APOLLO 16	
LM TIMELINE BOOK	
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APOLLO 16

LM TIMELINE BOOK

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ACKNOWLEDGEMENT

AREA	NAME/BRANCH	LOCATION
Rendezvous (Pg. 11,12,19-44)	S. Grega Flight Procedures CG4	Ext 5348 Bldg 4, Rm 222
Post Docking (Pg. 13-18)	G. Doerre Spacecraft Systems CG2	Ext 4371 Bldg 4, Rm 252

It is requested that any organization having comments in the above areas contact the responsible individuals.

LM TIMELINE BOOK

LIST OF EFFECTIVE PAGES

BASIC 3/10/72
CHANGE A 3/30/72
CHANGE B 4/5/72 (P&I)
CHANGE C 4/11/72 (P&I)

PAGE	DATE
*i	3/30/72
1	3/10/72
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*13	~~3/30/72~~ ~~4/5/72~~ 4/11/72
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*18	3/30/72
19	3/10/72
20	3/10/72
21	3/10/72
22	3/10/72
23	3/10/72
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25	3/10/72
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36	3/10/72
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39	3/10/72
40	3/10/72
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42	3/10/72
43	3/10/72
44	3/10/72

*Current Change

96:00

PREP FOR UNDOCKING
USE ACTIVATION & C.O.
C/L TO 10 MIN BEFORE UNDOCK
CHECK ATT (0, 284, 060)
V48 22012
LM WT _____ (36,685)
PRO, V34
V06N20 COPY LM AND CSM ANGLES AND TIME
P47

UNDOCK & SEPARATION ____:____:____ (96:14)
V77E
P00, V60 [TRIM TO .1 FPS]
YAW LT 60°
PITCH UP 90°
*SEQUENCE CAMERA - ON (1 MIN) *
FDAI (0, 013, 0)
*VHF ANT - FWD *
*SEQUENCE CAMERA - OFF *
HELMETS & GLOVES - OFF (OPT)

*SUIT GAS DIVERTER - EGRESS *
*CABIN GAS RETURN - EGRESS *

AOS 96 +16

*S-BD ANT - AFT, VERIFY COMM *
*✓S-BD P_____(+63) *
* Y_____(-32) *
*S-BD ANT - SLEW (>3.0) *
*TRACK MODE - AUTO *
*VHF B XMTR - OFF *
*BIOMED - LEFT, PCM - HI *
*
*UPLINK SQUELCH - OFF *
VOICE N20 ANGLES AND TIME TO MSFN
CAMERA SETTINGS FOR CABIN PHOTOS
LM/DAC/10/CEX (T/1.8, 1/60, 2ft)
* 6 FPS, .125 MAG N, (2 MIN) *
*LM/DC/60/HCEX (f5.6, 1/2 - 1/8, *
* FOCUS) 5 FR, MAG A *

96:20

96:20

DPS THROTTLE CHECK
*CB(16) STAB/CONT: ENG ARM - CLOSE *
THROT CONT - MAN/CDR
TTCA (BOTH) - THROTTLE (MIN)
*VERIFY MSFN CONTACT *
ENG STOP - PUSH
ENG ARM - DES (DES REG LT - ON)
TTCA MIN (6.6% - 13.4%)
THEN SOFT STOP (46.2% - 59.2%)
THEN MAX (93.6% - 100+%)
THEN MIN
ADJUST FRICTION
MAN THROT - LMP
*REPEAT TEST FOR LMP TTCA *
ENG ARM - OFF
*CYCLE CWEA (DES REG LT - OFF) *
ENG STOP - RESET
THROT CONT - AUTO/CDR
TTCA (BOTH) - JETS

DPS PRESS & C.O.

PRPLNT TEMP/PRESS MON - DES 1 & 2
FUEL 50°-75°F 50-130 PSI
OXID 50°-75°F 30-80 PSI
HELIUM MON: SUPCRIT PRESS 1070-1570
: AMB PRESS 1495-1750
DES He REG 1 tb - GRAY, REG 2 tb - bp
MASTER ARM - ON
DES PRPLNT ISOL VLV - FIRE
He PRESS/DES START - FIRE
MASTER ARM - OFF
PRPLNT TEMP/PRESS MON: DES 1 & 2
FUEL & OXID 50°-90°F 200-250 PSI
HELIUM MON: AMB PRESS 200-1110
: SUPCRIT PRESS 1070-1570

96:25

96:25

AGS ACTIVATION

*AGS STATUS - STBY (MASTER ALARM, *
* & AGS WARNING LT - ON) *
*CB(16) STAB/CONT: AEA - CLOSE *
* (AGS WARNING LT - OFF) *
CB(11) AC BUS B: AGS - CLOSE
*RECORD TIME _____:_____:_____ *
*AGS STATUS - OPERATE (MASTER ALARM, *
* & AGS WARNING LT - ON) *
*02/H20 QTY MON - C/W RESET *
*ATT MON (LMP) - AGS *
*V16 N65E *
*SET AGS TIME USING 90 HR BIAS *
* 377 _____ (+03850) *
*616+0 *
*224 _____ (+60514) *
*225 _____ (+29419) *
*226 _____ (+60384) *
*305 _____ (+00563) *
*662 _____ (-33024) *
*673 _____ (-54517) *
*412R+1 SELF TEST SATISFACTORY *
* +3 LOGIC TEST FAILURE *
* +4 MEMORY TEST FAILURE *
* +7 LOGIC & MEMORY TEST FAILURE *
*574R DESCENT STAGE (+ NOT STAGED) *
*604R LUNAR SURFACE FLAG *
* (+ NOT ON LUNAR SURFACE) *
*612R STAGING COUNTER (+0 NOM) *
*373 _____ (+05147) *

96:30

96:30

*232R +00600 *
*233R +00250 *
*464R +00500 *
*465R +00195 *
*623R +00000 *
*514R +00000 *
*515R +40000 *
*516R +00000 *
*000 +888888 (OPR ERR LT - ON) *
*123 -45679 (DO NOT ENTR) *

MSFN UPDATE

*COPY AGS K FACTOR _____:_____:_____ *
*V47E *

*V25E LOAD AGS K FACTOR UPDATE *
*414+1 *
*400+3 (AFTER 50 16) *
*V83, 317R, 440R, SET ORDEAL *

LANDING RADAR CHECKOUT

CB(11) PGNS: LDG RDR - CLOSE
CK TEMP (60° - 95°)
X-PNTRS - HI MULT

MODE SEL - LR
TM SW - H/$\dot{H}$
LDG ANT - AUTO

RDR TEST - LDG
POWER SIGNAL LIGHT OUT
TEST MON - ALT/VEL XMTR (2.1 - 5.0), AGC
X-PNTRS PEGGED UP, LT
TM - H (8000 ± 100), $\dot{H}$ (-480 ± 2)
V63 N12 OPT 2, PRO
N66 8286 ± 10, ANT POS 1 (00001), PRO
N67 V_x (-00495 ± 2), V_y (+01862 ± 2),
V_z (+01331 ± 2)
V34, RDR TEST OFF (ALT - 0, POWER SIGNAL
LIGHT ON, X-PNTRS - CENTERED)
CB(11) PGNS: LDG RDR - OPEN

96:35

96:35

AGS CONT CHECK

MODE CONT (AGS) - ATT HOLD
GUID CONT - AGS
MNVR TO FDAI (0, 330, 0)

*CAMERA SETTINGS FOR REV 12 TCA *
*LM3/DAC/10/CEX (T/2.8, 1/250, ·) *
* 1 FPS, .05 MAG N, (5 MIN) *
*LM/DC/60/HCEX (f5.6, 1/125, ·) *
* 5 FR, MAG A *

*SEQUENCE CAMERA - ON (96:41) *

REV 12 LS TCA ___:___:___ (96:46)

*SEQUENCE CAMERA - OFF *

RENDEZVOUS RADAR CHECKOUT

GUID CONT - PGNS
CB(11) AC BUS A: RNDZ RDR - CLOSE

CB(11) PGNS: RNDZ RDR - CLOSE
*VHF A XMTR - VOICE/RNG *
✓ TEMP (10° - 75°)
RT/ERR MON - RR
RR SLEW, MANUAL LOCK-ON, RR LGC
TM - RNG/RNG RT
V63, PRO, NO TRACK LIGHT OUT, PRO, N78

COMPARE N78, VHF, TM
V34
VHF A XMTR - VOICE *
V41N72E (+00000 TRUN, +28300 SHFT)
CB(11) PGNS: RNDZ RDR - OPEN
CB(11) AC BUS A: RNDZ RDR - OPEN
V44, RR - SLEW
RT/ERR MON - LDG RDR/CMPTR
TM - H/Ḣ

	R	Ṙ
MAX	.27 NM	7 FPS
N78		
VHF		
TM		

96:50

96:50

SS
96
+52

MSFN UPDATE

*COPY CSM CIRC P76 *
*SET DET TO COUNT DN TO CSM CIRC *
*COPY PADS FOR *
* NO PDI + 12 ABORT *
* PDI *
* PDI EARLY ABORT *
* PDI LATE ABORT *
* T2 ABORT *
* T3 TIG *

IMU FINE ALIGN

V76
P52 OPT 3
CB(11) AC BUS B: AOT LAMP - CLOSE
AOT - DETENT F/0.0°
PGNS MODE CONT - AUTO
1ST STAR SPICA (226)
PRO
2ND STAR ANTARES (233)
N05 ANGLE DIFF _____
PRO
N93 TORQUING ANG
X_____
Y_____
Z_____
PRO, RCD GET ___:___:___
N25, ENTR
P00
DETENT CL
CB AOT LAMP - OPEN

MSFN UPLINK

*UPDATA LINK - DATA *
*UPLINK CSM/LM S.V., E-MEMORY, *
* DESCENT TARGETING *
*UPDATA LINK - OFF *
*V47, 414+1, 400+3 *
*V83, 317R, 440R, SET ORDEAL *

97:05

97:05

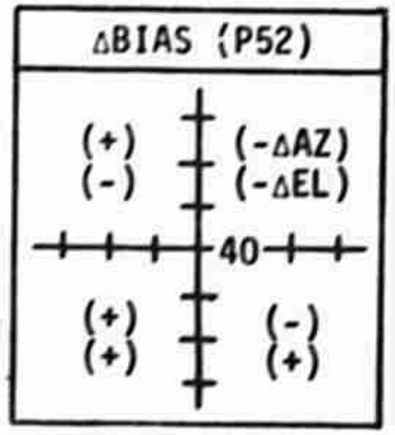
COAS CALIBRATION

P52
PGNS MODE CONT - AUTO
N70, ENTR 026 (SPICA), PRO
N87, (+00000, +00000) PRO, PRO

BIAS AZ_____
EL_____

LPD CALIBRATION

ENTR
N70, ENTR 026 (SPICA), PRO
N87, (+00000, +32046) PRO, PRO
P00



MSFN UPDATE

COPY AND LOAD GYRO DRIFT COMP, PIPA BIAS
(REF. P2 DATA CARD BOOK)

CONFIGURE COMM FOR LOS

LOS 97 +22

*MATCH INDICATED ANGLES *
*TRACK MODE - SLEW *
*S-BD ANT - FWD *
*SET P____(- 2) *
* Y____(+41) *
*VHF B XMTR - DATA, PCM - LO *
*UPLINK SQUELCH - ENABLE *

MNVR TO AGS CAL ATT

V49, +02250 OGA ROLL 24
+11250 IGA PITCH 122 } FDAI
+02250 MGA YAW 339

97:25

COAS CAL TO CSM CIRC

97:25

AGS CALIBRATION

*READ AND RECORD INITIAL CAL.NOS. *
PGNS MODE CONT - ATT HOLD
*VERIFY 25 MIN SINCE TURN-ON *
V60, V76, V16N20E
RATES < 0.075°/SEC
*400+6, START WATCH *
*400R *
MONITOR ICDU LIMITS
OGA +00000 / +04500
IGA +09000 / +13500 } LIMITS
MGA +00000 / +04500

BEFORE LIMITS ARE EXCEEDED, 400+0.
IF TIME IS LESS THAN 5 MINUTES
REPEAT AGS CALIBRATION.

*CHECK ECS, RCS, EPS, APS *
*CYCLE CWEA CB *
*400R+0 *
*READ AND RECORD CAL VALUES *

	INIT	CAL	Δ LIM
540			± .039
541			± .039
542			± .039
544			±2.00
545			±2.00
546			±2.00

SR 97 +41

CSM CIRCULARIZATION ____:____:____(97:42)

P76 (UPDATE CSM S.V.), PRO
V82, N12-00002, PRO
✓CSM HA/HP
*PCM - HI
*V47, 414+1
*V83, 317R, 440R
*PCM - LO

97:45

97:45

P63 IGNITION ALGORITHM TEST

P63
*RESET DET TO CONT DN TO PDI *
PGNS MODE CONT - AUTO
N18 R, P, Y (0, 111, XXX) PRO
YAW TO 340°
P00
V48, 22112, 00011, PRO, V34

*CAMERA SETTING (PDI) *
LM3/DAC/10/CEX-WDG (T/2.8, 1/500, ∞)
* 12 FPS, .75 MAG N, (6 MIN) *
*CAMERA SETTING (EARTH RISE) *
*LM/DC/60/HCEX (f16, 1/250, ∞) *
* 5 FR, MAG A *

COAS TO OVERHEAD WINDOW
VERIFY LOOSE GEAR STOWED
RESTRAINTS ATTACHED
VERIFY FDAI'S INERTIAL

PRE-PDI ECS CHECKOUT

HELMETS AND GLOVES ON
*CABIN REPRESS - CLOSE *
*SUIT GAS DIVERTER - EGRESS *
*CABIN GAS RETURN - EGRESS *
*PRESS REGS A&B - EGRESS *

PRE-PDI SWITCH SETTING CHECK

*VHF ANT - FWD *
CB(11)EPS: INV 1 - CLOSE *
*SELECT INV 1 *

98:00

98:00

CB(11) STAB/CONT: AELD - CLOSE
CB(11) STAB/CONT: ABORT STAGE - CLOSE
RESET ENG STOP PB
SET WINDOW BARS

*CB(16) STAB/CONT: AELD - CLOSE *
CB(16) STAB/CONT: ABORT STAGE - CLOSE

*CYCLE CWEA CB *
-35 *BATS 5 & 6 NORM FEED - ON *
*RECORD GET _____:_____:_____ *
THROT CONT - AUTO
CDR TTCA - THROTTLE - MIN
*LMP TTCA - THROTTLE - SOFT STOP
RATE SCALE - 25°/SEC
ATT/TRANSL - 4 JET
CHECK DPS, APS, RCS, ECS, EPS
CHECK SWITCH GUARDS
PRPLNT QTY MON - DES 1

AOS 98 +10 -25
*S-BD ANT - FWD, VERIFY COMM *
*✓S-BD P _____(-2) *
* Y _____(+41) *
*S-BD ANT - SLEW (>3.0) *
*TRACK MODE - AUTO *
*VHF B XMTR - OFF *
*BIOMED - LEFT, PCM - HI *
*UPLINK SQUELCH - OFF *
*VOICE AGS CAL. NOS. TO MSFN *
*CHECK ED BATTS AND REPORT *
*VOICE ASC BATT ON TIME TO MSFN *

MSFN UPLINK, UPDATE

*UPDATA LINK - DATA *
UPLINK LM S.V., RLS
*UPDATA LINK - VOICE BU *
*COPY, LOAD AGS RLS (231)_____ *
*COPY, LOAD LPD BIAS *

✓BURN ABORT RULES

98:20

AGS INITIALIZE TO PDI

98:20

AGS INITIALIZE

```
-15          *V47, 414+1                    *
             *V83, 317R, 440R               *
             *240 + (231 RLS PAD)           *
             *254+05390                     *
             *262-00150                     *

   MODE SEL - AGS
```

POWERED DESCENT INITIATION

```
-10     V25 N69E (IF NO UPLINK)
        PGNS MODE CONT - AUTO
        AGS MODE CONT - AUTO
        P63
        AUDIO MODE (BOTH) - VOX

        ✓DPS CONFIG CARD
-8           *RESET DET                     *
        N18, R, P, Y  (0, 111, 340)
        VERIFY FDAI
             *V40N20E, 400+3, 410+0         *
             *400+1, 433R VI                *
-5      CB(11) PGNS: LDG RDR - CLOSE
        ✓ALT XMTR
-4      PRO - FINAL TRIM
        ENTR, ✓DET
        GO/NO-GO FOR PDI
        COMM CHECK WITH CSM
        RESET WATCH
-2:00   MASTER ARM - ON
        MODE SEL - PGNS
             *367R                          *
-0:30   ENG ARM - DES
-0:07.5 ULLAGE
-0:05   PRO
 0:00 PDI ____:____:____ (98:34:41)
+0:02   (NO IGN) - START PB - PUSH
+0:05   DES ENG CMD OVRD - ON
        MASTER ARM - OFF
```

GO-AROUND

```
SECURE SYSTEMS
    ENG ARM - OFF
    MASTER ARM - OFF
    POO
    LR - OFF
    ASC BATTS - OFF
    PRLPNT QTY MON - OFF
    AUDIO - PTT
    ECS - CABIN MODE
    HELMETS & GLOVES - OFF (OPTIONAL)
    AGS - ATT HOLD
ALIGN IMU
    P52 (SAME STARS)

MSFN UPDATE
    COPY PADS FOR:
      NO PDI + 12
      PDI
      PDI EARLY ABORT
      PDI LATE ABORT
      T2 ABORT
      T3 TIG
      AGS ABORT CONSTANTS
         224,225,226,305,662,673
      AGS T2 UPDATE - 254

MSFN UPLINK
    DESCENT TARGETING, ABORT CONSTANTS,
                                LM & CSM S.V.
CONFIGURE COMM FOR LOS

PICK UP WITH P63 IGNITION ALGORITHM TEST, P.5
```

PDI THRU TD+3 MIN

-2:00 MASTER ARM-ON
MODE SEL-PGNS
367R
- :30 ENG ARM-DES
- :07.5 ULLAGE
- :05 PRO

+ :00 **PDI**

+ :02 (NO IGN) ---
START PB-PUSH
+ :05 DES ENG OVRD-ON
MASTER ARM-OFF
+ :26 THROTTLE UP
✓T/W > 1.6

+2 V21 N69E (DN RNG)
+3 YAW FACE UP
+4 ✓ ED BATTS
V57E TO PERMIT
LR DATA
+5 V24 N69E (DN RNG,
X-RNG)

N68

EVAL MAN CONT

+8 V23 N69E (ALT)

223+00140 (E @ 14K)
360-0XXX0E
SEQ CAMERA - ON

TFI	θ	ΔHMAX	(-ḢMAX) -HDOT	H	DPS	SBD
0:00	111		5.0	52700	95	-2/41
0:30	111		7.0	52600	95	
1:00	103		25.0	52100	95	5/36
1:30	97		36.0	51100	92	
2:00	93		45.0	49900	87	13/29
2:30	89		51.0	48500	82	
3:00	85		57.0	46800	77	19/23
3:30	82		62.0	45100	71	
4:00	79		67.0	43100	66	8/5
4:30	77		73.0	40400	61	
5:00	75	+17000	78.0	39000	56	11/2
5:30	74	+17000	89.0	36600	50	
6:00	72	+16000	99.0	32800	45	13/0
6:30	71	+14000	(511.0) 107.0	30000	40	
7:00	67	+12400	(481.0) 104.0	26900	35	17/-3
7:30	62	+10000	(447.0) 103.0	23500	30	
8:00	59	+ 8200	(410.0) 130.0	20000	27	23/-8
8:30	59	+ 6900	(368.0) 155.0	16400	24	
9:00	55	+ 4500	(298.0) 172.0	11300	21	26/-11

P64

P64 + 15 SEC:
NO THROTTLE DN
- ABORT

MODE CONT (PGNS)-ATT HOLD

P66

X-PNTR - LO MULT

BINGO FUEL
DES QTY LT+1+31

TOUCHDOWN

ENG STOP - PUSH
ENG ARM - OFF
PRO
DES ENG CMD OVRD - OFF
MODE CONT (PGNS)-ATT HLD
MODE CONT (AGS)-AUTO
413+1
RECYCLE PARKER VALVES

H	(-ḢMAX) -HDOT	DPS	VH (362)
7000	(226.0) 176.0	18	254
6000	(207.0) 159.0	18	234
5000	(185.0) 137.0	17	219
4000	(162.0) 115.0	16	200
3000	(135.0) 92.0	15	176
2000	(104.0) 66.0	14	144
1000	(63.0) 36.0	13	96
500	(35.0) 17.0	11	53
400	(28.0) 12.0	11	39
300	(21.0) 8.0	10	19
200	(12.0) 5.0	9	-6

ABORT STAGE - PUSH
ENG ARM - ASC
ENG STOP - RESET
ENG START - PUSH
V22 N46 E,E
MODE CONT (BOTH) - AUTO

TD +3 THRU T2 ABORT

*RECYCLE PARKER VALVES *
PRPLNT TEMP PRESS MON - ASC, THEN DES
ASC He MON - CYCLE
*O2/H2O QTY MON - ASC 1, 2, THEN DES 2, 1 *
*SEQUENCE CAMERA - OFF *
CB(11) PGNS: LDG RDR - OPEN

17:30 T1 STAY/NO STAY

NO STAY
V22 N46 E,E
MODE CONT (BOTH) - AUTO
ABORT STAGE - PUSH
ENG ARM - ASC
ENG STOP - RESET
ENG START - PUSH

STAY
*414+2 *
*400+4 *

P68
ENG STOP-RESET

PRO
P12
MODE CONT (PGNS) - AUTO
N33 T-2 (98:58:57)

N76 5510.6 V HORZ
19.5 V VERT
CROSS RNG (<8.1)
N74 TFI, YAW, PITCH

*IF AGS ALIGNMENT NO GO *
*V47E, 414+1 *
*V40N20E, 400+3 *

*410+0 *

22:16 T2 STAY/NO STAY AND GO/NO-GO FOR
NO STAY DPS VENT

-2:00 ASC He SEL - BOTH
MASTER ARM - ON
ASC He PRESS - FIRE
ASC He REGS 1, 2 - OPEN
*A ASC FEED 2-OPEN (UNLESS CDR) *
*A MAIN SOV -CLOSE (BUSS LOSS) *
*B ASC FEED 2-OPEN (UNLESS LMP) *
*B MAIN SOV -CLOSE (BUSS LOSS) *
*CRSFD - CLOSED *
*BAT 1,3 - OFF *
*BAT 2,4 - OFF *
*CB(16) EPS:ASC ECA CONT-CLOSE *
*DES BAT - DEADFACE *
*SELECT ASC H2O TANK *
*DES O2 - CLOSE *
*ASC 1 O2 - OPEN *
*DES H2O - CLOSE *
*ASC H2O - OPEN *
*400+1, 367R *
- :10 ABORT STAGE - PUSH (AT T=0 FOR AGS)
ENG ARM - ASC
- :05 PRO
:00 *DET - RESET, RELEASE *
T2 ____:____:____ (98:58:57)
+ :01 ENG START - PUSH (IF AUTO IGN)

STAY
*TAPE RECORDER - OFF *
AUDIO MODE - ICS/PTT
POO

FDAI AND OVERHEAD WINDOW ANGLES FOR MANUAL DESCENT ABORT

ALL PITCH RATES
5°/SEC

DPS/APS

1:00	250/0	4:30	0/LV	8:00	0/LV
2:26	SD(FDAI)	4:44	300/36	8:14	300/36
2:36	SD(OHW)	6:26	270/5	10:16	270/15
		7:32	250/0	14:30	250/0
		8:19	SD	14:43	SD
1:30	0/0	5:00	0/LV	8:30	0/LV
1:44	300/0	5:14	300/36	8:44	300/36
2:30	250/0	6:58	270/5	11:12	270/15
3:20	SD	8:20	250/0	15:18	250/0
		9:03	SD	15:31	SD
2:00	0/LV	5:30	0/LV	9:00	0/LV
2:14	300/36	5:44	300/36	9:14	300/36
3:00	300/0	7:34	270/10	12:10	270/16
3:18	250/0	9:04	250/0	16:04	250/0
4:16	SD	9:46	SD	16:18	SD
2:30	0/LV	6:00	0/LV	9:30	0/LV
2:44	300/36	6:14	300/36	9:44	300/36
3:46	300/0	8:04	270/11	12:56	270/16
4:02	250/0	9:50	250/0	16:44	250/0
5:12	SD	10:39	SD	16:58	SD
3:00	0/LV	6:30	0/LV	10:00	0/LV
3:14	300/36	6:44	300/36	10:14	300/36
4:34	270/0	8:34	270/11	13:16	270/16
5:10	250/0	11:04	250/0	17:32	SD
5:57	SD(FDAI)	11:47	SD		
6:06	SD(OHW)				
3:30	0/LV	7:00	0/LV	10:30	0/LV
3:44	300/36	7:14	300/36	10:44	300/36
5:24	270/0	9:06	270/14	13:48	270/16
5:54	250/0	12:26	250/0	18:05	SD
6:50	SD(FDAI)	12:53	SD		
7:02	SD(OHW)				
4:00	0/LV	7:30	0/LV	11:00	*
4:14	300/36	7:44	300/36		USE
5:56	270/0	9:38	270/14		MANUAL
6:38	250/0	13:38	250/0		ASCENT
7:34	SD(FDAI)	13:53	SD		ANGLES
7:40	SD(OHW)				

* ESTABLISH POSITIVE HDOT, THEN ABORT STAGE TO USE MANUAL ASCENT ANGLES

APS

1:00	250/0	4:30	0/LV	8:00	0/LV
2:24	SD/(FDAI)	5:10	300/36	8:40	300/36
2:36	SD(OHW)	6:22	270/10	12:06	270/14
		8:26	250/0	14:26	250/0
		8:51	SD	15:05	SD
1:30	0/LV	5:00	0/LV	8:30	0/LV
2:10	250/0	5:40	300/36	9:10	300/36
3:32	SD(FDAI)	7:08	270/10	13:00	270/14
3:52	SD(OHW)	9:20	250/0	15:02	250/0
		9:46	SD	15:50	SD
2:00	0/LV	5:30	0/LV	9:00	0/LV
2:40	300/0	6:10	300/36	9:40	300/36
3:10	250/0	7:54	270/12	13:54	270/14
4:24	SD(FDAI)	10:14	250/0	15:34	250/0
4:34	SD(OHW)	10:42	SD	16:31	SD
2:30	0/LV	6:00	0/LV	9:30	0/LV
3:10	300/0	6:40	300/36	10:10	300/36
4:00	250/0	8:44	270/14	14:30	270/14
5:18	SD	11:08	250/0	16:12	250/0
		11:37	SD	17:07	SD
3:00	0/LV	6:30	0/LV	10:00	0/LV
3:40	300/36	7:10	300/36	10:40	300/36
4:22	270/0	9:34	270/14	14:30	270/14
5:28	250/0	12:02	250/0	17:00	250/0
6:09	SD	12:33	SD	17:37	SD
3:30	0/LV	7:00	0/LV	10:30	0/LV
4:10	300/36	7:40	300/36	11:10	300/36
5:00	270/5	10:24	270/14	14:48	270/14
6:30	250/0	12:56	250/0	17:50	250/0
7:02	SD	13:28	SD	18:09	SD
4:00	0/LV	7:30	0/LV	11:00	*
4:40	300/36	8:10	300/36		USE
5:40	270/5	11:12	270/14		MANUAL
7:28	250/0	13:48	250/0		ASCENT
7:56	SD	14:19	SD		ANGLES

MANUAL ABORT

ASCENT
MONITOR

ASCENT

TIG-2 MASTER ARM - ON
AUDIO MODE (BOTH) - VOX
400+1E GUID STEERING
RESET WATCH
367R (604+0 FOR AGS)
START CAMERA
- :10 ABORT STAGE - PUSH (AT T=0 FOR AGS)
ENG ARM - ASC
- :05 PRO
+ :00 ASC (171:45:09)
+ :01 ENG START-PUSH (IF AUTO IGN)
CHECK S-BD ANT

N76E (VH, Vv, ΔR)
V16 N77E (Tgo, VY, VI)
KEY RLSE

+4:00 STOP CAMERA
500R
500 FPS MAIN SOV (2) - OPEN•
ASC FEED 2 (2) - CLOSE•
200 FPS ENG ARM-OFF(IF IGN WAS AUTO)
0 FPS ABORT STAGE-RESET
ENG STOP - PUSH

PRO, NULL X < 2 FPS
PRO
STOP DET, RESET WATCH
COPY GET
ENG STOP - RESET
POO
•MCC FOR TWEAK

FOR NO VOICE (TRIM <2 FPS)
PGNS,AGS DIFFER <10 FPS,
TRIM ACTIVE SYSTEM
PGNS,AGS DIFFER >10 FPS,
TRIM SYSTEM THAT AGREES
WITH RR
(10° IN OHW) (0° YAW)

V82

TFI	θ	OHW (0° YAW)	VGX	H DOT	H	SBD
0:00			1080.0	0.0	0	79/-30
0:10			880.0	53.0	300	
0:30	308	39	4810.0	91.0	1800	
1:00	305	38	4640.0	124.0	5100	137/-18
1:30	302	36	4460.0	151.0	9200	
2:00	299	34	4240.0	170.0	14000	142/-15
2:30	296	31	3980.0	183.0	19400	
3:00	293	29	3700.0	190.0	25000	147/-11
3:30	289	27	3380.0	190.0	30700	
4:00	285	24	3020.0	184.0	36300	152/-6
4:30	282	22	2640.0	173.0	41700	
5:00	278	19	2230.0	157.0	46600	158/-1
5:30	274	17	1790.0	135.0	51000	
6:00	269	14	1320.0	109.0	54700	164/4
6:30	265	11	810.0	80.0	57500	
7:00	260	8	270.0	49.0	59500	170/11
7:14	257	6	0.0	32.0	60100	172/13

NO AUTO IGNITION
WITHIN 10 SEC:
1. GUID CONT-AGS
STILL NO IGNITION
1. GUID CONT-PGNS
2. ENG START-PUSH

MANUAL ASCENT (WILL NOMINALLY BE TARGETED 11.5 MIN LATE)
CONFIGURATION NOMINAL EXCEPT:
MODE CONT - ATT HOLD
PROFILE NOMINAL EXCEPT:
7-STEP FOR DIRECT MODE

TFI	FDAI	OHW
0:00	0	
0:15	305	38
2:00	295	31
3:00	290	28
4:00	285	24
5:00	275	18
6:00	265	11
7:00	260	8

PITCH RATES 5°/SEC

MSFN WILL CALL PITCH AND ROLL BIAS COMMANDS FROM GROUND TRACKING.

6+30 - MAIN SOV(2) - OPEN•
ASC FEED 2 (2) - CLOSE•

SHUTDOWN
ENGINE ARM OFF
STANDBY TO RESET ABORT STAGE Pb AND DEPRESS ENGINE STOP Pb ON CALL FROM MSFN

TIME	RANGE	RDOT
LO+5	142	1652
LO+6	154	802
LO+7	157	-191
INS	156	-447
1+00	152	-444
2+00	148	-440
3+00	143	-436
4+00	139	-432
5+00	135	-426
6+00	130	-421
7+00	126	-415
8+00	122	-408
9+00	118	-401
10+00	114	-394

INSERTION 171:52:23

V82

V76 — ATT CONT-PULSE

AGS MODE CONT-ATT HOLD — MODE CONT-AUTO

RR MODE-LGC

RATE/ERR MON(2)-RNDZ RDR *

SHFT/TRUN +5

RATE SCALE 5°/SEC

RNG/ALT MON-RNG/RNG RT

*VHF ANT-FWD *

*400+2 Z-AXIS STEER *

*410+4 TPI EXEC *

*373+0159.3 TIG TPI *

*616+00005 ULLAGE *

*623+0 *

*COPY AGS DATA *

AUDIO MODE(2)-ICS/PTT *

✓INV 2, CB INV 1-OPEN *

CB(11) & (16) ED: LOGIC PWR-OPEN

CB(11) ECS CABIN FAN1-CLOSE

+1 GO/NO-GO FOR TWEAK

P47 FDAI (0,257,0)

*404+0, 405+0, 406+0 *

*MONITOR 470, 471, 472 *

+3 TWEAK 171:55:23

ΔV'S

P47 FDAI (0,242,0) OR 10° OHW

*404+0, 405+0, 406+0 *

*MONITOR 470, 471, 472 *

40 LM BAILOUT @ L.O.+12:10

TIG	171:57:23	
ΔVX	41.0	

*EXT LTG-TRACK *

P20, AUTO MNVR — RR-AUTO TRACK

V80, MAX N49(2.00,12.0)

P34 TGT TPI

*VERIFY PGNS WITH MSFN *

*V47, 414+1, 400+3 *

*400+2 Z-AXIS STEER *

*417+1 (✓417+0) *

*411+1 START AUTO(19,18) *

*310R SET DET *

*303R θ TPI *

V82

V83 SET ORDEAL (35NM)

*317R, 440R, 277R *

V48, 12012

LM WT _____

35 CSM BAILOUT GET P76 PAD

30 CHART R/RDOT } R

SS

27 RDOT } R

M=15, V32

24 RDOT } R

*COMPARE CMC,AGS,VHF/RR *

*POLAR PLOT @ 90 NM *

21 RDOT } R

18 RDOT } R

*CHECK RCS, EPS, ECS *

LOS

15 RDOT } R

*514+0 *

*515+4 YAW STEER VEC *

*516+0 *

*MATCH INDICATED ANGLES *

*TRACK MODE-SLEW *

*S-BD ANT-AFT *

SET P _____ (+125) *

Y _____ (-55) *

*BIOMED-OFF, PCM-HI *

*UPLINK SQUELCH-ENABLE *

12 RDOT } R

10 CHART R/RDOT/÷

9 RDOT } R

8 PRO-FINAL COMP

*411+0 STOP AUTO *

6 *COMPARE CMC, AGS *

CHECK TIG OF CSM

*✓DET & APS BURN CARD *

P42 N86

PERFORM YAW/ROLL MANEUVER

*404+0, 405+0, 406+0 *

*623+1 *

*400+1 GUID STEER — ATT CONT-MODE CONT

5 *410+5

*500R _____ *

1:00 AGS MODE CONT-AUTO

:30 ABORT STAGE PB-PUSH

:10 MANUAL ULLAGE

:05 PRO

:00 TPI 172:39:23

ABORT STAGE PB-RESET

NO IGNITION

ENG ARM-ASC

MANUAL START

MANUAL STOP 3 SEC

ENG ARM-OFF

NULL RESIDUALS

```
0  TPI 172:39:23
   V76, AGS MODE CONT-ATT HOLD
   P35 TGT MCC 1        [ATT CONT-PULSE
   MAX N49(0.80,5.0)     MODE CONT-AUTO]
   V67 (+02000,+00020,+00005)
      *400+0                    *
      *623+0                    *
      *417+1 (✓621+0)           *
      *411+1 START AUTO(13,12)  *
2                          [SR]
      *410+4 TPI EXEC           *
      *373+TPI TIME +15 MIN     *
      *307+028.00               *

4                     [RDOT  SR]
6                     [RDOT  SR]
8                     [RDOT  SR]
[9 CHART 0]                     *
10                    [RDOT  SR]
[12 PRO FINAL COMP]   [RDOT  SR]
[13 CHART R/RDOT/0]
      *411+0 STOP AUTO          *
            [370R TOTAL VEL MCC1
             371R ΔV TPF]

      *404+0, 405+0, 406+0      *
   P41, V77

14    *410+5              [ATT CONT-
      *502R _____            MODE CONT]

:05   *472R/502R                *[A/H]
[15 MCC1]
   NULL RESIDUALS
```

```
   V76
   P35 TGT MCC 2        [ATT CONT-PULSE
   V93                   MODE CONT-AUTO]
      *VERIFY PGNS (PCM-HI)     *
      *V47, 414+1, 400+3        *
      *411+1 START AUTO         *
      *EXT LTG-OFF              *
                             [SR]
17                    [RDOT  SR]
      *410+4 TPI EXEC           *
      *373+TPI TIME +30 MIN     *
      *307+013.00               *

19                    [RDOT  SR]
21                    [RDOT  SR]
23                    [RDOT  SR]
[24 CHART 0]                    *
25                    [RDOT  SR]
[27 PRO-FINAL COMP]   [RDOT  SR]
[28 CHART R/RDOT/0]
      *411+0 STOP AUTO          *
            [370R TOTAL VEL MCC2
             371R ΔV TPF]

      *404+0, 405+0, 406+0      *
   P41, V77

20    *410+5              [ATT CONT-
      *502R _____            MODE CONT]

:05   *472R/502R                *[A/H]
[30 MCC2]
   NULL RESIDUALS
```

```
AOS
   P00
   V48, 11002
   P47, V63
      *404+0, 405+0, 406+0      *

      *S-BD ANT-AFT,VERIFY COMM*
      *✓S-BD P _____ (+125)     *
            Y _____ (-55)       *
      *S-BD ANT-SLEW (>3.0)     *
      *TRACK MODE-AUTO          *
      *BIOMED-LEFT, PCM-HI      *
      *UPLINK SQUELCH-OFF       *
   TPI BURN REPORT

[40 INITIATE BRAKING]
      30 FPS - 6000 FT
      20 FPS - 3000 FT
      10 FPS - 1500 FT
       5 FPS -  600 FT

      *SETUP CAMERA FOR         *
      *  DOCKING:               *
      *LM3/DAC/10/CEX-ULC        *
      *  (T8,1/250,6) 1FPS      *
      * .25 MAG(0), (4MIN)       *

   V34, P00
   V76                  [ATT CONT-PULSE]
   MANEUVER/PICTURES OF SIMBAY,RCS
[55 INITIATE DOCKING]
   COAS TO OVHD WINDOW
      *EXT LTG-DOCK             *
   SHFT/TRUN ±50                *
   V41N72 (+000,+320)
   CB RR(2)-OPEN, V44
   FDAI (180,282,300)
   V77                  [ATT CONT-
[65 CONTACT]               MODE CONT]

   CONFIRM CAPTURE FROM CSM
   MODE CONT (BOTH)-OFF
```

173:55

CONFIGURE S-BAND

1 Verify FWD Dump VLV - AUTO
CB(11): ECS CABIN FAN 1 - OPEN
TAPE RECORDER - OFF
CSM Maneuvers To JETT ATT, Proceed With "PREP FOR TRANSFER" Until Maneuver Completed

2 Verify: Jettison Attitude (330,XXX/~~303~~ 236,046)
CSM in Narrow Deadband, Attitude Hold

3 S-BAND: PM,SEC,PRIM,VOICE,PCM,RANGE,RIGHT,HI
S-BD ANT - ~~FWD~~, Verify COMM
TRACK MODE - SLEW AFT
S-BD P _____ (+205)
Y _____ (+ 62)
S-BD ANT - SLEW "(Peak Until >3.9)"
(DO NOT PLACE TRACK MODE - AUTO)

174:00

PREP FOR TRANSFER

1 Window Shades (3) - Close
Install Crash Bars
Verify Tunnel Pressurized From CSM
OVHD Dump VLV - OPEN

2 Doff Helmets and Gloves

3 Install Purse (ISA Bottom Pkt)
Remove & Stow In Purse:
CWG Adapter W/Cap (2, Fwd LHSSC)
Purge Vlv (1, Aft LHSSC)
Padded Sample Bags (2, LHSSC)
Waist Tethers (2, Fwd RHSSC)
Neck Ring Dust Covers (2, AFT RHSSC)

SS 174 +08

4 Remove RH Window SEQ Camr, place Mag O In ISA Top Pkt(Bag) & Stow 16mm Camr In Purse
Disconnect Lower ISA Hooks
Stow LHSSC Collection Bag Aft of Engine Cover

5 When Tunnel/LM Pressures Equal,
OVHD DUMP VLV - AUTO
Verify PRESS REGS A&B - EGRESS
Place LEVA Bags On Floor, Right Side-Fwd

6 Open Hatch
Receive Probe From CMP, And Stow On Left Hand Side Using Outboard (Double) Restraint Cable
Receive Drogue From CMP and Stow Over Probe Using Inboard (Single) Restraint Cables Through Drogue Handles

7 Receive Vacuum Cleaner Assembly From CMP
Transfer LEVA Bags, Helmets, & IV Gloves w/Liner to CMP

8 Vacuum PGA's

LOS 174 +27

9 CB(11) AC BUS A: TAPE RCDR - Open
COMM: CDR AUDIO - Open
CB(16) COMM: DISP - Open
: S.E. AUDIO - Open
Disconnect DSEA & Place In Purse
CB(11) COMM: CDR AUDIO - Close
CB(16) COMM: DISP - Close
: S.E. AUDIO - Close

SR 174 +54

AOS
175
+10

10 Receive Decontamination Bags & Jett Bag
From CSM
Transfer Purse To CSM

11 Unstow, Vacuum/Wet Wipe as required and
Transfer to CSM:
(*Decontamination Bag Provided)
70MM Magazines (4 and 3 in Bags, RHSSC)
(3 and 3 in Bags, Bot
Boot Compt)
16MM Magazines (6 in Bag, RHSSC)
PPK's (3, LHMS - AFT SRC's)
Flag Kit (LHMS - AFT SRC's)
OPS (W/Highest Source Pressure), Perform
Checkout per Decal
*UV Cassette (Upper Boot Cmpt)
*Penetrometer Drum (Upper Boot Cmpt)
*Cosmic Ray Detector (Recharge Station)
Core Stems (+Z27)
Flight Data File (Place In Jett Bag → UL LGTS
and Transfer to CMP) ACA'S, NETTING, SCALES,
ASST GUARD, CLIPS, 16MM CORD, PLIERS, LCG
ADPT, COAS

*Collection Bags (1, LHSSC) (1, RHSSC) - A1
*Collection Bag (1, Recharge Station) - PGA Bag
*BSLSS Rock Bag (+Z27) - A7
*ISA - A2
Collection Bag (Box AFT Eng Cover) - A9

12 Unstow SRC's (2), Vacuum and Transfer to CSM
Receive B5 & B6 from CSM and Stow in SRC Rack

13 Receive Purse (empty) from CSM

14 Stow Unused Food, used Fecal & Urine Bags
in Purse

15 Transfer Vacuum Cleaner (Leave Bag in LM)
& Purse to CSM

175:50

MSFN UPLINK/UPDATE

1 UPDATA LINK - DATA
MSFN Uplinks LM State Vector, P30
EXT ΔV Load & P99 Erasable Loads (3)

2 Copy LM DAP Wt & DEORBIT Burn Pad

3 V48, 12021, PRO
N47 _____ LM WT (From MSFN)
PRO

4 V47E, 414+1

5 400+3

176:00

TARGET PGNS

1 P30 Target Impact Burn
N45
PRO, POO

CONFIGURE AGS

SS
176
+07

1 404+0
405+0
406+0
470R

2 MCC-H GO/NO-GO For LM Closeout

LOS
176
+25

3 Verify All Items in LM TO CM TRANSFER
LIST (Pg 18) Have been Transferred or
WILL Be Transferred "ON CREW."

176:40

CONFIGURE LM FOR JETTISON

1 VERIFY CSM MIN DB/ATT HOLD
GUID CONT - PGNS
PGNS MODE CONT - AUTO (NO DAP Lt - OFF)
AGS MODE CONT - ATT HOLD
ATT CONT (3) - MODE CONT
Verify INV-2

2 VHF A: XMTR - VOICE/RANGE
: RCVR - OFF
VHF B: XMTR - OFF
: RCVR - ON
BIOMED - OFF

3 ASC FEED (4) - tb-bp
SYS A&B QUADS (8) - ENABLE; tb-gray
CRSFD - tb-bp
SYS A&B MAIN SOV (2) - tb-gray

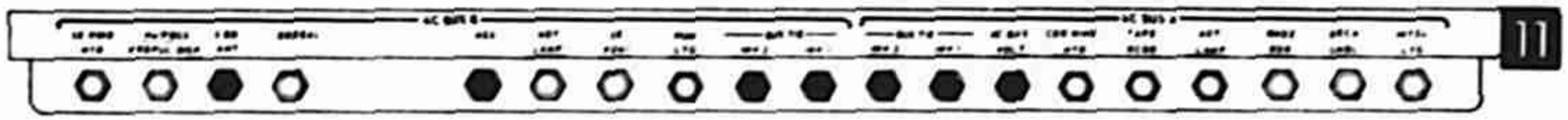
4 SUIT CIRCUIT RELIEF - AUTO
SUIT ISOL VLV (Both) - SUIT DISC
CB(11) COMM: CDR AUDIO - Open
CB(16) COMM: S.E. AUDIO - Open
ECS: LCG PUMP - Open
Both Disconnect LM Hoses & Stow

5 S-BAND VOICE - OFF
Verify UPDATA LINK - DATA

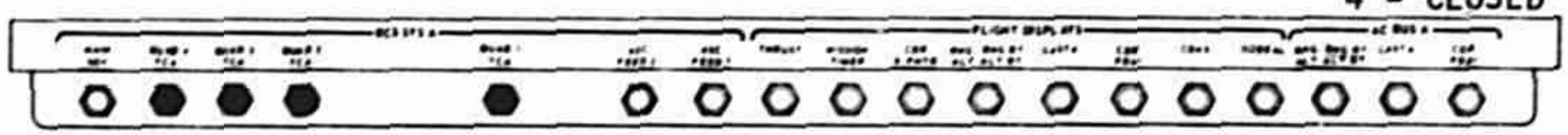
6 Configure CB's Per Chart

POST DOCKING

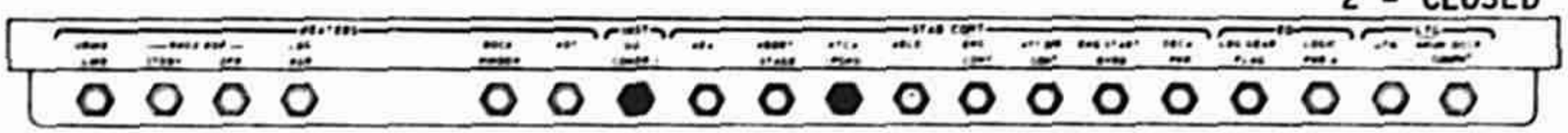
7 - CLOSED



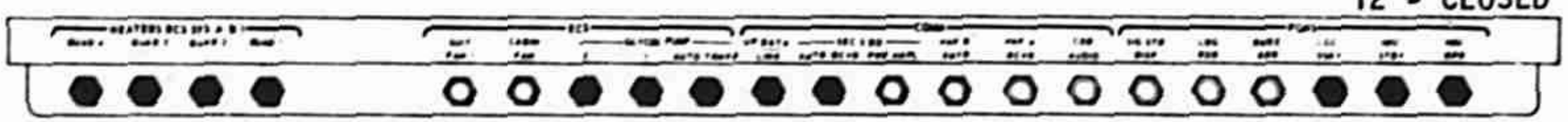
4 - CLOSED



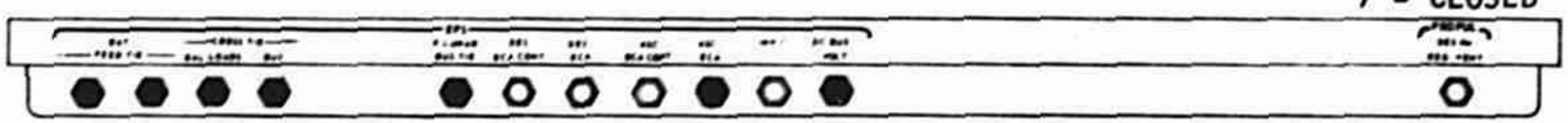
2 - CLOSED



12 - CLOSED



7 - CLOSED



176:50

IVT TO CSM

1 Stow CSM Jet Bag Behind LMP Restraint Cables

2 EXTERIOR LTG - TRACK
BAT 5&6 BACK UP FEED-ON; tb(2) - Gray
FLOOD LT - OFF
Verify OVHD Dump VLV-AUTO
Transfer To CSM

SR
176
+52

LM TO CM TRANSFER LIST

LM	ITEM	CSM
Floor	LEVA Bag (2) & Contents:	Temp Stwg
	LEVA	
	EV Gloves	
	Helmets (2)	HSB
	IV Gloves w/Liner (2 Pr)	HSB
	Purse & Contents (1st XFR):	
	CWG Adptr w/cap (2)	A8
	EMU Maint Kit (1)	A8
	Purge vlv (1)	L/H TSB
	Waist Tethers (2)	L/H TSB
	LCG Plugs (2)	L/H TSB
	PGA Pocket Contents	L/H TSB
	PGA Elect Conn Covers	PGA Bag
	Neck Ring Dust Covers	PGA Bag
	16mm RH Window SEQ Camr	F1
	DSEA	Temp A7
	Padded Sample Bags (2)	A6
RHSSC	70mm Mag (4) in Bag	R13
RHSSC	70mm Mag (3) in Bag	R13
Boot Compt	70mm Mag (3) in Bag	R13
Boot Compt	70mm Mag (3) in Bag	A8
RHSSC	16mm Mag (6) in Bag	R13
LHMS	PPK's (3)	Temp A7
LHMS	Flag Kit	Temp A7
Floor	OPS	A7
Boot Compt	UV Cassette	A7
Boot Compt	Penetrometer Drum	A7
Rechrg Stat	Cosmic Ray Detector	A7
+Z27	Core Stems	Wire Tray
Data File	Flt Data File in Jett Bag	L/H Couch
LHSSC/RHSSC	Collection Bag (2)	A1
Rechrg Stat	Collection Bag (1)	PGA Bag
+Z27	BSLSS/ROCK Bag	A7
	ISA & Contents:	A2
	Lens Brush (1)	
	16mm Mag (2) in Bag	
	Solar Wind Exp in Bag	
	Collection Bags (2)	
AFT Eng	Collection Bag	A9
SRC Rack	SRC (2)	B5/B6
Temp Stwg	Vacuum Cleaner	RH TSB
	Purse & Contents (2nd XFR):	
	Unused Food	B1
	Used Urine Bags	Fecal Bag
	Used Fecal Bags	Fecal Bag
	Suit (2) & Ancillary Eqpt:	
	Bio Instrumentation (2)	
	UCTA (2)	
	FCS (2)	
	LCG (2)	
	Sunglasses in Pouch (2)	
	Watch/Wrist Mirror/Watchband (2)	
	Pen (2)	
	Pen-Felt Tip (2)	
	Pencil (2)	
	Pocket, C/L & Scissor (2)	
	Pocket, Data (2)	
	Penlight (2)	
	Earplug (2 pr)	
	Dosimeter - Personal (2)	
	Passive (6)	
	Comm Carrier (2)	
	Scissor	

NASA — MSC

RENDEZVOUS TIMELINES

RELATIVE MOTION TRAJECTORIES

INERTIAL PLOTS

AND

ABORT CHARTS

ABORT SECTION

3/6/72 Final

PDI SUMMARY DATA

PAGE	ABORT	INS			BOOST	HAM	CSI		CDH			TPI	AIM		
	TIME PDI+	TIME PDI+	N76	HA/HINS	TIME INS+	TIME INS+	TIME INS+	ΔVX	TIME INS+	ΔVX	ΔVZ	TIME PDI+	TIME PDI+	ΔVX	ΔVZ
A-1	NO 1+12	NA	NA	NA	NA	NA	1+00+00*	46.4	2+02+17*	-121.0	-62.7	2+48+42	12+00	102.3	-50.0
A-2	1+00	2+05	5655.2	137.3/55316.	NA	NA	0+55+00	50.2	1+57+17	-120.3	-42.9	2+47+19	NA	NA	NA
	2+00	3+59	5650.3	136.1/60016.				48.2	1+57+12	-117.9	-39.6				
	3+00	5+41	5646.3	132.8/60018.				47.7	1+57+02	-113.5	-33.7				
	4+00	7+18	5639.3	127.2/60023.				47.5	1+56+46	-106.2	-24.9				
	5+00	8+49	5629.8	119.6/60030.				47.3	1+56+25	-96.8	-14.2				
	6+00	10+13	5617.2	109.6/60038.				47.5	1+55+59	-84.3	-1.1				
	7+00	12+27	5597.2	97.0/65209.				46.0	1+55+24	-67.8	13.6				
A-3	8+00	14+29	5570.9	80.0/70999.				44.5	1+54+38	-45.6	30.2				
	9+00	16+06	5546.2	63.2/74096.				43.7	1+53+52	-23.0	43.4				
	10+00	17+15	5529.7	49.9/71992.				44.0	1+53+16	-4.7	51.0				
A-4	11+00	18+20	5554.2	65.7/67668.	50+00	1+50+00	2+40+00	35.3	3+38+59	-26.1	-37.3	4+46+08	NA	NA	NA
	12+00	19+23	5550.5	59.9/62010.				38.0	3+38+46	-19.8	-23.2				
	13+00	20+26	5541.9	52.7/60244.				39.9	3+38+29	-11.5	-6.1				
	14+00	21+26	5534.3	47.2/60242.				40.7	3+38+16	-4.8	6.2				
	15+00	22+25	5526.7	41.7/60241.				41.2	3+38+02	2.2	17.4				
	16+00	23+25	5519.1	36.2/60239.				41.6	3+37+48	9.4	27.7				
	17+00	24+24	5511.5	30.8/60238.				41.8	3+37+34	16.9	36.9				
A-5	T2-1	7+22Ω	5510.4	29.8/60154.	50+00	3+50+00	4+40+00	36.5	5+37+20	23.0	54.4	6+44+52	NA	NA	NA
A-6	NO 2+12	NA	NA	NA	1+07+00*	2+07+00*	3+07+00*	39.3	4+09+42*	-129.6	2.0	4+50+48	12+00	112.0	-50.0
A-7	1+00	2+07	5666.7	146.3/54651.	1+00+00	2+00+00	3+00+00	40.9	4+02+43	-132.1	-9.3	4+50+55	NA	NA	NA
	2+00	4+00	5661.5	145.2/60017.				38.7	4+02+38	-129.9	-6.8				
	3+00	5+43	5659.5	143.6/60019.				38.1	4+02+32	-127.2	-1.4				
	4+00	7+19	5656.2	140.9/60024.				37.5	4+02+24	-123.4	6.7				
	5+00	8+50	5651.5	137.1/60031.				37.2	4+02+13	-118.2	17.3				
	6+00	10+15	5645.6	132.3/60039.				36.7	4+01+59	-112.0	29.4				
A-8	7+00	12+32	5657.3	145.0/65451.	NA	NA	0+55+00	43.7	1+57+30	-125.5	-52.6	2+52+06	NA	NA	NA
	8+00	14+33	5632.3	128.0/71163.				43.3	1+56+46	-105.7	-26.5				
	9+00	16+10	5609.0	111.2/74179.				43.3	1+56+01	-85.4	-4.0				
	10+00	17+19	5593.7	98.0/72050.				44.2	1+55+26	-68.9	11.5				
A-9	11+00	18+22	5581.0	85.9/67701.				45.4	1+54+54	-53.4	23.9				
	12+00	19+24	5569.4	74.0/62035.				46.8	1+54+22	-37.8	34.3				
	13+00	20+26	5551.4	59.7/60246.				47.2	1+53+43	-18.6	44.5				
A-10	14+00	21+26	5536.6	48.8/60243.				47.1	1+53+14	-3.6	50.7				
	15+00	22+25	5521.5	37.9/60240.				46.8	1+52+44	11.7	55.1				
A-4	T2-2	7+22Ω	5510.4	29.8/60154.	50+00	1+50+00	2+40+00	42.0	3+37+31	17.9	38.9	4+50+52	NA	NA	NA

Ω INDICATES TIME IS REFERENCED TO LIFT-OFF.

* INDICATES TIME IS REFERENCED TO PDI.

RANGE AND RANGE RATE AT INS AND 10 MINUTES PRIOR TO SUBSEQUENT BURNS

3/1/72

PAGE	ABORT TIME PDI+	INS RANGE	INS RANGE RATE	BOOST RANGE	BOOST RANGE RATE	HAM RANGE	HAM RANGE RAGE	CSI RANGE	CSI RANGE RATE	CDH RANGE	CDH RANGE RATE
A-1	NO 1+12	NA	NA	NA	NA	NA	NA	193.3	-526.5	104.3	-109.6
A-2	01+00	160.9	559.5	NA	NA	NA	NA	178.2	-526.3	105.3	-123.0
	02+00	157.5	545.2					173.2	-514.9	101.2	-123.1
	03+00	143.7	526.8					159.1	-491.3	100.4	-129.1
	04+00	119.0	493.6					135.5	-447.3	101.5	-112.0
	05+00	84.1	414.6					101.6	-373.1	98.5	-136.3
	06+00	49.9	85.5					58.4	-224.1	96.7	-149.7
	07+00	74.4	-428.8					33.2	243.6	96.4	-157.6
A-3	08+00	149.9	-468.5					86.2	196.7	96.1	-168.7
	09+00	224.5	-446.9					145.0	60.2	94.1	-176.6
	10+00	283.6	-424.8					190.7	-46.0	94.4	-182.2
A-4	11+00	335.5	-443.0	263.0	75.6	212.3	-378.0	81.5	24.3	99.3	-88.2
	12+00	387.7	-429.2	311.8	32.1	236.2	-385.3	106.5	-6.0	98.7	-101.2
	13+00	437.3	-415.9	357.9	-9.7	258.9	-390.0	131.1	-57.9	97.5	-111.8
	14+00	487.5	-402.0	404.2	-52.8	282.0	-392.2	153.0	-68.3	96.0	-121.2
	15+00	537.5	-388.0	450.1	-96.4	305.0	-392.3	175.9	-102.6	95.4	-130.6
	16+00	587.1	-374.0	495.3	-140.6	328.1	-390.4	198.2	-139.0	93.4	-138.2
	17+00	636.3	-359.8	540.0	-185.3	351.2	-386.7	220.1	-177.4	92.3	-149.4
A-5	T2-1	983.5	-305.9	895.9	-197.7	362.6	-350.9	245.2	-206.3	84.5	-154.7
A-6	NO 2+12	NA	NA	381.6	-726.1	158.0	468.2	195.2	-618.9	95.9	-160.2
A-7	01+00	381.1	618.1	373.0	-718.7	143.8	479.3	193.2	-611.4	103.9	-165.2
	02+00	378.2	604.0	368.1	-707.7	144.6	468.7	190.2	-603.0	99.1	-163.7
	03+00	364.3	594.8	352.8	-695.9	137.3	465.8	180.2	-588.6	101.1	-158.2
	04+00	338.8	583.8	327.3	-674.3	126.0	464.8	166.2	-565.8	99.2	-165.6
	05+00	300.2	570.2	289.8	-642.7	108.7	463.4	146.2	-530.3	97.3	-175.8
	06+00	247.0	551.9	238.9	-597.2	85.8	455.0	120.4	-475.0	96.4	-178.8
A-8	07+00	178.7	544.3	NA	NA	NA	NA	188.6	-540.8	102.7	-123.9
	08+00	99.5	455.1					115.8	-406.9	101.2	-135.0
	09+00	48.7	40.3					55.2	-203.7	98.1	-152.8
	10+00	69.8	-414.7					32.1	211.8	97.1	-156.9
A-9	11+00	114.4	-470.5					58.2	260.1	94.6	-164.5
	12+00	164.5	-466.4					97.0	166.5	92.1	-168.9
	13+00	213.5	-451.3					135.3	74.9	91.6	-171.7
A-10	14+00	264.0	-432.4					174.2	-18.6	90.7	-175.7
	15+00	314.6	-412.2					212.5	-112.5	88.3	-175.1
A-4	T2-2	654.0	-356.5	556.8	-194.8	363.0	-386.3	231.6	-185.9	93.2	-141.3

RANGE
RANGE RATE

60 INSERTION

SS

V82
AGS MODE CONT-ATT HOLD
SHFT/TRUN ±5
RATE SCALE 5°/SEC
RNG/ALT MON-RNG/RNG RT
*VHF ANT-FWD
*EXT LTG-TRACK *
*SEQUENCE CAMERA-OFF *
*400+2 *
*616+00005 ULLAGE *
*623+0 *
*RATE/ERR MON-RNDZ RDR *
AUDIO MODE(2)-ICS/PTT *
✓INV 2, CB INV 1-OPEN *
CB(11) & (16) ED: LOGIC PWR-OPEN
CB PGNS LDG RDR-OPEN
CB RR(2)-CLOSE

ATT CONT-
PULSE
MODE CONT-
AUTO

V48, 1 (2) 1002

V41N72 (+000, +283)
CB RR(2)-OPEN, V44
RATE/ERR MON-LDG RDR/CMPTR
P52 OPT 3
CB AOT LAMP-CLOSE
AOT DETENT F/0°
V76
1st STAR _____
2nd STAR _____
N05 ANG DIFF
PRO
N93 TORQUING ANG
X_____
Y_____
Z_____
PRO N25(R1=14) GET
PRO N25(R1=15)
PRO TO PICAPAIR
DETENT CL
CB AOT LAMP-OPEN

40 V34
P00
*VERIFY PGNS WITH MSFN *
*V47, 414+1, 400+3 *
*400+2 *

V48, 1 (2) 2022

LOS

*MATCH INDICATED ANGLES *
*TRACK MODE-SLEW *
*S-BD ANT-AFT *
SET P _____ *
Y _____ *
*BIOMED-OFF, PCM-HI *
*UPLINK SQUELCH-ENABLE *

30

20

20

18

*CHECK RCS, EPS, ECS *

10

*VERIFY PGNS (PCM-HI) *
*V47, 414+1, 400+3 *
*400+2 *

SR

*EXT LTG-OFF *

ΔVX = +10.0 (HORZ)
P30
N33 TIG BOOST (INS + ΔT)
*373 + TIG BOOST *
IF STAGING @ BOOST
V48, 12022, PRO, V34
P41, V77
*404+0, 405+0, 406+0 *
*400+1 GUID STEER
5 *410+5 LOAD ΔV
*500R _____ *

ATT CONT-
MODE CONT

:05 *500R *A/H
STAGE AT BOOST IGNITION
0 BOOST

60 BOOST

```
P00                                  ATT CONT-
V82                                    PULSE
V76                                  MODE CONT-
   *400+2 Z-AXIS STEER                 AUTO
   *416+1 1/2 PERIOD                    *
   *410+1 TGT CSI                       *
   *373+_____ TIG CSI                   *
   *275+_____ TIG TPI                   *
   *605+00777 COT                       *
   *310R SET DET (-60 MIN)              *
   *402R_____ ΔH                        *
```

50

AOS

```
   *S-BD ANT-FWD,VERIFY COMM*
   */S-BD P _____                      *
         Y _____                       *
   *S-BD ANT-SLEW (>3.0)               *
   *TRACK MODE-AUTO                    *
   *BIOMED-LEFT, PCM-HI                *
   *UPLINK SQUELCH-OFF                 *
```

40

40

```
V48, 12012
(IF R <400)
CB RR(2)-CLOSE                         *
RATE/ERR MON-RNDZ RDR
RR MODE-LGC
P20, AUTO MNVR                      RR-AUTO
V80, MAX N49(2.00,12.0)               TRACK

P32, TGT CSI
N11 TIG CSI (INS + ΔT)
N37 TIG TPI (PDI + ΔT)
   *VERIFY PGNS WITH MSFN              *
   *V47, 414+1, 400+3                  *
   *400+2 Z-AXIS STEER                 *
   *417+1 (/417+0)                     *
   *411+1 START AUTO(19,19)            *

V83 SET ORDEAL
   *317R, 440R, 277R                   *
   *COMPARE VHF/RR                     *
```

36 ∮R

33 RDOT ∮R

30 RDOT ∮R

27 RDOT ∮R

M=10,V32

24 RDOT ∮R

21 RDOT ∮R

18 RDOT ∮R

```
   *CHECK RCS, EPS, ECS                *
```

15 RDOT ∮R

```
V90
```

12 RDOT ∮R

```
   *402R _____                         *
```

10 PRO-FINAL COMP

```
   *411+0 STOP AUTO                    *
   *USE HAM CHART                      *
   *COMPARE CMC HAM                    *

V83, SET ORDEAL
   *317R, 440R, 277R                   *

P30
N33 TIG HAM (INS + ΔT)
   *373+_____ TIG HAM                  *

P41, V77, N86
   *400+1 GUID STEER                 ATT CONT-
5  *410+5 LOAD ΔV                     MODE CONT
   *370R _____ TOT ΔV                  *
   *500R _____                         *

:05 *500R                              *A/H
```

0 HAM

```
P00
V82
```

TIME	RANGE	RDOT
INS	282	-453
1+00	278	-449
2+00	273	-444
3+00	269	-439
4+00	264	-433
5+00	260	-427
6+00	256	-420
7+00	252	-413
8+00	248	-405
9+00	244	-397
10+00	240	-389

NOM COELLIPTIC/ONE REV ABORTS

INSERTION

V82
AGS MODE CONT-ATT HOLD — ATT CONT-PULSE
RR MODE-LGC — MODE CONT-AUTO
SHFT/TRUN ±5
RATE SCALE 5°/SEC
RNG/ALT MON-RNG/RNG RT
*VHF ANT-FWD *
*SEQUENCE CAMERA-OFF *
*616+00005 ULLAGE *
*605+00777 COT *
*RATE/ERR MON-RNDZ RDR *
AUDIO MODE(2)-ICS/PTT *
✓INV 2, CB INV 1-OPEN *
CB(11) & (16) ED: LOGIC PWR-OPEN
CB(11) ECS CABIN FAN1-CLOSE
CB RR(2)-CLOSE

*400+2 Z-AXIS STEER *
*507+0 Z-AXIS TRACT *
*623+0 *
*410+1 TGT CSI *
*373+_____ TIG CSI *
*275+_____ TIG TPI *
*416+1 1/2 PERIOD *
*310R SET DET *
*COPY AGS DATA(450R) *

INS/HAM THRU CSI

V48, 11002
V41N72 (+000, +283) — RR-AUTO TRACK
CB RR(2)-OPEN, V44
RATE/ERR MON-LDG RDR/CMPTR
P52 OPT 3
CB AOT LAMP-CLOSE
AOT DETENT F/0°
V76
1st STAR NUNKI (37)
2nd STAR SPICA (26) — 417+1 ⅋R — LOS
45
42 — RDOT ⅋R
39 — RDOT ⅋R
N05 ANG DIFF
PRO
N93 TORQUING ANG
X_____
Y_____
Z_____
PRO N25(R1=14) GET
PRO N25(R1=15)
PRO TO PICAPAIR
DETENT CL
CB AOT LAMP-OPEN
SS *EXT LTG-TRACK *
36 V34 — RDOT ⅋R
V48, 12012
CB RR(2)-CLOSE
RATE/ERR MON-RNDZ RDR
P20, AUTO MNVR
V80, MAX N49(2.00,12.0)
P32, TGT CSI
*VERIFY PGNS WITH MSFN *
*V47, 414+1, 400+3 *
*400+2 *
*417+1 (✓417+0,621+0) *
45 *411+1 START AUTO(19,19) *
V83 SET ORDEAL (35NM)
*317R, 440R, 277R *
33 — RDOT ⅋R

30 CHART RDOT — RDOT ⅋R
27 — RDOT ⅋R
24 — RDOT ⅋R
M=10, V32
21 — RDOT ⅋R
20 CHART RDOT
*COMPARE CMC,AGS,VHF/RR *
*MATCH INDICATED ANGLES *
*TRACK MODE-SLEW *
*S-BD ANT-AFT *
SET P _____ (-7) *
Y _____ (+22) *
*BIOMED-OFF, PCM-HI *
*UPLINK SQUELCH-ENABLE *
18 — RDOT ⅋R
*CHECK RCS, EPS, ECS *
15 — RDOT ⅋R
V90 OBTAIN CMC LM YDOT
12 — RDOT ⅋R *
10 CHART R/RDOT
PRO-FINAL COMP
N81 LOAD CMC LM YDOT(IF>5fps)
9 — RDOT ⅋R
N13 CDH TIG TO CSM
*411+0 STOP AUTO *
*COPY AGS DATA *
CB(11) ECS CABIN FAN1-OPEN
V83 SET ORDEAL
*317R, 440R, 277R *
P41, V77, N86
5 *410+5 — ATT CONT-MODE CONT
*370R _____ TOT ΔV
*ΔV's TO CSM *
:05 *500R/502R *A/H
:00 CSI
NULL RESIDUALS

58 CSI
V76
P33 TGT CDH
MAX N49(0.80,5.0)
V67 (+02000,+00020,+00005)
ATT CONT-PULSE
MODE CONT-AUTO

*417+1 (✓621+0) *
*410+2 TGT CDH *
*373R TM CDH *
*310R SET DET *
*COPY AGS DATA *
55 *411+1 START AUTO(19,19)*

V82

V83 SET ORDEAL (45NM)
*317R, 440R, 277R *

54 RDOT ⅜R

51 M=7, V32 RDOT ⅜R

48 V90, LOAD CDH-30 RDOT ⅜R
*COMPARE CMC,AGS,VHF/RR *

SR

45 RDOT ⅜R

M=15, V32

42 RDOT ⅜R

39 V34, P30 (PC ONLY) RDOT ⅜R
38 *411+0 STOP AUTO *

V90 LOAD CDH-30
OBTAIN CMC LM YDOT

36 CHART RDOT RDOT ⅜R

P41, V77

*373+_____ TIG PC
35 *410+5 LOAD ΔV ATT CONT-
*263R _____ MODE CONT
*501R _____ *

:05 *270R/501R *A/H
30 PLANE CHANGE

AOS

S-BD ANT-FWD,VERIFY COMM
*✓S-BD P _____ (-7) *
Y _____ (+22) *
*S-BD ANT-SLEW (>3.0) *
*TRACK MODE-AUTO *
*BIOMED-LEFT, PCM-HI *
*UPLINK SQUELCH-OFF *

CSI BURN REPORT
TIG,ΔV'S, RESIDUALS

V76
P33 TGT CDH ATT CONT-PULSE
V93 MODE CONT-AUTO
*VERIFY PGNS WITH MSFN *
*V47, 414+1, 400+3 *
*400+2 Z-AXIS STEER *
*410+2 TGT CDH *
373+_____ TIG CDH IF PC
*451+0 YDOT *
*COPY AGS DATA *
28 *411+1 START AUTO *

27 ⅜R

24 RDOT ⅜R

23 CHART RDOT

21 RDOT ⅜R
M=7, V32
*COMPARE CMC,AGS,VHF/RR *

18 RDOT ⅜R

*CHECK RCS, EPS, ECS *

15 RDOT ⅜R

V90 OBTAIN CMC LM YDOT

12 RDOT ⅜R

10 CHART RDOT *
PRO-FINAL COMP
N81 LOAD CMC LM YDOT
9 RDOT ⅜R

*411+0 STOP AUTO *
*VERIFY PGNS (PCM-HI) *
*V47, 414+1, 400+3 *
*400+2 Z-AXIS STEER *
*COPY AGS DATA *
V83, SET ORDEAL
*317R, 440R, 277R *

P41, V77, N86
(LARGE ΔV USE APS OR DPS)
5 *410+5 ATT CONT-
*370R _____ TOT ΔV MODE CONT
*500R _____ *
*502R _____ *

:05 *500R/502R *A/H
:00 CDH
NULL RESIDUALS

CSI THRU CDH

CDH THRU TPI


```
53 CDH
   V76
   P34 TGT TPI          [ATT CONT-PULSE  ] LOS
   MAX N49(0.80,5.0)    [ MODE CONT-AUTO ]
   V93
      *417+1 (✓621+0)          *
      *SET DET                 *
   V82
      *410+3 TPI SRCH          *
      *310+TIME TO TPI         *
      *303R θ TPI              *
      *410+4 (When 303=26.6)   *
43    *411+1 START AUTO(19,19)*
      *POLAR PLOT @ 75 NM      *
                          [310R]

42                        [ R ]

39 M=7, V32               [RDOT  R]
      *COMPARE TPI TIME        *
36                        [RDOT  R]

33                        [RDOT  R]

30                        [RDOT  R]

27                        [RDOT  R]
SS    *MONITOR 303R θ TPI AND *
      *RETARGET IF REQ         *
      *COPY AGS DATA           *
24                        [RDOT  R]
   M=15, V32
      *COMPARE CMC,AGS,VHF/RR *
      *VOICE LM TPI TIME       *
      * TO CSM                 *
21                        [RDOT  R]

18                        [RDOT  R]
      *CHECK RCS, EPS, ECS     *
```

```
15                        [RDOT  R]

      *MATCH INDICATED ANGLES *
      *TRACK MODE-SLEW        *
      *S-BD ANT-AFT           *
         SET  P ____ (+236)   *
              Y ____ (+51)    *
      *BIOMED-OFF, PCM-HI     *
      *UPLINK SQUELCH-ENABLE  *

12                        [RDOT  R]

      *VERIFY PGNS (PCM-HI)   *
      *411+0 STOP AUTO        *
      *V47, 414+1, 400+3      *
      *400+2 Z-AXIS STEER     *

[10 PRO-FINAL COMP]
   TIG TO CSM
      *SET DET                *
[9  CHART θ]                  [RDOT  R]

      *411+0 STOP AUTO        *
      *410+3                  *
      *310+TIME TO TPI         *
      *303R θ TPI              *
      *410+4 (WHEN 303=26.6)   *
      *310R ✓ WITH DET         *
      *COPY AGS DATA           *

[5  CHART R/RDOT/θ]

   P41, V77, N86
      *404+0, 405+0, 406+0    *
4     *410+5 LOAD ΔV & TIG    *
      *507+1 THR Z-AXIS       [ATT CONT-
      *502R ____              [ MODE CONT]

:05   *472R/502R              *[A/H]
:00 TPI
   NULL RESIDUALS
```

```
0  TPI
   V76
      *507+0 Z-AXIS TRACT        *
   P35 TGT MCC 1        [ATT CONT-PULSE
   MAX N49(0.80,5.0)     MODE CONT-AUTO]
   V93
      *417+1 (✓621+0)            *
      *411+1 START AUTO(13,12)   *

2                                  [R]
      *410+4 TPI EXEC            *
      *373+TPI TIME +15 MIN      *
      *307+028.00                *

4                          [RDOT  R]
6                          [RDOT  R]
8                          [RDOT  R]

9  CHART 0                         *

10                         [RDOT  R]

12 PRO FINAL COMP          [RDOT  R]

13 CHART R/RDOT/
      *411+0 STOP AUTO           *
                 [370R TOTAL VEL MCC1
                  371R ΔV TPF]

      *404+0, 405+0, 406+0       *
   P41, V77

14    *410+5              [ATT CONT-
      *502R _____            MODE CONT]

:05   *472R/502R                 *[A/H]
15 MCC1
   NULL RESIDUALS
```

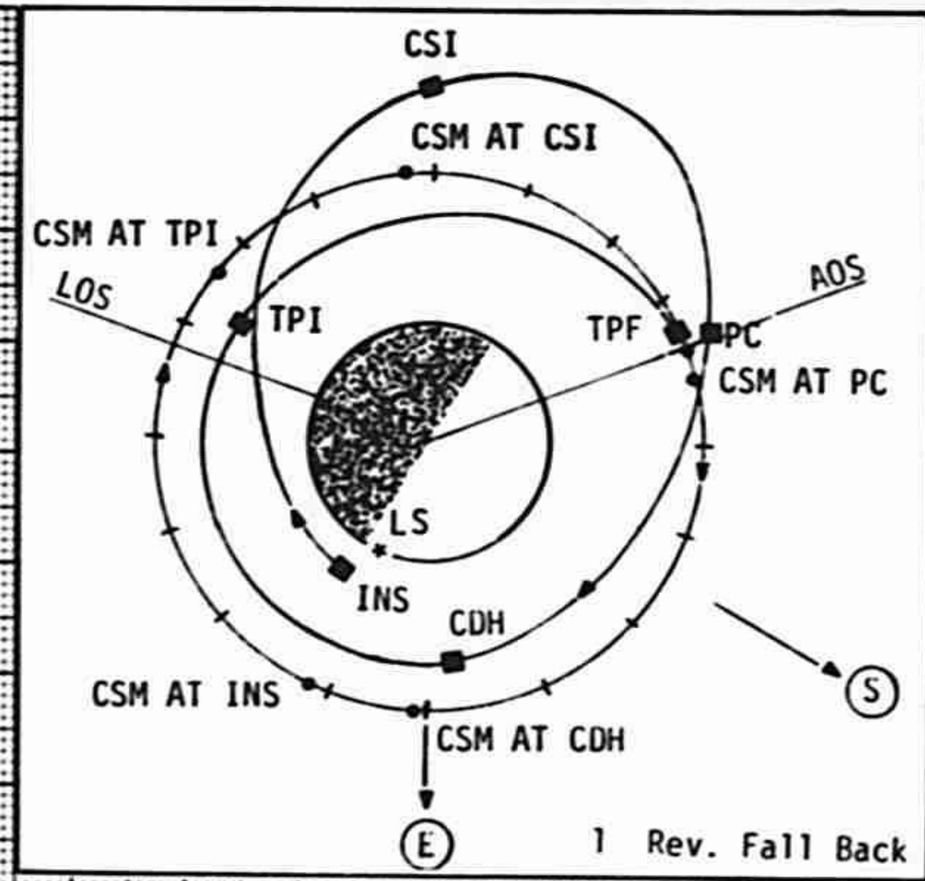
SR

```
V76
P35 TGT MCC 2          [ATT CONT-PULSE
V93                     MODE CONT-AUTO]

   *VERIFY PGNS (PCM-HI)         *
   *V47,414+1,400+3              *
   *400+2 Z-AXIS STEER           *
   *411+1 START AUTO             *

                                    [R]
   *410+4 TPI EXEC               *
   *373+TPI TIME +30 MIN         *
   *307+013.00                   *
   *EXT LTG-OFF                  *
                          [RDOT  R]
                          [RDOT  R]
                          [RDOT  R]

24 CHART 0                       *

25                         [RDOT  R]

27 PRO-FINAL COMP          [RDOT  R]

28 CHART R/RDOT/
      *411+0 STOP AUTO           *
                 [370R TOTAL VEL MCC2
                  371R ΔV TPF]

      *404+0, 405+0, 406+0       *
   P41, V77

29    *410+5              [ATT CONT-
      *502R _____            MODE CONT]

:05   *472R/502R                 *[A/H]
30 MCC2
   NULL RESIDUALS
```

AOS

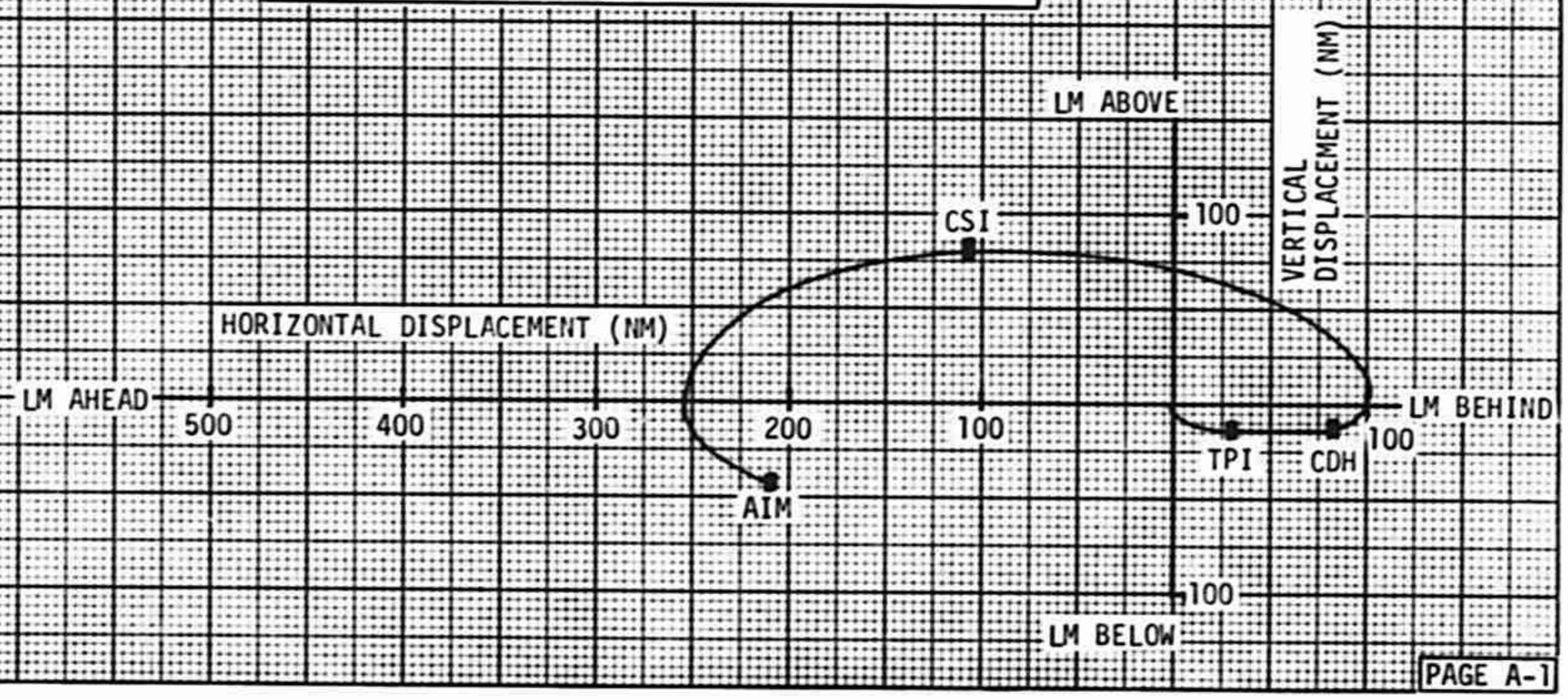
```
   CB(11) ECS CABIN FAN1-CLOSE
   P00
   V48, 11002
   P47, V63
      *404+0, 405+0, 406+0       *
   TPI BURN REPORT
40 INITIATE BRAKING
      30 FPS - 6000 FT
      20 FPS - 3000 FT
      10 FPS - 1500 FT
       5 FPS -  600 FT

      *SETUP CAMERA FOR          *
      *  DOCKING:                *
      *LM3/DAC/10/CEX-ULC        *
      *  (T3,1/250,6) 1FPS       *
      * .25 MAG(0), (4MIN)       *

   V34, P00
   V76                   [ATT CONT-PULSE]
   MANEUVER/PICTURES OF SIMBAY,RCS
55 INITIATE DOCKING
   COAS TO OVHD WINDOW
      *EXT LTG-DOCK              *
   SHFT/TRUN ±50                 *
   V41N72 (+000,+320)
   CB RR(2)-OPEN, V44
      *S-BD ANT-FWD,VERIFY COMM*
      *✓S-BD P _____ (+236)      *
            Y _____ (+51)        *
      *S-BD ANT-SLEW (>3.0)      *
      *TRACK MODE-AUTO           *
      *BIOMED-LEFT, PCM-HI       *
      *UPLINK SQUELCH-OFF        *
   FDAI (180,290,300)
   V77                   [ATT CONT-
65 CONTACT                 MODE CONT]

   CONFIRM CAPTURE FROM CSM
   MODE CONT (BOTH)-OFF
   POST DOCKING PROCEDURES
```

EVENT	GET TIG
INS	
CSI	
PC	
CDH	
TPI	



APOLLO 16/17 MISSIONS
INERTIAL AND RELATIVE PLOTS

NO PDI 1+12



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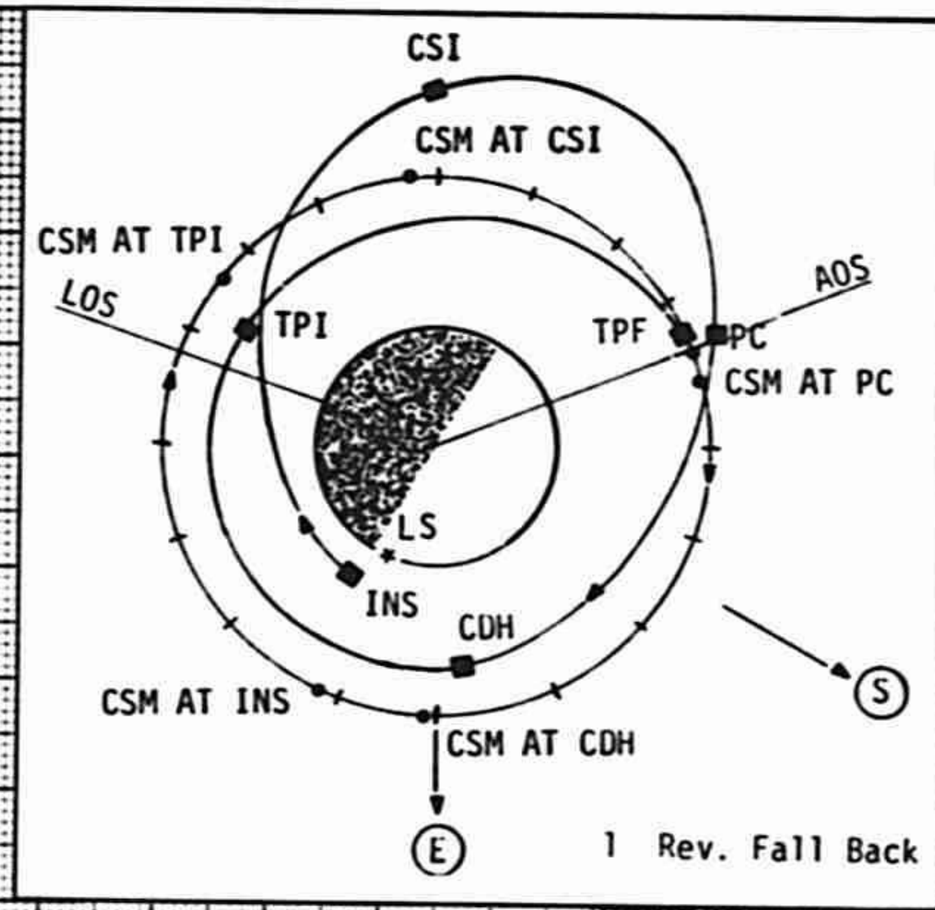
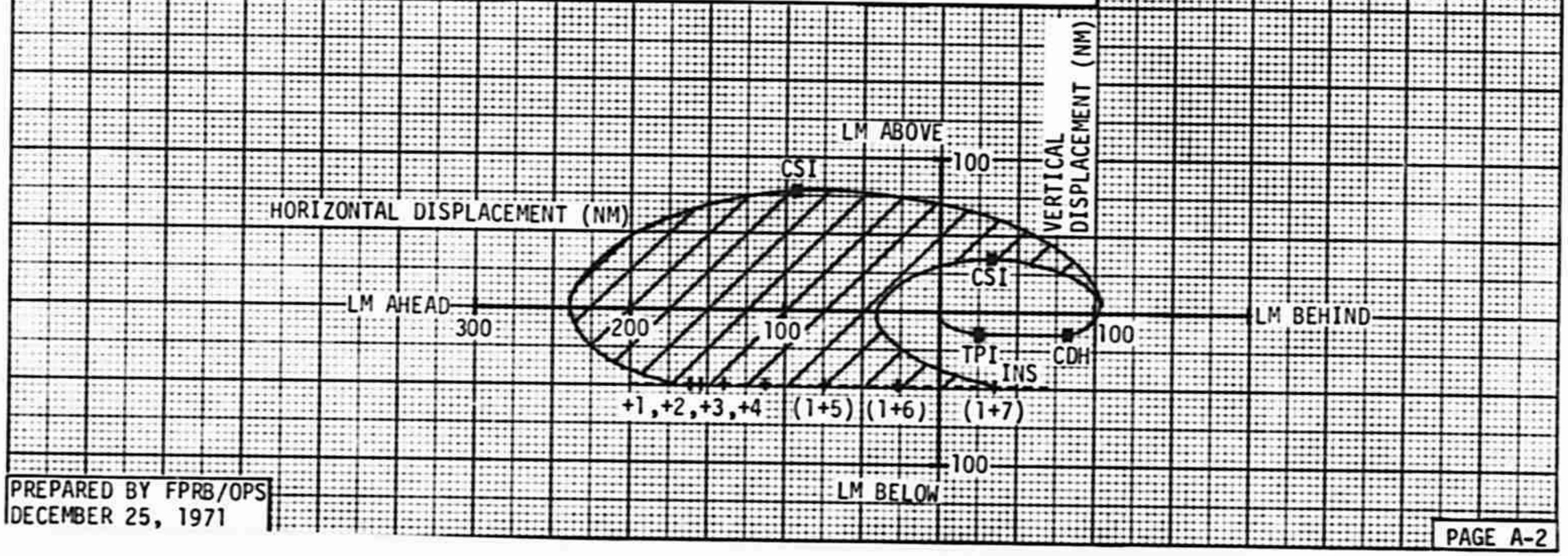
EVENT	GET TIG
INS	
CSI	
PC	
CDH	
TPI	



APOLLO 16/17 MISSIONS
INERTIAL AND RELATIVE PLOTS

1. $1 \leq$ PDI $1 \leq 7$



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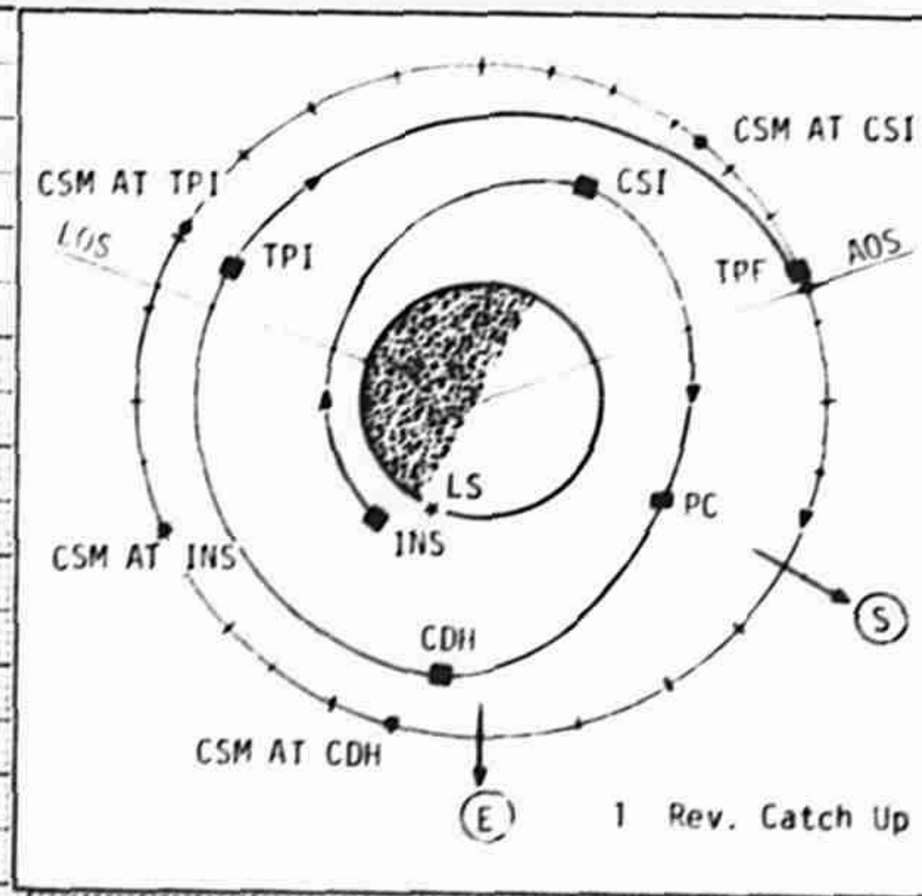
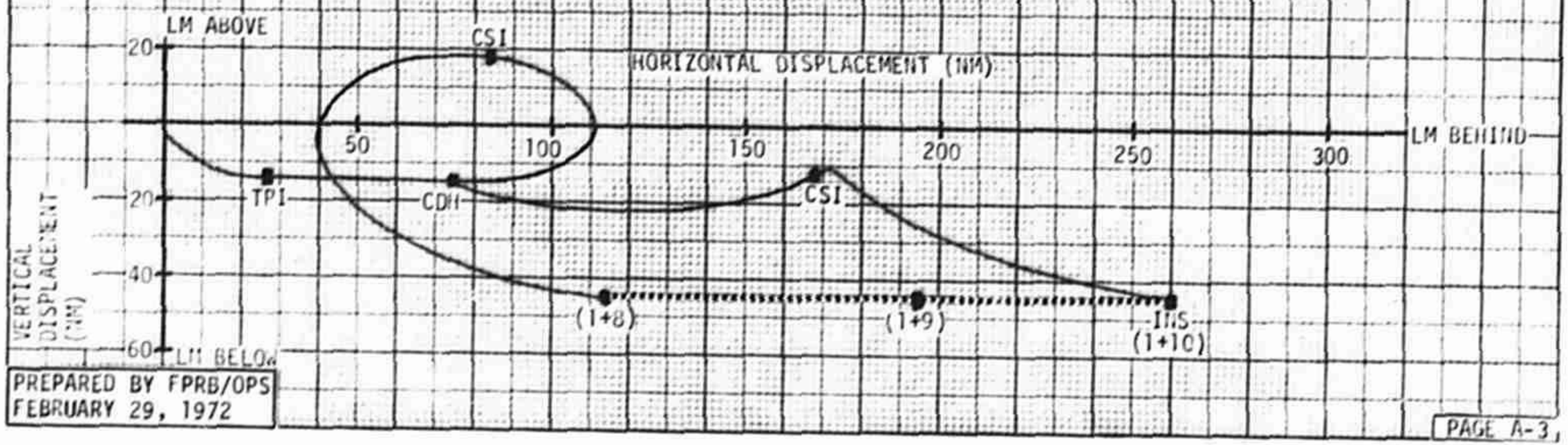
PAGE A-2

EVENT	GET TIG
INS	
CSI	
PC	
CDH	
TPI	

APOLLO 16/17 MISSIONS
INERTIAL AND RELATIVE PLOTS

8 ≤ PDI 1 ≤ 10





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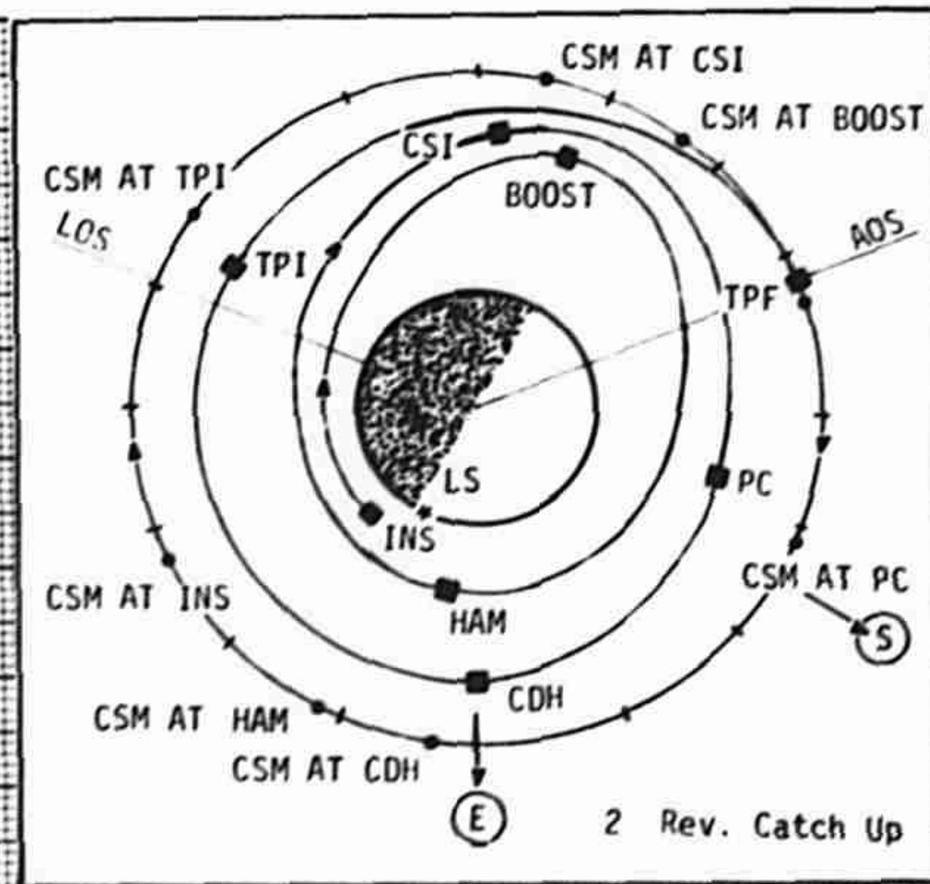
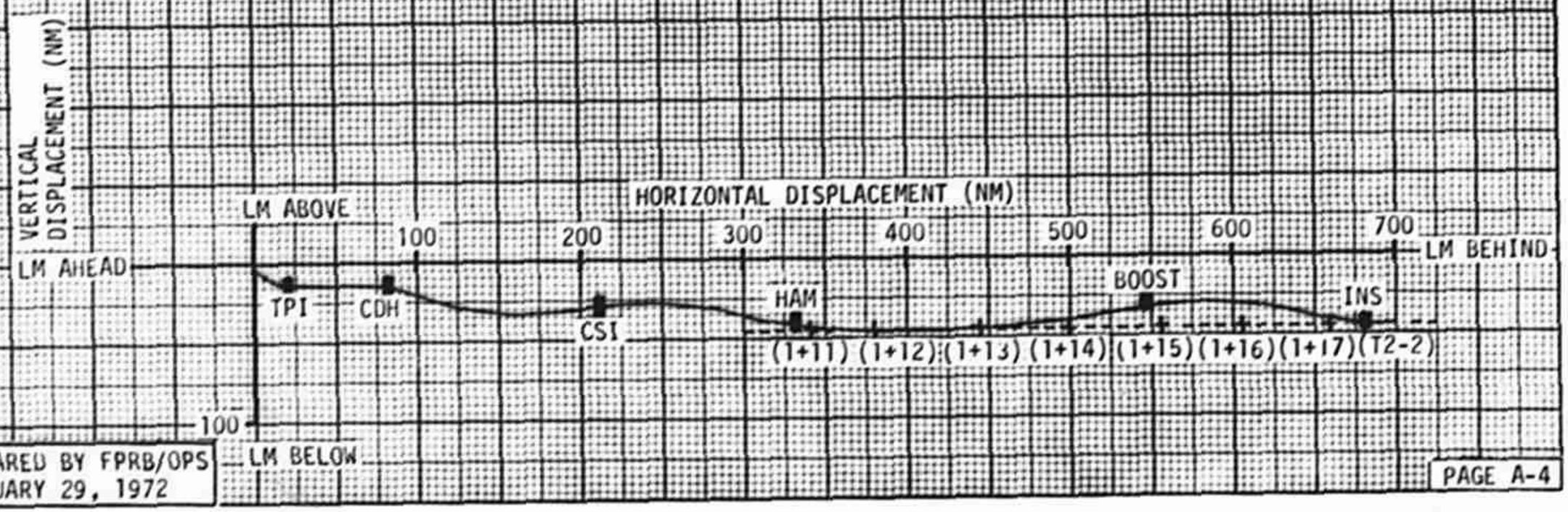
PAGE A-3

APOLLO 16/17 MISSIONS
INERTIAL AND RELATIVE PLOTS
1. 11 < PDI 1 ≤ 17
2. T2-2

EVENT	GET TIG
INS	
BOOST	
HAM	
CSI	
PC	
CDH	
TPI	





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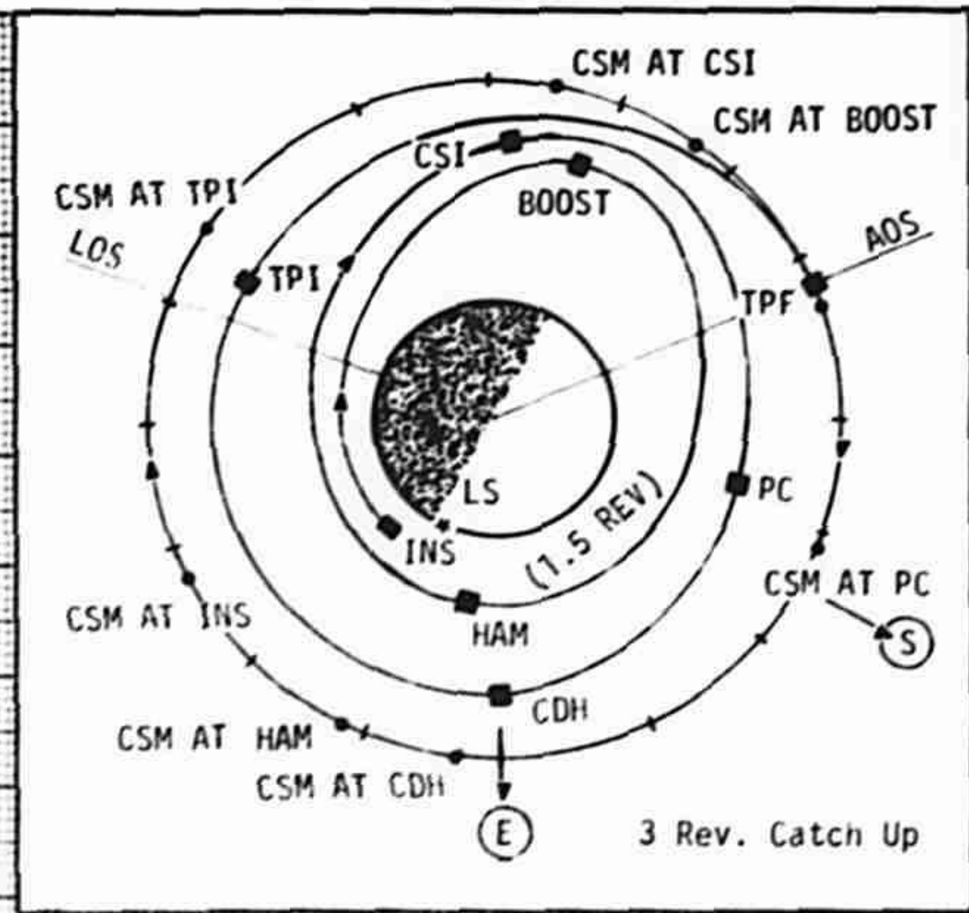
PAGE A-4

EVENT	GET TIG
INS	
BOOST	
HAM	
CSI	
PC	
CDH	
TPI	



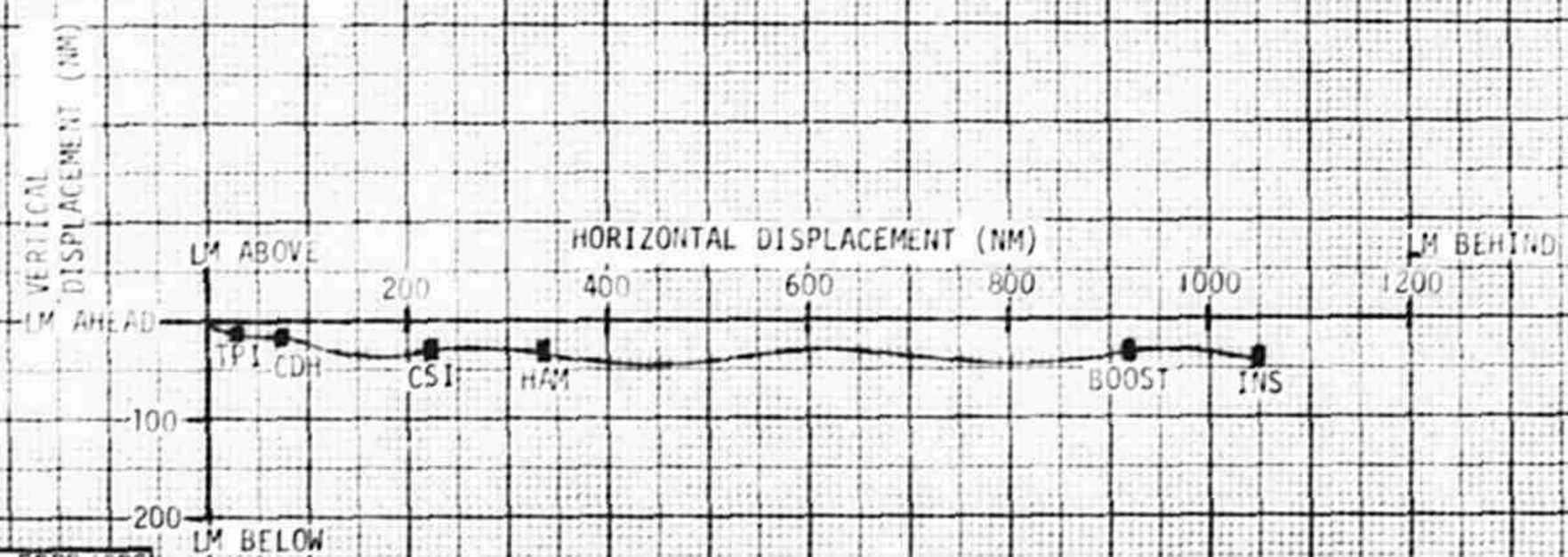
APOLLO 16/17 MISSIONS
INERTIAL AND RELATIVE PLOTS

T2-1

PROCEDURES:

BOOST BURN PERFORMED
P00
V82
V76
1 REV COASTING FLIGHT
60 MIN PRIOR TO HAM
DO PROCEDURES FOR
BOOST THRU HAM.
ON PAGE 23

BURN GROUND HAM



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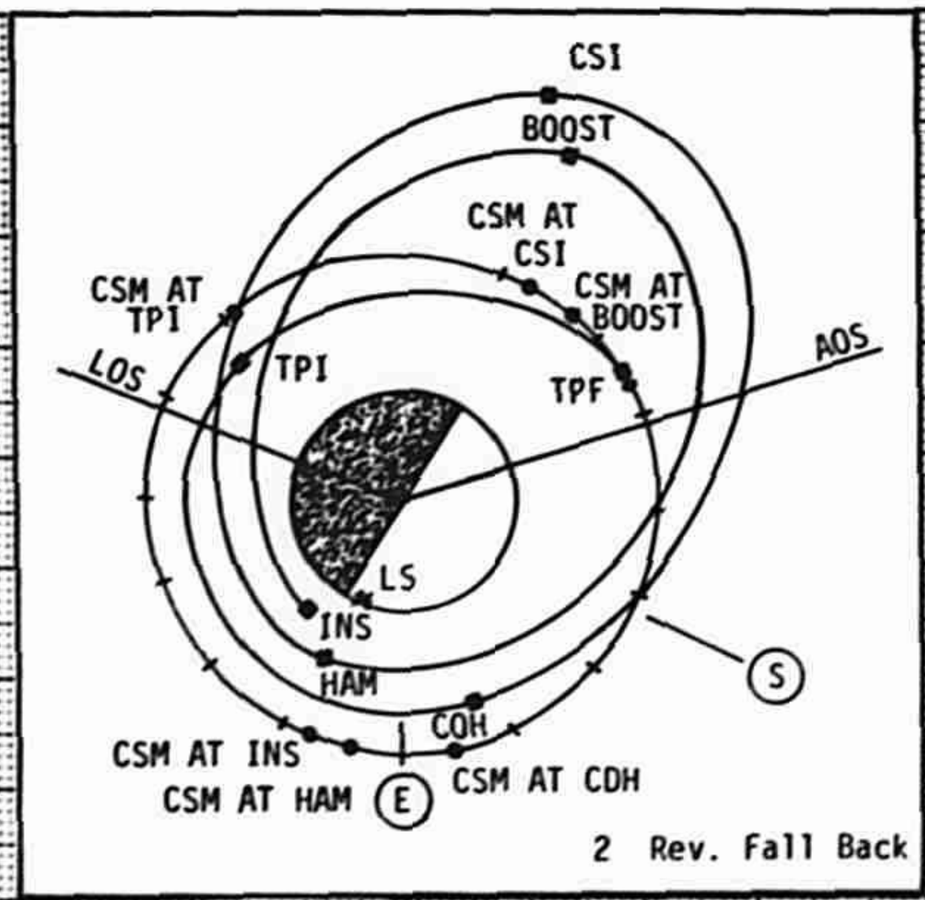
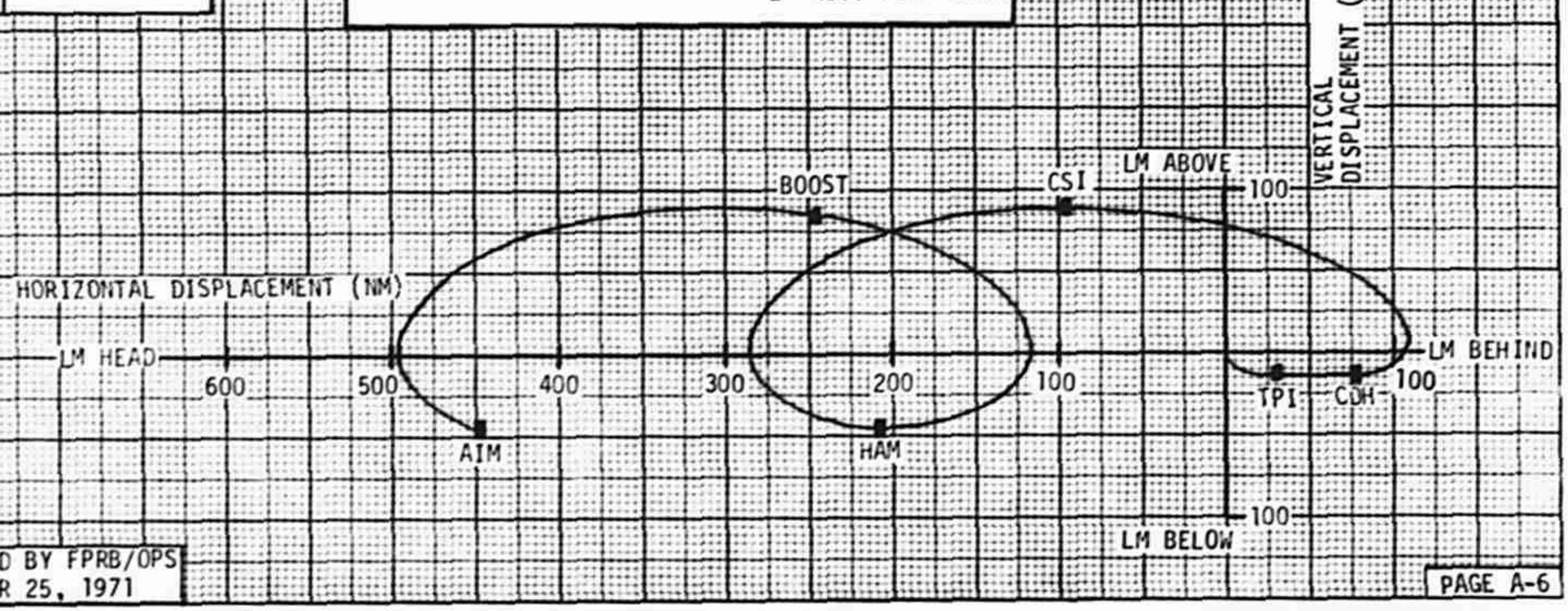
PAGE A-5

EVENT	GET TIG
INS	
BOOST	
HAM	
CSI	
PC	
CDH	
TPI	



APOLLO 16/17 MISSIONS
INERTIAL AND RELATIVE PLOTS

NO PDI 2 + 12



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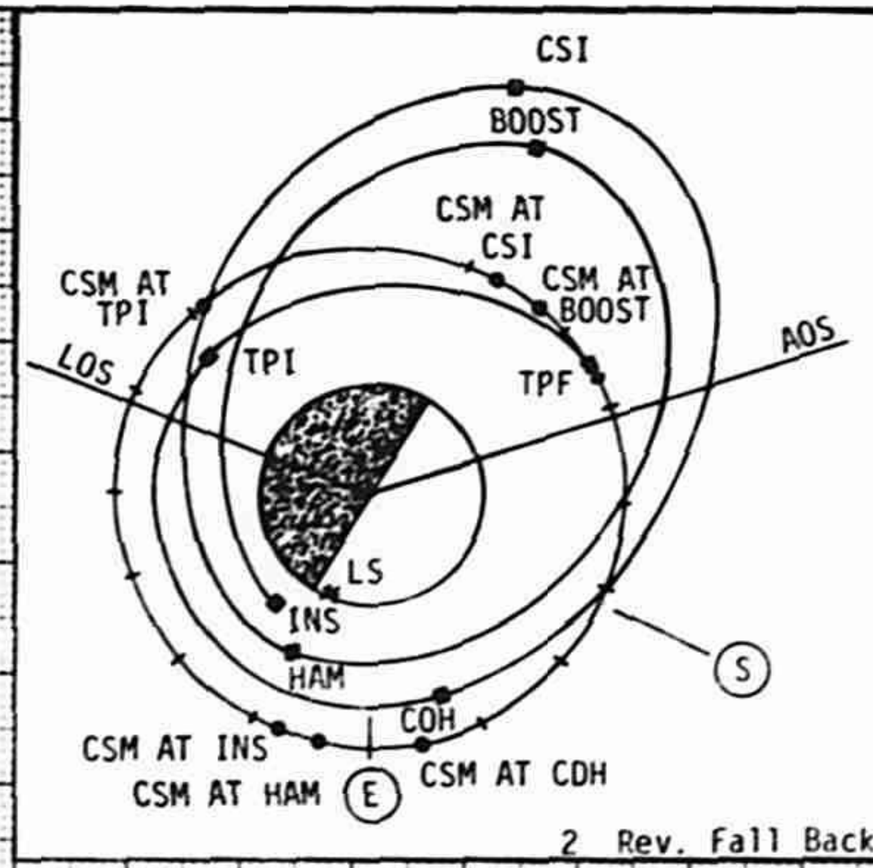
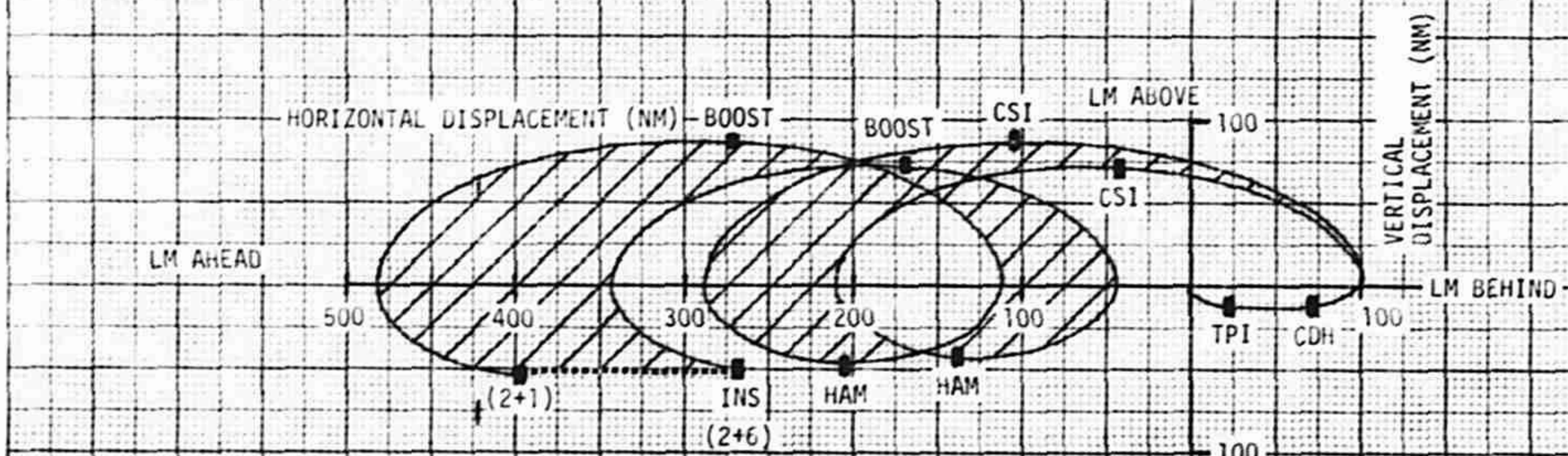
PAGE A-6

EVENT	GET TIG
INS	
BOOST	
HAM	
CSI	
PC	
CDH	
TPI	

APOLLO 16/17 MISSIONS
INERTIAL AND RELATIVE PLOTS

1. $1 \leq PDI\ 2 \leq 6$





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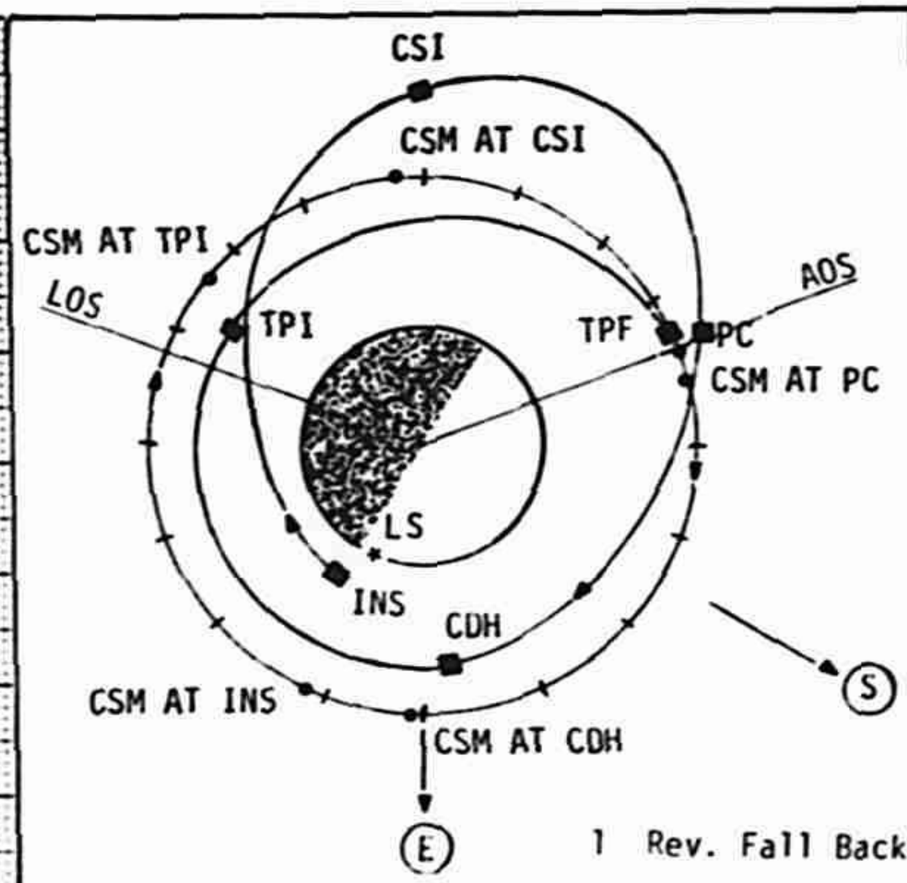
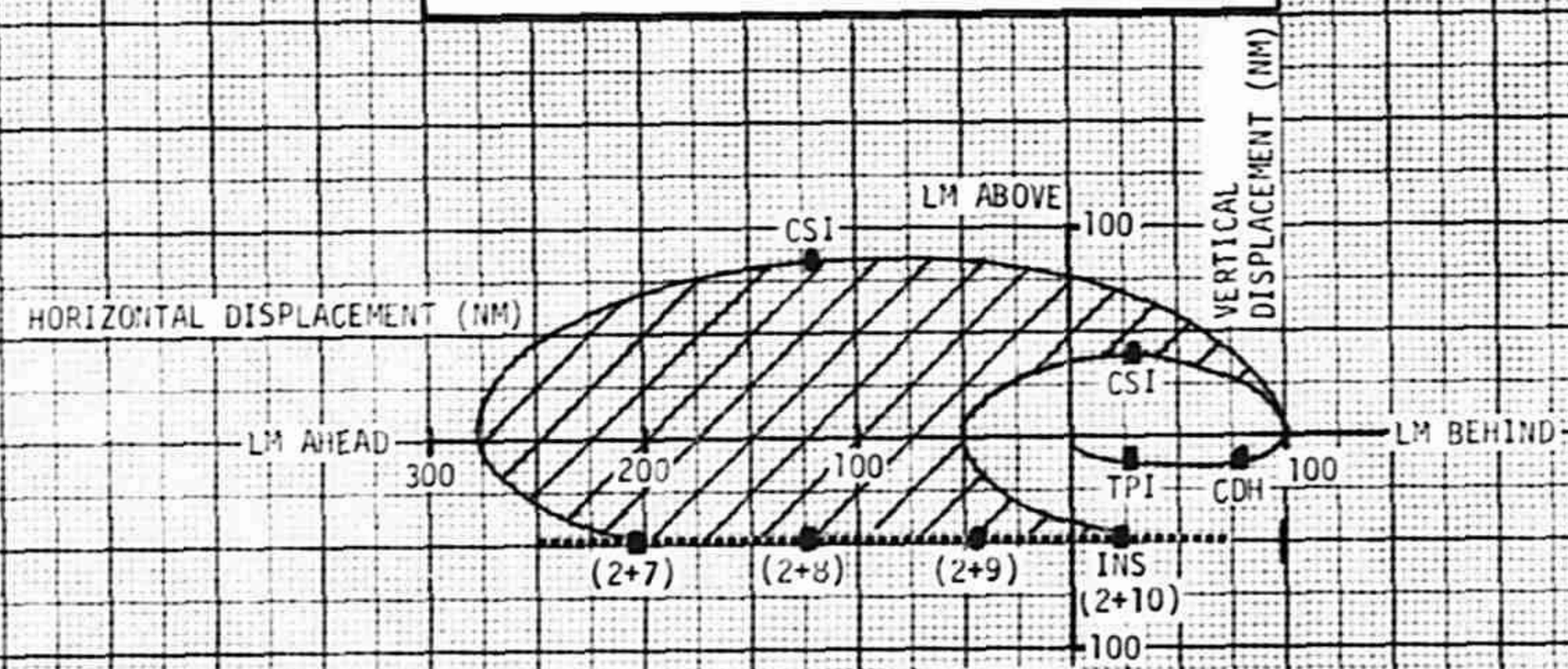
PAGE A-7

EVENT	GET TIG
INS	
CSI	
PC	
CDH	
TPI	

APOLLO 16/17 MISSIONS
INERTIAL AND RELATIVE PLOTS

$7 \leq PDI\ 2 \leq 10$





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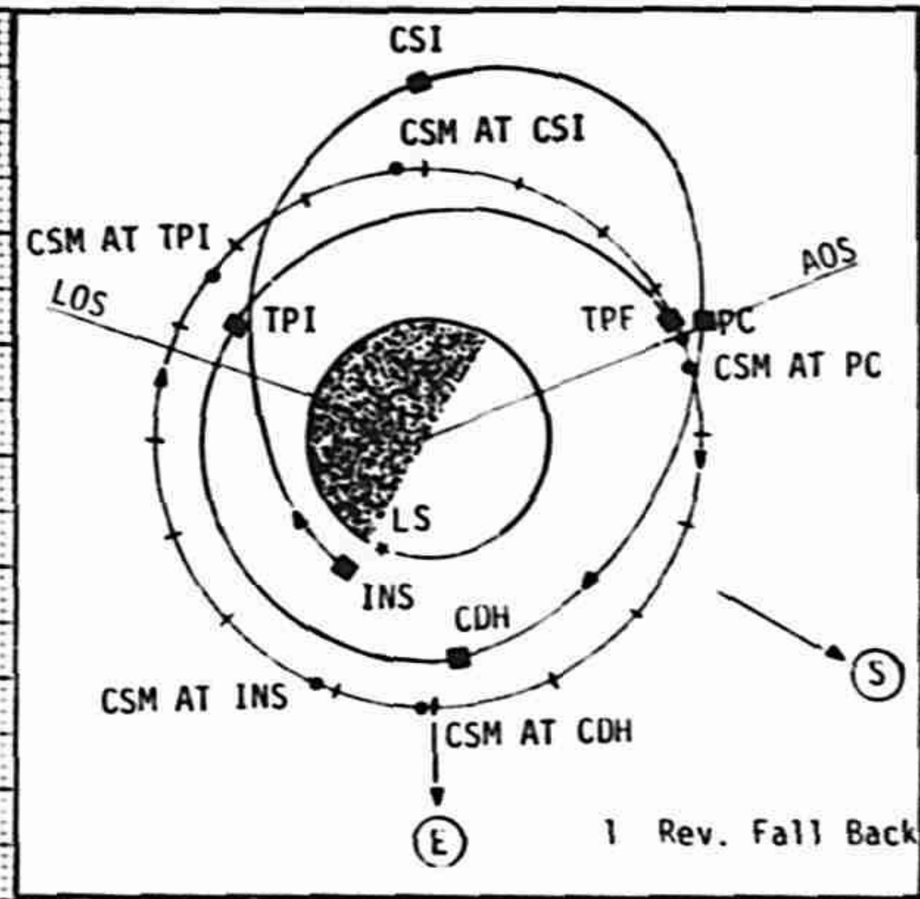
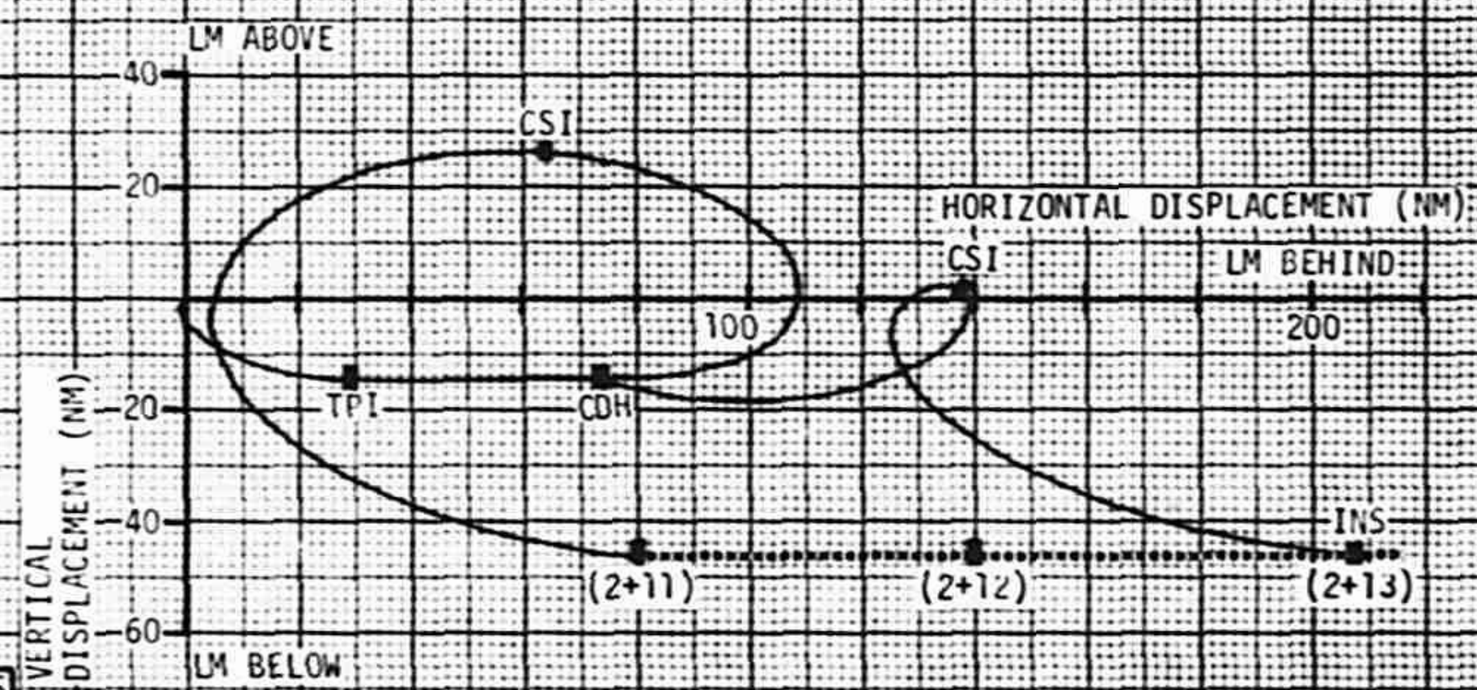
PAGE A-8

EVENT	GET TIG
INS	
CSI	
PC	
CDH	
TPI	



APOLLO 16/17 MISSIONS
INERTIAL AND RELATIVE PLOTS

11 ≤ PDI 2 ≤ 13



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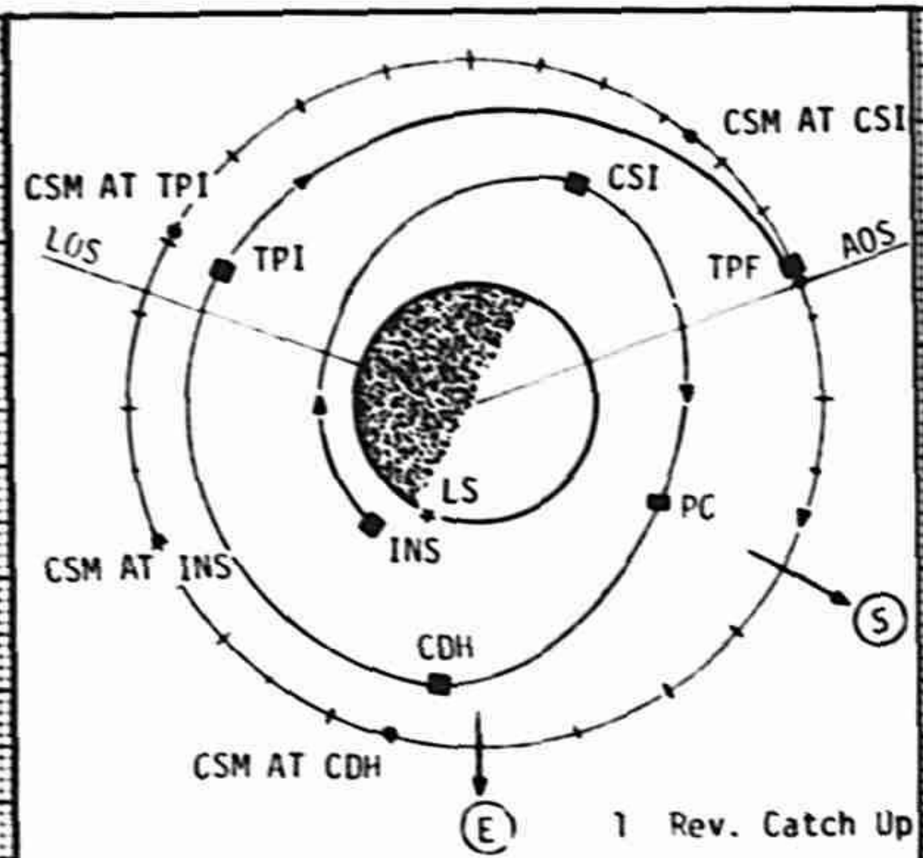
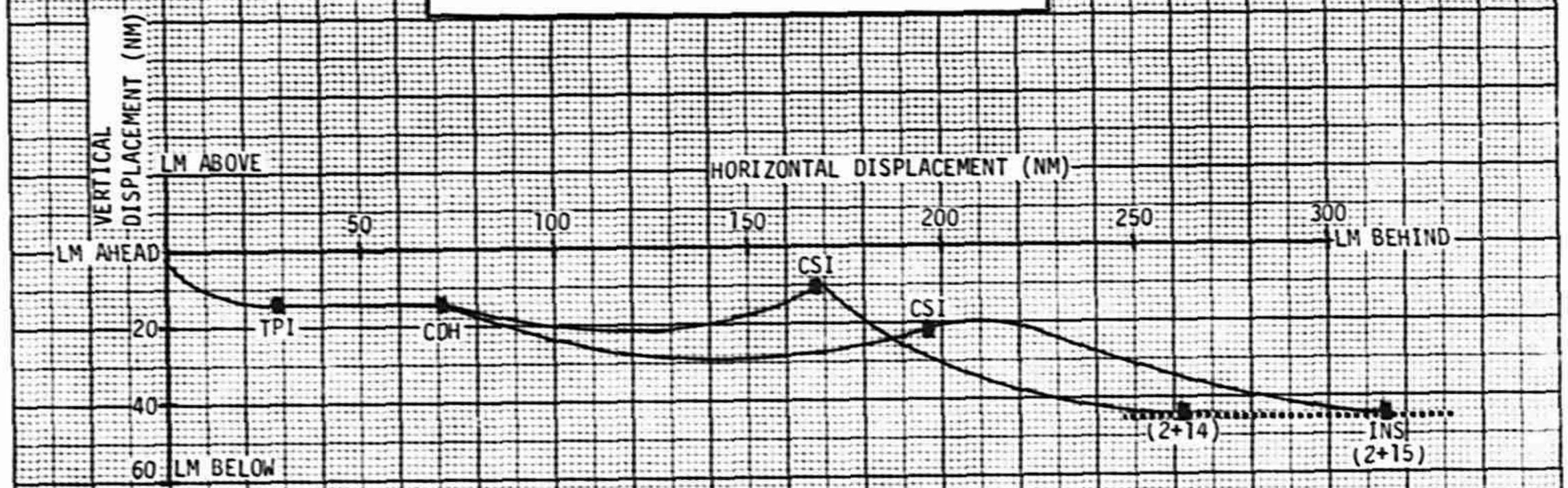
EVENT	GET TIG
INS	
CSI	
PC	
CDH	
TPI	

APOLLO 16/17 MISSIONS
INERTIAL AND RELATIVE PLOTS

14 ≤ PDI 2 ≤ 15





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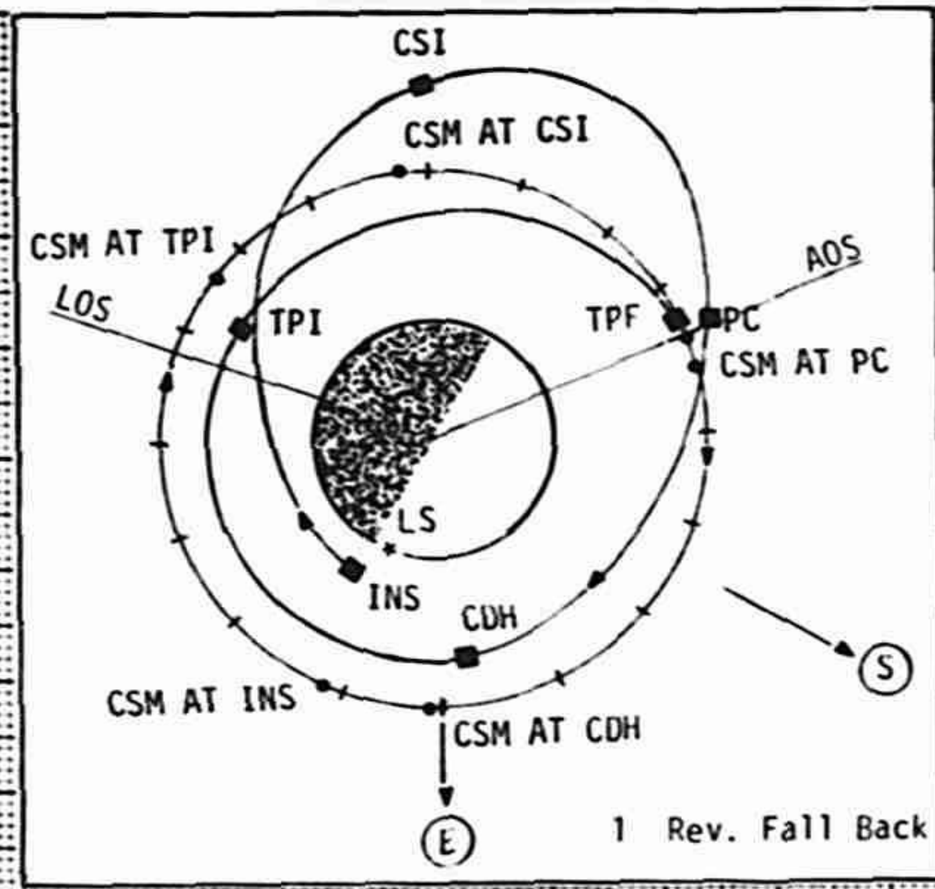
PAGE A-10

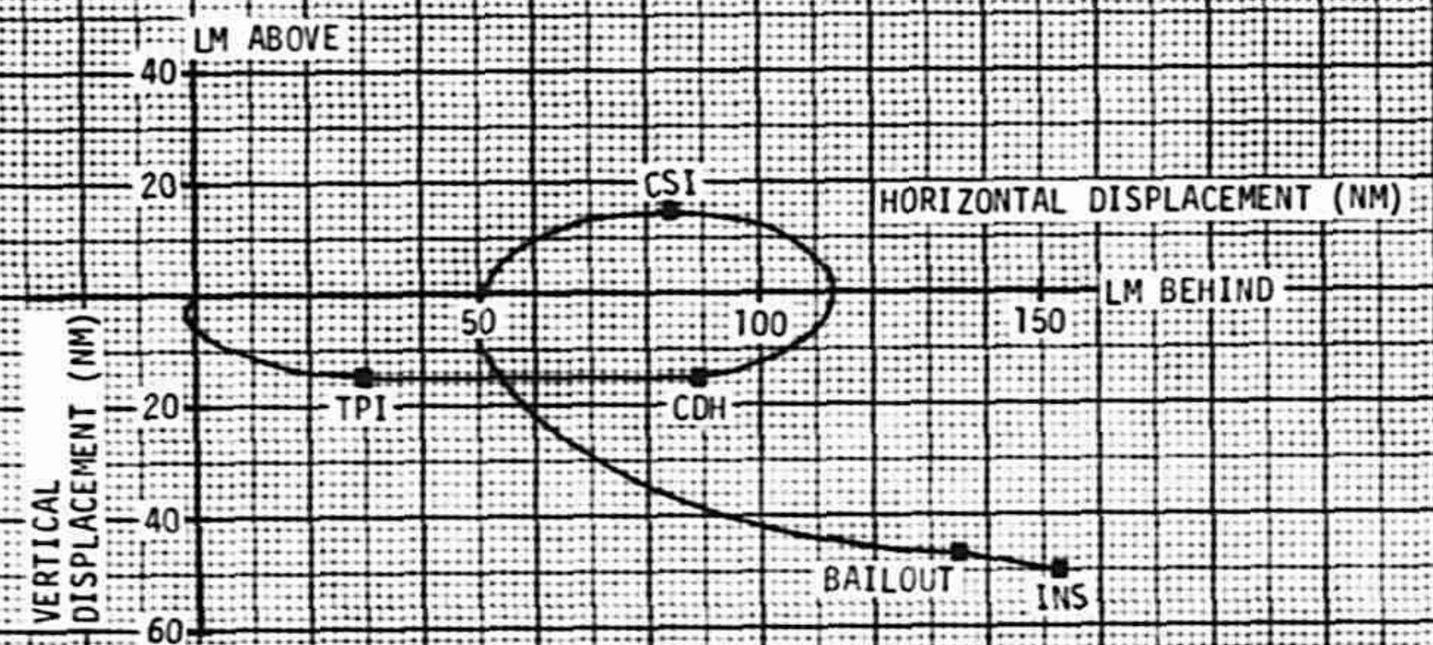
LM BAILOUT REL
TRAJECTORY

APOLLO 16/17 MISSIONS
INERTIAL AND RELATIVE PLOTS

BAILOUT

EVENT	GET TIG
INS	
BAILOUT	
CSI	
PC	
CDH	
TPI	





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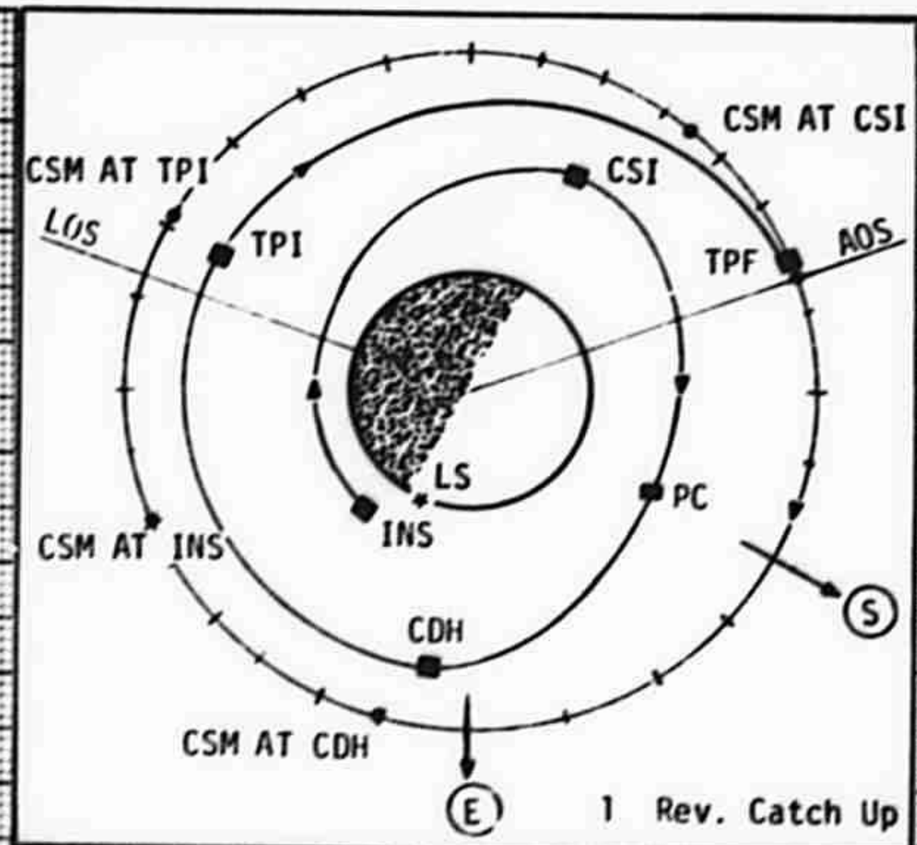
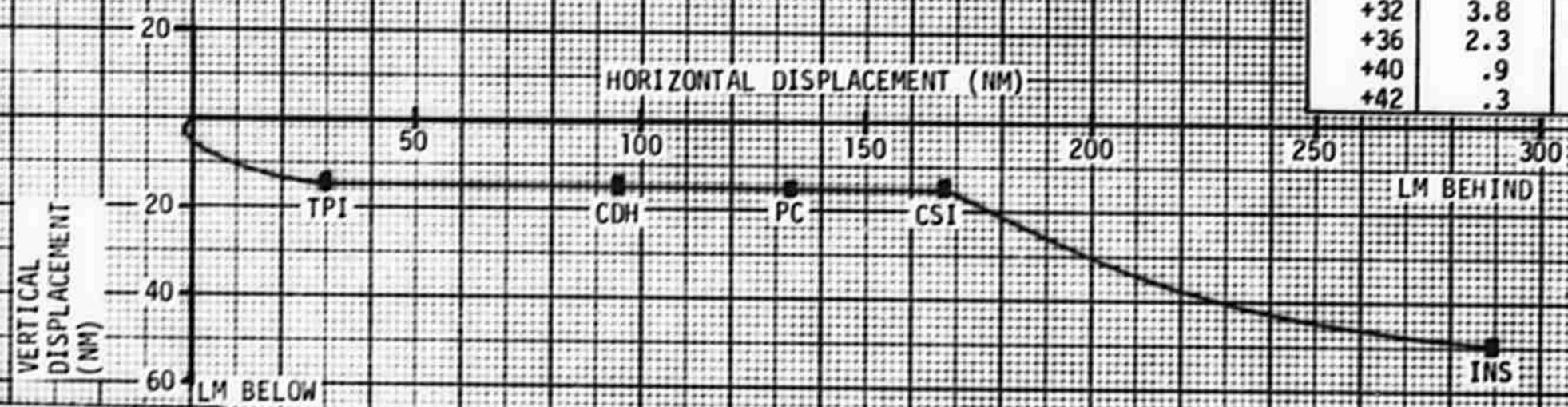
EVENT	GET TIG
INS	
CSI	
PC	
CDH	
TPI	



APOLLO 16/17 MISSIONS
INERTIAL AND RELATIVE PLOTS

NOMINAL COELLIPTIC RNDZ

ΔT	RANGE	RDOT
INS	285.6	-456.6
-48	281.1	-452.3
-44	263.6	-429.7
-40	247.3	-399.1
-36	232.2	-362.0
-32	218.7	-320.2
-28	206.9	-275.8
-24	196.9	-230.9
-20	188.7	-188.0
-16	182.0	-149.3
-12	176.8	-116.8
-8	172.7	-92.0
-4	169.4	-76.0
CSI	166.6	-69.4
CDH	95.7	-122.2
TPI	33.5	-110.2
+4	27.8	-129.3
+8	22.9	-120.4
+12	18.4	-108.8
+16	14.3	-95.2
+20	10.9	-80.4
+24	8.0	-65.7
+28	5.6	-52.5
+32	3.8	-42.0
+36	2.3	-35.3
+40	.9	-32.4
+42	.3	-31.9



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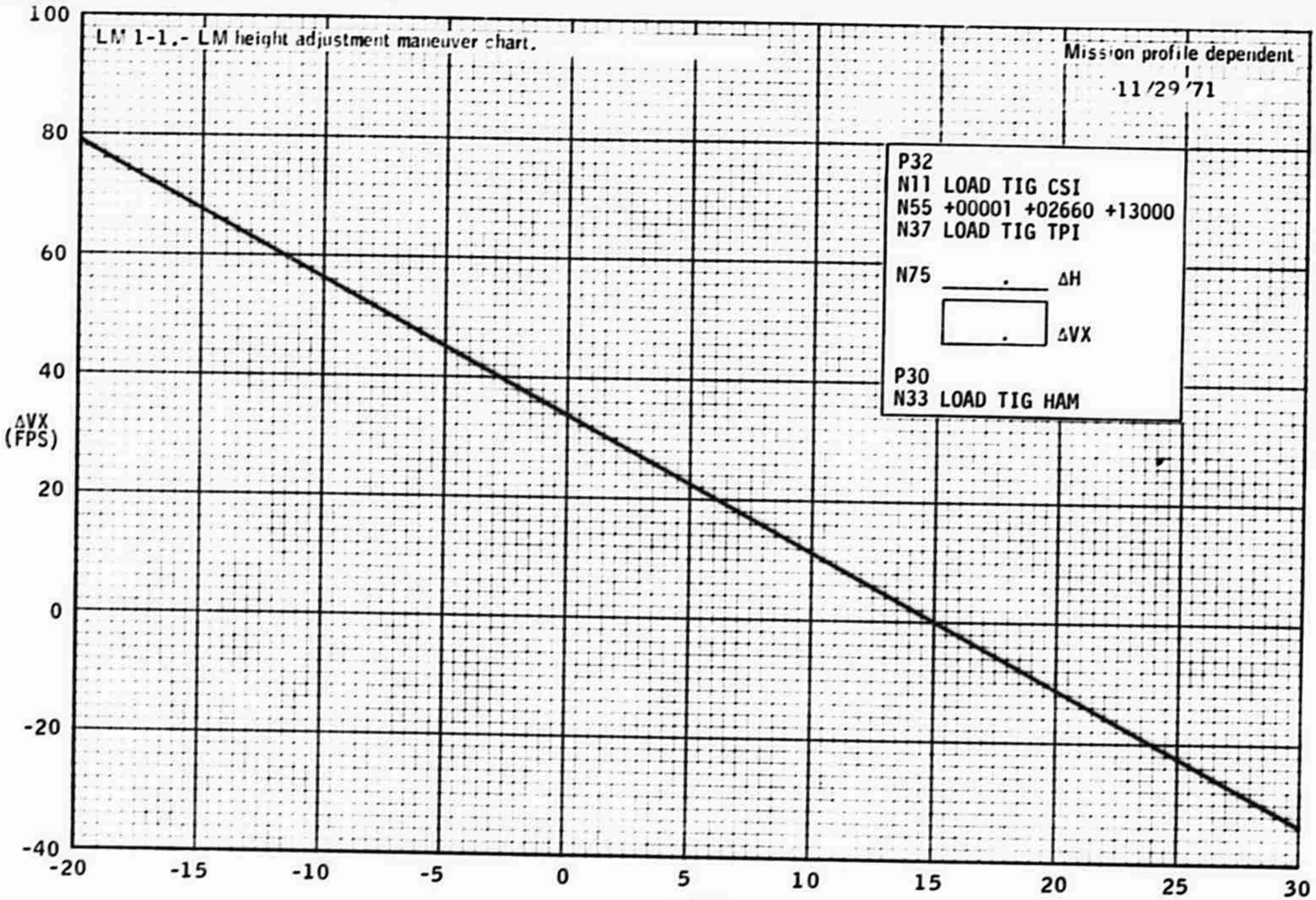
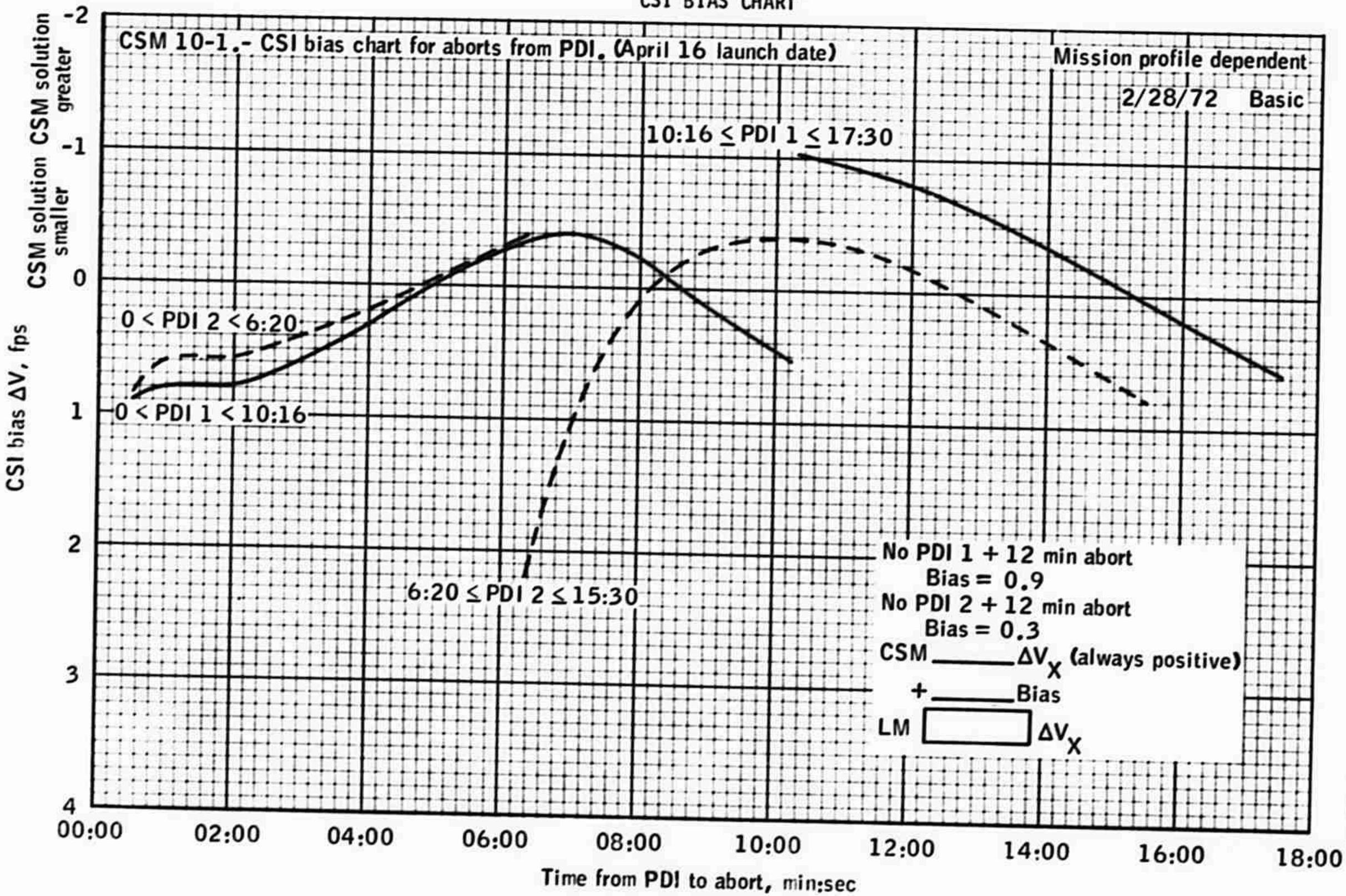
RELATIVE TRAJ
NOM COEL RNDZ


LM 1-1.- LM height adjustment maneuver chart.
Mission profile dependent
11/29/71
P32
N11 LOAD TIG CSI
N55 +00001 +02660 +13000
N37 LOAD TIG TPI
N75 ____.____ ΔH
____.____ ΔVX
P30
N33 LOAD TIG HAM
ΔVX (FPS)
100
80
60
40
20
0
-20
-40
-20
-15
-10
-5
0
5
10
15
20
25
30
ΔH (NM)

HAM CHART

CSI BIAS CHART



CSI BIAS
DELTA V

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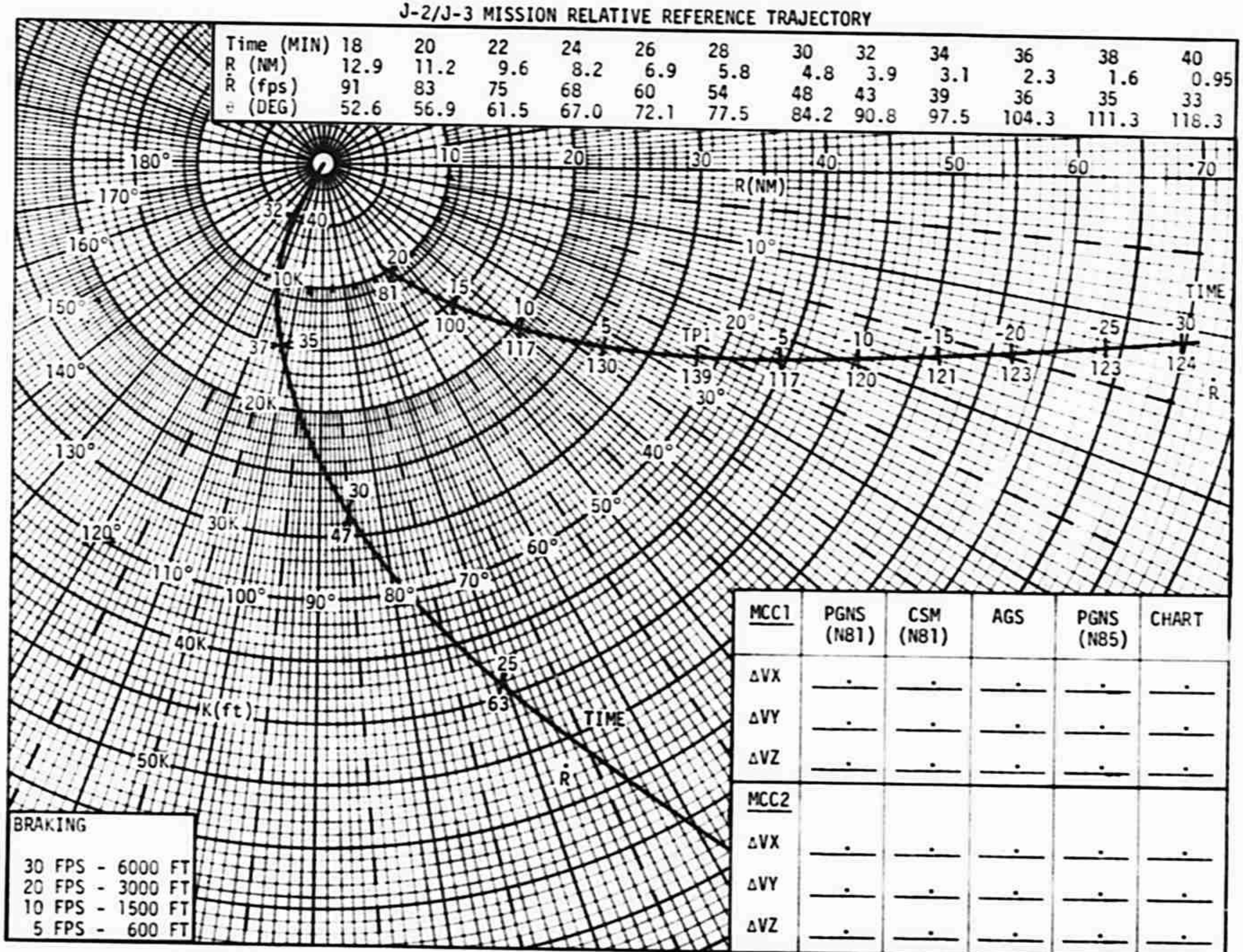
J-2/J-3 MISSION RELATIVE REFERENCE TRAJECTORY

Time (MIN)	18	20	22	24	26	28	30	32	34	36	38	40
R (NM)	12.9	11.2	9.6	8.2	6.9	5.8	4.8	3.9	3.1	2.3	1.6	0.95
$\dot{R}$ (fps)	91	83	75	68	60	54	48	43	39	36	35	33
θ (DEG)	52.6	56.9	61.5	67.0	72.1	77.5	84.2	90.8	97.5	104.3	111.3	118.3



MCC1	PGNS (N81)	CSM (N81)	AGS	PGNS (N85)	CHART
ΔVX	___.___	___.___	___.___	___.___	___.___
ΔVY	___.___	___.___	___.___	___.___	___.___
ΔVZ	___.___	___.___	___.___	___.___	___.___
MCC2					
ΔVX	___.___	___.___	___.___	___.___	___.___
ΔVY	___.___	___.___	___.___	___.___	___.___
ΔVZ	___.___	___.___	___.___	___.___	___.___

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MISSION APOLLO 16, DECEMBER 25, 1971

TPF REL TRAJ
NOM COEL RNDZ

J-2/J-3 MISSION RELATIVE REFERENCE TRAJECTORY

Time (MIN)	18	20	22	24	26	28	30	32	34	36	38	40
R (NM)	12.56	10.91	9.40	8.03	6.80	5.70	4.72	3.84	3.05	2.53	1.64	.99
Ṙ (fps)	87.27	80.02	72.77	65.67	58.90	52.62	47.02	42.23	38.36	35.45	33.47	32.32
θ (DEG)	52.27	56.47	61.03	65.99	71.34	77.09	83.18	89.57	96.16	102.84	109.50	116.03

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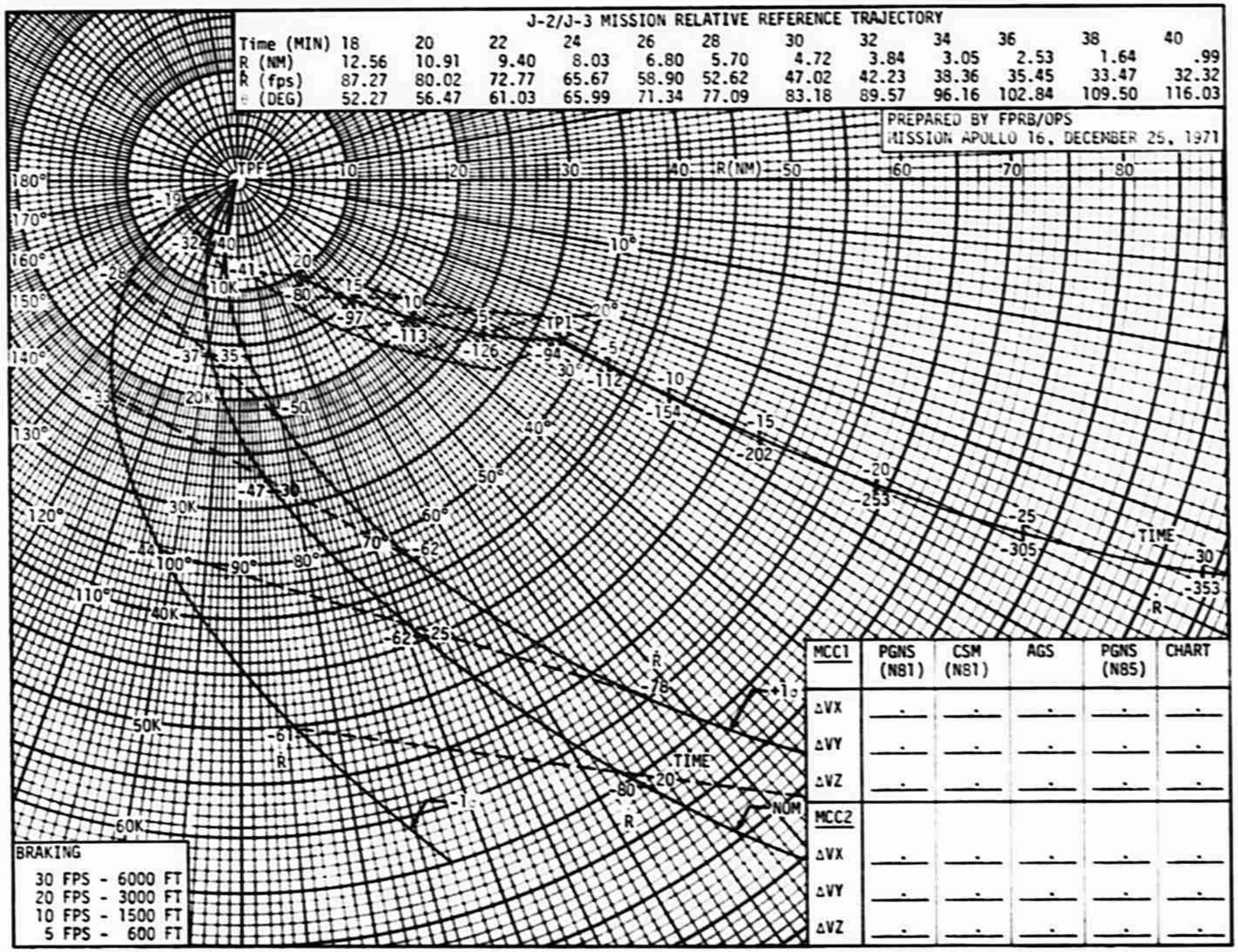
MISSION APOLLO 16, DECEMBER 25, 1971



MCC1	PGNS (NB1)	CSM (NB1)	AGS	PGNS (NB5)	CHART
ΔVX	.	.	.	.	.
ΔVY	.	.	.	.	.
ΔVZ	.	.	.	.	.
MCC2					
ΔVX	.	.	.	.	.
ΔVY	.	.	.	.	.
ΔVZ	.	.	.	.	.

NASA — MSC