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GEORGE C. MARSHALL SPACE FLIGHT CENTER
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TECHNICAL INFORMATION SUMMARY

AS-501

APOLLO SATURN V FLIGHT VEHICLE

PREPARED BY:
R-AERO-P
R-ASTR-S
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AS-501

TECHNICAL INFORMATION

SUMMARY

This document is prepared jointly by the Marshall Space Flight Center Laboratories R-AERO-P, R-ASTR-S, and R-P&VE-VN. The document presents a brief and concise description of the AS-501 Apollo Saturn Space Vehicle. Where necessary, for clarification, additional related information has been included.

It is not the intent of this document to completely define the Space Vehicle or its systems and subsystems in detail. The information presented herein, by text and sketches, describes launch preparation activities, launch facilities, and the space vehicle. This information permits the reader to follow the space vehicle sequence of events beginning a few hours prior to liftoff to its journey into space.

1. Mission Purpose:

The purpose of the AS-501 mission is to develop the Saturn V launch vehicle for manned flights and to verify the adequacy of the Apollo Command Module heat shield at lunar reentry velocities.

The AS-501 mission is an unmanned, elliptical earth orbital flight.

2. Mission Objectives:

a. Demonstrate structure and thermal integrity, and compatibility of the launch vehicle and spacecraft, and determine structural loads and dynamic characteristics during powered and coasting flight.

b. Determine launch vehicle in-flight internal environment.

c. Verify launch support equipment compatibility, and mission support capability for launch and mission operations to high post-injection altitudes and Command Module recovery.

d. Demonstrate the S-IC and S-II stage propulsion systems and determine in-flight system performance parameter.

e. Demonstrate the launch vehicle guidance and control system during powered flight; achieve guidance cutoff and evaluate system accuracy.

f. Demonstrate S-IC/S-II dual plane separation and S-II/S-IVB separation.

g. Demonstrate launch vehicle sequencing system.

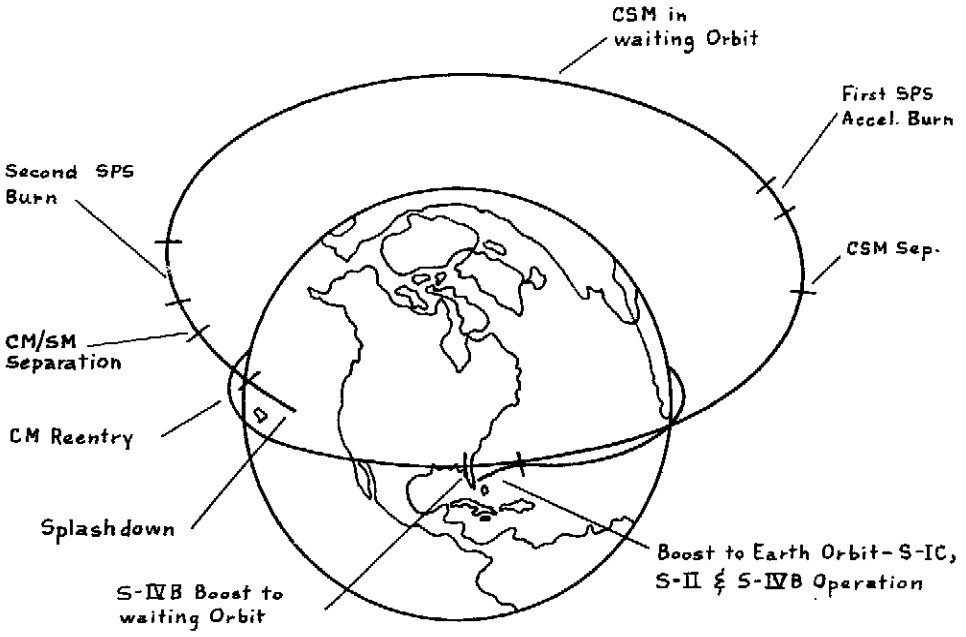
h. Evaluate performance of the emergency detection system (EDS) in an open-loop configuration.

i. Demonstrate S-IVB stage restart capability.

j. Verify adequacy of the Command Module heat shield for reentry at lunar return conditions.

3. Mission Profiles:

AS-501 will be launched from Launch Complex 39, Pad A, Kennedy Space Center (KSC); at a launch azimuth of 90°E of N. Shortly after liftoff (approximately 12 sec) the vehicle begins a roll maneuver to attain a flight azimuth of 72°E of N and maintains a near zero-lift (gravity turn) trajectory through the maximum dynamic pressure region. After S-IC burn and separation; S-II burn and separation, the first burn of the S-IVB will propel the S-IVB/IU/Spacecraft into a 100-nautical-mile parking orbit using the Iterative Guidance Mode (IGM). The vehicle will remain in this orbit for approximately two revolutions with its' longitudinal axis in the orbital plane and parallel to the local horizon. During the second revolution, when the vehicle is within tracking range of KSC, the S-IVB engine will be re-started to boost the vehicle into an elliptical atmosphere - intersecting waiting orbit with an apogee of approximately 9,000 nautical miles. Spacecraft separation occurs approximately 590 seconds after injection into waiting orbit. The coast time in waiting orbit between S-IVB cutoff and Command Module (CM) reentry is approximately 4.6 hours. Shortly after spacecraft separation a service propulsion system (SPS) burn and navigational corrections will be performed to achieve lunar return velocity and the proper reentry corridor. Following the second SPS burn, Command Module/Service Module (CM/SM) separation will occur and the CM will be reoriented for a guided lifting reentry which will produce the heat load desired to test the CM heat shield at lunar returning velocity. Splash-down will be near Hawaii.



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