MILITARY SPACE PROJECTS

REPORT OF PROGRESS

FOR

QUARTER ENDED 30 SEPTEMBER 1959

ARPA

ADVANCED RESEARCH PROJECTS AGENCY

SECRET

ARPA

MILITARY SPACE PROJECTS

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QUARTER ENDED 30 SEPTEMBER 1959

Department of Defense

Washington 25, D.C.

SECRET

THE SECRETARY OF DEFENSE
WASHINGTON

October 29, 1959

Dear Mr. President:

I am forwarding herewith the Military Space Projects Report for the quarter ended September 30, 1959.

The DISCOVERER V satellite was launched successfully into orbit from the Pacific Missile Range on August 13, 1959. DISCOVERER VI, launched on August 19, 1959, also successfully achieved orbit. However, due to malfunction of recovery aids, the attempts to recover the re-entry capsules of both satellites were unsuccessful. The next DISCOVERER launch is scheduled for November 3, 1959.

[redacted]

With great respect, I am

Faithfully yours,

(Signed) Thomas S. Gates
Acting

1 Incl.:
Report
cc: Members of the National Aeronautics and Space Council

The President
The White House

ADVANCED RESEARCH PROJECTS AGENCY
WASHINGTON 25, D. C.

October 28, 1959

MEMORANDUM FOR THE SECRETARY OF DEFENSE

SUBJECT: Progress Report on Military Space Projects for Quarter Ended September 30, 1959

This transmits the Military Space Projects Report for the quarter ended September 30, 1959.

Highlights of major events occurring during the quarter are covered briefly in the attached draft of your letter which will transmit the report to the President.

Roy W. Johnson
Dep. Director

1 Incl.:
Report, subject
as above

FOREWORD

The previous issue of this report gave considerable attention to the background and objectives of the respective Military Space Projects. In this and future issues, such background material will be held to a minimum and emphasis will be placed on progress attained during the three months covered by the report.

It is suggested, therefore, that the June 30, 1959, issue be retained as a more complete reference on the background and objectives of the Space Projects.

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[redacted]

PROGRESS HIGHLIGHTS

During the Quarter Ended September 30, 1959

On August 13, 1959, DISCOVERER V was successfully launched into orbit from the Pacific Missile Range. The recoverable capsule separated as planned. However, due to temperature conditions in the capsule, the recovery aids failed to function and the recovery forces failed to locate the capsule. DISCOVERER VI, launched on August 19, also achieved orbit. Due to malfunction of recovery aids, however, no positive indication of capsule re-entry was obtained.

In the SAMOS (reconnaissance satellite) Project, an analysis of satellite operational coverage has been completed. The analysis has yielded data on the frequency of coverage of a target by a single satellite and on the number of satellites required for 100% coverage of the earth's surface.

[redacted]

[redacted]

TOPICAL SUMMARY

DISCOVERER PROJECT

(COMPONENT TESTING SATELLITE)

INTRODUCTION

Project Objectives-Development and testing of components for Military Space Technology Program.

The objectives of the DISCOVERER Satellite Program are to conduct research and development on components, equipment, instrumentation, propulsion, data processing, communications and operating techniques all dealing with military space technology.

The DISCOVERER project is characterized by an open-end series of space flights to be utilized testing classified equipments within the space environment. All of the earlier flights planned for this project will utilize the THOR IRBM Booster and the AGENA second stage.

DISCOVERER FLIGHTS

DISCOVERER V

DISCOVERER V achieves orbit.

DISCOVERER V was successfully launched on August 13, 1959, from the Pacific Missile Range. (Figure 1 shows DISCOVERER V prior to erection on launch pad.) Launch, booster performance, and orbital injection were normal. A departure azimuth approximately one degree east of the 170 degree nominal azimuth was obtained. AGENA vehicle and subsystems, except recovery aids, performed as planned.

Satellite Subsystems perform as expected.

Telemetry indicated that satellite propulsion, guidance and stabilization, and auxiliary power subsystems performed as expected during the orbital period before capsule separation. Command of the orbital timer was maintained throughout the flight.

Capsule separated, but recovery aids failed to function.

Telemetry indicates that the capsule separated as planned. However, capsule temperatures were so low that the battery used to initiate the

recovery sequence could not have functioned. The failure was attributed to this temperature condition. (Figure 2 shows a view of a re-entry capsule.)

Recovery forces fail to locate capsule.

The expected capsule re-entry point was shifted 88 miles northward during the last 85 minutes before separation. Only the aircraft were able to redeploy in time for capsule descent. The recovery forces failed to locate the capsule.

DISCOVERER VI

DISCOVERER VI successfully launched.

DISCOVERER VI was launched successfully from the Pacific Missile Range on August 19, 1959. All launch equipment functioned as planned. Orbital tracking of the satellite was satisfactory.

Capsule re-entry point shifted.

However, intermittent malfunctions of the orbital timer command control caused the expected capsule re-entry point to shift 366 nautical miles to the south. The RC-121 aircraft were able to redeploy for the expected capsule re-entry, but the C-119 aircraft and surface vessels could not redeploy in time. No positive indication of capsule re-entry was obtained.

Recovery aids do not function.

The paint on the nose cone had been removed to raise capsule temperature, but the temperature rise was only 10 degrees, still below the 40 degrees required for successful battery operation. Since the temperature sensors in the AGENA vehicle did not react to indicate retro rocket firing, it is not known if the rocket fired.

Both flights provide invaluable data.

These flights were of great value in testing the AGENA vehicle. This satellite vehicle will be utilized with more powerful boosters in the Advanced Military Reconnaissance Satellite Programs. The AGENA performed extremely well on both flights as did the satellite propulsion system. The guidance and stabilization system, controlled by a horizon scanner, functioned as planned. The satellite reoriented to a nose-backward position as programmed on both flights and stabilization was satisfactory.

TECHNICAL STATUS

Study conducted on capsule recovery aids.

An intensive study has been conducted to determine the cause for failure of the capsule recovery aids (telemetry beacon and parachute) on DISCOVERER flights V and VI. The studies concluded:

1. Additional telemetry is required to provide positive indication of the sequential recovery occurrences.

2. To obtain this telemetry, the tracking and telemetry ship, Joseph E. Mann, must take station at a point at which it is able to track the vehicle during the time of capsule separation.

3. Temperatures in the recovery capsule must be stabilized at the desired value.

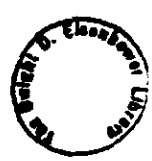
FUTURE FLIGHTS

DISCOVERER VII will be modified as indicated by the results of the study.

The recovery capsule of DISCOVERER VII is being equipped with heaters, to control capsule temperature, and with additional telemetry. This telemetry will provide positive indication of the sequence of events during capsule separation and operation of the recovery aids. The capsule beacon will be turned on prior to separation, and will broadcast throughout the entire re-entry trajectory. The new telemetry beacon will also provide a backup capability for tracking the capsule. The two surface vessels to be on station in the recovery area are being equipped with additional antennae and receivers to provide additional tracking data.

Next satellites prepared for launch.

In addition to DISCOVERER VII, four vehicles are presently undergoing functional tests at the Pacific Missile Range. These constitute presently planned launch vehicles through DISCOVERER XI.



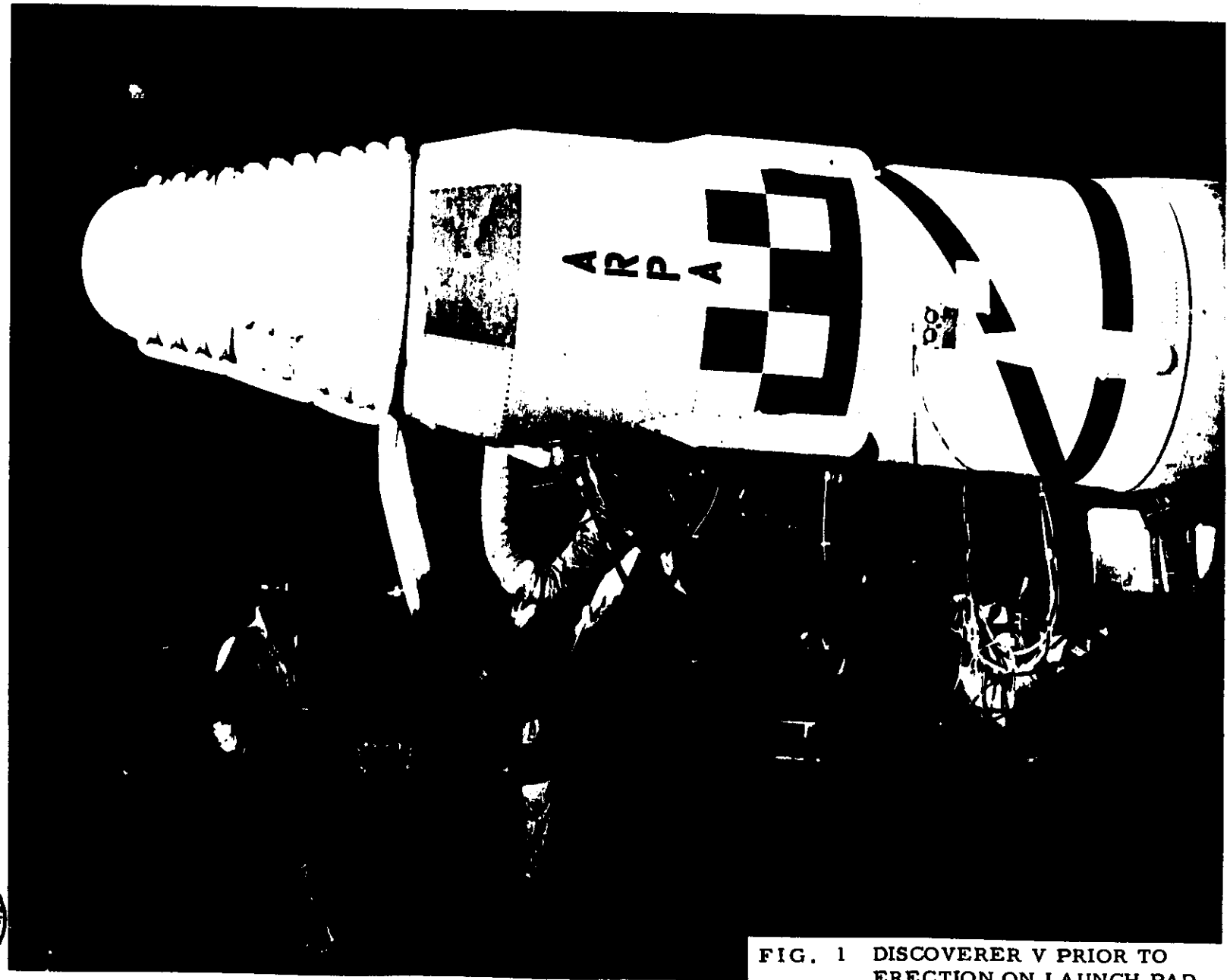


FIG. 1 DISCOVERER V PRIOR TO ERECTION ON LAUNCH PAD.

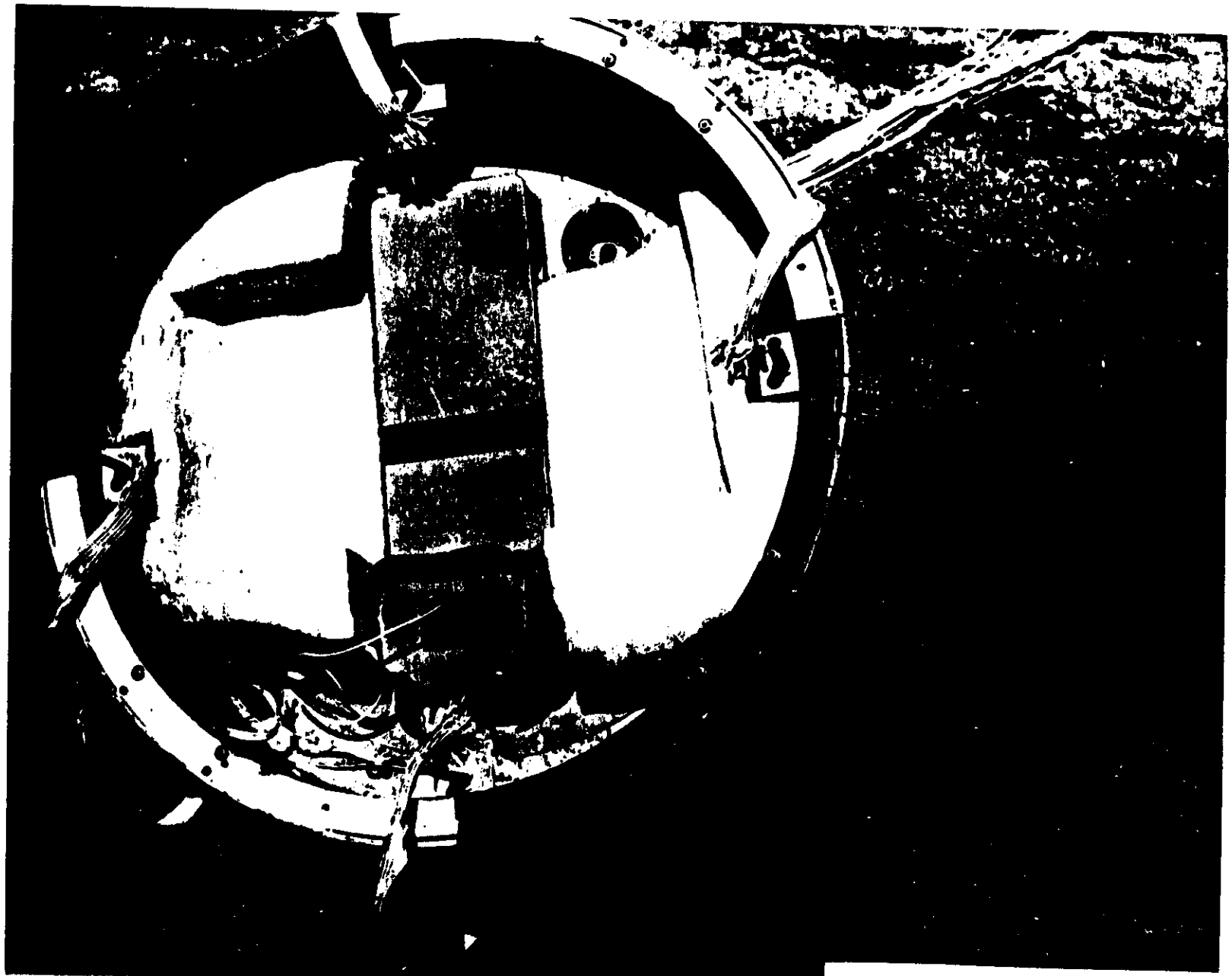


FIG. 2 RECOVERY CAPSULE

SAMOS PROJECT

(RECONNAISSANCE SATELLITE)

INTRODUCTION

SAMOS to provide both Visual (Photographic) and Ferret (Electromagnetic) Data.

The objective of the SAMOS project is the development of a reconnaissance system utilizing polar orbiting satellites to collect and process visual (photographic) data and ferret (electromagnetic) data. The SAMOS system is expected to acquire a great amount of technical intelligence regarding enemy military and industrial strength.

Acquisition of data by capsule recovery and by readout.

Two approaches are being developed for acquiring intelligence data; (1) the recovery system - for visual data - in which a capsule is ejected from the satellite and recovered, and (2) the electronic data readout system - for both visual and ferret - in which data is transmitted to ground stations.

GENERAL

Satellite coverage considerations analyzed.

An analysis of satellite operational coverage considerations was completed during the quarter. The results indicate (1) the frequency of coverage of a target by a single satellite and (2) the number of satellites required for 100 percent coverage of the earth's surface.

System design studies continue.

Design studies are continuing of a system capable of controlling and distributing data received from various simultaneously orbiting satellites.

VISUAL

Flights of first Visual payloads (E-1) to test components in space environment.

Visual system payloads are designated by the letter E. E-1 payloads are designed to use prototype components for early availability and are for the purpose of testing the validity of component design in actual space environment.

(See Figure 3) E-2 and subsequent payloads are based on progressively more sophisticated designs.

Acceptance test of first flyable E-1 payload 50 percent complete.

Acceptance testing of the first flyable prototype (E-1) payload is 50 percent complete, with delivery scheduled for November 23, 1959.

Fabrication of E-2 payloads progressing satisfactorily.

Fabrication of the first flyable E-2 prototype steerable payload, with the 36-inch focal length lens is approximately 60 percent complete. The engineering model of the E-2 payload is in final stages of development test and modification. Completion of this non-flyable, functional test model is expected by mid-October.

FERRET

Ferret system payloads to become progressively sophisticated.

Ferret system payloads are designated by the letter F. F-1 payloads will use prototype components for early availability and will be used to test the validity of component design in the space environment. F-2 and subsequent payloads are based on progressively more advanced designs.

Final acceptance of first F-1 payload near.

The first prototype F-1 payload (to be flown dually with the E-1 payload) is nearing completion of final acceptance tests. The second service test model (Figure 4) was given environmental tests. Results will determine the most desirable skin coating characteristics for maintaining optimum equipment temperature in orbit.

F-2A payload components near completion.

Fabrication of the assemblies and subassemblies of the first deliverable F-2A payload is complete except for the band 1 and band 2 receivers and the power and control unit. Testing of completed subassemblies has been started.

[redacted]

[redacted]

FACILITIES AND SITES

Facilities work at Offutt AFB placed on accelerated schedule.

Offutt AFB, Omaha, Nebraska - All SAMOS work at this base has been placed on an accelerated schedule. Equipment will be installed to provide a small interim data processing capability for the first three SAMOS flights.

Launch complex occupancy initiated at Point Arguello.

Point Arguello Launch Complexes 1 and 2 - Beneficial occupancy of Launch Complex 1 blockhouse began in August, with beneficial occupancy of the launch pad scheduled for January 1960. Beneficial occupancy of launch pad 2 is scheduled for February 1960.

Tracking station construction continues on schedule.

Vandenberg AFB Tracking and Data Acquisition Station construction is scheduled for completion on an incremental basis from October 1959 through January 1960. Completion of the various facilities of the New Boston station is scheduled on an incremental basis from February to September 1960. Plans and specifications for the technical facilities at the Ottumwa, Iowa, station are complete and ready for contract advertising.

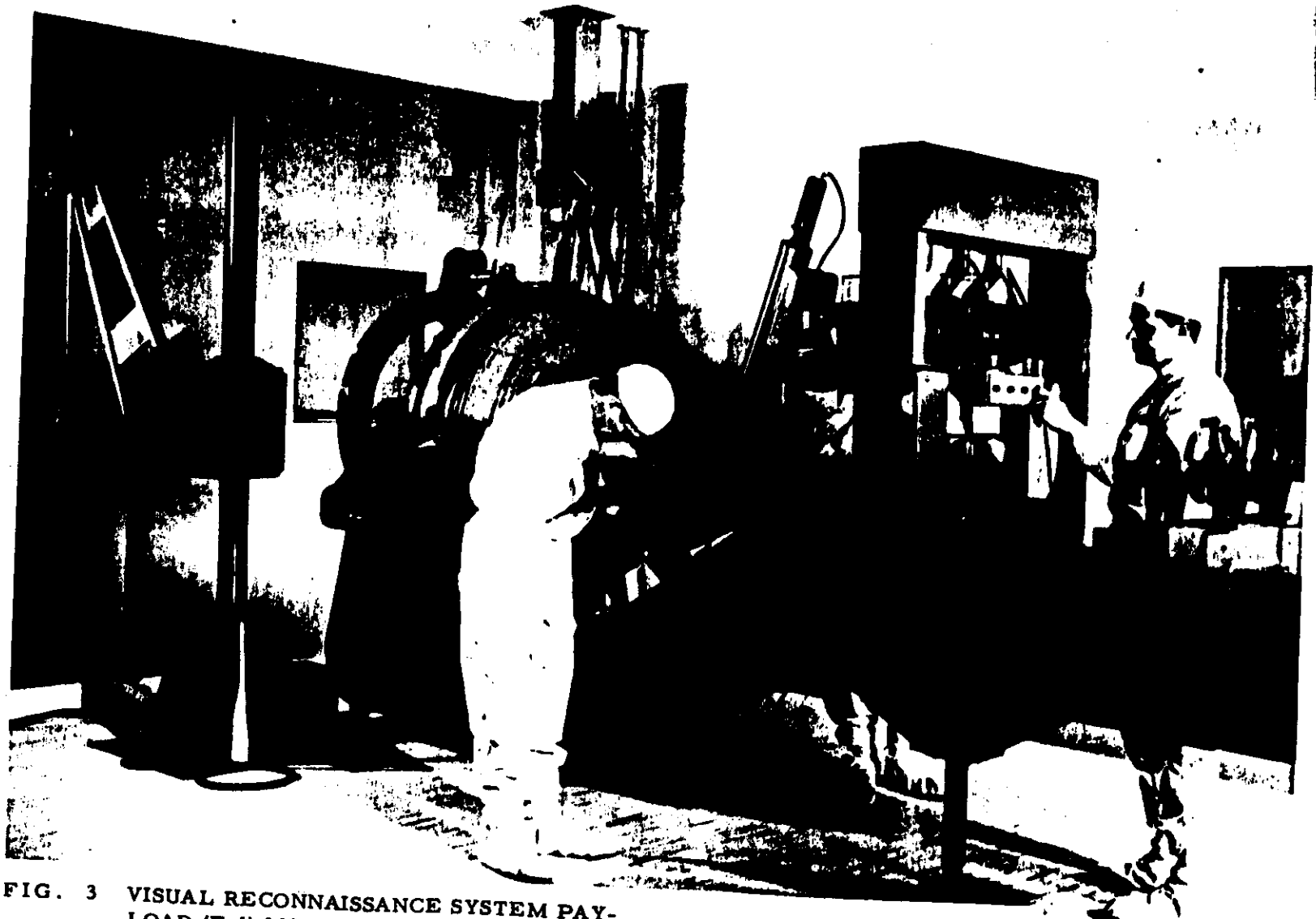


FIG. 3 VISUAL RECONNAISSANCE SYSTEM PAYLOAD (E-1) MOUNTED ON 40-INCH COLLIMATOR.

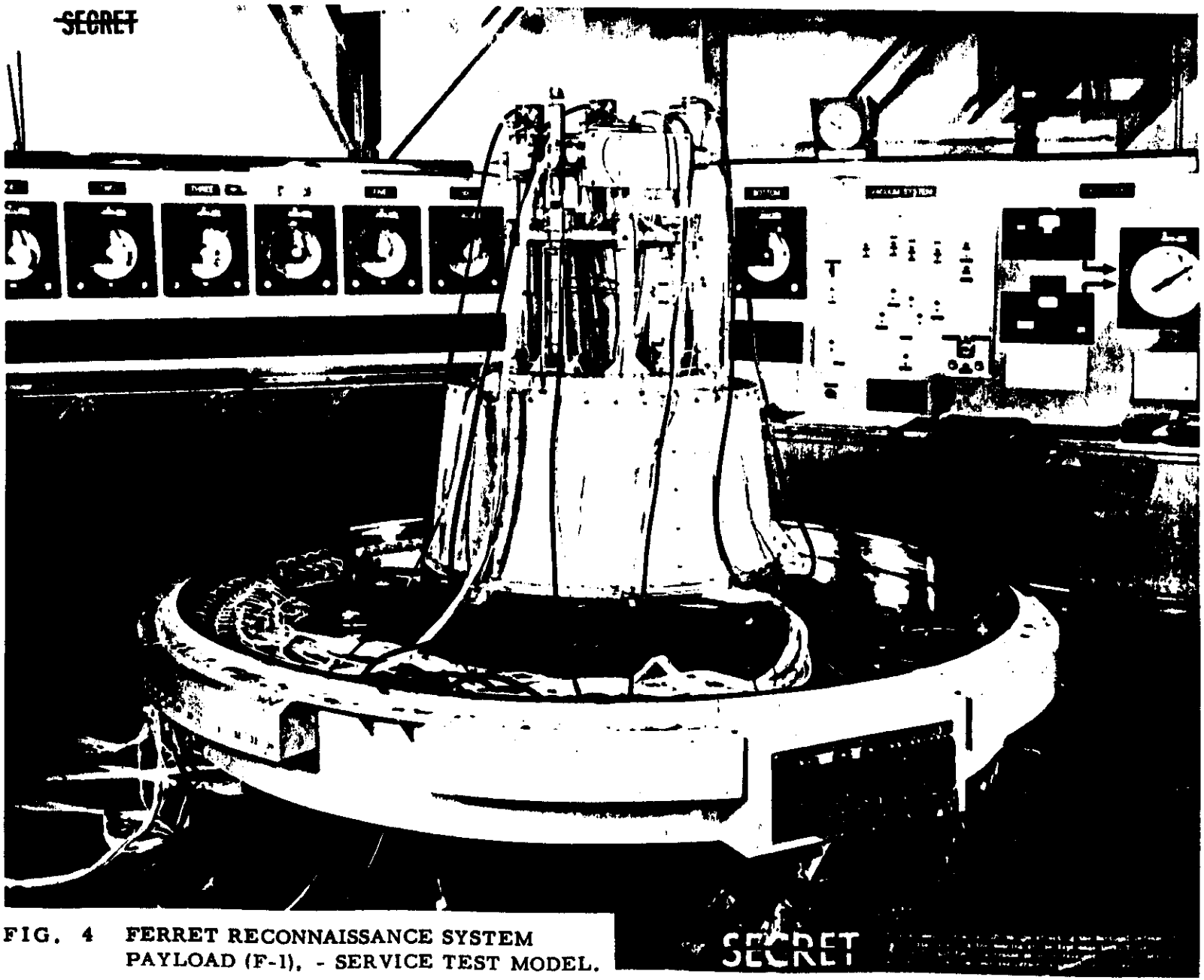


FIG. 4 FERRET RECONNAISSANCE SYSTEM PAYLOAD (F-1), - SERVICE TEST MODEL.

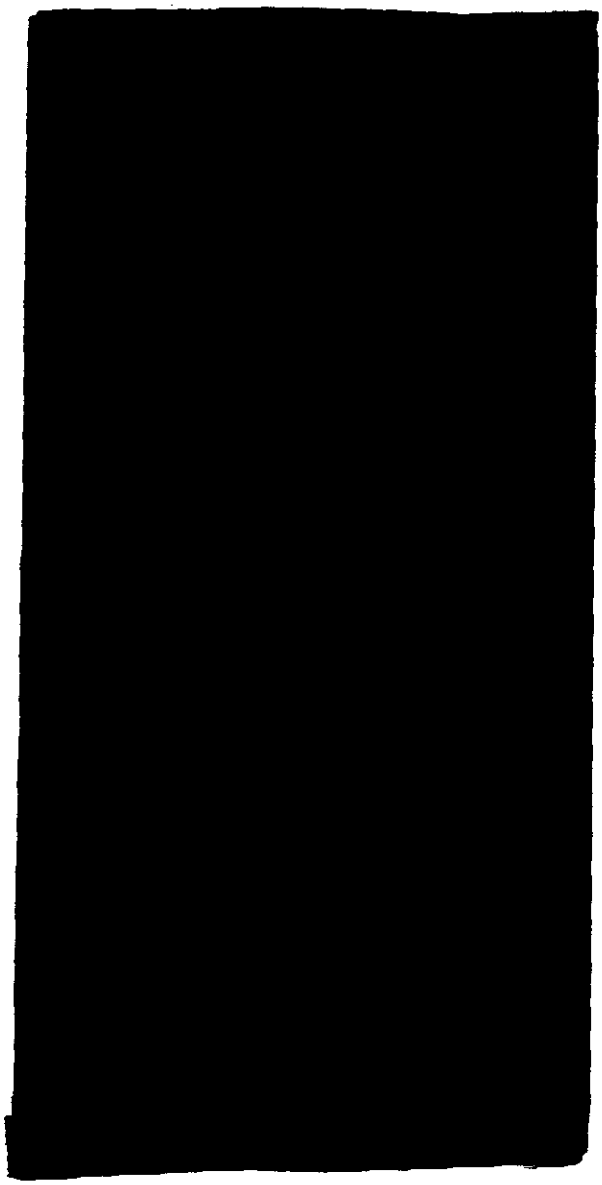
NOTICE OF REMOVED PAGES

Pages 9 through 17 and Figures 5 through 8 are not provided because their full text does not contain CORONA, ARGON, LANYARD programmatic information.

DOD SPACE TRACKING, READOUT AND COMPUTING FACILITIES

The map shown in Figure 9 reflects the tracking, readout and computing facilities utilized in ARPA Projects.

In most cases, these facilities serve several functions in the general areas of tracking, receiving, transmitting, read-in, read-out, communications and computing. For the purpose of clarity, however, the stations appearing on the map are listed below under the system for which they perform their primary or major function.

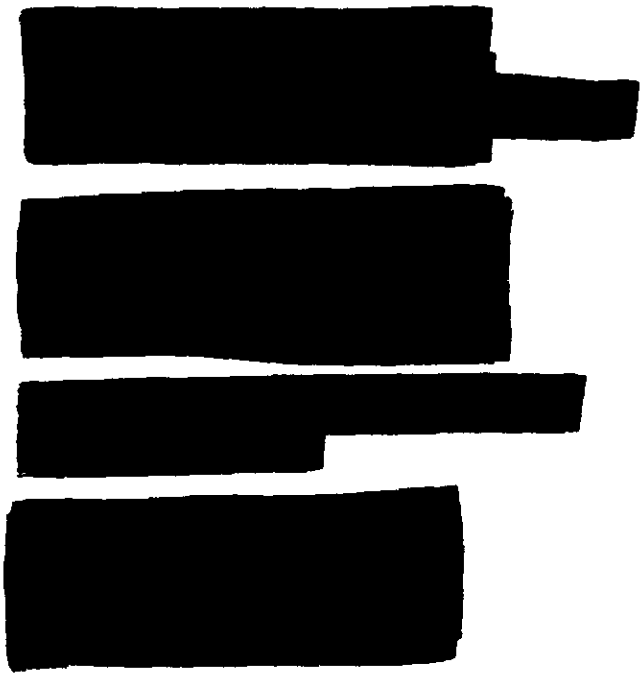


Discoverer, Samos and
R&D Programs

Point Mugu, California

1 Ship Station

Palo Alto, California
Fort Greeley, Alaska



NOTICE OF REMOVED PAGES

Pages 19 through 27 and Figures 10 and 11 are not provided because their full text does not contain CORONA, ARGON, LANYARD programmatic information.

STATUS OF FUNDS

(In Millions)
September 30, 1959

Project	Funded (ARPA Orders Issued) FY 1959 & Prior Years	Amounts Programmed FY 1960	Cumulative Obligations	Cumulativ[e] Expenditu[r]...
DISCOVERER [1/]	[redacted]	[redacted]	[redacted]	[redacted]
SAMOS [1/]	105.6	152.4	133.6	81.0
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]				
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

1/ Excludes [redacted] programmed during Fiscal Year 1958 and prior years for WS 117 Program. DISCOVERER, SAMOS and [redacted] projects are outgrowths of WS 117L

2/ [redacted] funded as of September 30, 1959.

~~SECRET~~

DOD SATELLITE LAUNCH SCHEDULE

Program	Vehicle	Launch Site	FY 1960 1959 Quarters 1 2 3 4	FY 1960 1960 Quarters 1 2 3 4	FY 1961 1961 Quarters 1 2 3 4
1. DISCOVERER	Thor-Agena	PMR	5	4 5 6 2	
2. Reconnaissance (SAMOS)	Atlas-Agena	PMR		2 1 3	1 4 4 3
[redacted]					

MILITARY SPACE PROJECTS

FLIGHT DATA ON

SATELLITES ACHIEVING ORBIT

DISCOVERER FLIGHTS

DISCOVERER V (192 - 1029)

Date Launched: August 13, 1959
Booster: THOR #192, IRBM
Gross Weight: 117,153
Payload Weight: 300 lbs.
Perigee: 136 Statute Miles
Apogee: 450 Statute Miles
Eccentricity: .037
Period: 94 minutes
Payload: Mark II biomedical recovery capsule.

Subsystems: Airframe, Propulsion, Auxiliary Power, Guidance and Biomedical
Second Stage: DISCOVERER Vehicle
On-Orbit Weight: 1,745 lbs.
Propulsion: XLR81-Be-5 Engine
Fuel: Unsymmetrical Di-Methyl Hydrazine/Inhibited Red Fuming Nitric Acid.
Flight Characteristics: Ballistic trajectory to orbit.

DISCOVERER VI (200 - 1028)

Date Launched: August 19, 1959
Booster: THOR #200, IRBM
Gross Weight: 117,424
Payload Weight: 300 lbs.
Perigee: 139 Statute Miles
Apogee: 537 Statute Miles
Eccentricity: .046
Period: 95.2 minutes
Payload: Mark II biomedical recovery capsule

Subsystems: Airframe, Propulsion, Auxiliary Power, Guidance and Biomedical
Second Stage: DISCOVERER Vehicle
On-Orbit Weight: 1,730 lbs.
Propulsion: XLR81-Be-5 Engine
Fuel: Unsymmetrical Di-Methyl Hydrazine/Inhibited Red Fuming Nitric Acid
Flight Characteristics: Ballistic trajectory to orbit.