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MONTHLY SUMMARY OF

SPACE

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ACTIVITIES

MARCH 1961

WDLPR-4-281

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a foreword to...

SPACE

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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

WDLPR-4

14 April 1961

Monthly Summary of SPACE SYSTEM DIVISION Activities

MARCH 1961

FOREWORD

Two space vehicles were launched during March. DISCOVERER XXII did not reach sufficient velocity to attain orbit because of a hydraulic system malfunction in the AGENA stage. BLUE SCOUT missile D-4 successfully boosted a 172-pound Air Force Special Weapons Center payload to an altitude of approximately 1,380 nautical miles on a probe trajectory. All test objectives were achieved and valuable radiation measurement information was obtained by the six payload experiments. This month's report also includes extensive additional information in the program description portion of the Project MERCURY Section and the Space Program Boosters Section.

for O. J. RITLAND
Major General, USAF
Commander

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SATELLITE

systems

DISCOVERER
MIDAS
ADVENT

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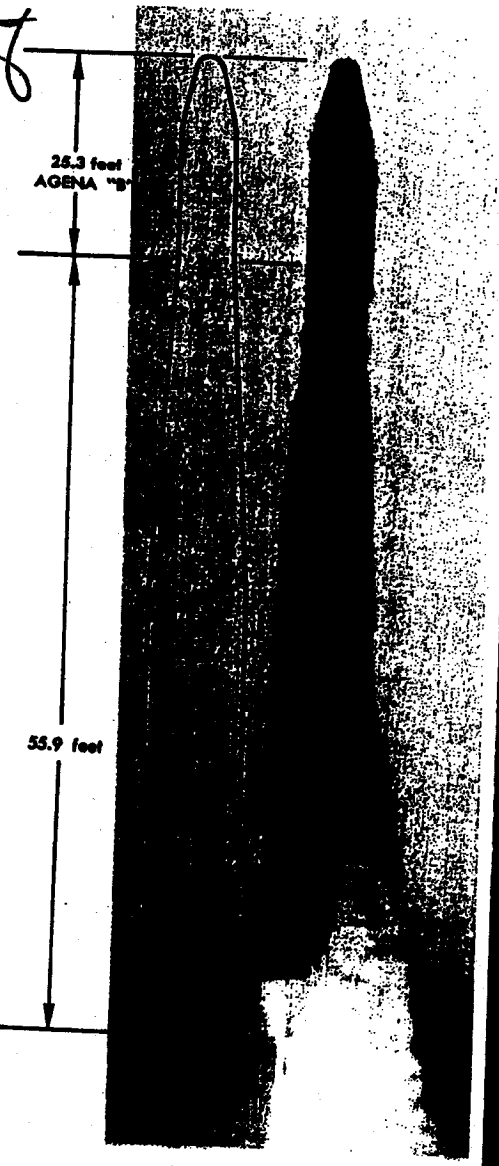
Discoverer

The DISCOVERER Program consists of the design, development and flight testing of 39 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 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 pages A-5 and A-6.

SECOND STAGE	AGENA "B"
Weight—	
Inert	1,346
Payload equipment	915
Orbital	2,261
Impulse propellants	12,950
Other	511
TOTAL WEIGHT	15,722
Engine Model	XLR81-Ba-9
Thrust-lbs., vac.	16,000
Spec. Imp.-sec., vac.	290
Burn time-sec.	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. Imp., sec. (S.L.)	248.3
Burn Time, sec.	148

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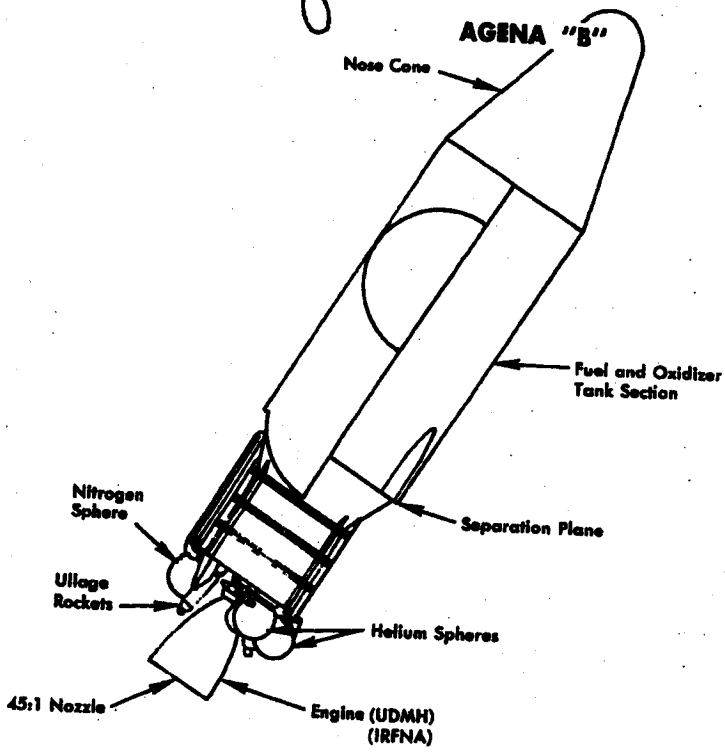
Telemetry ships are positioned as required by the specific mission of each flight. Illustrations on the opposite page show a typical launch trajectory from Vandenberg Air Force Base and a typical orbit. An additional objective of this program is the development of a controlled re-entry and recovery capability 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.

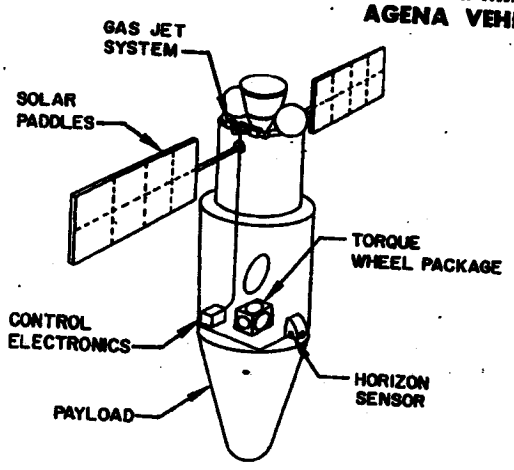
AGENA VEHICLE DEVELOPMENT

The AGENA vehicle was originally designed 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.

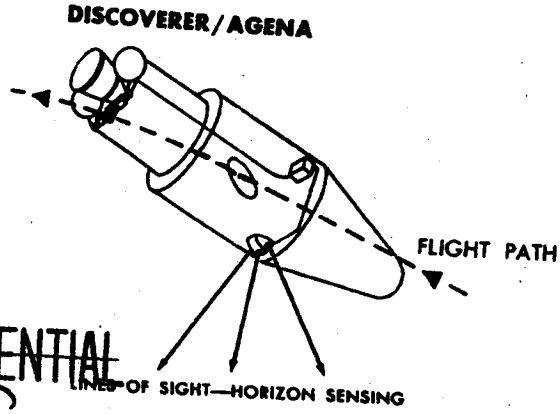
By increasing the tank capacities on the AGENA "A" an improved performance capability was achieved. This new configuration or AGENA "B" used the bell XLR-81Ba-7 engine and was first flown on DISCOVERER XVI. The latest AGENA "B" vehicles use the 16,000 pound thrust XLR-81Ba-9 engine which has a restart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



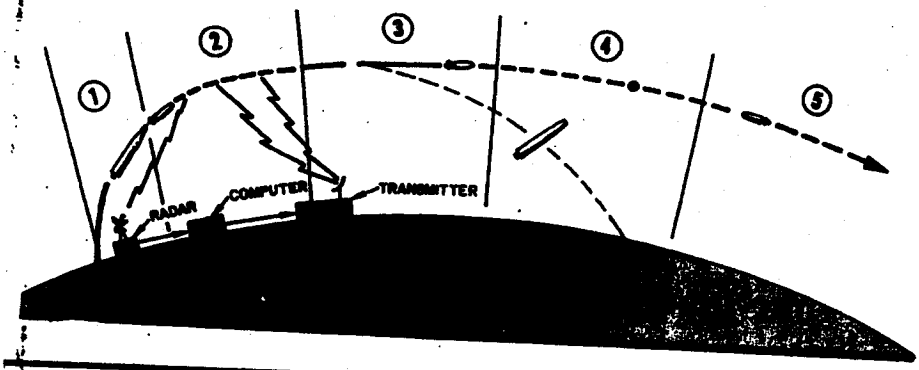
SAMOS and MIDAS AGENA VEHICLE



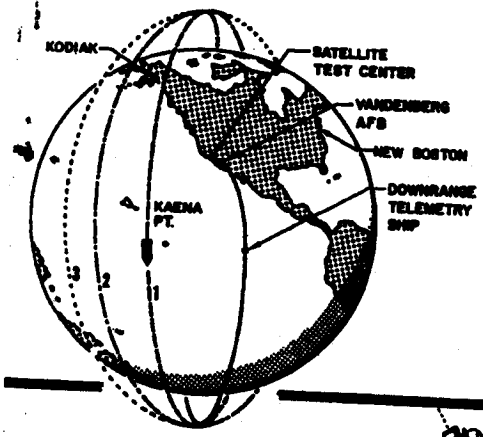
DISCOVERER/AGENA



Powered Flight Trajectory



1. **First Stage Powered Flight** — 2.5 minutes duration, 78 n.m. downrange, guided by programmed autopilot and BTL 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).

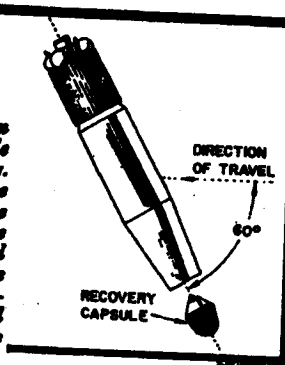


Orbital Trajectory

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.*

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	BGHJ	Recovery capsule tracking.

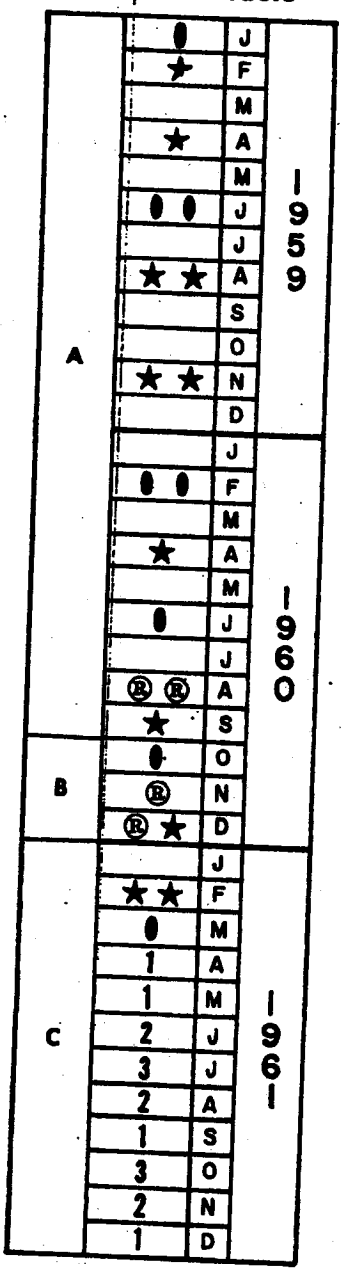
†Primary Tracking Stations (have command capability)

*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 ascent only)
F. VERLORT
G. VHF FM/FM Telemetry Station
H. VHF Direction Finding Equipment
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



★ Attained orbit successfully.

Ⓡ Capsule recovered.

● Failed to attain orbit.

Flight History

DISCOVERER No.	THOR No.	AGENA No.	Flight Date	Remarks
				DISCOVERER FLIGHTS 0 THRU XX ARE ON PAGE A-6
XXI	261	1102	18 February	*Attained orbit successfully. Non-recoverable, radiometric data gathering MIDAS support flight.*
XXII	300	1105	30 March	*Launch, ascent, separation, coast and orbital stage ignition normal. Orbital velocity was not attained because of an AGENA hydraulic malfunction.*

VEHICLE CONFIGURATIONS

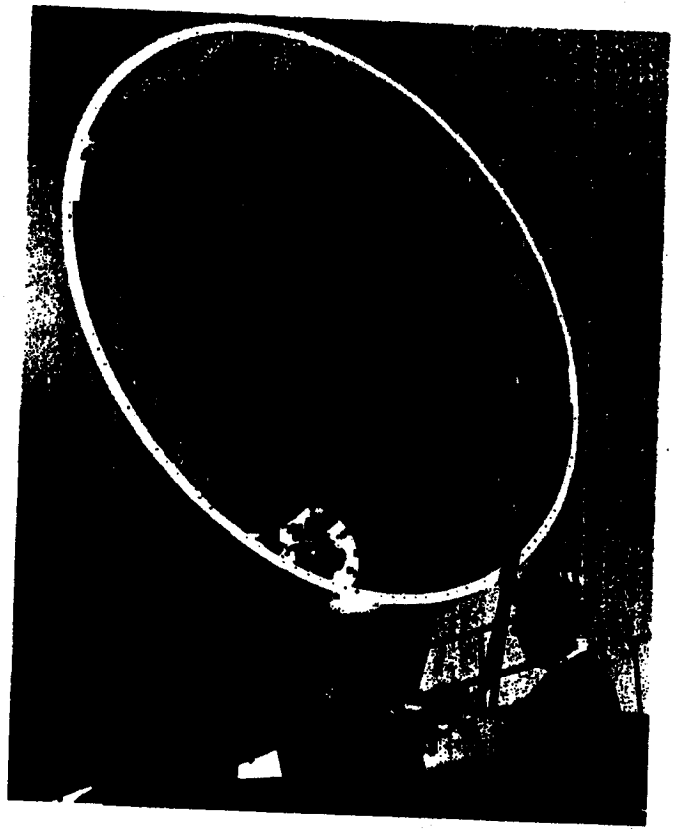
A. THOR—DM-18/AGENA "A"

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

Flight History (continued)

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.*
XX	298	1104	17 February	*Attained orbit successfully. Capsule did not re-enter due to on-orbit malfunction.*



Monthly Progress — DISCOVERER Program

Flight Test Progress

DISCOVERER XXII

- DISCOVERER XXII was launched from Vandenberg Air Force Base Pad 4 Complex 75-3 at 12:34 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. Investigation into the cause of the hydraulic failure is proceeding rapidly so that corrective action can be taken prior to the scheduled launch of DISCOVERER XXIII.

- 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. Preliminary results indicate that the BTL guidance performance was excellent.

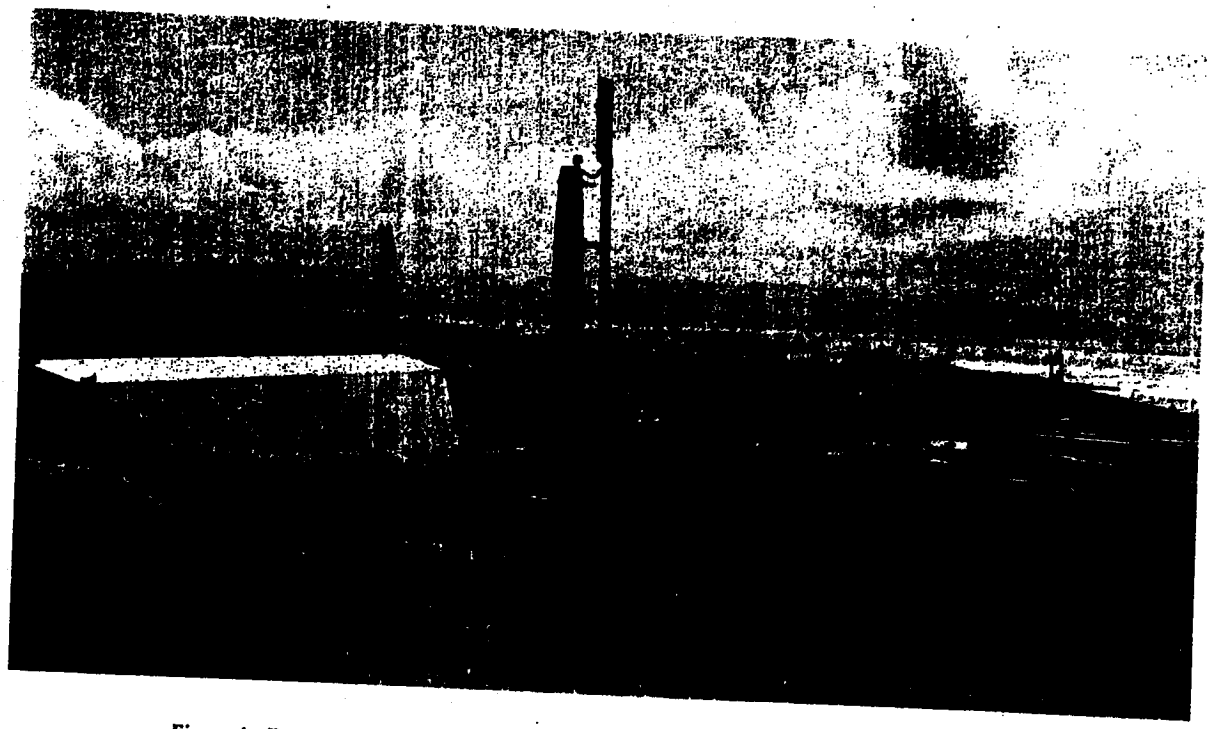


Figure 1. Booster for DISCOVERER XXIII on Pad 4, Complex 75-3 at Vandenberg Air Force Base. The vehicle was launched on 30 March, but did not attain orbit. Modification of this launch pad started immediately after the launch. BTL guidance system components (top left). The upper container houses the flight controller and the large unit is the inertial reference package.

- The recovery capsule containing a Biopack and a Geophysical Research Directorate emulsion block for further studies into effects of space radiation on biomedical experiments. These were similar to the Biopack and emulsion blocks carried on several previous DISCOVERER flights.

- Several important modifications were made on this satellite. Instrumentation was added to the interim programmer to permit tracking stations to better determine the conditions of the programmer before sending commands. This was done to preclude a recurrence of the malfunction that resulted in the failure to eject the capsule on DISCOVERER XX.

- A different model single phase, 400-cycle power amplifier was installed in DISCOVERER XXII to increase the reliability of this satellite guidance system power supply. The loss of satellite stability on DISCOVERER XXI was attributed to a failure of the previous amplifier.

Future Flights

- DISCOVERER XXIII is scheduled for launch on 8 April from Vandenberg Air Force Base. This satellite is almost identical to DISCOVERER XXII but is programmed for slightly different orbit. The injection altitude will be 190 statute miles which is 40 miles higher than DISCOVERER XXII. A dosimeter capable of measuring total dosimeter radiation (5 millirad to 600 rad range) will be included in the payload.

- DISCOVERER XXIII, XXIV, and XXV will be instrumented to provide data on the 20 cycle per second longitudinal oscillation. This oscillation has been apparent immediately prior to booster burnout on several recent DISCOVERER flights. Data indicate that the oscillations are induced by the MB3 rocket engine and the reduction or elimination of the oscillator is being pursued by an analysis and test program conducted by Rocketdyne, Douglas Aircraft and Lockheed Missile and Space Division. 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.

Technical Progress

Second Stage Vehicle

- The Engine Reliability test program is nearing completion at the Bell Aerosystems test facilities.

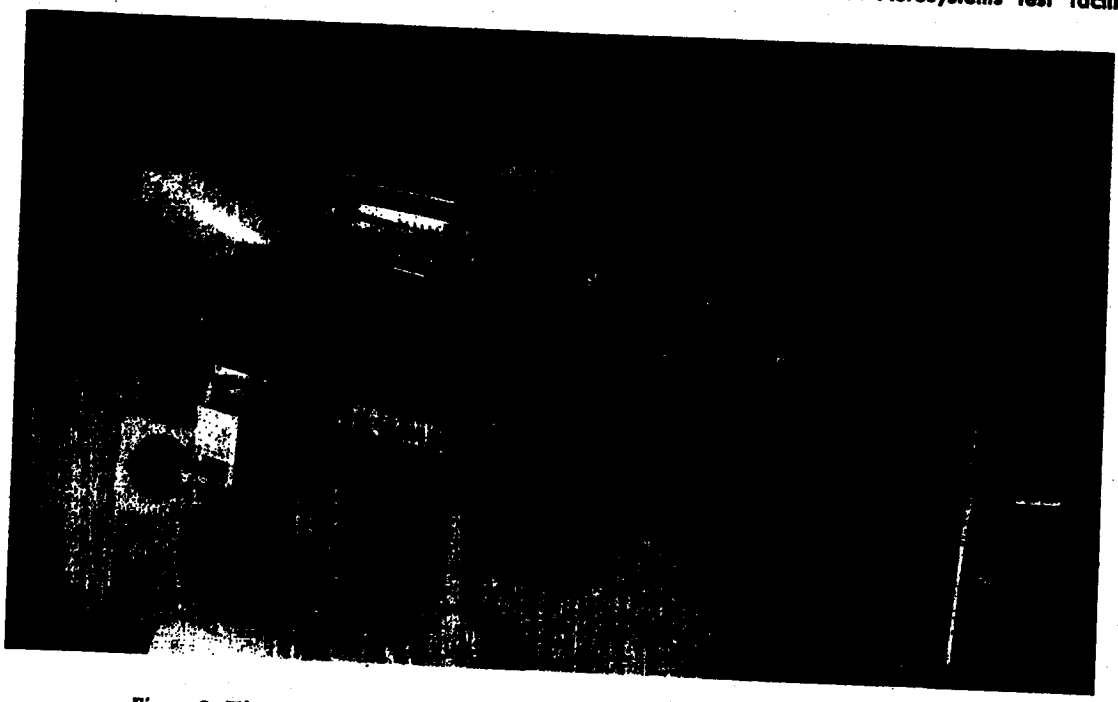


Figure 2. The new engine access door which provides mounting space for research instruments. The instruments on the door are from the Geophysical Research Directorate and include a cosmic ray monitor, micrometeorite detector and two density gauges. The white cone on the right is a heat shield which is installed to protect vehicle components from flame damage in space. The pencil-like flame characteristic of rocket engines in the atmosphere becomes a large ball which envelops the engine in space.

Thirty-seven of the 40 firings scheduled have been completed. These tests are now scheduled for completion in mid-April.

- Twenty-three of the 25 Arnold Engineering Development Center reliability test firings have been completed.

Space Research Program

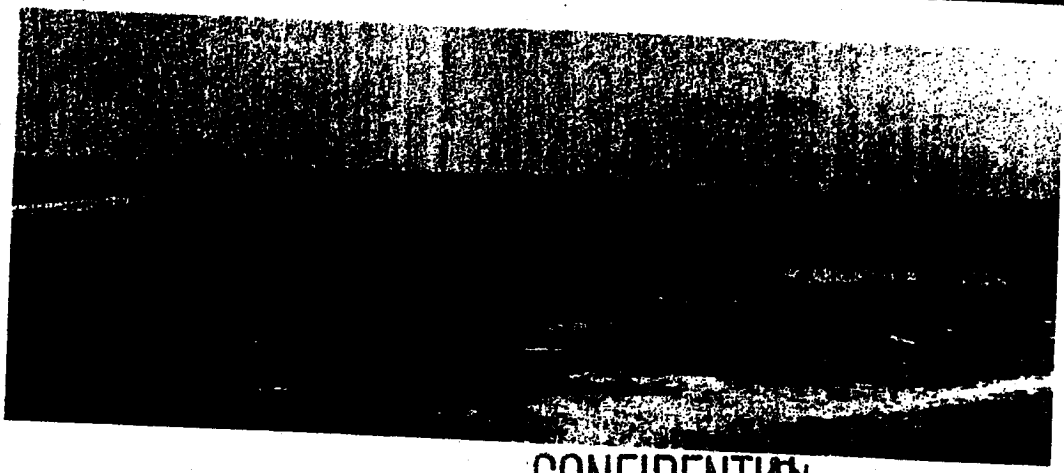
- Programs utilizing the increased DISCOVERER weight carrying capability for scientific experiments in the space environment are being greatly expanded. The success of earlier experiments (flashing lights, Biopacks and Geophysical Research Directorate equipment) indicates a major contribution to scientific knowledge can be made by carrying this type of equipment. About half of the remaining DISCOVERER satellites to be flown will each be capable of carrying approximately 100 pounds of scientific instruments and recorders.

- To facilitate the installation of this equipment, a new access door to the engine compartment has been designed and fabricated. The new door is designed with universal type mounting rails on the under side for mounting components. The Geophysical Research Directorate module is pre-wired to permit installation in the satellite with a minimum delay of prelaunch operations. Starting in June, each satellite will have the capability of carrying such modules.

Geophysical Research Directorate (GRD) Experiments

The Geophysical Research Directorate is furnishing equipment for a number of DISCOVERER flights aimed primarily at determining environment in space:

Figure 3. First photographs of the DISCOVERER Christmas Island facilities. This tracking station is manned only during DISCOVERER flights. The station is located south of Hawaii near the equator and tracks the capsule during re-entry.



1. 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.

2. Cosmic Radiation. These measurements will be made to assess the radiation hazard to components above 130 miles, in the Van Allen and Auroral regions.

3. Thermal Radiation. Infrared radiation from the earth and atmosphere, scattered solar radiation will be measured to obtain data for calculating proper vehicle equilibrium temperatures.

4. 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.

5. Solar Ultraviolet Radiation. Solar radiation in the ultraviolet and X-ray regions will be measured to determine aging effects on plastic and organic materials.

6. 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 needed.

7. 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.

Facilities

- Pad 1 of Complex 75-1 is currently being modified and will be activated in time to support a late May DISCOVERER launch. This pad is being converted from a THOR/IRBM to a DISCOVERER launch facility. Modifications required include extending the missile shelter to accommodate the DM-21/AGENA combination, adding the DISCOVERER fuel transfer, ground support and launch control systems. Because of delinquencies in delivering the launch control system equipment, activation of the pad is approximately thirty days behind schedule.

- Rework of Complex 75-3 Pad 4 began immediately after the launch of DISCOVERER XXII. A new propellant transfer system and launch control system equipment are required as part of this modification. This pad is scheduled to support an early June DISCOVERER launch. A similar rework of Pad 5 will begin after the launch of DISCOVERER XXIII on 8 April. This pad will be available to support a mid-June launch.

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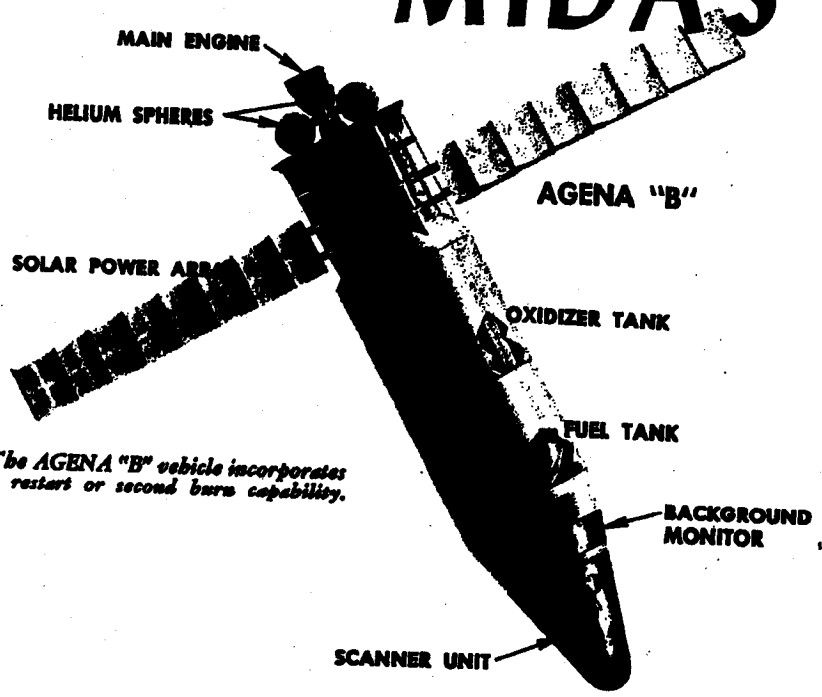
MIDAS

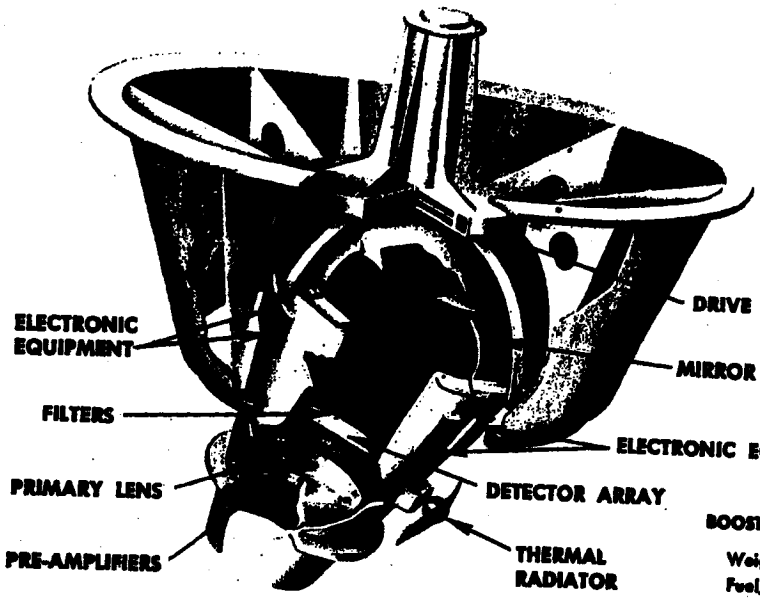
SECOND STAGE	AGENA "B"
Weight—	
Inert	1,763
Payload equipment	1,641
Orbital	3,404
Impulse Propellants	12,950
Fuel (UDMH)	
Oxidizer (IRFNA)	
Other	758
GROSS WEIGHT (lbs.)	17,112
Engine	XLR81-Ba-9
Thrust, lbs. (vac.)	16,000
Spec. Imp., sec. (vac.)	290
Burn Time, sec.	240
Restart Provisions	Yes

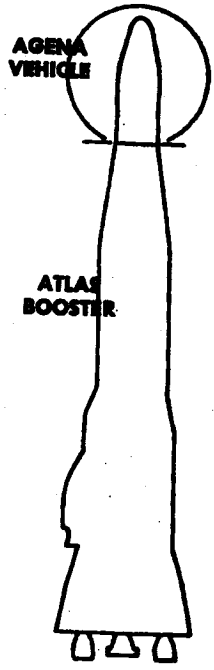


The AGENA "B" vehicle incorporates a restart or second burn capability.

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.





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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PROGRAM HISTORY

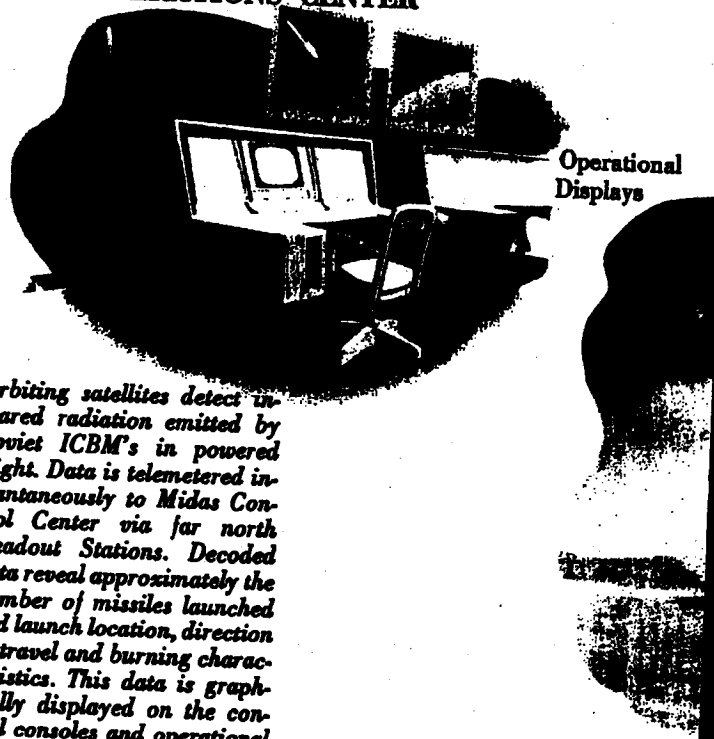
The MIDAS Program was included in Weapon System 117L when WS 117L was transferred to the Advanced Research Projects Agency. ARPA subsequently separated WS 117L into the DISCOVERER, SAMOS and MIDAS Programs, with the MIDAS objectives based on an infrared early warning system. The MIDAS (Missile Defense Alarm System) Program was directed by ARPA Order No. 38, dated 5 November 1958 until transferred to the Air Force on 17 November 1959. Additional authorization has been obtained to utilize two DISCOVERER flights (designated RM-1 and RM-2) to carry background radiometers in support of MIDAS.

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.

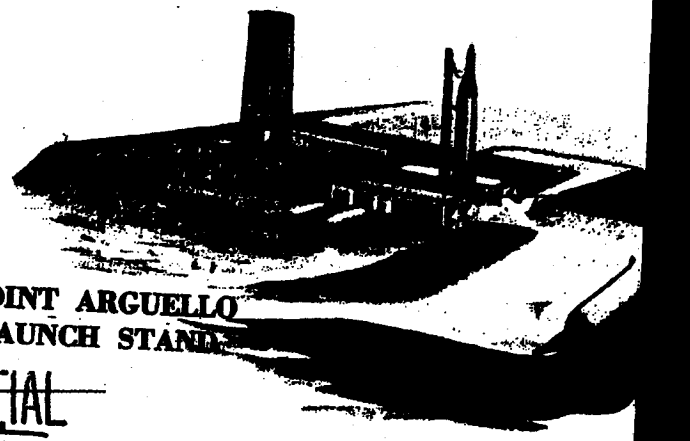
The first two R&D flights used the AGENA "A" and ATLAS "D" vehicle programmed to place the payload in a circular 261 nautical mile orbit. Subsequent R&D flights will utilize the ATLAS "D"/AGENA "B" configuration which will be programmed to place the payload in a circular 2,000 nautical mile polar orbit.

OPERATIONS CENTER



Orbiting satellites detect infrared radiation emitted by Soviet ICBM's in powered flight. Data is 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. This data is graphically displayed on the control consoles and operational displays at the Operations Center. The Tracking and Control Center monitors the whole tracking operation. The Point Arguello stands are used to launch the MIDAS satellites into polar orbits.

TRACKING AND CONTROL C



POINT ARGUELLO LAUNCH STAND

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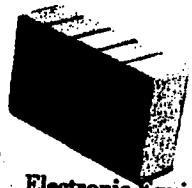
Satellite Vehicle

Eight MIDAS Satellites — four each in two orthogonal polar orbital planes — at 2,000 n.m. altitude

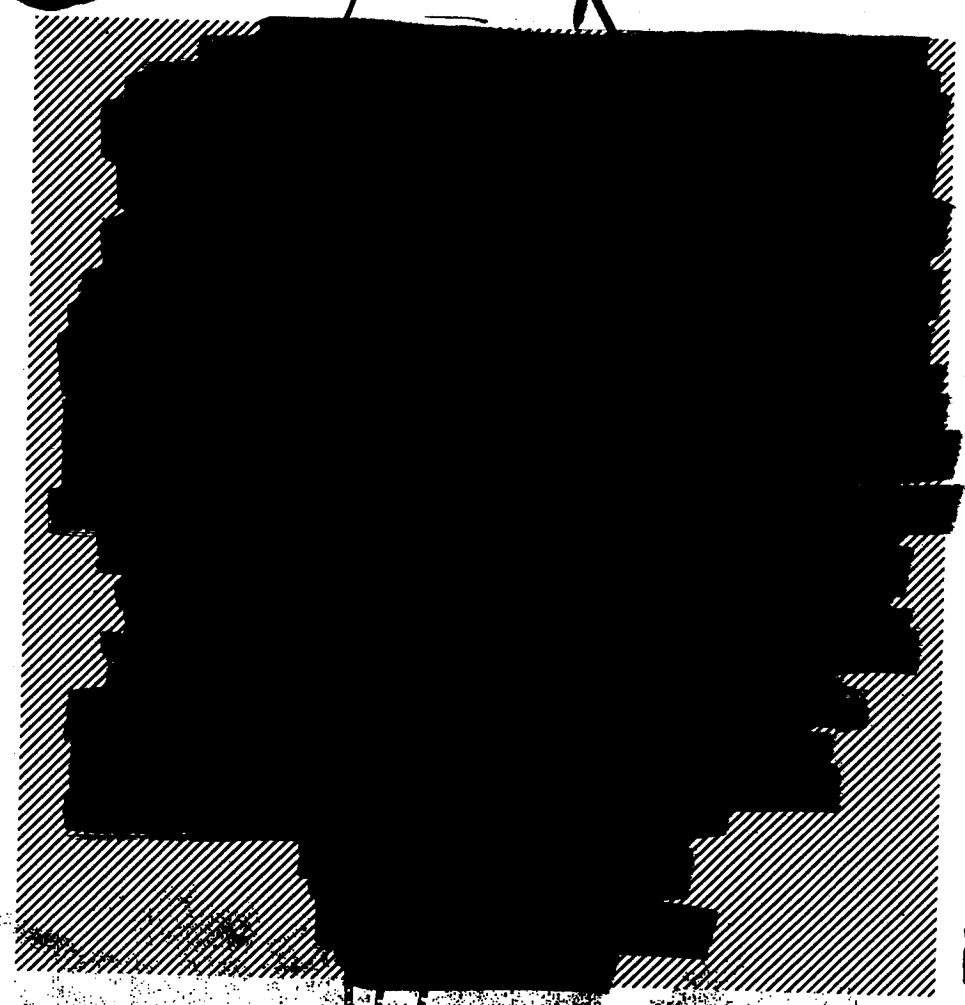
Antenna

READOUT STATION



Electronic Equipment

ENTER

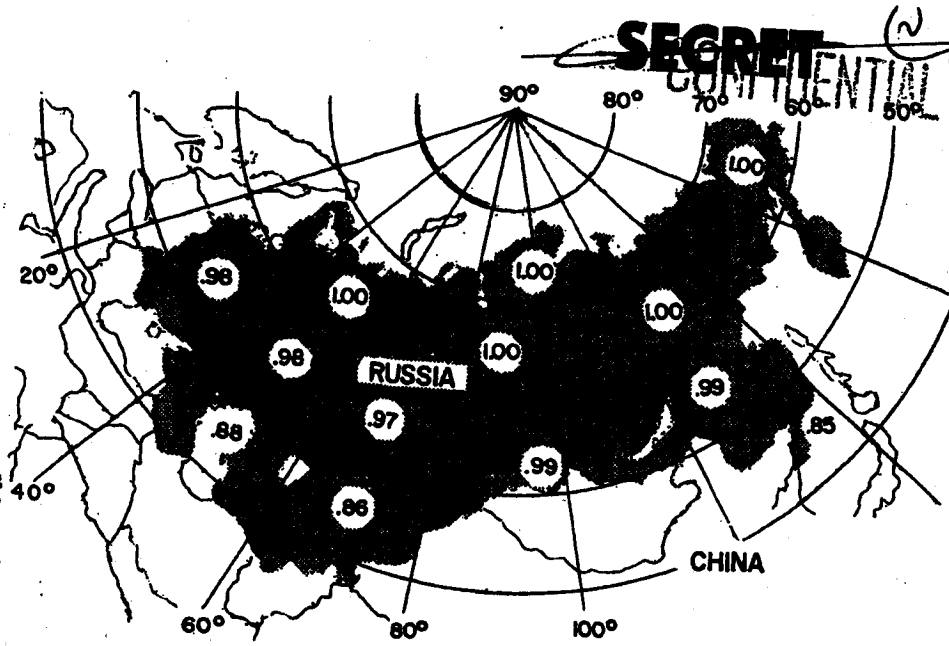


Sunnyvale Satellite Test Center

Point Arguello

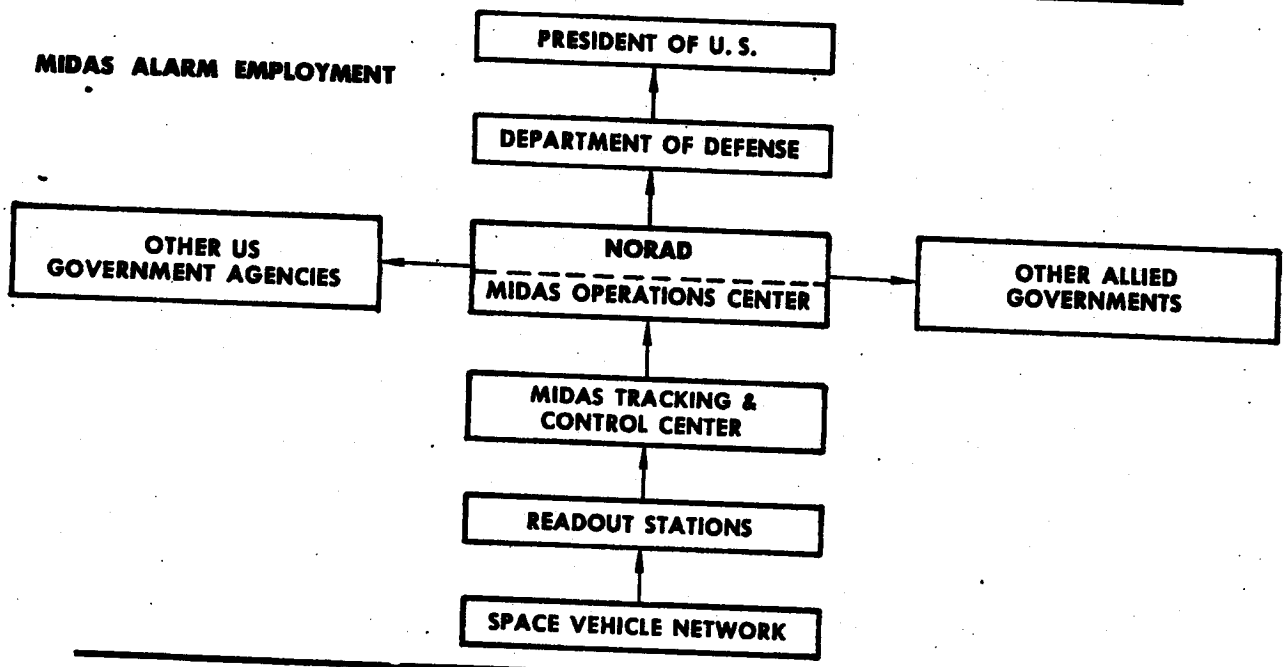
New

Italic — Indicates R&D Facilities Only



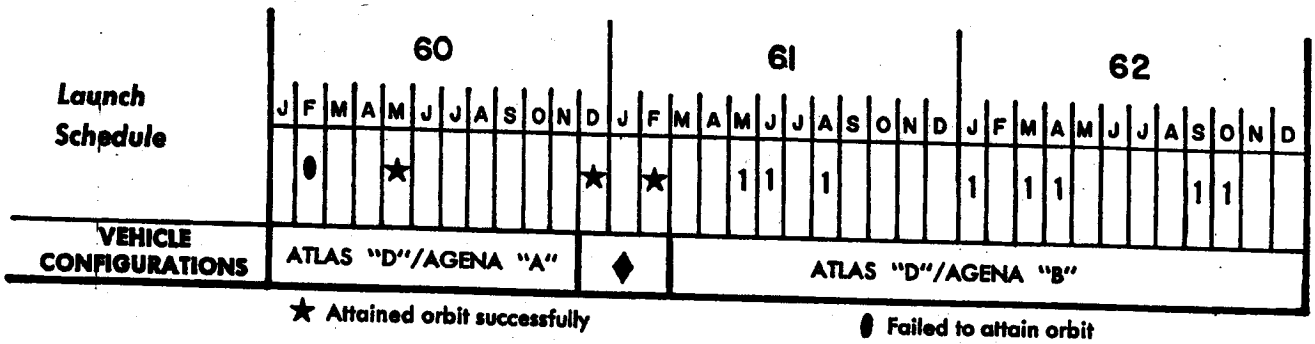
Probabilities of less than 1.00 on this map indicate the probability of at least one MIDAS satellite detecting an ICBM launch. Probabilities of 1.00 indicate that more than one MIDAS satellite will always be in position to detect an ICBM launch. These figures are based on geometric considerations of the family of satellites and ground readout station locations. Darker areas indicate most probable Russian ICBM launch site locations.

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. 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 military and defense agencies.



★ Attained orbit successfully ● Failed to attain orbit

◆ DISCOVERER vehicles carrying MIDAS radiometric payloads

Flight History

MIDAS No.	Launch Date	ATLAS No.	AGENA No.	Remarks
I	26 February	29D	1008	*Did not attain orbit because of a failure during ATLAS/AGENA separation.*
II	24 May	45D	1007	*Highly successful. Performance with respect to programmed orbital parameters was outstanding. Useful infrared data were observed and recorded.*
RM-1	20 December	DISCOVERER Vehicle		*Despite satellite oscillations, sufficient data were obtained for evaluation of payload 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.*
RM-2	18 February	DISCOVERER Vehicle		*All channels functioned properly and valid data were obtained on six stable orbits. Data confirmed previous radiometric measurements.*

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