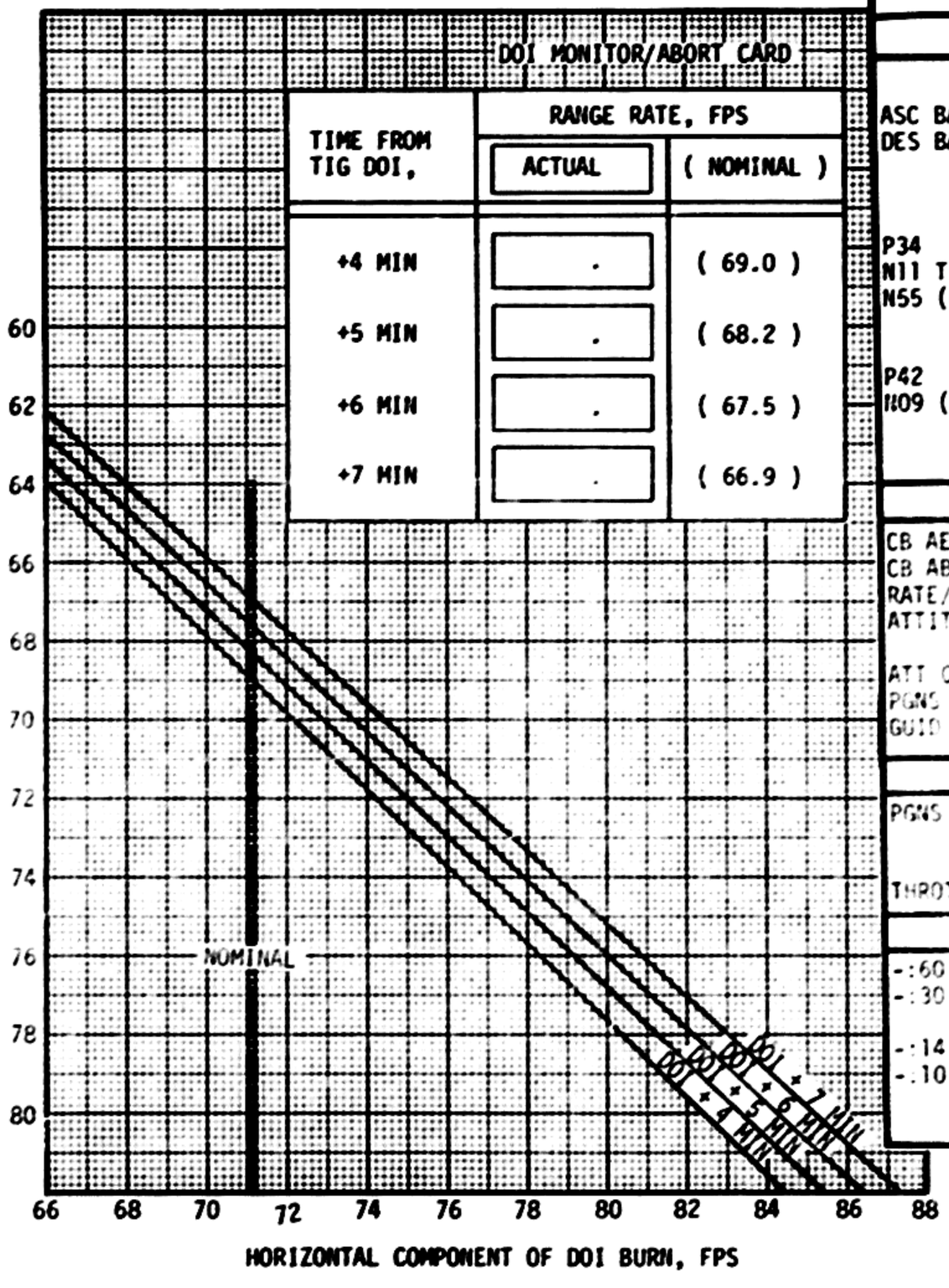
FAO

APOLLO 12	
LM DATA CARD BOOK	
PART NO	S/N
SKB32100081-387	1002

DOI MONITOR/ABORT CARD

TIME FROM TIG DOI,	RANGE RATE, FPS ACTUAL	(NOMINAL)
+4 MIN	.	(69.0)
+5 MIN	.	(68.2)
+6 MIN	.	(67.5)
+7 MIN	.	(66.9)



TARGETING PGNS & AGS

PGNS	AGS DPS	AGS APS
ASC BATTS(2)-ON DES BATTS(1&3)-OFF P34 N11 TIG TPI (DOI+10) N55 (0,0,060.00) P42 N09 (1706), PRO	507+0 THRUST X-AXIS 306+0 NODE AT TPF 616+00004 ULLAGE COUNTER 410+4 TPI EXECUTE 373 DOI+10 MIN(+0573.0) 307 TRANSFER TIME (02000) 267 ΔV 371 ΔV + BRAKING 410+5 EXT ΔV 400+1 GUID STEER 411+0 500R	ASC BATTS(2)-ON DES BATTS(1&3)-OFF 507+0 THRUST X-AXIS 306+0 NODE AT TPF 616+00007 ULLAGE COUNTER 410+4 TPI EXECUTE 373 DOI+10 MIN(+0573.0) 307 TRANSFER TIME (02000) 267 ΔV 371 ΔV + BRAKING 410+5 EXT ΔV 400+1 GUID STEER 411+1 500R

SWITCH CONFIGURATION

CB AELD(2)-CLOSE CB ABORT STAGE(2)-CLOSE RATE/ERR MON-LDG RDR/CMPTR ATTITUDE MON-PGNS ATT CONT(3)-MODE CONT PGNS MODE CONT-ATT HOLD GUID CONT-PGNS	ENG GMBL-ENABLE RATE/ERR MON-LDG RDR/CMPTR ATTITUDE MON-AGS DEAD BAND-MIN ATT CONT(3)-PULSE AGS MODE CONT-AUTO GUID CONT-AGS	CB AELD(2)-CLOSE CB ABORT STAGE(2)-CLOSE RATE/ERR MON-LDG RDR/CMPTR ATTITUDE MON-AGS DEAD BAND-MIN ATT CONT(3)-PULSE AGS MODE CONT-AUTO GUID CONT-AGS

MANUEVER TO BURN ATT

PGNS MODE CONT-AUTO THROT/JET-JETS (BOTH)	ATT CONT(3)-MODE CONT 407+0 (READ) 500R THROT/JET-JETS (LMP)	ATT CONT(3)-MODE CONT 407+0 (READ) 500R THROT/JET-JETS (BOTH)

BURN

-:60 MASTER ARM-ON -:30 ABORT STAGE-PUSH ENG ARM-ASC -:14 ULLAGE (LMP) -.10 STAGE FIRE	-:30 ABORT PB-PUSH ENG ARM-DES -:08 ULLAGE (LMP) +:15 THROTTLE-MAX	-:60 MASTER ARM-ON -:30 ABORT STAGE-PUSH ENG ARM-ASC -:14 ULLAGE (LMP) -:10 STAGE FIRE

Prepared By FPRB/OPS
MISSION APOLLO 12, NOVEMBER 8, 1969

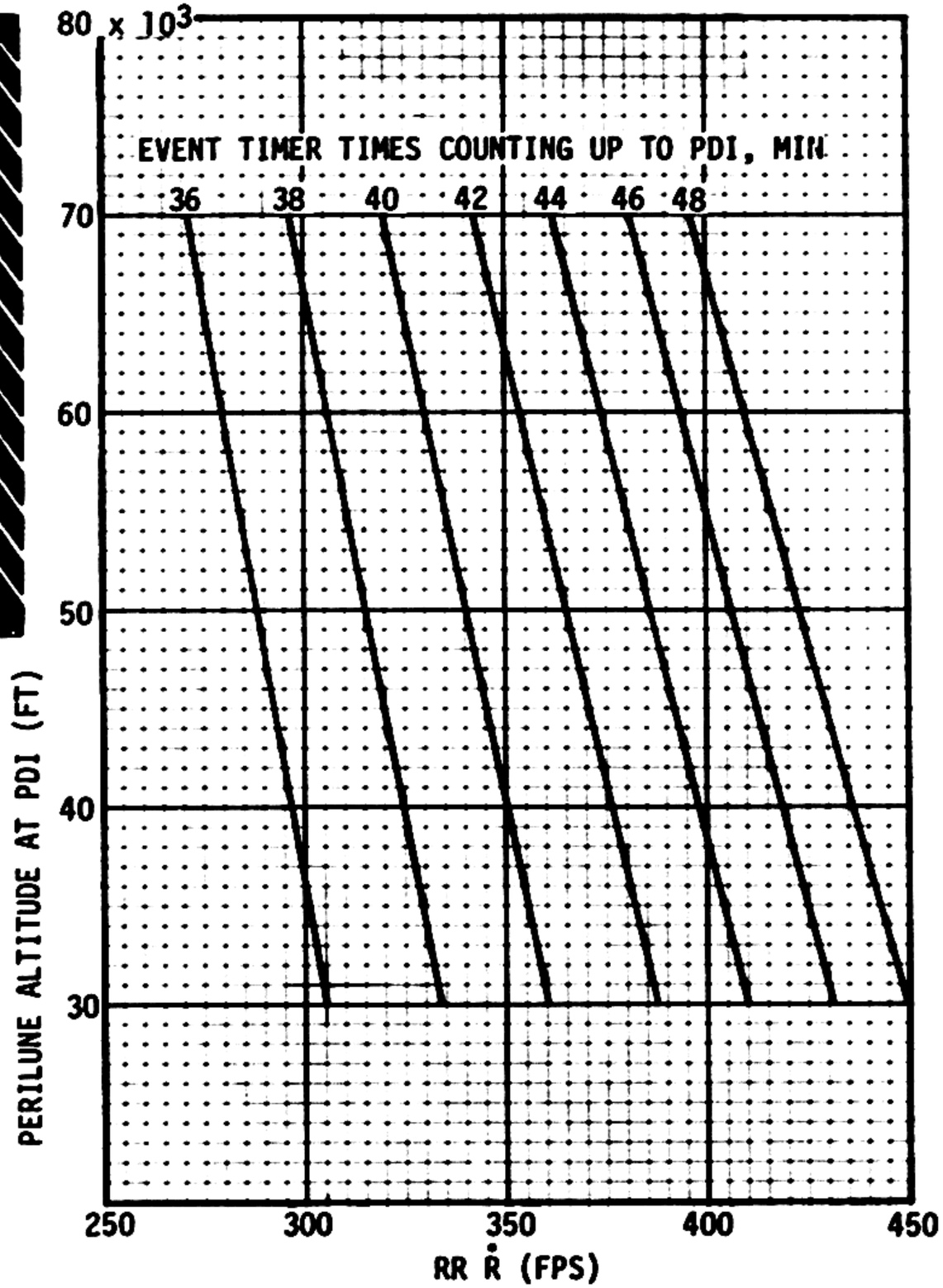
DOI MONITOR/ABORT
.PDI RULES/RR PRLN

PDI RULES

1. NO ULLAGE - NO GO FOR PDI
2. NO IGNITION DELAY 5 SEC THEN SET DES ENG OVRD - ON
3. T/W > 1.6 AND DSKY CHANGES > 18fps/2 sec
4. ATT/RATE <5°/SEC
5. ΔH WITHIN LIMITS >10 SEC AND NOT OUT OF LIMITS >60 SEC
6. DATA GOOD AT >10,000 ft
7. IF NO THROTTLE DOWN BY P64 +15 SEC - ABORT
8. BINGO FUEL 1 MIN 34 SEC AFTER LOW LEVEL OR WHEN FUEL QTY <2% UNLESS LANDING IMMINENT.

NOTE: FOR FLASHING LR ALT OR VEL LIGHTS THAT ARE PRECEDED BY A STEADY LR LIGHT, CYCLE THE RADAR TEST SWITCH.

PREDICTED PERILUNE ALTITUDE CHECKS AT PDI



MPAD DATA MODIFIED BY FPRB/OPS
MISSION APOLLO 12, OCTOBER 27, 1969

DATE October 30, 1969

PDI/PDI 1 ABORT CARD

PDI PAD

+	0	0	1	1	0	+	0	0	1	1	0	HRS TIG
+	0	0	0	2	0	+	0	0	0	2	0	MIN PDI
+	0	3	7	5	8	+	0	0	0	0	0	SEC
X	X	0	9	4	2	X	X	0	9	3	9	TGO N61
-	0	0	0	4	9	-	0	0	0	0	2	CROSSRANGE
X	X	X	3	5	6	X	X	X	0	0	0	R FDAI
X	X	X	1	1	0	X	X	X	1	0	9	P AT TIG
X	X	X	0	0	0	X	X	X	0	0	0	Y
+	5	6	9	6	0	+	5	6	9	3	6	DEDA 231 IF RQD

0 <PDI 1 ≤ 10 MIN ABORT PAD

LOG INSERTION GET= ___ ___ ___:__ __:__ __
+ 5 0 0 0
CSI TIG= ___ ___ ___:___ ___:___ ___

+	0	0	/	/	2	+	0	0	1	1	2	HRS N37
+	0	0	0	5	8	+	0	0	0	5	7	MIN TPI
+	0	0	0	0	0	+	0	1	2	0	0	SEC (10 MIN)

T1-1 (10 <PDI 1 ≤ 16:20) ABORT PAD

LOG INSERTION GET= ___ ___ ___:__ __:__ __
+ 5 0 0 0
BOOST GET= ___ ___ ___:__ __:__ __
+ 1 0 0 0 0
CSI 1, GET= ___ ___ ___:__ __:__ __
+ 5 0 0 0
CSI 2, GET= ___ ___ ___:___ ___:___ ___

+	0	0	/	/	4	+	0	0	1	1	4	HRS N37
+	0	0	0	5	7	+	0	0	0	5	5	MIN TPI
+	0	0	0	0	0	+	0	4	9	0	0	SEC (12 MIN)

T2-1 (PDI1+21:22) ABORT PAD

LOG INSERTION GET= ___ ___ ___:__ __:__ __
+ 5 0 0 0
BOOST GET= ___ ___ ___:__ __:__ __
+ 2 4 8 0 0
CSI 1, GET= ___ ___ ___:__ __:__ __
+ 5 0 0 0
CSI 2, GET= ___ ___ ___:___ ___:___ ___

+	0	0	1	1	0	+	0	0	1	1	0	HRS
+	0	0	0	4	2	+	0	0	0	4	1	MIN TIG
+	0	0	0	0	0	+	0	1	9	0	0	SEC
+	0	0	1	1	6	+	0	0	1	1	6	HRS N37
+	0	0	0	5	6	+	0	0	0	5	4	MIN TPI
+	0	0	0	0	0	+	0	1	5	0	0	SEC

T2-1 AT PDI + 21+25 21:22

N69

											ΔDN RNG
											ΔX RNG
											ΔRLS

THROTTLE DOWN _____:_____

N43

				.		-	0	0	2	9	8	LAT (+N)
				.		-	0	2	3	3	9	LONG (+E)
					.	-	0	0	0	1	3	ALT

PDI/PDI 2 ABORT CARD

PDI PAD												
+	0	0				+	0	0	1	1	0	HRS TIG
+	0	0	0			+	0	0	0	2	0	MIN PDI
+	0					+	0	0	0	0	0	SEC
X	X					X	X	0	9	3	9	TGO N61
						-	0	0	0	0	2	CROSSRANGE
X	X	X				X	X	X	0	0	0	R FDAI
X	X	X				X	X	X	1	0	9	P AT TIG
X	X	X				X	X	X	0	0	0	Y
						+	5	6	9	3	6	DEDA 231 IF RQD

T1-2 (0 ≤ PDI 2 ≤ 14:24) ABORT PAD

LOG INSERTION GET= ___ ___ ___:___ ___:___ ___
+ 5 0 : 0 0
CSI TIG= ___ ___ ___:___ ___:___ ___

+	0	0				+	0	0	1	1	4	HRS N37
+	0	0	0			+	0	0	0	5	6	MIN TPI
+	0					+	0	0	0	0	0	SEC (14 MIN)

Gyro torque angles
- 00045
- 00035
00042

T2-2 (PDI 2+21:00) ABORT PAD

LOG INSERTION GET= ___ ___ ___:___ ___:___ ___
+ 5 0 : 0 0
BOOST GET= ___ ___ ___:___ ___:___ ___
+ 1 0 0 : 0 0
CSI 1, GET= ___ ___ ___:___ ___:___ ___
+ 5 0 : 0 0
CSI 2, GET= ___ ___ ___:___ ___:___ ___

+	0	0				+	0	0	1	1	2	HRS
+	0	0	0			+	0	0	0	3	3	MIN TIG
+	0					+	0	3	5	0	0	SEC
+	0	0				+	0	0	1	1	6	HRS N37
+	0	0	0			+	0	0	0	5	4	MIN TPI
+	0					+	0	1	8	0	0	SEC

T2-2 AT PDI + _____ 21:00

N69

												ΔDN RNG
												ΔX RNG
												ΔRLS

THROTTLE DOWN _____:_____

N43

						-	0	0	2	9	8	LAT (+N)
						-	0	2	3	3	9	LONG (+E)
						-	0	0	0	1	3	ALT

ABORT/ASCENT CARD

ASCENT RULES

	PGNS	AGS
UNDERBURN		
< 400 fps(20 SEC)	NULL RESIDUALS	AUTO, A/H 15 fps
> 400 fps(20 SEC)	A/H BURN Hp	AUTO, A/H 15 fps

INSERTION

PGNS & AGS WITHIN 10fps TRIM ACTIVE SYSTEM

PGNS & AGS DIFFER > 10fps

OPTIONS:

a. TRIM AGS OR PGNS (X ONLY)

b. TWEAK @ 2 MIN (10° OHW OR 253° FDAI)

ATT/RATE ERRORS > 10°/SEC

T3 (1 REV) ABORT PAD

LOG INSERTION GET = ___ ___ ___:___ ___:___ ___

\+ 5 0:0 0

CSI TIG = ___ ___ ___:___ ___:___ ___

\+ 1 3 3 0 0

TPI TIG = ___ ___ ___:___ ___:___ ___

+	0	0	1	1	2	+	0	0	1	1	2	HRS	T3-1
+	0	0	0	2	7	+	0	0	0	2	7	MIN	TIG
+	0	4	2	0	0	+	0	1	0	3	7	SEC	

P22 ACQUISITION TIME 12:25:00

___:___:___

LM ASCENT PAD

+	0	0	1	4	2	+	0	0	1	4	2	HRS
+	0	0	0	0	3	+	0	0	0	0	1	MIN TIG
+	0	4	7	0	0	+	0	1	8	0	0	SEC
+	5	5	3	5	0	+	5	5	3	3	9	V (HOR)
+	0	0	8	7	0	+	0	0	3	4	4	V (VERT) N76
+	0	0	0	0	2	+	0	0	0	0	0	*CROSSRANGE
+	3	7	3	6	4							047
+	0	5	6	0	7							053
+	6	8	6	4	2							225/226
+	5	6	9	5	6							231
+	0	0	3	7	0							465
.	/	/	/	4								546
+	0	0	/	4	4	+	0	0				HRS
+	0	0	0	0	2	+	0	0	0			MIN TIG
+	0	2	9	0	)	+	0					SEC
+	/	0	7	8	9	+	1	0	6	9	9	LM WT
+	3	5	5	9	0	+	3	5	6	0	7	CSM WT

*NOTE: LOAD 8 NM CROSSRANGE IF GREATER THAN 8 NM

COMMENTS:

+						+						315 (HA)
+						+						403 (HP)

RESIDUALS

PGNS		AGS		
N85		500		ΔVX
		501		ΔVY
		502		ΔVZ

GET(CSI) = GET(LO) + 0:57
GET(TPI) = GET(LO) + 2:37

CSI CARD

HR	TIG N11	+	0	0	1	4	3	+	0	0	1	4	2
MIN	CSI	+	0	0	0	0	1	+	0	0	0	5	8
SEC		+	0	6	0	6	0	+	0	0	5	2	0
N55		(+00001)			(+02660)			(+13000)					
HR	TIG N37	+	0	0	1	4	4	+	0	0	1	4	4
MIN	TPI	+	0	0	0	3	8	+	0	0	0	3	6
SEC		+	0	0	0	0	0	+	0	2	5	7	0
ΔVX	N81	+	0	0	4	9	2	+	0	0	5	0	3
ΔVY			0	0	0	0	0		0	0	0	0	0
373		+	0	1	8	1	8	+	0	1	7	8	1
275		+	0	2	7	8	0	+	0	2	7	6	4

410+1, 605+00777, 416+1, 623 + 0

ΔVX	AGS N86	+	0	0	4	9	2	+	0	0	5	0	3
ΔVY	AGS	+	0	0	0	0	0		0	0	0	0	0
ΔVZ	AGS	+	0	0	0	1	0	+	0	0	0	0	0

RESIDUALS

	PGNS	AGS
ΔVX	N85	500
ΔVY		501
ΔVZ		502

BURN RULES
CRITERIA 3fps
COMPARE: 1 PGNS vs CMC
2 PGNS vs AGS
3 CMC vs AGS

PAGE 8

PGNCS

N75: ΔH (15.0) | CSI/CDH (58:23) | CDH/TPI (39:13)

N81: ΔVX CSI (50.3) | YDOT N90 CSI (+0.0)

N82: ΔVX CDH (+0.0) | ΔVY CDH (+0.0) | ΔVZ CDH (+0.0)

AGS

402 ΔH | 372 CSI-CDH | 267/450 ΔVG (CSI)

CSM SOLUTION (CHANGE SIGN AND SUBTRACT 1 fps ΔVX)
ΔVX CSI | ΔVY CSI

N86 (AGS): ΔVX | ΔVY | ΔVZ

263 Y DOT CSI | 371 ΔV CDH

APOLLO 12 FLIGHT DATA FILE

DATE OCTOBER 30, 1969

LM DATA CARD BOOK

CDH CARD

HR	N13	+	0	0				+	0	0	1	4	3
MIN	TIG	+	0	0	0			+	0	0	0	5	6
SEC	CDH	+	0					+	0	2	7	5	0
ΔVX			0					-	0	0	0	0	0
ΔVY	N81		0						0	0	0	0	0
ΔVZ			0					-	0	0	0	0	0
PLM	FDAI	X	X	X				X	X	X			
373		+						+	0	2	3	6	5
ΔVX	N86		0					-	0	0	0	0	0
ΔVY	AGS		0					+	0	0	0	0	0
ΔVZ			0					-	0	0	0	0	0

RESIDUALS

		PGNS	AGS
ΔVX	N85		500
ΔVY			501
ΔVZ			502

PLANE CHANGE P30,V90,410+5

TIG CDH ___:___:___:___

-30:00.00

TIG PC ___:___:___:___

YDOT

CSM N90	PGNS N90	AGS 270
(-)	(-)	
(-)	(-)	

RESIDUALS

		PGNS	AGS
ΔVX	N85		500
ΔVY			501
ΔVZ			502

PGNCS

N75

ΔH (15.0)	Δ Y TPI/CDH (39:13)	TPI SLIP (0:00)

N81

ΔVX (+0.0)	YDOT CDH N90 (+0.0)	ΔVZ (+0.0)
	(-)	
	(-)	

BURN RULES

CRITERIA $\dot{X}$=2fps And $\dot{Z}$=6fps

COMPARE 1.PGNS vs CMC
2.PGNS vs AGS
3.CMC vs AGS
4.IF ALL ABOVE FAIL BURN CMC SOLUTION

AGS

402 ΔH	450 ΔVX	452 ΔVZ

CSM SOLUTION (CHANGE SIGN)

ΔVX	ΔVY	ΔVZ

N86 (AGS)

ΔVX	ΔVY	ΔVZ

263 ΔVY(CDH) 270 ΔVY (NOW)

CDH
TPI

CDH
TPI

HR N37	+	0	0				+	0	0	1	4	4
MIN TIG	+	0	0	0			+	0	0	0	3	6
SEC TPI	+	0					+	0	2	5	7	0
N55	(+00000) (+026.60) (+130.00)											
ΔVX N81		0					+	0	0	2	2	0
ΔVY		0					-	0	0	0	0	2
ΔVZ		0					-	0	0	1	1	0
ΔVR N42	+	0					+	0	0	2	4	8
RLM	X	X	X				X	X	X			
PLM	X	X	X				X	X	X			
R TPI N54	+	0					+	0	3	8	2	2
R TPI TIG-5		0					-	0	1	1	2	4
F/A (+/-) N59		0					+	0	0	2	4	7
R/L (+/-) ΔV		0						0				
D/U (+/-) LOS		0						0				
BT	X	X					X	X	0	0	2	2

307+043.00, 314+0

TPI CARD

RESIDUALS

		PGNS				AGS				
ΔVX	N85					500				
ΔVY						501				
ΔVZ						502				

BURN RULES

CRITERIA: $\dot{X}$=2fps, $\dot{Y}$=5fps, $\dot{Z}$=6fps
COMPARE :
1. PGNS vs CMC
2. PGNS vs AGS
3. CMC vs AGS
4. IF ALL ABOVE FAIL, BURN CMC SOLUTION.

If TIG TPI > 8 Min EARLY - RECYCLE
P32 WITH TIG EQUAL TO NOMINAL TIG - 8 MIN.

PGNCS

N37 TIG TPI (144:36:26)	N58 HP (43.8)	N58 ΔV TPI (24.8)	N58 ΔV TPF (31.6)	N81 ΔVX (22.0)	N81 ΔVY (-0.2)	N81 ΔVZ (-11.0)	N59 ΔVF/A- (24.8)	N59 ΔVR/L- (0.0)	N59 ΔVD+/U (0.0)
					N90				

AGS

373 TIG TPI (+0276.4)

267 ΔVTPI 371 ΔV TPI+TPF

CSM SOLUTION (CHANGE SIGN) ΔVX	ΔVY	ΔVZ

N86(AGS) ΔVX	ΔVY	ΔVZ

CSM SOLUTION (CHANGE SIGN) ΔVX	ΔVY	ΔVZ

DATE October 30, 1969

P76 PAD

PURPOSE	
+ 0 0 + 0 0	HRS N33
+ 0 0 0 + 0 0 0	MIN TIG
+ 0 + 0	SEC
	ΔVX N84
	ΔVY
	ΔVZ
PURPOSE	
+ 0 0 + 0 0	HRS N33
+ 0 0 0 + 0 0 0	MIN TIG
+ 0 + 0	SEC
	ΔVX N84
	ΔVY
	ΔVZ
PURPOSE	
+ 0 0 + 0 0	HRS N33
+ 0 0 0 + 0 0 0	MIN TIG
+ 0 + 0	SEC
	ΔVX N84
	ΔVY
	ΔVZ
PURPOSE	
+ 0 0 + 0 0	HRS N33
+ 0 0 0 + 0 0 0	MIN TIG
+ 0 + 0	SEC
	ΔVX N84
	ΔVY
	ΔVZ

P76/P27
AGS SV/IMPACT

P27 PAD

V : :	INDEX	01 1173
V : :	INDEX	02
V : :	INDEX	03
PURP		04
		05
		06
		07
		10
		11
		12
		13
		14
		15
		16
		17
		20
		21 1213
		22
		23
		24 1216
X X X	X X X	HRS
X X X X	X X X X	MIN
X X	X X	SEC NAV CHECK
0	0	LAT N43
		LONG
+ 0	+ 0	ALT

P76/P27
AGS SV/IMPACT

AGS STATE VECTOR PAD	PURP	LOAD
	240	
	241	
	242	
	260	
	261	
	262	
	254	414+2
	244	
	245	
	246	
	264	
	265	
	266	
	272	414+3

AGS STATE VECTOR PAD	PURP	LOAD
	240	
	241	
	242	
	260	
	261	
	262	
	254	414+2
	244	
	245	
	246	
	264	
	265	
	266	
	272	414+3

IMPACT PAD														
+	0	0				+	0	0	1	4	9	HRS	N33	
+	0	0	0			+	0	0	0	2	8	MIN	TIG	
+	0					+	0	1	7	5	0	SEC		
						−	0	1	8	1	2	ΔVX	N81	
						+	0	0	6	0	3	ΔVY	LOCAL	
						−	0	0	0	1	5	ΔVZ	VERT	
+						+			N/A			H_A	N42	
												H_P		
+						+						ΔVR		
X	X	X				X	X	X		N/A		BT		
X	X	X				X	X	X	1	6	2	R	FDAI	
X	X	X				X	X	X	3	5	8	P	INER	
						−	0	1	8	1	1	ΔVX	AGS	N86
						+	0	0	6	0	3	ΔVY	AGS	
						−	0	0	0	2	8	ΔVZ	AGS	

GET(CSI) = GET(LO) + 0:57
GET(TPI) = GET(LO) + 2:37

CSI CARD

HR	TIG N11	+	0	0				+	0	0	1	4	2
MIN	CSI	+	0	0	0			+	0	0	0	5	8
SEC		+	0			.		+	0	0	5	2	0
N55				(+00001)			(+02660)				(+13000)		
HR	TIG N37	+	0	0				+	0	0	1	4	4
MIN	TPI	+	0	0	0			+	0	0	0	3	6
SEC		+	0			.		+	0	2	5	7	0
ΔVX	N81	+	0			.		+	0	0	5	0	3
ΔVY			0			.			0	0	0	0	0
373		+				.		+	0	1	7	8	1
275		+				.		+	0	2	7	6	4

410+1, 605+00777, 416+1, 623 + 0

ΔVX	AGS N86		0			.			0	0	5	0	3
ΔVY	AGS		0			.			0	0	0	0	0
ΔVZ	AGS		0			.			0	0	0	0	0

RESIDUALS

	PGNS	AGS
ΔVX	N85	500
ΔVY		501
ΔVZ		502

BURN RULES
CRITERIA 3fps
COMPARE: 1 PGNS vs CMC
2 PGNS vs AGS
3 CMC vs AGS

APOLLO 12 FLIGHT DATA FILE

PGNCS

N75: ΔH (15.0) | CSI/CDH (58:23) | CDH/TPI (39:13)

N81: ΔVX CSI (50.3) | YDOT CSI N90 (+0.0)

N82: ΔVX CDH (+0.0) | ΔVY CDH (+0.0) | ΔVZ CDH (+0.0)

AGS

402 ΔH | 372 CSI-CDH | 267/450 ΔVG (CSI)

CSM SOLUTION (CHANGE SIGN AND SUBTRACT 1 fps ΔVX)
ΔVX CSI | ΔVY CSI

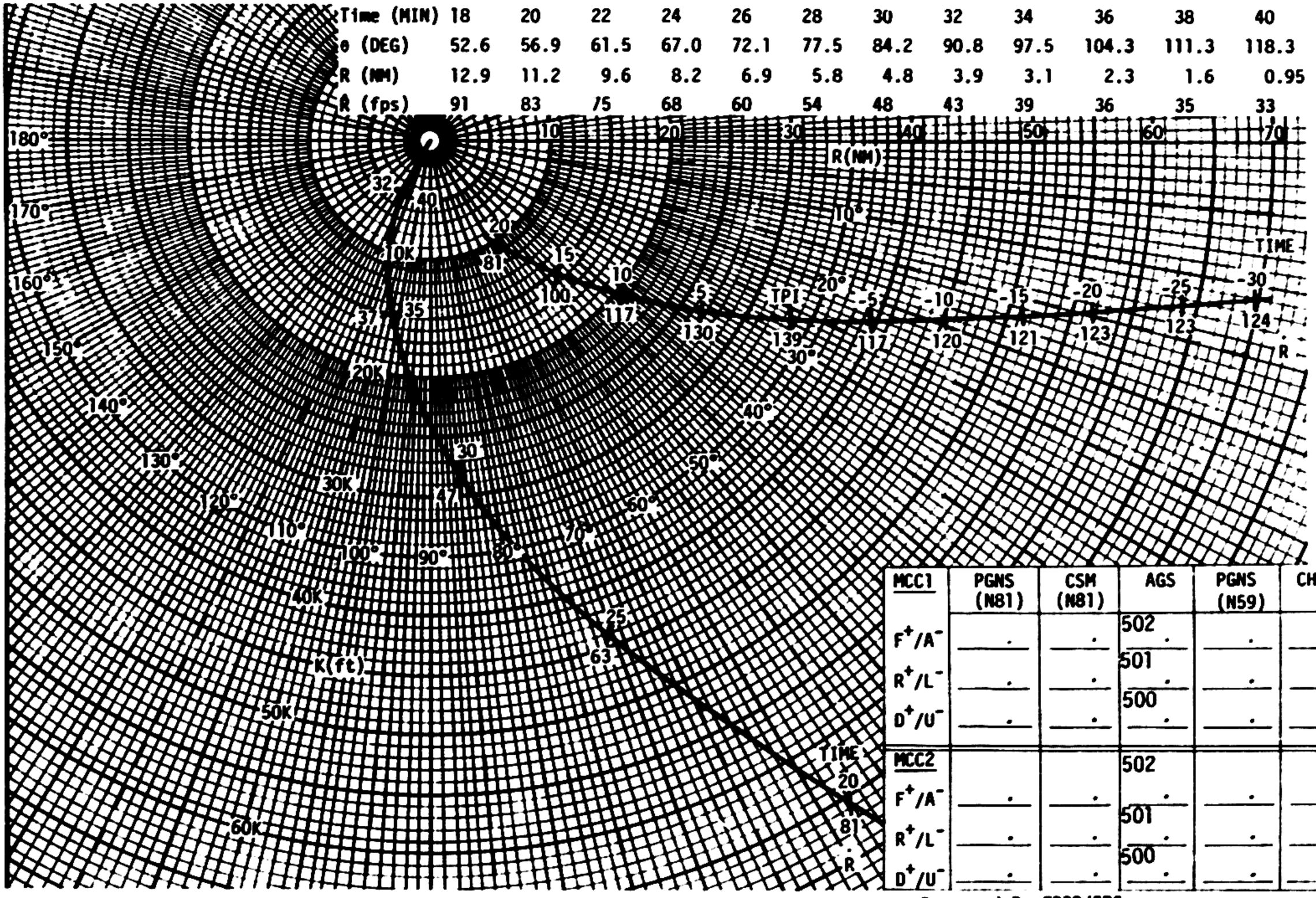
N86 (AGS): ΔVX | ΔVY | ΔVZ

263 Y DOT CSI | 371 ΔV CDH

CSI
REL REF TRAJ

H-1 MISSION RELATIVE REFERENCE TRAJECTORY

Time (MIN)	18	20	22	24	26	28	30	32	34	36	38	40
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
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



MCC1	PGNS (N81)	CSM (N81)	AGS	PGNS (N59)	CHART
F^+/A^-	.	.	502 .	.	.
R^+/L^-	.	.	501 .	.	.
D^+/U^-	.	.	500 .	.	.
MCC2					
F^+/A^-	.	.	502 .	.	.
R^+/L^-	.	.	501 .	.	.
D^+/U^-	.	.	500 .	.	.

Prepared By FPRB/OPS
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SOURCE
DATE OCTOBER 30, 1969

LM DATA CARD BOOK