



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

REVISION A

APOLLO 13 FLIGHT PLAN

AS-508/CSM-109/LM-7

MARCH 27, 1970

FLIGHT PLANNING BRANCH
FLIGHT CREW SUPPORT DIVISION



MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

UNITED STATES GOVERNMENT

Memorandum

TO : Distribution

DATE: MAR 23 1970

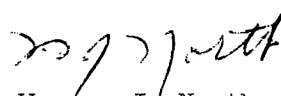
FROM : CF/Chief, Flight Crew Support Division

In reply refer to:
CF62-70M-089

SUBJECT: Revision A to the Apollo 13 Final Flight Plan

Enclosed is Revision A to the Apollo 13 Final Flight Plan. Revision A includes:

- a. Pen and ink changes to be made on indicated pages
- b. Pages to be inserted in place of original pages
- c. Attitude illustration pages to be inserted in section 3


Warren J. North

Enclosure

CF62:TRLindsey:avg 3-24-70



APOLLO FLIGHT DATA FILE

ORIGINAL 3/16/70

REVISION A 3/27/70

LIST OF EFFECTIVE PAGES

* INDICATES CURRENT CHANGES

PAGE NUMBER	ISSUE
i thru xx	Original
1-1 thru 1-25	Original
2-1 thru 2-4	Original
3i thru 3-54A	Original
*3-54B	Revision A
3-55 thru 3-56	Original
*3-56A	Revision A
3-57 thru 3-57A	Original
*3-57B	Revision A
3-58	Original
*3-58A	Revision A
3-59 thru 3-60	Original
*3-60A thru 3-60B	Revision A
3-61 thru 3-69	Original
*3-69A thru 3-69B	Revision A
3-70 thru 3-72	Original
*3-72A thru 3-72B	Revision A
3-73 thru 3-74A	Original
*3-74B	Revision A
3-75 thru 3-76	Original
*3-76A thru 3-76C	Revision A
3-77 thru 3-78A	Original
*3-78B	Revision A
3-79 thru 3-80B	Original
*3-80C	Revision A
3-81 thru 3-82B	Original
*3-82C	Revision A
3-83 thru 3-84A	Original
*3-84B	Revision A
3-85 thru 3-86	Original
*3-86AA	Revision A
3-86A thru 3-88	Original
*3-88A	Revision A
3-89 thru 3-95A	Original
*3-95B	Revision A
3-96 thru 3-97A	Original
*3-97B	Revision A
3-98 thru 3-99	Original
*3-99A	Revision A

3-100 thru 3-102A	Original
*3-102B	Revision A
3-103 thru 3-103A	Original
*3-104 thru 3-105	Revision A
3-106 thru 3-107	Original
*3-107A thru 3-107B	Revision A
3-108 thru 3-109	Original
*3-109A thru 3-109B	Revision A
3-110 thru 3-111	Original
*3-111A	Revision A
3-112 thru 3-113	Original
*3-113A	Revision A
3-114 thru 3-117	Original
*3-117A	Revision A
3-118 thru 3-119	Original
*3-119B	Revision A
3-120 thru 3-122	Original
*3-122A thru 3-122B	Revision A
3-123 thru 3-126	Original
*3-126AA	Revision A
3-126A	Original
*3-126B	Revision A
3-127 thru 3-128A	Original
*3-128B	Revision A
3-129 thru 3-130	Original
*3-130A	Revision A
3-131 thru 3-192	Original
4-1 thru 4-32	Original
5-1 thru 5-10	Original
6-1 thru 6-3	Original

Make the following pen and ink changes to the Final Apollo 13 Flight Plan dated March 16, 1970.

- Pg. 1-5 Paragraph 6, line 7 as reads "pitched up 20°" change to read "pitched up 90°".
- Pg. 1-14 Add on first blank line of TV schedule:
"Saturday, Apr. 11, 2:49 pm, 01:36, 05 min, EARTH SURFACE, CSM/S-IVB, MILA". Change Note at bottom of page to read "**Approval received for Satellite time".
- Pg. 1-17 Line 6, change MCC-4 Refsmmat to "PTC".
- Pg. 1-22 Line 3, change 13-1 Altitude to -00.279; at bottom of page, change Mean Lunar Radius to "1738.09 KM".
- Pg. 1-24 In set TLC-1 (06:00), change 3rd Star (76) to read "125/EFH EPSILON SCORPII". In set TLC-2 (31:00), change 3rd Star (42) to read "212/EFH DELTA SAGITTARII". In set TLC-2 (31:00), change 4th Star (45) to read "44/ENHENIF".
- Pg. 3-2 At 01:35, add "TV (MILA) 01:36 to 01:41".
- Pg. 3-3 At 02:45, MCC-H Column, add "DUMP DSE". At 02:55, fill in "OMNI C".
- Pg. 3-4 At 03:00, change DAP LOAD to read (11103, 11111).
- Pg. 3-4 At 03:10, fill in "HGA P -5, Y 297".
- Pg. 3-5 At 04:05, fill in "OMNI D".
At 04:25, add HGA P -10, Y 350.
At 04:35, delete "SECURE HGA . . .".
- Pg. 3-6 At 05:55, add "SECURE HGA, HGA TRACK-MAN, HGA Pitch -52, HGA Yaw 270".
- Pg. 3-7 At 06:00, fill in "OMNI B".
At 06:10, delete "OMNI ".
At 06:33, change 3rd Star (76) to read:
"3. STAR 125 EFH (R3 00120) EPSILON SCORPII
N88: (R1 -12736)(R2 -39323)(R3 -28133)".
- Pg. 3-9 Earth Field of VIEW, change GET to "10" hrs and F.O.V. to "10°".
- Pg. 3-10 Earth Field of VIEW, change GET to "8" hrs and F.O.V. to "11°".
- Pg. 3-25 At 31:00, add OMNI B, at 31:28 change 3rd Star (42, PEACOCK) to read:
"3. STAR 212 EFH (R3 00120) DELTA SAGITTARII
N88: (R1 +03605)(R2 -43220)(R3 -24881)".

At 31:33, change 4th STAR (45) to read:
"4. STAR 44 ENH (R3 00110) ENIF".

- Pg. 3-40 At 58:00, Fill in "Roll 285, HGA P 21, Y 270".
- Pg. 3-52 At 74:20, Change Moon View ATT to "R 359, P 111, Y 320,
HGA P 43, Y 283".
- Pg. 3-55 At 77:52, in notes column, change S-IVB LUNAR IMPACT NOTE to read "(GET 77:44) LAT 3.0°S, LONG 30.0°W".
- Pg. 3-60 At 82:00, in notes column add "NOTE" IF AUTO ACQ W/HGA unsuccessful, acquire in Manual Mode, Wide Beamwidth. If no comm use Omni A. At 82:04, center column, add "REPORT DOI ATTITUDE DEVIATIONS TO MSFN".
- Pg. 3-63 At 85:12, change "Tunnel Vent Valve - LM Press" to read "Tunnel Vent Valve - LM/CM ΔP".
- Pg. 3-73 At 99:43, CMP column, change "25 sec between marks" to read "10 sec between marks".
- Pg. 3-74 At 100:56, CMP column, change MNVR complete time to "(101:05)".
- Pg. 3-74A Change altitude of LANDMARK 13-1 as reads -000.18 to read "-000.28".
- Pg. 3-75 At 101:23, MCC-H column, after "UPLINK TO LM DESCENT TARGET" add "LPD BIAS (IF REQ'D)". At 101:30, LMP column, fill in "Steerable ANT P 132, Y -36".
- Pg. 3-75, Add S/C darkness strip to LM MSFN column from 101:47:00 to
3-76 102:35:45. Terminator passage occurs at 101:42 and 102:41.
- Pg. 3-76 At 102:58, CMP column, delete "REACQUIRE MSFN V64" and add "OMNI B".
- Pg. 3-77 At 103:54, LMP column, delete "Biomed SW-RT"; at 103:57, MCC-H column, delete "Disable S-BD Relay"; at 103:00, MCC-H column, delete "DUMP DSE". At 103:22, MCC-H column add "DUMP DSE".
- Pg. 3-78 At 104:55, MCC-H column, add "Update to LM, P 22 ACQ TIME 28° ELEV". At 104:56, CMP column, add "ORBITAL SCIENCE" and at 104:59 add "PHOTO TGT 14".
- Pg. 3-78A 13-1 P22 LDMK TRACKING PAD, delete DAC shutter speed "(1/60)". Change 13-1 altitude as reads "-000.18" to read "-000.28".
- Pg. 3-79 At 105:00, CMP column, delete "ORBITAL SCIENCE, PHOTO TGT 14". At 105:23, MCC-H column, delete "P22 ACQ time 28° EL". At 105:59, CMP column, add "HGA P -6, Y 181; in MCC-H column add "DUMP DSE".
- Pg. 3-80 LM columns, delete line now showing "EQUIPMENT PREP" beginning at 106:30, draw in new line at 106:15.

- Pg. 3-81 At 107:19, CMP column, change TOPO Attitude to "R 358, P 123, Y 359".
- Pg. 3-82 At 108:02, CMP column, after "P 018" add "OMNI D".
- Pg. 3-85 At 111:36, CMP column, after "DAC OFF . . ." add "LOAD DAP (10102) (11111)".
- Pg. 3-87 At 113:52, CMP column, change MNVR COMPLETE TIME TO "(113:54)".
At 113:56, CMP column, delete "OMNI B" add HGA P -44, Y 225.
- Pg. 3-88 LM columns, delete line now showing "PLSS RECHARGE" beginning at 114:09. Draw in new line a 114:00. Delete "EAT PERIOD" in CDR and LMP columns at 114:04. At 114:54, change "SC CONT-CMC/FREE . . ." to read "SC CONT-CMC/AUTO . . .". At 115:00, delete "SC CONT CMC/AUTO".
- Pg. 3-94 At 124:24, LM column, change "LGC PUMP CB-CLOSE" to "LCG PUMP CB-CLOSE".
- Pg. 3-97 At 127:10, MCC-H column, add "MSFN record CMP voice on DSE". At 127:12, CMP column, add "OMNI A".
- Pg. 3-98 At 128:18, across LM column, add "PERFORM THERMAL DEGRADATION TEST".
At 128:35, CMP column, change "OMNI D" to "OMNI C".
- Pg. 3-99 At 129:22, CMP column, delete "V64 ACQ MSFN".
- Pg. 3-100 At 130:33, CMP column, change "OMNI C" to "OMNI D". At 130:41, CMP column, add "OMNI A". At 130:46, CMP column, add "V64 ACQ MSFN".
- Pg. 3-101 At 131:14, CMP column, fill in R 012, P 116.8, Y 008. At 131:25, CMP column, change "OMNI C" to "OMNI A".
- Pg. 3-103A 13-1 P22 LDMK Tracking Pad, delete DAC shutter speed "(1/60)". Change 13-1 altitude as reads "-000.18" to read "-000.28".
- Pg. 3-104 At 134:30, CMP column, change "OMNI C" to "OMNI D".
- Pg. 3-106 CMP column, at 136:30, change "STOW JETTISON ITEMS" to "PACK JETTISON ITEMS".
- Pg. 3-114 At 144:21, change "OMNI D" to "OMNI C". At 144:57, add "Presleep checklist". At 144:57, add "CABIN FANS (2)-OFF; remove and stow (on A-13) Cabin Fan Lunar Dust Filter".
- Pg. 3-115 At 145:18, delete "(10111, 11111), V21N01, 3255E, 1616E".
Add V79
$$\begin{pmatrix} -0.000G \\ +010.00 \\ +11111 \end{pmatrix}$$
- Pg. 3-119 At 153:08, delete "MNVR TO P52 ATT (153:15), R 098, P 274, Y 315".
At 153:14, change HGA to "P -5, Y 250". At 153:43, delete "OMNI A".
- Pg. 3-120 At 154:55, change P52 ATT to "R 180, P 0, Y 320, OMNI A".

- Pg. 3-121 At 155:46, as reads "MNVR TO PHOTO ATT BY", delete "BY".
- Pg. 3-122 At 156:19, delete "V64 Acquire MSFN". At 156:48, add "V64 Acquire MSFN". At 156:53, change "VISUAL TGT 16, N . . ." to read "VISUAL TGT 15, N . . .".
- Pg. 3-124 At 158:32, add "V64 Acquire MSFN". At 158:47, delete "V64 Acquire MSFN". At 158:52, change f stop for TGT 63 from "f4" to "f5.6".
- Pg. 3-126 At 160:16, add "V64 Acquire MSFN". At 160:21, MCC-H column, after "Record PCM . . . ON DSE" add "(IF NO HGA)". At 160:35, delete "V64 Acquire MSFN". At 160:50, change f stop for TGT 66 from "f4" to "f5.6".
- Pg. 3-131 At 165:50, change TV Attitude Yaw to "Y 352".
- Pg. 3-136 At 170:03, add "OMNI D".
- Pg. 3-144 At 183:00, change Optics Cal Attitude to "R 075, P 063, Y 0" and add HGA P -79, Y 290. At 183:06, change Optics Cal Star to "STAR 4 4".
- Pg. 3-145 At 184:00, after "START PTC" add "S-BD ANT-OMNI B ON MCC CUE, SECURE HGA".
- Pg. 3-148 At 187:00, add "OMNI D".
- Pg. 3-152 At 191:00, add "OMNI B".
- Pg. 3-156 At 195:00, add "OMNI D".
- Pg. 3-164 At 208:00, add "OMNI B".
- Pg. 3-168 At 212:00, add "OMNI B".
- Pg. 3-173 At 217:00, add "OMNI B".
- Pg. 3-174 At 218:22, delete "R ____, P ____, Y ____".
- Pg. 3-176 At 220:00, add "OMNI B". At 220:54, fill in R 340, P 270, Y 0, HGA P 20, Y 270".
- Pg. 3-178 At 222:03, after "START PTC", add "S-BD ANT-OMNI B ON MCC CUE, SECURE HGA".
- Pg. 3-184 At 232:00, add "OMNI B".
- Pg. 3-187 At 235:50, fill in "R 075, P 063, Y 0, OMNI B OPTICS CAL STAR 4 4".
- Pg. 3-188 At 236:00, fill in "R 090, P 171, Y 345".
- Pg. 3-190 At 238:52, fill in "R 0, P 156, Y 0, OMNI B, VHF ANT RT".
- Pg. 3-192 At 240:35, fill in "R 0, P 156, Y 0".

CSM GNC GO CRITERIA

SPS

- 0 FU/OX TANK (W/O LEAK) -FU/OX
- 0 GN₂ TANK (W/O LEAK) - 1 OF 2 (CANT CONFIRM)
- 0 BALL VALVE BANK - BOTH
- 0 FEEDLINE TEMP >40° F
- 0 FU/OX ΔP<20 PSI
- 0 PC>70 PSI
- 0 ULLAGE CAPABILITY - 1 OF 2
- 0 HE TANK (W/O LEAK)

SM RCS

- 0 HE TANK (W/O LEAK) - ALL
- 0 NO LEAK BELOW ISO VLV - ALL
- 0 PKG TEMP > 55° - ALL
- 0 THRUSTERS - 3 OF 4 P & Y, 6 OF 8 R

CM RCS

- 0 HE TANK (W/O LEAK) - BOTH
- 0 MANIFOLD (W/O LEAK) - BOTH
- 0 NOT ARMED

SYSTEMS MANAGEMENT

- 0 START BURN ON BANK B
- 0 OPEN BANK A TIG + 2-5 SECONDS

LOI INHIBIT CRITERIA

- 0 FULL CRITICAL SYSTEMS REDUNDANCY
- 0 ADEQUATE CONSUMABLES FOR MIN LO OPS, CAPABILITY TO SUSTAIN TANK LOSS AND RETURN TO EARTH WITH AVG POWER LEVEL OF 40 AMPS
- 0 SPS PRPLNT RESERVE FOR TEI AND TEC MCC'S
- 0 RCS PRPLNT RESERVE FOR TEI AND TEC MCC CONTROL, PTC, AND MIN LUNAR ORBIT OPERATIONS
- 0 DPS LOI IF REQUIRED TO ACCOMPLISH A LUNAR ORBIT OPERATION

CSM GNC GO CRITERIA

GNC'S/SCS

- 0 3 - AXIS AUTO ATTITUDE CONTROL
- 0 3 - AXIS RATE DAMPING
- 0 3 - AXIS DIRECT RCS
- 0 BMAGS P, Y -- 1 OF 2
- 0 BMAGS R -- 1 OF 2
- 0 FDAI -- 1 OF 2
- 0 CMC, ISS, OSS, OPTICS DAC
- 0 TVC SERVO LOOP -- BOTH
- 0 DSKY -- 1 OF 2

FLIGHT PLAN

LOI
BURN TABLE

P OR Y RATES	ATT DEVIATION	SHUTDOWN TIME	RESIDUALS
10°/SEC TAKEOVER	+10° TAKEOVER	BT + 10 SEC	DO NOT TRIM

TABLE 3-6
LOI ABORT TABLE

MODE I (DPS ONLY)	MODE II	MODE III
	(DPS ONLY)	(DPS ONLY)
0-1 MIN 45 SEC	1 MIN 45 SEC TO 2 MIN 50 SEC	2 MIN 50 SEC TO 3 MIN 50 SEC
ΔV_m 0-750 (TIGHT)	ΔV_m 750-1245 (LOOSE)	ΔV_m 1245-1700 (LOOSE)
LOI + 2 HR.	DPS ₁ @ LOI + 2 HR	DPS @ LOI + 1 REV
MCC-H TARGET OR CREW CHART (NO COMM)	DPS ₂ @ LOI + 1 REV MCC-H TARGET	DPS @ LOI + 1 REV MCC-H TARGET

TABLE 3-7

TIGHT SPS LIMITS

FUEL - OXID DELTA P GREATER THAN 20 PSI CONFIRMED BY LOW PC
PROP TANK PRESS LESS THAN 160 PSI CONFIRMED BY LOW PC
PC LESS THAN 80 PSI OR DECAYS 10 PSI DURING THE BURN

ANY BALL VALVE FAILS TO OPERATE, OR CLOSES PREMATURELY, SHUT DOWN THE GOOD BANK AND (A) IF THRUST CEASES-ABORT (B) IF THRUST CONTINUES-REENABLE BOTH BANKS AND CONTINUE

NOTE: IF THE FIRST BANK SELECTED FAILS TO OPERATE UNDER G & N CONTROL, ATTEMPT TO START THAT BANK UNDER SCS CONTROL. IF THE BANK STARTS UNDER SCS CONTROL, CONTINUE THE BURN AND EVALUATE G & N STEERING. IF THE BANK FAILS TO START UNDER SCS CONTROL, INHIBIT LOI.

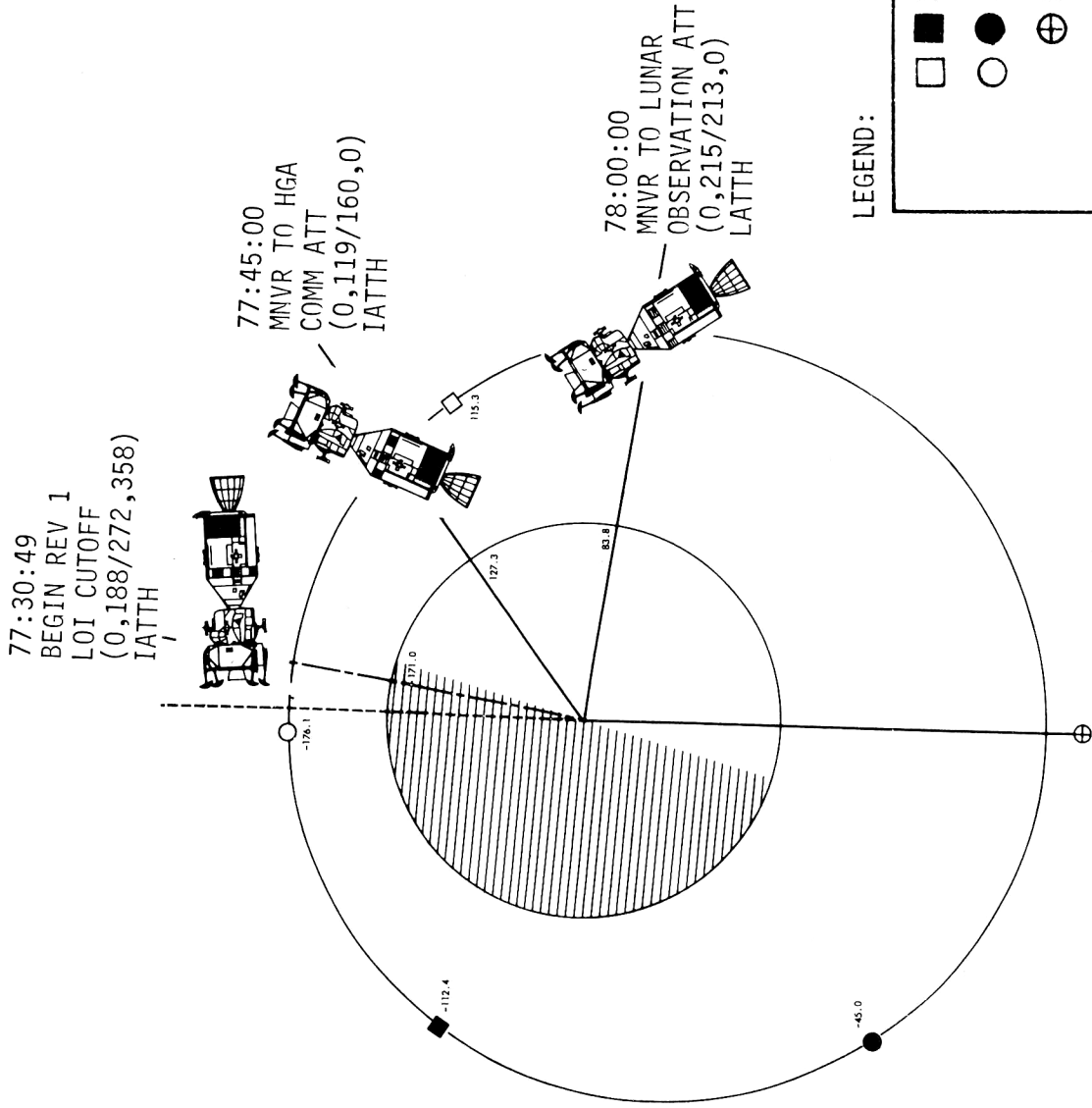
LOOSE SPS LIMITS

PC LESS THAN 70 PSI CONFIRMED BY OTHER CUES

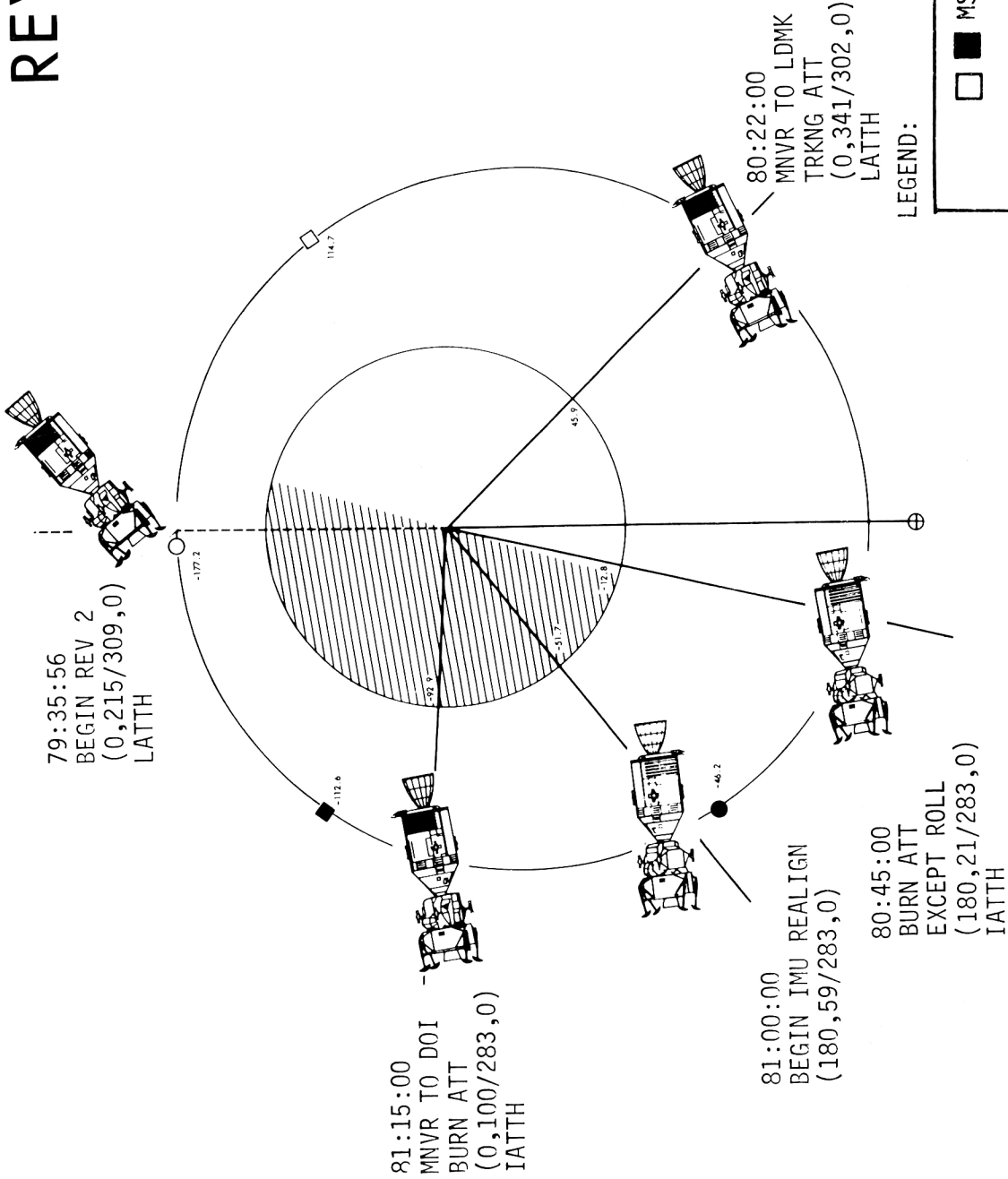
PROP TANK PRESS LESS THAN 115 PSI CONFIRMED BY LOW PC

PHYSIOLOGICAL INDICATIONS OF ERRATIC ENGINE PERFORMANCE (VIBRATION, POPPING, ETC.)

REV 1



REV 2



LEGEND:

- MSFN AOS, LOS
- S/C SUNRISE, SUNSET
- ⊕ SUBEARTH POINT

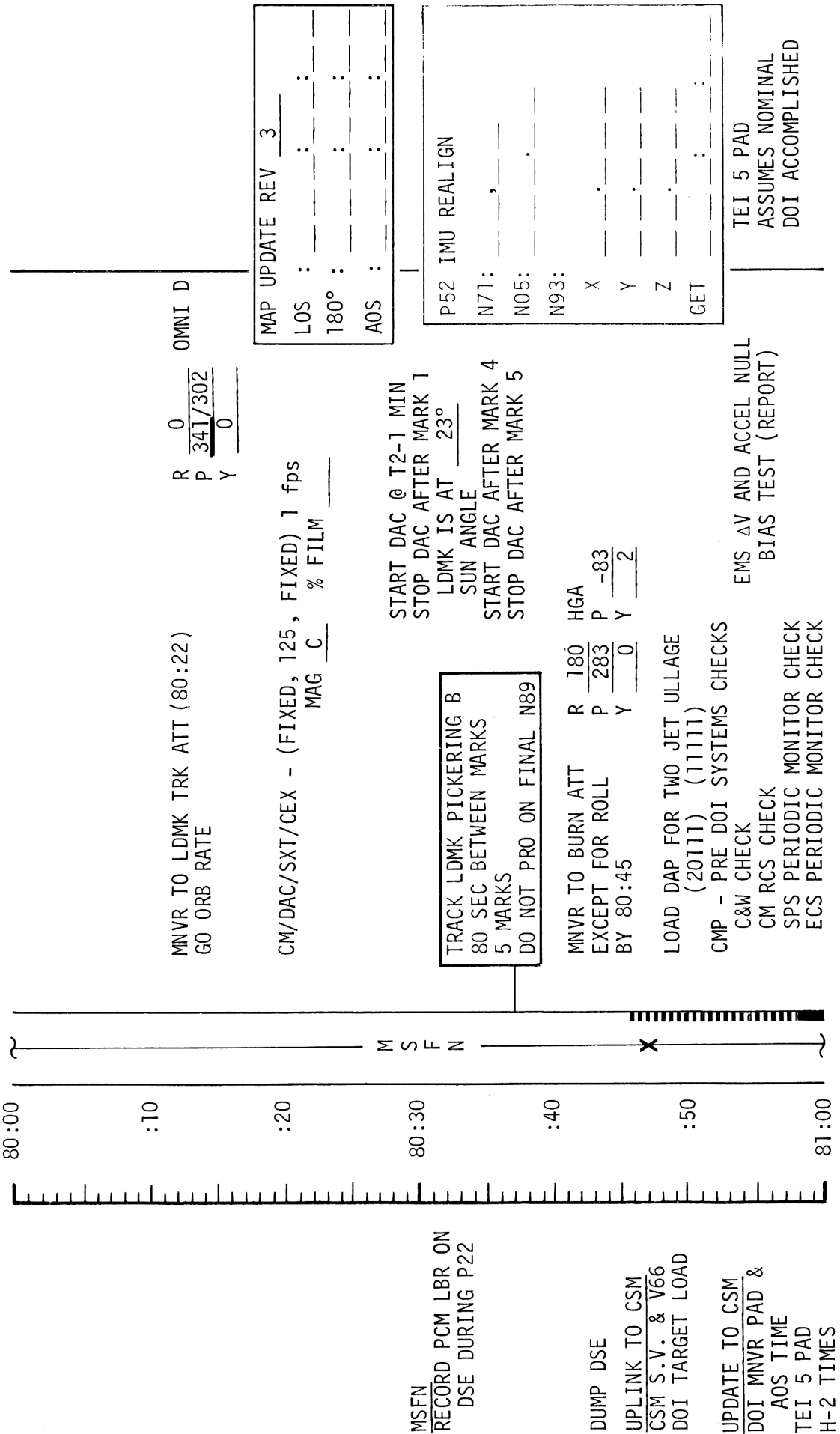
(R, LHP/INP, Y)
IATTH - INERTIAL ATTITUDE HOLD
LATTH - LOCAL ATTITUDE HOLD

FLIGHT PLAN

NOTES

2113 CST

MCC-H



R 0 OMNI D
P 341/302
Y 0

MSFN
RECORD PCM LBR ON
DSE DURING P22

DUMP DSE
UPLINK TO CSM
CSM S.V. & V66
DOI TARGET LOAD

UPDATE TO CSM
DOI MNVR PAD &
AOS TIME
TEI 5 PAD
H-2 TIMES

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	80:00 - 81:00	4/2	3-58

FLIGHT PLAN

DOI

BURN TABLE

P OR Y RATES	ATT DEVIATIONS	SHUTDOWN TIME	RESIDUALS
10°/SEC TAKEOVER	+ 10° TAKEOVER	BT + 1 SEC	TRIM X TO WITHIN 1 FPS * DO NOT TRIM Y & Z

*IF OVERBURN IS >2.2 FPS PITCH 180 AND TRIM RCS IF <10, SPS IF >10.

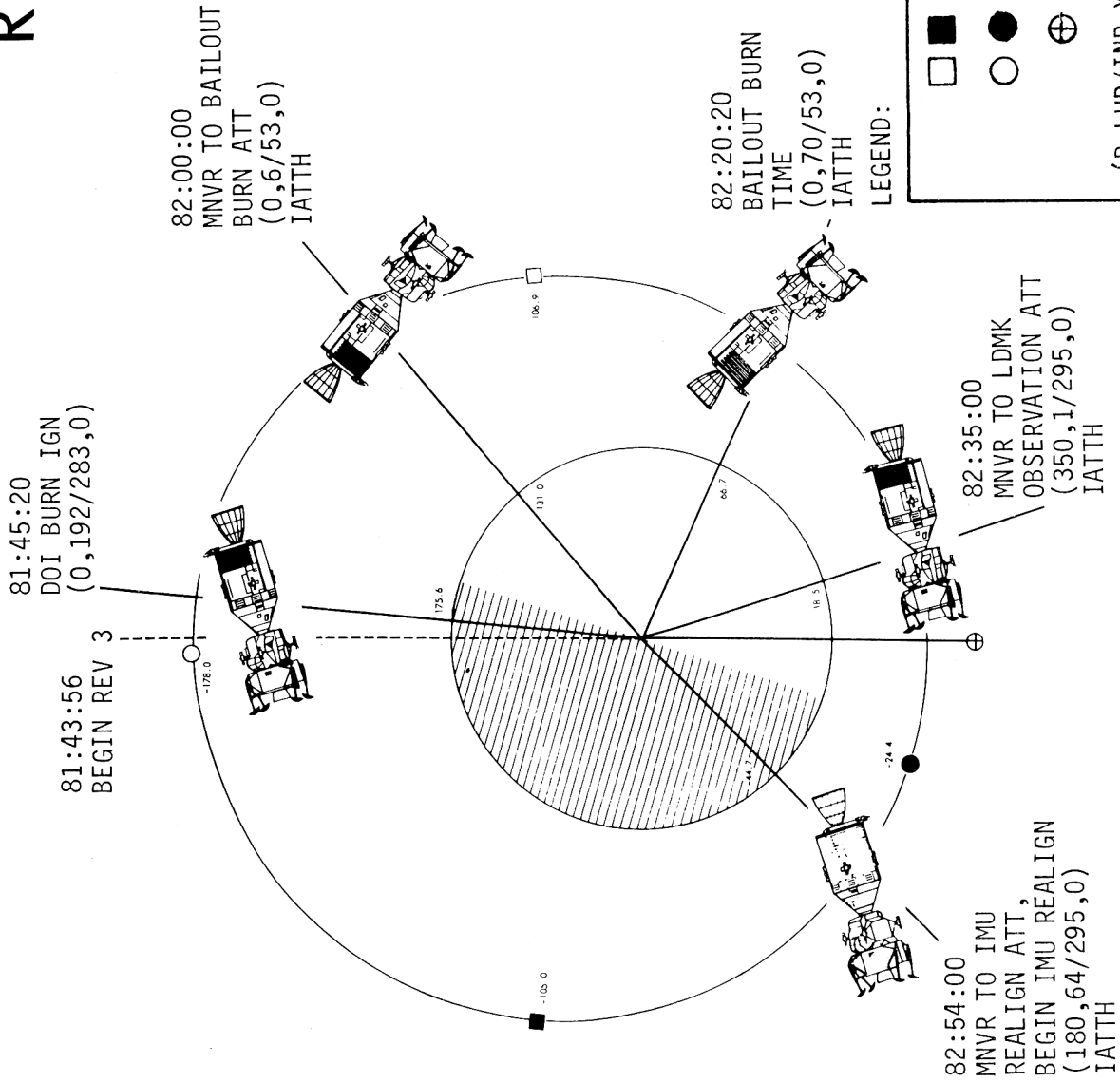
AT AOS AFTER DOI, THE REQUIREMENT FOR THE BAILOUT MANEUVER WILL BE DETERMINED BY EVALUATION OF THE THREE TRAJECTORY MONITORING SOURCES. THESE SOURCES--PGNS, EMS, AND MSFN--WILL BE EXAMINED WITH THE FOLLOWING CRITERIA:

1. IF MSFN RADAR DATA IS VALID AND REASONABLE, A STAY VOTE FROM MSFN IS REQUIRED TO REMAIN IN THE LOW ORBIT.
 2. IF MSFN RADAR DATA IS INVALID OR UNAVAILABLE, THE FOLLOWING CRITERIA APPLIES:
 - A. 2 OUT OF 2 STAY VOTES REQUIRED TO REMAIN IN THE LOW ORBIT.
 - B. 1 OF 1 STAY VOTE REQUIRED TO REMAIN IN THE LOW ORBIT.
- (1) THE EMS VOTE IS NO STAY IF THE EMS INDICATES A 12FPS OVERSPEED AFTER TRIMMING THE PGNS.
- (2) THE MSFN VOTE IS NO STAY IF THE INCOMING RADAR DATA INDICATES CLOSEST APPROACH ALTITUDE OF EQUAL TO OR LESS THAN 1.0 N MI ABOVE THE LUNAR TERRAIN. THIS ALTITUDE CORRESPONDS TO A PERICYNTHION ALTITUDE OF 3.6 N MI AND DOPPLER RESIDUALS AT AOS OF -32 CYCLES PER SECOND.

TABLE 3-8
3-58A

REVISION A

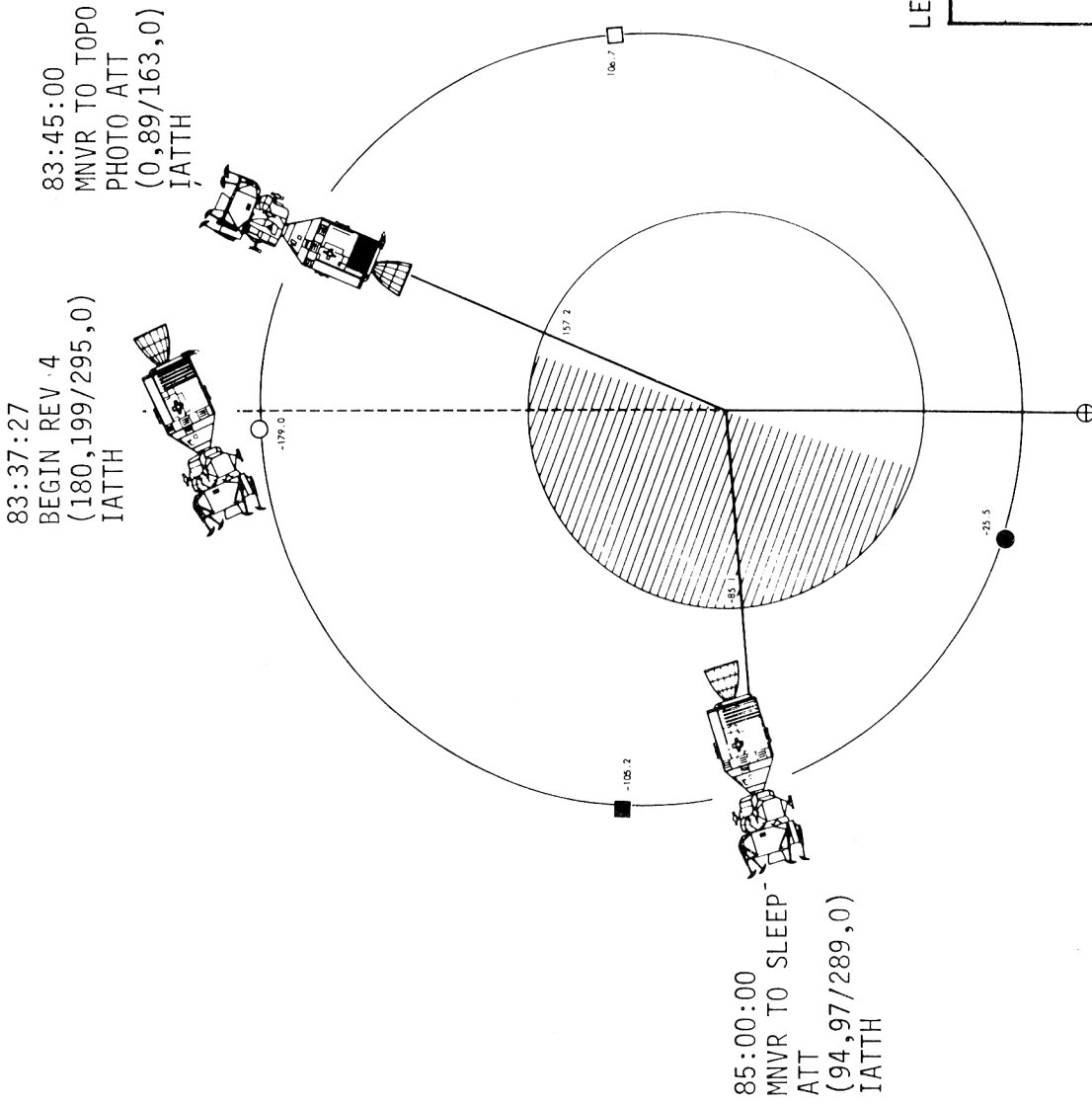
REV 3



LEGEND:

- MSFN AOS, LOS
- S/C SUNRISE, SUNSET
- ⊕ SUBEARTH POINT

(R,LHP/INP,Y)
IATTH - INERTIAL ATTITUDE HOLD
LATTH - LOCAL ATTITUDE HOLD



LEGEND:

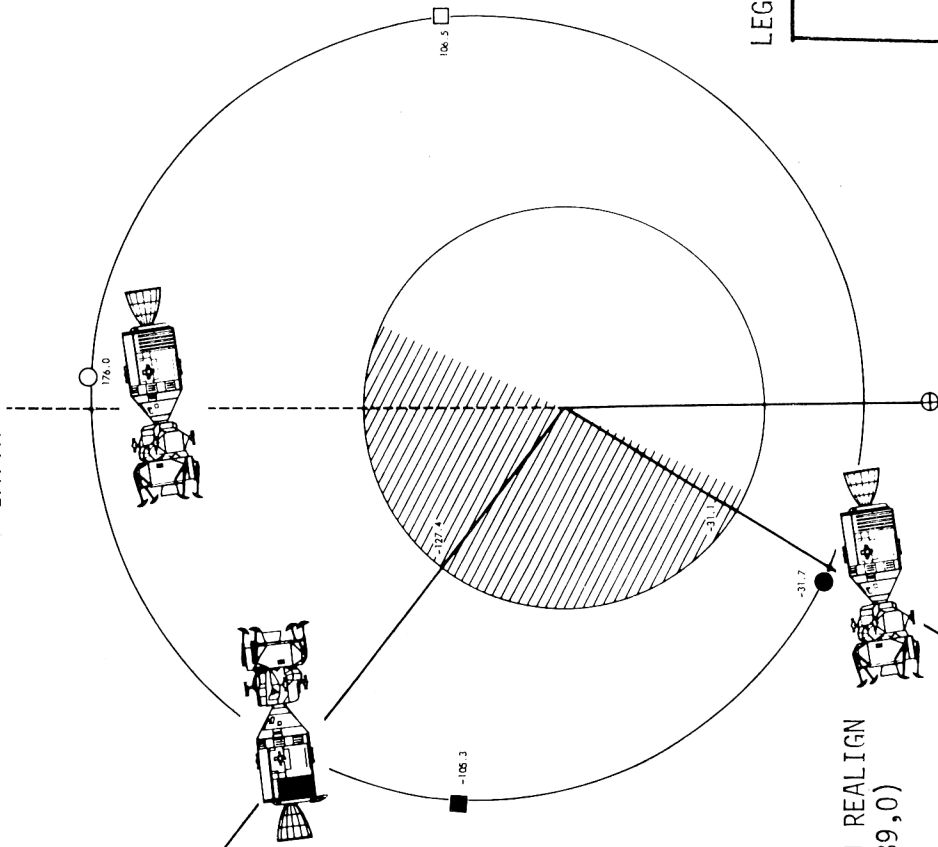
■	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT (R,LHP/INP,Y)
	IATTH - INERTIAL ATTITUDE HOLD
	LATTH - LOCAL ATTITUDE HOLD

REV 10

94:58:56
 BEGIN REV 10
 (94,187/289,0)
 IATTH

96:35:00
 MNVR TO AGS
 CALIBRATION ATT
 (8,316/113,23)
 IATTH

96:05:00
 BEGIN IMU REALIGN
 (94,37/289,0)

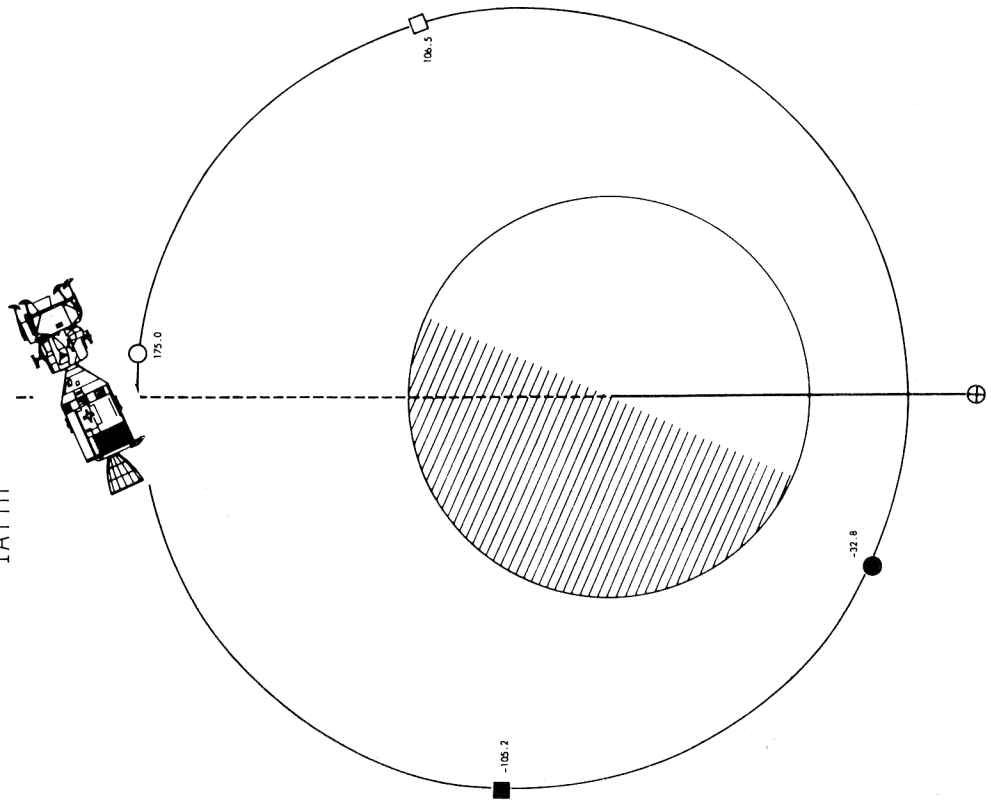


LEGEND:

	MSFN AOS, LOS
	S/C SUNRISE, SUNSET
	SUBEARTH POINT (R,LHP/INP,Y)*
	IATTH - INERTIAL ATTITUDE HOLD
	LATTH - LOCAL ATTITUDE HOLD

REV 11

96:52:30
 BEGIN REV 11
 (8,9/113,23)
 IATTH



LEGEND:

■	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT
(R, LHP/INP, Y)	
IATTH - INERTIAL ATTITUDE HOLD	
LATTH - LOCAL ATTITUDE HOLD	

3-69B

REVISION A

FLIGHT PLAN

CSM

CMP

INHIBIT ROLL COMMANDS
 UNTIL LM/CM ΔP>3.5 PSID
 REMOVE & STOW
 CSM/LM UMBILICAL
 INSTALL DROGUE & PROBE
 PRELOAD PROBE
 COCK LATCHES (12)
 INSTALL HATCH
 VENT TUNNEL
 HATCH INTEGRITY
 CHECK
 CMC - FREE/AUTO
 VERIFY DSE MOTION AT LOS
 RECORD LM PCM DATA
 DOFF HELMET & GLOVES
 LiOH CANISTER CHANGE
 TO INTO B, STOW 8 IN B6
 RR TRANSDUCER ACT
 & SELF TEST

LOAD DAP
 R=21101, R2=11111

V06N20E
 INHIBIT B3
 THRUSTER FOR
 RR ACT & SELF TEST
 CMC FREE FOR AGS CAL
 P30/P41 TO MANEUVER
 TO UNDOCKING ATT
 (99:10)
 R 0, P 102, Y 0

1513 CST

98:00

:10

:20

98:30

:40

REV 12

:50

99:00

CDR

DOCKED IMU FINE ALIGN

VERIFY DROGUE
 & PROBE
 INSTALLATION

CLOSE AND SECURE
 HATCH

DON HELMET & GLOVES

LMP

COPY UPDATES

AGS ACTIVATION & SELF
 TEST

AGS TIME INITIALIZATION

LOAD AGS PAD

STEERABLE ANT
 P 131, Y 41

VHF B XMTR - DATA

DON HELMET & GLOVES

ARS/PGA PRESSURE INTEGRITY CHECK

CABIN REGULATOR CHECK

DOFF HELMETS & GLOVES (CREW OPTION)

RATE GYRO
 TEST

V47-AGS UPDATE & ALIGN

DOCKED AGS

CALIBRATION

RR ACT & SELF TEST

UPDATE TO LM
 GYRO TORQUING X's
 AGS ABORT CONSTANTS
 DAP DATA
 UPLINK TO LM
 LS REFSMMAT
 LM S.V. & V66
 LGC/CMC CLOCK SYNC
 LGC ABORT CONSTANTS
 E MEMORY UPDATE
 (IF REQ'D)
 UPDATE TO LM
 AGS K FACTOR

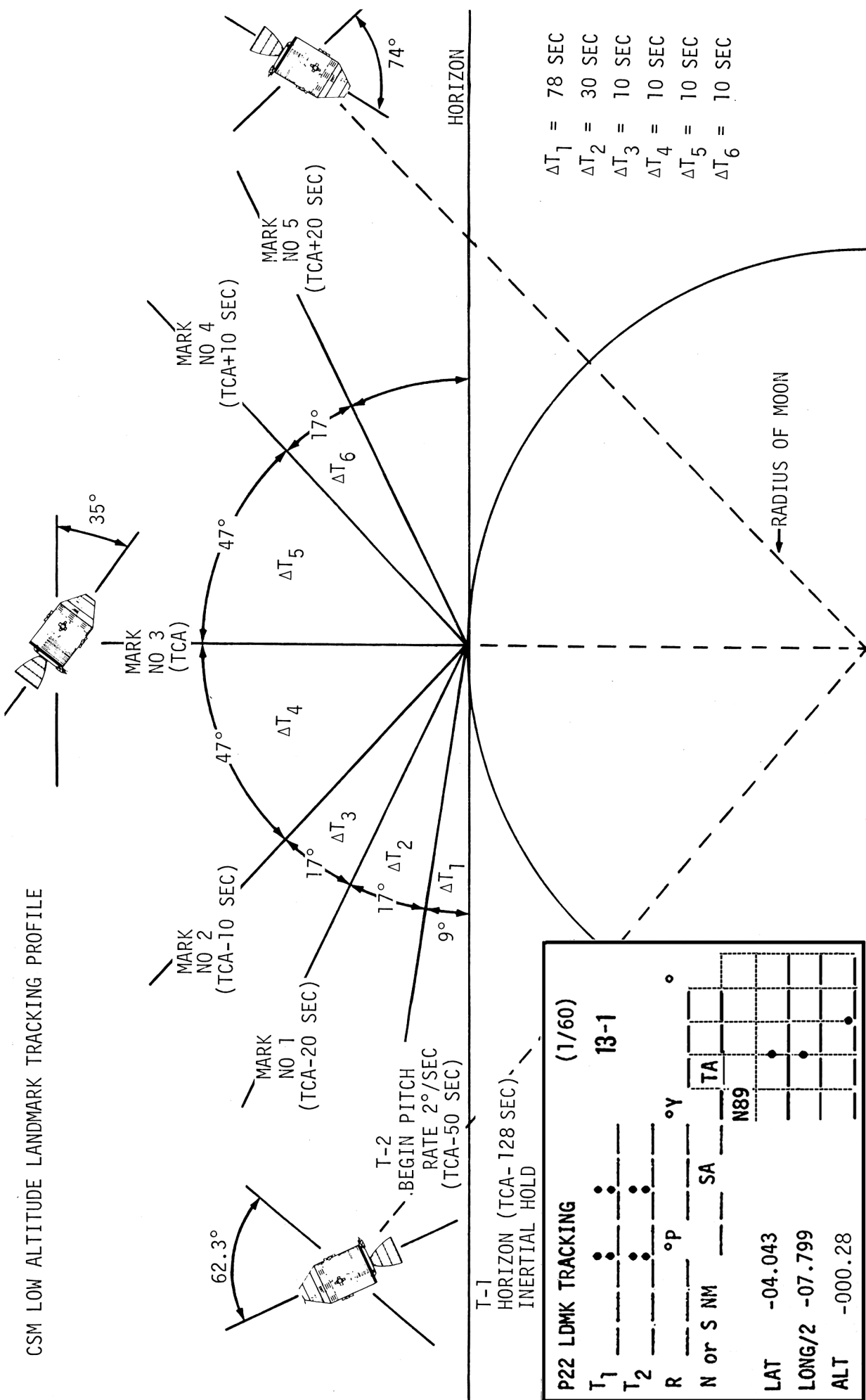
MAP UPDATE REV 12
 LOS : : : :
 180° : : : :
 AOS : : : :

LM

MCC-H

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 16, 1970	98:00 - 99:00	5/11-12	3-72

CSM LOW ALTITUDE LANDMARK TRACKING PROFILE



P22 LDMK TRACKING (1/60)

T₁ 13-1

T₂ 13-1

R 0° P 0° Y 0°

N or S NM SA TA

N89

LAT -04.043

LONG/2 -07.799

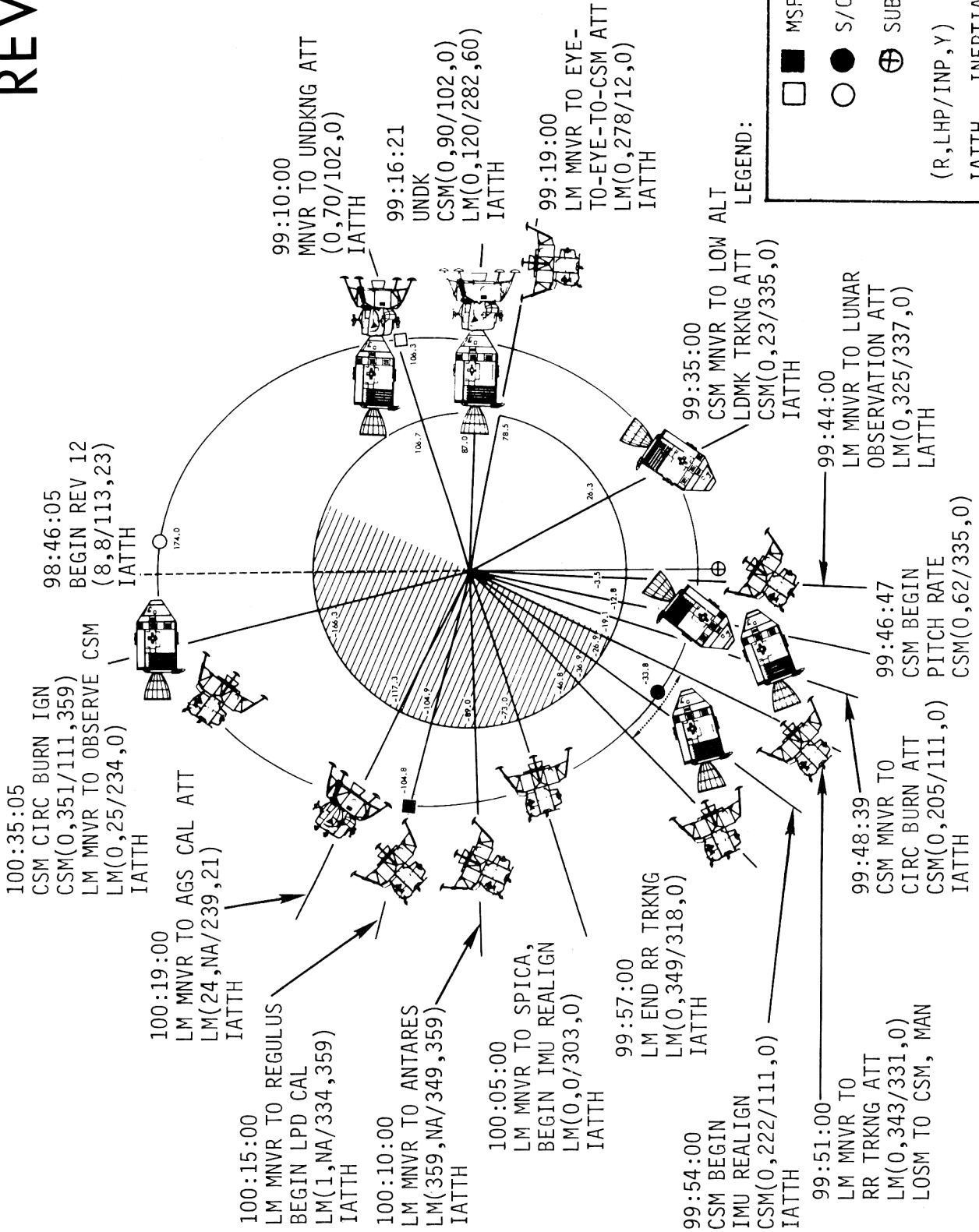
ALT -000.28

	13-2	13-3	13-4	13-5
LAT	-03.606	-03.189	-03.707	-03.226
LONG/2	-07.658	-07.739	-07.006	-07.057
ALT	+000.00	-000.76	-000.73	-000.85

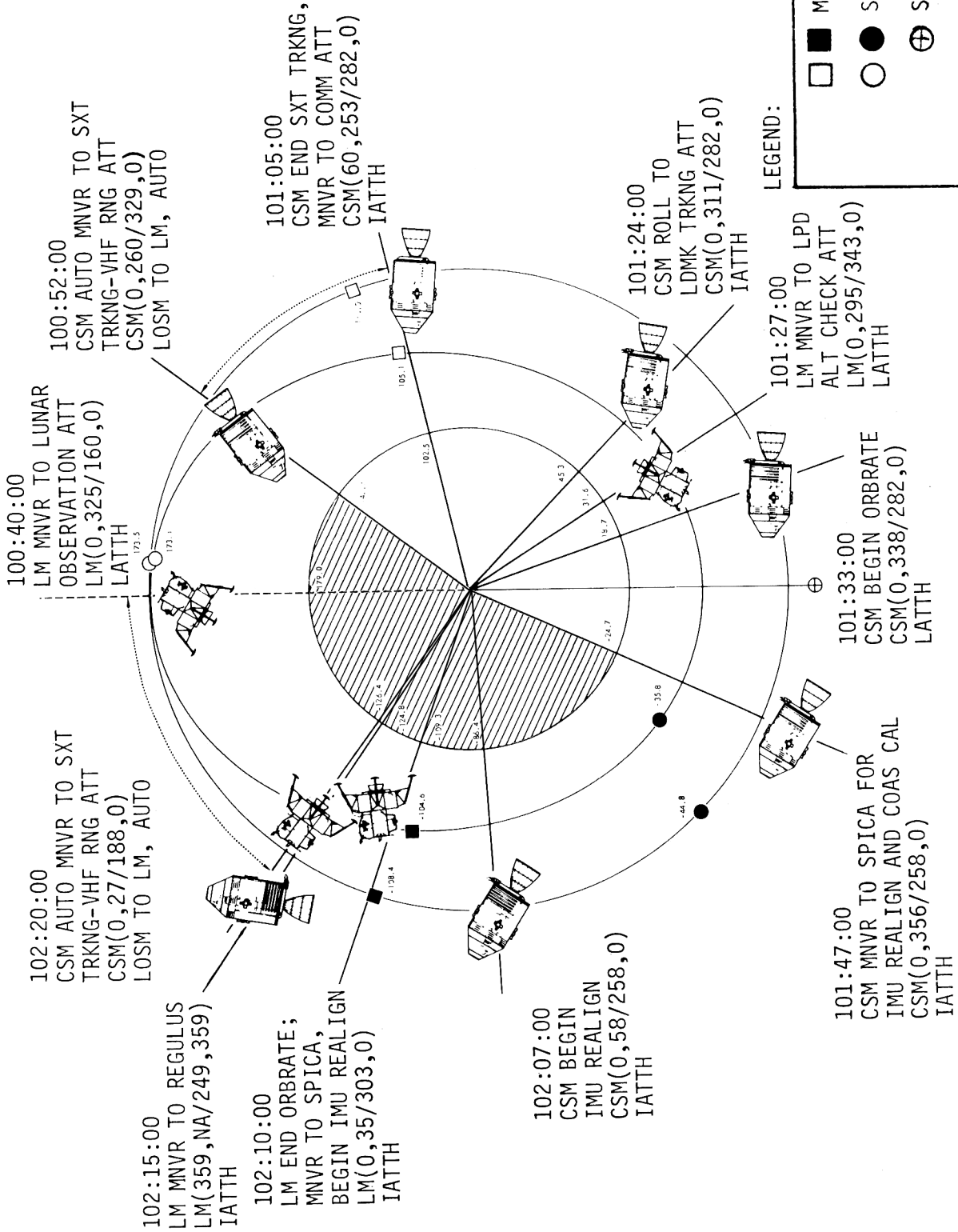
CENTER OF MOON
FIGURE 3-3
3-72A

- $\Delta T_1 = 78 \text{ SEC}$
- $\Delta T_2 = 30 \text{ SEC}$
- $\Delta T_3 = 10 \text{ SEC}$
- $\Delta T_4 = 10 \text{ SEC}$
- $\Delta T_5 = 10 \text{ SEC}$
- $\Delta T_6 = 10 \text{ SEC}$

REV 12



REV 13

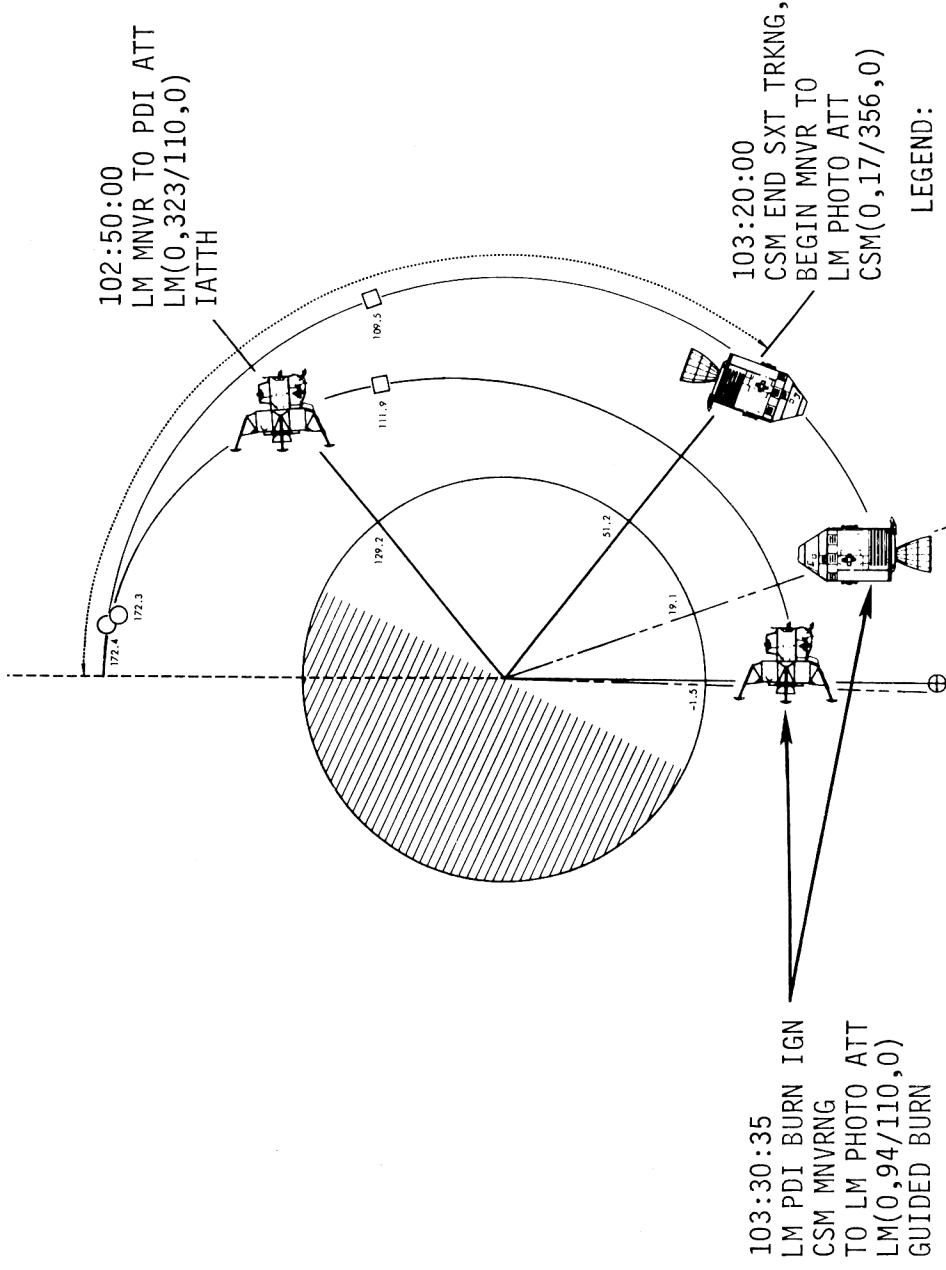


LEGEND:

- ◻ MSFN AOS, LOS
- ◉ S/C SUNRISE, SUNSET
- ⊕ SUBEARTH POINT

(R,LHP/INP,Y)
IATTH - INERTIAL ATTITUDE HOLD
LATH - LOCAL ATTITUDE HOLD

REV 14



LEGEND:

◻	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT
(R,LHP/INP,Y)	
IATTH	- INERTIAL ATTITUDE HOLD
LATTH	- LOCAL ATTITUDE HOLD

3-76A

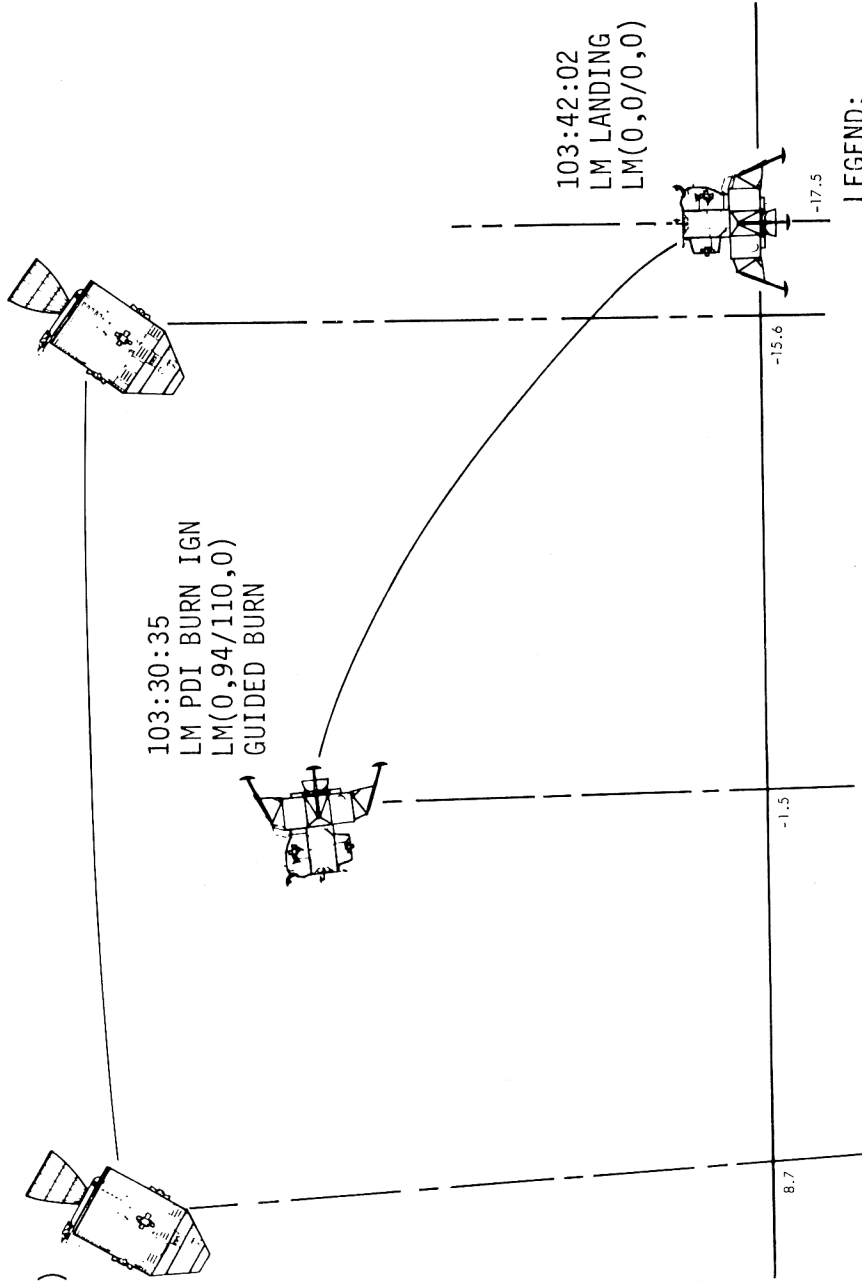
REVISION A

103:42:02
LM LANDING
CSM(0,241/153,0)
IATTH

103:42:02
LM LANDING
LM(0,0/0,0)

103:30:35
LM PDI BURN IGN
LM(0,94/110,0)
GUIDED BURN

103:34:00
CSM MNVR TO
LM PHOTO ATT
CSM(0,217/153,0)
IATTH



LEGEND:

	MSFN AOS, LOS
	S/C SUNRISE, SUNSET
	SUBEARTH POINT
(R,LHP/INP,Y)	
IATTH - INERTIAL ATTITUDE HOLD	
LATTH - LOCAL ATTITUDE HOLD	

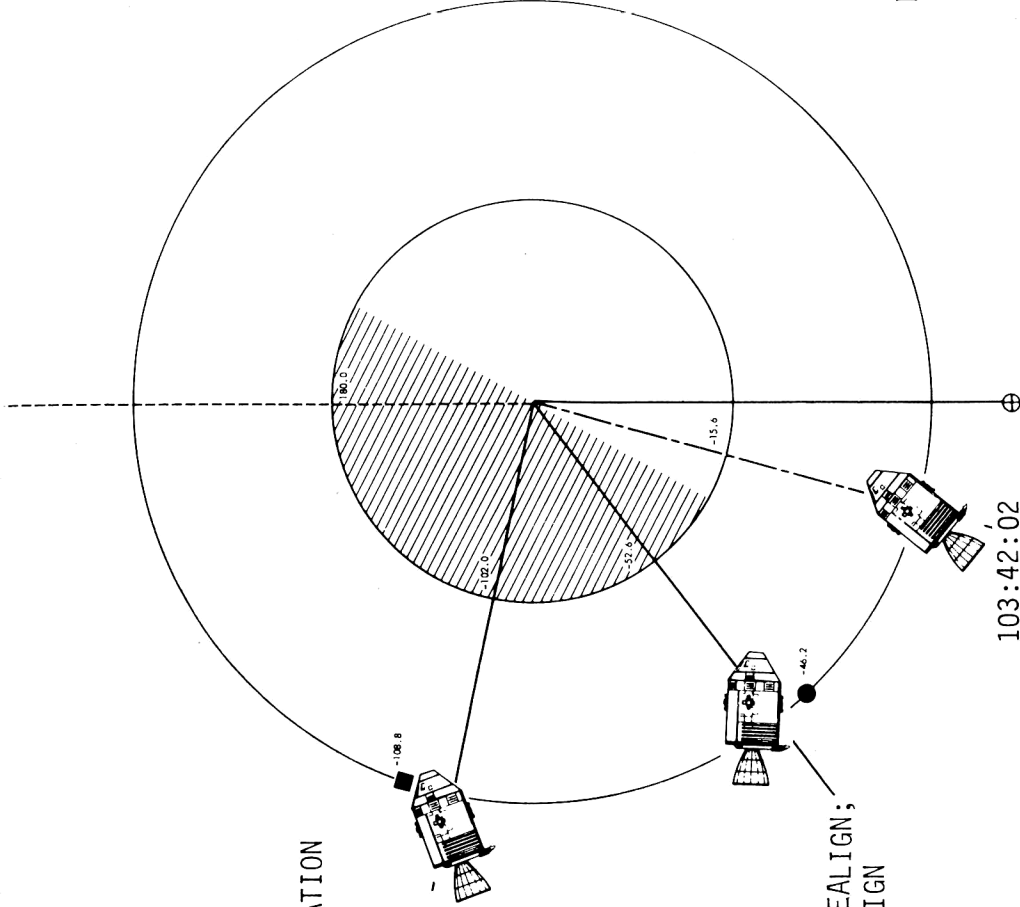
3-76B

REVISION A

104:10:00
 MNVR TO SC CONTAMINATION
 PHOTO ATT
 (320,307/133,348)
 IATTH

103:54:00
 MNVR FOR IMU REALIGN;
 BEGIN IMU REALIGN
 (0,225/100,0)
 IATTH

103:42:02
 LM LANDING
 (0,241/153,0)
 IATTH



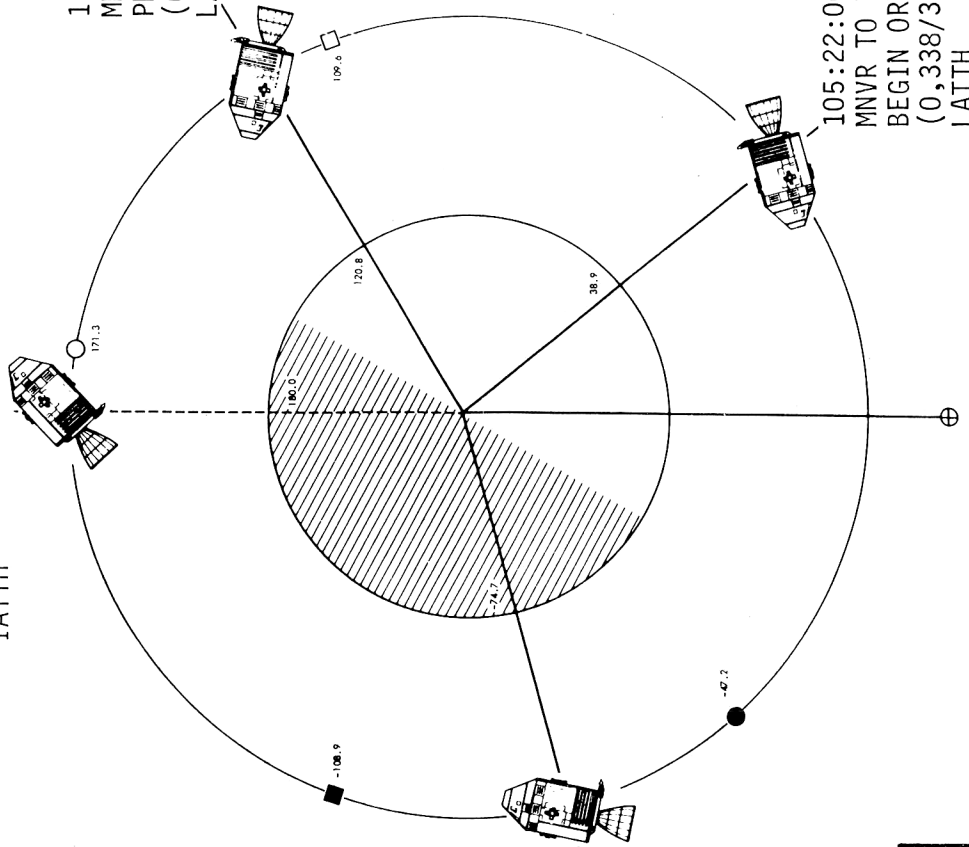
LEGEND:

□	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT
(R,LHP/INP,Y)	
IATTH -	INERTIAL ATTITUDE HOLD
LATTH -	LOCAL ATTITUDE HOLD

REV 15

104:35:33
 BEGIN REV 15
 (320,25/133,348)
 IATTH

104:55:00
 MNVR TO ORB SCIENCE
 PHOTO ATT
 (0,230/279,0)
 LATTH



105:59:08
 TERMINATE LATTH
 IN SC CONTAMINATION
 PHOTO ATT
 (0,338/192,0)
 IATTH

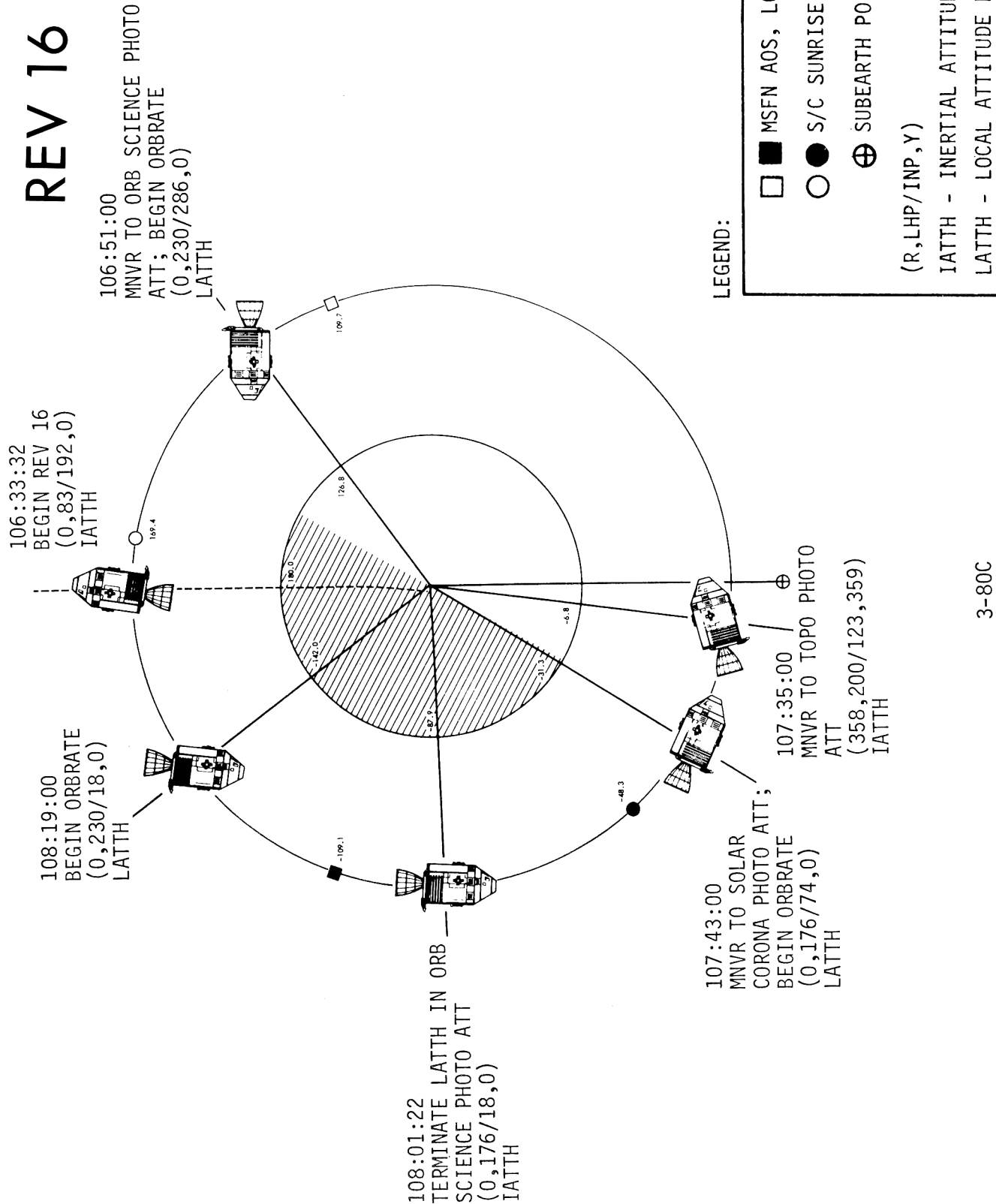
105:22:00
 MNVR TO LDMK TRKNG ATT;
 BEGIN ORBRATE
 (0,338/306,0)
 LATTH

LEGEND:

■	MSFN AOS, LOS
●	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT
(R,LHP/INP,Y)	
IATTH	- INERTIAL ATTITUDE HOLD
LATTH	- LOCAL ATTITUDE HOLD

3-78B

REV 16



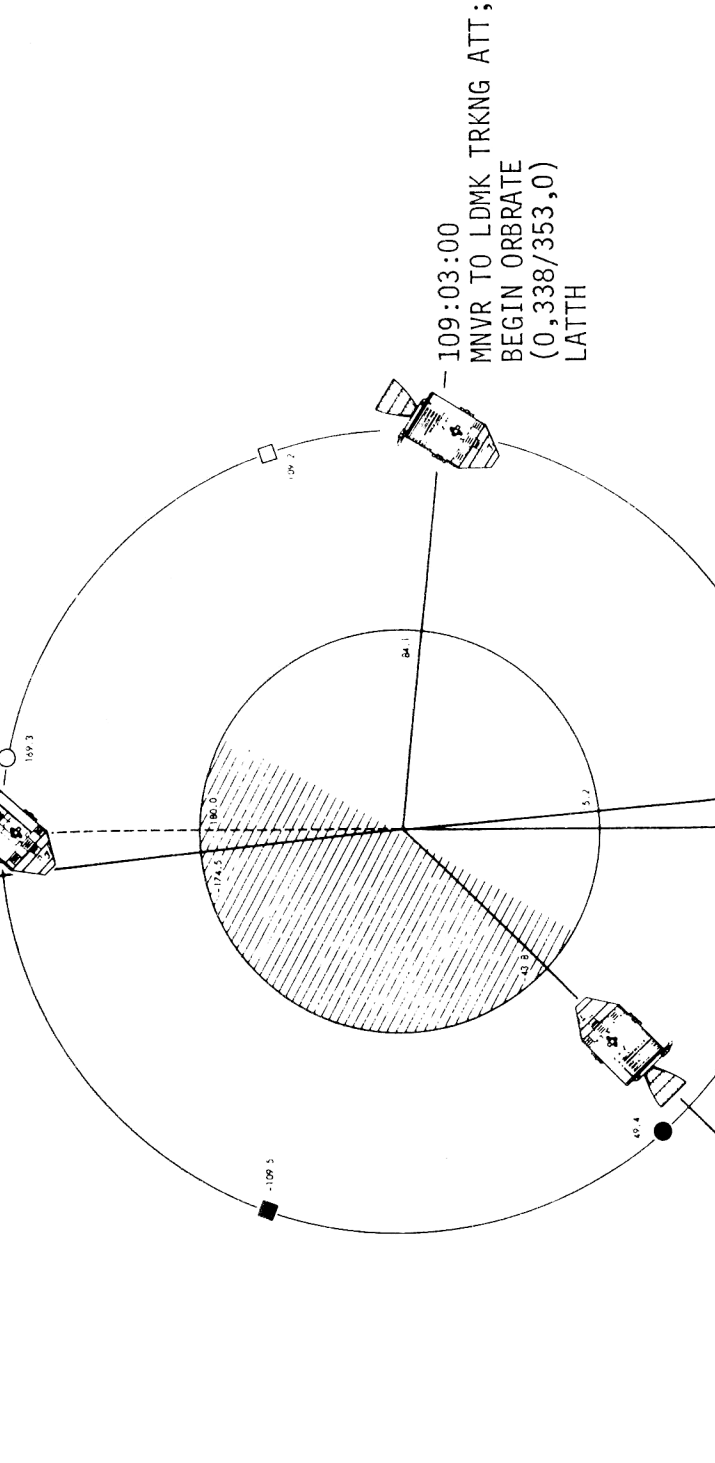
3-80C

REVISION A

REV 17

108:31:30
 BEGIN REV 17
 (0,230/340,0)
 LATTH

110:27:37
 TERMINATE LATTH IN LDMK
 TRKNG ATT
 (0,270/27,0)
 IATTH



109:03:00
 MNVR TO LDMK TRKNG ATT;
 BEGIN ORBRATE
 (0,338/353,0)
 LATTH

109:45:00
 MNVR TO EARTHSHINE PHOTO
 ATT; BEGIN ORBRATE
 (0,270/157,0)
 LATTH

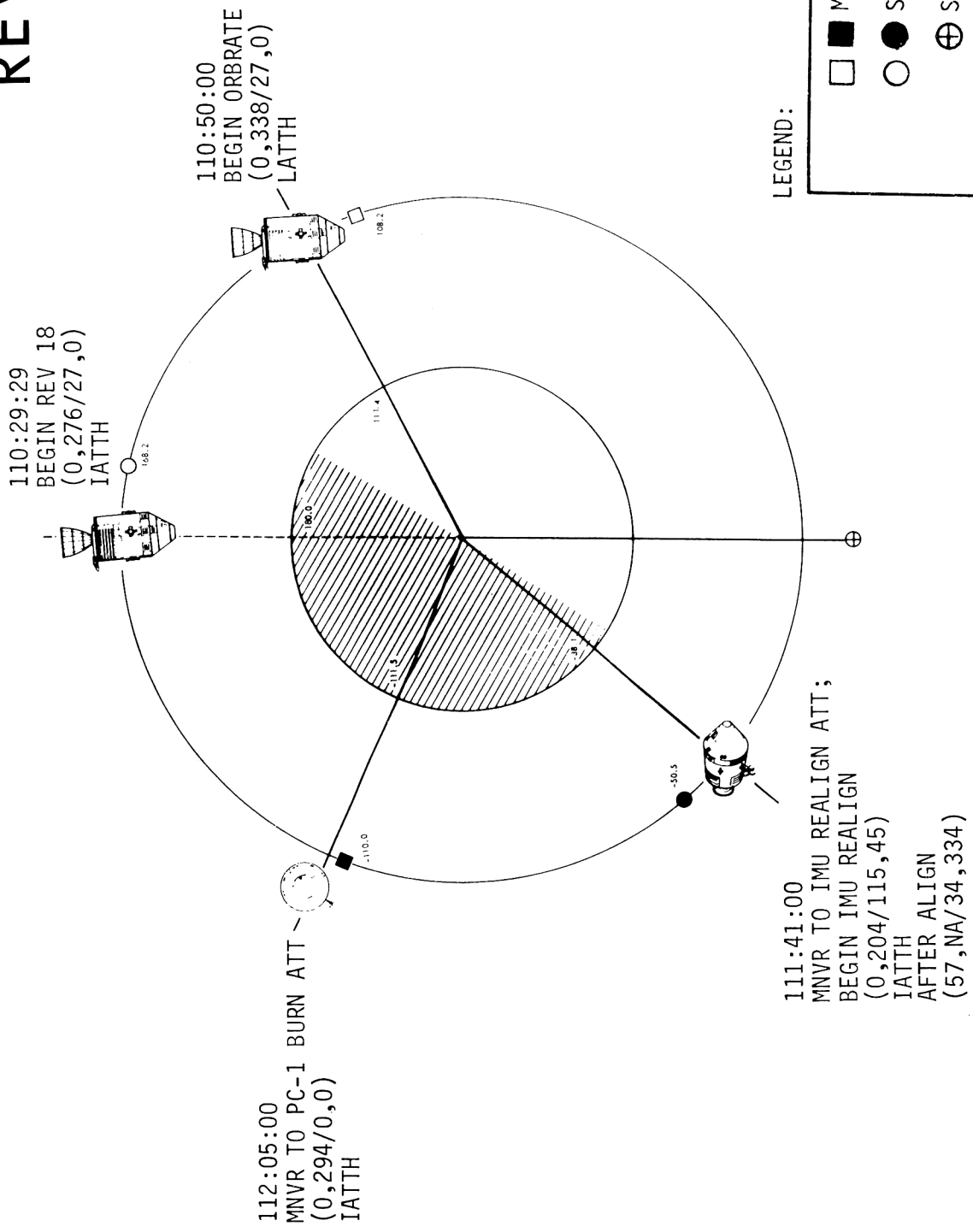
109:29:00
 MNVR TO LM TRKNG
 ATT; BEGIN ORBRATE
 (0,0/296,0)
 LATTH

LEGEND:

□	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT
(R,L,HP/INP,Y)	
IATTH - INERTIAL ATTITUDE HOLD	
LATTH - LOCAL ATTITUDE HOLD	

REVISION A

REV 18



3-84B

REVISION A

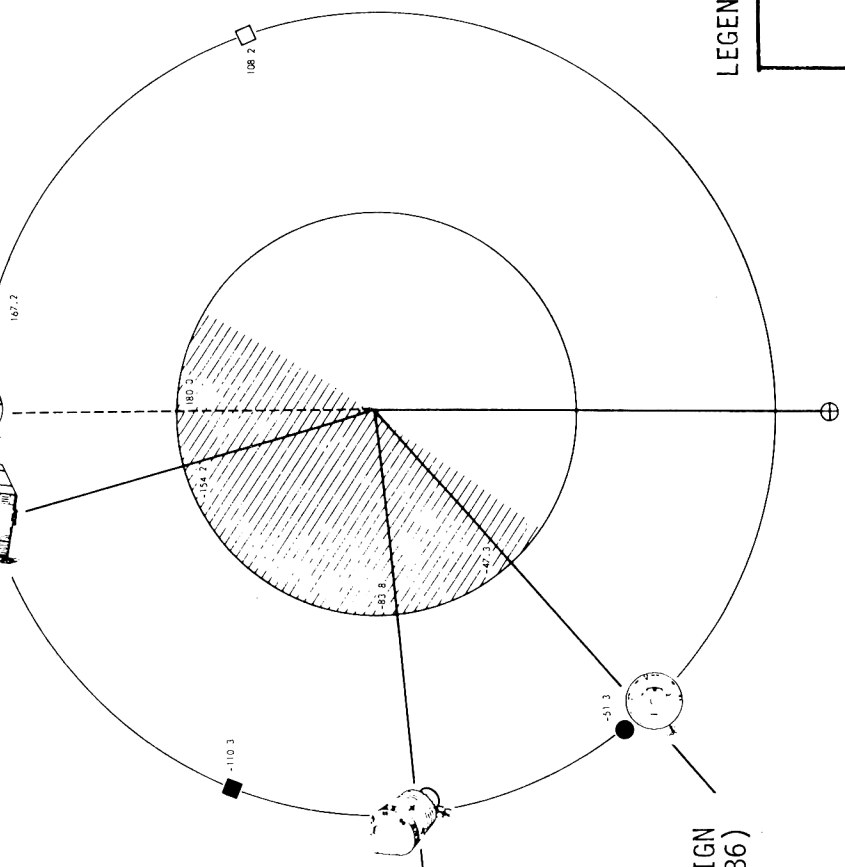
REV 19

114:20:00
 MNVR TO SOLAR
 CORONA ATT, BEGIN ORBRATE
 (0,340/92,0)
 LATTH

112:27:27
 BEGIN REV 19
 (0,3/0,0)
 IATTH

113:54:00
 MNVR TO ATT TO
 REALIGN IMU TO
 LIFTOFF REFSMMAT
 (0,34/45,0)
 IATTH
 AFTER ALIGN
 (184,NA/225,45)

113:42:03
 PC1 BURN IGN
 (0,229/0,86)
 IATTH



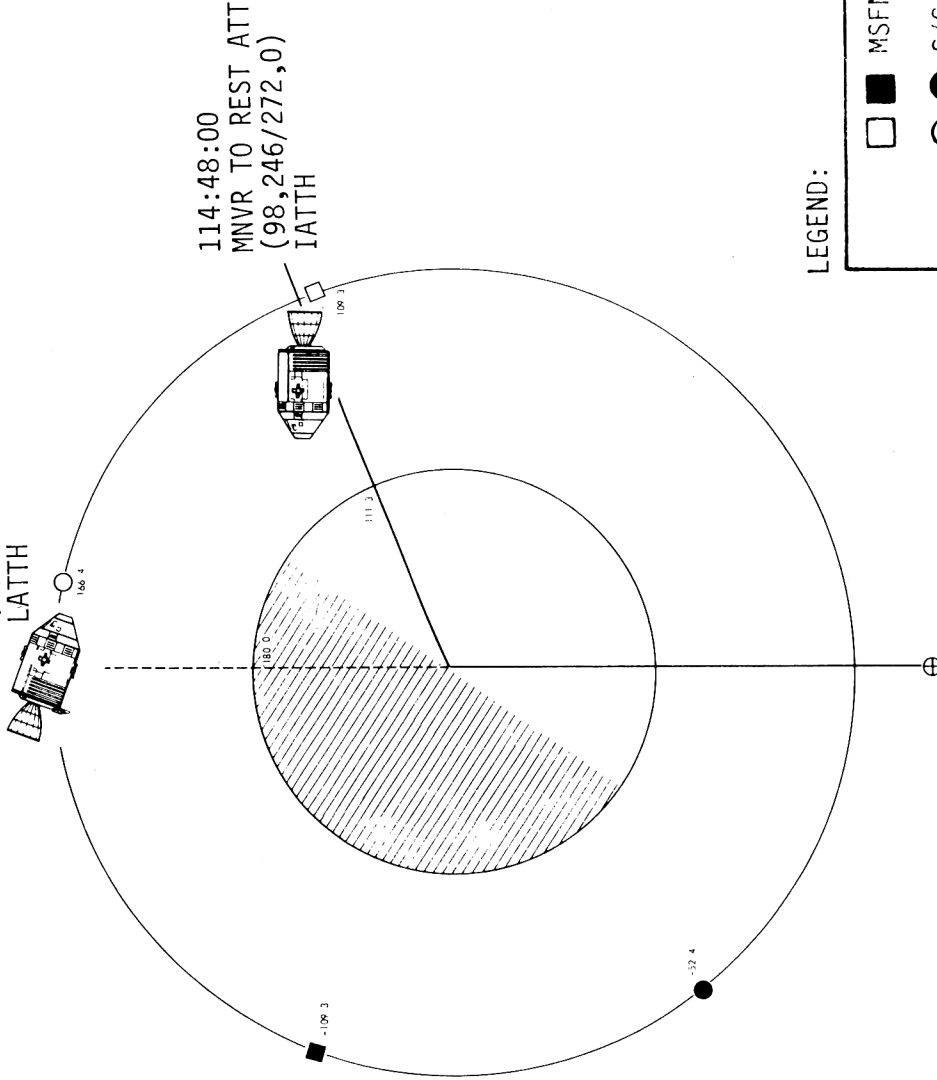
LEGEND:

□	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT

(R,LHP/INP,Y)*
 IATTH - INERTIAL ATTITUDE HOLD
 LATTH - LOCAL ATTITUDE HOLD

REV 20

114:25:28
 BEGIN REV 20
 (0,340/75,0)
 LATTH



114:48:00
 MNVR TO REST ATT
 (98,246/272,0)
 IATTH

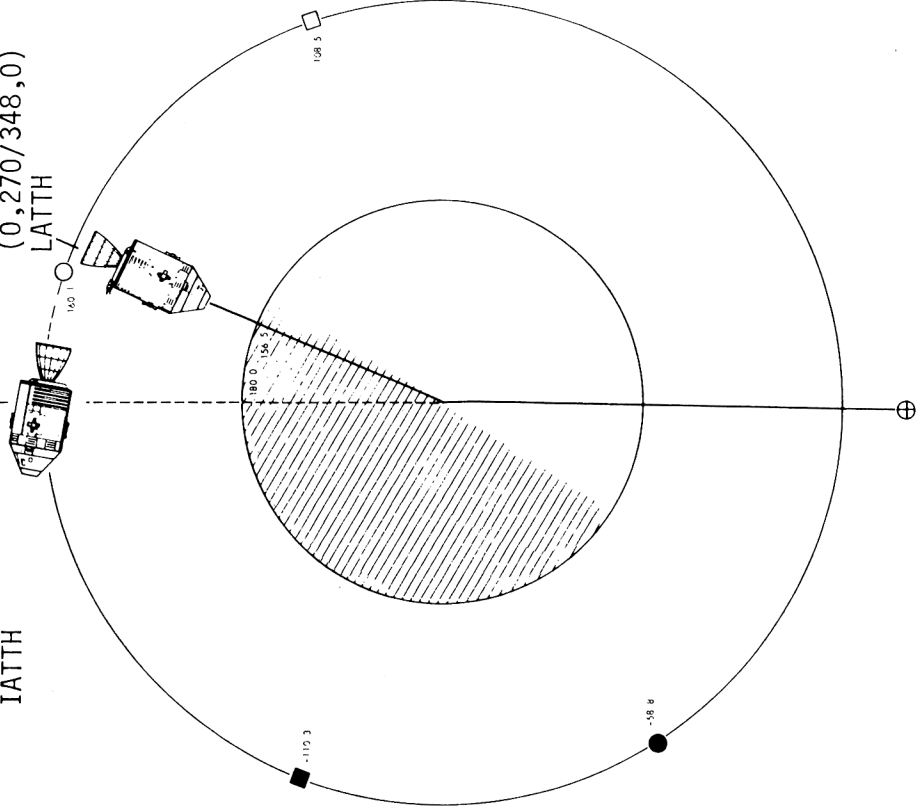
LEGEND:

- MSFN AOS, LOS
 - S/C SUNRISE, SUNSET
 - ⊕ SUBEARTH POINT
- (R,LHP/INP,Y)
 IATTH - INERTIAL ATTITUDE HOLD
 LATTH - LOCAL ATTITUDE HOLD

REV 26

126:13:21
 BEGIN REV 26
 (98,171/272,0)
 IATTH

126:21:00
 MNVR TO VERT STRIP
 PHOTO ATT, BEGIN ORBRATE
 (0,270/348,0)
 LATTH

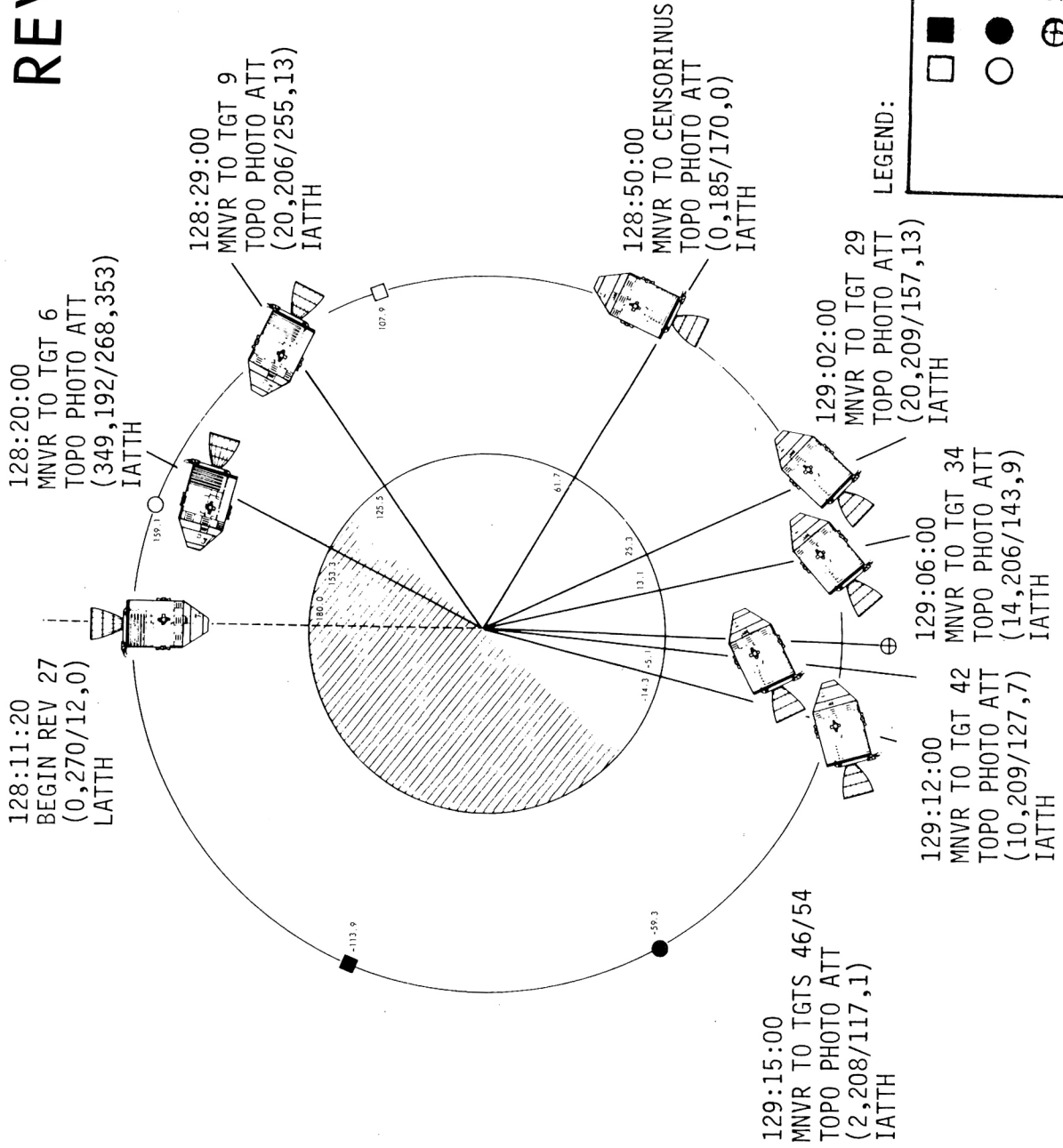


LEGEND:

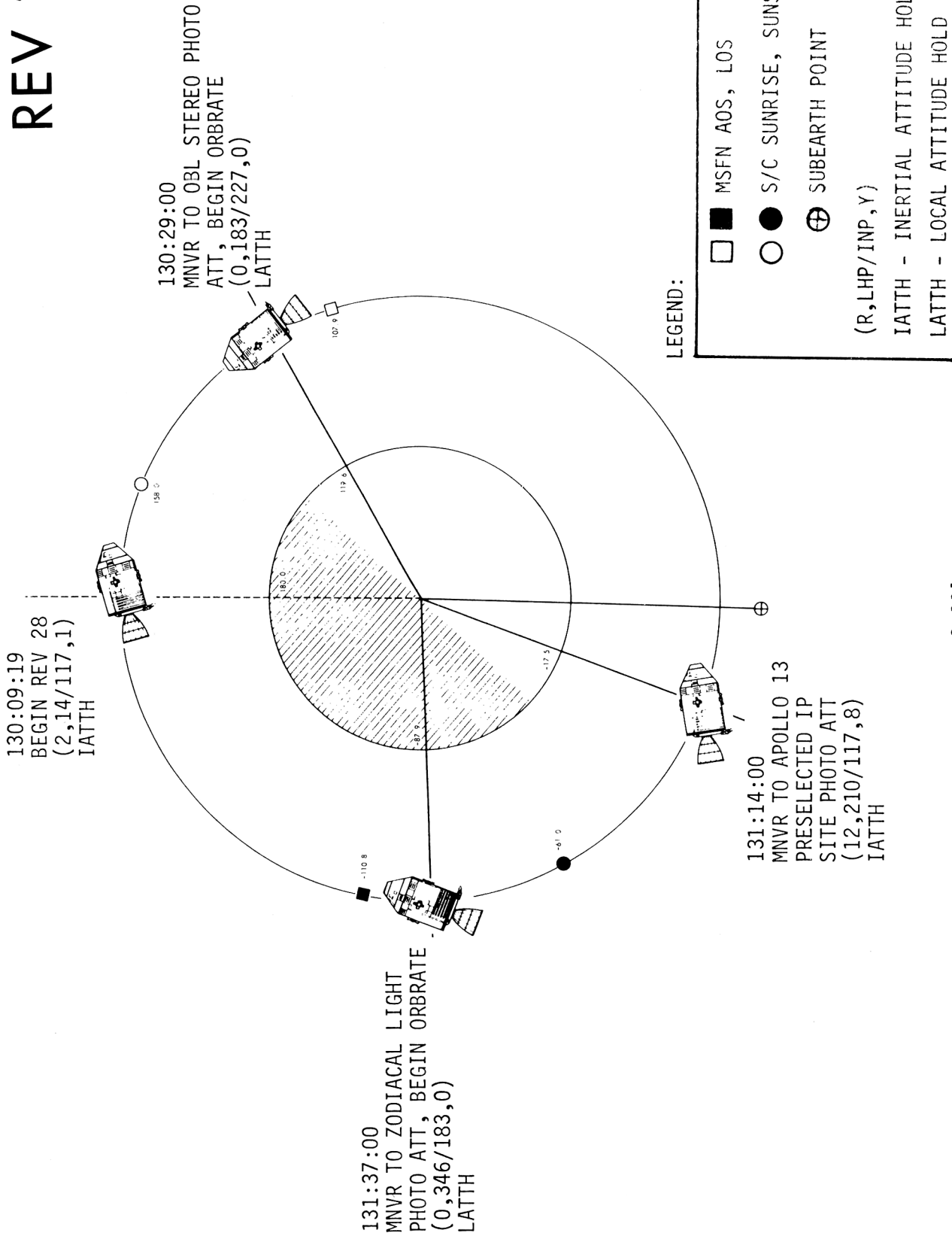
□	MSFN AOS, LOS
●	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT
(R,LHP/INP,Y)	
IATTH	- INERTIAL ATTITUDE HOLD
LATTH	- LOCAL ATTITUDE HOLD

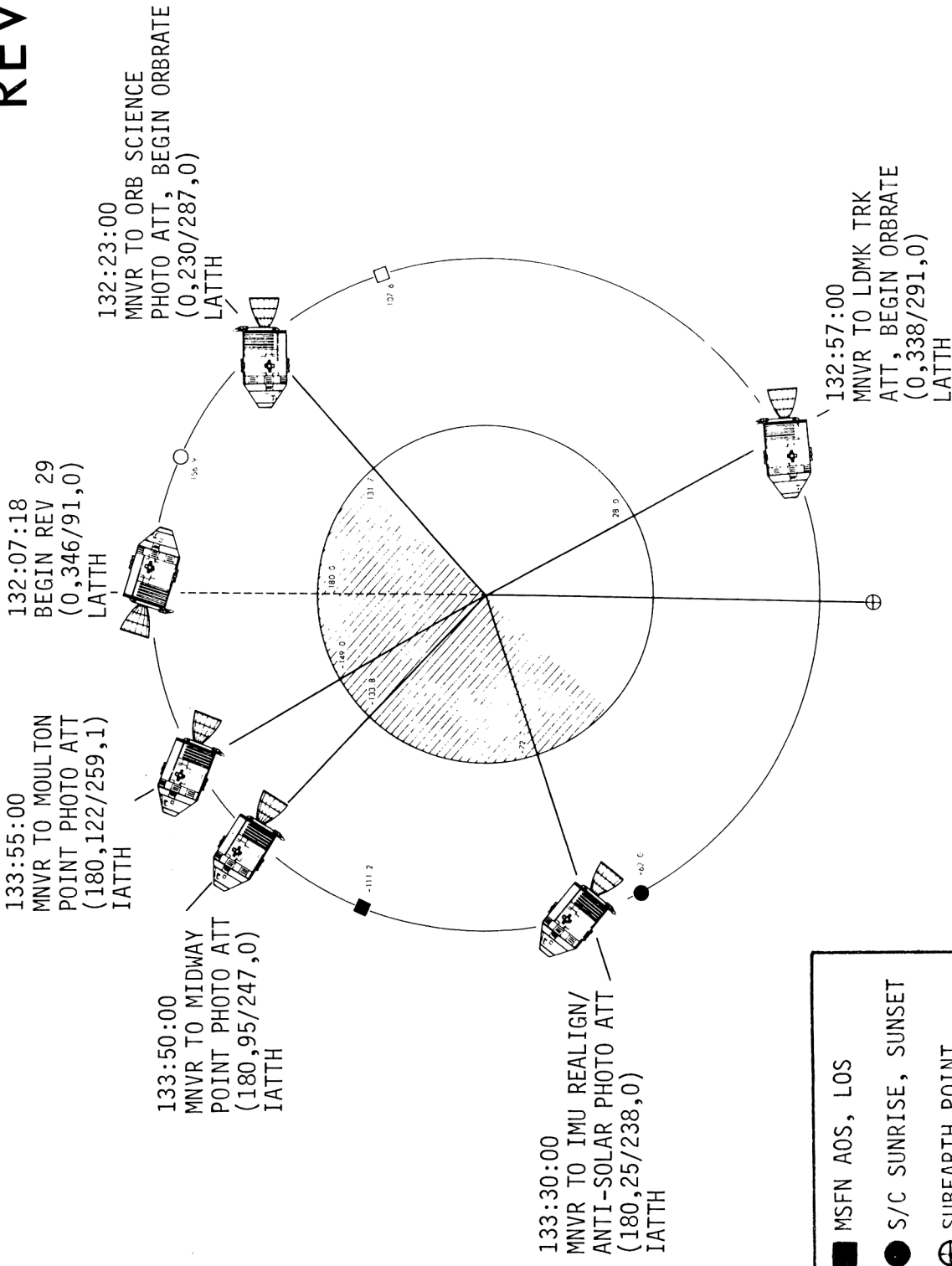
REVISION A

REV 27



3-97B



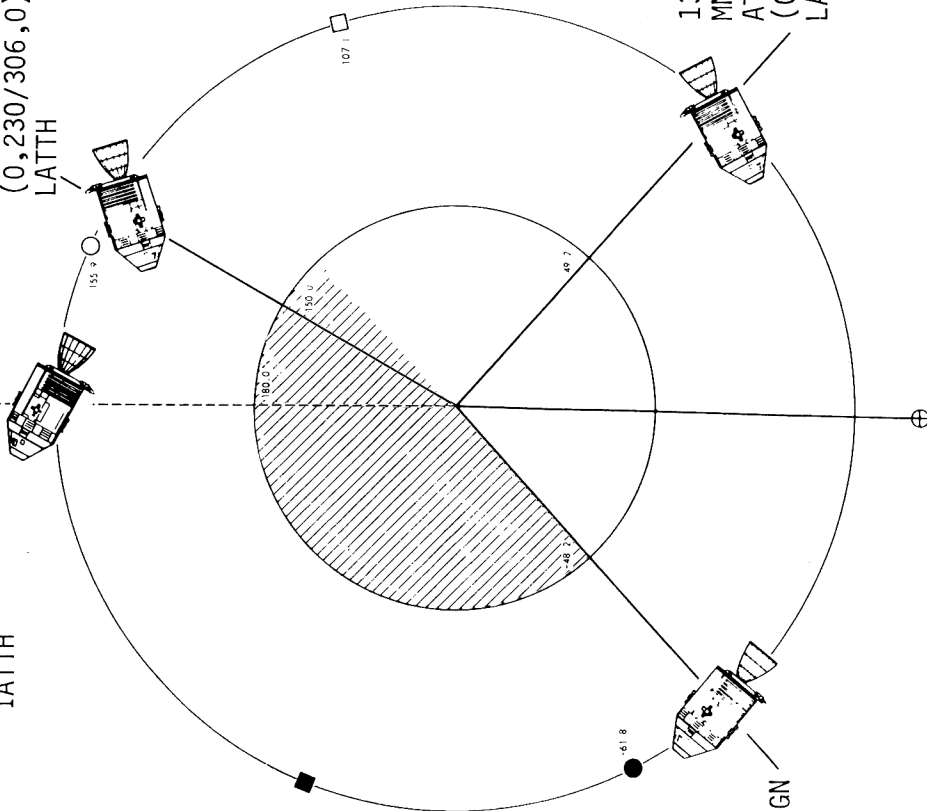


3-102B

REV 30

134:05:17
 BEGIN REV 30
 (179,153/259,1)
 IATTH

134:15:00
 MNVR TO ORB SCIENCE
 PHOTO ATT, BEGIN ORBRATE
 (0,230/306,0)
 LATTH



135:20:00
 MNVR TO SPICA,
 BEGIN IMU REALIGN
 AND COAS CAL
 (180,1/240,358)
 IATTH

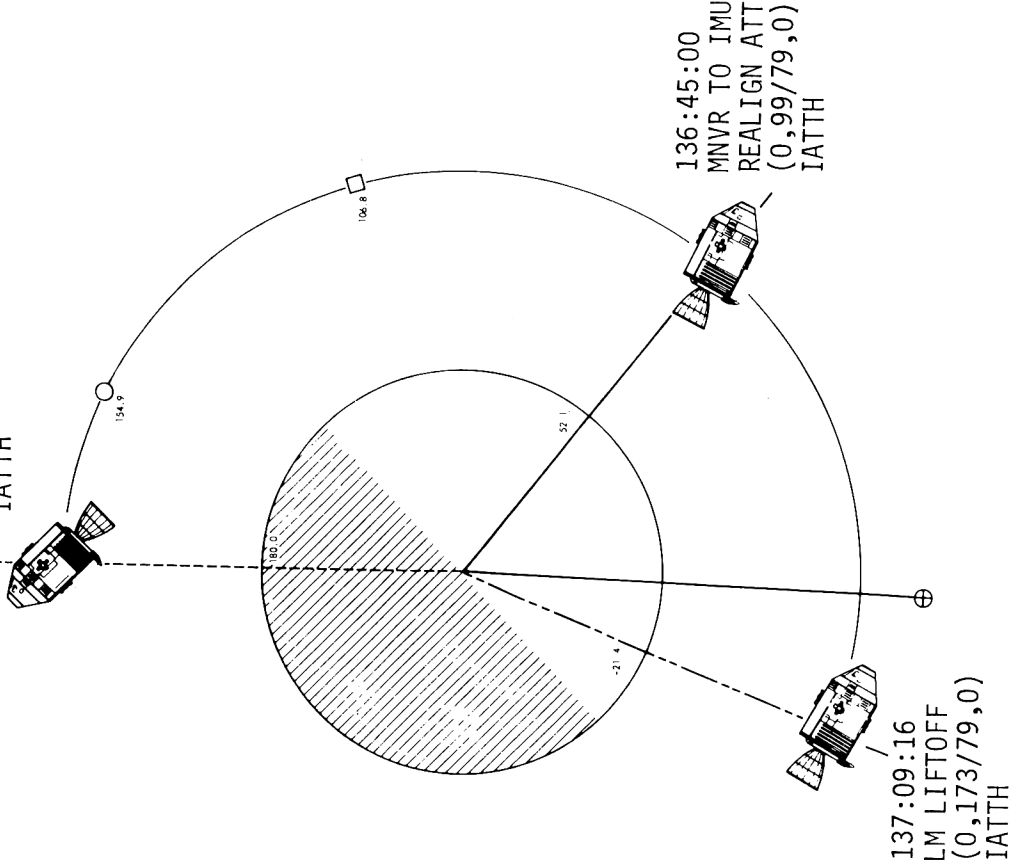
134:48:00
 MNVR TO LDMK TRK
 ATT, BEGIN ORBRATE
 (0,338/314,0)
 LATTH

LEGEND:

□	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT
(R, LHP/INP, Y)	
IATTH	INERTIAL ATTITUDE HOLD
LATTH	LOCAL ATTITUDE HOLD

REV 31

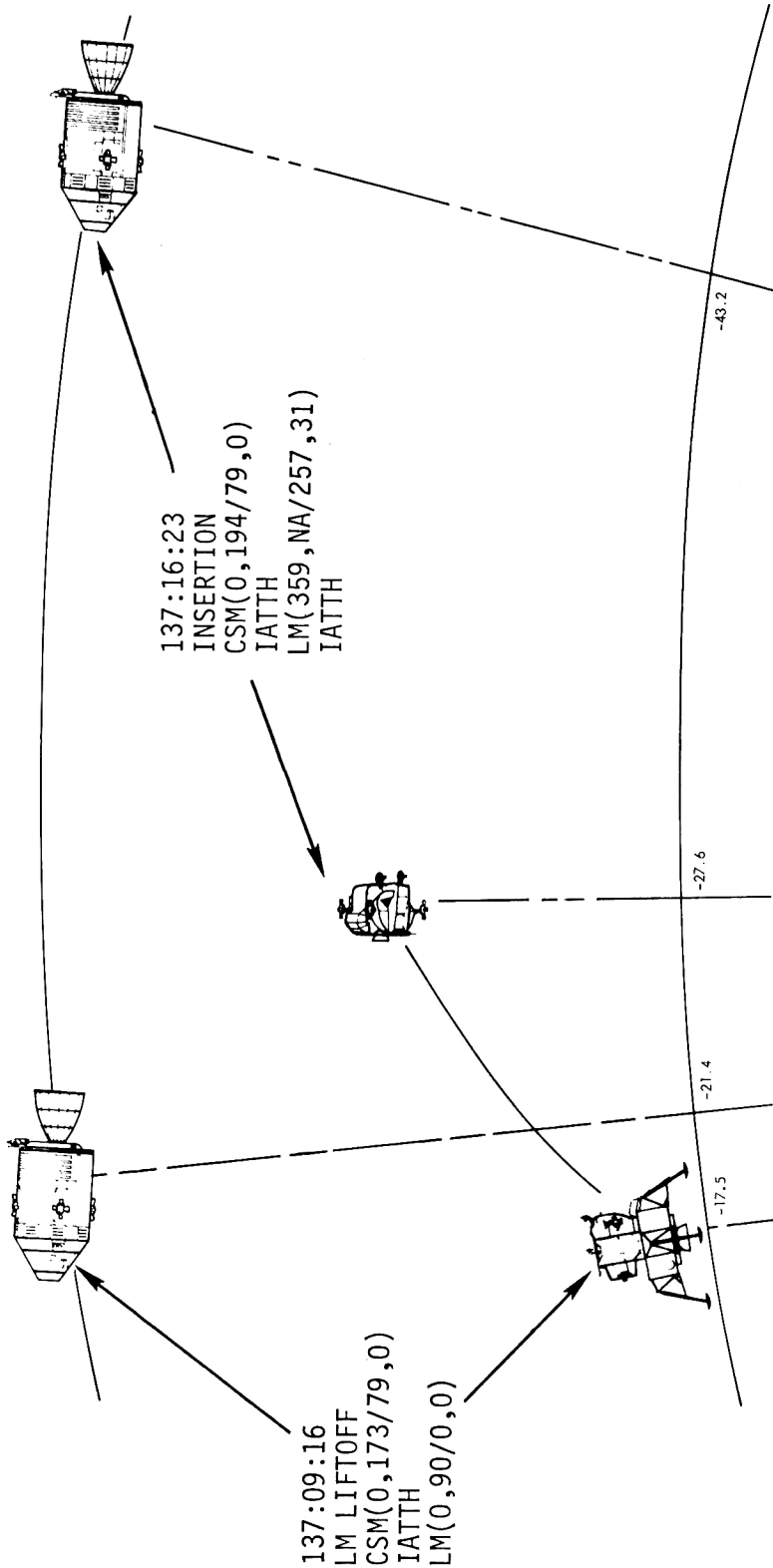
136:03:16
 BEGIN REV 31
 (180,133/240,358)
 IATTH



LEGEND:

□	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT
(R,LHP/INP,Y)*	
IATTH	- INERTIAL ATTITUDE HOLD
LATTH	- LOCAL ATTITUDE HOLD

REVISION A



LEGEND:

□	MSFN AOS, LOS
●	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT
(R,LHP/INF,Y)	
IATTH	- INERTIAL ATTITUDE HOLD
LATTH	- LOCAL ATTITUDE HOLD

3-107A

REVISION A

REV 31 & REV 32

138:06:01
 CSI BURN IGNITION
 CSM(0,180/274,0)
 IATTH
 LM(0,359/191,0)
 LOSM TO CSM

138:12:45
 CSM AND LM BEGIN
 VHF RNG AND RR TRKNG,
 RESPECTIVELY
 CSM(0,225/298,0)
 LOSM TO LM
 LM(0,2/173,0)
 LOSM TO CSM

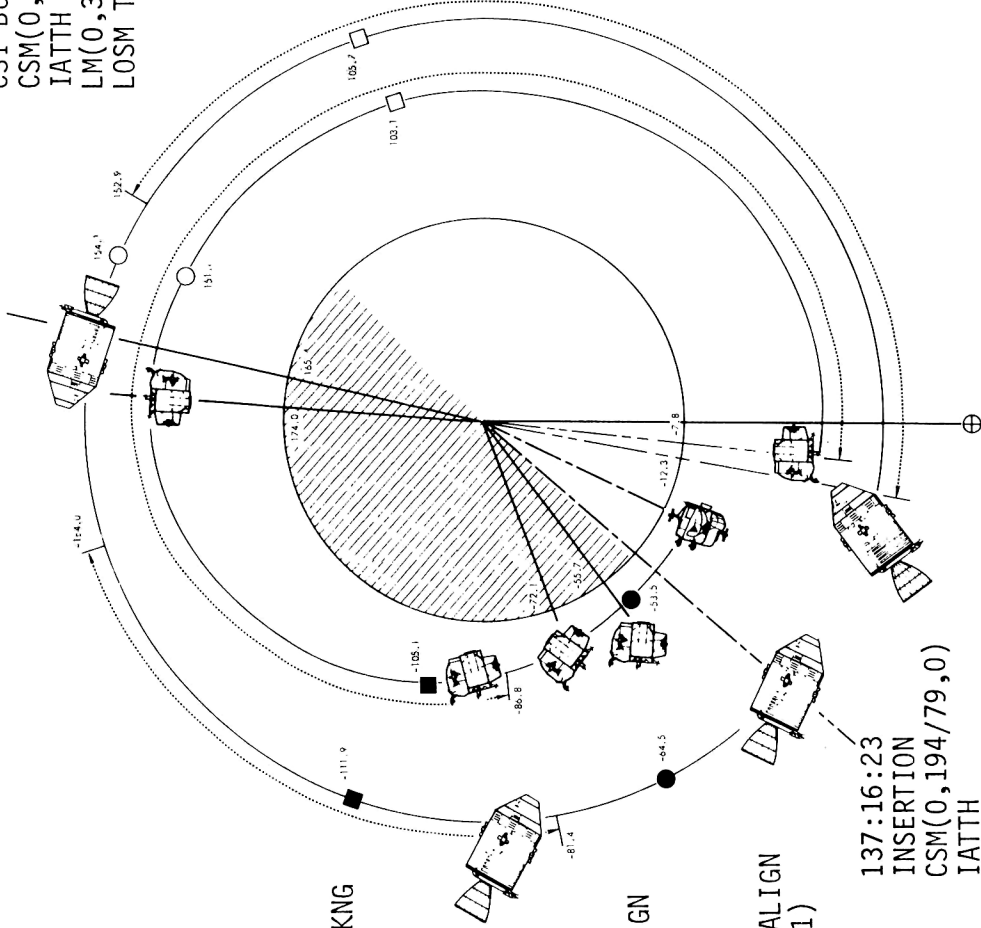
137:34:23
 LM BEGIN RR TRKNG
 LM(0,5/296,0)
 LOSM TO CSM

137:28:53
 CSM BEGIN VHF RNG
 CSM(0,232/79,0)
 LOSM TO LM

137:29:53
 LM BEGIN IMU REALIGN
 LM(359,25/331,1)
 IATTH

137:24:53
 LM BEGIN IMU REALIGN
 LM(359,323/285,1)
 IATTH

137:16:23
 INSERTION
 CSM(0,194/79,0)
 IATTH
 LM(359,NA/257,31)
 IATTH



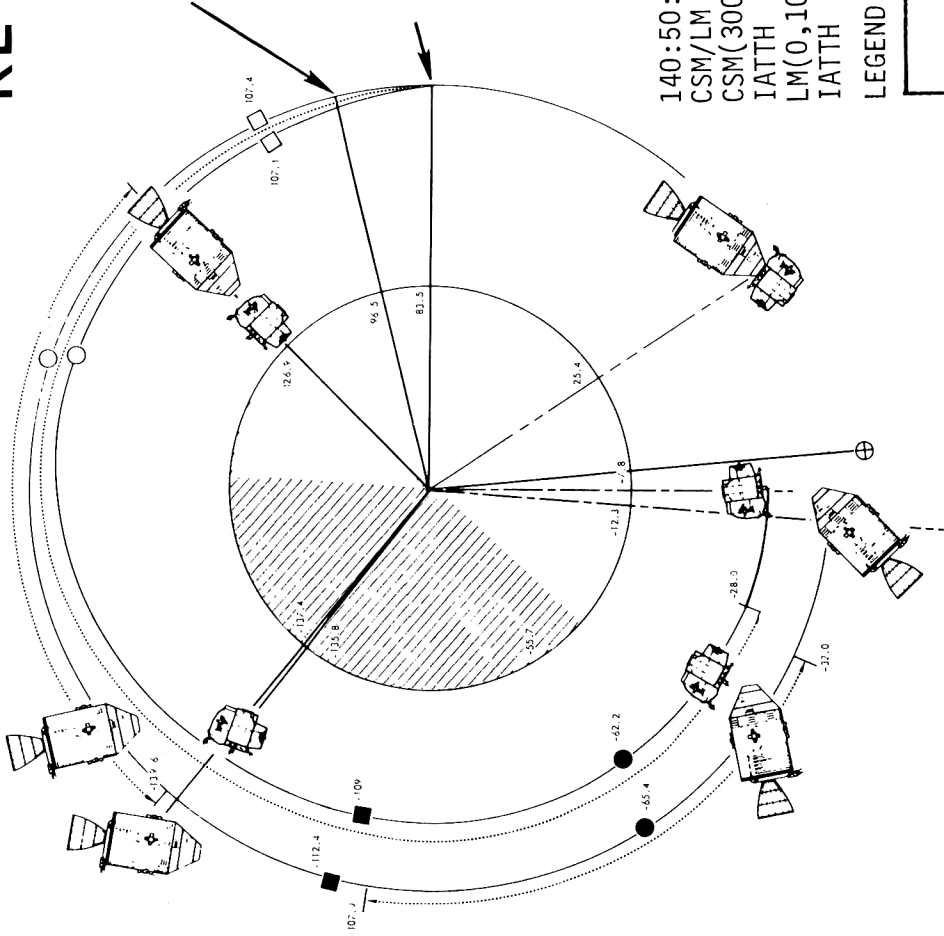
LEGEND:

☐	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT (R,LHP/INP,Y)
	IATTH - INERTIAL ATTITUDE HOLD
	LATTH - LOCAL ATTITUDE HOLD

REVISION A

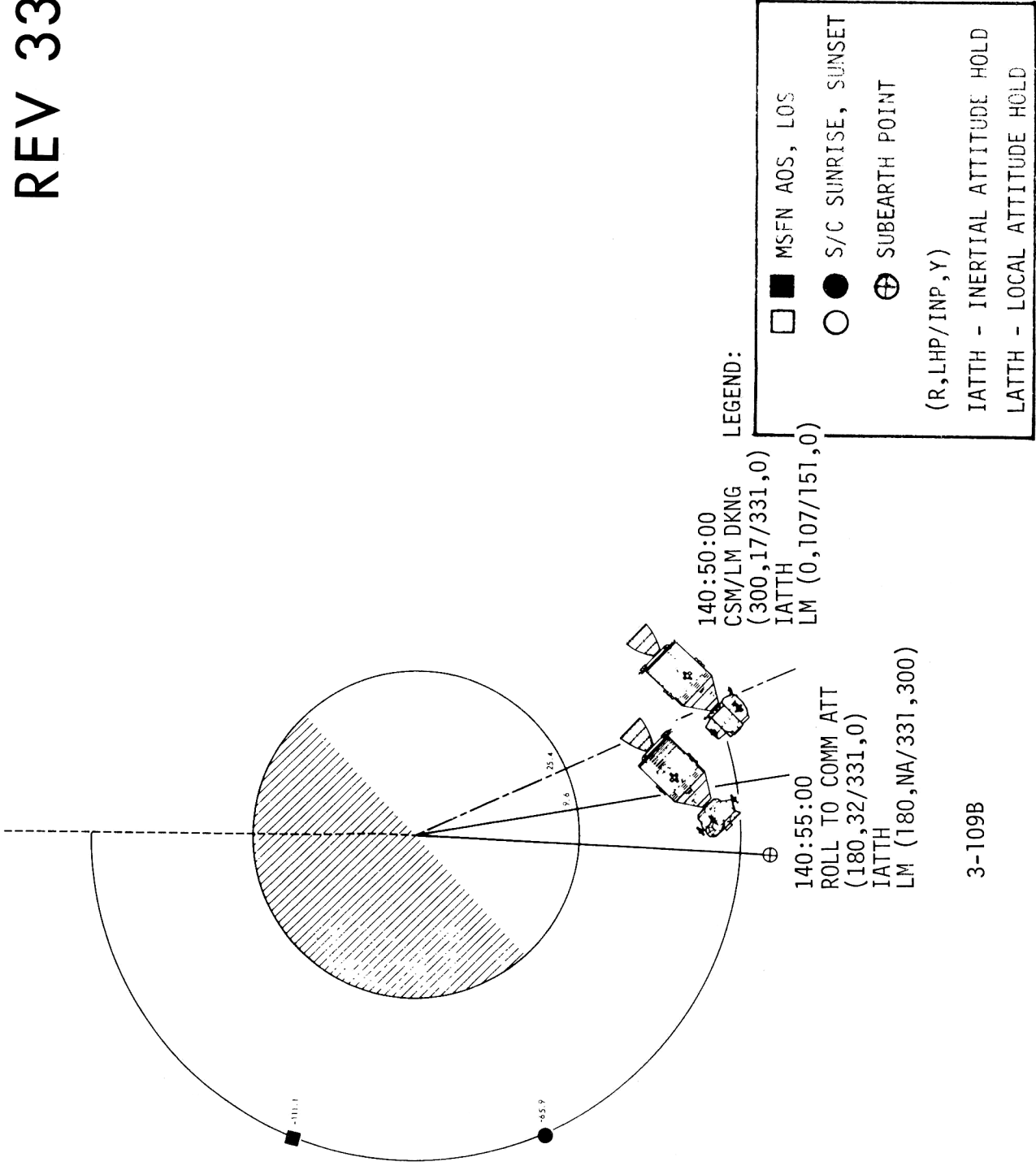
REV 32 & REV 33

139:45:14
 TPI BURN IGNITION
 CSM(0,208/0,0)
 IATTH
 LM(0,26/270,0)
 LOSM TO CSM



3-109A

REVISION A



3-109B

REVISION A

CSM

COMP

MCC-1 BACKUP
 CONFIRM LM MCC-1
 P35-TARGET MCC-2
 SXT & VHF TRACKING

FINAL MCC-2 COMP
 P41-RCS THRUSTING
 MCC-2 BACKUP
 CONFIRM LM MCC-2
 PREDOCK CHECKLIST
 P47-THRUST MONITOR
 ROLL 180° FOR HI GAIN
 HGA P -47, Y 358
 TV (MAD) 140:23-140:35
 START DAC

PITCH 360° FOR LM PHOTOS
 GO/NO-GO FOR PYRO ARM
 (CUE MSFN), LOGIC-ON
 ROLL RT 120° TO DOCK ATT:
 R 300, P 332, Y 0
 OMNI D
 PYRO ARM

CSM ACTIVE DOCKING

ROLL LEFT 120° TO R 180
 HGA: P -45, Y 356
 SC CONT-SCS
 N46 (61112, 11111)

FLIGHT PLAN

LM

CDR

NULL RESIDUALS
 P35-TARGET MCC-2
 RNDZ RADAR TRACKING

FINAL MCC-2 COMPUTATION
 P41-RCS THRUSTING

NULL RESIDUALS
 V48-LOAD DAP, N46-11002
 P47-THRUST MONITOR
 V63-RR SELF TEST

BRAKING PHASE

RR-OFF

PITCH 90° TO DOCK ATT
 R 0, P 152, Y 0

MODE CONTROL-OFF
 N46-12021

CONFIGURE ECS FOR
 DECONTAMINATION

DOCKING

STEERABLE
 P 190, Y 66

LMP ASSIST CDR WITH
 DECONTAMINATION AND
 TRANSFER:

MCC-H

LMP

TIG: 140:00:41
 ΔV_R: NOMINALLY ZERO

TIG: 140:15:41
 ΔV_R: NOMINALLY ZERO

OMNI-AFT
 BIOMED-RIGHT

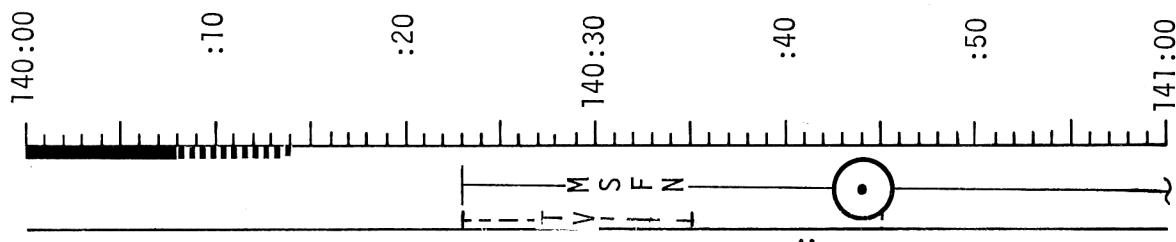
SET UP CAMERAS FOR CSM
 PHOTOS & DOCKING
 LM3/DC
 LM3/DAC
 EXTERIOR LTG-OFF
 PHOTOGRAPH CSM

OMNI-FWD

GO/NO-GO FOR PYRO ARM

DUMP DSE
 UPLINK TO LM
 LM S.V. (TIG*-10)
 P30 TARGET LOAD
 *TIG OF LM
 DEORBIT BURN

0913 CST



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 27, 1970	140:00 - 141:00	6/33	3-110

FLIGHT PLANNING BRANCH

REVISION A

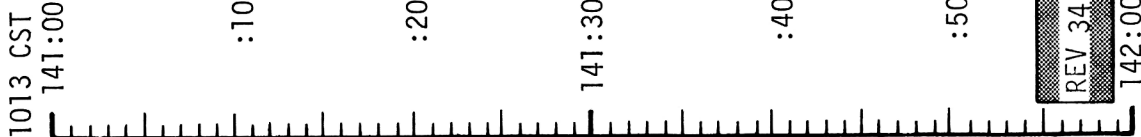
FLIGHT PLAN CSM

MCC-H

UPDATE TO LM
 DEORBIT BURN PAD
 DAP WEIGHTS
 UPDATE TO CSM
 LM JETT ATT & TIME
 CSM SEP BURN PAD
 DAP LOAD
 UPLINK TO CSM
 CSM S.V. (TIG*-10)
 LM S.V. (TIG*-10)

*TIG OF LM
 DEORBIT BURN

MCC VERIFY DSE
 MOTION BEFORE
 LOS



VERIFY CRYO 02 PRESS
 REPRESS PKG VLV-OFF
 PRESSURIZE CABIN TO 5.5 PSIA
 ADJUST 02 FLOW <0.5 LB/HR
 ADJUST 02 FLOW TO 0.6 LB/HR
 PRESSURIZE TUNNEL TO 3 PSID
 VERIFY ΔP STABLE FOR 3 MINUTES
 VERIFY LM FWD DUMP VALVE-AUTO
 CABIN FAN (2)-ON (UP)
 EQUALIZE TUNNEL PRESSURE
 LiOH CANISTER CHANGE
 12 INTO B, STOW 10 IN A3
 STOW OPTICS
 REMOVE HATCH AND STOW
 VERIFY DOCKING LATCHES (>3)
 REMOVE PROBE AND DROGUE
 STOW TV CAMERA
 PASS TO CDR AT HIS REQUEST:
 PROBE
 DROGUE
 HELMET/GLOVE BAGS
 DECONTAMINATION BAGS (A8 & U1)
 RECEIVE FROM LM AND STOW:
 TOP A1 ← (1 DC BAG)
 UPPER EQUIP BAY ← (2 HSB's)
 B5, B6 ← (2 DC BAGS)
 TOP A7, A11 ← (1 DC BAG)
 R13 ← (2 DC BAGS)
 R13 ← (1 DC BAG)
 A8 ← (1 DC BAG)
 B1 ← (IN B1 BAG) ← (1 DC BAG)
 B1 ← (1 DC BAG)

LM

DOFF GLOVES
 CONFIGURE HOSES AND BRUSH
 FOR VACUUMING
 UNSTOW & VACUUM CSRC & CSC CASSETTE
 UNSTOW, VACUUM & RESTOW SRC'S
 UNSTOW, VACUUM & SET ASIDE:
 LUNAR SURFACE HASSELBLAD
 TOTE BAG
 ISA
 DOFF HELMETS, VACUUM & SET ASIDE
 VACUUM PGA'S

DISCONNECT & STOW VACUUM
 BRUSH & HOSES

VERIFY TUNNEL PRESSURIZED
 OPEN HATCH
 RECEIVE PROBE FROM CMP & STOW
 RECEIVE DROGUE FROM CMP & STOW
 OVER PROBE

RECEIVE BAGS FROM CSM
 BAG AND TRANSFER TO CMP:
 1 ISA W/ TOTE BAG & WEIGH BAG
 2 HELMETS (GLOVES INSIDE)
 2 SRC'S FROM SRC RACKS
 1 TOTE BAG W/DUST COVER CONTAINING
 LENS BRUSH
 5 70 MM MAGS IN BAGS (3+2)
 6 16 MM MAGS IN BAG
 1 70 MM CAMERA
 1 CSC CASSETTE
 1 CLSRC
 2 16 MM MAGS IN BAG

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MSC Form 29 (May 69)

FLIGHT PLANNING BRANCH

REVISION A

REV 34

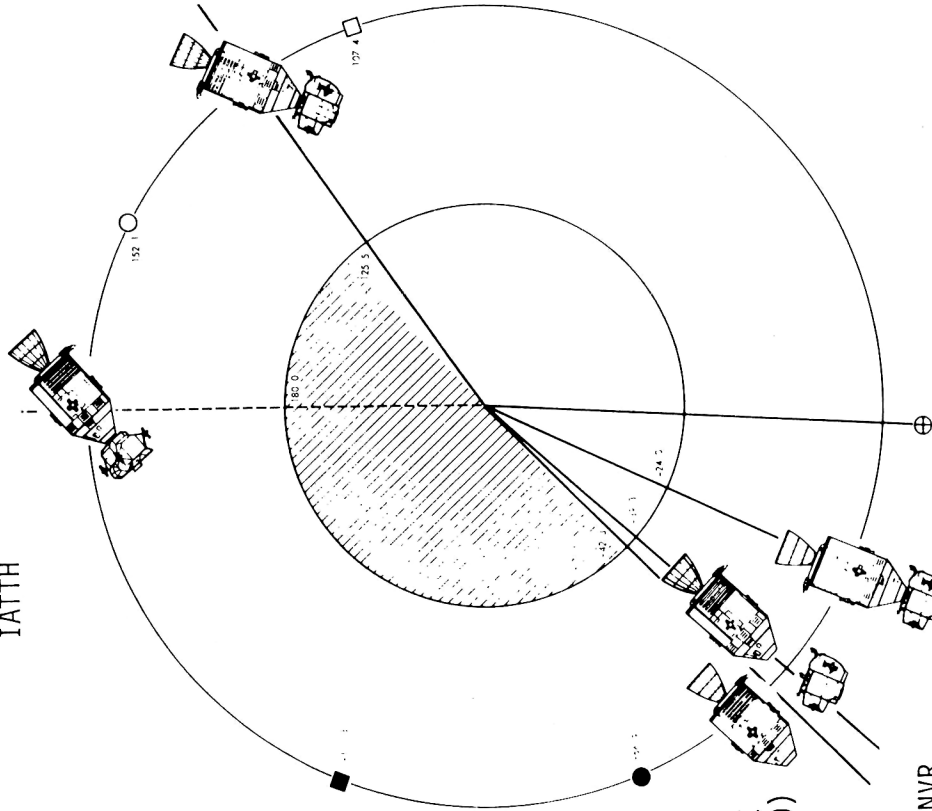
141:57:12
 BEGIN REV 34
 (180,221/331,0)
 IATTH

142:15:00
 MNVR TO LM JETT ATT
 (285,300/356,346)
 IATTH
 LM (14,NA/180,345)

143:10:00
 BEGIN ORBRATE
 (180,93/342,0)
 LATTH

143:09:00
 CSM SEP MNVR
 (180,90/342,0)
 IATTH

143:04:00
 LM JETT
 (285,89/356,346)
 IATTH



LEGEND:

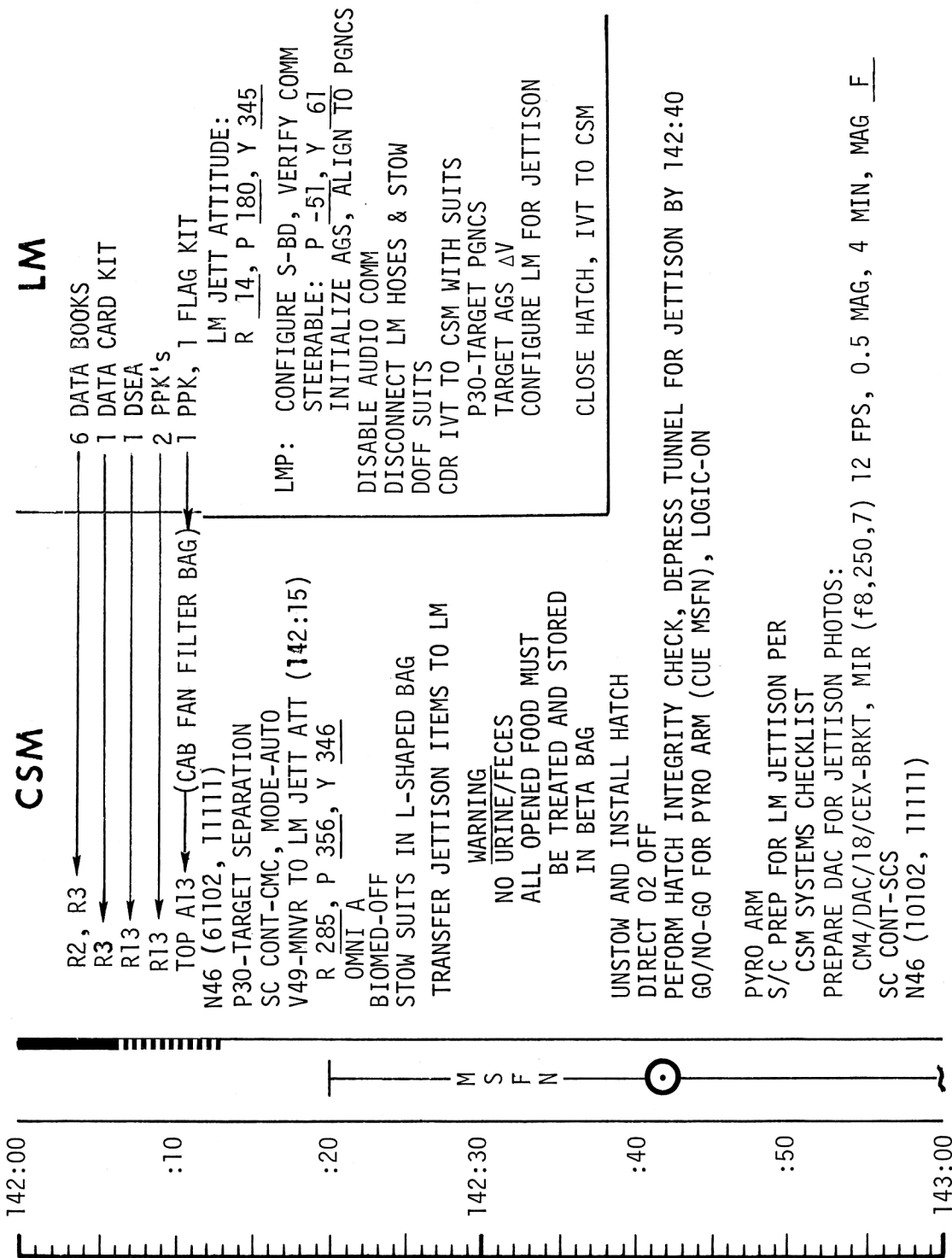
□	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT
(R,LHP/INP,Y)	
IATTH	- INERTIAL ATTITUDE HOLD
LATTH	- LOCAL ATTITUDE HOLD

REVISION _____ A _____

MCC-H

FLIGHT PLAN

1113 CST



GO/NO-GO FOR LM CLOSEOUT

GO/NO-GO FOR PYRO ARM

MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 27, 1970	142:00 - 143:00	6/34	3-112

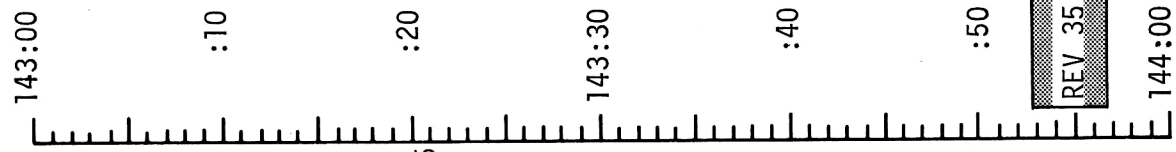
MSC Form 29 (May 69)

FLIGHT PLANNING BRANCH

REVISION A

FLIGHT PLAN

1213 CST



DAC ON
 P47-THRUST MONITOR
 LM JETTISON 143:04
 P41-RCS THRUSTING
 MNVR TO SEP ATT, (143:08) R 180, P 341.6, Y 0
 OMNI B

CSM SEPARATION 143:09

GO ORB RATE (143:10) P 093/342, V64-ACQ MSFN
 PREPARE DAC FOR LM DEORBIT BURN PHOTOGRAPHY
 CM/DAC/SXT/CEX (FIXED,250,FIXED) 12 FPS, 0.5 MAG, 4 MIN
 MAG F

S/C CLEANUP

CMP DOFF PGA

CONFIGURE FOR BI-STATIC RADAR TEST
 VERIFY VHF AM B - DUPLEX
 VHF RANGING-RANGING
 VHF ANTENNA-LEFT
 VHF AM SQUELCH A-MAX
 VHF AM T/R OFF

VERIFY DSE MOTION @ LOS

(3 AUDIO PANELS)
 THIS VHF CONFIGURATION WILL BE
 MAINTAINED UNTIL 166:10

EAT PERIOD

TOPO PHOTO PAD REV 35
 R P Y
 T START: : :
 T STOP : : :
 RNG NM.

TIG: 143:09
 BT: 6.12 SEC
 ΔVR: 1.0 FT/SEC
 ULLAGE: N/A
 ORBIT: 57.7 x 55.3

LM IS TARGETED FOR
 APS IMPULSE BURN.
 THRUST IS RCS
 ULLAGE ONLY.

ONBOARD READOUT

BAT C	_____
PYRO BAT A	_____
PYRO BAT B	_____
RCS A	_____
B	_____
C	_____
D	_____

DC IND SEL - MNA OR B

MAP UPDATE REV 35

LOS : : :
 180° : : :
 AOS : : :

DUMP DSE
 UPLINK TO LM
 V48-LOAD DAP
 R1-12011
 P42-APS THRUSTING
 UPDATE TO CSM
 TOPO PHOTO PAD REV 35

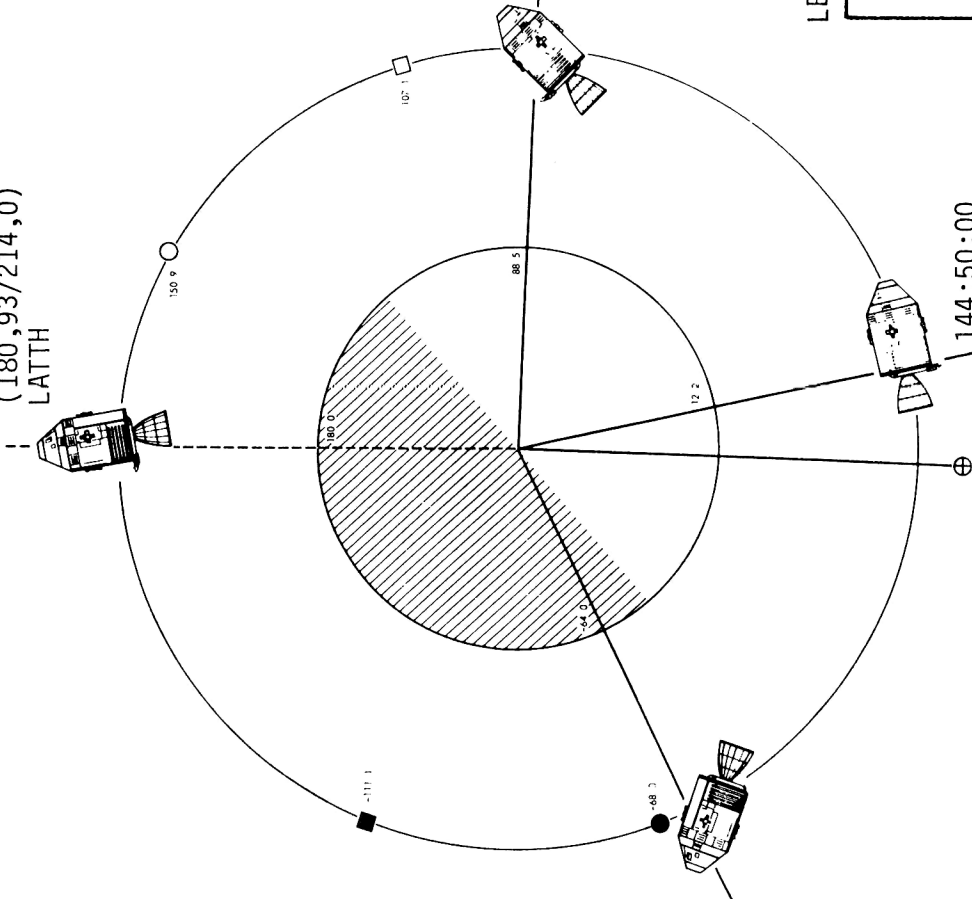
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 13	FINAL (APRIL)	MARCH 27, 1970	143:00 - 144:00	6/34-35	3-113

REVISION A

FLIGHT PLANNING BRANCH

REV 35

143:55:10
 BEGIN REV 35
 (180,93/214,0)
 LATTH



144:25:00
 MNVR TO DEORBIT
 OBSERVATION ATT
 (180,139/159,0)
 IATTH

144:50:00
 MNVR TO LM IMPACT
 PHOTO ATT
 (5,178/122,8)
 IATTH

145:15:00
 MNVR TO REST ATT
 (98,46/274,0)
 IATTH

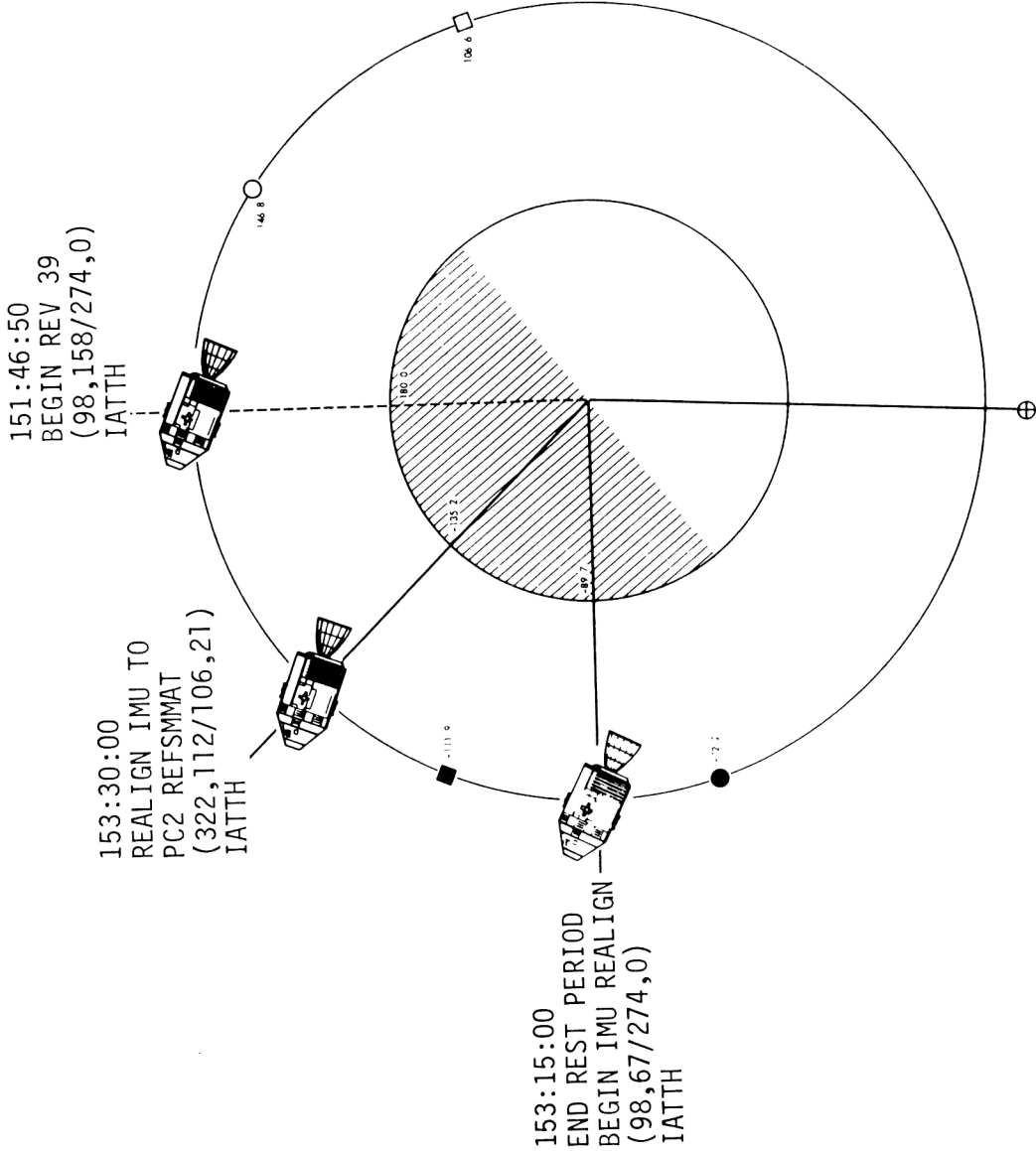
LEGEND:

□	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT (R,LHP/INP,Y)
	IATTH - INERTIAL ATTITUDE HOLD
	LATTH - LOCAL ATTITUDE HOLD

REVISION A

3-113A

REV 39



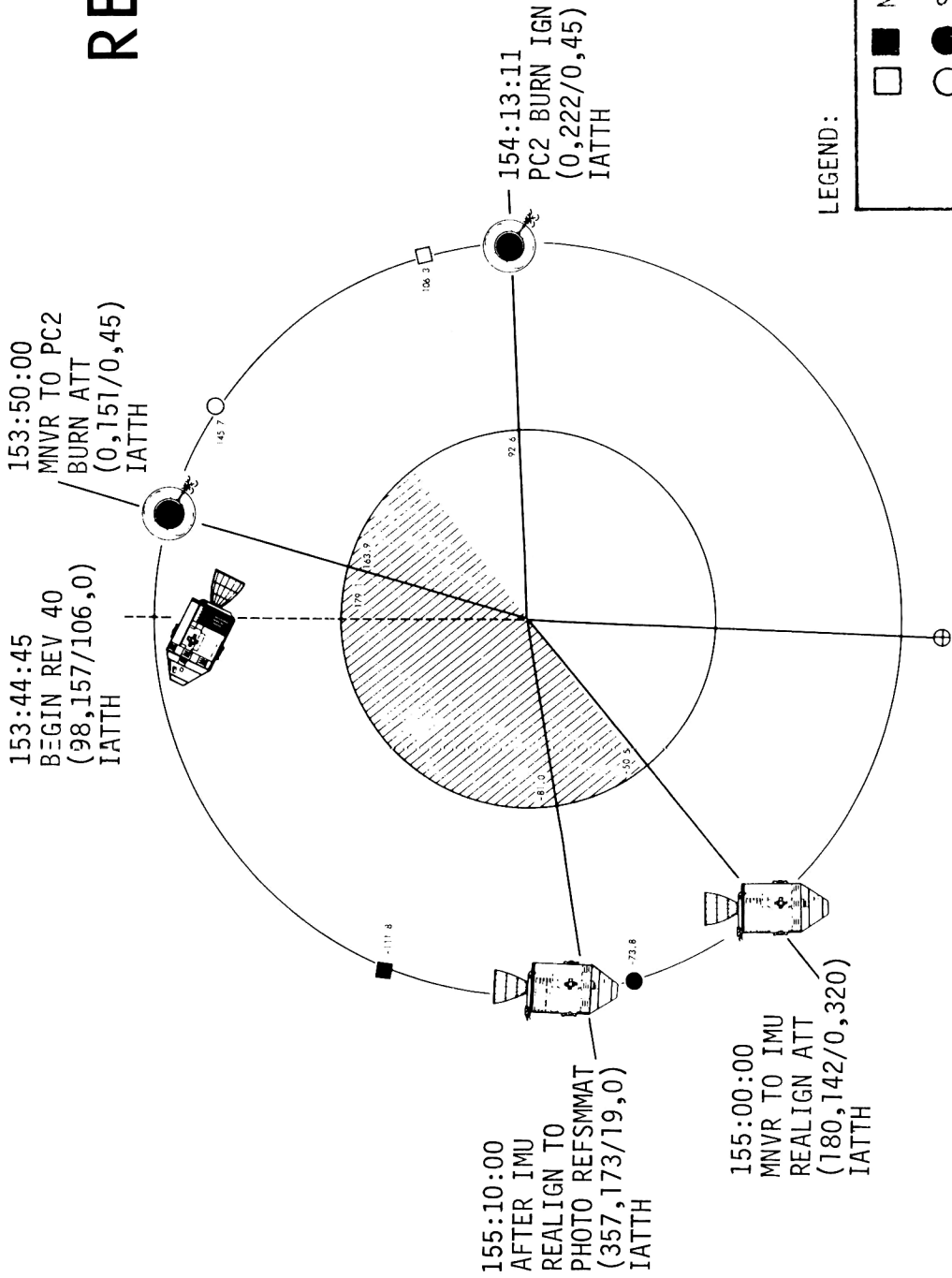
LEGEND:

□	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT
(R,LHP/INP,Y)	
IATTH	- INERTIAL ATTITUDE HOLD
LATTH	- LOCAL ATTITUDE HOLD

REVISION _____ A

3-117A

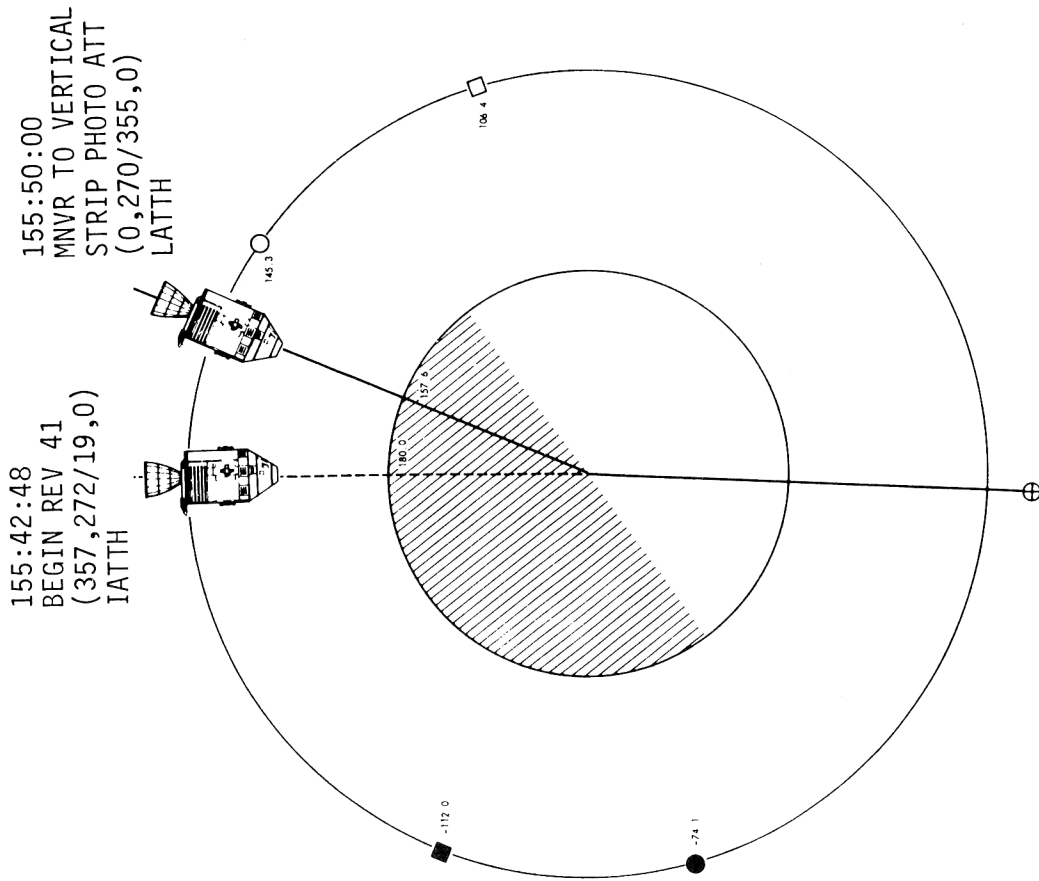
REV 40



LEGEND:

□	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT
(R,LHP/INP,Y)	
IATTH	- INERTIAL ATTITUDE HOLD
LATTH	- LOCAL ATTITUDE HOLD

REV 41

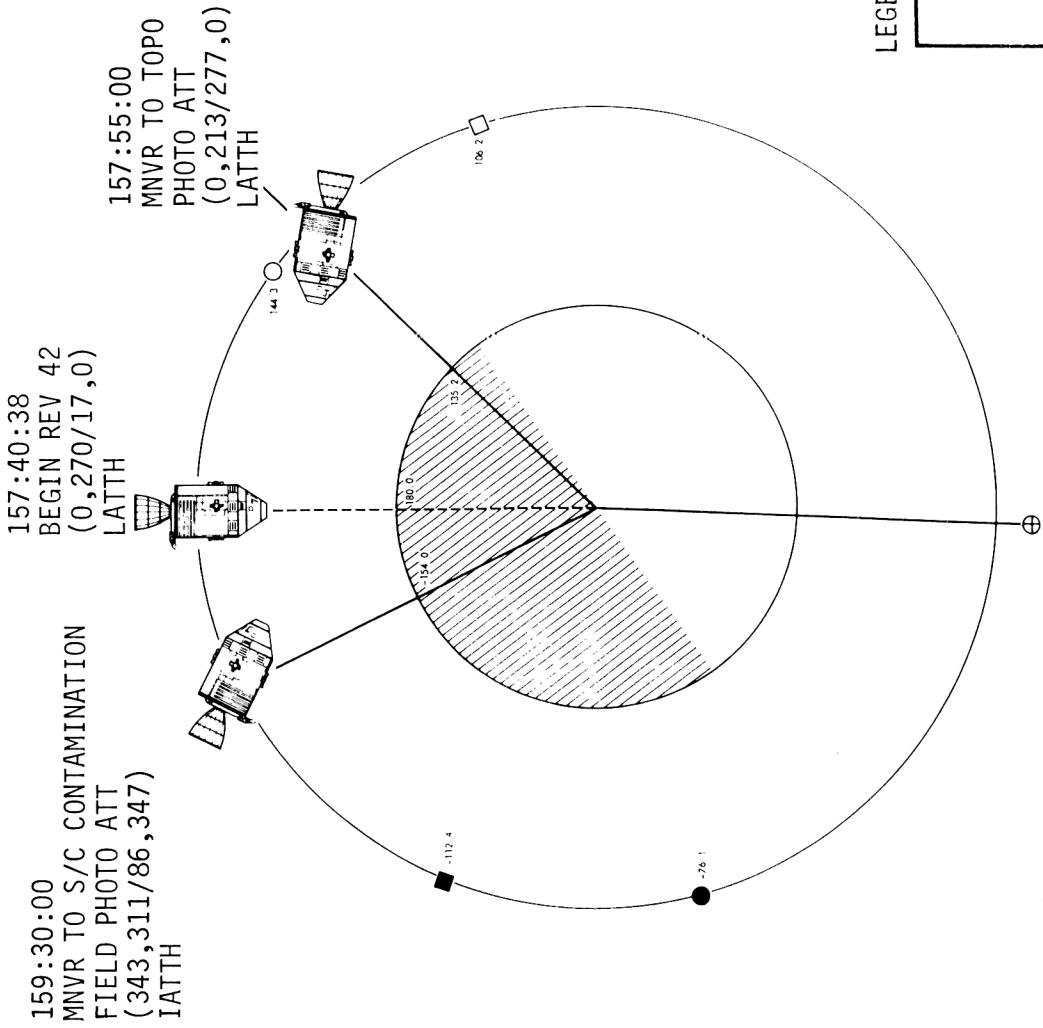


LEGEND:

□	MSFN AOS, LOS
●	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT
(R, LHP/INP, Y)	
IATTH	- INERTIAL ATTITUDE HOLD
LATTH	- LOCAL ATTITUDE HOLD

REVISION A

REV 42

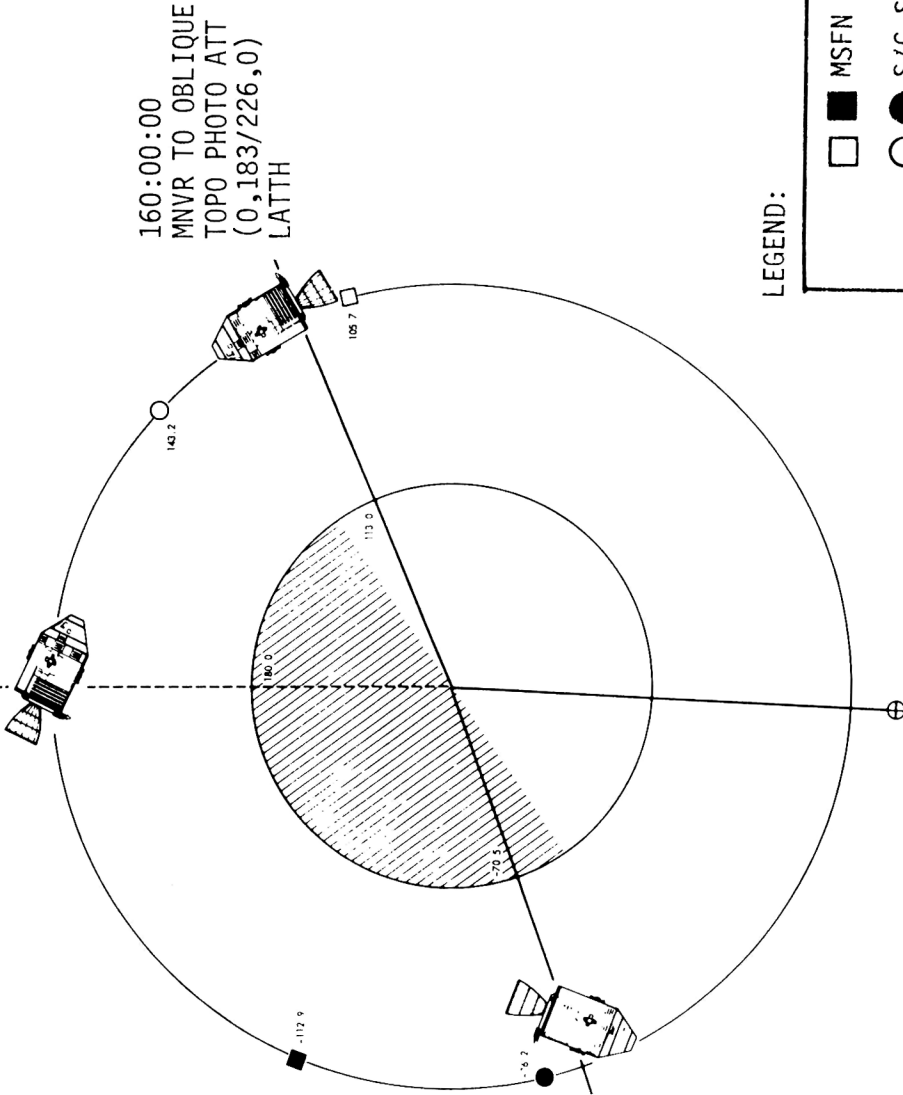


3-122B

REVISION A

REV 43

159:38:28
 BEGIN REV 43
 (343,337/86,347)
 IATTH



161:00:00
 MNVR FOR
 IMU REALIGN
 (0,140/0,0)
 IATTH

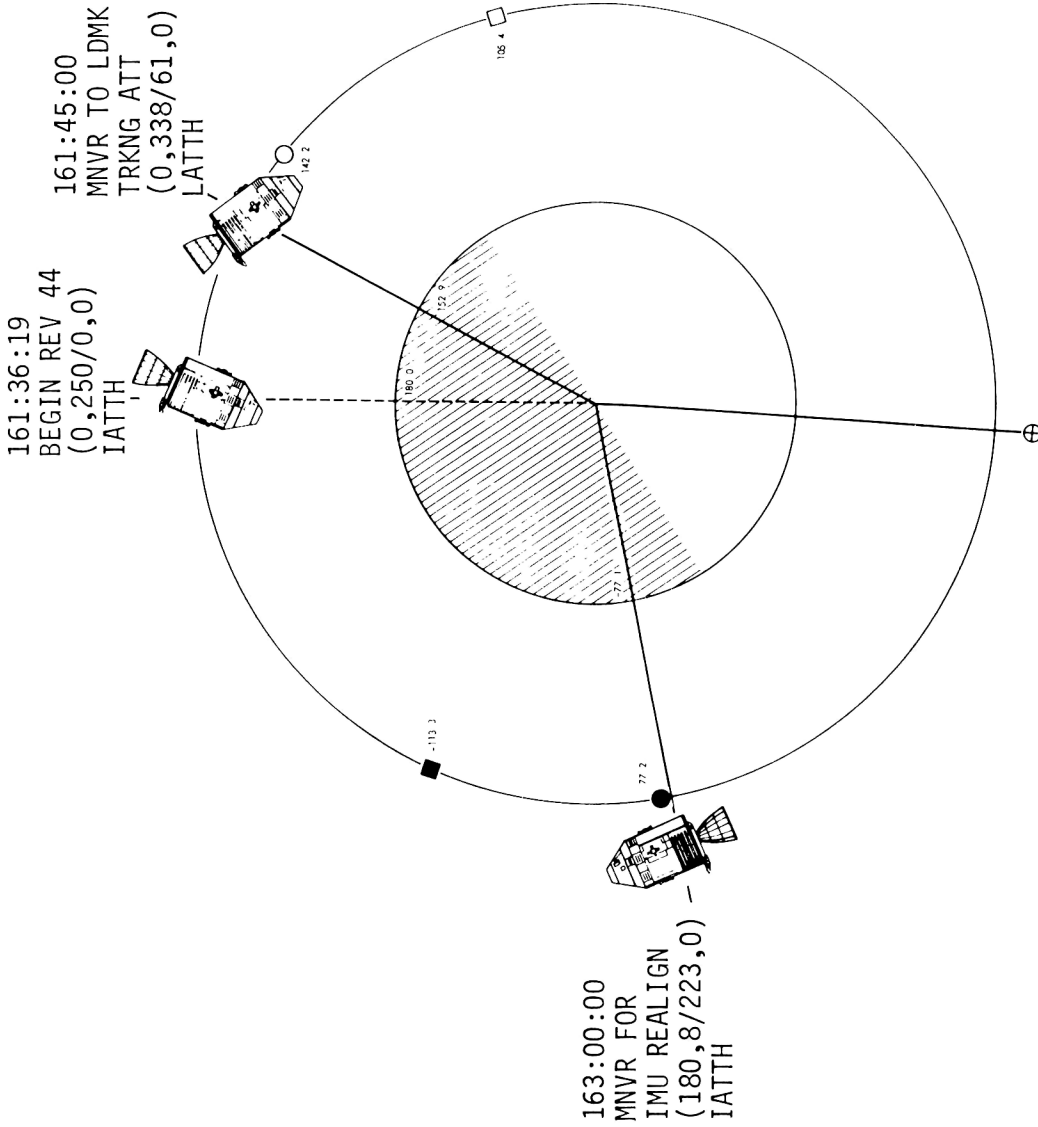
160:00:00
 MNVR TO OBLIQUE
 TOPO PHOTO ATT
 (0,183/226,0)
 LATTH

LEGEND:

■	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT

(R,LHP/INP,Y).
 IATTH - INERTIAL ATTITUDE HOLD
 LATTH - LOCAL ATTITUDE HOLD

REV 44

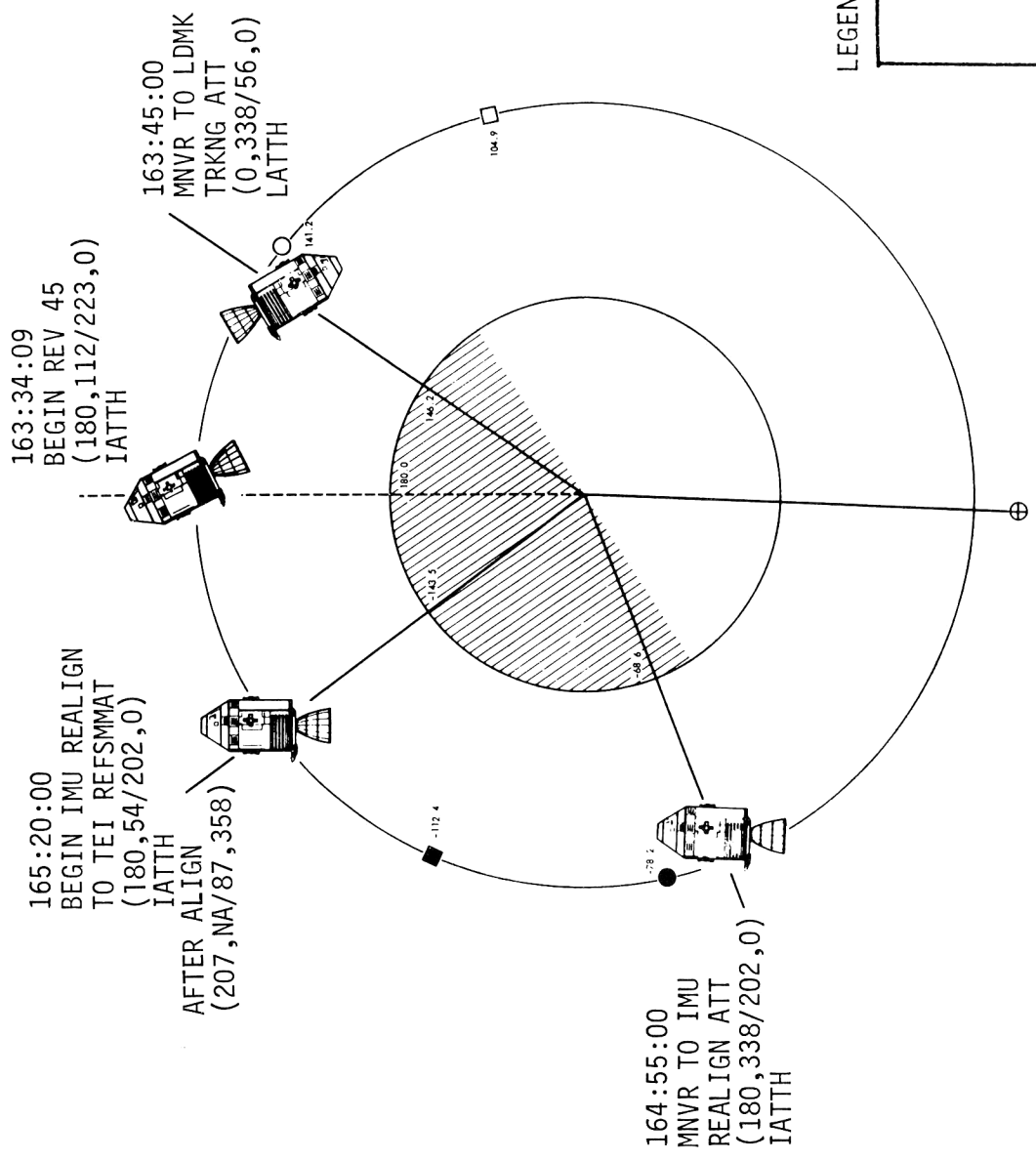


LEGEND:

□	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT
(R, LHP/INP, Y)	
IATTH - INERTIAL ATTITUDE HOLD	
LATTH - LOCAL ATTITUDE HOLD	

REVISION _____ A

REV 45



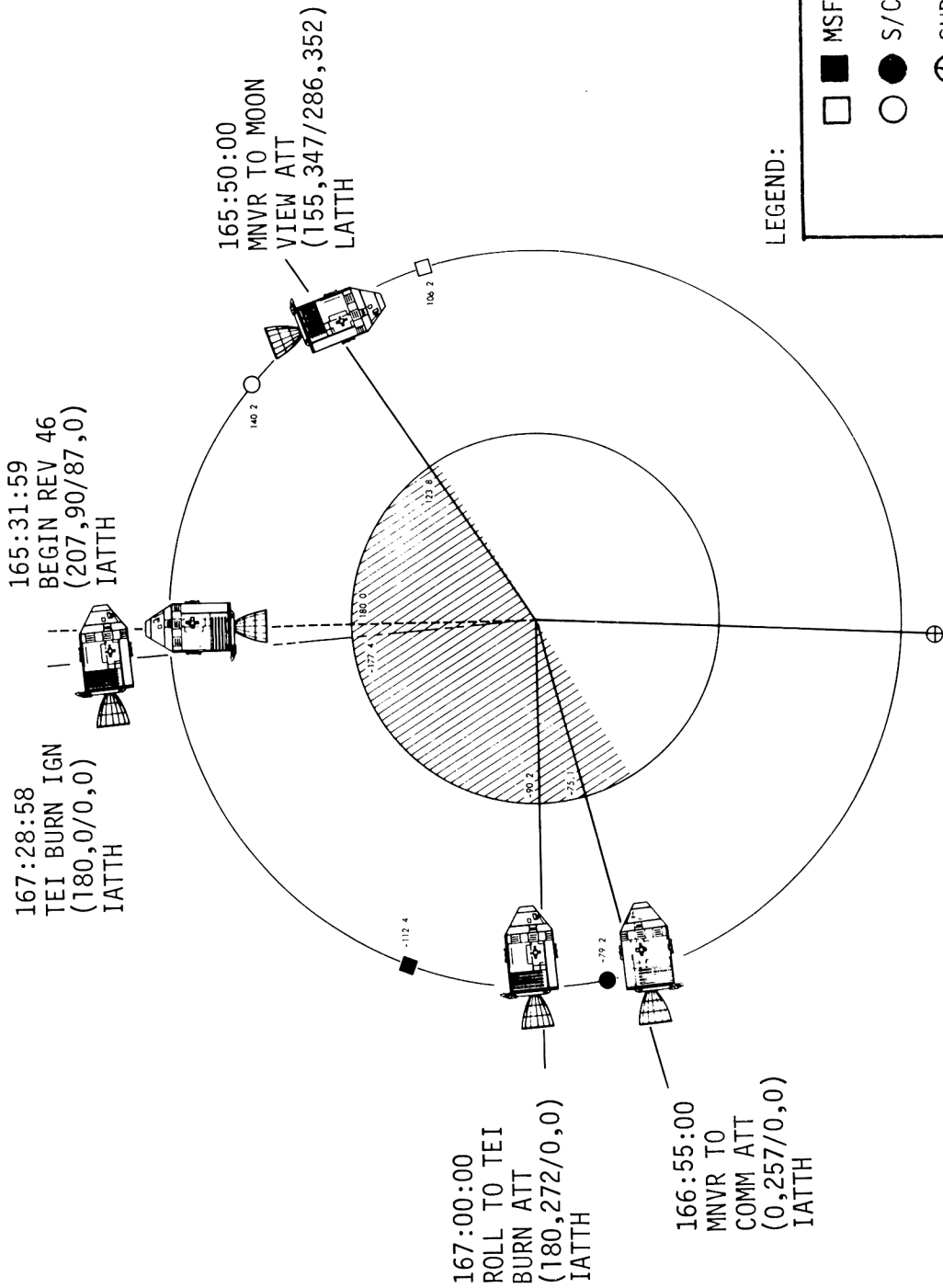
LEGEND:

□	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT
(R, LHP/INP, Y)'	
IATTH - INERTIAL ATTITUDE HOLD	
LATTH - LOCAL ATTITUDE HOLD	

REVISION _____ A

3-128B

REV 46



LEGEND:

□	MSFN AOS, LOS
○	S/C SUNRISE, SUNSET
⊕	SUBEARTH POINT
(R, LHP/INP, Y).*	
IATTH - INERTIAL ATTITUDE HOLD	
LATTH - LOCAL ATTITUDE HOLD	

REVISION A

3-130A

