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U.S. GENERAL ACCOUNTING OFFICE
STAFF STUDY

[DEFENSE SATELLITE COMMUNICATIONS SYSTEM - PHASE II]

DEPARTMENT OF DEFENSE

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ABBREVIATIONS

DCA	Defense Communications Agency
DCP	Development Concept Paper
DOD	Department of Defense
DSCS	Defense Satellite Communications System
GAO	General Accounting Office
SAMSO	Space and Missile Systems Organization
SAR	Selected Acquisition Reporting
SATCOMA	Satellite Communications Agency

C o n t e n t s

		<u>Page</u>
SUMMARY		1
CHAPTER		
1	INTRODUCTION	6
	Description and primary mission	6
	Historical summary of program	7
	Program management	9
	Scope of review	10
2	SYSTEM STATUS	11
	System cost experience	11
	System schedule experience	13
	System performance experience	17
	Selected acquisition reporting	19
	Conclusions	21
3	PROGRESS MEASUREMENT	22
	Management approach	22
	Reporting system	23
	Sources of input by program participants	25
	Conclusions	28
4	MANAGEMENT PROBLEMS	30
	Current status of previously proposed solutions	30
	Current management problems	31
	Conclusions	32
APPENDIX		
1	Photograph of DSCS satellite	33

DEFENSE SATELLITE COMMUNICATIONS SYSTEM - PHASE II

SYSTEM DESCRIPTION AND STATUS

Phase II of the Defense Satellite Communications System (DSCS) consists of two basic elements, geo-stationary satellites and terminals. Phase II is a follow-on to the Initial Defense Satellite Communications System and its acquisition will continue through 1975.

Acquisition of the space or satellite segment is the responsibility of the Air Force. The acquisition of the terminal segment consists of interrelated efforts by the Army, Air Force, and Navy to modify and develop ground and shipborne terminals.

(DCA)
The Defense Communications Agency/manages the overall program, but this agency's responsibility for and authority over the Navy's shipborne terminal efforts is limited to assuring technical interface with the DSCS.

COMING EVENTS

A firm decision on the launching date of the next two satellites (numbers 3 and 4) is expected in the near future. This decision was delayed pending resolution of the problems experienced with the first pair of satellites (numbers 1 and 2) launched in November 1971.

The Office of the Secretary of Defense (OSD) has authorized the procurement out of fiscal year 1974 funds of two replenishment satellites. These are intended for replacement of satellites 1 and 2, thus maintaining the planned basic system configuration of four operational and two backup satellites. OSD also authorized the procurement out of fiscal year 1973 funds of two of the recently developed heavy transportable ground terminals. Procurement of these terminals had been approved

by the Development Concept Paper (DCP) originally issued in July 1968, but deferred by the Deputy Secretary of Defense in a memorandum issued in May 1970. The revised DCP scheduled to be issued in early 1972 was expected to include decisions on satellite quantity and the number and types of ground terminals.

COST

The June 30, 1972 Selected Acquisition Report (SAR) for the DSCS showed an estimated program acquisition cost of \$276.4 million, comprised of \$142.0 million for the space subsystem, \$86.1 million for new ground and shipborne terminals, and \$48.3 million for modifications to existing ground terminals.

The estimated program cost has increased by \$15.4 million over the development estimate (baseline) and by \$16.8 million over the June 30, 1971 current estimate. The increase of \$16.8 million provides \$4.2 million for the space subsystem, \$4.3 million for modifications to existing ground terminals, and \$8.3 million for development of new ground equipment.

CONTRACT DATA

The major contractors and the types of contracts follow.

TRW, Inc. (Satellites) - FPIF

Philco-Ford Corporation (new ground terminals) - FPI

International Telephone & Telegraph Co. (new shipborne terminal) - CPIF

Collins Radio Corporation (interim shipborne terminal) - FFP

In addition, the Army has outstanding about 50 contracts for the procurement of components and services needed to modify the existing ground terminals.

PERFORMANCE

On November 2, 1971, the first pair of Phase II satellites was launched into orbit; however, these satellites developed serious technical problems after launching. Operation of satellite number 1 was restored in early 1972, but at the present time it is demonstrating some performance degradation. Operation of number 2 was restored in June 1972, but in September it was rendered completely nonoperational by technical problems.

An Air Force review team concluded that the anomalous condition of satellite number 2 was probably irreversible and that the cause was internal to the satellite. The team recommended design changes and modifications to correct the deficiencies disclosed by their review.

No significant performance problems in the terminal segments of the DSCS were reported during fiscal year 1972.

PROGRAM MILESTONES

The launch ready date of the second pair of satellites was estimated in the June 1972 SAR for January 1973, a slippage of 8 months. However, on February 1, 1973 the program manager estimated that the actual launch date would slip an additional 8 months because of the problems subsequently encountered with satellite number 2.

As of February 1, 1973, the completion date for the modification of existing ground terminals has slipped by 18 months to May 1974. On the other hand, the development of the new heavy transportable ground terminal was completed in November 1972, 5 months ahead of schedule. Development of the medium transportable ground terminal is expected to be completed 2 months ahead of the scheduled date of April 1973.

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Production of the interim shipborne terminals was completed in October 1972, 2 months ahead of schedule. Advanced development models of the new shipborne terminals was completed in November 1972, 2 months behind schedule.

RELATIONSHIP TO OTHER SYSTEMS

The Phase II DSCS is a follow-on to the initial Defense Satellite Communications system program (Phase I). Between June 1966 and June 1968, 26 Phase I communications satellites were launched, fourteen of which were operational as of December 1972. The Phase I satellites were designed for an expected average operating life of 1 1/2 years and were equipped to automatically shut off after 6 or 6 1/2 years. It is projected that all Phase I satellites will be shut off by December 1974.

SELECTED ACQUISITION REPORTING

The June 30, 1972 SAR was prepared generally in accordance with established guidelines. However, the SARs continue to report cost, schedule, and performance parameters on an individual subsystem basis.

In July 1972, the Assistant Secretary of Defense (Comptroller) directed that the June 1972 SAR be the final submission on the DSCS. The DSCS program manager stated that the program is now far enough advanced that a SAR is no longer necessary for management information or control.

PROGRESS MEASUREMENT

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Although DCA personnel keep track of the status of the DSCS, they are not directly involved with comparing and correlating the amount of cost incurred with the physical progress of the system. The program office, because of its place in the system management structure, is concerned only with overall coordination and policy. The military departments have sufficient latitude in the management of their funds to execute the program with limited intervention by DCA.

Because the Phase II DSCS management structure places the DCA program manager two levels above the contractors, he must rely on the intermediate levels (participating DOD organizations) for information on the formal progress of the program.

MATTERS FOR CONSIDERATION

The creation of a single program office for all DOD satellite communications has not been implemented as originally planned. The use of a single program office is expected to alleviate some of the problems resulting from fragmented management of satellite communications programs.

A revised DCP, which was expected to clarify program objectives and baselines as well as the DCA's responsibilities concerning the shipborne terminals, was not issued in early 1972 as originally scheduled. The DSCS program manager stated that some OSD officials believe that a DCP is no longer applicable to this program. In the absence of an updated DCP, annual funding guidance must also suffice as program guidance for completion of the DSCS acquisition.

AGENCY REVIEW

A draft of this staff study was reviewed informally by selected Department of Defense officials associated with the management of the program, and their comments were incorporated in the report as we believe appropriate. We know of no residual difference with respect to the factual material presented herein.

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CHAPTER 1

INTRODUCTION

As part of the efforts by the General Accounting Office (GAO) to furnish current information to the Congress on the status of major weapon systems, we reviewed various management aspects in the acquisition of Phase II of the Defense Satellite Communications System (DSCS). During our review, we examined primarily the DSCS Selected Acquisition Reports (SARs), and the management system for measuring the progress of the DSCS acquisition program. We also inquired into the status of certain proposed actions to alleviate DSCS management problems reported in our staff study of March 1972.

DESCRIPTION AND PRIMARY MISSION

The DSCS consists of two basic elements, satellites for relaying communications and terminals for transmitting and receiving communications. The mission of the DSCS is to satisfy unique and vital telecommunications needs of Department of Defense (DOD), selected National Communications System users, and authorized allies.

The DSCS is designed to provide protected communication service to high priority users, unprotected trunking and wideband communication service, and contingency communication service for crisis situations on a global basis.

HISTORICAL SUMMARY OF PROGRAM

The Phase II DSCS is a follow-on to the Initial Defense Satellite Communications System program (Phase I), which demonstrated that satellite communications provide the capabilities to meet the essential worldwide communication needs of the DOD. Between June 1966 and June 1968, 26 Phase I communications satellites were launched; of these, 14 were operational as of December 1972. The Phase I satellites were designed for an expected average operating life of 1-1/2 years and were equipped to automatically shut off after 6 or 6-1/2 years. It is projected that all Phase I satellites will be shut off by December 1974.

The acquisition of the Phase II system was authorized by the Deputy Secretary of Defense in June 1968, when he approved a Development Concept Paper (DCP No. 37) for the system. However, in May 1970, he directed significant changes in the acquisition of both satellites and terminals.

Satellite segment

Under Phase II of the DSCS program, six satellites are to be acquired. Initially, four satellites were planned for the basic system configuration and the remaining two were to be held for backup and/or system replenishment. In May 1970, the Deputy Secretary of Defense directed that two satellites be launched early in 1971; however, he deferred the decision on the total number of operational satellites to be eventually maintained in orbit.

On November 2, 1971, the first pair of Phase II satellites was launched into orbit; however, these satellites experienced serious anomalies after launching. The operational usefulness of satellite number 1 is limited. Satellite number 2 has been completely nonoperational since September 8, 1972.

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At the completion of our review, no firm decision had been made on the launch date for the next pair of satellites. In view of the limited capabilities of satellite number 1 and the nonoperational status of number 2, the early launching of satellites numbers 3 and 4 appears essential, in order to establish an operational satellite communications system.

Terminal segment

Originally, 66 terminals were to be provided for the Phase II system, consisting of 36 modified Phase I terminals, and 30 through the development and procurement of new ground, shipborne, and airborne terminals. Seven (shipboard terminals AN/SSC-3) of the existing 36 Phase I terminals were subsequently deleted from the Phase II system because of marginal technical performance. However, because of increased costs of new terminals, this plan was changed in May 1970, when the Deputy Secretary of Defense eliminated the requirement for airborne terminals and restricted the acquisition program to development of ground and shipborne terminals with new modulation and multiplex equipment. The current plan continues to require modification of the remaining 29 Phase I terminals.

In December 1970, the production of "interim" shipborne terminals was authorized, but the DCP was not revised to provide for this change in the program. The Defense Communications Agency's (DCA) authority over the shipborne terminal programs, being managed by the Navy, is limited to assuring technical interface with the DSCS.

PROGRAM MANAGEMENT

The DCA was assigned the overall responsibility for managing the acquisition of Phase II of the DSCS. The Air Force, Army, Navy, and the National Security Agency have been charged with responsibility for planning, programming, budgeting and funding of one or more segments of the program. Specific organizations within these agencies have been designated to carry out the design, development, production and deployment functions. The Joint Chiefs of Staff are responsible for specifying the use, location and application of the satellites and terminals for the activities of the DOD.

Under the DSCS program, the Air Force is responsible for the acquisition of the space segment (satellites). This work is being carried out by the Space and Missile Systems Organization (SAMSO), El Segundo, California. The Army is responsible for the acquisition of the ground environment segment, which includes (1) modification of existing ground terminals and (2) development of new ground terminals. This work is being carried out by the Army Satellite Communications Agency (SATCOMA), Fort Monmouth, New Jersey. The Navy is responsible for the acquisition of shipborne terminals, being carried out by the Naval Electronics Systems Command, Washington, D.C.

SCOPE OF REVIEW

Information on this program was obtained by reviewing plans, reports, correspondence and other records and by interviewing knowledgeable officials in the program offices of DCA, the Army and the Air Force. Our review of progress measurement was performed primarily at the Defense Communications Agency, Arlington, Virginia, the Army Satellite Communications Agency, Fort Monmouth, New Jersey, the Air Force Space and Missile Systems Organization, El Segundo, California, and at the facilities of the prime contractor for development and production of the Phase II satellites, TRW, Inc., Redondo Beach, California.

We evaluated management policies, procedures, and controls related to the decision-making process, but we did not make detailed analyses or audits of the basic data supporting program documents. We made no attempt to assess the military threat or the technology, develop technological approaches, or involve ourselves in decisions while they were being made.

CHAPTER 2

SYSTEM STATUS

During fiscal year 1972, estimated program costs increased and schedule milestones slipped for Phase II of the DSCS. Although current estimates shown in the June 30, 1972 SAR indicate that performance characteristics for the DSCS program will generally be met, significant operational problems have been experienced in the two satellites currently in orbit. The results of our review of the cost, schedule and performance characteristics of the DSCS program are presented in this chapter.

SYSTEM COST EXPERIENCE

The original planning estimate for Phase II of the program, based on the DCP dated July 26, 1968, was \$259.0 million. Because of increased costs of new terminals and slippages in their operational dates, the program was reassessed and interim guidance modifying the DCP was issued by the Deputy Secretary of Defense on May 27, 1970. This guidance revised the acquisition cost to \$238.0 million. Based on an approved technical development plan for shipborne terminal development and a program budget decision for procurement of interim shipborne terminals, the acquisition cost was further increased by \$13.8 million to complete the AN/WSC-2 terminal, and \$9.2 million, to acquire the AN/SSC-6 terminal. This revised total estimate of \$261.0 million is referred to as the development estimate and is used in the SAR as the baseline for comparison with subsequent estimates. As of June 30, 1972, the program acquisition cost was estimated at \$276.4 million or \$15.4 million over the development estimate, and about \$16.8 million over the June 30, 1971 current estimate of \$259.6 million. These estimates are presented graphically in figure 1.

Cost increases from June 1971
through June 1972

The estimated program increase of \$16.8 million includes increases of (1) \$4.2 million for costs relating to redesign of spacecrafts 3 through 6, (2) \$4.3 million for ground terminal reliability modifications and configuration changes directed by the Joint Chiefs of Staff, and (3) \$8.3 million for development of new terminals and modulation equipment. The \$8.3 million reflects a \$12.0 million increase in development funds and a \$3.7 million decrease in procurement funds, transferred for use in terminal modifications. The \$12.0 million increase provides \$9.8 million for development of light terminals, antennas, and other equipment. The remaining \$2.2 million represents funds for fiscal year 1969 and prior years applied to new terminal development but not recognized in the May 1970 revision to the DCP.

The following table presents the total estimated acquisition costs by program element as of June 30, 1972.

<u>Program element</u>	<u>Estimated acquisition cost</u> (millions)
Space subsystem	\$142.0
New terminal development	86.1
Modifications to existing terminals	<u>48.3</u>
	<u>\$276.4</u>

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The estimated total acquisition cost as of 31 Dec 1972 has increased \$8.2 million over the June 1972 SAR estimate of \$276.4 million. This increase of \$8.2 million is the net result of an additional \$1.6 million in development funds, \$2.8 million in procurement funds for the space subsystem, \$6.9 million for the modification of existing ground terminals, and a decrease of \$3.1 million in the procurement funds originally allocated for procurement of technical data associated with the development of new terminals.

Program funds appropriated

Through fiscal year 1972, \$226.4 million or about 82 percent of the June 30, 1972 current estimate of \$276.4 million had been funded. Figures II and III compare appropriated and current program funding by fiscal year for research, development, test and evaluation (RDT&E) and procurement, respectively. These figures demonstrate that funding for Phase II of the DSCS program is declining.

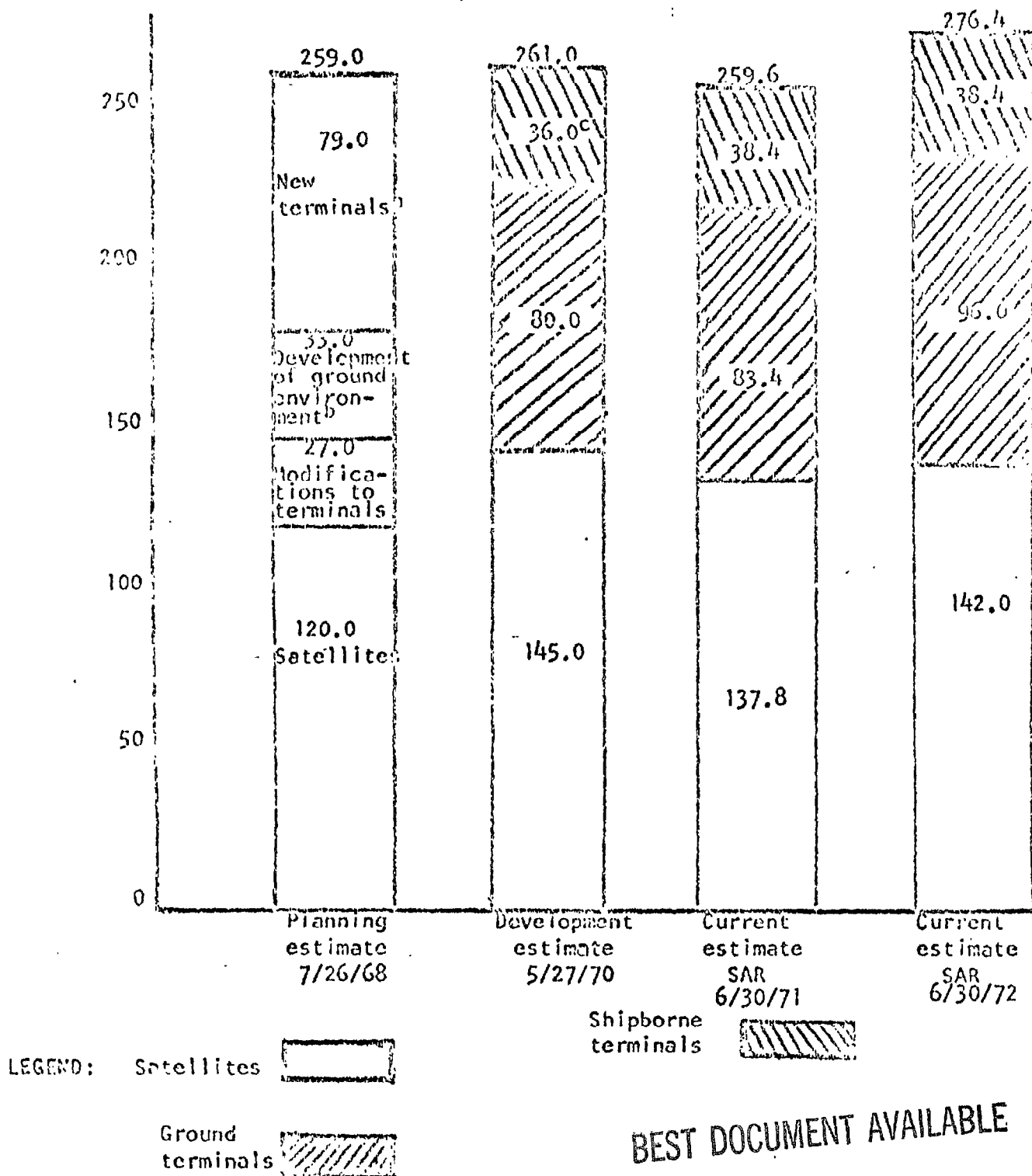
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SYSTEM SCHEDULE EXPERIENCE

The ready launch date for the second pair of satellites has slipped 8 months from the approved program date of May 1972, to the current estimate of January 1973. Subsequent to the issuance of the June 30, 1972 SAR, the DSCS program manager informed us that as of February 1, 1973 he estimated the actual launch date would slip an additional 8 months because of the problems encountered in satellite number 2. The approved program completion date for the modification of existing ground terminals is November 1972, with operational capability established February 1973. The June 30, 1972 SAR shows that these milestones have slipped 15 and 13 months, respectively, to February and March 1974. As of February 1, 1973, the operational capability date has slipped further to June 1974.

DSCS PROGRAM COST DATA

(in millions)



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^aFor the procurement of 30 new ground, shipborne and airborne terminals. Dropped from the revised DCP (May 1970).

^bincludes development of heavy and medium transportable ground terminals, time division multiple access equipment, supporting hardware, and advanced shipborne terminals.

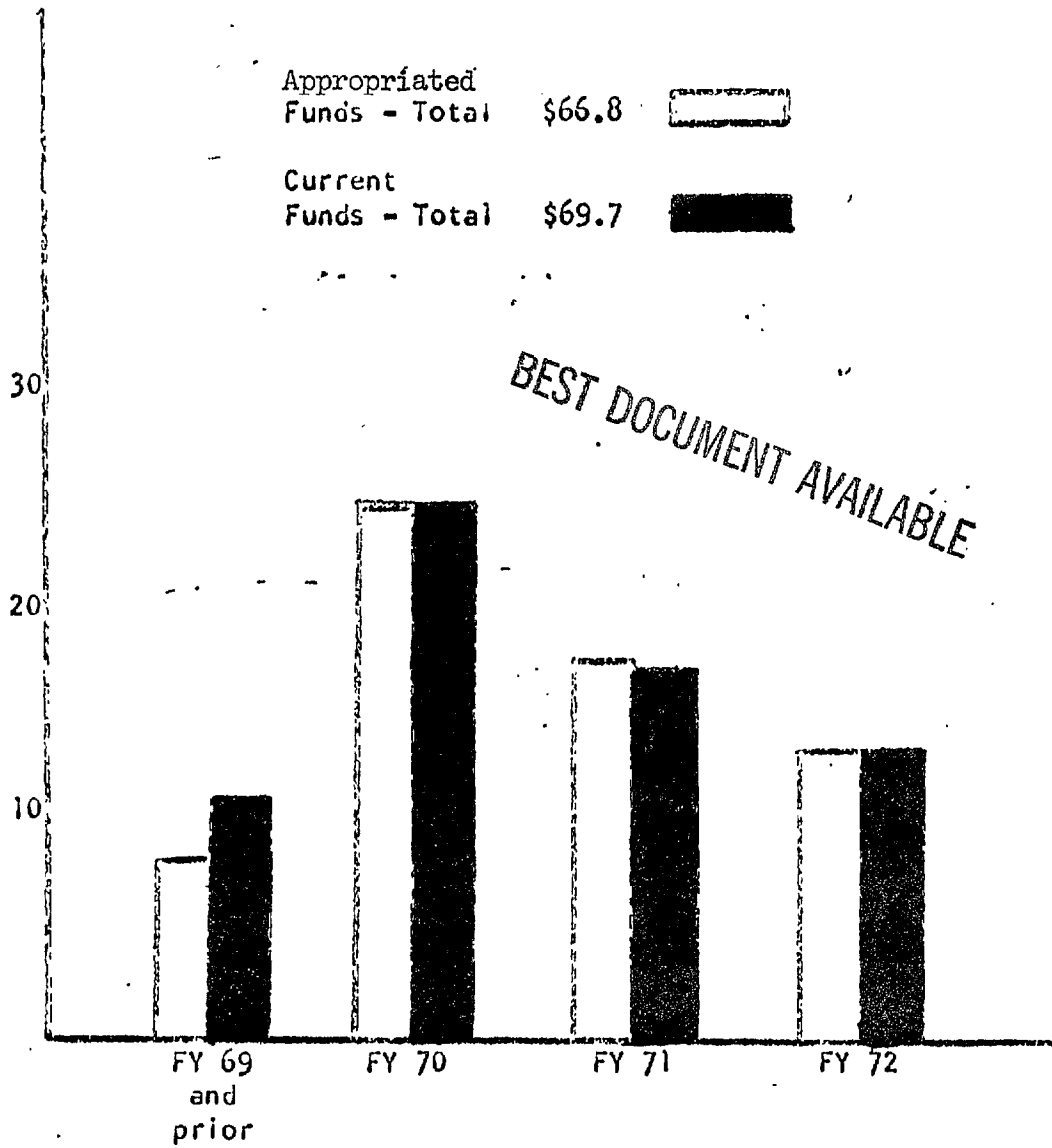
^cIncludes \$9.2 million for the procurement of interim shipborne terminals not included in the planning estimate or revised DCP.

CHART OF APPROPRIATED AND CURRENT
PROGRAM FUNDS BY FISCAL YEAR

RDTC-E

DSCS PROGRAM

(in millions)



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NOTE: Difference between appropriated and current program funds in a given FY is the result of reprogramming funds to or from another program.

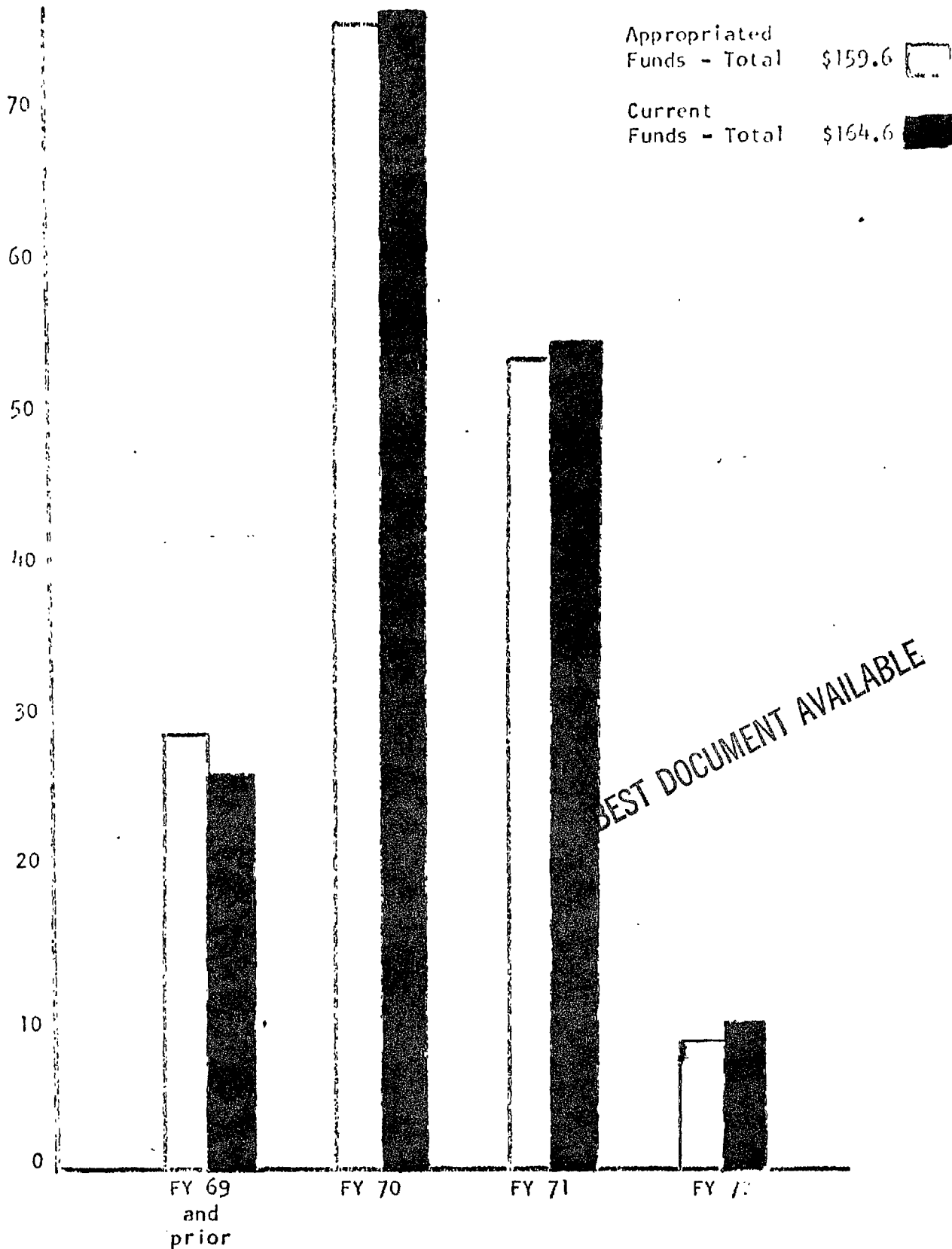
FIGURE 11

PROGRAM FUNDS BY FISCAL YEAR

PROCUREMENT

DSCS PROGRAM

(in millions)



NOTE: Difference between appropriated and current program funds in a given FY is the result of reprogramming funds to or from another program

The approved program completion date for the development of both the heavy ground terminal and the medium ground terminal is April 1973. The heavy terminal was accepted in November 1972, 5 months ahead of the approved program completion date, and development of the medium terminal is 2 months ahead of the scheduled completion date.

The production of interim shipborne terminals was completed in October 1972, 2 months ahead of its approved program completion date. Delivery of the advanced development model of the new shipborne terminals was completed in November 1972, a slippage of 2 months from the approved program completion date of September 1972.

SYSTEM PERFORMANCE EXPERIENCE

The first two DSCS Phase II satellites were launched on November 2, 1971. In early December 1971 both satellites developed serious technical problems. Operation of satellite number 1 was restored in early 1972 and the operational test program was resumed. It was turned over to DCA for operation on January 31, 1972, and in late September 1972, it completed its move to a position over the Atlantic Ocean designated by the Joint Chiefs of Staff. At the present time the satellite demonstrates some performance degradation in both the earth coverage and narrow beam antenna modes. If the company is determined to be responsible, a penalty of \$1.71 million will be imposed on TRW for failure to meet performance requirements.

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Satellite number 2 was recovered from its initial anomalous state on June 8, 1972, and the remaining orbital testing was completed. The satellite was released to DCA control on June 27, 1972. On August 4, 1972, the satellite completed its move to an operational position over the Pacific Ocean designated by the Joint Chiefs of Staff. Most of the Pacific ground communication links were then transferred to satellite number 2 from the Phase I satellites. However, on September 8, 1972, the satellite again experienced technical problems and to date recovery attempts have been unsuccessful. Communication links have been transferred back to the Phase I satellites.

Because of the technical problems which developed with the initial pair of satellites, redesign efforts have been initiated on the remaining four. Two independent technical review boards were established (one by the Government and one by the contractor) to determine the causes of the problems presently being experienced with satellite number 2, and submit recommendations for additional design changes considered necessary. Findings of the review boards have been taken into consideration in the redesign effort.

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Cause of failure of satellite number 2

We were furnished by the Air Force a summary of the final report dated October 17, 1972, issued by an independent team formed by SAMSO to review the anomaly experienced by satellite number 2. This team was composed of personnel from the Air Force, Aerospace Corporation, Lincoln Laboratories, and DCA. It concluded that the anomaly was probably irreversible and that the cause was internal to the satellite. The team found

that several piece parts (capacitors and electro magnetic interference filters, in particular), marginal cabling protection (routing techniques) or marginal design guidelines for power leads (wiring and printed circuit board traces) could have contributed to the anomaly.

The team recommended satellite design changes and modifications to correct the deficiencies disclosed by the review.

SELECTED ACQUISITION REPORTING

The first SAR on Phase II of the DSCS program was dated March 31, 1971. In March 1972, we reported on our evaluation of the June 30, 1971 SAR. Our current effort consisted primarily of comparing the June 30, 1971 and June 30, 1972 SARs.

The lack of baselines for certain items, cited in last year's staff study, was corrected in the September 30, 1971 SAR. However, our review indicated the following weaknesses in the June 1972 SAR.

Launch support costs

Prior to the June 30, 1972 SAR, the cost of launch support was included and reported in both the development and current estimates as part of the procurement costs of the Space Subsystem. Prior to the June 30, 1972 SAR submission as a result of policy change, launch support costs were transferred from the procurement category to the separate cost category of operation and maintenance (O&M). The June 30, 1972 SAR reflected this reduction in the current estimate for Air Force procurement costs, and in the total current estimate for space subsystem acquisition. However,

the development estimate was not reduced accordingly. This change was explained in the variance analysis section of the SAR. The failure to reduce the development estimate by the amount of launch support costs results in an inflated space subsystem procurement threshold.

Failure to report on
a total system basis

The SARs continue to report cost, schedule, and performance parameters on an individual subsystem basis. There have been no material changes made in the SAR reporting format, nor have the "stub items" been changed as suggested in last year's staff study.

SAR reporting changes since June 30, 1971

All SARs subsequent to June 30, 1971, have discontinued the use of the "Cost Change" column in the "Program Acquisition Cost" section. Cost changes between the development estimate and the current estimate are now included in the variance analysis sections.

Reporting on the funding and quantity requirements of the Five Year Defense Program was discontinued as of the June 30, 1971 SAR. This change was occasioned by a change in SAR reporting instructions.

A summary of programmed funds, current and prior years', and funds required to complete the program, has been added to the "Program Acquisition Cost" section in all SARs following June 30, 1971.

In our opinion the deletions have not detracted from the informational value of the SAR. We believe, however, that the addition of the "Programmed Funds" summary contributes significantly to the value of the SAR for purposes of evaluating total program acquisition.

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Dropping of SAR

The Assistant Secretary of Defense (Comptroller) by a memorandum dated July 13, 1972, directed that the June 30, 1972 SAR be the final submission on the DSCS. The Project Manager stated that the program is far enough advanced that a SAR is no longer necessary for management information or control.

CONCLUSIONS

Our review indicated that preparation of the SAR by the DSCS Project Manager's office was generally in accordance with established guidelines. We believe that the purpose of the SAR as a tool of management information and control could be significantly enhanced if an overall system rather than component only reporting approach were established in order to more readily assess the total progress of the DSCS.

We do not agree that a SAR is no longer required for the DSCS. Problems with the space subsystem indicate that the acquisition process is not as complete as it appeared on July 13, 1972, the date the Assistant Secretary directed discontinuance of the SAR for the DSCS. We believe that the SAR should be continued until the system has become operational; it (1) informs top DOD management and the Congress of project status and (2) provides the Project Manager with a means for self-evaluation.

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CHAPTER 3

PROGRESS MEASUREMENT

Information in terms of cost, schedule and technical performance, regularly reported on a successive summarization basis to higher echelons, should provide management not only with a means to measure progress of a system through the acquisition process, but also with an early warning of potential problems. To that effect, management should establish and maintain a reporting system structured to provide timely information in a form suitable for its needs. The reporting system should provide the program manager with sufficient timely information by program participants to keep apprised of where the acquisition stands in relation to where it was expected to stand at a given point in time in terms of cost, schedule, and technical performance.

MANAGEMENT APPROACH

Acquisition of Phase II of the DSCS is a DOD-wide effort. The Director of DCA manages the program on a project manager basis and makes specific tasking to the participating DOD organizations to accomplish the responsibilities outlined by the Deputy Secretary of Defense in a memorandum dated September 3, 1968, "Defense Satellite Communications System." The DCA management approach and the responsibilities and reporting requirements of project participants are specified in the Management Engineering Plan issued by the DSCS program manager in May 1971. (This plan superseded an interim plan issued July 2, 1970.)

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Work packages

To accomplish the acquisition of Phase II of the DSCS, the DSCS program manager issues work packages to the participating DOD organizations which provide specific guidance in terms of cost, schedules, and technical performance requirements, as well as implementation instructions and reporting requirements. DCA considers the work packages as the basic management control documents for accomplishing the work required.

Implementation plan

The participating DOD organizations are required to prepare and submit for DCA approval plans which outline the implementation of the work required. These plans include refined estimates of the established baselines. If DCA concurs, the refined estimates become the current baselines against which progress is measured. Implementation plans usually include a work breakdown structure, a list of key milestones, a network chart, and a funding plan.

As part of the implementation process, DCA reviews and approves procurement documentation prepared by the participating DOD organizations. Such documentation includes technical specifications, statements of work, contract data requirements lists, and requests for proposals.

REPORTING SYSTEM

The "Defense Satellite Communication Program (DSCP) Acquisition Report" is the primary management information tool for the DSCS program manager and the main source of input for the SAR. This report is submitted by each participating organization, usually on a monthly basis.

The acquisition reports cover the status of the work packages assigned to the participating organizations in terms of cost, schedule and technical performance. Variances between initial and/or current baselines and/or current estimates are explained in summary form. In addition, major events which occurred during the reporting period are summarized and their potential effect on the baselines is assessed. A program cost summary, showing funds received and additional funds required for completion, is also included in each monthly acquisition report.

Other formal reports

The Management Engineering Plan provides for a special "Red Flag Report" to inform the DSCS program manager of any problems which require immediate attention. These reports are submitted by participating organizations when indicated variances exist which might result in a significant disruption to the program. During fiscal year 1972, only one Red Flag Report was submitted to the DSCS program manager. It dealt with a potential schedule slippage resulting from problems with a ground terminal component.

The DSCS program manager also receives weekly reports from DCA field offices located in Los Angeles, California, and Fort Monmouth, New Jersey. (The Fort Monmouth field office was discontinued on June 30, 1972.) Representatives from these offices attended and reported on weekly management review meetings held at TRW (satellite segment) and at the Army Satellite Communications Agency (ground terminals segment). The meetings focus primarily on technical matters, and deal with current or potential problems as well as the status of ongoing tests and pending procurement actions.

Other sources of information

In addition to periodic reports, the program manager obtains information through other means including (1) field visits by DCA personnel, (2) telephone contacts, (3) meetings and (4) reports on and participating in tests and technical reviews.

The DSCS program manager believes that he receives from his various sources the information he needs for monitoring the program. Although DCA personnel keep track of the status of the DSCS, they are not directly involved with comparing and correlating the amount of cost incurred with the physical progress of the system. Each participating military department is responsible for managing its funds and for monitoring the physical progress under the contracts awarded to accomplish the assigned tasks.

SOURCES OF INPUT BY
PROGRAM PARTICIPANTS

We inquired into the procedures followed by the Army Satellite Communications Agency (SATCOMA) and the Space and Missile Systems Organization (SAMSO) in preparing acquisition reports for the DCA project manager. Our inquiries were directed primarily toward the sources of information shown in the acquisition reports.

SATCOMA

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As of June 30, 1972, SATCOMA was reporting to DCA on 15 work packages. The work included (1) modifications to existing ground terminals, (2) development of new ground terminals, (3) upgrading of components, (4) procurement of equipment and subsystems, (5) site preparation, and (6) training. At the time of our review, SATCOMA had outstanding about 50 contracts amounting to about \$50.2 million for the completion of the assigned work.

SATCOMA officials informed us that the baselines shown in their acquisition reports to DCA are based on the following.

- Initial baseline Usually as stated in the initial work package received from DCA.
- Current baseline Usually the estimate resulting from a change in specifications, and thus a change to the work package.
- Current estimate Reflects the status of the contract and is usually based on the results of acceptance tests.

Schedule milestones are based on (1) monthly network charts prepared by contractors, (2) technical reports from contractors, and (3) input from the contracting officer's representatives at contractors' plants. Any changes in milestones are explained in the acquisition reports.

SAMSO

As of June 30, 1972, SAMSO was reporting to DCA on two work packages. These work packages cover (1) satellite design, production, launch, and performance verification and (2) Phase II orbital support. According to the June 30, 1972 SAR, the estimated cost for the space subsystem segment (identified as Program 777) amounted to \$142.0 million. Of that amount, \$75.0 million was estimated for the development and production of satellites by TRW Systems, Inc., about \$57.0 million was estimated for the procurement of launch vehicles (Titan III C), and about \$10 million for such items as outside engineering and technical assistance, test range costs, and ground communications equipment.

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We were advised that person-to-person contact is the key method used by SAMS0 in managing the space subsystem segment. Reports are used as a tool for documenting and evaluating the status of the program. The reports flow basically from the prime contractor to the Air Force program office and from there to the DCA program manager. The monthly acquisition reports to DCA are based upon information obtained from TRW monthly reports, SAMS0 internal accounting records, and cognizant program officials.

Reports submitted by
the prime contractor

TRW, the prime contractor for the satellites, has a progress reporting system that has been validated as meeting the objectives of DOD Instruction 7000.2. The provisions of this instruction require the use of Cost/Schedule Control Systems Criteria in selected acquisitions during engineering development, operational systems development, and production. An objective is to encourage DOD contractors to accept and install management control systems and procedures to provide data which (1) indicate work progress, (2) properly relate cost, schedule and technical performance, (3) are valid, timely and auditable, and (4) supply DOD managers with a practicable level of summarization.

As of December 1972, TRW submits 14 periodic reports to SAMS0. The monthly Program Progress Report, the monthly Failure Summary Report, and two monthly cost report tab runs are representative of the types and sources of information included in these reports.

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The monthly Program Progress Report is a consolidation of reports on individual activities, such as satellite design, satellite integration, and testing. The basic information is derived from sources such as test records and engineering log books maintained by responsible personnel in each of the major activity areas.

The monthly Failure Summary Report describes and categorizes failures by satellite subsystem. Sources are reports of test discrepancies and related corrective actions.

TRW provides SAMSO with two monthly cost report tab runs. The Cost/Schedule Performance Measurement tab run compares budgeted cost of work performed to actual costs incurred. The monthly Cost Summary-Forecast tab run shows current month, inception to date forecasts, and actual costs. Both tab runs report at various work breakdown structure levels. Input data for these tab runs include timecards and labor and burden rate tables.

CONCLUSIONS

Although DCA personnel keep track of the status of the DSCS, they are not directly involved with comparing and correlating the amount of cost incurred with the physical progress of the system. We were informed that reports or other data to that effect are not prepared. The program office, because of its place in the system management structure, is concerned only with overall coordination and policy. The military departments have sufficient latitude in the management of their funds to execute the program with limited intervention by DCA.

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Because the Phase II DSCS management structure places the DCA program manager two levels above the contractors, he must rely on the intermediate levels (participating DOD organizations) for information on the normal progress of the program.

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MANAGEMENT PROBLEMS

Previous reports by GAO and other organizations indicated that the splitting of management between DOD components, had adversely affected development and deployment of major defense communications systems. In last year's staff study, we reported that some of these management problems existed in the DSCS program but major actions were underway which were expected to alleviate the problems recognized.

CURRENT STATUS OF PREVIOUSLY
PROPOSED SOLUTIONS

On August 3, 1971, the Deputy Secretary of Defense directed that, as feasible, all DOD efforts in satellite communications be consolidated into a single program during calendar year 1971. During our last year's review of this program, the Acting Deputy Assistant for Advanced Systems and Technology, Assistant to the Secretary of Defense (Telecommunications), stated that certain proposals expected to be approved by the end of calendar year 1971, should alleviate management problems in the DSCS program.

The proposals were that:

- A program office be established over all satellite communications which would report directly to the Assistant to the Secretary of Defense (Telecommunications). Its charter would clearly define interface between the new office and existing service and agency operations.
- To lessen funding problems future satellite funding would be included as a separate line item in the individual services' appropriations. (To have appropriations separate from the services would require the program office to build up a large financial organization.)

On February 1, 1973, the DSCS program manager informed us that the program office had not been established but is under active consideration by the Assistant Secretary of Defense (Telecommunications).

The second proposal has been implemented.

DCP revision

As noted in our previous study, a revised DCP for the DSCS, as directed by the Deputy Secretary of Defense in his memorandum of May 27, 1970, was submitted for consideration to the OSD on July 12, 1971. The revised DCP was intended, among other things, to clarify program objectives and baselines and consolidate documentation. The program manager informed us that the proposed revision to the DCP has not been acted upon by OSD.

The DSCS program manager stated that some OSD officials believe that a DCP is no longer applicable to the DSCS program. He added that the program can progress without a DCP since it is far enough along with most of its objectives and management responsibilities already established. He stated that OSD has recently authorized funds for fiscal years 1973 and 1974, to provide for procurement of two new heavy ground terminals and two replenishment satellites (numbers 7 and 8). Had the updated DCP been acted upon the quantity of satellites and the number and types of ground terminals to be acquired and funded would have been clearly defined.

CURRENT MANAGEMENT PROBLEMS

In our previous report we noted the lack of authority of the DSCS program manager. The DSCS program manager advised us during our current review that this problem has not adversely affected cost or system performance accomplishments but that it has caused delays in meeting schedules. He was unable, however, to furnish us with an estimate of the overall schedule slippage because of this problem.

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CONCLUSION

We believe that the unification of the management of all satellite communication programs into one office can help to prevent management problems similar to those experienced in the DSCS program. Proposals to that effect have been presented, but as yet, have not been approved for implementation.

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