[redacted]
AIR FORCE BALLISTIC MISSILE DIVISION
HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

REPLY TO
ATTN OF: WDLPM-4

12 April 1960

MILITARY SATELLITE PROGRAMS PROGRESS REPORT
Month Ending 31 March 1960
DD-DR&E (M) 397

FOREWORD

Attached are the reports covering progress during the month of March 1960 for the DISCOVERER, SAMOS and MIDAS Programs. These reports are directed by Secretary of Defense memorandum to the Secretary of the Air Force, dated 27 February 1960.

R. Curtin for

O. J. RITLAND
Major General, USAF
Commander

WDLPM-4-198

[redacted]

[redacted]

DISCOVERER PROGRAM

1. This report, covering progress during the month of March 1960, is submitted in accordance with Department of Defense memorandum to the Secretary of the Air Force, dated 27 February 1960. Table 1 shows the flight schedule, vehicle configurations and flight history to date for the DISCOVERER Program.

2. FLIGHT TEST STATUS

While there were no DISCOVERER launches during the current report period, an April launch of DISCOVERER XI from pad 5, Vandenberg Air Force Base is scheduled. To prevent recurrence of the pitch rate circuit malfunction a procedure change was instituted.

3. TECHNICAL STATUS

a. Second Stage Vehicles

(1) The first AGENA B vehicle (XLR-81Ba-7 engine) was delivered to Santa Cruz Test Base on 1 March. The vehicle has been installed in test stand 2 and preparations for hot firing tests are being accomplished.

(2) Checkout is being accomplished in the Systems Test Area on AGENA B vehicles for DISCOVERER flights 18, 19 and 20. The systems checks of these vehicles are 90, 65, and 60 percent complete, respectively.

(3) The XLR-81Ba-9 engine test firing program at Santa Cruz Test Base consisting of nine firings, including several restart operations, was completed in March. The design testing of a fuel-powered hydraulic system to gimbal the engine was one of the prime objectives of this test program. This system, which offers a twenty pound weight reduction and an appreciable savings of electrical power, performed satisfactorily. Nozzle extension tests continued at Bell Aircraft Co. and the Arnold Engineering Development Center. A titanium extension was successfully fired twice at BAC and is being sent to AEDC for further evaluation. Also, firings have been conducted at AEDC with 45 to 1 and 60 to 1 stainless steel extionsions with favorable results.

(4) Two transistorized S-band beacons were completed on 11 March. To expedite delivery of the beacons, formal acceptance testing of the units was begun at the Avion facility on 14 March. Upon acceptance the two beacons will be sent to Philco, one will be used for type testing and the other will be retained as a spare for the first AGENA B flight.

[redacted]

[redacted]

b. Ground Support Equipment

(1) A 100-pin umbilical system will be incorporated starting with the fifth AGENA B vehicle. The change will standardize fabrication and checkout procedures and reduce countdown time. Existing vehicle wiring is being divided into that necessary for launch countdown and that necessary for checkouts. Present blockhouse and trailer wiring will remain unchanged.

(2) Major damage to the aft tri-helix antenna on the Pvt. Joe E. Mann occurred on 19 February when a violent storm struck the ship, sheared the mounting bolts, and dashed the asembly to the deck. Repairs were completed at the Hawaiian tracking station and the antenna was re-assembled on 2 March.

(3) To expedite delivery of programmers, Fairchild engineers were advised to modify their procedures for re-testing after modification. Three programmers will be delivered in late March.

c. Facilities

(1) Modifications to the Hawaiian tracking station, in support of the NASA TIROS project, were completed prior to the launch of that vehicle. Fly-by tests have been successfully conducted and exercises run to determine change-over time required to convert the radar equipment from DISCOVERER to TIROS operation. Exercise results were satisfactory; change-over time is approximately 20 minutes.

(2) Personnel hazards related to propellant storage and handling methods at the Vandenberg launch site have been temporarily resolved by the following measures: installation of adequate flood lighting; a second diesel generator to provide standby power for lighting; a water distribution and tanking system, including emergency showers and eye washes; a reinforced flushing and dumping pit for the IRFNA area; grading and compacting areas around propellant shelters for water drainage; and coordination with base on maintenance of access roads. These measures are considered minimum, and the planned usage is only until permanent facilities can be provided.

b. Biomedical Capsules

(1) Fabrication of the first Mark 2 biomedical flight capsule (USE-74) is nearing completion and shipment to Lockheed is scheduled for 16 April. Components of this flight article were design tested successfully in the recent flight simulation with a primate passenger.

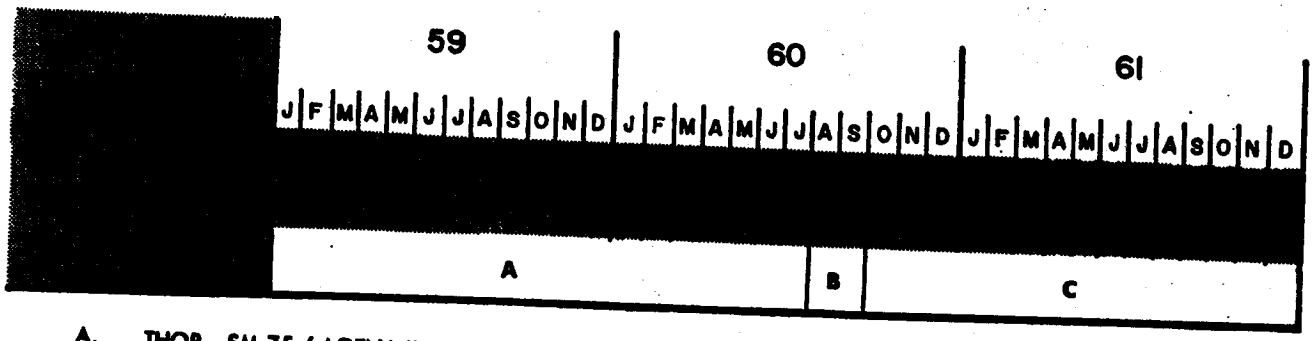
[redacted]

[redacted]

(2) At a meeting of AFBMD and Lockheed biomedical personnel on 11 March, a program for specialized environmental testing of the Mark 2 biomedical capsule was approved. A special capsule (USE-77), without live specimen, will be subjected to a maximum reliability test program beginning in April. During the meeting, a philosophy was established making two payload capsule recoveries desirable prior to including a biomedical capsule in the payload.

[redacted]

[redacted]



A. THOR—SM-75 / AGENA "A"

B. THOR—DM-21 / AGENA "B"
MB-3 Block 1 / XLR81-Ba-7

C. THOR—DM-21 / AGENA "B"
MB-3 Block 2 / XLR81-Ba-9

Flight History

DISCOVERER No.	AGENA No.	THOR No.	Flight Date	Remarks
0	1019	160	21 January	*AGENA destroyed by malfunction on pad. THOR refurbished for use on flight XII.*
I	1022	163	28 Feb 1959	*Attained orbit successfully. Telemetry received for 514 seconds after lift-off.*
II	1018	170	13 April	*Attained orbit successfully. Recovery capsule ejected on 17th orbit was not recovered. All objectives except recovery successfully achieved.*
III	1020	174	3 June	*Launch, ascent, separation, coast and orbital boost successful. Failed to achieve orbit because of low performance of satellite engine.*
IV	1023	179	25 June	*Same as DISCOVERER III.*
V	1029	192	13 August	*All objectives successfully achieved except capsule recovery after ejection on 17th orbit.*
VI	1028	200	19 August	*Same as DISCOVERER V.*
VII	1051	206	7 November	*Attained orbit successfully. Lack of 400-cycle power prevented stabilization on orbit and recovery.*
VIII	1050	212	20 November	*Attained orbit successfully. Malfunction prevented AGENA engine shutdown at desired orbital velocity. Recovery capsule ejected but not recovered.*
IX	1052	218	4 February	*THOR shut down prematurely. Umbilical cord mast did not retract. Quick disconnect failed, causing loss of helium pressure.*
X	1054	223	19 February	*THOR destroyed at T plus 56 sec. by Range Safety Officer.*

TABLE 1.

[redacted]

[redacted]

SAMOS PROGRAM

1. This report, covering progress during the month of March 1960, is submitted in accordance with Department of Defense memorandum to the Secretary of the Air Force, dated 27 February 1960. The first three SAMOS flights are programmed to carry a dual payload including both visual and ferret reconnaissance system packages. Future flights will carry payloads of only a visual or ferret system. Payloads are being developed as follows to attain progressively higher levels of performance.

Visual Reconnaissance Systems

E-1 - Component Test Payloads
E-2 - Steerable Reconnaissance Payloads (with 20-foot ground resolution)

Recoverable Visual Reconnaissance System

E-5 - High Resolution, Steerable, Recoverable Payload (with 5-foot ground resolution)

Ferret Reconnaissance System

F-1 - R&D Test Payloads
F-2 - Digital General Coverage Payloads
F-3 - Specific Mission Payloads - Analog Presentation
F-4 - Technical Analysis (Study stage only)

2. TECHNICAL STATUS

a. Second Stage Vehicles

(1) The AGENA vehicle for the first SAMOS flight was undergoing systems checks in the System Test Area (formerly Modification and Checkout Center) at the end of the reporting period. Shortage of a satisfactory flight article UHF narrow band transmitter will cause a delay in shipment of this unit to Santa Cruz Test Base for static hot firing tests. Shipment is scheduled for a 2 September launch date. The AGENA vehicle for the second SAMOS flight was delivered to the System Test Area for systems testing late in March. Assembly of the major structural components of the AGENA vehicle for the third flight was accomplished on 9 March. The vehicle is now in the final assembly phase of manufacturing.

[redacted]

[redacted]

(2) The facilities checkout vehicle for the AGENA "A" (dual payload configuration) was shipped to Vandenberg AFB early in March. Delivery was made on a special flat bed trailer developed for transporting AGENA "B" vehicles.

(3) Design of the AGENA "B" vehicle for the fourth SAMOS flight is proceeding on schedule. This vehicle will carry an E-2 camera payload and will be the first single payload flight in the SAMOS program.

(4) Design requirements are being established for the AGENA vehicle programmed to carry the E-5 (recoverable visual) payload. Seven such flights are scheduled at this time.

b. Visual Reconnaissance Systems

(1) Subsystem testing of the first E-1 payload has been completed successfully and the payload compatibility with the vehicle has been established. Systems testing is now underway. Both the E-1 and F-1 payloads will be included in static hot firing tests at Santa Cruz Test Base.

(2) Acceptance tests of the second E-1 payload were started on 17 March at Eastman Kodak, with delivery to LMSD scheduled for early in April. A 48-hour operating test performed during the modification and checkout procedure revealed a high voltage power supply deficiency. A back up development has been initiated on this item.

(3) Fabrication and assembly of components for the first two E-2 payloads is nearing completion. Performance improvement has been attained by extensive rework based on results of environmental testing of thermal mockup payloads. Component testing has been underway since mid-March and is scheduled for completion by 22 April.

(4) All payload support equipment functioned successfully during a subsystem test with the E-1 payload mounted on the 40-inch optical collimator. Satisfactory operation was also experienced during a subsequent preliminary system test run with the payload mated to the AGENA vehicle.

c. Recoverable Visual Reconnaissance System

(1) Design review meetings are being held on the E-5 system functional requirements to establish firm definitions of camera design,

[redacted]

[redacted]

capsule configuration and recovery sequence. Preliminary design of the 66-inch lens camera continues at the Itek Corporation. A special optical glass for the camera lens is being procured from West Germany and will be delivered during April.

(2) A contract was let to AVCO Corporation for the recovery capsule ablative shield plus other required heat shielding, and preliminary work has been started. Several recovery capsule configurations are being evaluated and wind tunnel and ballistic range tests are being performed. Both over-land and over-water recovery capability will be included.

d. Ferret Reconnaissance Systems

(1) Subsystem tests of the first two F-1 payloads have been completed. The first F-1 payload has been aligned with the first E-1 payload and the dual package installed in the AGENA vehicle. Systems testing of the complete installation were started late in March.

(2) Design and modification of the reoriented F-2 and F-3 systems are in progress. Delivery of the first F-2 flight article payload is scheduled for October and the first F-3 is scheduled for March 1962.

(3) Studies of the F-4 system are being continued at Airborne Instruments Laboratory, based on 1965 intelligence requirements.

(4) Mechanical inspection by the Air Force of the F-1 data conversion equipment was completed on 22 March. Electrical acceptance testing was in progress at the close of the report period. This equipment will be installed in the Satellite Test Center, Sunnyvale, California.

(5) The checkout equipment for subsystem testing of F-1 payloads was shipped to LMSD on 25 March. This equipment will be installed in the missile assembly building at Vandenberg AFB.

e. Communications and Control

(1) The UHF ground system is being dismantled by the contractor for shipment to Vandenberg AFB. Included in the system are the angle tracker, command transmitter, and the tracking and acquisition system. The 60-foot tracking and acquisition antenna will be dismantled and transported by police escorted truck to the dock at Moffett Field, California. It will then be loaded on a barge for shipment to Vandenberg.

[redacted]

[redacted]

(2) Shortages of acceptable magnetron tubes has caused a serious problem in the testing and delivery of UHF wade band and narrow band transmitters. The only operable wide band transmitter is installed in the AGENA vehicle for the first SAMOS flight. The first narrow band transmitter is unacceptable as a flight article but is being used in test operations at Sunnyvale to expedite subsystems testing.

(3) The first Model 1604 computer will be delivered to the Satellite Test Center on 1 April. Checkout is scheduled for completion by 15 April. The second such computer is scheduled for delivery to Vandenberg AFB on 15 June.

(4) Additional LMSD requirements for the data acquisition and processing building at Vandenberg AFB have resulted in a slippage of the beneficial occupancy date which may affect the launch schedule. Construction is being expedited and installation of equipment concurrently with building construction is being considered.

f. Ground Support Equipment

(1) Installation of launch monitoring control equipment for Point Arguello launch pad 1 is 90 percent complete. Ground handling and service equipment for this pad has been completely installed. Fabrication and assembly of the launch control system for pad 2 and been completed and the system is undergoing functional testing and checkout at LMSD. Delivery to Point Arguello is scheduled for 24 April.

(2) Acceptance testing of the individual consoles which comprise systems checkout complex 2A was started on 22 March.

[redacted]

[redacted]

MIDAS PROGRAM

1. This report covering progress during the month of March 1960, is submitted in accordance with Department of Defense memorandum to the Secretary of the Air Force, dated 27 February 1960.

2. FLIGHT TEST STATUS

a. As reported last month, the first MIDAS flight test vehicle was launched on 26 February from AMR. Analysis of flight data indicate that an event occurred at the approximate time of AGENA separation which damaged the vehicle and prevented the attainment of a successful orbit. Significant events occurred in the following sequence:

(1) Final countdown was smooth and lift-off was normal.

(2) ATLAS performance to the point of AGENA separation was normal.

(3) AGENA separation command was received at T plus 258 seconds, following ATLAS vernier engine cutoff.

(4) AGENA telemetry signals were temporarily lost at T plus 258 and then were received intermittently with highly degraded quality until approximately T plus 325 seconds.

(5) ATLAS telemetry, at reduced signal strength, continued until T plus 989 seconds.

(6) Tracking data confirmed that the AGENA did not attain orbit.

b. Analysis of the first MIDAS flight has resulted in the following changes being made to the second MIDAS vehicle.

(1) Destruct system circuity has been modified.

(2) The separation sequence has been modified.

(3) Instrumentation has been added in the ATLAS adapter section to obtain data on items associated with separation.

[redacted]

[redacted]

(4) Adapter data transmission has been changed from AGENA telemetry to ATLAS telemetry.

c. AFBMD, in response to a Hq USAF request for conducting additional MIDAS flights between the originally scheduled second and third flights, has proposed that AGENA B vehicles and THOR boosters from the DISCOVERER program and the back up Aerojet-General scanners be used. This change would not affect the DISCOVERER launch schedules. The payloads would be modified to fit the DISCOVERER vehicles and no change in the DISCOVERER command circuitry or procedures would be required. These vehicles launched from Vandenberg AFB in mid-September would be placed in a polar orbit with an orbital time of 4 hours and a useful payload life of 4 days.

3. TECHNICAL PROGRESS

a. Second Stage Vehicles

(1) The second MIDAS flight, incorporating the changes noted above, has been rescheduled to 20 April. This vehicle will be launched from Pad 14, AMR with the same objectives as Flight 1. The MIDAS payload will be placed into a 261 nautical mile orbit, with a nominal orbital time of 94 minutes duration, and an anticipated useful lifetime of 24 days.

(2) Manufacture of the AGENA B for the third MIDAS flight test has begun and is proceeding with completion scheduled on 11 July. Launch is scheduled for December.

(3) A full scale mockup of the solar auxiliary power array mechanism for flights 3 and subsequent was completed in March. Several successful functional tests have been completed with this mockup. Solar cell manufacture is in progress.

b. Infrared Scanners

The following infrared scanner unit designs are included in the current MIDAS program:

Flights 1 &2 - Aerojet-General Co.
Flights 3, 4 & 5 - Baird-Atomic, Inc.

[redacted]

[redacted]

(1) Thermal and altitude tests of the Aerojet-General infrared scanner unit 3 were conducted from 7 to 10 March in the high altitude temperature simulation chamber. A collimater was installed in the chamber with the scanner, together with a blackbody source of infrared radiation. At various temperatures and pressures, and over the full range of scanner head positions, the scanner read out infrared signals from the blackbody source. Scanner performance was satisfactory throughout the tests.

(2) Tests of the Baird-Atomic thermomechanical equivalent model of the infrared scanner were completed in the high altitude temperature simulation chamber on 4 March. At low temperatures some binding in the main bearing was observed. The contractor has initiated a low temperature testing program to solve this problem.

(3) Infrared scanner unit 1 is undergoing optical testing and unit 3 is being assembled at the Baird-Atomic facility.

c. Communications and Control

(1) Qualification testing of the engineering test model of the 256 channel (Model B) multiplexer is in progress. The multiplexer, scheduled for the third MIDAS flight, is essentially an electronic commutator for the telemetry system. The manufacture of components for flight units is on schedule.

(2) A study has been made of a deflection monitor for radar antennas. This monitor will permit a reduction in present ultra-rigid radar mount design requirements by employing a correction system for deflection of less rigid mounts. This would permit the use of lighter metals and simpler designs, and result in lower costs.

(3) Each radar beacon for MIDAS flights 2 and subsequent will be adjusted by the contractor to respond to different interrogations and commands from the VERLORT radar. This makes possible communication with each satellite individually when more than one is within range of a tracking station. The VERLORT radar, designed to operate with six different beacon addresses almost simultaneously, will require no modification of ground equipment.

d. Facilities

(1) The addition to the data processing and acquisition building at Vandenberg Air Force Base to house MIDAS equipment will be completed on 15 April.

[redacted]

[redacted]

(2) On 8 March an Air Force Site Survey Team left for Salisbury, Northern Rhodesia, for conferences with local authorities prior to a survey of possible tracking station sites. The survey of Northern Rhodesia will take approximately 4 weeks. This station will provide data on the restart portion of MIDAS flight 3 and subsequent.

[redacted]

[redacted]

DISTRIBUTION

Hq United States Air Force	20
Air Research and Development Command	5
Strategic Air Command	1
Air Force Ballistic Missile Division	22

[redacted]