

SM RCS QUAD HTRS(4)-OFF(ctr) (274)

51+00

+7:30 R HP-65 DATA FOR TPI+7:30

+8:30 R AND θ HP-65 DATA FOR TPI+8:30
 THC PWR-ON(up)
TPM1 BURN ASAP WITH SOYUZ BORESIGHTED IN COAS
 (AVF RCS WITH EMS) (AVD TIMED RCS)
 REACQUIRE VHF RANGING (R=11 NM)

RCS X AXIS
 1 FPS=2.50 SEC
 RCS Y&Z AXIS
 1 FPS=5.00 SEC

◀Turn on your orientation lights. ВКЛЮЧИТЕ ВАШИ ОГНИ ОРИЕНТАЦИИ.

51+10

+16:30 θ HP-65 DATA FOR TPI+16:30

CENTER SOYUZ IN COAS WHEN
 READING HP-65 DATA θ

+19:30 R HP-65 DATA FOR TPI+19:30

+20:30 R AND θ HP-65 DATA FOR TPI+20:30
 THC PWR-ON(up)
TPM2 BURN ASAP WITH SOYUZ BORESIGHT IN COAS
 (AVF RCS WITH EMS) (AVD TIMED RCS)
 REACQUIRE VHF RANGING (R=3 NM)

RCS X AXIS
 1 FPS=2.50 SEC
 RCS Y&Z AXIS
 1 FPS=5.00 SEC

STOW HP-65 KIT(U1) & CHECKLIST(R1)
 MONITOR LOS RATES AND CALCULATE AVE RANGE RATE FOR R=1.5 NM

PRE-BRAKING SWITCH LIST (Pg 2-18) $R=(\Delta R(nm)/1 \text{ MIN})100$

VTR/DAC SWITCH LIST (Pg 2-18)
 NULL LOS RATES AND ADJUST RANGE RATE TO BRAKING GATES (TIMED RCS)

51+20

51+30

STATION KEEP ON SOYUZ +X AXIS (R~150FT)
 Apollo stationkeeping ЕСТЬ ЗАВИСАНИЕ АПОЛЛОНА.

TPM1 ONBOARD DATA

TPM1 HP-65 SOLN

ΔV (LOS)	ΔV_F	[Grid]				$\Delta V_{D BT}$
	ΔV_R	[Grid]				
	ΔV_D	[Grid]				

TPM2 ONBOARD DATA

TPM2 HP-65 SOLN

ΔV (LOS)	ΔV_F	[Grid]				$\Delta V_{D BT}$
	ΔV_R	[Grid]				
	ΔV_D	[Grid]				

PRE-BRAKING SWITCH LIST

MAN ATT(3)-RATE CMD	ATT SET-IMU
LIMIT CYCLE-OFF	THC PWR-PWR
DBD/RATE-MIN/LOW	RHC PWR NORMAL #2-AC/DC
BMAG MODE(3)-ATT 1/RATE 2	RHC PWR DIRECT #2-MNA/MNB
SC CONT-SCS	AUTO RCS SELECT(16)-MNA/MNB
FDAI SCALE-5/1	THC-ARMED
FDAI SELECT-1	RHC #2-ARMED
FDAI SOURCE-ATT SET	

VTR/DAC SWITCH LIST

VTR POWER(3)-ON(UP)
 HEAD WHEEL DRIVE MOTOR-ON (MOTOR ON LT-ON)
 MODE-RECORD (RECORD LT-ON)

DAC-ON
 (IF desired)HDC CX06

BRAKING GATES			θ (DEG)	
R(NM)	R(FPS)	R(FT)	SOLAR PANEL	BODY
1.00	30	6000		
.50	20	3000	0.5	
.25	10	1500	1.0	
.08	5	500	3.1	1.0
.05		300	5.2	1.7
.03		200	7.9	2.6
.02		130		3.9
.01		60		8.4

CM CAMR 2

V T R 51+30

LOAD ASCP tw WITH DOCKING ATT (Pg 2-19)
 ◀Initiating orientation of Apollo. НАЧИНАЮ ОРИЕНТАЦИЮ АПОЛЛОНА.
 MNVR TO DOCKING ROLL ATT (-60° CCW)
 (REF ATT SET ERROR NEEDLES)
 VTR/TV SWITCH LIST (Pg 2-19)

A T S

◀Orientation established. ОРИЕНТАЦИЯ УСТАНОВЛЕНА.
 ▶Initiate docking orientation as programmed. НАЧНИТЕ ОРИЕНТАЦИЮ
 СТЫКОВКИ ПО ПРОГРАММЕ.

ACQUIRE ATS HGA: MAN, WIDE P -36, Y 44
 S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW

EMS FUNC/MODE-ΔV SET/STBY
 SET ΔVC = -100.0 FPS
 EMS FUNC-ΔV

51+40 ACTIVE DOCKING PREPARATION CHECKLIST (Pg 1-20)

MONITOR SOYUZ MNVR ON SOYUZ +X AXIS

SOYUZ MNVRS TO DOCKING ATT
 51+44:25 - 51+47:00

ACTIVE DOCKING CHECKLIST (Pg 1-21)

TV - GRD CMD
 51+48 - 52+09

51+50 **M A D**

CSM/SOYUZ INTERFACE SEAL COMPRESSED

52+00 **U S R**

SUNSET
 AT 52:05

DOCKING ATTITUDE

		NOMINAL			UPDATE		
ASCP tw	R	⊗	⊗	⊗	3	0	0
	P	⊗	⊗	⊗	1	5	7
	Y	⊗	⊗	⊗	0	0	0

VTR/TV SWITCH LIST

VTR HEAD WHEEL DRIVE MOTOR-OFF(400)
 (MOTOR ON LT-OFF)

ON TV CAMERA AT LOCATION 606:
 CAMERA-AVG, SLAVE, LINEAR
 LENS (F, ZOOM, FOC)-22, 25, infinity

GDC REFSMMAT REALIGN (P52)

- Notes:
1. P51 Is Not Required As-Long-As A Valid REFSMMAT Is Stored Or Can Be Obtained Via STDN Uplink.
 2. If DAP Related Extended Verbs (i.e. V46, V48 Load) Are Executed, EMP SL-50 Will Require Reloading.
 3. It Is Desirable To Maintain A Constant Inertial Att Throughout The Entire P52 OPT 3 (Or P52 OPT 3 & OPT 1) Procedure. If A Mnvr Is Required, However, Reload N20 With The New Att.
 4. It Is Probable That The GDC Drift Rate Will Be Greater Than The BMAG's. As A Result, The FDAI Ball May Be Drifting Whereas The SC IS Maintaining An Inertial Att. Therefore, The SC Att Should Not Be Slaved To The Initial Ball Reading, And N20 Should Not Be Reloaded Unless A Mnvr Is Actually Commanded By The Astronaut.

Assumptions: REFSMMAT Flag SET; CSM DAP Has Been Activated, Followed By A NO-DAP Initialization; EMP SL-50 Has Been Loaded.

(P52 OPT 3)

1. BMAG MODE(3)-RATE 2
DBD/RATE-MIN/LOW
BMAG MODE(3)-ATT 1/RATE 2
LIMIT CYCLE-ON(up)
2. RHC-Mnvr To Acquire Star Pair (If Req'd, Ref STAR ACQ PAD)
ATT SET-GDC (verify)
ZERO FDAI 1 Error Needles With ASCP tw.
V25N20E
Load N20 With ASCP tw Angles.
3. V37E52E
Proceed Thru P52 And Perform Star Marks.
(If Att Mnvr Required Between Star Marks Reload N20)
4. F 06 05 Accept Angular Separation Error (Reg 1) Up To .40 Deg.
PRO
F 06 93 TORQUING ANGLES OG,IG,MG (.001 Deg)
V5N26E
Verify N26 = 10001,1642,50006 (If Not: Reload N26)
KEY RLSE
V30E *F 01 70 (RESTART)*
*Redo 2nd Mark *
- F 06 22 NEW ICDU ANGLES OG,IG,MG (.01 Deg)
Set ASCP tw To N22 Values.
GDC Align pb-Push.
PRO (Sets N20 = N22)
- F 06 93 TORQUING ANGLES OG,IG,MG (.001 Deg)
V32E
- F 50 25 00014 ALIGNMENT CHECK
(Perform 3rd Star Check) PRO
5. V3700E
(If Immediately Followed By P52 OPT 1, Bypass Remaining Procedures)
LIMIT CYCLE-OFF
RATE-HIGH

(P52 OPT 1) (If Immediately Preceded By P52 OPT 3, Steps 1 & 2 May Not Be Required)

1. BMAG MODE(3)-RATE 2
DBD/RATE-MIN/LOW
BMAG MODE(3)-ATT 1/RATE 2
LIMIT CYCLE-ON(up)
2. RHC-Mnvr To Acquire Star Pair (If Req'd, Ref STAR ACQ PAD)
ATT SET-GDC (verify)
ZERO FDAI 1 Error Needles With ASCP tw.
V25N20E
Load N20 With ASCP tw Angles.
3. V37E52E
Align GDC to N22.
Record N22 And
Load N20 With N22.
PRO On GYRO TORQUE Request (Reg 1 = 00013).
Ignore PROG ALARM (#'s 211 & 217)
Do Not Touch DSKY Until F 50 25 00015 Is Displayed Or The New REFSMMAT Will Be Lost. (Will Take ~5 Min)
Continue In P52 And Perform Star Check To Verify Alignment
4. If Star Check Fails: Continue In P52 And Perform Star Marks
(Ref P52 OPT 3 Procedures, Steps 3, 4 & 5)
5. V37E00E
LIMIT CYCLE-OFF
RATE-HIGH

EMP SL-50 MANUAL LOAD

DSKY LOAD	(REG 3 ADDRESS)	
V2111E		77776E
3242E		E
6006E (3242)		34124E
N15E		E
77775E		55237E
E		E
2703E		35040E (3270)
E		E
2661E		4647E
E		E
77775E		24000E
E		E
2711E		20456E
E		E
2667E (3250)		5537E
E		E
77775E		1677E
E		E
2717E		5537E
E		E
2675E		4E
E		E
77634E		6E (3300)
E		E
24017E		31300E
E		E
47471E		52033E
E		E
77634E		31301E
E		E
24017E (3260)		54034E
E		E
34747E		5537E (3305)
E		E
77634E		
E		V25N26E
24017E		10001E
E		1642E
47303E		50006E
E		

To Verify EMP Load:

V1N1E
3242E
(Verify Reg 1 = 6006)
N15E
(Verify Reg 1 = 77775)

Key ENTER To Verify Successive Values.

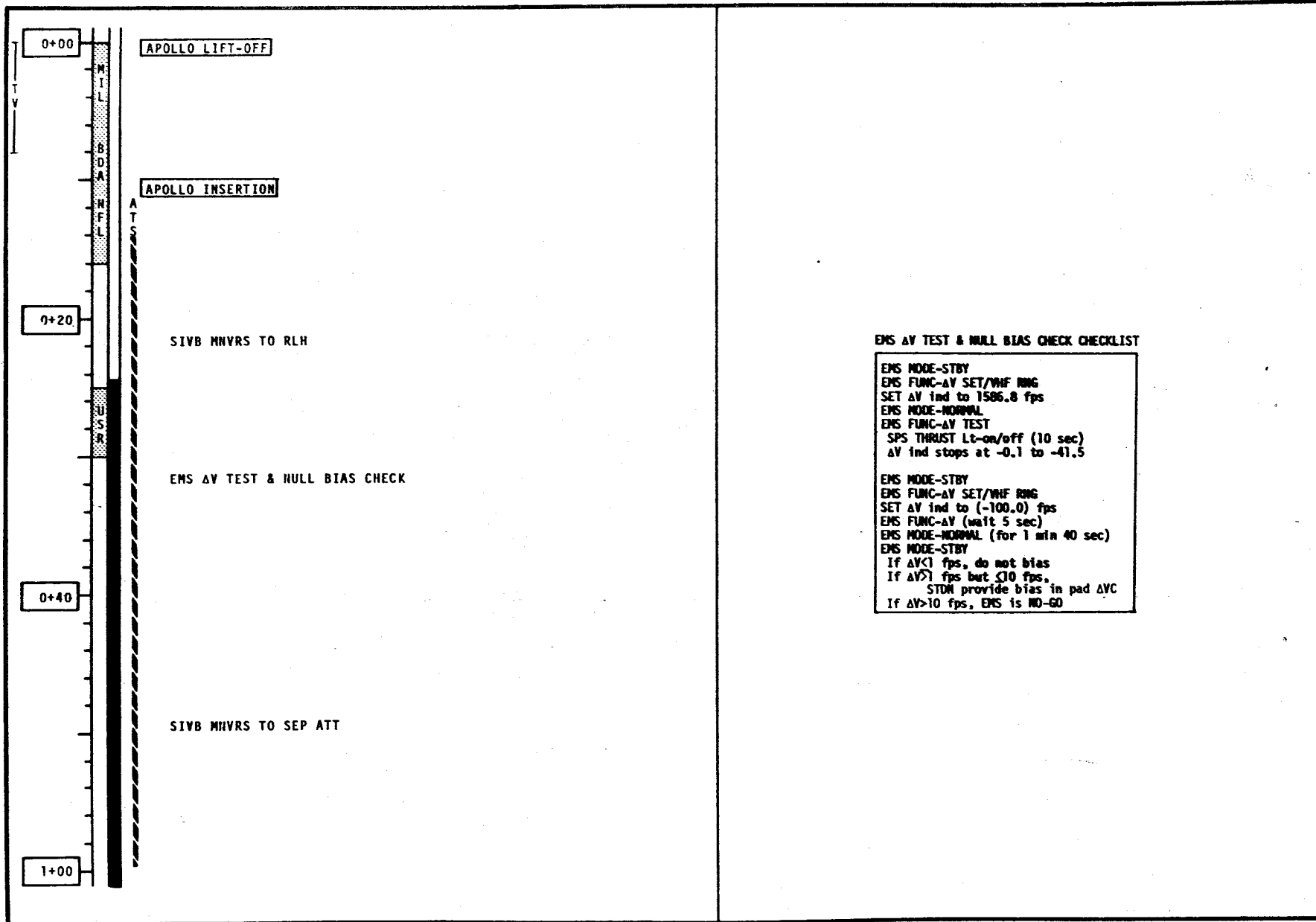
If Incorrect Load Discovered:

Record Address (Reg 3) And Correct Value.
Continue Verification.

To Correct EMP Load:

V21E1E
Load Recorded Address, ENTER
Load Correct Value, ENTER

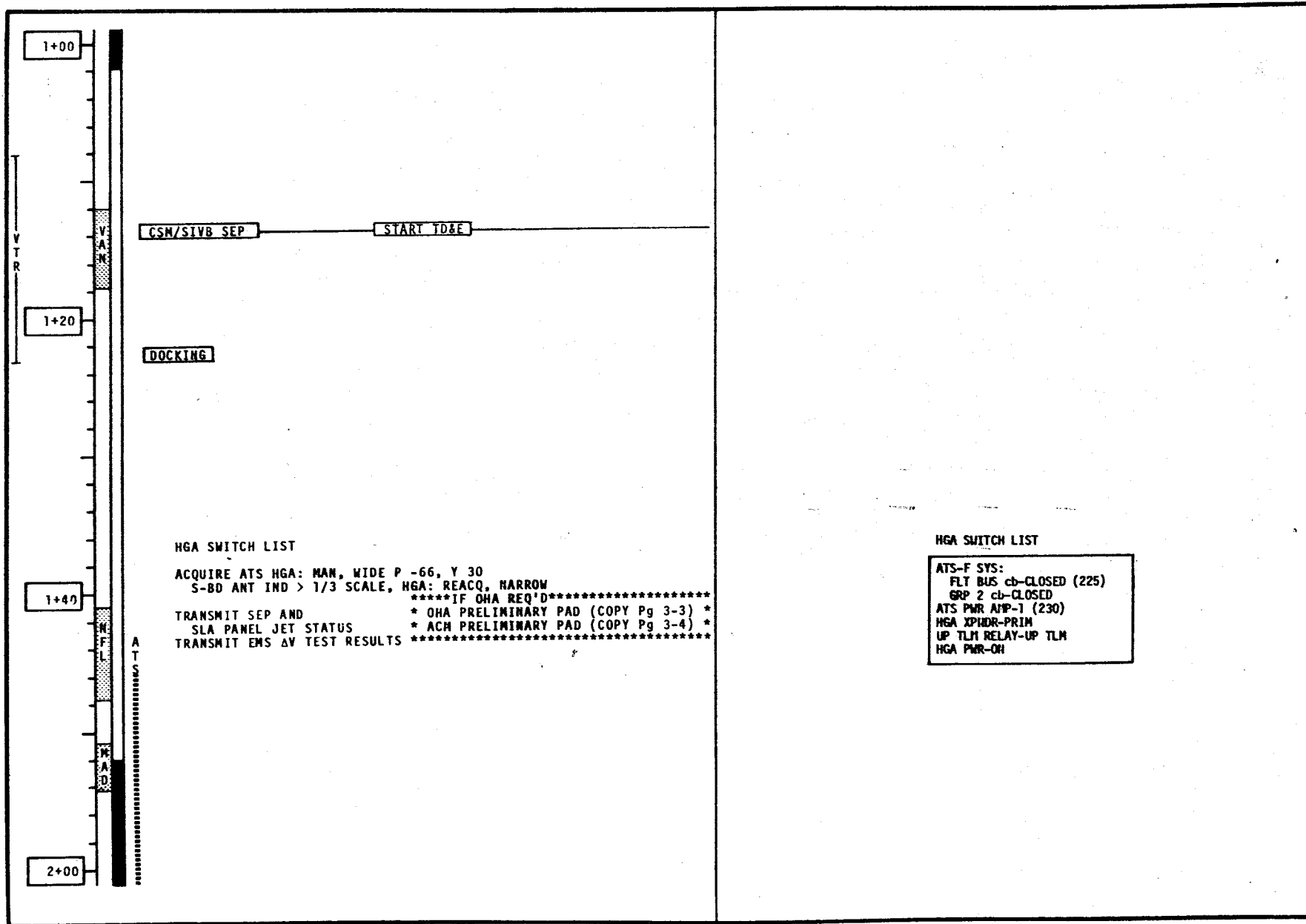
Key ENTER For Additional Corrections & Load Address & Value.



EMS ΔV TEST & NULL BIAS CHECK CHECKLIST

EMS MODE-STBY
 EMS FUNC-ΔV SET/WHF RING
 SET ΔV ind to 1586.8 fps
 EMS MODE-NORMAL
 EMS FUNC-ΔV TEST
 SPS THRUST Lt-on/off (10 sec)
 ΔV ind stops at -0.1 to -41.5

EMS MODE-STBY
 EMS FUNC-ΔV SET/WHF RING
 SET ΔV ind to (-100.0) fps
 EMS FUNC-ΔV (wait 5 sec)
 EMS MODE-NORMAL (for 1 min 40 sec)
 EMS MODE-STBY
 If ΔV < 1 fps, do not bias
 If ΔV > 1 fps but < 10 fps,
 STDN provide bias in pad ΔVC
 If ΔV > 10 fps, EMS is NO-GO



IMU FAILURE

IMU FAILURE

IMU FAILURE

IMU FAILURE

IMU FAILURE

IMU FAILURE

IMU FAILURE

2+00

2+20

0:00

2+40

3+00

SIVB MNVRS TO EXTRACTION ATT

RECORD GDC ATT

ALIGN GDC

POO

CSM/DH EXTRACTION

AEM

END TD&E

TV(2)/VTR POWER(3)-OFF
DSE:(LBR/RCD/FWD/CMD RESET)

UNSTOW CUE CARDS (DATA CARD KIT-R3)
PSM ACTIVATION (AFTER VAN AOS)
TRANSMIT EXTRACTION &
AEM STATUS
TRANSMIT GDC ATT

MNVR TO ACM NOMINAL
PAD ATT (Pg 3-4)

SNACK PERIOD

*****FOR M=14 RNDZ*****
* DP START PGA DOFFING (Pg 3-5), *
* THEN CP *
* AC START SNACK PERIOD, DOFF *
* AFTER ACM *

*****IF OHA REQ'D*****
* STDN UPLINK (P27) (CSM S.V. & *
* OHA TARGET LOAD) *
* OHA FINAL PAD (COPY) *
* *
* SET DET *
* SET ASCP tw TO OHA BURN ATT *
* *
* MNVR, LOAD N20 & *
* V41N91 TO PAD DATA *
* IF STAR NOT IN SXT FOV- *
* PERFORM HORIZ CK *
* IF HORIZ >5° OF MK-DO NOT BURN *
* *
* GO TO SPS BURN CUE CARD(SCS ↓) *
* (BANK A) *

OHA PAD DATA

		NOMINAL				PRELIMINARY				FINAL			
N33	HR	+	X	X	X	+	X	X	X	+	X	X	X
TIG	OHA MIN	+	X	X	X	+	X	X	X	+	X	X	X
	SEC	+				+				+			
N81	ΔV _X		X	X	X		X	X	X		X	X	X
ΔV _{CHA}	ΔV _Y	+		0	0	0	0			+		0	0
	ΔV _Z												
N22	R	+			0	0			+			0	0
OHA	P	+			0	0			+			0	0
	Y	+			0	0			+			0	0
	ΔV _C		X	X	X		X	X	X		X	X	X
	BT		X	X	X		X	X	X		X	X	X

WT	+	X	X	X	X	PT					YT				
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		BURN ATT CHECK				BURN ATT CHECK UPDATE								
STAR		X	X	X	X	STAR	X	X	X	X				
SA	+				0	SA	+						0	
TA	+				0	TA	+						0	0

HORIZON CK DATA: TIG MINUS _____ MIN, WINDOW MK _____ DEG

GDC ATT

GDC	R	X	X	X	X
ASCP	P	X	X	X	X
tw	Y	X	X	X	X

SPS BURN STATUS

ΔTIG	X	X	X	X
AFTER TRIM				
ΔVC	X	X	X	X

PSM ACTIVATION SWITCH LIST

MAN ATT(3)-MIN IMP
SM RCS QUAD He A,B,C,D-CLOSE, tb(4)-bp
SM RCS PRPLNT A,B,C,D-CLOSE, tb(8)-bp
SM RCS PSM He-OPEN, tb-gray
SM RCS PSM PRPLNT A,B,C,D-OPEN, tb(4)-gray
MAN ATT(3)-RATE CMD

3+00

GDCS

STDN UPLINK (P27) (CSM & SOYUZ S.V.'s)
ACM PRELIMINARY PAD (COPY)

OHA (. / .)

RECORD BURN STATUS (Pg 3-3)
P77 (VERIFY OHA PAD VALUES); P00
TRANSMIT OHA BURN STATUS
MNR TO ACM NOMINAL
PAD ATT (Pg 3-4)
CONT WITH NOMINAL PROCEDURES

ACQUIRE ATS HGA: MAN, WIDE P -78, Y 34
S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW
BACKUP GDC ALIGN PAD &
STAR ACQUISITION PAD
(COPY Pg 3-a)

P52 (OPT 3) (REF Pg 3-b) (RECORD)
(IF STARS NOT AVAILABLE
REF STAR ACQ PAD "B") (Pg 3-a)

STDN UPLINK (P27) (ACM TARGET LOAD)
ACM FINAL PAD (COPY)
TRANSMIT GYRO TORQUE ANGLES AND TIME
P00

SET DET

SET ASCP tw TO ACM BURN ATT

GO TO SPS BURN CUE CARD(SCS Δ)
(BANK A)

3+20

3+40

0:00

ACM (179,34/213,1)

RECORD BURN STATUS
P77 (VERIFY ACM PAD VALUES); P00
TRANSMIT ACM BURN STATUS

PGA DOFFING (Pg 3-5)

*****FOR M=14 RNDZ*****
* AC START PGA DOFFING (Pg 3-5) *
* CP & DP START SNACK PERIOD *

ACM PAD DATA

		NOMINAL				PRELIMINARY				FINAL			
N33	HR	+	0	0	3	+				+			
TIG	ACM MIN	+		4	5	+				+			
	SEC	+	0	0		+				+			
N81	ΔV _X	+	0	1	6	7							
ΔV _{ACM}	ΔV _Y	+	0	0	0	0							
	ΔV _Z	-	0	1	2	1							
N22	R	+	1	7	9	0	0		0	0		0	0
	P	+	2	1	3	0	0		0	0		0	0
	Y	+	0	0	1	0	0		0	0		0	0
	ΔV _C	+	0	0	8	1							
	BT	+	0	0	0	1							
	ΔVC AT IGN	+											
	ΔVC TAILOFF	-											
WT		+											
PT													
YT													

BURN ATT CHECK

STAR					
SA	+				0
TA	+				0 0

BURN ATT CHECK UPDATE

STAR					
SA	+				0
TA	+				0 0

P52 (OPTION 3)

N71 1ST STAR		0	0	0	
N71 2ND STAR		0	0	0	
N05(R1) § ERR					
N93	X				
	Y				
	Z				
GYRO TORQUING ANGLES					
HR	+	0	0		
TIME OF GDC ALIGN	MIN	+	0	0	0
	SEC	+	0		

SPS BURN STATUS

ΔTIG					
AFTER TRIM					
ΔVC					

4+00	S T S	<p>*****FOR M=14 RNDZ***** * PRE-DOCKING DM CHECKOUT (D/1-1) * * STEP 1 THRU STEP 7 * *****</p>	PGA DOFFING														
4+20	O R R	<p>STDN UPLINK (P27) (CSM S.V.) NC1 PRELIMINARY PAD (COPY Pg 3-6) NPC ADVISORY</p>	<p>POWER - OFF (6,9,10) AUDIO COM1 - NORM (6,9,10)(verify) SUIT POWER - OFF (6,9,10)</p> <p>UCTA doffing: If unused, doff UCTA, discard cuff If used, doff UCTA, install clamp (R11), drain per S/1-27 Stow UCTAs in accessory bags</p> <p>Doff comm carrier, stow in TSB Discon all umbilicals from PGA & stow Suit Flow V1vs (3) - SUIT FILL FLOW(verify) Stow PGAs in PGA bags(U2) Stow PGAs: AC under left couch (A3), CP under left couch (A3), CP head of center couch under side hatch</p> <p>Unstow 3 O2 hose screen caps and 3 PGA elect connector covers (A5)</p> <p>Install screen caps on CM return hoses(red) Install elect connector caps on PGAs</p> <p>Stow life vests in F1 Stow loose shoulder and leg pkt items as desired in TSB top pkt Stow wristlets and comfort gloves in PGA zipper kit</p> <p>Doff PGA - discon elect and urine connections inside PGA</p> <p>Secure PGA elect harness at neckring Install helmets & gloves on PGA Install helmet bags on helmets Secure accessory bags to helmet bags</p> <p>OBS doffing: Discon connector from sig conditioners Remove electrodes from chest Discard tape disks and tape rings</p> <p>Clean electrodes with tissue (A2) Stow harness and biobelt in accy bags</p> <p>Configure comm: For comm carrier or headset use - Don CHG harness (U2 or temp stowed) Conn CM elect to CHG harness Don comm carrier or light wt headset as reqd., connect to CHG harness SPKR/HDST-HEADSET (98) (verify)</p> <p>For SPEAKER Box use (Pn1 98): POWER-ON SPK/HDST-SPEAKER VOL tw-as desired</p> <p>POWER - AUDIO/TONE (6,9,10) SUIT POWER - ON (up) (6,9,10)</p>														
4+40	H A W	<p>ACQUIRE ATS HGA: MAN, WIDE P -55, Y 45 S-BD ANT IND > 1/3 SCALE, HGA: REACQ, HARROW</p>															
5+00	N F L	<p>NC1 FINAL PAD (COPY Pg 3-6) NPC PRELIMINARY PAD (COPY Pg 3-7)</p> <p>TRANSMIT DM/CM ΔP (1ST OPP ONLY)</p> <p>STDN UPLINK (P27) (NC1 TARGET LOAD)</p> <p>BIOSTACK-ON (MA 107) (R1) RECORD GET & INDICATOR STATUS (Pg 3-5)</p>	<p>BIOSTACK PAD</p> <table border="1"> <tr> <td>GET</td> <td>HR</td> <td></td> <td></td> <td>IND</td> <td>LT</td> <td>ON</td> </tr> <tr> <td></td> <td>MIN</td> <td></td> <td></td> <td></td> <td></td> <td>OFF</td> </tr> </table>	GET	HR			IND	LT	ON		MIN					OFF
GET	HR			IND	LT	ON											
	MIN					OFF											

5+00

5+20

-12:00

5+40
0:00

6+00

ZFF PHOTOS (J/10-1)

SET DET

P52 (OPT 3) (REF Pg 3-b) (RECORD)
(IF STARS NOT AVAILABLE
REF STAR ACQ PAD "B") (Pg 3-a)

P00

MNVR TO STDN NC1 BURN (PITCH) ATT

SET ASCP ϵ_w TO NC1 BURN ATT

GO TO SPS BURN CUE CARD(SCS Δ)
(BANK B)

NC1 (181,358/59,0)

RECORD BURN STATUS
P77 (VERIFY NC1 PAD VALUES); P00

IF NPC NOT REQ'D
MNVR TO SI +X FWD ATT
(ATT = 12,14,332)

CP CM HEIGHT & LEG VOLUME
MEASUREMENTS (1ST OPP ONLY)
AC & DP (IF TIME PERMITS)
RECORD (EXP C/L Pgs 1-59/51)

TRANSMIT NC1 BURN STATUS
TRANSMIT GYRO TORQUE ANGLES
AND TIME

*****IF NPC REQ'D*****
* MNVR TO PRE-NPC ATT (180,160,0) *

*****FOR M-14 RNDZ*****
* PRE-DOCKING DM CHECKOUT (D/1-2) *
* STEP 8 THRU COMPLETION *
* (IF NPC REQ'D, PERFORM AS MANY *
* COMPLETE STEPS BEFORE NPC AS *
* POSSIBLE, CONTINUE AFTER NPC) *

*****FOR M-14 RNDZ*****
* CHARGE BATT A (AFTER HAW AOS) *

NC1 PAD DATA

		NOMINAL				PRELIMINARY				FINAL			
N33	HR	+	X	X	0 0 5	+	X	X		+	X	X	
TIG NC1	MIN	+	X	X	4 1	+	X	X		+	X	X	
	SEC	+	X	X	2 8	+	X	X		+	X	X	
NB1	ΔV_x	+	X	X	0 6 6 3	+	X	X		+	X	X	
ΔV_{NC1}	ΔV_y	+	X	X	0 0 0 0	+	X	X		+	X	X	
	ΔV_z	+	X	X	0 0 0 2	+	X	X		+	X	X	
N22	R	+	1	8	1 0 0	+			0 0	+			0 0
NC1	P	+	0	5	9 0 0	+			0 0	+			0 0
	Y	+	0	0	0 0 0	+			0 0	+			0 0
	ΔV_C	X	X	X	0 5 3 7	X	X	X		X	X	X	
	BT	X	X	X	0 0 0 3	X	X	X		X	X	X	

WT	+	X	X	X	X
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PT				
----	--	--	--	--

YT				
----	--	--	--	--

BURN ATT CHECK					
STAR	X	X	X	X	
SA	+				0
TA	+				0 0

BURN ATT CHECK UPDATE					
STAR	X	X	X	X	
SA	+				0
TA	+				0 0

SPS BURN STATUS

ΔTIG	X	X		
AFTER TRIM				
ΔVC	X			

P52 (OPTION 3)

N71 1ST STAR	X	0	0	0	
N71 2ND STAR	X	0	0	0	
N05(R1) } ERR	X				
N93	X				
GYRO TORQUING ANGLES	Y				
	Z				
HR	+	0	0		
MIN	+	0	0	0	
SEC	+	0			

UVA LAMP TURN ON PAD (FOR M-14 RNDZ)

GET HR		
MIN		

NPC PAD DATA

		PRELIMINARY				FINAL			
N33	HR	+	X	X	X	+	X	X	X
TIG NPC	MIN	+	X	X	X	+	X	X	X
	SEC	+	X	X	X	+	X	X	X
N81	ΔV_X								
ΔV_{NPC}	ΔV_Y								
	ΔV_Z								
N22	R	+		0	0	+		0	0
NPC	P	+		0	0	+		0	0
	Y	+		0	0	+		0	0
	ΔV_C								
	BT								

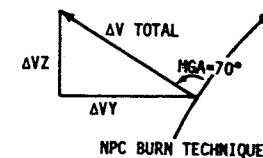
WT	+	X	X	X	X	PT					YT				
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		BURN ATT CHECK			
STAR		X	X	X	X
SA	+				0
TA	+				0 0

		BURN ATT CHECK UPDATE			
STAR		X	X	X	X
SA	+				0
TA	+				0 0

P52 (OPTION 3)

N71 1ST STAR	X	0	0	0	
N71 2ND STAR	X	0	0	0	
N05(RT) } ERR	X				
N93	X				
GYRO TORQUING ANGLES	Y				
	Z				
HR	+	0	0		
TIME OF GDC ALIGN	MIN	+	0	0	0
	SEC	+	0		



IF NPC NOT REQ'D
 SET HGA: MAN P -54, Y 265
 S-BD ANT IND > 1/3 SCALE
 HGA: REACQ, NARROW

STDN UPLINK (P27) (NOMINAL RNDZ REFSMMAT)
 P52 (OPT 3)(REF Pg 3-b)(RECORD)

P52 (OPT 1; COARSE ALIGN)
 (REF Pg 3-b)

POO
 VERIFY SI +X FWD ATT
 (ATT = 18,170,330)

TRANSMIT GYRO TORQUE ANGLES AND TIME

*****IF NPC REQ'D*****
 SET HGA: MAN P -51, Y 96
 S-BD ANT IND > 1/3 SCALE
 HGA: REACQ, NARROW

STDN UPLINK (P27 (CSM S.V. & NPC TARGET LOAD)
 NPC FINAL PAD (COPY)
 SET DET
 P52(OPT 3)(REF Pg 3-b)(RECORD)

POO
 NOTE: GDC OUT-OF-PLANE REALIGN NOT REQ'D FOR NPC

SET ASCP tw TO NPC BURN ATT

GO TO SPS BURN CUE CARD(SCS Δ) (BANK A)

NPC

RECORD BURN STATUS (Pg 3-8)
 P77 (VERIFY NPC PAD VALUES);POO

MNVR TO SI +X FWD ATT
 (ATT = 12,14,332)

START EAT PERIOD

6+00

6+20

6+40

7+00

A
 T
 C
 M

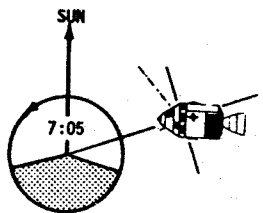
7+00

7+20

7+40

15+30

*****FOR M=14 RNDZ*****
 * CONTINUE PRE-DOCKING DM CHECKOUT *



*****IF NPC EXECUTED*****
 * STDN UPLINK (P27) (NOMINAL RNDZ
 REFSMMAT)
 * TRANSMIT NPC BURN STATUS *
 * * * * *

SET HGA: MAN P -29, Y 259
 HGA: REACQ, NARROW
 PWR DOWN CHECKLIST (Pg 3-8)
 DIRECT O2 VLV-CLOSE(cw)

PRESLEEP (S/1-49)

STDN UPLINK(P27)(LIFT-OFF TIME)
 SYNC MISSION TIMER TO CMC
 CLOCK (V16N65) UPON STDN CUE
 STDN UPLINK (P27) (ATS S.V. &
 HGA EMP) (1ST OPP ONLY)

GO TO FLIGHT PLAN (Pg 4.1-6)

SPS BURN STATUS

ATIG	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AFTER TRIM									
AVC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

P52 (OPTION 3)

N71 1ST STAR	<input checked="" type="checkbox"/>	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N71 2ND STAR	<input checked="" type="checkbox"/>	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N05(R1) } ERR	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N93	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GYRO TORQUING ANGLES	Y	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Z	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TIME OF	HR	+	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GDC	MIN	+	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ALIGN	SEC	+	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PWR DOWN CHECKLIST

OHC-DRIVE TRUN <10 DEG
 OPTICS ZERO-ZERO
 G/N PWR OPTICS-OFF

UVA LAMPS SHUT DOWN CHECKLIST
 (FOR M=14 RNDZ)

VERIFY > 2 HR SINCE UVA LAMP BURN IN GET
 (RECORDED Pg 1-6)
 UVA ABSORPTION LAMPS-OFF
 UVA ABSORPTION POWER-OFF
 DISCONNECT UVA CABLE
 REATTACH DUST CAPS
 STOW CABLE (A1)

46+30

Y
A
H

STON UPLINK (P27) (CSM & SOYUZ S.V.'s)
 STAR ACQUISITION PAD (COPY Pg 3-a)
 NC2 PRELIM PAD & TPI TIG (N37) (COPY Pg 3-12)

*****IF REFSMHT REALIGN REQ'D*****
 * STON UPLINK(P27)(RNDZ REFSMMAT) *
 * BACKUP GDC ALIGN PAD (COPY Pg 3-2) *
 * RNDZ/RNDZ REALIGN PAD (COPY Pg 2-a) *
 * * * * *

OPTICS PWR UP CHECKLIST (Pg 3-9) * OPTICS PWR UP CHECKLIST (Pg 3-9) *
 P52 (OPT 3)(REF Pg 3-b)(RECORD) * P52 (OPT 3)(REF Pg 3-b)(RECORD) *
 * * * * *

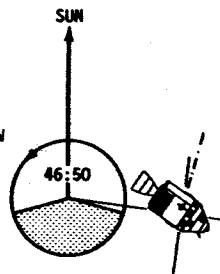
P00

* P52 (OPT 1: COARSE ALIGN) (REF Pg 3-b)
 * * * * *

* P00

46+40

ACQUIRE ATS HGA: MAN, WIDE P 13, Y 230
 S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW



L10H CANISTER CHANGE (6 INTO B, STOW 4 IN A4)

*****FOR M-14 RNDZ*****
 * STON 2 IN A4)
 * * * * *

46+50

A
T
S

47+00

OPTICS PWR UP CHECKLIST

VERIFY OPTICS MANUAL DRIVE DISENGAGED
 OPTICS ZERO-OFF
 OPT MODE-MAN
 G/N PWR OPTICS-OH(up)
 OHC-DRIVE TRUN <10 DEG
 OPT ZERO-ZERO (15 SEC)

P52 (OPTION 3)

N71 1ST STAR	<input checked="" type="checkbox"/>	0	0	0		
N71 2ND STAR	<input checked="" type="checkbox"/>	0	0	0		
N05(R1) ↓ ERR	<input checked="" type="checkbox"/>					
N93	X					
GYRO TORQUING ANGLES	Y					
	Z					
TIME OF GDC ALIGN	HR	+	0	0		
	MIN	+	0	0	0	
	SEC	+	0			

47+00

TV CHECKLIST (Pg 3-10)

CM2/DAC/25/CX02-BRKT, MIR (f8,1/250,∞) 2 FPS
UTILITY POWER-ON

FURNACE SHUT DOWN (D/7-6) (1ST OPP ONLY)

TV- GRD CMD
47+10 - 47+37

*****FOR M=14 RNDZ*****
* BIOSTACK-OFF (MA 107) (R1) *
* RECORD GET & INDICATOR STATUS *
* GET HR [] [] [] IND LT ON [] *
* MIN [] [] [] OFF [] *

DM CLOSEOUT

DP TRANSFER TO DM
OPEN cb CAUT/WARN DMB (815)
DM1 & DM2 TV STA PWR-OFF (808)
DP TRANSFER TO CM
TERMINATE CM-DM ATMOSPHERE MIXING
INSTALL HATCH 1 (DECAL) (S/2-9)
HATCH 1 PRESSURE EQUALIZATION
VLV-CLOSE(cw)/LOCK(verify)

END MANUAL HEAT SOAK AND
PERFORM HELIUM INJECTION(D/7-5)
(1ST OPP ONLY)

*****FOR M=14 RNDZ*****
* cb VHF FM XCVR DMA-CLOSE(verify)*
* (PNL 815) *
* VHF FM-T/R (verify) (6) *
* DP PERFORM MCC-H/MCC-H/APOLLO *
* COMM CHECK *

ZFF PHOTOS (J/10-1)

47+10

47+20

47+30

TV CHECKLIST

Remove TV camera and U-mount (location 11)
Position U-mount X, Y, Z - 105, 190, 65
Remount camera (location 11) (pin in hole 4)
Install polarized filters on couch lights and camera
On TV camera at location 606:
Verify camera - PEAK, SLAVE, LINEAR
Note: Select AVG if white content of scene
rises above approx 10%
Verify lens (F, ZOOM, FOC) - 22, 100, infinity
(Adjust ZOOM as range requires)
On pnl 181:
CM/DM CAMR POWER-ON(up)(verify)
TV AMPL-ON
CM1 TV STA POWER-ON
CM2 TV STA POWER-ON
On pnl 808:
DM1 TV STA POWER-ON
DM2 TV STA POWER-ON
Check monitors, adjust camera pointing and
lens if required



CM CAMR 1



DM CAMR 1



DM CAMR 2

47+30

U.S. AIR FORCE

47+40

H2 PURGE LINE HTR-ON(up)

P32; BYPASS MINKEY OPTION
LOAD N28 PAD VALUE (Pg 3-12)
VERIFY N37 = PAD VALUE (Pg 3-12)

P32 (RECYCLE: RECORD Pg 3-12)

P00

47+50

48+00

H2/O2 FUEL CELL PURGE (S/1-6)
(20 MIN AFTER LINE HTR-ON)

P52 (OPTION 3)

N71 1ST STAR	X	0	0	0		
N71 2ND STAR	X	0	0	0		
N05(R1) § ERR	X					
N93	X					
GYRO TORQUING ANGLES	Y					
	Z					
TIME OF GDC ALIGN	HR	+	0	0		
	MIN	+	0	0	0	
	SEC	+	0			

COAS LOS DETERMINATION CHECKLIST

- COAS PMR-ON(up)
MNR TO BORESIGHT ATTITUDE
MAN ATT(3)-MIN IMP
BORESIGHT ON STAR AND OBTAIN EXACT BORESIGHT ATTITUDE FROM ASCP tw (with FDAI 1 ERROR NEEDLES ZEROED)
LOAD N20 WITH ASCP tw VALUES
MAN ATT(3)-RATE CMD
- F 04 06 V37E52E
R1 00001
R2 00003
PRD
F 50 25 00015
ENTER
F 01 70 000DE STAR CODE
Load STAR CODE
OPT MODE-CMC(verify)
OPT ZERO-OFF
PRD
06 92 SHAFT,TRUM
RECORD SHAFT,TRUM
(NOMINAL = 0°, +57.470°)
- V37E00E
OPT MODE-MAN
OHC-Drive trun<10°
OPT ZERO-ZERO

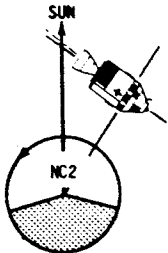
COAS LOS DETERMINATION

N92	SA	+					
	TA	+					

SUN

48:00

SOYUZ MNVRS TO ORBITAL ATTITUDE RATE



48+30

0:00

48+40

48+50

49+00

NC2 (0,182/34,0) (R=263.3 NM)

RECORD BURN STATUS
P77 (VERIFY NC2 PAD VALUES)
TRANSMIT NC2 BURN STATUS
TRANSMIT GYRO TORQUE ANGLES AND TIME (Pg 3-11)
P33

ROLL LEFT TO 180°, THEN
PITCH DOWN ~ 145° TO TRACK HORIZON
(ATT ~ 180,175,0)

DP ESTABLISH VHF AM & FM COMM WITH SOYUZ (PERFORM
CHECKS FROM PANEL 6 ONLY)

SET DET

DP PERFORM VHF AM COMM CK

TV- GRD CMD
48+50 - 49+00

VHF AM SPEC RANGE
= 196 NM

VHF AM AND FM COMM

<p>VHF FM-T/R (6) VHF AM-T/R VHF FM-T/R (9) VHF AM-T/R VHF AM A-SIMPLEX (3) VHF AM SQUELCH A tw-noise + 1 VHF ANTENNA-RIGHT MODE-VOX (10) VOX SENS tw-3 VHF FM-RCV</p>	<p>VHF FM tw-5 S BAND-T/R S BAND tw-full decrease POWER-AUDIO MASTER tw-5 INTERCOM-T/R INTERCOM tw-full decrease VHF AM-OFF AUDIO CONTROL-BACKUP PHONE/MIC CONNECT-ON</p>
--	---

◀ This is Apollo. Я АПОЛЛОН.
◀ How do you read? РАК БИ СТЕБИТЕ?

* If no comm, repeat *
* statements until comm *
* established. If still *
* no comm by (TBD) GET, *
* inform MCC. *

VHF AM COMM CHECK 48+59

◀ Configure for VHF AM check. ГОТОВЬТЕСЬ К ПРОВЕРКЕ СВЯЗИ НА УКВ АМ.
VHF FM-OFF
◀ This is Apollo on VHF AM. Я АПОЛЛОН НА УКВ АМ.

* If no comm, repeat *
* statement until comm *
* established. If still *
* no comm, inform MCC. *

VHF FM COMM CHECK 49+08

◀ Configure for VHF FM check. ГОТОВЬТЕСЬ К ПРОВЕРКЕ СВЯЗИ НА УКВ ЧМ.
VHF FM-T/R (6)
VHF AM-OFF
◀ This is Apollo on VHF FM. Я АПОЛЛОН НА УКВ ЧМ.

* If no comm, repeat *
* statement until comm *
* established. If still *
* no comm, inform MCC. *

VHF RANGING COMM CHECK 49+23

◀ Turn on VHF ranging. ВКЛЮЧИТЕ ИЗМЕРЕНИЕ ДАЛЬНОСТИ.

VHF AM A-OFF(ctr)
VHF AM B-DUPLEX
VHF RANGING-ON(up)
VHF ANTENNA-RIGHT(verify)
EIS FUNC-AV SET/VHF RNG
EIS MODE-BACKUP/VHF RNG
VHF RNG-RESET

◀ Ranging lockup established. РЕЖИМ ИЗМЕРЕНИЯ ДАЛЬНОСТИ УСТАНОВЛЕН.
◀ Range miles. ДАЛЬНОСТЬ _____ МИЛЬ.

VHF FM-OFF(6)
VHF AM-T/R
◀ This is Apollo on VHF ranging. Я АПОЛЛОН НА РЕЖИМЕ ИЗМЕРЕНИЯ ДАЛЬНОСТИ.

* If no comm, *
* VHF FM-T/R (6) *
* Continue nominal RNDZ *
* procedures, inform MCC. *

◀ VHF AM and FM comm checked. ПРОВЕРИЛ СВЯЗЬ УКВ ЧМ И АМ.
VHF FM-T/R (6)

* If ranging lockup is lost, *
* Your voice degrading ranging lockup. ПОЛОЖИТЕ РУЧКУ В РЕЖИМ *
* VHF RNG-RESET (1) ИЗМЕРЕНИЯ ДАЛЬНОСТИ. *
* Ranging lockup established. РЕЖИМ ИЗМЕРЕНИЯ ДАЛЬНОСТИ УСТАНОВЛЕН. *

NCC FINAL PAD (COPY)
NSR FINAL PAD (COPY Pg 3-15)

P33 (FINAL COMP: RECORD)
(LOAD STDN SOLUTION)

DP PERFORM VHF FM COMM CK

P40, P00
GO TO SPS BURN CUE CARD(SCS Δ)
(BANK A)

NCC

NCC (180,349/21,359) (R=145.5 NM)
RECORD BURN STATUS
P77 (LOAD CMC COMPUTED ΔVY)
P34, V32E(RECYCLE : RECORD)(Pg 3-15)
PITCH UP TO TRACK HORIZON
REPORT COMM CHECK RESULTS
TRANSMIT NCC BURN STATUS
V76E (LOAD N72 WITH TIG NSR-28)
V67E; LOAD N99 WITH +10000, +100, +1; PRO
SET DET
←NCC completed. NCC ENJOYHEH.
DP PERFORM VHF RANGING VOICE CHECK WITH SOYUZ

V87E (START VHF MARKING)
R HP-65 DATA FOR NSR-28

NCC PAD DATA

		NOMINAL			PRELIMINARY			FINAL		
N11	HR	+	0	4	9	+			+	
TIG	NCC MIN	+			1	8			+	
	SEC	+	0	3					+	
N81	ΔV _X	+	0	3	9	6				
	ΔV _Y	-	0	0	0	6				
	ΔV _Z	+	0	0	6	4				
N22	R	+	1	8	0	0	0		+	0
	NCC	+	0	2	1	0	0		+	0
	P	+	0	2	1	0	0		+	0
	Y	+	3	5	9	0	0		+	0
	ΔV _C		0	2	7	4				
	BT		0	0	0	2				
WT		+							PT	
									YT	

BURN ATT CHECK

STAR					
SA	+				0
TA	+				0

BURN ATT CHECK UPDATE

STAR					
SA	+				0
TA	+				0

NCC ONBOARD DATA

XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X N81 COMP LIMITS HA X
X STON SOLN PRIME X
X IF STDN SOLN NOT AVAILABLE X
X DO NOT BURN NCC X
XXXXXXXXXXXXXXXXXXXXXXXXXXXXX

SPS BURN STATUS

ΔTIG					
AFTER TRIM					
ΔVC					

P33 FINAL COMP

N82	ΔV _X	0			
	ΔV _{NSR}	ΔV _Y	0		
	ΔV _Z	0			
N81	ΔV _X	0			
	ΔV _{NSR}	ΔV _Y	0		
	ΔV _Z	0			

N13 (TIG NSR)					
		2	8		
N72					

VHF FM SPEC RANGE = 162 NM

VHF RANGING SPEC RANGE = 144 NM

XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X UNREASONABLE UPDATE X
X 1.00 NM, 6.0 FPS X
XXXXXXXXXXXXXXXXXXXXXXXXXXXXX

IMU FAILURE IMU FAILURE IMU FAILURE IMU FAILURE IMU FAILURE IMU FAILURE IMU FAILURE

49+30

VHF

-24:00

R HP-65 DATA FOR NSR-24
PITCH UP 15° (TO MAINTAIN VHF LOCK-ON)
P52 (OPT 3) (REF Pg 3-b)(RECORD Pg 3-16)

XXXXXXXXXXXXXXXXXXXXXXXXX
X UNREASONABLE UPDATE X
X 1.00 NM, 6.0 FPS X
XXXXXXXXXXXXXXXXXXXXXXXXX

-20:00

R HP-65 DATA FOR NSR-20

WHEN P52 COMPLETE: P34, V87E;
CONTINUE TO TRACK HORIZON

-16:00

R HP-65 DATA FOR NSR-16

49+40

VHF

-12:00

R HP-65 DATA FOR NSR-12
V77E (TERMINATE VHF RANGE RATE PROCESSING ROUTINE)
P34 (FINAL COMP: RECORD)
(LOAD ΔVX & ΔVZ, IF REQ'D, & STDN ΔVY)
V25N20E (LOAD PAD BURN ATT)

GO TO SPS BURN CUE CARD(SCS Δ)
FOR HP-65 OR CMC SOLUTION:
IN P40 AT F50 18, RECORD BURN ATT

N18	R								
BURN ATT	P								
ATT	Y								
N40	ΔV _T	+							
ΔV TAIL OFF	-				1	3	0		
ΔV _C	+								

15

49+50

A

16:00

A

6:00

NSR (176,307/188,357) (R=81.0 NM)

RECORD BURN STATUS
P77 (LOAD CMC COMPUTED RECYCLE ΔVY)
TRANSMIT NSR BURN STATUS
←NSR completed. NSR BURN ATT
ACQUIRE ATS HGA: MAN, WIDE P -19, Y 308
S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW

P35
V22N78E,+E; V16H22E (+X-AXIS TRACK ATT)
TRACK SOYUZ IN BOTTOM OF CDR WINDOW (ATT ~ 180,212,0)

ATT

50+00

NSR PAD DATA

TIG NSR(N13)=TIG MCC(N11) + 00:37:00= _____ : _____ : _____

		NOMINAL					PRELIMINARY					FINAL							
NS1	ΔV _X	-			0	1	7	0											
ΔV _{NSR}	ΔV _Y	-			0	0	1	4											
	ΔV _Z	+			0	2	1	2											
N22	R	+			1	7	6	0	0										
NSR	P	+			1	8	8	0	0										
	Y	+			3	5	7	0	0										
	ΔV _C				0	1	4	5											
	BT				0	0	0	1											
	ΔVC AT IGN	+																	
	ΔVC TAILOFF	-																	

WT + [X][X][X][X][X] PT [][][][][] YT [][][][][]

BURN ATT CHECK					BURN ATT CHECK UPDATE				
STAR					STAR				
SA	+			0	SA	+			0
TA	+			0	TA	+			0

NSR ONBOARD DATA

P34 RECYCLE					P34 FINAL COMP				
N75	ΔH _{NSR}	+	0	0	+	0	0		
	ΔT(NSR/TPI)	+		B			B		
	ΔT(TPI/TPI)			B			B		
N81	ΔV _X	0			0				
ΔV _{NSR}	ΔV _Y	0			* S T D N *				
	ΔV _Z	0			0				

XX

X N81 COMP LIMITS NA X

X USE STDN ΔVY IN ALL CASES X

X BURN STDN MACHED PAIR SOLN X

X IF MCC EXECUTION IS QUESTIONABLE-THE ORDER X

X OF PRIORITIES ARE: X

X HP-65 X

X CMC UNMACHED X

X STDN UNMACHED X

X DO NOT BURN HSR X

XX

NSR HP-65 SOLN				
ΔV _X				
ΔV _Y	* S T D N *			
ΔV _Z				

SPS BURN STATUS

ΔTIG	[X][X][][][]
AFTER TRIM	[][][][][][][][][]
ΔVC	[][][][][][][][][]
TRANSMIT BURN ATT & ΔVC LOADED	[][][][][][][][][]

50+00

50+10

50+20

50+30

-53:00

-32:00

VHF

REMOVE POLAR PLOT
SNACK PERIOD

V32E (1ST P35 RECYCLE: RECORD),(RECORD N37)
REF TPI EARLY/LATE LOGIC
REACQUIRE VHF RANGING (R=74 NM) FOR SV UPDATING AND HP-65 DATA

V87E (START VHF MARKING)
SET DET

V76E (LOAD N72 WITH HP-65 TPI TIG 1-32)

XXXXXXXXXXXXXXXXXXXXX
X UNREASONABLE UPDATE X
X 0.50 NM, 3.0 FPS X
XXXXXXXXXXXXXXXXXXXXX

TV- GRD CMD
50+12 - 50+22

TPI PRELIMINARY PAD (COPY Pg 3-17)
DOCKING ATTITUDE PAD (COPY Pg 3-19)
TRANSMIT GYRO TORQUE ANGLES AND TIME (Pg 3-16)

R HP-65 DATA FOR TPI-32 (GET)

*****TPI EARLY/LATE LOGIC*****

* 1ST RECYCLE

* IF 2 SOLUTIONS INDICATE TIG SLIP>+8 MIN FROM PRE-NC2 N37(Pg 3-12)

* ADJUST LOCATION OF 2ND RECYCLE +8 MIN

* 2ND RECYCLE

* IF CMC SOLUTION INDICATES TIG SLIP>+10 MIN FROM PRE-NC2 N37:

* USE CMC TIG OPTION:
RECALL P35, PRO TO N37, LOAD PRE-NC2 N37+10 MIN
PRO TO N55, SPECIFY TIG OPTION (V22E, +E)

* CONTINUE HP-65 SOLUTION FOR FINAL ΔV COMPARISON

* AT FINAL COMP-USE NOMINAL COMPARISON LOGIC
IF ALL COMPARISONS DISAGREE-BURN THE SOLUTION
WHOSE TIG (CMC 2ND RECYCLE, STDN PREL PAD)
COMPARES CLOSEST WITH HP-65 TPI TIG 2.

P52 (OPTION 3)

N71 1ST STAR	X	0	0	0		
N71 2ND STAR	X	0	0	0		
N05(R1) ERR	X					
N93	X					
GYRO TORQUING ANGLES	Y					
	Z					
TIME OF GDC ALIGN	HR	+	0	0		
	MIN	+	0	0	0	
	SEC	+	0			

HP-65 TPI TIG 1									
			3	2					
N72									

TPI TIG (N37)

PRE-NC2 (Pg 3-12)									
RECYCLES	1ST								
	2ND								
HP-65 TPI TIG 2									

1ST P35 RECYCLE					2ND P35 RECYCLE				
N37	HR	+	0	0					
TIG TPI	MIN	+	0	0	0				
	SEC	+	0						
N58	ΔV TPI	+	0	0					
	ΔV TPF	+	0	0					
ΔT(TPI/TPI)				B			B		
N81	ΔV X		0	0					
ΔV TPI	ΔV Y	*	S	T	D	N	*		
	ΔV Z		0	0					
V16N59	ΔV F		0	0					
ΔV (LOS)	ΔV R		0	0					
	ΔV D		0	0					

51+00 SM RCS QUAD HTRS(4)-OFF(ctr)(274)

XXXXXXXXXXXXXXXXXXXXX
X UNREASONABLE UPDATE X
X 0.50 NM, 3.0 FPS X
XXXXXXXXXXXXXXXXXXXXX

+7:30 R HP-65 DATA FOR TPI+7:30

+8:30 R AND θ HP-65 DATA FOR TPI+8:30

+9:00 PRO (P36 FINAL COMP: RECORD)
(LOAD N59 R2 WITH +ZERO)
P41; P00; THC PWR-ON(up)
BURN WITH SOYUZ BORESIGHTED IN COAS
(ΔV_F RCS WITH EMS) (ΔV_D TIMED RCS)

+12:00 **TPM1**
P77
P36, V25N33E (LOAD TPI TIG)
REACQUIRE VHF RANGING (R=8 NM)

+15:00 **TPM1**
RCS X AXIS
1 FPS=2.50 SEC
RCS Y&Z AXIS
1 FPS=5.00 SEC

+15:00 Turn on your orientation lights. ВКЛЮЧИТЕ ВАШИ ОПНН ОРИЕНТАЦИОН.
51+10 V87E (START VHF MARKING)

+16:30 θ HP-65 DATA FOR TPI+16:30

+19:30 R HP-65 DATA FOR TPI+19:30

+20:30 R AND θ HP-65 DATA FOR TPI+20:30

+21:00 PRO (P36 FINAL COMP: RECORD)(HP-65 SOLN PRIME)
(LOAD N59 R2 WITH +ZERO)(LOAD R1 & R3 WITH HP-65 SOLN)
P00; THC PWR-ON(up)
BURN WITH SOYUZ BORESIGHTED IN COAS
(ΔV_F RCS WITH EMS) (ΔV_D TIMED RCS)

+24:00 **TPM2**
P77
REACQUIRE VHF RANGING (R=2 NM)

51+20 STOW HP-65 KIT(U1) & CHECKLIST(R1)
P25; LOAD N72 WITH +ZERO
(MONITOR LOS RATES AND RANGE RATE)
(N77=R,R,-00001)(R,R FROM R27 VHF RANGING FILTER)
PRE-BRAKING SWITCH LIST (Pg 3-18)

VTR/DAC SWITCH LIST (Pg 3-18)
NULL LOS RATES AND ADJUST RANGE RATE TO BRAKING GATES
V76E, PRO AFTER EACH THRUSTING (ALLOW 20 SEC FOR CONVERGENCE)

51+30 STATION KEEP ON SOYUZ +X AXIS (R~150 FT)
Apo11o stationkeeping. ПОСЛЕ ЗАВЕРШЕНИЯ АПОЛЛОНА.

TPM1 ONBOARD DATA

N59 ΔV (LOS)	ΔV_F	0	0						
	ΔV_R								
	ΔV_D	0	0						

P36 FINAL COMP TPM1 HP-65 SOLN

ΔV_D BT

TPM2 ONBOARD DATA

N59 ΔV (LOS)	ΔV_F	0	0						
	ΔV_R								
	ΔV_D	0	0						

P36 FINAL COMP TPM2 HP-65 SOLN

ΔV_D BT

PRE-BRAKING SWITCH LIST

MAN ATT(3)-RATE CMD	ATT SET-GDC
LIMIT CYCLE-OFF	THC PWR-PWR
DBD/RATE-MIN/LOW	RHC PWR NORMAL #2-AC/DC
BMAG MODE(3)-ATT 1/RATE 2	RHC PWR DIRECT #2-MNA/MNB
SC CONT-SCS	AUTO RCS SELECT(16)-MNA/MNB
FDAI SCALE-5/1	THC-ARMED
FDAI SELECT-1	RHC #2-ARMED
FDAI SOURCE-ATT SET	

VTR/DAC SWITCH LIST

VTR POWER(3)-ON(UP)
HEAD WHEEL DRIVE MOTOR-ON (MOTOR ON LT-ON)
MODE-RECORD (RECORD LT-ON)

DAC-ON
(IF desired)HDC CX06

BRAKING GATES			θ (DEG)	
R(NM)	R(FPS)	R(FT)	SOLAR PANEL	BODY
1.00	30	6000		
.50	20	3000	0.5	
.25	10	1500	1.0	
.08	5	500	3.1	1.0
.05		300	5.2	1.7
.03		200	7.9	2.6
.02		130		3.9
.01		60		8.4

CM CAMR 2

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51+30

LOAD ASCP tw WITH DOCKING ATT (Pg 3-19)
 Initiating orientation of Apollo. НАВИГАЦИОННО-ОРИЕНТАЦИОННО-АПОЛЛОНА.
 MNVR TO DOCKING ROLL ATT (-60° CCW)
 (REF ATT SET ERROR NEEDLES)
 VTR/TV SWITCH LIST (Pg 3-19)

Orientation established. ОРИЕНТАЦИЯ УСТАНОВЛЕНА.
 Initiate docking orientation as programmed. НАВНИТЕ ОРИЕНТАЦИОННО-ДОКОВАННЯ ПО ПРОГРАММЕ.
 СТИКОВКИ ПО ПРОГРАММЕ.

ACQUIRE ATS HGA: MAN, WIDE P -36, Y 44
 S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW

EMS FUNC/MODE-ΔV SET/STBY
 SET ΔVC = -100.0 FPS
 EMS FUNC-ΔV

51+40

ACTIVE DOCKING PREPARATION CHECKLIST (Pg 1-20)

MONITOR SOYUZ MNVR ON SOYUZ +X AXIS

SOYUZ MNVRS TO DOCKING ATT
 51+44:25 - 51+47:00

SC CONT/MODE-SCS/FREE
 ACTIVE DOCKING CHECKLIST (Pg 1-21)

TV - GRD CMD
 51+48 - 52+09

51+50

CSM/SOYUZ INTERFACE SEAL COMPRESSED

52+00

SUNSET
 AT 52:05

DOCKING ATTITUDE

		NOMINAL			UPDATE		
ASCP tw	R		3	0	0		
	P		1	5	7		
	Y		0	0	0		

VTR/TV SWITCH LIST

VTR HEAD WHEEL DRIVE MOTOR-OFF(400)
 (MOTOR ON LT-OFF)

ON TV CAMERA AT LOCATION 606:
 CAMERA-AVG, SLAVE, LINEAR
 LENS (F, ZOOM, FOC)-22, 25, infinity

CANNOT SEE THROUGH OPTICS

Note: Use STDN ΔVY For All Burns.

FOR IMU ALIGNMENTS

Delete P52's While Attached To Booster.

If COAS Not Calibrated-

1. If GDC & IMU Compare Within 5 Deg-
Perform COAS LOS DETERMINATION Procedures (Pg 1-11) ASAP.
If Not- Verify IMU Alignment:
Use P21 (G/4-4) To Obtain Altitude.
Mnvr To & Maintain +X Axis Track Of Horizon.
Key V83E & Verify Depression Angle.
80 NM Alt = 348 Deg Dep Ang 200 NM Alt = 341 Deg Dep Ang
120 NM Alt = 345 Deg Dep Ang 240 NM Alt = 339 Deg Dep Ang
160 NM Alt = 343 Deg Dep Ang
If IMU Compare Within 5 Deg-
Perform COAS LOS DETERMINATION Procedures (Pg 1-11) ASAP.
If Not- Use Nominal COAS Angles (+0, +57470) For P54's.

2. In Place Of P52 OPT 3-
Use P20 OPT 1 To Obtain Star Sighting Attitudes:

	STAR	ROLL	PITCH	YAW
Load N78 With +ZERO's.	_____	_____	_____	_____
Load 1ST Star, Record N18 And Perform Auto Mnvr To Star Att.	_____	_____	_____	_____
Recall P20, Load 2ND Star & Record.	_____	_____	_____	_____
Recall P20, Load 3RD Star & Record.	_____	_____	_____	_____
Perform P54 OPT 3 (G/3-9): Verify N94 Loaded With COAS LOS Angles Recorded (Pg 1-11).	_____	_____	_____	_____

SC CONT/MODE-CMC/FREE
Center Star In COAS with RHC.
ENTER To Mark (ENTER On V50N25 00016 To Reject)
Manually Mnvr To 2ND Star.
For Subsequent P54's (With Same REFSMMAT), Can Use
V49 Mnvr To 1ST Star.

3. In Place of P52 OPT 1 COARSE ALIGN- Perform
P52 OPT 1 PULSE TORQUE (ENTER On Torque Request)
(Do Not Perform Star Sightings).

If COAS LOS DETERMINATION Has Been Performed-
Repeat Above Steps 2 & 3, As Required.

FOR STATE VECTOR UPDATING

Pre NCC - None, Except For Possible STDN Uplink.
Post NCC- Before Initiating VHF Marks:
Key V67E And Load N99 With +10000, +100, +1; PRO.
Post HSR- Perform VHF Marking (V87E) In Place Of SXT Marking.
Post TPI- (Pg 1-17) ENTER To Bypass P36 Auto Mnvr To Track Att.
Key V22N78E, +E (For COAS Tracking).
Key V58E, Perform Auto Mnvr To COAS Track Att.
Use VHF Marking (V87E) Along With COAS Marking (V54E).
Load N94 With COAS LOS Angles Recorded (Pg 1-11).
PRO To F 53 45.
SC CONT/MODE-CMC/FREE
Center Soyuz In COAS With RHC.
ENTER To Mark (V86E To Reject). To Avoid Taking Unwanted Marks,
Be Sure To Terminate COAS Marking Routine (PRO On F 53 45)
Before Keying Vxx Or Nxx ENTER. V16NxxE Is Permissible.
Read θ For TPM HP-65 Soln From ORDEAL FDAI While Centering
Soyuz in COAS.

OPTICS FROZEN

Before Doing IMU Align Or SV Updating (Perform One Time)

1. OPTICS POWER-ON
2. OPT ZERO-ZERO
3. VERIFY SXT/SCT LOS SLAVED
IF NOT CONTINUE USING SCT
4. RECORD TPAC'S
IF TA NEGATIVE (XXX.XX) SUBTRACT 270°
5. KEY V64E, LOAD N94 WITH SA & TA
PRO, RECORD N78 REG 1 & 2
PRO
6. GO TO IMU ALIGN OR SV UPDATING PROCEDURE

TPAC'S

SA	_____
TA	_____

N78

R1	_____
R2	_____

Delete P52's While Attached To Booster.

In Place Of P52 OPT 3-

- Use P20 OPT 1 To Obtain Star Sighting Attitudes:
Load N78 With Values Recorded Above.
Load 1ST Star, Record N18 And
Perform Auto Mnvr To Star Att.
Recall P20, Load 2ND Star & Record.
Recall P20, Load 3RD Star & Record.

STAR	ROLL	PITCH	YAW
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Perform P54 OPT 3 (G/3-9):
Verify N94 Loaded With Recorded SA & TA.
SC CONT/MODE-CMC/FREE
Center Star In SXT With MIC.
ENTER To Mark (ENTER On V50N25 00016 To Reject)
Manually Mnvr To 2ND Star.

For Subsequent P54's (With Same REFSMMAT), Can Use
V49 Mnvr To 1ST Star.

- In Place of P52 OPT 1 COARSE ALIGN - Perform
P52 OPT 1 PULSE TORQUE (ENTER On Torque Request)
(DO NOT Perform Star Sightings).

FOR STATE VECTOR UPDATING

1. Each Time MINKEY Is Initiated (PRO On Minkey Option)
ENTER To Bypass Auto Mnvr To Track Att.
Key V64E, Verify N94 Loaded With Recorded SA & TA,
PRO, Verify N78 Values, PRO.
Key V58E, Perform Auto Mnvr To Soyuz Track Att.
2. Use COAS Marking Routine (V54E), But Use SXT Instead Of COAS.
Verify N94 Loaded With Recorded SA & TA.
PRO To F 53 45.
SC CONT/MODE-CMC/FREE
Center Soyuz In SXT With MIC.
ENTER To Mark (V86E To Reject). To Avoid Taking Unwanted Marks,
Be Sure To Terminate COAS Marking Routine (PRO On F 53 45)
Before Keying Vxx Or Nxx ENTER. V16Nxx Is Permissible.

SOYUZ TRACKER LIGHTS FAILED

Notes: 1. Perform NOMINAL Rndz Timeline (SXT Marks Not Possible When Soyuz In Darkness).
2. If Post TPM1 Lighting Will Allow, TPM2 Soln Accuracy Will Be Greatly Improved If At Least One SXT Mark Is Incorporated.
3. Nominally, HP-65 Soln Not Possible For TPM1 And TPM2.
Immediately- V57E, V22E, 1E, PRO (For Post TPI Single Sensor WRI Logic)

MARK BUTTON FAILED

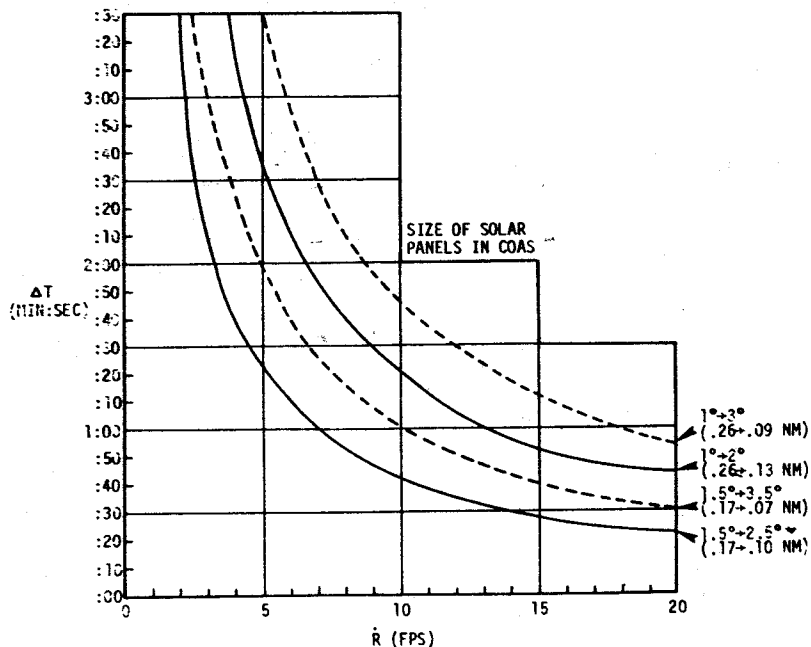
FAILED OPEN (Bit 6 Channel 16 Remains = Zero)
Note: Normal DSKY Operations (e.g. V76E, V16N78E) Are Permitted During Marking Periods.
Before Marking-
Load Following EHP(SL-5) (Can Be Loaded Anytime)
V25N26E
1E (1cs Time Delay)
2151E (Fixed Memory Add-
16067E res of MARKDIF)
For EACH Mark-
Key V31 (Do Not Key ENTER)
ENTER (When Target Centered)
(ENTER Must Be Done From NAV DSKY)
After Completion Of SXT NAV (TPM2)-
Key V21N26E, OE (To Disable EMP SL-5)
FAILED CLOSE (Bit 6 Channel 16 Remains = One)
Note: EMP SL-5 Is Not Required.
Perform ALL Program Procedures On MAIN DSKY.
To Mark- Depress ANY
Key on NAV DSKY (Except PRO).

EMS ΔV/RANGE DISPLAY BLANK

For SCS Burns- EMS FUNC-OFF (Make Timed Burns)
SPS THRUST-DIRECT ON (To Initiate Burn)
ΔV THRUST-OFF (To Terminate Burn)
SPS THRUST-NORMAL
For Hp-65 Data: Pre NSR- V76E (Use VHF Range Rate Processing Routine)
V25E, Load N72 With GET Of Next Data Point.
PRO
N76E (To Read Range)
TPI TIG- V76E, V25E, +E, +E, PRO (To Terminate
Optimized Range Calculations)
N76E (To Read Current Range)
Pre TPI- V76E (Use VHF Range Rate Processing Routine)
V25E, Load N72 With GET Of Next Data Point.
PRO
N76E (To Read Range)
(TPI-14)-V76E, V25E, +E, +E, PRO (To Terminate
Optimized Range Calculations)
V76E (To Read Current Range)
Post TPI-V76E, V25E, +E, +E, PRO (To Terminate
Optimized Range Calculations)
N76E (To Read Current Range)

NO VHF RANGING

Note: HP-65 Solutions Not Possible, Delete:
V87's (Used To Enable VHF Marking)
V76's (Used To Enable VHF Range Rate Processing Routine)
Immediately- V77E (To Terminate VHF Range Rate Processing Routine)
V88E (To Terminate VHF Marking)
V57E, V22E, 1E, PRO (For Post TPI Single Sensor WRI Logic)
Braking- V37E47E, V83E (Monitor R & R)
CAUTION: WORSE CASE CMC RANGE ERROR CAN BE ~.8 NM.
REF BRAKING GATE TABLE (Pg 1-18) FOR SIZE VS RANGE.
IF SOLAR PANEL GROWTH BECOMES APPARENT (.25° TO .5°)
BEFORE FIRST BRAKING GATE, BEGIN BRAKING IMMEDIATELY.
Establish R = -25.0 FPS At 1 NM, Then RESET DET Counting UP.
Load EMS = -25.0, EMS FUNC/MODE-ΔV/NORMAL
When DET = 01:00, Brake EMS To -20.0 (R = .75 NM)
= 02:15, -15.0 (R = .50 NM)
When Soyuz Solar Panel = 1° In COAS (Or DET = 03:45)
Brake EMS To -10.0 (R = .25 NM)
Obtain ΔT For Change In COAS (1° to 3°, 1° to 2°,
1.5° to 3.5°, Or 1.5° to 2.5°)
Use Chart To Determine R For Final Braking.



QUAD FAILED: CMC CONTROL

QUAD HE(1) (Failed Quad)-CLOSE (Mom)
 PRIM/SEC PRPLNT(1) (Failed Quad)-CLOSE (Mom)
 AUTO RCS SELECT(4) (Failed Quad)-OFF
 SC CONT-CMC/AUTO (Maintain CMC Control Until Docked)
 V48E, Load H47 Per Table (Load XX As Specified In Nominal C/L)

FAILED QUAD	A	B	C	D
DAP LOAD	101XX	110XX	101XX	110XX
	00111	11011	01101	11110

NOTES FOR RCS TRANSLATION:

- 50% Reduction In Effectiveness For All Axes.
- Degraded Attitude Hold Authority.
- Unwanted ΔV_X For Y & Z Translation.
- For Quad A Or C Failed With Z Translation:
Possible Loss Of PITCH Control
(Partially Compensate By Using The RHC To Initiate An UP/DOWN Rate Prior To +/- Z Translation).
- For Quad B Or D Failed With Y Translation:
Possible Loss Of YAW Control
(Partially Compensate By Using The RHC To Initiate A LEFT/RIGHT Rate Prior To +/- Y Translation).
- If $N85 > 5$ FPS In Any Axis, Rotate S/C To Maximize ΔV_X .
If $N85 \leq 5$ FPS In All Axes, Trim ΔV_X Last.

NOTES FOR SPS BURNS:

- Use 2 Jet, 20 Second Ullage. (Review Notes 1 & 2)
- Trim Residuals Using Note 6.

NOTES FOR BRAKING:

- In The PRE-BRAKING SWITCH LIST:
Use SC CONT-CMC/AUTO rather than SCS Control.
- Verify 0.5°/Sec Rate Is In The DAP Prior To Braking.
- Initiate Braking ASAP (2 Quads) (Review Note 1)
- Use SCS Control (MIN/LOW) To Make Accurate LOS Rate Checks.
- A Low LOS Rate Must Be Maintained. (Not Enough Translation Authority To Control Rate Buildup Later On)
- LOS Rate Control Gives Pronounced Changes To Closure Rate.

NOTES FOR DOCKING:

- CMC ATT DB (0.5°) Is Being Used For Docking;
Not The SCS DB (0.2°).
- Immediately Prior To Contact, The RHC May Be Used To Center The COAS On The Target.

QUAD FAILED: SCS CONTROL

QUAD HE(1) (Failed Quad)-CLOSE (Mom)
 PRIM/SEC PRPLNT(1) (Failed Quad)-CLOSE (Mom)
 AUTO RCS SELECT(4) (Failed Quad)-OFF
 SC CONT-SCS
 DBD/RATE-MIN/LOW
 BMAG MODE(3)-ATT 1/RATE 2

NOTES FOR RCS TRANSLATION:

- Translation And Attitude Control Depend On Proper Manipulation Of AUTO RCS SELECT Switches.
- For All Single Axis Translation:
AUTO RCS SELECT (Failed Quad Plus Table)-OFF

FAILED QUAD	A	B	C	D
+X TRANS	(5.0)	(5.0)	A4-OFF (5.0)	B4-OFF (5.5)
-X TRANS	C4-OFF* (5.0)	D4-OFF** (5.5)	A3-OFF (5.5)	B3-OFF (5.5)
+Y TRANS	C1-OFF (10.5)	Note 7	A2-OFF (10.5)	Note 7
-Y TRANS	C2-OFF (10.5)	Note 7	A1-OFF (10.5)	Note 7
+Z TRANS	Note 6	D1-OFF (10.5)	Note 6	B2-OFF (10.5)
-Z TRANS	Note 6	D2-OFF (10.5)	Note 6	B1-OFF (10.5)

() = Approximate Number Of Seconds To Obtain 1.0 FPS.

* Cycle ON To Control PITCH.

** If Required, Cycle ON To Control YAW.

- 50% Reduction In Effectiveness For All Axes.
- Degraded Attitude Hold Authority.
- Unwanted ΔV Normal To Translation Axis.
- For Quad A Or C Failed With Z Translation:
Possible Loss Of PITCH Control (Partially Compensate By Using The RHC To Initiate An UP/DOWN Rate Prior To +/- Z Translation).
- For Quad B Or D Failed With Y Translation:
Possible Loss Of YAW Control (Partially Compensate By Using The RHC To Initiate A LEFT/RIGHT Rate Prior To +/- Y Translation).
- If $N85 > 5$ FPS In Any Axis, Rotate S/C To Maximize ΔV_X .
If $N85 \leq 5$ FPS In All Axes, Trim ΔV_X Last.

NOTES FOR SPS BURNS:

- Use 2 Jet, 20 Second Ullage. (Review Notes 3 & 4).
- Trim Residuals Using Note 8.

NOTES FOR BRAKING:

- If Possible, Use SC CONT-CMC/HOLD Rather Than SCS. (Reference CMC Control Procedures And Verify 0.5°/Sec Rate Is Loaded Into DAP).
- Initiate Braking ASAP (2 Quads) (Review Note 3).
- A Low LOS Rate Must Be Maintained. (Not Enough Translation Authority To Control Rate Buildup Later On.)
- LOS Rate Control Gives Pronounced Changes To Closure Rate.

NOTES FOR DOCKING:

- Immediately Prior To Contact, The RHC May Be Used To Center The COAS On The Target.

MAX THRUSTING RCS BURN (4 JET X TRANSLATION)

- Notes: 1. Max Duration For Any Continuous Burn Or Total Accumulated Multiple Short Duration Burns During ANY 45 Min Period Is 150 Sec For +X RCS Jets And 50 For -X RCS Jets. (Nominal RCS Targeting Limit Will Be 100 Sec +X, 50 Sec -X).
2. There Must Be At Least 45 Min Of Elapsed Time Between A Max Duration Burn And Other RCS Burns (Max Or Otherwise).

-X RCS ($\Delta V_{Total} < 0$ or = 50 Sec)

1. Use P41.
V25N17E, Load N17 = (Any roll), (N18pitch \pm 180), (360 - N18yaw)
2. Load EMS = $-\Delta V_{TOTAL}$
V63E; Manually Mnv To -X Burn Att Using N17 Error Needles.
3. At TIG, Translate -X RCS & Trim N85 Residuals.

+X RCS / -X RCS (100 Sec $< \Delta V_{TOTAL} \leq 200$ Sec)

1. Use P41 & Auto Mnv To N18 Burn Att.
2. V25N17E; Load N17 = (Any roll), (N18pitch \pm 180), (360 - N18yaw)
3. Load EMS = +X ΔV_{TOTAL}
4. At TIG, Translate +X RCS = +X ΔV_{TOTAL}
V63E
5. Manually Mnv To -X Burn Att Using N17 Error Needles.
6. Load EMS = -X ΔV_{TOTAL}
7. Translate -X RCS & Trim N85 Residuals.

+X RCS / SPS

1. Use P40 & Auto Mnv To N18 Burn Att.
2. Load EMS = ($\Delta V_{TOTAL} - \Delta V_{TAILOFF}$)
3. Translate +X RCS Ullage = 100 Sec (Do Not PRO On V99N40)
4. Perform SPS SCS Auto Burn.
5. Key ENTER On V99N40 After SPS Engine Cutoff.
6. Trim N85 Residuals.

+X RCS / SPS / -X RCS ($\Delta V_{TOTAL} > 200$ Sec)

1. Use P40 & Auto Mnv To N18 Burn Att.
2. V25N17E; Load N17 = (Any roll), (N18pitch + 180), (360 - N18yaw)
3. Load EMS = ($\Delta V_{TOTAL} - \Delta V_{TAILOFF} - \Delta V_{XRCS}$)
4. Translate +X RCS Ullage = 100 Sec (Do Not PRO on V99N40)
5. Perform SPS SCS Auto Burn.
6. Key ENTER On V99N40 After SPS Engine Cutoff.
V63E
7. Manually Mnv To -X Burn Att Using N17 Error Needles)
8. Load EMS = $-\Delta V_{XRCS}$
9. Translate -X RCS & Trim N85 Residuals.

<p>52+00</p> <p>V T R</p> <p>U S R</p> <p>52+20</p> <p>52+40</p> <p>V T R</p> <p>53+00</p>	<p>INFORM SOYUZ : APOLLO DOCKING DELAYED. ОТМЕЖЕНА АПОЛЛОНА ОТКЛАДЫВАЕТСЯ.</p> <p>INFORM SOYUZ : IS YOUR ORIENTATION SYSTEM ACTIVATED? ВАША СИСТЕМА ОРИЕНТАЦИИ ВКЛЮЧЕНА?</p> <p>* IF YES: INFORM SOYUZ : APOLLO WILL ATTEMPT DOCKING AT 52+42. АПОЛЛОН ПОВТОРИТ ПОПЫТКУ СТЫКОВКИ В 52+42.</p> <p>* IF NO: INFORM SOYUZ : APOLLO WILL ATTEMPT DOCKING AT 53+23. АПОЛЛОН ПОВТОРИТ ПОПЫТКУ СТЫКОВКИ В 53+23.</p> <p>EXTERIOR LIGHTS RUN/EVA-RUN/EVA</p> <p>* IF NO COMM: DSE: (LBR/RCD/FWD/CMD RESET) VTR HEAD WHEEL DRIVE MOTOR-OFF(MOTOR ON LT-OFF)</p> <p>DAC-OFF SC CONT/MODE-CMC/AUTO</p> <p>INFORM SOYUZ : TURN ON VHF SIMPLEX A. ВКЛЮЧИТЕ УКВ СИМПЛЕКС А.</p> <p>VHF RANGING-OFF VHF AM A-SIMPLEX VHF AM B-OFF</p> <p>* IF SOYUZ ORIENTATION SYSTEM REMAINED ACTIVATED AFTER NOMINAL DOCKING ATTEMPT: EMS FUNC/MODE-ΔV SET/STBY SET ΔVC=-100.0 FPS EMS FUNC-ΔV</p> <p>DAC-ON (IF DESIRED) HDC/CX06 SC CONT/MODE-SCS/FREE ACTIVE DOCKING CHECKLIST(Pg 1-21)</p> <p>DOCK(AT SR) 52+42</p> <p>EXTERIOR LIGHTS RUN/EVA-OFF</p> <p>* IF NO DOCKING(AT SR): DSE: (LBR/RCD/FWD/CMD RESET) VTR HEAD WHEEL DRIVE MOTOR-OFF(MOTOR ON LT-OFF) DAC-OFF SC CONT/MODE-CMC/AUTO</p>	<p>53+00</p> <p>Q U I</p> <p>B O A T</p> <p>V T R</p> <p>53+20</p> <p>H A D</p> <p>U S R</p> <p>53+40</p> <p>54+00</p>	<p>VERIFY STATIONKEEPING ON SOYUZ +X AXIS(R≈150 FT)</p> <p>EMS FUNC/MODE-ΔV SET/STBY SET ΔVC=-100.0 FPS EMS FUNC-ΔV</p> <p>ACQ ATS HGA: MAN, WIDE P -43, Y 16 S-BD ANT IND > 1/3 SCALE HGA: REACQ, NARROW</p> <p>DAC-ON (IF DESIRED) HDC/CX06 SC CONT/MODE-SCS/FREE ACTIVE DOCKING CHECKLIST(Pg 1-21)</p> <p>SOYUZ MNVRS TO DOCKING ATT 53+16 - 53+19</p> <p>DOCK(ONE REV LATE) 53+23</p> <p>* IF NO DOCKING: CONTINUE *</p> <p>VTR HEAD WHEEL DRIVE MOTOR-OFF(MOTOR ON LT-OFF) DAC-OFF SC CONT/MODE-CMC/AUTO</p> <p>EXTERIOR LIGHTS RUN/EVA-RUN/EVA</p> <p>INFORM SOYUZ : APOLLO DOCKING DELAYED. СТЫКОВКА АПОЛЛОНА ОТКЛАДЫВАЕТСЯ.</p> <p>INFORM SOYUZ : APOLLO WILL ATTEMPT DOCKING AT 54+52. АПОЛЛОН ПОВТОРИТ ПОПЫТКУ СТЫКОВКИ В 54+52.</p> <p>GUIDE RING A-RETRACT(~40 SEC)</p> <p>GUIDE RING EXTEND LT-OUT PASSIVE LT-ON</p> <p>GUIDE RING A-OFF(CTR)</p> <p>DSE: (LBR/RCD/FWD/CMD RESET)</p>
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DELAYED DOCKING

DELAYED DOCKING

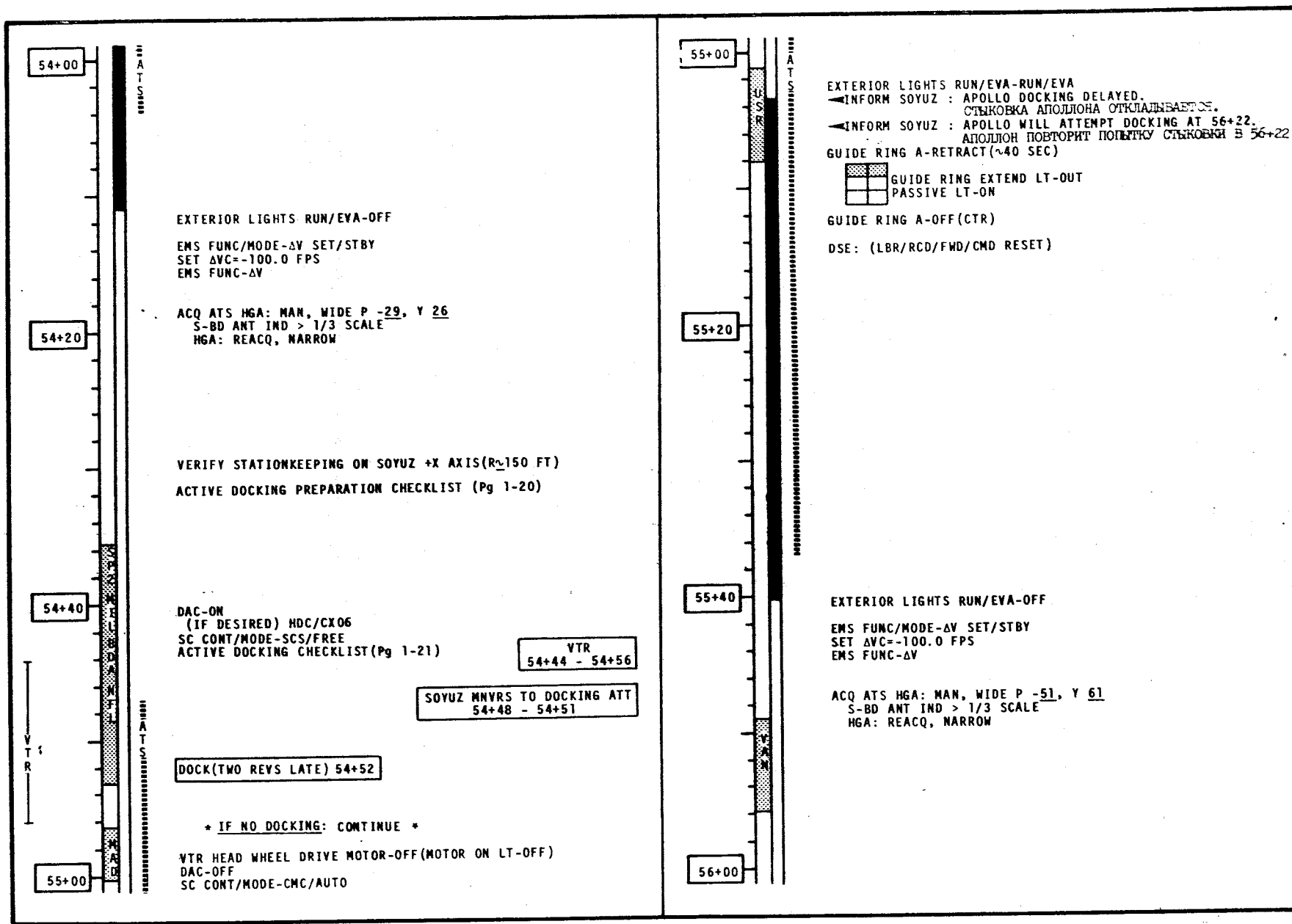
DELAYED DOCKING

DELAYED DOCKING

DELAYED DOCKING

DELAYED DOCKING

DELAYED DOCKING



EXTERIOR LIGHTS RUN/EVA-OFF

EMS FUNC/MODE-ΔV SET/STBY
 SET ΔVC=-100.0 FPS
 EMS FUNC-ΔV

ACQ ATS HGA: MAN, WIDE P -29, Y 26
 S-BD ANT IND > 1/3 SCALE
 HGA: REACQ, NARROW

VERIFY STATIONKEEPING ON SOYUZ +X AXIS(R=150 FT)
 ACTIVE DOCKING PREPARATION CHECKLIST (Pg 1-20)

DAC-ON
 (IF DESIRED) HDC/CX06
 SC CONT/MODE-SCS/FREE
 ACTIVE DOCKING CHECKLIST(Pg 1-21)

VTR
 54+44 - 54+56

SOYUZ MNVRS TO DOCKING ATT
 54+48 - 54+51

DOCK(TWO REVS LATE) 54+52

+ IF NO DOCKING: CONTINUE +

VTR HEAD WHEEL DRIVE MOTOR-OFF(MOTOR ON LT-OFF)
 DAC-OFF
 SC CONT/MODE-CMC/AUTO

EXTERIOR LIGHTS RUN/EVA-RUN/EVA
 ←INFORM SOYUZ : APOLLO DOCKING DELAYED.
 СТЫКОВКА АПОЛЛОНА ОТКЛАДЫВАЕТСЯ.
 ←INFORM SOYUZ : APOLLO WILL ATTEMPT DOCKING AT 56+22.
 АПОЛЛОН ПОВТОРИТ ПОПЫТКУ СТЫКОВКИ В 56+22.

GUIDE RING A-RETRACT(~40 SEC)

GUIDE RING EXTEND LT-OUT
 PASSIVE LT-ON

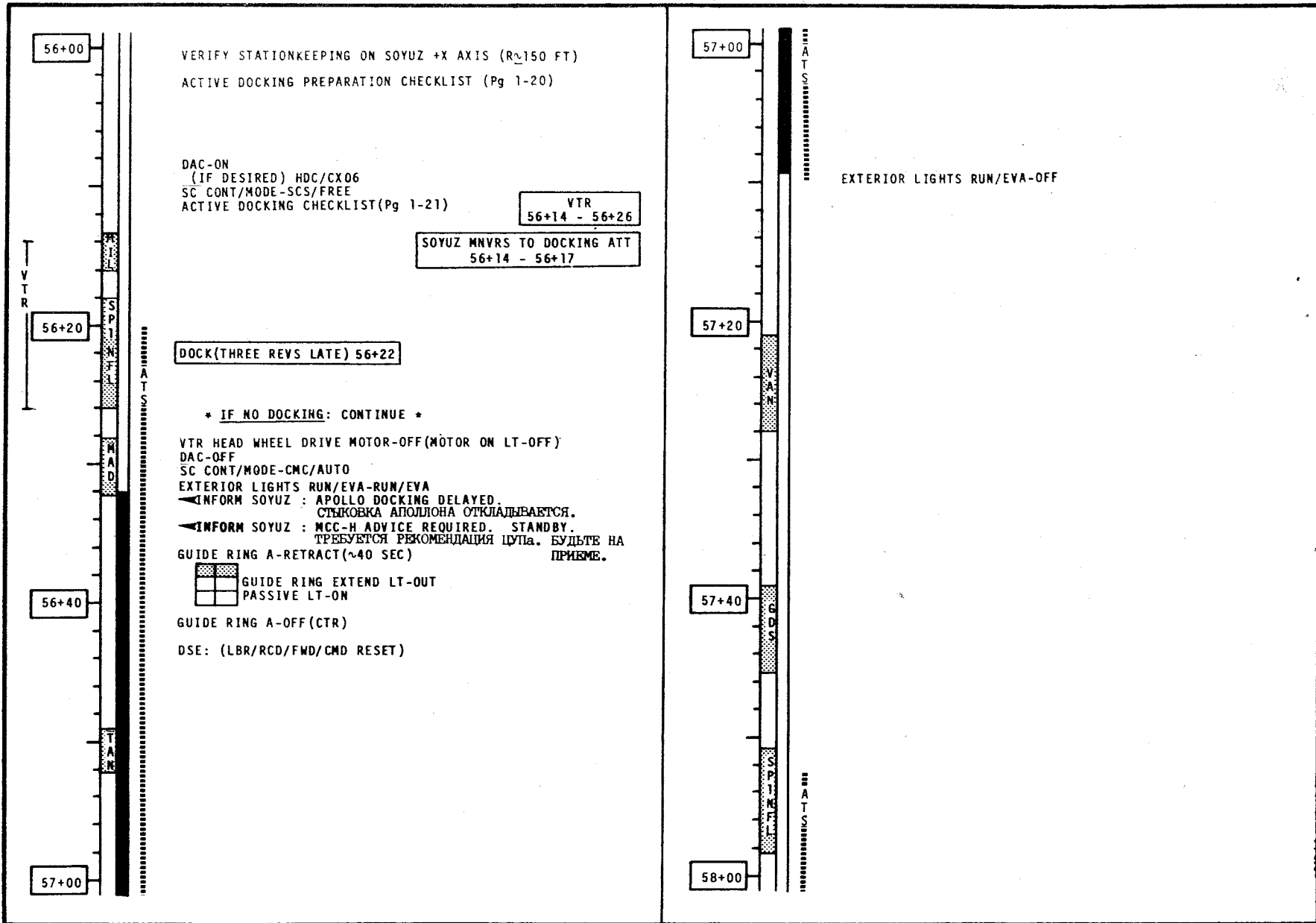
GUIDE RING A-OFF(CTR)

DSE: (LBR/RCD/FWD/CMD RESET)

EXTERIOR LIGHTS RUN/EVA-OFF

EMS FUNC/MODE-ΔV SET/STBY
 SET ΔVC=-100.0 FPS
 EMS FUNC-ΔV

ACQ ATS HGA: MAN, WIDE P -51, Y 61
 S-BD ANT IND > 1/3 SCALE
 HGA: REACQ, NARROW



SOYUZ RE-RENDEZVOUS POLAR PLOT (WT = 290°)

BASIC ASSUMPTIONS

- (Pre C/L) o Apollo in heads down configuration (HDSUPFLG RESET). (nominal for ATS coverage pre-TPI2)
- (Pre C/L) o IMU aligned to re-rndz REFSMMAT (re-rndz REFSMMAT related to TPI2 same as nominal is to TPI1)
- (Pre C/L) o Soyuz VHF ranging is off, configured for comm on SIMPLEX AM. (to conserve Soyuz battery)
- (Pre C/L) o STDN supplied maneuvers have been executed, placing Apollo/Soyuz in a stable orbit condition. (Apollo trailing Soyuz 47 ± 10 NM and $\Delta H = \text{Zero}$ at TPI1)
- maybe (Pre C/L) o STDN will advise crew when to obtain pre-TPI1 relative range data. (will be used by STDN in determining TPI1 solution)
- o TPI1 ideally only maneuver required other than braking.
- o TPI2 orbital conditions same as nominal TPI1. (2 min before midnight, $\Delta H = 10 \pm 2$ NM, Elev = 27°, $\omega T = 130^\circ$)
- o Pre-TPI2 procedures close to nominal.
- o Post-TPI2 procedures same as nominal

STATE VECTOR UPDATING

- (Pre C/L) o Uplinked before entering checklist.
- o Uplinked again before TPI1.
- o SXT and VHF marks after TPI1.

MANEUVER SOLUTION

- o TPI1 - STDN (Final pad only will be computed)
- o TPI2 - CMC (P35) (Nominally zero)
- o TPM1 - CMC (P36) and HP-65
- o TPM2 - CMC (P36) and HP-65

PAD DATA SUPPLIED BY STDN (all voiced pre-TPI1)

- o Relation of GET to checklist.
- o Pg 6-1 ATS AOS/LOS GET's. ATS HGA angles STDN AOS/LOS GET's. USR AOS/LOS GET's.
- o Pg 6-2 TPI1 Final Pad
- o Pg 6-3 TPI2 TIG
- o Pg 6-5 Docking Attitude.

STDN UPLINKED DATA

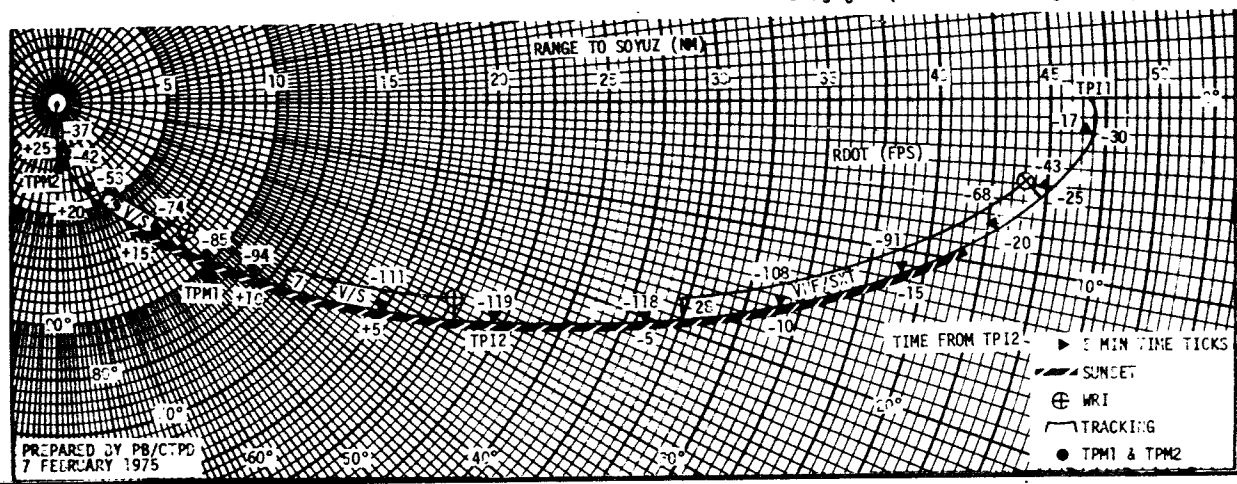
- (Pre C/L) o State vectors (CSM & Soyuz)
- (Pre C/L) o REFSMMAT
- o State vectors (CSM & Soyuz)
- o TPI1 Target Load

DATA VOICED TO STDN

- maybe (Pre C/L) o Pre-TPI1 relative range (may be done before entering checklist)
- o Pg 6-1 P52 (OPT 3)
- o Pg 6-2 TPI1 SPS Burn status
- o General status report on TPI2, TPM1, TPM2.

APOLLO/SOYUZ COMMUNICATION

- o Request VHF ranging on for pre-TPI1 range data; after recording data, request VHF ranging off, configure to SIMPLEX AM, to conserve Soyuz battery.
- o Pg 6-1 request Soyuz beacon on.
- o Pg 6-2 report TPI1 completed. request VHF ranging on.
- o Pg 6-3 report TPI2 completed.
- o Pg 6-4 request Soyuz orientation lights on. report Apollo station keeping.
- o Pg 6-5 (nominal docking related comm)



SOYUZ RE-RNDZ SOYUZ RE-RNDZ SOYUZ RE-RNDZ SOYUZ RE-RNDZ SOYUZ RE-RNDZ SOYUZ RE-RNDZ SOYUZ RE-RNDZ

SOYUZ RE-RNDZ

(11103)
(01111)

-12:00

V4GE (LOAD 4 JET, 2°/SEC)
(LOAD WT, PT & YT)

P30 (VERIFY N33 & N31 PAD VALUES)

GO TO SPS BURN CUE CARD (USE P41 IF ΔV<19 FPS)
ULLAGE AT -15 SEC
(BANK A)

P40

0:00

TPI1 (/) (R = 47 NM)
(TRIM VG's +0.2)
RECORD BURN STATUS
◀TPI1 completed.TPI1 BHHCHHEH.

P35E; VERIFY N37 PAD VALVE, SELECT TIG OPTION (N55 REG 2 = +ZERO)
V32E (P35 RECYCLE: RECORD Pg 6-3)

◀Turn on VHF ranging. BKHPMTE HSKPEPHEM DATEDHCH.
VHF RANGING SWITCH LIST, ACQUIRE VHF RANGING (R = 47 NM)

-33:00

⊗ V37E (START VHF RANGING)

S
X
T
/
V
H
F

XXXXXXXXXXXXXXXXXXXXX
X UNREASONABLE UPDATE X
X 1.00 NM, 6.0 FPS X
XXXXXXXXXXXXXXXXXXXXX

TPI1 PAD DATA

		NOMINAL			FINAL		
N33	HR	+	+	+	+	+	+
TIG	MIN	+	+	+	+	+	+
	SEC	+	+	+	+	+	+
N31	ΔV _x	-	1	8	8		
	ΔV _y	+	0	0	0		
	ΔV _z	+	2	2	6		
N22	R	+	0	0	+	0	0
	P	+	0	0	+	0	0
	Y	+	0	0	+	0	0
	ΔV _C	+	0	1	6	4	
	BT	+					
	ΔVC AT IGN	+					
	ΔVC TAILOFF	-					

WT + PT YT

BURN ATT CHECK

STAR	+	+	+	+	+	+	+
SA	+						0
TA	+						0

VHF RANGING SWITCH LIST

VHF AM A-OFF(ctr)	
VHF AM B-DUPLEX	
VHF RANGING-ON(up)	
VHF ANTENNA-RIGHT(verify)	
EMS FUNC-ΔV SET/VHF RNG	
EMS MODE-BACKUP/VHF RNG	
VHF RNG-RESET	

SPS BURN STATUS

ΔTIG	+	+	+	+	+	+	+
AFTER TRIM							
ΔVC	+	+	+	+	+	+	+
FDAI (IF ATTITUDE NOT NOMINAL)	R	+					
	P	+					
	Y	+					
N85 (IF VG > .2)	VGX	0	0				
	VGY	0	0				
	VGZ	0	0				

(11103)
(01111)

S
X
T
/
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H
F

UNSTOW HP-65 KIT (U1) & CHECKLIST (R1)
HP-65 CHECKOUT (Pg 1)

REMOVE POLAR PLOT

V83E, SET ORDEAL (FDAI 1)

H=118

SET HDSUP FLG (V25N7E, 106E, 2000E, 1E)
LOAD N78 REG 3 = ZERO (V23N78E, +E)
P35 (FINAL COMP: RECORD)
PRO, N59E (RECORD)
RHC-MMVR TO ZERO ROLL (ROLL RIGHT)

IGNORE ATT ERROR NEEDLES
& UPLINK ACTIVITY LIGHT

P41

TPI2 (R = 21 NM)
(TRIM VG's +0.2)
P36 (VERIFY TRACK ROLL ATT ~ ZERO DEG)
TPI2 completed. TPI2 ВЫПОЛНЕН.
REACQUIRE VHF RANGING (R = 18 NM)

FDAI 1-ORB RATE

CENTER SOYUZ IN SXT WHEN
READING HP-65 DATA θ AND TA

θ AND TA HP-65 DATA FOR TPI2+4:30

XXXXXXXXXXXXXXXXXXXXX
X UNREASONABLE UPDATE X
X 1.00 NM, 6.0 FPS X
XXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXX
X UNREASONABLE UPDATE X
X 0.50 NM, 3.0 FPS X
XXXXXXXXXXXXXXXXXXXXX

TPI2 PAD DATA

		NOMINAL					FINAL				
N37	HR	+	X	X	X	X	+	X	X	X	X
TIG TPI	MIN	+	X	X	X	X	+	X	X	X	X
	SEC	+	X	X	X	X	+	X	X	X	X

TPI2 ONBOARD DATA

		P35 RECYCLE					P35 FINAL COMP				
N55	REG 2 ELEV	X					X				
N58	ΔV_{TPI}	+	0	0			+	0	0		
	ΔV_{TPF}	+	0	0			+	0	0		
	$\Delta T(TPI/TPI)$	+	0	0	B	0	0	+	0	0	B
N81	ΔV_X		0	0				0	0		
ΔV_{TPI}	ΔV_Y		0	0				0	0		
	ΔV_Z		0	0				0	0		
N59	ΔV_F		0	0				0	0		
$\Delta V(LOS)$	ΔV_R		0	0				0	0		
	ΔV_D		0	0				0	0		

XXXXXXXXXXXXXXXXXXXXX
X UNREASONABLE UPDATE X
X 0.50 NM, 3.0 FPS X
XXXXXXXXXXXXXXXXXXXXX

SM RCS QUAD HTRS(4)-OFF(ctr)(274)

R HP-65 DATA FOR TPI2+7:30

R, θ AND TA HP-65 DATA FOR TPI2+8:30
PRO (P36 FINAL COMP: RECORD)

P41

TPM1

P36
V25N33E (LOAD TPI2 TIG)

←Turn on your orientation lights. ВКЛЮЧИТЕ ВАШИ ОГНИ ОРИЕНТАЦИИ.

CENTER SOYUZ IN SXT WHEN
READING HP-65 DATA θ AND TA

θ AND TA HP-65 DATA FOR TPI2+16:30

R HP-65 DATA FOR TPI2+19:30

R, θ AND TA HP-65 DATA FOR TPI2+20:30
PRO (P36 FINAL COMP: RECORD)

P41

TPM2

P37 (ACCEPT AUTO MNVR)(N54 = R, \dot{R} , θ FROM NAVIGATED STATE VECTORS)
STOW HP-65 KIT(U1) & CHECKLIST(R1)
CMC MODE-HOLD (MONITOR LOS RATES AND RANGE RATE)
PRE-BRAKING SWITCH LIST (Pg 6-4)

PRO (P48)(N77 = R, \dot{R} , θ)(R, \dot{R} FROM R27 VHF RANGING FILTER)
V48E (LOAD 0.5°/SEC)
VTR/DAC SWITCH LIST (Pg 6-4)N
NULL LOS RATES AND ADJUST RANGE RATE TO BRAKING GATES.
N83 ($\Delta V_X, \Delta V_Y, \Delta V_Z$ CONT OPTIONAL)

STATION KEEP ON SOYUZ +X AXIS (R₀150 FT)
←APOLLO stationkeeping. ЕСТЬ ЗАВИСАНИЕ АПОЛЛОНА.

TPM1 ONBOARD DATA

			P36 FINAL COMP				TPM1 CHART SOLN				
N59	ΔV_F		0	0							
$\Delta V_{(LOS)}$	ΔV_R		0	0							
	ΔV_D		0	0							

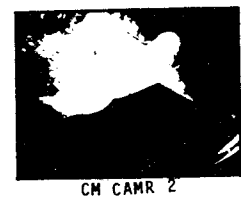
TPM2 ONBOARD DATA

			P36 FINAL COMP				TPM2 CHART SOLN				
N59	ΔV_F		0	0							
$\Delta V_{(LOS)}$	ΔV_R		0	0							
	ΔV_D		0	0							

- PRE-BRAKING SWITCH LIST**
- | | |
|---------------------------|-----------------------------|
| MAN ATT(3)-RATE CMD | ATT SET-GDC |
| LIMIT CYCLE-OFF | THC PWR-PWR |
| DBD/RATE-MIN/LOW | RHC PWR NORMAL #2-AC/DC |
| BMAG MODE(3)-ATT 1/RATE 2 | RHC PWR DIRECT #2-MNA/MNB |
| SC CONT-SCS | AUTO RCS SELECT(16)-MNA/MNB |
| FDAI SCALE-5/1 | THC-ARMED |
| FDAI SELECT-1/2 | RHC #2-ARMED |
| FDAI SOURCE-ATT SET | |

- VTR/DAC SWITCH LIST**
- | |
|--|
| VTR POWER(3)-ON(UP) |
| HEAD WHEEL DRIVE MOTOR-ON (MOTOR ON LT-ON) |
| MODE-RECORD (RECORD LT-ON) |
| DAC-ON |
| (IF desired)HDC CX06 |

BRAKING GATES			θ (DEG)	
R(NM)	R(FPS)	R(FT)	SOLAR PANEL	BODY
1.00	30	6000		
.50	20	3000	0.5	
.25	10	1500	1.0	
.08	5	500	3.1	1.0
.05		300	5.2	1.7
.03		200	7.9	2.6
.02		130		3.9
.01		60		8.4



V25N22E (LOAD DOCKING ATT) (Pg 6-5)
 ◀Initiating orientation of Apollo. НАЧИНАЮ ОРИЕНТАЦИЮ АПОЛЛО.
 MNVR TO DOCKING ROLL ATT
 V62E (REF ERROR NEEDLES)
 VTR/TV SWITCH LIST (Pg 6-5)

◀Orientation established. ОРИЕНТАЦИЯ УСТАНОВЛЕНА.
 ◀Initiate docking orientation as programmed. НАЧИНАЮ ОРИЕНТАЦИЮ
 СПОСОБНОСТИ ДО ПРОГРАММЕ.

V44E (VERIFY DOCKED DAP LOAD) (DO NOT ACTIVATE UNTIL
 DOCKING IS COMPLETE)

EMS FUNC/MODE-ΔV SET/STBY
 SET ΔVC = -100.0 FPS
 EMS FUNC-ΔV

ACTIVE DOCKING PREPARATION CHECKLIST (Pg 1-20)

MONITOR SOYUZ MNVR ON SOYUZ +X AXIS

SOYUZ MNVRS TO DOCKING ATT

SC CONT/MODE-SCS/FREE
 ACTIVE DOCKING CHECKLIST (Pg 1-21)

TV- GRD CMD

CSM/SOYUZ INTERFACE SEAL COMPRESSED

SUNSET IN
 ~ 5 MIN

DOCKING ATTITUDE

N22	R	+				0	0
	P	+				0	0
	Y	+				0	0

VTR/TV SWITCH LIST

VTR HEAD WHEEL DRIVE MOTOR-OFF(400)
 (MOTOR ON LT-OFF)

ON TV CAMERA AT LOCATION 606:
 CAMERA-AVG, SLAVE, LINEAR
 LENS (F, ZOOM, FOC)-22, 25, infinity

(11111)
 (00146)
 (00000)

 (05000)
 (00500)

BASIC ASSUMPTIONS

- o HGA will be deployed ASAP after SEPARATION MUVR
- o No IMU re-alignment (maintain Launch REFSMMAT)
- o STDN tracking not as accurate as CMC SXT tracking.
- o STDN SOR1 & SOR2 maneuver solutions will be computed using CMC state vectors.
- o P52 OPT 3 will be performed during first 3 night periods following SEP.
- o Pre-TPI ΔH = zero nm, TPI to TPF wt = 200°.
- o Return to Launch C/L after Station Keeping for Docking, Extraction, etc.

PAD DATA SUPPLIED BY STDN

- o Pg 7-c GET, HGA's & ATT's for ATS coverage
- o Pg 7-c HC Final Pad, SOR1 Final Pad
- o Pg 7-1 1ST INTERCEPT TIME Pad, TPI TIG Pad, SOR2 Final Pad
- o Pg 7-2 2ND INTERCEPT TIME Pad
- o Pg 7-4 DOCKING ATTITUDE Pad

STDN UPLINKED DATA

- o State Vectors (before Post-NC SXT marking)

DATA VOICED TO STDN

- o SEP status
- o Pg 7-c P52 (OPT 3), HC Burn Status, SOR1 Burn Status
- o Pg 7-1 SOR2 Burn Status
- o General status report on TPI, TPM1, TPM2

STATE VECTOR UPDATING

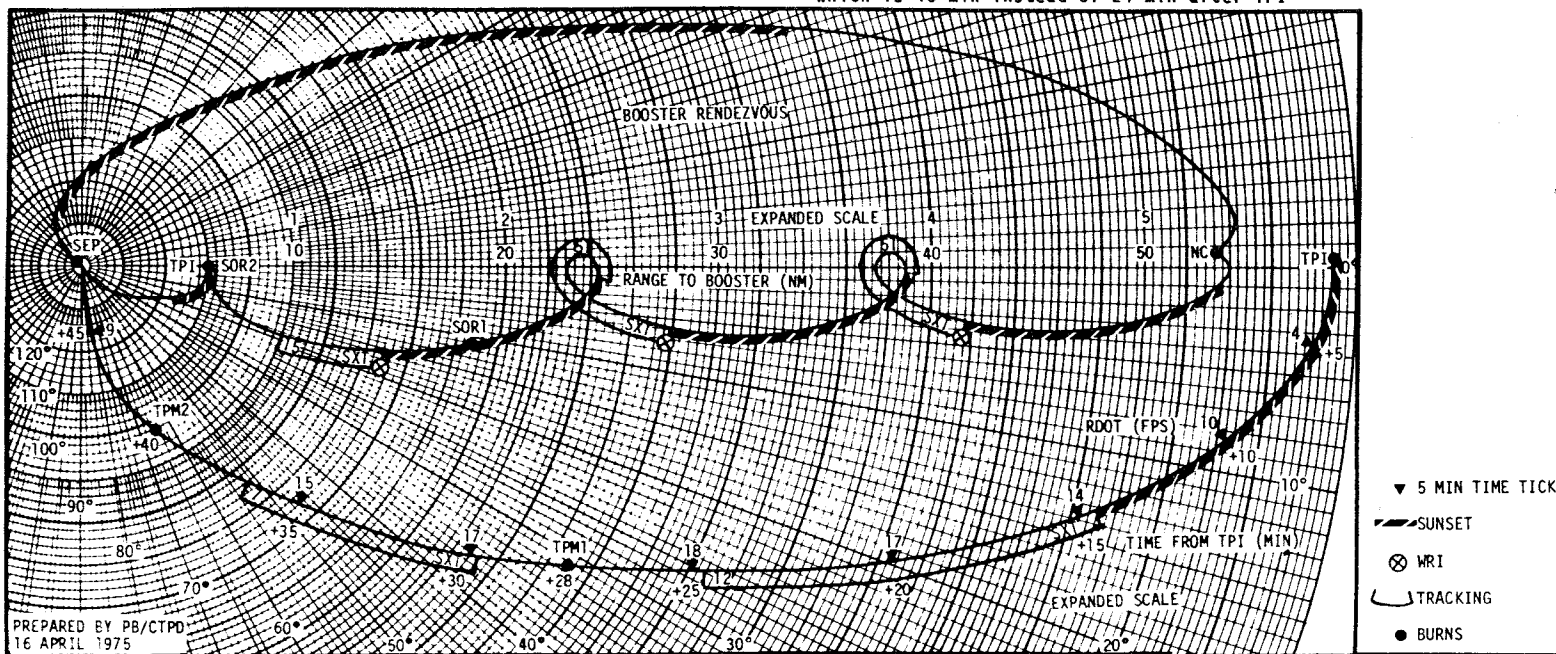
- o Uplinked after NC
- o SXT marks during each day period following NC
- o Nav programs- P20 OPT 4 used pre-SOR2, P36 used post-SOR2
- o W-Matrix initialization- Load with 2000/2 before first mark.
Force initialization (V93E) to occur with first mark of each of the 3 pre-SOR2 marking periods.
No initialization desired (bypass MINKEY) during the post-SOR2 marking periods.

MANEUVER SOLUTIONS

- o HC, SOR1 & SOR2 - STDN (final PAD only will be computed)
- o TPI, TPM1 & TPM2 - CMC(P36)

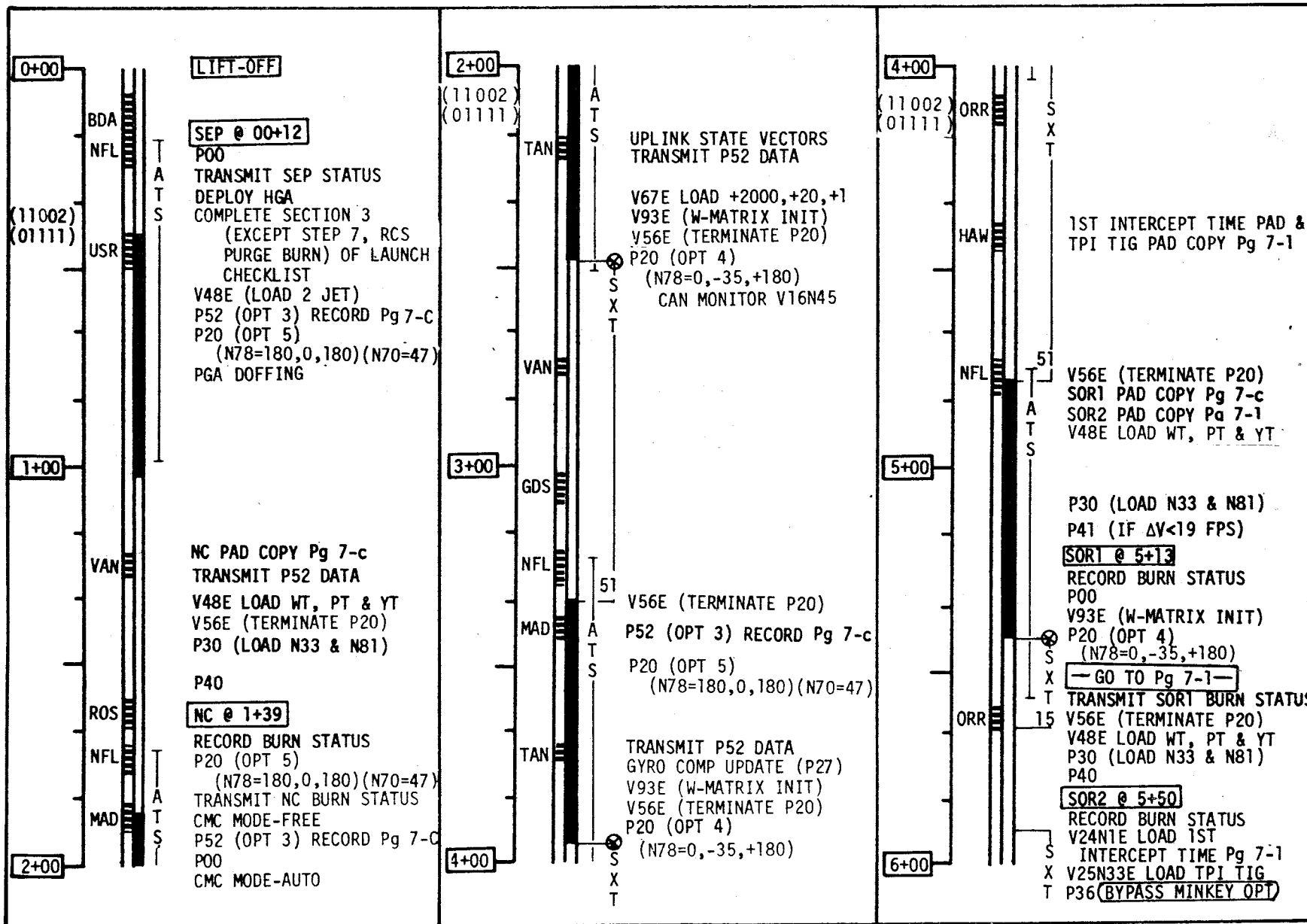
ONBOARD TARGETING

- o TPI - Use P36 instead of P35 to compute solution
Load 1ST INTERCEPT TIME (pad Pg 7-1), allows final comp to be done 23 min instead of 3 min before TIG.
No Recycle
PRO for Final Comp at TIG-23 min.
Key V16N81E and record ΔVX & ΔVZ
Use P30/P41(40) with P36 H81 values of ΔVX & ΔVZ and with ΔVY = Zero. (Note: will have to load H33 in P30 with TPI TIG, since P36 computed one to be 3 min from PRO)
- o TPM's - Use 2ND INTERCEPT TIME (pad Pg 7-2) for both midcourses
TPM1 is 38 min instead of 12 min after TPI
TPM2 is 12 min (nominal) after TPM2,
which is 40 min instead of 24 min after TPI



BOOSTER RNDZ BOOSTER RNDZ BOOSTER RNDZ BOOSTER RNDZ BOOSTER RNDZ BOOSTER RNDZ BOOSTER RNDZ

BOOSTER RNDZ



XXXXXXXXXXXXXXXXXXXXXXXX
 X UNREASONABLE UPDATE X
 X 0.50 NM, 3.0 FPS X
 XXXXXXXXXXXXXXXXXXXXXXXX

6+00
(11002)
(01111)

-35:00

6+10

-23:00

6+20
(11103)
(01111)

-12:00

6+30

I
S
T

20

PRO at TIG -23 MIN (P36 FINAL COMP: RECORD)
N81E (RECORD ΔVX & ΔVZ)

P00
2ND INTERCEPT TIME PAD (COPY)
DOCKING ATTITUDE PAD (COPY Pg 7-4)
TRANSMIT SOR2 BURN STATUS (Pg 7-1)
ACQUIRE ATS HGA: MAN, HIDE P, Y
S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW

CM2/DAC/25/CX02-BRKT, MIR(f8,1/250,∞) 2 FPS
UTILITY POWER-ON

V48E (LOAD 4 JET, 2°/sec)

RHC-MNVR TO ZERO ROLL

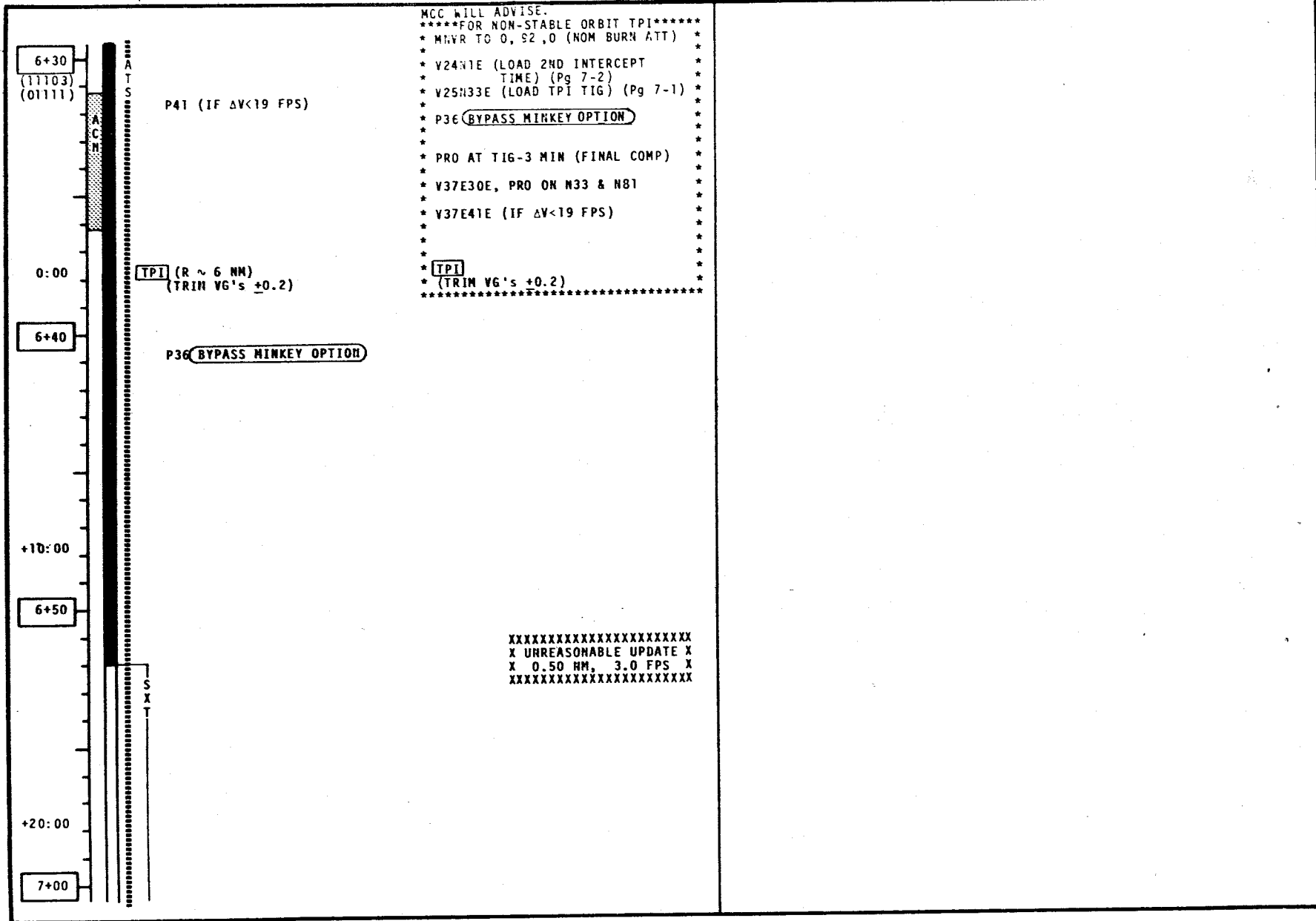
P30
LOAD N33 (TPI TIG PAD Pg 7-1)
LOAD N81 (ΔVY=ZERO, RECORDED P36 ΔVX & ΔVZ)
V24N1E (LOAD 2ND INTERCEPT TIME) (Pg 7-2)

2ND INTERCEPT TIME PAD
(TPF IS 16 MIN PRIOR TO SUNSET)

		NOMINAL					UPDATE				
N1	ADDR	0	3	6	3	3	×	×	×	×	×
	R1	0	0	2	4	3	×	×	×	×	×
	R2	2	2	6	1	0	×	×	×	×	×

TPI ONBOARD DATA

		NOMINAL					P36 FINAL COMP				
N59 ΔV (LOS)	ΔV _F	-	0	0	0	9	0	0	0	0	0
	ΔV _R	+	0	0	0	0	0	0	0	0	0
	ΔV _D	+	0	0	0	9	0	0	0	0	0
Y16N81E ΔV (LV)	ΔV _X	-	0	0	0	9	0	0	0	0	0
	ΔV _Y	+	0	0	0	0	+	0	0	0	0
	ΔV _Z	+	0	0	0	9	0	0	0	0	0



XXXXXXXXXXXXXXXXXXXXX
 X UNREASONABLE UPDATE X
 X 0.50 NM, 3.0 FPS X
 XXXXXXXXXXXXXXXXXXXXX

7+00
 (11103)
 (01111)

+25:00

+28:00

7+10

+37:00

+40:00

7+20

7+30

A
S
T
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O
N

PRO (P36 FINAL COMP: RECORD)
P41

TPM1

P36 BYPASS MINKEY OPTION
 V25N33E (LOAD TPI TIG) (Pg 7-1)

NOTE: IF BOOSTER DIA > 5° (distance between cross and mark to left or right of cross) START BRAKING PROCEDURES IMMEDIATELY.

PRO (P36 FINAL COMP: RECORD)
P41

TPM2

P37 (ACCEPT AUTO MNVR)(N54=R,R,θ FROM NAVIGATED STATE VECTORS)
 LOAD EMS WITH CMC RANGE RATE (NOM ~-15 FPS)
 CMC MODE-HOLD (MONITOR LOS RATES AND RANGE IN COAS)
 PRE-BRAKING SWITCH LIST (Pg 7-4)

DAC-OM: HDC/CX06
 V37E47E (MONITOR LOS RATES AND RANGE IN COAS)
 ESTABLISH MINIMUM CLOSURE RATE=-15 FPS
 HULL LOS RATES
 ADJUST RANGE RATE (EMS) USING FOLLOWING PROCEDURES
 EMS FUNC/MODE-ΔV/NORMAL (EMS LOADED WITH POST TPM2 R)
 ESTABLISH EMS=-15 WHEN DIA=.4 DEG (R=.5 NM), THEN
 WHEN DIA=.8 DEG BRAKE EMS TO -10 (R=.25)

OBTAIN ΔT FOR CHANGE IN COAS (1° TO 3°, 1° TO 2°,
 1.5° TO 3.5°, OR 1.5° TO 2.5°)
 USE CHART TO DETERMINE R FOR FINAL BRAKING

STATION KEEP ON BOOSTER +X AXIS (R~150 FT)
 EXTERIOR LT RNDZ-SPOT
 GO TO LAUNCH C/L (L/4-3)

SUNSET
 AT 7+42

TPM ONBOARD DATA

		TPM1				TPM2			
N59	ΔV _F	0	0		0	0			
ΔV (LOS)	ΔV _R	0	0		0	0			
	ΔV _D	0	0		0	0			

PRE-BRAKING SWITCH LIST

MAN ATT(3)-RATE CMD	ATT SET-GDC
LIMIT CYCLE-OFF	THC PWR-PWR
DBD/RATE-MIN/LOW	RHC PWR NORMAL #2-AC/DC
BMAG MODE(3)-ATT 1/RATE 2	RHC PWR DIRECT #2-MNA/MNB
SC CONT-SCS	AUTO RCS SELECT(16)-MNA/MNB
FDAI SCALE-5/1	THC-ARMED
FDAI SELECT-1/2	RHC #2-ARMED
FDAI SOURCE-ATT SET	

BOOSTER DIAMETER
IN COAS

BRAKING GATES		θ (DEG)
R(NM)	Ṙ(FPS)	R(FT)
1.00	30	6000
.50	20	3000
.25	10	1500
.08	5	500
.05		300
.03		200
.02		130
.01		60

DOCKING ATTITUDE UPDATE

N22	R	+			0	0
	P	+			0	0
	Y	+			0	0

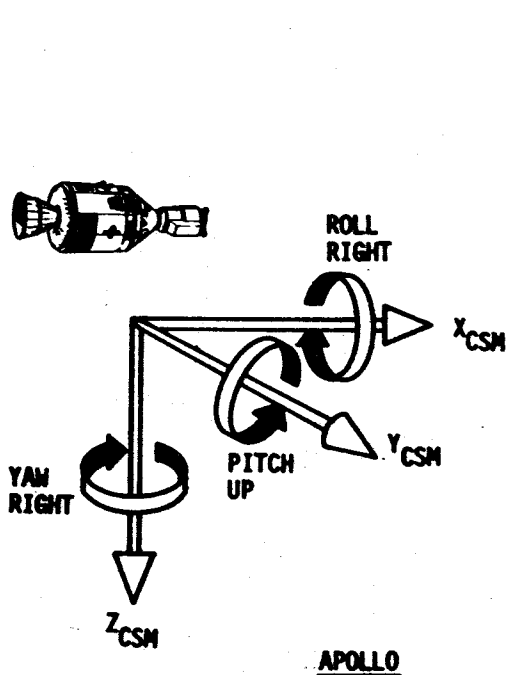
GENERAL COMMUNICATIONS
ОБЩАЯ СВЯЗЬ

- | | |
|---|---|
| 1. SAY AGAIN SLOWLY | ПОВТОРИТЕ МЕДЛЕННО |
| 2. HE WILL COMPLY | БУДЕТ СДЕЛАНО |
| 3. GO BACK TO STEP NO. _____ | ВОЗВРАЩАЙТЕСЬ К ПУНКТУ № _____ |
| 4. PITCH UP (DOWN) | ТАНГАХ ВВЕРХ / ВНИЗ / |
| 5. ROLL LEFT (RIGHT) | КРЕН ВЛЕВО / ВПРАВО / |
| 6. YAW LEFT (RIGHT) | РЫСКАНИЕ ВЛЕВО / ВПРАВО / |
| 7. BACK AWAY | ОТСОДИТЕ НАЗАД |
| 8. STAND BY | БУДЬТЕ НА ПРИЕМЕ |
| 9. CONTINUING NORMAL OPERATIONS | ПРОДОЛЖАЕМ ШТАТНЫЕ ОПЕРАЦИИ |
| 10. MCC WILL REPORT ABOUT THE PROBLEM | ЦУП СООБДИТ О НЕИСПРАВНОСТИ |
| 11. PROBLEM IS: | НЕИСПРАВНОСТЬ В: |
| CONTROL SYSTEM | СИСТЕМЕ УПРАВЛЕНИЯ |
| ELECTRICAL POWER SYSTEM | СИСТЕМЕ ЭЛЕКТРОПИТАНИЯ |
| ENVIRONMENTAL CONTROL SYSTEM | СИСТЕМЕ ЖИЗНЕОБЕСПЕЧЕНИЯ |
| COMMUNICATIONS SYSTEM | СИСТЕМЕ СВЯЗИ |
| SERVICE PROPULSION SYSTEM | НАРЯДОВОЙ ДВИГАТЕЛЬНОЙ УСТАНОВКЕ |
| GUIDANCE AND NAVIGATION | СИСТЕМЕ НАВЕДЕНИЯ И НАВИГАЦИИ |
| 12. CHECKING OUR SYSTEM | ПРОВЕРЯЮ НАШУ СИСТЕМУ |
| 13. CHECK YOUR SYSTEM | ПРОВЕРЬТЕ ВАШУ СИСТЕМУ |
| 14. WE HAVE A DELAY BUT CONTINUING NORMAL OPERATIONS | У НАС БЫЛА ЗАДЕРЖКА НО ПРОДОЛЖАЕМ ШТАТНЫЕ ОПЕРАЦИИ |
| 15. DO NOT INITIATE (ORIENTATION FOR DOCKING, INERTIAL ORIENTATION) | НЕ НАЧИНАЙТЕ /ОРИЕНТАЦИЮ ДЛЯ СТЫКОВКИ, ИНЕРЦИАЛЬНУЮ ОРИЕНТАЦИЮ/ |
| 16. I MADE A MISTAKE | Я ОШИБСЯ |
| 17. GIVING A CORRECTION | ДАЮ ПОПРАВКУ |
| 18. MOSCOW GIVES PERMISSION TO SOYUZ FOR: | Москва дает разрешение Союзу на: |
| DOCKING | стыковку |
| TRANSFER | переход |
| UNDOCKING | расстыковку |

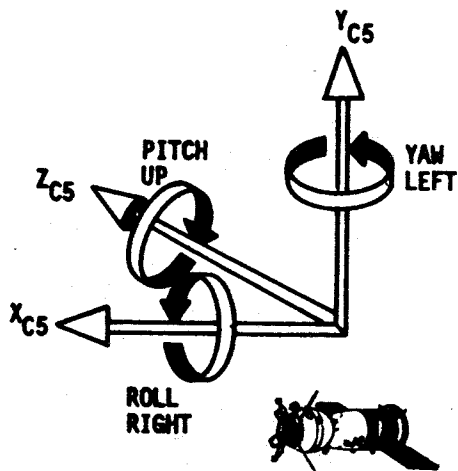
ADDITIONAL RENDEZVOUS PHRASES

ДОПОЛНИТЕЛЬНЫЕ ФРАЗЫ ДЛЯ СВЯЗИ ПРИ ВСТРЕЧЕ

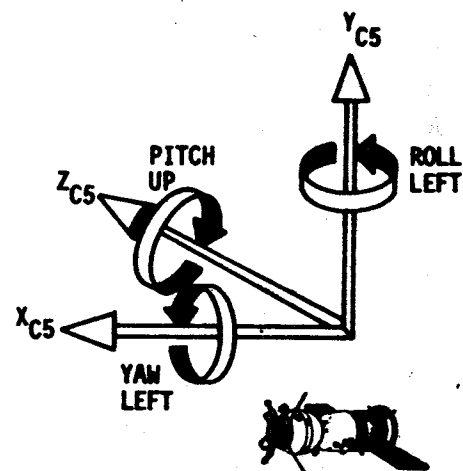
- | | |
|--|--|
| 19. CANNOT (RECEIVE, TRANSMIT) ON VHF (AM, FM) | НЕ МОГУ /ПРИНИМАТЬ/ПЕРЕДАВАТЬ/ ПО УКВ /АМ, ЧМ/ |
| 20. VHF (AM, FM) COMMUNICATIONS ARE (WEAK, INTERMITTENT) | СВЯЗЬ ПО УКВ /АМ, ЧМ/, /СЛАБАЯ, ПРЕРЫВАЕТСЯ/. |
| 21. GO OVER TO VHF (AM, FM) FOR COMMUNICATIONS | ПЕРЕЙДИТЕ НА УКВ /АМ, ЧМ/ ДЛЯ СВЯЗИ |
| 22. WILL TRY (VHF AM, VHF FM, RANGING) AT CLOSER RANGE | ПОПРОБУЮ СВЯЗАТЬСЯ /ПО УКВ АМ, ЧМ, ПРИ ИЗМЕРЕНИИ ДАЛЬНОСТИ/ НА БОЛЕЕ БЛИЗКОМ РАССТОЯНИИ |
| 23. RANGING LOCKUP NOT ESTABLISHED | РЕЖИМ ИЗМЕРЕНИЯ ДАЛЬНОСТИ НЕ УСТАНОВЛЕН. |
| 24. APOLLO CANNOT SIMULTANEOUSLY MAINTAIN BOTH RANGING LOCKUP AND VOICE COMMUNICATIONS | "АПОЛЛОН" НЕ МОЖЕТ ПОДДЕРЖИВАТЬ ОДНОВРЕМЕННО И ИЗМЕРЕНИЕ ДАЛЬНОСТИ И ЗВУКОВУЮ СВЯЗЬ |
| 25. MCC NOT COMPLETED | НСС НЕ ВЫПОЛНЕН |
| 26. APOLLO CANNOT PERFORM _____ | "АПОЛЛОН" НЕ МОЖЕТ ВЫПОЛНИТЬ _____ |
| 27. DOCKING WILL BE DELAYED AT LEAST TWO ORBITS | СТЫКОВКА БУДЕТ ОТЛОЖЕНА ПО КРАЙНЕЙ МЕРЕ НА ДВА ОБОРОТА |
| 28. STATIONKEEPING NOT ESTABLISHED | ЗАВИСАНИЕ НЕ УСТАНОВЛЕНО |
| 29. RANGE _____ | ДАЛЬНОСТЬ _____ МИЛЬ |
| 30. RANGE RATE | СКОРОСТЬ СБЛИЖЕНИЯ _____ |
| 31. CAN SOYUZ MAINTAIN (ORIENTATION FOR DOCKING, INERTIAL ORIENTATION, ORBITAL ORIENTATION)? | МОЖЕТ ЛИ "СОЮЗ" ПОДДЕРЖИВАТЬ /ОРИЕНТАЦИЮ ДЛЯ СТЫКОВКИ, ИНЕРЦИАЛЬНУЮ ОРИЕНТАЦИЮ, ОРБИТАЛЬНУЮ ОРИЕНТАЦИЮ/? |
| 32. DO NOT INITIATE _____ | НЕ НАЧИНАЙТЕ _____ |
| 33. DO NOT SEE YOUR (BEACON, ORIENTATION LIGHTS) | НЕ ВИЖУ ВАШЕГО /МАЯКА, ОГНЕЙ ОРИЕНТАЦИИ/ |
| 34. TURNING ON FLOODLIGHTS | ВКЛЮЧАЮ ПРОЖЕКТОРЫ |



APOLLO



SOYUZ
APPROACH MODE
(PERISCOPE ALONG + X_{C5})



SOYUZ
ORIENTATION MODE
(PERISCOPE ALONG - Y_{C5})

SOYUZ ATTITUDE MNVR INSTRUCTIONS (UNDOCKED)

SOYUZ ATTITUDE MNVR INSTRUCTIONS (DOCKED)

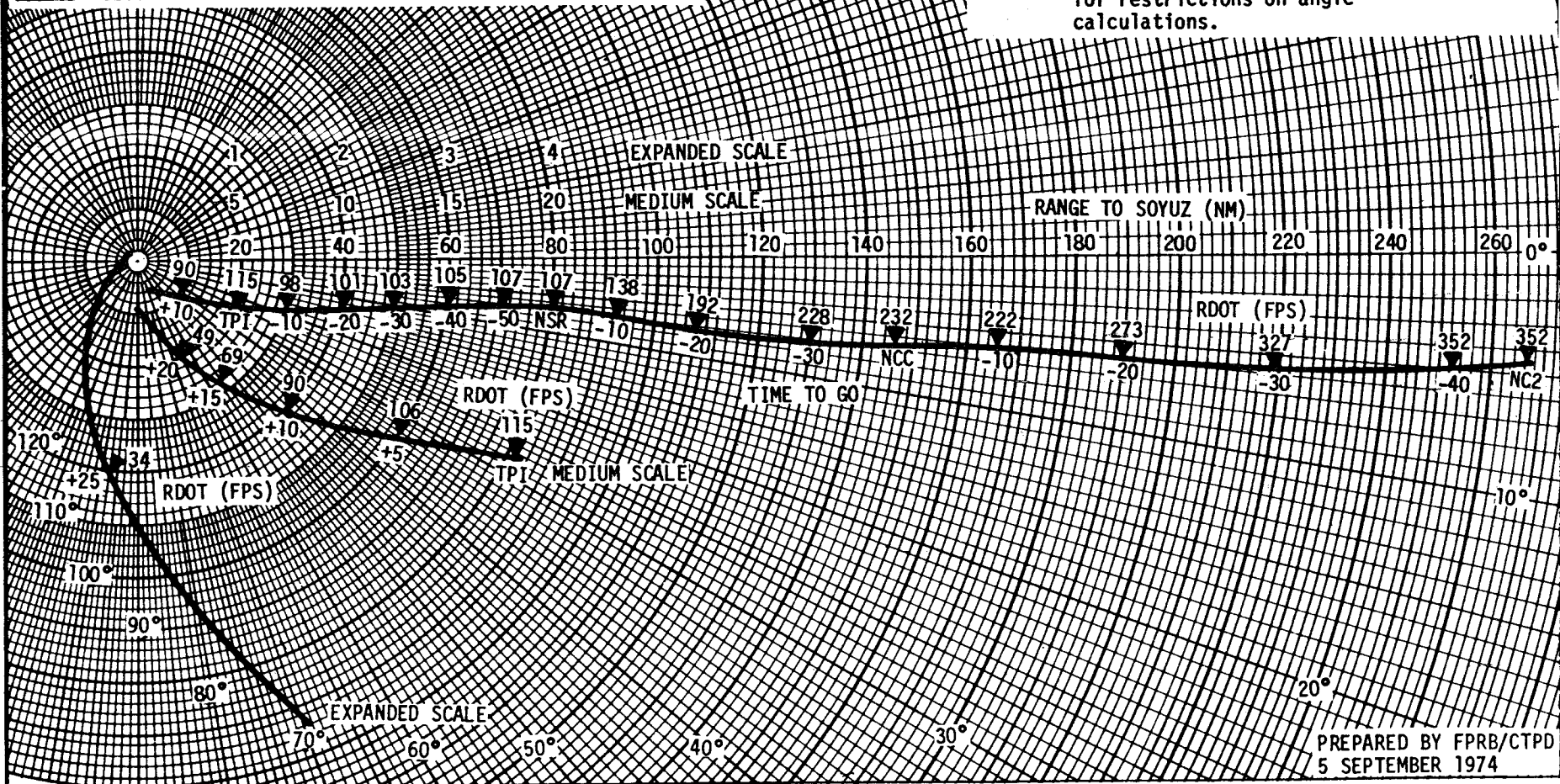
DESIRED SOYUZ ATTITUDE MNVR	SOYUZ ATTITUDE MNVR INSTRUCTION		SOYUZ AXES	DESIRED APOLLO ATTITUDE MNVR	SOYUZ ATTITUDE MNVR INSTRUCTION		SOYUZ AXES	C S M
	APPROACH MODE	ORIENTATION MODE			APPROACH MODE	ORIENTATION MODE		
ROLL RIGHT (LEFT)	ROLL RIGHT	YAW LEFT	X_{C5}	ROLL RIGHT (LEFT)	ROLL LEFT	YAW RIGHT	X_{C5}	X
PITCH UP (DN)	PITCH UP	PITCH UP	Z_{C5}	PITCH UP (DN)	PITCH DN	PITCH DN	Z_{C5}	Y
YAW RIGHT (LEFT)	YAW RIGHT	ROLL RIGHT	Y_{C5}	YAW RIGHT (LEFT)	YAW RIGHT	ROLL RIGHT	Y_{C5}	Z

POLAR PLOT							
T	R	RDOT	θ/θ	T	R	RDOT	θ/θ

FOR SXT TRACKING, RECORD θ : V76/N77*
 V85/N53

FOR COAS TRACKING, RECORD θ : FDAI ORDEAL PITCH
 V83/N54
 P37/N54
 P48/N77*

*NOTE: If data selected while running
 V76 in the optimizing mode,
 reference G&C C/L (G/4-7)
 for restrictions on angle
 calculations.



PREPARED BY FPRB/CTPD
 5 SEPTEMBER 1974

POLAR PLOTS

NASA-JSC

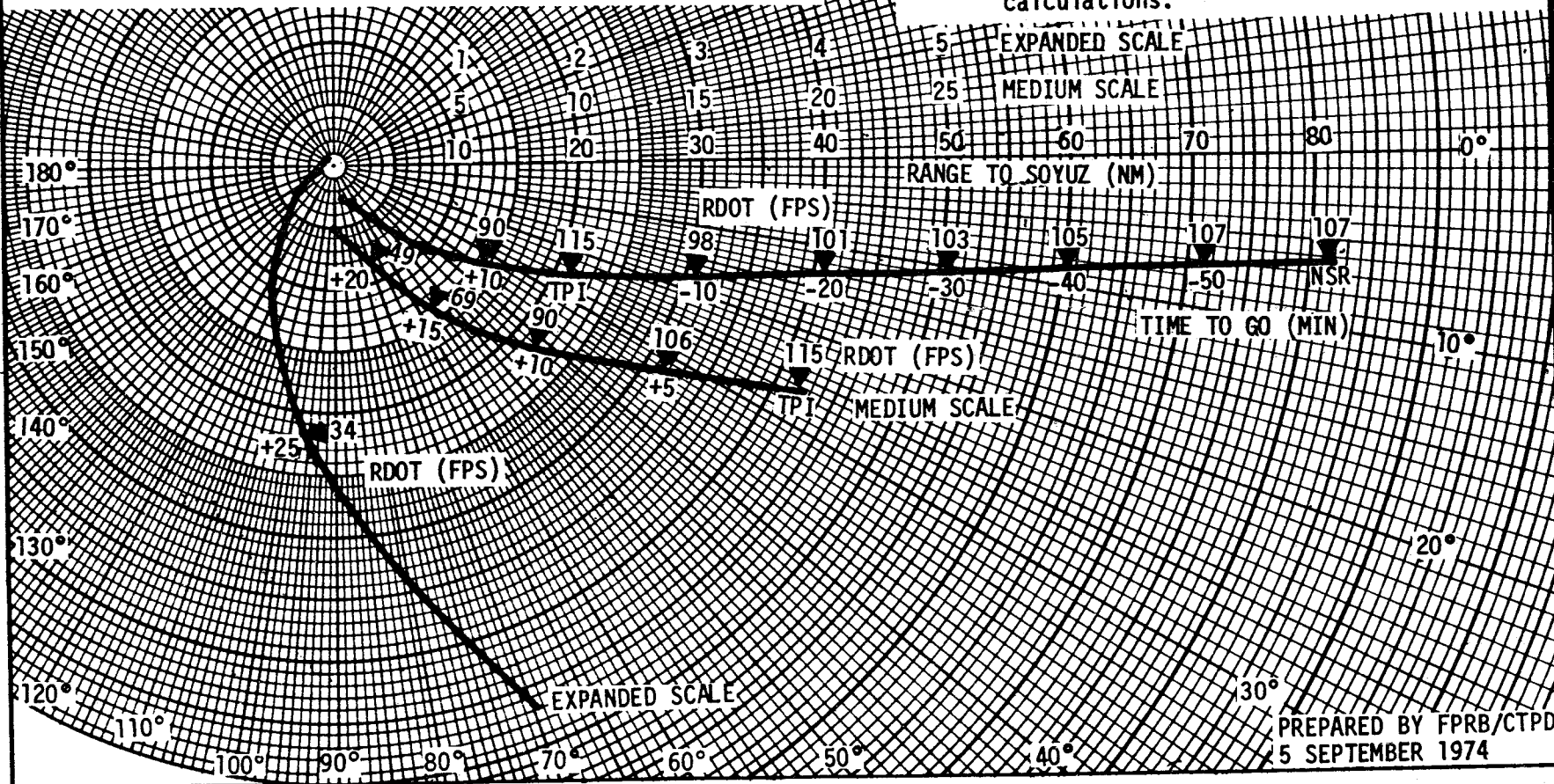
POLAR PLOT

FOR SXT TRACKING, RECORD θ : V76/N77*
V85/N53

FOR COAS TRACKING, RECORD θ : FDAI ORDEAL PITCH
V83/N54
P37/N54
P48/N77*

*NOTE: If data selected while running
V76 in the optimizing mode,
reference G&C C/L (G/4-7)
for restrictions on angle
calculations.

T	R	RDOT	θ/θ	T	R	RDOT	θ/θ



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5 SEPTEMBER 1974