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AIR FORCE BALLISTIC MISSILE DIVISION



SPACE

DOWNGRADED AT 12 YEAR
INTERVALS; NOT AUTOMATICALLY
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NOVEMBER
1960

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**HEADQUARTERS
AIR FORCE BALLISTIC MISSILE DIVISION (ARDC)
UNITED STATES AIR FORCE
Air Force Unit Post Office
Los Angeles 45, California**

**Summary of
AIR FORCE BALLISTIC MISSILE DIVISION
Activities in Space**

NOVEMBER 1960 [*Special Issue —
data not included in
regular November issue
is underscored below.*]

5 December 1960

This report includes information on the recovery of the DISCOVERER XVII capsule following a two-day exposure to the space environment. This was the second flight test of an AGENA "B" vehicle. The MIDAS section includes photographs and progress reports on the construction of the Donnelly Flats tracking station in Alaska. The ADVENT Section includes a Program History starting on 29 August 1958 and reporting significant facts up to the present. A preliminary report of the TRANSIT 3A flight is included. With the successful flight and orbital performance of COURIER 1B on 4 October, all objectives of this program were fulfilled. Coverage of this program is being terminated with the Program Summary given in this issue. This month the SAINT section has been revised to include a proposed payload and the flight trajectory in graphic form. Information about the ORBITAL INTERCEPTOR Program is included for the first time. Also included this month is a BIOASTRONAUTICS section which includes a review of the successes accomplished with the Mark II biomedical capsules.

Henry B. Krehman
Col USAF

O. J. RITLAND
Major General, USAF
Commander

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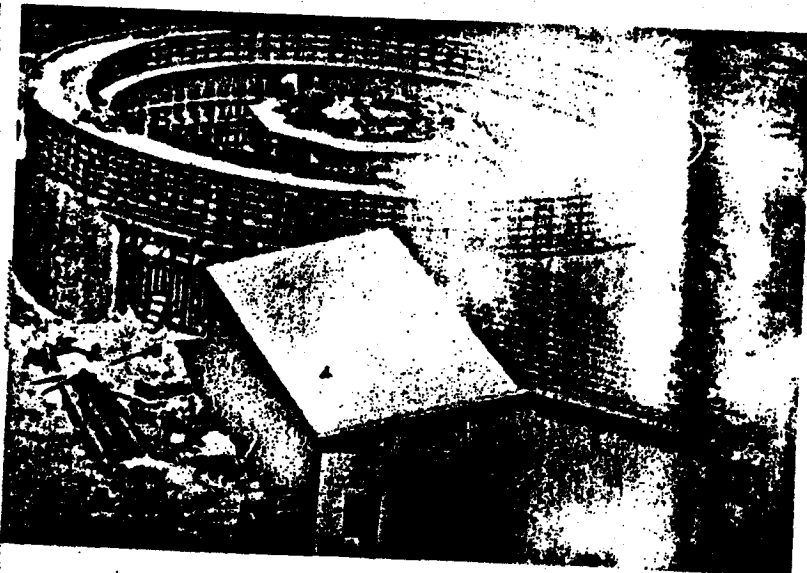
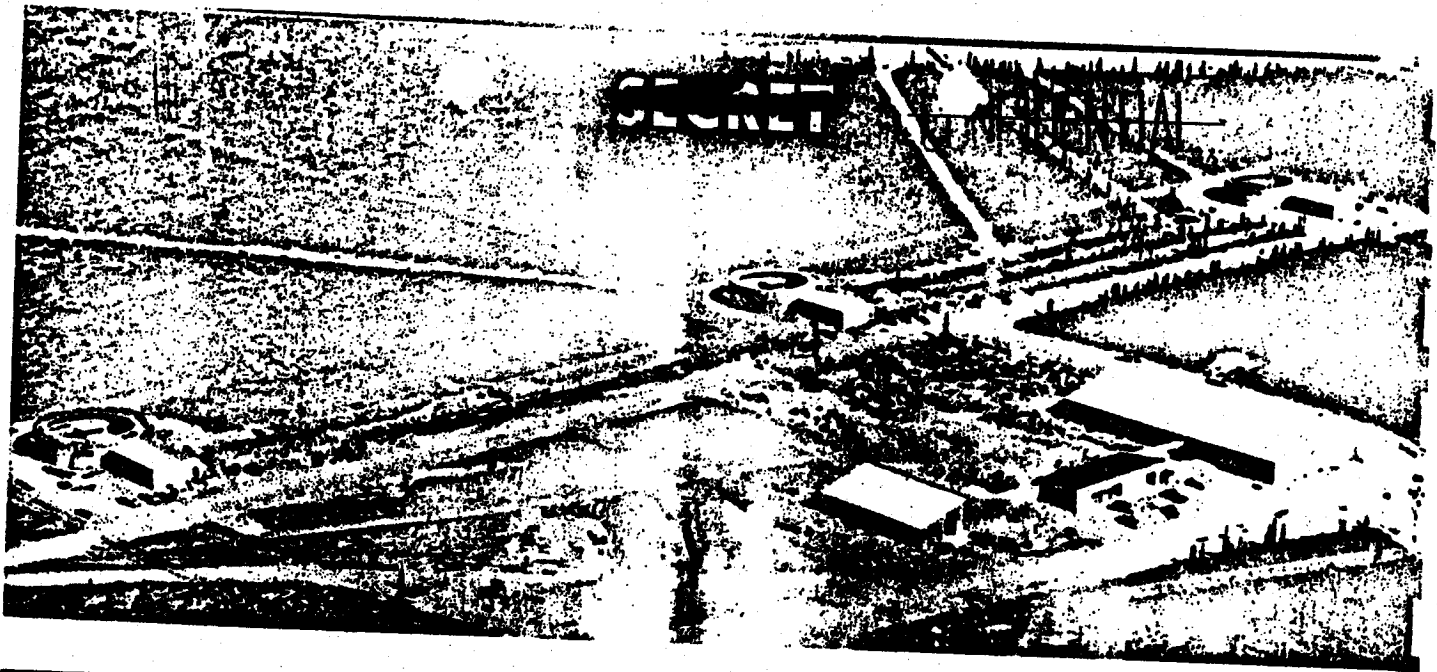
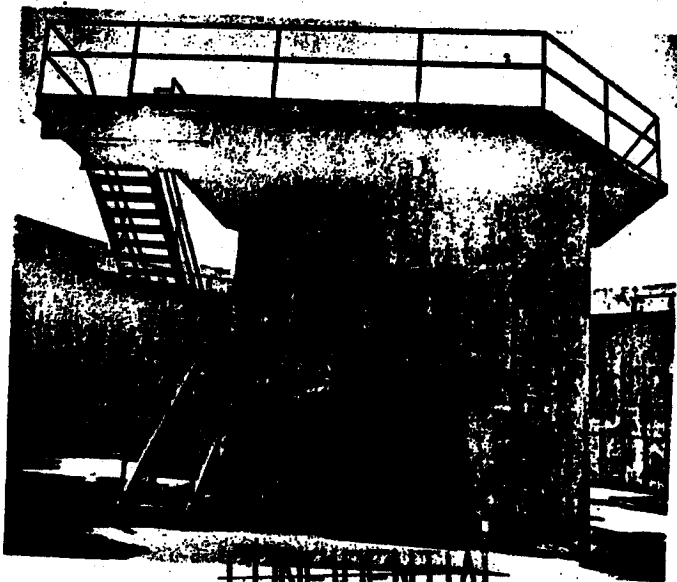


Figure 8. Aerial view (above) of the Donnelly Flats, Alaska technical facilities. The three radome structures can be seen in the background. The corrugated steel storage buildings are in the left foreground, the next building houses the diesel powered generators, next is the heated vehicle storage building and last is the data acquisition and processing building. One radome site (left) showing the radome support structure and the support equipment building. The support for the radar antenna is shown in the lower photo. On the opposite page is an interior view showing the three large diesel driven generators which provide power for this important tracking station. The lower photo shows the heated vehicle storage building with the data acquisition and processing building in the background.

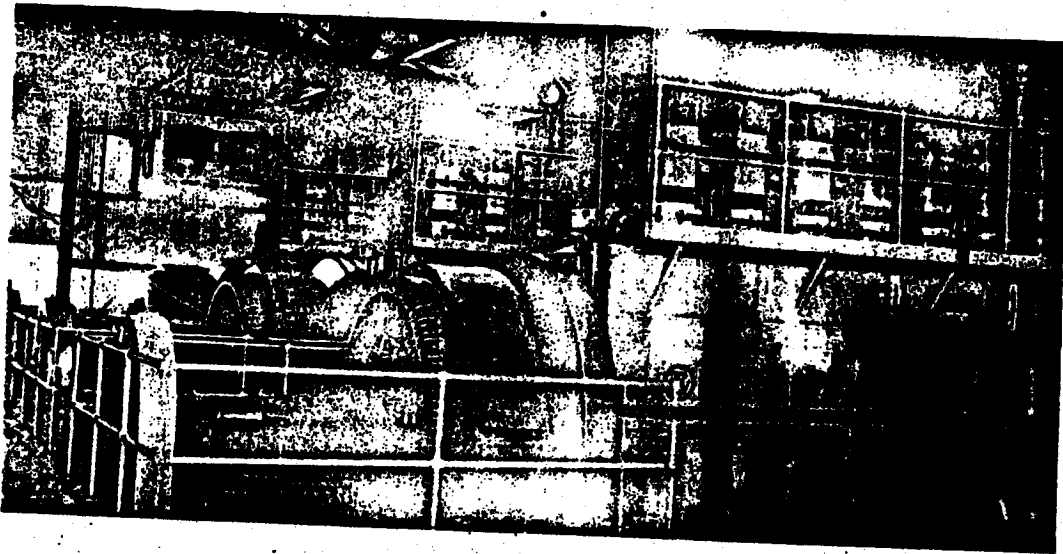


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Figure 9. Combination dormitory and dining hall at the Ft. Greely, Alaska support facilities. Construction of both technical and support facilities is progressing rapidly despite the severe weather.



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ARMY						NASA						ARMY																	
ATLAS/AGENA "B"												ATLAS/CENTAUR																	

ADVENT Launch Schedule

Monthly Progress—ADVENT Program Administration

- Brigadier General Thames, Commanding General, US Army ADVENT Management Agency (USAAMA) and members of his staff visited AFBMD on 15 November. A general orientation on the various AFBMD space and ballistic missile programs was presented and the conventional AFBMD/BMC management methods were discussed. General Thames desired that detailed negotiation of a management agreement not be held until 2 December. He will also discuss details with all participating agencies at that time. General Powell and members of AFBMD/BMC will attend the 2 December meeting at USAAMA.
- The contract with Space Technology Laboratories, Inc. (STL) for over-all systems engineering and technical direction was terminated on 11 November. Aerospace Corporation was directed to proceed with vehicle systems engineering and technical direction effective 12 November.
- A teletype message was sent to USAAMA on 18 November requesting \$1.5 millions additional funding be made available to AFBMD to cover the final stage vehicle contract through 31 December. The General Electric, Missile and Space Vehicle Department (GE-MSVD) contract will exhaust the funds now available early in December. There has been no indication by USAAMA when FY 61 funds will be released.
- The restriction on the extension of the Philco contract beyond the design study phase has been removed and purchase request action initiated for Philco to continue on additional tasks of the ADVENT tracking, telemetry and command system.
- A review of the AMR/PMR ADVENT Support Plan No. 1600 was accomplished by AFBMD, AMR and 6555th Test Wing personnel on 16-17 November. The plan was approved and interested agencies notified. Presentation of the plan was made to

Lt. General Yates, Deputy Director of Defense Research and Engineering (DDRE) on 22 November. USAAMA, on 30 November, recommended to DDRE that the plan be implemented and funded in FY 61.

Technical Progress

Launch Vehicles

- Work statements for AGENA and CENTAUR launch vehicles and for LR-119 (CENTAUR) Rocket Engines, have been completed and forwarded to appropriate contractors with a Request for Proposals. The Proposal for the AGENA has been received and is currently being reviewed. Proposals for the CENTAUR and for the LR-119 Rocket Engine are expected on or before 15 December. ATLAS boosters for the ATLAS/AGENA boosted phase of the program have been ordered under existing AFBMD contracts. Work Statement for the Assembly and Test Operation Contractor for the ATLAS/CENTAUR boosted launches was forwarded to the Atlantic Missile Range (6555th Test Wing) on 8 November. Upon receipt of Atlantic Missile Range coordination, this Work Statement will be forwarded to Convair with a Request for Proposal.

- To preclude the possibility of program slippage caused by prolonged negotiations of definitized contracts, letter contracts have been written with Lockheed and with Convair covering the initial efforts (long lead time requirements) associated with second stage procurement. If necessary, similar arrangements will be made with Pratt & Whitney for the LR-119 rocket engine contract.

Final Stage Vehicle

- Formal contract negotiations with General Electric, Missile and Space Vehicle Department (GE-MSVD) are continuing.
- General Electric has prepared the Program Plan document. They are continuing the design effort of all major final stage vehicle subsystems. During the report period, Aerospace and AFBMD repre-

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representatives attended a General Electric preliminary design review. A draft of the Final Stage Vehicle Design Criteria has been furnished General Electric. This draft was prepared by STL prior to contract termination.

Tracking, Telemetry and Command

• Philco completed the design study phase (Task 2) of the contract for the ADVENT tracking, telemetry and command ground stations at Vandenberg Air Force Base and Kaena Point, Hawaii. Representatives of Philco, STL and AFBMD presented a review of the Philco preliminary design and analysis to USAAMA on 9 November. On 14 November, USAAMA dispatched a teletype message to AFBMD directing that work on the Philco contract proceed on the condition that tracking, telemetry and command equipment be provided at Fort Dix and Camp Roberts. The message also stated that USAAMA will decide in the near future on whether to continue plans for an ADVENT tracking, telemetry and command installation at Vandenberg.

• A meeting of Philco, Bendix, AFBMD, USAAMA and USASRD personnel was held at USAAMA on 29 November to review requirements and interface areas concerning the equipments that Philco will supply as GFE for the ground communication stations at Camp Roberts and Fort Dix to provide these stations with a tracking, telemetry and command capability.

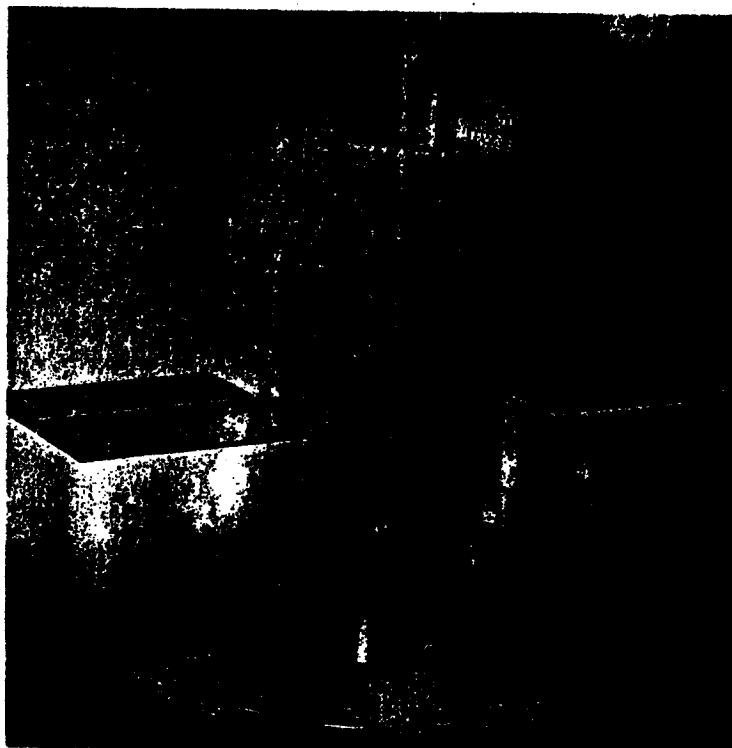


Figure 3. A model of the General Electric ADVENT final stage vehicle to be flown in a six-hour inclined orbit. These photographs show the payload with the solar paddles extended and antenna retracted (lower) and the solar paddles unfurled and the antenna extended (right). The temperature control vanes are located on the payload above and below the control arms for the solar paddles. These vanes are automatically positioned to regulate the internal payload temperature.

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ADVENT PROGRAM HISTORY

Hq USAF was briefed on System 470L Communications Satellite Development plan on 29 August 1958; ARPA briefed on 5 September. On 30 September, the Secretary of Air Force outlined in a memo to ARPA the urgent requirements for a communications satellite, with the major requirement being long range ground-air communications. In October an ad hoc committee was established to formulate a unified communication satellite development program.

ARPA memo to ARDC and the Signal Corps dated 5 November outlined a basic program for a 24-hour communication satellite. Joint preparation of a development plan by AFBMD and USASRD was requested. AFBMD was assigned vehicle responsibility; USASRD had communications. No agency assigned over-all program coordination. General Cook Army Signal Corps (ASC) to coordinate the development plan on pro tem basis. On 21 November, ARPA was requested to recognize the instantaneous long range ground-air system as top priority. It was urged that a six-hour polar orbit satellite be given top priority. SAC's strike forces operating in the polar region long range communications were a necessity.

On 10 December, General Schriever stated his position on the necessity for making AFBMD project manager. ARPA was not receptive and indicated their intention of exercising project supervision at the ARPA level, using ARDC and ASC as support agencies. It was obvious that AFBMD and ASC were expected to develop the details of the working relationship. Later in the month ARPA requested three versions of modified schedules and funding for the December development plan. One schedule was to stretch out the entire program to fit available ARPA funding; the other two reduced the 1960 launches from 8 to 4 under two conditions: (1) COURIER implemented, (2) COURIER not implemented (funds to be used for COMM SAT). A revised development plan was submitted on 19 January 1959.

In January 1959 ARPA Orders 54 and 55 initiated work on preliminary design and supporting R&D for vehicle development and communications equipment for the 1962 24-hour communication satellite program. ARPA had program management; ARDC was responsible for development of communications equipment.

On 2 February, USAF GOR 178 outlined the Air Force requirements for development and employment of a communication satellite system. Three

requirements were specified: (1) two-way communications from Commanders in the U.S. with global airborne forces; (2) two-way communications between Commanders and activities both within and between points in the U.S. and overseas; (3) one-way broadcasts for rapid and wide dissemination of vital and highly perishable information. Initial capability should be obtained not later than 1962. On 4 March an abbreviated Development Plan for a 6-hour polar satellite was submitted as requested by ARPA.

On 22 May Amendment No. 1 to ARPA Order No. 54 initiated work on SAC polar communications satellite (STEER), advanced polar communications project (TACKLE) and the ATLAS-CENTAUR 24-hour orbit phase of the global communications satellite project (DECREE). An additional \$6.6 million was provided. A first-launch date of 22 August 1960 was specified. Project supervision was assigned ARDC with five stipulations, three of which hampered AFBMD in its role of project supervisor. The first required ARDC to procure the communications payload and ground complexes for TACKLE and DECREE from the Signal Corps; preventing effective system integration and interface control. The second required ARDC to contract for systems engineering on a competitive basis with quality and availability of staff and facilities as the most salient factors to be considered; jeopardizing the AFBMD/STL team by not considering experience. The third placed the systems engineering contractor under the technical direction of ARPA in all matters relevant to establishing effective systems integration; delaying the program by requiring project engineering at the top management level.

On 9 June a meeting was held to discuss ARPA Order 54, Amendment No. 1. ARPA agreed to accept normal AF Source Selection Board procedure with ARPA review. AFBMD and USASRD expected to evolve a working agreement and refer only matters of conflict to ARPA. On 11 August Amendment No. 2 to ARPA Order 54 confirmed the 9 June agreements and deleted the requirements for competitive bid contracting of systems engineering and final selection of contractors by ARPA.

On 28 September General Cook, Chief Signal Officer disagreed with the 27 August working agreement prepared by AFBMD. The Signal Corps objected to accepting technical direction from AFBMD. They also wanted a greater portion of the program; e.g., developing all electronics for the satellite, attitude

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control, orbit control and responsibility for all in-orbit tests.

An ARPA memo, dated 4 November, listed some of the design objectives to be incorporated into Project STEER. It emphasized that work to be accomplished must be done with technical feasibility as the primary objective and not aimed at an operational system. This memo was answered on 25 November with one from the DDR&E emphasizing the fact that ARPA programs make little sense unless they form the basis of an operational program. Objectives, such as tremendously enhanced reliability and the basic requirements for an operational satellite, should be consistent with a future operational communication satellite.

Requests to ARPA for release of FY 60 funds were made on:

7 Nov	TWX WZSC 11-6-59 to ARPA
9 Nov	Monthly Progress report for October
17 Nov	Letter to ARPA thru USAF
27 Nov	TWX WZDP 11-64-E to USAF
3 Dec	TWX WZDP 11-63-E to USAF
8 Dec	Monthly Progress Report for November
8 Jan	Progress Report for Quarter 1960 ending 31 Dec.
14 Jan	TWX WZDP 1-6-E to ARDC
8 Feb	Monthly Progress Report for Jan
8 Mar	Monthly Progress Report for Feb
24 Mar	TWX WZCYC 1042 to USAF

On 8 December a telephone call from Hq USAF to Hq AFBMD advised that Dr. York, DDR&E, had issued verbal instructions to cancel STEER. A memo from the AFBMD Liaison Officer to General Schriever on 18 December advised that Dr. York had suspended his verbal instructions of 8 December and directed a review to be conducted by ARPA/IDA.

Because no FY60 funds has been received, existing contractors were directed on 7 Jan 1960 to maintain only minimum sustaining effort and to refrain from any procurement or fabrication of hardware. Former launch schedules were invalidated. This action was intended to preserve the integrity of the engineering team. The Assistant Secretary of AF (R&D) memo to the DDR&E on 21 Jan urged that STEER be continued rather than cancelled and be turned over to the Air Force together with its programmed funds. It also pointed out that STEER would advance the objectives of DECREE. On 29 Jan Sec of AF memo to Sec of Defense stated that Sec. McElroy's memo of 18 Sept 1959 assigned certain responsibilities for the "interim satellite communications system" to the Army. The Army had interpreted it to mean only COURIER. It also urged

DECREE be directed toward realization of operational capability in the 65-67 time period.

On 11 February Amendment No. 2 to ARPA Order 55 and No. 4 to ARPA Order 54 were signed, published, but not formally distributed. These companion amendments gave program responsibility to the Army, with the right to approve expenditures of funds. The Army was to procure boosters from the Air Force. On 29 Feb Amendment No. 4 to ARPA Order 54 was issued as an interim directive pending review by the JCS and decision by Sec of Defense. Cancelled STEER, TACKLE, and DECREE, and integrated efforts under a single R&D program for a 24-hour global system (ADVENT). Four six-hour polar launches beginning Sept 1961 were specified. Released \$2.0 million to continue efforts through April 1960. A draft of the development plan called for by Amendment No. 4 was prepared on 3 March. On 21 March a TWX was received from ARPA stating that the 3 March development plan did not meet the requirements of Amendment No. 4. No specific reasons were given nor was any guidance offered for the requested revision.

Amendment No. 5 to ARPA Order 54 was published on 11 April. Phase-out of the Bendix contract for UHF communication sub-system was directed. Alternate microwave capability for ground-to-aircraft is not to be considered until after surface-to-surface demonstration (1962). A launch program was provided consisting of: four ATLAS/AGENA flights (Sept & Dec 61; Mar & June 62); seven ATLAS/CENTAUR flights (Sept & Nov 62; Jan, Mar, May, July and Sept 63); and NASA R&D ATLAS/CENTAUR flights (Feb, April, and June 62). Estimated program costs placed at \$140 millions. ARPA had prior knowledge that minimum program cost was approximately \$190 million. Partial funding for GE and STL through June was provided. Also provided "go-ahead" for microwave communication development. Amendment No. 6 to ARPA Order 54 was published on 26 April. It provided approximately \$20 million more in FY 62 and FY 63 to cover the additional costs of the ARPA prescribed program using ATLAS/AGENA launches.

ARPA was briefed on two development plans on 4 May. One dated 25 Apr presented the ARPA Amendment No. 5 program. The other, dated 2 May, presented the AFBMD recommended program (no ATLAS/AGENA launches). It was indicated that the decision had been made to turn the program over to the Army with a target date of 30 June.

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On 10 May an ARPA TWX to AFBMD requested detailed trajectory information for the ATLAS/CENTAUR combination assuming two cases: (1) no propulsion in the final stage vehicle (FSV), and (2) a propulsion means in the FSV. It now became apparent that ARPA wanted the satellite design to be propulsionless; thus, it would be a "payload" rather than a "stage" and Army could logically be given responsibility for the satellite under Secretary McElroy's memo of 18 Sept 1959. A briefing for ARPA on 13 May and an STL report indicated that a propulsionless FSV would not give a sufficient velocity margin at injection, nor would it permit the FSV to be positioned in operationally phased orbits.

On 7 June Amendment No. 7 to ARPA Order 54 was published to fund the program for another two months. \$7.6 millions were provided. On 20 June, ARPA had reached a decision on the technical program but wanted to delay formal notification to AFBMD of this decision pending formal approval of the management transfer to the Army. In reply to a telephone query from ARPA, an AFBMD TWX stated that further delay in development plan approval would incur the risk of wasted effort, wasted funds and program schedule slippage. On 30 June, an ARPA TWX directed AFBMD to hold in abeyance a proposed contract with Philco WDL for the tracking, telemetry and command (TTC) subsystem development pending ARPA negotiations with AMR. After verbally explaining to ARPA the impact of this action on the program, ARPA sent another TWX on 1 July permitting AFBMD to proceed with the study phase of the contract.

Amendment No. 8 to ARPA Order No. 54 was published on 11 July. This was the first ARPA guidance received on ADVENT since the development plans were presented on 4 May. Amendment 8 approved the 25 April development plan (ARPA directed plan) with several modifications. The more important ones were: (1) a new 10-flight program was specified with initial launch in Dec 61; (2) no FSV hot gas propulsion in first equatorial flights; (3) no correction for solar and lunar perturbations; (4) conflicting statements about attempting less sophisticated experiments by increasing the reliability and anti-jam efforts; (5) no TTC hardware procurement pending ARPA negotiations with AMR. A meeting was held with ARPA, AFBMD, STL and USASRDJ representatives on 28 July to discuss Amendment No. 8. Advantages of a hot gas system in the FSV were briefed by STL; chiefly, (1) greater useful payload could be put in orbit, and (2) system would give an operational "indexing" capability by means of a walk-in

orbit (i.e., FSV's could thereby be placed at any position around the equator to give an operational system). It was pointed out to ARPA that Dec 61 launch could not be met due to lead-time on booster procurement and other considerations. The delay in development plan approval had made the Dec 61 launch date impractical.

Amendment No. 9 to ARPA Order 54 was published on 11 August. This amendment established March 1962 as the initial launch date and granted "approval" to the FSV Work Statement after the usual "project engineering" treatment by ARPA. Approval was conditioned on the requirements that (1) ARPA-specified test objectives be used, (2) ARPA-specified design criteria be used, and (3) no management responsibility or relationships be specified. The FSV Work Statement had been hand carried to ARPA for approval on 14 July. AFBMD, TWX, WDZC 16-8-16, concerning Amendment 9, was sent to ARDC on 17 August. This message recommended that every effort be made to obtain DOD support for implementing the present management relationship or devising an arrangement which the DOD would support. On 22 August, ARPA published Amendment No. 10 to ARPA Order 54, granting conditional approval of the ATLAS and AGENA Work Statements which had been delivered to ARPA on 4 August. Some modifications to the work statements were specified, and approval was withheld on management relationships and responsibilities.

During August, there was concerted activity by ARDC and Air Force to have the Air Force designated DOD management agency for the ADVENT Program. In compliance with General Schriever's request to General Ritland, AFBMD TWX, WDZC 19-8-17 was sent to ARDC on 18 August giving the recommended text of a memo from Secretary Choryk to Secretary Douglas. The reasons why the Air Force should be appointed management agency were given. It was pointed out that the program would continue uninterrupted to attain current schedules and objectives. The program technical team of AFBMD and USASRDJ and their respective contractors would remain intact. This team had functioned effectively for nearly two years; all preliminary preparation had been accomplished, and the program was now ready to accelerate to full normal development status. Colonel Burrus (RDRB) visited AFBMD on 29 and 30 August to obtain material for General Schriever to discuss ADVENT program management with Secretary Gates. A dossier was prepared and hand carried by Colonel Burrus on 30 August. Duplicate copies of all material were given to General Ritland.

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An ADVENT management meeting was held in the OSD on 31 August. It was determined that the OSD memo of 18 Sep 59 would govern and that management would be transferred from ARPA to the Department of the Army. Consequently, an Army memo of 14 Sept outlined in the new ADVENT management relationships. This memo was approved by Mr. Rubel, Acting DDR&E. An OSD memo of 15 Sept accomplished the management transfer. AFBMD was given responsibility for: (1) the development, fabrication and launching of the booster vehicle system and necessary system integration incident thereto; (2) the development and fabrication of the final stage vehicle, its integration with the booster vehicle system and its injection into and control on orbit; and (3) detailed systems engineering for these portions of the program. The Army ADVENT Management Agency was given responsibility for over-all management, funding, over-all systems engineering and integration of the vehicle subsystems, the microwave payload, and the ground communications network.

Amendment No. 11 to ARPA Order 54 was published on 22 September transferring administrative and technical responsibilities under ARPA Order 54 to the Department of the Army. On 3 October, Amendment No. 12 withdrew all FY-61 funds (\$19,108,900) from AFBMD in preparation of transferring all program funds from ARPA to the Army.

USAAMA Order No. 1 dated 7 October 60 to Commander, AFBMD requested AFBMD to continue existing and initiate contractual effort on booster vehicles for ADVENT. The order made available \$4.0 millions to cover initial efforts. Necessary contracts to be awarded within 90 days. Any technical and scientific reports and information to give appropriate credit to USAAMA. For other projects, utilization of equipment and materials procured in connection with ADVENT is subject to the direction of USAAMA.

On 11 Oct 60 TWX RDG 11-10-9 from General Schriever to General Ritland directed AFBMD to implement the provisions of the 15 Sep 60 OSD memo and to enlist the technical support of Aerospace Corporation to fulfill the AFBMD responsibilities.

On 12 Oct 60 USAAMA ltr to AFBMD requested that the work statement for vehicle systems engineering and technical direction be amended to delete the requirement for SE/TD to insure proper control on orbit, which responsibility had clearly been given to AFBMD by the 15 Sept 60 OSD memo. AFBMD replied by TWX on 4 Nov 60, expressed the AFBMD position that "control on orbit" is a function for

which the USAF was made responsible by the 15 Sep 60 OSD memo; therefore we could not fail to provide SE/TD for it.

On 17 Oct 60 TWX, SIGFM/PAM-4-9 to AFBMD, specified no new major contracts or modifications of contracts, or change of contractors, or commitment of funds without prior approval of USAAMA. This prevented AFBMD from effectively carrying out the instructions of USAAMA Order No. 1.

On 18 Oct 60 TWX, WDZC 18-10-33 to USAAMA, requested permission to proceed with booster contracts upon which contractual action had been initiated prior to receipt of the USAAMA TWX of 17 Oct 60.

On 24 Oct 60 ltr from General Schriever to General Ritland gave guidance on AFBMD's conduct of the ADVENT Program.

On 25 Oct 60 USAAMA Management Directive No. 1 specified the management relationships for the ADVENT Program. Gave USAAMA detailed approval authority over all aspects of the program and offered strong evidence that very little responsibility and authority are to rest with AFBMD.

On 25 Oct 60 TWX, SIGFM/PAM-4-14 gave authority to expend limited funds on CENTAUR vehicles and CENTAUR engines and gave authority to use a portion of the funds received with USAAMA Order No. 1 to apply upon the existing GE, STL and Philco contracts. Directed that all bid proposals be reviewed by USAAMA.

On 1 Nov 60 TWX, SIGFM/PAM-4-21 to AFBMD, directed that all facilities recommended for ADVENT be referred to USAAMA for approval prior to contractual action.

On 9 Nov 60 TWX, SIGFM/PAM-32 to AFBMD directed that USAAMA will review and approve Aerospace Work Statement prior to finalization.

On 25 Nov 60 USAAMA Management Directive No. 3 on Program Control identified subsystems and functional categories of ADVENT. Satellite control on orbit and on-orbit testing was not mentioned. Specified immediate and continuing analysis to be conducted by USAAMA with conferences involving USAAMA, responsible development agencies (AFBMD, USASRD, BuShips) and their relevant contractors. First conference to be early in December. Analysis to assign cost estimates to each element of the subsystems (e.g., attitude control element, electrical power element, orbit indexing element, etc.)

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