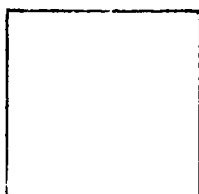


PHOTOGRAPH THIS SHEET

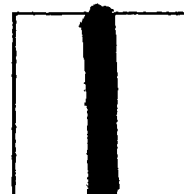
ADA950166

DTIC ACCESSION NUMBER



LEVEL

SPACE SYSTEMS DIV. LOS ANGELES
AIR FORCE STATION, CA



INVENTORY

CHRONOLOGY OF EARLY AIR FORCE MAN-IN-SPACE ACTIVITY
1955-1960. JAN. 65 AFSC HISTORICAL PUB-65-21-1

DOCUMENT IDENTIFICATION

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

DISTRIBUTION STATEMENT

ACCESSION FOR	
NTIS	GRA&I ☒
DTIC	TAB ☐
UNANNOUNCED	☐
JUSTIFICATION	
Per DTIC Form 50 on	
File	
BY (Jan. 1965)	
DISTRIBUTION /	
AVAILABILITY CODES	
DIST	AVAIL AND/OR SPECIAL
A	

DISTRIBUTION STAMP

Released

DTIC
ELECTE
S FEB 17 1981 D
D

DATE ACCESSIONED

UNANNOUNCED

81 2 13 003

DATE RECEIVED IN DTIC

PHOTOGRAPH THIS SHEET AND RETURN TO DTIC-DDA-2

**AFSC HISTORICAL
PUBLICATIONS SERIES**

65-21-1

ADA950166



**CHRONOLOGY OF EARLY AIR FORCE
MAN-IN-SPACE ACTIVITY**

1955 - 1960



CHRONOLOGY OF
EARLY AIR FORCE MAN-IN-SPACE ACTIVITY
1955 - 1960

Prepared by
Historical Division
Office of Information
Space Systems Division
Air Force Systems Command
United States Air Force

FOREWORD

The United States Air Force was one of several government agencies and departments with an interest in the exploration and utilization of outer space before the creation of the National Aeronautics and Space Administration in 1958. As the management agency for rockets which have launched the vast majority of United States space projects, the Air Force is a major contributor to the total national space program while responsible for virtually all the nation's military space activity. This chronology records a small portion of Air Force space activity - specifically, the planning for manned space flight prior to the establishment of Project Mercury by the National Aeronautics and Space Administration.

In this chronology, Air Force manned space flight activity is viewed from the perspective of the ballistic missile development agency - the Air Research and Development Command's Western Development Division, later re-named the Air Force Ballistic Missile Division. Due to resource limitations at the Space Systems Division historical office, research for this chronology has been generally limited to materials available in the files of that office. All documents cited in the notes which follow each entry are located in the archives of the Historical Division, Office of Information, Space Systems Division, in Los Angeles, California.

A general note of caution is offered users of this chronology to help maintain historical perspective. The Air Force Ballistic Missile Division, and its predecessor organization, had one mission of overriding importance - to field a force of intercontinental range ballistic missiles at the earliest possible moment. This mission was accorded the nation's top priority in 1955, and any other activity automatically took a subordinate position. It could have been no other way if the risk of an unfavorable shift in the world strategic balance was to be avoided. Other responsibilities were acquired, and by late 1958 execution of assigned space projects was a major portion of the organization's mission. Even at that point in time, however, the principal and overriding priority was still creation of a missile force for the nation. This situation should be kept in mind as the reader retraces the steps taken by the Air Force toward a program to put a man in space.

WDP
January, 1965

CHRONOLOGY

Early Air Force Man-In-Space Activity (1955 - 1960)

General Background
1955 - 1957

Early as 1955 the Air Force received proposals from industry for development of manned research satellites and the idea of projecting boost glide vehicles to orbital speed was considered. In 1956 the Air Research and Development Command (ARDC) proposed a feasibility study of a "Manned Ballistic Rocket Research System." Major aircraft companies and other interested organizations were briefed on the study and urged to conduct independent investigations of the problem--mainly because Air Research and Development Command was without funds to support this avenue of research. AVCO Corporation was encouraged to study the problem of a manned research satellite. Rand Corporation, a strong proponent of reconnaissance satellite systems since 1947, reported on space vehicles for other than reconnaissance purposes. In May 1956 the corporation offered a concept for a "Lunar Instrument Carrier," and later in the year briefed the proposal to various Air Force organizations. Rand continued its space studies and in May 1957 presented to its military advisory group concepts on "Space Flight and the Air Force" and, in November 1957, published a projection of an over-all space program and with anticipated performance characteristics of combinations of various existing ballistic missiles that could be used as space boosters. In April 1956, Western Development Division - Ramo-Wooldridge (the Air Force's ballistic missile development organization in Los Angeles) began a study of using ballistic missiles as boosters. Results were presented to the Scientific Advisory Board in a meeting held at Rand in the latter part of July 1957. At the same meeting a Research and Development Command group presented a briefing on "Space Technology: Key to Advanced Weapon Systems." The studies included an investigation of manned space flight, an area later stimulated by the sensational 4 October 1957 launch of Sputnik I. Thereafter interest in space rapidly evolved into concrete Air Force planning for development of a manned space system. (USAF Manned Military Space System Development Plan, 25 April 1958, prep by AFBMD, I-I-3, Vol I.)

- 1955 - 1957 Many Air Force officers in widely scattered field units, without coordinated effort, prepared papers and studies proposing military space projects. "Small groups at Headquarters Air Research and Development Command, at the Ballistic Missile Division, at Holloman Air Force Base, and at Wright Air Development Center (WADC) sensed danger in the Government's unwillingness to give the new technology the urgent support they felt it deserved." Programs were proposed which called for organized space experiments, "at the earliest practicable date." Such experiments included orbiting satellites, manned and unmanned, a manned space station and a spacecraft voyage to the moon. (Bowen, Lee, The Threshold of Space, Sep 1960, published by the Air Force Historical Liaison Ofc, p. 7)
- 28 Jun 1955 ✓ A committee, appointed by Secretary of the Air Force, D. A. Quarles, to recommend the best method of furnishing the United States with a satellite between the dates of June and December 1958, was briefed at Western Development Division (WDD). The Atlas project was reviewed and the potential of Atlas as a booster vehicle in a selected satellite system was presented. The committee was advised that WDD was qualified to manage the program if so directed but that such a program would interfere, to some extent with the high priority of the Atlas development effort. (Memo, Col C. H. Terhune, Dep Cmdr Tech Ops, WDD, to Brig Gen B. A. Schriever, Cmdr WDD, 28 Jun 55, subj: Visit of DOD Satellite Committee, 28 Jun 55.)
- 29 Jul 1955 The President announced that the United States, as part of its International Geophysical Year contributions, would attempt to launch a number of 21 pound satellites without the use of military missiles. The project, named Vanguard, although organized in the Department of Defense under Navy management, would be completely removed from military significance. (Bowen, The Threshold of Space, p.10.)
- Apr 1956 ✓ The Army Ballistic Missile Agency requested that the Department of Defense grant permission to use its Jupiter C missile to launch a satellite, "in view of Vanguard delays and increasing evidence that the Soviets would be first in space--an event certain to inflict 'serious damage' to the prestige of the United States."

Apr 1956
(Cont'd)

The Army's proposal was rejected by the Department of Defense, presumably in line with the policy announced by the President on 29 July 1955, that the United States would remain strictly within its International Geophysical Year satellite commitment without using military missiles, thus clearly demonstrating United States intent to explore space for peaceful purposes. (Bowen, Threshold of Space, pp, 10-11.)

May 1956

Rand Corporation issued a series of reports on the feasibility of a lunar instrument carrier, based on use of an Atlas booster. (Early BMD-ARDC General Space Chronology, 11 Feb 59, prep by AFBMD Hist Ofc.)

3 Oct

Western Development Division released a short study report entitled, "Ballistic Missiles, Satellites and Space Vehicles." The paper recommended a detailed survey of technical developments which might anticipate "logical extensions of our present ballistic missile and satellite programs." Advanced systems were foreseen in the next 20 years which might well furnish equipment and technology for manned exploration of space including voyages to the moon and near by planets. The paper also recommended that the Air Force plan an orderly development of space programs aimed at these far reaching but reasonable long term objectives. (Paper, Ballistic Missiles, Satellites and Space Vehicles, 1956 to 1976, dtd 3 Oct 56, prep by Col L. D. Ely, Asst for Tech Groups, Tech Operations, WDD.)

Nov 1956

Air Research and Development Command Guided Missile and Space Vehicle Committee report, based primarily on Western Development Division--Ramo-Wooldridge sources, contained a technological forecast (1955-1970) and program recommendations for ballistic missiles, satellite reconnaissance systems, recoverable satellites, manned interplanetary space exploration, and related facilities, funds and manpower requirements. It was estimated that program costs would reach \$800 million by fiscal year 1961 and continue at a level of \$500 million a year until 1970, then soar to \$1.9 billion in 1971. (Early BMD-ARDC General Space Chronology, 11 Feb 59.)

5 Feb 1957

The Air Force authorized Ramo-Wooldridge (Guided Missile Research Division) to begin a study of second generation ballistic missiles and space vehicles.

5 Feb 1957
(Cont'd)

(Early BMD-ARDC General Space Chronology, 11 Feb 59.)

29 Jul

Air Force Ballistic Missile Division (Western Development Division was redesignated Air Force Ballistic Missile Division, 1 Jun 1957) presented to the Scientific Advisory Board Ad Hoc Committee, meeting at Rand Corporation, a summary of follow on ballistic missile weapon systems and advanced space programs which it was prepared to undertake. These programs included development of high thrust space vehicles capable of earth orbital and lunar flights. (AFBMD Presentation to the Scientific Advisory Board Ad Hoc Committee to Study Advanced Weapons Technology and Environment, 29 Jul 57, prep by AFBMD.)

20 Sep 1957

First fully successful test flight of Thor intermediate range ballistic missile. (AF Ballistic Missiles Program Status Report.)

4 Oct

Sputnik I launched by the Soviet Union.

9 Oct

The Scientific Advisory Board Ad Hoc Committee on Advanced Weapons Technology and Environment published its review of ". . . problems of national defense in cis-lunar space, with particular regard to their impact on future weapons technology and the operating environment in which these weapons might function." The committee report urged development of second generation missiles not only for their primary weapon system value but for their use as space boosters. The next priority, in the committee's analysis, was to develop military satellite systems for reconnaissance, communications and weather prediction. The Air Force should also plan on reaching the moon and, despite the failure of the committee to define any specific military application resulting from occupation of the moon, appropriate steps should be taken to develop a space technology to support advanced exploration of space. The committee was also concerned that, while it appeared to be the plan of the Air Research and Development Command to place all ballistic missile programs under the management of the Ballistic Missile Division, there was not yet ". . . an official understanding that Air Force Ballistic Missile Division is a permanent organization set up to cover this role into the future." The committee therefore urged that ". . . Air

9 Oct 1957
(Cont'd)

Force Ballistic Missile Division be recognized at the earliest possible date as a permanent organization for ballistic missiles and satellite projects." (Rpt of the Scientific Advisory Board Ad Hoc Committee to Study Advanced Weapons Technology and Environment, 9 Oct 57.)

Oct - Nov 1957

Despite the focus of worldwide interest and public acclaim on the launch of Russian satellites (Sputnik I, 4 October; Sputnik II, 3 November) many high ranking government officials attempted to belittle this Russian scientific achievement. On 9 October the White House announced that the "United States would not become engaged in a space race with other nations and that Project Vanguard would not be accelerated." Nevertheless, the Secretary of the Air Force, James H. Douglas, called upon a committee of distinguished scientists and Air Force officers headed by Dr. Edward Teller to propose a line of positive action. The committee's report, completed 22 October, contained a strong recommendation for a unified program--a recommendation which was disregarded, "in favor of a divided program that, in the opinion of many, tended to dissipate rather than concentrate the expanded effort." (Bowen, Threshold of Space, p. 13.)

5 Nov

The Air Force briefed the Armed Forces Policy Council on a reconnaissance satellite program and possible combinations of vehicles that could be used for "cold war and scientific programs." The Air Force recommended using the available intermediate range ballistic missile as a booster to hasten launching an orbital system as early as March 1958. If approved this program would require an additional six Thors and \$12 million to cover additional costs. (Ltr, Col R. J. Nunzio, Asst for Spec Prog, DCS/Dev, Hq USAF, to SAFRD, 12 Nov 57, subj: Outer Space Vehicle.)

7 Nov 1957

In response to the nation's urgent need to demonstrate at least an early space vehicle capability it was suggested that three Thor boosters be made available from the missile test program and from these an early satellite or space capability could be obtained. Accordingly, Air Force headquarters requested Air Research and Development Command to conduct an engineering study which would " . . . provide sufficient information to this headquarters within the next 30 - 45 days on which a decision

7 Nov 1957
(Cont'd)

can be based as to the feasibility, capability and cost of such a program. " An immediate release of \$100,000 enabled the command to fund preliminary design studies. (Msg, 11-033, ARDC to AFBMD, 13 Nov 57.)

12 Nov

Assistant Secretary of the Air Force for Research and Development, R. E. Horner, requested the Department of Defense approve a space program that would furnish an early demonstration of space capability and "provide important development test vehicles leading to larger reconnaissance and scientific satellites." To hasten action three Thor missiles, 114,116 and 118 ". . . could be made available in a relatively short period of time with minimum interference to the IRBM program." These boosters could be used to orbit a recoverable animal satellite prior to 1 July 1958. Thor, it was also suggested, would be a practical vehicle to furnish the Air Force satellites with specific military capabilities. (Memo, Asst SAF (R&D), R. E. Horner, to SOD, 12 Nov 57, subj: Outer Space Vehicle.)

13 Nov

✓ Major General B. A. Schriever, Commander of Air Force Ballistic Missile Division directed preparation of a plan for a 10 - 15 year program leading to development of man carrying vehicle systems for space exploration. A preliminary plan for an orderly space development effort and ultimate manned flight had, in fact, already been prepared and awaited presentation to General S. E. Anderson, Commander of Air Research and Development Command. The plan envisioned manned space flight with a minimum of new development through the use of existing knowledge, experimental programs, missile-boosters, and facilities available throughout the command. (Memo, Col L. D. Ely, Dir Tech Divs, Weapon Systems, AFBMD, to Col C. H. Terhune, Dep Cmdr, Weapon Systems, AFBMD, 13 Dec 57, subj: Manned Space Flight Program; Cmdrs Reference Book, Chronology of Man in Space Effort, 23 Mar 59, prep by AFBMD.)

20 Nov 1957

Air Force headquarters affirmed the necessity for the Air Force to acquire recognized competence in "astronautics and space technology." Therefore the Air Research and Development Command was instructed to prepare by 1 December 1957 an astronautics program with estimates of its funding requirements. The plan was to review those space programs already underway and

20 Nov 1957
(Cont'd)

make a projection of development in astronautics and space technology over the next five years. (Msg, 11-055, Cmdr ARDC, to Comdr AFBMD, 20 Nov 57.)

20 Nov

Air Force Missile Development Center (AFMDC) was investigating vital environmental elements applicable to manned space flight. One of two technical development projects was titled, "Human Factors of Space Flight." The investigation covered exposure to space radiation, tolerance to high g loads and weightlessness, problems of descent and recovery from space, and physical and environmental problems of sealed cabins. A second study, "Biodynamics of Human Factors for Aviation", investigated tolerance to abrupt deceleration, total pressure changes, abrupt wind blasts and aircraft crash forces. These studies were symptomatic of a renaissance of scientific interest in space research throughout the Air Research and Development Command. (Memo, Maj D. L. Carter, Dep Dir, Tech Div, Weapon Sys, AFBMD, to Col C. H. Terhune, Dep Cmdr, Weapon Sys, 19 Dec 57, subj: Meeting With Major Simons, AFMDC.)

26 Nov 1957

Air Research and Development Command began a strong effort to orient the work of the command to meet accelerating demands of space technology. A Ballistic Missile Space Vehicle Working Group, appointed by the Commander on 18 January 1957, was convened to establish "new Research and Development Parameters for the Technical Program." The group's work, essentially, was to predict Air Force space vehicle requirements and developments over the next 15 year time period. (Ltr, Col R. V. Dickson, Asst Dep Cmdr (R&D), to Comdr AFBMD, 26 Nov 57, subj: Ballistic Missile/Space Vehicle Working Group.)

6 Dec 1957

The Air Force Scientific Advisory Board Ad Hoc Committee on Space Technology recommended, because "Sputnik and the Russian ICBM capability have created a national emergency," acceleration of specific military programs and a vigorous space program with the immediate goal of landings on the moon. (Rpt, SAB Ad Hoc Committee on Space Technology, 6 Dec 57.)

9 Dec

AVCO Corporation proposed development of a manned satellite system to the Air Force. The basic elements of the proposal included a Titan rocket to boost a manned

9 Dec
(Cont'd)

satellite into a 110 nautical mile earth orbit. The satellite would be a spherical capsule containing instrumentation and a life support system capable of sustaining one man for three or four days. A novel feature of the system would be development of a stainless steel cloth parachute which would lower the capsule safely through re-entry deceleration. As the air pressure increased the parachute would automatically expand to its full size and land the capsule at a survival, if bone jarring, rate of 35 feet per second. AVCO asked \$500,000 for a three month study and mockup of the capsule device and estimated, as a "rough guess", a total development cost of \$100 million. The ballistic missile division, however, was not convinced that this was the best approach to the manned re-entry problem. The division's position was that when the Air Force identified its space goals and established specific technical requirements it would then be wiser to "ask for bids and put it (development) on an open competitive basis." (Memo, Col L. D. Ely, to Col C. H. Terhune, 17 Dec 57, subj: AVCO Proposal for Manned Satellite.)

10 Dec 1957

Lieutenant General D. L. Putt, Deputy Chief of Staff Development at Air Force headquarters, announced establishment of the Directorate of Astronautics, to be headed by Brigadier General Homer A. Boushey. There was, however, an adverse Department of Defense reaction to this action. The Secretary of Defense objected to the use of the term "astronautics" and William Holaday, Defense Director of Guided Missiles, publicly stated the Air Force "wanted to grab the lime light and establish a position." Just three days later General Putt directed that the organizational change be cancelled. (Bowen, Threshold of Space, p. 20.)

10 Dec

Although the tempo of space technology research within recent months had been significantly accelerated by the Air Research and Development Command, a further increase was yet desirable. A plan, which would increase space research by 50 percent or more by fiscal 1959 and place management responsibility for the over-all space technology program within command headquarters, was now adopted. (Ltr, Lt Gen S. E. Anderson, Cmdr ARDC, to Cmdr AFMDC, 10 Dec 57, subj: Space Technology.)

16 - 17 Dec

The Scientific Advisory Committee to the Secretary of the Air Force met at the ballistic missile division. The

16 - 17 Dec
(Cont'd)

committee reviewed Air Force plans for advanced ballistic missile and space programs and recommended that space technology development be managed by the Air Force Ballistic Missile Division. (Early BMD-ARDC General Space Chronology, 11 Feb 59, prep by AFBMD Hist Ofc.)

17 Dec

First successful flight test of Series A Atlas missile. (AF Ballistic Missiles Program Status Report.)

18 Dec

Major General B. A. Schriever again offered a well defined astronautics program at an estimated cost of \$16 million in fiscal 1958 and \$112 million in 1959. In addition, \$10 million in 1958 and \$20 million in 1959 would be needed to procure Thor hardware and acquire a Thor space launch complex. Furthermore, said Schriever, although use of all resources qualified to participate in the program was endorsed it was ". . . imperative that the total Air Force effort in the ballistic missile and space field must be managed by one agency and that agency must be the Air Force Ballistic Missile Division." Schriever also proposed creation of a research and development command committee, chaired by the missile division, to formulate and recommend technical development in space technology. "The committee would meet periodically and make recommendations to the commander, AFBMD, for formulation of the Air Force program." (Ltr, Maj Gen B. A. Schriever, Cmdr AFBMD, to Lt Gen S. E. Anderson, Cmdr ARDC, 18 Dec 57, subj: Proposal for Future Air Force Ballistic Missile and Space Technology Development.)

20 Dec 1957

The technical program of the Air Force research and development structure was being reoriented toward state of the art development which would ". . . provide the United States significant capabilities in the area of space technology." Air Force Ballistic Missile Division was instructed to review and revise its technical programs to insure that they were contributing to the development of a sound space technology. (Ltr, Maj Gen J. W. Sessums, V/Cmdr ARDC, to Cmdr AFBMD, 20 Dec 57, subj: Space Technology.)

27 Dec 1957

An appraisal of Air Research and Development Command research and engineering resources revealed that the command was well prepared to undertake immediate development of a manned space program. The ballistic missile division possessed the resources to embark on vehicle development and command headquarters was ready with a " . . . fairly comprehensive program laid out in support of the manned aspects of space flight. " In specific terms this involved support from the School of Aviation Medicine, the Aeromedical Laboratory at Wright Air Development Center (WADC), and the Aeromedical Field Laboratory at AFMDC. (Memo, Col L. D. Ely, to Col C. H. Terhune, 30 Dec 57, subj: Telephone Call from General Flickinger and Visit of Colonel Karstens, School of Aviation Medicine.)

30 Dec

The Air Research and Development Command completed a 15 year plan for astronautics research and technical development. From this effort was distilled a five year astronautics program which, on this date, was presented to Air Force headquarters. (Ltr, Brig Gen M. C. Demler, D/ Cmdr, R&D, Hq ARDC, to Cmdr AFBMD, 30 Dec 57, no subject.)

31 Dec

The astronautics program "package" was under review by Air Force headquarters. Some additional data from AFBMD was requested -- cost information, amount of money needed to perform specific tasks and the desirable priorities to be assigned each task. (MFR, Brig Gen O. J. Ritland, V/ Cmdr, AFBMD, 31 Dec 57, subj: Telephone Call from Col Nunziato.)

3 Jan 1958

Air Force Ballistic Missile Division's recommendation for a strong astronautics program, forwarded to Lt General D. L. Putt, Deputy Chief of Staff, Development, at Air Force headquarters, included the following specific proposals: (1) Thor plus a Vanguard second stage would be used as the basic booster to provide a vehicle with a recoverable data capsule; first orbital flight with telemetry only by September 1958, followed by four additional flights during the remainder of fiscal 1959. (2) Develop a recoverable animal carrying satellite using rhesus monkeys; four flights during fiscal 1959. (3) Lunar impact missions could be attempted with a high probability of success by adding a Vanguard third stage to the Thor and Vanguard second stage vehicle; four vehicles should be planned for this mission beginning during the last quarter

3 Jan 1958
(Cont'd)

of 1958. (4) Four vehicles should be assigned the mission of circumlunar flight. Total cost of these programs was estimated at \$26.8 million during fiscal 1958, and \$30.4 million in fiscal 1959 including ground equipment and tests. Thor production would have to be increased by two units per month if the entire astronautics program were adopted as proposed. (Msg, WDG-1-2, Cmdr AFBMD, to Cmdr ARDC, 3 Jan 58.)

9 Jan

The first clarification to emerge from the nation's amorphous space policies was revealed on 15 November 1957 when Secretary of Defense McElroy told a press conference he was thinking of centralizing control of space research and development in a special agency. This was the first public announcement of the future birth of ARPA, as it was later called--the Advanced Research Projects Agency. Confirmation of this intent was stated in the President's State-of-the-Union message to Congress on 9 January 1958, when he said that Secretary McElroy "has already decided to concentrate into one organization all the anti-missile and satellite technology undertaken within the Department of Defense." (History, Hq ARDC, 1 Jan - 31 Dec 1958, Vol 1, prep by ARDC Hist Div, p.7.)

13 Jan 1958

The Air Force Ballistic Missile Division continued to study anticipated man-in-space problems, chief among which was safe re-entry and recovery of a manned space capsule. Deceleration through re-entry might well exceed the limits of human tolerance. Experimental evidence, however, suggested that forces high as 18 g's might be tolerated for short periods and that an actual series of tests conducted in Berlin had human subjects enduring 15 g's as long as two minutes without harmful effects. The effect of weightlessness was far more difficult to assess and nearly impossible to simulate for any appreciable length of time other than through actual orbital experimentation. The weight of evidence suggested that manned entry into space and return to earth would be a difficult, but far from impossible, task and the scientific and engineering arts could control the space environment within limits of human tolerance. (Memo, Col L. D. Ely, to Col C. H. Terhune, 13 Jan 58, subj: Additional Human Factors Information.)

16 Jan

The first rough draft of a development plan for the Air Force space weapons development and technology program was completed by the ballistic missile division, oriented

16 Jan
(Cont'd)

to meet five basic requirements: reconnaissance, communications, manned space flight, technical development and experimental support. To accomplish these objectives it was necessary to make maximum use of Air Force missile hardware and pursue a "daring and bold merger of the aeronautics and manned aircraft experience of the last decade with the rocket and ballistic missile experience in recent years." The program's fiscal 1958 funding needs were estimated to be as follows: astronautics, \$16 million; additional Thor hardware and launch complex for the advanced astronautics program, \$10 million. (Memo, Col C. H. Terhune, Dep Cmdr, Weapon Sys, AFBMD, to Cmdr ARDC, 16 Jan 58, subj: AF Astronautics Development Program.)

16 Jan 1958

Representatives of Aeronutronic Systems, Inc., visited the ballistic missile division to present their concept of an Air Force astronautics program. Their program was based on use of existing hardware and conservative evaluation of new equipment to be obtained through technical evolution. Test flight of earth satellites and lunar vehicles would acquire necessary data concerning the space environment. Specific goals included biomedical experiments, development of precision orbital flight, recovery and reconnaissance systems, and lunar impact. From this background of successful technical achievement the program would move to manned satellite flights, lunar flights and manned space exploration. This program was designed to lead to manned flight in approximately four to six years. (Memo, Col L. D. Ely, to Col C. H. Terhune, 23 Jan 59, subj: Astronautics Briefing by Aeronutronic Systems, Inc.)

22 Jan

Lt General S. E. Anderson, Commander, Air Research and Development Command, outlined the command concept of the missile division's space mission in answering General Schriever's proposals of 18 December 1957. Said Anderson: "It is our intention to make maximum use of the peculiar talents of your Division while at the same time bringing capabilities of all elements of the Command to bear upon the problems in this area." Therefore it was the view of the commander that the division should concentrate on "... the development and model improvements. . . of certain scheduled space systems to include both planning and management associated therewith." In application this policy meant that the division would in "certain instances perform technical developments in astronautics." The Deputy Commander for Research and Development at Command Headquarters was to retain

22 Jan 1958
(Cont'd)

over-all responsibility for formulation of the Astronautics Technical Development Program. (Ltr, Anderson to Schriever, 22 Jan 58, subj: Proposal for Future Air Force Ballistic Missile and Space Technology Development.)

22 - 24 Jan

The Air Research and Development Command convened a committee to prepare a final planning draft of an Air Force Astronautics Program for presentation to Mr. W. M. Holaday, Department of Defense Director of Guided Missiles. The Air Force proposed five year space program included development of research and test vehicles, satellite reconnaissance systems, a lunar based intelligence system, defense systems, logistic requirements of lunar transport, and strategic communications. If the program were accepted in its entirety, \$1.156 billion in initial funding would be needed in fiscal 1959. (Memo, Col L. D. Ely, Dir Tech Div, to Col C. H. Terhune, AFBMD, 28 Jan 58, subj: Trip Report.)

31 Jan

The Air Force invited the National Advisory Committee for Aeronautics (NACA) to participate in "a research vehicle program to explore and solve the problems of manned space flight." Specifically, the Air Force objective was to achieve the earliest possible manned orbital flight which would significantly contribute to development of "follow-on scientific and military space systems." An immediate decision was therefore necessary to determine the best approach to the design of an orbiting research vehicle--should it be a glide vehicle or one designed only to accomplish the satellite mission? Inasmuch as both NACA and the Air Force were well along in their investigations of the best approach to be taken in the design of a manned orbiting research vehicle it was suggested that, "These efforts should be joined at once and brought promptly to a conclusion." Accordingly NACA was invited to collaborate with Air Research and Development Command on an over-all evaluation of relevant space plans and projects and any program resulting from the joint evaluation would be, it was suggested, "managed and funded along the lines of the X-15 effort." Specific guide lines were furnished the Advisory Committee to facilitate its response to the Air Force request. (Ltr, Lt Gen D. L. Putt, DCS/D, Hq USAF, to Dr. H. L. Dryden, Dir NACA, 31 Jan 58, no subject.)

31 Jan 1958

Air Force headquarters instructed the Air Research and Development Command, in collaboration with the National Advisory Committee for Aeronautics to ". . . expedite the evaluation of existing or planned projects, appropriate available proposals and other competitive proposals with a view to providing an experimental system capable of an early flight of a manned vehicle making an orbit of the earth." Furthermore, it was asserted that it was "vital to the prestige of the nation that such a feat be accomplished at the earliest technically practicable date--if at all possible before the Russians." It was therefore important that the evaluation determine whether the objective of a manned space flight could be accomplished more readily under the Dyna Soar program or by means of an orbiting satellite. The minimum time to the first orbital flight and the associated costs were to be determined. The approach to this objective was also to furnish tangible contributions to the over-all Air Force astronautics program. Furthermore, the hazard accompanying such a flight was to be the minimum dictated by sound engineering and experimental flight safety practices. If at all possible, pilot safety was to be secured by furnishing an emergency escape system. (Ltr, Lt Gen D. L. Putt, DCS/D, Hq USAF, to Cmdr, ARDC, 31 Jan 58, subj: Advanced Hypersonic Research Aircraft.)

31 Jan

Air Research and Development Command headquarters directed the Wright Air Development Center to "investigate and evaluate" the quickest way to put a man in space and recover him. Since the crux of the problem was the obvious lack of large high performance booster, the center requested the assistance of the Air Force Ballistic Missile Division in finding a solution to the problem. (Chronological Space History, 1958, prep by AFBMD.)

Feb 1958

The National Advisory Committee for Aeronautics informed the Air Force that it was working on the design of a space capsule and would coordinate on the Air Force space program late in March when the design work was scheduled for completion. (DF, Lt Col C. C. Strathy, Ch Research and Tgt Sys Div, Dir of Systems Plans, Dep Cmdr for Weapon Sys, to Asst for Msls, Dep Cmdr for Weapon Sys, Hq ARDC, 25 Feb 58, subj: Man in Space; Outline History of Man-in-Space, R&D Program, 10 Nov 59, prep by Col J. L. Martin, Hq USAF.)

1 Feb 1958

Secretary of the Air Force James H. Douglas urged the Secretary of Defense to approve Air Force use of Thor missiles to boost test satellites into orbit before the close of the calendar year. The Secretary of Defense was also advised that in the face of the impending establishment of the Advanced Research Projects Agency (ARPA), the Air Force continue managing development of military space reconnaissance projects, first under the general direction of the Director of Guided Missiles and then under the general direction of ARPA. (Memo, SAF J. H. Douglas, to SOD, 1 Feb 58, subj: Reconnaissance Satellite.)

3 Feb

Experimental preliminary steps to a manned space program were directed by Air Force headquarters. The development command was assigned authority to develop a recoverable satellite and the first launch date was set for October 1958. The command was also instructed to conduct a moon impact program although the authority to conduct such a program had not yet been granted. Necessary planning action would be taken in order ". . . to expedite the program immediately upon approval from the Department of Defense." (Ltr, Brig Gen H. A. Boushey, DCS/D, Hq USAF, to Cmdr ARDC, 3 Feb 58, subj: Astronautics Program.)

7 Feb 1958

The Department of Defense established the Advanced Research Projects Agency to direct and conduct space research leading toward operational systems. In pursuit of these objectives the agency was authorized management of projects which would be conducted by military departments and it was also empowered to contract directly with individuals, private business organizations, scientific institutions and public agencies. (DOD Dir 5105.15, 7 Feb 58, subj: Department of Defense Advanced Research Projects Agency.)

10 Feb

Air Research and Development Command headquarters forwarded further instructions to the missile division as a guide to planning for a space program. The research command was to proceed, when Department of Defense approval was obtained, with development of a ballistic research and test system (WS 609A, later called Blue Scout), specifically designed to satisfy most research flight test requirements. In addition, the Thor missile was to be used as a booster for (1) "Able" re-entry tests; (2) recoverable satellites; (3) and moon impact. The latter program was not yet finally approved but planning

10 Feb
(Cont'd)

actions were authorized to "expedite this project immediately upon receipt of DOD approval" and \$1 million had been set aside to cover initial project costs. (Msg, RDX-2-1-E, Hq ARDC to AFBMD, 10 Feb 58.)

11 Feb

The ballistic missile division informed command headquarters that as many as 14 Thor boosters would be available during the calendar year for special purpose flights. These were tentatively allocated as follows: three were assigned to Phase I "Able" series flights, six were assigned to the program for recoverable satellites, and five were assigned to Phase II "Able" for continued development leading to a Thor ICBM capability. (For a time Thor plus a second stage and warhead was considered as a means of acquiring an early emergency ICBM inventory well ahead of Atlas and Titan.) However, only eight additional launchings could be scheduled through 1958--three for Phase I "Able", three for recoverable satellites to be launched one a month beginning in October, and two in support of Phase II "Able" precisely guided re-entry vehicles. Thus this appeared to be the maximum effort possible in the category of space related experimental flights essential to a more advance program. If a greater effort was desirable it would be necessary to obtain additional launching facilities, a problem that might be quickly and easily solved by modifying Navaho launch stands to accept Thor vehicles. (Msg, WDT 2-7-E, AFBMD to ARDC, 11 Feb 58.)

14 Feb

The Secretary of the Air Force forwarded to the Secretary of Defense, recommendations which "should be undertaken promptly by the Air Force." Other than the first project, converting Thor into an intercontinental range weapon by adding a second stage, the recommendations concerned the following space proposals: (1) develop and orbit a satellite equipped with a small television transmitter to furnish weather information. A Thor plus a second stage could accomplish the first orbital launch by September 1958. (2) Develop a recoverable satellite equipped to carry a variety of payloads which might be ejected from orbit by decelerating devices. This project would also use a Thor booster with an added Vanguard second stage which could be launched by July 1958. (3) A Thor-Hustler (later called Agena) second stage to launch a 300 pound scientific satellite by October 1958. (4) As previously recommended, the Air Force was prepared to launch a moon rocket by using a Thor plus two

14 Feb 1958
(Cont'd)

Vanguard upper stages. Said the secretary: "In addition to the scientific data that can be obtained from such a flight, the United States could make a major international psychological gain by beating the Russians to the moon. I urge that this Air Force approach be used." (Memo, SAF J. H. Douglas to the SOD, 14 Feb 58, subj: Thor and WS 117L Program.)

24 Feb

The Office of the Secretary of Defense Ballistic Missile Committee, then the final approval authority for all ballistic missile development programs, acted to include satellite programs with objectives of "political, scientific, psychological or military impact" within its review responsibilities. (Memo, D. W. Patterson, Chmn, OSD Ballistic Missiles Committee Alternates, to Executive Sec AFBMC, 24 Feb 58, subj: Submission of Items for OSD-BMC Consideration.)

24 Feb

Wright Air Development Center and Air Force Missile Development Center recommended industrial sources and provided the money to study and design a life support system for sustaining a man in orbital flight for 24 hours and for study, design and fabrication of orbital capsules equipped to carry and sustain the life of an animal passenger. WADC issued a purchase request valued at \$445,954 for procurement of the study. (Chronological Space Hist, 1958.)

26 Feb

Air Force headquarters again affirmed its strong support of a program to demonstrate at the earliest possible date a "capability to launch a satellite and to follow as soon thereafter as practicable with a shot to the moon." Until such time as the Department of Defense approved early satellite launchings in support of 117L, and launch of a moon impact payload, the research command was directed to "take all actions necessary to be in position to accomplish both projects at the earliest time feasible." The command was further advised to design the first satellite as simply as possible and consider it a "warm up for subsequent more sophisticated vehicles." Simplicity and an early launch date were considered more important than demonstrating a capability to recover payloads or otherwise demonstrate an advanced state of competence. (Msg, AF'CVC 56978, Hq USAF to ARDC, 26 Feb 58.)

28 Feb 1958

Advanced Research Projects Director, Mr. R. W. Johnson declared the Air Force had a ". . . long term development responsibility for manned space flight capability with the primary objective of accomplishing satellite flight as soon as technology permits." In pursuit of this objective the Air Force was told to develop a Thor booster with a suitable second stage vehicle "as an available device for experimental flights with laboratory animals." Provision for the recovery of the orbiting animals in "furtherance of the objective of manned flight" was also authorized. (Memo, R. W. Johnson, Dir, ARPA, to SAF, 28 Feb 58, subj: Reconnaissance Satellites and Manned Space Exploration.)

3 Mar

The Secretary of Defense approved acceleration of the 117L military satellite system, including test vehicles launched with the Thor booster--a series of orbital experiments that were also considered preliminary to a man in space program. The ballistic missile division was instructed to submit a complete development plan and fiscal estimate by 15 March 1958 for "review and approval." (Msg, AFCVC 57197, Hq USAF to Hq ARDC, 3 Mar 58.)

4 Mar

The Air Force Chief of Staff directed that space projects which depended on the use of ballistic missile components ". . . will be administered in the same manner and by the same procedures as the ICBM/IRBM programs." The decision process would be identical and, as in the "ballistic missile programs, approved development plans will constitute action documents." (Memo, Maj Gen J. E. Smart, AF Asst Vice Chief of Staff, to Air Staff distribution, 4 Mar 58, subj: Space Projects Involving ICBM/IRBM Components.)

5 Mar

The Office of the Secretary of Defense, in the first significant forward step to accelerate development of a space capability, reiterated the space role of the Air Force by stating that in addition to its missile programs the Air Force was responsible for the 117L system and ". . . has a recognized long term development responsibility for manned space flight capability with the primary objective of accomplishing satellite flight as soon as technology permits." Furthermore, the Air Force was told it was to carry forward and accelerate the Atlas 117L project "under the highest national priority in order to attain an initial operational capability in the earliest possible date."

5 Mar 1958
(Cont'd)

But the proposed interim system using a Thor booster combined with a second stage and recoverable capsule "should not be pursued." The Department of Defense did agree that a Thor booster with a suitable second stage "may be the most promptly and readily available device for experimental flights with laboratory animals" and development of such hardware including a system for recovery of animals was authorized. (Msg 03-014, Cmdr ARDC, to Cmdr AFBMD, 5 Mar 58.)

8 Mar

The Air Force Ballistic Missile Division proposed an over-all space objective about which all other experimental projects would be oriented. This goal was briefly stated as "Manned Space Flight to the Moon and Return." To achieve this ultimate accomplishment many other space projects and programs would be necessary. The final goal would furnish an objective and a means to develop an integrated space program instead of isolated space ventures whose value might be unrelated to any national purpose. Admittedly, achieving this goal would require much preliminary work and completion of the following programs:

- Instrumented Satellite Flights and Return
- Animals in Satellite Orbit and Return
- Biomedical Experiments in Satellite Flights
- Man in Satellite Orbit and Return
- Instruments and Equipment Around Moon and Return
- Animal Around Moon and Return
- Instrumented Hard Landing on Moon
- Instruments-Equipment Soft Landing on Moon and Return
- Animal Soft Landing on Moon and Return
- Man Around Moon and Return
- Manned Landing on the Moon and Return

(Memo, Col L. D. Ely, to Col C. H. Terhune, 8 Mar 58, subj: Meeting with Hq ARDC Biomedical and Behavioral Sciences Panels, 10-12 Mar.)

10-12 Mar

An Air Research and Development Command meeting held at the ballistic missile division to prepare an abbreviated development plan for the man in space program. The general Air Research and Development Command headquarters outline of the immediate planning task centered about designing a manned vehicle within a weight limitation of 2,700-3,000 pounds which would have to contain a man, a life support system with a capacity to

10-12 Mar 1958
(Cont'd)

remain aloft for 48 hours, telemetry-communications, and a recovery system. The Air Force Ballistic Missile Division approach was directed to a more distant goal, "Man on the Moon and Return." By the second day of the conference general agreement on program objectives had been reached. Technical recommendations included selection of an improved thrust Thor with a fluorine-hydrazine second stage, 2,700-3,000 pound spacecraft and a General Electric guidance system. As then planned the complete experimental and test program would require approximately 30 Thor boosters, 8 to 12 Vanguard second stages and about 20 fluorine-hydrazine second stages for testing and advanced phases of the program. By the third day an abbreviated draft development plan had been completed. The conference was pervaded by a strong sense of urgency, motivated by the dramatic Air Force mission to get a man in space at the earliest possible time. Those attending the conference anticipated accelerated program approval and scheduled contractor selection to begin on or about 10 April 1958. (Memo, Col C. H. Terhune, Dep Cmdr, Tech Operations, to Maj Gen B. A. Schriever, Cmdr, AFBMD, 25 Mar 58, subj: Man in Space Meeting at AFBMD, 10-12 March 58.)

14 Mar

Air Research and Development Command submitted to Air Force headquarters a Man-In-Space abbreviated development plan. (Chronological Space Hist, 1958, prep by AFBMD.)

19 Mar

Air Force Undersecretary, M. A. MacIntyre, submitted to the Advanced Research Projects Agency Fiscal 1959 budget requirements if the Air Force man in space program was to meet its mid-1960 operational date:

<u>Budget Category</u>	<u>Amount(millions)</u>
P-100 Aircraft and Missiles	\$82.0
P-200 Support	\$11.5
P-300 Construction	\$ 2.5
P-600 Research and Development	\$37.0
Total	<u>\$133.0</u>

19 Mar 1958
(Cont'd)

If this amount was not fully funded the following projects could be progressively undertaken, but the first manned capsule launch would be delayed to some future date: (1) Development of small animal carrying capsules for use in the 117L program starting November 1958 - \$16 million. (2) Construction of launch pad assembly buildings and instrumentation modifications - \$5 million. (3) Design of man size capsule, second stage booster; development, procurement, test of support test vehicles - \$30 million. (4) Fabrication of a small number of capsules, second stages and boosters - \$15 million. (5) Design, development, test and procurement of capsules, second stages, boosters and support test vehicles leading to the earliest possible manned space flight - \$67 million. (Memo, Undersecretary of the Air Force, M. A. MacIntyre, to Dir, ARPA, 19 Mar 58, subj: Air Force Man-In-Space Program.)

26 Mar 1958

The President's Science Advisory Committee affirmed that development of "space technology" was required by, "human curiosity, scientific knowledge, the maintenance of national prestige, and the defense of the United States. This was the first official declaration by the government that space was of military significance, but there was still no evaluation of space as a realm of military operations." (Bowen, Threshold of Space, p.14.)

31 Mar

Major General B. A. Schriever, Ballistic Missile Division Commander, directed the preparation of a development plan for a full scale manned military space systems program. The goal of the program was to achieve a manned flight to the moon and return. (Chronological Space Hist, 1958.)

2 Apr

President Eisenhower sent to Congress a detailed recommendation for a national space program. The President, basing his recommendation on the March 26th report of his Science Advisory Committee, stated it was essential that the nation adopt the program because it represented the next step forward in man's compelling urge to explore and discover, it would develop space technology essential to our defense, enhance our national prestige, and furnish the nation new opportunities for scientific observation and experiment which would add to man's "understanding of the earth, the solar system and the universe." The President therefore advised Congress

2 Apr 1958
(Cont'd)

that a National Aeronautics and Space Administration be created to furnish, "a civilian setting for administration of space functions [which] will emphasize the concern of our nation that outer space be devoted to peaceful and scientific purposes." (History, Hq ARDC, 1 Jan - 31 Dec 1958, p. 13; Max Rosenberg, The Air Force in Space, 1959-1960, dtd Jun 62, USAF Hist Div Liaison Ofc, p.3.)

4-5 Apr

Representatives from Air Research and Development Command headquarters and from centers throughout the command were requested to assemble at the missile division by 9 April to constitute a task force to prepare development planning data for a manned space program. (Chronological Space Hist, 1958.)

8 Apr

The Air Research and Development Command informed the National Advisory Committee for Aeronautics that it had initiated a 30 day effort at the ballistic missile division to prepare a detailed development plan for "an extended manned space vehicle program of which man in space at the earliest practicable date is an integral part." The advisory committee was invited to participate in the preparation of the plan and to advise the Air Force of their anticipated action. (Msg, 04-9-01, Cmdr, ARDC, to Cmdr AFBMD, 9 Apr 58.)

21 Apr

Air Force Ballistic Missile Division presented briefings on the manned Military Space System Development Plan to higher Air Force and Department of Defense authorities in Washington, to Air Research and Development Command headquarters, the Vice Chief of Staff, and R. W. Johnson, Director of the Advanced Research Projects Agency. (Chronological Space Hist, 58.)

23 Apr

The Air Force launched a research test rocket which carried a mouse in the re-entry vehicle. This was the first small beginning of a research program to determine the requirements of a space life support system. (Msg, SAFIS-3C 47151, SAF to AFBMD, 29 Apr 58.)

25 Apr

The Air Force Ballistic Missile Division published the first development plan for an Air Force Manned Military Space Systems Program. The objective was to "... achieve an early capability to land a man on the moon and return him safely to earth." The program represented

25 April 1958
(Cont'd)

a reasonable level of accomplishment with a minimum of time and money and called for start of a high priority program (similar to that enjoyed by ballistic missiles) characterized by "concurrency" and single Air Force agency management. The complete program would be carried out in four phases: first, "Man-In-Space-Soonest," was to determine functional capabilities and limitations of man in space by means of earth orbital flights--beginning with an instrumented 2,900 pound re-entry body, then a primate passenger and, finally, a manned capsule. The second, designated "Man-In-Space-Sophisticated," would use a drag type 3,200 pound re-entry vehicle, capable of a 14 day manned space flight. This device would be used for earth orbital flight only but it would perform experiments essential to the final phase of the lunar program. The third phase, "Lunar Reconnaissance," would explore the moon by television camera and by means of a soft landing of an instrumented package on the moon's surface. The final phase of the projected program was "Manned Lunar Landing and Return," which would first test equipment by circumlunar flights returning to earth with instrumented capsules containing animals. At this stage of project development payload capacity would be increased to 9,000 pounds. The spacecraft would then undertake a full scale flight to the moon and safe return to earth with an animal passenger. The climax of the entire project would then be a manned lunar landing, brief surface exploration, and return to earth. This would be followed by other circumlunar flights to fully explore the moon's surface and gather additional physical data. The program was scheduled for completion in December of 1965 at a total estimated cost of \$1.5 billion. Program cost estimates were based on use of Air Force rocket hardware and available ground facilities thus eliminating much new development and construction funding. However, new launch vehicle combinations would have to be developed progressing in performance as follows: a Thor-Vanguard second stage, a Thor-fluorine second stage, a "super" Titan with a fluorine-hydrazine second and third stages. Methods of landing involved use of retrorockets to insure a soft landing on the moon and return to earth through re-entry to a predetermined landing area. (USAF Manned Military Space System Development Plan, 25 Apr 58, prep by AFBMD.)

28 Apr

The director of the Advanced Research Projects Agency received a brief review of the Air Force proposed man in space program. This meeting also produced an

28 Apr 1958
(Cont'd)

arrangement to have the man in space development plan reviewed by the Secretary of the Air Force and Chief of Staff prior to its formal presentation to the Advanced Research Projects Agency. The director also expressed interest in ". . . the early recovery of a small chimpanzee from orbit as a prelude to man in space." Such a flight not only would have significant scientific value but a considerable amount of psychological value as well. Therefore the missile division was requested to analyze the value of developing a small capsule for a chimpanzee orbital flight test in addition to the man-sized capsule and to estimate the cost and possible timing of such a program. (Msg 04-29-01, Hq ARDC, to Cmdr, AFBMD, 29 Apr 58.)

30 Apr

An AVCO-Convair contractor team submitted to the Air Force an unsolicited proposal for development of a manned satellite at the earliest possible date. The proposed system was built around an Atlas booster, no second stage, mounting a light double walled capsule which would rely on a steel mesh drag chute for deceleration and recovery. The proposal was analyzed by Air Force space specialists who concluded that the plan was feasible but offered little margin for error. Furthermore, weight estimates were optimistic, its orbital endurance and altitude were low and it possessed no growth potential although use of Atlas as a booster appeared to have merit. Air Force Ballistic Missile Division felt adoption of the proposal would only gain three or four months over the much more versatile Thor-fluorine combination vehicle which would also be free from the major limitations inherent in the AVCO-Convair proposal. (Memo, Col J. D. Lowe, AFBMD. to Col H. Evans, AFBMD, 16 May 1958, no subject.)

2 May

The missile division published its second Man-In-Space Development Plan. This plan concentrated on the first phase of the over-all manned lunar program, designated "Man-In-Space-Soonest." During this phase of project development the launch vehicles would be a Thor-Vanguard combination for instrumented tests, and a Thor-fluorine second stage combination for the manned flights. This plan, if approved, would place a man in a 150 nautical mile orbit by October 1960 at an approximate cost of \$120 million. (USAF Manned Military Space System Development Plan, 2 May 1958, prep by AFBMD)

9 May 1958

Data on bio-medical aspects of man in space were to be provided through experiments planned in the 117L program. Design, development, and fabrication of five animal containers, and associated environmental control and telemetry equipment was planned under a fiscal 1959 117L budget item of \$1.3 million. In addition, \$4.7 million was allocated for specialized checkout equipment, recovery devices, beacons, and necessary recovery operations for bio-medical specimens. (Ltr, Lt Gen S. E. Anderson, Cmdr, ARDC, to Cmdr, AFBMD, 22 May 58, subj: Support of Bioastronautics Program; Chronological Space Hist, 1958.)

15 May

On instructions from command headquarters, the ballistic missile division prepared several funding alternatives to meet the amount of money that might be realistically budgeted for the manned space program. These were sorted out at four levels: (a) \$100 million fiscal 1959 appropriation which reduced the test program for Thor-Vanguard vehicles but maintained the October 1960 date for the first manned space flight; (b) a \$90 million program for the same number of vehicles but postponing the first manned flight from October 1960 to April 1961; (c) a \$90 million high risk effort incurred by deleting four more vehicles from the program and retaining the October 1960 launch date; (d) a \$75 million program with the same number of vehicles as (c) but delaying the first manned flight date to October 1961. (Memo, Col C. H. Terhune, Dep Cmdr, Tech Operations, AFBMD, to Maj Gen B. A. Schriever, Cmdr AFBMD, 15 May 58, subj: Revisions to the Man-In-Space Development Plan.)

15 May

Acting on directions from General Schriever, the missile division staff prepared to establish a fluorine propulsion program. This development was to support the manned military space system, particularly the Man-In-Space-Soonest effort which was to use a Thor-fluorine second stage. The first action was to arrange a meeting of Air Force, North American Aviation and Bell Aircraft propulsion specialists to determine the status of their fluorine propulsion programs, funds available and overall development expectations for fluorine propulsion systems. (Chronological Space Hist, 1958.)

19 May

Air Force Ballistic Missile Division completed its third Man-In-Space Development Plan which was similar to the

19 May 1958
(Cont'd)

other two plans except it contained additional fiscal 1959 funding alternatives; i. e. , \$100 million; \$90 million; \$75 million or \$67 million. It was clearly apparent that a major stumbling block to Air Force manned space program approval was its high cost, particularly for development of a new fluorine second stage. (Commander's Reference Book, "Chronology of Man-In-Space Effort, 23 Mar 59.)

20 - 21 May

The ballistic missile division briefing on Man-In-Space-Soonest was presented at Air Research and Development Command headquarters, to General C. E. LeMay and members of the Air Staff, and to Air Force Undersecretary M. A. MacIntyre and Assistant Secretary R. E. Horner. Favorable reception was accorded the briefings and the command was assured that adequate funding, "somewhere between seventy-five and one hundred million dollars" would be allocated the program for fiscal year 1959. The briefing to MacIntyre and Horner evoked a specific suggestion that an ICBM be used as a booster in lieu of developing a second stage for the Thor. The division was allowed two weeks to prepare a plan using an Atlas booster and bring it to Washington for secretarial review. (Memo, Col H. L. Evans, Asst Dep Cmdr, Space Sys, to Col C. H. Terhune, 23 May 58, subj: Trip Report.)

21 May

In an attempt to define more clearly the role of the ballistic missile division in space projects, Major General B. A. Schriever, division commander, outlined his understanding that he was assigned initial responsibility for "planning, initiating and managing the Manned Military Space System Program." Planning had advanced to the point of contractor selection, awaiting only allocation of sufficient funds to begin the Man-In-Space-Soonest program. Moreover, General Schriever was arranging to meet with Dr. H. L. Dryden of the National Advisory Committee for Aeronautics, ". . . at the earliest practicable time," to establish the highest level of support and mutual cooperation possible. Working level conferences were already underway to develop concrete application of this cooperative interest in the program. It was also intended that other organizations were to be used as appropriate to "insure maximum utilization of the Air Research and Development Command's Resources." (Ltr, Maj Gen B. A. Schriever, Cmdr, AFBMD, to Lt Gen S. E. Anderson, Cmdr, ARDC, 21 May 58, no subject.)

28 May 1958

Air Force Ballistic Missile Division completed its fourth Man-In-Space Development Plan, which, in the form of charts rather than a formal publication, proposed use of the Atlas booster plus a second stage consisting of a Lockheed Hustler (second stage of the 117L, later called Agena) to place a man in a 150 nautical mile orbit during October 1960. Cost for this project was estimated to be \$106.11 million for fiscal 1959. The plan was briefed at command and Air Force headquarters, as well as the Air Force secretariat level. (Chronological Space Hist, 1958.)

31 May

Washington discussion of the Air Force Man-In-Space proposal continued to ferment without any sign of the approval necessary to start the program. The Advanced Research Projects Agency indicated general agreement with the Air Force space development plan and the National Security Council Planning Board displayed a "feeling of great urgency to achieve animal flights in space with safe return and to achieve the Man-In-Space-Soonest at the earliest possible date." Other than this nebulous progress the Air Force man in space effort was no nearer realization. (Memo, Col H. L. Evans, Asst Dep Cmdr, Space Sys, to Col C. H. Terhune, 31 May 58, subj: Trip Report.)

Jun 1958

The Air Force obtained Advanced Research Projects Agency approval to proceed with study contracts on space life support systems--ecological aspects of the manned space capsule environment were to be investigated and the study effort was to include construction of a mockup. Two three month contracts totaling \$740,000 were awarded to North American Aviation and General Electric for life support system development. (Rpt, Comparison of NASA Manned Space Program and USAF Manned Military Space Proposal, 25 Feb 60, prep by AFBMD.)

6 Jun

Air Research and Development Command headquarters established a post of Special Assistant for Bio-Astronautics to the Deputy Commander for Ballistic Missiles. Life sciences personnel were to be placed on temporary duty with, or assigned to the ballistic missile division and authorized to make appropriate decisions. Command headquarters was to be informed of all decisions and through monthly reports maintain cognizance of development, fabrication, testing and scheduling of the

6 Jun 1958
(Cont'd)

life sciences portion of the over-all program. The Aeromedical Laboratory at Wright Air Development Center; USAF School of Aviation Medicine; and Aeromedical Field Laboratory of Air Force Missile Development Center were designated points of contact for weapon systems management organizations and contractors concerned with the life sciences experiments and hardware development. (Chronological Space Hist, 1958.)

13 Jun

A conference was scheduled at Air Force headquarters on 25-26 Jun 1958 to discuss the "over-all problems of the manned satellite development program." The conference was sponsored by the Advanced Research Projects Agency with representatives of the National Advisory Committee for Aeronautics, Air Research and Development Command, Air Force Ballistic Missile Division, Space Technology Laboratories, and Convair invited to the meeting. Questions to be attacked were: Could the booster be an Atlas without a second stage? What would be the subsystem distribution of payload weight? What was Atlas maximum payload weight performance? The question of ablation or heat sink capsule design was to be resolved before the conference. If it was concluded that Atlas weight lifting performance was inadequate an alternate choice would be the Atlas with a 117L second stage. Complete funding plans covering program options were to be available to the conferees. (Msg, AFDRD 51947, Hq USAF, to Hq ARDC, 13 Jun 58.)

13 Jun

The ballistic missile division informed command headquarters that reducing the orbit of a manned spacecraft from 150 to 100 nautical miles would either significantly (by 50 percent) increase the number of stations needed for tracking and control of the manned satellite or decrease the reliability and length of contact appreciably. Also on this same date, the missile division agreed to prepare a revised manned space program which scheduled its first manned flight in April 1960--moving the date up from October by six months--by using an Atlas D booster (Chronological Space Hist, 1958.)

15 Jun 1958

A draft revision of the Man-In-Space-Soonest development plan was prepared. This plan proposed use of an Atlas booster to place a man in 115 nautical mile orbit during April 1960. In event the performance was not up to lifting the required payload weight, a 117L or a Vanguard second stage would be added.

15 Jun 1958
(Cont'd)

Costs were estimated at \$99.3 million for Atlas alone, \$105 million with a Vanguard second stage (AJ 10), and \$139.51 million if a 117L vehicle were used as the second stage. (Chronological Space Hist, 1958.)

16 - 26 Jun

Air Force Ballistic Missile Division presented its fifth Man-In-Space-Soonest development plan to Washington decision points in the Air Force and Office of the Secretary of Defense. The division was instructed to complete its plans for an Atlas vehicle plus a second stage as a backup in the event the Atlas could not handle the job alone. (Chronological Space Hist, 1958.)

19 Jun

The Advanced Research Projects Agency had not yet directed a "go ahead" for the man in space program. However, Air Force headquarters considered it a certainty that direction of an Atlas boosted manned space flight would be given to the Air Force at an early date, that funds for the project would probably total \$66 million and that a series of Thor boosted, instrument and animal capsule flights would precede the Atlas full sized instrumented capsule, chimpanzee, and manned shots. The Air Force would probably re-program to obtain whatever additional funds were required to support the program. The ballistic missile division was advised that while waiting for an authoritative "go ahead" it should continue preparation of work statements for industry competition and contractor selection so they might be coordinated with the Advanced Research Projects Agency and the National Advisory Committee for Aeronautics. (Ltr, Maj Gen J. E. Smart, Asst V/CS, to Lt Gen S. E. Anderson, Cmdr ARDC, 19 Jun 58, no subject given, quoted in TWX, RDZGW-6-33-K, Hq ARDC, to Hq AFBMD, 27 Jun 58.)

23 Jun

A contract was signed with General Electric Company for research and development of a life support system for the space cabin of an orbital vehicle. (Cmdrs Ref book, "Chronology of Man-In-Space," 23 Mar 59.)

24 Jun

Inasmuch as availability of basic booster units threatened to limit selection of the most desirable space programs, the Secretary of the Air Force authorized an increase in missile production as follows: four more Thor boosters, delivery to begin in December

24 Jun 1958
(Cont'd)

1958 at a rate of one a month; four more Atlas boosters, delivery to begin in May 1959 at a rate of one a month; and \$8 million budgeted to the Advanced Research Projects Agency for procurement of four additional Lockheed 117L vehicles, delivery to begin January 1959 at a rate of one a month. (Memo, SAF to C/S USAF, 24 Jun 58, no subject.)

30 Jun

Space Technology Laboratories was requested to submit a proposal to perform system engineering and technical direction of the Air Force man in space program based on the Air Force Ballistic Missile Division's work statement. In event program authorization was received prior to completion of the proposal, work would begin under a letter contract. Pending receipt of such approval, the contractor's work on Man-In-Space-Soonest program would be confined to technical staff assistance, a function it was performing as a technical requirement of the existing contract. (Chronological Space Hist, 1958.)

10 Jul 1958

The Advanced Research Projects Agency addressed two questions to the research and development command: Would the Air Force accept a 110 nautical mile orbit instead of 150 nautical miles for the manned space flight? What degree of program accomplishment could be obtained with a fiscal 1959 program of \$50 million based on an Atlas-117L second stage? (Chronological Space Hist, 1958.)

12 Jul

Air Force Ballistic Missile Division answered the two questions forwarded on 10 July. The division understood that the Advanced Research Projects Agency was disposed to favor the Convair-AVCO proposal to complete the Man-In-Space-Soonest Program. Under this assumption 150 nautical miles would be the minimum altitude for technical and economic reasons. Although the division would not choose to drop to a \$50 million level for fiscal 1959, if it were directed to do so it could prepare the planning in time for a briefing to the commander of Air Research and Development Command by 15 August 1958. A manned orbital flight under such a program would not be possible until late in calendar year 1961 or early 1962. The division requested that command headquarters issue confirming instructions and additional guidance. (Chronological Space Hist, 1958.)

24 Jul 1958

Air Force Ballistic Missile Division published its sixth Manned Military Space System Development plan which proposed a single Atlas booster, but with a back-up program for a second stage (either 117L or AJ 10), to place a man in a 150 nautical mile orbit in June 1960. The cost to carry out this plan was estimated at \$106.66 million for fiscal 1959. (Chronological Space Hist, 1958.)

24 Jul

Major General B. A. Schriever, missile division commander, recommended slipping the target date for the first manned flight from April to May 1960 because of continued delay in approving the Man-In-Space program. Work statements had been initiated for all aspects of the program and the Air Force was studying the Ground Based Information System (tracking and control network) and the heat sink versus ablation problem, while Convair, Aerojet-General and Lockheed were studying the design of the backup second stage. Source selection had been established to evaluate prospective contractors to submit proposals for a small capsule. Invitations to the request for proposals briefing would be dispatched within 24 hours after program approval and commitment of funds. Requests for proposals were also being prepared on system assembly tests and a large capsule design. To forestall further program slippage, Schriever made the following recommendations: immediate approval of Man-In-Space-Soonest at a level of \$106.6 million for fiscal 1959; grant \$31.92 million immediately for first quarter commitment; remainder of second quarter funds, \$21.85 million, be released by 1 October and the third and fourth quarter funds of \$52.89 million be available by 1 January 1959. Finally, the program should be assigned a priority commensurate with the urgency of the man in space mission. (Ltr, Schriever to Anderson, 24 Jul 58, subj: Actions Required for Man-In-Space-Soonest Program.)

24 - 25 Jul

Air Force Ballistic Missile Division representatives again presented a series of Washington briefings to Lt General S. E. Anderson, Commander, Air Research and Development Command; the Air Staff; Secretary of the Air Force and Staff; and Director Roy Johnson, of the Advanced Research Projects Agency. The latter presentation, in addition to reporting detailed man in space planning, requested prompt program approval

24 - 25 Jul 1958
(Cont'd)

and emphasized the urgency of firm funds commitment if further delay was to be avoided. Johnson's response to the briefing may be summarized as follows: (a) the man in space program would not be approved at this time; (b) it appeared that \$50 million would be an optimistic estimate of man in space funding until the Space Council, authorized by recent legislation, was organized and working, an event that was not probable before Thanksgiving; (c) planning anything over a \$50 million program, the maximum likely to be approved under any circumstances, was wasted effort; (d) statements of prominent scientists had convinced the White House there was no currently valid reason for Man-In-Space; (e) when the Space Council became a viable organization, man in space would probably become a joint effort of the Advanced Research Projects Agency and the National Advisory Committee for Aeronautics; (f) The National Advisory Committee for Aeronautics (the National Aeronautics and Space Act creating the National Aeronautics and Space Administration was to become law on 29 July 1958) was already thinking of an independent but very similar space program that would cost about \$40 million in fiscal 1959. After these two days of briefings it was clear that quick approval of a military man in space program was not forthcoming. (MFR, Col J. D. Lowe, Ch, Space Sys Div, AFBMD, 30 Jul 58, subj: MISS Briefing to Hq ARDC, Hq USAF, the Secretary of the Air Force and ARPA on 24-25 July 1958.)

29 Jul

The President signed the law by which the National Advisory Committee for Aeronautics would be succeeded by the National Aeronautics and Space Administration with an expanded role of peaceful exploitation of space. The new agency would have custody of all space programs except those clearly oriented toward military objectives. Air Force headquarters obtained approval of the Office of the Secretary of Defense to establish within the Deputy Chief of Staff, Development, a Directorate of Advanced Technology. Brigadier General H. A. Boushey was appointed director of the new office and its primary function, although the words "space" and "astronautics" were conspicuously absent from its mission description, was to serve as the control point for all Air Force space projects. (Bowen, The Threshold of Space, p. 21.)

29 Jul 1958

Despite mounting evidence that the Air Force would not be assigned management of any national lunar program, it continued to press for a manned space program. On this date there was a meeting of Dr. Dryden, National Advisory Committee for Aeronautics; Mr. R. Johnson, Advanced Research Projects Agency; and Secretary of Defense Neil McElroy but future management of a manned space program was not resolved and it appeared that resolution would only be attained at the Presidential level. It was assumed, however, that the Air Force would have at least \$50 million in fiscal 1959 funds to further its space program. (MFR, Col J.D. Lowe, AFBMD, 29 Jul 58, subj: Man-In-Space Program, cited in Chronological Space Hist, 1958.)

30 Jul

Air Force headquarters forwarded the following instructions and request for information to the Air Research and Development Command: the Man-In-Space Program was to be programmed at a fiscal 1959 level of \$50 million. The level of expenditures was to be scheduled so that acceleration would be possible on 1 December 1958 if additional funds were forthcoming or if they were not, the program could be funded in an orderly manner through the remainder of the year. The research and development command should also seek to answer the question: Why should the military furnish the first man in space? (Msg, AFDAT 53918, Hq USAF to Cmdr ARDC, 30 Jul 58, cited in Chronological Space Hist, 1958.)

30 Jul

The military services and particularly the Air Force found their space prospects disheartening. Obviously the military services no longer controlled development of space vehicles and programs. Through fiscal 1958 all space programs had been managed by the Department of Defense through the Advanced Research Projects Agency. The new fiscal year offered little hope for change and, on 29 July, the President ordered transfer to National Aeronautics and Space Administration of non-military space programs such as lunar probes, scientific satellites, and the Vanguard project. (Bowen, The Threshold of Space, p. 28.)

2 Aug 1958

The first successful flight test of a Series B Atlas missile. This was also the first successful staging of a long-range missile. (AF Ballistic Missiles Program Status Report.)

11 Aug

General Schriever summarized the status of Air Force Manned Military Space Systems by pointing out that a series of man in space programs had been developed, each with different ground rules, without discernible progress toward an approved program. Moreover, Air Force Ballistic Missile Division was currently preparing an abbreviated development plan, based on a fiscal 1959 level of \$40 million. National Aeronautics and Space Administration cooperation in planning the program was worthwhile but it did not bring the Air Force any closer to an active development effort. In all probability this situation would prevail until high level civilian and military management relationships and certain national policy questions were settled. Since the director of the civilian space agency had now been named an "early high level meeting to resolve problems" was suggested. (Msg, AFBMD to ARDC, 11 Aug 58, cited in Chronological Space Hist, 1958.)

19 Aug 1958

AVCO briefed Brigadier General H. A. Boushey, Director of Advanced Technology, Headquarters USAF. The company proposed--as it had on previous occasions--a metal drag brake system as a technique for re-entry. The proposal appeared especially attractive to the Advanced Research Projects Agency staff and the Air Staff because of its apparent potential versatility in terms of military applications. The Air Research and Development Command was directed to proceed immediately with a technical evaluation of the proposal and the Defense Department seriously considered supporting a project which would test AVCO's concept. The ballistic missile division preferred the solution to the re-entry problem offered in the man in space technical plan--which appeared to be in the process of being absorbed by the civilian space agency; evidence of the plan's technical validity. Beyond these developments there was no change in the status of the military space program and the likelihood of the Advanced Research Projects Agency accepting even a scaled down fiscal 1959 appropriation of \$40 million in support of the military space effort appeared, in the words of Johnson, "to be less than 50 - 50." (Msg RDZGW 8-25 -E, Hq ARDC, to AFBMD, 21 Aug 58.)

Sep 1958

While the future of the proposed Air Force space program was uncertain it was evident that the creation of the Advanced Research Projects Agency and the National Aeronautics and Space Administration had stimulated a re-examination of the nation's space objectives and goals. It also appeared probable that no final over-all space program would be adopted until the large area of overlapping jurisdiction between the two agencies was sorted out. In addition, the Department of Defense was required to transfer some \$117 million in fiscal 1959 funds to the National Aeronautics and Space Administration of which \$58.8 million was Air Force money. Thus it appeared that of the various proposed programs already within National Aeronautics and Space Administration's legitimate area of interest it might well take over the man in space program primarily because it had the money to undertake its development. In respect to the lunar probe program, the Air Force had to wait for further direction before proceeding further. The large booster (one million pound thrust) authorized for Air Force development was transferred to the civilian space agency. The Air Force would continue development of the 117L system under the over-all direction of the Advanced Research Projects Agency. (Memo, Col C. R. Roderick, Committee Liaison Div, Ofc of Legislative Liaison, to Asst Dir, Legislative Liaison, Sep 58, no subj.)

11 Sep 1958

Air Force Ballistic Missile Division published the seventh Manned Military Space System Development Plan. The word "Soonest" was conspicuously absent from the title. The plan contained no startling innovations but reduced the program to fit fiscal 1959 anticipated expenditures of \$40 million with no second stage backup. The first manned flight was scheduled for December 1960. (Ltr, Brig Gen O. J. Ritland, V/Commander, AFBMD, to Commander, ARDC, 15 Sep 58, subj: Man-In-Space Program.)

12 Sep

The ballistic missile division reorganized to meet the demands of new military space programs. The deputy commander organizational structure, under which the division carried out its development mission and support functions, was enlarged to four deputy commanders--one each for ballistic missiles, military space systems, installations, and resources.

12 Sep
(Cont'd)

(Hist, The Space Systems Division--Background
(1957-1962), Feb 63, prep by SSD Hist Div.)

15 - 26 Sep

Evaluation of life support Phase I contractor efforts at North American Aviation and General Electric was completed. The studies of both contractors were considered excellent. The contract winner, however, was not announced because the National Aeronautics and Space Administration was taking over the manned space program. The mockup of the manned capsule developed by North American Aviation, together with associated technical data was, subsequently, delivered to the civilian agency's Space Task Group at Langley Research Center. (Rpt, Comparison of NASA Manned Space Program and USAF Manned Military Space Proposal, 25 Feb 60, prep by AFBMD; Cmhrs Ref Book, 25 Mar 59.)

17 Sep 1958

A joint Manned Satellite Panel was established by the Advanced Research Projects Agency and the National Aeronautics and Space Administration. (Rpt, Comparison of NASA Manned Space Program and USAF Manned Military Space Proposal, 25 Feb 60.)

8 Oct

A National Aeronautics and Space Administration Space Task Group was organized to direct and conduct Project Mercury. (Ibid.; J. M. Grimwood, Project Mercury, A Chronology, 1963, NASA MSC Publication HR-1.)

23 Oct

The first of a series of meetings between the Space Task Group and Air Force Ballistic Missile Division was held to define support required by the civilian space agency. The scope of the manned space effort, its booster requirements, procurement procedures, launch schedules and facilities, were defined. The missile division also needed to define the extent of its own role in the Mercury program. Control of booster procurement, scheduling use of scarce ground and launch facilities in the face of possible interference with ballistic missile development, and the desire to use the existing Air Force Ballistic Missile Division/Space Technology Laboratories management structure in carrying out the support role were some of the questions and policies to be resolved. The first meeting was exploratory in nature;

23 Oct 1958
(Cont'd)

the missile division indicated its complete support of the Mercury program insofar as it did not interfere with the missile development effort; the space agency indicated its desire to procure boosters through, and use as much of Air Force Ballistic Missile Division's resources and capabilities as possible. (Rpt, AFBMD Support, Project Mercury, Dec 1960, prep by AFBMD Space Div (WDZ.)

29 - 30 Oct

A second Space Task Group - Air Force Ballistic Missile Division meeting, held at Langley Research Center, continued the task of developing a coordinated Project Mercury effort. The space agency offered a tentative launch and test program and the missile division assisted in preparing a development plan. Schedules, operating procedures, funding and general allocation of responsibilities were discussed but the meeting was not marked by any major agreements. (Rpt, AFBMD Support, Proj Mercury, Dec 1960 prep by AFBMD Space Div (WDZ.)

15 Nov

At the request of John W. McCormack, Chairman of House Committee on Aeronautics and Space Exploration, Major General B. A. Schriever prepared a paper, "Space Development Capabilities 1958-1968" which eloquently projected space advances and goals over the next decade. Schriever pointed out that above developments in any other technical area "... improvements in rocket thrust--our lifting capability --will be a direct determinant of our over-all rate of progress." To this date the rate of progress in space rested directly on the nation's missile programs. Another area of primary concern was increasing the reliability of all elements of a space system. With significant improvements in these two areas the nation could anticipate ever increasing payloads placed in orbit, manned orbital satellites and space stations, lunar flights and near planetary explorations. Recoverable chemical powered boosters, ion beam or thermo-nuclear plasma propulsion systems in outer space would open an entirely new phase of space exploration. Thus in the months and years ahead it was possible to foresee many dramatic developments in propulsion systems, high thrust space vehicles and a vastly increased knowledge of the space environment. (Paper, "Space Development Capability, 1958-1968," submitted 15 Nov 58, prep by Maj Gen B. A. Schriever, Cmdr, AFBMD.)

17 - 19 Nov 1958

The National Aeronautics and Space Administration's Space Task Group met at Air Force Missile Test Center, received an orientation briefing and a tour of the Cape launching facilities. (Paper, AFBMD Support, Proj Mercury, Dec 60, prep by AFBMD Space Div (WDZ).

25 Nov

Air Force Ballistic Missile Division received its first specific request from the civilian space agency to support a "preliminary research program leading to manned space flight." The division was requested to procure "... one Atlas C ballistic missile booster with its associated control and guidance equipment." This request was a forerunner of a support effort for a program "requiring approximately thirteen (13) ballistic missile boosters of the Thor and Atlas class." The space agency would procure the payload, scheduled for May 1959 delivery. The missile division was to furnish detailed plans, subject to the approval of the National Aeronautics and Space Administration, for the design, construction and launching of this vehicle. One million dollars was immediately transferred to the Air Force with more money to be supplied as it was requested. (Msg, no cite number, Hq NASA, to Cmdr, AFBMD, 25 Nov 58.)

28 Nov

First successful full-range Atlas flight, 5,506 nautical miles down range. (AF Ballistic Missiles Program Status Report.)

1 Dec

While the probability of the ballistic missile division developing a military manned space system was rapidly diminishing, an accelerating military and civilian demand for space boosters and launching facilities was threatening to saturate the division's resources. Except for certain strictly military applications it was plain the Air Force would play mainly a supporting role in the nation's space program, supplying boosters and launch facilities to the civilian space agency and the Advanced Research Projects Agency. On this date there were approximately 11 scheduled programs, several only in the planning stage. One of the firm programs was the civilian agency's man in space which was scheduled to launch its first experimental Atlas C payload in May 1959 and start a series of nine Atlas D launches beginning December 1959. (Ltr, Col L. D. Ely, Asst Dep Cmdr,

1 Dec 1958 (Cont'd)	Military Space Sys, AFBMD, to Col C. H. Terhune, 1 Dec 58, subj: Atlas Boosters for Space Projects.)
2 - 3 Dec	National Aeronautics and Space Administration representatives met at Air Force Ballistic Missile Division to hear a Space Technology Laboratories briefing on its space capsule efforts associated with the earlier missile division man in space program. (Rpt, AFBMD Support, Proj Mercury, Dec 1960.)
8 Dec	The National Aeronautics and Space Administration ordered nine more Atlas boosters from the missile division for the Mercury Program. (NASA Order HS-36, Msg, Hq NASA to AFBMD, 8 Dec 58)
18 Dec 1958	Project Score, Atlas rocket placed in orbit carrying communications equipment which relayed President Eisenhower's Christmas message to the world from outer space. (AF Ballistic Missiles Program Status Report.)
19 - 20 Jan 1959	One of the most important Project Mercury meetings between the National Aeronautics and Space Adminis- tration and the missile division, at which a series of agreements was approved controlling administrative arrangements and procedural channels essential to coordinated, efficient management of the joint phases of the program. Cost of the Atlas booster was set at \$3.5 million, Space Technology Laboratories systems engineering and technical direction of the Air Force Ballistic Missile Division's part in the program was agreed upon, revision of program requirements was accomplished, regular technical and management meetings were arranged, and the missile division promised to prepare a development plan for the first Mercury booster (HS-24) by February 1959. (Ref file, AFBMD Support, Proj Mercury, Dec 60.)
11 Mar	The civilian space agency acknowledged receipt of the missile division development plan for the first booster scheduled to start the man in space effort. Except for two revisions, the National Aeronautics and Space Administration declared the plan to be "satisfactory." One of the revisions was suggested in this statement:

11 March 1959
(Cont'd)

"NASA prefers not to be committed to the specified sum of \$3,556,000, but reserves the right to negotiate the costs." (Ltr, T. K. Glennan, NASA Administrator, to Cmdr, ARDC, 11 Mar 59, no subject.)

24 Apr

Air Force Ballistic Missile Division replied to the 11 March 1959 letter in which the civilian agency demurred at accepting the charge of \$3.55 million without the right to negotiate the cost. The missile division reminded National Aeronautics and Space Administration that it had already committed \$2.761 million to the space agency's Order HS-24 and in the immediate future additional funds were required up to \$3.556 million to cover the cost of the basic Atlas booster and additional work schedule through the launching sequence as stipulated in the development plan. (Msg, WDP-4-4, Cmdr AFBMD, to NASA, 24 Apr 59.)

14 May

The National Aeronautics and Space Administration instructed the missile division to combine its first order for an Atlas booster (HS-24) with a later order for nine Atlas boosters. This action would also combine fund allocations of \$2,761,000 for the first booster and \$6 million for the nine boosters to a fund total of \$8,761,000 for Mercury booster procurement. Therefore, the missile division was requested to prepare a development and funding plan covering the amended HS-36 order and forward the plan to NASA by 15 June 1959. (Msg, no cite number, NASA to AFBMD, 14 May 1959.)

28 Jul

First successful Series D Atlas missile flight test. (Air Force Ballistic Missiles Program Status Report.)

10 Aug

The Department of Defense appointed Major General Donald N. Yates, Commander, Atlantic Missile Range, as its representative for Project Mercury support operations. All plans relevant to Department of Defense support of the project were to be submitted through General Yates. He was also made responsible for direction and control of the Department of Defense facilities, forces and assets so used as well as performance of specific missions assigned for project support. (Memo, Thomas S. Gates, Dep Sec of Defense, to Secretaries of the Military Departments,

10 Aug
(Cont'd)

10 Aug 59, subj: Assignment of Responsibility for
DOD Support of Project Mercury.)

17 Oct 1960

The Air Force no longer seriously entertained the prospect of a separate military man in space program at this time. The ballistic missile division became deeply involved in support activity for the civilian space agency, especially developing and supplying hardware for the Mercury program. As of this date, Air Force Ballistic Missile Division participation included the following: providing 16 Atlas D boosters modified to accept Mercury capsules and adapters, to be provided by the space agency, a modified guidance structure, an installed abort system to insure pilot safety, and telemetry. Air Force Ballistic Missile Division also furnished launch facilities at the Atlantic Missile Range Complex 14, and one-half of Hangar J and the necessary modifications thereto as requested and made necessary by booster requirements. Such work included installation of capsule umbilical and checkout cabling, telemetry, communications, and data transfer equipment required by the payload. The missile division also provided the guidance site and use of the range Atlas guidance computer (Mod III) for powered trajectory guidance and the special computations requested by the space agency. Air Force Ballistic Missile Division and several Air Force contractors provided, as of this date, 401 military and civilian personnel to the program. Much of the cost of this support activity was reimbursed by the National Aeronautics and Space Administration, but some was not. Air Force personnel costs, military and civilian; office space and equipment; and normal base support functions were provided at Air Force expense. Cost of a 14 booster program (the additional two boosters were ordered too late to be included in this summary) was as follows:

17 Oct 1960
(Cont'd)

(Millions of Dollars)

	<u>Prior Years</u>	<u>FY 61</u>	<u>FY 62</u>	<u>Total</u>
Booster Hardware and Launch Service	19.769	15.324	5.924	41.017
Engineering Modifications and Studies, Technical Direction, Booster Safety Program, etc.	3.436	6.367	1.362	11.165
Miscellaneous, Propellant, Transportation, Travel, etc.	.466	1.133	.122	1.721
Total Estimate	23.671	22.824	7.408	53.903

(Msg, WDGP 17-10-5, AFBMD to Hq ARDC, 17 Oct 1960)

GLOSSARY OF ABBREVIATIONS

AFB	Air Force Base
AFBMC	Air Force Ballistic Missile Committee
AFBMD	Air Force Ballistic Missile Division
AFMDC	Air Force Missile Development Center
AFMTC	Air Force Missile Test Center
AJ	Aerojet-General (Corporation)
AMR	Atlantic Missile Range
ARDC	Air Research and Development Command
ARPA	Advanced Research Projects Agency
Asst	Assistant
BMD	Ballistic Missile Division (frequently used as a contraction of Air Force Ballistic Missile Division)
Brig	Brigadier
Ch	Chief
Chmn	Chairman
Cmdr	Commander
Col	Colonel
C/S	Chief of Staff
DCS	Deputy Chief of Staff
DCS/D	Deputy Chief of Staff, Development
Dev	Development
DF	Disposition Form
Dir	Director; Directorate
Div	Division
DOD	Department of Defense
Gen	General
Hq	Headquarters
ICBM	Intercontinental Ballistic Missile
IGY	International Geophysical Year
IRBM	Intermediate Range Ballistic Missile
Lt	Lieutenant
Ltr	Letter
Maj	Major
Memo	Memorandum
MFR	Memorandum for the Record
MIS	Man-In-Space

MISS	Man-In-Space-Soonest
MSC	Manned Space Center
Msg	Message
Msls	Missiles
NACA	National Advisory Committee for Aeronautics
NASA	National Aeronautics and Space Administration
Ofc	Office
Opns	Operations
OSD	Office of the Secretary of Defense
OSD-BMC	Office of the Secretary of Defense Ballistic Missile Committee
Prog	Program
Proj	Project
R and D	Research and Development
Rpt	Report
SAB	Scientific Advisory Board
SAF	Secretary of the Air Force
SAFRD	Assistant Secretary of the Air Force, Research and Development
Sec	Secretary
SOD	Secretary of Defense
Spec	Special
STL	Space Technology Laboratories
Subj	Subject
Sys	System
Tech	Technology
Tgt	Target; Targeting
USAF	United States Air Force
V/ Cmdr	Vice Commander
V/ CS	Vice Chief of Staff
Vol	Volume
WADC	Wright Air Development Center
WDD	Western Development Division
WS	Weapon System