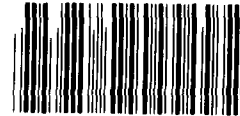


GAO

July 31, 1986

DOD ACQUISITION

Case Study of the MILSTAR Satellite Communications System



130589

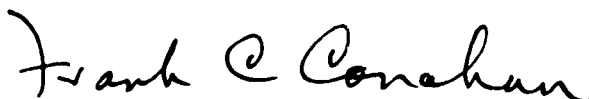
!

!

Preface

The Chairmen of the Senate Committee on Governmental Affairs and its Subcommittee on Oversight of Government Management asked GAO to examine the capabilities of the program manager and contracting officer in weapon systems acquisition. As part of this study, GAO examined 17 new major weapon system programs in their initial stages of development. These case studies document the history of the programs and are being made available for informational purposes.

This study of the Military Strategic and Tactical Relay (MILSTAR) program focuses on the role of the program manager and contracting officer in developing the acquisition strategy. Conclusions and recommendations can be found in our overall report, DOD Acquisition: Strengthening Capabilities of Key Personnel in Systems Acquisition (GAO/NSIAD-86-45, May 12, 1986).



Frank C. Conahan, Director
National Security and
International Affairs Division

The MILSTAR Program

Origin of the Program

The Military Strategic and Tactical Relay (MILSTAR) Satellite Communications System is being developed jointly by the Air Force, Navy, and Army. The system is designed to meet the minimum essential wartime communication needs of the President and Commanders-in-Chief to command and control our strategic and tactical forces through all levels of conflict.

MILSTAR will be composed of satellites in geostationary orbit (about 22,894 nautical miles above the center of the earth) and other complementary orbits that will be crosslinked for worldwide coverage. The system will use the extremely high frequency band to prevent jamming. The satellite's survivability and endurance will also be enhanced.

Currently, strategic communications are accomplished through communication packages aboard other satellites. This system is called the Air Force Satellite Communication System. Deficiencies in this system and the need to replace a critical component prompted a search for a follow-on system with primary emphasis on resistance to jamming and spacecraft survivability.

During 1979-81, a debate arose in the Department of Defense (DOD) over the preferred satellite successor to the Air Force Satellite Communication System. The Air Force favored procuring single-purpose satellites, designated the Strategic Satellite System (STRATSAT). The plan for this system was to have four STRATSAT's orbit at an altitude of 110,000 nautical miles to enhance survivability (most communication satellites operate in geostationary orbit). The system was expected to use extremely high frequencies and sophisticated electronic techniques to increase resistance to jamming and increase performance in a disturbed electromagnetic environment.

The Defense Science Board, however, favored deploying single channel transponder packages aboard future military satellites. Proponents of this approach argued that an array of transponders aboard numerous future military satellites would more likely survive a Soviet anti-satellite attack than a system confined to four STRATSAT satellites, and would be more cost effective. The cost advantage of the single channel transponder system was recognized as modest if the system was designed to equal STRATSAT's expected capacity, availability, and jam resistance.

Neither the STRATSAT nor the single channel transponder option was chosen as the Air Force Satellite Communication System's successor. Congress rejected Air Force requests for a STRATSAT program for three

consecutive years. DOD in its fiscal year 1982 budget request chose not to pursue either of these follow-on options. Instead, it undertook a communications satellite architecture review that recommended a need for a multi-mission satellite.

In the fall of 1981, President Reagan announced the strategic modernization program, which led to the structuring of the MILSTAR mission and program. The strategic modernization plan consisted of five elements: (1) improvements in communication and control systems, (2) modernization of strategic bombers, (3) deployment of new submarine-launched missiles, (4) phased introduction of new land-based MX missiles, and (5) improvements to strategic defenses. According to the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence), the President has given strategic command, control, and communications top priority in the strategic modernization program.

The MILSTAR technology was demonstrated during earlier development and evaluation programs. Most of the technology base was developed for the intelligence community. The Naval Ocean Systems Center worked on the development of extremely high frequency communications technology. Rome Air Development Center performed the technology level studies for the STRATSAT system, and Lincoln Laboratory formulated the current system architecture. The Navy performed conceptual studies on the extremely high frequency communications test package for MILSTAR. Work related to MILSTAR was also performed under the Advanced Space Communications Program.

Formation of Program Office

The Air Force initiated the MILSTAR program in November 1981. The joint MILSTAR program office, formed at the Air Force Space Division in January 1982, has overall responsibility for program development and acquisition of the space and mission control segments. In addition, each service is managing a satellite communications terminal program under the overall direction of the MILSTAR joint terminal program office managed by the Navy. This case study focuses on the MILSTAR space segment managed by Space Division.

An Air Force colonel was appointed as the first program manager in January 1982 when the joint MILSTAR program office was formed. His background includes master and doctorate degrees in engineering and many years' program management experience in avionics and ballistic missiles. In May 1983, this individual left the program manager position

and became Space Division's assistant deputy commander for Space Systems and deputy for Space Communications Systems programs. From this position he has retained oversight responsibility for the MILSTAR program.

The second program manager, also an Air Force colonel, was assigned to the program in June 1983. His background includes a master's degree in electrical engineering, prior program office experience with satellite systems, and several Air Force headquarters positions.

The MILSTAR contracts manager served as an advisor to the program before being appointed contracts manager in June 1982. The contracting officer, who reports directly to the contracts manager, was appointed in April 1981.

To coordinate and expedite the MILSTAR acquisition process, DOD established a separate executive committee—chaired by the Deputy Assistant Secretary of Defense (Command, Control, Communications, and Intelligence)—to periodically review the program. This committee discharges the acquisition review function normally assigned to the Defense Systems Acquisition Review Council—a group of top-level DOD managers responsible for advising the Secretary of Defense on milestone decisions for major systems such as MILSTAR.

Because the MILSTAR system is a highly classified program, it was designated a special access program. This designation sharply limited the number of people who had access to information concerning the program, provided an opportunity for a streamlined management structure and focused review staff involvement to single points of contact.

The MILSTAR program was initiated in fiscal year 1982 with \$16 million appropriated for the Advanced Space Communication program and \$32 million for the Air Force Satellite Communication System program. Funding specifically for the MILSTAR Satellite Communications System program was first requested in the fiscal year 1983 budget submission, which contained both satellite and terminal development funds. Beginning in fiscal year 1984, terminal development was funded in the Air Force Satellite Communication System program, and only the MILSTAR satellite and its mission control segment programs was funded in the MILSTAR program. The total cost for the MILSTAR program is classified.

Development of the Acquisition Strategy

The MILSTAR acquisition strategy was developed by the program office and contracting staff. In the original acquisition strategy, the program office wanted to acquire the total system (electronics payload, satellite bus, mission control) as an integrated package.¹ The strategy called for multiple phase 1 validation contracts, down selecting to one contractor for the phase 2 full-scale development/production contract. However, TRW Space and Technology Group and Hughes Aircraft Company subsequently teamed and became the prime contenders for the MILSTAR contract. Officials of Lockheed Missiles and Space Company, Inc. expressed concern that since TRW and Hughes had performed the majority of extremely high frequency technology work, their teaming represented an insurmountable challenge to other contractors. Since other contracting teams also expressed their intent not to compete with the Hughes and TRW team, competition in the MILSTAR acquisition approach was jeopardized.

Acquisition Strategy Revised

In reaction to these events, the MILSTAR program office designed an alternative acquisition strategy based on an associate contractor approach. Under such an approach, rather than contracting for the whole system with a prime contractor, the government contracts with different firms for components of the system. This strategy was designed by the MILSTAR program manager and approved by the Commander, Space Division.

In the first phase, which the Air Force called the validation phase, all specifications, statement of work, plans, and conceptual studies were generated. Three teams for the electronics payload and three teams for the satellite bus and systems integration (which included mission control) would compete for the second phase, the full-scale engineering development phase.

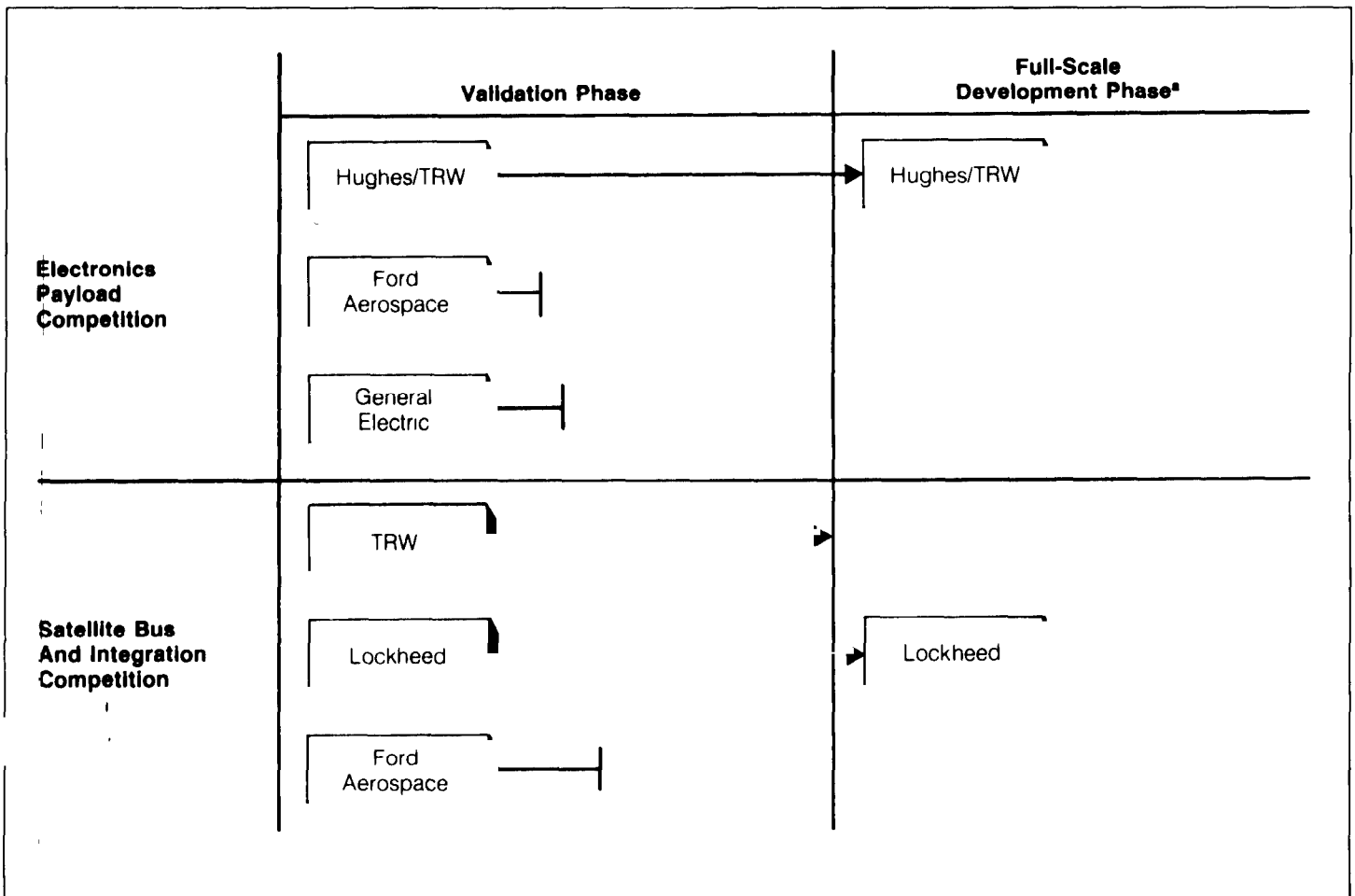
The satellite bus and integration validation contracts were awarded in February 1982, to Lockheed, TRW, and Ford Aerospace. In July 1982 Ford withdrew from the competition.

Contracts for the electronics payload validation were awarded in May 1982 to the Hughes/TRW team, General Electric, and Ford Aerospace. Ford and General Electric subsequently withdrew from the competition.

¹A satellite is comprised of a bus and an electronics package or payload. The electronics payload is the equipment that satisfies the mission of the satellite. All support equipment such as the satellite housing, power supply, and propulsion system comprise the bus.

According to the first program manager, these contractors could not compete with Hughes/TRW because of that team's technological lead. Figure 1 illustrates MILSTAR's revised acquisition strategy and resulting contracts.

Figure 1: Revised MILSTAR Strategy and Resulting Contracts



*In a later revision, it was decided that the electronics payload contractor would be a subcontractor to the satellite bus and integration contractor

Planning the extent and type of competition for the MILSTAR program was a joint effort between the program office and the contracting staff. The contracts manager and his staff established the original business competition strategy. The MILSTAR program manager structured an alternative strategy for concept validation due to Hughes and TRW teaming. By splitting the electronics payload and spacecraft effort, competition

was achieved for the satellite bus and integration. However, no meaningful competition was obtained for the electronics payload competition.

Request for Proposal for Full-Scale Development

After awarding the validation contracts, the program office began preparing the full-scale engineering development and initial production phase request for proposal. On June 24, 1982, the MILSTAR program office solicited a statement of interest from industry via the Commerce Business Daily for MILSTAR's full-scale engineering development. A request for proposal for full-scale engineering development was issued on September 15, 1982.

The statement of work was prepared by the program office's technical personnel with the program manager's guidance. The contracting officer and his staff reviewed it to assure that no particular design or approach was favored, and that no unnecessary requirements would preclude competition. The statement of work went through many iterations between the engineering and contracting organizations. According to the contracts manager most of the restrictive provisions were eliminated early in the process. The program manager chaired the solicitation review panel which reviewed the statement of work. The program manager stated that this panel used fair competition as a major criterion for consideration in its review of the program's request for proposal.

The process for developing the MILSTAR specifications was similar to the statement of work. The contracting staff acted in an advisory capacity to the program manager in the specification development and made minor recommendations to alleviate restrictive provisions. Some, but not all, of these recommendations were accepted by the program manager.

The MILSTAR contracting officer prepared the business terms and conditions, which were reviewed and approved by the program manager.

Source Selection Process

Proposals were received on November 22, 1982 from Lockheed and TRW, the two remaining potential systems integration contractors. Because the Hughes/TRW team was the only remaining competitor for the electronics payload contract, the program office decided that the electronics payload developer should be a subcontractor to the satellite bus and integration contractor.

The program office initiated the source selection process in parallel with the development of the request for proposal. The source selection process involved developing a source selection plan and evaluation criteria, establishing a source selection evaluation board, evaluating contractor proposals, holding pre-award discussions and negotiations, and then awarding the contract. During the MILSTAR full-scale development source selection process, the program was rescoped in order to meet schedule and budgetary constraints, as discussed below.

The MILSTAR evaluation criteria were established by the source selection advisory group. The contracting officer provided advice and the program manager reviewed and approved the evaluation criteria.

The MILSTAR contracting officer (1) reviewed the contractors' technical proposals for overall responsiveness and completeness and (2) supervised the analysis and audit of the cost proposals. The contracting officer participated in the source selection team which evaluated performance and reported to the source selection authority. The program manager was on the source selection advisory council and, as such, advised the source selection advisory council chairman who, in turn, advised the source selection authority regarding contractor selection.

The MILSTAR deputy program manager, a Naval officer, chaired the negotiations. The contracting officer supported and advised the deputy program manager while participating in the negotiations. The negotiations took place over a one-week period, while the preceding month was spent in preparation.

The detailed pre-award discussions and subsequent negotiations were based on the negotiation objectives the program manager had established. The program manager then approved the results of the negotiations. According to the contracts manager, the contracting officer and the deputy program manager were a team at the negotiations in that discussions held with the contractors were always attended by both.

MILSTAR Rescoping

In mid to late 1982, during the validation phase of the program, the Air Force realized that the MILSTAR configuration could not be achieved given existing schedule and budgetary constraints. At the start of the program, before concept formulation, the MILSTAR program office made cost estimates based on estimated system weight. Because these estimates seemed to be in line with the STRATSAT budget the program office

agreed to accept the STRATSAT's budget for MILSTAR. However, as the concept formulation progressed, system weight increased and, therefore, so did the cost estimates.

The program office began rescoping the program to conform to the budgetary constraints in a design-to-budget exercise. A preliminary rescoped configuration was established in December 1982 after a meeting among the services and the potential contractors. The program office was responsible for the rescoping exercise.

The successful bidder for the systems integration contract, Lockheed, was selected based on its response to the original request for proposal before rescoping. According to the MILSTAR program manager, the program office did not revise the request for proposal because of the time and expense that would have been involved. Lockheed's MILSTAR program manager explained that when rescoping occurred the major performance reduction was in the electronics payload, not in the spacecraft or mission control. The rescoping did not affect the TRW/Lockheed competition because the satellite bus remained essentially unchanged, and it did not affect the electronics payload competition since the Hughes/TRW team was the only remaining competitor. To prevent a bid protest, the program office required both TRW and Lockheed to agree to this procedure in writing. As an additional precaution, the program office discussed this procedure with Ford, which had dropped out of the system integration competition. The program office obtained confirmation from Ford that the change in scope would not generate a bid protest.

Selection and Award

On February 25, 1983, at the end of the concept validation phase, Lockheed was selected by the Air Force for the MILSTAR full-scale engineering development and initial production phase. The other validation phase contractors (the Hughes/TRW electronics payload contracting team) became subcontractors to Lockheed instead of associate contractors. The program was rescoped for a second time by the program office—this time adding requirements due to user input and concerns. Lockheed and the Air Force subsequently negotiated a contract based on the new set of requirements for MILSTAR, that is, a final revision to the rescoped configuration. A letter contract was issued to Lockheed on March 1, 1983. Lockheed was awarded a cost plus incentive fee contract for MILSTAR's full-scale engineering development on June 30, 1983.

The MILSTAR program manager provided the oral award notifications, and the deputy program manager provided the contractor debriefing,

the content of which had been approved by the program manager. The contracting officer provided the letter notice of award to the winner and participated in the debriefing of the unsuccessful bidder.

Industry Comments on Acquisition Strategy

According to Lockheed's MILSTAR program manager, Lockheed was initially concerned that the original acquisition strategy would have precluded competition because of the technical experience of Hughes and TRW in extremely high frequency space communications. With the issuance of the revised acquisition strategies, Lockheed's concerns were alleviated. TRW's viewpoint on the original acquisition strategy, as expressed by the Vice President of Space Systems, was that Lockheed could have teamed with General Electric or Ford and could have competed well against the TRW/Hughes team for the total MILSTAR system.

Evaluation of Roles and Acquisition Strategy

Roles and Responsibilities

The program manager had a lead role in developing the original acquisition strategy while the contracts manager drafted the strategy. When two firms teamed, necessitating a change in the strategy, the program manager developed the alternate strategy, with the advice of the contracts manager. The contracts manager developed the incentive plan which supported the cost plus incentive fee contract.

Design Competition

DOD policy encourages competitive design work up to full-scale development or beyond if cost effective. Air Force Systems Command's policy is to compete programs up to critical design review (an advanced stage of full-scale development) and preferably through full-scale development. The MILSTAR program carried this competition up to full-scale development for the satellite bus and integration contract; for the payload contract, competition terminated during phase 1 validation.

Production Competition

Because of the small number of satellites to be acquired, competition is not planned for the production phase of the program.

External Influences

Teaming of the technology leaders limited the amount of competition that could be obtained on the program. Hughes and TRW had performed the majority of the extremely high frequency work for the intelligence community and had developed the technical expertise which was perceived to be an insurmountable obstacle for other contractors to overcome. The teaming of the contractors involved in this pre-program technology development precluded the program office from implementing its original acquisition strategy of competing the MILSTAR program as a total integrated system package (electronics payload, satellite bus/integration).

Present Status

MILSTAR is currently in the full-scale engineering development/initial production phase.

Chronology of Events

1979-81	Air Force Satellite Communication System follow-on debated.
1981	DOD space communications architecture review undertaken.
April 1981	Contracting officer assigned.
October 1981	President announces strategic modernization program.
November 1981	Air Force initiates MILSTAR program.
December 1981	Satellite bus and integration validation request for proposal issued.
January 1982	Joint program office formed. Program manager appointed. Payload validation request for proposal issued.
February 1982	Satellite bus and integration validation contracts awarded.
May 1982	Payload validation contracts awarded.
July 1982	Ford discontinues participation in the satellite bus and integration competition.
August 1982	Ford discontinues participation in payload competition.
October 1982	General Electric discontinues participation in payload competition.

Chronology of Events

September 1982	Full-scale engineering development request for proposal issued.
December 1982	Preliminary rescoped configuration established.
February 1983	Decision made to have payload contractor be a subcontractor to satellite bus and integration contractor. Lockheed selected as source for full-scale engineering development.
March 1983	Letter contract issued.
March-June 1983	Second rescoping; contract negotiations held. Second program manager appointed.
June 1983	Full-scale engineering development commences.

Requests for copies of GAO reports should be sent to:

U.S. General Accounting Office
Post Office Box 6015
Gaithersburg, Maryland 20877

Telephone 202-275-6241

The first five copies of each report are free. Additional copies are \$2.00 each.

There is a 25% discount on orders for 100 or more copies mailed to a single address.

Orders must be prepaid by cash or by check or money order made out to the Superintendent of Documents.

United States
General Accounting Office
Washington, D.C. 20548

First-Class Mail
Postage & Fees Paid
GAO
Permit No. G100

Official Business
Penalty for Private Use \$300

Address Correction Requested
