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FOREWORD

This revised document up-dates the LMSD proposal of 15 May 1959 for the Sentry Program. Incorporated are the various changes, revisions, and corrections to the program initiated since the original issue.

The information contained in this document constitutes the definition of the Sentry Program.

Section 1 sets forth the objectives of the total Sentry Program, and therefore, is not confined to any specific funding period. These objectives, which establish the goals toward which effort will be directed, are described for the areas of system requirements, satellite vehicle, ground equipment, facilities, personnel, logistics, and launch plan.

Section 2 presents the work statement for that part of the total Sentry Program to be accomplished during the period between the completion of Contract AF 04(647)-97 and 31 December 1960. This section consists of the statement of work, schedule, summary of items to be furnished, Government-furnished items, and ground equipment.

The Sentry Program designation has been changed to Samos; however, in order to expedite this document, this change has not been made herein.

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CONTENTS

SYSTEM REQUIREMENTS

1. SCOPE

A. GENERAL. The requirements for the Sentry Program, using Agena vehicles as the carriers for reconnaissance equipment, are established in this tab. The development program and overall operational characteristics of the system may be described as follows:

1. DEVELOPMENT PROGRAM

a. The Sentry Program shall provide a satellite reconnaissance system capable of obtaining reconnaissance information which can be integrated into the USAF intelligence data handling system and disseminated to operational military agencies. The Sentry Program, employing orbiting satellites composed of Agena vehicles and reconnaissance payloads, shall provide surveillance of the entire Soviet complex, enabling evaluation of Soviet intention to attack. Timeliness of receipt of the intelligence information with daily reconnaissance coverage of high resolution is the ideal. In consideration of the requirement for earliest availability of the Sentry system, the engineering progression and Air Force acceptance shall be from the lesser to the greater resolution. The research and development effort shall be directed toward providing equipment which shall permit the following:

(1) Coverage of world-wide areas of interest

(2) Detecting new and hiterto unknown targets

(3) Determining electronic signal characteristics

(4) Locating and verifying targets and defenses

(5) Collecting data on technological progress

(6) Evaluating military and industrial strength

(7) Monitoring electronic emissions

(8) Observing enemy build-up indications

(9) Evaluating attack capability

(10) Assessing damage from high-yield weapons

(11) Reconnoitering military movements

(12) Locating naval forces throughout the world.

b. The Sentry Program shall continue over a period of years and include a variety of configurations, capabilities, and useful satellite life spans. The development of the reconnaissance system shall proceed from a relatively simple design to more refined versions capable of meeting stated system requirements. The original design and subsequent development work shall endeavor to keep the basic system design as flexible as possible to provide a relatively rapid reaction to changing requirements. The development program shall include, besides the satellite vehicle and its attendant equipment, development of visual and ferret equipment to provide reconnaissance information, and development of the ground based satellite control system equipment necessary for the collection control of the orbiting vehicles. This equipment shall provide a reconnaissance capability of two modes: readout and recovery.

(1) Readout

(a) Visual Reconnaissance: The reconnaissance equipment for the visual reconnaissance readout portion of the Sentry Program consists of the satellite-borne equipment required to collect information in the visible spectrum, to process and store this information, and on a command signal from the ground to convert stored images to appropriate signals for transmission to the ground. In addition to the satellite-borne equipment, related ground-based equipment shall be required to take the output of the satellite-borne data link and reconstitute the signal into photographic form for system control purposes, vehicle equipment adjustment, engineering evaluation, and for further processing and intelligence use. Initial visual equipment shall be capable of resolving targets 20 feet in size, and development shall continue toward the goal of achieving resolutions of 5 feet or less. Target location shall have an error no greater than ±1 mile with respect to the North American Datum. Future consideration shall be given to the development and use of electrostatic sensors and high-resolution television in conjunction with magnetic tape storage. The vehicle-borne and ground-based equipment shall consist of and be capable of the following functions:

(i) Vehicle Camera: A steerable reconnaissance camera with a film supply shall be capable of providing photographic coverage for the useful reconnaissance life of the vehicle. Means shall

[redacted]

be provided for focus adjustment and exposure control by command signals from the ground stations. The film-drive mechanism shall be capable of being controlled by the programmer on the basis of command signals originating from the ground. A means for indexing the film with time-base information shall be included to assist in providing positional accuracy to ±1 mile for the overall system. The camera will operate on an intermittent basis dependent upon orbital period and orientation. The film supply shall be sufficient to meet the reconnaissance requirements plus serving as leader when required.

(ii) Vehicle Processor: A normal-speed/low-speed 70mm film processor together with its associated equipment shall be capable of processing and drying the film in the satellite vehicle.

(iii) Vehicle Readout: The vehicle readout mechanism shall, on receipt of command signals, be capable of scanning the processed film and generating an output signal from the video amplifier compatible with the reconnaissance data link. The composite video signal output of the readout equipment shall include synchronizing, blanking, and other information as required to record and process the visual data on the ground.

(iv) Vehicle Control and Transport Equipment: The control, transport, and storage equipment shall be capable of executing the command signals provided by the vehicle programmer and command control communications. The functions to be executed shall include, but not be limited to, maintaining correct image motion compensation (IMC) in the camera and supplying programmed or commanded changes to IMC; exposure control and focus operations; film transport functions from the camera through the readout device; operation and sequencing of the film processing and drying; monitoring performance of the readout equipment; and control and sequencing of payload gimbaling mechanism.

(v) Ground Reconstruction Equipment and Monitor (Primary Record): The ground photo reconstruction and processing equipment shall be capable of converting the video signal received from the data link into photographic form and of monitoring the vehicle readout and ground reconstruction equipment. The primary record formed in the above operation will contain the reconnaissance image plus the auxiliary data, and the monitor will provide the means for checking the performance of critical components in the system and for initiating command control of the process

[redacted]

(b) Ferret Reconnaissance: The ferret reconnaissance portion of the Sentry Program consists of the satellite-borne equipment required to collect information from radiation in certain selected regions of the electromagnetic spectrum, to store this information, to filter or index it as may be necessary, and at the proper time to convert the stored information into an appropriate electrical signal for transmission to the ground. Ground-based equipment shall be required for inflight calibration and vehicle equipment adjustment; engineering evaluation of vehicle equipment performance, and transmission of reconnaissance, calibration, attitude, and time information to the data processing activities.

(2) Recovery. The recovery portion of the Sentry Program shall provide a payload which will be designed to obtain high-resolution photographic reconnaissance and shall be capable of achieving 5 foot resolution. The data shall be returned to the earth in a recovery capsule ejected from the satellite vehicle.

2. OVERALL OPERATIONAL CHARACTERISTICS

a. The Sentry Program shall utilize satellite vehicles, modified ICBM boosters, launch facilities, tracking facilities, and a complex communication and data processing network with related facilities. The ICBM booster provides the primary propulsive power to the Sentry satellite vehicle. Separation occurs on attainment of the proper altitude and attitude. As the booster falls away, the satellite vehicle continues in a self-stabilized, predetermined coast to a programmed altitude. Orbital altitudes shall be selected according to mission requirements. At the termination of the coast phase, the satellite orbital boost engine activates, supplying the orbital velocity increment required to establish a substantially circular orbit. The internal controls shall then orient the vehicle to the proper attitude. The most common orbits shall pass within a few degrees of the poles. The vehicle shall complete a revolution of the earth at approximately 94-minute intervals. Because the orbit is essentially fixed in space, while the earth rotates inside it, successive passes over the earth's surface will be displaced slightly more than 22-1/2° at the equator. This offsetting will permit a single vehicle to observe the entire earth in a total time period which depends, in part, on the width of the swath observed.

b. The satellite vehicle equipment used in the readout portion of the Sentry Program will be programmed by a secure ground-space communication link to activate and deactivate visual or electronic sensing equipment over the target area in accordance with operating requirements. When within range of a Sentry ground receiving station, the vehicle shall, upon command, transmit the recorded data. These

data will be received, processed, and transmitted to the using agencies. Useful operations will be terminated when air drag changes the orbit sufficiently to prevent operations, or when either the electrical power supply is exhausted or a failure of equipment takes place. Expected useful life for early versions of the readout satellite vehicle is about 10 to 30 days. Expected useful life for later versions of the readout satellite vehicle is more than a year for ferret reconnaissance equipment and 3 to 12 months for visual reconnaissance equipment.

c. The satellite vehicle equipment used in the recovery portion of the Sentry Program shall be programmed to provide high-resolution photo reconnaissance of specific areas of interest. For positioning the satellite vehicle as required to obtain data on specific areas of interest, the orbital period may be adjusted by ground command during the high-resolution flights. Upon recovery, the exposed film shall be transported to the processing and using agencies. Useful operations will be terminated upon command or upon the exhaustion of the film or the electrical power supply. Expected useful life for the high resolution payload is approximately 15 days.

d. The re-entry and recovery sequence of operations may be initiated by the vehicle timer or by ground command. The recovery capsule shall be ejected from the satellite vehicle and propelled in an appropriate re-entry trajectory for air-recovery in the ocean area adjacent to Hawaii. While only over-water recovery is planned herein, the satellite vehicle, recovery capsule, and airborne recovery components and equipment shall be designed to allow for overland recovery within the United States Zone of Interior if required. At the proper altitude a parachute system shall be deployed. Simultaneously, the recovery capsule radio beacon and light beacon shall begin operating. Aircraft specially equipped with direction finder systems and air recovery gear will detect, locate, and accomplish air recovery of the capsule. If over-water air recovery fails, surface vessels, similarly equipped with direction-finder systems, will recover the capsule from the sea with the assistance of helicopters.

B. PROGRAM OBJECTIVES

1. READOUT. The objective of the readout portion of the Sentry Program shall be to:

a. Develop and demonstrate the equipment techniques and procedures for launching the Sentry readout vehicles in combination with the Atlas (SM-65) boosters

b. Demonstrate capability of attaining orbit utilizing Sentry readout vehicles in combination with Atlas (SM-65) boosters

c. Develop the equipment for and demonstrate the effectiveness of satellite-borne photographic techniques, including the photographic coverage of specific areas of interest, film processing and storage, and electronic space-ground transmission of visual data

d. Develop the equipment for and demonstrate the effectiveness of satellite-borne electronic reconnaissance techniques, including ferret coverage of specific areas of interest, electronic data storage, and space-ground transmission of ferret data

e. Develop the equipment for and demonstrate the capability of the orbital attitude system to meet the needs of the readout portion of the Sentry Program

f. Develop and demonstrate the equipment, techniques, and procedures for ground-based acquisition, tracking command, and data processing and reconstruction for system control and technical evaluation

g. Develop the equipment for and demonstrate the incremental orbital period adjustment techniques

h. Demonstrate system operating techniques and procedures

i. Develop the equipment for and demonstrate the capability for utilizing solar voltaic collector auxiliary power in satellite reconnaissance vehicles

j. Carry out research leading to the development of all-electronic visual equipment suitable for satellite reconnaissance

k. Develop visual reconnaissance equipment capable of 5-foot ground resolution

l. Develop the capability for utilizing high-energy battery auxiliary power in satellite reconnaissance vehicles

m. Develop the capability for utilizing nuclear auxiliary power in satellite reconnaissance vehicles

n. Develop the capability for extending the coverage of the ferret reconnaissance equipment to include the electromagnetic spectrum from 30 to 300,000 MC/S

o. Assess feedback information from the data user to the satellite ground control system for design improvement and system control.

p. Consideration will be given to the application of dual-burning engine capability and optimized propellant-carrying capacity, developed in the Discoverer Program, to the Sentry vehicle in order to provide for more diversified system capabilities.

2. RECOVERY. The objectives of the recovery portion of the Sentry Program shall be to:

a. Develop and demonstrate the equipment, techniques, and procedures for launching the Sentry recovery vehicles in combination with the Atlas (SM-65) boosters

b. Demonstrate capability of attaining orbit utilizing Sentry recovery vehicles in combination with Atlas (SM-65) boosters

c. Develop the equipment for and demonstrate the capability of the orbital attitude system to meet the needs of the recovery portion of the Sentry Program

d. Develop the equipment for and demonstrate capsule recovery capability by ejecting a capsule from orbit, propelling it into an appropriate descent trajectory, and recovering it by air snatch techniques

e. Demonstrate system operating techniques and procedures

f. Develop the equipment for and demonstrate the use of the Sentry recovery vehicles to accomplish extremely high resolution reconnaissance photography of specific areas of interest

g. Demonstrate the incremental orbital period adjustment techniques

h. Develop and demonstrate the equipment, techniques, and procedures for the satellite ground control system to provide for acquisition, tracking, command, scheduling, recovery control, and data processing for system control and technical evaluation

i. Assess feedback information from the data user to the satellite ground control system for design improvement and system control

j. Consideration will be given to the application of dual-burning engine capability and optimized propellant-carrying capacity, developed in the Discoverer Program, to the Sentry vehicle in order to provide for more diversified system capabilities.

C. FLIGHT MISSIONS. Flight missions shall be defined as those goals toward which each test flight shall be planned and toward which system development effort shall be directed. The flight missions for the Sentry Program shall be as specified in Tables I and II of this tab.

D. ACTIVE ORBITAL LIFE. Active orbital life shall be defined as that period of time on orbit during which useful data is obtained. It is a design objective that the equipment operating on orbit shall be capable of maintaining failure-free operation during the active orbital life period, except that inoperativeness of equipment due to normal exhaustion of energy sources or gas supply shall not be considered as equipment failure.

II. DESIGN CRITERIA

A. PUBLICATIONS. Contractor publications, specifications, drawings, and other documents, with Air Force approval, shall be used in the Sentry Program as indicated in Tabs 2 through 6 of this Section.

III. SYSTEM DESCRIPTION

A. TEST VEHICLES

1. BOOST VEHICLES. Atlas missiles (SM-65) to be used in modified form as the boosters for the Sentry test flights shall be supplied, together with necessary ground support units, as Government-furnished equipment items. The Atlas configuration shall not include the nose cone but shall include the guidance system and appropriate ground equipment such as that used with the "D" Atlas series. The booster and ground equipment shall be modified to make it compatible with the satellite vehicle requirements described in Tab 2 of this Section. Booster performance requirements shall be in accordance with Table III of this tab.

2. SATELLITE VEHICLE. The Sentry satellite vehicles shall be designed in four basic configurations for the readout portion of the Sentry Program and in one basic configuration for the recovery portion of the Sentry Program as defined in Tab 2 of this Section. Differences between vehicles shall consist of those changes necessary to satisfy the technical requirements of the Sentry Program objectives. For the readout portion of the Sentry Program the satellite vehicle shall consist of the Agena vehicle and payloads as follows:

a. AGENA

(1) Airframe (Subsystem A)

(2) Propulsion (Subsystem B)

(3) Auxiliary Power (Subsystem C)

(4) Guidance and Control (Subsystem D)

(5) Vehicle-borne Communications (Subsystem H).

b. PAYLOAD

(1) Visual Reconnaissance (Subsystem E)

(2) Ferret Reconnaissance (Subsystem F).

For the recovery portion of the Sentry Program the satellite vehicle shall consist of the Agena vehicle and payloads as follows:

a. AGENA

(1) Airframe (Subsystem A)

(2) Propulsion (Subsystem B)

(3) Auxiliary Power (Subsystem C)

(4) Guidance and Control (Subsystem D)

(5) Vehicle-borne Communications (Subsystem H).

b. PAYLOAD

(1) Recovery Capsule (Subsystem L)

(2) Visual Reconnaissance (Subsystem E).

B. GROUND EQUIPMENT

1. SPECIAL TEST EQUIPMENT. Special test equipment shall be defined as that equipment which is so specialized that its use is peculiar to the performance of the inplant testing processes required for the Sentry Program. This equipment shall include the special test equipment described in Tab 3 of this Section.

2. GROUND SUPPORT EQUIPMENT. Ground support equipment shall be defined as any or all non-vehicle-borne implements or devices which are required to inspect, test, adjust, calibrate, appraise, gage, measure, repair, overhaul, assemble, disassemble, service, transport, safeguard, record, store, actuate, or otherwise perform a

function in support of the Sentry satellite vehicle. This equipment includes ground handling equipment, ground servicing equipment, launch monitor and control equipment, vehicle subsystem and vehicle system checkout equipment as described in Tab 3 of this Section.

3. SATELLITE GROUND CONTROL EQUIPMENT. Satellite ground control equipment shall include all ground equipment necessary to provide for centralized system control for the launched vehicles and for the orbiting satellites. This includes ground-based communications equipment and all non-vehicle-borne specialized equipment required to transmit, receive, check out and test, record, analyze, process, store, decode indexed information, display, safeguard, or otherwise perform functions at tracking, acquisition and readout sites and at control centers immediately subsequent to launch and throughout the satellite's orbiting life. This equipment includes VERLORT radar equipment, VHF acquisition and tracking equipment, ground control and display equipment, data handling and computation equipment, VHF data receiving equipment, UHF acquisition and tracking equipment, UHF data receiving equipment, UHF command transmitting equipment, payload ground equipment, ground timing and display equipment, intra/interstation communications and data transmission equipment, alignment and calibration equipment, and miscellaneous equipment as described in Tab 3 of this Section.

C. TEST OPERATIONS

1. SANTA CRUZ TEST BASE. The Santa Cruz Test Base shall provide test operations involving the capability of testing components, subsystems, and satellite vehicles including engine firing, as required for development and acceptance testing.

2. LAUNCH BASE, VANDENBERG AFB, CALIFORNIA. All satellite vehicles of the Sentry Program shall be launched from Vandenberg AFB - Point Arguello. Base test operations shall include:

a. Vehicle assembly

b. Vehicle subsystem and system checkout, modification, and repair

c. Countdown, monitor, and launch.

Base facilities and ground equipment will be provided in accordance with the requirements established in Tabs 3 and 4 of this Section.

3. TRACKING AND ACQUISITION STATIONS. Seven tracking and acquisition stations shall be used for the Sentry Program and shall be located as follows:

a. Vandenberg AFB, California

b. Kaena Point, Hawaii

c. New Boston, New Hampshire

d. Ottumwa, Iowa

e. Fort Stevens, Oregon

f. Point Mugu, California

g. Kodiak Island, Alaska.

Each station shall have the capability to acquire, track, and command the satellite vehicle and to receive telemetry and reconnaissance readout data transmitted from the vehicle except:

a. Kaena Point shall have no reconnaissance data read-out capability

b. Point Mugu will be used for launch tracking and ascent telemetry only

c. Kodiak Island will be used for VERLORT tracking only

d. Vandenberg AFB shall have added VHF telemetry capability to provide real time telemetry data displays and recordings for the Atlas booster during the boost phase.

Facilities and equipment shall conform to the requirements of Tabs 3 and 4 of this Section.

4. TELEMETRY SHIP. A ship equipped with manually trained antennas and telemetry receiving and recording equipment and with ferret inflight calibration equipment shall be used to obtain telemetry data and to perform inflight calibration of ferret equipment. The ship shall be stationed at appropriate position to receive telemetry data transmitted from the satellite vehicle. The facilities and equipment shall conform to the requirements of Tabs 3 and 4 of this Section.

5. SPACE TRACK TRACKING STATIONS. The facilities of Space Track shall be utilized to provide additional data on vehicle orbital position during the recovery portion of the Sentry Program. The positional data derived from Space Track optical tracking activities shall be integrated into the computations undertaken for high-accuracy determination of vehicle orbital position.

6. DEVELOPMENT CONTROL CENTER, SUNNYVALE. Sentry flight test operations shall be centrally controlled and directed from the Development Control Center. The Development Control Center is the hub of the communications network and is the focal point for all systems status and control preceding and during launch operations. Also, the Center, including the computer facilities, provides for centralized system control for the orbiting satellites and centralized collection control for the sensor equipments. Such sensor control includes equipment scheduling, command programming, calibration evaluation, and integrated data handling. This Center shall conform to the requirements of Tabs 3 and 4 of this Section.

7. VANDENBERG CONTROL CENTER. Launch and orbit injection operations at the launch base, the tracking and acquisition stations at Vandenberg AFB and Point Mugu, and the telemetry ship shall be monitored and coordinated by the Vandenberg Control Center. Operations at the launch pad will be under specific control and direction from the blockhouse. The equipment of the Vandenberg Control Center shall conform to the requirements of Tab 3 of this Section.

8. HAWAIIAN CONTROL CENTER. The Hawaiian Control Center located at Hickam AFB, Hawaii, shall dispatch and control air and sea elements of the recovery force during recovery operations in the area of the Hawaiian Islands. This Center shall be equipped with necessary communications to permit real-time command and control of both the airborne and seaborne elements of the recovery force. The Hawaiian Control Center shall conform to the requirements of Tabs 3 and 4 of this Section.

9. RECOVERY FORCE. The recovery force shall consist of a minimum of four aircraft and two naval vessels. Both the aircraft and the naval vessels shall be equipped with 360° search, long-range direction-finding equipment. The aircraft shall also be equipped with air snatch equipment that can be deployed during flight at the aircraft's cruising speed. This recovery force shall be assigned to the Hawaiian Control Center for recovery operations in the vicinity of the Hawaiian Islands. Helicopters will be carried by the surface vessels to accomplish visual search in case of water impact.

10. USAF WEATHER FORECASTING. The USAF weather forecasting service will provide up-to-date estimates of the weather conditions existing at the targets to be photographed by the Visual Recovery Reconnaissance system.

D. SYSTEMS SUPPORT

1. PERSONNEL. Contractor-furnished personnel shall be assigned to all facilities listed above except for the Space Track optical tracking stations and the recovery force. A personnel selection and training program shall be planned and conducted as outlined in Tab 5 of this Section, so that all Contractor-furnished personnel will be qualified for the jobs assigned.

2. LOGISTICS. A logistic support program shall be developed and implemented so that the Sentry Program shall be adequately supported through the provision of stocks of equipment, material, and spare parts, and through the establishment of maintenance facilities as outlined in Tab 6 of this Section.

IV. TESTING REQUIREMENTS

A. FLIGHT TESTING. Each satellite vehicle shall be flight tested at Vandenberg AFB, using the facilities described above. Prior to each flight, a Flight Test Directive shall be prepared and shall establish the test objectives for that flight. These flight test objectives shall consist of three categories which are defined as follows:

1. PRIMARY OBJECTIVES. Those flight test objectives which are essential to and which contribute directly to the fulfillment of the program objectives shall be termed primary objectives. Any malfunction of test vehicle or ground equipment shall constitute grounds for holding, recycling, or terminating the launch countdown. Any tendency toward malfunction of equipment, deterioration of weather conditions, or change of range status that could in any manner jeopardize the accomplishment of a primary objective shall be sufficient justification to delay the test.

2. SECONDARY OBJECTIVES. Those flight test objectives which are highly desirable, but are not essential to the fulfillment of the program objectives, shall be termed secondary objectives. If the accomplishment of any secondary objective appears to be in jeopardy at any time prior to initiation of the booster automatic launch sequence, as determined by the Flight Test Controller, the countdown may be held or recycled to resolve the difficulty.

3. TERTIARY OBJECTIVES. Those flight test objectives which contribute to design research, environmental research, associated projects, or other supporting engineering effort shall be termed tertiary objectives. There shall be no delay, hold, or recycling of a countdown to assure accomplishment of a tertiary objective. Launch schedule rearrangements to favor the achievement of a tertiary objective shall be

considered desirable when, in the opinion of the Flight Test Controller, such rearrangements can be tolerated.

B. GROUND TESTING

1. SATELLITE VEHICLE TESTING. Satellite vehicle acceptance testing, including engine firing, shall be performed on each of the satellite vehicles to provide an accurate final checkout of the complete vehicle. These tests shall be conducted in accordance with the test specifications applicable to each vehicle as described in LMSD-445087, "Specification Program for Discoverer, MIDAS, and Sentry," dated 15 April 1959.

2. SATELLITE GROUND CONTROL TESTS. Satellite ground control tests shall be conducted as necessary to assure the functional effectiveness of the control and communications networks between and within tracking, acquisition, and readout stations, launch bases, and control centers; the data links; telemetry and reconnaissance data handling, system status, and display equipment; and the computer facilities.

V. RELIABILITY REQUIREMENTS

A. RELIABILITY OBJECTIVE. Reliability of the Sentry Program shall satisfy the following objective:

1. The average output of the system, the output being measured at the point of issue of the reconnaissance information from the ground processing station, shall not be reduced by the effects of equipment unreliability by more than the amounts specified in LMSD-427102, "Reliability Requirements and Reliability Program for Sentry Program," dated 19 March 1959.

TABLE I

FLIGHT MISSIONS (READOUT)

The four flight missions of the readout portion of the Sentry Program are distinguished by progressive advance in technology toward a system for readout of high resolution photo and advanced ferret reconnaissance data. These missions have been established as follows:

FLIGHT MISSION I (Dual Payload)

1. Demonstrate the ability of the Sentry/Atlas combination to place the satellite vehicle on a planned orbit.

2. Demonstrate the ability of the satellite vehicle to achieve and maintain a predetermined attitude orientation on orbit.

3. Utilizing E-1 visual equipment, read out pre-exposed and pre-processed film, process and read out pre-exposed film, and perform total subsystem operation within the capability limits imposed by the dual payload configuration.

4. Utilizing the F-1 ferret equipment, monitor electromagnetic emissions, quantize and store significant characteristics of these emissions, and read out these data via the vehicle-ground communication link to evaluate ferret reconnaissance techniques.

5. Test and evaluate the basic subsystems comprising the satellite vehicle.

6. Test and evaluate the capability of the ground equipment and facilities to support the satellite vehicle in its prelaunch, launch, ascent, and orbital phases.

7. Collect, record, and transmit telemetered data.

8. Demonstrate the capability of the satellite ground control system to maintain control of system operations.

FLIGHT MISSION II (Dual Payload)

1. Demonstrate the ability of the Sentry/Atlas combination to place the satellite vehicle on a planned orbit.

2. Demonstrate the ability of the satellite vehicle to achieve and maintain a predetermined attitude orientation on orbit.

3. Utilizing the E-1 visual equipment, read out pre-exposed and pre-processed film, process and read out pre-exposed film, and perform total subsystem operation within the capability limits imposed by the dual payload configuration.

4. Utilizing the F-2A ferret equipment, monitor electromagnetic emissions, quantize and store significant characteristics of these emissions, and read out these data via the vehicle-ground communication link to evaluate ferret reconnaissance techniques.

5. Test and evaluate the basic subsystems comprising the satellite vehicle.

6. Test and evaluate the capability of the ground equipment and facilities to support the satellite vehicle in its prelaunch, launch, ascent, and orbital phases.

7. Collect, record, and transmit telemetered data.

8. Demonstrate the capability of the satellite ground control system to maintain control of system operations.

FLIGHT MISSION III (Medium-Resolution Photo Reconnaissance)

1. Demonstrate the ability of the Sentry/Atlas combination to place the satellite vehicle on a planned orbit.

2. Demonstrate the ability of the satellite vehicle to achieve and maintain a predetermined attitude orientation on orbit.

3. Utilizing the E-2 visual reconnaissance equipment, demonstrate the ability to photograph specific areas of interest, process the exposed film, and electronically sense and read out the information via the vehicle-ground communications link.

4. Test and evaluate a vehicle auxiliary power system, which incorporates solar voltaic collectors, primary, and secondary batteries.

5. Test and evaluate the basic subsystems comprising the satellite vehicle.

6. Test and evaluate the capability of the ground equipment and facilities to support the satellite vehicle in its prelaunch, launch, ascent, and orbital phases.

7. Demonstrate the capability of the satellite ground control system to maintain control of multiple satellite operation.

FLIGHT MISSION IV (Ferret Reconnaissance)

1. Demonstrate the ability of the Sentry/Atlas combination to place the satellite vehicle on a planned orbit.

2. Demonstrate the ability of the satellite vehicle to achieve and maintain a predetermined attitude orientation on orbit.

3. Utilizing the F-2B, F-3A, and F-3B ferret equipment, in flight vehicles of Configuration IV monitor electromagnetic emissions, quantize and store significant characteristics of these emissions, record special signals by analog methods, and read out the data via the vehicle-ground communication link to evaluate ferret reconnaissance equipment.

4. Test and evaluate a vehicle auxiliary power system which incorporates solar voltaic collectors, primary, and secondary batteries.

5. Test and evaluate the basic subsystems comprising the satellite vehicle.

6. Test and evaluate the capability of the ground equipment and facilities to support the satellite vehicle in its prelaunch, launch, ascent, and orbital phases.

7. Demonstrate the capability of the satellite ground control system to maintain control of multiple satellite operation.

8. Obtain and process geophysical data.

TABLE II

FLIGHT MISSION (RECOVERY)

The flight mission of the recovery portion of the Sentry Program is designed to obtain high resolution photographic information.

FLIGHT MISSION (High-Resolution Surveillance)

1. Demonstrate the ability of the Sentry/Atlas combination to place the satellite vehicle on a planned orbit.

2. Demonstrate the ability of the satellite vehicle to achieve and maintain a predetermined attitude orientation on orbit.

3. Evaluate precise vehicle position and attitude determination techniques.

4. Test and evaluate a vehicle auxiliary power system which incorporates solar voltaic collectors, primary, and secondary batteries.

5. Test and evaluate the capability of the camera system to provide high-resolution photographic coverage of specific areas of interest.

6. Test capsule separation, retrodynamics, thermal protection and recovery techniques.

7. Evaluate orbital period adjustment, control, and computing systems.

8. Demonstrate the capability of the satellite ground control system equipment and facilities to control system operations, and to collect, record, and assess telemetered data.

TABLE III
ATLAS (SM-65) BOOSTER PERFORMANCE REQUIREMENTS

The Atlas missile furnished by the Government shall have a minimum booster exit performance as established by the following parameters. This performance is based upon a launch gross weight of the satellite vehicle limited to 11,600 pounds.

	Sustainer	Booster	Each Vernier	
			Pump Fed	Tank Fed
Thrust (lb)	56713 ± 3%	308366 ± 3%	1000 ± 3%	985 ± 3%
Specific Impulse (minimum)	215	245	220	214

3σ Variation in required nominal apogee altitude ± 2000 feet

3σ Variation in required nominal apogee velocity ± 2 feet per second

3σ Variation in required nominal orbit plane inclination ± 0.5 degree

SATELLITE VEHICLES

I. SCOPE

A. GENERAL. The performance requirements of the satellite vehicles comprising the space-borne test platforms to be used in exploiting the technical capabilities of the Sentry Program are established in this tab.

B. DESIGN OBJECTIVE. The basic objective of the satellite vehicle shall be to achieve flight mission capability defined in Tab 1 of this Section. The satellite vehicle shall be designed in four basic configurations for the readout portion of the Sentry Program and one basic configuration for the recovery portion of the Sentry Program. The design will satisfy the requirements of Table I, Nominal Performance, and Table II, Flight Missions and Configurations, of this tab.

II. DESIGN CRITERIA

A. PUBLICATIONS. The following publications shall be used in the design of the satellite vehicles for the Sentry Program:

1. MILITARY. The following military specification shall be used as a guide:

a. MIL-I-26600 (USAF), "Interference Control Requirements, Aeronautical Equipment," dated 2 June 1958.

2. LOCKHEED MISSILES AND SPACE DIVISION

a. Compliance with the following Contractor specifications shall be required. Later Air Force approved revisions shall be subject to separate negotiations.

(1) LMSD-6224, "Airframe Subsystem Specification (SM-65 and Battery Auxiliary Power)," Revision D, dated 26 May 1959

(2) LMSD-423965, "Airframe Subsystem Specification (SM-65 and Solar Power) MIDAS Program," Revision B, dated 26 May 1959

(3) LMSD-6161, "Propulsion Subsystem Specification (UDMH Configuration) for Discoverer Program," Revision B, dated 27 July 1959

(4) LMSD-2959, "Model Specification, Engine, Rocket, Liquid Propellant, USAF Model XLR-81-BA-5," Revision A, dated 31 March 1959

(5) LMSD-6226, "Subsystem C Battery Auxiliary Power Supply Specification (Atlas Configuration)," Revision B, dated 25 February 1959

(6) LMSD-423966, "Subsystem C Solar Auxiliary Power Supply Specification (Atlas Configuration)," dated 20 April 1959

(7) LMSD-6227, "Guidance and Control Subsystem Specification, Programs I, II, and III," dated 31 December 1958

(8) LMSD-6229, Subsystem E Specification for E-1 (Component Test) Payload," dated 30 April 1959

(9) LMSD-445000, "Subsystem F Specification for F-1 Equipment," dated 15 May 1959

(10) LMSD-6231, "Subsystem F Specification for F-2 Equipment," Revision A, dated 18 March 1959

(11) LMSD-6117A, "General Environmental Specifications for Discoverer, MIDAS, and Sentry Programs," Revision A, dated 24 June 1959.

b. Compliance requirements for the following Contractor specifications which are to be prepared shall be subject to both Air Force approval and separate negotiations.

(1) LMSD-445043, "Subsystem A Specification, Sentry Program".

(2) LMSD-6230, "Subsystem E Specification for E-2 Equipment".

(3) LMSD-424178, "Subsystem E Specification for E-5 Equipment".