BY THE COMPTROLLER GENERAL

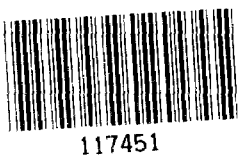
Report To The Congress

OF THE UNITED STATES

Consolidated Space Operations Center Lacks Adequate DOD Planning

The Department of Defense is planning construction of a Consolidated Space Operations Center near Colorado Springs in FY 1983. The Air Force, as executive agent, estimates that this joint military satellite/Shuttle operations control facility will cost approximately $1.4 billion when fully operational in 1990.

GAO found that while the selection methodology was questionable, the site selected is technically acceptable. However, GAO has reservations about beginning full-scale construction at this time because the operational requirements and associated costs for the Center are not sufficiently definitive. In addition, the lack of an overall military space plan and the fragmented military space operations structure makes GAO believe that construction of other than critical backup capability is premature.



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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON D.C. 20548

B-205335

To the President of the Senate and the
Speaker of the House of Representatives

This report presents our views on the major issues concerning Air Force development of the Consolidated Space Operations Center. The facility is intended to be a control center for U.S. military Shuttle and satellite operations.

This review was made at the request of the chairman, Senate Committee on Appropriations; the chairman, Subcommittee on Defense, Senate Committee on Appropriations; and the chairman, Subcommittee on Science, Technology and Space, Senate Committee on Commerce, Science and Transportation.

We requested official comments from the Department of Defense, but their response was received after the 30-day period required by Public Law 96-226. In accordance with the wish of the committees, the agency comments received from Defense are included, without evaluation, as appendix V.

Copies of this report are being sent to the Director, Office of Management and Budget; the Secretary of Defense; and other interested parties. We will make this report available to the public on request.

Milton J. Socolar

Acting Comptroller General
of the United States

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

CONSOLIDATED SPACE OPERATIONS CENTER LACKS DOD PLANNING

D I G E S T

The Consolidated Space Operations Center (CSOC) is a proposed Department of Defense (DOD) facility for conducting military operations in space. As currently being planned by the Air Force, it is supposed to consist of a Satellite Operations Complex and a Shuttle Operations and Planning Complex, with the eventual addition of other satellite mission control complexes.

GAO conducted this review because the Senate Committee on Appropriations; the Subcommittee on Defense, Senate Committee on Appropriations; and the Subcommittee on Science, Technology and Space, Senate Committee on Commerce, Science and Transportation expressed concern about the apparent lack of overall U.S. military space planning and the implications of this on the development of CSOC. They were also concerned whether the site selected for CSOC at Colorado Springs, Colorado, offered the best technological support at the least cost to the Government.

STATUS OF CSOC

The Air Force selected the site on State land near Colorado Springs after 3 years of site surveys and analyses. The final selection was not based on the original criteria, but on "other unique operational and organizational factors." This was because technical substitutes for the original criteria obscured differences between the sites. The Air Force, through the U.S. Army Corps of Engineers, is securing a right-of-way on a section of Colorado State land for the center site. The final cost of the completed CSOC is estimated to be $1.4 billion thru 1990. (See pp. 6 to 12 and 21.)

RESULTS OF GAO REVIEW

Although GAO found weaknesses that would make the site selection methodology questionable, GAO believes the site finally selected is technologically acceptable and has no recommendation for a better alternative location. GAO's Office of General Counsel reviewed the draft conveyance

documents for the land acquisition, and barring unforeseen developments to the contrary, found it generally unobjectionable. (See p. 12.)

DOD, while given the overall responsibility for military operations in space, has failed to designate a single manager who would provide clear and authoritative guidance. They have, instead, delegated authority and responsibility in such a manner that a large number of organizations now have operational planning and control of individual space programs. This could result in future duplication of assets and operational conflicts. (See pp. 13 to 16.)

The Air Force has the responsibility only for the development of CSOC. GAO found that they are following vague policy guidance and a developmental approach hastily implemented to achieve only short-term objectives. (See p. 16.)

Further, GAO found that the Air Force deviated from standard development and procurement procedures. The CSOC planning is in its formative stages, lacks order and direction, and is being done by several organizations. This may result in its development being subject to cost overruns, schedule slippages, and ultimately in less than the required capability. (See pp. 16 to 19.)

The Air Force, because of its hastily developed implementation plan, has not adequately explored cost savings alternatives. The inclusion of other satellite control facilities, such as the Global Positioning System and Defense Meteorological Satellite Program, by functionally integrating them into CSOC could effect substantial savings. Also, GAO believes significant cost savings are available by incorporating the Space Defense Operations Center into CSOC. (See pp. 21 to 23.)

RECOMMENDATIONS

The Secretary of Defense should take immediate action to:

--Designate a single manager for management of military space development and operation.

--Direct that the manager prepare an overall plan for the military exploitation of space. Included in this plan should be consideration of an interim Satellite Operations Complex in Colorado Springs, with a follow-on CSOC at such time as adequate planning is completed for a fully integrated system. Also, the CSOC implementation plan should be supported by an adequate cost-benefit analysis.

AGENCY COMMENTS

GAO requested official comments from DOD, but their response was received after the 30-day period required by Public Law 96-226. In accordance with the wish of the committees, GAO continued processing this report to meet their deadline and have included DOD comments without evaluation as appendix V. (See p. 41.)

MATTERS FOR CONSIDERATION BY THE CONGRESS

GAO believes that the Congress should consider restricting Military Construction Program funding for CSOC to that level necessary for an interim Satellite Operations Complex. Full CSOC funding should follow when DOD has completed an adequate plan for military exploitation of space and a cost-benefit analysis. Program implementation should be closely monitored.

Contents

ABBREVIATIONS

AFB	Air Force Base
CSOC	Consolidated Space Operations Center
DOD	Department of Defense
DSCS	Defense Satellite Communications System
DSM	Data System Modernization
GAO	General Accounting Office
GPS	Global Positioning System
IBM	International Business Machines
JSC	Johnson Space Center
NASA	National Aeronautics and Space Administration
OMB	Office of Management and Budget
SCF	Satellite Control Facility
SOC	Satellite Operations Complex
SOPC	Shuttle Operations and Planning Complex
SPADOC	Space Defense Operations Center
TDRSS	Tracking and Data Relay Satellite System
WESTPAC	Western Pacific

CHAPTER 1

INTRODUCTION

We evaluated the planning and development approach for a proposed Department of Defense (DOD) Consolidated Space Operations Center (CSOC) at the request of the chairman, Senate Committee on Appropriations; the chairman, Subcommittee on Defense, Senate Committee on Appropriations; and the chairman, Subcommittee on Science, Technology and Space, Senate Committee on Commerce, Science and Transportation. According to their instructions, we are issuing this report to the full Congress.

OBJECTIVES, SCOPE, AND METHODOLOGY

The objective of our review was to evaluate those factors affecting successful development of CSOC. One concern of the committees was the apparent lack of U.S. military space planning. Another was whether the site selected by the Air Force provides the greatest technical support at least cost to the Government. Also, the committees requested specific information on

- --evolution of evaluation criteria and inconsistencies, if any, in their application;
- --unique operational and organizational factors bearing on final site selection;
- --possible legal ramifications of the manner in which State of Colorado land is being procured for CSOC use;
- --viable alternatives to the currently planned site construction, including our recommendation of the most cost-effective alternative; and
- --other potential cost savings related to this project which might be available to the Air Force.

We reviewed documents obtained from cognizant officials in Air Force Headquarters and those commands responsible for the planning and development of U.S. space assets, including CSOC. In many cases, we relied on information gathered from interviews and draft documents, since official documentation did not exist at the time of our fieldwork. Also, we reviewed our other reports on the National Aeronautics and Space Administration (NASA) and Air Force space operations to ensure that the data we obtained were accurate and consistent with those gathered by other evaluators.

While we reviewed documents related to all the possible CSOC sites considered, we limited our actual site visits to those three considered in the final selection process. These were Kirtland Air Force Base (AFB), Albuquerque, New Mexico;

Malmstrom AFB, Great Falls, Montana; and Peterson AFB, Colorado Springs, Colorado. At these sites, we independently verified the evaluation criteria with the assistance of Air Force surveyors and photographers.

Our evaluation of the legal ramifications of the CSOC land acquisition is based on a legal review of available documentation by our Office of General Counsel.

We requested official comments from DOD, but their response was received after the 30-day period required by Public Law 96-226. In accordance with the wish of the committees, we continued processing the report to meet their deadline and have included the DOD comments, unevaluated, as appendix V.

INDICATIONS OF PROBLEMS AHEAD FOR SPACE CENTER DEVELOPMENT

As discussed in chapter 2, we believe that CSOC is necessary for the command and control of U.S. military space assets. It could well be the nucleus of a future space force charged with the military exploitation of space. However, as we point out in subsequent chapters, we are concerned with the planning and acquisition methods being used to develop this capability. In chapter 3 we evaluate the manner in which the CSOC site was selected and weaknesses that make the selection methodology questionable. Also, the legal ramifications of site acquisition are discussed. In chapter 4 we explore the need to develop a national strategy for the military exploitation of space, planning problems associated with the CSOC development approach, the unreliability of available cost estimates, and other programs that might provide future savings if incorporated into CSOC. Our conclusions and recommendations for remedial actions are included in chapter 5.

CHAPTER 2

A SEPARATE DOD SPACE CENTER IS NEEDED

CSOC is being developed to conduct military operations in space and could be used as the nucleus for a future space force. As currently being planned by the Air Force, it is supposed to consist of a Satellite Operations Complex (SOC) and a Shuttle Operations and Planning Complex (SOPC). Also, additional satellite mission control complexes are expected to be incorporated into SOC as necessary.

Goals that have been identified to date are articulated in a CSOC Definition and Requirements document dated October 20, 1981. This was drafted by the Space Division of the Air Force Systems Command in mid-1981. The document states that CSOC will provide DOD with

--improved operational survivability and security;

--adequate planning, preparation, and control of military Shuttle and satellite operations;

--backup for Satellite Control Facility (SCF), Sunnyvale, California, and Johnson Space Center (JSC), Houston, Texas, to ensure continuity of those operations; and

--a growth plan that responds to new aerospace requirements levied by national objectives and accommodates new or expanded capabilities.

The need for a separate DOD facility appears reasonable since many of the the military missions in space will be of a highly classified nature that require rigid security. Also, there are potential fiscal advantages to centralizing and integrating the various systems required for command and control of these missions. The primary component systems of CSOC, SOC, and SOPC, presently incorporate capabilities of the Air Force SFC and JSC. These existing facilities each have significant drawbacks that could preclude efficient integrated operation and adequately secure military operations. These are discussed below.

SOC

SOC will share responsibility with and act as a backup for SCF at Sunnyvale, California. SCF is the nerve center of the Air Force worldwide satellite control network and interacts with seven remote tracking stations strategically located around the globe. Through this network, the Air Force currently provides communications, command, and control to about 40 satellites. By 1985, this workload is expected to grow to about 65 satellites. SOC is also expected to interface with the other component of

CSOC, SOPC, to support satellite activities such as launch and recovery.

During missions, SOC will monitor satellite vehicle status, coordinate satellite operations with Shuttle operations, determine satellite orbital parameters, and issue commands to effect control of the satellite. The Air Force plans to put control of certain satellites in SOC, retain control of others at SCF, and to have joint control capability for a prescribed number of satellites critical to national defense.

Since 1977 the Air Force has been planning this backup capability because the existing SCF is located within 18 miles of three major earthquake faults and has no comparable backup. The buildings associated with this facility do not meet today's construction standards and are expected to suffer significant damage if there is a major earthquake. A catastrophic loss of this control center would result in a major disruption of communications, tracking, and control of its space systems. Consequently, there would be a critically adverse impact on national security.

Also, SCF is located on a crowded 20-acre site surrounded by major highways and industrial parks. This provides a highly vulnerable target to possible saboteurs. The site also prevents SCF from expanding to meet projected mission growth.

SHUTTLE OPERATIONS AND PLANNING COMPLEX

In the early 1970s, NASA proposed development of a reusable Shuttle to eventually replace costly Expendable Launch Vehicles. NASA postulated that the Shuttle would meet its needs and those of DOD and other users, at significant cost savings, for the 1980s and beyond. In this regard, DOD's expectation as a participant in the Space Transportation System Program is to achieve routine access to space with improved reliability and payload delivery. Therefore, DOD committed itself to use the Shuttle as its primary launch vehicle after the mid-1980s. This commitment was recently reiterated in National Security Decision Directive Number 8, dated November 13, 1981, that states:

> "The STS [Space Transportation System] will be the primary space launch system for both United States military and civil government missions. In coordination with NASA, the Department of Defense will assure the Shuttle's utility to defense and integrate national security missions into the Shuttle system."

All Shuttle operations are currently run by NASA's JSC. This is a highly visible, civilian-controlled, relatively unsecure facility with extensive international involvement. Such an environment creates obvious security hazards. DOD takes the position that the extreme sensitivity of their new space programs requires

a separate control facility to ensure successful satellite deployment and operation.

SOPC is supposed to provide all the capabilities required for Shuttle command and control in conjunction with the flight crew. This includes planning Shuttle operations; preparing operations documents, data files, Shuttle load data, and SOPC data bases; and evaluating the SOPC's readiness to support the flight. Also, it is to provide the data processing necessary to support these activities. During flight operations, SOPC will coordinate its operations with SOC, monitor and analyze the Shuttle vehicle and orbital parameters to support onboard crew activities, and issue commands required to effect proper Shuttle control. At the conclusion of each flight, SOPC conducts an evaluation of its operations and recommends ways to improve SOPC and Shuttle performance.

Until such a facility is available, however, the Air Force and NASA have created an interim secure control center at JSC. This $85 million capability, the Controlled Mode, is intended to provide protection for DOD Shuttle missions until SOPC is fully operational. Originally, the Controlled Mode was planned only as an interim capability. However, the current Air Force plan of October 20, 1981, indicates that the Controlled Mode capability will be maintained indefinitely at JSC as a limited backup for CSOC during military Shuttle operations.

Besides security issues, the control of military operations from NASA facilities does not coincide with the intent of the National Aeronautics and Space Act of 1958. This act requires that the military directly control their space operations. Air force and NASA officials have indicated that the presence of military personnel at NASA facilities is counter to NASA's projected image of a purely civilian space operation. We agree with this assessment, but the Controlled Mode is being constructed such that it can be used in the interim with relatively low visibility. Also, it is an announced mission of the Space Shuttle to support military operations, and the public in general can know that there is a military mission aboard without knowing the classified purpose or nature.

CHAPTER 3

SITE SELECTION METHODOLOGY IS QUESTIONABLE

Factors used by the Air Force to determine a location best suited for CSOC activity generally consisted of an initial selection process based on technological, environmental, and base support criteria, with final selection based on unique operational and organizational requirements. Our evaluation of the methodology used to determine a final location included a review of the site selection criteria, unique operational and organizational requirements, and any potential legal ramifications of the land acquisition process. These are discussed below. Although we found weaknesses that would make this methodology questionable, we believe the site finally selected is technologically acceptable, and we have no recommmendation for a better alternative location.

SITE SELECTION PROCESS

From 1977 to 1980, the Air Force endeavored to select the best site for CSOC. Over that period of time, it performed a desk top analysis and two physical site surveys, known as 78-21 and 79-26, before basing the final selection on "other unique operational and organization factors." Significant details of this process follow, with a more detailed chronology of events included as appendix IV.

Desk top analysis

Beginning in late 1976, the Air Force's Space and Missile Systems Office, now Space Division, began a series of space mission alternative studies. Among the options considered was a combined SOC and SOPC facility. While these studies were going on, the Air Force began initial screening of potential locations.

SCF, which had developed the siting requirements, requested Air Force Headquarters assistance in identifying candidate sites. In April 1977 the Air Force tasked SCF to perform a limited desk top analysis of six possible locations: Kirtland, Hill, Mountain Home, Nellis, Luke, and Malmstrom AFBs. The Air Force, in January 1978, suggested four additional locations with excess facilities. These were Fort Lee, Virginia; Hancock Field, New York; McChord AFB, Washington; and an air defense control facility in Duluth, Minnesota. SCF suggested two more: Williams AFB and Davis-Monthan AFB in Arizona, thus 12 locations were evaluated.

The criteria initially developed and used to evaluate the sites generally consisted of technical, environmental, and base support factors. The 17 criteria initially proposed by SCF are similar to those used in Site Survey 78-21, shown on page 8.

In performing its desk top analysis, SCF determined that only nine of the criteria could be evaluated without actually visiting the sites. Three of these they considered critical to a siting decision were (1) 250 miles within U.S. borders, (2) in an area cloud free 70 to 90 percent of the time, and (3) adequate visibility of the Defense Satellite Communications System (DSCS) Western Pacific (WESTPAC) satellite. Nellis AFB in Nevada was the only location evaluated that fully met the three critical factors. Malmstrom AFB failed all three critical criteria, and Kirtland AFB failed the DSCS WESTPAC visibility criterion.

Survey of 12 locations
(Site Survey 78-21)

Between April 1978 and January 1979, Space Division, with Air Force approval, conducted physical site surveys. There were 12 candidate sites surveyed; however, these were not identical to the 12 sites included in the desk top analysis. In this instance, Williams and Davis-Monthan AFBs in Arizona, Fort Lee in Virginia, and McChord AFB in Washington were replaced by Buckley Air National Guard Base, Peterson AFB; the NORAD Cheyenne Mountain Complex in Colorado; and Offutt AFB in Nebraska. Documentation provided did not give specific reasons for this substitution; however, apparently it was done because the replacement sites were farther inland. The Site Survey 78-21 report did not rank the sites considered but did include the evaluation summary shown in the chart on page 8. Space Division's own analysis was that the two best sites were at Kirtland and Luke. Malmstrom ranked lower, with the site on the corner of Peterson AFB ranked still lower.

With respect to this survey, we found that it was based on technical changes (workarounds) assuming the DSCS WESTPAC satellite could be moved eastward. The Air Force was subsequently informed by the Defense Communications Agency that this satellite could not be moved. This necessitated still other workarounds. Further, quantifiable measures of the criteria were relaxed. In the earlier analysis, each site was categorized as either meeting, not meeting, or marginally meeting criteria. In the 78-21 iteration, "marginally meeting" was changed to "meets with qualification." We believe this encouraged the use of possible technical workarounds. For example, a major change from the critical criteria used in the desk analysis was the reduction of the 250-mile criteria to 125 miles inland from coasts and 75 miles within borders. According to Air Force documents, this was based on a hypothesized change in satellite technology. Another major change, though not documented as to reason, was the elimination of the mandatory criterion of locating the facility away from other high priority targets. Finally, only limited cost studies were done examining the cost effectiveness of proposed workarounds.

CSOC SITE SELECTION
EVALUATION SUMMARY
(SITE SURVEY 78-21)

CRITERIA	LUKE SITE 1A	LUKE SITE 1B	LUKE SITE 2	NELLIS	HILL	MOUNTAIN HOME	MALMSTROM SITE 1	MALMSTROM SITE 2	KIRTLAND	BUCKLEY	PETERSON	CHEYENNE SITE 1A	CHEYENNE SITE 1B	OFFUTT	DULUTH SITE 1	DULUTH SITE 2	HANCOCK
MANDATORY																	
Adeqate DSCS Satellite Visibility	■	■	■	■	□	■	□	□	□	□	□	□	□	X	X	X	X
Minimum Local Obscura	■	■	■	■	■	■	■	■	■	■	■	□	■	■	■	■	■
Mission Compatibility - EMI/RFI	■	■	■	X	■	■	■	■	■	X	■	■	■	X	□	□	■
Mission Compatibility - A/C OPS	X	□	□	X	X	X	X	X	■	X	■	■	X	X	X	X	X
Acceptable EMR Exposure	□	■	■	■	□	□	■	■	■	□	□	■	□	□	■	■	□
Minimum Natural Threats	□	□	■	■	X	■	■	■	■	■	■	□	■	X	□	□	■
Minimum Physical Threats	□	□	■	■	□	■	■	■	■	□	□	□	□	□	□	■	□
On Federal Property	X	□	□	■	■	■	■	■	■	■	■	X	□	■	□	■	■
Sufficient Acreage	□	□	■	■	■	■	□	■	■	□	■	X	X	□	□	■	□
GROWTH																	
Maximum Clear, Dry Weather	■	■	■	■	X	X	X	X	□	□	□	□	□	X	X	X	X
Electronic Threats	■	■	■	■	■	■	■	■	■	■	■	■	■	■	X	X	X
Additional Land Available	X	□	■	■	□	■	X	■	■	X	X	X	X	X	X	■	X
DESIRABLE																	
On/Near Active Base	■	■	■	■	■	■	■	■	■	■	■	■	■	■	□	□	□
Existing Facilities Available	■	■	X	X	X	X	■	X	□	X	X	□	□	X	■	X	■
Technical Personnel, Education, Etc., Facilities	■	■	■	■	■	X	□	□	■	■	■	■	■	■	■	■	■
Adequate Airline Service	■	■	■	■	■	X	X	X	■	■	■	■	■	□	X	X	□
ENVIRONMENTAL																	
Physical/Biological	■	■	■	■	■	■	■	■	■	■	■	□	■	■	■	■	□
Socioeconomic	■	■	■	■	■	X	■	■	■	■	■	■	■	■	■	■	■
Base Supportability	■	■	□	■	■	□	■	■	■	□	■	■	■	■	X	X	X
Site Facility Cost Impact	■	□	□	■	■	□	■	□	■	■	■	X	X	■	■	□	■

KEY ■ = MEETS REQUIREMENT □ = MEETS REQUIREMENT WITH QUALIFICATION X = DOES NOT MEET REQUIREMENT

SOURCE: HEADQUARTERS USAF REPORT ON THE SITE SELECTION FOR THE CONSOLIDATED SPACE OPERATIONS CENTER, DECEMBER 1979.

Survey of three finalist sites
(Site Survey 79-26)

In February 1979, the same month the summary report on Site Survey 78-21 was issued, the Office of Management and Budget (OMB) sent a letter to DOD and NASA. They asked if a separate Shuttle control facility was needed by DOD, or whether it was possible to share facilities at JSC. The Air Force determined that a separate facility was needed, and the Secretary of the Air Force established a working group to validate siting criteria and narrow the previous 12 locations examined in Survey 78-21 to 3 for final consideration. During this same time frame, the Air Force was still revising candidate sites for facility location. In July 1979 they issued a report called "USAF Site Survey 78-21 Executive Summary" which introduced a possible substitute site, located on Colorado State land, for the Peterson AFB location. The effect of this substitution was to enhance the competitive status of a Colorado site based on the validated criteria. Also, according to available documentation, it was apparently the only instance where non-Federal land was deemed acceptable.

The working group selected Kirtland and Malmstrom AFBs and the new Colorado site approximately 10 miles east of Peterson AFB. These sites were physically examined based on the validated criteria, and a report known as Site Survey 79-26 was issued in September 1979. The primary change in the criteria, as validated, was the inclusion of visibility of the NASA Tracking and Data Relay Satellite System (TDRSS) satellite. In this regard, TDRSS was only visible from Kirtland AFB. However, when the Air Force considered technical workarounds to this and other criteria, differences between the sites were no longer considered significant. We found that these workarounds proposed were generally not documented as to cost or feasibility.

Because of the lack of a clearly defined CSOC mission and requirements, as well as the blurring of quantitative measures due to workarounds, neither we nor the Air Force were able to discern differences in candidate sites based on the validated technological, environmental, or base support factors. A summary of this evaluation on the three different sites as discerned by the Air Force in Site Survey 79-26 is contained in the chart on page 11.

UNIQUE OPERATIONAL AND
ORGANIZATIONAL FACTORS

Since the Air Force perceived no significant differences between the three finalist sites, "other unique operational and organizational factors" favoring the Colorado Springs site were introduced as the basis of the final selection. All of the "operational and organizational factors" are highly subjective and largely based on prospective advantages that might be possible by locating the CSOC in proximity to the Space Defense Operations Center (SPADOC). This facility is in Cheyenne Mountain about

27 miles from the proposed CSOC site. SPADOC, responsible for the mission of space surveillance and warning, will of necessity require close coordination and data exchange with CSOC as it does now with SCF and JSC.

The Air Force cites a number of prospective increased efficiency, effectiveness, and life-cycle cost advantages from this proximity. Among these are specific actions that appear reasonable, such as the proposed sharing of a DSCS satellite terminal already programed to support the Aerospace Defense Command and projected to save $13 million over 10 years. However, most of the other prospective advantages are relatively nebulous and dependent on uncertain future events. For example, the Air Force projects personnel cost savings of from $2 million to $5 million over a 10-year period by the sharing scarce space and computer personnel between the CSOC and SPADOC.

In this regard, the Air Force, in its December 1979 report on CSOC site selection, pointed out that the actual savings depends on selection of compatible hardware for the two facilities. This is speculative because the Space Division currently plans to replicate SCF and JSC hardware and software into CSOC. Future software, according to their October 1981 planning document, would largely be developed at existing facilities at SCF or JSC. In regards to SPADOC, the Electronics Systems Division has just awarded 1-year competitive design contracts, and selection of computers will be predicated on these contracts. In our opinion, it would appear unlikely that these divergent procurement efforts would ultimately arrive at sufficiently similar computer hardware and software configurations to permit the savings postulated by sharing computer maintenance personnel between CSOC and SPADOC.

Another subjective example used as decision support by the Air Force is that DOD space organization currently is in a state of transition, and placing CSOC in proximity to other space assets maintains the option of one day consolidating these assets. Again, this seems highly speculative, considering the current state of Air Force and DOD planning. As we point out in chapter 4, DOD planning for the military exploitation of space is only in its formative stages. Also, we found current management of military space assets is fragmented among various DOD and Air Force components.

We discussed these various factors with Air Force officials at JSC, SCF, Space Division, Aerospace Defense Command, and Air Force Headquarters. We are not convinced that the cited organizational and operational factors are so unique that they should have been used to make a decision among the finalist sites. Also, we discussed and analyzed intelligence operations where appropriate. We could find none that should have significantly influenced the final decisionmaking process.

We believe that the Air Force justifications for CSOC and SPADOC being located near one another should logically be taken

CSOC SITE SELECTION EVALUATION SUMMARY (SITE SURVEY 79-26)

SITE	CRITERION	INTERIOR CONUS	EMR HAZARD	RF QUIET	OBSCURA	NATURAL DISASTER	ACREAGE	MILITARY BASE	WX ATTENUATION	PHYSICAL THREAT	EXPANSION	FEDERAL PROP	TRANSPORATION	DSCS WESTPAC	TDRSS	TECH SUPPORT BASE	FACILITIES
MALMSTROM AFB	■	X	■	■	■	■	■	■	■	■	■	□	□	X	□	■
COLORADO SPRINGS/ PETERSON AFB	■	■	■	■	■	■	■	■	■	■	□	■	□	X	■	■
KIRTLAND AFB	■	■	X	X	■	■	■	■	■	■	■	■	□	■	■	■

SOURCE: DRAFT CONSOLIDATED SPACE OPERATIONS CENTER DEFINITIONS AND REQUIREMENTS AIR FORCE SYSTEMS COMMAND SPACE DIVISION, UNDATED.

■ = MEETS CRITERION
□ = SOME IMPACT
X = POTENTIAL IMPACT FOR FUTURE SYSTEMS

one step further and the two capabilities consolidated. These issues are discussed further in the following chapter.

LEGAL OPINION ON LAND ACQUISITION

The committees requested that we discuss the legal ramifications of the manner in which the Air Force procured the use of Colorado State land.

Therefore, our Office of General Counsel reviewed those documents made available by the Air Force and the U.S. Army Corps of Engineers, who are executing the procurement action. They also discussed this transaction with the counsel to the Colorado Board of Land Commissioners. Of particular interest was the preliminary draft of the conveyance document between the U.S. Government and the State of Colorado. At this time, the procurement has not been consummated, and the parties may yet change the terms. Based on the draft agreement, our Office of General Counsel generally finds no legal problems which would interfere with the use of this site. However, there are still outstanding issues to be resolved. For example, the Corps of Engineers must still ensure that any claims of private parties against the Colorado Springs site will not interfere with the Air Force's ability to build and operate CSOC.

Also, under the provisions of Section 255 of Title 40, United States Code, the Air Force must still obtain approval by the U.S. Attorney General before funds can be spent to acquire the right-of-way to use Colorado lands. At this time, we see no reason that the Air Force cannot legally proceed with their planning for the construction of CSOC. The complete statement of our Office of General Counsel is included as appendix IV.

CHAPTER 4

PLANNING AND DEVELOPMENT NEEDS IMPROVEMENT

Efficient program development and acquisition usually results from sound requirements based on explicit policy guidance and an overall plan of operation. During our review, we found that the Air Force, which is developing CSOC, is following overall policy guidance which is not sufficiently explicit and a development approach hastily implemented to achieve short-term objectives. This lack of explicit policy guidance has implications for space programs being developed by other services as well. Also, we discussed other programs that might provide significant cost savings and should be considered for incorporation into CSOC.

NO OVERALL DOD PLAN EXISTS FOR THE MILITARY USE OF SPACE

DOD was given the responsibility for all military operations in space in the National Aeronautics and Space Administration Act of 1958 (Public Law 85-568). This was defined further in the DOD Reorganization Act of 1958 (Public Law 85-599) that followed. Executive guidance was provided in Presidential Directives 37 and 42, but none of these led to a clear and authoritative articulation of organizational space operational responsibilities or a space exploitation plan.

Fragmented space responsibility

Between 1958 and 1970, little open attention was paid to any military space activity, and no refinement of executive policy or national military space strategy emerged. It was not until September 1970 that DOD moved to delegate to the Air Force overt authority for development, production, and deployment for certain kinds of space systems in its Directive 5160.32. This directive states:

> "The Air Force will have the responsibility for development, production and deployment of space systems for warning and surveillance of enemy nuclear delivery capabilities and all launch vehicles, including launch and orbital support operations."

The directive goes on, however, to fragment the operational planning and control of most space systems by delegating this responsibility across all of the services and DOD components. Consequently, there is no single manager for military operations in space responsible for preparing an overall plan for the coordinated military use of space.

In 1978 additional executive policy guidance was issued in the form of classified Presidential Directives 37 (May 1978)

and 42 (August 1978). Although they discussed space program management relationships, coordination, and information exchange, they did not prompt DOD to clarify management responsibility or designate a single space manager and eliminate fragmentation. We discuss below the consequences of DOD's failure to effectively implement national space policy and how this affects Air Force planning for CSOC.

DOD, as noted earlier, delegated the responsibility for the operational planning and control of most space systems across all the services. As a consequence, a large number of organizations are involved in the operational planning and control of space systems besides the Air Force. Within the Air Force this responsibility is spread among the Systems Command, Strategic Air Command, Military Airlift Command, Tactical Air Command, Aerospace Defense Command, and Communications Command, which all have varied responsibilities.

The effect of this fragmentation within the Air Force was summarized in a December 1979 letter from the Commanding General of the Aerospace Defense Command to the Air Force Chief of Staff. He stated:

> "A planning focus is fundamental to both resource management and long term planning for space operations * * * integrated planning in a single organization seems imperative if we are to * * * meet the dictates of PD/NSC-37 [Presidential Directive/National Security Council] to avoid duplication and promote cross-utilization."

Further, he stated:

> "* * * unless we make an explicit organizational decision which assigns to a single organization the Air Force responsibilities in space operations once and for all, we will be faced with negative long term impacts on resource management and planning. In my judgement, we can no longer afford the luxury of so many groups -- and diversified interests -- sharing responsibility for the space activities that have progressed beyond development and are operational. The critical element in whatever organizational decision we make is not how to attend to today's operational problem--although that is important--but rather to assign total Air Force mission responsibilities in space operations in a clear and unequivocal way so that necessary planning can proceed."

Also, the General specifically mentioned its potential effect on planning for CSOC.

> "The system operation concept for CSOC just drafted by Space Division, perhaps prompted by the absence of organizational guidance, is notably lacking in

definitive statements on management and operations interfaces."

We believe the General's comments are valid and could be extended from the context of just the fragmentation within the Air Force to that of DOD as a whole.

In an apparent attempt to cope with the lack of a national space exploitation plan and program fragmentation, Air Force Headquarters recently formed a new Directorate of Space under the Deputy Chief of Staff for Operations, Plans, and Readiness. As far as we can ascertain, this organization is presently working on a master plan for the Air Force, in lieu of an overall DOD space plan. In this regard, we were informed by that organization that one of their main priorities, in addition to developing a space plan, is to determine who will be the final operator of CSOC.

Lack of clearly defined responsibilities may result in future duplication and interservice rivalries

Although the Air Force was delegated authority for the development, production, and deployment of certain space systems by DOD Directive 5160.32, its role as an operator of such systems has not been clearly defined in most cases. An exception in relation to the Shuttle was made on March 27, 1980, when a Memorandum of Understanding was signed by NASA and DOD. It designated the Shuttle as a national asset and made NASA responsible for the overall management of the Space Transportation System, including the overall operational system, tracking, and processing. It designated the Air Force as the DOD component to:

"Develop, acquire, and operate a dedicated shuttle, mission planning, operations, and control facility for national security missions."

This document does not state, however, that the Air Force will build and operate CSOC or manage overall military operations in space. The document only covers the SOPC portion of CSOC. As mentioned in chapter 2, CSOC could grow to encompass the planning and operation of a variety of space programs. Therefore, we believe the planning and operational responsibilities should be clearly defined to avoid interservice rivalries.

Indications of potential interservice rivalries have already been noted in an Action Memorandum that accompanied the NASA/DOD Memorandum of Understanding. It was from the Secretary of the Air Force to the Deputy Secretary of Defense. This indicated that the concurrence of the Army, Navy, Joint Chiefs of Staff, and others was only gained when it was emphasized that designation of the Air Force did not mean centralization of space operations. Apparently the Navy was especially concerned that

it would lose some control of its space systems. In our view, this is indicative of the resistance of the services toward any consolidation of space operations. As long as this attitude persists, we feel that the potential economies represented by CSOC will never be realized, and the proliferation of space management centers will continue.

WEAKNESSES ASSOCIATED WITH CSOC DEVELOPMENT APPROACH

We found that the Air Force is proceeding with CSOC development based on the assumption that the critical need for a SOC justifies the deviation from standard Air Force, DOD, and OMB development and procurement procedures. Further, the current CSOC planning lacks order and direction. And, finally, the Air Force plans to use outmoded technology based on the assumption of short-term cost avoidance.

Air Force deviated from standard procedures

DOD and the Air Force have a series of directives implementing the guidance of OMB Circular A-109 concerning the development and acquisition of major systems. Besides OMB Circular A-109, DOD Directives 7920.1 and 7920.2 and Air Force 800 Series Regulations are predicated on the orderly development and validation of requirements for new systems. There are four phases, as shown in the chart on page 18. They are: (1) identify system requirements, (2) validate those requirements, (3) examine alternative concepts, and (4) validate the most cost-effective alternative. It has been our experience that developments and acquisitions of major systems are successful only when these steps have been rigorously adhered to.

According to the Definition and Requirements document, dated October 20, 1981, the precise definition of requirements that we feel necessary for successful program development and acquisition is yet to be accomplished. The initial document used by the Air Force to state general system requirements is the Mission Element Needs Statement. We found that the Air Force is basing the development of CSOC on two Mission Element Needs Statements: one for SOC and one for SOPC. Accordingly, the emphasis in the development of CSOC is on the development of two separate systems rather than one integrated facility. In our opinion, the most cost-effective CSOC requires extensive integration of SOC and SOPC which should be defined in a single Mission Element Needs Statement as the first planning step.

We recognize that a lack of overall system coordination and planning has led to a situation where the immediate replication of SCF at a location like Colorado Springs is urgent. We disagree, however, with the premise that such urgency warrants the immediate construction of a consolidated facility for which the exact role and mission is to be defined at some future date. This is not

to infer that there is no planning whatsoever for CSOC, but as we point out below, we feel that these efforts have been inadequate to warrant commencement of full-scale construction of CSOC at the present time.

Current CSOC planning lacks order and direction

As shown by the chart on page 20, CSOC planning is still in the formative stage. It is dependent on the input of two separate organizations, one under Space Division directly and one a joint venture between Space Division and NASA. SCF, under Space Division is planning the Data System Modernization (DSM), while the joint Air Force/NASA group is planning SOPC. Also, the other systems that will be closely interfaced with CSOC, such as SPADOC at the NORAD Cheyenne Mountain Complex, are independently defining their interface requirements with CSOC. The Air Force has advocated the collocation/integration of facilities in CSOC since their August 1979 report to OMB, in which they stated:

> "A facility to meet the needs described here, a Satellite Operations Center (SOC), could be included for example with the proposed DOD Shuttle Operations and Planning Center (SOPC) and the NAVSTAR Global Positioning System Master Control Center, with resultant cost savings, into a new consolidated space operations center. Collocation/Integration of these capabilities into a single facility presents a cost savings opportunity of between 10 and 30 percent."

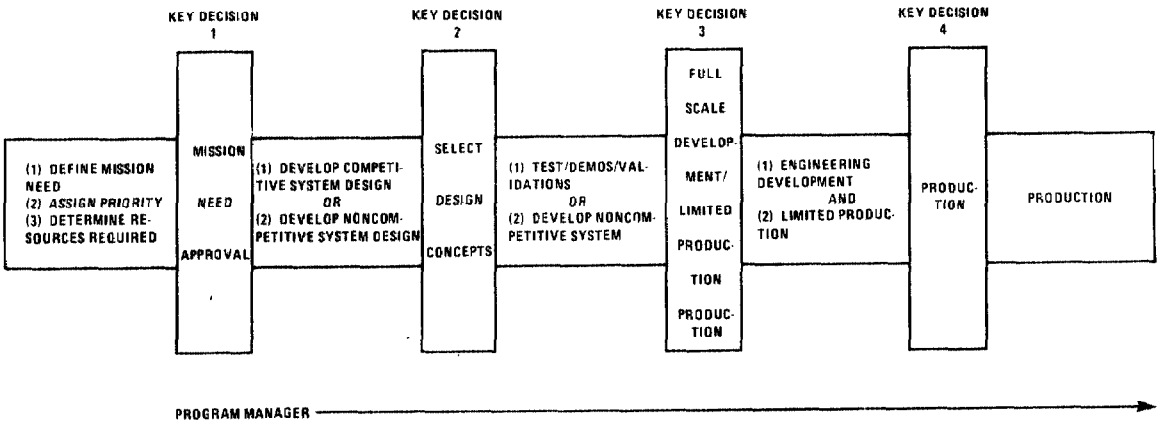
In this report requested by OMB, the Air Force evaluated different options concerned with collocation and integration. They concluded that the most cost-effective alternative with respect to physical security and possible natural disasters was an integrated CSOC in the central continental United States. Although the Air Force is aware of potential cost savings of planning and developing one fully integrated space operations center, they are planning rather to develop a less integrated facility that only takes advantage of collocation.

The Air Force has said that it intends to integrate the various components of CSOC and their outside users and coordination points through some form of internetting. Internetting, we agree, is a viable mechanism for reducing the duplication and improving the effective application of resources. Internetting, while a possible short-term solution, in our opinion is not the answer to the need for a integrated space operations management system in DOD.

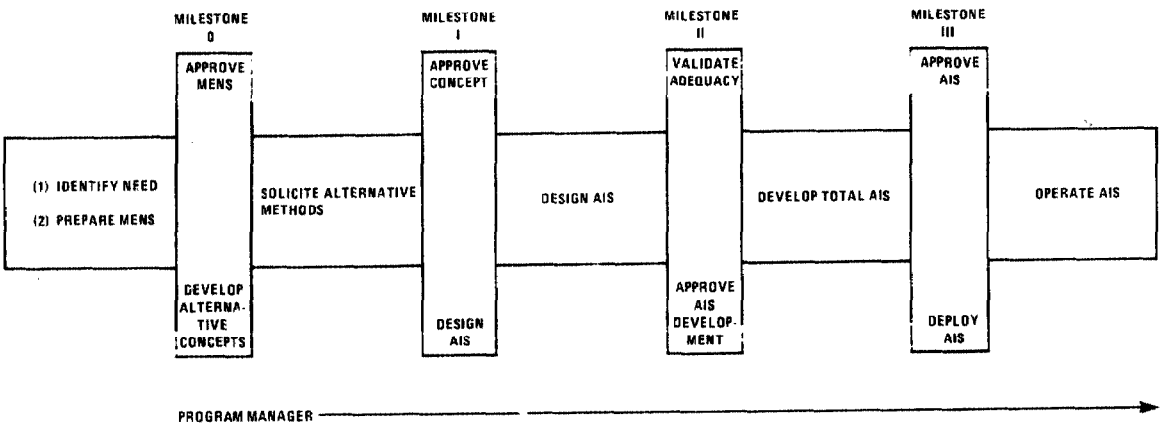
As mentioned above, CSOC is potentially the nucleus for a future space command. We believe that the focus of this center should be that of one single, fully integrated, control center from its inception. The lack of a single manager to order and direct the development of this extremely expensive national space

LIFE CYCLE OF MAJOR SYSTEM ACQUISITIONS

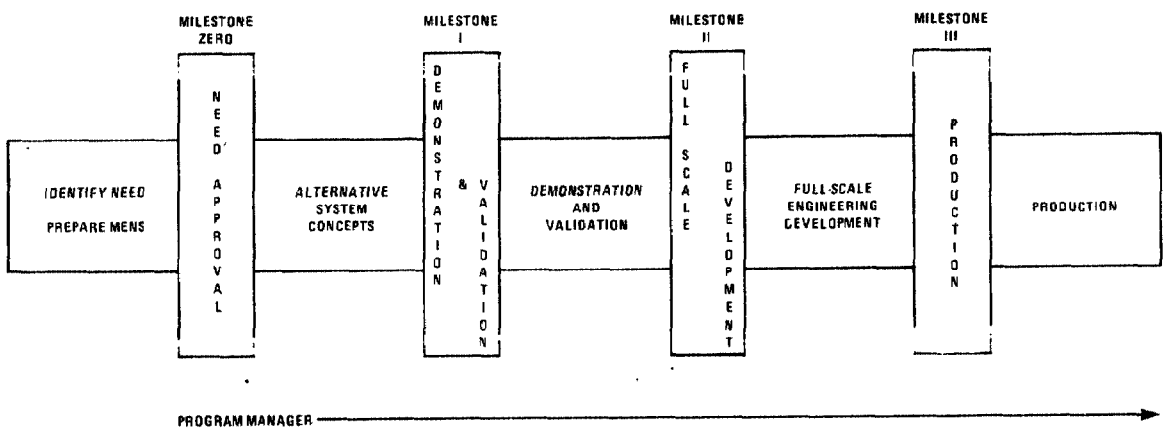
OMB CIRCULAR A-109



AUTOMATED INFORMATION SYSTEMS (AIS)
DOD DIRECTIVE 7920.1 AND 7920.2



AIR FORCE REGULATION 800 SERIES



resource, and the current indecision as to the final configuration, let alone operator of CSOC, indicates that this development may well be subject to extensive cost overruns, schedule slippages, and result in less than acceptable capability. It is our opinion that the CSOC should not be developed in the absence of firm requirements definition, a single centralized management structure, and an adequate overall military space exploitation plan.

The problem of utilizing outmoded technology

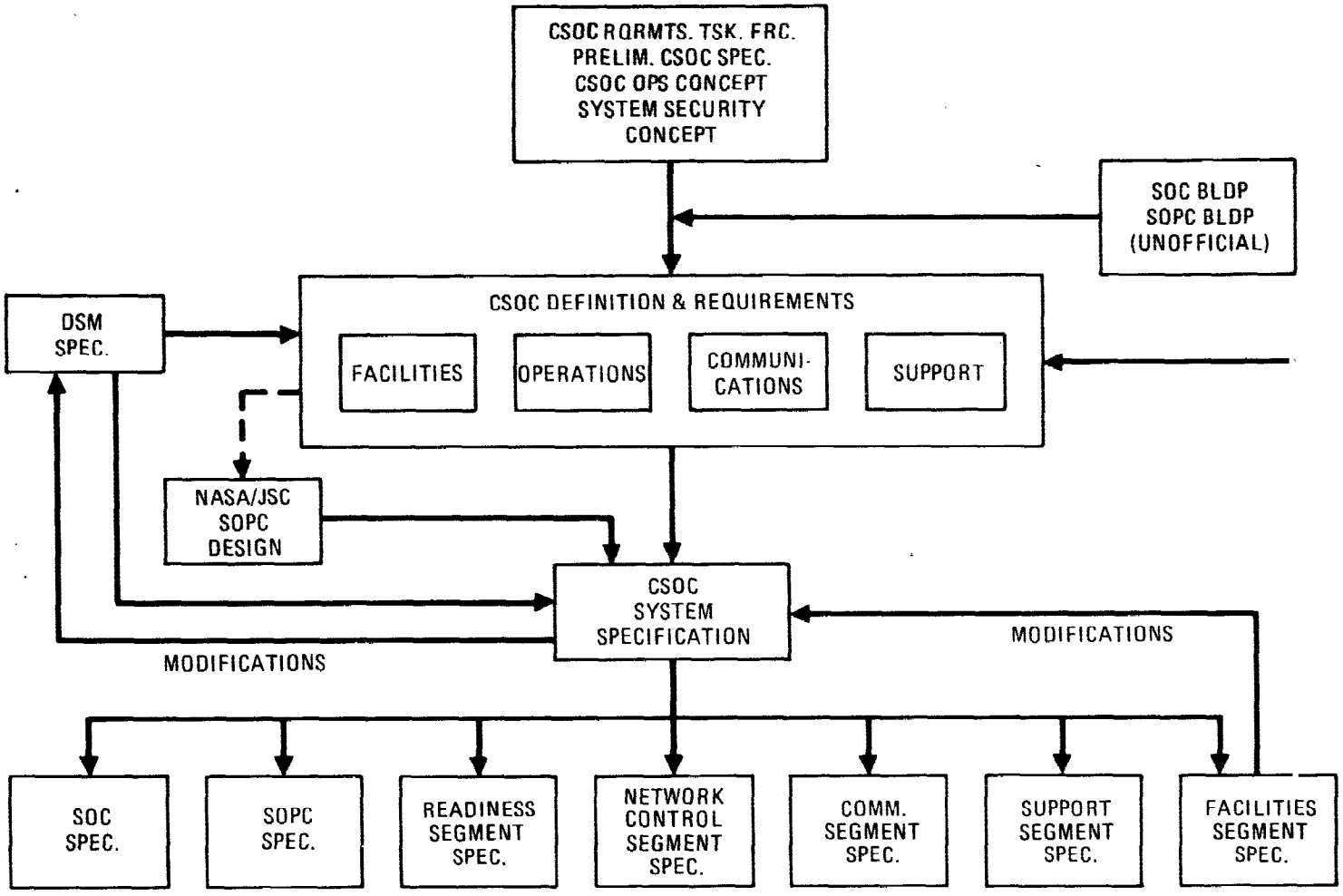
SCF and JSC are currently upgrading their computers. According to available information, DSM plan for SCF calls for the installation of 3 International Business Machine (IBM) 3033s and 18 IBM model 4341 computers. JSC upgrade anticipates using at least 10 IBM 3033s. The reasons given for upgrading to these computers are basically predicated on cost savings by the avoidance of software conversion and redevelopment through the use of compatible hardware.

The IBM 3033s were developed about 1977, and if CSOC reaches its scheduled Initial Operating Capability by 1987, they will be 10 years old. They have already been pronounced obsolete, being replaced by the IBM 3081 computers. This raises serious questions about maintenance repair parts and maintenance personnel availability in 1987. In addition to being old, these business type processors (scalar) are not the scientific type of computers (vector) that are more efficient for complex satellite orbit computations. If a normal automatic data processing development cycle had been followed, the advantages of more capable scientific computers probably could have been considered.

Besides modern hardware, new developments in software technology have not been recognized. The replication of SCF hardware and software may be the least expensive short-run option available. In the long run, however, the increasing difficulty with maintaining old software may offset any savings. We have noted that SOC and SOPC are written in older languages, Jovial and Fortran. The Air Force intends to replicate the JSC software and rewrite the upgraded SCF system in Jovial J-73. In this regard, DOD is currently standardizing on a new high level language called Ada. This state-of-the-art language is intended to replace the older Jovial and provide more cost-effective software development and maintenance capability. While we have not fully reviewed the DSM program, we believe that converting the programs to Jovial J-73 then having to convert into the DOD standard Ada language is not a cost-effective approach.

We discussed the possibilities of using the new software technology with Air Force officials. They said that they presently have no plan to utilize a common language such as Ada. In fact, we were informed that no further software language decisions are expected until after 1990, when the system is supposed to be fully operational. This means when the system reaches operational

CONSOLIDATED SPACE OPERATIONS CENTER PLANNING CYCLE



Source: Consolidated Space Operations Center [CSOC] Definition And Requirements 20 October 1981

capability, the Air Force will probably face a major system hardware and software redesign.

AVAILABLE COST ESTIMATES ARE NOT FIRM

CSOC cost estimates, because of the preliminary nature of Air Force planning, are somewhat speculative. The documentation made available to us during this review was limited, and most unclear as to assumptions made and what was included. It has ranged from just replicating the SCF and JSC systems in CSOC to fully integrating SOC, SOPC, the Global Positioning System (GPS), and Defense Meteorological Satellite Program. We discuss below how these estimates have evolved and potential savings that might be available to the Air Force by incorporating other related space programs into CSOC.

Evolution of estimated life-cycle cost

In September 1981 the System Program Office provided us an approximate evolution of the CSOC cost growth as they know it. They caveated their presentation with a statement that these figures were fluid and could not be officially documented.

In the summer of 1979, the Air Force informed OMB that a CSOC would cost about $500 million. However, according to the System Program Office, this figure was grossly understated, and by the fall of 1979, the total development cost was revised upward to $1.3 billion. The original estimate ignored $400 million necessary for software integration. While $400 million was, at best, a rough estimate, it apparently justified preclusion of integration as an option in further deliberations. As noted on page 23, we believe that integration would effect cost savings.

In early 1980 a Space Division task force looked for alternatives to try to limit costs to the $500 million estimate given to OMB. By fall, five options ranging from $650 million to $1.2 billion were developed. The preferred option was presented in the Air Force Program Management Directive R-S 00042 (2) dated December 4, 1980. It estimated costs to be $731.8 million through 1986. This official budget planning document did not, however, identify a date for Initial Operating Capability or Final Operating Capability. This preferred option required deferral of approximately half of the CSOC capability until some later date.

On December 4, 1981, we were again briefed by the CSOC System Program Office and representatives of Air Force Headquarters. This time, they estimated that development, through replication and internetting of SOC, SOPC, GPS, and the Defense Meteorological Satellite Program would cost approximately $1.4 billion by 1990. We believe these frequent changes in development estimates indicate that Air Force planning for CSOC has not yet adequately defined

what CSOC is to do. This leads us to believe that all cost estimates developed to date are questionable.

Inclusion of other programs might provide future savings

At various stages in Air Force planning, the inclusion of other space programs has been considered. In December 1981 officials from Air Force Headquarters said that it was now definite that the operations centers for GPS and the Defense Meteorological Satellite Program are to be internetted with CSOC to take advantage of this facility's communication and processing capabilities. In fact, these officials suggested that there could be real economies realized by the actual incorporation of the main mission control centers for GPS and the Defense Meteorological Satellite Program such that other existing sites could be reduced in size and staffing, or even closed altogether. We agree that inclusion of these systems may reduce operation and maintenance costs by the reduction of personnel required at the various control sites. However, we believe that additional savings could be realized by functionally integrating these various systems into one common system, enabling personnel familiar with one system to be readily adaptable to another such system. Further, we believe significant cost savings are available by incorporating SPADOC into CSOC.

Combining SPADOC and CSOC

SPADOC computers in NORAD's Cheyenne Mountain are scheduled for upgrade. It is the expressed intention of the Air Force that SPADOC will evolve into the command, control, and communication center for the space defense of the United States. Performance of its mission will require close coordination with spacecraft operators. Identification of hostile or abnormal space activities requires current knowledge of their activities, both domestic and foreign. Because of the time criticality associated with defensive measures that can be taken, coordination between SPADOC and CSOC will logically require real-time data exchange between their computers.

In its December 1979 report on site selection for CSOC, the Air Force recognized factors indicating economies in the integration of CSOC and SPADOC when it stated:

> "Many of the requirements which drive the design of the CSOC are inherently the same as those for the SPADOC. The computer system and software (orbital mechanics algorithms) requirements are similar, and in many cases, computational routines will be identical. Communications links, terminal requirements * * *, automated switching and message handling are also expected to be similar, if not identical. The capability to calculate orbits for predictive avoidance in CSOC and SPADOC would allow the flexibility to run the program

in SPADOC while CSOC is saturated with another high priority job, or during a subsystem failure."

We agree with the Air Force that the computational requirements of CSOC and SPADOC are remarkably similar. We also note that they will require many of the same data bases for their computations, such as Earth atmospheric and gravitational models. Because of these similar computational algorithm and data base requirements, SPADOC appears to be an excellent candidate for functional integration within CSOC. The fact that both CSOC and SPADOC are in the concept definition stage represents an opportunity for the Air Force to effect their merger. This would ensure compatible systems for the two centers.

We could not specifically quantify dollar savings possible by including other space programs, since each of these systems would require an indepth review. We believe, however, that a secure, state-of-the-art, space command and control center, functionally integrated under the control of a single manager could effect savings in our space program by

--centralizing and more efficiently utilizing our limited space technology personnel resources;

--sharing ground station communications, computers, and other resources;

--maximizing the effective application of our limited space dollars by prioritizing system budgets; and

--directing DOD's subsidy of space technology developments toward those projects that have the most cost-effective yield.

CHAPTER 5

CONCLUSIONS, RECOMMENDATIONS, AND MATTERS FOR CONSIDERATION OF THE CONGRESS

Conclusions and recommendations based on our evaluation follow.

CONCLUSIONS

We believe there is a justifiable need for a DOD CSOC because SCF is in an earthquake zone with a high probability of damage, and only limited security can be effected at JSC. With respect to the choice of Colorado Springs as the CSOC site, we conclude that it is acceptable. This siting could offer significant future economies if other space assets, such as SPADOC, already located at Colorado Springs, are functionally integrated into CSOC. We could find no legal reason why the Air Force cannot use the proposed site.

The absence of clearly defined responsibilities within DOD and the Air Force have the direct manifestation of substandard planning within DOD for military use of space. We conclude that immediate action must be taken to clarify roles and responsibilities of space program participants. This action should culminate in filling the critical need for a single manager with the requisite development of an overall plan for military exploitation of space.

The current construction of a Controlled Mode capability at JSC, in our opinion, removes the element of time criticality for a SOPC capability at Colorado Springs. SOC, on the other hand, needs a backup as soon as possible. Replication of SCF through SOC at Colorado Springs on an interim basis appears to be an expedient means of acquiring needed capability. However, we conclude that other alternatives for a consolidated DOD facility should be considered. We believe that the current developmental approach could lead to extensive problems and may not meet mission requirements once they are known. This is because the Air Force chose replication and system internetting of disparate systems over functional integration under a single manager. If SOC is replicated on an interim basis, similar to that used for the JSC Controlled Mode operation, the Air Force should have adequate time to define CSOC requirements.

A new development approach should be instituted that adequately considers alternatives, takes advantage of new technology, and defines cost effectiveness. Because of fragmented, and in some instances, inadequate Air Force planning, we were unable to determine the cost effectiveness of the Colorado Springs site. The

final configuration plan of CSOC has not been completed, the programs that it will ultimately support have not been fully identified, and the interfaces of CSOC with other space exploitation system users and operators are not clear. Finally, cost-benefit analyses on the various aspects range from inadequate to nonexistent. Deficiencies such as these must be corrected if CSOC development is to be successful.

RECOMMENDATIONS

We recommend that the Secretary of Defense take immediate action to:

--Designate a single manager for the management of military space development and operation.

--Direct that the manager prepare an overall plan for the military exploitation of space. Included in this plan should be consideration of an interim SOC in Colorado Springs, with a follow-on CSOC at such time as adequate planning is completed for a fully functionally integrated system. Also, the CSOC implementation plan should be supported by an adequate cost-benefit analysis.

MATTERS FOR CONSIDERATION BY THE CONGRESS

We believe that the Congress should consider restricting Military Construction Program funding for CSOC to that level necessary for an interim SOC. Full CSOC funding should follow when DOD has completed an adequate plan for the military exploitation of space and related cost-benefit analyses. Program development should be closely monitored.

APPENDIX I

United States Senate

WASHINGTON, D.C. 20510

May 18, 1981

Mr. Milton J. Socolar
Acting Comptroller General
of the United States
General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Socolar:

During the past several years the United States Air Force has been gathering data concerning the requirement for, and for the site selection of, a Consolidated Space Operations Center (CSOC).

In December of 1979, the Headquarters of the United States Air Force issued a report on the Site Selection for the Consolidated Space Operations Center which evaluated twelve potential sites, including Kirtland Air Force Base in New Mexico and Peterson Air Force Base in Colorado.

On October 24, 1980, the Department of Air Force issued a Draft Environmental Impact Statement indicating that Peterson Air Force Base was the preferred location because of its proximity to the Space Defense Operations Center (SPADOC) of the North American Air Defense Command.

In January of this year, the final Environmental Impact Statement (EIS) was issued continuing to support the original conclusions despite the information provided by many sources indicating that the evaluation had been less than complete.

The candidate sites were assessed against sixteen criteria. The Peterson site had a definite advantage in only one of the criteria, Kirtland led on eight of the criteria and the two sites were approximately equal on the seven remaining criteria. However, when questions were raised about this obvious indication that the criteria appeared to favor the New Mexico site over the Colorado location, the Air Force responded with a statement that the environmental analysis is only one element of the selection process and that economic and operational considerations were not addressed in the EIS because they are not issues within the scope of the EIS process.

The site selection was earlier challenged on the cost of construction at the New Mexico site versus the Colorado site, and the response was to the effect that "unique operational characteristics" favored the Air Force's decision and offset any increased construction costs over the life of the project. The original CSOC siting criteria called for the facility to be located away from populated areas and roadways. This was ignored in the selection. The criteria also called for the utilization of existing federal property and buildings. This too was ignored. In fact, the issues of security, land acquisition, visual impact, military housing, utilities, road construction, weather conditions, air transportation, labor force, and construction costs were all apparently ignored in view of the fact that the Albuquerque site offered greater advantages and potential in each area.

Also ignored is the fact that the original criteria required that CSOC be located within the footprint of the Tracking and Data Relay Satellite System (TDRSS). TDRSS will be the prime communication link with the Space Shuttle, and the Peterson site does not satisfy this criterion. A General Accounting Office report (MASAD-81-6) prepared on Department of Defense participation in the Space Transportation System indicated that full use of the Space Shuttle's capabilities is dependent upon availability of the NASA TDRSS. The Air Force's own evaluation of this situation indicates that the cost of relaying downlink data from payloads aboard the shuttle from NASA's TDRSS ground terminal at White Sands, New Mexico to the CSOC would range from $500,000 to $2 million per year depending upon the capacity of the data transmission system. This would amount to approximately $5 million to $20 million over the ten year life given the project. This figure apparently was not included in the comparison of costs between the two sites.

Development and acquisition costs for CSOC have been estimated by the Air Force at $403 million. Estimates made during discussions with knowledgeable NASA officials experienced in the development of space operations facilities cite a figure closer to $1.4 billion. Noticeably absent from the Air Force evaluation was either the utilization or expansion of existing facilities at Johnson Spacecraft Center. We have repeatedly heard that NASA is not capable of handling simultaneous classified missions, yet funds have been provided to provide secure operations and communications at Kennedy, Vanderberg, Sunnyvale and Goddard. This issue needs to be addressed to ascertain whether expansion of Johnson Spacecraft Center facilities would meet Air Force requirements for space operations at a lower cost.

APPENDIX I

The greatest error in the selection process is the decision to place the entire United States Space Operations and Space Defense programs within a single area which is already a very attractive military target. It appears that proper consideration was not given to geographic dispersal of vital operational installations.

Finally, the decision is supported by the suggestion that federal dollars can be saved by sharing various personnel and equipment common to both the Space Defense Center and the Space Operations Center. The reports very carefully, however, avoid making any definite commitment to carry out such actions upon which the projected savings are based. Therefore, we would like to request that the General Accounting Office conduct a review of manner in which the Air Force made the decision to select Peterson Air Force Base to insure that this is the site which offers the greatest technical support at the least cost. There is considerable evidence to indicate that these factors were not the primary reason behind the final decision. We do not expect that your review would include an analysis of whether there is in fact a need for CSOC, but rather whether that need can best be met by the project selected.

We would appreciate having your report on this matter by January of 1982.

Sincerely,

Mark O. Hatfield, Chairman
Appropriations Committee

Harrison H. Schmitt, Chairman
Science, Technology & Space
Subcommittee

Ted Stevens, Chairman
Defense Appropriations
Subcommittee

APPENDIX II

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

MISSION ANALYSIS AND
SYSTEMS ACQUISITION DIVISION

The Honorable Mark O. Hatfield
Chairman, Committee on Appropriations
United States Senate

SEP 23 1981

The Honorable Ted Stevens
Chairman, Subcommittee on Defense
Committee on Appropriations
United States Senate

The Honorable Harrison H. Schmitt
Chairman, Subcommittee on Science,
Technology and Space
Committee on Commerce, Science, and
Transportation
United States Senate

On September 17, 1981, members of my staff met with Senator Schmitt to discuss the progress to date on our review of Air Force Consolidated Space Operations Center Siting Decision (CSOC). During that meeting, Senator Schmitt indicated that there were several additional areas of congressional concern that were not included in your letter of May 15, 1981. Specifically, the information that he requested be included in our report to you not later than January 31, 1982, is as follows:

--Alternatives to the currently planned CSOC site construction in Colorado Springs, Colorado;

--GAO's assessment of the viability of each of those alternatives;

--GAO's recommendation as to the most cost effective alternative;

--Discussions of any cost savings that could be effected by the Air Force in this program;

--Discussion of GAO's perceptions of the apparent lack of planning on the part of the Air Force for the CSOC;

--Explanation of deviations from normal Air Force procedure in CSOC planning;

--History of the site surveys performed showing the evolution of the criteria and inconsistencies in their application;

--Discussion of other land options not considered, and

--Any legal ramifications of the manner in which the Air Force procured the property easement at Colorado Springs.

APPENDIX II

We will be pleased to incorporate such additional information in our report on January 31, 1982. If you, or any of your staff, have further questions relative to our intentions in this report, please contact Mr. Warren G. Reed, Senior Associate Director on 275-6531.

Donald E. Day

W. H. Sheley, Jr.
Director

DETAILED

CHRONOLOGY OF CSOC

SITE SELECTION PROCESS

This chronology of the CSOC site selection process is based on documents made available to us by the Air Force during the course of our review.

November 1976: The Aerospace Corporation, supporting Space and Missile System Office, now Space Division, determined that using an augmented satellite control facility was a viable alternative to a separate DOD facility at JSC.

December 1976: The Thompson, Ramo, Woolridge Corporation (TRW), under contract to the Space and Missile System Office, formalized the concept of a SOPC. This TRW report recommended that

--firm operational requirements for military Shuttle mission operations be established,

--SOPC implementation options be investigated in greater depth with the goal of reducing costs, and

--potential utilization of SOPC for other than Shuttle space missions be considered in any decisions concerning the SOPC location, configuration, and cost.

February 1977: SCF, in a message to Air Force Headquarters, detailed 20 siting requirements for a prospective collocated SOC and SOPC. The siting requirements were prioritized into mandatory and desirable classifications. Mandatory were those criteria primarily of a technical nature. The desirable fell into the category of nice-to-have items primarily related to support issues.

March 1977: Air Force Systems Command Headquarters asked the Space and Missile System Office, the SCF parent command, to provide a list of candidate sites for the STC II (later became SOC) and SOPC.

April 1977: Air Force Headquarters, in a message to the Air Force Systems Command, upon receipt of SCF suggestions, recommended six sites for a limited desk top analysis: the sites were (1) Kirtland AFB, New Mexico, (2) Hill AFB, Utah, (3) Mountain Home AFB, Idaho, (4) Nellis AFB, Nevada, (5) Luke AFB, Arizona, and (6) Malmstrom AFB, Montana.

June 1977: Ford Aerospace and Communications Corporation, after analysis of the projected SOC and SOPC requirements, recommended a baseline configuration. They identified requirements for the two systems as well.

July 1977: The Space and Missile System Office identified alternatives for evaluation. They also identified which classified information about launches should be protected from inadvertent disclosure. This led to definition of requirements for JSC Controlled Mode operation.

August 1977: An Air Force ad hoc Shuttle Security Group briefed their recommendations to Air Force Headquarters that SOPC be located with SCF at Sunnyvale, California, that GPS be considered separately, and that SOC proceed independently of either the GPS or SOPC planning.

February 1978: A desk top analysis was completed by SCF on 12 locations. Three key criteria, identified by SCF as driving the siting decision, resulted in the SCF conclusion that siting should be made in Arizona or southern Nevada at one of four locations: Nellis AFB, Luke AFB, Williams AFB, or Davis-Monthan AFB. SCF also introduced the concept of technical workarounds to satisfy criteria deficiencies. For example, larger antennae on the satellites could reduce the size of reception areas on the Earth, reducing the distance from border criteria from 250 miles. However, the cost of such satellite modifications was not priced. Kirtland AFB in New Mexico was not recommended since it had no DSCS WESTPAC satellite visibility and only marginally met the 250 mile from international borders criteria. Malmstrom AFB in Montana met none of the three critical criteria.

April 1978: The first of three phases of Site Survey 78-21 began when SCF was given permission to survey five locations: (1) Luke AFB, Arizona, (2) Nellis AFB, Nevada, (3) Hill AFB, Utah, (4) Mountain Home AFB, Idaho, and (5) Malmstrom AFB, Montana.

July 1978: Ford Aerospace and Communications Corporation prepared SOC facility design concept and criteria, including Site Survey 78-21 criteria. The study stated the possibility of collocation of SOC and SOPC and thus included SOPC in siting criteria.

November 1978: The second phase of 78-21 began. SCF was given permission to carry out surveys at three more locations: (1) Kirtland AFB, New Mexico, (2) Buckley Air National Guard Base, Colorado, and (3) Peterson AFB, Colorado. The site surveyed at Peterson AFB was on the base itself.

December 1978: Air Force Systems Command, in a message to Space Division, gave details that the Commanders of the Aerospace Defense Command and Air Force Systems Command met on December 19 and agreed the Air Force Systems Command would look at Cheyenne Mountain as a possible location for SOC.

January 1979: The third and final phase of 78-21 began. SCF was given permission to survey four more locations: (1) NORAD's Cheyenne Mountain Complex, Colorado, (2) Offutt AFB,

Nebraska, (3) Hancock Field, New York, and (4) Duluth International Airport, Minnesota.

Space Division, in a message analyzing the results of 78-21, introduced a new criterion favoring Kirtland AFB and Luke AFB, that of being in the Earth reception area of the NASA TDRSS. They also went on to introduce the possibilities of workarounds making other locations feasible. In their justification they stated:

> "* * * survey activity to date has been constrained * * * to active AF installations. If Federal and/or private property within 50 miles of survey sites are considered, Nellis AFB, Hill AFB, Buckley ANGB, and Peterson AFB could be made acceptable."

Specifically referring to the Federal property criterion, they stated:

> "Retention of Federal Property criterion is considered important. Acquisition of non-Federal property would increase project cost and probably cause delays * * * due to the land acquisition process."

The importance of these changes was apparent in the conclusion contained in that message. They concluded that the sites located at Kirtland AFB and Luke AFB best met the criteria. Neither met the original criteria of the desk analysis. The Peterson AFB and Malmstrom AFB sites ranked too low in the analysis to be considered.

February 1979: The Site Survey 78-21 Summary Report was published without ranking locations. Siting criteria changes included: (1) dropping criterion to be away from other high-priority targets, (2) assumption that WESTPAC satellite could be moved eastward, and (3) the general elimination of quantitative measures associated with various criteria; for example, the 70- to 90-percent clear sky criterion became a minimum of 70 percent.

The Defense Communications Agency informed Air Force Headquarters that the DSCS WESTPAC satellite could not be moved eastward, which meant that it would not be visible from Kirtland AFB, Peterson AFB, or Malmstrom AFB. Space Division, in a message to the Air Force Systems Command, stated that it was their assessment that they could get by without DSCS WESTPAC coverage if an alternative wideband communications link was provided. They also stated a new requirement for TDRSS, using this satellite to communicate with remote sites overseas in lieu of DSCS. Space Division stated that Kirtland AFB and Luke AFB were still the preferred sites.

Air Force Systems Command, in a letter to Air Force Headquarters stated that Kirtland AFB could best meet technical and support requirements. They also noted that the Air Force had

a comparable capability to TDRSS and that the use of TDRSS might be the only solution OMB and the Congress would accept.

OMB requested that DOD and NASA determine whether a joint mission control center or separate DOD and NASA facilities should be used to meet post-1985 Shuttle mission requirements.

March 1979: The Commander of Space Division directed SCF to look at the feasibility of SOPC at Vandenberg AFB.

May 1979: The Secretary of the Air Force, in a memorandum, summarized his comments to a briefing on SOC. He stated that better workload statistics were needed. He emphasized trying to use existing facilities and cited possible locations as Malmstrom AFB, Buckley ANGB, Luke AFB, and Hill AFB. Kirtland AFB was not mentioned. He concluded that the Air Force would have a much better chance of obtaining funding from the Congress if they could combine space control centers like GPS, SOPC, and SOC.

June 1979: The Air Force Systems Command, in a message to Aerospace Defense Command, stated their position recommending four locations for a CSOC. By preference they were: (1) Kirtland AFB, (2) Luke AFB, (3) Peterson AFB, and (4) Malmstrom AFB. They also stated that they were considering the addition of other facilities in the CSOC, specifically GPS and SPADOC.

July 1979: In the Site Survey 78-21 Executive Summary, based on the survey itself and a June 1979 briefing, the concept of a "hypothetical site east of Peterson AFB" was introduced. From this point on, all references to the Peterson site were dropped in the selection process and the only site mentioned in Colorado Springs was the State land east of Peterson AFB.

August 1979: Air Force Headquarters reported to OMB, recommending a separate Shuttle control center for DOD, and that to save money it can be collocated with SOC to form a CSOC. The Secretary of the Air Force established a working group to validate the siting criteria and narrow the candidates for final consideration to three. Candidates selected for consideration were Peterson AFB, Kirtland AFB, and Malmstrom AFB. Prior to the selection of the finalists, the Tactical Air Command asked that Luke be removed from consideration due to possible operational conflicts with pilot training at Luke AFB.

September 1979: Site Survey 79-26 began, conducted by a team comprised of personnel from Air Force Headquarters, Air Force Systems Command, and various other Air Force commands. This study was directed by the Secretary of the Air Force. The Air Force Systems Command, in a message to Air Force Headquarters, gave their preliminary assessment based on the team's understanding of the siting criteria. They ranked the candidate sites as follows: (1) Kirtland AFB, (2) Colorado Springs, and (3) Malmstrom AFB. The final report of Site Survey 79-26 was issued shortly thereafter, but no such ranking of the sites was included.

October 1979: The Commander-in-Chief of the Aerospace Defense Command provided his classified comments to Air Force Headquarters on operational and organizational factors affecting CSOC siting.

December 1979: Air Force Headquarters issued its final report on site selection for CSOC. This report summarized the site selection process from Site Survey 78-21 to date and stated that the general conclusions of Site Survey 79-26 were that there were no overriding technical, environmental, or base support reasons for selecting one site over another, although Kirtland AFB showed the lowest initial estimated military construction program costs. It stated subsequent to 79-26 that the three sites were evaluated against operational and organizational factors which affected effectiveness and efficiency of CSOC as well as life-cycle costs. It stated that this evaluation resulted in the selection of the Colorado Springs site as the preferred location.

Air Force Headquarters in a message to the Air Force Systems Command, stated that selection of the Colorado Springs site was contingent upon successful completion of the Environmental Impact Statement and successful acquisition of the land.

April 1980: A proposed Environmental Impact Statement was issued for comment and coordination.

August 1980: Air Force Headquarters in a letter to the Colorado Board of Land Commissioners, requested a firm commitment on the land selected for CSOC.

September 1980: The Colorado Board of Land Commissioners responded. In their letter to the Principal Deputy Assistant Secretary of the Air Force:

> "We are pleased to answer your letter of August 26, on the Consolidated Space Operations Center near Peterson Air Force Base, Colorado Springs, Colorado.
>
> "The State Board of Land Commissioners have agreed to commit the use of Sec. 26, T. 14 S., R. 64 W., El Paso County, for use as outlined in your letter,* * *
>
> "We will grant a right-of-way at a cost of $48,000, plus $1,950 to cover the improvements owned by our lessee, for a total of $49,950."

February 1981: The Secretary of the Air Force, in response to a request from the New Mexico congressional delegation, reviewed the Air Force CSOC site selection process. He evaluated the siting criteria and its application and reaffirmed the Colorado Springs site decision. The New Mexico delegation was advised of the results of this review in a letter from the Secretary, dated March 17, 1981.

APPENDIX IV

B-205335

ATTACHMENT

ACQUISITION OF RIGHT-OF-WAY FOR CONSOLIDATED SPACE OPERATIONS CENTER (CSOC)

The Air Force is in the process of acquiring a right-of-way from the State of Colorado for the use of State-owned land to erect the CSOC. GAO has reviewed a draft of the proposed conveyance. The draft has not yet been finally approved either by the Air Force or the Army Corps of Engineers which is handling the acquisition for the Air Force, and has not yet been agreed to by the State of Colorado. Accordingly, our conclusions are tentative and not necessarily applicable to a later draft or to the final agreement.

The Chairman asked that we discuss possible legal ramifications of the manner in which the land is being procured. In general, we find no legal problems beyond what would normally be encountered in a transfer of real estate or which are likely to affect the Air Force's ability to proceed with construction and operation of the CSOC.

The preliminary agreement with the State calls for the United States to get the use of the land "in perpetuity" but with a right of reversion to the State when the United States no longer needs it. The Air Force will pay $48,000 to the State for the right-of-way.

The Air Force's method of acquisition appears to be consistent with applicable statutes and regulations. The general DOD policy is that if the Government is going to build on land, it should acquire either title or a permanent easement. Here, the Air Force is getting what amounts to a permanent easement, the right to use the land as long as it is needed for governmental purposes.

Moreover, even if the Air Force's interest were construed as less than a permanent easement because of the right of reversion to the State, the Air Force has statutory authority to acquire temporary interests in land for less than $100,000 (10 U.S.C. §2672) and to put improvements on land held temporarily (e.g., section 601, Pub. L. No. 96-418, 94 Stat. 1768). We agree with the Air Force's Assistant General Counsel that this transaction is authorized upon compliance with DOD Directive 4165.16, requiring approval from the Secretary of Defense of the acquisition.

With respect to whether the Air Force is adequately protected against existing encumbrances on the land, the draft

APPENDIX IV

says that the Air Force's interest is subject to prior easements and rights-of-way, if any. This is standard language in a conveyance and would be true as a matter of law even if the clause were not in the draft. However, according to the counsel to the State Board of Land Commissioners, State land records have been searched, more thoroughly than a normal title search, and the Board is confident that there is no existing interest in the property which might interfere with the Air Force's use of the land. The Board's representative indicated that the State could, if necessary, cancel a conflicting right-of-way and could eliminate other interests by condemnation if necessary. Also, the United States can always exercise its own power of condemnation to acquire without delay any interest which might interfere with its use of the property. 40 U.S.C. §258a. Thus, the provision in the draft conveyance making the Air Force's interest subject to existing rights-of-way is not objectionable, since it will have no adverse consequences, as a practical matter.

Counsel for the Corps told us that his agency intends to seek an agreement directly with the owner of the existing grazing rights and improvements, the only encumbrance on the land of which the Corps is aware, with the intention of reaching a separate agreement with him for purchase of his interest. According to counsel to the Board, the owner of the existing interest is anxious to facilitate the proposed transfer to the Air Force and there is no reason to anticipate any difficulty in this negotiation.

Various other features of the draft seem unobjectionable. The mineral rights are reserved to the State but cannot be exploited without the approval of the United States. This adequately protects the Air Force from conflicting uses of these rights.

Under the draft, the United States is protected also in that it has no liability to restore the land to its original condition, and buildings and other improvements placed on the land remain the property of the United States, to sell or abandon as it sees fit.

The draft agreement provides that the State is not liable for any injury or damage to persons or property which arises from the use of the property by the United States. This is a reasonable provision: the State should not be liable for activities over which it will have no control.

Water rights are reserved to the State by the draft agreement, although the United States can explore, drill, or establish wells if the State agrees. Since the Air Force reportedly has a source of water in sufficient quantity for the foreseeable needs of the CSOC, this provision seems unobjectionable.

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Under the draft agreement, the United States' use of the land is not limited to the CSOC. It can transfer or assign its rights without the State's consent (but it must give the State written notice) for any governmental purpose. This gives the United States considerable flexibility.

Finally, we considered the authority of the State to convey the land to the Air Force. Under Colorado's Constitution (Article IX, Section 10), the "sale or other disposition" of State lands must be conducted "in such manner as will secure the maximum possible amount therefor." This kind of language is usually understood to require a sale at public auction to the highest bidder. On the other hand, a State law allows the Board of Land Commissioners to grant to any agency of the United States, for any public purpose, a right-of-way to use State land "on such terms as the Board shall determine." The Board may grant only a right-of-way, an interest less than title, under the statute, and any right-of-way, when the land is no longer used for the purpose for which the right-of-way was granted, must terminate and all rights must revert to the State. (Col. R. Stat. §36-1-136, 1980 Cum. Supp.)

The Air Force and State are evidently treating this transaction as a grant of right-of-way falling under the statute rather than as a sale or other disposition falling under the constitutional provision. Whether this is correct is a question of State law. Generally, GAO will not question a State's interpretation of its own law. The Board's counsel advised us that the Board does not believe the constitutional provision applies and therefore that the Board is not required to secure the maximum possible amount.

The possibility exists that the legality of the conveyance could be challenged in a lawsuit. While the possibility of litigation cannot be foreclosed, it is in our judgment not likely. Moreover, as mentioned earlier, the United States may condemn without delay whatever interest in land it needs, should any doubt later arise as to the legality of the conveyance by the State. With that option available, and given the Board's view that it has legal authority to convey the right-of-way, we find no legal reason for the Air Force not to go ahead with the acquisition as planned.

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APPLICABILITY OF 40 U.S.C. §255
TO RIGHT-OF-WAY FOR CONSOLIDATED SPACE
OPERATIONS CENTER

The Chairman has raised an additional question, specifically whether 40 U.S.C. §255 applies to the Air Force's acquisition of the right-of-way. That statute states in pertinent part:

> "Unless the Attorney General gives prior written approval of the sufficiency of the title to land for the purpose for which the property is being acquired by the United States, public money may not be expended for the purchase of the land or any interest therein.
>
> "The Attorney General may delegate his responsibilities under this section to other departments and agencies, subject to his general supervision and in accordance with regulations promulgated by him."

An attorney for the Corps of Engineers (Corps), which is conducting the negotiations for the Air Force, has informed us that 40 U.S.C. §255 is applicable. The Attorney General has delegated some of his authority under section 255 to the Corps but has reserved the right to approve acquisitions such as this one, where the property ultimately reverts to the owner. 1/ In this case, therefore, the Attorney General will pass judgment on the sufficiency of title. If he determines that title is sufficient, the Corps will make a last check of the records to ensure that no encumbrances were missed in previous record

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1/ Paragraph 7 of the draft contract states in pertinent part:

> "In the event the party of the second part [the United States], or its assigns, shall cease to use said land for governmental purposes, then and in that case this right-of-way and easement shall become void and of no effect, and any and all such rights and privilege herein granted shall revert to the party of the first part [Colorado] or its successors in interest."

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Based on our reading of the draft contract and knowledge of the facts, we believe that the title being acquired is sufficient for the purpose, building and operating the CSOC. However, as discussed above, that decision is for the Attorney General to make.

THE UNDER SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301

RESEARCH AND
ENGINEERING

20 JAN 1982

Mr. Warren G. Reed
Senior Associate Director
United States General
Accounting Office
Washington, D.C. 20548

Dear Mr. Reed:

This is in reply to your letter to Secretary Weinberger regarding your draft report dated December 15, 1981, "The Consolidated Space Operations Center: Is Not Supported by Adequate Defense Department Planning" Code 954017, (OSD Case #5836). With respect to the conclusions and recommendations of this report, the Department of Defense makes the following comments:

- The DoD currently views space as a place to deploy systems as an adjunct to other means of accomplishing existing missions, such as those of providing communications, surveillance, navigation and meteorological support. Until such time as a new and unique mission in space mandates the designation of an organization to accomplish that mission, we believe that our present functional approach to management and operation of space systems is appropriate. The DoD and Presidential space policy studies currently underway may precipitate additional organizational consideration upon completion.

- Further, given the recent reaffirmation to the objectives of the National Space Transportation System by the current Administration and the commitment of the DoD to that system, we believe it is necessary and timely to proceed with the acquisition of a military command and control facility, i.e., CSOC, to enable full exploitation of the Space Shuttle's unique capabilities for national security operations. The GAO suggestion to limit CSOC funding to an interim satellite control complex is of particular concern. The facilities concept, now beyond the 35% design completion point, is for a consolidated facility. A restructure would obviate the advantages of consolidation and delay the completion of a shuttle operations and planning capability beyond the point required to adequately support national security space missions.

These comments were not received within the 30-day period required by Public Law 96-226. Therefore, they have not been evaluated, but are being included pursuant to the wish of the requesting committees. Changes made to the draft report during the normal internal GAO report review process have, in some instances, resulted in deletion or modification of passages cited by the Agency.

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- Planning for the CSOC has come into much sharper focus during the last six to nine months. The Air Force has developed a satellite control plan; Space Division has proposed an integrated satellite control approach in which CSOC is a central feature; the CSOC Program Office has published updated requirements definition documentation; and we are acquiring a refined perception of Shuttle operations through our participation in NASA's orbital flight test program. The dynamic nature of these activities and their concurrence with the general period of the survey perhaps has made it difficult for the GAO to fully appreciate their scope.

We appreciate the opportunity to comment on your draft report and detailed comments are attached.

Sincerely,

James P. Wade Jr.

James P. Wade, Jr.
Acting

Attachment

APPENDIX V

DOD COMMENTS
ON
DRAFT GENERAL ACCOUNTING OFFICE REPORT

THE CONSOLIDATED SPACE OPERATIONS CENTER:
IS NOT SUPPORTED BY ADEQUATE
DEFENSE DEPARTMENT PLANNING

Code 954017 (OSD Case #5836)

1. Ref: RECOMMENDATIONS (p iii)

"We recommend that the Secretary of Defense take immediate action to:

-- designate a single agency for management of military space development and operation;

-- direct that agency to prepare an overall plan for military exploitation of space. Included in this plan should be consideration of an interim SOC in Colorado Springs, with a follow-on CSOC at such time as adequate planning is completed for a fully integrated system. Also, the CSOC implementation plan should be supported by an adequate cost-benefit analysis."

Comment: DOD Directive 5160.32 currently designates the Air Force as the DOD activity responsible for space launch and orbital support operations. A proposed draft revision of DODD 5160.32 designating the Air Force as the DOD executive agent for space currently is being coordinated among the Services by the Air Force. After this process, it will undergo formal OSD review.

In discussion of the designation of an "overall manager for military space operations" the GAO does not distinguish between designation of an agency (which is an appropriate action for OSD) and the organizations within that agency to perform its functions (which is an agency prerogative). National space policy currently is being updated by the Office of Science and Technology Policy, and this activity is being supported by the formulation of a DOD space policy and implementation plan. Organizational changes, if required, are premature until this new policy is promulgated.

With regard to overall planning and cost benefit analysis for CSOC, the Air Force has conducted over the last three years extensive analysis of alternatives for achieving the capabilities that CSOC will provide. The report to OMB (Dec 78) determined that collocating the satellite and Shuttle capabilities was the most cost-effective alternative. Since that report, the Air Force has continued to examine various alternatives for achieving these capabilities (CSOC Task Force, CSOC Integration Study and the Satellite Control Plan) in the most cost-effective and efficient manner compatible with the mission requirements. The DOD believes that the current program baseline is the most cost-effective alternative for meeting mission requirements.

See following Comments for discussion of GAO recommendation to defer CSOC.

2. Ref: MATTERS FOR CONSIDERATION OF CONGRESS (p. iii)

"We believe that the Congress should consider restricting Military Construction Program funding for CSOC to that level necessary for an interim SOC. Full CSOC funding should follow when DOD has completed an adequate cost benefit-analysis.

Program implementation should be closely monitored."

Comment: The FY 83-87 Budget Estimate Submission includes MILCON funding in FY 83 and FY 84 for an integrated facility to house both satellite and Shuttle control functions. The 35% design milestone has already been met. The FY 83 increment provides the technical building with some utility support; the FY 84 program provides engineering, administrative and support buildings. This approach is consistent with the installation and checkout lead times associated with the technical systems. Limitation to an "interim" Satellite Operations Complex would obviate the consolidated approach that the Air Force has undertaken and that GAO asserts is necessary in its previous recommendation to the SECDEF. This consolidated approach was shown to be the most cost effective in the Aug 1979 report to the OMB on Satellite and DOD Shuttle Control Capabilities.

The Air Force acquisition strategy does achieve a satellite control capability first; however, the activation of the Shuttle control capability in the 1987 time frame is necessary if we are to support the current national mission model. NASA estimates that the Controlled Mode at Johnson Space Center will be saturated with 6 to 8 DOD missions per year. The mission model shows this rate occuring in 1987 with 12 to 14 missions per year by 1989 and dictates the Shuttle control IOC of 1987 to meet DOD mission requirements.

3. Ref: LOCATIONS VISITED (p. 5)

Comment: Space Division, Los Angeles AFS, CA should be included and points of contact at NASA should be clarified.

4. Ref: GUIDANCE FOR MILITARY EXPLOITATION OF SPACE IS NOT EXPLICIT (p. 6)

"There is no single manager of military operations in space."

Comment: The GAO assertion assumes that space is a mission rather than a place. In fact, space systems provide support across the spectrum of mission areas, particularly in the areas of strategic defense, reconnaissance, and command, control, communications. Space systems compete with other types of systems in establishing the most effective means of accomplishing a given mission.

By analogy, one could argue that aircraft operations are fragmented because the Air Force, Navy, and Army all use aircraft even though the missions of each service are quite distinct. To carry the analogy further, within the Air Force, aircraft are employed by Strategic Air Command, Tactical Air Command, Military Airlift Command, etc., all with distinct missions.

However, space does have unique aspects, and the operations support structure is large and expensive to operate. In recognition of this fact, the Space Division of Air Force Systems Command is the focal point for space systems acquisition, launch, and a large portion of orbital support through the Satellite Control Facility. This "single manager" approach for common support functions is appropriate and has been implemented, while operational control of space systems is vested in those organizations having direct mission responsibilities -- ADCOM (DSP), SAC (GPS), DCA (DSCS), etc.

5. Ref: AIR FORCE ROLE AS SPACE PROGRAM OPERATOR NEEDS CLARIFICATION (pp. 8-9)

"Although the Air Force has been delegated authority for the development, production and deployment of space systems..."

Comment: This incomplete statement implies broader delegation than, in fact, exists. DODD 5160.32 states "The Air Force will have responsibility for development, production and deployment of space systems for warning and surveillance of enemy nuclear delivery capabilities and all launch vehicles, including launch and orbital support. Military Department proposals for space development programs will require specific OSD approval based on DCP and DSARC policies. DCP's for space communications, navigation, unique surveillance (i.e., ocean or battlefield), meteorology, defense/offense, mapping/charting/geodesy, and major technology programs will designate the Military Department or DOD agency responsible for execution of the program."

The Space Transportation System MOU is referenced and the following observation made: "This document, does not state, however, that the Air Force will build and operate a CSOC or manage overall military operations in space."

Comment: The STS MOU is intended to address the functional responsibilities of the DOD and NASA with respect to the Space Transportation System. Management of systems external to the STS (e.g. satellite control) and the design implementation of Air Force and NASA segments of the STS and agency organization are neither necessary nor appropriate features in such an inter-agency agreement.

"CSOC is intended to be a multi-purpose complex that will encompass the planning and operations of a variety of space programs. .....the Air Force prerogatives should be clearly spelled out... (or) conflicts are bound to arise between Air Force and other space program operators such as the Army and Navy."

Comment: The CSOC is not a multi-purpose facility; it has clearly defined dual missions: satellite control and national security Shuttle operations control. In the launch support area, DOD missions will be conducted in accordance with already designated Air Force responsibilities. On-orbit control for numerous satellite programs will be supported; however, this generic on-orbit support is a service provided to the operational "owner" responsible for the satellite mission just as the SCF provides these services today.

"Indications of potential problems have already been noted in an Action Memorandum which accompanied the NASA/DOD MOU. It was from the Secretary of the Air Force to the Deputy Secretary of Defense and emphasized the need for an overall DOD plan for space exploitation and stated that the other services are expressing concern over the Air Force being designated the sole interface with NASA and the Space Shuttle."

Comment: This appears to be a gross misunderstanding of the ACTION MEMORANDUM which is attached for reference.

6. Ref: AIR FORCE DEVELOPMENT APPROACH SHOULD BE RECONSIDERED (pp. 9-11)

"The expedient measures currently being taken focus on duplicating and colocating existing systems." (p. 11)

APPENDIX V

MEMORANDUM TO THE DEPUTY SECRETARY OF DEFENSE

SUBJECT: NASA/DOD Memorandum of Understanding - ACTION MEMORANDUM

Attached for your signature is a proposed Memorandum of Understanding between the Department of Defense and the National Aeronautics and Space Administration covering the operation of the Space Transportation System (Shuttle). The Memorandum is intended to replace the Memorandum of Understanding between NASA and the DOD, dated 14 January 1977, and reflects technical and organizational changes that have occurred since the earlier Memorandum was signed.

The new Memorandum is consistent with the Department of Defense Directive 5160.32 which deals with the operation of the Space Shuttle for flights related to the national security. The Memorandum has been provided to the Secretaries of the Army and Navy, and to the Office of the Joint Chiefs of Staff for their comments. Mr. Alexander interposed no objections to the Memorandum. While Mr. Hidalgo was initially concerned that the Memorandum would adversely impact the Navy's relationship with NASA regarding the NOSS, and with their R&D efforts, he has been assured that the MOU is written in such a way as to enhance the Navy's use of the Shuttle, and will in no way diminish their Research and Development activities. A copy of this correspondence is attached. Based on the clarification to him, the Navy now interposes no objection to the MOU. The JCS have noted the MOU, and offer no objection; however, they have indicated that as we proceed to make the Shuttle an operational system, they will wish to become more involved.

We hope very much that this staffing of the Memorandum will provide the basis for your signature at your earliest opportunity.

Gerald P. Dinneen

GERALD P. DINNEEN
Assistant Secretary of
Defense (C^3I)
DSOC Member

Hans Mark

HANS MARK
Secretary of the Air Force
DSOC Chairman

Daniel J. Murphy

DANIEL J. MURPHY
Deputy Under Secretary of
Defense (PR)
DSOC Member

MAR 27 1980

DEP SEC HAS SEEN

off-the-shelf software available on the IBM machines. New family members are introduced to the 370 series regularly, allowing software compatible upgrades to newer hardware technology. Furthermore, a very competitive IBM compatible mainframe market exists.

Array processing, while potentially advantageous for certain selected portions of the AFSCF mission, is not beneficial for the bulk of the command and control activities in the MCC. The lack of software development tools on large array processors also restricts their utility for DSM. In general, the computer selection for the DSM was specifically sized for the mission requirement. It should be noted that the architecture with the current mainframes provided 50% growth capacity as well as the upward compatibility. More capable processors are not warranted based on mission projections.

"DOD is standardizing on a high level computer language called ADA. SOC and SOPC software....is written basically in the older languages, JOVIAL and FORTRAN. This will undoubtedly create inordinate individual problems in the sharing of computer software maintenance personnel as originally envisioned for the CSOC."

Comment: The GAO observation is not correct. DSM is the first major program to make use of ADA structure. Although there are no compilers now available for the language, the DSM is following a software development methodology which exploits modern programming techniques and the ADA structure to provide modular,

maintainable software. The ADA product specifications will be coded in JOVIAL J73, the most advanced of the DOD approved programming languages for which a compiler exists. DARPA and the ADA Joint Program Office have specified that this DSM methodology be used as the model for command and control software development. The logic to remain with FORTRAN for SOPC applications is dictated by the common sense requirement to insure interoperability with the NASA system and operate the Shuttle with a single set of software under central configuration management.

"...no further software language decisions are expected until after 1990, when the system is supposed to be fully operational. This means that when the system reaches operational capability, the Air Force will most likely be faced with a major modification of their computer software in the CSOC."

Comment: This conclusion is not valid. Major block changes in the software are accomplished as the mission requirements dictate. The DSM implementation methodology supports use of ADA language when ADA compilers become operational. It is not clear that recompiling the CSOC software would be necessary or even desirable just for the sake of code commonality. The software structure will allow it to be adapted to other missions should the need arise.

8. Ref: INCLUSION OF OTHER PROGRAMS MIGHT PROVIDE FUTURE SAVINGS (pp. 15-19)

"The management of the various programs has been fragmented due to the lack of an overall space exploitation plan and a single manager for space."

Comment: Recent Air Force efforts have addressed the internetting of satellite control systems as well as the inclusion of additional missions into the CSOC. The Air Staff/MAJCOM developed Satellite Control Plan considered CSOC in the context of overall satellite and Shuttle control networks and looked at technology needs for the future. Space Division has developed a satellite control integration

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approach that addresses internetting and recommends additional CSOC missions. These recommendations have considerable merit, and implementation will be considered by the Air Force during FY 84 POM formulation.

"SAC --- operates the Vandenberg launch complex in California."

Comment: SAC provides host base (housekeeping) support for Air Force Systems Command (AFSC) space launch operations.

"MAC has overall responsibility for the Defense Meteorological Satellite Program."

Comment: AFSC has overall responsibility. MAC is the user. SAC is the operator.

"The CSOC, in assuming programs from the various current owners and operators, could become embroiled in administrative chaos unless the Secretary of Defense takes action to organize and control military space planning."

Comment: The CSOC is a facility that will provide an operational support capability. It is not an organization that will "assume programs from various owners and operators". CSOC will certainly be a factor in considering future organizational evolution. Until such changes are made, CSOC will provide launch and orbit

control functions within existing command structure as a service to the satellite program owners and operators just as the SCF provides these services today.

9. Ref: COMBINING CSOC AND SPADOC (p. 17)

"Because of these similar computational and data base requirements, SPADOC is an excellent candidate for functional integration within the CSOC." And previously: "Because of the time criticality associated with defensive measures that can be taken, coordination between the SPADOC and CSOC would logically require real-time data exchange between their computers."

Comment: There is a distinction between the military command control functions of the SPADOC and the technical control functions of the CSOC (and other satellite control sites such as the Satellite Test Center and dedicated mission ground stations of the DSP and others). The Air Force has examined the relationships between SPADOC and CSOC and recognizes the similarity of some computational tasks. These tasks, however, are a subset of the overall functions of each facility; the differences are as significant as the similarities. For example, SPADOC does not perform mission planning or command generation for U.S. spacecraft; CSOC does not maintain data on foreign space objects nor correlate indications and warning data. The Cheyenne Mountain Complex exchanges real time data with other command centers such as the SAC Command Post and the National Military Command Center in addition to interfacing with space control elements. The real time computer exchange of data between SPADOC and CSOC would not be unique.

Close interactions between SPADOC and all space control elements (including CSOC) will enhance mission effectiveness, and collocation of SPADOC and CSOC was considered. However, collocation in the Cheyenne Mountain Complex is not feasible due to physical space limitations; collocation in the CSOC does not recognize the integral nature of the SPADOC in the CINCAD command structure, working directly and intimately with the Cheyenne Mountain Complex Command Director in accomplishing the entire spectrum of Space Defense missions.

10. Ref: COST EFFECTIVENESS OF SELECTED SITE CANNOT BE DETERMINED (pp. 7-14)

"Our review of candidate sites was limited to three finalists in the Air Force selection process--Kirtland and Malmstrom Air Force Bases and the Colorado Springs site 10 miles east of Peterson Air Force Base." (p. 2)

"Our evaluation of this (site selection) matter disclosed that the cost effectiveness of the selected site could not be accurately determined because criteria changed during the selection process; they were not consistently applied and there was generally a lack of reliable program cost data." (p. 7)

Comment: Chapter 3 examines the site selection activity that predates the the CSOC; initial surveys were for a Satellite Test Center II. The addition of Shuttle planning and control to the STC II mission led to the concept of a "consolidated" center. The siting criteria did evolve over several years as the mission expanded and technical considerations were better understood. We believe the criteria was consistently applied to each site during each survey, although some criteria were modified as the concept evolved. The Air Force and GAO agree that there were no overriding technical reasons discriminating among the three finalists. The ultimate selection was based on military judgment of operational and organizational factors.

11. Ref: AVAILABLE COST ESTIMATES ARE NOT FIRM AND RELIABLE (pp. 24-25)

"Original cost estimates of $500 million, we were informed by the program office, were grossly understated. The most recent estimate is $1.4 billion through 1990."

Comment: Meaningful comparisons of cost estimates are difficult without careful review of the underlying assumptions, including base year dollars, program start dates, projected IOC dates, inflation indices and other factors. It is not clear what the cited $500 million figure refers to. Planning efforts such as the 1980 Space Division task force did focus on costs through an IOC which could be achieved in the five-year planning cycle with funding on this order.

The current estimates for development and acquisition are $900 million through IOC (for both satellite and Shuttle control) and $1200 million through FOC. These cost projections have increased since CSOC inception, but the uncertainties have been greatly reduced. The Data System Modernization project is now on contract with options for CSOC satellite control equipment. NASA has successfully flown the orbiter and is working with Space Division to design the Shuttle control systems. Facility design is beyond 35% complete.

12. Ref: CONCLUSIONS (pp. 27-28)

"The current construction of a Control Mode capability at Johnson Space Center, in our opinion, removes the element of time criticality for a SOPC capability at Colorado Springs."

Comment: The Controlled Mode was designed from the onset as an interim capability with limited capacity and restricted security. The initial DOD operations will require workarounds, particularly for classified Shuttle missions. The projected JSC capacity cannot meet the DOD mission model without severely impacting civil missions. The Rev 10 Mission Model shows a DOD flight rate of 12 to 14 missions per year by 1989 with JSC saturated at 6 to 8 flights per

year in 1987. Deferral of CSOC would result in either a Shuttle control capacity deficit or implementation of costly measures at JSC that fall far short of the stated DOD operational requirement.

"The current developmental approach could lead to extensive integration and redesign problems and may not meet mission requirements once they are known."

Comment: The Air Force agrees that CSOC integration will be one of the more challanging aspects of the program. The current development approach recognizes this fact and the first CSOC procurement will be for an Integration Support Contractor. The Request for Proposal (RFP) for this effort was issued to industry on 1 Dec 81. We do not agree that the mission requirements are undefined. The mission requirements have been successively defined from the top level requirements (Mission Element Need Statement) down to the lower system level requirements (SOC, Baseline System Description, Task Force Report, D&R document).

"The final configuration of the center is not planned, the programs it supports are not known and, according to the Director of the Air Force Directorate of Space, the final system operator has not yet been identified."

Comment: The CSOC Definition and Requirements Document, 20 Oct 81, describes the CSOC configuration including satellite program allocation. While continuing refinement will take place, the configuration plans and activation philosophy are defined. Facility concept definition and 35% facility design have been completed.

The current CSOC Program Management Directive states that the CSOC operating agency will be the Air Force Systems Command; this resposibility has been assigned to Space Division. While Air Force organizational evolution may occur in the future, the current direction is clear. Space Division is undertaking the activation responsibilities of the CSOC operator.

13. Ref: DETAILED CHRONOLOGY OF CSOC SITE SELECTION PROCESS (pp. 36-42)

Comment: For completeness, the following should be added:
February 1981: The Secretary of the Air Force, Verne Orr, in response to a request from the New Mexico Congressional delegation, reviewed the Air Force CSOC site selection process. Mr. Orr evaluated the siting criteria and its application and reaffirmed the Colorado Springs site decision. The New Mexico delegation was advised of the results of this review in a 17 March 1981 letter from Mr. Orr.

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