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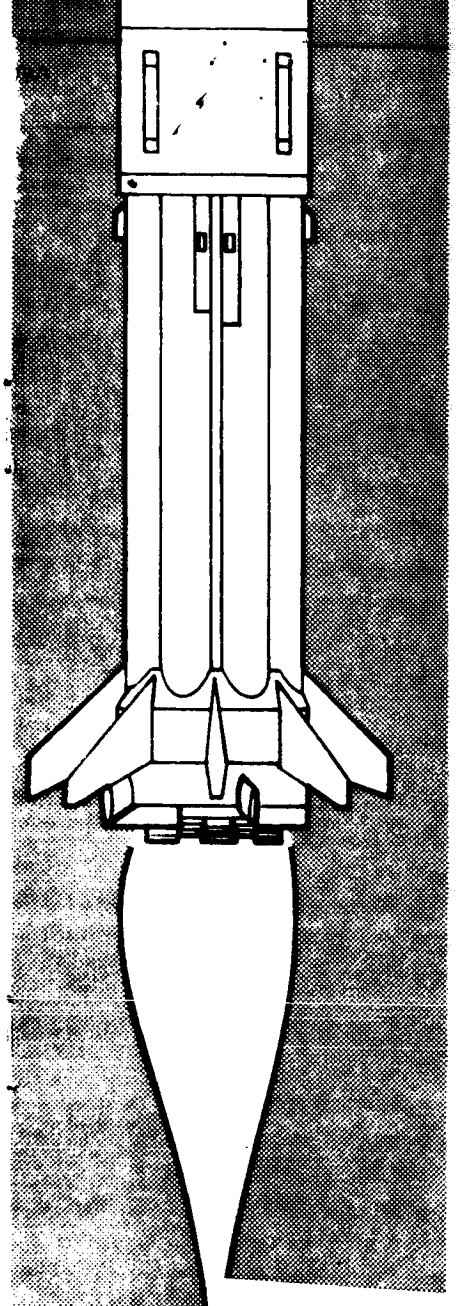
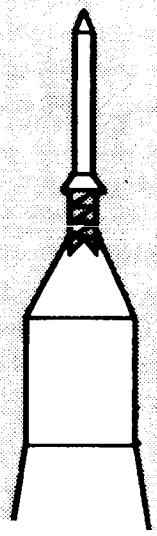
(TN-AP-67-255)

PART IV

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)





CONTRACT NAS8-4016 SCHEDULE II, VEHICLE SYSTEMS INTEGRATION

SPACE DIVISION CHRYSLER CORPORATION

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(TN-AP-67-255)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

JULY 25, 1967

by

AEROSPACE PHYSICS BRANCH

CHRYSLER CORPORATION SPACE DIVISION

PREPARED BY T. J. WHARTON, A. C. GENTER, AND B. B. BARRETT

Checked By: R. M. Blackstock
R. M. Blackstock,
Preflight Trajectory Unit

APPROVED:

S. A. Zobal
S. A. Zobal, Managing Engineer
Preflight & Range Safety Group

R. D. Taylor
R. D. Taylor, Managing Engineer
Vehicle Performance Group

J. G. Swider
J. G. Swider, Manager
Flight Mechanics Section

R. H. Ross
R. H. Ross, Chief Engineer
Aerospace Physics Branch

FOREWORD

This report documents the AS-204/LM-1 Launch Vehicle Operational Flight Trajectory (Revision I). The analysis and documentation were performed by Aerospace Physics Branch, Chrysler Corporation Space Division, within the scope of NAS 8-4016, Modification MSFC-1, Amendment 23, MCRR No. 101, BB Item 3.1.3-10-M01, Part IV.

Acknowledgements are made to the personnel of Marshall Space Flight Center, R-AERO-FM, for their assistance and cooperation.

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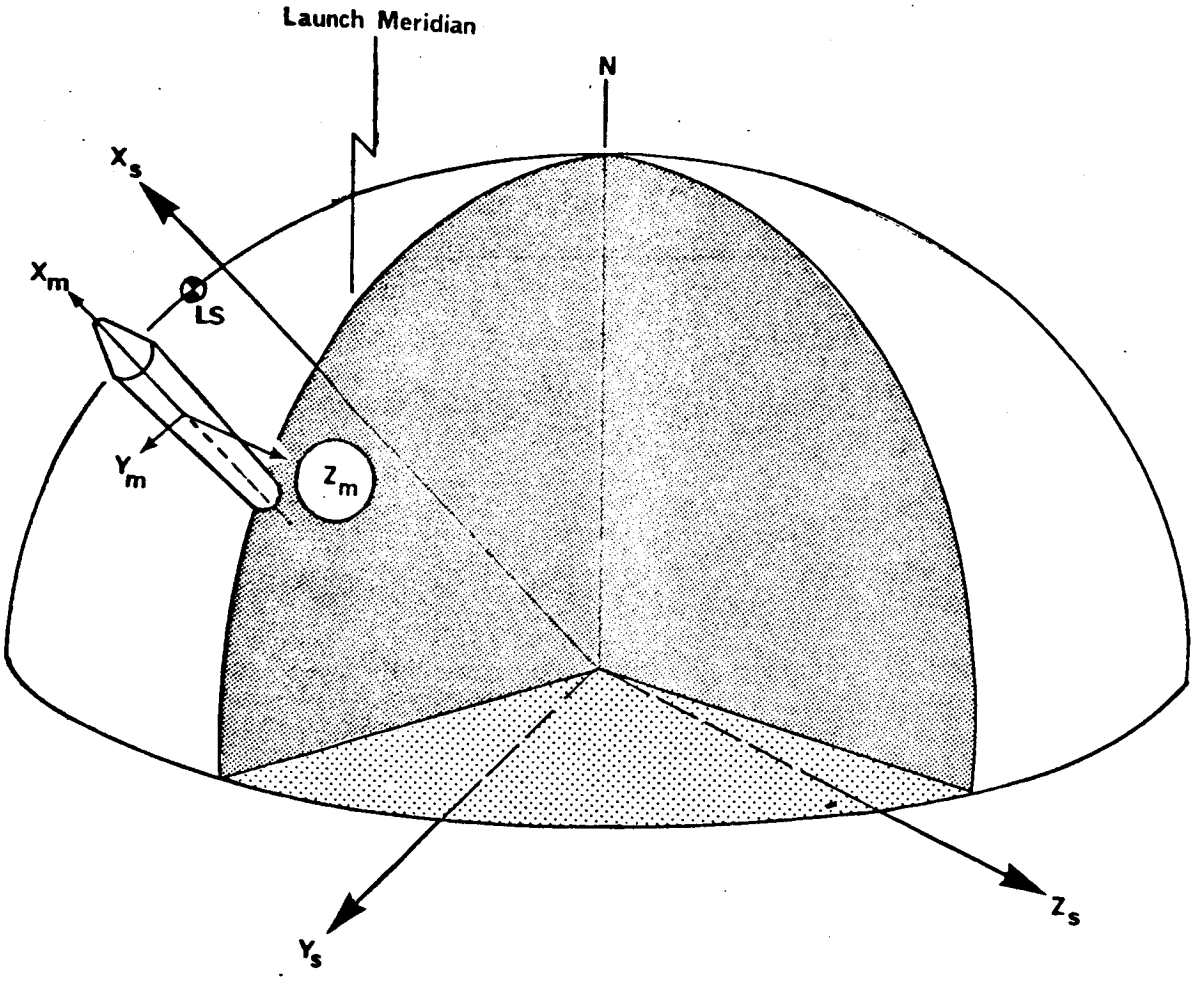
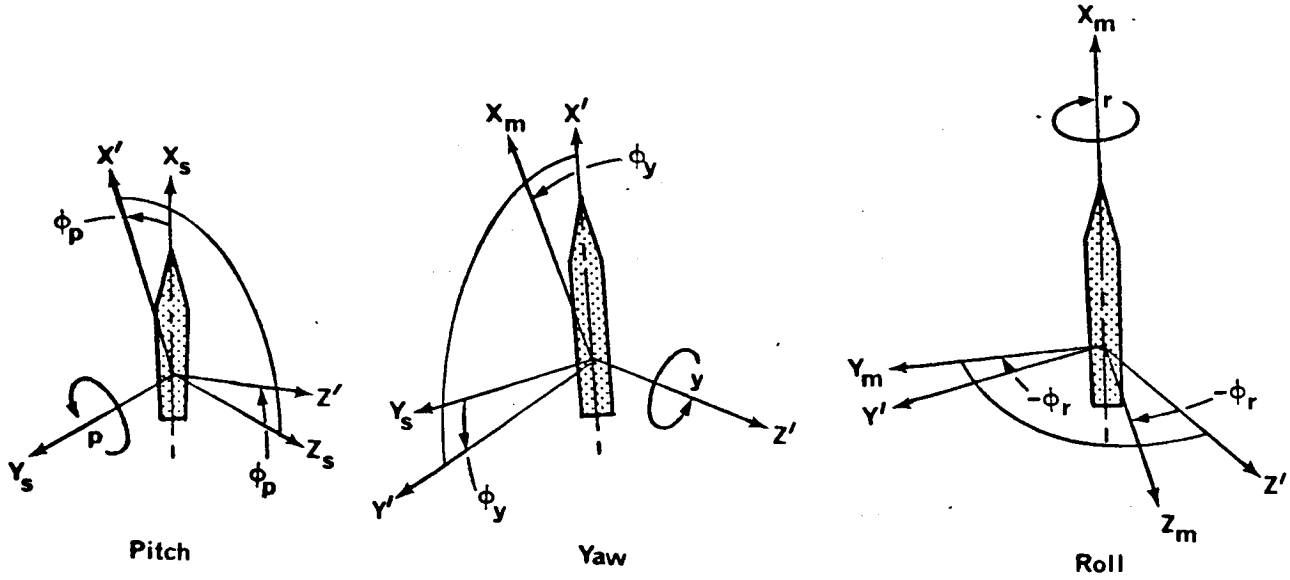
Aerodynamic Heating Indicator	$\int \frac{qV_r}{\pi/2 - \lvert\alpha_t\rvert}\, dt$ q = dynamic pressure V_r = relative velocity α_t = total angle of attack
Aerodynamic Load Indicator	Product of dynamic pressure and angle of attack.
Altitude	Vehicle altitude above the referenced ellipsoid measured along the geocentric position vector.
Angle of Attack, Pitch	Angle between the pitch plane relative velocity component and the longitudinal axis of the vehicle, measured positive nose up.
Axial Force	Component of the resultant aerodynamic force along the vehicle longitudinal axis (X axis of PASCS 8a), measured positive toward the tail of the vehicle.
Central Range Angle	Angle between instantaneous space fixed position vector and space fixed position vector at Guidance Reference Release
Descending Node Argument	Angle measured in the equatorial plane between the orbit plane descending node and the space fixed meridian plane defined at Guidance Reference Release.
Drag	Component of the resultant aerodynamic force along the earth fixed velocity vector, measured positive opposite to the velocity vector.
Dynamic Pressure	$\frac{1}{2}$ x (Density) x (Relative Velocity)^2
Earth Fixed Position	Position vector components in an earth-fixed pad-centered plumbline coordinate system. The Xe axis is coincident with the reference ellipsoid normal, positive upward. The Ze axis is parallel to the earth-fixed aiming azimuth and is positive downrange. The Ye axis completes a right handed system. (PASCS 10)
Earth Fixed Cross Range	Ye component of PASCS 10 position vector.

Earth Fixed Flight Path Angle	Angle between the earth fixed velocity vector and the earth fixed geocentric position vector (PASCS 11), measured positive downrange from the position vector.
Earth Fixed Velocity	Velocity vector components in PASCS 10.
Earth Fixed Velocity Magnitude	$\sqrt{\dot{X}e^2 + \dot{Y}e^2 + \dot{Z}e^2}$
Flight Azimuth	Angle defining orientation of the space fixed coordinate system downrange axis, Zs, at Guidance Reference Release, measured positive east of north in plane normal to the space fixed Xs axis at Guidance Reference Release.
Geocentric Declination	Angle between the geocentric radius vector and the true equatorial plane, measured positive north of the equator.
Geodetic Latitude	Angle between the reference ellipsoid normal through the point of interest and the true equatorial plane, measured positive north of the equator.
Ground Range	Surface range measured from launch site to the sub vehicle point.
Inclination	Angle between the instantaneous flight plane and the equatorial plane.
Longitude	Angle between the Greenwich meridian plane and the projection of the geocentric position vector in the equatorial plane, measured positive east of Greenwich.
Longitudinal Acceleration	That part of the total measurable acceleration directed along the longitudinal axis of the vehicle.
Mach Number	(Relative Velocity) ÷ (Local Speed of Sound)



$$\bar{X}_m = (-\phi_r)_1 (\phi_y)_3 (\phi_p)_2 \bar{X}_s$$



Mass	Mass of the vehicle.
Normal Force	Component of the resultant aerodynamic force normal to the vehicle X axis, and in the X-Z plane (PASCS 8a), measured positive toward Position I.
Pitch, Yaw, Roll	Eulerian angle of vehicle attitude measured with respect to the space fixed coordinate system. Vehicle attitude is defined by the ordered rotation of pitch, yaw, and roll, respectively. (See illustration)
Radius	$\sqrt{Xs^2 + Ys^2 + Zs^2}$
Relative Velocity	Velocity relative to the atmosphere (includes wind velocity).
Space Fixed Position	Position vector components in a spaced fixed, earth centered, plumbline coordinate system defined at Guidance Reference Release. The Xs axis is parallel to the reference ellipsoid normal which passes through the launch site. The Zs axis is parallel to, and positive in the same direction as the earth-fixed firing azimuth. The Ys axis completes the right handed system. This is Project Apollo Standard Coordinate System 13. (PASCS 13.)
Space Fixed Cross Range	Ys component of PASCS 13 position vector.
Space Fixed Flight Path Angle	Angle between the space-fixed velocity vector and the radius vector (PASCS 13), measured positive downrange from radius vector.
Space Fixed Velocity	Velocity vector components in PASCS 13.
Space Fixed Velocity Magnitude	$\sqrt{\dot{Xs}^2 + \dot{Ys}^2 + \dot{Zs}^2}$
Time	Instantaneous flight time referenced to first motion.
Weight	Weight of vehicle in pounds.

SUMMARY

This report documents the AS-204/LM-1 Launch Vehicle Operational Flight Trajectory (Revision I). Trajectory data are tabulated for all phases of flight for which the Saturn IB Launch Vehicle has a functional requirement. A comprehensive summary of the launch vehicle characteristics is also presented.

The predicted S-IB and S-IVB stage end conditions are summarized below:

		S-IB/S-IVB Separation	Guidance Cutoff Signal
Flight Time	(sec)	143.523	598.152
Altitude	(m)	63,579.	163,193.
Space Fixed Velocity	(m/sec)	2,369.58	7,821.49
Space Fixed Path Angle	(deg)	62.854	90.004
Range	(m)	62,766.	1,796,200.

The nominal weight in orbit capability is predicted to be 70,205 pounds. This is 3,386 pounds in excess of the nominal propellant depletion weight. The 3-sigma flight performance reserve given in Reference 1, approximately 1,300 pounds, is considered reasonable for the AS-204/LM-1 configuration. Hence, from a performance standpoint, approximately 2,086 pounds of S-IVB propellant is available to compensate for S-IB stage early engine shutdown.

Summaries of the trajectory flight envelope at S-IB/S-IVB separation and S-IVB cutoff are presented in Tables 11 and 12. These data were taken from Reference 1, with the exceptions noted, and are considered applicable to this trajectory.

The supporting tracking and alternate mission trajectories are documented in References 2 and 3, respectively. Summaries of the tracking coverage are presented in Figures 22 and 23.

SECTION 1

INTRODUCTION

The AS-204/LM-1 Launch Vehicle Operational Flight Trajectory (Revision I) is presented in this document. By definition, the Launch Vehicle Operational Trajectory includes all phases of flight for which the S-IB stage and the S-IVB/IU stage have functional requirements.

In addition, comprehensive summaries of vehicle data, sub-systems characteristics, and the guidance and control modes are presented herein.

SECTION 2

MISSION DESCRIPTION

2.1 MISSION OBJECTIVES: The basic purpose of the Apollo Saturn 204/LM-1 Mission is to launch and test an unmanned LM for verification of crew safety items and to verify the launch vehicle's systems performance in preparation for subsequent operational manned space vehicle missions. An S-IVB stage propellant dump experiment is also planned after LM separation. The primary objective of the SA-204 Launch Vehicle is to insert the S-IVB/IU/Payload configuration in a near earth 85/120 nautical mile elliptic orbit. The payload consists of a Lunar Module (LM), Spacecraft LM Adapter (SLA), and a 25° Nose Cone. (See References 4 & 5.)

In the event of an S-IB engine premature shutdown, the desired orbit may be attained by using the remaining seven S-IB engines, S-IVB burn, and, if necessary, LM burn to orbit. The effects of S-IB engine premature shutdown on mission capability are documented in Reference 3. In the event of S-IVB engine failure, the inflight alternate mission is LM burn to orbit.

2.2 MISSION GROUND RULES AND CONSTRAINTS: The following mission criteria, vehicle constraints, and trajectory constraints have been imposed on this trajectory:

1) Launch from AFETR Pad 37B.

2) Pad oriented launch azimuth of 90 degrees east-of-north.

3) Flight azimuth of 72 degrees east-of-north.

4) S-IB stage tilt program defined in Table 1B.

5) S-IVB cutoff conditions for 85/120 nautical mile elliptic orbit insertion.

6) Commanded pitch and yaw attitude rate limit of one degree per second.

7) Average mean head/tailwind for September and October.

SECTION 3

LAUNCH VEHICLE AND ENVIRONMENT DESCRIPTION

3.1 CONFIGURATION: The SA-204/LM-1 Saturn IB Launch Vehicle consists of a S-IB first stage, a S-IVB second stage, an instrument unit, and a payload. The payload consists of a Lunar Module (LM), 25° Nose Cone, and a Spacecraft LM Adapter (SIA). An outboard profile of the complete configuration is shown in Figure 1A, Appendix A.

3.2 MASS CHARACTERISTICS: The SA-204 vehicle mass characteristics are defined in Reference 6. Table 1A presents a vehicle weight breakdown of the launch vehicle. These data are consistent with Reference 6 and the trajectory presented herein. Tables 2A and 3A present a time history of the vehicle mass and the associated center of gravity and moment of inertia data for the S-IB and S-IVB stages of flight, respectively.

3.3 AERODYNAMIC PROPERTIES: Aerodynamic data for the S-IB and S-IVB stages of powered flight were obtained from References 7-9. Flight time histories of the S-IB stage of flight aerodynamic data are presented in Table 4A. Orbital drag data was extracted from Reference 10.

3.4 PROPULSION SYSTEMS: The S-IB stage is powered by eight H-1 engines which have a nominally rated sea level thrust of 200,000 pounds each. The predicted nominal thrust magnitude history for each H-1 engine, including thrust decay and the associated turbine engine thrust, were obtained from Reference 11. The thrust magnitude time history for each H-1 engine is delineated in Table 5A. Figure 2A depicts the thrust decay histories.

The S-IVB stage is powered by a single J-2 engine which has a rated vacuum thrust of 200,000 pounds at a nominal mixture ratio of 5:1. However, the propellant utilization system produces a Programmed Mixture Ratio (PMR) shift which provides a high mixture ratio level and a corresponding high thrust level for approximately 325 seconds of flight. The predicted nominal J-2 engine thrust history from the 90% thrust level time point to the time of the guidance cutoff signal was obtained from Reference 12. The thrust buildup and thrust decay histories were obtained from Reference 13. Table 6A presents a summary of the J-2 engine thrust history. The J-2 thrust buildup and decay histories are depicted in Figures 3A and 4A.

Four solid propellant retro-motors (TE-M-29) mounted on the S-IB/S-IVB interstage provide thrust to decelerate the S-IB stage after separation. The retromotors are rated at a nominal thrust level of 36,720 pounds each (Reference 14).

Three solid propellant ullage motors mounted on the S-IVB stage aft skirt provide a positive acceleration for the S-IVB stage to settle propellants for J-2 engine start. The ullage motors are rated at 3,460 pounds-thrust each (Reference 15).

The S-IVB Stage Auxiliary Propulsion System (APS) consists of two modules. Each module contains three 150 pound thrust (vacuum) hypergolic rocket engines. This system provides roll control during the J-2 burn phase and pitch, yaw and roll control after J-2 cutoff.

3.5 ENVIRONMENT DESCRIPTION: The 1963 Patrick Reference Atmosphere model defines the atmospheric properties incorporated in the trajectory simulation. The earth model and potential function are those of the Fischer Earth Model. The wind profile is an average of the September and October mean headwind/tailwind profiles defined in Reference 16. It is depicted in Figure 5A.

SECTION 4

GUIDANCE AND CONTROL

The Saturn IB inertial guidance system performs navigation evaluations, issues discrete commands, initiates guidance and control functions, and issues steering commands to guide the launch vehicle to the prespecified targeting conditions. These functions are accomplished by the AS-204/LM-1 Flight Program which is stored in the Launch Vehicle Digital Computer (LVDC). Inputs to the LVDC for navigation and steering command evaluations are the predetermined constants for the different guidance modes and the inertial velocity increments sensed by the stabilized platform accelerometers.

4.1 GUIDANCE: Guidance of the AS-204/LM-1 Launch Vehicle into orbit and throughout the orbital phases of active attitude control is divided into three distinct phases: (1) Pre-IGM; (2) IGM; and (3) Orbital.

The Pre-IGM phase guidance provides pitch, yaw and roll vehicle attitude commands as a function of the time from liftoff to the time of IGM initiation. The S-IB stage pitch program polynomials for this mission are delineated in Appendix B, Table IB. Also included in Table IB is a time history of the yaw and roll attitude commands. A history of the pitch attitude steering command generated by the polynomials is given in Table 2B.

In the Iterative Guidance Mode (IGM) phase, a two-stage three-dimensional formulation of the IGM equations and logic provides active guidance of the S-IVB stage in pitch and yaw from the time of IGM initiation, TB3 + 17.0 seconds, to J-2 cutoff. The commanded roll attitude is zero. The IGM equations and logic programmed for the LVDC Flight Program are defined in Reference 17. The IGM presettings for the mission are given in Appendix B, Table 3B.

The orbital guidance mode provides pitch, yaw and roll attitude commands for the planned maneuvers during the orbital phase of the mission. The specific guidance equations are defined in Reference 17. Table 4B presents a summary of the attitude maneuvers simulated during the orbital phase. (See Reference 18.)

4.2 CONTROL SYSTEMS: Pitch, yaw and roll attitude control are maintained by the four swivelable H-1 engines during the S-IB stage of powered flight. The control law, gains, and network characteristics for the S-IB stage control system are defined in Reference 19.

The J-2 engine provides pitch and yaw attitude control throughout the S-IVB stage of powered flight. Roll attitude control is maintained by the Auxiliary Propulsion System. The control law, gains and network characteristics of the S-IVB stage control systems are defined in Reference 19.

SECTION 5

LAUNCH VEHICLE TRAJECTORY

The nominal sequence of events for the AS-204/LM-1 Launch Vehicle Operational Flight Trajectory (Revision I) is summarized in Table 1. These data are consistent with Reference 20 and the mass and propulsion data referenced herein.

Table 2 provides a summary of trajectory parameters at pertinent events from liftoff to loss of attitude control. Convenient summaries of the end conditions of flight for the S-IB and S-IVB stages of powered flight are presented in Tables 3 and 4 , respectively. Tabulated listings of the trajectory are presented in Tables 5 - 8. Corresponding tabular listings, in English units, are given in Appendix C. Graphical displays of the ascent trajectory profile are shown in Figures 1 through 5.

The associated data tapes required for distribution by MSFC, R-AERO-F, are identified as follows:

Trajectory Listing (Printout Tape):
CCSD/Slidell Reel No. 5634,
MSFC Copy was delivered 7-6-67.

Data Tape (B-7 Tape):
CCSD/Slidell Reel No. 6476,
MSFC Copy was transmitted 7-10-67.

5.1 S-IB STAGE POWERED FLIGHT PHASE: Tabulated listings of trajectory parameters for this phase are presented in Table 5. The phase is initiated at Guidance Reference Release (GRR), which is assumed to be 5 seconds prior to launch (first motion). The time of umbilical disconnect and the corresponding establishment of Time Base one (TB1) is assumed to be 0.2 seconds after first motion. The phase ends at S-IB/S-IVB physical separation, which is assumed to be 1.379 seconds after Outboard Engine Cutoff signal (OECO).

A time history of the S-IB stage pitch attitude steering command is depicted in Figure 6. Figures 7 and 8 present summaries of the resulting vehicle pitch attitude rate and attitude error. A summary of the pitch plane angle of attack is presented in Figure 9. Figure 10 presents a summary of the dynamic pressure history. The longitudinal acceleration history is depicted in Figure 11.

In order to establish a more realistic nominal trajectory prediction, a constant thrust bias equal to + 0.7 per cent of the vehicle sea level longitudinal thrust has been included in the S-IB stage trajectory. This action is an attempt to minimize the effects of an apparent systematic shift in the ground to flight test performance level.

5.2 S-IVB STAGE POWERED FLIGHT PHASE: Tabulated listings of the trajectory from S-IB/S-IVB separation to the time of orbit insertion are presented in Table 6.

Orbit insertion is defined to be at Guidance Cutoff Signal (GCS) plus 10 seconds. GCS occurs when the space fixed velocity magnitude equals a prespecified value of 7821.49 m/sec. This phase of the trajectory includes the ullage rocket burns, J-2 engine thrust buildup, mainstage burn with ullage case jettisoning and Engine Mixture Ratio (EMR) shift, J-2 thrust decay and LOX venting.

The pitch and yaw attitude angle steering commands during the S-IVB powered flight phase are depicted in Figures 12 and 13. The acceleration history is depicted in Figure 14. Trajectory parameters pertinent to an analysis of the trajectory from S-IB/S-IVB separation to the time of active control are depicted in Figures 15 - 18.

5.3 ORBITAL FLIGHT PHASE: Table 7 presents tabulated listings of trajectory parameters for the orbital flight phase of the Launch Vehicle trajectory from orbit insertion to loss of S-IVB/IU stage attitude control. Histories of altitude, velocity and pitch attitude for this phase are displayed in Figures 19 through 21.

5.4 SPENT S-IB STAGE TRAJECTORY: The re-entry trajectory for the spent S-IB stage is summarized in Table 8. This phase of the S-IB stage trajectory is initiated at S-IB/S-IVB separation and includes the retro-rocket burns.

5.5 TRACKING SUMMARY: Radar and telemetry coverage during ascent are provided by the stations listed in Tables 9 and 10. Summaries of the tracking and telemetry coverage for each station are presented in Figures 22 and 23.

5.6 TRAJECTORY DISPERSION SUMMARY: The predicted nominal performance characteristics of the launch vehicle and the predicted flight environment are subject to deviations. Therefore, to complement the nominal trajectory a flight envelope is required. Presented in Tables 11 and 12 are trajectory flight envelope summaries at S-IB/S-IVB separation and S-IVB cutoff, respectively. These data were taken from Reference 1, with exceptions noted, and are considered applicable to this trajectory. Based on current dispersion philosophy, two envelope components required updating. These components are the IMU and S-IB thrust misalignment deviations. Updating of the IMU error effects was necessitated by a revision of 3-sigma tolerances (Reference 21). An additional S-IB thrust misalignment was incorporated to determine a realistic envelope for vehicle roll attitude at S-IB/S-IVB stage separation.

5.7 LAUNCH VEHICLE PERFORMANCE CHARACTERISTICS: The predicted S-IB and S-IVB stage performance characteristics are presented in Table 13. These data are time averages of the detailed vehicle performance data referenced herein.

SECTION 6

REFERENCES

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19. "Control Gains and Shaping Networks for AS-208 S-IB and S-IVB Stages", R-ASTR-F-66-237, 8 December 1966; "Control System Information for AS-204L", R-ASTR-NG-40-67, 5 June 1967.

20. "Interface Control Document, Definition of Saturn SA-204 Flight Sequence Program", 40M33604C, 13 December 1965 and IRN 13, 14 and 15.

21. "ST-124M Platform Hardware Errors to be Used in Performing a Hardware Error Analysis of the Saturn IB and Saturn V Launch Vehicle", R-ASTR-NG-168-66, 12 December 1966 (C).

TABLE 1

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
FLIGHT SEQUENCE OF EVENTS

NOMINAL FLIGHT TIME (HR: MIN: SEC)	TIME (SEC)	PROGRAM TIME (SEC)	EVENT
- 0:0:05.0	- 5.00	---	Guidance Reference Release (GRR).
- 0:0:03.1	- 3.10	---	Initiate S-IB Mainstage Ignition Sequence.
0:0:00.0	0.00	---	First Motion.
0:0:00.2	0.20	$(0.0)_1$	Lift-off Signal; Initiate Time Base 1.
0:0:10.2	10.20	$(10.0)_1$	Initiate Pitch and Roll Maneuvers.
0:0:40.2	40.20	$(40.0)_1$	Control Gain Switch Point.
0:1:14.0	74.00	---	Maximum Dynamic Pressure.
0:1:40.2	100.20	$(100.0)_1$	Control Gain Switch Point.
0:2:00.2	120.20	$(120.0)_1$	Control Gain Switch Point.
0:2:12.5	132.50	$(132.3)_1$	Enable S-IB Propellant Level Sensors.
0:2:13.2	133.20	$(133.0)_1$	Tilt Arrest.
0:2:16.0	136.04	$(0.0)_2$	Level Sensor Activation; Initiate Time Base 2.
0:2:19.1	139.14	$(3.1)_2$	Inboard Engine Cutoff (IECO).
0:2:22.1	142.14	$(0.0)_3$	Outboard Engine Cutoff (OECO); Initiate Time Base 3.
0:2:23.4	143.44	$(1.3)_3$	Separation Signal.
0:2:23.5	143.52	--- $(1.4)_3$	S-IB/S-IVB Physical Separation; Control Gain Switch Point.

TABLE 1 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
FLIGHT SEQUENCE OF EVENTS

NOMINAL FLIGHT (HR: MIN: SEC)	TIME (SEC)	PROGRAM TIME (SEC)	EVENT
0:2:24.8	144.84	$(2.7)_3$	J-2 Engine Start Command.
0:2:27.2	147.19	----	Ullage Burn Out.
0:2:28.1	148.14	----	90% J-2 Thrust Level.
0:2:30.8	150.84	$(8.7)_3$	Command PU System Activation.
0:2:35.4	155.44	$(13.3)_3$	Jettison Ullage Rocket Motors.
0:2:39.1	159.14	$(17.0)_3$	Command Active Guidance Initiation.
0:4:45.8	285.84	$(143.7)_3$	Control Gain Switch Point.
0:7:55.8	475.75	----	EMR Shift Sensed by IGM.
0:9:58.2	598.15	----	Guidance Cutoff Signal (GCS).
0:9:58.4	598.35	$(0.0)_4$	Initiate Time Base 4. (Reflects an approximate 0.2 second systems delay)
0:10:08.2	608.15	----	Orbital Insertion.
0:10:43.4	643.35	$(45.0)_4$	Nose Cone Jettison.
0:19:58.4	1198.35	$(600.0)_4$	SIA Panel Deployment.
0:53:55.0	3235.00	----	LM Separation.
4:30:00.0	16200.00	----	Loss of S-IVB/IU Attitude Control.

TABLE 2

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
LAUNCH VEHICLE TRAJECTORY SUMMARY

Event	Flight Time (sec)	Altitude (km)	Space Fixed - Velocity (m/s)	Space Fixed - Flight Path Angle (deg)	Space Fixed - Azimuth (deg)	Geodetic Lat. (deg)	Longitude (Pos. East) (deg)
Guidance Ref. Release	-5.0	0.03	408.93	90.000	90.00	28.53	- 80.56
First Motion	0.0	0.03	408.93	90.000	90.00	28.53	- 80.56
Max. Dyn. Pressure	74.0	12.34	745.54	57.854	83.40	28.54	- 80.53
Tilt Arrest	133.2	52.62	2091.86	61.285	76.07	28.66	- 80.11
Inboard Engine Cutoff	139.1	58.82	2309.91	62.154	75.71	28.69	- 80.03
Outboard Engine Cutoff	142.1	62.08	2368.73	62.606	75.64	28.70	- 79.98
S-IB/S-IVB Physical Sep.	143.5	63.58	2369.58	62.854	75.64	28.71	- 79.95
J-2 Eng. Start Command	144.8	65.00	2364.15	63.102	75.66	28.71	- 79.93
Ullage Case Jettison	155.4	75.97	2374.30	64.990	75.68	28.76	- 79.76
Initiate IGM	159.3	79.76	2387.08	65.631	75.67	28.78	- 79.69
EMR Shift Sensed by IGM	475.8	177.00	5483.43	91.465	81.53	30.73	- 69.88
S-IB Stage Impact	563.4	0.00	412.55	102.667	90.10	29.87	- 75.41
Guidance C/O Signal	598.2	163.19	7821.49	90.004	85.71	31.52	- 62.24
Orbit Insertion	608.2	163.22	7828.60	89.992	86.13	31.57	- 61.48
Jettison Nose Cone	643.4	163.33	7829.63	89.979	87.61	31.70	- 58.80
LM Separation	3235.0	223.31	7758.22	90.008	94.58	-31.48	105.96
Loss of S-IVB Att. Control	16200.0	148.11	7841.05	89.998	76.21	28.90	- 147.63

TABLE 3

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
S-IB STAGE END CONDITIONS OF FLIGHT

Flight Time (t): OECO + 1.379 seconds	143.523	(sec)
Radius (R):	6436843.	(m)
Altitude:	63579.	(m)
Space Fixed Velocity (V):	2369.58	(m/s)
Space Fixed Path Angle (θ):	62.854	(deg)
Space Fixed Flight Azimuth (AZI):	75.644	(deg)
Earth Fixed Flight Azimuth (AZE):	72.221	(deg)
Geocentric Declination (δ):	28.546	(deg)
Geodetic Latitude (ϕ):	28.706	(deg)
Longitude (λ): (Pos.East)	-79.955	(deg)

SPACE FIXED POSITION AND VELOCITY COMPONENTS

Xs	=	6435696.	(m)
Ys	=	35477.	(m)
Zs	=	116174.	(m)
$\dot{X}s$	=	1042.34	(m/s)
$\dot{Y}s$	=	118.28	(m/s)
$\dot{Z}s$	=	2124.72	(m/s)

VEHICLE ATTITUDE AND ATTITUDE RATE

Pitch Attitude Angle (ϕ_P):	-59.460	(deg)
Yaw Attitude Angle (ϕ_Y):	-0.084	(deg)
Roll Attitude Angle (ϕ_R):	-0.004	(deg)
Pitch Rate ($\dot{\phi}_P$):	-0.002	(deg/s)
Yaw Rate ($\dot{\phi}_Y$):	0.000	(deg/s)
Roll Rate ($\dot{\phi}_R$):	-0.003	(deg/s)

TABLE 4

AS-204/IM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION II)
S-IVB STAGE END CONDITION OF FLIGHT

Flight Time (t): GCS	598.152	(sec)
Radius (R):	6535549.	(m)
Altitude:	163193.	(m)
Space Fixed Velocity (V):	7821.49	(m/s)
Space Fixed Flight Path Angle (θ):	90.004	(deg)
Space Fixed Flight Azimuth (AZI):	85.707	(deg)
Earth Fixed Flight Azimuth (AZE):	85.472	(deg)
Geocentric Declination (δ):	31.351	(deg)
Geodetic Latitude (ϕ):	31.518	(deg)
Longitude (λ): (Pos. East)	-62.240	(deg)
Inclination (i):	31.614	(deg)
Descending Node Argument (Θ):	119.055	(deg)

SPACE FIXED POSITION AND VELOCITY COMPONENTS

Xs	=	6206692.	(m)
Ys	=	142015.	(m)
Zs	=	2042110.	(m)
$\dot{X}s$	=	-2450.10	(m/s)
$\dot{Y}s$	=	411.04	(m/s)
$\dot{Z}s$	=	7416.46	(m/s)

VEHICLE ATTITUDE ANGLES

Pitch Attitude Angle (ϕ_P)	=	-98.901	(deg)
Yaw Attitude Angle (ϕ_Y)	=	3.396	(deg)
Roll Attitude Angle (ϕ_R)	=	-0.414	(deg)

OSCULATING CONIC PARAMETERS

*Perigee Altitude	=	157.38	(km)
*Apogee Altitude	=	197.38	(km)
Eccentricity	=	0.0031	
Semi-Major Axis	=	6555.54	(km)
True Anomaly	=	-1.26	(deg)
Period	=	88.04	(min)

* Referenced to Equatorial Radius (6378.16 km)

TABLE 4 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
S-IVB STAGE END CONDITIONS OF FLIGHT

Flight Time (t): Orbit Insertion	608.152	(sec)
Radius (R):	6535557.	(m)
Altitude:	163218.	(m)
Space Fixed Velocity (V):	7828.60	(m/s)
Space Fixed Flight Path Angle (θ):	89.992	(deg)
Space Fixed Flight Azimuth (AZI):	86.125	(deg)
Earth Fixed Flight Azimuth (AZE):	85.913	(deg)
Geocentric Declination (δ):	31.400	(deg)
Geodetic Latitude (ϕ):	31.567	(deg)
Longitude (λ): (Pos. East)	-61.480	(deg)
Inclination (i):	31.614	(deg)
Descending Node Argument (Θ):	119.054	(deg)

SPACE FIXED POSITION AND VELOCITY COMPONENTS

Xs	=	6181739.	(m)
Ys	=	146120.	(m)
Zs	=	2116190.	(m)
$\dot{X}s$	=	-2539.69	(m/s)
$\dot{Y}s$	=	409.49	(m/s)
$\dot{Z}s$	=	7393.86	(m/s)

VEHICLE ATTITUDE ANGLES

Pitch Attitude Angle (θ_P)	=	-98.903	(deg)
Yaw Attitude Angle (θ_Y)	=	3.380	(deg)
Roll Attitude Angle (θ_R)	=	-0.414	(deg)

OSCULATING CONIC PARAMETERS

* Perigee Altitude	=	157.38	(km)
* Apogee Altitude	=	221.42	(km)
Eccentricity	=	0.0049	
Semi-Major Axis	=	6567.57	(km)
True Anomaly	=	1.60	(deg)
Period	=	88.28	(min)

* Referenced to Equatorial Radius (6378.16 km)

TABLE 5

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

S-IB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	----- SPACE FIXED ----- RADIUS (M)	VELOCITY (M/S)	PATH ANGLE (DEG)	--- SPACE FIXED POSITION AND VELOCITY VECTOR COMPONENTS --- X (M)	Y (M)	Z (M)	DX (M/S)	DY (M/S)	DZ (M/S)
1)	-5.00	6373352.	408.93	90.000	6373327.	17051.	-5540.	0.00	126.37	388.92
2)	0.00	6373352.	408.93	90.000	6373327.	17683.	-3556.	-0.13	126.30	388.94
	5.00	6373385.	409.15	88.130	6373359.	18314.	-1651.	13.09	126.20	388.98
	10.00	6373489.	409.86	86.008	6373461.	18945.	294.	28.14	126.10	388.96
	15.00	6373673.	411.51	83.627	6373643.	19575.	2239.	45.16	126.03	389.13
	20.00	6373950.	415.05	80.968	6373916.	20205.	4187.	64.50	125.95	390.18
	25.00	6374329.	421.24	78.094	6374292.	20835.	6143.	86.12	125.87	392.66
	30.00	6374823.	430.95	75.078	6374781.	21464.	8117.	110.04	125.76	397.23
	35.00	6375442.	445.05	72.023	6375396.	22092.	10120.	136.28	125.63	404.61
	40.00	6376200.	464.30	69.051	6376148.	22720.	12169.	164.76	125.51	415.54
	45.00	6377106.	489.31	66.283	6377047.	23347.	14283.	195.39	125.39	430.73
	50.00	6378171.	520.54	63.818	6378105.	23974.	16485.	228.04	125.27	450.85
	55.00	6379406.	557.71	61.721	6379331.	24600.	18799.	262.34	125.14	475.98
	60.00	6380813.	599.50	60.153	6380728.	25225.	21253.	296.19	125.01	506.02
	65.00	6382387.	645.50	59.091	6382291.	25850.	23868.	329.06	124.87	541.11
	70.00	6384132.	698.09	58.319	6384021.	26474.	26674.	363.68	124.72	582.67
3)	74.00	6385658.	745.54	57.854	6385535.	26973.	29080.	393.34	124.58	620.96
	80.00	6388182.	826.13	57.371	6388037.	27720.	32999.	441.36	124.35	687.19
	85.00	6390518.	902.15	57.172	6390350.	28341.	36591.	484.24	124.17	750.98
	90.00	6393077.	986.62	57.170	6392883.	28961.	40523.	529.13	123.97	823.45
	95.00	6395870.	1079.55	57.340	6395644.	29581.	44840.	575.69	123.75	904.82
	100.00	6398905.	1180.80	57.642	6398642.	30199.	49586.	623.70	123.51	995.00
	105.00	6402192.	1290.46	58.038	6401884.	30815.	54805.	673.19	123.17	1094.04
	110.00	6405740.	1408.80	58.489	6405377.	31430.	60542.	724.42	122.79	1202.03
	115.00	6409559.	1536.47	58.982	6409131.	32043.	66842.	777.43	122.36	1319.61
	120.00	6413661.	1674.08	59.518	6413154.	32654.	73755.	832.00	121.88	1447.57
	125.00	6418054.	1822.42	60.114	6417452.	33262.	81337.	887.42	121.17	1587.14
	130.00	6422743.	1982.57	60.791	6422028.	33866.	89648.	942.68	120.34	1739.96
4)	133.20	6425899.	2091.86	61.285	6425100.	34250.	95384.	977.12	119.79	1845.75
5)	139.14	6432087.	2309.91	62.154	6431102.	34958.	106975.	1044.24	118.67	2056.98
6)	142.14	6435344.	2368.73	62.606	6434251.	35314.	113246.	1052.09	118.35	2118.96
7)	143.44	6436757.	2369.83	62.839	6435614.	35468.	116007.	1043.05	118.28	2124.65
8)	143.52	6436843.	2369.58	62.854	6435696.	35477.	116174.	1042.34	118.28	2124.72

1) GRR;
2) First Motion;
3) Maximum Dynamic Pressure;
4) Tilt Arrest;
5) IECO;
6) OECO;
7) Separation Signal;
8) Physical Separation.

TABLE 5 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

S-IB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	EARTH FIXED POSITION (M)	EARTH FIXED VELOCITY (M/S)	EARTH FIXED PATH ANGLE (DEG)	EARTH FIXED X (M)	EARTH FIXED Y (M)	EARTH FIXED Z (M)	EARTH FIXED DX (M/S)	EARTH FIXED DY (M/S)	EARTH FIXED DZ (M/S)
1)	-5.00	34.	0.00	N/A	34.	-0.	0.	-0.00	0.00	-0.00
2)	0.00	34.	0.00	N/A	34.	-0.	-0.	-0.00	0.00	0.00
	5.00	67.	13.35	0.298	67.	-0.	0.	13.35	-0.03	0.01
	10.00	171.	28.53	0.309	171.	-0.	0.	28.53	-0.07	-0.05
	15.00	355.	45.68	0.291	355.	-1.	-0.	45.68	-0.09	0.05
	20.00	632.	65.17	0.983	632.	-1.	2.	65.16	-0.12	1.02
	25.00	1011.	86.98	2.303	1011.	-2.	12.	86.91	-0.16	3.40
	30.00	1505.	111.25	4.095	1505.	-3.	39.	110.98	-0.23	7.83
	35.00	2127.	138.19	6.312	2124.	-4.	95.	137.37	-0.32	15.06
	40.00	2889.	168.02	8.886	2882.	-6.	196.	166.03	-0.40	25.80
	45.00	3805.	201.02	11.750	3788.	-8.	360.	196.84	-0.48	40.76
	50.00	4892.	237.59	14.833	4854.	-11.	612.	229.72	-0.55	60.64
	55.00	6166.	277.77	17.965	6089.	-14.	975.	264.29	-0.63	85.47
	60.00	7640.	319.90	21.143	7496.	-17.	1474.	298.44	-0.70	115.18
	65.00	9319.	363.98	24.358	9071.	-21.	2135.	331.66	-0.74	149.93
	70.00	11220.	413.51	27.550	10816.	-25.	2985.	366.70	-0.78	191.10
3)	74.00	12921.	458.12	30.015	12342.	-28.	3823.	396.75	-0.81	229.05
	80.00	15814.	534.12	33.490	14867.	-33.	5389.	445.45	-0.83	294.70
	85.00	18578.	606.01	36.192	17202.	-37.	7017.	489.00	-0.81	357.96
	90.00	21706.	686.03	38.767	19760.	-41.	8983.	534.67	-0.75	429.84
	95.00	25238.	774.31	41.202	22552.	-44.	11331.	582.13	-0.66	510.57
	100.00	29214.	870.89	43.476	25584.	-47.	14103.	631.17	-0.55	600.06
	105.00	33677.	976.01	45.580	28866.	-50.	17346.	681.84	-0.46	698.35
	110.00	38671.	1090.05	47.506	32406.	-52.	21102.	734.39	-0.34	805.54
	115.00	44243.	1213.63	49.279	36213.	-53.	25417.	788.89	-0.20	922.25
	120.00	50443.	1347.32	50.928	40298.	-54.	30341.	845.16	-0.01	1049.28
	125.00	57324.	1491.80	52.503	44666.	-54.	35929.	902.47	0.04	1187.86
	130.00	64939.	1648.03	54.051	49322.	-53.	42242.	959.85	0.10	1339.65
4)	134.27	70226.	1754.69	55.056	52452.	-53.	46695.	995.81	0.18	1444.75
5)	139.14	80967.	1968.30	56.759	58574.	-51.	55899.	1066.02	0.39	1654.63
6)	142.14	86801.	2025.09	57.441	61790.	-50.	60962.	1075.11	0.62	1716.14
7)	143.44	89366.	2025.25	57.713	63184.	-49.	63199.	1066.43	0.73	1721.73
8)	143.52	89522.	2024.94	57.729	63268.	-49.	63335.	1065.74	0.74	1721.80

1) GRR;
2) First Motion;
3) Maximum Dynamic Pressure;
4) Tilt Arrest;
5) IECO;
6) OECO;
7) Separation Signal;
8) Physical Separation.

TABLE 5 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

S-IB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	MASS (KG)	THRUST (TOTAL) (N)	DRAG (N)	LONGITUDINAL ACCELERATION (M/SEC2)	DYNAMIC PRESSURE (N/M2)	A.H.I. (KG-M/M2-RAD)	MACH NO.	PITCH ANGLE OF ATTACK (DEG)
1)	-5.00	589243.	0.	0.	0.000	0.	0.	0.00	0.000
2)	0.00	582886.	7007287.	5884.	12.117	0.	0.	0.00	0.000
	5.00	568924.	7155103.	13100.	12.660	105.	114.	0.04	1.471
	10.00	554904.	7186991.	27749.	13.011	476.	2109.	0.08	2.831
	15.00	540920.	7253906.	39034.	13.452	1198.	12246.	0.13	1.554
	20.00	526649.	7319856.	49118.	13.919	2377.	44603.	0.19	1.054
	25.00	512425.	7380204.	70425.	14.380	4088.	125000.	0.25	0.813
	30.00	498160.	7444858.	90516.	14.880	6376.	294514.	0.33	0.289
	35.00	483867.	7509924.	117100.	15.397	9246.	612913.	0.41	-0.063
	40.00	469554.	7579341.	152508.	15.937	12648.	1160467.	0.50	-0.299
	45.00	455229.	7648604.	181931.	16.524	16481.	2037658.	0.60	-0.444
	50.00	440898.	7719919.	216590.	17.142	20589.	3363223.	0.72	-0.435
	55.00	426566.	7791182.	330464.	17.616	24699.	5265105.	0.85	-0.465
	60.00	412245.	7851192.	670205.	17.548	28172.	7841383.	1.00	-0.528
	65.00	397901.	7916879.	729419.	18.195	30630.	11101929.	1.16	-0.599
	70.00	383500.	7981068.	661220.	19.222	32216.	15050034.	1.36	-0.670
3)	74.00	371978.	8028967.	561369.	20.212	32693.	18695347.	1.53	-0.515
	80.00	354699.	8085829.	437958.	21.702	31473.	24872558.	1.85	-0.179
	85.00	340304.	8122106.	327217.	23.051	28079.	30385625.	2.12	0.079
	90.00	325991.	8145237.	233460.	24.421	23025.	35732869.	2.37	0.093
	95.00	311709.	8158376.	164457.	25.803	18279.	40621784.	2.64	0.091
	100.00	297439.	8161401.	115734.	27.214	14075.	44931629.	2.93	-0.007
	105.00	283189.	8157367.	79371.	28.698	10513.	48601875.	3.24	0.031
	110.00	268961.	8149379.	50310.	30.295	7505.	51597051.	3.54	-0.131
	115.00	254762.	8134658.	22697.	32.034	5225.	53943727.	3.87	-0.273
	120.00	240598.	8113670.	8893.	33.890	3524.	55730529.	4.18	-0.808
	125.00	226476.	8089775.	1896.	35.930	2356.	57051533.	4.54	-1.505
	130.00	212403.	8060245.	-3523.	38.198	1563.	58022972.	4.95	-2.741
4)	133.20	203436.	8037008.	-7359.	39.788	1219.	58496471.	5.33	-3.676
5)	139.14	186844.	7975494.	-13428.	43.020	729.	59183684.	6.15	-2.079
6)	142.14	181762.	3566980.	-13808.	19.701	515.	59422511.	6.46	-1.279
7)	143.44	181025.	215184.	-11923.	1.255	430.	59502369.	6.52	-0.992
8)	143.52	181012.	199782.	-11789.	1.169	425.	59506761.	6.52	-0.975

1) GRR;
2) First Motion;
3) Maximum Dynamic Pressure;
4) Tilt Arrest;
5) IECO;
6) OECO;
7) Separation Signal;
8) Physical Separation.

TABLE 5 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

S-IB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	ALTITUDE (KM)	RANGE (KM)	VELOCITY VECTOR AZIMUTH SPACE FIXED (DEG)	EARTH FIXED (DEG)	LONGITUDE (POS. EAST) (DEG)	GEOCENTRIC DECLINATION (DEG)	GEODETIC LATITUDE (DEG)
1)	-5.00	0.034	0.000	90.000	N/A	-80.565	28.371	28.532
2)	0.00	0.034	0.000	90.000	N/A	-80.565	28.371	28.532
	5.00	0.067	0.000	89.990	N/A	-80.565	28.371	28.532
	10.00	0.171	0.001	89.981	N/A	-80.565	28.371	28.532
	15.00	0.355	-0.002	89.968	N/A	-80.565	28.371	28.532
	20.00	0.631	0.004	89.914	56.743	-80.565	28.371	28.532
	25.00	1.010	0.014	89.799	65.594	-80.565	28.371	28.532
	30.00	1.504	0.041	89.594	68.224	-80.565	28.371	28.532
	35.00	2.124	0.097	89.277	69.419	-80.564	28.371	28.532
	40.00	2.882	0.199	88.835	70.135	-80.563	28.371	28.532
	45.00	3.788	0.364	88.260	70.594	-80.561	28.372	28.533
	50.00	4.854	0.616	87.558	70.902	-80.559	28.373	28.534
	55.00	6.088	0.980	86.763	71.111	-80.556	28.374	28.535
	60.00	7.496	1.480	85.913	71.266	-80.551	28.375	28.536
	65.00	9.071	2.140	85.038	71.390	-80.544	28.377	28.538
	70.00	10.816	2.989	84.133	71.488	-80.536	28.379	28.540
3)	74.00	12.343	3.827	83.403	71.550	-80.528	28.382	28.543
	85.00	17.205	7.014	81.474	71.695	-80.497	28.391	28.552
	90.00	19.766	8.973	80.662	71.751	-80.478	28.396	28.557
	95.00	22.561	11.311	79.907	71.804	-80.455	28.403	28.564
	100.00	25.599	14.070	79.215	71.852	-80.429	28.411	28.571
	105.00	28.889	17.293	78.587	71.893	-80.397	28.420	28.580
	110.00	32.440	21.023	78.022	71.934	-80.361	28.430	28.591
	115.00	36.263	25.305	77.517	71.974	-80.319	28.442	28.603
	120.00	40.369	30.186	77.065	72.016	-80.272	28.456	28.616
	125.00	44.767	35.718	76.654	72.051	-80.218	28.471	28.631
	130.00	49.461	41.960	76.284	72.089	-80.157	28.488	28.649
4)	133.23	52.621	46.359	76.069	72.117	-80.115	28.500	28.661
5)	139.14	58.817	55.439	75.714	72.172	-80.026	28.525	28.686
6)	142.14	62.079	60.429	75.640	72.206	-79.977	28.539	28.699
7)	143.44	63.494	62.632	75.644	72.220	-79.956	28.545	28.705
8)	143.52	63.579	62.766	75.644	72.221	-79.955	28.546	28.706

1) GRR;
2) First Motion;
3) Maximum Dynamic Pressure;
4) Tilt Arrest;
5) IECO;
6) OECO;
7) Separation Signal;
8) Physical Separation.

TABLE 5 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)
S-IB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	VEHICLE ATTITUDE ANGLE PITCH (DEG)	YAW (DEG)	ROLL (DEG)	VEHICLE ATTITUDE RATE PITCH (DEG/S)	YAW (DEG/S)	ROLL (DEG/S)	VEHICLE ATTITUDE ERROR PITCH (DEG)	YAW (DEG)	ROLL (DEG)
1)	-5.00	0.000	0.000	18.000	-0.003	0.001	-0.002	0.000	0.000	0.000
2)	0.00	-0.017	0.006	17.990	-0.003	0.001	-0.002	-0.017	0.006	-0.010
	5.00	-0.013	-0.015	18.004	-0.007	-0.004	-0.003	-0.013	-0.015	0.004
	10.00	-0.003	-0.019	18.001	-0.000	-0.000	0.000	-0.003	-0.019	0.001
	15.00	-0.567	-0.001	14.384	-0.117	-0.013	-1.087	0.109	-0.001	1.184
	20.00	-1.500	0.012	9.387	-0.229	-0.001	-1.002	0.195	0.012	1.187
	25.00	-2.863	0.002	4.385	-0.313	-0.004	-1.000	0.267	0.002	1.185
	30.00	-4.638	-0.022	-0.007	-0.394	-0.004	-0.169	0.323	-0.022	-0.007
	35.00	-6.800	-0.023	0.000	-0.469	-0.000	-0.001	0.365	-0.023	0.000
	40.00	-9.312	-0.024	-0.002	-0.536	-0.000	-0.000	0.410	-0.024	-0.002
	45.00	-12.139	-0.027	-0.005	-0.595	-0.001	-0.001	0.476	-0.027	-0.005
	50.00	-15.057	-0.032	-0.008	-0.563	-0.001	0.001	0.529	-0.032	-0.008
	55.00	-18.088	-0.039	-0.010	-0.609	-0.001	-0.000	0.599	-0.039	-0.010
	60.00	-21.189	-0.041	-0.013	-0.625	-0.000	-0.001	0.651	-0.041	-0.013
	65.00	-24.280	-0.047	-0.016	-0.617	-0.001	-0.001	0.728	-0.047	-0.016
	70.00	-27.332	-0.051	-0.021	-0.595	-0.001	-0.001	0.824	-0.051	-0.021
3)	74.30	-29.627	-0.060	-0.018	-0.592	-0.000	0.003	1.007	-0.060	-0.018
	80.00	-33.374	-0.047	-0.008	-0.602	-0.000	0.003	0.866	-0.047	-0.008
	85.00	-36.424	-0.047	0.002	-0.606	0.000	0.001	0.679	-0.047	0.002
	90.00	-39.325	-0.045	0.002	-0.547	0.001	-0.000	0.472	-0.045	0.002
	95.00	-41.907	-0.040	0.002	-0.488	0.000	-0.000	0.379	-0.040	0.002
	100.00	-44.303	-0.039	-0.000	-0.451	0.000	-0.000	0.325	-0.039	-0.000
	105.00	-46.357	-0.062	0.001	-0.395	0.002	-0.000	0.333	-0.062	0.001
	110.00	-48.285	-0.063	-0.001	-0.382	-0.001	-0.001	0.309	-0.063	-0.001
	115.00	-50.185	-0.070	-0.002	-0.390	-0.001	-0.001	0.313	-0.070	-0.002
	120.00	-52.219	-0.074	-0.005	-0.431	-0.001	-0.001	0.342	-0.074	-0.005
	125.00	-54.534	-0.161	-0.005	-0.494	0.008	-0.000	0.409	-0.161	-0.005
	130.00	-57.267	-0.161	-0.007	-0.601	-0.000	-0.000	0.535	-0.161	-0.007
4)	133.20	-59.274	-0.163	-0.009	-0.505	-0.001	-0.005	0.155	-0.163	-0.009
5)	139.14	-59.491	-0.170	-0.003	0.000	-0.001	0.001	-0.062	-0.170	-0.003
6)	142.14	-59.460	-0.085	-0.002	0.002	0.003	0.001	-0.031	-0.085	-0.002
7)	143.44	-59.460	-0.084	-0.004	-0.002	-0.000	-0.003	-0.031	-0.084	-0.004
8)	143.52	-59.460	-0.084	-0.004	-0.002	-0.000	-0.003	-0.031	-0.084	-0.004

1) GRR;
2) First Motion;
3) Maximum Dynamic Pressure;
4) Tilt Arrest;
5) IECO;
6) OECO;
7) Separation Signal;
8) Physical Separation.

TABLE 6

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

S-IVB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	----- SPACE FIXED ----- RADIUS (M)	VELOCITY (M/S)	PATH ANGLE (DEG)	--- SPACE FIXED POSITION AND VELOCITY VECTOR COMPONENTS --- X (M)	Y (M)	Z (M)	DX (M/S)	DY (M/S)	DZ (M/S)
1)	143.52	6436843.	2369.58	62.854	6435696.	35477.	116174.	1042.34	118.28	2124.72
2)	144.84	6438263.	2364.15	63.102	6437065.	35633.	118981.	1029.81	118.23	2124.79
3)	147.19	6440752.	2355.46	63.546	6439459.	35911.	123975.	1007.94	118.12	2125.63
	148.14	6441746.	2355.74	63.719	6440413.	36023.	125996.	1000.97	118.06	2129.23
4)	148.14	6441746.	2355.74	63.719	6440413.	36023.	125996.	1000.97	118.06	2129.23
	150.00	6443672.	2359.63	64.048	6442260.	36242.	129957.	989.03	117.87	2139.11
5)	150.94	6444542.	2361.58	64.196	6443092.	36342.	131764.	983.70	117.76	2143.72
6)	155.44	6449214.	2374.30	64.990	6447552.	36882.	141684.	955.70	117.15	2170.30
7)	159.25	6452998.	2387.08	65.631	6451147.	37327.	149989.	933.53	116.64	2193.87
	170.00	6463293.	2427.15	67.489	6460836.	38585.	173943.	867.97	118.59	2263.54
	190.00	6480827.	2515.94	70.866	6476943.	41023.	220572.	742.60	125.27	2400.59
	210.00	6496302.	2621.21	73.978	6490542.	43603.	270008.	617.40	133.16	2543.98
	230.00	6509793.	2741.55	76.794	6501641.	46360.	322369.	492.57	142.68	2693.16
	250.00	6521380.	2876.80	79.323	6510242.	49313.	377781.	367.43	152.65	2849.16
	270.00	6531141.	3026.52	81.569	6516335.	52469.	436383.	241.73	162.97	3012.44
	290.00	6539160.	3190.21	83.542	6519905.	55834.	498329.	115.06	173.45	3183.41
	310.00	6545520.	3368.36	85.263	6520925.	59403.	563781.	-13.27	183.91	3363.31
	330.00	6550220.	3560.95	86.737	6519364.	63197.	632925.	-143.19	195.62	3552.69
	350.00	6553663.	3768.40	87.984	6515183.	67231.	705958.	-275.42	207.87	3752.57
	370.00	6555661.	3991.65	89.020	6508327.	71516.	783107.	-410.69	220.68	3964.33
	390.00	6556438.	4230.94	89.856	6498733.	76062.	864614.	-549.29	234.07	4188.59
	410.00	6556134.	4488.21	90.507	6486327.	80883.	950748.	-692.21	248.15	4427.57
	430.00	6554905.	4765.76	90.984	6471010.	85994.	1041830.	-840.43	263.05	4683.69
	450.00	6552926.	5065.05	91.293	6452669.	91411.	1138221.	-994.73	278.84	4958.58
	470.00	6550407.	5388.30	91.443	6431175.	97154.	1240313.	-1156.07	295.61	5254.51
8)	475.75	6549613.	5483.43	91.465	6424390.	98867.	1270777.	-1204.08	300.48	5341.15
	490.00	6547551.	5712.43	91.494	6406377.	103232.	1348370.	-1324.97	311.99	5547.88
	510.00	6544483.	6038.59	91.475	6378100.	109631.	1462219.	-1503.83	327.99	5839.14
	530.00	6541457.	6385.81	91.301	6346196.	116356.	1582060.	-1688.60	344.72	6148.86
	550.00	6538779.	6761.00	91.019	6310468.	123427.	1708330.	-1886.52	362.51	6482.34
	570.00	6536753.	7170.34	90.638	6270624.	130865.	1841545.	-2101.44	381.60	6844.86
	590.00	6535673.	7623.61	90.211	6226235.	138701.	1982367.	-2344.54	402.14	7242.98
9)	598.15	6535549.	7821.49	90.004	6206697.	142015.	2042110.	-2450.10	411.04	7416.46
10)	608.15	6535557.	7828.60	89.992	6181739.	146120.	2116190.	-2539.69	409.49	7392.86

1) Separation Completed;
2) J-2 Start Command;
3) Terminate Ullage Burn;
4) 90% Thrust Level;
5) Command P.U. Activation;
6) Ullage Case Jettison;
7) I.G.M. Initiation;
8) E.M.R. Shift sensed by I.G.M.;
9) Guidance Cutoff Signal;
10) Orbit Insertion.

TABLE 6 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

S-IVB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	EARTH FIXED POSITION (M)	EARTH FIXED VELOCITY (M/S)	EARTH FIXED PATH ANGLE (DEG)	EARTH FIXED X (M)	EARTH FIXED Y (M)	EARTH FIXED Z (M)	EARTH FIXED DX (M/S)	EARTH FIXED DY (M/S)	EARTH FIXED DZ (M/S)
1)	143.52	89522.	2024.94	57.729	63268.	-49.	63335.	1065.74	0.74	1721.80
2)	144.84	92122.	2018.54	58.004	64668.	-48.	65610.	1053.52	0.84	1721.80
3)	147.19	96730.	2008.13	58.478	67118.	-45.	69656.	1032.22	1.03	1722.54
	148.14	98589.	2007.74	58.700	68095.	-44.	71294.	1025.50	1.09	1726.08
4)	148.14	98589.	2007.74	58.700	68095.	-44.	71294.	1025.50	1.09	1726.08
	150.00	102223.	2010.35	59.093	69988.	-42.	74506.	1014.10	1.16	1735.84
5)	150.84	103877.	2011.73	59.270	70842.	-41.	75973.	1009.01	1.18	1740.39
6)	155.44	112919.	2021.43	60.226	75421.	-36.	84038.	982.38	1.25	1766.67
7)	159.25	120440.	2031.82	61.004	79120.	-31.	90806.	961.36	1.32	1789.99
	170.00	141897.	2065.11	63.257	89126.	-3.	110414.	899.21	5.02	1859.05
	190.00	182769.	2142.65	67.364	105924.	199.	148945.	780.65	15.35	1995.32
	210.00	225143.	2238.89	71.147	120358.	621.	190271.	662.88	27.35	2138.34
	230.00	269338.	2352.20	74.557	132446.	1308.	234519.	546.10	41.49	2287.55
	250.00	315676.	2482.11	77.600	142203.	2287.	281823.	429.69	56.59	2443.98
	270.00	364481.	2627.88	80.278	149635.	3577.	332329.	313.43	72.59	2608.11
	290.00	416079.	2788.75	82.608	154740.	5196.	386200.	196.98	89.32	2780.35
	310.00	470794.	2964.94	84.617	157507.	7150.	443608.	79.69	106.64	2961.95
	330.00	528958.	3156.20	86.319	157923.	9473.	504745.	-38.29	125.87	3153.46
	350.00	590904.	3362.81	87.741	155967.	12193.	569818.	-157.63	146.32	3355.93
	370.00	656579.	3585.56	88.909	151604.	15335.	639064.	-278.97	168.09	3570.74
	390.00	727539.	3824.58	89.841	144794.	18926.	712734.	-402.51	191.24	3798.53
	410.00	802953.	4081.77	90.557	135484.	22995.	791106.	-529.11	215.96	4041.56
	430.00	883636.	4359.33	91.075	123604.	27576.	874514.	-659.64	242.48	4302.30
	450.00	970034.	4658.68	91.406	109069.	32707.	963327.	-794.72	270.95	4582.40
	470.00	1062622.	4982.03	91.561	91781.	38428.	1057954.	-935.15	301.56	4884.18
8)	475.75	1090455.	5077.19	91.583	86284.	40188.	1086293.	-976.89	310.61	4972.63
	490.00	1161743.	5306.28	91.609	71619.	44772.	1158669.	-1082.09	332.64	5184.11
	510.00	1267298.	5632.57	91.582	48428.	51738.	1265315.	-1237.93	364.20	5482.76
	530.00	1379562.	5979.89	91.389	22087.	59353.	1378107.	-1397.93	397.72	5800.58
	550.00	1499048.	6355.16	91.084	-7564.	67663.	1497501.	-1569.05	433.77	6143.12
	570.00	1626353.	6764.54	90.677	-40771.	76724.	1624031.	-1754.82	472.84	6515.83
	590.00	1762242.	7217.82	90.223	-77913.	86601.	1758387.	-1966.02	515.45	6925.75
9)	598.15	1820283.	7415.70	90.004	-94315.	90878.	1815565.	-2057.71	533.98	7104.46
10)	608.15	1892522.	7422.79	89.992	-115301.	96245.	1886553.	-2138.98	529.00	7087.46

1) Separation Completed;
2) J-2 Start Command;
3) Terminate Ullage Burn;
4) 90% Thrust Level;
5) Command P.U. Activation;
6) Ullage Case Jettison;
7) I.G.M. Initiation;
8) E.M.R. Shift sensed by I.G.M.;
9) Guidance Cutoff Signal;
10) Orbit Insertion.

TABLE 6 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

S-IVB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	MASS (KG)	THRUST (TOTAL) (N)	LONGITUDINAL ACCELERATION (M/S2)	DYNAMIC PRESSURE (N/M2)	CENTRAL RANGE ANGLE (DEG)	PITCH ATT. COMMAND (DEG)	PITCH ANGLE OF ATTACK (DEG)
1)	143.52	134360.	38915.	0.267	425.	1.096	-59.429	-0.975
2)	144.84	134326.	38364.	0.267	351.	1.121	-59.429	-0.765
3)	147.19	134211.	380886.	2.825	249.	1.165	-59.429	-0.647
	148.14	134101.	797977.	5.939	217.	1.182	-59.429	-0.535
4)	148.14	134101.	797977.	5.939	217.	1.182	-59.429	-0.535
	150.00	133719.	875276.	6.537	166.	1.217	-59.429	0.075
5)	150.84	133545.	875236.	6.546	147.	1.233	-59.429	0.384
6)	155.44	132542.	980803.	7.396	74.	1.320	-59.429	1.540
7)	159.25	131549.	981603.	7.460	41.	1.393	-59.429	2.347
	170.00	129002.	990216.	7.676	7.	1.603	-64.534	-0.288
	190.00	124222.	997812.	8.032	0.	2.011	-66.132	3.317
	210.00	119426.	998925.	8.364	0.	2.443	-67.318	6.547
	230.00	114639.	998184.	8.707	0.	2.900	-68.518	8.839
	250.00	109856.	996845.	9.074	0.	3.382	-69.742	11.306
	270.00	105078.	997966.	9.497	0.	3.893	-71.178	13.026
	290.00	100310.	996431.	9.933	0.	4.433	-72.435	14.266
	310.00	95537.	997032.	10.436	0.	5.005	-73.693	15.532
	330.00	90771.	996407.	10.977	0.	5.609	-75.144	16.331
	350.00	86004.	997326.	11.596	0.	6.249	-76.717	16.796
	370.00	81235.	995759.	12.258	0.	6.927	-78.218	17.092
	390.00	76477.	993405.	12.989	0.	7.645	-79.751	17.184
	410.00	71718.	994567.	13.867	0.	8.407	-81.435	16.954
	430.00	66956.	994654.	14.855	0.	9.215	-83.104	16.571
	450.00	62200.	990684.	15.927	0.	10.074	-84.699	16.161
	470.00	57460.	982625.	17.101	0.	10.987	-86.419	15.472
8)	475.75	56139.	938665.	16.720	0.	11.261	-86.772	15.377
	490.00	53093.	864235.	16.277	0.	11.959	-87.966	14.931
	510.00	49068.	836211.	17.041	0.	12.986	-88.953	14.776
	530.00	45119.	828826.	18.369	0.	14.074	-90.868	13.908
	550.00	41217.	817157.	19.825	0.	15.225	-92.810	12.805
	570.00	37351.	814718.	21.812	0.	16.445	-95.463	11.000
	590.00	33506.	804375.	24.006	0.	17.741	-99.046	7.753
9)	598.15	31954.	801715.	25.089	0.	18.293	-98.060	9.367
10)	608.15	31845.	1603.	0.050	0.	18.979	-98.060	10.040

1) Separation Completed;
2) J-2 Start Command;
3) Terminate Ullage Burn;
4) 90% Thrust Level;
5) Command P.U. Ativation;
6) Ullage Case Jettison;
7) I.G.M. Initiation;
8) E.M.R. Shift sensed by I.G.M.;
9) Guidance Cutoff Signal;
10) Orbit Insertion.

TABLE 6 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

S-IVB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	ALTITUDE (KM)	RANGE (KM)	VELOCITY VECTOR AZIMUTH SPACE FIXED (DEG)	VELOCITY VECTOR AZIMUTH EARTH FIXED (DEG)	LONGITUDE (POS. EAST) (DEG)	GEOCENTRIC DECLINATION (DEG)	GEODETIC LATITUDE (DEG)
1)	143.52	63.579	62.766	75.644	72.221	-79.955	28.546	28.706
2)	144.84	65.002	65.005	75.657	72.236	-79.933	28.552	28.712
3)	147.19	67.494	68.986	75.679	72.263	-79.894	28.563	28.723
	148.14	68.489	70.597	75.683	72.273	-79.878	28.567	28.727
4)	148.14	68.489	70.597	75.683	72.273	-79.878	28.567	28.727
	150.00	70.418	73.755	75.683	72.292	-79.848	28.576	28.736
5)	150.84	71.289	75.196	75.683	72.300	-79.834	28.580	28.740
6)	155.44	75.968	83.116	75.679	72.342	-79.756	28.601	28.761
7)	159.25	79.758	89.756	75.675	72.378	-79.691	28.619	28.779
	170.00	90.069	108.958	75.753	72.589	-79.504	28.671	28.831
	190.00	107.634	146.576	75.977	73.068	-79.135	28.771	28.931
	210.00	123.142	186.796	76.235	73.565	-78.740	28.875	29.035
	230.00	136.668	229.763	76.533	74.089	-78.316	28.983	29.142
	250.00	148.289	275.632	76.843	74.607	-77.862	29.094	29.254
	270.00	158.087	324.574	77.163	75.120	-77.376	29.209	29.369
	290.00	166.144	376.776	77.492	75.626	-76.855	29.327	29.488
	310.00	172.543	432.440	77.828	76.126	-76.298	29.449	29.610
	330.00	177.383	491.791	78.193	76.647	-75.702	29.575	29.736
	350.00	180.768	555.071	78.577	77.175	-75.064	29.704	29.865
	370.00	182.808	622.553	78.980	77.713	-74.382	29.836	29.997
	390.00	183.628	694.530	79.405	78.264	-73.651	29.970	30.132
	410.00	183.370	771.324	79.853	78.831	-72.869	30.107	30.270
	430.00	182.185	853.312	80.328	79.417	-72.032	30.247	30.410
	450.00	180.253	940.913	80.833	80.025	-71.134	30.387	30.551
	470.00	177.779	1034.582	81.369	80.659	-70.170	30.528	30.693
8)	475.75	176.999	1062.701	81.530	80.846	-69.880	30.569	30.733
	490.00	174.970	1134.651	81.941	81.319	-69.137	30.669	30.834
	510.00	171.948	1241.040	82.547	82.006	-68.036	30.808	30.973
	530.00	168.966	1354.023	83.190	82.725	-66.863	30.943	31.109
	550.00	166.330	1474.101	83.873	83.480	-65.612	31.073	31.239
	570.00	164.346	1601.864	84.601	84.276	-64.277	31.195	31.362
	590.00	163.303	1738.068	85.376	85.115	-62.850	31.309	31.475
9)	598.15	163.193	1796.200	85.707	85.472	-62.240	31.351	31.518
10)	608.15	163.218	1868.548	86.125	85.913	-61.480	31.400	31.567

1) Separation Completed;
2) J-2 Start Command;
3) Terminate Ullage Burn;
4) 90% Thrust Level;
5) Command P.U. Activation;
6) Ullage Case Jettison;
7) I.G.M. Initiation;
8) E.M.R. Shift sensed by I.G.M.;
9) Guidance Cutoff Signal;
10) Orbit Insertion.

TABLE 6 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)
S-IVB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	VEHICLE ATTITUDE ANGLE PITCH (DEG)	YAW (DEG)	ROLL (DEG)	VEHICLE ATTITUDE RATE PITCH (DEG/S)	YAW (DEG/S)	ROLL (DEG/S)	VEHICLE ATTITUDE ERROR PITCH (DEG)	YAW (DEG)	ROLL (DEG)
1)	143.52	-59.460	-0.084	-0.004	-0.002	-0.000	-0.003	-0.031	-0.084	-0.004
2)	144.84	-59.539	-0.090	-0.012	-0.109	-0.010	-0.008	-0.109	-0.090	-0.012
3)	147.19	-59.940	-0.145	-0.039	-0.186	-0.056	-0.018	-0.511	-0.145	-0.039
	148.14	-60.041	-0.233	-0.067	-0.010	-0.123	-0.041	-0.612	-0.233	-0.067
4)	148.14	-60.041	-0.233	-0.067	-0.010	-0.123	-0.041	-0.612	-0.233	-0.067
	150.00	-59.946	-0.458	-0.167	0.155	-0.088	-0.058	-0.416	-0.458	-0.167
5)	150.84	-59.725	-0.514	-0.213	0.127	-0.046	-0.052	-0.295	-0.514	-0.213
6)	155.44	-59.584	-0.506	-0.364	-0.015	0.008	-0.019	-0.154	-0.506	-0.364
7)	159.25	-59.609	-0.501	-0.412	0.003	-0.005	-0.007	-0.179	-0.501	-0.412
	170.00	-64.668	2.948	0.016	-0.027	-0.023	-0.004	-0.134	-0.498	0.016
	190.00	-66.272	3.024	-0.012	-0.054	0.004	-0.003	-0.140	-0.526	-0.012
	210.00	-67.446	3.699	-0.038	-0.066	0.018	-0.002	-0.128	-0.563	-0.038
	230.00	-68.654	3.807	-0.091	-0.075	0.001	-0.002	-0.137	-0.556	-0.091
	250.00	-69.898	3.803	-0.147	-0.061	-0.001	-0.003	-0.156	-0.573	-0.147
	270.00	-71.377	3.792	-0.193	-0.056	-0.000	-0.003	-0.199	-0.596	-0.193
	290.00	-72.888	3.118	-0.263	-0.120	-0.088	-0.003	-0.453	-1.358	-0.263
	310.00	-74.138	3.780	-0.281	-0.063	0.005	-0.002	-0.445	-1.275	-0.281
	330.00	-75.613	3.800	-0.323	-0.072	0.000	-0.002	-0.469	-1.309	-0.323
	350.00	-77.186	3.780	-0.361	-0.075	-0.003	-0.002	-0.470	-1.359	-0.361
	370.00	-78.719	3.760	-0.398	-0.079	-0.001	-0.002	-0.501	-1.405	-0.398
	390.00	-80.264	3.741	-0.433	-0.080	-0.001	-0.002	-0.512	-1.451	-0.433
	410.00	-81.964	3.719	-0.457	-0.083	0.000	-0.001	-0.529	-1.500	-0.457
	430.00	-83.668	3.698	-0.478	-0.081	-0.001	-0.001	-0.565	-1.547	-0.478
	450.00	-85.266	3.668	-0.503	-0.081	-0.002	-0.001	-0.566	-1.601	-0.503
	470.00	-87.023	3.646	-0.515	-0.085	-0.001	-0.001	-0.604	-1.655	-0.515
8)	475.75	-87.414	3.633	-0.525	-0.055	-0.002	-0.003	-0.642	-1.673	-0.525
	490.00	-88.585	3.610	-0.537	-0.109	-0.002	0.001	-0.620	-1.706	-0.537
	510.00	-89.743	3.572	-0.579	0.008	-0.003	-0.006	-0.790	-1.749	-0.579
	530.00	-91.508	3.535	-0.580	-0.106	-0.001	0.001	-0.640	-1.803	-0.580
	550.00	-93.461	3.495	-0.564	-0.110	-0.001	0.002	-0.651	-1.851	-0.564
	570.00	-96.035	3.454	-0.507	-0.145	-0.002	0.004	-0.621	-1.894	-0.507
	590.00	-100.182	3.351	-0.383	0.180	0.010	-0.004	-1.135	-1.950	-0.383
9)	598.15	-98.901	3.396	-0.414	0.004	-0.002	-0.000	-0.841	-1.949	-0.414
10)	608.15	-98.903	3.380	-0.414	-0.000	-0.001	0.000	-0.843	-1.965	-0.414

1) Separation Completed;
2) J-2 Start Command;
3) Terminate Ullage Burn;
4) 90% Thrust Level;
5) Command P.U Activation;
6) Ullage Case Jettison;
7) I.G.M. Initiation;
8) E.M.R. Shift sensed by I.G.M.;
9) Guidance Cutoff Signal;
10) Orbit Insertion.

TABLE 7-1

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	SPACE FIXED RADIUS (M)	SPACE FIXED VELOCITY (M/S)	PATH ANGLE * (DEG)	SPACE FIXED POSITION AND VELOCITY VECTORS X (M)	Y (M)	Z (M)	DX (M/S)	DY (M/S)	DZ (M/S)
1)	608.15	6535557.	7828.60	0.008	6181739.	146120.	2116190.	-2539.69	409.49	7393.86
	638.60	6535612.	7829.65	0.019	6100331.	158495.	2339886.	-2806.96	403.32	7298.06
2)	638.60	6535612.	7829.65	0.019	6100331.	158495.	2339886.	-2806.96	403.32	7298.06
	643.35	6535625.	7829.63	0.021	6086900.	160409.	2374514.	-2848.30	402.30	7282.06
3)	643.35	6535625.	7829.63	0.021	6086900.	160409.	2374514.	-2848.30	402.30	7282.06
	688.35	6535799.	7829.40	0.036	5949988.	178285.	2698615.	-3235.18	391.99	7118.95
	688.35	6535799.	7829.40	0.036	5949988.	178285.	2698615.	-3235.18	391.99	7118.95
	724.46	6536004.	7829.15	0.048	5827663.	192277.	2953088.	-3538.89	382.90	6973.18
	724.46	6536004.	7829.15	0.048	5827663.	192277.	2953088.	-3538.89	382.90	6973.18
	800.00	6536623.	7828.45	0.072	5536972.	220416.	3467103.	-4152.20	361.60	6626.70
	992.00	6539305.	7825.58	0.131	4601690.	283696.	4637509.	-5547.36	294.66	5511.78
	1184.00	6543442.	7821.24	0.183	3425493.	332573.	5565252.	-6650.75	212.22	4110.27
	1198.35	6543803.	7820.86	0.186	3329557.	335571.	5623416.	-6719.79	205.55	3996.01
	1198.35	6543803.	7820.86	0.186	3329557.	335571.	5623416.	-6719.79	205.55	3996.01
	1376.00	6548786.	7815.59	0.223	2070183.	364469.	6202266.	-7405.08	118.55	2496.85
	1568.00	6555022.	7808.87	0.251	606777.	377688.	6515941.	-7772.07	18.51	757.08
	1760.00	6561791.	7801.36	0.264	-888340.	371503.	6490758.	-7734.29	-82.70	-1017.41
	1858.40	6565344.	7797.32	0.266	-1641605.	360863.	6346547.	-7558.56	-133.32	-1910.13
4)	1858.40	6565344.	7797.32	0.266	-1641605.	360863.	6346547.	-7558.56	-133.32	-1910.13
	1952.00	6568715.	7793.40	0.263	-2337506.	346191.	6128967.	-7295.89	-179.86	-2734.01
	2144.00	6575425.	7785.37	0.249	-3665882.	303016.	5450294.	-6481.89	-267.98	-4304.10
	2336.00	6581575.	7777.70	0.221	-4805310.	244154.	4490714.	-5336.52	-342.57	-5647.72
	2528.00	6586868.	7770.81	0.184	-5697749.	172578.	3300409.	-3920.38	-399.86	-6697.48
	2720.00	6591060.	7765.11	0.137	-6298094.	91902.	1941041.	-2307.01	-436.97	-7401.61
	2912.00	6593970.	7760.97	0.086	-6576289.	6195.	482528.	-578.94	-452.04	-7726.14
	3000.00	6594841.	7759.67	0.060	-6591760.	-33588.	-198734.	227.56	-451.33	-7743.19
	3000.00	6594841.	7759.67	0.060	-6591760.	-33588.	-198734.	227.56	-451.33	-7743.19
	3104.00	6595480.	7758.66	0.030	-6518660.	-80219.	-1000500.	1176.40	-444.29	-7656.08
	3235.00	6595676.	7758.22	-0.008	-6287589.	-137338.	-1987537.	2344.35	-426.03	-7383.26
5)	3235.00	6595676.	7758.22	-0.008	-6287589.	-137338.	-1987537.	2344.35	-426.03	-7383.26
	3296.00	6595535.	7758.34	-0.026	-6128459.	-162972.	-2432388.	2870.79	-414.05	-7195.76
	3403.40	6594931.	7759.05	-0.057	-5771903.	-206089.	-3183674.	3760.15	-387.81	-6775.97
6)	3403.40	6594931.	7759.05	-0.057	-5771903.	-206089.	-3183674.	3760.15	-387.81	-6775.97
	3415.00	6594839.	7759.16	-0.060	-5727747.	-210569.	-3261975.	3852.87	-384.59	-6723.99
	3415.00	6594839.	7759.16	-0.060	-5727747.	-210569.	-3261975.	3852.87	-384.59	-6723.99

1) Orbit Insertion;
2) End LOX Vent;
3) Nose Cone Jettison;
4) End LH_2 Vent;
5) LM Separation;
6) Start LH_2 Vent.

* Relative to local horizontal.

TABLE 7-1 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	RADIUS (M)	SPACE FIXED VELOCITY (M/S)	PATH ANGLE* (DEG)	SPACE FIXED POSITION AND VELOCITY VECTORS X (M)	Y (M)	Z (M)	DX (M/S)	DY (M/S)	DZ (M/S)
	3481.00	6594218.	7759.95	-0.079	-5456379.	-235316.	-3695439.	4366.29	-364.94	-6404.62
	3481.00	6594218.	7759.95	-0.079	-5456379.	-235316.	-3695439.	4366.29	-364.94	-6404.62
	3488.00	6594142.	7760.05	-0.081	-5425629.	-237863.	-3740145.	4419.26	-362.72	-6368.44
	3680.00	6591367.	7763.71	-0.132	-4445817.	-301062.	-4856974.	5743.80	-292.74	-5215.19
	3872.00	6587332.	7769.09	-0.177	-3238684.	-349294.	-5725545.	6776.99	-207.45	-3793.16
	4064.00	6582214.	7775.86	-0.214	-1865567.	-380008.	-6300856.	7465.18	-111.00	-2173.20
	4256.00	6576239.	7783.61	-0.242	-396546.	-391509.	-6552587.	7771.34	-8.16	-436.80
	4448.00	6569681.	7791.88	-0.258	1092975.	-383063.	-6466790.	7677.35	95.90	1327.60
	4603.40	6564160.	7798.62	-0.262	2260752.	-361776.	-6151936.	7309.10	177.38	2713.68
7)	4603.40	6564160.	7798.62	-0.262	2260752.	-361776.	-6151936.	7309.10	177.38	2713.68
	4640.00	6562853.	7800.18	-0.262	2526043.	-354945.	-6046830.	7185.41	195.87	3028.92
	4832.00	6556093.	7808.07	-0.252	3828137.	-308446.	-5313435.	6318.59	286.52	4578.14
	5024.00	6549756.	7815.14	-0.229	4931112.	-245825.	-4303837.	5120.06	363.05	5893.18
	5216.00	6544187.	7821.06	-0.194	5776905.	-170204.	-3069981.	3651.21	421.32	6903.63
	5408.00	6539701.	7825.59	-0.147	6320747.	-85416.	-1675874.	1988.53	458.10	7554.85
	5485.00	6538269.	7826.98	-0.125	6446933.	-49802.	-1087901.	1286.67	466.30	7706.41
	5485.00	6538269.	7826.98	-0.125	6446933.	-49802.	-1087901.	1286.67	466.30	7706.41
	5600.00	6536564.	7828.58	-0.091	6533677.	4195.	-194228.	219.44	471.30	7811.30
	5792.00	6534966.	7829.93	-0.030	6404187.	93998.	1297434.	-1562.51	460.07	7658.63
	5984.00	6535007.	7829.62	0.033	5938902.	179325.	2720955.	-3262.90	424.86	7104.64
	6148.40	6536345.	7828.07	0.086	5291654.	245447.	3829093.	-4585.71	376.95	6333.08
8)	6148.40	6536345.	7828.07	0.086	5291654.	245447.	3829093.	-4585.71	376.95	6333.08
	6176.00	6536684.	7827.70	0.094	5162234.	255720.	4001773.	-4791.72	367.42	6178.78
	6355.00	6539631.	7824.54	0.146	4193442.	315361.	5008230.	-5991.30	296.41	5023.93
	6355.00	6539631.	7824.54	0.146	4193442.	315361.	5008230.	-5991.30	296.41	5023.93
	6368.00	6539893.	7824.26	0.149	4115053.	319177.	5072935.	-6068.33	290.68	4930.51
	6560.00	6544437.	7819.46	0.196	2852447.	366358.	5878689.	-7025.95	198.61	3426.45
	6566.60	6544614.	7819.27	0.197	2805988.	367657.	5901121.	-7052.54	195.23	3371.14
	6566.60	6544614.	7819.27	0.197	2805988.	367657.	5901121.	-7052.54	195.23	3371.14
	6748.40	6549927.	7813.61	0.230	1468110.	394420.	6371078.	-7607.72	98.00	1779.19
9)	6748.40	6549927.	7813.61	0.230	1468110.	394420.	6371078.	-7607.72	98.00	1779.19
	6752.00	6550040.	7813.49	0.230	1440708.	394769.	6377424.	-7615.17	96.01	1746.61
	6944.00	6556369.	7806.58	0.251	-46270.	402893.	6543815.	-7806.55	-11.79	-20.17
	7136.00	6563063.	7799.02	0.258	-1530979.	390268.	6370054.	-7591.98	-119.19	-1781.12
	7328.00	6569752.	7791.17	0.252	-2936422.	357506.	5866111.	-6984.83	-220.64	-3444.67

7) End LH_2 Vent;
8) Start LH_2 Vent;
9) End LH_2 Vent.

* Relative to local horizontal.

TABLE 7-1 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	SPACE FIXED RADIUS (M)	SPACE FIXED VELOCITY (M/S)	PATH ANGLE* (DEG)	SPACE FIXED POSITION AND VELOCITY VECTORS X (M)	Y (M)	Z (M)	DX (M/S)	DY (M/S)	DZ (M/S)
	7520.00	6576083.	7783.43	0.232	-4190147.	306255.	5059026.	-6018.80	-310.95	-4925.35
	7712.00	6581739.	7776.20	0.200	-5227956.	239110.	3991314.	-4745.69	-385.51	-6148.10
	7904.00	6586451.	7769.92	0.160	-5997091.	159469.	2718603.	-3232.32	-440.56	-7051.92
	8096.00	6590008.	7764.96	0.112	-6458773.	71362.	1306659.	-1556.80	-473.33	-7592.56
	8288.00	6592259.	7761.66	0.060	-6589982.	-20757.	-172002.	195.49	-482.17	-7744.20
	8438.35	6593052.	7760.37	0.018	-6457356.	-92677.	-1327512.	1563.98	-472.04	-7586.47
	8438.35	6593052.	7760.37	0.018	-6457356.	-92677.	-1327512.	1563.98	-472.04	-7586.47
	8480.00	6593117.	7760.23	0.006	-6384452.	-112228.	-1641758.	1936.11	-466.60	-7500.32
	8647.00	6592706.	7760.61	-0.042	-5939751.	-187648.	-2854458.	3372.46	-433.72	-6976.06
	8647.00	6592706.	7760.61	-0.042	-5939751.	-187648.	-2854458.	3372.46	-433.72	-6976.06
	8672.00	6592553.	7760.80	-0.049	-5852869.	-198412.	-3027593.	3577.60	-427.32	-6873.73
	8779.00	6591631.	7761.99	-0.078	-5424511.	-242506.	-3737041.	4418.52	-395.77	-6369.34
10)	8779.00	6591631.	7761.99	-0.078	-5424511.	-242506.	-3737041.	4418.52	-395.77	-6369.34
	8824.50	6590844.	7763.02	-0.177	-5215531.	-260158.	-4021167.	4765.19	-379.95	-6116.62
	8824.50	6590844.	7763.02	-0.177	-5215531.	-260158.	-4021167.	4765.19	-379.95	-6116.62
	8848.40	6590243.	7763.77	-0.192	-5099569.	-269137.	-4165725.	4937.89	-371.38	-5979.59
	8848.40	6590243.	7763.77	-0.192	-5099569.	-269137.	-4165725.	4937.89	-371.38	-5979.59
	8864.00	6589828.	7764.30	-0.200	-5021674.	-274885.	-4258293.	5048.25	-365.64	-5887.76
	8899.40	6588833.	7765.55	-0.214	-4838621.	-287592.	-4462931.	5292.13	-352.16	-5672.14
11)	8899.40	6588833.	7765.55	-0.214	-4838621.	-287592.	-4462931.	5292.13	-352.16	-5672.14
	8909.20	6588547.	7765.91	-0.216	-4786435.	-291025.	-4518217.	5357.90	-348.32	-5610.79
12)	8909.20	6588547.	7765.91	-0.216	-4786435.	-291025.	-4518217.	5357.90	-348.32	-5610.79
	8978.40	6586395.	7768.64	-0.241	-4400067.	-314156.	-4890942.	5802.50	-319.85	-5155.63
	8978.40	6586395.	7768.64	-0.241	-4400067.	-314156.	-4890942.	5802.50	-319.85	-5155.63
	9056.00	6583740.	7772.03	-0.263	-3931910.	-337655.	-5269887.	6254.99	-285.35	-4604.13
	9089.40	6582530.	7773.57	-0.271	-3719977.	-346926.	-5419513.	6433.90	-269.72	-4354.38
13)	9089.40	6582530.	7773.57	-0.271	-3719977.	-346926.	-5419513.	6433.90	-269.72	-4354.38
	9099.40	6582161.	7774.05	-0.273	-3655379.	-349599.	-5462676.	6485.50	-264.96	-4278.30
14)	9099.40	6582161.	7774.05	-0.273	-3655379.	-349599.	-5462676.	6485.50	-264.96	-4278.30
	9248.00	6576321.	7781.53	-0.304	-2640152.	-383488.	-6010868.	7143.37	-189.92	-3080.32
	9348.40	6572075.	7786.96	-0.317	-1905964.	-399845.	-6276909.	7464.70	-135.51	-2212.85
	9348.40	6572075.	7786.96	-0.317	-1905964.	-399845.	-6276909.	7464.70	-135.51	-2212.85
	9398.35	6569905.	7789.74	-0.321	-1529973.	-405919.	-6376368.	7585.62	-107.60	-1768.28
	9398.35	6569905.	7789.74	-0.321	-1529973.	-405919.	-6376368.	7585.62	-107.60	-1768.28
	9440.00	6568077.	7792.06	-0.324	-1212289.	-409910.	-6442202.	7666.18	-83.99	-1392.39

10) Start J-2 LOX Purge;
11) End J-2 LOX Purge;
12) Start J-2 LH_2 Purge;
13) End J-2 LH_2 Purge;
14) Start J-2 LH_2 Vent; Start J-2 LOX Vent.

* Relative to local horizontal.

TABLE 7-1 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	SPACE FIXED RADIUS (M)	SPACE FIXED VELOCITY (M/S)	SPACE FIXED PATH ANGLE* (DEG)	SPACE FIXED POSITION AND VELOCITY VECTORS X (M)	Y (M)	Z (M)	DX (M/S)	DY (M/S)	DZ (M/S)
	9556.63	6562905.	7798.51	-0.327	-309414.	-415797.	-6542408.	7791.80	-16.75	-322.85
	9556.63	6562905.	7798.51	-0.327	-309414.	-415797.	-6542408.	7791.80	-16.75	-322.85
	9632.00	6559557.	7802.62	-0.325	278315.	-415406.	-6540471.	7793.59	27.14	374.32
	9824.00	6551200.	7812.72	-0.311	1754477.	-399514.	-6299239.	7515.88	137.83	2128.66
	10016.00	6543406.	7821.82	-0.281	3139162.	-362876.	-5729759.	6844.42	242.29	3778.37
	10208.00	6536561.	7829.44	-0.238	4359581.	-307230.	-4860689.	5811.97	334.95	5235.35
	10400.00	6531012.	7835.21	-0.182	5351192.	-235334.	-3736775.	4471.40	410.78	6420.93
	10592.00	6527055.	7838.90	-0.117	6061339.	-150836.	-2416581.	2893.04	465.61	7270.61
	10784.00	6524906.	7840.40	-0.045	6452237.	-58081.	-969361.	1160.74	496.39	7738.10
	10976.00	6524684.	7839.75	0.029	6503115.	38120.	528721.	-632.96	501.33	7798.06
	11168.00	6526401.	7837.06	0.102	6211376.	132748.	1998774.	-2392.24	480.07	7447.56
	11360.00	6529952.	7832.53	0.168	5592697.	220854.	3363515.	-4023.45	433.68	6706.14
	11552.00	6535121.	7826.42	0.225	4680095.	297822.	4551463.	-5440.45	364.56	5614.39
	11646.40	6538164.	7822.93	0.248	4137848.	330324.	5051405.	-6035.48	323.30	4966.56
	11646.40	6538164.	7822.93	0.248	4137848.	330324.	5051405.	-6035.48	323.30	4966.56
	11656.20	6538496.	7822.55	0.250	4078418.	333470.	5099729.	-6092.93	318.78	4895.59
15)	11656.20	6538496.	7822.55	0.250	4078418.	333470.	5099729.	-6092.93	318.78	4895.59
	11744.00	6541597.	7819.11	0.268	3522030.	359619.	5500770.	-6569.32	276.34	4231.57
	11936.00	6548996.	7810.97	0.295	2179655.	403008.	6162470.	-7352.17	173.65	2631.86
	12128.00	6556890.	7802.23	0.306	723486.	425715.	6502933.	-7749.89	61.84	900.18
	12320.00	6564833.	7793.30	0.300	-770434.	426540.	6505500.	-7744.12	-53.29	-872.51
	12512.00	6572384.	7784.57	0.277	-2224572.	405418.	6171155.	-7337.74	-165.81	-2594.14
	12704.00	6579141.	7776.46	0.240	-3563944.	363406.	5518273.	-6554.22	-269.96	-4176.45
	12896.00	6584756.	7769.40	0.190	-4719925.	302629.	4581456.	-5435.94	-360.45	-5539.33
	13088.00	6588959.	7763.78	0.132	-5633642.	226159.	3409591.	-4041.64	-432.74	-6614.70
	13280.00	6591561.	7759.95	0.068	-6258811.	137856.	2063239.	-2443.11	-483.19	-7349.46
	13472.00	6592459.	7758.16	0.002	-6563899.	42177.	611529.	-721.57	-509.25	-7707.73
	13664.00	6591635.	7758.58	-0.064	-6533557.	-56045.	-871284.	1036.24	-509.55	-7672.17
	13856.00	6589149.	7761.24	-0.126	-6169301.	-151832.	-2309450.	2742.07	-483.98	-7244.56
	14048.00	6585137.	7766.03	-0.181	-5489427.	-240304.	-3629391.	4310.03	-433.64	-6445.68
	14221.40	6580363.	7771.99	-0.223	-4632361.	-310124.	-4663287.	5541.19	-368.80	-5437.18
16)	14221.40	6580363.	7771.99	-0.223	-4632361.	-310124.	-4663287.	5541.19	-368.80	-5437.18
	14240.00	6579794.	7772.69	-0.227	-4528181.	-316910.	-4763281.	5660.46	-360.86	-5314.47
	14432.00	6573369.	7780.66	-0.263	-3334224.	-377656.	-5652389.	6723.52	-269.10	-3906.48
	14598.40	6567140.	7788.46	-0.296	-2157965.	-414953.	-6188565.	7368.61	-177.64	-2516.36

15) End J-2 LH_2 Vent; End J-2 LOX Vent;

16) Start J-2 LOX Vent; Start J-2 LH_2 Vent.

* Relative to local horizontal.

TABLE 7-1 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATICNAL FLIGHT TRAJECTORY (REVISION I)

ORBITAL FLIGHT DATA

FLIGHT TIME (SEC)	SPACE FIXED - RADIUS (M)	VELOCITY (M/S)	PATH ANGLE* (DEG)	SPACE FIXED POSITION AND VELOCITY VECTORS X (M)	Y (M)	Z (M)	DX (M/S)	DY (M/S)	DZ (M/S)
14598.40	6567140.	7788.46	-0.286	-2157965.	-414953.	-6188565.	7368.61	-177.64	-2516.36
14624.00	6566142.	7789.74	-0.288	-1968360.	-419311.	-6250117.	7443.13	-162.81	-2292.01
14816.00	6558439.	7799.56	-0.299	-500605.	-439582.	-6524514.	7779.80	-47.28	-552.76
15008.00	6550615.	7809.35	-0.296	993206.	-437248.	-6460101.	7712.82	71.64	1221.93
15200.00	6543049.	7818.53	-0.279	2435262.	-412248.	-6058964.	7242.55	187.80	2939.30
15392.00	6536123.	7826.60	-0.247	3749896.	-365703.	-5340922.	6390.95	295.06	4508.25
15584.00	6530197.	7833.13	-0.202	4867687.	-299885.	-4342715.	5200.93	387.66	5844.48
15776.00	6525597.	7837.83	-0.146	5729321.	-218106.	-3116203.	3734.39	460.55	6875.60
15968.00	6522583.	7840.53	-0.082	6288936.	-124556.	-1725649.	2068.90	509.70	7545.44
16160.00	6521338.	7841.17	-0.012	6516718.	-24081.	-244253.	293.29	532.35	7817.58
17) 16200.00	6521311.	7841.05	0.002	6520950.	-2758.	68607.	-81.74	533.58	7822.44

17) Loss of S-IVB/IU Attitude Control.

* Relative to local horizontal.

TABLE 7-2

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	CHI* PITCH (DEG)	CHI* YAW (DEG)	PITCH ATTITUDE (LOCAL HORIZONTAL) (DEG)	THRUST (N)	MASS (KG)	AXIAL FORCE (N)	NORMAL FORCE (N)
1)	608.15	-8.90	-3.38	10.08	1603.43	31844.50	3.39	-0.75
	638.60	-8.90	-3.38	12.16	1217.73	31761.63	3.59	-0.95
2)	638.60	-8.90	-3.38	12.16	0.00	31761.63	3.59	-0.95
	643.35	-8.90	-3.38	12.49	0.00	31759.88	3.63	-0.98
3)	643.35	-8.90	-3.38	12.49	0.00	31275.90	3.23	-0.76
	688.35	-8.90	-3.38	15.58	0.00	31267.73	3.40	-1.01
	688.35	-8.90	-3.38	15.58	0.00	31267.73	3.40	-1.01
	724.46	-26.96	-2.80	-0.00	0.00	31261.18	2.66	-0.00
	724.46	-26.96	-2.80	-0.00	0.00	31261.18	2.66	-0.00
	800.00	-32.14	-2.65	0.00	0.00	31247.46	2.61	-0.01
	992.00	-45.32	-2.15	0.00	0.00	31212.62	2.42	-0.03
	1184.00	-58.47	-1.55	-0.00	0.00	31177.78	2.17	-0.05
	1198.35	-59.45	-1.50	0.00	0.00	31175.17	2.15	-0.05
	1198.35	-59.45	-1.50	0.00	0.00	31175.17	4.22	-0.09
	1376.00	-71.59	-0.86	0.00	0.00	31142.94	3.73	-0.10
	1568.00	-84.69	-0.12	-0.00	0.00	31108.10	3.20	-0.11
	1760.00	-97.76	0.62	0.00	0.00	31073.26	2.68	-0.10
	1858.40	-104.45	0.99	0.00	0.00	31055.40	2.43	-0.09
4)	1858.40	-104.45	0.99	0.00	0.00	31055.40	2.43	-0.09
	1952.00	-110.81	1.34	0.00	0.00	31054.78	2.21	-0.09
	2144.00	-123.83	1.98	-0.00	0.00	31054.78	1.84	-0.07
	2336.00	-136.84	2.53	0.00	0.00	31054.78	1.53	-0.06
	2528.00	-149.84	2.95	-0.00	0.00	31054.78	1.29	-0.04
	2720.00	-162.83	3.23	-0.00	0.00	31054.78	1.12	-0.03
	2912.00	-175.80	3.34	-0.00	0.00	31054.78	1.01	-0.02
	3000.00	178.26	3.33	0.00	0.00	31054.78	0.98	-0.02
	3000.00	178.26	3.33	0.00	0.00	31054.78	0.98	-0.02
	3104.00	178.38	3.34	7.13	0.00	31054.78	0.97	-0.13
	3235.00	178.54	3.36	16.12	0.00	31054.78	0.99	-0.30
5)	3235.00	178.54	3.36	16.12	0.00	16804.72	1.02	-0.33
	3296.00	178.61	3.36	20.31	0.00	16804.72	1.04	-0.41
	3403.40	178.74	3.37	27.67	0.00	16804.72	1.05	-0.58
6)	3403.40	178.74	3.37	27.67	0.00	16804.72	1.05	-0.58
	3415.00	178.75	3.37	28.47	0.00	16802.83	1.05	-0.60
	3415.00	178.75	3.37	28.47	0.00	16802.83	1.05	-0.60

1) Orbit Insertion;
2) End LOX Vent;
3) Nose Cone Jettison;
4) End LH_2 Vent;
5) LM Separation;
6) Start LH_2 Vent.

* Referenced to the Z_s axis (PASCS-13) measured positive counter clockwise.

TABLE 7-2 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	CHI* PITCH (DEG)	CHI* YAW (DEG)	PITCH ATTITUDE (LOCAL HORIZONTAL) (DEG)	THRUST (N)	MASS (KG)	AXIAL FORCE (N)	NORMAL FORCE (N)
	3481.00	145.79	2.70	0.00	0.00	16790.85	1.00	-0.01
	3481.00	145.79	2.70	0.00	0.00	16790.85	1.00	-0.01
	3488.00	145.32	2.68	-0.00	0.00	16789.58	1.00	-0.01
	3680.00	132.37	2.17	-0.00	0.00	16754.74	1.09	-0.02
	3872.00	119.41	1.54	0.00	0.00	16719.90	1.25	-0.03
	4064.00	106.45	0.83	0.00	0.00	16685.06	1.48	-0.05
	4256.00	93.46	0.07	0.00	0.00	16650.22	1.79	-0.07
	4448.00	80.45	-0.69	0.00	0.00	16615.38	2.20	-0.09
	4603.40	69.89	-1.29	-0.00	0.00	16587.18	2.61	-0.11
7)	4603.40	69.89	-1.29	-0.00	0.00	16587.18	2.61	-0.11
	4640.00	67.40	-1.42	-0.00	0.00	16586.97	2.71	-0.11
	4832.00	54.33	-2.09	-0.00	0.00	16586.97	3.32	-0.13
	5024.00	41.21	-2.65	-0.00	0.00	16586.97	3.96	-0.15
	5216.00	28.07	-3.08	0.00	0.00	16586.97	4.60	-0.15
	5408.00	14.89	-3.35	0.00	0.00	16586.97	5.14	-0.13
	5485.00	9.60	-3.41	0.00	0.00	16586.97	5.32	-0.12
	5485.00	9.60	-3.41	0.00	0.00	16586.97	5.32	-0.12
	5600.00	9.60	-3.42	7.89	0.00	16586.97	5.67	-0.93
	5792.00	9.60	-3.44	21.06	0.00	16586.97	6.10	-2.52
	5984.00	9.59	-3.46	34.23	0.00	16586.97	5.95	-4.11
	6148.40	9.58	-3.47	45.51	0.00	16586.97	5.31	-5.33
8)	6148.40	9.58	-3.47	45.51	0.00	16586.97	5.31	-5.33
	6176.00	9.58	-3.47	47.40	0.00	16582.49	5.13	-5.51
	6355.00	9.58	-3.48	59.68	0.00	16550.01	3.97	-6.18
	6355.00	9.58	-3.48	59.68	0.00	16550.01	3.97	-6.18
	6368.00	16.10	-3.40	67.07	0.00	16547.65	3.02	-6.51
	6560.00	112.05	1.23	176.25	0.00	16512.81	-4.55	-0.39
	6566.60	115.35	1.42	180.00	0.00	16511.61	-4.55	-0.12
	6566.60	115.35	1.42	180.00	0.00	16511.61	-4.55	-0.12
	6748.40	102.93	0.70	180.00	0.00	16478.63	-3.99	-0.13
9)	6748.40	102.93	0.70	180.00	0.00	16478.63	-3.99	-0.13
	6752.00	102.69	0.69	180.00	0.00	16478.46	-3.98	-0.13
	6944.00	89.60	-0.10	180.00	0.00	16478.46	-3.38	-0.13
	7136.00	76.54	-0.89	180.00	0.00	16478.46	-2.82	-0.11
	7328.00	63.50	-1.64	180.00	0.00	16478.46	-2.33	-0.10

7) End LH_2 Vent;
8) Start LH_2 Vent;
9) End LH_2 Vent.

* Referenced to the Z_s axis (PASCS-13) measured positive counter clockwise.

TABLE 7-2 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	CHI* PITCH (DEG)	CHI* YAW (DEG)	PITCH ATTITUDE (LOCAL HORIZONTAL) (DEG)	THRUST (N)	MASS (KG)	AXIAL FORCE (N)	NORMAL FORCE (N)
	7520.00	50.47	-2.30	180.00	0.00	16478.46	-1.94	-0.08
	7712.00	37.46	-2.85	180.00	0.00	16478.46	-1.63	-0.06
	7904.00	24.46	-3.25	180.00	0.00	16478.46	-1.40	-0.04
	8096.00	11.47	-3.50	180.00	0.00	16478.46	-1.24	-0.03
	8288.00	-1.51	-3.56	180.00	0.00	16478.46	-1.14	-0.02
	8438.35	-11.67	-3.49	180.00	0.00	16478.46	-1.10	-0.01
	8438.35	-11.67	-3.49	-180.00	0.00	16478.46	-1.10	-0.01
	8480.00	3.52	-3.58	-162.03	0.00	16478.46	-1.06	-0.41
	8647.00	64.33	-1.63	-90.00	0.00	16478.46	-0.76	-1.42
	8647.00	64.33	-1.63	-90.00	0.00	16478.46	-0.76	-1.42
	8672.00	62.65	-1.72	-90.00	0.00	16478.46	-0.76	-1.42
	8779.00	55.44	-2.11	-90.00	0.00	16478.46	-0.78	-1.46
10)	8779.00	55.44	-2.11	-90.00	4136.85	16478.46	-0.78	-1.46
	8824.50	52.37	-2.26	-90.00	4136.85	15554.31	-0.80	-1.50
	8824.50	52.37	-2.26	-90.00	1112.95	15554.31	-0.80	-1.50
	8848.40	50.76	-2.34	-90.00	489.30	15472.60	-0.81	-1.52
	8848.40	50.76	-2.34	-90.00	489.30	15472.60	-0.81	-1.52
	8864.00	49.70	-2.39	-90.00	407.67	15420.66	-0.82	-1.54
	8899.40	47.31	-2.50	-90.00	222.41	15302.79	-0.84	-1.59
11)	8899.40	47.31	-2.50	-90.00	0.00	15302.79	-0.84	-1.59
	8909.20	46.65	-2.53	-90.00	0.00	15302.29	-0.85	-1.60
12)	8909.20	46.65	-2.53	-90.00	337.18	15302.29	-0.85	-1.60
	8978.40	41.98	-2.73	-90.00	177.93	15281.40	-0.91	-1.70
	8978.40	41.98	-2.73	-90.00	177.93	15281.40	-0.91	-1.70
	9056.00	36.73	-2.94	-90.00	128.17	15257.91	-0.98	-1.84
	9089.40	34.47	-3.02	-90.00	106.76	15247.80	-1.02	-1.91
13)	9089.40	34.47	-3.02	-90.00	0.00	15247.80	-1.02	-1.91
	9099.40	33.79	-3.04	-90.00	0.00	15247.75	-1.03	-1.93
14)	9099.40	33.79	-3.04	-90.00	155.69	15247.75	-1.03	-1.93
	9248.00	23.71	-3.34	-90.00	86.67	15230.35	-1.23	-2.31
	9348.40	16.89	-3.49	-90.00	40.03	15218.58	-1.40	-2.64
	9348.40	16.89	-3.49	-90.00	13.59	15218.58	-1.40	-2.64
	9398.35	13.49	-3.54	-90.00	13.59	15212.73	-1.50	-2.83
	9398.35	13.49	-3.54	-90.00	13.59	15212.73	-1.50	-2.83
	9440.00	-13.07	-3.53	-113.68	13.59	15207.85	-1.97	-3.02

10) Start J-2 LOX Purge;
11) End J-2 LOX Purge;
12) Start J-2 LH_2 Purge;
13) End J-2 LH_2 Purge;
14) Start J-2 LH_2 Vent; Start J-2 LOX Vent.

* Referenced to the Z_s axis (PASCS-13) measured positive counter clockwise.

TABLE 7-2 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)
ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	CHI * PITCH (DEG)	CHI* YAW (DEG)	PITCH ATTITUDE (LOCAL HORIZONTAL) (DEC)	THRUST (N)	MASS (KG)	AXIAL FORCE (N)	NORMAL FORCE (N)
	9556.63	-87.30	-0.14	-180.00	13.59	15194.18	-2.75	-0.10
	9556.63	-87.30	-0.14	180.00	13.59	15194.18	-2.75	-0.10
	9632.00	-92.43	0.18	180.00	13.59	15185.35	-3.08	-0.12
	9824.00	-105.50	0.99	180.00	13.59	15162.85	-4.09	-0.16
	10016.00	-118.62	1.76	180.00	13.59	15140.35	-5.38	-0.22
	10208.00	-131.77	2.44	180.00	13.59	15117.85	-6.87	-0.26
	10400.00	-144.96	3.00	180.00	13.59	15095.35	-8.44	-0.29
	10592.00	-158.18	3.40	180.00	13.59	15072.85	-9.58	-0.28
	10784.00	-171.42	3.63	180.00	13.59	15050.35	-9.98	-0.22
	10976.00	175.33	3.67	180.00	13.59	15027.85	-9.58	-0.13
	11168.00	162.09	3.51	180.00	13.59	15005.35	-8.59	-0.04
	11360.00	148.87	3.17	180.00	13.59	14982.85	-7.30	-0.04
	11552.00	135.68	2.66	180.00	13.59	14960.35	-6.04	-0.09
	11646.40	129.20	2.36	180.00	13.59	14949.29	-5.49	-0.10
	11646.40	129.20	2.36	180.00	13.59	14949.29	-5.49	-0.10
	11656.20	128.53	2.32	180.00	13.59	14948.55	-5.43	-0.10
15)	11656.20	128.53	2.32	180.00	0.00	14948.55	-5.43	-0.10
	11744.00	122.52	2.01	180.00	0.00	14948.53	-4.95	-0.11
	11936.00	109.40	1.26	180.00	0.00	14948.53	-4.03	-0.12
	12128.00	96.32	0.43	180.00	0.00	14948.53	-3.27	-0.12
	12320.00	83.27	-0.41	180.00	0.00	14948.53	-2.65	-0.10
	12512.00	70.25	-1.24	180.00	0.00	14948.53	-2.17	-0.09
	12704.00	57.25	-2.00	180.00	0.00	14948.53	-1.80	-0.07
	12896.00	44.27	-2.67	180.00	0.00	14948.53	-1.53	-0.06
	13088.00	31.29	-3.20	180.00	0.00	14948.53	-1.33	-0.04
	13280.00	18.32	-3.57	180.00	0.00	14948.53	-1.21	-0.03
	13472.00	5.35	-3.76	180.00	0.00	14948.53	-1.14	-0.02
	13664.00	-7.63	-3.77	180.00	0.00	14948.53	-1.14	-0.01
	13856.00	-20.61	-3.58	180.00	0.00	14948.53	-1.20	-0.00
	14048.00	-33.59	-3.21	180.00	0.00	14948.53	-1.33	-0.01
	14221.40	-45.32	-2.73	180.00	0.00	14948.53	-1.53	-0.02
16)	14221.40	-45.32	-2.73	180.00	17.79	14948.53	-1.53	-0.02
	14240.00	-46.58	-2.67	180.00	17.79	14948.24	-1.56	-0.03
	14432.00	-59.58	-2.00	180.00	17.79	14945.14	-1.90	-0.05
	14598.40	-70.86	-1.32	180.00	17.79	14942.46	-2.32	-0.07

15) End J-2 LH_2 Vent; End J-2 LOX Vent;
16) Start J-2 LOX Vent; **Start J-2 LH_2 Vent.**

* Referenced to the Z_s **axis (PASCS-13) measured positive counter clockwise.**

TABLE 7-2 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	CHI * PITCH (DEG)	CHI * YAW (DEG)	PITCH ATTITUDE (LOCAL HORIZONTAL) (DEG)	THRUST (N)	MASS (KG)	AXIAL FORCE (N)	NORMAL FORCE (N)
	14598.40	-70.86	-1.32	180.00	0.00	14942.46	-2.32	-0.07
	14624.00	-72.60	-1.22	180.00	0.00	14942.05	-2.40	-0.07
	14816.00	-85.64	-0.37	180.00	0.00	14938.98	-3.13	-0.11
	15008.00	-98.71	0.51	180.00	0.00	14935.90	-4.13	-0.16
	15200.00	-111.81	1.36	180.00	0.00	14932.82	-5.45	-0.22
	15392.00	-124.95	2.15	180.00	0.00	14929.75	-7.10	-0.28
	15584.00	-138.13	2.83	180.00	0.00	14926.67	-8.99	-0.33
	15776.00	-151.35	3.36	180.00	0.00	14923.60	-10.65	-0.34
	15968.00	-164.58	3.73	180.00	0.00	14920.52	-11.70	-0.30
	16160.00	-177.84	3.89	180.00	0.00	14917.44	-11.72	-0.21
17)	16200.00	179.40	3.90	180.00	0.00	14916.80	-11.59	-0.18

17) Loss of S-IVB/IU Attitude Control.

* Referenced to the Z_s axis (PASCS-13) measured positive counter clockwise

TABLE 7-3

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	ALTITUDE (KM)	CENTRAL RANGE ANGLE (DEG)	VELOCITY VECTOR AZIMUTH SPACE FIXED (DEG)	EARTH FIXED (DEG)	LONGITUDE (POS. EAST) (DEG)	GEOCENTRIC DECLINATION (DEG)	GEODETIC LATITUDE (DEG)
1)	608.15	163.22	18.979	86.125	85.913	-61.480	31.400	31.567
	638.60	163.31	21.069	87.405	87.263	-59.161	31.518	31.686
2)	638.60	163.31	21.069	87.405	87.263	-59.161	31.518	31.686
	643.35	163.33	21.395	87.605	87.474	-58.799	31.532	31.700
3)	643.35	163.33	21.395	87.605	87.474	-58.799	31.532	31.700
	688.35	163.53	24.484	89.507	89.480	-55.363	31.610	31.778
	688.35	163.53	24.484	89.507	89.480	-55.363	31.610	31.778
	724.46	163.73	26.962	91.036	91.093	-52.603	31.599	31.766
	724.46	163.73	26.962	91.036	91.093	-52.603	31.599	31.766
	800.00	164.27	32.146	94.216	94.447	-46.846	31.361	31.528
	992.00	166.34	45.316	101.933	102.596	-32.515	29.499	29.660
	1184.00	169.40	58.473	108.661	109.721	-18.970	26.007	26.155
	1198.35	169.67	59.456	109.112	110.200	-17.997	25.689	25.836
	1198.35	169.67	59.456	109.112	110.200	-17.997	25.689	25.836
	1376.00	173.43	71.613	114.047	115.450	-6.417	21.199	21.326
	1568.00	178.38	84.730	117.977	119.650	5.195	15.423	15.519
	1760.00	184.15	97.822	120.469	122.325	16.078	9.008	9.066
	1858.40	187.38	104.521	121.208	123.121	21.465	5.571	5.607
4)	1858.40	187.38	104.521	121.208	123.121	21.465	5.571	5.607
	1952.00	190.58	110.887	121.581	123.525	26.520	2.253	2.267
	2144.00	197.40	123.925	121.354	123.285	36.834	-4.575	-4.605
	2336.00	204.22	136.937	119.789	121.607	47.336	-11.215	-11.287
	2528.00	210.62	149.926	116.852	118.462	58.330	-17.400	-17.506
	2720.00	216.13	162.895	112.504	113.824	70.076	-22.837	-22.971
	2912.00	220.29	175.848	106.767	107.728	82.740	-27.212	-27.364
	3000.00	221.65	178.218	103.714	104.493	88.857	-28.774	-28.931
	3000.00	221.65	178.218	103.714	104.493	88.857	-28.774	-28.931
	3104.00	222.75	171.208	99.818	100.370	96.308	-30.206	-30.368
	3235.00	223.31	162.379	94.580	94.836	105.957	-31.315	-31.481
5)	3235.00	223.31	162.379	94.580	94.836	105.957	-31.315	-31.481
	3296.00	223.25	158.268	92.065	92.180	110.513	-31.554	-31.720
	3403.40	222.64	151.029	87.604	87.471	118.561	-31.533	-31.699
6)	3403.40	222.64	151.029	87.604	87.471	118.561	-31.533	-31.699
	3415.00	222.53	150.247	87.124	86.964	119.428	-31.497	-31.663
	3415.00	222.53	150.247	87.124	86.964	119.428	-31.497	-31.663

1) Orbit Insertion;
2) End LOX Vent;
3) Nose Cone Jettison;
4) End LH_2 Vent;
5) LM Separation;
6) Start LH_2 Vent.

TABLE 7-3 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	ALTITUDE (KM)	CENTRAL RANGE ANGLE (DEG)	VELOCITY VECTOR AZIMUTH SPACE FIXED (DEG)	EARTH FIXED (DEG)	LONGITUDE (POS. EAST) (DEG)	GEOCENTRIC DECLINATION (DEG)	GEODETIC LATITUDE (DEG)
	3481.00	221.80	145.797	84.415	84.103	124.348	-31.168	-31.333
	3481.00	221.80	145.797	84.415	84.103	124.348	-31.168	-31.333
	3488.00	221.71	145.325	84.131	83.803	124.868	-31.121	-31.286
	3680.00	218.23	132.374	76.693	75.939	138.826	-28.951	-29.108
	3872.00	213.07	119.409	70.297	69.146	151.992	-25.246	-25.390
	4064.00	206.63	106.424	65.204	63.737	164.224	-20.305	-20.427
	4256.00	199.41	93.416	61.539	59.820	175.603	-14.452	-14.542
	4448.00	191.93	80.383	59.273	57.393	-173.651	-7.993	-8.045
	4603.40	186.04	69.814	58.437	56.497	-165.219	-2.515	-2.532
7)	4603.40	186.04	69.814	58.437	56.497	-165.219	-2.515	-2.532
	4640.00	184.70	67.322	58.368	56.423	-163.249	-1.209	-1.217
	4832.00	178.14	54.234	58.802	56.895	-152.880	5.634	5.671
	5024.00	172.56	41.120	60.600	58.828	-142.226	12.273	12.351
	5216.00	168.17	27.983	63.813	62.269	-130.981	18.422	18.535
	5408.00	165.02	14.827	68.489	67.253	-118.887	23.766	23.904
	5485.00	164.11	9.547	70.772	69.678	-113.761	25.605	25.752
	5485.00	164.11	9.547	70.772	69.678	-113.761	25.605	25.752
	5600.00	163.12	1.657	74.589	73.726	-105.804	27.959	28.114
	5792.00	162.38	11.521	81.887	81.440	-91.801	30.662	30.827
	5984.00	162.74	24.702	89.889	89.883	-77.231	31.614	31.781
	6148.40	163.86	35.986	96.775	97.147	-64.730	30.954	31.120
8)	6148.40	163.86	35.986	96.775	97.147	-64.730	30.954	31.120
	6176.00	164.12	37.880	97.899	98.334	-62.657	30.713	30.878
	6355.00	166.29	50.156	104.756	105.582	-49.568	28.288	28.445
	6355.00	166.29	50.156	104.756	105.582	-49.568	28.288	28.445
	6368.00	166.48	51.047	105.218	106.071	-48.645	28.058	28.214
	6560.00	169.80	64.200	111.350	112.577	-35.551	23.909	24.048
	6566.60	169.93	64.652	111.536	112.775	-35.119	23.744	23.882
	6566.60	169.93	64.652	111.536	112.775	-35.119	23.744	23.882
	6748.40	173.97	77.088	115.987	117.520	-23.669	18.713	18.827
9)	6748.40	173.97	77.088	115.987	117.520	-23.669	18.713	18.827
	6752.00	174.06	77.334	116.062	117.600	-23.451	18.605	18.718
	6944.00	179.21	90.445	119.316	121.085	-12.207	12.489	12.568
	7136.00	185.12	103.530	121.157	123.066	-1.563	5.877	5.915
	7328.00	191.59	116.589	121.640	123.590	8.785	-0.948	-0.954

7) End LH_2 Vent;
8) Start LH_2 Vent;
9) End LH_2 Vent.

TABLE 7-3 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	ALTITUDE (KM)	CENTRAL RANGE ANGLE (DEG)	VELOCITY VECTOR SPACE FIXED (DEG)	AZIMUTH EARTH FIXED (DEG)	LONGITUDE (POS. EAST) (DEG)	GEOCENTRIC DECLINATION (DEG)	GEODETIC LATITUDE (DEG)
	7520.00	198.31	129.622	120.789	122.678	19.155	-7.724	-7.774
	7712.00	204.86	142.631	118.585	120.316	29.858	-14.189	-14.278
	7904.00	210.81	155.617	114.987	116.470	41.184	-20.065	-20.185
	8096.00	215.69	168.587	109.973	111.131	53.358	-25.046	-25.190
	8288.00	219.08	178.455	103.627	104.400	66.473	-28.812	-28.969
	8438.35	220.48	168.315	97.900	98.342	77.325	-30.713	-30.876
	8438.35	220.48	168.315	97.900	98.342	77.325	-30.713	-30.876
	8480.00	220.66	165.507	96.228	96.576	80.399	-31.058	-31.223
	8647.00	220.44	154.244	89.338	89.301	92.879	-31.608	-31.774
	8647.00	220.44	154.244	89.338	89.301	92.879	-31.608	-31.774
	8672.00	220.27	152.558	88.299	88.204	94.754	-31.573	-31.739
	8779.00	219.18	145.340	83.899	83.558	102.739	-31.081	-31.246
10)	8779.00	219.18	145.340	83.899	83.558	102.739	-31.081	-31.246
	8824.50	218.27	142.270	82.071	81.627	106.100	-30.706	-30.870
	8824.50	218.27	142.270	82.071	81.627	106.100	-30.706	-30.870
	8848.40	217.60	140.657	81.126	80.628	107.854	-30.470	-30.633
	8848.40	217.60	140.657	81.126	80.628	107.854	-30.470	-30.633
	8864.00	217.13	139.604	80.515	79.982	108.994	-30.302	-30.465
	8899.40	215.99	137.214	79.148	78.537	111.565	-29.880	-30.041
11)	8899.40	215.99	137.214	79.148	78.537	111.565	-29.880	-30.041
	8909.20	215.67	136.552	78.775	78.143	112.273	-29.754	-29.914
12)	8909.20	215.67	136.552	78.775	78.143	112.273	-29.754	-29.914
	8978.40	213.19	131.877	76.212	75.430	117.215	-28.740	-28.898
	8978.40	213.19	131.877	76.212	75.430	117.215	-28.740	-28.898
	9056.00	210.11	126.631	73.504	72.562	122.630	-27.369	-27.521
	9089.40	208.70	124.371	72.399	71.390	124.915	-26.706	-26.856
13)	9089.40	208.70	124.371	72.399	71.390	124.915	-26.706	-26.856
	9099.40	208.27	123.695	72.076	71.047	125.594	-26.500	-26.649
14)	9099.40	208.27	123.695	72.076	71.047	125.594	-26.500	-26.649
	9248.00	201.44	113.630	67.693	66.391	135.382	-23.028	-23.162
	9348.40	196.50	106.818	65.203	63.739	141.681	-20.303	-20.425
	9348.40	196.50	106.818	65.203	63.739	141.681	-20.303	-20.425
	9398.35	193.98	103.426	64.109	62.573	144.726	-18.850	-18.965
	9398.35	193.98	103.426	64.109	62.573	144.726	-18.850	-18.965
	9440.00	191.88	100.596	63.271	61.678	147.223	-17.596	-17.704

10) Start J-2 LOX Purge;
11) End J-2 LOX Purge;
12) Start J-2 LH_2 Purge;
13) End J-2 LH_2 Purge;
14) Start J-2 LH_2 Vent; Start J-2 LOX Vent.

TABEL 7-3 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	ALTITUDE (KM)	CENTRAL RANGE ANGLE (DEG)	VELOCITY VECTOR AZIMUTH SPACE FIXED (DEG)	EARTH FIXED (DEG)	LONGITUDE (POS. EAST) (DEG)	GEOCENTRIC DECLINATION (DEG)	GEODETIC LATITUDE (DEG)
	9556.63	185.98	92.662	61.282	59.552	154.032	-13.900	-13.987
	9556.63	185.98	92.662	61.282	59.552	154.032	-13.900	-13.987
	9632.00	182.23	87.528	60.273	58.472	158.309	-11.392	-11.464
	9824.00	173.18	74.426	58.664	56.750	168.898	-4.713	-4.744
	10016.00	165.27	61.291	58.413	56.484	179.296	2.164	2.178
	10208.00	158.92	48.128	59.521	57.679	-170.180	8.972	9.030
	10400.00	154.37	34.940	62.029	60.369	-159.212	15.434	15.531
	10592.00	151.71	21.735	65.993	64.602	-147.512	21.245	21.372
	10784.00	150.89	8.520	71.427	70.378	-134.870	26.068	26.216
	10976.00	151.74	4.701	78.207	77.555	-121.242	29.550	29.712
	11168.00	154.05	17.915	85.964	85.743	-106.848	31.382	31.549
	11360.00	157.60	31.118	94.077	94.300	-92.173	31.377	31.544
	11552.00	162.17	44.303	101.815	102.470	-77.815	29.542	29.704
	11646.40	164.74	50.777	105.285	106.142	-71.027	28.023	28.179
	11646.40	164.74	50.777	105.285	106.142	-71.027	28.023	28.179
	11656.20	165.01	51.449	105.629	106.507	-70.335	27.844	27.999
15)	11656.20	165.01	51.449	105.629	106.507	-70.335	27.844	27.999
	11744.00	167.58	57.465	108.564	109.618	-64.250	26.074	26.222
	11936.00	173.66	70.600	113.971	115.370	-51.686	21.286	21.413
	12128.00	180.27	83.705	117.922	119.593	-40.071	15.528	15.625
	12320.00	187.21	96.779	120.436	122.292	-29.193	9.131	9.190
	12512.00	194.26	109.823	121.572	123.518	-18.764	2.390	2.406
	12704.00	201.10	122.839	121.373	123.309	-8.470	-4.427	-4.456
	12896.00	207.38	135.830	119.841	121.666	2.005	-11.063	-11.133
	13088.00	212.68	148.800	116.942	118.561	12.966	-17.253	-17.358
	13280.00	216.60	161.756	112.635	113.965	24.678	-22.708	-22.841
	13472.00	218.75	174.702	106.936	107.908	37.311	-27.113	-27.264
	13664.00	218.88	172.347	100.013	100.576	50.860	-30.147	-30.309
	13856.00	216.86	159.396	92.266	92.393	65.068	-31.541	-31.707
	14048.00	212.71	146.431	84.315	83.998	79.452	-31.152	-31.317
	14221.40	207.34	134.706	77.527	76.824	92.134	-29.292	-29.452
16)	14221.40	207.34	134.706	77.527	76.824	92.134	-29.292	-29.452
	14240.00	206.68	133.448	76.841	76.098	93.462	-29.013	-29.171
	14432.00	199.13	120.440	70.389	69.259	106.692	-25.323	-25.468
	14598.40	191.76	109.144	65.866	64.449	117.403	-21.100	-21.226

15) End J-2 LH_2 Vent; End J-2 LOX Vent;

16) Start J-2 LOX Vent; Start J-2 LH_2 Vent.

TABLE 7-3 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
ORBITAL FLIGHT DATA

FLIGHT TIME (SEC)	ALTITUDE (KM)	CENTRAL RANGE ANGLE (DEG)	VELOCITY VECTOR AZIMUTH SPACE FIXED (DEG)	EARTH FIXED (DEG)	LONGITUDE (POS. EAST) (DEG)	GEOCENTRIC DECLINATION (DEG)	GEODETIC LATITUDE (DEG)
14598.40	191.76	109.144	65.866	64.449	117.403	-21.100	-21.226
14624.00	190.58	107.405	65.265	63.808	118.990	-20.380	-20.503
14816.00	181.62	94.338	61.566	59.858	130.433	-14.509	-14.600
15008.00	172.87	81.240	59.280	57.411	141.240	-8.021	-8.073
15200.00	164.89	68.110	58.367	56.434	151.702	-1.202	-1.210
15392.00	158.17	54.951	58.809	56.914	162.132	5.678	5.715
15584.00	153.02	41.767	60.629	58.870	172.852	12.349	12.428
15776.00	149.60	28.562	63.880	62.349	-175.831	18.521	18.634
15968.00	147.93	15.344	68.607	67.384	-163.657	23.870	24.010
16160.00	147.92	2.128	74.765	73.916	-150.491	28.049	28.205
17) 16200.00	148.11	0.676	76.211	75.445	-147.625	28.740	28.898

17) Loss of S-IVB/IU Attitude Control.

TABLE 8

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

S-IB STAGE RE-ENTRY DATA

	FLIGHT TIME (SEC)	----- SPACE FIXED ----- RADIUS (M)	VELOCITY (M/S)	PATH ANGLE (DEG)	--- SPACE FIXED POSITION AND VELOCITY VECTOR COMPONENTS --- X (M)	Y (M)	Z (M)	DX (M/S)	DY (M/S)	DZ (M/S)
1)	143.52	6436843.	2369.58	62.854	6435696.	35477.	116174.	1042.34	118.28	2124.72
2)	145.08	6438502.	2341.73	63.331	6437295.	35657.	119470.	1011.50	112.75	2108.99
	160.00	6453143.	2273.42	66.301	6451272.	37329.	150848.	864.28	111.76	2099.76
	180.00	6469636.	2202.33	70.482	6466642.	39555.	192785.	673.04	110.87	2094.03
	200.00	6482582.	2145.61	74.901	6478201.	41763.	234604.	482.98	109.91	2087.65
	220.00	6491996.	2103.55	79.520	6485966.	43951.	276283.	293.64	108.90	2080.11
	240.00	6497889.	2076.84	84.287	6489950.	46119.	317800.	104.79	107.83	2071.29
	260.00	6500267.	2065.94	89.139	6490160.	48264.	359131.	-83.76	106.70	2061.49
3)	264.00	6500321.	2065.69	90.113	6489749.	48691.	367373.	-121.45	106.47	2059.36
	280.00	6499132.	2071.07	94.003	6486600.	50387.	400252.	-272.20	105.51	2050.39
	300.00	6494483.	2092.11	98.809	6479271.	52484.	441138.	-460.73	104.26	2038.08
	320.00	6486315.	2128.69	103.488	6468169.	54557.	481767.	-649.55	102.94	2024.55
	340.00	6474620.	2180.17	107.984	6453286.	56602.	522112.	-838.85	101.56	2009.76
	360.00	6459386.	2245.56	112.253	6434611.	58618.	562148.	-1028.75	100.11	1993.53
	380.00	6440609.	2319.91	116.260	6412142.	60606.	601827.	-1217.05	98.60	1972.57
	400.00	6418536.	2335.59	119.869	6386167.	62563.	640748.	-1360.27	97.25	1896.11
	420.00	6397647.	1448.72	120.239	6361774.	64515.	673465.	-857.84	98.99	1163.22
	440.00	6389610.	595.08	112.066	6352073.	66521.	688378.	-281.68	100.74	514.42
	460.00	6385725.	485.47	111.338	6347149.	68528.	697484.	-224.79	99.93	418.52
	480.00	6382467.	448.81	109.550	6342959.	70521.	705535.	-195.84	99.42	391.41
	500.00	6379685.	431.22	107.401	6339274.	72508.	713252.	-173.89	99.31	381.91
	520.00	6377271.	422.27	105.557	6335961.	74493.	720853.	-158.25	99.22	378.72
	540.00	6375131.	416.78	104.064	6332919.	76476.	728413.	-146.56	99.09	377.37
	560.00	6373205.	412.75	102.853	6330084.	78457.	735948.	-137.43	98.93	376.42
4)	563.39	6372896.	412.55	102.667	6329621.	78792.	737224.	-136.18	98.88	376.66

1) Physical Separation;
2) Retro-Rocket Burnout;
3) S-IB Stage Apogee;
4) S-IVB Stage Impact.

TABLE 8 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
S-IB STAGE RE-ENTRY DATA

	FLIGHT TIME (SEC)	----- EARTH FIXED ----- POSITION (M)	VELOCITY (M/S)	PATH ANGLE (DEG)	---- EARTH FIXED POSITION AND VELOCITY VECTOR COMPONENTS ---- X (M)	Y (M)	Z (M)	DX (M/S)	DY (M/S)	DZ (M/S)
1)	143.92	89522.	2024.94	57.729	63268.	-49.	63335.	1065.74	0.74	1721.80
2)	145.08	92568.	1995.62	58.218	64903.	-52.	66004.	1035.11	-4.63	1706.18
	160.00	120954.	1916.43	61.523	79257.	-118.	91368.	891.29	-3.81	1696.55
	180.00	157324.	1831.81	66.316	95213.	-177.	125240.	704.65	-2.06	1690.85
	200.00	191903.	1763.33	71.520	107450.	-200.	159001.	519.17	-0.17	1685.17
	220.00	224864.	1711.97	77.085	115985.	-183.	192644.	334.37	1.86	1679.00
	240.00	256411.	1679.05	82.927	120828.	-124.	226158.	150.03	4.03	1672.33
	260.00	286773.	1665.50	88.931	121988.	-21.	259533.	-34.05	6.34	1665.14
3)	264.00	292724.	1665.17	90.140	121778.	6.	266191.	-70.85	6.82	1663.65
	280.00	316197.	1671.75	94.961	119467.	130.	292760.	-218.07	8.78	1657.45
	300.00	344953.	1697.60	100.878	113265.	331.	325828.	-402.23	11.35	1649.22
	320.00	373324.	1742.28	106.557	103376.	585.	358725.	-586.73	14.05	1640.46
	340.00	401610.	1804.57	111.902	89792.	894.	391442.	-771.78	16.88	1631.12
	360.00	430122.	1882.81	116.851	72501.	1261.	423965.	-957.48	19.82	1621.05
	380.00	459162.	1971.34	121.377	51499.	1688.	456262.	-1141.75	22.84	1606.89
	400.00	488692.	2001.72	125.527	27061.	2170.	487938.	-1282.38	25.03	1536.80
	420.00	513452.	1123.91	130.477	4132.	2611.	513428.	-795.19	14.88	794.13
	440.00	520807.	269.24	146.132	-4521.	2760.	520780.	-234.93	3.04	131.48
	460.00	522290.	183.32	164.497	-8535.	2794.	522213.	-180.04	0.74	34.53
	480.00	522721.	151.48	172.716	-11834.	2799.	522580.	-151.32	-0.05	6.97
	500.00	522816.	129.19	176.628	-14627.	2796.	522604.	-129.15	-0.14	-2.88
	520.00	522792.	113.29	178.531	-17041.	2794.	522507.	-113.12	-0.08	-6.30
	540.00	522724.	101.28	179.708	-19176.	2793.	522365.	-100.98	-0.01	-7.80
	560.00	522629.	91.83	179.089	-21096.	2794.	522196.	-91.40	0.06	-8.86
4)	563.39	522612.	90.47	179.153	-21403.	2794.	522166.	-90.06	0.06	-8.62

1) Physical Separation;
2) Retro-Rocket Burnout;
3) S-IB Stage Apogee;
4) S-IVB Stage Impact.

TABLE 8 (Cont'd)

AS-?04/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

S-IB STAGE RE-ENTRY DATA

	FLIGHT TIME (SEC)	MASS (KG)	THRUST (TOTAL) (N)	DRAG (N)	LONGITUDINAL ACCELERATION (M/SEC?)	DYNAMIC PRESSURE (N/M2)	A.H.I. (KG-M/M?-RAD)	MACH NO.
1)	143.52	46650.	0.	57896.	-1.241	425.	59513694.	6.52
2)	145.08	46018.	551580.	45285.	-12.120	332.	59588887.	6.49
	160.00	46018.	0.	4850.	-0.105	36.	59840115.	6.86
	180.00	46018.	0.	215.	-0.005	2.	59866114.	6.32
	200.00	46018.	0.	26.	-0.001	0.	59867428.	5.61
	220.00	46018.	0.	7.	-0.000	0.	59867604.	4.74
	240.00	46018.	0.	3.	-0.000	0.	59867627.	4.04
	260.00	46018.	0.	2.	-0.000	0.	59867627.	3.80
3)	264.00	46018.	0.	2.	-0.000	0.	59867627.	3.80
	280.00	46018.	0.	3.	-0.000	0.	59867627.	3.91
	300.00	46018.	0.	5.	-0.000	0.	59867627.	4.44
	320.00	46018.	0.	14.	-0.000	0.	59867723.	5.23
	340.00	46018.	0.	85.	-0.002	1.	59868313.	5.98
	360.00	46018.	0.	1496.	-0.033	11.	59876392.	6.89
	380.00	46018.	0.	31940.	-0.694	235.	60066021.	6.51
	400.00	46018.	0.	520444.	-11.310	3797.	63385659.	6.08
	420.00	46018.	0.	4010199.	-87.145	26855.	96888842.	3.79
	440.00	46018.	0.	874796.	-19.010	5993.	109679445.	0.94
	460.00	46018.	0.	527624.	-11.466	4888.	111075965.	0.62
	480.00	46018.	0.	505156.	-10.977	5040.	112137646.	0.49
	500.00	46018.	0.	492017.	-10.693	4982.	113045572.	0.40
	520.00	46018.	0.	481307.	-10.459	4932.	113821858.	0.34
	540.00	46018.	0.	474635.	-10.314	4906.	114504966.	0.30
	560.00	46018.	0.	469513.	-10.203	4853.	115115381.	0.27
4)	563.39	46018.	0.	468651.	-10.184	4844.	115212151.	0.26

1) Physical Separation;
2) Retro-Rocket Burnout;
3) S-IB Stage Apogee;
4) S-IVB Stage Impact.

TABLE 8 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATICNAL FLIGHT TRAJECTORY (REVISION I)
S-IB STAGE RE-ENTRY DATA

	FLIGHT TIME (SEC)	ALTITUDE (KM)	RANGE (KM)	VELOCITY VECTOR AZIMUTH SPACE FIXED (DEG)	EARTH FIXED (DEG)	LONGITUDE (POS. EAST) (DEG)	GEOCENTRIC DECLINATION (DEG)	GEODETIC LATITUDE (DEG)
1)	143.52	63.579	62.766	75.644	72.221	-79.955	28.546	28.706
2)	145.08	65.241	65.392	75.536	72.054	-79.929	28.553	28.713
	160.00	79.903	90.309	75.686	72.210	-79.686	28.622	28.782
	180.00	96.424	123.465	75.889	72.441	-79.363	28.712	28.872
	200.00	109.399	156.428	76.091	72.678	-79.040	28.801	28.961
	220.00	118.841	189.247	76.293	72.919	-78.718	28.888	29.048
	240.00	124.761	221.967	76.496	73.166	-78.397	28.974	29.134
	260.00	127.166	254.632	76.699	73.418	-78.075	29.058	29.219
3)	264.00	127.225	261.162	76.740	73.469	-78.011	29.075	29.236
	280.00	126.057	287.286	76.903	73.675	-77.753	29.141	29.302
	300.00	121.434	319.973	77.109	73.938	-77.430	29.223	29.385
	320.00	113.292	352.736	77.315	74.206	-77.105	29.304	29.466
	340.00	101.623	385.620	77.523	74.480	-76.779	29.384	29.546
	360.00	86.413	418.669	77.733	74.759	-76.450	29.463	29.626
	380.00	67.662	451.907	77.950	75.044	-76.118	29.541	29.704
	400.00	45.613	484.981	78.248	75.332	-75.788	29.617	29.781
	420.00	24.743	512.020	80.227	75.612	-75.517	29.678	29.843
	440.00	16.712	520.015	86.207	75.928	-75.437	29.696	29.861
	460.00	12.829	521.764	88.500	76.023	-75.419	29.699	29.865
	480.00	9.571	522.395	89.360	75.765	-75.413	29.701	29.866
	500.00	6.789	522.646	89.753	76.490	-75.410	29.701	29.867
	520.00	4.375	522.744	89.928	79.909	-75.409	29.701	29.867
	540.00	2.235	522.776	90.027	111.475	-75.409	29.701	29.867
	560.00	0.309	522.763	90.102	240.607	-75.409	29.701	29.867
4)	563.39	0.000	522.758	90.096	239.775	-75.409	29.701	29.867

1) Physical Separation;
2) Retro-Rocket Burnout;
3) S-IB Stage Apogee;
4) S-IVB Stage Impact.

TABLE 9

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)
TRACKING AND TELEMETRY STATION COORDINATES: LAUNCH PHASE

STATION	GEODETIC LATITUDE(1) (DEGREES NORTH)	LONGITUDE(1) (DEGREES EAST)	ALTITUDE ABOVE ELLIPSOID (METERS)
GLOTRAC			
GLOTRAC 1	28.413386	-80.592263	10.95
Bassett Cove	26.614552	-78.323580	16.15
Atlantic	34.881507	-76.353404	2.92
Grand Turk	21.433765	-71.145032	21.00
Bermuda	32.254488	-64.838675	87.09
Telemetry			
Cape Tel 4	28.463713	-80.653029	0.00(4)
MILA-CIF	28.542366	-80.643533	0.00(4)
Vero Beach(2)	27.666667	-80.350000	0.00(4)
New Smyrna Beach(2)	29.066667	-80.916667	0.00(4)
Powered Flight Ship	31.000000	-63.000000	0.00(4)
Grand Bahama	26.628514	-78.299444	0.00(4)
Grand Turk	21.446016	-71.147500	0.00(4)
Bermuda	32.348102	-64.653800	18.00
C-Band Radar			
MILA	28.424862	-80.664404	12.02
Patrick A.F. Base	28.226553	-80.599293	15.51
Grand Bahama	26.615778	-78.347833	13.98
Grand Turk	21.462890	-71.132114	28.00
Bermuda	32.348103	-64.653801	24.31
Powered Flight Ship	31.000000	-63.000000	0.00(4)
ODOP			
Transmitter (3) (1.3.1.7)	28.444373	-80.579973	5.14

Notes:
1. All coordinates are referenced to Fischer Ellipsoid of 1960.
2. New Smyrna and Vero Beach receive signal strength only.
3. ODOP tracks the S-IB stage during powered flight and after separation from the S-IVB until loss of track at an elevation of zero degrees.
4. An altitude of zero meters is assumed whenever a value for the actual station altitude is not available.

TABLE 10

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)
TRACKING AND TELEMETRY STATION COORDINATES: ORBITAL PHASE

STATION	GEODETIC LATITUDE(1) (DEGREES NORTH)	LONGITUDE(1) (DEGREES EAST)	ALTITUDE ABOVE(1) ELLIPSOID (METERS)
Telemetry			
Cape Tel 4	28.463713	- 80.653029	0.00 (2)
MILA-CIF	28.542366	- 80.643533	0.00 (2)
Grand Bahama	26.628514	- 78.299444	0.00 (2)
Grand Turk	21.446016	- 71.147500	0.00 (2)
Bermuda	32.348102	- 64.653800	18.00
Antigua	17.137333	- 61.774955	41.20
Apollo Ship (3)	28.000000	- 41.000000	00.00 (2)
Canary Island	27.742797	- 15.598103	35.00
Ascension	- 7.974314	- 14.392221	29.98
Tananarive	-19.018056	47.304444	1375.00
Ship I	-27.000000	96.000000	0.00 (2)
Carnarvon	-24.897356	113.716067	64.00
Hawaii	22.125267	-159.667691	1142.00
Guaymas	27.958406	-110.720792	18.00
Corpus Christi	27.655400	- 97.380256	10.00
C-Band Radar			
MILA	28.424862	- 80.664404	12.02
Grand Bahama	26.615778	- 78.347833	13.98
Grand Turk	21.462890	- 71.132114	28.00
Bermuda	32.348103	- 64.653801	24.31
Antigua	17.144032	- 61.792859	49.37
Apollo Ship (3)	28.000000	- 41.000000	0.00 (2)
Canary Island	27.744861	- 15.602000	36.00
Ascension	- 7.951514	- 14.412606	152.43
Pretoria	-25.943731	+ 28.358490	1622.40
Tananarive	-19.018056	47.304444	1375.00
Carnarvon	-24.897403	113.716078	62.00
Woomera	-30.819728	-136.836989	151.00
Hawaii	22.122092	-159.665383	1140.00
Point Arguello	34.582903	-120.561150	646.00
White Sands	32.358222	-106.369564	1232.00

Notes:
1. All coordinates are referenced to Fischer Ellipsoid of 1960
2. A station altitude of zero is assumed when the actual value is unavailable.
3. The Apollo ship will track only on the first revolution immediately after insertion.

TABLE 11

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
TRAJECTORY DISPERSION ENVELOPE AT S-IB/S-IVB SEPARATION
COMBINED S-IB AND S-IVB STAGE THREE SIGMA DEVIATIONS

DISPERSION GROUP		FLIGHT TIME (SEC)	ALTITUDE (M)	SPACE-FIXED VELOCITY (M/S)	SPACE-FIXED FLIGHT PATH ANGLE (DEG)	GROUND RANGE (M)	EARTH-FIXED CROSS RANGE (M)	VEHICLE WEIGHT (LB)
S-IB Propulsion	+RSS	4.94	1405.	14.05	1.868	4953.	17.	3796.
S-IB Propulsion	-RSS	2.48	1585.	19.18	1.127	2221.	10.	1507.
S-IB Non Propulsion	+RSS	0.00	1579.	30.40	1.652	3106.	3320.	310.
S-IB Non Propulsion	-RSS	0.00	1630.	29.71	1.657	2861.	3152.	310.
S-IVB Propulsion	+RSS	0.00	550.	13.37	0.120	324.	2.	3010.
S-IVB Propulsion	-RSS	0.00	547.	13.29	0.120	323.	2.	3010.
S-IVB Non Propulsion	+RSS	0.00	36.	0.88	0.008	21.	0.	200.
S-IVB Non Propulsion	-RSS	0.00	36.	0.88	0.008	21.	0.	200.
Combined Positive	RSS	4.94	2184.	36.07	2.497	5855.	3320.	4859.
Combined Negative	RSS	2.48	2339.	37.79	2.008	3636.	3152.	3386.

TABLE 11 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
TRAJECTORY DISPERSION ENVELOPE AT S-IB/S-IVB SEPARATION
COMBINED S-IB AND S-IVB STAGE THREE SIGMA DEVIATIONS

DISPERSION GROUP		FLIGHT TIME (SEC)	SPACE FIXED POSITION VECTOR X (M)	Y (M)	Z (M)	SPACE FIXED VELOCITY VECTOR XDOT (M/S)	YDOT (M/S)	ZDOT (M/S)
S-IB Propulsion	+RSS	4.94	1455.	595.	6911.	43.13	0.24	28.68
S-IB Propulsion	-RSS	2.48	1682.	300.	3185.	75.05	0.20	25.55
S-IB Non Propulsion	+RSS	0.00	1614.	3320.	3117.	52.57	74.68	51.31
S-IB Non Propulsion	-RSS	0.00	1666.	3151.	2871.	54.64	73.79	52.51
S-IVB Propulsion	+RSS	0.00	544.	2.	337.	9.93	0.07	10.18
S-IVB Propulsion	-RSS	0.00	541.	2.	336.	9.85	0.07	10.13
S-IVB Non Propulsion	+RSS	0.00	36.	0.	22.	0.65	0.00	0.67
S-IVB Non Propulsion	-RSS	0.00	36.	0.	22.	0.65	0.00	0.67
Combined Positive	RSS	4.94	2240.	3373.	7589.	68.73	74.68	59.66
Combined Negative	RSS	2.48	2429.	3165.	4301.	93.36	73.79	59.27

TABLE 11 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
TRAJECTORY DISPERSION ENVELOPE AT S-IB/S-IVB SEPARATION
COMBINED S-IB AND S-IVB STAGE THREE SIGMA DEVIATIONS

DISPERSION GROUP		FLIGHT TIME (SEC)	VEHICLE ATTITUDE PITCH (DEG)	VEHICLE ATTITUDE YAW (DEG)	VEHICLE ATTITUDE ROLL (DEG)	(1) VEHICLE ATTITUDE RATE PITCH (DEG/S)	VEHICLE ATTITUDE RATE YAW (DEG/S)	VEHICLE ATTITUDE RATE ROLL (DEG/S)
S-IB Propulsion	+RSS	4.94	0.082	0.003	0.026	----	----	----
S-IB Propulsion	-RSS	2.48	0.041	0.004	0.011	----	----	----
S-IB Non Propulsion	+RSS	0.00	1.145	1.141	(2) 5.840	----	----	----
S-IB Non Propulsion	-RSS	0.00	1.140	1.141	(2) 5.840	----	----	----
S-IVB Propulsion	+RSS	0.00	0.001	0.000	0.000	----	----	----
S-IVB Propulsion	-RSS	0.00	0.002	0.000	0.001	----	----	----
S-IVB Non Propulsion	+RSS	0.00	0.000	0.000	0.000	----	----	----
S-IVB Non Propulsion	-RSS	0.00	0.000	0.000	0.000	----	----	----
Combined Positive	RSS	4.94	1.148	1.141	5.840	----	----	----
Combined Negative	RSS	2.48	1.141	1.141	5.840	----	----	----

(1) The S-IB stage attitude rates have been omitted in order that more realistic values, reflecting conditions at physical separation, can be determined. These data will be determined prior to launch.

(2) **Includes the effect of the H-1 thrust misalignment combination which produces a 3-sigma roll attitude deviation.**

TABLE 12

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
TRAJECTORY DISPERSION ENVELOPE AT J-2 ENGINE CUTOFF SIGNAL
COMBINED S-IB AND S-IVB STAGE THREE SIGMA DEVIATIONS

DISPERSION GROUP		FLIGHT TIME (SEC)	ALTITUDE (M)	SPACE-FIXED VELOCITY (M/S)	SPACE-FIXED FLIGHT PATH ANGLE (DEG)	GROUND RANGE (M)	EARTH-FIXED CROSS RANGE (M)	VEHICLE WEIGHT (LB)
S-IB Propulsion	+RSS	6.20	6.	0.00	0.000	9220.	546.	359.
S-IB Propulsion	-RSS	2.85	12.	0.00	0.000	6084.	416.	682.
S-IB Non Propulsion	+RSS	1.38	5.	0.00	0.001	11024.	895.	520.
S-IB Non Propulsion	-RSS	1.21	11.	0.00	0.001	11018.	903.	591.
S-IVB Propulsion	+RSS	17.92	12.	0.00	0.003	71322.	5051.	837.
S-IVB Propulsion	-RSS	16.88	7.	0.00	0.002	70803.	5002.	924.
S-IVB Non Propulsion	+RSS	0.44	3.	0.00	0.000	1782.	130.	24.
S-IVB Non Propulsion	-RSS	0.44	3.	0.00	0.000	1829.	135.	44.
(1) IMU Dispersions	+RSS	0.03	601.	1.60	0.026	318.	----	----
(1) IMU Dispersions	-RSS	0.03	601.	1.60	0.026	318.	----	----
Combined Positive	RSS	19.02	601.	1.60	0.026	72778.	5160.	1049.
Combined Negative	RSS	17.17	601.	1.60	0.026	71937.	5102.	1292.

(1) Based on the new 3-sigma tolerances defined in Reference 21.

TABLE 12 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
TRAJECTORY DISPERSION ENVELOPE AT J-2 ENGINE CUTOFF SIGNAL
COMBINED S-IB AND S-IVB STAGE THREE SIGMA DEVIATIONS

DISPERSION GROUP		FLIGHT TIME (SEC)	SPACE FIXED POSITION VECTOR X (M)	Y (M)	Z (M)	SPACE FIXED VELOCITY VECTOR XDOT (M/S)	YDOT (M/S)	ZDOT (M/S)
S-IB Propulsion	+RSS	6.20	2178.	633.	11242.	8.18	0.17	2.61
S-IB Propulsion	-RSS	2.85	3629	383.	6791.	13.48	0.33	4.32
S-IB Non Propulsion	+RSS	1.38	3311.	588.	10439.	12.46	0.32	3.98
S-IB Non Propulsion	-RSS	1.21	3361	584.	10350.	12.54	0.36	4.02
S-IVB Propulsion	+RSS	17.92	23687.	4301.	76336.	90.80	1.95	28.35
S-IVB Propulsion	-RSS	16.88	24504.	4258.	75527.	91.97	1.98	29.41
S-IVB Non Propulsion	+RSS	0.44	612.	105.	1868.	2.26	0.10	0.72
S-IVB Non Propulsion	-RSS	0.44	602.	107.	1898.	2.22	0.11	0.71
(1) IMU Dispersions	+RSS	0.03	654.	725.	207.	4.10	3.05	0.65
(1) IMU Dispersions	-RSS	0.03	654.	725.	207.	4.10	3.05	0.65
Combined Positive	RSS	19.02	24033.	4448.	77885.	92.13	3.64	28.76
Combined Negative	RSS	17.17	25014.	4377.	76559.	93.91	3.67	30.01

(1) Based on the new 3-sigma tolerances defined in Reference 21.

TABLE 12 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
TRAJECTORY DISPERSION ENVELOPE AT J-2 ENGINE CUTOFF SIGNAL
COMBINED S-IB AND S-IVB STAGE THREE SIGMA DEVIATIONS

DISPERSION		FLIGHT TIME (SEC)	VEHICLE ATTITUDE PITCH (DEG)	VEHICLE ATTITUDE YAW (DEG)	VEHICLE ATTITUDE *ROLL (DEG)	VEHICLE ATTITUDE RATE PITCH (DEG/S)	VEHICLE ATTITUDE RATE YAW (DEG/S)	VEHICLE ATTITUDE RATE *ROLL (DEG/S)
S-IB Propulsion	+RSS	6.20	1.242	0.037	---	0.013	0.001	---
S-IB Propulsion	-RSS	2.85	2.007	0.017	---	0.010	0.001	---
S-IB Non Propulsion	+RSS	1.38	1.652	2.144	---	0.012	0.003	---
S-IB Non Propulsion	-RSS	1.21	1.726	2.146	---	0.014	0.005	---
S-IVB Propulsion	+RSS	17.92	2.347	0.116	---	0.000	0.003	---
S-IVB Propulsion	-RSS	16.88	3.439	0.086	---	0.028	0.000	---
S-IVB Non Propulsion	+RSS	0.44	0.321	0.358	---	0.002	0.000	---
S-IVB Non Propulsion	-RSS	0.44	0.355	0.351	---	0.005	0.002	---
(1) IMU Dispersions	+RSS	0.03	---	---	---	---	---	---
(1) IMU Dispersions	-RSS	0.03	---	---	---	---	---	---
Combined Positive	RSS	19.02	3.144	2.177	---	0.018	0.004	---
Combined Negative	RSS	17.17	4.354	2.176	---	0.033	0.005	---

(1) Based on the new 3 sigma tolerances defined in Reference 21.

* Not Applicable

TABLE 13

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
LAUNCH VEHICLE PERFORMANCE CHARACTERISTICS

S-IB STAGE

Average Longitudinal Sea Level Thrust (lbs)

	H-1 Engine	Turbine	Total
Engine #1	203877.	591.	204468.
Engine #2	202227.	655.	202882.
Engine #3	202621.	630.	203251.
Engine #4	199535.	620.	200155.
Engine #5	202343.	590.	202933.
Engine #6	205170.	647.	205817.
Engine #7	202972.	607.	203579.
Engine #8	204036.	597.	204633.

Total Average Sea Level Thrust (F): 1,627,718.

Flight Time Interval: 0.0 - 139.144 seconds (IECO)

$\dot{W} = [Wt\ (t=0) - Wt\ (t = 139.144) - * Waux\ ] / 139.144$

$= 6266.82$ (lb/sec)

$Isp = F/\dot{W}$

$= 259.74$ (sec)

*Waux:

Frost	1100 lbs
Seal Purge	6 lbs
Fuel Additive	27 lbs
Total	1133 lbs

S-IVB STAGE

High Thrust Level Flight Time Interval: 150.84 - 475.75 seconds
Low Thrust Level Flight Time Interval: 475.75 - 598.15 seconds

AVERAGE VALUES

	High Thrust Level	Low Thrust Level
Vacuum Thrust (lbs)	223,397.	186,979.
Flowrate (lb/sec)	525.22	435.62
Specific Impulse (sec)	425.34	429.23

NOTE: The 0.7% S-IB stage bias, previously mentioned, is not included in these data.

Figure 1

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
FLIGHT PROFILE: ALTITUDE VS FLIGHT TIME

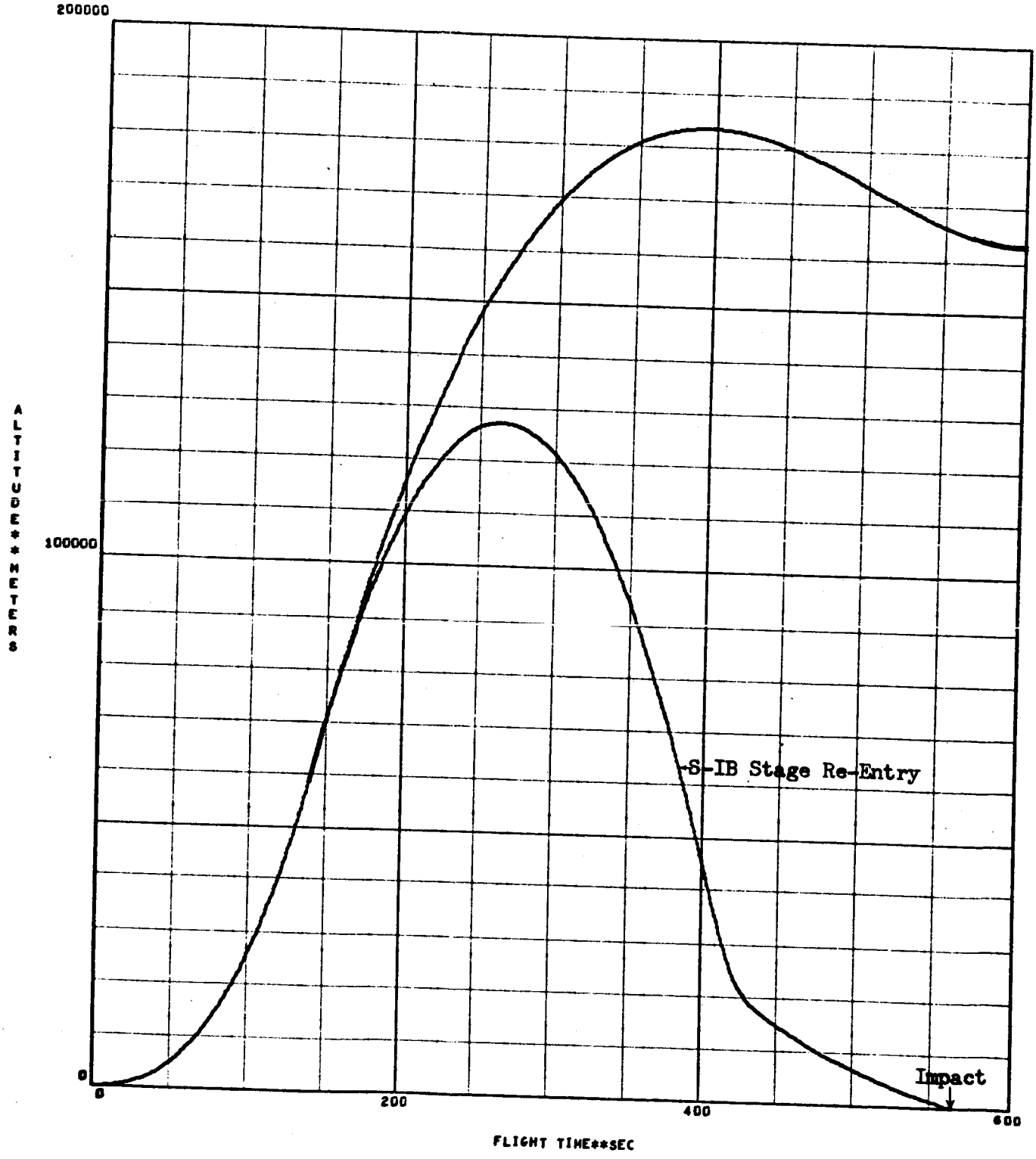


Figure 2

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
FLIGHT PROFILE: ALTITUDE VS GROUND RANGE

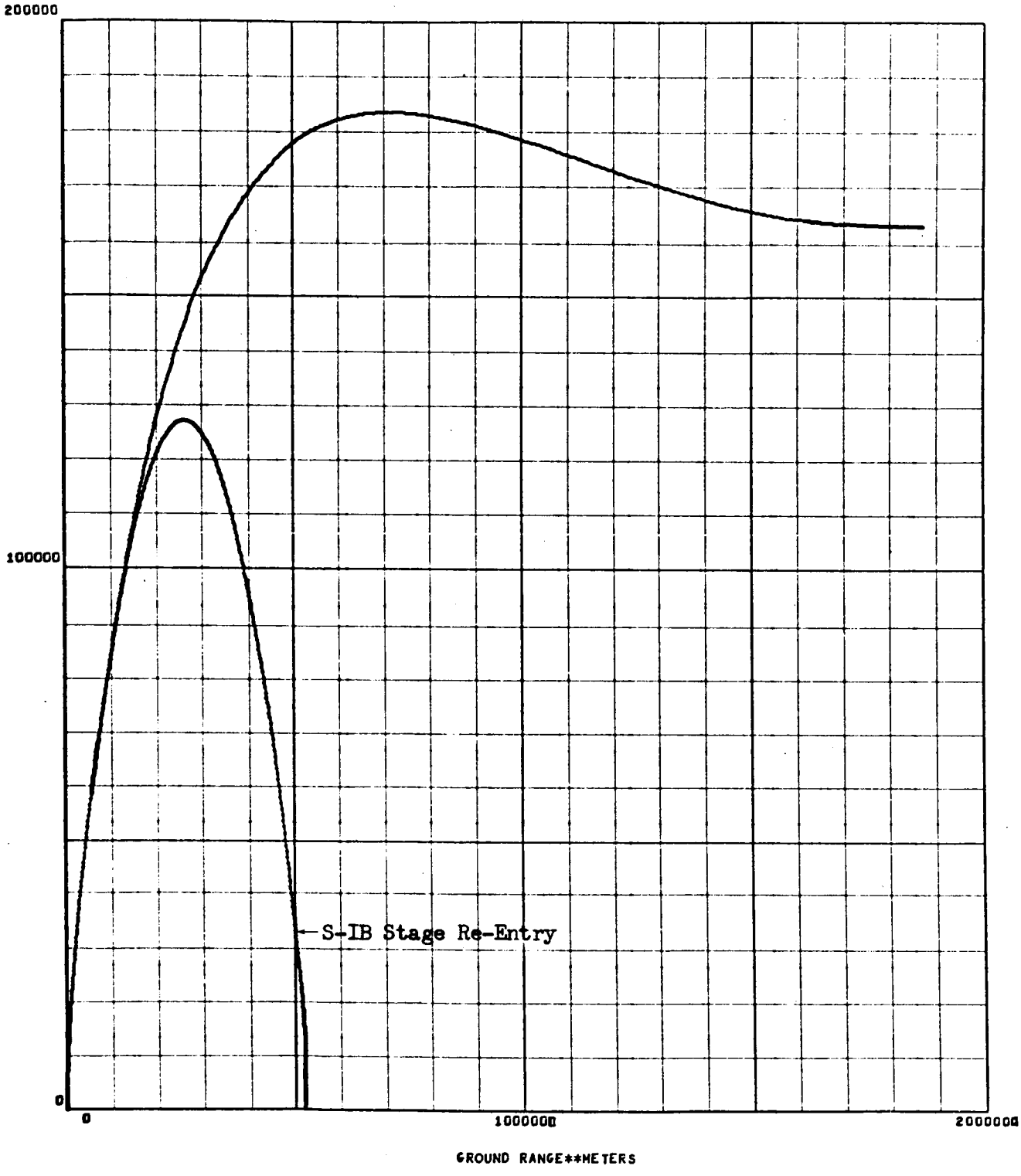


Figure 3

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
FLIGHT PROFILE: VELOCITY VS FLIGHT TIME

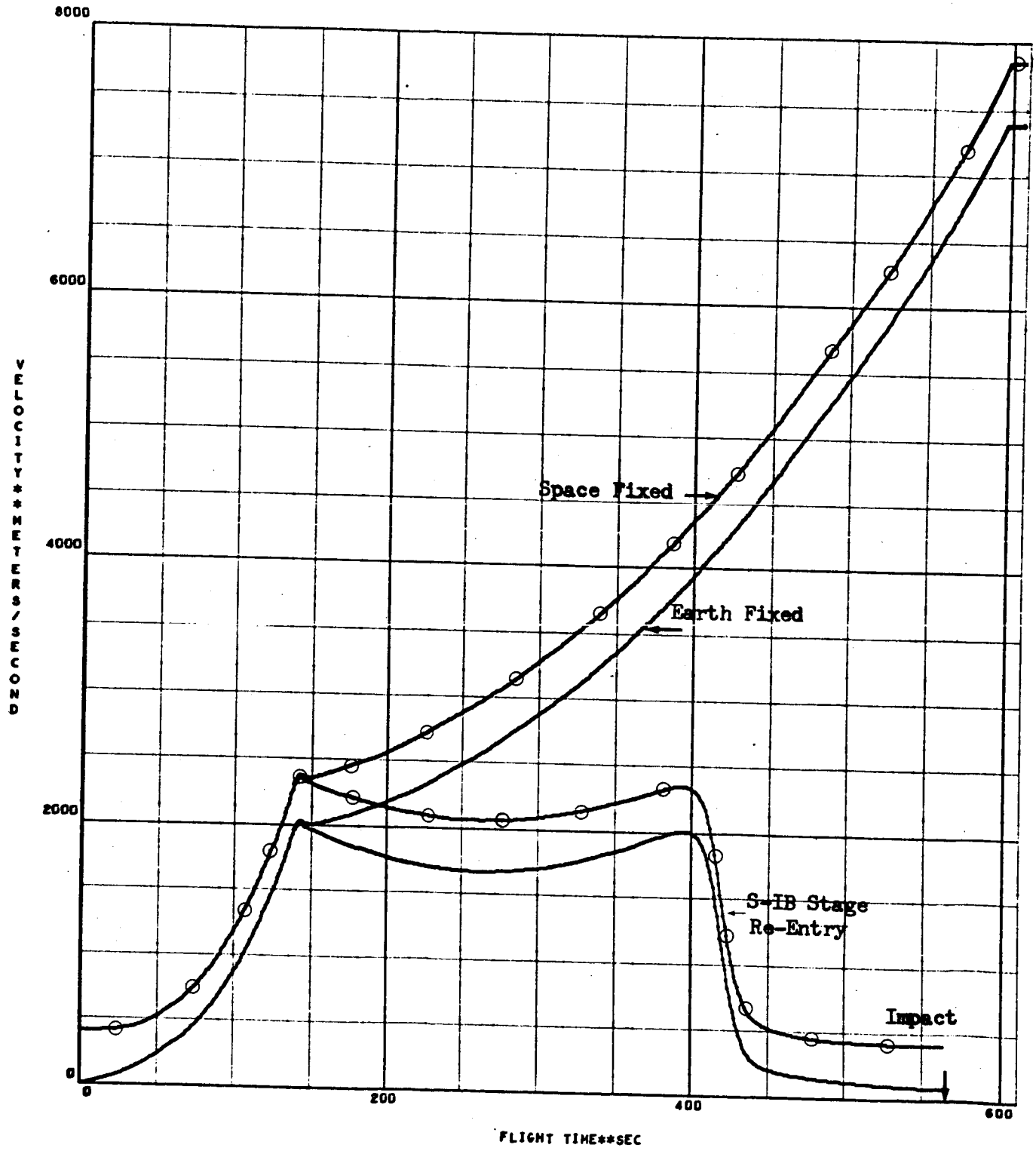


Figure 4

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
FLIGHT PROFILE: SPACE FIXED FLIGHT PATH ANGLE VS FLIGHT TIME

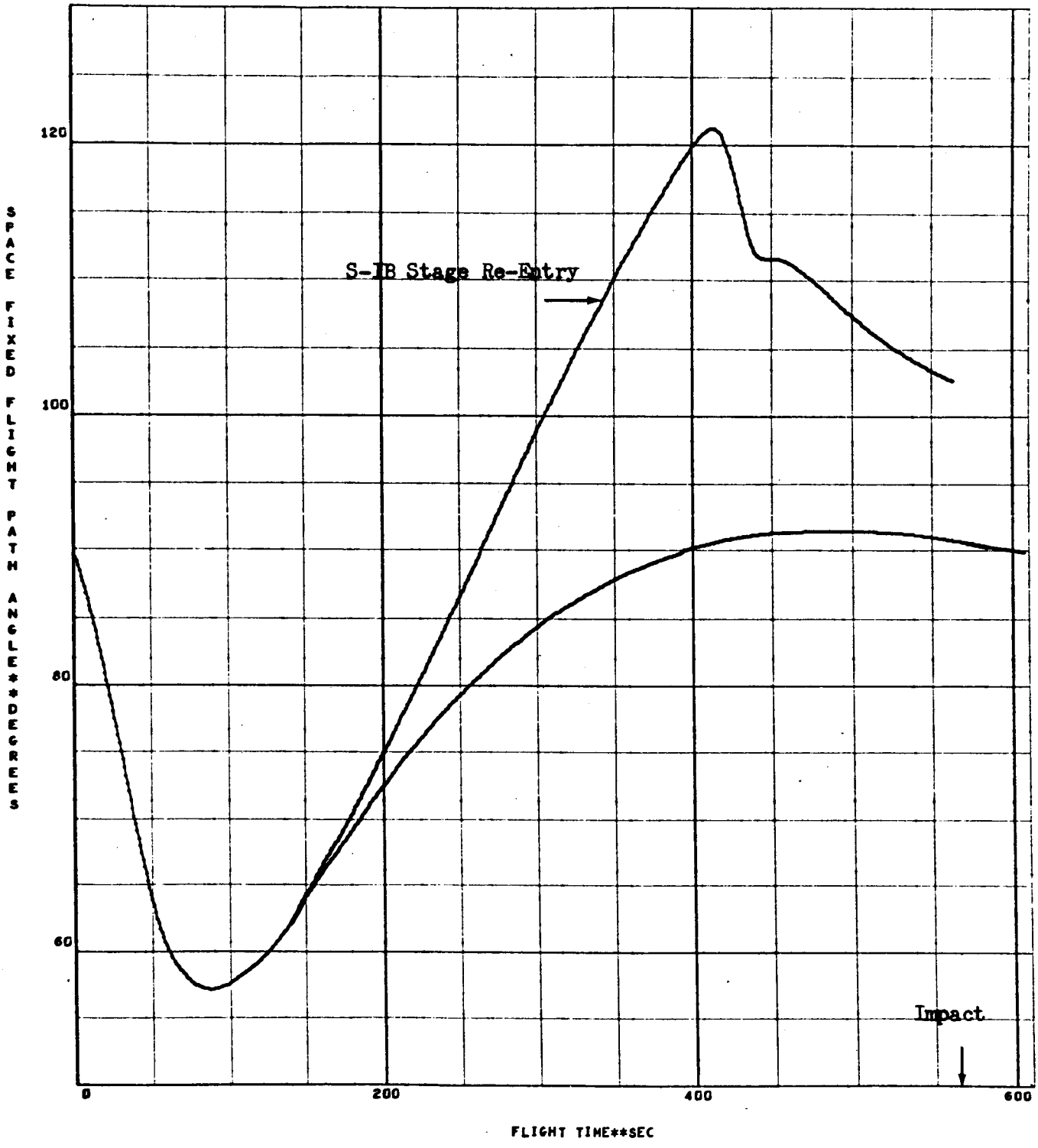


Figure 5

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
FLIGHT PROFILE: EARTH FIXED FLIGHT PATH ANGLE VS FLIGHT TIME

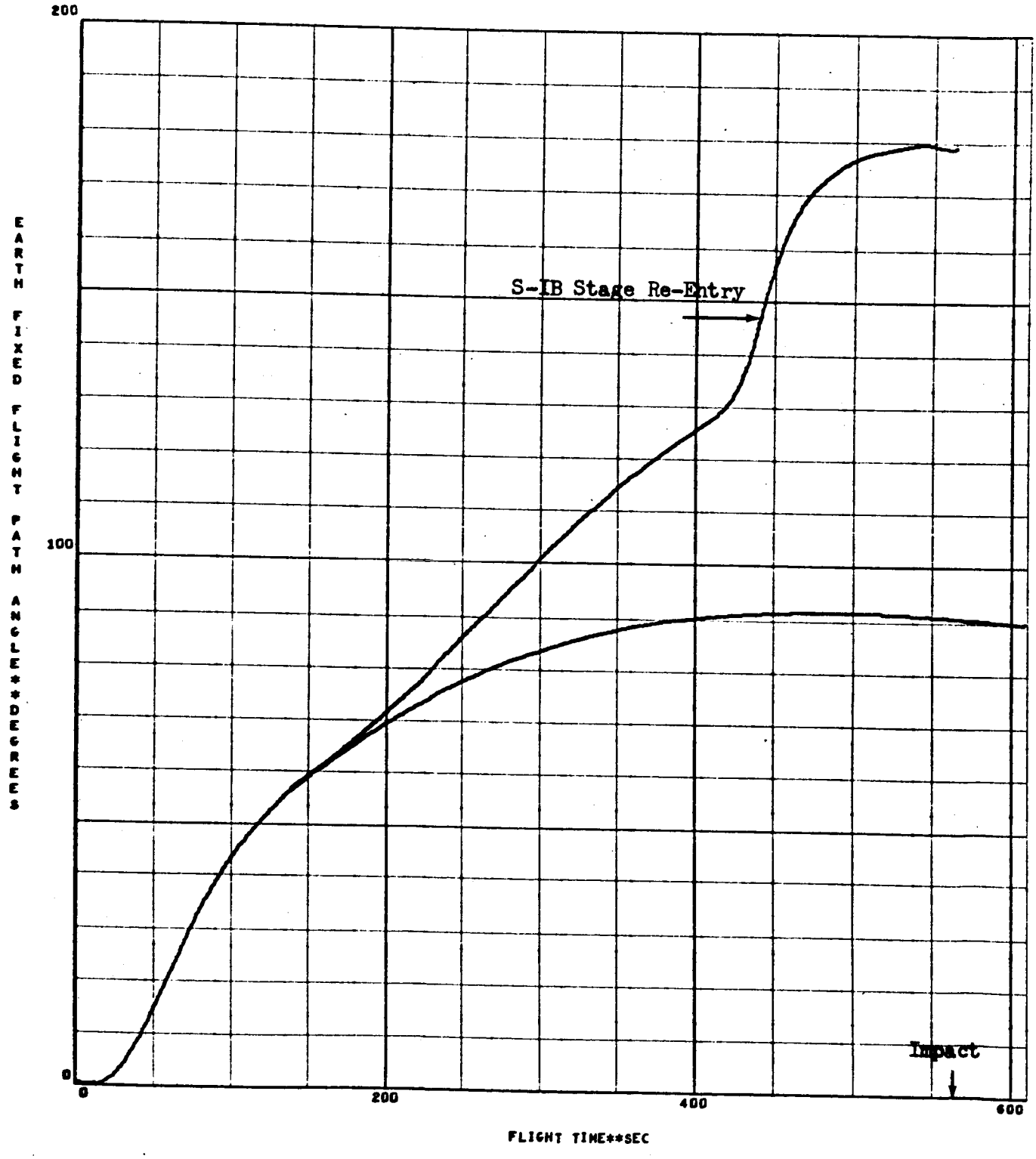


Figure 6

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
PITCH ATTITUDE STEERING COMMAND: S-IB STAGE FLIGHT DATA

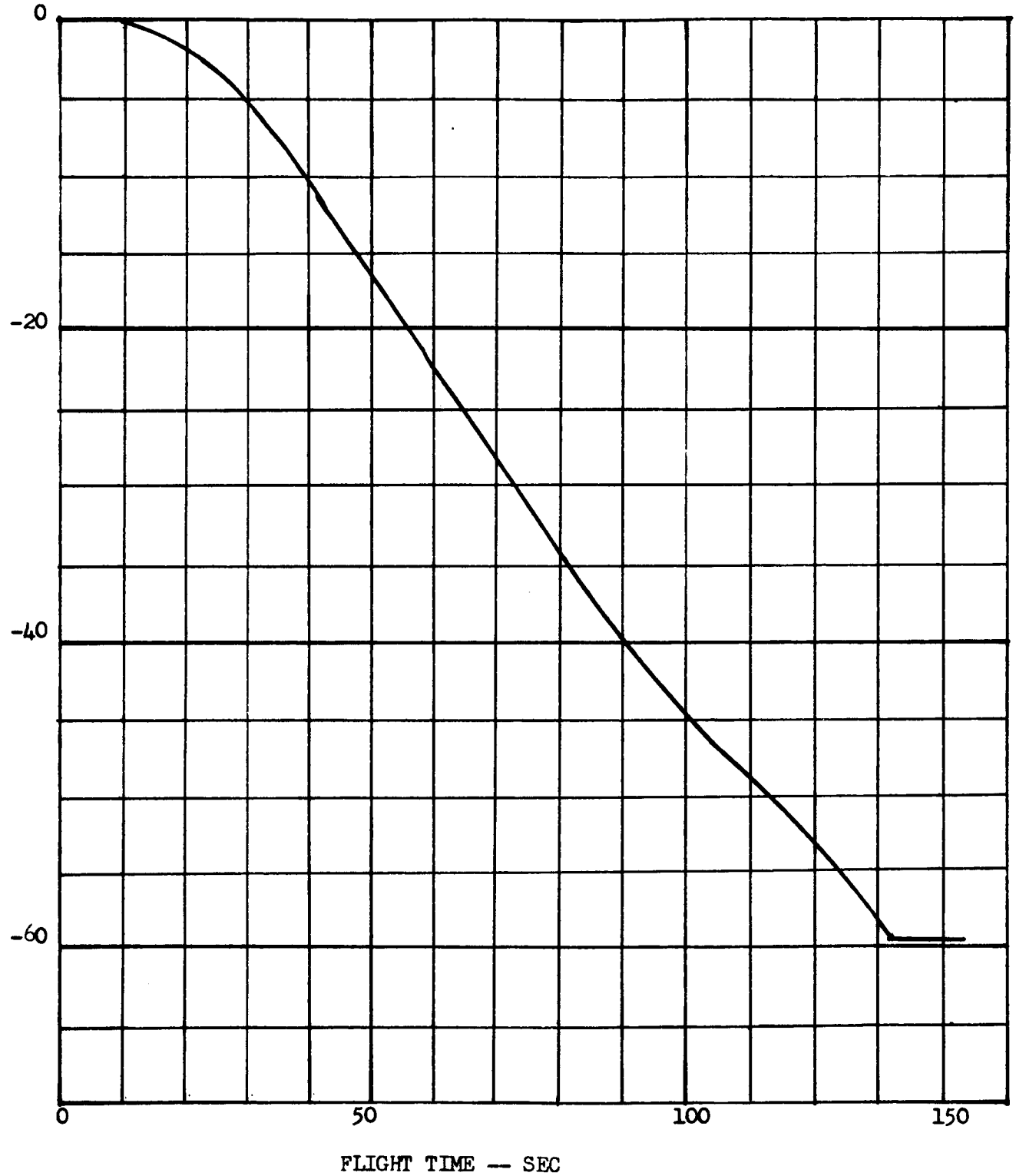


Figure 7

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
VEHICLE PITCH ATTITUDE RATE: S-IB STAGE FLIGHT DATA

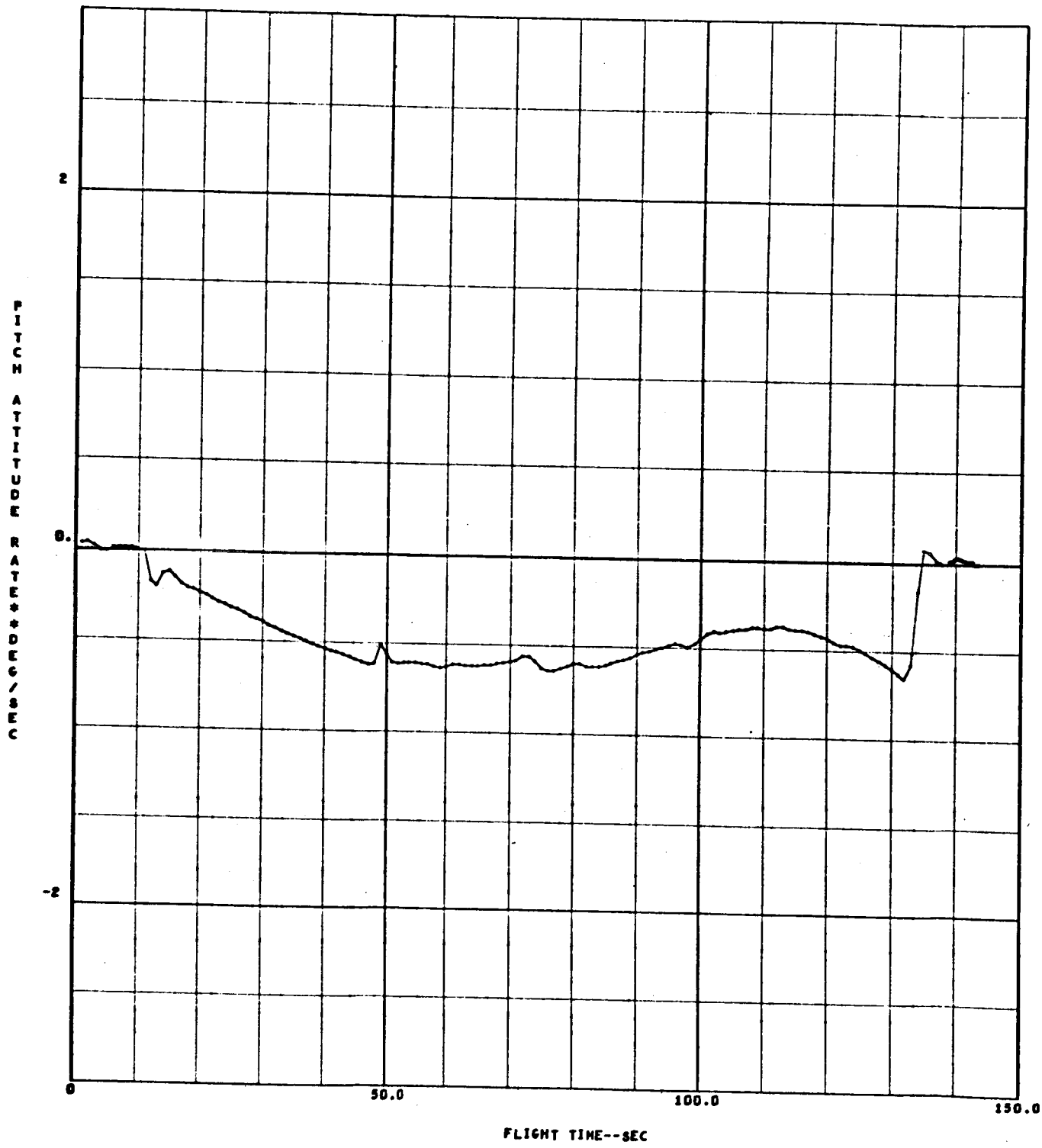


Figure 8

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
PITCH ATTITUDE ERROR: S-IB STAGE FLIGHT DATA

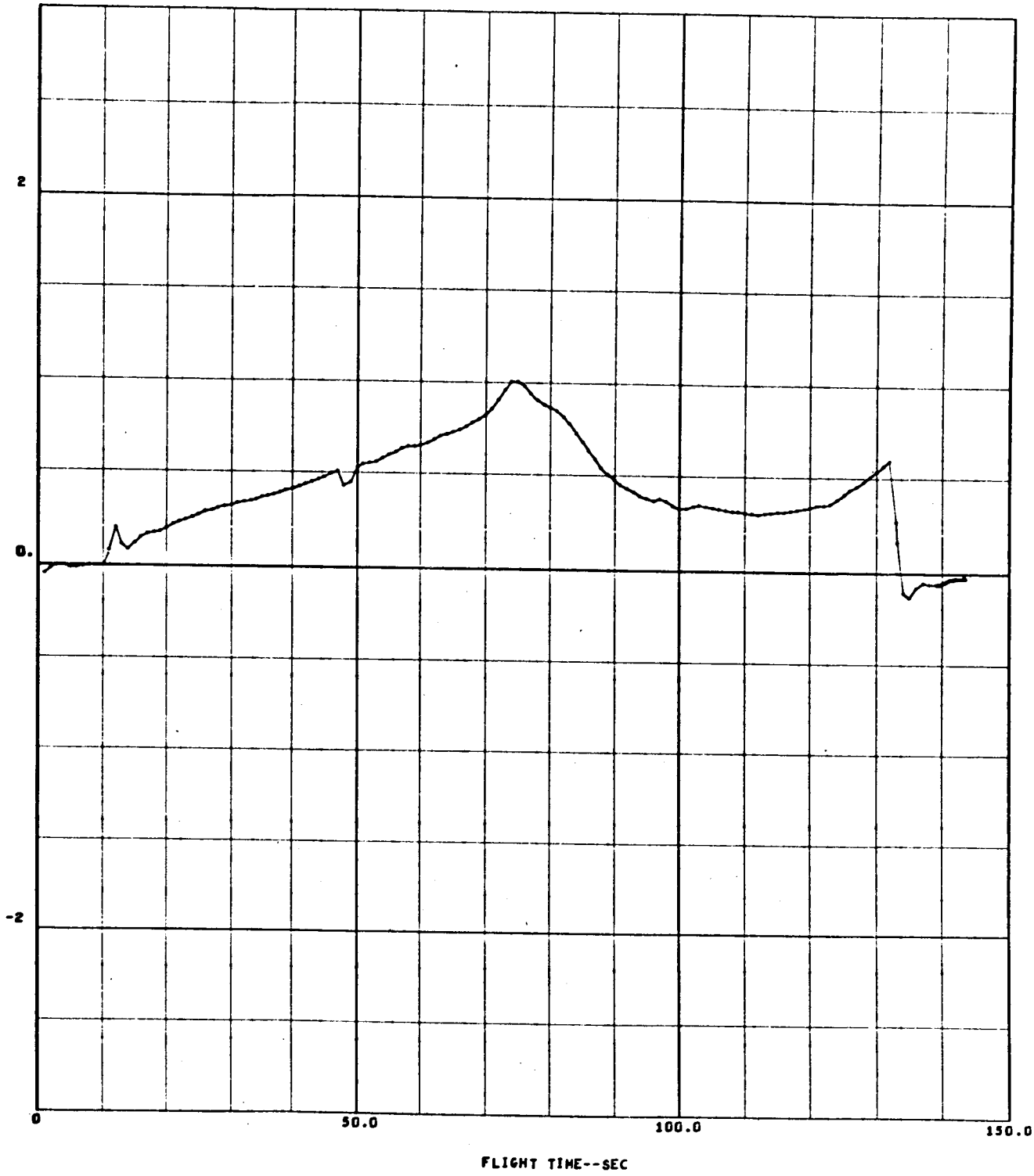


Figure 9

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
PITCH ANGLE OF ATTACK HISTORY: S-IB STAGE FLIGHT DATA

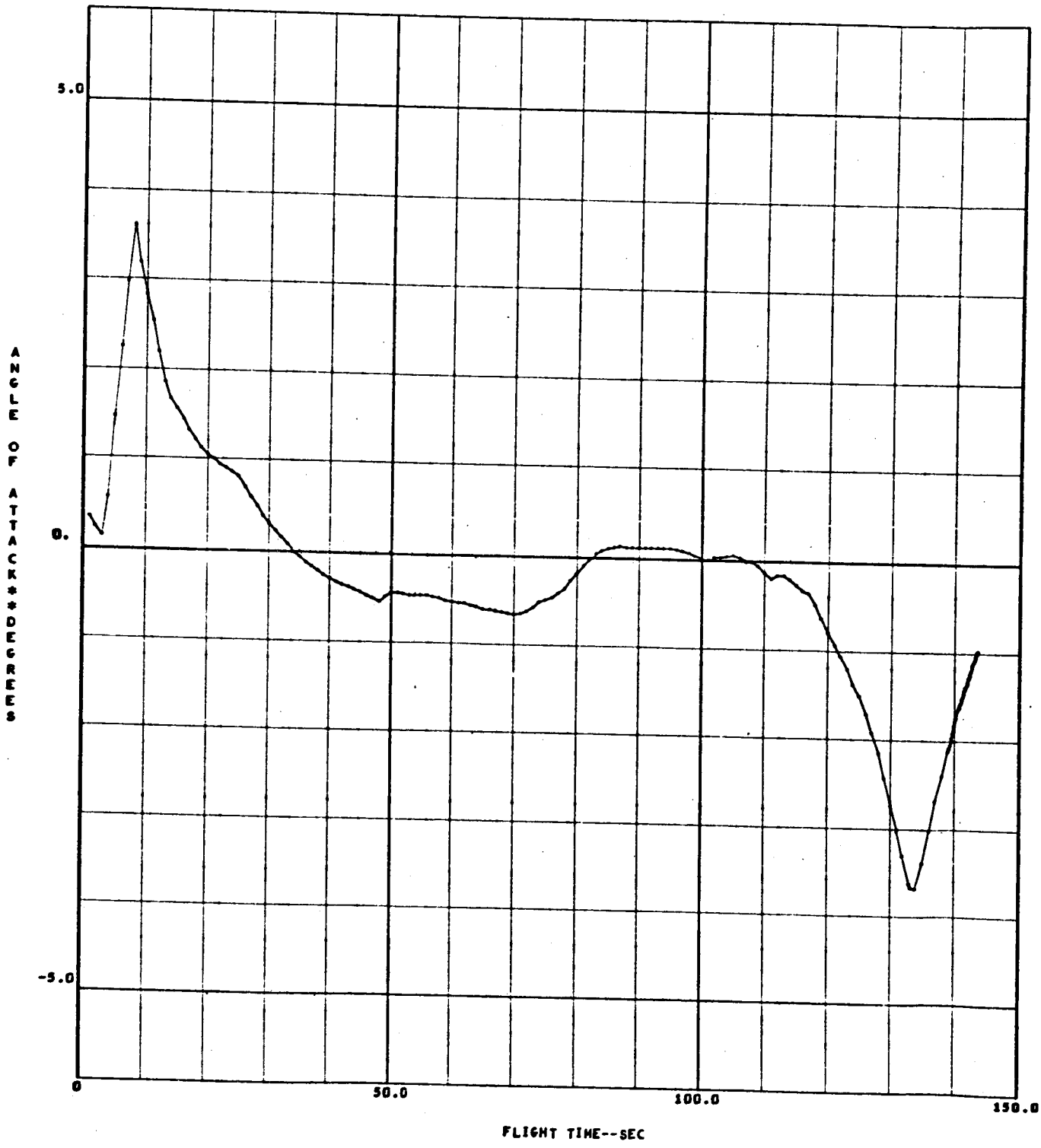


Figure 10

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
DYNAMIC PRESSURE HISTORY: S-IB STAGE FLIGHT DATA

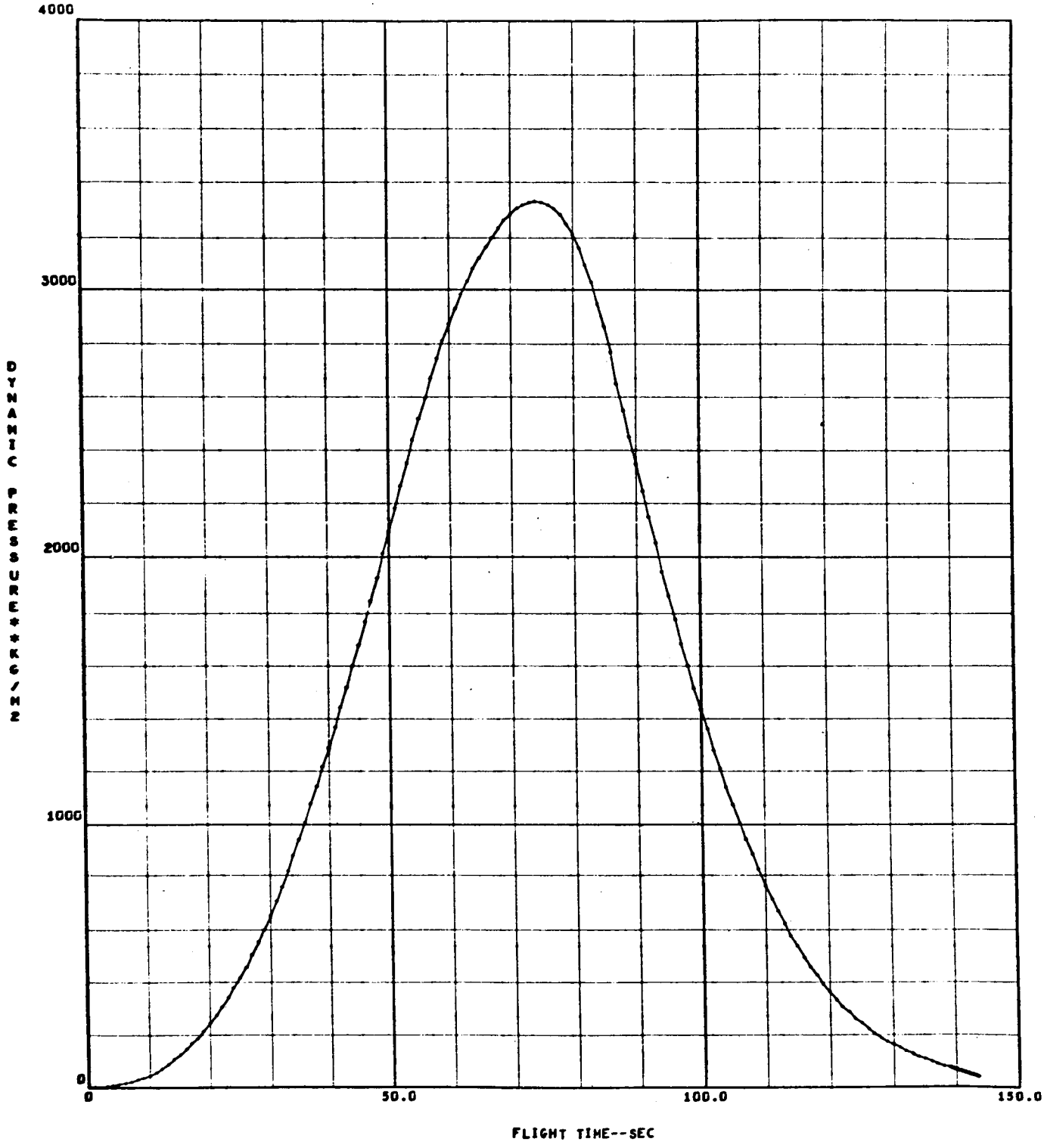


Figure 11

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
LONGITUDINAL ACCELERATION : S-IB STAGE FLIGHT DATA

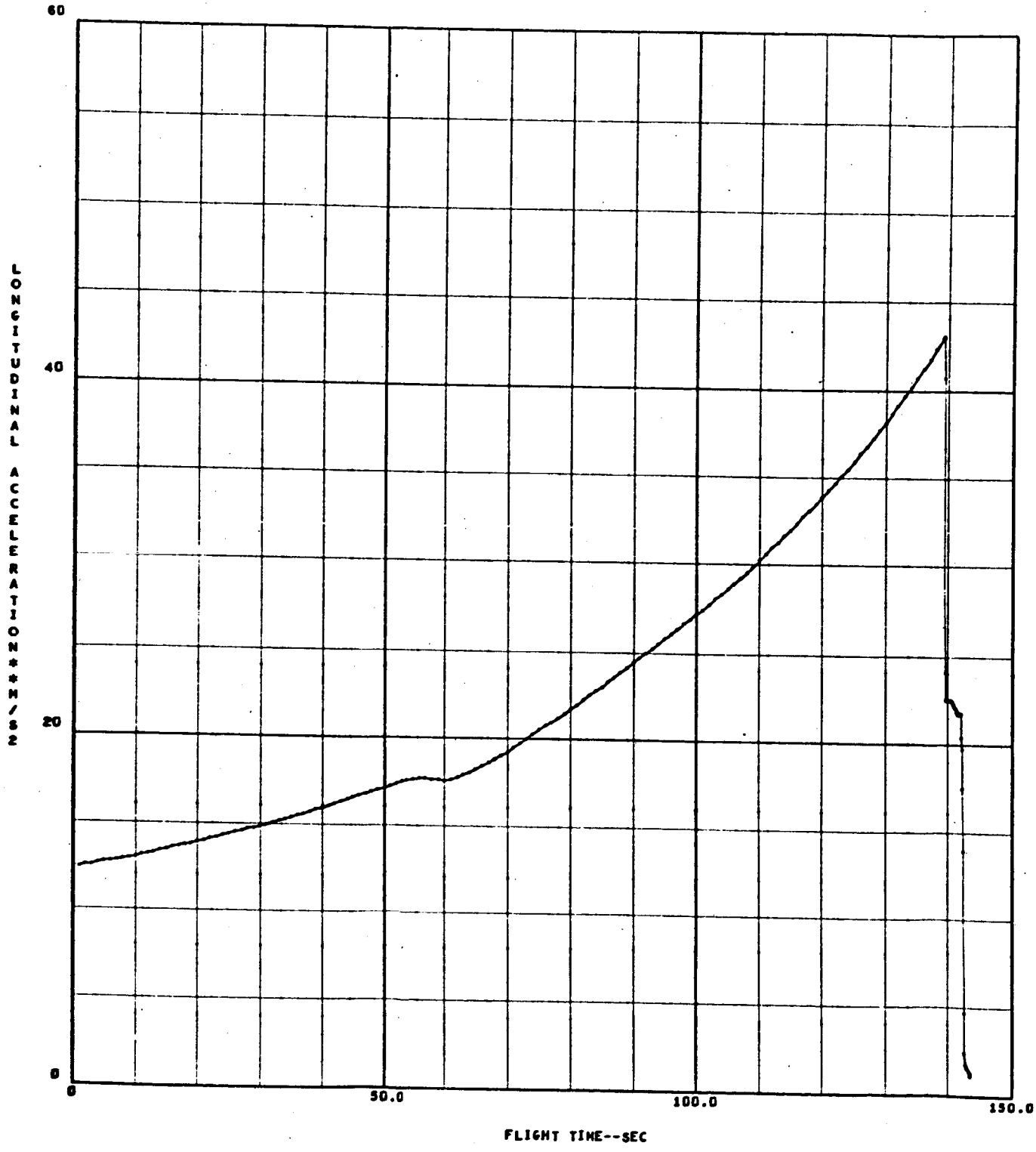


Figure 12

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
PITCH ATTITUDE STEERING COMMAND
S-IVB STAGE FLIGHT DATA

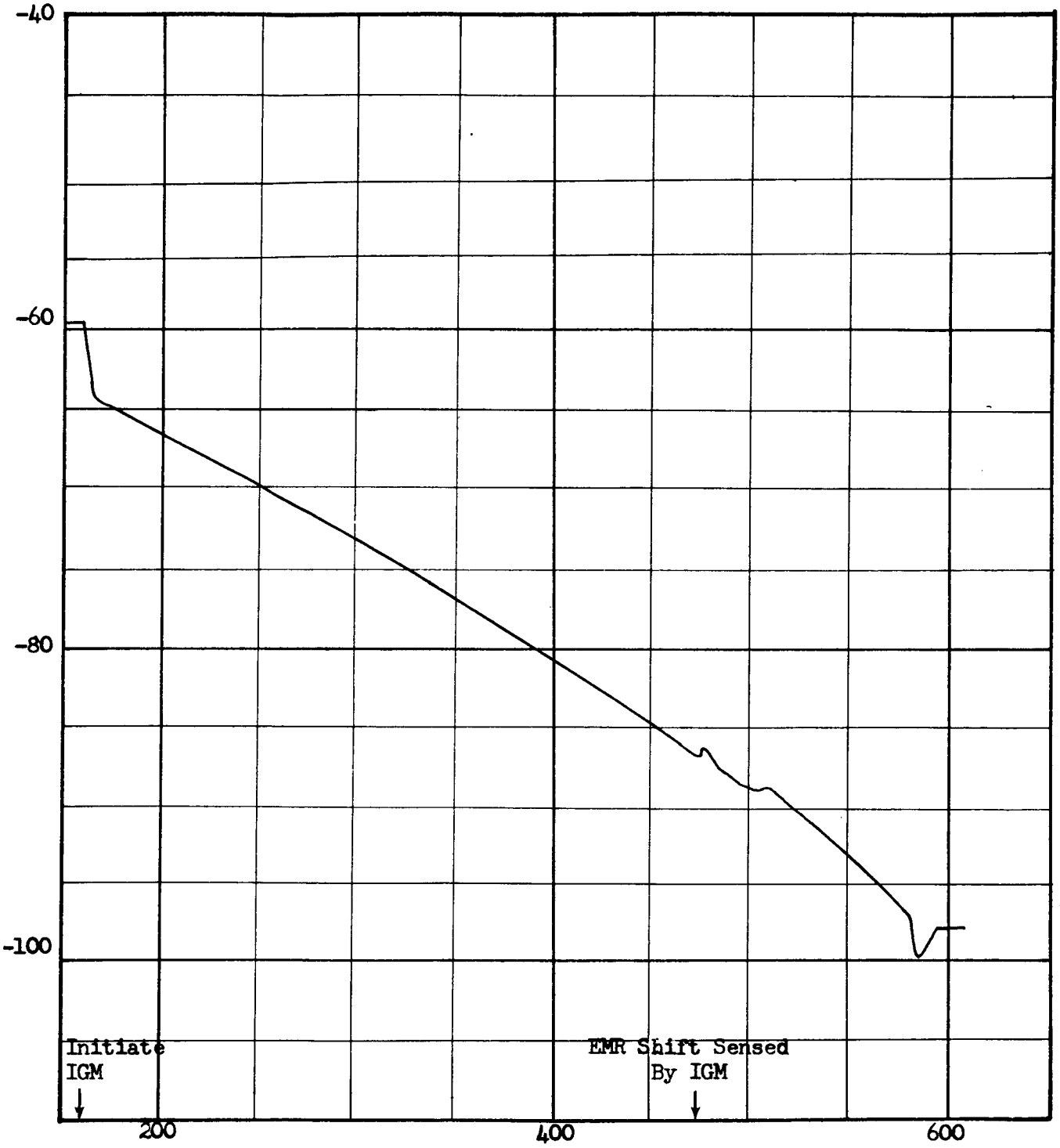


Figure 13

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
YAW ATTITUDE STEERING COMMAND: S-IVB STAGE FLIGHT DATA

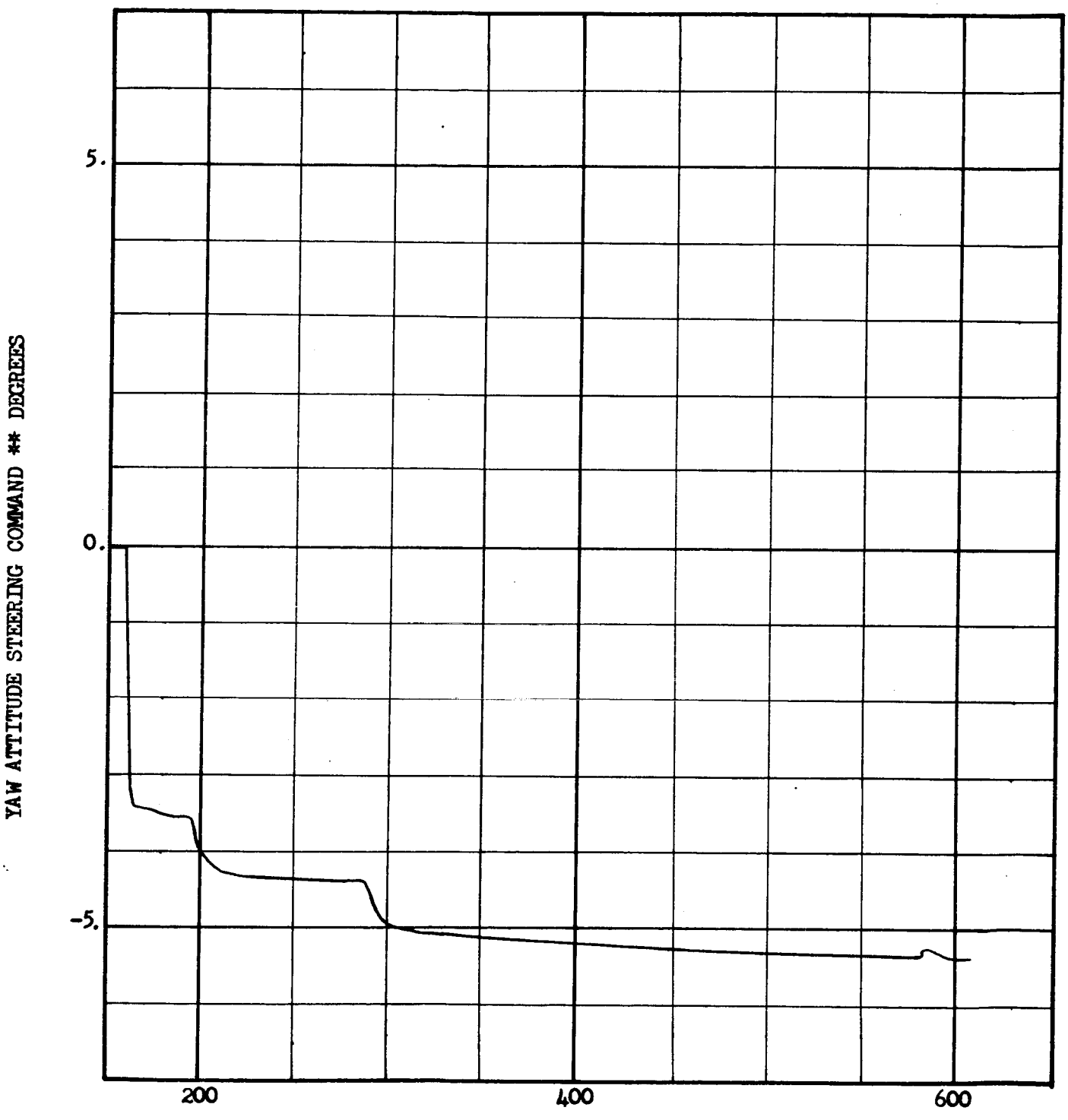


Figure 14

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
LONGITUDINAL ACCELERATION: S-IVB FLIGHT DATA

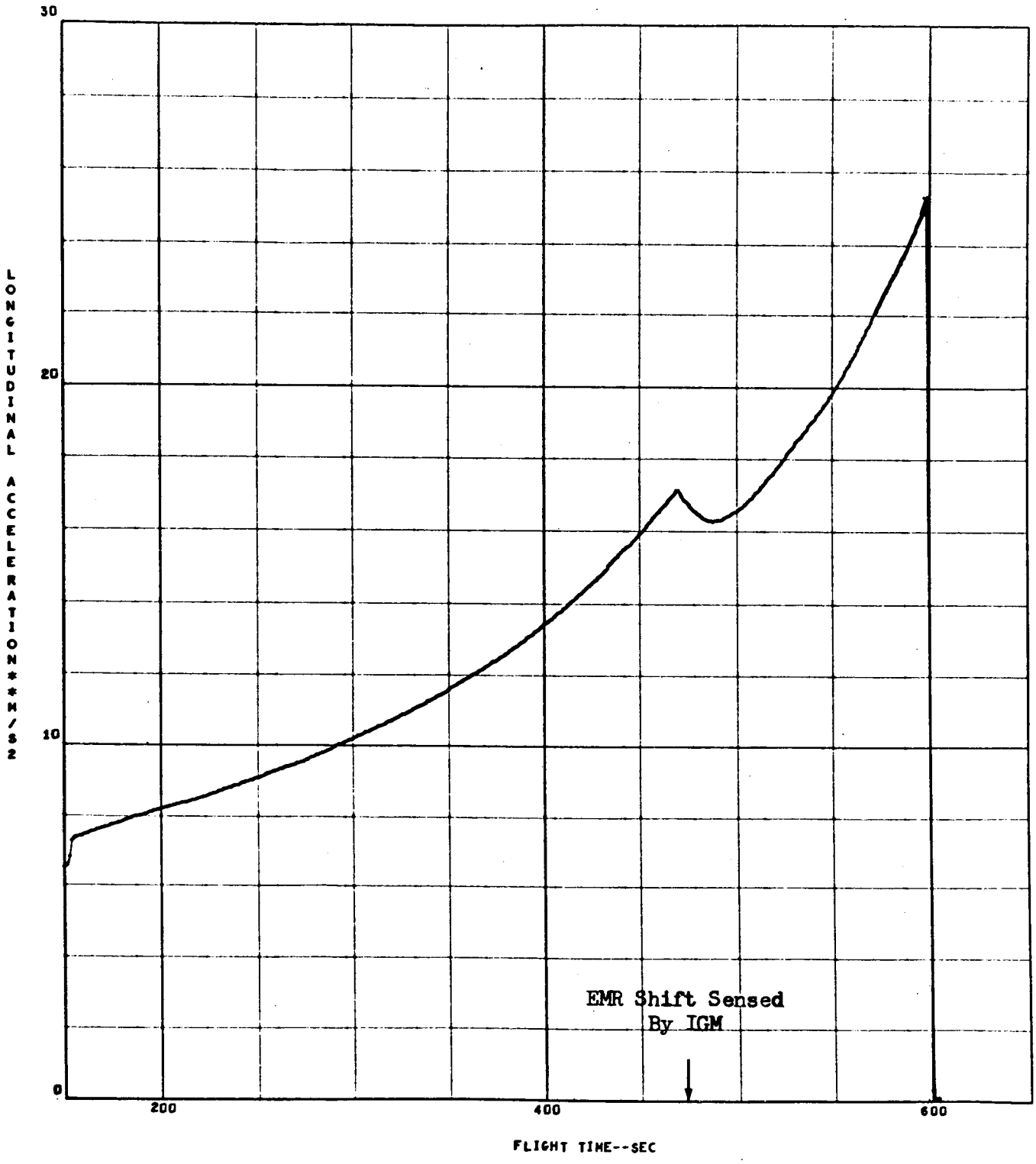


Figure 15

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
VEHICLE ATTITUDE RATE: S-IVB STAGE FLIGHT DATA

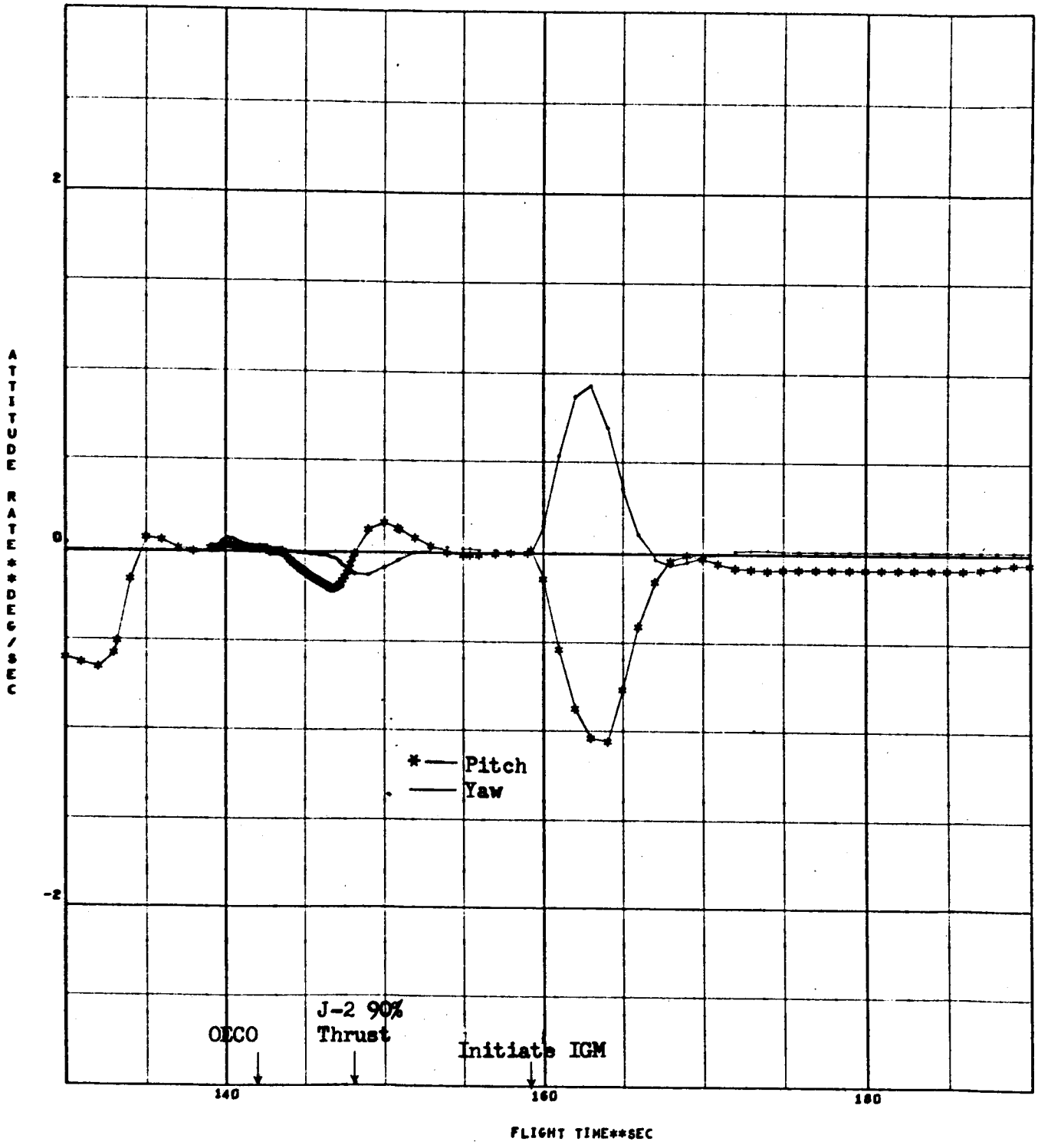


Figure 16

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
ATTITUDE ERROR: S-IVB STAGE FLIGHT DATA

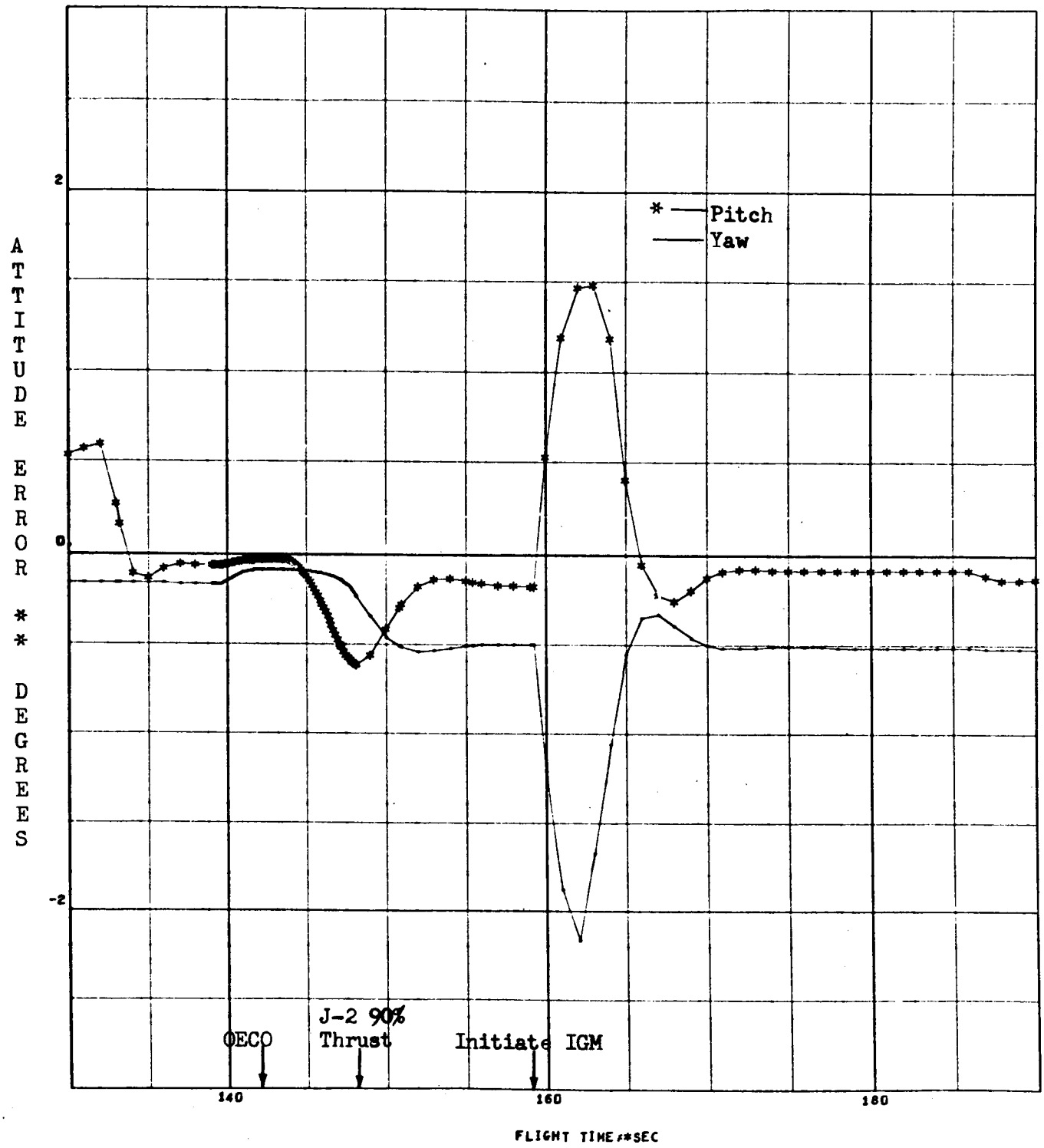


Figure 17

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
ANGLE OF ATTACK: S-IVB STAGE FLIGHT DATA

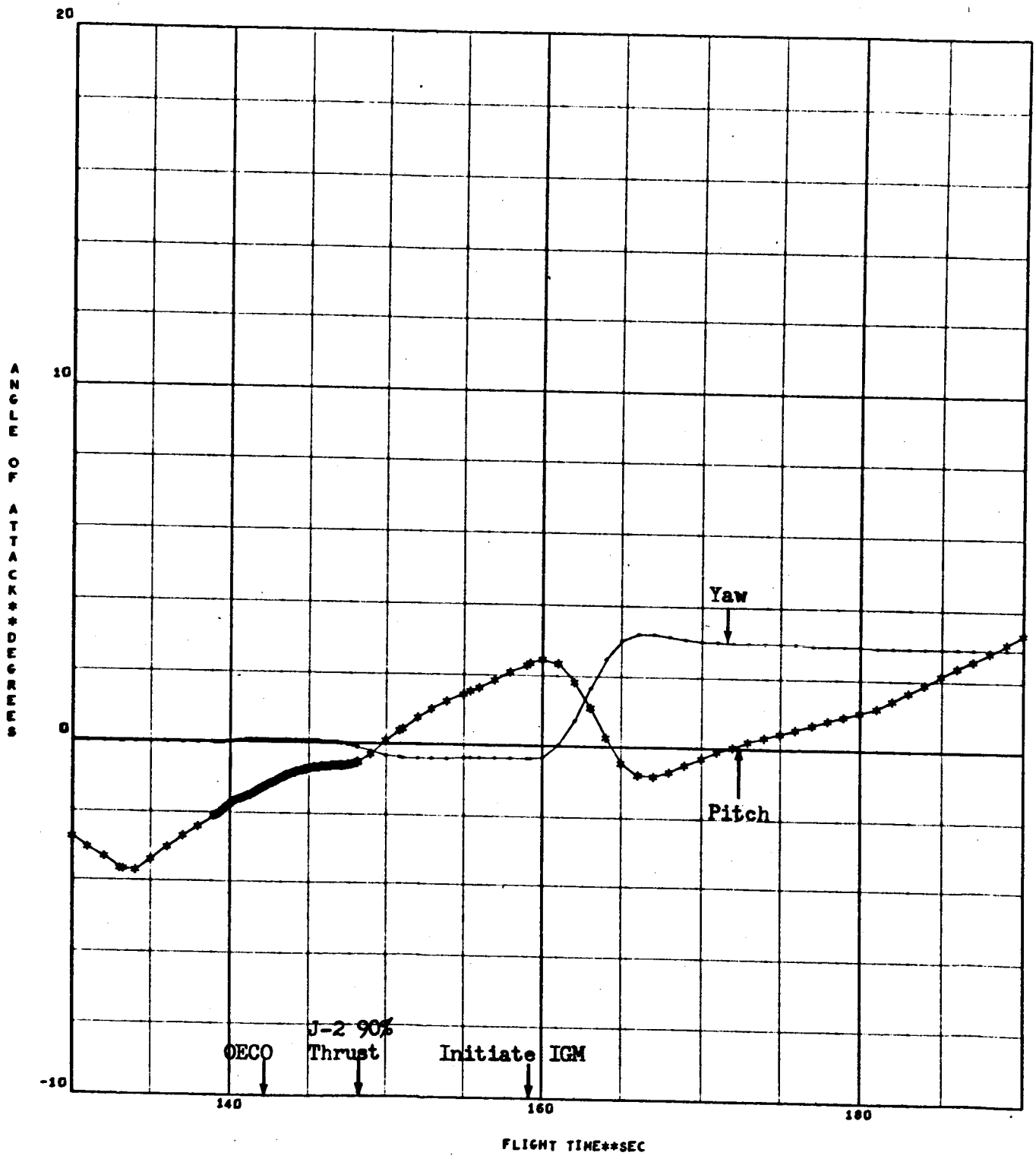


Figure 18

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
DYNAMIC PRESSURE: S-IVB STAGE FLIGHT DATA

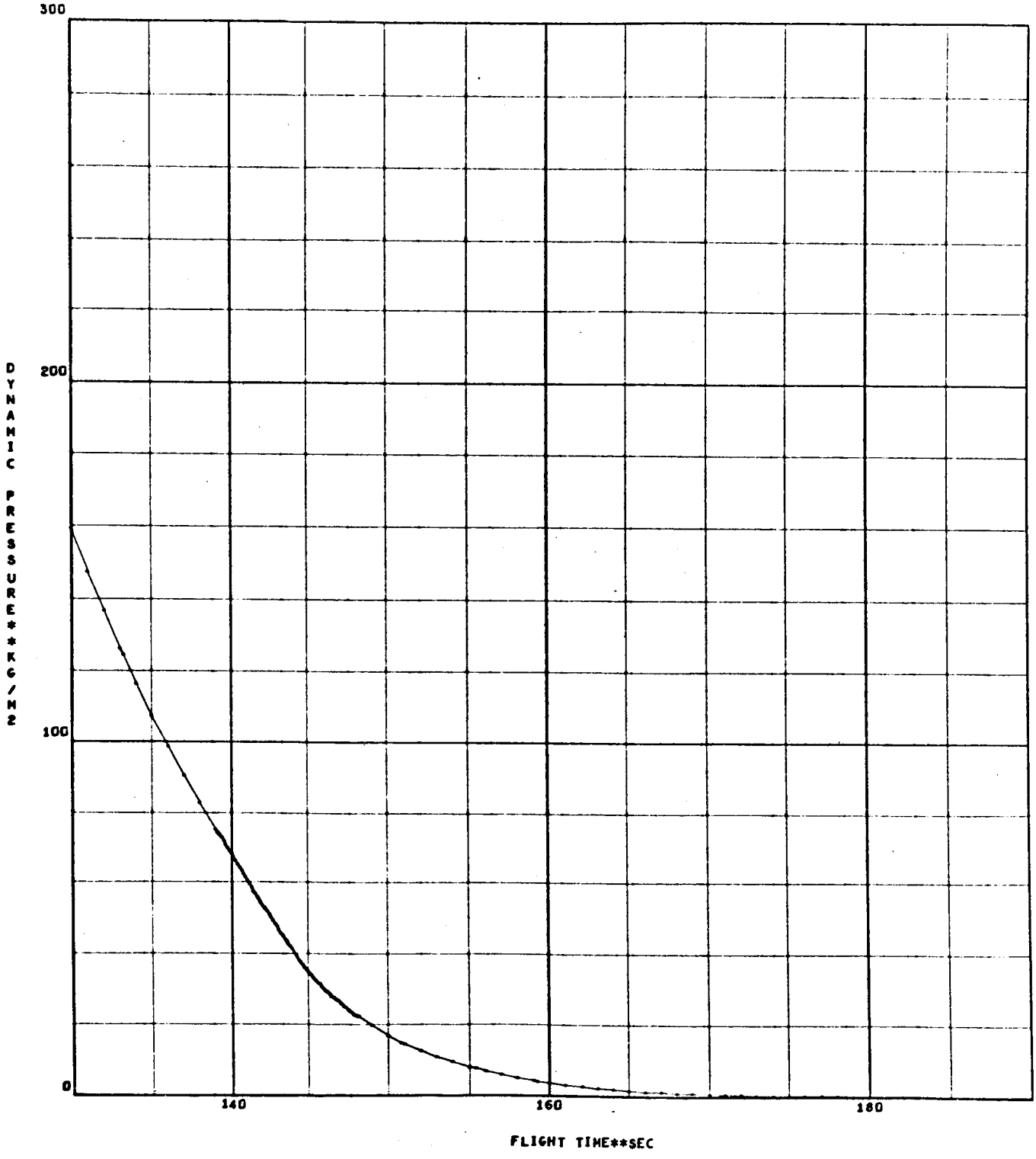


Figure 19

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
ALTITUDE HISTORY: ORBITAL FLIGHT

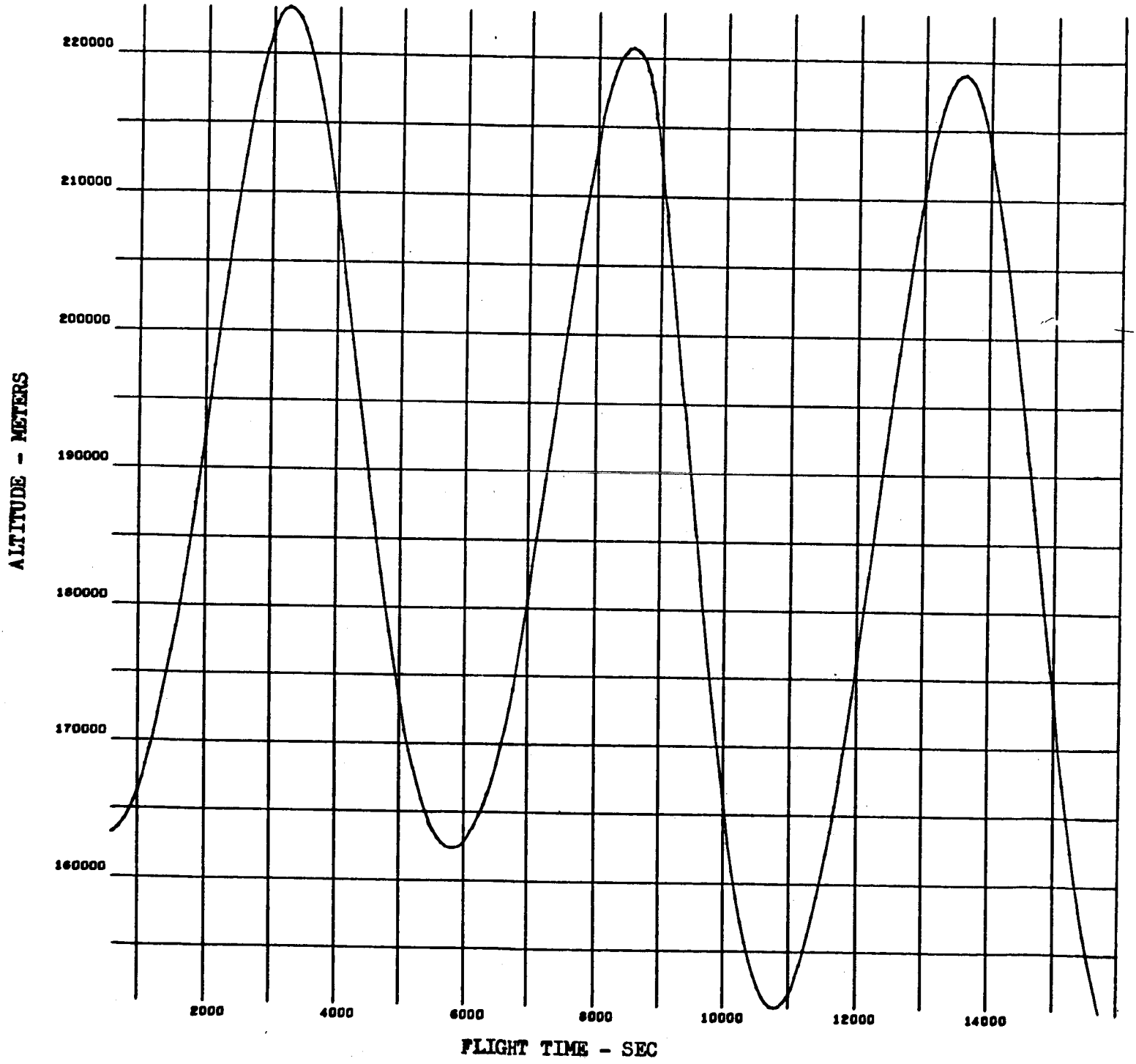


Figure 20

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
SPACE FIXED VELOCITY HISTORY: ORBITAL FLIGHT

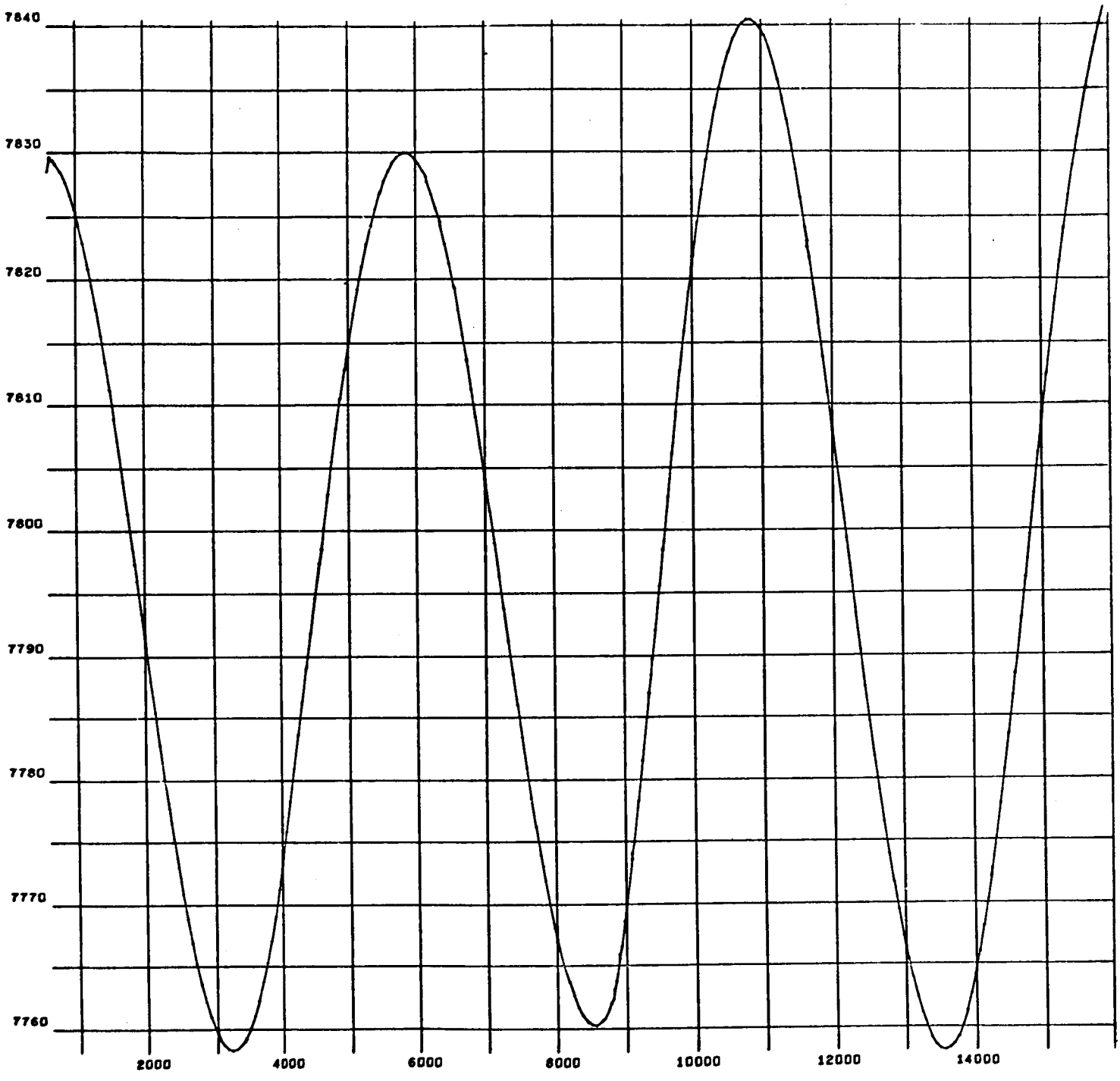


Figure 21

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
PITCH ATTITUDE HISTORY: ORBITAL FLIGHT

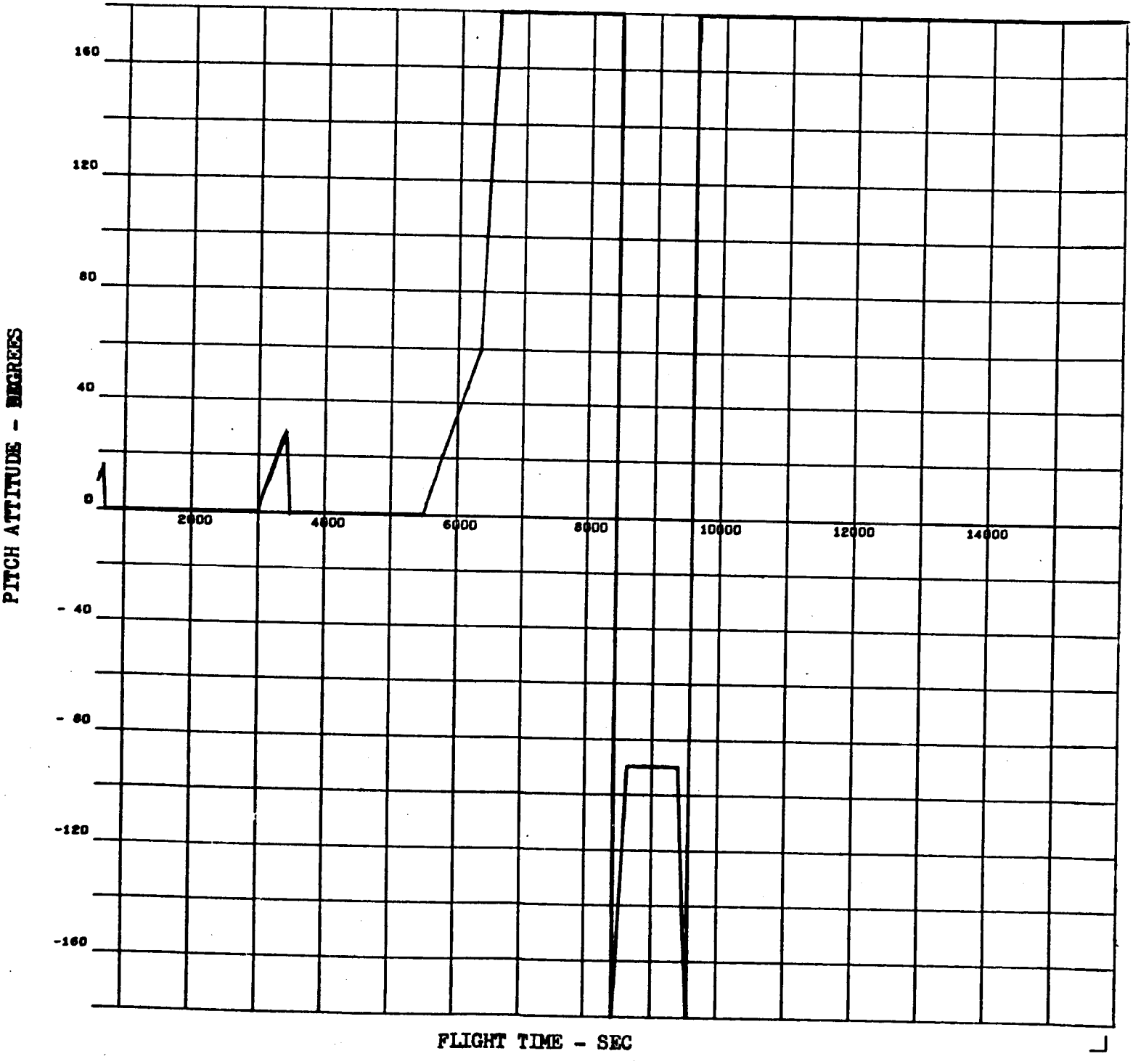


Figure 22

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
POWERED FLIGHT GROUND TRACE - TRACKING COVERAGE ABOVE 5° ELEVATION ANGLE

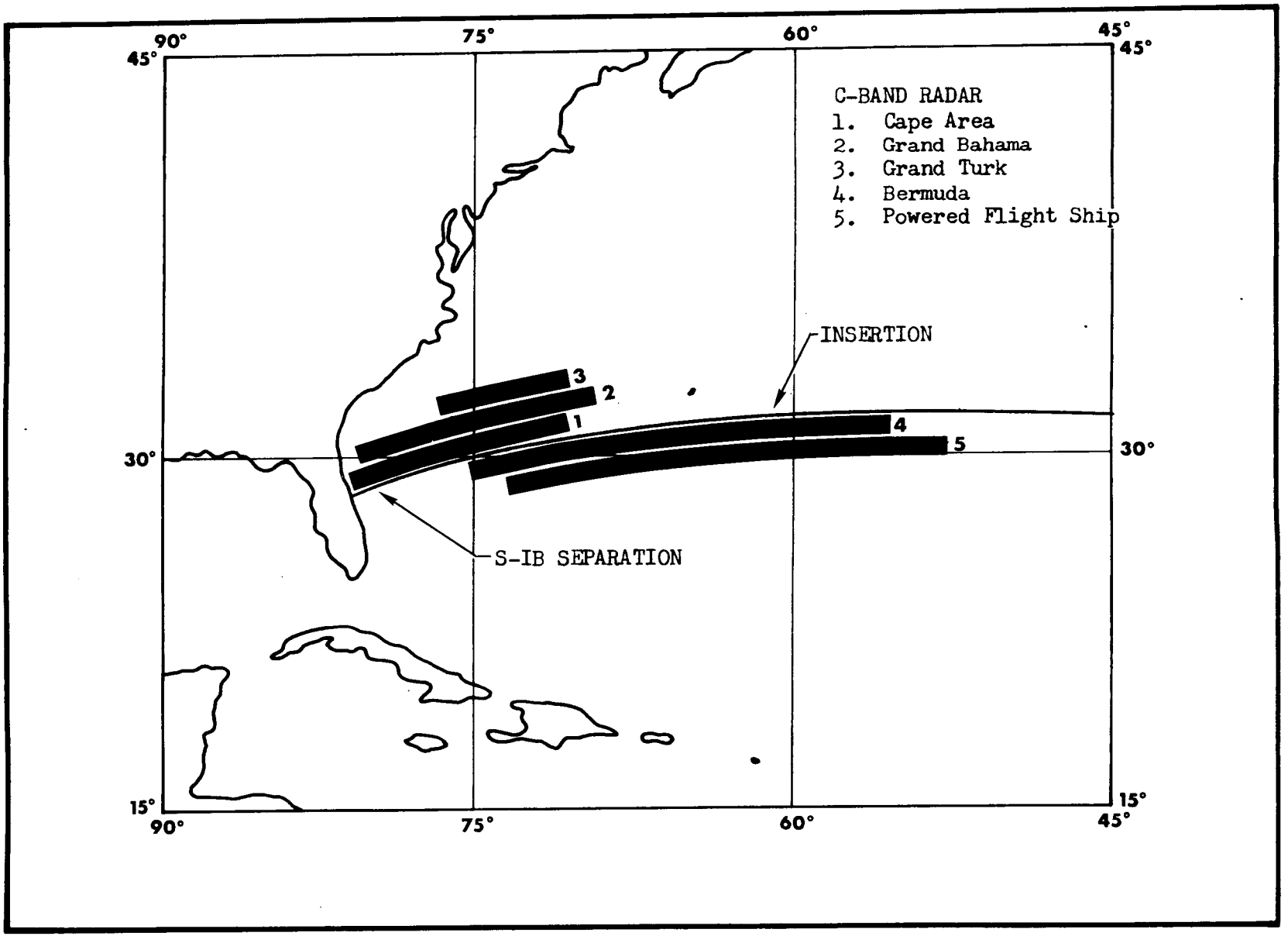
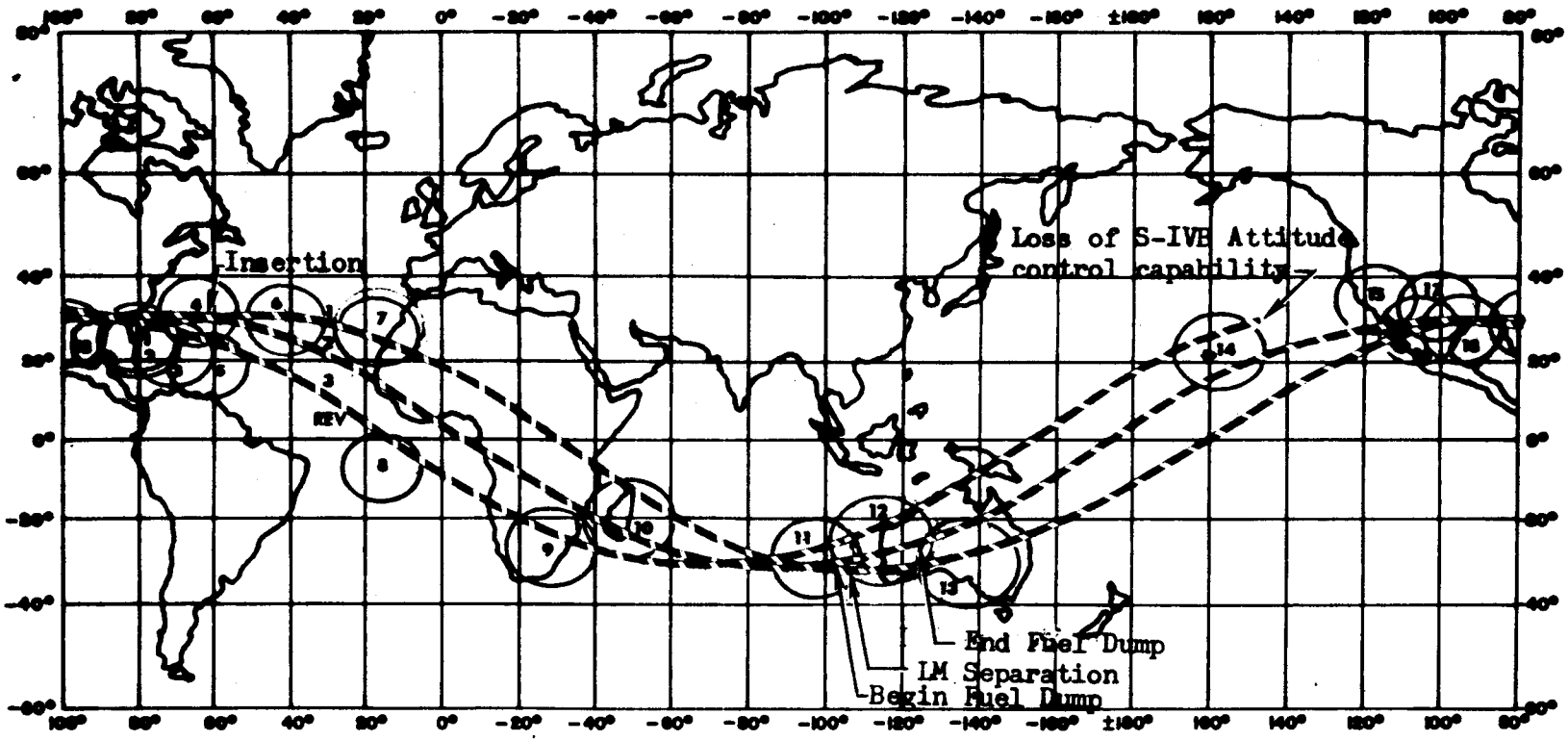


Figure 23

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
ORBITAL GROUND PROJECTION - TRACKING AND TELEMETRY COVERAGE ABOVE 5 DEG. ELEVATION ANGLE



STATION *

1. CAPE AREA-R/T	6. APOLLO SHIP-R/T	11. SHIP I-T	16. GUAYMAS-T
2. GRAND BAHAMA-R/T	7. CANARY ISLAND-R/T	12. CARNARVON-R/T	17. WHITE SANDS-R
3. GRAND TURK-R/T	8. ASCENSION ISLAND-R/T	13. WOOMERA-R	18. CORPUS CHRISTI-T
4. BERMUDA-R/T	9. PRETORIA-R	14. HAWAII-R/T	
5. ANTIGUA-R/T	10. TANANARIVE-R/T	15. POINT ARGUELLO-R	

* R denotes C-band radar stations; T denotes telemetry stations.

APPENDIX A: "LAUNCH VEHICLE CHARACTERISTICS"

TABLE 1A

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
VEHICLE WEIGHT BREAKDOWN
(POUNDS)

Spacecraft *	36,342	
Instrument Unit	4,600	
S-IVB Stage Dry	23,427	
S-IVB Residuals	2,450	
Useable Reserve Propellant (Includes FPR)	3,386	
Injection Weight		70,205
J-2 Thrust Decay Propellant and LOX Venting	241	
S-IVB Cutoff Weight		70,446
S-IVB Propellant Consumed	224,976	
S-IVB APS Propellant Consumed	6	
Ullage Cases	215	
S-IVB "90% Thrust" Weight		295,643
S-IVB GH2 Start Tank	4	
S-IVB Buildup Propellant Consumed	390	
Ullage Propellant Consumed	176	
S-IVB Detonation Package	5	
S-IVB Stage Weight at Separation		296,218
S-IVB Aft Frame Hardware	31	
S-IB/S-IVB Interstage	6,654	
S-IB Dry Weight	85,317	
S-IB Residuals and Reserves	10,843	
S-IVB Frost Consumed	100	
S-IB Frost Consumed	1,000	
S-IB Seal Purge Consumed	6	
S-IB Fuel Additive Consumed	27	
S-IB Gearbox Lubricant Consumed	714	
Inboard Engine Thrust Decay Prpt Consumed	2,143	
Outboard Engine Thrust Decay Prpt Consumed To Separation	1,653	
S-IB Mainstage Propellant Consumed	880,338	
Vehicle Liftoff Weight		1,285,044

* SLA 3,950
Lunar Module 31,325
Nose Cone 1,067
36,342

TABLE 2A

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

S-IB STAGE MASS CHARACTERISTICS

	FLIGHT TIME (SEC)	MASS (KG)	--- CENTER OF GRAVITY --- X-AXIS (M)	Y-AXIS (M)	Z-AXIS (M)	---- MOMENT OF INERTIA ---- X-AXIS (KG-M-S2)	Y-AXIS (KG-M-S2)	Z-AXIS (KG-M-S2)
1)	-5.00	589243.	-----	-----	-------	-------	-------	-------
2)	0.00	582886.	15.8528	0.0066	-0.0023	216276.	6148696.	6148696.
	5.00	568924.	15.7672	0.0066	-0.0025	210670.	6125244.	6125244.
	10.00	554934.	15.6915	0.0069	-0.0025	204542.	6106098.	6106098.
	15.00	540820.	15.6262	0.0071	-0.0025	198383.	6090762.	6090762.
	20.00	526649.	15.5714	0.0071	-0.0028	192266.	6078708.	6078708.
	25.00	512425.	15.5290	0.0074	-0.0028	186153.	6069383.	6069383.
	30.00	498160.	15.5003	0.0076	-0.0028	180016.	6062276.	6062276.
	35.00	483867.	15.4866	0.0079	-0.0030	173831.	6056278.	6056278.
	40.00	469554.	15.4892	0.0081	-0.0030	167630.	6050845.	6050845.
	45.00	455229.	15.5087	0.0084	-0.0030	161431.	6044901.	6044901.
	50.00	440898.	15.5486	0.0086	-0.0033	155234.	6037244.	6037244.
	55.00	426566.	15.6093	0.0089	-0.0033	149052.	6026944.	6026944.
	60.00	412245.	15.6941	0.0091	-0.0036	142881.	6012683.	6012683.
	65.00	397901.	15.8064	0.0097	-0.0036	136707.	5992713.	5992713.
	70.00	383500.	15.9500	0.0099	-0.0038	130531.	5964984.	5964984.
3)	74.00	371978.	16.0910	0.0103	-0.0038	125594.	5935741.	5935741.
	80.00	354699.	16.3397	0.0109	-0.0041	118196.	5881046.	5881046.
	85.00	340304.	16.5950	0.0112	-0.0043	112037.	5820460.	5820460.
	90.00	325991.	16.8946	0.0119	-0.0043	105898.	5745103.	5745103.
	95.00	311709.	17.2464	0.0124	-0.0046	99766.	5651107.	5651107.
	100.00	297439.	17.6584	0.0130	-0.0048	93635.	5534428.	5534428.
	105.00	283189.	18.1401	0.0137	-0.0051	87510.	5390703.	5390703.
	110.00	268961.	18.7015	0.0145	-0.0053	81395.	5214586.	5214586.
	115.00	254762.	19.3562	0.0152	-0.0056	75286.	4999965.	4999965.
	120.00	240598.	20.1193	0.0163	-0.0061	69187.	4739325.	4739325.
	125.00	226476.	21.0097	0.0173	-0.0063	63109.	4423461.	4423461.
	130.00	212403.	22.0522	0.0183	-0.0069	57055.	4041026.	4041026.
4)	133.20	203436.	22.8363	0.0191	-0.0072	53194.	3744416.	3744416.
5)	139.14	186844.	24.4571	0.0211	-0.0076	46016.	3118606.	3118606.
6)	142.14	181762.	25.0517	0.0218	-0.0079	43793.	2876025.	2876025.
7)	143.44	181025.	25.1425	0.0218	-0.0079	43398.	2837949.	2837949.
8)	143.52	181012.	25.1444	0.0218	-0.0079	43392.	2837076.	2837076.

1) GRR;
2) First Motion;
3) Maximum Dynamic Pressure;
4) Tilt Arrest;
5) IECO;
6) OECO;
7) Separation Signal;
8) Physical Separation.

TABLE 3A

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

S-IVB STAGE MASS CHARACTERISTICS

	FLIGHT TIME (SEC)	MASS (KG)	--- CENTER OF GRAVITY --- X-AXIS (M)	Y-AXIS (M)	Z-AXIS (M)	---- MOMENT OF INERTIA ---- X-AXIS (KG-M-S2)	Y-AXIS (KG-M-S2)	Z-AXIS (KG-M-S2)
1)	143.52	134360.	6.3643	0.0216	-0.0091	14215.	371355.	371355.
2)	144.84	134326.	6.3643	0.0216	-0.0091	14215.	371355.	371355.
3)	147.19	134211.	6.3643	0.0216	-0.0091	14187.	371267.	371267.
	148.14	134101.	6.3643	0.0216	-0.0091	14153.	371162.	371162.
4)	148.14	134101.	6.3643	0.0216	-0.0091	14153.	371162.	371162.
	150.00	133719.	6.3640	0.0217	-0.0091	14153.	371018.	371018.
5)	150.84	133545.	6.3639	0.0217	-0.0091	14153.	370952.	370952.
6)	155.44	132542.	6.3643	0.0218	-0.0094	14152.	370544.	370544.
7)	159.25	131549.	6.3672	0.0221	-0.0094	14034.	370071.	370071.
	170.00	129002.	6.3714	0.0224	-0.0095	14033.	369065.	369065.
	190.00	124222.	6.3871	0.0232	-0.0099	14031.	367209.	367209.
	210.00	119426.	6.4125	0.0241	-0.0103	14028.	365432.	365432.
	230.00	114639.	6.4479	0.0250	-0.0107	14025.	363515.	363515.
	250.00	109856.	6.4940	0.0260	-0.0112	14023.	361380.	361380.
	270.00	105078.	6.5516	0.0273	-0.0117	14020.	359067.	359067.
	290.00	100310.	6.6226	0.0284	-0.0122	14017.	356457.	356457.
	310.00	95537.	6.7086	0.0298	-0.0128	14014.	353494.	353494.
	330.00	90771.	6.8120	0.0312	-0.0135	14011.	350102.	350102.
	350.00	86004.	6.9355	0.0330	-0.0141	14008.	346179.	346179.
	370.00	81235.	7.0810	0.0347	-0.0150	14005.	341732.	341732.
	390.00	76477.	7.2543	0.0368	-0.0158	14002.	336481.	336481.
	410.00	71718.	7.4616	0.0391	-0.0169	13999.	330214.	330214.
	430.00	66956.	7.7077	0.0417	-0.0181	13995.	322772.	322772.
	450.00	62200.	8.0047	0.0448	-0.0194	13992.	313741.	313741.
	470.00	57460.	8.3628	0.0484	-0.0210	13989.	302751.	302751.
8)	475.75	56139.	8.4760	0.0496	-0.0215	13987.	299247.	299247.
	490.00	53093.	8.7599	0.0522	-0.0227	13984.	290458.	290458.
	510.00	49068.	9.1992	0.0564	-0.0246	13981.	276707.	276707.
	530.00	45119.	9.7197	0.0612	-0.0266	13977.	260236.	260236.
	550.00	41217.	10.3491	0.0669	-0.0291	13973.	240097.	240097.
	570.00	37351.	11.1228	0.0736	-0.0320	13969.	214999.	214999.
	590.00	33506.	12.0973	0.0819	-0.0357	13964.	182501.	182501.
9)	598.15	31954.	12.5653	0.0856	-0.0373	13962.	166649.	166649.
10)	608.15	31845.	12.6015	0.0859	-0.0375	13962.	165407.	165407.

1) Separation Completed;
2) J-2 Start Command;
3) Terminate Ullage Burn;
4) 90% Thrust Level;
5) Command P.U. Activation;
6) Ullage Case Jettison;
7) I.G.M. Initiation;
8) E.M.R. Shift sensed by I.G.M.;
9) Guidance Cutoff Signal;
10) Orbit Insertion.

TABLE 4A

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

S-IB STAGE AERODYNAMIC CHARACTERISTICS

	FLIGHT TIME (SEC)	MACH NO.	CENTER OF PRESSURE (M)	AXIAL FORCE COEFFICIENT	NORMAL FORCE COEFFICIENT (1/RAD)
1)	-5.00	0.00	19.3900	1.0000	5.7300
2)	0.00	0.00	19.3900	1.0000	5.7300
	5.00	0.04	19.3630	1.0000	5.7454
	10.00	0.08	19.3322	1.0000	5.7630
	15.00	0.13	19.2812	0.8317	5.7894
	20.00	0.19	19.1573	0.6137	5.8316
	25.00	0.25	19.0495	0.5135	5.8516
	30.00	0.33	18.8954	0.4241	5.8780
	35.00	0.41	18.7840	0.3784	5.9048
	40.00	0.50	18.6011	0.3601	5.9597
	45.00	0.60	18.3384	0.3295	6.0013
	50.00	0.72	18.2144	0.3140	6.0599
	55.00	0.85	17.7792	0.3994	6.0893
	60.00	1.00	19.6567	0.7103	6.0693
	65.00	1.16	21.5122	0.7110	5.7159
	70.00	1.36	21.5119	0.6125	6.1995
3)	74.00	1.53	19.7402	0.5126	6.0190
	80.00	1.85	25.0303	0.4157	5.2573
	85.00	2.12	28.5148	0.3482	4.8545
	90.00	2.37	30.5154	0.3029	4.7188
	95.00	2.64	30.9284	0.2688	4.6696
	100.00	2.93	29.6859	0.2457	4.7100
	105.00	3.24	28.3757	0.2256	4.8978
	110.00	3.54	27.2262	0.2003	5.0856
	115.00	3.87	26.7643	0.1297	5.0535
	120.00	4.18	25.9741	0.0744	4.9998
	125.00	4.54	24.8433	0.0206	4.9230
	130.00	4.95	23.8184	-0.0785	4.8486
4)	133.20	5.33	23.8690	-0.2005	4.7880
5)	139.14	6.15	25.1644	-0.5570	4.6946
6)	142.14	6.46	25.8888	-0.8034	4.6638
7)	143.44	6.52	26.0344	-0.8300	4.6581
8)	143.52	6.52	26.0415	-0.8300	4.6579

1) GRR;
2) First Motion;
3) Maximum Dynamic Pressure;
4) Tilt Arrest;
5) IECO;
6) OECO;
7) Separation Signal;
8) Physical Separation.

TABLE 6A

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

S-IVB STAGE PROPULSION CHARACTERISTICS

	FLIGHT TIME (SEC)	ALTITUDE (KM)	LONGITUDINAL ACCELERATION (M/S2)	THRUST MAGNITUDE J-2 ENGINE (N)	APS IMPULSE (N-SEC)
1)	143.52	63.58	0.267	0.	0.000
2)	144.84	65.00	0.267	0.	0.000
3)	147.19	67.49	2.825	354651.	0.000
	148.14	68.49	5.939	797977.	0.000
4)	148.14	68.49	5.939	797978.	0.000
	150.00	70.42	6.537	875276.	0.000
5)	150.84	71.29	6.546	875236.	0.000
6)	155.44	75.97	7.396	980803.	0.000
7)	159.25	79.76	7.460	981603.	0.000
	170.00	90.07	7.676	990216.	0.000
	190.00	107.63	8.032	997812.	0.000
	210.00	123.14	8.364	998925.	0.000
	230.00	136.67	8.707	998184.	0.000
	250.00	148.29	9.074	996845.	0.000
	270.00	158.09	9.497	997966.	0.000
	290.00	166.14	9.933	996431.	0.000
	310.00	172.54	10.436	997032.	0.000
	330.00	177.38	10.977	996408.	0.000
	350.00	180.77	11.596	997326.	0.000
	370.00	182.81	12.258	995760.	0.000
	390.00	183.63	12.989	993405.	0.000
	410.00	183.37	13.867	994567.	0.000
	430.00	182.19	14.855	994654.	0.000
	450.00	180.25	15.927	990684.	0.000
	470.00	177.78	17.101	982625.	0.000
8)	475.75	177.00	16.720	938665.	0.000
	490.00	174.97	16.277	864235.	0.000
	510.00	171.95	17.041	836211.	0.000
	530.00	168.97	18.369	828827.	0.000
	550.00	166.33	19.825	817157.	0.000
	570.00	164.35	21.812	814718.	0.000
	590.00	163.30	24.006	804376.	0.000
9)	598.15	163.19	25.089	801715.	0.000
10)	608.15	163.22	0.050	1603.	0.000

1) Separation Completed;
2) J-2 Start Command;
3) Terminate Ullage Burn;
4) 90% Thrust Level;
5) Command P.U. Activation;
6) Ullage Case Jettison;
7) I.G.M. Initiation;
8) E.M.R. Shift sensed by I.G.M.;
9) Guidance Cutoff Signal;
10) Orbit Insertion.

TABLE 5A

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

S-IB STAGE PROPULSION CHARACTERISTICS

	FLIGHT TIME (SEC)	ALTITUDE (KM)	LONG. ACCEL (M/S2)	H-1 ENGINE THRUST MAGNITUDES ENGINE 1 (N)	ENGINE 2 (N)	ENGINE 3 (N)	ENGINE 4 (N)	ENGINE 5 (N)	ENGINE 6 (N)	ENGINE 7 (N)	ENGINE 8 (N)
1)	-5.00	0.03	0.000	0.	0.	0.	0.	0.	0.	0.	0.
2)	0.00	0.03	12.117	884481.	877231.	879148.	865023.	869994.	882825.	872992.	877634.
	5.00	0.07	12.660	902879.	895631.	897544.	883447.	888517.	901254.	891410.	896134.
	10.00	0.17	13.011	906835.	899578.	901493.	887397.	892491.	905202.	895371.	900093.
	15.00	0.36	13.452	915107.	907881.	909759.	895708.	900828.	913509.	903673.	908423.
	20.00	0.63	13.919	923258.	916021.	917904.	903854.	909022.	921652.	911838.	916585.
	25.00	1.01	14.380	930674.	923435.	925315.	911276.	916467.	929069.	919263.	924016.
	30.00	1.50	14.880	938584.	931371.	933220.	919218.	924371.	936978.	927151.	931938.
	35.00	2.12	15.397	946501.	939260.	941134.	927109.	932273.	944898.	935045.	939862.
	40.00	2.88	15.937	954878.	947608.	949509.	935459.	940690.	953217.	943454.	948186.
	45.00	3.79	16.524	963216.	955916.	957846.	943771.	949005.	961555.	951767.	956527.
	50.00	4.85	17.142	971831.	964589.	966460.	952444.	957566.	970170.	960326.	965143.
	55.00	6.09	17.616	980415.	973174.	975044.	961030.	966212.	978755.	968972.	973727.
	60.00	7.50	17.548	987602.	980361.	982233.	968217.	973392.	986001.	976159.	980970.
	65.00	9.07	18.195	995547.	988249.	990179.	976105.	981337.	993888.	984107.	988855.
	70.00	10.82	19.222	1003340.	995984.	997972.	983839.	989015.	1001685.	991783.	996651.
3)	74.00	12.34	20.212	1009042.	1001810.	1003676.	989665.	994843.	1007451.	997610.	1002419.
	80.00	14.87	21.702	1015920.	1008692.	1010556.	996548.	1001665.	1014273.	1004433.	1009241.
	85.00	17.21	23.051	1020300.	1013013.	1014937.	1000867.	1006108.	1018595.	1008878.	1013560.
	90.00	19.77	24.421	1023226.	1015630.	1017863.	1003486.	1008846.	1021398.	1011619.	1016363.
	95.00	22.56	25.803	1024564.	1017345.	1019205.	1005196.	1010432.	1022991.	1013210.	1017951.
	100.00	25.60	27.214	1024979.	1017640.	1019622.	1005488.	1010719.	1023285.	1013504.	1018240.
	105.00	28.89	28.698	1024409.	1017196.	1019055.	1005043.	1010142.	1022717.	1012936.	1017668.
	110.00	32.44	30.295	1023390.	1016057.	1018039.	1003899.	1009236.	1021702.	1012041.	1016643.
	115.00	36.26	32.034	1021447.	1014242.	1016101.	1002082.	1007405.	1019886.	1010223.	1014820.
	120.00	40.37	33.890	1018914.	1011591.	1013573.	999427.	1004612.	1017356.	1007444.	1012278.
	125.00	44.77	35.930	1015805.	1008736.	1010471.	996565.	1001609.	1014375.	1004460.	1009284.
	130.00	49.46	38.198	1012244.	1004811.	1006917.	992637.	998023.	1010693.	1000897.	1005588.
4)	133.20	52.62	39.788	1009372.	1001994.	1004050.	989813.	995036.	1007776.	997926.	1002657.
5)	139.14	58.82	43.020	1001582.	994341.	996313.	982211.	987390.	1000110.	990264.	994997.
6)	142.14	62.08	19.701	820809.	968230.	816178.	956137.	-0.	-0.	-0.	-0.
7)	143.44	63.49	1.255	66092.	41781.	65731.	41249.	-0.	-0.	-0.	-0.
8)	143.52	63.58	1.169	59925.	40232.	59597.	39720.	-0.	-0.	-0.	-0.

1) GRR;
2) First Motion;
3) Maximum Dynamic Pressure;
4) Tilt Arrest;
5) IECO;
6) OECO;
7) Separation Signal;
8) Physical Separation.

TABLE 7A

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
ORBITAL VENT SEQUENCE AND IMPULSE HISTORY

FLIGHT TIME (Hr:Min:Sec) Start	End		EFFECTIVE IMPULSE (lb-sec)
		LOX TANK	
00:09:59	00:10:39	VENT	11800.
02:26:19	02:28:19	PURGE	50700.*
02:31:39	03:14:16	VENT	12592.
03:57:02	04:43:06	VENT	1508.
		HYDROGEN TANK	
00:09:59	00:30:59	VENT	0.
00:56:43	01:16:43	VENT	0.
01:42:28	01:52:28	VENT	0.
02:28:29	02:31:29	PURGE	7560.*
02:31:39	03:14:16	VENT	0.
03:57:01	04:43:05	VENT	0.

* Propellant Dump Experiment

Figure 1A

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
VEHICLE PROFILE

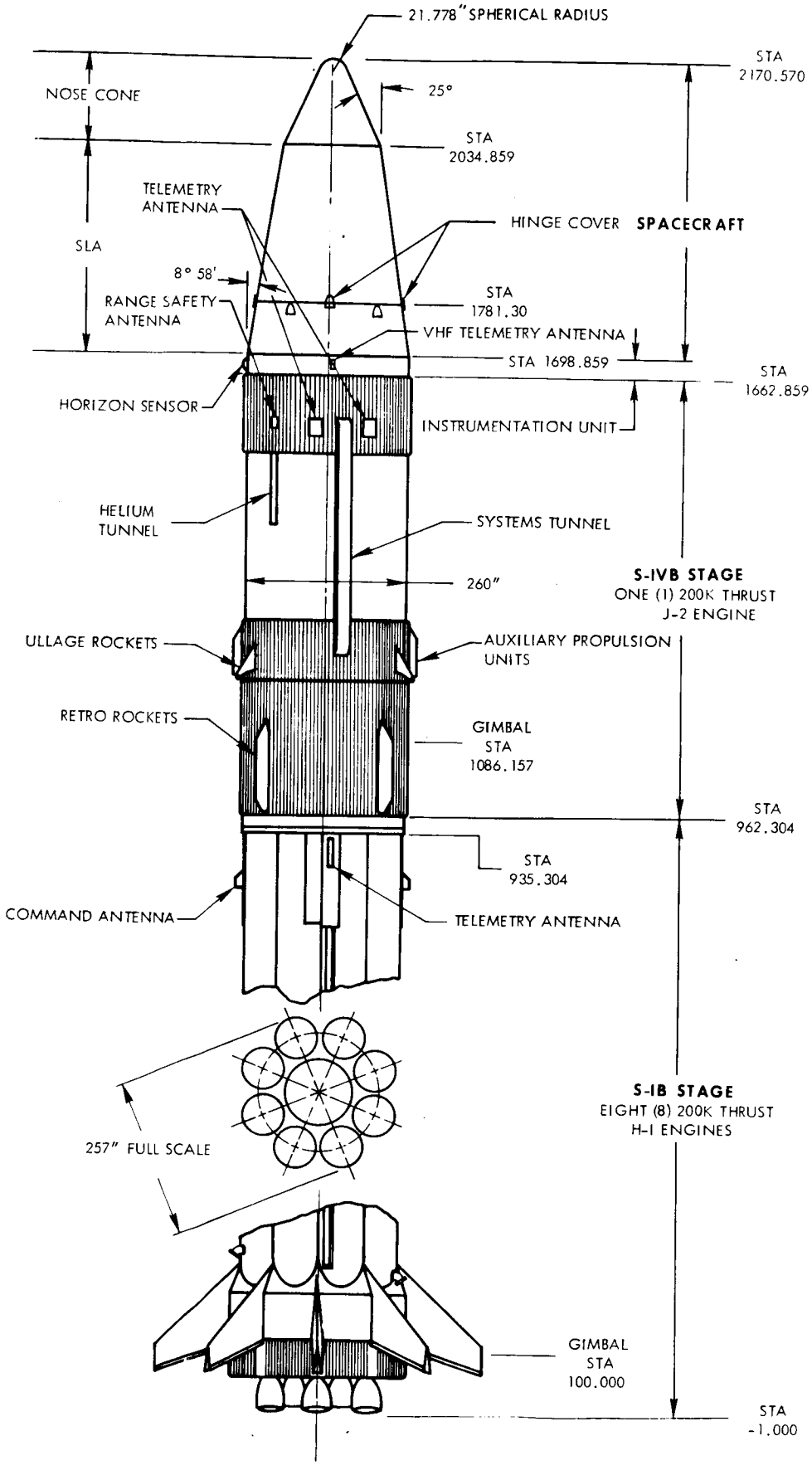


Figure 2A

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
H-1 ENGINE THRUST DECAY

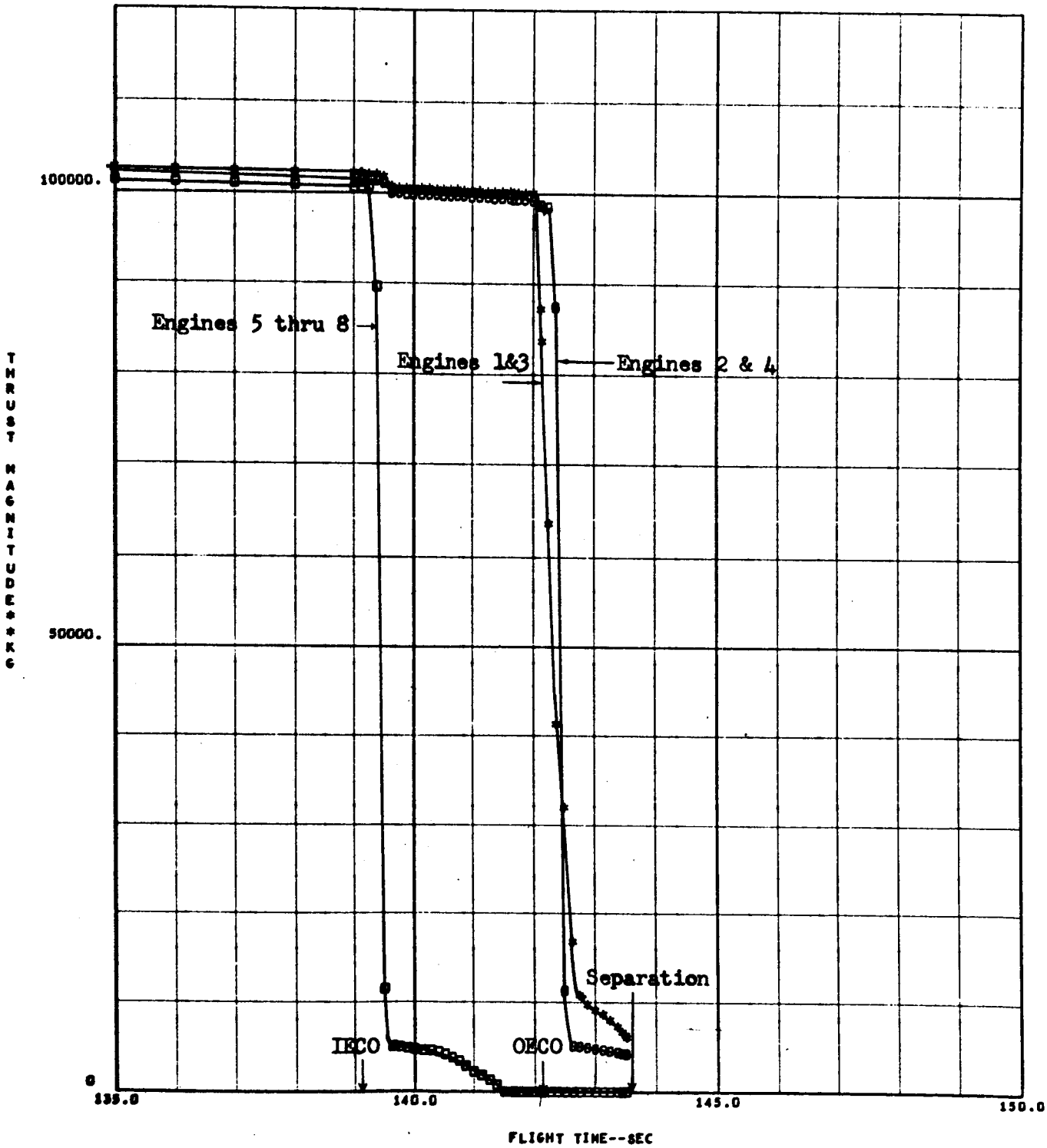


Figure 3A

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
J-2 ENGINE THRUST BUILDUP

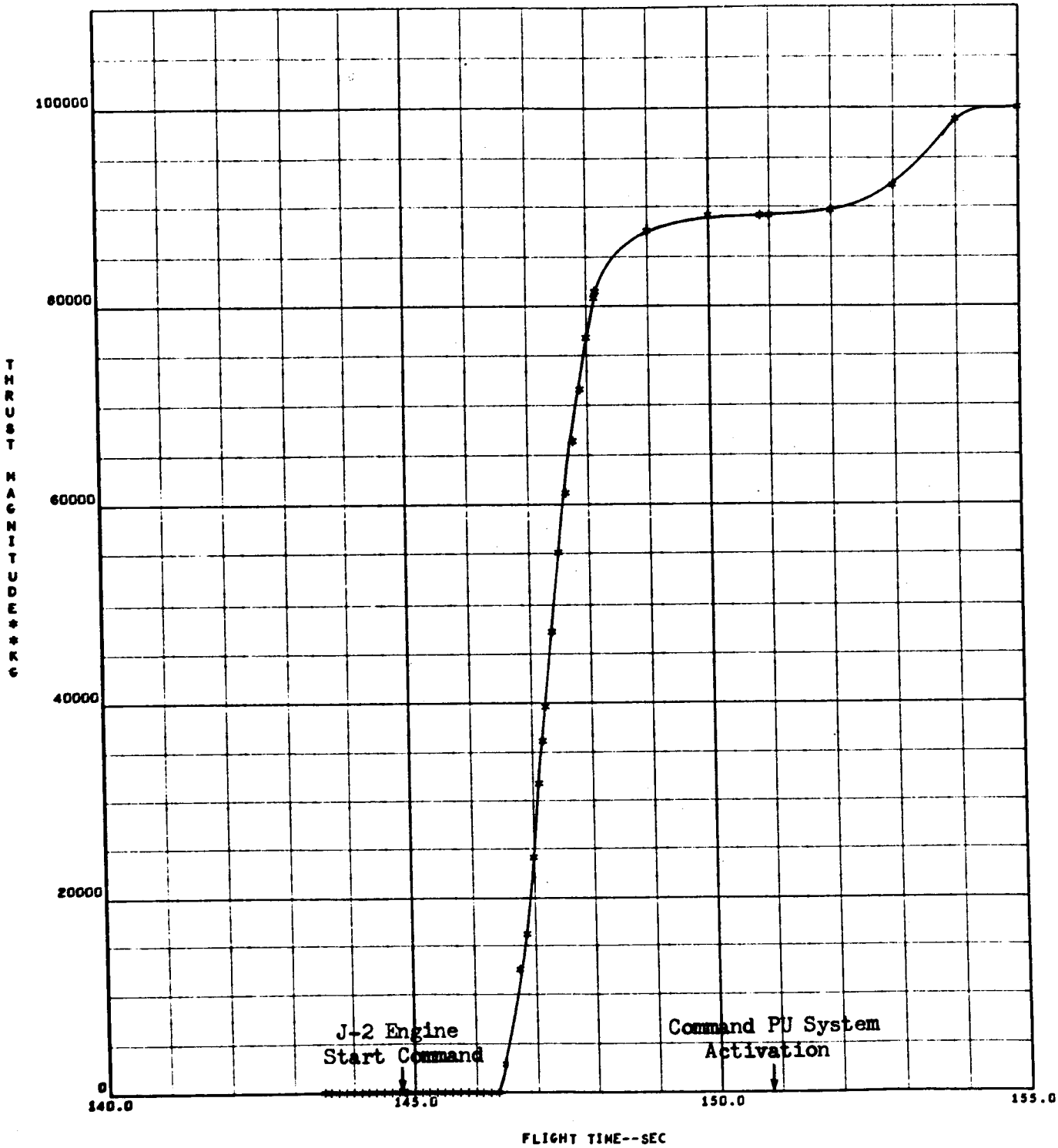


Figure 4A

AS-204/IM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
J-2 ENGINE THRUST DECAY

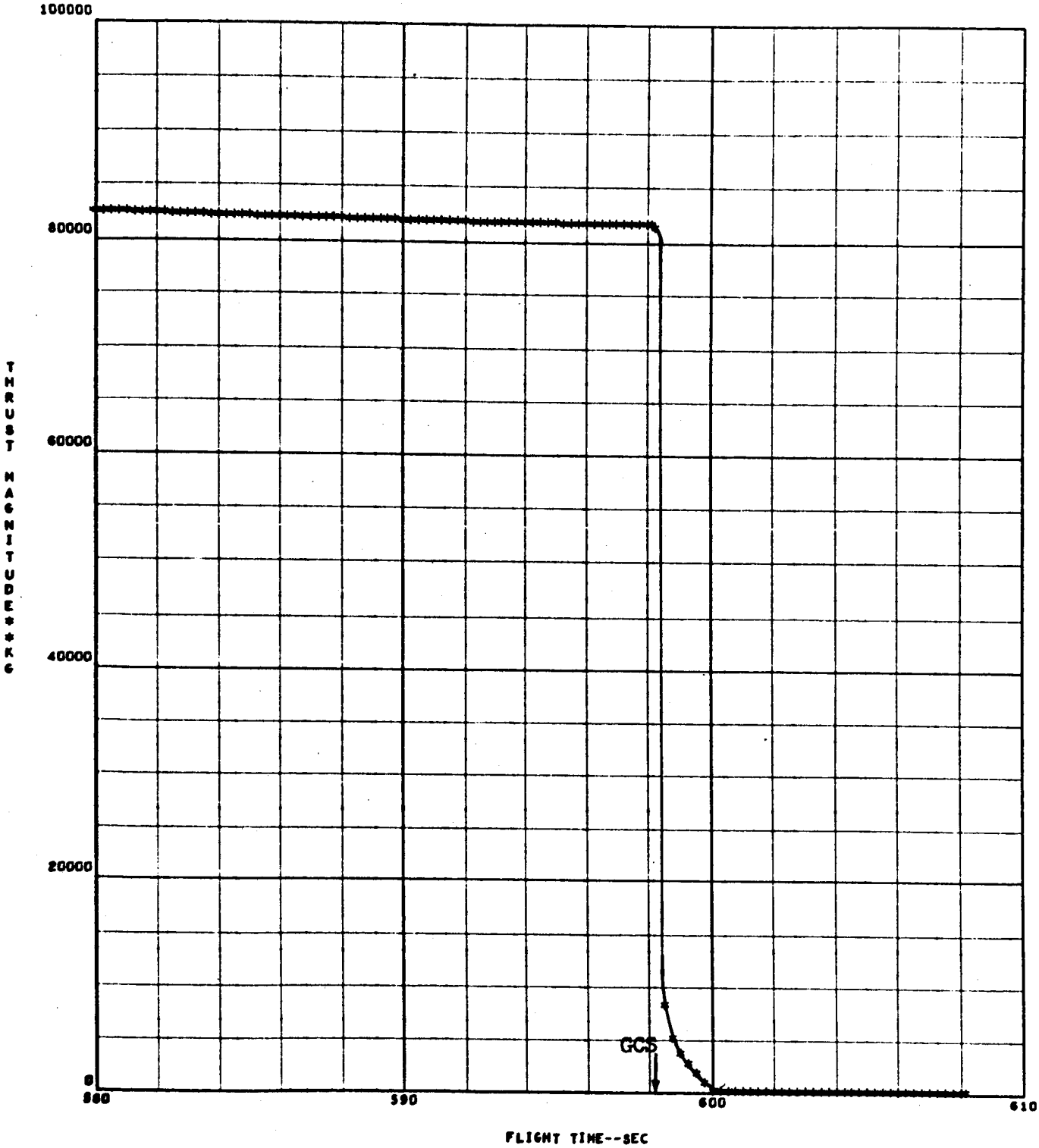
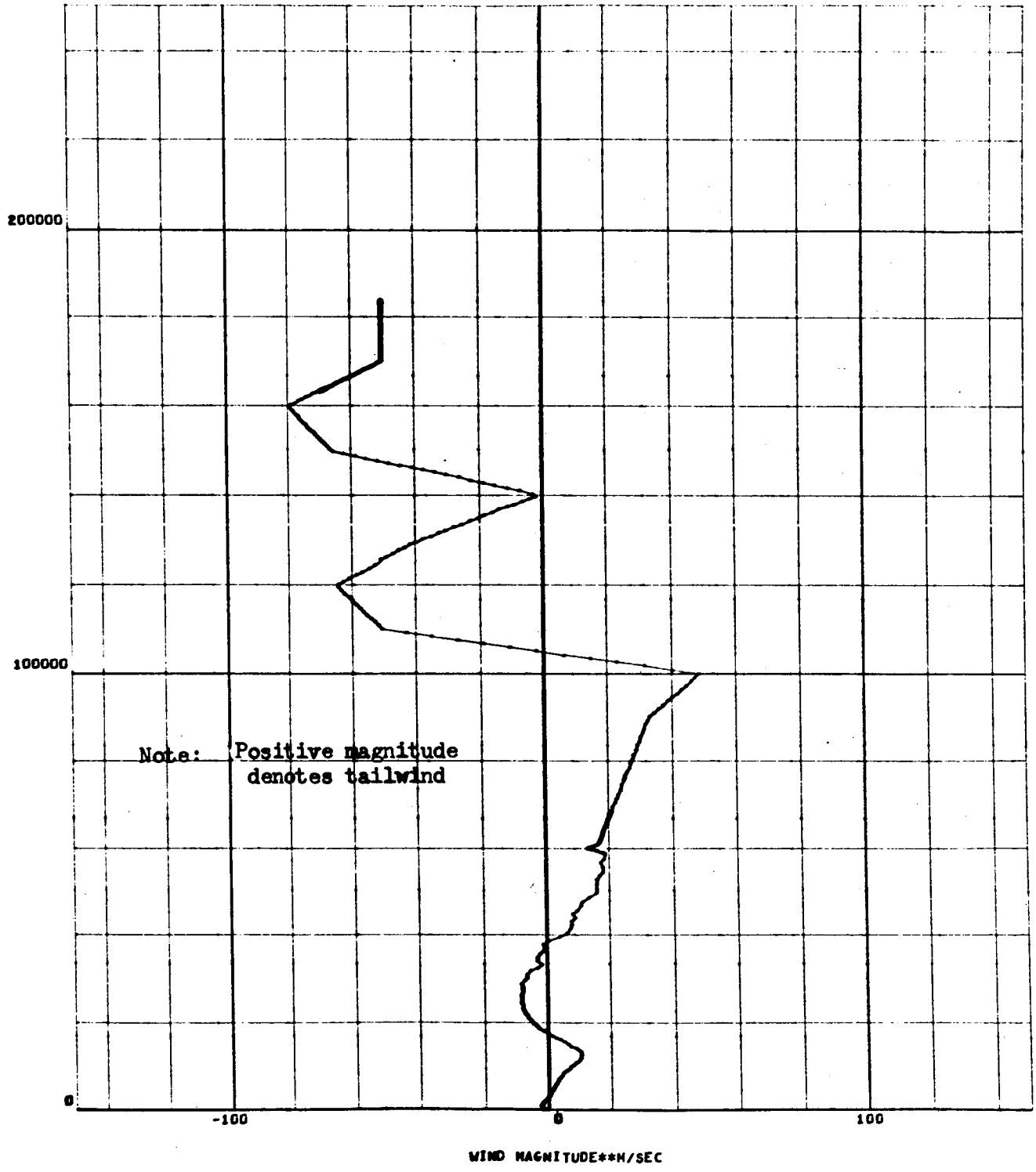


Figure 5A

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
AVERAGE MEAN HEADWIND/TAILWIND PROFILE
SEPTEMBER AND OCTOBER



APPENDIX B: "GUIDANCE PRESETTINGS"

TABLE 1E

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

S-IB STAGE STEERING PROGRAM

For the time segment $t - T1 \leq 10$:

$X_y = 0.$

$X_z = 0.$

$X_x = -0.314159$ rad. (-18. degrees)

For the time segment $10 < t - T1 \leq 47$:

$X_y = A0 + A1xT + A2xT^2 + A3xT^3$

A0 = -.655727 x 10^{-2} radians

A1 = .225645 x 10^{-2} radians/second

A2 = -.174025 x 10^{-3} radians/second^2

A3 = .472717 x 10^{-6} radians/second^3

$X_x = X_z = C.$

For the time segment $47 < t - T1 \leq 96$:

$X_y = B0 + B1xT + B2xT^2 + B3xT^3$

B0 = .774282 x 10^{-1} radians

B1 = -.945599 x 10^{-3} radians/second

B2 = -.161445 x 10^{-3} radians/seconds^2

B3 = .858421 x 10^{-6} radians/second^3

$X_x = X_z = C.$

For the time segment $96 < t - T1 \leq 133$:

$X_y = C0 + C1xT + C2xT^2 + C3xT^3$

C0 = .489574 x 10^{+1} radians

C1 = -.142762 x 10^{+0} radians/second

C2 = .123205 x 10^{-2} radians/second^2

C3 = -.371469 x 10^{-5} radians/second^3

$X_x = X_z = 0.$

For the time segment $t - T1 > 133$:

$X_y = -1.037239$ radians

$X_x = X_z = C.$

NOTE:

X_y: Pitch attitude angle measured negative downrange from inertial vertical

T = t - T1 + NGMDT

t: time from GRR

T1 : time of liftoff (Time Base 1), approximately 0.2 seconds after first motion

NGMDT: Bias to account for system delays

TABLE 2B

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
S-IB STAGE PITCH ATTITUDE COMMAND

FLIGHT TIME (SEC)	PITCH ATTITUDE COMMAND, χ_c (DEG)	FLIGHT TIME (SEC)	PITCH ATTITUDE COMMAND, χ_c (DEG)
0	0.0000	82	-35.4033
10	0.0000	84	-36.5426
12	-0.2712	86	-37.6564
14	-0.5231	88	-38.7425
16	-0.8443	90	-39.7971
18	-1.2367	92	-40.8194
20	-1.6956	94	-41.8070
22	-2.2200	96	-42.7558
24	-2.8115	98	-43.7211
26	-3.4658	100	-44.6279
28	-4.1816	102	-45.4819
30	-4.9606	104	-46.2958
32	-5.7985	106	-47.0794
34	-6.6942	108	-47.8419
36	-7.6489	110	-48.5944
38	-8.6587	112	-49.3468
40	-9.7225	114	-50.1096
42	-10.8413	116	-50.8927
44	-12.0113	118	-51.7058
46	-13.2314	120	-52.5610
48	-14.4068	122	-53.4666
50	-15.5864	124	-54.4323
52	-16.8176	126	-55.4717
54	-18.0611	128	-56.5918
56	-19.3141	130	-57.8021
58	-20.5742	132	-59.1178
60	-21.8394	134	-59.4294
62	-23.1071	↓	↓
64	-24.3749		
66	-25.6405		
68	-26.9015		
70	-28.1558		
72	-29.4005		
74	-30.6337		
76	-31.8532		
78	-33.0558	IGM Initiation	-59.4294
80	-34.2399		

TABLE 3B

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
IGM PRESETTINGS

IVDC SYMBOL	INITIAL VALUE	UNITS	DESCRIPTION
---	17.	sec	Time from time base 3 to initiate IGM guidance
T1i	316.8	sec	Time to go for first IGM stage
T3i	111.7	sec	Time to go for second IGM stage
τ_3	271.0	sec	Average value of $\dot{m}/m$ at initiation of second IGM stage
Vex1	4151.00	m/sec	Average exhaust velocity (go x Isp) for 1st IGM stage phase of flight
Vex3	4221.00	m/sec	Average exhaust velocity (go x Isp) for 2nd IGM stage phase of flight
VT	7821.494	m/sec	Guidance cutoff signal (GCS) criteria. Terminal velocity for IGM equations
XVT	6535586.	m	Desired terminal position vector components in IGM coordinate system
YVT	0.	m	
ZVT	0.	m	
$\dot{X}$VT	0.	m/sec	Desired cutoff velocity components in IGM coordinate system
$\dot{Y}$VT	0.	m/sec	
$\dot{Z}$VT	7821.494	m/sec	
$\ddot{X}$VGT	-9.332	m/sec^2	Terminal gravitation vector components in IGM coordinate system
$\ddot{Y}$VGT	0.	m/sec^2	
$\ddot{Z}$VGT	0.	m/sec^2	

TABLE 3B (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

IGM PRESETTINGS

LVDC SYMBOL	INITIAL VALUE	UNITS	DESCRIPTIONS
ϵ	15.	sec	Value of T3i to initiate IGM ΔV guidance
---	3.	sec	Value of T3i to freeze IGM (ϵ')
Tr1	1.8	N/D	Mission dependent constant multiplier for terminal range angle equation
Tr2	0.	N/D	Mission dependent constants for N3 and N4 equations
Tr3	0.	N/D	
---	200.	sec	Time to initiate thrust misalignment correction
T2	0.	sec	Terminal steering time argument
ΔTNCM	R-ASTR	sec	Nominal computation cycle length
ILD	0.	N/D	IGM staging flag (Burn switch)
AP1	-.42666501	E+00	Transformation matrix from navigation coordinate system to the (X4, Y4, Z4) coordinate system Az = 72. ϕ_L = 28.531856 θ_N = 119.0548 i = 31.6143
AP2	+.49514778	E-01	
AP3	+.90305329	E+00	
AP4	-.41829538	E-02	
AP5	+.99838143	E+00	
AP6	-.56717968	E-01	
AP7	-.90440002	E+00	
AP8	-.27976999	E-01	
AP9	-.42576733	E+00	
---	257.	sec	Time from time base 3 to sample F/M for IGM staging (Approximately 70 sec. prior to nominal IGM staging)
FLAG	2.	N/D	Number of F/M decreases required for IGM staging criteria

TABLE 3B (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
IGM PRESETTINGS

LVDC SYMBOL	INITIAL VALUE	UNITS	DESCRIPTION
ACC	0.01	m/sec^2	F/M comparison tolerance for IGM staging
T1C	316.8	sec	Constants for updating second stage time-to-go for perturbed EMR shift time
AC	495.8	sec	
A1	- 1.22	N/D	
PCO	60.	sec	Backup time for IGM staging
τ_{1C}	555.888	sec	Constants for artificial τ_3 mode
CC	35.	sec	
M02	130951.96	kg	
$\dot{M}1$	242.264	kg/sec	
$\dot{M}3$	199.427	kg/sec	

TABLE 4B

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
ORBITAL ATTITUDE MANEUVERS

FLIGHT TIME (HR:MIN:SEC)	(SEC)	DESCRIPTION
00:09:58	598	Maintain cutoff inertial attitude for 90 seconds after initiation of time base four (TB4).
00:10:43	643	Jettison nose cap.
00:11:28	688	Initiate pitch maneuver to align S-IVB/(LM) with local horizontal and maintain [(LM) forward/ position I down] with respect to local reference.
00:19:58	1198	Deploy SLA panels.
00:50:00	3000	Initiate maneuver to attain separation inertial attitude. Inertial attitude specified by pitch +87.1°, yaw -0.9°, roll 0° with respect to GRR inertial reference.
00:53:55	3235	Nominal (LM) separation.
00:56:55	3415	Initiate maneuver to align S-IVB with local horizontal and maintain (SIA forward/position I down) with respect to local reference.
01:31:25	5485	Initiate inertial attitude hold using gimbal angles at specified initiate time. Maintain inertial attitude.
01:45:55	6355	Initiate pitch maneuver to place S-IVB in retro-attitude with roll axis aligned along local horizontal. Maintain with respect to local reference.
02:20:38	8438	Initiate maneuver to pitch to 270° and maintain with local horizontal.
02:36:38	9398	Initiate maneuver to pitch to local horizontal (retro-attitude position I up) and maintain throughout remainder of flight.
04:30:00	16200	S-IVB loss of attitude control capability.

APPENDIX C: "LAUNCH VEHICLE TRAJECTORY LISTINGS, ENGLISH UNITS"

TABLE 1C

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

S-IB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	----- SPACE FIXED ----- RADIUS (FT)	VELOCITY (FT/S)	PATH ANGLE (DEG)	--- SPACE FIXED POSITION AND VELOCITY VECTOR COMPONENTS --- X (FT)	Y (FT)	Z (FT)	DX (FT/S)	DY (FT/S)	DZ (FT/S)
1)	-5.00	20909949.	1341.64	90.000	20909867.	55942.	-18177.	0.00	414.59	1275.97
2)	0.00	20909949.	1341.64	90.000	20909865.	58015.	-11797.	-0.43	414.37	1276.05
	5.00	20910056.	1342.36	88.130	20909969.	60086.	-5416.	42.94	414.05	1276.18
	10.00	20910397.	1344.69	86.008	20910304.	62155.	965.	92.32	413.71	1276.13
	15.00	20911002.	1350.11	83.627	20910903.	64223.	7346.	148.15	413.48	1276.67
	20.00	20911908.	1361.72	80.968	20911799.	66290.	13736.	211.63	413.23	1280.13
	25.00	20913152.	1382.03	78.094	20913031.	68355.	20155.	282.54	412.96	1288.27
	30.00	20914772.	1413.87	75.078	20914637.	70419.	26630.	361.03	412.60	1303.24
	35.00	20916806.	1460.13	72.023	20916654.	72481.	33203.	447.11	412.18	1327.47
	40.00	20919291.	1523.29	69.051	20919120.	74541.	39924.	540.56	411.78	1363.32
	45.00	20922264.	1605.35	66.283	20922071.	76599.	46859.	641.04	411.40	1413.14
	50.00	20925759.	1707.82	63.818	20925542.	78655.	54083.	748.17	411.00	1479.18
	55.00	20929809.	1829.77	61.721	20929563.	80709.	61678.	860.71	410.57	1561.62
	60.00	20934426.	1966.88	60.153	20934147.	82761.	69726.	971.74	410.12	1660.16
	65.00	20939591.	2117.79	59.091	20939273.	84810.	78307.	1079.58	409.68	1775.31
	70.00	20945315.	2290.31	58.319	20944952.	86858.	87515.	1193.17	409.19	1911.66
3)	74.00	20950321.	2445.99	57.854	20949917.	88493.	95408.	1290.48	408.72	2037.28
	80.00	20958603.	2710.41	57.371	20958127.	90943.	108265.	1448.04	407.98	2254.56
	85.00	20966265.	2959.81	57.172	20965715.	92982.	120050.	1588.71	407.39	2463.84
	90.00	20974661.	3236.94	57.170	20974025.	95017.	132951.	1736.00	406.74	2701.61
	95.00	20983824.	3541.84	57.340	20983084.	97049.	147114.	1888.75	406.02	2968.57
	100.00	20993784.	3874.00	57.642	20992920.	99077.	162685.	2046.25	405.20	3264.44
	105.00	21004568.	4233.79	58.038	21003555.	101101.	179807.	2208.64	404.09	3589.37
	110.00	21016207.	4622.06	58.489	21015016.	103118.	198627.	2376.70	402.84	3943.66
	115.00	21028738.	5040.90	58.982	21027332.	105129.	219296.	2550.61	401.44	4329.42
	120.00	21042194.	5492.39	59.518	21040531.	107132.	241978.	2729.67	399.88	4749.24
	125.00	21056607.	5979.06	60.114	21054633.	109126.	266852.	2911.49	397.53	5207.14
	130.00	21071990.	6504.51	60.791	21069645.	111107.	294122.	3092.77	394.83	5708.55
4)	133.20	21082346.	6863.07	61.285	21079724.	112368.	312939.	3205.78	393.00	6055.60
5)	139.14	21102646.	7578.44	62.154	21099416.	114693.	350966.	3425.98	389.35	6748.61
6)	142.14	21113334.	7771.43	62.606	21109747.	115859.	371543.	3451.75	388.28	6951.97
7)	143.44	21117970.	7775.03	62.839	21114219.	116364.	380599.	3422.10	388.07	6970.63
8)	143.62	21118250.	7774.20	62.854	21114490.	116395.	381150.	3419.76	388.06	6970.86

1) GRR;
2) First Motion;
3) Maximum Dynamic Pressure;
4) Tilt Arrest;
5) IECO;
6) OECO;
7) Separation Signal;
8) Physical Separation.

TABLE 1C (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

S-IB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	EARTH FIXED POSITION (FT)	EARTH FIXED VELOCITY (FT/S)	EARTH FIXED PATH ANGLE (DEG)	EARTH FIXED POSITION AND VELOCITY VECTOR COMPONENTS X (FT)	Y (FT)	Z (FT)	DX (FT/S)	DY (FT/S)	DZ (FT/S)
1)	-5.00	113.	0.00	N/A	113.	-0.	0.	-0.00	0.00	-0.00
2)	0.00	113.	0.00	N/A	113.	-0.	-0.	-0.00	0.00	0.00
	5.00	220.	43.80	0.298	220.	-0.	0.	43.80	-0.10	0.03
	10.00	561.	93.61	0.309	561.	-1.	0.	93.61	-0.25	-0.18
	15.00	1166.	149.87	0.291	1166.	-3.	-1.	149.87	-0.30	0.16
	20.00	2072.	213.81	0.983	2072.	-4.	6.	213.78	-0.39	3.35
	25.00	3317.	285.36	2.303	3316.	-7.	40.	285.14	-0.52	11.15
	30.00	4938.	365.00	4.095	4936.	-10.	129.	364.10	-0.74	25.70
	35.00	6977.	453.39	6.312	6970.	-14.	312.	450.69	-1.04	49.41
	40.00	9477.	551.25	8.886	9456.	-20.	642.	544.71	-1.32	84.64
	45.00	12485.	659.52	11.750	12429.	-27.	1182.	645.82	-1.57	133.74
	50.00	16051.	779.51	14.833	15925.	-36.	2007.	753.69	-1.82	198.94
	55.00	20230.	911.31	17.965	19975.	-45.	3198.	867.09	-2.07	280.42
	60.00	25065.	1049.52	21.143	24594.	-56.	4838.	979.13	-2.28	377.90
	65.00	30574.	1194.16	24.358	29761.	-68.	7004.	1088.13	-2.43	491.90
	70.00	36812.	1356.67	27.550	35485.	-81.	9792.	1203.10	-2.55	626.98
3)	74.00	42391.	1503.02	30.015	40492.	-91.	12544.	1301.67	-2.67	751.48
	80.00	51882.	1752.35	33.490	48776.	-107.	17681.	1461.46	-2.74	966.88
	85.00	60952.	1988.23	36.192	56437.	-121.	23023.	1604.33	-2.64	1174.40
	90.00	71215.	2250.75	38.767	64831.	-134.	29472.	1754.16	-2.47	1410.25
	95.00	82802.	2540.39	41.202	73988.	-145.	37174.	1909.87	-2.18	1675.11
	100.00	95847.	2857.24	43.476	83938.	-155.	46271.	2070.76	-1.80	1968.70
	105.00	110488.	3202.14	45.580	94705.	-164.	56909.	2236.99	-1.50	2291.19
	110.00	126872.	3576.29	47.506	106318.	-170.	69231.	2409.41	-1.12	2642.84
	115.00	145153.	3981.72	49.279	118809.	-175.	83389.	2588.24	-0.64	3025.75
	120.00	165496.	4420.35	50.928	132210.	-176.	99545.	2772.83	-0.03	3442.52
	125.00	188069.	4894.36	52.503	146543.	-176.	117878.	2960.85	0.12	3897.19
	130.00	213055.	5406.91	54.051	161819.	-175.	138589.	3149.13	0.32	4395.19
4)	133.20	230399.	5756.86	55.056	172086.	-173.	153200.	3267.08	0.58	4740.00
5)	139.14	265638.	6457.66	56.759	192172.	-168.	183394.	3497.43	1.28	5428.57
6)	142.14	284781.	6644.70	57.441	202724.	-163.	200008.	3527.28	2.05	5630.37
7)	143.44	293196.	6644.52	57.713	207295.	-160.	207346.	3498.80	2.40	5648.72
8)	143.52	293707.	6643.51	57.729	207572.	-160.	207793.	3496.53	2.42	5648.94

1) GRR;
2) First Motion;
3) Maximum Dynamic Pressure;
4) Tilt Arrest;
5) IECO;
6) OECO;
7) Separation Signal;
8) Physical Separation.

TABLE 1C (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

S-IB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	MASS (LB)	THRUST (TOTAL) (LB)	DRAG (LB)	LONGITUDINAL ACCELERATION (FT/SEC2)	DYNAMIC PRESSURE (LB/FT2)	A.H.I. (LB-FT/FT2-RAD)	MACH NO.	PITCH ANGLE OF ATTACK (DEG)
1)	-5.00	1299059.	0.	0.	0.000	0.	0.	0.00	0.000
2)	0.00	1285044.	1575301.	1323.	39.752	0.	0.	0.00	0.000
	5.00	1254262.	1608531.	2945.	41.537	2.	77.	0.04	1.471
	10.00	1223353.	1615700.	6238.	42.688	10.	1417.	0.08	2.831
	15.00	1192304.	1630743.	8775.	44.134	25.	8229.	0.13	1.554
	20.00	1161063.	1645569.	11042.	45.666	50.	29972.	0.19	1.054
	25.00	1129704.	1659136.	15832.	47.179	85.	83996.	0.25	0.813
	30.00	1098256.	1673671.	20349.	48.818	133.	197904.	0.33	0.289
	35.00	1066743.	1688298.	26325.	50.515	193.	411858.	0.41	-0.063
	40.00	1035188.	1703904.	34285.	52.287	264.	779798.	0.50	-0.299
	45.00	1003609.	1719474.	40900.	54.213	344.	1369243.	0.60	-0.444
	50.00	972014.	1735507.	48691.	56.240	430.	2259981.	0.72	-0.435
	55.00	940417.	1751527.	74291.	57.796	516.	3537987.	0.85	-0.465
	60.00	908844.	1765018.	150668.	57.572	588.	5269166.	1.00	-0.528
	65.00	877221.	1779785.	163980.	59.695	640.	7460151.	1.16	-0.599
	70.00	845473.	1794215.	148648.	63.064	673.	10113155.	1.36	-0.670
3)	74.00	820072.	1804984.	126201.	66.313	683.	12562693.	1.53	-0.515
	80.00	781977.	1817767.	98457.	71.200	657.	16713587.	1.85	-0.179
	85.00	750242.	1825922.	73561.	75.625	586.	20418197.	2.12	0.079
	90.00	718687.	1831122.	52484.	80.120	481.	24011379.	2.37	0.093
	95.00	687200.	1834076.	36972.	84.655	382.	27296578.	2.64	0.091
	100.00	655741.	1834756.	26018.	89.286	294.	30192660.	2.93	-0.007
	105.00	624324.	1833849.	17843.	94.154	220.	32658952.	3.24	0.031
	110.00	592957.	1832053.	11310.	99.392	157.	34671617.	3.54	-0.131
	115.00	561653.	1828744.	5102.	105.098	109.	36248510.	3.87	-0.273
	120.00	530427.	1824026.	1999.	111.189	74.	37449186.	4.18	-0.808
	125.00	499294.	1818654.	426.	117.879	49.	38336859.	4.54	-1.505
	130.00	468269.	1812015.	-792.	125.322	33.	38989636.	4.95	-2.741
4)	133.20	448500.	1806791.	-1654.	130.536	25.	39307813.	5.33	-3.676
5)	139.14	411921.	1792962.	-3019.	141.143	15.	39769599.	6.15	-2.079
6)	142.14	400716.	801889.	-3104.	64.635	11.	39930083.	6.46	-1.279
7)	143.44	399093.	48375.	-2680.	4.116	9.	39983745.	6.52	-0.992
8)	143.52	399063.	44913.	-2650.	3.835	9.	39986697.	6.52	-0.975

1) GRR;
2) First Motion;
3) Maximum Dynamic Pressure;
4) Tilt Arrest;
5) IECO;
6) OECO;
7) Separation Signal;
8) Physical Separation.

TABLE 1C (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

S-IB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	ALTITUDE (FT)	RANGE (NM)	VELOCITY VECTOR AZIMUTH SPACE FIXED (DEG)	VELOCITY VECTOR AZIMUTH EARTH FIXED (DEG)	LONGITUDE (POS. EAST) (DEG)	GEOCENTRIC DECLINATION (DEG)	GEODETIC LATITUDE (DEG)
1)	-5.00	112.	0.000	90.000	N/A	-80.565	28.371	28.532
2)	0.00	112.	0.000	90.000	N/A	-80.565	28.371	28.532
	5.00	218.	0.000	89.990	N/A	-80.565	28.371	28.532
	10.00	560.	0.000	89.981	N/A	-80.565	28.371	28.532
	15.00	1165.	-0.001	89.968	N/A	-80.565	28.371	28.532
	20.00	2071.	0.002	89.914	56.743	-80.565	28.371	28.532
	25.00	3315.	0.007	89.799	65.594	-80.565	28.371	28.532
	30.00	4935.	0.022	89.594	68.224	-80.565	28.371	28.532
	35.00	6969.	0.053	89.277	69.419	-80.564	28.371	28.532
	40.00	9454.	0.107	88.835	70.135	-80.563	28.371	28.532
	45.00	12428.	0.196	88.260	70.594	-80.561	28.372	28.533
	50.00	15924.	0.333	87.558	70.902	-80.559	28.373	28.534
	55.00	19975.	0.529	86.763	71.111	-80.556	28.374	28.535
	60.00	24594.	0.799	85.913	71.266	-80.551	28.375	28.536
	65.00	29760.	1.156	85.038	71.390	-80.544	28.377	28.538
	70.00	35486.	1.614	84.133	71.488	-80.536	28.379	28.540
3)	74.00	40495.	2.067	83.403	71.550	-80.528	28.382	28.543
	80.00	48782.	2.910	82.329	71.632	-80.513	28.386	28.547
	85.00	55448.	3.787	81.474	71.695	-80.497	28.391	28.552
	90.00	64850.	4.845	80.662	71.751	-80.478	28.396	28.557
	95.00	74020.	6.107	79.907	71.804	-80.455	28.403	28.564
	100.00	83988.	7.597	79.215	71.852	-80.429	28.411	28.571
	105.00	94781.	9.337	78.587	71.893	-80.397	28.420	28.580
	110.00	106431.	11.352	78.022	71.934	-80.361	28.430	28.591
	115.00	118974.	13.664	77.517	71.974	-80.319	28.442	28.603
	120.00	132445.	16.299	77.065	72.016	-80.272	28.456	28.616
	125.00	146872.	19.286	76.654	72.051	-80.218	28.471	28.631
	130.00	162274.	22.657	76.284	72.089	-80.157	28.488	28.649
4)	133.20	172642.	25.032	76.069	72.117	-80.115	28.500	28.661
5)	139.14	192968.	29.935	75.714	72.172	-80.026	28.525	28.686
6)	142.14	203670.	32.629	75.640	72.206	-79.977	28.539	28.699
7)	143.44	208312.	33.818	75.644	72.220	-79.956	28.545	28.705
8)	143.52	208593.	33.891	75.644	72.221	-79.955	28.546	28.706

1) GRR;
2) First Motion;
3) Maximum Dynamic Pressure;
4) Tilt Arrest;
5) IECO;
6) OECO;
7) Separation Signal;
8) Physical Separation.

TABLE 1C (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

S-IB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	VEHICLE ATTITUDE ANGLE PITCH (DEG)	YAW (DEG)	ROLL (DEG)	VEHICLE ATTITUDE RATE PITCH (DEG/S)	YAW (DEG/S)	ROLL (DEG/S)	VEHICLE ATTITUDE ERROR PITCH (DEG)	YAW (DEG)	ROLL (DEG)
1)	-5.00	0.000	0.000	18.000	-0.003	0.001	-0.002	0.000	0.000	0.000
2)	0.00	-0.017	0.006	17.990	-0.003	0.001	-0.002	-0.017	0.006	-0.010
	10.00	-0.003	-0.019	18.001	-0.000	-0.000	0.000	-0.003	-0.019	0.001
	15.00	-0.567	-0.001	14.384	-0.117	-0.013	-1.087	0.109	-0.001	1.184
	20.00	-1.500	0.012	9.387	-0.229	-0.001	-1.002	0.195	0.012	1.187
	25.00	-2.863	0.002	4.385	-0.313	-0.004	-1.000	0.267	0.002	1.185
	30.00	-4.638	-0.022	-0.007	-0.394	-0.004	-0.169	0.323	-0.022	-0.007
	35.00	-6.800	-0.023	0.000	-0.469	-0.000	-0.001	0.365	-0.023	0.000
	40.00	-9.312	-0.024	-0.002	-0.536	-0.000	-0.000	0.410	-0.024	-0.002
	45.00	-12.139	-0.027	-0.005	-0.595	-0.001	-0.001	0.476	-0.027	-0.005
	50.00	-15.057	-0.032	-0.008	-0.563	-0.001	0.001	0.529	-0.032	-0.008
	55.00	-18.088	-0.039	-0.010	-0.609	-0.001	-0.000	0.599	-0.039	-0.010
	60.00	-21.189	-0.041	-0.013	-0.625	-0.000	-0.001	0.651	-0.041	-0.013
	65.00	-24.280	-0.047	-0.016	-0.617	-0.001	-0.001	0.728	-0.047	-0.016
	70.00	-27.332	-0.051	-0.021	-0.595	-0.001	-0.001	0.824	-0.051	-0.021
3)	74.00	-29.627	-0.060	-0.018	-0.592	-0.000	0.003	1.007	-0.060	-0.018
	80.00	-33.374	-0.047	-0.008	-0.602	-0.000	0.003	0.866	-0.047	-0.008
	85.00	-36.424	-0.047	0.002	-0.606	0.000	0.001	0.679	-0.047	0.002
	90.00	-39.325	-0.045	0.002	-0.547	0.001	-0.000	0.472	-0.045	0.002
	95.00	-41.907	-0.040	0.002	-0.488	0.000	-0.000	0.379	-0.040	0.002
	100.00	-44.303	-0.039	-0.000	-0.451	0.000	-0.000	0.325	-0.039	-0.000
	105.00	-46.357	-0.062	0.001	-0.395	0.002	-0.000	0.333	-0.062	0.001
	110.00	-48.285	-0.063	-0.001	-0.382	-0.001	-0.001	0.309	-0.063	-0.001
	115.00	-50.185	-0.070	-0.002	-0.390	-0.001	-0.001	0.313	-0.070	-0.002
	120.00	-52.219	-0.074	-0.005	-0.431	-0.001	-0.001	0.342	-0.074	-0.005
	125.00	-54.534	-0.161	-0.005	-0.494	0.008	-0.000	0.409	-0.161	-0.005
	130.00	-57.267	-0.161	-0.007	-0.601	-0.000	-0.000	0.535	-0.161	-0.007
4)	133.20	-59.274	-0.163	-0.009	-0.505	-0.001	-0.005	0.155	-0.163	-0.009
5)	139.14	-59.491	-0.170	-0.003	0.000	-0.001	0.001	-0.062	-0.170	-0.003
6)	142.14	-59.460	-0.085	-0.002	0.002	0.003	0.001	-0.031	-0.085	-0.002
7)	143.44	-59.460	-0.084	-0.004	-0.002	-0.000	-0.003	-0.031	-0.084	-0.004
8)	143.52	-59.460	-0.084	-0.004	-0.002	-0.000	-0.003	-0.031	-0.084	-0.004

1) GRR;
2) First Motion;
3) Maximum Dynamic Pressure;
4) Tilt Arrest;
5) IECO;
6) OECO;
7) Separation Signal;
8) Physical Separation.

TABLE 2C

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

S-IVB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	----- SPACE FIXED ----- RADIUS (FT)	VELOCITY (FT/S)	PATH ANGLE (DEG)	--- SPACE FIXED POSITION AND VELOCITY VECTOR COMPONENTS --- X (FT)	Y (FT)	Z (FT)	DX (FT/S)	DY (FT/S)	DZ (FT/S)
1)	143.52	21118250.	7774.20	62.854	21114490.	116395.	381150.	3419.76	388.06	6970.86
2)	144.84	21122910.	7756.39	63.102	21118980.	116907.	390358.	3378.64	387.88	6971.08
3)	147.19	21131077.	7727.88	63.546	21126834.	117818.	406741.	3306.90	387.55	6973.84
	148.14	21134337.	7728.79	63.719	21129964.	118186.	413371.	3284.02	387.34	6985.66
4)	148.14	21134337.	7728.79	63.719	21129964.	118186.	413371.	3284.02	387.34	6985.66
	150.00	21140657.	7741.58	64.048	21136023.	118905.	426367.	3244.84	386.70	7018.08
5)	150.84	21143510.	7747.96	64.196	21138754.	119231.	432296.	3227.36	386.35	7033.19
6)	155.44	21158838.	7789.70	64.990	21153385.	121004.	464844.	3135.51	384.36	7120.42
7)	159.25	21171254.	7831.63	65.631	21165180.	122463.	492091.	3062.75	382.69	7197.75
	170.00	21205028.	7963.09	67.489	21196970.	126593.	570678.	2847.67	389.08	7426.31
	190.00	21262556.	8254.40	70.866	21249811.	134591.	723661.	2436.36	411.00	7875.94
	210.00	21313326.	8599.77	73.978	21294428.	143054.	885851.	2025.61	436.87	8346.38
	230.00	21357589.	8994.60	76.794	21330844.	152101.	1057640.	1616.05	468.12	8835.84
	250.00	21395603.	9438.33	79.323	21359060.	161788.	1239439.	1205.49	500.82	9347.63
	270.00	21427629.	9929.52	81.569	21379052.	172141.	1431704.	793.07	534.68	9883.34
	290.00	21453936.	10466.56	83.542	21390765.	183183.	1634937.	377.51	569.06	10444.26
	310.00	21474804.	11051.04	85.263	21394110.	194892.	1849675.	-43.53	603.38	11034.47
	330.00	21490550.	11682.91	86.737	21388988.	207341.	2076524.	-469.77	641.80	11655.81
	350.00	21501519.	12363.53	87.984	21375271.	220575.	2316134.	-903.60	681.97	12311.60
	370.00	21508073.	13095.98	89.020	21352778.	234632.	2569248.	-1347.41	724.01	13006.34
	390.00	21510622.	13881.02	89.856	21321303.	249548.	2836659.	-1802.14	767.93	13742.10
	410.00	21509627.	14725.11	90.507	21280599.	265364.	3119252.	-2271.02	814.14	14526.13
	430.00	21505593.	15635.70	90.984	21230348.	282132.	3418078.	-2757.32	863.03	15366.44
	450.00	21499102.	16617.61	91.293	21170175.	299905.	3734320.	-3263.53	914.82	16268.30
	470.00	21490835.	17678.15	91.443	21099655.	318746.	4069269.	-3792.88	969.83	17239.22
8)	475.75	21488232.	17990.26	91.465	21077395.	324368.	4169215.	-3950.39	985.82	17523.47
	490.00	21481466.	18741.58	91.494	21018298.	338688.	4423787.	-4347.02	1023.59	18201.71
	510.00	21471401.	19811.66	91.475	20925524.	359682.	4797308.	-4933.83	1076.07	19157.28
	530.00	21461473.	20950.83	91.301	20820854.	381746.	5190485.	-5540.02	1130.98	20173.41
	550.00	21452686.	22181.77	91.019	20703634.	404944.	5604758.	-6189.38	1189.34	21267.53
	570.00	21446040.	23524.73	90.638	20572914.	429348.	6041815.	-6894.48	1251.97	22456.88
	590.00	21442496.	25011.84	90.211	20427280.	455057.	6503830.	-7692.07	1319.36	23763.07
9)	598.15	21442090.	25661.07	90.004	20363162.	465930.	6698834.	-8038.39	1348.57	24332.21
10)	608.15	21442117.	25684.37	89.992	20281297.	479395.	6942881.	-8332.33	1343.48	24258.08

1) Separation Completed;
2) J-2 Start Command;
3) Terminate Ullage Burn;
4) 90% Thrust Level;
5) Command P.U. Activation;
6) Ullage Case Jettison;
7) I.G.M. Initiation;
8) E.M.R. Shift sensed by I.G.M.;
9) Guidance Cutoff Signal;
10) Orbit Insertion.

TABLE 2C (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

S-IVB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	----- EARTH FIXED ----- POSITION (FT)	VELOCITY (FT/S)	PATH ANGLE (DEG)	---- EARTH FIXED POSITION AND VELOCITY VECTOR COMPONENTS ---- X (FT)	Y (FT)	Z (FT)	DX (FT/S)	DY (FT/S)	DZ (FT/S)
1)	143.52	293707.	6643.51	57.729	207572.	-160.	207793.	3496.53	2.42	5648.9
2)	144.84	302239.	6622.51	58.004	212164.	-156.	215255.	3456.43	2.77	5648.9
3)	147.19	317357.	6588.37	58.498	220203.	-149.	228530.	3386.55	3.38	5651.3
	148.14	323455.	6587.07	58.700	223410.	-146.	233904.	3364.52	3.59	5662.9
4)	148.14	323455.	6587.07	58.700	223410.	-146.	233904.	3364.52	3.59	5662.9
	150.00	335377.	6595.65	59.093	229619.	-139.	244444.	3327.09	3.82	5695.0
5)	150.84	340805.	6600.15	59.270	232420.	-136.	249257.	3310.40	3.87	5709.9
6)	155.44	370469.	6631.98	60.226	247443.	-117.	275715.	3223.02	4.11	5796.1
7)	159.25	395143.	6666.06	61.004	259579.	-101.	297921.	3154.06	4.35	5872.6
	170.00	465542.	6775.30	63.257	292409.	-9.	362252.	2950.16	16.48	6099.2
	190.00	599637.	7029.69	67.364	347521.	654.	488665.	2561.20	50.35	6546.3
	210.00	738659.	7345.45	71.147	394875.	2037.	624249.	2174.79	89.74	7015.5
	230.00	883654.	7717.19	74.557	434534.	4290.	769420.	1791.66	136.12	7505.0
	250.00	1035681.	8143.40	77.600	466546.	7503.	924616.	1409.74	185.66	8018.3
	270.00	1195803.	8621.66	80.278	490929.	11736.	1090320.	1028.33	238.15	8556.8
	290.00	1365090.	9149.44	82.608	507677.	17049.	1267061.	646.28	293.03	9121.8
	310.00	1544601.	9727.49	84.617	516755.	23459.	1455406.	261.46	349.88	9717.6
	330.00	1735427.	10355.00	86.319	518120.	31080.	1655986.	-125.63	412.95	10346.0
	350.00	1938661.	11032.84	87.741	511703.	40003.	1869483.	-517.16	480.05	11010.2
	370.00	2155444.	11763.64	88.909	497390.	50311.	2096667.	-915.24	551.48	11715.0
	390.00	2386938.	12547.85	89.841	475046.	62092.	2338365.	-1320.56	627.43	12462.3
	410.00	2634361.	13391.63	90.557	444502.	75443.	2595493.	-1735.93	708.55	13259.7
	430.00	2899068.	14302.26	91.075	405525.	90473.	2869139.	-2164.18	795.54	14115.1
	450.00	3182525.	15284.40	91.406	357837.	107307.	3160523.	-2607.33	888.93	15034.1
	470.00	3486294.	16345.26	91.561	301117.	126077.	3470977.	-3068.09	989.39	16024.2
8)	475.75	3577609.	16657.46	91.583	283083.	131852.	3563954.	-3205.04	1019.07	16314.4
	490.00	3811493.	17409.05	91.609	234972.	146889.	3801406.	-3550.16	1091.33	17008.2
	510.00	4157801.	18479.54	91.582	158884.	169743.	4151296.	-4061.44	1194.88	17988.0
	530.00	4526121.	19619.05	91.389	72464.	194727.	4521350.	-4586.37	1304.87	19030.7
	550.00	4918137.	20850.25	91.084	-24816.	221993.	4913062.	-5147.81	1423.14	20154.5
	570.00	5335805.	22193.36	90.677	-133762.	251718.	5328186.	-5757.27	1551.31	21377.3
	590.00	5781633.	23680.52	90.223	-255621.	284125.	5768987.	-6450.20	1691.11	22722.2
9)	598.15	5972056.	24329.73	90.004	-309432.	298156.	5956577.	-6751.01	1751.91	23308.6
10)	608.15	6209063.	24353.00	89.992	-378283.	315765.	6189480.	-7017.66	1768.39	23252.8

1) Separation Completed;
2) J-2 Start Command;
3) Terminate Ullage Burn;
4) 90% Thrust Level;
5) Command P.U. Activation;
6) Ullage Case Jettison;
7) I.G.M. Initiation;
8) E.M.R. Shift sensed by I.G.M.;
9) Guidance Cutoff Signal;
10) Orbit Insertion.

TABLE 2C (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

S-IVB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	MASS (LB)	THRUST (TOTAL) (LB)	LONGITUDINAL ACCELERATION (FT/S²)	DYNAMIC PRESSURE (LB/FT2)	CENTRAL RANGE ANGLE (DEG)	PITCH ATT. COMMAND (DEG)	PITCH ANGLE OF ATTACK (DEG)
1)	143.52	296213.	8749.	0.877	9.	1.096	-59.429	-0.975
2)	144.84	296139.	8625.	0.876	7.	1.121	-59.429	-0.765
3)	147.15	295886.	85627.	9.268	5.	1.165	-59.429	-0.647
	148.14	295643.	179392.	19.485	5.	1.182	-59.429	-0.535
4)	148.14	295643.	179392.	19.485	5.	1.182	-59.429	-0.535
	150.00	294800.	196770.	21.446	3.	1.217	-59.429	0.075
5)	150.84	294416.	196761.	21.477	3.	1.233	-59.429	0.384
6)	155.44	292205.	220493.	24.265	2.	1.320	-59.429	1.540
7)	159.25	290017.	220673.	24.474	1.	1.393	-59.429	2.347
	170.00	284401.	222609.	25.182	0.	1.603	-64.534	-0.288
	190.00	273863.	224317.	26.253	0.	2.011	-66.132	3.317
	210.00	263288.	224567.	27.442	0.	2.443	-67.318	6.547
	230.00	252735.	224401.	28.567	0.	2.900	-68.518	8.839
	250.00	242192.	224100.	29.770	0.	3.382	-69.742	11.306
	270.00	231657.	224352.	31.159	0.	3.893	-71.178	13.026
	290.00	221145.	224007.	32.590	0.	4.433	-72.435	14.266
	310.00	210624.	224142.	34.239	0.	5.005	-73.693	15.532
	330.00	200116.	224001.	36.014	0.	5.609	-75.144	16.331
	350.00	189606.	224208.	38.045	0.	6.249	-76.717	16.796
	370.00	179093.	223856.	40.215	0.	6.927	-78.218	17.092
	390.00	168604.	223326.	42.616	0.	7.645	-79.751	17.184
	410.00	158112.	223587.	45.497	0.	8.407	-81.435	16.954
	430.00	147613.	223607.	48.737	0.	9.215	-83.104	16.571
	450.00	137129.	222715.	52.254	0.	10.074	-84.699	16.161
	470.00	126678.	220903.	56.104	0.	10.987	-86.419	15.472
8)	475.75	123766.	211020.	54.855	0.	11.261	-86.772	15.377
	490.00	117050.	194288.	53.404	0.	11.959	-87.966	14.931
	510.00	108177.	187988.	55.910	0.	12.986	-88.953	14.776
	530.00	99471.	186328.	60.266	0.	14.074	-90.868	13.908
	550.00	90868.	183704.	65.043	0.	15.225	-92.810	12.805
	570.00	82345.	183156.	71.561	0.	16.445	-95.463	11.000
	590.00	73868.	180831.	78.760	0.	17.741	-99.046	7.753
9)	598.15	70446.	180233.	82.314	0.	18.293	-98.060	9.367
10)	608.15	70205.	360.	0.165	0.	18.979	-98.060	10.040

1) Separation Completed;
2) J-2 Start Command;
3) Terminate Ullage Burn;
4) 90% Thrust Level;
5) Command P.U. Activation;
6) Ullage Case Jettison;
7) I.G.M. Initiation;
8) E.M.R. Shift sensed by I.G.M.;
9) Guidance Cutoff Signal;
10) Orbit Insertion.

TABLE 2C (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

S-IVB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	ALTITUDE (FT)	RANGE (NM)	VELOCITY VECTOR AZIMUTH SPACE FIXED (DEG)	VELOCITY VECTOR AZIMUTH EARTH FIXED (DEG)	LONGITUDE (POS. EAST) (DEG)	GEOCENTRIC DECLINATION (DEG)	GEODETIC LATITUDE (DEG)
1)	143.52	208593.	33.891	75.644	72.221	-79.955	28.546	28.706
2)	144.84	213260.	35.100	75.657	72.236	-79.933	28.552	28.712
3)	147.19	221437.	37.249	75.679	72.263	-79.894	28.563	28.723
	148.14	224702.	38.119	75.683	72.273	-79.878	28.567	28.727
4)	148.14	224702.	38.119	75.683	72.273	-79.878	28.567	28.727
	150.00	231031.	39.824	75.683	72.292	-79.848	28.576	28.736
5)	150.84	233888.	40.603	75.683	72.300	-79.834	28.580	28.740
6)	155.44	249238.	44.879	75.679	72.342	-79.756	28.601	28.761
7)	159.25	261673.	48.464	75.675	72.378	-79.691	28.619	28.779
	170.00	295501.	58.833	75.753	72.589	-79.504	28.671	28.831
	190.00	353131.	79.145	75.977	73.068	-79.135	28.771	28.931
	210.00	404009.	100.862	76.235	73.565	-78.740	28.875	29.035
	230.00	448384.	124.062	76.533	74.089	-78.316	28.983	29.142
	250.00	486514.	148.830	76.843	74.607	-77.862	29.094	29.254
	270.00	518660.	175.256	77.163	75.120	-77.376	29.209	29.369
	290.00	545091.	203.443	77.492	75.626	-76.855	29.327	29.488
	310.00	566087.	233.499	77.828	76.126	-76.298	29.449	29.610
	330.00	581966.	265.546	78.193	76.647	-75.702	29.575	29.736
	350.00	593070.	299.714	78.577	77.175	-75.064	29.704	29.865
	370.00	599764.	336.152	78.980	77.713	-74.382	29.836	29.997
	390.00	602456.	375.016	79.405	78.264	-73.651	29.970	30.132
	410.00	601607.	416.481	79.853	78.831	-72.869	30.107	30.270
	430.00	597721.	460.751	80.328	79.417	-72.032	30.247	30.410
	450.00	591380.	508.052	80.833	80.025	-71.134	30.387	30.551
	470.00	583265.	558.630	81.369	80.659	-70.170	30.528	30.693
8)	475.75	580706.	573.812	81.530	80.846	-69.880	30.569	30.733
	490.00	574048.	612.662	81.941	81.319	-69.137	30.669	30.834
	510.00	564133.	670.108	82.547	82.006	-68.036	30.808	30.973
	530.00	554351.	731.114	83.190	82.725	-66.863	30.943	31.109
	550.00	545704.	795.951	83.873	83.480	-65.612	31.073	31.239
	570.00	539191.	864.937	84.601	84.276	-64.277	31.195	31.362
	590.00	535771.	938.481	85.376	85.115	-62.850	31.309	31.475
9)	598.15	535411.	969.870	85.707	85.472	-62.240	31.351	31.518
10)	608.15	535491.	1008.935	86.125	85.913	-61.480	31.400	31.567

1) Separation Completed;
2) J-2 Start Command;
3) Terminate Ullage Burn;
4) 90% Thrust Level;
5) Command P.U. Activation
6) Ullage Case Jettison;
7) I.G.M. Initiation;
8) E.M.R. Shift sensed by I.G.M.;
9) Guidance Cutoff Signal;
10) Orbit Insertion.

TABLE 20 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

S-IVB STAGE FLIGHT DATA

	FLIGHT TIME (SEC)	VEHICLE ATTITUDE ANGLE PITCH (DEG)	YAW (DEG)	ROLL (DEG)	VEHICLE ATTITUDE RATE PITCH (DEG/S)	YAW (DEG/S)	ROLL (DEG/S)	VEHICLE ATTITUDE ERROR PITCH (DEG)	YAW (DEG)	ROLL (DEG)
1)	143.52	-59.460	-0.084	-0.004	-0.002	-0.000	-0.003	-0.031	-0.084	-0.004
2)	144.84	-59.539	-0.090	-0.012	-0.109	-0.010	-0.008	-0.109	-0.090	-0.012
3)	147.19	-59.940	-0.145	-0.039	-0.186	-0.056	-0.018	-0.511	-0.145	-0.039
	148.14	-60.041	-0.233	-0.067	-0.010	-0.123	-0.041	-0.612	-0.233	-0.067
4)	148.14	-60.041	-0.233	-0.067	-0.010	-0.123	-0.041	-0.612	-0.233	-0.067
	150.00	-59.846	-0.458	-0.167	0.155	-0.088	-0.058	-0.416	-0.458	-0.167
5)	150.84	-59.725	-0.514	-0.213	0.127	-0.046	-0.052	-0.295	-0.514	-0.213
6)	155.44	-59.584	-0.506	-0.364	-0.015	0.008	-0.019	-0.154	-0.506	-0.364
7)	159.25	-59.609	-0.501	-0.412	0.003	-0.005	-0.007	-0.179	-0.501	-0.412
	170.00	-64.668	2.948	0.016	-0.027	-0.023	-0.004	-0.134	-0.498	0.016
	190.00	-66.272	3.024	-0.012	-0.054	0.004	-0.003	-0.140	-0.526	-0.012
	210.00	-67.446	3.699	-0.038	-0.066	0.018	-0.002	-0.128	-0.563	-0.038
	230.00	-68.654	3.807	-0.091	-0.075	0.001	-0.002	-0.137	-0.556	-0.091
	250.00	-69.898	3.803	-0.147	-0.061	-0.001	-0.003	-0.156	-0.573	-0.147
	270.00	-71.377	3.792	-0.193	-0.056	-0.000	-0.003	-0.199	-0.596	-0.193
	290.00	-72.888	3.118	-0.263	-0.120	-0.088	-0.003	-0.453	-1.358	-0.263
	310.00	-74.138	3.780	-0.281	-0.063	0.005	-0.002	-0.445	-1.275	-0.281
	330.00	-75.613	3.800	-0.323	-0.072	0.000	-0.002	-0.469	-1.309	-0.323
	350.00	-77.186	3.780	-0.361	-0.075	-0.003	-0.002	-0.470	-1.359	-0.361
	370.00	-78.719	3.760	-0.398	-0.079	-0.001	-0.002	-0.501	-1.405	-0.398
	390.00	-80.264	3.741	-0.433	-0.080	-0.001	-0.002	-0.512	-1.451	-0.433
	410.00	-81.964	3.719	-0.457	-0.083	0.000	-0.001	-0.529	-1.500	-0.457
	430.00	-83.668	3.698	-0.478	-0.081	-0.001	-0.001	-0.565	-1.547	-0.478
	450.00	-85.266	3.668	-0.503	-0.081	-0.002	-0.001	-0.566	-1.601	-0.503
	470.00	-87.023	3.646	-0.515	-0.085	-0.001	-0.001	-0.604	-1.655	-0.515
8)	475.75	-87.414	3.633	-0.525	-0.055	-0.002	-0.003	-0.642	-1.673	-0.525
	490.00	-88.585	3.610	-0.537	-0.109	-0.002	0.001	-0.620	-1.706	-0.537
	510.00	-89.743	3.572	-0.579	0.008	-0.003	-0.006	-0.790	-1.749	-0.579
	530.00	-91.508	3.535	-0.580	-0.106	-0.001	0.001	-0.640	-1.803	-0.580
	550.00	-93.461	3.495	-0.564	-0.110	-0.001	0.002	-0.651	-1.851	-0.564
	570.00	-96.085	3.454	-0.507	-0.145	-0.002	0.004	-0.621	-1.894	-0.507
	590.00	-100.182	3.351	-0.383	0.180	0.010	-0.004	-1.135	-1.950	-0.383
9)	598.15	-98.901	3.396	-0.414	0.004	-0.002	-0.000	-0.841	-1.949	-0.414
10)	608.15	-98.903	3.380	-0.414	-0.000	-0.001	0.000	-0.843	-1.965	-0.414

1) Separation Completed;
2) J-2 Start Command;
3) Terminate Ullage Burn;
4) 90% Thrust Level;
5) Command P.U. Activation;
6) Ullage Case Jettison;
7) I.G.M. Initiation;
8) E.M.R. Shift sensed by I.G.M.;
9) Guidance Cutoff Signal;
10) Orbit Insertion.

TABLE 3C-1
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)
ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	SPACE FIXED RADIUS (FT)	SPACE FIXED VELOCITY (FT/S)	PATH ANGLE * (DEG)	SPACE FIXED POSITION AND VELOCITY VECTORS X (FT)	Y (FT)	Z (FT)	DX (FT/S)	DY (FT/S)	DZ (FT/S)
1)	608.15	21442117.	25684.37	0.008	20281297.	479395.	6942881.	-8332.33	1343.48	24258.08
	638.60	21442297.	25687.82	0.019	20014209.	519998.	7676792.	-9209.18	1323.23	23943.77
2)	638.60	21442297.	25687.82	0.019	20014209.	519998.	7676792.	-9209.18	1323.23	23943.77
	643.35	21442339.	25687.76	0.021	19970143.	526275.	7790400.	-9344.80	1319.88	23891.28
3)	643.35	21442339.	25687.76	0.021	19970143.	526275.	7790400.	-9344.80	1319.88	23891.28
	688.35	21442909.	25687.01	0.036	19520958.	584923.	8853723.	-10614.09	1286.06	23356.15
	688.35	21442909.	25687.01	0.036	19520958.	584923.	8853723.	-10614.09	1286.06	23356.15
	724.46	21443583.	25686.20	0.048	19119629.	630831.	9688607.	-11610.53	1256.24	22877.90
	724.46	21443583.	25686.20	0.048	19119629.	630831.	9688607.	-11610.53	1256.24	22877.90
	800.00	21445614.	25683.90	0.072	18165917.	723151.	11375010.	-13622.70	1186.36	21741.15
	992.00	21454414.	25674.48	0.131	15097407.	930762.	15214923.	-18199.98	966.75	18083.27
	1184.00	21467986.	25660.24	0.183	11238494.	1091120.	18258700.	-21820.04	696.27	13485.14
	1198.35	21469171.	25659.00	0.186	10923744.	1100954.	18449527.	-22046.55	674.38	13110.25
	1198.35	21469171.	25659.00	0.186	10923744.	1100954.	18449527.	-22046.55	674.38	13110.25
	1376.00	21485518.	25641.71	0.223	6791939.	1195766.	20348641.	-24294.88	388.94	8191.76
	1568.00	21505977.	25619.67	0.251	1990738.	1239135.	21377759.	-25498.91	60.74	2483.84
	1760.00	21528185.	25595.03	0.264	-2914501.	1218841.	21295138.	-25374.98	-271.33	-3337.97
	1858.40	21539842.	25581.75	0.266	-5385842.	1183933.	20822004.	-24798.41	-437.42	-6266.84
4)	1858.40	21539842.	25581.75	0.266	-5385842.	1183933.	20822004.	-24798.41	-437.42	-6266.84
	1952.00	21550904.	25568.90	0.263	-7668984.	1135797.	20108160.	-23936.64	-590.10	-8969.83
	2144.00	21572915.	25542.56	0.249	-12027171.	994147.	17881541.	-21266.06	-879.20	-14121.06
	2336.00	21593094.	25517.38	0.221	-15765454.	801030.	14733313.	-17508.28	-1123.91	-18529.27
	2528.00	21610459.	25494.78	0.184	-18693403.	566202.	10828114.	-12862.15	-1311.87	-21973.34
	2720.00	21624214.	25476.09	0.137	-20663039.	301517.	6368245.	-7568.93	-1433.62	-24283.48
	2912.00	21633761.	25462.51	0.086	-21575751.	20326.	1583096.	-1899.41	-1483.07	-25348.22
	3000.00	21636617.	25458.24	0.060	-21626510.	-110198.	-652015.	746.57	-1480.74	-25404.18
	3000.00	21636617.	25458.24	0.060	-21626510.	-110198.	-652015.	746.57	-1480.74	-25404.18
	3104.00	21638714.	25454.92	0.030	-21386679.	-263184.	-3282480.	3859.57	-1457.66	-25118.36
	3235.00	21639357.	25453.48	-0.008	-20628574.	-450584.	-6520790.	7691.42	-1397.75	-24223.30
5)	3235.00	21639357.	25453.48	-0.008	-20628574.	-450584.	-6520790.	7691.42	-1397.75	-24223.30
	3296.00	21638895.	25453.87	-0.026	-20106493.	-534684.	-7980277.	9418.61	-1358.44	-23608.13
	3403.40	21636914.	25456.20	-0.057	-18936691.	-676146.	-10445125.	12336.45	-1272.33	-22230.86
6)	3403.40	21636914.	25456.20	-0.057	-18936691.	-676146.	-10445125.	12336.45	-1272.33	-22230.86
	3415.00	21636612.	25456.57	-0.060	-18791821.	-690844.	-10702018.	12640.65	-1261.78	-22060.35
	3415.00	21636612.	25456.57	-0.060	-18791821.	-690844.	-10702018.	12640.65	-1261.78	-22060.35

1) Orbit Insertion;
2) End LOX Vent;
3) Nose Cone Jettison;
4) End LH_2 Vent;
5) LM Separation;
6) Start LH_2 Vent.

* Relative to the local horizontal.

TABLE 3C-1 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)
ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	RADIUS (FT)	SPACE FIXED VELOCITY (FT/S)	PATH ANGLE (DEG)	*	SPACE FIXED POSITION AND VELOCITY VECTORS X (FT)	Y (FT)	Z (FT)	DX (FT/S)	DY (FT/S)	DZ (FT/S)
	3481.00	21634573.	25459.17	-0.079		-17901505.	-772035.	-12124143.	14325.10	-1197.32	-21012.55
	3481.00	21634573.	25459.17	-0.079		-17901505.	-772035.	-12124143.	14325.10	-1197.32	-21012.55
	3488.00	21634325.	25459.49	-0.081		-17800620.	-780391.	-12270816.	14498.88	-1190.04	-20893.82
	3680.00	21625220.	25471.48	-0.132		-14586013.	-987736.	-15934954.	18844.50	-960.43	-17110.20
	3872.00	21611982.	25489.13	-0.177		-10625605.	-1145978.	-18784595.	22234.23	-680.61	-12444.75
	4064.00	21595189.	25511.35	-0.214		-6120627.	-1246744.	-20672101.	24492.05	-364.19	-7129.93
	4256.00	21575587.	25536.79	-0.242		-1301002.	-1284480.	-21497987.	25496.53	-26.78	-1433.08
	4448.00	21554071.	25563.91	-0.258		3585875.	-1256769.	-21216504.	25188.15	314.65	4355.63
	4603.40	21535956.	25586.02	-0.262		7417164.	-1186930.	-20183516.	23979.99	581.95	8903.14
7)	4603.40	21535956.	25586.02	-0.262		7417164.	-1186930.	-20183516.	23979.99	581.95	8903.14
	4640.00	21531668.	25591.15	-0.262		8287543.	-1164517.	-19838681.	23574.19	642.62	9937.39
	4832.00	21509493.	25617.03	-0.252		12559503.	-1011961.	-17432530.	20730.27	940.04	15020.13
	5024.00	21488702.	25640.22	-0.229		16178188.	-806511.	-14120201.	16798.08	1191.12	19334.59
	5216.00	21470428.	25659.65	-0.194		18953100.	-558413.	-10072114.	11979.04	1382.27	22649.71
	5408.00	21455712.	25674.52	-0.147		20737358.	-280236.	-5498274.	6524.05	1502.96	24786.26
	5485.00	21451012.	25679.08	-0.125		21151355.	-163391.	-3569230.	4221.35	1529.87	25283.49
	5485.00	21451012.	25679.08	-0.125		21151355.	-163391.	-3569230.	4221.35	1529.87	25283.49
	5600.00	21445420.	25684.31	-0.091		21435946.	13762.	-637231.	719.96	1546.27	25627.61
	5792.00	21440178.	25688.73	-0.030		21011113.	308392.	4256672.	-5126.34	1509.42	25126.74
	5984.00	21440310.	25687.73	0.033		19484567.	588337.	8927017.	-10705.05	1393.91	23309.19
	6148.40	21444701.	25682.65	0.086		17361070.	805271.	12562642.	-15044.98	1236.70	20777.82
8)	6148.40	21444701.	25682.65	0.086		17361070.	805271.	12562642.	-15044.98	1236.70	20777.82
	6176.00	21445813.	25681.43	0.094		16936463.	838976.	13129175.	-15720.85	1205.44	20271.59
	6355.00	21455483.	25671.07	0.146		13758012.	1034648.	16431201.	-19656.50	972.46	16482.72
	6355.00	21455483.	25671.07	0.146		13758012.	1034648.	16431201.	-19656.50	972.46	16482.72
	6368.00	21456343.	25670.16	0.149		13500829.	1047163.	16643488.	-19909.23	953.67	16176.22
	6560.00	21471251.	25654.40	0.196		9358422.	1201961.	19287038.	-23051.01	651.62	11241.65
	6566.60	21471831.	25653.79	0.197		9205998.	1206225.	19360634.	-23138.26	640.53	11060.17
	6566.60	21471831.	25653.79	0.197		9205998.	1206225.	19360634.	-23138.26	640.53	11060.17
	6748.40	21489261.	25635.22	0.230		4816632.	1294027.	20902485.	-24959.72	321.53	5837.25
9)	6748.40	21489261.	25635.22	0.230		4816632.	1294027.	20902485.	-24959.72	321.53	5837.25
	6752.00	21489631.	25634.82	0.230		4726734.	1295173.	20923307.	-24984.15	315.00	5730.35
	6944.00	21510397.	25612.14	0.251		-151804.	1321828.	21469208.	-25612.03	-38.67	-66.17
	7136.00	21532358.	25587.35	0.258		-5022896.	1280407.	20899127.	-24908.07	-391.04	-5843.57
	7329.00	21554303.	25561.59	0.252		-9633329.	1172920.	19245770.	-22916.13	-723.90	-11301.42

7) End LH_2 Vent
8) Start LH_2 Vent;
9) End LH_2 Vent.

* Relative to the local horizontal.

TABLE 3C-1 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)
ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	SPACE FIXED RADIUS (FT)	SPACE FIXED VELOCITY (FT/S)	PATH ANGLE* (DEG)	SPACE FIXED POSITION AND VELOCITY VECTORS X (FT)	Y (FT)	Z (FT)	DX (FT/S)	DY (FT/S)	DZ (FT/S)
	7520.00	21575075.	25536.17	0.232	-13747203.	1004775.	16597853.	-19746.73	-1020.18	-16159.27
	7712.00	21593631.	25512.47	0.200	-17152086.	784481.	13094864.	-15569.85	-1264.81	-20170.92
	7904.00	21609091.	25491.85	0.160	-19675496.	523193.	8919302.	-10604.72	-1445.41	-23136.23
	8096.00	21620760.	25475.60	0.112	-21190201.	234128.	4286940.	-5107.62	-1552.93	-24909.97
	8288.00	21628146.	25464.75	0.060	-21620676.	-68100.	-564312.	641.39	-1581.94	-25407.47
	8438.35	21630746.	25460.53	0.018	-21185552.	-304058.	-4355355.	5131.17	-1548.68	-24889.98
	8438.35	21630746.	25460.53	0.018	-21185552.	-304058.	-4355355.	5131.17	-1548.68	-24889.98
	8480.00	21630961.	25460.06	0.006	-20946365.	-368201.	-5386345.	6352.08	-1530.85	-24607.36
	8647.00	21629614.	25461.33	-0.042	-19487371.	-615643.	-9365018.	11064.52	-1422.96	-22887.35
	8647.00	21629614.	25461.33	-0.042	-19487371.	-615643.	-9365018.	11064.52	-1422.96	-22887.35
	8672.00	21629110.	25461.95	-0.049	-19202325.	-650957.	-9933046.	11737.54	-1401.95	-22551.62
	8779.00	21626085.	25465.85	-0.078	-17796951.	-795622.	-12260632.	14496.47	-1298.45	-20896.79
10)	8779.00	21626085.	25465.85	-0.078	-17796951.	-795622.	-12260632.	14496.47	-1298.45	-20896.79
	8824.50	21623505.	25469.21	-0.177	-17111321.	-853536.	-13192806.	15633.81	-1246.56	-20067.66
	8824.50	21623505.	25469.21	-0.177	-17111321.	-853536.	-13192806.	15633.81	-1246.56	-20067.66
	8848.40	21621533.	25471.70	-0.192	-16730869.	-882994.	-13667078.	16200.43	-1218.45	-19618.08
	8848.40	21621533.	25471.70	-0.192	-16730869.	-882994.	-13667078.	16200.43	-1218.45	-19618.08
	8864.00	21620170.	25473.42	-0.200	-16475309.	-901855.	-13970776.	16562.52	-1199.61	-19316.80
	8899.40	21616905.	25477.53	-0.214	-15874741.	-943544.	-14642162.	17362.64	-1155.37	-18609.37
11)	8899.40	21616905.	25477.53	-0.214	-15874741.	-943544.	-14642162.	17362.64	-1155.37	-18609.37
	8909.20	21615966.	25478.72	-0.216	-15703528.	-954805.	-14823548.	17578.41	-1142.79	-18408.11
12)	8909.20	21615966.	25478.72	-0.216	-15703528.	-954805.	-14823548.	17578.41	-1142.79	-18408.11
	8978.40	21608907.	25487.68	-0.241	-14435917.	-1030697.	-16046396.	19037.06	-1049.39	-16914.81
	8978.40	21608907.	25487.68	-0.241	-14435917.	-1030697.	-16046396.	19037.06	-1049.39	-16914.81
	9056.00	21600197.	25498.78	-0.263	-12899966.	-1107793.	-17289655.	20521.63	-936.19	-15105.42
	9089.40	21596228.	25503.85	-0.271	-12204649.	-1138209.	-17780554.	21108.60	-884.91	-14286.02
13)	9089.40	21596228.	25503.85	-0.271	-12204649.	-1138209.	-17780554.	21108.60	-884.91	-14286.02
	9099.40	21595017.	25505.40	-0.273	-11992713.	-1146980.	-17922166.	21277.90	-869.28	-14036.40
14)	9099.40	21595017.	25505.40	-0.273	-11992713.	-1146980.	-17922166.	21277.90	-869.28	-14036.40
	9248.00	21575856.	25529.95	-0.304	-8661916.	-1259164.	-19720695.	23436.25	-623.08	-10106.04
	9348.40	21561924.	25547.78	-0.317	-6253162.	-1311829.	-20593534.	24490.48	-444.58	-7260.02
	9348.40	21561924.	25547.78	-0.317	-6253162.	-1311829.	-20593534.	24490.48	-444.58	-7260.02
	9398.35	21554805.	25556.88	-0.321	-5019595.	-1331755.	-20919841.	24887.20	-353.03	-5801.44
	9398.35	21554805.	25556.88	-0.321	-5019595.	-1331755.	-20919841.	24887.20	-353.03	-5801.44
	9440.00	21548809.	25564.49	-0.324	-3977326.	-1344849.	-21135832.	25151.52	-275.57	-4568.19

10) Start J-2 LOX Purge;
11) End J-2 LOX Purge;
12) Start J-2 LH_2 Purge;
13) End J-2 LH_2 Purge;
14) Start J-2 LH_2 Vent; Start J-2 LOX Vent.

* Relative to local horizontal.

TABLE 3C-1 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)
ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	RADIUS (FT)	SPACE FIXED VELOCITY (FT/S)	PATH ANGLE * (DEG)	SPACE FIXED POSITION AND VELOCITY VECTORS X (FT)	Y (FT)	Z (FT)	DX (FT/S)	DY (FT/S)	DZ (FT/S)
	9556.63	21531840.	25585.65	-0.327	-1015137.	-1364164.	-21464592.	25563.65	-54.95	-1059.21
	9556.63	21531840.	25585.65	-0.327	-1015137.	-1364164.	-21464592.	25563.65	-54.95	-1059.21
	9632.00	21520856.	25599.15	-0.325	913108.	-1362880.	-21458239.	25569.52	89.06	1228.07
	9824.00	21493437.	25632.28	-0.311	5756158.	-1310741.	-20666796.	24658.38	452.21	6983.78
	10016.00	21467867.	25662.13	-0.281	10299089.	-1190539.	-18798423.	22455.44	794.92	12396.22
	10208.00	21445409.	25687.13	-0.238	14303086.	-1007972.	-15947141.	19068.14	1098.91	17176.35
	10400.00	21427204.	25706.06	-0.182	17556403.	-772094.	-12259759.	14669.96	1347.70	21066.03
	10592.00	21414223.	25718.16	-0.117	19986284.	-494869.	-7928417.	9491.62	1527.61	23853.71
	10784.00	21407171.	25723.10	-0.045	21168757.	-190554.	-3180318.	3808.21	1628.56	25387.47
	10976.00	21406444.	25720.96	0.029	21335680.	125065.	1734648.	-2076.65	1644.77	25584.17
	11168.00	21412076.	25712.12	0.102	20378529.	435526.	6557659.	-7848.54	1575.03	24434.26
	11360.00	21423726.	25697.26	0.168	18348743.	724588.	11035155.	-13200.29	1422.82	22001.76
	11552.00	21440686.	25677.22	0.225	15354643.	977107.	14932622.	-17849.24	1196.05	18419.93
	11646.40	21450669.	25665.77	0.248	13575616.	1083739.	16572850.	-19801.43	1060.71	16294.48
	11646.40	21450669.	25665.77	0.248	13575616.	1083739.	16572850.	-19801.43	1060.71	16294.48
	11656.20	21451760.	25664.53	0.250	13380637.	1094061.	16731395.	-19989.94	1045.85	16061.65
15)	11656.20	21451760.	25664.53	0.250	13380637.	1094061.	16731395.	-19989.94	1045.85	16061.65
	11744.00	21461932.	25653.26	0.268	11555216.	1179853.	18047146.	-21552.90	906.63	13883.10
	11936.00	21486206.	25626.53	0.295	7151099.	1322206.	20218077.	-24121.28	569.72	8634.71
	12128.00	21512107.	25597.88	0.306	2373640.	1396703.	21335083.	-25426.13	202.88	2953.34
	12320.00	21538166.	25568.57	0.300	-2527670.	1399411.	21343503.	-25407.22	-174.85	-2862.55
	12512.00	21562939.	25539.92	0.277	-7298463.	1330110.	20246570.	-24073.95	-543.99	-8510.96
	12704.00	21585108.	25513.34	0.240	-11692730.	1192277.	18104569.	-21503.35	-885.68	-13702.26
	12896.00	21603530.	25490.17	0.190	-15485319.	992878.	15031022.	-17834.46	-1182.59	-18173.67
	13088.00	21617320.	25471.73	0.132	-18483077.	741991.	11186323.	-13259.96	-1419.76	-21701.77
	13280.00	21625857.	25459.15	0.068	-20534158.	452283.	6769156.	-8015.44	-1585.27	-24112.41
	13472.00	21628803.	25453.29	0.002	-21535102.	138375.	2006329.	-2367.36	-1670.76	-25287.83
	13664.00	21626098.	25454.67	-0.064	-21435556.	-183875.	-2858545.	3399.75	-1671.76	-25171.15
	13856.00	21617944.	25463.38	-0.126	-20240490.	-498138.	-7576935.	8996.29	-1587.85	-23768.24
	14048.00	21604730.	25479.10	-0.181	-18009930.	-788399.	-11907450.	14140.51	-1422.69	-21147.25
	14221.40	21589119.	25498.65	-0.223	-15198033.	-1017466.	-15299497.	18179.76	-1209.99	-17838.53
16)	14221.40	21589119.	25498.65	-0.223	-15198033.	-1017466.	-15299497.	18179.76	-1209.99	-17838.53
	14240.00	21587151.	25500.94	-0.227	-14856235.	-1039730.	-15627561.	18571.06	-1183.92	-17435.94
	14432.00	21566171.	25527.10	-0.263	-10939056.	-1239028.	-18544584.	22058.79	-882.86	-12816.52
	14598.40	21545736.	25552.68	-0.286	-7079937.	-1361393.	-20303691.	24175.24	-582.80	-8255.76

15) End J-2 LH_2 Vent; End J-2 LOX Vent;
16) Start J-2 LOX Vent; Start J-2 LH_2 Vent.

* Relative to local horizontal.

TABLE 3C-1 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

ORBITAL FLIGHT DATA

FLIGHT TIME (SEC)	SPACE FIXED RADIUS (FT)	SPACE FIXED VELOCITY (FT/S)	PATH ANGLE * (DEG)	SPACE FIXED POSITION AND VELOCITY VECTORS X (FT)	Y (FT)	Z (FT)	DX (FT/S)	DY (FT/S)	DZ (FT/S)
14598.40	21545736.	25552.68	-0.286	-7079937.	-1361393.	-20303691.	24175.24	-582.80	-8255.76
14624.00	21542461.	25556.88	-0.288	-6457875.	-1375691.	-20505633.	24419.72	-534.15	-7519.72
14816.00	21517187.	25589.11	-0.299	-1642404.	-1442197.	-21405885.	25524.29	-155.12	-1813.52
15008.00	21491517.	25621.21	-0.296	3258549.	-1434542.	-21194558.	25304.53	235.05	4008.96
15200.00	21466697.	25651.34	-0.279	7989705.	-1352519.	-19878490.	23761.66	616.14	9643.39
15392.00	21443972.	25677.81	-0.247	12302807.	-1199814.	-17522709.	20967.68	968.04	14790.84
15584.00	21424532.	25699.25	-0.202	15970101.	-983874.	-14247752.	17063.42	1271.85	19174.81
15776.00	21409438.	25714.67	-0.146	18796986.	-715571.	-10223762.	12251.94	1510.98	22557.73
15968.00	21399550.	25723.51	-0.082	20632990.	-408650.	-5661578.	6787.73	1672.24	24755.39
16160.00	21395466.	25725.61	-0.012	21380308.	-79005.	-801355.	962.24	1746.55	25648.21
17)16200.00	21395377.	25725.21	0.002	21394191.	-9049.	225090.	-268.17	1750.60	25664.18

17) Loss of S-IVB/IU Attitude Control.

* Relative to local horizontal.

TABLE 30-2

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	CHI* PITCH (DEG)	CHI* YAW (DEG)	PITCH ATTITUDE (LOCAL HORIZONTAL) (DEG)	THRUST (POUNDS)	WEIGHT (POUNDS)	AXIAL FORCE (POUNDS)	NORMAL FORCE (POUNDS)
1)	608.15	-8.90	-3.38	10.08	360.46	70205.10	0.76	-0.17
	638.60	-8.90	-3.38	12.16	273.76	70022.41	0.81	-0.21
2)	638.60	-8.90	-3.38	12.16	0.00	70022.41	0.81	-0.21
	643.35	-8.90	-3.38	12.49	0.00	70018.54	0.82	-0.22
3)	643.35	-8.90	-3.38	12.49	0.00	68951.54	0.73	-0.17
	688.35	-8.90	-3.38	15.58	0.00	68933.53	0.76	-0.23
	688.35	-8.90	-3.38	15.58	0.00	68933.53	0.76	-0.23
	724.46	-26.96	-2.80	-0.00	0.00	68919.08	0.60	-0.00
	724.46	-26.96	-2.80	-0.00	0.00	68919.08	0.60	-0.00
	800.00	-32.14	-2.65	0.00	0.00	68888.85	0.59	-0.00
	992.00	-45.32	-2.15	0.00	0.00	68812.03	0.54	-0.01
	1184.00	-58.47	-1.55	-0.00	0.00	68735.22	0.49	-0.01
	1198.35	-59.45	-1.50	0.00	0.00	68729.48	0.48	-0.01
	1198.35	-59.45	-1.50	0.00	0.00	68729.48	0.95	-0.02
	1376.00	-71.59	-0.86	0.00	0.00	68658.41	0.84	-0.02
	1568.00	-84.69	-0.12	-0.00	0.00	68581.60	0.72	-0.02
	1760.00	-97.76	0.62	0.00	0.00	68504.79	0.60	-0.02
	1858.40	-104.45	0.99	0.00	0.00	68465.43	0.55	-0.02
4)	1858.40	-104.45	0.99	0.00	0.00	68465.43	0.55	-0.02
	1952.00	-110.81	1.34	0.00	0.00	68464.07	0.50	-0.02
	2144.00	-123.83	1.98	-0.00	0.00	68464.07	0.41	-0.02
	2336.00	-136.84	2.53	0.00	0.00	68464.07	0.34	-0.01
	2528.00	-149.84	2.95	-0.00	0.00	68464.07	0.29	-0.01
	2720.00	-162.83	3.23	-0.00	0.00	68464.07	0.25	-0.01
	2912.00	-175.80	3.34	-0.00	0.00	68464.07	0.23	-0.00
	3000.00	178.26	3.33	0.00	0.00	68464.07	0.22	-0.00
	3000.00	178.26	3.33	0.00	0.00	68464.07	0.22	-0.00
	3104.00	178.38	3.34	7.13	0.00	68464.07	0.22	-0.03
	3235.00	178.54	3.36	16.12	0.00	68464.07	0.22	-0.07
5)	3235.00	178.54	3.36	16.12	0.00	37048.07	0.23	-0.07
	3295.00	178.61	3.36	20.31	0.00	37048.07	0.23	-0.09
	3403.40	178.74	3.37	27.67	0.00	37048.07	0.24	-0.13
6)	3403.40	178.74	3.37	27.67	0.00	37048.07	0.24	-0.13
	3415.00	178.75	3.37	28.47	0.00	37043.89	0.24	-0.13
	3415.00	178.75	3.37	28.47	0.00	37043.89	0.24	-0.13

1) Orbit Insertion;
2) End LOX Vent;
3) Nose Cone Jettison;
4) End LH_2 Vent;
5) LM Separation;
6) Start LH_2 Vent.

* Referenced to the Z_s axis (PASCS-13) measured positive counter clockwise.

TABLE 3C-2 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	CHI * PITCH (DEG)	CHI * YAW (DEG)	PITCH ATTITUDE (LOCAL HORIZONTAL) (DEG)	THRUST (POUNDS)	WEIGHT (POUNDS)	AXIAL FORCE (POUNDS)	NORMAL FORCE (POUNDS)
	3481.00	145.79	2.70	0.00	0.00	37017.48	0.22	-0.00
	3481.00	145.79	2.70	0.00	0.00	37017.48	0.22	-0.00
	3488.00	145.32	2.68	-0.00	0.00	37014.68	0.23	-0.00
	3680.00	132.37	2.17	-0.00	0.00	36937.87	0.25	-0.00
	3872.00	119.41	1.54	0.00	0.00	36861.07	0.28	-0.01
	4064.00	106.45	0.83	0.00	0.00	36784.26	0.33	-0.01
	4256.00	93.46	0.07	0.00	0.00	36707.45	0.40	-0.01
	4448.00	80.45	-0.69	0.00	0.00	36630.64	0.49	-0.02
	4603.40	69.89	-1.29	-0.00	0.00	36568.47	0.59	-0.02
7)	4603.40	69.89	-1.29	-0.00	0.00	36568.47	0.59	-0.02
	4640.00	67.40	-1.42	-0.00	0.00	36568.01	0.61	-0.03
	4832.00	54.33	-2.09	-0.00	0.00	36568.01	0.75	-0.03
	5024.00	41.21	-2.65	-0.00	0.00	36568.01	0.89	-0.03
	5216.00	28.07	-3.08	0.00	0.00	36568.01	1.03	-0.03
	5408.00	14.89	-3.35	0.00	0.00	36568.01	1.16	-0.03
	5485.00	9.60	-3.41	0.00	0.00	36568.01	1.20	-0.03
	5485.00	9.60	-3.41	0.00	0.00	36568.01	1.20	-0.03
	5600.00	9.60	-3.42	7.89	0.00	36568.01	1.28	-0.21
	5792.00	9.60	-3.44	21.06	0.00	36568.01	1.37	-0.57
	5984.00	9.59	-3.46	34.23	0.00	36568.01	1.34	-0.92
	6148.40	9.58	-3.47	45.51	0.00	36568.01	1.19	-1.20
8)	6148.40	9.58	-3.47	45.51	0.00	36568.01	1.19	-1.20
	6176.00	9.58	-3.47	47.40	0.00	36558.13	1.15	-1.24
	6355.00	9.58	-3.48	59.68	0.00	36486.52	0.89	-1.39
	6355.00	9.58	-3.48	59.68	0.00	36486.52	0.89	-1.39
	6368.00	16.10	-3.40	67.07	0.00	36481.32	0.68	-1.46
	6560.00	112.05	1.23	176.25	0.00	36404.51	-1.02	-0.09
	6566.60	115.35	1.42	180.00	0.00	36401.87	-1.02	-0.03
	6566.60	115.35	1.42	180.00	0.00	36401.87	-1.02	-0.03
	6748.40	102.93	0.70	180.00	0.00	36329.14	-0.90	-0.03
9)	6748.40	102.93	0.70	180.00	0.00	36329.14	-0.90	-0.03
	6752.00	102.69	0.69	180.00	0.00	36328.78	-0.89	-0.03
	6944.00	89.60	-0.10	180.00	0.00	36328.78	-0.76	-0.03
	7136.00	76.54	-0.89	180.00	0.00	36328.78	-0.63	-0.03
	7328.00	63.50	-1.64	180.00	0.00	36328.78	-0.52	-0.02

7) End LH_2 Vent;
8) Start LH_2 Vent;
9) End LH_2 Vent.

* Referenced to the Z_s axis (PASCS-13) measured positive counter clockwise.

TABLE 3C-2 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	CHI * PITCH (DEG)	CHI * YAW (DEG)	PITCH ATTITUDE (LOCAL HORIZONTAL) (DEG)	THRUST (POUNDS)	WEIGHT (POUNDS)	AXIAL FORCE (POUNDS)	NORMAL FORCE (POUNDS)
	7520.00	50.47	-2.30	180.00	0.00	36328.78	-0.44	-0.02
	7712.00	37.46	-2.85	180.00	0.00	36328.78	-0.37	-0.01
	7904.00	24.46	-3.25	180.00	0.00	36328.78	-0.31	-0.01
	8096.00	11.47	-3.50	180.00	0.00	36328.78	-0.28	-0.01
	8288.00	-1.51	-3.56	180.00	0.00	36328.78	-0.26	-0.00
	8438.35	-11.67	-3.49	180.00	0.00	36328.78	-0.25	-0.00
	8438.35	-11.67	-3.49	-180.00	0.00	36328.78	-0.25	-0.00
	8480.00	3.52	-3.58	-162.03	0.00	36328.78	-0.24	-0.09
	8647.00	64.33	-1.63	-90.00	0.00	36328.78	-0.17	-0.32
	8647.00	64.33	-1.63	-90.00	0.00	36328.78	-0.17	-0.32
	8672.00	62.65	-1.72	-90.00	0.00	36328.78	-0.17	-0.32
	8779.00	55.44	-2.11	-90.00	0.00	36328.78	-0.18	-0.33
10)	8779.00	55.44	-2.11	-90.00	930.00	36328.78	-0.18	-0.33
	8824.50	52.37	-2.26	-90.00	930.00	34291.39	-0.18	-0.34
	8824.50	52.37	-2.26	-90.00	250.20	34291.39	-0.18	-0.34
	8848.40	50.76	-2.34	-90.00	110.00	34111.24	-0.18	-0.34
	8848.40	50.76	-2.34	-90.00	110.00	34111.24	-0.18	-0.34
	8864.00	49.70	-2.39	-90.00	91.65	33996.73	-0.18	-0.35
	8899.40	47.31	-2.50	-90.00	50.00	33736.88	-0.19	-0.36
11)	8899.40	47.31	-2.50	-90.00	0.00	33736.88	-0.19	-0.36
	8909.20	46.65	-2.53	-90.00	0.00	33735.77	-0.19	-0.36
12)	8909.20	46.65	-2.53	-90.00	75.80	33735.77	-0.19	-0.36
	8978.40	41.98	-2.73	-90.00	40.00	33689.72	-0.20	-0.38
	8978.40	41.98	-2.73	-90.00	40.00	33689.72	-0.20	-0.38
	9056.00	36.73	-2.94	-90.00	28.81	33637.93	-0.22	-0.41
	9089.40	34.47	-3.02	-90.00	24.00	33615.64	-0.23	-0.43
13)	9089.40	34.47	-3.02	-90.00	0.00	33615.64	-0.23	-0.43
	9099.40	33.79	-3.04	-90.00	0.00	33615.52	-0.23	-0.43
14)	9099.40	33.79	-3.04	-90.00	35.00	33615.52	-0.23	-0.43
	9248.00	23.71	-3.34	-90.00	19.48	33577.17	-0.28	-0.52
	9348.40	16.89	-3.49	-90.00	9.00	33551.23	-0.32	-0.59
	9348.40	16.89	-3.49	-90.00	3.06	33551.23	-0.32	-0.59
	9398.35	13.49	-3.54	-90.00	3.06	33538.32	-0.34	-0.64
	9398.35	13.49	-3.54	-90.00	3.06	33538.32	-0.34	-0.64
	9440.00	-13.07	-3.53	-113.68	3.06	33527.56	-0.44	-0.68

10) Start J-2 LOX Purge;
11) End J-2 LOX Purge;
12) Start J-2 LH_2 Purge;
13) End J-2 LH_2 Purge;
14) Start J-2 LH_2 Vent; Start J-2 LOX Vent.

* Referenced to the Z_s axis (PASCS-13) measured positive counter clockwise.

TABLE 3C-2 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)
ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	CHI * PITCH (DEG)	CHI * YAW (DEG)	PITCH ATTITUDE (LOCAL HORIZONTAL) (DEG)	THRUST (POUNDS)	WEIGHT (POUNDS)	AXIAL FORCE (POUNDS)	NORMAL FORCE (POUNDS)
	9556.63	-87.30	-0.14	-180.00	3.06	33497.43	-0.62	-0.02
	9556.63	-87.30	-0.14	180.00	3.06	33497.43	-0.62	-0.02
	9632.00	-92.43	0.18	180.00	3.06	33477.96	-0.69	-0.03
	9824.00	-105.50	0.99	180.00	3.06	33428.35	-0.92	-0.04
	10016.00	-118.62	1.76	180.00	3.06	33378.75	-1.21	-0.05
	10208.00	-131.77	2.44	180.00	3.06	33329.15	-1.55	-0.06
	10400.00	-144.96	3.00	180.00	3.06	33279.54	-1.90	-0.07
	10592.00	-158.18	3.40	180.00	3.06	33229.94	-2.15	-0.06
	10784.00	-171.42	3.63	180.00	3.06	33180.33	-2.24	-0.05
	10976.00	175.33	3.67	180.00	3.06	33130.73	-2.15	-0.03
	11168.00	162.09	3.51	180.00	3.06	33081.13	-1.93	-0.01
	11360.00	148.87	3.17	180.00	3.06	33031.52	-1.64	-0.01
	11552.00	135.68	2.66	180.00	3.06	32981.92	-1.36	-0.02
	11646.40	129.20	2.36	180.00	3.06	32957.53	-1.23	-0.02
	11646.40	129.20	2.36	180.00	3.06	32957.53	-1.23	-0.02
	11656.20	128.53	2.32	180.00	3.06	32955.91	-1.22	-0.02
15)	11656.20	128.53	2.32	180.00	0.00	32955.91	-1.22	-0.02
	11744.00	122.52	2.01	180.00	0.00	32955.87	-1.11	-0.03
	11936.00	109.40	1.26	180.00	0.00	32955.87	-0.91	-0.03
	12128.00	96.32	0.43	180.00	0.00	32955.87	-0.73	-0.03
	12320.00	83.27	-0.41	180.00	0.00	32955.87	-0.59	-0.02
	12512.00	70.25	-1.24	180.00	0.00	32955.87	-0.49	-0.02
	12704.00	57.25	-2.00	180.00	0.00	32955.87	-0.40	-0.02
	12896.00	44.27	-2.67	180.00	0.00	32955.87	-0.34	-0.01
	13088.00	31.29	-3.20	180.00	0.00	32955.87	-0.30	-0.01
	13280.00	18.32	-3.57	180.00	0.00	32955.87	-0.27	-0.01
	13472.00	5.35	-3.76	180.00	0.00	32955.87	-0.26	-0.01
	13664.00	-7.63	-3.77	180.00	0.00	32955.87	-0.26	-0.00
	13856.00	-20.61	-3.58	180.00	0.00	32955.87	-0.27	-0.00
	14048.00	-33.59	-3.21	180.00	0.00	32955.87	-0.30	-0.00
	14221.40	-45.32	-2.73	180.00	0.00	32955.87	-0.34	-0.01
16)	14221.40	-45.32	-2.73	180.00	4.00	32955.87	-0.34	-0.01
	14240.00	-46.58	-2.67	180.00	4.00	32955.22	-0.35	-0.01
	14432.00	-59.58	-2.00	180.00	4.00	32948.40	-0.43	-0.01
	14598.40	-70.86	-1.32	180.00	4.00	32942.49	-0.52	-0.02

15) End J-2 LH_2 Vent; End J-2 LOX Vent;
16) Start J-2 LOX Vent; Start J-2 LH_2 Vent.

* Referenced to the Z_S axis (PASCS-13) measured positive counter clockwise

TABLE 3C-2 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)
ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	CHI * PITCH (DEG)	CHI * YAW (DEG)	PITCH ATTITUDE (LOCAL HORIZONTAL) (DEG)	THRUST (POUNDS)	WEIGHT (POUNDS)	AXIAL FORCE (POUNDS)	NORMAL FORCE (POUNDS)
	14598.4	-70.86	-1.32	180.00	0.00	32942.49	-0.52	-0.02
	14624.0	-72.60	-1.22	180.00	0.00	32941.58	-0.54	-0.02
	14816.0	-85.64	-0.37	180.00	0.00	32934.80	-0.70	-0.03
	15008.0	-98.71	0.51	180.00	0.00	32928.02	-0.93	-0.04
	15200.0	-111.81	1.36	180.00	0.00	32921.24	-1.22	-0.05
	15392.0	-124.95	2.15	180.00	0.00	32914.45	-1.60	-0.06
	15584.0	-138.13	2.83	180.00	0.00	32907.67	-2.02	-0.07
	15776.0	-151.35	3.36	180.00	0.00	32900.89	-2.39	-0.08
	15968.0	-164.58	3.73	180.00	0.00	32894.11	-2.63	-0.07
	16160.0	-177.84	3.89	180.00	0.00	32887.33	-2.63	-0.05
17)	16200.0	179.40	3.90	180.00	0.00	32885.91	-2.61	-0.04

17) Loss of S-IVB/IU Attitude Control.

* Referenced to the Z_S axis (PASCS-13) measured positive counter clockwise.

TABLE 3C-3

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	ALTITUDE (FT)	CENTRAL RANGE ANGLE (DEG)	VELOCITY VECTOR AZIMUTH SPACE FIXED (DEG)	VELOCITY VECTOR AZIMUTH EARTH FIXED (DEG)	LONGITUDE (POS. EAST) (DEG)	GEOCENTRIC DECLINATION (DEG)	GEODETIC LATITUDE (DEG)
1)	608.15	535490.60	18.979	86.125	85.913	-61.480	31.400	31.567
	638.60	535798.99	21.069	87.405	87.263	-59.161	31.518	31.686
2)	638.60	535798.99	21.069	87.405	87.263	-59.161	31.518	31.686
	643.35	535856.41	21.395	87.605	87.474	-58.799	31.532	31.700
3)	643.35	535856.41	21.395	87.605	87.474	-58.799	31.532	31.700
	688.35	536511.13	24.484	89.507	89.480	-55.363	31.610	31.778
	688.35	536511.13	24.484	89.507	89.480	-55.363	31.610	31.778
	724.46	537172.83	26.962	91.036	91.093	-52.603	31.599	31.766
	724.46	537172.83	26.962	91.036	91.093	-52.603	31.599	31.766
	800.00	538943.67	32.146	94.216	94.447	-46.846	31.361	31.528
	992.00	545748.48	45.316	101.933	102.596	-32.515	29.499	29.660
	1184.00	555789.80	58.473	108.661	109.721	-18.970	26.007	26.155
	1198.35	556668.06	59.456	109.112	110.200	-17.997	25.689	25.836
	1198.35	556668.06	59.456	109.112	110.200	-17.997	25.689	25.836
	1376.00	568993.40	71.613	114.047	115.450	-6.417	21.199	21.326
	1568.00	585224.91	84.730	117.977	119.650	5.195	15.423	15.519
	1760.00	604177.41	97.822	120.469	122.325	16.078	9.008	9.066
	1858.40	614770.82	104.521	121.208	123.121	21.465	5.571	5.607
4)	1858.40	614770.82	104.521	121.208	123.121	21.465	5.571	5.607
	1952.00	625276.59	110.887	121.581	123.525	26.520	2.253	2.267
	2144.00	647627.65	123.925	121.354	123.285	36.834	-4.575	-4.605
	2336.00	670023.45	136.937	119.789	121.607	47.336	-11.215	-11.287
	2528.00	691023.81	149.926	116.852	118.462	58.330	-17.400	-17.506
	2720.00	709087.57	162.895	112.504	113.824	70.076	-22.837	-22.971
	2912.00	722749.18	175.848	106.767	107.728	82.740	-27.212	-27.364
	3000.00	727193.48	178.218	103.714	104.493	88.857	-28.774	-28.931
	3000.00	727193.48	178.218	103.714	104.493	88.857	-28.774	-28.931
	3104.00	730797.09	171.208	99.818	100.370	96.308	-30.206	-30.368
	3235.00	732636.67	162.379	94.580	94.836	105.957	-31.315	-31.481
5)	3235.00	732636.67	162.379	94.580	94.836	105.957	-31.315	-31.481
	3296.00	732434.67	158.268	92.065	92.180	110.513	-31.554	-31.720
	3403.40	730430.91	151.029	87.604	87.471	118.561	-31.533	-31.699
6)	3403.40	730430.91	151.029	87.604	87.471	118.561	-31.533	-31.699
	3415.00	730090.13	150.247	87.124	86.964	119.428	-31.497	-31.663
	3415.00	730090.13	150.247	87.124	86.964	119.428	-31.497	-31.663

1) Orbit Insertion;
2) End LOX Vent;
3) Nose Cone Jettison;
4) End LH_2 Vent;
5) LM Separation;
6) Start LH_2 Vent.

TABLE 3C-3 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)
ORBITAL FLIGHT DATA

FLIGHT TIME (SEC)	ALTITUDE (FT)	CENTRAL RANGE ANGLE (DEG)	VELOCITY VECTOR AZIMUTH SPACE FIXED (DEG)	EARTH FIXED (DEG)	LONGITUDE (POS. EAST) (DEG)	GEOCENTRIC DECLINATION (DEG)	GEODETIC LATITUDE (DEG)
3481.00	727692.48	145.797	84.415	84.103	124.348	-31.168	-31.333
3481.00	727692.48	145.797	84.415	84.103	124.348	-31.168	-31.333
3488.00	727393.32	145.825	84.131	83.803	124.868	-31.121	-31.286
3680.00	715980.00	132.374	76.693	75.939	138.826	-28.951	-29.108
3872.00	699055.70	119.409	70.287	69.146	151.992	-25.246	-25.390
4064.00	677935.99	106.424	65.204	63.737	164.224	-20.305	-20.427
4256.00	654239.43	93.416	61.539	59.820	175.603	-14.452	-14.542
4448.00	629698.30	80.383	59.273	57.393	-173.651	-7.993	-8.045
4603.40	610356.14	69.814	58.437	56.497	-165.219	-2.515	-2.532
7) 4603.40	610356.14	69.814	58.437	56.497	-165.219	-2.515	-2.532
4640.00	605963.94	67.322	58.368	56.423	-163.249	-1.209	-1.217
4832.00	584436.38	54.234	58.802	56.895	-152.880	5.634	5.671
5024.00	566150.00	41.120	60.600	58.828	-142.226	12.273	12.351
5216.00	551728.10	27.983	63.813	62.269	-130.981	18.422	18.535
5408.00	541414.66	14.827	68.489	67.253	-118.887	23.766	23.904
5485.00	538429.12	9.547	70.772	69.678	-113.761	25.605	25.752
5485.00	538429.12	9.547	70.772	69.678	-113.761	25.605	25.752
5600.00	535160.98	1.657	74.589	73.726	-105.804	27.959	28.114
5792.00	532750.35	11.521	81.887	81.440	-91.801	30.662	30.827
5984.00	533916.40	24.702	89.889	89.883	-77.231	31.614	31.781
6148.40	537589.55	35.986	96.775	97.147	-64.730	30.954	31.120
8) 6148.40	537589.55	35.986	96.775	97.147	-64.730	30.954	31.120
6176.00	538440.13	37.880	97.899	98.334	-62.657	30.713	30.878
6355.00	545560.35	50.156	104.756	105.582	-49.568	28.288	28.445
6355.00	545560.35	50.156	104.756	105.582	-49.568	28.288	28.445
6368.00	546184.96	51.047	105.218	106.071	-48.645	28.058	28.214
6560.00	557083.89	64.200	111.350	112.577	-35.551	23.909	24.048
6566.60	557513.49	64.652	111.536	112.775	-35.119	23.744	23.882
6566.60	557513.49	64.652	111.536	112.775	-35.119	23.744	23.882
6748.40	570776.18	77.088	115.987	117.520	-23.669	18.713	18.827
9) 6748.40	570776.18	77.088	115.987	117.520	-23.669	18.713	18.827
6752.00	571065.73	77.334	116.062	117.600	-23.451	18.605	18.718
6944.00	587956.48	90.445	119.316	121.085	-12.207	12.489	12.568
7136.00	607361.03	103.530	121.157	123.066	-1.563	5.877	5.915
7328.00	628586.77	116.589	121.640	123.590	8.785	-0.948	-0.954

7) End LH_2 Vent;
8) Start LH_2 Vent;
9) End LH_2 Vent.

TABLE 3C-3 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

ORBITAL FLIGHT DATA

FLIGHT TIME (SEC)	ALTITUDE (FT)	CENTRAL RANGE ANGLE (DEG)	VELOCITY VECTOR AZIMUTH SPACE FIXED (DEG)	EARTH FIXED (DEG)	LONGITUDE (POS. EAST) (DEG)	GEOCENTRIC DECLINATION (DEG)	GEODETIC LATITUDE (DEG)
7520.00	650612.23	129.622	120.789	122.678	19.155	-7.724	-7.774
7712.00	672129.24	142.631	118.585	120.316	29.858	-14.189	-14.278
7904.00	691646.83	155.617	114.987	116.470	41.184	-20.065	-20.185
8096.00	707645.96	168.587	109.973	111.131	53.358	-25.046	-25.190
8288.00	718762.77	178.455	103.627	104.400	66.473	-28.812	-28.969
8438.35	723373.34	168.315	97.900	98.342	77.325	-30.713	-30.876
8438.35	723373.34	168.315	97.900	98.342	77.325	-30.713	-30.876
8480.00	723961.17	165.507	96.228	96.576	80.399	-31.058	-31.223
8647.00	723213.30	154.244	89.338	89.301	92.879	-31.608	-31.774
8647.00	723213.30	154.244	89.338	89.301	92.879	-31.608	-31.774
8672.00	722671.76	152.558	88.299	88.204	94.754	-31.573	-31.739
8779.00	719110.07	145.340	83.899	83.558	102.739	-31.081	-31.246
10) 8779.00	719110.07	145.340	83.899	83.558	102.739	-31.081	-31.246
8824.50	716124.76	142.270	82.071	81.627	106.100	-30.706	-30.870
8824.50	716124.76	142.270	82.071	81.627	106.100	-30.706	-30.870
8848.40	713898.54	140.657	81.126	80.628	107.854	-30.470	-30.633
8848.40	713898.54	140.657	81.126	80.628	107.854	-30.470	-30.633
8864.00	712355.95	139.604	80.515	79.982	108.994	-30.302	-30.465
8899.40	708641.70	137.214	79.148	78.537	111.565	-29.880	-30.041
11) 8899.40	708641.70	137.214	79.148	78.537	111.565	-29.880	-30.041
8909.20	707569.09	136.552	78.775	78.143	112.273	-29.754	-29.914
12) 8909.20	707569.09	136.552	78.775	78.143	112.273	-29.754	-29.914
8978.40	699449.37	131.877	76.212	75.430	117.215	-28.740	-28.898
8978.40	699449.37	131.877	76.212	75.430	117.215	-28.740	-28.898
9056.00	689341.51	126.631	73.504	72.562	122.630	-27.369	-27.521
9089.40	684714.19	124.371	72.399	71.390	124.915	-26.706	-26.856
13) 9089.40	684714.19	124.371	72.399	71.390	124.915	-26.706	-26.856
9099.40	683300.79	123.695	72.076	71.047	125.594	-26.500	-26.649
14) 9099.40	683300.79	123.695	72.076	71.047	125.594	-26.500	-26.649
9248.00	660898.08	113.630	67.693	66.391	135.382	-23.028	-23.162
9348.40	644669.38	106.818	65.203	63.739	141.681	-20.303	-20.425
9348.40	644669.38	106.818	65.203	63.739	141.681	-20.303	-20.425
9398.35	636423.59	103.426	64.109	62.573	144.726	-18.850	-18.965
9398.35	636423.59	103.426	64.109	62.573	144.726	-18.850	-18.965
9440.00	629511.22	100.596	63.271	61.678	147.223	-17.596	-17.704

10) Start J-2 LOX Purge;
11) End J-2 LOX Purge;
12) Start J-2 LH_2 Purge;
13) End J-2 LH_2 Purge
14) Start J-2 LH_2 Vent; Start J-2 LOX Vent.

TABLE 3C-3 (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	ALTITUDE (FT)	CENTRAL RANGE ANGLE (DEG)	VELOCITY VECTOR AZIMUTH SPACE FIXED (DEG)	EARTH FIXED (DEG)	LONGITUDE (POS. EAST) (DEG)	GEOCENTRIC DECLINATION (DEG)	GEODETIC LATITUDE (DEG)
	9556.63	610170.27	92.662	61.282	59.552	154.032	-13.900	-13.987
	9556.63	610170.27	92.662	61.282	59.552	154.032	-13.900	-13.987
	9632.00	597869.41	87.528	60.273	58.472	158.309	-11.392	-11.464
	9824.00	568176.99	74.426	58.664	56.750	168.898	-4.713	-4.744
	10016.00	542231.76	61.291	58.413	56.484	179.296	2.164	2.178
	10208.00	521387.51	48.128	59.521	57.679	-170.180	8.972	9.030
	10400.00	506459.43	34.940	62.029	60.369	-159.212	15.434	15.531
	10592.00	497737.01	21.735	65.993	64.602	-147.512	21.245	21.372
	10784.00	495033.76	8.520	71.427	70.378	-134.870	26.068	26.216
	10976.00	497833.02	4.701	78.207	77.555	-121.242	29.550	29.712
	11168.00	505429.63	17.915	85.964	85.743	-106.848	31.382	31.549
	11360.00	517073.48	31.118	94.077	94.300	-92.173	31.377	31.544
	11552.00	532066.81	44.303	101.815	102.470	-77.815	29.542	29.704
	11646.40	540475.91	50.777	105.285	106.142	-71.027	28.023	28.179
	11646.40	540475.91	50.777	105.285	106.142	-71.027	28.023	28.179
	11656.20	541384.31	51.449	105.629	106.507	-70.335	27.844	27.999
15)	11656.20	541384.31	51.449	105.629	106.507	-70.335	27.844	27.999
	11744.00	549800.23	57.465	108.564	109.618	-64.250	26.074	26.222
	11936.00	569753.52	70.600	113.971	115.370	-51.686	21.286	21.413
	12128.00	591420.75	83.705	117.922	119.593	-40.071	15.528	15.625
	12320.00	614204.66	96.779	120.436	122.292	-29.193	9.131	9.190
	12512.00	637325.88	109.823	121.572	123.518	-18.764	2.390	2.406
	12704.00	659791.57	122.839	121.373	123.309	-8.470	-4.427	-4.456
	12896.00	680389.26	135.830	119.841	121.656	2.005	-11.063	-11.133
	13088.00	697781.32	148.800	116.942	118.561	12.966	-17.253	-17.358
	13280.00	710616.37	161.756	112.635	113.965	24.678	-22.708	-22.841
	13472.00	717691.38	174.702	106.936	107.908	37.311	-27.113	-27.264
	13664.00	718118.75	172.347	100.013	100.576	50.860	-30.147	-30.309
	13856.00	711470.81	159.396	92.266	92.393	65.068	-31.541	-31.707
	14048.00	697882.09	146.431	84.315	83.998	79.452	-31.152	-31.317
	14221.40	680236.16	134.706	77.527	76.824	92.134	-29.292	-29.452
16)	14221.40	680236.16	134.706	77.527	76.824	92.134	-29.292	-29.452
	14240.00	678076.59	133.448	76.841	76.098	93.462	-29.013	-29.171
	14432.00	653318.27	120.440	70.289	69.259	106.692	-25.323	-25.468
	14598.40	629129.00	109.144	65.866	64.449	117.403	-21.100	-21.226

15) End J-2 LH_2 Vent; End J-2 LOX Vent;

16) Start J-2 LOX Vent; Start J-2 LH_2 Vent.

TABLE 3C-3 (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)
ORBITAL FLIGHT DATA

	FLIGHT TIME (SEC)	ALTITUDE (FT)	CENTRAL RANGE ANGLE (DEG)	VELOCITY VECTOR AZIMUTH SPACE FIXED (DEG)	EARTH FIXED (DEG)	LONGITUDE (POS. EAST) (DEG)	GEOCENTRIC DECLINATION (DEG)	GEODETIC LATITUDE (DEG)
	14598.40	629129.00	109.144	65.866	64.449	117.403	-21.100	-21.226
	14624.00	625268.78	107.405	65.265	63.808	118.990	-20.380	-20.503
	14816.00	595874.17	94.338	61.566	59.858	130.433	-14.509	-14.600
	15008.00	567154.03	81.240	59.280	57.411	141.240	-8.021	-8.073
	15200.00	540991.62	68.110	58.367	56.434	151.702	-1.202	-1.210
	15392.00	518926.02	54.951	58.809	56.914	162.132	5.678	5.715
	15584.00	502019.69	41.767	60.629	58.870	172.852	12.349	12.428
	15776.00	490810.40	28.562	63.880	62.349	-175.831	18.521	18.634
	15968.00	485347.93	15.344	68.607	67.384	-163.657	23.870	24.010
	16160.00	485298.96	2.128	74.765	73.916	-150.491	28.049	28.205
17)	16200.00	485919.38	0.676	76.211	75.445	-147.625	28.740	28.898

17) Loss of S-IVB/IU Attitude Control.

TABLE 4C

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

S-IB STAGE RE-ENTRY DATA

	FLIGHT TIME (SEC)	SPACE FIXED RADIUS (FT)	SPACE FIXED VELOCITY (FT/S)	SPACE FIXED PATH ANGLE (DEG)	SPACE FIXED POSITION X (FT)	SPACE FIXED POSITION Y (FT)	SPACE FIXED POSITION Z (FT)	VELOCITY VECTOR DX (FT/S)	VELOCITY VECTOR DY (FT/S)	VELOCITY VECTOR DZ (FT/S)
1)	143.52	21118250.	7774.20	62.854	21114490.	116395.	381150.	3419.76	388.06	6970.86
2)	145.08	21123695.	7682.84	63.331	21119734.	116984.	391962.	3318.56	369.93	6919.27
	160.00	21171728.	7458.74	66.301	21165589.	122470.	484907.	2835.56	366.65	6888.97
	180.00	21225839.	7225.48	70.482	21216016.	129774.	632496.	2208.15	363.74	6870.18
	200.00	21268313.	7039.40	74.901	21253939.	137018.	769697.	1584.60	360.61	6849.25
	220.00	21299200.	6901.43	79.520	21279416.	144198.	906441.	963.38	357.30	6824.51
	240.00	21318535.	6813.79	84.287	21292485.	151309.	1042651.	342.80	353.79	6795.90
	260.00	21326336.	6778.03	89.139	21293174.	158348.	1178251.	-274.79	350.08	6763.41
3)	264.00	21326513.	6777.19	90.113	21291828.	159746.	1205291.	-398.45	349.31	6756.44
	280.00	21322612.	6794.84	94.003	21281496.	165310.	1313162.	-893.03	346.17	6727.00
	300.00	21307360.	6863.88	98.809	21257452.	172193.	1447305.	-1511.58	342.05	6686.62
	320.00	21280562.	6983.89	103.488	21221027.	178991.	1580600.	-2131.07	337.73	6642.23
	340.00	21242192.	7152.78	107.984	21172199.	185701.	1712966.	-2752.15	333.20	6593.70
	360.00	21192211.	7367.31	112.253	21110929.	192318.	1844317.	-3375.17	328.44	6540.46
	380.00	21130608.	7611.24	116.260	21037215.	198837.	1974497.	-3992.95	323.50	6471.68
	400.00	21058188.	7662.71	119.869	20951991.	205260.	2102193.	-4462.82	319.06	6220.82
	420.00	20989655.	4753.01	120.239	20871962.	211663.	2209532.	-2814.44	324.78	3816.35
	440.00	20963288.	1952.36	112.066	20840134.	218245.	2258457.	-924.14	330.51	1687.74
	460.00	20950542.	1592.75	111.338	20823981.	224830.	2288333.	-737.52	327.84	1373.11
	480.00	20939852.	1472.49	109.560	20810234.	231366.	2314748.	-642.51	326.17	1284.14
	500.00	20930724.	1414.77	107.401	20798143.	237886.	2340065.	-570.51	325.83	1252.97
	520.00	20922804.	1385.40	105.557	20787275.	244400.	2365002.	-519.18	325.53	1242.51
	540.00	20915784.	1367.38	104.064	20777293.	250906.	2389805.	-480.83	325.10	1238.08
	560.00	20909464.	1354.18	102.853	20767991.	257403.	2414529.	-450.90	324.59	1234.97
4)	563.39	20908451.	1353.51	102.667	20766471.	258503.	2418713.	-446.80	324.41	1235.77

1) Physical Separation;
2) Retro-Rocket Burnout;
3) S-IB Stage Apogee;
4) S-IVB Stage Impact.

TABLE 4C (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION 1)

S-IB STAGE RE-ENTRY DATA

	FLIGHT TIME (SEC)	EARTH FIXED POSITION (FT)	EARTH FIXED VELOCITY (FT/S)	EARTH FIXED PATH ANGLE (DEG)	EARTH FIXED X (FT)	EARTH FIXED Y (FT)	EARTH FIXED Z (FT)	EARTH FIXED VECTOR COMPONENTS DX (FT/S)	EARTH FIXED VECTOR COMPONENTS DY (FT/S)	EARTH FIXED VECTOR COMPONENTS DZ (FT/S
1)	143.52	293707.	6643.51	57.729	207572.	-160.	207793.	3496.52	2.42	5648.
2)	145.08	303701.	6547.31	58.218	212936.	-170.	216547.	3396.01	-15.20	5597.
	160.00	396829.	6287.49	61.523	260029.	-387.	299763.	2924.17	-12.51	5566.
	180.00	516153.	6009.86	66.316	312380.	-580.	410893.	2311.86	-6.77	5547.
	200.00	629605.	5785.20	71.520	352527.	-655.	521657.	1703.32	-0.57	5528.
	220.00	737744.	5616.70	77.085	380528.	-600.	632033.	1097.02	6.11	5508.
	240.00	841244.	5508.69	82.927	396418.	-407.	741987.	492.23	13.23	5486.
	260.00	940855.	5464.25	88.931	400223.	-68.	851487.	-111.70	20.80	5463.
3)	264.00	960381.	5463.15	90.140	399535.	18.	873329.	-232.44	22.37	5458.
	280.00	1037393.	5484.75	94.961	391952.	428.	960499.	-715.44	28.81	5437.
	300.00	1131735.	5569.55	100.878	371603.	1087.	1068988.	-1319.64	37.25	5410.
	320.00	1224816.	5716.15	106.557	339160.	1920.	1176920.	-1924.97	46.10	5382.
	340.00	1317617.	5920.52	111.902	294593.	2934.	1284258.	-2532.07	55.37	5351.
	360.00	1411160.	6177.20	116.851	237863.	4138.	1390963.	-3141.35	65.04	5318.
	380.00	1506437.	6467.66	121.377	168959.	5538.	1496922.	-3745.88	74.92	5271.
	400.00	1603321.	6567.34	125.527	88781.	7121.	1600845.	-4207.30	82.11	5042.
	420.00	1684552.	3687.38	130.477	13557.	8567.	1684476.	-2608.88	48.83	2605.
	440.00	1708683.	883.32	146.132	-14832.	9054.	1708595.	-770.77	9.96	431.
	460.00	1713551.	601.45	164.497	-28003.	9166.	1713298.	-590.68	2.44	113.
	480.00	1714964.	496.98	172.716	-38825.	9182.	1714500.	-496.46	-0.16	22.
	500.00	1715276.	423.84	176.628	-47989.	9174.	1714580.	-423.74	-0.46	-9.
	520.00	1715196.	371.69	178.531	-55909.	9167.	1714260.	-371.11	-0.26	-20.
	540.00	1714973.	332.29	179.708	-62915.	9164.	1713795.	-331.31	-0.02	-25.
	560.00	1714663.	301.28	179.089	-69211.	9167.	1713241.	-299.88	0.21	-29.
4)	563.39	1714606.	296.83	179.153	-70219.	9167.	1713143.	-295.48	0.19	-28.

1) Physical Separation;
2) Retro-Rocket Burnout;
3) S-IB Stage Apogee;
4) S-IVB Stage Impact;

TABLE 4C (Cont'd)

AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)

S-IB STAGE RE-ENTRY DATA

	FLIGHT TIME (SEC)	MASS (LB)	THRUST (TOTAL) (LB)	DRAG (LB)	LONGITUDINAL ACCELERATION (FT/SEC2)	DYNAMIC PRESSURE (LB/FT2)	A.M.I. (LB-FT/FT2-RAD)	MACH NO.
1)	143.52	102845.	0.	13015.	-4.072	9.	39991355.	6.52
2)	145.08	101452.	124000.	10181.	-29.764	7.	40041882.	6.49
	160.00	101452.	0.	1090.	-0.346	1.	40210700.	6.86
	180.00	101452.	0.	48.	-0.015	0.	40228171.	6.32
	200.00	101452.	0.	6.	-0.002	0.	40229054.	5.61
	220.00	101452.	0.	2.	-0.000	0.	40229172.	4.74
	240.00	101452.	0.	1.	-0.000	0.	40229187.	4.04
	260.00	101452.	0.	1.	-0.000	0.	40229187.	3.80
3)	264.00	101452.	0.	1.	-0.000	0.	40229187.	3.80
	280.00	101452.	0.	1.	-0.000	0.	40229187.	3.91
	300.00	101452.	0.	1.	-0.000	0.	40229187.	4.44
	320.00	101452.	0.	2.	-0.001	0.	40229252.	5.23
	340.00	101452.	0.	19.	-0.006	0.	40229648.	5.98
	360.00	101452.	0.	336.	-0.107	0.	40235077.	6.89
	380.00	101452.	0.	7180.	-2.277	5.	40362502.	6.51
	400.00	101452.	0.	117000.	-37.105	79.	42593195.	6.08
	420.00	101452.	0.	901528.	-285.903	561.	65106295.	2.79
	440.00	101452.	0.	196662.	-62.369	125.	73701183.	0.94
	460.00	101452.	0.	118615.	-37.617	102.	74639601.	0.62
	480.00	101452.	0.	113554.	-36.015	105.	75353018.	0.49
	500.00	101452.	0.	110610.	-35.078	104.	75963116.	0.40
	520.00	101452.	0.	108202.	-34.315	103.	76484756.	0.34
	540.00	101452.	0.	106702.	-33.839	102.	76943783.	0.30
	560.00	101452.	0.	105551.	-33.474	101.	77353962.	0.27
4)	563.39	101452.	0.	105357.	-33.412	101.	77418990.	0.26

1) Physical Separation;
2) Retro-Rocket Burnout;
3) S-IB Stage Apogee;
4) S-IVB Stage Impact.

TABLE 4C (Cont'd)
AS-204/LM-1 LAUNCH VEHICLE OPERATIONAL FLIGHT TRAJECTORY (REVISION I)
S-IB STAGE RE-ENTRY DATA

	FLIGHT TIME (SEC)	ALTITUDE (FT)	RANGE (NM)	VELOCITY VECTOR AZIMUTH SPACE FIXED (DEG)	VELOCITY VECTOR AZIMUTH EARTH FIXED (DEG)	LONGITUDE (POS. EAST) (DEG)	GEOCENTRIC DECLINATION (DEG)	GEODETIC LATITUDE (DEG)
1)	143.52	208593.	33.891	75.644	72.221	-79.955	28.546	28.706
2)	145.08	214045.	35.309	75.536	72.054	-79.929	28.553	28.713
	160.00	262150.	48.763	75.686	72.210	-79.686	28.622	28.782
	180.00	316353.	66.666	75.889	72.441	-79.363	28.712	28.872
	200.00	358919.	84.464	76.091	72.678	-79.040	28.801	28.961
	220.00	389898.	102.185	76.293	72.919	-78.718	28.888	29.048
	240.00	409321.	119.853	76.496	73.166	-78.397	28.974	29.134
	260.00	417210.	137.490	76.699	73.418	-78.075	29.058	29.219
3)	264.00	417405.	141.016	76.740	73.469	-78.011	29.075	29.236
	280.00	413573.	155.122	76.903	73.675	-77.753	29.141	29.302
	300.00	398406.	172.772	77.109	73.938	-77.430	29.223	29.385
	320.00	371694.	190.462	77.315	74.206	-77.105	29.304	29.466
	340.00	333407.	208.218	77.523	74.480	-76.779	29.384	29.546
	360.00	283508.	226.063	77.733	74.759	-76.450	29.463	29.626
	380.00	221988.	244.010	77.950	75.044	-76.118	29.541	29.704
	400.00	149648.	261.869	78.248	75.332	-75.788	29.617	29.781
	420.00	81179.	276.469	80.227	75.612	-75.517	29.678	29.843
	440.00	54831.	280.786	86.207	75.928	-75.437	29.696	29.861
	460.00	42088.	281.730	88.500	76.023	-75.419	29.699	29.865
	480.00	31400.	282.071	89.360	75.765	-75.413	29.701	29.866
	500.00	22273.	282.206	89.753	76.490	-75.410	29.701	29.867
	520.00	14354.	282.259	89.928	79.909	-75.409	29.701	29.867
	540.00	7333.	282.276	90.027	111.475	-75.409	29.701	29.867
	560.00	1013.	282.269	90.102	240.607	-75.409	29.701	29.867
4)	563.39	0.	282.267	90.096	239.775	-75.409	29.701	29.867

1) Physical Separation;
2) Retro-Rocket Burnout;
3) S-IB Stage Apogee;
4) S-IVB Stage Impact.

DISTRIBUTION

W. H. Mann, Jr.	I-1/1B-E	(1)
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