for existing sonars, development of class specific Arctic operational guidelines and the testing of ice-capable submarine support structures. This program also provides the framework for various R& D programs to conduct Test and Evaluation in shallow water and Arctic regions.

B. (U) Program Change Summary: (show total funding, schedule, and technical changes for the program element that have occurred since the last submission).

	FY 1998	FY 1999	FY 2000
(U) FY 1999 President's Budget:	4.0	4.7	5.6
(U) Appropriated Value:	4.9	4.7	
(U) Adjustment to FY 1998 Appropriated Value/ FY 1999 President's Budget:			
a. SBIR/Cong Undistributed. Reductions	-0.2	-0.2	-0.035
b. Minor Submarine ESM Adjustments	-0.7		-0.9
c. Outsourcing Adjustment			-0.008
d. NWCF NUWC Rates			+0.010
e. NWCF NSWC Rates			+0.002
(U) FY 2000/01 PRES Budget Submit:	4.0	4.5	4.7

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY **RDT&E,N/4**	R-1 ITEM NOMENCLATURE **Submarine Tactical Warfare Systems/0603562N**

(U) Change Summary Explanation:

(U) Funding: The FY98 decrease of $0.9M is due to an SBIR assessment ($.045M), Congressional Undistributed Reductions ($0.179M) and minor submarine ESM adjustments ($0.7M). The FY99 decrease of $.159M is due to Congressional Undistributed Reductions. The FY00 decrease of $0.955M is due to minor submarine ESM adjustments ($0.9M), outsourcing adjustment ($.008), NWCF NUWC Rate adjustment ($.010) and NWCF NSWC Rate adjustment ($.002) and Congressional Undistributed Reductions ($.035M).

(U) Schedule: As a result of the funding cuts in FY2000 and FY2001, Ultra High Frequency (UHF) Satellite Communications (SATCOM) Transmit/Receive scope development effort will be deferred from FY2000 start to FY2002 start. Millimeter Wave (MMW) development will be stretched one year, all other projects will slip in schedule approximately 3 months.

(U) Technical: Not applicable.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY **RDT&E,N/4**	Program Element Name & No. **Submarine. Tactical Warfare Systems/0603562N**	Project Name and Number. **Advanced Submarine Support Equipment Program (ASSEP)/F0770**

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	1.8	2.5	2.3	2.4	3.3	3.4	3.5	3.6	Continuing	Continuing
RDT&E Articles Qty	2	2	0	1	1	2	0	0	Continuing	Continuing

A. (U) Mission Description and Budget Item Justification: This program develops submarine ESM equipment and image processing technology. A continuing need exists to improve submarine capabilities in these areas to enhance operational effectiveness in the increasingly dense and sophisticated electromagnetic environment caused by the proliferation of complex radar, communications, and navigation equipment of potential adversaries. Improvements are necessary for submarine ESM and imaging to be effective in conducting the following mission areas: Joint Littoral Warfare, Joint Surveillance, Space and Electronic Warfare, Intelligence Collection, Maritime Protection and Joint Strike. Specific efforts include development of: Radar Cross Section Reduction (RCSR) Techniques, Sensor Technology Insertion Program (STIP), and ESM Technology Insertion Program (ESMTIP). The RCSR evaluates the vulnerability of submarine masts, periscopes and sensors to radar and infrared threats and evaluates the state of the art in radar absorbent material, resulting in potential periscope/ mast engineering improvements to reduce the counter-detection threat. The STIP and ESMTIP programs develop submarine unique improvements to mast, periscope and hull mounted ESM electromagnetic and electro-optic sensors based on emerging technologies that are available from DOD Exploratory Development Programs, industry Independent Research and Development, and other sources. Feasibility demonstration models (FDMs) are developed to provide a realistic method of evaluating the improvements, including deployment on submarines for testing. STIP projects include: Laser detection and warning (LIDAR); radio frequency (RF) extensions; RF bandwidth improvements; passive localization; upgrades to the Imaging Mast sensors and software; and advanced antenna arrays for beam steering and high resolution direction finding enhancements. ESMTIP projects include: improvements to signal sorting and recognition methods to support classification and identification of ESM contacts encountered during Littoral operations; signal processing improvements for processing of low probability of intercept signals; voice/ language recognition and human/ machine interface (HMI) enhancements. All programs funded in this project are non- acquisition category programs in accordance with Non-Acquisition Program Definition Document (NAPDD) # 428- 87. The test articles identified consist of critical components of FDM's that will be fully developed during engineering development into Engineering Development Models (EDM's).

(U) Program Accomplishments and Plans:

1. (U) FY 1998 Accomplishments:
   - (U) ($ 0.1) Continued Radar cross Section Reduction (RCSR) techniques and materials investigation.
   - (U) ($ 1.2) Completed development of LIDAR Warning Receiver.
   - (U) ($ 0.3) Completed development of shock hardened radome and update of simulation tools.
   - (U) ($ 0.2) Initiated development of FDM's for Passive Localization, Millimeter Wave (MMW) Frequency Extension and Imaging Auto Target Recognition and Tracking Algorithms.
   - (U) The estimated total cost of the two sets of FDM components initiated during this fiscal year is $0.9M

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY **RDT&E,N/4**	Program Element Name & No. **Submarine. Tactical Warfare Systems/0603562N**	Project Name and Number. **Advanced Submarine Support Equipment Program (ASSEP)/F0770**

2. (U) FY 1999 Plans:
   - (U) ($ 0.3) Continue Radar Cross Section Reduction (RCSR) techniques and materials investigation.
   - (U) ($ 1.6) Continue Sensor Technology Insertion Program (STIP) development of Passive Localization, Imaging Auto Target Recognition and enhancement in MMW signal reception.
   - (U) ($ 0.5) Initiate STIP and Electronic Support Measures Technology Insertion Program (ESMTIP) development of Type 18 Low Band Direction Finding (DF) and Counter Detection and Range Assessment.
   - (U) ($ .033) Portion of extramural program is reserved for Small Business Innovative Research assessment in accordance with 15 USC 638.
   - (U) The estimated total cost of the two sets of Feasibility Demonstration Models (FDM) components initiated during this fiscal year is $1.1M.

3. (U) FY 2000 Plans:
   - (U) ($ 0.2) Continue RCSR techniques and materials investigation.
   - (U) ($ 0.8) Continue STIP development of Passive Localization, Imaging Auto Target Recognition and MMW frequency extension.
   - (U) ($ 0.4) Continue STIP development of Low Band DF.
   - (U) ($ 0.4) Continue ESMTIP development of Counter Detection and Range Assessment.
   - (U) ($ 0.5) Initiate ESMTIP development of Combat Control System (CCS) interface for SSN 688 and Integrated Electronic Support (ES) Workstation.

B. (U) Other Program Funding Summary: Not applicable.
(U)Related RDT&E:
(U) PE 0604503N(Submarine System Equipment Development)
(U) PE 0604558N(New Design SSN Development)
(U) PE 0604777N(Navigation /ID Systems)

C. (U) Acquisition Strategy: This project will optimize technology insertion using a build-test-build approach to support Electronic Support (ES) operational needs. Operational needs have been based on FY97 COMSUBLANT/COMSUBPAC command technology issues, New Design SSN (NSSN) Operational Requirements Document objectives, a review, assessment and prioritization of Sensor and Processor efforts and SSN force level projections for SSN688/688I and SSN21 classes through FY2015. The STIP and ESMTIP efforts will develop submarine unique improvements to mast, periscope and hull mounted ESM electromagnetic and electro-optic sensors based on emerging technologies that are available from DOD Exploratory Development Programs, industry Independent Research and Development, and other sources. Feasibility Demonstration Models (FDMs) will be developed to provide a realistic method of evaluating the improvements, including deployment on submarines for testing.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY **RDT&E,N/4**	Program Element Name & No. **Submarine. Tactical Warfare Systems/0603562N**	Project Name and Number. **Advanced Submarine Support Equipment Program (ASSEP)/F0770**

D. (U) Schedule Profile. See attached schedule.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY **RDT&E,N/4**	Program Element Name & No. **Submarine. Tactical Warfare Systems/0603562N**	Project Name and Number. **Advanced Submarine Support Equipment Program (ASSEP)/F0770**

ASSEP Schedules

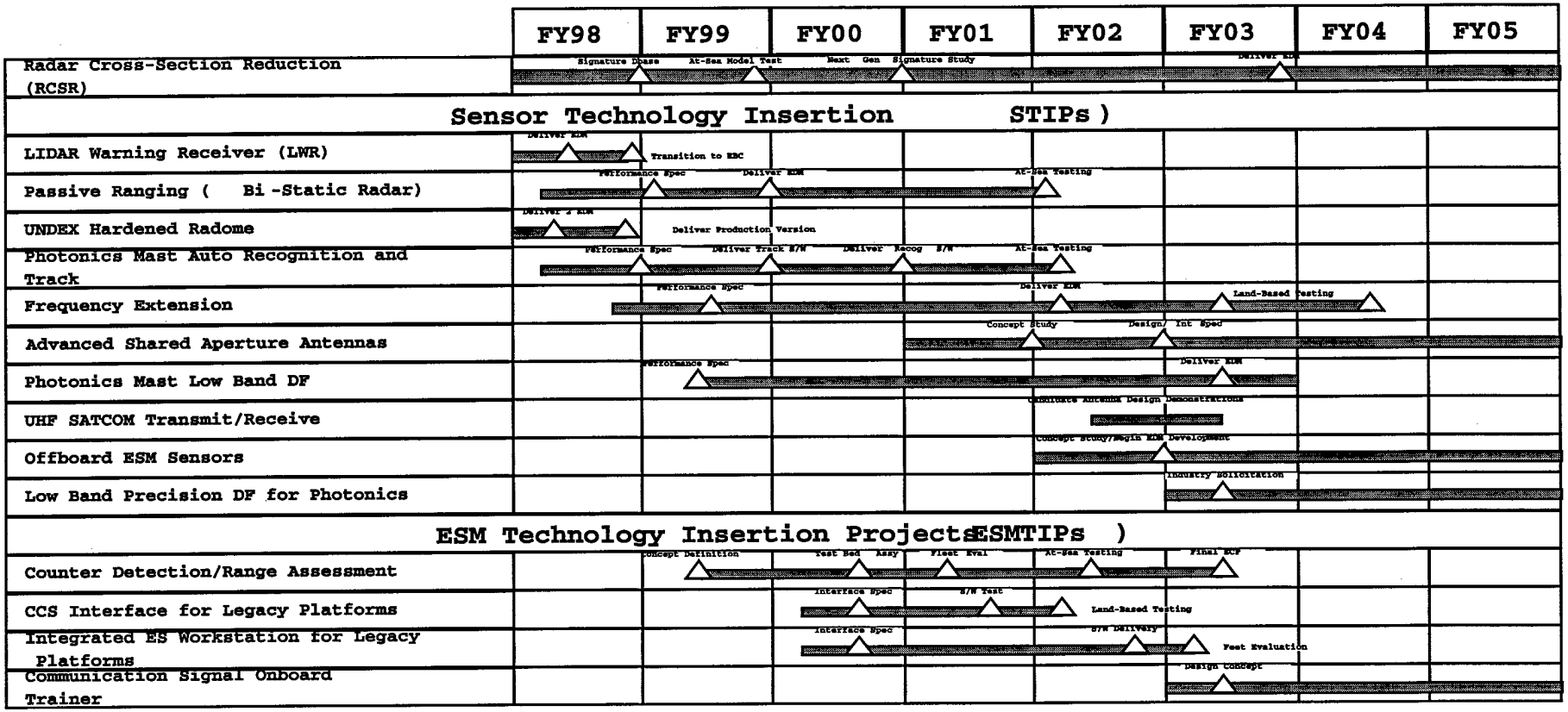


Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY **RDT&E,N/4**	PROGRAM ELEMENT NAME AND NUMBER **Submarine Tactical Warfare Systems/0603562N**	PROJECT NAME AND NUMBER **Advanced Submarine Support Equipment Program (ASSEP)/F0770**

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development LIDAR Warning Receiver	C/CPIF	JHU/APL Laurel, MD.	3.1	0	N/A	0	N/A			0	3.1	3.1
STIP FDM's	RCP	TBD	0	0.9	1/99	0.6	1/00			Cont.	Cont.	TBD
ESMTIP FDM's	RCP	TBD	0	0	N/A	0.5	1/00			Cont.	Cont.	TBD
Systems Engineering	WR	NUWC Newport, RI	9.3	1.1	11/98	0.9	11/99			Cont.	Cont.	N/A
GFE	N/A	N/A	0	0	N/A	0	N/A			N/A	N/A	N/A
Miscellaneous	Various	Various	7.2	0.3	Var.	0.2	Var.			Cont.	Cont.	N/A
Subtotal Product Development			19.6	2.3		2.2				Cont.	Cont.	
Remarks:												
Miscellaneous Engineering Technical Services	Various	Various	0.9	.01	11/98	.01	11/99			Cont.	Cont.	N/A
GFE												
Subtotal Support			0.9	.01		.01				Cont.	Cont.	N/A
Remarks												
Subtotal T&E												
Remarks **Not applicable.**												
Miscellaneous Management Support Services	Various	Various	1.0	0.1	11/98	0.1	11/99			Cont.	Cont.	N/A
Award Fee	N/A	N/A										
Studies Analysis & Evaluations	Various	Various	0.8	0	N/A	0	N/A			0	0.8	N/A
Subtotal Management			1.8	0.1		0.1				Cont.	Cont.	N/A
Remarks												
Total Cost			22.3	2.4		2.3				Cont.	Cont.	
Remarks												

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/4	Program Element Name & No. Submarine Tactical Warfare Systems/P.E. 0603562N	Project Name and Number. Submarine Special Operations Support Development/V1739

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	2.2	2.1	2.3	1.9	2.1	2.3	2.3	2.4	CONT.	CONT.
RDT&E Articles Qty	Arctic ex. (2)	Arctic ex. (1)	Arctic ex. (2)	Arctic ex. (1)	Arctic ex. (2)	Arctic ex. (1)	Arctic ex. (2)	Arctic ex. (1)	CONT.	CONT.

A. (U) Mission Description and Budget Item Justification: This program responds to the increased threat of Naval activity in the Littoral and continuing threat of submarine and surface ship activity in all regions of the world through the development of advanced submarine operational concepts. It places particular emphasis on submarine operability and mission support in unique environments. Efforts include assessment of combat system effectiveness, use of high frequency sonars in Arctic regions, testing of ice-capable submarine structures, and development of class specific Arctic shallow water operational guidelines. This program also provides the framework for various Research and Development (R&D) programs to conduct Test and Evaluation in the shallow water and Arctic regions.

(U) Program Accomplishments and Plans

1. (U) FY 1998 Accomplishments
   - (U) ($2.0) Conducted/Supported an Arctic Science Exercise (SCICEX) and ICEX 1-98.
   - (U) ($0.2) Provide updates to the Naval Warfare Publication (NWP) concerning routine and emergency under-ice surfacing operations for SSN 688.

2. (U) FY 1999 Plans
   - (U) ($2.1) Conduct/support an Arctic Science Exercise and plan for ICEX 1-00.
   - (U) ($0.047) Portion of extramural program is reserved for Small Business Innovation Research Assessment in accordance with 15 USC 638.

3. (U) FY 2000 Plans
   - (U) ($2.4) Conduct/Support SCICEX 1-00 and ICEX 1-00.

B. (U) Other Program Funding Summary: Not Applicable
C. (U) Acquisition Strategy: NON-ACAT Program
D. (U) Schedule Profile: See Attached Schedule

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/4	Program Element Name & No. Submarine Tactical Warfare Systems/P.E. 0603562N	Project Name and Number. Submarine Special Operations Support Development/V1739

Program Element: 0603562N
Project Number: V1739
Title: Submarine Special Operations Support Development

Schedule Profile

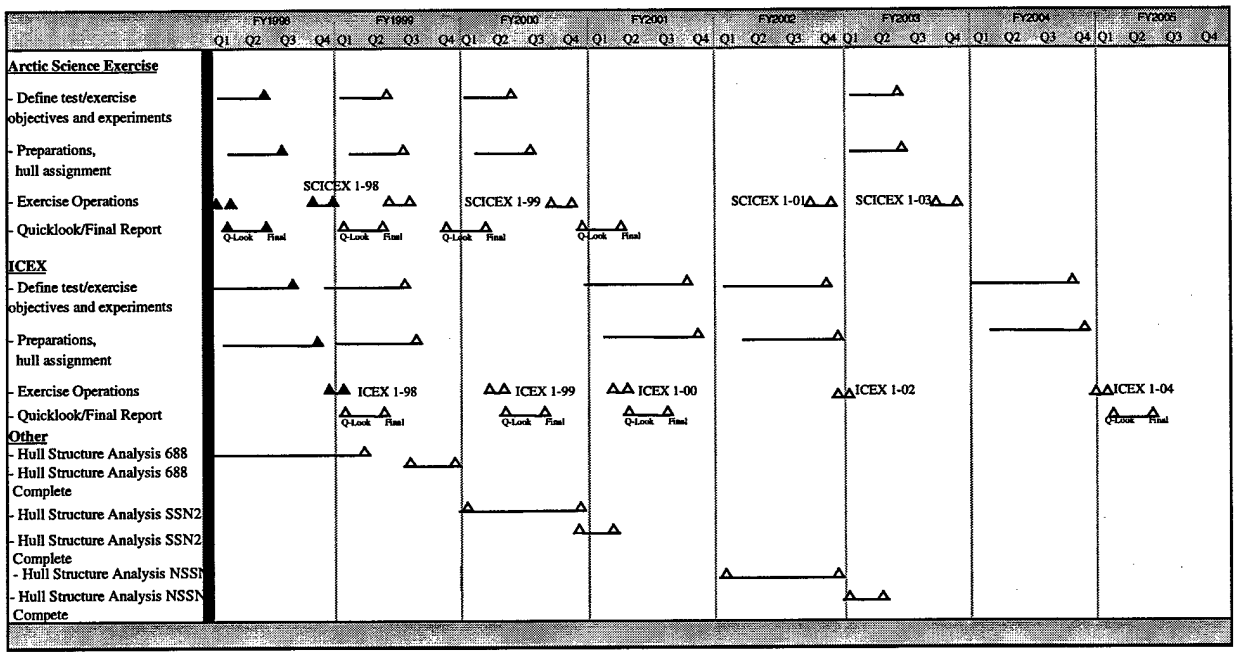


Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/4	PROGRAM ELEMENT NAME AND NUMBER Submarine Tactical Warfare Systems/P.E. 0603562N	PROJECT NAME AND NUMBER Submarine Special Operations Support Development/V1739

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYS Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	WR	NSWC Carderock	1.3	0.2	11/98	0.2	11/99					
GFE												
Subtotal Product Development			1.3	0.2	11/98	0.2	11/99					
Remarks:												
Subtotal Support **Not applicable**												
Remarks:												
Developmental Test & Evaluation	WR	SUBDEVRON 5	6.7	1.67	11/98	1.94	11/99/			Cont.	Cont.	Cont.
	WR	CMDR, 3rd NAVCON BRIGADE	.05	.05	10/98	.05	10/99			Cont.	Cont.	Cont.
Operational Test & Evaluation												
GFE												
Subtotal T&E			6.8	1.72		1.99				Cont.	Cont.	Cont.
Remarks:												
Contractor Engineering Support												
Program Management Support				.16	11/98	.16	11/99			Cont.	Cont.	Cont.
Travel				.02	10/98	.02	10/99			Cont.	Cont.	Cont.
Labor (Research Personnel)												
Overhead												
Subtotal Management				.18		.18				Cont.	Cont.	Cont.
Remarks:												
Total Cost			8.1	2.1		2.4						
Remarks:												

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N / Demonstration & Validation BA-4	R-1 ITEM NOMENCLATURE SHIP CONCEPT ADVANCED DESIGN, PE 0603563N

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total P.E. Cost	5.264	7.077	5.318	5.675	6.495	6.595	6.677	6.863	Continuing	Cont.
DESIGN TOOLS, PLANS & CONCEPTS / S2196	5.264	7.077	5.318	5.675	6.495	6.595	6.677	6.863	Continuing	Cont.
Quantity of RDT&E Articles & cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

A. (U) Mission Description and Budget Item Justification: The efforts within this PE directly support the Navy's ability to design more affordable mission capable ships with reduced manning, increased producibility, reduced operating and support costs, and greater utilization of the latest technology. The program directly supports the Navy Shipbuilding Plan with state-of-the-art design tools and methods for ship concept studies, and the actual conduct of design concept studies for the ships in that plan. The program provides the foundation for affordable surface ship design, construction, and life cycle support and is a required first step in the integration of total ship systems, including combat systems and hull, mechanical and electrical (HM&E) systems. Inadequate early planning and ship concept formulation can result in down-stream design/construction and operational problems. A more subtle and severely negative impact of neglecting this early effort is that the "best" concepts and technologies may never even be considered and our greatest potential ship design advances never realized. Designs and technologies must meet the threat. This project supports this requirement. Computer modeling and simulation developments will permit virtual operation and evaluation of the ship and enable reduction of ship production and support cost by allowing fleet representatives, shipbuilders and maintenance staffs to build, test, operate or repair the ship "in the computer" at a design stage where the design is flexible and where feedback and suggested changes can be incorporated relatively easily.

(U) This project accomplishes the following: (1) identifies future surface ship requirements and characteristics necessary to meet future threats and support mission needs; (2) investigates new affordable ship concepts and evaluates technologies necessary to support these concepts; (3) provides design methods and automated design tools to develop and evaluate ship concepts, support early ship design, and solve pressing fleet engineering problems; (4) develops design criteria and common standards to improve affordability; (5) improves the quality of the product in the design phases, to reduce or eliminate the costs of fixing problems after ships reach the fleet; (6) develops investment strategies for new concepts and technologies; (7) and supports development of Mission Need Statements (MNS) for future ships.

(U) Efforts under Project S2196 transition directly to early stage ship design in PE 0603564N, Ship Preliminary Design and Feasibility Studies. While these efforts support all surface ship acquisition programs, they are not direct efforts for specific authorized shipbuilding programs. This project is the only R&D effort (Government or commercial) that supports and maintains this country's naval ship design and engineering capabilities in the area of early stage (Concept through Contract Design) design tools, criteria, and methods.

(U) The FY 1998 funds for the Affordability Through Commonality (ATC) Program were budgeted and executed under this PE/Project. The FY 1999 funds for ATC were budgeted under this PE/Project as displayed in the FY 1999 President's Budget but transitioned to PE 0603513N / Project 32469 for execution. ATC funding has transferred to PE 0603513N, Project 32469 for both budget and execution in FY 2000 and out-years.

Exhibit R-2, RDT&E Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N / Demonstration & Validation BA-4	PROGRAM ELEMENT NAME AND NUMBER SHIP CONCEPT ADVANCED DESIGN, PE 0603563N	PROJECT NAME AND NUMBER DESIGN TOOLS, PLANS & CONCEPTS, PROJECT S2196

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:
   Note: Accomplishments for FY 1998 reflect actual executed funding of $6.276M.

- (U) ($1.165) Pre-Milestone 0 Ship Concepts and Mission Need Analysis / Total Ship Technology Assessment: Developed ship concepts for potential ships 5-10 years out in the SCN plan, including ship size, configuration, capabilities and rough order of magnitude (ROM) ship costs. Integrated new technologies in total ship concepts. Conducted pre-Milestone 0 ship concept studies for large deck amphibious assault ship, joint command ship, and medical capabilities afloat in support of SCN planning. Analyzed the benefits and impacts of new concepts and technologies. Supported trimaran advanced hull form concept development.

- (U) ($1.706) Ship Design and Engineering Tools, Methods, and Criteria: Developed and improved early stage ship design methods, criteria, standards, and data bases. Improved surface ship synthesis/assessment models in the following areas: integrated improved performance assessment capabilities, updated program executive, link to commercial CAD II system, increased ability to handle common modules and other large space objects, developed a link to industry STEP data exchange protocols, updated capabilities to support on-going future ship designs to handle new ship configurations, hull form alternatives, and signature reduction features. Supported development of advanced computer aided design methods and tools for early stage ship design in the following areas: updated design weight estimating tool, developed surface ships structural rational design tools, integrated structural analysis tools with CAD II system, began upgrades to manning estimation tools, completed development of infrared and magnetic signature assessment tools, upgraded ship hydrostatics and stability analysis for new geometry definition, and upgraded general arrangements tool capabilities. Developed a materials selection database. Supported Navy Industry Digital Data Exchange Specification Committee (NIDDESC) development of STEP computer aided design (CAD) systems data and parts library exchange protocol standards for shipbuilding industry. Identified and characterized new and emergent technologies and updated the HM&E technology database. Finished migration of HM&E technology database to commercial software.

- (U) ($1.425) Simulation Based Ship Design & Engineering: Began broad-based implementation of state-of-the-art visualization and simulation techniques for ship design and engineering applications. Acquired and started validation, adaptation, and implementation of commercial visualization and simulation tools for the areas of: fluid / piping systems simulation, and crew reduction performance simulation. Developed custom visualization and simulation tools where no alternate source exists in the following areas: automated ventilation duct routing and analysis. Began development of standard "wrapper" program to integrate visualization and simulation tools with legacy computer aided design and physics-based hull, mechanical and electrical (HM&E) analysis tools. Began development of capabilities for realistic, physics-based simulation of ship performance, behavior, and response in the following area: survivability, damage tolerance, and damaged mission capability simulation by developing an integrated survivability assessment and analysis capability.

Exhibit R-2, RDT&E Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N / Demonstration & Validation BA-4	PROGRAM ELEMENT NAME AND NUMBER SHIP CONCEPT ADVANCED DESIGN, PE 0603563N	PROJECT NAME AND NUMBER DESIGN TOOLS, PLANS & CONCEPTS, PROJECT S2196

- (U) ($0.980) Reliability Based Structural Design Criteria: Collected and analyzed long-term hydrodynamic loads data. Developed and validated seaway loads prediction method. Completed assessment and methods for predicting extreme and cumulative lifetime loads. Developed non-dimensional response amplitude operators for vertical and lateral bending moments. Completed updating of compressive strength of plating stiffeners study. Begun large scale grillage strength tests and assessments. Completed stiffener geometry testing. Completed compressive strength of stiffener testing. Completed analysis of fatigue test data and update design data sheet (DDS). Updated reliability inputs and assessment techniques. Developed stiffened panels (part III) of the reliability-based load and resistance factor design (LRFD) structural rules for naval surface ships. Validated processes and utilized technologies/improved design methods on existing ships and new designs. Co-sponsored with the American Bureau of Shipping (ABS) and the Ship Structure Committee (SSC) transition planning and technical review of the Development of Load and Resistance Factor Design Rules for Ship Structures.

- (U) ($1.000) Total Ownership Cost Methods and Modeling: Developed total ownership cost modeling and cost decision making tools for ships. Supported Navy-Shipbuilding Industry cost model development team. Implemented the Product Oriented Design and Construction (PODAC) cost model at two more shipyards. Validated the prototype PODAC cost model at two more shipyards. Used PODAC cost model to analyze new technologies to validate model capabilities to correctly reflect acquisition cost impacts. Added a capability to the PODAC cost model for incorporating separately estimated combat systems and C4I, or other independent system/equipment costs into a total ship procurement cost. Developed initial high level parametric cost estimating method using gross compensated tonnage and complexity factors. Investigated risk and schedule capabilities to PODAC cost model. Began developing a plan to develop a ship operating and support cost model. Coordinated efforts with cost modeling and cost analysis for on-going ship programs.

- (U) Note: Affordability Through Commonality (ATC) program efforts shown in PE 0603513N, Project 32469.

2. (U) FY 1999 PLAN:

- (U) ($1.535) Pre-Milestone 0 Ship Concepts and Mission Need Analysis: Develop ship concepts and perform mission area analysis (MAA) for potential ships 5-10 years out in the SCN plan, including ship size, configuration, capabilities and rough order of magnitude (ROM) ship costs. Conduct pre-Milestone 0 ship concept studies for LHA replacement (large deck amphibious assault ship), joint command ship, medical capabilities afloat, and other potential ship concepts / configurations in support of SCN planning. Develop future surface warfare vision including mission needs and concepts, and technology needs and plans.

- (U) ($0.435) Total Ship Technology Assessment: Analyze the benefits and impacts of new ship and hull, mechanical and electrical (HM&E) concepts and technologies. Identify, characterize and assess new and emergent technologies and update the HM&E technology database. Support integration and transition of new technologies in total ship concepts. Establish baseline ship concepts and technology attributes for use in technology assessments.

Exhibit R-2, RDT&E Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N / Demonstration & Validation BA-4	PROGRAM ELEMENT NAME AND NUMBER SHIP CONCEPT ADVANCED DESIGN, PE 0603563N	PROJECT NAME AND NUMBER DESIGN TOOLS, PLANS & CONCEPTS, PROJECT S2196

- (U) ($1.365) Ship Design and Engineering Tools, Methods, and Criteria: Develop and improve early stage ship design methods, criteria, standards, and data bases. Improve surface ship synthesis/assessment models in the following areas: improve performance assessment capabilities, complete link to commercial CAD II system, increase ability to handle alternative distributed system architectures, link to industry STEP data exchange protocols, begin efforts to link with operational effectiveness models, update and enhance capabilities to support on-going future surface ship designs to handle new ship configurations, hull form alternatives, signature reduction features, address minimum required shipboard manning, reduced construction cost, and increased capabilities to determine ship size impacts of new technologies. Improve ship cost estimating capabilities: link new acquisition cost modeling capability to ship synthesis/assessment models. Support development of advanced computer aided design methods and tools for early stage ship design in the following areas: complete development and integration of structural analysis tools with CAD II system, upgrade manning estimation tools, enhance machinery design tools, complete general arrangements tool upgrades, and integrate distributed systems analysis software with CAD II system. Support Navy Industry Digital Data Exchange Specification Committee (NIDDESC) development of STEP computer aided design (CAD) systems data and parts library exchange protocol standards for shipbuilding industry.

- (U) ($1.420) Simulation Based Ship Design and Engineering: Broad-based implementation of state-of-the-art visualization and simulation techniques for ship design and engineering applications. Integrate visualization and simulation tools from all sources, including DARPA, ONR, and other government activities for areas such as ship motions, maneuvering, powering, personnel flow, stores flow, structural response, command and communications systems, electric power systems, piping systems, HVAC systems, and combat systems. Acquire and validate, adapt, and implement commercial and other source visualization and simulation tools for the areas of: fluid / piping systems simulation, and crew reduction performance simulation. Develop custom visualization and simulation tools where no alternate source exists in the following areas: aircraft handling simulation, signature visualization and simulation. Complete development of standard "wrapper" program to integrate visualization and simulation tools with legacy computer aided design and physics-based hull, mechanical and electrical (HM&E) analysis tools. Develop capabilities for realistic, physics-based simulation of ship performance, behavior, and response in the following areas: survivability, damage tolerance, and damaged mission capability simulation by developing an integrated survivability assessment and analysis capability.

- (U) ($1.160) Reliability Based Structural Design Criteria: Add new reliability inputs and assessment techniques to design rules. Incorporate methods for predicting extreme and cumulative lifetime loads into design rules. Collect and analyze long-term hydrodynamic loads data. Correlate full scale loads measurements with model test results. Validate and adapt advanced seaway loads prediction methods for use with design rules. Develop methodology for bow form effects on hull loads. Establish safety indices for naval ship structures for hull girders. Perform large scale grillage strength tests. Begin assessment of grillage strength test data. Update design data sheet for compressive strength of plating stiffeners and grillages. Develop structural fatigue (part IV) of the reliability-based load and resistance factor design (LRFD) structural rules for naval surface ships. Validate processes and utilize technologies/improved design methods on existing ships and new designs. Support transition to industry through Ship Structure Committee (SSC).

Exhibit R-2, RDT&E Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N / Demonstration & Validation BA-4	PROGRAM ELEMENT NAME AND NUMBER SHIP CONCEPT ADVANCED DESIGN, PE 0603563N	PROJECT NAME AND NUMBER DESIGN TOOLS, PLANS & CONCEPTS, PROJECT S2196

- (U) ($1.060) Total Ownership Cost Methods and Modeling: Develop total ownership cost modeling and cost decision making tools for ships. Support Navy-Shipbuilding Industry cost model development team. Validate the prototype PODAC cost model at two or more additional shipyards. Develop plan for PODAC cost model extensions for combat systems and C4I costs. Collect and analyze cost data of shipbuilders for development of activity cost factors for naval ships. Develop PODAC cost model estimating ratios for shipbuilding interim products, parametric scaleable systems, and shipboard equipment for ships. Develop a plan for risk and schedule capabilities to PODAC cost model. Use PODAC cost model to analyze new technologies to validate model capabilities to correctly reflect acquisition cost impacts. Begin execution of plan to adapt and integrate an existing ship operating and support (O&S) cost module with the PODAC cost model. Link O&S cost analysis methodology with product work break down of PODAC cost model. Develop a link between PODAC and computer aided ship design tools, so that cost-related information produced by these design tools can be readily imported into the cost model. Support cost modeling and cost analysis for on-going ship programs.

- (U) ($0.102) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

- (U) Note: Affordability Through Commonality (ATC) program efforts are shown in PE 0603513N, Project 32469.

3. (U) FY 2000 PLAN:

- (U) ($0.935) Pre-Milestone 0 Ship Concepts and Mission Need Analysis: Develop ship concepts and perform mission area analysis (MAA) for potential ships 5-10 years out in the SCN plan, including ship size, configuration, capabilities and rough order of magnitude (ROM) ship costs. Conduct pre-Milestone 0 ship concept studies for LHA replacement (large deck amphibious assault ship), medical capabilities afloat, future mine countermeasures ships, and other potential ship concepts / configurations in support of SCN planning. Develop potential future fleet architecture concepts and high level ship concepts for the ships in these fleet concepts.

- (U) ($0.345) Total Ship Technology Assessment: Analyze the benefits and impacts of new ship and hull, mechanical & electrical (HM&E) concepts and technologies. Identify, characterize and assess new and emergent technologies and update the HM&E technology database. Support integration and transition of new technologies in total ship concepts. Update baseline ship concepts and technology attribute database for use in technology assessments. Support development of total ship and HM&E technology roadmaps.

- (U) ($1.178) Ship Design and Engineering Tools, Methods, and Criteria. Improve capability for rapid and accurate ship performance/cost/risk assessments and tradeoff studies and improve interoperability of Navy and shipbuilder design systems. Improve surface ship synthesis/assessment models in the following areas: improve performance assessment capabilities, increase ability to handle alternative distributed system architectures, update and enhance capabilities to handle new ship configurations, hull form alternatives, signature reduction features, characterize advanced machinery technologies, address minimum required shipboard manning, reduced construction cost, and increased capabilities to determine ship size impacts of new technologies. Continue development of interoperability standards and capability between and among: synthesis/assessment models, cost estimation models, operational effectiveness models, shipbuilder computer aided design (CAD) models, and Navy-developed analysis tools by participation in and support for collaborative efforts such as the Navy Industry Digital Data Exchange Standards Committee (NIDDESC) and the Maritech Advanced Shipbuilding Enterprise (ASE).

Exhibit R-2, RDT&E Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N / Demonstration & Validation BA-4	PROGRAM ELEMENT NAME AND NUMBER SHIP CONCEPT ADVANCED DESIGN, PE 0603563N	PROJECT NAME AND NUMBER DESIGN TOOLS, PLANS & CONCEPTS, PROJECT S2196

- (U) ($1.180) Simulation Based Ship Design & Engineering: Continue to adapt state-of-the-art visualization and simulation techniques for ship design and engineering applications. Review pending ship design needs and ship technology developments to identify top priority simulation requirements. Acquire, validate, adapt, and implement commercial visualization and simulation tools for the areas such as piping systems simulation and ergonomic models in crew reduction performance simulation. Validate and implement visualization and simulation tools from DARPA, ONR, and other government sources for areas such as ship motions, maneuvering, powering, personnel flow, stores flow, structural response, command and communications systems, electric power systems, piping systems, HVAC systems, and combat systems. Develop custom visualization and simulation tools where no alternate source exists in areas such as aircraft handling simulation, signature visualization and simulation. Continue development of interoperability standards and capability between visualization and simulation tools, ship synthesis/assessment models and computer aided design (CAD) models.

- (U) ($0.740) Reliability Based Structural Design Criteria: Begin development of methodology for overall strength analysis of surface ships. Add new reliability inputs and assessment techniques to design rules. Incorporate methods for predicting extreme and cumulative lifetime loads into design rules. Collect and analyze long-term hydrodynamic loads data. Correlate full scale loads measurements with model test results. Validate and adapt advanced seaway loads prediction methods for use with design rules. Develop methodology for bow form effects on hull loads. Establish safety indices for naval ship structures components (unstiffened and stiffened plates). Continue performing large scale grillage strength tests. Assessment of grillage strength test data. Update design data sheet for compressive strength of plating stiffeners and grillages. Begin integration of all four parts of the reliability-based load and resistance factor design (LRFD) structural rules for naval surface ships. Validate processes and utilize technologies/improved design methods on existing ships and new designs. Support transition to industry through the Ship Structure Committee (SSC).

- (U) ($0.940) Total Ownership Cost Methods and Modeling: Develop total ownership cost modeling and cost decision making tools for ships. Support Navy-Shipbuilding Industry cost model development team. Enhance the PODAC cost model capability to incorporate separately estimated cost for C4I and combat systems. Execute development plan for risk and schedule capabilities of PODAC cost model. Collect and analyze cost data of shipbuilders for development of activity based cost estimation factors. Continue to develop PODAC cost model estimating ratios for shipbuilding interim products, parametric scaleable systems, and shipboard equipment for ships. Develop cost estimation ratios for world class shipbuilding processes and practices and for new ship production processes, technologies, and materials. Continue integration of operating and support (O&S) cost modeling and analysis capabilities. Develop O&S cost estimating ratios for naval ships through analysis of VAMOSC and other historical O&S databases. Continue work on design data analysis module to link PODAC with computer-aided ship design tools.

- (U) Note: Affordability Through Commonality (ATC) program efforts transferred to PE 0603513N, Project 32469 in FY 2000 and out years.

Exhibit R-2, RDT&E Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N / Demonstration & Validation BA-4	PROGRAM ELEMENT NAME AND NUMBER SHIP CONCEPT ADVANCED DESIGN, PE 0603563N	PROJECT NAME AND NUMBER DESIGN TOOLS, PLANS & CONCEPTS, PROJECT S2196

B. Program Change Summary:

	FY 1998	FY 1999	FY 2000
FY 1999 President's Budget	15.713	14.900	14.019
Appropriated Value	16.198	14.900	
Adjustment to FY 1998 Appropriated Value/ FY 1999 President's Budget	-10.934	-7.823	-8.701
FY 2000/01 PRES Budget Submit	5.264	7.077	5.318

(U) Funding: FY 1998, FY 1999 and FY 2000 large funding changes reflect realignment of Affordability Through Commonality funding and efforts to PE 0603513N, Project 32469. FY 1998 funding also decreased due to Below Threshold Reprogramming actions, Congressional general adjustments and revised economic assumptions, and SBIR reduction. Note that actual FY 1998 executed funding was $6.276M. FY 2000 funding also decreased due to sponsor POM 00 modifications and outsourcing reductions.

(U) Schedule: None.

(U) Technical: None

C. Other Program Funding Summary: Not applicable.

(U) Related RDT&E
- (U) PE 0602121N (Surface Ship Technology)
- (U) PE 0603513N (Shipboard Systems Component Development)
- (U) PE 0603564N (Ship Preliminary Design and Feasibility Studies)
- (U) PE 0604300N (SC21 Total Ship Systems Engineering)
- (U) PE 0604567N (Ship Contract Design/Live Fire T&E)

D. Acquisition Strategy:
This is a non acquisition program that develops, demonstrates, evaluates, and validates early stage total ship concepts, architectures, tools, methods that are used by on-going and future ship acquisition programs.

Exhibit R-2, RDT&E Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N / Demonstration & Validation BA-4	PROGRAM ELEMENT NAME AND NUMBER SHIP CONCEPT ADVANCED DESIGN, PE 0603563N	PROJECT NAME AND NUMBER DESIGN TOOLS, PLANS & CONCEPTS, PROJECT S2196

E. Schedule Profile

	FY 1998	FY 1999	FY 2000	
Program Milestones	(Not applicable - Non-Acquisition Program)			
Engineering Milestones		Complete joint command ship concept studies 4Q	Complete LHA replacement concept studies 4Q	
	Complete Feasibility Tool (ASSET) Integration w/CAD II 4Q	Complete Feasibility Tool (ASSET) to Cost Model interface. 4Q	Complete Feasibility Tool interface to major operational assessment tool (eg NABEM II) 4Q	
	Complete "Focus Problem" CAD to analysis program demonstration project. 3Q	Simulation of Distributed Fluid Systems behavior 4Q	Visualization/Simulation of advanced aircraft handling station 4Q	
	Publish "Ship Engineering Framework" system architecture for collaborative, interoperable design system development. 4Q	Standardize interface mechanism (eg, STEP, COM) for design tool interoperability. 4Q	Publication of interface specifications for 20 analysis programs. 4Q	
	Stiffened Panel LRFD structural rules 4Q	Structural Fatigue LRFD structural rules 4Q	Safety indices for naval ship structures components (unstiffened and stiffened plates). 4Q	
	Updated design data sheet for fatigue of ship metal structures (DDS) 4Q	Establish safety indices for naval ship structures for hull girders. 4Q	Fracture & Grillage Tests of Shipyard Fabrication Specimens Complete 4Q	
	PODAC Cost Model Validation Complete at 2 shipyards 4Q	PODAC Cost Model Validation Complete at 2 additional shipyards 4Q		
		PODAC Cost Model Version 1 4Q		
Testing Milestones	(Not applicable - Non-Acquisition Program)			
Contract Milestones	(Not applicable - Non-Acquisition Program)			

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N / Demonstration & Validation BA-4	PROGRAM ELEMENT NAME AND NUMBER SHIP CONCEPT ADVANCED DESIGN, PE 0603563N	PROJECT NAME AND NUMBER DESIGN TOOLS, PLANS & CONCEPTS, PROJECT S2196

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering, Concept Development, Engineering Development, Demonstration & Evaluation	C/CPFF	Advanced Marine Enterprises (AME) Arlington, VA	5.006	0.700	Note (1)	0.600	Note (1)			Cont.	Cont.	N/A
Cost Model Development, Demonstration & Evaluation and Cost Analysis	C/CPFF	SPAR Assoc, Annapolis MD Note(2)	0.700	0.800	Note (2)	0.700	Note (2)			Cont.	Cont.	N/A
Systems Engineering, Concept Development, Engineering Development, Demonstration & Evaluation	various	Other Contractors	42.104	1.490	various	0.925	various			N/A	N/A	N/A
Systems Engineering, Concept Development, Engineering Development, Demonstration & Evaluation	WR	NSWC/Carderock Division, Carderock. MD	19.374	3.337	N/A	2.900	N/A			N/A	N/A	N/A
Systems Engineering, Concept Development, Engineering Development, Demonstration & Evaluation	WR & MIPR	Other Govt. Activities	6.593	0.750	N/A	0.193	N/A			N/A	N/A	N/A
Subtotal Product Development			73.777	7.077		5.318						
Remarks: Note (1): Existing Contract awarded April 1995. Modifications award 1st quarter of FY. Note (2): Existing Contract awarded March 1998. Modifications award 1st quarter of FY. This contract also includes Avondale Industries, New Orleans, LA; Bath Irons Works, Bath, ME; Ingalls Shipbuilding, Pascagoula, MS; NASSCO, San Diego, CA; Designers & Planners, Arlington, VA; and The University of Michigan Transportation Research Institute, Ann Arbor, MI												
Subtotal Support			0	0	N/A	0	N/A			N/A	N/A	N/A
Remarks:												
Subtotal T&E			0	0	N/A	0	N/A			N/A	N/A	N/A
Remarks: Demonstration & Evaluation Costs are included in product development cost category.												
Subtotal Management			0	0	N/A	0	N/A			N/A	N/A	N/A
Remarks:												
Total Cost			73.777	7.077		5.318						

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY:. RDT&E,N/4	R-1 ITEM NOMENCLATURE Ship Preliminary Design and Feasibility Studies -- 0603564N

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total PE Cost	17.721	8.929	12.012	17.000	33.015	37.359	7.859	0	0	164.426
S0408 Ship Feasibility Studies	6.675	2.017	12.012	17.000	33.015	37.359	7.859	0	0	151.468
S2609 ADC(X) Auxiliary Cargo Ship Development	0	5.914	0	0	0	0	0	0	0	5.914
S2610 SSBN To SSGN Analysis	0	.998	0	0	0	0	0	0	0	.998
22300 CV Feasibility Studies	0	0	0	0	0	0	0	0	0	
S2392Cruiser Conversion Studies	11.046	0	0	0	0	0	0	0	0	11.046
Quantity of RDT&E Articles & cost										

A. Mission Description and Budget Item Justification

(U) The primary objective of Ship Preliminary Design and Feasibility Studies is to design more capable warships at reduced cost, with reduced manning and increased producibility, utilizing the latest technologies. Modern day ship design and acquisition processes do not separate Preliminary and Contract Design. These are seamless design actions conducted between MS I and II. Therefore after FY 1996, design activities formerly conducted in this Program Element (P.E.) as Preliminary Design were combined under P.E. 0604567N, Ship Contract Design/Live Fire Test and Evaluation. This program dire ctly supports the Navy Shipbuilding Plan by performing ship Feasibility Studies.

(U) Project S0408 – Ship Development (Advanced), supports post Milestone 0 ship Feasibility Studies that provide the technical definition and initial cost estimates for various ship alternatives being considered in the Analysis of Alternatives (AOA). This project develops the primary supporting documentation for Milestone I decisions.

(U) Project S2392 – This program is funded to support planning yard feasibility studies in support of the CG47 Class Conversion Plan.

(U) Project S2609 – This program provides Auxiliary Dry Cargo (ADC(X)) Feasibility Studies and Analysis of Alternatives (AOA) support.

(U) Project S2610 – This program is funded to analyze the feasibility of converting some Trident SSBNs to the SSGN configuration.

(U) Project 22300 (formerly S2300) – The CV Feasibility Studies project has transitioned to P.E. 0603512N.

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY:. RDT&E,N/4	R-1 ITEM NOMENCLATURE Ship Preliminary Design and Feasibility Studies – 0603564N

B. Program Change Summary:

	FY 1998	FY 1999	FY 2000
FY 1999 President's Budget:	52.084	42.668	25.762
Appropriated Value:	53.682	44.596	
Adjustment to FY 1998/99 Appropriated Value/ FY 1999 President's Budget:	-35.363	-35.667	-13.750
FY 2000 PRESBUDG Submit:	17.721	8.929	12.012

Funding: FY 1998 Changes consist of: -31.124M FY 98/99 Comparability Adjustment -1.223M FY 98 SBIR Reduction; -1.497M FY 1998 BTR Issue, -.369M FY 1998 Updates and -.150M minor pricing adjustments.

FY 1999 Changes consist of : + 1.000M SSGN Study, +5.928M Transfer for ADC(X). Reductions: -35.159M PE Realignment to 0603512N/S2693, -.103M Revised Economic Assumptions, -.026M Civilian Personnel Underexecution, -.354M Contract Advisory & Assistance Services, -.025M FFRDC Reduction, and -5.000M CVX Feasibility Studies reduction.

FY 2000 Changes consist of: +12.000M Realignment for JCC(X), -10.300M LH(X) transfer; -15.428M Other Programmatic Adjustments; and -.022M Additional Inflation Reduction.

Schedule: Not applicable.

Technical: Not applicable.

Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	P.E. Ship Preliminary Design & Feasibility Studies – 0603564N	Ship Feasibility Studies - S0408	

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	6.675	2.017	12.012	17.000	33.015	37.359	7.859	0	0	151.468
RDT&E Articles Qty										

A. (U) Mission Description and Budget Item Justification. Ship concepts, identified in PE 0603563N (Ship Concept Advanced Design) are transitioned to and further developed by this project after an approved Milestone 0 (MS 0) decision. This project performs the Ship Feasibility Studies required after MS 0 to address a specific Mission Needs Statement (MNS) and supports the Analysis of Alternatives(AOA) for new surface ships in the Navy Shipbuilding Plan; performs impact studies of warfare, hull, mechanical and electrical subsystems on advanced ship designs; develops the initial documentation and design methodology required by the government for the design of surface ships in the Shipbuilding Program in accordance with the requirements of the DoD 5000 directives/instructions; supports the development of the Operational Requirements Document (ORD) and other documentation required at Milestone I; develops and evaluates conventional and unconventional hull form alternatives suitable for future acquisition in support of a Milestone I decision. Completion of this phase allows review and approval, at Milestone I, to transfer a ship program to the Contract Design Program Element 0604567N. Ship Feasibility Study products include a description of the alternative ships' principal characteristics and mission critical subsystems, weight estimates, general arrangement sketches, technical risk assessments, and Class F cost estimates. The objective is to provide the decision makers with feasible, affordable alternatives.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:

- (U) ($6.675) Continued ADC(X) Ship Feasibility Studies, AOA support and preparation of documentation required for a Milestone I decision. Began CG 47 Class Cruiser Conversion feasibility studies under project S2392.

2. (U) FY 1999 PLAN:

- (U) ($1.971) Feasibility Studies and AOA support will begin for a new class of helicopter carrier, LH(X) following a Milestone 0 decision
- (U) ($ .046) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLAN:

- (U) ($12.012) Pre-Milestone I Feasibility Studies for a new Joint Command and Control (JCC(X)) Ship.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA 4	P.E. Ship Preliminary Design & Feasibility Studies – 0603564N	Ship Feasibility Studies - S0408

B. (U) Other Program Funding Summary: Not applicable.

FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost

(U) Related RDT&E:
- (U) PE 0603563N (Ship Concept Advanced Design)
- (U) PE 0604567N (Ship Contract Design/Live Fire T&E)
- (U) PE 0603508N (Ship Propulsion System)
- (U) PE 0602121N (Surface Ship Technology)
- (U) PE 0603573N (Advanced Surface Machinery Systems)
- (U) PE 0603512N (CarrierSystems Development)

C. (U) Acquisition Strategy: Not applicable.

D. (U) Schedule Profile

	FY 1998	FY 1999	FY 2000
Program Milestones	1Q DD21 MS I	2Q LH (X) MS 0	4Q JCC(X) MS I
Engineering Milestones	TBD – Milestone schedule is established at MS I.		
T&E Milestones	See individual ship acquisition program documentation.		
Contract Milestones	See individual ship acquisition program documentation.		

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY: RDT&E,N/BA4	PROGRAM ELEMENT NAME AND NUMBER Ship Preliminary Design and Feasibility Studies – 0603564N	PROJECT NAME AND NUMBER Ship Feasibility Studies – S0408

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total Pys Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	WR	NSWC Dahlgren,	8.842	0		0		14.629	23.471	
	PD	VA	3.100	0		0		0	3.100	
		SUPSHIP,	0	0		6.0		0	6.0	
	WR/Reqn	Pascagoula	7.458	.200	Various	1.0		19.172	27.830	
	Comp	SPAWAR	6.939	0	Various	0		23.172	30.111	
		Other Government								
	Comp	Applied Physics Lab,	5.857	0	Various	0		10.002	15.859	
	Comp	MD	9.830	1.817	Various	5.012	Various	28.258	44.917	
		J.J. McMullen, VA								
		Other Contractor								
Subtotal Product Development			42.026	2.017		12.012		95.233	151.29	
Remarks:										
Support: Not applicable.										
Subtotal Support			N/A	N/A		N/A		N/A	N/A	
Remarks:										
T&E: Not applicable										
Subtotal T&E			N/A	N/A		N/A		N/A	N/A	
Remarks:										
Management	Comp	Various	.180	0		0		0	.180	
Subtotal Management			.180	0		0		0	.180	
Remarks:										
Total Cost			42.206	2.017		12.012		95.233	151.468	

Exhibit R-2, RDT&E Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/4	R-1 ITEM NOMENCLATURE ADVANCED SURFACE MACHINERY/0603573N	

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total P.E. Cost	29.514	34.444*	17.727	3.664	3.664	2.747	1.829	0	Cont	Cont
Advanced Surface Machinery/S1314	29.514	34.444	17.727	3.664	3.664	2.747	1.829	0	Cont	Cont
Quantity of RDT&E Articles & Cost: N/A										

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: Advanced Surface Machinery (ASM) Programs develop affordable advanced machinery and subsystems for surface ship propulsion, electric and auxiliary requirements

(U) ICR Gas Turbine Engine. The ICR Gas Turbine Engine is a next generation marine propulsion gas turbine. ICR will reduce life cycle fuel cost and provide a minimum impact alternative to increase range.

(U) A contract for ICR Advanced Development (AD) with an option for Full Scale Development was awarded to Westinghouse Electric Corporation in December 1991. The ICR is derived from the Rolls-Royce RB211 aircraft engine and through the introduction of an intercooled, recuperator, and variable area nozzles achieves approximately a 25% to 27% propulsion annual fuel savings when compared to the LM2500 on a mechanical drive ship. The RB211 is a commercial aircraft engine with over 2000 engines delivered to date and production projected well into the next century.

(U) ICR developmental full scale system testing began in July 1994 and is continuing at Pyestock, U. K.. Recuperator recovery efforts are continuing following the failure in January 1995 of the initial recuperator. A second generation recuperator, which is the exhaust heat recovery unit that provides most of the fuel efficiency gains, was delivered to the test site in December 1995. To date a series of eight (8) engine tests have been completed with over 1400 hours of successful testing including over 1150 hours with the redesigned recuperator which performed satisfactorily. Tests to date have met objectives.

* This amount includes a proposed $10.1 million reprogramming action

(U) A Cooperative Agreement between the United Kingdom (U.K.) and United States governments was signed by USD(A&T) on 21 June 1994 and revised in March 1997 for in-kind and cash contributions to the ICR program. A Cooperative Agreement between the French and United States governments was signed by ASN(RD&A) on 30 August 95 for in-kind and cash contributions to the ICR program.

(U) The FY1998 and FY 1999 funds for Integrated Power Systems (IPS) were budgeted and executed under P.E. 0603573N/Project S1314. IPS funding has transitioned to P.E. 06031513N/Project 32471 for both budget and execution in FY 2000 and out.

Exhibit R-2, RDT&E Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/4	R-1 ITEM NOMENCLATURE ADVANCED SURFACE MACHINERY/0603573N	

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:

- (U) ($ 28.648) ICR: Initiated manufacture of Engineering Developmental Model (EDM) recuperator. Completed Design Review Four (DR4) Performed testing on B/4 engine. Testing included high pressure turbine metal temperature measurements and functional and performance testing. Initiated strip and inspection of the B/4 engine.

- (U) ($ .866) Systems Engineering: Perform module development, systems integration and other systems engineering tasks required to maintain the ICR engine as viable candidate for the DD21.

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2. (U) FY 1999 PLAN:

- (U) ($33.939*) ICR: Complete the manufacture and deliver the EDM recuperator. Install the recuperator at the Royal Navy test facility in Pyestock and perform the last development test at Pyestock. Initiate a 500 hour development and endurance test at NAVSSES, Philadelphia. The test site will be configured for ICR testing. The engine, recuperator, enclosure and all ancillary hardware will be delivered to the site, assembled and installed. Test running will begin. Modification of the Memoranda of Understanding with the U.K. and France will complete. This modification will implement the "Essential Program".
  * Includes proposed $10.1 million reprogramming action.

- (U) ($ .505) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638..

3. (U) FY 2000 PLAN:

- (U) ($17.727) ICR: The 500 hour development and endurance test at NAVSSES, Philadelphia will complete. A final development Design Review called DR5 will be conducted. Following this design review, the development portion of the "Essential Program" will be complete. At that time, the joint U.S./U.K. and U.S./France programs will be transitioned to U.K./France for management of the qualification portion of the program. The U.S. Navy will remain engaged in Allied qualification efforts to ensure that qualification testing and test results comply with US Navy requirements.

Exhibit R-2, RDT&E Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/4	R-1 ITEM NOMENCLATURE ADVANCED SURFACE MACHINERY/0603573N	

B. Program Change Summary:

	FY 1998	FY 1999	FY 2000
FY 1999 President's Budget:	46.324	58.419	83.821
Appropriated Value:	49.741	58.419	
Adjustments to FY 1998 Appropriated/			
FY 1999 President's Budget:	-20.227	-34.075	-66.094
FY 2000/01 OSD Budget Submit:	29.514	24.344	17.727

Funding: FY 1998 reductions –19.600K Programmatic Adjustments, -1.311K General Reductions, -1.125K SBIR Reduction, -.993K Execution Updates, -.106K Economic Assumptions. FY 1998 increases include: +2.908K Below Threshold Reprogramming.

FY 1999: reductions –.134K Revised Economic Assumptions, –.012K Civpers Underexcution, –34.014K Programmatic Adjustment. Increase include .085K Restructure/Adjustment

FY 2000: -73.800K Programmatic Adjustments, -.031K Outsourcing adjustments, -.273K Economic Assumptions. Increases include 7.700K Essential Program, .030K NWCF Rates – Naval Surface Warfare and .280K NATO Research and Development.

Schedule: ICR - No change. IPS program transitions to P.E. 0603513N/Project 32471, in FY 2000.

Technical: IPS program transitions to P.E. 0603513N/Project 32471 in FY 2000. In FY 2000, the ICR program will transition the qualification portion of program to Allied countries for completion.

C. Other Program Funding Summary:

FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost

D. Acquisition Strategy: IPS and ICR are candidate systems for DD-21

Exhibit R-2, RDT&E Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/4	R-1 ITEM NOMENCLATURE ADVANCED SURFACE MACHINERY/0603573N	

E. Schedule Profile:

ICR Engine Schedule

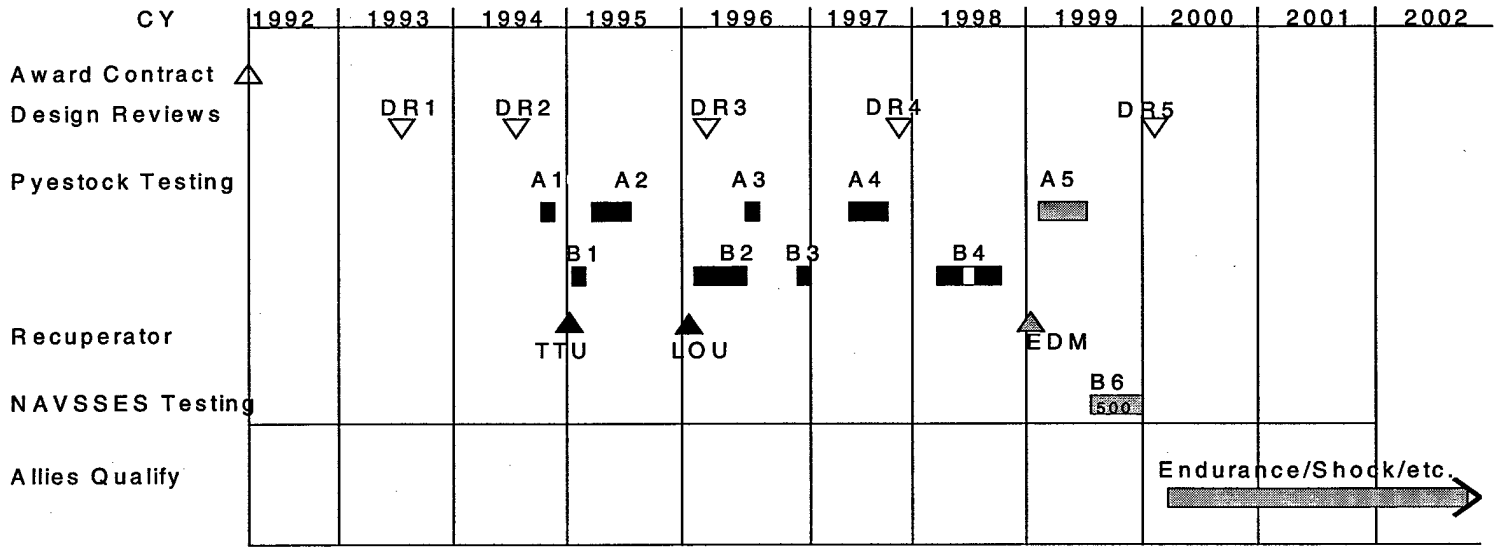


Exhibit R-3 Cost Analysis ($ in millions)		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/4	PROGRAM ELEMENT NAME AND NUMBER ADVANCED SURFACE MACHINERY/0603573N	PROJECT NAME AND NUMBER ADVANCED SURFACE MACHINERY/S1314

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total Pys Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	C/CPAF	Northrop Grumman, Sunnyvale ,CA	119.165	18.562	Nov 98	13.780	Nov 99	CONT.	CONT.	CONT.
Ancillary Hardware Development										
Systems Engineering										
Licenses										
Tooling										
GFE										
Award Fees	C/CPAF	Northrop Grumman, Sunnyvale ,CA	2.522	.882	Aug 99	1.009	July 00	CONT.	CONT.	CONT.
Subtotal Product Development			121.687	19.444		14.789		CONT.	CONT.	CONT.
Remarks										

Exhibit R-3 Cost Analysis ($ in millions)		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/4	PROGRAM ELEMENT NAME AND NUMBER ADVANCED SURFACE MACHINERY/0603573N	PROJECT NAME AND NUMBER ADVANCED SURFACE MACHINERY/S1314

Development Support	C/CPFF	GRC/Arlington, VA	.208	.250	Oct 98	.250	Oct 99	CONT.	CONT.	CONT.
Software Development										
Training Development										
Integrated Logistics Support										
Configuration Management										
Technical Data										
GFE										
Subtotal Support			.208	.250		.250		CONT	CONT	CONT
Remarks:										
Developmental Test & Evaluation	WR	NSWC/CD Phila,PA	1.770	3.350	Oct 98	.879	Oct 99	CONT	CONT	CONT
Operational Test & Evaluation										
Tooling										
GFE										
Subtotal T&E			1.770	3.350		.879		CONT	CONT	CONT
Remarks:										

Exhibit R-3 Cost Analysis ($ in millions)		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/4	PROGRAM ELEMENT NAME AND NUMBER ADVANCED SURFACE MACHINERY/0603573N	PROJECT NAME AND NUMBER ADVANCED SURFACE MACHINERY/S1314

Contractor Engineering Support										
Government Engineering Support	WR	NSWC/CD Phila,PA	5.415	1.200		1.709		CONT	CONT	CONT
Program Management Support										
Program Management Personnel										
Travel			338	.100		.100		CONT	CONT	CONT
Labor (Research Personnel)										
Overhead										
Subtotal Management			5.753	1.300		1.809		CONT	CONT	CONT
Remarks:										
Total Cost			129.418	24.344		17.727		CONT	CONT	CONT
Remarks:										

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY **RDT&E/BUDGET ACTIVITY 4**	R-1 ITEM NOMENCLATURE Program Element (PE) Name and No. COMBAT SYTEMS INTEGRATION PE 0603582N

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total P.E. Cost										
Combat System Integration S0164	11.1	39.2*	46.7	24.3	24.4	23.6	23.8	24.0	CONT.	CONT.
Quantity of RDT&E Articles & cost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

A. Mission Description and Budget Item Justification: This project provides shore based testing of integrated combat direction, weapon, sensor and computing systems prior to their installation in operational fleet units. The operational computer programs are assembled and tested to assure proper configuration and interoperability in a test environment similar to their ultimate shipboard operational environment. Included is operational assessment testing of the integrated suite of computer programs. Additionally, with issuance of CNO MSG DTG 021648Z May 1998, on Battle Group Interoperability (BGI), this program includes Battle Group (BG)/Battle Force (BF) requirements engineering, analysis, BG/BF configuration management and BG Interoperability testing which is a prerequisite for operational Certification of the battle group configuration. This is the only opportunity for comprehensive interoperability testing of combat system and C4I configuration items prior to shipboard delivery for operational use in surface combatant platforms and battle group units. Configuration control is maintained by updates to the Surface Combat System Master Plan (SSCSMP).

* FY 1999 amount includes a planned prior approval reprogramming of $30 million to fund continued development of a distributed engineering "plant" to support interoperability testing as well as the development of prototype interoperability profiles and correction of deficiencies for deploying battle groups in 1999 and 2000.

PROGRAM ACCOMPLISHMENTS AND PLANS:

1. FY 1998 ACOMMPLISHMENTS:

- (U) ($5.5) Conducted combat system integration testing of Advanced Combat Direction System (ACDS) Block1 upgrades, Cooperative Engagement Capability (CEC) Baseline 1 and Ship Self Defense System (SSDS) in CV/CVN, LHD, LHA and LSD ship classes.

- (U) ($4.3) Continued design and development of test beds for CVN 68, CVN 76 and LPD 17 Classes. Continued planning for out-year testing including simulation system, test bed and test procedures design and development. Initiated planning, design and development of test beds and Distributed Engineering Plant (DEP) to support battle group interoperability testing for USS THEODORE ROOSEVELT, USS CONSTELLATION AND USS JOHN F. KENNEDY.

- (U) ($1.0) Continued execution of D-30 Process including; Battle Group Action Officer (BGAO)efforts, BG Change Control Process, Land Based Triage, BG Capabilities and Limitations Report and Engineering assessments.

- (U) ($.3) Continued SSCSMP updates.

2. FY 1999 PLAN:

- (U) ($7.2) Conduct integration testing of Advanced Combat Direction System (ACDS) of Block 1, Cooperative Engagement Capability (CEC) Baseline 1 and Ships Self Defense System (SSDS) in CV/CVN, LHD, LHA and LSD Classes. Conduct Battle Group Integration Testing (BGIT) in USS THEODORE ROOSEVELT, USS CONSTELLATION AND USS JOHN F. KENNEDY Carrier Battle Groups (CVBGs). Develop the test plans and procedures to support Certification of platform combat systems, C4I systems and Battle Group Interoperability (BGI).

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY **RDT&E/BUDGET ACTIVITY 4**	R-1 ITEM NOMENCLATURE Program Element (PE) Name and No. COMBAT SYTEMS INTEGRATION PE 0603582N

2. FY 1999 PLAN Continued:

- (U) ($6.0) Continue execution of D-30 Process including; Battle Group Action Officer (BGAO) efforts, BG Change Control Process, Land Based Triage, BG Capabilities and Limitations Report and Engineering assessments.
- (U) ($9.0) Initiate the development of Warfare Systems Engineering Requirements. Conduct BG related sytems engineering efforts, to include Design Reference Mission (DRM) and Analysis of Alternatives studies (AOA).
- (U) ($16.6) Continue design and development of platform test beds to include test networks for the CVN 68, CVN 76 and LPD 17 classes. Conclude development of DEP Phase 0 JFK BG configuration. Continue development of DEP phases 1 and 2. Prepare test beds to support battle group interoperability testing for USS STENNIS, USS DWIGHT D. EISENHOWER AND USS HARRY S. TRUMAN. Continue planning and preparations for out-year testing including simulation system, test bed and test procedures design and development.
- (U) ($.3) Continue SSCSMP updates.
- (U) ($.1) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

3. FY 2000 PLAN:

- (U) ($7.0) Conduct integration testing of Integrated Combat Direction System (ICDS) Block 1, Cooperative Engagement Capability (CEC) Baseline 2 and Integrated Ships Defense System (ISDS) in CV/CVN, LHD, LSD, LHA and LPD Ship Classes. Conduct Battle Group Integration Testing (BGIT) in USS STENNIS, USS DWIGHT D. EISENHOWER AND USS HARRY S. TRUMAN CVBGs. Develop the test plans and procedures to support Certification of platform combat systems, C4I systems and Battle Group Interoperability (BGI).
- (U) ($24.4) Continue planning and preparations for out-year testing including simulation system, test bed and test procedures design and development. Prepare test beds to support battle group interoperability testing for USS ABRAHAM LINCOLN, USS GEORGE WASHINGTON AND USS CONSTELLATION. Conclude DEP Phases 1/2.
- (U) ($9.0) Continue Warfare Systems Engineering Requirements development. Conduct BG related sytems engineering efforts, to include Design Reference Mission (DRM) and Analysis of Alternatives studies (AOA).
- (U) ($6.0) Continue execution of D-30 Process including; BGAO efforts, BG Change Control Process, Land Based Triage, BG Capabilities and Limitations Report and Engineering assessments.
- (U) ($.3) Continue SSCSMP updates.

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY **RDT&E/BUDGET ACTIVITY 4**	R-1 ITEM NOMENCLATURE Program Element (PE) Name and No. COMBAT SYTEMS INTEGRATION PE 0603582N

B. Program Change Summary:

	FY 1998	FY 1999	FY 2000
FY 1999 President's Budget:	7.4	9.7	9.4
Appropriated Value:	7.7	9.7	
Adjustment to FY 1998 Appropriated Value/ FY 1999 President's Budget			
a. Adjustments	+3.4	+29.6	+37.4
FY 2000 PRESBUDG Submit:	11.1	39.2	46.7

Funding: FY 1998: Increase by programming for Battle Group Interoperability (BGI) efforts (+$3,809); Minor Pricing Adjustments (-$360).
FY 1999: Increase by programming for Battle Group Interoperability (BGI) efforts (+$30,000); Undistributed reductions (-$406).
FY 2000: Increase by programming for Battle Group Interoperability (BGI) efforts (+$38,000); Rate adjustments, undistributed reductions (-$601).

Schedule: Not applicable.

Technical: Not applicable.

C. Other Program Funding Summary: Not applicable.

Related RDT&E: Computer programs developed under these programs are tested in their integrated configuration.

PE 0204571N (Consolidated Training Systems Development)
PE 0205620N (Surface ASW Combat System Technology)
PE 0603382N (Advanced Combat System Technology)
PE 0603755N (Ship Self Defense)
PE 0603852N (Cooperative Engagement Capability)
PE 0604518N (CIC Conversion)
PE 0604755N (Ship Self Defense)
PE 0603514N (Ship Combat Survivability)

Acquisition Strategy: Not applicable.

D. Schedule Profile: Not applicable.

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/BUDGET ACTIVITY 4	PROGRAM ELEMENT NAME AND NUMBER Combat System Integration PE 0603582N	PROJECT NAME AND NUMBER Combat System Integration S0164

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development												
Ancillary Hardware Development												
Systems Engineering												
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development												
Remarks: Not applicable.												
Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support												
Remarks: Not applicable.												

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/BUDGET ACTIVITY 4	PROGRAM ELEMENT NAME AND NUMBER Combat System Integration PE 0603582N	PROJECT NAME AND NUMBER Combat System Integration S0164

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total Pys Cost	FY99 Cost	FY99 Award Date	Fy00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Integration Interoperability Testing	WR/RC WR/RC MIPR MIPR	NSWC PHD NSWC DD JPO DISA JPO GSA	5.7 1.6 1.0 0.5	8.4 14.5	VAR.	10.2 20.2	VAR.			CONT.	CONT.	
BG Interop Eng & Analysis	WR/RC	NSWC PHD NSWC DD	1.0	6.0 8.0	VAR.	6.0 8.0	VAR.			CONT.	CONT.	
Contract Engineering Support	VAR.	VARIOUS	1.3	2.3	VAR.	2.3	VAR.			CONT.	CONT.	
Travel		NAVSEA Travel	.04	.04		.04				CONT.	CONT.	
Subtotal Test & Evaluation			11.1	39.2		46.7						
Remarks:												
Program Management Support												
Program Management Personnel												
Travel												
Labor (Research Personnel)												
Overhead												
Subtotal Management												
Remarks: Not applicable.												
Total Cost			11.1	39.2		46.7				CONT.	CONT.	
Remarks:												

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY 1319 / BA 4	R-1 ITEM NOMENCLATURE Conventional Munitions / 0603609N

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total P.E. Cost	36.870	40.596	34.309	31.318	29.791	30.307	30.882	38.160	Continuing	Continuing
K2299 Non-Nuclear Expendable Ordnance (NNEO)	1.732	2.287	1.360	.895	.959	.981	1.005	1.030	Continuing	Continuing
S0363 Insensitive Munitions Advanced Development	9.826	12.449	8.177	9.875	9.946	9.944	10.004	16.753	Continuing	Continuing
S2611 Env Safe Energetic Materials		.998								
K1821/U1821 Conventional Fuze/Warhead Package	21.351	24.862	24.772	20.548	18.886	19.382	19.873	20.377	Continuing	Continuing
K2393/U2393 Optical Correlator Tech.	3.961	0	0	0	0	0	0	0	0	3.961
Quantity of RDT&E Articles & cost										

A. Mission Description and Budget Item Justification

Non-Nuclear Expendable Ordnance (NNEO) (Project K2299): This item addresses improvements to Navy surface launched (2T) non-nuclear expendable ordnance. It supports transition of the Multi-Function Fuze from Engineering and Manufacturing Development (E&MD) to production

Insensitive Munitions Advanced Development (IMAD) (Project S0363): 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 IMAD program will provide, validate, and transition technology for explosives, propellants, and ordnance to enable production of munitions insensitive to unplanned stimuli with no reduction to combat performance.

Environmentally Safe Energetic Materials (Project S2611): This project will mature and demonstrate energetic materials and processes for explosives, propellants, and pyrotechnics which minimize or eliminate any adverse environmental impact normally associated with these materials in production and demilitarization. These new environmentally safe materials will meet insensitive munitions and system performance requirements while lowering the total ownership costs of the weapon systems.

Conventional Fuze/Warhead Package (Project U1821): The Navy requires improved lethality of air and surface launched ordnance to defeat advanced threats. Current specific requirements and initiatives to address them include: the ability to defeat anti-ship missiles attacking at extremely low altitudes by improving SPARROW Missile through the Missile Homing Improvement Program (MHIP) to counter deceptive countermeasures; demonstrate advance missile advance missile fuzing systems to defeat extremely low altitude and low observable targets with the Advance Threat Fuze; develop advanced integrated guidance /fuzing and warhead mass-focusing systems to increase lethality against current and emerging threats. This project will, in future years, also provide the vehicle to address emergent requirements by transitioning mature fuze and warhead technology from conceptual developments to engineering development with minimum technical and financial risk.

Optical Correlator Technology (Project U2393): The purpose of this effort is to enhance next generation Target Discrimination and Aimpoint selection performance.

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY 1319 / BA 4	R-1 ITEM NOMENCLATURE Conventional Munitions / 0603609N

B. Program Change Summary:

	FY 1998	FY 1999	FY 2000
FY 1999 President's Budget:	37.236	39.775	48.766
Appropriated Value:	38.390	40.775	
Adjustment to FY 1998 Appropriated Value/			
FY 1999 President's Budget:			
a. SBIR reduction	-0.441		
b. Congressional undistributed reduction	-1.054		
c. Minor pricing adjustments	0.162	-0.179	0.041
d. Below threshhold reprogramming	-0.187		
e. Congressional program increase		1.000	
f. PBD 606 Civilian pay rates			0.206
g. PBD 604 inflation			-0.498
h. PBD 426 working capitol			-0.099
i. N86 priority item offsets			-6.660
j. Insensitive munitions decrease			-4.600
k. Low expenditure rate			-2.847
FY 2000 President's Budget Submit:	36.870	40.596	34.309

Schedule: Not applicable.
Technical: Not applicable

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY 1319/4	Program Element Name & No. Convention Munitions/0603609N	Project Name and Number. Non-Nuclear Expendable Ordnance (NNEO) K2299

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	1.732	2.287	1.360	.895	.959	.981	1.005	1.030	Continuing	Continuing
RDT&E Articles Qty										

A. Mission Description and Budget Item Justification:

This budget item addresses improvements to Navy surface launched (2T) non-nuclear expendable ordnance (NNEO) outside existing operational requirements. The commodities comprising 2T NNEO are: Major and medium caliber gun ammunition, small arms ammunition, other ship gun ammunition, pyrotechnics, and demolition items. There are no other RDT&E budget items supporting the 2T NNEO program. This project supports the Multi-function Fuze (MFF), Mk 2 Grenade proximity Fuze and Cargo Competent Fuzes. These fuzes will be used with 5"/54 gun ammunition.

FY 98 PLANS: ($1.732) Multi- Function Fuze (MFF): Incorporate pre-planned product improvement programs to reduce fuze unit cost and increase producibility. P^3I items include: new battery and semiconductor bridgewire.

FY 99 PLANS: ($2.269) Multi-Function Fuze (MFF): Incorporate changes to the design of the fuze which reduces cost, increase producibility and improves performance. P^3I items include: new battery and semiconductor bridgewire. Achieve Milestone III.
($.018) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

FY 00 PLANS: ($1.360) Multi-Function Fuze (MFF): Incorporate pre-planned product improvement programs to reduce fuze unit cost, increase producibility and performance. P^3I items include: multi-plexing air mode and initial velocity sensor.

B. Other Program Funding Summary

1. (U) Related RDT&E: PE 0603795 (Naval Surface Fire Support)
2. (U) The 5"/54 Improved Conventional Munition projectile will be qualified with the MFF. MS III scheduled for 3Q FY 1999.

Procurement of Ammunition, Navy and Marine Corps (PANMC) 5"/54 Ammunition, BLIN 025000, Cost Code AC893 (Reno)

FY1998	FY1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	To FY 2005	Total Complete	Cost
0.0	11.0	6.2	8.8	9.0	9.3	9.4	9.5	TBD	TBD

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY 1319/4	Program Element Name & No. Convention Munitions/0603609N	Project Name and Number. Non-Nuclear Expendable Ordnance (NNEO) K2299

C. Acquisition Strategy: Award 5-Year (Multi-Year) Contract for MFF. As P^3I are completed, they will be incorporated into the next production lot.

D. Schedule Profile

	FY 1998	FY 1999	FY 2000
Program Milestones		3Q MSIII 4Q IOC	
Engineering Milestones			
T&E Milestones		1Q TECHEVAL OPEVAL	1Q TECHEVAL P^3I 1Q OPEVAL P^3I
Contract Milestones		3Q PRODUCTION 3Q P^3I	1Q PRODUCTION P^3I

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY 1319/4	PROGRAM ELEMENT NAME AND NUMBER Conventional Munition/0603609N	PROJECT NAME AND NUMBER Non-Nuclear Expendable Ord (NNEO) K2299

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total Pys Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	WR C/CPFF SS/CPFF	DAH ALLIANT MOTORALA	.254 .322 .300	.753 .536 .200	VAR VAR VAR	.241 .094 .150	VAR VAR VAR			CONT. CONT. CONT.	CONT. CONT. CONT.	N/A N/A N/A
Ancillary Hardware Development												
Systems Engineering												
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development			.876	1.489		.485				CONT.	CONT.	N/A
Remarks:												
Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support												
Remarks												

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY 1319/4	PROGRAM ELEMENT NAME AND NUMBER Conventional Munition/0603609N	PROJECT NAME AND NUMBER Non-Nuclear Expendable Ord (NNEO) K2299

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total Pys Cost	FY99 Cost	FY99 Award Date	Fy00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR WR	DAH CHINA LAKE	.208 .150	.150 .200	VAR VAR	.375 .200	VAR VAR			CONT. CONT.	CONT. CONT.	N/A N/A
Operational Test & Evaluation	WR	COMOPTEVFOR	.400	.148	VAR	0						
Tooling												
GFE												
Subtotal T&E			.758	.498		.575				CONT.	CONT.	N/A
Remarks:												
Contractor Engineering Support												
Government Engineering Support	WR	DAH	.200	.200	11/98	.200	11/99			CONT.	CONT.	N/A
Program Management Support	WR	DAH	.054	.080	11/98	.080	11/.99			CONT.	CONT.	N/A
Program Management Personnel												
Travel	WR	DAH	.010	.010	11/98	.010	11/99			CONT.	CONT.	N/A
Labor (Research Personnel)												
Overhead/MISC	WR	DAH	.010	.010	11/98	.010	11/99			CONT.	CONT.	N/A
Subtotal Management			.274	.300		.300				CONT.	CONT.	N/A
Remarks:												
Total Cost:			1.908	2.269		1.360				CONT.	CONT.	N/A

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA4	Program Element Name & No. CONVENTIONAL MUNITIONS/0603609N	Project Name and Number. INSENSITIVE MUNITIONS ADVANCED DEVELOPMENT/S0363

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	9.826	12.449	8.177	9.875	9.946	9.944	10.004	16.753	CONT	CONT
RDT&E Articles Qty										

A. (U) Mission Description and Budget Item Justification:
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 all new weapon developments and priority weapon systems and enable production of munitions insensitive to these stimuli with no reduction in combat performance. The Insensitive Munitions (IM) Advanced Development Program is the Navy's focused effort on propellants, propulsion units, explosives, warheads, fuzes and pyrotechnics to reduce the severity of cook-off and bullet/fragment impact reactions, minimizing the 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 subtasks 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 other Military Departments, NATO and allied countries to eliminate redundant efforts and maximize efficiency. A joint service IM requirement has been developed. Insensitive munitions are identified as a DoD critical technology requirement and considered as part of a weapon design per DoD 5000.2R.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:

- (U) ($1.239) Validated and assessed weapon systems POA&Ms for IM compliance. Compiled and analyzed weapon system, energetic material and generic technology IM test data.

- (U) ($3.300) Demonstrated high explosives that showed improved IM characteristics while maintaining or improving operational performance. Completed scale-up of a castable CL-20 based explosive, and initiated performance and vulnerability testing. Continued qualification of improved underwater explosives. Continued development of enhanced blast and low cost metal accelerating explosives.

- (U) ($4.400) Evaluated and demonstrated IM propellants and propulsion systems which provided improved or comparable performance to in-service systems and better IM characteristics. Combined candidate IM propellants and case concepts to demonstrate compliance with IM and performance requirements. Completed demonstration and evaluation of prototype IM advanced booster propulsion systems for large diameter, 13-inch or greater, rocket motors for surface missile systems (SMS). Demonstrated high stiffness composite motor cases

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA4	Program Element Name & No. CONVENTIONAL MUNITIONS/0603609N	Project Name and Number. INSENSITIVE MUNITIONS ADVANCED DEVELOPMENT/S0363

- (U) ($0.887) Continued evaluation of IM ordnance concepts. Conducted system demonstrations of new high explosives combined with improved warhead and booster for potential application to JSOW unitary variant. Continued modeling application that reduced and enhanced IM warhead design and test efforts.

2. (U) FY 1999 PLAN:

- (U) ($1.575) Validate and assess weapon systems POA&Ms for IM compliance. Compile and analyze weapon system, energetic material and generic technology IM test data.

- (U) ($4.200) Demonstrate high explosives that show improved IM characteristics while maintaining or improving operational performance. Demonstrate deformable high explosives for new Anti-Air-Warfare Warheads. Demonstrate internal blast explosive and high perfomance pressed metal accelerating explosives and begin qualification when warranted. Qualify an insensitive high bubble energy underwater explosive. Complete qualification of a castable CL-20 based explosive and low cost metal accelerating explosive.

- (U) ($1.075) Evaluate IM ordnance concepts. Conduct system demonstrations of new high explosives combined with improved warhead and booster designed to support technology transitions. Continue modeling applications that reduce and enhance IM warhead design and test efforts.

- (U) ($5.581) Evaluate and demonstrate IM propellants and propulsion systems which provide improved or comparable performance to in-service systems and better IM characteristics. Combine candidate IM propellants and case concepts to demonstrate compliance with IM and performance requirements. Initiate scale-up, performance and vulnerability testing of ADN based propellant. Demonstrate performance of super high-pressure composite case motor. Demonstrate insensitive high-energy booster propellants and motors.

- (U) ($0.018) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLAN:

- ($1.450) Continue validation and assessment of weapon systems POA&Ms for IM compliance. Continue compilation and analysis of weapon system, energetic material and generic technology IM test data.

- (U) ($2.940) Demonstrate high explosives that show improved IM characteristics while maintaining or improving operational performance.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA4	Program Element Name & No. CONVENTIONAL MUNITIONS/0603609N	Project Name and Number. INSENSITIVE MUNITIONS ADVANCED DEVELOPMENT/S0363

Demonstrate high performance cast explosive. Initiate qualification of internal blast explosive, high performance pressed metal accelerating explosive and deformable explosive and transition to weapon systems. Begin qualification of high performance, low cost replacement for initiator explosives. Complete qualification of high performance booster explosive.

- (U) ($1.000) Evaluate IM ordnance concepts. Conduct system demonstrations of new high explosives combined with improved warhead and booster designed to support technology transitions. Continue modeling applications that reduce and enhance IM warhead design and test efforts.

- (U) ($2.787) Evaluate and demonstrate IM propellants and propulsion systems which provide improved or comparable performance to in-service systems and better IM characteristics. Combine candidate IM propellants and case concepts to demonstrate compliance with IM and performance requirements. Complete scale-up, performance and vulnerability testing of ADN based propellant. Demonstrate an insensitive, multi-mission, high performance rocket motor. Evaluate and demonstrate hybrid rocket motor concepts for IM compliance. Demonstrate high-pressure propellants in high-pressure composite motor cases.

B. (U) OTHER PROGRAM FUNDING SUMMARY: NOT APPLICABLE

(U) RELATED RDT&E:

(U) PE 0601153N (Defense Research Sciences)
(U) PE 0602111N (Surface/Aerospace Surveillance and Weapons Technology)
(U) PE 0602314N (Undersea Surveillance and Weapons Technology)
(U) PE 0602315N (MCM, Mining and Special Warfare Technology)
(U) PE 0603216N (Aviation Survivability) Project W0592 Aircraft and Ordnance Safety
(U) PE 0604603N (Unguided Conventional Air-launched Weapons)
(U) Cooperative technology transfer efforts with all weapons project offices are in progress.

C. (U) ACQUISITION STRATEGY: NOT APPLICABLE

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA4	Program Element Name & No. CONVENTIONAL MUNITIONS/0603609N	Project Name and Number. INSENSITIVE MUNITIONS ADVANCED DEVELOPMENT/S0363

D. (U) SCHEDULE PROFILE: NOT APPLICABLE

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY 1319/4	PROGRAM ELEMENT NAME AND NUMBER Conventional Munition/0603609N	PROJECT NAME AND NUMBER INSENSITIVE MUNITIONS ADVANCED DEVELOPMENT/S0363

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Technology Development	WR	VARIOUS	76.981	4.985	11/98	2.947	11/99			CONT	CONT	NA
Subtotal Product Development	WR	VARIOUS	76.981	4.985		2.947				CONT	CONT	NA
Remarks: Performing activities include: NSWC/DAHLGREN, NSWC/INDIAN HEAD, NAWC WP DIV/CHINA LAKE AND NSWC/CRANE												
Demonstration Test & Evaluation	WR	VARIOUS	91.415	5.900	11/98	3.780	11/99			CONT	CONT	NA
Subtotal T&E	WR	VARIOUS	91.415	5.900		3.780				CONT	CONT	NA
Remarks: Performing activities include: NSWC/DAHLGREN, NSWC/INDIAN HEAD, NAWC WP DIV/CHINA LAKE AND NSWC/CRANE												
Program Management Support	WR	NSCW/IH	23.867	1.539	11/98	1.425	11/99			CONT	CONT	NA
Travel	PD	NAVSEA Travel	.190	.025	10/98	.025	11/99			CONT	CONT	NA
Subtotal Management			24.057	1.564		1.450				CONT	CONT	NA
Remarks:												
Total Cost			192.453	12.449		8.177				CONT	CONT	NA

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA4	Program Element Name & No. CONVENTIONAL MUNITIONS/0603609N	Project Name and Number. ENVIRONMENTALLY SAFE ENERGETIC MATERIALS/S2611

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	0	.998	0	0	0	0	0	0	.998	.998
RDT&E Articles Qty										

A. (U) Mission Description and Budget Item Justification:
The development, manufacture and demilitarization of energetic materials generate significant quantities of waste. The generation and subsequent disposal of this waste has come under increased scrutiny and regulation by Federal, State and local officials. Additionally, due to environmental compliance and waste disposal issues, the cost of energetic materials is rapidly increasing. New technologies, energetic materials and ingredients that minimize any adverse environmental impact are being developed within the Navy's science and technology initiatives. These technologies are commonly referred to as "green" energetic materials. The efforts under this project will provide, validate, and transition technology for explosives, propellants and pyrotechnics using materials and compositions that have low adverse environmental impact in production and demilitarization, will meet insensitive munitions requirements and will have no reduction to combat performance.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS: NOT APPLICABLE

2. (U) FY 1999 PLAN:

- (U) ($.980) Evaluate and demonstrate solventless processing of explosive molding powder. Demonstrate the recycle, recovery and reuse and of hydrolyzable rocket propellant formulations. Evaluate alternate low environmental impact explosive molecules to replace current nitramines. Evaluate and predict the environmental impact and associated life cycle costs for energetic materials and processes.
- (U) ($.018) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLAN: NOT APPLICABLE

B. (U) OTHER PROGRAM FUNDING SUMMARY: NOT APPLICABLE

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA4	Program Element Name & No. CONVENTIONAL MUNITIONS/0603609N	Project Name and Number. ENVIRONMENTALLY SAFE ENERGETIC MATERIALS/S2611

(U) RELATED RDT&E:

(U) PE 0601153N (Defense Research Sciences)
(U) PE 0602111N (Surface/Aerospace Surveillance and Weapons Technology)
(U) PE 0602314N (Undersea Surveillance and Weapons Technology)
(U) PE 0602315N (MCM, Mining and Special Warfare Technology)
(U) PE 0603216N (Aviation Survivability) Project W0592 Aircraft and Ordnance Safety
(U) PE 0604603N (Unguided Conventional Air-launched Weapons)

C. (U) ACQUISITION STRATEGY: NOT APPLICABLE

D. (U) SCHEDULE PROFILE: NOT APPLICABLE

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY 1319/4	PROGRAM ELEMENT NAME AND NUMBER Conventional Munition/0603609N	PROJECT NAME AND NUMBER ENVIRONMENTALLY SAFE ENERGETIC MATERIALS/S2611

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Technology Development	WR	VARIOUS	0	.445	2/99	0	NA	0	NA	.445	.445	NA
Subtotal Product Development	WR	VARIOUS	0	.445		0		0		.445	.445	NA
Remarks: Performing activities include: NSWC/DAHLGREN, NSWC/INDIAN HEAD, NAWC WP DIV/CHINA LAKE AND NSWC/CRANE												
Demonstration Test & Evaluation	WR	VARIOUS	0	.478	2/99	0	NA	0	NA	.478	.478	NA
Subtotal T&E	WR	VARIOUS	0	.478		0		0		.478	.478	NA
Remarks: Performing activities include: NSWC/DAHLGREN, NSWC/INDIAN HEAD, NAWC WP DIV/CHINA LAKE AND NSWC/CRANE												
Program Management Support	WR	NSCW/IH	0	.075	2/99	0	NA	0	NA	.075	.075	NA
Travel	PD	NAVSEA Travel	0	0	NA	0	NA	0	NA	0	0	NA
Subtotal Management			0	.075		0		0		.075	.075	NA
Remarks:												
Total Cost			0	.998		0		0		.998	.998	NA

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA4	Program Element Name & No. CONVENTIONAL MUNITIONS/0603609N	Project Name and Number. Conventional Fuze and Warhead Package (K1821/U1821)

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	21.351	24.862	24.772	20.548	18.886	19.382	19.873	20.377	Continuing	Continuing
RDT&E Articles Qty										

A. Mission Description and Budget Item Justification

The Navy requires improved lethality of air and surface launched ordnance to defeat advanced threats. This is the only Navy 6.3B RDT&E program that addresses improvements in warhead and fuze technology to meet this requirement. This program is a significant vehicle for orderly planning and timely and effective transition of Navy 6.2 and 6.3A investments into E&MD missile/weapon systems. This program addresses increased lethality against current and emerging threats, is responsive to all mission areas -- anti-air, strike, defense suppression, theater defense and ship defense, and supports development of complete ordnance sections. The current, on-going projects address significant technology advancements for missile systems by developing: a mass focusing ordnance, maturing physical concepts to enhance anti-air kill probability, advanced ordnance with augmented overland cruise missile defense capability, strike ordnance with deep penetration payload, and advanced seeker technology. The program supports the full spectrum of missile advanced development and technology improvements, and in future years will continue to provide the vehicle to address emergent requirements by transitioning mature development efforts into weapon systems with minimal technical and financial risk.

1. (U) FY 1998 ACCOMPLISHMENTS:
   - (U) ($4.132) DIRECTIONAL ORDNANCE SYSTEM: Assembled demonstration hardware. Conducted system demonstration. Developed specifications, drawings, and design and test data reports. Prepared system demonstration report.
   - (U) ($.324) ADVANCED STRIKE WARFARE HIGH VELOCITY PENETRATOR: Initiated effort to demonstrate high velocity penetrating payload (warhead and fuze) for enhancing penetration of deeply buried targets.
   - (U) ($.671) ORDNANCE COMPONENTS TECHNOLOGY: Continued effort with customized S-A components. Continued very high energy density capacitors and high G fiber optic accelerometer efforts.
   - (U) ($8.217) Advanced Seeker Technology: Initiated advanced seeker technology development effort.
   - (U) ($8.007) ADVANCE ORDNANCE SECTION (FORMERLY OVERALAND CRUISE MISSILE DEFENSE/DIRECT HIT): Continued with warhead concept characterization studies, target interaction, lethality and vulnerability model updates for 15 selected targets, and conducted end-game effectiveness and evaluation studies. Continued with reactive material for ATD risk reduction efforts.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA4	Program Element Name & No. CONVENTIONAL MUNITIONS/0603609N	Project Name and Number. Conventional Fuze and Warhead Package (K1821/U1821)

2. (U) FY 1999 PLAN:
   - ($.360) DIRECTIONAL ORDNANCE SYSTEM: Conduct quick look scaling design/test.
   - ($6.295) ADVANCED STRIKE WARFARE HIGH VELOCITY PENETRATOR: Continue with the effort to demonstrate the penetrating payload (warhead and fuze) for enhancing penetration of deeplt buried targets.
   - ($1.100) ORDNANCE COMPONENT TECHNOLOGY: Complete efforts on high energy density capacitors and high G fiber optic accelerometer. Initiate efforts on near field contact sensors and enhanced low energy exploding foil initiator.
   - ($7.849) ADVANCED ORDNANCE SECTION: Complete interim down select to 3-4 warhead concepts variants. Incorporate updated fuze models, conduct critical experiments, perform fabrication/evaluation studies, perform end-game statistical assessments. Incorporate reactive fragments vulnerability models.
   - ($8.330) ADVANCED SEEKER TECHNOLOGY: Continue with advanced seeker technology development effort.
   - ($.300) ADVANCED AIR TO AIR: Initiate advanced air to air development effort. Conduct value added studies.
   - ($.628) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLAN:
   - ($1.210) ADVANCED STRIKE WARFARE HIGH VELOCITY PENETRATOR: Complete warhead case design and evaluation. Complete fuze/S-A evaluation and selection. Complete high explosive evaluation and selection. Conduct missile system demonstration of baseline concept (300lbs payload). Initiate 750lbs payload missile application and payload integration effort.
   - ($1.200) ORDNANCE COMPONENT TECHNOLOGY: Initiate efforts on delayed functioning exploding foil initiator (EFI) and identify friend or foe circuits (S-A/TDD)
   - ($5.045) ADVANCED ORDNANCE SECTION: Down select to 2 concepts. Conduct component and systems tests. Complete draft warhead/fuze performance requirements and draft systems specifications.
   - ($1.270) ADVANCED AIR TO AIR: Define ordnance system requirements and applicable technology to satisfy these requirements. Initiate prototype design and development.
   - (U) ($16.047) ADVANCED SEEKER TECHNOLOGY: Continue with advanced seeker technology effort.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA4	Program Element Name & No. CONVENTIONAL MUNITIONS/0603609N	Project Name and Number. Conventional Fuze and Warhead Package (K1821/U1821)

B. Other Program Funding Summary: Not applicable.

C. Acquisition Strategy: Not applicable.

D. Schedule Profile: Not Applicable.

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY 1319/4	PROGRAM ELEMENT NAME AND NUMBER Conventional Munition/0603609N	Conventional Fuze and Warhead Package / K1821/U1821

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Design and Analysis	WR	NSWC/DD	28.123	4.359	11/98	.618	11/99			Continuing	Cont.	N/A
	WR	NAWC/China Lake	55.042	4.463	11/98	.830	11/99			Continuing	Cont.	N/A
	CPAF	Motorola/Raytheon	4.474	2.800	12/98	1.900	12/99			.600	9.774	9.774
	PD	Office of Special Projects	7.751	7.130	12/98	13.104	12/99			Continuing	Cont.	N/A
Hardware Fabrication & Procurement	WR	NSWC/DD	5.000	.700	11/98	.700	11/99			Continuing	Cont.	N/A
	WR	NAWC/China Lake	6.500	.800	11/98	.800	11/99			Continuing	Cont.	N/A
	CPAF	Motorola/Raytheon	.300	.200	12/98	.100	12/99				.600	.600
	PD	Office of Special Projects	1.100	1.200	12/98	3.000	12/99			Continuing	Cont.	
Subtotal Product Development			108.290	21.652		21.052						10.374
Remarks:												
Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support												
Remarks:												

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	Fy00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Demonstration Test & Evaluation	WR	NSWC/DD	10.447	1.500	11/98	2.000	11/99			Cont.	Cont.	
	WR	NAWC China Lake	10.482	1.500	11/98	1.500	11/99			Cont.	Cont.	
Subtotal T&E			20.929	3.000		3.500						
Remarks:												
Program Management Support	WR	NSWC/DD	1.899	.075	11/98	.075	11/99			Cont.	Cont.	
	WR	NAWC China Lake	3.135	.075	11/98	.075	11/99			Cont.	Cont.	

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY 1319/4	PROGRAM ELEMENT NAME AND NUMBER Conventional Munition/0603609N	Conventional Fuze and Warhead Package / K1821/U1821

	FPI	TMAI		.010	11/98	.020	11/99			Cont.	Cont.	
Travel	PD	NAVSEA Travel	.200	.050	11/98	.050	11/99			Cont.	Cont.	
Labor (Research Personnel)												
Overhead												
Subtotal Management			5.234	.210		.220						
Remarks:												
Total Cost			134.453	24.862		24.772						
Remarks:												

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration/Validation

PE NUMBER AND TITLE: 0603611M Marine Corps Assault Amphibious Vehicles

COST (*In Millions*)	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
B0020 ADVANCED AMPHIBIOUS ASSAULT VEHICLE (AAAV)	67202	103966	94843	110584	128929	149593	69778	55496	Continuing	Continuing
Quantity of RDT&E Articles		1	2			11				

A. (U) Mission Description and Budget Item Justification:

(U) The AAAV program will field a successor to the Marine Corps' current amphibious vehicle, the AAV7A1. The AAAV will provide the principal means of tactical surface mobility for the Marine Air-Ground Task Force (MAGTF) during both ship-to-objective maneuver and subsequent combat operations ashore as part of the Navy and Marine Corps Operation Maneuver from the Sea Doctrine. The AAAV will provide the Marine Corps with the capability to execute the full spectrum of military missions from humanitarian operations to conventional combat operations. The AAAV replaces the AAV7A1 vehicle.

(U) **Justification for Budget Activity:** The AAAV Program was approved by the Defense Acquisition Board (DAB) which conducted a Milestone I review in 1995 signifying the beginning of the Program Definition and Risk Reduction (PDRR) phase. During this phase three (3) prototypes willo be designed, frabricated, and undergo Development and Operational testing..

(U) FY 1998 Accomplishments:

- (U) $ 60419 Continued PDRR phase, conducted preliminary and critical prototype design reviews. Continued Modeling and Simulation and initiated fabrication of long lead subsystem/components for the AAAV Personnel (P) prototypes. Initiate AAAV Survivability program.
- (U) $ 3513 Continued to provide in-house technical support.
- (U) $ 3270 Continued to provide program support to coordinate and update program planning, program analysis, and program execution.

(U)Total $ 67202

	DATE February 1999
BUDGET ACTIVITY **4 - Demonstration/Validation**	PE NUMBER AND TITLE **0603611M Marine Corps Assault Amphibious Vehicles**

(U) FY 1999 Planned Program:

• (U) $	92135	Continue PDRR phase, initiate and complete assembly of first prototype, initiate extensive contractor prototype testing. Initiate AAAV Command (C) System development. Initiate second and third prototype assembly. Continue AAAV Survivability program.
• (U) $	2451	Continue to provide in-house technical support.
• (U) $	5282	Continue to provide program support to coordinate and update program planning, program analysis, and program execution. Initiate software Independent Verification and Validation (IV&V).
• (U) $	1550	Complete armor validation and initiate armor characterization testing. Initiate combined government/contractor prototype acceptance testing.
• (U) $	2548	SBIR: Portion of program reserved for Small Business Innovation Research assessment with 15 U.S.C. 638 (f)(1).
(U)Total $	103966	

(U) FY 2000 Planned Program:

• (U) $	77974	Continue PDRR phase. Complete assembly of second and third prototypes. Complete extensive contractor testing of all three prototypes. Continue AAAV (C) system development. Continue AAAV Survivability program.
• (U) $	3383	Continue to provide in-house technical support.
• (U) $	5486	Continue to provide program support to coordinate and update program planning, program analysis, and program execution. Continue software IV&V.
• (U) $	4500	Initiate and complete combined government/contractor Developmental Testing-I (DT-I) , Initiate Early Operational Assessment (EOA) testing, Initiate and complete ballistic hull & turret testing.
(U)Total $	94843	
(U) $	3500	Initiate Smart Work initiatives to reduce production and operational support costs

	DATE February 1999
BUDGET ACTIVITY **4 - Demonstration/Validation**	PE NUMBER AND TITLE **0603611M Marine Corps Assault Amphibious Vehicles**

B. (U) Project Change Summary

	FY 1998	FY 1999	FY 2000
(U) Previous President's Budget	68186	104822	92795
(U) Adjustments to Previous President's Budget	-984	-856	2048
(U) Current Budget Submit	67202	103966	94843

(U) Change Summary Explanation:

(U) Funding: FY 1998 reflects an increase of below threshold reprogramming of $1,203 thousand and a decrease of $2,187 thousand for SBIR. FY2000/01 reallocation of funds. FY 1999 reflects a return of funds reduced in previous years, a decrease of $856 thousand for FFRDC and various economic and R&D general reductions. FY 2000 reflects funding adjustments for non-pay inflation and Smart Work initiatives for the AAAV engine.

(U) Schedule: Not applicable.

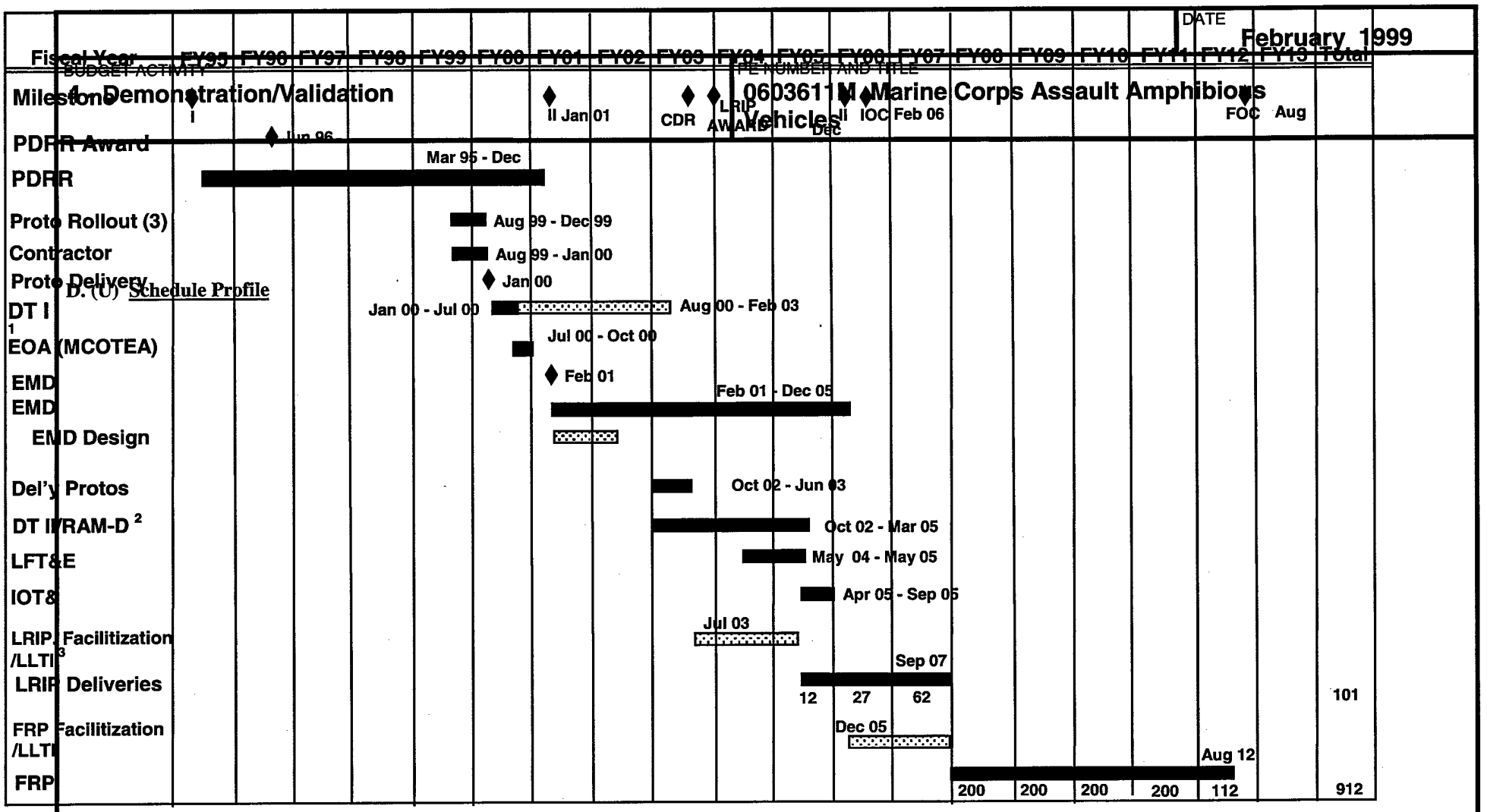
(U) Technical: Not applicable.

C. (U) Other Program Funding Summary

(APPN, BLI #, NOMEN)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Compl	Total Cost
(U) PANMC, BLI# 147500, AAAV							7083	17872	Cont.	Cont.
(U) PMC, BLI# 202200, AAAV						36270	182627	274602	Cont.	Cont.

(U) Related RDT&E

(U) PE 0206623M (Marine Corps Ground Combat/Supporting Arms Systems), Project C0021, AAV7A1.
(U) PE 0206623M (Marine Corps Ground Combat/Supporting Arms Systems), Project C2237, AVTB.



D. (U) Schedule Profile

[1] PDRR vehicle tests continue for the period Aug 00 to Feb 03 for EMD design solutions and the accumulation of reliability data.

[2] 2 EMD vehicles go to LFT&E; 9 vehicles continue RAM-D testing for Apr 04 to Mar 05.

[3] Long lead time items (LLTI) that are not affected by redesign.

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration/Validation

PE NUMBER AND TITLE: 0603611M Marine Corps Assault Amphibious Vehicles

A. (U) Project Cost Breakdown

	FY 1998	FY 1999	FY 2000
Product Development	60419	92135	81474
Support and Management	6733	10281	8869
Test and Evaluation	50	1550	4500
Total	67202	103966	94843

B. Budget Acquisition History and Planning Information

Performing Organizations

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Product Development Organizations										
GDLS (PDRR)	CPAF	JUN 96			64851	60419	92135	81474	CONT.	CONT.
EMD award		FEB 01							CONT.	CONT.
Support and Management Organizations										
TMA Alex, VA	CPFF	DEC 93	3925	3925	3262	663	0	0	0	3925
Support Contract	FFF	SEP 98			0	0	3745	3851	CONT.	CONT.
Misc. Contracts	CPFF	Various	CONT.	CONT.	5587	2257	3770	1335	CONT.	CONT.
Misc. Gov. labs	WR	Various	CONT.	CONT.	8301	3513	2451	3383	CONT.	CONT.
Program Office Personnel Costs	WR	OCT 96	2773	2773	2773	0	0		0	2773
Modeling & Simulation	WR	Various	4361	4361	3146	300	315	300	300	4361
Test and Evaluation Organizations										
Miscellaneous	Various	Various	CONT.	CONT.	1235	50	1550	4500	CONT.	CONT.

Government Furnished Property

	DATE
	February 1999

BUDGET ACTIVITY	PE NUMBER AND TITLE
4 - Demonstration/Validation	**0603611M Marine Corps Assault Amphibious Vehicles**

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Product Development Property				27	0	0	0	0	27
Support and Management Property									
Test and Evaluation Property									

	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Subtotal Product Development	64878	60419	92135	81474	CONT.	CONT.
Subtotal Support and Management	23069	6733	10281	8869	CONT.	CONT.
Subtotal Test and Evaluation	1235	50	1550	4500	CONT.	CONT.
Total Project	89182	67202	103966	94843	CONT.	CONT.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: **4 - Demonstration/Validation**

PE NUMBER AND TITLE: **0603635M Marine Corps Ground Combat/Supporting Arms Systems**

COST *(In Thousands)*	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	41118	54251	42654	17698	4900	3659	1078	796	Continuing	Continuing
C1964 Antiarmor Weapon System	327	427	633	610	640	896	832	551	Continuing	Continuing
C2112 Howitzer, Medium Towed 155MM XM777 (LW 155)	36180	32332	23237	12105	0	0	0	0	0	131931
C2113 Predator Short Range Assault Weapon (SRAW)	4611	12781	13371	492	0	0	0	0	0	144060
C2256 Integrated Infantry Combat System (IICS)	0	730	751	768	0	0	0	0	0	2249
C2507 Small Unit Riverine Craft (SURC)	0	0	3038	1750	226	10	0	0	0	5024
C2508 Light Strike Vehicle	0	0	1624	1973	4034	2753	246	245	122	10997
C2614 SMAW Follow-On	0	2993	0	0	0	0	0	0	0	0
C2615 Trajectory Corrected Munitions (TCM)	0	4988	0	0	0	0	0	0	0	0
Quantity of RDT&E Articles										

(U) **Mission Description and Budget Item Justification:** This PE supports the demonstration and validation of Marine Corps Ground/Supporting Arms Systems for utilization in Marine Air-Ground Expeditionary Force amphibious operations.

(U) **Justification for Budget Activity:** This program is funded under DEMONSTRATION & VALIDATION because it develops and integrates hardware for experimental test related to specific ground weapon system applications.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration/Validation	PE NUMBER AND TITLE 0603635M Marine Corps Ground Combat/Supporting Arms Systems PROJECT C1964

COST *(In Thousands)*	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
C1964 Antiarmor Weapon System	327	427	633	610	640	896	832	551	Continuing	Continuing
Quantity of RDT&E Articles										

A. (U) Mission Description and Budget Item Justification:

(U) This project provides for Marine Corps participation in the Joint Anti-Armor Program entitled Javelin (Advanced Anti-Tank Weapon System - Medium (AAWS-M)) and the Anti-Armor Weapon System - Heavy (AAWS-H). The Javelin weapon system will provide the Marine Corps and Army with state-of-the-art capability to destroy sophisticated and future armored threats. No such medium anti-armor system is currently available to the infantryman. The AAWS-H is a long range, antitank weapon system that will replace the Tube Launched, Optically Tracked, Wire Guided Missile System. It will satisfy an operational requirement to provide increased range (4000 meters), increased lethality against all armored threats, to include explosive reactive armor, active protection, increased probability of hit and kill and increased gunner survivability. Possible Light Armored Vehicle-Anti Tank usage would promote commonality among Marine Corps systems.

(U) FY 1998 Accomplishments:

- (U) $ 167 Conducted Engineering/Technical Support to monitor and participate in production qualification testing (PQT) & pre-planned product improvements (P3I) for Javelin.
- (U) $ 151 Conducted Engineering/Technical Support to monitor and participate in technical developments in the AAWS-H
- (U) $ 9 Prepared necessary Marine Corps documentation for AAWS-H Milestone I.

(U)Total $ 327

(U) FY 1999 Planned Program:

- (U) $ 201 Engineering/Technical Support to monitor and participate in PQT & P3I for Javelin.
- (U) $ 196 Engineering/Technical support to monitor and participate in developmental testing and technical developments in the AAWS-H program.
- (U) $ 29 Prepare necessary Marine Corps documentation for the AAWS-H program.
- (U) $ 1 Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

(U)Total $ 427

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration/Validation	PE NUMBER AND TITLE 0603635M Marine Corps Ground Combat/Supporting Arms Systems
	PROJECT C1964

(U) FY 2000 Planned Program:

- (U) $ 237 Engineering/Technical support to monitor and participate in PQT and P3I for the Javelin program.
- (U) $ 372 Engineering and Technical Support to monitor and participate in technical developments in the AAWS-H program.
- (U) $ 24 Prepare necessary Marine Corps documentation for the AAWS-H program.

(U)Total $ 633

B. (U) Project Change Summary	FY 1998	FY 1999	FY 2000
(U) Previous President's Budget	411	429	489
(U) Adjustments to Previous President's Budget	-84	-2	+144
(U) Current Budget Submit	327	427	633

(U) Change Summary Explanation: Decrease of $84 thousand due to minor affordability changes in FY 1998. FY 2000 increase is due to increased participation in both the Javelin and AAWS-H programs in response to complying with directions as to be set forth in the results of the Anti-Armor Requirements study and revised economic assumption and general adjustments.

C. (U) Other Program Funding Summary (APPN, BLI #, NOMEN)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
(U) PMC BLI# 301100	57,802	82,653	92,737	32,181	1,048	1,065	114	139	0	305,890

(U) Related RDT&E
PE 0604611A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration/Validation	PE NUMBER AND TITLE 0603635M Marine Corps Ground Combat/Supporting Arms Systems
	PROJECT C1964

D. (U) Schedule Profile

Javelin

	FY1998	FY 1999	FY2000	FY2001	TO COMPLETE
Program Milestones					
Contract Milestones	1Q MY Contract Award	3Q MY Contract Award	1Q FY00 2nd Multiyear Contract Award (FY00-02)		
Fielding		3Q FY99-4Q FY03			

AAWS-H

	FY 1998	FY 1999	FY 2000	FY 2001	TO COMPLETE
Program Milestones		MS I			
Studies & Analysis Milestones		1Q Analysis of Alternatives			
Developmental Testing - Army		^^			
Fielding	TBD				

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration/Validation

PE NUMBER AND TITLE: 0603635M Marine Corps Ground Combat/Supporting Arms Systems

PROJECT: C2112

COST *(In Thousands)*	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
C2112 Howitzer, Medium Towed 155MM XM777 (LW 155)	36180	32332	23237	12105	0	0	0	0	0	131931
Quantity of RDT&E Articles	8									

A. (U) Mission Description and Budget Item Justification: (U) The LW155 is the replacement for the aging, operationally deficient M198 155 Howitzer for the Marine Corps and the Army. The LW155 retains the current M198 howitzer's range, but will weigh 9,000 pounds compared to the M198's 16,000 pounds. The weight reduction significantly improves transportability and mobility by sea, air, and land platforms and enables the LW155 to emplace, displace, and bold shift in half the time of the current system while increasing the rate of fire. Thus, the LW155 provides greater transportability and mobility in strategic/tactical movements. The LW155 is a joint Marine Corps and Army program, with the Marine Corps as the Lead service. The Joint Operational Requirements Document (JORD) was approved by the Assistant Commandant of the Marine Corps on 27 June 1996. The JORD was validated and approved by the Army on 29 September 1995. A MS I/II Marine Corps Program Decision Memorandum (MCPDM) was approved on 5 February 1996. After a ten month "shoot-off" between competitors a three year EMD contract was signed with Cadillac Gage Textron Inc. on 17 March 1997. On 21 December 1998, the three parties involved in the development of the LW155 signed a novation agreement whereby Vickers Shipbuilding and Engineering Limited (VSEL) took over prime contractor responsibilities from Cadillac Gage Textron. Textron, VSEL and the government were all in agreement that this move was in the best interest of fielding the advanced Howitzer to Marine and Army units.

(U) FY 1998 Accomplishments:

- (U) $ 2,100 Provided government program management support.
- (U) $ 2,110 Provided Army Research, Development, and Engineering Center (ARDEC) matrix development engineering to system, logistics, safety, quality assurance, corrosion prevention.
- (U) $ 2,195 Provided other government development engineering to system, logistics, safety, quality assurance and included forward finance $800K of the FY 1999 effort.
- (U) $ 24,225 Continued contractor development engineering and prototype manufacturing. Labor/material for 8 prototypes.
- (U) $ 935 Conducted system development test and evaluation at Yuma Proving Grounds, AZ (fatigue and wear).
- (U) $ 4,615 Conducted engineering and manufacturing development of pototypes at Benet Labs and Watervliet Arsenal, NY.

(U)Total $ 36,180

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration/Validation	PE NUMBER AND TITLE 0603635M Marine Corps Ground Combat/Supporting Arms Systems PROJECT C2112

(U) FY 1999 Planned Program:

• (U) $	2,100	Provide government program management support.
• (U) $	2,778	ARDEC contine matrix development engineering to system, logistics, safety, quality assurance, corrosion prevention.
• (U) $	116	Provide other government development engineering to system, logistics, safety, quality assurance.
• (U) $	21,525	Continue and complete contractor development engineering and prototype manufacturing. Restructure efforts such as Alternate Propellant Ignition System, Modular Artillery Charge System Compatibility, Long-Range Barrel, and Auto-Rammer to reduce risk and enhance system performance established in the Joint Operational Requirements Document (JORD).
• (U) $	2,774	Conduct system development test and evaluation at Yuma Proving Grounds, AZ (wear, firing table).
• (U) $	2,617	Conduct engineering and prototype manufacturing at Benet Labs and Watervliet Arsenal, NY.
• (U) $	422	Portion of extramural program reserved for Small Business Innovation Research (SBIR) assessment in accordance with 15 USC 638.
(U)Total$	32,332	

(U) FY 2000 Planned Program:

• (U) $	2,100	Program management support.
• (U) $	2,200	ARDEC continue matrix development engineering to system, logistics, safety, quality assurance, corrosion prevention.
• (U) $	9,188	Engineering and manufacturing development (EMD) contract increment.
• (U) $	2,100	Provide other government development engineering support to logistics and quality assurance.
• (U) $	7,649	Conduct technical test series (fatigue, recoil durability, cold, hot/humid, corrosion, transportability, logistics demonstration).
(U)Total $	23,237	

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE: February 1999
BUDGET ACTIVITY: 4 - Demonstration/Validation	PE NUMBER AND TITLE: 0603635M Marine Corps Ground Combat/Supporting Arms Systems — PROJECT: C2112

B. (U) Project Change Summary

	FY 1998	FY 1999	FY 2000
(U) Previous President's Budget	37,635	25,409	8,349
(U) Adjustments to Previous President's Budget	-1,455	+6,923	+14,888
(U) Current Budget Submit	36,180	32,332	23,237

(U) Change Summary Explanation:

(U) Funding: The FY 1998 decrease is due to SBIR transfer and a minor affordability adjustment. The FY 1999 increase reflects a $7 million Congressional increase for program restructure. The FY 2000 increase reflects program rebaselining, revised economic assumption and general adjustments.

(U) Schedule: Changes show restructure of program.

(U) Technical: Not applicable.

C. (U) Other Program Funding Summary (APPN, BLI #, NOMEN)

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Compl	Total Cost
(U) PMC, BLI #218500, Howitzer, Medium Towed 155MM XM777 (LW 155)	0	0	0	9,763	91,427	115,445	144,231	88,241	0	449,107

(U) Related RDT&E: PE 0604854A (Artillery Systems-Engineering Development)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration/Validation	PE NUMBER AND TITLE 0603635M Marine Corps Ground Combat/Supporting Arms Systems PROJECT C2112

(U) **Schedule Profile**



Activity	FY95	FY96	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09
LW155 Milestone 0	◆														
LW155 Milestone I/II		◆													
Shoot-off															
LW155 EMD Phase															
Milestone III							◇								
USMC LW155 Production						LL	△								

Dollars ($M)	FY95	FY96	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	Total
USMC RDTE	6.3	14.4	13.5	36.2	32.3	23.2	12.1								138.0
USMC LW155 Prod						0	10.0	91.4	115.4	144.2	88.2				449.2
Quantity								70	120	170	90				450

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1999
BUDGET ACTIVITY **4 - Demonstration/Validation**	PE NUMBER AND TITLE **0603635M Marine Corps Ground Combat/Supporting Arms Systems**
	PROJECT **C2112**

A. (U) Project Cost Breakdown	FY 1998	FY 1999	FY 2000
Project Cost Categories			
a. Primary Hardware Development	24,225	21,947	9,188
b. Government Developmental Engineering	4,305	2,894	4,300
c. Program Management Support	2,100	2,100	2,100
d. Test and Evaluation	935	2,774	7,649
e. Conduct Engineering and Prototype Manufacturing, AZ Benet & Watervliet Arsenal, NY	4,615	2,617	0
Total	36,180	32,332	23,237

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration/Validation	PE NUMBER AND TITLE 0603635M Marine Corps Ground Combat/Supporting Arms Systems PROJECT C2112

B. Budget Acquisition History and Planning Information

Performing Organizations

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	BudgetTo Complete	Total Program
Product Development Organizations										
Cadiliac Gage Textron, Inc., New Orleans, LA	CPIF	Mar 1997	28,640	28,640	5,639	23,001	0	0	0	28,640
VSEL Barrow-In-Furance UK	CPIF	Dec 1998	35,612	35,612	0	1,224	19,900	9,188	5,300	35,612
Kara Bedford, PA	CPIF	Feb 1999	2,491	2,491	0	0	1,625	0	866	2,491
ARDEC, Picatinny, NJ	MIPR	Oct 1996	12,115	12,115	3,227	2,110	2,778	2,200	1,800	12,115
ARDEC, Picatinny, NJ (Source Selection Evaluation Board)	MIPR	Oct 1996	4,494	4,494	4,494	0	0	0	0	4,494
Misc Government Accounts	MIPR	Various	11,119	11,119	5,408	2,195	116	2,100	1,300	11,119
SBIR	N/A	N/A	N/A	N/A	0	0	422	0	0	422
Support and Management Organizations										
PMO LW 155, Picatinny, NJ	MIPR	Oct 1996	15,867	15,867	7,562	2,100	2,100	2,100	2,005	15,867

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration/Validation	PE NUMBER AND TITLE 0603635M Marine Corps Ground Combat/Supporting Arms Systems PROJECT C2112

B. Budget Acquisition History and Planning Information

Performing Organizations

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Test and Evaluation Organizations										
Misc Government Activities	MIPR	Varies	3,376	3,376	3,376	0	0	0	0	3,376
Yuma Proving Ground, Yuma, AZ (Shoot-off)	MIPR	Feb 1996	1,900	1,900	1,900	0	0	0	0	1,900
Yuma Proving Ground, Yuma AZ	MIPR	Oct 1996	12,929	12,929	737	935	2,774	7,649	834	12,929

Government Furnished Property

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Product Development Property									
Benet Labs, Watervliet Arsenal, NY	MIPR	Various	Various	2,111	4,615	2,617	0	0	9,343
Support and Management Property									
Test and Evaluation Property									

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1999
BUDGET ACTIVITY **4 - Demonstration/Validation**	PE NUMBER AND TITLE **0603635M Marine Corps Ground Combat/Supporting Arms Systems**
	PROJECT **C2112**

	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Subtotal Product Development	20,879	33,145	27,458	13,488	9,266	104,236
Subtotal Support and Management	7,562	2,100	2,100	2,100	2,005	15,867
Subtotal Test and Evaluation	6,013	935	2,774	7,649	834	18,205
Total Project	34,454	36,180	32,332	23,237	12,105	138,308

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration/Validation

PE NUMBER AND TITLE: 0603635M Marine Corps Ground Combat/Supporting Arms Systems

PROJECT: C2113

COST *(In Thousands)*	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
C2113 Predator Short Range Assault Weapon (SRAW)	4611	12781	13371	492	0	0	0	0	0	144060
Quantity of RDT&E Articles	25	51	103							

A. (U) Mission Description and Budget Item Justification:

(U) Predator (SRAW) will provide the Marine Corps with a lethal, disposable, fire and forget, top-attack, soft launch for firing from enclosed spaces, proliferable, accurate, night vision capable, lightweight, main battle tank killer. Modularity of the system will allow development of optimal warheads (flame, bunker-busting, multi-purpose) to fit on the flight module.

(U) FY 1998 Accomplishments:

- (U) $ 4,385 Continued Engineering & Manufacturing Development (EMD) Phase of program. This effort forward financed with $4,296M of FY97 funds.
- (U) $ 226 Provided Program Management (PM)/In-House Support

(U)Total $ 4,611

(U) FY 1999 Planned Program:

- (U) $ 8,700 Continue EMD Phase of program.
- (U) $ 419 Conduct Modeling & Simulation Independent Validation and Verification.
- (U) $ 380 Preparation for Operational Testing.
- (U) $ 2,419 Engineering/Technical services to complete Developmental Testing (DT)
- (U) $ 609 PM/In-House Support/Engineering Change Proposals (ECP)
- (U) $ 254 Portion of extramural program reserved for Small business Innovation Research assessment in accordance with 15 USC 638.

(U)Total $ 12,781

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration/Validation	PE NUMBER AND TITLE 0603635M Marine Corps Ground Combat/Supporting Arms Systems
	PROJECT C2113

(U) **FY 2000 Planned Program:**

•	(U) $	7,000	Complete EMD Phase of the program.
•	(U) $	1,971	Conduct Operational Testing.
•	(U) $	205	Complete Modeling & Simulation
•	(U) $	1,330	PM/In-House Support/ECPs
•	(U) $	2,865	Engineering/Technical Services Support
(U)Total $		13,371	

B. (U) Project Change Summary

	FY 1998	FY 1999	FY 2000
(U) Previous President's Budget	2,311	9,827	0
(U) Adjustments to Previous President's Budget	+2,300	+2,954	+13,371
(U) Current Budget Submit	4,611	12,781	13,371

(U) Change Summary Explanation:

(U) Funding: Adjustments to funding are due to program restructuring and EMD program execution.

(U) Schedule: Operational Testing (OT) rescheduled to 2nd Qtr FY 2000 from 2nd Qtr FY 1999 due to restructuring of the program and EMD program extension with MS III rescheduled for 4th Qtr FY 2000.

(U) Technical: Missile sensor problems resulted in additional evaluation, correction and testing.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration/Validation

PE NUMBER AND TITLE: 0603635M Marine Corps Ground Combat/Supporting Arms Systems

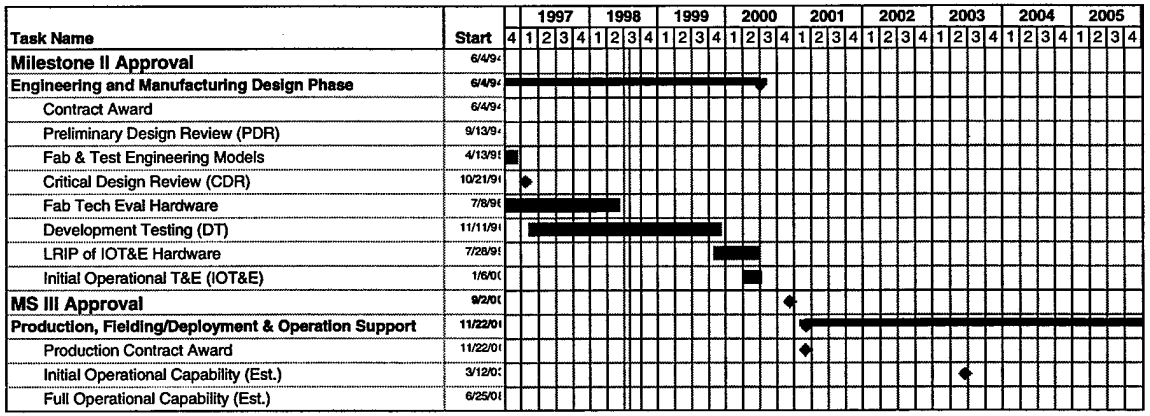
PROJECT: C2113

C. (U) Other Program Funding Summary (APPN, BLI #, NOMEN)

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Compl	Total Cost
(U) PMC, 308900, Predator (SRAW)	0	0	0	27,142	26,120	26,902	103,684	146,690	145,083	475,621

(U) **Related RDT&E: Not Applicable**

D. (U) **Schedule Profile:**



RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration/Validation

PE NUMBER AND TITLE: 0603635M Marine Corps Ground Combat/Supporting Arms Systems

PROJECT: C2113

A. (U) Project Cost Breakdown	FY 1998	FY 1999	FY 2000
a. Primary Hardware Development	240	0	0
Airframe & Launcher	0	0	0
Electronics	240	0	0
Propulsion & Ordnance	0	0	0
System Integration	0	0	0
b. Materials and Subcontracting	840	1030	1490
c. Test Evaluation and Equipment in Support of Product Development	1025	2000	0
Support Equipment	0	0	0
Development Tests	0	0	0
Qualification Tests	875	1860	0
Government Support	150	140	0
d. Production Support	930	2910	3250
Engineering Support	0	410	920
First Article Inspection and Test	0	0	0
Manufacturing and Process Engineering	930	2500	2330
e. Program Support	270	1190	980
Quality Assurance	90	310	180
Procurement	60	170	90
ILS Support	120	710	710
f. System Engineering	430	610	460
g. Project/Technical Management	650	960	820
h. Government Engineering/Technical Services	0	2419	2865
i. PM/In-House Support/ECPs	226	863	1330
j. Operational Testing	0	799	2176
Total	4,611	12,781	13,371

	DATE
	February 1999

BUDGET ACTIVITY	PE NUMBER AND TITLE
4 - Demonstration/Validation	0603635M Marine Corps Ground Combat/Supporting Arms Systems

B. Budget Acquisition History and Planning Information

Performing Organizations

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Product Development Organizations										
Lockheed Martin Electronics and Missiles, Orlando	SS/CPIF	2 June 94	114,564	114,564	94,479	4,385	8,700	7,000	2000	114564
Support and Management Organizations										
NSWC Dahlgren, VA	WR	1 Oct 96	21,148	21,148	15,547	0	2,419	2,865	317	21148
Miscellaneous	Various	Various	4,687	4,687	2,093	226	863	1,330	175	4687
Test and Evaluation Organizations										
Marine Corps Operational Test Activity			2,351	2,351	0	0	380	1,971	0	2351
CECOM	MIPR		1,310	1,310	686	0	419	205	0	1310

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1999
BUDGET ACTIVITY **4 - Demonstration/Validation**	PE NUMBER AND TITLE **0603635M Marine Corps Ground Combat/Supporting Arms Systems** PROJECT **C2113**

Government Furnished Property

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									

	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Subtotal Product Development	94,479	4,385	8,700	7,000	0	114,564
Subtotal Support and Management	17,640	226	3,282	4,195	492	25,835
Subtotal Test and Evaluation	686	0	799	2,176	0	3,661
Total Project	112,805	4,611	12,781	13,371	492	144,060

C. (U) **Funding Profile:** **Not Applicable**

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration/Validation

PE NUMBER AND TITLE: 0603635M Marine Corps Ground Combat/Supporting Arms Systems

PROJECT: C2256

COST *(In Thousands)*	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
C2256 Integrated Infantry Combat System (IICS)	0	730	751	768	0	0	0	0	0	2249
Quantity of RDT&E Articles										

A. (U) Mission Description and Budget Item Justification: (U) USMC name for this program is now Integrated Infantry Combat System (IICS) for dismounted combat Marines. The program will enhance the Marine's battlefield capabilities through the development and integration of an assortment of Marine systems/components and technologies into a cohesive, timely and combat effective system. These systems/components include weapon, integrated helmet assembly, protective clothing, communications and target acquisition technologies. This will provide the infantryman with increased lethality, survivability and situational awareness enhancements. Initial funding in this line will be utilized to determine and exploit integration opportunities on existing infantry equipment which will be fielded in the near future. Funds will also be utilized for the Research & Development of a future integrated system which is modular in design which will enhance the infantrymans mobility, lethality, survivability and communications.

(U) FY 1998 Accomplishments:

(U)Total $ 0 FY 1998 funding is contained in PE 0603640M.

(U) FY 1999 Planned Program:

- (U) $ 117 Transition from the Technology Demonstration Phase to the Program Definition and Risk Reduction (PDRR) phase. Participate fully in the Joint Army/Marine Corps program. Develop Marine unique sub-systems and aspects.
- (U) $ 119 Initiate integration of existing infantry equipment as determined and recommended by previous studies.
- (U) $ 476 Studies, analysis and support services.
- (U) $ 18 Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

(U)Total$ 730

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration/Validation	PE NUMBER AND TITLE 0603635M Marine Corps Ground Combat/Supporting Arms Systems
	PROJECT C2256

(U) **FY 2000 Planned Program:**

- (U) $ 515 Integration of existing infantry equipment as determined and recommended by previous studies.
- (U) $ 136 Continued development and coordination w/US Army Land Warrior Program.
- (U) $ 100 Studies, analysis and support services.

(U)Total$ 751

B. (U) Project Change Summary

	FY 1998	FY 1999	FY 2000
(U) Previous President's Budget	0	744	853
(U) Adjustments to Previous President's Budget	0	-14	-102
(U) Current Budget Submit	0	730	751

(U) Change Summary Explanation:

(U) Funding: Decrease of $14k in FY 1999 due to minor affordability changes. FY 00 decrease is due to revised economic assumptions and general adjustments.

(U) Schedule: Not Applicable

(U) Technical: Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration/Validation	PE NUMBER AND TITLE 0603635M Marine Corps Ground Combat/Supporting Arms Systems PROJECT C2256

C. (U) **Other Program Funding Summary**

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
(U) PE 64657M,C2256 (RDT&E,N)	0	0	0	0	1768	1784	1801	1817	Cont.	Cont.

(U) **Related RDT&E:**

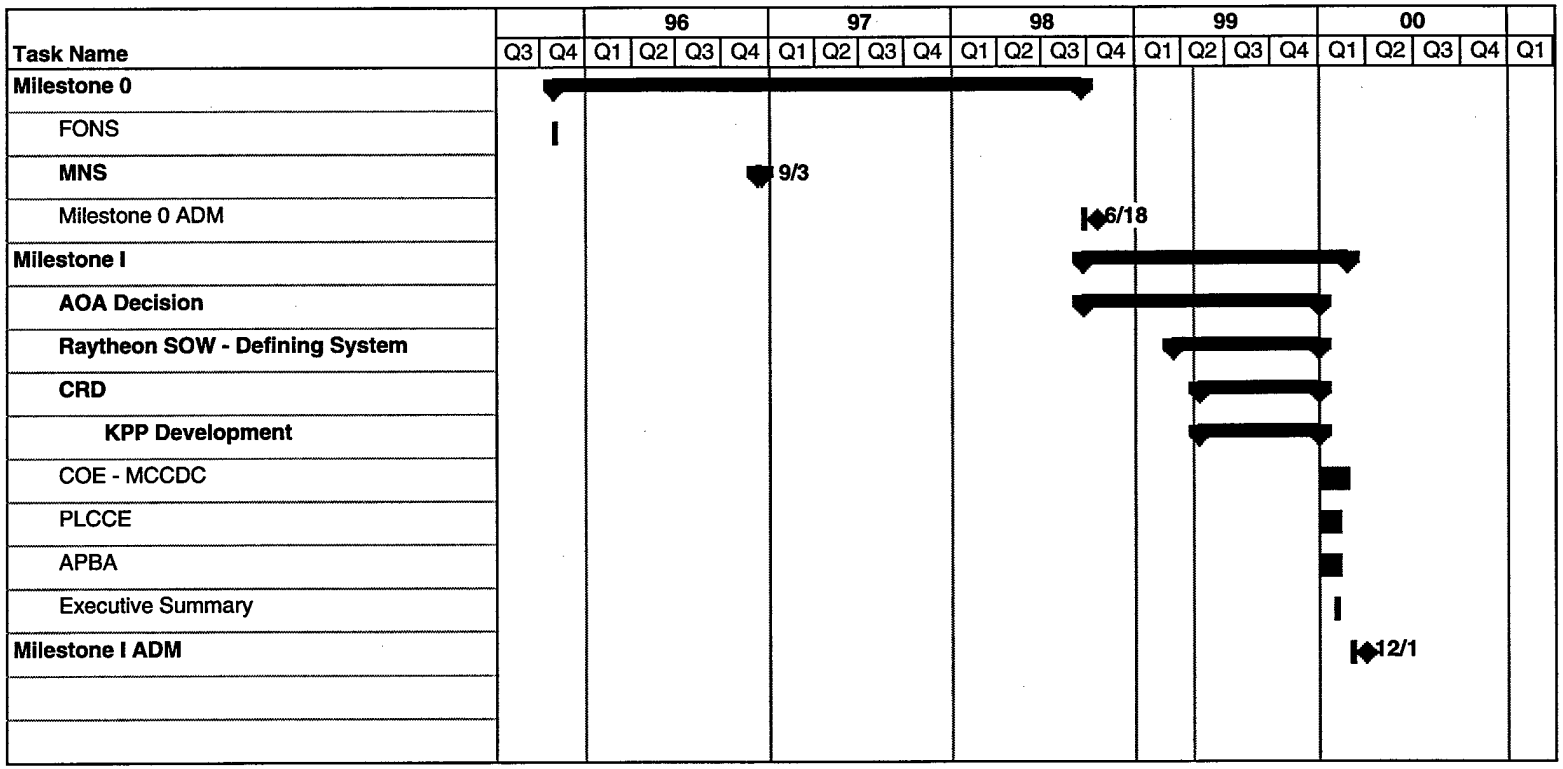
(U) PE 0602131M (Marine Corps Landing Force Technology)
(U) PE 0603640M (Marine Corps Advanced Technology Demonstration)
(U) PE 64657M (US Army Land Warrior Program)

D. (U) **Schedule Profile:**

	DATE
	February 1999

BUDGET ACTIVITY	PE NUMBER AND TITLE
4 - Demonstration/Validation	0603635M Marine Corps Ground Combat/Supporting Arms Systems

INTEGRATED INFANTRY COMBAT SYSTEM



RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration/Validation	PE NUMBER AND TITLE 0603635M Marine Corps Ground Combat/Supporting Arms Systems PROJECT C2507

COST *(In Thousands)*	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
C2507 Small Unit Riverine Craft (SURC)	0	0	3038	1750	226	10	0	0	0	5024
Quantity of RDT&E Articles										

A. (U) **Mission Description and Budget Item Justification:**

(U) The Small Unit Riverine Craft (SURC) will provide tactical mobility and a weapons platform for elements of a Marine Air Ground Task Force (MAGTF) Ground Combat Element (GCE) in the Riverine Environment. The SURC will replace the Rigid Raiding Craft (RRC) which was fielded 12 years ago. It will augment the larger Riverine Assault Craft (RAC) in riverine operations to include troop transport, troop insertion, and extraction, convoy ops, and application of fires.

(U) FY 1998 Accomplishments: Not Applicable.

(U) FY 1999 Planned Program: Not Applicable.

(U) FY 2000 Planned Program:

- (U) $ 368 System Analysis for SURC integration and testing of non-developmental components.
- (U) $ 325 Developmental Test Plan/Conduct Developmental Testing / Performance and Functioning testing.
- (U) $ 150 Commercial Design Review for non-developmental integration.
- (U) $ 625 Procure Candidate Hulls and conduct modifications for the integration of non-developmental candidate sub-systems.
- (U) $ 1,500 Procure and Integrate candidate Engines, Propulsion System, Navigation and Communication System, and Weapon System Mounts into Hulls.
- (U) $ 70 Provide Government Project Management and Documentation Support for the SURC Program.

(U)Total $ 3,038

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration/Validation

PE NUMBER AND TITLE: 0603635M Marine Corps Ground Combat/Supporting Arms Systems

PROJECT: C2507

B. (U) Project Change Summary

	FY 1998	FY 1999	FY 2000
(U) Previous President's Budget	0	0	0
(U) Adjustments to Previous President's Budget	0	0	+3038
(U) Current Budget Submit	0	0	3038

(U) Change Summary Explanation:

(U) Funding: New Start

(U) Schedule: New Start

(U) Technical: N/A

C. (U) Other Program Funding Summary

(APPN, BLI #, NOMEN)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Compl	Total Cost
(U) PMC BLI # 667000, SURC	0	0	0	0	3189	2363	2219	0	0	7771

(U) Related RDT&E

E. (U) Schedule Profile

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

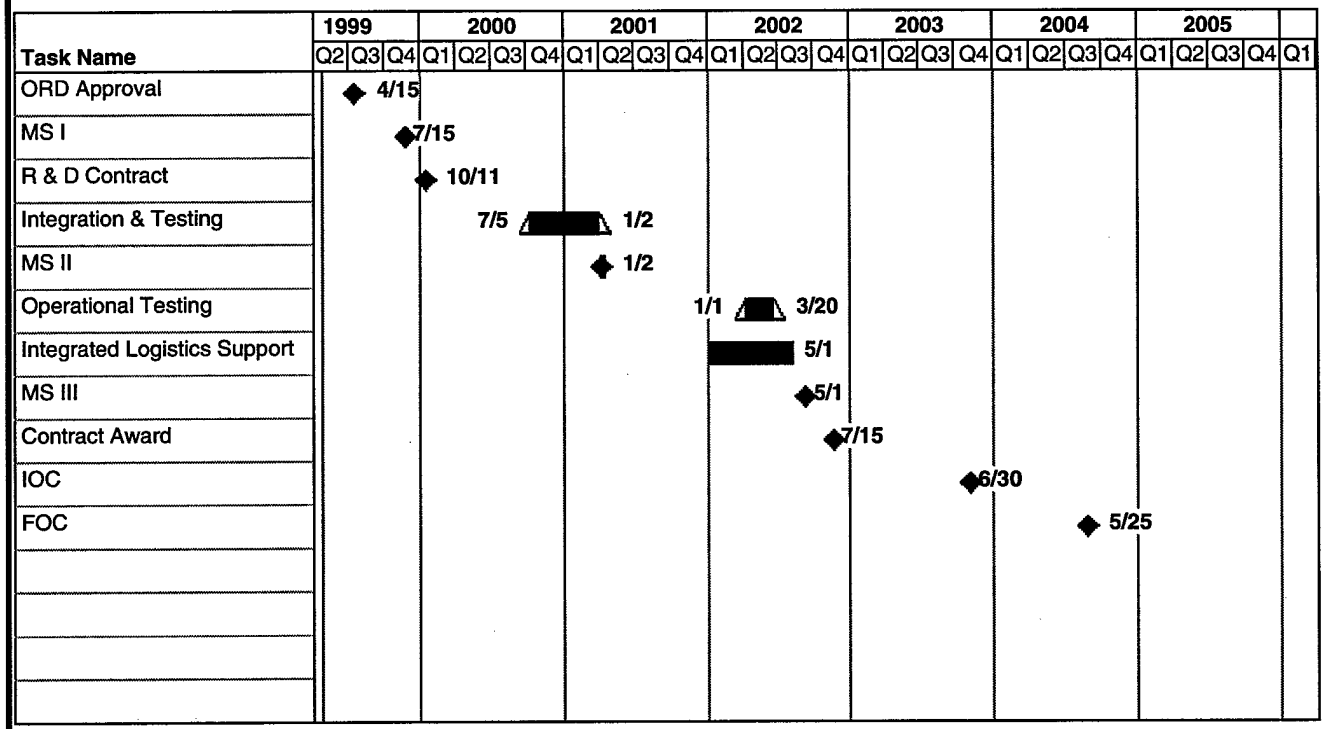
DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration/Validation

PE NUMBER AND TITLE: 0603635M Marine Corps Ground Combat/Supporting Arms Systems

PROJECT: C2507

SMALL UNIT RIVERINE CRAFT (SURC)



RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration/Validation

PE NUMBER AND TITLE: 0603635M Marine Corps Ground Combat/Supporting Arms Systems

PROJECT: C2507

A. (U) Project Cost Breakdown

	FY 1998	FY 1999	FY 2000
a. Government Developmental Engineering / Contract development.	0	0	2125
b. Test and Evaluation.	0	0	325
c. Conduct Engineering and Prototype Development.	0	0	518
d. Program Management Support	0	0	70
Total	0	0	3038

B. Budget Acquisition History and Planning Information

Performing Organizations

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Product Development Organizations										
NSWC Carderock, Suffolk, VA	WR	Oct 1999	2651	2651	0	0	0	2125	526	2651
NSWC Carderock, Suffolk, VA	WR	Oct 1999	1289	1289	0	0	0	518	771	1289
Support and Management Organizations										
ALS Inc. triangle VA	MIPR	Oct 1999	150	150	0	0	0	70	80	150
Test and Evaluation Organizations										
NSWC, Carderock, Suffolk VA	WR	Oct 1999	934	934	0	0	0	325	609	934

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration/Validation	PE NUMBER AND TITLE 0603635M Marine Corps Ground Combat/Supporting Arms Systems PROJECT C2507

Government Furnished Property

N/A

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									

	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Subtotal Product Development	0	0	0	2643	1297	3940
Subtotal Support and Management	0	0	0	70	80	150
Subtotal Test and Evaluation	0	0	0	325	609	934
Total Project	0	0	0	3038	1986	5024

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration/Validation

PE NUMBER AND TITLE: 0603635M Marine Corps Ground Combat/Supporting Arms Systems

PROJECT: C2508

COST *(In Thousands)*	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
C2508 Light Strike Vehicle	0	0	1624	1973	4034	2753	246	245	122	10997
Quantity of RDT&E Articles										

A. (U) **Mission Description and Budget Item Justification:** This project develops a joint MV-22 aircraft transportable, light strike, wheeled vehicle. The Light Strike Vehicle (LSV) will provide reconnaisance units with a high mobility weapons platform. It will improve ground reconnaissance mobility and support a wide variety of missions. The LSV will replace the Fast Attack Vehicles (FAVs) currently employed throughout the Marine Air Ground Task Force (MAGTF).

(U) **FY 1998 Accomplishments:** Not Applicable.

(U) **FY 1999 Planned Program:** Not Applicable.

(U) **FY 2000 Planned Program:**

- (U) $ 1200 Demonstration and Validation of two contract design vehicles.
- (U) $ 174 In House program management and TAD/travel.
- (U) $ 250 Engineering Support.

(U)Total $ 1,624

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration/Validation

PE NUMBER AND TITLE: 0603635M Marine Corps Ground Combat/Supporting Arms Systems

PROJECT: C2508

B. (U) Project Change Summary

	FY 1998	FY 1999	FY 2000
(U) Previous President's Budget	0	0	0
(U) Adjustments to Previous President's Budget	0	0	+1624
(U) Current Budget Submit	0	0	1624

(U) Change Summary Explanation:

(V) Funding: Transition from Advanced Technology Demonstration efforts.

(U) Schedule: Not applicable

(U) Technical: Not applicable

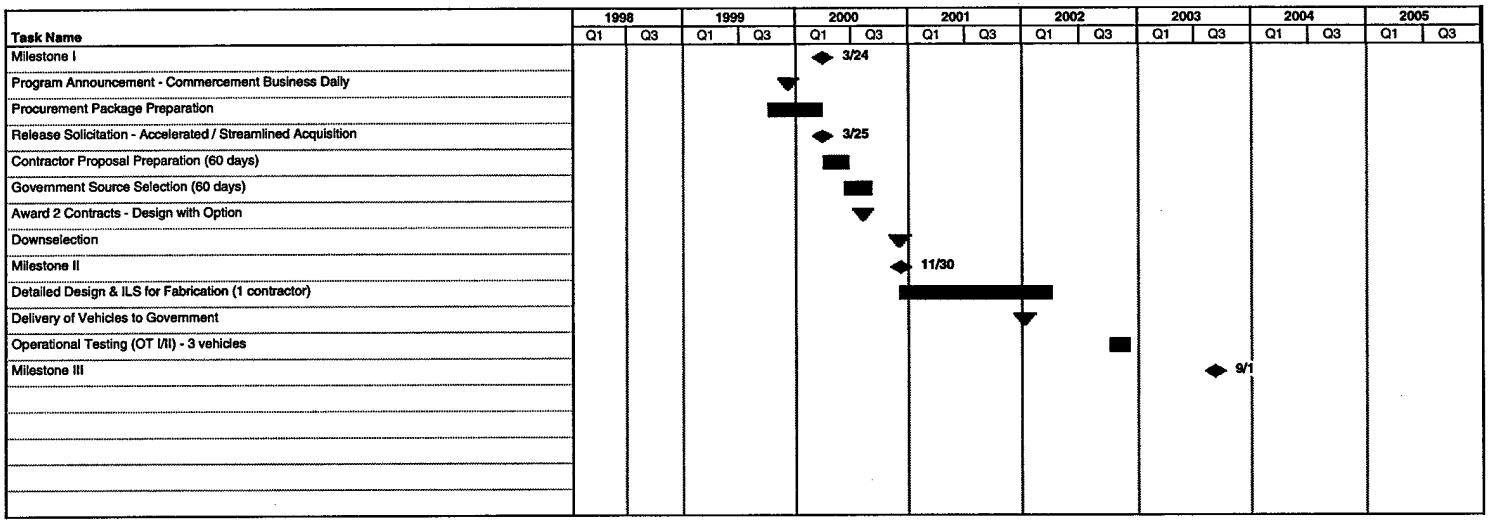
C. (U) Other Program Funding Summary (APPN, BLI #, NOMEN)

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Compl	Total Cost
(U) 204000 Light Strike Vehicle						0	16080	29459		
(U) **Related RDT&E:** SOCCOM joint particpation in LSV program.			295	510	545					

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1999
BUDGET ACTIVITY 4 - Demonstration/Validation	PE NUMBER AND TITLE 0603635M Marine Corps Ground Combat/Supporting Arms Systems PROJECT C2508

D. (U) **Schedule Profile**

LIGHT STRIKE VEHICLE



RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration/Validation

PE NUMBER AND TITLE: 0603635M Marine Corps Ground Combat/Supporting Arms Systems

PROJECT: C2508

A. (U) Project Cost Breakdown

	FY 1998	FY 1999	FY 2000
1. Systems Engineering	0	0	1200
a. Program management and Support	0	0	274
b. Government Engineering Support	0	0	120
c. Miscellaneous	0	0	30
Total	0	0	1624

B. Budget Acquisition History and Planning Information

Performing Organizations

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Product Development Organizations										
NSWC-Carderock, MD			3860	3860	0	0	0	1525	2335	3860
Support and Management Organizations										
Acquisition Logistics Systems, Dumfries, VA			467	467	0	0	0	99	368	467
Test and Evaluation Organizations										
NSWC-Carderock, MD			6670	6670	0	0	0	0	6670	6670

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration/Validation

PE NUMBER AND TITLE: 0603635M Marine Corps Ground Combat/Supporting Arms Systems

PROJECT: C2508

Government Furnished Property: Not applicable

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									

	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Subtotal Product Development				1525	2335	3860
Subtotal Support and Management				99	368	467
Subtotal Test and Evaluation				0	6670	6670
Total Project				1624	9373	10997

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY **RDT&E,N/BA 4**	R-1 ITEM NOMENCLATURE Joint Service Explosive Ordnance Disposal (EOD) Development 0603654N

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total P.E. Cost	10.1	10.5	11.2	10.9	9.3	9.2	9.4	9.6	Continuing	Continuing
JT Service Explosive Ordnance Disposal Systems/Q0377	4.5	5.1	6.1	6.1	6.3	6.4	6.5	6.7	Continuing	Continuing
EOD Diving Systems/Q1317	5.7	5.3	5.1	4.7	3.0	2.8	2.9	2.9	Continuing	Continuing
Quantity of RDT&E Articles & cost	Various	Various	Various	Various	Various	Various	Various	Various		

A. Mission Description and Budget Item Justification: This is a Joint Service Program. This program provides for the development of Explosive 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 5160.62 of 26 April 1989, for management of the Joint Service Explosive Ordnance Disposal Research and Development Program. Increasing types of foreign and domestic weapons necessitate a continuing development program to provide Explosive Ordnance Disposal personnel of all military service with the special equipment and tools required to support this mission. This program also provides life support related equipment necessary to support 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-safe and dispose of sea mines and other underwater ordnance.

B. Program Change Summary:

	FY 1998	FY 1999	FY 2000
FY 1999 President's Budget:	10.301	10.756	11.200
Appropriated Value:	10.701		
Adjustment to FY 1998 Appropriated Value/ FY 1999 President's Budget:	-.559	-298	+.32
FY 2000 DON Budget Submit:	10.142	10.458	11.168

Funding: Decreases are due to general adjustments.

Schedule: Not applicable for Q0377. Q1317-The Acoustic Firing System (AFS) Acquisition Program Baseline references the technical difficulties experienced during recent developmental testing that has subsequently resulted in additional testing requirements. As a result, modifications to key hardware components and corrections to software have extended the schedule by six months.

Technical: Not applicable.

Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA 4	Program Element Name & No. JT Service EOD Development 0603654N	Project Name and Number. JT Service EOD Systems/Q0377	

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	4.5	5.1	6.1	6.1	6.3	6.4	6.5	6.7	Continuing	Continuing
RDT&E Articles Qty	Various	Various	Various	Various	Various	Various	Various	Various		

A. Mission Description and Budget Item Justification: Provides Explosive Ordnance 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.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. FY 1998 ACCOMPLISHMENTS :

- ($1.460) Obtained Milestone III decision for Advanced Radiographic System (ARS) project and Classified Project I and Milestone II decision for Lightweight Disposable Disrupter (LIDD).
- ($2.524) Continued development of the Remote Ordnance Neutralization System (RONS) and Main Charge Disrupter (MCD) projects.
- ($.506) Initiated the Classified Project II project.

2. FY 1999 PLAN:

- ($1.924) Obtain Milestone III decision for RONS and MCD projects.
- ($2.038) Continue development of the Classified Project II and LIDD projects.
- ($1.159) Conduct Analysis of Alternatives studies of the Explosive Safe/Arm Monitor, and Large Improvised Explosive Device (IED) Neutralization projects. Initiate the Improved (Standoff) Disrupter Tools (Small Caliber Dearmer and Standoff Disrupter) projects.

3. FY2000 PLAN:

- ($.900) Obtain Milestone III decision for LIDD project.
- ($3.273) Continue development of the Classified Project II, Small Caliber Dearmer (SCD) and Standoff Disrupter (SD) projects.
- ($1.500) Initiate the Large IED Neutralization project.
- ($.400) Conduct Analysis of Alternative studies for the Explosive Safe/Arm (ESA) Monitor and EOD Incident C2I System projects.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA 4	Program Element Name & No. JT Service EOD Development 0603654N	Project Name and Number. JT Service EOD Systems/Q0377

B. Other Program Funding Summary:

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
OPN Line Item										
5509	.200	1.476	1.568	1.568	.621	.950	1.575	1.200	Cont.	Cont.
3400			.234	.510					0	.744

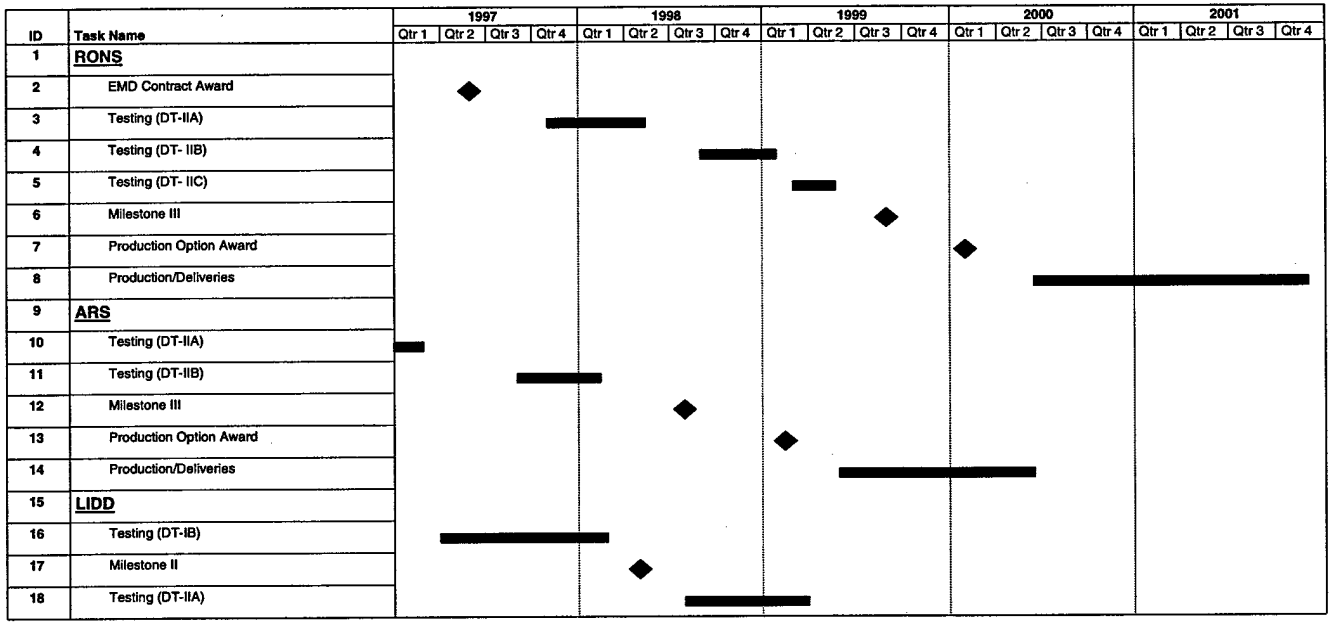
C. Acquisition Strategy: Analysis of Alternatives (AOA) studies are always conducted prior to the initiation of new subprojects. The AOA addresses and emphasizes acquisition strategies of the most cost-effective solution over the subprojects' life-cycle. The acquisition strategies observe the following hierarchy of alternatives: commercial item (including modification), non-developmental item (including modification), and lastly, developmental programs. Contracting for RDT&E, if required, is always competitive and when feasible, production options are included.

D. Schedule Profile: See Attached.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA 4	Program Element Name & No. JT Service EOD Development 0603654N	Project Name and Number. JT Service EOD Systems/Q0377

PE 0603654N JOINT SERVICE EOD DEVELOPMENT
Q0377 JOINT SERVICE EOD SYSTEMS

RDT&E MILESTONE CHART



**This Milestone Chart is in Fiscal Years

1

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA 4	PROGRAM ELEMENT NAME AND NUMBER JT Service EOD Development 0603654N	PROJECT NAME AND NUMBER JT Service EOD Systems/Q0377

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	WR	EODTD, IH, MD	69.956	1.649	10/98	2.526	10/99			CONT.	CONT.	
Software Development	WR	EODTD, IH, MD	3.254	.050	10/98		10/99			CONT.	CONT.	
ILS	WR	EODTD, IH, MD	32.540	.820	10/98	.910	10/99			CONT.	CONT.	
Subtotal Product Development			105.750	2.519		3.436				CONT.	CONT.	
Remarks:												
Program Management Support	CPFF	Dynamic Systems, Alex, VA	2.020	.320	1/99	.340	1/00			.940	3.980	
Subtotal Support			2.020	.320		.340				.940	3.980	
Remarks:												

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA 4	PROGRAM ELEMENT NAME AND NUMBER JT Service EOD Development 0603654N	PROJECT NAME AND NUMBER JT Service EOD Systems/Q0377

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	Fy00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	EODTD, IH, MD	48.812		10/98	1.050	10/99			CONT.	CONT.	
Operational Test & Evaluation	WR	EODTD, IH, MD	8.135	1.296	10/98	.110	10/99			CONT.	CONT.	
Subtotal T&E			56.947	1.296		1.160						
Remarks:												
Program Management Personnel	WR	EODTD, IH, MD	3.000	.220	10/98	.225	10/99			CONT.	CONT.	
Miscellaneous	Various	Various	.800	.766	2/99	.912	2/00			CONT.	CONT.	
Subtotal Management			3.800	.986		1.137						
Remarks:												
Total Cost			168.517	5.121		6.073						

Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA 4	Program Element Name & No. JT Service EOD Development 0603654N	Project Name and Number. EOD Diving Systems/Q1317	

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	5.7	5.3	5.1	4.7	3.0	2.9	2.9	2.9	Continuing	Continuing
RDT&E Articles Qty	Various	Various	Various	Various	Various	Various	Various	Various		

A. Mission Description and Budget Item Justification: Provides for development of diving equipment and explosive charges to support Explosive Ordnance Disposal (EOD) underwater operations. The equipment must have inherently low acoustic and magnetic signatures in order to allow the EOD technician to safely approach, render-safe, and dispose of sea mines and other underwater ordnance. Provides support for the Navy's high priority mission of Very Shallow Water (VSW) mine countermeasures, including clandestine reconnaissance, in support of amphibious operations.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. FY 1998 PLAN:

- ($.813) Continued to develop equipment which improves diver capability and endurance.
- ($.604) Continued to develop a non-magnetic acoustic firing system.
- ($.475) Developed non-magnetic diver held underwater equipment to detect objects in the water column.
- ($.245) Developed non-magnetic diver underwater navigation system compatible with Global Positioning System (GPS).
- (3.515) Developed, test and gained approval for fleet use of specialized equipment to support the Very Shallow Water Mine Countermeasures mission and CNO approved VSW MCM Detachment (USN/USMC).

2. FY 1999 PLAN:

- ($.323) Continue developing equipment which improves diver capability and endurance.
- ($.400) Continue developing a non-magnetic acoustic firing system.
- ($.796) Continue developing non-magnetic diver held underwater equipment to detect objects in the water column.
- ($.300) Continue developing non-magnetic diver underwater navigation system compatible with GPS.
- ($.309) Develop low influence underwater diver mounted display which will provide video interface with other EOD systems (Underwater Imaging System, Underwater Navigation System and MK 16 UBA).
- ($.385) Develop non-magnetic underwater vehicles to transport divers and associated equipment in support of MCM operations.
- (2.824) Develop, test and gain approval for fleet use of specialized equipment to support the Very Shallow Water Mine Countermeasures mission and CNO approved VSW MCM Detachment (USN/USMC).

Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA 4	Program Element Name & No. JT Service EOD Development 0603654N	Project Name and Number. EOD Diving Systems/Q1317	

3. FY2000 PLAN:

- ($.380) Continue developing equipment which improves diver capability and endurance.
- ($.853) Continue developing a non-magnetic acoustic firing system.
- ($.923) Continue developing non-magnetic diver held underwater equipment to detect objects in the water column.
- ($.434) Develop 1.3 ata HeO2 diving tables for the MK 16 MOD 0 underwater breathing apparatus.
- ($2.510) Continue to develop, test and gain approval for fleet use of specialized equipment to support the Very Shallow Water Mine Countermeasures mission and CNO approved VSW MCM Detachment (USN/USMC).

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA 4	Program Element Name & No. JT Service EOD Development 0603654N	Project Name and Number. EOD Diving Systems/Q1317

B. Other Program Funding Summary

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
OPN Line Item										
5509	4.726	4.080	2.219	.840	3.306	3.472	4.778	4.951	CONT.	CONT.
3400		2.914	1.960						4.874	4.874

C. Acquisition Strategy: Analysis of Alternatives (AOA) studies are always conducted prior to the initiation of new subprojects. The AOA addresses and emphasizes acquisition strategies of the most cost-effective solution over the subprojects' life-cycle. The acquisition strategies observe the following hierarchy of alternatives: commercial item (including modification), non-developmental item (including modification), and lastly, developmental programs. Contracting for RDT&E, if required, is always competitive and when feasible, production options are included.

D. Schedule Profile: See Attached.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA 4	Program Element Name & No. JT Service EOD Development 0603654N	Project Name and Number. EOD Diving Systems/Q1317

Q1317 EOD Diving Systems MS

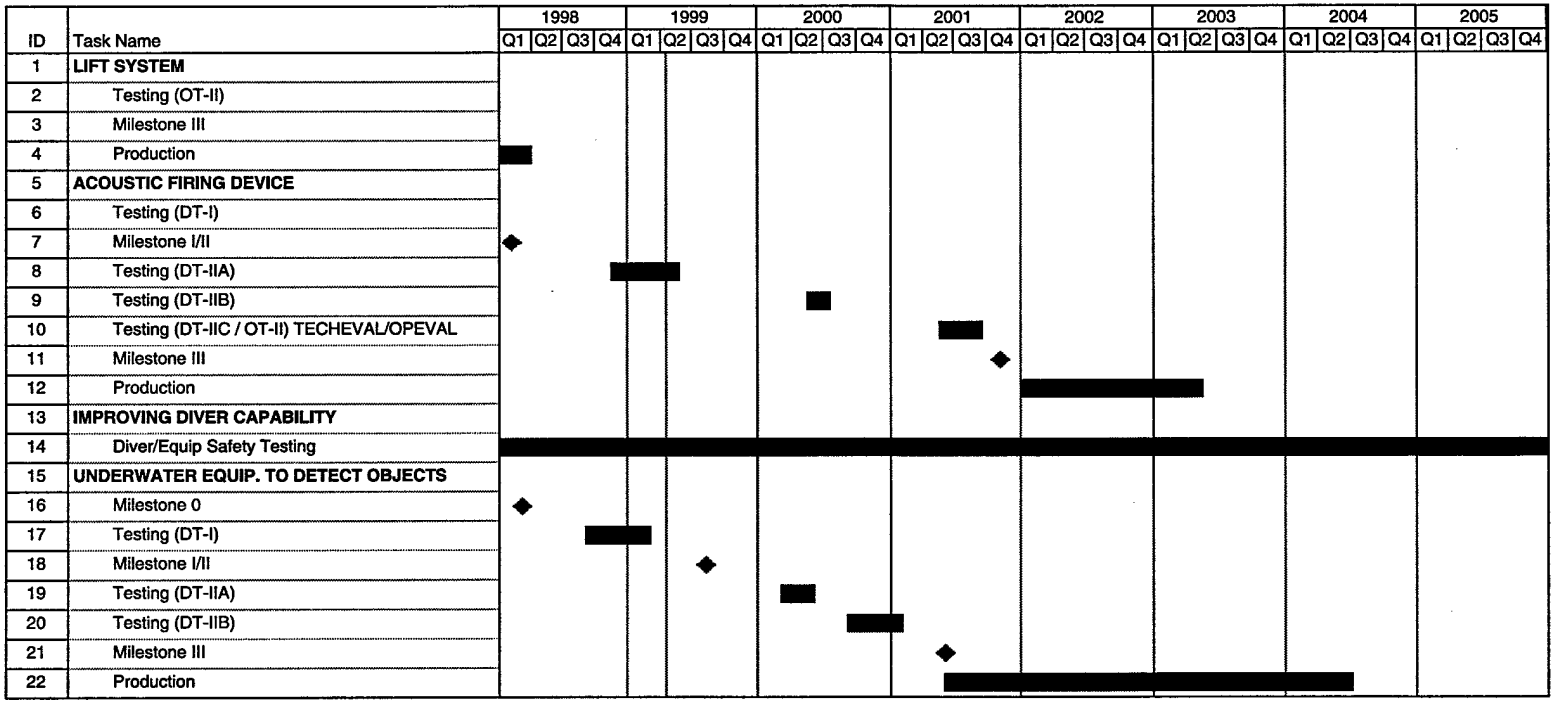


Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA 4	Program Element Name & No. JT Service EOD Development 0603654N	Project Name and Number. EOD Diving Systems/Q1317

Q1317 EOD Diving Systems MS

ID	Task Name
23	**UNDERWATER NAVIGATION SYSTEM**
24	Milestone 0
25	Testing (DT-I)
26	Milestone I/II
27	Testing (DT-IIA)
28	Testing (DT-IIB)
29	Milestone III
30	Production
31	**DIVERS HEADS-UP DISPLAY**
32	Milestone 0
33	Testing (DT-I)
34	Milestone I/II
35	Testing (DT-IIA)
36	Testing (DT-IIB)
37	Milestone III
38	Production
39	**DIVER SUPPORT VEHICLE, (AAP)**
40	Program Initiation
41	Testing
42	Production Decision
43	Production
44	**VERY SHALLOW WATER**
45	Milestone 0
46	Primary Hardware Development

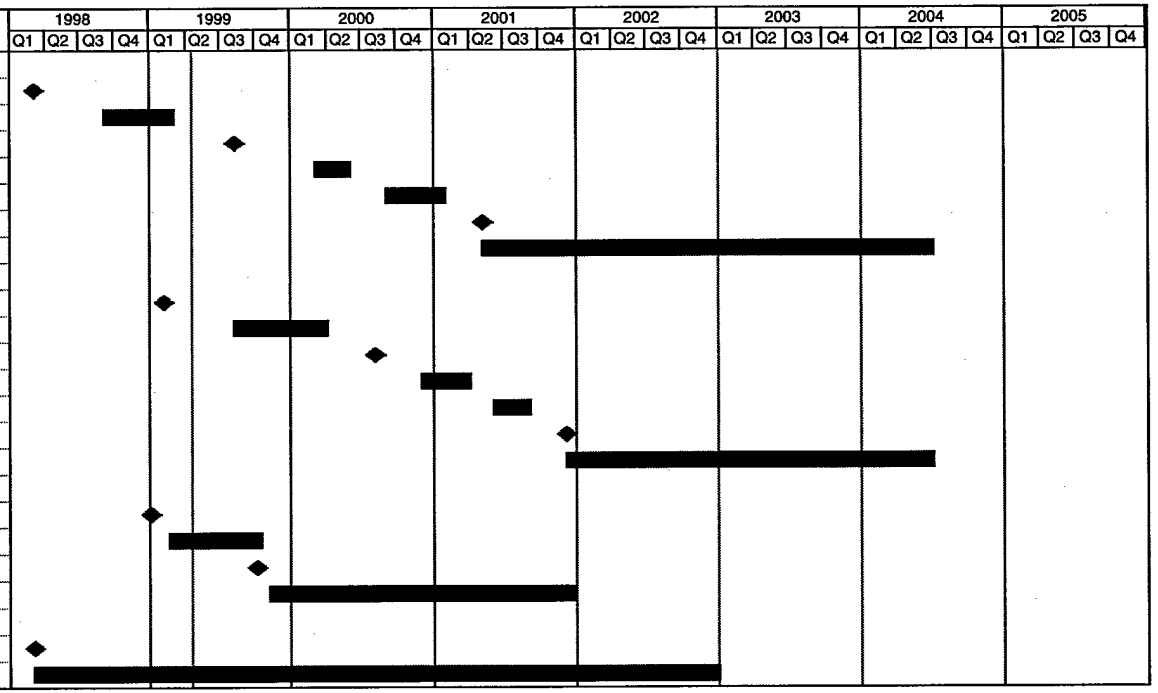


Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA 4	PROGRAM ELEMENT NAME AND NUMBER Joint Service EOD Development 0603654N	PROJECT NAME AND NUMBER EOD Diving Systems/Q1317

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	WR	SPAWAR,SD, CA	1.500	1.130	10/98	1.000	10/99			CONT.	CONT.	
Primary Hardware Development	WR	VARIOUS	14.273	1.339	10/98	.885	10/99			CONT.	CONT.	
Software Development	WR	VARIOUS	.600	.133	10/98	.158	10/99			CONT.	CONT.	
Systems Engineering	WR	VARIOUS	6.000	.400	10/98	.350	10/99			CONT.	CONT.	
ILS	WR	VARIOUS	10.192	.500	10/98	.200	10/99			CONT.	CONT.	
Subtotal Product Development			32.565	3.502		2.593						
Remarks:												
Program Management Support	CPFF	Dynamic Sys, Alex, VA	1.418	.428	1/99	.440	1/99			1.150	3.886	
Subtotal Support			1.418	.428		.440				1.150	3.886	
Remarks:												

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA 4	PROGRAM ELEMENT NAME AND NUMBER Joint Service EOD Development 0603654N	PROJECT NAME AND NUMBER EOD Diving Systems/Q1317

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	Fy00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	VARIOUS	1.200	.720	10/98	.400	10/99			CONT.	CONT.	
Operational Test & Evaluation	WR	VARIOUS	.450	.150	10/98	.320	10/99			CONT.	CONT.	
Subtotal T&E			1.650	.870		.720						
Remarks:												
Program Management Personnel	WR	EODTD, IH, MD	3.000	.467	10/98	.650	10/99			CONT.	CONT.	
Miscellaneous	Various	Various	1.000	.070	2/99	.692	2/00			CONT.	CONT.	
Subtotal Management			4.000	.537		1.342						
Remarks:												
Total Cost			39.633	5.337		5.095						
Remarks:												

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA 4	PROGRAM ELEMENT NAME AND NUMBER Joint Service EOD Development 0603654N	PROJECT NAME AND NUMBER EOD Diving Systems/Q1317

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Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/4	R-1 ITEM NOMENCLATURE Cooperative Engagement Capability Program Element (PE) Name and No. 0603658N

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total P.E. Cost	200.512	195.462	114.931	98.203	50.655	49.485	47.604	47.790	CONT.	CONT.
CEC/K2039/U2039	200.512	118.640	114.931	98.203	50.655	49.485	47.604	47.790	CONT.	CONT.
CEC/K2616	0	76.822	0	0	0	0	0	0		
Quantity of RDT&E Articles & cost										

A. (U) Mission Description and Budget Item Justification: Cooperative Engagement Capability (CEC) significantly improves Battle Force Anti-Air Warfare (AAW) capability by coordinating all Battle Force AAW sensors into a single, real-time, composite track picture having fire control quality. CEC distributes sensor data from each ship and aircraft, or cooperating unit (CU), to all other CUs in the battle force through a real-time, line of sight, high data rate sensor and engagement data distribution network. CEC is highly resistant to jamming and provides accurate gridlocking between CUs. Each CU independently employs high capacity, parallel processing and advanced algorithms to combine all distributed sensor data into a fire control quality track picture which is the same for all CUs. CEC data is presented as a superset of the best AAW sensor capabilities from each CU, all of which are integrated into a single input to each CU's combat weapons system. CEC will significantly improve our Battle Force defense in depth, including both local area and ship defense capabilities against current and future AAW threats. Moreover, CEC will provide critical connectivity and integration of over-land air defense systems capable of countering emerging air threats, including land attack cruise missiles, in a complex littoral environment.

(U) CEC consists of the Data Distribution System (DDS), the Cooperative Engagement Processor (CEP), and Combat System Modifications. The DDS encodes and distributes ownership sensor and engagement data, is a high capacity, jam resistant, directive system providing a precision gridlocking and high throughput of data. The CEP is a high capacity distributed processor which is able to process force levels of data in a timely manner that allows its output to be considered real-time fire control data. This data is passed to the ship's combat system as fire control quality data for which the ship can cue its onboard sensors or use the data to engage targets without actually tracking them.

PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1998 ACCOMPLISHMENTS:

- (U) ($ 55.736) Continued CEC hardware and software systems engineering efforts at Raytheon Systems Company, St. Petersburg, FL.
- (U) ($ 26.372) Continued CEC Technical Design Agent/Design Agent (TDA/DA) engineering efforts at the Johns Hopkins University, Applied Physics Laboratory, Laurel, MD (JHU/APL).
- (U) ($ 36.100) Continued CEC E-2C integration efforts at PMA 231.
- (U) ($ 15.010) Continued airborne E-2C integration support and completed installation aboard P-3 aircraft.
- (U) ($ 4.847) Continued Advanced Combat Direction System (ACDS) integration efforts and conducted ACDS Block 1 Certification Testing at Integrated Combat Systems Test Facility, San Diego (ICSTF).
- (U) ($ 21.824) Continued AEGIS integration efforts; developed and conducted initial at-sea testing of integrated CEC/AEGIS Baseline 6, Phase 1 software.
- (U) ($ 17.367) Continued field support (In-Service Engineering; Software Support; Integrated Logistics Support Planning).
- (U) ($ 6.807) Conducted test and evaluation (T&E) efforts (engineering tests; underway periods 1-4 with USS John F. Kennedy battle group) .
- (U) ($ 9.372) Continued Naval and Joint integration efforts (AN/TPS-59 HAWK; Satellites).
- (U) ($ 7.077) Continued Program Management support.

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/4	R-1 ITEM NOMENCLATURE Cooperative Engagement Capability Program Element (PE) Name and No. 0603658N

(U) FY 1999 PLAN:

- (U) ($ 74.404) Continue CEC hardware and software systems engineering efforts at Raytheon; commence AN/USG-2 Design Agent transition from JHU/APL.
- (U) ($ 19.058) Continue CEC TDA/DA engineering efforts at JHU/APL.
- (U) ($ 37.680) Continue CEC E-2C integration efforts at PMA 231.
- (U) ($ 8.065) Continue ACDS/CEC integration efforts (test support; correction of interoperability/interface problems).
- (U) ($ 12.160) Continue field support (In-Service Engineering; Software Support; Integrated Logistics Support Planning).
- (U) ($ 15.615) Continue T&E efforts; conduct engineering; developmental and operational testing.
- (U) ($ 14.005) Continue Naval and Joint fleet exercises and integration efforts.
- (U) ($ 9.866) Continue Program Management support.
- (U) ($ 4.609) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

(U) FY 2000 PLAN:

- (U) ($ 34.726) Continue CEC hardware and software systems engineering and DA transition efforts at Raytheon.
- (U) ($ 17.500) Continue CEC TDA engineering efforts at JHU/APL.
- (U) ($ 11.600) Continue CEC E-2C integration efforts at PMA 231.
- (U) ($ 14.800) Continue field support (In-Service Engineering; Software Support; Integrated Logistics Support Planning).
- (U) ($ 28.800) Conduct T&E efforts (TECHEVAL/OPEVAL Phase 1).
- (U) ($ 4.653) Continue Naval and Joint fleet exercises and integration efforts.
- (U) ($ 2.852) Continue Program Management support.

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/4	R-1 ITEM NOMENCLATURE Cooperative Engagement Capability Program Element (PE) Name and No. 0603658N

B. Program Change Summary:

	FY 1998	FY 1999	FY 2000
FY 1999 President's Budget:	206.851	131.623	82.704
Appropriated Value:	213.229	196.123	
Adjustment to FY 1998 Appropriated Value/			
FY 1999 President's Budget:	-12.717	-0.661	+32.227
FY 2000 PRES Budget Submit:	200.512	195.462	114.931

Funding: FY 1998 changes are due to a decrease for FY98 SBIR (-5.369), a decrease for Congressional Undistributed Reductions (-6.378), a decrease for minor pricing adjustments (-.710), and a decrease for FY 1998 update (-.260). FY 1999 changes are due to various rate adjustments. FY 2000 changes are due to an increase to adjust CEC program funding (+15.700), an increase to support the revised testing schedule (+28.500), a decrease for LAMPS III Data Link transfer (-10.000), and a decrease for various rate adjustments (-1.973).

Schedule: DT-IIC/OT-IIA2 Operational Assessment of the integrated CEC/E-2C aircraft is scheduled for May 1999. The 2nd Low Rate Initial Production contract award is scheduled for February 1999. DT-IID/OT-IIA3 is scheduled for mid-1999. OPEVAL is planned for 2000. Milestone III is scheduled for July 2001.

Technical: Not applicable.

C. Other Program Funding Summary

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
OPN 260600/5/6	70.908	81.993	60.494	74.407	155.646	185.456	126.648	124.961	458.521	1.336.034
SCN Various	21.475	14.544	23.401	21.460	31.470	47.425	20.507	20.204	31.514	232.000
O&MN 1D4D	17.886	20.388	22.243	24.168	25.230	25.353	25.988	26.659	CONT.	CONT.
APN (BA-5,1) 330000			12.734	19.933	19.706	19.904	12.534	12.743	353.690	451.244
R&D(0204152N)	5.109									5.109
R&D (U2039)(0603755N)										836.063

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/4	R-1 ITEM NOMENCLATURE Cooperative Engagement Capability Program Element (PE) Name and No. 0603658N

D. Acquisition Strategy: The CEC program received LRIP approval in March 1998 and a sole source contract was issued to Raytheon Systems Company, St. Petersburg, Florida. Follow-on LRIP contracts are planned in the 2nd quarter of FY 1999 and FY 2000. Full Rate Production is planned for FY 2001. Separate contracts will be issued for software maintenance and development and repair of existing CEC equipment. LRIP and software contracts are planned to be cost plus incentive/award fees and the system maintenance contract will be a Basic Ordering Agreement. A competition feasibility analysis will be completed prior to entering full rate production. A Pre-Planned Product Improvement program in 2002 is expected to incorporate technology advancements/increased functional capabilities. The goal will be to decrease Total Ownership Cost and increase Reliability and Maintainability.

E. Schedule Profile (See Next Page)

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/4	R-1 ITEM NOMENCLATURE Cooperative Engagement Capability Program Element (PE) Name and No. 0603658N

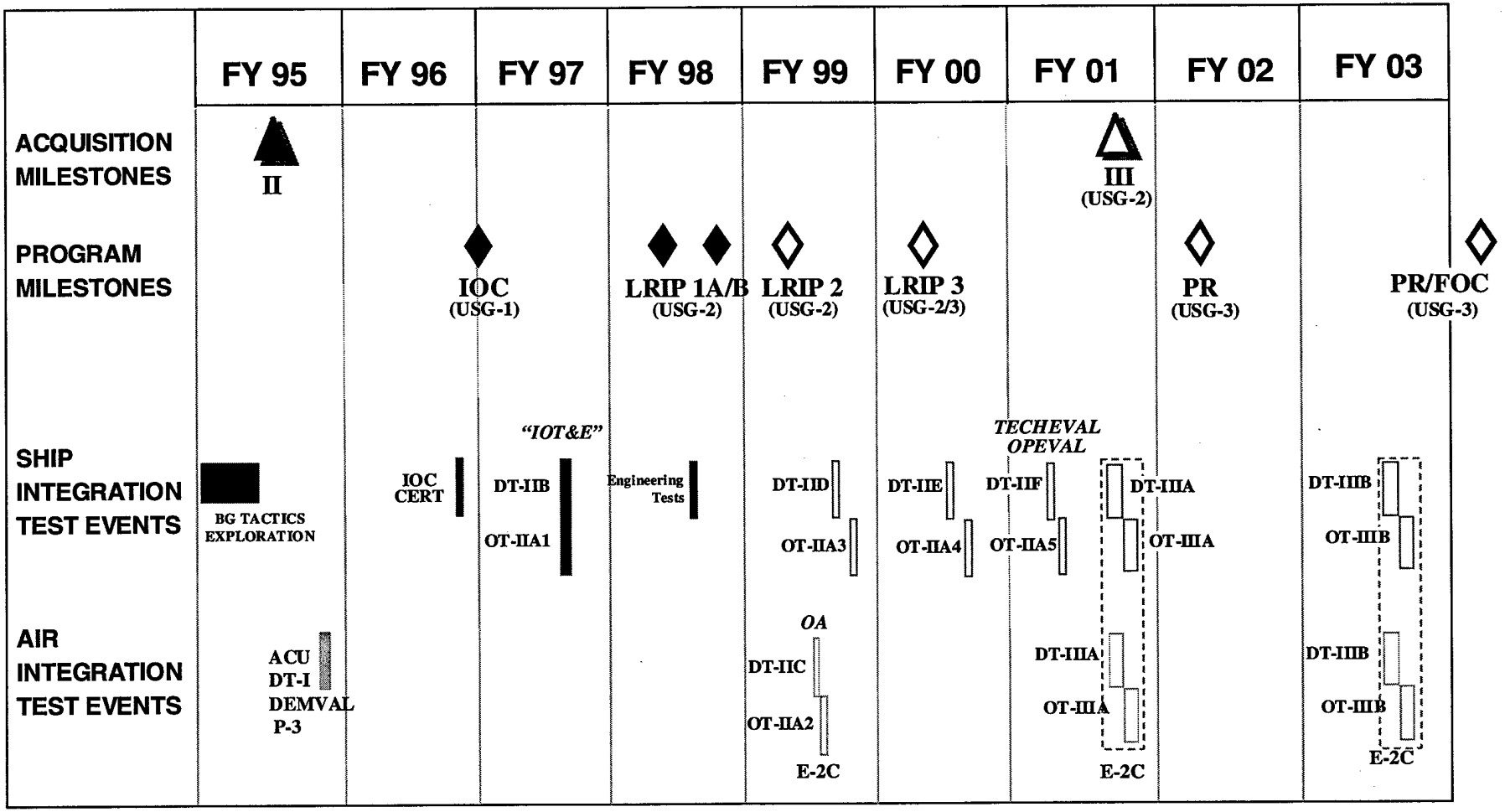


Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/4	PROGRAM ELEMENT NAME AND NUMBER Cooperative Engagement Capability 0603658N	PROJECT NAME AND NUMBER CEC/K2039

	Contract Method & Type	Performing Activity & Location	Total Pys Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Product Development	SS/CPAF	Raytheon Systems, ST. PETERSBURG, FL	381.781	4.510	3/99	0	N/A			386.291	386.291	
	SS/CPAF	Raytheon Systems, ST. PETERSBURG, FL	0	69.894	7/99	34.726	6/00			CONT.	CONT.	
	SS/CPFF	JHU/APL LAUREL, MD	154.622	19.058	8/99	17.500	6/00			CONT.	CONT.	
	PD	NAVAIR PMA-231 PAX RIVER, MD	83.200	37.680	6/99	11.600	5/00			CONT.	CONT.	
	C/FFP	LOCKHEED AERO SYS, MARIETTA,GA	40.512	0	N/A	0	N/A			0	40.512	
	WR	NSWC,CRANE	19.982	2.444	11/98	4.133	1/00			CONT.	CONT.	
	WR	NSWC,DAHLGREN	28.677	3.664	1/99	5.334	1/00			CONT.	CONT.	
	WR	NSWC, PT HUENEME, CA	34.396	6.052	4/99	5.333	5/00			CONT.	CONT.	
	RC	NORFOLK NSY NORFOLK, VA	3.753	0	N/A	0	N/A			CONT.	CONT.	
	RC	SUPSHIP JACKSONVILLE, FL	2.805	0	N/A	0	N/A			CONT.	CONT.	
	RC	SUPSHIP PASC	1.159	0	N/A	0	N/A			CONT.	CONT.	

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/4	PROGRAM ELEMENT NAME AND NUMBER Cooperative Engagement Capability 0603658N	PROJECT NAME AND NUMBER CEC/K2039

	Contract Method & Type	Performing Activity & Location	Total Pys Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
	PD	DRPM, AEGIS WASHINGTON,DC	115.245	0	N/A	0	N/A			0	115.245	
	C/CPFF	NORTHRUP/GRUMMAN, BETHPAGE NY	9.295	0	N/A	0	N/A			0	9.295	
	C/CPFF	LORAL CORP. EAGAN, MN	5.075	0	N/A	0	N/A			0	5.075	
	MIPR	AWACS SPO HANSCOM AFB, MA	2.989	0	N/A	0	N/A			0	2.989	
	WR	SPAWAR, SAN DIEGO, CA	23.609	.815	3/99	0	N/A			0	24.424	
	C/CPFF	RAYTHEON, AEROSPACE ,CA	21.761	3.162	5/99	0	N/A			0	24.923	25.220
	C/CPIF	UNISYS, INC. ST. PAUL, MN	24.630	0	N/A	0	N/A			0	24.630	
	VAR	MISCELLANEOUS	44.668	22.702	8/99	4.653	7/00			CONT.	CONT.	
TOTAL Product Dev			998.159	169.981	N/A	83.279	N/A			CONT.	CONT.	
Remarks:												

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/4	PROGRAM ELEMENT NAME AND NUMBER Cooperative Engagement Capability 0603658N	PROJECT NAME AND NUMBER CEC/K2039

	Contract Method & Type	Performing Activity & Location	Total Pys Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	VARIOUS	Miscellaneous	16.478	15.615	7/99	28.800	8/00			CONT.	CONT.	
STOTAL T&E			16.478	15.615	N/A	28.800	N/A			CONT.	CONT.	
Remarks:												
Manage-ment	C/CPFF	Technautics	7.671	1.554	6/99		N/A			0	9.225	
	VARIOUS	Miscellaneous	14.267	8.312	8/99	2.852	2/00			CONT.	CONT.	
STOTAL Mgmt.			21.938	9.866	N/A	2.852	N/A			CONT.	CONT.	
TOTAL			1,036.575	195.462	N/A	114.931	N/A			CONT.	CONT.	
Remarks:												

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDTEN/BA4	R-1 ITEM NOMENCLATURE Program Element (PE) Name and No. Ocean Engineering Development 0603713N

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total P.E. Cost	9.953	15.219	16.813	16.289	16.225	14.482	14.780	15.084	Continuing	Continuing
Deep Submergence Biomedical Development/S0099	3.741	4.005	3.779	3.784	3.750	3.908	3.989	4.070	Continuing	Continuing
Shallow Depth Diving Equipment/S0394	6.212	11.214	13.034	12.505	12.475	10.574	10.791	11.014	Continuing	Continuing
Quantity of RDT&E Articles & cost										

A. Mission Description and Budget Item Justification: Developments in this program will enable the U.S. Navy to overcome deficiencies that constrain underwater operations in the areas of search, location, rescue, recovery, salvage, construction, and protection of offshore assets. This program develops medical technology, diver life support equipment, and the vehicles, systems, and tools to permit manned underwater operations.

B. Program Change Summary:

	FY 1998	FY 1999	FY 2000
FY 1999 President's Budget:	10.283	15.257	17.103
Appropriated Value:	12.658	15.257	
Adjustment to FY 1998 Appropriated Value/			
FY 1999 President's Budget:	-2.705	-.038	-.290
FY 2000/01 PRES Budget Submit:	9.953	15.219	16.813

Funding: The FY 98 decrease of $2.705M results from the 62207 FY 98 SBIR Reduction ($263K), 62371 DD1002: April 1998 Update Reduction ($32K), 64022 BTR Issue Addition ($23K), 64543 FY 1998 Update Reduction ($58K), Undistributed Reduction ($375K), and Shallow Water Diving Equipment Reprogramming ($2,000). The FY 99 decrease of $0.038M results from the 64128 Sec. 8108 Revised Economic Assumption Reduction ($35K) and 64231 Civilian Personnel Underexecution Reduction ($3K). The FY 00 decrease of $0.290M results from the 62288 Outsourcing Adjustment Reduction ($30K), 66547 PBD 604: Non Pay Inflation Reduction ($244K) and 66748 Additional Inflation Reduction ($16K).

The FY 98 decrease of $2.647M results from the 62207 FY 98 SBIR Reduction ($263K), 62371 DD1002: April 1998 Update Reduction ($32K), 64022 BTR Issue Addition ($23K) and.

Schedule: Not applicable.

Technical: Not applicable.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDTEN/BA4	Program Element Name & No. Ocean Engineering Development 0603713N	Project Name and Number. Deep Submergence Biomedical Development/S0099

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	3.741	4.005	3.779	3.784	3.750	3.908	3.989	4.070	Continuing	Continuing
RDT&E Articles Qty										

A. Mission Description and Budget Item Justification: Develops advanced biomedical/bioengineering technology for enhancing medical and life support for submarine escape and rescue; and for diver safety and effectiveness; supports deeper, longer, safer, more flexible dives. Deliverables include: a) exposure guidance for DISSUB atmospheric contaminants, underwater continuous and impulsive noise, underwater blast, oxygen breathing, and diving depth/time profiles; b) medical procedures for life support on DISSUB, submarine escape and rescue (including new Submarine Rescue Diving and Recompression System, SRDRS), prevention and treatment of decompression illness, c) technologies to assess underwater noise and DISSUB life support parameters; enable non-chemical CO2 scrubbing; predict decompression risk in diving; provide DISSUB senior survivor with expert decision system, and enhance underwater swimming efficiency. Requirements: NAPDD #429-873, Deep Submergence Biomedical Development, 29 March 95.

Program Accomplishments and Plans:

FY 1998 Accomplishments:

- ($2.901) Plan for Diver Health and Safety Research: Validate nitrox decompression tables for 1.3 Atmosphere Absolute (ATA) Oxygen. Develop models to predict decompression stress from available data from human and animal diving database. Identify the effect of increased partial pressure of oxygen on incidence of decompression sickness. Define variables required to calculate optimal decompression procedures. Develop tables of pulmonary and Central Nervous System (CNS) oxygen toxicity and identify methods to prevent CNS oxygen toxicity, extend disabled submarine crew survival time. Using pig and sheep models of decompression sickness, investigate risk associated with delay of recompression on air divers. Investigate alternative decompression protocols for air saturated divers with emphasis on the early/aggressive use of oxygen. Validate existing procedures for surface decompression using oxygen.

- ($.480) Plan for Submarine Rescue: Investigate non-electrical methods for improvement of carbon dioxide scrubbing efficiency; review/extend 24 hour limits for contaminant exposure in disabled submarine environments, develop submarine escape and rescue algorithm, perform functional testing of submarine atmosphere monitoring equipment in a disabled submarine environment.

- ($.360) Plan for Underwater Sound: Develop dive site capability to measure underwater sound exposure. Deliver standards for exposure to non-impulsive underwater sound. Deliver unmanned underwater tool noise procedures.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDTEN/BA4	Program Element Name & No. Ocean Engineering Development 0603713N	Project Name and Number. Deep Submergence Biomedical Development/S0099

FY 1999 Plan:

- ($2.049) Plan for Diver Health and Safety Research: Deliver integrated set of diving decompression tables for air and nitrox. Develop methods to record variables (e.g. time, depth, water temp, decompression stress) during operational dives. Deliver tables of pulmonary and CNS oxygen toxicity and identify methods to prevent CNS oxygen toxicity. Develop one-atmosphere treatment protocols for decompression sickness using large animals. Develop adjustable, non-tethered diver thermal protection garment specifications; issue guidance for swimming efficiency. Deliver dive site capability to measure underwater sound exposure. Develop procedures for assessing underwater blast/impulse noise hazards; identify underwater acoustic threats to divers and develop strategy to protect divers; issue standardized tool noise assessment instruction.

- ($1.956) Plan for Submarine Rescue: Deliver Submarine escape and rescue Senior Survivor Expert decision aid (SEAREX) hardware & software, plus training recommendations for class SSN 688. Determine impact of hypothermia on crew survival in disabled submarine, refine estimates of crew escape time in disabled submarine scenario by actual trial, publish effects of low oxygen and high carbon dioxide on oxygen consumption; publish new guidance for passive CO2 scrubbing on DISSUB. Continue work on nitrox decompression and efforts to develop alternative decompression protocol for air saturated divers (DISSUB survivors) in DSRV and SRDRS described in FY98 Accomplishments

FY 2000 Plan:

- ($1.879) Plan for Diver Health and Safety Research: Develop new underwater thermal protection garments. Develop guidance for acceptable underwater breathing apparatus respiratory loads present in combination. Produce diving at altitude decompression tables. Deliver validated scaling procedures from animals to humans for decompression. Conduct manned test of one-atmosphere treatments for decompression sickness with divers. Determine damage risk thresholds for underwater blast/impulse noise. Develop protective materials and procedures against underwater sound threats to divers.

- ($1.900) Plan for Submarine Rescue: Deliver SEAREX and Guard Book package for SSBN 726 class. Issue DISSUB atmosphere contaminant exposure guidance. Deliver new markers for re-entry into fire-contaminated spaces. Publish revised Pressurized Submarine Rescue Manual. Develop guidance for decompression in SRDRS. Provide alternative to electrically-powered or passive CO2 scrubbing.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDTEN/BA4	Program Element Name & No. Ocean Engineering Development 0603713N	Project Name and Number. Deep Submergence Biomedical Development/S0099

B. Other Program Funding Summary: Not applicable.

Related RDT&E: Not Applicable.

C. Acquisition Strategy: Integrated thrust area teams (e.g. decompression research) are established with university, commercial and in-house Navy lab to jointly execute biomedical R&D; peer review of research proposals accomplished by independent Technical Advisory Board; annual review of progress by Executive Review Board (CNO/NAVSEA/ONR/BUMED); program management by 0-6 Medical Dept Officer; contracting by competitive process using BAA and leveraging ONR capabilities.

D. Schedule Profile: Not applicable

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDTEN/BA4	PROGRAM ELEMENT NAME AND NUMBER Ocean Engineering Development 0603713N	PROJECT NAME AND NUMBER Deep Submergence Biomedical Development/S0099

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development												
Ancillary Hardware Development												
Systems Engineering												
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development												
Remarks: Not Applicable.												
Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support												
Remarks: Not Applicable.												

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDTEN/BA4	PROGRAM ELEMENT NAME AND NUMBER Ocean Engineering Development 0603713N	PROJECT NAME AND NUMBER Deep Submergence Biomedical Development/S0099

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	Fy00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation												
Operational Test & Evaluation												
Tooling												
GFE												
Subtotal T&E												
Remarks: Not Applicable.												
Contractor Engineering Support												
Government Engineering Support												
Program Management Support	WR	NEDU	3.741	4.005		3.779				Continuing	Continuing	
Program Management Personnel												
Travel										Continuing	Continuing	
Labor (Research Personnel)										Continuing	Continuing	
Overhead												
Subtotal Management			3.741	4.005		3.779				Continuing	Continuing	
Remarks: Not Applicable.												
Total Cost			17.752*	4.005		3.779				Continuing	Continuing	
Remarks: * Prior to FY98, funds were in Project M0099.												

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDTEN/BA4	Program Element Name & No. Ocean Engineering Development 0603713N	Project Name and Number. Shallow Depth Diving Equipment/S0394

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	6.212	11.214	13.034	12.505	12.475	10.574	10.791	11.014	Continuing	Continuing
RDT&E Articles Qty										

A. Mission Description and Budget Item Justification: This project is to develop systems to support submarine escape and rescue missions, and conventional diver operations. 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 that ensure diver safety and allow maximum work efficiency will replace currently antiquated systems. Efforts are currently focused on the Submarine Rescue Diving and Recompression System (SRDRS) to provide a new rapidly deployed emergency submarine rescue capability. SRDRS will fill the gap created by the decommissioning of USS PIGEON (ASR 21) and USS ORTOLAN (ASR 22) and provide a new capability of pressurized transportation of rescuees from a stricken submarine directly to the decompression system eliminating the requirement for Deep Submergence Rescue Vehicles, Mother Submarines and Submarine Rescue Chambers. SRDRS is to include an air transportable rapid assessment/underwater work system, a decompression chamber system and a pressurized rescue module. The SRDRS will provide a global rapid response capability to support submarine rescue missions with an increase in capability at a fraction of the cost of the currently available systems.

Program Accomplishments and Plans:

FY 1998 Accomplishments:

- ($6.212) Submarine Rescue Diving and Recompression System: Continue acquisition of and acceptance testing of the prototype Assessment/Underwater Work System. Award contract for fabrication of prototype Submarine Decompression System. Complete preliminary design of Pressurized Rescue Module.

FY 1999 Plan:

- ($11.171) Submarine Rescue Diving and Recompression System: Complete acquisition of and continue acceptance testing of the prototype assessment/Underwater Work System. Continue fabrication of the prototype Submarine Decompression System. Solicit for detailed design and fabrication of the Pressurized Rescue Module. Complete design and award contract for Submarine Decompression System support equipment.

- ($0.258) Portion of extramural program is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

FY 2000 Plan:

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDTEN/BA4	Program Element Name & No. Ocean Engineering Development 0603713N	Project Name and Number. Shallow Depth Diving Equipment/S0394

- ($13.034) Submarine Rescue Diving and Recompression System: Complete acceptance testing of the prototype Assessment/Underwater Work System. Complete fabrication and acceptance testing of the prototype Submarine Decompression System and support equipment. Complete contract award for detailed design and fabrication of prototype Pressurized Rescue Module.

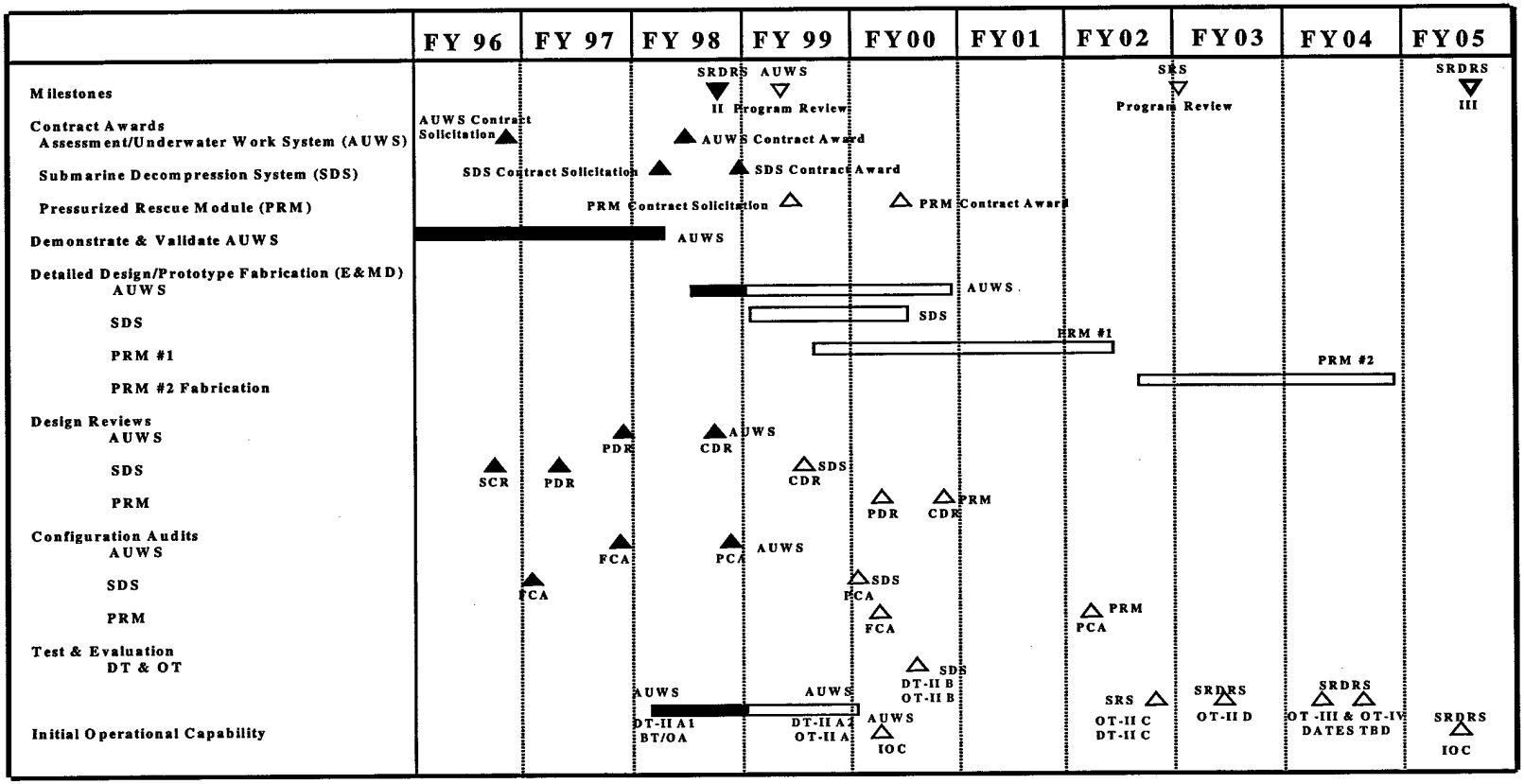
B. Other Program Funding Summary: Not applicable.

Related RDT&E: Not Applicable.

C. Acquisition Strategy: The Atmospheric Diving Suit (ADS) Segment of the SRDRS is a Non-Developmental Item (NDI) which is procured via a sole source contract. The Submarine Rescue System (SRS) segment of the SRDRS is largely based on the use of Commercial-Off –the-Shelf (COTS) technology and maximum use of Non-Developmental Items (NDI). The SRS segment is being procured using performance based specifications. The SRS contracts will be awarded competitively and will be based on technical capability and cost considerations (best value). Program Management of SRDRS is accomplished through the use of SEA 00C leadership of an Integrated Product Team (IPT). The Prototype system will provide full operational capability and no additional procurement is planned. The system is designed to be a Government Owned/Commercially Operated (GO/CO).

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDTEN/BA4	Program Element Name & No. Ocean Engineering Development 0603713N	Project Name and Number. Shallow Depth Diving Equipment/S0394

D. Schedule Profile:



SRDRS Milestone Schedule

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDTEN/BA4	PROGRAM ELEMENT NAME AND NUMBER Ocean Engineering Development 0603713N	PROJECT NAME AND NUMBER Shallow Depth Diving Equipment/S0394

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	WR	CSS	16.259	1.960	12/98						18.219	
	CPAF	Oceaneering	9.078								9.078	9.078
	RC	NAVFAC	.900	2.340	12/98						1.950	
	Various	Miscellaneous	2.446	4.238		10.619				Continuing	Continuing	
Ancillary Hardware Development												
Systems Engineering	CPAF	Oceaneering		1.384	12/98						1.384	1.384
	Various	Miscellaneous				0.920				Continuing	Continuing	
Licenses												
Tooling												
GFE												
Award Fees		Oceaneering	.597	.112	12/98						.709	.709
Subtotal Product Development			29.280	10.034		11.539				Continuing	Continuing	
Remarks: Award Fees are 6%.												
Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support	Various	Miscellaneous		.080		.070				Continuing	Continuing	
Configuration Management	Various	Miscellaneous		.010		.015				Continuing	Continuing	
Technical Data	Various	Miscellaneous		.010		.020				Continuing	Continuing	
GFE												
Subtotal Support				.100		.105				Continuing	Continuing	
Remarks:												

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDTEN/BA4	PROGRAM ELEMENT NAME AND NUMBER Ocean Engineering Development 0603713N	PROJECT NAME AND NUMBER Shallow Depth Diving Equipment/S0394

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	Fy00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	Various	Miscellaneous	.529	.100		.100				Continuing	Continuing	
Operational Test & Evaluation	Various	Miscellaneous		.200		.250				Continuing	Continuing	
Tooling												
GFE												
Subtotal T&E			.529	.300		.350				Continuing	Continuing	
Remarks:												
Contractor Engineering Support	Various	Miscellaneous	*	.448		.680				Continuing	Continuing	
Government Engineering Support	WR	NFESC	*	.172	12/98	.200				Continuing	Continuing	
Program Management Support												
Program Management Personnel												
Travel				.060		.060				Continuing	Continuing	
Labor (Research Personnel)			.453	.100		.100				Continuing	Continuing	
Overhead												
Subtotal Management			* .453	.780		1.040				Continuing	Continuing	
Remarks: *Prior years Contractor and Government Engineering support is included in Primary Hardware Development.												
Total Cost			30.262	11.214		13.034				Continuing	Continuing	
Remarks:												

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	R-1 ITEM NOMENCLATURE Environmental Protection / PE0603721N

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
TOTAL	50.718	71.170	70.793	64.373	45.582	43.616	44.557	45.182	Cont	Cont
Shipboard Waste Mgmt/S0401	35.380	43.126	56.913	49.588	29.846	26.957	27.444	27.644	Cont	Cont
Env Compliance/W2210	2.412	4.419	4.522	4.812	5.131	5.430	5.616	5.764	Cont	Cont
Aviation Depot Maint Tech/W2623*		1.995							Cont	Cont
Pollution Abatement/Y0817	7.265	8.660	9.358	9.973	10.605	11.229	11.497	11.774	Cont	Cont
Asbestos Removal/Y2402*	1.887	3.991							0.0	5.878
Resource Recovery Tech Center/Y2403*	3.774	6.984							0.0	10.758
Molten Salt Oxidation/Y2622*		1.995							0.0	1.995

A. (U) Mission Description and Budget Item Justification: This program develops processes, prototype hardware, systems, and operational procedures that will allow the Navy to operate in the U.S., foreign and international waters, air, space, and land areas while complying with U.S. statutes and international agreements. The program also includes efforts to improve the Navy's response to salvage-related pollution incidents. Projects support the Navy's requirement to meet environmental standards outlined by Environmental Protection Agency Executive Order 12088 of October 1978, Act to Prevent Pollution from Ships, Endangered Species Act, Marine Mammal Protection Act, Endangered Species Act, Clean Air Act, Clean Water Act, DoD Directive 6050.4 of 16 March 1982, DoD Directive 4210.15 of 27 July 1989, DoD Directive 6050.15 of 14 June 1985, DoD Directive 6050.9 of 13 February 1989, and OPNAVINST 5090.1B CH-1 of 2 February 1998. Project S0401 supports RDT&E efforts that allow the Navy to be in compliance with existing and anticipated laws with regard to four major areas: 1) ozone depleting substances, 2) solid wastes, 3) liquid wastes, and 4) hazardous and other ship wastes. Project W2210 supports development of environmental systems for naval aviation operations to enable compliance with environmental laws and regulations and minimize the cost associated with environmental compliance. Project Y0817 supports and validates development of technologies to enable facilities to comply with environmental laws and regulations in a cost effective manner.
* Projects W2623, Y2402, Y2403, and Y2622 are Congressional adds.

B. (U) Program Change Summary:

	FY 1998	FY 1999	FY 2000
(U) FY 1999 President's Budget:	55.685	59.438	69.557
(U) Appropriated Value:	58.401	59.438	
(U) Adjustments to FY 1998/99 Appropriated Value/ FY 1999 President's Budget:	-7.683	+11.732	+1.236
(U) FY 2000 Presbudg Submit:	50.718	71.170	70.793

Exhibit R-2, RDT&E Budget Item Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	R-1 ITEM NOMENCLATURE Environmental Protection / PE0603721N	

(U) Funding:	FY 1998	Decrease of $7.683M reflects General Undistributed Reductions (-$1.216M); Project S0401 reprogramming to Combat System Trainer (CST/BEWT) Adjustment (-$1.000M); Other Minor Pricing Adjustments (-$0.210M); SBIR Transfer (-$0.469M); FY98 BTR Adjustments (-$4.788M).
	FY 1999	Increase of $11.732M reflects solid waste pulper (submarine) program reduction (-$3.0M); General Undistributed Reductions (-$0.268M); Project W2623 Aviation Depot Maintenance Technology FY99 Congressional add (+$2.0M); Project Y2402 Asbestos Removal FY99 Congressional add (+$4.0M); Project Y2403 Resource Recovery Technology FY99 Congressional add (+$7.0M); and Project Y2622 Molten Salt Oxidation Technology FY99 Congressional add (+$2.0M).
	FY 2000	Increase of $1.236M reflects Project S0401 Flag BD – Afloat BAM (+$1.876M); General Undistributed Reductions (-$0.970M); and Other Minor Pricing Adjustments (+0.330M).

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Shipboard Waste Management / S0401

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Shipboard Waste Mgmt/S0401	35.380	43.126	56.913	49.588	29.846	26.957	27.444	27.644	Cont	Cont
Quantity of RDT&E Articles & Cost										
Oily Waste Polishing System - Engineering Dev Models	2-$1M	1-$1M	1-$1M	1-$0.4M						
Non-Oily Waste Polishing Sys - Engineering Dev Models	1-$1M	1-$1M	1-$1M	1-$1M		1-$0.6M				
Non-CFC Refrigerant Replacement Kits - Engineering Dev Models	2-$1M	1-$0.5M								
Liquid Waste Therm Destruct - Engineering Dev Models	1-$0.8M		2-$3M		1-$2M		1-$0.9M			
Shpbd Pollution Prevention - Test Articles	34-$0.5M	27-$0.5M								
Solid Waste - Engineering Dev Models		1-$0.7M	1-$2M	1-$2M						
Underwater Hull Cleaning - Engineering Dev Model				1-$0.7M						

A. (U) Mission Description and Budget Item Justification

1. (U) FY 1998 ACCOMPLISHMENTS:

- (U) ($11.614M) Ozone Depleting Substances - Continued at-sea evaluation of first submarine refrigeration plants converted to HFC-134a. Completed development of backfit modification kits for two surface ship 200-ton CFC-114 air-conditioning plant designs. Completed development of backfit modification kit for surface ship 300-ton CFC-114 air-conditioning plant designs. Continued development of backfit modification kit for the surface ship 125-ton CFC-114 air-conditioning plant design. Initiated development of backfit modification kit for surface ship 150-ton CFC-114 air-conditioning plant design. Continued development of backfit modifications for other surface ship air-conditioning plant designs. Modified 200-ton CFC-114 air-conditioning plants onboard a ship to HFC-236fa for one-year at-sea test and initiate evaluation. Initiated laboratory evaluations of future fleet non-chlorofluorocarbon 200-ton centrifugal air-conditioning plant and 1.5-ton refrigeration plant prototypes to qualify systems. Continued development of alternative solvents and

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Shipboard Waste Management / S0401

processes for oxygen systems cleaning applications. Continued development of Alternative Firefighting Agent Delivery System (AFFADS) for new ship construction.

- (U) ($14.813M) Integrated Liquid Wastes - Continued support of rulemaking process with Environmental Protection Agency (EPA) in development of Uniform National Discharge Standards (UNDS) for liquid waste discharges from Navy vessels. Continued development of integrated liquid waste treatment system: continued development of Oily Waste Polishing Systems (OWPSs), including 10-gal/min unit (OWS-10 Polisher) and 50-gal/min unit (OWS-50 Polisher); continued development of Engineering Development Model (EDM) non-oily wastewater treatment system; continued development of advanced Oil Content Monitor (OCM); and continued test and evaluation of upgraded shipboard vortex sewage incinerator, with emphasis on evaporation/incineration of all concentrated ship liquid wastes. Continued development of design fixes for compensated fuel ballast systems. Continued development of High-Capacity Oil/Water Separator (HCOWS): completed testing. Continued testing of Non-Seeping Grease Seal (NSGS) on submarine dive and steering gear.

- (U) ($3.837M) Solid Wastes - Continued development of management processes and systems for plastics for submarine application. Completed evaluation of prototype solid waste processing equipment on surface ships. Issued report on efforts supporting Report to Congress on plan to comply with "special area" provisions of the International Convention for the Prevention of Pollution from Ships (MARPOL Annex V).

- (U) ($5.116M) Hazardous and Other Major Ship Wastes – Continued shipboard hazardous materials substitution and elimination task and continued T&E of pollution prevention equipment aboard ship. Completed investigation of Non-Asbestos Substitutes (NAS). Continued quality assurance testing on reformulated commercial paints. Continued development of oil spill response capabilities; continued development of Recovered Oil Logistics System; continued development of computer-based contingency planning system; continued development of oil outflow and salvage response analysis program; continued development of in-situ oil burning system after one-year delay; and initiated development of oil and skimmer tracking system.

2. (U) FY 1999 PLAN:

- (U) ($14.000M) Ozone Depleting Substances - Complete evaluation of first submarine refrigeration plants converted to HFC-134a. Complete development of backfit modification kit for the surface ship 125-ton CFC-114 air-conditioning plant design. Continue development of backfit modification kit for surface ship 150-ton CFC-114 air-conditioning plant design. Continue development of backfit modifications for other surface ships air-conditioning plant designs: continue development of backfit modification kits for surface ship 250-ton and 363-ton CFC-114 air-conditioning plant designs, and continue development and initiate qualification of backfit modifications for remaining surface ship 250-ton CFC-114 air-conditioning plant designs. Complete one-year at-sea ship test and evaluation of HFC-236fa backfit modifications in 200-ton CFC-114 air-conditioning plants. Complete laboratory evaluations of future fleet non-chlorofluorocarbon 200-ton centrifugal air-conditioning plant and 1.5-ton refrigeration plant prototypes to qualify systems. Complete development of alternative solvents and processes for oxygen systems cleaning applications. Complete development of AFFADS for new ship construction.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Shipboard Waste Management / S0401

- (U) ($19.280M) Integrated Liquid Wastes - Continue support of rulemaking process with EPA in development of UNDS for liquid waste discharges from Navy vessels: complete Phase I, determination of incidental discharges requiring Marine Pollution Control Devices (MPCDs); and initiate Phase II, setting of MPCD performance standards. Continue development of integrated liquid waste treatment system: complete development of 10-gal/min unit OWPS (OWS-10 Polisher) and continue development of 50-gal/min OWPS (OWS-50 Polisher); continue development of EDM non-oily wastewater treatment system; continue development of advanced OCM; and continue test and evaluation of upgraded shipboard vortex sewage incinerator, with emphasis on evaporation/incineration of all concentrated ship liquid wastes. Continue development of design fixes for compensated fuel ballast systems. Complete development of HCOWS. Complete testing of NSGS on submarine dive and steering gear.

- (U) ($4.000M) Solid Wastes - Continue development of management processes and systems for plastics for submarine application: perform temporary alteration (TEMPALT) of prototype equipment aboard SSN-688 Class submarine and initiate test & evaluation; investigate onboard storage techniques for SSBN-726 Class submarines.

- (U) ($5.346M) Hazardous and Other Major Ship Wastes - Continue shipboard hazardous materials substitution and elimination task and continue T&E of pollution prevention equipment aboard ship. Issue final report for NAS. Continue quality assurance testing on reformulated commercial paints. Continue development of oil spill response capabilities; continue development of Recovered Oil Logistics System; continue development of computer-based contingency planning system; continue development of oil outflow and salvage response analysis program; continue development of in-situ oil burning system; and continue development of oil and skimmer tracking system. Initiate development of marine mammals ship database tracking system.

- (U) ($0.500M) Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLAN:

- (U) ($12.500M) Ozone Depleting Substances - Complete development of backfit modification kit for surface ship 150-ton CFC-114 air-conditioning plant design. Continue development of backfit modification for other surface ship air-conditioning plant designs: continue development of backfit modification kits for surface ship 250-ton and 363-ton CFC-114 air-conditioning plant designs; continue development of backfit modifications for remaining surface ship 250-ton CFC-114 air-conditioning plant designs.

- (U) ($28.213M) Integrated Liquid Wastes - Continue support of rulemaking process with EPA in development of UNDS for liquid waste discharges from Navy vessels: complete Phase II, setting of MPCD performance standards; and initiate Phase III, establishing guidelines for designing, constructing, installing, and using MPCDs. Continue development of integrated liquid waste treatment system: continue development of 50-gal/min OWPS and initiate development of new-construction ship system (OWS-3 Polisher) OWPS; continue development of EDM non-oily wastewater treatment system; continue development of advanced OCM; and continue test and evaluation of upgraded shipboard vortex sewage incinerator, with emphasis on evaporation/incineration of all concentrated ship liquid wastes. Continue development of design fixes for compensated fuel ballast systems.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Shipboard Waste Management / S0401

- (U) ($7.200M) Solid Wastes - Continue development of management processes and systems for plastics for submarine application: continue test and evaluation of prototype equipment aboard SSN-688 Class submarine; and perform temporary alteration (TEMPALT) of prototype equipment aboard SSBN-726 Class submarine and initiate test and evaluation; investigate onboard storage techniques for SSN-21 Class submarines. Initiate development of advanced thermal destruction system for processing shipboard solid wastes.

- (U) ($9.000M) Hazardous and Other Major Ship Wastes - Continue shipboard hazardous materials substitution and elimination task and continue T&E of pollution prevention equipment aboard ship. Complete quality assurance testing on reformulated commercial paints. Continue development of oil spill response capabilities; continue development of Recovered Oil Logistics System, continue development of oil and skimmer tracking system; complete development of computer-based contingency planning system; complete development of oil outflow and salvage response analysis program; complete development of in-situ oil burning system; and initiate development of oil and skimmer efficiency improvements and development of oil/water separator. Continue development of marine mammals ship database tracking system. Initiate development of new low-copper underwater hull coatings. Initiate development of underwater hull cleaning system.

A. (U) Program Summary Change: Not applicable.

B. (U) Other Program Funding Summary: Demonstrated and validated technologies are transitioned to various SCN, OPN, and O&MN budget accounts for implementation as part of a Fleet modernization program or new ship construction.

(U) Related RDT&E:
(U) Defense Research Sciences/Shipboard Processes (PE 61153N/R3162)
(U) Readiness, Training, and Environmental Quality/Logistics and Environmental Quality (PE 62233N)
(U) Environmental Quality and Logistics Advanced Technology/Environmental Requirements Advanced Technology (PE 63712N/R2206)

C. (U) Acquisition Strategy: (U) RDT&E Contracts are Competitive Procurements.

D. (U) Schedule Profile:

PE63721N/ Project S0401	FY1998	FY1999	FY2000	FY2001
Ozone Depleting Substances	Comp 200T & 300T C-114 A/C Mod Kits Init 150T CFC-114 A/C Mod Kit Init Eval Future 200T A/C & 1.5T Ref Designs	Comp Eval First Sub Ref Plant Mods Comp Dev 125T CFC-114 A/C Mod Kit Comp Ship Test 200T CFC-114 A/C Mod Comp Eval Future 200T A/C & 1.5T Ref Prototypes	Comp Dev 150T CFC-114 A/C Mod Kit	Comp Dev 250T & 363T CFC-114 A/C Mod Kits

Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Shipboard Waste Management / S0401	

		Comp Dev Alternative Solvents for O2 Sys Comp Dev AFFADS for New Ships		
Integrated Liquid Wastes	Comp Ship Eval HCOWS	Comp UNDS Phase I (Discharges Req MPCD) Init UNDS Phase II (MPCD Perf Stndrds) Comp Dev OWS-10 Polisher Comp Dev HCOWS Comp Test Sub Non-Seeping Grease Seal	Comp UNDS Phase II (MPCD Perf Stndrds) Init UNDS Phase III (MPCD Guidelines) Init Dev Future OWS-3 Polisher	Comp UNDS Phase III (MPCD Guidelines) Comp Dev OWS-50 Polisher Comp Dev Future OWS-3 Polisher Comp Dev Advanced OCM
Shipboard Solid Wastes	Comp Eval Ship SW Processing Equipment Comp Report to Congress Support	SSN-688 Plastics TEMPALT & Init T&E Investigate SSBN-726 Plastics Storage Tech	SSBN-726 Plastics TEMPALT & Init T&E Investigate SSN-21 Plastics Storage Tech Init Dev Advanced Thermal Destruction Sys	Comp SSN-688 Plastics T&E aboard ship SSN-21 Plastics TEMPALT & Init T&E
Hazardous & Other Major Ship Wastes	Comp Non-Asbestos Substitutes Init Dev Oil & Skimmer Tracking Sys	Issue Final Report Non-Asbestos Substitutes Init Dev Marine Mammal Database	Comp Test Reformulated Paints Comp Dev Oil Contingency Planning Sys Comp Dev Oil Outflow/Salvage Program Comp Dev In-Situ Oil Burning System Init Dev Oil & Skimmer Improvemnts & OWS Init Dev New Underwater Hull Coatings Init Dev Underwater Hull Cleaning Sys	Comp HM Elimination/Substitution Comp Pollution Prevention Afloat Init Light Oil Recovery Sys Mods

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Shipboard Waste Management / S0401

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	Award Date	FY00 Cost	Award Date	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	C/CPFF	Westinghouse Machinery Tech Div, Pitts, PA	14.580	0	N/A	0	N/A	N/A	14.580	14.580
Primary Hardware Development	C/CPFF	Geo-Centers, Inc., Boston, MA	7.450	3.000	Jan-99	4.000	Dec-99	Cont	Cont	N/A
Primary Hardware Development	SS/CPFF	York International Corp, York, PA	2.700	0	N/A	0	N/A	N/A	2.700	2.700
Primary Hardware Development	SS/CPFF	York International Corp, York, PA	4.800	2.500	Feb-99	3.000	Feb-00	14.700	25.000	25.000
Primary Hardware Development	SS/CPFF	Northern Research & Engineering Corp, Waburn, MA	1.200	0	N/A	0	N/A	N/A	1.200	1.200
Primary Hardware Development	C/CPFF	M. Rosenblatt & Son New York, NY	7.163	1.500	Jan-99	6.000	Jan-00	Cont	Cont	N/A
Ancillary Hardware Development	Various	Misc. Contracts	15.110	1.000	N/A	1.000	N/A	N/A	N/A	N/A
Systems Engineering	C/CPFF	John J. McMullen & Associates, Pitts, PA	2.087	1.000	Jan-99	2.000	Dec-99	Cont	Cont	N/A
Subtotal Product Development			55.090	9.000		16.000		Cont	Cont	N/A
Remarks: (1) Hardware Development and Systems Engineering Tasks use CPFF Delivery Order Contracts for Continuing Development of Pollution Abatement Hardware and Ship Systems Engineering Analysis										
Software Development			0.070	0	0	0	0	0	0.070	0.070
Training Development										
Integrated logistics Support										
Configuration Management										
Technical Data										
GFE										
Subtotal Support			0.070	0	0	0	0	0	0.070	0.070
Remarks: Not Applicable.										

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Shipboard Waste Management / S0401

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	Award Date	FY00 Cost	Award Date	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NSWC Carderock Div, Bethesda, MD	63.824	22.006	N/A	25.000	N/A	Cont	Cont	N/A
Developmental Test & Evaluation	WR	Naval Research Lab Wash, DC	15.082	3.000	N/A	4.500	N/A	Cont	Cont	N/A
Developmental Test & Evaluation	WR	NCCOSC San Diego, CA	2.710	1.000	N/A	1.000	N/A	Cont	Cont	N/A
Developmental Test & Evaluation	WR	NNSY Norfolk, VA	4.158	1.000	N/A	2.000	N/A	Cont	Cont	N/A
Developmental Test & Evaluation	WR	Misc. Govt Labs	15.825	1.000	N/A	1.374	N/A	Cont	Cont	N/A
Developmental Test & Evaluation	C/CPFF	Geo-Centers, Inc. Boston, MA	8.651	1.500	Jan-99	3.500	Dec-99	Cont	Cont	N/A
Developmental Test & Evaluation	C/CPFF	York International Corp, York, PA	12.000	0	N/A	0	N/A	0	12.000	12.000
Developmental Test & Evaluation	C/CPFF	Misc. Contracts	6.866	4.620	Var	3.539	Var	Cont	Cont	N/A
Subtotal T&E			129.116	34.126		40.913		0	Cont	N/A
Remarks:										
Contractor Engineering Support										
Government Engineering Support										
Program Management Support										
Program Management Personnel										
Travel										
Labor (Research Personnel)										
Overhead										
Subtotal Management: N/A										
Remarks: Not Applicable.										
Total Cost			184.276	43.126		56.913			Cont	Cont
Remarks:										

Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Environmental Compliance / W2210	

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Env Compliance/W2210	2.412	4.419	4.522	4.812	5.131	5.430	5.616	5.764	Cont	Cont
Quantity of RDT&E Articles & Cost										

A. (U) Mission Description and Budget Item Justification: This project supports development and implementation of technologies which will lead to environmentally safe naval aviation operations and support; compliance with international, federal, state, and local regulations and policies; reduction of increasing compliance costs and personal liability; and enhancement of naval aviation mission effectiveness. Naval aviation pollution prevention efforts were previously supported by Project Y0817, Pollution Abatement Ashore. This project will support that part of project Y0817 that addressed aviation pollution prevention technologies as well as additional operational and shipboard aviation requirements previously unsupported. Specific regulatory requirements include Executive Orders 12856 (Pollution Prevention) and 12873 (Recycling & Waste Prevention), the Clean Air Act (CAA) and associated National Emission Standards for Hazardous Air Pollutants (NESHAPs) and National Ambient Air Quality Standards (NAAQS), the Clean Water Act (CWA), the Resource Conservation and Recovery Act (RCRA), as well as Occupational, Safety and Health Administration (OSHA) standards.

1. (U) FY 1998 ACCOMPLISHMENTS:

- (U) ($1.559M) Continued to research, develop and test: Alternatives for cadmium, chromium, and plating nonchromate aluminum pretreatments, and sealants; non-hazardous paint stripping processes; alternative non-hazardous solvents and cleaners. Initiated development and test of low/non-volatile organic compound (VOC) coatings; and non-hazardous corrosion control materials and processes.

- (U) ($0.345M) Continued to evaluate alternative aircraft materials, processes, and systems to eliminate or reduce the emission of hazardous materials.

- (U) ($0.508M) Continued to demonstrate performance of water-borne topcoats. Continued to develop and test hazardous operational chemical and material alternatives.

2. (U) FY 1999 PLAN:

- (U) ($2.481M) Continue to research, develop and test: Alternatives for cadmium, chromium, and cyanide plating nonchromate aluminum pre-treatments, and sealants; non-hazardous chemical paint stripping processes; alternative non-hazardous solvents and cleaners; low/non-VOC coatings; and non-hazardous corrosion control materials and processes.

- (U) ($0.944M) Continue to evaluate alternative aircraft systems to eliminate or reduce the emission of hazardous materials.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Environmental Compliance / W2210

- (U) ($0.973M) Continue to demonstrate performance of water-borne topcoats. Develop and test hazardous operational chemical and material alternatives. Develop and demonstrate technologies for control of ordnance and composite material emissions.

- (U) ($0.021M) Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLAN:

- (U) ($1.782M) Continue to research, develop, and test alternatives to aircraft finishing, repair and maintenance processes that use toxic heavy metals, hazardous air pollutants (HAPs), and volatile organic compounds (VOCs). Formulate and certify newly developed aircraft coatings. Continue technology research development, demonstrations/validations of alternatives to chromium and cadmium electroplating processes. Develop and validate source reduction in aircraft wash and de-icing. Develop and demonstrate alternative propulsion system technologies that minimize the use and generation of hazardous materials in manufacturing and repair processes. Complete development and demonstration of the following technologies: waterborne topcoats, electrocoat/powder coat, flashjet, non-HAPs paint purge solvents, non-HAPs chemical strippers, zinc/nickel plating as a cadmium replacement, tin-zinc plating as a cadmium replacement, CO2 retrofit of portable chloro-flouro carbon (CFC) fire extinguishers, reduction of halon 1301 release during maintenance and glass bead media recycling.

- (U) ($0.890M) Continue to provide scientific and technical expertise for continued aviation pollution prevention technology development, demonstration, and validation.

- (U) ($0.690M) Continue to develop and demonstrate low VOCs, non-chromated adhesive bonding primers, and aluminum-manganese electroplating as a cadmium replacement.

- (U) ($0.455M) Continue to develop and demonstrate conversion coatings alternatives.

- (U) ($0.355M) Initiate development and demonstration of alternative ordnance materials and processes, innovative industrial wastewater source reduction technology that minimizes hazardous waste generation and toxic emissions to the atmosphere.

- (U) ($0.350M) Initiate development and demonstration of environmentally compatible Aircraft Launch and Recovery Equipment (ALRE) lubricants and certify processes that reduce their emission to the sea.

A. (U) Program Summary Change: Not applicable.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Environmental Compliance / W2210

B. (U) Other Program Funding Summary: Not applicable.

(U) RELATED RDT&E: (U) PE 0602233N (Readiness/Training/Environmental Quality)
(U) PE 0603716D (Strategic Environmental R&D Program)
(U) PE 0603851D (Environmental Security Technology Certification Program)

C. (U) Acquisition Strategy: Technologies developed under this project are demonstrated and validated primarily through Competitive Procurements. Validated technology is transitioned to users through new or revised Performance Specifications, Technical Manuals or Competitive Procurements of subsystems, materials or processes.

D. (U) Schedule Profile:

PE0603721N/Project W2210	FY 2000	FY 2001
(U) Engineering Milestones	Comp. Eval. Waterborne Topcoats Comp. Eval. Electrocoat & Powder Coat Comp. Dev. Zn-Ni Plating as a Cadmium Replacement Comp. Dev. Sn-Zn Plating as a Cadmium Replacement Comp. Dev. Flashjet Comp. Dev. Non-HAPs Chemical Strippers Comp. Dev. Paint Purge Solvents Comp. Eval. Glass Bead Media Recycling Init. Dev. Env. Compatible ALRE Lubricants Init. Dev. Alternative Ordnance Materials & Processes Comp. Eval. CO2 Retrofit of Halon Extinguishers Comp. Eval. Halon Releases During Bottle Maint. Init. Eval. Wastewater Source Reduction	Comp. Dev. Conv. Coating Alt. Comp. Dev. Non-Chromated Primers Comp. Dev. Non-Chromated Sealers Comp. Dev. Flashjet Mobile Manipulator System Init. Dev. Source Reduction A/C Wash & Deicing Comp. Dev. Non-Haps Prepaint Cleaner

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Environmental Compliance / W2210

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	Award Date	FY00 Cost	Award Date	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development										
Ancillary Hardware Development										
Systems Engineering	WX	Various		2.320		2.618		Cont	Cont	Cont
	WX	NAWC-Pax		2.089		1.894		Cont	Cont	Cont
Licenses										
Tooling										
GFE										
Award Fees										
Subtotal Product Development				4.409		4.512		Cont	Cont	Cont
Remarks:										
Development Support										
Software Development										
Training Development										
Integrated Logistics Support										
Configuration Management										
Technical Data										
GFE										
Subtotal Support: N/A										
Remarks:										

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	Award Date	FY00 Cost	Award Date	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation										
Operational Test & Evaluation										
Tooling										
GFE										

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Environmental Compliance / W2210

Subtotal T&E: N/A										
Remarks:										
Contractor Engineering Support										
Government Engineering Support										
Program Management Support				0.010		0.010		Cont	Cont	Cont
Program Management Personnel										
Travel										
Labor (Research Personnel)										
Overhead										
Subtotal Management				0.010		0.010		Cont	Cont	Cont
Remarks:										
Total Cost				4.419		4.522		Cont	Cont	Cont
Remarks:										

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Pollution Abatement / Y0817

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Pollution Abatement/Y0817	7.265	8.660	9.358	9.973	10.605	11.229	11.497	11.774	Cont	Cont
Quantity of RDT&E Articles & Cost	12	16	14	15	TBD	TBD	TBD	TBD	NA	NA

A. (U) Mission Description and Budget Item Justification: This project develops and validates new technologies needed to address pervasive Navy shoreside environmental requirements imposed on Naval shore activities by the need to comply with environmental laws, regulations, orders, and policies. The goal of the program is to minimize personnel liabilities, operational costs, and regulatory oversight while preserving or enhancing the ability of Naval shore activities to accomplish their required missions and functions. Each project task addresses one or more of the requirements from the Navy Environmental Quality RDT&E Strategic Plan of October 1994. The plan is being updated and upon Chief of Naval Operations approval it will govern future task selections. Project investment is made in five thrust areas:

- (U) SHIP MAINTENANCE/REPAIR/DEACTIVATION

(U) Thus far, tasks in this thrust area have addressed environmental requirements originating at Naval shipyards. As the Navy pursues a strategy to reduce ship maintenance costs by shifting work to Ship Intermediate Maintenance Activities (SIMAs), new requirements are emerging as these processes and resulting hazardous waste streams become more decentralized. SIMAs will require technologies that are cost-effective when operated less frequently and with lower throughput. Future SIMA tasks will be selected based on compliance and pollution prevention studies being conducted on the Naval Station Mayport SIMA as part of the Navy Environmental Leadership Program (NELP) during FY 1999.

- (U) ORDNANCE TESTING/MANUFACTURE/DISPOSAL

(U) Current tasks in this thrust address specific compliance-driven environmental requirements of Navy ordnance activities. With respect to disposal, the thrust addresses requirements for disposal of quantities typical of testing and manufacturing operations, not of the much larger quantities associated with demilitarization. Future tasks will shift much of the investment in this area to pollution prevention requirements, particularly where they also reduce compliance impacts and costs. These tasks will be identified as part of an ordnance environmental requirements study being conducted in partnership with the Navy's Ordnance Environmental Specialty Office (OESO) during FY 1999.

Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Pollution Abatement / Y0817	

- (U) OTHER INDUSTRIAL OPERATIONS

  (U) Tasks in this thrust address compliance and pollution prevention environmental requirements originating from the industrial operations of Navy Public Works Centers and Naval Stations. As part of an overall Navy strategy, future tasks will shift more of the investment from compliance technologies to pollution prevention technologies that are cost-effective solutions to compliance requirements. It is also expected that there will be new requirements driven by the trend towards stricter federal, state, and local air emission regulations.

- (U) NON-INDUSTRIAL OPERATIONS

  (U) Tasks in this thrust address requirements to reduce air and water emissions (CAA, CWA), hazardous waste (RCRA) generation, and cost of environmental compliance for non-industrial operations occurring at Naval activities. In addition, tasks evaluate alternative restoration technologies for the over 1000 Navy sites requiring cleanup and restoration under CERCLA. The alternative restoration tasks are selected and linked to the urgent requirements of specific restoration projects in partnership with the Navy's Alternative Restoration Technology Team (ARTT). It is expected that one area requiring new investment is technologies to reduce the long-term operation and monitoring costs of installation restoration projects.

- (U) HAZARDOUS WASTE MINIMIZATION/RECYCLING/DISPOSAL

  (U) Prior tasks have shown that the Navy neither has the funding required to acquire a new government-owned hazardous waste treatment system nor a large enough hazardous waste stream to make a new contractor-owned treatment systems profitable. Tasks now primarily address requirements to upgrade capabilities of Navy-owned industrial waste treatment plants (IWTPs) and/or to pre-treat Navy-generated wastes prior to being discharged to publicly-owned wastewater treatment systems (POWTS).

1. (U) FY 1998 ACCOMPLISHMENTS:

- (U) ($1.880M) Ship Maintenance/Repair/Deactivation - Completed development of Closed-Loop Ultra High Pressure Water System for Removal of Ship Coatings: completed validation of garnet injection pump upgrade and use of system on non-skid coating of aircraft carrier flight decks. Continued development of Recycling of Bilge Derusting and Pacification Chemicals. Continued development of Recycling of Shipyard Hazardous Waste Using Catalytic Extraction Process. Continued development of Hexavalent Chromium Emission Reduction from Shipyard Welding Operations. Initiated development of Automated Paint Application System with Overspray Capture and Treatment. Initiated Air Emission Reduction from Shipyard Cutting and Arc-Gouging Operations.

Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Pollution Abatement / Y0817	

- (U) ($1.465M) Ordnance Testing/Manufacture/Disposal – Continued development of Exhaust Scrubber for Static Testing of Small Rocket Motors: completed testing of phase 1 prototype. Continued development of Confined Burn Facility to Replace Open Burning of Ordnance and Energetics: completed design of 10-pound capacity prototype. Initiated development of Marine Sediment Toxicity Data for Ordnance Compounds. Initiated evaluation of Electrochemical Oxidation Options for Destruction of Waste Energetic Materials.

- (U) ($1.665M) Other Industrial Operations - Completed development of Cleaning of Livefront Electrical Switchgear: validation and evaluation using frozen carbon-dioxide pellets. Completed development of Mobile Automatic Alkaline Cleaner Recycler. Continued development of Leak Detection System for Large Underground Bulk Fuel Storage Tanks. Initiated Jet Engine Test Cell Emissions Reduction: evaluation of nitrous oxide, particle, and noise emission reduction alternatives.

- (U) ($1.290M) Non-Industrial Operations - Completed AFFF Foam-Free Nozzle Testing for Crash Fire Rescue Trucks. Completed development of QwikLite Marine Bioassays Using Bioluminescent Dinoflagellates. Completed Evaluation of Volatile Organic Compound (VOC) Off-Gas Treatment Options for installation restoration projects. Continued development of Controlling Non-Point Source Discharges Using Constructed Wetlands. Continued development of Sub-Lethal Biochemical Toxicity Analysis using DNA Integrity. Continued development of Sound Propagation Over Water Model Corrections for Navy-Unique Scenarios. Continued development of QwikSet Marine Sediment Bioassays using Bioluminescent Dinoflagellates. Continued development of Subsurface Contaminant Transport and DNAPL Sensor System. Continued development of Integrated Field Screening for Rapid Sediment Contaminant Characterization. Continued development of Pier-Side Oil Spill Detection System. Continued development of Environmentally Sound Fire Fighting Training Facilities. Initiated validation of In-Situ Remediation of Contaminants Using Fenton's Reagent. Initiated development of Reduced False Positive From Marine Sediment Bioassays.

- (U) ($0.965M) Hazardous Waste Minimization/Recycling/Disposal - Completed validation of Closed-Loop Washrack Wastewater Recycling System for external cleaning of aircraft. Continued development of Plasma Arc Waste Treatment Technology. Continued development of Contaminated Sediment Volume Minimization Using Particle Separation. Initiated Evaluation of Waste Paint Disposal and Recycling Alternatives. Initiated evaluation of Options for Recycling Rags Contaminated With RCRA Wastes. Initiated Transition of Cyanide Wastewater Treatment Technologies from Navy Exploratory Development (6.2) Program.

2. (U) FY 1999 PLAN:

- (U) ($2.281M) Ship Maintenance/Repair/Deactivation – Complete development of Bilge Derusting and Pacification Chemicals: validation of system to recycle citric acid used for the derusting and pacification of ship bilges. Complete development of Recycling of Shipyard Hazardous Waste Using Catalkytic Extraction Process: feasibility of recycling hazardous wastes generated by the deactivation of submarines and ships using a contractor owned and operated

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Pollution Abatement / Y0817

facility based on molten metal technology. Complete development (evaluation) of alternatives for reduction of Hexavalent Chromium Emission Reduction from Shipyard Welding Operations. Continue development of Automated Paint Application with Overspray Capture and Treatment. Continue development of Air Emission Reduction from Shipyard Cutting and Arc-Gouging Operations.

- (U) ($2.402M) Ordnance Testing/Manufacture/Disposal - Complete development of Marine Sediment Toxicity Data for Ordnance Compounds. Continue development of Exhaust Scrubber for Static Testing of Small Rocket Motors: design phase 2 prototype. Continue development of Confined Burn Facility to Replace Open Burning of Ordnance and Energetics: test 10-pound capacity prototype. Complete evaluation of Electrochemical Oxidation for Destruction of Waste Energetic Materials.

- (U) ($1.365M) Other Industrial Operations - Complete development (validation) of Leak Detection System for Large Underground Bulk Fuel Storage Tanks. Continue Jet Engine Test Cell Emissions Reduction. Initiate development of In-Line Monitoring and Diversion for Problem Contaminants in Discharges: sensor and valve components needed for systems to automatically detect and divert occasional wastewater discharges with treatment-resistant contaminants.

- (U) ($1.110M) Non-Industrial Operations - Complete development (validation) of Controlling Non-Point Source Discharges Using Constructed Wetlands. Complete development of Sub-Lethal Biochemical Toxicity Analysis Using DNA Integrity. Complete development of In-Situ Remediation of Contaminants Using Fenton's Reagent. Continue development of Sound Propagation Over Water Model Corrections for Navy-Unique Scenarios. Continue development of QwikSet Marine Sediment Bioassays Using Bioluminescent Dinoflagellates. Continue development of Subsurface Contaminant Transport and DNAPL Sensor System. Continue development of Integrated Field Screening for Rapid Sediment Contaminant Characterization. Continue development of Pier-Side Oil Spill Detection System. Continue development of Environmentally Sound Fire Fighting Training Facilities. Continue development of Reduced False Positive From Marine Sediment Bioassays. Initiate development of Methods to Assess Subsurface Contaminant Migration From Coastal Landfills.

- (U) ($0.692M) Hazardous Waste Minimization/Recycling/Disposal - Complete development (validation) of Plasma Arc Waste Treatment Technology. Complete development of Contaminated Sediment Volume Minimization Using Particle Separation. Complete Evaluation of Waste Paint Disposal and Recycling Alternatives. Continue development of Options for Recycling Rags Contaminated With RCRA Wastes. Continue Transition of Cyanide Wastewater Treatment Technologies from Navy Exploratory Development (6.2) Program. Initiate development of Shoreside Collection and Treatment System for Compensated Fuel Tank Ballast Water. Initiate development of Total Toxic Organic Reduction for Navy Industrial Waste Treatment Plants.

- (U) ($0.810M) Portion of extramural program reserved for Small Business Innovation Research Assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLAN:

Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Pollution Abatement / Y0817	

- (U) ($2.449M) Ship Maintenance/Repair/Deactivation - Complete development of Automated Paint Application with Overspray Capture and Treatment. Complete development of Air Emission Reduction from Shipyard Cutting and Arc-Gouging Operations. Initiated tasks addressing Ship Intermediate Maintenance Activity (SIMA) requirements identified during compliance and pollution prevention studies conducted on Naval Station Mayport SIMA as part of Navy Environmental Leadership Program (NELP) during FY99.

- (U) ($1.939M) Ordnance Testing/Manufacture/Disposal - Continue development of Exhaust Scrubber for Static Testing of Small Rocket Motors: initiate fabrication of phase 2 prototype. Continue development of Confined Burn Facility to Replace Open Burning of Ordnance and Energetics: initiated tasks to address requirements identified as part of ordnance environmental requirements study conducted in partnership with Navy's Ordnance Environmental Specialty Office (OESO) during FY99.

- (U) ($2.150M) Other Industrial Operations - Complete development of Jet Engine Test Cell Emissions Reduction: complete validation of approaches to reduce nitrous oxide, particle, and noise emissions. Continue development of In-Line Monitoring and Diversion of Problem Contaminants in Discharges to automatically detect and divert occasional wastewater discharges with treatment-resistant contaminants. Initiate tasks to address requirements identified as part of update of Navy Environmental Quality RDT&E Strategic Plan completed during FY99; it is expected that there will be new requirements driven by stricter federal, state, and local air emission regulations.

- (U) ($1.947M) Non-Industrial Operations - Complete development of Sound Propagation Over Water Model Corrections for Navy-Unique Scenarios. Complete development of QwikSet Marine Sediment Bioassays Using Bioluminescent Dinoflagellates. Complete development of Subsurface Contaminant Transport and DNAPL Sensor System. Complete development of Integrated Field Screening for Rapid Sediment Contaminant Characterization. Complete development of Pier-Side Oil Spill Detection System. Continue development of Environmentally Sound Fire Fighting Training Facilities. Continue development of Reduced False Positive From Marine Sediment Bioassays. Continue development of Methods to Assess Subsurface Contaminant Migration from Coastal Landfills. Initiate tasks to address requirements identified as part of update of Navy Environmental Quality RDT&E Strategic Plan completed during FY99; it is expected that one area requiring new investment is technologies to reduce the long-term operation and monitoring costs of installation restoration projects.

- (U) ($0.873M) Hazardous Waste Minimization/Recycling/Disposal - Complete development of Options for Recycling Rags Contaminated with RCRA Wastes. Complete Transition of Cyanide Wastewater Treatment Technologies from Navy Exploratory Development (6.2) Program. Continue development of Shoreside Collection and Treatment System for Compensated Fuel Tank Ballast Water. Continue development of Total Toxic Organic Reduction for Navy Industrial Waste Treatment Plants. Initiate additional tasks for Volume and Contaminants Reduction in Wastewater Discharged to Navy-Owned Industrial Waste Treatment Plants (IWTPs) and Publicly-Owned Wastewater Treatment Systems (POWTS).

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Pollution Abatement / Y0817

A. (U) Program Change Summary: Not applicable.

B. (U) Other Program Funding Summary: This project transitions technologies from PE0603712N, Environmental Quality, Logistics Advanced Technology Demonstrations Program, and PE0603716D, the Strategic Environmental Research and Development Program (SERDP). Whenever possible, funding is leveraged by transitioning technologies to PE 0603851D, the Environmental Security Technology Certification Program (ESTCP), for certification and by providing funding for Navy participation in ESTCP projects that could address Navy requirements. Within this program element, the project looks for fund leveraging opportunities with Project S0401 and W2210. Execution of this project is coordinated with related Army and Air Force programs by the Tri-Service Environmental Quality R&D Strategic Plan developed under the leadership of the Joint Engineers Management Panel (JEMP). Additional coordination occurs between the Army, Navy, and Air Force centers for environmental excellence.

(U) RELATED RDT&E: This project transitions shoreside pollution abatement technologies from two Navy Science and Technology programs and the Strategic Environmental Research and Development Program (SERDP). Project funding is leveraged by transitioning technologies to the Environmental Security Technology Certification Program (ESTCP) for final certification and by providing funding for Navy participation in ESTCP projects. Execution of this project is coordinated with related Army and Air Force programs by the Tri-Service Environmental Quality R&D Strategic Plan developed under the leadership of the Joint Engineers Management Panel (JEMP).

(U) PE 0602233N, Readiness, Training, and Environmental Quality Technology Development
(U) PE 0603712N, Environmental Quality, Logistics Advanced Technology Demonstrations
(U) PE 0603716D, Strategic Environmental Research & Development Program (SERDP)
(U) PE 0603851D, Environmental Security Technology Certification Program (ESTCP)

C. (U) Acquisition Strategy: This project is categorized as Non-ACAT (Non Acquisition). The project delivers a broad spectrum of products that require a variety of acquisition processes to implement. Equipment products for Naval stations and other mission funded activities costing over 100K are often procured centrally through the Navy Pollution Prevention Equipment Program (PPEP) where as equipment products for Shipyards and other Navy Working Capital Fund (NWCF) activities costing over 100K are procured through their Capital Purchases Program (CPP). For both types of activities, equipment products costing less than 100K, and process changes not requiring the purchase of new equipment such as consumable material or product substitutions, are funded through the activity's operating budgets. Occasionally there is a technology that must be implemented as a specialized facility. These are acquired through the Military Construction (MCON) Program. All these acquisition processes are pursued using a common strategy that satisfies the needs of all the critical stakeholders: 1) Navy end user; 2) Funding sponsor for the Navy end user; 3) Cognizant environmental federal, state, and local regulators; 4) Other stakeholders with cognizance over the Navy process or operation being changed, and 5) The private or government organization that will produce the product.

Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Pollution Abatement / Y0817	

D. (U) Schedule Profile: Below are the ongoing and already identified new starts for the project categorized by the five thrust areas described in paragraph A.

Project Thrust Area/Tasks in Area	FY98	FY99	FY00	FY01
SHIP MAINTENANCE/REPAIR/DEACTIVATION				
Closed-Loop Ultra High Pressure Water System for Removal of Ship Coatings	X			
Recycling of Bilge Derusting and Pacification Chemicals		X		
Recycling of Shipyard Hazardous Waste Using Catalytic Extraction Process		X		
Hexavalent Chromium Emission Reduction from Shipyard Welding Operations		X		
Automated Paint Application with Overspray Capture and Treatment	X		X	
Air Emission Reduction from Shipyard Cutting and Arc-Gouging Operations	X		X	
Ship Intermediate Maintenance Activity (SIMA) Requirements Under NELP			X	>
ORDNANCE TESTING/MANUFACTURE/DISPOSAL				
Exhaust Scrubber for Static Testing of Small Rocket Motors				>
Confined Burn Facility to Replace Open Burning of Ordnance and Energetics				>
Development of Marine Sediment Toxicity Data for Ordnance Compounds	X	X		
Evaluation of Electrochemical Oxidation Options for Destruction of Waste Energetic Materials	X	X		
OTHER INDUSTRIAL OPERATIONS				
Cleaning of Livefront Electrical Switchgear	X			
Mobile Automatic Alkaline Cleaner Recycler	X			
Leak Detection System for Large Underground Bulk Fuel Storage Tanks		X		
Jet Engine Test Cell Emissions Reduction	X		X	
In-Line Monitoring and Diversion of Problem Contaminants in Discharges		X		X
New Requirements From Navy EQ RDT&E Strategic Plan Update			X	>
NON-INDUSTRIAL OPERATIONS				
AFFF Foam-Free Nozzle Testing for Crash Fire Rescue Trucks	X			
QwikLite Marine Bioassays Using Bioluminescent Dinoflagellates	X			
VOC Off-Gas Treatment Options Evaluation	X			
Controlling Non-Point Source Discharges Using Constructed Wetlands		X		
Sub-Lethal Biochemical Toxicity Analysis Using DNA Integrity		X		
In-Situ Remediation of Contaminants Using Fenton's Reagent	X	X		
Sound Propagation Over Water Model Corrections for Navy-Unique Scenarios			X	
QwikSet Marine Sediment Bioassays Using Bioluminescent Dinoflagellates			X	
Subsurface Contaminant Transport and DNAPL Sensor System			X	
Integrated Field Screening for Rapid Sediment Contaminant Characterization			X	
Pier-Side Oil Spill Detection System			X	
Environmentally Sound Fire Fighting Training Facilities				X
Reduced False Positive From Marine Sediment Bioassays	X			X

Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Pollution Abatement / Y0817	

Project Thrust Area/Tasks in Area	FY98	FY99	FY00	FY01
Methods to Assess Subsurface Contaminant Migration From Coastal Landfills		X===========	==========	==========X
New Requirements From Navy EQ RDT&E Strategic Plan Update			X==========	==========>
HAZARDOUS WASTE MINIMIZATION/RECYCLING/DISPOSAL				
Closed-Loop Washrack Wastewater Recycling System	==========X			
Evaluation of Waste Paint Disposal and Recycling Alternatives	X==========	==========X		
Options for Recycling Rags Contaminated With RCRA Wastes	X==========	==========	==========X	
Transition Cyanide Wastewater Treatment Technologies form Navy Exploratory Development Program	X==========	==========	==========X	
Plasma Arc Waste Treatment Technology	==========	==========X		
Contaminated Sediment Volume Minimization Using Particle Separation	==========	==========X		
Evaluation of Waste Paint Disposal and Recycling Alternatives	==========	==========X		
Shoreside Collection and Treatment System for Compensated Fuel Tank Ballast Water		X==========	==========	==========X
Total Toxic Organic Reduction for Navy Industrial Waste Treatment Plants		X==========	==========	==========X
Volume and Contaminants Reduction in Wastewater Discharged to Navy IWTPs and POWTs			X==========	==========>

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Pollution Abatement / Y0817

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	Award Date	FY00 Cost	Award Date	Cost To Complete	Total Cost	Target Value of Contract
Ship Maintenance/Repair/Deact	WR/PO	NSWC-CD	4.745	1.826	varies	1.960	varies	cont	cont	na
Ship Maintenance/Repair/Deact	WR/PO	NFESC	3.428	0.456	varies	0.486	varies	cont	cont	na
Ordnance Testing/Manufact/Disp	WR/PO	NSWC-IH	8.299	2.406	varies	1.936	varies	cont	cont	na
Other Industrial Operations	WR/PO	NFESC	10.429	1.176	varies	1.506	varies	cont	cont	na
Other Industrial Operations	WR/PO	SSC-SD	5.824	0.496	varies	0.646	varies	cont	cont	na
Non-Industrial Operations	WR/PO	SSC-SD	10.168	0.816	varies	1.171	varies	cont	cont	na
Non-Industrial Operations	WR/PO	NFESC	5.203	0.541	varies	0.776	varies	cont	cont	na
Haz Waste Min/Recycle/Disp	WR/PO	NFESC	5.817	0.756	varies	0.696	varies	cont	cont	na
Haz Waste Min/Recycle/Disp	WR/PO	NRL	1.789	0.187	varies	0.181	varies	cont	cont	na
Subtotal Product Development			55.702	8.660		9.358				
Performing Activities: Naval Surface Warfare Center, Carderock Division (NSWC-CD), Naval Facilities Engineering Service Center (NFESC), Naval Surface Warfare Center, Indian Head Division (NSWC-IH), Space and Warfare Systems Center, San Diego (SSC-SD), Naval Research Laboratory (NRL). Total Prior Years Cost: Summation starts with FY80. Subtotal does not include performing activities from prior years that are no longer performing activities. Award Dates: About 55% of the project is executed via contracts awarded by the performing activities.										
Development Support										
Software Development										
Training Development										
Integrated Logistics Support										
Configuration Management										
Technical Data										
GFE										
Subtotal Support: N/A										
Remarks: Included in Product Development costs.										

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4	Program Element Name & No. Environmental Protection / PE0603721N	Project Name & No. Pollution Abatement / Y0817

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	Award Date	FY00 Cost	Award Date	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation										
Operational Test & Evaluation										
Tooling										
GFE										
Subtotal T&E:			0	0		0				
Remarks: Included in Product Development costs.										
Contractor Engineering Support										
Government Engineering Support										
Program Management Support										
Program Management Personnel										
Travel										
Labor (Research Personnel)										
Overhead										
Subtotal Management: N/A			0	0		0				
Remarks: Included in Product Development costs.										
Total Cost			55.702	8.660		9.425			Cont	Cont
Remarks:										

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603724N
PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 1998 ACTUAL	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R0829	Energy Conservation (ADV)									
	2,110	2,495	2,799	2,761	2,898	2,966	3,048	3,124	CONT.	CONT.
R0838	Mobility Fuels (ADV)									
	1,895	2,076	2,185	2,201	2,248	2,301	2,359	2,419	CONT.	CONT.
TOTAL	4,005	4,571	4,984	4,962	5,146	5,267	5,407	5,543	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program supports projects to evaluate, adapt, and demonstrate energy related technologies for ship and aircraft operations to: (a) increase fuel-related weapons systems capabilities such as range and time on station; (b) conserve energy and reduce energy costs; (c) reduce dependence on petroleum fuels and apply energy technologies that improve environmental compliance; (d) relax unnecessarily restrictive fuel specification requirements to reduce cost and increase availability worldwide; (e) provide guidance to fleet operators for the safe use of commercial grade or off-specification fuels when military specification fuels are unavailable or in short supply; and (f) make needed periodic changes to fuel specifications to ensure fuel quality and avoid fleet operating problems. Through 1995, the Navy Energy Research & Development Program, of which this program element is a part, had produced energy cost avoidance estimated at $130M per year (compared to 1985 consumption rates). As currently funded, additional savings of $25M per year are projected to be achieved by FY 2000.

(U) This program, and the companion PE 0604710N, Navy Energy Program (ENG), support the achievement of legislated, White House, Department of Defense and Navy Energy Management Goals; and also the Office of the Secretary of Defense, the Secretary of the Navy and the Chief of Naval Operations direction to make up-front investment in technologies that reduce future cost of operation and ownership of the fleet and supporting infrastructure.

(U) Joint Mission Areas/Warfare Areas (JMA): This program directly supports the following JMA's: Littoral Warfare, Sea and Air Superiority, Strategic Mobility, Readiness and Support and Infrastructure.

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603724N
PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under DEMONSTRATION & VALIDATION because it develops and integrates hardware for experimental tests related to specific ship or aircraft applications.

U) PROGRAM CHANGE SUMMARY FOR TOTAL PE:

	FY 1998	FY 1999	FY 2000
(U) FY 1999 President's Budget:	4,037	4,592	4,896
(U) Appropriated Value:	0	4,522	-
(U) Adjustments from FY 1999 PRESBUDG:	-32	-21	+88
(U) FY 2000 President's Submission	4,005	4,571	4,984

(U) CHANGE SUMMARY EXPLANATION:

(U) Funding: FY 1998 decrease reflects a Small Business Innovation Research (SBIR) adjustment (-22) and Actual Execution Update (-10). The FY 1999 reduction reflects Revised Economic Assumption (-11) and CIVPERS (-10). The FY 2000 increase reflects full institutional funding of MRTFB (-18), NWCF adjustment (+165), CIVPERS (+29), Non Pay Inflation (-78) and Working Capital (-10).

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603724N PROGRAM ELEMENT TITLE: Navy Energy Program (ADV) PROJECT: R0829 PROJECT TITLE: Energy Conservation

(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 1998 ACTUAL	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R0829 Energy Conservation	2,110	2,495	2,799	2,761	2,898	2,966	3,048	3,124	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project improves the energy efficiency of Navy ships and aircraft, and thereby contributes to reduced operating costs and improved fleet sustainability and performance. Major efforts include work to increase the efficiency of aircraft engines; and develop improved hull drag reducing technologies and more efficient energy conversion systems for ships.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:
   - (U) ($822) Aircraft: Completed altitude tests of advanced Performance Seeking Control (PSC) system on F414 test engine. Began program planning for flight worthy F414 PSC system for in-depth simulator and eventual flight testing (joint with General Electric (GE)). Initiated detailed design (joint with GE) of advanced High Pressure Turbine (HPT) to meet F414 growth requirements. Technology for F414B insertion (e.g. this HPT) must be designed and made in time for a GE-23a technology demonstrator engine assembly and operation in FY 2003 (Navy, Air Force, GE and the F414 program are developing engine components in a cooperative effort).
   - ((U) ($1,288) Ships: Analytically screened bow bulb and stern/propeller hydrodynamic enhancements for a TAO-187 class oiler to demonstrate reduced powering requirements. Model tested stern flap, and combined stern wedge/flap retrofit for early Guided Missile Destroyer (DDG)-51's (28 ships). Continued screening tests of advanced anti-fouling (AF) materials/coating systems (expanded testing of ablative and self-polishing copper/cobiocide paints). Supported design of hydro-fluorocarbon (HFC) 134a air conditioning plants for new construction. Supported compressor design for new 125 ton HFC-236fa plant in support of R114 replacement program. All new forward fit and retrofit compressors will incorporate Energy program developed variable geometry diffuser technology. Evaluated

high efficiency, low emission power generation concept.

2. (U) FY 1999 PLAN:

- (U) ($916) Aircraft: Conduct simulator testing of developmental PSC system to ensure flight worthiness. Participate in conceptual design of advanced fan for F414 engine to ensure efficiency gains. Continue cooperative effort with GE to design a prototype advanced HPT to meet F414 growth requirements. Evaluate F404 variant technologies to identify cost effective, fuel efficient, retrofit candidates for the F404-400.
- (U) ($1,558) Ships: Model test bow bulb and stern/propeller hydrodynamic enhancements for TAO-187 class to demonstrate reduced powering requirements. Complete detailed design and drawings for DDG-51 retrofit stern flap or wedge/flap (first 28 ships). Conduct model tests of simple hydrodynamic mods for additional ships. Continue laboratory to bilge-keel panel tests of emerging AF coatings, self-polishing reduced copper/cobiocide paints in particular.
- (U) ($21) Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLAN:

- (U) ($1,050) Aircraft: Flight test PSC advanced engine control logic on F/A-18E/F. Continue participation in GE-23a demonstrator engine program (with GE, Navy F414, and Air Force/Navy integrated high performance turbine engine technology programs) to develop advanced components to meet F414 growth requirements: advanced fan, low- pressure turbine, advanced full authority digital engine control with PSC. Energy program participation provides incentives for these efforts and ensures that efficiency, as well as performance gains are pursued.
- (U) ($1,749) Ships: Complete detailed design and drawings for hydrodynamic refinements for TAO-187 class. Evaluate self-polishing reduced copper/cobiocide paints for energy savings and environmental impact. Continue model tests of hydrodynamic refinements to reduce powering requirements of existing/future ships. Support design of optimized air-conditioning plants for both retrofit and forward fit. Develop unified Navy approach to the generation of ship service power from fuel cells. Evaluate on-line water-wash system for gas turbines. Optimize tool designs for hull inspection remotely operated vehicle (ROV) for fouling assessment and spot cleaning.

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

(U) RELATED RDT&E:

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603724N PROJECT: R0829
PROGRAM ELEMENT TITLE: Navy Energy Program (ADV) PROJECT TITLE: Energy Conservation

- (U) PE 0601153N (Defense Research Sciences)
- (U) PE 0602121N (Ship, Submarine and Logistics Technology)
- (U) PE 0602122N (Aircraft Technology)
- (U) PE 0602234N (Materials, Electronics and Computer Technology)
- (U) PE 0603217N (Air Systems and Weapons Advanced Technology)
- (U) PE 0603712N (Environmental Quality and Logistics Advanced Technology)
- (U) PE 0603721N (Environmental Protection)
- (U) PE 0604710N (Navy Energy Program (ENG))

D. (U) SCHEDULE PROFILE: Not applicable.

FY 2000 RDT&E,N PROGRAM ELEMENT/PROJECT COST BREAKDOWN DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603724N PROJECT NUMBER: R0829
PROGRAM ELEMENT TITLE: Navy Energy Program (ADV) PROJECT TITLE: Energy Conservation

A. (U) PROJECT COST BREAKDOWN: ($ in thousands)

Project Cost Categories	FY 1998	FY 1999	FY 2000
a. System Development and Integration	2,110	2,495	2,795

B. (U) BUDGET ACQUISITION HISTORY AND PLANNING INFORMATION: Not applicable

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1998

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603724N
PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

(U) COST: (Dollars in thousands)

PROJECT NUMBER & TITLE	FY 1998 ACTUAL	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R0838 Mobility Fuels (ADV)	1,895	2,076	2,185	2,201	2,248	2,301	2,359	2,419	CONT.	CONT.

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603724N PROJECT NUMBER: R0838
PROGRAM ELEMENT TITLE: Navy Energy Program (ADV) PROJECT TITLE: Mobility Fuels (ADV)

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project provides data through engine and fuel system tests which relate the effects of changes in Navy fuel procurement specification properties to the performance and reliability of Naval ship and aircraft engines and fuel systems. This information is required to: (a) determine the extent to which unnecessarily restrictive specification features can be relaxed to reduce cost and increase availability worldwide; (b) provide guidance to fleet operators for the safe use of off-specification or commercial grade fuels when military specification fuels are unavailable or in short supply; and (c) make needed periodic changes to fuel specifications to ensure fuel quality and avoid fleet operating problems while accommodating evolutionary changes in the fuel supply industry. Recent problems with fuel quality have adversely affected ship and aircraft system performance and reliability and resulted in degradation of fuel in storage. The resulting readiness impacts, additional maintenance costs, and the cost of lost equipment, although difficult to quantify, are many times the cost of this project. Over the next decade, the potential for fuel quality related problems will increase because of changing industry practices required to comply with new environmental regulations. This project represents the only investment designed to maintain the Navy's ability to operate as a "smart" customer for fuels that cost over $2B per year to procure, transport, store and consume and are essential to fleet operations.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:
   - (U) ($863) Ships: Completed work to determine effects of absorbed and free seawater on the lubricity of Navy ship fuels and the performance of industry approved fuel lubricity test methods. Completed analysis of quality, availability and cost data for samples of commercial distillate marine fuels collected in a worldwide survey. Initiated a study to forecast through FY 2010 trends in, (a) worldwide commercial marine distillate fuel quality and availability and (b) the fuel quality needs and tolerances of future Navy ship propulsion and fuel handling systems.
   - (U) ($1,032) Aircraft: Completed initial assessment of effect of +100 aircraft fuel thermal stability enhancement additives on shipboard fuel handling equipment. Initiated evaluation of +100 additives on T-45 engine systems. Initiated T&E of prototype fuel/water separator elements for fuels containing +100 additives.

2. (U) FY 1999 PLAN:
   - (U) ($936) Ships: Complete experimental work to determine lubricity characteristics of low sulfur Navy military specification (MILSPEC) ship diesel fuels. Initiate work to determine effects of low lubricity ship diesel fuels on

the durability of Navy gas turbine engine and high-speed diesel engine fuel handling systems. Conduct bench scale tests of the effects of red-dyed marine distillate fuels on Navy gas turbine engine hot section materials. Complete study to forecast marine distillate fuel and Navy engine characteristics through 2010. Initiate work to determine the feasibility of specifying a single fuel for use by all Naval systems (ships, aircraft, and ground equipment).

- (U) ($6) Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

- (U) ($1,134) Aircraft: Complete test & evaluation (T&E) of prototype fuel/water separator elements for +100 additive containing fuels. Complete evaluation of effect of +100 additives on P-3 and C-130 engines. Initiate evaluation of effects of +100 additives on F/A-18 engine systems. Complete development of a prototype copper contamination removal system for fuels. Complete T&E of non-toxic, environmentally benign fuel system icing inhibitors.

3. (U) FY 2000 PLAN:

- (U) ($970) Ships: Complete gas turbine engine T&E with broadened specification marine diesel fuels and determine extent to which MILSPEC limits can be relaxed. Complete gas turbine and diesel engine component tests with low lubricity MILSPEC ship diesel fuels to determine effects on durability and initiate full-scale fuel handling system tests. Initiate evaluation of lubricity enhancing additives for use with low lubricity MILSPEC ship diesel fuels. Initiate work to quantify effects of low thermal stability Navy distillate fuels on maintenance requirements for navy gas turbine and diesel engines. Complete assessment of the feasibility of specifying the use of a single fuel for all Naval Systems.
- (U) ($1,215)) Aircraft: Initiate shipboard evaluation of prototype fuel/water separator elements for +100 additive containing fuels. Complete evaluation of effects of +100 additives on F/A-18C/D and T-45 engine systems. Complete detailed cost benefit analysis for Naval use of +100 additives. Conduct field tests of prototype copper contamination removal system for fuels. Complete F/A-18E/F engine component tests to determine effects of copper contaminated Navy jet fuels on engine maintenance requirements.

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603724N PROGRAM ELEMENT TITLE: Navy Energy Program (ADV) PROJECT NUMBER: R0838 PROJECT TITLE: Mobility Fuels (ADV)

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

(U) RELATED RDT&E:
(U) PE 0601152N (In-House Independent Laboratory Research)
(U) PE 0602234N (Materials, Electronics and Computer Technology)

D. (U) SCHEDULE PROFILE: Not applicable.

A. (U) PROJECT COST BREAKDOWN: ($ in thousands)

Project Cost Categories	FY 1998	FY 1999	FY 2000
a. Reliability, Maintainability, and Availability	1,895	2,076	2,185

B. (U) BUDGET ACQUISITION HISTORY AND PLANNING INFORMATION: Not applicable

Exhibit R-2, RDT&E Budget Item Justification								Date: February 1999		
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4					R-1 ITEM NOMENCLATURE Program Element (PE) Name and No. Facilities Improvement 0603725N					
COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total PE Cost	6.387	1.853	1.985	1.916	1.754	1.791	1.838	1.886	CONT	CONT
Navy Facilities System/Y0995	1.669	1.853	1.985	1.916	1.754	1.791	1.838	1.886	CONT	CONT
Engineered Lumber Dev/Y2404	4.718	0	0	0	0	0	0	0	0	4.718
RDT&E Articles Qty	6	5	5	6	TBD	TBD	TBD	TBD	NA	NA

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program provides the Navy with new civil engineering capabilities that are required to overcome specific performance limitations of Naval shore facilities while reducing the cost of sustaining the Naval shore infrastructure. The program focuses available resources on satisfying facility requirements where the Navy is a major stakeholder, there are no test validated Commercial off the Shelf (COTS) solutions available, and a timely solution will not emerge without a Navy sponsored demonstration and validation. The program completes the development and validation of facility technologies originating in Navy Science and Technology programs, plus a variety of other sources which includes the National Science Foundation (NSF) and the National Institute of Standards and Technology (NIST). Validated technologies are implemented in the Navy's Military Construction (MILCON) and Real Property Maintenance (RPM) Programs. Project Y0995 is addressing four Navy facility requirements during the fiscal years FY 1998 through FY 2000: The High Performance (HP) Magazine, Waterfront Facilities Repair and Upgrade, Facility Technologies To Reduce The Real Property Maintenance (RPM) Backlog, and Modular Hybrid Pier. Additional information is provided in the Project Y0995 R-2A. Project Y2404, Engineering Lumber, is a one time Congressional increase to this program to demonstrate and validate engineered lumber products made from wood by products and recycled plastic that are being developed in the Office of Naval Research's (ONR) Materials Exploratory Development Program using funds from an FY 1997 Congressional increase to PE0602234N, Materials, Electronics and Computer Technology. Expected benefits from increased use of engineered lumber will include lower life cycle costs for Navy Waterfront structures. Engineered lumber products successfully validated by Project Y2404 will then be incorporated into Waterfront Facilities Repair and Upgrade, and Modular Hybrid Pier thrusts of Project Y0995. The execution of this program is consistent with the findings and recommendation of two National Academy of Sciences Reports: "The Role of Federal Agencies in Fostering New Technology and Innovation in Building" and "Federal Policies to Foster Innovation and Improvement in Constructed Facilities."

B. (U) PROGRAM CHANGE SUMMARY:

	FY 1998	FY 1999	FY 2000
(U) FY 1999 President's Budget:	1.669	1.861	1.988
a. Congressional Add for Engineered Lumber Development (Y2404)	+4.852	0	0
b. SBIR Reduction to Y2404	-134	0	0
c. Revised Economic Assumptions		-4	-31
d. Civ Pers Underexecution		-4	
e. CIVPERS Pay Raise Adjustments			28
(U) FY 2000 President's Budget Submit:	6.387	1.853	1.985

Exhibit R-2a, RDT&E Project Justification								Date: February 1999		
APPROPRIATION/BUDGET ACTIVITY RDT&E / 4		PROGRAM ELEMENT 0603725N			PROJECT NAME AND NUMBER Navy Facilities System, Y0995					
Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	1.669	1.853	1.985	1.916	1.754	1.791	1.838	1.886	CONT	CONT
RDT&E Articles Qty	3	5	5	6	TBD	TBD	TBD	TBD	NA	NA

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program provides the Navy with new civil engineering capabilities that are required to overcome specific performance limitations of Naval shore facilities while reducing the cost of sustaining the Naval shore infrastructure. The program focuses available resources on satisfying facility requirements where the Navy is a major stakeholder, there are no test validated Commercial off the Shelf (COTS) solutions available, and a timely solution will not emerge without a Navy sponsored demonstration and validation. The program completes the development and validation of facility technologies originating in Navy Science and Technology programs, plus a variety of other sources which includes the National Science Foundation (NSF) and the National Institute of Standards and Technology (NIST). Validated technologies are implemented in the Navy's Military Construction (MILCON) and Real Property Maintenance (RPM) Programs. This project is addressing four Navy facility requirements during the fiscal years FY 1998 through FY 2000:

- (U) THE HIGH PERFORMANCE (HP) MAGAZINE.

(U) Based on current magazine technologies, substantial land areas within Naval activities cannot be used for inhabited buildings in order to satisfy Explosives Safety Quantify Distance (ESQD) arcs. The converse is also true, the Navy is not able to construct new magazines where they are needed because of the presence of inhabited buildings. This effort enables a quantification of the specific hazard scenarios capable of causing ordnance detonation, an improved capability to model an ordnance explosion in a magazine, and the innovative use of energy absorbing construction materials to provide the Navy with a new magazine concept in which the ESQD arcs are based on a Maximum Credible Event (MCE) that is not the detonation of the entire magazine but rather the detonation of the contents of one, much smaller, storage cell within the magazine. For a typical magazines with Net Explosive Weight (NEW) capacities of 250,000 pounds, the allowable ordnance storage density is increased from 370 pounds/acre to 2,222 pounds/acre. In addition, the number of incompatible classes of ordnance that can be stored in the same magazine is increased from none to eight. This will lead to lower operational costs for the Receipt, Segregation, Storage, and Issue (RSSI) of ordnance and, for some activities, a reduction in the number of magazines required to accomplish their mission.

- (U) WATERFRONT FACILITIES REPAIR AND UPGRADE.

(U) Over 75% of the Navy's waterfront facilities are over 45 years old. They were designed for a service life of no more than 25 years and to satisfy the mission requirements existing at that time of construction. The reinforced concrete used to construct nearly all of them requires costly and repetitive repairs. In addition, they are unable to satisfy new mission requirements, such as the increase in pier deck capacity required to accomplish more extensive pier-side ship maintenance and repair tasks using truck-mounted cranes that have concentrated outrigger loads of up to 120 tons on a pier originally designed for no concentrated deck loading. This effort integrates new advanced structural diagnostic and modeling capabilities with the innovative application of high performance materials and corrosion arrestment techniques to provide new methods to extend the service life of existing waterfront facilities by an additional 15 to 30 years, and to cost-effectively upgrade them to satisfy new mission requirements. Specific benefits include increasing the durability of spalled marine concrete repairs from 3 to 15

(U) years, new longer-lasting low-maintenance fendering systems that eliminate the need for the frequent replacement of timber piles, a new Impulse Load Method of assessing the vertical load capacity of pile-supported waterfront structures, and providing new pier upgrade alternatives costing about $5M for a typical pier instead of the now required demolish then replace approach costing about $30M.

- (U) FACILITY TECHNOLOGIES TO REDUCE THE REAL PROPERTY MAINTENANCE (RPM) BACKLOG.

(U) The Real Property Maintenance(RPM) costs to correct critical facility deficiencies are over $2.0B as reported in the FY 1995 Annual Inspection Summary (AIS). Current Navy RPM funding levels are insufficient to prevent the continued growth of the critical backlog of maintenance and repairs. This effort will validate and accelerate the wide-spread implementation of a broad range of advanced facility technologies needed to overcome design and construction practices that are conservative and remain costly because of the high risk the private sector associates with the utilization of new facility technologies. The effort will accelerate the validation, commercialization, and wide-spread implementation of the facility technologies urgently required to reduce the cost of deficiencies in the Navy's RPM backlog by reducing initial construction costs up to 20% and facility component service lives that are up to 25 years longer.

- (U) MODULAR HYBRID PIER.

(U) The Navy is faced with the necessity of recapitalizing a large portion of its waterfront infrastructure over the next several decades. The Modular Hybrid Pier thrust develops and validates technologies for a mission flexible waterfront infrastructure characterized by significantly reduced life cycle costs. The concepts validated by this project's Waterfront Facilities Repair and Upgrade thrust will enable the Navy to economically extend the useful service life of many existing piers and wharves. They will reduce the Navy's need to construct new piers and wharves, but will not eliminate the need completely. Emerging innovative materials technologies, particularly those that will transition from the Navy's Exploratory Development (6.2) Research Program, can provide a new capability to design replacement structures that have a comparable initial cost yet have far less maintenance and repair cost. Use of fiber-reinforced plastics (FRP) for appurtenances and FRP-reinforced high strength light-weight concrete for structural elements will produce structures that have twice the structural service life of the structures that they will replaced. Modular design will enable off-site fabrication that will shorten the duration and lower the cost of the on site construction. Modular design will also facilitate change-out of components to repair damage or to modify structure geometry or capacity to adapt to future changes in ship designs. An economic analysis has shown that a modular hybrid pier will have a Net Present Value (NPV) cost that is $21M less over its service life than that for a conventional structure constructed of steel-reinforced concrete.

1. (U) FY 1998 ACCOMPLISHMENTS

- (U) ($0.361M) The High Performance (HP) Magazine - Obtained Department of Defense Explosives Safety Board approval of the HP Magazine design concept. Completed 35% standard design of magazine and 100% design of operating system for the storage pit covers. Completed operational tests of Universal Straddle Lift Carrier for moving palletized and containerized ordnance within the magazine. Completed analysis to reduce cost of the magazine's overhead crane.

- (U) ($1.208M) Waterfront Repair and Upgrade - Designed and installed test section of fender piles for primary fendering at Pier 5000 in SUBASE San Diego. Test section contains 4749 linear feet of piling comprised of fiber-reinforced plastic shells filled with concrete manufactured by three companies: Lancaster Composites, Hardcore Fiberglass Tubular Piling, and Plastic Piling Inc. Awarded contract with Mar Inc. for design and fabrication of a composite camel system for submarine use to be tested at SUBASE New London. Awarded contract to Engineering and Research International (ERI) Inc. for development and fabrication of a falling weight deflectometer (FWD) capable of exerting 120,000 LB dynamic force for non-destructive testing of safe load capacity of pier decks.

- (U) ($0.100M) Real Property Maintenance (RPM) Backlog Reduction - Reviewed proposed RPM projects and emerging facility technologies to identify candidate roofing, coatings, composite material, and high performance concrete technologies that will have highest payoffs for reducing RPM cost. Coordinated FY 1999 technology selection and validation test planning with the Civil Engineering Research Foundation (CERF) and with Navy RPM managers.

2. (U) FY 1999 PLANS
   - (U) ($0.225M) The High Performance (HP) Magazine - Complete 100% standard design of magazine. Obtain certification of 100% design by Department of Defense Explosives Safety Board.

   - (U) ($0.666M) Waterfront Repair and Upgrade - Install and test two composite submarine camels and backing fender piles (one complete submarine berth) at SUBASE New London. Collect load and energy dissipation performance data. Conduct field test of blocking, wale and camel replacement components comprised of composite wood products developed under Project Y2404, Engineered Lumber. Complete performance specifications for composite fender piling and composite camel systems. Initiate design for upgrade of a pier or wharf using composite structural systems. Validate performance of the falling weight deflectometer (FWD) on a selected Navy pier having a deck thickness greater than 18-inches.

   - (U) ($0.962M) Real Property Maintenance (RPM) Backlog Reduction - Initiate large scale field tests to validate performance of selected facility technologies within the general areas of high performance concrete, roofing, coatings and corrosion protection, and composite materials. Continue FY 1999 testing coordination with the Civil Engineering Research Foundation (CERF), and with participating Navy activities. Begin technology selection and validation test planning for the FY 2000 tests.

   - (U) ($0.9M) Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLANS
   - (U) ($0.753M) Waterfront Repair and Upgrade - Complete design and award contract for corrosion stabilization, concrete repair and strengthening with composites of a selected Navy pier. Install instrumentation to monitor long term corrosion state and structural performance.

   - (U) ($1.232M) Real Property Maintenance (RPM) Backlog Reduction - Continue technology validation tests initiated in FY 1999. Initiate additional tests planned during FY 1999. National performance standards will be used to evaluate resulting test data when they are applicable. When none exist, the resulting test data will be submitted to the National Evaluation Service - Building Innovation Center (NES-BIC) of CERF for independent technical evaluation. Begin technology selection and validation test planning for FY 2001 tests.

Exhibit R-2a, RDT&E Project Justification	Date: February 1999

B. (U) OTHER PROGRAM FUNDING SUMMARY: This project transitions waterfront facility technologies from three Navy Exploratory Development (6.2) Research Programs: PE0602121N - Ship, Submarine and Logistics Technology, PE0602234N - Materials, Electronics and Computer Technology, and PE0603712N - Environmental Quality and Logistics Advanced Technology Demonstrations. It also transitions facility technologies developed at universities under the sponsorship of the National Science Foundation (NSF), by the Building and Fire Research Laboratory (BFRL) of the National Institute of Standards and Technology (NIST), and by the Constructed Engineering Research Laboratories (CERL) and Waterways Experiment Station (WES) of the U.S. Army Corps of Engineers when they can contribute to the solution of one of the Navy requirements being addressed by this project. The project pursues opportunities to leverage private sector investment through partnerships with private sector organizations, such as the Civil Engineering Research Foundation (CERF) and the Composites Institute (CI) of The Society of the Plastics Industry (SPI). The project pursues opportunities to leverage Navy Real Property Maintenance (RPM) and Military Construction (MILCON) investment through partnerships with RPM and MILCON program and project managers.

C. (U) ACQUISITION STRATEGY: This project is categorized as Non-ACAT (Non Acquisition). The information produced from this project for: 1) specifying the performance of the technology, 2) utilization of the technology in designs, 3) control of quality of the technology during constructions, 4) maintenance of the technology during operations, and 5) life-cycle costs of the technology is transitioned to Navy users by being included or referenced by the applicable Naval Facilities Engineering Command policy, guidance, and criteria. Navy Real Property Maintenance (RPM) and Military Construction (MILCON) program and project managers are then able to implement the technologies in their RPM and MILCON projects. Private sector capability to provide the new technology for use by the Navy is developed by including both individual contractors and industry organizations in development and testing of the technology.

D. (U) SCHEDULE PROFILE:

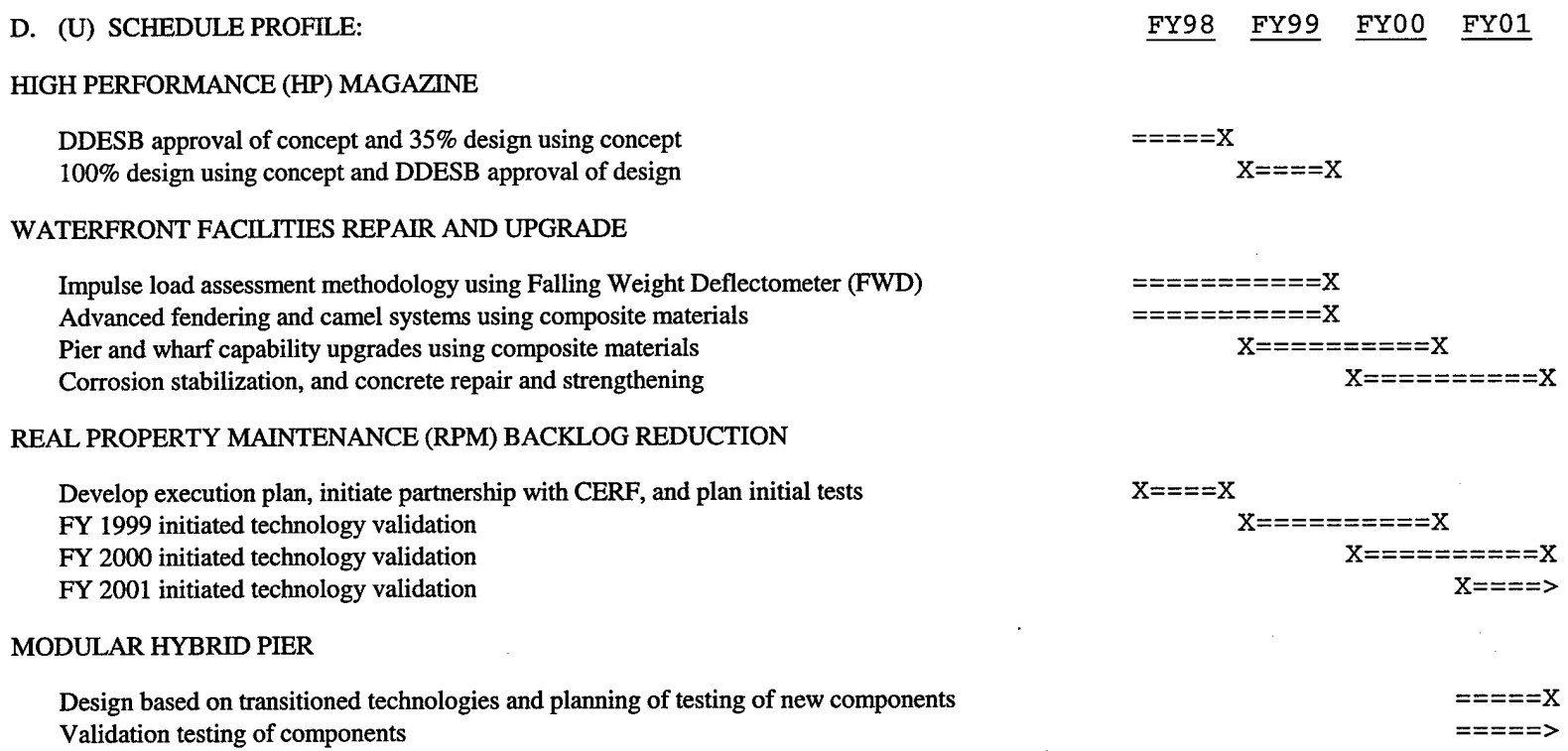


Exhibit R-3 Cost Analysis (page 1)								Date: February 1999				
APPROPRIATION/BUDGET ACTIVITY RDT&E/ 4			PROGRAM ELEMENT NAME AND NUMBER: Facs Improvement, PE060372 5N					PROJECT NAME AND NUMBER Navy Facilities System, Y0995				
Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	Cost to Complete			Total Cost	Target Value of Contract
High Performance (HP) Magazine	WX	NFESC Pt Hueneme, CA	3.478	85	1st qtr							
	WR	NSWC Indian Head, CA	45	15	1st qtr							
	WR/RC	LANTDIV Norfolk, VA	334	100	1st qtr							
	FP	SVERDRUP St Louis, MO	236	25	2nd qtr							
Waterfront Facilities Repair and Upgrade	WX	NFESC Pt Hueneme, CA	770	466	Varies	297	1st qtr	122				
	WR	NUWC New London, CT	487	200	Varies							
	FP	Contractors TBD Locations TBD				452	varies	150				
Real Property Maintenance (RPM) Backlog Reduction	WX	NFESC Pt Hueneme, CA	200	401	1st qtr	446	1st qtr	440			cont.	na
	FP	CERF Washington D.C.	45	50	1st qtr	50	1st qtr	50			cont.	na
	FP	Contractors TBD Locations TBD		511	Varies	740	varies	854			cont.	na
Modular Hybrid Pier	WX	NFESC Pt Hueneme, CA						300			cont.	na
Subtotal Product Development			5.595	1.853		1.985		1.916				

Remarks:

Total Prior Years Cost: Summation starts with FY94. Subtotal does not include performing activities from prior years that are no longer performing activities.

Exhibit R-3 Cost Analysis (page 2)												Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E/ 4			PROGRAM ELEMENT NAME AND NUMBER: Facs Improvement, PE06037 25N					PROJECT NAME AND NUMBER Navy Facilities System, Y0995				
Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support			0	0		0						
Remarks: Included in Product Development costs.												
Cost Categories (Tailor to WBS or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY 99 Award Date	FY00 Cost	FY00 Award Date	Cost to Complete			Total Cost	Target Value of Contract
Developmental Test & Evaluation												
Operational Test & Evaluation												
Tooling												
GFE												
Subtotal T&E			0	0		0		0				
Remarks: Included in Product Development costs.												
Contractor Engineering Support												
Government Engineering Support												
Program Management Support												
Program Management Personnel												
Travel												
Labor (Research Personnel)												
Overhead												
Subtotal Management			0	0		0		0				
Remarks: Included in Product Development costs.												
Total Cost			5.595	1.853		1.985		1.916				
Remarks												

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E / BA4	R-1 ITEM NOMENCLATURE Ship Self Defense / 0603755N

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total P.E. Cost	9.253	12.120	5.654	7.707	7.827	7.960	8.125	8.292	CONT.	CONT.
QRCC / K2133/U2133	3.328	4.351	0	0	0	0	0	0	0	101.520
Force AAW Coord. Tech. (FACT)/ K2184/U2133	5.925	7.769	5.654	7.707	7.827	7.960	8.125	8.292	CONT.	CONT.
Quantity of RDT&E Articles & cost										

A. (U) Mission Description and Budget Item Justification:

This program incorporates efforts dedicated to the enhancement of ship self defense against Anti-Air Warfare (AAW) threats. Its primary focus is on the development of technologies, systems, and procedures necessary to defeat the evolving Anti-Ship Cruise Missile (ASCM) threat. These projects focus on ship defense improvements through the development of advanced concepts and capabilities that will enhance both defense in depth of ships in a force and self defense of individual ships in a littoral war-fighting environment. Quick Reaction Capability (QRCC), Project K2133, provides advanced concepts and technology developments for the multi-sensor integration of ship detection equipment, integration and coordination of ship self defense weapons, and coordination of hardkill and softkill assets to improve individual ship self defense capabilities against the ASCM threat. Force Anti-Air Warfare Coordination Technology (FACT), Project K2184, demonstrates Force Anti-Air Warfare (AAW) concepts and capabilities which will enhance the AAW war-fighting ability of ships and aircraft and enable the coupling of the Force into a single, distributed AAW weapon system through more effective use of tactical data, and force sensors and weapons.

B. (U) Program Change Summary:

	FY 1998	FY 1999	FY 2000
FY 1999 President's Budget:	9.597	12.337	12.287
Appropriated Value:	9.961	12.337	
Adjustment to FY 1998 Appropriated Value/ FY 1999 President's Budget:			
a. Congressional Undistributed Reduction	-0.364		
b. FY98 SBIR Reduction	-0.211		
c Minor Pricing Adjustments	-0.133	-0.217	-0.100
d. Program Reduction			-2.000
e. Accelerate MFP Capability			-4.533
FY 2000 PRES Budget Submit:	9.253	12.120	5.654

FundingFY98 and FY99 reductions are due to minor pricing adjustments. FY2000 reductions due to Program Redution (-$2.0), Acceleration of MFP Capability (-$4.533) and minor pricing adjustments (-$.1).

:

Schedule: Not applicable.
Technical: Not applicable.

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY **RDT&E 4**	PROGRAM ELEMENT NAME AND NUMBER SHIP SELF DEFENSE 0603755N	PROJECT NAME AND NUMBER FORCE AAW COORDINATION TECHNOLOGY K2184/U2184

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	5.925	7.769	5.654	7.707	7.827	7.960	8.125	8.292	CONT.	CONT.
RDT&E Articles Qty										

A. (U) Mission Description and Budget Item Justification: Force Anti-Air Warfare Coordination Technology (FACT) Program is an advanced development effort designed to demonstrate Force Anti-Air Warfare (AAW) concepts and capabilities which will significantly improve our Force defense in depth, including both local area and self defense capabilities against current and future AAW threats. FACT improvements are designed to enhance the AAW warfighting ability of ships and aircraft and to enable coupling of the Force into a single, distributed AAW weapon system and towards more effective use of tactical data and the cooperative use of all the force sensors and weapons. These capabilities will provide the ship defense flexibility needed to meet the threat brought about by increasing numbers of highly sophisticated weapons held by potentially hostile third world countries. FACT defines requirements and develops prototype systems or modifications to existing systems to test new concepts for the coordination of Force AAW operations. Some examples of prototype systems now in production are AN/SPS-48C Detection Data Converter, AN/SPS-48E Environmental Control Feature, Shipboard Gridlock System Automatic Correlation (SGS/AC) and Dial-a-Track Link-11 Quality Selection. Other FACT developments nearing production stages are the Automatic Identification System (Auto-ID) and the Multi-Frequency Link-11 capability; Dual Net Multi-Frequency Line (DNMFL); Force Threat Evaluation Weapons Assignment (FTEWA); and the prototype Area Air Defense Commander (AADC) capability. Short and long term objectives will be phased in to produce higher degrees of ship defense and battle coordination and effectiveness.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1998 ACCOMPLISHMENTS:

- (U) ($ 4.375) Continued AADC concept development and evaluation, including the integration of Theater Ballistic Missile Defense (TBMD) capabilities into the prototype AADC.
- (U) ($ 1.050) Supported DNMFL experiments in the IKE Battle Group, USS Cowpens, and US LaSalle; support FTEWA experiments in the USS Cowpens and USS LaSalle; support AADC experiments in Joint air defense exercises.
- (U) ($ .500) Supported Link 11, Link 16 and CEC interoperability across Joint and Allied forces, including multiple simultaneous links, and participation in Link Inter-operability Working Group (LIWG) and BattleGroup System Integration Testing (BGSIT) efforts.

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY **RDT&E 4**	PROGRAM ELEMENT NAME AND NUMBER SHIP SELF DEFENSE 0603755N	PROJECT NAME AND NUMBER FORCE AAW COORDINATION TECHNOLOGY K2184/U2184

(U) FY 1999 PLAN

. (U) ($ 4.500) Continue AADC concept development and evaluation, including the integration of air space deconflict capabilities, combat air patrol (CAP) stationing, Engage on Remote (EOR), and AEGIS weapons system integration.

(U) ($ 1.574) Support DNMFL experiments in IKE Battle Group, USS LaSalle; support AADC experiments with the AADC prototypes at land based facilities and at-sea.

. (U) ($ 1.000) Begin development of Coherent Track Processor to integrate CEC, Link 11, and Link 16.

. (U) ($ .500) Support Navy and Joint link interoperability

. (U) ($ .195) Portion of extramural progam is reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

(U) FY 2000 PLAN:

. (U) ($ 2.248) Continue concept development of advanced air defense command and control capabilities, including development of concepts to support CAP/SAM coordination, Joint Fires airspace coordination, coordinated cooperative engagements, and advanced air defense capabilities.

. (U) ($ 1.365) Support landbased and at-sea experiments of advanced Command and Control systems to evaluate air defense concepts and capabilities, including multi-TADIL operations, and air defense operations.

. (U) ($ 1.541) Develop concepts and capabilities to support the integration of Multi-TADIL and cooperative engagement networks across Joint air defense systems.

. (U) ($ .500) Improve Navy and Joint Link interoperability.

B. (U) Other Program Funding Summary: Not applicable.

FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	To FY 2003	Total FY 2004	FY 2005	Complete	Cost

C. (U) Acquisition Strategy: Not applicable.

D. (U) Schedule Profile: Not applicable

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY **RDT&E 4**	PROGRAM ELEMENT NAME AND NUMBER SHIP SELF DEFENSE 0603755N	PROJECT NAME AND NUMBER FORCE AAW COORDINATION TECHNOLOGY K2184/U2184

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development		APL/LAUREL, MD	50.408	7.769	10/98	5.654	10/99			CONT.	CONT.	CONT.
Ancillary Hardware Development												
Systems Engineering												
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development			50.408	7.769	10/98	5.654	10/99			CONT.	CONT.	CONT.
Remarks:												
Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support												
Remarks: Not Applicable												

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY **RDT&E 4**	PROGRAM ELEMENT NAME AND NUMBER SHIP SELF DEFENSE 0603755N	PROJECT NAME AND NUMBER FORCE AAW COORDINATION TECHNOLOGY K2184/U2184

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation												
Operational Test & Evaluation												
Tooling												
GFE												
Subtotal T&E												
Remarks Not Applicable												
Contractor Engineering Support												
Government Engineering Support												
Program Management Support												
Program Management Personnel												
Travel												
Labor (Research Personnel)												
Overhead												
Subtotal Management												
Remarks: Not Applicable												
Total Cost			50.408	7.769	10/98	5.654	10/99			CONT.	CONT.	CONT.
Remarks:												

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603790N
PROGRAM ELEMENT TITLE: NATO Research and Development

(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 1998 ACTUAL	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R2293 NATO Cooperative Research and Development (R&D)	5,526	8,852	5,461	9,053	11,670	11,748	11,948	12,447	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project provides funding for the continuation of on-going research and development identification and projects between the U.S. Navy and allies under ASN(RD&A) or USD(A&T) signed international agreements in accordance with Title 10 U.S. Code Section 2350a. Many of these projects were initiated under OSD PE 0603790D in prior years.

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under DEMONSTRATION & VALIDATION because it develops and integrates hardware for experimental tests related to specific ship or aircraft applications.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:
   - (U) ($1,386) Supported on-going Navy efforts on the U.S./Japanese Cooperative Material Project for Advanced Steel initiated with OSD funding.

- (U) ($1,016) Supported on-going work on the High-Speed Protocol Project with France initiated with OSD funding.
- (U) ($395) Provided support for negotiation of the Vector project Memorandum of Agreement between the U.S. and Germany.
- (U) ($99) Supported on-going work on the U.S./Norway joint project on Composite Hull Embedded Sensor System initiated with OSD funding.
- (U) ($1,650) Supported on-going Navy work related to the U.S./United Kingdom development of the Intercooled Recuperated (ICR) Gas Turbine Engine.
- (U) ($230) Supported work on the Unmanned Undersea Vehicle cooperative R&D project between the U.S. and France initiated with OSD funding.
- (U) ($600) Supported on-going work on the U.S./U.K. Trimaran Demonstrator Project initiated with OSD funding.
- (U) ($150) Supported on-going work on the U.S./Germany joint project on Computer Codes for Predicting Underwater Explosion Effects.

2. (U) FY 1999 PLAN:

- (U) ($1,000) Support on-going work related to the U.S./United Kingdom Anti-Torpedo Torpedo cooperative R&D project.
- (U) ($1,600) Support on-going work related to the cooperative R&D program between the U.S. and U.K. for Trimaran Hull initiated with OSD funding.
- (U) ($1,150) Support on-going work on the U.S./Japanese Cooperative Material Project for Advanced Steel.
- (U) ($2,500) Support work on the Vector Project between the U.S. and Germany.
- (U) ($902) Support efforts on the High Speed Protocol Project with France.
- (U) ($400) Supported work on the Unmanned Undersea Vehicle cooperative R&D project between the U.S. and France initiated with OSD funding.
- (U) ($300) Support on-going Navy work related to the U.S./United Kingdom development of the Intercooled Recuperated (ICR) Gas Turbine Engine.
- (U) ($1,000) Support Norwegian Mineclearing.

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603790N PROJECT NUMBER: R2293
PROGRAM ELEMENT TITLE: NATO Research and Development PROJECT TITLE: NATO Cooperative R&D

3. (U) FY 2000 PLAN:
- (U) ($3,000) Support work on the Vector Project between the U.S. and Germany.
- (U) ($500) Support Fiber Optic Bottom Mounted Acoustic Array.
- (U) ($961) Support efforts on the Multilateral MOU for Interoperable Network for Secure Communications.
- (U) ($200) Support on-going work related to the U.S./United Kingdom Anti-Torpedo Torpedo cooperative R&D project.
- (U) ($600) Support on-going Navy efforts on the U.S./Japanese Cooperative Material Project for Advanced Steel initiated with OSD funding.
- (U) ($100) Support work related to the Standoff Sensors for Non-Acoustic ASW with the U. K.
- (U) ($100) Support work related to the Improved Submarine Launched Mobile Mine with Australia.

B. (U) PROGRAM CHANGE SUMMARY:

	FY 1998	FY 1999	FY 2000
(U) FY 1999 President's Budget:	9,672	11,004	10,922
(U) Appropriated Value:	-	9,004	-
(U) Adjustments from FY 1999 PRESBUDG:	-4,146	-2,152	-5,461
(U) FY 2000 President's Budget Submission:	5,526	8,852	5,461

(U) CHANGE SUMMARY EXPLANATION:

(U) Funding: FY 1998 adjustments are due to SBIR assessment (-146), Comparability Adjustment (-1,000), and Omnibus Recession (-3,000). FY 1999 adjustments are due to Revised Economic Assumptions (-21), Civilian Personnel Underexecution (-20), General Reduction (-2,000), and Contract Advisory and Assistance Services (-111). FY 2000 adjustments are due to Undistributed Reduction (-79), NWCF Rates (72), net zero realignment of funds from NATO R&D PE into project PEs to provide a single funding source for work under signed NATO Cooperative R&D International Agreements in accordance with Title 10 Section 2350a(-5,415), Civilian Pay Rates (55), Non Pay Inflation (-84), and Working Capital Fund (-10).

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603790N PROJECT NUMBER: R2293
PROGRAM ELEMENT TITLE: NATO Research and Development PROJECT TITLE: NATO Cooperative R&D

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

(U) RELATED RDT&E:
(U) PE 0603790D (NATO Cooperative Research and Development)
(U) PE 0605853N (Management, Technical and International Support)
(U) PE 0605130D (Foreign Comparative Testing)

D. (U) SCHEDULE PROFILE: Not applicable.

FY 2000/2001 RDT&E,N PROGRAM ELEMENT/PROJECT COST BREAKDOWN DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603790N PROJECT NUMBER: R2293
PROGRAM ELEMENT TITLE: NATO Research and Development PROJECT TITLE: NATO Cooperative R&D

A. (U) PROJECT COST BREAKDOWN: ($ in thousands)

Project Cost Categories	FY 1998	FY 1999	FY 2000
a. Cooperative Research and Development	5,526	8,852	5,461

B. (U) BUDGET ACQUISITION HISTORY AND PLANNING INFORMATION:

PERFORMING ORGANIZATIONS

Contractor/ Government Performing Activity	Contract Method/ Fund Type Vehicle	Award/ Oblig Date	Perform Activity EAC	Project Office EAC	Total FY 1997 & Prior	FY 1998 Budget	FY 1999 Budget	FY 2000 Budget	To Complete	Total Program
Product Development										
Westinghouse	C/CPAF	12/26/91			2,646	230	400	0	CONT.	CONT.
NSWC-CD	WX	1/31/97			2,500	900	1,625	180	CONT.	CONT.
Boeing					0	316	2,000	2,400		
Miscellaneous					4,235	4,080	4,827	2,881	CONT.	CONT.

Support and Management: Not applicable.

Test and Evaluation: Not applicable.

GOVERNMENT FURNISHED PROPERTY: Not applicable.

FY 2000/2001 RDT&E,N PROGRAM ELEMENT/PROJECT COST BREAKDOWN DATE: February 1999

BUDGET ACTIVITY: 4
PROGRAM ELEMENT: 0603790N
PROGRAM ELEMENT TITLE: NATO Research and Development
PROJECT NUMBER: R2293
PROJECT TITLE: NATO Cooperative R&D

	Total FY 1997 & Prior	FY 1998 Budget	FY 1999 Budget	FY 2000 Budget	To Complete	Total Program
Subtotal Product Development	9,381	5,526	8,852	5,461	CONT.	CONT.
Subtotal Support and Management	0	0	0	0	0	0
Subtotal Test and Evaluation	0	0	0	0	0	0
Total Project	9,381	5,526	8,852	5,461	CONT.	CONT.

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	R-1 ITEM NOMENCLATURE Program Element (PE) Name and No. 0603795N Gun Weapons Systems Technology

COST ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total P.E. Cost	61.282	78.858	101.489	93.494	71.505	51.102	52.283	53.403	CONT	CONT
NTACMS/J2241*	0	0	0	0	0	0	0	0	0	0
NSFS/K2156	58.582	51.807	52.637	40.430	31.303	32.163	32.928	33.623	CONT	CONT
VGAS/K2323**	0	0	0	0	0	0	0	0	0	0
NFCS/K2325	0	19.069	27.014	30.527	25.646	18.939	19.355	19.780	CONT	CONT
LASM/K2409	2.700	0	21.838	22.537	14.556	0	0	0	0	61.631
ERGM/K2624***	0	7.982	0	0	0	0	0	0	0	7.982
Quantity of RDT&E Articles & cost			90/8	12						

*NTACMS Funding Terminated.
**Funds Transferred to PE 0603513N/Project 32467.
***FY-1999 Congressional Plus up.

A. (U) Mission Description and Budget Item Justification: The Gun Weapons Systems Technology line supports the Naval Surface Fire Support (NSFS) mission. In order to meet the United States Marine Corp (USMC) requirements for NSFS in support of Operational Maneuvers from the Sea (OMFTS), the Navy is developing a variety of weapons systems that can provide the required range, lethality, accuracy, and responsiveness. NSFS systems being developed include both gun and missile systems. Gun systems include the 5"/62 gun (a modification of the existing 5"/54 gun); a 5" Extended Range Guided Munitions (ERGM) with a coupled internal Global Positioning and Inertial Navigation System capable of delivering a submunition payload to a range of 63 NM; an Advanced Gun System (AGS) for the next generation surface combatant (DD21); and propelling charge improvements. In order to satisfy USMC requirements for longer range, responsive fire support, the Navy is developing a land attack variant of the Land Attack Standard Missile (LASM). The Naval Fires Control System (NFCS) will support mission planning for 5"/62 – ERGM, and LASM. It will automate shipboard land attack battle management duties to be interoperable and consistent with joint C4ISR systems. These shipboard weapon systems will significantly improve the Navy's ability to support OMFTS. This program element also includes the transition of ATD's and P^3Is into the NSFS program.

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	R-1 ITEM NOMENCLATURE Program Element (PE) Name and No. 0603795N Gun Weapons Systems Technology

B. (U) Program Change Summary:

	FY 1998	FY 1999	FY 2000
FY 1999 President's Budget:	58.998	110.104	121.051
Appropriated Value:	60.874		
Adjustment to FY 1998 Appropriated Value/			
FY 1999 President's Budget:	+408	-31.246	-19.562
FY 2000/01 President's Budget Submit:	61.282	78.858	101.489
Funding: Moved VGAS funding to new PE within DD 21 PEO			-40.138
Terminated NTACMS funding		-11.301	-10.573
Added LASM funding.			+22.176
Added ERGM stability reserve			+14.300
ERGM Re-programming	+3.999		
Cancel LAW-DC			- 4.014
FY99 Congressional Transfer: ERGM		+ 8.000	
FY99 Congressional Cut: NFCS		- 2.500	
FY98/99 Comparability Adj. – VGAS		-25.134	
FY99 Congressional Cut: VGAS		-10.000	
Restructured and Comparability Adj.: VGAS		+10.000	
PBD 752: Above Core/Program Mod Accel			
PBD 606: Civilian Pay Rates			+0.188
PBD 604: Non-Pay Inflation			-1.469
SBIR Reduction	- 1.212		
Various Adjustments	- 2.379	-.311	- 0.145
Outsourcing Reduction			- 0.177

Schedule: N/A
Technical: N/A

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	Program Element Name & No. 0603795N Gun Weapons Systems Technology	Project Name and Number. Naval Surface Fire Support.....K2156

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	58.582	51.807	52.637	40.430	31.303	32.163	32.928	33.623	CONT	CONT
RDT&E Articles Qty			90							

A. (U) Mission Description and Budget Item Justification: These funds provide for the development of the 5"/62 Extend Range Guided Munition (ERGM) weapons systems which consists of a: 5" MK 45 gun modification which strengthens the gun to accommodate higher firing loads (18 megajoules) to fire the EX 171 Extended Range Guided Munition (ERGM); ERGM, a 5" munition with an internal Global Positioning System receiver coupled with an inertial Navigation System capable of delivering a submunitions to a range of 63NM; a gun fire control system which updates the MK 160 MOD 7 to a MOD 8 providing direct digital interface with the gun as well as the ERGM; and an upgraded propelling charge to provide the higher gun firing energy required by ERGM. This project also includes the transition of ATDs and P^3Is into the NSFS envelope.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:

- (U) ($26.936) Continued development of EX-171 EDMs for ERGM.
- (U) ($ 2.504) Continued development of EX-171 Advanced Solid Propelling Charge. Achieved 18 megajoules capability.
- (U) ($14.208) Continued development of 5" MK 45 Modification and GFP preparation. Delivered prototype gun, 3rd QTR.
- (U) ($ 4.165) Continued development of Gun Fire Control Modification and required interfaces.
- (U) ($ .771) Analyzed life cycle costs and evaluated tradeoffs.
- (U) ($ 9.998) Continued development and engineering analysis of the Army ATACM missile integration onto naval platforms to meet Marine Corps requirements.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	Program Element Name & No. 0603795N Gun Weapons Systems Technology	Project Name and Number. Naval Surface Fire Support.....K2156

2. (U) FY 1999 PLAN:
- (U) ($30.664) Continue development of EX-171 EDMs for ERGM. Test rocket motor and component integration.
- (U) ($ 2.983) Continue development of EX-171 Advanced Solid Propelling Charge.
- (U) ($11.768) Continue development of 5" MK 45 Modification and GFP preparation. Commence test firing.
- (U) ($ 4.117) Continue development of the Gun Fire Control Modification and required interfaces.
- (U) ($ 1.468) Analyze life cycle costs and evaluated tradeoffs.\
- (U) ($ .807) Portion of extramural program is reserved for Small Business Innovation Research Assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLAN:
- (U) ($37.715) Continue development of EX-171 EDMs for ERGM. Start ERGM LRIP deliveries.
- (U) ($. 552) Continue development of EX-171 Advanced Solid Propelling Charge.
- (U) ($ 5.901) Continue development of 5" MK 45 Modification and GFP preparation.
- (U) ($ 3.229) Continue development of the Gun Fire Control modification and required interfaces.
- (U) ($ 1.640) Analyze life cycle costs and evaluated tradeoffs
- (U) ($ 3.600) Procure 90 LRIP ERGMs in support of OPEVAL.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	Program Element Name & No. 0603795N Gun Weapons Systems Technology	Project Name and Number. Naval Surface Fire Support.....K2156

B. (U) Other Program Funding Summary:

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
PAN,MC	0	27.395	3.004	24.500	45.269	70.395	71.685	97.389	CONT.	CONT.

(U) Related RDT&E,N: N/A

C. (U) Acquisition Strategy: A competition was held in FY 96 for the ERGM. It resulted in an award to Texas Instruments (now Raytheon Systems Company) with a corporate investment of 47.5% of development cost. The gun is being developed under a sole source arrangement with United Defense, the current MK 45 MOD 2 producer. The Fire Control (MK 160) and the propelling charge are being developed by NSWC since they are modifications to current government owned/supplied equipment.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	Program Element Name & No. 0603795N Gun Weapons Systems Technology	Project Name and Number. Naval Surface Fire Support.....K2156

D. (U) Schedule Profile:

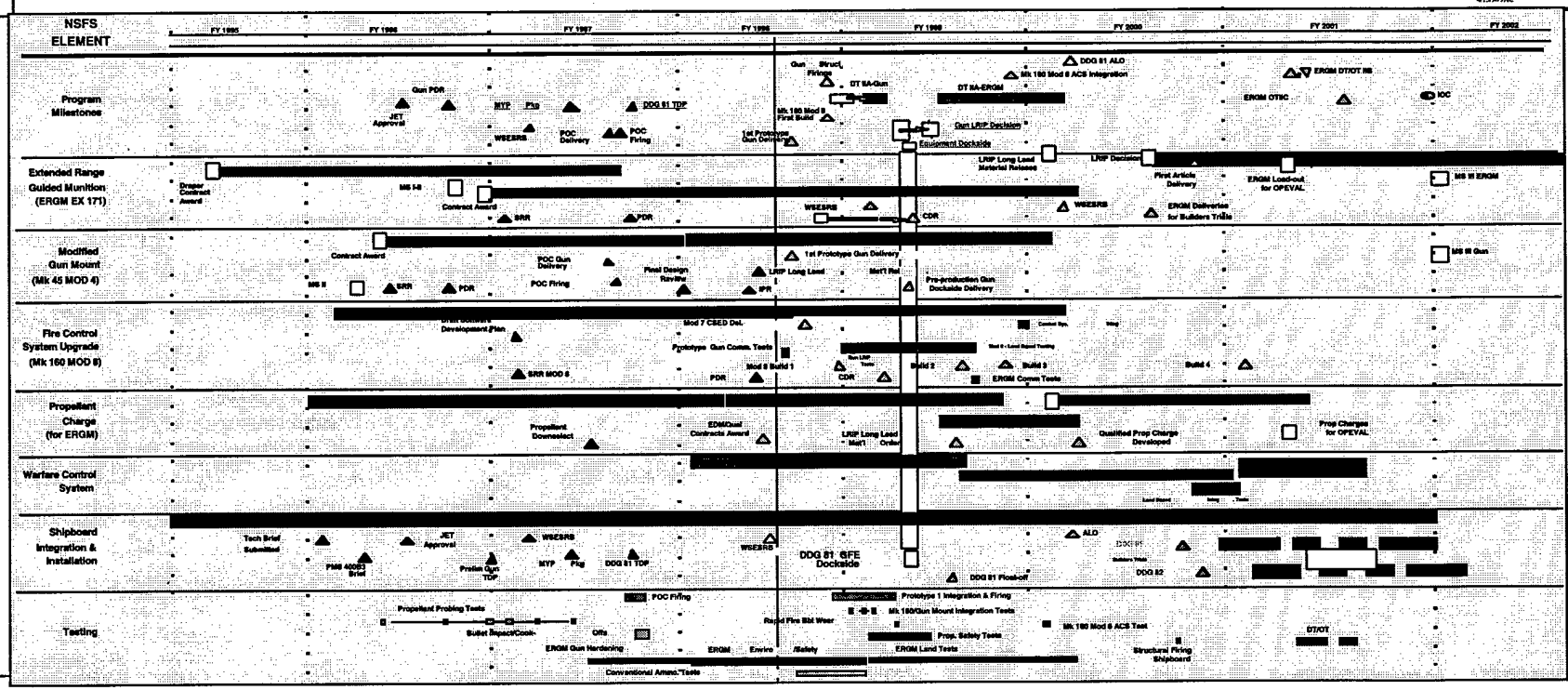


Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	PROGRAM ELEMENT NAME AND NUMBER 0603795N Gun Weapons System Technology	PROJECT NAME AND NUMBER Naval Surface Fire Support.....K2156

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	CPFF	UDLP, Minneapolis, MN	42.961	8.517	10/98	3.865	10/99			CONT	CONT	44.726
	CPAF/IF	Raytheon Texas Inst., Lewisville, TX	33.237	18.282	10/98	24.212	10/99			CONT	CONT	66.809
	WR	NSWC Dahlgren, VA	39.999	14.854	10/98	7.195	10/99			CONT	CONT	N/A
	WR	NWSC Indian Head, MD	11.024	2.052	10/98	1.136	10/99			CONT	CONT	N/A
	WR	NSWC Port Hue, CA	23.096	2.831	10/98	2.903	10/99			CONT	CONT	N/A
Ancillary Hardware Development												
Systems Engineering	VAR	Miscellaneous	48.357	4.473	10/98	2.884	10/99			CONT	CONT	N/A
Licenses												
Tooling												
GFE												
Award Fees	CPAF/IF	Raytheon Texas Inst., Lewisville, TX	1.123	.698	12/98 06/99	.148	12/99 06/00			1.01	2.070	2.070
Subtotal Product Development			199.797	51.707		42.343				CONT	CONT	CONT

Remarks: The budget for each development contract is higher than the target value based on the program managers estimate of what will be needed to cover changes to requirements and cost growths.

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	PROGRAM ELEMENT NAME AND NUMBER 0603795N Gun Weapons System Technology	PROJECT NAME AND NUMBER Naval Surface Fire Support.....K2156

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support												
Configuration Management												
Technical Data												
GFE												
Subtotal Support												
Remarks:												

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	CP	Raytheon Texas Ins., Lewisville, TX	0	0		3.600	11/00			0	3.600	3.600
Development Test & Evaluation	WR	NSWC Dahlgren, VA	0	0		6.594	10/00			CONT.	CONT	
Operational Test & Evaluation												
Tooling												
GFE												
Subtotal T&E			0	0		10.194				CONT.	CONT	

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	PROGRAM ELEMENT NAME AND NUMBER 0603795N Gun Weapons System Technology	PROJECT NAME AND NUMBER Naval Surface Fire Support.....K2156

Remarks

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Contractor Engineering Support												
Government Engineering Support		VARIOUS	0	0		0				CONT	CONT	
Program Management Support		VARIOUS	0	0		0				CONT	CONT	
Program Management Personnel												
Travel	PD	NAVSEA HQ	.223	.100	VAR	.100	VAR			CONT	CONT	
Labor (Research Personnel)												
Overhead												
Subtotal Management			.223	.100	VAR	.100	VAR			CONT	CONT	
Remarks:												
Total Cost			200.020	51.807		52.637				CONT	CONT	CONT

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	Program Element Name & No. 0603795N Gun Weapons Systems Technology	Project Name and Number. Naval Fires Control System.....K2325

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	0	19.069	27.014	30.527	25.646	18.939	19.355	19.780	CONT	CONT
RDT&E Articles Qty										

A. (U) Mission Description and Budget Item Justification: Naval Fires Control System (NFCS) covers the mission planning and coordination for future Naval Surface Fire Support system requirements. NFCS will plan, coordinate and manage the firing of the new Naval Surface Fires Support (NSFS) weapon systems including the 5"/62 caliber gun and the Land Attack Standard Missile (LASM). It will be available to amphibious ships, command ships, and the DD-21 program if selected by the full service contractor. The software may ultimately be integrated into future Tactical TOMAHAWK Weapons Control Systems (TTWCS) but will initially be hosted in the existing combat suite on DDG-81 for fleet introduction in 2001. Prototyping, demonstrations and development will be conducted during FY 99 and FY 00.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS: N/A.

2. (U) FY 1999 PLAN:

- (U) ($13.119) Software development and system engineering to include analysis, design and reuse of existing government and commercial computer programs to support ERGM, LASM, and other naval weapon applications.
- (U) ($ 4.050) Identify and configure hardware configuration to support NFCS implementation.
- (U) ($ 1.600) Independent validation and verification, joint requirements investigation, Concept of Operations (CONOPs) scenario development.
- (U) ($ .300) C4I and combat system interface investigation and analysis to include Battle Force Tactical Trainer (BFTT), LINK 16, TTWCS and other developing C4I system and technology.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	Program Element Name & No. 0603795N Gun Weapons Systems Technology	Project Name and Number. Naval Fires Control System.....K2325

3. (U) FY 2000 PLAN:

- (U) ($17.082) Software and system engineering to include analysis, development, reuse and integration of government and commercial computer programs to support ERGM, LASM and other naval weapon applications.
- (U) ($ 5.880) Support hardware configuration to support NFCS implementation. Support DT Validation.
- (U) ($ 1.930) Independent validation and verification, joint requirements investigation, Concept of Operations (CONOPs) scenario development.
- (U) ($ 1.700) C4I and combat system interface investigation and analysis to include BFTT, Link 16, TTWCS and other developing C4I system and technology.
- (U) ($ .422) Portion of extramural program is reserved for Small Business Innovation Research Assessment in accordance with 15 USC 638.

B. (U) Other Program Funding Summary: N/A

(U) Related RDT&E,N: N/A

C. (U) Acquisition Strategy: The acquisition strategy has not yet been approved. The strategy will be to perform prototyping efforts and to award a competitive contract for software development. The TTWCS contractor assisted by the NFCS developer will integrate NFCS into TTWCS.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	Program Element Name & No. 0603795N Gun Weapons Systems Technology	Project Name and Number. Naval Fires Control System.....K2325

D. (U) Schedule Profile

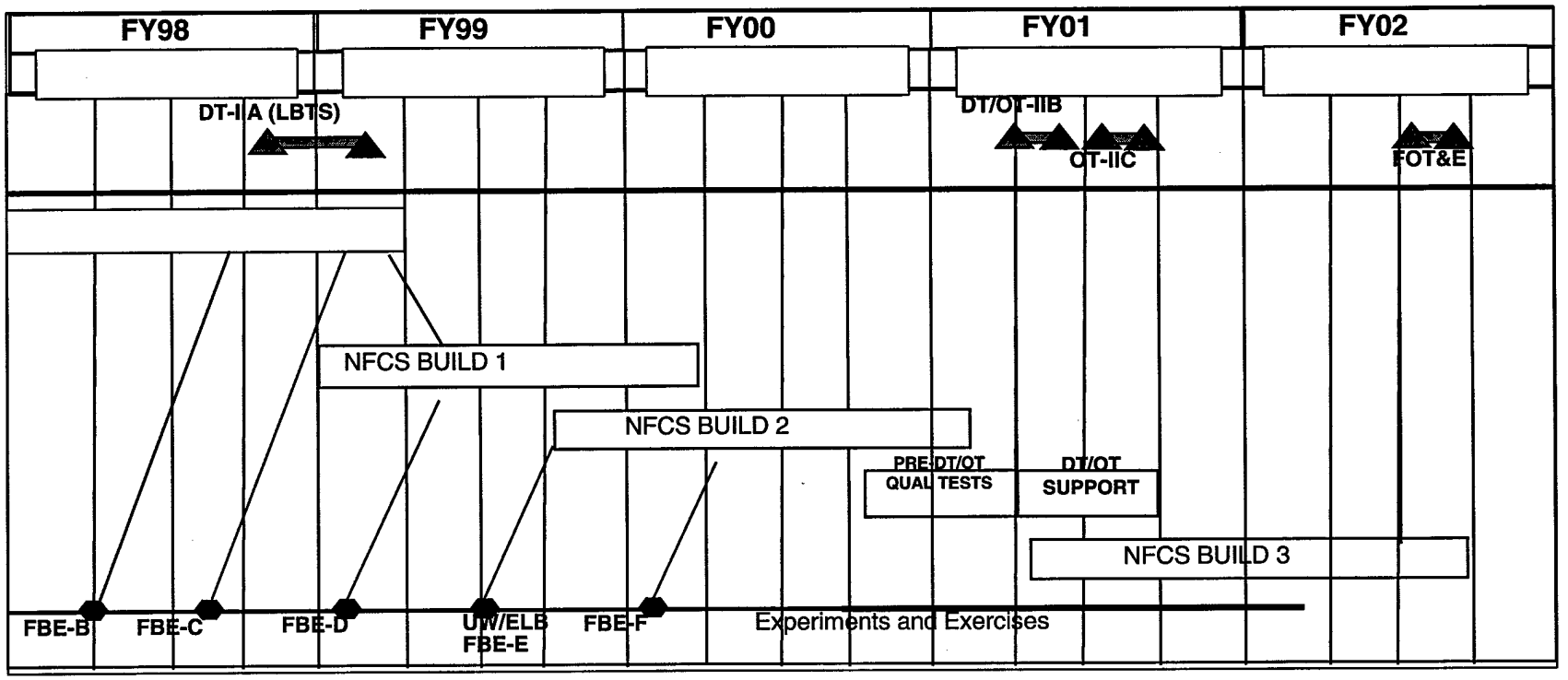


Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	PROGRAM ELEMENT NAME AND NUMBER 0603795N Gun Weapons System Technology	PROJECT NAME AND NUMBER Naval Fires Control System.....K2325

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Primary Software Development	TO/CPFF	ITC, Arlington, VA		12.199	01/99					TBD	TBD	TBD
Primary Software Development	CM/CPFF	TBD				15.674	10/99			TBD	TBD	TBD
Ancillary Hardware Development	SS/CP	Lockheed Martin, MD				5.147	10/99			TBD	TBD	TBD
Ancillary Hardware Development	VAR	VARIOUS								CONT	CONT	
Systems Engineering	WR	SSC/SD		3.000	11/98	1.314	10/99			CONT	CONT	
Systems Engineering	SS/CP	VITRO		.300	02//99	1.700	10/99			TBD	TBD	TBD
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development			0	15.499		23.835				CONT	CONT	
Remarks:												
Development Support Equipment												
Software Development	WR	NSWC.Dahlgren, VA		2.500	11/98	1.015	10/99			CONT	CONT	
Training Development												
Integrated Logistics Support	VAR	VARIOUS		.970	11/98	1.840	10/99			CONT	CONT	
Configuration Management												
Technical Data												
GFE												
Subtotal Support			0	3.470		2.855				CONT	CONT	

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	PROGRAM ELEMENT NAME AND NUMBER 0603795N Gun Weapons System Technology	PROJECT NAME AND NUMBER Naval Fires Control System.....K2325

Remarks:

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NSWC/PT HUE,CA				.250	10/99			CONT	CONT	
Operational Test & Evaluation												
Tooling												
GFE												
Subtotal T&E			0	0		.250				CONT	CONT	
Remarks:												
Contractor Engineering Support												
Government Engineering Support												
Program Management Support												
Program Management Personnel												
Travel	PD	NAVSEA HQ	0	.100	VAR	.100	VAR			CONT	CONT	
Labor (Research Personnel)												
Overhead												
Subtotal Management			0	.100		.100				CONT	CONT	
Remarks:												
Total Cost			0	19.069		27.040				CONT	CONT	
Remarks												

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	Program Element Name & No. 0603795N Gun Weapons Systems Technology	Project Name and Number. Land Attack Missile.....K2409

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost	2.700	0	21.838	22.537	14.556	0	0	0	0	61.631
RDT&E Articles Qty			8	12						

A. (U) Mission Description and Budget Item Justification: This project funds the Land Attack Standard Missile (LASM) (SM-4) program to provide Naval Surface Fire Support to Ground Combat Elements. The major efforts involved are systems integration and testing. Systems integration consists of integrating GPS/INS guidance, height of burst sensors, and warhead modifications to optimize effects against ground element targets into existing SM-2 missiles (refurbished as necessary). Testing will include ground, captive carry and flight tests to demonstrate safety, accuracy, anti-jamming capability, resistance, and lethality. RDT&E,N articles include inert operational missiles for ground and captive carry testing and complete all up rounds for flight testing.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:
- (U) ($ 2.000) Developed proto- flight test hardware including GPS/INS package.
- (U) ($ .700) Tested prototype hardware and plan for next testing round.

2. (U) FY 1999 PLAN: N/A

3. (U) FY 2000 PLAN:
- (U) ($20.988) Continue development of prototype flight test hardware including GPS/INS package.
- (U) ($ .850) Test prototype hardware and plan for next testing round.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	Program Element Name & No. 0603795N Gun Weapons Systems Technology	Project Name and Number. Land Attack Missile.....K2409

B. (U) Other Program Funding Summary:

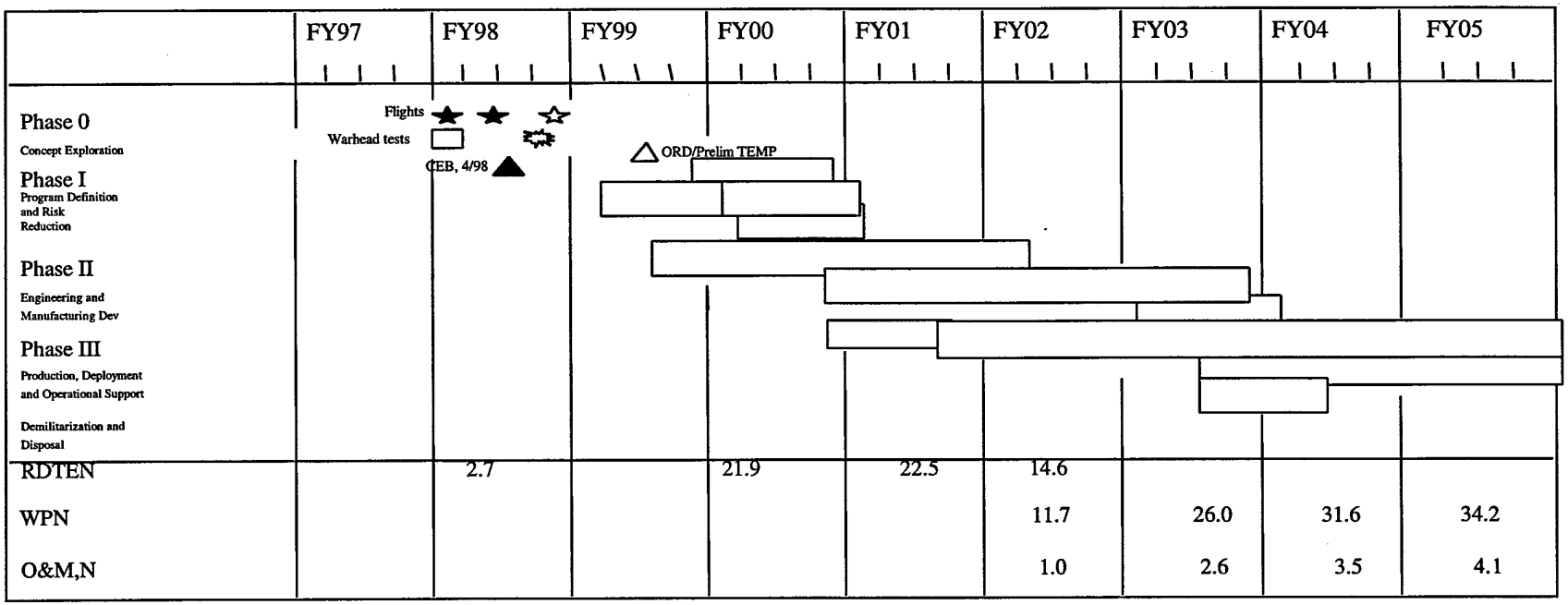
	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Cost
WPN	0	0	0	0	11.7	26.0	31.6	34.2	158.8	262.3
O&MN	0	0	0	0	1.0	2.6	3.5	4.1	111.0	122.2

(U) Related RDT&E,N: N/A

C. (U) Acquisition Strategy: Pre EMD testing and engineering efforts will be conducted under level of effort contracts with the OEM. An E&MD completion contract will be awarded competitively to integrate the capability improvements into and refurbish as necessary existing SM-2 Block II missiles and to support DT/OT. The GFM will be refurbished during this process and, with capability improvement, will become the Land Attack Standard Missile (SM-4).

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	Program Element Name & No. 0603795N Gun Weapons Systems Technology	Project Name and Number. Land Attack Missile.....K2409

D. (U) Schedule Profile



RDTEN		2.7		21.9	22.5	14.6		
WPN						11.7	26.0	31.6	34.2
O&M,N						1.0	2.6	3.5	4.1

Legend: ☆ Flight Test ▭ Warhead test (static)

Note: * Option exists for this to be full rate instead of LRIP if MS III is accomplished early.

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	PROGRAM ELEMENT NAME AND NUMBER 0603795N Gun Weapons System Technology	PROJECT NAME AND NUMBER Land Attack Missile System.....K2409

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total Pys Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development												
Ancillary Hardware Development	WR	NSWC/Dahlgren, VA	.700			1.400	10/99			1.300	3.400	
	WR	VAR	.100			.298	10/99			.402	.800	
Systems Engineering	CPFF	VAR	.300			.500	10/99			1.174	1.974	
	SS/CPAF	Raytheon Missile Systems Co., Tucson, Az	.890			18.140	10/99			26.442	45.472	TBD
Licenses												
Tooling												
GFE												
Award Fees												
Subtotal Product Development			1.990	0		20.338				29.318	51.646	
Remarks												
Development Support Equipment												
Software Development												
Training Development												
Integrated Logistics Support	WR	VAR	0			.080	10/99			.260	.340	
Configuration Management	WR	VAR	0			.120	10/99			.390	.510	
Technical Data												
GFE												
Subtotal Support			0	0		.200				.650	.850	
Remarks:												

Exhibit R-3 Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/BA-4	PROGRAM ELEMENT NAME AND NUMBER 0603795N Gun Weapons System Technology	PROJECT NAME AND NUMBER Land Attack Missile System.....K2409

Cost Categories (Tailor to WBS, or System/Item Requirements)	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date			Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NAWC/WD, White Sands Missile Range, NM	.700			.500	10/99			1.625	2.825	
	WR	VAR	0			.290	10/99			.230	.520	
Operational Test & Evaluation	WR	NAWC/AD, Pt Mugu, CA	0			.030	10/99			3.900	3.930	
	WR	VAR	0			.030	10/99			.120	.150	
Tooling												
GFE												
Subtotal T&E			.700	0		.850				5.875	7.425	
Remarks:												
Contractor Engineering Support												
Government Engineering Support												
Program Management Support	VAR	VAR				.350	10/99			1.050	1.400	
Program Management Personnel												
Travel	PD	NAVSEA HQ	.010			.100	10/99			.200	.310	
Labor (Research Personnel)												
Overhead												
Subtotal Management			.010	0		.450				1.250	1.710	
Remarks:												
Total Cost			2.700			21.838				37.093	61.631	
Remarks:												

EXHIBIT R-2, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603800N
PROGRAM ELEMENT TITLE: JOINT STRIKE FIGHTER (JSF) PROGRAM

(U) COST (Dollars in thousands)

PROJECT NUMBER TITLE	FY 1998 BUDGET	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
D2209 JSF	448,236	468,509	241,238	25,762	0	0	0	0	0	1,635,252

Quantity of RDT&E Articles 4

(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The Joint Strike Fighter (JSF) Program will develop and field an affordable, highly common family of next generation strike fighter aircraft for the USN, USMC, USAF and allies. Current program emphasis is on facilitating the evolution of fully validated and affordable joint operational requirements, and demonstrating cost leveraging technologies and concepts to lower risk prior to entering Engineering and Manufacturing Demonstration (E&MD) in FY 2001. This is a joint program with no executive service. Navy and Air Force each provide approximately equal shares of annual funding for the program. The United Kingdom is a collaborative partner in this phase of the program and several other countries also participate.

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under DEMONSTRATION & VALIDATION because it integrates hardware for test related to specific ship or aircraft applications.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET PROJECT JUSTIFICATION SHEET DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603800N PROJECT NUMBER: D2209
PROGRAM ELEMENT TITLE: JOINT STRIKE FIGHTER (JSF) PROGRAM PROJECT TITLE: JSF

(U) COST (Dollars in thousands)

PROJECT NUMBER TITLE	FY 1998 BUDGET	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
D2209 JSF	448,236	468,509	241,238	25,762	0	0	0	0	0	1,635,252

Quantity of RDT&E Articles 4

(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The Joint Strike Fighter (JSF) Program will develop and field an affordable, highly common family of next generation strike fighter aircraft for the USN, USMC, USAF and allies. Current program emphasis is on facilitating the evolution of fully validated and affordable joint operational requirements, and demonstrating cost leveraging technologies and concepts to lower risk prior to entering Engineering and Manufacturing Demonstration (E&MD) in FY 2001. This is a joint program with no executive service. Navy and Air Force each provide approximately equal shares of annual funding for the program. The United Kingdom is a collaborative partner in this phase of the program and several other countries also participate.

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under DEMONSTRATION & VALIDATION because it integrates hardware for test related to specific ship or aircraft applications.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS: (Breakout reflects Navy, Air Force, DARPA, UK, Multi-Lateral and Canadian funding)

- (U) ($717,026) Continued Concept Demonstration efforts by Boeing, Lockheed Martin and Pratt & Whitney including company unique technology demonstrations and concept refinement for a tri-service family of aircraft.

- (U) ($ 34,956) Continued the Alternate Engine Program.

- (U) ($179,584) Continued technology maturation demonstrations and assessments in the areas of airframe, flight systems, manufacturing and producibility, propulsion, and mission systems. Continued systems engineering support for the Concept Demonstration Phase in the areas of system test, air vehicle analysis and integration, advanced cost estimating, survivability, integrated flight and propulsion control and carrier suitability.

- (U) ($ 23,325) Continued technology maturation demonstrations and assessments in the area of prognostics and health management and supportability and training.

- (U) ($ 20,642) Continued modeling and simulation activities to support strike warfare mission area analysis and requirements analysis efforts including Cost & Operational Performance Trades (COPT) to facilitate the Services' joint requirements definition.

- (U) ($ 15,005) Continued mission support, including program office functions.

- (U) ($990,538) Total

2. (U) FY 1999 PLAN: (Breakout reflects Navy, Air Force, UK, Multi-Lateral, Canadian and Italian funding)

- (U) ($670,284) Continue Concept Demonstration efforts by Boeing, Lockheed Martin and Pratt & Whitney including company unique technology demonstrations, complete final design and continue build of Concept Demonstrator Aircraft (CDA) and continue concept refinement for a tri-service family of aircraft.

- (U) ($ 25,790) Continue the Alternate Engine Program.

- (U) ($195,011) Continue technology maturation demonstrations and assessments in the areas of airframe, flight systems, manufacturing and producibility, propulsion and mission systems. Complete approximately half of the demonstrations. Continue systems engineering support for the Concept Demonstration Phase in the areas of system test, air vehicle analysis and integration, advanced cost estimating, survivability, integrated flight and propulsion control and carrier suitability.

- (U) ($ 28,009) Continue technology maturation demonstrations and assessments in the area of prognostics and health management and supportability and training.

- (U) ($ 13,328) Continue modeling and simulation activities to support strike warfare mission area analysis and requirements analysis efforts including COPT to facilitate the Services' joint requirements definition. Complete requirements analysis in support of final requirements document. Continue modeling and simulation support testing, training, and refinement of concept of operations for the weapons system (simulation based acquisition).

- (U) ($ 15,174) Continue mission support, including program office functions.

- (U) ($ 7,980) Anticipated General Reductions.

- (U) ($ 11,003) Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638. (USN only)

- (U) ($ 11,219) Identified as a source for SBIR (USAF only).

- (U) ($977,798) Total

3. (U) FY 2000 PLAN: (Breakout reflects Navy, Air Force, UK, Multi-Lateral and Canadian funding)

- (U) ($357,791) Continue Concept Demonstration efforts by Boeing, Lockheed Martin and Pratt & Whitney including ground and flight demonstrations and concept refinement for a tri-service family of aircraft. Request proposals from contractors for their designs and E&MD programs.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET PROJECT JUSTIFICATION SHEET DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603800N PROJECT NUMBER: D2209
PROGRAM ELEMENT TITLE: JOINT STRIKE FIGHTER (JSF) PROGRAM PROJECT TITLE: JSF

- (U) ($ 33,000) Continue the Alternate Engine Program.

- (U) ($ 76,000) Complete the remaining technology maturation demonstrations and assessments in the areas of airframe, flight systems, manufacturing and producibility, propulsion and mission systems. Continue systems engineering support for the Concept Demonstration Phase in the areas of system test, air vehicle analysis and integration, advanced cost estimating, survivability, integrated flight and propulsion control and carrier suitability.

- (U) ($ 22,438) Continue technology maturation demonstrations and assessments in the area of prognostics and health management and supportability and training.

- (U) ($ 10,000) Continue modeling and simulation activities to support strike warfare mission area analysis and requirements analysis efforts including COPT to facilitate the Services' joint requirements definition. Support analysis as required for final Joint Operational Requirements Document (JORD) coordination and signature. Continue modeling and simulation support testing, training, and refinement of concept of operations for the weapons system (simulation based acquisition).

- (U) ($ 11,183) Continue mission support, including program office functions.

- (U) ($510,412) Total

(U) B. PROGRAM CHANGE SUMMARY: (Dollars in thousands)

	FY 1998	FY 1999	FY 2000
(U) FY 1999 President's Budget:	$449,674	$463,402	$244,983
(U) Appropriated Value:	$463,855	$470,902	
(U) Adjustments from FY 1999 President's Budget:	-$1,438	+$5,107	-$3,745
(U) FY 2000 President's Budget Submission:	$448,236	$468,509	$241,238

(U) CHANGE SUMMARY EXPLANATION:

(U) Funding: FY 1998 net decrease of -$1,438 thousand reflects SBIR reduction of -$5,231 thousand, Federal Technology Transfer reduction of -$12 thousand and below threshold reprogramming of +$3,805. FY 1999 net increase of +$5,107 thousand reflects inflation adjustment of -$1,083 thousand, Congressional undistributed reductions of -$1,310 thousand and Alternate Engine Development increase of +$7,500 thousand. FY 2000 decrease of -$3,745 reflects Inflation reduction of -$3,714 thousand and miscellaneous rate adjustments of -$31 thousand.

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET PROJECT JUSTIFICATION SHEET DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603800N PROJECT NUMBER: D2209
PROGRAM ELEMENT TITLE: JOINT STRIKE FIGHTER (JSF) PROGRAM PROJECT TITLE: JSF

(U) C. OTHER PROGRAM FUNDING SUMMARY: (Dollars in thousands) This is a joint program with no executive service. The United Kingdom is a collaborative partner in this phase of the program and several other countries also participate.

Appn	FY 1998 BUDGET	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
(U) RDT&E 0603800F	444,277	454,789	235,374	22,558	0	0	0	0	0	1,573,681
(U) RDT&E 0603800E	20,925	0	0	0	0	0	0	0	0	118,006
(U) UNITED KINGDOM	55,000	34,000	26,000	0	0	0	0	0	0	200,000
(U) MULTI-LATERAL	17,800	7,500	5,100	1,700	0	0	0	0	0	32,100
(U) CANADA	4,300	3,000	2,700	600	0	0	0	0	0	10,600
(U) ITALY	0	10,000	0	0	0	0	0	0	0	10,000

(U) RELATED RDT&E:
Milestone II for E&MD of the Joint Strike Fighter (JSF) is planned in FY 2001.

	FY 1998 BUDGET	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM *
(U) RDT&E 0604800F	0	0	0	536,586	1,332,890	1,814,352	1,871,288	1,649,464	TBD**	TBD**
(U) RDT&E 0604800N	0	0	0	535,757	1,338,397	1,823,084	1,881,144	1,658,884	TBD**	TBD**

*Excludes anticipated foreign funding which is TBD.

** TBD pending completion of the December 1998 Selected Acquisition Report (SAR).

(U) RELATED PROCUREMENT FUNDING:

Advanced Procurement for the Joint Strike Fighter (JSF) is planned in FY 2004.

	FY 1998 BUDGET	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
(U) USAF 0207142F	0	0	0	0	0	0	18,000	599,983	TBD	TBD
(U) APN-1 0204800N	0	0	0	0	0	0	0	58,532	TBD	TBD

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET PROJECT JUSTIFICATION SHEET DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603800N PROJECT NUMBER: D2209
PROGRAM ELEMENT TITLE: JOINT STRIKE FIGHTER (JSF) PROGRAM PROJECT TITLE: JSF

(U) D. ACQUISITION STRATEGY:

Program activities center around three distinct objectives that provide a sound foundation for the start of Engineering and Manufacturing Development (E&MD) in 2001:

(1) facilitating the Services' development of fully validated, affordable operational requirements;
(2) lowering risk by investing in and demonstrating key leveraging technologies that lower the cost of development, production and ownership; and
(3) demonstrating operational concepts.

Early warfighter and technologist interaction is an essential aspect of the requirements definition process, and key to achieving JSF affordability goals. To an unprecedented degree the JSF Program is using cost-performance trades early, as an integral part of the weapon system development process. The Services are defining requirements through an iterative process, balancing weapon system capability against life cycle cost at every stage. Each iteration of requirements is provided to industry. They evolve their designs and provide cost data back to the warfighters. The warfighters evaluate trades and make decisions for the next iteration. This process produced the Services' first Joint Initial Requirements Document (JIRD I) in 1995 and the second and third iterations in 1997 and 1998, respectively. The Services continue to refine their requirements through this process, which will culminate in the Joint Operational Requirements Document (JORD) in FY 2000 to support the Milestone II decision.

A sizable technology maturation effort is underway to reduce risk and life cycle cost (LCC) through technology maturation and demonstration. The primary emphasis is on technologies which have been identified as high payoff contributors to affordability, supportability, survivability and lethality. Numerous demonstrations have been accomplished and others are in process to validate performance and life cycle cost impact to component, subsystem, and the total system.

A multi-year $2.2 billion JSF Concept Demonstration effort commenced in November 1996 with competitive contract awards to Boeing and Lockheed Martin for Concept Demonstration Programs. These competing contractors will build and fly concept demonstrator aircraft, conduct concept unique ground demonstrators, and continue refinement of their ultimate delivered weapon system concepts. Specifically, Boeing and Lockheed Martin will demonstrate commonality and modularity, STOVL hover and transition, and low speed handling qualities of their respective weapon system concepts. Pratt and Whitney is providing propulsion hardware and engineering support for both Boeing's and Lockheed Martin's on-going JSF Concept Demonstration efforts. The JSF Concept Demonstration approach has several benefits:

(1) maintains the competitive environment prior to E&MD and provides for two different STOVL approaches and two different aerodynamic configurations
(2) demonstrates the viability of a multi-service family of variants with high commonality and modularity between CTOL, CV, and STOVL variants
(3) provides affordable and low risk technology transition to the JSF E&MD phase.

The JSF Alternate Engine Program, with General Electric, continues development of an alternate engine for production.

Downselect to a single prime weapon system contractor for E&MD and Milestone II are planned in FY 2001. JSF production is planned to begin in FY 2005.

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET PROJECT JUSTIFICATION SHEET DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603800N PROJECT NUMBER: D2209
PROGRAM ELEMENT TITLE: JOINT STRIKE FIGHTER (JSF) PROGRAM PROJECT TITLE: JSF

(U) E. SCHEDULE PROFILE:
Dec 94 Commenced Concept Development Phase
Mar 96 Released RFP for Concept Demonstration Efforts
May 96 Designated a joint, DOD, Acquisition Category ID Program by USD(A&T)
Nov 96 Competitively Awarded Concept Demonstration Contracts to Boeing and Lockheed Martin
Dec 99 Complete Joint Operational Requirements Document (JORD)
Mar 01 Milestone II for JSF E&MD

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS DATE: February 1999

BUDGET ACTIVITY: 4	PROGRAM ELEMENT:	0603800N	USN	PROJECT NUMBER:	D2209
BUDGET ACTIVITY: 4	PROGRAM ELEMENT:	0603800F	USAF	PROJECT NUMBER:	2025
BUDGET ACTIVITY: 3	PROGRAM ELEMENT:	0603800E	DARPA	PROJECT NUMBER:	JA-01
BUDGET ACTIVITY: NA	PROGRAM ELEMENT:	N/A	UNITED KINGDOM	PROJECT NUMBER:	UK
BUDGET ACTIVITY: NA	PROGRAM ELEMENT:	N/A	MULTI-LATERAL	PROJECT NUMBER:	ML
BUDGET ACTIVITY: NA	PROGRAM ELEMENT:	N/A	CANADA	PROJECT NUMBER:	CAN
BUDGET ACTIVITY: NA	PROGRAM ELEMENT:	N/A	ITALY	PROJECT NUMBER:	ITALY
	PROGRAM ELEMENT TITLE:		JOINT STRIKE FIGHTER (JS	PROJECT TITLE:	JSF

B. (U) BUDGET ACQUISITION HISTORY AND PLANNING ($ in thousands) No budget in FY 1993 and Prior

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total FY 1998 & Prior	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	Cost To Complete	Total Cost	Target Value of Contract
PROJECT DEVELOPMENT										
Strike Warfare Concept Studies (Total Prior to FY 2000)										
	Various	Miscellaneous	11,467						11,467	
SUBTOTAL			11,467						11,467	
Technology Maturation Concept Exploration Phase (Total Prior to FY 2000)										
	Various	Fld. Activ.	3,432						3,432	
Strike Warfare Systems Design Development (Total Prior to FY 2000)										
	C/CPFF	Boeing Seattle WA	32,770						32,770	
	C/CPFF	McAir St. Louis MO	23,708						23,708	
	C/CPFF	Northrop Pico Rivera CA	21,358						21,358	
	C/CPFF	Lockheed Fort Worth TX	28,311						28,311	
	Various	Miscellaneous	1,121						1,121	
	Various	Fld. Activ.	8,322						8,322	
SUBTOTAL			115,590						115,590	
ASTOVL (Total Prior to FY 2000)										
	SS/CPFF	Lockheed	16,416						16,416	
	SS/CPFF	Boeing	11,200						11,200	
	Various	Miscellaneous	15,539						15,539	
SUBTOTAL			43,155						43,155	
Core Team Support (Total Prior to FY 2000)										
	Various	Fld. Activ.	2,522						2,522	

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS DATE: February 1999

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total FY 1998 & Prior	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Weapon System Concept Demonstrations (including flying demonstrators and supporting propulsion efforts)										
	C/CPFF	Boeing *	267,735	223,734	Oct 98	142,491	Oct 99	10,892	644,852	732,853
	C/CPFF	Lockheed *	321,800	231,950	Oct 98	139,100	Oct 99	9,000	701,850	795,631
	SS/CPAF	Pratt & Whitney * West Palm Beach FL	502,166	188,808	Nov 98	59,974	Nov 99	200	751,148	865,615
Award Fees										
	C/CPFF	Pratt & Whitney	35,052	25,792	Various	16,226	Various	0	77,070	
SUBTOTAL			1,126,753	670,284		357,791		20,092	2,174,920	
Alternate Engine Program										
	SS/CPFF	GE Cincinnati OH	7,000						7,000	
	SS/CPFF	GE	59,956	25,790	Nov 98	33,000	Oct 99		118,746	121,746
SUBTOTAL			66,956	25,790		33,000			125,746	
Technology Maturation										
Airframe										
	SS/CPFF	McAir	19,240						19,240	
	Various	Miscellaneous	1,985	500	Various	500	Various		2,985	
	Various	Fld. Activ.	4,236	728	Nov 98	1,000	Nov 99		5,964	
SUBTOTAL			25,461	1,228		1,500			28,189	
Flight Systems										
	C/CPFF	Lockheed	41,515	7,731	Nov 98	1,502	Nov 99		50,748	
	C/CPFF	McAir	46,901	13,300	Nov 98	4,620	Nov 99		64,821	
	TBD	TBD		8,000	Mar 99				8,000	
	Various	Miscellaneous	9,090	600	Nov 98	311	Nov 99		10,001	
	Various	Fld. Activ.	13,491	7,356	Nov 98	3,289	Nov 99		24,136	
SUBTOTAL			110,997	36,987		9,722			157,706	

*includes government managed equipment

Note: The Total Costs of the Boeing and Lockheed contracts reflect the budgeted basic Concept Development Program (CDP) efforts only. The Target Values of these contracts reflect funding requirements for CDP and Technology Maturation efforts for Prognostics and Health Management/Supportability and Training and Mission Systems. Pratt & Whitney Total Cost excludes award fees reflected below. The Pratt & Whitney Target Value includes award fees, and reflects CDP efforts and Technology Maturation efforts in Propulsion and Prognostics and Health Management.

Note: FY 1997 percentage of award fee paid was 91%; FY 1998 percentage of award fee paid was 84%.

Note: The Target Value includes Propulsion Technology Maturation efforts.

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS

DATE: February 1999

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total FY 1998 & Prior	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Manufacturing and Producibility										
	C/CPFF	Hughes	5,065						5,065	
	C/CPFF	Los Angeles CA Lockheed	7,500	2,890	Nov 98	170	Nov 99		10,560	
	C/CPFF	General Res. Corp. Huntsville AL	1,945						1,945	
	C/CPFF	Scaled Composites	2,000						2,000	
	C/CPFF	Lockheed	700						700	
	Various	Miscellaneous	1,343	270	Various				1,613	
	Various	Fld. Activ.	3,286	1,055	Nov 98	1,530	Nov 99		5,871	
SUBTOTAL			21,839	4,215		1,700			27,754	
Propulsion										
	C/CPFF	Pratt/Whitney	5,448						5,448	
	SS/CPFF	GE	5,681						5,681	
	SS/CPFF	Pratt/Whitney	30,000						30,000	
	SS/CPFF	GE	3,000						3,000	
	SS/CPFF	Pratt/Whitney	22,988	3,789	Jan 99				26,777	
	SS/CPFF	Pratt & Whitney	3,640						3,640	
	SS/TBD	Pratt & Whitney	7,000	1,200	Dec 98				8,200	
	NASA Contract		700						700	
	Various	Miscellaneous	12,895						12,895	
	Various	Fld. Activ.	24,484	18,048	Various	3,600	Various		46,132	
SUBTOTAL			115,836	23,037		3,600			142,473	
Mission Systems										
	C/CPFF	TI Plano TX	2,464						2,464	
	SS/CPFF	Lockheed	6,856						6,856	
	SS/CPFF	McAir	6,524						6,524	
	C/CPFF	Raytheon	27,274	22,582	Nov 98	3,512	Nov 99		53,368	
	C/CPFF	Northrop/Grumman	25,946	19,272	Nov 98	1,697	Nov 99		46,915	
	C/CPFF	Boeing	15,174	16,700	Nov 98	990	Nov 99		32,864	
	C/CPFF	Lockheed	14,983	16,700	Nov 98	1,205	Nov 99		32,888	
	C/CPFF	Boeing	1,100	2,500	Nov 98	2,747	Nov 99	4,377	10,724	
	C/CPFF	Lockheed	1,100	2,500	Nov 98	2,747	Nov 99	4,216	10,563	
	C/CPFF	Hughes	3,681						3,681	
	Classified	Classified	2,000	1,000	Nov 98				3,000	
	Various	Miscellaneous	20,097	3,114	Various	4,644	Various		27,855	
	Various	Fld. Activ.	22,283	5,956	Nov 98	6,498	Nov 99	255	34,992	
SUBTOTAL			149,482	90,324		24,040		8,848	272,694	

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS

DATE: February 1999

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total FY 1998 & Prior	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering Support										
	Various	Miscellaneous	11,993	5,667	Various	5,658	Various	657	23,975	
	Various	Fld. Activ.	71,648	32,632	Nov 98	28,860	Nov 99	3,699	136,839	
SUBTOTAL			83,641	38,299		34,518		4,356	160,814	
Prognostics and Health Management/Supportability and Training										
	C/CPFF	Boeing	4,450	3,706	Nov 98	2,868	Nov 99		11,024	
	C/CPFF	Lockheed	5,050	5,350	Nov 98	2,647	Nov 99		13,047	
	C/CPFF	Pratt & Whitney	10,100						10,100	
	C/CPFF	General Electric		1,500	Jan 99				1,500	
	C/CPFF	Classified								
	C/CPFF	Project 3	7,826	750	Jan 99				8,576	
	C/CPFF	Project 4	4,799	750	Jan 99				5,549	
	C/CPFF	Boeing	2,375	1,012	Nov 98				3,387	
	C/CPFF	Lockheed	2,375	1,625	Nov 98				4,000	
	C/CPFF	Boeing		2,465	Jan 99	4,265	Nov 99	1,000	7,730	
	C/CPFF	Lockheed		2,465	Jan 99	4,265	Nov 99	1,000	7,730	
	TBD	New Contract			Feb 99		Nov 99	7,000	7,000	
	Various	Miscellaneous	3,815	3,394	Various	2,500	Various	500	10,209	
		Fld. Activ.	8,202	4,990	Nov 98	5,893	Nov 99	2,444	21,529	
SUBTOTAL			48,992	28,007		22,438		11,944	111,381	
Modeling, Simulation, Analysis, Threat, COPT and Core Support										
	Various	Miscellaneous	38,061	9,281	Various	7,583	Various	2,515	57,440	
	Various	Fld. Activ.	19,008	3,001	Nov 98	2,017	Nov 99	685	24,711	
SUBTOTAL			57,069	12,282		9,600		3,200	82,151	
Mission Support										
	Grant	Institute for Defense Anal	2,500						2,500	
	Various	Fld. Activ.	19,289	7,332	Various	3,438	Various	1,880	31,939	
SUBTOTAL			21,789	7,332		3,438		1,880	34,439	
Subtotal Project Development			2,004,981	937,768		501,347		50,320	3,494,416	
SUPPORT (CS)										
	SS/CPFF	ANSER Arlington VA	19,541	4,720	Jan 99	4,720	Jan 00		28,981	
	Various	Miscellaneous	16,287	5,091	Various	4,345		300	26,023	
Subtotal Support			35,828	9,811		9,065		300	55,004	
Subtotal Anticipated General Reductions				7,980					7,980	

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS

DATE: February 1999

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total FY 1998 & Prior	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	Cost To Complete	Total Cost	Target Value of Contract
TEST AND EVALUATION: (included above)										
MANAGEMENT: N/A										
SBIR Assessment: (USN ONLY)				11,003					11,003	
Identified as Source for SBIR (USAF ONLY)				11,219					11,219	
Total Cost			2,040,809	977,798		510,412		50,620	3,579,639	
Funding Resources										
0603800N			899,743	468,509		241,238		25,762	1,635,252	
0603800F			860,960	454,789		235,374		22,558	1,573,681	
0603800E			118,006						118,006	
United Kingdom			140,000	34,000		26,000			200,000	
Multi-Lateral			17,800	7,500		5,100		1,700	32,100	
Canada			4,300	3,000		2,700		600	10,600	
Italy			0	10,000		0		0	10,000	
Total			2,040,809	977,798		510,412		50,620	3,579,639	

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration/Validation

PE NUMBER AND TITLE: 0603851M Non-Lethal Warfare DEM/VAL

PROJECT: C2319

COST (*In Thousands*)	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
C2319 Non Lethal Weapons Program	16073	34512	23277	23782	24237	24690	26584	27123	Continuing	Continuing
Quantity of RDT&E Articles										

A. (U) Mission Description and Budget Item Justification:

This project covers non-lethal weapon (NLW) systems which are those systems that by their design, do not inflict fatal or permanent injuries. Instead, these systems are designed to stun, incapacitate, or hinder movement of individuals, crowds, or equipment. The availability of NLWs allows commanders less than lethal options, particularly in urban warfare and military operations other than war, i.e., peacekeeping, humanitarian assistance and disaster relief, as well as special operations.

(U) **Justification for Budget Activity**: This program is funded under Demonstration/Validation because it develops and integrates hardware for non-lethal weapons capabilities.

(U) FY 1998 Accomplishments:

- (U) $ 961 Execution oversight and administration of the Joint NLW Programs and technologies database expansion.
- (U) $ 970 Evaluated Marine Corps and Army NL technologies including Kinetics, Foams, Unmanned air and ground vehicles, Parafoils, etc.
- (U) $ 1066 Modeling and Simulation of NLW in the Joint Conflict and Tactical Simulation (JCATS) model.
- (U) $ 728 Technology analysis of the NL Electro-Magnetic Pulser, Malodorous and Spider Fiber Technical Base Programs.
- (U) $ 584 Continued program definition/risk reduction on a NL round of munitions for the M203 40mm Grenade Launcher for crowd control and vehicle protection in the 10-30 meter range.
- (U) $ 1460 Acoustics – Focused on determining the bio-effects for target vulnerability and operator safety in the infrasound and audible acoustic regimes and established an initial database.
- (U) $ 1092 Modular Crowd Control Munitions – Program definition/risk reduction of a ground or vehicle mounted non-lethal "claymore" mine. This mine contains 600 rubber balls for blunt impact trauma for crowd control or site security.
- (U) $ 1016 Ground Vehicle Stopper - Evaluated several proposed electrical vehicle stoppers that will deliver electromagnetic radiation at high power levels to disrupt ground vehicle engine electronics.
- (U) $ 1016 Vessel Stopper System - Continued evaluation of NL means of stopping maritime vessels.

•	(U) $	965	Portable Vehicle Immobilizer System - Continued program definition and risk reduction of a ground emplaced system to stop a vehicle (up to 5100 pounds) traveling at speeds between 40-60 mph within 200 feet without harming the occupants.
•	(U) $	1885	Active Denial Technology – Continued development of a HMMWV mounted directed energy system.
•	(U) $	618	66mm NL Munitions - Continued development of 66mm vehicle launched munitions (stingball and flash-bang) for crowd control and site security missions.
•	(U) $	582	UAV NL Payloads - Continued program definition and risk reduction of multiple NL munitions ejected from an ALE-47 Chaff/Flare Dispenser which is loaded into Unmanned Aerial Vehicles (UAVs).
•	(U) $	918	Bounding NL Munitions - Continued program definition and risk reduction of several non-lethal bounding munitions that function similar to a tactical bounding anti-personnel mine, but with a NL payload. Used for area denial/perimeter defense system.
•	(U) $	1225	Canister Launched Area Denial System - Continued program definition and risk reduction of fielding NL munitions launched from an aircraft/vehicle-mounted mine dispenser.
•	(U) $	290	Foams - Evaluated rigid and slippery foams, which may be dispensed from a hand-held or shoulder-slung ruggedized dispenser for area denial, sealing building entrances and counter-material applications.
•	(U) $	441	Vortex Ring Run - Continued development of combustion driven ring vortices that can be entrained with NL chemical or malodorant payloads that can be focused on specific individuals or crowds.
•	(U) $	256	Under-barrel Tactical Payload Delivery System - Continued development and evaluation of an under-barrel NL weapons system capable of inflicting blunt trauma (stingball) for crowd dispersal and point target.
	(U)Total $	16,073	

(U) FY 1999 Planned Program:

•	(U) $	1813	Execution oversight and administration of the Joint NLW Program and technologies database expansion.
•	(U) $	1606	Evaluation of NLWs by Service warfighting laboratories for direct user feedback on various NL technologies and munitions.
•	(U) $	580	Continue modeling and simulation of NLW in the Joint Conflict and Tactical Simulation (JCATS) model.
•	(U) $	2737	Continue pursuit of new technology through open competion of industry, academia and government lab sources for NL capabilities.
•	(U) $	613	NL Crowd Dispersal Cartridge - Continue development and testing on a NL round of munitions for the M203 40mm Grenade Launcher.
•	(U) $	3390	Acoustics - Continue development and evaluation of bio-effects on target vulnerability and operator safety in the infrasound and audible acoustic regimes and continue work on the database.
•	(U) $	1376	Ground Vehicle Stopper - Continue evaluation of several proposed electrical vehicle stopper technologies that have potential to stop/slow ground vehicles.
•	(U) $	1376	Vessel Stopper System - Continue evaluation of NL means of stopping maritime vessels.

•	(U) $	3275	Studies and Analysis – Medical and NL casuality data collection; strategic planning; human effects assessments; and technical studies/analysis of emerging technologies for possible NL application.
•	(U) $	1305	Area Denial – Explore and develop technical NL solutions to anti-personnel landmines.
•	(U) $	1950	Portable Vehicle Immobilizer System - Continue development and testing of a pre-emplaced system to stop a vehicle (up to 7500 pounds) traveling at speeds up to 45 mph.
•	(U) $	6725	Active Denial Technology – Continue product definition and risk reduction of a HMMWV mounted directed energy system.
•	(U) $	2477	66mm NL Munitions - Continue development and testing of 66mm vehicle launched munitions.
•	(U) $	56	UAV NL Payloads - Continue integration of non-lethal payloads into Unmanned Aerial Vehicles (UAVs).
•	(U) $	1712	Bounding NL Munitions – Continue development of non-lethal bounding munitions to serve as an area denial/perimeter defense system.
•	(U) $	1143	Canister Launched Area Denial System - Further development of NL munitions launched from an aircraft/ vehicle-mounted mine dispenser.
•	(U) $	816	Foams - Continue evaluation and testing of foams and packaging delivery platforms.
•	(U) $	935	Modular Crowd Control Munitions (MCCM) – Continue evaluation and testing of a ground or vehicle mounted NL "claymore" mine.
•	(U) $	267	Joint Intergration Project (JIT) – Select and test commercial products that will meet the Joint Services' requirement for specific NL capability set items.
•	(U) $	360	Small Business Inovation Research Assessment portion of program reserved.
	Total $	34512	

(U) FY 2000 Planned Program:

•	(U) $	792	Execution oversight and administration of the Joint NLW Program and technologies database expansion.
•	(U) $	1480	Evaluation of NLWs by Service warfighting laboratories for direct user feedback on various NL technologies and munitions.
•	(U) $	700	Continue modeling and simulation of NLW in the Joint Conflict and Tactical Simulation (JCATS) model and performance effects data collection.
•	(U) $	1800	Continue pursuit of new technology through open competion of industry, academia and government lab sources for NL capabilities.
•	(U) $	659	NL Crowd Dispersal Cartridge – Test and demonstrate of the NL round of munitions for the M203 40mm Grenade Launcher.
•	(U) $	108	Acoustics – Continue evaluation on target vulnerability and operator safety in the infrasound and audible acoustic regimes.
•	(U) $	1200	Ground Vehicle Stopper - Continue evaluation of proposed electrical vehicle stopper options.
•	(U) $	1200	Vessel Stopper System - Continue development and evaluation of NL means of stopping maritime vessels.
•	(U) $	5200	Active Dentinal Technology - Continue development and evaluation of a HMMWV mounted directed energy system.
•	(U) $	1911	66mm NL Munitions – Testing of the 66mm vehicle launched munitions for crowd control and site security missions.
•	(U) $	108	UAV NL Payloads - Continue development of the integration of non-lethal payloads into Unmanned Aerial Vehicles (UAVs).

•	(U) $	540	Bounding NL Munitions - Continue development of NL bounding munitions.
•	(U) $	1674	Canister Launched Area Denial System –Continue development of NL munitions launched from an aircraft/vehicle-mounted mine dispenser.
•	(U) $	1017	Foams - Continue development of two foam systems; specifically integration of foams into delivery platform.
•	(U) $	1000	Studies and Analysis – Medical and NL casualty data collection; strategic planning; human effects assessements; and technical studies/analysis of emerging technologies for possible NL application.
•	(U) $	1000	Area Denial – Continue to explore and develop technical NL solutions to anti-personnel landmines.
•	(U) $	325	JIP – Continue to select and test commercial products that will meet the Joint Services' requirement for specific NL capability sets items.
•	(U) $	800	Advanced Kinetic NL Weapons/Munitions – Development and evaluate of NL weapons/munitions that will provide a capability to precisely deliver NL payloads with an air burst capability.
•	(U) $	664	Develop and evaluate new RDT&E NLW technology initiatives.
•	(U) $	693	Modular Crowd Control Munitions (MCCM) – Continue evaluation and testing of a vehicle mounted NL "claymore" mine.
•	(U) $	406	Running Gear Entaglement System (RGES) – Development of a non-lethal entanglement capability to stop small, fact moving boats.
	Total $	23,277	

B. (U) Project Change Summary

	FY 1998	FY 1999	FY 2000
(U) Previous President's Budget	16290	22,592	23,636
(U) Adjustments to Previous President's Budget (Taxes)	-217	+11920	-359
(U) Current Budget Submit	16073	34512	23,277

(U) Change Summary Explanation:

(U) Funding: The FY98 decrease of ($217) is the result of a decrease of ($214) by Pre-review and ($3) MARCORSYSCOM Deputy For Management (DFM) adjustment. The FY99 increase is due to a Congressional plus-up $12M and a decrease of ($80) Revised Economical Assumption. The FY00 decrease of ($359).

(U) Schedule: N/A

(U) Technical: N/A

C. (U) Other Program Funding Summary

(APPN, BLI,NOMEN)	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Complete	Total Cost
PAN,MC, BLI 166300, Items < $2M	1906	0	0	0	0	0	0	0	3806
PAN,MC, BLI 162800, Non-Lethals	0	1956	984	2000	2700	2079	4136	Cont	Cont.
PAN, MC, BLI 221200, Non-Lethals Warfare (OOTW) PMC	0	0	0	1498	1400	1200	1192	Cont.	Cont.

D. (U) Schedule Profile N/A

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1999

BUDGET ACTIVITY: 4 - Demonstration/Validation

PE NUMBER AND TITLE: 0603851M Non-Lethal Warfare DEM/VAL

PROJECT: C2319

A. (U) Project Cost Breakdown

	FY 1998	FY 1999	FY 2000
Product Development	15112	27981	19943
Support and Management	961	6531	3334
Total	16073	34512	23277

B. Budget Acquisition History and Planning Information

Performing Organizations

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Product Development Organizations										
USAIC, Ft. Benning, GA	MIPR	Oct 97			1000	500	846	740	Cont	Cont
MCWL, Quantico, VA	WR	Apr 98			0	500	760	740	Cont	Cont
ARDEC, Picatinny, NJ	MIPR	Oct 97			6507	9100	14901	9455	Cont	Cont
NSWC, Various	WR	Oct 97			2423	1612	1432	1308	Cont	Cont
Brooks AFB, TX	MIPR	Oct 97			1705	1900	6725	5200	Cont	Cont
JWFC, Ft. Monroe, VA	MIPR	Mar 98			0	300	250	300	Cont	Cont
Various (M&S)	WR	Oct 97			640	550	330	400	Cont	Cont
Various (TIP)	MIPR	Oct 97			0	650	2737	1800	Cont	Cont
Support and Management Organizations										

MCSC, Quantico, VA	WR	Oct 97	100	300	816	1017	Cont	Cont
NSWC, Dahlgren, VA	WR	Oct 97	606	150	153	200	Cont	Cont
CTQMCSC, Quantico, VA	RCP	Dec 97	338	264	3200	792	Cont	Cont
Various		Oct 97	200	250	2362	1325	Cont	Cont

Test and Evaluation Organizations

Government Furnished Property N/A

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									

	Total Prior to FY 1998	FY 1998	FY 1999	FY 2000	Budget to Complete	Total Program
Subtotal Product Development	12275	15112	27981	19943	Cont	Cont
Subtotal Support and Management	1244	964	6531	3334	Cont	Cont
Subtotal Test and Evaluation						
Total Project	13519	16076	34512	23277	Cont	Cont

Exhibit R-2 , RDT&E Budget Item Justification	DATE: February 1999
RDT&E, N / BA 04	R-1 Item Nomenclature: ASCIET Program Element: 0603857N

COST ($000)	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	Cost to Complete	Total Cost
Total PE	8,000	12,194	13,027	13,248	13,471	13,690	13,679	Cont.	Cont.
ASCIET	8,000	12,194	13,027	13,248	13,471	13,690	13,679	Cont.	Cont.

(U) **A. Mission Description and Budget Item Justification**

(U) **BRIEF DESCRIPTION OF ELEMENT:**

(U) The All Service Combat Identification Evaluation Team (ASCIET) transferred from General Officer Steering Committee-Combat Identification (GOSC-CI) oversight to the Joint Staff during FY 1998. ASCIET was formed from the OSD-Sponsored Joint Air Defense Operations/Joint Engagement Zone (JADO/JEZ) Joint Test and Evaluation Program conducted during FY 1990 through FY 1994. JADO/JEZ tested the ability of Service forces to execute an effective air defense (air-to-air and ground-to air) network in a tactical environment. Because of the relatively high fratricides (ground-to-ground and air-to-ground) experienced in DESERT STORM and other conflicts, in December 1993, the Joint Requirements Oversight Council (JROC) directed that the JADO/JEZ Program convert to the ASCIET Program on 1 October 1994. ASCIET ran evaluations in 95, 96 and 97 in the Gulfport/Camp Shelby MS area. However because the Army was dissatisfied with the small maneuver area at Camp Shelby, ASCIET was directed by GOSC-CI to conduct Joint Service site surveys to find an operational area which would better support all four Services' mission needs, and simultaneously support evaluation of all four combat ID mission areas. In addition the area of operations had to support cost effective, full instrumentation for collection of time, space, position information and shot pairing. Based on the Joint surveys, in March of 1998 the JROC selected Ft Stewart GA/East Coast as the ASCIET 99 evaluation venue and directed that ASCIET conduct a four mission area evaluation in the Ft Stewart area. The ASCIET Mission is to investigate, evaluate and assess combat identification (CID) concepts and selected critical warfighting areas on the joint battlefield and provide recommendations that address organization, systems, technology, tactics, techniques and procedures (TTP) and doctrine. As part of ACOM, ASCIET will become the primary demonstration/experimentation venue that utilizes and evaluates operational forces and robust tactical Command, Control, Communications, Computers and Intelligence (C4I) networks. Defense Reform Initiative Directive (DRID) #29 directed a study to determine which "joint agencies" should be transferred to a Unified Commander-in-Chief. The study determined that ASCIET should be transferred to United States Atlantic Command (USACOM). As such, Program Budget Decision (PBD) 744 assigned USACOM as Executive Agent for ASCIET effective 1 October 1999. Subsequently, CINC USACOM has directed ASCIET to continue its surface-to-surface, air-to-surface emphasis with a fix-test-fix approach to air defense in the Ft Stewart area for FY2000. Some future evaluations may take place at the National Training Center.

Exhibit R-2 , RDT&E Budget Item Justification Sheet	DATE: February 1999
RDT&E, N / BA 04	R-1 Item Nomenclature: ASCIET Program Element: 0603857N

(U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY1998 Accomplishments:

(U) During FY 1998 ASCIET did not have an evaluatioon due to the venue change and to move the evaluation out of the 4th Quarter of the fiscal year. FY98 funding was used for planning, and instrutmentation in preparation for ASCIET 99, analysis of 97 data and production and dissemination of the final report for ASCIET 97, contractor support and basic operating costs. ($8.0 Million) Past accomplishments may be found in final reports for ASCIETs 95, 96 and 97, they include data link deficiencies, CID deficiencies in all mission areas, command and control deficiencies and recommendations for fixing all of the above.

(U) FY1999 Plans:

(U) USCINCACOM Implementation Plan for All Service Combat Identification Team (ASCIET) (I-Plan) proposed (not approved by the Chairman) - dated 31 March 1999 is CINCUSACOM's concept and plan for executing the Charter for ASCIET. It establishes the transfer time table and methodology. Describes how USACOM will task organize to accomplish the mission. Currently ASCIET will conduct ASCIET 99 evaluation in the Ft Stewart/East Coast area in the February – March 99 time frame. This evaluation is an increase in scope of the surface-to-surface (from company to battalion size elements) and also an expanded emphasis on surface-to-surface and air-to-surface. In order to meet these requirements, ASCIET changed its venue to a larger maneuver area (Ft Stewart, GA.) for ASCIET 99. ($12.914 Million)

(U) FY2000 Plans:

(U) Venue selection for FY00 is currently planned for the Ft Stewart GA area. Fiscal considerations dictate that the 00 evaluation be again conducted at the Ft Stewart and surrounding area; however, this is an on going staff effort and will require service component coordination.

Exhibit R-2 , RDT&E Budget Item Justification Sheet	DATE: February 1999
RDT&E, N / BA 04	R-1 Item Nomenclature: ASCIET Program Element: 0603857N

(U) **ACQUISITION STRATEGY:** Not Applicable

(U) B. Program Change Summary	FY1998	FY1999	FY2000	To Complete	Total Cost
Previous President's Budget				Continuing	Continuing
Appropriated Value				Continuing	Continuing
Adjustments to Appropriated Value					
a. Congressionally Directed undistributed reduction					
b. Rescission/Below-threshold Reprogramming, Inflation Adjustment					
c. Other				Continuing	Continuing
Current President's Budget				Continuing	Continuing

Change Summary Explanation:

(U) **Funding:** Not Applicable

(U) **Schedule:** Not Applicable

(U) **Technical:** Not Applicable

(U) **C. Other Program Funding Summary Cost** Not Applicable

(U) **D. Schedule Profile** Not Applicable

EXHIBIT R-2, FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603860N
PROGRAM ELEMENT TITLE: Joint Precision Approach and Landing System

(U) COST: (Dollars in Thousands)

Project Number & Title	FY 1998 Budget	FY 1999 Budget	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	To Complete	Total Program
W2329 Joint Precision Approach & Landing System (JPALS)										
TOTAL	**2,825**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**CONT.**	**CONT.**

Quantity of RDT&E Articles

(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program is funded under PROGRAM DEFINITION & RISK REDUCTION (DemVal) because it encompasses risk reduction of new end-items prior to the next milestone decision. This program element provides for the engineering definition, integration, adaptation and risk reduction testing of new and/or modernized precision air traffic control and landing aids. The Joint Precision Approach and Landing System (JPALS) hardware and software are required to provide improved flight safety and more reliable all-weather landing capabilities ashore and afloat. Funded programs are required to upgrade or replace aging landing equipment on aircraft, aircraft carriers, amphibious ships, Naval Air Stations, and Navy/Marine Corps tactical/expeditionary airfields and remote landing sites. Development of the JPALS hardware is required for Navy unique ship, shore and avoinics applications.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. FY 1998 ACCOMPLISHMENTS:

   - (U) ($2,380) Provided engineering support, system development, and test and evaluation for JPALS.
   - (U) ($445) Provided JPALS aircraft integration/A-kit development.

2. FY 1999 PLAN: Not applicable.

3. FY 2000 PLAN: Not applicable.

DATE: February 1999

BUDGET ACTIVITY: 4 | PROGRAM ELEMENT: 0603860N | PROGRAM ELEMENT TITLE: JPALS | PROJECT NUMBER: W2329 | PROJECT TITLE: JPALS

(U) B. PROGRAM CHANGE SUMMARY

	FY 1998	FY 1999	FY 2000
(U) FY 1999 President's Budget:	2,894	0	0
(U) Appropriated Value:	2,993	0	
(U) Adjustments from President's Budget:	-69	0	0
(U) FY 2000 President's Budget Submit:	2,825	0	0

CHANGE SUMMARY EXPLANATION:

(U) Funding: FY 1998 decrease of $69 thousand consists of a $33 thousand reprogramming for other higher priority Navy priorities, a $33 thousand economic adjustment, and a $3 thousand adjustment for the Small Business Innovation Research (SBIR) assessment.

(U) Schedule: Not Applicable.

(U) Technical: Not applicable

(U) C. OTHER PROGRAM FUNDING SUMMARY

Related RDT&E

(U) P.E. 0603860F (Joint Precision Approach and Landing System)
0305114A (Joint Precision Approach and Landing System)
0305114F (Joint Precision Approach and Landing System)
0305114N (Joint Precision Approach and Landing System)
0603512N (Carrier Systems Development)
0604504N (Air Control)
0604512N (Shipboard Aviation Systems)

EXHIBIT R-2a, FY 2000 RDT&E,N BUDGET PROJECT JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 4 **PROGRAM ELEMENT: 0603860N** **PROJECT NUMBER: W2329**
PROGRAM ELEMENT TITLE: JPALS **PROJECT TITLE: JPALS**

(U) D. ACQUISITION STRATEGY: Not applicable.

(U) E. SCHEDULE PROFILE

	FY 1998	FY 1999	FY 2000	To Complete
(U) Program Milestones	SAMP 4Q 98I Initial ORD 4Q98			
(U) Engineering Milestones	SEMP 4Q98			
(U) T&E Milestones	Initial TEMP 4Q98			
(U) Contract Milestones	SRGPS Awd. 4Q98			

Glossary of Abbreviations:
SAMP = Single Acquisition Management Plan
ORD = Operational Requirements Document
SEMP = Systems Engineering Management Plan
TEMP = Test and Evaluation Management Plan
SRGPS = Shipboard Relative Global Positioning System

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N – BA4	Program Element Name & No. PE 0604327N Hardened Target Munitions

C ost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Total PE Cost	4.6	3.0	4.9	0	0	0	0	0	CONT.	CONT.
J2331 Hard Target Munitions	4.6	0	4.9	0	0	0	0	0		
J2629 Hard Target Munitions	0	3.0	0	0	0	0	0	0	CONT	CONT
.									CONT	CONT
RDT&E Articles Qty										

A. (U) Mission Description and Budget Item Justification:
The Advanced Penetrator Definition Program will develop an advanced conventional earth penetrating warhead for use on conventional ballistic missiles.
(U) JUSTIFICATION FOR BUDGET ACTIVITY: The Advanced Penetrator Definition Program is appropriately justified in BA-4, Demonstration and Validation, as this effort evaluates advanced conventional earth penetrating warhead materials in as realistic an operating environment as possible to assess the performance of advanced technology.

Exhibit R-2, RDT&E Budget Item Justification	Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N – BA4	Program Element Name & No. PE 0604327N Hardened Target Munitions

B. (U) Program Change Summary:

	FY 1998	FY1999	FY 2000
FY 1999 President's Budget	4.8	9.8	0
Appropriated Value	4.8	9.8	0
Adjustments to FY 1998 Appropriated/FY 1999 President's Budget	-.2	- 6.8	+4.9
FY 2000/2001 President's Budget Submit	4.6	3.0	4.9

Explanation: In FY 1998, the reduction is attributed to SBIR and economic assumptions. FY 1999 was reduced by Congress. The increase in FY 2000 was to finance the completion of Phase one of the Hard and Deeply Buried Target Defense System (HDBTDS).

C. (U) Other Program Funding Summary: See enclosed R-2a for each individual project data.

D. (U) Acquisition Strategy: See enclosed R-2a for each individual project data.

E. (U) Schedule Profile: Not Applicable.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N – BA4	Program Element Name & No. PE 0604327N, Hardened Target Munitions	Project Name and Number. Hard Target Munitions J2331

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project Cost J2331 Hard Target Munitions	4.6	0	4.9	0	0	0	0	0	CONT.	CONT.
RDT&E Articles Qty										

A. (U) Mission Description and Budget Item Justification:

The Advanced Penetrator Definition Program will develop an advanced conventional eath penetrating warhead for use on conventional ballistic missiles.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N – BA4	Program Element Name & No. PE 0604327N, Hardened Target Munitions	Project Name and Number. Hard Target Munitions J2331

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:
   - (U) ($4.6) Initiated Advanced Penetrator Definition program. This is fully obligated. FY 1998 efforts included:
     (U) Initiate evaluation of reactive materials for penetrator warhead loading.
     (U) Defined evaluation of reactive materials for penetrator warhead loading.
     (U) Defined penetrator design options for increased penetration.
     (U) Completed initial definition of missile functional interfaces in support of providing missile guidance from the warhead
2. (U) FY 1999 PLAN: Funding is provided in Project J2629

3. (U) FY 2000 PLAN:
   - (U) ($4.9) Continue Advanced Penetrator Definition program. Design efforts will focus on risk reduction technology efforts. Full obligation is projected by the 4th quarter of the first year. FY 2000 efforts include:
     (U) Define penetrator fuze requirements.
     (U)) Initiate testing to obtain environment data on penetrators which impact concrete at velocities up to 4000 feet per second.
     (U) Initiate preliminary design of the missile/reentry body separation system.
     (U) Initiate trade studies focusing on internal packaging and system guidance architectures.
     (U) Define GPS receiver design and data processing options that optimize system accuracy and minimize degradation due to jamming.

4. (U) FY 2001 PLAN: To be addressed by the Navy in the FY 2001 Program Review.

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N – BA4	Program Element Name & No. PE 0604327N, Hardened Target Munitions	Project Name and Number. Hard Target Munitions J2331

B. (U) Other Program Funding Summary: (Dollars in Thousands)

FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	To Complete	Total Programt
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(U) Related RDT&E: N/A

C. (U) Acquisition Strategy:
Contracts will continue to be awarded to those sources who were engaged in the TRIDENT II (D5) development program and are currently engaged in the production and/or operational support of the deployed D5/C4 Strategic Weapons Systems on the basis of Other Than Full and Open Competition pursuant to the authority of 10 U.S.C. 2304 ©(1) and (3) implemented by FAR 6.302.-1, 3 4.

D. (U) Schedule Profile: Not Applicable.

Exhibit R-3, Cost Analysis		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N – BA4	Program Element Name & No. PE 0604327N, Hardened Target Munitions	Project Name and Number. Hard Target Munitions J2331

Cost Categories Product Development	Contract Method & Type	Performing Activity & Location	Total Pys Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Ancillary Hardware Development	SS/CPFF	LMDS/CAL.	1.2	0.0	10/98	2.2	10/99		N/A	Cont.	Cont.	Cont.
Ancillary Hardware Development	SS/CPFF	SPA/MD	0.2	0.0	10/98	.1	10/99		N/A	Cont.	Cont.	Cont.
Ancillary Hardware Development	WR	NAWC/NJ	0.6	0.0	10/98	1.0	10/99		N/A	Cont.	Cont.	Cont.
Ancillary Hardware Development	WR	SNL/NM	1.5	0.0	10/98	.7	10/99		N/A	Cont.	Cont.	Cont.
Ancillary Hardware Development	WR	ARMY/ALA	1.1	0.0	10/98	.4	10/99		N/A	Cont.	Cont.	Cont.
Ancillary Hardware Development	PD	Air Force	0.0	0.0		.2	10/99		N/A			
Ancillary Hardware Development	SS/CPFF	CSDL/MA	0.0	0.0		.3	10/99		N/A			
Subtotal Product Development			4.6	0.0		4.9						
Remarks:												
Total Cost			4.6	0.0		4.9				Cont.	Cont.	Cont.
Remarks:												

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N – BA4	Program Element Name & No. PE 0604327N Hardened Target Munitions	Project Name and Number. Hard Target Munitions – J2629

Cost ($ in Millions)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost to Complete	Total Cost
Project J2629 Hard Target Munitions	0*	3.0	0*	0	0	0	0	0	CONT.	CONT.
RDT&E Articles Qty										

A. (U) Mission Description and Budget Item Justification:

The Advanced Penetrator Definition Program will develop an advanced conventional eath penetrating warhead for use on conventional ballistic missiles.

* Funded in Project J2331

Exhibit R-2a, RDT&E Project Justification			Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N – BA4	Program Element Name & No. PE 0604327N Hardened Target Munitions	Project Name and Number. Hard Target Munitions – J2629	

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 Accomplishments: funded in Project J2331

2. (U) FY 1999 Plan (3.0) This will support a Milestone I acquisition decision. Conduct a joint Navy/Air Force Analysis of Alternatives (AOA) as well as initial planning efforts associated with establishing a joint hard and deeply buried target defeat program. Full obligation is projected by the 4th quarter of the 1st year. FY 1999 efforts include:
   - (U) Program Office AOA support for the Generic Super Sonic Cruise Missile
   - (U) Completion of AOA Studies/Analysis.
   - (U) Produce documentation for Defense Acquisition Board (DAB), Support AOA efforts and DAB activities.
   - (U) Support AOA Alternative Defeat Analysis.

3. (U) FY 2000 Plan: Funded in Project J2331

4. (U) FY 2001 Plan: N/A

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N – BA4	Program Element Name & No. PE 0604327N Hardened Target Munitions	Project Name and Number. Hard Target Munitions – J2629

B. (U) Other Program Funding Summary: (Dollars in Thousands)

FY 1998 ESTIMATE	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	To COMPLETE	TOTAL PROGRAM
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(U) Related RDT&E: N/A

C. (U) Acquisition Strategy:
Contracts will continue to be awarded to those sources who were engaged in the TRIDENT II (D5) development program and are currently engaged in the production and/or operational support of the deployed D5/C4 Strategic Weapons Systems on the basis of Other Than Full and Open Competition pursuant to the authority of 10 U.S.C. 2304 (c) (1) and (3) implemented by FAR 6.302.-1, 3 4.

D (U) Schedule Profile: Not Applicable

Exhibit R-2a, RDT&E Project Justification		Date: February 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N – BA4	Program Element Name & No. PE 0604327N Hardened Target Munitions	Project Name and Number. Hard Target Munitions – J2629

Cost Categories Product Development	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Ancillary Hardware Development	SS/CPFF	LMDS/CAL.	00.	.2	12/98	0.0	N/A		N/A	Cont.	Cont.	Cont.
Ancillary Hardware Development	SS/CPFF	SPA/MD	00.	.2	12/98	0.0	N/A		N/A	Cont.	Cont.	Cont.
Ancillary Hardware Development	WR	NAWC/NJ	00.	.5	12/98	0.0	N/A		N/A	Cont.	Cont.	Cont.
Ancillary Hardware Development	WR	SNL/NM	00.	.1	12/98	.0.0	N/A		N/A	Cont.	Cont.	Cont.
Ancillary Hardware Development	WR	ARMY/ALA	00.	.4	12/98	.0.0	N/A		N/A	Cont.	Cont.	Cont.
Ancillary Hardware Development	PD	Air Force	00.	1.5	12/98	0.0	N/A		N/A			
Ancillary Hardware Development	SS/CPFF	CSDL/MA	0.0	.1	12/98	0.0	N/A		N/A			
Subtotal Product Development			0.0	3.0		0.0						
Remarks:												
Total Cost			0.0	3.0		0.0				Cont.	Cont.	Cont.
Remarks:												

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support

(U) COST: (Dollars in Thousands)

PROJECT NUMBER TITLE	FY 1998 ACTUAL	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
X0798 OTH Targeting	1,378	1,601	1,600	1,615	1,851	1,948	2,002	2,058	Cont.	Cont.
X2144 SEW Engineering	7,014	7,386	8,593	8,701	8,758	7,871	9,168	9,551	Cont.	Cont.
X2357 Maritime Battle Center	2,831	8,822	23,915	24,082	24,191	24,212	24,198	24,184	Cont.	Cont.
X2461 Dec Centered Design	1,637	0	1,062	1,514	1,448	931	879	881	Cont.	Cont.
X2630 Adv Comm Info Tech	0	1,995	0	0	0	0	0	0	Cont.	Cont.
TOTAL	12,860	19,804	35,170	35,912	36,248	34,962	36,247	36,674	Cont.	Cont.

(U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This Program Element (PE) contains five projects: Over-the-Horizon (OTH) Targeting, Space and Electronic Warfare (SEW) Engineering, Maritime Battle Center and Decision Centered Design (DCD), Advanced Communications Information Technology (ACI). The projects are systems engineering non-acquisition programs with the objectives of developing, testing and validating Naval Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance, (C4ISR) architectures to support naval missions in Joint and Coalition Theater. The mission of this program element is carried out by multiple tasks that are used to ensure Naval C4ISR Command and Control Warfare (C2W) components of SEW are effectively integrated into the C4ISR architectures. The Program additionally ensures that (1) the composite operational capabilities of SEW systems (not the individual component systems) conform to the Naval C4ISR architecture as related to the objectives of National Defense Strategy and evolving joint visions and direction, such as Joint Vision 2010 (JV 2010), "Copernicus...C4ISR for the 21st Century," "Forward...From the Sea," C4I For the Warrior, and the Defense Science Board Summer Study Task Force on Information Architecture for the Battlefield and are guided by CINC requirements; and (2) that SEW systems and systems integration effort involves leading-edge technology transfer of information processing technologies primarily through integration of government and commercial off-the-shelf (GOTS/COTS) products to enhance the Navy's operational capability, interoperability, flexible reconfiguration, as well as reduce costs. The Maritime Battle Center is a distributed organization consisting of concept development, experimentation and analysis coordinated by the Naval War College, and the Navy Warfare Development Command, and C4ISR technical and acquisition support coordinated by the Space and Naval Warfare Systems Command (SPAWAR). The MBC will also act as the Navy representative to the Joint Battle Center and the Battle Labs of other services. The Decision Centered Design (DCD) program will develop, implement and support a Navy process to examine emerging cognitive and technical advancements, critical Decision Makers' requirements and integrate them into measured and

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0604707N
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support

costed enhancements for decision support systems, doctrine, training and manning requirements.

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under DEMONSTRATION & VALIDATION because it develops and integrates hardware for experimental tests related to specific ship or aircraft applications. It also develops a virtual demonstration and validation environment across Navy for C4ISR.

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X0798
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support PROJECT TITLE: OTH Targeting

(U) COST: (Dollars in Thousands)

NUMBER TITLE	FY 1998 ACTUAL	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2004 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
X0798 OTH Targeting	1,378	1,601	1,600	1,615	1,851	1,948	2,002	2,058	Cont.	Cont.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The Over-the-Horizon Targeting (OTH-T) program provides a virtual, global systems integration and test facility for Information Technology for the 21st Century (IT-21) C4ISR technology that supports the collection, transmission, correlation, and display of track data into a Common Operational Picture (COP) in support of warfighting requirements. This effort was originally undertaken to support targeting of over the horizon weapons such as the TOMAHAWK cruise missile. The common view of the battle space that was provided to the warfighter by OTH-T has been applied across the spectrum of warfare missions; however, the technology and doctrine on which it was based has changed radically in recent years. The result is that the first goal of the OTH-T program is to transition the OTH architectures and systems from older MIL STD technologies to COTS based technologies that support the network centric model of the Navy's plan to support JV 2010 implementing IT-21 technology. The second goal of the OTH-T program will be to support the integration of all C4I systems into warfighting capabilities which includes Year 2000 (Y2K) integration and testing. This support includes providing technical expertise afloat and ashore via a cadre of highly-trained Fleet Systems Engineers who ensure smooth integration of new capabilities to enhance OTH-T during major Fleet exercises and demonstrations which are used to validate and evaluate developed portions of configuration. The OTH-T program integration and testing in support of the warfighting capabilities will also include Y2K interoperability testing for both MIL-STD and IT-21 COTS equipment for submarines, surface, and land based components.

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X0798
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support PROJECT TITLE: OTH Targeting

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:

- (U) ($273) Performed interoperability test on Global Command and Control System - Maritime (GCCS-M) to verify compliance with appropriate specifications. Reported findings from test to program developer to allow discrepancies to be addressed prior to OPEVAL testing.

- (U) ($123) Supported development of COP Synchronization Tools Functional requirements. Addressed multicast dissemination of COP. Developed e-mail CONOPs for IT-21 hardware and software configurations on Lincoln Battle Group and tested at the Reconfigurable Land Based Test Site (RLBTS).

- (U) ($449) Performed IT-21 interoperability testing aboard the Lincoln and Kitty Hawk Battle Groups. Validated and verified testing parameters addressing Asychronous Transfer Mode (ATM) interoperability, e-mail configuration, and interfaces between JMCIS 98 and legacy C4I equipment. Provided system engineering support to Stennis, Lincoln, Saipan, Enterprise, Eisenhower, and Kitty Hawk to test for OTH-T interoperability problems during exercises. Participated as advisor on the Naval Virtual Internet (NVI) Integrated Product Team.

- (U) ($237) Performed interoperability tests, testing performance of COTS products over Automated Digital Network System (ADNS). Recommended changes to Microsoft products to operate in compliance with TCP specifications in order to optimize performance over ADNS and INMARSAT-B networks. Recreated problems found during CVBG workups in lab and recommended courses of action. Performed interoperability test of SSN IT-21 configuration of JMCIS 98 and legacy equipment.

- (U) ($296) Upgraded the Repeatable Performance Evaluation Analysis Tool (REPEAT) to provide Windows interface to data preparation and analysis functions. Demonstrated ability to transfer Mission Data Updates (MDU) using WWW pages based on REPEAT. Began developing mechanism to import Link-16 data into REPEAT.

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X0798
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support PROJECT TITLE: OTH Targeting

2. (U) FY 1999 PLAN:

- (U) ($155) Based on results of integration testing, develop capability functional description documents which will be used by the programs of record to define system functional requirements that support these capabilities. Develop system interface standards where required. Provided a valid master configuration database in support of the new IT-21 Battlegroup configurations.

- (U) ($316) Conduct systems integration, interoperability, and Y2K testing using the facilities of the Land Based Test Network (LBTN) and Systems Integration and Test (expanded RLBTS to validate IT-21 technologies prior to shipboard installation).

- (U) ($496) Validate and verify the interoperability of architectures for new capabilities and supporting systems to the fleet. Work with the fleet staffs and Naval Doctrine Command to develop policy and doctrine for operations of NVI in support of Network Centric Warfare ideology. Serve as technical expert in researching the fleet's technical questions and providing information.

- (U) ($419) Ensure joint interoperability of all systems on the NVI by enforcing compliance with the Joint Technical Architecture and Y2K. Verify relevance, recommend modifications to, and maintain OTH-T specifications for support of distribution of the COP to maritime forces. The program's systems engineers will make input into the SPAWAR advanced technology division to insure critical deficiencies are high priority during investigation of IT-21. Provide connectivity and conduct integration and interoperability testing to verify Y2K compliance and provide systems engineering expertise for both IT-21 and MIL-STD technologies.

- (U) ($215) Provide software enhancements to the REPEAT software including adapting the software operationally to transfer MDUs through available data links.

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X0798
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support PROJECT TITLE: OTH Targeting

3. (U) FY 2000 PLAN

- (U) ($391) Conduct and document interoperability certification testing at the OTH-T Land Based Test Site and Systems Integration and Test Facility. Use the Land Based Test Site to test evolutionary software enhancements of GCCS-M and JMCOMS. Furnish mechanisms for providing feedback to the developers of the GCCS-M and JMCOMS applications.

- (U) ($118) Maintain configuration control over OTH-T systems and chair the Configuration Control Board (CCB) in order to maintain interoperability between legacy and non-legacy systems.

- (U) ($45) Prepare/update OTH-T specification, (e.g., Battle Group Database Management Specification, Rev B, and Message Processing Specification), based on results of interoperability testing, for support of distribution of COP to maritime forces.

- (U) ($410) Provide connectivity and conduct C4ISR state-of-the-art systems integration and interoperability testing using the Systems Integration & Test (SIT) and LBTN to validate configurations and equipment to be provided to the warfighter in approaching JV2010 network centric warfare capabilites.

- (U) ($196) Prepare a recommended evolutionary acquisition strategy for N6 to use in bringing the C4ISR operational framework, the possibilities created by IT-21 and the emerging concept of Network Centric Warfare, to the warfighter.

- (U) ($440) Validate and verify the interoperability of architectures for new capabilities and supporting systems to the fleet.

B. (U) PROGRAM CHANGE SUMMARY: FY1998: SBIR Reduction (-$38K), BTR Updates (-$153K); FY 1999: Revised Economic Assumptions (-$4K), Civilian Personnel Underexecution (-$2K); FY 2000: C2 Systems Program Offset for IT-21 (-$69K), Reduction to finance higher priority program (-$40K), NWCF Rates (+$21K), Civilian Pay Rates (+$7K), Non Pay Inflation (-$23K), and additional inflation reduction (-$1K).

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X0798
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support PROJECT TITLE: OTH Targeting

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

(U) RELATED RDT&E: (SEW) Architecture/Engineering Support program element is related to all Naval C4I related efforts.

D. (U) Schedule Profile: Not applicable.

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS
FY 2000 President's Budget Estimates

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X0798

Exhibit R-3 Cost Analysis (page 1)												Date: January 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/4		PROGRAM ELEMENT 0604707N										PROJECT NAME AND NUMBER OTH Targeting X0798
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY-99 Cost	FY-99 Award Date	FY-00 Cost	FY-00 Award Date	FY-01 Cost	FY-01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal Product Development												
Remarks:												
Subtotal Support												
Remarks												

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS
FY 2000 President's Budget Estimates DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X0798

Exhibit R-3 Cost Analysis (page 2)											Date: January 1999		
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/4			PROGRAM ELEMENT 0604707N								PROJECT NAME AND NUMBER OTH Targeting X0798		
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY-99 Cost	FY-99 Award Date	FY-00 Cost	FY-00 Award Date	FY-01 Cost	FY-01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Program Management	Various	Various	1319	156	TBD	153	TBD			Cont.	Cont.	Cont.
System Test and Evaluation	Various	Various	3056	623	TBD	726	TBD			Cont.	Cont.	Cont.
Systems Engineering	Various	Various	764	326	TBD	235	TBD			Cont.	Cont.	Cont.
Interoperability Requirements	Various	Various	2792	496	TBD	486	TBD			Cont.	Cont.	Cont.
Subtotal T&E			7931	1601		1600				Cont.	Cont.	Cont.
Remarks												
Subtotal Management												
Remarks												
Total Cost			7931	1601		1600				Cont.	Cont.	Cont.

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X2144
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support PROJECT TITLE: SEW Engineering

(U) COST: (Dollars in Thousands)

NUMBER TITLE	FY 1998 ACTUAL	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2004 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
X2144 SEW Engineering	7,014	7,386	8,593	8,701	8,758	7,871	9,168	9,551	Cont.	Cont.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: Space and Electronic Warfare (SEW) Engineering is a non-acquisition engineering effort defined as the neutralization or destruction of enemy targets and the enhancement of friendly force battle management through integrated employment and exploitation of the electromagnetic spectrum and the medium of space. SEW Engineering encompasses efforts to ensure that 1) the composite operational capabilities of SEW systems (not the individual component systems) conform to the Naval C4ISR architecture as related to the National Defense Strategy and evolving joint visions and direction such as Joint Vision 2010, "Copernicus...C4ISR for the 21st Century," "Forward...From the Sea," C4I for the Warrior, and the Defense Science Board Summer Study Task Force Report on Information Architecture for the Battlefield, and are guided by CINC requirements; 2) the systems support emerging fleet requirements as documented and necessitated through concepts such as Network Centric Warfare, Integrated Information Base, IT-21, and Naval Virtual Intranet; and 3) the SEW systems and systems integration effort involves leading edge technology transfer of information processing technologies primarily through integration of government and commercial off-the-shelf (GOTS/COTS) products to enhance the Navy's operational capability, interoperability, flexible reconfiguration, as well as reduce costs. SEW Engineering also provides the Navy support in the demonstration and integration of C4I systems developed by the services and by commercial vendors as part of the annual Joint Warrior Interoperability Demonstration (JWID) sponsored by the Joint Chiefs of Staff. Each JWID is designed to identify joint interoperability deficiencies, and to solicit solutions to these deficiencies from commercial industry. Additionally, JWID demonstrates these technologies for assessment by the warfighters from ongoing service efforts. Service participants benefit from the exposure to the new technologies, the assessments process, and the equipment that is left in place for further use and evaluation.

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X2144
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support PROJECT TITLE: SEW Engineering

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:

- (U) ($2,815) Developed plans for the integration of maturing system developments, military and commercial technologies that support the "Copernicus...C4ISR for the 21st Century" concept into the annual Joint Warrior Interoperability Demonstration (JWID). Plans incorporated the use of enhanced operational capabilities in key CINC priority areas and Joint Mission Area (JMA) Assessment Thrust Areas including high capacity communication, improved Command and Control Warfare (C2W), integrated land fight architecture, trusted systems/multi-level security, improved sensors/strike planning, common tactical/operational picture, theater air defense/force protection, and combat identification.

- (U) ($1,770) Developed installation/integration plans for Fleet Battle Experiments (FBE) Charlie and Delta in support of the Maritime Battle Center (MBC). Coordinated the installation of C4ISR systems and equipment to effect the conduct of the above experiments that examined new C4ISR concepts and technologies. Beginning in FY99 Maritime Battle Center will be funded in Project X2357.

- (U) ($1,132) Continued to develop and validate a Naval C4ISR Architecture based the multi-tier architecture framework of Operational, System, and Technical to support Naval missions in a Joint and Coalition Theater. Architectural development will consist of (1) assisting OPNAV, Navy Doctrine Command, and Fleet Commanders in the continuing upgrade of Operation Architectures and maintain documentation describing the Operational Architectures; and (2) providing system architecture parameters, attributes, and characteristics necessary to ensure that Program Executives and Managers acquire systems that achieve the desired operational objectives. Participated with the Joint Battle Center and Naval Battle Laboratories to verify and validate operational and system architectures. The "To-Be" C4ISR systems architecture was initiated. Previously delivered operational architectures were updated.

- (U) ($650) Continued architectural and system engineering efforts leading to incremental design and implementation, specifically the integration of JMCOMS, JMCIS, and CDS.

- (U) ($175) Reviewed, validated, and provided operational insight into the development of the "Copernicus...C4ISR for the 21st Century" Implementation Documentation.

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X2144
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support PROJECT TITLE: SEW Engineering

- (U) ($472) Developed the high-level systems and operational architecture processes to include long-range planning for Joint Vision 2010, "Copernicus...C4ISR for the 21st Century," C4I for the Warrior, Joint Air Operations Functional Process Improvement, Theater Battle Management (in conjunction with the Air Force), Digitization of the Battlefield (with the Army), Marine Air Ground Task Force (MAGTF) C4I and integration into the DII. An updated integrated C4ISR systems architecture, integrated node list, information exchange requirements and hierarchical data dictionary will be provided. Participated in OSD and joint architectural working groups and panels.

2. (U) FY 1999 PLAN:

- (U) ($941) Develop plans for the integration of maturing system developments, military and commercial technologies that support enhanced operational capabilities in key CINC priority areas and Joint Mission Area (JMA) Assessment Thrust Areas into the annual Joint Warrior Interoperability Demonstration (JWID). Integration plans will include high-capacity communications, improved Command and Control Warfare (C2W), integrated landfight architecture, trusted systems/multi-level security, improved sensors/strike planning, common operational picture, collaborative planning, knowledge based systems, smart push-warrior pull data flow, theater air defense/force protection, and combat identification.

- (U) ($881) Generate the Copernicus Implementation Guidance, applying a web-based collaborative grid approach where programs/projects are synchronized across the claimancy / acquisition community. The current guidance requires redirection to incorporate emerging warfighter requirements and concepts. The shift from platform centric warfare to network centric warfare demands that new approaches are identified, matured and tested with the warfighters and systems developers. The product will be a validated and modeled methodology, based on web technology, whereby a matrix of capabilities are mapped to organizations and products, leading to prioritized and scoped C4ISR work elements for claimancy pursuits.

- (U) ($188) Augment / update / maintain the Overarching C4ISR Operational Requirements Documentation. The composite operational capabilities of C4ISR systems (not the individual component systems) must be designed so that they conform to the Naval C4ISR architecture as it relates to the National Defense Strategy and evolving joint visions and direction such as Joint Vision 2010, "Copernicus...C4ISR for

the 21st Century," "Forward...From the Sea", C4I for the Warrior and the Defense Science Board Summer Study Task Force Report on Information Architecture for the Battlefield, and are guided by CINC requirements. As operational requirements change, either through changes in mission, technological change, technical insertion into systems, or through systems integration efforts, these changes must be reflected in the latest operational architectures. Additionally, support related C4ISR architecture projects as they support Theater and Battleforce C4ISR architectures must be maintained.

- (U) ($2,659) Enhance and refine the C4ISR Planned Systems Design for the POM years. Continue to develop and validate a Naval C4ISR Architecture based on the multi-tier architecture framework of Operational, System, and Technical to support Naval missions in a Joint and Coalition Theater. Architectural development will consist of (1) assisting OPNAV, Navy Doctrine Command, and Fleet Commanders in the development of operation and overarching architectures and maintaining documentation describing the Systems Architectures; (2) providing system architecture parameters, attributes, and characteristics necessary to ensure that Program Executives and Managers acquire systems that achieve the desired operational objectives. Participate with the Joint Battle Center and Naval Battle Laboratories to verify and validate systems architectures. The POM C4ISR Systems Architecture will be completed. The "As-Is" C4ISR Systems Architecture will be updated as appropriate. The decomposition of the overarching POM C4ISR Systems Architecture will be accomplished. This involves breaking down the specifics of warfighter functions to lower levels of detail. From this, SPAWAR can develop the "ring charts" for Battle Groups / Amphibious Ready Groups, generic platform designs, and detailed designs for each platform. Sponsor and/or participate in related IPTs within the claimancy and throughout the Navy Department and DoD, as required; and Participate in OSD and joint architectural working groups and panels. Define an end-to-end process model to document the C4ISR systems development process and relationships among the systems development components.

- (U) ($841) Continue support to the Joint Technical Architecture/Standards development/documentation and implementation effort, and publish periodic updates. Represent and coordinate Navy inputs into the Joint Technical Architecture developed in conjunction with both internal Naval and external service units and agencies including the and ASD(C3I) Joint Technical Architecture (JTA) Development Group (JTADG). Navy inputs to the JTA Version 3.0 will be developed in accordance with direction from the Technical Architecture Steering Group (TASG) and the DoD Architecture Coordination Council (ACC). Coordinate the JTA standards and protocols with the DON CIO's Information Technology Standards Guidance (ITSG) document. Coordinate the implementation of JTA standards and protocols throughout the C4ISR systems development community. Provide appropriate design guidance and resulting data inputs into the Naval Architecture Database (NAD). Support and coordinate NAD tools development for JTA

products. Mature the Levels of Information Systems Interoperability (LISI) constructs as they relate to the JTA.

- (U) ($1,876) Mature the Naval Architecture Database (NAD) to encompass; establish and populate the dynamic systems model, analyze of the criteria and requirements for the operational system architecture functional transition, continue population of the data models and update the Hierarchical Data Dictionary to reflect Joint study inputs, and provide C4ISR implementation of the Maritime Battle Center (MBC) including senior test engineers and laboratory coordinators to provide test/experimentation development planning with other Navy and service organizations for the conduct of Naval and Joint experiments including Fleet Warfare Experiments, JWID, IT-21, Theater Air Defense (TAD) Battle Management C4I (BMC4I), etc. Products include; expanded reference sets, a refined data model and schema, the addition of the SMIDB database, the Levels of Information Systems Interoperability Technical Reference Model, an expanded tool set, and documented relationships to related databases.

3. (U) FY 2000 PLAN:

- (U) ($2,694) Develop plans for the integration of maturing system developments, military and commercial technologies that support enhanced operational capabilities in key CINC priority areas and Joint Mission Area (JMA) Assessment Thrust Areas into the annual Joint Warrior Interoperability Demonstration (JWID). Integration plans will include high-capacity communications, improved Command and Control Warfare (C2W), integrated landfight architecture, trusted systems/multi-level security, improved sensors/strike planning, common operational picture, collaborative planning, knowledge based systems, smart push-warrior pull data flow, theater air defense/force protection, and combat identification. Procure demonstrated and assessed Joint Chief of Staff mandated Golden Nuggets Technologies that will benefit operational forces with their immediate employment at sea or in the field.

- (U) ($806) Generate the Copernicus Implementation Guidance, applying a web-based collaborative grid approach where programs/projects are synchronized across the claimancy / acquisition community. The current guidance requires redirection to incorporate emerging warfighter requirements and concepts. The shift from platform centric warfare to network centric warfare demands that new approaches are identified, matured and tested with the warfighters and systems developers. The product will be a

validated and modeled methodology, based on web technology, whereby a matrix of capabilities are mapped to organizations and products, leading to prioritized and scoped C4ISR work elements for claimancy pursuits.

- (U) ($172) Augment / update / maintain the Overarching C4ISR Operational Requirements Documentation. The composite operational capabilities of C4ISR systems (not the individual component systems) must be designed so that they conform to the Naval C4ISR architecture as it relates to the National Defense Strategy and evolving joint visions and direction such as Joint Vision 2010, "Copernicus...C4ISR for the 21st Century," "Forward...From the Sea", C4I for the Warrior and the Defense Science Board Summer Study Task Force Report on Information Architecture for the Battlefield, and are guided by CINC requirements. As operational requirements change, either through changes in mission, technological change, technical insertion into systems, or through systems integration efforts, these changes must be reflected in the latest operational architectures. Additionally, support related C4ISR architecture projects as they support Theater and Battleforce C4ISR architectures must be maintained.

- (U) ($2,434) Enhance and refine the C4ISR Planned Systems Design for the POM years. Continue to develop and validate a Naval C4ISR Architecture based on the multi-tier architecture framework of Operational, System, and Technical to support Naval missions in a Joint and Coalition Theater. Architectural development will consist of (1) assisting OPNAV, Navy Doctrine Command, and Fleet Commanders in the development of operation and overarching architectures and maintaining documentation describing the Systems Architectures; (2) providing system architecture parameters, attributes, and characteristics necessary to ensure that Program Executives and Managers acquire systems that achieve the desired operational objectives. Participate with the Joint Battle Center and Naval Battle Laboratories to verify and validate systems architectures. The POM C4ISR Systems Architecture will be completed. The "As-Is" C4ISR Systems Architecture will be updated as appropriate. The decomposition of the overarching POM C4ISR Systems Architecture will be accomplished. This involves breaking down the specifics of warfighter functions to lower levels of detail. From this, SPAWAR can develop the "ring charts" for Battle Groups / Amphibious Ready Groups, generic platform designs, and detailed designs for each platform. Sponsor and/or participate in related IPTs within the claimancy and throughout the Navy Department and DoD, as required; and Participate in OSD and joint architectural working groups and panels. Define an end-to-end process model to document the C4ISR systems development process and relationships among the systems development components.

- (U) ($769) Continue support to the Joint Technical Architecture/Standards development/documentation and implementation effort, and publish periodic updates. Represent and coordinate Navy inputs into the

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X2144
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support PROJECT TITLE: SEW Engineering

Joint Technical Architecture developed in conjunction with both internal Naval and external service units and agencies including the and ASD(C3I) Joint Technical Architecture (JTA) Development Group (JTADG). Navy inputs to the JTA Version 3.0 will be developed in accordance with direction from the Technical Architecture Steering Group (TASG) and the DoD Architecture Coordination Council (ACC). Coordinate the JTA standards and protocols with the DON CIO's Information Technology Standards Guidance (ITSG) document. Coordinate the implementation of JTA standards and protocols throughout the C4ISR systems development community. Provide appropriate design guidance and resulting data inputs into the Naval Architecture Database (NAD). Support and coordinate NAD tools development for JTA products. Mature the Levels of Information Systems Interoperability (LISI) constructs as they relate to the JTA.

- (U) ($1,718) Mature the Naval Architecture Database (NAD) to encompass; establish and populate the dynamic systems model, analyze of the criteria and requirements for the operational system architecture functional transition, continue population of the data models and update the Hierarchical Data Dictionary to reflect Joint study inputs, and provide C4ISR implementation of the Maritime Battle Center (MBC) including senior test engineers and laboratory coordinators to provide test/experimentation development planning with other Navy and service organizations for the conduct of Naval and Joint experiments including Fleet Warfare Experiments, JWID, IT-21, Theater Air Defense (TAD) Battle Management C4I (BMC4I), etc. Products include; expanded reference sets, a refined data model and schema, the addition of the SMIDB database, the Levels of Information Systems Interoperability Technical Reference Model, an expanded tool set, and documented relationships to related databases.

B. (U) PROGRAM CHANGE SUMMARY: FY 1998: SBIR Reduction (-$82K), DD1002, April 1998 Update (+$614K), FY 1998 BTR Update as of June (+$1,613K), BTR Update as of September (+$954K); FY 1999: Revised Economic Assumptions (-$17K), Civilian Personnel Underexecution (-$9K), Contract Advisory & Assistance Services (-$44K), and FFRDC Distribution (-$48K); FY 2000: Increase to JWID funding (+$1,804K), Reduction to C4ISR architecture (-$411K), Funding for Decision Centered Design (-$200K), NWCF Rates (+$60K), Reduction to finance higher priority program (-$178K), Civilian Pay Rates (+$21K), Non Pay Inflation (-$124K), and additional Inflation Reduction (-$8K).

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X2144
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support PROJECT TITLE: SEW Engineering

(U) RELATED RDT&E: (SEW) Architecture/Engineering Support program element relates to all Naval C4I related efforts.

D. (U) SCHEDULE PROFILE: Not applicable.

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS
FY 2000 President's Budget Estimates

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X2144

Exhibit R-3 Cost Analysis (page 1)											Date: January 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E,N		PROGRAM ELEMENT 0604707N									PROJECT NAME AND NUMBER SEW Engineering X2144	
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY-99 Cost	FY-99 Award Date	FY-00 Cost	FY-00 Award Date	FY-01 Cost	FY-01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal Product Development												
Remarks:												
SEW/C4I Technology Integration	Various	Various	4554							0	4554	4554
Systems A&E and Validation	Various	Various	10101							0	10101	10101
Systems Validation	Various	Various	1034							0	1034	1034
Systems Engineering			1850							0	1850	1850
Operational Requirements	Various	Various		188	TBD	172	TBD		TBD	Cont.	Cont.	Cont.
Systems Design	Various	Various		2659	TBD	2434	TBD		TBD	Cont.	Cont.	Cont.
Technical Standards	Various	Various		841	TBD	769	TBD		TBD	Cont.	Cont.	Cont.
Information Repository/Naval Architecture Database	Various	Various		1876	TBD	1718	TBD		TBD	Cont.	Cont.	Cont.
C4ISR Capabilities	Various	Various		881	TBD	806	TBD		TBD	Cont.	Cont.	Cont.
Subtotal Support	Various	Various	17539	6445		5899			TBD	Cont.	Cont.	Cont.
Remarks												

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS
FY 2000 President's Budget Estimates

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X2144

Exhibit R-3 Cost Analysis (page 2)											Date: January 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E,N			PROGRAM ELEMENT 0604707N								PROJECT NAME AND NUMBER SEW Engineering X2144	
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY-99 Cost	FY-99 Award Date	FY-00 Cost	FY-00 Award Date	FY-01 Cost	FY-01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
SEW Engr/JWID	Various	Various	3815	941	N/A	2694	TBD		TBD	Cont.	Cont.	Cont.
Subtotal T&E	Various	Various	3815	941	N/A	2694	TBD		TBD	Cont.	Cont.	Cont.
Remarks												
Subtotal Management												
Remarks												
Total Cost			21507	7386		8593				Cont	Cont.	Cont.

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X2357
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support PROJECT TITLE: Maritime Battle Ctr

(U) COST: (Dollars in Thousands)

PROJECT NUMBER TITLE	FY 1998 ACTUAL	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
X2357 Maritime Battle Center	2,831	8,822	23,915	24,082	24,191	24,212	24,198	24,184	Cont.	Cont.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The mission of the Maritime Battle Center (MBC) is to execute the Naval Warfare Innovation Process. The process takes concepts developed by the Strategic Studies Group and approved by the Chief of Naval Operations into Fleet Battle Experiments; conducts preliminary sub-scale experiments and technological demonstrations focused on the advanced engineering and operational system development of systems related to all conflict levels of Littoral Battlespace. The MBC environment is a network centric environment that links the existing "core" Naval facilities to the Marine Corps Warfighting Lab (MCWL), the Joint Battle Center/Federated Battle Lab, and technologists in industry and academia as appropriate. The MBC is essential to the evolution of combat capabilities since it is the engine for validating the new network centric warfare techniques in conjunction with the Sea Based Battle Laboratories (SBBL), Science & Technology (S&T) initiatives and other initiatives that originate with the operating forces. The MBC will support the early and sustained involvement of Joint Warfighters in refining the technology to meet the tactics, techniques, and procedures needed for 2010-2020 Littoral Battlespace. The MBC will have multiple roles since it is a crosscutting organization involved in several facets of concept, platform, weapons, weapon systems and Information Technologies (IT),Information System (IS) and Information Management (IM)systems development and integration. These include collaborative planning, operational experimentation planning and execution, technology transition/acquisition support, systems engineering, and integration, technology assimilation and operational demonstrations.

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X2357
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support PROJECT TITLE: Maritime Battle Ctr

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENT

(U) Funding was redirected to ONR and execution was made by ONR for FY 98.

- (U) ($280) MBC Administration and Management - The management and administration of MBC activities includes oversight of the experimental planning phase, the execution and collection phases, the analysis phase, and the output decision phase. This entails the integration of many preliminary experiments and technology demonstrations coupled with the inputs of experienced military leaders, current warfighting CINCs, and technologists from industry and academia.

- (U) ($760) Enabling Technical Development - Prior to any technology transition to the Project Spaces onboard the Sea Based Battle Labs (SBBL) during a Fleet Battle Experiment (FBE), the technology needs preliminary engineering experimentation to determine its compatibility and compliance with the Global Command and Control System (GCCS) architectures, IT-21 architectures, and the identification of high performance and interoperability issues. The objectives of these preliminary experiments is to bring information superiority to Fleet operations while achieving a level of critical mass in the early identification of technologies with "production" potential. These technologies include commercially developed technologies in collaborative planning, interactive sharing, the correlation of decision data–reducing "decision" time, and the exploration of dynamically managed circuits operating in sea, ground, and/or aerospace domains.

- (U) ($980) Fleet Battle Experiments (FBE) - The Second and Third Fleets are the designated experimentation lead. Commander Second Fleet (C2F) and Command Third Fleet (C3F) will lead the FBE series and have designated their flagships USS MT.WHITNEY and USS CORONADO as Sea Based Battle Laboratories (SBBL) that will work with the MBC Director in the conduct of the FBEs. This provides the opportunity for the fleet to directly participate in the development of future Navy capabilities and provides a common sense check for the technologist and concept developer. Commander Second Fleet (C2F) executed Fleet Battle Experiment "C" in the Spring of '98 and Seventh Fleet (C7F) will execute "D" during the Fall of '98. For both experiments the Advanced Concepts Site will capture experiment outcomes.

- (U) ($811) Battle Staff Level Collaboration - The Navy Collaborative Information Technology Initiative (NAVCITI) at Virginia Polytechnic Institute and State University will assist the SPAWAR, Advanced Concepts Site in the planning and execution phases of Fleet Battle experiments and ACS experiments. The assistance

will include the conceptualization, design, and implementation of the Naval Virtual Intranet; providing candidate technological solutions in: distributed software development, software quality assessment, prediction methodologies, distributed group collaboration tools, distributed maritime information management, and wireless LANs/WANs. The NAVCITI will participate in selected experiments, analyzing technical information, and making recommendations in support of the Naval Warfare Innovation Process; assist the ACS in developing proposals for follow-on experimentation.

2. (U) FY 1999 PLAN:

- (U) ($978) FBE Analysis and Core Support: The management and administration of MBC activities includes oversight of the experimental planning phase, the execution and collection phases, the analysis phase, and the output decision phase. This entails the integration of many preliminary experiments and technology demonstrations coupled with the inputs of experienced military leaders, current warfighting CINCs, and technologists from industry and academia.

- (U) ($484) Enabling Technical Development: Prior to any technology transition to the Numbered Fleet Commanders during a Fleet Battle Experiment (FBE) or Limited Objective Experiment (LOE), the technology needs preliminary engineering experimentation to determine its compatibility and compliance with the Global Command and Control System (GCCS) architectures, IT 21 architectures, and the identification of high performance and interoperability issues. The objectives of these preliminary experiments is to bring information superiority to Fleet operations while achieving a level of critical mass in the early identification of technologies with "production" potential. These technologies include commercially developed technologies in collaborative planning, interactive sharing, the correlation of decision data-reducing "decision time, and the exploration of dynamically managed circuits operating in sea, ground, and/or aerospace domains.

- (U) ($5,896) FBE Direct Experimentation: The Numbered Fleet Commanders are designated experimentation leads for FBEs and LOEs. The Fleet Commander in the AOR where the experiment is held will lead the F|BE series and designate their flagship as Sea Based Battle Laboratories (SBBL) that will work with the MBC Director in the conduct of the FBE. This enables the Fleet to directly participate in the development of future Navy concepts and capabilities and provides the Fleet an opportunity to provide immediate feedback to the technologist and concept developer.

- (U) ($1,464) Technical Evaluation: MBC will plan and participate in planning by other services and joint commands of exercises and tests that involve the Navy experimentation process. Its core competency will be

fleet operations, exercise designs, costing, equipping and exercise analysis and overall evaluations with recommendations for future related activities. The technical operations will also evaluate the results of Advanced Concept Technology Demonstrations (ACTDs), Joint Warrior Interoperability Demonstration (JWIDs), and Joint Battle Center (JBC) activities and determine the most expeditious paths to transition such concepts into actual and sustainable Naval warfighting capability. As promising innovative technologies emerge from the commercial section, the technical operations element will devise insertion strategies for prototypes. Using existing resources, the components needed to provide the required set of capabilities will be generated and brought into operation for testing and analysis purposes. Navy laboratory support from all claimancies will be tasked dependent on the requirements. Knowledge of laboratory capabilities and projected needs of such laboratories will be inherent in this support. Joint exercise support supplied by maritime forces will also be coordinated using this organizational function.

3. (U) FY 2000 PLAN:

- (U) ($4,887) FBE Analysis and Core Support: The management and administration of MBC activities includes oversight of the experimental planning phase, the execution and collection phases, the analysis phase, and the output decision phase. This entails the integration of many preliminary experiments and technology demonstrations coupled with the inputs of experienced military leaders, current warfighting CINCs, and technologists from industry and academia.

- (U) ($4,082) Enabling Technical Development: Prior to any technology transition to the Numbered Fleet Commanders during a Fleet Battle Experiment (FBE) or Limited Objective Experiment (LOE), the technology needs preliminary engineering experimentation to determine its compatibility and compliance with the Global Command and Control System (GCCS) architectures, IT 21 architectures, and the identification of high performance and interoperability issues. The objectives of these preliminary experiments is to bring information superiority to Fleet operations while achieving a level of critical mass in the early identification of technologies with "production" potential. These technologies include commercially developed technologies in collaborative planning, interactive sharing, the correlation of decision data-reducing "decision time, and the exploration of dynamically managed circuits operating in sea, ground, and/or aerospace domains.

- (U) ($13,439) FBE Direct Experimentation: The Numbered Fleet Commanders are designated experimentation leads for FBEs and LOEs. The Fleet Commander in the AOR where the experiment is held will lead the F|BE series and designate their flagship as Sea Based Battle Laboratories (SBBL) that will work with the MBC Director in the conduct of the FBE. This enables the Fleet to directly participate in the development

of future Navy concepts and capabilities and provides the Fleet an opportunity to provide immediate feedback to the technologist and concept developer.

- (U) ($1,507) Technical Evaluation: MBC will plan and participate in planning by other services and joint commands of exercises and tests that involve the Navy experimentation process. Its core competency will be fleet operations, exercise designs, costing, equipping and exercise analysis and overall evaluations with recommendations for future related activities. The technical operations will also evaluate the results of Advanced Concept Technology Demonstrations (ACTDs), Joint Warrior Interoperability Demonstration (JWIDs), and Joint Battle Center (JBC) activities and determine the most expeditious paths to transition such concepts into actual and sustainable Naval warfighting capability. As promising innovative technologies emerge from the commercial section, the technical operations element will devise insertion strategies for prototypes. Using existing resources, the components needed to provide the required set of capabilities will be generated and brought into operation for testing and analysis purposes. Navy laboratory support from all claimancies will be tasked dependent on the requirements. Knowledge of laboratory capabilities and projected needs of such laboratories will be inherent in this support. Joint exercise support supplied by maritime forces will also be coordinated using this organizational function.

B. (U) PROGRAM CHANGE SUMMARY: FY 1998: SBIR Reduction (-$80K); FY 1999: Revised Economic Assumptions (-$20K), Civilian Personnel Underexecution (-$2K); FY 2000: Fund Maritime Battle Center (+$14.698M), Fund Decision Centered Design (-$330K), NWCF Rate Adjustments (+$10K), Civilian Pay Rates (+$5K), Non-Pay Inflation (-$346K), NAWC Working Capital (-$2K), and additional Inflation Reduction (-$23K).

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

D. (U) Schedule Profile: N/A

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS
FY 2000 President's Budget Estimates

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4

PROJECT NUMBER: X2357
PROJECT TITLE: Maritime Battle Cen

Exhibit R-3 Cost Analysis (page 1)											Date: January 1999	
APPROPRIATION/BUDGET ACTIVITY RDT&E,N			PROGRAM ELEMENT 0604707N								PROJECT NAME AND NUMBER Maritime Battle Center X2357	
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY-99 Cost	FY-99 Award Date	FY-00 Cost	FY-00 Award Date	FY-01 Cost	FY-01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal Product Development												
Remarks:												
Subtotal Support												
Remarks												

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS
FY 2000 President's Budget Estimates

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4

PROJECT NUMBER: X2357
PROJECT TITLE: Maritime Battle Cen

Exhibit R-3 Cost Analysis (page 2)											Date: January 1999		
APPROPRIATION/BUDGET ACTIVITY RDT&E,N			PROGRAM ELEMENT 0604707N								PROJECT NAME AND NUMBER Maritime Battle Center X2357		
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY-99 Cost	FY-99 Award Date	FY-00 Cost	FY-00 Award Date	FY-01 Cost	FY-01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
System Test and Evaluation	Various	Various	2551	7844		19028				CONT	CONT	CONT
Subtotal T&E			2551	7844		19028				CONT	CONT	CONT
Remarks												
Program Management	Various	Various	280	978		4887				CONT	CONT	CONT
Subtotal Management			280	978		4887				CONT	CONT	CONT
Remarks												
Total Cost			2831	8822		23915				CONT	CONT	CONT

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support
PROJECT NUMBER: X2461
PROJECT TITLE: Dec Cen Des

(U) COST: (Dollars in Thousands)

NUMBER TITLE	FY 1998 ACTUAL	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
X2461 Decision Centered Design	1,637	0	1,062	1,514	1,448	931	879	881	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The Decision Centered Design (DCD) program is a 1997 Strategic Studies Group-recommended, CNO-endorsed initiative to establish a Navy process to institutionally examine emerging cognitive concepts and technical advances to support enhanced decision making at all levels of warfighting. Initial DCD methodology, based on previous, successful redesign of USMC Regimental Combat Operations Center (RCOC), leverages existing evaluation and validation capabilities at the existing facilities responsible for design and testing of systems, doctrine and training. The DCD coordination center is an upgrade of existing facilities at SPAWARSYSCEN. Together, they allow DCD to conduct scientific, engineering, training and operational evaluations of decision support requirements for accelerated and consistent deployment Navy wide.

Under this project, initiated in FY 98 as a critical CNO project to support Network Centric Warfare, Information Technology 21 (IT21) and Joint Vision 2010 under PE0303150N Project X2304, an initial DCD process is being refined by prototyping Commander, Joint Task Force (CJTF). Once refined, it will be applied to other difficult decision making such as Naval Fires Control. Enhancements from all efforts are reviewed and coordinated with applicable sponsors, (Director, Surface Warfare (N86) and Program Executive Office, Surface Ships/Theater Air Defense (PEO-SC/TAD) for AADC), program managers and support laboratories throughout the process to facilitate recommendation acceptance and easy integration. DCD orientation courses for acquisition managers and system engineers are being developed to support the process.

System, fleet, doctrine, training and manning partners continue to be identified from other decision support programs, government agencies, and private industry. Coordination examination of cognitive and technical advances highlights better advances for efficient, consistent integration throughout the services. Research needs coordination also provides similar benefits. DCD is applicable to all C2 systems from the National Command Authority (NCA) on down. Its success is paramount to achieving true speed of command.

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support
PROJECT NUMBER: X2461
PROJECT TITLE: Dec Cen Des

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 Accomplishment:
   - ($1,637) Performed DCD processes on AADC and CJTF positions; started development of DCD coordination and evaluation facility.

2. (U) FY 1999 Plan:
   - (U) BTR in process for $2488 which will enable continuation of DCD on CJTF; complete development of DCD coordination and evaluation facility; develop DCD training for acquisition managers and systems designers.

3. (U) FY 2000 Plan:
   - (U) ($489) Continue refinement and validation of DCD methodology to integrate emerging advancements into decision support systems, doctrine, training and manning requirements by continuing the DCD process on CJTF and evaluation of DCD recommendations ashore and in Fleet Battle Experiments.
   - (U) ($297) Complete development of DCD training module for System Designers. Explain DCD process, current and near term cognitive and technical techniques and their employment in system design or upgrade.
   - (U) ($276) Conduct evaluation of emerging cognitive concepts and technical advances, such as intelligent software agents, various visual and multimedia stimuli, etc., at the coordination center and associated sites per oversight committee direction and in coordination with other decision support programs, government agencies, and private industry.

B. (U) PROGRAM CHANGE SUMMARY: FY 1998: FY-00 Comparability Adjustments (+$1,637K). FY 1999: received funding via BTR from PE 0303150N. FY 2000: Funding of Decision Centered Design (+$2,761K), BSO Submission/Realignment (-$29K), C4I RDT&E,N Expenditure Carryover (-$1,000K), Joint C4ISR Battle Center Shortfall (-$670K), NWCF Rate Adjustment(+$12K), Civilian Pay Rates (+$4K), Non-Pay Inflation (-$15K) and additional Inflation Reduction (-$1K).

C. (U) OTHER PROGRAM FUNDING SUMMARY:

		FY1998	FY1999	FY2000
O&M,N	PE0204662N/1C1C (Partial)	0	0	339

(U) RELATED RDT&E: Not applicable.

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X2461
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support PROJECT TITLE: Dec Cen Des

D. (U) SCHEDULE PROFILE: Not applicable.

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS
FY 2000 President's Budget Estimates

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X2461

Exhibit R-3 Cost Analysis (page 1)												Date: January 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/4			PROGRAM ELEMENT 0604707N									PROJECT NAME AND NUMBER Decision Centered Design X2461
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
System Engr.	SS/FF	Multiple	0	N/A	0	791	N/A			Cont	Cont	Cont
System Engr	N/A	SSC SD	0	N/A	0	271	N/A			Cont	Cont	Cont
Subtotal Product Development						1062				Cont	Cont	Cont
Remarks:												

Subtotal Support												
Remarks												

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS
FY 2000 President's Budget Estimates

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X2461

Exhibit R-3 Cost Analysis (page 2)												Date: January 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/4			PROGRAM ELEMENT 0604707N									PROJECT NAME AND NUMBER Decision Centered Design X2461
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal T&E												
Remarks												
Subtotal Management												
Remarks												
Total Cost						1062				Cont.	Cont.	Cont.
Remarks												

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N
PROGRAM ELEMENT TITLE: SEW Architecture/Eng Support

PROJECT NUMBER: X2630
PROJECT TITLE: Adv Comm Info Tech

(U) COST: (Dollars in Thousands)

NUMBER TITLE	FY 1998 ACTUAL	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
X2630 Adv Comm Info Tech	0	1,995	0	0	0	0	0	0	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project will support the Navy's effort at creating an initiative for integrating information technology (IT).

(U) PROGRAM PLAN:

1. (U) FY 99 PLAN:

- Creation of a virtual environment room that allows Naval Planners and Naval Training Personnel to plan and rehearse missions; investigate the utility of wireless communications; smart antenna technology as well as evaluating candidate radiating elements.

B. (U) PROGRAM CHANGE SUMMARY: FY 1999: Revised Economic Assumptions (-$5K).

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

(U) RELATED RDT&E: Not applicable.

D. (U) SCHEDULE PROFILE: Not applicable.

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS
FY 2000 President's Budget Estimates

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X2630

Exhibit R-3 Cost Analysis (page 1)												Date: FEBRUARY 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E,N/4			PROGRAM ELEMENT 0604707N									PROJECT NAME AND NUMBER Adv Comm Info Tech X2630
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Subtotal Product Development												
Remarks:												
Subtotal Support												
Remarks												

EXHIBIT R-3, FY 2000 RDT&E,N COST ANALYSIS
FY 2000 President's Budget Estimates

DATE: FEBRUARY 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0604707N PROJECT NUMBER: X2630

Exhibit R-3 Cost Analysis (page 2)												Date: FEBRUARY 1999
APPROPRIATION/BUDGET ACTIVITY RDT&E, N/4			PROGRAM ELEMENT 0604707N									PROJECT NAME AND NUMBER Adv. Comm Info Tech X2630
Cost Categories	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY99 Cost	FY99 Award Date	FY00 Cost	FY00 Award Date	FY01 Cost	FY01 Award Date	Cost To Complete	Total Cost	Target Value of Contract
Program Management												
System Test and Evaluation												
Systems Engineering												
Interoperability Requirements												
Subtotal T&E												
Remarks												
Subtotal Management												
Remarks												
Total Cost												