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Defense Acquisition Executive Summary (DAES) Report

PATRIOT PAC-3

Submission Date: 25 May 1997

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BALLISTIC MISSILE DEFENSE ORGANIZATION
7100 DEFENSE PENTAGON
WASHINGTON D.C. 20301-7100

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PATRIOT PAC-3
Section 1 - Executive Summary

May 1997
Prepared: 05 May 97

1. Executive Summary

a. Program Issues

[U] PROGRAM SCHEDULE STATUS: Analysis of the PAC-3 missile development progress indicates that the first missile flight test will occur in Jul 97. This launch date supports a Long Lead LRIP decision in time for material contract award in Oct 97. Overall, the program continues to be on track to achieving all parameters established by the 20 Aug 96 approved Acquisition Program Baseline.

b. Significant Developments Since Last Report

[U] PAC-3 MISSILE DEVELOPMENT: The PAC-3 missile is progressing towards a Jul 97 first flight. Control Test Flight Missile CTM-1 and Raytheon Ground Test Simulation Facility (GTSF) missile component hardware and software have been integrated and dry runs have been started at both Hardware-in-the-Loop (HWIL) facilities. All components, subassemblies, and software on the PAC-3 missile segment have been manufactured/coded and have passed all acceptance tests. All technical issues encountered in ground testing have been resolved. The best indicator of program status will be the results of the LMVS missile HWIL tests ending in May 97. All other aspects of the PAC-3 missile segment (performance simulation development, production pilot line verification, and preparation for fielding) remain on schedule. Production Readiness Reviews at Honeywell, Clearwater, FL and ARC, Gainesville, VA have been successfully completed. Production Qualification Testing has been initiated for the following components: Solid Rocket Motor (SRM), Radio Frequency Data Link (RFDL), Inertial Measurement Unit (IMU), Enhanced Launcher Electronics System (ELES), Attitude Control Motor (ACM), batteries, Fire Solution Computer (FSC), and the following Seeker subsystems: crystal filter, Intermediate Frequency Processor Integrated Circuit, multi-channel receiver and video.

The PAC-3 DT-1 Missile Solid Rocket Motor (SRM) design successfully conducted its lot acceptance test firing on 26 Mar. The performance exceeded specifications. Two flight RFDLs and 5 brassboard RFDLs have been delivered and integrated into the LMVS and Raytheon HWIL facilities. Hardware and software integration is proceeding smoothly as three ELES and seven FSCs at Raytheon and WSMR have successfully passed all integration tests to date logging over 2,000 hours on the ELES, and 14,500 hours on the FSCs without a failure. Live Fire Test and Evaluation sled testing has completed its successful lethality demonstration against the High Explosive submunition series and the first of three simulated nuclear weapon warheads. These sled tests continue to confirm the Verification, Validation, and Accreditation (VV&A) of the PAC-3 lethality simulations. The PAC-3 Sim Verification is nearing completion and accreditation by OPTEC is expected by late May 97. All VV&A

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activities have been funded or budgeted.

KWAJALEIN MISSILE RANGE (KMR) TESTING: The PATRIOT Project Office successfully completed two months of testing at KMR on 21 Mar 97, which involved supporting the Willow Dune, TMD Critical Measurements Program (TCMP), and System Integration Test (SIT) programs. The Willow Dune program consisted of missile firings against a tactical ballistic missile target. Successful firings occurred on 7 Feb and 20 Mar, and test data is currently under analysis. The SIT was a communications and interoperability test. The TCMP effort consisted of tracking longer range TBM's containing scientific and advanced concepts. A significant amount of data was obtained from these missions and analysis is continuing.

CONFIGURATION 3 STATUS: The Classification, Discrimination, and Identification Phase 3 (CDI-3) final integration and testing continues on pre-production hardware and system software. Delays in integrating hardware and software have increased schedule risk, but technical risk remains low. No major technical issues remain, only minor integration issues in the digital area. Lessons learned from KMR testing are currently being incorporated into system software. All test assets have been modified and are in the final stages of system test. Formal test activities at WSMR are still scheduled for later this year followed by a Production Decision in Oct 97.

The Remote Launch/Communications Enhancement Upgrade (RL/CEU) hardware design is complete. The majority of the EMD mod kits have been fabricated. Installation and checkout of one Engagement Control Station (ECS) and one Communications Relay group (CRG) have been completed at WSMR. Systems engineering tests have been started on these two shelters. The Department of the Army Modification Work Order (DAMWO) for the second ECS and Information Coordination Central (ICC) has begun. The Joint Analysis Team has completed the final draft of the Production Qualification Test (PQT) Plan.

PATRIOT INTEGRATING IPT (IIPT): The new PAC-3 Missile Acquisition Strategy was approved by the Defense Acquisition Executive on 3 Apr 97. The strategy reintroduces a Long Lead decision in Aug 97 and has the LRIP DAB scheduled for Dec 97. The LRIP RFP is expected to be released in early May 97. The basic Long Lead item contract award is expected in Oct 97. The next IIPT meeting is scheduled for 3 Jun 97.

CONTRACT ACTIONS: In accordance with the approved PAC-3 Re-Baselining, the PEO-AMD approved acquisition decisions for the Command and Launch System (CLS) Limited Procurement Authority (LPA) and Low Rate Initial Production (LRIP) Initial Production Facilities (IPF) on 28 Mar 97. The CLS LPA decision authorized procurement of assets to support Configuration 3 system level testing and PAC-3 First Unit Equipped. The LRIP IPF decision authorized procurement of special tooling and inspection equipment to support LRIP missile

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production.

2. Baseline Information/History

[U] Program Type: DAB

Next Review: DEC 97 Review Type: P/R

Next RFP: MAY 97

[U] Next RFP: PAC-3 Missile Low Rate Initial Production

FIRE UNIT

Initial Development APB Date: 22 Feb 95

Current Development APB Date: 20 Aug 96

Total Number of Baselines: 2

Total Number of Current Parameters: 44

Cost: 6

Performance Characteristics: 16

Milestones: 22

[U] □

3. Mission and Description

[U] PATRIOT, the centerpiece of the Army's corps and theater air defense forces, is an extremely capable high-to-medium altitude, long-range air defense missile system which provides air defense of ground combat forces and high-value assets against the air threat of the 1990s and beyond. PATRIOT is designed to cope with enemy defense suppression tactics that may include tactical ballistic missiles (TBM), cruise missiles, anti-radiation missiles, advanced aircraft employing saturation, maneuver, sophisticated electronic countermeasures (ECM), and low radar cross-section. In the Field Army, PATRIOT air defenses will be complemented by short-range, low altitude forward area defense weapons and will be integrated with other ground and air assets in the overall air defense of the theater of operations. The system can conduct multiple simultaneous engagements of high performance air breathing targets and TBMs with a high probability of target kill. The system will provide air defense protection in all weather conditions and in hostile ECM environments. At the battery level or Fire Unit (FU) level, the PATRIOT missile system consists of an Engagement Control Station (ECS), one Radar Set (RS), an Electric Power Plant (EPP), eight Launching Stations (LS), and associated

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communications equipment. At the battalion level, command and control is exercised through the Information and Coordination Central (ICC) and associated communications equipment including Communications Relay Groups (CRG). The PATRIOT RS is a multifunction phased array radar which performs a variety of surveillance, acquisition, and guidance tasks. The only manned element of the FU during air battle, the ECS, provides the human interface for control of automated operations.

The PATRIOT Advanced Capability (PAC-3) program is the result of a series of integrated, phased system improvements in combination with the PAC-3 missile (formerly ERINT). The PAC-3 missile is a high velocity hit-to-kill, surface-to-air missile capable of intercepting and destroying tactical missiles and air breathing threats. The PAC-3 missile provides the range, accuracy, and lethality to effectively defend against tactical missiles with nuclear, conventional high explosive, biological and chemical warheads. The missile uses a solid propellant rocket motor, aerodynamic vane controls, and inertial guidance to navigate to an intercept point. Shortly before arrival at the intercept point, the missile's rate of spin is increased, the on-board radar homing seeker acquires the target, and terminal homing guidance is initiated to achieve hit-to-kill by high resolution maneuvers.

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Section 2 - Assessments

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FIRE UNIT

Program Assessment Indicators	Assessment	Class
Performance Characteristics	G	[U]
Test & Evaluation	G	[U]
Logistics Requirements & Readiness Objectives	G	[U]
Cost	YA	[U]
Funding	G	[U]
Schedule	G	[U]
Contracts	G	[U]
Production	G	[U]
Management Structure	G	[U]

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Section 3 - Program Manager's Comments

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FIRE UNIT

[U] Explanation of YA in Cost

[U] Although the PAC-3 Missile EMD contract performance has experienced unfavorable trends, recent trends indicate improvement in both cost and schedule performance. Aggressive management will continue to put pressure on cost and schedule performance through 3rd quarter FY97 as design, fabrication, and integration activities culminate in preparation for the first missile flight test in Jul 97. Through Mar 97, the cumulative schedule variance is -4.3% and the cumulative cost variance is -7.0%. The PM's current estimate-at-completion projects an unfavorable variance of -4.5% based on performance trends to date. This is after the consideration for Management Reserve usage and availability. Improved efficiencies are expected throughout the remaining integration, assembly, and test phases of the program due to the repetitive nature of these tasks and the learning curve associated with repeating basic flight test and subsequent lot productions which should partially offset the performance inefficiencies to date.

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Section 4 - PEO Comments

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FIRE UNIT

No Data Entered.

Section 4 - CAE Comments

FIRE UNIT

[U] The PAC-3 Flight Test program is progressing toward the first controlled test flight (CTF-1/DT-1) of the PAC-3 missile. The Program Office is conducting a rigorous Flight Test Readiness Review process, with the first formal review set for 3 June 1997. Additionally, BMDO is participating in an independent review prior to the projected mid-July first flight. While the DT&E schedule continues to be a concern, all major technical issues to date have been resolved.

The PATRIOT PAC-3 program continues toward a December 1997 LRIP DAB. To minimize impact to schedule and ensure adequate time for data reduction after the first guided flight test, the acquisition strategy was amended to procure selected items via long lead. Test data available to support this Long Lead Decision consists of the Environmental Qualification, Flight Worthiness, Quick Look Captive Carry results, and a number of Production Readiness Reviews. Limited Procurement Authority for the Command Launch System (CLS) and Initial Production Facilitization (IPF) was approved by the PEO-AMD on 28 March 1997.

During the Roving Sands exercise at Ft. Bliss, Texas in April 1997, PATRIOT concluded thirteen of fourteen launches with successful engagements. The single mis-fire was caused when the radar lost lock with the missile. One of these engagements included a PAC-2/GEM missile successfully intercepting a target. Another of the intercepts took place while the launching firing unit and controlling Tactical Operations Center (TOC) were operated by different nations (US and Germany). This "hands-on" interoperability demonstration proves the ability of PATRIOT to conduct multi-national operations between potential coalition partners. Finally, the exercise included successful cooperative (simulated) engagements with PATRIOT batteries being cued by a THAAD TOC.

As part of the POM deliberations for FY99 funding, BMDO is addressing the PM's estimate of -\$28.3M Variance at Completion on the LMVS Missile EMD contract. Funding for the FY99 Targets costs will require a transfer of funds from FY99 Army Procurement accounts to BMDO RDT&E. This transfer is being discussed with the Army Staff. BMDO, which centrally manages the targets program, provides target information for the DAES. The PAC-3 TMD targets, while not directly managed by PEO-AMD, are included in the program baseline.

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Section 5 - Approved Program Data

May 1997
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1. Performance Characteristics

Performance Characteristics	Initially Approved	Recently Revised	Demonstrated Performance	PM's Current Estimate
☐				[U]
☐				[U]
BENCHMARKS AND EXIT CRITERIA				[U]
EMD Benchmarks				[U]
1. Conduct one flight test against maneuvering ABT prior to PDR.				Complete [U]
2. Demonstrate intercept point measurement capability and relate to the ORD required SSEKP prior to PDR.				Complete [U]
3. Complete SW Development Plan including intended validation schedule for the end-to-end PAC-3 system simulation prior to PDR.				Complete [U]
4. Conduct computer/HWIL simulations using DEM/VAL seeker to fully characterize performance of the missile against DIA approved threat maneuvering TBM prior to CDR.				Complete [U]
5. Verify end-to-end computer HWIL system simulation prior to IOT&E.				[U]
☐				[U]
LRIP Exit Criteria				[U]
1. Complete successful CDR IAW applicable DoD guidance.				Complete [U]

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Section 5 - Approved Program Data

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1. Performance Characteristics

Performance Characteristics	Initially Approved	Recently Revised	Demonstrated Performance	PM's Current Estimate
2. Project Office concurrence of contractor Configuration Manager's approval and release of at least 90% of drawings.				Complete [U]
3. Complete at least one successful engagement against a threat representative target.				[U]
4. Successfully complete environmental tests for critical components and subsystems identified at CDR.				[U]
5. Demonstrate PAC-3 ORD performance and battlespace requirements using DIA approved threat models, and computer/HWIL simulations validated with available test data.				[U]
6. Demonstrate capability of pilot line production by producing EMD missiles on pilot lines, including producing components and subassemblies and assembling missiles as planned in the Manufacturing Plan.				[U]
□				[U]
FRP Exit Criteria				[U]

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Section 7 - Supplemental Contract Cost Information

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Prepared: 05 May 97

27. Contract Comments

[U] 1. The total authorized price of the PAC-3 EMD Missile Contract is \$691.3M. This is a \$1.8M decrease from the \$693.1M in the Feb 97 DAES report. This change was a result of definitization of modifications for the Risk Mitigation and the Risk Abatement efforts. The Negotiated Cost increased from \$484.1M to \$623.5M, the Authorized/Unpriced Work decreased from \$144.9M to \$3.9M as a result of this definitization.

2. The Program Manager's current, best, and worst case Estimates-at-Completion (EACs) are \$655.8M, \$655.8M, and \$669.6M, respectively. The PM's current EAC projects a variance at completion of -\$28.3M or -4.5% based on acknowledgment of the nonrecoverable cost variance from past performance and anticipates all Management Reserve will be consumed.

Cumulative unfavorable performance is associated with an extended engineering design phase driven by: missile instability issues in early EMD (Spring 95); increased ground vibration requirements due to test results (Summer 95); results of early environmental tests (Fall 96); rigorous ground testing resulting in extensive rework, and the overtime required to resolve first article fabrication issues. The PM will assess performance and closely examine estimates to complete through the ongoing Incremental Integrated Baseline Review (IIBR) process as the Risk Abatement change order is incorporated into the contract performance measurement baseline. LMVS will conduct a bottoms-up EAC by late Summer after program uncertainties with first flight, establishing pilot production lines, and downsizing program headcount are settled. Manpower levels will be reduced by half over the next six months now that the first missile is in HWIL.

3. The cumulative cost variance of -\$28.4M (-7.0%) reflects a favorable change of \$0.8M from the Feb 97 DAES report. Overall, retention of manpower to resolve late arising fabrication issues and to regain schedule has driven costs for LMVS. Cost variance drivers include the Seeker, Missile Radio Frequency Data Link (RFDL), Guidance Processor Unit (GPU), Inertial Measurement Unit (IMU), and Enhanced Launcher Electronics System (ELES). Prolonged design refinements to the seeker Master Frequency Generator (MFG), power assembly, antenna, and interface definitions have resulted from hardware integration with final software at Boeing North America. Additional cost variance has been incurred in fabrication of the first RFDL, GPU, IMU and ELES. Extended hardware and software integration effort and engineering labor drive the cost variance for the ELES.

4. The cumulative schedule variance of -\$18.0M (-4.3%) is a \$5.8M favorable change from the Feb 97 report. Schedule drivers are the seeker Master Frequency Generator (MFG), ELES, Radio Frequency Data Link (RFDL), and Guidance Processor Unit (GPU). Schedule delays at the seeker MFG supplier (LMMS) have improved due to initial deliveries of flight hardware. The ELES continues to dominate the CLS

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schedule variance; however, lessons learned in the delivery of the first ELES have accelerated the delivery of subsequent units. Test set design and software development are primary contributors to RFDL schedule variance. Redesign and updates of the GPU caused by assembly interference drives the schedule variance.

5. The independent EAC calculated by the DCMC is \$666.3M. This EAC projects variance at completion of -\$38.9M or -6.2% overrun. DCMC estimates that 90% of the \$28.2M Management Reserve will be used to complete the contract.

6. Top challenges to meet contract objectives:

a. On schedule completion of integration and performance verification of first Controlled Test Flight (Developmental Test-1 (DT-1) and first Guided Test Flight (DT-3) missiles in the prime contractor's Hardware-in-the-Loop Facility.

b. On schedule completion of Production Qualification testing of DT-1 and DT-3 missile subassemblies.

c. Successful intercepts of targets during developmental flight tests.

28. Unit Cost Report Requirements

Classification: [U]

a. Contract Cost Baseline Established On: 18 Jan 96

b. There have been no breaches of the contract cost baseline.

c. Variance analysis since baseline report

	Values as of Last Unit Cost Breach	Current Values	Changes Since APB	Changes Since Last Unit Cost Breach
	Values as of 31 Dec 94 APB			
Cost Variance				
\$ in millions	0.0	N/A	-28.4	-28.4
Percent (%)	0.00	N/A	-7.02	-7.02
Schedule Variance				
\$ in millions	0.0	N/A	-18.0	-18.0
Percent (%)	0.00	N/A	-4.26	-4.26

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** CONTRACT IDENTIFICATION DATA **

1. PROGRAM NAME PATRIOT PAC-3		2. CONTRACT NAME PAC-3 MSL INTEGRATION		3. CONTRACTOR (NAME & LOCATION) RAYTHEON CO. ELECTRONIC SYSTEMS DIVISION BEDFORD, MA 01730-	
4a. CONTRACT NUM DAAH01-95-C-0022	4c. CONTRACT TYPE CPIF/AF	4d. CONTRACT DEL TOT QTY: 0 PLAN QTY: 0 DEL QTY: 0			
4b. CHANGE ORDER NUM P00009				8. TARGET PRICE 138.7 CEILING PRICE N/A	
5. PROGRAM PHASE DEVELOPMENT	6. NEGOTIATED COST: 93.6	7. AUTHORIZED UNPRICED WORK: 29.7			

** CONTRACT SCHEDULE DATA **

9. CONTRACT DEFN DATE: 23 Oct 95	11. CRITICAL MILESTONE 1: GTSF CTF RDYNSS RVW JUN 97	12. CRITICAL MILESTONE 2: DEV TEST FLT-1 JUL 97	13. SIG EFF COMPLETION DATE: JUL 99
10. WORK START DATE: NOV 94			14. EST COMPLETION DATE: JUL 99

** CONTRACT PERFORMANCE DATA **

	15. Report Date 30 Mar 97	16. Source Document CPR	17. Data Verification Review Type: IBR Review Date: DEC 95
18. BCWS 55.4	19. BCWP 52.3	20. ACWP 50.0	21. Mgt Reserve 1.7
22. Cont Budg Base 123.3	23. Total All Budg 123.3	24. Contr's Est Cost 121.6	25. PM's Est Cost Current: 123.3 Best: 123.3 Worst: 123.3

** CONTRACT VARIANCE DATA **

Cost Variance =	2.3	Schedule Variance =	-3.1
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Section 7 - Supplemental Contract Cost Information

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27. Contract Comments

- [U] 1. The Negotiated Cost is unchanged from the Feb 97 report. The Authorized/Unpriced Work, Target Price, Contract Budget Base, and Total Allocated Budget increased \$0.5M from the Feb report to reflect an update to the undefinitized added scope proposal. The Authorized/Unpriced work reflects the contract change order issued in Aug 96 which directed replanning of the PAC-3 Integration effort in conjunction with the overall PAC-3 program restructure.
2. The Project Manager's Estimated Costs at Completion (ECACs) increased \$0.5M from the prior report and are shown at the contract Target Cost of \$123.3M. The independent assessment by the DCMC-Raytheon is \$120.5M.
3. The contractor's ECAC of \$121.6M increased \$0.5M from the prior report due to the proposal update.
4. The cumulative schedule variance of \$-3.1M (-5.6%) reflects a favorable net change of \$0.1M from the Feb 97 report. Primary schedule variance drivers occurred in manufacturing due to late launcher junction box design releases which have delayed deliveries. Unfavorable variances were offset by favorable schedule performance in system test activities and systems engineering software concept requirements completion.
5. The cumulative cost variance of \$2.3M (+4.4%) reflects a favorable change of \$1.2M from the Feb 97 report. The change is primarily due to completions in tactical software concept requirements, progress in system testing of software for Fire Solution Computer and Enhanced Launcher Electronics System, and less than planned expenditures in program management.
6. Top challenges to meeting contract objectives:
- a. On schedule completion of integration of Fire Solution Computer (FSC), Enhanced Launcher Electronics System (ELES), first PAC-3 Controlled Flight Test missile, and ground software into the PATRIOT System to support the first developmental test flight (DT-1).
 - b. On schedule completion of integration of FSC, ELES, first Guided Flight Test Missile, and ground software to support the first guided test flight mission (DT-3).
 - c. Completion of Launcher Integration and test, including verification of PAC-2 Launch capability.

28. Unit Cost Report Requirements

Classification: [U]

- a. Contract Cost Baseline Established On: 18 Jan 96

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b. There have been no breaches of the contract cost baseline.

c. Variance analysis since baseline report

	Values as of 31 Dec 94	Values as of Last Unit Cost Breach	Current Values	Changes Since APB	Changes Since Last Unit Cost Breach
Cost Variance					
\$ in millions	0.0	N/A	2.3	2.3	N/A
Percent (%)	0.00	N/A	4.40	4.40	N/A
Schedule Variance					
\$ in millions	0.0	N/A	-3.1	-3.1	N/A
Percent (%)	0.00	N/A	-5.60	-5.60	N/A

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** CONTRACT IDENTIFICATION DATA **

1. PROGRAM NAME PATRIOT PAC-3		2. CONTRACT NAME REM LCH COMMO ENH UPGRAD		3.CONTRACTOR (NAME & LOCATION) RAYTHEON CO. ELECTRONIC SYSTEMS DIVISION BEDFORD, MA 01730-	
4a.CONTRACT NUM DAAH01-96-C-0018	4c.CONTRACT TYPE CPIF	4d.CONTRACT DEL TOT QTY: 0 PLAN QTY: 0 DEL QTY: 0		8. TARGET PRICE 66.5 CEILING PRICE 0.0	
4b.CHANGE ORDER NUM P00007					
5. PROGRAM PHASE DEVELOPMENT	6. NEGOTIATED COST: 59.6	7. AUTHORIZED UNPRICED WORK:		0.0	

** CONTRACT SCHEDULE DATA **

9. CONTRACT DEFN DATE: 23 Dec 96	11. CRITICAL MILESTONE 1: SYS TEST ANALYSIS JUN 97	12. CRITICAL MILESTONE 2: PRODUCTION DEC MAR 98	13. SIG EFF COMPLETION DATE: DEC 98
10. WORK START DATE: NOV 95			14. EST COMPLETION DATE: DEC 98

** CONTRACT PERFORMANCE DATA **

	15. Report Date 30 Mar 97	16. Source Document CPR	17. Data Verification Review Type: IBR Review Date: NOV 96
18. BCWS 34.5	19. BCWP 30.9	20. ACWP 31.5	21. Mgt Reserve 1.4
22. Cont Budg Base 59.6	23. Total All Budg 59.6	24. Contr's Est Cost 59.6	25. PM's Est Cost Current: 59.6 Best: 59.6 Worst: 62.7

** CONTRACT VARIANCE DATA **

Cost Variance =	-0.6	Schedule Variance =	-3.6
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27. Contract Comments

- [U] 1. The Negotiated Cost, Authorized/Unpriced Work, Target Price, Contract Budget Base, and Total Allocated Budget are unchanged from the Feb 97 report. The Program Manager's Current and Best Case Estimates-at-Completion (EAC) and the contractor's EAC are at contract Target Cost. The PM's Worst Case EAC of \$62.7M is based on potential cost impacts of the schedule delays in the Integrated Digital Operator Communications System (IDOCs) and Universal Serial Input/Output (USIO) modules. The independent DCMC Estimate-at-Completion is \$60.1M.
2. The cumulative schedule variance of \$-3.6M reflects a worsening of \$0.8M from the Feb 97 report. Schedule has been impacted by the late receipt of data from PAC-3 Missile Program which has delayed the completion of guidance analysis. Design problems with the Universal Serial Input/Output (USIO) module have delayed release of this module and the finalization of the Automatic Test Equipment (ATE). Delays in hardware deliveries for system integration have added to the variance.
3. The cumulative cost variance of -\$0.6M reflects an unfavorable change of \$0.6M from the Feb 97 report. Changes in the cables because of evolving Integrated Digital Operator Communications System (IDOCs) design have resulted in higher levels of rework and in higher than anticipated costs.

28. Unit Cost Report Requirements

Classification: [U]

- a. Contract Cost Baseline Established On: 23 Jan 97
- b. There have been no breaches of the contract cost baseline.
- c. Variance analysis since baseline report

	Values as of	Values as of Last Unit Cost Breach	Current Values	Changes Since APB	Changes Since Last Unit Cost Breach
Cost Variance					
\$ in millions	N/A	N/A	-0.6	N/A	N/A
Percent (%)	N/A	N/A	-1.94	N/A	N/A
Schedule Variance					
\$ in millions	N/A	N/A	-3.6	N/A	N/A
Percent (%)	N/A	N/A	-10.43	N/A	N/A

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Prepared: 05 May 97

** CONTRACT IDENTIFICATION DATA **

1. PROGRAM NAME PATRIOT PAC-3		2. CONTRACT NAME RADAR ENH PH3 MOD KITS		3. CONTRACTOR (NAME & LOCATION) RAYTHEON Co. ELECTRONIC SYSTEMS DIVISION BEDFORD, MA 01730-	
4a.CONTRACT NUM DAAH01-95-C-0446	4c.CONTRACT TYPE FFP	4d.CONTRACT DEL TOT QTY: 22 PLAN QTY: 0 DEL QTY: 0		8. TARGET PRICE 201.3 CEILING PRICE 0.0	
4b.CHANGE ORDER NUM P00004					
5. PROGRAM PHASE PRODUCTION	6. NEGOTIATED COST: 201.3	7. AUTHORIZED UNPRICED WORK: 0.0			

** CONTRACT SCHEDULE DATA **

9. CONTRACT DEFN DATE: 06 Dec 96	11. CRITICAL MILESTONE 1: START RETROFIT NOV 97	12. CRITICAL MILESTONE 2: COMPLETE RETROFIT SEP 99	13. SIG EFF COMPLETION DATE: SEP 99
10. WORK START DATE: SEP 95			14. EST COMPLETION DATE: SEP 99

** CONTRACT PERFORMANCE DATA **

	15. Report Date	16. Source Document N/A	17. Data Verification Review Type: N/A Review Date:
18. BCWS 0.0	19. BCWP 0.0	20. ACWP 0.0	21. Mgt Reserve 0.0
22. Cont Budg Base 0.0	23. Total All Budg 0.0	24. Contr's Est Cost 0.0	25. PM's Est Cost Current: 201.3 Best: 201.3 Worst: 201.3

** CONTRACT VARIANCE DATA **

Cost Variance =	0.0	Schedule Variance =	0.0
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PATRIOT PAC-3

Section 7 - Supplemental Contract Cost Information

May 1997

Prepared: 05 May 97

27. Contract Comments

- [U] 1. The Radar Enhancement Phase 3 Modification Kit production contract was awarded to Raytheon in Sep 95, for tooling and test equipment, six modification kits, and associated spares. The contract was modified in Dec 95, to authorize production of an additional 16 modification kits and spares. The contract was definitized on 6 Dec 96 at a value of \$201.3M.
2. This contract is a Firm Fixed Price contract, and no cost performance reporting is required.
3. The Significant Effort Completion and Estimated Completion dates (Blocks 13 & 14) of Sep 99 reflect the completion of planned deliveries for production of 22 kits. Additional kits will be procured in this contract for the balance of the Radar Enhancements modification kits. The additional procurements will be incorporated as options to this contract.

28. Unit Cost Report Requirements

Classification: [U]

- a. Contract Cost Baseline Established On:
- b. There have been no breaches of the contract cost baseline.
- c. Variance analysis since baseline report

	Values as of	Values as of Last Unit Cost Breach	Current Values	Changes Since APB	Changes Since Last Unit Cost Breach
Cost Variance					
\$ in millions	N/A	N/A	0.0	N/A	N/A
Percent (%)	N/A	N/A	N/A	N/A	N/A
Schedule Variance					
\$ in millions	N/A	N/A	0.0	N/A	N/A
Percent (%)	N/A	N/A	N/A	N/A	N/A

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PATRIOT PAC-3
Section 7 - Supplemental Contract Cost Information

May 1997
Prepared: 05 May 97

** CONTRACT IDENTIFICATION DATA **

1. PROGRAM NAME PATRIOT PAC-3		2. CONTRACT NAME TMD- Targets Program		3. CONTRACTOR (NAME & LOCATION) Coleman Research Corp. Launch Systems Orlando, FL 32819-	
4a. CONTRACT NUM DASC50-92-C-0217	4c. CONTRACT TYPE CPFF	4d. CONTRACT DEL TOT QTY: 25 PLAN QTY: DEL QTY:			
4b. CHANGE ORDER NUM P00045				8. TARGET PRICE 219.2 CEILING PRICE	
5. PROGRAM PHASE Fabrication	6. NEGOTIATED COST: 168.8	7. AUTHORIZED UNPRICED WORK: 39.4			

** CONTRACT SCHEDULE DATA **

9. CONTRACT DEFN DATE: 00 00	11. CRITICAL MILESTONE 1: THAAD FT-7 MAR 97	12. CRITICAL MILESTONE 2: THAAD FT-8 JUN 97	13. SIG EFF COMPLETION DATE: JUN 99
10. WORK START DATE:			14. EST COMPLETION DATE: JUN 99

** CONTRACT PERFORMANCE DATA **

	15. Report Date 28 Mar 97	16. Source Document CPR	17. Data Verification Review Type: DEMO Review Date: SEP 94
18. BCWS 148.3	19. BCWP 143.9	20. ACWP 148.9	21. Mgt Reserve 7.8
22. Cont Budg Base 208.2	23. Total All Budg 208.2	24. Contr's Est Cost 208.2	25. PM's Est Cost Current: 214.0 Best: 208.2 Worst: 220.0

** CONTRACT VARIANCE DATA **

Cost Variance =	-5.0	Schedule Variance =	-4.4
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PATRIOT PAC-3

Section 7 - Supplemental Contract Cost Information

May 1997
Prepared: 05 May 97

27. Contract Comments

28. Unit Cost Report Requirements

Classification: [U]

- a. Contract Cost Baseline Established On:
- b. There have been no breaches of the contract cost baseline.
- c. Variance analysis since baseline report

	Values as of	Values as of Last Unit Cost Breach	Current Values	Changes Since APB	Changes Since Last Unit Cost Breach
Cost Variance					
\$ in millions	N/A	N/A	-5.0	N/A	N/A
Percent (%)	N/A	N/A	-3.47	N/A	N/A
Schedule Variance					
\$ in millions	N/A	N/A	-4.4	N/A	N/A
Percent (%)	N/A	N/A	-2.97	N/A	N/A

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PATRIOT PAC-3

Section 5 - Approved Program Data

May 1997

Prepared: 05 May 97

1. Performance Characteristics

Performance Characteristics	Initially Approved	Recently Revised	Demon- strated Perform- ance	PM's Current Estimate
1. Successful intercepts achieved at the PAC-3 ORD accuracy/lethality requirements against a maneuvering TBM and a low radar cross section ABT.				[U]
2. Verify that the reliability growth curve thresholds have not been breached, based on goal of achieving required missile reliability levels prior to FUE.				[U]
3. Demonstrate PAC-3 ORD performance and battlespace requirements using DIA approved threat models, and computer/HWIL simulations validated using available test data.				[U]
4. Demonstrate that contractors are on schedule to meet full rate production through the proof of manufacturing process. Produce components and assemble missiles using the pilot lines and validate the capability to meet full rate production requirements.				[U]

[U] Threshold values are shown for the Program Manager's Current Estimate for Approved Performance Characteristics until contracts are awarded for all hardware delivery and subsequent system testing.

The Demonstrated Performance values for "Other Significant Performance

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PATRIOT PAC-3

Section 5 - Approved Program Data

May 1997

Prepared: 05 May 97

1. Performance Characteristics

Characteristics" reflect performance demonstrated in testing for the Materiel Release of Configuration 1 items. System performance meets or exceeds ORD requirements.

Notes to EMD Benchmarks and Exit Criteria:

EMD Benchmarks:

Benchmark 1 Verification: GTF-4 destroyed a maneuvering MQM-107D on 2 Jun 94.

Benchmark 2 Verification: Photonic hit indicator for TBM targets successfully tested on sled track 17 Mar 95.

Benchmark 3 Verification: Software development plan completed in Jan 95.

Benchmark 4 Verification: Millimeter Wave System Simulation 2 (MSS-2) reconstructed DEM/VAL flight test scenarios to provide comprehensive characterization of the DEM/VAL seeker hardware.

LRIP Exit Criteria:

Criterion 1 Verification: Missile segment CDR was conducted 19-21 Mar 96.

Criterion 2 Verification: Project Office concurred with contractor Configuration Manager's approval and release of 94% of drawings at CDR.

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PATRIOT PAC-3
Section 5 - Approved Program Data
2. Program Schedule Milestones

May 1997
Prepared: 05 May 97

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Approved Program Schedule Milestones

Schedule Milestones	Initial Development Objective	Current Development Objective/ Threshold	PM's Current Estimate	
MISSILE				
Milestone II (Missile) (DAB)	MAY 94	MAY 94 /NOV 94	MAY 94	[U]
Development Contract Award	SEP 94	SEP 94 /MAR 95	OCT 94	[U]
Preliminary Design Review Complete	SEP 95	SEP 95 /MAR 96	OCT 95	[U]
Critical Design Review Complete	MAR 96	MAR 96 /SEP 96	MAR 96	[U]
Service Final DT&E				[U]
Start	JAN 97	APR 97 /OCT 97	JUL 97	[U]
Complete	DEC 97	DEC 98 /JUN 99	DEC 98	[U]
Low Rate Initial Production Decision (DAB)	JUN 97	SEP 97 /MAR 98	DEC 97	[U]
Low Rate Initial Production Contract Award	JUL 97	OCT 97 /APR 98	JAN 98	[U]
Low Rate Production First Delivery IOT&E	MAY 98	APR 99 /OCT 99	APR 99	[U]
Start	JAN 98	FEB 99 /AUG 99	FEB 99	[U]
Complete	JUN 98	MAR 99 /SEP 99	MAR 99	[U]
Milestone III Production Decision	AUG 98	JUN 99 /DEC 99	JUN 99	[U]
Full Rate Production Contract Award	AUG 98	OCT 99 /APR 00	OCT 99	[U]
First Unit Equipped	SEP 98	JUL 99 /JAN 00	JUL 99	[U]
Service Depot Support	SEP 01	JUL 02 /JAN 03	JUL 02	[U]
OTHER UPGRADES				
Configuration 1 Production	MAR 95	MAR 95 /SEP 95	MAY 95	[U]
Confirmatory Test				[U]
Configuration 1 First Unit Equipped	JUN 95	JUN 95 /DEC 95	DEC 95	[U]
Configuration 2 Follow On Test	DEC 95	DEC 95 /JUN 96	MAY 96	[U]
Configuration 2 First Unit Equipped	JUN 96	JUN 96 /DEC 96	DEC 96	[U]
Configuration 3 Follow On Test	JUN 98	FEB 99 /AUG 99	FEB 99	[U]
Configuration 3 First Unit Equipped	SEP 98	JUL 99 /JAN 00	JUL 99	[U]

Other Significant Schedule Milestones

No data entered.

[U] The Initial Development APB Objective column reflects the 22 Feb 95 APB approved values. The Current Development APB Objectives and Thresholds reflect the 20 Aug 96 approved APB.

The PM's Current Estimate for Service Final DT&E - Start changed from JUN 97 to JUL 97 based on the current planning date of the first PAC-3

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PATRIOT PAC-3

Section 5 - Approved Program Data

2. Program Schedule Milestones
missile flight test.

May 1997

Prepared: 05 May 97

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PATRIOT PAC-3
Section 5 - Approved Program Data
3. Approved Program Acquisition Cost

May 1997
Prepared: 05 May 97

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Program Base Year: 1988

	Initial Development APB Objective	Current Development APB Objective/ Threshold	PM's Current Estimate	Class
Base Year Costs				
Development (RDT&E):	2015.6	2332.3/2511.0	2376.4	[U]
Procurement (PROC):	2783.2	3122.7/3278.8	3204.1	[U]
MILCON:	0.0	0.0/0.0	0.0	[U]
Acquisition O&M:				[U]
Total Base Year Costs:	4798.8	5455.0/5789.8	5580.5	[U]
Acquisition O&S:				[U]
Total BY Life Cycle Costs:	4798.8	5455.0/5789.8	5580.5	[U]
Then Year Costs				
Development (RDT&E):	2435.8	2860.8	2918.9	[U]
Procurement (PROC):	3945.8	4392.6	4506.7	[U]
MILCON:	0.0	0.0	0.0	[U]
Acquisition O&M:	0.0	0.0	0.0	[U]
Total Then Year Costs:	6381.6	7253.4	7425.6	[U]
Quantities				
Development (RDT&E):	0	0		[U]
Procurement (PROC):	54	54	54	[U]
Unit Cost				
Avg Proc Unit Cost (BY \$M):	51.500	57.828/62.165	59.335	[U]
Avg Proc Unit Cost (TY \$M):	N/A	N/A	83.457	[U]

[U] The Initial Development APB Objective column reflects the 22 Feb 95 APB approved values. The Current Development APB Objectives and Thresholds reflect the 20 Aug 96 approved APB.

The PM's Current Estimate is the President's Budget (18 Feb 97 BMDO CSP, FA 97-7 FINALA, and Army Jan 97 PB).

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PATRIOT PAC-3
Section 6 - Program Background Data
1. Track To Budget

May 1997
Prepared: 05 May 97

a. RDT&E Program Element (PE) & Project Data

PE/Proj Num	PE/Project Name	SAR
0603216C		Y [U]
0604216C		Y [U]
0604225C		Y [U]
0604865C		Y [U]
0604866C		Y [U]
23801D036		Y [U]

b. Procurement Annex Line Item (PALI) Data

Appn Code	Item Number	Control Type	Cost BA BSA	PALI Name	SAR
0300D	0208060C				Y [U]
2032A	C50700				Y [U]
2032A	CA0267				Y [U]

c. MILCON Program Element (PE) Data

No current MILCON PEs.

d. O&M Program Element (PE) Data

No current O&M PEs.

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PATRIOT PAC-3

Section 6 - Program Background Data

2. Unit Cost Report - (Dollars in Millions)

May 1997

Prepared: 05 May 97

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Classification: [U]

	Current Estimate MAY 97	UCR Baseline AUG 96 APB	Percent Change
a. Program Acquisition			
Unit Cost (PAUC)			
(1) Cost (BY\$)	5580.5	5455.0	
(2) Quantity	54	54	
(3) Unit Cost	103.343	101.019	2.30
b. Average Procurement			
Unit Cost (APUC)			
(1) Cost (BY\$)	3204.1	3122.7	
(2) Quantity	54	54	
(3) Unit Cost	59.3352	57.8278	2.61

[U] The UCR Baseline Cost for the PAC-3 missile procurement quantity of 1200 missiles is \$1754.0M BY88. The Current Estimate for PAC-3 missile procurement is \$1756.7M BY88.

The data shown for the UCR Baseline is the 20 Aug 96 APB.

The Program Acquisition Unit Cost (PAUC) and the Average Unit Procurement Cost (AUPC) unit of measure is tactical Fire Units (FUs). All FUs have been procured and fielded. The FUs are undergoing modification to PAC-3 configuration.

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PATRIOT PAC-3

Section 6 - Program Background Data

3. Procurement Delivery Information

May 1997
Prepared: 05 May 97

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No data entered.

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Section 6 - Program Background Data

May 1997

Prepared: 05 May 97

4. Program and Contract Cost Info Summary - (TY Dollars in Millions)

Appropriation: RDT&E

	PMCEPAC Budgeted by PM	PMCEPAC Budgeted by Other Sources	Class
a. Completed Contracts	213.3	858.1	[U]
b. Large Active Contracts			
(1) PAC-3 MISSILE EMD	0.0	691.3	[U]
DAAH01-95-C-0021 CPIF/AF			
(2) PAC-3 MSL INTEGRATION	0.0	138.7	[U]
DAAH01-95-C-0022 CPIF/AF			
(3) REM LCH COMMO ENH UPGRAD	0.0	66.5	[U]
DAAH01-96-C-0018 CPIF			
(4) RADAR ENH PH3 MOD KITS			[U]
DAAH01-95-C-0446 FFP			
c. Small Active Contracts	6.2	72.6	[U]
d. Non-contract Cost	29.9	257.6	[U]
e. Management Reserve	0.0	0.0	[U]
f. Future Contract Effort	126.0	458.7	[U]
g. Total RDT&E	375.4	2543.5	[U]

[U] 1. The PMCEPAC Budgeted by Other Sources for Large Active Contracts is BMDO funds as follows:

a. The \$691.3M for PAC-3 Missile EMD is for the negotiated contract Target Price plus the Not-to-Exceed Price for contract modifications for Risk Mitigation, two additional flight tests, update of the Security Classification Guide, and the Risk Abatement contract change order.

b. The \$138.7M for PAC-3 Missile Integration includes \$104.8M for the negotiated contract plus the Not-to-Exceed of \$33.9M for the risk abatement modification.

c. The \$66.5M for Remote Launch Communications Enhancement Upgrade (RLCEU) is for the negotiated Target Price.

2. The PMCEPAC Budgeted by Other Sources for Small Active Contracts of \$72.6M includes \$62.8M for targets supplied to the PAC-3 program under the Coleman Research contract (DASC50-92-C-0217).

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PATRIOT PAC-3

Section 6 - Program Background Data

May 1997

Prepared: 05 May 97

4. Program and Contract Cost Info Summary - (TY Dollars in Millions)

Appropriation: Procurement

	PMCEPAC Budgeted by PM	PMCEPAC Budgeted by Other Sources	Class
a. Completed Contracts	323.2	69.5	[U]
b. Large Active Contracts			
(1) PAC-3 MISSILE EMD			[U]
DAAH01-95-C-0021 CPIF/AF			
(2) PAC-3 MSL INTEGRATION			[U]
DAAH01-95-C-0022 CPIF/AF			
(3) REM LCH COMMO ENH UPGRAD			[U]
DAAH01-96-C-0018 CPIF			
(4) RADAR ENH PH3 MOD KITS	0.0	201.3	[U]
DAAH01-95-C-0446 FFP			
c. Small Active Contracts	13.3	258.6	[U]
d. Non-contract Cost	46.7	445.8	[U]
e. Management Reserve	0.0	0.0	[U]
f. Future Contract Effort	3148.3	0.0	[U]
g. Total Procurement	3531.5	975.2	[U]

[U] 1. The \$201.3M PMCEPAC Budgeted by Other Sources for Large Active Contracts represents BMDO funds for the negotiated value for the Radar Enhancement Phase III modification kit production contract.

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PATRIOT PAC-3

Section 6 - Program Background Data

5. International Cooperative Program

May 1997

Prepared: 05 May 97

No data entered.

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PATRIOT PAC-3
Section 6 - Program Background Data
6. Joint Potential Designation

May 1997
Prepared: 05 May 97

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Class

- a. Proposed Other Component Involvement: None
- b. Date of JROC Assessment of Designation: None

[U]

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PATRIOT PAC-3
Section 6 - Program Background Data
7. Procurement/Platform Support

May 1997
Prepared: 05 May 97

FIRE UNIT

No data entered.

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PATRIOT PAC-3
Section 7 - Supplemental Contract Cost Information

May 1997
Prepared: 05 May 97

** CONTRACT IDENTIFICATION DATA **

1. PROGRAM NAME PATRIOT PAC-3		2. CONTRACT NAME PAC-3 MISSILE EMD		3.CONTRACTOR (NAME & LOCATION) LOCKHEED MARTIN VOUGHT SYSTEMS DALLAS, TX 75265-0003	
4a.CONTRACT NUM DAAH01-95-C-0021	4c.CONTRACT TYPE CPIF/AF		4d.CONTRACT DEL TOT QTY: 0 PLAN QTY: 0 DEL QTY: 0		8. TARGET PRICE 691.3 CEILING PRICE 0.0
4b.CHANGE ORDER NUM P00032					
5. PROGRAM PHASE DEVELOPMENT	6. NEGOTIATED COST: 623.5		7. AUTHORIZED UNPRICED WORK: 3.9		

** CONTRACT SCHEDULE DATA **

9. CONTRACT DEFN DATE: 07 Nov 95	11. CRITICAL MILESTONE 1: DEVEL TEST FLT-1 JUL 97	12. CRITICAL MILESTONE 2: DEVEL TEST FLT-2 AUG 97	13. SIG EFF COMPLETION DATE: APR 99
10. WORK START DATE: NOV 94			14. EST COMPLETION DATE: APR 99

** CONTRACT PERFORMANCE DATA **

	15. Report Date 23 Mar 97	16. Source Document CPR	17. Data Verification Review Type: IBR Review Date: OCT 95
18. BCWS 422.7	19. BCWP 404.7	20. ACWP 433.1	21. Mgt Reserve 28.2
22. Cont Budg Base 627.4	23. Total All Budg 627.4	24. Contr's Est Cost 627.4	25. PM's Est Cost Current: 655.8 Best: 655.8 Worst: 669.6

** CONTRACT VARIANCE DATA **

Cost Variance =	-28.4	Schedule Variance =	-18.0
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PATRIOT PAC-3

Section 8 - Annual President's Budget Program Funding Summary prepared: 05 May 97

No data entered.

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