January 3, 1966

GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

MSFC

FLIGHT MISSION DIRECTIVE

APOLLO-SATURN 205 MISSION

Prepared by
Saturn I/IB Program Office

National Aeronautics and Space Administration

NASA

MSFC

FLIGHT MISSION DIRECTIVE

APOLLO-SATURN 205 MISSION

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NATIONAL AERONAUTICS AND SPACE ADMINISTPATION

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1.0 Introduction

1.1 Document's Purpose: The purpose of this directive is to provide, under one cover, coordinated direction for the AS-205 Space Vehicle Flight. Within this document, mission objectives are specified, vehicle configuration is described and referenced, flight trajectories, data acquisition requirements, instrumentation requirements, and detailed documentation requirements necessary to meet launch vehicle mission objectives are defined and/or referenced.

1.2 Precedence: This mission directive implements the Apollo Flight Mission Assignments Document, (M-D MA 500-11), in accordance with the MSF Flight Mission Directive for the Apollo-Saturn 205 Mission, the Mission Rules Guidelines, the Apollo Program Specification (SE0005-001-1), and the Apollo Test Requirements, (NPC 500-10). It shall take precedence over all MSFC documents concerning the mission with respect to the launch vehicle for long range overall test planning and control.

Subsidiary documentation to the Mission Directive includes the detailed MSFC inputs to the Launch and Flight Rules, and to the Program Support Requirements Document.

Supporting documents, drawings, and reports directly related to the implementation of this Mission Directive which are referenced throughout the text must reflect the overall test planning and control represented by this document.

In certain stipulated cases (e.g., Launch and Flight Rules) referenced documents will take precedence when issued over the contents of this mission directive in order to provide detailed updated requirements on a current basis.

1.3 Scope: The MSFC Flight Mission Directive for the Apollo-Saturn 205 Mission is the MSFC planning document that implements the requirements and basic objectives specified by the Apollo Flight Mission Assignments Document. It reflects in greater detail the mission objectives, vehicle configuration, flight trajectories and other requirements specified in the MSF Mission Directive for this flight.

The scope of this document is satisfied by references to the documents to be utilized for details in specific areas of endeavor as specified throughout this document. A list of referenced documents is contained in Appendix B.

1.4 Revisions: Revisions to this directive will be made at MSFC by the Saturn IB Program Manager when necessary to reflect major changes in test plans. Such changes will be documented and coordinated in accordance with the implementation requirements of the MSF Mission Directive for this mission.

The latest revision of referenced documentation will be applicable. The originator of specific documentation is responsible for the distribution of revisions and their use (so far as user cognizance of their existence is concerned). Distribution of any such revisions must include the Saturn IB Program Manager.

1.5 Responsibilities:

1.5.1 MSFC: The Saturn I/IB Test Office, in cooperation with the Systems Engineering Office, is responsible for collecting, coordinating and assembling the material content of this document. The following organizations have accepted the responsibility for providing and coordinating the subject material noted:

a.	I-I/IB-E	Objectives/Evaluation Criteria
b.	R-AERO-P	Flight Description
c.	I-MO-O	Mission Operations Activities
d.	R-P&VE-VA R-ASTR-S	Vehicle Configuration
e.	R-ASTR-I	Instrumentation
f.	R-AERO-F	Data Analysis
g.	I-I/IB-T	KSC Checkout
h.	I-I/IB-G	Ground Support Equipment
i.	I-I/IB-T	Mission Supporting Tests
j.	I-MO-R	Support Requirements

1.5.2 MSC: The spacecraft and spacecraft operations after liftoff are MSC responsibilities (See Section 14, Apollo Program Development Plan). Information contained within this document which is within the MSC area of responsibility is so stated and is to be utilized for information only. The MSC Flight Mission Directive for the Apollo-Saturn 205 Mission applies and is referenced in these areas.

1.5.3 KSC: Launch vehicle checkout, countdown and launch operations are MSFC responsibilities delegated to KSC. Provisions for MSFC input to such KSC responsible areas have been indicated within this document. All other information with respect to KSC responsible areas is for information only and subject to change.

1.6 Terminology:

1.6.1 Definitions: Definitions of terms used in this document are consistent in general with those given in the NASA SP-6001 Apollo Terminology.

1.6.2 Abbreviations: Abbreviations used within the document are contained in Appendix A.

1.6.3 Designations: The Apollo Saturn 205 Mission designation is used throughout the document when reference is made to the mission or flight itself. The launch vehicle (excluding the spacecraft) is referred to as the SA-205 vehicle (or launch vehicle) while the total space vehicle is referred to as the AS-205 vehicle (or space vehicle). The intent in the use of these designations is consistent with Instruction MA2262.054, subject: "Clarification of Apollo-Saturn IB and V Flight Mission Designations", from OMSF MA/Director, Apollo Program, dated April 12, 1965,

2.0 Mission Objectives

2.1 General:

2.1.1 Mission Purpose: The basic purpose of the Apollo-Saturn 205 Mission is to verify spacecraft/crew operations and subsystems performance for an orbital mission of from 10 (minimum) to 14 days duration.

2.1.2 Mission Objectives Categories:

(a) Primary Objectives: Primary objectives are those which are mandatory. Malfunctions of spacecraft or launch vehicle systems, ground equipment, or instrumentation which would result in failure to acheive these objectives will be cause to hold or cancel the mission until the malfunction has been eliminated.

(b) Secondary Objectives: Secondary objectives are those which are desirable but not mandatory. Malfunctions which would result in failure to attain these objectives may be cause to hold or cancel the mission as indicated in the Mission Rules.

(c) The objectives category listing is according to priority. This priority listing (primary vs. secondary) shall be utilized as a guide when integrating and implementing all objectives for this mission. The planned mission profile and mission support plans shall reflect the requirements of these objectives.

2.2 General Objectives (primary objectives listed in the Flight Mission Assignments Document):

2.2.1 Verify spacecraft/crew operations for a mission of up to 14 days duration.

2.2.2 Determine CSM subsystem performance in an earth orbital environment

2.2.3 Demonstrate crew/CSM/launch vehicle/mission support facilities performance during a long duration earth orbital mission.

2.3 Detailed Objectives (expanded Listing of General Objectives):

2.3.1 Primary:* A detailed expanded listing of the above general objectives for the SA-205 launch vehicle is not required since the only launch vehicle primary objective is to insert the manned Block I Apollo Spacecraft in a near earth orbit.

2.3.2 Secondary:* No secondary objectives are assigned for the launch vehicle.

*Future launch vehicle performance, data evaluation results, or major changes may require additional objectives to be assigned for this launch vehicle flight.

2.3.3 Spacecraft: The spacecraft detailed primary and secondary objectives are presented in the MSC Program Apollo Flight Mission Directive for Mission A-205.

3.0 Mission Description

3.1 Powered Flight:

The AS-205 space vheicle will be launched from Launch Complex 34 at Cape Kennedy on a 100° E of N launch azimuth. The Flight Control Computer provides signals to the control system as required to rotate the vehicle to the 72° E of N flight azimuth. The S-IB boost phase utilizes a preset time-tilt program which is in the LVDC to produce a gravity turn trajectory.

Immediately following S-IB engine cutoff, staging occurs. Approximately 2.5 seconds after S-IB cutoff, the S-IVB engine is ignited. Approximately 20 seconds after S-IVB ignition active adaptive guidance is initiated utilizing the Iterative Guidance Mode (IGM) which navigates and guides the vehicle into an elliptical orbit having an 85 nautical mile perigee and a 130 nautical mile apogee.

The vehicle reference trajectory will be contained in the Launch Vehicle Reference Trajectory for Saturn IB, AS-205.

3.2 Post Insertion:

The AS-205 space vehicle post insertion data will be supplied in the MSC Flight Mission Directive for the Apollo-Saturn 205 Mission.

3.3 Abort Capability:

The launch escape subsystem provides abort capability prior to liftoff in the event of pad emergency, and between liftoff and LES jettison. The service propulsion subsystem provides the abort capability from LES jettison until spacecraft separation from the S-IVB. Detailed spacecraft abort sequence information is contained in the MSC Program Apollo Flight Mission Directive for Mission A-205.

3.4 Preplanned Alternate Mission:

There is no alternate mission preplanned for the AS-205 Mission.

3.5 Inflight Alternate Mission Capability:

(1) The inflight alternate mission capability during the S-IB powered flight is as follows (The Flight Mechanics Summary will define flight time effectivity of engine out):

(a) 1 engine out- Seven S-IB engine burn + S-IVB burn + CSM burn to orbit

(b) 2 engines out- Six S-IB engine burn + S-IVB burn + CSM burn to orbit

(c) Complete loss of thrust- S-IVB burn + CSM burn to orbit

(2) The inflight alternate mission capability during the S-IVB powered flight is as follows:

Loss of thrust - CSM burn to orbit

4.0 Saturn Launch Vehicle Description

4.1 General: The launch vehicle description presented within this section is formulated to meet the objectives specified in section 2. The latest revisions of referenced documentation is to be utilized for any problem areas associated with configuration.

The only planned major differences between the SA-204 and SA-205 Launch Vehicles is the deletion of the R&D instrumentation from SA-205. This deletion is a direct result of the change in primary objectives which do not require launch vehicle evaluation for the AS-205 Mission.

4.2 Weight: A memorandum entitled "Weight Status Report for the Saturn IB Launch Vehicle" presents the latest weight status through the 15th of each month. Six weeks prior to flight a predicted weight report will be issued and one month after flight an actual weight report will be issued by Marshall Space Flight Center (R-P&VE-VAW). Weights quoted throughout the text of this section are control weights (not actual weights).

4.3 Vehicle Profile: Launch vehicle configuration is documented in the Marshall Space Flight Center (MSFC) drawings 10C03713 and 60C00842. Vehicle to launch facility configuration will be documented by Kennedy Space Center (KSC), drawing number not available at this time. The SA 205 Vehicle Launching Information Document will be published in three sections, S-IB Stage by Chrysler Corporation Space Division, New Orleans, S-IVB Stage by Douglas Aircraft Company, Los Angeles, and the Instrument Unit by IBM, Huntsville. These will be available about one month before shipment of the vehicle to Kennedy Space Center (KSC). The following paragraphs describe in detail the configuration of the three major launch vehicle assemblies, the S-IB Stage, the S-IVB Stage, and the Instrument Unit.

4.3.1 S-IB Stage: The S-IB booster stage is made up of a tail section, a propellant section, a second stage adapter assembly, and eight fins.

Tail Section: The tail section contains eight H-1 engines rated at 200,000 pounds thrust each. It is made up of a thrust structure, a shroud, actuation controls and the eight H-1 engines. The thrust structure consists basically of a barrel assembly, eight radial outriggers with shear panels and two outer rings. The barrel assembly supports the center LOX container and provides attachments for the outriggers and four inner engine mounting brackets. The radial outrigger shear panels transfer thrust from the outboard engines, support the outer propellant containers and provide attachment points for the fins and outboard engine gimbal mounts. The shroud is an aerodynamic skin consisting of eight smooth forward panels and eight corrugated aft panels. The four inboard engines are installed in the pitch and yaw planes of the vehicle on a 32-inch radius. Fixed inboard engine mounts are attached to the thrust structure cylinder and cant the engines 3 degrees radially outboard from the vertical axis of the vehicle. The four outboard engines are installed in planes 45 degrees from the pitch and yaw planes of the vehicle on a 95-inch radius. The outboard engines are canted 6 degrees radially outboard from the vertical axis of the vehicle and gimbal $\pm$ 8 degrees in a square pattern to provide thrust vector control. The gimbal bearing and actuator mounts are attached to the same outrigger shear panel.

Propellant Container Section: The propellant container section consists of nine propellant tanks. Eight of these are 70 inches in diameter and mounted in a circular pattern around a 105-inch diameter LOX tank. Four of the eight 70-inch tanks contain LOX and the other four contain fuel, RP-1. The LOX and fuel tanks are arranged alternately. The center LOX tank is rigidly mounted between the barrel section of the thrust structure and the center hub of the second stage adapter. The four fuel containers are mounted to allow for thermal contraction of the outer and center LOX tanks. Various power supply, control, and instrumentation equipment is part of the instrument canisters mounted in the forward skirt of the propellant tanks.

Second Stage Adapter Assembly: The second stage adapter assembly consists of eight aluminum I beams radiating from a central hub and an outer ring to stabilize the radial beams. It provides forward attachment points for the propellant tanks, structural integrity for the forward portion of the S-IB Stage, mounting for high pressure helium storage spheres, and provisions for a field splice to the S-IB/S-IVB interstage skirt.

The S-IB Stage measures 21.4 feet in diameter at the propellant tanks, 22.8 feet in diameter at the tail unit assembly and has a span of 40.7 feet across the fins. The length of the S-IB is 80.2 feet. The dry control weight of the S-IB is 85,800 pounds. A detailed list of current weights is contained in the latest "Weight Status Report for Saturn IB Vehicles," (see paragraph 4.2).

Fins: Four fins are spaced 90 degrees apart around the circumference of the shroud on the pitch and yaw axes. The remaining four fins are spaced 45 degrees from each axis fin. Each of the eight fins attach to an outrigger shear panel and provide preflight support of the vehicle.

The S-IB Stage configuration is documented by drawing number 60C00324. S-IB Stage Assembly drawing number 60M18205 defines the assembly of the Apollo Saturn 205, S-IB Stage. The alignment of components to the S-IB Stage, S-IB Stage to launch facility, and S-IB Stage to S-IVB Stage is also controlled by drawing 60M18205. Electrical equipment will conform to the latest revision to the "Electrical Equipment List Apollo Saturn 205, S-IB Stage." Instrumentation will conform to the latest revision to the "Instrumentation Program and Components, Apollo Saturn 205, S-IB Stage," drawing number 60C50009.

4.3.2 S-IVB Stage: The S-IVB Stage consists basically of an aft interstage, an aft skirt, a thrust structure, a divided propellant container, a J-2 engine and a forward skirt.

Aft Interstage: The aft interstage, also referred to as the S-IB/S-IVB interstage, is a semimonocoque structure which supports the remainder of the S-IVB Stage, the Instrument Unit, and the Spacecraft prior to the S-IB/S-IVB separation. Four Thiokol TE-29-IB solid propellant retro-motors equally spaced circumferentially provide thrust to impart a negative acceleration to the S-IB Stage and the aft interstage immediately after the separation of the aft interstage/aft skirt interface.

Aft Skirt: The aft skirt is a semimonocoque structure which is attached to the aft end of the cylindrical portion of the propellant container. Three Thiokol TX-280 solid propellant motors equally spaced circumferentially provide a positive acceleration to the S-IVB Stage to settle propellants for J-2 engine start. The aft skirt also provides mounting facilities for two diametrically opposed attitude control modules. Each module contains three TAPCO 150-pound-thrust (vacuum) hypergolic (MMH and N_2O_2) rocket engines. These provide roll control during powered flight of the S-IVB Stage as well as attitude control in orbit.

Thrust Structure: The thrust structure is a truncated cone with longitudinal stiffeners. The thrust structure provides attachment points for the engine gimbal mount and the hydraulic actuators. An ambient spherical helium bottle mounted on the thrust structure provides pneumatic control pressurization throughout the vehicle pressure system. The forward end of the cone (large diameter) attaches tangentially to the aft bulkhead of the propellant container.

Propellant Container: The propellant container is an insulated cylinder with hemispherical bulkheads at each end. An internal hemispherical bulkhead divides the propellant container into an aft section for LOX storage and a forward section for liquid hydrogen storage. Eight cold helium spheres located in the hydrogen tank provide LOX tank pressurization. The hydrogen tank is initially pressurized by a cold helium ground source and pressure is maintained by gaseous hydrogen tapped off the thrust chamber fuel injection manifold.

Forward Skirt: The forward skirt is a semimonocoque cylindrical structure which attaches to the forward end of the cylindrical portion of the propellant container and supports the Instrument Unit and the payload.

J-2 Engine: A single J-2 rocket engine of 200,000-pound nominal thrust (vacuum) is installed on the centerline of the S-IVB Stage. The engine gimbals ($\pm$ 7 degrees maximum in a square pattern) to provide pitch and yaw control.

The S-IVB Stage has a diameter of 21.7 feet and a length of 59.1 feet (including approximately 8-inch protrusion of the liquid hydrogen tank bulkhead into the Instrument Unit). The control weight of the S-IB/S-IVB Interstage is 6,600 pounds and the control dry weight of the S-IVB Stage (without interstage) is 23,353 pounds. A detailed list of current weights for this stage is contained in the latest "Weight Status Report for Saturn IB Vehicles."

The S-IVB Stage configuration is documented by drawing number 10M03563D. S-IVB Stage Assembly drawing number 1A74633-507 defines the assembly of the S-IVB-205 stage. Alignment of the S-IVB Stage is controlled by drawing number 10M04197. Instrumentation will conform to the latest revision to the "Instrumentation Program Components List, Apollo-Saturn 205, S-IVB Stage."

4.3.3 Instrument Unit: The Instrument Unit structurally consists of three arc segments of honeycomb sandwich bonded panels joined with splice plates to form a cylindrical monocoque structure. Ring-segment angles are bonded to the skins of the panels to provide mating surfaces to attach the Instrument Unit to adjacent stages. Brackets are bolted to the inner face of the panel segments to provide mounting for the environmental conditioning cold plates with their integrally cooled components. The Instrument Unit structure provides mounting for the systems hardware and transmits the flight loads between the Spacecraft and the S-IVB Stage.

The Instrument Unit houses instrumentation concerned with vehicle performance from lift-off until after insertion of the combined S-IVB Stage, Instrument Unit and Spacecraft into orbit. Primary systems contained within the Instrument Unit include guidance and control, tracking, and telemetry. Service systems include power supply, distribution, and environmental control which includes pressure regulated gaseous nitrogen supply for the inertial platform bearings of the guidance and control system.

S-IU-205 is the second Saturn IB Instrument Unit furnished by IBM. The Instrument Unit has a diameter of 21.7 feet and a length of 3.0 feet. The control weight of the Instrument Unit is 4,150 pounds.

The Instrument Unit configuration is documented by MSFC drawing number 10Z03688. The Instrument Unit Assembly drawing number 10Z22204 defines the assembly of the Apollo Saturn 205, Instrument Unit. Alignment of the Instrument Unit is controlled by drawing number 10Z04198B. Electrical equipment will conform to the latest revision to the "Electrical Equipment List, Apollo Saturn 205, Instrument Unit," drawing number 60Z09061. Instrumentation will conform to the latest revision to the "Instrumentation Program and Components, Apollo Saturn 205, Instrument Unit," drawing number 6009030.

4.4 Interface Requirements:

4.4.1 Physical Interfaces: The following table lists the physical requirements of specific major assembly interfaces.

TABLE

Interface Document	Drawing Number
H-1 Engine (Inboard)/S-IB Stage Physical Requirements	13M20501
H-1 Engine (Outboard)/S-IB Stage Physical Requirements	13M20500
S-IB/Launch GSE Interface	INACTIVE
S-IB/Launch Handling Equipment Interface	INACTIVE
S-IB/S-IVB Stage Interface	13M20506
J-2 Engines/S-IVB Stage Interface	13M20502
S-IVB/Launch GSE Interface	INACTIVE
S-IVB/Launch Handling Equipment Interface	13M20513
S-IVB/Instrument Unit Interface	13M20507
Instrument Unit/Launch GSE Interface	INACTIVE

TABLE (cont'd)

Interface Document	Drawing Number
Instrument Unit/Launch Handling Equipment Interface	13M20515
Saturn IB Vehicle S-IB Stage Fluid Requirements	13M20097
Saturn IB Vehicle S-IVB Stage Fluid Requirements	13M20098
Saturn IB Vehicle Instrument Unit Fluid Requirements	13M20099

4.4.2 Electrical Interfaces: The following table lists the requirements of specific major electrical interfaces.

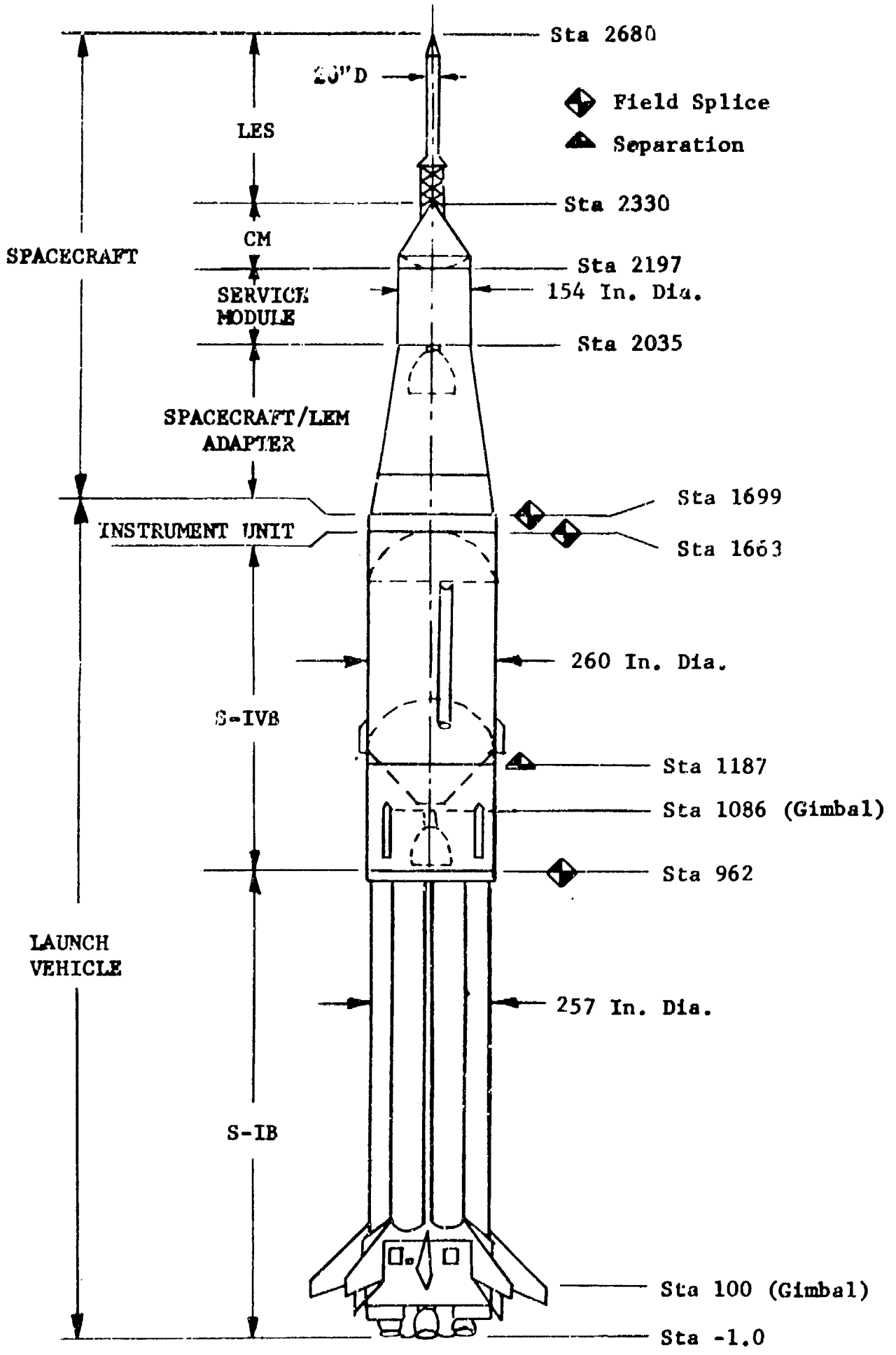
TABLE

Interface Document	Drawing Number
Definition of Saturn IB Vehicle S-IB/S-IVB Electrical Interface	A40M30682
Definition of Saturn IB Vehicle S-IVB/IU Electrical Interface	A40M30695
Definition of Saturn IB Vehicle S-IB/ESE Electrical Interface	A40M35004
Definition of Saturn IB Vehicle SA-205 and subsequent S-IVB/ESE Electrical Interface	A40M35041
Definition of Saturn IB Vehicle IU/ESE Electrical Interface	A40M35007

4.4.3 Inter-Center Interfaces: Inter-center interfaces are contained in the latest revision of the Apollo Inter-Center Interfaces Control Document Log, IAOI. The following specific major interfaces are included:

TABLE

Interface Document	Drawing Number
I.U. to Spacecraft Physical Requirements	13M20508
Spacecraft to Q-Ball Physical Interface	13M20509
Envelope LEM/S-IVB/IU Clearance	13M20517
I.U. to Spacecraft Electrical Requirements	40M37509
Design Criteria for Saturn IB On-Board EDS	13M65000
Description of Saturn SA-205 and Apollo S/C EDS	40M37550
EDS Checkout Schematics	40M37538



SATURN IB CONFIGURATION

Figure 4-1

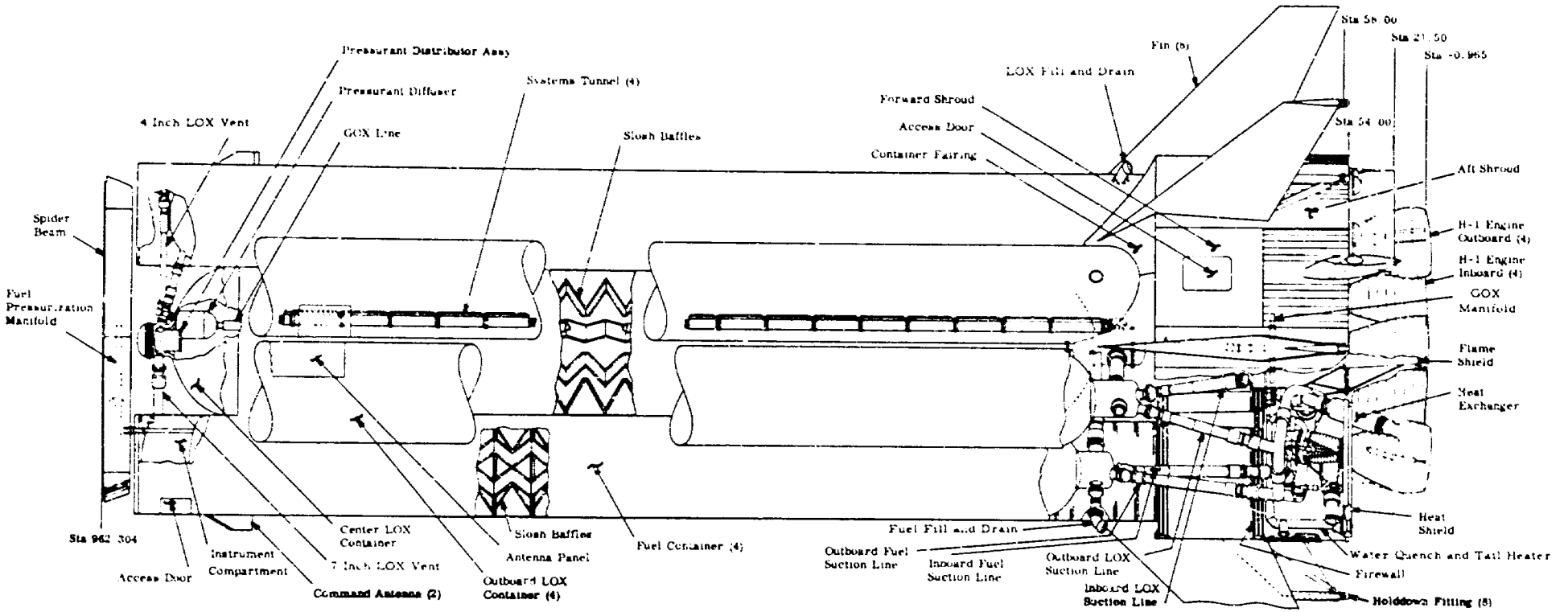


Figure 4-2 S-IB Stage Inboard Profile

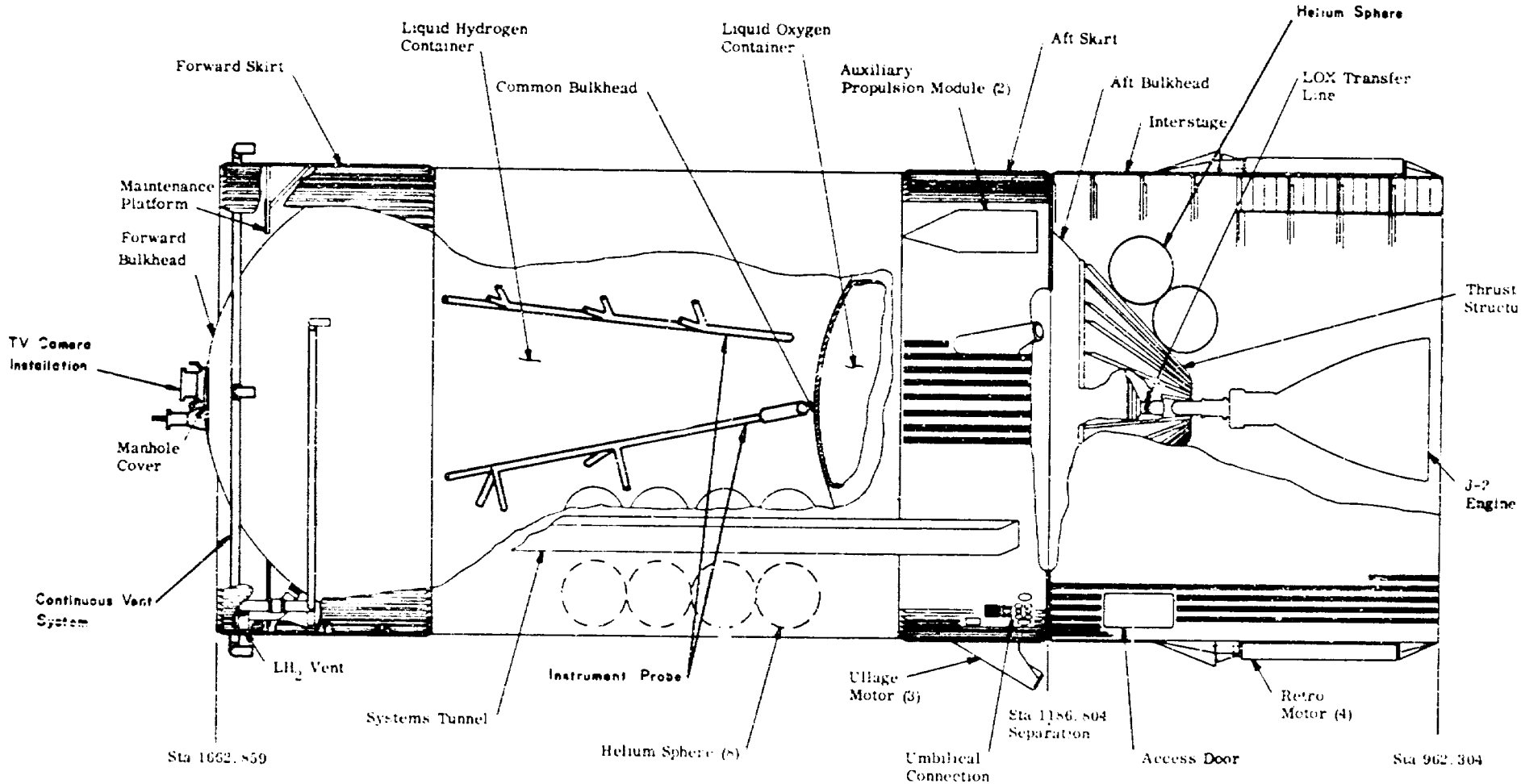
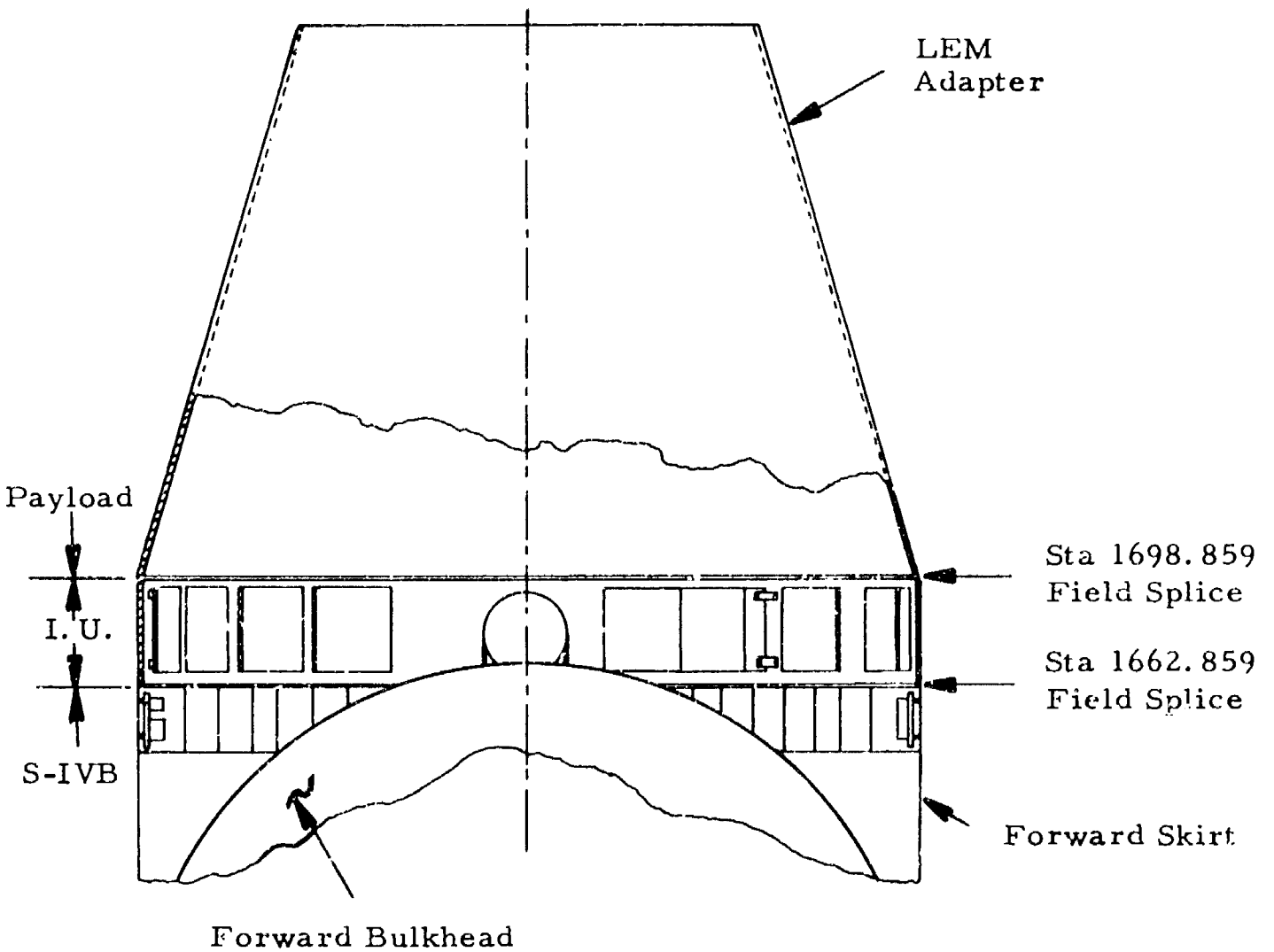


Figure 4-3 S-IVB Stage Inboard Profile



INSTRUMENT UNIT ARRANGEMENT

Figure 4-4

5.0 Spacecraft Description

5.1 General:

The spacecraft is a MSC responsibility and detailed information concerning the spacecraft and its subsystems is available through the MSC Flight Mission Directive for the Apollo-Saturn 205 Mission. The spacecraft information contained within this section is for information only.

5.2 Spacecraft Configuration:

The spacecraft scheduled for the Apollo-Saturn 205 Mission is CSM 014. Spacecraft configuration is specified within the following documents:

a. SID 64-1237, "CSM Master End Item Specification (Block 1)", dated February 22, 1965 (Confidential)

b. SID 63-313, "CSM Technical Specification (Block 1)", dated February 22, 1965 (Confidential)

c. SID 64-1080, "CSM End Item Specification, Part 1, Performance/Design Requirements, Spacecraft 014, Apollo", dated February 22, 1965, (Confidential)

6.0 Mission Supporting Tests

6.1 Launch Vehicle Ground Test Constraints:

No major launch vehicle ground tests beside the required prelaunch checkout tests are planned as constraints to the flight of the SA-205 launch vehicle.

6.2 Stage Level Ground Test Constraints:

The following major ground stage level test milestones represent constraints on the scheduled 205 flight.

a. Qualification of Redesigned Components

b. Reliability Demonstration (or assessment)

c. Acceptance Tests

(1) Manufacturing Checkout

(2) Static Test Operations

(3) Post Static Checkout

(4) KSC Prelaunch Checkout

7.0 Objectives Evaluation Criteria

Since the only launch vehicle objective is to insert the spacecraft in orbit, there is no detailed objectives evaluation criteria. R&D instrumentation has been deleted from the launch vehicle. The only instrumentation onboard is the minimum required for satisfactory vehicle operation and flight evaluation. The measurements required to support vehicle operation and flight evaluation are contained in the Saturn IB Technical Information Checklist. The mission rules will define the mandatory measurements that must be operating at lift-off.

8.0 KSC Checkout Activities

8.1 Checkout Prerequisites: In addition to satisfying ground test requirements as specified in the Apollo Test Requirements, checkout activities provide information for a series of reviews and assessments of launch vehicle status by the Saturn IB Program Manager. This assessment process continues throughout the pre-mission period and is concluded by the Apollo Program Flight Readiness Review. The Saturn IB Program assessment events include:

a. Quarterly Reviews

b. Certificate of Flight Worthiness Certification Points

c. MSFC Launch Vehicle Preflight Reviews

8.2 Vehicle Checkout Milestones

The checkout of the SA-205 Launch Vehicle is a MSFC responsibility delegated to KSC. The following events represent an outline of checkout activities at KSC for information only. Event times are approximate times prior to the Countdown Demonstration.

Event Times	Milestone Events
11 weeks	S-IB Erection
10 weeks	S-IVB/IU Erection and Stage Level Systems Tests
9 weeks	LV Electrical Mate
6 weeks	SC Erection
5 weeks	SV Electrical Mate
3 weeks	SV Umbilical Eject Test
1 week	SV Flight Readiness Test
0 weeks	SV Countdown Demonstration

8.3 Launch Operations Plan

Responsibilities for KSC checkout activities including receipt, processing, support, and launch of AS-205 Space Vehicle will be prescribed within the KSC Apollo/Saturn IB Launch Plan AS-205 (K-IB-02). The Launch Plan is the control document which identifies and briefly describes the content of the subordinate documents necessary for checkout and launch activities.

9.0 Mission Operations

9.1 Test Management: Pre-launch, launch and flight operations test management during the mission period is centered under the MSF Mission Director. Control over operations is exercised through the Launch Director and the Flight Director. The Launch Director has overall responsibility for directing launch operations until the Space Vehicle has cleared the Umbilical Tower. The MSC Flight Director then assumes control over operations. MSFC involvement in test management is exercised through the MSFC Launch Vehicle Representative as outlined in the MSFC Apollo/Saturn Program Operations Plan and Section 14 of the Apollo Program Development Plan.

9.2 Test Support: On-call advisory support to the MSFC Launch Vehicle Representative, the Launch Director, and the Mission Director for interpretation of mission rules and resolution of vehicle problem areas will be provided by LIEF (Launch Information Exchange Facility). LIEF will provide a locator service for MSFC and key contractor personnel during pre-launch checkout tests and the terminal countdown. MSFC personnel designated as required for advisory purposes will be kept available on call. During the terminal countdown (T-12 hours) they will be assembled and kept informed of countdown status to insure immediate response. LIEF management and support are outlined in the MSFC Apollo/Saturn Program Operations Plan. Personnel selection and detailed operating plans will be documented in the LIEF Operations Plan to be issued approximately eight weeks prior to launch.

Remote advisory support to the Saturn Launch Vehicle Staff Support Room in the MCC-H will be jointly provided from the HOSC and LCC. Detailed operating plans for this support will be given in the Saturn Launch Vehicle Remote Support Interface Plan and in the LIEF Operations Plan.

9.3 Launch Restrictions: The Go/Hold/No-go restrictions and other constraints within this section are MSFC requirements for planning purposes. The detailed restrictions and constraints will be finalized and provided to KSC on a time basis consistent with KSC document release schedules. The MSFC input to the KSC Launch Mission Rules will be established and submitted to KSC by the MSFC Mission Operations Office with the concurrence of the Saturn IB Program Manager. The final release of the inter-center coordinated Launch Mission Rules will supersede this Mission Directive with respect to launch operations.

The Launch Mission Rules will be utilized as a guide by the Mission Director in reaching Go/No-go decisions during the conduct of the launch operation. The MSFC Launch Vehicle Representative, for the Program Manager, on the Launch Director's team will recommend necessary waivers or modifications to the launch vehicle and will recommend action concerning go/hold/no-go conditions during the countdown.

Revisions of the MSFC minimum requirements or constraints and additions of requirements currently unavailable will be supplied to KSC by the MSFC Mission Operations Office with the concurrence of the Saturn IB Program Manager.

9.3.1 Data Acquisition Restrictions: In order to accomplish the mission objectives specified in Section 2, data acquisition requirements impose constraints on the launch operation. The data acquisition requirements will constitute one of the basis for detailed mission rules in the area of instrumentation.

9.3.2 Launch Window Restrictions: There are no known Launch Window Restrictions imposed by MSFC. The KSC Launch Mission Rules will provide window parameters as necessary.

9.3.3 Tracking and Telemetry Systems: The tracking and telemetry systems to be utilized for the Apollo-Saturn 205 Mission are specified in the Apollo/Saturn IB Program Support Requirements Document (PSRD) prepared by OSRO.

9.3.4 Weather Restrictions:

(a) Wind: Approximately four weeks prior to scheduled launch, wind velocity limits for the AS-205 vehicle will be determined for the month of launch as a function of wind direction. The limits will be established based upon the control responses and structural capabilities of the vehicle and will include perturbations due to variations in propulsion, guidance, control and aerodynamic effects. This data will be provided at that time in the SA-205 Mission Flight Mechanics Summary.

(b) Other Weather Restrictions: Other weather restrictions such as severe weather and cloud cover will be contained in the mission rules as appropriate for this mission.

9.4 Flight Control Operations: Flight control operations are conducted from the Mission Control Center - Houston; and are the responsibility of the Flight Director. MSFC representation on the Flight Director's team is provided by the resident MSFC Flight Control Office at Houston. Mission constraints and criteria which effect flight control operations are established and coordinated on a continuous basis through the MSFC Flight Control Office. MSFC imputs to the Flight Mission Rules are provided to MSC on a time basis consistent with MSC document release schedules by the Mission Operations Office through the MSFC Flight Control Office. The MSFC/MSC interface in the area of flight control operations is further outlined in the MSFC Apollo/Saturn Program Operations Plan.

10.0 Pad and Range Safety Requirements

10.1 Pad Safety:

Pad safety is a KSC responsibility under the pad safety supervisor. Safety provisions are contained in the "General Range Safety Plan", Volume I, AFMTCP 80-2, dated October 1, 1965 and its supplements and revisions.

10.2 Range Safety:

The range safety trajectory and aerodynamic data requirements for the Saturn vehicle are published in memorandum dated July 28, 1961, from MTRSM/R. M. Montgomery. Final data must be provided approximately 30 days prior to scheduled launch.

The range safety data requirements for the launch vehicle are met as follows: (1) A magnetic tape written in a special "Cape Tape" format will be prepared containing the nominal predicted trajectory and three sigma perturbed trajectories. (2) A Range Safety Data Report will be published containing the expected effects of destruct action during powered flight, turning rate of the velocity vector, a statistical analysis for overflight of inhabited areas (including kill probability), the trace of instantaneous impact points of all trajectories, and other pertinent data. A summary of the range safety data will be included in the Operational Predicted Flight Mechanical Summary Report.

11.0 Tracking and Support Data Requirements

11.1 Operations Support Requirements:

Operations support requirements such as tracking, telemetry, meteorological, data capsule, recovery, and photographic requirements are broadly specified in the Apollo/Saturn IB Program Support Requirements Document (PSRD) prepared by OSRO. Detailed mission requirements will be finalized approximately six months prior to launch. These detailed requirements will be provided to OSRO by MSFC for inclusion in the support requirements documentation. They include both real time and post flight engineering data requirements with specifications for data dispositon.

11.2 Onboard Instrumentation:

Instrumentation Systems for the SA-205 Launch Vehicle are subject to change. For detailed and current instrumentation systems information refer to the Instrumentation Program and Components List for each stage and IU as listed below and to the Program Support Requirements Document.

S-IB-205	Drawing No. 60C50009
S-IVB-205	Drawing No. 1B34558
S-IU-205	Drawing No. 6009039

12.0 Recovery Requirements

12.1 Launch Vehicle:

There are no launch vehicle recovery requirements for the Apollo-Saturn 205 Mission.

12.2 Spacecraft:

Spacecraft recovery requirements are contained in the MSC Flight Mission Directive for this mission.

13.0 Postflight Tests

13.1 Launch Vehicle:

Postflight tests are not applicable to the SA-205 launch vehicle.

13.2 Spacecraft:

Spacecraft postflight test requirements are contained in the MSC Flight Mission Directive for this mission.

14.0 Data Processing, Analysis, and Reporting

14.1 Launch Vehicle:

a. Data Handling and Processing: Data handling will be specified in the AS-205 Program Support Requirements Document. MSFC real time data will be processed according to the AS-205 LIEF Operations Plan. Post-flight engineering data will be processed according to the MSFC AS-205 Processed Data Requirements Document (PDRD).

b. Data Analysis: The analysis of the launch vehicle flight performance will be the responsibility of the MSFC Flight Evaluation Working Group. The working group will report the findings of the analysis in accordance with the schedule given in Paragraph c below.

c. Data Reporting: Launch vehicle test results will be reported by MSFC on the following time basis:

(1) Three Day TWX to Associate Administrator, OMSF, Director, Apollo Program; and Director, Apollo Test.

(2) Ten Day Report to Director, Apollo Test.

(3) Flight Evaluation Bulletins to MSFC Organizations and limited NASA distribution.

(4) Sixty Day Engineering Report to NASA distribution.

14.2 Spacecraft:

Spacecraft data processing, analysis and reporting requirements are contained in the MSC Flight Mission Directive for this mission.

15.0 Ground Support Equipment

15.1 Launch Vehicle:

Launch Complex 34 will be utilized to launch the AS-205 vehicle. The checkout equipment complex for the Saturn IB Program provides an automation capability for rapid and extensive computer controlled checkout of the complex systems involved in the Saturn Launch Vehicles. The major GSE items utilized are described and listed in the following documents:

a. "Launch and Checkout Computer Program Configuration and Control Plan".

b. "Saturn IB Ground Support Equipment Functional Listing" (to be released)

c. "Saturn IB Ground Support Equipment Location Listing" (to be released)

d. "Electrical Equipment List" and associated technical data.

15.2 Spacecraft

See the MSC Flight Mission Directive for the Apollo-Saturn 205 Mission.

MSFC

FLIGHT MISSION DIRECTIVE

APOLLO-SATURN 205 MISSION

APPENDIX A

LIST OF ABBREVIATIONS

LIST OF ABBREVIATIONS

APS	-	Auxiliary Propulsion System
ATR	-	Apollo Test Requirements
AZUSA	-	Tracking System
BP	-	Boilerplate
CM	-	Command Module
CSM	-	Command Service Module
ECS	-	Environmental Control System
EDS	-	Emergency Detection System
ELS	-	Earth Landing System
EPS	-	Electrical Power System
ESE	-	Electrical Support Equipment
ETR	-	Eastern Test Range
GBI	-	Grand Bahama Island
GLOTRAC	-	Global Tracking (ETR Uprange Systems)
GSE	-	Ground Support Equipment
GSFC	-	Goddard Space Flight Center
IO	-	Industrial Operations
IU	-	Instrument Unit
KSC	-	Kennedy Space Center
LCC	-	Launch Control Center
LES	-	Launch Escape System
LH	-	Liquid Hydrogen
LIEF	-	Launch Information Exchange Facility
LOS	-	Loss of Signal
LV	-	Launch Vehicle
MANDY	-	A KSC TM and Tracking Facility
MISTRAM	-	Missile Trajectory Measurement
MILA	-	Merritt Island Launch Area
MSC	-	Manned Spacecraft Center
MSFC	-	Marshall Space Flight Center
MSR	-	Mission Support Requirements
NM	-	Nautical Mile
ODOP	-	Off-set Doppler Tracking System
OSRO	-	Operations Support Requirements Office

PSR	-	Program Support Requirements
RCS	-	Reaction Control System
S-IVB	-	Second Stage of Saturn IB Launch Vehicle
S-IB	-	First Stage of Saturn IB Launch Vehicle
SATCON	-	Satellite Control Center
SCAMA	-	Goddard-leased hard-line communication net
SCS	-	Stabilization and Control System
SLA	-	Spacecraft LEM Adapter
SM	-	Service Module of Apollo Spacecraft
SPS	-	Service Propulsion System
STADAN	-	Satellite Tracking and Data Acquisition Net
STC	-	Sacremento Test Center
TM	-	Telemetry

MSFC

FLIGHT MISSION DIRECTIVE

APOLLO-SATURN 205 MISSION

APPENDIX B

LIST OF SUPPORTING DOCUMENTS

LIST OF SUPPORTING DOCUMENTS

Apollo Flight Mission Assignments Document (M-D MA 500-11).
Apollo Inter-Center Interfaces Control Document Log IAOI
Apollo Program Development Plan
Apollo Terminology (NASA SP-6001)
Apollo Test Requirements (NPC 500-10)
AS-205 Vehicle Launching Information Document

Checkout Procedures for R.F. and Antenna Systems, S-IB-5, Drawing Number 60C50134
Checkout Procedure for R.F. Systems SA-205, Drawing Number 60C09042
Checkout Procedures for S-IB-5 Flight Measurements System, Drawing Number 60C50027
Checkout Procedures for Telemetry Systems, SA-205, Drawing Number 60C09041
CSM End Item Specification, Part 1, Performance/Design Requirements Spacecraft 014, Apollo SID-64-1080
CSM Master End Item Specification SID 64-1237
CSM Technical Specifications SID 63-313

Electrical Equipment List

General Range Safety Plan Vol. I AFMTCP 80-2

Instrument Unit Assembly, Drawing Number 10Z22204
Instrumentation Operations Analysis Report
Instrumentation Program and Components, Apollo-Saturn 205, Instrument Unit Drawing Number 60Z09039.

Launch and Checkout Computer Program Configuration and Control Plan
Launch Vehicle Reference Trajectory for Saturn IB AS-205
LIEF Operations Plan

Mission Rules Guidelines
MSC Apollo Program Flight Mission Directive for AS-205 Mission
MSF Flight Mission Directive for the Apollo-Saturn 205 Mission
MSFC AS-205 Processed Data Requirements Document (PDRD)
MSFC Plan for Apollo Mission Operations

Operational Predicted Flight Mechanical Summary Report
Operations Directive Plan (ETR)

Program Support Requirements (OSRO)

Range Safety Data Report

Saturn Antenna Systems, Drawing Number 60C09061
Saturn IB Ground Support Equipment Functional Listing
Saturn IB Ground Support Equipment Location Listing
Saturn IB Instrumentation Systems Description, Drawing Number 60C09075
Saturn Launch Vehicle Remote Support Interface Plan
SA-205 Mission Flight Mechanics Summary
Saturn IB Technical Information Checklist

Telemetry Diagram Handbook, Drawing Number 60C09073

Weight Status Report for the Saturn IB Launch Vehicle

APPROVAL

MSFC

FLIGHT MISSION DIRECTIVE

APOLLO-SATURN 205

The information in this report has been reviewed for security classification. Review of any information concerning Department of Defense or Atomic Energy Commission programs has been made by the MSFC Security Classification Officer. This directive, in its entirety, has been determined to be unclassified.

Stanley L. Scraggs
MSFC Security Classification Officer

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