

APOLLO MISSION PROFILE

CREW SAFETY AND PROCEDURES BRANCH

OCTOBER 1967

APOLLO LUNAR LANDING MISSION
MISSION OBJECTIVE
DEMONSTRATE MANNED INTERPLANETARY FLIGHT

DRM II A

DRM II A:

SATISFIES ALL MISSION REQUIREMENTS

UTILIZES OPERATIONAL PROCEDURES - ABORTS, G&N,
RENDEZVOUS, ENTRY

COMPLIES WITH MISSION GROUND RULES-TRAJECTORY,
ATTITUDE, SYSTEM OPERATIONS, DESIGN, PROCEDURE

PROVIDES BASIS FOR MISSION PLANNING

○ **LAUNCH PHASE**

DAY - SEPTEMBER 17, 1969

AZIMUTH - 90°

ALTITUDE PARKING ORBIT - 100 NM

○ **TRANSLUNAR INJECTION**

INJECTION - ATLANTIC WINDOW, 2nd ORBIT

TIME - 1.68 HRS AFTER LIFTOFF

○ **TRANSLUNAR AND FREE RETURN**

TIME FROM INJECTION TO PERICYNTHION - 61.7 HRS

PERICYNTHION ALTITUDE - 56 NM

TIME FROM INJECTION TO RETURN PERIGEE - 130.3 HRS

PERIGEE ALTITUDE - 29.9 NM

DATA TAKEN FROM MSFC
DRAWING 10M04106, Rev. H

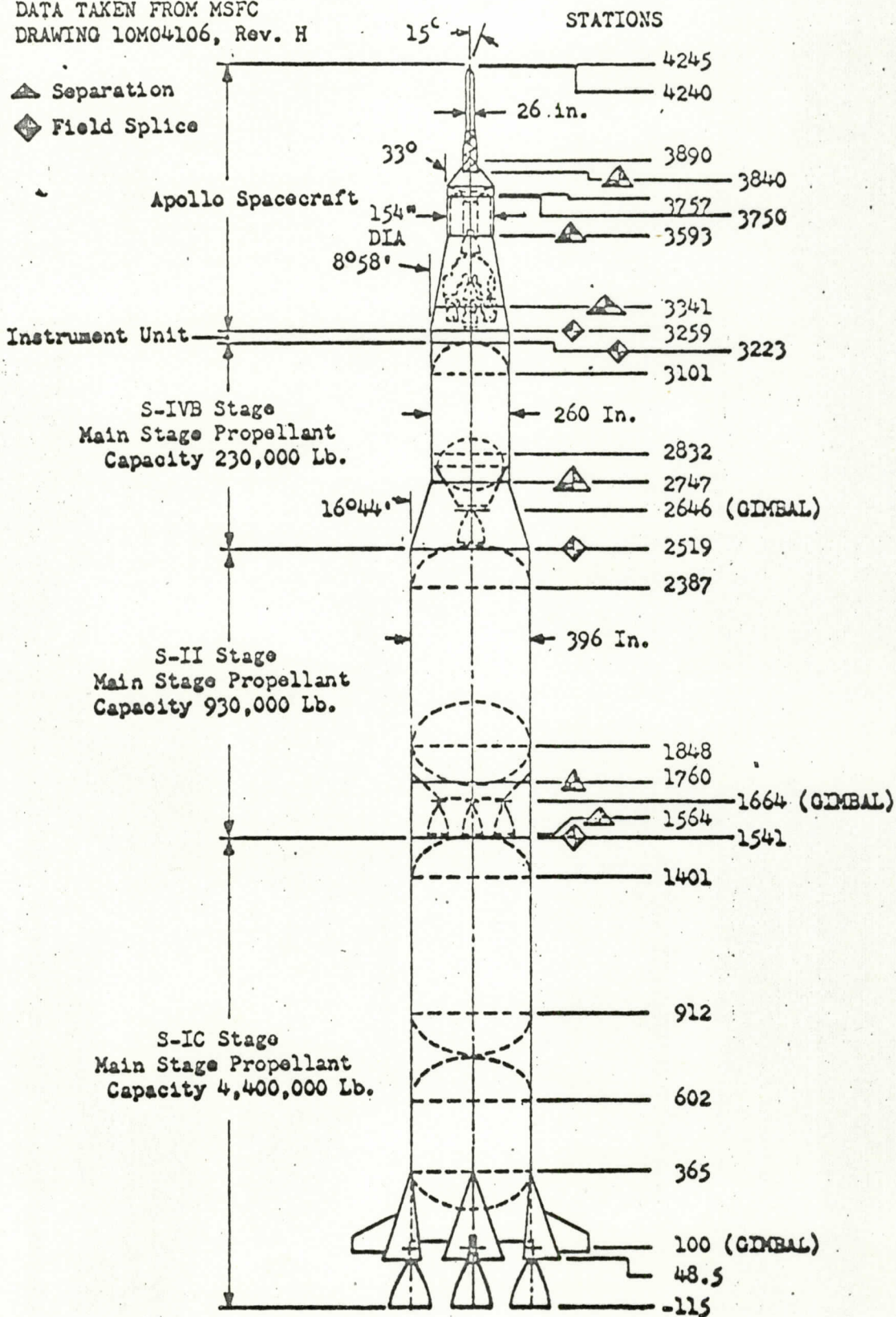


FIGURE 1.- SATURN V VEHICLE CONFIGURATION.

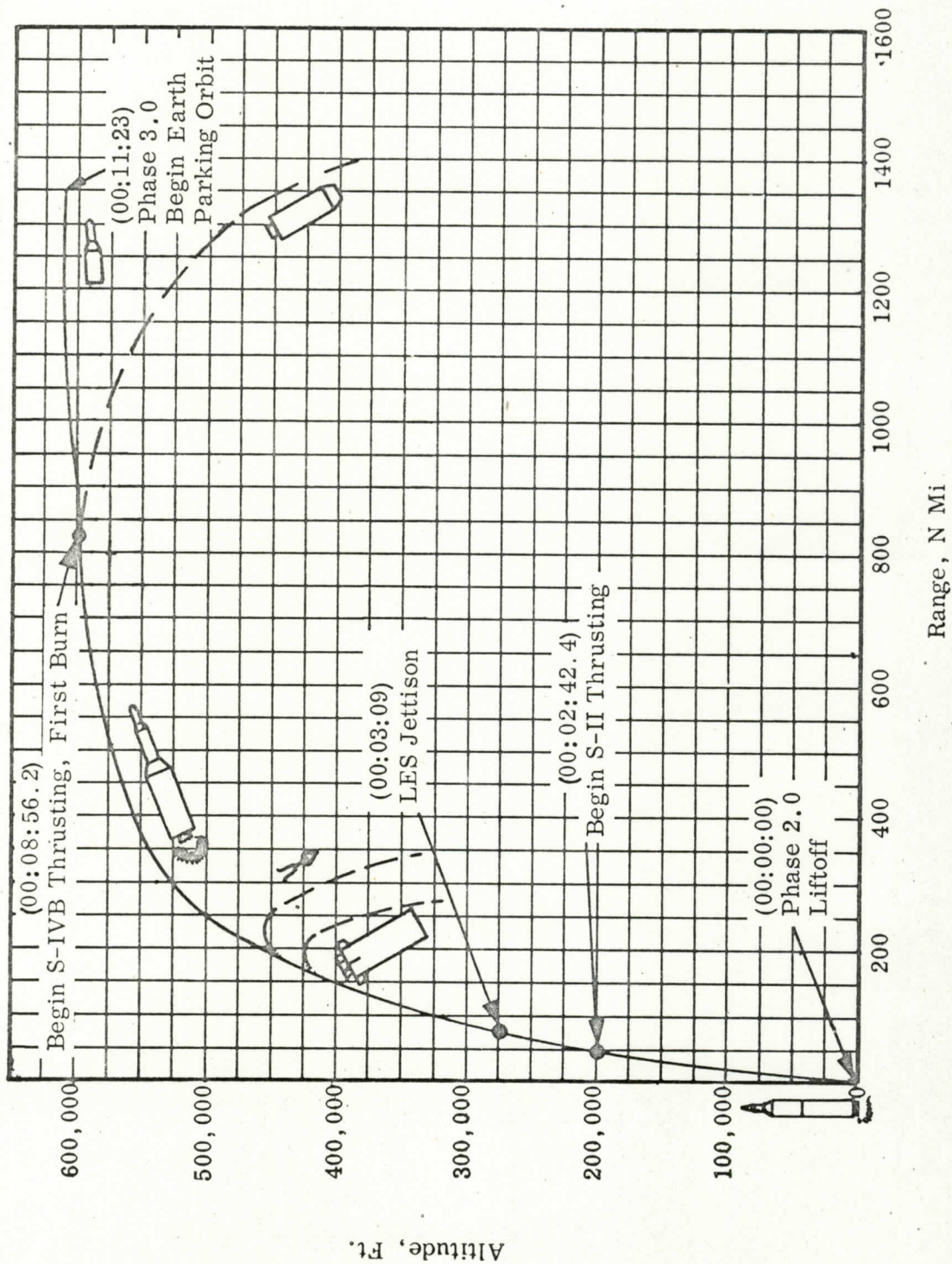
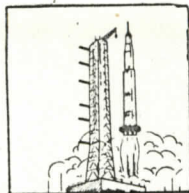
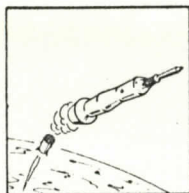


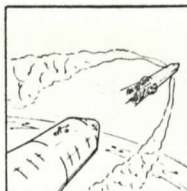
Figure 4.2-1 Earth Ascent Phase Description



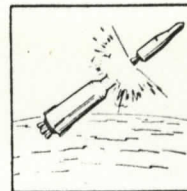
① 2.1(00:00:00)
Liftoff



② 2.2.1 (00:02:34)
Begin S-II
Thrusting



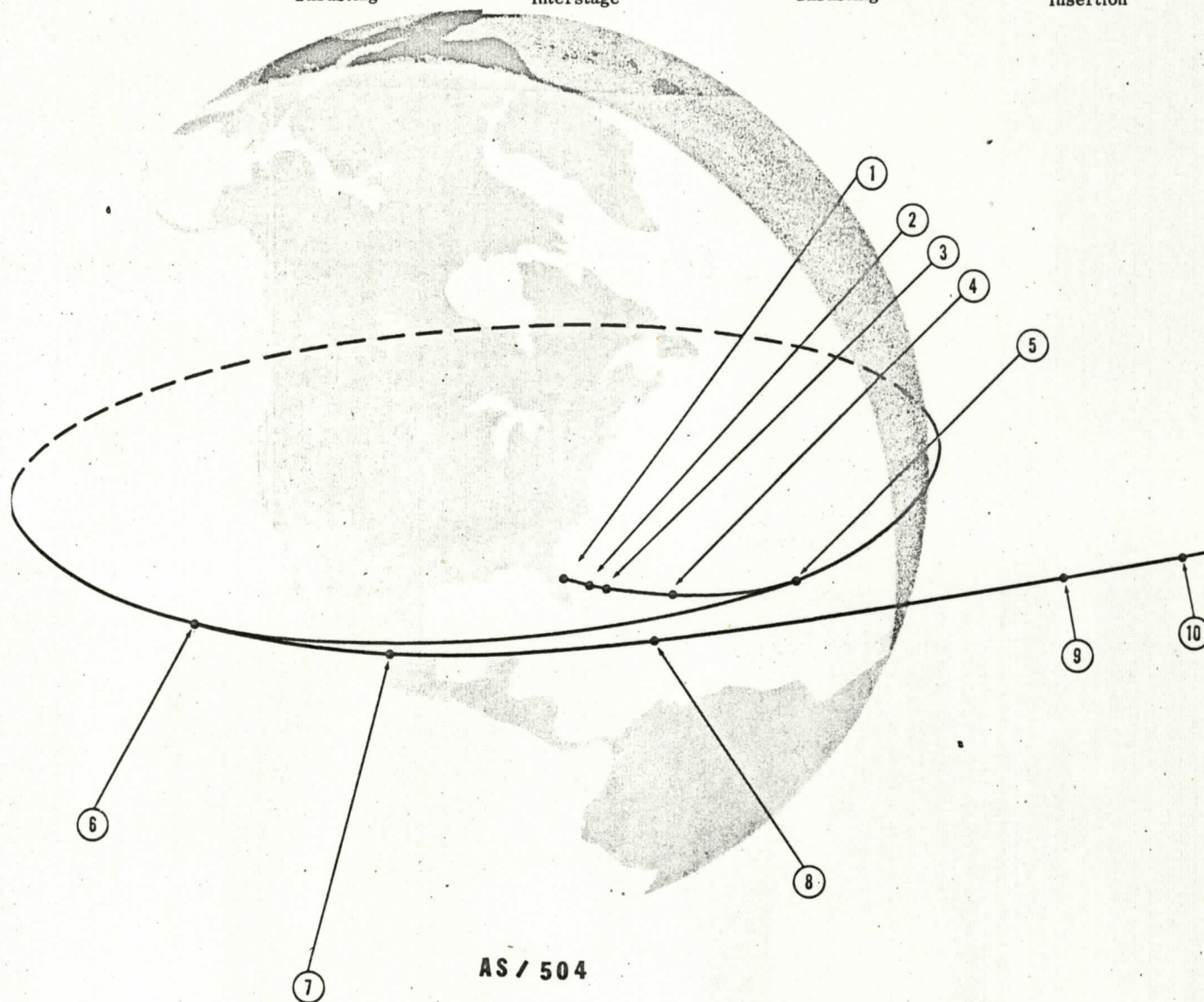
③ 2.2.2(00:02:54)
Jettison LES +
Interstage



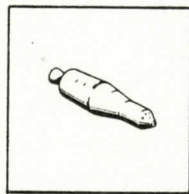
④ 2.3(00:09:04)
Begin S-IVB
Thrusting



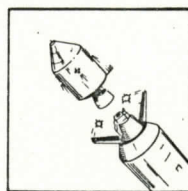
⑤ 3.1(00:11:52)
Earth Orbit
Insertion



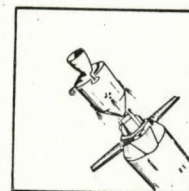
⑥ 4.0(03:00:43)
Begin Translunar
Injection on
Second Orbit



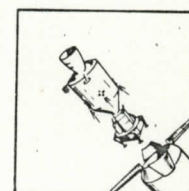
⑦ 5.1(03:05:58)
Begin Initial Coast
To Transposition
& Docking



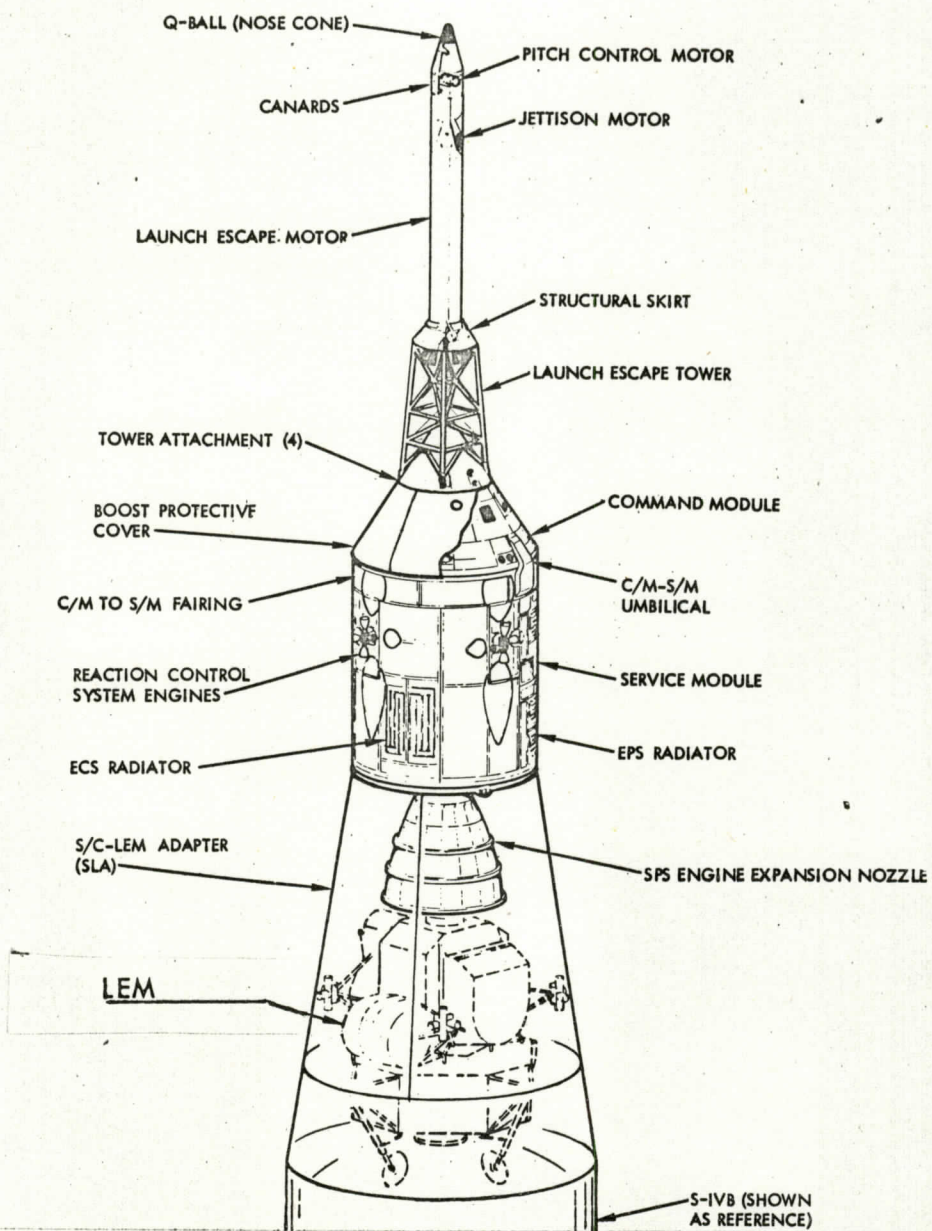
⑧ 5.2(03:20:58)
Begin Transposition
& Docking



⑨ 5.3(03:47:58)
CSM Docked -
Begin Coast -
Thru S-IVB
Jettison



⑩ 6.1(03:50:58)
Jettison SIV B
Begin Coast To
Lunar Orbit
Insertion



LM-CSM STACK

002:41:40 S-IVB Jettison

Relationship of Command and Service Module Axes to LM Axes in the Docked Configuration

OMNI Null

OMNI Null

OMNI
Null

Sunlight (In Trajectory Plane)

Figure 4.5-2 Translunar Transposition and Docking

◦ LUNAR ORBIT INSERTION AND LUNAR ORBITS

INSERTION PLANE CHANGE - 5.7°

ORBITAL ALTITUDE AT INSERTION - 80.9 NM

TIME OF CSM/LEM SEPARATION - 67 HRS, 25 MIN (HOHMANN TRANSFER)

LEM STAY TIME - 34.6 HRS

LEM OUT - OF - PLANE ANGLE AT LIFTOFF - 0.44°

LUNAR LANDING SITE - 0.33° S. LAT, 2.85° E. LONG.

◦ TRANSEARTH THRUST AND TRANSEARTH COAST

TIME OF INJECTION - 108 HRS

TIME FROM INJECTION TO REENTRY - 92.1 HRS

◦ REENTRY

GEOCENTRIC LONG. AND LAT. OF ENTRY - 28.84° LAT.
- 170.4° LONG.

RECOVERY - 158.3° W

- 12.6° N

- 200 HRS, 32 MIN AFTER LIFTOFF

REENTRY RANGE - 2001 NM

REENTRY ALT - 416,550 FT, 68.6 NM

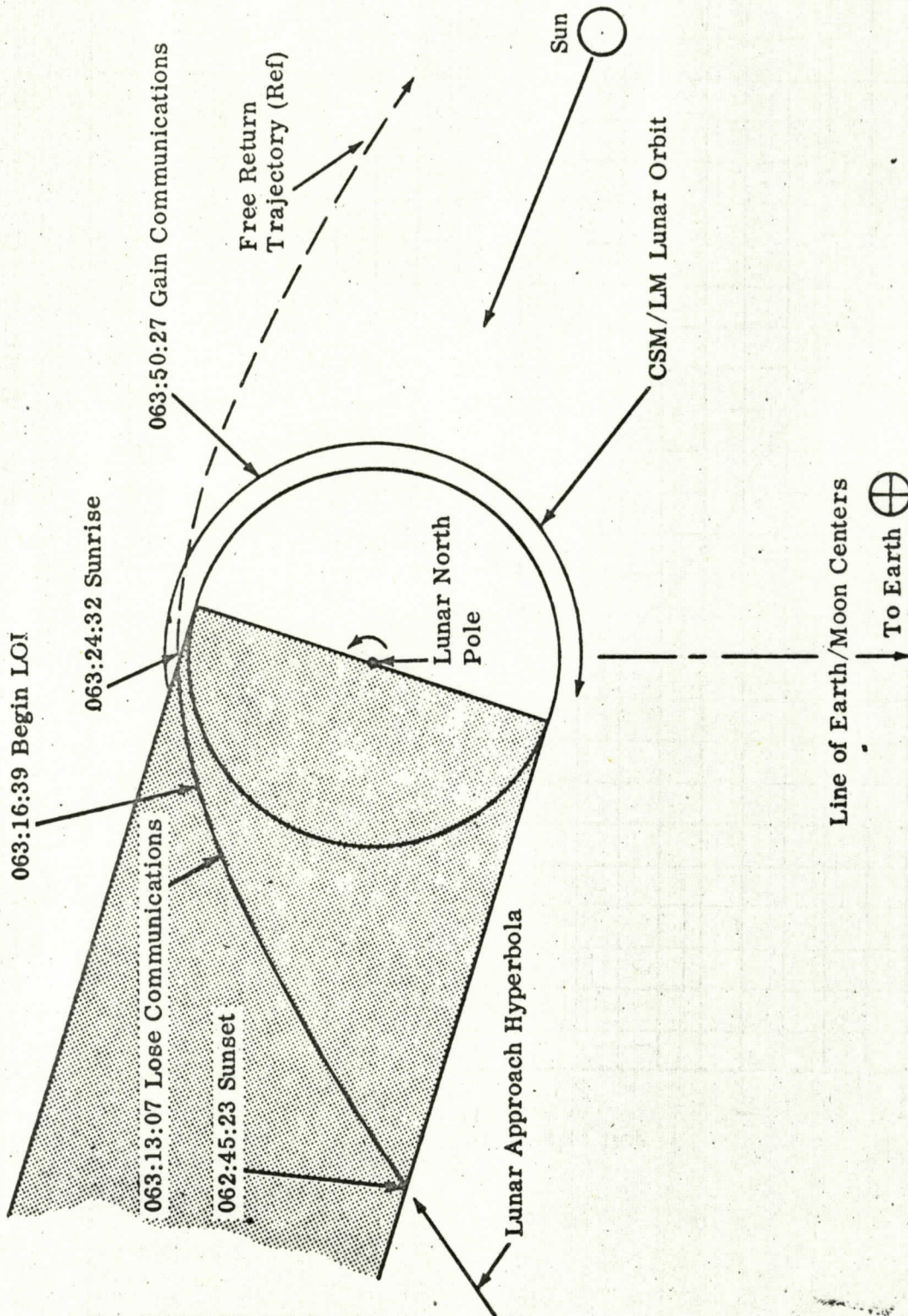


Figure 4.7-4 Lunar Orbit Insertion Lighting/Communications

2-19/20

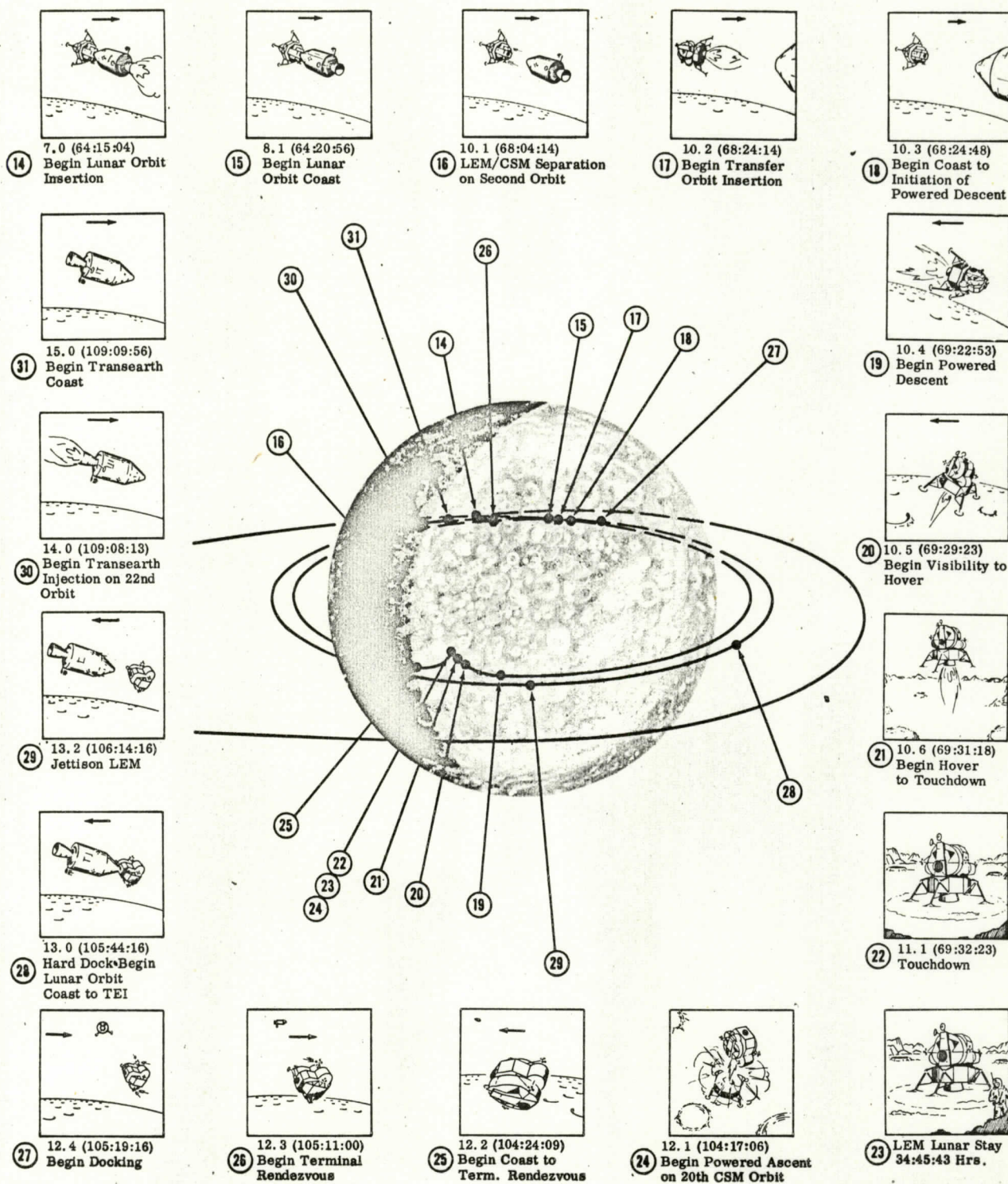
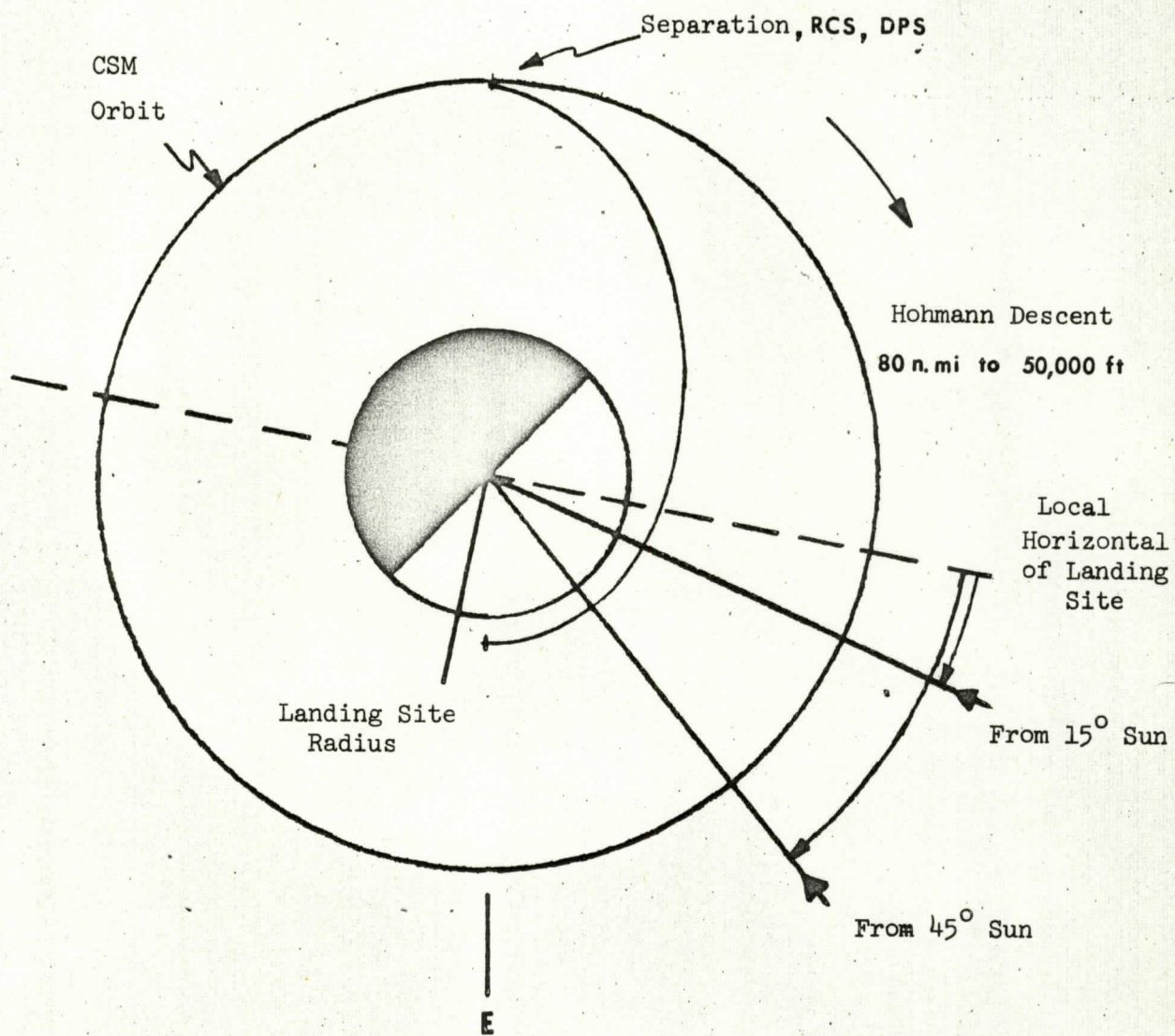


Figure 2.2-2 Lunar Vicinity Mission Description



NOMINAL HOHMANN DESCENT

ABORTS FROM FROM COASTING DESCENT

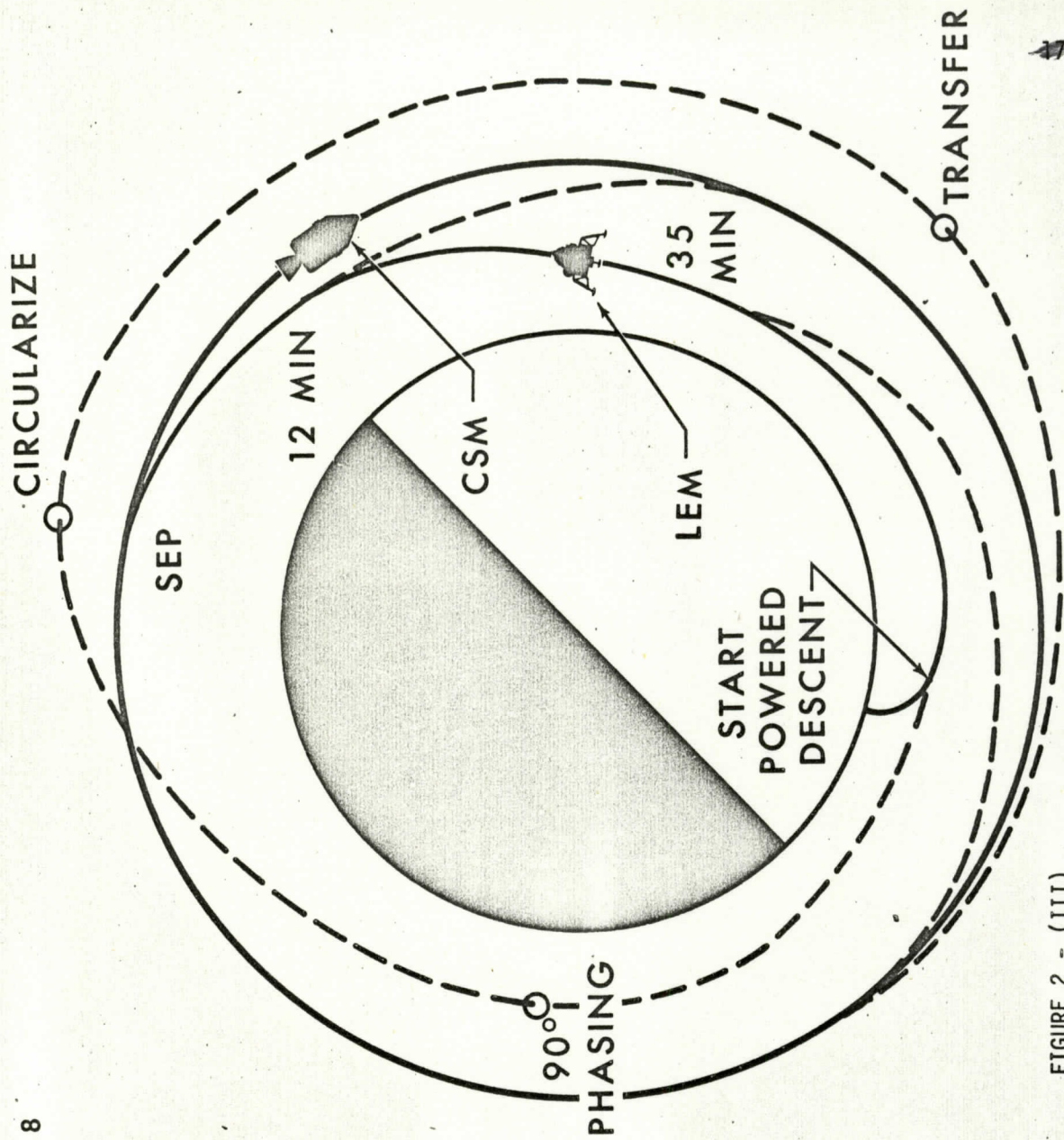
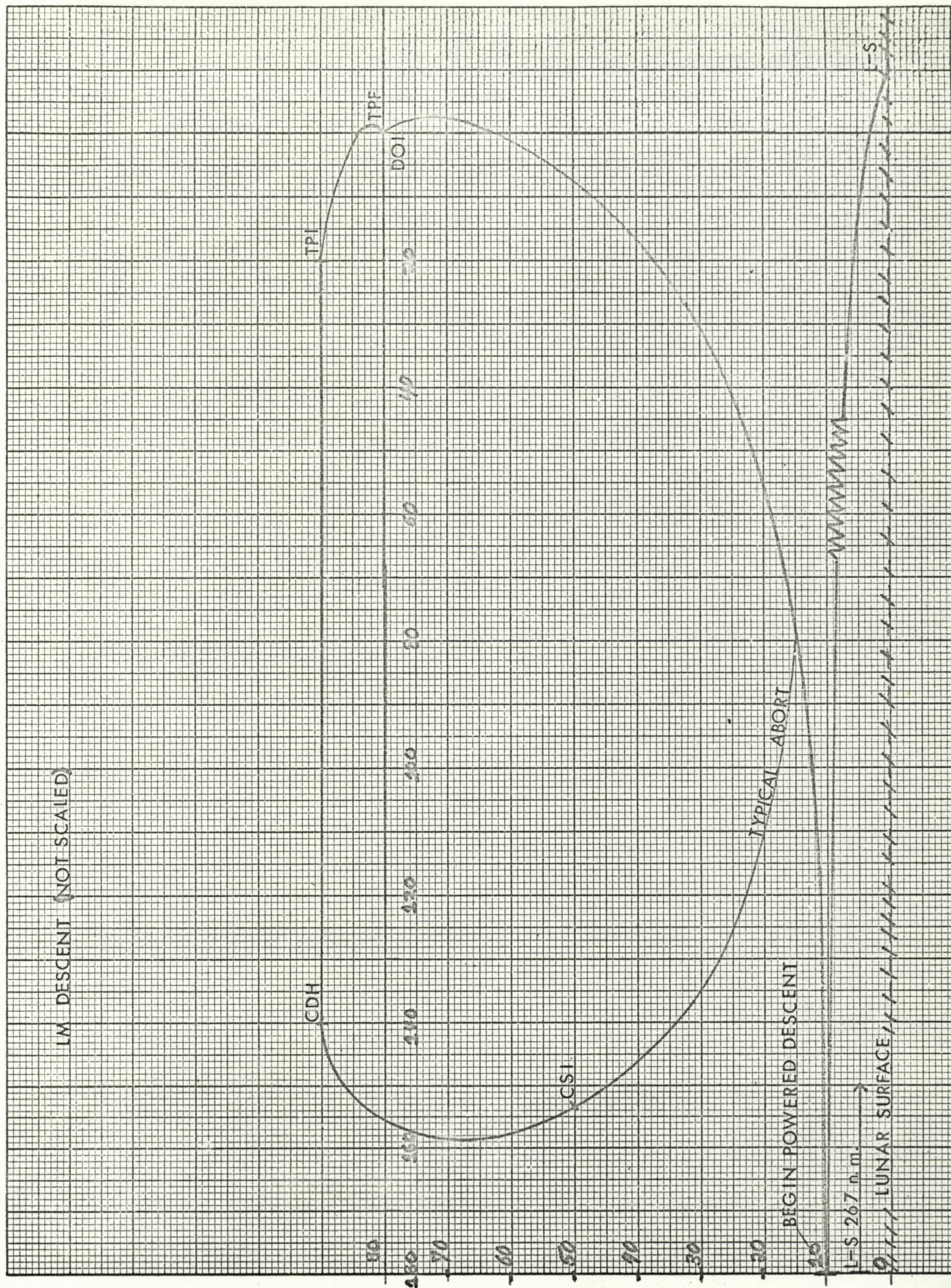


FIGURE 2 - (III)

K&E 10 X 10 TO 1 1/2 INCH 46 1473
7 1/2 X 10 INCHES
MADE IN U.S.A. •
KEUFFEL & ESSER CO.

LM DESCENT (NOT SCALED)



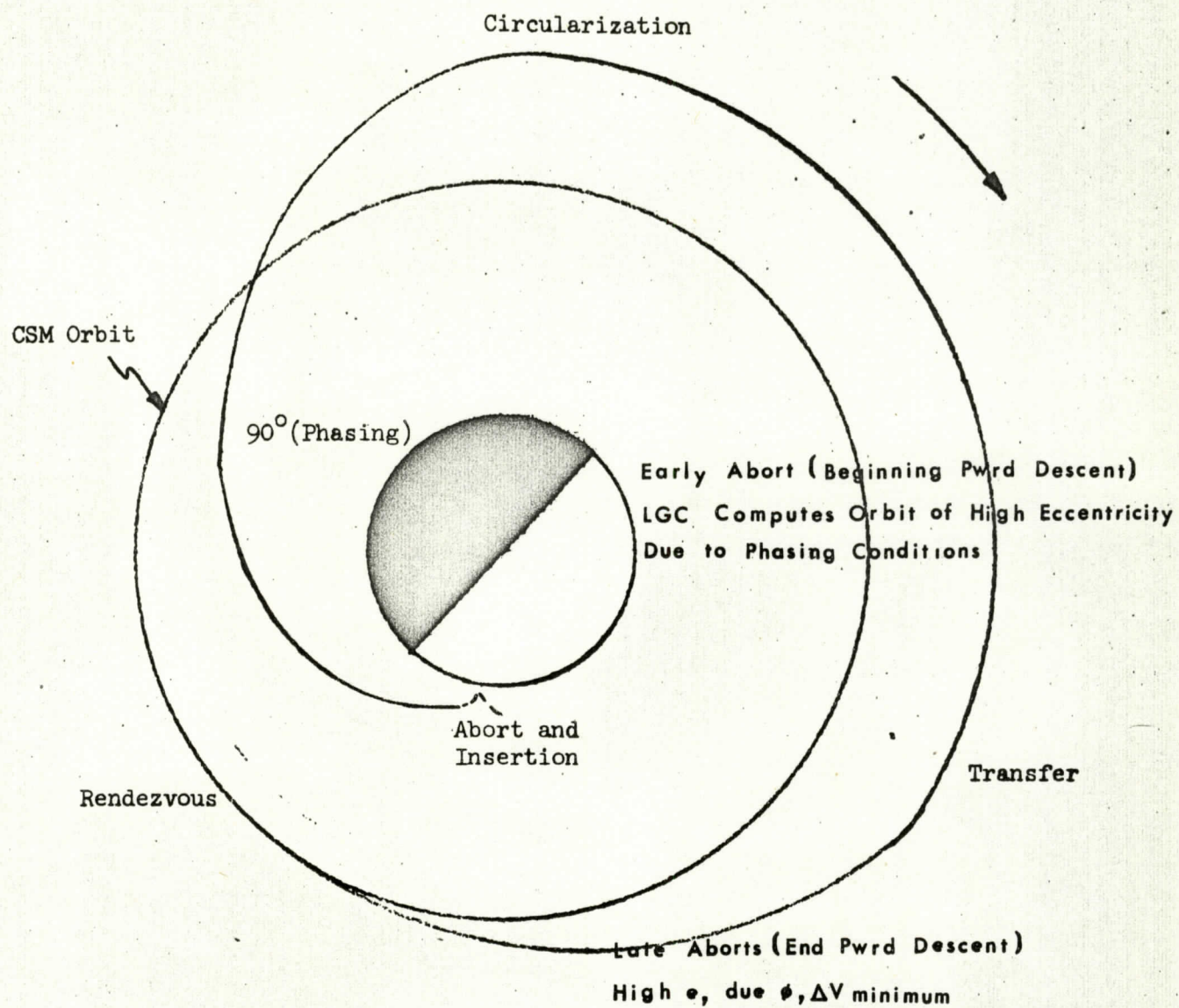
L-S 267 n.m.

BEGIN POWERED DESCENT

TYPICAL ABORT

LUNAR SURFACE

Trajectory compares to burns in nominal ascent



ABORT OFF POWERED DESCENT

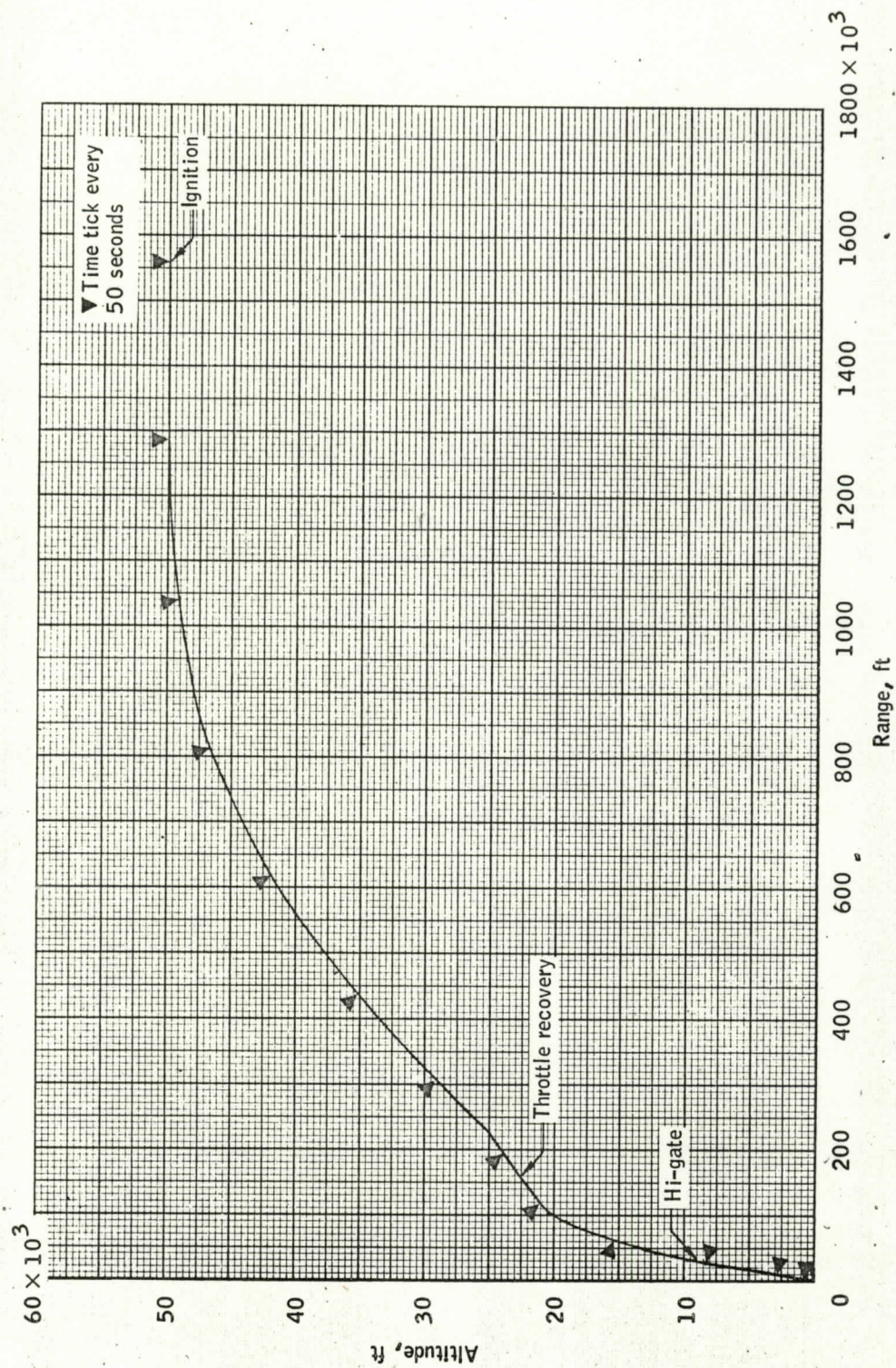
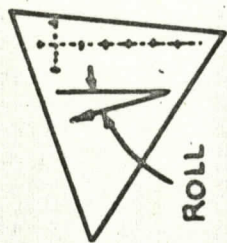
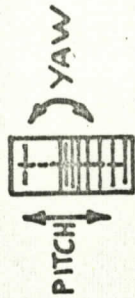
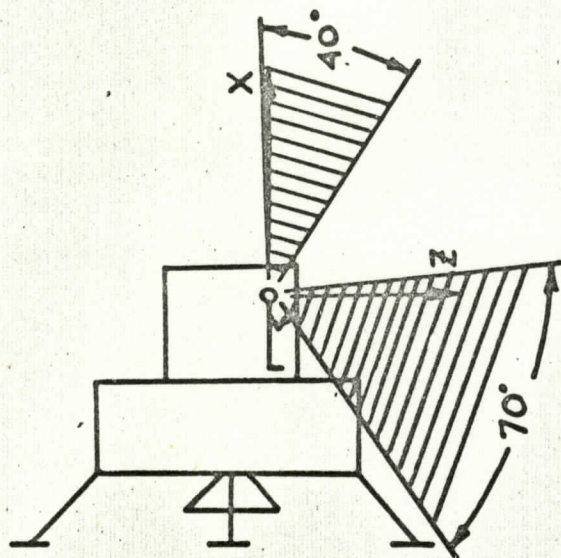
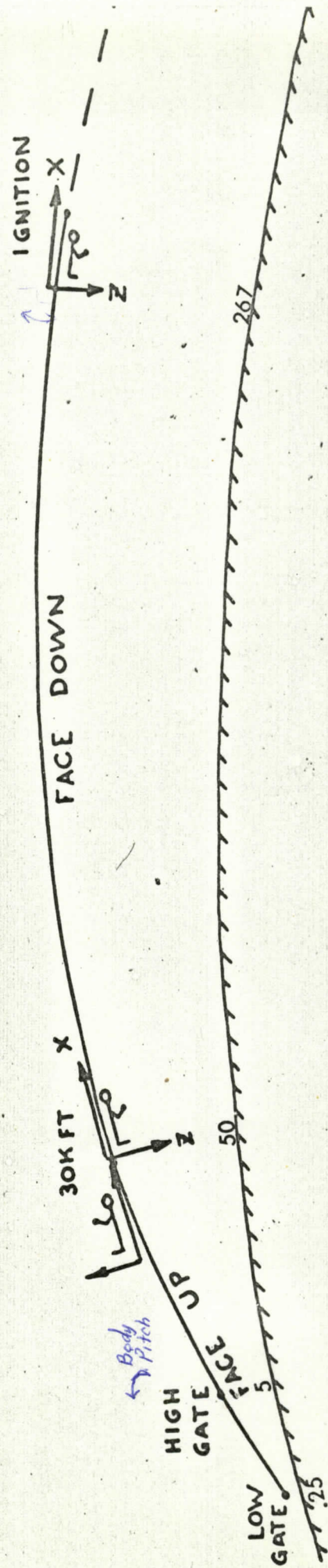


Figure 2. - Altitude-range profile for LM lunar descent trajectory.

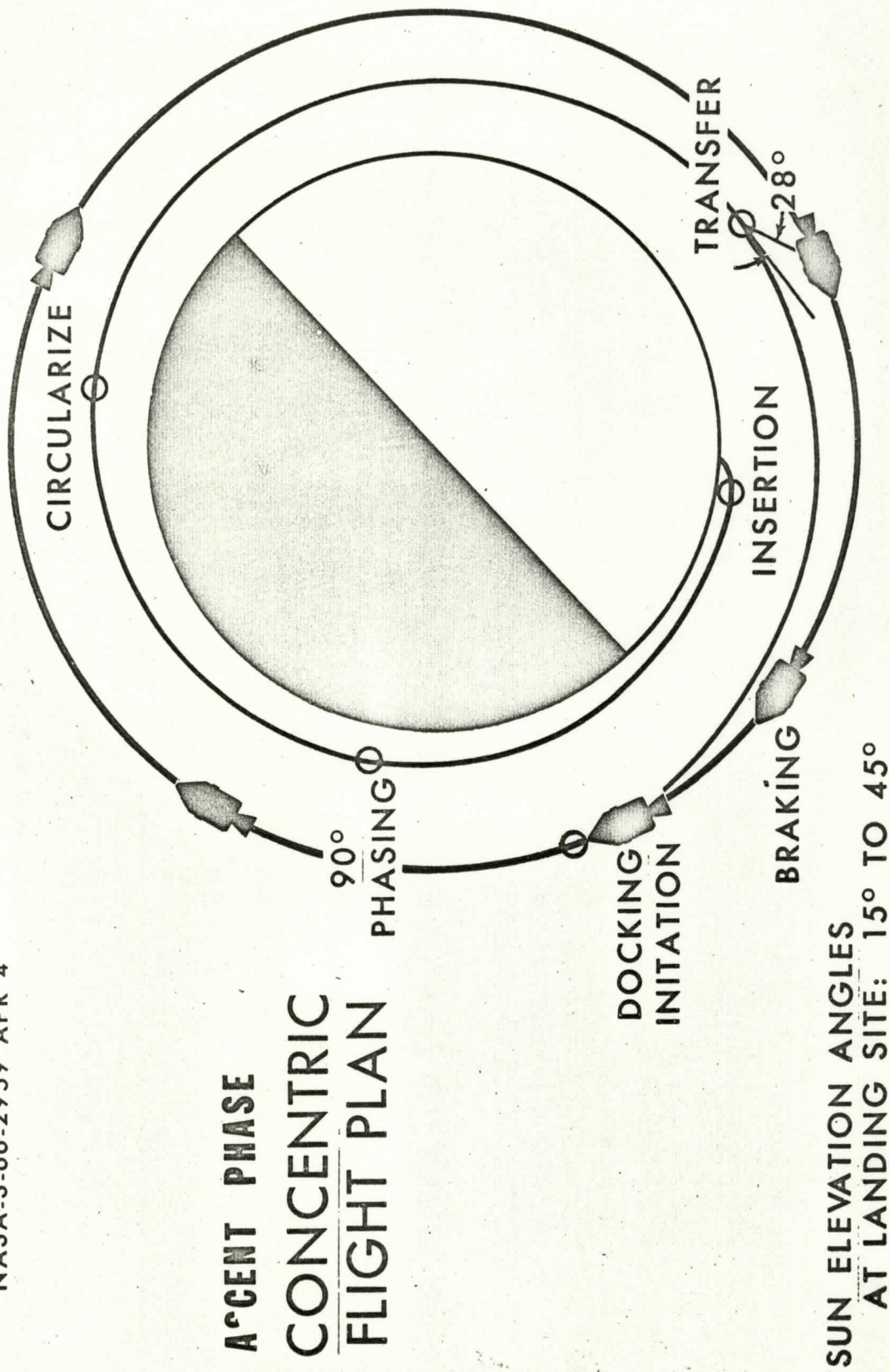
VISIBILITY



Body Roll

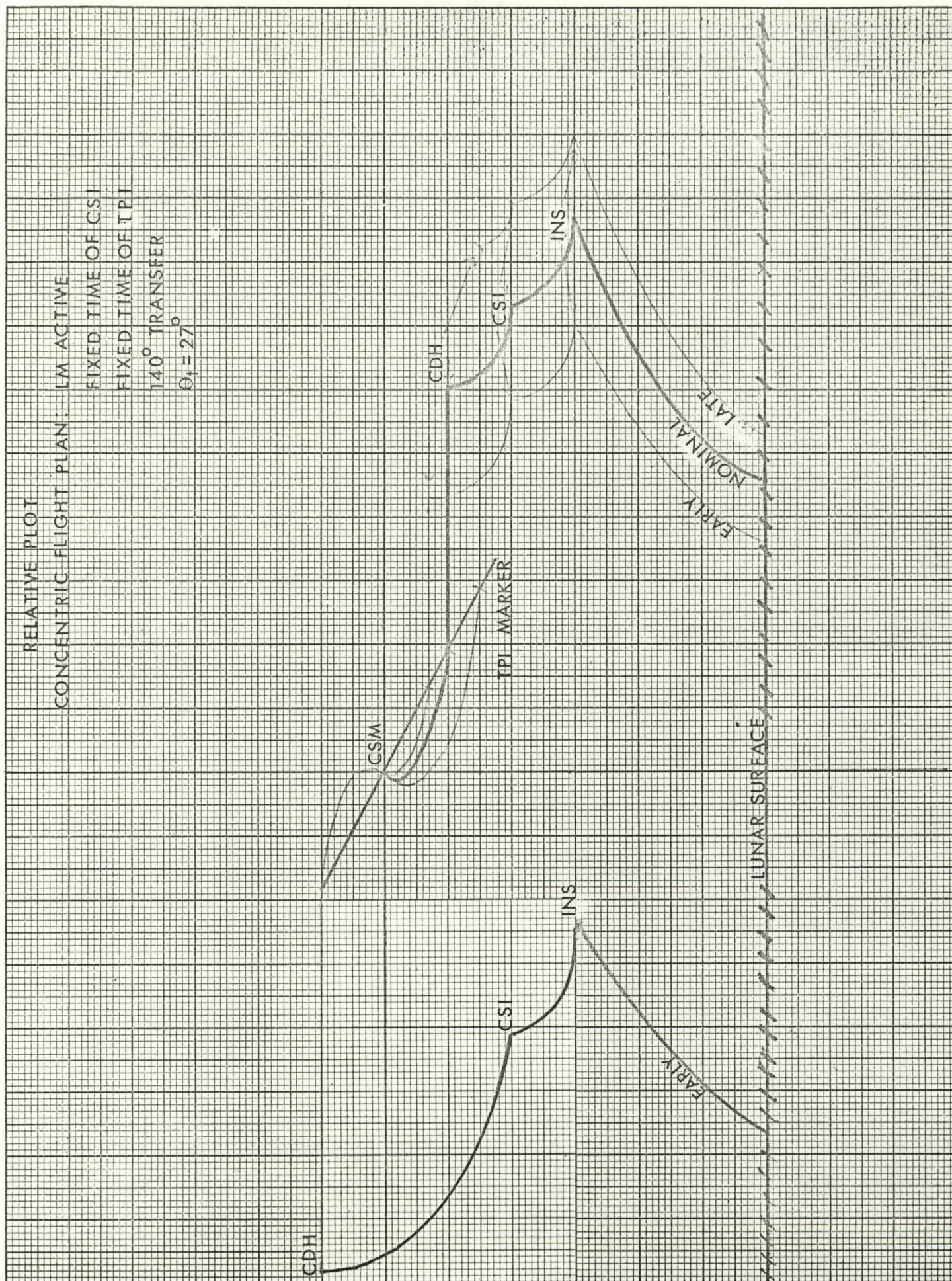


A-CENT PHASE CONCENTRIC FLIGHT PLAN



CIRCULARIZATION
ALTITUDES: 30 TO 65 N MI

FIGURE 1 - (III)



REFERENCES

1. Apollo Design Reference Mission IIA, MSC Report No. PM3/M-171/66, 3 volumes:
Volume 1 - Mission Description
Volume 3 - Spacecraft Sequence of Operations
Appendices to Volume 1 (Mission Rules)
2. Saturn V AS-504 Launch Vehicle Performance Analysis, Boeing D5-155519-4, July 14, 1967.
3. Apollo Abort Summary Document, MSC Internal Note 67-IN-2, July 3, 1967.
4. Proposed LM Powered-Descent Trajectory, MSC Internal Note 67-FM-117, August 15, 1967.

APOLLO LUNAR LANDING MISSION

I. LAUNCH PHASE

- A. VEHICLE DESCRIPTION (SIZE, WEIGHT, PERFORMANCE)
- B. NOMINAL LAUNCH SEQUENCE OF EVENTS (STAGING, ETC.)
- C. CREW ACTIVITIES DURING LAUNCH (G&N, SYS MON)
- D. ABORT PROCEDURES (TYPES, CREW ACTIVITY)

II. PARKING ORBIT

- A. CSM DESCRIPTION
 - 1. PHYSICAL CHARACTERISTICS

2. G&N SYSTEM

B. PARKING ORBIT ACTIVITIES (PLAT ALIGN, SYSTEM CHECKS)

C. TLI

III. TRANSLUNAR COAST

IV. LUNAR ORBIT INSERTION

V. LUNAR PARKING ORBIT ACTIVITIES (MAN, CHECKOUT LM)

VI. LUNAR DESCENT

A. COASTING DESCENT

B. POWERED DESCENT

C. ABORTS FROM POWERED DESCENT

VII. LUNAR ASCENT - PHILOSOPHY OF RENDEZVOUS

A. LO TO INS

B. INS TO CSI

C. CSI TO CDH

D. CDH TO TPI

E. TPI TO BRAKING

VIII. TRANS-EARTH INJECTION

IX. TRANS-EARTH COAST

X. REENTRY