PRELIMINARY

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J. R. Parker

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

(JULY 26 LAUNCH)

* APOLLO 15

LM-10

BASIC

LM CUE CARDS

INDEXING DATA

DATE	OPN	#	T	PGM	SUBJECT	SIGNATOR	LOC
5/10/71	MSC	00	P	A60	+	WILKINS	CB0-13A

PREPARED BY

FLIGHT DATA SECTION

FLIGHT PLANNING BRANCH

CREW PROCEDURES DIVISION

MANNED SPACECRAFT CENTER

HOUSTON, TEXAS

MAY 10, 1971

(TRIM FRONT PAGE ON SOLID CROP MARKS; BACK PAGE ON DASH CROP MARKS.)

APOLLO 15

LM CUE CARDS

MAY 10, 1971

PREPARED BY: _____
C. E. WILKINS
BOOK MANAGER

APPROVED BY: _____
J. W. O'NEILL, CHIEF
FLIGHT PLANNING BRANCH
CREW PROCEDURES DIVISION

DATE

DATE

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

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

LM CUE CARDS

LIST OF EFFECTIVE PAGES

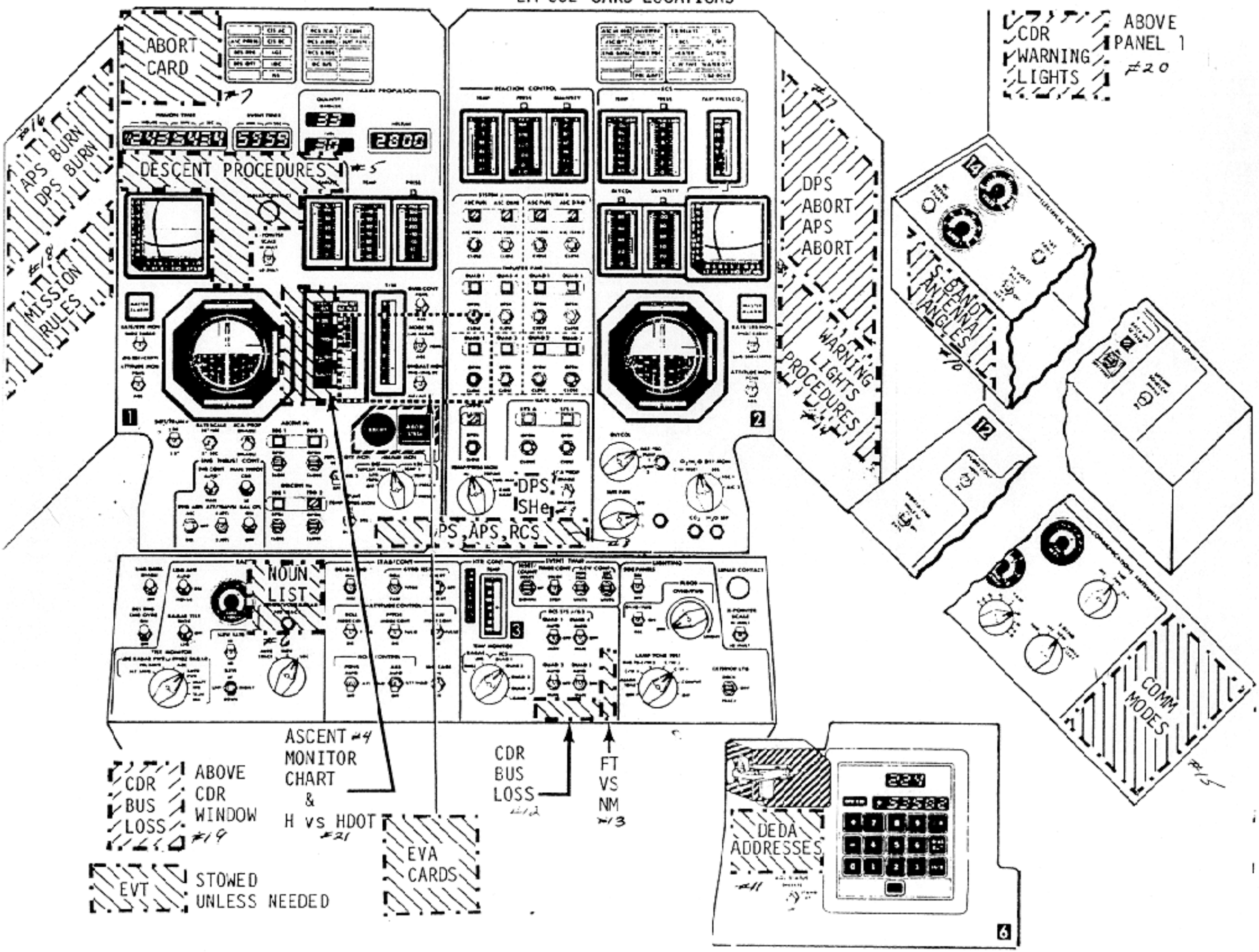
Basic 5/10/71

LIST OF EFFECTIVE PAGES (CONT)

NOTE: These pages also serve as a table of contents.

5/10/71

LM CUE CARD LOCATIONS



F13

B13

ft	nm
500	= 0.08
1000	= 0.16
1500	= 0.25
2000	= 0.33
2500	= 0.41
3000	= 0.49
3500	= 0.58
4000	= 0.66
4500	= 0.74
5000	= 0.82
5500	= 0.91
6000	= 0.99
6500	= 1.07
7000	= 1.15
7500	= 1.23
8000	= 1.32
8500	= 1.40
9000	= 1.48
9500	= 1.56

5/10/11

5/10/11

F10

B10

S-BAND
ANTENNA ANGLES
DESCENT REFSMMAT

PAGE 2

YAW=0° ANTENNA P	YAW=0° ANTENNA Y	IGA (PITCH)
72	-63	0
53	-60	10
38	-55	20
26	-49	30
17	-42	40
8	-35	50
1	-28	60
-6	-21	70
-13	-14	80
-20	-7	90
-26	-1	100
-34	5	110
-41	11	120
-50	16	130
-58	20	140
-68	23	150
282	25	160
271	26	170
261	26	180
251	24	190
241	21	200
232	17	210
223	12	220
215	7	230
208	1	240
201	-6	250
194	-12	260
188	-19	270
181	-26	280
174	-33	290
166	-40	300
156	-47	310
145	-53	320
131	-59	330
113	-62	340
93	-64	350

HOOK VELCRO

HOOK VELCRO

5/10/70

5/10/71

DEDA ADDRESSES

Vi	433		V16N78 R/RDOT
HDOT	367(360 UPDATE)		V16N92 %THROT/HDOT/H
H	337(223 UPDATE)		V21N69 ΔRLS
Ha	315		
Hp	403	AUTO	MAN
Y	211(-)(100Ft)	417+1	
YDOT	270,263	411+1	411+0
R	317	621 R	415+1
RDOT	440	606+R NEXT	316 E R
θ	277	-RDOT NEXT	503 E RDOT
		411+0 STOP	

F8

DPS	APS	RCS
TEMP/PRESS MON >30 PSI @ PDI HELIUM NOM >1000<1150 PSI PRE PDI	TEMP PRESS MON >78 PSI OX >114 PSI FU 40 - 90°F ΔT<10°F NOM HELIUM NOM PRESS 3125 PSI	He >1400 PSI PRPLNT PRESS >100 PSI TEMP 40 - 100°F FUEL/OXID MANF PRESS >100 PSI ΔP <80 PSI QUAD TEMP >119°F (25 MIN TO FIRING)

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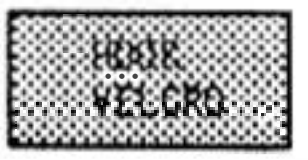
F12

CDR BUS LOST	LMP BUS LOST
AGS, INV 2, SUIT FAN 2	INV 1, SUIT FAN 1
S-BD XMTR/RCVR-PRIM	LMP AUDIO CONT - BU
S-BD PWR AMPL-PRIM	S-BD PWR AMPL - SEC
CDR AUDIO CONT-BU	ON VOICE - BU, BIOMED - OFF
ACTIVATE SEC GLY LOOP	S-BD ANT - OMNI
SEE EPS 1, BLOCK 17	SEE EPS 1, BLOCK 28

5/10/71



B12

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F9

DPS PRE PRESS RNG

	FUEL	OXID
TEMP	50°-75°	50°-75°
PRESS	70-122	41-78

SHe PRESS RNG

TIME	PRESS
LOI ABORT	610-1130
DPS PRESS (106:20)	725-1320

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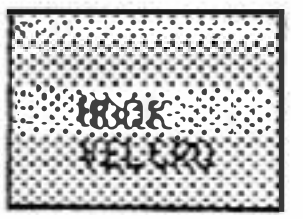

B9

F15

LM COMM MODES

COMM BASIC CONFIGURATION	PRIOR TO DOCKING	PREP FOR UNDOCKING	LM RELAY WITH VHF RNG	CSM RELAY	LUNAR STAY	PLSS/EVCS WITH TV (EVA)	PLSS/EVCS WITH LCRU (EVA)
CB 11 ALL COMM CLOSED							
PNL 8 AUDIO SWITCHES							
S-BD T/R - T/R				REC			
ICS T/R - T/R							
RELAY ON/OFF - OFF							
MODE - ICS/PTT			VOX			VOX	VOX
AUDIO CONT - NORM							
VHF A - T/R					OFF	OFF	OFF
VHF B - OFF	RCV	RCV	RCV	REC	RCV		
VOX SENS - MAX INCR							
CB 16 ALL COMM CLOSED							
CB 18 TV - OPEN						CLOSED	OPEN
PNL 14 UPSQU - AS DES	ENABLE	ENABLE	ENABLE	OFF	OFF*	ENABLE	ENABLE
PNL 12 UPDATA LNK-OFF							
PNL 12 AUDIO SWITCHES							
S-BD T/R - T/R			RCV	REC			
ICS T/R - T/R							
RELAY ON/OFF - OFF			ON			ON	ON
MODE - ICS/PTT			VOX			VOX	VOX
AUDIO CONT - NORM							
VHF A - T/R					OFF		
VHF B - OFF	RCV	RCV	RCV	REC	RCV	RCV	RCV
VOX SENS - MAX INCR							
PNL 12 COMM SWITCHES							
S-BD MODULATE - PM						FM	PM
S-BD XMTR/RCVR - SEC							
S-BD PWR AMPL - PRIM							OFF
S-BD VOICE - VOICE							
S-BD PCM - PCM							
S-BD RNG - OFF/RESET		RANGE			AS REQ		
VHF A XMTR - VOICE	VOICE/ RNG		VOICE OR VOICE/RNG	VOICE/ RNG	OFF		
VHF A RCVR - ON			OFF	OFF			
VHF B XMTR - OFF				OFF	OFF		
VHF B RCVR - OFF	ON	ON	ON	ON		ON	ON
SQUELCH VHF A - NORM						N+1 1/2	N+1 1/2
SQUELCH VHF B - NORM						N+1 1/2	N+1 1/2
TLM BIOMED - AS REQ	RIGHT	LEFT	OFF			OFF	OFF
TLM PCM - HI		LO					
RECORDER - OFF	AS DES	AS DES	AS DES	AS DES	AS DES	ON	ON
PNL 12 OMNI ANTENNAS							
TRACK MODE - AUTO					AS REQ	SLEW	SLEW
PITCH CONT - COMP 4							
YAW CONT - COMP 4							
S-BD SEL - SLEW					AS REQ	SLEW	SLEW
VHF SEL - AFT OR FWD					AFT	EVA	EVA

*DURING EVA - ENABLE.

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B15

HOOK VELCRO

LOSS OF COMM (PDI)

1 VERIFY STANDARD COMM CONFIG
2 S-BD SIG STR LOW (<3.0)-REACQ WITH STEERABLE
3 STILL NO COMM(SIG STR LOW<3.0)-SELECT BEST OMNI
4 STILL NO COMM
ON VOICE BU, BIOMED - OFF (HOT MIKE)
5 STILL NO COMM
S-BD: XMTR/RCVR - PRIM AND PWR AMPL - SEC
6 60 SEC, STILL NO COMM
VOICE and FM
7 60 SEC, STILL NO COMM
CSM RELAY

PM

S-BD AUDIO (BOTH) - OFF
NOTIFY CSM TO CONFIG FOR RELAY

LOSS OF COMM (EVA)

1 CK COMM CBs
2 SEL ALT S-BD XMTR/RCVR
3 IF SIG STR METER < 3.9,
SEL STEERABLE ANT
4 CONFIG FOR CDR RELAY:
AUDIO (LMP) AUDIO (CDR)
RELAY-OFF RELAY-ON
VHF A-OFF VHF A-T/R
VHF B-OFF VHF B-RCV
IF COMM OK, PLSS MODE-AR
5 CONFIG LM TO B/U EVA MODE
XMTR A-OFF
XMTR B-VOICE
AUDIO (CDR)
VHF A-RCV
VHF B-T/R
PLSS MODE-A(CDR), B(LMP)
6 S-BD - ON VOICE BU
7 UPDATA LINK - VOICE BU
8 VHF ANT-AFT

LM COORD	STER ANT	
	PITCH	YAW
+X	90	-45
-X		
+Y	90	45
-Y		
+Z	0	0
-Z	180	0

HOOK VELCRO

5/10/71

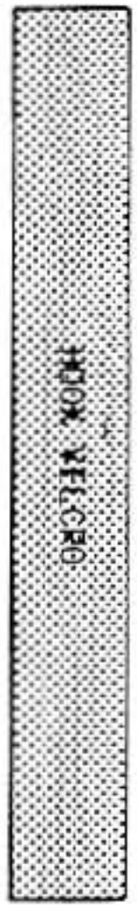
F4

TF1	●	H	HDOT	OHW	He
:30	308	1.8	91	40	28
1:	305	5.1	124	38	26
1:30	302	9.2	151	36	25
2:	299	14.0	170	34	23
2:30	296	19.4	183	32	21
3:	292	25.0	189	29	20
3:30	289	30.7	190	27	18
4:	285	36.3	184	25	17
4:30	281	41.7	173	22	16
5:	278	46.6	156	19	14
5:30	273	51.0	135	17	12
6:	269	54.7	109	14	11
6:30	265	57.5	81	11	10
7:	260	59.5	50	8	8

LPD LOCAL HORIZONTAL = 8.5°

5/12/71

B4



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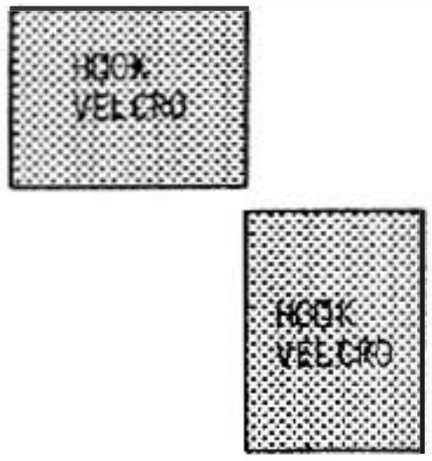
B6



F6

(DPS)-ASCENT
(DECA GMBL AC-CLSD)
S/C CB's(AEA)-CLSD
(16)DISP OVRD-CLSD
(THR AUTO-CDR)
ATT TRANS-4 JETT
BAL CPL - DN
(ENG GMBL - ENABLE)
(DES OVRD - OFF)
AB/AB STG - RESET
DB - MIN, RATE - 25
ATT CONT(3) - MODE
MODE CONT(2) - AUTO
STOP(2) - RESET
TTCA-(THR/-MIN)-JETT

49	54	55	56	60	63	64
.ΔR	.RX	1/2P	.AZ	V.FWD	ΔH.	TG LP
Δ.V	RD.T	.EL	.EL	HD.T	HD.T	HD.T
SEC	.θX	C.EN		H.	H.	H.

67	68	69	72	74	75	76	77
LRX	R.G	DN.	.TR	TFI	Δ.H	V.H	TG
LRY	TB	X.	.SH	.YX	ΔT	V.V	VG.Y
LRZ	V.I	UP.		.PX	ΔT	X.R	V.I

78	79	90	92	94	99	TIME
.RX	.CR	.YX	THR	VG.X	POS	NOUNS
RD.T	.SP	YD.T	HD.T	HD.T	VE.L	11:CSI
TFI	POS	P.SI	H.	H.	MR.	13:CDH

	PRE ASC/CSI	POST	37:TPI
W	+10000+100+15	+2000+20+5	16:EX.V
49	+200+120	+80+50	33:TIG

525:SIDE LOBE-V32 | RR NULL-REINIT
MAIN-ALIGN COAS | NO5 INCR-
PGNS NULL(N49)-V32 | REINIT

	LM	CSM
400 nm	1.64	1.68
200 nm	1.94	2.02
100 nm	2.22	2.26
50 nm	2.42	2.48
25 nm	2.60	2.67
12.5 nm	2.74	2.83
6.25 nm	2.86	2.94
3.12 nm	2.94	3.02
2.0 nm	3.00	3.05
6000 ft	3.02	3.06
3000 ft	3.04	3.08
1500 ft	3.06	3.13
800 ft	3.12	3.22

VEH	X	ACA	DB	RATE
	CUT OUT			
		0 4.	0 .3	0 .2
1 ASC	0 2-A	1 20.	1 1.	1 .5
2 DES	1 2-B	CSM.4	2 5.	2 2.
3 CSM	2 4-AB		PWR 1	3 10
	MIN	20/	.3/.4Y	5/10P
ASC	MAX	7.5	5.	30
	MIN	20	.3/.4Y	5/10P
DES	MAX	17	5.	10

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F5

V57:ENABLE LR
58:DISABLE LR
59:LR TO POS 2
68:TERM TERRAIN

N60:V FWD,HDOT,H
63:ΔH,HDOT,H
64:TR/LPD,HDOT,H
68: NG,TG,VI
92:THR,HDOT,H
94:VGX,HDOT,H

214:AGS
402:AGS (IF 4 TIMES)
500:LR DES/1
511:LR-HVR,N63 FOR
ΔΔH NONE LR DES
520:LR RUPT,GO
522:LR Δ POS,GO
523:LR NDT 2,GO
1107:AGS
1406:P66
1407:P66
1466:AGS
1410:AGS
(PGNS MAN
THR)
2XXXX:AGS 3XXXX:RSET

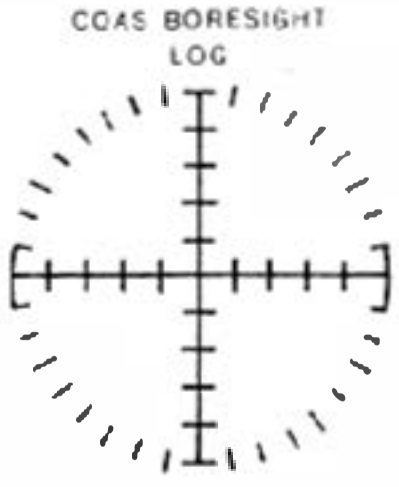
-10:V25N69,P63, (0,111,310)
:V40N20
- 5:CB LR - CLOSE
- 4:FINAL TRIM, GO - NO GO
- 1:MASTER ARM - ON,MODE - PGNS
-:30 ENG ARM - DES
-:07 ULLAGE (+X MANUAL)
:00 104:28:55 (11 + 03)
:02 (NO IGN - START)
:05 DES OVRD - ON,MA - OFF
TH >80,T/W>1.6,N68VI>18
:26 THR UP(TTCA-UP BY 31:)(AB)
1:00 ✓AGS ATT (ERR,RATE<5,
SHe INCR)
2:00 V21N69 SYS CK
3:00 YAW R to ~ 0°
ΔH OK > 10 SEC:V57 (V58)
ALT: 30 25 20 15 10
ΔH: 17 15 12 3 7000
CONV, THEN OUT →P64
NO LOCK OR 169 BY 6K(AB)
→P64:NO LOCK BY 20 SEC(AB)
LOSS OF LOCK - GO
5:00 V24N69 SYS CK
5:30 TFI THR DOWN
6:00 AUTO YAW AT 30K
7:28 THR<57% MCC ± 10 SEC
CMD +40 SEC + ATT CHG(AB)
P64 +15 SEC : (AB)
8:00 V23N69
EVAL MAN CONT : PGNS-AUTO
8:20 N68:P64 AT TGO = 100(9:23)

ENG STOP - PUSH
ENG ARM - OFF
PRO
DES OVRD - OFF
PGNS - ATT HOLD
AGS - AUTO
PROP/TEMP MON - ASC,
THEN DES
ASC He MON - 1, 2
CB LR - OPEN
SHe STEADY (DCR:MCC)
OX:20-40,FUEL:8,CLOSE
5/10/71

ABORT STG - PUSH
ENG ARM - ASC
STOP - RESET
START - PUSH

PGNS - ATT
HOLD
AGS - AUTO
P73

B5



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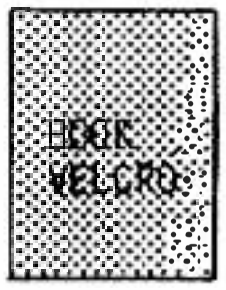
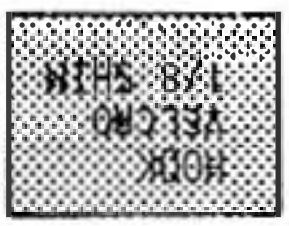


MANUAL STAGE
ASC BATT(2) - ON
DES BATTS - OFF
GUID - 11002 V77, P47
DEADBAND - MIN
ATT CONT (3) - MODE CONT
MODE CONT - ATT HOLD
MASTER ARM - ON
ASC He SEL - BOTH
He PRESS ASC - FIRE
-X:2 fps
STAGE - FIRE, +X:2 fps
NO PDI + 12 APS ABORT

P30
P42 1706 - PRO
N86
N18(0,270,0)
He MON - ASC PRESS
MASTER ARM - ON
ASC He SEL - BOTH
He PRESS ASC - FIRE

9/10/71



ABORT - DPS	MANUAL	INSERTION
GUID SW -	+ 0: 0°	500:MAIN SOV - OPEN
MODE CONT - AUTO	+20:300°	ASC FEED (2) - CLOSE
ENG ARM - DES	PDI+(): 270°	200:DES OVRD - OFF
THROTTLE - MAX	PDI+(): 250°	(EXCEPT BUS LOSS)
TIG:ABORT	SHUTDN=PDI()	ASC ARM - OFF
DES OVRD - ON		(EXCEPT BUS LOSS)
YAW RT 40°		(>30:DPS C.O.-AB STG)
31% DES REG - CLOSE TO 160		0:ABORT/AB STG - RESET
ABORT STAGE - ASC		STOP - PUSH
GUID SW -	BAT 1,3 - OFF	MODE CONT (2)-ATT HOLD
MODE CONT-AUTO	CABIN REPRESS	ARM - OFF
TIG:ABORT STG	DES O2-CLOSE	>400:ATT HOLD :45X9°
ENG ARM - ASC	#1 ASC O2-OPN	<400:ATT HOLD NUL N85
START - PUSH	PRESS REG	PGNS-AGS <10:NULL VGX
ASC FEED-OPEN	A8B EGRESS	TWEAK:257°,10° OHW, 2
MAIN SOV-CL SE	SUIT GAS	CB RR(2) CLOSE
YAW RT 40°	DIVERT-EGRESS	RR-LGC P20 AUTO
PRPLNT QTY-OFF	CAB GAS RET -	V95 V80 (2.0/12.0)
PRPLNT T/P-ASC	EGRESS	
He MON - ASC	H2O SEL - ASC	
ASC He SEL-BOTH	DES H2O-CLOSE	
MASTER ARM - ON	ASC H2O-OPEN	
THR - JETT		

FT6

DPS BURN
CB(11) ECA GMBL AC - CLOSED
CB(16) DISP/ENG OVRD LOGIC - CLOSED
CB(11&16) STAB/CONT (ALL) - CLOSED
EXCEPT CB(11) AEA - OPEN

ATE SCALE [PDI] - 25°/SEC

THR CONT - MAN/CDR
- [PDI] AUTO/CDR

ATT/TRANSL - 4 JETS
BAL CPL - ON
ENG GMBL - ENABLE
ES ENG CMD OVRD - OFF
ABORT/ABORT STAGE - RESET
DEADBAND - MIN
ATT CONT(3) - MODE CONT

MODE CONT [PDI] PGNS - AUTO
AGS - AUTO
STOP PB (2) - RESET
TTCA (2) - THROT/Min [PDI] LMP TTCA-SOFT STOP

[FOR PDI GO TO TIMELINE BOOK]

-2:00 400+1

-1:00 MASTER ARM - ON (1st BURN)

- :30 ENG ARM - DES

FOR AGS BURN ABORT PB - PUSH (T=0 FOR AGS)

-:07.5 ULLAGE (MANUAL FOR AGS)
- :05 PRO

+ :01 DES He REG (1) - OPEN (>31%)
TFC-10 DES He REG (2) - CLOSE (<86%)
ΔV=0 STOP PB - PUSH
ENG ARM - OFF
ABORT PB - RESET

5/10/71

NO PDI+12 APS ABORT

ASSUMPTIONS:
PDI CHECKLIST COMPLETE TO TIG.
DPS INOPERATIVE.

V37E 30E
LOAD NO PDI+12 PAD
V37E 42E
01706 ALARM, PRO
N86
410+5, LOAD ΔV
370 R

N18 R, P, Y (0, 270, 0)

SET DET

He MON - ASC PRESS
MASTER ARM - ON
ASC He SEL - BOTH
✓CB(11&16)
ED LOGIC PWR(2)-CLOSED
He PRESS ASC - FIRE

DES O2 - CLOSE
#1 ASC O2 - OPEN
H2O SEL - ASC
DES H2O - CLOSE
ASC H2O - OPEN

V48,11002

CHECK APS BURN

APS BURN

CB(16)
DISP/ENG OVRD LOGIC - CLOSED
CB(11&16) AEA AND DECA PWR AND
STAB/CONT (ALL) - CLOSED
EXCEPT
CB(11) AEA AND DECA PWR AND
CB(16) DES ENG OVRD - OPEN
CB(16) EPS:
CROSS TIE BAL LOADS - OPEN
RATE SCALE - 25°/SEC
ATT/TRANSL - 4 JETS
BAL CPL - ON
DEAD BAND - MIN
ABORT/ABORT STAGE - RESET
ATT CONT(3) - MODE CONT
MODE CONT - ASCENT - PGNS - AUTO
AGS - AUTO
STOP PB (2) - RESET
TTCA (2) JETS

-2:00 400+1
AGS/PGNS
-1:00 MASTER ARM - ON

RCS STAGE
-:14 MANUAL ULLAGE
-:10 STAGE-FIRE

-:10 ABORT STAGE PB - PUSH(T=0 FOR AGS)
ENG ARM - ASC

-:05 PRO

:00 ENG ON
+:01 ENG START - PUSH
200 fps ENG ARM - OFF
0 fps ABORT STAGE - RESET
STOP PB - PUSH

5/10/11

DPS ABORT/INSERTION

/GUID SW
THROTTLE-UP
ABORT PB-PUSH
MODE CONT(2)-AUTO
YAW RT 40°
623+1
/INVERTER
V16N85 (500R)
31% DES He REG (2)-CLOSE
200fps DES ENG CMD OVRD-OFF
(UNLESS CDR BUS LOSS)
TFC-10 DES He REG (2) -Close (<86%)
STANDBY TO COPY GET
0fps STOP PB - PUSH
DET - STOP
GET_____
MODE CONT-ATT HOLD
ENG ARM-OFF
ABORT (STAGE)-RESET
STOP PB - RESET
ΔV 404,5,6=0 470R

ABORT RULES

1 ATT & RATE LIMITS
OPS >5° SEC
APS >10° SEC
2 DPS SHUTDOWN
<30 fps - STAGE & RCS
>30 fps - BORT STAGE
3 APS UNDER BURN

PGNS	AGS
<400 NULL RESIDUALS	AUTO, A/H 15FPS
>400 A/H BURN Ha,Hp,HDOT	

4 INSERTION
WITH VOICE-GROUND RECOMMENDS TRIM SOURCE AT TGO ~ 1 MIN
TRIM TO <2fps (AGS X AXIS ONLY) AND STANDBY FOR TWEAK
AT INSERTION +2 MINUTES(10° OMW OR 257° FDAI)
5 NO VOICE
AGS & PGNS <10fps TRIM ACTIVE SYSTEM
AGS & PGNS >10fps TRIM SYSTEM THAT AGREES WITH RR

APS ABORT/INSERTION

/GUID SW
ABORT STAGE PB-PUSH
MODE CONT(2)-AUTO
ENG ARM-ASC
START PB-PUSH
ASC FEED(2)-OPEN + (UNLESS
MAIN SOV-CLOSE + BUS LOSS)
YAW RT 40°
623+1
CABIN REPRESS - CLOSE
DES O2-CLOSE, #1 ASC O2-OPEN
PRESS REGS A&B - EGRESS
SUIT GAS DIV - EGRESS
CABIN GAS RETURN - EGRESS
H2O SEL-ASC
DES H2O-CLOSE, ASC H2O - OPEN
PROP TEMP/PRESS-ASC
He MON-ASC
/XFEED
/INVERTERS
THROTTLE/JETS-JETS
V16N85 (500R)
500fps MAIN SOV-OPEN +
ASC FEED(2)-CLOSE +
200fps ENG ARM-OFF (UNLESS BUS LOSS)
ST NDBY TO COPY GET
0fps ABORT STAGE-RESET
STOP PB-PUSH
DET-STOP
GET_____
MODE CONT-ATT HOLD
ΔV 404,5,6=0 470R

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STAGING

ASC BATT (2)-ON(PRECONDITION)
DES BATTS-OFF
MODE CONT (2)-ATT HOLD
DEADFACE
✓GUID SW (IF PGNS: DAP 11002, V77)
ATT CONT (3)-MODE CONT
BAL CPL-ON
DEAD BAND-MIN
P47, 404,5,6=0 470R
HELIUM MON-✓ ASC PRESS
MASTER ARM-ON
ASC He SEL-BOTH
✓CB ED LOGIC PWR (2)-CLOSED
He PRESS ASC-FIRE
STOP PB-PUSH
-X TRANS 2 fps
STAGE-FIRE
+X TRANS 2 fps
CB(11&16) ED LOGIC PWR (2)-OPEN
CABIN REPRESS-CLOSE
DES O2-CLOSE, #1 ASC O2-OPEN
H2O SEL-ASC
DES H2O-CLOSE, ASC H2O-OPEN
PRESS REG A&B-EGRESS
SUIT GAS DIV-EGRESS
CABIN GAS RETURN-EGRESS
ATT/TRANSL-2 JETS
POO
STOP PB-RESET

✓GUID SW

DPS ABORT/APS INSERTION

✓GUID SW
THROTTLE-UP
ABORT PB-PUSH
MODE CONT (2)-AUTO
YAW RT 40°
623+1
31% DES REG-CLOSE
BURN DPS TO DEPLETION
ABORT STAGE PB-PUSH
ENG ARM-ASC
START PB-PUSH
ASC FEED(2)-OPEN + (UNLESS
MAIN SOV-CLOSE + BUS LOSS)
CABIN REPRESS-CLOSE
DES O2-CLOSE, #1 ASC O2-OPEN
H2O SEL-ASC
DES H2O-CLOSE, ASC H2O-OPEN
PRESS REGS A&B-EGRESS
SUIT GAS DIVERTER-EGRESS
CABIN GAS RETURN-EGRESS
PROP TEMP/PRESS-ASC
He MON-ASC
✓XFEED
✓INVERTER
THROTTLE/JET-JETS
CB(11) RR(2) - CLOSED
V16NB5 (500R)
500fps MAIN SOV-OPEN +
ASC FEED (2) - CLOSE +
200fps ENG ARM-OFF (UNLESS BUS LOSS)
STANDBY TO COPY GET
0fps ABORT STAGE-RESET
STOP PB-PUSH
OET-STOP
GET
MODE CONT-ATT HOLD
▲V 404,5,6=0 470R

ALARM CODES (PDI)

CODES	DEFINITION	ACTION
00214	LGC USING IMU WHEN POWER TURNED OFF	GUID CONT - AGS
00402 (4 TIMES)	DAP STEERING LOST	GUID CONT - AGS
00511	NEITHER OR BOTH LR ANT POSITION DISCRETES PRESENT	LOG ANT - HOVER, NO ΔH (N63) UPDATE (10 SEC): LOG ANT - DES
01107	PHASE TABLE DISCREPANCY	GUID CONT-AGS (LAND MANUALLY IF DESIRED)
RECURRING 01406	TGO COMP FAIL (P64)	NO GUIDANCE, SWITCH TO P66 OR SWITCH TO AGS
RECURRING 01410	DES GUIDANCE EQUATIONS OVERFLOW (P64)	NO GUIDANCE, SWITCH TO P66 OR SWITCH TO AGS
01412	NON CONVERGING P63 TIG	MSFN UPLINK NEW S.V. & TARGET
01466	INSUFFICIENT THROTTLE SERVICING (P66)	IF RECURS, MAN THR & ATT HOLD (or AGS)
01703	TIG SLIPPED DUE TO INTEGRATION	IF LARGE IGNITION DELAY-DO NOT BURN PDI IF SMALL IGNITION DELAY-MANUALLY THROTTLE UP AT DET N+26
2XXXX	ALL POODOO'S (EXCEPT 21406)	GUID CONT - AGS
21406	BAD RETURN FROM TIME TO TGT RTN (P63)	MSFN UPLINK NEW S.V. & RECALL P63
RECURRING 3XXXX	ALL SOFTWARE RESTARTS (BAILOUT)	CONTINUE-INSURE NO UNSAFE CONDITION DEVELOPS.
N49	RMAX VMAX <.3nm; 2.0fps	1. IF STEADY STATE-RESET 2. REJECT FIRST MARK THEN ACCEPT NEXT COUPLE OF MARKS AND MONITOR FOR NEXT CONVERGENCE >2.0nm OR 12.0fps PRIOR TO CSI OR >.8nm OR 5.0fps AFTER CSI CONSIDERED EXCESSIVE
F97N63	LGC THINKS ENG FAILED	PRO TO SET ΔV MON. DO NOT ENTER BECAUSE IT WILL SLIP TIG IF RECURRING, NO GUIDANCE

MISSION RULES NO-GO'S

	PRE PDI	PDI TO PDI +6+10	PDI +6+10 TO HI GATE	HI GATE TO TO
EPS	ONE DC BUS	ABORT	ABORT	ABORT
	ONE DESCENT FEEDER SHORTED	ABORT	ABORT	ABORT
	ONE ASCENT FEEDER SHORTED	ABORT	ABORT	ABORT
	4 DESCENT BATS	ABORT	ABORT	GO
	ONE ASCENT BAT	ABORT	ABORT	GO
	BOTH INVERTERS	ABORT	ABORT	GO
	AC BUS A AND B	ABORT	ABORT	GO
ED	ONE PYRO SYSTEM ARMED	ABORT	ABORT	ABORT
	ONE PYRO SYSTEM DEARMED	ABORT	GO	GO
	ONE STAGING RELAY CLOSED	ABORT	ABORT	ABORT
	ONE PYRO SYSTEM BATTERY	ABORT	GO	GO
ECS	CABIN PRESS <4.4	ABORT	ABORT	GO
	SUIT LEAK	ABORT	ABORT	ABORT
	BOTH SUIT FANS	ABORT	ABORT	GO
	BOTH DEMAND REGS	ABORT	ABORT	GO
	BOTH H2O SEPS	ABORT	ABORT	GO
	BOTH DESCENT O2 TANKS	ABORT	ABORT	GO
	BOTH ASC O2 TANKS	ABORT	ABORT	GO
	PRI OR SEC COOLANT LOOP	ABORT	ABORT	GO
	PRI OR SEC H2O FEED	ABORT	ABORT	GO
	BOTH DESCENT H2O TANKS	ABORT	ABORT	GO
	BOTH ASC H2O TANKS	ABORT	ABORT	GO
G&C	PGNS GUID STEER	ABORT	ABORT	GO
	3 AXIS ATT CONT			
	PGNS RATE CMD & PGNS AUTO	ABORT	ABORT	OPTION
	AGS RATE CMD	ABORT	ABORT	OPTION
	2 ACA	ABORT	ABORT	OPTION
	AUTO +X & AUTO DPS IGNITION	GO	GO	GO
	2 FDAI-ATT/RATE/ERR	OPTION	OPTION	OPTION
	LR	ABORT	ABORT	GO
	REDNT APS N	ABORT	GO	GO
	P & R GDA TRIM (IMPING CONST VIOL)	ABORT	ABORT	ABORT
	MANUAL THROTTLE (2 TTCA) & AUTO THROT	ABORT	ABORT	ABORT
DPS	PROP LEAK (ΔQ FU/OX>10%)	ABORT	ABORT	ABORT
	FU OR OX INLET/ULLAGE<160	ABORT	ABORT	ABORT
	BINGO/2%			ABORT
APS	PROP LEAK	ABORT	ABORT	ABORT
	FU/OX INLET PRESS<62,>220	ABORT	ABORT	ABORT
	APS HE 1 OR 2 DECREASING	ABORT	ABORT	ABORT
RCS	HE/PROP LEAK			
	PROP LEAK (DOWNSTREAM OF MAIN)	ABORT	ABORT	GO
	FU/OX MNFLD A OR B PRESS<100	ABORT	ABORT	GO

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ABNORMAL VEHICLE DYNAMICS

Use ACA Hardover to Stabilize Vehicle
If RCS TCA LT ON-CB QUAD TCA - OPEN
GUID CONT-AGS, MODE CONT-ATT HOLD, ATT CONT(3)-MODE CONT,
V77E (PGNS ONLY)
If Not Stabilized-CB(11) STAB/CONT:ATT DIR CONT-OPEN
If Not Stabilized-TTCA/TRANSL(2) - DISABLE, DEADBAND - MAX
If Not Stabilized-ACA PROP(2) - DISABLE

RAPID IMU REALIGN

1) AGS INERTIAL FOAI TO 0°, 0°, 0°
2) V41 N20E, E, E, E,
3) V40 N20 0°, 0°, 0° ON AGS FOAI, ENTR
WAIT 11 SEC.
4) P51E, PRO, P00E
5) V25N07E, 77E, 10000E, 1E
5) PERFORM P52, OPTION 3 (AUTO OPTICS ARE GOOD)
NOTE: FOR TEMPORARY LOSS OF CDR'S BUS, UPDATE LGC CLOCK WITH V55 TO COMPLETE RECOVERY.

LIGHT	MEANING	IMMEDIATE ACTION (POSSIBLE OPERATIONAL IMPLICATIONS)	
DC BUS BATTERY W&C LTS: CDR X-POINTER THRUST	CDR BUS FAILURE	(DPS GOES TO 100% And GDA LOCKED) GUIDE CONT - AGS, SUIT FAN - 2, CDR AUDIO CONT - BU, S-BD-XMTR/RCVR & PWR AMPL - PRIM, INV 2, Activate Sec Glycol Loop TO START DPS: DES ENG CMD OVRD - ON TO STOP DPS: DES ENG CMD OVRD - OFF, ENG ARM - OFF TO START APS: AGS Auto ON TO STOP APS: AGS Auto OFF, ABORT STAGE - Reset	UNSTAGED (M45) STAGED (M47)
DC BUS BATTERY W&C LTS: LMP X-POINTER, PROP PRESS RCS PRESS, QTY ECS PRESS, GLYCOL, QTY	LMP BUS FAILURE	(DPS GOES TO 100% And GDA LOCKED) GUID CONT - PGNS, SUIT FAN - 1, LMP AUDIO CONT - BU, PWR AMPL - SEC, INV 1 TO START APS/DPS: ENG START - PUSH TO STOP APS/DPS: ENG STOP - PUSH	UNSTAGED (M45) STAGED (M47)
ASC PRESS	Either He Press<2775psi (Before Staging)	IF APS NOT PRESSURIZED - CONSULT MSFN, GO TO MAL PROC APS-1 IF APS PRESSURIZED - CLOSE ASC He REG 1 & 2: MONITOR ASC He PRESS; IF BOTH <2775 AND DECREASING - IMMEDIATE LIFTOFF MONITOR FUEL/OXID PRESS; IF EITHER DECREASING - IMMEDIATE LIFTOFF	(M37)
DES REG	220 psi>He Press>260psi	DES He REG 1 - CLOSE, DES He REG 2 - OPEN Monitor TEMP/PRESS, Maintain FUEL & OXID>160psi	(M31)
CES AC	ATCA AC Out of Tolerance	GUID CONT - PGNS, GYRO TEST - POS RT. If Light Stays ON, CWEA Fail. Poss Loss of AGS Control, FDAI Rate Needles Unreliable, RR Usable In LGC Mode Only.	(M27)
CES DC	ATCA DC Out of Tolerance	GUID CONT - PGNS, GYRO TEST - POS RT. If Lt Stays ON, CWEA Fail, If Lt OFF - Cycle CWEA CB, If Lt Stays OFF, Cycle DECA GMBL AC CB To Unlock Throttle. If Lt Reappears: Poss GDA Lock-up, DPS To 100%, No AGS Attitude Control	(M27)
AGS	AGS Power Supply Out of Tolerance, AGS Heater Failed ON, AGS Self Test Failed	GUID CONT - PGNS. If PGNS Unavailable: MODE CONT (AGS) - ATT HOLD, AGS RATE CMD OK, But NO ATT HOLD (Free Drift). 412R, Self Test.	(M17)

LIGHT	MEANING	IMMEDIATE ACTION (POSSIBLE OPERATIONAL IMPLICATIONS)	
.GC	LGC Power, Scaler, or Counter Fail	GUID CONT - AGS. Poss No Auto Eng Shutdown. If RESTART Lt ON, LGC Fail. CB(11)AEA - CLOSE	(M10)
SS	IMU, ICDU or PIPA (Thrusting) FAIL	GUID CONT - AGS. Pos No Auto Eng Shutdown. IF PROG Lt NOT On, CWEA Fail. CB(11) AEA - CLOSE	(M9)
CS TCA	One Or More Thrusters Fail Off, Collinear Thrusters Firing Simultaneously	If Stable, Recycle CWEA. If Unstable (or unusual thruster activity) Affected CB QUAD TCA - Open, LGC THR PAIR CMDS - DISABLE During ullage (PDI), if RCS TCA lite and quad flag comes on: Pull CB for 1st flag. If 2nd flag appears, pull CB, DISABLE and reclose 1st CB	(M42)
RCS A REG RCS B REG	165psi>Reg Press>218psi	Monitor MANF PRESS, When <100psi: Bad System MAIN SOV - CLOSE, CRSFD - OPEN	(M42)
ASC HI REG	Manf Press>220psi	ASC He REG 1 & 2 CLOSE, When <220psi, Open Each REG Separately.	(M38)
ASC QTY	<10 Sec Burn Time	MAIN SOV (2) - OPEN, ASC FEED 2 (2) - CLOSE	(M38)
ENG GMBL	GMBL Cmd/Response Discrepancy	ENGN GMBL - OFF. If Lt Still ON: ENG GMBL - ENABLE (CWEA FAIL)	(M25)
INVERTER	AC VOLTS <112 398>FREQ>402	Check AC VOLTS & FREQ. Switch to INV - 2. Bus A&B BUS TIE INV 1 (2) - OPEN (INV 1 Feeder Short). BUS B: BUS TIE INV 2 - OPEN (BUS B Short) BUS A&B: BUS TIE INV 1 (2) - CLOSE. Select INV 1. BUS A: BUS TIE INV 2 - OPEN (INV 2 Feeder Short). BUS A: BUS TIE INV 1 - OPEN (BUS A Short, Lt Stays ON; Close BUS B: BUS TIE INV 2 Before Selecting INV 2).	(M49)
BATTERY	BATT OVERTEMP REV CURRENT >10A OVERCURRENT	UNSTAGED: Check All BATS VOLTS, AMPS & TB's If VOLTS, AMPS OK: Faulty BAT - OFF Then ON If VOLTS, AMPS NOT OK: Faulty BAT - OFF, CB (11&16) CROSS TIE BAL LOADS - CLOSE STAGED: Check BAT 5, 6 VOLTS, AMPS & TB'S If VOLTS, AMPS NOT OK: CB (11&16) CROSS TIE BUS - CLOSE Faulty BAT: NORMAL FEED - OFF, Good BAT: BACKUP FEED - ON	(M48) (M48)
D RELAY	ED Relays K1 To K6 CLOSE With MASTER ARM - OFF	BEFORE PDI: Do NOT Set MASTER ARM-ON, STAGE RELAY - RESET, Appropriate LOGIC POWER CB - OPEN AFTER PDI: Do NOT Set MASTER ARM - ON, STAGE RELAY - RESET If STAGE SEQ RELAYS Lt Still ON: ASC He PRESS - FIRE, Monitor ASC Fuel/Oxid Press. If APS Pressurizes, ABORT	(M73)
TAGE SEQ ELAY LT. FF AT PDI	Possible Relay Fail	AT PDI: MASTER ARM - OFF, Open LOGIC PWR CB On System Which Had SEQ Lt - ON, MASTER ARM - ON. At Ignition Monitor DPS SHe And FUEL/OXID PRESS. SHe Tank Inoperative: STOP PB - PUSH, ENG ARM - OFF. SHe Tank OK: MASTER ARM - OFF, LOGIC PWR CB - CLOSE	(M73)
CS	A OR B He Press<1700	Monitor He PRESS & RCS QUANTITY. Affected Sys: LGC THR PAIR CMDS (4)-DISABLE, MAIN SOV - CLOSE, CB(11 or 16) QUAD TCA (4) - Open. Monitor MANF PRESS Go to Mal Proc RCS 1	(M41)

F21

H	HDOT
7000	162.0
6000	157.0
5000	135.0
4000	112.0
3000	90.0
2000	62.0
1000	33.0
500	16.0
400	13.0
300	9.0
200	5.0

B21

F20

ASC PRESS	ASC He REGS CLOSE; MAINTAIN P>125, ΔP<10
DES REG	REG 1-CLOSE, 2-OPEN, MAINTAIN P>160
DES QTY	<5.8%
CES AC	GUID CONT-PGNS, GYRO TEST - POS RT (LT ON: CWEA)(NO AGS CONT, RR - LGC ONLY, NO RATE NEEDLES
CES DC	GUID CONT-PGNS, GYRO TEST - POS RT (LT ON: CWEA) LT OFF: CYCLE CWEA; LT OFF: CYCLE DECA GMBL TO UNLOCK THR CONT(NO THR, NO GMBL, NO AGS D.B., DPS TO 100%)(PGNS + AGS AUTO APS IGN LOST)
AGS	GUID CONT-PGNS (412R)(NO AEA, ATT HOLD - OK, NO ATT D.B.)
LGC	GUID CONT-AGS (RESTART, DSKY BLANK: LGC FAIL - CB[11] AEA - CLOSE)
ISS	GUID CONT-AGS (PROG:ISS)(NO PROG: CWEA)
RCS TCA	IF STABLE, CYCLE CWEA
RCS A REG	(165<MANIF PRESS<218): HI: GO, MON He, LO: IF <100, SOV, XFEED
DC BUS	+ BATT + DC FAULT + TB BP = FEED SHORT (IF BATT 5:NO AGS; IF BATT 6:NO PGNS) + DC FAULT + TB BP = NORM FEED FAIL GO BKUP FEED:5 TB:NO AGS, 6 TB:NO PGNS + NORM VOLTAGE = CWEA
CABIN	+ LO CABIN PRESS:DUMP VLVS-CLOSE, PRESS A/B-EGRESS
SUIT FAN	+ SUIT FAN COMP:CB 16 ΔP - OPEN + FLOW + SUIT PRESS = CWEA
ASC HI REG	ASC He REGS (2):CLOSE, OPEN (1) WHEN P<220
ASC QTY	BT <10 SEC
INVERTER	+ VOLTS<112:CB AC BUS A/B INV 1: OPEN:LT OFF:INV 1 FAIL
BATTERY	+ BATT FAULT - BATT FAIL (NONE = CWEA)
RNDZ RDR	+ NO TRACK:RDR TEST, RR (15 SEC) OR CB RR:OPEN (10 SEC), THEN SLEW (2 SEC) RR:SLEW:IF RR LT OFF:CWEA, ON:NO TK LT FAIL
PRE AMPS	+ CES AC:NO ASA, RR LGC ONLY + CB ATCA - CYCLE DECA GMBL
ED RELAYS	MASTER ARM:OFF, STG RELAY RESET, CB LOGIC - OPEN
RCS	+ He >1700:CWEA, He <1400: SOV-CLOSED
HEATER	RR TEMP, S-BAND TEMP MON: CB'S OPEN IF LT ON
ECS	IF NO COMP LT ON:CWEA
O2 QTY	O2 QTY >10%:CWEA
GLYCOL	+ GLY TEMP >50 + SUIT TEMP >60: PRI EVAP FLO 1 - CLOSED:PRI EVAP FLO 2:OPEN IF NO TEMP DECR (5 MIN):PRI EVAP FLO 1&2:CLOSE, H2O TK-SEC, GLY-SEC, CB GLY PUMP SEC-CLOSE, SEC EVAP FLO-OPEN + GLY TEMP <50:CB GLY PUMP 1 - OPEN: GLY PRESS DECR:LEAK

STG SEQ LT OFF:AT PDI:MA-OFF,CB LGC(ON LT)-OPEN
MA-ON. AT IGN,SHe INOP:STOP;SHe OK,MA-OFF,
LGC-CLOSE

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B20

F19

LGC + DC BUS + BATT

GUID CONT - AGS
DES ENG OVRD - ON
CDR AUDIO - BU
GLYCOL - SEC
SUIT FAN - 2
DPS MANUAL - OFF
(ARM,OVRD,STOP)

START (MAN)
GASTA
THRUST, TAPE
RCS - FEED A
RR, LR
INV 1
DIR, PULS, +X

CES DC + DC BUS + BATT

GUID CONT - PGNS
SUIT FAN - 1
LMP AUDIO - BU
INV - 1
ABT STG:
ENG ARM - ASC
MAN START, MAN STOP

DES OVRD
AUTO THROT, TH CMD
AUTO IGN, AUTO OFF
RATE NEEDLES
RCS - FEED B, XFD
RR SLEW, AUTO TRACK
INV 2

AC-A

CB BUS TIE A (2) - OPEN
RR - LGC
LMP FDAI - AGS

GDA
GASTA
CDR FDAI
TAPE HOOT/RDOT

AC-B

CB BUS TIE B (2) - OPEN
CDR FDAI - PGNS

DEDA
FDAI - AGS
LMP - FDAI