Audit Report

OFFICE OF THE INSPECTOR GENERAL

ULTRA HIGH FREQUENCY FOLLOW-ON SATELLITE

Report Number 92-112 **June 30, 1992**

Department of Defense

The following acronyms are used in this report.

ASD(C3I).....Assistant Secretary of Defense (Command, Control, Communications and Intelligence)
CAAS.....Contracted Advisory and Assistance Services
CDR.....Critical Design Review
DAB.....Defense Acquisition Board
DISA.....Defense Information Systems Agency
EHF.....Extremely High Frequency
FAR.....Federal Acquisition Regulation
JCS.....Joint Chiefs of Staff
MILSTAR.....Military Strategic and Tactical Relay
MOU.....Memorandum of Understanding
OMB.....Office of Management and Budget
UHF.....Ultra-High Frequency

INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
400 ARMY NAVY DRIVE
ARLINGTON, VIRGINIA 22202-2884

June 30, 1992

MEMORANDUM FOR ASSISTANT SECRETARY OF DEFENSE (COMMAND, CONTROL, COMMUNICATIONS AND INTELLIGENCE)
ASSISTANT SECRETARY OF THE NAVY (FINANCIAL MANAGEMENT)
ASSISTANT SECRETARY OF THE AIR FORCE (FINANCIAL MANAGEMENT AND COMPTROLLER)
DIRECTOR, JOINT STAFF

SUBJECT: Audit Report on the Ultra-High Frequency Follow-on Satellite (Report No. 92-112)

We are providing this final report for your information and use. Comments on a draft of this report were considered in preparing the final report. DoD Directive 7650.3 requires that all audit recommendations be resolved promptly. Therefore, the Assistant Secretary of Defense (Command, Control, Communications and Intelligence), the Assistant Secretary of the Navy (Research, Development and Acquisition), and the Deputy Assistant Secretary of the Air Force (Acquisition) must provide final comments on the unresolved recommendations by August 31, 1992. See the "Status of Recommendations" section at the end of each finding for the unresolved recommendations and the specific requirements for these comments. If appropriate, you may propose alternative methods for accomplishing the desired improvements. Recommendations are subject to resolution in accordance with DoD Directive 7650.3 in the event of nonconcurrence or failure to comment.

We appreciate the courtesies extended to our audit staff. If you have any questions on this audit, please contact Mr. John Meling, Program Director, at (703) 697-8056 (DSN 227-8056) or Mr. Harold James, Project Manager, at (703) 693-0517 (DSN 223-0517). Appendix G lists the distribution of this report.

Robert J. Lieberman

Robert J. Lieberman
Assistant Inspector General
for Auditing

Enclosures

cc:
Secretary of the Navy
Secretary of the Air Force

Office of the Inspector General

AUDIT REPORT NO. 92-112 **June 30, 1992**
(Project No. 1AS-0053)

ULTRA-HIGH FREQUENCY FOLLOW-ON SATELLITE

EXECUTIVE SUMMARY

Introduction. The Navy's Ultra-High Frequency Follow-on Satellite (the Satellite) will provide key command and control links for mobile forces of DoD and other Government agencies. Satellite production began in July 1988 with an estimated cost of $1.7 billion (then-year dollars) for nine satellites.

Objectives. The audit objectives were to evaluate the overall effectiveness of the satellite acquisition management and to determine if the Satellite was being cost-effectively procured. We also reviewed associated internal controls.

Audit Results. The audit disclosed four reportable conditions.

o The Office of the Assistant Secretary of Defense (Command, Control, Communications and Intelligence) and the Joint Chiefs of Staff did not determine if the extremely high frequency capabilities planned for the Satellite would satisfy joint Service extremely high frequency user communication requirements. As a result, the Defense Acquisition Executive approved extremely high frequency satellite capabilities that will not fully satisfy joint Service extremely high frequency user communication requirements (Finding A).

o The Navy and the Air Force did not establish a jointly staffed program office (the program office) or sign a memorandum of understanding as directed by the Deputy Secretary of Defense. As a result, the program office could not directly rely on Air Force officials for technical expertise and encountered difficulties in effectively coordinating with the Air Force (Finding B).

o The program office did not plan to perform the critical design review of the extremely high frequency configuration until after complex components of the design were fabricated and assembled. As a result, design deficiencies identified at the planned critical design review could adversely affect satellite number 4 deployment requirements or result in the Government paying Hughes Aircraft Company 90 percent of the costs for a dysfunctional satellite if there is a failure after Government acceptance of flight hardware (Finding C).

o The Navy was not properly identifying and reporting contracted advisory and assistance services, and the program office was using them to satisfy 61 percent of the program office's work requirements. As a result, contractor support services were not subject to congressional restrictions, and the extended reliance on contractor support may not be appropriate or cost-effective (Finding D).

Internal Controls. The internal controls reviewed were deemed to be effective in that no material deficiencies were disclosed by the audit. Part I provides additional details.

Potential Benefits of Audit. Performance of a cost-effectiveness study will show that substantial savings can be realized if the size of the program office staff can be increased with Government employees to perform the work of contractor support employees. Appendix F includes additional details.

Summary of Recommendations. We recommended that extremely high frequency satellite requirements be validated and the design be updated as needed. We also recommended that a jointly staffed Navy and Air Force program office be established and that incremental critical design reviews of the extremely high frequency design be performed. In addition, we recommended that contractor support services be reported as contracted advisory and assistance services, that minimum program office needs for contractor support employees be determined, and that plans be made to increase staffing with Government employees.

Management Comments. The Assistant Secretary of Defense (Command, Control, Communications and Intelligence) nonconcurred with validating extremely high frequency requirements and updating satellite design as needed and also nonconcurred with establishing a jointly staffed Navy and Air Force program office. The Director, Joint Staff, agreed to initiate action to modify extremely high frequency requirements for the Satellite if the system Executive Agent determines that the design changes are necessary, cost-effective, and do not slip the satellite launch schedule. The Assistant Secretary of the Navy (Research, Development and Acquisition) nonconcurred with establishing a jointly staffed program office, conducting incremental critical design reviews of the extreme high frequency design, and determining if the program office staff can be increased with Government employees to perform the work of contractor support employees. He concurred with reporting contract support services as contracted advisory and assistance services. The Deputy Assistant Secretary of the Air Force (Acquisition) concurred with the need for better coordination between the Navy and the Air Force and suggested alternatives to a jointly staffed program office.

Audit Response. We have carefully considered all management comments and accept the alternative actions proposed by the Navy concerning critical design reviews and by the Navy and Air Force concerning joint program management as being responsive to our findings. We still believe that our other recommendations are valid. Part II summarizes the management comments and audit responses; Part IV contains the complete management comments. We request that the Assistant Secretary of Defense (Command, Control, Communications and Intelligence), the Assistant Secretary of the Navy (Research, Development and Acquisition), and the Deputy Assistant Secretary of the Air Force (Acquisition) provide additional comments to the final report by August 31, 1992.

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This report was prepared by the Acquisition Management Directorate, Office of the Assistant Inspector General for Auditing, DoD. Copies of the report can be obtained from the Information Officer, Audit Planning and Technical Support Directorate, (703) 614-6303.

PART I - INTRODUCTION

Background

The Ultra-High Frequency (UHF) Follow-on Satellite (the Satellite) is a Navy program that was started in 1988 to provide key command and control links for mobile forces of the DoD and other Government agencies. This communication satellite is being developed to replenish the existing constellation of UHF satellites beginning in the early 1990's. The satellite constellation will consist of one in-orbit spare and two satellites over each of the following areas: the continental United States and the Atlantic, Indian, and Pacific Oceans.

Since 1988, the Navy has awarded production contracts for nine satellites. In July 1988, the Navy awarded Hughes Aircraft Company (Hughes) a fixed-price contract for the production of the first satellite. Based on the results of the May 1990 Defense Acquisition Board (DAB) program review, the Navy modified the contract to include the procurement of satellite numbers 2 through 10. In addition, the DAB approved the addition of an 11-channel extremely high frequency (EHF) capability to the Satellite beginning with satellite number 4. The Joint Chiefs of Staff (JCS) directed the addition of the EHF package because the UHF receiver is vulnerable to jamming, and the EHF receivers defeat all but the most dedicated and expensive jammers. The JCS requirements for the EHF capability include increasing the number of EHF spot beams available to Navy battle groups and augmenting Military Strategic and Tactical Relay (MILSTAR) satellite EHF capabilities for intratheater communications.

In October 1990, the Deputy Secretary of Defense approved Program Budget Decision No. 172, which delayed launch dates for satellite numbers 7 through 9 and deleted funding for satellite number 10. The Navy estimates that procurement costs for the nine satellites will total $1.7 billion (then-year dollars).

Objectives

The audit objectives were to evaluate the overall effectiveness of the satellite acquisition management and to determine if the satellite was being cost-effectively procured. In performing the audit, we reviewed the following eight critical program management elements: mission need, correction of deficiencies found in previous reviews, component breakout actions, testing, acquisition planning, cost estimating and analysis, contracting procedures, and design maturity. We also reviewed related internal controls.

Our audit tests identified no deficiencies in correction of deficiencies found in previous reviews, component breakout

actions, testing, and cost estimating and analysis (Appendix A). Part II addresses findings and recommendations pertaining to the remaining four program management elements.

Scope

This economy and efficiency audit was conducted from May through December 1991 under auditing standards issued by the Comptroller General of the United States, as implemented by the Inspector General, DoD, and accordingly included necessary tests of internal controls. We reviewed accounting and program data for the period January 1984 through October 1991. We interviewed Government and contractor employees involved in the management, acquisition, and manufacture of the Satellite. Appendix G lists the activities visited or contacted.

We were assisted by employees in the Technical Assessment Division, Office of the Assistant Inspector General for Auditing, OIG, in the areas of mission need, design maturity, and technical reviews.

Internal Controls

Internal controls were reviewed for the eight critical program management elements addressed during the audit. Internal controls were determined from applicable DoD and Navy directives, instructions, and manuals. Our review included system testing, configuration management, system threat analysis, program office staffing, cost estimating, and contracting controls established to safeguard Government resources. The internal controls were deemed to be effective in that no material deficiencies were disclosed by the audit.

Prior Audits and Other Reviews

There were no audits in this area requiring follow-up action in the last 5 years.

PART II - FINDINGS AND RECOMMENDATIONS

A. JOINT SERVICE SATELLITE COMMUNICATION REQUIREMENTS

The Office of the Assistant Secretary of Defense (Command, Control, Communications and Intelligence) (ASD[C3I]) and the JCS did not determine if the EHF capabilities planned for the Satellite would satisfy joint Service EHF user communication requirements not satisfied by MILSTAR satellites. This condition occurred because the ASD(C3I) did not address issues in a September 1989 Defense Information Systems Agency (DISA)[1] study by advising JCS of the need to review and update EHF requirements for the Satellite. As a result, the Defense Acquisition Executive approved EHF satellite capabilities that will not fully satisfy joint Service EHF user communication requirements not satisfied by MILSTAR.

DISCUSSION OF DETAILS

Background

Policy. JCS Memorandum of Policy No. 178, "Military Satellite Communications Systems" (Memorandum 178), September 1986, states that satellites are a collective resource of the DoD, which is managed and operated by DoD elements. Memorandum 178 states that the JCS must review and validate satellite system communication requirements to ensure the maximum effective use of resources to support C3I requirements vital to national interests. In this respect, Memorandum 178 states that it is JCS's objective to develop and maintain a joint Service military satellite communications system architecture.

DoD Directive 5137.1, "Assistant Secretary of Defense for Command, Control, Communications and Intelligence," March 1990, requires that the ASD(C3I) review, validate, and recommend requirements and priorities to ensure that DoD user requirements are considered fully in the development of C3I plans and programs.

Satellite requirements document. JCS Memorandum of Policy No. 68-88, "Follow-on UHF Communications Satellite Requirements" (Memorandum 68-88), May 13, 1988, requires that an 11-channel EHF communications capability be added to satellite numbers 4 through 9. Memorandum 68-88 states that the 11 EHF channels will consist of 3 broadcast uplink channels; 7 communications uplink channels; and 1 tracking, telemetry, and control uplink channel.

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[1] On June 25, 1991, the Defense Communications Agency was renamed DISA.

In addition, Memorandum 68-88 states that the satellite constellation must maintain the EHF capability indefinitely.

Defense Information Systems Agency Study. The DISA study, "EHF Package Requirements Evaluation," September 1989, addressed the capability of the planned EHF package for the Satellite to satisfy EHF user communication requirements that could not be satisfied by the planned eight-satellite MILSTAR constellation. The study was based on a 1988 comparison of the approved joint Service EHF user communication requirements against the capabilities of the 8-satellite MILSTAR constellation and the planned 6-satellite constellation having 11 EHF channels. The DISA concluded that the MILSTAR constellation would satisfy 61 percent of the validated joint Service EHF user communication requirements. Also, DISA concluded that the planned 6-satellite constellation having 11 EHF channels would not fully satisfy the remaining joint Service EHF user communication requirements. The DISA suggested that a channel group switch be added to allow the Satellite to switch Earth coverage and spot beam channels and that 9 channels be added to use fully the 20-channel EHF wave form.

The DISA stated that the channel group switch would be useful because spot beam requirements were low in two of the four satellite sectors. A spot beam provides concentrated power, which lets battle groups and users with small antenna terminals communicate through the Satellite. Accordingly, a channel group switch would let the Satellite switch the seven communication uplink channels to Earth coverage to increase the satisfaction of joint Service EHF user communication requirements in the two satellite sectors with low spot beam requirements. In addition, the nine additional EHF channels would magnify the benefits of the channel group switch.

The DISA concluded that implementation of the two design changes would increase the Satellite's satisfaction of joint Service EHF user communication requirements by 31 percent. The DISA and ASD(C3I) officials considered the two design changes as necessary to meet joint Service EHF user communication requirements and of apparent low technical and cost impact.

Satisfaction of Joint Service EHS User Communication Requirements

Before the May 1990 DAB meeting, ASD(C3I) and JCS officials had not acted on the recommendations in the DISA study by ensuring that the Satellite was designed to satisfy joint Service EHF user communication requirements not satisfied by MILSTAR. Action was not taken because responsible ASD(C3I) officials did not advise JCS to review and update the satellite EHF requirements based on the DISA study. The ASD(C3I) officials stated that they were busy trying to resolve other urgent satellite program issues before the May 1990 DAB meeting. These issues included deciding

if the Navy or the Air Force would be the agent for satellite launch services and deciding the acquisition strategy for the EHF package.

Feasibility of Implementing Design Changes

Program office and Hughes engineers agreed that it was technically feasible to implement the two design changes. Hughes engineers did a preliminary analysis of the impact of adding the channel group switch and stated that adding the switch would have no affect on the power and minimal impact on the weight of the Satellite. In addition, Hughes engineers stated that sufficient lead time may exist for the channel group switch to be added beginning with satellite number 4. Hughes engineers could not provide information on the cost impact of the design change without being formally tasked by the program office.

Hughes engineers stated that they could not add nine EHF channels to satellite numbers 4 through 6 because the addition would significantly delay satellite delivery schedules. However, the engineers stated that it would be technically feasible to implement the design change by satellite number 7 based on expected EHF design efficiencies that will enable the nine channels to be added with reduced power and weight impact on the satellite. Hughes engineers could not provide information on the cost impact of the design change without being formally tasked by the program office.

Continuing Need for Design Changes

The JCS, ASD(C3I), and DISA officials asserted that joint Service EHF user communication requirements were expected to stay at 1991 levels or increase in the future. In October 1991, DISA issued the "DoD MILSATCOM Architecture Study" that was based on an updated threat analysis prepared by the Defense Intelligence Agency. This study showed that satellite EHF communication requirements were expected to increase between calendar years 1991 and 2010. With an expected increase in joint Service EHF user communication requirements and the reduction of the planned MILSTAR constellation from eight to six satellites since the 1989 DISA study, we believe that there is still a valid need to make the satellite design changes that DISA suggested.

RECOMMENDATIONS FOR CORRECTIVE ACTION

1. We recommend that Assistant Secretary of Defense (Command, Control, Communications and Intelligence):

a. Update the Defense Information Systems Agency study, "EHF Package Requirements Evaluation," September 1989, to reflect the downsizing of the planned Military Strategic and Tactical Relay satellite constellation and to quantify additional joint

Service extremely high frequency user communication requirements that could be satisfied by implementing satellite design changes for a channel group switch and nine more extremely high frequency channels.

b. Determine the cost-effectiveness of adding a channel group switch to satellite numbers 4 through 9 and an additional nine extremely high frequency channels to satellite numbers 7 through 9.

c. Direct the Navy to implement the design change for the channel group switch on satellite numbers 4 through 9, if the design change is determined to be necessary and cost-effective.

2. We recommend that the Joint Chiefs of Staff Satellite Communications Division revise Memorandum No. 68-88, "Follow-on UHF Communications Satellite Requirements," March 13, 1988, based on the results of the Assistant Secretary of Defense (Command, Control, Communications and Intelligence) analysis of the need and the cost-effectiveness to add nine EHF channels to satellite numbers 7 through 9.

MANAGEMENT COMMENTS

The Assistant Secretary of Defense (Command, Control, Communications and Intelligence) nonconcurred with Recommendation A.1. stating that architectural decisions regarding the EHF package on the Satellite did not need to be revisited. He stated that the entire military satellite communications architecture was reviewed in FY 1991 and that changes to the EHF package on the Satellite were specifically considered but judged not cost-effective.

In response to Recommendation A.2., the Director, Joint Staff, stated he would modify EHF requirements for the Satellite if the system Executive Agent determines that the design changes to the EHF package were necessary, cost-effective, and did not slip the satellite launch schedule.

AUDIT RESPONSE TO MANAGEMENT COMMENTS

The Assistant Secretary of Defense (Command, Control, Communications and Intelligence) assertion that EHF package improvements were considered as part of the study of military satellite communications architecture is not correct. Study participants told us that they concentrated on evaluating 12 alternative architectures, none of which involved enhancements to EHF packages. On the other hand, this study did indicate that there were significant shortfalls in the capacity of the planned communications architecture to meet satellite communication requirements in a jamming environment. Although the introduction of MILSTAR satellites with improved capacity will help alleviate

these shortfalls, the first improved MILSTAR satellite will not be launched until 1997 and the full MILSTAR satellite constellation will not be in place until 2010.

While we realize the EHF package is being designed under tight power and weight restrictions, Hughes identified the channel group switch enhancement as having no power and nominal weight impact. In addition, Hughes personnel expect that production experience and advancing EHF technology will aid design efficiencies during the production of satellite numbers 4 through 6 that will lessen weight and power demands necessary to add the additional 9 channels to satellite numbers 7 to 9.

Based on the projected shortfalls in EHF capacity, we still believe that our recommendations are valid and in agreement with the DoD strategy to procure future satellite communications systems that will provide the required level of mission support and operational flexibility, at the lowest possible cost to DoD. Therefore we request the Assistant Secretary to reconsider his response to Recommendation A.1. when responding to the final report.

STATUS OF RECOMMENDATIONS

		Response Should Cover:		
Number	Addressee	Concur/ Nonconcur	Proposed Action	Completion Date
A.1.	Assistant Secretary of Defense (Command, Control, Communications and Intelligence)	X	X	X

B. JOINT SERVICE PARTICIPATION

The Navy and the Air Force had not established a jointly staffed program office or signed a memorandum of understanding (MOU) as directed by the Deputy Secretary of Defense. The Navy and the Air Force did not comply with the direction because they could not determine which Military Department should provide the satellite launch services. As a result, the program office could not directly rely on Air Force officials for technical expertise in managing the program and has encountered difficulties in effectively coordinating with the Air Force on satellite control and support issues, which caused the Military Departments to incur $12.4 million in unnecessary costs.

DISCUSSION OF DETAILS

Background

The Deputy Secretary of Defense designated the Navy as executive agent and procurement manager for the satellite program in a December 2, 1987, memorandum. This memorandum also directed that the Navy and Air Force establish a MOU between them and form a jointly staffed program office. The Deputy Secretary issued this memorandum because he wanted the Navy to have access to the Air Force's technical experience in managing the satellite program.

Compliance with Deputy Secretary of Defense Direction

The Navy and Air Force have not formed a jointly staffed program office or established a MOU. In December 1987, the Under Secretary of the Navy sent a proposed MOU to the Assistant Secretary of the Air Force (Acquisition). The proposed MOU provided for an Air Force deputy program manager to serve as directed by the Navy program manager and as a single point of contact to the Air Force in matters related to the Satellite. The proposed MOU also provided for additional Air Force staffing, if requested by the Navy. The Air Force refused to sign the MOU because the program office planned to procure launch services through a satellite production contract with Hughes. The Air Force, as the Executive Agent for space launch activities, contended that it should provide the satellite launch services. Each Military Department believed its strategy was more economical and efficient.

Because of the disagreement, the Secretary of the Air Force advised the Deputy Secretary of Defense in February 1988 that the Air Force was withdrawing all Air Force Space Division and Aerospace Corporation support for the satellite contractor source selection process until the launch services issue was resolved. At the July 1988 DAB meeting, the OSD Cost Analysis Improvement Group was directed to study satellite launch services alternatives to determine which alternative minimized launch

costs. In April 1990, the OSD Cost Analysis Improvement Group reported that there was no cost advantage in the Navy using Air Force satellite launch services and recommended that the Navy's planned acquisition strategy be implemented. Although the issue was resolved, the Navy and the Air Force did not initiate further action to establish a MOU and form a jointly staffed program office.

As a result of not having Air Force employees assigned to the program office, the Navy has encountered difficulties in effectively coordinating satellite control and support issues with the Air Force. Without a jointly staffed program office, the Navy and Air Force have established working groups that meet quarterly to discuss satellite control and support issues. Although useful, these working groups have not prevented problems that could have been avoided or addressed more efficiently and effectively had a MOU and a jointly staffed program office been established. Coordination problems experienced in interoperability, integration, and operational support are discussed below.[2]

Interoperability. JCS Memorandum of Policy No. 68-88 requires that the Satellite's EHF capability be interoperable with terminals being developed for the MILSTAR. The program office used Military Standard 1582, "Satellite Data Link Standard," as a design guideline for the EHF design. Because the program office did not coordinate with the Air Force, it selected uplink antenna to channel group assignments and downlink hop assignments in Military Standard 1582 that were different from the assignments used in the design of the MILSTAR EHF terminals. To correct this interoperability design problem, the Military Departments had to modify their satellite EHF terminals for an estimated cost of $11.4 million (Army--$3 million, Navy--$1 million, and Air Force--$7.4 million). The ASD(C3I) was clarifying the guidance in Military Standard 1582 to prevent future interoperability between communication satellite resources.

Integration. Once the Satellite is launched, the Air Force's satellite control network will perform satellite control functions. Accordingly, the program office was required to integrate satellite mission-unique software with common user software used by the Air Force in its satellite control network. This integration requirement caused problems because the program office and Hughes were unfamiliar with the Air Force

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[2] Coordination problems resulted in unnecessary costs totaling $12.4 million ($11.4 million for terminal interoperability and $971,000 to upgrade the mission-unique satellite software for integration with existing Air Force software).

common user software and software update procedures. As a result, Hughes designed the satellite mission-unique software to be integrated with Air Force common user software that was applicable in 1988 and was not required to upgrade the software when the Air Force updated its common user software every 6 months. As a result, the Navy had to modify the contract in June 1991 to pay Hughes another $971,000 to upgrade the satellite mission-unique software. The program office advised us that any further software integration problems will have schedule and performance impacts on the launch of the first satellite.

Operational support. Once the Satellite is launched, the Air Force uses contractors to operate and maintain it. Accordingly, the Air Force requires that there be no proprietary restrictions on data contained in the Satellite's Orbital Operations Handbook. In January 1990, the Air Force advised the program office that Hughes did not intend to include sufficient technical information in the Orbital Operations Handbook to let the contractors maintain the Satellite. Hughes contended that the additional technical information was proprietary and not needed by the contractors to maintain the Satellite. As of November 1991, the program office was still working with Hughes and the Air Force to resolve this problem. In our opinion, the existence of a jointly staffed program office would have uncovered the proprietary data issue earlier and resolved it more easily.

Continuing Need for Technical Expertise and Coordination

The program office advised us that it will continue to need technical expertise to assist in effectively managing the program through FY 1998. Similarly, the program office's ability to meet the required satellite launch schedule through FY 1998 will depend on whether the program office, the Air Force, and Hughes can successfully coordinate on satellite requirements. While we cannot conclusively demonstrate that identified coordination problems would not have occurred under a jointly staffed program office, we believe that a jointly staffed program office would have encouraged and enabled more effective coordination between the Navy and the Air Force. To fulfill the Deputy Secretary's direction, the Air Force needs to provide the program office with a deputy program manager and that the Navy and the Air Force need to sign a MOU that defines their responsibilities regarding the Satellite.

RECOMMENDATIONS FOR CORRECTIVE ACTION

1. We recommend that the Assistant Secretary of Defense (Command, Control, Communications and Intelligence) establish a jointly staffed program office and a memorandum of understanding that defines Navy and Air Force responsibilities regarding the management of the Satellite, as directed by the Deputy Secretary of Defense, and gives the implementation date.

2. We recommend that the Assistant Secretaries of the Navy (Research, Development and Acquisition) and the Air Force (Acquisition) establish a jointly staffed program office and a memorandum of understanding that defines each Service's responsibilities regarding the management of the Satellite, as directed by the Deputy Secretary of Defense.

3. We recommend that the Assistant Secretary of the Air Force (Acquisition) assign an Air Force deputy program manager to the jointly staffed program office.

MANAGEMENT COMMENTS

The Assistant Secretary of Defense (Command, Control, Communications and Intelligence) nonconcurred with Recommendation B.1. stating that the Secretary of the Air Force had advised the Deputy Secretary of Defense in February 1988 that plans to establish a jointly staffed program office and to sign an MOU had broken down. He further stated that it was not the time to resurrect this long-dead issue as the program is preparing for its first launch. Also, he did not agree that ineffective coordination between Navy and Air Force caused $12.4 million in unnecessary costs, stating that part of this cost was to build in extra interoperability flexibility for future EFH systems.

The Assistant Secretary of the Navy (Research, Development and Acquisition) nonconcurred with Recommendation B.2. stating that effective working relationships existed among the program office, the Air Force, and the prime and supporting contractors. He stated that the insertion of new personnel into the program 5 months before the first scheduled launch did not seem warranted. However, he stated that the Navy and Air Force were developing a MOU for the command and control of the Fleet Satellite Communications Systems, which includes the UHF Follow-on System.

The Deputy Assistant Secretary of the Air Force (Acquisition) concurred with the intent of Recommendations B.2. and B.3. While recognizing the need for improved coordination between the Navy and the Air Force, he stated that reorganizing the program office at this point in the program could also have negative effects, particularly if instituted in the critical period leading up to the first launch of the Satellite. He recommended that the Navy and the Air Force develop a program management and oversight structure that would resolve the audit findings attributed to difficulties in effectively coordinating satellite control and support issues.

AUDIT RESPONSE TO MANAGEMENT COMMENTS

Contrary to the Assistant Secretary of Defense (Command, Control, Communications and Intelligence) comments to Recommendation B.1.,

our audit showed that there was a continuing need for a close and effective working relationship between the Navy and the Air Force. The difficulties the Navy has encountered in effectively coordinating with the Air Force regarding EHF terminal interoperability, satellite control, and operational support were not resolved or even fully recognized 4 years ago when negotiations for a MOU broke down between the Navy and the Air Force. As of December 1991, coordination difficulties were still issues. In addition, there is a continuing critical need for successful Navy and Air Force coordination in satellite control and support as the Satellites are launched and put into operation over the next 6 years.

The Assistant Secretary of Defense (Commmand, Control, Communications and Intelligence) was not correct in commenting that the $12.4 million cost impact resulting from Navy and Air Force coordination difficulties included costs to build-in extra interoperability flexibility for the future. Employees in the Office of the Communications Division, Joint Chiefs of Staff, who coordinated Military Department efforts to access the impact of correcting satellite terminal incompatibility problems, reported that $10.4 million (Army--$3 million and Air Force--$7.4 million) was required to correct the MILSTAR and UHF Follow-on terminal compatibility problems. The employees also documented that the Navy was planning to spend another $61.8 million on terminal compatibility to make the Navy terminals meet requirements for future systems. Employees in the EHF Satellite Communications Terminals Division of the Space and Naval Warfare Systems Command estimated that, as part of this cost, $1 million would be needed to make the Navy EHF terminals compatible with the MILSTAR terminals. The balance of the $12.4 million, as explained in the finding, was not for terminal compatibility but for upgrade of mission-unique software for control of the Satellite.

Responsive action is planned by the Navy and the Air Force. Therefore no additional comments to Recommendation B.1. are required.

The Navy's plan to establish a MOU between the Navy and the Air Force and the Air Force's plan to work with the Navy to establish a program management and oversight structure is responsive to the intent of Recommendations B.2. and B.3. In response to the final report, we request that the Navy and the Air Force provide estimated completion dates to establish the required MOU and the program management and oversight structure.

STATUS OF RECOMMENDATIONS

Number	Addressee	Response Should Cover: Concur/ Nonconcur	Proposed Action	Completion Date
B.2.	Assistant Secretary of the Navy (Research, Development and Acquisition)			X
B.3.	Deputy Assistant Secretary of the Air Force (Acquisition)			X

C. CRITICAL DESIGN REVIEWS

The program office did not plan to perform the critical design review (CDR) of the EHF configuration until after complex components of the design were fabricated and assembled. This condition occurred because the program office did not implement provisions in Military Standard 1521-B, "Technical Reviews and Audits for Systems, Equipments, and Computer Software," December 19, 1985, which encourages the performance of incremental CDRs during weapon system development. As a result, design deficiencies identified at the planned CDR could adversely affect satellite number 4 deployment requirements or result in the Government paying Hughes 90 percent of the costs for a dysfunctional satellite EHF capability if there is a failure after Government acceptance of flight hardware.

DISCUSSION OF DETAILS

Background

Design reviews. Military Standard 1521-B requires that program offices perform CDRs to verify that detail design solutions satisfy established weapon system requirements and that they assess producibility and risk. Further, Military Standard 1521-B requires that the program office perform the CDR before the contractor is authorized to proceed with weapon system fabrication and assembly. In respect to complex and large weapon systems, Military Standard 1521-B provides that CDRs may be performed incrementally to reduce program risks.

Incremental CDRs would let the program office increase the promptness and effectiveness of its design review of the EHF package and reduce program risks. The incremental reviews should be done when meaningful design data become available for each major EHF component. The incremental reviews would identify design problems earlier and lessen schedule and readiness impacts of corrective actions. Early identification of design problems is especially significant for the EHF package because, under the planned contractual provisions, Hughes is liable for only 10 percent of the EHF package cost if the package malfunctions in orbit. Because a final system-level CDR would still be required for the EHF package, less contractor formality could be allowed in the presentation of the incremental CDRs.

Naval Staff Office Manual P-6071, "Best Practices - How to Avoid Surprises in the World's Most Complicated Technical Process, The Transition from Development to Production," March 1986, reinforced the requirement of Military Standard 1521-B by stating that the design review process is critical to reducing program risk by providing the discipline necessary to ensure prompt identification of design problems and their solutions.

Satellite design requirement. JCS Memorandum of Policy No. 68-88 requires that the EHF package be included on satellite numbers 4 through 9. In response to this added satellite requirement, the program office required that Hughes develop an acquisition strategy that contained concurrent development and production of the EHF package to meet the 1994 launch schedule for satellite number 4. The program office established a May 1995 initial operational capability date for satellite number 4 based on the expected expiration dates of currently deployed satellites. The program office and Hughes have recognized the EHF package as the most challenging item in the satellite development because the EHF technology is more advanced than that of the UHF.

Hughes' design reviews. Hughes established an EHF acquisition strategy where internal design reviews for each of the EHF hardware components would be performed as the EHF engineering model was designed and built. The reviews were established to satisfy Hughes' internal design requirements before completing fabrication of EHF hardware components. Although the program office may attend these design reviews, its role in these design reviews has not been formally defined.

Program Office Critical Design Reviews

The program office performed the CDR for the design of the satellite UHF package before equipment fabrication and assembly, as required in Military Standard 1521-B. In contrast, the program office planned to perform the CDR for the EHF package in December 1992, when, according to Hughes' master schedule for the EHF package, all EHF equipment would be partially or completely fabricated and assembled (Appendix B).

In planning the CDR for the EHF package, the program office did not schedule incremental CDRs to satisfy design review requirements in Military Standard 1521-B and to lessen EHF program risks associated with the concurrent development and production acquisition strategy. Instead, the program office planned one CDR for December 1992 when Hughes would have necessary design data available for the complete EHF package.

As a result of not planning incremental CDRs, the program office unnecessarily increased program risk. The identification of critical design deficiencies at the planned EHF package CDR could either adversely affect satellite number 4 deployment requirements through schedule delays or performance deficiencies or result in the Government paying Hughes 90 percent of the costs for a dysfunctional EHF package if failure occurs after Government acceptance of this flight hardware.

RECOMMENDATIONS FOR CORRECTIVE ACTION

We recommend that the program office for the Ultra-High Frequency Follow-on Satellite:

1. Schedule and perform incremental critical design reviews as provided in Military Standard 1521-B, "Technical Reviews and Audits for Systems, Equipments, and Computer Software," December 19, 1985, for extremely high frequency hardware components to coincide with the scheduled performance of Hughes' internal design reviews.

2. Structure formal incremental design reviews based on Hughes' internal design reviews' data requirements and limit additional data requirements to those needed to identify critical design deficiencies.

MANAGEMENT COMMENTS

The Assistant Secretary of the Navy (Research, Development and Acquisition) nonconcurred with Recommendations C.1. and C.2., stating that appropriate Navy design review of the EHF package is being performed. He stated that the Navy is satisfying the intent of the incremental CDRs discussed in Military Standard 1521-B through active participation in the internal unit-level design reviews held by Hughes. He further stated that the program office has attended the first 4 of the 14 unit-level design reviews planned by Hughes between December 1991 and December 1992. At the reviews, Hughes accommodated the program office's design review requirements. In addition, the Assistant Secretary stated that the draft report incorrectly concluded that the Navy must pay 90 percent of the cost for a dysfunctional satellite EHF capability. He stated that any flight hardware that does not satisfy Navy requirements will not be accepted.

AUDIT RESPONSE TO MANAGEMENT COMMENTS

Although the Navy nonconcurred with Recommendations C.1. and C.2., the Navy's alternative action taken is responsive to the intent of Recommendations C.1. and C.2. Therefore no additional comments to Recommendations C.1. and C.2. are required.

Based on Navy comments, we have clarified our statements concerning the Government's liability for paying 90 percent of the cost of a defective EHF capability. The Government's 90 percent liability is incurred if the EHF package fails after Government acceptance of the flight hardware.

D. CONTRACTOR SUPPORT AND PROGRAM OFFICE STAFFING

The Navy did not properly identify and report contracted advisory and assistance services (CAAS) to Congress, and the program office was using CAAS to satisfy 61 percent of the program office's work requirements. The contracting officer did not report the CAAS efforts, because he believed that the engineering services did not meet the CAAS definition. Also, contractor support services were used because the program office staffing levels were insufficient to meet mission requirements. As a result, contractor support services were not subject to congressional restrictions, and the extended reliance on contractor support may not be appropriate or cost-effective.

DISCUSSION OF DETAILS

Background

Policy. Congress has been interested in CAAS for many years because of CAAS' vulnerability to abuse and conflict of interest. Office of Management and Budget (OMB) Circular A-120, "Guidelines for the Use of Advisory and Assistance Services," January 4, 1988, provides general policy to determine and control the appropriate use of CAAS. DoD Directive 4205.2, "DoD Contracted Advisory and Assistance Services," January 27, 1986, establishes policy, assigns responsibilities, and prescribes procedures for planning, managing, evaluating, and reporting CAAS. DoD Directive 4205.2 states that CAAS policy will be to obtain contractor support services on an intermittent or temporary basis, and repeated or extended CAAS arrangements shall occur only under extraordinary circumstances. Although DoD Directive 4205.2 does not define "intermittent or temporary," OMB Circular A-120 states that CAAS contracts may not continue for longer than 5 years without review for compliance with policy.

Definition of contractor support services. Federal Acquisition Regulation (FAR), subpart 37.2, "Advisory and Assistance Services," defines CAAS as including management support services and engineering and technical services. Management support services include acquisition management, project monitoring and reporting, data collection, and accounting. Contract engineering and technical services ensure more efficient and effective operation of weapon systems, equipment, components, and software. However, the CAAS definition does not include engineering and technical services that provide feedback concerning production and continuing engineering programs.

The Under Secretary of Defense for Acquisition agreed to clarify the definition of CAAS in DoD Directive 4205.2 in response to our Audit Report No. 91-041, "Contracted Advisory and Assistance Service Contracts," February 1, 1991. The revised Directive,

issued February 10, 1992, clarified the CAAS definition for Management and Professional Support Services. DoD Directive 4205.2 now states that:

> These services provide engineering or technical support, assistance, advice, or training for the efficient and effective management and operation of DoD organizations, activities, or systems. They are normally closely related to the basic responsibilities and mission of the using organization. This category includes efforts that support or contribute to improved organization or program management, logistics management, project monitoring and reporting, data collection, budgeting, accounting, auditing, and administrative and/or technical support for conferences and training programs.

Program office contractor support services. The Space and Sensor System Program Directorate, Space and Naval Warfare System Command (the Command), uses contractor support services to provide management and technical support to program managers. On July 31, 1990, the Command awarded a 5-year cost-plus-award-fee contract to Booz, Allen, and Hamilton to provide support services to program managers. For FY 1992, the contracting officer obligated $1 million on this contract for program office support. The Command has used Booz, Allen, and Hamilton for program manager support since 1987. In addition, the Air Force supported the program office with management and technical support services from its contractor, the Aerospace Corporation. On the Aerospace Corporation contract, the Command obligated about $2 million to support the program office in FY 1991.

Program office staffing policy. OMB Circular A-120 provides general guidance on program office staffing in Office of Federal Procurement Policy Pamphlet No. 1 (the Pamphlet), "Major System Acquisitions," August 1976. The Pamphlet states that a weapon system program manager should recruit employees with the requisite skills and experience to manage the assigned system, and the management level should be consistent with the importance and scope of the program. On March 25, 1991, OMB issued a clarifying letter stating that DoD should take the necessary steps to ensure that adequate staffing is available to perform inherently governmental functions.

Program Office Use of Contracted Services

Our examination of program office tasking orders on the Booze, Allen, and Hamilton contract for FYs 1990 and 1991 showed that

the contractor was performing CAAS services for the program office; that is, the contractor was assisting the program office in monitoring the performance of the satellite prime contractor. In this capacity, Booz, Allen, and Hamilton was required to:

- o review and comment on prime contractor documentation, such as test plans, status reports, system and component designs, production plans, and scheduling;
- o maintain production planning and program documentation;
- o monitor contractor progress against schedule;
- o prepare program related graphics, visual aids, and text material on program production, planning, and scheduling;
- o attend, and assist the program office in preparing for, various production, technical, and program working group meetings;
- o document discussions and decisions;
- o track action items; and
- o review, analyze, and comment on program office and Air Force-generated planning documents.

The contracting officer did not classify the Booz, Allen, and Hamilton contract as CAAS because Navy Comptroller Instruction 7102.2B, "Category D, Engineering and Technical Services," defines CAAS as:

> Engineering and technical services provided by contractors to increase the original design capabilities of existing or new systems, and those integral to the operation of a deployed system and which have been formally reviewed and approved during the acquisition planning process are excluded.

Although the Booz, Allen, and Hamilton effort was engineering in nature, we believe that the effort should be reported as CAAS because it provided the program office with engineering support necessary for effective contractor oversight, milestone and schedule tracking, and administration.

The contractor support services performed by the Aerospace Corporation were not required to be reported as CAAS because it is classified as a Federally Funded Research and Development Center. Although these organizations often perform work that meets the definition of CAAS, they report the expenditures for their work to Congress separately.

Program Office Staffing

Contractor support services were extensively and continuously used to augment program office staffing. As of November 1991, the program office's work force consisted of 14 military and civilian employees. This work force was supplemented by contractor support. Our analysis of labor hours expended by the program office from February 6 to August 28, 1991, showed that 61 percent of the labor hours were expended by Booz, Allen, and Hamilton and Aerospace Corporation employees. The program office's reliance on contractor support resulted from a continuing Space and Naval Warfare Systems Command practice of supplementing thinly staffed program offices with contractor support.

Cost-Effectiveness of Contractor Support

We used the cost comparison methodology prescribed in OMB Circular A-76, "Performance of Commercial Activities," August 4, 1983, to determine the cost-effectiveness of procuring CAAS versus having the work performed in-house. Our review showed that the cost will be $297,000 more under the Booz, Allen, and Hamilton contract than having the work done by similarly qualified military or civilian employees during FY 1992. Appendixes C, D, and E detail the comparison of contractor support versus in-house support costs. The program office expects that its annual CAAS work load will remain close to the FY 1992 level of effort through FY 1995.

We realize there may still be a need for contractor support expertise in certain situations. However, our review of contractor support deliverables and our discussions with program office staff disclosed that, in many cases, similar work was split between Navy and contractor support employees. Accordingly, we believe that substantial savings can be realized if the size of the program office staff can be increased with Government employees to perform the work of contractor support employees. Neither the Space and Naval Warfare Systems Command nor the program office had studied the cost-effectiveness of continuing to use contractor support versus increasing Government employees.

RECOMMENDATIONS FOR CORRECTIVE ACTION

We recommend that the Navy Program Executive Officer for Space Communications and Sensors:

1. Report the program office's contractor support services as contracted advisory and assistance services, as required by Office of Management and Budget Circular A-120, "Guidelines for the Use of Advisory and Assistance Services," January 4, 1988.

2. Determine the minimum number of contractor support employees needed and plan to increase staffing with appropriately skilled Government employees.

MANAGEMENT COMMENTS

The Assistant Secretary of the Navy (Research, Development and Acquisition) concurred with Recommendation D.1.

The Assistant Secretary nonconcurred with Recommendation D.2. stating that during this period of contraction within DoD, the program office cannot plan for or request an increased level of Government civilian or military personnel staffing.

AUDIT RESPONSE TO MANAGEMENT COMMENTS

The Assistant Secretary of the Navy (Research, Development and Acquisition) concurred with Recommendation D.1. No additional comments are required.

The Navy's response to Recommendation D.2. is not in concert with its 1988 commitment to reduce reliance on contractor support at all program offices within the Systems Commands to reduce risk and improve efficiency. The Navy's initiative showed that 533 contractor positions would be converted to civil service positions at the Naval Air Systems Command from FY 1989 through FY 1994. Also, the Navy incorrectly maintained that the program office cannot plan for or request an increased level of Government civilian or military employees because of the current work force contraction within DoD. Civilian/Contractor Manpower Division personnel within the Office of the Comptroller of the Navy stated that staffing changes of the type recommended can be made where justified even during periods of work force contraction within DoD. Therefore we request that the Navy reconsider its position when responding to the final report.

STATUS OF RECOMMENDATIONS

		Response Should Cover:		
Number	Addressee	Concur/ Nonconcur	Proposed Action	Completion Date
D.2.	Assistant Secretary of the Navy (Research, Development and Acquisition)	X	X	X

PART III - ADDITIONAL INFORMATION

Appendix A - Areas Not Requiring Further Review

Appendix B - Hughes' Program Master Schedule for the Extremely High Frequency Package

Appendix C - Estimated Costs for Civilian Government Employees

Appendix D - Estimated Costs for Contractor Support Employees

Appendix E - Comparison of Contractor Support Versus In-House Support Costs

Appendix F - Summary of Potential Benefits Resulting from Audit

Appendix G - Activities Visited or Contacted

Appendix H - Report Distribution

APPENDIX A: AREAS NOT REQUIRING FURTHER REVIEW

During the survey phase of the audit, we determined that additional audit work was not warranted in the following program management elements.

Correction of deficiencies found in previous reviews. The program office conducted technical reviews and audits for the Satellite, as required by Military Standard 1521-B. For deficiencies noted, the program office tracked contractor proposed corrective actions through implementation. In addition, the program office acknowledged the closure of a technical review and audit when corrective actions for all deficiencies were considered adequate.

Component breakout actions. The Under Secretary of Defense for Acquisition recommended not breaking out satellite launch services. This decision was based on the results of a Cost Analysis Improvement Group review that concluded that the cost benefit of breakout was outweighed by the desirability to maintain contractual accountability and warranty provisions with Hughes. In addition, we concluded that breakout was not applicable to other satellite components.

Testing. The program office acquisition strategy places the responsibility for satellite success on the contractor. In this respect, the satellite contract specifies that the program office will not accept satellites from Hughes until the contractor proves they are operational in orbit though operational testing. The Navy Commander, Operational Test and Evaluation Force, has monitored the contractor's efforts since the outset of the satellite program. In addition, we found that the satellite test program was on track and that there were no testing issues that would jeopardize the first satellite launch planned for July 1992.

Cost estimating and analysis. The program office prepared reasonable program cost estimates in support of the May 1990 Defense Acquisition Board program review. In this respect, the program office could satisfactorily explain the 5-percent difference between the independent cost estimate and the program cost estimate.

APPENDIX B: HUGHES' PROGRAM MASTER SCHEDULE FOR THE EXTREMELY HIGH FREQUENCY PACKAGE

(AS OF OCTOBER 10, 1991)

	1991						1992											1993						
	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
PROGRAM MILESTONES [1]																								
Preliminary Design Review				X																				
Critical Design Review																	X							
Engineering Model [2]																				X				
EQUIPMENT MILESTONES																								
Baseband Unit										<---Fabrication and Assembly->								<----Integration and Test---->						
										(Fabrication)								(Testing)						
Downlink Modulator Unit											<---------Fabrication---------->							<-----Testing----->					
Radio Frequency Unit									<----------Fabrication---------->									<--Testing-->					
Low Noise Amplifier										<-------Fabrication------->							<-------Testing------->						
High Power Amplifier	<----------Fabrication---------->																<----------Testing---------->						
Antennas:																								
Spot Beam								<----------Fabrication---------->									<-Testing->							
Earth Coverage													<----------Fabrication---------->											

[1] Month of program milestone is designated by an "X."

[2] Month engineering model assembly was programmed to be completed.

APPENDIX C: ESTIMATED COSTS FOR CIVILIAN GOVERNMENT EMPLOYEES

		Additional Employee Burdens						Burdened Costs*	
Grade/ Step	Annual Salary	Retirement at 21.75 Percent	Medicare at 2.17 Percent	Life/ Health at 4.70 Percent	Fringe Benefits at 1.7 Percent	Office Space at $29.70 Sq. Ft.	Other Misc. Costs	Total Annual Wages FY 1992	Hourly Wages
GS-15/5	$71,493	$15,550	$1,551	$3,360	$1,215	$4,752	$1,200	$99,122	$53.55
GS-14/5	$60,780	$13,220	$1,319	$2,857	$1,033	$3,564	$1,100	$83,872	$45.31
GS-13/5	$51,433	$11,187	$1,116	$2,417	$ 874	$2,376	$1,000	$70,403	$38.04
GS-12/5	$43,252	$ 9,407	$ 939	$2,033	$ 735	$2,376	$ 800	$59,542	$32.17
GS-11/5	$36,087	$ 7,849	$ 783	$1,696	$ 613	$2,138	$ 800	$49,967	$26.99
GS-9/5	$29,825	$ 6,487	$ 647	$1,402	$ 507	$2,138	$ 600	$41,606	$22.48
GS-7/5	$24,383	$ 5,303	$ 529	$1,146	$ 415	$1,426	$ 500	$33,702	$18.21
GS-5/5	$19,686	$ 4,282	$ 427	$ 925	$ 335	$1,426	$ 500	$27,580	$14.90

* Burdened hourly costs were determined by taking the total annual burdened cost and dividing it by 1,851 hours (2,087 total yearly hours, less 156 annual leave hours, less 80 administrative leave hours [training, sick leave, other]).

APPENDIX D: ESTIMATED COSTS FOR CONTRACTOR SUPPORT EMPLOYEES

BOOZ, ALLEN, AND HAMILTON CONTRACT

Labor Category	Hourly Rate* FY 1992	Add-on Material at 4.67 Percent	Award Fee at 10 Percent	Burdened Hourly Rate
Program Manager	$86.86	$4.06	$8.69	$99.60
Deputy Program Manager	$56.23	$2.63	$5.62	$64.48
Senior Project System Engineering Manager	$47.00	$2.19	$4.70	$53.89
Project Engineer	$29.82	$1.39	$2.98	$34.19
Software Systems Analyst	$30.67	$1.43	$3.07	$35.17
Senior Configuration Management Specialist	$40.85	$1.91	$4.09	$46.84
Financial Specialist	$19.87	$ .93	$1.99	$22.78
Technical Editor	$20.63	$ .96	$2.06	$23.66
Clerk/Typist	$14.36	$ .67	$1.44	$16.47
Illustrator	$18.46	$ .86	$1.85	$21.17
Field Engineer	$19.83	$ .93	$1.98	$22.74

* The hourly rate includes loaded fringe benefits, company overhead, general and administrative expenses, and an add-on cost factor.

APPENDIX E: COMPARISON OF CONTRACTOR SUPPORT VERSUS IN-HOUSE SUPPORT COSTS

BOOZ, ALLEN, AND HAMILTON CONTRACT

Contractor Labor Category	Burdened Contractor Rate	Contractor Hours	Contract Cost	Equivalent Government Grade	Cost of Government Employees	Government Cost	Difference Between In-House and Contracted Services by Labor Category	Percentage Savings
Program Manager	$99.60	2,400	$239,040	GM-15/5	$53.55	$128,520	$110,520	
Deputy Program Manager	$64.48	3,800	$245,024	GM-14/5	$45.31	$172,178	$ 72,846	
Senior Project System Engineering Manager	$53.89	4,200	$226,338	GS-13/5	$38.04	$159,768	$ 66,570	
Project Engineer	$34.19	2,000	$ 68,380	GS-09/5	$22.48	$ 44,960	$ 23,420	
Senior Configuration Management Specialist	$46.84	1,000	$ 46,840	GS-12/5	$32.17	$ 32,170	$ 14,670	
Financial Specialist	$22.78	1,000	$ 22,780	GS-09/5	$22.48	$ 22,480	$ 300	
Technical Editor	$23.66	500	$ 11,830	GS-09/5	$22.48	$ 11,240	$ 590	
Clerk/Typist	$16.47	1,600	$ 26,352	GS-05/5	$14.90	$ 23,840	$ 2,512	
Illustrator	$21.17	500	$ 10,585	GS-07/5	$18.21	$ 9,105	$ 1,480	
Field Engineer	$22.74	500	$ 11,370	GS-05/5	$14.90	$ 7,450	$ 3,920	
		17,500	$908,539			$611,711	$296,828	32.67

APPENDIX F: SUMMARY OF POTENTIAL BENEFITS RESULTING FROM AUDIT

Recommendation Reference	Description of Benefit	Type of Benefit
A.1.a.	Compliance with regulations. ASD(C3I) will ensure that DoD EHF user communication requirements are adequately considered in establishing EHF design requirements.	Nonmonetary.
A.1.b.	Economy and efficiency. ASD(C3I) will determine the cost-effectiveness of adding the channel group switch and the additional nine channels to the Satellite's EHF design.	Nonmonetary.
A.1.c.	Economy and efficiency. ASD(C3I) will ensure that the Navy implements the design change for the channel group switch if the design change is determined to be necessary and cost-effective.	Nonmonetary.
A.2.	Compliance with regulations. JCS will implement the results of the ASD(C3I) analysis of the satellite requirements document.	Nonmonetary.
B.1.	Compliance with direction. ASD(C3I) will ensure that the Navy and Air Force form a jointly staffed program office and a MOU as directed by the Deputy Secretary of Defense.	Nonmonetary.

APPENDIX F: SUMMARY OF POTENTIAL BENEFITS RESULTING FROM AUDIT (continued)

Recommendation Reference	Description of Benefit	Type of Benefit
B.2.	Compliance with direction. Ensures that the Navy and the Air Force comply with the Deputy Secretary of Defense direction.	Nonmonetary.
B.3.	Compliance with direction. Ensures that the Air Force provides staffing to the jointly staffed program office in compliance with Deputy Secretary of Defense direction.	Nonmonetary.
C.1.	Internal Control. The program office will conduct reviews to ensure that the design is adequate before Hughes fabricates and assembles satellite EHF components.	Nonmonetary.
C.2.	Internal Control. Helps implement Recommendation C.1.	Nonmonetary.
D.1.	Compliance with regulation. Ensures that contractor support services for program office are identified and reported to OMB as required by DoD direction.	Nonmonetary.
D.2.	Economy and efficiency. Ensures that the program office's use of contractor support services are cost-effective and appropriate.	Undeterminable. Amount not quantifiable until the evaluation is performed to determine the appropriate mix of in-house and contractor support employees for the program office.

APPENDIX G: ACTIVITIES VISITED OR CONTACTED

Office of the Secretary of Defense

Office of the Under Secretary of Defense for Acquisition, Washington, DC
Office of the Assistant Secretary of Defense (Command, Control, Communications and Intelligence), Washington, DC
Office of the Director, Joint Chiefs of Staff (Command, Control, Communications and Computer Systems), Washington, DC

Department of the Navy

Office of the Assistant Secretary of the Navy (Research, Development and Acquisition), Washington, DC
Office of the Chief of Naval Operations, Washington, DC
Space and Naval Warfare Systems Command, Washington, DC
Ultra-High Frequency Follow-On Satellite Program Office, Washington, DC

Department of the Air Force

Office of the Assistant Secretary of the Air Force (Acquisition), Washington, DC
Air Force Space Command, Peterson Air Force Base, CO
Air Force Space Division, Military Satellite Communication System Office, Los Angeles, CA
Air Force Space Division, Satellite Control Network Program Office, Los Angeles, CA
Military Strategic and Tactical Relay System Program Office, Los Angeles, CA

Other Defense Organizations

Defense Information Systems Agency, Arlington, VA
Defense Contract Management Command, Defense Plant Representative Office, General Dynamics Corporation, San Diego, CA
Defense Contract Management Command, Defense Plant Representative Office, Hughes Aircraft Company, El Segundo, CA

Non-Government Organizations

Aerospace Corporation, El Segundo, CA
Booz, Allen, and Hamilton, McLean, VA
General Dynamics Corporation, San Diego, CA
Hughes Aircraft Company, El Segundo, CA

APPENDIX H: REPORT DISTRIBUTION

Office of the Secretary of Defense

Under Secretary of Defense for Acquisition
Assistant Secretary of Defense (Command, Control, Communications and Intelligence)
Director, Joint Staff

Department of the Navy

Secretary of the Navy
Assistant Secretary of the Navy (Financial Management)
Assistant Secretary of the Navy (Research, Development and Acquisition)
Commander, Space and Naval Warfare Systems Command
Program Manager, Ultra-High Frequency Follow-On Satellite

Department of the Air Force

Secretary of the Air Force
Assistant Secretary of the Air Force (Acquisition)
Assistant Secretary of the Air Force (Financial Management and Comptroller)

Defense Agency

Defense Information Systems Agency

Non-DoD Federal Organizations

Office of Management and Budget
U.S. General Accounting Office, NSIAD Technical Information Center

Congressional Committees:

- Senate Subcommittee on Defense, Committee on Appropriations
- Senate Committee on Armed Services
- Senate Committee on Governmental Affairs
- Ranking Minority Member, Senate Committee on Armed Services
- House Committee on Appropriations
- House Subcommittee on Defense, Committee on Appropriations
- Ranking Minority Member, House Committee on Appropriations
- House Committee on Armed Services
- House Committee on Government Operations
- House Subcommittee on Legislation and National Security, Committee on Government Operations

PART IV - MANAGEMENT COMMENTS

Assistant Secretary of Defense (Command, Control, Communications and Intelligence)

Assistant Secretary of the Navy (Research, Development and Acquisition)

Deputy Assistant Secretary of the Air Force (Acquisition)

Director, Joint Staff

Assistant Secretary of Defense Comments

COMMAND, CONTROL, COMMUNICATIONS AND INTELLIGENCE

ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301-3040

May 18, 1992

MEMORANDUM FOR DIRECTOR, ACQUISITION MANAGEMENT, OFFICE OF THE INSPECTOR GENERAL

SUBJECT: Report on the Audit of the Ultra-High Frequency Follow-on Satellite (Project No. 1AS-0053)

We have reviewed your draft report on the Ultra-High Frequency (UHF) Follow-On (UFO) satellite program. I have attached comments concerning the specific findings and recommendations that were addressed to me.

In general, we agree with your statements of facts cited in your report, but we do not concur with your recommendations. The UFO program is a fixed price effort approaching the launch of its first satellite. This is not the proper time to change the management structure of the program or to look at upgrading the satellite beyond its established requirements.

In 1991, I tasked the Defense Information Systems Agency to lead a integrated review of our entire MILSATCOM architecture. This review looked at our overall EHF requirements, but recommended no changes to the EHF package on the UHF Follow-On satellite despite the restructure of Milstar. We continuously review our programs with the goal of improving cost and operational effectiveness, but we must balance this goal with the cost and acquisition risk of perturbing baselined programs.

Duane P. Andrews

Attachment

ASD(C3I) COMMENTS

ON

REPORT ON THE AUDIT OF THE ULTRA-HIGH FREQUENCY FOLLOW-ON SATELLITE PROJECT NO. 1AS-0053

FINDING A: The offices of the Assistant Secretary of Defense (Command, Control, Communications and Intelligence) and the Joint Chiefs of Staff did not determine whether the extremely high frequency capability planned for the satellite would satisfy joint Service users extremely high frequency communication requirements. As a result, the Defense Acquisition Executive approved extremely high frequency satellite capabilities that will not fully satisfy joint Service requirements.

C3I Comment: Partially concur. The extremely high frequency (EHF) package added to the Ultra-High Frequency Follow-On Satellite is a supplement to Milstar's service in the same frequency range. There was no attempt to satisfy all joint Service user requirements through the combination of Milstar and this small payload. Instead, we found ourselves presented with a cheap, low risk way to supplement Milstar service especially with regard to fleet operations.

The EHF payload was added to the Ultra-High Frequency Follow-On Satellite program. The Navy is procuring these communication satellites on an innovative, fixed-price contract. The added payload had to fit within severe weight and power constraints and had to present acceptable risk. After due consideration of all program factors, the 11 channel EHF package was approved for the program.

FINDING A, RECOMMENDATION 1: We recommend that Assistant Secretary of Defense (Command, Control, Communications and Intelligence):

a. Update the September 1989 DISA study on "EHF Package Requirements Evaluation" to reflect the downsizing of the planned Military Strategic and Tactical Relay satellite constellation and to quantify additional extremely high frequency user requirements that could be satisfied by implementing satellite design changes for a channel group switch and nine more extremely high frequency channels.

b. Determine the cost-effectiveness of adding a channel group switch to satellite numbers 4 through 9 and an additional nine extremely high frequency channels to satellite numbers 7-9.

c. Direct the Navy to implement the design change for the channel group switch on satellite numbers 4 through 9, if the design change is determined to be necessary and cost-effective.

C3I Comments: Non-concur. These architectural decisions do not need to be revisited again. The entire Military Satellite Communications Architecture was reviewed extensively in FY 1991. Changes to the UFO EHF package were specifically considered, but were judged not cost-effective. The Department will continue to review the Military Satellite Communications Architecture with a specific concentration of Decision Opportunities identified by the architecture review.

FINDING A, RECOMMENDATION 2: We recommend that the Joint Chiefs of Staff Satellite Communications Division revise memorandum No. 68-88, "Follow-on UHF Communications Satellite Requirements for UHF," March 13, 1988, based on the results of the Assistant Secretary of Defense (Command, Control, Communications and Intelligence) analysis of the need to add, and cost-effectiveness of adding, nine EHF channels to satellite numbers 7 through 9.

C3I Comments: Non-concur. As stated in our response to recommendation 1, we do not see the need to revisit this issue again. In FY 1991 we reexamined our entire architecture and concluded that our present plans are the most prudent, and cost effective approach to our requirements.

FINDING B: The Navy and the Air Force did not establish a jointly staffed program office or sign a memorandum of understanding as directed by the Deputy Secretary of Defense. As a result, the program office could not directly rely on Air Force officials for technical expertise and encountered difficulties in effectively coordinating with the Air Force, which caused $12.4 million in unnecessary costs.

C3I Comments: Partially concur. The Navy and Air Force did not establish a joint office and did not sign a Memorandum of Understanding. However, we do not agree with the IG that these actions caused a $12.4 million cost impact. The quoted costs are for the impact of modifying terminals not only to operate with the Navy's satellites, but to build in extra interoperability flexibility for future extremely high frequency systems.

FINDING B, RECOMMENDATION 1: We recommend that the Assistant Secretary of Defense (Command, Control, Communications and Intelligence) establish an implementation date for the establishment of a jointly staffed program office and a memorandum of understanding that defines Navy and Air Force responsibilities regarding the management of the satellite, as directed by the Deputy Secretary of Defense.

C3I Comment: Non-concur. As stated in the IG report, the Secretary of the Air Force advised the Deputy Secretary in February 1988 that plans to establish a joint office and to sign a memorandum of understanding had broken down. Now, four years later, as the program is preparing for its first launch, is not the time to resurrect this long-dead issue.

Office of the Assistant Secretary of the Navy

DEPARTMENT OF THE NAVY
OFFICE OF THE ASSISTANT SECRETARY
(Research, Development and Acquisition)
WASHINGTON, D.C. 20360-1000

21 May 1992

MEMORANDUM FOR THE DIRECTOR, ACQUISITION MANAGEMENT DIRECTORATE, DODIG

Subj: DRAFT REPORT ON THE AUDIT OF THE ULTRA-HIGH FREQUENCY FOLLOW-ON SATELLITE (PROJECT NO. 1AS-0053)

Ref: (a) DODIG memo of 16 Mar 1992, same subj

Encl: (1) Department of the Navy Response

I am responding to the draft audit report forwarded by reference (a) concerning the procurement of the Ultra-High Frequency Follow-on Satellite by the Space and Naval Warfare Systems Command, Washington, DC.

The Department of the Navy response is provided at enclosure (1). We generally agree with the fourth finding but do not concur with the second and third. Department concerns with the second and third findings, as well as the specific actions DON is planning to take in the future to ensure adequate management control of similar procurements, are outlined in the enclosed response.

Edward C. Whitman

EDWARD C. WHITMAN
Deputy Assistant Secretary
of the Navy (C4I/EW/Space)

DEPARTMENT OF THE NAVY RESPONSE
TO
DODIG 16 MARCH 1992
DRAFT REPORT ON THE AUDIT OF
THE ULTRA-HIGH FREQUENCY FOLLOW-ON SATELLITE SYSTEM
(PROJECT 1AS-0053)

Finding B

The Navy and the Air Force had not established a jointly staffed office or signed a memorandum of understanding (MOU) as directed by the Deputy Secretary of Defense. The Navy and the Air Force did not comply with the direction because they could not determine which Military Department should provide the satellite launch services. As a result, the Navy UHF Follow-on program office was unable to directly rely on Air Force officials for technical expertise in managing the program and has encountered difficulties in effectively coordinating with the Air Force on satellite control and support issues, which caused the Military Departments to incur $12.4 million in unnecessary costs.

Recommendation B-1

We recommend that the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) establish an implementation date for the establishment of a jointly staffed program office and a memorandum of understanding that defines Navy and Air Force responsibilities regarding the management of the satellite, as directed by the Deputy Secretary of Defense.

DON Response

Do not concur. The Navy made repeated efforts to conclude a MOU with the Air Force to establish the joint staffing structure directed by DEPSECDEF. The Air Force withdrew from the process. Effective working relationships now exist among the UFO program office, the various Air Force activities supporting this effort, and the prime and supporting contractors. The DON does not concur that the lack of a jointly staffed program office was the direct cause of $12.4 million in unnecessary costs--it is not supported by fact. A Memorandum of Understanding between the Navy and the Air Force is currently being developed for the command and control of the FLTSATCOM satellite systems. FLTSATCOM includes UFO, FLTSAT, and LEASAT satellites.

Recommendation B-2

We recommend that the Assistant Secretaries of the Navy (Research, Development, and Acquisition), and the Air Force (Acquisition) establish a jointly staffed program office and a memorandum of understanding that defines each Service's responsibilities regarding the management of the satellite, as directed by the Deputy Secretary of Defense.

Enclosure (1)

DON Response

Do not concur. Effective working relationships now exist among the UFO program office, the various Air Force activities supporting this effort, and the prime and supporting contractors. Insertion of new personnel into this program, just five months before the first scheduled launch, does not seem warranted. A Memorandum of Understanding between the Navy and the Air Force is currently being developed for the command and control of the FLTSATCOM satellite systems, which includes UFO.

Recommendation B-3

We recommend that the Assistant Secretary of the Air Force (Acquisition) assign an Air Force Deputy program manager to the jointly staffed program office.

DON Response

Do not concur. Insertion of new personnel into this program, just five months before the first scheduled launch, does not seem warranted.

Finding C

The program office did not plan to perform the critical design review (CDR) of the EHF configuration until after complex components of the design were fabricated and assembled. This condition occurred because the program office did not implement provisions in Military Standard 1521-B, "Technical Reviews and Audits for Systems, Equipments, Computer Software," December 19, 1985, which encourages the performance of incremental CDRs during weapon system development. As a result, the design deficiencies identified at the planned CDR could adversely affect satellite number 4 deployment requirements or result in the Government paying Hughes 90 percent of the costs for a dysfunctional satellite EHF capability.

Recommendation C-1

We recommend that the Program Office for the Ultra-High Frequency Follow-On Satellite schedule and perform incremental critical design reviews as provided for in Military Standard 1521-B for extremely high-frequency hardware components to coincide with the scheduled performance of Hughes' internal design reviews.

DON Response

Do not concur. Through a formal Critical Design Review (CDR) to validate the design of the engineering model, active government participation in Hughes' internal unit-level design

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reviews, weekly and quarterly status reviews, and continuous on-site participation, appropriate Navy review of the UFO EHF SP design is currently being performed to maximize the quality of the flight systems to be placed in orbit. To prevent any design surprises at CDR and satisfy the intent of the incremental CDRs discussed in MIL-STD-1521B, the Navy actively participates in the internal unit-level design reviews conducted by Hughes, of which 14 are scheduled to be held between December 1991 and the formal CDR in December 1992. Of the four which have been held so far, Hughes has totally accommodated the government's needs during the internal reviews, and it is evident that Hughes is highly motivated to proceed towards the formal CDR with full Navy concurrence in the design. With the above design review processes in place, design deficiencies are not expected to be found during CDR. Correction of any deficiencies that are identified at CDR, however, regardless of the degree of fabrication and assembly of any flight hardware existing at the time, is Hughes' responsibility and cost under this fixed price contract. The report conclusion that Navy must pay 90% of the cost for a dysfunctional satellite EHF capability is erroneous and has no factual basis. Any flight hardware that does not satisfy Navy requirements will not be accepted.

Recommendation C-2

We recommend that the Program Office for the Ultra-High Frequency Follow-on Satellite structure formal incremental critical design reviews based on Hughes' internal design reviews' data requirements and limit additional data requirements to those needed to identify critical design deficiencies.

DON Response

Do not concur. Through a formal Critical Design Review (CDR) to validate the design of the engineering model, active government participation in Hughes' internal unit-level design reviews, weekly and quarterly status reviews, and continuous on-site participation, appropriate Navy review of the UFO EHF SP design is currently being performed to maximize the quality of the flight systems to be placed in orbit. To prevent any design surprises at CDR and satisfy the intent of the incremental CDRs discussed in MIL-STD-1521B, the Navy actively participates in the internal unit level design reviews conducted by Hughes, of which 14 are scheduled to be held between December 1991 and the formal CDR in December 1992. Of the four which have been held so far, Hughes has totally accommodated the government's needs during the internal reviews, and it is evident that Hughes is highly motivated to proceed towards the formal CDR with full Navy concurrence in the design. With the above design review processes in place, design deficiencies are not expected to be found during CDR.

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Finding D

The Navy did not properly identify and report contracted advisory and assistance services (CAAS) to Congress, and the UHF Follow-on program office was using CAAS to satisfy 61 percent of the program office's work requirements. The contracting officer did not report the CAAS efforts, because he believed that the engineering services did not meet the CAAS definition. Also, contracted services were used because the program office staffing levels were insufficient to meet mission requirements. As a result, contracted support services were not subject to congressional restrictions, and the extended reliance on support contractors may not be appropriate or cost-effective.

Recommendation D-1

We recommend that the Navy Program Executive Officer for Space Communications and Sensors report the program office's contracted support services as contracted advisory and assistance services, as required by Office of Management Budget Circular A-120, "Guidelines for the Use of Advisory and Assistance Services," January 4, 1988.

DON Response

Concur.

Recommendation D-2

We recommend that the Navy Program Executive Officer for Space Communications and Sensors determine the minimum number of contract support personnel needed and plan to increase staffing with appropriately skilled employees.

DON Response

Do not concur. During this period of contraction within DOD, the program office cannot plan for or request an increased level of government civilian or military personnel staffing.

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Office of the Assistant Secretary of the Air Force

DEPARTMENT OF THE AIR FORCE
WASHINGTON DC 20330-1000

OFFICE OF THE ASSISTANT SECRETARY

MAY 1 8 1992

SAF/AQ
The Pentagon Room 4E964
Washington, DC

MEMORANDUM FOR THE INSPECTOR GENERAL, DEPARTMENT OF DEFENSE

SUBJECT Report of the Audit of the Ultra-High Frequency Follow-on Satellite (UFO) (Project No. 1AS-0053) - ACTION MEMORANDUM

We concur with finding B However, the recommendations to establish and man a Joint Program Office (B1, B2, and B3) may not be the most effective corrective action Reorganizing the UFO program office at this point in the program could have negative effects as well - particularly during the critical period leading up to the first launch of the follow-on satellite

We recommend the Navy and Air Force develop a program management and oversight structure which will resolve the audit findings attributed to difficulties with Service interfaces The anticipated recommendations would range from establishing a joint program office to stengthening existing interfaces between the Services

The Air Force is a major user of UHF MILSATCOM and is committed to insuring the continued effective management of this program.

DANIEL S RAK
Deputy Assistant Secretary
(Acquisition)

Copies to.
AF/SC/XO
SAF/SX/FM
Joint Staff J6S
ASD(C3I)/S&TC3
USD(A) /S&TNF

The Joint Staff Comments

THE JOINT STAFF
WASHINGTON, DC

Reply ZIP Code:
20318-0300

DJSM-577-92
14 May 1992

MEMORANDUM FOR THE INSPECTOR GENERAL, DEPARTMENT OF DEFENSE

Subject: Draft DOD IG Audit Report on the Ultra-High Frequency Follow-On Satellite (Project No. 1AS-0053)

1. In response to your request,* the Joint Staff has reviewed the recently released draft DOD IG Audit Report on the UHF Follow-On (UFO) Satellite. The following comment is provided:

Page 12, Part II, Paragraph A, (recommendation 2).
Comment: The Joint Staff notes that the recommended action relating to finding A was undertaken during the DOD MILSATCOM architecture development. Changes to the UFO EHF package were specifically considered and deemed to be not cost effective. However, if the system executive agent determines that the design change to the extremely high frequency package is necessary, cost effective, and does not slip the satellite launch schedule, the Joint Staff will initiate actions to modify UFO requirements.

2. Joint Staff point of contact is Captain Warren Patterson, USA, J6S, extension 78073.

HENRY VICCELLIO, JR.
Lieutenant General, USAF
Director, Joint Staff

Reference:
* DOD IG memorandum, 16 March 1992, "Report on the Audit of the Ultra-High Frequency Follow-On Satellite (Project No. 1AS-0053)"

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