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V4-2

AIR FORCE BALLISTIC MISSILE

SPACE

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JANUARY 1961

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a foreword to...

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

WDLPR-4

9 February 1961

Summary of
AIR FORCE BALLISTIC MISSILE DIVISION
Activities in Space
JANUARY 1961

FOREWORD

This report includes information about: the DISCOVERER Engine Reliability Program, the data gathered by the MIDAS Radiometric Measurement flight and the successful Blue Scout I launch. The results of space radiation measurements conducted on 9 November are reported in the BIOASTRONAUTICS Section. VELA HOTEL information is included in the BOOSTER SUPPORT PROGRAMS Section.

~~Robert W. Hoffman Col USAF~~
for

O. J. RITLAND
Major General, USAF
Commander

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SATELLITE
systems

DISCOVERER
MIDAS
ADVENT

Discoverer

The DISCOVERER Program consists of the design, development and flight testing of 41 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 Project's 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.

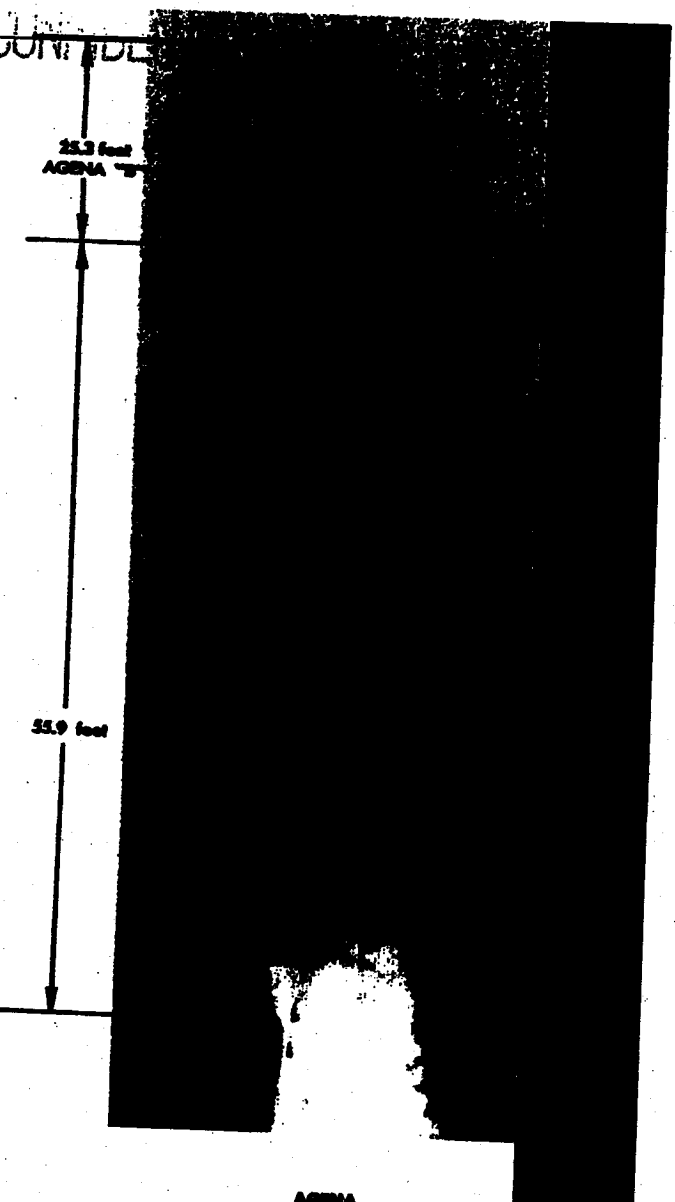
(e) Testing of ground support equipment and development of personnel proficiency.

(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 overall 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 page A-5.



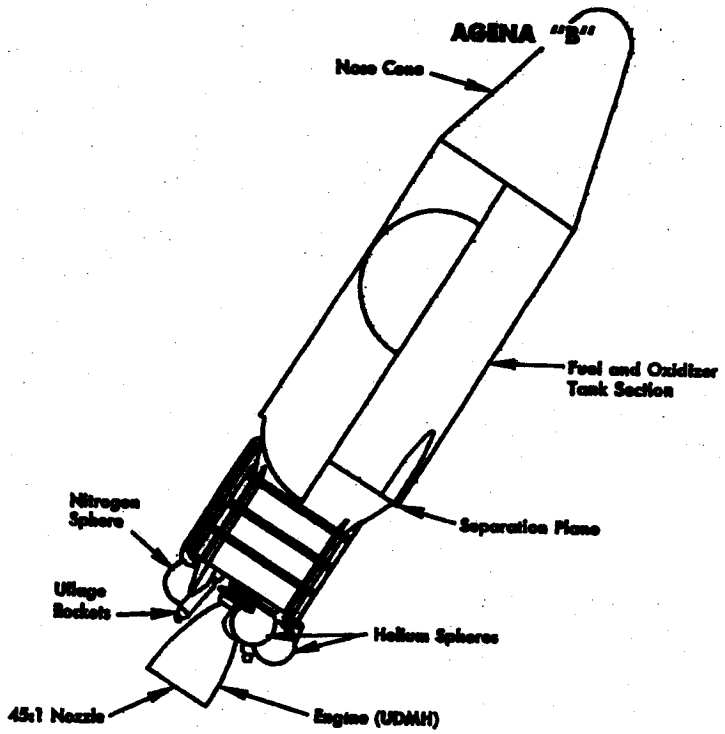
SECOND STAGE	AGENA "B"	
Weight—		
Inert	1,328	1,346
Payload equipment	887	915
Orbital	2,215	2,261
Impulse propellants	12,950	12,950
Other	511	511
TOTAL WEIGHT	15,676	15,722
Engine Model	XLR81-Ba-7	XLR81-Ba-9
Thrust-lbs., vac.	15,600	16,000
Spec. Impv.-sec., vac.	277	290
Burn time-sec.	240	240
BOOSTER	DM-21	
Weight—Dry	6,500	
Fuel	33,700	
Oxidizer (LOX)	68,200	
GROSS WEIGHT (lbs.)	108,400	
Engine	MB-3 Block 2	
Thrust, lbs. (S.L.)	169,000	
Spec. Impv., sec. (S.L.)	248.3	
Burn Time, sec.	148	

Telemetry ships are positioned as required by the specific mission of each flight. Figures 2 and 3 show a typical launch trajectory from Vandenberg Air Force Base, and figure 3 shows schematically a typical orbit. An additional objective of this program is the development of a controlled re-entry and recovery capability for the payload capsule (Figure 4). 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 aircraft and for sea recovery by Navy surface vessels. The recovery phase of the program has provided advances in re-entry vehicle technology. This information will be used in support of more advanced projects, including the return of a manned satellite from orbit.

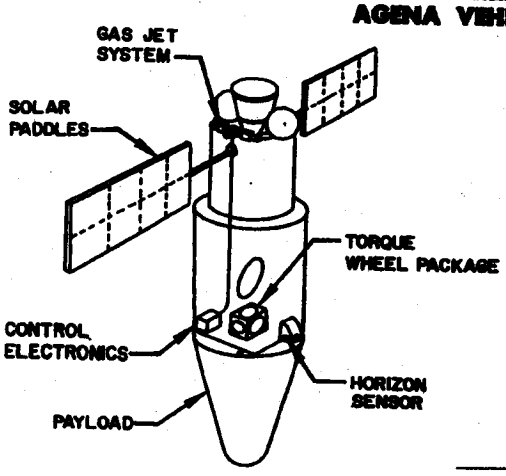
AGENA VEHICLE DEVELOPMENT

The AGENA vehicle was originally designed by the Air Force as the basic satellite vehicle for Advanced Military Reconnaissance Satellite Systems Programs. The first AGENA satellites or "A" configuration employed the YLR-81Ba-5 engine which developed 15,600 pounds thrust at altitude. The development of an optical inertial system for vehicle stabilization and an attitude control system for orbit injection resulted from the advanced programs stringent eccentricity requirements.

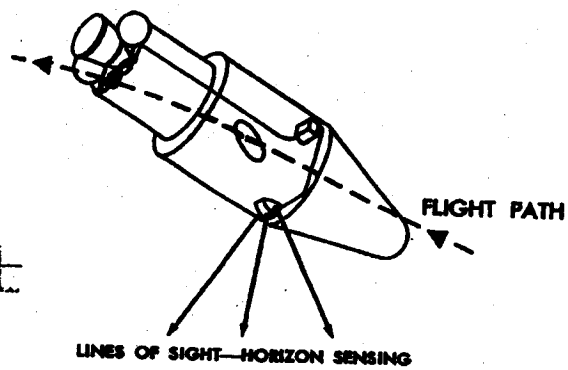
By increasing the tank capacities on the AGENA "A" an improved performance capability was achieved. This new configuration or AGENA "B" used the Bell XLR-81Ba-7 engine and was first flown on DISCOVERER XVI. The latest AGENA "B" vehicles use the 16,000 pound thrust XLR-81Ba-9 engine which has a restart capability. This larger vehicle permits achieving higher injection altitudes with equivalent weight payloads and the restart provision permits orbital adjustment.



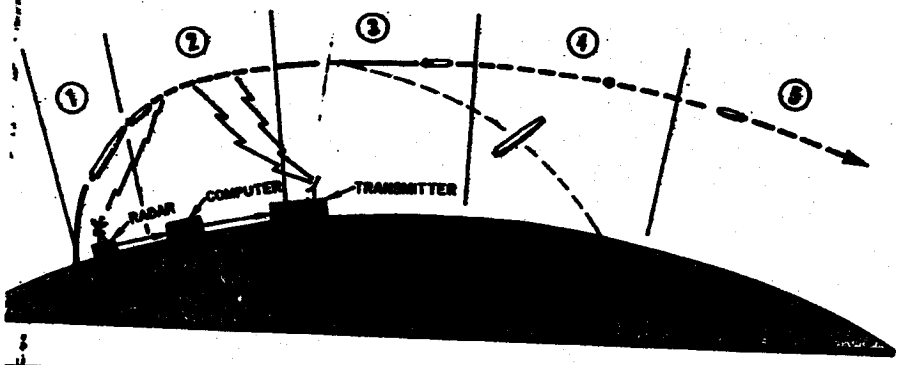
SAMOS and MIDAS AGENA VEHICLE



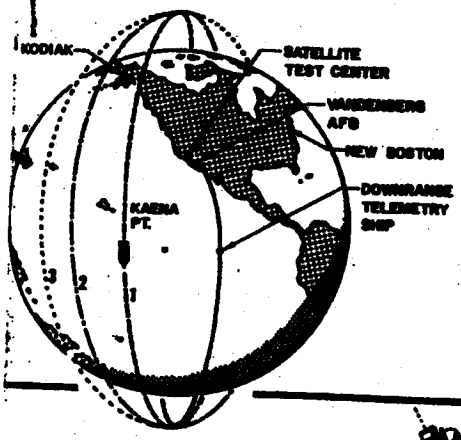
DISCOVERER/AGENA



Powered Flight Trajectory



1. **First Stage Powered Flight** — 2.5 minutes duration, 70 n.m. downrange, guided by programmed autopilot and SIT guidance.
2. **Coast Period** — 2.4 minutes duration, to 380 n.m. downrange, attitude controlled by inertial reference package, horizon scanner, gas reaction jets. Receives AGENA time to fire and velocity to be gained commands.
3. **Second Stage Powered Flight** — Approximately four minutes or until injection velocity is attained. Pitch and yaw stabilization achieved by gimballing the engine and roll by gas reaction jets. Engine shutdown achieved by integrator accelerometer cutoff command.
4. **Vehicle Reorients to Nose Aft** — 2 minutes duration. Guided and attitude controlled by inertial reference package, horizon scanner and gas reaction jets.
5. **In Orbit** — Controlled (same as 4).

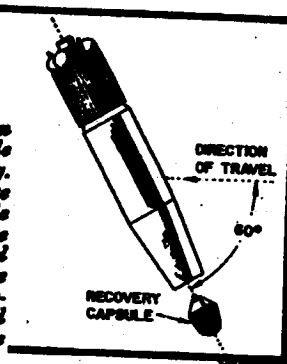


Orbital Trajectory

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 nose section of the AGENA vehicle. Ejection 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 and programmed into the vehicle prior to launch. If an alternate pass is desirable, an ejection command is sent to the satellite before this alternate re-entry pass. 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 re-entry. Following parachute deployment the aerial recovery force converges on the descending capsule and snags the parachute. The capsule contains a radio beacon and reflective chaff which is dispersed to aid in tracking.*
- *The recovery force consists of C-119, RC-121, WVII and JC-54 aircraft supplemented by 2 or 3 surface vessels that receive and record telemetry data. If it is necessary to retrieve the capsule from the sea, these ships are available.*

GROUND SUPPORT FACILITIES

Facility	Equipment*	Flight Function
Satellite Test Center	ABCD	Over-all control, orbit computations and predictions, acquisition data for tracking stations, prediction of recovery area.
†Vandenberg AFB Tracking Station	BDEFGHIJ	Ascent and orbital tracking, telemetry reception, trajectory measurements, command transmission.
†Mugu Tracking Station	BDEFGHIJ	Ascent tracking, telemetry reception, computation and transmission of ignition and shutdown corrections.
Downrange Telemetry Ship	BGIJK	Telemetry reception and tracking during ascent and early part of first orbit.
†New Hampshire Tracking Station	BDFGHIJ	Orbit tracking, telemetry reception, commands to satellite.
†Kodiak Tracking Station	BDFGHIJ	Orbit tracking, telemetry reception, initial acquisition on pass 1, monitor events in recovery sequence.
†Hawaiian Tracking Station	BDFGHIJ	Orbit tracking, telemetry reception and transmission of commands to satellite.
Hickam AFB Oahu, Hawaii	D	Over-all direction of capsule recovery operations.
Tern Island	BGHIJ	Recovery capsule tracking.

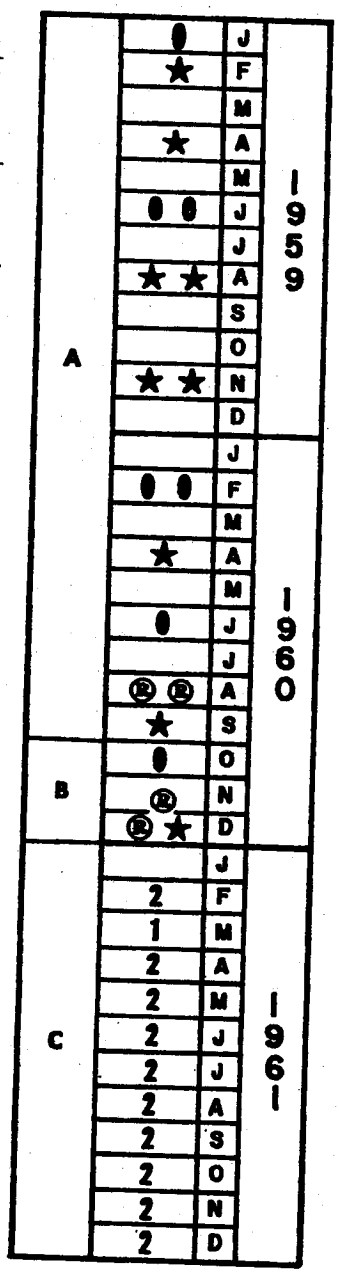
†Primary Tracking Stations (have command capability)

*Equipment

A. General Purpose Computer(s) and Support Equipment
B. Data Conversion Equipment
C. Master Timing Equipment
D. Control and Display Equipment
E. Guidance and Command Equipment (DISCOVERER escort only)
F. VERLORT
G. VHF FM/FM Telemetry Station
H. VHF Direction Finding Equipment
I. Doppler Equipment
J. VHF Telemetry Antenna
K. AFI. Doppler Equipment

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

LAUNCH SCHEDULE



★ Attained orbit successfully.

Ⓡ Capsule recovered.

● Failed to attain orbit.

FLIGHT HISTORY

DISCOVERER No.	THOR No. / AGENA No.	Flight Date	Remarks
0	160 / 1019	21 January 1959	*AGENA destroyed by malfunction on pad. THOR refurbished for use on flight XII.*
I	163 / 1022	28 February	*Attained orbit successfully. Telemetry received for 514 seconds after lift-off.*
II	170 / 1018	13 April	*Attained orbit successfully. Recovery capsule ejected on 17th orbit was not recovered. All objectives except recovery successfully achieved.*
III	174 / 1020	3 June	*Launch, ascent, separation, coast and orbital boost successful. Failed 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 capsule 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 mast did not retract. Quick disconnect failed, causing loss of helium pressure.*
X	223 / 1054	19 February	*THOR destroyed at T plus 56 sec. by Range Safety Officer. Severe pitch oscillations caused by booster autopilot 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 ignition were successful. Failed to achieve orbit because of AGENA attitude during orbital stage boost.*
XIII	231 / 1057	10 August	*Attained orbit successfully. Recovery capsule ejected on 17th orbit. Capsule was recovered after a water 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. Capsule impact occurred south of the recovery forces; located but lost prior to being retrieved.*
XVI	253 / 1061	26 October	*Launch and ascent normal. AGENA 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 aerial recovery was accomplished. All objectives were successfully achieved.*
XIX	258 / 1101	20 December	*Attained orbit successfully. Non-recoverable, radiometric data gathering MIDAS support flight.*

VEHICLE CONFIGURATIONS

A. THOR—DM-18/AGENA "A"

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

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

Monthly Progress -- DISCOVERER Program

Flight Test Progress

DISCOVERER XIX Flight Investigation

- DISCOVERER XIX was launched on 20 December carrying a radiometric payload (non-recoverable) in support of the MIDAS Program. Because of a loss of control gas, the satellite was unstable in attitude on orbit. Despite the satellite oscillations, sufficient data were obtained for evaluation of the payload operation. Gas expenditure through ascent and orbital injection was normal. Telemetry data shows a rapid loss of gas from engine cutoff until the satellite passed out of range of the telemetry ship. By the time of acquisition at Kodiak on the first pass, all gas in the storage bottles was gone.

- The nature of the malfunction, as determined from telemetered data, pointed to a failure in some portion of the equipment which controls gas valves one and three. The most probable point of failure was ascertained to be the output stage of the gas valve amplifier. A dynamic simulation on an analog computer confirmed this analysis. Tests were conducted on an identical amplifier and these tests narrowed the failure to a particular transistor in the amplifier.

Future Flights

- Two DISCOVERER launches were scheduled for January but both launches have been rescheduled for early in February. This resulted from the decision to delay the launch of SAMOS II from 20 January to 31 January. DISCOVERER XX was rescheduled to avoid possible interference during SAMOS orbital operations.

- DISCOVERER XX, scheduled for launch on 10 February, will carry a recoverable Advanced Engineering Test payload and will be used in the first attempt at a four-day recovery mission. One, two and three-day missions have been successfully accomplished on previous DISCOVERER flights. The nominal recovery pass will be number 63 on this flight. The orbital programmer, however, can be adjusted by command from the ground to permit recovery on pass 15, 17, 30, 32, 46, 48 or 61.

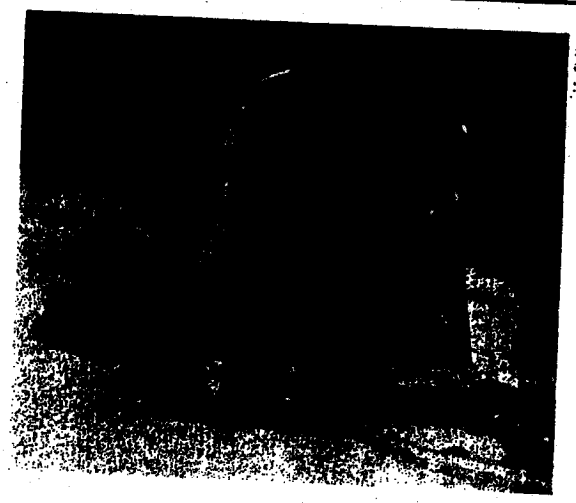


Figure 1. Radiometer for RM payload prior to installation in DISCOVERER vehicle. This unit is designed to obtain measurements of the earth's background infrared radiation and is being flown on DISCOVERER vehicles in support of the MIDAS Program. RM payload (right) is shown being lowered into a vacuum chamber at the Vandenberg Air Force Base Missile Assembly Building for a leak test of the nitrogen supply system.

- The DM-21 will carry a Bell Telephone Laboratories (BTL) guidance system for the first time on a DISCOVERER flight. It will be carried open-loop (not guiding) and performance data will be telemetered back for system evaluation. If performance of the guidance system is satisfactory, future DISCOVERER vehicles will be guided by the BTL system. The BTL guidance system, developed for TITAN I, provides very precise guidance.

- The rescheduling of DISCOVERER XX has caused the launch of DISCOVERER XXI to be delayed until mid-February. This flight will carry the second non-recoverable radiometric payload for the MIDAS program, to measure the earth's infrared radiation background.

- The first satellite (AGENA) engine re-start experiment will be conducted on DISCOVERER XXI. This first on-orbit test will be a one-second firing initiated by the orbital programmer while the satellite is over Kodiak on its first pass. The effect of reburn on the orbit will be minor. The experiment will require that the yaw-around from a nose-first to a tail-first attitude be delayed until the restart is completed. This usually occurs immediately after orbital injection.

Technical Progress

Second Stage Vehicles

- The Engine Reliability Program is on schedule at the Bell Aerosystems test facility. Twenty-six of forty scheduled firings have been completed. The phase involving evaluation of the effects of using fuels with high solid content was completed with no excessive skin temperatures being recorded.

- Ten starter assemblies were subjected to temperature and vacuum conditioning for thirty days and fired successfully. Two other assemblies were disassembled and one was found to have a cracked grain. Both units will be fired to determine the effect of the crack. These tests are part of the Thirty Day Coast Program which has the objective of developing the capability of restarting the engine after an extended coast period in space.

- The occasional speed fluctuations in the XLR-81Ba-9 engines have been corrected by installation of an acoustic damper in the gas generator. No speed fluctuations have occurred during acceptance testing of eight turbine pumps and six engines incorporating the acoustic damper. A 2 percent speed discrepancy between turbine pump acceptance tests and engine acceptance tests on production engines 323, 324 and reliability program engine 306 (all with acoustic dampers) has been attributed to servicing discrepancies.

- The causes for power level drop-offs occurring in Preliminary Flight Rating Tests on XLR-81Ba-9 engine serial number 306 have not been completely defined, but may be associated with the vertical firing position. Investigations of possible oxidizer pump housing etching and internal gas generator damage connected with vertical firing and an evaluation of the effect of these conditions on engine power level are being conducted.

Optical Tracking Light Experiments

- A meeting was held at the Smithsonian Astrophysical Observatory (SAO) on 9 January to discuss results and future plans of the DISCOVERER Optical Tracking Light Experiment. Although the Observatory has successfully photographed the AGENA vehicle on all orbiting flights since DISCOVERER XI (Figure 2), final data reduction has been insufficient to analyze the results completely. It was decided that the Observatory will complete the data reduction for DISCOVERER XVII and XVIII and forward it to Lockheed for comparison with other tracking systems (radar). Final plans for this experiment will be made following receipt of the Lockheed analysis.

Biomedical Test Program

- Results of the biopack specimens analysis carried in the recovered DISCOVERER XVIII capsule are included in the BIOASTRONAUTICS Section of this report.

Recovery Aircraft

- The JC-130B recovery aircraft should begin arriving at the 6594th Recovery and Control Group early in May with the last aircraft due to arrive on 15 June. At present one aircraft is at Edwards Air Force Base being used for pilot check out and one is at Wilmington, Delaware undergoing final tests of recovery equipment. Four other aircraft are being modified at Warner-Robbins Air Force Base.

Facilities

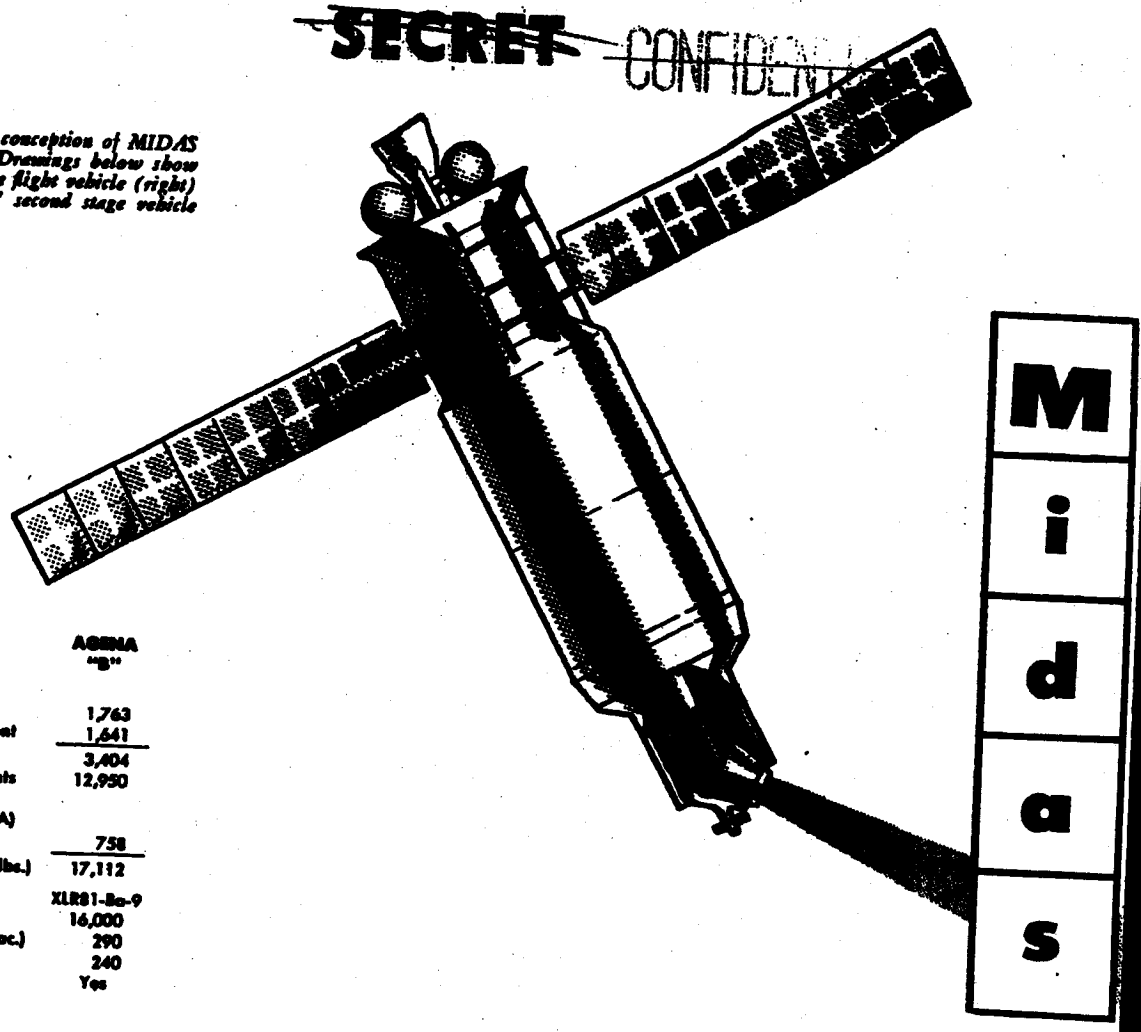
- Deliveries of AGENA launch control equipment for Vandenberg Air Force Base Complex 75-1, Pad 1 is approximately three weeks behind schedule. In an attempt to recover and adhere to the original modification completion date, AFBMD has directed

Figure 2. Optical tracking lights (left) as installed on DISCOVERER XI. Ground stations throughout the world were able to track this vehicle with powerful cameras. The lights have been carried on all subsequent DISCOVERER vehicles. The photometric sphere, shown on the right, is used to measure the intensity of optical tracking lights and the reflectance of various surfaces and to assist in the establishment of desired optical parameters.

Lockheed and Douglas to prepare an integrated revision to the installation and checkout plan which will permit AGENA Missile-On-Stand as presently scheduled. The revised schedule will result in earlier completion of items with available equipment and the simultaneous accomplishment of certain checkout functions. Review and approval of the revised installation and checkout plan is expected early in February. This revised plan provides for pad 1 activation to support a mid-May launch.

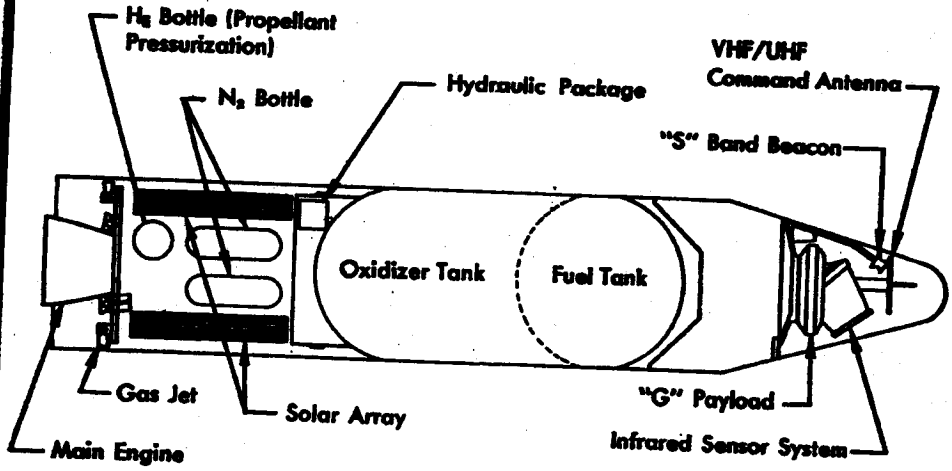
- Plans and schedules for conversion of Complex 75-3, at Vandenberg Air Force Base, to permanent propellant transfer systems and launch control modernization have been formulated by Lockheed and Douglas and approved by AFBMD. Design of facilities modification has been completed and some preliminary facility work is being accomplished on a non-interference basis. The new propellant transfer systems are scheduled for delivery to Vandenberg Air Force Base in February.

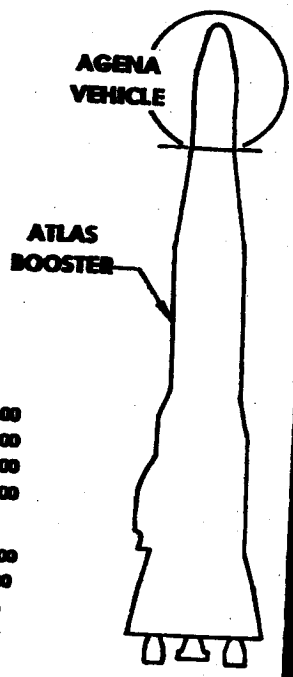
Figure 1. Artist's conception of MIDAS satellite (right). Drawings below show complete two-stage flight vehicle (right) and AGENA "B" second stage vehicle (left).



Midas

SECOND STAGE	AGENA "B"
Weight—	
Inert	
Payload equipment	1,763
	1,641
Orbital	3,404
Impulse Propellants	12,950
• Fuel (UDMH)	
Oxidizer (IRFNA)	
Other	758
GROSS WEIGHT (lbs.)	17,112
Engine	XLR81-Ba-9
Thrust, lbs. (vac.)	16,000
Spec. Imp., sec. (vac.)	290
Burn Time, sec.	240
Restart Provisions	Yes





MIDAS, Configuration II, AGENA "B" Satellite

BOOSTER—ATLAS ICBM	
Weight—Dry	15,100
Fuel, RP-1	74,900
Oxidizer (LOX)	172,300
GROSS WEIGHT (lbs.)	262,300
Engine—MA-2	
Thrust (lbs. vac.) Boost	356,000
Sustainer	82,100
Spec. Imp. (sec. vac.) Boost	286
Sustainer	310

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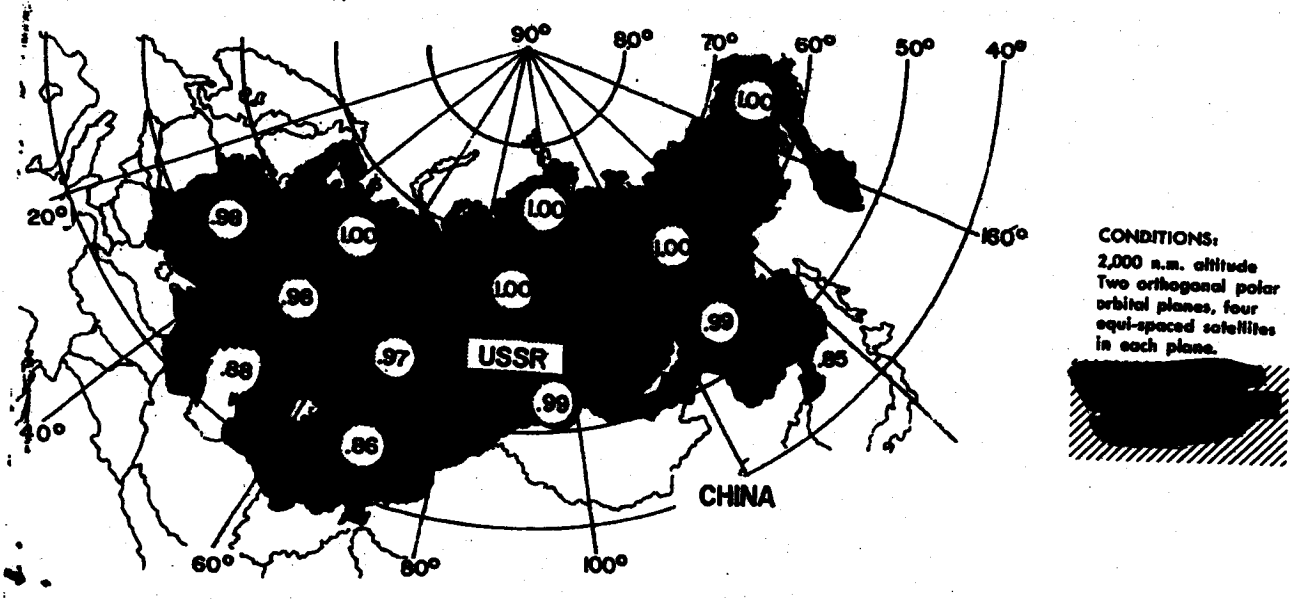
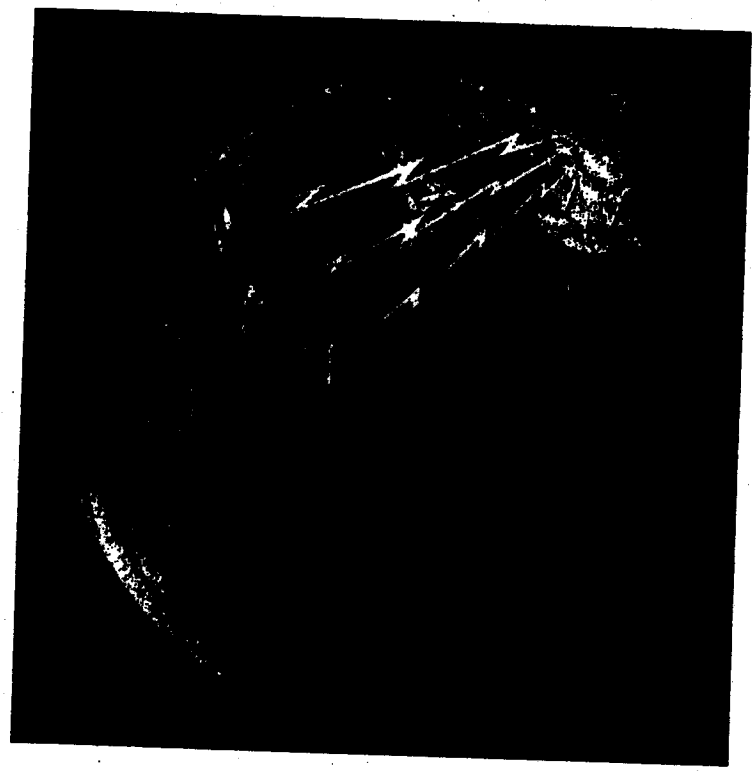


Figure 4.
Orbiting satellites detect infrared radiation emitted by Soviet ICBM's in powered flight. Data telemetered instantaneously to MIDAS Control Center via far north readout stations. Decoded data reveal approximately the number of missiles launched and launch location, direction of travel and burning characteristics. Probabilities of less than 1.00 on the above map indicate the probability of at least one MIDAS satellite detecting an ICBM launch. Probabilities of 1.00 indicate that more than one MIDAS satellite will always be in position to detect an ICBM launch. These figures are based on geometric considerations of the family of satellites and ground readout station locations.



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 (Figure 1). The final configuration payload weight will be approximately 1,000 pounds.

The first two of the ten 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.

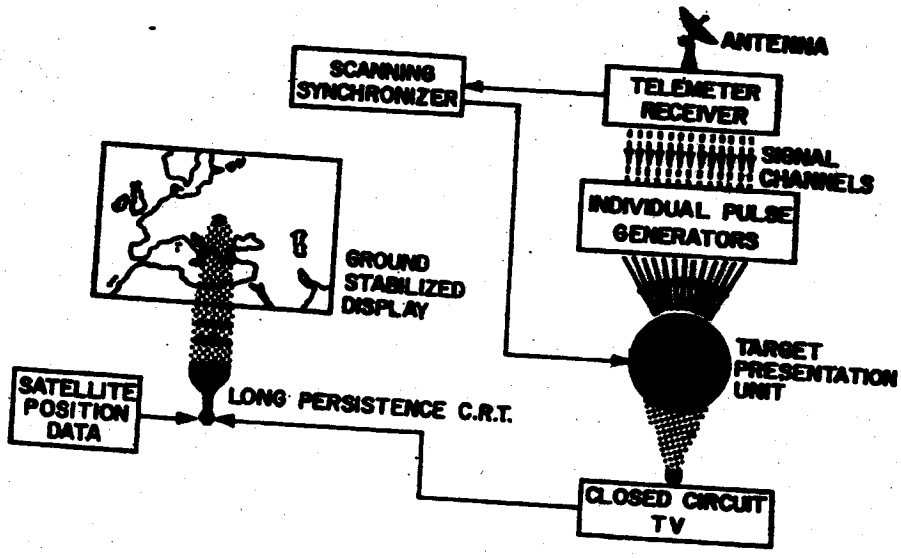
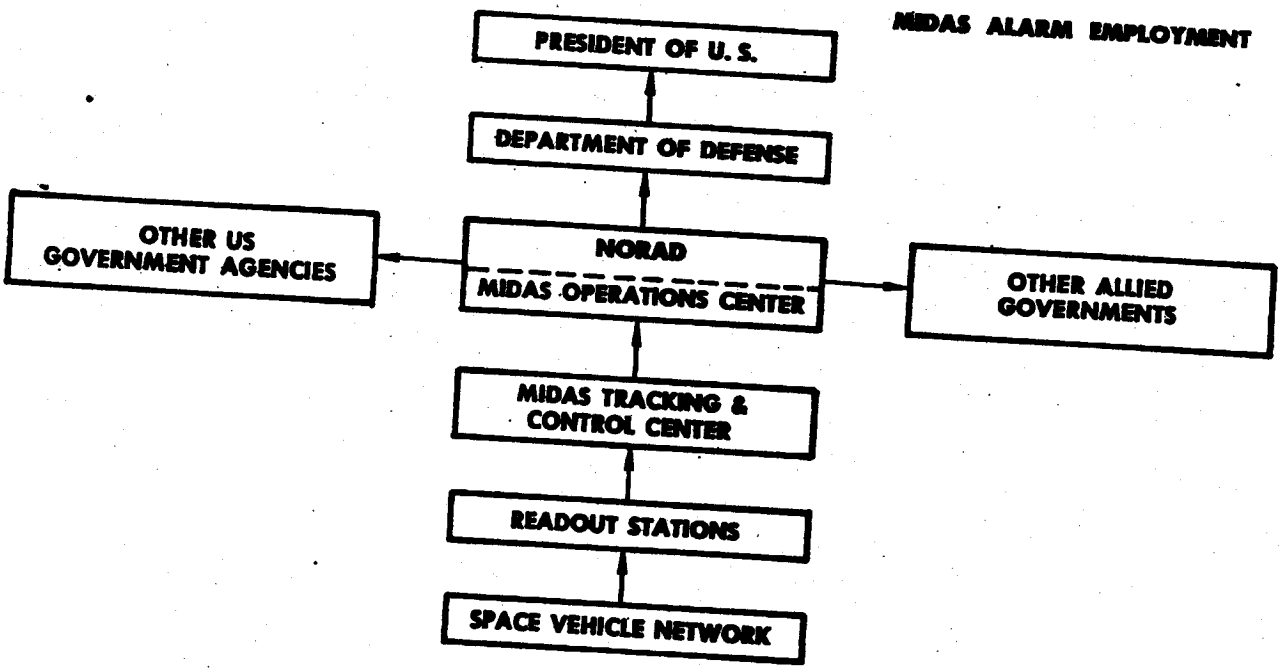


Figure 5.
Simplified version of ground presentation system (left) for display of infrared warning data. The data is displayed on a TV monitor with a map overlay. The chart below shows data flow from the readout stations to decision-making agencies. The MIDAS Control Center, or other using agencies having a correlated ground stabilized display, can determine when an actual attack has been launched.

MIDAS ALARM EMPLOYMENT



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 (Figure 3). The area under surveillance must be in line-of-sight view of the scanning satellite. Mission capabilities are shown in Figure 4. 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 (Figure 5). 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.

	60												61												62											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
	ATLAS "D"/AGENA "A"												ATLAS "D"/AGENA "B"																							

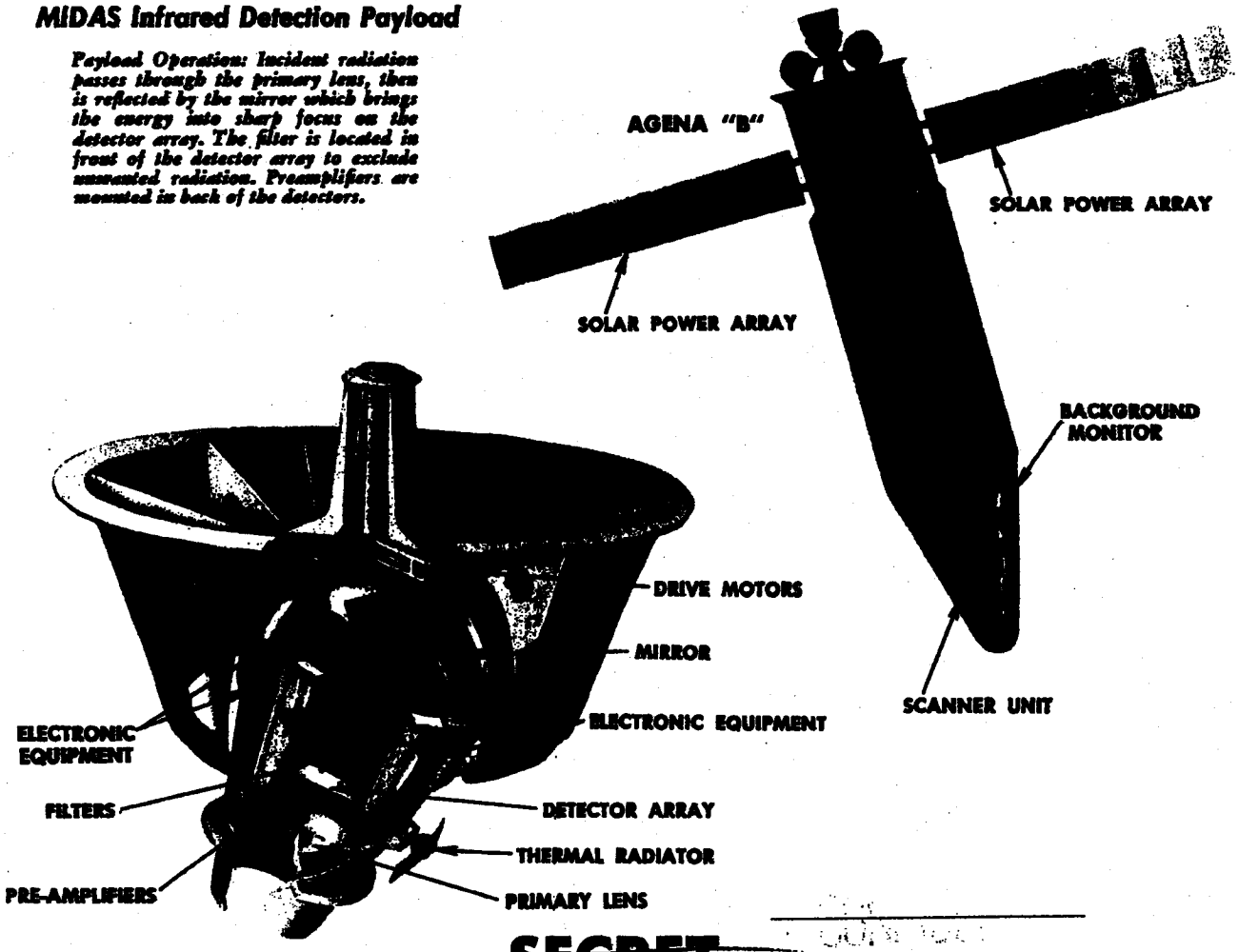
★ Attained orbit successfully ● Failed to attain orbit

Flight History

MIDAS No.	Launch Date	ATLAS No.	AGENA No.	Remarks
I	26 February 1960	29D	1008	*Did not attain orbit because of a failure during ATLAS/AGENA separation.*
II	24 May 1960	45D	1007	*Highly successful. Performance with respect to programmed orbital parameters was outstanding. Useful infrared data were observed and recorded.*

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 unwanted radiation. Preamplifiers are mounted in back of the detectors.



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 Telemetry Ships	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, all stations have inter- and intra-station communications equipment and checkout equipment.

(2) Equipment listed is either presently available or planned and approved for procurement.

*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. VERLORT
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

Monthly Progress — MIDAS Program

Program Administration

- A Headquarters USAF team, composed of members of the Weapons Board and Air Defense Panel, reviewed a revision of the MIDAS Development Plan at AFBMD on 20 January. The revised plan was prepared in response to the guidance received upon presentation of the 3 January Development Plan to the Air Force Ballistic Missile and Space Committee and Air Staff on 5-6 January. The Headquarters USAF team accepted the plan as modified and will present the new plan to the committee early in February.

- Representatives of Lockheed Missiles and Space Division (LMSD) and AFBMD met on 26 January and developed a basis for a projected MIDAS Program costing for the next five years. This possible projection of the program will be used for the annual cost study currently being compiled and scheduled for completion prior to the end of February. The cost study is being assembled and computed in such form that it may be used for inputs into the budget preparation of the actual program when finalized.

- Representatives from several contractors, Headquarters AFMTC, the 6555th Test Wing, and AFBMD met on 24-25 January to discuss the scope, policies and implementation details of the infrared measurement programs utilizing the KC-135 aircraft. The Aerojet-General Corporation has been placed under a six-month contract to install, modify and operate the target measurement equipment.

Flight Test Progress

Radiometric Measurement Flight (RM-1)

- The successful RM-1 flight (DISCOVERER XIX) on 20 December carried a radiometer designed to gather background infrared radiation information. Preliminary evaluation of the information indicates agreement with earlier data obtained from balloon-borne radiometric equipment in the 2.7-micron region with respect to structural content and average level. The 4.3 micron region is somewhat higher than had been anticipated from theoretical studies. A report on this initial evaluation is being prepared.

Future Flights

- The second radiometric measurement flight (RM-2) is scheduled for late February. A radiometer identical to RM-1 will be carried aboard this DISCOVERER XXI flight.

- The launch of MIDAS III has been rescheduled for 17 April. The General Electric horizon sensor and other equipment problems have prevented the completion of an acceptable systems test. If current sensor modifications and vehicle circuitry changes resolve the problem the April launch date can be met. However, if it is necessary to revert to the backup development system to solve the problem the launch will be delayed for an extended period. The contractors are expending every effort to resolve the problems and meet the launch date.

Technical Progress

Second Stage Vehicles

- The MIDAS IV vehicle, which has been rescheduled for launch late in May, is approximately 40 percent complete in the systems test phase. Transfer of the vehicle from systems test is scheduled for 28 March. The ATLAS booster for this flight is on schedule.

Infrared Scanners

Infrared scanners for MIDAS III, IV and V are being developed by Baird-Atomic, Inc., and for MIDAS VI, VII and VIII by Aerojet-General Corporation.

- Negotiations are in progress with Aerojet-General on their proposal for a Series IV infrared detection payload. The Series IV payload will be carried on MIDAS IX and subsequent.

Ground Support Equipment

- The ground display system manufactured by Baird-Atomic, to be used in support of MIDAS III, IV and V flights, was installed at the Vandenberg Tracking Station in early January. This equipment will provide a ground stabilized presentation of the payload readout. Similar equipment is being activated at the Satellite Test Center.

- Test equipment which will demonstrate the compatibility of the Series II payload and R-F link will be completed in mid-February. Field tests at Vandenberg Air Force Base will begin in early March.

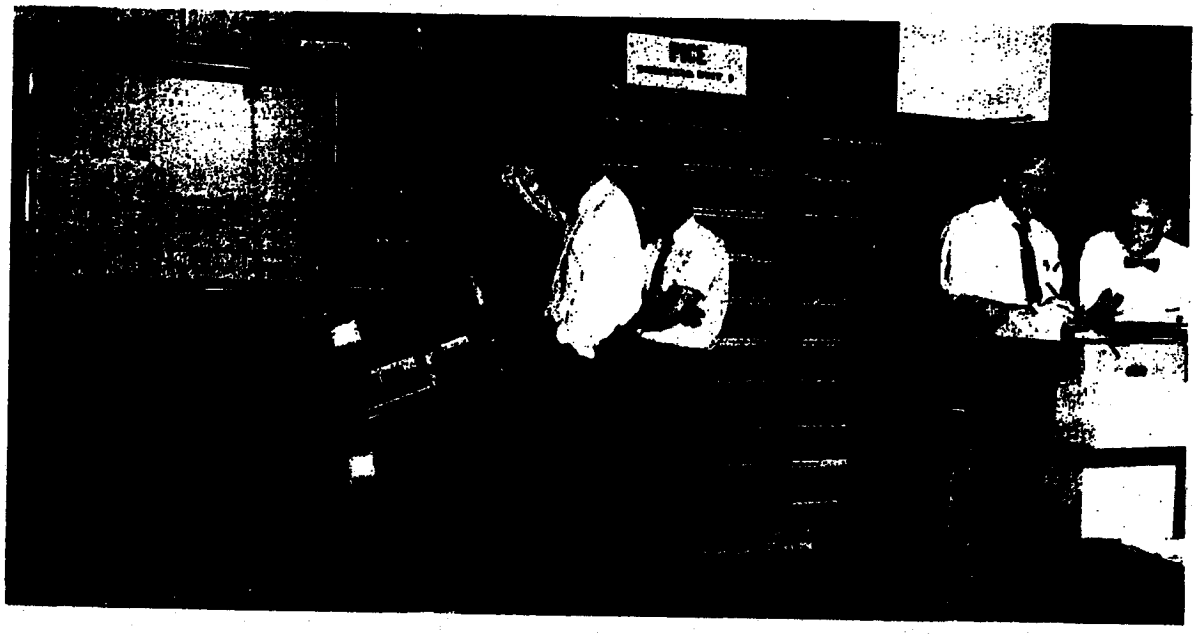


Figure 6. The PICE terminal unit (above) shown during tests at Beckman Instruments, is scheduled for shipment to Vandenberg Air Force Base in late January. This unit serves as a tie-in between all station consoles, displays and PICE. Similar units are being built for installation at the Satellite Test Center and the new Boston Tracking Station. The High Speed Plotter (right) was designed by Lockheed to plot digital data coming from PICE units. It is capable of plotting ten curves and alphanumerical data simultaneously on sensitized paper contained in the magazine on the right of the unit. The unit plots at a paper drive speed of two inches per second with plot points .002 inches apart. This unit is complete and has been checked out with a simulated input and will be checked receiving inputs from a PICE unit. Acceptance testing is scheduled to start on 26 January.

• The Donnelly Flats communications requirements were finalized early in January. Philco was selected as the prime contractor and Western Electric as a subcontractor for the installation of equipment. This procedure will permit a better interface of all facilities.

Horizon Sensor Flight Test Program

• The U-2 Flight Test Program for initial tests of the General Electric Mod II MIDAS horizon sensor has been accomplished on a crash basis. To date, three flights have been made and data gathered on horizon sensor sensitivity is presently being analyzed. The results of this analysis will determine the extent of future flight testing.

Facilities

• Modifications to accommodate either a SAMOS or MIDAS configuration AGENA "B" at Point Arguello Complex #1, Pad 2, are progressing satisfactorily and should satisfy program need dates. The