~~SECRET~~

CONTROL NO. S-9972

COPY NO. 2

MILITARY RECONNAISSANCE SATELLITE PROGRAM

PROGRESS REPORT

QUARTER ENDING 30 JUNE 1958

ARPA

ADVANCED RESEARCH PROJECTS AGENCY

~~SECRET~~

SECRET

ARPA

MILITARY RECONNAISSANCE SATELLITE PROGRAM

THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18, U.S.C., SECTIONS 793 AND 794. THE TRANSMISSION OR THE REVELATION OF ITS CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

QUARTER ENDING 30 JUNE 1958

Department of Defense

Washington 25, D.C.

SECRET

~~SECRET~~

ADVANCED RESEARCH PROJECTS AGENCY
WASHINGTON 25, D. C.

July 17, 1958

MEMORANDUM FOR THE SECRETARY OF DEFENSE

SUBJECT: Report of Progress in the Military Reconnaissance Satellite Program During the Quarter Ending June 30, 1958

This transmits the report of progress in the Military Reconnaissance Satellite Program for the quarter ending June 30, 1958.

A condensed history of the Military Reconnaissance Satellite Program and an outline of plans for its implementation through development of Weapons System 117L were presented in the preceding quarterly report. The present report covers current status of these plans and discusses progress made in the development of the equipment and supporting facilities which make up Weapons System 117L.

Information on major accomplishments in the Military Reconnaissance Satellite Program during the reporting period is included in the accompanying draft of your letter of transmittal of the report to the President.

Roy W. Johnson
Director

1 Incl
Report, subject
as above

SECRET

THE SECRETARY OF DEFENSE
WASHINGTON July 18, 1958

Dear Mr. President:

I am forwarding herewith the report of progress in the Military Reconnaissance Satellite Program during the quarter ending June 30, 1958. This program is under the management direction of the Advanced Research Projects Agency, Department of Defense.

A condensed history of the Military Reconnaissance Satellite Program and an outline of plans for its implementation through development of Weapons System 117L were presented in the preceding quarterly report. The present report covers current status of these plans and discusses progress made in the development of the equipment and supporting facilities which make up Weapons System 117L.

Progress toward launching a THOR-boosted WS 117L vehicle in late 1958 is on schedule. In addition, emphasis is being placed on the development of a recoverable biosatellite capsule as a secondary objective of the program.

Decision to change the fuel used for the main engines of the launching rocket has permitted planning for use of larger payloads in the WS 117L vehicle. Studies are also in progress on utilization of solar and nuclear auxiliary power which will provide for longer life of the WS 117L satellite guidance and reconnaissance devices.

With great respect, I am

Faithfully yours,

(Signed) Neil McElroy

1 Incl
Report, as stated

SecDefContr S-1097-58

The President

The White House

SECRET

CONTENTS

~~SECRET~~

BRIEF OF PROGRESS

During the Quarter Ending June 30, 1958

Development of the Military Reconnaissance Satellite (Weapons System 117L Vehicle) and its supporting equipment and facilities progressed on schedule during this quarterly reporting period. The initial THOR-boosted WS 117L vehicle is presently scheduled for launch from Cooke Air Force Base late in 1958.

Reprogramming directives for THOR-boosted flights placed emphasis as a secondary objective upon collection of geophysical research data and development testing of a recoverable biosatellite capsule. The primary objective of flight testing the WS 117L vehicle and the ground-space communication network was unchanged. To obtain the new secondary objectives, the WS 117L vehicle was redesigned for lighter weight. A decision to change the fuel used for the main engines of the WS 117L vehicle to an unsymmetrical di-methyl hydrazine/inhibited red fuming nitric acid combination, a higher energy fuel, permitted planning for use of larger payloads in the WS 117L vehicle. It is planned to phase in the unsymmetrical di-methyl hydrazine engine in the flight test vehicle No. 5.

Twenty-two significant cold flow propulsion tests were performed at the Santa Cruz Test Base of the Lockheed Missile Systems Division during this period. Design of the auxiliary power subsystem for the first WS 117L flight was completed and drawings were released. Detailed integration designs were started for installation of subsystems for nuclear auxiliary power units into the WS 117L vehicle.

A breadboard model of the visual reconnaissance subsystem for the WS 117L program was demonstrated at the Eastman Kodak Laboratories on April 24, 1958. Significant progress was made on both the interim Pioneer and the Pioneer Ferret equipment programs. A program to provide infrared radiation measurements was undertaken. High altitude balloon flights to obtain infrared power ground measurements in the 2.7 micron region were successfully completed.

A contract was awarded to provide for design and implementation of the intelligence data handling subsystem for the WS 117L.

~~SECRET~~

TOPICAL SUMMARY

GENERAL

ATLAS and THOR Boosters to be Used for the Weapons System 117L Vehicle Launchings

Both ATLAS and THOR missiles will be used in support of the Military Reconnaissance Satellite Program. THOR-boosted WS 117L vehicles will be used in the early phase of the program primarily for engineering tests of the orbital capability of the vehicle. Early ATLAS-boosted WS 117L vehicles will also be used for engineering purposes but, unlike the THOR-boosted vehicles, will contain developmental reconnaissance equipment. The ATLAS-boosted vehicles will evolve into the operationally configured 117L Weapons System.

Initial Flight Test of THOR-boosted WS 117L Vehicle scheduled for late 1958

Work on the first THOR-boosted WS 117L vehicle continued generally on schedule throughout this quarterly reporting period, and system installation design milestones were successfully achieved. This vehicle is expected to be completed early in the summer and will be launched from Cooke Air Force Base late in 1958. Following this initial flight, one THOR-boosted flight per month is tentatively scheduled through August 1959.

Initial Flight Test of ATLAS-boosted WS 117L Vehicle scheduled for March 1960

The first ATLAS-boosted flight test of the WS 117L vehicle is scheduled for June 1959 from the Air Force Missile Test Center, Florida. After initial launchings from AFMTC, subsequent ATLAS-boosted flights will be transferred to Cooke Air Force Base. The first ATLAS-boosted flight from Cooke is tentatively scheduled for March 1960.

Recoverable Biosatellite Capsule an additional objective of the Program

Instructions issued in March 1958 redirected the secondary objective of THOR-boosted WS 117L flights. The secondary objective of these flights originally emphasized Pioneer Visual reconnaissance. The new directives shifted the emphasis as a secondary objective

from a visual reconnaissance application employing a recoverable film capsule to the collection of geophysical research data and the development testing of a recoverable biosatellite capsule. Flight testing of the WS 117L basic vehicle system and the ground-space communication network still remain the primary objective of the redirected program.

Two Types of Biosatellite Payloads Contemplated

Two types of biosatellite payloads are contemplated for WS 117L flight tests; a recovery capsule to demonstrate the feasibility of the system by returning a living animal from orbit to earth, and a recovery capsule which will return a sub-human primate from orbit. Only environmental data will be collected in the early type capsule. Psysiological data, in addition to the environmental data, will be obtained from the animal capsule.

NOTE: For further detail information on plans for the recoverable biosatellite capsule see pages 11 and 12.

SATELLITE AIRFRAME

Airframe Design Progress is Satisfactory

Despite the introduction of accelerated schedules and changes in program objectives from recovery of visual reconnaissance to the geophysical and biomedical programs, the airframe subsystem maintained satisfactory design progress throughout the quarterly reporting period.

NOTE: An exploded view of the WS 117L vehicle mockup and the ATLAS adapter is shown in Figure 1.

WS 117L Vehicle Redesigned to Facilitate Biosatellite Tests

To obtain engineering test and biomedical program objectives, the WS 117L vehicle was redesigned for lighter weight. WS 117L vehicle and THOR-interface problems (such as booster payload capabilities, allowable loadings, separation

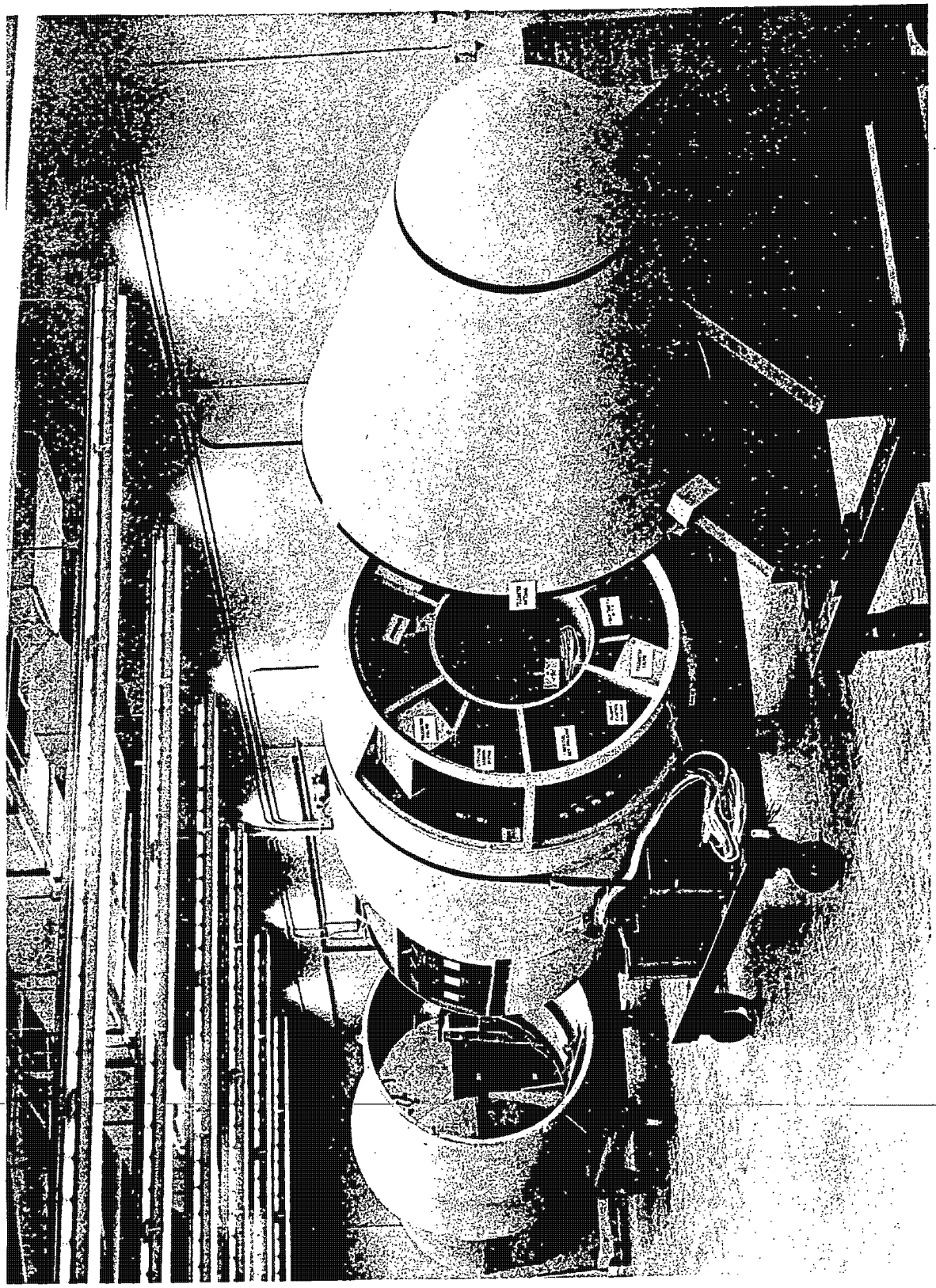


FIGURE 1. Exploded view of the WS 117L vehicle mockup and ATLAS adapter showing from front to rear: (A) Nose cone with detachable nose cap (B) Midbody with forward and aft equipment racks (C) ATLAS adapter section (D) Uninstalled, sperically nested fuel and acid tanks for the vehicle.

dynamics, guidance and control) were mainly resolved. Extensive performance studies were conducted and nominal trajectories were calculated. Small scale (1/15) wind tunnel tests were completed with a WS 117L/THOR configuration. Design for a substantial balance of the instrumentation required for the engineering test and biomedical program was accomplished.

Stabilization of WS 117L Vehicle possible by a single Helium Boom

It has been determined that a single helium boom extension would insure proper vehicle aerodynamic stabilization at the lower orbital altitudes assumed for early engineering test and biomedical flights. However, engineering effort continued on the twin-boom extension mechanism for the purpose of increasing the functional reliability of this mechanism. Small vanes or fins are being added to the aft of the vehicle for vertical stabilization. These additions will permit better alignment of the vehicle's center of pressure and center of gravity.

Helium Regulator Problem Remedied

An early test on the helium regulator used for pressurizing propellant tanks indicated a technical problem area. However, tests on a second helium regulator produced by Robert-Shaw Fulton Company were satisfactory. Failure on the early test was attributed to faulty test procedure and metal chips found in the regulator assembly.

SATELLITE PROPULSION SYSTEM

22 Propulsion Cold-Flow Tests Performed to Date

Twenty-two significant propulsion cold-flow tests were performed to date at the Santa Cruz Test Base. Testing revealed no difficulty with suction pressure during the starting transients. It was found that helium line pressure drops were higher than the calculated design figure and additional test instrumentation was installed to determine the cause of this discrepancy.

Larger Payloads through use of Unsymmetrical Di-methyl Hydrazine Propellant

To increase satellite-vehicle rocket-engine performance, an unsymmetrical di-methyl hydrazine/inhibited red fuming nitric acid propellant combination will be introduced early in the flight test program to replace the JP-4/inhibited red fuming nitric acid combination planned for use in the initial THOR-boosted WS 117L flights. The first unsymmetrical di-methyl hydrazine engine, a modified JP-4 engine, has been tested. A satisfactory run of 17 seconds has been completed.

Hot Firing Tests show satisfactory progress

The two WS 117L rocket engines delivered by Bell Aircraft during the first quarter of 1958 were assigned to the Santa Cruz Test Base of the Lockheed Missile Systems Division. The first ground test engine was mounted in the newly completed propulsion test assembly. The entire propulsion system (composed of prototype components, except for boiler plate tanks) underwent hot firing tests. The second engine was assigned for installation in propulsion test vehicle assembly No. 1. Three hot firings were conducted on the prototype system. The first firing was cut off by the ground safety equipment because of gas generator flame-out due to faulty installation procedures. The second was successful and was shut down, by command, after seven seconds. Engine performance was satisfactory. A third hot-firing of twelve seconds duration also was successful. However, pump inlet pressures were greater than specified, and the cause is being investigated. Analysis of data from these firings is still in progress. Preliminary results indicate that objectives were obtained.

NOTE: The static firing test stands and the instrumentation blockhouse at the Santa Cruz Test Base are shown in Figure 2. The gimbal-mounted engine is shown in Figure 3.

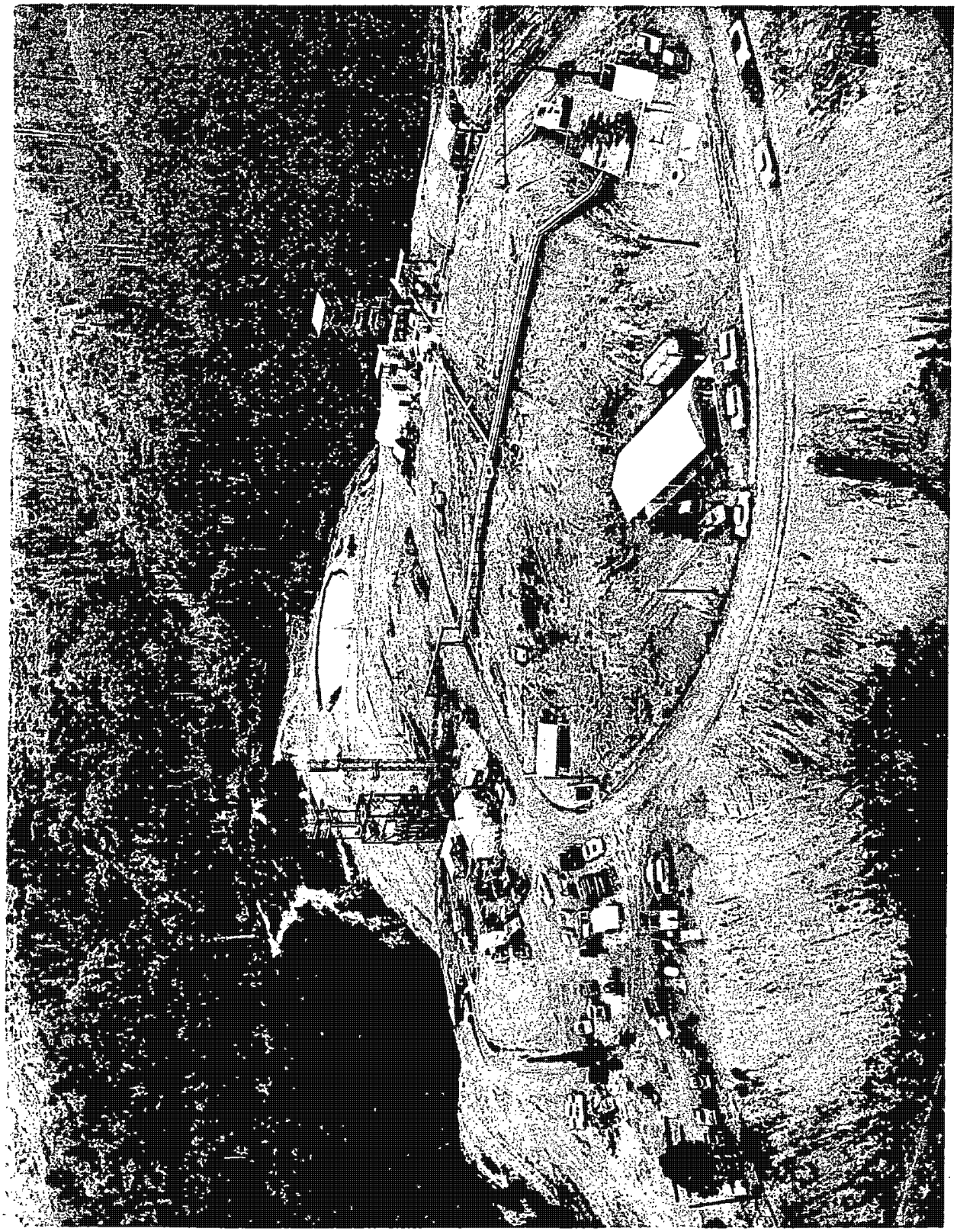


FIGURE 2. Static firing test stands and instrumentation blockhouse at the Lockheed Missile Systems Division, Santa Cruz Test Base.

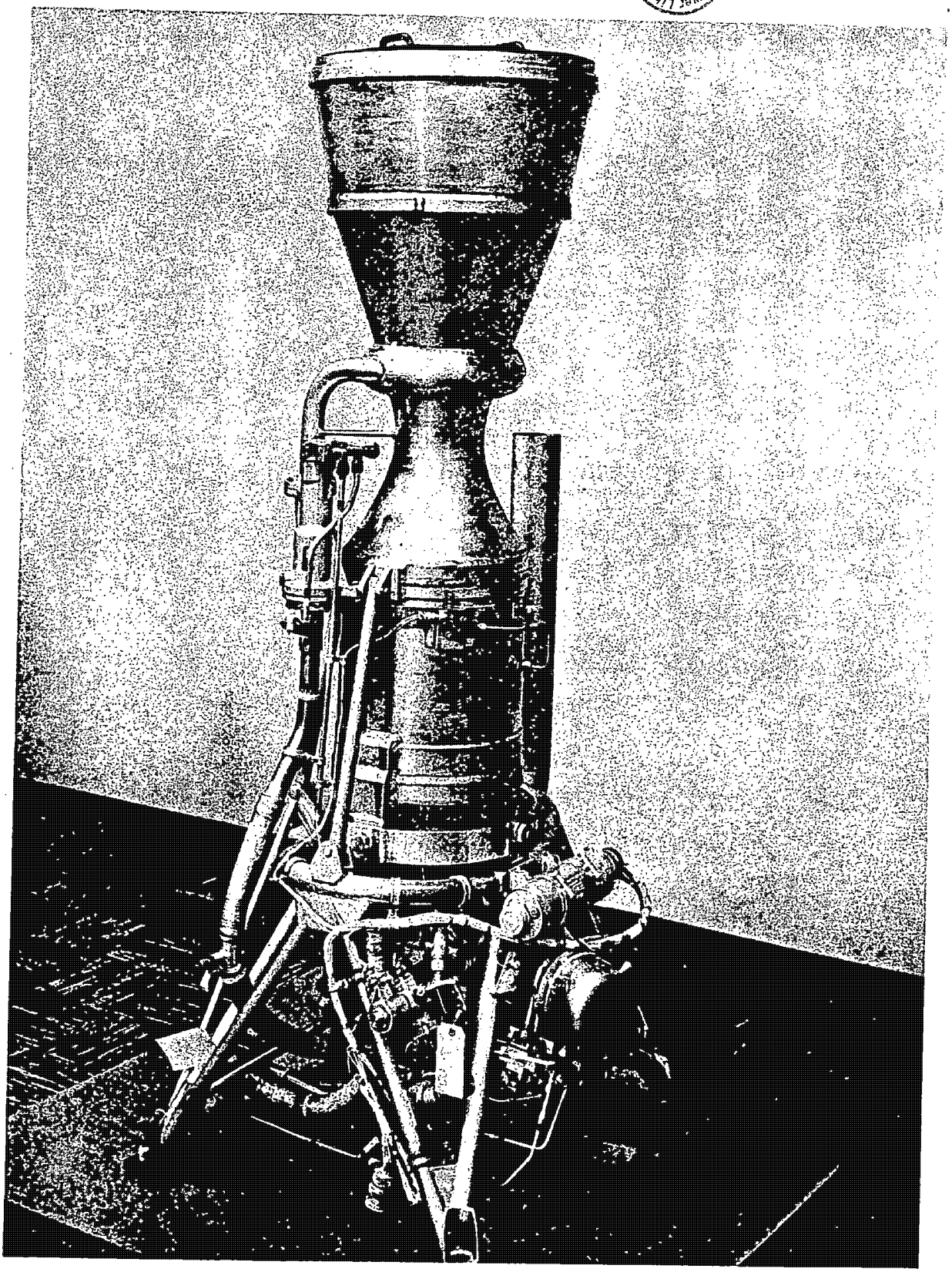


FIGURE 3. Final stage, gimbal-mounted engine.

AUXILIARY POWER SUBSYSTEM

Design of the Auxiliary Power Subsystem Completed

The design of the auxiliary power subsystem for the first WS 117L flight vehicle has been completed and all drawings have been released. An analysis of the electrical load requirements has been completed.

Design Initiated for use of Nuclear Auxiliary Power

Detailed integration designs were started for the installation of both SNAP I and SNAP II (subsystems for nuclear auxiliary power) into the WS 117L vehicle. Design sketches of the equipment beam were forwarded to subcontractors for coordination of the initial installation concept of the auxiliary power unit equipment. Detailed shield designs for both the SNAP I and SNAP II auxiliary power units also were initiated in connection with this detailed integration program. Development of ground-support equipment requirements and start procedures for the SNAP I program continued.

Use of Solar Auxiliary Power Under Study

In addition to battery power, the use of solar power for the tracking beacons is being considered for engineering test and biomedical program flights. Design effort is being coordinated with temperature, efficiency, and power requirement studies to determine how the solar power collectors can be incorporated into these flight vehicles as soon as possible.

SATELLITE GUIDANCE AND CONTROL SYSTEM

Guidance System now in Procurement Stage

A procurement plan for the production of a light-weight all-inertial guidance system for the WS 117L vehicle has been developed. The guidance system is being developed by the Massachusetts Institute of Technology to guide the WS 117L vehicle into orbit and to stabilize its position with reference to the earth while in orbit. Arrangements have

been completed to provide the initial units of the essential guidance and control hardware for the WS 117L/THOR combination. The plan calls for the first test flight of the production system using an ATLAS booster early in 1961.

SATELLITE RECONNAISSANCE DEVICES

Visual Reconnaissance

Demonstration Model of Pioneer Visual Reconnaissance Subsystem completely Successful

A significant milestone was met with the succesful demonstration, on schedule, of the breadboard model of the Pioneer Visual reconnaissance subsystem at the Eastman Kodak Company. The model included airborne equipment and equipment for recording data at the ground station. The airborne portion consisted of the camera, the processor, and the readout scanning mechanism operating in series. The ground portion was a separate unit with a complete readout device scanning simulated photography which was displayed on the ground reconstruction device.

Experimental Model of Advanced Visual Reconnaissance Subsystem Under Test

The experimental model of the 36-inch focal length lens and collimator for testing were delivered in May 1958 to the Eastman Kodak Company. This lens is planned for the advanced visual program. Preliminary tests indicate that design requirements of 100 lines/mm resolution have been met.

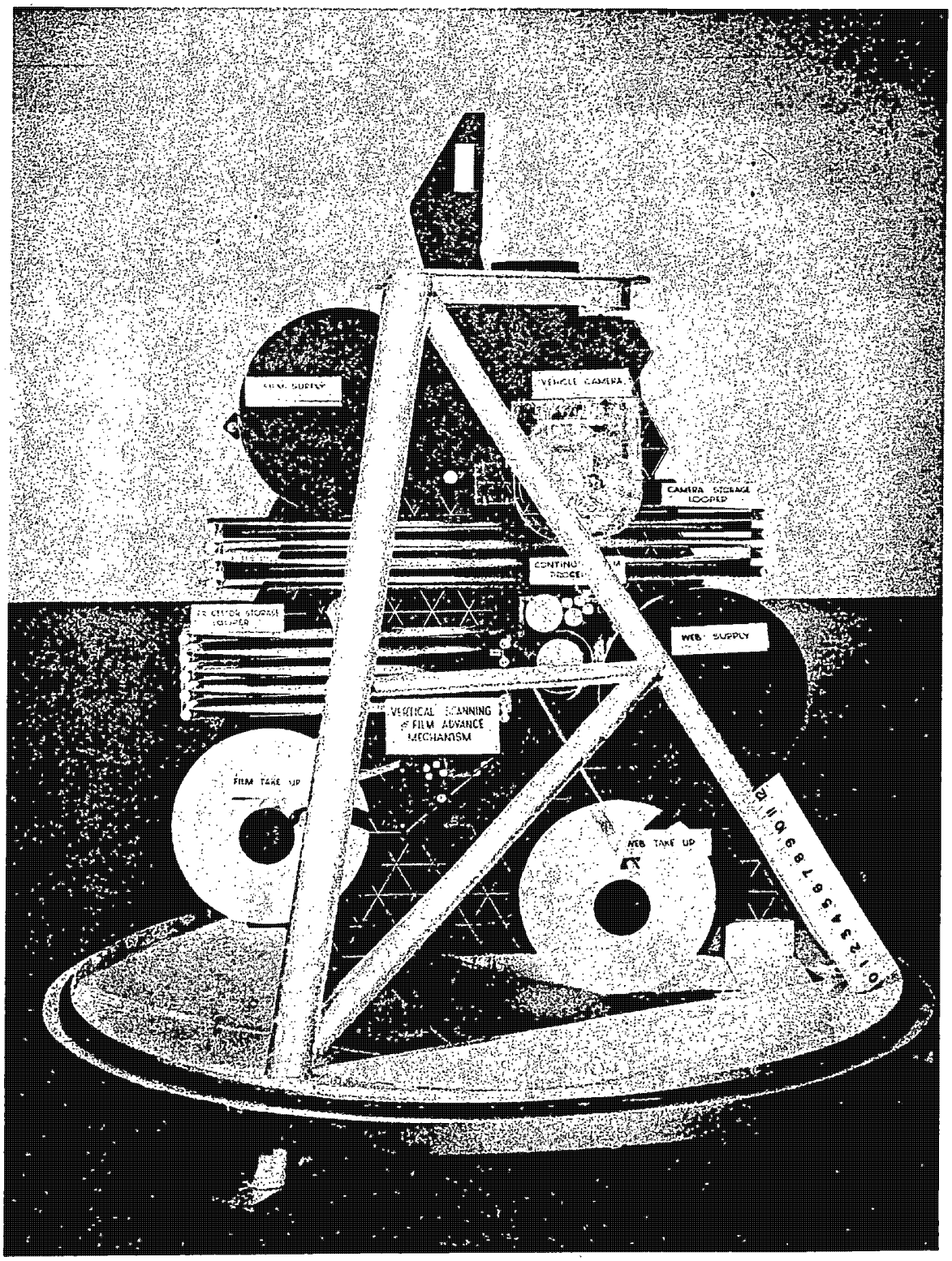
NOTE: The visual reconnaissance payload mockup is illustrated in Figure 4.

Electronic Reconnaissance

Interim Pioneer Electronic Reconnaissance Design Criteria Completed

Significant progress was made by the Airborne Instruments Laboratory, the electronic reconnaissance subsystem contractor, on both the interim Pioneer and Pioneer Ferret equipment programs. Major subassemblies were designed and design criteria on the interim Pioneer subsystem were completed.

SECRET



SECRET

FIGURE 4. Visual reconnaissance payload mockup.

Infrared Reconnaissance

First Infrared Radiation Measurements Performed from Aircraft

The first successful measurements of infrared radiation from intercontinental ballistic missiles were made from B-47 aircraft during the flight of ATLAS 15A. These measurements were the first in a series to determine how an ICBM appears to a satellite-borne infrared scanner during the power and altitude stages of the missile trajectory. The infrared scanning system is being designed to give early warning of an enemy ICBM attack as well as other data.

Infrared Radiation Much Greater than Supposed

Efforts to obtain infrared radiation measurements, halted temporarily by the emergency grounding of all B-47 aircraft, were resumed late in June. The program provides for measuring radiation from all ICBM's to be launched at the Air Force Missile Test Center. Additional detailed information is being acquired from a similar measurement program which has already produced very successful results. This information indicates that infrared radiation from ICBM's may be much greater than previously estimated. Data from one ATLAS flight and one VANGUARD flight indicated that sensing equipment was saturated with infrared radiation at a range of 600 miles.

Balloons to be Used for Further Infrared Measurements

The series of high-altitude balloon flights planned for obtaining infrared-power ground measurements in the 2.7 micron region has been successfully completed, and a final report has been submitted. Preparations are underway for making additional flights to take measurements in the 3 to 5 micron regions of the spectrum. The infrared detector in these measurements will be the Eastman Kodak lead-selenide cell, cooled to dry-ice temperature. In carrying out the comprehensive program of evaluating all possible detectors for use in the WS 117L infrared subsystem, measurements have been completed on 12 unimmersed lead sulphide cells supplied by Electronic Corporation of America and 12 lead sulphide cells supplied by Infrared Industries Incorporated.

COMMUNICATIONS SYSTEM

Ground-Space Communications Progressing

Development of ground-space communications progressed throughout this quarterly reporting period. Preliminary tests were completed on the S-band beacon and a preliminary communication plan for the engineering test and biomedical program was drawn up. Design for orbit antennas to be used for telemetry and beacon in a vehicle with nose-down attitude were completed. Exit antennas were reduced in weight and voltage breakdown tests were conducted on different antennas.

Five Ground Stations will be Required

Requirements for tracking and data acquisition sites necessary for obtaining data from the THOR-boosted WS 117L vehicle launchings from Cooke Air Force Base have been established. A total of five tracking and data acquisition stations will be required. One station will be provided at Cooke, and a down-range tracking station will be located in the vicinity of Oxnard, California. One of the remaining three stations will be located in Hawaii, and two will be in Alaska. One Alaska station will be in the Anchorage area; the other will be in the Sitka area.

DATA PROCESSING SUBSYSTEM

Subcontracts for Data Handling Equipment Negotiated

A contract with the Ramo-Wooldridge Corporation provides for the design and implementation of the intelligence data handling subsystem. Major subcontracts were negotiated by Ramo-Wooldridge in this period with ITEK Corporation for the major optical assemblies and devices; Broadview Research Corporation for photo interpretation keys and equipment requirements; Systems Laboratories Corporation for geodetic calculations and applications; and Planning Research Corporation for application of their intelligence parameter work.

~~SECRET~~

QUALITATIVE PERSONNEL REQUIREMENTS

Personnel Requirements for Operational Program Studied

The Qualitative Personnel Requirements Information program for WS 117L progressed satisfactorily. The initial conference for the program was held at Palo Alto, California, on June 3, 1958, and a report was published on June 30 by the Air Force and the Lockheed Missile Systems Division.

FACILITIES DATA

Cooke Selected for WS 117L Launching Site

The south Cooke Air Force Base area was selected as the optimum location for conducting WS 117L launches. Air Staff approval was obtained to site two launchers and a blockhouse for the WS 117L program in that area. Design criteria for the ATLAS-booster launch complex at Cooke Air Force Base have been submitted. Modification of existing buildings to provide an interim assembly facility was started on June 3, 1958, and is scheduled for completion in mid-August 1958. Construction of launch stands and blockhouses for the THOR-booster launch complex at Cooke Air Force Base progressed on schedule.

STATUS OF FUNDS

As of June 30, 1958
(in millions)

Fiscal Year 1957 and Prior Years Program	Fiscal Year 1958 Program	Fiscal Year 1958 Obligations	Fiscal Year 1959 Program
$18.7 1/	$65.4 1/	$51.0 2/	$215.0 3/

1/ Revised figures.
2/ As of May 31, 1958. It can be assumed that as of June 30, 1958 all funds will be obligated with the exception of small amounts.
3/ Increase due to reprogramming to permit accomplishment of accelerated Fiscal Year 1959 program.

~~SECRET~~

~~SECRET~~

DESCRIPTIVE DETAIL

I. Recoverable Biosatellite Capsule

Formation of an Air Force Bioastronautics Division at Inglewood, California, was directed on April 23, 1958. The Bioastronautics Division will function as a subsystem consultant and liaison group for all biomedical activity in the WS 117L program. In conjunction with Lockheed, Bioastronautics Division prepared a work statement dated May 14, 1958, which will result in a contract to produce five biosatellite recovery capsules for WS 117L vehicles. These recovery capsules will permit the launch, orbit, and recovery of animal subjects. The animals will suffer no irreversible biological damage. Collection of biological and environmental data such as temperature, humidity, pressures, acceleration, cosmic radiation, weightlessness, psychological responses, etc. is planned. Mice, rats, and small primates will be used. The first launch of four mice is programmed for early in 1959.

All five of the contemplated biosatellite flights will be launched south from Cooke Air Force Base. With the ground stations planned for the primary flight objectives of the program, it would be impractical to recover anywhere except over the Pacific Ocean. It is planned that all biosatellites will make eighteen orbits with approximately a ninety-minute period prior to recovery. Re-entry trajectories will be initiated over Alaska, and recovery after re-entry will take place in the vicinity of Hawaii.

Studies have been conducted to establish the feasibility of "drag only" re-entry trajectory using ablation techniques to protect the basic structure and contents. Preliminary calculations have shown that this method is feasible for re-entry. After re-entry is completed, the capsule should decelerate to its subsonic terminal velocity at about 50,000 feet altitude. Below this altitude a reefed parachute will be used to accomplish further decelerations with low shock loadings, and touchdown on earth will be at about 20 feet per second.

Studies were initiated to determine the relative advantages of aerial, sea, or land recovery of biosatellites. Currently, indications favor aerial recovery at approximately 10,000 feet altitude by using a system already fully developed for the C-119.

Over 1500 successful recoveries with the C-119 system indicate its serviceability for this application. To pinpoint the descending parachute capsule, silvering of the chute, ejection of chaff charges from the capsule, and a capsule Sarah beacon can be employed in conjunction with radar aircraft (RC-121 equipped with APS-20 search radars and Sarah beacon receivers).

II. Design and Testing of Flight Tanks

Four segmented steel tanks were completed, and will be used as back-up for the aluminum tanks planned for flight test use. Three of these tanks failed when subjected to pressure tests. The fourth was modified and successfully passed pressure tests, but is slightly heavier than the desired weight.

With the cooperation of the Sandia Centrifuge Section, inertial loading tests were performed on the first spun aluminum flight tank and one segmented steel tank. Both passed the tests successfully. The aluminum tank, completed on May 24, 1958, was pressure tested to 85 psi and then flown to Sandia. Excellent cooperation was received from the Atomic Energy Commission and Sandia on these tests.

A welding machine for assembling spun aluminum tanks was received by Lockheed, and training in its use is underway. Efforts are being made to reduce the number of manufacturing processes involved in producing the aluminum tanks. One result of these efforts is the elimination of the chem-mill process.

Problems previously encountered in the welding of magnesium thorium alloys used for structure and skin are being eliminated as experience is gained. The elimination of these problems removes one of the possible delaying factors in the flight schedule.

III. Selection of Sites and Construction of Supporting Facilities

a. Tracking and Data Acquisition Stations

Construction drawings and specifications for an interim tracking and telemetry station at Cooke Air Force Base have been completed. Construction will be completed by August 15, 1958, and equipment will be installed by November 1, 1958. Design of the entire station has been initiated and is scheduled for completion in September 1958.

Electronic surveys of proposed locations for the northeast United States tracking and data acquisition site were completed on May 31, 1958. At the meeting of the Site Selection Board on June 9, 1958, Sampson Air Force Base, New York, was selected as the first choice for the northeast site. Permission to survey Sampson Air Force Base was denied, however, and an electronic survey team was directed to make additional surveys of possible sites. It was decided to electronically survey the Veterans Administration property at Togus, Maine, and the New Boston Range, New Hampshire, as possible locations. The Board is scheduled to meet again on July 7, 1958, to decide upon a firm site. Ottumwa, Iowa, and Fort Crowder, Missouri, were selected for possible use as the Central United States tracking and data acquisition station. These surveys will start on July 7, 1958.

The site survey team recommended Fort Stevens, Oregon, for the site of the northwest United States tracking and data acquisition station. Electronic surveys indicated the suitability of the area for WS 117L operations. Site Selection Board approval was obtained and recommendations for the area have been approved by Headquarters, United States Air Force. Design criteria for this station is being reviewed and a contract for architect-engineer services for the design will be awarded early in July 1958.

Construction drawings and specifications have been completed and released for construction of the interim tracking and data acquisition station at Kaena Point on the Island of Oahu, Hawaii. A construction contract was awarded in May 1958. Beneficial occupancy date is August 15, 1958, and installation of equipment will begin at that time. The need date is November 1958. Design of the complete station will be completed by September 1, 1958. Access road construction is complete. Need date for the complete station is October 1, 1959.

An existing aircraft control and warning station at Cape Chiniak, Kodiak Island, Alaska will be used as an auxiliary test tracking station. This arrangement will eliminate the need for construction of new facilities in that area.

A construction contract for the auxiliary test tracking station at Annette Island, Alaska, will be awarded in July 1958. Completion is scheduled for mid-August 1958. Need date for this facility is November 1, 1958.

b. Central Intelligence Center

Design criteria for the WS 117L intelligence interpretation and dissemination facility were completed and made available for review during June 1958. This facility will serve as the program control center, as the collection center for all reconnaissance data obtained from the data acquisition stations, and as the training center. Construction is scheduled to start in December 1958. The facility is expected to be ready for use by the need date, March 1960. The location for the Central Intelligence Center is unresolved.

c. Data Analysis Laboratory

A facility to house laboratory equipment and instrumentation for analysis of technical information will be built at Wright-Patterson Air Force Base. Criteria for the facility, which will be needed by March 1960, have been developed.

IV. Special Studies, Meetings and Reports

The first meeting of the 117L Weapon System Phasing Group was held in May 1958. Briefings were presented on the background and status of the over-all system, the various subsystems, and the content of the WS 117L preliminary Operational Plan. A Communications and Electronics Subcommittee was established. This subcommittee was directed to investigate probelms concerning frequency allocations to the WS 117L program, system requirements dictating the extreme bandwidth in the ground point-to-point communication system, and any communication and electronic problem which could have bearing upon the WS 117L program.

A study of system reliability has been underway. The system reliability analysis includes reliability models for the system and for each of the subsystems. Reliability allocations have been calculated for each of the subsystems. This information is being prepared for distribution in a technical report. A malfunction reporting procedure has been formulated and is being reviewed.

The engineering analysis report for the Pioneer Electronic Reconnaissance satellite has been completed and will be published by the Lockheed Aircraft Corporation as a formal engineering report.

Computations were conducted to obtain data for predicting orbital paths of the WS 117L vehicle in anticipation of the ground tracking operation, and for commanding initial call-down of the biosatellite recovery capsule operation. A report on the "Preliminary Estimates of Reliability on the Ground-Space Communication System" has been published.

The initial conference for the Qualitative Personnel Requirements Information program was held at Palo Alto, California on June 3, 1958. A report on the results of this conference was published on June 30, 1958, by the Air Force and the Lockheed Missile Systems Division.