



TRW No. 70:7254.2-16
Re: ASPO 81-3

National Aeronautics and Space Administration
Manned Spacecraft Center
Houston, Texas 77058

Attention: Mr. M. Contella, CF24

Subject: LM PGNS/AGS Training Card

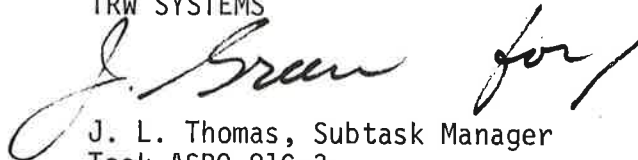
Reference: TRW Letter 70:6840.JLT.26, "Final Preliminary LM PGNS/AGS
Training Card," Dated 7 October 1970

Gentlemen:

Attached are 100 copies of the complete and final version of the
PGNS (LUM 178)/AGS (PROG 7) Training Card. Included with each card is
TRW Memo No. 70:7252.3-63 which provides a user guide to the Training
Card. These attachments supercede all previous preliminary versions of
the LM PGNS/AGS Training Card and were prepared under Task ASPO 81C-3.

Very truly yours,

TRW SYSTEMS


J. L. Thomas, Subtask Manager
Task ASPO 81C-3



W. J. McKenzie
Assistant Project Manager
Apollo Spacecraft Program Support
Spacecraft Systems Analysis Project

JG/ms

cc: R. Albon, PD7
S. P. Grega, CF24
R. H. Kohrs, PD7
P. C. Kramer, CF24
C. O. Lewis, CF24
J. W. O'Neill, CF34
W. R. Pogue, CB



KB
KLB

70:7252.3-63

INTEROFFICE CORRESPONDENCE

TO: Distribution

DATE: 22 October 1970

SUBJECT: LM PGNS/AGS Training Card
(Task ASPO 81C-3)

FROM: J B Hill *JBH*
BLDG. H4 ROOM 2116a EXT. 2671

Reference: "Apollo 14 LM-8 Flight Crew G&N Dictionary" 15 June 1970

The attached LM PGNS/AGS training card, generated under MSC/TRW Task ASPO 81C-3, was prepared under the direction of Lt Col W R Pogue. The card, hopefully, provides a supplemental tool in the flight-crew simulator training; it is not intended to modify or supersede any officially released publication.

The training card consists of both PGNS (LUMINARY, Rev 178) and AGS (Flight Program 7) operationally-oriented data. A topical summary of the data is presented in Table 1. Crew checklist operations, however, are not generally covered by the card.

The card format was developed under the assumption that the user possesses some familiarity of the PGNS and AGS operational modes. Because of space limitations, abbreviations, acronyms, and mnemonics were employed extensively. The acronyms are standard, and most of the abbreviations and mnemonics are self-explanatory*. Table 2 provides a list of those terms which might not be immediately evident to the user.

*Review of the complete list of abbreviations, acronyms, and mnemonics by non-technically oriented personnel revealed that a very large percentage of the abbreviations were recognizable. The acronyms were not generally recognized (as one might suspect). The star ID mnemonics were recommended by Lt Col W R Pogue. Should the card notation be unclear to the user, it is recommended that the referenced document be consulted.

Table 1
 PGNS/AGS Training Card Topical Summary

<u>PGNS Summary</u>	<u>AGS Summary</u>
Verb List	DEDA Address
Noun List	Orbit Insertion
Alarm Codes	Direct Rendezvous/Midcourse Correction
V50 Checklist	CSI
Star ID	CDH
N49 Acceptance Criteria	TPI
Nominal Sequencing for following LUMINARY Programs:	External ΔV
P06 P27 P35 P51 P66	Burn (common logic)
P12 P30 P40 P52 P68	RR Auto Update (spare)
P20 P32 P41 P57 P70	RR Manual Update
P21 P33 P42 P63 P71	AGS/PGNS
P25 P34 P47 P64 P76	Alignment/Calibration
Thrust	AGS Abort
No Ignition Engine Fail (97 XX)	Reference Frame (External ΔV)
DAP Data Load	Engine Select
Rapid IMU Align	Ordeal
RR Antenna	Descent
Rendezvous	DEDA state Vector Update
Ascent	Orbit Parameters
Descent	LM/CSM
Attitude	Times
Times	ΔV Monitor
Orbit/Flight Path	Attitude/Steering
Cross-Pointer	
FDAI	

- Notes:
- The nominal flow for LUMINARY routines was omitted due to space limitations
 - P22 program sequencing was deleted (per Lt Col Pogue) due to space limitations. This decision was felt justified in view of the fact that P22 is not performed under time-critical conditions.
 - P72 through P75 were not listed since their program logic is identical respectively to P32 through P35.
 - The card presents only those DEDA addressable quantities that are of operational interest.
 - The AGS rendezvous logic is presented assuming the AGS solutions are to be burned. Should either the PGNS or ground solution be burned, the user would retarget via the "EXT ΔV " logic prior to executing the maneuver.

Table 2

Partial List of Abbreviations used in PGNS/AGS Training Card

⊥	Perpendicular to (see N77)	RLM	LM position vector (see N59)
	Parallel to (see DEDA 623, BURN 623, OI 623)	ROD	Rate-of-descent (see P64,P66)
✱	Angle; boresight if alone (see RR MAN UPDT N59)	RTN	Return (see P20)
A/T	Alignment technique (see P57,alarm 00701)	S-MAJ	Semi-major (see DEDA 224, 662R, OI 224, 662)
ALN	Align (typically,CRS ALN)	SPFY	Specify
CCS	AGC Instruction "count, compare, & skip" (see alarm 21103)	SQRT	Square-root (see alarm 21302)
CO	Cutoff (see N40)	STO ATT	Stored attitude (see P57)
CTR	Counter (see DEDA 616, OI 616)	T-RAD	Time-radius conic solution (see alarm 20607)
CTRL	Control	TG	Time-to-go to specified condition (see N61,N77)
DEL	Delay (see N26)	THRST	Thrust (see BURN 507)
DES	Designate (see P63:50 25 (00500)"LDG ANT-DES")	TK ATT	Tracking attitude (see P20)
DSPY	Display	TOT	Total (see FDAI "TOT ATT-V62")
DSRD	Desired (also DESRD)	TPER	Time from perigee (see ORB/FLT PATH)
ENC	Encoder (see alarm 00206)	TR	Remaining redesignate time (see N64,P64)
IMAG	Imaginary (see alarm 00600)	VAC	AGC "scratch pad" locations i.e."vector accumulator" (see alarm 31201)
INPT	Input		
ITER	Iterations (see alarm 00605)		
KREL	DSKY "KEY REL"		
M:S	Minutes:Seconds		
MRAD	Milli-radian (see N99)		
NDLS	Needles (see alarm 01466)		
PER	Period (see DEDA 416)		
PL	Plane (see DEDA 623, BURN 623, OI 623)		
PR	Pair (see P51,P52)		
PRPR	Proper (see NO IGN ENG FAIL)		
PTH	Path (see N91)		

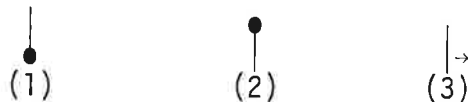
22 October 1970

The training card should be essentially self-explanatory providing the user has some knowledge of the PGNS/AGS operational modes. However, the format used to describe the program logic probably deserves some explanation. Presented for each program are the nominal sequencing, possible alarms and/or displays for non-nominal sequencing, and pertinent displays that are available to the user whenever the specific program is selected. Certain notational techniques described below were also adopted for purposes of clarity.

At virtually every flashing DSKY display, a V34E represents a "terminate the program in progress" operation. This standard crew response, therefore, has been omitted from the card except for P20 (after 06 49) and P63 (after V57E) where V34 has a special significance.

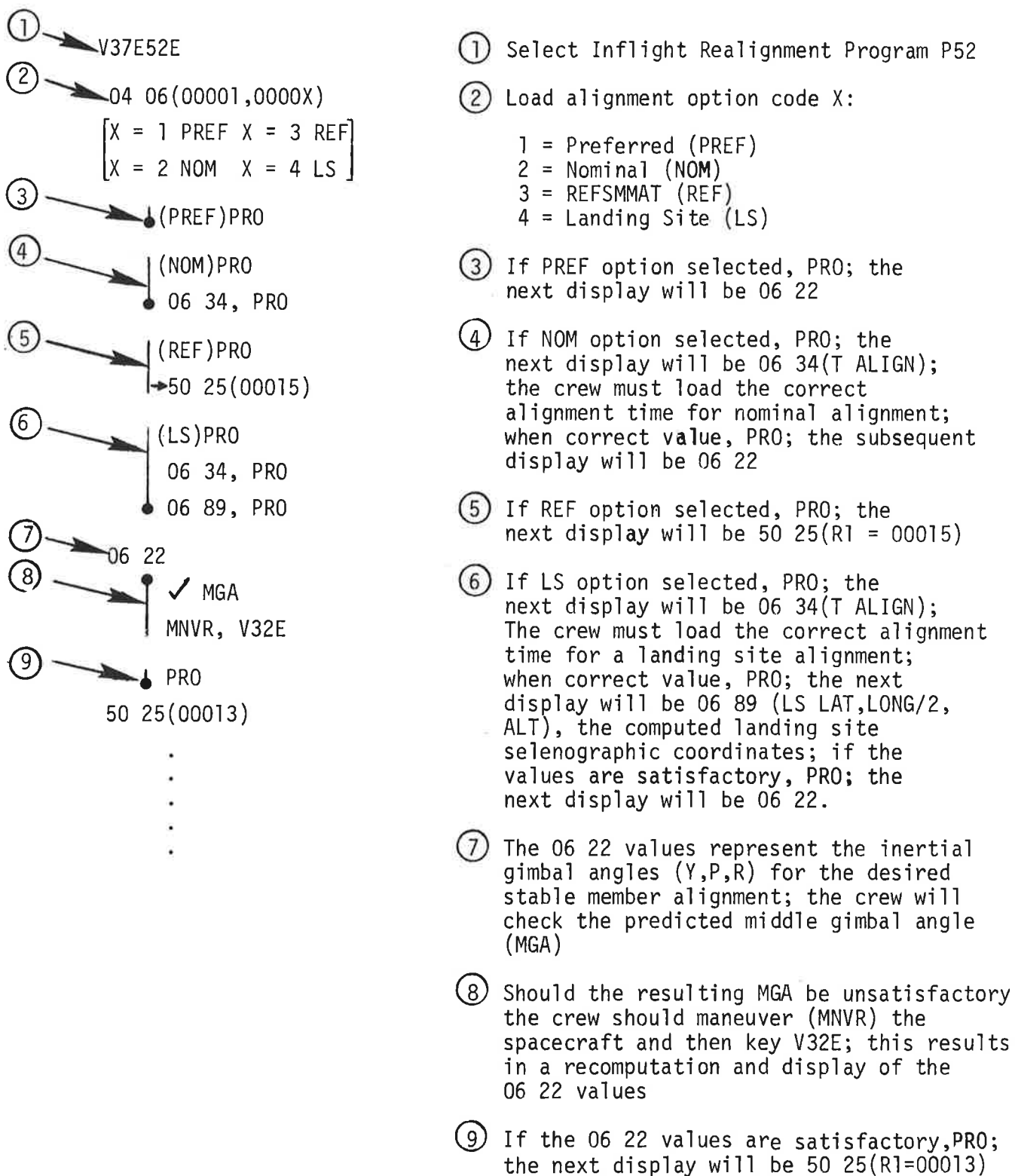
In most programs, certain input parameters must be specified either via pad load or crew DSKY entries during the program sequencing. Although the training card defines which parameters are loadable (see "Noun List"), the card does not specify such data loading operations as part of the nominal sequencing.

In many programs, the logic is such that the crew must specify one of several possible program sequences available at a given display. A special notational technique has been developed to describe these potential alternatives. Combinations of the following symbols are employed to represent the available options (one symbol per option):



For a selected option, the sequence to the right of the vertical bar of each symbol is to be performed. For symbol (1), the "ball" indicates the subsequent display (or action) to occur immediately following the series of options. For symbol (2), the "ball" indicates the sequence will recycle to the display present when the option was selected. For symbol (3), the absence of a "ball" indicates the sequence will jump to some other point (specified by the "arrow") in the program. The card notation is best illustrated by the example in Table 3.

Table 3
Explanation of PGNS/AGS Training Card Program Flow



Specific extended verbs are called and/or nouns are monitored as a matter of course during certain programs (e.g., V16N85 during P12; V90 during P32 and P33; V57 during P63). It was considered desirable to present such sequencing and yet indicate which displays were not part of the basic program logic. This has been accomplished by enclosing such displays in brackets.

Of the various PGNS programs, P20 is probably the most difficult to follow. P20 may be grouped operationally into four semi-autonomous sequences:

- Tracking attitude maneuver TRACK ATT
- CSM manual acquisition RR MAN
- RR antenna designate via LGC RR AUTO
- Automatic state vector updating (rendezvous navigation)

The training card is similarly organized except that the automatic state vector updating is included with the "RR MAN" or "RR AUTO" sequences. After selection of P20 via V37E20E, the subsequent display is dependent upon several factors.

1. Unless the LM is in attitude hold, a tracking attitude maneuver is required. Assuming the tracking attitude maneuver is to be performed, the crew will observe a 50 18 display only if the angle between the LM/CSM LOS and the LM +Z axis exceeds 15 degrees. otherwise, the tracking attitude maneuver will be executed automatically without a DSKY display.
2. Upon completion of the tracking attitude maneuver (assuming one was required), the subsequent program flow is governed by the RR mode select switch position (AUTO TRACK/SLEW/LGC).
 - If the RR mode select switch is at "LGC," an RR antenna designation is attempted by the LGC. If successful, the RR trunnion and shaft angles are displayed via 50 72. After verifying CSM acquisition, the crew keys PRO and rendezvous navigation is automatic without DSKY displays (DSKY blanks) unless excessive updates are incurred.

- If the RR mode select switch is at "AUTO TRACK" or "SLEW" the crew is requested via display 50 25(R1=00201) to select "LGC" (the RR auto mode). If the crew desires automatic CSM acquisition, the mode switch is set to "LGC" and PRO is keyed. However, if a manual CSM acquisition is to be performed, the crew keys ENTR. The program then requests via 50 25(R1=00205) the crew to perform the acquisition. When acquisition is accomplished, the crew sets the RR mode switch to "LGC" and keys PRO. State vector updating is automatic thereafter without DSKY displays (DSKY blanks) unless excessive updates are incurred.

Approved: _____


W J Klenk, Manager
Systems Analysis & Software Dept.

JBH/jlh

NOUN LIST

- L - LEGIT LOADABLE NOUN
- V - VALID DATA CALLABLE ANYTIME
- CALLABLE ANYTIME & LOADABLE

- 01 SPFY ADRS-FRAC [X.XXXXX]
- 02 SPFY ADRS-WHOLE [XXXXX.]
- 03 SPFY ADRS-DEG [X.01]
- 04 GRAV ERR % [010(R1)]
- 05 SIGHT % DIFF [010(R1)]
- 06 OPTN [P21, P22, P52, P57] [OCT]
- 07 L CHNL/E-MEMORY OPER OCT (IDENTIFIER, BIT ID, ACTION)
- 08 V ALARM DATA [OCT]
- 09 V ALARM (ST, 2ND, LAST) [OCT]
- 10 Y SPFY XCH [OCT(R1)]
- 11 L TC(S) OR T(A) [H, M, .01S]
- 12 L OPTN [41, 72, V65, V82, V89] [OCT (0000X, 0000Y)]
- 13 L T(CDH) [H, M, .01S]
- 15 - INCRMT ADRS [OCT(R1)]
- 16 L TIEVENT [H, M, .01S]
- 18 MNVR DSRD FDI R, P, Y, [010]
- 20 V PRSNT ICDU Y, P, R, [010]
- 21 V PIPA PULSES X, Y, Z [XXXXXX]
- 22 L DSRD ICDU Y, P, R, [010]
- 24 L LGC CLOCK AT [H, M, .01S]
- 25 SEE V50 CHECKLIST [OCT(R1)]
- 26 L PRIO/DEL, ADRS, BBCON [OCT]
- 27 * SELF TEST ON/OFFX. [R1]
- 32 T FICM PERIGEE [H, M, .01S]
- 33 L TIE [H, M, .01S]
- 34 L TIEVE [H, M, .01S]
- 35 TFI [H, M, .01S]
- 36 V LGC CLOCK TIME [H, M, .01S]
- 37 L T(TPI) [H, M, .01S]
- 38 V SV INTEG TIME [H, M, .01S]
- 40 TFI/CO, VG, VM, [M.S., 1.FPS]
- 42 HA, HP, VG, 1.INM, 1.INM, 1.FPS] [LAT(+N), LONG(+E), ALT [010, 010, 1.INM]
- 44 HA, HP, TFF, 1.INM, 1.INM, M.S.] [TFF = -59.59 IF HP=35K FT]
- 45 V MKS, TFI, CODE [X, M.S, Y] (R1 VALID ANYTIME)
Y = -1:NOT LAST PASS
Y = -2:LAST PASS, NO ALN
Y = MGA, 010: LAST PASS WITH IMU ALN
- 46 * SEE DAP DATA LOAD [OCT(R1)]
- 47 LM WT, CSM WT [LBM(R1, R2)]
- 48 L + P TRM, + R TRM [010, 1.FPS]
- 49 AR, AV, SOURCE [1.INM, 1.FPS, X]
X = 1 RANGE X = 3 SHFT
X = 2 RDOT X = 4 TRUN
- 51 S-BAND P-Y % [010(R1, R2)]
- 52 ACT VEH CENTRL % [010(R1, R2)]
- 54 RANGE, RDOT, B (+Z, HORIZ) [01.NM, 1.FPS, 010]
- 55 L P32:APIS, ELEV % , CODE [XXXXXX, 010, Y]
Y = 0:CDH AT APSIDAL CROSSING SPFY BY R1
Y = 0:CDH AT (R1) (180°)
- L P34:CODE, ELEV %, CENTRAL % [X, 010, 010]
INTEG (X=0 CONIC, X≠0 PREC)
ELEV % = 0:ELEV % OPTN
ELEV % = 0:TPI TIME OPTN
- 56 RR LOS AZ, ELEV [010(R1, R2)] (+AZ ABOUT Z; +EL ABOUT Y)
PST-TPI HP, TFI, AV, TFF AV [1.INM, 1.FPS, 1.FPS]
- 59 OS AV (X, Y, Z) [1.FPS]
[X-LOS, Y-LOS, Z-LOS; X-Y, FWD, RT, DN IF X, IN-PL, HD, UP]
- 60 V (+Z), HDOT, H, L, 1.FPS, 1.FPS, FT]
- 61 TG(AIM TPI, TFI, XR) (+LS N S/C) [M.S, M.S., 1.INM]
- 62 VI, TFI, AV [1.FPS, M.S., 1.FPS]
- 63 VI, HDOT, H, L, 1.FPS, 1.FPS, FT]
- 64 TR/LPD, HDOT, H[S, 010, 1.FPS, FT]
- 65 V SAMPLED LGC TIME [H, M, .01S]
- 66 V LR, SR, LR ANT POSN [FT, X(R1, R2)]
X = 1, 2 (R2 VALID ANYTIME)
- 67 LR VX, VY, VZ [1.FPS]
- 68 SR TO LS, TG(BRK), AH [1.INM, M.S, FT]
- 69 L LS CORR COMP Z, Y, X [FT]
- 70 L AOT DTNT/STAR CODE [000YY] (X=DETNT, Y=STAR ID)
X = 0 COAS/LPD CAL (P52)
X = 1-6 AOT(L, F, R, RR, CL, LR)
X = 7 COAS
- 71 L AOT DTNT/STAR CODE [000YY] (SEE NOUN 70 ABOVE)
- 72 V RR TRUN, SHFT [010(R1, R2)]
- 73 L DSRD RR TRUN, SHFT [010(R1, R2)]
- 74 TFI, DSRD Y, P [M.S., 010, 010]
- 75 P32:CDH AH, CSI/CDH AT, CDH/TPI AT, 1.INM, M.S, M.S] P33:CDH AH, CDH/TPI AT, NOM TPI/TPI AT [1.INM, M.S, M.S]
- 76 L V(FNL), HDOT(FNL), XR [1.FPS, 1.FPS, 1.INM]
- 77 TG(CUTOFF), YDOT (1.CSM) [M.S., 1.FPS(R1, R2)]
- 78 RR RANGE, RDOT, TFI [01.NM, M.S]
- 79 L CR5R, SPR, DTNT [010, 010, X]
X = 1-6 AOT(L, F, R, RR, CL, LR)
[XXXXXX, 010(R1, R2)]
- 81 L LV ΔV(FWD, RT, DN) [1.FPS]
- 82 LV ΔV(FWD, RT, DN) [1.FPS]
- 83 LM ΔV(UP, RT, FWD) [1.FPS]
- 84 L OTHER VEH ΔV X, Y, Z [1.FPS]
- 85 LM VG(UP, RT, FWD) [1.FPS]
- 86 LV VG(FWD, RT, DN) [1.FPS]
- 87 L COAS ΔV (+RT), ELEV (+UP) [010(R1, R2)]
- 88 L CELEST BODY UNIT VEC [XXXXX]
- 89 L LS [LAT(+N), LONG(2+), E, ALT [0010, 0010, 01.NM]
- 90 Y, YDOT, PSIS, 01.NM, 1.FPS, 010]
- 91 ALT W, FT PTH [01.NM, FPS, 010]
- 92 THRLL, HDOT, H % , 1.FPS, FT]
- 93 A GYRO TORQ % XYZ [0010]
- 99 L W-MAT RMS POSN, VEL, RR BIAS [FT, 1.FPS, MRAD]

VERB LIST

- 01-05 DISPLAY OCT
- 06,07 DISPLAY DEC
- 11-15 MONITOR OCT
- 16,17 MONITOR DEC
- 21,25 DATA LOAD
- 27 DISPLAY FIXED
- 30 MEMORY
- 31 EXECUTIVE (P00)
- 32 WAITLIST (P00)
- 33 RECYCLE
- 34 PROCEED(V21-23)
- 35 TERMINATE
- 36 TEST LITES (P00)
- 37 FRESH START
- 38 CHANGE PROG
- 40, 20 ZERO ICDU'S
- 41, 72 ZMU CRS ALN
- 42, 72 RR CRS ALN
- 43 GYRO TORQ
- 44 FDI BIAS
- 45 CHK (P00)
- 46 TERM RR DESIGNATE
- 47 INITIALIZE ACS
- 48 DAP DATA LOAD
- 49 CREW MNVR (P00)
- 50 PLEASE PERFORM
- 51 PLEASE MARK X
- 52 PLEASE MARK Y
- 53 PLEASE MK X OR Y
- 55 INCRMT LGC CLOCK (DEC)
- 56 TERM TRACKING
- 57 CALL LR UPDATE
- 58 INHIBIT LR UPDATE
- 59 CMD LR TO POSN 2
- 60 DAP VEH RATES
- 61 DAP FOLLOWING
- 62 ATT ERROR (MODE I)
- 63 TOTAL ATT ERROR (N22-N20) (MODE II)
- 63 RR/LR SELF TEST
- 64 S-BAND ANT
- 65 DISABLE U, V JETS
- 66 LM SV TO CSM SLOT
- 67 W-MATRIX DSPY
- 68 TERM TERRAIN MODEL
- 69 CAUSE RESTART
- 70 LIFTOFF UPDT (P27)
- 71 BLK ADRS UPDT (P27)
- 72 SINGULAR UPDT (P27)
- 73 CLK OCT UPDT (P27)
- 74 ERASABLE DUMP
- 75 ENABLE U, V JETS
- 76 MINIMUM IMPULSE
- 77 RATE CMD/ATT HOLD
- 78 LR SPURIOUS TEST
- 79 STOP LR SPUR TEST
- 80 LM SV UPDATE
- 81 CSM SV UPDATE
- 82 ORBIT PMTR DSPY
- 83 RDZ PMTR DSPY
- 85 RR LOS AZ/ELEV
- 86 RDZ FNL MZR (P00)
- 90 OUT-OF-PLANE DSPY
- 91 DSPY BANKSUM (P00)
- 93 INITIALIZE W-MATRIX
- 95 INHIBIT SV UPDTS
- 96 STOP SV INTEG
- 97 PLEASE PERFORM ENG FAIL PROC
- 99 PLEASE ENABLE ENG IGNITION

V50 CHECKLIST

- 00013 PERFM CRS ALN: NRM (PRO) PLS TORQ (E)
- 00014 RECHK OR EXIT
- 00015 ACQUIRE STAR
- 00062 PWR DOWN LGC
- 00201 SEL RR AUTO
- 00203 SEL PGNS, AUTO
- 00210 ATT, AUTO THRTL (P40, P63, P70)
- 00205 SLEW RR FOR MAN ACQUIRE
- 00500 SW LR ANT TO POSN 1

V37E06E P06

IMU OPN-OPEN 50 25 (00062) PRO

V37E12E P12

06 33, PRO 06 76, PRO

V37E12E P12

IF NOT PGNS, AUTO 50 25 (00203)

V37E12E P12

06 33, PRO 06 76, PRO

V37E12E P12

06 33, PRO 06 76, PRO

V37E12E P12

06 33, PRO 06 76, PRO

V37E12E P12

06 33, PRO 06 76, PRO

V37E12E P12

06 33, PRO 06 76, PRO

V37E20E P20

IF ATT HOLD BYPASS [TK ATT]

V37E32E P32

IF TKT ATT ERR < 15°, AUTO MNVR W/O DSPY

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

V37E30E P30

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E32E P32

IF TKT ATT ERR < 15°, AUTO MNVR W/O DSPY

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

50 25(00201) (AUTO) PRO

RR MAN-ACQUIRE

V37E40E P40

(MAN)MNVR, E (AUTO) PRO 06 18, E 50 18, E

V37E42E P42

IF NOT PGNS, AUTO 50 25 (00203)

V37E42E P42

IF NOT AUTO THRTL 50 25 (00203)

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

06 33, PRO 06 31, PRO 06 42, PRO 16 45, PRO 37

V37E42E P42

V37E50E P50

(MAN)MNVR, E (AUTO) PRO 06 18, E 50 18, E

V37E52E P52

IF NOT PGNS, AUTO 50 25 (00203)

V37E52E P52

IF NOT AUTO THRTL 50 25 (00203)