SECRET

MONTHLY

SPACE

Systems Div

ACTIVITIES

EXEMPTED FROM
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REVIEWER 61 DATE REVIEWED 18 Aug 99
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Tab 20

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

12 June 1961

Monthly Summary of SPACE SYSTEMS DIVISION ACTIVITIES

MAY 1961

FOREWORD

During this month a major effort was made to ready the MIDAS III vehicle, payload and tracking network for the scheduled 20 June launch. The BIOASTRONAUTICS Orbital Space System (BOSS) Development Plan has been approved by the Air Force Systems Command. This program will be an important step in our conquest of space. The TRANSIT 4A launch vehicles have been installed on stand and are ready to support the 27 June launch.

Significant changes have been made to the permanent portion of the BLUE SCOUT and RANGER Program report to reflect the types of payloads these programs will support. The format of the report has been changed to coincide with the current organization of the Space Systems Division, i.e. SATELLITE SYSTEMS, LAUNCH VEHICLES, and TECHNICAL DEVELOPMENT. The programs listed behind each of these dividers are the responsibility of the respective deputies. A Table of Contents has been provided on the FOREWORD Divider for the user's convenience.

The Monthly Summary of Space Systems Division Activities 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.

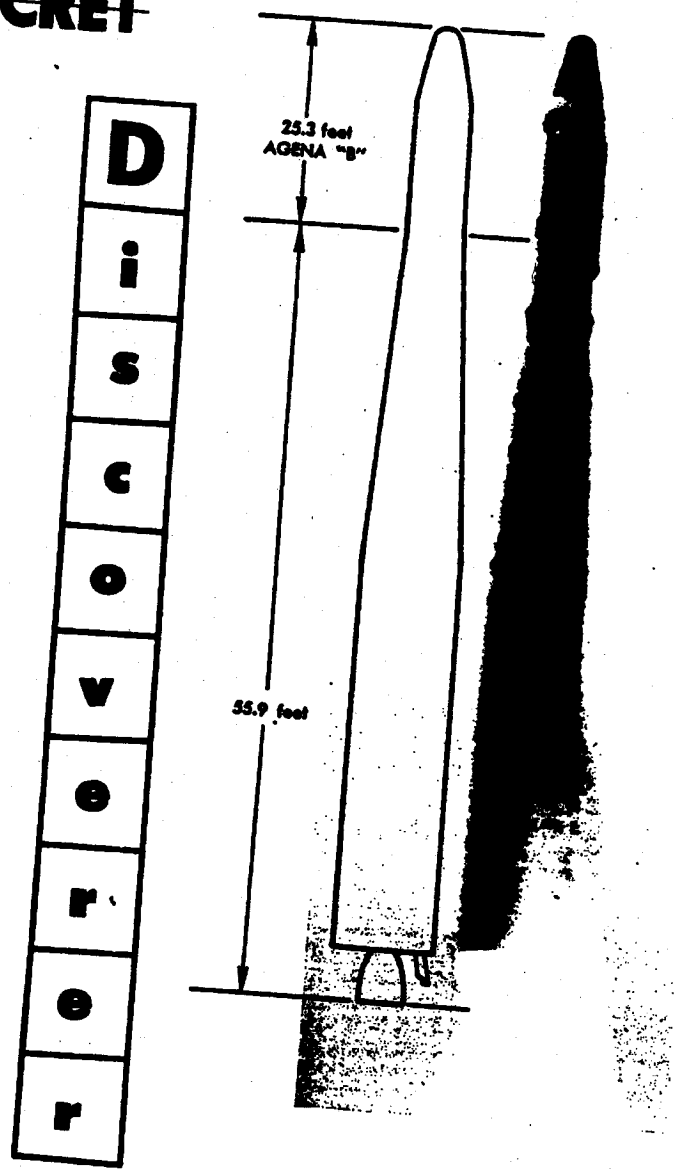
for O. J. RITLAND
Major General, USAF
Commander

SATELLITE
SYSTEMS

DISCOVERER
MIDAS
BIOASTRONAUTICS
BLUE SCOUT
SAINT
VELA HOTEL

Discoverer

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 and the AGENA as the second stage, satellite vehicle. The program was established early in 1958 under the direction of the Advanced Research Projects Agency, with technical management assigned to Space Systems Division. 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.

SECOND STAGE	AGENA "B"
Weight—	
Inert	
Payload equipment	1,346
Orbital	915
	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

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.
Downrange Telemetry Ship	BGIJK	Telemetry reception and tracking during ascent and orbit injection.
†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.

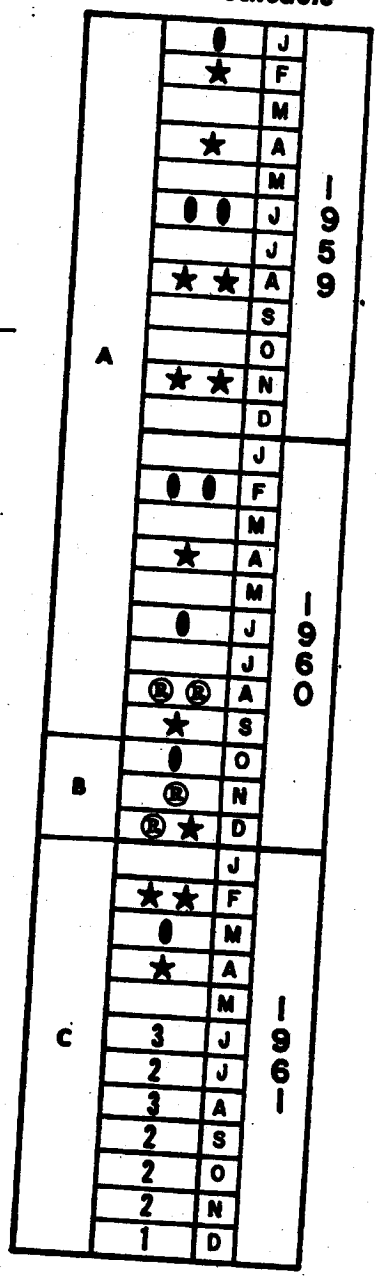
†Primary Tracking Stations (have command capability)

*Equipment

A. General Purpose Computer(s) and Support Equipment
B. Data Conversion Equipment
C. Master Timing Equipment
D. Control and Display Equipment
E. STL Tracking Station (DISCOVERER escort 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.	DM-21 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, radio metric 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.*
XXIII	307	1106	8 April	*Attained orbit successfully. Loss of control gas prevented 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 "B" MB-3 Block 2/XLR81-Be-9

Flight History (continued)

DISCOVERER No.	DM-21 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 XXIV will be launched from Pad 4, Complex 75-3, Vandenberg Air Force Base, early in June. (S)

- DISCOVERER XXV 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 to a DISCOVERER launch facility. Required modifications include extending the missile shelter to accommodate the DM-21/AGENA combination and adding the DISCOVERER fuel transfer, ground support and launch control systems. The launch of DISCOVERER XXV is scheduled for mid-June. (S)

Parameter	Discoverer XXIV	Discoverer XXV
Apogee, statute miles	382	290
Perigee, statute miles	190	150
Eccentricity	0.023	0.017
Period, minutes	93.8	91.6
Inclination Angle, degrees	81.7	81.75
Recovery Pass (nominal)	63	64

TABLE I. DISCOVERER XXIV and XXV Programmed Orbital Parameters

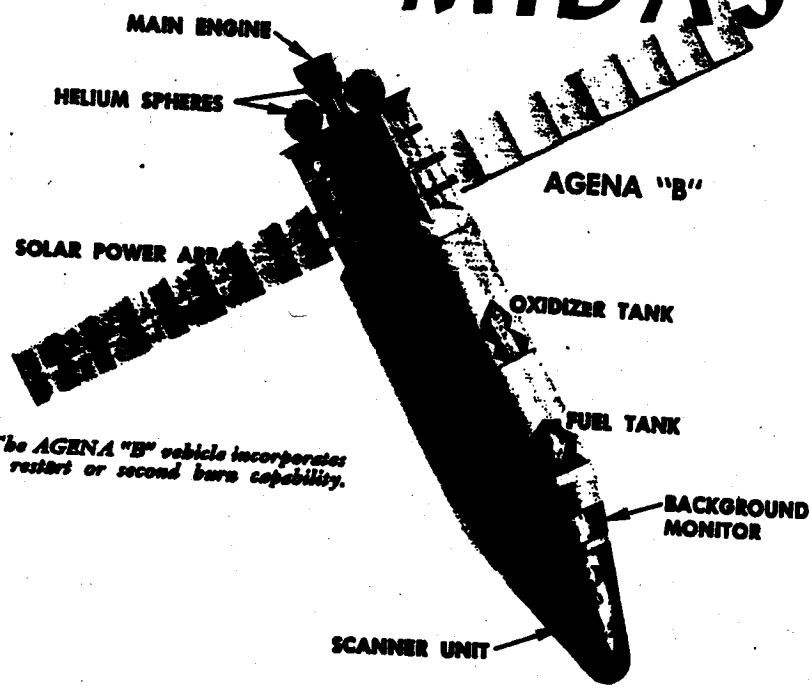
- Both DISCOVERER XXIV and XXV will carry recoverable payloads with recovery planned after four days in orbit. Programmed orbital parameters for the two flights are given in Table I. (S)

Space Research Experiments

- Extensive equipment for space research will be carried on DISCOVERER XXV. Equipment furnished by the Geophysical Research Directorate will include a cosmic ray monitor, a micrometeorite detector, two atmospheric density gages and associated electronics. This module and its instruments will replace an AGENA vehicle engine access door on DISCOVERER XXV. Data from this equipment will be telemetered to tracking stations during the flight. Several devices for measuring and determining the effects of space radiation will be carried in the capsule and will be recovered for later study after four days in orbit. Small discs of gold, nickel, titanium, magnesium, iron and lead will be attached to the capsule and will be analyzed after exposure to space radiation. Dosimeters and film packs will also be included in the capsule. (C)

MIDAS

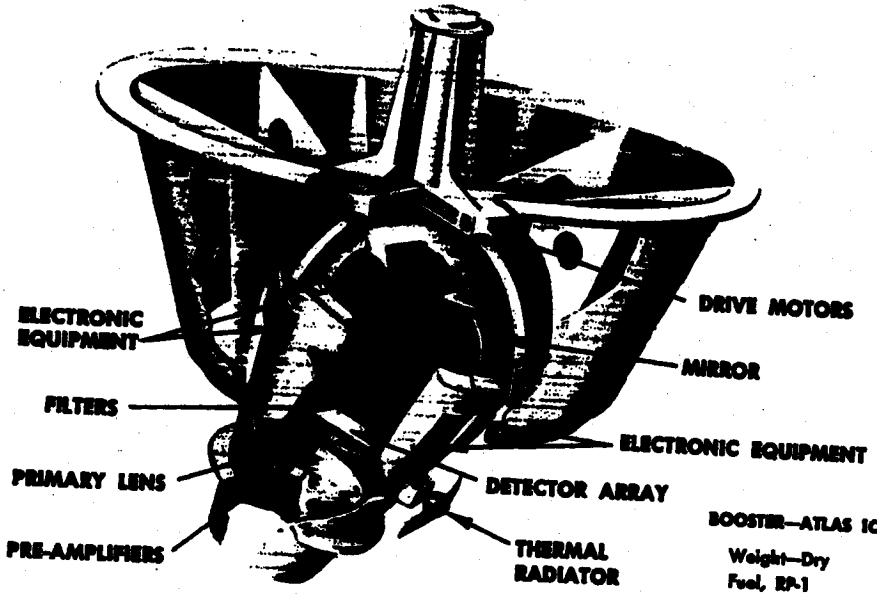
SECOND STAGE	AGENA "B"
Weight—	
Inert	1,763
Payload equipment	1,641
Orbital	3,404
Impulse Propellants	12,950
Fuel (UDMH)	
Oxidizer (IRFNA)	
Other	758
GROSS WEIGHT (lbs.)	17,112
Engine	XLR81-Ba-9
Thrust, lbs. (vac.)	16,000
Spec. Imp., sec. (vac.)	290
Burn Time, sec.	240
Restart Provisions	Yes

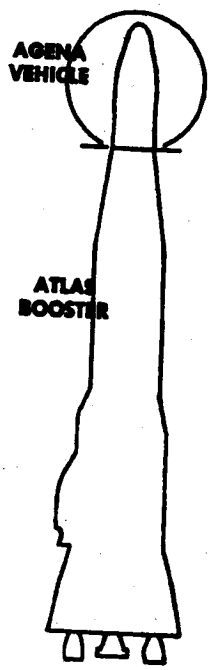


The AGENA "B" vehicle incorporates a restart or second burn capability.

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

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.

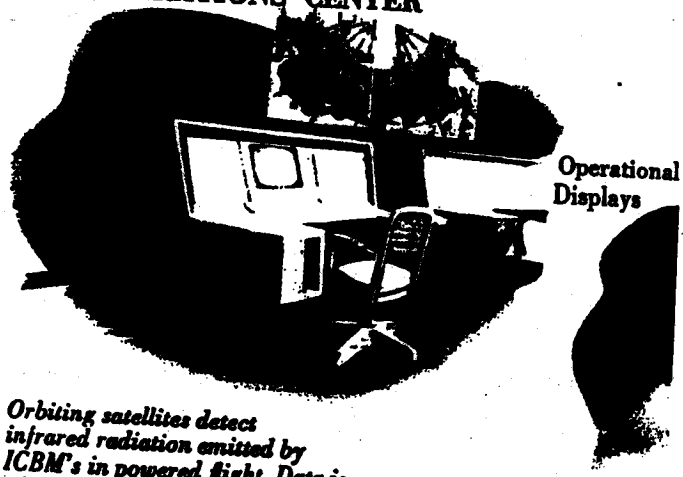
A program of complete system development, including the ground environment of MIDAS, has been submitted to the Department of the Air Force and has been approved in principle and objective. The launch schedule of that program, 31 March 1961 MIDAS R&D Development Plan, is shown on page B-5. Authorization 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

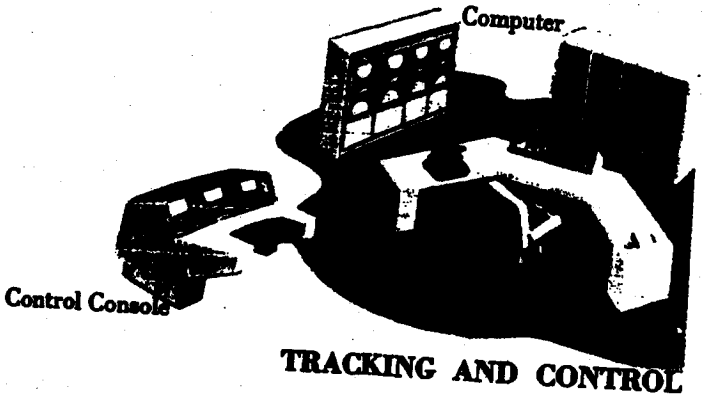
The MIDAS infrared early warning payload is engineered to use a standard launch vehicle configuration. This consists of an ATLAS missile as the first stage and the AGENA vehicle, powered by a Bell Aircraft rocket engine as the second, orbiting stage. The final configuration payload weight will be approximately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

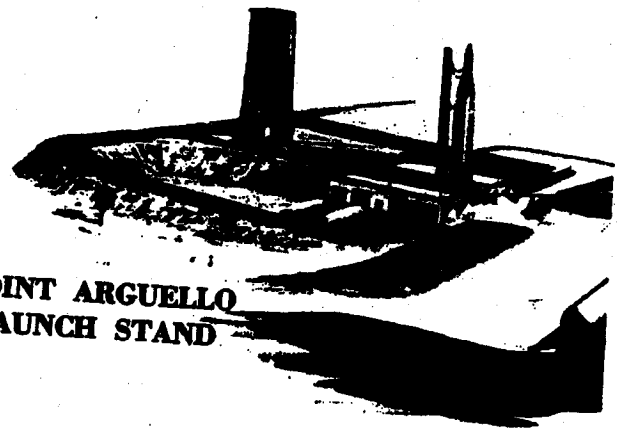
OPERATIONS CENTER



Orbiting satellites detect infrared radiation emitted by 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 and controls the status of the orbital network and the ground environment. The Point Arguello stands are used to launch the MIDAS satellites into polar orbits.



TRACKING AND CONTROL

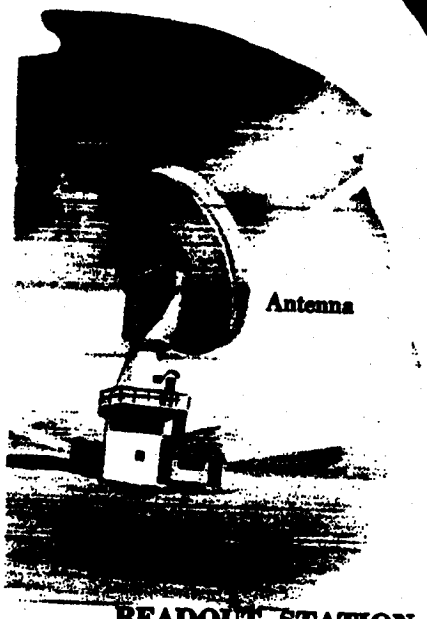


POINT ARGUELLO
LAUNCH STAND

SECRET

Satellite Vehicle

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



Antenna

READOUT STATION

Donnelly Flats

Electronic Equipment

CENTER

Sunnyvale
Satellite Test Center

Point Arguello

New

Italic — Indicates R&D Facilities Only

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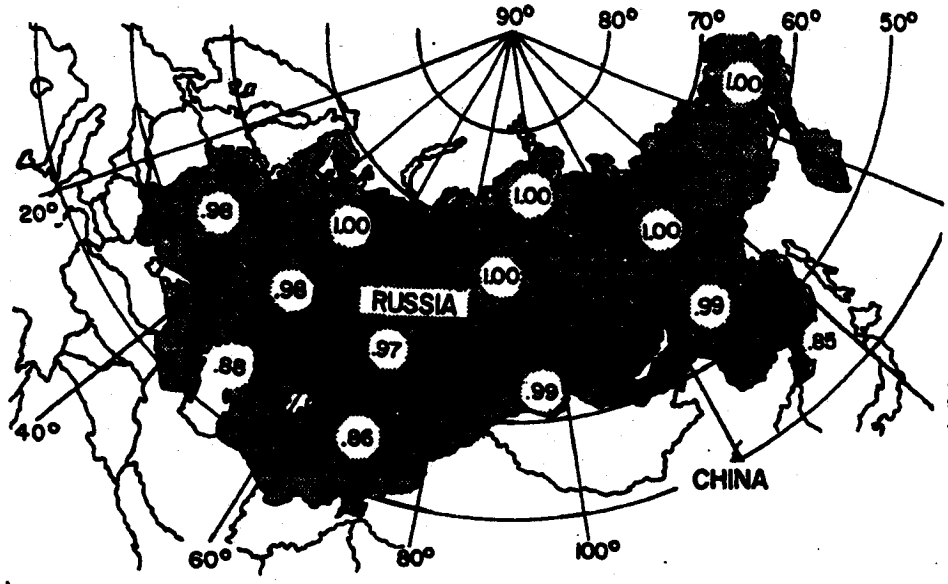
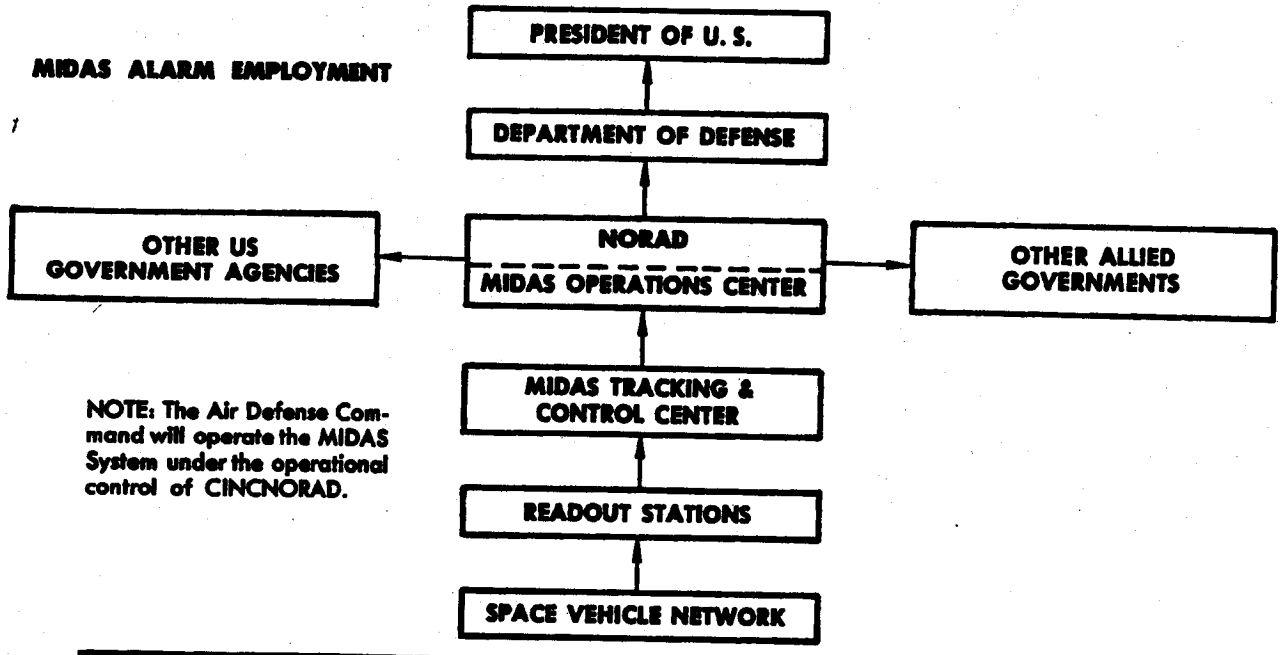


Probabilities of less than 1.00 on this map indicate the probability of at least one MIDAS satellite detecting an ICBM launch. Probabilities of 1.00 indicate that more than one MIDAS satellite will always be in position to detect an ICBM launch. These figures are based on geometric considerations of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

MIDAS ALARM EMPLOYMENT

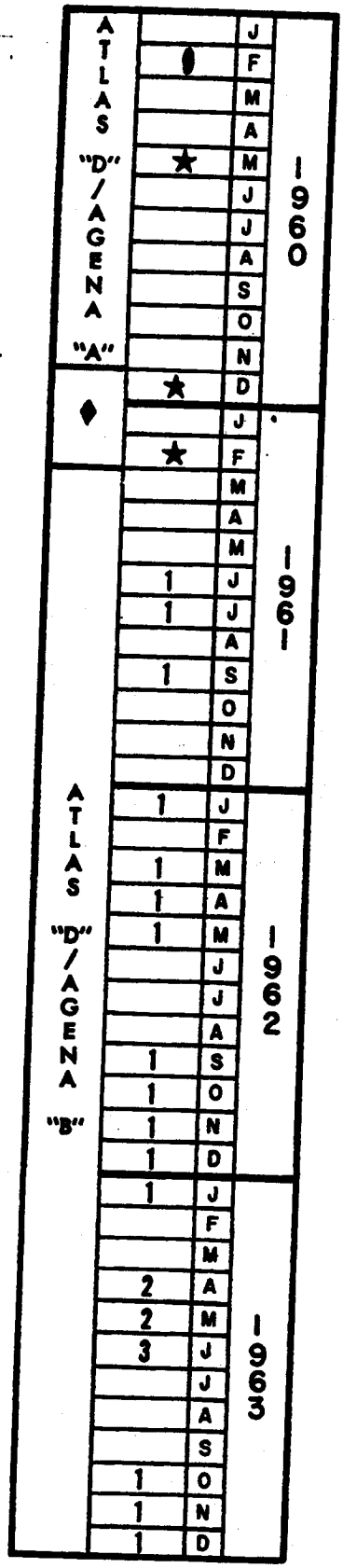


NOTE: The Air Defense Command will operate the MIDAS System under the operational control of CINCNORAD.

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



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.*

♦ DISCOVERER vehicles carrying MIDAS radiometric payloads

★ Attained orbit successfully ⬮ Failed to attain orbit

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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 Administration

- 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)

- 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 plane, two 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. (C)

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. (C)

Technical Progress

Booster

- ATLAS 97D is installed on Pt. Arguello Pad No. 2 and checkout is on schedule. This booster originally went "on stand" on 9 December and successfully completed its flight readiness firing on 9 March. (C)

Second Stage Vehicles

- The AGENA vehicle for the MIDAS III flight completed systems test in the Vandenberg Air Force Base Missile Assembly Building (MAB). Changes incorporated during or subsequent to the tests included the following:

1. The horizon sensors were modified to avoid possible sun saturation. New sensor harnesses and

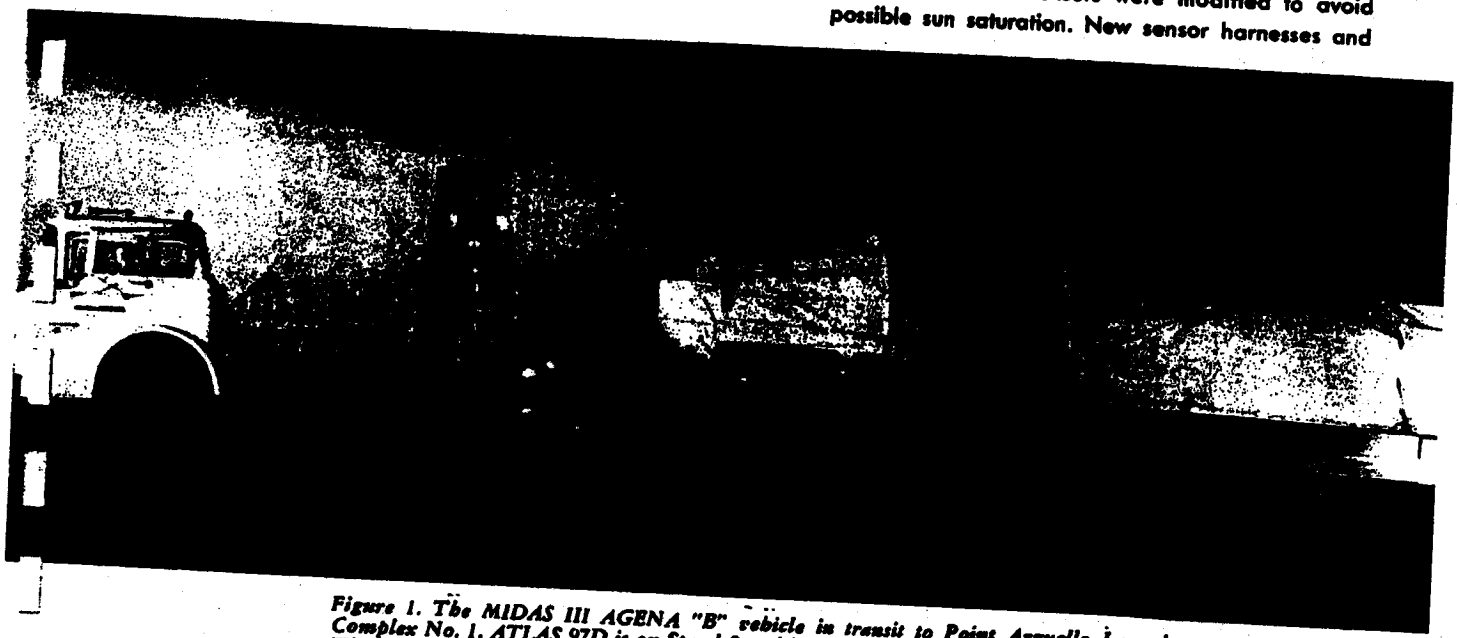


Figure 1. The MIDAS III AGENA "B" vehicle in transit to Point Arguello Launch Complex No. 1. ATLAS 97D is on Stand 2 waiting for the satellite vehicle and payload. This launch is scheduled for 20 June.

heads were installed permitting the vehicle to be satisfactorily stabilized in pitch even though one sensor was scanning the sun.

2. A propellant tank venting problem required that a propellant tank vent and engine drain line nullifiers be installed.

3. A power control unit access door was installed that permits the emergency reset timer to be set without removing the power control unit. (C)

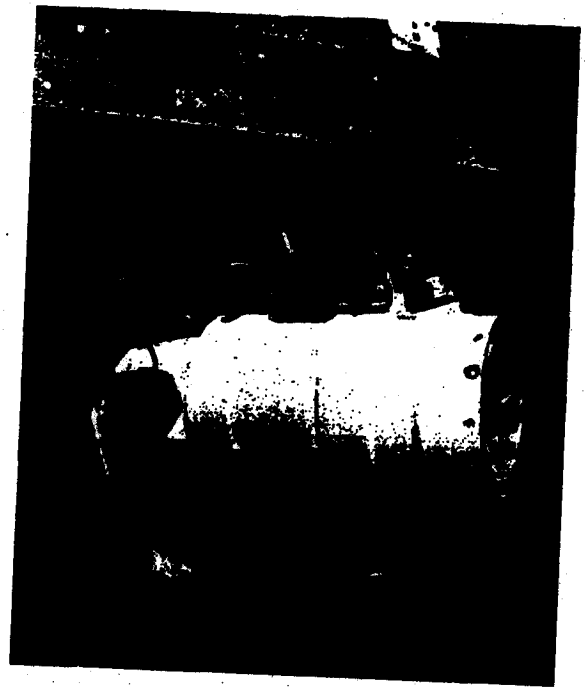
- On 12 May, the satellite vehicle completed a successful simulated countdown and flight, and on 24 May following a series of final alignments, was delivered to Pad 2 of Pt. Arguello Launch Complex No. 1. The launch in now scheduled for 20 June. (S)

- The AGENA vehicle for the MIDAS IV flight is completing the 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 only. Since MIDAS vehicles are being produced under the "block" concept, every modification made to MIDAS III is being made to MIDAS IV and V vehicles. The MIDAS IV launch could be delayed because of possible conflict with a SAMOS vehicle in the Vandenberg Air Force Base missile assembly building. (C)

Figure 2. MIDAS III payload and AGENA vehicle (below) during system run at Vandenberg Air Force Base. New horizon sensor (right) installed on the MIDAS III AGENA vehicle.

Infrared Scanners

- A contract is being negotiated with the Electronics Corporation of America, Cambridge, Massachusetts, for the development and improvement of reliability of lead-sulfide detectors. It is anticipated that negotiations will be completed and a contract awarded early in June. (U)



Aerospace Ground Equipment

- The required ground equipment to support the MIDAS III test has been installed and checkout has been completed at the Hawaii tracking station, the Southeast Africa station, and the telemetry and control facilities. The shipboard equipment has been installed aboard the downrange tracking ships and is currently being checked out. (C)

- Noise has been encountered during daytime transmission over the New Hampshire tracking station's data circuit 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 and programming problems. (U)

- Acceptance of the computer program at the Satellite Test Center by operation and integration of the GP-1 PAM/FM ground station has not been completed. Because of the existence of many computer programming problems, acceptance is forecast for mid-June. Problems associated with the data line translators will be corrected early in June. U

Facilities

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

- Final design plans for the MIDAS Technical Support Building at the New Hampshire tracking station were completed on 19 May. Contract documents will be turned over to the construction agency on or about 9 June with contract award scheduled for 30 June. (U)

- Preliminary design of the Ottumwa, Iowa, tracking and control center technical facilities was completed on 26 May. The preliminary design review will be held on 9 June. Authorization to proceed with the design of the Ottumwa base support facilities rehabilitation was given to the AFRCE at Omaha, Nebraska on 7 May. (C)

Figure 3. Construction progress at the Southeast Africa tracking station (Atlantic Missile Range Station 13) near Pretoria. The tracking station support buildings and the power vans (left) and the communication building (left) and power supply building (right) (above) are nearing completion. This station will be ready to record AGENA second-burn data on the MIDAS III flight.

Aerospace Ground Equipment

- The required ground equipment to support the MIDAS III test has been installed and checkout has been completed at the Hawaii tracking station, the Southeast Africa station, and the telemetry and control facilities. The shipboard equipment has been installed aboard the downrange tracking ships and is currently being checked out. (C)

- Noise has been encountered during daytime transmission over the New Hampshire tracking station's data circuit 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 and programming problems. (U)

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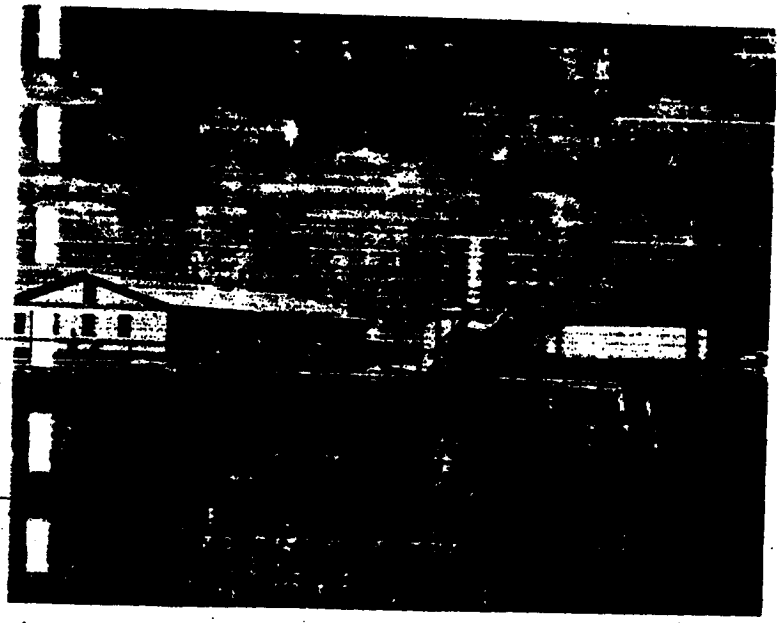

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~~CONFIDENTIAL~~

BIOASTRONAUTICS

ORBITING SPACE CAPSULE

Program History

The BIOASTRONAUTICS Office was established in May 1958 and charged with the biotechnical supervision of the early military "Man-in-Space" Program and the Bioastronautics aspects of the DISCOVERER Program. NASA was subsequently assigned the "Man-in-Space" responsibility in the fall of 1958. The development and fabrication of suitable Biomedical Recovery Capsules for the DISCOVERER Program has continued without interruption.

On 13 May 1959, a MARK I biomedical capsule was successfully flown without specimens. The flight telemetry demonstrated successful operation of the Bioastronautic subsystem as an engineering concept. Although re-entry was successful, recovery was not accomplished. A second MARK I capsule was launched on DISCOVERER IV on 25 June 1959 with four mice aboard. Although orbit and recovery were not achieved, 600 seconds to telemetry showed the animals to be in good condition throughout the flight.

Subsequent DISCOVERER efforts culminated in preparation of a MARK II capsule suitable for a small primate. Launch and recovery of a small primate from orbit awaits approval of an "Abbreviated Space Systems Development Plan, Biomedical Program" submitted to Hq AFSC in November 1960.

Applied Research contracts for the design and development of advanced biocapsule hardware include photosynthetic oxygen production, super-critical gas storage, radiation shielding and bio-instrumentation. All components are scheduled to be flown in subsequent advanced space biocapsule programs.

An Advanced Biomedical Capsule has successfully completed the mockup phase of development. The capsule is designed to carry a fifty pound chimpanzee to altitudes of about 25,000 n.m. to thoroughly explore and assess the radiation hazards of the inner and outer Van Allen Belts. In addition, long-term weightlessness effects will be investigated. On 7 November 1960, Space Systems Division approved continued development of the advanced capsule in support of eventual manned military space systems.

Program Concept

The complete exploration of space, including limits to manned operational space systems, requires a determination of the biological effects of the space environment. The Space Systems Division is continuing its aggressive research and development program in this technical area to insure that sufficient bioastronautics knowledge will be available during the 1963-1965 time period. Present deficiencies in reaching these goals are: capsule development, life support system design, biological instrumentation and determination of space flight stresses (long term weightlessness, operational experience in the radiation belts, and isolation). Neither Project MERCURY with its short duration, low altitude orbit, nor DYNA SOAR with its low altitude suborbital flight will provide data concerning the key problems of long term weightlessness and Van Allen Belt radiation, Knowledge which is crucial to manned operational space systems.

The current BIOASTRONAUTICS Program is furnishing a limited amount of data from actual ballistic and orbital flights. Experiments include those made on a space-available basis aboard scheduled ICBM and DISCOVERER Program flights. The Bioastronautics Orbital Space System (BOSS), when approved as an Air Force system, will not be limited by piggy-back or space-available restrictions. Data obtained from these tests will be available for correlation with those obtained from laboratory experiments. The results will be of supplemental significance to the DYNA SOAR Program and Project MERCURY and will be necessary to the success of future manned military missions such as SMART.