

R. Parker



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

* APOLLO 16

APRIL 16 LAUNCH

NOTE: CHANGE E INCORPORATES APOLLO 17 PROCEDURE AND TECHNIQUE CHANGES INTO THE APOLLO 16 TIMELINE. THIS BOOK WILL BE USED FOR TRAINING AND SIMULATION UNTIL SIMULATORS ARE RE-CONFIGURED WITH APOLLO 17 TRAJECTORY DATA.

CHANGE E
LM DATA CARD
BOOK

PREPARED BY
FLIGHT PLANNING BRANCH
CREW PROCEDURES DIVISION



MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

JULY 7, 1972

INDEXING DATA

DATE	OPR	#	T	PGM	SUBJECT	SIGNATOR	LOC
7-7-72	MSC	00	R	AP0	*	Mitchell	080-26A

APOLLO 16

LM DATA CARD BOOK

JULY 7, 1972

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It is requested that any organization having comments, questions, or suggestions concerning this document contact R. A. Mitchell, TRW Task 81, Building 4, room 265, telephone 483-3953.

This document is under the configuration control of the Crew Procedures Control Board (CPCB). All proposed changes should be submitted to the Apollo Flight Data File Manager, T. W. Holloway, CG5, Building 4, room 230, telephone 483-4271.

Distribution of this document is controlled by Flight Data File Manager, T. W. Holloway, Flight Planning Branch, Crew Procedures Division.

APOLLO 16

LM DATA CARD BOOK

LIST OF EFFECTIVE PAGES

BASIC 12/16/71
 REV A 3/10/72
 CHANGE A 3/28/72 (P&I)
 CHANGE B 3/30/72 (P&I)
 CHANGE C 4/7/72 (P&I)
 CHANGE D 4/11/72 (P&I)
 CHANGE E 7/7/72

PAGE	DATE
*i	7/7/72
ii	3/10/72
iii	3/10/72
iv	3/10/72
*1	7/7/72
*2	7/7/72
*3	7/7/72
*4	7/7/72
*5	7/7/72
*6	7/7/72
7	3/10/72
8	3/10/72
*9	7/7/72
*10	7/7/72
11	3/10/72
12	3/28/72
*13	7/7/72
*14	7/7/72
15	3/10/72
16	3/10/72
17	4/11/72
18	4/7/72
19	3/28/72
20	3/10/72
21	4/7/72
22	3/10/72
23	3/10/72
24	3/10/72
25	3/10/72
26	3/10/72
27	3/10/72
28	3/10/72
29	3/10/72
30	3/10/72
31	3/10/72
32	3/10/72
33	3/10/72
34	3/10/72
35	3/10/72
36	3/10/72

*Current Change

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LM ACTIVATION CARD

DATE 7/7/72

PRIM EVAP ACTIVATION TIME													
:		:		GET									
DAP PAD													
+										+		LM WT (36685)N47	
+										+		CSM WT(39354)	
+										+		GMBL (00648)N48	
+										+		(00646)	
ED BATT VOLTAGE													
												BATT A	
												BATT B	
												GET	
DOCKED P52 ALIGN													
												R ₁ N93	
												R ₂	
												R ₃	
												GET	
V06 N20													
LM			CSM			R		GET					
						R1		:	:	:			
						R2	(94	:	56	:	00)
						R3							
						R1		:	:	:			
						R2	(95	:	08	:	00)
						R3							
						R1		:	:	:			
						R2	(96	:	08	:	00)
						R3							

S-BD			
P	(+109)	AOS	(94 : 22 : 00)
Y	(+18)		
P	(+63)	AOS	(96 : 16 : 17)
Y	(-32)		
P	(-2)	AOS	(98 : 08 : 36)
Y	(+41)		

UNDOCK/SEP GET

(96	:	13	:	31)
---	----	---	----	---	----	---

AGS			
K FACTOR			
(90	:	00 : 00
+			(+60514) 224
+			(+29419) 225
+			(+60384) 226
+			(+00959) 305
-			(-33024) 662
-			(-54517) 673
			(-00010) 540
			(+00001) 541
			(+00002) 542
			(-00010) 544
			(+00027) 545
			(-00059) 546

PAGE 1

NO CSM CIRC													
+	0	0				+	0	0				HRS	TIME
+	0	0	0			+	0	0	0			MIN	CLOSEST
+	0					+	0					SEC	APPROACH
												RANGE	
												RDOT	
0						0						θ	

PDI RULES

1. NO AUTO ULLAGE - BACKUP VIA +X OVERRIDE (+NO AUTO IGNITION - PDI NO-GO)
2. NO IGN (WITH AUTO ULL) DELAY 2 SEC, THEN START PB-PUSH; THEN DES OVRD - ON AT 5 SEC
3. T/W >1.6 AND DSKY CHANGES <18 fps/2 SEC
4. ATT/RATE <5°/SEC
5. ΔH IN LIMITS >10 SEC, NOT OUT OF LIMITS >60 SEC
6. DATA GOOD AT > 6,000 ft
7. IF NO THROTTLE DOWN BY P64 + 15 SEC - ABORT
8. BINGO FUEL 1 MIN 31 SEC AFTER LOW LEVEL OR WHEN FUEL QTY <2% UNLESS LANDING IMMINENT

NOTE: FLASHING LR ALT OR VEL LTS PRECEDED BY STEADY LR LT WITH ALT LOCK-ON (<40K ft), CYCLE LR CB

NO PDI + 12

+	0	0				+	0	0				HRS ()	N33
+	0	0	0			+	0	0	0			MIN ()	TIG
+	0					+	0					SEC ()	E
												ΔVX ()	N81
												ΔVY ()	LV
												ΔVZ ()	F
+						+						HA ()	N42
												HP ()	
+						+						ΔVR ()	
X	X	X				X	X	X				BT (:)	
X	X	X				X	X	X				R ()	FDAI
X	X	X				X	X	X				P ()	INER
+						+						TIG ()	373
												ΔVX ()	N86
												ΔVY ()	AGS
												ΔVZ ()	
+	0	0				+	0	0				HRS ()	N11
+	0	0	0			+	0	0	0			MIN ()	CSI
+	0					+	0					SEC ()	G
+	0	0				+	0	0				HRS ()	N37
+	0	0	0			+	0	0	0			MIN ()	TPI
+	0					+	0					SEC ()	H
RESIDUALS													
PGNS						AGS							
						ΔVX	N85					ΔVX	500
						ΔVY						ΔVY	501
						ΔVZ						ΔVZ	502

PDI 1 ABORT CARD

PDI 1 PAD											
+ 0 0				+ 0 0				HRS()	N33		
+ 0 0 0				+ 0 0 0				MIN()	PDI		
+ 0		•		+ 0		•		SEC()			
X X		•		X X		•		TGO(:)	N61		
			•				•	X RANGE(+0.0)			
X X X				X X X				R ()	FDAI		
X X X				X X X				P ()	AT TIG		
X X X				X X X				Y ()			
DEDA 231 IF ROD											
(0 < PDI 1 < :) ABORT PAD EARLY											
LOG INSERTION GET = _____ : _____											
+ _____ 5 5 0 0											
CSI GET = _____ : _____											
+ 0 0				+ 0 0				HRS()	N37		
+ 0 0 0				+ 0 0 0				MIN()	TPI		
+ 0		•		+ 0		•		SEC()			
T1-1 (: ≤ PDI 1 ≤ :) ABORT PAD LATE											
LOG INSERTION GET = _____ : _____											
+ _____ 5 0 0 0											
BOOST GET = _____ : _____											
+ _____ 1 0 0 0 0											
HAM GET = _____ : _____											
+ _____ 5 0 0 0											
CSI GET = _____ : _____											
+ 0 0				+ 0 0				HRS()	N37		
+ 0 0 0				+ 0 0 0				MIN()	TPI		
+ 0		•		+ 0		•		SEC()			

T2-1(PDI 1 + : :) ABORT PAD											
LOG INSERTION GET = _____ : _____											
+ _____ 5 0 0 0											
BOOST GET = _____ : _____											
+ _____ 3 0 0 0 0											
HAM GET = _____ : _____											
+ _____ 5 0 0 0											
CSI GET = _____ : _____											
+ 0 0				+ 0 0				HRS()	N33		
+ 0 0 0				+ 0 0 0				MIN()	TIG		
+ 0		•		+ 0		•		SEC(.)			
+ 0 0				+ 0 0				HRS()	N37		
+ 0 0 0				+ 0 0 0				MIN()	TPI		
+ 0		•		+ 0		•		SEC(.)			
N69 TARGET UPDATE											
ΔDN RNG											
ΔX RNG V25											
ΔRLS											
ΔDN RNG V21											
ΔDN RNG V24											
ΔX RNG V24											
ΔRLS V23											
THROTTLE DOWN _____ : _____											
T3-1 (1 REV) ABORT TIME											
+ 0 0				+ 0 0				HRS()	N33		
+ 0 0 0				+ 0 0 0				MIN()	TIG		
+ 0		•		+ 0		•		SEC(.)			

FIRST REV ACTIVITY

LUNAR SURFACE CARD

LAUNCH PREP

N20 (EMERGENCY LIFTOFF)
OG IG MG

N43
LAT(+N) :
LONG(+E) :
ALT :

P57, A/T 3, LANDING SITE
N04 , GRAV ERR
ALIGN STAR (N71)
N05 ANGLE DIFF
N93 X
Y
Z

P57, A/T 3, LANDING SITE
N04 , GRAV ERR
STAR (N71)
N05 ANGLE DIFF
N 93 X
Y
Z

P57, A/T 3, REFSMMAT
N04 , GRAV ERR
STAR (N71)
N05 ANGLE DIFF
N93 X
Y
Z

047 053
544 +5:02
545
546

DATA STAR 1
DATA STAR 2
DATA STAR 3
DATA STAR 4

P22 ACQ (:)

N20 (PARKING)
OG 0.00 IG MG

LIFT-OFF TABLE

NO VOICE LGC CLOCK SYNCH

CST ZERO = : :
+(i)·(24) = : : (1)
Latest CST = : : (2)
+CST(Watch)= : : (3)
GET = : :

NOMINAL = (M=2) (M=1) ~ (M=2) -2:30

REV	NEW TIG	NOM TIG	REV	NEW TIG	NOM TIG
15			32		
16			33		
17			34		
18			35		
19			36		
20			37		
21			38		
22			39		
23			40		
24			41		
25			42		
26			43		
27			44		
28			45		
29			46		
30			47		
31			48		
			49		
			50		

REV 50 TIG (:)

544 +5:02
545
546
377

K FACTOR (: : 00 : : 00)

047
053

PIPA BIAS UPDATE*

PBIASX
PBIASY
PBIASZ

GYRO DRIFT UPDATE*

NBDX
NBDY
NBDZ

*PROCEDURES ON PAGE 2

LM SHADOW LENGTH
GET LENGTH (ft)

- NOTES:
(1) i=1, 2, 3, -----
(2) Latest CST not exceeding NOM TIG for this REV
(3) Must be in 24 hour day

AGS RECOVERY FROM BAD RADAR MARKS

PRE TPI

ASSUMED STEADY STATE BEFORE N49

411+0

✓ ANGLE, RANGE AND RANGE RATE

606R -XXXXX RANGE AND ANGLES USED IN LAST UPDATE

+00000 RANGE RATE USED IN LAST UPDATE

DO AN IMMEDIATE V47 FOR THE FOLLOWING:

- 1) LESS THAN 10 MIN OF TRACKING LEFT (AND ANOTHER AT TIG -5 MIN)
- 2) FOR θ , R, OR \dot{R} GREATER THAN 5° , 5NM, OR 15FPS: ALSO REINITIALIZE FILTER, AND CONTINUE MANUAL UPDATING.

DON'T DO A V47 FOR THE FOLLOWING:

- 1) FOR θ , R, OR \dot{R} LESS THAN 5° , 5NM, OR 15FPS: DO REINITIALIZE FILTER, AND CONTINUE MANUAL UPDATING.

POST TPI

N49 ON FIRST PGNC'S UPDATE

- 1) DO NOT INCORPORATE INTO PGNC'S, WAIT FOR SECOND UPDATE.
- 2) AT SECOND UPDATE:
IF N49 REPEATS: KEEP AGS AUTO UPDATING
IF N49 DOES NOT REPEAT: DO V47 AND NO UPDATES

N49 AFTER STEADY-STATE

DO V47 WITH NO FURTHER UPDATES

TPI 2 PROCEDURE

PERFORM MCC-1

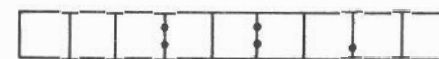
PGNS

P34

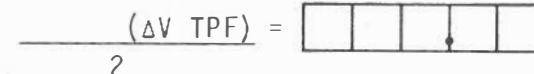
LOG N37
+

----- $\dot{\theta}$ 3 7 \dot{R} -----

GET TPI 2 =



N55 (ω_t) =



V93

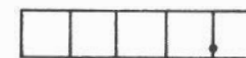
AGS

410 + 4

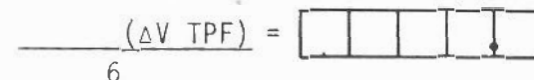
LOG TIG TPI
+

----- $\dot{\theta}$ 3 7.0 (373)

GET TPI 2 =



307 =



417 + 1

411 + 1

CSI CARD

BURN RULES

IF TWO OF THREE SOLUTIONS AGREE
BURN PRIORITY SOLUTION.

PRIORITY OF SOLUTIONS: PGNS, AGS, CMC, CHARTS.

GUIDE VALUE: $\dot{X} = 3$ fps.

RR AGREES WITH VHF WHERE

$\Delta R = 0.01R + 0.5$ NM, ΔR IS ALWAYS ≥ 1 NM

RR DOES NOT AGREE WITH VHF,

MSFN ISOLATES FAILED SYSTEM.

V90 < 5 fps - NO BURN

APS FOR $\Delta V > 40$ fps, DPS FOR $\Delta V > 6$ fps (DPS FULL)

CSI SOLUTIONS

PGNS

AGS

CMC

CHARTS

ΔH (.) N75 _____ 402 _____
 CSI/CDH(:) _____ 372 _____
 CDH/TPI(:) _____
 ΔVX (ΔVG) N81 _____ 370 _____ N81* _____ ΔV _____
 ΔVY _____ 263 _____ * _____
 CDH $\Delta VX(0.0)$ N82 _____ *CHANGE SIGN
 CDH $\Delta VX(0.0)$ _____ $\Delta IAS; \Delta VX = -1.0$

CSI PAD

+ 0 0	+ 0 0	HRS() N11
+ 0 0 0	+ 0 0 0	MIN() CSI
+ 0	+ 0	SEC(.)
R1(+00001), R2(+026.60), R3(+130.00)		N55
+ 0 0	+ 0 0	HRS() N37
+ 0 0 0	+ 0 0 0	MIN() TPI
+ 0	+ 0	SEC(.)
0	0	$\Delta VX(.)$ N81
0	0	$\Delta VY(+0.0)$ LV
410+1, 605+00777, 416+1, 623+0		
+ 0 0	+ 0 0	373(.)
+ 0 0	+ 0 0	275(.)
0	0	$\Delta VX(.)$ N86
0	0	$\Delta VY(+0.0)$ AGS
0	0	$\Delta VZ(.)$

ΔH N75 _____ 402 _____
 CSI/CDH _____ 372 _____
 CDH/TPI _____
 ΔVX (ΔVG) N81 _____ 370 _____ N81* _____ ΔV _____
 ΔVY _____ 263 _____ * _____
 CDH ΔVX N82 _____
 CDH ΔVZ _____

RESIDUALS

PGNS		AGS	
ΔVX	N85	ΔVX	500
ΔVY		ΔVY	501
ΔVZ		ΔVZ	502

P76/77 PADS

										PURPOSE		
+	0	0					+	0	0		HRS	N33
+	0	0	0				+	0	0	0	MIN	TIG
+	0						+	0			SEC	
											ΔVX	N84/N81
											ΔVY	
											ΔVZ	
										PURPOSE		
+	0	0					+	0	0		HRS	N33
+	0	0	0				+	0	0	0	MIN	TIG
+	0						+	0			SEC	
											ΔVX	N84/N81
											ΔVY	
											ΔVZ	
										PURPOSE		
+	0	0					+	0	0		HRS	N33
+	0	0	0				+	0	0	0	MIN	TIG
+	0						+	0			SEC	
											ΔVX	N84/N81
											ΔVY	
											ΔVZ	
										PURPOSE		
+	0	0					+	0	0		HRS	N33
+	0	0	0				+	0	0	0	MIN	TIG
+	0						+	0			SEC	
											ΔVX	N84/N81
											ΔVY	
											ΔVZ	

AGS SV PADS

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

DATE 7/1/72

PAGE 13

P27 PADS

V			V			V			PURP
:	:		:	:		:	:		GET
INDEX			INDEX			INDEX			
									01 1173
									02 1174
									03 1175
									04 1176
									05 1177
									06 1200
									07 1201
									10 1202
									11 1203
									12 1204
									13 1205
									14 1206
									15 1207
									16 1210
									17 1211
									20 1212
									21 1213
									22 1214
									23 1215
									24 1216
X	X	X				X	X	X	HRS
X	X	X	X			X	X	X	MIN
X	X					X	X		SEC NAV CHECK
	0						0		LAT N43
									LONG
+	0					+	0		ALT

V			V			V			PURP
:	:		:	:		:	:		GET
INDEX			INDEX			INDEX			
									01 1173
									02 1174
									03 1175
									04 1176
									05 1177
									06 1200
									07 1201
									10 1202
									11 1203
									12 1204
									13 1205
									14 1206
									15 1207
									16 1210
									17 1211
									20 1212
									21 1213
									22 1214
									23 1215
									24 1216
X	X	X				X	X	X	HRS
X	X	X	X			X	X	X	MIN
X	X					X	X		SEC NAV CHECK
	0						0		LAT N43
									LONG
+	0					+	0		ALT