Audit Report

OFFICE OF THE INSPECTOR GENERAL

THE MINUTEMAN III GUIDANCE REPLACEMENT PROGRAM

Report No. 97-199 July 29, 1997

Department of Defense

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Acronyms

DCMC	Defense Contract Management Command
EAC	Estimate at Completion

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July 29, 1997

MEMORANDUM FOR ASSISTANT SECRETARY OF THE AIR FORCE
(FINANCIAL MANAGEMENT AND COMPTROLLER)

SUBJECT: Audit Report on the Minuteman III Guidance Replacement Program
(Report No. 97-199)

We are providing this final audit report for your information and use. Management comments on a draft of this report were considered in preparing the final report.

Comments on the draft of this report conformed to the requirements of DoD Directive 7650.3 and left no unresolved issues. Therefore, no additional response is necessary.

We appreciate the courtesies extended to the audit staff. Questions on the audit should be directed to Mr. John E. Meling, Audit Program Director, at (703) 604-9091 (DSN 664-9091) or Mr. Harold C. James, Audit Project Manager, at (703) 604-9093 (DSN 664-9093). See Appendix G for the report distribution. Audit team members are listed inside the back cover.

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Assistant Inspector General
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Office of the Inspector General, DoD

Report No. 97-199 **July 29, 1997**
(Project No. 6AE-0058)

The Minuteman III Guidance Replacement Program

Executive Summary

Introduction. The Minuteman III is expected to be the United States' only fielded land-based intercontinental ballistic missile system after the year 2003, when the Minuteman II and Peacekeeper missiles are retired as a result of arms control initiatives. The Minuteman III Guidance Replacement Program (the Guidance Replacement Program) is part of a DoD initiative to extend the life of the Minuteman III weapon system through the year 2020. The Guidance Replacement Program replaces the existing guidance set and increases guidance system reliability. The program entered the engineering and manufacturing development phase of the acquisition process in August 1993. The Air Force Program Executive Officer for Space Programs plans to review the readiness of the Guidance Replacement Program to enter low-rate initial production no later than March 1998. The Air Force funded the Guidance Replacement Program for $1.9 billion through FY 2003.

Audit Objective. The primary audit objective was to evaluate the overall management of the Guidance Replacement Program. Specifically, we determined whether the Intercontinental Ballistic Missile System Program Office was cost-effectively developing the system and making it ready for low-rate initial production. We also reviewed the adequacy of the Intercontinental Ballistic Missile System Program Office's management control program as it applied to the audit objective.

Audit Results. Overall, the Air Force was effectively managing the development of the Guidance Replacement Program and making it ready for low-rate initial production. Also, the Intercontinental Ballistic Missile System Program Office has strived to fully implement acquisition streamlining for the Guidance Replacement Program and has an adequate management control program in place. Further, the Intercontinental Ballistic Missile System Program Office was receptive to audit suggestions and has already made changes to improve management of the acquisition as discussed in Appendix C. However, three conditions warrant additional management attention.

o The Intercontinental Ballistic Missile System Program Office would have benefited from requesting the Office of the Deputy Assistant Secretary of the Air Force (Cost and Economics) to perform an Air Force Component Cost Analysis (independent cost estimate) to assess the impact of two major program restructures. Although not required, an independent cost estimate would increase the confidence of the Air Force Acquisition Executive that updated program cost estimates reflect a realistic appraisal of the most likely program cost that the Air Force will realize (Finding A).

o The Intercontinental Ballistic Missile System Program Office could improve the effectiveness of its resources to monitor, assess, and estimate contract costs for the prime contract. More effective monitoring and DCMC support should increase the accuracy of the assessment of estimated prime contract costs and provide the Director, Intercontinental Ballistic Missile System Program Office, with an improved basis for making effective management decisions concerning funding needed to complete the contract (Finding B).

o The Intercontinental Ballistic Missile System Program Office did not plan to develop a programmatic environmental, safety, and health evaluation before the full-rate production decision to the extent required by the new DoD Regulation 5000.2-R. Without performing the evaluation, the Intercontinental Ballistic Missile System Program Office will not have assurance that it is aware of mission and cost impacts arising from environmental, safety, and health issues (Finding C).

Summary of Recommendations. We recommend an independent program cost estimate, technical assistance during the next estimate-at-completion review, and contractor performance training for appropriate program staff. We also recommend a programmatic environmental, safety, and health evaluation before the full-rate production decision in accordance with the new DoD Regulation 5000.2-R.

Management Comments. The Air Force concurred with all the recommendations and provided expected dates for completion of corrective actions. Although not required to comment, the Office of the Under Secretary of Defense for Acquisition and Technology concurred with the findings and recommendations. Part III contains the complete text of management comments.

Table of Contents

Executive Summary i

Part I - Audit Results

Audit Background 2
Audit Objective 3
Finding A. Independent Cost Estimate 4
Finding B. Contract Estimate at Completion 8
Finding C. Programmatic Environmental, Safety, and Health Evaluation 16

Part II - Additional Information

Appendix A. Audit Process
Scope 24
Methodology 24
Management Control Program 25
Prior Audits and Other Reviews 25
Appendix B. Other Areas Reviewed 27
Appendix C. Management's Corrective Actions Initiated During the Audit 32
Appendix D. Summary of Program Restructures 37
Appendix E. Required Environmental, Safety, and Health Analyses 39
Appendix F. Defense Contract Management Command Actions Taken 41
Appendix G. Report Distribution 42

Part III - Management Comments

Office of the Under Secretary of Defense for Acquisition and Technology Comments 46
Department of the Air Force Comments 47

Part I - Audit Results

Audit Background

The Minuteman III is expected to be the United States' only fielded land-based intercontinental ballistic missile system after the year 2003, when the Minuteman II and Peacekeeper missiles are retired as a result of arms control initiatives. The Minuteman III Guidance Replacement Program (the Guidance Replacement Program) is part of a DoD initiative to extend the life of the Minuteman III through the year 2020. The Guidance Replacement Program replaces the existing missile guidance set and increases guidance system reliability. The Director, Intercontinental Ballistic Missile System Program Office (System Program Office), executes the overall acquisition management for the Guidance Replacement Program. The Guidance Replacement Program Manager manages the daily operations of the program.

In July 1992, DoD submitted to Congress the "Minuteman III Life Extension Report," which documented the need and practicality of extending the service life of the Minuteman III beyond the year 2010. Based on the report, the Joint Requirements Oversight Council validated a Mission Need Statement for the Guidance Replacement Program in November 1992.

In August 1993, the Deputy Assistant Secretary of the Air Force (Acquisition) approved the Guidance Replacement Program for entry into the engineering and manufacturing development phase of the acquisition process. The Air Force Materiel Command awarded Rockwell International, Autonetics and Missile Systems Division (called Boeing North American Incorporated, Autonetics and Missile Systems Division, after December 6, 1996), a cost-plus-award-fee contract in August 1993 to develop the guidance replacement set. The Boeing North American Incorporated (Boeing) contract value was $253.3 million.

The Air Force Program Executive Officer for Space Programs is scheduled to consider the readiness of the Guidance Replacement Program to enter low-rate initial production no later than March 1998. Because the Guidance Replacement Program is an acquisition category IC program, the Air Force Acquisition Executive will make the full-rate production decision. The decision is planned for no later than December 1998. The Air Force funded the Guidance Replacement Program for $1.9 billion (then-year dollars) to procure 652 missile guidance sets through FY 2003.

Audit Objective

The primary audit objective was to evaluate the overall management of the Guidance Replacement Program and to determine whether the System Program Office was cost-effectively developing and making ready the system for low-rate initial production. We followed our critical program management elements approach for the audit and tailored the approach to the engineering and manufacturing development phase of the acquisition process. We reviewed program definition, program structure, program design, contracting, program assessments and decision reviews, periodic reporting, and the management control program related to the audit objective. Appendix A discusses the audit process used to accomplish the audit objective as well as management controls and prior audit coverage. Appendix B discusses other audit areas reviewed. Appendix C discusses positive actions that the System Program Office took or planned relative to the audit objective, including:

o developing more specific exit criteria to support awarding the low-rate initial production contract and

o reducing program risk through restructuring the program to delay the award of the low-rate initial production contract and to allow for additional testing before starting production.

Finding A. Independent Cost Estimate

The Director, System Program Office, would have benefited from requesting the Office of the Deputy Assistant Secretary of the Air Force (Cost and Economics) to perform an Air Force Component Cost Analysis (independent cost estimate) to assess the impact of two major program restructures. The Director did not request an independent cost estimate because DoD required the updated estimates only to support program milestone reviews. Although not required, an independent cost estimate would increase the confidence of the Air Force Acquisition Executive that updated program cost estimates reflect a realistic appraisal of the most likely program cost that the Air Force will realize.

Estimating Program Costs

DoD acquisition and budget communities rely on the reconciliation of two types of cost estimates to determine the most likely life-cycle costs for acquisition category IC programs. The estimates are the program manager's cost estimate and an estimate performed independently of the System Program Office.

Program Manager's Cost Estimate. DoD Regulation 5000.2-R, "Mandatory Procedures for Major Defense Acquisition Programs (MDAPs) and Major Automated Information Systems (MAIS) Acquisition Programs," March 15 1996, requires that program managers prepare an estimate of program life-cycle costs beginning at Milestone I, "Approval to Begin a New Acquisition Program," and at each following milestone. Program managers are also to update their cost estimates as necessary to support annual budget submissions. The program manager's cost estimate is to include estimates of total expected life-cycle expenditures for development, production, and support of a weapon system. Program managers are to base their estimates on careful assessments of risk and realistic appraisals of costs most likely to be realized.

Independent Cost Estimate. For acquisition category IC programs, DoD Regulation 5000.2-R requires a Component cost agency to prepare an independent cost estimate for reconciliation with the program manager's cost estimate and before program milestone reviews. In the Air Force, the Office of the Deputy Assistant Secretary of the Air Force (Cost and Economics) is responsible for preparing the Air Force independent cost estimate, called the Component Cost Analysis. The purpose of the independent cost estimate is to provide decisionmakers with an unbiased estimate of program life-cycle costs.

The estimate is independent because the organization that prepares the estimate is separate from the program's acquisition chain of command. Based on the reconciliation of any significant differences between the independent cost estimate and the program manager's cost estimates, the Air Force Acquisition Executive can have a better idea of the most likely cost of a program. While DoD Regulation 5000.2-R requires that the Office of the Deputy Assistant Secretary of the Air Force (Cost and Economics) prepare an independent cost estimate before program milestone reviews, independent cost estimates can also be useful to program decisionmakers between major milestone reviews. Specifically, the Defense Acquisition Deskbook states that an independent cost estimate can help programs to stay on track and within budget at all stages of the acquisition cycle.

Program Restructures

Although two major program restructures materially impacted program costs, the Director, System Program Office, did not obtain an independent cost estimate to verify that the program manager's cost estimate reflected a realistic appraisal of the level of cost that the program would most likely realize. In both January 1995 and February 1997, the Air Force significantly increased program costs and increased the length of the planned development and production efforts over what it programmed when the Guidance Replacement Program entered into engineering and manufacturing development in August 1993. From January 1995 through February 1997, the Air Force increased development costs by 21 percent, from $452 million to $547 million, and increased production costs by 12 percent, from $1.18 billion to $1.32 billion. Similarly, the program restructures lengthened the development and production phases by 1 year. The Air Force Acquisition Executive made the program restructures to adjust for unexpected technical challenges, to reduce program risks, and to adjust for program budget cuts. Appendix D provides a synopsis of the two program restructures and the reasons for them.

Reason for Not Requesting Independent Cost Estimates

The Director, System Program Office, did not request that the Office of the Deputy Assistant Secretary of the Air Force (Cost and Economics) perform an independent cost estimate because independent cost estimates were mandatory only for support of program milestone reviews. The Director also advised that

the Deputy Assistant Secretary of the Air Force (Cost and Economics) had limited staffing resources and could not perform independent cost estimates between program milestone reviews for all Air Force programs. When queried, the Office of the Deputy Assistant Secretary of the Air Force (Cost and Economics) advised that it would make resources available to perform an independent cost estimate of the Guidance Replacement Program, if the System Program Office requested.

Benefits of Performing an Independent Cost Estimate

We recognize that independent cost estimates are not mandatory between program milestone reviews. However, since approval of the program cost baseline at the engineering and manufacturing development decision, estimated development and production costs have significantly grown and the program manager's estimates have been revised upward. The need to independently verify the reasonableness of the System Program Office's revised cost estimates justifies the use of the limited independent cost estimate resources within the Air Force. By requesting an independent cost estimate and reconciling it with the System Program Office, the Director, System Program Office, could provide the Air Force Acquisition Executive with better assurance of the level of cost that the restructured program will most likely realize and could enhance his ability to provide funding stability and to make decisions related to program affordability.

Recommendations and Management Comments

A. We recommend that the Director, Intercontinental Ballistic Missile System Program Office:

1. Request the Deputy Assistant Secretary of the Air Force (Cost and Economics) to perform an independent cost estimate to validate the latest System Program Office cost estimate for the Minuteman III Guidance Replacement Program before the low-rate initial production program review planned for March 1998.

Principal Deputy Assistant Secretary of the Air Force (Acquisition) Comments. The Principal Deputy Assistant Secretary, responding for the Director, System Program Office, concurred, stating that an Air Force team will begin an independent cost estimate in August 1997.

2. Reconcile the Intercontinental Ballistic Missile System Program Office cost estimate with the results of the independent cost estimate and update the Intercontinental Ballistic Missile System Program Office's cost estimate, as necessary.

Principal Deputy Assistant Secretary of the Air Force (Acquisition) Comments. The Principal Deputy Assistant Secretary, responding for the Director, System Program Office, concurred, stating that the Air Force will reconcile any differences between the independent team's cost estimate and the estimate of the System Program Office at the completion of the independent cost estimate.

Finding B. Contract Estimate at Completion

The System Program Office could improve the effectiveness of its resources to monitor, assess, and estimate contract costs for the prime contract. The System Program Office would be able to develop more realistic assessments of the estimated contract costs if it provided the staff with additional experience and training to assess the estimated costs needed to complete the contract. Additionally, the memorandum of agreement between the System Program Office and the Defense Contract Management Command (DCMC) did not require the DCMC staff to support estimate-at-completion reviews or to provide independent assessments of the estimated prime contract costs. More effective monitoring and DCMC support may increase the accuracy of the assessment of estimated prime contract costs and would provide the Director, System Program Office, with an improved basis for making effective management decisions concerning funding needed to complete the contract.

Procedures for Monitoring Contractor Performance

The objectives of a cost and schedule control system, or earned value management system,* are to ensure that DoD contractors:

o use effective management control systems and procedures that indicate work in progress and that properly relate cost, schedule, and technical performance and

o provide DoD managers with valid, timely, and auditable contract performance information on which to base responsible management decisions.

*The Under Secretary of Defense for Acquisition and Technology signed a policy memorandum on December 14, 1996, to replace the 35 cost and schedule control system criteria with 32 earned value management system guidelines from industry.

A cost and schedule control system must specify that the contractor measure actual work progress by "earned value," an objective measure of how much work the contractor accomplished on the contract compared with the planned work.

Contract Estimate at Completion. DoD Regulation 5000.2-R requires contractors to comply with reporting requirements for cost and schedule control system criteria on research, development, test, and evaluation contracts with a value of at least $70 million (in FY 1996 constant dollars). Periodically, contractors are required to submit to the Government a comprehensive estimate of the final contract costs, which is called the contract estimate at completion (EAC). The EAC is the sum of the actual cost of work completed and the contractor's estimate of the costs to complete the remaining contract work. To compute the EAC, the contractor evaluates cost and schedule performance trends for completed work and compares them with the budgets for remaining work. The contractor applies the trend analysis to future work efforts to estimate the costs to complete the remaining work. Although the cost and schedule control criteria do not establish specific time periods for contractors to develop comprehensive estimates of final contract costs, most contractors perform an EAC review at least annually.

Monitoring and Assessing Contract Costs. DoD Regulation 5000.2-R requires contractors working under cost and schedule control criteria to provide periodic cost performance reports to Government program managers. The cost performance report is the primary means by which contractors report cost and schedule performance trends, including the contract EAC, to program managers. Cost performance is a ratio of the value of work performed compared with actual work costs. Schedule performance is a ratio of work accomplished compared with work planned. A ratio of 100 percent efficiency indicates that the contractor's cost or schedule performance is as planned. A ratio of more than 100 percent efficiency indicates that the contractor's cost or schedule performance is better than planned. A ratio of less than 100 percent efficiency indicates that the contractor's cost or schedule performance is worse than planned.

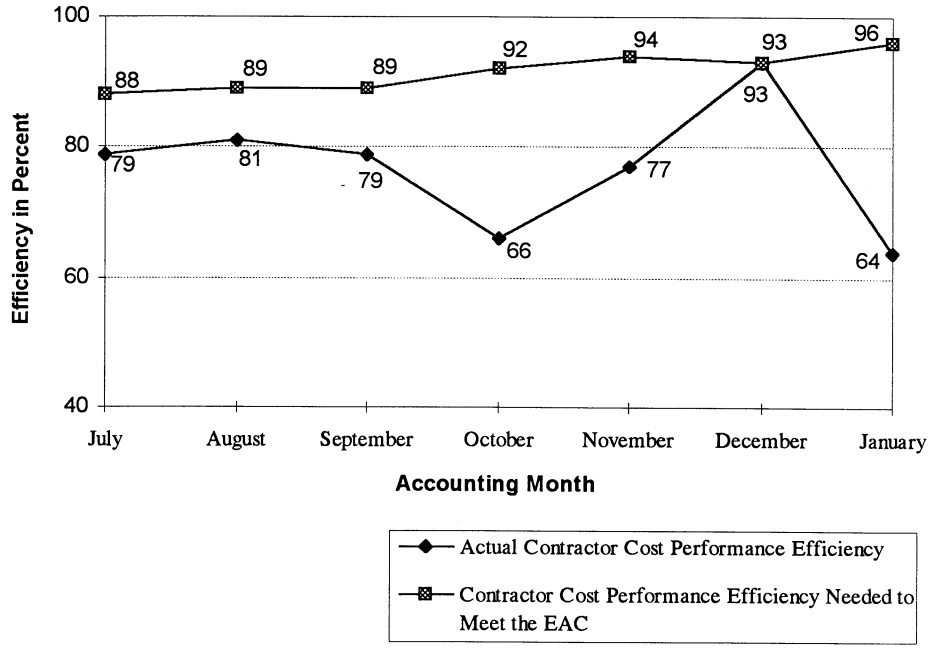
Reporting Contract Costs. DoD program managers report cost and schedule data, including estimated final contract costs, to the Office of the Secretary of Defense through the quarterly Defense Acquisition Executive Summary report. The report provides the Under Secretary of Defense for Acquisition and Technology with advance indicators of potential contract cost, schedule, or performance problems before an acquisition program deviates from the approved program baseline.

Process for Monitoring Contract Estimate at Completion

The System Program Office could improve the effectiveness of its resources to better monitor, assess, and estimate contract costs for the prime contract. Specifically, during EAC reviews, the System Program Office staff had not adequately considered recent contractor cost performance trends as an indicator of future performance and to forecast the contract EAC.

After the December 1995 EAC review, the Director, System Program Office, reported the first significant cost increase on the prime contract. The Director reported a contract EAC increase from $261.8 million to $320.4 million, or an increase of 22 percent. The System Program Office attributed most of the $58.6 million increase to the cumulative effect of program funding instability, less-than-expected contractor performance, and new contract requirements. Shortly after reporting the first cost increase, the System Program Office and Boeing recognized that the contractor was using management reserve funds for the contract at a faster rate than anticipated. As a result, the System Program Office and Boeing performed another EAC review in July 1996 and raised the EAC to $341.1 million. The System Program Office attributed the contract cost increases to unanticipated design problems, underestimated staff needs, and unexpected problems with manufacturing some peculiar support equipment.

During the December 1995 and July 1996 EAC reviews, the System Program Office reviewed and analyzed past contract performance, the amount of work remaining, and the resources available to perform the work. However, the System Program Office relied on cumulative cost performance trends, rather than recent cost performance trends, as an indicator of future performance to assess the reasonableness of the contract EAC. For example, Boeing would need to perform at an 88-percent cost efficiency for the remainder of the contract to attain the $341.1 million contract EAC that the System Program Office reported in July 1996. Boeing's cost performance efficiency rate reached 88 percent only once during the 6 months ending June 1996 and ranged from 76 to 85 percent efficiency during the other 5 months. Beginning in August 1996, Boeing's cost performance efficiency rate was further impacted by Boeing adding staff to the contract to complete planned work. The addition of staff further contributed to Boeing not being able to improve its contract cost performance trends after July 1996. The following figure compares Boeing's monthly contract cost performance with the cost performance needed to attain the System Program Office's $341.1 million contract EAC from July 1996 through January 1997.



Cost Performance Comparison From July 1996 Through January 1997

From July 1996 through January 1997, Boeing's cost performance efficiency ranged from 64 percent to 93 percent. The gap between the two lines represents where Boeing's cost performance efficiency was less than that needed to meet the contract EAC. In January 1997, the Director reported another cost increase, a $376 million contract EAC, because it was unlikely that Boeing could meet the contract EAC established in July 1996.

Technical Staff Experience and Training

The System Program Office would be able to develop more realistic assessments of the estimated contract costs if it provided the staff with additional experience and training to assess the estimated costs needed to complete the contract. Although additional earned value experience and training does not necessarily eliminate contractor cost and schedule performance problems, it can help the program staff to better identify and understand the impact of contractor performance problems and better plan to mitigate those problems. The "Earned Value Management Implementation Guide," December 1996, states that

program office technical staff should be adequately trained before performing contractor reviews. Specifically, the staff members should receive training to:

o conduct contractor performance reviews,

o understand contractor performance measurement and the specifics of the contractor's earned value management system, and

o perform recurring reviews and analyses of the baseline and performance data.

While the System Program Office staff was familiar with Boeing's cost and schedule control system, the staff had not received formal performance measurement training before performing EAC reviews in December 1995 and July 1996. The Director, System Program Office, stated that the Guidance Replacement Program staff were relatively new to the acquisition process. Also, the Guidance Replacement Program Manager stated that the December 1995 EAC review was primarily contractor-led because of the inexperience of his staff in performing EAC reviews. The Program Manager stated that his staff was better prepared to perform the July 1996 EAC review. Specifically, he stated that his staff had 6 months more experience with the program and took a much more active role in performing a bottom-up review of the program. As evidenced by the results of the July 1996 EAC review, the Guidance Replacement Program technical staff could still benefit from training on contractor performance management before conducting future EAC reviews.

The Earned Value Management Information Guide also states that cost and schedule control system support organizations can provide qualified personnel to assist in conducting EAC reviews. Based on the limited System Program Office experience, the Director should obtain assistance from qualified personnel within the Air Force to provide advice and assistance during the next baseline review. In that regard, the Air Force Materiel Command, Weapon System Cost Branch, and its subordinate command, Space and Missile Command, have technical staff who are qualified to help ensure that program office staff can provide program managers with accurate assessments of the contractor's performance measurement baseline. The Space and Missile Command has staff who are familiar with the Guidance Replacement Program and have provided cost and schedule program support to the Guidance Replacement Program in the past on an as-needed basis. During a discussion with a Space and Missile Command staff member, he stated that his organization would be willing to assist the System Program Office; however, that direction should be made through the Air Force Materiel Command.

DCMC Field Office Role in the EAC Review Process

The memorandum of agreement between the Director, System Program Office, and the Commander, DCMC Santa Ana-Boeing, did not require the DCMC office to participate in EAC reviews or to provide the Director with an independent assessment of the contract EAC. Accordingly, the DCMC Santa Ana-Boeing cost performance measurement monitor had not routinely provided the System Program Office with an independent assessment of Boeing's EAC. Defense Logistics Agency Directive 5000.4, "Contract Management," June 1995, requires that cost performance measurement monitors at DCMC field offices support DoD program managers by participating in contract EAC reviews. The Directive further requires the monitors to provide DoD program managers with an independent assessment of the reported contract cost and schedule performance. The independent assessment should include an assessment of the contractor's EAC. Had the DCMC field office routinely performed and reported an independent EAC assessment to the System Program Office, the Director may have received a more timely and accurate assessment of the impact of unfavorable cost variances on the contract costs. Because DCMC Santa Ana-Boeing and the System Program Office implemented actions to better monitor the contract EAC, this report makes no recommendations to improve DCMC program support.

Impact on Program Management and Budget Decisions

Since the start of the engineering and manufacturing development phase in August 1993, the System Program Office reported that the EAC increased from $253.3 million to $376.0 million, or an increase of 48 percent. The $122.7 million contract EAC increase was primarily attributed to program funding instability, increased contract scope, and technical and schedule-related impacts. For some of the contract EAC increases, the System Program Office staff did not accurately assess the impact of Boeing's unfavorable contractor cost and schedule performance trends on the contract EAC. More effective monitoring and DCMC support will help increase the accuracy of the assessment of estimated prime contract costs and will provide the Director, System Program Office, with an improved basis for making effective management decisions concerning funding needed to complete the contract. Also, the System Program Office can provide Defense and Air Force Acquisition Executives with reliable EAC information in the Defense Acquisition Executive Summary reports to perform their acquisition oversight

responsibilities and to make timely program decisions concerning estimated program costs needed to complete the Guidance Replacement Program engineering and manufacturing development phase of the contract.

Management Actions

In response to suggestions made during the audit, the Director, System Program Office, initiated some corrective actions to help resolve conditions identified in this finding. Specifically, the Director, System Program Office, and the Commander, DCMC Santa Ana-Boeing, updated the memorandum of agreement to include DCMC Santa Ana-Boeing as part of future EAC reviews. Also, the updated memorandum of agreement requires that DCMC Santa Ana-Boeing provide monthly status reports to the System Program Office that include an independent assessment of the contract EAC. Finally, in December 1996, the Director, System Program Office, reported a more realistic prime contract EAC to the Office of the Secretary of Defense. The revised EAC for the prime contract is $376 million and is consistent with recent contractor cost performance trends.

While those actions respond to most of the audit observations, the Director, System Program Office, would further benefit from the Air Force Materiel Command participating in a System Program Office EAC review. Also, the System Program Office staff should receive contractor performance management training to ensure that they adequately monitor and assess the prime contract costs.

Management Comments on the Finding and Audit Response

Management Comment. The Principal Deputy Assistant Secretary of the Air Force (Acquisition) suggested that we revise the tone of the finding paragraph to more accurately reflect the issue.

Audit Response. We revised the final report as suggested with the following exception. The suggested change did not include a statement of cause for the condition noted in the finding. We inserted a sentence which explains that, at the time of our review, the System Program Office staff needed additional training and experience to more accurately assess estimated contract cost.

Recommendations and Management Comments

B. We recommend that the Director, Intercontinental Ballistic Missile System Program Office:

1. Request, through the Air Force Materiel Command, that the Space and Missile Command provide assistance and advice to the Intercontinental Ballistic Missile System Program Office during the next estimate-at-completion review.

Principal Deputy Assistant Secretary of the Air Force (Acquisition) Comments. The Principal Deputy Assistant Secretary, responding for the Director, System Program Office, concurred, stating that an Air Force Materiel Command cost expert is providing financial consultation to the program office and will assist during an integrated baseline review scheduled for August 1997.

2. Schedule contractor performance management training for Minuteman III Guidance Replacement Program Office staff performing cost and schedule performance analyses.

Principal Deputy Assistant Secretary of the Air Force (Acquisition) Comments. The Principal Deputy Assistant Secretary, responding for the Director, System Program Office, concurred, stating that Guidance Replacement Program staff that are participating in financial analysis will be trained between August 1997 and June 1998.

Finding C. Programmatic Environmental, Safety, and Health Evaluation

The System Program Office did not plan to develop a programmatic environmental, safety, and health evaluation before the full-rate production decision to the extent required by the new DoD Regulation 5000.2-R. The System Program Office did not plan to meet the revised acquisition policy requirements for the evaluation because the Guidance Replacement Program staff had developed an environmental, safety, and health evaluation process by following the acquisition policy in force in 1993 and because the Guidance Replacement Program was granted an exclusion from the requirement for an environmental impact analysis. In March 1996, DoD Regulation 5000.2-R changed acquisition policy to require that all programs conduct environmental, safety, and health analyses in the system engineering process. Without performing the required programmatic environmental, safety, and health evaluation, the System Program Office will not have assurance that it is aware of mission and cost impacts arising from environmental, safety, and health issues.

Environmental, Safety, and Health Policy

DoD Regulation 5000.2-R requires that all programs, regardless of acquisition category, conduct environmental, safety, and health analyses in the system engineering process. The analyses are to support the development of a programmatic environmental, safety, and health evaluation that is required at milestone decision reviews. Acquisition managers use the programmatic environmental, safety, and health evaluation to:

- describe the program manager's strategy for meeting environmental, safety, and health requirements;
- establish program responsibilities; and
- identify how a program manager will track progress.

DoD Regulation 5000.2-R requires greater program manager consideration of environmental impacts when planning and performing system design and

engineering than was required under the predecessor policy in DoD Instruction 5000.2, "Defense Acquisition Management Policies and Procedures," February 23, 1991.

Appendix E describes the various types of analyses that program managers are required to conduct as part of the programmatic environmental, safety, and health evaluation.

Environmental, Safety, and Health Evaluation

The System Program Office did not plan to develop a programmatic environmental, safety, and health evaluation before the full-rate production decision. Air Force and contractor personnel will perform programmatic actions that will have potential environmental impact at the Boeing Guidance and Repair Center in Heath, Ohio, and the Boeing manufacturing facility in El Paso, Texas. By following the approved acquisition policy in force in 1993 in developing an environmental, safety, and health evaluation process, the Guidance Replacement Program staff identified hazardous materials and performed an Occupational Health Hazard Assessment to identify feasible substitutes.

The new missile guidance sets (designated NS-50) will contain materials that the draft Guidance Replacement Program Occupational Health Hazard Assessment identifies as hazardous. The contractor also used some of the same materials in the existing missile guidance sets (designated NS-20). Examples of hazardous materials used in the Minuteman III guidance system include lithium and carbonmonofluoride, which are contained in the strategic random access memory battery for the new missile guidance set. Additionally, missile maintainers plan to use substances in the missile maintenance process, such as acetone and chromic acids, which are also identified as hazardous materials.

Programmatic actions primarily involve the planned procedures for upgrading the missile guidance sets. Beginning in FY 1999, the Air Force will replace failed NS-20 missile guidance sets with the new NS-50 missile guidance sets. The Air Force will ship the replaced NS-20 missile guidance sets to the Boeing Guidance and Repair Center in Heath, Ohio, where the computer, missile guidance set control, and electrical wiring will be removed and the gyro-stabilized platform will be disassembled. The Air Force will then ship the missile guidance sets to the contractor facility in El Paso, where the contractor will install the NS-50 missile guidance set components. The contractor will

forward the upgraded sets to various storage locations where the Air Force will use them to replace other failed NS-20 missile guidance sets. Of the 652 NS-50 missile guidance sets to be procured, the Air Force will put 500 missile guidance sets on alert, with the remainder used for spares and engineering support. The Air Force will store the excess NS-20 missile guidance set components in locations yet to be determined and will use them as serviceable spares until FY 2005, when it plans to begin demilitarization and disposal of the components. The Guidance Replacement Program has established a draft plan and budgeted funds for the storage and demilitarization of the NS-20 missile guidance set.

Implementing Environmental, Safety, and Health Policy

The System Program Office did not plan to meet the revised requirements for the evaluation because Guidance Replacement Program staff had developed an environmental, safety, and health evaluation process by following the acquisition policy in force in 1993. The Guidance Replacement Program was granted an exclusion from the requirement for an environmental impact analysis as required by the predecessor to DoD Regulation 5000.2-R, DoD Instruction 5000.2, "Defense Acquisition Management Policies and Procedures," February 23, 1991. In March 1996, DoD Regulation 5000.2-R changed acquisition policy to require that all programs conduct environmental, safety, and health analyses in the system engineering process.

Program Exemptions. The System Program Office received environmental impact categorical exclusions from the Air Force Environmental Planning Director in March 1993 and the Air Logistics Center Environmental Impact Director in October 1991 exempting it from the requirement in DoD Instruction 5000.2 to prepare programmatic environmental impact analyses in support of the full-rate production decision. The categorical exclusions were supported by an environmental assessment performed by Vandenberg Air Force Station for Minuteman launches in April 1976 and a Candidate Environmental Statement for the Minuteman Program signed in November 1973.

The Council on Environmental Quality National Environmental Policy Act Regulations, however, recommend that agencies reexamine environmental impact statements that are more than 5 years old. Also, an official in the Deputy Under Secretary of Defense for Environmental Security office stated that the courts have ruled that agencies must update environmental documentation every 5 years. Additionally, the 20-year categorical exclusions

focused on the impact of test flights and did not address the environmental impact of replacing missile guidance sets and disposing of associated hazardous materials.

Performance of Evaluation. Program managers are required to prepare the initial environmental, safety, and health evaluation in support of Milestone I, "Approval to Begin a New Acquisition Program." Once the program completes the initial evaluation, DoD Regulation 5000.2-R requires that program managers continually update the evaluation throughout the life cycle of the program. Because the System Program Office staff did not recognize that the DoD Regulation 5000.2-R evaluation requirement applied to ongoing programs as well as new starts, they did not prepare the initial evaluation.

Benefits of Environmental, Safety, and Health Evaluation

When program managers perform the analyses required for the programmatic environmental, safety, and health evaluation, they gain timely information on the potential environmental, safety, and health impacts of developing, fielding, storing, demilitarizing, and disposing of their weapons system. That information is critical because any unforeseen environmental, safety, or health impact that violates local, state, or Federal law can cause lengthy program delays and enormous mission and cost impacts. Therefore, it is only prudent for a program to analyze and document all possible programmatic actions that may require National Environmental Policy Act or Executive Order analyses.

The System Program Office staff already has access to much of the information needed to support a programmatic environmental, safety, and health evaluation. In March 1997, Boeing provided safety information in the Occupational Health Hazard Assessment and the System Safety Hazard Analysis Report, and in August 1996, the System Program Office published pollution prevention information in the Pollution Prevention Program Plan. A well prepared programmatic environmental, safety, and health evaluation that would identify, analyze, and resolve potential environmental impact "show stoppers" as early as possible would help System Program Office staff to handle hazardous materials in the most expedient and cost-effective manner possible while staying within program cost, schedule, and performance goals.

Management Comments on the Finding and Audit Response

Management Comments. The Principal Deputy Assistant Secretary of the Air Force (Acquisition) suggested that we revise the first and second paragraphs of the subsection entitled "Environmental, Safety, and Health Evaluation." Specifically, the Principal Deputy suggested changes to recognize that the Guidance Replacement Program Office followed approved policy as of 1993 in developing its environmental, safety, and health evaluation process.

Audit Response. We revised the final report to recognize that the Guidance Replacement Program staff had followed the acquisition policy in force in 1993 when developing its environmental, safety, and health evaluation process and that the staff had performed an Occupational Health Hazard Assessment to identify hazardous materials. We also changed "Heath Air Force Station, Ohio" to "Boeing Guidance and Repair Center in Heath, Ohio." However, we did not remove other text in the two paragraphs that explains that the contractor was using hazardous materials in the new missile guidance sets.

Management Comments. The Principal Deputy Assistant Secretary of the Air Force (Acquisition) suggested that we delete the section entitled "Implementing Environmental, Safety, and Health Policy" because the first three paragraphs provided information contained elsewhere and because the third paragraph contained other agency recommendations.

Audit Response. We did not delete the section. The section discusses in greater detail topics mentioned earlier in the finding to provide the reader with details on:

- the specific regulations that the Guidance Replacement Program staff followed in developing their planned environmental evaluation process and

- the reasons that the documentation supporting the program exemptions from the requirement for environmental impact analysis was no longer valid.

Additionally, the guidance contained in the Council on Environmental Policy Act Regulations are germane to the finding because the regulations apply to DoD as well as to other Government agencies.

Management Comments. The Principal Deputy Assistant Secretary of the Air Force (Acquisition) requested that we delete the first paragraph of the section entitled, "Benefits of Environmental, Safety, and Health Evaluation."

Audit Response. We did not delete the first paragraph because it informs the reader of the significant benefits of performing the analyses required for the programmatic environmental, safety, and health evaluation.

Recommendation and Management Comments

C. We recommend that the Director, Intercontinental Ballistic Missile System Program Office, prepare a programmatic environmental, safety, and health evaluation before the full-rate production decision milestone review for the Minuteman III Guidance Replacement Program.

Principal Deputy Assistant Secretary of the Air Force (Acquisition) Comments. The Principal Deputy Assistant Secretary, responding for the Director, Intercontinental Ballistic Missile System Program Office, concurred, stating that the Air Force will perform a Programmatic Environmental, Safety, and Health Evaluation before the Guidance Replacement Program full-rate production milestone review, scheduled for December 1998.

Part II - Additional Information

Appendix A. Audit Process

Scope

We conducted this program management element audit from July 1996 through March 1997 in accordance with auditing standards issued by the Comptroller General of the United States, as implemented by the Inspector General, DoD, program management element approach. Accordingly, we included tests of management controls as considered necessary. We reviewed acquisition data dating from November 1973 through March 1997 covering the Guidance Replacement Program engineering and manufacturing development phase as well as earlier related work on the Guidance Replacement Program. Because of prior program coverage in Inspector General, DoD, Report No. 96-162, "Risk Management," June 14, 1996, we did not review the risk management program management element. To perform the audit, we interviewed and obtained documentation from the staffs of the System Program Office; DCMC Santa Ana-Boeing, Boeing Autonetics and Missile Systems Division; several Boeing subcontractors; and other DoD and Air Force oversight offices.

Methodology

We reviewed program definition, program structure, program design, contracting, program assessments and decision reviews, periodic reporting, and management controls related to the audit objective. We did not rely on computer-processed data or statistical sampling procedures to develop conclusions on this audit. Technical experts from the Technical Assessment Division in the Analysis, Planning, and Technical Support Directorate of the Inspector General, DoD, assisted in the analysis of operational requirements, engineering design, testing, production, specialized test equipment, and management. The technical experts accompanied the auditors on visits to the System Program Office, DCMC Santa Ana-Boeing, and the Boeing Autonetics and Missile Systems Division.

Contacts During the Audit. We visited or contacted individuals and organizations within DoD and the Boeing Autonetics and Missile Systems Division. Further details are available on request.

Management Control Program

DoD Directive 5010.38, "Management Control (MC) Program," August 26, 1996, requires DoD managers to implement a comprehensive system of management controls that provides reasonable assurance that programs are operating as intended and to evaluate the adequacy of those controls.

Scope of Review of Management Control Program. We limited our review of management controls because of relevant coverage in Inspector General, DoD, Report No. 96-028, "Implementation of the DoD Management Control Program for Major Defense Acquisition Programs," November 28, 1995. The report discusses the effectiveness of the management control program that the Defense Acquisition Executive and the Component Acquisition Executives used for major Defense acquisition programs. The report concludes that the acquisition community had not effectively integrated DoD Management Control Program requirements into its management assessment and reporting processes. As a result of the report recommendations, the Under Secretary of Defense for Acquisition and Technology integrated DoD Directive 5010.38 requirements into the March 15, 1996, revision to DoD Directive 5000.1, "Defense Acquisition," and DoD Regulation 5000.2-R. Acquisition managers are now to use program cost, schedule, and performance parameters as control objectives to implement the DoD Directive 5010.38 requirements. The managers are to identify material weaknesses through deviations from approved acquisition program baselines and exit criteria in the Defense Acquisition Executive Summary report. Consequently, we limited our review to management controls directly related to the critical program management elements of the Guidance Replacement Program acquisition.

Adequacy of Management Controls. Management controls were adequate as they applied to our primary audit objective.

Prior Audits and Other Reviews

Since FY 1992, the General Accounting Office and the Inspector General, DoD, have each issued one report that related directly to our audit effort:

o General Accounting Office Report No. NSIAD 93-181 (OSD Case No. 9408), "ICBM Modernization: Minuteman III Guidance Replacement Program Has Not Been Adequately Justified," June 1993. The General Accounting Office concluded that beginning engineering and manufacturing

development of the first phase of the Guidance Replacement Program was premature and recommended that the Secretary of the Air Force delay a decision to begin engineering and manufacturing development until the Air Force developed sufficient analytical evidence to clearly demonstrate that the start of the effort was justified. The Air Force nonconcurred with the General Accounting Office, stating that it had sufficient evidence to indicate that the degradation of the existing missile guidance set could reasonably be expected to adversely impact the Minuteman III weapon system reliability. The Guidance Replacement Program proceeded into the engineering and manufacturing development phase in August 1993.

o Inspector General, DoD, Report No. 96-162, "Risk Management," June 14, 1996, discusses the effectiveness of risk management programs for Defense acquisition systems. The audit evaluated risk management programs for five acquisitions, including the Minuteman III Guidance Replacement Program. Although the report made recommendations to address risk management, the report did not include any recommendations specific to the Guidance Replacement Program.

Appendix B. Other Areas Reviewed

The Air Force was effectively managing many areas of the program definition, program structure, program design, contracting, program assessment, and periodic reporting program management elements.

Program Definition

Requirements. The Air Force met requirements in DoD Regulation 5000.2-R for validating the requirements and quantities of the guidance replacement sets needed to sustain Minuteman III missile systems through the year 2020. The Air Force Chief of Staff validated the program's key performance parameters.

Analysis of Alternatives. In 1993, the Director, System Program Office, appropriately developed a cost and operational effectiveness analysis in support of the engineering and manufacturing development milestone review for the Guidance Replacement Program. The cost and operational effectiveness analysis gave adequate consideration to competing alternatives and the costs associated with each. Further, the floor and ceiling range of costs identified in the cost and operational effectiveness analysis assisted the Air Force Acquisition Executive in making the decision to pursue the development of the Guidance Replacement Program.

Program Structure

The Director, System Program Office, established an event-driven strategy that linked program decisions to demonstrated accomplishments in development, testing, initial production, and life-cycle support as specified in DoD Regulation 5000.2-R. In tailoring the acquisition strategy, the Director implemented acquisition reform initiatives including using integrated product teams, eliminating and tailoring contract data requirements lists, and implementing clear accountability in design. The Director also considered cost as an independent variable in making program decisions. The Director's implementation of reform initiatives has enabled reductions in program office staffing, improved communication and decisionmaking, and decreased time to complete design reviews.

Program Design

Engineering and Manufacturing. With the exception of the environmental issues discussed in Finding C, the Air Force and the contractor were effectively managing engineering and manufacturing. During the engineering and manufacturing development phase, the System Program Office and Boeing prepared engineering and manufacturing documents that adequately addressed systems engineering, software, human resources, and producibility as specified in DoD Regulation 5000.2-R. Specifically, Boeing submitted and implemented an Integrated Product Development Plan with 20 appendixes covering areas such as reliability, maintainability, testability and integrated diagnostics, software development, human engineering, and manufacturing and production. The contractor's plan adequately documented the systems engineering process, the program planning and control processes, and specialty and discipline integration plans for the Guidance Replacement Program. The activities were described in the context of Boeing's integrated product team organization. Each integrated product team includes members knowledgeable in disciplines required to develop its assigned product build-to, train-to, and support-to packages. Further, the teams had clearly defined responsibilities with authority and accountability for all aspects of their product development.

Systems Engineering. The System Program Office and Boeing used the systems engineering process throughout the requirements, preliminary design, detailed design, and verification phases. Requirements and specification development were accomplished through the system requirements analysis process. The System Program Office analyzed and controlled preliminary and detail design compliance through a series of completed and ongoing interim, preliminary, and critical design reviews for the following: aerospace vehicle equipment and command and launch equipment, system test and operational support equipment, peculiar support equipment, and trainers. As a result of the restructured Guidance Replacement Program schedule, the System Program Office delayed the start of the critical design review for the aerospace vehicle equipment and command and launch equipment from December 1996 to April 1997. The verification phase of the system design effort is progressing through the use of analysis, simulation, inspection, and testing to verify that system and end-item design and performance requirements are met.

Software. As required by DoD Regulation 5000.2-R, the System Program Office prepared the Computer Resources Life Cycle Management Plan, and Boeing prepared the Software Development Plan as part of the Independent Product Development Plan. Also, the System Program Office conducted software

critical design reviews for the operational flight program and the operational ground program. Boeing took appropriate actions to correct action items resulting from the software reviews. Under the restructured Guidance Replacement Program schedule, the start of the software test readiness review was postponed from December 1996 to no later than July 1997.

Human Resources. Boeing prepared a Human Engineering Plan for the Guidance Replacement Program as part of the Independent Product Development Plan. As specified in the Human Engineering Plan, the System Program Office and Boeing engineering personnel are taking an active role in integrated product teams for the following:

- o systems engineering and integration,
- o aerospace vehicle equipment and command and launch equipment,
- o system test and operational support,
- o peculiar support equipment, and
- o training.

As members of the integrated product teams, System Program Office and Boeing engineering personnel are helping to define and allocate human factors requirements, review drawings, analyze design concepts, evaluate and provide human factors rationale for the selected design, and support formal design reviews and hardware demonstrations.

The only change that the Guidance Replacement Program makes to the current Minuteman III missile in the area of human intent is the addition of human interface in the prearm design for the warhead that is contained in the Reentry Vehicle. Currently, the Minuteman III warhead prearm is not under direct human control. The Guidance Replacement Program warhead prearm will require direct human interface for its enable and launch commands.

Producibility. Boeing submitted its Production and Manufacturing Plan as part of the Independent Product Development Plan. Boeing updated the plan periodically. The System Program Office prepared its Production Readiness Assessment Plan and held at least one production readiness review. The System Program Office also scheduled additional assessments and an additional production readiness review. Currently, Boeing is producing operational

models to be used in testing at the El Paso, Texas, plant and Honeywell's Clearwater, Florida, plant using full-rate production manufacturing processes. Both plants will produce low-rate initial production units.

Logistics. The System Program Office adequately addressed logistics requirements through the Integrated Logistics Support Plan. The System Program Office was implementing an Integrated Logistics Support Plan that included manpower, technical manuals, training, transportability, configuration management, computer-aided logistics support, and functional and physical configuration audits. Boeing is developing test and peculiar support equipment. The equipment is expected to satisfy system support requirements.

Contracting

The System Program Office awarded and managed contracts in accordance with the Federal Acquisition Regulation. Further, the System Program Office implemented contract actions necessary to support the engineering and manufacturing development phase of the acquisition process. In August 1993, the Air Force Materiel Command awarded a $253.3 million cost-plus-incentive-fee contract to Rockwell International, Autonetics and Missile Systems Division (changed to Boeing in December 1996). Since contract award, the Air Force has awarded contract incentives fees to Boeing for successfully designing and developing the hardware and software needed to upgrade the Guidance Replacement Program.

Program Assessments

In August 1993, the Air Force System Acquisition Review Council assessed the readiness of the Guidance Replacement Program to proceed into the engineering and manufacturing development phase of the acquisition process. To perform the assessment, the Review Council prepared an integrated program assessment on the Guidance Replacement Program as required by the DoD 5000 series of documents. Based on the Review Council's assessment, the Deputy Assistant Secretary of the Air Force (Acquisition) approved the Guidance Replacement Program for entry into the engineering and manufacturing development phase. In the August 1993 Acquisition Decision Memorandum, the Deputy Assistant Secretary delegated the approval authority for awarding the low-rate initial production contract to the Program Executive Officer for Space Systems. The low-rate initial production program review is scheduled for March 1998.

Overall, the Guidance Replacement Program was adequately progressing toward low-rate initial production. During the audit, management took corrective actions related to audit issues concerning the award of the low-rate initial production contract. The corrective actions are discussed in Appendix C.

Periodic Reporting

DoD Regulation 5000.2-R describes reports that program managers must prepare periodically to provide the Defense and Air Force Acquisition Executives and Congress with adequate information for overseeing the acquisition process and making necessary management decisions. Mandatory reports include the Defense Acquisition Executive Summary report and the Selected Acquisition Report.

Defense Acquisition Executive Summary Report. As required by DoD Regulation 5000.2-R, the Director, System Program Office, prepared quarterly Defense Acquisition Executive Summary reports from December 25, 1993, through January 25, 1997, that highlighted potential and actual program problems to the Office of the Under Secretary of Defense for Acquisition and Technology before the problems became significant. Our review of selected quarterly reports showed that the reports were adequate and accurate and that they realistically reported the Guidance Replacement Program status (with the exception of estimated contract costs as discussed in Finding B), including program assessments, unit costs, current estimates of the acquisition program baseline parameters, status reporting of exit criteria, and vulnerability assessments on the Guidance Replacement Program.

Selected Acquisition Reports. The Director, System Program Office, prepared annual Selected Acquisition Reports from December 1993 through December 1996 in accordance with instructions in the DoD Regulation 5000.2-R. Our review of the December 1995 and 1996 reports showed that the System Program Office realistically reported information on total program cost, schedule, and performance; program unit cost; and unit cost breaches.

Appendix C. Management's Corrective Actions Initiated During the Audit

During our audit, the Program Executive Officer for Space Programs; the Director, System Program Office; the Guidance Replacement Program Manager; and the Commander, DCMC Santa Ana-Boeing initiated corrective actions related to audit issues concerning program risks associated with the planned decision to award a low-rate initial production contract and improving DCMC support to the System Program Office. The Director and Program Manager formulated and the Program Executive Officer approved a revised and more specific set of exit criteria for award of the contract. They also reduced program risk through a program restructure, which will delay the planned June 1997 award of the low-rate initial production contract from 7 to 9 months, and added $43 million in research and development funding to the FY 1998 President's Budget. Further, the Commander, DCMC Santa Ana-Boeing, and the Director, System Program Office, took action to more effectively use DCMC resources in providing the System Program Office contract administrative information and in processing single-process initiative concept papers that affect the Guidance Replacement Program prime contract.

Revised Exit Criteria

On March 6, 1997, the Program Executive Officer for Space Programs approved revised exit criteria for the low-rate initial production program decision program review that is scheduled for no later than March 1998. The original exit criteria that the Office of the Secretary of Defense staff approved in August 1993 were general in nature. The original exit criteria were:

o satisfactory demonstration of the functional and technical requirements for the operational model hardware and engineering software and

o completion of an Air Force Operational Test and Evaluation Command operational assessment.

The revised exit criteria listed more specific accomplishments as prerequisites for awarding the low-rate initial production contract. Specifically, the Program Manager must complete the following steps:

- o critical design review of the aerospace vehicle equipment (guidance replacement hardware and system interface),
- o operational model box qualification,
- o flight proof testing,
- o operational model weapon system testing, and
- o drawings for low-rate initial production build-to-package.

Although the revised exit criteria did not specify that the Air Force Operational Test and Evaluation Command must complete an operational assessment before the program review, the Air Force test organization stated that it still planned to provide an operational assessment before the March 1998 program review.

Program Restructure

Rescheduled Test Events. In implementing the program restructure, the Director, System Program Office, rescheduled four significant test events from occurring after to occurring before the low-rate initial production decision program review.

Electromagnetic Compatibility Integration Missile Test. The Electromagnetic Compatibility Integration Missile test will verify the electromagnetic safety margins of the guidance replacement set and related new subsystems in their operational and functional environments.

Weapon System Pathfinder Test. The Weapon System Pathfinder test will confirm that the guidance replacement hardware, installed in a ground test missile, operates properly in a total weapon system environment. The test will also confirm that the command and destruct system will operate in the presence of all possible radio frequency radiation.

Simulated Electronic Launch Test for "B" Version Launch Facilities. The Simulated Electronic Launch test will verify that missile guidance set software will support a simulated missile launch at the "B" version launch facility. Similar testing for the other Minuteman launch facility, the"A"version, was already planned for completion before the low-rate initial production decision program review.

Minuteman B Integration Facility Minuteman Guidance Set and Propulsion System Rocket Engine Integration Test. The Minuteman B Integration Facility Minuteman Guidance Set and Propulsion System Rocket Engine Integration test will confirm physical fitness and compatibility between the missile guidance set and the propulsion system rocket engine and verify correct continuity on system cables.

Planned Additional Testing. In implementing the program restructure, the Director also accepted a Boeing proposal to perform additional preproduction testing before the production contract award. Boeing will perform additional preproduction testing using engineering and operational models of the missile guidance set at the Strategic Missile Integration Center from March through September 1997. Planned test objectives include:

o evaluating modifications to add needed extra voltage to the power distribution unit within the missile guidance set,

o debugging and repairing the guidance and control lab test set that Boeing plans to use to verify successful development of the missile guidance set,

o verifying test control plans that will be used to control testing on the guidance and control lab test set, and

o testing software for the operational version of the missile guidance set.

Boeing advised that the additional testing will provide its engineering and test personnel with an early opportunity to use the actual power supplies, connections, and ground equipment that will be used to test early production units. Additionally, the added testing will provide increased confidence in the hardware and software designs before entering into low-rate initial production.

Defense Contract Management Command Program Support

On March 14, 1997, the Commander, DCMC Santa Ana-Boeing, and the Director, System Program Office, updated their memorandum of agreement to more clearly define DCMC contract administrative support provided to the System Program Office. Specifically, they updated their memorandum of agreement for:

o providing monthly status reports to the Guidance Replacement Program Manager on the results of risk and cost performance assessments;

o participating in contractor financial and baseline reviews;

o providing DCMC Santa Ana-Boeing with full access to the software that the System Program Office used to coordinate program management issues that the various integrated product teams were addressing;

o supporting integrated product teams in performing technical design reviews, technical interchange meetings, and production readiness reviews; and

o coordinating and implementing the single-process initiative.

Benefits of clarifying DCMC responsibilities in the memorandum of agreement include maximizing the use of limited DCMC Santa Ana-Boeing resources, reducing misunderstanding of roles and responsibilities, and enhancing the established working relationship between DCMC Santa Ana-Boeing and the System Program Office.

The Commander also took action to streamline the single-process initiative process. DCMC Santa Ana-Boeing did not succeed in processing the first two concept papers received from the Boeing Autonetics and Missile Systems Division within the 120-day goal that the Under Secretary of Defense for Acquisition and Technology established in a December 8, 1995, policy memorandum. While the lack of timely processing of the two concept papers did not significantly impact the Guidance Replacement Program prime contract, the Commander recognized the need to improve the implementation of the single-process initiative. The Commander took actions to streamline processing of concept papers, which included providing for early interface between Boeing, key customers, and the Defense Contract Audit Agency before Boeing submits concept papers and holding roundtable meetings with key customers and the Defense Contract Audit Agency to evaluate the contractor's cost-benefit analysis relating to contract changes recommended in the concept papers. Finally, the

Commander developed a process to document management council decisions that will be included in the contract files with the contract modifications implementing the block changes. Appendix F contains the complete text of the Commander's actions taken.

Appendix D. Summary of Program Restructures

Program Restructure in January 1995

Cause of Restructure. The Air Force Acquisition Executive approved a restructure for the program in January 1995, based on the following factors:

o In preparing for the engineering and manufacturing development decision, the Director, Systems Program Office, baselined the schedule for the Guidance Replacement Program on the premise that the development contract would be awarded in August 1993 for $253.3 million and the low-rate initial production contract would be awarded within 33 months. At the time, the Office of the Secretary of Defense Cost Analysis Improvement Group indicated that the program's initial cost and schedule appeared ambitious. The Guidance Replacement Program Office was able to award the development contract to Boeing (formerly Rockwell) in August 1993 as planned. Because of a competing contractor's protest, however, Boeing experienced a 1-month delay in beginning work on the contract. The Under Secretary of Defense (Comptroller), in response to lower-than-planned obligations in FY 1993, issued Program Budget Decision 123 in December 1993 to reduce the program's FY 1993 research, development, test, and evaluation funding by $56 million.

o The Program Executive Officer for Space Programs had concerns with the risk associated with concurrent development and production schedules. As a result, the Office of the Secretary of Defense issued Program Budget Decision 120 on November 30, 1994, to realign program production funding from FY 1996 to FY 1997 and to reduce concurrency in program development and initial production schedules.

Results of Restructure. The resulting program restructure significantly increased estimated development and production costs for the program and stretched the development and production schedule.

Development Costs. In August 1993, the Air Force Acquisition Executive approved a program cost baseline of $452 million for developing the Guidance Replacement Program. In January 1995, the Director, System Program Office, increased the development cost estimate to $513 million as a result of the program restructure. The development cost included $340 million for the prime development contract and $173 million for other contracts and

other program costs. In July 1996, the Director revised the Guidance Replacement Program's development cost estimate downward to $494 million. The July 1996 estimate included $370 million for the prime development contract and $124 million for smaller contracts and personnel travel.

Production Costs. In August 1993, the approved program baseline for production cost was $1.2 billion for 652 units. The Director, System Program Office, increased the production cost to $1.3 billion as a result of the program restructure in January 1995. The System Program Office increased the production cost estimate because of the extension of the development program and the delayed start of production from July 1996 to June 1997.

Program Restructure in February 1997

On November 20, 1996, the Director, System Program Office, informed the Program Executive Officer for Space Programs of the need to extend the development schedule, stating that, while Boeing had made significant progress in the development effort, additional work would still require more time and funding. The additional development work included completion of a Worst Case Circuit Analyses before holding the critical design review and additional software development. The circuit analyses were critical to determining the functionality of the design. The software development effort would allow for better integration and checkout of guidance system software. As a result, the Air Force Acquisition Executive restructured the program in February 1997 after recognizing that the development effort had become more technically challenging than originally anticipated. The program restructure added development time needed to complete key development activities. Because of the restructure, the Air Force FY 1998 President's Budget submission increased budgeted program development costs to $547 million and projected production costs to $1.3 billion. The Air Force Acquisition Executive extended the development schedule to September 1998 from March 1998 and delayed the start of production to March 1998 from June 1997.

Appendix E. Required Environmental, Safety, and Health Analyses

The following describes each analysis required in support of the programmatic environmental, safety, and health evaluation. The analyses are used to integrate applicable environmental, safety, and health issues into the program's systems engineering processes.

National Environmental Policy Act Analysis. The program manager must analyze all programmatic actions that may require a National Environmental Policy Act analysis or an analysis in accordance with Executive Orders 12114 and 11514. Program managers must complete analyses required under the National Environmental Policy Act or Executive Orders before a decision to proceed with a proposed action that may affect the quality of the human environment. The Air Force Acquisition Executive is the final approval authority for National Environmental Policy Act and Executive Order documentation.

Environmental Compliance Analysis. To minimize cost and schedule risks that result from changing environmental regulations, DoD Regulation 5000.2-R requires the program manager to analyze applicable Federal, state, interstate, and local environmental regulations. Throughout the acquisition process, the program manager is to continually evaluate the potential impact of environmental regulations on the program's cost, schedule, and performance. Environmental regulations are a source of external constraints that program managers must identify and integrate into program execution to ensure successful program completion.

System Safety and Health Analysis. DoD Regulation 5000.2-R requires the program manager to identify and evaluate system safety and health hazards and to define associated risk levels. The program manager is to:

- document each decision to accept the risks associated with an identified hazard,
- establish a program that manages the probability and severity of all system hazards, and
- cost-effectively manage all safety and health hazards consistently with mission requirements.

The Air Force Acquisition Executive is the final decision authority for acceptance of high-risk hazards.

Hazardous Materials Analysis. DoD Regulation 5000.2-R requires the program manager to evaluate and manage the selection, use, and disposal of hazardous materials so that DoD incurs the lowest cost required to protect human health and the environment over the program's life cycle. The program manager is to establish a hazardous material management program that ensures that the program gives appropriate consideration to eliminating and reducing the use of hazardous materials rather than simply managing pollution that the program creates. Where hazardous material use cannot be avoided, the program manager is to develop and implement plans and procedures for identifying, minimizing use of, tracking, storing, handling, and disposing of such materials and equipment.

Pollution Prevention Analysis. DoD Regulation 5000.2-R requires the program manager to establish a pollution prevention program to help minimize environmental impacts and the life-cycle costs associated with environmental compliance. The program manager is to identify the impacts of the program on the environment; wastes released to the environment; environmental, safety, and health risks associated with using new technologies; and other information needed to identify source reduction and recycling opportunities. In designing, manufacturing, testing, operating, maintaining, and disposing of systems, the program manager also is to ensure that the program prevents or reduces all forms of pollution whenever feasible. If all forms of pollution cannot be prevented or recycled, the program manager is to ensure that the pollution will be treated in an environmentally safe manner.

Appendix F. Defense Contract Management Command Actions Taken

DEFENSE LOGISTICS AGENCY
DEFENSE CONTRACT MANAGEMENT COMMAND
DEFENSE CONTRACT MANAGEMENT AREA OPERATIONS, SANTA ANA - BOEING, ANAHEIM
3370 MIRALOMA AVENUE
ANAHEIM, CALIFORNIA, 92803-3110

IN REPLY REFER DCMDW-GA0RA

January 8, 1997

MEMORANDUM FOR INSPECTOR GENERAL
Department Of Defense
Attention: Ms. Patricia Brannin, Acting Director, Acquisition Management Directorate, Room 600
400 Army Navy Drive
Arlington, Virginia, 22202-2884

SUBJECT: Audit of the Minuteman(MM) III Guidance Replacement Program (GRP) - Phase I (Project No. 6AE - 0058) -- Accomplishment Of Action Items

DCMC -Santa Ana Rockwell, Anaheim has taken action to implement proposed recommendations presented in the IG Survey Debrief of October 25, 1996.

The existing Memorandum Of Agreement (MOA) between DCMC-Santa Ana Rockwell, Anaheim and the ICBM System Program Office for MM III GRP was updated to include the following recommendations:

a. DCMC to provide a monthly status report of DCMC risk assessments and cost performance reports and forecasts.
b. DCMC will participate in all Level 2 meetings between the GRP IPTs and the contractor (Level 3 meetings will be attended upon request).
c. GRP Project Manager to provide DCMC with read and write capability for Lotus Notes.
d. DCMC will support the Program Office in coordinating and implementing Single Process Initiatives.
e. DCMC will participate in technical (i.e. IPT integration meetings (formerly called program management reviews (PMRs), design reviews, technical interchange meetings (TIMs), and production readiness reviews (PRRs).
f. DCMC will participate in Estimate At Completion (EAC) reviews and baseline reviews.

The MOA was signed by our DCMC Commander on October 7, 1996 and then forwarded to the GRP Systems Program Director for review and signature. Upon receipt of the signed MOA, it will be forwarded to you under separate cover.

DCMC's review and recommendation/ approval process for the Acquisition Reform Single Process Initiative proposals (concept papers) was finalized in a meeting with Lt Steve Masiello, Government Coordinator, on November 21, 1996, to provide increased effectiveness and control. DCMC's review and approval process includes (1) early interface with contractor, customer and DCAA prior to formal concept paper, (2) round table discussions with DCAA, Key Customer Representatives and DCMC to evaluate contractor technical and cost benefit analysis and (3) written documentation of Management Council's approval of concept papers.

Clifford E. Findley Jr.
CLIFFORD E. FINDLEY, JR.
LtCol, USAF
Commander, DCMC - Santa Ana Boeing (Rockwell)

Appendix G. Report Distribution

Office of the Secretary of Defense

Under Secretary of Defense for Acquisition and Technology
  Deputy Under Secretary of Defense (Acquisition Reform)
  Deputy Under Secretary of Defense (Environmental Security)
  Director, Defense Logistics Studies Information Exchange
Under Secretary of Defense (Comptroller)
  Deputy Chief Financial Officer
  Deputy Comptroller (Program/Budget)
Assistant Secretary of Defense (Public Affairs)

Department of the Army

Auditor General, Department of the Army

Department of the Navy

Auditor General, Department of the Navy

Department of the Air Force

Assistant Secretary of the Air Force (Financial Management and Comptroller)
Assistant Secretary of the Air Force (Research, Development, and Acquisition)
Auditor General, Department of the Air Force
Commander, Air Force Materiel Command
Associate Deputy Assistant Secretary of the Air Force (Science Technology and Engineering)
Air Force Program Executive Officer for Space Programs
  Director, Intercontinental Ballistic Missile System Program Office

Other Defense Organizations

Director, Defense Contract Audit Agency
Director, Defense Logistics Agency
Commander, Defense Contract Management Command, Santa Ana-Boeing North American Incorporated
Director, National Security Agency
Inspector General, National Security Agency
Inspector General, Defense Intelligence Agency

Non-Defense Federal Organizations and Individuals

Office of Management and Budget
Technical Information Center, National Security and International Affairs Division, General Accounting Office

Chairman and ranking minority member of each of the following congressional committees and subcommittees:

Senate Committee on Appropriations
Senate Subcommittee on Defense, Committee on Appropriations
Senate Committee on Armed Services
Senate Committee on Governmental Affairs
House Committee on Appropriations
House Subcommittee on National Security, Committee on Appropriations
House Committee on Government Reform and Oversight
House Subcommittee on Government Management, Information, and Technology, Committee on Government Reform and Oversight
House Subcommittee on National Security, International Affairs, and Criminal Justice, Committee on Government Reform and Oversight
House Committee on National Security

Part III - Management Comments

Office of the Under Secretary of Defense for Acquisition and Technology Comments

ACQUISITION AND TECHNOLOGY

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON
WASHINGTON DC 20301-3000

10 JUL 1997

MEMORANDUM FOR DIRECTOR, ACQUISITION MANAGEMENT, DoDIG

SUBJECT: Audit Report on the Minuteman III Guidance Replacement Program (Project No. 6AE-0058)

We have reviewed your draft Audit Report and concur with the Findings and Recommendations.

George R. Schneiter
Director
Strategic and Tactical Systems

Department of the Air Force Comments

DEPARTMENT OF THE AIR FORCE
WASHINGTON, DC

Office of the Assistant Secretary

08 JUL 1997

MEMORANDUM FOR ASSISTANT INSPECTOR GENERAL FOR AUDITING
OFFICE OF THE INSPECTOR GENERAL,
DEPARTMENT OF DEFENSE

FROM: SAF/AQ

SUBJECT: DOD IG Draft Report, The Minuteman III Guidance Replacement Program, Project No. 6AE-0058, May 5, 1997

1. My office has completed our review of the DOD IG Draft Report on Minuteman III Guidance Replacement Program (GRP). Our response to your findings is as follows:

Finding A: The program did not request an independent cost estimate to assess the impact of two major program restructures. **Air Force Response**: Concur with comments (see Attachment).

Recommendation 1: The Air Force concurs with the recommendation to conduct an independent cost estimate. An Air Force team will begin the effort in August 1997.

Recommendation 2: The Air Force concurs with the recommendation to reconcile any differences between the independent team's cost estimate and the Program Office Estimate. Differences will be addressed at the completion of the independent cost estimate.

Finding B: The program could use available resources better to monitor and assess Contract Estimate At Complete (EAC) estimates. **Air Force Response**: Concur with comments (see Attachment).

Recommendation 1: The Air Force concurs with the recommendation that AFMC assist in the next Estimate At Completion. An AFMC cost expert is providing financial consultation to the program office and will assist during an integrated baseline review, scheduled for August 1997.

Recommendation 2: The Air Force concurs with the recommendation to train GRP staff participating in financial analysis. The training will be conducted between August 1997 and June 1998.

2

Finding C: The program did not plan to conduct a Programmatic Environmental, Safety, and Health Evaluation before the full-rate production decision. **Air Force Response**: Concur with comments (see Attachment).

Recommendation: The Air Force concurs with the recommendation to prepare a Programmatic Environmental, Safety, and Health Evaluation before the GRP full-rate production decision milestone review, scheduled for December 1998.

2. If you have any questions concerning this response, please contact Major James Nally, SAF/AQSL, (703) 697-8123.

GEORGE K. MUELLNER, Lt Gen, USAF
Principal Deputy
Assistant Secretary of the Air Force (Acquisition)

Attachment:
Air Force Comments to Draft DOD IG Report

Final Report Reference

7 July 1997

Air Force Comments to Draft DOD IG Audit Report
on
Minuteman III Guidance Replacement Program
(Project No. 6AE-0058, dated 5 May 97)

Executive Summary:

Recommended Change: Provide complete Findings in the Executive Summary
Rationale: Unedited Findings provide a better representation of the issues

Recommended Change: Summary of Recommendations, last line, add "in accordance with the new DOD 5000.2-R." — Added
Rationale: For completeness and accuracy

Finding A. Independent Cost Estimate (Page ii and Page 4)

Recommended Change: Change the Finding to read as follows: "The Intercontinental Ballistic Missile System Program Office would have benefited from the performance of an independent cost estimate by the Office of the Deputy Assistant Secretary of the Air Force (Cost and Economics) to assess the impact of the two program restructures. The Director did not request an independent cost estimate because DoD requires the estimate only to support program milestone reviews. Although not required, an independent cost estimate would increase the confidence of the Air Force Acquisition Executive that updated program cost estimates reflect a realistic appraisal of the most likely program cost the Air Force will realize." — Revised
Rationale: More accurately reflects the issue and context. Clarifies the optional nature of an independent cost estimate and that the SPO director did not act inappropriately by not requesting one.

Recommended Change: Page 5, Program Restructures, line 13: Change "director" to Air Force Acquisition Executive." — Revised
Rationale: The Director does not have the authority to restructure the program. Restructures affecting the program baseline are approved by the AFAE with input from AFPEO/SP, AFSPC, USSTRATCOM, and the SAF staff.

Final Report Reference

Finding B. Contract Estimate at Completion (Page ii and Page 8)

Revised

Recommended Change: Change the Finding to read as follows: "The Intercontinental Ballistic Missile System Program Office could improve the effectiveness of their resources to monitor, assess, and estimate contract costs for the Guidance Replacement Program. Additionally, the memorandum of agreement between the System Program Office and the Defense Contract Management Command (DCMC) did not require the DCMC staff to support estimate-at-completion reviews or provide independent assessments of the estimated prime contract costs. More effective monitoring and DCMC support may increase the accuracy of the assessment of estimated prime contract costs and improve the basis for making effective management decisions concerning funding needed to complete the contract by the Director, Intercontinental Ballistic Missile System Program Office"
Rationale: The revised wording more accurately reflects the issue.

Page 13 Revised

Recommended Change: Page 14, Impact on Program Management and Budget Decisions, second sentence: Change to read: "The $122.7 million contract EAC increase was primarily attributed to program funding instability, increased contract scope, and technical and schedule-related impacts."
Rationale: The revised wording more accurately reflects the issue. Some of the contract line items were always planned to be definitized after key design reviews. Cost growth accounted for less than 10% of the EAC of $376M.

Finding C. Programmatic Environmental, Safety, and Health Evaluation (Page ii and Page 16)

Revised

Recommended Change: Change Finding to read as follows: "The System Program Office did not plan to develop a programmatic environmental, safety, and health evaluation before the full-rate production decision to the extent required by the new DOD 5000.2-R. The GRP Program Office developed the environmental, safety, and health evaluation process by following acquisition policy in force in 1993. GRP was granted a categorical exclusion for an environmental impact analysis. This policy was changed by DoD 5000.2-R which requires that all programs conduct environmental, safety, and health analyses in the system engineering process."
Rationale: The revised wording more accurately reflects the issue.

Revised

Recommended Change: Page 17, Environmental, Safety, and Health Evaluation: first and second paragraphs

"The GRP Office followed approved policy as of 1993 in developing its environmental, safety, and health evaluation process. Air Force and contractor personnel will perform programmatic actions that will have potential environmental impact at the Boeing Guidance and Repair Center (BGRC) in Heath, Ohio and the Boeing manufacturing facility in El Paso, Texas. As required by the policy in force in 1993 the GRP Office identified hazardous materials. The Occupational Health Hazard Assessment (OHHA) identified feasible substitutes."

Final Report Reference

Recommended Change: Page 17, third paragraph, Line 13 (next to last sentence): Change to read: "Of the 652 NS-50 missile guidance sets to be procured, the Air Force will put 500 missile guidance sets on alert with the remainder used for spares and engineering support."
Rationale: The revised wording more accurately reflects the allocation of the NS-50 guidance set.

Page 18 Revised

Recommended Change: Page 18, fourth paragraph: Change to read as follows: "The GRP Office has established a draft plan and has a budget for the storage and demilitarization of the NS-20 missile guidance set."
Rationale: Clarification of miscommunication during site visit.

Revised

Recommended Change: Page 18, Implementing Environmental, Safety, and Health Policy: Delete entire section.
Rationale: Paragraphs one, two, and three provide information contained elsewhere. Paragraph three also contains other agency recommendations.

Recommended Change: Page 19, Benefits of Environmental, Safety, and Health Evaluation: Delete the first paragraph and change the second paragraph to read as follows:

Revised

"The GRP Office staff already has access to much of the information needed to support a programmatic environmental, safety, and health evaluation. In March 1997, Boeing provided safety information in the OHHA and the System Safety Hazard Analysis Report, and in August 1996, the Systems Program Office published pollution prevention information in the Pollution Prevention Program Plan. A well prepared programmatic environmental, safety, and health evaluation which would identify, analyze, and resolve potential environmental impact "show stoppers" as early as possible would help GRP Office staff to handle hazardous materials in the most expedient and cost-effective manner possible while staying within program cost, schedule, and performance goals."
Rationale: The revised wording more accurately reflects the issue.

Please refer any questions regarding these changes and suggested changes to Major James Nally, SAF/AQSL, (703) 697-8123

Audit Team Members

This report was produced by the Acquisition Management Directorate, Office of the Assistant Inspector General for Auditing, DoD.

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