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HEADQUARTERS
AIR FORCE BALLISTIC MISSILE DIVISION (ARDC)
UNITED STATES AIR FORCE
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WDLPM-4

10 October 1960

MILITARY SATELLITE PROGRAMS PROGRESS REPORT
Month Ending 30 September 1960
DD-DR&E(M) 397

FOREWORD

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

O. J. RITLAND
Major General, USAF
Commander

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1. (S) DISCOVERER Program
2. (S) MIDAS Program

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d. Launch Pad Requirements Study

A detailed evaluation of launch pad requirements for the MIDAS operational phase has been accomplished. This study indicates the need for a three-pad launch complex during the establishment of the operational network, and a requirement for from two-to-three pads for maintaining the MIDAS satellite network once the buildup phase has been completed.

e. High Energy Proton Damage Investigation

As a result of recent investigations by Space Technology Laboratories on the significance of the high energy tail of Van Allen protons, and their potential effect on long-life satellites, Lockheed has been requested to develop special instrumentation to be carried on MIDAS flights. Contrary to the present theory that the damage cross section is inversely proportional to energy, evidence has been found that solar photovoltaic cells may be degraded at a much higher rate by high energy protons, e. g., 700 MEV. A comprehensive program has been initiated to determine the sensitivity of selected components to high energy proton radiation and to determine the quantitative and qualitative characteristics of the Van Allen radiation at MIDAS flight altitudes.

f. Facilities

(1) Final acceptance of North Pacific station technical facilities at Donnelly Flats, Alaska, was accomplished on 29 September. The heated vehicle storage building at Fort Greely is scheduled for completion on 31 October. Completion of the combined dormitory and dining hall facility, except for exterior area grading, will be completed on 30 December. The [redacted] is scheduled for completion on 15 December. Beneficial occupancy of the remaining North Pacific communications stations is programmed for 1 January 1961.

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(4) All New Boston station support facilities located on Grenier Field, New Hampshire, were completed and accepted during the report period. Support facilities on the New Boston station are on schedule. Design of the data acquisition and processing building modification has been completed and a construction contract is presently being negotiated. Completion is scheduled on an incremental basis with final completion scheduled for 1 January 1961.

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## DISCOVERER PROGRAM

1. This report, covering progress during the month of September 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. DISCOVERER XV Flight

(1) DISCOVERER XV was launched from Vandenberg Air Force Base at 1515 PDT on 13 September and was successfully injected into polar orbit. Two-thirds of the satellites launched in the DISCOVERER Program have attained orbit. THOR booster trajectory was satisfactory; AGENA performance was nominal. Propellant exhaustion caused shutdown, rather than integrator command. A comparison of programmed and actual orbital parameters is shown in the following table:

| PARAMETER | PROGRAMMED | ACTUAL |
|---|---|---|
| Azimuth, degree | 172.0 | 175.2 |
| Perigee, statute miles | 120 | 129 |
| Apogee, statute miles | 410 | 478 |
| Injection Angle | 0 | -0.2 |
| Eccentricity | 0.0371 | 0.04 |
| Period, minutes | 93.44 | 94.2 |

DISCOVERER XV PROGRAMMED AND ACTUAL ORBITAL PARAMETERS

(2) Data received on the first pass over Kodiak and Hawaii indicated that the satellite was stable and in correct attitude but that control gas consumption was excessive. The capsule was ejected on the 17th orbit but, because of a loss of control gas, the pitch-down prior to ejection was not accomplished. As a result, the capsule impacted about 1,000 miles south of the impact point predicted prior to capsule ejection. Subsequent analysis indicates that the roll rate gyro was not properly restraining the rate of satellite roll movements to the proper frequency. This caused the satellite to roll between limits faster than normal and resulted in higher than normal control gas expenditure.

(3) The capsule descent was tracked by the Hawaiian tracking station until re-entry; a computer run of this data resulted in a revised impact point prediction. Aircraft and the recovery ship "Dalton Victory" were dispatched to the impact area. The first aircraft to reach the area

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located the capsule by radio beacon at 2105 PDT and a second aircraft sighted it thirty minutes later. Marker beacons, strobe lights, smoke bombs and aluminum dye were dropped to mark the area. On the morning of the 15th, a Coast Guard amphibian arrived but did not land because of rough seas. Because of deteriorating weather and sea conditions, a plan to drop parachutists and a raft was abandoned.

(4) At 1115 PDT on 15 September electronic contact was lost. Fifteen minutes later, the aircraft lost sight of the capsule which was then listing and riding low in the water. The capsule was not seen again although the search continued throughout 15 and 16 September.

b. DISCOVERER XVI

(1) DISCOVERER XVI is scheduled for launch from Vandenberg Air Force Base in October. This will be the first AGENA "B" vehicle to be launched. Vehicle subsystem and system checks were completed during September and the vehicle has been installed on the launch pad. The AGENA "B" is an improved version of the AGENA "A" containing integral propellant tanks which form part of the satellite skin and having double the propellant capacity.

(2) The increased payload capability of the AGENA "B" will permit use of extra batteries and control gas required for two, three and four day intervals between launch and capsule recovery. The recoverable payload is similar to those flown on DISCOVERER XIV and XV. The ascent parameters for AGENA "B" DISCOVERER satellites are markedly different from previous DISCOVERER vehicles. A comparison of predicted parameters for DISCOVERER XV and DISCOVERER XVI are shown in the following table:

| | DISCOVERER XV (AGENA "A") | DISCOVERER XVI (AGENA "B") |
|---|---|---|
| ASCENT PARAMETERS | | |
| THOR Burnout Time, seconds from liftoff | 163 | 163 |
| THOR Velocity at Burnout, fps | 13,660 | 10,610 |
| AGENA Ignition Time, seconds from liftoff | 269 | 237 |
| AGENA Burn Time, seconds | 117 — | 240 — |
| Injection Velocity, fps | 26,032 | 25,964 |
| ORBITAL PARAMETERS | | |
| Apogee, statute miles | 410 | 426 |
| Perigee, statute miles | 120 | 130 |
| Eccentricity | 0.0371 | 0.035 |
| Inclination Angle, degree | 79.63 | 81.83 |
| Period, minutes | 93.44 | 93.5 |

COMPARISON OF ASCENT AND ORBITAL PARAMETERS FOR AGENA "A" AND AGENA "B" SATELLITES



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## 3. TECHNICAL STATUS

### a. DISCOVERER XV Malfunction Investigation

The results of an investigation into system and equipment performance on DISCOVERER XV were presented on 20 September. The presentation included analysis of the various problem areas encountered; action taken to improve test procedures, inspections and equipment specifications; and action to incorporate improvements in DISCOVERER XVI.

### b. Second Stage Vehicles

The XLR-81Ba-9 engine (serial No. 307) was fitted with a new thrust chamber and subjected to a full duration calibration run. The 240 second firing was completed without appreciable nozzle throat erosion, using a titanium uncooled extension which had previously completed a five day humidity test. The nozzle extension was in excellent condition following the firing. This test completed the Preliminary Flight Rating Test for this engine which is now being prepared for re-acceptance inspection prior to shipment to Arnold Engineering Development Center for reliability testing.



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## MIDAS PROGRAM

1. This report, covering progress during the month of September 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

The vehicle for the third MIDAS flight is currently in the systems test phase of checkout. This is the first MIDAS vehicle to have restart capability. Because of problems which developed in the horizon sensor and related checkout equipment, this vehicle is behind schedule. Based on delivery of a reworked horizon sensor on 15 October, it is scheduled to complete the systems test phase on 12 December. The scheduled launch date for this flight remains 28 February 1961.

3. TECHNICAL PROGRESS

a. Second Stage Vehicles

Assembly of the AGENA "B" vehicles for the fourth and fifth MIDAS flights is proceeding on schedule. The vehicle scheduled for the fourth MIDAS flight is now in final assembly.

b. Infrared Scanners

Infrared scanner units for flights 3, 4 and 5 are being manufactured by Baird-Atomic, Inc., and for flights 6, 7 and 8 by Aerojet-General Corporation.

(1) The infrared detector payload scheduled to be carried on the third MIDAS flight has been delivered. Acceptance testing of this payload will be completed in early October. The second flight payload is scheduled for delivery on 15 October. Two more payloads, one for backup purposes, remain to be delivered.

(2) Temperature profile tests of the engineering test model of the Baird-Atomic configuration are in progress in the High Altitude Temperature Simulation Chamber.

c. Ground Support Equipment

Delivery of the initial Baird-Atomic ground infrared data display equipment is scheduled for 15 October. This equipment will be installed in the Satellite Test Center; a second unit will be installed in the Vandenberg Air Force Base Tracking station. The late delivery of the equipment for the Satellite Test Center will not affect the scheduled activation date. Some revision of the integration activity will be required; however, this will not affect the MIDAS launch schedule. Delays in delivering the second unit of ground station equipment, however, will cause some slippage in the Vandenberg Air Force Base tracking station activation date for support of MIDAS flights.



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