~~2/205~~
117917

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

MISSION ANALYSIS AND
SYSTEMS ACQUISITION DIVISION

B-205335

MARCH 22, 1982

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

Dear Mr. Chairman:

As requested in your letter of January 28, 1982, we have evaluated the Department of Defense (DOD) comments on our report "Consolidated Space Operations Center Lacks Adequate DOD Planning" (MASAD-82-14, Jan. 29, 1982). These comments were included in our report unevaluated because they were received after the 30-day period required by Public Law 96-226, and our reporting deadline precluded a detailed evaluation in the report.

Basically, DOD agrees with the facts we found during our review of the Consolidated Space Operations Center siting decision. However, they disagree with our interpretation of these findings and our recommendations based thereon. We have addressed each of their concerns in our enclosed evaluation.

Copies of this report are being sent to the President of the Senate, Speaker of the House of Representatives, chairmen of the Senate Appropriations Committee and Subcommittee on Defense, Director of the Office of Management and Budget, Secretary of Defense, and other interested parties. We will also make this evaluation available to the public on request.

Sincerely yours,

W. H. Sheley, Jr.
Director

Enclosure

ENCLOSURE I

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.

ENCLOSURE I

- 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

ENCLOSURE I

EVALUATION OF AGENCY COMMENTS

CONSOLIDATED SPACE OPERATIONS CENTER

LACKS ADEQUATE DOD PLANNING

DEPARTMENT OF DEFENSE LETTER

- 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.

OUR EVALUATION

Although the Department of Defense (DOD) may view space as an adjunct to accomplishing other missions, our review of existing Presidential policy directives generally indicates a broader U.S. view. For example, it is specifically stated that the United States will take necessary action regarding space to (1) maintain the right of free access, (2) explore and use space in support of our national well-being, and (3) pursue space activities in support of our national defense and thereby strengthen national security, the deterrence of attack, and arms control agreements. Certainly, achieving these broad objectives requires the focus on space as a mission area.

The Shuttle and Soyuz successes have indicated the feasibility of deploying military personnel and weapons in space. If the United States is to have unlimited access to both near Earth and deep space, we must have appropriate means to guarantee protection of our interests. Since the use of space to support terrestrial military activities has been well proven, negation of a country's space assets will be a military objective in future conflicts. The United States should take immediate action to provide a capability to exploit space and protect our interests there.

Regardless of the DOD position that its approach is appropriate, we still believe that the Consolidated Space Operations Center (CSOC) should not be funded until such time as a policy has been adequately defined, a space exploitation plan completed, and the requirements for a true CSOC are fully articulated. In other words, true consolidation should be based on a functionally integrated total system concept capable of modular incorporation of other systems, such as the Global Positioning System, Defense Meteorological Satellite System, and the Space Defense Operations

Center (SPADOC), required to achieve adequate command and control of space for our national defense.

DOD LETTER

- 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.

OUR EVALUATION

We agree that National Security Decision Directive Number 8, dated November 13, 1981, reaffirms executive support for the Space Transportation System. We also agree it commits DOD to support that system. However, DOD's stated need for immediate CSOC construction is predicated on the expectation of a fleet of Shuttles capable of performing six to eight military missions per year, in addition to already scheduled civilian missions, by 1987. Since a fleet with that capability does not currently exist, we question the time criticality of CSOC construction.

On several occasions, we asked Air Force and DOD officials for documentary evidence of "35 percent facility concept completion." They indicated that this was not available. In any event, DOD appears to be taking the position that 35-percent completion of a building concept is adequate justification for CSOC program implementation. Our concern is not whether the Air Force constructs a building, but with what is to go inside that building. Office of Management and Budget (OMB), DOD, and Air Force procurement regulations all require a clear articulation of system requirements and adequate analyses of various possible alternative system configurations. This has not been done. Our purpose in suggesting restriction of fiscal year 1983 Military Construction Program (MCP) funding is not to impair CSOC development, but to have the Congress require DOD to prepare an adequate plan for CSOC as a functionally integrated program.

ENCLOSURE I

DOD LETTER

- 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.

OUR EVALUATION

Since we began reviewing the Air Force's CSOC siting decision in May 1981, there has been an increase in DOD and Air Force planning activity. However, the focus of this activity has been to perpetuate the concept of colocating two separate and relatively autonomous systems in a single facility. This is the concept discussed in the official CSOC definition and requirements document issued in October 1981. As pointed out in our report, it does not adequately consider the advantages of functional integration, apparently because of the perceived need for immediate redundancy for the Satellite Control Facility and the Controlled Mode at Johnson Space Center. In our opinion, the planning mentioned in this DOD comment will not result in a long-term, cost-effective, and efficiently implemented CSOC.

We appreciate the dynamic nature of DOD's approach, especially since it chose to proceed without an adequate space exploitation plan and limited CSOC requirements definition. We do understand the scope of these activities and have determined that they are directed toward short-term expedient goals that may not be in the best interest of the Government.

ENCLOSURE I

DOD COMMENT NUMBER 1

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.

OUR EVALUATION

We understand that the Air Force has assumed the initiative in space planning. However, we feel that its authority should have been delegated by DOD. Also, if the Air Force is to continue

doing the DOD space planning, DOD should designate it the single manager of space operations.

DOD appears confused by our recommendation that a single manager be designated. To clarify our point, the single manager should be an agency of DOD. That agency would then be charged with the responsibility of preparing an overall DOD space exploitation plan. We believe that a single manager must be designated as soon as possible. Whatever changes may take place in policy, the need for a single focal point will remain.

We do not believe that the analyses performed by the Air Force adequately support any construction decision at this time, other than for an interim Satellite Operation Complex to back up the Satellite Control Facility. Also, as stated in our report, the System Program Office indicated that those cost estimates the Air Force gave to OMB in 1979 were grossly understated. Any cost analyses made in the absence of adequate system planning are questionable. During our review, we found no evidence which indicated the Air Force had performed adequate cost-benefit analyses of alternative approaches.

DOD COMMENT NUMBER 2

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.

OUR EVALUATION

We do not argue with the immediate need to acquire redundant satellite control capability. The present Air Force acquisition strategy is geared to the rapid implementation of colocated autonomous systems with little concern about the advantages of functional integration. As discussed in our report, we believe time is available to consider this approach, and it could prove more cost effective and efficient. Also, it could be achieved through modular development and not hinder immediate implementation of the satellite control capabilities mentioned above.

Further, basing the acquisition strategy on 12 to 14 military Shuttle missions a year by 1989 is questionable. It assumes the existence of a substantial Shuttle fleet that does not exist. Currently, with only one operational Shuttle, it does not appear that DOD could achieve the six to eight missions a year expected in 1987. In our opinion, the current turnaround time of approximately 90 days would limit DOD's flights to four or five per year. In this event, the controlled mode at Johnson Space Center should be able to accommodate DOD's need, on an interim basis, until CSOC is properly developed.

DOD COMMENT NUMBER 3

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.

OUR EVALUATION

This information was deleted from the final report.

DOD COMMENT NUMBER 4

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.

OUR EVALUATION

As previously stated, our review of Presidential directives leaves little doubt in our mind that military space exploitation is to be considered a mission area as opposed to an adjunct to other missions. DOD's comparisons of space operations to aircraft operations are not appropriate with regard to our report. There are substantial differences between aircraft and spacecraft. It is not necessary to launch and recover all aircraft from one or two geographical locations as with space systems. Manned aircraft do not require computer control from the ground and are able to fly an unlimited number of directions in the Earth's atmosphere. Finally, aircraft do not cost as much as satellite or Shuttle systems.

The Space Division does not represent the single space manager we recommend. The DOD discussion of various systems and operators in its response illustrates fragmented operational management. It is our understanding that the Space Division only provides launch services and orbit support to the many different users. The single manager we refer to is one that controls and protects all military space assets once launched.

DOD COMMENT NUMBER 5

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.

ENCLOSURE I

"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.

GAO note: Memorandum attached as page 21.

OUR EVALUATION

We do not intend to imply that the Air Force currently has broad and sweeping delegation of authority. Our position is quite the contrary. We believe that some agency, possibly the Air Force, should have such delegation.

DOD implies that we interpret the National Aeronautics and Space Administration (NASA)/DOD Memorandum of Understanding (MOU) as a single manager charter. As previously stated, we believe that a single space manager, with responsibilities including the military use of the Shuttle, is necessary.

Reference to CSOC as a multipurpose facility was deleted from our final report, however, with the eventual inclusion of other systems, such as the Global Positioning System and the Defense Meteorological Satellite System, we believe such a term could be appropriate.

The action memorandum attached to the NASA/DOD MOU was mentioned because it demonstrated the reluctance of the Navy to agree with Air Force control of DOD Shuttle activities. They would not agree unless given assurances that the Air Force was not assuming

Navy space operations. It was our intention to demonstrate that the existence of fragmented space management and the lack of a strong single space manager could result in interservice rivalry within DOD. In this regard, however, effective space operations management need not include the absorption of a particular service's mission prerogatives although it may involve the integration or colocation of equipment. A true CSOC could be jointly staffed by personnel from all the services to ensure protection of individual mission responsibilities.

DOD COMMENT NUMBER 6

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)

Comment: There seem to be several apparent misconceptions evidenced by the GAO observations:

The satellite control systems in the CSOC will be based on the Data System Modernization (DSM) project of the Satellite Control Facility. DSM is not an existing system but rather a major ongoing development effort with an IOC scheduled in 1985.

The Shuttle control systems will be "functionally" equivalent to the NASA systems. This functional equivalance is motivated by the configuration control necessary between CSOC and JSC to provide mutual backup. The detail design implemenatation of the SOPC is to be derived from engineering analyses now being initiated. Both the SOPC and the NASA Shuttle control systems will be extensions of the development systems now being used at JSC for the Shuttle Orbital Flight Tests. The new systems will be tailored toward operational use of the Shuttle.

"While we recognize, as the Air Force contends, that this (internetting) is an expedient method of acquiring needed capability, we believe it has several serious drawbacks. For example, such development can not be as cost-effective as a functionally integrated system which shares data bases and common functions."

Comment: Functional integration theoretically could be more cost effective technically, but is not, under the circumstances, judged to be the most mission effective. Real world factors significantly impact the operational responsiveness of an "integrated" approach in meeting mission needs of all segments. This problem is particularly acute when two separate and distinct existing operational capabilities, i.e., satellites and shuttle control, must be maintained during respective transitions and these transitions commence from widely differing initial computational and software configurations.

However, the collocation of mission functions does have benefit with respect to shared administration, facilities and logistics since these support functions are generally less sensitive to changing needs of the individual elements. The appropriate degree of integration is typically addressed in analyses preceeding the design implementation, i.e., during specification development.

OUR EVALUATION

The fact that the DSM program at Sunnyvale is still incomplete (initial operational capability of 1985) indicates that CSOC is still in the formative planning stages. Again, as shown in the chart on page 20 of our report (Consolidated Space Operations Center Planning Cycle), CSOC definition and requirements are dependent upon input from the DSM program. The functional equivalent to NASA's system is required because the NASA computers currently used are obsolete. The Controlled Mode will use newer computers from the same vendor and NASA's old software (in FORTRAN), some of which dates back to the early 1960s and Project Mercury.

DOD agrees that functional integration of systems could be more cost effective than its chosen approach, albeit in a "theoretical" manner. Cost effectiveness possible in our approach is no more theoretical than the Air Force's expectations of short-term cost avoidance by replicating older systems and internetting them into some form of total system. One final, authoritative, set of mission requirements for CSOC could resolve this disagreement.

DOD COMMENT NUMBER 7

7. Ref: POTENTIALLY OUTMODED TECHNOLOGY (p. 14)

"Had a normal development cycle been followed, the advantage of more capable scientific processors could have been considered."

Comment: Computer systems for the Space Operations Complex are being procured as options to the Data Systems Modernization (DSM) Program of the Satellite Control Facility. This program has followed a rigorous development cycle beginning in Jul 1979 with a competitive design phase and the recent award of a development/acquisition contract to IBM in Dec 1980. IBM's solution is designed around its 370 series equipment. The design uses small scale computers (4341s) in Mission Control Complexes (MCC) which have relatively low processing requirements and larger mainframes (3033s) only where the additional computational capacity is needed. The IBM 370 series machines are software compatible allowing development of one set of shared software and the use of the large body of 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.

OUR EVALUATION

The replication of obsolete systems, while possibly providing some short-term savings, have no long-term advantages. In our opinion, CSOC is important to this Nation's future space activities and should not be based on the use of obsolete equipment and software, especially when newer and more capable resources are available.

DOD's assertion that array processing is not needed is somewhat premature, especially since the design of the CSOC computer system is not complete. The Air Force believes that upgrading to newer equipment from the same vendor (International Business Machines Corporation) will yield short-term cost avoidance in the area of software conversion. As we state in our report, the DSM programs will all be rewritten in the JOVIAL J-73 language. This would seem to nullify any conversion cost savings expected. It is also our understanding that DOD has recently announced its intention to standardize software on a new high level scientific computer language called Ada. We know of no migration path from JOVIAL J-73 to Ada and can only foresee future cost escalation due to substantial software conversions. We do not agree with DOD that Ada compilers are not available. We have found that they are commercially available but have not yet been approved by DOD.

We were informed by DOD officials in our December 1981 meeting on CSOC that no further software language decisions were expected on CSOC until that system is fully operational in 1990. Our conclusion, based on that stated intent, is still valid. If

this DOD comment is intended to announce a change from that stated position, we have another concern. It would appear that DOD has taken action that in effect grants the Air Force an exemption from using the standard Ada language regarding CSOC. This creates a situation where potentially all DOD computers would use Ada by 1990, but the CSOC computers would use JOVIAL J-73 and FORTRAN. This appears counter to the sound resource management doctrine espoused in the DOD intent to standardize on Ada.

DOD COMMENT NUMBER 8

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 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.

OUR EVALUATION

Apparently, DOD agrees with our statement that there are cost savings available by including other space programs in CSOC. However, since we do not have Fiscal Year 1984 Program Objective Memorandum information, we cannot substantiate their position.

With regard to DOD comments referring to Strategic Air Command (SAC), Military Airlift Command (MAC), and AFSC operations, we have deleted this section in the final report due to security considerations. We still hold, however, that there are too many organizations responsible for space operations.

We agree with DOD that "CSOC is not an organization * * *." In December 1981 DOD's Director of Space said that the final operating agency for CSOC had not yet been identified. However, we believe that CSOC has the potential to become the cornerstone of a U.S. Space Force, and current planning should consider this possibility.

DOD COMMENT NUMBER 9

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.

OUR EVALUATION

In its justification of the CSOC siting decision, the Air Force suggested having SPADOC provide a backup capability. We never suggested putting CSOC inside Cheyenne Mountain. As the Air Force determined in its 1979 analysis, there is not enough room. We still maintain, however, that SPADOC and CSOC could be integrated into one center, away from Cheyenne Mountain, under a single manager.

DOD COMMENT NUMBER 10

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. 4)

"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. 20)

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.

OUR EVALUATION

As stated in the DOD comment, we agree that there are no significant technical differences in the three finalist sites. We also agree that the Air Force based the final decision on other than technical criteria.

We do not agree with DOD that the criteria were uniformly applied to all 17 candidate sites. One significant example of this is that other than Federal land was not allowed to be substituted at any location except Colorado Springs. Had such substitution been uniformly allowed, other competitive alternatives could have been considered. For example, an old Semi-automatic Ground Environment (SAGE) site (West Mesa Air Force Station) 9 miles west of Albuquerque could have been considered as a candidate site. By all technical criteria, we found this site as acceptable as the Colorado Springs site.

DOD COMMENT NUMBER 11

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.

OUR EVALUATION

The $500 million we referred to was provided by the Project Management Office at Space Division as the estimate given to OMB in 1979. The $1.4 billion was the figure provided to us by DOD in 1981. We have no information, other than the DOD comment, explaining what "$1.2 billion through FOC" represents. As we mentioned in our report, cost estimates regarding the CSOC program changed so rapidly during our review that we could not rely on their accuracy. Therefore, we must regard the figures provided in this DOD comment as just another iteration of many changes.

We are aware that the Shuttle has completed two successful flights and that representatives of Space Division have been working very closely with NASA to define what will be needed in the Controlled Mode, and eventually, CSOC operations. As stated on page 5, the Air Force did not provide documentation to substantiate their comment that the CSOC facility design concept was 35-percent complete. We do believe that, since this is considered such a critical Military Construction Program funding criterion, the Air Force should provide the Congress with documentary evidence of that degree of completion. This should also include reasons why it is essential to move ahead before proper consideration is given to development of a true CSOC.

DOD COMMENT NUMBER 12

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.

OUR EVALUATION

Reference to DOD's Mission Model with a Shuttle flight rate of 12 to 14 missions annually must be predicated on the existence of a substantial Shuttle fleet. This appears very optimistic, and our remarks concerning Shuttle availability in connection with DOD comment number 2 on page 9 also apply here. We are aware that the Air Force is purchasing additional Expendable Launch Vehicles which may indicate a cautious optimism on their part.

ENCLOSURE I

The Mission Element Need Statements we found in our review were for the Satellite Operations Complex and the Shuttle Operations and Planning Complex, separately defined. We found no specific CSOC Mission Element Need Statement. Again, the Air Force planning chart mentioned on page 13 of our evaluation indicates that the current level of Air Force planning is not sufficient to support full construction of a CSOC. The final operator of CSOC has not yet been identified. We maintain that it is the responsibility of DOD, as stated in the National Aeronautics and Space Act of 1958, to take a strong and decisive leadership position. We still believe that DOD should designate one executive agency for all military space operations.

DOD COMMENT NUMBER 13

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.

OUR EVALUATION

We included this as part of our Detailed Chronology of CSOC Site Selection Process, appendix III, page 35 of the final report.

ENCLOSURE I

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
Deputy Under Secretary of
Defense (PR)
DSOC Member

MAR 27 1980

DEP SEC HAS SEEN

(954017)