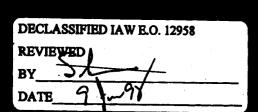
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MILITARY SATELLITE PROGRAM PROGRESS REPORT

FOR QUARTER ENDING 31 MAY 1961 RCS DD-DR&E(Q) 397



Prepared By Headquarters, Space Systems Division
Air Force Systems Command

UNITED STATES AIR FORCE Air Force Unit Post Office • Los Angeles 45. California

HEADQUARTERS SPACE SYSTEMS DIVISION AIR FORCE SYSTEMS COMMAND UNITED STATES AIR FORCE Air Force Unit Post Office, Los Angeles 45, California

WDLPR-4

12 JUNE 1961

MILITARY SATELLITE PROGRAM PROGRESS REPORT QUARTER ENDING 31 MAY RCS DD-DR&E(Q) 397

FOREWORD

During this quarter, two DISCOVERER satellites were launched. One of these attained orbit. Because of satellite stability problems and a vehicle command problem, the capsule was ejected upward rather than downward on a recovery trajectory. Eight DISCOVERER vehicles are scheduled for launch during the next quarter. Several of these vehicles will carry additional modules for further space exploration. During this quarter, the XLR-81Ba-9 engine reliability program was successfully completed. Also during this quarter, the launch equipment at two DISCOVERER launch pads was modernized and one pad was converted from a THOR/IRBM stand to a DM-21/AGENA "B" stand. A maximum effort in the MIDAS Program has readied the second stage vehicle, payload and ground tracking network for the scheduled 20 June launch.

The Military Satellite Program Progress Report has been determined to be a Group 3 document in accordance with paragraph 6, AFR 205-2. This categorization applies to all previous issues. Holders of these documents are responsible for acting promptly to place the correct notation on the document in accordance with this regulation.

O. J. RITLAND

Major General, USAF

Commander

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The DISCOVERER Program consists of the design, development and flight testing of two-stage vehicles, using the Douglas DM-21 Space Booster as the first stage booster and the AGENA as the second stage, satellite vehicle. The program was established early in 1958 under direction of the Advanced Research Projects Agency, with technical management assigned to AFBMD. On 14 November 1959, program responsibility was transferred from ARPA to the Air Force by the Secretary of Defense. Prime contractor for the program is Lockheed Missile and Space Division. The DISCOVERER Program will perform space research in support of the advanced military reconnaissance satellite programs.

PROGRAM OBJECTIVES

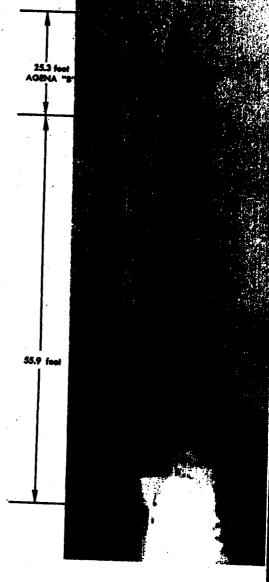
- (a) Flight test of the satellite vehicle airframe, propulsion, guidance and control systems, auxiliary power supply, and telemetry, tracking and command equipment.
- (b) Attaining satellite stabilization in orbit.
- (c)- Obtaining satellite internal thermal environment data.
- (d) Testing of techniques for recovery of a capsule ejected from the orbiting satellite.
- (e) Testing of ground support equipment and development of personnel proficiency.
- (f) Conducting bio-medical experiments with mice and small primates, including injection into orbit, re-entry and recovery.

PROGRAM SUMMARY

Early launches confirmed vehicle flight and satellite orbit capabilities, developed system reliability, and established ground support, tracking and data acquisition requirements. Later in the program, biomedical and advanced engineering payloads will be flight tested to obtain support data for more advanced space systems programs. DISCOVERER vehicles are launched from Vandenberg Air Force Base, with orbital operational control exercised by the Satellite Test Center, Sunnyvale, California.

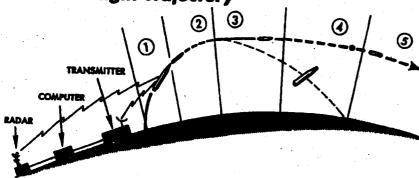
Tracking and command functions are performed by the stations listed in the Table on Page A-4. A history of DISCOVERER flights to date is given on pages A-5 and A-6.

a



| SECOND STAGE | AGENA |
|-------------------------|----------------|
| Weight- | • • |
| inert | 1,346 |
| Payload equipment | 915 |
| Orbital | 2,261 |
| impulse propellants | 12,950 |
| Other | 511 |
| TOTAL WEIGHT | 15,722 |
| Engine Model | XLR81-8g-9 |
| Thrust-lbs., voc. | 16,000 |
| Spec. Imp. eec., vac. | 290 |
| Burn time-sec. | |
| BOOSTER | 240 |
| | DM-21 |
| WeightDry Fuel | 6,50 0· |
| | 33,700 |
| Oxidizer (LOX) | 68,200 |
| GROSS WEIGHT (Ibs.) | 108,400 |
| Engine | MB-3 |
| | Block 2 |
| Thrust, ibs. (S.L.) | 169,000 |
| Spec. Imp., sec. (S.L.) | 248.3 |
| Bern Time, sec. | 148 |

Powered Flight Trajectory



 First Stage Powered Flight — 2.5 minutes duration, 78 n.m. downrange, guided by programmed autopilat.

programmed autopilot.

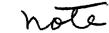
2. Court Period — 2.4 minutes duration, to 380 n.m. downrange, attitude controlled by inertial reference puckage, horizon sconner, gos reaction jets. Receives AGENA time to fire and velocity to be gained commands thru the BTL system.

3. Second Stage Powered Plight -- Approximately four minutes or until injection velocity is attained. Pitch and yow stabilization achieved by glaballing the engine and roll by get reaction jets. Engine shutdown achieved by integrator accelerances cataff cananasal

4. Vehicle Recrients to Nese Aft — 2 minvies deretion. Guided and attitude controlled by inertial reference package, horizon sommer and gas reaction jets.

5. In Orbit -- Controlled (some as 4).

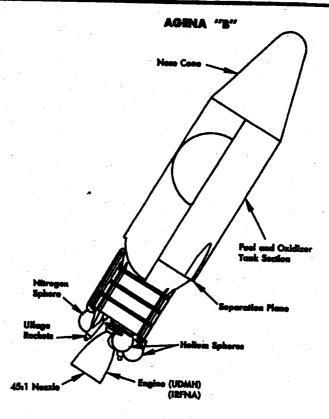
Telemetry ships are positioned as required by the specific mission of each flight. Illustrations on the opposite page show a typical launch trajectory from Vandenberg Air Force Base and a typical orbit. An additional objective of this program is the development of a controlled re-entry and recovery capability for the payload capsule. The recovery operation is also shown on the opposite page. An impact area has been established near the Hawaiian Islands and a recovery force activated. Techniques have been developed for aerial recovery by C-119 and JC-130 aircraft and for sea recovery by Navy surface vessels. The recovery phase of the program has provided advances in re-entry technology. This information will be used in support of more advanced projects, including the return of a manned satellite from orbit.



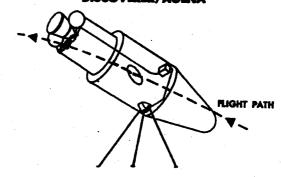
AGENA VEHICLE DEVELOPMENT

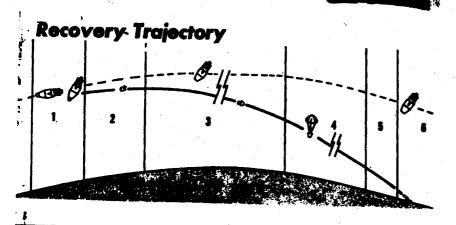
The AGENA vehicle was originally designed as a basic satellite vehicle for Military Space Programs.

The first AGENA "B" used the Bell XLR-81Ba-7 engine and was first flown on DISCOVERER XVI.—
The latest AGENA "B" vehicles use the 16,000 pound thrust XLR-81Ba-9 engine which has a restart capability. This larger vehicle permits achieving higher injection altitudes with equivalent weight payloads and the restart provision permits orbital adjustment.



DISCOVERER/AGENA





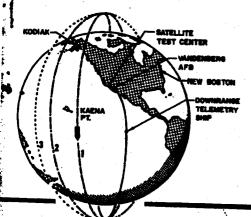
-83.5 seconds duration, 2,000 navi rth of impact point. Pitch reori

rule separates, spin rockets fire, retro ne and de-spin rockets fire. Retro rocket ust cone separate from re-entry cop

entry —8 minutes duration, recovery re-enters the earth's atmosphere, Parate cover is ejected and ablation shell separated

4. Beccent to Recevery Altitude —18 min-utes duration. Rested paracture is deployed and chaff ite aid in radar tracking) is ejected. Cap-sule descends from 55,000 feet to 14,000 feet. sure descents from 35,000 feet to 1,500 feet during which time air recovery is attempted.

See Recovery—Capsule impacts in the sea, surface forces attempt recovery.



Orbital Trajectory

Schematic presentation of orbital trajectory following launch from Vandenberg Air Force Base. Functions performed by each station and a listing of equipment used by each station, is given on page 4.

RECOVERY CAPABILITY

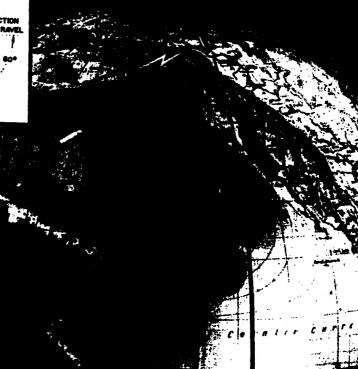
This objective was added to the program after the first lanned achieved vehicle flight and orbit objectives mecessfully. It includes the orientation of the satellite vehicle to permit a recoverable capsule to be ejected from the mose section of the AGENA vehicle. Bjection is programmed to occur on a selected orbit, for capsule impact within the predatorminal recovery area near Haunii. Aircraft and surface vessels are deployed within the area as a recovery force. area as a recovery force.

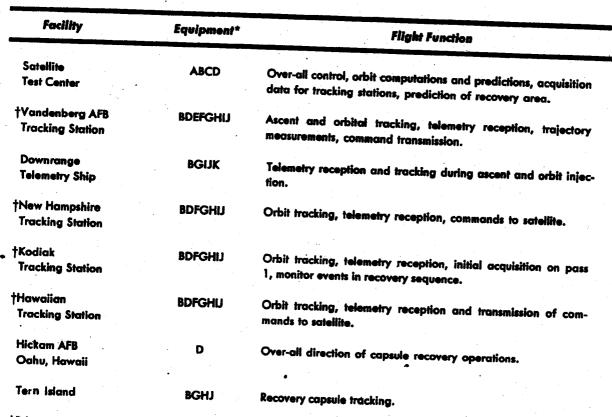
CAPSULE RECOVERY SEQUENCE

The desired orbit for capsule ejection is selected after the vahicle is on orbit based on satellite performance, longitudinal location of the orbits, recovery force status, and weather in the potential recovery area. A command is sent to the vehicle prior to the selected recovery pass which initiates the recovery sequence. This command may be sent from any of the primary tracking stations listed on page A-4.

• The ejection sequence includes a pitch down maneuver, capsule separation, spin-up, retro-rocket firing, de-spin and reseasery. Following parachete deployment the aerial recovery force converges on the descending capsule and mags the parachete. The capsule contains a radio beacon and reflective chaft which is dispersed to aid in tracking.
• The recovery force consists of C-119, RC-121, WVII and JC-54 mirrors supplemented by 2 or 3 surface vessels that receive and record telementy data. If it is necessary to retrieve the capsule from the sea, these ships are available.







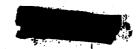
†Primary Tracking Stations (have command capability)

*Equipment

- A. General Purpose Computer(s) and Support Equipment
- **B.** Data Conversion Equipment
- C. Master Timing Equipment
- . D. Control and Display Equipment
- E. BTL Tracking Station (DISCOVERER ascent only)

- F. VERLORT
- G. VHF FM/FM Telemetry Station
- H. VHF Direction Finding Squipment
- i. Doppler Equipment
- J. VHF Telemetry Antenna
- K. APL Doppler Equipment

NOTE: In addition to equipment listed, all stations have inter- and intra-station communications equipment and checkout equipment.



Launch Schedule

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Flight History

| DISCOVERER No. | DM-21 No. | AGINA No. | Flight Date | Remarks |
|-------------------|--------------|--------------|--------------|--|
| | | ISCOVER | ER FLIGHTS 0 | THRU XX ARE ON PAGE A-6 |
| XXI | 261 | 1102 | 18 February | Attained orbit successfully. Non-recoverable, radio- metric data gathering MIDAS support flight. |
| IDOX | 300 | 1105 | 30 March | Launch, ascent, separation, coast and orbital stage ignition normal. Orbital velocity was not attained because of an AGENA bydraulic malfunction. |
| XXIII | 307 | 1106 | 8 April | Assained orbit successfully. Loss of control gas pre- vented proper positioning of the satellite for capsule re-entry. Capsule was ejected into new orbit on re-entry pass. |

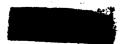
VEHICLE CONFIGURATIONS

A. THOR-DM-18/AGENA "A"

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

C. THOR—DM-21/AGENA "5" MB-3 Block 2/XLR81-8e-9





^{*} Attained orbit successfully.

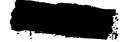
[®] Capsule recovered.

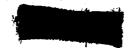
[•] Failed to attain orbit.



Flight History (continued)

| DISCOVERER DM-21 No. No. | | AGENA No. | Flight Date | Remarks |
|-----------------------------|-----|--------------|-----------------|---|
| 0 | 160 | 1019 | 21 January 1959 | AGENA destroyed by malfunction on pad. THOR rejurbished for use on flight XII. |
| 1 | 163 | 1022 | 28 February | Attained orbit successfully. Telemetry received for 51 seconds after lift-off. |
| 11 | 170 | 1018 | 13 April | Attained orbit successfully. Recovery capsule ejecte on 17th orbit was not recovered. All objectives excepted achieved. |
| | 174 | 1020 | 3 June | Launch, ascent, separation, coast and orbital boost successful. Pailed to achieve orbit because of low performance of satellite engine. |
| IV | 179 | 1023 | 25 June | Same as DISCOVERER III. |
| V | 192 | 1029 | 13 August | All objectives successfully achieved except capsul recovery after ejection on 17th orbit. |
| VI | 200 | 1028 | 19 August | Same as DISCOVERER V. |
| VII | 206 | 1051 | 7 November | Attained orbit successfully. Lack of 400-cycle power prevented stabilization on orbit and recovery. |
| VIII | 212 | 1050 | 20 November | Attained orbit successfully. Malfunction prevented AGENA engine shutdown at desired orbital velocity Recovery capsule ejected but not recovered. |
| iX · | 218 | 1052 | 4 February 1960 | THOR shut down prematurely. Umbilical cord mass did not retract. Quick disconnect failed, cassing loss of bolium pressure. |
| X | 223 | 1054 | 19 February | THOR destroyed at T plass 56 sec. by Range Safety Officer. Severe pitch oscillations caused by booster autopilos malfunction. |
| XI | 234 | 1055 | 15 April | Attained orbit successfully, Recovery capsule ejected on 17th orbit was not recovered. All objectives except recovery successfully achieved. |
| XII | 160 | 1053 | 29 June | Launch, ascent, separation, coast and orbital stage ig- nition were successful. Failed to achieve orbit because of AGENA attitude during orbital stage boost. |
| XIII | 231 | 1057 | 10 August | Astained orbit successfully. Recovery capsule ejected on 17th orbit. Capsule was recovered after a unter impact with negligible damage. All objectives except the airborne recovery were successfully achieved. |
| XIV | 237 | 1056 | 18 August | Attained orbit successfully. Recovery capsule ejected on 17th orbit and was successfully recovered by the airborne force. All objectives successfully achieved. |
| XV | 246 | 1058 | 13 September | Attained orbit successfully. Ejection and recovery sequence completed. Cabsule impact occurred south of the recovery forces; located but lost prior to being retrieval. |
| XVI | 253 | 1061 | 26 October | Lannch and ascent normal. AGBNA failed to separate from booster and failed to attain orbit. |
| XVII | 297 | 1062 | 12 November | Attained orbit successfully. Recovery capsule ejected on 31st orbit and aerial recovery was accomplished. All objectives were successfully achieved. |
| XVIII | 296 | 1103 | 7 December | Attained orbit successfully. Recovery capsule ejected on 48th orbit and april economy |
| XIX | 258 | 1101 | 20 December | All objectives were successfully achieved. Attained orbit successfully. Non-recoverable, radiometric data gathering MIDAS support flight. |
| XX | 298 | 1104 | 17 February | Attained orbit successfully. Copsule did not retenter due to on-orbit maljunction. |



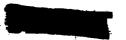


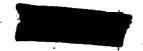
A. BRIEF OF PROGRESS

DISCOVERER XXII was launched from Vandenberg Air Force Base on 30 March. The loss of engine control resulted in insufficient velocity to attain orbit. DISCOVERER XXIII launched on 8 April was injected into a near nominal orbit. Because of satellite stability problems and a vehicle command problem the capsule was ejected into a more elliptical orbit. Because of these malfunctions and in the continuing effort to increase reliability the horizon sensor has been modified, the command beacon circuitry has been changed, and electric blankets are being provided for the gas jet control valves. (3)

Eight DISCOVERER vehicles are scheduled for launch during the coming quarter. Additional equipment for measuring the space environment will be carried aboard several of these vehicles. DISCOVERER XXV will carry a Geophysical Research Directorate module in June.

The XLR-81Ba-9 engine reliability test program which was conducted at Beli Aerasystems Company and the Arnold Engineering Development Center was successfully concluded during this quarter.





B. TOPICAL SUMMARY

1. Flights

a. DISCOVERER XXII

(1) DISCOVERER XXII was launched from Vandenberg Air Force Base Pad 4, Complex 75-3, at 1234 PST on 30 March. Recovery of the vehicle's capsule was scheduled after four days on orbit. Booster operation was nominal. The 20 cycles per second longitudinal oscillation appeared as on previous flights but on a slightly lower level. AGENA ignition occurred as planned; however, approximately 20 seconds prior to engine shut down a rapid drop in hydraulic pressure caused a loss of engine control. This resulted in a total velocity less than that required to attain orbit.

(2) The Bell Telephone Laboratory (BTL) guidance system was used to guide the DM-21 booster for the first time. This system also commands AGENA ignition, vehicle correction and operation. Results indicate excellent BTL guidance performance. (C)

b. DISCOVERER XXIII

(1) DISCOVERER XXIII Flight

(a) DISCOVERER XXIII was launched from Vandenberg Air Force Base Pad 5, Complex 75-3, at 1121 PST on 8 April. Recovery of the vehicle's capsule was scheduled after four days on orbit. All ascent operation: boost, separation, coast, and orbital boost were accomplished as planned and the DISCOVERER satellite was injected into a near nominal orbit. Table I shows the predicted and attained parameters. The AGENA operation proved the effectiveness of the hydraulic modification resulting from the DISCOVERER XXII malfunction. (8)

| | Programmed | Actual |
|------------------------|------------|--------|
| Apogee, statute miles | 421.5 | 404 |
| Perigee, statute miles | 190 | 180 |
| Eccentricity | 0.0274 | 0.0257 |
| Period, minutes | 94.40 | 94.074 |

TABLE I. COMPARISON OF PROGRAMMED AND ACTUAL ORBITAL PARAMETERS FOR DISCOVERER XXIII

(b) Tracking and telemetry data received on the first and second passes showed that the satellite had satisfactorily recriented to an engine first attitude and was stable. On the next contact with the vehicle (pass seven) abnormalities in horizon scanner operation were noted. Between pass nine and ten, all control gas was expanded and the satellite became unstable. Although ground stations were able to command the satellite and received usable telemetry data, this resulted in intermittent radar lock-on and cyclical fluctuations in signal strength from satellite RF transmissions. (S)

DISCOVERER XXII launched

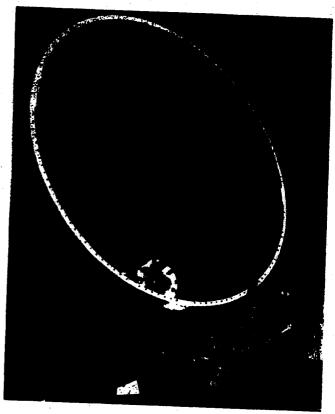
on 30 March

First use of BTL guidance system

DISCOVERER XXIII launched on 8 April

SATELLITE is unstable





Pigure 1. DISCOVRRER XXIII (left) during final obschoot at Complex 75-3, Pad 5, the morning of 8 April. The satellite's orbit was very close to that planned for the flight. Satellite instability caused the capsule to be alected into a more elliptical orbit. Bell Telephone Laboratories guidance system components (above). This system is being stad to guide the DM-21 booster. The upper container bouses the flight controller and the large smit at one o'clock is the inertial reference package. The dark line following the thin contour is the unsegnide which connects the flight controller with the autenna.

Ejection attempted after two days on orbit

(c) The decision was made to attempt recovery of the capsule on pass 32 instead of the nominal pass 63. The New Hampshire Tracking station transmitted the ejection command but the satellite received a spurious command. As a result, the capsule was ejected on pass 31. The capsule retro-sequence operated satisfactorily, but since the satellite was not in the proper attitude at separation, the capsule was ejected into a new orbit. The capsule's orbit has an apogee of 850 nautical miles, a perigee of 120 nautical

record to

Horizon scanner modified

Command beacon circuitry

modified

(2) DISCOVERER XXIII Flight Analysis

miles and a period of 101 minutes. (8)

(a) As a result of the continuing effort to improve reliability, a modified horizon scanner will be flown on future DISCOVERER satellites. One of the improved units completed 210 hours of bench tests and was then placed in a vacuum chamber to be operated until it fails. Let

(b) The spurious command problem which resulted in the radar beacon receiving two commands when only one was sent is attributed to the difficulty of commanding an unstable satellite where radar lock cannot be held. The characteristics of the command signal tones and the rotation rate of the radar antenna operating on an unstable satellite can produce the results recorded on DISCOVERER XXIII. Although this explains the command problem, an intensive investigation has resulted in proposed changes to the command beacon circuitry and operating procedures which will minimize this kind of problem. (S)

Blankets provided for gas control valves

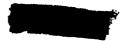
(c) Analysis of data indicates that sub-normal temperatures caused erratic operation of the gas jet control valves and resulted in the rapid expenditure of control gas. Temperature pickups located near some of the valves recorded temperatures considerably colder than those recorded on previous DISCOVERER flights. This probably resulted from the screening of the earth and solar radiation by the new flame shield. An analog simulation of the conditions demonstrated that the observed satellite behavior could have been caused by sluggish, sticky operation of the control valves. To prevent a recurrence of this difficulty on subsequent DISCOVERER satellites, control valves will be coated with a heat absorbent material and will be wrapped with thermostatically controlled electric blankets.

DISCOVERER XXIV

c. Scheduled Flights

DISCOVERER XXV

- (1) DISCOVERER XXIV will be launched from Pad 4, Complex 75-3, Vandenberg Air Force Base, early in June. 487
- (2) DISCOVERER XXV, which is scheduled for launch in mid-June, will be the first vehicle launched from the newly converted Pad 1, Complex 75-1, at Vandenberg Air Force Base. This pad has been converted from a THOR IRBM launch facility to a DISCOVERER facility. 181



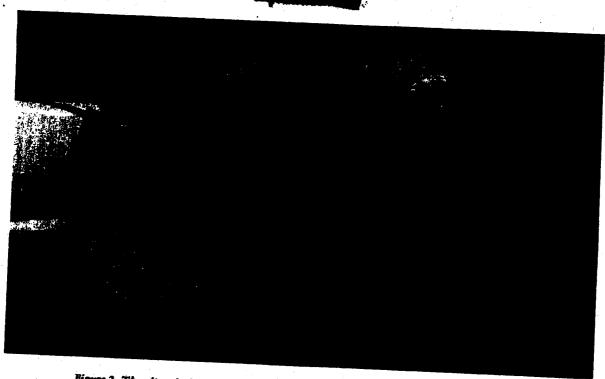


Figure 2. The aft end of the AGENA vehicle showing the heat shield (white cone around the engine nozzle). The pencil-like flame characteristics of a rocket engine in the atmosphere becomes a large ball which envelopes the engine in space.

20 cycle per second oscillation studied

(3) DISCOVERER XXIV and XXV will be instrumented to provide data on the 20 cycle per second longitudinal oscillation which has been apparent immediately prior to booster burnout on several recent DISCOVERER flights. Instrumentation added to these vehicles will provide data indicating the distribution of loads imposed by the oscillation. This data could serve as a basis for strengthening the spacecraft in areas where the loads approach the design limits.

2. Technical Status

a. XLR-81Bq-9 Engine Development

(1) Production of XLR-81Ba-9 engines at the Bell Aerosystems Company has practically been halted because of a substantial stretch-out in engine delivery requirements by Lockheed Missiles and Space Division. (8)

(2) All firings of the XLR-81Ba-9 engine reliability test program were completed in April. Forty tests were conducted at Bell Aerosystems Company, ten of which were restart and thirty were full-duration firings. Twenty-five restart firings were made in an Arnold Engineering Development Center altitude chamber. The tests were satisfactory and demonstrated a major component life far in excess of specification requirements.

Engine delivery stretchout

Engine reliability program completed

WDLPR-4-292



Space environment equipment to be carried

b. Geophysical Research Directorate (GRD) Experiments

- (1) The Geophysical Research Directorate is furnishing equipment for a number of DISCOVERER flights aimed primarily at determining environment in space:
- (a) Atmospheric Density: This will include measurements of atmospheric density and determination of the existence of atmospheric waves at altitudes of 100 to 400 miles as a function of latitude, time of day and season. Calculations based on these data will be valuable in determining vehicle drag and lifetime.
- (b) Cosmic Radiation: These measurements will be made to assess the radiation hazard to components above 130 miles, in the Van Allen and Auroral regions.
- (c) Thermal Radiation: Infrared radiation from the earth and atmosphere, scattered solar radiation will be measured to obtain data for calculating proper vehicle equilibrium temperatures.
- (d) Micrometeorites: Rates of penetration of vehicle skin, mass, density and energy of micrometeorites, and skin erosion will be measured to obtain data on thermodynamic effects.
- (e) Solar Ultra-Violet Radiation: Solar radiation in the ultra-violet and X-ray regions will be measured to determine aging effects on plastic and organic materials.
- (f) Atmospheric Composition: Data on the kinds and states of atmospheric particles, since organic and plastic materials show aging, corroding or chemical effects when exposed to free radicals such as atomic oxygen. Data on ion concentrations are
- (g) Magnetic Field: Results from more complete studies of the earth's magnetic field are of interest for possible use in attitude stabilization systems. Magnitude and direction at various altitudes will be determined. Long term variations will also be determined.
- (2) The first of the new modules to be used for carrying Geophysical Research Directorate Instruments for measuring the space environment is at Vandenberg Air Force Base awaiting launch on DISCOVERER XXV. This module includes a cosmic ray monitor, micrometeorite detector, two atmospheric density gages and associated electronics. The equipment is powered by the satellite vehicle power supply and data is transmitted by the vehicle's telemetry system.
- (3) This is the first of several modules scheduled for flight on DISCOVERER satellites in a program designed to utilize the weight carrying capability available on some flights for space research purposes. The modules replace the engine access door and are designed with universal mounting rails upon which a variety of instruments can be mounted. Nearly all units and wiring are mounted on the modules so that installation and removal can be accomplished with minimum interference to prelaunch operation. (C)

DISCOVERER XXV to carry GRD module

Module to replace engine access door



Pigure 3. The first Geophysical Research Directorate module (left). This module end its instruments will replace an engine access door on DISCOV. ERER XXV. The atmospheric density gages, upper right, are held against the module during ascent and will pop-out to the position shown after orbit is attained. Installing the module on the AGENA vehicle (below). The smits and wiring are mounted on the module so that installation and removal can be accomplished with minimum interference to prelaunch operations.



WDLPR-4-292

Pad 1 modified

Propellant transfer system modernized

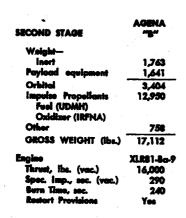
3. Facilities

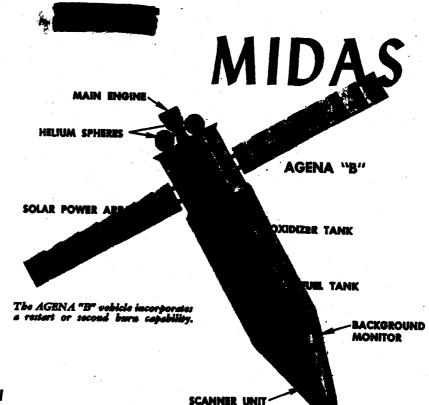
a. Complex 75-1

Pad 1 of Complex 75-1 has been converted from a THOR IRBM to a DISCOVERER launch facility. Modifications completed include extending the missile shelter to accommodate the DM-21/AGENA vehicle, and adding the DISCOVERER fuel transfer, ground support and launch control systems. This new equipment will permit faster, more reliable launch operations. (C)

b. Complex 75-3

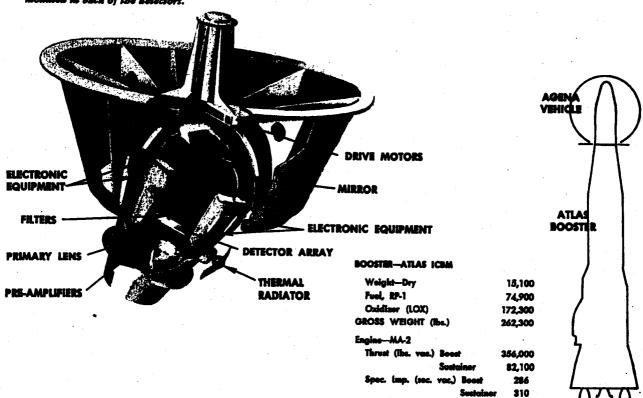
Modernization of DISCOVERER launch pads 4 and 5 at Complex 75-3, including installation of new propellant transfer sets and updated launch control system equipment, has been completed. Both pads are available for June launches.





MIDAS Infrared Detection Payload

Payload Operation: Incident radiation passes through the primary lens, then is reflected by the mirror which brings the energy into sharp focus on the detector array. The filter is located in front of the detector array to exclude mounted radiation. Preamplifiers are mounted in back of the detectors.



PROGRAM HISTORY

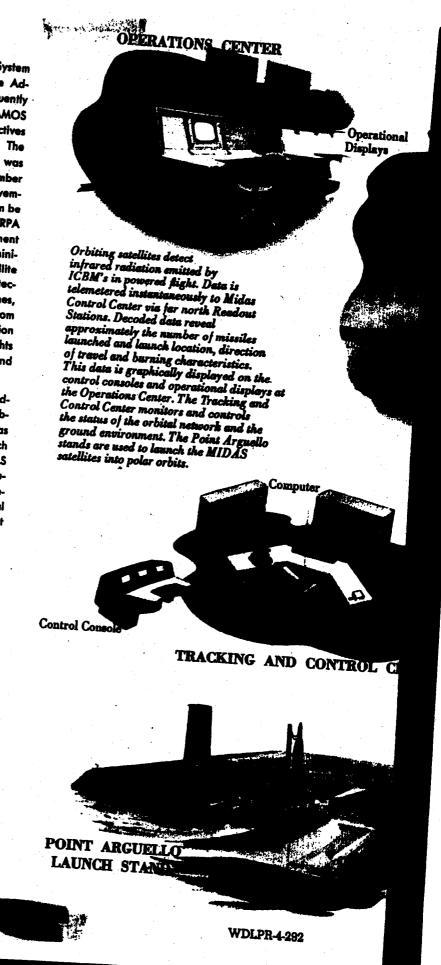
The MIDAS Program was included in Weapon System 117L when WS 117L was transferred to the Advanced Research Projects Agency. ARPA subsequently separated WS 117L into the DISCOVERER, SAMOS and MIDAS Programs, with the MIDAS objectives based on an infrared early warning system. The MIDAS (Missile Defense Alarm System) Program was directed by ARPA Order No. 38, dated 5 November 1958 until transferred to the Air Force on 17 November 1959. The Air Force directed that the program be continued under the technical guidance of the ARPA Order and approved the MIDAS R&D Development plan dated 15 January 1960. This plan was a "minimum essential" program directed toward the satellite vehicle and proof of the feasibility of infrared detection capabilities. It provided for ten test launches, two from the Atlantic Missile Range and eight from the Pacific Missile Range. Subsequent authorization was obtained to utilize two DISCOVERER flights (designated RM-1 and RM-2) to carry background radiometers in support of MIDAS.

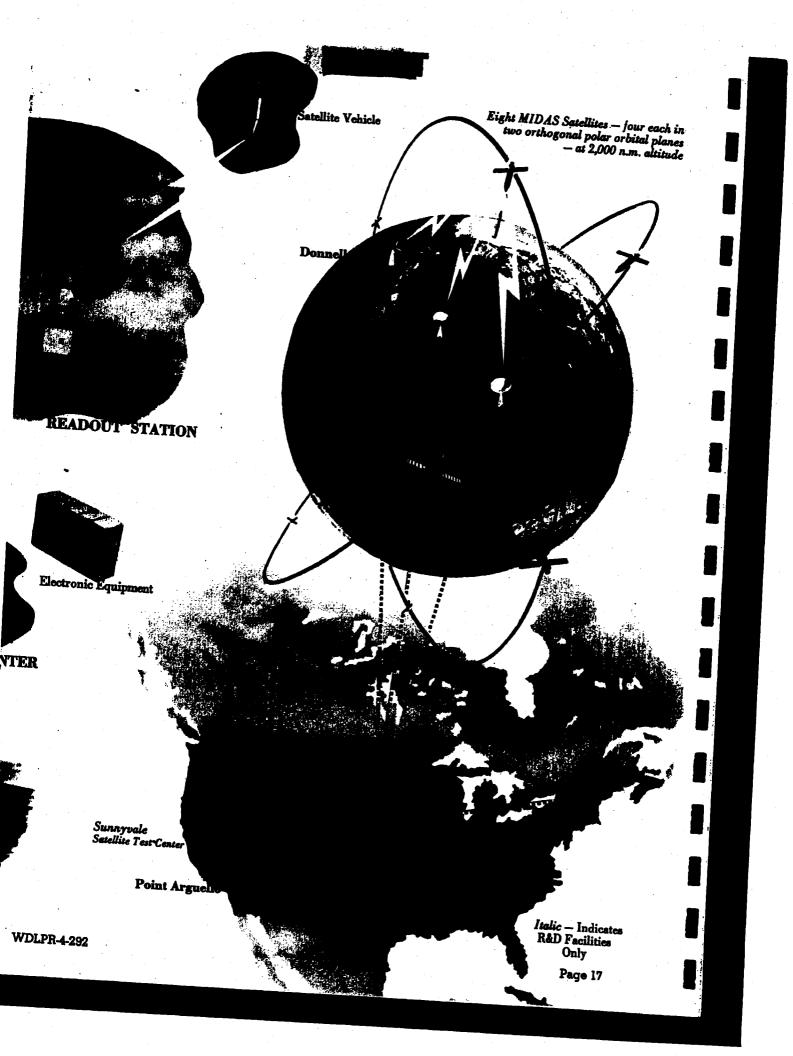
A program of complete system development, including the ground environment of MIDAS, has been submitted to the Department of the Air Force and has been approved in principle and objective. The launch schedule of that program, 31 March 1961 MIDAS R&D Development Plan, is shown on page B-5. Authorization has been received to initiate action implementing the plan with reconsideration for approval to be accomplished subsequent to a successful test launch in 1961.

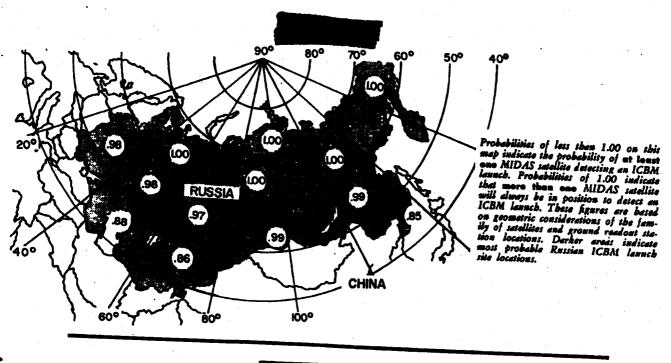
TECHNICAL HISTORY

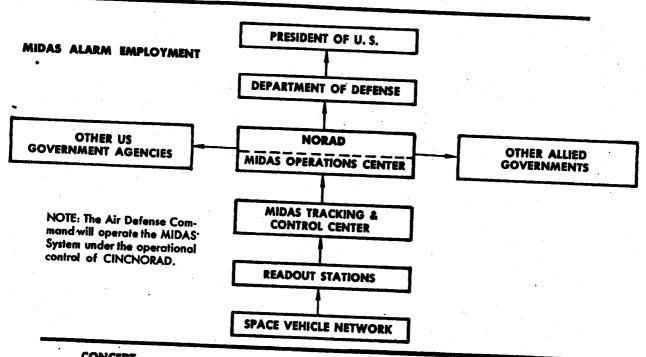
The MIDAS infrared early warning payload is engineered to use a standard launch vehicle configuration. This consists of an ATLAS missile as the first stage and the AGENA vehicle, powered by a Bell Aircraft rocket engine as the second, orbiting stage. The final configuration payload weight will be approximately 1,000 pounds.

The first two R&D flights used the AGENA "A" and ATLAS "D" vehicle programmed to place the payload in a circular 261 nautical mile orbit. Subsequent R&D flights will utilize the ATLAS "D"/AGENA "B" configuration which will be programmed to place the payload in a circular 2,000 nautical mile polar orbit.









CONCEPT

The MIDAS system is designed to provide continuous infrared coverage of the Soviet Union. Surveillance will be conducted by eight satellite vehicles in accurately positioned orbits. The area under surveillance must be in line-of-sight view of the scanning satellite. The system is designed to accomplish instantaneous readout of acquired data by at least one of three strategically located readout stations. The readout

stations transmit the data directly to the MIDAS Tracking and Control Center where it is processed. It is then displayed and evaluated in the MIDAS Operations Center. If an attack is determined to be underway, the intelligence is communicated to a central Department of Defense Command Post for relay to the President and all national retaliatory and defense agencies.

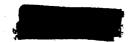
Launch Schedule

| | La | vnch | Sc | | ule |
|---------------|-----------------|---------------|---|-------------------------------|------|
| *** | ATLAS D'AGENA " | | 8 | J F M A M J J A S O N O D S T | -960 |
| | | 1 1 | | J F M A M J J A S O N D | -96- |
| ATLAS D'AGENA | | 1 1 1 1 1 1 1 | N D | | 962 |
| | | 2 2 3 | J F M A M J J A S O N | 963 | |

Flight History

| MIDA: No. | Launch Date | ATLAS No. | AGENA No. | Romarks |
|--------------|----------------|--------------|---------------|---|
| 1 | 26 February | 29D | 1008 | Did not attain orbit because of a failure during |
| | 24 May | 45D | 1007 | Highly successful, Performance with respect to pro- grammed orbital parameters was outstanding. Useful infrared data was observed |
| | | | VERER Vehicle | Despite satellite oscillations, sufficient data were obtained for evaluation of psylond operation. Information obtained in the 2.7- micron region agrees with data obtained from balloon-borne radiometric equipment. Data in the 4.3- micron region is somewhat higher than had been anticipated from theoretical studies. |
| K/Y1-2 | 18 February | DISCOV | ERER Vehicle | All channels functioned properly and valid data were obtained on six stable orbits. Data confirmed previous radiometric measurements. |

- DISCOVERER vehicles carrying MIDAS radiometric payloads
- * Attained orbit successfully
- Failed to attain orbit



MIDAS GROUND SUPPORT FACILITIES

| Facility | Equipment* | Flight Function |
|------------------------------------|---|--|
| Satellite Test Center | ABCDEP | Operations control, orbit computations and predictions, initiation of commands to satellite (via tracking stations), process payload data. |
| Vandenberg AFB Tracking Station | ABCEFGHIJKLMP | Ascent and orbital tracking; telemetry reception; trajectory computations; command transmission; reception recording and processing of payload data. |
| Downrange Teleme Ships | try GHIJNO | Tracking and data reception during ascent. (Three ships are available for this function. Equipment is typical.) |
| Hawaiian Tracking Station | BEFGHJ | Orbital tracking, telemetry reception, payload data reception |
| AMR | HJ | Orbital data reception. |
| New Hampshire Station | ABCEFGHIJKLM | Orbital tracking; telemetry reception; command transmission reception, recording and transmission of payload data. |
| African Tracking Station | BEGJ | Telemetry reception and recording during second burn. |
| North Pacific Station | BCEHKMP | Satellite and payload data reception, command transmission |
| Kodiak Tracking Station | FJ | Orbital tracking. |
| Mugu Tracking Station | BEFGJ | Tracking and telemetry reception. |
| NOTES: (1) | In addition to equipment listed, communications equipment and a | all stations have inter- and intra-station checkout equipment. |
| (2) | | ty available or planned and approved |

*Equipment

- A. General Purpose Computer(s) and Support Equipment
- B. Data Conversion Equipment
- C. PICE
- D. Master Timing Equipment
- E. Control and Display Equipment
- F. YERLORT
- G. VHF FM/FM Telemetry Station
- H. PAM FM Ground Station

- i. Doppler Equipment
- J. VHF Telemetry Antenna
- K. UHF Tracking and Data Acquisition Equipment (60 foot F&D Antenna)
- L UHF Angle Tracker
- M. UHF Command Transmitter
- N. APL Doppler Equipment
- O. SPQ-2 Radar
- P. Midas Payload Evaluation and Command Equipment

A. BRIEF OF PROGRESS

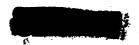
A Development Plan was prepared and printed early in April. On 24 April, the Air Force Systems Command approved the plan. Final approval by the Air Force Ballistic Missiles and Space Committee is still pending. (U)

A proposal for simplifying the MIDAS operational prototype system has been submitted and is currently being evaluated by the Space Systems Division. Substantial increases in reliability and life expectancy are proposed benefits of this simplified system (U)

ATLAS 97D (MIDAS III booster) is being prepared for final validation for flight. The AGENA vehicle has been delivered to Point Arguello Pad 2 and is being readied for the 20 June launch. The payload is undergoing final testing prior to being mated with the AGENA satellite vehicle. -(S)

Considerable progress was made during the quarter on the design of facilities. The design of the technical support facilities at Vandenberg Air Force Base was completed, Final plans for the New Hampshire tracking station technical support were also completed. Preliminary design of the Ottumwa tracking and control center facilities was completed on 26 May. Authorization to proceed with the rehabilitation of base support facilities was given on 7 May. (U)





B. TOPICAL SUMMARY

Development Plan prepared

1. Program Administration

a. Program adjustments resultant to guidance received from the Air Force Ballistic Missiles and Space Committee (AFBMSC) were resolved with the major contractors and local governmental agencies during March. Coordination of the adjusted program plan was accomplished with the range facility, Pacific Missile Range. A Development Plan, dated 31 March, reflecting the increased scope and program acceleration approved by the AFBMSC and adjusted to the funding guidance received, was printed early in April. (U)

AFSC approves Development
Plan

b. On 24 April, representatives from the Space Systems Division (SSD) briefed the Air Force System Command on the MIDAS R&D Development Plan. The plan received Command approval and the following day a briefing covering its background, content, and objectives was presented to members of the Department of Defense and to the Defense Panel of the Weapons Board, Headquarters USAF. Authority was given for SSD to proceed against the plan pending final detailed approval by the AFBMSC. (U)

"System Package Program" documentation prepared

c. A vigorous program to document a "system package program" in response to the 375 series of Air Force regulations was initiated in March. Initial documentation and formulation of management organization and concepts has been completed. Analysis of these efforts reveal that there remains a considerable amount of data to be generated and inter and intra-command coordination to be accomplished. The internal organization and management realignment resulting from the new structure of the Air Force Systems Command and the Air Force Logistics Command has had considerable impact on this effort. Results of this command structure and functional realignment are being incorporated into the documentation as they are identified and finalized. (U)

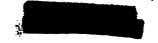
Operational system concept clarified

d. The MIDAS Operational System concept is being reviewed to define in greater detail, based on present knowledge, the operational philosophy and requirements for each system element. (U)

Operational prototype system simplification proposal analyzed

- e. The Space Systems Division is presently analyzing and evaluating a Lockheed Missiles and Space Division proposal for simplification of the MIDAS Series IV prototype system. Primary emphasis is placed on vehicle simplification with ancillary reduction of complexity in the design and manufacture of support, checkout, and launch control equipment. Substantial increases in reliability and life expectancy are proposed benefits of this simplified system. Some of the concepts of the proposed simplified system are:
- (1) Twelve satellites randomly spaced in orbit, four in each of three orbital planes. Two satellites in each plane would orbit in one direction and the other two would orbit in the opposite direction.





- (2) All satellite equipment would operate on a continuous duty cycle.
 - (3) Provisions for orbital adjustment would not be required.
- (4) The solar auxiliary power array would be static following its initial extension no constant adjustment to provide maximum sun exposure.
 - (5) The attitude control requirements would be reduced.
 - (6) All data transmission would be accomplished on UHF.
- (7) No command system would be required, eliminating the need for the orbital programmer and the power control unit.
- (8) Reduced tracking accuracy requirement of 20 nautical miles would allow tracking to be accomplished with the 60-foot tracking and data acquisition antenna by angle tracking only.

While the proposal has many desirable and attractive possibilities, it, must be carefully analyzed as to impact on mission capability, vulnerability, cost, schedules, productibility and logistic support, etc., to positively assure that this approach is optimum for this time period.

2. Flights

- a. Analysis of the data transmitted by the second radiometric flight (RM-2) conducted in February has provided valuable information despite vehicle tumbling. Telemetry, and reference channels performed satisfactorily.
- b. During the second pass the Kaena Point, Hawaii, station received particularly good data in the 4.3 micron range. This data was of better quality than that obtained on the RM-1 flight. At this time the vehicle was stable and pitched downward at approximately

13th pass, despite the tumbling of the satellite, the New Hampshire station acquired some valuable data. A final report on the RM-1 and RM-2 data and an analysis of them is being published and will be available in mid-June.

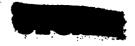
3. Technical Status

a. Boosters

On 9 March, ATLAS 97D (MIDAS III booster) successfully completed a flight readiness firing at the Point Arguello launch complex. The booster was then used to complete Stand and Automatic Programmed Checkout Equipment (APCHE) validation checks. The booster is also being prepared for final validation for flight which starts on the AGENA "on-stand" date. Booster progress is satisfactory to support the launch of MIDAS III.

b. Second Stage Vehicles

(1) MIDAS II, launched from the Atlantic Missile Range on 24 May 1960, was tracked by the Hawaiian tracking station on



RM-2 flight transmits valuable data

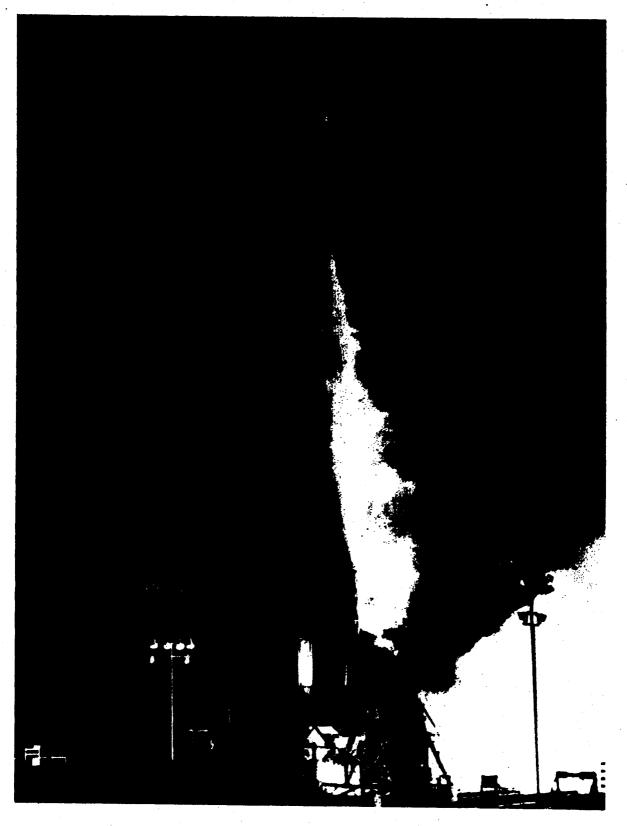
Final RM-1 and RM-2 reports to be published in mid-June

ATLAS 97D ready for launch

MIDAS II SAPUT still operating

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Pigure 1. Successful flight readiness firing of ATLAS 97D at Point Arguello Pad No. 2. An AGENA checkout vehicle is installed on the ATLAS booster for these tests.

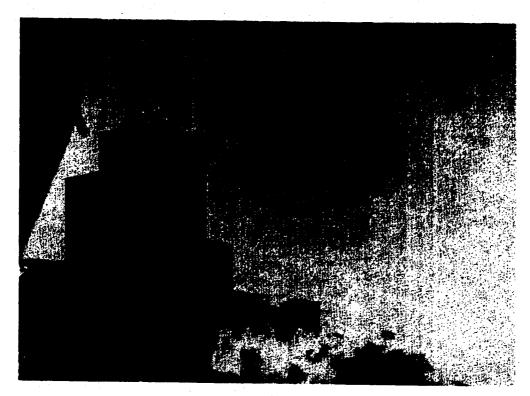


Figure 2. Successful "bot-firing" of the MIDAS III AGENA vehicle at the Santa Cruz Test Base. Complete simulation of AGENA boost and orbital operation was accomplished during these tests.

pass 5054, 20 April 1961, and pass 5070, 21 April, for a total of 21.6 minutes of the auto-track with a TLM-18 antenna. The SAPUT (Solar Auxiliary Power Unit Telemeter) was still operating with a signal strength of four microvolts. (U)

MIDAS III AGENA vehicle "hot-fired"

(2) On 1 March, the AGENA vehicle for MIDAS III was successfully hot-fired at the Santa Cruz Test Base. This hot firing included a complete simulation of the AGENA boost and orbiting operation for a simulated altitude of 2,000 nautical miles. The payload was operated during the simulated orbit and the scanner was rotated throughout its entire travel. Checkeut of the payload was accomplished through the regular command and data links.

AGENA vehicle modified

- (3) The launch delay of over two months since the first of the year has been caused largely because of AGENA vehicle subsystem checkout problems. The solution of these problems involved some modification of the AGENA vehicle during the vehicle prelaunch preparation and test phase. Modifications accomplished during the system tests at Vandenberg Air Force Base are listed below.
- (a) The horizon sensors were modified to avoid possible sun saturation. New sensor hornesses and heads were installed permitting the vehicle to be satisfactorily stabilized in pitch even though one sensor was scanning the sun.



- 12
- (b) A propellant tank venting problem required that a propellant tank vent and engine drain line nullifiers be installed.
- (c) A power control unit access door has been installed that permits the emergency reset timer to be reset without removing the power control unit.
- AGENA delivered to Pad 2 on May 24
- (4) On 12 May, the satellite vehicle completed a successful simulation countdown and flight, and on 24 May, following a series of final alignments, was delivered to Pad 2 of Point Arguello Launch Complex No. 1. The launch is now scheduled for 20 June.

MIDAS IV vehicle in systems test

(5) The AGENA vehicle for the MIDAS IV flight is completing integrated systems tests at the Lockheed manufacturing facilities. Upon completion of system tests, the vehicle will be transported to the Santa Cruz Test Base for flushing. Since MIDAS vehicles are being produced under the "block" concept, every modification made to MIDAS III is being made to the MIDAS IV and V vehicles. This standardization will increase the degree of confidence in the basic vehicle configuration. The MIDAS IV could be delayed because of possible conflict with a SAMOS vehicle in the Vandenberg Air Force Base missile assembly building.

MIDAS III payload at VAFB

c. Infrared Scanners

Final Series II payload accepted in March

(1) The payload for MIDAS III is now at Vandenberg Air Force Base undergoing final testing prior to being mated to the AGENA satellite vehicle.

Baird-Atomic to develop backup Series IV payload (2) The final production and acceptance Series II payloads were completed in March. This provides three units for flight test, one for life testing and one spare. The spare is currently being used to check compatibility between payload, ground readout stations and display equipment. (C)

Lead-sulfide detector contract negotiated

(3) The design and development of an infrared detection payload as a backup to the Series IV payload design has been awarded to Baird-Atomic, Inc. The basic Series IV payload is being developed by the Aerojet-General Corporation.

(4) A contract was awarded to Infrared Industries, Waltham, Massachusetts, in April for the development and product engineering of lead-sulfide detectors. A similar contract is being negotiated with the Electronics Corporation of America, Cambridge, Massachusetts. It is anticipated that negotiations will be completed and a contract awarded early in June. (U)

Background radiometer flights completed

d. Background Radiometer Filghts

A series of U-2 airplane high altitude measurement flights conducted from Edwards Air Force Base were successfully completed in March. Terrestrial infrared radiation and horizon measurements

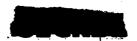


Figure 3. Delivering the MIDAS III AGENA Satellite vehicle to Point Arguello Pad No. 2. After installation on the ground handling dolly, the vehicle will be wheeled into the shelter on the right for final checks. ATLAS 97D is surrounded by the gentry in the background.



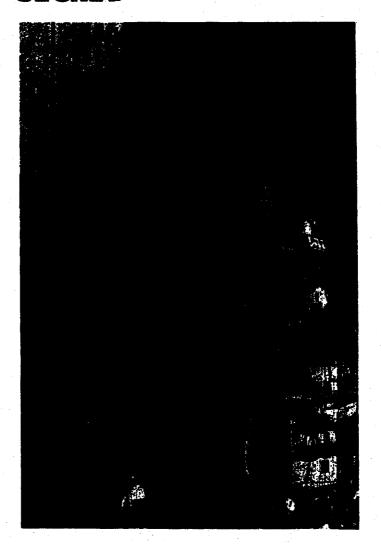
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Page 27

* SECOND

Figure 4. Closenp (right) of the Baird-Atomic, Inc., psyload mounted on the MIDAS III AGENA vehicle during bot firing tests at Santa Crux Test Base. Some of the AGENA guidance mits are visible. The inertial reference package is in the lower left and the reaction wheel assembly is the white circular mit in the lower foreground. The borizon scanner is the white cylinder in the upper right bay. Checking MIDAS infrared detection payload at Vandenberg Air Force Base (below). The scanner unit is being exposed to smallght and the readont is being fed into the console recorder.





Page 28

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were taken under desert conditions. Another series of flights from Eielson Air Force Base, Alaska, were completed in April. This series obtained background data under arctic conditions. A third series, designed to gather data under tropical conditions, has been completed from Patrick Air Force Base. These data are presently being reduced.

Data flow analysis negotiations completed

Development of design criteria for new launch complex initiated

Ground equipment installed and checkout accomplished

Noise during New Hampshire transmissions investigated

e. Data Flow Analysis Subcontract Signed

Negotiations with International Business Machines (IBM) were completed in March for analysis of anticipated data flow in the MIDAS Operational Center (MOC) and the Tracking and Control Center (TCC). (U)

f. Aerospace Ground Equipment

(1) Originally, MIDAS planning assumed that the new Point Arguello launch complex No. 2 would serve as the Operational Launch Complex, if an operational MIDAS Program were directed. The MIDAS System Test in early 1963 was intended to prove out the suitability of this complex for the operational program. Equipment design was intended to possess features permitting operation by a MIDAS Air Force launch organization. The capability to support other R&D programs was to be maintained, but on a secondary basis using auxiliary equipment where required. In May, after a comprehensive re-evaluation of forecast launch requirements, need dates, costs and capabilities, the new complex was repriented to serve primarily as a general purpose R&D facility, it will have the capability to launch MIDAS satellites and will be used along with Complex 1 to help establish the initial operational satellite network if an operational program is directed. However, under the present design and use philosophy, it will not be used as the MIDAS operational launch complex for subsequent network maintenance activities. A new operational launch complex must therefore be included in the operational implementation program to satisfy this requirement. Development of design criteria for this new complex has been initiated. (8)

(2) The necessary ground equipment to support the MIDAS

(2) The necessary ground equipment to support the MIDAS

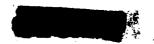
(3) The necessary ground equipment to support the MIDAS

(4) The necessary ground equipment to support the MIDAS

telemetry and control facilities. The shipborne equipment has been installed aboard the downrange tracking ships and is currently being checked out.

(3) Noise has been encountered during daytime transmission over the New Hampshire tracking station 1200 bit line and is being investigated. The MIDAS Intercept Assembly Register (MIAR) is being modified; as soon as these modifications are completed, checks will be made with the GP-1 PAM/FM ground station. Validation and acceptance of the computer program awaits resolution of the equipment problems. (U)





STC computer program to be accepted in mid-June

(4) Acceptance of the computer program at the Satellite Test Center by Operations, and integration of the GP-1 PAM/FM ground station is forecast for mid-June. Problems associated with the data line translators will also be corrected early in June. (U)

4. Facilities

Launch complex facilities ready

a. All launch complex facilities required to support MIDAS

AGENA second-burn data. (2)

Design of VAFB support facilities completed

b. Design of MIDAS technical support facilities in support of the 6565th Test Wing activities at Vandenberg Air Force Base was completed during the quarter. Funds covering seventy percent of the revised project estimate have been allocated against this project by Headquarters USAF. One building will be advertised initially with the remainder of the package deferred until the balance of funds is received. (U)

Donnelly Flats modifications released for construction

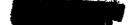
e. Plans and specifications for modifications to the MIDAS technical facilities at the Donnelly Flats, Alaska, tracking station were released for construction to the Alaska Air Command on 24 May with a requested beneficial occupancy date of 1 September. (U)



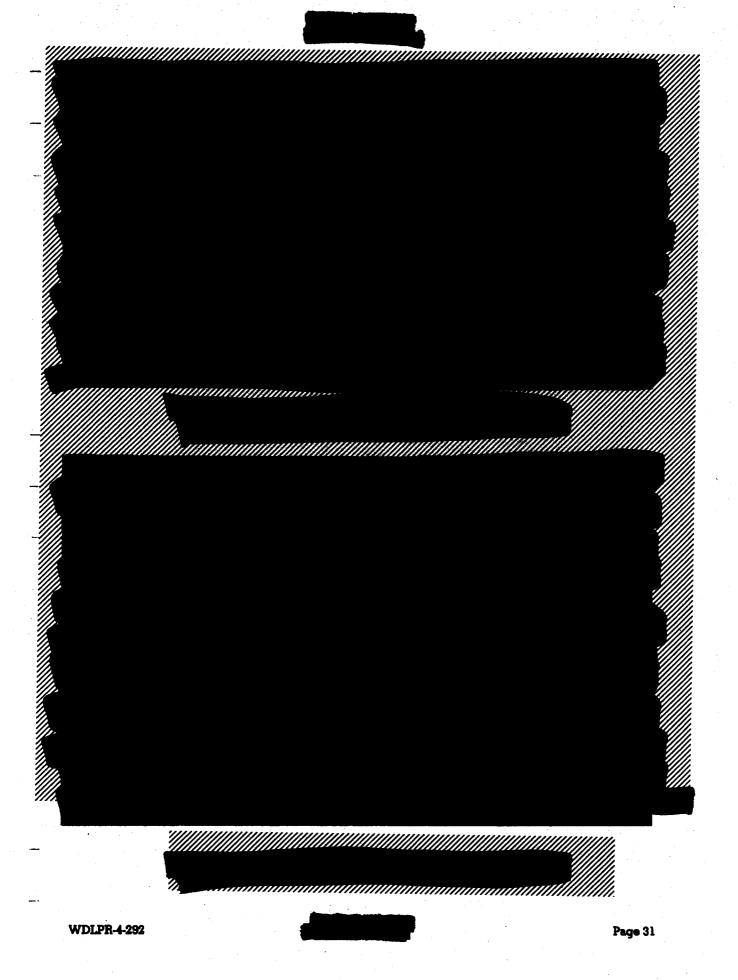
e. Final plans for the MIDAS technical support building at the New Hampshire tracking station were completed during this quarter. Contract award is scheduled for 30 June. (U)

Ottumwa TCC preliminary design completed

f. Preliminary design of the Ottumwa, lowa, tracking and control center technical facilities was completed on 26 May. A preliminary design review is scheduled for 9 June. Rehabilitation of base support facilities at Ottumwa will be accomplished through the Corps of Engineers District Office, Omaha, Nebraska. Authorization to proceed was given to the AFRCE, Missouri River Region on 7 May. (U)



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UNCLASSIFIED

MILITARY SATELLITE PROGRAM PROGRESS REPORT

FOR QUARTER ENDING 31 AUGUST 1961

RCS DD-DR&E(Q)397

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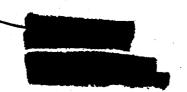
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Headquarters, Space Systems Division
Air Force Systems Command

UNITED STATES AIR FORCE Air Force Unit Post Office Los Angeles 45, California





THE COVER...

Early morning photograph of MIDAS III at Point Arguello, Pad No. 2. This vehicle, launched on 12 July, demonstrated the ability of the ATLAS D/AGENA B combination to establish a programmed, oriented, and stabilized 1850 nautical mile circular orbit with a 0.0039 eccentricity. (S)

HEADQUARTERS BALLISTIC SYSTEMS DIVISION AIR FORCE SYSTEMS COMMAND UNITED STATES AIR FORCE Air Force Unit Post Office, Los Angeles 45, California

DCLPS

12 September 1961

MILITARY SATELLITE PROGRAM PROGRESS REPORT QUARTER ENDING 31 AUGUST RCS DD-DR&E(Q) 397

FOREWORD

During the quarter, six DISCOVERER vehicles were launched. Of the six, three attained orbit and all three were recovered. Each of these flights utilized the increased DISCOVERER weight carrying capability to place scientific experiments into the space environment. Biopacks, Geophysical Research Directorate experiments, and Lawrence Radiation Laboratories instruments in support of the VELA HOTEL Program have been carried.

The MIDAS Program achieved a major milestone with the successful launch and orbit of MIDAS III. Payload data were received. Modifications, based on MIDAS III information, are being incorporated into the MIDAS IV vehicle. The MIDAS IV flight vehicle is being readied for launch early in October. The agreement providing for the construction of technical facilities and the operation and maintenance of the United Kingdom readout station was consummated on 19 July. Hq USAF has not yet released construction funds for this project. Significant progress is being made in the design of the Ottumwa, lowa, Tracking and Control Center technical facilities. Construction has started on Point Arguello Launch Complex No. 2.

O. J. RITLAND

Major General, USAF

Commander

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DOWNGRADED AT 12 YEAR INTERVALS; NOT AUTOMATICALLY DECLASSIFIED. DOD DIR \$200.10 The DISCOVERER Program consists of the design, development and flight testing of two-stage vehicles, using the Douglas DM-21 Space Booster as the first stage booster and the AGENA as the second stage, satellite vehicle. The program was established early in 1958 under direction of the Advanced Research Projects Agency, with technical management assigned to AFBMD. On 14 November 1959, program responsibility was transferred from ARPA to the Air Force by the Secretary of Defense. Prime contractor for the program is Lockheed Missile and Space Division. The DISCOVERER Program will perform space research in support of advanced satellite programs.

PROGRAM OBJECTIVES

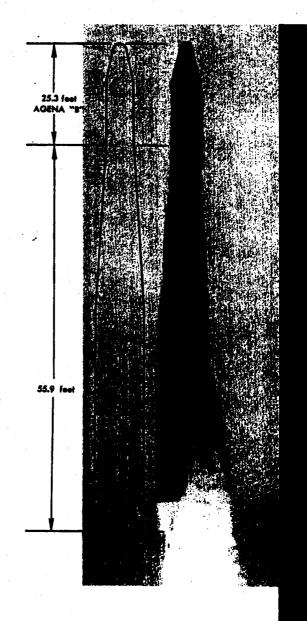
- (a) Flight test of the satellite vehicle airframe, propulsion, guidance and control systems, auxiliary power supply, and telemetry, tracking and command equipment.
- (b) Attaining satellite stabilization in orbit.
- (c) Obtaining satellite internal thermal environment data.
- (d) Testing of techniques for recovery of a capsule ejected from the orbiting satellite.
- (e) Testing of ground support equipment and development of personnel proficiency.
- (f) Conducting bio-medical experiments, including injection into orbit, re-entry and recovery.

PROGRAM SUMMARY

Early launches confirmed vehicle flight and satellite orbit capabilities, developed system reliability, and established ground support, tracking and data acquisition requirements. Later in the program, biomedical and advanced engineering payloads will be flight tested to obtain support data for more advanced space systems programs. DISCOVERER vehicles are launched from Vandenberg Air Force Base, with orbital operational control exercised by the Satellite Test Center, Sunnyvale, California.

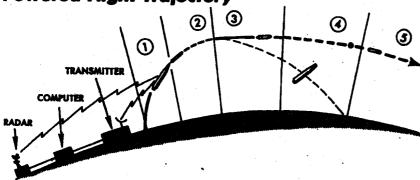
Tracking and command functions are performed by the stations listed in the Table on Page 4. A history of DISCOVERER flights to date is given on pages 5 and 6.

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| SECOND STAGE | AGENA "B" |
|-------------------------|--------------|
| Weight- | |
| Orbital | 2,261 |
| Impulse propellants | 12,950 |
| Other | 511 |
| TOTAL WEIGHT | 15,722 |
| Engine Model | XLR8 1-8a-9 |
| Thrust-libe., vac. | 16,000 |
| Spec. Impeec., vac. | 290 |
| Burn time-sec. | 240 |
| BOOSTER | DM-21 |
| Weight—Dry | 6,500 |
| Fuel | 33,700 |
| Oxidizer (LOX) | 68,200 |
| GROSS WEIGHT (Ibs.) | 108,400 |
| Engine | MB-3 |
| | Block 2 |
| Thrust, Ibs. (S.L.) | 169,000 |
| Spec. Imp., sec. (S.L.) | 248.3 |
| Burn Time, sec. | 148 |

Powered Flight Trajectory



1. First Stage Powered Flight - 2.5 min-

ceives AGENA #

ls to Nose Aft — 2 mis duration. Guided and attitude controlled tertial reference par aas reaction jets.

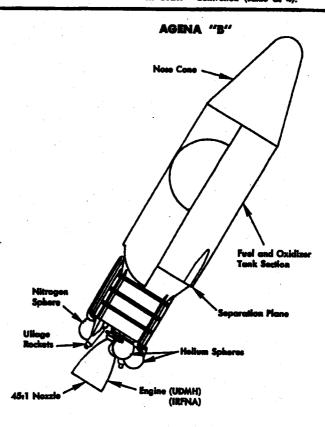
d (sa

Telemetry ships are positioned as required by the specific mission of each flight. Illustrations on the opposite page show a typical launch trajectory from Vandenberg Air Force Base and a typical orbit. An additional objective of this program is the development of a controlled re-entry and recovery capability for the payload capsule. The recovery operation is also shown on the opposite page. An impact area has been established near the Hawaiian Islands and a recovery force activated. Techniques have been developed for aerial recovery by C-119 and JC-130 aircraft and for sea recovery by Air Force pararescue men and Navy surface vessels. The recovery phase of the program has provided advances in re-entry technology. This information will be used in support of more advanced projects.

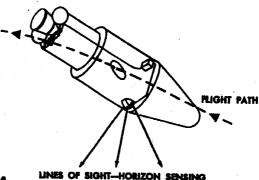
AGENA VEHICLE DEVELOPMENT

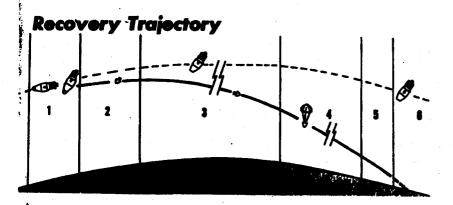
The AGENA vehicle was originally designed as a basic satellite vehicle for Military Space Programs.

The first AGENA "B" used the Bell XLR-81Ba-7 engine and was first flown on DISCOVERER XVI. The latest AGENA "B" vehicles use the 16,000 pound thrust XLR-81Ba-9 engine.



DISCOVERER/AGENA





Vehicle Recrients to Separation Attitude—83.5 seconds duration, 2,000 noutice miles north of impact point. Pitch recrientation starts and vehicle assumes separation attitude.

2. Capsule Separation — 18 seconds duration, capsule separates, spin gas jets fire, retro rocket fires and de-spin gas jets fire. Retro racket and thrust some separate from re-entry capsule.

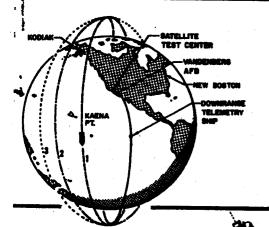
3. Re-entry — 8 minutes duration, recovery capsule re-enters the earth's atmosphere, Paractute cover is ejected and ablation shell separated from capsule,

4. Descent to Recovery Altitude —18 minutes duration. Reefed parachute is deployed and chaff its aid in radar tracking) is elected. Copsule descends from 55,000 feet to 14,000 feet.

5. Air Recovery—6 minutes duration, capsule descends from 14,000 feet to 1,500 feet during which first artificial in the contraction.

which time air recovery is attempted.

5. Sea Recovery... Capcule impacts in the sea, surface forces attempt recovery.



Orbital Trajectory

Schematic presentation of orbital trajectory following launch from Vandenberg Air Force Base. Functions performed by each station and a listing of equipment used by each station, is given on page 4.

RECOVERY CAPABILITY

This objective was added to the program after the first launch achieved vehicle flight and orbit objectives successfully. It includes the orientation of the satellite vehicle to permit a recoverable capsule to be ejected from the mose section of the AGENA vehicle. Bjection is programmed to occur on a selected orbit, for capsule impact within the predetermined recovery area near Hawaii. Aircraft and surface vessels are deployed within the area as a recovery force.

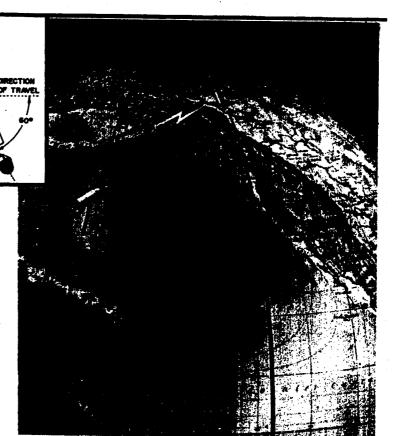
CAPSULE RECOVERY SEQUENCE

• The desired orbit for capsule ejection is selected after the vehicle is on orbit based on satellite performance, longitudinal location of the orbits, recovery force status and weather in the potential recovery area. A command is sent to the vehicle prior to the selected recovery pass which imitiates the recovery sequence. This command may be sent from any of the primary tracking stations listed on page 4.

RECOVERY

The ejection sequence includes a pitch down maneuver, capsule separation, spin-up, retro-rocket firing, de-spin and reentry. Following parachute deployment the serial recovery force converges on the descending capsule and mags the parachute. The capsule contains a radio beacon and reflective chaff which is dispersed to aid in tracking.

The recovery force consists of G-119, RG-121, G-130, WVII and JG-54 aircreft supplemented by 2 or 3 surface vessels that receive and record telementy data. If it is necessary to reviewe the capsule from the sea, these ships are available. Also available is a pararescue team who can be deployed to retrieve the capsule from the ocean.



GROUND SUPPORT FACILITIES

| Facility | Equipment* | Flight Function | | | | | | | |
|------------------------------------|------------|---|--|--|--|--|--|--|--|
| Satellite Test Center | ABCD | Orbital control, orbit computations and predictions, acquisition data for tracking stations, prediction of recovery area. | | | | | | | |
| Vandenberg AFB Tracking Station | BDEFGHI | Ascent and orbital tracking, telemetry reception, trajectory measurements, command transmission. | | | | | | | |
| Downrange Telemetry Ship | BFHI | Telemetry reception and tracking during ascent and orbit injection. | | | | | | | |
| New Hampshire Tracking Station | BDEFGHI | Orbit tracking, telemetry reception, commands to satellite. | | | | | | | |
| Kodiak Tracking Station | BDEFGHI | Orbit tracking, telemetry reception, initial acquisition on pass 1, monitor events in recovery sequence. | | | | | | | |
| Hawaijan Tracking Station | BDEFGHI | Orbit tracking, telemetry reception and transmission of commands to satellite. | | | | | | | |
| Hickam AFB Oahu, Hawaii | D | Over-all direction of capsule recovery operations. | | | | | | | |
| Tern Island | BFGI | Recovery capsule tracking. | | | | | | | |

†Primary Tracking Stations (have command capability)

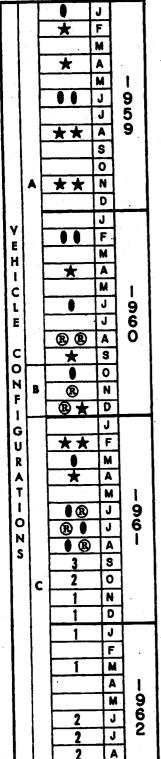
*Equipment

- A. General Purpose Computer(s) and Support Equipment
- B. Data Conversion Equipment
- C. Master Timing Equipment
- D. Control and Display Equipment

- E. VERLORT
- F. VHF FM/FM Telemetry Station
- G. VHF Direction Finding Equipment
- H. Doppler Equipment
- I. VHF Telemetry Antenna

NOTE: In addition to equipment listed, all stations have inter- and intra-station communications equipment and checkout equipment.

Launch Schedule





Flight History

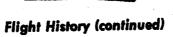
| DISCOVERER No. | DM-21 No. | AGENA No. | Flight Date | Remerks |
|-------------------|--------------|--------------|----------------|--|
| · · · · · · · · | D | ISCOVERI | ir flights o t | HRU XX ARE ON PAGE A-6 |
| XXI | 261 | 1102 | 18 February | Assained orbit successfully. Non-recoverable, radio- metric data gathering MIDAS support flight. |
| IDCK | 300 | 1105 | 30 March | Launch, ascent, separation, coast and orbital stage ignition normal. Orbital velocity was not attained because of an AGENA hydraulic malfunction. |
| IIIXX | 307 | 1106 | 8 April | Attained orbit successfully. Loss of control gas pre- vented proper positioning of the satellite for capsule re-entry. Capsule was ejected into new orbit on re-entry pass. |
| XXIV | 302 | 1108 | 8 June | Pailed to attain orbit because of a second stage maljunction. |
| XXV | 303 | 1107 | 16 June | Attained orbit successfully. Capsule recovered from the ocean after two days on orbit. All objectives achieved. |
| XXVI | 308 | 1109 | 7 July | Attained orbit successfully. Capsule was ejected on the 32nd orbit and aerial recovery was accomplished. All objectives achieved. |
| XXVII | 322 | 1110 | 21 July | Pailed to attain orbit because of severe booster pitch oscillation. |
| XXVIII | 309 | 1111 | 3 August | Pailed to attain orbit because of a hydraulic failure in the satellite engine control system. |
| XXIX | 323 | 1112 | 30 August | Attained orbit successfully. Capsule recovered from the ocean after two days on orbit. All objective achieved. |

- ★ Attained orbit successfully.
- (R) Attained orbit and capsule recovered.
- Failed to attain orbit.

VEHICLE CONFIGURATIONS

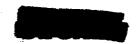
- A. THOR-DM-18/AGENA "A"
- 8. THOR-DM-21/AGENA "B" MB-3 Block 1/XLR81-Ba-7
- C. THOR-DM-21/AGENA "B" MB-3 Block 2/XLR81-Ba-9





| DISCOVERER No. | RER DM-21 AGENA No. No. | | Flight Date | Romarks |
|-------------------|----------------------------|--------------|-----------------|---|
| 0 | 160 | 1019 | 21 January 1959 | AGENA destroyed by malfunction on pad. THOR refurbished for use on flight XII. |
| 1 | 163 1022 28 Febru | | 28 February | Attained orbit successfully. Telemetry received for 514 seconds after lift-off. |
| it . | 170 1018 13 April | | 13 April | Attained orbit successfully. Recovery capsule ejected on 17th orbit was not recovered. All objectives except recovery successfully achieved. |
| 111 | 174 | 1020 | 3 June | Launch, ascent, separation, coast and orbital boost suc- cessful. Pailed to achieve orbit because of low perform- ance of satellite engine. |
| IV | 179 | 1023 | 25 June | Same as DISCOVERER III. |
| v . | 192 | 1029 | 13 August | All objectives successfully achieved except capsule recovery after ejection on 17th orbit. |
| VI. | 200 | 1028 | 19 August | Same as DISCOVERER V. |
| VII | 206 | 1051 | 7 November | Assained orbit successfully. Lack of 400-cycle power prevented stabilization on orbit and recovery. |
| VIII | 212 | 1050 | 20 November | Attained orbit successfully. Maljunction prevented AGENA engine shutdown at desired orbital velocity. Recovery capsule ejected but not recovered. |
| ix | 218 | 1052 | 4 February 1960 | THOR shut down prematurely. Umbilical cord mas did not retract. Quick disconnect failed, causing loss o beliam pressure. |
| x | 223 | 1054 | 19 February | THOR destroyed at T plus 56 sec. by Range Safet Officer. Sewere pitch oscillations caused by boosts autopilos malfunction. |
| Xi | 234 | 1055 | 15 April | Attained orbit successfully. Recovery capsule ejecte on 17th orbit was not recovered. All objectives exceptecovery successfully achieved. |
| XII | 160 | 1053 | 29 June | Learnch, ascent, separation, coast and orbital stage is nition were successful. Failed to achieve orbit because of AGENA attitude during orbital stage boost. |
| XIII | 231 | 10 <i>57</i> | 10 August | Attained orbit successfully. Recovery capsule ejects on 17th orbit. Capsule was recovered after a wat impact with negligible damage. All objectives excet the airborne recovery were successfully achieved. |
| VIX | 237 | 1056 | 18 August | Attained orbit successfully. Recovery capsule eject on 17th orbit and was successfully recovered by s airborne force. All objectives successfully achieved. |
| XV | 246 | 1058 | 13 September | Attained orbit successfully. Bjection and recove sequence completed. Capsule impact occurred sou of the recovery forces; located but lost prior to bein retrieved. |
| XVI | 253 | 1061 | 26 October | Launch and ascent normal. AGENA failed to separa- from booster and failed to attain orbit. |
| XVII | 297 | 1062 | 12 November | Assained orbit successfully. Recovery capsule ejection 31st orbit and aerial recovery was accomplish All objectives were successfully achieved. |
| XVIII | 296 | 1103 | 7 December | Attained orbit successfully. Recovery capsule ejec on 48th orbit and aerial recovery was accomplish All objectives were successfully achieved. |
| XIX | 258 | 1101 | 20 December | Attained orbit successfully. Non-recoverable, rad metric data gathering MIDAS support flight. |
| XX | 298 | 1104 | 17 February | Astained orbit successfully. Capsule did not re-en due to on-orbit mallunction. |

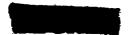




A. BRIEF OF PROGRESS

Six DISCOVERER vehicles, of eight originally scheduled for launch during the quarter, were launched in this three month period. Of these six, three attained orbit and all three were recovered. This is the greatest number of vehicles to be launched in one quarter and the one-hundred percent recovery record is a major program milestone. Only one of the capsules was recovered by the aerial recovery force; the other two were retrieved from the Pacific by Air Force pararescue teams trained for this mission.

Additional equipment for measuring the space environment was carried aboard these DISCOVERER vehicles. Some of these instruments were provided by the Geophysical Research Directorate and some by the Lawrence Radiation Laboratories in support of the VELA HOTEL program. The different orbits attained (Table I) provided the gathering of information under a variety of conditions.



B. TOPICAL SUMMARY

1. Flights

g. DISCOVERER XXIV

DISCOVERER XXIV launched on 8 June

(1) DISCOVERER XXIV was launched from Vandenberg Air Force Base at 1416 PDT on 8 June. DM-21 performance was nominal throughout the boost phase. However, a constant temperature increase in the aft equipment area from liftoff until a loss of telemetry occurred at T plus 147 seconds indicated a small fire had started in this area. Other data indicated that separation did occur but that the AGENA vehicle did not develop sufficient thrust for orbital boost. Failure to attain orbit was attributed to damage resulting from the fire.

Fuel seepage causes fire

(2) Seepage of unsymmetrical di-methyl hydrazine (fuel) from a plumbing leak or quick disconnect spillage are suspected to be the source of the DISCOVERER XXIV fire. Remedial action for subsequent flights included requiring a manual fuel leak check of the AGENA vehicle during the countdown and adding "scuppers" near the propellant quick-disconnects to catch any spillage as the line is pulled away.

b. DISCOVERER XXV

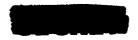
(1) Flight

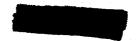
DISCOVERER XXV launched on 16 June

DISCOVERER XXV was launched from Vandenberg Air Force Base at 1603 PDT on 16 June and was successfully injected into a near-polar orbit. The ascent was normal with all events occurring essentially as planned. On orbit the satellite was oriented and stabilized as planned. The thermostatically controlled electric heaters installed to correct the sticky attitude control valve operation encountered on DISCOVERER XXIII performed successfully. This was the first on orbit test of the system. Table I shows the predicted and attained orbital parameters.

| | DISCOVER | ER XXV | DISCOVER | ER XXVI | DISCOVER | ER XXIX |
|----------------------------|------------|--------|------------|---------|------------|---------|
| Event | Programmed | Actual | Programmed | Actual | Programmed | Actual |
| Apogee, statute miles | 292 | 256 | 293.6 | 505.5 | 257.1 | 353.4 |
| Perigee, statute miles | 147 | 140 | 147.4 | 142.8 | 147.4 | 103.62 |
| Period, minutes | 91.6 | 90.9 | 91.6 | 95.02 | 91.0 | 91.5 |
| Eccentricity | 0.017 | 0.0138 | 0.0175 | 0.0421 | 0.0133 | 0.0298 |
| Inclination Angle, degrees | 81.8 | 82.1 | 81.5 | 82.9 | 81.8 | 82.07 |

TABLE I. COMPARISON OF PROGRAMMED AND ACTUAL ORBITAL PARAMETERS FOR DISCOVERER XXV, DISCOVERER XXVI AND DISCOVERER XXIX.



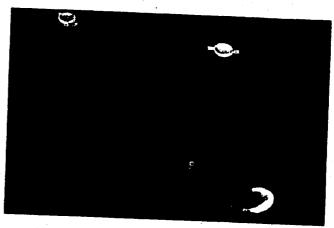


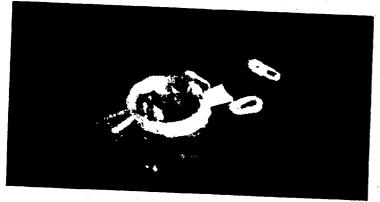
Capsule Recovered by Air Force para-rescue team on 18 June

(2) Capsule Recovery

As planned, capsule recovery was initiated on the 33rd pass (two days on orbit) at 1800 PDT on 18 June. All events occurred as programmed and the capsule descent followed a nominal trajectory. However the impact area was incorrectly calculated. This resulted in the recovery aircraft being positioned improperly and prevented them from effecting an aerial recovery. The floating capsule was located electronically and visually sighted by a recovery aircraft at 1845 PST. An Air Force para-rescue team was deployed and by 2046 PST the capsule was safely aboard their raft. The capsule and the rescue team were picked up by a Navy destroyer the next morning. The capsule was taken to Hawaii by the destroyer and flown to the mainland for evaluation.

Figure 1 — Air Force pararescue team (right) during recovery of DISCOVERER XXV capsule. One team member and the capsule's parachute are visible in the lower right of the photograph. The three-man team has the capsule safely aboard the large raft (below). The Navy destroyer picking up the capsule and the men on the morning of 19 June.







(3) Space Research Experiments

Metal samples exposed to space environment

Space research experiments furnish data

(a) A number of space environment experiments were conducted successfully during the DISCOVERER XXV flight. An emulsion block, dosimeters, and discs of gold, nickel, titanium, cadmium, magnesium, bismuth, iron, and yttrium were recovered with the capsule and are currently being compared with identical samples retained on earth to determine the effects of space radiation on these elements. (U)

(b) Two atmospheric density gages, two micrometeorite detectors, a cosmic ray monitor and twelve temperature probes were carried on DISCOVERER XXV and telemetered data from these instruments are being analyzed. No satisfactory data were received from the atmospheric density gages. However, temperatures in the 25 degree Fahrenheit range were recorded and the micrometeorite detectors recorded evidence of impacts.

c. DISCOVERER XXVI

(1) Flight

DISCOVERER XXVI was launched from Vandenberg Air Force Base at 1629 PDT on 7 July and was injected into a near-nominal orbit. All events during launch, boost separation, coast, AGENA burn and orbital injection occurred as planned, except for a longer than normal AGENA burn time. This has been attributed to an accelerometer-integrator system error. Table I shows the predicated and attained orbital parameters. All subsystems operated satisfactorily throughout the orbital flight. The thermostatically controlled electric heaters installed on attitude control valves performed successfully. ICI

DISCOVERER XXVI launched on 7 July



Figure 2 — Attitude control valve heating element installation which has been used successfully on DISCOVERER XXV and subsequent vehicles. Attitude control difficulty on DISCOVERER XXIII was attributed to sluggish or sticking volves resulting from the extremely low temperatures encountered while on orbit.

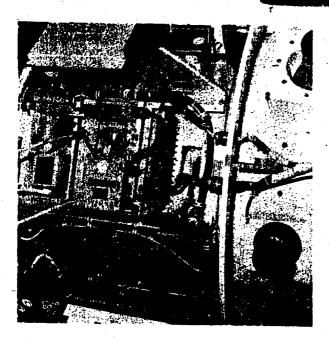
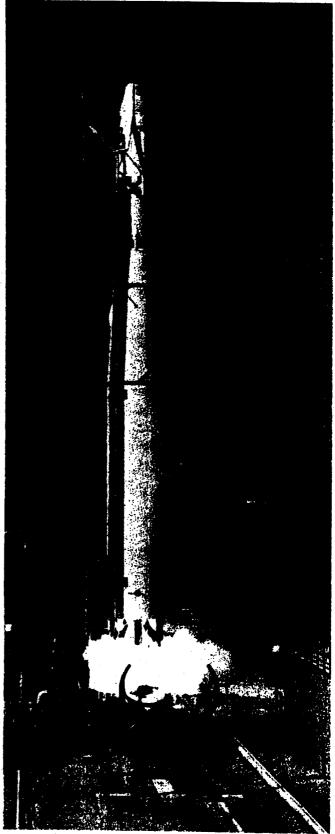


Figure 3 — Launch of DISCOVERER XXVI at 1629 PDT on 7 July. The capsule from this vehicle was retrieved by the aerial recovery forces after two days on orbit. The photo above shows the DISCOVERER XXV AGENA vehicle; below is the DISCOVERER XXVI vehicle. The fuel and exidizer quick disconnects are visible on the right in both photos. In the lower photo the new "scuppers" are visible. They are part of a system for catching propellant spillage as the lines are pulled away. This modification was made as a result of the fire aboard DISCOVERER XXIV. The space research experiments furnished by the Geophysical Research Directorate are shown in both photos.





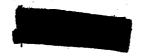
DISCOVERER XXVI CAPSULE RECOVERY







Page 12



Fourth aerial recovery achieved

(2) Capsule Recovery

As planned, capsule recovery was initiated on the 32nd pass (two days on orbit) at 1905 PDT on 9 July. All events occurred as programmed and the capsule followed the predicted descent trajectory. The capsule was sighted northwest of Hawaii and aerial recovery was accomplished. This was the fourth DISCOVERER capsule recovered by the airborne forces; two other capsules have been recovered from sea. Following capsule ejection, the AGENA satellite reoriented to its normal "on-orbit" attitude and operated satisfactorily for the remainder of its battery life.

Metal samples again carried into space

(3) Space Research Experiments

(a) As part of the continuing program designed to measure the space environment and determine radiation effects on various materials, nearly 45 pounds of additional instruments and specimens were carried on the DISCOVERER XXVI satellite vehicle and its capsule. The capsule carried "poker chip" samples of iron, nickel, yttrium, titanium, magnesium, lead and bismuth. Half of the samples were returned to the Air Force Geophysical Research Directorate for evaluation and the rest were analyzed by Lockheed scientists. (U)

Biological materials, desimeters and film samples in capsule

(b) Several canisters were recovered after exposure to the space environment aboard the DISCOVERER XXVI capsule. One contained inert biological materials (cellulose products) and was returned to the Space Systems Division for analysis. Another contained various dosimeters and was returned to the Air Force Special Weapons Center. Various metal and film samples were included in a third canister to provide information on the effects of space radiation on photographic materials. (8)

GRD instruments again placed on orbit

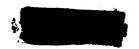
(c) The non-recoverable Geophysical Research Directorate equipment, which was mounted on the module that replaces the engine access door, included two atmospheric density gages, two micrometeorite detectors, a cosmic ray monitor and temperature probes. During the flight, data from those instruments were telemetered to tracking stations by the AGENA telemetry system. The information was sent to the Geophysical Research Directorate for reduction and analysis. An initial review of the raw data indicated that all instruments operated satisfactorily and the data obtained appeared to be valid. (U)

DISCOVERER XXVII launched on 21 July

d. DISCOVERER XXVII

DISCOVERER XXVII was launched from Vandenberg Air Farce Base at 1535 PDT on 21 July. A DM-21 booster pitch oscillation, evident immediately after launch, became severe after approximately one minute of flight. The vehicle apparently broke up at this time. A destruct command was sent at T plus 95.1 seconds. Three minutes after launch, the DISCOVERER satellite S-band beacon signal was lost and approximately two and one-quarter minutes later, booster telemetry was lost. The DISCOVERER satellite reached an altitude of only 35,000 feet and impacted twelve to fifteen miles downrange. Ships from the Pacific Missile Range located several main parts of the DM-21 booster, but were unable to recover the parts connected with the failure.





e. DISCOVERER XXVIII

DISCOVERER XXVIII launched on 3 August

(1) DISCOVERER XXVIII was launched from Vandenberg Air Force Base at 1701 PDT on 3 August. The launch was scheduled for 2 August but a malfunction of the horizon scanner caused a one-day postponement. Booster performance, separation, coast and AGENA ignition occurred as planned. Approximately 188 seconds after AGENA ignition the hydraulic pressure for operating the actuators which position the rocket engine dropped to zero. A decrease in hydraulic fluid temperature and a slight increase in engine turbine speed were coincident with the hydraulic pressure drop.

Vehicle tumbles because of hydraulic pressure loss

(2) Bearing friction held the satellite engine in position for a few seconds, but the actuators could not respond to correction signals from the inertial reference package. The vehicle started to tumble. The high acceleration forces caused the vehicle to break up. Impact was in the South Pacific. Analysis of the flight data revealed that only two types of failure could account for all of the observed effects: failure of tubing or fittings on the high pressure side of the system or failure of a high pressure transducer. Subsequent bench tests on a hydraulic system package supported the analytical findings. As a result of these tests, some AGENA tubing will be re-routed to reduce the possibility of vibration effects, some fittings will be changed, and a "fail-safe" type transducer will be substituted.

f. DISCOVERER XXIX

(1) Flight

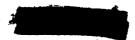
DISCOVERER XXIX launched on 30 August

DISCOVERER XXIX was launched into orbit from Vandenberg Air Force Base at 1300 PDT on 30 August. The satellite was launched at the earliest possible moment allowed by the established 1300-1600 launch window. All events during launch, boost, separation, coast, AGENA burn and orbital injection occurred as planned. One and one-half hours after liftoff orbital status was verified by tracking and telemetry contact over Kodiak, Alaska. The orbit, based upon calculations made after pass ten, is satisfactory although slightly different than originally programmed. Table I shows the predicted and attained parameters. The variation is attributed to a slightly positive (AGENA vehicle in a pitch up position) flight path angle at orbital injection. Vehicle operation on orbit is satisfactory.

(2) Capsule Recovery

Capsule recovered by Air Force pararescue team

As planned, capsule recovery was initiated on the 33rd pass at 1514 PDT on 1 September. Because of impact short of the recovery area, the aerial recovery force was unable to "catch" the capsule. For the second time in the DISCOVERER series a team of three Air Force pararescue men jumped into the Pacific to recover the capsule. At 1700 PDT the pararescue team had the capsule aboard



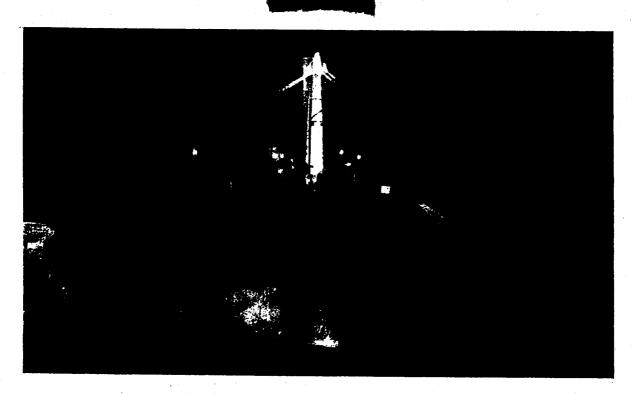


Figure 4 — Searchlight on Space...DISCOVERER XXIX during final launch preparations on the grey, foggy morning of 30 August. The capsule in the nose of the AGENA vehicle was the third recovered during the quarter.

their rafts and began their wait for the Navy destroyer that was to pick them up and return them to Hawaii. Together with other space experiments this capsule contained a biopack with a three day-old embryonic chicken heart, bone, and influenza virus sealed inside. The biopack has been flown to the School of Aerospace Medicine for evaluation. (U)

(3) Space Research Experiments

VELA HOTEL instruments flown "piggyback"

(a) The first VELA HOTEL instruments to be flown "piggy-back" on DISCOVERER satellites were installed on DISCOVERER XXIX. These experiments are part of the VELA HOTEL Program whose goal is the development of satellite-borne payloads capable of detecting nuclear explosions in space. The instruments, mounted on the engine access door module, consist of two X-ray detectors and a solid state electron spectrometer. These instruments provided data about background radiation in space. The units are wired as a system to provide maximum discrimination between random radiation and radiation bursts. Data was recorded continuously on a tape recorder for playback at a 36:1 rate when the vehicle was over a tracking station. During playback, data from the instruments was transmitted to the station in real time over separate channels, thereby providing complete data recovery. Lawrence Radiation Laboratories provided the instruments and is analyzing the data.

GRD instruments provide space environment data

(b) In addition to the VELA HOTEL instruments, DISCOVERER XXIX carried a cosmic ray monitor and a galactic detector, both provided by the Air Force Geophysical Research Directorate. The cosmic ray monitor is similar to those aboard DISCOVERER XXV and XXVI, but on this flight data was continuously recorded. The galactic detector is essentially a radio frequency receiver for detecting background RF noise emanating from celestial galaxies. Data obtained from these instruments by the DISCOVERER tracking stations is being furnished to the Geophysical Research Directorate for analysis. (U)

2. Technical Status

Space Environment Experiments

During the quarter three DISCOVERER vehicles carried Geophysical Research Directorate experiments designed primarily to determine the environment in space. Among the instruments carried were those designed to measure:

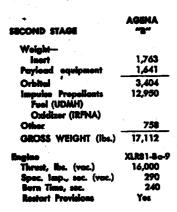
- (a) Atmospheric Density: These instruments will measure atmospheric density and determine the existence of atmospheric waves at altitudes of 100 to 400 miles as a function of latitude, time of day and season. Calculations based on these data will be valuable in determining vehicle drag and orbital lifetime.
- (b) Cosmic Radiation: These instruments will assess the radiation hazard to components above 130 miles, in the Van Allen and Auroral regions.
- (c) Thermal Radiation: Infrared radiation from the earth and atmosphere and scattered solar radiation will be measured to obtain data for calculating proper vehicle equilibrium temperatures.
- (d) Micrometeorites: These instruments will record the rates of penetration of vehicle skin, mass density and energy of micrometeorites, and skin erosion to obtain data on thermodynamic effects.
- (e) Solar Ultra-Violet Radiation: Solar radiation in the ultra-violet and X-ray regions will be measured to determine the aging effects on plastic and organic materials.
- (f) Atmospheric Composition: Data on the kinds and states of atmospheric particles, since organic and plastic materials show aging, corroding or chemical effects when exposed to free radicals such as atomic oxygen. Data on ion concentrations will be provided.
- (g) Magnetic Field: Results from more complete studies of the earth's magnetic field are of interest for possible use in attitude stabilization systems. Magnitude and direction at various altitudes will be determined. Long term variations will also be determined. (U)

Three recent flights check space environment

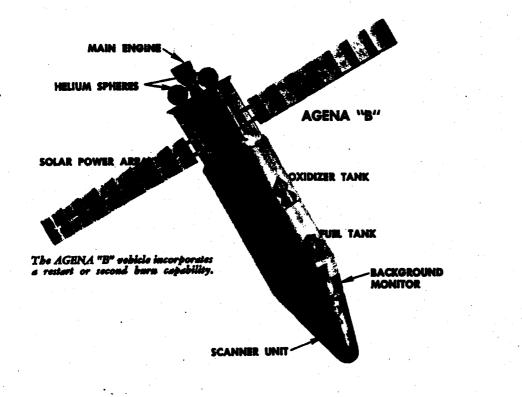


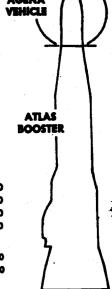


Figure 5 — DISCOVERER launch pad 5 of Complex 75-3 at Vandenberg Air Force Base. The missile shelter has been pulled back to provide room for preparation of the DM-21 booster. The liquid oxygen tank, valve complex, and nitrogen trailer are on the left; the RJ-1 tank and valve complex are on the right. Clustered behind the retaining walls in the center are the electrical, power control, helium, freon, air conditioning, and high pressure nitrogen trailers. The modification of this area, including installation of new propellant transfer sets and up-dated launch control system equipment, was completed in June. The new equipment permits faster, more reliable launch operations.



MIDAS





BOOSTER-ATLAS ICEM

 Weight—Dry
 15,100

 Fuel, RP-1
 74,900

 Oxidizer (LOX)
 172,300

 GROSS WEIGHT (lbs.)
 262,300

Engine--MA-2

Thrust (ibs. vuc.) Boost 256,000 Sustainer 82,100 Spec. (spc. vpc.) Boost 286

sc. Imp. (sec. vac.) Boost 21 Sustainer 31

PROGRAM HISTORY

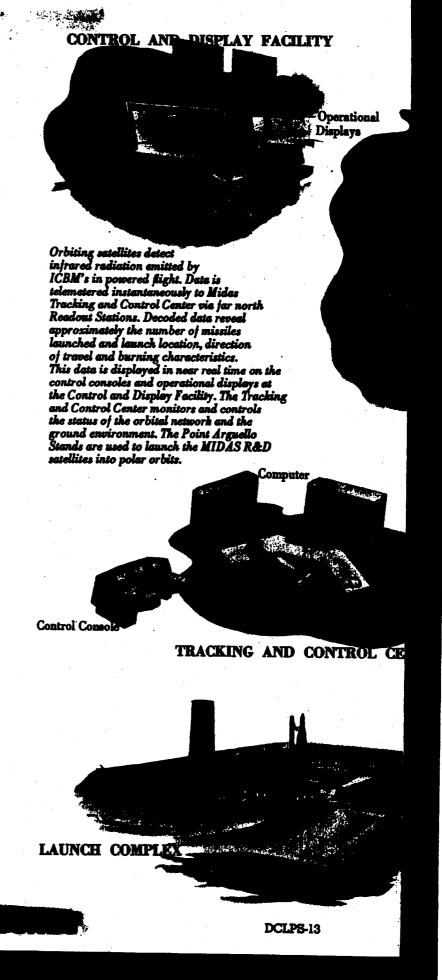
The MIDAS Program was included in Weapon System 117L when WS 117L was transferred to the Advanced Research Projects Agency. ARPA subsequently separated WS 117L into the DISCOVERER, SAMOS and MIDAS Programs, with the MIDAS objectives based on an infrared early warning system. The MIDAS (Missile Defense Alarm System) Program was directed by ARPA Order No. 38, dated 5 November 1958 until transferred to the Air Force on 17 November 1959. The Air Force directed that the program be continued under the technical guidance of the ARPA Order and approved the MIDAS R&D Development plan dated 15 January 1960. This plan was a "minimum essential" program directed toward the satellite vehicle and proof of the feasibility of infrared detection capabilities. It provided for ten test launches, two from the Atlantic Missile Range and eight from the Pacific Missile Range. Subsequent authorization was obtained to utilize two DISCOVERER flights (designated RM-1 and RM-2) to carry background radiometers in support of MIDAS.

A program of complete system development, including the ground environment of MIDAS, has been submitted to the Department of the Air Force and has been approved in principle and objective. Authorization has been received to initiate action implementing the plan with reconsideration for approval to be accomplished subsequent to a successful test launch in 1961.

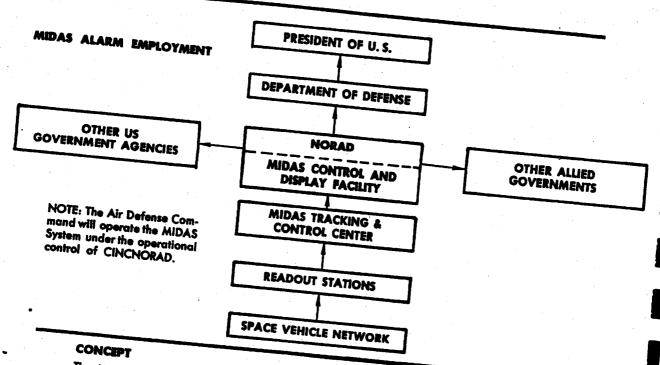
TECHNICAL HISTORY

The MIDAS infrared early warning payload is engineered to use a standard launch vehicle configuration. This consists of an ATLAS missile as the first stage and the AGENA vehicle, powered by a Bell Aircraft rocket engine as the second, orbiting stage. The final configuration payload weight will be approximately 1,000 pounds.

The first two R&D flights used the AGENA "A" and ATLAS "D" vehicle programmed to place the payload in a circular 261 nautical mile orbit. Subsequent R&D flights utilize the ATLAS "D"/AGENA "B" configuration programmed to place the payload in a circular 2,000 nautical mile polar orbit.



Satellite Vehicle Eight MIDAS Satellites — four each in two orthogonal polar orbital planes — at 2,000 n.m. altitude Donnell READOUT STATION Electronic Equip Sunnyvale Satellite Test Center Point Arguello Launch Complex Italic — Indicates R&D Facilities DCLPS-13 Page 21



The MIDAS system is designed to provide continuous infrared coverage of the Soviet Union. Surveillance will be conducted by eight satellite vehicles in accurately positioned orbits. The area under surveillance must be in line-of-sight view of the scanning satellite. The system is designed to accomplish instantaneous readout of acquired data by at least one of three strategically located readout stations. The readout

stations transmit the data directly to the MIDAS Tracking and Control Center where it is processed. It is then displayed and evaluated in the MIDAS Control and Display Facility. If an attack is determined to be underway, the intelligence is communicated to a central Department of Defense Command Post for relay to the President and national retaliatory and defense agencies.

Launch Schedule

| | aunch | Sch | edu | le |
|-----------------|---|---|-------------------------|------|
| ATLAS D'AGENA A | * | - | J F M A M J J A S O N D | 1960 |
| ATLAS D'AGENA B | 1 | S O N D D A S O N D D | 1962 | -96- |
| | 1 2 3 2 1 1 1 1 | F M A M J J A S O N D | 1963 | |



| MIDA: No. | Launch Date | ATLAS No. | AGENA No. | Romarks |
|--------------|----------------|--------------|---------------|---|
| | 26 February | 29D | 1008 | Did not attain orbit because of a failure during ATLAS/AGENA separation. |
| 11 | 24 May | 45D | 1007 | Highly successful. Performance with respect to programmed orbital parameters was outstanding. Useful sufrance date was observed. |
| | | DISCO | VERER Vehicle | Despite satellite oscillations, sufficient data were obtained for evaluation of psylond operation. Information obtained in the 2.7- micron region agrees with data obtained from balloon-borne radiometric equipment. Data in the 4.3- micron region is somewhat higher than had been anticipated from theoretical studies. |
| KM-2 | 18 February | DISCOV | ERER Vehicle | All channels functioned properly and valid data were obtained on six stable orbits. Data confirmed previous radiometric measurements. |
| III | 12 July | 97D | 1201 | Estremely successful. Second firing of the second stage occurred as programmed. AGRNA R making |

Extremely successful. Second firing of the second stag occurred as programmed. AGENA B webicle was stabilized in an 1850 mentical mile circular orbit with a bilized in an 1850 mentical mile circular orbit with a accentsicity of 0.0039. Operation of the psyload and data link was excellent. Recents of an electrical power loss, apparently caused by the failure of one solar array panel to extend, data acquired subsequents to past fee was limited to Van Allen hals radiation information. Inability to properly control power consumption by appropriate and timely vehicle command programming resulted in nearly complete power descriptions within the successful several orbits. Van Allen radiation measurements will be obtained during the anticipated 60-90 day battery life of the High Energy Proton Damage Experiment (HEPDEX) package.

♦ DISCOVERER vehicles carrying MIDAS radiometric payloads

★ Attained orbit successfully

Failed to attain orbit







MIDAS GROUND SUPPORT FACILITIES

| Facility | Equipment* | Flight Function |
|----------------------------|---|--|
| Satellite Test Cer | iter ABCDEP | Operations control adds |
| Vandenberg AFB | ABCEFGHIJKLMP | payload data. |
| Tracking Station | | Ascent and orbital tracking; telemetry reception; trajectory computations; command transmission; reception recording and processing of payload data. |
| Downrange Telen Ships | etry GHIJNO | - · · · |
| Hawaiian Tracking |) Draw | Tracking and data reception during ascent. (Three ships are available for this function. Equipment is typical.) |
| Station | BEFGHJ | Orbital tracking, telemetry reception, payload data reception. |
| AMR Now Handle | HJ | Orbital data reception. |
| New Hampshire Station | ABCEFGHIJKLM | Orbital tracking, telements |
| African Tracking Station | BEGJ | The state of the s |
| North Pacific | | Telemetry reception and recording during second burn. |
| Station | BCEHKMP | Satellite and payload data reception, command transmission. |
| Codiak Tracking Station | FJ | Orbital tracking. |
| Augu Tracking tation | BEFGJ | Tracking and telemetry reception. |
| NOTES: (1) | In addition to equipment listed, all communications equipment and ch | |
| (2) | Equipment listed is either presently for procurement. | eckout equipment. available or planned and approved |

*Equipment

- A. General Purpose Computer(s) and Support Equipment
- 8. Data Conversion Equipment
- C. PICE
- D. Master Timing Equipment
- E. Control and Display Equipment
- F. VERLORT
- G. VHF FM/FM Telemetry Station
- H. PAM FM Ground Station

- 1. Doppler Equipment
- J. VHF Telemetry Antenna
- K. UHF Tracking and Data Acquisition Equipment (60 foot F&D Antenna)
- L. UHF Angle Tracker
- M. UHF Command Transmitter
- N. APL Doppler Equipment
- O. SPQ-2 Radar
- P. Midas Payload Evaluation and Command Equipment



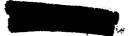
Analysis and preliminary design are being conducted on an alternate, "simplified" MIDAS configuration utilizing randomly distributed satel-

On 12 July, the ATLAS-boosted MIDAS III was placed into circular 1870 n.m. orbit. Payload data were received. Flight test records which have been reduced indicate that MIDAS III was highly successful. However, failure of one solar array to extend fully caused a partial power loss. Changes are being incorporated in the MIDAS IV vehicle to prevent a recurrence of this problem.

The Atlas booster for the MIDAS IV flight has been installed on Point Arguello Pad No. 2. The AGENA vehicle, modified for the WestFord Project, will be transferred to the launch pad in early September. The payload for this flight has completed its final checks and is ready to be installed on the satellite vehicle. This flight is scheduled for 3 October.

A "task type" systems test in accordance with a new test philosophy, is being utilized in the checkout of the MIDAS V satellite vehicle. This new test philosophy, when completely effected, will considerably reduce the time normally spent in the Vandenberg Air Force Base Missile Assembly Building. (C)

The agreement covering the construction of technical facilities and the operation and maintenance of the United Kingdom readout station was finalized on 19 July. A shortage of funds has delayed the start of modifications to the Donnelly Flats technical facilities. Considerable progress was made during the quarter on the rehabilitation of the support facilities at Ottumwa, lowa and on the design of the Tracking and Control Center facilities. This station will be the hub of the MIDAS operational systems. Work has been started and good progress is being made on the construction of Launch Complex No. 2 at Point Arguello. A Critical Path Scheduling (CPS) program is being used during construction of this facility. Construction progress on the Lockheed High Vacuum Orbital Simulator (HIVOS) indicates that it will be ready to begin tests in mid-January 1962.





B. TOPICAL SUMMARY

1. Program Administration

"Simplified" MIDAS satellite system proposed

a. Lockheed Missiles and Space Company is continuing preliminary design of their proposal for a "simplified" MIDAS satellite configuration. Fundamental to the "simplified" MIDAS concept is the use of an orbital network of randomly distributed satellites as opposed to the controlled distribution previously proposed. System analyses are being conducted by LMSC, Aerospace Corporation and Lincoln Laboratories to determine the coverage capability of the random network which will be evaluated in the light of operational requirements.

Air Defense Command briefed on MIDAS network configurations

b. During July, Air Defense Command personnel were briefed on MIDAS coverage for various satellite network configurations. The purpose of these briefings was to acquaint ADC personnel with the fundamentals involved to facilitate their analysis which will assist in determination of MIDAS operational requirements. Results of the ADC analysis should be available in September.

2. Flights

a. MIDAS II Tracked

SAPUT transmitter still operating

The 6594th Test Wing reported of a series of tracks of MIDAS II, vehicle 1007, launched in May 1960. The tracks were recorded during the period 18 through 21 July 1961 on several passes, pass No. 6414 and No. 6450 on the dates noted. The Solar Auxiliary Power Unit Telemetry (SAPUT) continues to transmit and operation appears satisfactory. (U)

Three problems delay MIDAS III launch

b. MIDAS III Prelgunch

During June, three delays were encountered in preparing MIDAS III for launch. An AGENA problem caused the first delay. Analysis of DISCOVERER XXIII flight data indicated that on orbit temperatures below the attitude control valve design operating temperatures were causing erratic operation of the valves. The condition resulted in a rapid expenditure of control gas and caused the satellite to be unstable. To eliminate a possible cause of the low valve temperatures a modification was incorporated providing thermal insulation between the valve attachment bolts and the vehicle structure. Thermostatically controlled electric heaters were also installed to insure that this problem could not occur on MIDAS III. The second delay was caused by the necessity to replace a defective liquid oxygen pressure regulator on the ATLAS booster. The third delay was caused by an intermittent electrical short in the infrared detection system.



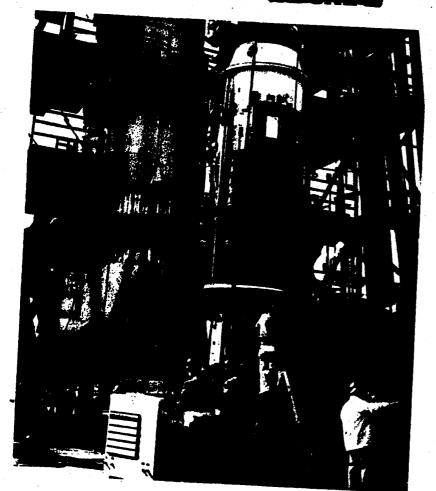
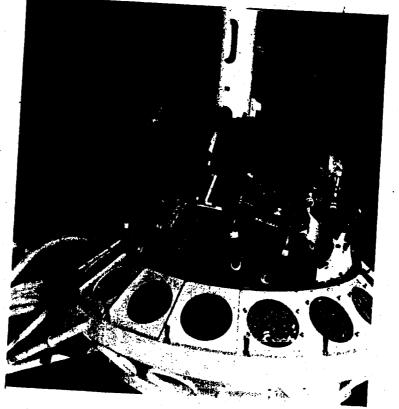


Figure 2 — Final checkout of AGENA vehicle 1201 before heisting it into the gantry and mating it with ATLAS 97D. Installing the MIDAS III Baird-Atomic payload. The payload lens is covered during these operations. The waveguide for the S band beacon is visible in the foreground. The technician is felding the VHF/UHF command antenna so that the nose fairing can be installed.



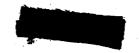


Figure 1 — installation of the solar array on MIDAS III. The new attitude control valve heating installation is visible on top of the AGENA vehicle, behind the flame shield. Closeup of MIDAS III payload at the completion of final checkout. The white cylinder in the foreground is the telemetry antenna mount. Also visible on the telescope assembly are the past-amplifiers, the DC power supply, and the radiometer pre-amplifier.



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MIDAS III launched on 12 July

Space Technology firsts achieved

MIDAS III highly successful

AGE and operating procedure deficiencies revealed

c. MIDAS III Launch

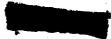
On 2 July the countdown of MIDAS III went to T-6 seconds when an ATLAS booster malfunction caused the launch to be rescheduled to 10 July. The second countdown proceeded to T-0 when a malfunction of the ATLAS umbilical caused the booster engines to shut down immediately after ignition. This malfunction was corrected and MIDAS III was successfully launched into orbit from Point Arguello Complex 1, Pad No. 2 at 0811 PDT on 12 July. Throughout ascent and orbit injection, booster and satellite performance were extremely close to the predicted values. Table I shows the predicted and attained orbital parameters.

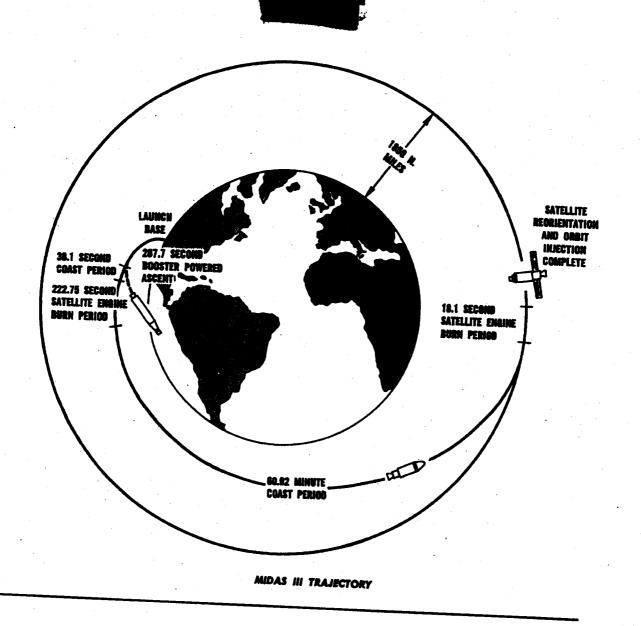
| Event | Programmed | Actual |
|---|---------------------|-----------------------|
| Apogee, nautical miles Perigee, nautical miles Period, minutes TABLE I. COMPARISON OF TRACE | 1861 1854 161 | 1890 1850 161.5 |

TABLE I. COMPARISON OF PROGRAMMED AND ACTUAL ORBITAL PARAMETERS FOR MIDAS III.

d. MIDAS III Flight

- (1) A number of significant firsts in space technology were achieved or proven during the MIDAS III flight.
- (a) The ability of the ATLAS AGENA B (3672 pounds orbital weight) to successfully establish a programmed, oriented, and stabilized 1870 n.m. (mean) circular orbit with 0.0039 eccentricity.
 - (b) AGENA B dual burn performance.
 - (c) ATLAS D/AGENA B compatibility.
- (d) Measurement of the high energy proton spectrum of the Van Allen belt from 90° to the equator. (48)
- (2) A complete review of the flight data indicates that MIDAS III was highly successful. Failure of one solar array to extend fully caused a partial loss of power for vehicle operation and transmittal of payload and vehicle telemetry data. The reduction and analysis of flight test data has not yet revealed the cause of this difficulty. Analysis of payload data received indicates no observed background, normal sensitivity, and verification of thermal and mechanical design. Analysis also established that Venus and vehicle reflections of the sun were among radiating sources detected by the
- (3) Vehicle "real time" command control, activating payload operation and telemetry, was successfully accomplished on passes number one and number five. However, deficiencies were revealed in the design of ground equipment and ground "command and control" operating procedures by the inability to resolve the emergency created by receiving only partial power from the solar array. The inability to formulate and load the required "stored program" commands into the vehicle contributed to the indicated early depletion of vehicle power





HEPDEX equipment still operating

and subsequent loss of payload data link and vehicle status telemetry. Vehicle status telemetry was received on pass one as programmed through stored commands loaded prior to launch.

(4) Van Allen radiation measurement data required as a mission objective for MIDAS III is still being provided by the High Energy Proton Detection Experiment (HEPDEX). The HEPDEX equipment power supply is independent of the solar array system. (S)

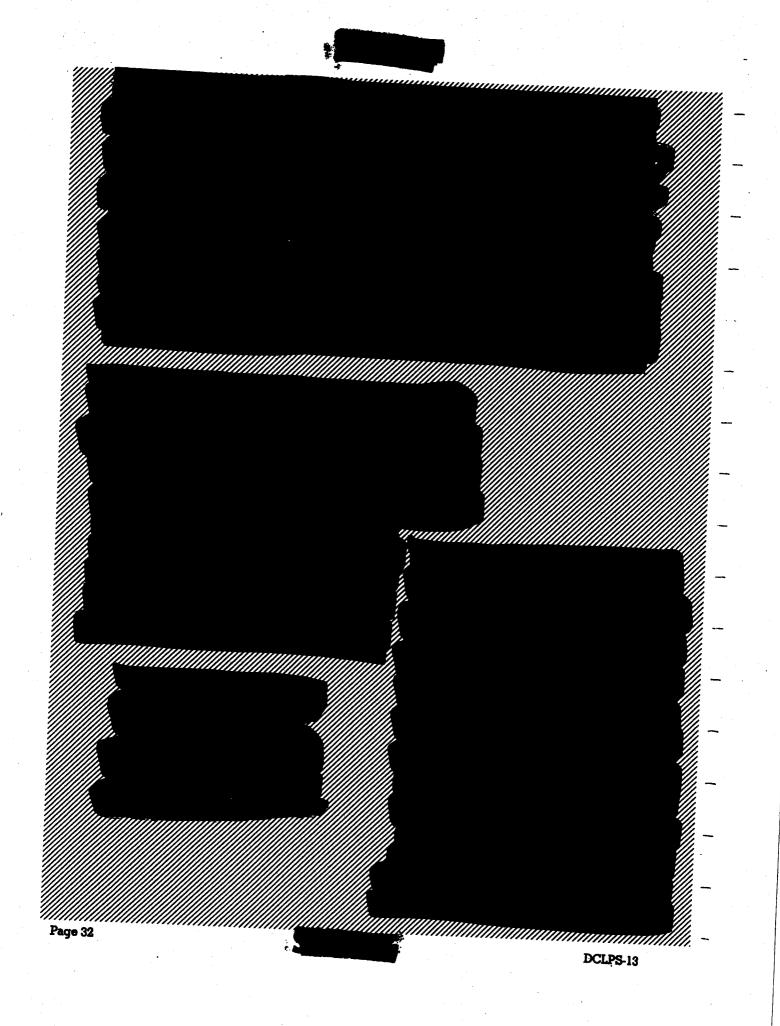
3. Technical Status

a. Boosters

(1) A decision was made in June by the Space Systems Division that the guidance systems on the ATLAS boosters for the

Improved model ATLAS gyro to be incorporated

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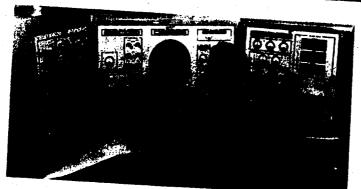
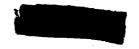


Figure 4 — New Boston, New Hampshire, MIDAS tracking station. The 60-foot tracking antenna and the data acquisition and processing building are in the right background. Two radomes and vans containing monitoring consoles (insert). This equipment is located several miles behind the main station. Air Force technician, left, at the antenna control console. The control console for the CDC 1604 computer, below, showing the tape storage cabinets on the left and other MIDAS support equipment in the background.



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MIDAS launches should be modified to incorporate an improved model gyro. Since the improved gyro has not been produced in sufficient quantity to supply all ATLAS modification requirements, a potential problem exists.

ATLAS 105D on stand

(2) ATLAS 105D (MIDAS IV booster) was transferred to Point Arguello Launch Complex, Pad No. 2 for prelaunch preparations on 24 July. Preparations are proceeding with no major difficulties. (U)

b. Second Stage Vehicles

(1) MIDAS IV

MIDAS IV arrives at VAFB MAB

(a) During July, the MIDAS IV vehicle (1202) completed operations at the Systems Test Complex, was shipped to Santa Cruz Base for flushing, and arrived at the Vandenberg Air Force Base Missile Assembly Building. During the receiving inspection pin hole leaks were detected in an oxidizer fill line weld. The part was X-rayed and weld porosity was determined to be the cause. The defect has been corrected. (S)

MIDAS IV modified for WestFord Project

(b) Also during July, action was initiated to effect equipment changes to MIDAS IV which would allow a higher orbital altitude (2050 n.m.) for participation in the WestFord (needle dispenser) experiment. These changes included the deletion of the vacuum bearing tester, all Geophysical Research Directorate equipment, the APL doppler equipment and its power supply, the Speidel tape recorder, and the R&D radiometer. These changes were completed early in August. Also completed in August were changes to the SAPUT (Solar Auxiliary Power Unit Telemeter), solar array, and vehicle command system resulting from the MIDAS III flight experience. The command system modification permits real time ground commands to override stored program commands for the operation of vehicle telemetry (FM/FM) and the "S" band beacon. This modification will provide greater utility and control in vehicle tracking and in obtaining vehicle status data.

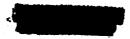
MIDAS IV AGENA B in MAB

(c) At the end of the reporting period the MIDAS IV AGENA vehicle (1202) was undergoing prelaunch testing in the Vandenberg Air Force Base Missile Assembly Building, with transfer to the launch pad scheduled for 8 September.

MIDAS V in systems test

(2) MIDAS V

The MIDAS V satellite vehicle (1203) is undergoing systems test at LMSC, Sunnyvale, and is scheduled for release to the Vandenberg Air Force Base Missile Assembly Building on 29 September. The systems test is being conducted in accordance with a new test philosophy which will eliminate system testing in the Missile Assembly Building; however, it appears that modifications which must be incorporated in AGENA vehicle 1203 will necessitate a re-run of systems test in the Missile Assembly Building.



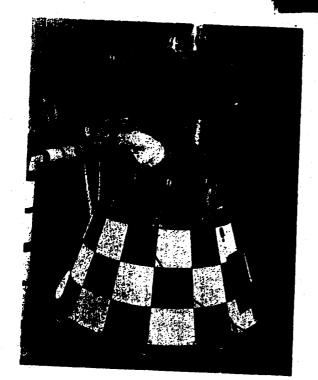
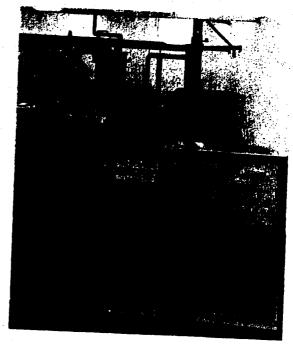


Figure 5 — Service test model Series ill Aerojet-General payload during checkout on the collimater. The first Series III payload is scheduled for flight on MIDAS VI in early June 1962.

Figure 6 — A portion of the equipment which is used to checkout the MIDAS payloads. In the fore-ground is the final acceptance test console.

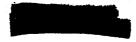


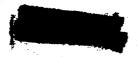
Series III IR subassemblies complete acceptance tests

Series IV payload design continues

c. Infrared Scanners

- (1) During July MIDAS Series III payload subassemblies completed acceptance tests at the Aerojet-General facility and data from these tests have been analyzed. One payload per month production will begin with delivery scheduled to begin in September to support flight and ground testing. The first MIDAS Series III payload is scheduled for flight on MIDAS VI in early 1962. (8)
- (2) Preliminary designs for Series IV payloads are in process at Aerojet-General and Baird-Atomic, Inc. (U)





Background radiometer flight data published

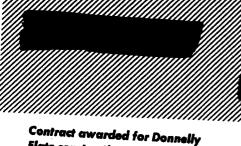
d. U-2 Background Radiometer Flights

Data from the U-2 infrared background measurement flights has been reduced by Baird-Atomic, Inc. and the results have been published. Distribution will be made during September. These flights originated from Edwards Air Force Base in March, Eielson Air Force Base, Alaska in April, and Patrick Air Force Base in May. These flights were designed to gather terrestrial infrared radiation and horizon measurements under desert, arctic, and tropical conditions. The data obtained will be used to refine the design of the payload scanner unit. (U)

Description of data processing configuration published

e. System Development

A conceptual description of a data processing configuration for MIDAS was published in June (Lincoln Report MS-7) as a result of a study performed by Lincoln Laboratory. Lockheed Missiles and Space Company has examined the report and directed their formal comments to the Space Systems Division. The Lincoln report has proven to be a valuable asset; several of its concepts have been adopted. (U)



Flats construction

b. A contract was awarded during August for modification of the MIDAS technical facilities at Donnelly Flats, Alaska. The first phase is scheduled for completion on 1 November with the second phase scheduled for completion on approximately 25 November. (U)

Technical Support Building contract awarded

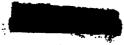
c. The construction contract for the MIDAS Technical Support Building at the New Hampshire tracking and telemetry station was awarded during August by the Corps of Engineers. (U)

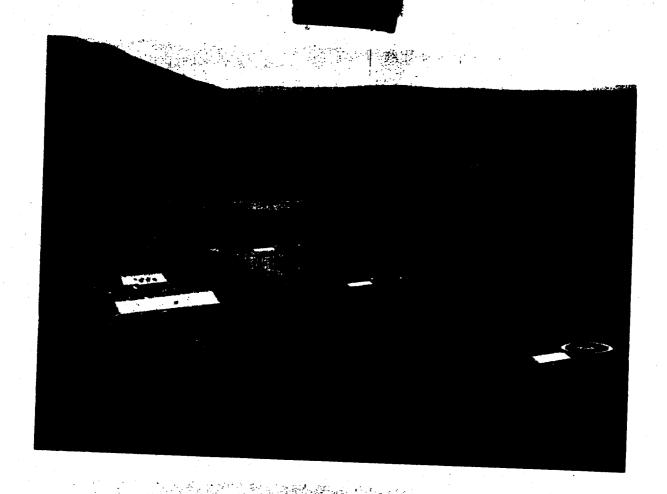
Conference held to discuss Ottumwa TCC

d. A review conference of preliminary design plans for the Ottumwa, Iowa, Tracking and Control Center technical facilities was held on 27 and 28 June. A review conference of final design plans for these facilities was held on 31 August. On 14 June, a predesign conference was held at Omaha, Nebraska to discuss the rehabilitafion of the base support facilities at Ottumwa. The final plans and specifications for rehabilitation of base support facilities are scheduled for completion during October.

Point Arguello Launch Complex No. 2 construction begins

e. Construction contract bids for Point Arguello Launch Complex No. 2 were opened on 26 June and the contract awarded to Paul Hardeman, Inc. on 27 June. The complex will accommodate launching of Series IV MIDAS vehicles. The complex will be similar to Launch Complex No. 1, but will incorporate improvements in ground equipment. At present the complex will consist of two launch stands with a third stand to be constructed upon approval and receipt of





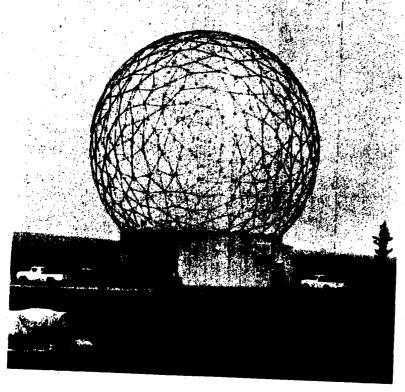
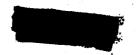


Figure 7 — Aerial view of the Donnelly Flats, Alaska, technical facilities. Three radome support rings are visible in the background. The smaller building on the left houses the diesel powered generators; the larger structure is the data acquisition and processing building. Partially visible between the two is the heated garage. A later photo showing the "spider-web" steel framework which will support the radome to protect the tracking antennas.

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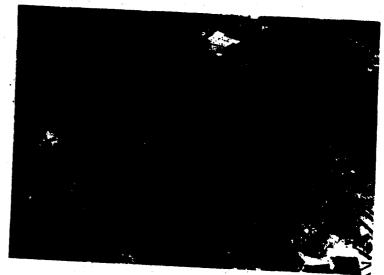
funds from Hq USAF. Construction was started on 1 July and major items required during construction have been ordered by the contractor. Initiation of a Critical Rath Scheduling (CPS) program as a management tool for construction of this complex is believed to be the first use of this technique within the Air Force during facility construction.

Construction is progressing satisfactorily and the contractor is considered to be on schedule. Principal accomplishments during this time period have been:

- (1) Completion of excavation work Pad No. 3.
- (2) Major earthwork involved in building main roads and parking lot.
 - (3) Foundations for Technical Support Building.
 - (4) Foundations for Pad No. 3.
 - (5) Completion of critical path scheduling network systems.
- (6) Completion of excavation work for Launch Operations
 Building. (U)
- f. Because of design changes, the beneficial occupancy date for modification of support facilities at Vandenberg Air Force Base is now scheduled for 1 October. The notice to proceed on the second increment was issued on 15 August. The final modification increment will be awarded upon receipt of FY 62 Military Construction Program funds. (U)
- g. The Lockheed High Vacuum Orbital Simulator (HIVOS) presently under construction at the Sunnyvale facility was 85 percent complete at the end of August. Data handling and instrumentation installation together with system calibration have not yet been completed. Testing of a satellite within the simulator is scheduled to start on 15 January 1962. (U)

Modification of VAFB support facilities underway

HIVOS 85% complete



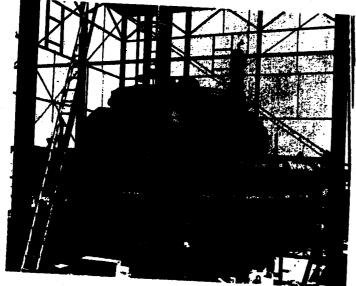
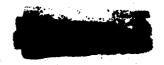


Figure 8 — Views of the High Vacuum Orbital Simulator (HIVOS) test chamber being constructed at Lockhood, Sunnyvale. The test chamber, which has an inside diameter of 18 feet, is designed to simulate the space environment. Redundancy has been incorporated into the vacuum system to enable one-year continuous operation. The test chamber will provide a temperature range from plus 500 degrees Fahrenheit te minus 300 degrees Fahrenheit. The behavior of the MIDAS payload in the test chamber will be controlled, observed, and recorded by an Automatic Programming and Data System (APADS).



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HEADQUARTERS

SPACE SYSTEMS DIVISION (AFSC)

UNITED STATES AIR FORCE

Air Force Unit Post Office
Los Angeles 45, California

SSLPR

13 February 1962

MILITARY SATELLITE PROGRAMS PROGRESS REPORT Month Ending 31 January 1962

FOREWORD

Attached are the reports covering progress during the month of January 1962 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.

0. J. RITLAND ON OSAF Major General, USAF Commander

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1. (C) DISCOVERER Program

2. (S) MIDAS Program

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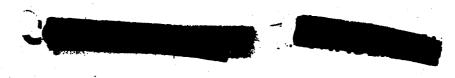
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DISCOVERER PROGRAM

1. This report, covering progress during the month of January 1962, is submitted in accordance with Department of Defense memorandum to the Secretary of the Air Force, dated 27 February 1960.

2. FLIGHT PROGRAM

a. DISCOVERER 37

- (1) Discoverer 37, launched from Pad 4, Vandenberg Air Force Base, Saturday, 13 January 1962, failed to achieve orbit. Lift-off and separation of the Thor booster and the Agena B vehicle occurred as expected. At separation, however, a malfunction apparently caused blowing of a fuse and consequent loss of power to the gyro spin motors in the inertial reference package. Subsequent to Agena engine ignition the vehicle began tumbling. Due to the tumbling motion, first burn of the Agena engine extended over a period of only 10 seconds when fuel starvation resulted in engine cut-off. Following a ballistic trajectory, the Agena vehicle impacted in the Pacific.
- (2) Possible causes of the malfunction have been studied since the flight. Systems Test of Agena 1123, the subsequent flight vehicle satellite, has been extended from 30 January to 1 February to permit completion of an extensive test program on all components which may have caused the malfunction.

b. DISCOVERER 38

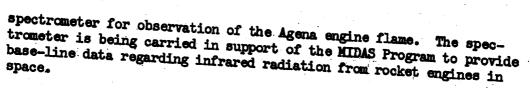
- (1) Discoverer 38 is scheduled for launch from Pad 4, Vandenberg Air Force Base on Monday, 26 February. The vehicle will be delivered to the Missile Assembly Building at Vandenberg from Lockheed Missiles and Space Company, Sunnyvale, on Friday, 2 February. The Vehicle-On-Site (VOS) date is set for 12 February. As noted above, an extensive investigation is underway to prevent reoccurrence of the electrical system malfunction on the Discoverer 37 flight.
- (2) Discoverer 38, as did the previous flight, will carry the Defense Atomic Support Agency (DASA) payload for measurement of the aurora effects on radio propagation. The experiment will be conducted in conjunction with aircraft-borne radio transmitters.
 - (3) The Agena for Discoverer 38 will also carry a plume

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(4) The recoverable payload proposed for the Discoverer 38 flight will include solar cells, and other radiation measurement devices. Upon recovery, the solar cells will be studied to determine the extent of deterioration on the electrical system solar arrays from radiation in space.

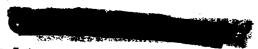
3. Facilities.

a. Vandenberg AFB, 75-1 and 3 Complex Modifications. Design started on 15 January 1962. Construction contract will be awarded incrementally to satisfy program requirements.

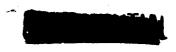
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MIDAS PROGRAM

1. This report, covering progress during the month of January 1962, is submitted in accordance with Department of Defense memorandum to the Secretary of the Air Force, dated 27 February 1960.

2. PROGRAM ADMINISTRATION

- a. A IMSC proposal for development of a MIDAS IR Data Processing Laboratory was received by SSD for comment and approval. Approval to proceed with activation of long-lead work was given to LMSC. Early finalization of full approval is expected. The proposal sets forth the plan for developing the necessary techniques for processing and displaying MIDAS payload data in near real time. It calls for establishment of a small, MIDAS research laboratory at LMSC which will simulate operation of the complete MIDAS IR data processing system.
- b. A IMSC MIDAS Electromagnetic Interference Control Plan and associated Test Plans are in preparation and are expected in SSD in February. The Control Plan deals with methods of minimizing interference, equipment required, schedules, and costs. The Test Plans will cover methods of testing to define effectiveness of the interference control efforts and identifying problem areas.
- c. LMSC Technical Comments on "Evaluation of MIDAS R&D Program by the Department of Defense Research and Engineering (DDR&E) Ad Hoc Group on MIDAS," is scheduled for completion in February. These comments will be forwarded to Hq AFSC and Hq USAF.

3. FLIGHT PROGRAM.

- a. MIDAS V Launch Preparations. MIDAS V scheduled launch date remains firm. Missile Assembly Building launch preparations for this satellite commenced late in January and will be complete 3 March. Vehicle-on-stand (VOS) schedule is 12 March and launch will be scheduled for 30 March. These dates are based on a Program 101B.
- b. MIDAS VI is in Systems Test. Communications and Controls checks have been completed and the vehicle is now undergoing solar

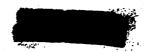
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array fit tests. These tests and Guidance System competibility checks will be completed in February. The 24 July launch date is still firm.

c. MIDAS VII was shipped from IMSC, Summyvale to the Santa Cruz Test Base on 19 January for fill and drain (flush) operations. These operations were delayed by the recent inclement weather but no impact on the schedule for this reason is foreseen.

4. FACILITIES.

a. Vandenberg AFB.

- (1) Technical Support Facilities Modification of Building 6007 has been completed. Modification work on 18 of the 20 buildings in the second increment of this package started on 7 August 1961, and is approximately 99 per cent complete. The remaining portion of the second increment package will be awarded if FY62 funds are made
- (2) Tracking and Telemetry Station, Data acquisition and processing building - Construction contract has been awarded and work is 30 per cent completed. Required modifications to the existing air conditioning system are being prepared as a separate package.

b. Pt. Arguello:

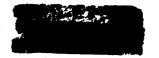
- (1) Launch Complex #1 (MOD) Vehicle Support Building with minor discrepancies was accepted on 30 January 1962. Remaining modification to Stands #1 and #2 are delayed pending availability of
- (2) Launch Complex #2 Overall completion of all construction to date is estimated at 50 per cent. Technical Support Building structure is essentially finished, with interior work continuing. BOD for this building is scheduled for 15 February 1962. Interior mechanical and electronic work is progressing in Launch Operations Building. All concrete work for Launch Pad and Service Tower Building #3 is essentially complete. Missile Service Tower #3 is being erected. Concrete work for Launch Pad and Service Building #4 is rapidly nearing completion. Forming and steel placing continues in the general area. The water reservoir tank is approximately 95 per cent complete. The main road into the complex as well as the road to Launch Pad and Service Building #3 and the parking lot have been paved. Grading for the fallback area is nearing completion.

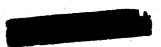
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c. North Pacific MIDAS Readout Station & Modifications to technical room areas are completed. Installation of supplementary air conditioning equipment is scheduled for completion by 31 January 1962.

- e. New Boston Tracking and Telemetry Station, New Hampshire-
 - (1) Construction of the technical support building is scheduled for completion in March 1962.
 - (2) Control and Identification Building Project has been released for design and construction to the New England Division Corps of Engineers.
 - f. Ottumwa Tracking and Control Center, Iowa -
 - (1) TCC Technical Facilities Design complete.
 Advertising for construction is deferred pending release of funds.
 - (2) TCC Support Facilities Design backcheck review is scheduled for 15 February 1962.

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