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SPACE

a foreword to...

SPACE

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

WDLPM-4

21 September 1960

FOREWORD

Activities summarized in the report include the major space systems, support programs and defense programs for which the Air Force Ballistic Missile Division is wholly or partially responsible. Each space system and program is introduced by a concise history of the administration, concept and objectives, making possible a more meaningful evaluation of the monthly progress information. The program description information is revised monthly as necessary to reflect major technical and administrative changes. These programs must be sufficiently flexible to permit continuous and effective integration of rapidly occurring advances in the state-of-the-art.

During this report period two DISCOVERER capsules were recovered after extended exposure to the space environment. Recovery of the capsule of DISCOVERER XIII marked the first recovery of an object from extended space flight. Subsequent recovery of the capsule from DISCOVERER XIV was the first aerial recovery of an object from space.

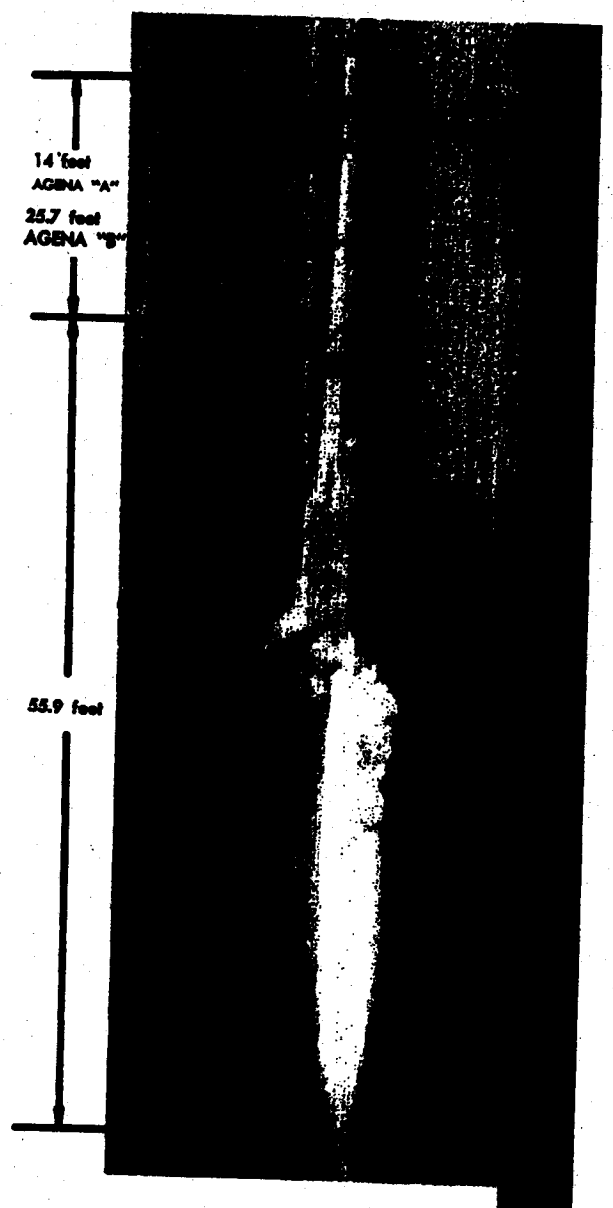
for Ludwig R. Odin Col USAF
O. J. RITLAND
Major General, USAF
Commander

SATELLITE
systems

DISCOVERER
SAMOS
MIDAS
COMMUNICATIONS
SATELLITE

Discoverer

The DISCOVERER Program consists of the design, development and flight testing of 37 two-stage vehicles, using the THOR IRBM 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, Palo Alto, California.

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

SECOND STAGE	AGENA "A"	AGENA "B"	
Weight—			
Inert	1,262	1,328	1,346
Payload equipment	497	887	915
Orbital	1,759	2,215	2,216
Impulse propellants	6,525	12,950	12,950
Other	378	511	511
TOTAL WEIGHT	8,662	15,676	15,722
Engine Model	YLR81-Ba-5	XLR81-Ba-7	XLR81-Ba-9
Thrust-lbs., vac.	15,600	15,600	16,000
Spec. Imp.-sec., vac.	277	277	290
Burn time-sec.	120	240	240
THOR BOOSTER		DM-18	DM-21
Weight—Dry		6,950	6,500
Fuel		33,700	33,700
Oxidizer (LOX)		68,200	68,200
GROSS WEIGHT (lbs.)		108,850	108,400
Engine		MB-3 Block 1	MB-3 Block 2
Thrust, lbs. (S.L.)		152,000	167,000
Spec. Imp., sec. (S.L.)		247.8	248.3
Burn Time, sec.		163	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.

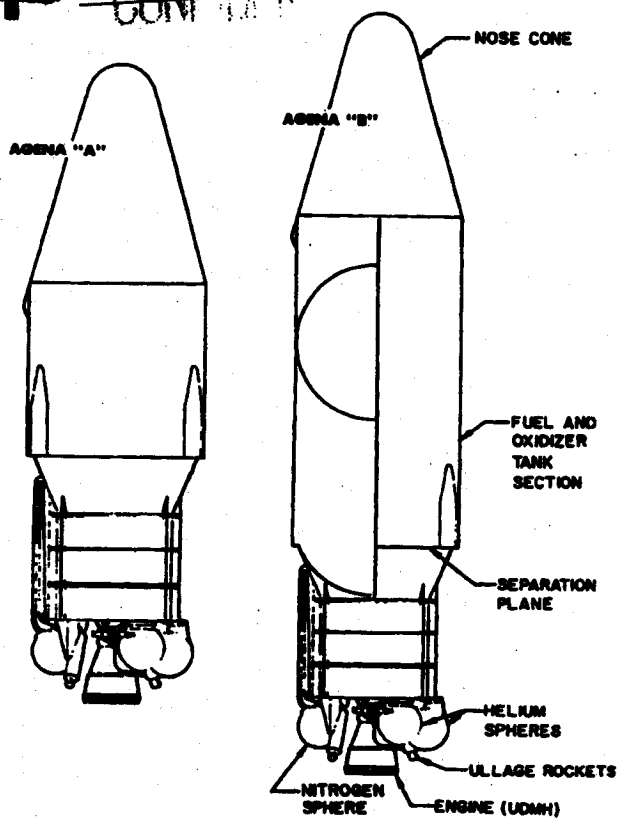
FLIGHT VEHICLE

The three versions of flight test vehicles used in the DISCOVERER Program are defined in the launch schedule shown on page A-5. Specifications for the two THOR configurations and three AGENA configurations used are given on page A-1.

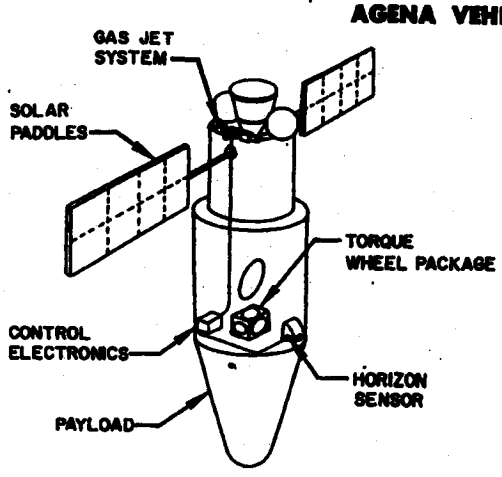
AGENA VEHICLE DEVELOPMENT

The AGENA vehicle was originally designed by the Air Force as the basic satellite vehicle for Advanced Military Reconnaissance Satellite Systems Programs. Basic design was based on use of the ATLAS ICBM as the first stage. ATLAS trajectory characteristics and the stringent eccentricity requirements of the advanced programs led to the selection of a guidance system suited to achieving orbital injection in a horizontal attitude. As a result, an optical inertial system was developed for vehicle guidance and a gas jet system for orbital attitude control. An urgent need for attaining higher altitude orbits resulted in development of the AGENA "B" versions. The YLR81 Ba-5 version of the LR81-Ba-3 engine (Bell Hustler engine developed for B-58 aircraft) is used on AGENA "A" vehicles. The YLR81-Ba-5 version of this engine was developed to provide increased performance through the use of unsymmetrical di-methyl hydrazine (UDMH) fuel instead of JP-4.

Early AGENA "B" vehicles will use the YLR81-Ba-7 version of this engine. The majority of AGENA "B" vehicles will use the XLR81-Ba-9 engine incorporating a nozzle expansion ratio of 45:1, and providing a further increase in performance capability including engine restart and extended burn-capability.



SAMOS and MIDAS AGENA VEHICLE

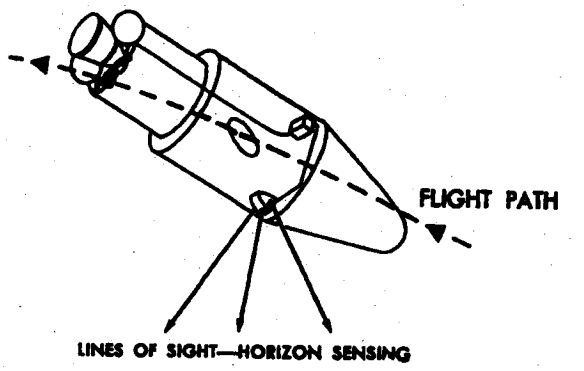


PERFORMANCE CAPABILITIES

ALTITUDE
200–20,000 MILES

ATTITUDE
ROLL – 0.1 DEGREE
PITCH – 0.1 DEGREE
YAW – 1 DEGREE

DISCOVERER/AGENA



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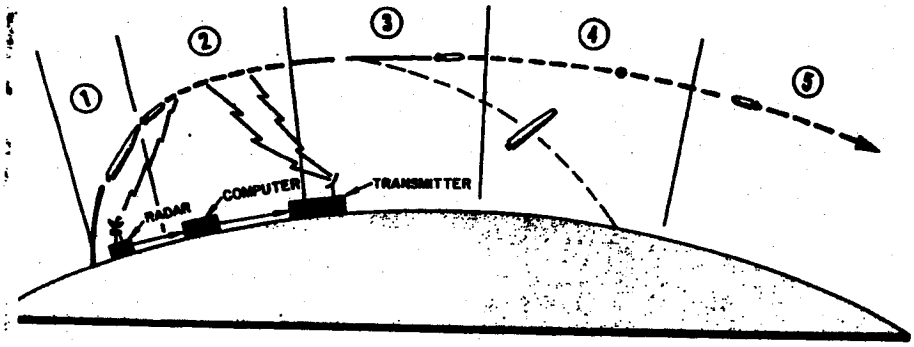
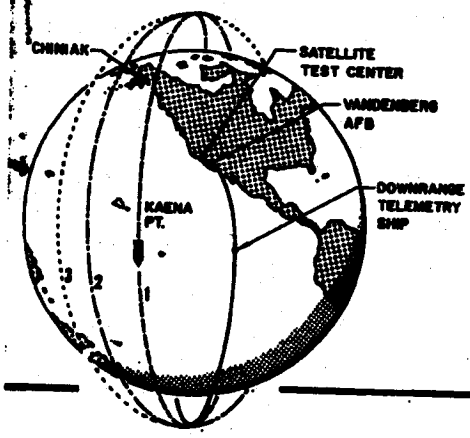
Powered Flight Trajectory

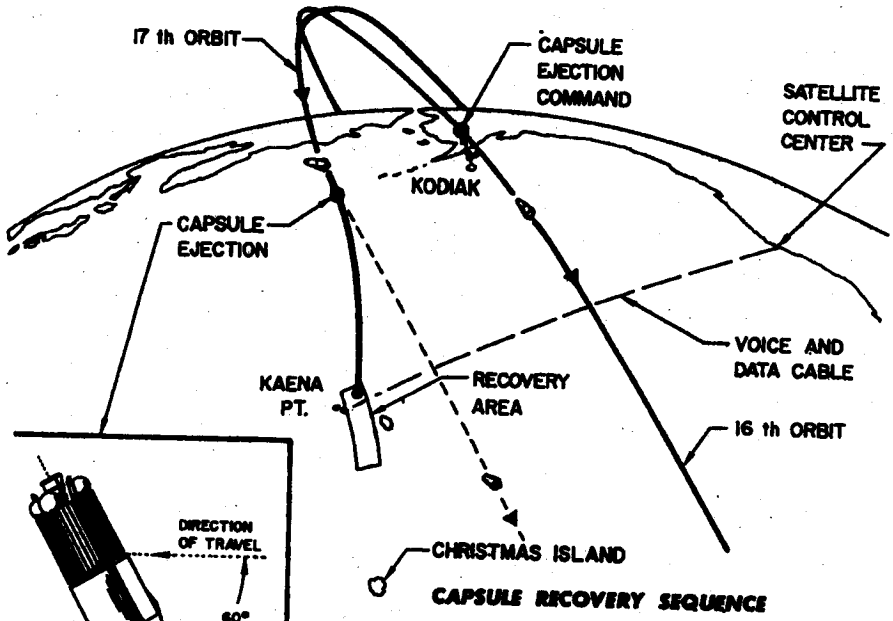


1. First Stage Powered Flight—2.5 minutes duration, 78 n.m. downrange, guided by programmed auto pilot.
2. Coast Period—2.4 minutes duration, to 380 n.m. downrange; altitude controlled by inertial reference package, horizon scanner, gas reaction jets. Receives AGENA time to fire and velocity to be gained commands.
3. Second Stage Powered Flight—2 minutes duration, to 770 n.m. downrange. Guided and controlled by inertial reference package, horizon scanner, gas reaction jets (roll) gimballing engine, yaw and pitch accelerometer—integrated.
4. Vehicle Reorients to Nose Aft—2 minutes duration, to 2,000 n.m. downrange. 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 A-4.



CAPSULE RECOVERY SEQUENCE

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 command on the 17th orbit, for capsule impact within the predetermined recovery area south of Hawaii. Aircraft and surface vessels are deployed within the area as a recovery force.

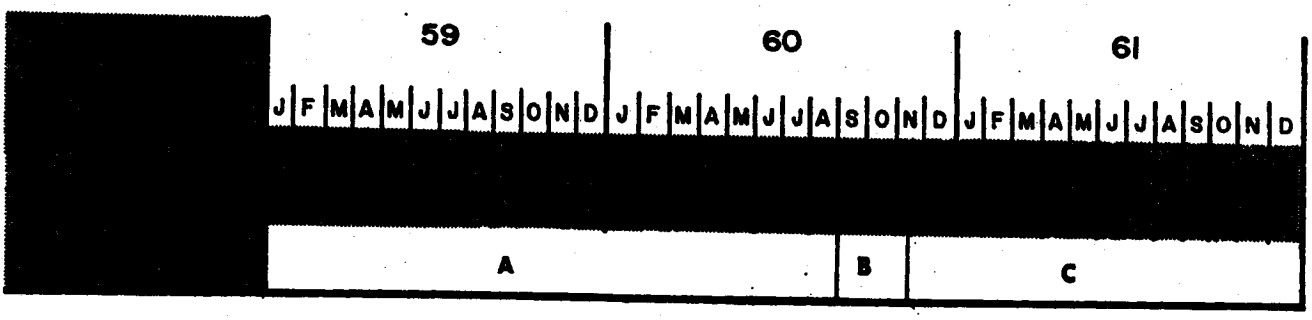
Capsule ejection command is sent to the satellite by the Chiniak, Alaska station on the 16th orbit. The vehicle reorients its position (see inset) to permit ejection to occur on a re-entry trajectory on the 17th orbit. The recovery capsule parachute is activated at about 30,000 feet, and the capsule beacon transmits a radio signal for tracking purposes. The recovery force is deployed in the recovery (impact) area.

Facility	Equipment*	Flight Function
Satellite Test Center	A	Over-all control, convert tracking stations data to obtain a predicted orbit and generate subsequent ephemerides issue acquisition data to tracking stations for subsequent passes, predict recovery area.
Vandenberg AFB	BCDEFGHIJK	Launch, ascent and orbital tracking, telemetry reception, trajectory measurements including time to ignite second stage.
Point Mugu	BCDEFGHIJKL	Ascent tracking and telemetry data reception, transmits command to ignite and shut down AGENA (via guidance computer).
Telemetry Ship (Pvt. Joe E. Mann)	DF	Final stage ascent tracking and telemetry data reception.
Kodiak, Alaska (tracking station)	BDEFGHIJK	Orbital tracking and telemetry data reception, including first pass acquisition, recovery capsule ejection and impact prediction.
Kaena Point, Oahu, Hawaii (tracking station)	BCDEFGHIJK	Orbital tracking and telemetry data reception.
Hickam AFB Oahu, Hawaii		Over-all direction of capsule recovery operations.

*Equipment

A. 2 UNIVAC 1103-A digital computers
B. VERLORT (Modified Mod II) radar
C. TLM-18 self-tracking telemetering antenna
D. Tri-helix antenna
E. Doppler range detection equipment
F. Telemetry tape recording equipment
G. Telemetry decommutators for real time data presentation
H. Plot boards for radar and TLM-18 tracking data
I. Conversion equipment for teletype transmission of radar, TLM-18 and doppler tracking data in binary format
J. Acquisition programmer for pre-acquisition direction of antennas
K. Ground command to satellite transmission equipment
L. Guidance computer

GROUND SUPPORT FACILITIES



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

● Attained orbit successfully.

△ Failed to attain orbit.

Flight History

DISCOVERER No.	AGENA No.	THOR No.	Flight Date	Remarks
0	1019	160	21 January 1959	*AGENA destroyed by malfunction on pad. THOR refurbished for use on flight XII.*
I	1022	163	28 February	*Attained orbit successfully. Telemetry received for 514 seconds after lift-off.*
II	1018	170	13 April	*Attained orbit successfully. Recovery capsule ejected on 17th orbit was not recovered. All objectives except recovery successfully achieved.*
III	1020	174	3 June	*Launch, ascent, separation, coast and orbital boost successful. Failed to achieve orbit because of low performance of satellite engine.*
IV	1023	179	25 June	*Same as DISCOVERER III.*
V	1029	192	13 August	*All objectives successfully achieved except capsule recovery after ejection on 17th orbit.*
VI	1028	200	19 August	*Same as DISCOVERER V.*
VII	1051	206	7 November	*Attained orbit successfully. Lack of 400-cycle power prevented stabilization on orbit and recovery.*
VIII	1050	212	20 November	*Attained orbit successfully. Malfunction prevented AGENA engine shutdown at desired orbital velocity. Recovery capsule ejected but not recovered.*
IX	1052	218	4 February 1960	*THOR shut down prematurely. Umbilical cord mast did not retract. Quick disconnect failed, causing loss of helium pressure.*
X	1054	223	19 February	*THOR destroyed at T plus 56 sec. by Range Safety Officer.*
XI	1055	234	15 April	*Attained orbit successfully. Recovery capsule ejected on 17th orbit was not recovered. All objectives except recovery successfully achieved.*
XII	1053	160	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	1057	231	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	1056	237	18 August	*Attained orbit successfully. Recovery capsule ejected on the 17th orbit and was successfully recovered by the airborne force. All objectives successfully achieved.*

MONTHLY PROGRESS—DISCOVERER Program

Progress

● During August a significant milestone was achieved in the DISCOVERER program when the data capsules of DISCOVERER XIII and XIV were ejected from the orbiting satellite, re-entered the earth's atmosphere and were recovered successfully within the programmed area north of the Hawaiian Islands. These two capsules represent the first objects to have been successfully recovered from an orbit in space. As such, they take their place among four other "firsts" achieved by the DISCOVERER program (see Table III).

DISCOVERER XIII

● DISCOVERER XIII was launched from Vandenberg Air Force Base at 13:38, PDT, on 10 August and was successfully injected into polar orbit. THOR booster trajectory was slightly high and west but was well within tolerance. Second stage separation was successfully accomplished as was transmission of Commands 5 (time-to-fire correction) and 6 (velocity-to-be-gained correction). AGENA performance was very close to norminal. Re-orientation of the satellite into a nose aft attitude was accomplished after burnout. Table I lists nominal and actual orbital parameters.

PARAMETER	NOMINAL	ACTUAL
Apogee, Statute Miles	408	429
Perigee, Statute Miles	140	155
Eccentricity	0.0323	0.0326
Period, Minimum	93.5	94.1
Inclination Angle, Degree	81.69	82.67
Injection, Altitude, Statute Miles	140	156
Injection Angle, Minimum	0	+0.08
Injection Velocity, ft/sec		25,852

TABLE I. DISCOVERER XIII Orbital Parameters

● The recovery sequence was automatically initiated by the satellite programmer 26 hours, 37 minutes after launch. This event occurred within range of the Kodiak, Alaska, tracking station as DISCOVERER XIII passed southward toward Hawaii on its

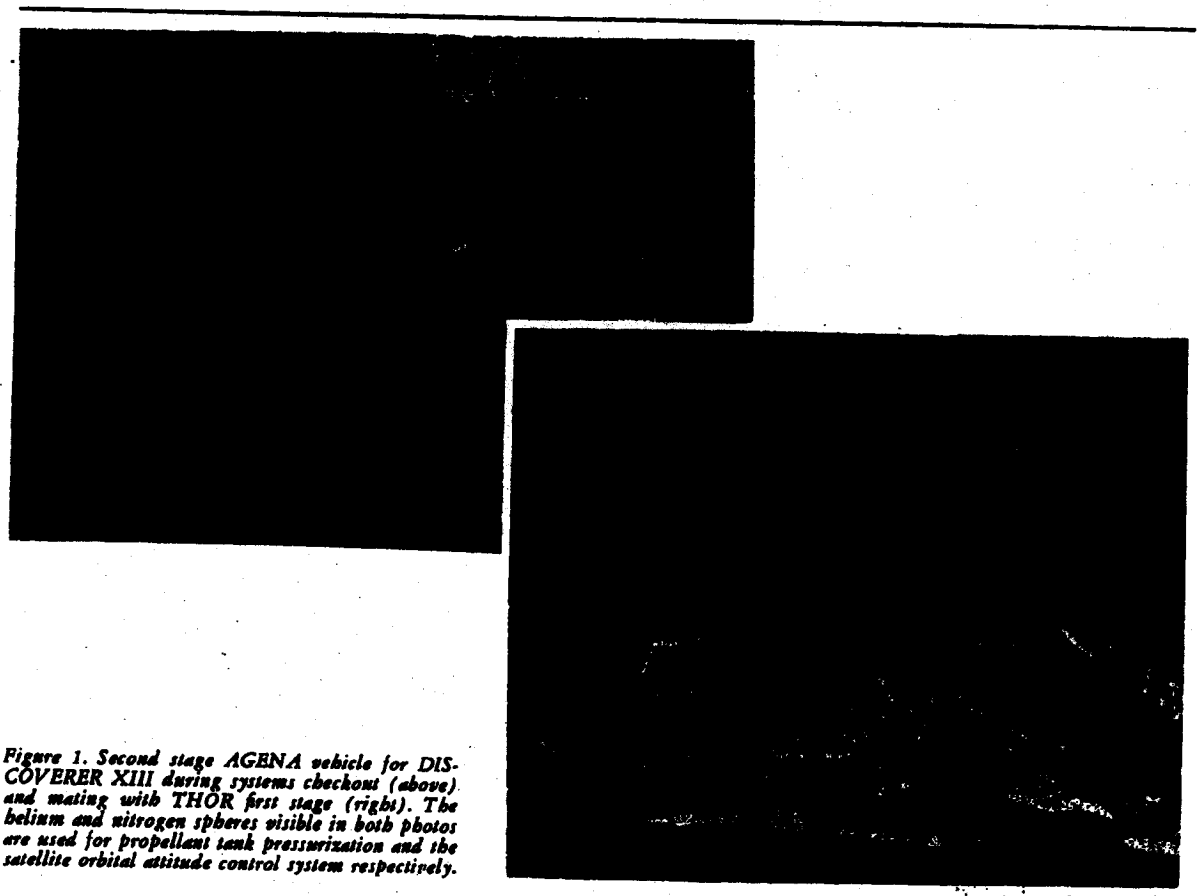


Figure 1. Second stage AGENA vehicle for DISCOVERER XIII during systems checkout (above) and mating with THOR first stage (right). The helium and nitrogen spheres visible in both photos are used for propellant tank pressurization and the satellite orbital attitude control system respectively.

17th orbit. Telemetry received by Kodiak from the satellite and the capsule confirmed that satellite pitchdown, capsule ejection, spin, retro rocket firing, capsule de-spin and thrust cone ejection were accomplished. Minutes later the Hawaiian tracking station acquired the telemetry signal and determined that ablative shield ejection and parachute deployment had occurred.

- All aircraft and ships of the recovery force within range acquired the capsule's RF beacon and began homing on the signal. No aircraft was able to attempt recovery, but one plane did observe the capsule impacting in the sea. A helicopter from the "Haiti Victory," one of the recovery ships, was sent to retrieve the capsule. The capsule was flown to Hawaii by helicopter, transferred to an Air Force plane, and delivered to Washington DC. After being viewed by President Eisenhower, the capsule was placed on public display by the Air Force. This historic object, the first man-made object recovered after a sustained period of orbit, will become part of the Smithsonian Institute's collection of space vehicles.

- DISCOVERER XIII carried a diagnostic payload in addition to the normal recovery equipment. The payload contained instrumentation to determine capsule environment and the functioning of separation and recovery sequence events. A five channel telemetry system was installed to transmit the data obtained to the ground stations. To assure receipt of all data, a tape recorder was provided to record the real time events and capsule performance during the telemetry "blackout" period which occurs when the capsule re-enters the atmosphere. After a two-minute time delay, these stored data were transmitted to the ground stations. The high speed of re-entry induces ionization over the skin of the capsule which effectively blocks telemetry transmission. An S-band transponder was also provided to aid in tracking the capsule from ejection through recovery.

DISCOVERER XIV

- DISCOVERER XIV was launched at 1257, PDT, on 18 August into a polar orbit from Vandenberg Air Force Base. The launch was delayed approximately 15 minutes because the still orbiting DISCOVERER XIII satellite was passing through the projected flight area. THOR booster performance was near nominal. Separation, transmission of Commands 5 and 6, and orbital boost were accomplished as planned. Nominal and actual orbital parameters are given in Table II.

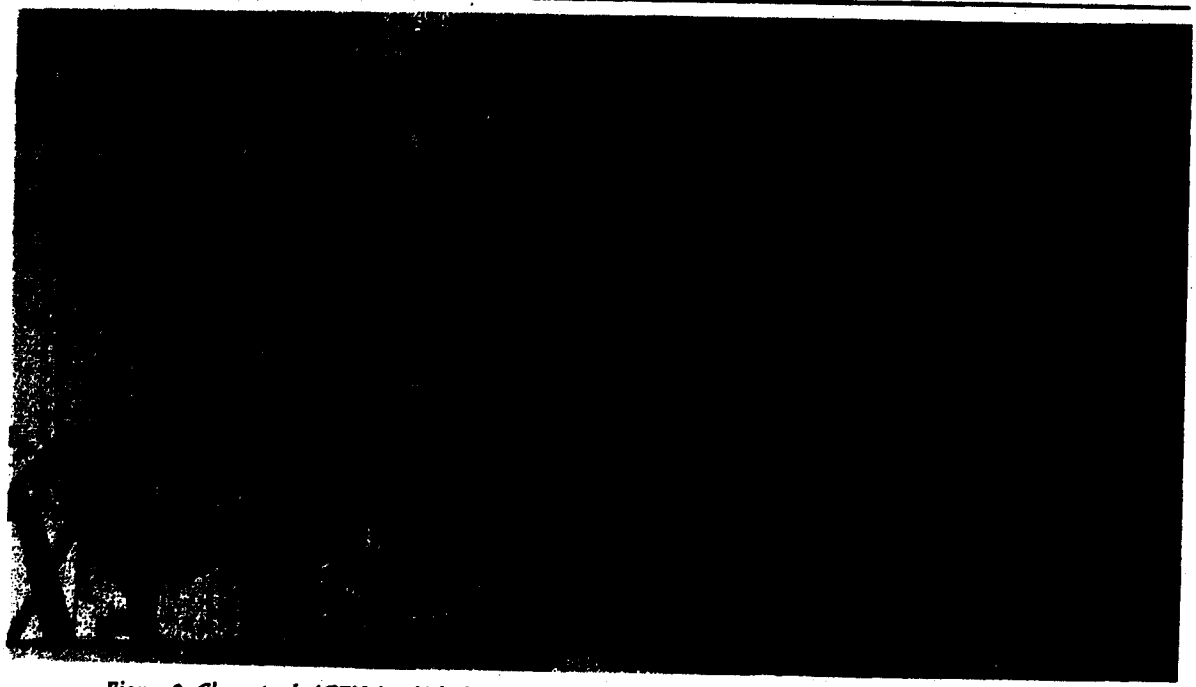
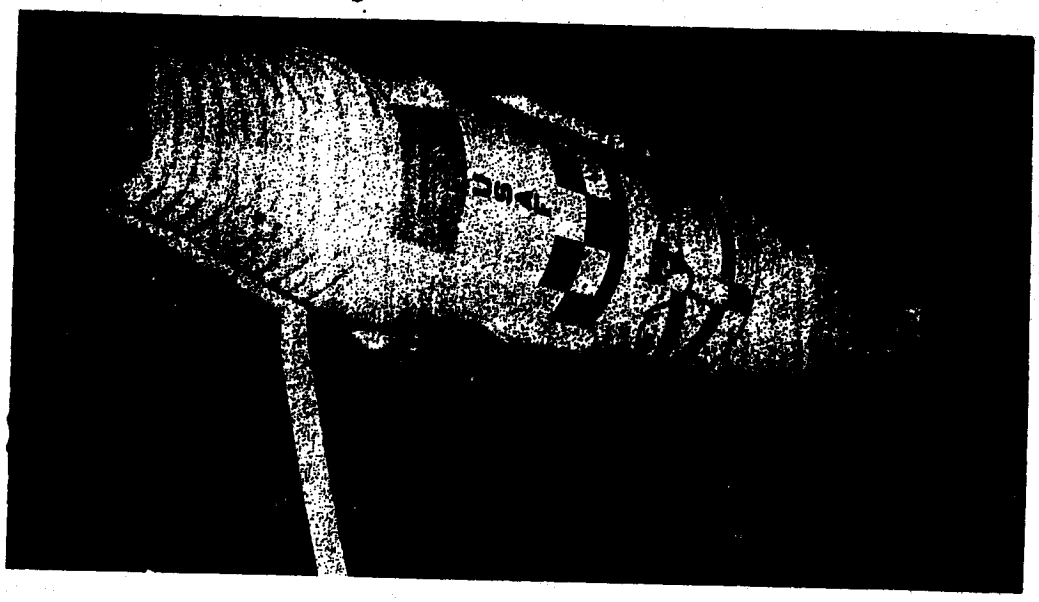


Figure 2. Close-up of AGENA vehicle forward equipment compartment prior to mating with THOR booster.



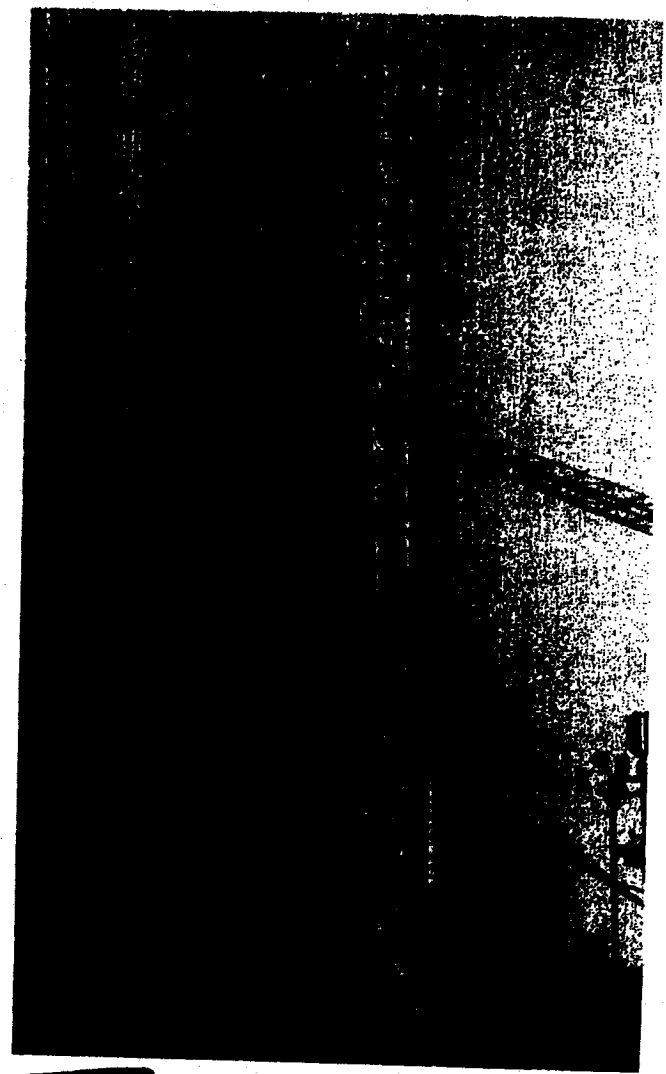
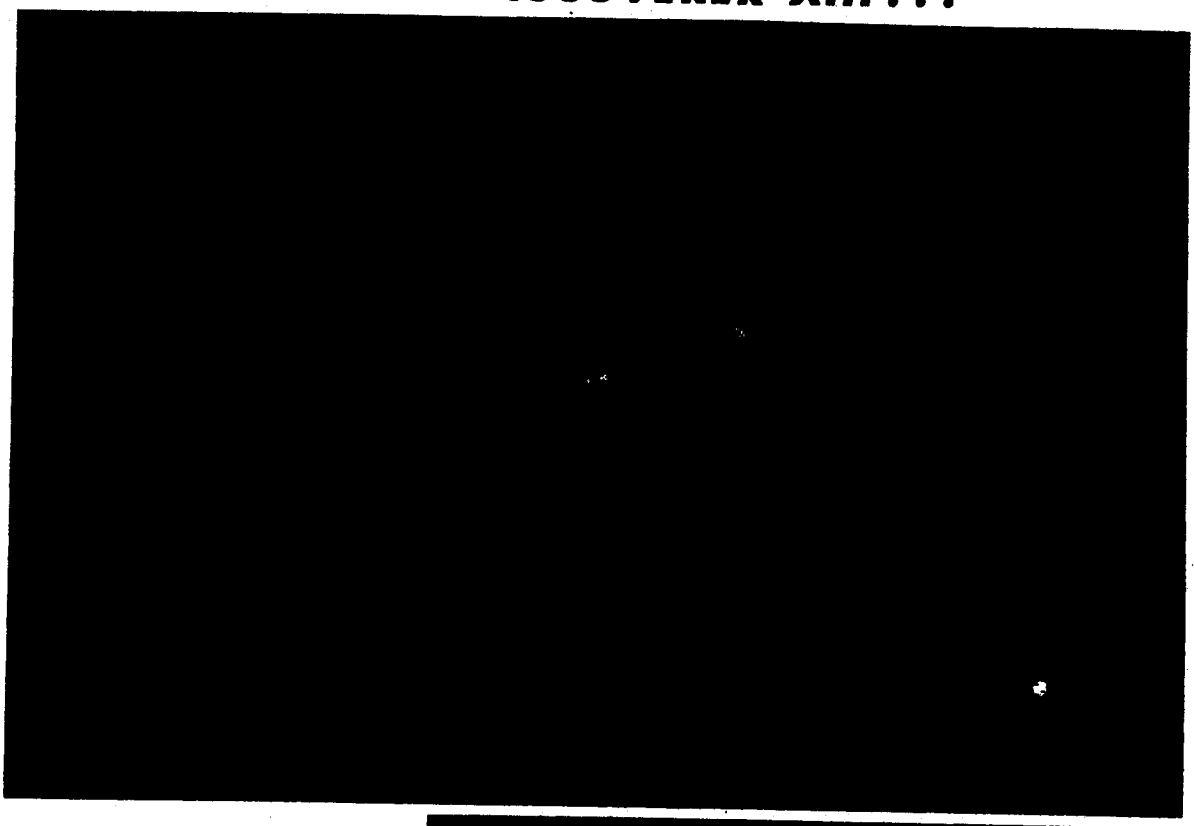


Figure 3. DISCOVERER XIII during pre-dawn countdown on 10 August, prior to erection (above) and during servicing operations following erection on launch pad (right). In top view, the blanket surrounding the nose cone provides air conditioning for capsule electronics during countdown to prevent overheating. The black dome protruding from the blanket is part of the ablative shield which surrounds and protects the capsule during re-entry.

Figure 4. DISCOVERER XIII during lift-off from Vandenberg Air Force Base launch complex on 10 August.

DISCOVERER XIII . . .



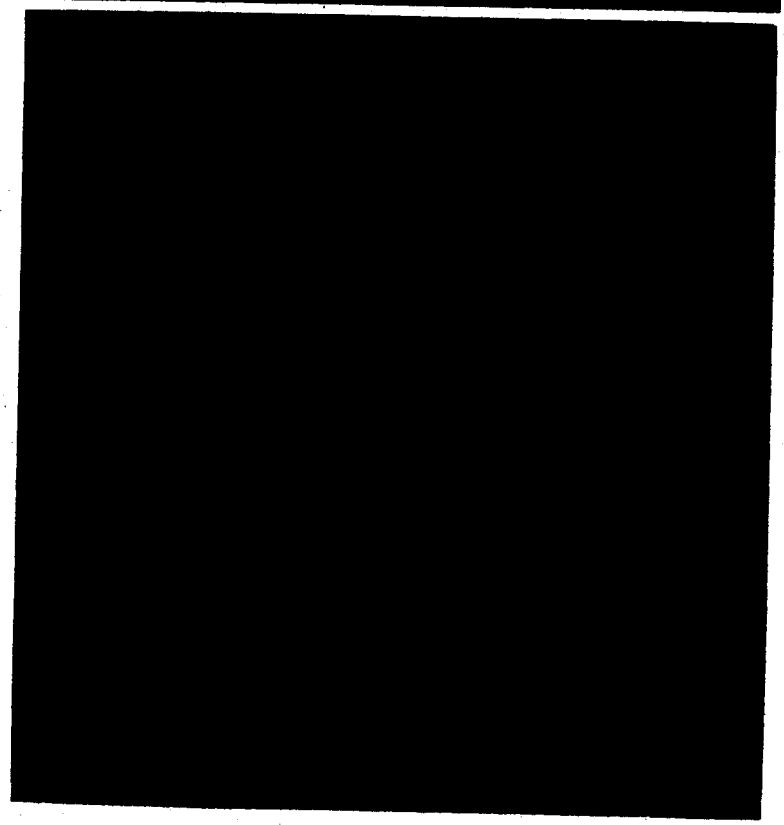
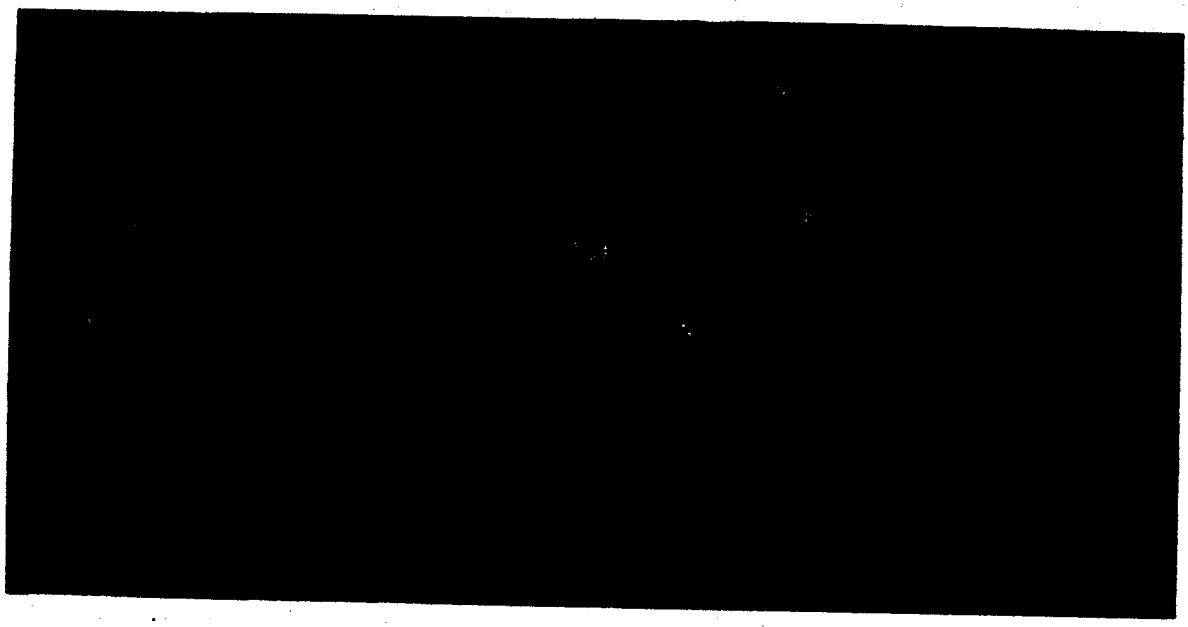
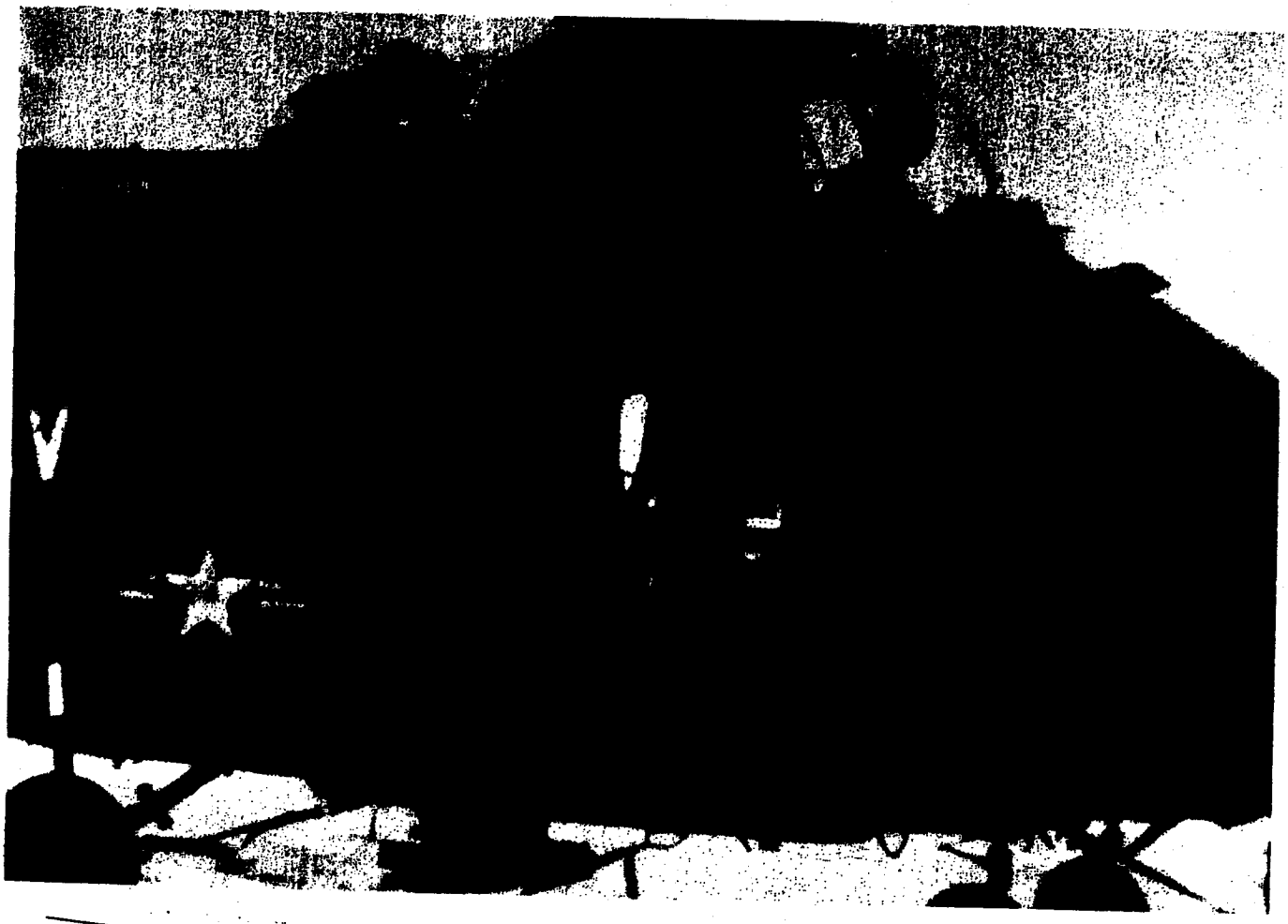


Figure 5. Helicopter recovers DISCOVERER XIII capsule from sea north of Hawaii. Frogman jumps into sea (above) to secure recovery gear to capsule. The capsule is reeled in by the helicopter winch (right) and the frogman is returned to the helicopter (top photo, opposite page). The capsule is shown prior to removal from the helicopter (bottom photo, opposite page), following its return to the recovery force ship "Haiti Victory."

SEA RECOVERY OF CAPSULE





DISCOVERER XIV...

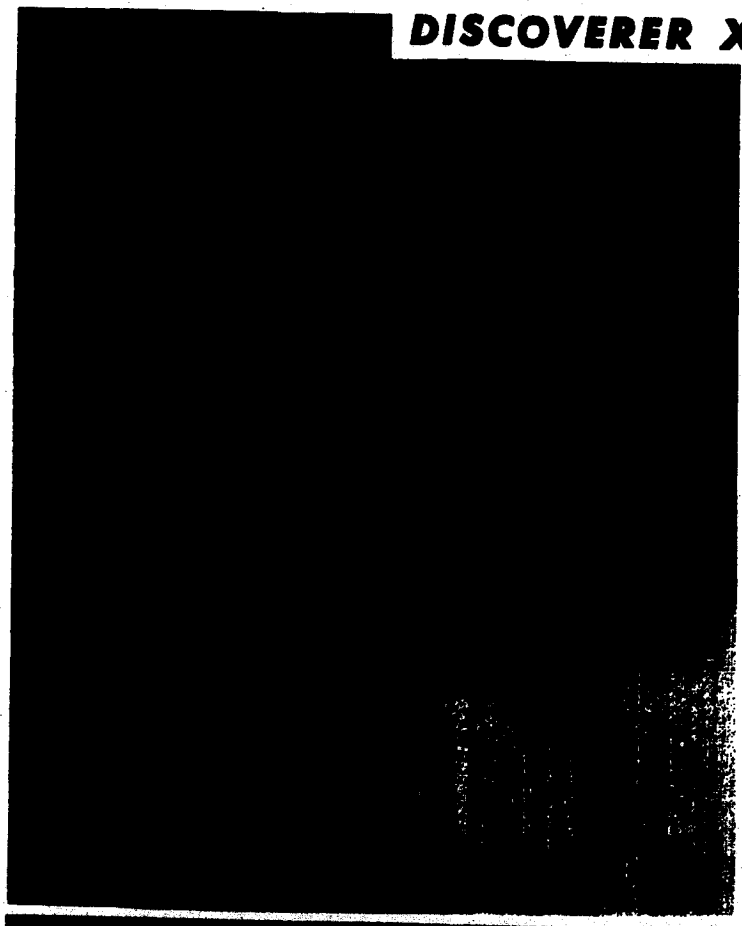
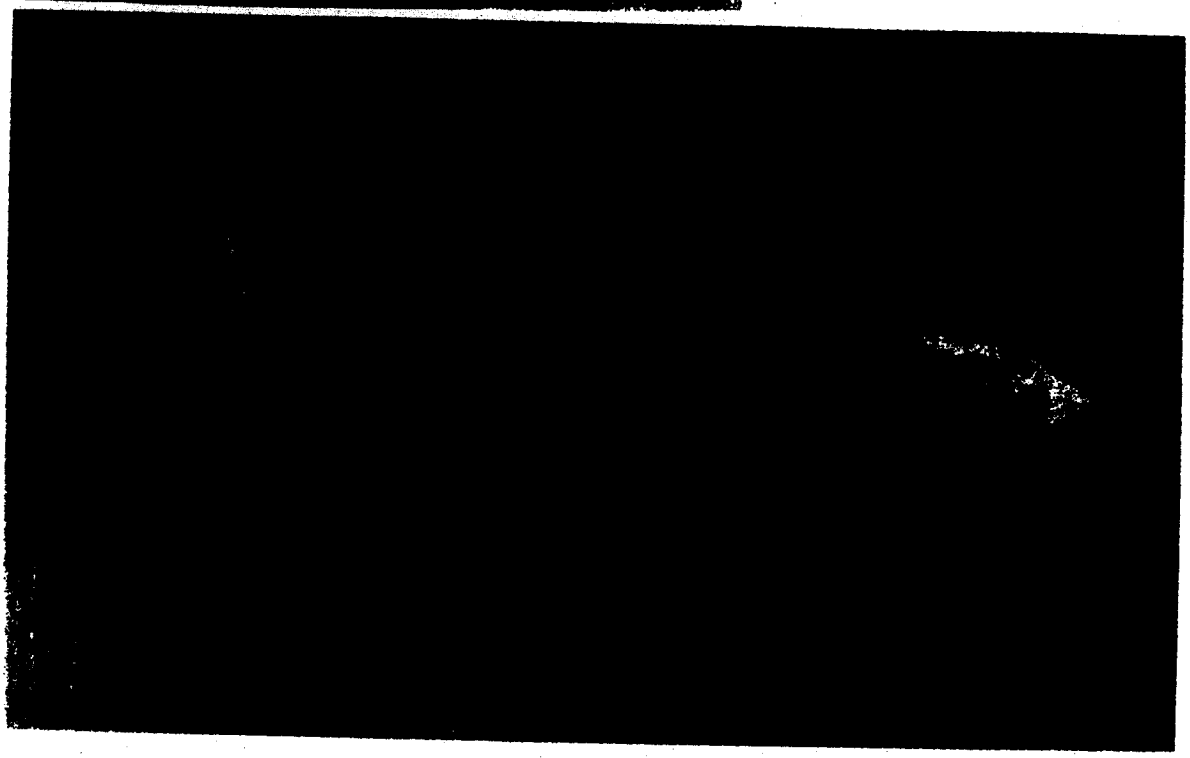
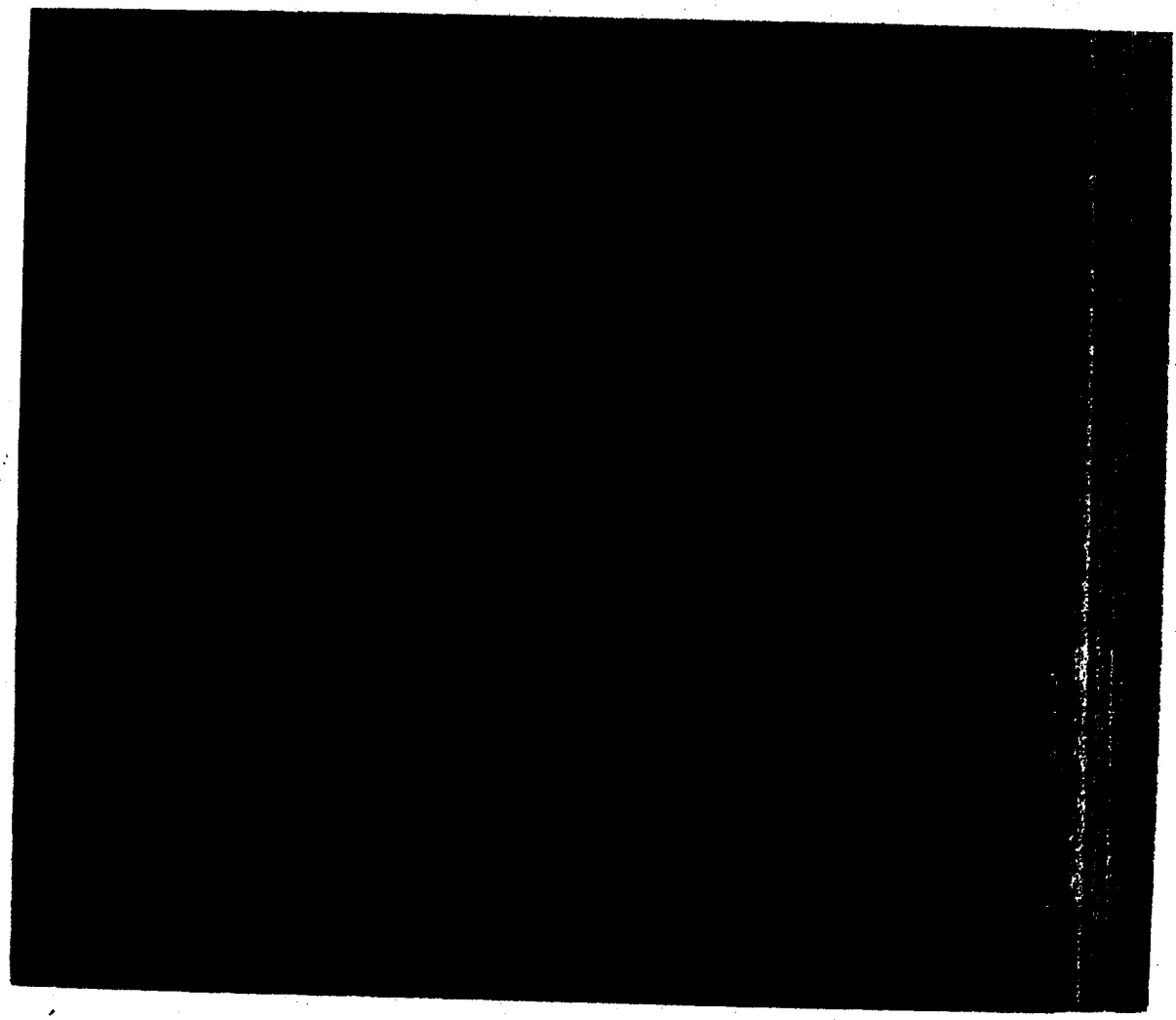


Figure 6. Crewmen aboard recovery aircraft check hook on recovery harness prior to harness deployment.

Air Force C-119 patrolling in recovery area north of Hawaii with capsule recovery harness extended.

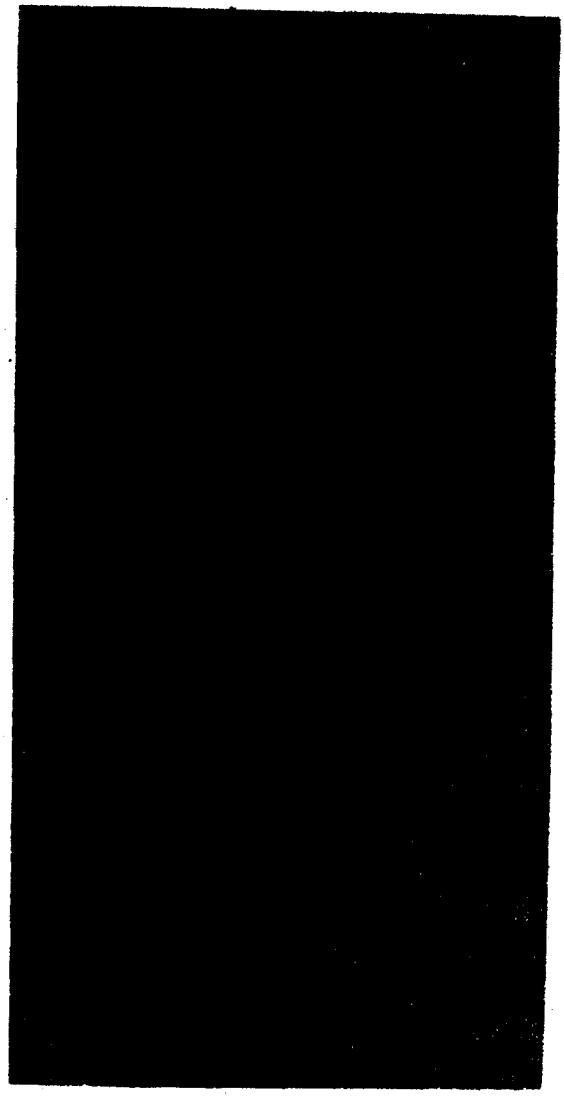


. . . AERIAL RECOVERY OF CAPSULE



Photograph of capsule and parachute taken from within C-119 fuselage on second of two unsuccessful attempts at aerial recovery of DISCOVERER XIV.

Capsule being re
fuselage by memb
ery crew.



Photograph of recovery harness engaging capsule and parachute, taken from within C-119 fuselage on the third recovery attempt.

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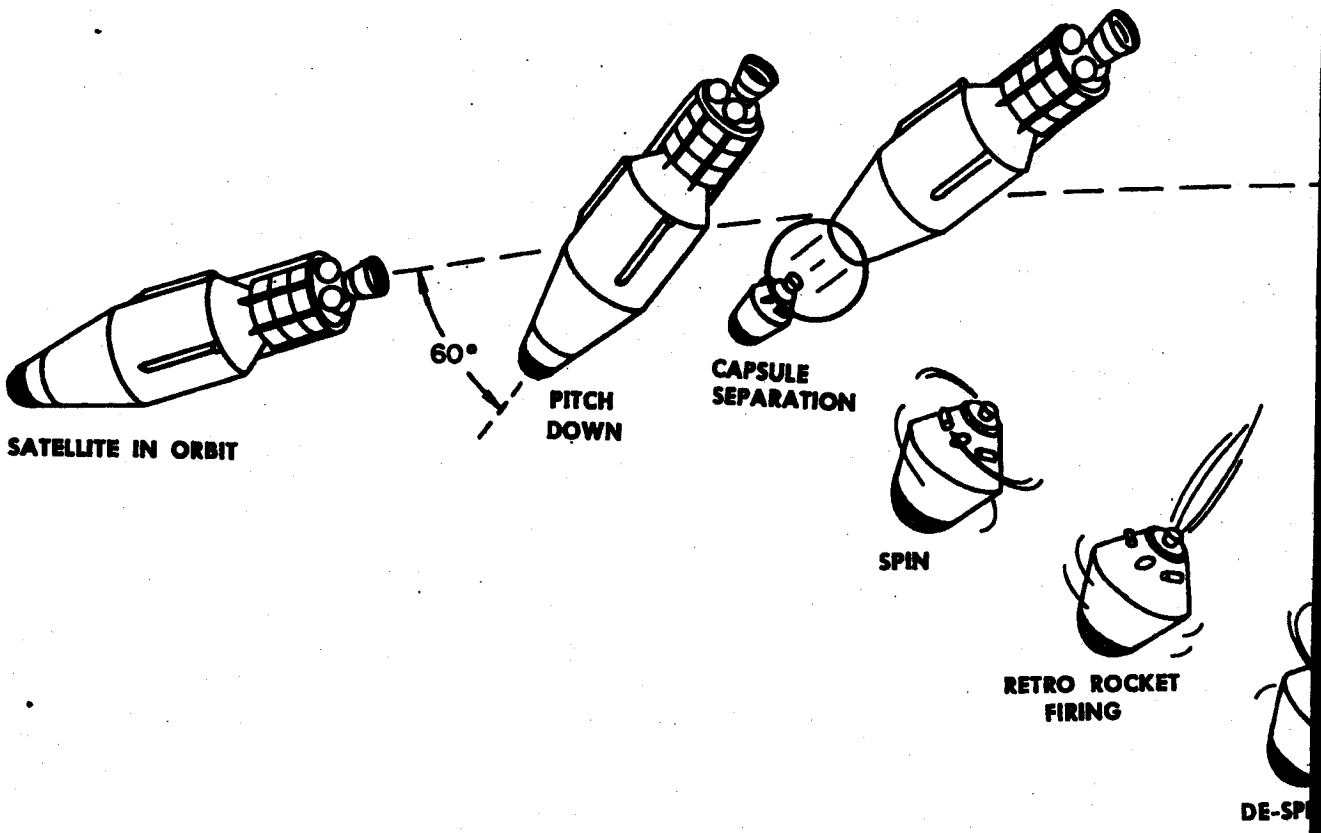
s of the recov-



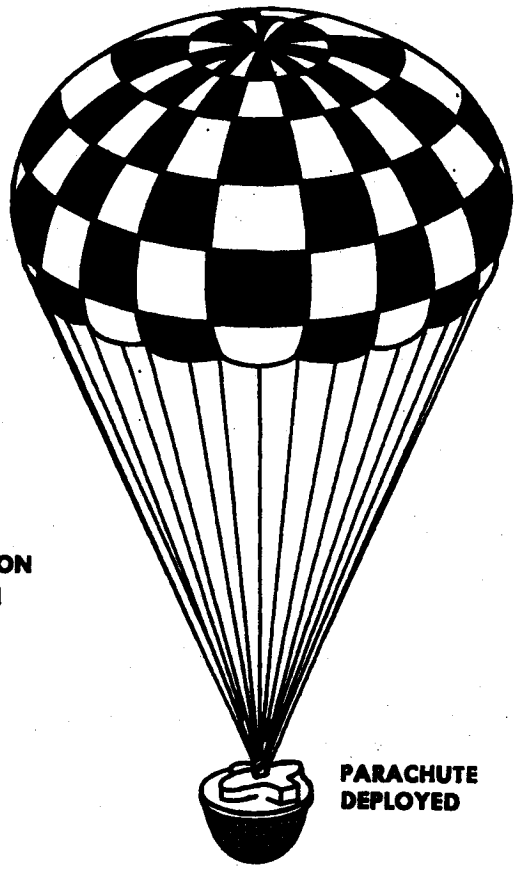
During its seventeenth orbit (approximately 26 and three-quarter hours after launch) the AGENA vehicle pitches nose down and capsule separation occurs. These operations require about a minute and one half. From launch to capsule ejection the satellite has traveled about 444,000 miles in its elliptical orbit around the earth. The "cold gas" spin system operates, the retro rocket fires and the "cold gas" de-spin system operates. Next the thrust cone separates. The thrust cone contains the spin/de-spin system gas spheres, squib operated valves, manifolds, and exhaust jets; the retro-rocket; the rocket programmer; and the S-band beacon transmitter. The capsule then free falls in much the same position as when it was ejected. Upon re-entry the capsule re-orients itself so that the ablation shield absorbs the intense heat of re-entry. After the two and one-half minute period of re-entry the parachute compartment cover is ejected and the chute unfolds. At this time the ablation shield, having served its purpose, is separated from the capsule. The parachute is deployed at approximately 55,000 feet and the capsule, sending out a signal on which the recovery aircraft "home," descends toward the earth it left only the day before. On recovery, the weight of the capsule is approximately one-third what it was at the time of separation. Items that are no longer needed are ejected to reduce the capsule weight and permit recovery.

DISCOVERER CAPSULE EJECTION, RE-ENTRY, AND PARACHUTE DEPLOYMENT

THRUST CONE SEPARATION

RE-ENTRY

PARACHUTE DEPLOYMENT—ABLATION SHIELD SEPARATION



PARACHUTE DEPLOYED

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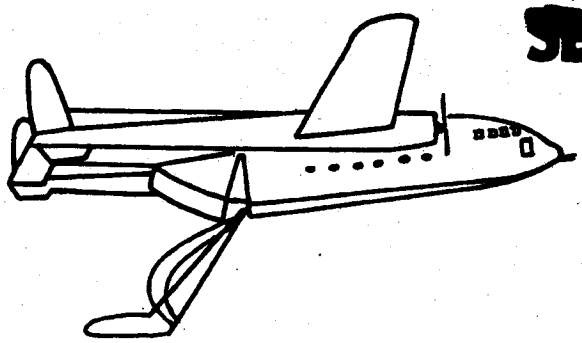
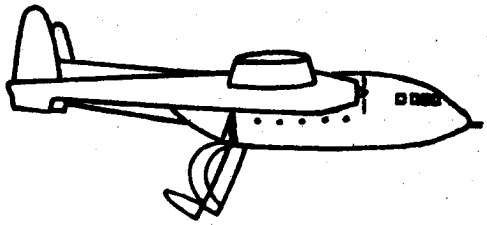


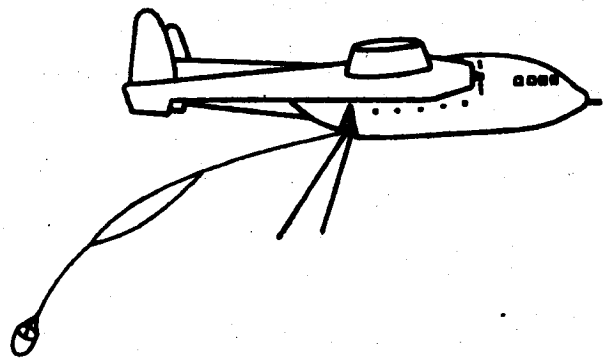


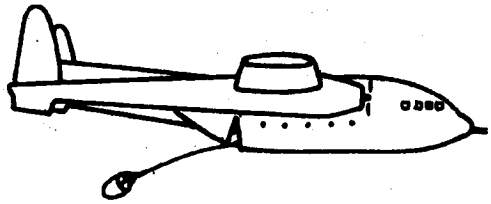
DISCOVERER CAPSULE AERIAL RECOVERY

After capsule ejection from the satellite and re-entry into the earth's atmosphere, the parachute deploys. Parachute deployment occurs at an altitude of approximately 55,000 feet. The crews of C-119 aircraft in the recovery zone "home" in on the signals transmitted by the capsule's beacon and determine their intercept course. They have between 20 and 30 minutes from the time of parachute opening until it impacts into the sea to effect recovery.

The sequence on this page shows contact being made (top center), the aircraft making a pass on the falling capsule (above), the hook of the recovery gear snagging the nylon canopy (above right), and the capsule being hauled into the recovery aircraft. From the time the chute is snagged until it is safely aboard requires from 15 to 20 minutes. If the aircraft cannot effect recovery, surface vessels in the impact area attempt to recover the capsule from the sea. A flashing lite, dye markers, and the transmitter aid them in their search.

Recovery of the DISCOVERER XIV capsule by the Hawaiian based recovery force was the first time in history a man-made object returning from a sustained period in space was recovered by an aircraft.





PARAMETER	NOMINAL	ACTUAL
Apogee, Statute Miles	428	500
Perigee, Statute Miles	118	111
Eccentricity	0.037	0.046
Period, Minimum	93.4	94.5
Inclination Angle, Degree	79.6	19.6
Injection Altitude, Statute Miles	118	118
Injection Angle, Minimum	0	−0.22
Injection Velocity, ft/sec		26,150

TABLE II. DISCOVERER XIV Orbital Parameters

- On the first pass over Kodiak, telemetry data indicated an abnormal satellite attitude, stop indications by the horizon scanner and excessive control gas consumption. The satellite stabilized in its proper attitude on subsequent passes and orbited as planned.

- While on its 17th orbit, the satellite programmer automatically initiated the recovery sequence. The capsule re-entered the atmosphere and its parachute was deployed. A C-119, one of the airborne recovery force, homed on the CW beacon signal and visually sighted the capsule. On the third pass, 1609 PDT, the hooks on the special air-recovery gear snagged the nylon canopy. The chute and capsule were carefully reeled in and at 1623 PST were safely aboard the aircraft. The capsule is presently being analyzed at the contractor's facility.

Technical Progress

Second Stage Vehicles

- Only two DISCOVERER AGENA "A" vehicles remain to be flown. DISCOVERER XV is at Vandenberg Air Force Base in preparation for a September launch. The remaining vehicle is at Sunnyvale for modifications incorporating the improvements from the latest flight tests.

- Two AGENA "B" satellites were delivered to Vandenberg Air Force Base during August and are currently undergoing subsystem checks in the missile assembly building. An additional AGENA "B" has been accepted by the Air Force and is awaiting shipment to Vandenberg Air Force Base. Three vehicles have completed their test firings at Santa Cruz Test Base and are being readied for Air Force acceptance inspections.

- Phase 2 of the Preliminary Flight Rating Tests (PFRT) on the XLR-81Ba-9 engine (serial number 306) were initiated during August. After being retrofitted with flight configuration components the engine was installed on the Bell Test Center vertical test stand for initiation of start-stop and malfunction tests. A 30-second restart firing was accomplished, but test

TABLE III. Space FIRSTS achieved in DISCOVERER Program.

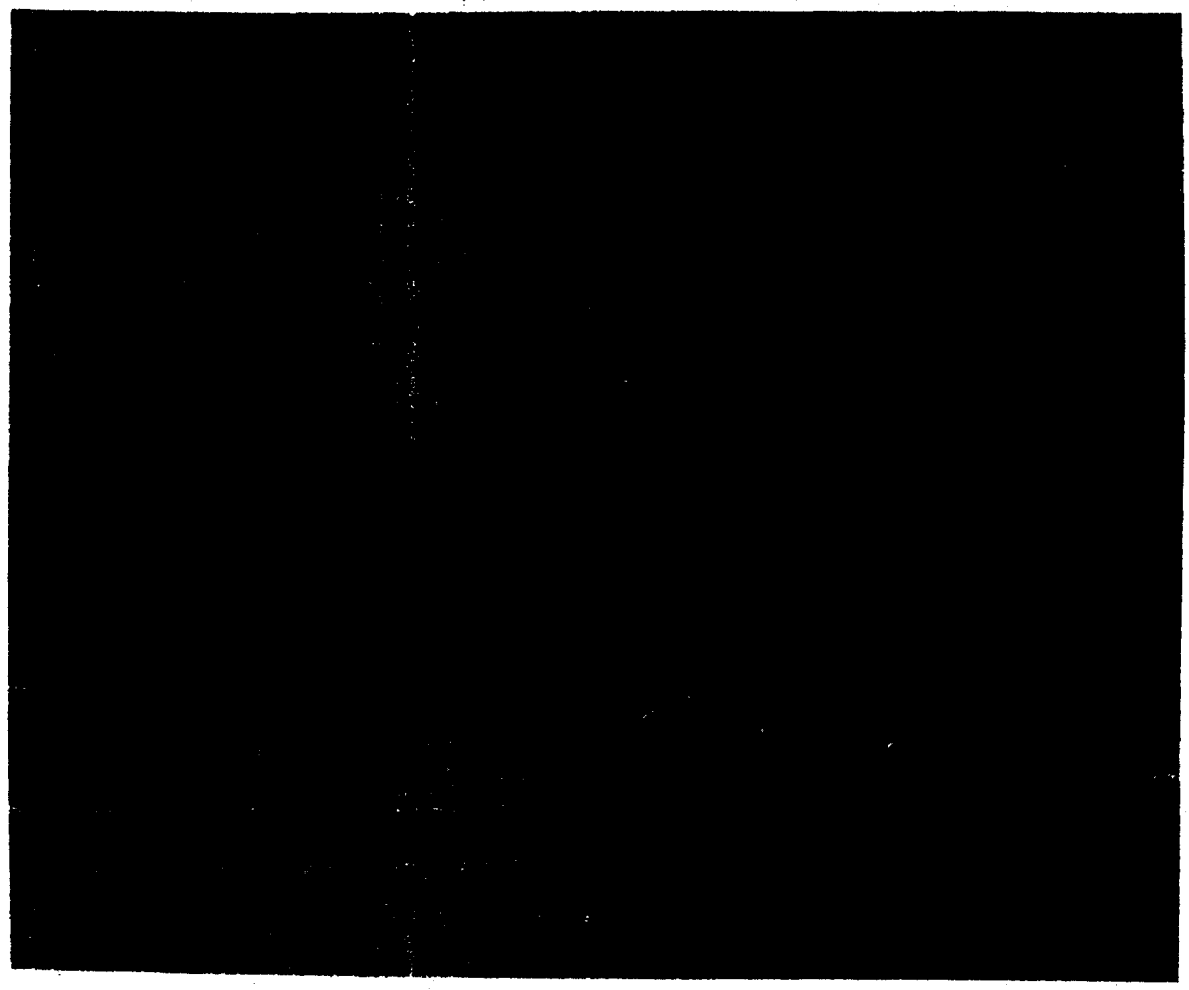
- *The DISCOVERER is the first satellite of major size (above 1,000 pounds) orbited by the United States.*

- *The DISCOVERER is the first satellite to be placed in orbit over the north and south pole.*

- *The DISCOVERER was the first satellite to be reoriented on orbit into a programmed attitude.*

- *The DISCOVERER was the first satellite to be maintained in a stable earth-referenced attitude while on orbit.*

- *The first man-made object ever recovered after a sustained period in space was the capsule ejected from a DISCOVERER satellite.*



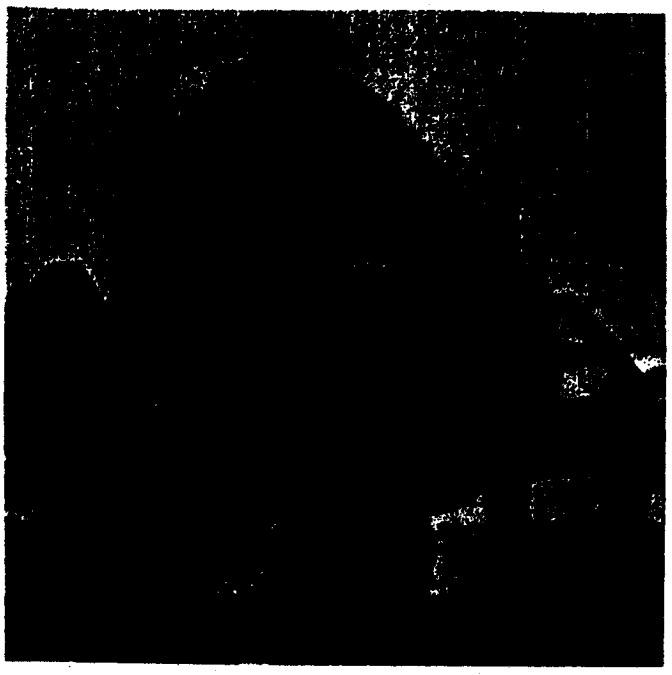


Figure 7. Loading one of the telemetry vans into a C-124 aircraft for airlift to the new DISCOVERER ground station at New Boston, New Hampshire.

data indicated a 2.75 percent shift in the power level. The engine was torn down for examination. Tests of this engine are expected to resume early in September.

- The first XLR-81Ba-9 engine (serial number 316) delivered with flight configuration hardware, has successfully completed acceptance testing. One engine (serial number 317) has been hot fired but operation was unstable and the power level dropped. Analysis disclosed that the gas generator venturies required resizing and that the oxidizer filter was improperly installed. This engine is now being prepared for final acceptance testing.

Balloon Drop Test Program

- The drop test program continued at Holloman Air Force Base with two test attempts on 4 August. The first balloon burst at 30,000 feet, before the planned drop of the Mark IV capsule, however, the equipment was recovered successfully. On the second the capsule was dropped and parachute deployment was satisfactory. The purpose of these tests was to determine if the new parachute cover would release properly during capsule deceleration. The Mark IV capsule is similar to the recently recovered capsules but contains an improved programmer and other modified components.

Facilities

- Acceptance of the air conditioning system modification for the Vandenberg Air Force Base data acquisition and processing building was made following successful completion of an equipment test run.

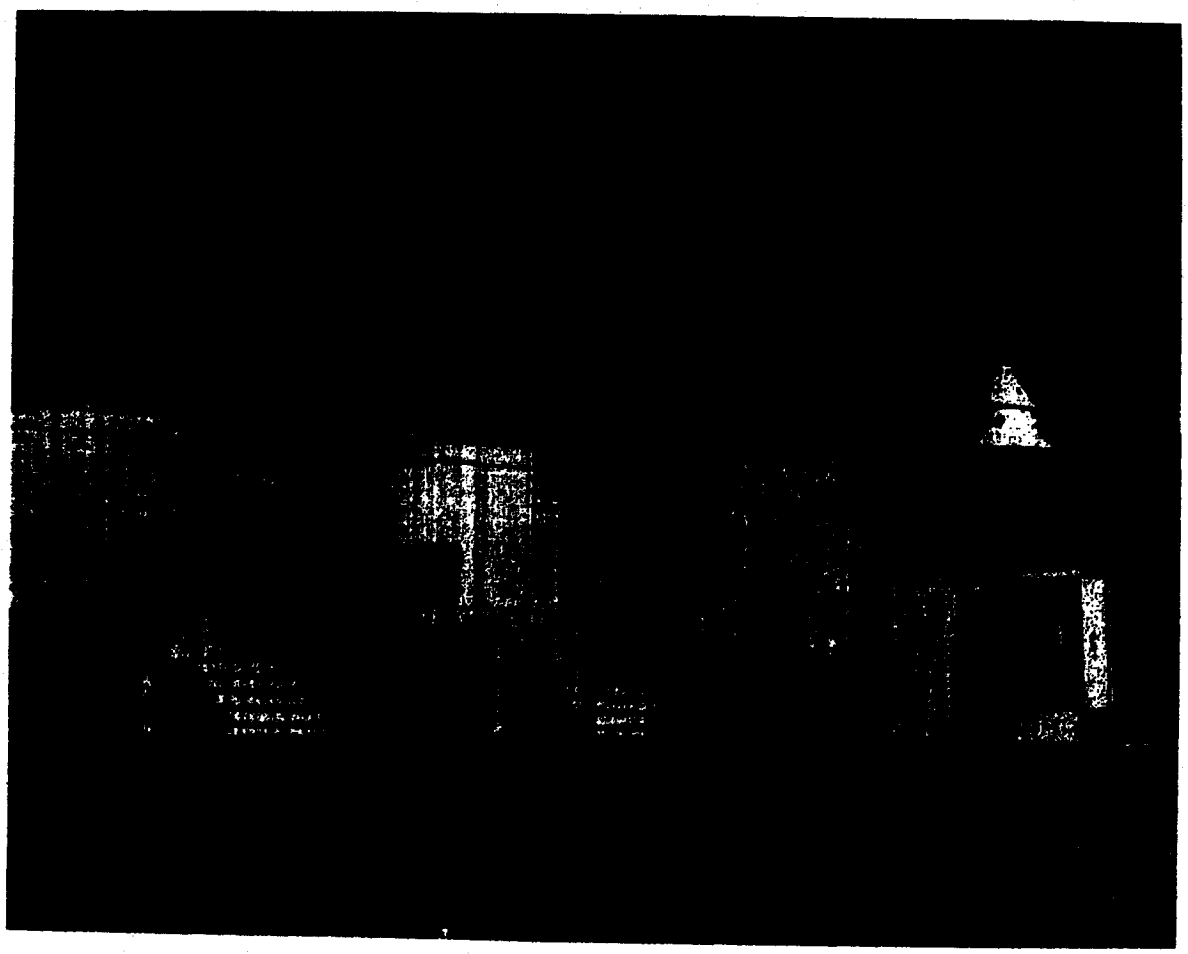
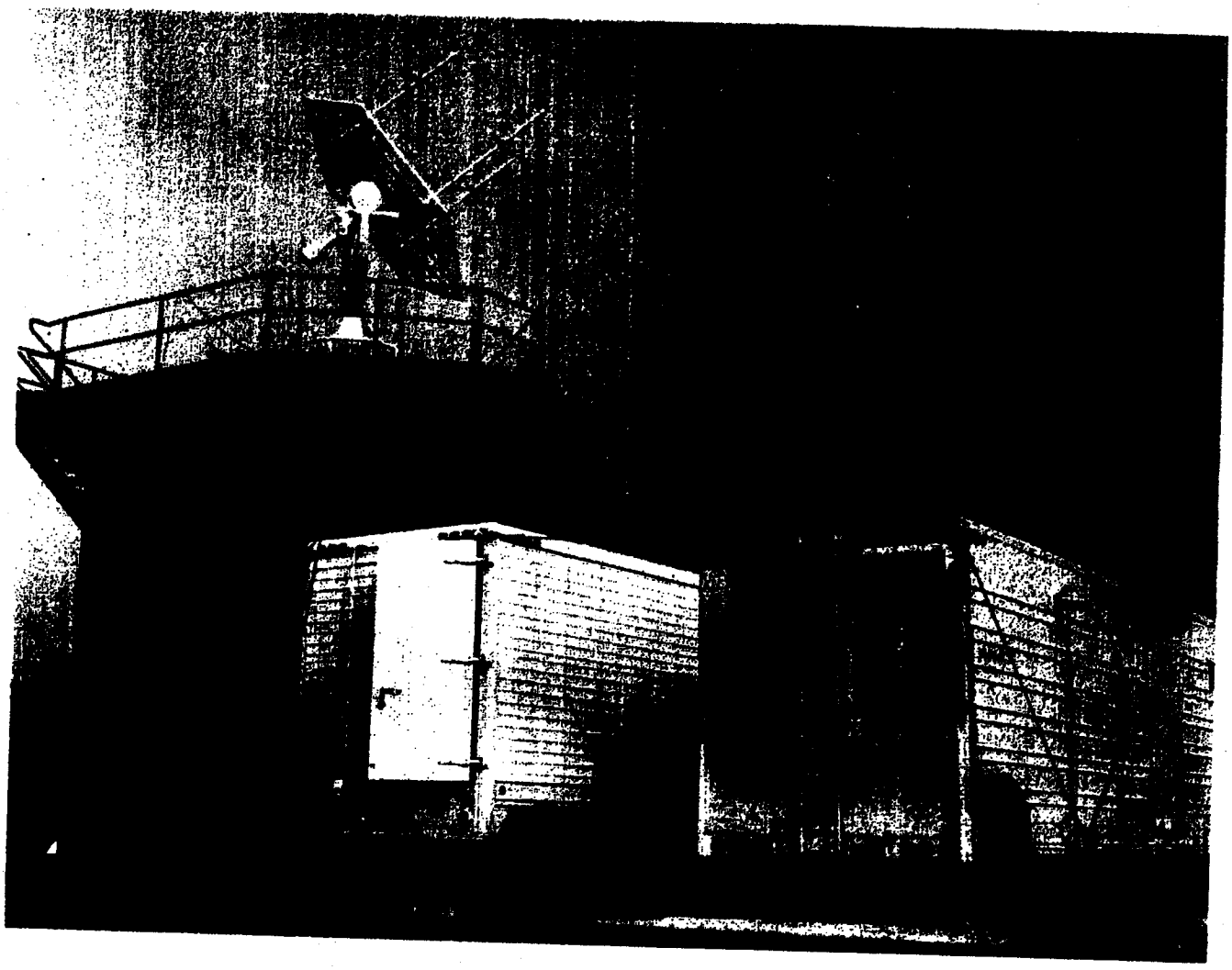


Figure 8. Vans installed alongside facilities buildings at new DISCOVERER ground station at New Boston, New Hampshire.

- Installation of a DISCOVERER ground station at the New Boston, New Hampshire, facility was completed and checked out on 17 August. Installation of equipment was started in July. The station has the capability for Verlort radar tracking, command and telemetry reception. Construction of support facilities is on schedule. The initial increment of support facilities was accepted on 2 August with the remainder scheduled for completion on 7 September.



SAMOS

BOOSTER—ATLAS ICBM	
Weight—Wet	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

SECOND STAGE	AGENA "A"	AGENA "B"
Weight—		
Inert	1,508	1,695
Payload equipment	2,605	3,058
Orbital	4,113	4,753
Impulse Propellants	6,492	12,950
Fuel (UDMH)		
Oxidizer (IRFNA)		
Other	606	718
GROSS WEIGHT (lbs.)	11,211	18,421
Engine	YLR81-Ba-5	XLR81-Ba-9
Thrust, lbs. (vac.)	15,600	16,000
Spec. Imp., sec. (vac.)	277	290
Burn Time, sec.	120	240

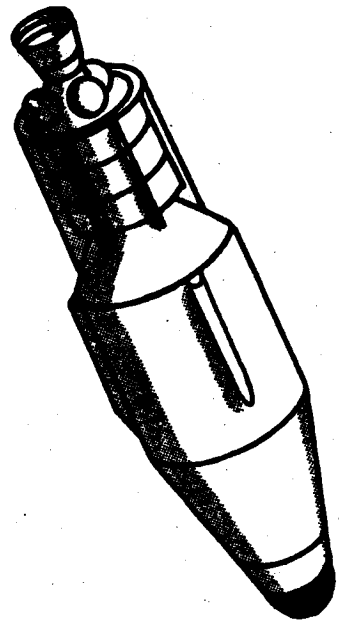
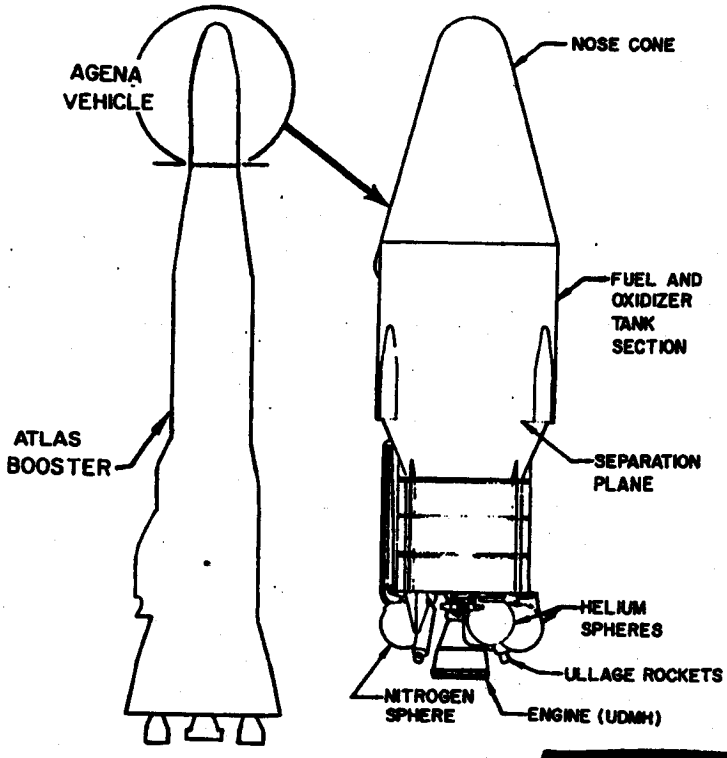


Figure 1.

Artists' concept of SAMOS satellite. Line drawing of complete flight vehicle (right) and detailed view of basic AGENA upper stage (left).



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PROGRAM HISTORY

The SAMOS Program was included in Weapon System 117L when WS 117L was transferred to the Advanced Research Projects Agency early in 1958. ARPA separated WS 117L into the DISCOVERER, SAMOS and MIDAS programs with the SAMOS objectives based on a visual and ferret reconnaissance system. On 17 November 1959 responsibility for this program was transferred from ARPA to the Air Force by the Secretary of Defense. The program was realigned on 11 August 1960 to emphasize visual reconnaissance over ferret and physical recovery of data over electronic readout.

PROGRAM MISSION

The primary mission of the SAMOS advanced reconnaissance system is to provide visual and electronic coverage of the USSR and its allied nations. Efforts include development of hardware to permit:

a. Verification of known targets, detection of unknown targets.

b. Location and evaluation of defenses.

c. Evaluation of military and industrial strength.

d. Assessment of high-yield weapons damage.

e. Reconnoitering of troop movements.

f. Location of naval forces throughout the world.

g. Determination of characteristics of enemy electronic emissions.