Document II-26

[1]

Agreement Between the Department of Defense and the National Aeronautics and Space Administration Covering a Possible New Manned Earth Orbital Research and Development Project

Objective

It is the purpose of this agreement to ensure that in the national interest complete coordination is achieved between the National Aeronautics and Space Administration and the Department of Defense in approaching a possible new project in the area of manned earth orbital research and development vehicles.

Basic Considerations

The National Space Program has now advanced to the point that further significant progress in the areas of scientific research, space exploration, basic space technology, and defense applications may well require the operation of a manned orbital research and development system involving spacecraft larger and more sophisticated than Gemini and Apollo. Such a system would be a major technical and financial undertaking. For this reason, and while recognizing that the National Aeronautics and Space Act of 1958 assigns to their respective Agencies separate and distinct responsibilities in the planning, directing, and conduct of aeronautical and space activities, the Secretary of Defense and the Administrator of the NASA agree that advanced exploratory studies and any follow-on actions in this area should be most carefully coordinated through the Aeronautics and Astronautics Coordinating Board (AACB), successor to the Civilian-Military Liaison Committee established by the Space Act. They further agree that in so far as practicable all foreseeable future requirements of both agencies in this area should be encompassed in a single project.

A system involving a manned earth orbital research and development vehicle capable of prolonged space flight would provide basic scientific and technological knowledge and basic design and operational criteria which would have across-the-board application to both military and civilian operational programs. Such a developmental system would be a mandatory forerunner of any long duration manned space operational system. Based upon present knowledge, it appears that the requirements of the DOD and the NASA, as well as of all other interested governmental agencies, can be met in a single national program. It is necessary that the NASA and the DOD take steps to ensure that their total effort is directed to this end.

Agreement

Pursuant to the foregoing, the Secretary of Defense and the Administrator of NASA agree to a common approach to this project through the steps set forth below. In the event that agreement is not reached on [2] any issue considered by either party adversely to involve the responsibilities of his Agency, the issue of disagreement will be jointly referred to the President for resolution.

a. The DOD and the NASA will continue advanced and exploratory studies in this area as considered necessary by the Secretary of Defense and the Administrator, NASA,

respectively, to develop data as to Agency requirements, possible design concepts, feasibility, and costs; these studies will be coordinated under the AACB in accordance with the procedures set forth in the attachment hereto.

b. The AACB will include the evaluation of various concepts from the standpoint of productiveness, feasibility, and estimated costs.

c. The Secretary of Defense and the Administrator, NASA, will then attempt to arrive at a joint recommendation as to whether to proceed with a new project in this area, evaluating the national need by comparing potential returns to returns which could be realized by an extension of current on-going projects.

d. If the recommendation under c., above, is affirmative, the DOD and the NASA will jointly formulate an agreed project description for submission to the President together with

e. A recommendation as to responsibility for the direction of the project based on predominant interest and consideration of other pertinent factors, such as management competence, relation to other programs in progress, and international political implications.

f. If and when a decision is made by the Administration to proceed with such a project, the appropriate timing determined, and responsibility for direction assigned, a joint DOD/NASA board will be established to formulate the specific objectives to be obtained by means of the project and to approve the experiments to be conducted.

g. Acting in accordance with the results of f., above, the Agency assigned responsibility for direction will prepare a definitive project plan for approval by the Administration and submission to Congress for funding.

h. On provision of the necessary funding, the project will be implemented under single management but with joint DOD/NASA participation and monitorship.

James E. Webb
Administrator, NASA
Aug. 17, 1963

Robert S, McNamara
Secretary of Defense

Attachment
Procedure for Coordination of
Advanced Exploratory Studies

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[1]

Procedure for Coordination of Advanced Exploratory Studies by the DOD and the NASA in the Area of Manned Earth Orbital Flight Under the Aegis of the Aeronautics and Astronautics Coordinating Board

(Attached to McNamara/Webb Agreement dated August 17, 1963)

1. As a general procedure, there will be the maximum practicable interchange of ideas and information at all levels within the two Agencies beginning early in the conceptual or planning stage of the advanced exploratory studies in this area.

2. Within fifteen (15) days after the signing of the Basic Agreement, each Agency will present to the Manned Space Flight Panel a list of studies which have been completed during the past three (3) years. Detailed information relating to these studies will be furnished to the non-sponsoring Agency on request.
3. Within fifteen (15) days after the signing of the Basic Agreement, each Agency will present to the Manned Space Flight Panel a status report concerning:
(a) All studies which are in progress under contract and in-house;
(b) All studies which already have been formalized in a Statement of Work but not yet approved; and
(c) All additional new studies under active consideration or development.
4. Within thirty (30) days after the signing of the Basic Agreement, the Panel will:
(a) Institute a review of the studies under category (a) above, and will effect such coordinating action as is deemed appropriate and practicable in the light of their ongoing status;
(b) Designate to the AACB those studies in categories (b) and (c) above which either Agency considers should be formally coordinated to incorporate requirements of both Agencies and to avoid unwarranted duplication.
5. Thereafter, the Panel will be kept informed of all new studies taken under active consideration or development by either Agency, and will promptly designate to the AACB any new study which either Agency considers should be formally coordinated as above.
[2] 6. In the case of each study designated to the AACB for coordination, the non-sponsoring Agency will, within fifteen (15) days of such designation, indicate in writing its concurrence in the study without change, its reasons for not concurring, or submit in writing a list of the requirements of the non-sponsoring Agency which are desired to be considered for incorporation in the study. If no comments are received within the fifteen (15) day limit, satisfactory coordination may be assumed.
7. Within thirty (30) days of the receipt of notification from the Panel of the designation of a study for coordination, the Co-Chairmen of the AACB will either:
(a) Certify in writing that satisfactory coordination has been accomplished, or
(b) Jointly submit to the Secretary of Defense and the Administrator, NASA, an explanation of any areas of disagreement arising out of the coordinating action. At that point, the sponsoring Agency may, if desired, proceed with the study.
8. In all of the foregoing steps, the responsibility for taking the initiative in the coordinating process will rest with the Agency sponsoring the study in question.

Document II-27

[1] 16 Sept. 1963
Honorable James E. Webb
Administrator
National Aeronautics and Space Administration
Washington 25, D.C.

Dear Jim:

Thank you for your correspondence of August 17, 1963, and your proposed agreement covering a possible new manned earth orbital research and development project. I appreciate your constructive and earnest efforts to develop a method which will insure a sound, coordinated approach to this potentially important national effort. I am fully

aware that, since we began our discussions on this matter, there have been many actions implemented which have already gone a long way toward improving the exchange of information between our agencies and the coordination of our study efforts. I concur in your proposed agreement in many respects and I feel that it is an excellent contribution to improved understanding and mutually useful effort of our agencies. I do, however, have certain reservations.

As I have expressed several times, my greatest current concern is to insure that advanced engineering studies are properly integrated and phased so that the requirements and design constraints of each agency can be really incorporated from the beginning. For this reason, and because of the potential scope and national importance of this program, I have continued to insist on the principle of concurrence of one agency in the proposed actions of the other vice simple coordination and possible subsequent unilateral action in the face of disagreement. As an example of the type of problem we are confronting, I refer to your proposed $3.5 million for contractor effort for the design of a Manned Orbital Research Laboratory (MORL). I believe that an effort of this magnitude is premature by eight months to a year since it will not be possible prior to that time for us to provide properly for the incorporation of Defense Department judgements [sic] and thoughts on military requirements into the design. You must realize that if ongoing DOD studies provide justifiable military objectives for a space station development, there may be the necessity for a significantly different design approach which will be responsive to both agency's needs.

[2] I further note that the proposed agreement does not define specifically the level of study effort required to qualify for interagency coordination [in] an "advanced exploratory study," although provision is made for the *coordination* of all such studies. I believe that an annual level of effort of $100,000 defines a reasonable threshold for initiating such action.

I concur in your view that the AACB is the proper medium for interagency coordination. I would observe, however, that while coordination has always been a prima facie AACB function, this has been accomplished in the past largely by other means, through other channels. I believe the AACB can serve as an effective coordinating body as long as proper attention continues to be accorded to the membership of the Board and its panels and the formulation and execution of meeting agendas, and as long as we both emphasize the resolution of issues at the Board level.

There remains, of course, the subject of recourse in the event that you and I cannot reach agreement on any issue referred to us. In the unlikely event that this should occur, I feel that, as a matter of practice, we should inform the Director of the Bureau of the Budget concerning the nature and extent of disagreement before initiating unilaterally any program actions which might later be subject to criticism in Congress or elsewhere.

Finally, I believe that at the present time it is not essential that we define the procedure for implementing the possible development program. It is inevitable that this procedure will be influenced by the nature and extent of each agency interest in such a program. Our final determinations of these procedures, therefore, may be somewhat different from what we now envisage.

I believe we have discussed this matter as much as is useful and that it is most important to insure continued harmonious accord between our agencies. Therefore, hoping you can accept my reservations as expressed in this letter, I have signed the agreement as you have prepared it. I believe that we can proceed constructively on the basis of this agreement and our mutual desire to formulate a recommended course of action in the best national interest.

Sincerely

Robert S. McNamara

Document II-28

Document title: John S. Foster, Jr., Director of Defense Research and Engineering, to Dr. Robert C. Seamans, Jr., NASA Associate Administrator, March 19, 1966, with attached: Robert Seamans, Jr., NASA Deputy Administrator, and John Foster, Jr., Director of Defense Research and Engineering, DOD, Memorandum of Agreement, "Establishment of a Manned Space Flight Experiments Board (MSFEB)," no date.

Source: Deputy Administrators Files, NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

This agreement established the principle of reciprocity and sharing of flight opportunities between NASA and the Department of Defense, and it applied to the Apollo and the Manned Orbiting Laboratory programs. When the Space Shuttle agreement was formulated, the agreement in this memorandum was not renewed. When the subject of human spaceflight experiments arose again in the mid-1980s, the approach taken in the earlier agreement was modified to fit with the shuttle management process and was handled by the Air Force.

[no pagination]

DIRECTOR OF DEFENSE RESEARCH
AND ENGINEERING
Washington 25, DC 20301

March 16, 1966

Dr. Robert C. Seamans, Jr.
Associate Administrator
National Aeronautics & Space Administration
Washington, DC 20546

Dear Bob:

In response to your letter of 1 March 1966, I have concurred in the NASA-DoD Memorandum of Agreement establishing the "Manned Space Flight Experiments Board (MSFEB)."

Based on discussions of our staff, and with the understanding that it would be acceptable to you, I have added to paragraph 6 of the Memorandum the following sentence:

"Similar technical advice will be made available from appropriate DoD agencies."

A copy of the revised Memorandum is attached.

Sincerely,
"Johnny"
John S. Foster, Jr.

Enclosure

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[1]

Memorandum of Agreement

Subject: Establishment of Manned Space Flight Experiments Board (MSFEB)

General Guidelines

This Memorandum of Agreement is implemented in order to provide a means of coordination of the DoD and NASA manned space flight experiments program. These experiments, of a scientific, technological, or non-military operational nature, will be carried as a secondary objective on a space-available basis on selected DoD flight missions and as primary or secondary objectives on NASA flight missions.

It is anticipated that experiments will be submitted from a variety of sources to both DoD and NASA where they will be reviewed and, if approved, submitted to a joint experiments review board whose functions are defined in this agreement. In general, those experiments which are related primarily to basic space science, technology, and applications will be assigned to NASA programs. Similarly, those experiments which are peculiar to or primarily associated with the development of weapons systems, military operations, or the defense of the United States would normally be assigned to DoD programs, whenever possible. This is not to preclude, however, the assignment of any experiment to a program of either Agency when this appears desirable on the basis of economy, timeliness, or other considerations of national interest.

[2] 1. *PURPOSE*

This agreement established a Manned Space Flight Experiments Board (MSFEB) to coordinate experiment programs which will be conducted on DoD and NASA manned space flights.

2. *AUTHORITY*

The MSFEB is advisory to the Associate Administrator for Manned Space Flight, NASA, and the Deputy Director for Strategic & Space Systems, DoD.

3. *FUNCTIONS*

The MSFEB will have the following functions:

a. Recommend the approval or disapproval of experiments to be conducted under DoD and NASA Manned Space Flight Programs.

b. Recommend assignment of experiments to specific flight programs.

c. Recommend relative priorities of experiments to be implemented, and periodically review the numbers of experiments scheduled for specific missions.

d. Review the status of approved experiments.

As used herein, "experiment" means an investigation which is not essential to the primary mission, launching, navigation, or recovery of the space vehicle or the spacecraft. Experiments normally will be under three general classifications: scientific, applications, and technological or non-military operational. MSFEB recommendations will be based on analyses which show that it will be operationally and technically feasible to conduct the experiment, and that the basic experimental objectives of the investigation can be satisfied within the framework of the primary mission objectives of the program to which the experiment is assigned.

[3] 4. *MEMBERSHIP*

The following personnel will serve as members and alternate members of the MSFEB:

Members	*Alternates*
Dr. Homer E. Newell Associate Administrator for Space Science & Applications, NASA	Mr. Edgar M. Cortright Deputy Associate Administrator for Space Science & Applications, NASA
Dr. Mac C. Adams Associate Administrator for Advanced Research & Technology, NASA	Dr. Alfred J. Eggers, Jr. Deputy Associate Administrator for Advanced Research & Technology, NASA
Dr. George E. Mueller Associate Administrator for Manned Space Flight, NASA	Mr. James C. Elms Deputy Associate Administrator for Manned Space Flight, NASA
Mr. Daniel J. Fink Deputy Director for Strategic & Space Systems, DOD	Mr. John E. Kirk Assistant Director for Space Technology, DOD
Gen. Bernard A. Schriever Commander of the Air Force Systems Command, USAF	Brig. Gen. Harry L. Evans Vice Director, MOL Program Office of the Secretary of the Air Force

5. *CHAIRMANSHIP AND VOTING PROCEDURES*

The Associate Administrator for Manned Space Flight, NASA, will act as Chairman. In his absence the DOD member will act as Chairman.

MSFEB recommendations will not be based on majority and minority voting. Where recommendations are not unanimous, the views of all members will be recorded.

6. *STAFF SUPPORT*

A technical advisor to the Board will be appointed from the staff of the Associate Administrator for Manned Space Flight to provide an independent source of advice to the Board on the feasibility and technical merit of proposed experiments submitted for Board approval, and on such other matters as the Board may deem desirable. Similar technical advice will be made available from appropriate DoD agencies.

[4] A member of the staff of the Associate Administrator for Manned Space Flight will serve as Executive Secretary to the Board and will be responsible for the management of the Board operations and maintenance of records. Additional support will be provided to the Board, as required, by the Director, Advanced Manned Missions Program.

7. *SUBMISSION OF EXPERIMENTS*

Experiments will be reviewed within the sponsoring NASA or DOD Program Offices for scientific and technical merit prior to their submission to the MSFEB Secretariat for consideration by the Board. This review should include a recommendation of the priority of an experiment relative to others submitted by the sponsoring office.

8. *COORDINATION*

It is the responsibility of the sponsoring office to accomplish appropriate coordination of experiment proposals within its program. The Executive Secretary, MSFEB, in

conjunction with his coordination duties for the NASA Advanced Manned Missions Program, will effect overall coordination of experiments among the NASA Program Offices and a designated point of contact in DOD prior to placing them on the agenda for MSFEB consideration.

9. *GENERAL*

The Executive Secretary, MSFEB, will document the recommendations of the MSFEB for presentation to the Associate Administrator for Manned Space Flight, NASA, and to the Deputy Director for Strategic & Space Systems, DOD.

Robert C. Seamans, Jr.
Deputy Administrator, NASA

John Foster, Jr.
Director of Defense Research & Engineering, DOD

Document II-29

Document title: Thomas O. Paine, NASA Administrator, to Honorable Robert C. Seamans, Secretary of the Air Force, April 4, 1969, with attached: "Terms of Reference for Joint DOD/NASA Study of Space Transportation Systems."

Source: Administrators Files, NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

President-elect Richard Nixon appointed a Space Task Group, chaired by Vice President-elect Spiro Agnew, to oversee American space policy. At a March 22, 1969, Space Task Group meeting, the membership discussed joint development of a Space Transportation System (STS). Less than two weeks later, on April 4, NASA Administrator Paine formally invited Secretary of the Air Force Seamans to study jointly the possibility of building a national STS.

[no pagination] April 4, 1969

Honorable Robert C. Seamans
Secretary of the Air Force
Department of Defense
Washington, DC 20301

Dear Dr. Seamans:

Enclosed is a draft of Terms of Reference for a joint DoD/NASA study of space transportation systems. I understand this draft has been coordinated between our staffs, and I have signed it. Upon notification of your approval and signature, we are prepared to proceed immediately to implement the terms of the study.

Sincerely yours,

T.O. Paine
Administrator

Enclosure

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[1]

Terms of Reference for Joint DoD/NASA Study of Space Transportation Systems

OBJECTIVE:

The objective of the joint DoD/NASA study of Space Transportation Systems is to assess the practicality of a common system to meet the needs of both the DoD and the NASA. Emphasis will be placed on the economic sensibility and technical feasibility of such a system.

BACKGROUND:

The need for a joint DoD/NASA group to study space transportation was discussed at the Space Task Group meeting of March 22, 1969. The Space Task Group was established by the President to recommend by September 1, 1969, a National Space Program for the post-Apollo period. It is expected that submissions by each participating agency will occur in June or July 1969. The joint DoD/NASA Study Group should provide timely results for these submissions.

FUNCTIONS:

The study shall be accomplished in two parts, the first part to be done separately by the two agencies, DoD and NASA, and the second part to be done jointly.

1. The first part of the study shall proceed as follows:
   (a) Each agency, DoD and NASA, shall study its own [2] needs, present and future, for a new space transportation system.
   (b) On the basis of its own needs, each agency shall make a preliminary determination of the characteristics of the transportation system that would best meet its needs.
2. The second part of the study shall be done jointly and shall proceed as follows:
   (a) The Joint Study Group shall assemble and correlate the needs of both agencies for a space transportation system.
   (b) The Joint Study Group shall assess the technical feasibility of various systems to meet the needs of both agencies.
   (c) The Joint Study Group shall compare the relative costs and assess the economic sensibility of systems meeting the needs of both agencies.
   (d) The Joint Study Group shall recommend a preferred concept and, if appropriate, alternative concepts of a space transportation system and provide the supporting rationale for each concept.

RESULTS:

A report shall be provided to the President's Space Task Group on June 15, 1969.

APPROACH:

The Staff Directors of DoD and NASA serving the Space Task [3] Group shall each designate a co-chairman for the Joint Study Group. Theses [sic] co-chairmen shall appoint members from each agency to form the group. The Staff Directors shall be responsible for providing a report to the Space Task Group on June 15, 1969.

APPROVAL:

Dr. Robert C. Seamans
Secretary of the Air Force

Dr. Thomas O. Paine
Administrator, NASA

Document II-30

Document title: George M. Low, NASA Deputy Administrator, Memorandum for the Record, "Space Shuttle Discussions with Secretary Seamans," January 28, 1970.

Source: Deputy Administrators Files, NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

By early 1970, NASA had recognized that Department of Defense (DOD) support would likely be essential if White House approval for the Space Shuttle program were ever to be obtained. In this memorandum, NASA Deputy Administrator George Low records an early policy-level discussion with Secretary of the Air Force Robert Seamans and Assistant Secretary for Research and Development Grant Hansen on NASA-DOD cooperation in shuttle planning.

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[1] Jan. 28, 1970

Memorandum for the Record

SUBJECT: Space Shuttle Discussions with Secretary Seamans

On January 27, 1970, I met with Bob Seamans to discuss the Phase B shuttle effort, shuttle classification, and the proposed DoD/NASA agreement on the Space Shuttle.

I informed Bob of our plans to move out with a Phase B effort in the near future and told him of our general Phase B plans. I mentioned that, to my knowledge, the Air Force was in basic agreement with these plans except possibly on the questions of gross weight versus payload weight and cross-range requirements. I explained the reasons for going with a 3 1/2 million-pound gross weight and pointed out that the studies could be redirected at mid-point if this was the wrong weight. I also pointed out that the cross-range question would be handled by having two point designs, one with low cross-range and the second with high cross-range. Seamans agreed that the basic objective of the shuttle program should be to develop a low-cost transportation system and that requirements, such as cross-range, go-around capability, etc., must be tested in the light of this objective. Although he made no specific commitment, I believe that he has no significant objections to the points that I made. Grant Hansen was also present and raised a question concerning the use of gross weight instead of payload weight. However, he voiced no strong objections to our approach. A letter from Paine to Seamans on this subject was given to Seamans.

On the subject of classification, there was agreement that the Space Shuttle program should be conducted on a generally unclassified basis. The justification for specific DoD performance requirements can, of course, be presented internal to the government on a classified basis, but the resulting Space Shuttle system should be unclassified in the same sense that the Apollo Program was unclassified. Seamans agreed to these points and fully recognized the international flavor of the program.

[2] I left copies of the proposed NASA/DoD agreement on the Space Shuttle. . . . Bob Seamans pointed out that the Air Force had no money to spend on shuttle development this year, but nevertheless was very much interested in developing the shuttle as a national capability. He strongly urged the establishment of a co-chaired board for DoD requirements. Although he did not have time to read the agreement while I was there, I read

pertinent excerpts to him and received a favorable response. I would expect that the Air Force will sign the agreement in short order.

In response to a direct question, Bob Seamans pointed out that the Air Force was indeed an agent for the DoD on the Space Shuttle program and that he had discussed this with both Secretary Laird and John Foster.

Following the discussions on the Space Shuttle, we talked about aeronautics, with Seamans emphasizing the need to move forward on an aeronautics program. Al Eggers [Dr. Alfred J. Eggers, Jr., special assistant to the Administrator] had, earlier in the day, discussed with him our dealings with [the Department of Transportation (DOT)] on the VTOL/STOL [vertical takeoff and landing/short takeoff and landing] aircraft program. Seamans indicated that the Air Force would like to participate in this effort as a third party, with the principal effort coming from NASA and DOT.

We also discussed the DoD/NASA funding picture, and Seamans pointed out that Secretary Laird is most interested in getting NASA to "pay its own way." He felt that Tom Paine should have lunch with Secretary Laird in the near future to discuss this in more detail. We agreed that the immediate problem is that of ETR [Eastern Test Range] and KSC and that some joint study in this area may be called for. At the present time the Air Force is conducting its own study on whether or not it should maintain a capability at ETR.

Bob Seamans' last point concerned the direction of NASA programs. He mentioned that, in the 1960's, NASA was fully supported because of the competition with Soviet Russia. This type of support should not be expected in the 1970's. NASA should therefore help solve the problems of the natural environment and thereby help pay for itself.

George M. Low
Deputy Administrator

Document II-31

Document title: Thomas O. Paine, NASA Administrator, and Robert C. Seamans, Jr., Secretary of the Air Force, "Agreement Between the National Aeronautics and Space Administration and the Department of the Air Force Concerning the Space Transportation System," NMI 1052.130, Attachment A, February 17, 1970.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

During 1969, it became clear that there was great interest within the Department of Defense (DOD) as well as NASA with respect to a reusable space launch system. Reflecting this, a joint NASA-Air Force (USAF) Space Transportation System Committee was formally created on February 17, 1970, and was given primacy among all joint activities pertaining to the Space Transportation System. Important concepts established in the agreement included the unclassified nature of the program, the possibility of international cooperation, and equal participation of NASA and DOD in shuttle development, in terms of both investment and operations. This equality of investment was later used as the basis for subsequent shuttle pricing agreements.

[1]

Agreement Between the National Aeronautics and Space Administration and the Department of the Air Force Concerning the Space Transportation System

This document establishes an agreement between NASA and the Department of the Air Force, acting as the agent of DoD, to insure that the proposed National Space Transportation System will be of maximum utility to both NASA and the DoD.

I. Objective of the Space Transportation System

The objective of the Space Transportation System (STS) is to provide the United States with an economical capability for delivering payloads of men, equipment, supplies, and other spacecraft to and from space by reducing operating costs an order of magnitude below those of present systems.

The program may involve international participation and use. The development of the STS will be managed by NASA. The project will be generally unclassified. For purposes of this agreement, the STS will consist of the earth-to-orbit Space Shuttle.

II. NASA/USAF STS Committee

A. Organization

In order that the STS be designed and developed to fulfill the objectives of both the NASA and the DoD in a manner [2] that best serves the national interest, a NASA/USAF STS Committee is hereby established that will report jointly to the Administrator of the NASA and the Secretary of the Air Force. The Committee will consist of eight members, four to be appointed by the Administrator of the NASA and four to be appointed by the Secretary of the Air Force. The Co-Chairmen of the Committee will be the Associate Administrator for Manned Space Flight (NASA) and the Assistant Secretary for Research and Development (Air Force). Any proposal for changing the composition or functions of the Committee will be referred to the NASA Administrator and the Air Force Secretary for their joint consideration.

B. Function

The Committee will conduct a continuing review of the STS Program and will recommend steps to achieve the objectives of a system that meets DoD and NASA requirements. Specifically, the Committee will review and make recommendations to the Administrator of NASA and to the Secretary of the Air Force on the establishment and assessment of program objectives, operational applications, and development plans. This will [3] include, but not be limited to: Development and operational aspects, technology status and needs, resource considerations, and interagency relationships.

THOMAS O. PAINE
Administrator, NASA
Date: Feb. 17, 1970

ROBERT C. SEAMANS, JR.
Secretary of the Air Force
Date: Feb. 17, 1970

Document II-32

Document title: William F. Moore, NASA STS Secretary, and Lt. Col. Donald L. Steelman, USAF STS Secretary, "Space Transportation System Committee: Summary of Activities for 1970," June 1971.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

The Space Transportation System (STS) Committee was established as the policy-level coordination forum between NASA and the Department of Defense (DOD) for developing the Space Shuttle. It drew its authority from the February 17, 1970, NASA-DOD agreement on the STS. It was through the forum of the STS Committee that DOD's requirements for the Space Shuttle were first transmitted to NASA; DOD indicated the conditions under which it would place exclusive reliance on the shuttle. This report summarizing the committee's first year activities, endorsed by the NASA and Air Force secretaries to the STS Committee, demonstrates the considerable groundwork that was laid during that time for the joint program. The acronyms MSC, MSFC, and KSC are NASA centers and stand for the Manned Space Center, the Marshall Space Flight Center, and the Kennedy Space Center, respectively. The acronym OSSA refers to NASA's Office of Space Science and Applications, and AFSC stands for the Air Force Space Center.

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[1]

Introduction

The NASA/USAF Space Transportation System Committee was formed for the purpose of providing a policy level interface between NASA and the USAF on the problems of developing the Space Shuttle. An agreement was formally signed on February 17, 1970 by Dr. Robert C. Seamans, Jr., Secretary of the Air Force, and Dr. Thomas O. Paine, Administrator, NASA. The agreement specified the objective of the Space Transportation System (STS), defined its limits, and established a committee to perform a continuing review of the program and recommend steps to achieve the objectives of the system that would meet the needs of both NASA and the DOD. The committee consists of eight members, four from each agency, and is co-chaired by the Associate Administrator for Manned Space Flight (NASA) and the Assistant Secretary for Research and Development (USAF). A copy of the agreement is attached to this summary.

The original members were:

USAF	
Mr. Grant L. Hansen	Co-Chairman
General Walter Hedrick	Member (HQ USAF)
General Raymond Gilbert	Member (AFSC)
General F. M. Rodgers	Member (AFSC)
NASA	
Mr. Dale D. Myers	Co-Chairman
Mr. Vincent Johnson	Member (OSSA)
Mr. Lee James	Member (MSFC)
Dr. Chris Kraft, Jr.	Member (MSC)

By separate correspondence the Secretary of the Air Force and the Acting Administrator of NASA invited the Executive Secretary of the National Aeronautics and Space Council [NASC] to participate on the committee as an official observer. During the year the membership has changed in the Air Force representation and provision was made for specific alternates to attend when the principal was unable to make a called meeting.

[2] The current membership and alternates are:

USAF
Mr. Grant IL. Hansen—Co-Chairman
Alternate—Mr. Frank Ross
MGen Paul Cooper—Member (AFSC)
Alternate—Col Paul Atkinson
BGen Kenneth Chapman—Member (AFSC)
Alternate—Col Ralph Ford
Col John Albert—Member (AF/RDS)
Alternate—Col Frank Knolle

Official Observer
Mr. William Anders—NASC
Alternate—M. Raymond Gilbert

NASA
Mr. Dale D. Myers—Co-Chairman
Alternate—Mr. Charles Mathews
Mr. Vincent Johnson—Member (OSSA)
Alternate—Dr. Robert Wilson
Mr. Lee James—Member (MSFC)
Alternate—Dr. William Lucas
Dr. Chris Kraft, Jr.—Member (MSC)
Alternate—Lt Gen (Ret) Frank Bogart

The following summary of the Space Transportation System Committee's activities covers the period from the initial meeting on May 28, 1970, through the sixth meeting on December 15, 1970.

[3]

USAF Personnel Participation in the Space Shuttle Program

One of the first questions at the initial meeting of the STS Committee was the extent to which the Air Force would participate in the Space Shuttle activities. The discussion focused on USAF personnel participation in the NASA program offices particularly at MSC and MSFC. SAMSO [Space and Missile Systems Organization] on an ad-hoc basis was already covering early integration meetings by travel assignments (TDY). NASA stressed that the activities were beginning to accelerate and that a more permanent arrangement would be welcome if the Air Force wanted to participate actively. It was emphasized that very close coordination between NASA and the Air Force at the center level was critical to the Phase B definition effort and that this was the most effective way to facilitate the

exchange of technical data and program activity status. NASA preferred direct involvement (or detailing) of Air Force personnel in the program activity, but that as a minimum, immediate liaison was recommended.

At the second meeting of the STS Committee in June 1970, NASA presented its plan based on non-reimbursable assignment of USAF officers to NASA Centers and Headquarters. The plan requested five officers each for Headquarters and MSFC, ten officers for MSC and two officers for KSC during the Phase B activity. When Phases C and D were begun the Air Force could augment these assignments with additional officers as the need arose. The USAF accepted the plan for further study and stated that ten qualified officers would be assigned to SAMSO with five placed at MSFC and five on duty at MSC to participate in the Phase D activity. They expected to have the officers on site by fall. In the meantime SAMSO would continue covering the two centers by TDY until the assignments were executed. No assignments were made to KSC but [the] Air Force agreed to reappraise its manpower situation and report to the Committee in 90 days. They would also investigate the possibility of establishing a point of contact in the 6555th Aerospace Test Wing at Patrick AFB to coordinate activities with KSC.

At the sixth meeting in December the Air Force reported that the two officers requested for KSC would be assigned to SAMSO with duty at KSC and that they should be on board by July 1971.

[4] As a result of these actions, the following officers are currently participating in the Space Shuttle activities at the two Centers.

MSFC	*MSC*
LCol Thomas Moore	Maj Patrick Crotty
Maj James A. Feibleman	Maj Gary H. Minar
Capt Byron Thurer	Maj Charles T. Essmeier

Implementation of Phase B Space Shuttle Management Plan

NASA reported to the STS Committee at the first meeting its management plan for implementing the Phase a definition studies. The organization chart attached shows the relationship of the three Manned Space Flight Centers (MSFC, MSC and KSC) to each other and to the Headquarters Space Shuttle Office. Also shown were the Phase B contractor management assignments to the centers and the Vehicle System Integration Activity (VSIA) function between MSC and MSFC with Headquarters participation.

Main points relative to the management of Phase efforts were the assignment of the North American Rockwell vehicle contract to MSC and the McDonnell Douglas vehicle contract to MSFC. Houston would have the overall orbiter technical responsibility for both contractors and Huntsville would have the overall booster technical responsibility for both contractors. The three Phase B engine contracts with Pratt and Whitney, Aerojet and Rocketdyne are being managed by MSFC. KSC has representatives in both center program offices and participates in the integration activity. Program integration activity takes place on a regular basis and includes representation from the Air Force (SAMSO).

Space Shuttle Facilities Planning

A briefing on the Master Facilities Planning Study was presented to the STS Committee at its first meeting. Basically the NASA Facilities Office is managing a $380K study by the Ralph M. Parsons Co. The study is to survey the candidate facilities as to their

adequacy to support the Space Shuttle [5] Program and the costs of modifications or new construction required to meet criteria established as necessary for the launch, recovery and refurbishment of the Space Shuttle. The twelve month study is to culminate in a report to NASA setting forth the plan having the most favorable overall features as measured against the "ideal facilities matrix."

The Committee was concerned as to how this study was tied into the facilities activity of AACB [Aeronautics and Astronautics Coordinating Board], but was assured that close personnel liaison and information exchange would prevent any duplication of effort. It was stated that the AACB effort is an across-the-board national facility activity whereas the Parsons study is specifically oriented toward Space Shuttle requirements. It was also pointed out that the Air Force had personnel participating in the Space Shuttle Facilities Planning Group and therefore would be kept fully aware of the progress of the study.

As a part of the discussion the question of industrial funding was raised by NASA, in particular, as it relates to the use of AEDC [Arnold Engineering Development Center] test facilities at Tullahoma and the Rocket Propulsion Laboratory Test Stand I-56 at Haystack Butte. The present policy of DOD requires user funding for such facilities and the Air Force did not have FY 71 funds available to support shuttle testing at AEDC. An alternative would be to reprogram funds within the DOD to support Space Shuttle testing. However, military priorities for project funding precluded this. Therefore, any Phase B Space Shuttle testing at AEDC facilities would have to be on a cost reimbursable basis in accordance with the DOD policy.

Space Tug or Orbit-to-Orbit Shuttle

A discussion of the expected similarities and differences between the DOD and NASA requirements for the space tug or orbit-to-orbit shuttle (OOS) was presented to the STS Committee by NASA at the first meeting. The main point emphasized was that a single design may be possible, but that further conceptual study and definition of mission requirements were needed.

NASA informed the Committee that it was proceeding with a pre-Phase A study of the space tug which it hoped would define its requirements. The Air Force reports that it also was planning to conduct a concept and requirements analysis for the OOS. The Committee felt that the two studies would be [6] complementary.

The Air Force Co-Chairman indicated that it might be appropriate for the development of the OOS to be undertaken by the Air Force. The NASA Co-Chairman stated that they would like the Air Force to consider that approach. Also the NASA Co-Chairman reported that the European Launcher Development Organization (ELDO) had contracted with two groups of foreign contractors for a pre-Phase A study to determine the feasibility and derive a simple definition for a space tug design. The costs of the contracts are approximately $500K. The STS Committee agreed that ELDO should be encouraged to continue in their space efforts.

At the sixth meeting in December 1970, NASA briefed the Committee on the ELDO tug studies and the NASA pre-Phase A Space Tug studies. The various configurations being studied by ELDO were discussed and the observation was made that nothing different from U.S. findings on the space tug had emerged. NASA concluded their presentation on the pre-Phase A studies briefing with the following list of findings:

a. Reusable tug synchronous mission performance is extremely sensitive to mass fraction.

b. Ground based tugs will not be recovered for most synchronous missions.

c. Synchronous payload recovery will require tug staging or orbital propellant loading.

d. Moderate increase in shuttle payload capability (above the 25K reference payload) will not affect general conclusions or tug utilization for synchronous missions.

e. Current upper stages may serve as effective interim expendable tugs for synchronous missions.

f. Shuttle economic model should assume no synchronous tug or payload recovery—at least for [the] early operational years.

The NASA Co-Chairman stressed that in the tug studies we want to make sure that the payload and Space Shuttle interface is minimized in order to keep the system complexity and cost down. NASA also covered the expendable stages for use with the Space Shuttle in lieu of an OOS or space tug. This included the current state of "kick" stages such as Agena, [7] Centaur, Burner II, and the Titan Transtage as well as the potential modified Agena and modified Centaur stages all of which could serve as interim tugs.

The Air Force gave a status report on the DOD orbit-to-orbit shuttle and expendable stage study efforts. In FY 71 the DOD effort has involved both contractor and in-house activity to define an OOS that would meet unique DOD requirements. Contracts for conceptual designs of a reusable OOS were let with two contractors in February 1971. This effort is directed toward meeting DOD needs with an assessment being made to see if [the] vehicle couldn't meet the needs of both agencies with a minimum of modification. The Air Force also was specifying that deployment/retrieval considerations for the earth orbital shuttle/orbit-to-orbit shuttle (EOS/OOS) and payload interfaces be examined. Engine design studies to define a light weight, high performance propulsion system for potential use in a high energy upper stage/OOS were being conducted at the same time.

General Security Guide

The development of a general security guide for the Space Shuttle program was assigned to both NASA and the USAF at the first meeting in May 1970 of the Space Transportation System Committee. A draft of the security guidelines was presented to the Committee for review and comment at the second meeting. It was requested that the guidelines for their comments and a report be made to the Committee at a later date. The Committee also suggested that the draft be as short as possible. A condensed version was submitted at the third meeting for consideration and coordination.

Comments were incorporated and the general security guidelines were accepted by the Committee at the fourth meeting in October 1970. The Co-Chairmen instructed the Secretariat to prepare the document for their signature. The guidelines were signed on November 19, 1970 and distributed through channels to all elements participating in the Space Shuttle Program.

[8]

Space Shuttle Payload Size

The Air Force briefed the STS Committee on DOD payload size and weight requirements at the second meeting in June 1970.

Payload physical size has a definite influence on development and operational costs; however, in order to make the decision, mission utility to both NASA and the DOD must be considered in the analysis as well. From the baseline the size and weight of future payloads was projected for missions to be flown eight to ten years hence when the shuttle would be operational. Also the growth history of launch vehicle payload capabilities and the length of payload fairings were shown as indicators of the need to plan for the accommodation large payload mission requirements that would utilize [a] 60 foot by 15 foot

cargo bay and carry an equivalent payload weight of 40,000 pounds to low earth polar orbit.

The diameters of current launch vehicles restrict their payload diameters which in turn causes design complications and the attendant high costs for packaging and reliability. Furthermore, analysis of available data shows that the pressing need for improved capability and mission use demands larger diameters and greater payload weight capabilities. Increased lifetime, power and minimum design cost are additional parameters for consideration.

Based on required improvements to the present systems, mission needs and payload growths predicted for the 1980's an equivalent payload weight capability of 40,000 to 53,000 pounds is required to low earth polar orbit; 40,000 to 50,000 pounds is required to low earth polar orbit. A 60 foot cargo bay length is necessary for current and projected missions and a 15 foot diameter is needed for high energy missions if the 60 foot length is not to be exceeded.

It was pointed out that studies [have] shown a Space Shuttle with a 40,000 to 50,000 pound capability coupled with sufficient payload volume (the baseline requirement) is the most economical size for DOD and national mission projections. NASA studies were in agreement and also indicated that the larger vehicle was more economical from a total dollar standpoint but there was the problem of securing the annual funding levels required for this type [of] development.

[9] The Air Force emphasized that if a shuttle of reduced payload capability was developed then NASA could expect the Air Force to retain an inventory of expendable launch vehicles to satisfy their mission needs and this would cause the shuttle to lose some of its economic attractiveness and probably degrade the utility of the shuttle. It was also noted that DOD has not been considering any upgrading of its current stable of expendables because it is intended that the shuttle, if properly sized and with the proper capability, would replace them.

NASA suggested that cost tradeoff studies for retaining a limited expendable launch vehicle capability and developing a smaller Space Shuttle versus the development of a large Space Shuttle should be considered. This suggestion was accepted and a report was requested for the next meeting.

At the fourth meeting the Committee was informed by NASA that the 60 foot by 15 foot cargo bay should be retained and that the 25,000 pound payload to reference orbit (55° x 270 nm) with air-breathing engines in [it] could be increased to 40,000 pounds to low earth polar orbit by removing the air-breathing engines. The USAF emphasized that operational and safety considerations must be analyzed before such a proposal would be accepted. NASA indicates that the airbreathers would be retained for all development/test flights and also for the early operational flights.

International Participation

At the second meeting of the STS Committee, the Office of International Affairs discussed the possibility of foreign industry and governments participating in the Space Shuttle Program. This would require a technology exchange between the parties involved. The STS Committee received a request from the Chairman, Interagency Ad Hoc Group on NSDM 72 for assistance in establishing procedures for the exchange of technical data with those nations desiring to participate in the development program. The Air Force indicated they had been studying this and therefore was assigned the task of drafting a technology sensitivity guidelines document for review by the Committee.

While the sensitivity guidelines document was being coordinated in both the DOD and NASA, the Phase A and B contractors were advised by NASA to control foreign representatives [10] within the contractor's system on the same basis as any foreign visitor. At the fifth meeting the STS Committee learned that the Grumman agreement with Dornier of West Germany and the North American Rockwell (NAR) agreement with Messerschmidt, Boelkow and Blohm (MBB) and British Aircraft Company (BAC) had been approved in two phases. The first phase provides for transfer of general data and the second phase provides for the transfer of more specific data after the U.S. contractors and their foreign participants have defined the areas of interest and government-to-government agreements have been approved.

The STS Committee requested copies of the coordinated sensitivity document be supplied to each member at the sixth meeting with comments to be forwarded to the Secretariat by December 28, 1970. The STS Committee also decided that the sensitivity document, when approved, would be subject to semi-annual reviews. (The document was subsequently approved and forwarded to the NASA Office of International Affairs—Code I).

Other Government Agency/Other Military Service Space Shuttle Mission Requirements

NASA was requested by the STS Committee to check with other civilian agencies and the Air Force was requested to check with other military services for all possible mission requirements that might be factored into the Space Shuttle mission model being formulated for the Phase B study contractors. NASA reported at the third meeting that mission requirements from other government agencies are coordinated by the Meteorological Satellite Program Review Board and provided to NASA planners when these requirements are firm. The Air Force reported that Army and Navy mission requirements have been validated and are reflected in the extended DOD mission and traffic models provided to NASA on 4 June 1970. These models cover projected missions and traffic through 1990. The Air Force will keep the model data current by updating or revising when necessary.

[11]

Early Flight Payload Identification

NASA informed the Air Force at the third STS Committee meeting that they were attempting to identify meaningful specific payloads that could be candidates for the early orbital shuttle flights. Primary emphasis was being placed on identifying payloads for low altitude missions, particularly those which would not require high energy stages. Payloads for high energy missions [that] would require additional propulsive stages would also be identified but in a separate category. It was suggested that the Air Force also identify a number of specific payloads that could be candidates for early flights.

At the fourth meeting the STS Committee was briefed on the results of a joint NASA/USAF-SAMSO study leading to the selection of specific payloads that could be carried on early shuttle flights. The STS Committee requested that USAF and NASA field installations be provided copies of the study for review and comment. Guidance for the review was given by USAF (Hdqtrs) and [the NASA Office of Manned Space Flight].

A briefing on the in-depth review of the first ten Space Shuttle missions was presented in December at the sixth meeting of the STS Committee. The NASA portion of the briefing provided data on the constraints that must be placed upon the early payloads and the capabilities that the crew and orbiter will have on the first few flights. With these limitations in mind, several prospective payloads were discussed but no hard schedule was

proposed nor desired. The USAF portion was classified and provided alternate payloads to those first proposed in the original package. They stressed that the Air Force data was for planning purposes and as such could change as mission requirements changed during the next eight years of shuttle development.

The STS Committee decided that NASA and the USAF should continue the study since it had proven a good mechanism for learning about some of the expected operational and interface problems.

[12]

Phase B Cost/Design Performance Management Plan

NASA presented its Cost/Design Performance Management Plan which was implemented during Phase B at the third meeting of the STS Committee in August 1970. The plan resulted from the need to assure NASA that they could afford to build the Space Shuttle and that the contractors were aware of the limitations of the NASA projected budget. By establishing objectives early in the program, NASA hoped to give the contractors "bogeys" which they could use in their definition studies and that the studies would produce a realistic program that NASA and the nation could afford.

These cost objectives or "bogeys" are in fact specific cost estimates established as a target or baseline reference to accomplish the specific goal. The bogeys which the Phase C vehicle contractors are using now related primarily to that portion of the Space Shuttle program for which they are responsible. It is important to realize that other cost elements such as main engines, facilities, special test handling equipment, etc., will have to be taken into account in addition to the vehicle contractor cost in order to arrive at a total Space Shuttle program cost. Cost objectives for these other elements of the program have been set and will be used at the appropriate time in the phased program plan.

The fundamental principal of the cost objective plan is to provide working cost targets as a cost reference in the design selection process during the Phase B definite effort. Cost thus becomes a major design criteria in the same sense as performance. The high cost elements and influence will be identified and consideration can be given to alternate design approaches or a modification of the requirements if necessary, e.g., the decision to make GLOW [gross liftoff weight] a tradeoff variable and baseline the payload weight as a means of lowering costs and simplifying design.

The necessity to stay within the cost objective can then be an incentive to find and adopt new ways of doing business including subsystems tradeoff. This method thus becomes the shared responsibility of both the government and the contracts to keep costs as low as possible while at the same time maintaining the high quality and reliability that have been a hallmark of the space program to date.

[13]

Crossrange Requirements

Operational requirements of the DOD and refinement of NASA studies have resulted in the crossrange of the Space Shuttle being baselined at 1100 nm.

In a classified briefing at the fourth meeting of the STS Committee the Air Force pointed out that the military need for a high crossrange is based on DOD dedicated missions requiring a fast response in the event of a national crisis, a quick return from orbit, [or] abort to orbit[,] and return to a high crossrange, the order of 1100 nm, is necessary to provide the operational flexibility required by these types of mission.

One way of achieving this requirement is to trade payload weight for the added Thermal Protection System (TPS) weight which will protect the vehicle in the hypersonic maneuvers that produce the desired crossrange. A study to determine the merit of such a trade was initiated by the Air Force. At the sixth STS meeting the Air Force gave a classified briefing covering the preliminary findings of the study.

Of the DOD applications, the near polar missions were shown as the ones requiring the 1100 nm crossrange if the orbiter is to return to the launch site after once around. This high crossrange requirement could be reduced if alternate landing sites were used. However, the orbiter would have to be ferried from the alternate recovery site to the launch site for refurbishment prior to its next launch. Use of alternate sites then would require additional handling and servicing equipment. Since the orbiter ferry range is limited to about 700 nm, either in-flight refueling or several flight legs night be required depending on the location of the alternate site.

About 30% of the DOD missions require the orbiter to carry an equivalent payload weight of about 40,000 pounds to low entry orbit and still have a high crossrange capability. This equivalent payload weight does not include the propellant weight of 11,000 pounds required for abort to orbit using the then currently baselined engine size. (Engine size has subsequently been increased to 550,000 pounds of thrust at sea level.)

The briefing concluded that, for some DOD missions, high crossrange requirements are coincident with heavy payloads. Therefore, unless alternate recovery sites and ferrying [14] capabilities are shown to be operationally attractive, the shuttle orbiter must have both the 1100 nm crossrange capability and the ability to deliver 40,000 pounds to low earth polar orbit. This capability will enable the Space Shuttle to capture the type of mission discussed above.

Air Force Phase B Study Tasks

The Air Force briefed the Committee on their FY 71 STS study tasks at the third meeting. Their primary emphasis was a study effort to identify the functions and operating modes peculiar to the support of DOD missions. Contract tasks were proposed as add-on effort to the two NASA Phase B vehicle contracts. This would provide an assessment of NASA Phase B candidate Space Shuttle system capabilities to support missions unique to DOD.

The contractors would perform tradeoff studies and cost analysis to determine the impact of specific DOD needs on baseline system design and operations and to determine the modifications necessary to the baseline configuration in order to capture the DOD missions. The Air Force assured NASA that this study effort would identify those DOD missions that the current NASA baseline configuration would satisfy. It was emphasized that contractor teams supporting the DOD study effort would be identifiable and separate from the teams performing work under the NASA Phase B contract. The contracting alternatives were discussed and the STS Committee recommended that the NASA Phase B Space Shuttle contracts be amended to accomplish the specified Air Force tasks. Also recommended was a management approach which assured the close integration of the SAMSO and NASA study efforts. NASA agreed with this approach and felt that the addition of the two $300K tasks would contribute significantly to the Phase B effort.

Document II-33

Document title: John S. Foster, Jr., Director of Defense Research and Engineering, to Dr. James C. Fletcher, Administrator, NASA, April 13, 1972.

Source: Administrators Files, NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

Because a large number of military and national security payloads are placed into polar orbits and the launch sites at Cape Canaveral are unsuitable for this purpose, the military has launched satellites into high-inclination orbits from Vandenberg Air Force Base in California since February 1959. The use of Vandenberg as a shuttle launch and landing site was one of the primary drivers of shuttle design, determining cross-range requirements and abort modes. In April 1972, the Department of Defense officially concurred with the selection of both Kennedy Space Center and Vandenberg as launch and landing sites for the Space Shuttle.

[no pagination] 13 April 1972

Dr. James C. Fletcher
Administrator, National Aeronautics and Space Administration
Washington, D.C. 20546

Dear Dr. Fletcher:

This is to advise you that the Department of Defense concurs in the selection of the Kennedy Space Center (KSC), Florida, and Vandenberg Air Force Base, California, as launch and landing sites for the Space Shuttle, as follows:

1. The initial launch and landing site will be at KSC and be used for research and development launches and for all easterly operational launches feasible from KSC. General purpose shuttle facilities for all users will be provided by NASA at KSC on a time schedule compatible with the shuttle development program.

2. A second operational site for missions requiring high inclination launches not feasible from KSC is planned at Vandenberg Air Force Base toward the end of the 1970's. General purpose shuttle facilities for all users will be provided by the Department of Defense at Vandenberg AFB on a time schedule compatible with progress in the shuttle development program and timely utilization of the shuttle for operational missions requiring high inclination launches.

Sincerely,

John S. Foster, Jr.

Document II-34

Document title: George M. Low, NASA Deputy Administrator, to NASA Associate Administrator for Manned Space Flight, "Space Tug Decision," October 3, 1973.

Source: Deputy Administrators Files, NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

This memorandum from NASA Deputy Administrator George M. Low reflected NASA thinking regarding management of the space tug. Low's reasoning included Department of Defense (DOD) funding of part of the development costs of the overall Space Transportation System, so NASA could reduce its costs and peak funding requirements. Furthermore, Low considered it important that the Air Force get more involved in the shuttle's development. DOD had committed to use the shuttle conditionally, requesting further study of its performance and technology and demonstration of both its cost savings and operational status. Deeper involvement by the Air Force, it was assumed, would lead to its stronger commitment to the shuttle. Don Fuqua, mentioned in the memorandum, was a Florida congressman active on the House Committee on Science and Astronautics. Jim Wilson was a committee staff member.

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[1] October 3, 1973

Memorandum

TO: M/Associate Administrator for Manned Space Flight

FR: AD/Deputy Administrator

SUBJECT: Space Tug Decision

Don Fuqua asked to see me privately after the ASTP [Apollo-Soyuz Test Project] briefing. During the private meeting he asked, "Does NASA intend to develop the Tug or do you intend to let the Air Force take it away from you?"

I told Don that this decision had not yet been made but that NASA management was quite interested in having the Air Force develop the Tug for two reasons:

1. to minimize NASA's peak funding requirements, and
2. to get the Air Force (DOD) more deeply involved in the Space Shuttle development.

Don voiced a number of concerns, most of which are expressed in the attached document, which, I believe, was prepared by Jim Wilson. I promised two things:

1. Phil Culbertson would get together with Jim Wilson soon to discuss some of the points raised in the document. Specifically, the question of the applicability of the Space Act would be discussed.
2. [NASA Associate Administrator for Manned Space Flight Dale] Myers and Low would get together with Fuqua toward the end of October to discuss the entire issue.

[2] I am not sure whether the end of October date needs to be firm, but certainly we ought to talk to Fuqua about it before a final decision is made.

By copy of this memo, I am asking Gerry Griffin to keep track of setting up this meeting.

George M. Low

Document II-35

Document title: James C. Fletcher, Administrator, NASA, to Honorable James R. Schlesinger, Secretary of Defense, June 21, 1974.

Document II-36

Document title: W.P. Clements, Deputy Secretary of Defense, to Honorable James C. Fletcher, Administrator, NASA, August 7, 1974.

Source: Both in Administrators Files, NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

NASA and the Office of Management and Budget had agreed on January 3, 1972, that the Space Shuttle would have a large payload bay, capable of handling the largest U.S. military satellites being planned. This did not mark a policy decision of exclusive use of the shuttle, however, as is evident in this letter from NASA Administrator James Fletcher to Secretary of Defense James Schlesinger and the reply from Deputy Secretary of Defense W.P. Clements. By 1974, the Department of Defense (DOD) was examining the wisdom of a complete phaseout of expendable launch vehicles, which raised serious concern within NASA and Congress. Later budgetary decisions would make abandoning expendable launch vehicles a de facto *policy because of the cost of maintaining both options. This* de facto *policy, however, was never explicitly stated; DOD continued to favor a prudent expendable launch vehicle backup policy. The handwritten note on the Clements letter is from NASA Deputy Administrator George Low to Fletcher. In the Fletcher letter, Mal Currie was the Director of Defense Research and Engineering; his name was misspelled by Clements.*

Document II-35

[1] June 21, 1974

Honorable James R. Schlesinger
Secretary of Defense
Washington, DC 20301

Dear Mr. Secretary:

I had hoped to see you before having to leave town for two weeks, but since this has not been possible I am taking this way to alert you to the matter I wanted to talk to you about.

It concerns the Space Shuttle. Through our regular contacts with DOD, we understand that in the present review of the DOD five-year plan questions are being raised on the DOD participation in the shuttle program which had been agreed to for planning purposes at the time the program was approved by the President. Questions are being raised on the DOD's provision of launch and landing facilities on the West Coast, on future DOD procurement of orbiters for DOD use, and on the planned phase-out of DOD's use of expendable launch vehicles.

We have discussed these problems with the Air Force and Mal Currie and they are working on ways to reduce the cost of the facilities planned at Vandenberg Air Force Base and to minimize the budgetary impact on DOD procurement of orbiters. Neither the VAFB facilities nor the procurement of orbiters are matters requiring actual decisions now or in the FY 1976 budget.

My concern is that a decision in the DOD planning process to back away from previously planned DOD participation in the shuttle program, or a decision which implies that the DOD will not rely on the shuttle for its space activities in the 1980's, could be used by Congressional opponents of the program to attack and perhaps even cut back the shuttle development program.

As you know, the Space Shuttle is an Administration program that is national in scope, and decisions to proceed with the shuttle were based, in part, on previous DOD studies which indicated [2] very substantial benefits to DOD through use of the shuttle. I'm sure you would plan to consult with me in advance if you believed that any decisions making significant changes in DOD's previously planned role and use of the Space Shuttle are necessary at this time. However, I was afraid that due to the press of other DOD business such consultation might have been overlooked and therefore was most anxious to see you before I left.

In my absence George Low will be available to meet with you whenever convenient.

With best wishes,

Sincerely,

James C. Fletcher
Administrator

Document II-36

[no pagination] Aug 7 1974

Honorable James C. Fletcher
Administrator
National Aeronautics & Space Administration
Washington, D. C. 20546

Dear Dr. Fletcher:

The Secretary and I were pleased to have the opportunity to discuss with you and Dr. Low the Space Shuttle program and the concerns which you raised earlier in your June 21, 1974, letter.

The Department of Defense is planning to use the Space Shuttle, which NASA is developing, to achieve more effective and flexible military space operations in the future. Once the Shuttle's capabilities and low operating cost are demonstrated we expect to launch essentially all of our military space payloads on this new vehicle and phase out of inventory our current expendable launch vehicles.

Recent budget actions assure that adequate outyear funding will be available to develop a low cost modified upper stage for use with the Shuttle. This stage will be ready for operational use at Kennedy Space Center concurrently with the Shuttle in 1980. Funding is also included now in out budget for establishing a minimum cost Shuttle launch capability at Vandenberg Air Force Base consistent with realistic DOD and NASA needs. This addition should be available around December 1982; however, funding constraints could cause some delays. As we made clear in our conversation, overall budget constraints force us to defer any consideration of orbiter buys at this time.

Dr. Curry [sic] has been very much involved in our budgetary deliberations on the use of the Shuttle and will be available to discuss these points further with you at any time.

Sincerely,

W. P. Clements

Document II-37

Document title: John F. Yardley, NASA Associate Administrator for Space Flight; John J. Martin, Assistant Secretary of the Air Force (Research and Development); James C. Fletcher, NASA Administrator; William P. Clements, Jr., Deputy Secretary of Defense, "NASA/DOD Memorandum of Understanding on Management and Operation of the Space Transportation System," January 14, 1977.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

In the mid-1970s, NASA and the Department of Defense (DOD) began to discuss the management and operations of the Space Shuttle system. These discussions resulted in a memorandum of understanding, which expanded earlier principles of cooperation between NASA and DOD. The document avoided asserting that the Space Transportation System would be the exclusive launch vehicle for DOD, referring to it instead as the primary launch vehicle.

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[1]

NASA/DOD Memorandum of Understanding on Management and Operation of the Space Transportation System

1.0 PURPOSE: This Memorandum of Understanding establishes the broad policies and principles that will govern the relationships between the DOD and NASA relevant to the development, acquisition and operation of the national Space Transportation System. The Memorandum of Understanding shall be used as the basis for more detailed documentation between the NASA and the DOD further delineating Space Transportation System management and operations concepts and the specific roles and responsibilities of each agency.

For purposes of this Memorandum of Understanding, the national Space Transportation System consists of an earth-to-orbit Space Shuttle, the upper stage(s) required for orbital velocities exceeding the Shuttle capability, and the ground support equipment and facilities necessary for operation of the system. A DOD-developed expendable Interim Upper Stage (IUS) will be available concurrently [2] with the operational Space Shuttle for use by both agencies. There is planning for development of Spinning Solid Upper Stage (SSUS) to supplement the IUS which would be available concurrently with the operational Space Shuttle for use by both agencies.

2.0 BACKGROUND: On February 13, 1969, the President appointed a multi-agency Space Task Group to develop recommendations on the direction which the U.S. Space Program should take in the Post Apollo period. The Space Task Group recommended that a reusable Space Transportation System be developed to allow more economical and effective use of space.

On February 17, 1970, NASA and the Air Force, acting as the designated agent for DOD, established by joint agreement the NASA/USAF Space Transportation System Committee to provide an instrumentality for joint review and recommendations concerning development and evolution of a Space Transportation System which fulfill the objectives of both NASA and DOD in a manner that best serves the national interest.

[3] On January 5, 1972, the President decided that the United States should proceed at once with the development of a space transportation system capable of providing routine access to space and taking the place of all present launch vehicles except the very smallest and the very largest.

On April 13, 1972, the selection of J.F. Kennedy Space Center, Florida, and Vandenberg Air Force Base, California, as launch/landing sites for the Space Shuttle was agreed upon.

3.0 GENERAL POLICIES AND PRINCIPLES: The Space Transportation System (STS) is a national program designed to serve all users—both civil and defense. The evolution of a viable, cost effective system requires the efficient use of extensive national resources, primarily those of NASA, DOD and the aerospace industry. The overall planning and coordination to insure the most effective utilization of these resources in the development, acquisition and operation of the STS are the responsibility of NASA. The DOD will use the STS and participate as a partner in development, acquisition, and operation activities as specifically defined herein.

[4] Effective and efficient use of the national STS requires an environment of understanding and cooperation between the agencies. To this end, there shall be maintained a free and effective interchange of essential technical, financial, and managerial information between the two agencies. This interchange shall be accomplished primarily throughout the NASA/USAF Space Transportation System Committee. Coordination will be maintained with the Aeronautics and Astronautics Coordinating Board and other joint groups established by mutual agreement.

It is anticipated that interest in the National Space Transportation System will continue to grow as more and more agencies recognize the merits and benefits associated with a non-expendable means for placing and retrieving payloads in space. The STS should provide benefits for many varied space requirements. Fulfillment of requirements from actual and potential users of this system must be given careful consideration. Insofar as their fulfillment does not compromise other priority requirements to an unreasonable degree, they will be accommodated.

[5] The cooperation and coordination required will be implemented so as to assure consistency with applicable policy with respect to the relationship between civil and military space activities.

4.0 MANAGEMENT AND OPERATIONS CONCEPTS: The overall objective is to ensure that the national Space Transportation System will be of maximum utility to both agencies. The accomplishment of this objective will be under the purview of the joint NASA/USAF STS Committee.

The following concepts, policies and principles, and the associated roles and responsibilities are agreed to:

4.1 NASA RESPONSIBILITIES: The NASA is responsible for developing the overall STS operations concepts and plans for serving as overall financial manager for the STS. In addition:

4.1.1 The NASA is responsible for the development of the Space Shuttle, to include the orbiter and its propulsion systems, the solid rocket boosters, the external tank and general purpose ground support equipment and facilities.

[6] 4.1.2 The NASA will make every effort to incorporate the DOD requirements into the Space Shuttle, with due consideration for schedule and cost impacts, in order that the STS be designed and developed to fulfill the objectives of future uses of the STS.

4.1.3 The NASA is responsible for providing the general purpose Shuttle equipment and facilities to perform the ground, launch and landing activities for all Space Shuttle operations at the Kennedy Space Center (KSC). NASA will plan for an initial operational capability at KSC in 1980.

4.1.4 The NASA will plan to use the Interim Upper Stage (IUS) for appropriate missions and is responsible for providing to DOD those requirements affecting the IUS design which are considered important to meet NASA objectives. NASA will provide the USAF with funds for their peculiar IUS requirements.

[7] 4.1.5 The NASA will plan to use the IUS for all of its planetary missions for those earth orbital missions that are not more economically achieved by the SSUS. The SSUS will be used primarily for geo-synchronous missions of the type currently flown by the expendable Delta and Atlas-Centaur vehicles.

4.1.6 The NASA is the responsible agency for Space Shuttle flight planning and interacting all flights and users. NASA will provide for management, integration, flight operations, and control for all Shuttle flights regardless of launch or landing site used. For DOD dedicated missions DOD will provide the mission director. STS users will provide to NASA their requirements in the format and to the detail required by NASA to allow the hardware and software integration of the payload or combined upper stage payload combination. Payload mission planning and operations are the responsibility of the payload agency. Funding for these activities will be in accordance with the reimbursement sub[-]agreement referred to in 4.1.8.

[8] 4.1.7 NASA with USAF assistance will develop integrated STS logistics and training plans encompassing, JSC [Johnson Space Center], KSC, and VAFB.

4.1.8 NASA, as financial manager of the STS, is responsible for establishing an STS pricing and reimbursement policy for all non-DOD users for the STS operational era. Because of DOD's heavy investment, large usage, and the operation of VAFB, the DOD pricing and reimbursement arrangements will be jointly negotiated between NASA and DOD and will be set forth in a more detailed NASA/DOD sub[-]agreement.

4.2 DOD RESPONSIBILITIES: The DOD will plan to use the STS as the primary vehicle for placing payloads in orbit. In addition:

4.2.1 The DOD is responsible for providing to NASA those requirements affecting the Space Transportation System which are the responsibility of NASA and considered essential to meet the DOD objectives.

[9] 4.2.2 The DOD will develop the IUS including the general purpose ground support equipment. The DOD will insure that both DOD and NASA requirements are considered in the current IUS validation phase.

4.2.3 The USAF is the responsible agency for planning the mission integration of users involving DOD programs and international military activities covered by government-to-government agreements. The USAF is the focal point for providing the necessary data to NASA for the STS integration of the integrated DOD payload upper stage combination.

4.2.4 The USAF is responsible for providing the general purpose Shuttle equipment and facilities to perform the ground, launching and landing activities for all Space Shuttle operations at VAFB. The USAF will operate VAFB and plan for an initial operational capability at VAFB of 1982.

[10] *4.3 OTHER RESPONSIBILITIES*

4.3.1 The resources of both agencies which can contribute to the development, testing, production, training and operations for the STS will be used to the maximum extent possible. The plans and agreements on agency roles and responsibilities for use of these resources will be developed as required.

4.3.2 To the maximum extent possible, ground support equipment and ground operating procedures developed for use at KSC by NASA will be used by DOD at VAFB. NASA will consider the DOD operational needs at VAFB in the development of KSC equipment and procedures.

4.3.3 Each agency is responsible for providing its own payload facilities external to the launch pad area. Launch pad payload facilities will be provided by the developing agency to satisfy the normal mode of payload operations at that launch site. Other payload peculiar facilities and [ground support equipment] will be provided [11] by the agency responsible for the peculiar payload. Mutual usage of facilities will be considered where feasible and appropriate.

4.3.4 Orbiter flight control for all missions will be the responsibility of the NASA JSC Mission Control Center (MCC) unless mission traffic changes or security needs require that a DOD MCC be developed. DOD and NASA will agree on DOD peculiar security provisions required at NASA facilities. Such provisions will be subjected to negotiated reimbursement.

4.3.5 STS flight elements procured will be interchangeable for use on either agency's missions, and capable of being operated at all designated sites.

4.3.6 A procurement strategy for acquisition of STS production items will be jointly developed by NASA and the USAF for both initial investment and continuing procurement.

4.3.7 The STS will be compatible with the communications, command, and control systems of both agencies.

[12] 4.3.8 An operating/using agency(ies) mission model, to include expendable booster transition and phase-out plans, will be maintained to provide the basis for program and operational analyses and planning.

4.3.9 This Memorandum of Understanding represents the current status of agreements between NASA and the DOD on development, acquisition and operation of the Space Transportation System. Revisions and/or amendments will be made as required to maintain the currency of this document.

5.0 EFFECTIVE DATE: This Memorandum of Understanding is effective on the last day of the signatures below:

John F. Yardley
Associate Administrator
for Space Flight

Date: 13 October, 1976

John J. Martin
Assistant Secretary of the
Air Force (Research and
Development)

Date: 13 October 1976

APPROVED:

James C. Fletcher
National Aeronautics and
Space Administration

Date: December 6, 1976

William P. Clements, Jr.
Deputy Secretary of Defense

Date: 1-14-77

Document II-38

Document title: John J. Martin, Assistant Secretary of the Air Force (Research and Development), Department of Defense; John F. Yardley, NASA Associate Administrator for Space Flight; Robert N. Parker, Acting Director, Defense Research and Engineering, Department of Defense; A.M. Lovelace, NASA Deputy Administrator, "Memorandum of Agreement Between NASA and DOD: Basic Principles for NASA/DOD Space Transportation System Launch Reimbursement," March 7, 1977.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

John J. Martin, Assistant Secretary of the Air Force (Research and Development), and John F. Yardley, NASA Associate Administrator for Space Flight, signed an agreement in March 1977 that determined what the Department of Defense (DOD) would pay for shuttle launch services. For the first six years of operation, DOD would pay NASA what amounted to the incremental costs of materials and services. This agreement later caused much public discussion about the favorable price allowed DOD payloads, but it is important to note that this decision had been based on the recognition of equal involvement established in the original Space Transportation System agreement of February 1970 (Document II-21 in this volume). VAFB is the acronym for Vandenberg Air Force Base, and KSC stands for Kennedy Space Center.

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[1]

Memorandum of Agreement Between NASA and DOD

SUBJECT: Basic Principles for NASA/DOD Space Transportation System Launch Reimbursement

1. The intent of this reimbursement agreement is to encourage efficient operation, early transition from expendable launch vehicles to the Space Shuttle, provide pricing stability and to establish a mutually acceptable price for STS launch and flight services. This agreement applies to DOD sponsored US payloads and DOD cooperative agreement payloads.

2. It is agreed that:
   (a) The DOD should pay a fair share price to have payloads placed in orbit by the Space Transportation System.
   (b) The price to the DOD should recognize that both the DOD and NASA will incur STS investment, operating and support costs.
   (c) NASA, as financial manager of the STS, is responsible for establishing an STS pricing and reimbursement policy for all non-DOD users which should recover

appropriate support and depreciation of investment costs. NASA will reimburse the DOD for appropriate use charges paid to NASA under NASA's reimbursement policy (reference Federal Register, dated January 21, 1977) in addition to any other changes as may be specifically required by law at the time of contract.

(d) The DOD reimbursement to NASA will be based on the costs of materials and services, to be mutually agreed upon. The DOD will provide the VAFB Space Shuttle launch support for all non-DOD users in return for provision by NASA of all Shuttle launch operations support from KSC and Shuttle flight operations support for all DOD flights. These services are projected to be of approximately equal value to each agency.

[2] 3. In line with the above, we agree that:

(a) The DOD should be charged a fixed price for the first six years of operations.

(b) The initial six year price per launch should be a realistic projected materials and services cost per launch averaged over the first six years. The materials and services costs definitions are set forth in Appendix A.

(c) There should he no recoupment of prior years costs ever or under the mutually agreed upon projected costs of part 3b.

(d) For launches after the first six years of STS operations, the price to DOD will be adjusted annually based on actual costs projected each year for materials and services. The adjustment is intended to insure meeting the goals established in parts 2a and 3c of this Agreement.

(e) The DOD and NASA agree to establish the price of STS launches for the DOD. The specific price for materials and services will take into consideration the programmatic, operational and technical services uncertainties in providing STS launch services during the six year fixed price period. The mutually agreed to price is $12.2M in FY 1975 dollars escalated according to a mutually agreed to economic index.

4. This agreement is contingent on the DOD meeting the VAFB STS launch site activation schedule agreed to in the MOU dated January 14, 1977, that NASA meet the [initial operational capability] dates for the KSC launch site and the Shuttle, and that NASA provide an adequate orbiter fleet.

5. DOD agrees to reimburse NASA for STS launches in the fiscal year prior to the fiscal year of launch and at least twelve months prior to the planned launch date. The reimbursement will be made in dollars escalated to the fiscal year of payment (reference paragraph 3e above). If after payment [3] for a DOD launch, the launch is slipped or cancelled, the DOD will receive credit on a future launch. The DOD and NASA will develop a launch schedule three years prior to launch based on the most probable launch requirements. The schedule will be updated annually.

6. This agreement becomes an integral part of the NASA/DOD Memorandum of Understanding on Management and Operations of the Space Transportation System dated January 14, 1977.

John J. Martin
Assistant Secretary of the Air
Force (Research and Development)
Department of Defense

Date: 7 MAR 1977

John F. Yardley
Associate Administrator
for Space Flight
National Aeronautics
and Space Administration

MAR 7 1977

Robert N. Parker
Acting Director, Defense Research
and Engineering
Department of Defense

Date: 7 MAR 1977

A.M. Lovelace
Deputy Administrator
National Aeronautics
and Space Administration

MAR 7 1977

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[no pagination]

Appendix A

The total of all costs incurred by the government for the procurement of all expended hardware; refurbishment hardware and all flight spares and provisions excluding external tank propellants, the maintenance and support costs included in the $12.2M are:

Space Shuttle Main Engine (SSME)
- Refurbishment
- Spares
- Engine Overhaul and Test
- Transportation

Solid Rocket Boosters (SRB's)
- Solid Propellants
- Refurbishment of SRB's
- Spares
- Procurement of Replacement Units
- Transportation

External Tank (ET)
- Production
- Spares
- Transportation (excludes West Coast Port to Launch Site Transportation)

System Support
- ET, SRB and SSME Sustaining Engineering Support Services

Orbiter Spares
- Replenishment and Transportation of LRU's and Shop Replaceable Units to Support Orbiter [Hardware] Maintenance and Replacement

Crew GPE
- Replacement and Replenishment Hardware and Field and Maintenance Support for all Crew Related GPE

Contract Administration
- Costs Associated with Contract Administration of all Shuttle Direct Support Contractors

Document II-39

Document Title: George M. Low, NASA Deputy Administrator, Co-Chairman, Aeronautics and Astronautics Coordinating Board (AACB), and Malcolm R. Currie, Director of Defense Research and Engineering, Department of Defense, Co-Chairman, AACB, "Joint NASA/DOD Position Statement on Space Shuttle Orbiter Procurement," January 23, 1976.

Source: Documentary History Collection, Space Policy Institute, George Washington University, Washington, D.C.

The initial launch rate for the shuttle was set at 60 flights per year, with 40 from Kennedy Space Center and 20 from Vandenberg Air Force Base. NASA soon determined, however, that this flight rate was unachievable without a five-orbiter fleet, and in 1976 the space agency began to ask for a fifth orbiter. NASA expected the Air Force to pay for this vehicle. Department of Defense (DOD) leadership refused to acknowledge that its mission dictated the need for the fifth orbiter and feared it would have to procure the vehicle on its own. NASA and DOD agreed that a fifth orbiter was needed, but both agencies deferred the decision to budget funds for the fourth and fifth orbiters, as well as the decision on who would pay for them. Ultimately, only four orbiters were built initially. A fifth orbiter was not built until after the loss of the Challenger.

[no pagination]

Joint NASA/DOD Position Statement on Space Shuttle Orbiter Procurement

The National Aeronautics and Space Administration and the Department of Defense agree that five Space Shuttle Orbiters are needed to meet our national traffic model requirements. Orbiters are funded by NASA within the [design, development, testing, and evaluation] and [the] production programs. Neither agency has budgeted funds for the remaining two Orbiters. While this is a current interagency Space Shuttle issue, NASA has evolved a production plan which does not require an FY 1977 funding increment. Therefore, NASA and DOD agree to work together to resolve this issue as part of the FY 1978 budget cycle activities.

George M. Low
Deputy Administrator
National Aeronautics and
Space Administration
Co-Chairman, AACB
23 Jan 1976
Date

Malcolm R. Currie
Director of Defense Research
and Engineering
Department of Defense
Co-Chairman, AACB
January 23, 1976
Date

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Plan for NASA-DOD Orbiter Procurement Decision

1.	Fletcher-Clements Exchange of Letters	Dec 75/Jan 76
2.	Currie/Low sign position paper	Jan 76
3.	Currie/Low prepare detailed request for NASA/DOD issues paper to be prepared by STS Committee	Jan 76
4.	STS Committee address the following issues:	By Aug 76
	a. Verify need for 5 orbiters	
	b. Develop detailed budget plans, using various delivery assumptions, and assuming either NASA or DOD funding	
	c. Prepare draft issues paper for Fletcher-Rumsfeld meeting	
5.	STS Committee prepare monthly progress reports addressed to Currie and Low. Currie and Low meet as necessary	Feb, Mar, Apr, May, Jun, Jul
6.	Fletcher-Rumsfeld meeting	Aug 76
7.	If Fletcher-Rumsfeld cannot agree on which agency funds orbiter, prepare joint Presidential issues paper	Aug 76
8.	Fletcher-Rumsfeld-Lynn discuss joint issues paper	Aug 76
9.	Fletcher-Rumsfeld-Lynn meet with President	Sep 76

Document II-40

Document title: General Robert T. Marsh, Commander, Air Force Systems Command, to General Charles A. Gabriel, Chief of Staff, USAF, August 5, 1982, with attachment.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

By the time the Space Shuttle became operational, it had changed considerably from what the Air Force had originally anticipated. The Air Force faced launch costs totaling nearly $300 million per flight. Air Force Systems Command Commander General Robert T. Marsh, who was in charge of Air Force participation in the Space Transportation System, felt it was necessary to inform Air Force Chief of Staff General Charles A. Gabriel of rising shuttle costs. His information package provides a detailed comparison of launch costs for a variety of Titan and Space Shuttle vehicle mixes.

[no pagination]

General Charles A. Gabriel
Chief of Staff
United States Air Force
Washington, DC 20330

5 AUG 1982

Dear Chief

Although many of us are familiar with projected costs of conventional weapons systems, the understanding of space systems and support costs, as well as future predictions, is not as clear. To enhance this understanding, I've provided a macro-perspective of where launch costs in the Shuttle era are headed.

I am emphasizing launch costs in this package because I want to alert you to the significant Air Force requirements we will see when the STS at Vandenberg AFB and [the Consolidated Space Operations Center] become operational. The effective cost to ride [the] Shuttle will be about $300M per launch in the late 1980s. These costs are based on an optimistic launch plan, and due to the high fixed costs involved, reducing the number of flights will increase the cost per flight.

The amounts in this package do not reflect our approved program. They are merely intended to convey the message that costs for access to space are increasing. Although most of our near-year requirements are founded, I think you'll agree that we face a significant budgeting challenge in the out-years when these systems become operational.

I think the attachments help generate a clearer understanding of the space arena. We will provide additional information should you desire.

Sincerely

ROBERT T. MARSH, General USAF
Commander

2 Atch
1. Titan and Shuttle Costs Per Flight
2. Launch Costs w/ Investments Amortized

TOTAL AMORTIZED LAUNCH PROFILE WITH AMORTIZED INVESTMENTS COSTS
(THEN YEAR $M)

SEGMENT	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91
HARDWARE	55.6	58.2	66.2	65.2	84.2	100.4	145.7	220.9	409.3	380.3	266.0	290.2	408.2	725.5	646.1	743.3
LAUNCH SERVICES	19.9	24.1	28.3	29.2	34.8	38.9	42.0	46.3	107.8	123.9	132.1	133.0	137.6	149.8	163.4	178.1
RANGE SUPPORT	63.1	68.9	74.0	80.7	88.9	98.1	107.2	118.4	244.8	271.8	256.0	305.4	309.3	336.9	367.4	400.4
SCF SUPPORT	65.7	57.7	64.9	69.5	96.1	90.3	99.2	114.1	144.5	225.2	167.1	255.2	243.7	265.4	289.5	315.4
ORBITER FLIGHT CHARGE[1]	-	-	-	-	-	-	-	-	106.5	193.0	383.6	597.0	520.8	1063.5	1082.2	1263.0
ORBITER FLIGHT CHARGE[2]	-	-	-	-	-	-	-	-	-	-	165.2	258.0	224.8	460.5	467.6	547.5
STS OPERATIONS	-	-	-	-	-	-	-	-	120.0	314.2	375.9	424.1	445.8	444.2	484.3	527.9
CSOC OPERATIONS	-	-	-	-	-	-	-	-	15.9	57.1	245.9	288.1	316.9	376.3	410.4	447.2
STS SECURITY	-	-	-	-	-	-	-	-	36.9	40.5	45.2	49.2	51.3	55.9	61.0	66.5
AMORTIZED COSTS[3]	—	—	—	—	—	—	—	89.9	89.8	109.4	263.3	245.7	245.7	245.7	245.7	245.7
TOTAL	204.3	208.9	233.4	244.6	304.0	327.7	394.1	589.6	1275.5	1715.4	2300.3	2845.9	2904.1	4123.7	4035.6	4735.0
DOD LAUNCHES[4]	2	2	2	2	2	2	2	3	6	7	7	10	8	15	14	15
COST P/LAUNCH WITH AMORTIZED COSTS	102.2	104.5	116.7	122.3	152.0	163.9	197.1	196.5	*	*	328.6	284.6	363.0	274.9	288.3	315.7

1 BASED ON $16.0M/FLT FY 84-85 AND $20.8M/FLT FY 86-91 (CONSTANT FY 75 $).
2 DELTA COST IF DOD REQUIRED TO PAY $29.8/FLT FY 86-91 (CONSTANT FY 75 $).
3 INCLUDED IUS DEVELOPMENT, AND CSOC, DELTA SYSTEMS MODERNIZATION, AND STS-VAFB INVESTMENT.
4 LAUNCH FORECASTS ARE HISTORICALLY OPTIMISTIC. REDUCTION IN LAUNCHES WILL INCREASE COST PER FLIGHT.

*NOT APPLICABLE: OVERLAP YEARS FOR TITAN AND SHUTTLE.

TOTAL AMORTIZED LAUNCH PROFILE WITH AMORTIZED INVESTMENTS COSTS
(THEN YEAR $M)

SEGMENT FY	84	85	86	87	88	89	90	91
HARDWARE	130.0	155.1	266.0	290.3	408.2	725.5	464.1	743.3
LAUNCH SERVICES	55.4	67.0	132.1	133.0	137.6	149.8	163.4	178.1
RANGE SUPPORT	244.8	271.8	256.0	305.4	309.3	336.9	367.4	400.4
SCF SUPPORT	144.5	225.2	167.1	255.2	243.7	265.4	289.5	315.4
ORBITER FLIGHT CHARGE[1]	106.5	193.0	383.6	597.0	520.8	1063.5	1082.2	1263.0
ORBITER FLIGHT CHARGE[2]	0	0	165.2	258.0	224.8	460.5	467.6	547.5
STS OPERATIONS	120.0	314.2	375.9	424.1	445.8	444.2	484.3	527.9
CSOC OPERATIONS	15.9	57.1	245.9	288.1	316.9	376.3	410.4	447.2
SECURITY	36.9	40.5	45.2	49.2	51.3	55.9	61.0	66.5
AMORTIZED COSTS[3]	89.8	109.4	263.3	245.7	245.7	245.7	245.7	245.7
TOTAL (THEN YR $)	943.8	1433.3	2300.3	2845.9	2904.1	4123.7	4035.6	4735.0
(FY 84 $)	943.8	1315.8	1936.9	2197.0	2056.1	2680.4	2405.2	2590.0
DOD LAUNCHES[4]	3	5	7	10	8	15	14	15
COST/FLIGHT (THEN YR $)	314.6	286.7	328.6	284.6	363.0	274.9	288.3	315.7
(FY 84)	314.6	263.2	276.7	219.7	257.0	178.7	171.8	172.7

AVERAGE COST PER FLIGHT: $307.1M (THEN YR $), 232.0M (FY 84)

1 BASED ON $16.0M/FLT FY 84-85 AND $20.8M/FLT FY 86-91 (CONSTANT FY 75 $).
2 DELTA COST IF DOD REQUIRED TO PAY $29.8/FLT FY 86-91 (CONSTANT FY 75 $).
3 INCLUDED IUS DEVELOPMENT, AND CSOC, DELTA SYSTEMS MODERNIZATION, AND STS-VAFB INVESTMENT.
4 LAUNCH FORECASTS ARE HISTORICALLY OPTIMISTIC. REDUCTION IN LAUNCHES WILL INCREASE COST PER FLIGHT.

AMORTIZED COSTS BACK-UP[1]
(THEN YEAR $M)

SEGMENT FY	83	84	85	86	87	88	89	90	91
IUS AMORTIZED[2]	72.2	72.2	72.2	72.2	72.2	72.2	72.2	72.2	72.2
STS SECURITY AMORTIZED[3]	17.6	17.6	17.6	17.6	17.6				
DATA SYSTEMS MOD AMORTIZED[4]			19.6	19.6	19.6	19.6	19.6	19.6	19.6
STS VAFB AMORTIZED[5]			93.2	93.2	93.2	93.2	93.2	93.2	
AMORTIZED COSTS[6]	—	—	—	60.7	60.7	60.7	60.7	60.7	60.7
	89.8	943.8	109.4	263.3	263.3	245.7	245.7	245.7	245.7

1 AMORTIZING BEGINS UPON IOC (STRAIGHT LINE)
2 TOTAL DEVELOPMENT ($722.2M)/PROJECTED LIFE (10 YEARS)=$72.2M/YR
3 TOTAL DEVELOPMENT ($87.9M)/PROJECTED LIFE (5 YEARS)=$12.6M/YR
4 TOTAL DEVELOPMENT ($391.5M)/PROJECTED LIFE (20 YEARS)=$19.6M/YR
5 TOTAL DEVELOPMENT ($2797.9M)/PROJECTED LIFE (30 YEARS)=$93.2M/YR
6 TOTAL DEVELOPMENT ($1213.5M)/PROJECTED LIFE (20 YEARS)=$60.7M/YR

TITAN IIIC/TITAN 34D COSTS PER LAUNCH
(CONSTANT FY 84 $M)

SEGMENT FY	76	77	78	79	80	81	82	83	84	85
HARDWARE	114.4	109.7	116.2	104.9	123.3	133.0	176.7	242.6	279.3	206.8
LAUNCH SERVICES	41.0	45.5	49.7	47.1	50.9	51.6	50.9	50.8	52.4	52.2
RANGE SUPPORT	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0
SCF SUPPORT[1]	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
TOTAL	335.4	335.2	345.9	332.0	354.2	364.6	407.6	473.5	511.7	439.0
ESMC LAUNCHES	2	2	2	2	2	2	2	3	3	2
COST PER LAUNCH	167.7	167.7	173.0	166.0	177.1	182.3	203.8	157.8	170.6	219.5

AVERAGE COST PER FLIGHT: $178.5M

1 THESE AMOUNTS DIFFER FROM THOSE SHOWN ON THE TOTAL SPACE LAUNCH PROFILE (ATCH 12). THE AMOUNTS ON THIS CHART REFLECT ONLY A PRO RATA ALLOCATION OF SCF SUPPORT FOR ESMC LAUNCHES.

STS LAUNCH COST PER FLIGHT*
(CONSTANT FY 84 $M)

SEGMENT FY	84	85	86	87	88	89	90	91
HARDWARE	130.0	142.4	224.0	224.0	289.0	471.6	276.6	406.6
LAUNCH SERVICES	55.4	61.5	111.2	102.7	97.4	97.4	97.4	97.4
RANGE SUPPORT	244.8	249.5	215.6	235.8	219.0	219.0	219.0	219.0
SCF SUPPORT	144.5	206.7	140.7	197.0	172.5	172.5	172.5	172.5
ORBITER FLIGHT CHARGE[1]	106.5	177.5	322.7	461.0	368.8	691.5	645.4	691.5
ORBITER FLIGHT CHARGE[2]	0	0	139.3	199.0	159.2	298.5	278.6	298.5
STS OPERATIONS	120.0	288.4	316.5	327.4	315.6	288.7	288.7	288.7
CSOC OPERATIONS	15.9	52.4	207.0	222.4	244.6	244.6	244.6	244.6
SECURITY	36.9	37.2	38.1	38.0	36.3	36.3	36.3	36.3
TOTAL	854.0	1215.6	1715.1	2007.3	1902.4	2520.1	2259.1	2455.1
DOD LAUNCHES[3]	3	5	7	10	8	15	14	15
COST PER FLIGHT	284.7	243.1	245.0	200.7	237.8	168.0	161.4	163.7

AVERAGE COST PER FLIGHT: $218.8M

* RECURRING COSTS ONLY. TREATS DEVELOPMENTS/ACQUISITIONS AS SUNK COSTS.
1 BASED ON $16.0M/FLT FY 84-85 AND $20.8M/FLT FY 86-91 (CONSTANT FY 75 $).
2 DELTA COST IF DOD REQUIRED TO PAY $29.8/FLT FY 86-91 (CONSTANT FY 75 $).
3 LAUNCH FORECASTS ARE HISTORICALLY OPTIMISTIC. REDUCTION IN LAUNCHES WILL INCREASE COST PER FLIGHT.

TOTAL SPACE PROGRAMS
(FY 84 $B)

SECTOR	84*	85	86	87	88	89**	90	91	92	93	94	95
Current												
Space***	5.4	6.3	6.3	5.9	6.3	6.4	6.6	6.7	6.8	7.0	7.1	7.3
Launch	0.9	0.9	1.0	1.0	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.4
Support	0.9	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0
Subtotal	7.2	8.2	8.4	7.8	8.4	8.5	8.7	8.9	9.0	9.2	9.4	9.6
Future												
Space	-	-	-	-	0.1	0.2	0.6	0.8	0.8	1.0	1.1	1.2
Launch	0.1	0.3	0.2	0.2	0.3	0.7	1.0	0.8	0.6	0.5	0.2	0.1
Support	-	-	-	-	-	-	0.1	0.1	0.1	0.3	0.3	0.3
Subtotal	0.1	0.3	0.2	0.2	0.4	0.9	1.7	1.7	1.5	1.8	1.6	1.6
TOTAL	7.3	8.5	8.6	8.0	8.8	9.4	10.4	10.6	10.5	11.0	11.0	11.2

* Current Systems—FY 84 AF POM through FY 88.
** Current Systems—FY 89 and out assumes 2% per year real growth.
*** Includes PE 34111F.

Document II-41

Document title: Lt. General Richard C. Henry, Commander, Air Force Space Division, to General Robert T. Marsh, Commander, Air Force Systems Command, March 4, 1983.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

By the early 1980s, the Space Shuttle program was considerably behind schedule and was not meeting its promised flight rates or cost targets. Various leaders in the U.S. Air Force were increasingly uneasy with relying on the shuttle. In March 1983, Lt. General Richard C. Henry, in this letter to General Robert T. Marsh, expressed growing concern that carrying humans aboard a vehicle designed to merely deliver payloads to orbit created an unnecessary expense. This indicated the changed status of human spaceflight initiatives in the military, which was later reflected in the Department of Defense's (DOD) position on the proposed NASA space station. Henry's letter also gave a broad overview of a proposed military launch strategy, which eventually evolved into what was called a "mixed fleet" after the Challenger *accident.*

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[1] 4 March 1983

General Robert T. Marsh
AFSC/CC
Andrews AFB, DC 20334

Dear General Marsh

Last year the AF committed to using [the] Space Transportation System exclusively and according to current planning, we will close down the Titan production line this spring and expand all Titans and Atlas' in the 1987, 1988 time frame. I believe this plan is seriously deficient from the DOD standpoint both operationally and economically.

Current estimates of STS mission model requirements have been reduced to where they can be satisfied with a launch capability of about 20 per year, 16 at KSC and 4 at VAFB. Thus, there is a debate underway as to whether a fifth orbiter should be procured. This situation coupled with a phase of Expandable Launch Vehicles, might lead to (an economically irreversible) loss of *all* U.S. capabilities to produce space launch vehicles in the 1985 time period.

A four orbiter only fleet, experiencing problems similar to those of Challenger, would develop a backlog of launches that would take months to years to work off. This presents a considerable threat to the continued vitality of the national space program and in particular, could impact national security through inadequate launch support of priority DOD spacecraft.

In the past, it has been argued that the shuttle would achieve economy by launch rate. A high launch rate is not materializing, and is unlikely to come forth; therefore, we should seek alternative ways to achieve best return on investment. An example is the acceptance of orbiter refurbishment and checkout at KSC prior to Vandenberg launch as a permanent procedure to restrict work force build up on the west coast. Another example is to re-look at the economics of using the shuttle on missions where its unique capabilities are not needed.

The current cost estimate ($FY 83) for shuttle launch to place a payload in geosynchronous equatorial orbit (GEO) is 165 million dollars. Similar estimates ($FY 83) for a commercial version of the Titan/Centaur and a modified Atlas/Centaur are 125/115 million dollars and 120/90 million dollars respectively, where the first number includes the amortization of development costs over nine launches and the second is the cost per launch thereafter. Launch of a stretch version of the Titan/Centaur is estimated at 145/120 million dollars. The major driver in the higher STS costs is the cost of carrying man on a mission which does not need man. The costs shown here for expendable vehicles, launched, [2] are slightly less conservative than we would have used in the past (possibly by 10 or 15 million per launch). However, the important point is that the GEO mission can be accomplished at less cost with an expandable booster. I have not included the not insignificant costs to our spacecraft to enable their carriage on a manned vehicle (the orbiter).

Assuming that commercialization of expandable launch vehicles does occur, I believe their most important use by DOD would be the transport of spacecraft to GEO, namely [the Defense Support Program], MILSTAR, [Defense Satellite Communication System] III and other special missions.

From the DOD standpoint, either the Titan/Centaur or the modified Atlas/Centaur launch vehicles would meet most of the performance requirements through the 1980's. Thus, a DOD commitment to commercial launches of either vehicle could provide an expendable launch vehicle capability for critical DOD programs through the late 1980's (in the longer term, the growth Titan/Centaur presents the option for launching larger payloads than does Atlas). DOD launch rate requirements for this time period, are expected to be about four or five per year.

Another opportunity for DOD participation in commercialization of expandable launch vehicles exists for the Delta class launch vehicles. The GPS [Global Positioning System] and the DMSP [Defense Meteorological Satellite Program] programs are currently being launched on Atlas. Both payloads are relatively small and lightweight and, therefore, both require manifesting with other payloads for effective Shuttle launching. To date, no other appropriate DOD payload has been found for manifesting with either GPS or DMSP. Although manifesting with non-DOD payloads may prove feasible, single payload launches, when needed, are necessary for effective systems operation. Thus, it would be highly desirable to have a dual capability for launching these payloads; the Satellite replacement rate for the GPS and DMSP programs is expected to be about three or four per year.

We estimate that the 20 flight per year STS requirement would include 6 flights per commercial GEO satellites and 7 for government. If commercial launch vehicles captured these flights, the yearly STS flight rate would be reduced to about 7. Most, if not all, of these would require the unique capabilities of the Shuttle.

100 flights have been postulated for the useful life of a Shuttle. Thus, a four orbiter fleet flying 20 flights per year could be expected to wear out in about 2 decades. Reducing Shuttle flights to those for which it has unique capabilities could significantly expand the life of the fleet.

The orbiter is necessarily an essential element of a space station program which NASA proposes to initiate. Therefore, if the nation embarks on a space station program in the near future, it will be argued that more orbiters should be procured for the construction and sustaining of the station. This would be an investment of about $2 billion per orbiter above and beyond the non[-]recurring and recurring space station costs.

The question of requirements for a space station is now under debate. I suggest that this debate is premature. The more fundamental question is the utility of [3] man in space

and whether we first, need him in a hostile environment; then, if we do, how can we sustain him in a more affordable way than we do today. I believe strongly that these questions can be addressed and answered with the existing four orbiter fleet on spacelab type missions.

In summary, I believe that the orbiter is a marvelous machine, but it is better used for those missions where the utility of man is clear or needs further exploration. It is clear that man is not needed on the transport mission to GEO and is, in fact, the more expensive alternative. I recommend an investment strategy in a mixed fleet, preferably with commercialization. The primary DoD mission is on orbit, not in getting there. I recommend the government endorse commercialization, and commit to commercial launches to GEO. This will assure the success of commercialization.

I recognize that these are issues that transcend the Air Force and DoD, and need NASA, OMB and National Security Council involvement, but I suggest that Air Force leadership is not inappropriate.

I urge your serious consideration of my recommendations before we burn our bridges behind us and stand ready to give any additional support that you may need.

Warm regards

Richard C. Henry
Lt. General, USAF
Commander

Document II-42

Document title: Caspar Weinberger, Secretary of Defense, Memorandum for Secretaries of the Military Departments; Chairman of the Joint Chiefs of Staff; Under Secretaries of Defense; Assistant Secretaries of Defense; General Counsel, "Defense Space Launch Strategy," February 7, 1984, with attached: "Defense Space Launch Strategy," January 23, 1984.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

The Department of Defense continued to support the Space Shuttle despite reservations about its performance and reliability. The Air Force, however, wanted a back-up expendable launch vehicle until the shuttle's problems had been solved. In early 1984, Secretary of Defense Caspar Weinberger issued a directive that established a need for a "complementary expendable launch vehicle" to supplement the Space Shuttle. The vehicle developed to meet this requirement became known as the Titan IV.

Memorandum for Secretaries of the Military Departments Chairman of the Joint Chiefs of Staff Under Secretaries of Defense Assistant Secretaries of Defense General Counsel

SUBJECT: Defense Space Launch Strategy

On 23 January 1984, I approved the attached Defense Space Launch Strategy. The approach described in this document will be used to guide future defense space launch planning. Please ensure maximum distribution to all those affected within your departments and agencies.

Caspar Weinberger

Attachment

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[1]

Defense Space Launch Strategy

POLICY

Defense space launch strategy has been developed in response to validated DoD assured space launch requirements and implements the launch policies contained in the National Space Policy and the Defense Space Policy. The National Space Policy identifies the Space Transportation System (STS) as the primary U.S. government space launch vehicle, but recognizes that unique national security requirements may dictate the development of special purpose launch capabilities. The Defense Space Policy states that:

> "While affirming its commitment to the STS, DoD will ensure the availability of an adequate launch capability to provide flexible and operationally responsive access to space, as needed for all levels of conflict, to meet the requirements of national security missions."

REQUIREMENTS

The DoD has a validated requirement for an assured launch capability under peace, crisis and conflict conditions. Assured launch capability is a function of satisfying two specific requirements: the need for complementary launch systems to hedge against unforeseen technical and operational problems, and the need for a launch system suited for operations in crisis and conflict situations. While DoD policy requires assured access to space across the spectrum of conflict, the ability to satisfy this requirement is currently unachievable if the U.S. mainland is subjected to direct attack. Therefore, this launch strategy addresses an assured launch capability only through levels of conflict in which it is postulated that the U.S. homeland is not under direct attack. Additional survivability options beyond an assured launch capability are being pursued to ensure sustained operations of critical space assets after homeland attack.

STRATEGY

Near Term: Existing Defense space launch planning specifies that DoD will rely on four unique, manned orbiters for sole access to space for all national security space systems. DoD studies and other independent evaluations have concluded that this does not represent an assured, flexible and responsive access to space. While the DoD is fully committed to the STS, total reliance upon the STS for sole access to space in view of the technical and operational uncertainties, represents an unacceptable national security risk. A complementary system is necessary to provide high confidence of access to space particularly since the Shuttle will be the only launch vehicle for all U.S. space users. In addition, the limited number of unique, manned Shuttle vehicles renders them ill-suited and inappropriate for use in a high risk environment.

The solution to this problem must be affordable and effective and yet offer a high degree of requirements satisfaction, low technical risk, and reasonable schedule availability. Unmanned, expendable launch vehicles meet these criteria [2] and satisfy DoD operational needs for a launch system which complements the STS and extends our ability to conduct launch operations further into the spectrum of conflict. These systems can provide unique and assured launch capabilities in peace, crisis and conflict levels short of general nuclear war. These vehicles are designed to be expendable and the loss of a single vehicle affects only that one mission and would not degrade future common, national launch capabilities by the loss of a reusable launch system.

The President's policy on the Commercialization of Expendable Launch Vehicles [ELVs] states that the goals of the U.S. space launch policy are to ensure a flexible and robust U.S. launch posture, to maintain space transportation leadership, and to encourage the U.S. private sector development of commercial launch operations. Consistent with this policy, the DoD will pursue the use of commercially procured ELVs to meet its requirements for improving its assured launch capabilities. For requirements that cannot be satisfied by commercially available ELVs, unique DoD developments may be undertaken for special purpose launch capabilities.

The STS will remain the primary launch system for routine DoD launch services. Unmanned, expendable launch vehicles represent a complementary capability to the STS and will be maintained and routinely launched to ensure their operational viability. To accomplish this, selected national security payloads will be identified for dedicated launch on ELVs, but will remain compatible with the STS.

Long Term: While commercial expendable launch vehicles represent an available solution to the unique DoD space launch requirements into the early-1990s, the need for other DoD launch capabilities to meet requirements beyond that must be evaluated and validated. This effort must be initiated immediately in order to ensure that future national security space missions are not constrained by inadequate launch capability. The evaluation should examine potential DoD launch requirements, such as the need for a heavy lift vehicle, and should attempt to take maximum advantage of prior investments in the U.S. launch vehicle technology base.

IMPLEMENTATION

As Executive Agent for launch vehicles, the Air Force will take immediate action to acquire a commercial, unmanned, expandable launch vehicle capability to complement the STS with a first launch availability no later than FY 1990. These vehicles must provide a launch capability essentially equal to the original STS weight and volume specifications.

In addition, the Air Force, in conjunction and coordination with other Services, affected agencies and departments, will:

a) identify specific national security systems that will be used on the commercially procured expendable launch vehicles and the proposed peacetime launch rate required to maintain an operationally responsive posture.

[3] b) develop a comprehensive space launch plan to meet projected national security requirements through the year 2000. This strategy will be submitted to the Secretary of Defense for approval and validation.

The Defense Space Launch Strategy will be reflected in the FY-86 Defense Guidance Plan.

Document II-43

Document title: Charles W. Cook, Executive Secretary, Defense Space Operations Committee, Memorandum for Defense Operations Committee (DSOC) Principals, "DoD Position on Shuttle Issues," November 19, 1984.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

The Defense Space Operations Committee was a Department of Defense (DOD)-wide internal policy-making and coordination group composed of the leading space individuals in each military service, the Office of the Secretary of Defense, and the organization of the Joint Chiefs of Staff. President Reagan had directed NASA and DoD to determine what steps were necessary to make the shuttle fully operational. The Defense Space Operations Committee was the mechanism to coordinate the DOD definition of the steps necessary to attain operational status. On October 19, 1984, the committee principals were briefed on the issues identified by the Air Force. Their comments were included in the operational plan. The committee met again on October 29, 1984, and the recommendations were finalized on November 19, in a memorandum representing the first coherent statement by DOD of what it meant by an "operational Space Transportation System." DOD felt that a number of requirements for the Space Transportation System had not been adequately addressed by NASA, and the outstanding issues were stated as changes needed in the Space Transportation Master Plan.

[no pagination] 19 November 1984

Memorandum for Defense Operations Committee (DSOC) Principals

SUBJECT: DoD Position on Shuttle Issues

Attached is a revised copy of the DoD Position resulting from the DSOC meeting of 29 October 1984. Changes have been incorporated to reflect the comments received. I would like to touch base with each of you personally early next week to go over the final position.

CHARLES W. COOK
Executive Secretary
DSOC

2 Attachments
1. Revised DoD Position
2. Summary—Issues Not Discussed

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[no pagination]

Memorandum for the Defense Space Operations Committee (DSOC)

SUBJECT: DoD Position on Shuttle Issues

During the 19 October 1984 meeting of the DSOC, DoD positions were established on several key Shuttle issues.

Attachment 1 summarizes the DoD positions on issues discussed during the DSOC meeting. Attachment 2 summarizes less controversial issues which were coordinated with you.

I am requesting that the Executive Secretary coordinate with NASA in revising the Space Transportation System Master Plan to reflect DoD positions prior to the Master Plan being approved.

2 Attachments
1. Summary—Issues Discussed
2. Summary—Issues Not Discussed

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[1]

Attachment 1

Defense Space Operations Committee, 29 October 1984 DoD Position on Key STS Master Plan Issues

Continued Orbiter Production

The Space Transportation System (STS) Master Plan must include a viable, long-term plan for the Space Shuttle System. Since the STS is the primary means of transportation to space for all U.S. programs, including national security programs, it is essential that the STS Master Plan contain a NASA program for providing continued orbiter capability.

The current NASA budget and financial program does not include plans for a fifth orbiter, follow-on orbiter, continuing spares production, requalifying and restarting production lines, or qualifying the orbiter fleet beyond 100 flights. In view of the national policy for the use of the Shuttle system, the plan would not be complete without a specific program for viability of the orbiter fleet through continued orbiter production. Therefore, the DoD takes the position:

> "In accordance with National Policy, the STS is the primary means of access to space for all U.S. programs, including National Security programs. The STS Master Plan should include provisions for continued orbiter fleet capability. Specifically, NASA should develop definitive plans with adequate budgetary funding for continuing spares production and qualification of the orbiter fleet beyond the current 100 flights. Since the loss of an orbiter would have a significant impact on the STS overall mission capability, NASA should develop a plan to address that contingency."

Interoperability of Orbiters

Space launch operational flexibility is restricted by the fact that each of the orbiters in the current fleet has different characteristics and capabilities.
[2] Therefore, the DoD takes the position:

> "The STS Master Plan should include Provisions to increase interoperability of the orbiter fleet. Specifically, additional orbiters should be fully capable of meeting all existing and documented DOD mission requirements. NASA should modify existing orbiters as follows:
>
> (1) Orbiter 103 modified to be Centaur-capable.
> (2) Orbiter 099 upgraded to allow operating from Vandenberg.
>
> All launch facilities should be interoperable with all orbiters. Therefore, the Air Force and NASA should modify the shuttle launch facilities to accommodate the configurations of all orbiters."

Payload Performance (Shuttle Lift Capability)

The STS Master Plan should include the Level I requirement of 32,000 pounds of payload lift capability for a Vandenberg Reference Mission 4 or equivalent. Of concern to the DoD is the fact that even with filament-wound-case solid rocket boosters and main engines operating at 109% thrust, maximum performance is approximately 28,000 pounds of payload to low earth orbit. Additionally, there is not a specific program (aside from hopeful flight experience, demanifesting, etc.) to attain the 4,000 pounds needed to reach the NASA "goal" of 32,000 pounds. Therefore, the DoD takes the position that:

> "The STS Master Plan should include a definitive technical plan with appropriate budgetary funding which, with a high degree of confidence, will meet the commitment of a lift capability of 32,000 pounds for Reference Mission 4 or equivalent."

Orbiter Crossrange Capability

The Shuttle orbiter crossrange requirement of 1100 nautical miles cannot be met with the current design. This shortfall will prevent a Vandenberg Shuttle launch from aborting once-around back to Vandenberg. Current orbiter capability is approximately 800 nautical miles. This impacts DoD payloads by involving increased exposure to landing at abort and contingency landing sites outside the Continental United States.

Complying with the 1100-mile crossrange requirement would appear to entail a costly orbiter redesign.
[3] Therefore, the DoD takes the position:

> "The Level I crossrange requirement of 1100 miles remains unchanged. The STS Master Plan should include extension of the current Shuttle crossrange beyond 800 miles. This extension should be accomplished through flight test and analysis. Until the crossrange requirement of 1100 miles can be met, NASA should develop definitive plans with adequate budgetary funding for a capability to provide air transportation of payload and orbiter from contingency landing sites to

the launch site. NASA should also assure that the design of any future orbiters or Thermal Protection System (TPS) meet the needed 1100 mile crossrange capability."

Orbiter/Cargo Transportation Capabilities

The STS Master Plan should include specific steps to be taken to provide payload and orbiter transportation capabilities.

The DoD takes the position:

"NASA should provide a second Shuttle Carrier Aircraft (SCA) and should install refueling capabilities on both SCA. The Air Force should plan to procure outside airborne cargo transportation capability. Both NASA and the Air Force should develop definitive plans with adequate budgetary funding to accomplish these tasks."

It is noted that the Air Force is examining a way that they may provide a Civil Reserve Air Fleet (CRAF) 147 that could be modified by NASA for use as a backup SCA.

Orbiter Bay Contamination

Since orbiter bay contamination could have a significant effect on the design of future payloads, the orbiter bay contamination environment must be accurately characterized. The DoD takes the position:

"The STS Master Plan should reflect the NASA and the Air Force Contamination Working Group plan to provide pre-flight cleanliness specifications and procedures, and inflight measurements to define the orbiter bay environment. NASA should provide quantitative contamination data to the payload community for design consideration."

[4] *Future Shuttle Management*

On the issue of future management of the Space Transportation System (STS) the DoD position is:

"The status quo with the current NASA-led, joint NASA/DoD management arrangement is the preferred management option for the foreseeable future. NASA should identify and separately account for the Shuttle budget (e.g. budgetary fencing) to distinguish that funding from other NASA Programs. Transfer of the STS to another government agency in the foreseeable future is not recommended."

Additional DoD comment[s]:

"The DoD should not be the sole operator of the STS."

"An STS operational organization within NASA might be acceptable to DoD if the following conditions are met:

- DoD participation in organizational implementation
- DoD participation in operational management
- Specific NASA commitments are made to complete the necessary Shuttle system enhancements as specified in the STS Master Plan's Baseline Operation Plan."

****

Attachment 2

Issues
STS Baseline Operations Plan

INFORMATION ITEMS

ISSUE	COMMENT
DOD SECURITY COSTS	– NON-SECURITY CHANGES TO SECURITY SYSTEMS
	– IN WORK BY NASA AND SYSTEMS COMMAND
OIL LEASE OFF VANDENBERG COAST	– COULD LIMIT LAUNCH AZIMUTH
	– SENSITIVE "POLITICAL" ISSUE
FUTURE FLIGHT CHANGES	– IAW REIMBURSEMENT MOA NEW PRICE DETAILED IN 1985
	– EXPECT $63-100M PRICE (FY 84 $)

RECOMMENDATION

CONTINUE WORKING THESE ITEMS SEPARATELY

NON-CONTROVERSIAL CAPABILITIES SHORTFALLS

ISSUE	SPECIFICATION SHUTTLE SYSTEM	CAPABILITY	COMMENT
MISSION DURATION	30 DAYS	10-12 DAYS	DOD REQ'T IS 7 DAYS + 2 DAYS CONTINGENCY
RESCUE CAPABILITY	SUITS & PERSONAL RESCUE SYSTEM	NONE	NO DOD REQUIREMENT
DOCKING MODULE	INTERNATIONAL REQUIREMENT FOR RENDEZVOUS & DOCKING CAPABILITY	NONE	NO DOD REQUIREMENT

OPERATING LIFE	10 YEARS, 500 USES	CERTIFIED TO 100 USES	SATISFIES PROJECTED 20-YEAR MISSION MODEL
ADDITIONAL PROPELLANT	ORBITAL MANEUVERING SYSTEM (OMS) KITS	NONE	NO DOD REQUIREMENT

RECOMMENDATION

CONCUR WITH NASA POSITION TO CHANGE REQUIREMENTS SPECIFICATION TO BE CONSISTENT WITH CAPABILITY

NATIONAL SECURITY/CRISIS CONSTRAINTS

ISSUE	SHUTTLE SYSTEM SPECIFICATION	CAPABILITY	COMMENT
LANDING WEATHER CONSTRAINTS AND AUTOLAND	NONE	NO PRECIPITATION 15,000 FT CEILING 7 MILE VISIBILITY 8 KNOT CROSSWIND	– RTLS & EOM* ALTERNATE LANDING SITES PLANNED – AUTOLAND DEMO ON STS 51-E (FEB 85)
ORBITER AUTONOMY	NONE	TACAN FOR NAV AND DEORBIT TARGETING UNTIL 1992	– GPS PLANNED – ORBITER COMPUTER UPGRADE APPROVED
LAUNCH FROM	WITHIN 2 HRS	6.5 HRS (KSC) 4.5 HRS (VAFB)	– ACCEPTABLE CONSTRAINTS
ORBITER TURN-AROUND TIME	14 DAYS BETWEEN FLIGHTS	28 DAYS IS GOAL	– ACCEPTABLE CONSTRAINT (DOD HAS PRIORITY)

RECOMMENDATION

ACCEPT FACT THAT STS WILL NOT MEET TRADITIONAL MILITARY SYSTEMS REQUIREMENTS (ALL WEATHER, RAPID DEPLOYMENT, SURVIVABILITY, ETC.)

* RETURN TO LAUNCH SITE AND END OF MISSION

PAYLOAD MISSION FLEXIBILITY CAPABILITIES

ISSUE	SHUTTLE SYSTEM CAPABILITY	DOD REQUIREMENT	COMMENT
NAVIGATION ACCURACY	1000'–ALL AXIS	45'–ALL AXIS WITH GPS	– GPS WILL MEET REQUIREMENT – NASA/AF PLAN FOR JOINT IMPLEMENTATION OF GPS CAPABILITY (FY 87 BUDGET $30-40M)
REDUNDANT PAYLOAD SERVICES – Ku BAND ANTENNA CONTROL – PAYLOAD DATA SYSTEM (PDI) – MANIPULATOR ARM (RMS)	NO REDUNDANCY	REDUNDANCY IN MISSION CRITICAL SYSTEMS	– AF PAYLOADS RELUCTANT TO USE SERVICES – REDUNDANT ANTENNA CONTROLLER OR MECHANICAL STOPS NECESSARY – REDUNDANT PAYLOAD DATA SYSTEM, MORE RELIABILITY IN ARM NEEDED – COSTS HIGH: PDI (40 POUNDS, $2M); RMS (900 POUNDS, $20M)
EXTRA VEHICULAR ACTIVITY (EVA) PROVISIONS			
– IMMEDIATE EVA	MINIMUM SEVERAL HOURS	NO CURRENT REQUIREMENT	– ACCEPTABLE CONSTRAINT
– CARGO BAY ENVELOPE	56 FT TO 60 FT	60 FT	– REQUIRES CONTINUED MISSION-BY-MISSION COORDINATION

RECOMMENDATION

- NASA/DOD AGREE ON EFFECTIVITY OF GPS
- NASA/DOD EVALUATE ON MISSION-BY-MISSION BASIS, COST AND WEIGHT TRADES OF REDUNDANT SYSTEMS
- ACCEPT EVA CONSTRAINT

Document II-44

Document title: National Security Decision Directive 164, "National Security Launch Strategy," February 25, 1985.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

Under Secretary of the Air Force Edward C. Aldridge wanted to keep expendable launch vehicle production lines open, because he was concerned that valuable manufacturing expertise would be lost. Having completed a commercial competition to select the complementary expendable launch vehicle, Aldridge needed NASA to concur with the Air Force's selection of a Titan derivative. Negotiations at the staff level had little success. Aldridge called NASA Administrator James Beggs to discuss the matter. They reached an agreement, which was transcribed and taken to the National Security Council to be processed for the President's signature. The result was the National Security Launch Strategy, which, after the Challenger *disaster, resulted in the Department of Defense transferring most of its payloads off the shuttle.*

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[1] February 25, 1985

National Security Launch Strategy

NSDD 144, National Space Strategy, states that the Space Transportation System (STS) will continue as the primary space launch system for both national security and civil government missions. It also directs DoD to pursue an improved assured launch capability that will be complementary to the STS. This NSDD provides a launch strategy to implement these two provisions, as well as initiate a study to look toward the future development of a second-generation space transportation system.

The National Aeronautics and Space Administration (NASA) and the Department of Defense (DoD) will work together to insure that the STS is fully operational and cost-effective at a flight rate sufficient to meet justified needs. (The target rate is 24 flights per year.)

The Air Force will buy ten expendable launch vehicles (ELVs) and will launch them at a rate of approximately two per year during the period 1988-92. A competitive decision will be made between the Titan derivative vehicle and the SBR-X before March 1, 1985.

DoD will rely on the STS as its primary launch vehicle and will commit to at least one-third of the STS flights available during the next ten years. NASA and DoD will jointly develop a pricing policy for DoD flights that provides a positive incentive for flying on the Shuttle. The pricing policy will be based upon the principle that an agreed reimbursement rate per flight will be comprised of a fixed and variable component. This will result in an annual fixed fee and a charge per flight at marginal or incremental cost. NASA will propose a pricing policy based upon this principle by April 15, 1985.

DoD and NASA will jointly study the development of a second-generation space transportation system—making use of manned and unmanned systems to meet the requirements of all users. A full range of operations will be studied, including Shuttle-derived technologies and others. It would be anticipated that NASA would be responsible for systems management of civil manned systems and DoD would be responsible for [2] systems management of unmanned systems. DoD and NASA will jointly define the terms of reference of this effort for issuance as a National Security Study Directive (NSSD).

Any disagreements regarding implementation of this Strategy should be referred first to the Assistant to the President for National Security Affairs and subsequently, if necessary, to the President for resolution.