



PRO

GRESS

DECEMBER

ARPA

ADVANCED RESEARCH PROJECTS AGENCY

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ARPA

MILITARY SPACE PROJECTS



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QUARTER ENDED 31 DECEMBER 1959

Department of Defense

Washington 25, D.C.

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ADVANCED RESEARCH PROJECTS AGENCY
WASHINGTON 25, D. C.

25 January 1960

MEMORANDUM FOR THE SECRETARY OF DEFENSE

SUBJECT: Progress Report on Military Space Projects for Quarter
Ended December 31, 1959


This transmits the Military Space Projects Report for the quarter ended December 31, 1959.

During the past quarter, decisions were made to transfer a number of military space projects from the management cognizance of the Advanced Research Projects Agency. As a result of these transfers, it has been determined that future quarterly reports on military space projects will be prepared by the Office of the Director of Defense Research and Engineering. ARPA and the military services will furnish necessary data to ODDR&E on space projects under their cognizance.

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.

1 Inclosure:
Quarterly Report on
Military Space Projects




A. W. Betts
Brig. General, USA
Director

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THE SECRETARY OF DEFENSE
WASHINGTON

January 26, 1960

Dear Mr. President:

I am forwarding herewith the Military Space Projects Report for the quarter ended December 31, 1959.

The DISCOVERER VII was launched successfully into orbit from the Pacific Missile Range on November 7, 1959. Due to a power failure, the vehicle tumbled, thus making it impossible to eject the recovery capsule. DISCOVERER VIII, launched on November 20, 1959, also achieved orbit. Because the orbital period was greater than planned, the recovery capsule was ejected on the fifteenth pass. Aircraft and a surface ship tracked the capsule beam after ejection, but the signal was lost after a short time and no contact was made. The next DISCOVERER launch is scheduled for January 29, 1960, following extensive modifications aimed at correcting earlier problems.

The second navigation satellite, TRANSIT, is scheduled to be launched in April 1960 from the Atlantic Missile Range.

In the SATURN Project (clustered booster), configuration of the upper stages has been approved and it has been determined that all upper stages will be fueled with hydrogen-oxygen propellants. Testing of all H-1 engines has been successfully completed, and the full eight-engine captive test firing is scheduled for April 1960.

With great respect, I am

Faithfully yours,

/s/ James H. Douglas
Deputy



1 Inclosure:
Military Space Projects Report

The President

The White House

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PROGRESS HIGHLIGHTS

During the Quarter Ended December 31, 1959

On November 7, 1959, DISCOVERER VII was successfully launched into orbit from the Pacific Missile Range. Due to a cycle power failure, the stabilization system became inoperative and the vehicle tumbled. It was impossible, therefore, to initiate the sequence to eject the recovery capsule. DISCOVERER VIII, launched on November 20, also achieved orbit. The orbital period, however, was greater than planned and the recovery capsule was ejected on the fifteenth pass. Nine aircraft and a surface ship tracked the capsule beacon after ejection, but the signal was lost after a short time and no further contact was made.

In the SAMOS (reconnaissance satellite) Project, modification and checkout of the AGENA second stage has been completed. This vehicle will be used, together with an ATLAS booster, for the first SAMOS launch, now scheduled for June 1960.

The MIDAS (Missile Defense Alarm System) Project flight schedule has been revised to attain higher altitude flights earlier in the development program. Flight 3 is now scheduled to be launched into a 2,000-mile polar orbit.

The second TRANSIT vehicle (navigation satellite) is scheduled to be launched in April 1960 from the Atlantic Missile Range.

The communications satellite project (NOTUS) is undergoing re-evaluation with a view toward the possible elimination of one or more intermediate hardware stages originally planned in the development of the 24-hour satellite - DECREE.

The satellite detection system, under Project SHEPHERD, continues to track satellites in space. DISCOVERER VII came down on November 26, and DISCOVERER VIII is still in orbit. A decision has been made to phase out of the tracking network the doppler system complex, known as DOPLOC.

In the SATURN Project (1.5 million pound cluster engine), configuration of upper stages has been approved. It has also been decided that all upper stages will be fueled with hydrogen-oxygen propellants. Testing of all H-1 engines has been successfully completed, and the full eight-engine captive test firing is now scheduled for April 1960.

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During the quarter, decisions were made to transfer military space projects from the management control of the Advanced Research Projects Agency. Projects DISCOVERER, MIDAS and SAMOS have been transferred to the Department of the Air Force. The SATURN project is being transferred to the National Aeronautics and Space Administration. Future reassignments to the military services will be made on the TRANSIT, NOTUS, and SHEPHERD Projects and portions of the LONGSIGHT Project.



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TOPICAL SUMMARY

DISCOVERER PROJECT

(COMPONENT TESTING SATELLITE)



INTRODUCTION

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

The objective 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

DISCOVERERS VII and VIII

DISCOVERERS VII and VIII launched into orbit successfully.

During the quarter DISCOVERERS VII and VIII were launched and placed into orbit. DISCOVERER VII was launched on November 7 (see Figure 1) and DISCOVERER VIII was launched on November 21 both from the Pacific Missile Range. Lift off and first stage trajectory were normal and accurate in both flights and orbital status was achieved, although the DISCOVERER VIII apogee was much higher than planned. These flights represent the fifth and sixth AGENA vehicles to be successfully injected into orbit since February 1959.

Payload recovery efforts unsuccessful.

Although both flights attained orbit successfully, neither of the payload recovery attempts was achieved. Initial telemetry received on the first pass of DISCOVERER VII indicated that a 400 cycle power failure had occurred. As a result, the stabilization system was inoperative and the vehicle was tumbling. Also it was impossible to

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initiate the ejection sequence. Subsequent investigations indicate that the power failure was probably caused by the load limiter. Because of the greater than planned orbital period, the DISCOVERER VIII capsule was ejected on the fifteenth pass. Nine C-119 aircraft and a surface ship tracked the capsule beacon after ejection, but the signal was lost after a short time and no further contact was made. Subsequent analysis indicated that the vehicle guidance system "hunting" for a stable attitude at the greater than planned apogee resulted in premature exhaustion of control gas. The vehicle, therefore, was improperly oriented at the time of capsule ejection.

DISCOVERER IX

Launch of DISCOVERER IX set for late January.

Launch of DISCOVERER IX is scheduled tentatively in late January. The exact flight date depends upon completion of various planned modifications and delivery of the payload to Vandenberg AFB.

STATUS OF AGENA VEHICLE

Final AGENA "A" vehicle in modification.

The last three AGENA "A" vehicles for the initial DISCOVERER flight design program underwent hot firing at Santa Cruz Test Base (SCTB). Two of these were accepted by the Air Force on November 17 and are now at Vandenberg AFB.

First AGENA "B" vehicle ready for checkout.

The first AGENA "B" vehicle in the follow-on program was essentially ready for modification and checkout at the close of this reporting period. This vehicle has an engine restart capability and includes integral propellant tanks of double the AGENA "A" capacity to permit extended engine burning time.

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BIOMEDICAL PROGRAM

Biomedical capsule thermal tests conducted.

Thermal testing of a special biomedical capsule, instrumented to determine thermal resistances throughout the capsule system, was completed on November 25, 1959, in the High Altitude Temperature Simulator. The tests were conducted to determine thermal profile extremes for the biomedical capsule (primate passenger) under anticipated orbital conditions. Initial results indicate that simplification of the system may be feasible. However, it appears that additional water evaporator capacity may be required to satisfy extreme heat flux conditions.

Live specimen testing to be resumed in January.

Biomedical testing with a live primate is expected to be resumed in January, following capsule modifications now being made. Modifications include correction of an air conditioning deficiency which caused the abort of the last test with a live specimen.

First increment of Test Center completed.

FACILITIES

Increment one of the Satellite Test Center (formerly Development Control Center) Sunnyvale, California, was completed and accepted from the construction agency during December. Increment two is scheduled for completion in June 1960.



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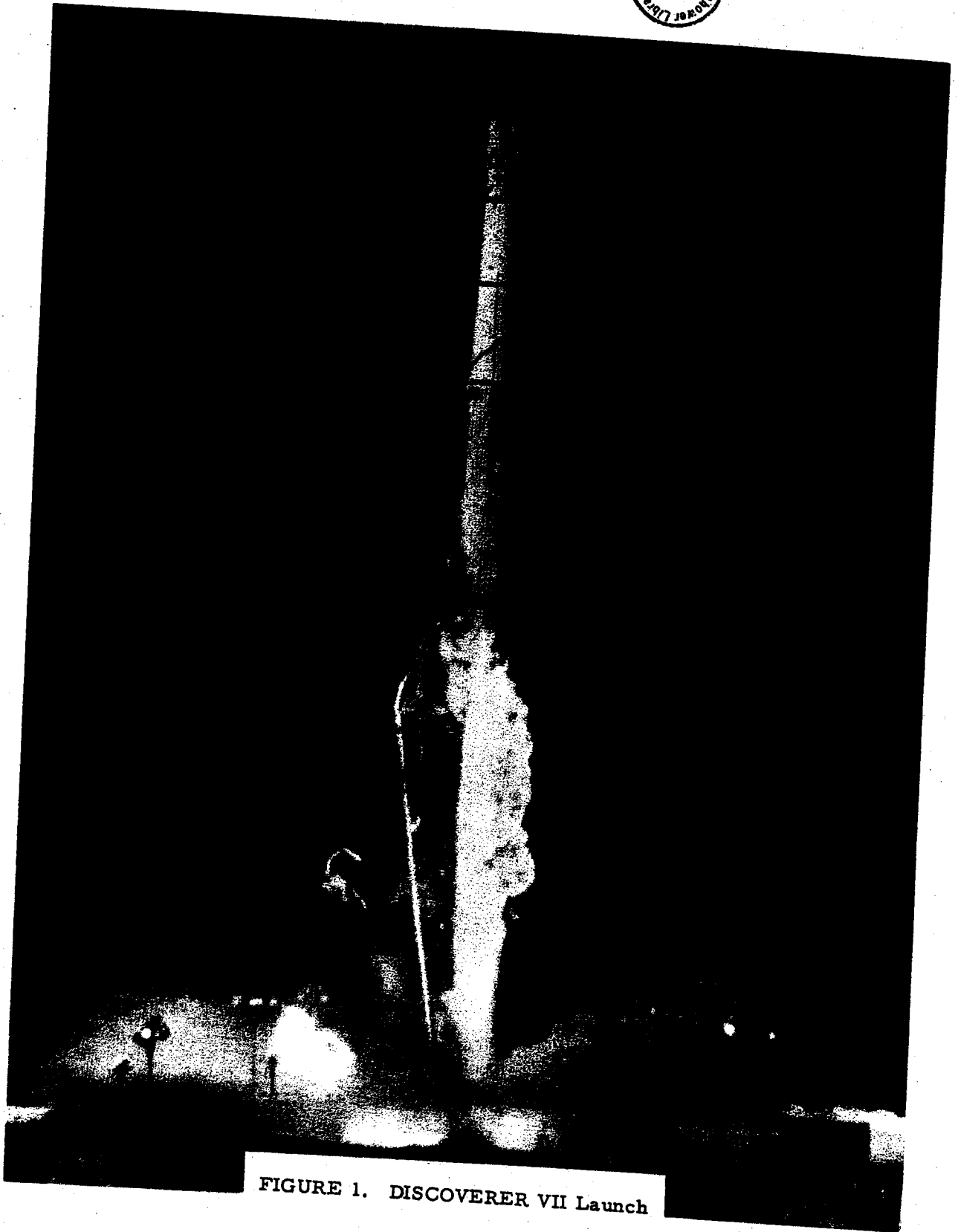


FIGURE 1. DISCOVERER VII Launch

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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.

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

AGENA vehicle for first SAMOS flight nears completion.

Stacking of the major components of the AGENA second stage for the first SAMOS flight vehicle, shown in Figure 2, was completed on November 6, 1959. Completion of modification and checkout is scheduled for January 1, 1960. Subassembly of the second AGENA vehicle is progressing on schedule. The first SAMOS launch is now scheduled for June 1960.

VISUAL RECONNAISSANCE SYSTEMS

First payload (E-1) operated successfully under orbit conditions.

Following comprehensive testing, the first flyable (E-1) payload was operated successfully for 72 hours under simulated orbital conditions. During subsequent vacuum tests, however, improper installation of a clamping ring assembly resulted in the payload pressure shell being damaged beyond repair. The payload has been diverted for type test use only. Work on the second deliverable E-1 payload has been accelerated for use as the first flight article. Delivery is scheduled for January 15 1960, to Lockheed.

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E-1 payload support equipment installation complete.

E-2 payload progress on schedule.

Extensive deliveries of support equipment made at Vandenberg AFB.

Recoverable system parameters being established.

F-1 payloads in modification and checkout area.

All E-1 payload support equipment has been installed in the Sunnyvale checkout area. Personnel are being trained in operation and maintenance of the equipment in advance of the January delivery of the first flyable E-1 payload.

Component fabrication and subassembly of the two flyable E-2 payloads with more sophisticated design are proceeding on schedule. Design studies are being made to reduce weight and improve performance of subsequent payloads.

Two primary record film processors and auxiliary equipment have been delivered to Vandenberg AFB. Installation will be made in the Missile Assembly Building (for payload checkout) beginning January 5, 1960; and at the tracking and data acquisition station (for orbital test operations) beginning January 12. Other items delivered to Vandenberg AFB include payload handling equipment, payload test support equipment, oscillograph record camera, and 35mm quality evaluation viewer.



Final design parameters are being established for the E-5 (recoverable photographic reconnaissance system). As presently planned, the E-5 payload will use a mirror system to permit mounting of the panoramic camera lens horizontally while in orbit. The system will use capsule recovery of both the film and camera. Recovery will be initiated no later than thirty days after launch, and the system will include the capability for command recovery any day prior to the thirty day lifetime limit. Recovery will be effected in the Hawaii area on a north-to-south pass. Launch will be from the Pacific Missile Range.

FERRET RECONNAISSANCE SYSTEMS

The first two F-1 payloads were delivered to Lockheed on October 23, 1959. These units are in the modification and checkout center undergoing functional testing and preparations for installation

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in the vehicle. The third F-1 payload is undergoing systems testing and is scheduled for delivery to the Lockheed Missile and Space Division on January 29, 1960.

Training courses completed.

Training courses on the characteristics and operation of the F-1 payload and ground support equipment were completed for modification and checkout personnel and for personnel who will be assigned to Vandenberg AFB.

FACILITIES

Launch stands near completion.

Beneficial occupancy date for Launch Stand No. 1, Point Arguello, California, except for the propellant loading system, is January 1960. Final completion of Stand No. 1 is scheduled for March and Stand No. 2 for April.

Plans and specifications for the Technical Support Building at Vandenberg AFB have been completed. Preliminary concept studies for a Technical Support Building at Point Arguello were completed on December 14, 1959.



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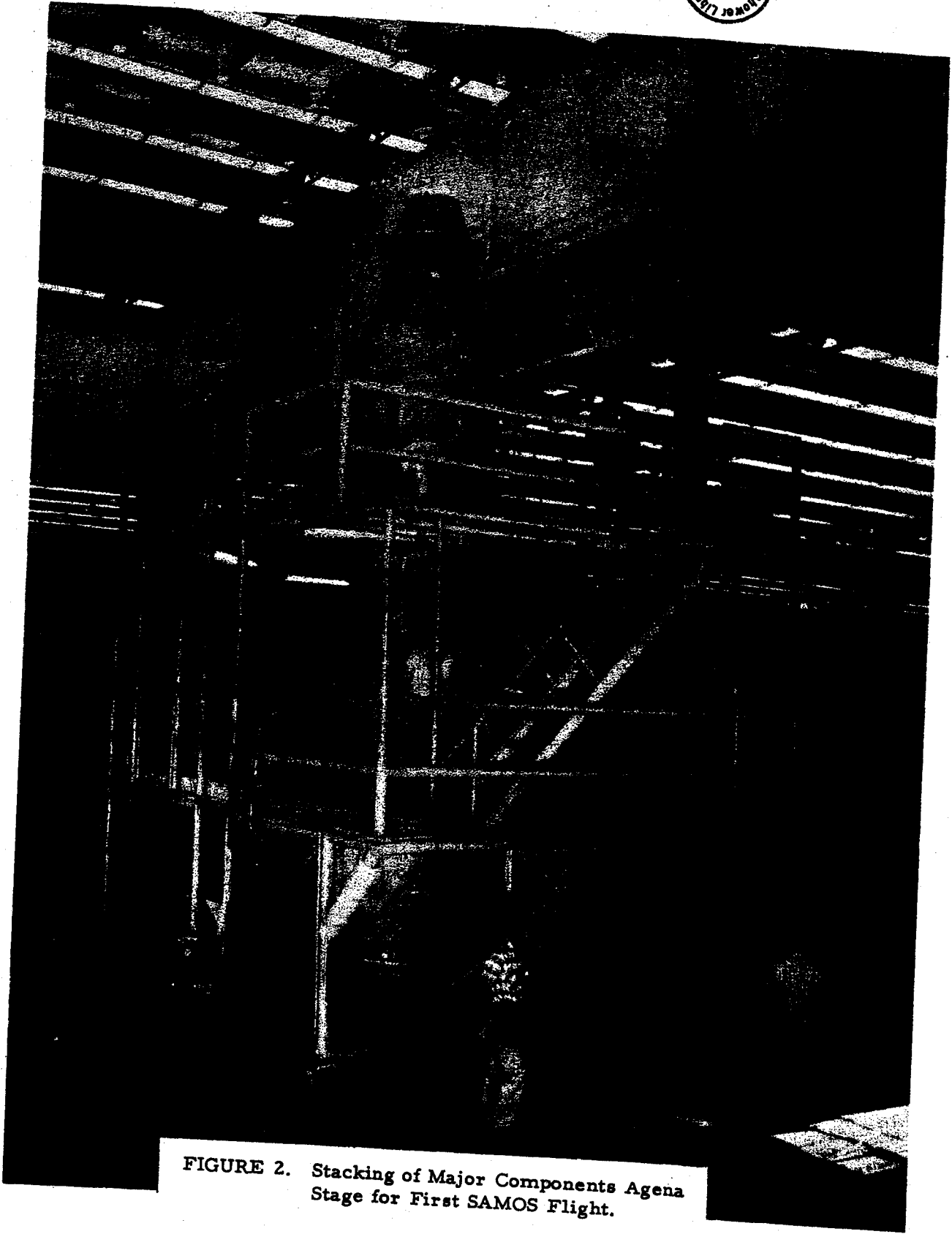


FIGURE 2. Stacking of Major Components Agena Stage for First SAMOS Flight.

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MIDAS PROJECT

(VERY EARLY WARNING SATELLITE)

INTRODUCTION

MIDAS will provide early warning of ballistic missile attack.

The MIDAS project is aimed toward establishing a reliable, operational satellite-borne missile alarm capability in the 1962 time period. The MIDAS project (Missile Defense Alarm System) will place a series of satellites around the earth in polar orbits. These will carry payloads consisting of infrared detection scanners capable of detecting emanations from ballistic missiles being launched, as the missiles rise above the atmosphere.

CURRENT STATUS



GENERAL

Flight schedule revised to permit earlier attainment of objectives.

The MIDAS flight schedule was revised early in the quarter to realize higher altitude flights earlier in the development program. Commencing with Flight 3, MIDAS satellites will be launched into circular polar orbits of 2,000 nautical miles altitude. The 1,000 nautical mile orbit flight has been eliminated. Flights 1 and 2 remain unchanged at 261 nautical miles, with Flight 1 scheduled in February. The slippage reflected in this date was caused by delay in obtaining occupancy of an Atlantic Missile Range launch pad.

MIDAS COMPONENTS

AGENA vehicle being prepared at AMR for first flight.

The AGENA second stage vehicle for the first MIDAS flight test vehicle was hot fired at Santa Cruz Test Base (SCTB) on October 23, 1959. On November 30, 1959, a successful full-duration hot firing was conducted. It is now being prepared for launch at the Atlantic Missile Range. The AGENA vehicle for the second flight is being prepared for acceptance hot firing at Santa Cruz.

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Common design possible for MIDAS and SAMOS airframes.

Aerojet-General equipment deliveries completed.

Baird Scanner unit thermal tests conducted.

Use of pyrotechnic targets evaluated.

Integration of MIDAS/BMEWS facilities considered.

Summary of construction progress for MIDAS program facilities.

Design studies conducted during the quarter indicate the feasibility of a common MIDAS/SAMOS airframe design (from the forward end of the forward equipment rack aft) for flights 3 and subsequent. Equipment installations need not be interchangeable.

On December 14, 1959, the fourth and final unit of the initial (Aerojet-General) scanner configuration was delivered to the Lockheed Missile and Space Division following acceptance testing. The second unit and the data link van are at the Atlantic Missile Range. (An Aerojet-General infrared scanner is shown in Figure 3.)

High altitude temperature simulation tests of the thermomechanical model of the Baird-Atomic scanner unit were conducted early in December.

Detailed test plans are being formulated for using pyrotechnics on the ground for MIDAS target. Minimum permissible burning time would be 30 seconds, assuring at least one "look" by the orbiting MIDAS scanner in the full scan mode.

FACILITIES



A preliminary determination has been made that Ballistic Missile Early Warning forward site computers were too heavily loaded to permit the processing of raw MIDAS data; that MIDAS could use BMEWS communications routes but not necessarily the same terminal equipment; and that mutual electronic interference considerations made it impractical for MIDAS and BMEWS to share forward site buildings.

1. North Pacific Station, Alaska. Construction of the various facilities is on schedule with completion planned on an incremental basis between June and October 1960.

2. North Atlantic Station. Studies are being continued to locate a suitable site for this station.

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3. East Atlantic Station. Action has been initiated to obtain use of RAF Station Kirkbride as the site of this station.

4. New Boston Station. Final acceptance inspection of Angle Tracker, Command Transmitter, and UHF Telemetry Receiver facilities was accomplished in November 1959. The remaining facilities are scheduled for completion incrementally between February and September 1960.

5. Ottumwa, Iowa Station. Plans and specifications for the technical facilities for the station are complete and ready for advertising.

6. Satellite Test Center, Sunnyvale, California. Increment one of this center (formerly Development Control Center) was completed and accepted from the construction agency during December. Increment two is scheduled for completion in June 1960.

7. Space Operations Control and Data Processing Facility, Offutt AFB (formerly Technical Operations Control and Processing Center. Design was initiated in October 1959 and is scheduled to be completed in March 1960.



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