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Report to the Chairman, Subcommittee on National Security, Committee on Appropriations, House of Representatives

November 1998

MILITARY SATELLITE COMMUNICATIONS

Concerns With Milstar's Support to Strategic and Tactical Forces

GAO/NSIAD-99-2

GAO

United States
General Accounting Office
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National Security and
International Affairs Division

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November 10, 1998

The Honorable C. W. Bill Young
Chairman, Subcommittee on National Security
Committee on Appropriations
House of Representatives

Dear Mr. Chairman:

The Department of Defense's (DOD) multiservice Milstar system is intended to provide the National Command Authorities, chief military commanders, and strategic and tactical military forces with a highly protected and survivable means of communications that would be operable nearly worldwide and throughout all levels of military conflict.[1] The Milstar program involves the acquisition of satellites; a mission control capability; and specially designed Army, Navy, and Air Force terminals for a variety of users operating from ground-mobile vehicles, ships, submarines, aircraft, and fixed-ground locations.

As you requested, we evaluated (1) the Milstar system's capabilities to support strategic and tactical missions and (2) the extent to which DOD has provided assurance of continuing comparable satellite communications among the users after the Milstar satellites under development are launched.

Background

DOD initiated the Milstar program under Air Force management in the early 1980s. Milstar is intended to be DOD's most robust communications satellite system. It is designed to operate in the extremely high frequency (EHF) radio spectrum, although it has super high frequency and ultra high frequency capabilities, and it was originally designed to transmit signals at low data rates (LDR).[2] Milstar employs computer processing capabilities on the satellites and several different radio signal processing techniques that provide resistance to electronic jamming. Computer processing associated with other DOD communication satellite systems is primarily performed

[1]The National Command Authorities are the President and the Secretary of Defense or their duly deputized alternates or successors. Protected and survivable communications means that the system is relatively resistant to electronic jamming and some effects of nuclear detonations. For Milstar, nearly worldwide communications means satellite coverage of the earth within 65 degrees south and 65 degrees north latitudes.

[2]EHF radio signals range from 30 to 300 gigahertz within the electromagnetic spectrum. Super high frequencies range from 3 to 30 gigahertz and ultra-high frequencies range from 300 to 3,000 megahertz. Milstar's LDR transmissions are at speeds of 75 to 2,400 bits per second.

with ground-based equipment and is considered to be less resistant to electronic jamming.

In 1990, as the Cold War subsided, the Congress directed DOD to either restructure the Milstar system or develop an alternative advanced communications system to (1) substantially reduce the cost of the Milstar program, (2) eliminate unnecessary capabilities for protracted nuclear war-fighting missions and operations, and (3) increase the usefulness of the program for tactical forces. DOD chose to restructure the system. As a result of the 1991 Gulf War experience, DOD established a basis for increased Milstar support to tactical forces by using a medium data rate (MDR) communications capability.[3]

Currently, there are two Milstar satellite designs—the LDR version, called Milstar I, and a combined LDR and MDR version, called Milstar II. A total of six satellites are included in the program—two Milstar I satellites were launched in 1994 and 1995, and four Milstar II satellites are being fabricated and are scheduled to be launched in fiscal years 1999 through 2002. As a follow-on effort, DOD has initiated an advanced EHF satellite communications program to replace the Milstar I and II designs, with plans to launch the first advanced satellite in fiscal year 2006.

Since program inception, DOD has spent several billions of dollars to acquire the Milstar I and II satellites, a mission control capability, and a variety of user terminals.[4] In total, DOD has procured, or plans to procure, over 3,500 terminals. In addition, it is planning to spend several more billions of dollars for the advanced EHF satellite system.

Results in Brief

There are several limitations associated with the Milstar system's capabilities to support strategic missions. Although the Milstar I system, which is primarily for strategic communications purposes, has been deployed for over 2 years, a May 1998 draft operational test report revealed that system support could be limited in some critical strategic mission areas. First, operational testing showed that military commanders could not communicate by voice in a timely and intelligible manner, when using the low data rate capabilities. The purpose of such voice

[3]Milstar's MDR transmissions are to be at speeds ranging from 4,800 to 1,544,000 bits per second, thus significantly increasing the volume of data processed through the satellites. For background on Milstar program restructuring, see Military Satellite Communications: Milstar Program Issues and Cost-Saving Opportunities (GAO/NSIAD-92-121, June 26, 1992).

[4]For national security reasons, the total amount of funds invested in Milstar cannot be disclosed.

communications is to discuss whether a ballistic missile launch threatens North America, and if so, to determine the appropriate retaliatory response. This limitation was attributable to inherent characteristics of Milstar's low data rate technology and associated peripheral equipment (referred to as input-output communication devices). Second, operational testing of the missile warning teletype network was planned, but not performed, to verify that accurate and timely ballistic missile alert messages could be transmitted from the North American Aerospace Defense Command to other strategic command centers. A subsequent Air Force test of this teletype network determined that a required redundancy check for data accuracy could not be performed without software modifications. Third, operational testing revealed a Milstar system endurance issue, associated with the nuclear bomber force, that must be resolved because of the requirement for continuous communication capabilities if the bomber force needed to be recalled or redirected. Fourth, testing showed that the configuration of peripheral equipment and its accompanying software has not been effectively controlled or fully certified to ensure communications interoperability with the Milstar system. DOD has identified corrective actions for the limitations in these four areas. However, final resolutions are dependent on approval of requirements, verification through testing, a certification process, or obtaining necessary funds.

Regarding tactical missions, the Air Force has encountered schedule delays related to software development for a critical Milstar component—called the automated communications management system—that could adversely affect Milstar II's timely support to tactical forces. This management system is intended to allocate and apportion Milstar's limited communication capabilities among multiple system users. A previous Air Force effort to develop such a management system encountered technical difficulties, resulting in the contractual work being canceled. Delays in delivering the current software have caused the Army to independently initiate an upgrade to the less sophisticated Milstar I communications management system for use with Army terminals. This upgrade effort, while compatible with the Army's terminal testing schedule, will require the Army to reconfigure its equipment and software and retrain its forces when the automated communications management system becomes available at a future date.

DOD has not provided assurance that the continuity of protected medium data rate satellite communication capabilities will be maintained for tactical forces after the four Milstar II satellites are launched. The satellite

constellation's communication capabilities, in terms of total capacity, are predicted to degrade below a minimally acceptable level in fiscal year 2003, before the advanced satellite system is expected to be available in fiscal year 2006. This prediction is based on computer modeling that takes factors such as satellite component reliability into account. In addition, the deployment of Milstar II tactical user terminals is expected to be completed in 2003, and tactical forces will have become dependent on the Milstar II system. This situation, coupled with the degraded satellite constellation's capabilities, could result in users not having the communications capacity they require or expect to execute their missions. Although DOD has been aware of this potential degradation in satellite communications for several years, it has not fully assessed the associated operational risks to tactical forces.

Milstar I Support to Some Critical Strategic Mission Areas Could Be Limited

The Milstar I system is expected to provide communication networks in support of designated strategic mission areas. For example, in regard to strategic ballistic missile threats to North America, the system is expected to (1) transmit missile warning data from sensor processing sites to command centers, (2) provide commanders a means of exchanging information about ballistic missile attack assessments, and (3) disseminate critical messages to forces on how to respond to missile attacks. However, a May 1998 draft operational test report, prepared by the Air Force Operational Test and Evaluation Center, concluded that although the Milstar system was found to be effective for communications during normal operations, numerous deficiencies would require corrective action before the full nuclear wartime strategic capabilities could be realized. Deficiencies in three areas were highlighted—(1) military commanders' voice conference network, (2) missile warning teletype network, and (3) emergency action message dissemination and force direction network. The deficiencies were associated with system connectivity—a critical operational issue that addresses the primary mission of Milstar to provide minimum essential worldwide communications among all services at all levels of military conflict.

The purpose of the operational test was to evaluate the effectiveness and suitability of the in-orbit Milstar I satellite system. According to operational test officials, testing was hampered because, in some instances, the evaluation criteria were based on ambiguous operational requirements. DOD has not yet completed efforts to validate updates to the Milstar 1992 operational requirements. In addition, more recent testing revealed that peripheral equipment and software to be used with Milstar

has not been effectively controlled to ensure communications interoperability with other systems. DOD regulations require such interoperability.

Military Commanders' Voice Conference Network

The purpose of the military commanders' voice conference network is to enable commanders to discuss whether a ballistic missile launch threatens North America, and if so, to determine the appropriate retaliatory response. However, operational testing and subsequent military exercises relative to this network determined that the National Command Authorities and the chief military commanders would be unable to communicate by voice in a timely and intelligible manner.

Program officials stated that communication signal delays and poor voice quality are inherent characteristics in Milstar LDR technology and associated peripheral equipment. However, they believe that voice conference quality can be improved by (1) assigning additional communication channels to the strategic commanders, thereby simplifying time consuming hand-over procedures and improving timeliness; (2) consolidating voice signals through communication switches to make conferencing more efficient and user friendly; and (3) upgrading software algorithms to improve voice intelligibility. According to Joint Staff representatives, requirements and funding issues must be resolved before a date can be established for making these corrections.

Missile Warning Teletype Network

The purpose of the missile warning teletype network is to provide alert messages of a pending ballistic missile attack. Transmitting accurate and timely messages from the North American Aerospace Defense Command to other strategic command centers is critical to ensuring a timely retaliatory response to an attack. However, operational testing of this network was not performed. In our attempt to determine the reason, we were provided with two viewpoints—(1) Milstar support to the missile warning and assessment mission area had not been approved for testing by Milstar program officials and (2) there was a conflict with another operational test being performed at the Cheyenne Mountain Complex. The result was that operational test officials could not verify that ballistic missile alert messages could be reliably transmitted by the Milstar system.

The Air Force Space Command subsequently tested the missile warning teletype network and identified that a required redundancy check could not be performed to ensure data accuracy. The Command concluded that

software modifications were necessary to ensure such accuracy before the network could be used without restrictions. A U.S. Space Command representative stated that a plan had been approved to make the necessary software modifications, but network certification is not expected until May 2000.

Emergency Action Message Dissemination and Force Direction Network

The purpose of the emergency action message dissemination and force direction network is to provide a means for instructing the strategic forces on an appropriate retaliatory response to a ballistic missile attack on North America. Operational testing of this network revealed that the bomber force could not sustain ultra high frequency radio access to Milstar satellites because the radios' batteries were not sufficiently reliable or endurable. Battery life is one of several Milstar endurance issues and is integrally linked with the Milstar system's endurance requirement. This requirement is the length of time that the system needs to be operational during and after a nuclear conflict. Continuous communication capabilities with deployed bomber forces are required if it became necessary to recall or redirect these forces.

The endurance deficiency may have resulted from a disagreement about the interpretation of operational requirements. Milstar program officials stated that the system satisfied the 1992 Milstar requirements for endurance and that additional requirements are being imposed on the system. However, U.S. Strategic Command officials stated that recent changes to Milstar operational requirements only clarify endurance requirements and that the system should have performed in a manner consistent with these requirements. DOD does not expect to resolve this endurance issue until 2002. Ongoing DOD actions include (1) the Joint Requirements Oversight Council's approval of updated Milstar operational requirements (which are to clarify endurance requirements) by April 1999, (2) the Director of Operational Test and Evaluation's directions for a full test of endurance requirements, and (3) addressing funding shortfalls associated with endurance solutions.

Additional Software and Equipment Concerns

The Milstar system supports multiple communication networks, and user access to these networks is through peripheral equipment such as telephone handsets, computers, facsimile machines, and teletypes (referred to as input-output communication devices). However, testing by the Joint Staff, completed in March 1998, revealed that the configuration of this equipment and its accompanying software had not been effectively

controlled to ensure communications interoperability. For example, the test report stated that network command centers were using software, which had not been formally approved, to interface with the Milstar system. A test representative told us that unless this situation is corrected, the probability increases that Milstar's effectiveness could be degraded.

Ensuring interoperability of peripheral equipment and software supporting Milstar and associated networks is critical to system operational effectiveness. According to DOD representatives, 238 equipment and software configurations that are to interoperate with Milstar terminals have been identified, but only 5 configurations have been approved for use and none have been fully certified. DOD requires that all military command, control, communications, computers, and intelligence systems must be certified as interoperable with other systems with which they share information.[5] However, DOD representatives stated that they were uncertain as to when the approval and certification process would be completed.

Milstar II's Support to Tactical Forces Could Be Adversely Affected by Software Development Delays

In fiscal year 1999, the Air Force plans to initiate operational tests to determine the effectiveness and suitability of the Milstar II satellite system. In addition, the Army and the Navy plan to operationally test their tactical terminals' capabilities to support tactical forces. However, schedule delays related to software development for a critical component of the Milstar II system could adversely affect these tests and plans for tactical forces to transition from older communication systems to the new Milstar II system. The component, called the automated communications management system (ACMS), is critical to efficient Milstar operations. ACMS is expected to allocate and apportion the system's limited LDR and MDR communication capabilities among multiple system users while permitting decentralized execution of communications planning and management functions by these users.

In 1989, the Milstar program office initiated efforts to develop communications planning and resource management software, called the Mission Planning Element. According to a program official, the effort was canceled in 1994 because of technical difficulties that the contractor could not overcome. In 1995, the program office signed an agreement with a Navy development organization for ACMS, which was to perform functions similar to the Mission Planning Element. Schedule delays since this ACMS

[5]DOD's interoperability guidance is contained in DOD Directive 4630.5, Nov. 12, 1992; DOD Instruction 4630.8, Nov. 18, 1992; and Chairman of the Joint Chiefs of Staff Instruction 6212.01A, June 30, 1995.

agreement was signed have totaled about 7 months. ACMS is currently scheduled to be delivered in April 1999.

This April 1999 delivery date will not provide sufficient time for ACMS to be integrated with the ground control station and allow for systems operational testing with the first Milstar II satellite, which is to be launched in January 1999. In addition, program officials stated that ACMS software development is on a compressed schedule—a reduction from 24 months to 12 months—increasing the risk that the April 1999 delivery date may not be met. This creates the potential for ACMS not being available to support operations with the second Milstar II satellite to be launched in December 1999, if an additional delay occurs. According to an Air Force official, an independent study team, chartered by the Joint Staff, is assessing the effect of possible delays in the ACMS schedule, including the feasibility of meeting the planned Milstar II launch schedule.

According to Army representatives, ACMS will not be available to support operational testing of Army terminals, which is scheduled to start in September 1999. The Army's intentions were to use these test results to decide on terminal deployment and on transitioning its tactical forces to Milstar II. Concerned that ACMS delivery will be further delayed, the Army is independently upgrading the less sophisticated, communications management system, which was developed for Milstar I. However, such an upgrade would only be able to support the small number of tactical terminals expected to be deployed for the first Milstar II satellite. The upgrade cannot support the increased number of tactical terminals that are expected to be deployed after the launch of the second Milstar II satellite in December 1999. At that time, the need for ACMS would be critical. When ACMS becomes available, the Army will have to reconfigure its equipment and software and retrain its forces.

Continuity of Communication Capabilities for Tactical Forces Has Not Been Assured

DOD predicts that MDR communication capabilities of the Milstar II constellation will begin degrading in 2003—3 years before the planned first launch of an advanced EHF satellite in fiscal year 2006. The year 2003 is also when the deployment of MDR terminals to tactical forces is to be completed and tactical forces will have become dependent on the Milstar II system. This situation, coupled with the degraded capabilities, could result in users not having the communications capacity they require or expect to execute their missions. Therefore, if a military conflict were to occur during this 3-year period, communications for the command and control of tactical forces, using Milstar, could be adversely affected.

The House Committee on Appropriations expressed concern about DOD not giving adequate attention to operational risk during the transition period from the Milstar II system to an advanced system, including consideration that hundreds of Milstar terminals would be deployed by that time. The Committee directed the Secretary of Defense to provide a report by March 31, 1999, to the congressional defense committees on the effects of the communications degradation, including suggested alternatives to minimize any adverse operational effects.[6] Although DOD is aware of this potential degradation in Milstar communications capabilities, it has not fully assessed the associated operational risks.

Constellation Predicted to Degrade Before Advanced System Is Available

In 1993, DOD performed a comprehensive assessment of U.S. defense needs in the post-Cold War international security environment—called the Secretary of Defense's Report on the Bottom-Up Review. The issues of Milstar affordability and alternative satellite designs were included in the report. At that time, DOD decided to limit the total number of Milstar II satellites to four, launch them in 1-year intervals from fiscal years 1999 through 2002, and begin launching advanced EHF satellites in fiscal year 2006.

In 1995, DOD predicted that Milstar II's MDR communication capabilities could begin to degrade below a minimally acceptable level in 2003—3 years before DOD plans to replace the system with an advanced EHF system. In the absence of a major failure, satellites usually degrade gradually while in orbit, and their useful lives can be estimated based on such factors as component reliability and fuel availability. DOD used a computer simulation model, known as the Generalized Availability Program, to predict a 70-percent probability that MDR capabilities would be maintained at a minimally acceptable operational level until 2003. This probability was predicted to decrease annually to about 35 percent in 2006.[7] A 1998 degradation analysis confirmed the 1995 results.

To describe the predicted degradation in more practical terms for Milstar users, the Air Force converted the probabilities into a predicted loss of MDR communication channels. Of the 128 planned MDR channels for the four Milstar II satellites (32 channels per satellite), 16 channels, or

[6]Report of the Committee on Appropriations, Department of Defense Appropriations Bill, 1999 (House Report 105-591, June 22, 1998, p. 220).

[7]LDR capabilities are predicted to have a 70-percent probability of maintaining a minimally acceptable operational level until 2007 because all six satellites (Milstar I and II) will contain the LDR capability, whereas only four satellites (Milstar II) will contain the MDR capability.

12 percent, could fail by 2003, and 41 channels, or 32 percent, could fail by 2006.

The Army and the Navy—the predominant planned users of Milstar II's MDR capabilities—have expressed concern about the communications degradation during the 3-year period. In 1996, the Army Vice Chief of Staff stated that accepting the 70-percent prediction criterion placed protected EHF communications, provided by the Milstar system, at an unacceptable level of risk to the Army's operational forces. Army representatives informed us that they remained concerned about the degradation adversely affecting tactical operations. Navy representatives informed us that Navy Milstar terminals would have to compete for fewer MDR resources during the 3-year period. However, they added that a concept of operations must be updated for using MDR terminals and that an analysis must be performed before the full operational effect of the degradation can be known.

Tactical Forces Will Become Increasingly Dependent on Milstar II by 2003

In 2003, when Milstar II satellite capacity is predicted to degrade below the minimum acceptable level, tactical forces (especially Army and Navy forces) are expected to complete their deployment of MDR terminals. By 2004, the Army and the Navy intend to complete their transition from older communications capabilities to Milstar II. Therefore, these forces will have become highly dependent on Milstar II for protected satellite communications.

The Army has maintained that existing tactical communication systems were not mobile enough during the 1991 Gulf War to engage in rapid offensive operations. Thus, the Army intends to use Milstar's unique capabilities to extend the range of protected battlefield communications, allowing forces to operate farther from command posts than is possible with existing communications systems. The Army plans to acquire 209 mobile terminals (called Secure Mobile Anti-jam Reliable Tactical Terminals) and deploy them by the end of 2003, replacing older, larger, and less mobile terminals that operate with the Defense Satellite Communications System at super high frequency.

The Navy plans to upgrade about 90 percent of its 350 LDR terminals with the MDR capability for ships, submarines, and shore installations. The first Navy battle group is scheduled to be equipped with the MDR upgrades in fiscal year 1999, and the remaining battle groups are expected to transition to Milstar II through fiscal year 2003.

Potential Adverse Effects of System Degradation Have Not Been Addressed

Since 1993, DOD's efforts to develop and refine its future military satellite communications architecture have reaffirmed the acquisition decision documented in the Secretary of Defense's Report on the Bottom-Up Review. However, these efforts have also cited a need to analyze the operational effects of degradation in MDR satellite capacity on tactical forces.

In 1995, a DOD satellite communications architecture study, led by the Defense Information Systems Agency, found that delaying the launch of follow-on Milstar satellites beyond 2003 would create a risk in satisfying a significant portion of DOD's satellite communication requirements. Also in 1995, the Under Secretary of Defense for Acquisition and Technology directed the Deputy Assistant Secretary of Defense for Command, Control, Communications, and Intelligence and the DOD Space Architect to develop recommendations that would mitigate possible shortfalls in EHF service to be provided by Milstar II. The Deputy Assistant Secretary responded to that direction, in a draft program plan, by presenting degradation avoidance and mitigation measures but stated that more analyses was needed. He recommended that the DOD Space Architect conduct a thorough analysis of the operational effects of the degradation.

In 1996, the DOD Space Architect stated that an acceptable approach to making the transition from Milstar II to an advanced EHF system was to plan military operations assuming less than a fully populated constellation of four Milstar II satellites. This apparent recognition of operational risk presumed that (1) because of the fiscal environment, the year 2005 would be the earliest that an advanced system could be developed and launched and (2) the Milstar II constellation would probably fall below its planned capability of four satellites before 2005 because of launch or in-orbit failures.

In 1997, representatives of unified commands and military satellite acquisition organizations met to refine the future military satellite communications architecture and develop an affordable transition and implementation plan for that architecture. These representatives acknowledged the risk of the Milstar constellation capacity degradation. However, they stated that work remains to be done in modeling the effect of information flow on combat operations.

Conclusions

Considering the importance of the Milstar system and the billions of dollars that have been invested in the program, it is essential for DOD to ensure that Milstar I and II capabilities will be operationally effective and able to adequately support strategic and tactical forces in a timely manner. Several actions could be taken to better substantiate the effectiveness of Milstar capabilities—clarifying operational requirements; modifying software to ensure network communications connectivity; certifying peripheral equipment and associated software to affirm communications interoperability; and ensuring timely development of the automated communications management system.

Because the Milstar II satellite constellation's communications capacity is predicted to degrade from fiscal years 2003 through 2006, when an advanced capability is to be available, the continuity of protected and mobile satellite communications capacity is a potentially significant issue. In addition, because the deployment of Milstar II terminals is expected to be completed by fiscal year 2003, such degradation in communications capacity could result in users not having the capabilities they require or expect to execute their missions. Until DOD assesses the potential operational risk to tactical military forces for this 2003 to 2006 satellite transition period, as directed by the House Committee on Appropriations, the seriousness of this matter will be unknown.

Recommendations

In conjunction with the report that DOD is directed to provide by March 31, 1999, to the congressional defense committees on the effects of Milstar communications degradation, we recommend that the Secretary of Defense provide information on the status and progress of DOD's efforts to resolve Milstar I operational issues and Milstar II developmental issues. This information should include technical, schedule, testing, and funding matters pertinent to (1) achieving user-to-user strategic communication network connectivity and (2) managing the development difficulties associated with the automated communications management system.

In assessing the operational risks associated with the predicted degradation of Milstar communications, as directed by the House Committee on Appropriations, we recommend that the Secretary of Defense specifically address (1) the minimally acceptable level of extremely high frequency satellite communications needed to support tactical forces and (2) the capability of the Milstar system to provide this minimum level of communications until an advanced extremely high frequency communications capability is deployed.

Agency Comments and Our Evaluation

DOD disagreed with our recommendation in the draft report that the Secretary of Defense provide the necessary directions to the military services and commands for (1) resolving the disagreements over operational requirements, (2) ensuring the availability of necessary software, (3) completing the certification process for interoperable equipment and software, and (4) managing the difficulties in developing the automated communications management system. DOD stated that although our draft report was essentially correct in describing Milstar issues during the 1997 operational test period, additional Secretary of Defense directions to resolve these issues are unnecessary. DOD claimed that the issues were being resolved and corrective actions were being taken through standard DOD processes and procedures associated with developing and fielding new capabilities. For example, DOD mentioned general officer level forums that were (1) providing ongoing oversight of operational, programmatic, and management issues affecting Milstar and (2) tracking issues to fulfill Secretary of Defense guidance for the transition of strategic users to Milstar by 2003.

In acknowledging the Milstar I issues identified during operational testing, DOD emphasized that the Milstar system passed 14 of 17 threshold parameters. However, according to operational test officials, these parameters were more representative of system specifications than operational requirements that would permit a judgment about Milstar's support to strategic mission areas. DOD identified several matters that remain to be resolved for achieving an effective strategic and tactical communications system. The matters were (1) funding for voice conferencing network upgrades to improve timeliness and voice quality; (2) completing software upgrades, equipment installations, and certification of the missile warning teletype network; (3) performing operational testing of nuclear bomber force communications and endurance requirements; (4) implementing a new Chairman of the Joint Chiefs of Staff Instruction, that addresses the management of satellite communications, to ensure interoperability certification of input-output communication devices, which are critical for user-to-user communications connectivity; and (5) completing ACMS development and performing tests to demonstrate the complex function of allocating and apportioning the fixed amount of Milstar communications capabilities. Considering the number and variety of Milstar matters that still need attention, we believe DOD should provide status and progress information for resolving these matters to the congressional defense committees. Accordingly, we modified our recommendation to the Secretary from

providing directions to the services to reporting on the status and progress of resolving operational and developmental issues.

DOD also disagreed with our recommendation dealing with the minimum level of extremely high frequency satellite communications needed to support tactical forces and the extent that Milstar could provide that level of communications until an advanced extremely high frequency communications capability is deployed. DOD stated that (1) it previously addressed the operational risk to tactical forces associated with the planned transition from Milstar to the advanced extremely high frequency satellite system; (2) another satellite system could provide some, but less effective, protected communications during the transition period; and (3) an additional review of this issue by the Secretary of Defense is unnecessary. DOD cited (1) the Joint Space Management Board as having approved military satellite communications architecture goals, strategy, and milestones; (2) the Defense Resource Board as having funded military satellite communication systems consistent with the architecture; and (3) the Joint Requirements Oversight Council as having endorsed an architecture transition plan based on a general officer level forum's evaluation of all future military satellite communication satellite requirements and capabilities through 2010.

DOD has apparently given considerable high-level attention to the predicted degradation in Milstar communication capabilities for the 2003 to 2006 period. Also, there is evidence that the operational risk accepted for this time period was based on financial, and possibly technical, reasons as to when an advanced extremely high frequency capability could be made available. Although this decision was originally made in 1993, and subsequently reaffirmed by various DOD authorities, it does not overcome the potential condition of insufficient protected communications for tactical forces during the 3-year transition period. DOD did not specifically address our point regarding what minimum level of extremely high frequency communications would be needed during the period, other than to state that the tactical requirement for protected communications far exceeds Milstar capabilities and tactical forces are not totally dependent on Milstar for protected communications. Nor did DOD address whether Milstar could provide that minimum level until an advanced capability is deployed. Accordingly, we reaffirm our recommendation.

DOD also provided technical comments on the draft report, which we have incorporated as appropriate. DOD's comments on a draft of this report are reprinted in their entirety in appendix I.

Scope and Methodology

Our review focused on Milstar system effectiveness and DOD's plans to provide continuing comparable EHF communications capabilities after the existing system degrades. Specifically, we evaluated the Milstar I system's operational effectiveness in supporting DOD strategic missions by reviewing the results of operational testing and exercises and comparing the identified deficiencies with system operational requirements. We obtained explanations of these deficiencies through discussions with tester, user, and program representatives. Additionally, we evaluated the Milstar II system's potential effectiveness to support DOD tactical missions by reviewing program schedules and comparing the status of critical development activities with the schedules. We obtained an explanation of delays from program and user representatives. Finally, we evaluated Air Force assessments of the Milstar satellite constellation's expected availability by reviewing the results from a computer simulation model used to predict satellite replenishment needs. We discussed the interpretation of the model results with program analysts. We performed our work primarily at the Air Force Space and Missile Systems Center in El Segundo, California, and the U.S. and Air Force Space Commands in Colorado Springs, Colorado, which included acquiring and assessing information from acquisition and budget documents, management reports, and internal memoranda.

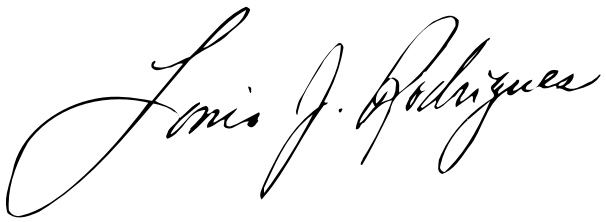
To gain an additional understanding of these matters, we reviewed information provided by the Office of the Under Secretary of Defense for Acquisition and Technology; DOD's Office of the Director, Operational Test and Evaluation; the Joint Staff; and the Departments of the Air Force, the Navy, and the Army in Washington, D.C. We also reviewed information provided by the U.S. Strategic Command at Offutt Air Force Base, Nebraska; the Air Force's Operational Test and Evaluation Center at Peterson Air Force Base, Colorado; the Army's Program Executive Office for Communications Systems at Fort Monmouth, New Jersey; the Army's Signal Center at Fort Gordon, Georgia; the Navy's Space and Naval Warfare Systems Command in San Diego, California; and the Air Force's Electronic Systems Center at Hanscom Air Force Base, Massachusetts.

We performed our review from August 1997 to August 1998 in accordance with generally accepted government auditing standards.

We are sending copies of this report to the Ranking Minority Member, Subcommittee on National Security, House Committee on Appropriations; and to the Chairmen and Ranking Minority Members of the House Committee on National Security; the Senate Committee on Armed Services; and the Subcommittee on Defense, Senate Committee on Appropriations. We are also sending copies to the Secretary of Defense, the Secretary of the Air Force, and the Director, Office of Management and Budget. We will make copies available to others upon request.

If you or your staff have any questions concerning this report, please call me at (202) 512-4841. Major contributors to this report are listed in appendix II.

Sincerely yours,



Louis J. Rodrigues
Director, Defense Acquisitions Issues

Contents

Abbreviations

ACMS	automated communications management system
DOD	Department of Defense
EHF	extremely high frequency
LDR	low data rates
MDR	medium data rate

Comments From the Department of Defense

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
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WASHINGTON, DC 20301-6000

COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE

Mr. Louis J. Rodrigues
Director, Defense Acquisition Issues
National Security and International Affairs Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Rodrigues:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "MILITARY SATELLITE COMMUNICATIONS: Concerns with Milstar's Support to Strategic and Tactical Forces," dated September 23, 1998 (GAO Code 707293/OSD Case 1693).

See pp. 13-14.

The DoD nonconcurs with GAO recommendation one. The GAO report is essentially correct in describing Milstar issues as they existed during the Initial Operational Test and Evaluation (IOT&E) period. However, contrary to the perception created by the report, Milstar has satisfied all requirements for Phase 1 Initial Operational Capability which was declared in July 1997, and is well on its way to becoming a reliable, survivable and enduring communications tool. While the majority of Milstar capabilities work as they were intended, the report focuses only on the few program issues which were already identified and being resolved through standard DoD processes and procedures associated with developing and fielding new capabilities. The GAO draft report ignores the work done over the last year to actively address these issues. Solutions have been identified to fully operationalize the Milstar system for all its missions. These solutions are expected to be tested and fully implemented by 2002 in time to meet the Secretary of Defense mandate for transitioning strategic users from the Defense Satellite Communications System to Milstar. The processes and procedures already established by the Secretary of Defense and the DoD are sufficient to ensure that the momentum is maintained for implementing the appropriate corrective actions. No additional direction by the Secretary of Defense is necessary.

See p. 14.

The DoD nonconcurs with GAO recommendation two. The DoD has previously addressed the operational risks to tactical forces associated with the transition from Milstar to the advanced extremely high frequency (AEHF) satellite system in 2006. The DoD position remains that the availability of protected communications for tactical forces is acceptable. Additional review of this issue by the Secretary of Defense is unnecessary.

Detailed comments on the report's recommendations are provided in the enclosure. Technical corrections to the report were provided separately. The DoD appreciates the opportunity to comment on the GAO draft report.

Sincerely,

Arthur L. Money
Senior Civilian Official

Enclosure

**GAO DRAFT REPORT - DATED SEPTEMBER 23, 1998
(GAO CODE 707293) OSD CASE 1693**

"MILITARY SATELLITE COMMUNICATIONS: CONCERNS WITH MILSTAR'S SUPPORT TO STRATEGIC AND TACTICAL FORCES"

DOD COMMENTS ON THE GAO RECOMMENDATIONS

Now on p. 12.

RECOMMENDATION 1: To better ensure the operational effectiveness of the Milstar system, the GAO recommended that the Secretary of Defense provide the necessary directions to the military services and commands for (1) resolving the disagreements over operational requirements, (2) ensuring the availability of necessary software, (3) completing the certification process for interoperable equipment and software, and (4) managing the difficulties developing the automated communications management system (ACMS). (pp. 17-18/GAO draft report)

See pp. 13-14.

DOD RESPONSE: Nonconcur. The GAO report is essentially correct in describing Milstar issues as they existed during the IOT&E period. However, additional direction from the Secretary of Defense is unnecessary to resolving these issues. The DoD is actively monitoring the progress on all the Milstar issues identified in the GAO draft report via existing Three-Star level forums, such as the *Military Satellite Communications (MilSatCom) Senior Steering Group* co-chaired by the Director for Communication and Command and Control Battle Management in the Office of the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (OASD/C3I) and the Director for Command, Control, Communications, and Computers Systems, Joint Staff/J6, and the *Milstar User's Conference* attended by all the theater J6 Directors. These forums provide on-going oversight of operational, programmatic, and management issues affecting Milstar, and they forward appropriate direction to the Services for resolution. All issues are being closely tracked to fulfill current Secretary of Defense guidance to transition strategic users to Milstar by 2003 in accordance with Defense Planning Guidance.

Additionally, while there was a basis for the issues identified in the GAO draft report, the report does not provide a balanced view of overall requirements satisfaction or the progress made in issue resolution. During IOT&E, Milstar successfully passed five of six Full Operational Capability (FOC) key performance parameters tested, with the sixth being unresolved. Additionally, the system passed 14 of 17 threshold parameters tested and the three that failed were by small percentage points. Early issues were resolved to the satisfaction of the user community and Phase 1 Initial Operational Capability (IOC) was declared in July 1997. Since then, considerable progress has been made on the remaining issues which have identified solutions, timelines, and plans for additional testing. Funding requirements have also been identified, although funding has not yet been provided for all solutions. Specific GAO issues and DoD solutions are addressed below:

Voice Conferencing - Voice conferencing capabilities were not required for Phase 1 IOC. However, additional voice conferencing improvements are planned. With near-term changes in operational procedures, initiation of a new network architecture, and more user familiarity with the system, National Command Authorities voice conferencing will support operational

communications with shorter delays for most users. Additionally, implementation of Joint Staff approved voice conferencing improvements scheduled for completion by 2002 will further improve both timeliness and voice quality. Some additional funding to complete the Joint Staff approved upgrades is still required.

Missile Warning - Headquarters Air Force Space Command verified the ability of the missile warning teletype network, a component of the Milstar Integrated Tactical Warning/Attack Assessment system, to fulfill mission objectives. This capability was declared operational as a secondary path for Phase 1 IOC by United States Space Command. Additional software upgrades, equipment installations, and certification will be completed by May 2000 for Milstar to become the primary path for MWTTY. The Survivable Communications Integration System has not yet been certified ready for operational testing, however FOC is planned for mid 1999. These will be used to baseline the Phase 2 IOC declaration in October 2000. Discussions are on-going to establish specific operational test dates.

Emergency Action Messages - United States Strategic Command (USSTRATCOM) approved the nuclear bomber force direction and report back concept of operations in March 1998. A software change has been implemented to allow users flexibility to define the ultra-high frequency channel configuration. This capability was subsequently demonstrated in developmental tests in April 1998. Operational tests are targeted for early 1999.

Endurance Requirements - New procedures have been implemented to overcome battery performance issues. However, this was not a required Phase 1 IOC capability. USSTRATCOM and Air Force agencies are aggressively working to implement the endurance solution by 2002 following Joint Requirements Oversight Council (JROC) approval of the Operational Requirements Document (which clarifies the endurance requirements), anticipated by April 1999. The Director Operational Test and Evaluation has also directed that future testing include a full test of the endurance requirement. Funding shortfalls associated with the endurance solution are being addressed.

Interoperability Certification - Certification of baseband components is a critical element of the end-to-end connectivity of Milstar. The DoD will ensure interoperability certification is performed by the Agencies responsible for providing and using the baseband items. To this end, Chairman of the Joint Chiefs of Staff Instruction 6250.01, which addresses management of satellite communications, is expected to be approved by the end of October 1998. This instruction will designate the Defense Information Systems Agency as the MilSatCom system engineer responsible for end-to-end communications.

ACMS - The complex ACMS has not developed as fast as originally planned. In the near term, the DoD has funded upgrades to the existing Milstar interim communications management tool. As planned, these upgrades will be sufficient to enable the interim tool to provide adequate support when the Milstar medium data rate (MDR) service becomes available during the third quarter of fiscal year 1999. This capability will be operationally tested during the Secure Mobile Anti-Jam Reliable Tactical Terminal Follow-On Test and Evaluation in 1999. ACMS is planned to be available for initial testing as early as July 1999 and is planned to be operational for Milstar

flight four. The GAO is correct in stating that transition from the interim tool to ACMS will entail some retraining of the operational forces.

RECOMMENDATION 2: In assessing the operational risks associated with the predicted degradation of Milstar communications for the House Committee on Appropriations, the GAO also recommended that the Secretary of Defense specifically address (1) the minimally acceptable level of extremely high frequency satellite communications needed to support tactical forces and (2) whether the Milstar system could provide this minimum level of communications until an advanced extremely high frequency communications capability is deployed. (p. 18/GAO draft report)

Now on p. 12.

See p. 14.

DOD RESPONSE: Nonconcur. The DoD has previously addressed the operational risks to tactical forces associated with the transition from Milstar to the AEHF satellite system in 2006. The DoD continues to believe the current transition strategy represents the best risk management approach after carefully assessing all available options. In 1996, the *Joint Space Management Board* co-chaired by the Under Secretary of Defense for Acquisition and Technology and the Deputy Director of Central Intelligence approved the future MilSatCom architecture goals and strategy, including specific future program major milestones. The *Defense Resource Board* chaired by the Deputy Secretary of Defense subsequently funded the MilSatCom systems consistent with the architecture. The Secretary of Defense has repeatedly supported the architecture's program milestones for Milstar and the follow-on system in the "Defense Planning Guidance" since that time.

In 1997, the Three-Star level *Senior Warfighter's Forum (SWARF)* performed a comprehensive evaluation of all future MilSatCom satellite requirements and capabilities through 2010 to establish the detailed architecture transition plan. That evaluation weighed all factors including the potential reduced MDR protected-communications capacity from the Milstar system between 2003 and 2006. It specifically considered terminal fielding schedules. Additionally, tactical forces are not totally dependent on Milstar MDR services. The DSCS and Wideband Gapfiller satellites, utilizing the Universal Modem System, will be able to provide a moderate level of protection as a risk mitigation during the transition period. The resulting plan recommended by the SWARF reaffirmed the architecture's deployment schedule. In October 1997, the *JROC* chaired by the Vice Chairman of the Joint Chiefs of Staff endorsed the plan recommended by the SWARF. The architecture transition plan signed by the Under Secretary of Defense for Acquisition and Technology, the Vice Chairman of the Joint Chiefs of Staff, and the Senior Civilian Official in the OASD/C3I was forwarded to the Deputy Secretary of Defense in May 1998.

Note that the availability of Milstar low data rate capability (LDR) in support of nuclear command and control is not an issue as there is sufficient LDR capacity on-orbit to meet the availability requirement.

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