JSC-09139

ASTP

REVISION A

CSM RENDEZVOUS BOOK

PREPARED BY

PROCEDURES BRANCH
CREW TRAINING & PROCEDURES DIVISION

National Aeronautics and Space Administration
LYNDON B. JOHNSON SPACE CENTER
Houston, Texas

JUNE 1, 1975

48

CHANGE CONTROL RECORD

APOLLO/SOYUZ TEST PROJECT RENDEZVOUS BOOK CHECKLIST-

CONTROL NO.	FDF EDITION INCORPORATED		DISAPPROVED OR OTHER DISPOSITION
	TITLE	DATE	
001		2/12/75	CANCELLED
002	REFERENCE EDITION	2/12/75	
003A	REFERENCE EDITION	2/12/75	
004	TWO RNDZ BOOK ONBOARD	2/12/75	
005	REFERENCE EDITION	2/12/75	
006A	REFERENCE EDITION	2/12/75	
007	REFERENCE EDITION	2/12/75	
008	REFERENCE EDITION	2/12/75	
009	FINAL EDITION	5/1/75	
010	FINAL EDITION	5/1/75	
011	REFERENCE EDITION	2/12/75	
012	REFERENCE EDITION	2/12/75	
013	REFERENCE EDITION	2/12/75	
014	REFERENCE EDITION	2/12/75	
015	REFERENCE EDITION	2/12/75	
016	REFERENCE EDITION	2/12/75	
017	REFERENCE EDITION	2/12/75	
018	REFERENCE EDITION	2/12/75	
019	REFERENCE EDITION	2/12/75	
020	FINAL EDITION	5/1/75	
021	FINAL EDITION	5/1/75	
022	FINAL EDITION	5/1/75	
023	FINAL EDITION	5/1/75	
024	FINAL EDITION	5/1/75	
025	FINAL EDITION	5/1/75	
026	FINAL EDITION	5/1/75	
027		5/1/75	DISAPPROVED
028		5/1/75	DISAPPROVED
029	FINAL EDITION	5/1/75	
030	FINAL EDITION	5/1/75	
031	FINAL EDITION	5/1/75	
032	FINAL EDITION	5/1/75	
033	FINAL EDITION	5/1/75	
034	FINAL EDITION	5/1/75	
035	FINAL EDITION	5/1/75	
036	FINAL EDITION	5/1/75	
037	FINAL EDITION	5/1/75	
038	FINAL EDITION	5/1/75	
039	FINAL EDITION	5/1/75	
040	FINAL EDITION	5/1/75	
041	FINAL EDITION	5/1/75	
042	FINAL EDITION	5/1/75	

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CHANGE CONTROL RECORD

APOLLO/SOYUZ TEST PROJECT RENDEZVOUS BOOK CHECKLIST

CONTROL NO.	FDF EDITION INCORPORATED		DISAPPROVED OR OTHER DISPOSITION
	TITLE	DATE	
043	FINAL EDITION(REV A)	6/1/75	
044	FINAL EDITION(REV A)	6/1/75	
045	FINAL EDITION(REV A)	6/1/75	
046	FINAL EDITION(REV A)	6/1/75	
047	FINAL EDITION(REV A)	6/1/75	
048	FINAL EDITION(REV A)	6/1/75	
049	FINAL EDITION(REV A)	6/1/75	
050	FINAL EDITION(REV A)	6/1/75	
051	FINAL EDITION(REV A)	6/1/75	

☆ U.S. GOVERNMENT PRINTING OFFICE: 1975—671-210/141

CSM RENDEZVOUS BOOK

ASTP

LIST OF EFFECTIVE PAGES

BASIC 10/25/74
REFERENCE 2/12/75
FINAL 5/1/75
REVISION A 6/1/75

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ii	6/1/75
iii	6/1/75
iv	6/1/75
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1-3	6/1/75
1-4	6/1/75
1-5	6/1/75
1-6	6/1/75
1-7	6/1/75
1-8	6/1/75
1-9	6/1/75
1-10	6/1/75
1-11	6/1/75
1-12	6/1/75
1-133	6/1/75
1-14	6/1/75
1-15	6/1/75
1-16	6/1/75
1-17	6/1/75
1-18	6/1/75
1-19	6/1/75
1-20	6/1/75
1-21	6/1/75
1-22	6/1/75
1-23	6/1/75
1-24	6/1/75
1-25	6/1/75
2-a	6/1/75
2-1	6/1/75
2-2	6/1/75
2-3	6/1/75
2-4	6/1/75
2-5	6/1/75
2-6	6/1/75
2-7	6/1/75
2-8	6/1/75
2-9	6/1/75
2-10	6/1/75
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2-12	6/1/75
2-13	6/1/75
2-14	6/1/75
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2-18	6/1/75
2-19	6/1/75
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3-5	6/1/75
3-6	6/1/75
3-7	6/1/75
3-8	6/1/75
3-9	6/1/75
3-10	6/1/75
3-11	6/1/75
3-12	6/1/75
3-13	6/1/75
3-14	6/1/75
3-15	6/1/75
3-16	6/1/75
3-17	6/1/75
3-18	6/1/75
3-19	6/1/75
4-1	6/1/75
4-2	6/1/75
4-3	6/1/75
4-4	6/1/75
5-1	6/1/75
5-2	6/1/75
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6-1	6/1/75
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6-3	6/1/75
6-4	6/1/75
6-5	6/1/75
7-a	6/1/75
7-b	6/1/75
7-c	6/1/75
7-1	6/1/75

PAGE	DATE
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LAUNCH → GET ~7+30 | GET ~7+30 → DOCK

BACKUP GDC ALIGN PAD

		A NOMINAL LAUNCH	B POST INS UPDATE	C NOMINAL RNDZ	D RNDZ UPDATE
0°/R STARS		33/37	/	33/37	/
ASCP tw	R	2496		2463	
	P	2775		0682	
	Y	3379		3325	

STAR ACQUISITION PAD

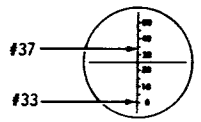
		A (ACM ATT) NOMINAL LAUNCH	B (ACM ATT) POST INS UPDATE	C (SI +X FWD) NOMINAL RNDZ	D RNDZ UPDATE
N22	R	+1790 00	+ 00	+0180 00	+ 00
	P	+2130 00	+ 00	+1700 00	+ 00
	Y	+0010 00	+ 00	+3300 00	+ 00
N71 1ST STAR		37		40	
TPAC	SA	2350 20	0	0866 0	0
ANGLES	TA	0413 30	0 0	0258 0	0 0
N71 2ND STAR		45		43	
TPAC	SA	0345 0	0	0008 0	0
ANGLES	TA	0123 0	0 0	0310 0	0 0
N71 3RD STAR		42		01	

DEFINITIONS

θD = ORDEAL ANGLE TO PLACE EARTH HORIZON IN CENTER OF COAS
H = AVERAGE ALTITUDE
θ = ORDEAL FDAI PITCH
TA = TRUNNION ANGLE

STAR AVAILABILITY

1.) BACKUP GDC ALIGN STARS ARE VISIBLE FROM SS-8 MIN TO SR+4 MIN.

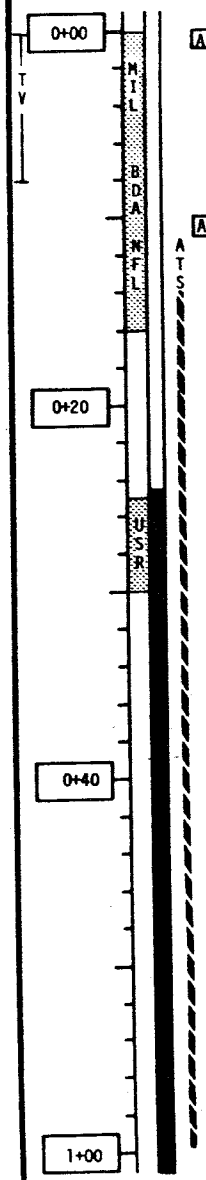


SHAFT = 0°
TRUN = 352.5°

2.) STAR ACQUISITION STARS ARE VISIBLE FROM SS+1 MIN TO SR+7 MIN.

STC/CPD-3431 (REV A74)

NOMINAL



APOLLO LIFT-OFF

APOLLO INSERTION

SIVB MNVRS TO RLH

P52 (OPT 3) (RECORD)

P00

EMS ΔV TEST & NULL BIAS CHECK

SIVB MNVRS TO SEP ATT

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			
TIME OF GYRO TORQUE	MIN	+	0	0	0		
	SEC	+	0				

EMS ΔV TEST & NULL BIAS CHECK CHECKLIST

EMS MODE-STBY
EMS FUNC-ΔV SET/VHF RNG
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/VHF RNG
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

NOMINAL

1+00 (11103) (01111)

VTR (11102) (01111)

1+20

0:00

1+40

30:00

2+00

VAN

NFL

MAD

ATS

CSM/SIVB SEP ——— START TD&E ———

DOCKING

START SCS DRIFT CHECK (BMAG 2)
ALIGN GDC
RESET AND START DET COUNTING UP

HGA SWITCH LIST

ACQUIRE ATS HGA: MAN, WIDE P -66, Y 30
S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW

TRANSMIT SEP AND
SLA PANEL JET STATUS
TRANSMIT GYRO TORQUE ANGLES
AND TIME (Pg 1-1)
TRANSMIT EMS ΔV TEST RESULTS

```
*****IF OHA REQ'D*******************
* OHA PRELIMINARY PAD (COPY Pg 1-3) *
* ACM PRELIMINARY PAD (COPY Pg 1-4) *
*                                   *
*                                   *
*                                   *
*                                   *
*                                   *
* P52 (OPT 3) (RECORD)              *
*                                   *
*                                   *
*                                   *
* P00; CMC MODE-AUTO                *
*************************************
******IF BMAG 2>10°/HR/AXIS**********
* START SCS DRIFT CHECK (BMAG 1)    *
*   ALIGN GDC                       *
*   BMAG MODE(3)-RATE 1             *
*   RESET AND START DET COUNTING UP *
*************************************
```

END SCS DRIFT CHECK (BMAG 2)
(REF GDC/IMU COMPARISON C/L)

GDC/IMU COMPARISON CHECKLIST

V16N20E
FDAI SELECT-1
FDAI SOURCE-ATT SET
ATT SET-GDC
ZERO FDAI 1 err needles with ASCP tw
Key VERB when ZERO
RECORD N20 values
RECORD ASCP tw values
RECORD DET
FDAI SELECT-1/2

```
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X TOTAL ATTITUDE DIFFERENCE GREATER X
X THAN 10 DEG/HR PER AXIS IS        X
X UNACCEPTABLE.                     X
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

HGA SWITCH LIST

ATS-F SYS:
FLT BUS cb-CLOSED (225)
GRP 2 cb-CLOSED
ATS PWR AMP-1 (230)
HGA XPNDR-PRIM
UP TLM RELAY-UP TLM
HGA PWR-ON

BMAG 2 GDC/IMU COMPARISON RESULTS

N20 IMU	R	+					
	P	+					
	Y	+					
ASCP tw GDC	R	X					X
	P	X					X
	Y	X					X
DET (30:00)	ΔT	X	X				

BMAG 1 GDC/IMU COMPARISON RESULTS

N20 IMU	R	+					
	P	+					
	Y	+					
ASCP tw GDC	R	X					X
	P	X					X
	Y	X					X
DET (30:00)	ΔT	X	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						
TIME OF GYRO TORQUE	HR	+	0	0			
	MIN	+	0	0	0		
	SEC	+	0				

2+00 (11102) (01111)

TV

TRANSMIT GDC/IMU COMPARISON
RESULTS (Pg 1-2)

2+20

SIVB MNVRS TO EXTRACTION ATT

V48E, LOAD N47 REG 1 = CSM/DM WT

+30:00

```
*****IF BMAG 2>10°/HR/AXIS***********
* END SCS DRIFT CHECK (BMAG 1)       *
*   (GDC/IMU COMPARISON C/L Pg 1-2)  *
***************************************
```

VTR 0:00

P30
P41
CSM/DM EXTRACTION ——— END TD&E
AEM
P00
TV(2)/VTR POWER(3)-OFF
DSE:(LBR/RCD/FWD/CMD RESET)

```
*****FOR M=14 RNDZ*****************
* DP START PGA DOFFING (Pg 1-5),   *
*   THEN CP                        *
* AC START SNACK PERIOD, DOFF      *
*   AFTER ACM                      *
***************************************
```

2+40

UNSTOW CUE CARDS (DATA CARD KIT-R3)

PSM ACTIVATION (AFTER VAN AOS)
TRANSMIT EXTRACTION &
AEM STATUS

MNVR TO ACM NOMINAL
PAD ATT (Pg 1-4)

SNACK PERIOD

```
*****IF OHA REQ'D*******************
* STDN UPLINK (P27) (CSM S.V. &    *
*   OHA TARGET LOAD)               *
* OHA FINAL PAD (COPY)             *
* (IF REQ'D)COPY PIPA BIAS UPDATE  *
*                                  *
* TRANSMIT GYRO TORQUE ANGLES AND  *
*   TIME (Pg 1-2)                  *
* V48E (LOAD 2 JET) (11002)        *
*      (LOAD WT, PT & YT IF REQ'D) *
* P30(VERIFY N33 & N81 PAD VALUES) *
* P00                              *
* V49 & V41N91 TO PAD DATA         *
* IF STAR NOT IN SXT FOV-G&N NO GO *
*  PERFORM GDC HORIZ CK            *
*  IF HORIZ >5° OF MK-DO NOT BURN  *
* GO TO SPS BURN CUE CARD          *
*   (BANK A)                       *
* P40                              *
```

3+00

OHA PAD DATA

		NOMINAL	PRELIMINARY	FINAL
N33 TIG OHA	HR	+	+	+
	MIN	+	+	+
	SEC	+	÷	+
N81 ΔV_{CHA}	ΔV_X			
	ΔV_Y	+ 0 0 0 0		
	ΔV_Z			
N22 OHA	R	+ 0 0	+ 0 0	+ 0 0
	P	+ 0 0	+ 0 0	+ 0 0
	Y	+ 0 0	+ 0 0	+ 0 0
	ΔV_C			
	BT			
WT		+	PT	YT

BURN ATT CHECK

STAR			
SA	+		0
TA	+	0	0

BURN ATT CHECK UPDATE

STAR			
SA	+		0
TA	+	0	0

HORIZON CK DATA: TIG MINUS ____MIN, WINDOW MK ____DEG

PSM ACTIVATION SWITCH LIST

```
SC CONT/MODE-CMC/FREE
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
SC CONT/MODE-CMC/AUTO
```

PIPA BIAS UPDATE PAD

	ADDRESS	DATA
X	1452	
Y	1454	
Z	1456	

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

NOMINAL

NOMINAL

3+00 (11102) (01111) — GDS

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

```
*                                    *
*                                    *
*                                    *
*                                    *
* OHA ( , ___/ , )                   *
*   (TRIM VGX +0.2)                  *
* RECORD BURN STATUS (Pg 1-3)        *
* TRANSMIT OHA BURN STATUS           *
* MNVR TO ACM NOMINAL                *
*   PAD ATT (Pg 1-4)                 *
* CONT WITH NOMINAL PROCEDURES       *
**************************************
```

NFL — ATS

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 1-a)

3+20

P52 (OPT 3) (RECORD)

HAD

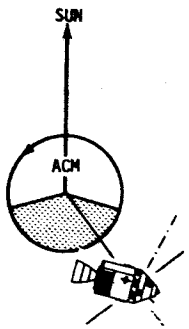
STDN UPLINK (P27) (ACM TARGET LOAD)
ACM FINAL PAD (COPY)
TRANSMIT GYRO TORQUE ANGLES AND TIME
P00; CMC MODE-AUTO
IF IMU DRIFT (P52 N93) > 1.5°/HR-G&N NO GO
PERFORM SCS BURN

(11002) (01111)

V48E (LOAD 2 JET)
(LOAD WT, PT & YT IF REQ'D)

-12:00

P30 (VERIFY N33 & N81 PAD VALUES)



GO TO SPS BURN CUE CARD
(BANK A)

3+40

P40

0:00

ACM (179,34/213,1)
(TRIM VGX +0.2)
RECORD BURN STATUS
TRANSMIT BURN STATUS
P00

```
*****FOR M=14 RNDZ*****************
* AC START PGA DOFFING (Pg 1-5)    *
* CP & DP START SNACK PERIOD       *
**************************************
```

PGA DOFFING (Pg 1-5)

4+00

ACM PAD DATA

		NOMINAL						PRELIMINARY						FINAL					
N33 TIG ACM	HR	+			0	0	3	+						+					
	MIN	+				4	5	+						+					
	SEC	+		0	0	0	0	+						+					
N81 ΔV_{ACM}	ΔV_X	+		0	1	6	7												
	ΔV_Y	+		0	0	0	0												
	ΔV_Z	-		0	1	2	1												
N22 ACM	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 GYRO TORQUING ANGLES	X					
	Y					
	Z					
TIME OF GYRO TORQUE	HR	+	0	0		
	MIN	+	0	0	0	
	SEC	+	0			

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		

4+00
(11002)
(01111)

ATS

ORR

*****FOR M=14 RNDZ*****
* PRE-DOCKING DM CHECKOUT (D/1-1) *
* STEP 1 THRU STEP 7 *
*****

4+20

HAM

STDN UPLINK (P27) (CSM S.V. & GYRO COMP UPDATE)
NC1 PRELIMINARY PAD (COPY Pg 1-6)
NPC ADVISORY

*****FOR M=14 RNDZ*****
* DOCKING SYSTEM CHECKOUT (J/1-1) *
*****

4+40

ACQUIRE ATS HGA: MAN, WIDE P -55, Y 45
S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW

NFL

ATS

NC1 FINAL PAD (COPY Pg 1-6)
NPC PRELIMINARY PAD (COPY Pg 1-7)

V48E (LOAD WT)
TRANSMIT DM/CM ΔP (1ST OPP ONLY)

STDN UPLINK (P27) (NC1 TARGET LOAD)

BIOSTACK-ON (MA 107) (R1)
RECORD GET & INDICATOR STATUS (Pg 1-5)

5+00

PGA DOFFING

POWER - OFF (6,9,10)
AUDIO CONT - NORM (6,9,10)(verify)
SUIT POWER - OFF (6,9,10)

Doff comm carrier, stow in TSB
Discon all umbilicals from PGA & stow
Suit Flow Vlvs (3) - SUIT FULL FLOW(verify)

Unstow 3 O2 hose screen caps and 3 PGA elect connector covers (A5)

Install screen caps on CM return hoses(red)
Install elect connector caps on PGAs

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

Doff PGA - discon elect and urine connections inside PGA

Secure PGA elect harness at neckring
Install helmets & gloves on PGA
Install helmet bags on helmets
Secure accessory bags to helmet bags

OBS doffing:
Discon connector from sig conditioners
Remove electrodes from chest
Discard tape disks and tape rings

Clean electrodes with tissue (A2)
Stow harness and biobelt in accy bags

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

Stow PGAs in PGA bags(U2)
Stow PGAs: AC under left couch (A3),
DP under left couch (A3),
CP head of center couch under side hatch

Don inflight clothing (U2 or TSB)
Obtain loose pkt items as required (TSB)

Configure comm:
For comm carrier or headset use -
Don CWG harness (U2 or temp stowed)
Conn CM elect to CWG harness
Don comm carrier or light wt headset as reqd., connect to CWG harness
SPKR/HDST-HEADSET (98) (verify)

For SPEAKER Box use (Pnl 98):
POWER-ON
SPK/HDST-SPEAKER
VOL tw-as desired

POWER - AUDIO/TONE (6,9,10)
SUIT POWER - ON (up) (6,9,10)

BIOSTACK PAD

GET HR				IND LT ON	
MIN				OFF	

NOMINAL

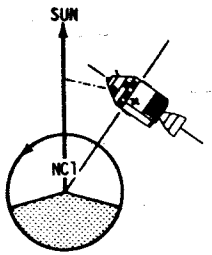
NOMINAL

5+00 (11002) (01111)	ZFF PHOTOS (J/10-1)
	P52 (OPT 3) (RECORD) BYPASS TORQUE IF N93 < 00.300 DEG
	P00 IF IMU DRIFT (P52 N93) > 1.5°/HR-G&N NO GO PERFORM SCS BURN
5+20	MNVR TO STDN NC1 BURN (PITCH) ATT
-12:00	P30 (VERIFY N33 & N81 PAD VALUES)
	GO TO SPS BURN CUE CARD (BANK B)
	P40
5+40 0:00	NC1 (181,358/59,0) (TRIM VGX +0.2) RECORD BURN STATUS
	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 CSM ALONE WT (COPY Pg 1-7)
6+00	

ATS

ORR

HAW




```
*****IF NPC REQ'D*****************
* MNVR TO P38 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 TIG NC1	HR	+ 0 0 5	+	+
	MIN	+ 4 1	+	+
	SEC	+ 2 8 1 0	+	+
N81 ΔV_{NC1}	ΔV_X	+ 0 6 6 3		
	ΔV_Y	+ 0 0 0 0		
	ΔV_Z	+ 0 0 0 2		
N22 NC1	R	+ 1 8 1 0 0	+ 0 0	+ 0 0
	P	+ 0 5 9 0 0	+ 0 0	+ 0 0
	Y	+ 0 0 0 0 0	+ 0 0	+ 0 0
	ΔV_C	0 5 3 7		
	BT	0 0 0 3		

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)

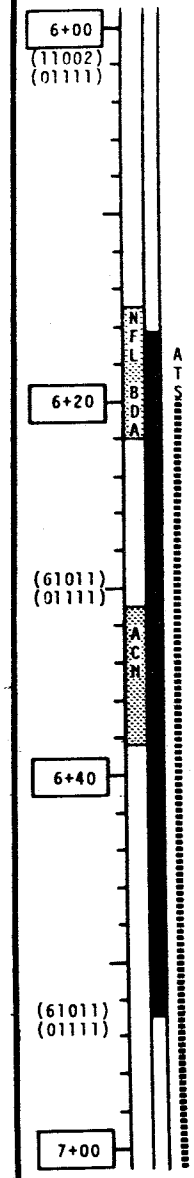
N71-1ST STAR		0	0	0
N71 2ND STAR		0	0	0
N05(R1) ∢ ERR				
N93 GYRO TORQUING ANGLES	X			
	Y			
	Z			
TIME OF GYRO TORQUE	HR	+ 0	0	
	MIN	+ 0	0	0
	SEC	+ 0		

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

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

GET HR			
MIN			




```
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) (RECORD)


P52(OPT 1: COARSE ALIGN)(RECORD)


P00; CMC MODE-AUTO
ALIGN GDC TO IMU
VERIFY SI +X FWD ATT(18,170,330)
V48E (LOAD LM ASCENT DAP,
      5°DB & 0.2°/SEC RATE)
      LOAD N47 REG 1 = CSM WT
                (REF PAD Pg 1-7)
                REG 2 = +04460
CMC MODE-FREE
V46E
CMC MODE-AUTO
TRANSMIT GYRO TORQUE ANGLES
  AND TIME (OPT's 3 & 1)


START EAT PERIOD
```

```
*****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 FINAL PAD (COPY)           *
*                                *
*                                *
*                                *
*                                *
* V48E (LOAD 2°/SEC) (11003)     *
*      (LOAD WT)                 *
*                                *
*                                *
*                                *
*                                *
* ENTER P38 (G/5-10) 20 MIN      *
*   PRIOR TO TIG                 *
* BYPASS AUTO MNVR               *
*                                *
* VERIFY P38 ATT (180,160,0)     *
* LOAD N33 & N81 PAD VALUES      *
* SET DET                        *
*                                *
*                                *
*                                *
* GO TO SPS BURN CUE CARD        *
*   (BANK A)                     *
*                                *
* P40, MNVR TO BURN ATT (INSURE  *
*   ROLL = PAD ROLL)             *
* OHC-SET IN TPAC ANGLES OF BURN *
*   ATT CHECK PAD STAR.          *
* IF STAR >5° FROM CTR OF SCT-   *
*   DO NOT BURN NPC.             *
* [NPC] (TRIM VGY ±0.2)          *
* RECORD BURN STATUS (Pg 1-8)    *
* REC-MNVR TO ZERO YAW (FDAI)    *
* BYPASS P20 AUTO MNVR           *
* GDC ALIGN AFTER P38 IMU TORQUE *
*                                *
* V48E (LOAD LM ASCENT DAP,      *
*       5°DB & 0.2°/SEC RATE)    *
*       LOAD N47 REG 1 = CSM WT  *
*                (REF PAD Pg 1-7)*
*                REG 2 = +04460  *
* CMC MODE-FREE                  *
* V46E                           *
* CMC MODE-AUTO                  *
*                                *
* MNVR TO SI +X FWD ATT          *
*   (ATT = 12,14,332)            *
**********************************
```

NPC PAD DATA

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

WT	+				

PT					

YT					

BURN ATT CHECK

STAR						
SA	+					0
TA	+				0	0

BURN ATT CHECK UPDATE

STAR						
SA	+					0
TA	+				0	0

LM ASCENT DAP DATA

CSM WT	+					

P52 (OPTION 3)

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

P52 (OPTION 1)

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

NOMINAL

NOMINAL

7+00 (61011) (01111)

ATS

7+20

GHM

7+40

ROSBDA MIL

ATS

15+30

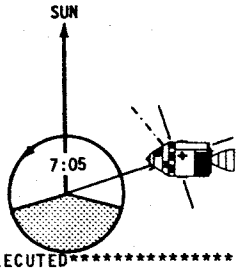
SET HGA: MAN P -29, Y 259
HGA: REACQ, NARROW

DIRECT O2 VLV-CLOSE(cw)
PWR DOWN CHECKLIST (Pg 1-8)
PRESLEEP (S/1-49)

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

GO TO FLIGHT PLAN (Pg 4.1-6)

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




```
*****IF NPC EXECUTED***************
* STDN UPLINK (P27) (NOMINAL RNDZ *
*   REFSMMAT)                     *
* TRANSMIT NPC BURN STATUS        *
*                                 *
*                                 *
*                                 *
*                                 *
*                                 *
*                                 *
*                                 *
*                                 *
*                                 *
*                                 *
*                                 *
*                                 *
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*                                 *
*                                 *
*                                 *
*                                 *
*                                 *
*                                 *
*                                 *
*                                 *
*                                 *
*                                 *
* P52(OPT 1: COARSE ALIGN)(RECORD)*
*                                 *
*                                 *
*                                 *
*                                 *
* P00; CMC MODE-AUTO              *
* ALIGN GDC TO IMU                *
* VERIFY SI +X FWD ATT(18,170,330)*
* TRANSMIT GYRO TORQUE ANGLES     *
*   AND TIME                      *
***********************************

*****FOR M=14 RNDZ*****************
* UVA LAMPS SHUT DOWN (Pg 1-8)    *
* TERMINATE BATT A CHARGE (UPON   *
*   STDN CUE) THEN CHARGE BATT B  *
***********************************
```

SPS BURN STATUS

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

P52 (OPTION 1)

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

PWR DOWN CHECKLIST

```
BMAG PWR #1-OFF
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)
```

6:50

46+30 (61011) (01111) — V A N

STDN UPLINK (P27) (CSM & SOYUZ S.V.'s)
NC2 PRELIM PAD & TPI TIG (N37)
(COPY Pg 1-12)

OPTICS PWR UP CHECKLIST(Pg 1-9)
P52 (OPT 3) (RECORD)

```
*****IF REFSMMAT REALIGN REQ'D******
* STDN UPLINK (P27)(RNDZ REFSMMAT) *
* BACKUP GDC ALIGN PAD &           *
*   STAR ACQUISITION PAD           *
*   (COPY Pg 1-a)                  *
* RNDZ/RNDZ REALIGN PAD            *
*   (COPY Pg 2-a)                  *
*                                  *
* OPTICS PWR UP CHECKLIST (Pg 1-9) *
* P52 (OPT 3) (RECORD)             *
*                                  *
*                                  *
*                                  
```

NOMINAL

7:00

47+00
(61011)
(01111)

ATS

TV CHFCKLIST (Pg 1-10)

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

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

7:30

47+10

TV

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)

7:20

47+20

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-M/APOLLO   *
*   COMM CHECK                    *
***********************************
```

USR

ZFF PHOTOS (J/10-1)

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

50

47+30 (61011) (01111) TV USR ATS

BMAG PWR #1-WARMUP

H2 PURGE LINE HTR-ON(up)

8:00

47+40

P32; BYPASS MINKEY OPTION & AUTO MNVR
LOAD N28 PAD VALUE (Pg 1-12)
VERIFY N37 = PAD VALUE (Pg 1-12)

P32 (RECYCLE: RECORD Pg 1-12)

P00
CMC MODE-FREE
V48E (LOAD CSM ONLY DAP,
0.5°DB & 0.5°/SEC RATE)
LOAD H47 REG 1 = CSM/DM WT (REF NC2 PAD Pg 1-12)
REG 2 = +0

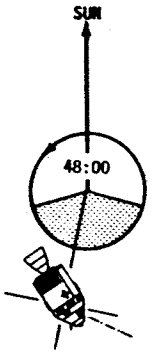
(11002) (01111)

V46E
CMC MODE-AUTO

8:10

47+50

P52 (OPT 3) (RECORD)



P00; CMC MODE-AUTO
COAS LOS DETERMINATION CHECKLIST

H2/02 FUEL CELL PURGE (S/1-6) (20 MIN AFTER LINE HTR-ON)

8:20

48+00

WASTE WATER DUMP CHECKLIST

BORESIGHT STAR
4 - ACHERNAR
(232, 16, 0)

P00

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 GYRO TORQUE	HR	+	0	0			
	MIN	+	0	0	0		
	SEC	+	0				

COAS LOS DETERMINATION CHECKLIST

1. COAS PWR-ON(up)
MNVR TO BORESIGHT ATTITUDE
CMC MODE-FREE
V37E52E
F 04 06 R1 00001
R2 00003
PRO
F 50 25 00015
ENTER
F 01 70 00006 STAR CODE
LOAD BORESIGHT STAR CODE
OPT MODE-CMC(verify)
OPT ZERO-OFF
PRO
06 92 SHAFT,TRUN

2. BORESIGHT ON STAR AND
MARK with VERB key
RECORD SHAFT,TRUN
(NOMINAL = 0°,+57.470°)
TO VERIFY: KEY RLSE
AND REPEAT STEP 2

3. V37E00E
CMC MODE-AUTO
OPT MODE-MAN
CMC-Drive trun<10°
OPT ZERO-ZERO

COAS LOS DETERMINATION

N92	SA	+					
	TA	+					

WASTE WATER DUMP CHECKLIST

BAT VENT VLV-CLOSED (252)
H2O QTY IND-WASTE (Panel 2)
WATER COMT PRESS REL VLV-DUMP A (352)
Monitor WASTE H2O QTY IND-decreasing
(~5% Per Min)
When WASTE H2O QTY IND- 60%
WATER COMT PRESS REL VLV-2
BAT VENT VLV-VENT (252)

NOMINAL

NOMINAL

8:20

48+00 (11002) (01111) — VAN

NC2 FINAL PAD (COPY)
NCC PRELIMINARY PAD (COPY Pg 1-14)
NSR PRELIMINARY PAD (COPY Pg 1-15)
TRANSMIT GYRO TORQUE ANGLES AND TIME (OPT's 3 & 1)(Pg's 1-9 & 1-11)

H2 PURGE LINE HTR-OFF (10 MIN AFTER PURGE)

8:30

48+10

UNSTOW HP-65 KIT(U1) & CHECKLIST(R1)
VELCRO (HOOK) FROM U3 (IN PIN STRAIGHTENING KIT)
HP-65 CHECKOUT (Pg 1)

MNVR TO NC2 FINAL PAD ATT

BMAG PWR #1-ON

8:40

48+20

P32; BYPASS AUTO MNVR
LOAD N28 PAD VALUE
VERIFY N37 = PAD VALUE (Pg 1-12)
SET DET

ACQUIRE ATS HGA: MAN, WIDE P -35, Y 144 — P ___ Y ___
S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW

-12:00 — ATS

P32 (FINAL COMP: RECORD)

GO TO SPS BURN CUE CARD
(BANK A)

P40

8:50

48+30

NC2 PAD DATA

		NOMINAL	PRELIMINARY	FINAL
N28 TIG NC2	HR	+ 0 4 8	+	+
	MIN	+ 3 4	+	+
	SEC	+ 0 4 1 0	+	+
N81 ΔV_{NC2}	ΔV_X	- 0 3 6 4		
	ΔV_Y	+ 0 0 0 0		
	ΔV_Z	+ 0 0 0 0		
N22 NC2	R	+ 0 0 0 0 0	+ 0 0	+ 0 0
	P	+ 0 3 4 0 0	+ 0 0	+ 0 0
	Y	+ 0 0 0 0 0	+ 0 0	+ 0 0
	ΔV_C	0 2 3 7		
	BT	0 0 0 2		

WT + ___ PT ___ YT ___

BURN ATT CHECK

STAR		
SA	+	0
TA	+	0 0

BURN ATT CHECK UPDATE

STAR		
SA	+	0
TA	+	0 0

TPI TIG N37 ___

NC2 ONBOARD DATA

		P32 RECYCLE	P32 FINAL COMP
N84	ΔV_{NCC}	+ 0	+ 0
	ΔH_{NCC}	+ 0 0	+ 0 0
	ΔV_{NSR}	+ 0 0	+ 0 0
N81 ΔV_{NC2}	ΔV_X	0	0
	ΔV_Y	+ 0 0 0 0 0	+ 0 0 0 0 0
	ΔV_Z	+ 0 0 0 0 0	+ 0 0 0 0 0

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

```
XXXXXXXXXXXXXXXXXXXXXXXXXXXX
X        N81 COMP LIMITS NA X
X                           X
X        STDN SOLN PRIME    X
X IF STDN SOLN NOT AVAILABLE X
X        DO NOT BURN NC2    X
XXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

8:50

48+30
(11002)
(01111)

00:00

9:00

48+40

9:10

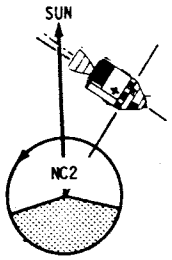
48+50

9:20

49+00

ATS
ACN
SXT
TV
USR

SOYUZ MNVRS TO ORBITAL ATTITUDE RATE



NC2 (0,182/34,0) (R=263.3 NM)
(TRIM VGX +0.2)
RECORD BURN STATUS
TRANSMIT NC2 BURN STATUS

P33

V67E; LOAD N99 WITH +10000, +100, +1; PRO

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

SET DET

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

TV- GRD CMD
48+50 - 49+00

DP PERFORM VHF AM COMM CK

VHF AM SPEC RANGE
= 196 NM

VHF AM AND FM COMM

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-S
VHF FM-RCV

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

◄This is Apollo. Я АПОЛЛОН.
◄How do you read? КАК ВЫ СЛЫШИТЕ?

* 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)
EMS FUNC-ΔV SET/VHF RNG
EMS 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. ГОЛОС УХУДШАЕТ РЕЖИМ ИЗМЕРЕНИЯ ДАЛЬНОСТИ.
* VHF RNG-RESET (1)
* ◄Ranging lockup established. РЕЖИМ ИЗМЕРЕНИЯ ДАЛЬНОСТИ УСТАНОВЛЕН.

NOMINAL

NOMINAL

9:20 am — 49+00 — (11002) (01111) — (10102) (01111) — -12:00 — 9:30 am — 49+10 — 00:00 — 9:40 am — 49+20 — -28:00 — 9:50 am — 49+30

USR — SXT — 24 — GWM — VHF

NCC FINAL PAD (COPY)
NSR FINAL PAD (COPY Pg 1-15)

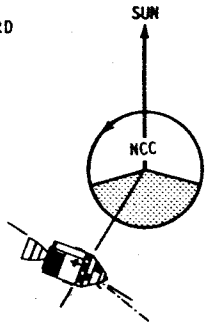
V48E (LOAD B/D TRANS)
(LOAD WT)

P33 (FINAL COMP: RECORD)

DP PERFORM VHF FM COMM CK

GO TO SPS BURN CUE CARD
(BANK A)

P40



VHF FM SPEC RANGE
= 162 NM

NCC (180,349/21,359) (R=145.5 NM)
(TRIM VG's ±0.2)
RECORD BURN STATUS
P34, V32E (P34 RECYCLE: RECORD CMC MATCHED PAIR)(Pg 1-15)
REPORT COMM CHECK RESULTS
TRANSMIT NCC BURN STATUS

V76E (LOAD N72 WITH TIG NSR-28)
SET DET
◄NCC completed. NCC ВЫПОЛНЕН.
DP PERFORM VHF RANGING VOICE CHECK WITH SOYUZ

VHF RANGING SPEC
RANGE = 144 NM

V87E (START VHF MARKING)

R HP-65 DATA FOR NSR-28

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

NCC PAD DATA

		NOMINAL	PRELIMINARY	FINAL
N17 TIG NCC	HR	+ 0 4 9	+	+
	MIN	+ 1 8	+	+
	SEC	+ 0 3 4 0	+	+
N81 ΔV_{NCC}	ΔV_X	+ 0 3 9 6		
	ΔV_Y	- 0 0 0 6		
	ΔV_Z	+ 0 0 6 4		
N22 NCC	R	+ 1 8 0 0 0	+ 0 0	+ 0 0
	P	+ 0 2 1 0 0	+ 0 0	+ 0 0
	Y	+ 3 5 9 0 0	+ 0 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 0

BURN ATT CHECK UPDATE

STAR		
SA	+	0
TA	+	0 0

NCC ONBOARD DATA

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
TRANSMIT N81 APPLIED		

P33 FINAL COMP

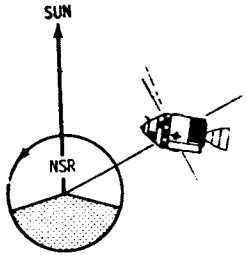
N82 ΔV_{NSR}	ΔV_X	0
	ΔV_Y	0
	ΔV_Z	0
N81 ΔV_{NCC}	ΔV_X	0
	ΔV_Y	0
	ΔV_Z	0

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X N81 COMP LIMITS ±1.5,±7.0,±10.0 FPS X
X X
X CMC/STDN WITHIN LIMITS GO CMC X
X NO AGREEMENT-NORMALLY GO STDN X
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

N13 (TIG NSR)	
	2 8
N72	

49+30		
-24:00 (10102) (01111)	VHF	R HP-65 DATA FOR NSR-24
-20:00		R HP-65 DATA FOR NSR-20
		V48E (LOAD WT)
-16:00		R HP-65 DATA FOR NSR-16
49+40		
-12:00	18	R HP-65 DATA FOR NSR-12 V88E (TERMINATE VHF MARKING) V77E (TERMINATE VHF RANGE RATE PROCESSING ROUTINE) P34 (FINAL COMP: RECORD)
		GO TO SPS BURN CUE CARD (BANK A)
		P40
49+50	AGO	
00:00	AGO ATS	NSR (176,307/188,357) (R=81.0 NM) (TRIM VG's ±0.2) RECORD BURN STATUS P35 TRANSMIT NSR BURN STATUS ◄NSR completed. NSR BURN[illegible]. ACQUIRE ATS HGA: MAN, WIDE P -19, Y 308 S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW
50+00		

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



P		
Y		

NSR PAD DATA

TIG NSR(N13)=TIG NCC(N11) + 00:37:00= ____:____:____.____

		NOMINAL	PRELIMINARY	FINAL
N81 ΔV_{NSR}	ΔV_X	+ 0 1 7 0		
	ΔV_Y	- 0 0 1 4		
	ΔV_Z	+ 0 2 1 2		
N22 NSR	R	+ 1 7 6 0 0	+ 0 0	+ 0 0
	P	+ 1 8 8 0 0	+ 0 0	+ 0 0
	Y	+ 3 5 7 0 0	+ 0 0	+ 0 0
	ΔV_C	0 1 4 5		
	BT	0 0 0 1		
ΔVC AT IGN		+	+	+
ΔVC TAILOFF		-	-	-
WT		+	PT	YT

BURN ATT CHECK			BURN ATT CHECK UPDATE		
STAR			STAR		
SA	+	0	SA	+	0
TA	+	0 0	TA	+	0 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_{NSR}	ΔV_X	0	0
	ΔV_Y	0	0
	ΔV_Z	0	0

NSR HP-65 SOLN

ΔV_X	
ΔV_Y	
ΔV_Z	

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
TRANSMIT N81 APPLIED		

XXXXXXXXXXXXXXXXXXXX

NOMINAL

9:30 am

50+00

(10102)
(01111)
-53:00

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

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

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

REMOVE POLAR PLOT

SNACK PERIOD

10:30 am

50+10

TV- GRD CMD
50+12 - 50+22

TTV

MAD

TPI PRELIMINARY PAD (COPY Pg 1-17)
DOCKING ATTITUDE PAD (COPY Pg 1-19)

50+20

10:40 am

-32:00

USR

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

50+30

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

* 1ST RECYCLE
* IF 2 SOLUTIONS INDICATE TIG SLIP>±8 MIN FROM PRE-NC2 N37(Pg 1-12)
* ●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.

HP-65 TPI TIG 1							
-			3	2			
N72							

TPI TIG (N37)

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

		1ST P35 RECYCLE						2ND P35 RECYCLE					
N37 TIG TPI	HR	+	0	0				+	0	0			
	MIN	+	0	0	0			+	0	0	0		
	SEC	+	0					+	0				
N58	ΔV_{TPI}	+	0	0				+	0	0			
	ΔV_{TPF}	+	0	0				+	0	0			
	$\Delta T(TPI/TPI)$				B						B		
N81 ΔV_{TPI}	ΔV_X		0	0					0	0			
	ΔV_Y		0	0					0	0			
	ΔV_Z		0	0					0	0			
V16N59 $\Delta V_{(LOS)}$	ΔV_F		0	0					0	0			
	ΔV_R		0	0					0	0			
	ΔV_D		0	0					0	0			

50+30 | -24:00 | (01111) | (11103) (01111) | -16:00 | 50+40 | -14:00 | -12:00 | 50+50 | 00:00 | +3:00 | +4:30 | 51+00

USR | SXT | SXT/VHF

```
XXXXXXXXXXXXXXXXXXXXXXX
X UNREASONABLE UPDATE X
X  0.50 NM,  3.0 FPS  X
XXXXXXXXXXXXXXXXXXXXXXX

R HP-65 DATA FOR TPI-24 (GET)

V32E (2ND P35 RECYCLE: RECORD),(RECORD N37)(Pg 1-16)

TPI FINAL PAD (COPY)

V48E (LOAD 4 JET, 2°/SEC
      (LOAD WT)

   R HP-65 DATA FOR TPI-16 (GET)
V77E (TERMINATE VHF RANGE RATE PROCESSING ROUTINE)
V83E, SET ORDEAL (FDAI 1)                          [H=118]

   R HP-65 DATA FOR TPI-14 (GET)
SET HDSUPFLG (V25N7E, 106E, 2000E, 1E)

LOAD N78 REG 3 = ZERO (V23N78E, +E)                [IGNORE ATT ERROR NEEDLES
P35 (FINAL COMP: RECORD)                            & UPLINK ACTIVITY LIGHT]
PRO, N59E (RECORD)
RHC-MNVR TO ZERO ROLL (ROLL RIGHT)

GO TO SPS BURN CUE CARD
  ULLAGE AT -15 SEC
  (BANK A)

P40

[TPI] (359,29/29,2) (R=21.2 NM)
  (TRIM VG's ±0.2)
  P36 (VERIFY TRACK ROLL ATT ~ ZERO DEG)
  ◄TPI completed.TPI BURNOTHER.
  REACQUIRE VHF RANGING (R=13 NM)
  V87E (START VHF MARKING)
  FDAI 1-ORB RATE

  θ AND TA HP-65 DATA FOR TPI+4:30

XXXXXXXXXXXXXXXXXXXXXXX
X UNREASONABLE UPDATE X
X  0.50 NM,  3.0 FPS  X
XXXXXXXXXXXXXXXXXXXXXXX
```

SUN

TPI

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

TPI PAD DATA

		NOMINAL	PRELIMINARY	FINAL
N37 HR		+ 0 5 0	+	+
TIG TPI MIN		+ 5 4	+	+
SEC		+ 2 5 1 0	+	+
N81 ΔV_X		+ 1 9 5		
ΔV_{TPI} ΔV_Y		+ 0 0 7		
ΔV_Z		- 1 0 0		
N59 (RCS) ΔV_F/BT		+ 2 1 9 5 5		
ΔV (LOS) ΔV_R/BT		+ 0 0 7 0 4		
ΔV_D/BT		+ 0 0 0 0 0		
ΔV_C		0 0 9 2		
BT		0 0 0 1		
N22 (SPS USING N81)	R	+ 3 5 9 0 0	+ 0 0	+ 0 0
	P	+ 0 2 9 0 0	+ 0 0	+ 0 0
	Y	+ 0 0 2 0 0	+ 0 0	+ 0 0
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

TPI ONBOARD DATA

TPI HP-65 SOLN

TIG	
ΔV_X	
ΔV_Y	
ΔV_Z	

```
XXXXXXXXXXXXXXXXXXXX
```

NOMINAL

51+00 (11103) (01111)

SM RCS QUAD HTRS(4)-OFF(OCM),OTH.

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

SXT/VHF 7

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

+8:30 R, θ AND TA HP-65 DATA FOR TPI+8:30

+9:00 PRO (P36 FINAL COMP: RECORD)

P41

+12:00 TPM1

P36

V25N33E (LOAD TPI TIG)

+15:00 ◄Turn on your orientation lights. ВКЛЮЧИТЕ ВАШИ ОГНИ ОРИЕНТАЦИИ.

51+10

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

SXT/VHF 7

+16:30 θ AND TA HP-65 DATA FOR TPI+16:30

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

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

+21:00 PRO (P36 FINAL COMP: RECORD)

P41

+24:00 TPM2

51+20

VHF

P37 (ACCEPT AUTO MNVR) (N54 = R,Ṙ,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 1-18)

(11102) (01111)

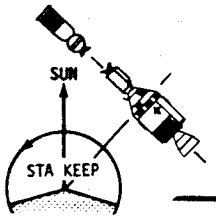
PRO (P48) (N77 = R,Ṙ,θ) (R,Ṙ FROM R27 VHF RANGING FILTER)
V48E (LOAD 0.5°/SEC)
VTR/DAC SWITCH LIST (Pg 1-18)
NULL LOS RATES AND ADJUST RANGE RATE TO BRAKING GATES
N83 (ΔVX,ΔVY,ΔVZ CONT) (OPTIONAL)

VTR

AGO

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

51+30



TPM1 ONBOARD DATA

N59		P36 FINAL COMP		TPM1 HP-65 SOLN
$\Delta V_{(LOS)}$	ΔV_F	0	0	
	ΔV_R	0	0	
	ΔV_D	0	0	

TPM2 ONBOARD DATA

N59		P36 FINAL COMP		TPM2 HP-65 SOLN
$\Delta V_{(LOS)}$	ΔV_F	0	0	
	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)	Ṙ(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

11:50 am

51+30

V25N22E (LOAD DOCKING ATT) (Pg 1-19)
◄Initiating orientation of Apollo. НАЧИНАЮ ОРИЕНТАЦИЮ АПОЛЛОНА.
MNVR TO DOCKING ROLL ATT (-60° CCW)
V62E (REF ERROR NEEDLES)
VTR/TV SWITCH LIST(Pg 1-19)

ATS

◄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

(11111)
(00146)
(00000)

(05000)
(00500)

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

12:00 am

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

TV

51+50

MAD

CSM/SOYUZ INTERFACE SEAL COMPRESSED

USR

52+00

SUNSET
AT 52:05

DOCKING ATTITUDE

		NOMINAL						UPDATE					
N22	R	+	3	0	0	0	0	+				0	0
	P	+	1	5	7	0	0	+				0	0
	Y	+	0	0	0	0	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

NOMINAL

ACTIVE DOCKING PREPARATION CHECKLIST

```
* * * * * * * * *  CAUTION  * * * * * * * * *
* GUIDE RING-EXTD/RETR MUST BE OPERATED      *
* BY SYSTEM A OR B ONLY (SINGLE MOTOR).      *
* DYNAMIC FORCES USING TWO MOTORS COULD      *
* CREATE STRUCTURAL LOADS BEYOND             *
* DESIGN LIMITS.                             *
*                                            *
* STRUCT LATCH-CLOSE/OPEN MUST BE OPERATED   *
* BY SYSTEM A OR B ONLY (SINGLE MOTOR).      *
* STALLED GEAR BOX LOAD USING TWO            *
* MOTORS COULD EXCEED CABLE BREAKING         *
* STRENGTH.                                  *
*                                            *
* MCC MAY ADVISE THAT MOTORS IN BOTH         *
* SYSTEMS ARE DEGRADED.  THEREFORE,          *
* BOTH SYSTEMS (A&B) MAY BE OPERATED         *
* SIMULTANEOUSLY.                            *
* * * * * * * * * * * * * * * * * * * * * * *
```

PNL

NOTE

3 MONITOR FC 1 OR 2(SYSTEM A) OR FC 3 (SYSTEM B) CURRENT WHEN OPERATING STRUCT LATCH, GUIDE RING, OR BACKUP PASSIVE MOTORS.

```
        * IF SYSTEM B MOTORS REQUIRED:          *
275     *  CB MAIN B BAT BUS B-CLOSE(VERIFY)     *
  5     *  MAIN BUS TIE B/C-ON(UP)               *
        *                                        *
        * IF SYSTEM A&B MOTORS REQUIRED:         *
        *  MAIN BUS TIE (2)-ON(UP)               *
        *                                        *
        * TO AVOID EXCESS CURRENT DRAIN          *
        * ON ENTRY BATTERIES:                    *
        *  MAIN BUS TIE (2)-OFF(DN)              *
        * AFTER SYSTEM TASK PERFORMED.           *
```

DOCKING SYSTEM PREPARATION:

DOCKING SYSTEM A:

274 CB IND LOGIC MNA-CLOSE
CB IND PWR AC1-CLOSE
CB CONTROL BAT A-CLOSE
CB MOTORS AC1(3)-CLOSE
CB DM POWER (2)-CLOSE(VERIFY)

DOCKING SYSTEM B:

274 CB IND LOGIC MNB-CLOSE
CB IND PWR AC2-CLOSE
CB CONTROL BAT B-CLOSE
CB MOTORS AC2(3)-CLOSE

2 STRUCT LATCH OPEN LT-ON(VERIFY)
PASSIVE LT-ON(VERIFY)

```
        * IF NO COMM:                          *
        *  DSE: (HBR/RCD/FWD/CMD RESET)        *
230     *  UP TEL-RELAY                        *
```

2 GUIDE RING A-EXTD(~40 SEC)(MAY CAUSE JET FIRINGS)
PASSIVE LT-OUT
GUIDE RING EXTD LT-ON

GUIDE RING A-OFF(CTR)

```
        * IF NO COMM:                          *
        *  DSE: (LBR/RCD/FWD/CMD RESET)        *
```

CONTINGENCY DOCKING SYSTEM EXTENSION VERIFICATION

PNL

-30:00 CM4/NK(B2)/300MM-EYEPIECE(A5)
LENS BRKT(A5)/DAC MOUNT(U1)

2 STRUCT LATCH OPEN LT-ON (VERIFY)
PASSIVE LT-ON (VERIFY)

ROTATE CAMERA TO PLACE SMALLEST VISIBLE LINE ON TARGET IN THE RANGEFINDER.
FOCUS CAMERA (FROM LOW END OF LENS SCALE) AND RECORD RANGE.

WARNING: DO NOT DISTURB CAMERA UNTIL GUIDE RING IS EXTENDED.

MCC WILL ADIVSE WHEN TO EXTEND AND RETRACT GUIDE RING.

0:00 GUIDE RING A-EXTEND (~40 SEC) (MAY CAUSE JET FIRINGS)

2 PASSIVE LT-OUT
GUIDE RING EXTD LT-ON

GUIDE RING A-OFF (CTR)
FOCUS CAMERA (FROM LOW END OF LENS SCALE) ON THE SAME LINE AND RECORD RANGE.

RANGE AT EXTENSION _____
RANGE AT RETRACTION _____
DISTANCES EXTENDED _____

COMPUTE GUIDE RING EXTENSION DISTANCE (RANGE AT EXTENSION MINUS RANGE AT RETRACTION).

2 GUIDE RING A-RETRACT (~40 SEC)
GUIDE RING EXTD LT-OFF
PASSIVE LT-ON

GUIDE RING A-OFF (CTR)

RESTOW CAMERA ASSEMBLY COMPONENTS

```
        APOLLO ACTIVE DOCKING:
PRL  <-INFORM SOYUZ : READY FOR DOCKING.
                      ARE YOU READY?

        [INFORM APOLLO : READY FOR DOCKING.]

     <-INFORM SOYUZ : APPROACHING SOYUZ.

        TO INITIATE APPROACH:
             * IF NO COMM BETWEEN SPACECRAFT AND     *
             * SOYUZ WISHES TO TERMINATE APOLLO      *
             * APPROACH:  SOYUZ WILL TURN ON BEACON  *
             * LTS FOR 10 SEC, THEN OFF (TWICE)      *
         VERIFY DOCKING ATTITUDE
   1     EMS MODE-NORMAL
-05:00   THC-THRUST +X (4 JET)(ΔVC=-100.5FPS)
         THC/RHC-MAINTAIN RELATIVE ALIGNMENT
          (CLOSING ΔV=0.5 FPS)

        CHANGE DAC = 12FPS
             * IF NO COMM:                                  *
             * DSE: (MBR/RCD/FWD/CMD RESET)                  *
 230         * UP TEL-RELAY                                 *
             *                                              *
 181         * TV STA SEL CM-CM(UP)                         *
             * TV STA SEL CMT-CM2(DN)                        *
             *                                              *
 400         * VTR HEAD WHEEL DRIVE MOTOR-ON (MOTOR ON LT-ON) *
             * MODE-RECORD (RECORD LT-ON)                    *
        AT CONTACT:

     <-INFORM SOYUZ : CONTACT.

        [INFORM APOLLO : CONTACT.]

 00:00   THC-THRUST +X (4 JET) AT CONTACT FOR 5 SEC MAX
   2     GUIDE RING CAPTURE LT-ON(CAPTURE LT MAY BLINK)
          OR WHEN SOYUZ REPORTS CAPTURE. (IF NEG. THC-X 1 SEC)
             * IF SCS CONTROL REQD:                 *
             * MAN ATT(3)-MIN IMP                    *
             *  (<2 SEC AFTER CAPTURE)               *
             * AUTO RCS SELECT : A3,C4,B3,D4-OFF     *
             *                 : B/D ROLL(4)-OFF     *
             * DBD/RATE-MIN/HI                       *
             * BMAG MODE(3)-ATT 1/RATE 2             *
             * MAN ATT(3)-RATE CMD                   *
             * SC CONT-SCS                           *
   1     SC CONT-CMC/FREE (<2 SEC AFTER CAPTURE)
   8     AUTO RCS SELECT: A3,C4,B3,D4-OFF
   1     SC CONT-GMC/AUTO

     <-INFORM SOYUZ : CAPTURE.

        [INFORM APOLLO : CAPTURE.]

        WAIT FOR SPACECRAFT TO STABILIZE(2 MIN)

     <-INFORM SOYUZ : INITIATING RETRACTION.

        TO RETRACT:
   2     GUIDE RING A-RETRACT(~40 SEC)
         GUIDE RING EXTD LT-OUT
         STRUCT RING CONTACT LT-ON
         (WAIT 2 SEC)
         GUIDE RING A-OFF(CTR)
        TO PRELOAD STRUCTURAL LATCHES:
   2     STRUCT LATCH A-CLOSE(~8 SEC)
         STRUCT LATCH OPEN LT-OUT
         STRUCT LATCH CLOSE LT-ON(LT MAY FLICKER)
         STRUCT LATCH A-OFF(CTR)

     <-INFORM SOYUZ : DOCKING COMPLETED.

        [INFORM APOLLO : INTERFACE SEAL COMPRESSED.
        SOYUZ SYSTEM CHECK]

        DAC/TV-OFF
        PERFORM STANDARD APOLLO DOCKED CONFIGURATION(Pg 1-22)
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                Активная стыковка "Аполлона"
в панели <-- СООБЩИТЬ на "Союз": Готов к стыковке.
                                 Вы готовы?

        [- СООБЩИТЬ на "Аполлон": Готов к стыковке.]

     <-- СООБЩИТЬ на "Союз": Подхожу к "Союзу".

        Начало подхода:
        + В случае отсутствия связи между кораблями при решении +
        + "Союза" остановить подход.  "Союз" включит на 10 сек. +
        + и выключит маяки /дважды/                             +
          - ПРОВЕРИТЬ ориентацию для стыковки
   1      - РЕЖИМ СИСТ. КОНТРОЛЯ ВХОДА В АТМОС. - НОРМАЛЬНЫЙ
-05:00    - С помощью РУ* перемещением ПОДАТЬ импульс +X
             /4 двигателя/ /ΔV = -100,5 фут./сек./
          - С помощью РУ вращением и перемещением ОБЕСПЕЧИТЬ
             согласование положения с "Союзом"
               /Заключительное ΔV = 0,5 фут. в сек./

          - При зависании УСТАНОВИТЬ на камере "ДАК"
             12 кадр./сек.

        В момент касания:

     <-- СООБЩИТЬ на "Союз": Есть касание.

        [- СООБЩИТЬ на "Аполлон": Есть касание.]

 00:00    - При контакте с помощью РУ перемещением ПОДАТЬ
             импульс +X /4 двигателя/ на 5 сек. макс.
   2      - Тр-т ЗАХВАТ КОЛЬЦА горит /Возможно мигание/
             или "Союз" сообщил о сцепке
        + Если требуется управление кораблем с помощью системы +
        + управления стабилизацией:                            +
        +  - РУЧНОЕ УПРАВЛ. ОРИЕНТ. /3/ - МИНИМАЛЬНЫЙ          +
        +     ИМПУЛЬС /<2 сек. после сцепки/                   +
        +  - ВЫБОР АВТ. РЕЖИМА РСУ:  A3,C4,B3,D4 - ВЫКЛ        +
        +                          :  КРЕН B/D /4/ - ВЫКЛ      +
        +  - ЗОНА НЕЧУВСТВИТЕЛЬНОСТИ/СКОРОСТЬ - МИНИМУМ/ВЫСОКАЯ+
        +  - РЕЖИМ ГИРОПЛАТФОРМ /3/ - ОРИЕНТ. 1/СКОРОСТЬ 2      +
        +  - РУЧНОЕ УПРАВЛ. ОРИЕНТ. /3/ - УПРАВЛ. СКОРОСТЬЮ     +
        +  - УПРАВЛ. КОРАБЛЕМ - СИСТЕМА УПРАВЛ. СТАБИЛИЗАЦИЕЙ  +

   1      - УПРАВЛ. КОРАБЛЕМ - ЭВМ/НЕСТАБИЛ. /<2 сек. после сцепки/
   8      - ВЫБОР АВТ. РЕЖИМА РСУ A3,C4,B3,D4 - ВЫКЛ
   1      - УПРАВЛ. КОРАБЛЕМ - ЭВМ/АВТ.

     <-- СООБЩИТЬ на "Союз": Есть сцепка.

        [- СООБЩИТЬ на "Аполлон": Есть сцепка.]

          - ОЖИДАТЬ стабилизации кораблей /2 мин./

     <-- СООБЩИТЬ на "Союз": Начинаю стягивание.

        Стягивание:
   2      - КОЛЬЦО С НАПРАВЛЯЮЩИМИ А - ВТЯНУТЬ /~40 сек./
          - Тр-т КОЛЬЦО ВЫДВИНУТО гаснет
          - Тр-т КАСАНИЕ ШПАНГОУТА загорается
            /ЖДАТЬ 2 сек./
          - КОЛЬЦО С НАПРАВЛЯЮЩИМИ А - ВЫКЛ /Среднее положение/

        Предварительная нагрузка активных крюков:
   2      - АКТИВНЫЕ КРЮКИ А - ЗАКР /~8 сек./
          - Тр-т АКТИВНЫЕ КРЮКИ ОТКРЫТЫ гаснет
          - Тр-т АКТИВНЫЕ КРЮКИ ЗАКРЫТЫ загорается
            /Возможно мигание/
          - АКТИВНЫЕ КРЮКИ А - ВЫКЛ /Среднее положение/

     <-- СООБЩИТЬ на "Союз": Стыковка выполнена.

        [- СООБЩИТЬ на "Аполлон": Стык обжат.
        Проверка систем "Союза"]

          - "ДАК"/ТВ - ВЫКЛ
          - Далее СМОТРИ инструкцию по штатному управлению
             "Аполлоном" в состыкованном состоянии /Стр. 1-22/
```

*Ручка управления

NOMINAL

STANDARD APOLLO DOCKED CONFIGURATION

PNL

P00
V93
* IF NOT PREVIOUSLY PERFORMED: *
* V44E N87 R1 11111 *
* R2 00146 *
* R3 00000 *
* N89 R1 +05000(RATE 0.5 DEG/SEC) *
* R2 +00500(DBD 5.0 DEG) *

V45E(ACTIVE DOCKED DAP)

RHC(BOTH)-LOCKED
THC-LOCKED

1 EMS FUNC/MODE-OFF/STBY
FDAI SCALE-5/1
FDAI SELECT-1/2
FDAI SOURCE-ATT SET
ATT SET-GDC
LIMIT CYCLE-OFF
DBD/RATE-MIN/HI
THC PWR-OFF
RHC PWR NORMAL(2)-OFF
RHC PWR DIRECT(2)-OFF

8 * IF SCS CONTROL REQD: *
1 * AUTO RCS SELECT : A/C ROLL(4)-MNA/MNB *
* : B/D ROLL(4)-OFF *
* : C3,A4,D3,B4-MNA/MNB *
* : A3,C4,B3,D4-OFF *
* FDAI SELECT-1 *
* BMAG MODE(3)-ATT 1/RATE 2 *
* MAN ATT(3)-RATE CMD *
* SC CONT-SCS *

MAN ATT(ROLL)-MIN IMP
MAN ATT(PITCH,YAW)-RATE CMD
SC CONT-CMC
CMC MODE-AUTO
BMAG MODE(3)-RATE 2

2 GUIDE RING A&B-OFF(CTR)
STRUCT LATCH A&B-OFF(CTR)

ACTIVE DOCKING SYSTEM:
GUIDE RING CAPTURE LT-ON
STRUCT RING CONTACT LT-ON
STRUCT LATCH CLOSE LT-ON

* PASSIVE DOCKING SYSTEM: *
* STRUCT LATCH OPEN LT-ON *
* GUIDE RING CAPTURE LT-ON *
* PASSIVE LT-ON *
* STRUCT RING CONTACT LT-ON *

PNL
5 MAIN BUS TIE(2)-OFF

8 AUTO RCS SELECT : A/C & B/D ROLL(8)-MNA/MNB
: PITCH & YAW(8)-OFF
* IF SCS REQD: *
* A/C ROLL(4)-MNA/MNB(VERIFY) *
* B/D ROLL(4)-OFF(VERIFY) *
* C3,A4,D3,B4-MNA/MNB(VERIFY) *
* A3,C4,B3,D4-OFF(VERIFY) *

13 FDAI(2)-INRTL

15 COAS PWR-OFF

122 OPTICS ZERO-ZERO

DOCKING SYSTEM A:
274 CB IND LOGIC MNA-OPEN
CB IND PWR AC1-OPEN
CB CONTROL BAT A-OPEN
CB MOTORS AC1(3)-OPEN
CB DM POWER(2)-CLOSED(VERIFY)

DOCKING SYSTEM B:
CB IND LOGIC MNB-OPEN
CB IND PWR AC2-OPEN
CB CONTROL BAT B-OPEN
CB MOTORS AC2(3)-OPEN

SM RCS QUAD HTR A-SEC
SM RCS QUAD HTR BCD(3)-PRIM

◄ INFORM SOYUZ : DOCKING SYSTEM POWER OFF.

VHF RANGE BIAS CHECK:
* IF VHF RANGING OFF: *
* ◄ TURN ON VHF RANGING *
* VHF AM A-OFF(CTR) *
* VHF AM B-DUPLEX *
* VHF RANGING-ON(UP) *
P25
LOAD N72 ALL ZEROS
PRO
9 VHF RNG-RESET(12 SEC)

REPORT : TIME WHEN VHF BIAS
CHECK WAS INITIATED.

MCC-H ADVISE APOLLO WHEN TO TERMINATE P25.

P00

CONFIGURE FOR VHF SIMPLEX A
3 VHF RANGING-OFF
VHF AM A-SIMPLEX
VHF AM B-OFF(CTR)

* IF NO COMM: *
* DSE: (LBR/RCD/FWD/CMD RESET) *
400 * VTR HEAD WHEEL DRIVE MOTOR-OFF (MOTOR ON LT-OFF) *
* *
181 * TV STA SEL CM1-UP TLM(CTR) *
* TV STA SEL CM-UP TLM(CTR) *

GO TO DM CHECKLIST (D/2-1)

DOCKED CONFIGURATION

APOLLO CONTINGENCY UNDOCKING

V48E(61102,11111)(DO NOT ACTIVATE DAP)

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

◄INFORM SOYUZ : PREPARING FOR UNDOCKING.

DOCKING SYSTEM PREPARATION:
DOCKING SYSTEM A:
274 CB IND LOGIC MNA-CLOSE
CB IND PWR AC1-CLOSE
CB CONTROL BAT A-CLOSE
CB MOTORS AC1(3)-CLOSE

DOCKING SYSTEM B:
CB IND LOGIC MNB-CLOSE
CB IND PWR AC2-CLOSE
CB CONTROL BAT B-CLOSE
CB MOTORS AC2(3)-CLOSE

DOCKING STATUS LIGHTS:
2 GUIDE RING CAPTURE LT-ON(VERIFY)
STRUCT RING CONTACT LT-ON(VERIFY)
STRUCT LATCH CLOSE LT-ON(VERIFY)

* IF SOYUZ CLOSED ACTIVE HOOKS: *
*
*◄INFORM SOYUZ : OPEN YOUR ACTIVE HOOKS. *
*
* INFORM APOLLO : ACTIVE HOOKS OPEN. *

◄INFORM SOYUZ : OPENING ACTIVE HOOKS

STRUCT LATCH A-OPEN(~8 SEC)
STRUCT LATCH CLOSE LT-OUT
STRUCT LATCH OPEN LT-ON

* IF STRUCT LATCH OPEN LT-OUT: *
* USE BU PROCEDURE FOR APOLLO ACTIVE *
* UNDOCKING JOINT OPS CKLT Pg J/3-4 *

STRUCT LATCH A-OFF(CTR)

-03:00 ◄INFORM SOYUZ : READY FOR UNDOCKING.

INFORM APOLLO : READY FOR UNDOCKING.

РАССТЫКОВКА АПОЛЛОНА В НЕШТАТНОЙ СИТУАЦИИ

- ВВЕСТИ глагол 48 /61102, 11111/ /ЦАП не включать/

№ панели
1 - СИСТ. КОНТРОЛЯ ВХОДА В АТМОС. - переключатель ФУНКЦИЯ/РЕЖИМ УСТАНОВИТЬ в положения УСТАВКА ΔV/РЕЖИМ ГОТОВНОСТИ
- УСТАНОВИТЬ на счетчике ΔV +100,0 фут./сек.
- СИСТ. КОНТРОЛЯ ВХОДА В АТМОС. - переключатель ФУНКЦИЯ УСТАНОВИТЬ в положение ΔV

◄ СООБЩИТЬ на "Союз": Готовлюсь к расстыковке.

Подготовка стыковочных систем:
Стыковочная система А:
274 - НАЖАТЬ АЗС ШИНЫ "А" ЛОГИКИ ИНДИКАТОРОВ
- НАЖАТЬ АЗС ИНДИКАТОРОВ ПИТ. ПЕРЕМ. ТОКА 1
- НАЖАТЬ АЗС УПРАВЛ. ПИТАНИЕМ ОТ БАТАРЕИ А
- НАЖАТЬ АЗС ПИТ. ПРИВОДОВ ПЕРЕМ. ТОКА 1 /3/

Стыковочная система В:
- НАЖАТЬ АЗС ШИНЫ "В" ЛОГИКИ ИНДИКАТОРОВ
- НАЖАТЬ АЗС ИНДИКАТОРОВ ПИТ. ПЕРЕМ. ТОКА 2
- НАЖАТЬ АЗС УПРАВЛ. ПИТАНИЕМ ОТ БАТАРЕИ В
- НАЖАТЬ АЗС ПИТ. ПРИВОДОВ ПЕРЕМ. ТОКА 2 /3/

Транспаранты состояния стыковки
2 - Тр-т ЗАХВАТ КОЛЬЦА горит /Проверить/
- Тр-т КАСАНИЕ ШПАНГОУТА горит /Проверить/
- Тр-т АКТИВНЫЕ КРЮКИ ЗАКРЫТЫ горит /Проверить/

+ Если активные крюки "Союза" закрыты: +
+◄ СООБЩИТЬ на "Союз": Откройте ваши активные +
+ крюки. +
+ +
+ - СООБЩИТЬ на "Аполлон": Активные крюки +
+ открыты. +

◄ СООБЩИТЬ на "Союз": Открываю активные крюки.

- АКТИВНЫЕ КРЮКИ А - ОТКР /~8 сек./
- Тр-т АКТИВНЫЕ КРЮКИ ЗАКРЫТЫ гаснет
- Тр-т АКТИВНЫЕ КРЮКИ ОТКРЫТЫ загорается

+ Если не горит тр-т "АКТИВНЫЕ КРЮКИ ОТКРЫТЫ", +
+ СМОТРИ резервные операции по активной рас- +
+ стыковке "Аполлона", инструкция по совместной +
+ работе, стр. J/3-4/ +

- АКТИВНЫЕ КРЮКИ А - ВЫКЛ /Среднее положение/

-03:00 ◄ СООБЩИТЬ на "Союз": Готов к расстыковке.

- СООБЩИТЬ на "Аполлон": Готов к расстыковке.

CONTINGENCY
UNDOCKING

PHL

TO INITIATE ACTIVE UNDOCKING:

1 EMS MODE-NORMAL

◄INFORM SOYUZ : INITIATING UNDOCKING
5,4,3,2,1 MARK.

2 CAPTURE LATCH A&B-RELEASE(MOM)
GUIDE RING CAPTURE LT-OUT
PASSIVE LT-ON
STRUCT RING CONTACT LT-OUT

00:00 MONITOR UNDOCKING ΔVC=+100.2 FPS

8 AUTO RCS SELECT(16)-MNA/MNB
1 BMAG MODE(3)-ATT 1/RATE 2
MAR ATT(3)-RATE CMD
SC CONT-SCS
EMS FUNC/MODE-OFF/STBY
V46E(ACTIVATE APOLLO DAP)

◄INFORM SOYUZ : UNDOCKING COMPLETED.

INFORM APOLLO : UNDOCKING COMPLETED.

DOCKING SYSTEM A:
274 CB IND LOGIC MNA-OPEN
CB IND PWR AC1-OPEN
CB CONTROL BAT A-OPEN
CB MOTORS AC1(3)-OPEN

DOCKING SYSTEM B:
CB IND LOGIC MNB-OPEN
CB IND PWR AC2-OPEN
CB CONTROL BAT B-OPEN
CB MOTORS AC2(3)-OPEN

5 MAIN BUS TIE (2)-OFF(DN)

№ панели

Начало активной расстыковки:

1 - РЕЖИМ СИСТ. КОНТРОЛЯ ВХОДА В АТМОС. - НОРМАЛЬНЫЙ

◄ СООБЩИТЬ на "Союз": Начинаю расстыковку
5,4,3,2,1 МАРК.

2 - ЗАЩЕЛКИ КОЛЬЦА А и В - ОТКР /Мгновенно/
- Тр-т ЗАХВАТ КОЛЬЦА гаснет
- Тр-т ПАССИВНО загорается
- Тр-т КАСАНИЕ ШПАНГОУТА гаснет

00:00 - КОНТРОЛИРОВАТЬ по счетчику: ΔV при расстыковке = +100,2 фут./сек.

8 - ВЫБОР АВТ. РЕЖИМА РСУ /16/ - ШИНА А/ШИНА В
1 - РЕЖИМ ГИРОПЛАТФОРМ /3/ - ОРИЕНТ. 1/СКОРОСТЬ 2
- РУЧНОЕ УПРАВЛ. ОРИЕНТ. /3/ - УПРАВЛ. СКОРОСТЬЮ
- УПРАВЛ. КОРАБЛЕМ - СИСТЕМА УПРАВЛ. СТАБИЛИЗАЦИЕЙ
- СИСТ. КОНТРОЛЯ ВХОДА В АТМОС. - переключатели ФУНКЦИЯ/РЕЖИМ УСТАНОВИТЬ в положения ВЫКЛ/РЕЖИМ ГОТОВНОСТИ
- ВВЕСТИ глагол 46 /Включить ЦАП/

◄ СООБЩИТЬ на "Союз": Расстыковка выполнена.

- СООБЩИТЬ на "Аполлон": Расстыковка выполнена.

Стыковочная система А:
274 - ВЫКЛЮЧИТЬ АЗС ШИНЫ "А" ЛОГИКИ ИНДИКАТОРОВ
- ВЫКЛЮЧИТЬ АЗС ИНДИКАТОРОВ ПИТ. ПЕРЕМ. ТОКА 1
- ВЫКЛЮЧИТЬ АЗС УПРАВЛ. ПИТАНИЕМ ОТ БАТАРЕИ А
- ВЫКЛЮЧИТЬ АЗС ПИТ. ПРИВОДОВ ПЕРЕМ. ТОКА 1 /3/

Стыковочная система В:
- ВЫКЛЮЧИТЬ АЗС ШИНЫ "В" ЛОГИКИ ИНДИКАТОРОВ
- ВЫКЛЮЧИТЬ АЗС ИНДИКАТОРОВ ПИТ. ПЕРЕМ. ТОКА 2
- ВЫКЛЮЧИТЬ АЗС УПРАВЛ. ПИТАНИЕМ ОТ БАТАРЕИ В
- ВЫКЛЮЧИТЬ АЗС ПИТ. ПРИВОДОВ ПЕРЕМ. ТОКА 2 /3/

5 - СОЕДИНЕНИЕ ГЛАВНЫХ ШИН /2/ - ВЫКЛ /Вниз/

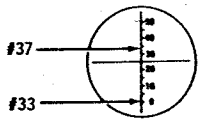
WHEN CMC FAILURE OCCURS

1.) PERFORM CMC FAILURE SWITCH LIST
SC CONT-SCS
DBD/RATE-MIN/HIGH
BMAG MODE(3)-ATT 1/RATE 2
MAN ATT(3)-RATE CMD
FDAI SELECT-1
FDAI SOURCE-ATT SET
ATT SET-IMU
LIMIT CYCLE-OFF
IF STDN CONFIRMS: cb GUID/NAV COMPUTER MNA,MNB-open (5)

2.) PERFORM IMU GO/NO GO CHECK
IF GDC & IMU COMPARE WITHIN 5°-IMU IS GO
IF NOT-PERFORM REMAINING PROCEDURES
ATT SET-IMU (VERIFY)
SET ASCP tw TO STAR ACQ PAD ATT (Pg 2-a)
RHC-MNVR TO STAR ACQ PAD ATT
BMAG MODE(3)-RATE 2
RATE-LOW
BMAG MODE(3)-ATT 1/RATE 2
RHC-MNVR (TRIM) TO ZERO FDAI 1 ERROR NEEDLES
OHC-SET IN TPAC ANGLES OF 1ST PAD STAR
IF STAR<5° FROM CTR OF SCT-IMU IS GO
*IF STAR>5° FROM CTR OF SCT
* PERFORM BACKUP GDC & IMU ALIGN
* CHECKLIST (G/3-12) REF PAD (Pg 2-a)
RATE-HIGH

3.) PROCEED TO APPROPRIATE POINT IN TIMELINE AND AT NEXT STDN SITE:
a) REPORT TRANSFER TO CMC FAIL C/L
b) PERFORM STDN/MET CLOCK CHECK

STAR AVAILABILITY
1.) BACKUP GDC ALIGN STARS ARE VISIBLE FROM SS-8 MIN TO SR+4 MIN.



SHAFT = 0°
TRUN = 352.5°

2.) STAR ACQUISITION STARS ARE VISIBLE FROM SS+1 MIN TO SR+7 MIN.

NOTES
1.) AN IMU GO/NO GO CHECK (STEP 2.) IS REQUIRED BEFORE OBTAINING INITIAL IMU DRIFT DATA.
2.) RECOMMEND TRACKING OF HORIZON AND SOYUZ: DBD/RATE-MIN/HIGH, MAN ATT PITCH-MIN IMP

DEFINITIONS
θD = ORDEAL ANGLE TO PLACE EARTH HORIZON IN CENTER OF COAS
H = AVERAGE ALTITUDE
θ = ORDEAL FDAI PITCH

LAUNCH / RNDZ REALIGN PAD

		NOMINAL LAUNCH	POST INS UPDATE
ASCP tw	R	0 0 5 0	
	P	1 5 2 2	
	Y	3 5 6 4	

LAUNCH → GET ~ 7+30

RNDZ/RNDZ REALIGN PAD

		RNDZ UPDATE
ASCP tw	R	
	P	
	Y	

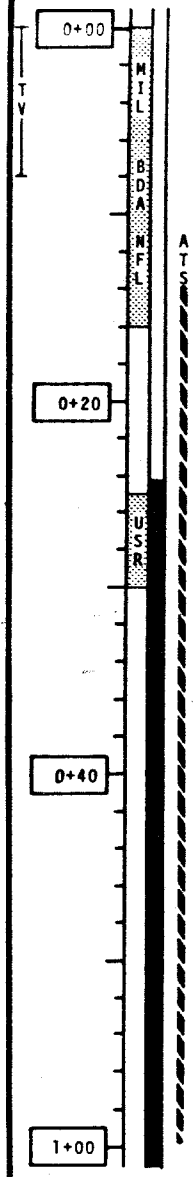
GET ~ 7+30 → DOCK

BACKUP GDC ALIGN PAD

		A NOMINAL LAUNCH	B POST INS UPDATE	C NOMINAL RNDZ	D RNDZ UPDATE
0°/R STARS		3 3 / 3 7	/	3 3 / 3 7	/
ASCP tw	R	2 4 9 6		2 4 6 3	
	P	2 7 7 5		0 6 8 2	
	Y	3 3 7 9		3 3 2 5	

STAR ACQUISITION PAD

		A (ACM ATT) NOMINAL LAUNCH	B (ACM ATT) POST INS UPDATE	C (SI +X FWD) NOMINAL RNDZ	D RNDZ UPDATE
ASCP tw	R	+ 1 7 9 0 0	+ 0 0	+ 0 1 8 0 0	+ 0 0
	P	+ 2 1 3 0 0	+ 0 0	+ 1 7 0 0 0	+ 0 0
	Y	+ 0 0 1 0 0	+ 0 0	+ 3 3 0 0 0	+ 0 0
1ST STAR		3 7		4 0	
TPAC	SA	2 3 5 2 0	0	0 8 6 6 0	0
ANGLES	TA	0 4 1 3 0	0 0	0 2 5 8 0	0 0 0
2ND STAR		4 5		4 3	
TPAC	SA	0 3 4 5 0	0	0 0 0 8 0	0
ANGLES	TA	0 1 2 3 0	0 0	0 3 1 0 0	0 0 0
3RD STAR		4 2		0 1	



APOLLO LIFT-OFF

APOLLO INSERTION

SIVB MNVRS TO RLH

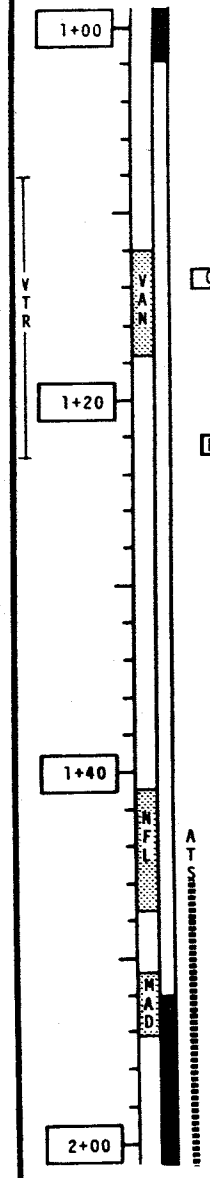
EMS ΔV TEST & NULL BIAS CHECK

SIVB MNVRS TO SEP ATT

EMS ΔV TEST & NULL BIAS CHECK CHECKLIST

EMS MODE-STBY
EMS FUNC-ΔV SET/VHF RNG
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/VHF RNG
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



CSM/SIVB SEP — START TD&E

DOCKING

HGA SWITCH LIST

ACQUIRE ATS HGA: MAN, WIDE P -66, Y 30
S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW

TRANSMIT SEP AND
SLA PANEL JET STATUS
TRANSMIT EMS ΔV TEST RESULTS

*****IF OHA REQ'D*****
* OHA PRELIMINARY PAD (COPY Pg 2-3) *
* AMC PRELIMINARY PAD (COPY Pg 2-4) *
*****

HGA SWITCH LIST

ATS-F SYS:
FLT BUS cb-CLOSED (225)
GRP 2 cb-CLOSED
ATS PWR AMP-1 (230)
HGA XPNDR-PRIM
UP TLM RELAY - UP TLM
HGA PWR-ON

CMC FAILURE | CMC FAILURE | CMC FAILURE | CMC FAILURE | CMC FAILURE | CMC FAILURE | CMC FAILURE

2+00

2+20

0:00

2+40

3+00

SIVB MNVRS TO EXTRACTION ATT

RECORD IMU & GDC ATT

ALIGN GDC

CSM/DM EXTRACTION — END TD&E

AEM

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 IMU & GDC ATT

MNVR TO ACM NOMINAL
PAD ATT (Pg 2-4)

SNACK PERIOD

```
*****FOR M=14 RNDZ*****************
* DP START PGA DOFFING (Pg 2-5),  *
*   THEN CP                       *
* AC START SNACK PERIOD, DOFF     *
*   AFTER ACM                     *
***********************************
```

```
*****IF OHA REQ'D******************
* OHA FINAL PAD (COPY)            *
*                                 *
*                                 *
*                                 *
* SET DET                         *
* SET ASCP tw TO OHA BURN ATT     *
*                                 *
* MNVR & DRIVE SXT TO PAD DATA    *
* IF STAR NOT IN SXT FOV-USE HORIZ *
* CK(±5°)TO DETERMINE IF IMU OR   *
* GDC IS GO                       *
* GO TO SPS BURN CUE CARD(SCS Δ)  *
*   (BANK A)                      *
*                                 *
*                                 *
*                                 *
*                                 *
```

OHA PAD DATA

		NOMINAL	PRELIMINARY	FINAL
N33 TIG OHA	HR	+	+	+
	MIN	+	+	+
	SEC	+	+	+
N81 ΔV_{CHA}	ΔV_X			
	ΔV_Y	+ 0 0 0 0		
	ΔV_Z			
N22 OHA	R	+ 0 0	+ 0 0	+ 0 0
	P	+ 0 0	+ 0 0	+ 0 0
	Y	+ 0 0	+ 0 0	+ 0 0
	ΔV_C			
	BT			
WT	+		PT	YT

BURN ATT CHECK

STAR			
SA	+		0
TA	+	0	0

BURN ATT CHECK UPDATE

STAR			
SA	+		0
TA	+	0	0

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

IMU & GDC ATT

IMU ASCP tw	R	
	P	
	Y	
GDC ASCP tw	R	
	P	
	Y	

SPS BURN STATUS

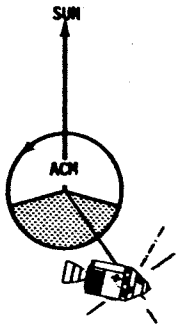
ΔTIG	
AFTER TRIM	
ΔVC	

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	GDS	ACM PRELIMINARY PAD (COPY) BACKUP GDC ALIGN PAD & STAR ACQUISITION PAD (COPY Pg 2-a)
		* OHA (, / ,) * * RECORD BURN STATUS (Pg 2-3) * * TRANSMIT OHA BURN STATUS * * MNVR TO ACM NOMINAL * * PAD ATT (Pg 2-4) * * CONT WITH NOMINAL PROCEDURES *
	NFL	ACQUIRE ATS HGA: MAN, WIDE P -78, Y 34 S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW
3+20	MAD	MNVR TO STAR ACQ PAD "B" ATT RECORD IMU & GDC ATT OHC-SET IN TPAC ANGLES OF 1ST PAD STAR IF STAR >5° FROM CTR OF SCT PERFORM BACKUP GDC & IMU ALIGNMENT (G/3-12), THEN REPEAT STAR CK TO VERIFY ACM FINAL PAD (COPY) TRANSMIT IMU & GDC ATT
		SET DET
-12:00		SET ASCP tw TO ACM BURN ATT
		GO TO SPS BURN CUE CARD(SCS Δ) (BANK A)
3+40		
0:00		ACM (179,34/213,1)
		RECORD BURN STATUS TRANSMIT ACM BURN STATUS
		PGA DOFFING (Pg 2-5)
		*****FOR M=14 RNDZ***** * AC START PGA DOFFING (Pg 2-5) * * CP & DP START SNACK PERIOD *
4+00		

ATS



ACM PAD DATA

		NOMINAL	PRELIMINARY	FINAL
N33 TIG ACM	HR	+ 0 0 3	+	+
	MIN	+ 4 5	+	+
	SEC	+ 0 0	+	+
N81 ΔV ACM	ΔV_X	+ 0 1 6 7		
	ΔV_Y	+ 0 0 0 0		
	ΔV_Z	- 0 1 2 1		
N22 ACM	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

IMU & GDC ATT

IMU ASCP tw	R	
	P	
	Y	
GDC ASCP tw	R	
	P	
	Y	

SPS BURN STATUS

ΔTIG	
AFTER TRIM	
ΔVC	

CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE

4+00

ATS

ORR

*****FOR M=14 RNDZ*****
* PRE-DOCKING DM CHECKOUT (D/1-1) *
* STEP 1 THRU STEP 7 *
*****

4+20

HAW

NCI PRELIMINARY PAD (COPY Pg 2-6)
NPC ADVISORY

*****FOR M=14 RNDZ*****
* DOCKING SYSTEM CHECKOUT (J/1-1) *
*****

4+40

NFL

ATS

ACQUIRE ATS HGA: MAN, WIDE P -55, Y 45
S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW

NCI FINAL PAD (COPY Pg 2-6)
NPC PRELIMINARY PAD (COPY Pg 2-7)

TRANSMIT DM/CM ΔP (1ST OPP ONLY)

BIOSTACK-ON (MA 107) (R1)
RECORD GET & INDICATOR STATUS (Pg 2-5)

5+00

PGA DOFFING

POWER - OFF (6,9,10)
AUDIO CONT - NORM (6,9,10)(verify)
SUIT POWER - OFF (6,9,10)

Doff comm carrier, stow in TSB
Discon all umbilicals from PGA & stow
Suit Flow Vlvs (3) - SUIT FULL FLOW(verify)

Unstow 3 O2 hose screen caps and 3 PGA elect connector covers (A3)

Install screen caps on CM return hoses(red)
Install elect connector caps on PGAs

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

Doff PGA - discon elect and urine connections inside PGA

Secure PGA elect harness at neckring
Install helmets & gloves on PGA
Install helmet bags on helmets
Secure accessory bags to helmet bags

OBS doffing:
Discon connector from sig conditioners
Remove electrodes from chest
Discard tape disks and tape rings

Clean electrodes with tissue (A2)
Stow harness and biobelt in accy bags

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

Stow PGAs in PGA bags(U2)
Stow PGAs: AC under left couch (A3),
DP under left couch (A3),
CP head of center couch under side hatch

Don inflight clothing (U2 or TSB)
Obtain loose pkt items as required (TSB)

Configure comm:
For comm carrier or headset use -
Don CWG harness (U2 or temp stowed)
Conn CM elect to CWG harness
Don comm carrier or light wt headset as reqd., connect to CWG harness
SPKR/HDST-HEADSET (98) (verify)

For SPEAKER Box use (Pnl 98):
POWER-ON
SPK/HDST-SPEAKER
VOL tw-as desired

POWER - AUDIO/TONE (6,9,10)
SUIT POWER - ON (up) (6,9,10)

BIOSTACK PAD

GET	HR				IND LT ON	
	MIN				OFF	

5+00

ZFF PHOTOS (J/10-1)

SET DET

MNVR TO STAR ACQ PAD "B" ATT
RECORD IMU & GDC ATT
OHC-SET IN TPAC ANGLES
OF 1ST PAD STAR
IF STAR >5° FROM CTR OF SCT
PERFORM BACKUP GDC & IMU
ALIGNMENT (G/3-12), THEN
REPEAT STAR CK TO VERIFY

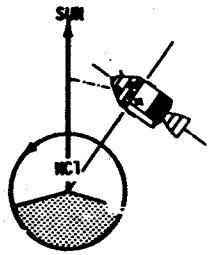
5+20

MNVR TO STDN NC1 BURN (PITCH) ATT

-12:00

SET ASCP tw TO NC1 BURN ATT

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



5+40
0:00

NC1 (181,358/59,0)

RECORD BURN STATUS

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 IMU & GDC ATT

*****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) *
*****

6+00

NC1 PAD DATA

		NOMINAL	PRELIMINARY	FINAL
N33 TIG NC1	HR	+ 0 0 5	+	+
	MIN	+ 4 1	+	+
	SEC	+ 2 8	+	+
N81 ΔV_{NC1}	ΔV_X	+ 0 6 6 3		
	ΔV_Y	+ 0 0 0 0		
	ΔV_Z	+ 0 0 0 2		
N22 NC1	R	+ 1 8 1 0 0	+ 0 0	+ 0 0
	P	+ 0 5 9 0 0	+ 0 0	+ 0 0
	Y	+ 0 0 0 0 0	+ 0 0	+ 0 0
	ΔV_C	0 5 3 7		
	BT	0 0 0 3		

WT + | PT | YT

BURN ATT CHECK

STAR		
SA	+	0
TA	+	0 0

BURN ATT CHECK UPDATE

STAR		
SA	+	0
TA	+	0 0

IMU & GDC ATT

IMU ASCP tw	R	
	P	
	Y	
GDC ASCP tw	R	
	P	
	Y	

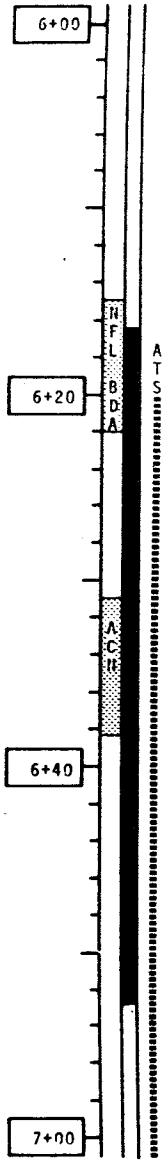
SPS BURN STATUS

ΔTIG	
AFTER TRIM	
ΔVC	

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

GET HR	
MIN	

CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE



IF NPC NOT REQ'D

SET HGA: MAN P -54, Y 265
S-BD ANT IND > 1/3 SCALE
HGA: REACQ, NARROW

GDC & IMU LAUNCH/RNDZ REALIGN CHECKLIST (Pg 2-8)

MNVR TO STAR ACQ PAD "C" ATT
IMU DRIFT CHECK (RATE-LOW)
RECORD SA'S AND TA'S REQUIRED TO CENTER STARS IN SXT (40,43)
RECORD GET WHEN FINISHED

VERIFY SI +X FWD ATT (ATT=18,170,330)
TRANSMIT IMU DRIFT CHECK DATA

START EAT PERIOD

*****IF NPC REQ'D*****

* SET HGA: MAN P -51, Y 96
* S-BD ANT IND > 1/3 SCALE
* HGA: REACQ, NARROW
*
* NPC FINAL PAD (COPY)
*
* SET DET
*
* SET ASCP tw TO NPC BURN ATT
* MNVR TO BURN ATT(IMU)
* NOTE: IMU/GDC OUT-OF-PLANE REALIGN NOT REQ'D FOR NPC.
* OHC-SET IN TPAC ANGLES OF BURN ATT CHECK PAD STAR.
* IF STAR >5° FROM CTR OF SCT- PERFORM BACKUP GDC & IMU ALIGNMENT (G/3-12), THEN REPEAT STAR CK TO VERIFY.
*
*
*
*
*
*
*
*
*
*
*
* GO TO SPS BURN CUE CARD(SCS Δ) (BANK A)
*
*
*
*
*
*
*
*
* NPC
*
* RECORD BURN STATUS (Pg 2-8)
*
* MNVR TO SI +X FWD ATT (ATT = 12,14,332)
*

NPC PAD DATA

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

WT + PT YT

BURN ATT CHECK

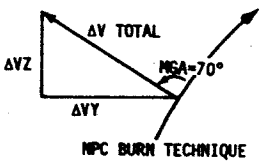
STAR			
SA	+		0
TA	+	0	0

BURN ATT CHECK UPDATE

STAR			
SA	+		0
TA	+	0	0

IMU DRIFT CHECK

ASCP tw	R					
	P					
	Y					
1ST STAR						
TPAC ANGLES	SA					
	TA					
2ND STAR						
TPAC ANGLES	SA					
	TA					
TIME OF DRIFT CHECK	HR	+	0	0		
	MIN	+	0	0	0	
	SEC	+	0			



7+00

7+20

7+40

15+30

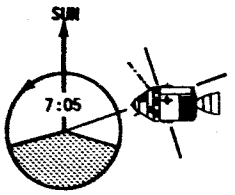
ATS

GWM

ROSBDAMIL

ATS

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



*****IF NPC EXECUTED*****
* TRANSMIT NPC BURN STATUS *

* GDC & IMU LAUNCH/RNDZ REALIGN *
* CHECKLIST (Pg 2-8) *

* MNVR TO STAR ACQ PAD "C" ATT *
* IMU DRIFT CHECK(RATE-LOW) *
* RECORD SA'S AND TA'S *
* REQUIRED TO CENTER STARS *
* IN SXT (40,43) *
* RECORD GET WHEN FINISHED *
* TRANSMIT IMU DRIFT CHECK DATA *
* VERIFY SI +X FWD ATT(18,170,330)
*****

*****FOR M=14 RNDZ*****
* UVA LAMPS SHUT DOWN (Pg 2-8) *
* TERMINATE BATT A CHARGE (UPON *
* STDN CUE) THEN CHARGE BATT B*
*****

SET HGA: MAN P -29, Y 259
HGA: REACQ, NARROW
PWR DOWN CHECKLIST (Pg 2-8)
DIRECT O2 VLV-CLOSE(cw)

PRESLEEP (S/1-49)

SYNCHRONIZE MISSION TIMER TO
SOYUZ GET UPON STDN CUE

GO TO FLIGHT PLAN (Pg 4.1-6)

SPS BURN STATUS

ΔTIG	X	X			•		
AFTER TRIM							
ΔVC		X				•	

GDC & IMU LAUNCH/RNDZ REALIGN CHECKLIST

ASSUMPTIONS: 1) GDC & IMU ARE ALIGNED TO LAUNCH REFSMMAT.
2) GDC & IMU COMPARE WITHIN 5° (IF NOT, PERFORM BACKUP GDC & IMU ALIGNMENT)(G/3-12)

FDAI SELECT-1
FDAI SOURCE-ATT SET
ATT SET-IMU

SET ASCP tw TO 0,0,0
RHC-MNVR TO 0,0,0 ON FDAI 1(IMU)
BMAG MODE(3)-RATE 2
DBD/RATE-MIN/LOW
BMAG MODE(3)-ATT 1/RATE 2
RHC-TWEAK MNVR TO ZERO FDAI 1 ERR NEEDLES

SET ASCP tw to LAUNCH/RNDZ REALIGN
PAD VALUES (Pg 2-a)
ATT SET-GDC
GDC ALIGN pb-push
SET ASCP tw TO 0,0,0

IMU CAGE-ON(up) & HOLD (until MNVR complete)
RHC-MNVR TO 0,0,0 ON FDAI 1(GDC)
BMAG MODE(3)-RATE 2
DBD/RATE-MIN/LOW
BMAG MODE(3)-ATT 1/RATE 2
RHC-TWEAK MNVR TO ZERO FDAI 1 ERR NEEDLES
IMU CAGE-RELEASE

ATT SET-IMU
RATE-HIGH
ROLL 180° TO HEADS DOWN ATT

IMU DRIFT CHECK

ASCP tw	R	X	X				•	
	P	X	X				•	
	Y	X	X				•	
1ST STAR		X	X	X	X			
TPAC ANGLES	SA	X					•	
	TA	X					•	
2ND STAR		X	X	X	X			
TPAC ANGLES	SA	X					•	
	TA	X					•	
TIME OF DRIFT CHECK	HR	+	0	0				
	MIN	+	0	0	0			
	SEC	+	0	X	X	X	X	

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)

CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE

46+30

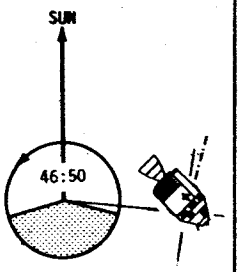
STAR ACQUISITION PAD
(COPY Pg 2-a)
NC2 PRELIM PAD & TPI TIG (N37)
(COPY Pg 2-12)

OPTICS PWR UP CHECKLIST (Pg 2-9)

```
*****IF REFSMMAT REALIGN REQ'D*****
* RNDZ/RNDZ REALIGN PAD &          *
*   BACKUP GDC ALIGN PAD           *
*   (COPY Pg 2-a)                  *
*                                  *
* OPTICS PWR UP CHECKLIST (Pg 2-9) *
* GDC & IMU RNDZ/RNDZ REALIGN      *
*   CHECKLIST (Pg 2-9)             *
*                                  *
*                                  *
*                                  *
*                                  *
*                                  *
*                                  *
*                                  *
*                                  *
*                                  *
* MNVR TO STAR ACQ PAD "D" ATT     *
* IMU DRIFT CHECK(RATE-LOW)        *
*   RECORD SA'S AND TA'S           *
*     REQUIRED TO CENTER STARS     *
*     IN SXT (33,42)               *
*   RECORD GET WHEN FINISHED       *
*                                  *
*                                  *
*                                  *
*                                  *
*                                  *
************************************
```

46+40

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



46+50

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

```
*****FOR M=14 RNDZ*****************
* STOW 2 IN A4                    *
***********************************
```

47+00

OPTICS PWR UP CHECKLIST

VERIFY OPTICS MANUAL DRIVE DISENGAGED
OPTICS ZERO-OFF
OPT MODE-MAN
CMC FAR OPTICS-ON(up)
OHC-DRIVE TRUN <10 DEG)
OPT ZERO-ZERO (15 SEC)

GDC & IMU RNDZ/RNDZ REALIGN CHECKLIST

ASSUMPTIONS: 1) GDC & IMU ARE ALIGNED TO RNDZ REFSMMAT.
2) GDC & IMU COMPARE WITHIN 5° (IF NOT, PERFORM BACKUP GDC & IMU ALIGNMENT)(G/3-12)

FDAI SELECT-1
FDAI SOURCE-ATT SET
ATT SET-IMU

SET ASCP tw TO 0,0,0
RHC-MNVR TO 0,0,0 ON FDAI 1(IMU)
BMAG MODE(3)-RATE 2
DBD/RATE-MIN/LOW
BMAG MODE(3)-ATT 1/RATE 2
RHC-TWEAK MNVR TO ZERO FDAI 1 ERR NEEDLES

SET ASCP tw to RNDZ/RNDZ REALIGN PAD VALUES (Pg 2-a)
ATT SET-GDC
GDC ALIGN pb-push
SET ASCP tw TO 0,0,0

IMU CAGE-ON(up) & HOLD (until MNVR complete)
RHC-MNVR TO 0,0,0 ON FDAI 1(GDC)
BMAG MODE(3)-RATE 2
DBD/RATE-MIN/LOW
BMAG MODE(3)-ATT 1/RATE 2
RHC-TWEAK MNVR TO ZERO FDAI 1 ERR NEEDLES
IMU CAGE-RELEASE

ATT SET-IMU
RATE-HIGH
ROLL 180° TO HEADS DOWN ATT

IMU DRIFT CHECK

ASCP tw	R						
	P						
	Y						
1ST STAR							
TPAC ANGLES	SA						
	TA						
2ND STAR							
TPAC ANGLES	SA						
	TA						
TIME OF DRIFT CHECK	HR	+	0	0			
	MIN	+	0	0	0		
	SEC	+	0				

47+00

47+10

47+20

47+30

TV

ATS

USR

TV CHECKLIST (Pg 2-10)

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-M/APOLLO   *
*   COMM CHECK                    *
***********************************
```

ZFF PHOTOS (J/10-1)

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

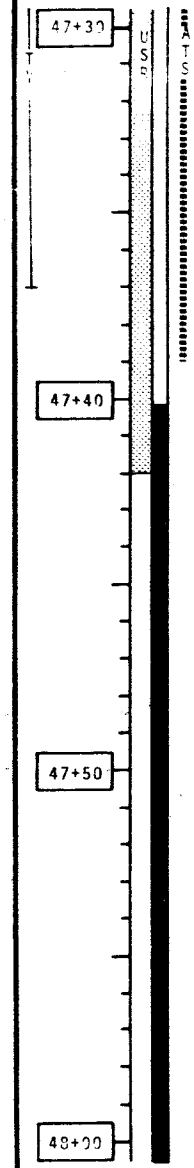
On pnl 808:
- DM1 TV STA POWER-ON
- DM2 TV STA POWER-ON

Check monitors, adjust camera pointing and lens if required

CM CAMR 1

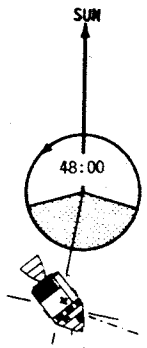
DM CAMR 1

DM CAMR 2



H2 PURGE LINE HTR-ON(up)

MNVR TO STAR ACQ PAD "D" ATT
IMU DRIFT CHECK(RATE-LOW)
RECORD SA'S AND TA'S REQUIRED
TO CENTER STARS IN SXT (33,42)
RECORD GET WHEN FINISHED



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

WASTE WATER DUMP CHECKLIST

IMU DRIFT CHECK

ASCP tw	R						•
	P						•
	Y						•
1ST STAR							
TPAC ANGLES	SA					•	
	TA					•	
2ND STAR							
TPAC ANGLES	SA					•	
	TA					•	
TIME OF DRIFT CHECK	HR	+	0	0			
	MIN	+	0	0	0		
	SEC	+	0				

WASTE WATER DUMP CHECKLIST

BAT VENT VLV-CLOSED (252)
H2O QTY IND-WASTE (Panel)
WATER CONT PRESS REL VLV-DUMP A (352)
Monitor WASTE H2O QTY IND-decreasing
(~5% PER MIN)
When WASTE H2O QTY IND-60%
WATER CONT PRESS REL VLV-2
BAT VENT VLV-VENT (252)

48+00

V A N

NC2 FINAL PAD (COPY)
NCC PRELIMINARY PAD (COPY Pg 2-14)
NSR PRELIMINARY PAD (COPY Pg 2-15)
TRANSMIT IMU DRIFT CHECK DATA (Pg's 2-9 & 2-11)

H2 PURGE LINE HTR-OFF (10 MIN AFTER PURGE)

48+10

UNSTOW HP-65 KIT(U1) & CHECKLIST(R1)
VELCRO (HOOK) FROM U3 (IN PIN STRAIGHTENING KIT)
HP-65 CHECKOUT (Pg 1)

MNVR TO NC2 FINAL PAD ATT

48+20

SET DET

P				Y			

ACQUIRE ATS HGA: MAN, WIDE P -35, Y 144
S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW

-12:00

SET ASCP tw TO NC2 BURN ATT

A T S

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

48+30

NC2 PAD DATA

			NOMINAL						PRELIMINARY						FINAL					
N28 TIG NC2	HR	+				0	4	8	+						+					
	MIN	+					3	4	+						+					
	SEC	+			0	4			+						+					
N81 ΔV_{NC2}	ΔV_X	-			0	3	6	4												
	ΔV_Y	+			0	0	0	0												
	ΔV_Z	-			0	0	0	1												
N22 NC2	R	+	0	0	0	0	0	0	+				0	0	+				0	0
	P	+	0	3	4	0	0		+				0	0	+				0	0
	Y	+	0	0	0	0	0	0	+				0	0	+				0	0
	ΔV_C				0	2	3	7												
	BT				0	0	0	0												

WT	+					

PT				

YT				

BURN ATT CHECK

STAR							
SA	+						0
TA	+					0	0

BURN ATT CHECK UPDATE

STAR							
SA	+						0
TA	+					0	0

TPI TIG	H37							

SPS BURN STATUS

ΔTIG						
AFTER TRIM						
ΔVC						

CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE

48+30

0:00

48+40

48+50

49+00

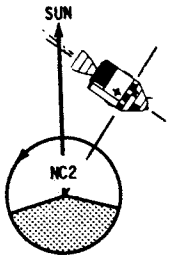
ATS

ACN

TV

USR

SOYUZ MNVRS TO ORBITAL ATTITUDE RATE



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

RECORD BURN STATUS
TRANSMIT NC2 BURN STATUS

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

TV- GRD CMD
48+50 - 49+00

DP PERFORM VHF AM COMM CK

VHF AM SPEC RANGE
= 196 NM

VHF AM AND FM COMM

VHF FM-T/R (6)	VHF FM tw-5
VHF AM-T/R	S BAND-T/R
VHF FM-T/R (9)	S BAND tw-full decrease
VHF AM-T/R	POWER-AUDIO
VHF AM A-SIMPLEX (3)	MASTER tw-5
VHF AM SQUELCH A tw-noise + 1	INTERCOM-T/R
VHF ANTENNA-RIGHT	INTERCOM tw-full decrease
MODE-VOX (10)	VHF AM-OFF
VOX SENS tw-8	AUDIO CONTROL-BACKUP
VHF FM-RCV	PHONE/MIC CONNECT-ON

◄This is Apollo. Я АПОЛЛОН.
◄How do you read? КАК ВЫ СЛЫШИТЕ?

* 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)
EMS FUNC-ΔV SET/VHF RNG
EMS 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. ГОЛОС УХУДШАЕТ РЕЖИМ ИЗМЕРЕНИЯ ДАЛЬНОСТИ. *
* VHF RNG-RESET (1) *
*◄Ranging lockup established. РЕЖИМ ИЗМЕРЕНИЯ ДАЛЬНОСТИ УСТАНОВЛЕН. *

49+00 — USR — ATS

NCC FINAL PAD (COPY)
NSR FINAL PAD (COPY Pg 2-15)

-12:00

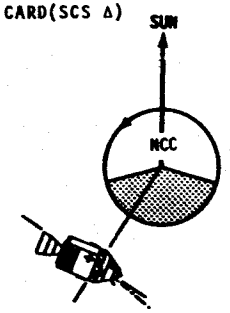
SET ASCP tw TO NCC BURN ATT

DP PERFORM VHF FM COMM CK

VHF FM SPEC RANGE = 162 NM

49+10

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



GWM

0:00

NCC (180,349/21,359) (R=145.5 NM)

RECORD BURN STATUS
REPORT COMM CHECK RESULTS
TRANSMIT NCC BURN STATUS
PITCH UP TO TRACK HORIZON

49+20

VHF RANGING SPEC RANGE = 144 NM

SET DET
◄NCC completed. NCC ВЫПОЛНЕН.
DP PERFORM VHF RANGING VOICE CHECK WITH SOYUZ

-28:00

R HP-65 DATA FOR NSR-28

49+30

NCC PAD DATA

		NOMINAL	PRELIMINARY	FINAL
N11 TIG NCC	HR	+ 0 4 9	+	+
	MIN	+ 1 8	+	+
	SEC	+ 0 3	÷	+
N81 ΔV_{NCC}	ΔV_X	+ 0 3 9 6		
	ΔV_Y	- 0 0 0 6		
	ΔV_Z	+ 0 0 6 4		
N22 NCC	R	+ 1 8 0 0 0	+ 0 0	+ 0 0
	P	+ 0 2 1 0 0	+ 0 0	+ 0 0
	Y	+ 3 5 9 0 0	+ 0 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 0

BURN ATT CHECK UPDATE

STAR		
SA	+	0
TA	+	0 0

SPS BURN STATUS

ΔTIG	
AFTER TRIM	
ΔVC	

N11 (TIG NCC)	
+	0 9
NSR-28	

CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE

49+30

-24:00 R HP-65 DATA FOR NSR-24

-20:00 R HP-65 DATA FOR NSR-20
SET ORDEAL (FDAI 1) WITH COAS
BORESIGHTED ON HORIZON

θD=346, H=111

-16:00 R HP-65 DATA FOR NSR-16

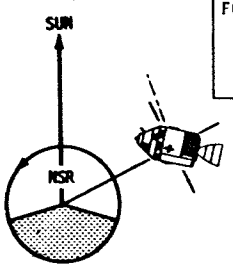
49+40

-12:00 R HP-65 DATA FOR NSR-12
SET ASCP tw TO NSR BURN ATT

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

FOR HP-65 SOLN
MNVR TO AND MAINTAIN ORDEAL BURN ATT (~.06°/SEC)
(BURN ΔVT SPS)
(BURN ΔVY TIMED RCS), WITH
AUTO RCS SELECT(16)-MNA/MNB

49+50



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

0:00 NSR (176,307/188,357) (R=81.0 NM)

RECORD BURN STATUS
TRANSMIT NSR BURN STATUS
◄NSR completed.NSR ВЫПОЛНЕН.

P				Y			

ATS

ACQUIRE ATS HGA: MAN, WIDE P -19, Y 308
S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW

TRACK SOYUZ IH BOTTOM OF CDR WINDOW (ATT ~ 180,212,0)

50+00

NSR PAD DATA

TIG NSR(N13)=TIG NCC(N11) + 00:37:00= ____:____:____.____

			NOMINAL						PRELIMINARY						FINAL					
N81 ΔV_NSR	ΔV_X	+		0	1	7	0													
	ΔV_Y	-		0	0	1	4													
	ΔV_Z	+		0	2	1	2													
N22 NSR	R	+	1	7	6	0	0	+				0	0	+				0	0
	P	+	1	8	8	0	0	+				0	0	+				0	0
	Y	+	3	5	7	0	0	+				0	0	+				0	0
	ΔV_C			0	1	4	5												
	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

NSR ONBOARD DATA

```
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X        N81 COMP LIMITS NA                     X
X                                               X
X        USE STDN ΔVY IN ALL CASES              X
X                                               X
X IF NCC EXECUTION IS QUESTIONABLE-THE ORDER    X
X        OF PRIORITIES ARE:                     X
X          HP-65                                X
X          STDN UNMATCHED                       X
X          DO NOT BURN NSR                      X
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

NSR HP-65 SOLN

ΔV_X						
ΔV_Y	*	S	T	D	N	*
ΔV_Z						

SPS BURN STATUS

ΔTIG											
FDAI (INTRL) (FOR HP-65 BURN ONLY)	R										
	P										
	Y										
AFTER TRIM											
ΔV_C											
TRANSMIT ΔVC LOADED											

ORDEAL BURN ATT								
ΔVT (IN PLANE)	+							
ΔV TAIL OFF	-				1	3	0	
ΔV_C	+							
ΔV_Y BT								

50+00

ATS

REACQUIRE VHF RANGING (R=74 NM) FOR HP-65 DATA
R HP-65 DATA FOR TPI TIG 1

R HP-65 DATA FOR TPI TIG 1

SET DET
REMOVE POLAR PLOT

SNACK PERIOD

50+10

TV

TV- GRD CMD
50+12 - 50+22

MAD

TPI PRELIMINARY PAD (COPY Pg 2-17)
DOCKING ATTITUDE PAD (COPY Pg 2-19)

50+20

-32:00

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

USR

50+30

HP-65 TPI TIG 1								
-				3	2			
TPI-32								

CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE CMC FAILURE

50+30 / -24:00 — USR — ATS

R HP-65 DATA FOR TPI-24 (GET)

TPI FINAL PAD (COPY)

-16:00

R HP-65 DATA FOR TPI-16 (GET)

50+40 / -14:00

R HP-65 DATA FOR TPI-14 (GET)
MNVR TO BORESIGHT COAS ON HORIZON
SET ORDEAL (FDAI 1)

θD=345, H=118

-12:00

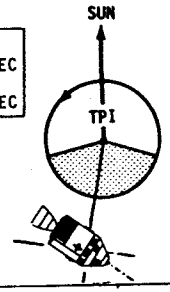
SET ASCP tw TO TPI BURN ATT
RCH-MNVR TO ZERO ROLL (ROLL RIGHT)

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

FOR HP-65 SOLUTION
MNVR TO AND MAINTAIN ORDEAL BURN ATT (~0.6°/SEC)
(BURN ΔVT SPS)

50+50

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



0:00

TPI (359,29/29,2) (R=21.2 NM)

◄TPI completed. TPI ВЫПОЛНЕН.
REACQUIRE VHF RANGING (R=18 NM)

CENTER SOYUZ IN COAS WHEN
READING HP-65 DATA θ

+4:30 / 51+00

θ HP-65 DATA FOR TPI+4:30

TPI PAD DATA

		NOMINAL	PRELIMINARY	FINAL
N37 HR		+ 0 5 0		
TIG TPI MIN		+ 5 4		
SEC		+ 2 5		
N81 ΔV_{TPI}	ΔV_X	+ 1 9 5		
	ΔV_Y	+ 0 0 7		
	ΔV_Z	- 1 0 0		
N59 (RCS) ΔV (LOS)	ΔV_F/BT	+ 2 1 9 5 5		
	ΔV_R/BT	+ 0 0 7 0 4		
	ΔV_D/BT	+ 0 0 0 0 0		
ΔV_C		0 0 9 2		
BT		0 0 0 1		
N22 (SPS USING N81)	R	+ 3 5 9 0 0	+ 0 0	+ 0 0
	P	+ 0 2 9 0 0	+ 0 0	+ 0 0
	Y	+ 0 0 2 0 0	+ 0 0	+ 0 0
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

TPI ONBOARD DATA

```
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X        N81 COMP LIMITS NA  X
X                            X
X        STDM SOLN PRIME     X
X IF STDM SOLN NOT AVAILABLE X
X        USE HP-65 SOLN      X
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

TPI HP-65 SOLN

TIG	
ΔV_X	
ΔV_Y	
ΔV_Z	

ORDEAL BURN ATT		
ΔVT (IN PLANE)	+	
ΔV TAIL OFF	-	1 3 0
ΔV_C	+	

51+00

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

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

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

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

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

51+10

CENTER SOYUZ IN COAS WHEN
READING HP-65 DATA θ

+16:30 θ HP-65 DATA FOR TPI+16:30

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

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

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

51+20

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)

$\dot{R}$=(ΔR(nm)/1 MIN)100

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

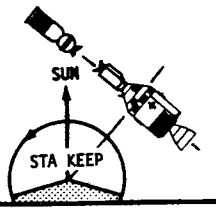
VTR

AGO

STATION KEEP ON SOYUZ +X AXIS (R~150FT)

51+30

◄Apollo stationkeeping ЕСТЬ ЗАВИСАНИЕ АПОЛЛОНА.



TPM1 ONBOARD DATA

TPM1 HP-65 SOLN

ΔV(LOS)	ΔV_F							
	ΔV_R							
	ΔV_D							

ΔV_D BT			

TPM2 ONBOARD DATA

TPM2 HP-65 SOLN

ΔV(LOS)	ΔV_F							
	ΔV_R							
	ΔV_D							

ΔV_D BT			

PRE-BRAKING SWITCH LIST

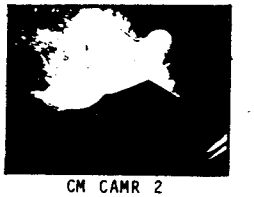
MAN ATT(3)-RATE CMD	ATT SET-IMU
LIMIT CYCLE-OFF	THC PWR-PWR
DBD/RATE-MIN/LOW	RHC PWR NORMAL #2-AC/DC
BMAG MODE(3)-ATT 1/RATE 2	RHC PWR DIRECT #2-MNA/MNB
SC CONT-SCS	AUTO RCS SELECT(16)-MNA/MNB
FDAI SCALE-5/1	THC-ARMED
FDAI SELECT-1	RHC #2-ARMED
FDAI SOURCE-ATT SET	

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)	$\dot{R}$(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

VTR

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)

ATS

◄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

TV

MAD

CSM/SOYUZ INTERFACE SEAL COMPRESSED

USR

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

WHEN IMU FAILURE OCCURS

1.) PERFORM IMU FAILURE SWITCH LIST
SC CONT-SCS
IMU PWR-OFF
DBD/RATE-MIN/HIGH
BMAG MODE(3)-ATT 1/RATE 2
MAN ATT(3)-RATE CMD
FDAI SELECT-1
FDAI SOURCE-ATT SET
ATT SET-GDC
LIMIT CYCLE-OFF

2.) SET REFSMMAT FLAG
KEY V37E00E; V25N7E, 77E, 10000E, 1E

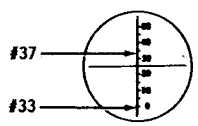
3.) INITIALIZE NO-DAP CONFIG
(VERIFY CSM DAP ACTIVATED PRIOR TO NO-DAP CONFIG)
KEY V48E, V21E, 0E, PRO, PRO, V24E AND LOAD
PT & YT REQD FOR REST OF RNDZ, PRO, V46E

4.) SINGLE SENSOR POST TPI
KEY V57E, V22E, 1E, PRO

5.) EMP SL-50
REQUEST UPLINK AT 1ST AVAILABLE OPPORTUNITY
(MANUAL LOAD ON Pg 3-c)

6.) PROCEED TO APPROPRIATE POINT IN TIMELINE
AND AT NEXT STDN SITE - REPORT TRANSFER TO IMU FAIL C/L

STAR AVAILABILITY
1.) BACKUP GDC ALIGN STARS VISIBLE
FROM SS-8 MIN TO SR+4 MIN.



SHAFT = 0°
TRUN = 352.5°

2.) STAR ACQUISITION STARS ARE VISIBLE
FROM SS+1 MIN TO SR+7 MIN.

DEFINITIONS
θD = ORDEAL ANGLE TO PLACE EARTH HORIZON IN CENTER OF COAS
H = AVERAGE ALTITUDE
θ = ORDEAL FDAI PITCH

NOTES
1.) N20 NEED NOT AGREE WITH CURRENT SC ATT EXCEPT FOR OPTICS MARKS, COAS LOS DETERM, P52 CALC OF N22, EMP SL-50 CALC OF N22, AND V83 CALC OF THETA.
2.) LOAD N81 DURING FINAL COMP TO AGREE WITH ΔV'S TO BE BURNED; LOAD N59 FOR TPM'S.
3.) IF LOS ATT IS DESIRED (WHEN P20 IS RUNNING) KEY V22N73E, +E, V16N22E.
4.) RECOMMEND TRACKING OF HORIZON AND SOYUZ: DBD/RATE-MIN/HIGH, MAN ATT PITCH-MIN IMP
5.) EMP SL-50 CONVERTS GYRO TORQUE ANGLES (N93) INTO RESULTANT ACTUAL CDU ANGLES (N22) AND SETS N20=N22.
6.) USE VHF MARKING TO UPDATE CMC STATE VECTORS.

LAUNCH→GET~7+30 | GET~7+30→DOCK

BACKUP GDC ALIGN PAD

		A NOMINAL LAUNCH	B POST INS UPDATE	C NOMINAL RNDZ	D RNDZ UPDATE
0°/R STARS		3 3 / 3 7	/	3 3 / 3 7	/
ASCP tw	R	2 4 9 6		2 4 6 3	
	P	2 7 7 5		0 6 8 2	
	Y	3 3 7 9		3 3 2 5	

STAR ACQUISITION PAD

		A (ACM ATT) NOMINAL LAUNCH	B (ACM ATT) POST INS UPDATE	C (SI +X FWD) NOMINAL RNDZ	D RNDZ UPDATE
N22	R	+ 1 7 9 0 0	+ 0 0	+ 0 1 8 0 0	+ 0 0
	P	+ 2 1 3 0 0	+ 0 0	+ 1 7 0 0 0	+ 0 0
	Y	+ 0 0 1 0 0	+ 0 0	+ 3 3 0 0 0	+ 0 0
N71 1ST STAR		3 7		4 0	
TPAC	SA	2 3 5 2 0	0	0 8 6 6 0	0
ANGLES	TA	0 4 1 3 0	0 0	0 2 5 8 0	0 0
N71 2ND STAR		4 5		4 3	
TPAC	SA	0 3 4 5 0	0	0 0 0 8 0	0
ANGLES	TA	0 1 2 3 0	0 0	0 3 1 0 0	0 0
N71 3RD STAR		4 2		0 1	

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 Reqd, Ref STAR ACQ PAD)
ATT SET-GDC (verify)
ZERO FDIA 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.
V37E00E
(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 Reqd, 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 Preform 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

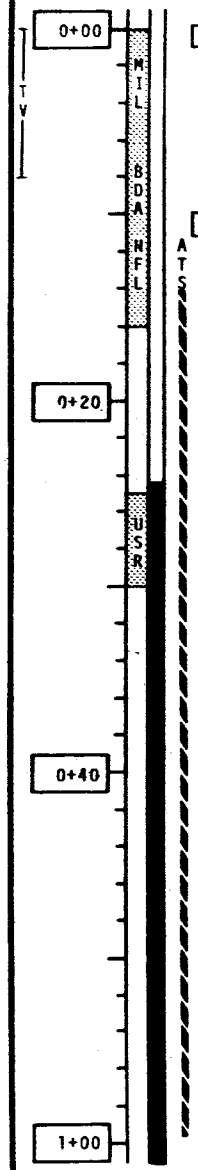
DSKY LOAD	REG 3 ADDRESS	
V21N1E		77776E
3242E		E
6006E	(3242)	34124E
N15E		E
77775E		55237E
E		E
2703E		35040E (3270)
E		E
2661E		4647E
E		E
77775E		24000E
E		E
2711E		20456E
E		E
2667E	(3250)	5537E
E		E
77775E		1677E
E		E
2717E		5537E
E		E
2675E		4E
E		E
77634E		6E (3300)
E		E
24017E		31300E
E		E
47471E		52033E
E		E
77634E		31301E
E		E
24017E	(3260)	54034E
E		E
34747E		5537E (3305)
E		
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.



APOLLO LIFT-OFF

APOLLO INSERTION

SIVB MNVRS TO RLH

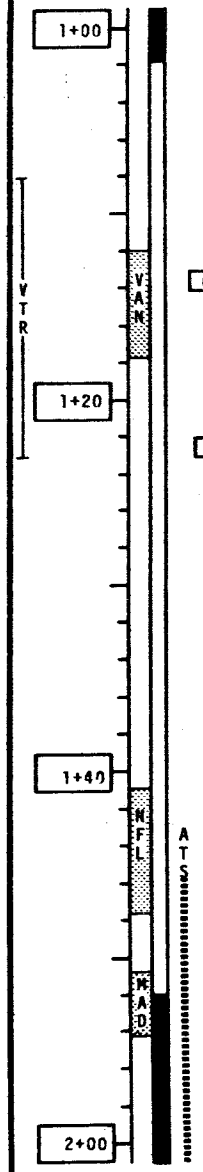
EMS ΔV TEST & NULL BIAS CHECK

SIVB MNVRS TO SEP ATT

EMS ΔV TEST & NULL BIAS CHECK CHECKLIST

EMS MODE-STBY
EMS FUNC-ΔV SET/VHF RNG
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/VHF RNG
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



CSM/SIVB SEP — START TD&E

DOCKING

HGA SWITCH LIST

ACQUIRE ATS HGA: MAN, WIDE P -66, Y 30
S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW

TRANSMIT SEP AND
SLA PANEL JET STATUS
TRANSMIT EMS ΔV TEST RESULTS

```
*****IF OHA REQ'D*******************
* OHA PRELIMINARY PAD (COPY Pg 3-3) *
* ACM PRELIMINARY PAD (COPY Pg 3-4) *
************************************
```

HGA SWITCH LIST

ATS-F SYS:
FLT BUS cb-CLOSED (225)
GRP 2 cb-CLOSED
ATS PWR AMP-1 (230)
HGA XPNDR-PRIM
UP TLM RELAY-UP TLM
HGA PWR-ON

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

2+00

2+20

0:00

2+40

3+00

ATS

TV

TEAN

VTR

VAN

SIVB MNVRS TO EXTRACTION ATT

RECORD GDC ATT

ALIGN GDC

P00

CSM/DM EXTRACTION — END TD&E

AEM

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 1)  *
*   (BANK A)                      *
*                                 *
```

OHA PAD DATA

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

WT + | PT | YT

BURN ATT CHECK

STAR		
SA	+	0
TA	+	0 0

BURN ATT CHECK UPDATE

STAR		
SA	+	0
TA	+	0 0

HORIZON CK DATA: TIG MINUS _____ MIN, WINDOW MK_____DEG

GDC ATT

GDC ASCP tw	
R	
P	
Y	

SPS BURN STATUS

ΔTIG	
AFTER TRIM	
ΔVC	

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

GDS

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

```
*                                    *
*                                    *
*                                    *
*                                    *
* OHA (    ,___/    ,    )          *
*                                    *
* RECORD BURN STATUS (Pg 3-3)        *
* P77 (VERIFY OHA PAD VALUES);POO*
* TRANSMIT OHA BURN STATUS           *
* MNVR TO ACM NOMINAL                *
*   PAD ATT (Pg 3-4)                 *
* CONT WITH NOMINAL PROCEDURES       *
*************************************
```

NFL

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)

ATS

3+20

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

WAD

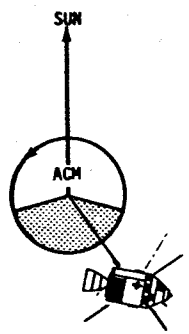
STDN UPLINK (P27) (ACM TARGET LOAD)
ACM FINAL PAD (COPY)
TRANSMIT GYRO TORQUE ANGLES AND TIME
POO

SET DET

-12:00

SET ASCP tw TO ACM BURN ATT

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



3+40

0:00

ACM (179,34/213,1)

RECORD BURN STATUS
P77 (VERIFY ACM PAD VALUES); POO
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       *
************************************
```

4+00

ACM PAD DATA

		NOMINAL	PRELIMINARY	FINAL
N33 TIG ACM HR		+ 0 0 3	+	+
N33 TIG ACM MIN		+ 4 5	+	+
N33 TIG ACM SEC		+ 0 0	+	+
N81 ΔV ACM	ΔV_X	+ 0 1 6 7		
	ΔV_Y	+ 0 0 0 0		
	ΔV_Z	- 0 1 2 1		
N22 ACM	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 GYRO TORQUING ANGLES	X					
	Y					
	Z					
TIME OF GDC ALIGN	HR	+	0	0		
	MIN	+	0	0	0	
	SEC	+	0			

SPS BURN STATUS

ΔTIG						
AFTER TRIM						
ΔVC						

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

4+00

ATS

ORR

*****FOR M=14 RNDZ*****
* PRE-DOCKING DM CHECKOUT (D/1-1) *
* STEP 1 THRU STEP 7 *
*****

4+20

HAW

STDN UPLINK (P27) (CSM S.V.)
NC1 PRELIMINARY PAD (COPY Pg 3-6)
NPC ADVISORY

*****FOR M=14 RNDZ*****
* DOCKING SYSTEM CHECKOUT (J/1-1) *
*****

4+40

NFL

ATS

ACQUIRE ATS HGA: MAN, WIDE P -55, Y 45
S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW

NC1 FINAL PAD (COPY Pg 3-6)
NPC PRELIMINARY PAD (COPY Pg 3-7)

TRANSMIT DM/CM ΔP (1ST OPP ONLY)

STDN UPLINK (P27) (NC1 TARGET LOAD)

BIOSTACK-ON (MA 107) (R1)
RECORD GET & INDICATOR STATUS (Pg 3-5)

5+00

PGA DOFFING

POWER - OFF (6,9,10)
AUDIO COMT - NORM (6,9,10)(verify)
SUIT POWER - OFF (6,9,10)

Doff comm carrier, stow in TSB
Discon all umbilicals from PGA & stow
Suit Flow Vlvs (3) - SUIT FULL FLOW(verify)

Unstow 3 O2 hose screen caps and 3 PGA elect connector covers (A5)

Install screen caps on CM return hoses(red)
Install elect connector caps on PGAs

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

Doff PGA - discon elect and urine connections inside PGA

Secure PGA elect harness at neckring
Install helmets & gloves on PGA
Install helmet bags on helmets
Secure accessory bags to helmet bags

OBS doffing:
Discon connector from sig conditioners
Remove electrodes from chest
Discard tape disks and tape rings

Clean electrodes with tissue (A2)
Stow harness and biobelt in accy bags

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

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

Don inflight clothing (U2 or TSB)
Obtain loose pkt items as required (TSB)

Configure comm:
For comm carrier or headset use -
Don CWG harness (U2 or temp stowed)
Conn CM elect to CWG harness
Don comm carrier or light wt headset as reqd., connect to CWG harness
SPKR/HDST-HEADSET (98) (verify)

For SPEAKER Box use (Pnl 98):
POWER-ON
SPK/HDST-SPEAKER
VOL tw-as desired

POWER - AUDIO/TONE (6,9,10)
SUIT POWER - ON (up) (6,9,10)

BIOSTACK PAD

GET HR				IND LT ON	
MIN				OFF	

5+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

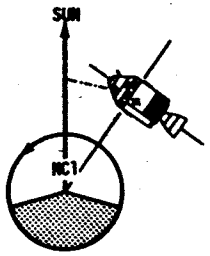
5+20

MNVR TO STDN NC1 BURN (PITCH) ATT

-12:00

SET ASCP tw TO NC1 BURN ATT

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



5+40
0:00

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 B 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) *
*****

6+00

NC1 PAD DATA

		NOMINAL	PRELIMINARY	FINAL
N33 TIG NC1	HR	+ 0 0 5	+	+
	MIN	+ 4 1	+	+
	SEC	+ 2 8	+	+
N81 ΔV_{NC1}	ΔV_X	+ 0 6 6 3		
	ΔV_Y	+ 0 0 0 0		
	ΔV_Z	+ 0 0 0 2		
N22 NC1	R	+ 1 8 1 0 0	+ 0 0	+ 0 0
	P	+ 0 5 9 0 0	+ 0 0	+ 0 0
	Y	+ 0 0 0 0 0	+ 0 0	+ 0 0
	ΔV_C	0 5 3 7		
	BT	0 0 0 3		

WT + | PT | YT

BURN ATT CHECK

STAR		
SA	+	0
TA	+	0 0

BURN ATT CHECK UPDATE

STAR		
SA	+	0
TA	+	0 0

SPS BURN STATUS

ΔTIG	
AFTER TRIM	
ΔVC	

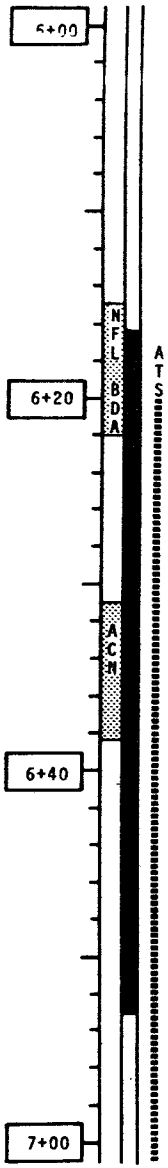
P52 (OPTION 3)

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

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

GET HR	
MIN	

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




```
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)


P00
VERIFY SI +X FWD ATT
  (ATT = 18,170,330)

TRANSMIT GYRO TORQUE ANGLES
  AND TIME


START EAT PERIOD
```

```
*****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) *
*                                *
*                                *
*                                *
* P00                            *
*                                *
* 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);P00 *
*                                *
* MNVR TO SI +X FWD ATT          *
*   (ATT = 12,14,332)            *
**********************************
```

NPC PAD DATA

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

WT	+					

PT				

YT				

BURN ATT CHECK

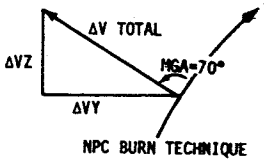
STAR						
SA	+					0
TA	+				0	0

BURN ATT CHECK UPDATE

STAR						
SA	+					0
TA	+				0	0

P52 (OPTION 3)

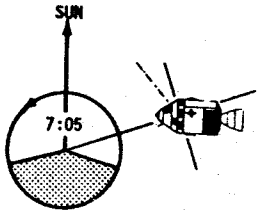
N71 1ST STAR		0	0	0		
N71 2ND STAR		0	0	0		
N05(R1) ∮ ERR						
N93 GYRO TORQUING ANGLES	X					
	Y					
	Z					
TIME OF GDC ALIGN	HR	+	0	0		
	MIN	+	0	0	0	
	SEC	+	0			



7+00

ATS

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



7+20

GMM

*****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)

7+40

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

PRESLEEP (S/1-49)

* P52 (OPT 3)(REF Pg 3-b)(RECORD) *

ROSBDA

MIL

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)

* POO *
* VERIFY SI +X FWD ATT(18,170,330)*
* TRANSMIT GYRO TORQUE ANGLES *
* AND TIME *
*****

ATS

*****FOR M=14 RNDZ*****
* UVA LAMPS SHUT DOWN (Pg 3-8) *
* TERMINATE BATT A CHARGE (UPON *
* STDN CUE) THEN CHARGE BATT B *
*****

15+30

GO TO FLIGHT PLAN (Pg 4.1-6)

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			↓			
TIME OF GDC ALIGN	HR	+	0	0			
	MIN	+	0	0	0		
	SEC	+	0		↓		

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

V A N

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

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

```
*****IF REFSMMAT REALIGN REQ'D*****
* STDN 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)*
* P52 (OPT 3)(REF Pg 3-b)(RECORD) *
*                                 *
*                                 *
*                                 
```

47+00

47+10

47+20

47+30

TV

ATS

USR

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-M/APOLLO   *
*   COMM CHECK                    *
***********************************
```

ZFF PHOTOS (J/10-1)

TV CHECKLIST

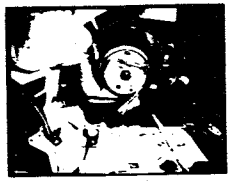
Remove TV camera and U-mount (location 11)
Position U-mount X, Y, Z - 105, 190, 65
Remount camera (location 11) (pin in hole 4)
Install polarized filters on couch lights and camera
On TV camera at location 606:
- Verify camera - PEAK, SLAVE, LINEAR
- Note: Select AVG if white content of scene rises above 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

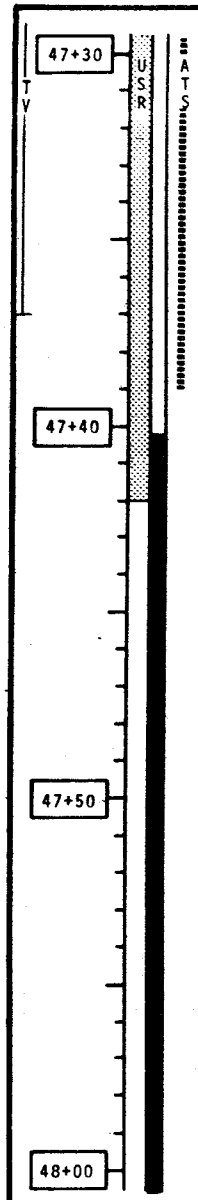
Check monitors, adjust camera pointing and lens if required

CM CAMR 1



DM CAMR 1

DM CAMR 2

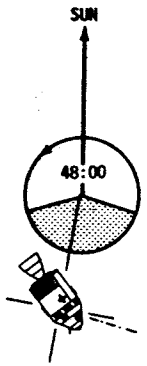


H2 PURGE LINE HTR-ON(up)

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



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

P52 (OPTION 3)

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

COAS LOS DETERMINATION CHECKLIST

1. COAS PWR-ON(up)
   MNVR 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

2. V37E52E
   F 04 06 R1 00001
   R2 00003
   PRO
   F 50 25 00015
   ENTER
   F 01 70 000DE STAR CODE
   Load STAR CODE
   OPT MODE-CMC(verify)
   OPT ZERO-OFF
   PRO
   06 92 SHAFT,TRUN
   RECORD SHAFT,TRUN
   (NOMINAL = 0°,+57.470°)

3. V37E00E
   OPT MODE-MAN
   OHC-Drive trun<10°
   OPT ZERO-ZERO

COAS LOS DETERMINATION

N92	SA	+					
	TA	+					

48+00

V A N

NC2 FINAL PAD (COPY)
NCC PRELIMINARY PAD (COPY Pg 3-14)
NSR PRELIMINARY PAD (COPY Pg 3-15)
TRANSMIT GYRO TORQUE ANGLES & TIME (Pg 3-9)

P52 (OPT 3) (REF Pg 3-b)(RECORD Pg 3-11)

H2 PURGE LINE HTR-OFF (10 MIN AFTER PURGE)
WASTE WATER DUMP CHECKLIST (Pg 3-12)
PERFORM COAS LOS DETERMINATION CHECKLIST (Pg 3-11)

48+10

UNSTOW HP-65 KIT(U1) & CHECKLIST(R1)
VELCRO (HOOK) FROM U3 (IN PIN STRAIGHTENING KIT)
HP-65 CHECKOUT (Pg 1)

BORESIGHT STAR
4 - ACHERNAR
(232, 16, 0)

P00
MNVR TO NC2 FINAL PAD ATT

P32
LOAD N28 PAD VALUE
VERIFY N37 = PAD VALUE (Pg 3-12)
SET DET

48+20

P | | | | Y | | | |

ACQUIRE ATS HGA: MAN, WIDE P -35, Y 144
S-BD ANT IND > 1/3 SCALE, HGA: REACQ, NARROW

-12:00

P32 (FINAL COMP: RECORD)
(LOAD STDN SOLN)(FOR P77)

A T S

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

48+30

NC2 PAD DATA

		NOMINAL	PRELIMINARY	FINAL
N28 TIG NC2	HR	+ 0 4 8	+	+
	MIN	+ 3 4	+	+
	SEC	+ 0 4	+	+
N81 ΔV_{NC2}	ΔV_X	- 0 3 6 . 4		
	ΔV_Y	+ 0 0 0 . 0		
	ΔV_Z	- 0 0 0 . 1		
N22 NC2	R	+ 0 0 0 . 0 0	+ 0 0	+ 0 0
	P	+ 0 3 4 . 0 0	+ 0 0	+ 0 0
	Y	+ 0 0 0 . 0 0	+ 0 0	+ 0 0
	ΔV_C	0 2 3 . 7		
	BT	0 0 . 0 2		

WT + | PT | YT

BURN ATT CHECK

STAR		
SA	+	0
TA	+	0 0

BURN ATT CHECK UPDATE

STAR		
SA	+	0
TA	+	0 0

TPI TIG N37

NC2 ONBOARD DATA

		P32 RECYCLE	P32 FINAL COMP
N84	ΔV_{NCC}	+ 0	+ 0
	ΔH_{NCC}	+ 0 0	+ 0 0
	ΔV_{NSR}	+ 0 0	+ 0 0
N81 ΔV_{NC2}	ΔV_X	0	0
	ΔV_Y	+ 0 0 0 0 0	+ 0 0 0 0 0
	ΔV_Z	+ 0 0 0 0 0	+ 0 0 0 0 0

WASTE WATER DUMP CHECKLIST

BAT VENT VLV-CLOSED (252)
H2O QTY IND-WASTE (Panel 2)
WATER CONT PRESS REL VLV-DUMP A (352)
Monitor WASTE H2O QTY IND-decreasing
(~5% Per Min)
When WASTE H2O QTY IND-60%
WATER CONT PRESS REL VLV-2
BAT VENT VLV-VENT (252)

XXXXXXXXXXXXXXXXXXXXXXXXXXXX
X N81 COMP LIMITS NA X
X X
X STDN SOLN PRIME X
X IF STDN SOLN NOT AVAILABLE X
X DO NOT BURN NC2 X
XXXXXXXXXXXXXXXXXXXXXXXXXXXX

SPS BURN STATUS

ΔTIG

AFTER TRIM

ΔVC

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

48+30

0:00

48+40

48+50

49+00

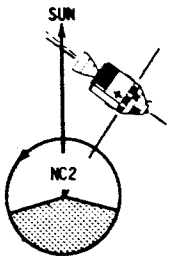
ATS

ACN

TV

USR

SOYUZ MNVRS TO ORBITAL ATTITUDE RATE



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

TV- GRD CMD
48+50 - 49+00

DP PERFORM VHF AM COMM CK

VHF AM SPEC RANGE
= 196 NM

VHF AM AND FM COMM

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

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

◄This is Apollo. Я АПОЛЛОН.
◄How do you read? КАК ВЫ СЛЫШИТЕ?

* 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)
EMS FUNC-ΔV SET/VHF RNG
EMS 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. ГОЛОС УХУДШАЕТ РЕЖИМ *
* VHF RNG-RESET (1) ИЗМЕРЕНИЯ ДАЛЬНОСТИ. *
*◄Ranging lockup established. РЕЖИМ ИЗМЕРЕНИЯ ДАЛЬНОСТИ УСТАНОВЛЕН. *

49+00

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

-12:00

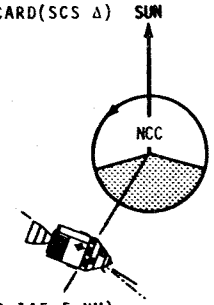
P33 (FINAL COMP: RECORD)
(LOAD STDN SOLUTION)

DP PERFORM VHF FM COMM CK

VHF FM SPEC RANGE = 162 NM

49+10

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



0:00

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 ВЫПОЛНЕН.
DP PERFORM VHF RANGING VOICE CHECK WITH SOYUZ

VHF RANGING SPEC RANGE = 144 NM

49+20

-28:00

V87E (START VHF MARKING)

R HP-65 DATA FOR NSR-28

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

49+30

NCC PAD DATA

		NOMINAL	PRELIMINARY	FINAL
N11 TIG NCC	HR	+ 0 4 9	+	+
	MIN	+ 1 8	+	+
	SEC	+ 0 3	÷	+
N81 ΔV_{NCC}	ΔV_X	+ 0 3 9 6		
	ΔV_Y	- 0 0 0 6		
	ΔV_Z	+ 0 0 6 4		
N22 NCC	R	+ 1 8 0 0 0	+ 0 0	+ 0 0
	P	+ 0 2 1 0 0	+ 0 0	+ 0 0
	Y	+ 3 5 9 0 0	+ 0 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 0

BURN ATT CHECK UPDATE

STAR		
SA	+	0
TA	+	0 0

NCC ONBOARD DATA

XXXXXXXXXXXXXXXXXXXXXXXXXXXX
X N81 COMP LIMITS NA X
X X
X STDN SOLN PRIME X
X IF STDN SOLN NOT AVAILABLE X
X DO NOT BURN NCC X
XXXXXXXXXXXXXXXXXXXXXXXXXXXX

SPS BURN STATUS

ΔTIG	
AFTER TRIM	
ΔVC	

P33 FINAL COMP

N82 ΔV_{NSR}	ΔV_X	0
	ΔV_Y	0
	ΔV_Z	0
N81 ΔV_{NCC}	ΔV_X	0
	ΔV_Y	0
	ΔV_Z	0

N13 (TIG NSR)	
	2 8
N72	

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

49+30

-24:00

VHF

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)

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

-20:00

R HP-65 DATA FOR NSR-20

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

-16:00

49+40

VHF

R HP-65 DATA FOR NSR-16

15

-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
SET ASCP tw TO BURN ATT
E,E TO 06 40, RECORD ΔVT
P00
(BANK A)

SUN

NSR

49+50

AGO

AGO

0:00

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 BEHOIHEH.
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)

50+00

ATS

P40

N18	R						
BURN ATT	P						
	Y						
N40	ΔV_T	+					
ΔV TAIL OFF		-			1	3	0
	ΔV_C	+					

P | | | | Y | | | |

NSR PAD DATA

TIG NSR(N13)=TIG NCC(N11) + 00:37:00= ____:____:____.____

		NOMINAL						PRELIMINARY						FINAL					
N81 ΔV_{NSR}	ΔV_X	-		0	1	7	0												
	ΔV_Y	-		0	0	1	4												
	ΔV_Z	+		0	2	1	2												
N22 NSR	R	+	1	7	6	0	0	+				0	0	+				0	0
	P	+	1	8	8	0	0	+				0	0	+				0	0
	Y	+	3	5	7	0	0	+				0	0	+				0	0
	ΔV_C			0	1	4	5												
	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

NSR ONBOARD DATA

P34 RECYCLE

N75	ΔH_{NSR}	+	0	0			
	ΔT(NSR/TPI)	+			B		
	ΔT(TPI/TPI)				B		
N81 ΔV_{NSR}	ΔV_X		0				
	ΔV_Y		0				
	ΔV_Z		0				

P34 FINAL COMP

+	0	0			
+			B		
			B		
	0				
*	S	T	D	N	*
	0				

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X N81 COMP LIMITS NA X
X X
X USE STDN ΔVY IN ALL CASES X
X X
X BURN STDN MATCHED PAIR SOLN X
X IF NCC EXECUTION IS QUESTIONABLE-THE ORDER X
X OF PRIORITIES ARE: X
X HP-65 X
X CMC UNMATCHED X
X STDN UNMATCHED X
X DO NOT BURN NSR X
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

NSR HP-65 SOLN

ΔV_X						
ΔV_Y	*	S	T	D	N	*
ΔV_Z						

SPS BURN STATUS

ΔTIG						
AFTER TRIM						
ΔVC						
TRANSMIT BURN ATT & ΔVC LOADED						

50+00

-53:00

50+10

50+20

-32:00

50+30

TTV

MAD

USR

ATS

VHF

VHF

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

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

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

REMOVE POLAR PLOT

SNACK PERIOD

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 GYRO TORQUING ANGLES	X						
	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 TIG TPI	HR	+	0	0				+	0	0			
	MIN	+	0	0	0			+	0	0	0		
	SEC	+	0					+	0				
N58	ΔV_{TPI}	+	0	0				+	0	0			
	ΔV_{TPF}	+	0	0				+	0	0			
ΔT(TPI/TPI)					B						B		
N81	ΔV_X		0	0					0	0			
ΔV_{TPI}	ΔV_Y	*	S	T	D	N	*	*	S	T	D	N	*
	ΔV_Z		0	0					0	0			
V16N59	ΔV_F		0	0					0	0			
ΔV(LOS)	ΔV_R		0	0					0	0			
	ΔV_D		0	0					0	0			

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

50+30 / -24:00 — USR — ATS — VHF

R HP-65 DATA FOR TPI-24 (GET)

```
XXXXXXXXXXXXXXXXXXXXXXX
X UNREASONABLE UPDATE X
X  0.50 NM,  3.0 FPS  X
XXXXXXXXXXXXXXXXXXXXXXX
```

V32E (2ND P35 RECYCLE: RECORD),(RECORD N37)(Pg 3-16)

TPI FINAL PAD (COPY)

V48E (LOAD WT)

-16:00

R HP-65 DATA FOR TPI-16 (GET)
V77E (TERMINATE VHF RANGE RATE PROCESSING ROUTINE)
V57E, V22E, 1E, PRO (POST TPI SINGLE SENSOR WRI LOGIC)
SET HDSUPFLG (V25N7E, 106E, 2000E, 1E)

50+40 / -14:00

R HP-65 DATA FOR TPI-14 (GET)
MNVR TO BORESIGHT COAS ON HORIZON
SET ORDEAL (FDAI 1)

θD=345, H=118

-12:00

P35 (FINAL COMP: RECORD)
(LOAD ΔVX & ΔVZ, IF REQ'D, & STDN ΔVY)
PRO, N59E (RECORD)
RHC-MNVR TO ZERO ROLL (ROLL RIGHT)

V25N20E (LOAD PAD BURN ATT)

P40						
N18 BURN ATT	R					
	P					
	Y					
N40	ΔV_T	+				
ΔV TAIL OFF		-		1	3	0
	ΔV_C	+				

GO TO SPS BURN CUE CARD(SCS Δ)
FOR HP-65 OR CMC SOLUTION:
IN P40 AT F50 18, RECORD BURN ATT
SET ASCP tw TO BURN ATT
E,E TO 06 40, RECORD ΔVT
POO
(BANK A)

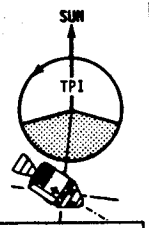
```
*****IF DRIFT RATES EXCESSIVE*********
* BURN WITH SOYUZ BORESIGHTED IN COAS *
* (ΔVF, ΔVR, & ΔVD TIMED RCS) WITH    *
* AUTO RCS SELECT(16)-MAN/MNB         *
****************************************
```

50+50

0:00

TPI (359,29/29,2) (R=21.2 NM)
P77; RATE-LOW
P36
◄TPI completed. TPI ВЫПОЛНЕН.
REACQUIRE VHF RANGING (R=18 NM)

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



+3:00

V87E (START VHF MARKING)
FDAI 1-ORB RATE

+4:30

θ HP-65 DATA FOR TPI+4:30

CENTER SOYUZ IN COAS WHEN READING HP-65 DATA θ

```
XXXXXXXXXXXXXXXXXXXXXXX
X UNREASONABLE UPDATE X
X  0.50 NM,  3.0 FPS  X
XXXXXXXXXXXXXXXXXXXXXXX
```

51+00

TPI PAD DATA

		NOMINAL	PRELIMINARY	FINAL
N37 TIG TPI	HR	+ 0 5 0	+	+
	MIN	+ 5 4	+	+
	SEC	+ 2 5	+	+
N81 ΔV_{TPI}	ΔV_X	+ 1 9 5		
	ΔV_Y	+ 0 0 7		
	ΔV_Z	- 1 0 0		
N59 (RCS) ΔV (LOS)	ΔV_F/BT	+ 2 1 9 5 5		
	ΔV_R/BT	+ 0 0 7 0 4		
	ΔV_D/BT	+ 0 0 0 0 0		
	ΔV_C	0 0 9 2		
	BT	0 0 0 1		
N22 (SPS USING N81)	R	+ 3 5 9 0 0	+ 0 0	+ 0 0
	P	+ 0 2 9 0 0	+ 0 0	+ 0 0
	Y	+ 0 0 2 0 0	+ 0 0	+ 0 0
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

TPI ONBOARD DATA

TPI HP-65 SOLN

ΔV_F BT	
ΔV_R BT	
ΔV_D BT	

TO OBTAIN LOS ΔV_F & ΔV_D: OVERWRITE N81 ΔV_X & ΔV_Z, PRO, N59E, RECORD

TIG						
	ΔV_X		X			
	ΔV_Y	*	S	T	D	N	*
	ΔV_Z		X			
	ΔV_F		X			
	ΔV_R	*	S	T	D	N	*
	ΔV_D		X			

```
XXXXXXXXXXXXXXXXXXXX
```

51+00

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

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

+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; POO; THC PWR-ON(up)
BURN WITH SOYUZ BORESIGHTED IN COAS
(ΔVF RCS WITH EMS) (ΔVD TIMED RCS)

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

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 ОГНИ ОРИЕНТАЦИИ.
V87E (START VHF MARKING)

CENTER SOYUZ IN COAS WHEN
READING HP-65 DATA θ

51+10

+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)
POO; THC PWR-ON(up)
BURN WITH SOYUZ BORESIGHTED IN COAS
(ΔVF RCS WITH EMS) (ΔVD TIMED RCS)

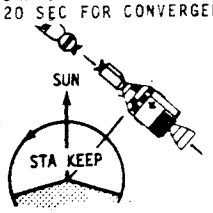
+24:00 TPM2
P77
REACQUIRE VHF RANGING (R=2 NM)

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

51+20

STOW HP-65 KIT(U1) & CHECKLIST(R1)
P25; LOAD N72 WITH +ZERO
(MONITOR LOS RATES AND RANGE RATE)
(N77=R,Ṙ,-00001)(R,Ṙ 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)



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

51+30

VHF 7 VHF 7 AGO VTR

TPM1 ONBOARD DATA

	P36 FINAL COMP						TPM1 HP-65 SOLN						
N59 $\Delta V_{(LOS)}$ ΔV_F		0	0										
ΔV_R													
ΔV_D		0	0										

$\Delta V_D BT$

TPM2 ONBOARD DATA

	P36 FINAL COMP						TPM2 HP-65 SOLN						
N59 $\Delta V_{(LOS)}$ ΔV_F		0	0										
ΔV_R													
ΔV_D		0	0										

$\Delta V_D BT$

PRE-BRAKING SWITCH LIST

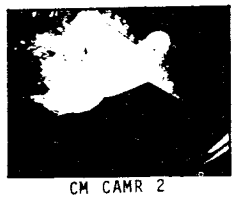
MAN ATT(3)-RATE CMD	ATT SET-GDC
LIMIT CYCLE-OFF	THC PWR-PWR
DBD/RATE-MIN/LOW	RHC PWR NORMAL #2-AC/DC
BMAG MODE(3)-ATT 1/RATE 2	RHC PWR DIRECT #2-MNA/MNB
SC CONT-SCS	AUTO RCS SELECT(16)-MNA/MNB
FDAI SCALE-5/1	THC-ARMED
FDAI SELECT-1	RHC #2-ARMED
FDAI SOURCE-ATT SET	

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)	Ṙ(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

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

VTR

51+30

LOAD ASCP tw WITH DOCKING ATT (Pg 3-19)
◄Initiating orientation of Apollo. НАЧИНАЮ ОРИЕНТАЦИЮ АПОЛЛОНА.
MNVR TO DOCKING ROLL ATT (-60° CCW)
(REF ATT SET ERROR NEEDLES)
VTR/TV SWITCH LIST(Pg3-19)

ATS

◄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

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

TV- GRD CMD
51+48 - 52+09

TV

51+50

MAD

CSM/SOYUZ INTERFACE SEAL COMPRESSED

USR

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 INU 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:
   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).

STAR	ROLL	PITCH	YAW
____	____.	____.	____
____	____.	____.	____
____	____.	____.	____

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 NSR- 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	____.____

FOR IMU ALIGNMENTS

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.
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).

STAR	ROLL	PITCH	YAW
____	____.	____.	____
____	____.	____.	____
____	____.	____.	____

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 Address Of MARKDIF)
16067E
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 MSR- 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, +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, +E, PRO (To Terminate Optomized Range Calculations)
V76E (To Read Current Range)
Post TPI-V76E, V25E, +E, +E, +E, PRO (To Terminate Optimized Range Calculations)
N76E (To Read Current Range)

NO VHF RANGING

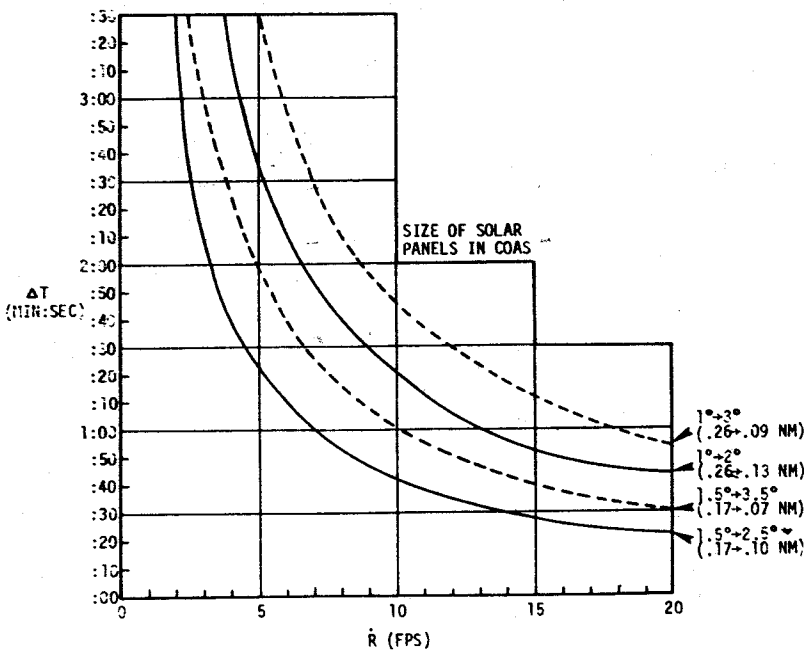
Note: HP-65 Solutions Not Possible, Delete:
V87's (Used To Enable VHF Marking)
V76's (Used To Enable VHF Range Rate Processing Routine)

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 & $\dot{R}$)

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 $\dot{R}$ = -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 $\dot{R}$ 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 N47 Per Table (Load XX As Specified In Nominal C/L)

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

NOTES FOR RCS TRANSLATION:

1. 50% Reduction In Effectiveness For All Axes.
2. Degraded Attitude Hold Authority.
3. Unwanted ΔVX For Y & Z Translation.
4. 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).
5. 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).
6. If N85 > 5 FPS In Any Axis, Rotate S/C To Maximize ΔVX.
   If N85 ≤ 5 FPS In All Axes, Trim ΔVX Last.

NOTES FOR SPS BURNS:

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

NOTES FOR BRAKING:

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

NOTES FOR DOCKING

15. CMC ATT DB (0.5°) Is Being Used For Docking; Not The SCS DB (0.2°).
16. 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:

1. Translation And Attitude Control Depend On Proper Manipulation Of AUTO RCS SELECT Switches.
2. 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.

3. 50% Reduction In Effectiveness For All Axes.
4. Degraded Attitude Hold Authority.
5. Unwanted ΔV Normal To Translation Axis.
6. 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).
7. 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).
8. If N85 > 5 FPS In Any Axis, Rotate S/C To Maximize ΔVX.
   If N85 ≤ 5 FPS In All Axes, Trim ΔVX Last.

NOTES FOR SPS BURNS:

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

NOTES FOR BRAKING:

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

NOTES FOR DOCKING:

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

VHF, OPTICS & OTHER FAILURES
VHF, OPTICS & OTHER FAILURES

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 (ΔVTotal < Or = 50 Sec)
1. Use P41.
V25N17E, Load N17 = (Any roll),(N18pitch ± 180),(360 - N18yaw)
2. Load EMS = -ΔVTOTAL
V63E; Manually Mnvr To -X Burn Att Using N17 Error Needles.
3. At TIG, Translate -X RCS & Trim N85 Residuals.

+X RCS / -X RCS (100 Sec < ΔVTOTAL ≤ 200 Sec)
1. Use P41 & Auto Mnvr To N18 Burn Att.
2. V25N17E; Load N17 = (Any roll),(N18pitch ± 180),(360 - N18yaw)
3. Load EMS = +X ΔVTOTAL
4. At TIG, Translate +X RCS = +X ΔVTOTAL
V63E
5. Manually Mnvr To -X Burn Att Using N17 Error Needles.
6. Load EMS = -X ΔVTOTAL
7. Translate -X RCS & Trim N85 Residuals.

+X RCS / SPS
1. Use P40 & Auto Mnvr To N18 Burn Att.
2. Load EMS = (ΔVTOTAL - ΔVTAILOFF)
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 (ΔVTOTAL > 200 Sec)
1. Use P40 & Auto Mnvr To N18 Burn Att.
2. V25N17E; Load N17 = (Any roll),(N18pitch ± 180),(360 - N18yaw)
3. Load EMS = (ΔVTOTAL - ΔVTAILOFF - ΔV-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 Mnvr To -X Burn Att Using N17 Error Needles)
8. Load EMS = -ΔV-XRCS
9. Translate -X RCS & Trim N85 Residuals.

52+00

VTR

USR

◄INFORM SOYUZ : APOLLO DOCKING DELAYED.
СТЫКОВКА АПОЛЛОНА ОТКЛАДЫВАЕТСЯ.

◄INFORM SOYUZ : IS YOUR ORIENTATION SYSTEM ACTIVATED?
ВАША СИСТЕМА ОРИЕНТАЦИИ ВКЛЮЧЕНА?

*IF YES:
◄INFORM SOYUZ : APOLLO WILL ATTEMPT DOCKING AT 52+42.
* АПОЛЛОН ПОВТОРИТ ПОПЫТКУ СТЫКОВКИ В 52+42.*
*IF NO:
◄INFORM SOYUZ : APOLLO WILL ATTEMPT DOCKING AT 53+23.
* АПОЛЛОН ПОВТОРИТ ПОПЫТКУ СТЫКОВКИ В 53+23. *

EXTERIOR LIGHTS RUN/EVA-RUN/EVA
*IF NO COMM:
* DSE: (LBR/RCD/FWD/CMD RESET)
* VTR HEAD WHEEL DRIVE MOTOR-OFF(MOTOR ON LT-OFF)
DAC-OFF
SC CONT/MODE-CMC/AUTO

◄INFORM SOYUZ : TURN ON VHF SIMPLEX A.
ВКЛЮЧИТЕ УКВ СИМПЛЕКС А.

52+20

VHF RANGING-OFF
VHF AM A-SIMPLEX
VHF AM B-OFF

*IF SOYUZ ORIENTATION SYSTEM REMAINED ACTIVATED AFTER *
*NOMINAL DOCKING ATTEMPT: *
* *
* EMS FUNC/MODE-ΔV SET/STBY *
* SET ΔVC=-100.0 FPS *
* EMS FUNC-ΔV *
* *
* *
* DAC-ON *
* (IF DESIRED) HDC/CX06 *
* SC CONT/MODE-SCS/FREE *
* ACTIVE DOCKING CHECKLIST(Pg 1-21) *
* *
* *
* *
* *
* *
* *
* DOCK(AT SR) 52+42 *
EXTERIOR LIGHTS RUN/EVA-OFF

SOYUZ STAYS IN DOCKING ATTITUDE FOR DOCKING AT 52+42

VTR 52+36 - 52+50

ORS

52+40

VTR

*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 *

53+00

53+00

QUI

VERIFY STATIONKEEPING ON SOYUZ +X AXIS(R≈150 FT)

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

ACQ ATS HGA: MAN, WIDE P -43, Y 16
S-BD ANT IND > 1/3 SCALE
HGA: REACQ, NARROW

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

VTR 53+12 - 53+26

SOYUZ MNVRS TO DOCKING ATT 53+16 - 53+19

BDANTL

VTR

ATS

53+20

DOCK(ONE REV LATE) 53+23

MAD

* 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 54+52.
АПОЛЛОН ПОВТОРИТ ПОПЫТКУ СТЫКОВКИ В 54+52.
GUIDE RING A-RETRACT(≈40 SEC)

USR

53+40

GUIDE RING EXTEND LT-OUT
PASSIVE LT-ON

GUIDE RING A-OFF(CTR)

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

54+00

DELAYED DOCKING DELAYED DOCKING DELAYED DOCKING DELAYED DOCKING DELAYED DOCKING DELAYED DOCKING

DELAYED DOCKING

54+00

ATS

EXTERIOR LIGHTS RUN/EVA-OFF

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

54+20

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)

54+40

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

VTR

ATS

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

55+00

55+00

ATS

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)

55+20

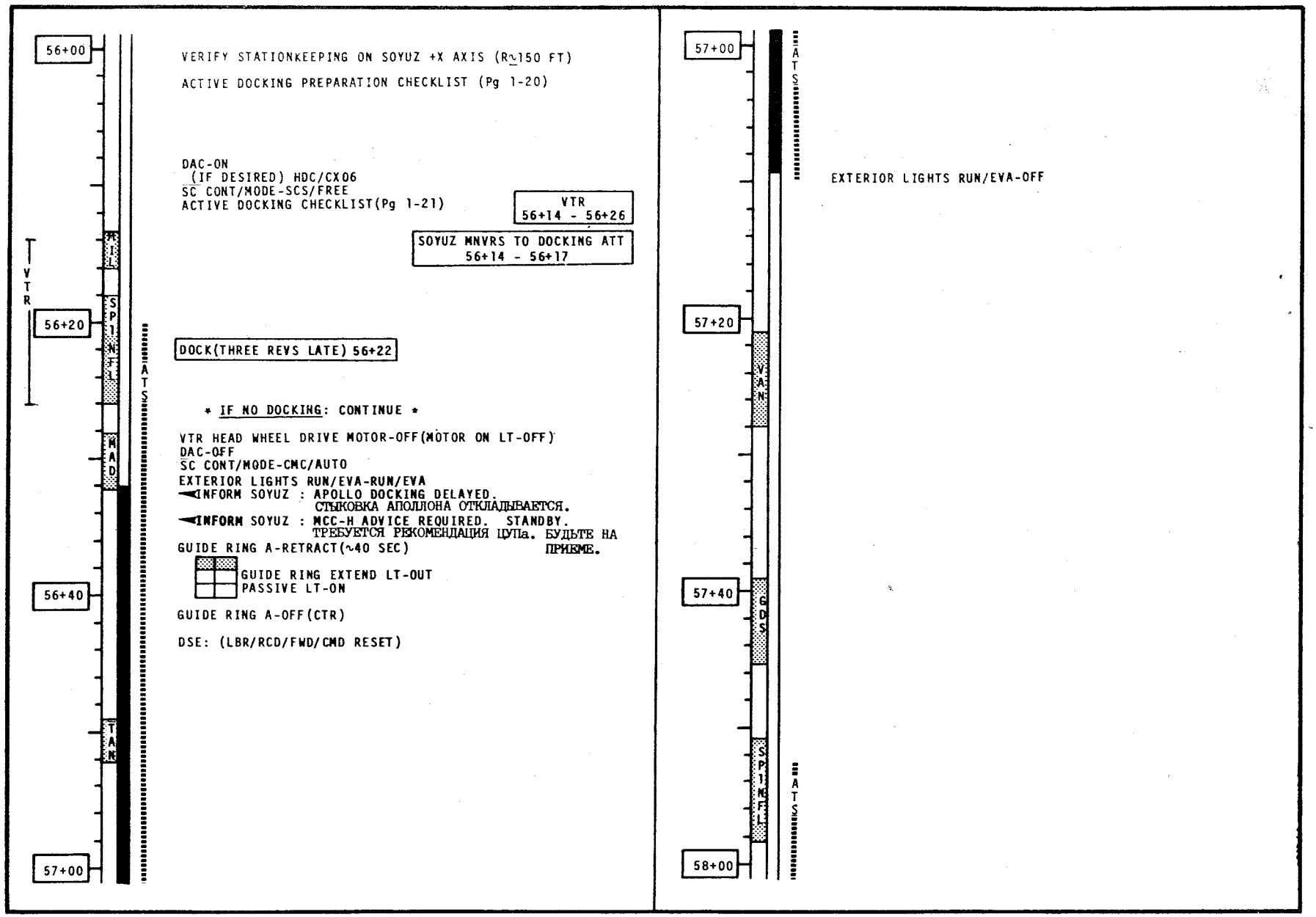
55+40

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

56+00


56+00
56+20
56+40
57+00
VTR
ATS
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
56+14 - 56+26
SOYUZ MNVRS TO DOCKING ATT
56+14 - 56+17
DOCK(THREE REVS LATE) 56+22
* 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 : MCC-H ADVICE REQUIRED. STANDBY.
ТРЕБУЕТСЯ РЕКОМЕНДАЦИЯ ЦУПа. БУДЬТЕ НА ПРИЕМЕ.
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)
57+00
57+20
57+40
58+00
EXTERIOR LIGHTS RUN/EVA-OFF

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 TPI)

(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 ΔH = 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 TPI.
(2 min before midnight, ΔH = 10 ± 2 NM, Elev = 27°, ωT = 130°)

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

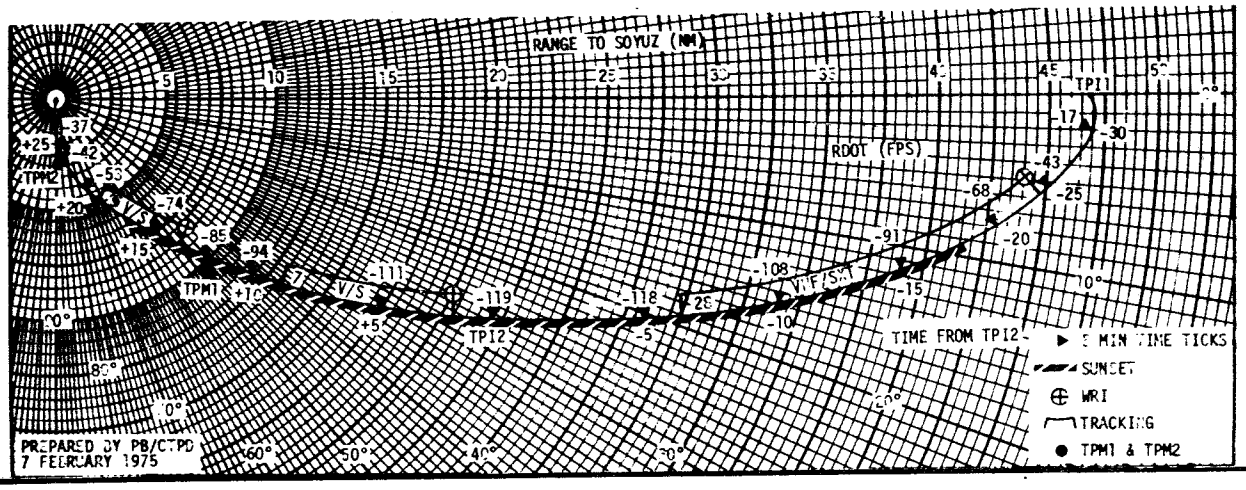
o State vectors (CSM & Soyuz)
o TPI1 Target Load

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)



(11002)
(01111)

P52 (OPT 3) (RECORD)

P00; CMC MODE-AUTO

V49 MNVR TO NOMINAL TPI1 BURN ATT (Pg 6-2)

◄Soyuz beacon on. МАЯК СОЮЗА ВКЛЮЧЕН.

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

STDN UPLINK (P27) (CSM & SOYUZ
S.V.'s & TPI 1 TARGET LOAD)
TPI1 PAD (COPY Pg 6-2)
TPI2 TIG (COPY Pg 6-3)
DOCKING ATTITUDE PAD (COPY Pg 6-5)

P52 (OPTION 3)

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

STATION	GET AOS	GET LOS	HGA PITCH	HGA YAW

(11103)
(01111)

V43E (LOAD 4 JET, 2°/SEC)
(LOAD WT, PT & YT)

-12:00

P30 (VERIFY N33 & N81 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 ВЫПОЛНЕН.

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

◄Turn on VHF ranging. ВКЛЮЧИТЕ ИЗМЕРЕНИЕ ДАЛЬНОСТИ.
VHF RANGING SWITCH LIST, ACQUIRE VHF RANGING (R = 47 NM)

-33:00

S X T / V H F

V37E (START VHF RANGING)

```
XXXXXXXXXXXXXXXXXXXXXX
X UNREASONABLE UPDATE X
X  1.00 NM,  6.0 FPS  X
XXXXXXXXXXXXXXXXXXXXXX
```

TPI1 PAD DATA

		NOMINAL	FINAL
N33 TIG	HR	+	+
	MIN	+	+
	SEC	+	+
N81 ΔV	ΔV_X	- 188	
	ΔV_Y	+ 000	
	ΔV_Z	+ 226	
N22	R	+ 00	+ 00
	P	+ 00	+ 00
	Y	+ 00	+ 00
	ΔV_C	0164	
	BT		
ΔVC AT IGN		+	+
ΔVC TAILOFF		-	-

WT	PT	YT
+		

BURN ATT CHECK

STAR		
SA	+	0
TA	+	00

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	00
	VGY	00
	VGZ	00

(11103)
(01111)

SXT/VHF

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

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

REMOVE POLAR PLOT

H=118

V83E, SET ORDEAL (FDAI 1)

SET HDSUP FLG (V25N7E, 106E, 2000E, 1E)

28 LOAD N78 REG 3 = ZERO (V23N78E, +E)
P35 (FINAL COMP: RECORD)
PRO, N59E (RECORD)
RHC-MNVR TO ZERO ROLL (ROLL RIGHT)

IGNORE ATT ERROR NEEDLES & UPLINK ACTIVITY LIGHT

- 6:00

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)

0:00

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

FDAI 1-ORB RATE

+ 3:00

SXT/VHF

θ AND TA HP-65 DATA FOR TPI2+4:30

+ 4:30

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

TPI2 PAD DATA

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

TPI2 ONBOARD DATA

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

(11103)
(01111)
+ 7:30
+ 8:30
+ 9:00
+12:00
+15:00
+16:30
+19:30
+20:30
+21:00
+24:00
(11102)
(01111)

SXT/VHF-7

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

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

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

SXT/VHF-7

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

VHF

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 (ΔVX,ΔYX,ΔVZ CONT OPTIONAL)

STATION KEEP ON SOYUZ +X AXIS (R≈150 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

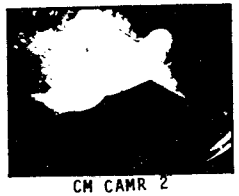
MAN ATT(3)-RATE CMD	ATT SET-GDC
LIMIT CYCLE-OFF	THC PWR-PWR
DBD/RATE-MIN/LOW	RHC PWR NORMAL #2-AC/DC
BMAG MODE(3)-ATT 1/RATE 2	RHC PWR DIRECT #2-MNA/MNB
SC CONT-SCS	AUTO RCS SELECT(16)-MNA/MNB
FDAI SCALE-5/1	THC-ARMED
FDAI SELECT-1/2	RHC #2-ARMED
FDAI SOURCE-ATT SET	

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)	$\dot{R}$(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

V25N22E (LOAD DOCKING ATT) (Pg 6-5)
◄Iniatiating orientation of Apollo. НАЧИНАЮ ОРИЕНТАЦИЮ АПОЛЛОНА.
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. НАЧНИТЕ ОРИЕНТАЦИЮ СТЫКОВКИ ПО ПРОГРАММЕ.

(11111)
(00146)
(00000)

(05000)
(00500)

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

BASIC ASSUMPTIONS

- o HGA will be deployed ASAP after SEPARATION MNVR
- 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 ωt = 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 NC 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), NC Burn Status, SOR1 Burn Status
- o Pg 7-1 SOR2 Burn Status
- o General status report on TPI, TPM1, TPM2

STATE VECTOR UPDATING

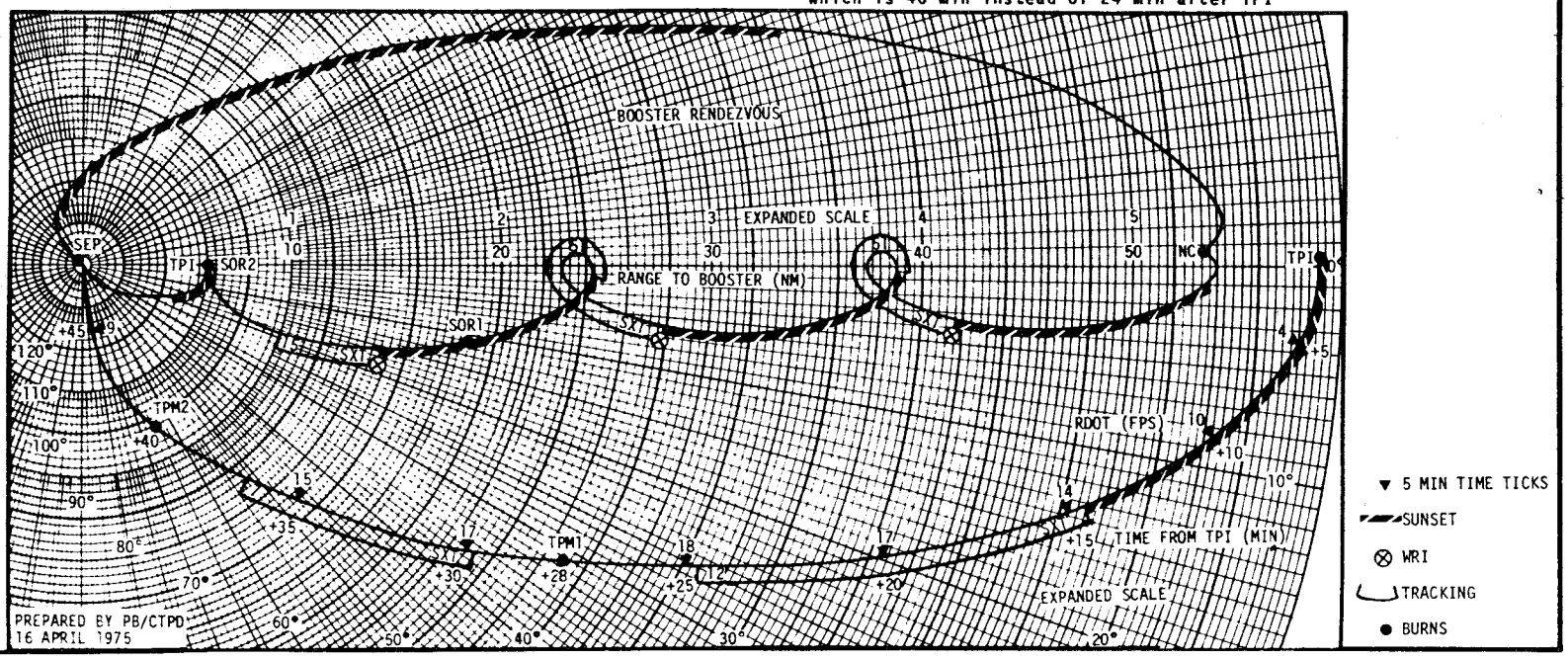
- o Uplinked after NC
- o SXT marks during each day period folling NC
- o Nav programs - P20 OPT 4 used pre-SOR2, P36 used post-SOR2
- o W-Matrix initialization - Load with 2000/2 before first mark.
  Force initilization (V93E) to occur with first mark of each of the 3 pre-SOR2 marking periods.
  No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

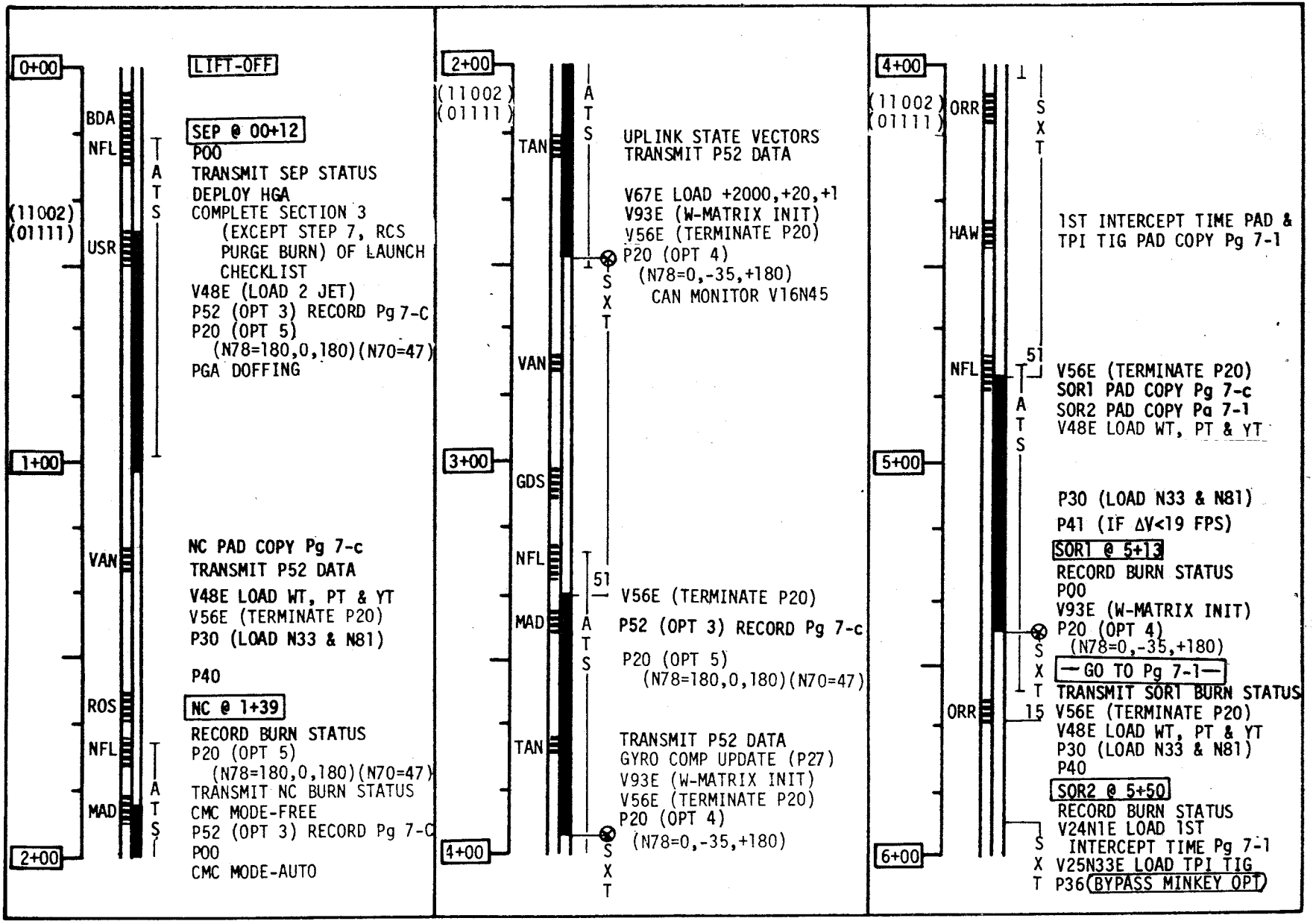
MANEUVER SOLUTIONS

- o NC, 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 N81 values of ΔVX & ΔVZ and with ΔVY = Zero, (Note: will have to load N33 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




0+00
LIFT-OFF
BDA
NFL
(11002)
(01111)
USR
SEP @ 00+12
P00
TRANSMIT SEP STATUS
DEPLOY HGA
COMPLETE SECTION 3
(EXCEPT STEP 7, RCS
PURGE BURN) OF LAUNCH
CHECKLIST
V48E (LOAD 2 JET)
P52 (OPT 3) RECORD Pg 7-C
P20 (OPT 5)
(N78=180,0,180)(N70=47)
PGA DOFFING
ATS
1+00
VAN
NC PAD COPY Pg 7-c
TRANSMIT P52 DATA
V48E LOAD WT, PT & YT
V56E (TERMINATE P20)
P30 (LOAD N33 & N81)
P40
ROS
NC @ 1+39
RECORD BURN STATUS
P20 (OPT 5)
(N78=180,0,180)(N70=47)
TRANSMIT NC BURN STATUS
CMC MODE-FREE
P52 (OPT 3) RECORD Pg 7-C
P00
CMC MODE-AUTO
NFL
MAD
2+00
2+00
(11002)
(01111)
TAN
UPLINK STATE VECTORS
TRANSMIT P52 DATA
V67E LOAD +2000,+20,+1
V93E (W-MATRIX INIT)
V56E (TERMINATE P20)
P20 (OPT 4)
(N78=0,-35,+180)
CAN MONITOR V16N45
SXT
VAN
3+00
GDS
NFL
51
V56E (TERMINATE P20)
MAD
P52 (OPT 3) RECORD Pg 7-c
P20 (OPT 5)
(N78=180,0,180)(N70=47)
TAN
TRANSMIT P52 DATA
GYRO COMP UPDATE (P27)
V93E (W-MATRIX INIT)
V56E (TERMINATE P20)
P20 (OPT 4)
(N78=0,-35,+180)
4+00
4+00
(11002)
(01111)
ORR
1ST INTERCEPT TIME PAD &
TPI TIG PAD COPY Pg 7-1
HAW
NFL
51
V56E (TERMINATE P20)
SOR1 PAD COPY Pg 7-c
SOR2 PAD COPY Pa 7-1
V48E LOAD WT, PT & YT
5+00
P30 (LOAD N33 & N81)
P41 (IF ΔV<19 FPS)
SOR1 @ 5+13
RECORD BURN STATUS
P00
V93E (W-MATRIX INIT)
P20 (OPT 4)
(N78=0,-35,+180)
— GO TO Pg 7-1 —
TRANSMIT SOR1 BURN STATUS
ORR
15
V56E (TERMINATE P20)
V48E LOAD WT, PT & YT
P30 (LOAD N33 & N81)
P40
SOR2 @ 5+50
RECORD BURN STATUS
V24N1E LOAD 1ST
INTERCEPT TIME Pg 7-1
V25N33E LOAD TPI TIG
P36 BYPASS MINKEY OPT
6+00

5+30
(11002)
(01111)

A S
T X
S T

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

TRANSMIT SOR1 BURN STATUS (Pg 7-c)

O
R
R

15

-12:00

V56E (TERMINATE P20)
V48E (LOAD WT, PT & YT)

P30
LOAD N33 & N81 PAD VALUES

5+40

P40

0:00

5+50

SOR2
(TRIM VG's ±0.2)
RECORD BURN STATUS
V21N55E, +0E (NO. OF TARGET OFFSETS)
V24N1E (LOAD 1ST INTERCEPT TIME) (Pg 7-1)
V25N33E (LOAD TPI TIG) (Pg 7-1)

P36 BYPASS MINKEY OPTION

S
X
T

6+00

SOR2 PAD DATA

		NOMINAL						FINAL					
N33 TIG SOR2	HR	+			0	0	5	+					
	MIN	+				5	0	+					
	SEC	+		0	0	0	0	+					
N81 ΔV_{SOR2}	ΔV_X	+		0	0	3	7						
	ΔV_Y	+		0	0	0	0						
	ΔV_Z	+		0	1	7	9						
N22 SOR2	R	+	1	7	8	0	0	+				0	0
	P	+	3	0	5	0	0	+				0	0
	Y	+	3	5	9	0	0	+				0	0
	ΔV_C			0	1	8	3						
	BT												

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			

WT	+					
PT						
YT						

BURN ATT CHECK							
STAR							
SA	+						0
TA	+					0	0

1ST INTERCEPT TIME PAD

(TPF IS 36 MIN PRIOR TO SUNSET)

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

TPI TIG PAD

		NOMINAL						UPDATE					
N33	HR	+			0	0	6	+					
	MIN	+				3	8	+					
	SEC	+		0	0	0	0	+					

6+00
(11002)
(01111)

-35:00

6+10

-23:00

6+20
(11103)
(01111)

-12:00

6+30

S X T

20

A T S

B D A H T L

```
XXXXXXXXXXXXXXXXXXXXXX
X UNREASONABLE UPDATE X
X  0.50 NM,  3.0 FPS  X
XXXXXXXXXXXXXXXXXXXXXX
```

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, WIDE 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)

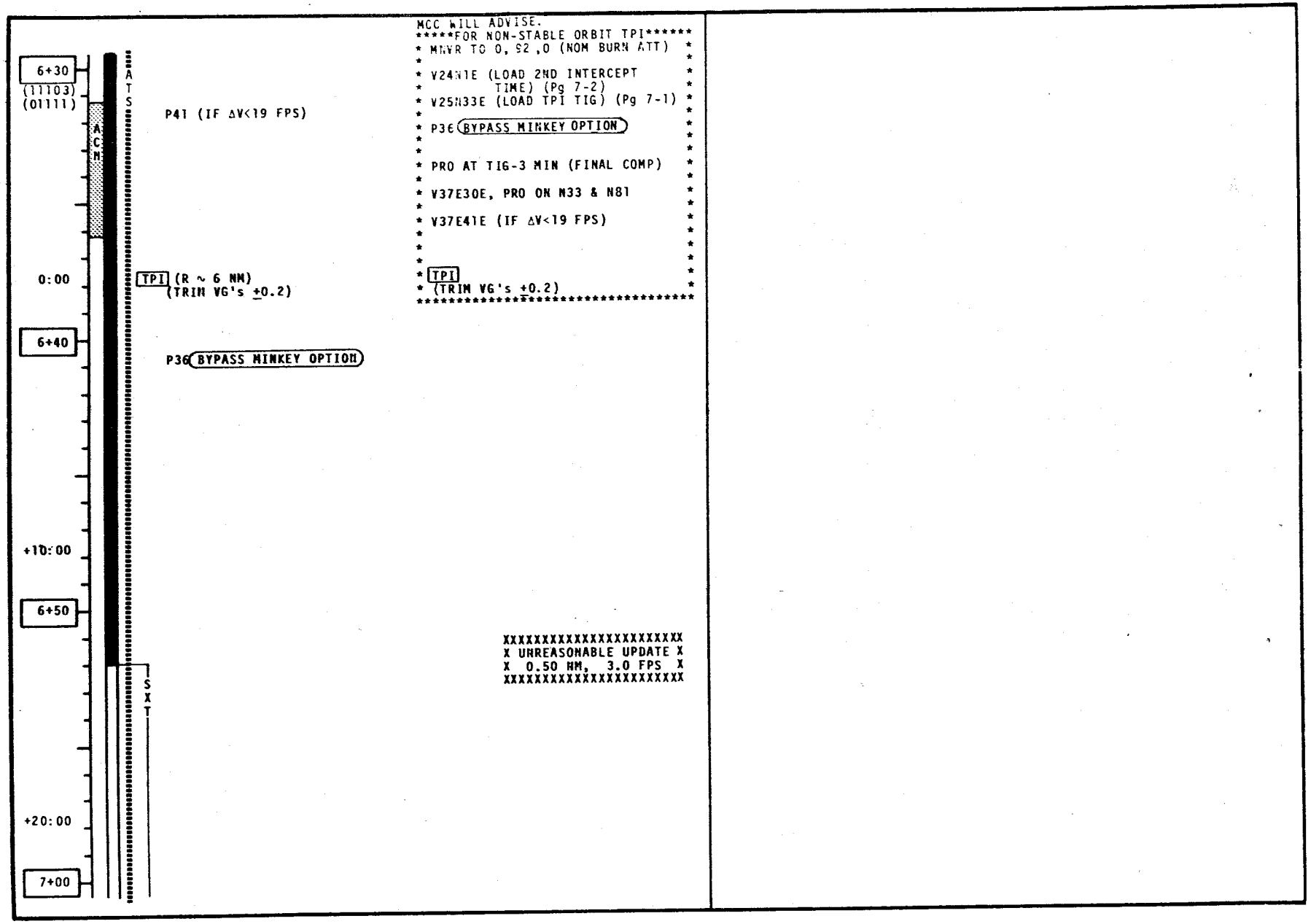
2ND INTERCEPT TIME PAD

(TPF IS 16 MIN PRIOR TO SUNSET)

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

TPI ONBOARD DATA

		NOMINAL						P36 FINAL COMP					
N59	ΔV_F	-	0	0	0	0	9		0	0			
$\Delta V_{(LOS)}$	ΔV_R	+	0	0	0	0	0		0	0			
	ΔV_D	+	0	0	0	9	1		0	0			
V16N81E	ΔV_X	-	0	0	0	0	9		0	0			
$\Delta V_{(LV)}$	ΔV_Y	+	0	0	0	0	0	+	0	0	0	0	0
	ΔV_Z	+	0	0	0	9	1		0	0			


6+30
(11103)
(01111)
ACN
ATS
P41 (IF ΔV<19 FPS)
0:00
TPI (R ~ 6 NM)
(TRIM VG's ±0.2)
6+40
P36 BYPASS MINKEY OPTION
+10:00
6+50
SXT
+20:00
7+00
MCC WILL ADVISE.
*****FOR NON-STABLE ORBIT TPI******
* MNVR TO 0, 92 ,0 (NOM BURN ATT) *
* V24N11E (LOAD 2ND INTERCEPT *
* TIME) (Pg 7-2) *
* V25N33E (LOAD TPI TIG) (Pg 7-1) *
* P36 BYPASS MINKEY OPTION *
* PRO AT TIG-3 MIN (FINAL COMP) *
* V37E30E, PRO ON N33 & N81 *
* V37E41E (IF ΔV<19 FPS) *
* TPI *
* (TRIM VG's ±0.2) *
XXXXXXXXXXXXXXXXXXXXXX
X UNREASONABLE UPDATE X
X 0.50 NM, 3.0 FPS X
XXXXXXXXXXXXXXXXXXXXXX

7+00 (11103) (01111)

+25:00

+28:00

7+10

+37:00

+40:00

7+20

7+30

ATS SXTI 12

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

PRO (P36 FINAL COMP: RECORD)

P41

TPM1

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

SXT 7

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

GWM

TPM2

P37 (ACCEPT AUTO MNVR)(N54=R,$\dot{R}$,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-ON: HDC/CX06
V37E47E (MONITOR LOS RATES AND RANGE IN COAS)
ESTABLISH MINIMUM CLOSURE RATE=-15 FPS
NULL LOS RATES
ADJUST RANGE RATE (EMS) USING FOLLOWING PROCEDURES
EMS FUNC/MODE-ΔV/NORMAL (EMS LOADED WITH POST TPM2 $\dot{R}$)
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 $\dot{R}$ FOR FINAL BRAKING

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

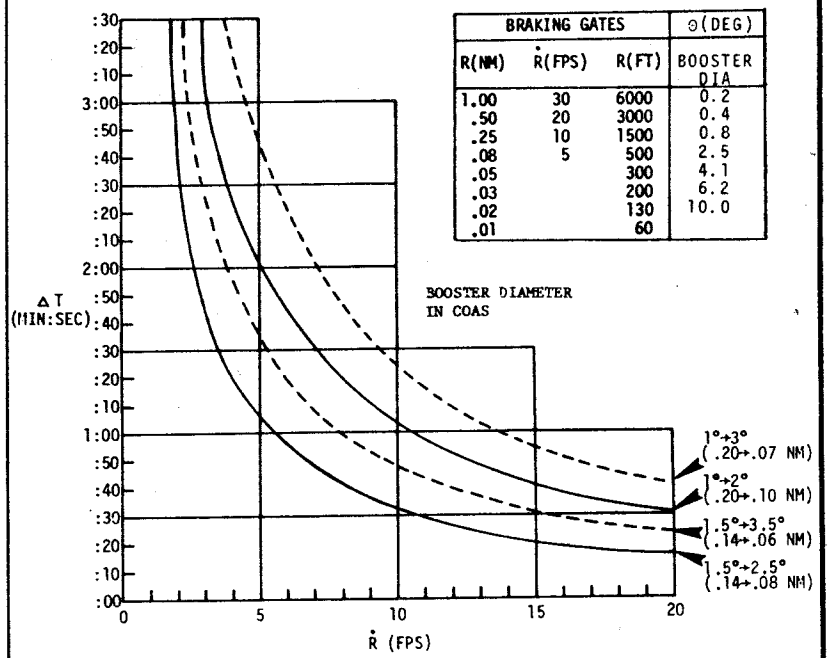
SUNSET AT 7+42

TPM ONBOARD DATA

		TPM1						TPM2					
N59	ΔV_F		0	0					0	0			
$\Delta V_{(LOS)}$	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	



BRAKING GATES			θ(DEG)
R(NM)	Ṙ(FPS)	R(FT)	BOOSTER DIA
1.00	30	6000	0.2
.50	20	3000	0.4
.25	10	1500	0.8
.08	5	500	2.5
.05		300	4.1
.03		200	6.2
.02		130	10.0
.01		60	

DOCKING ATTITUDE

UPDATE

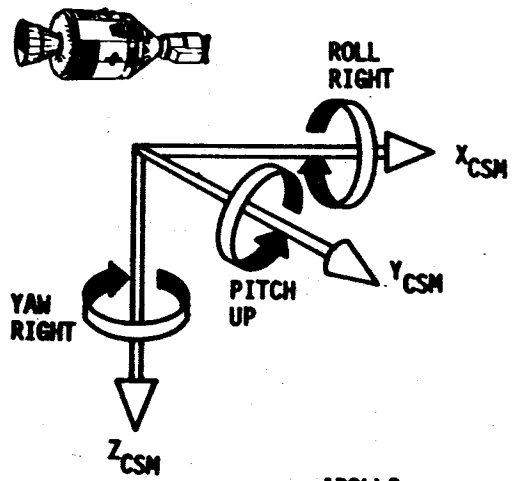
N22	R	+				0	0
	P	+				0	0
	Y	+				0	0

GENERAL COMMUNICATIONS
ОБЩАЯ СВЯЗЬ

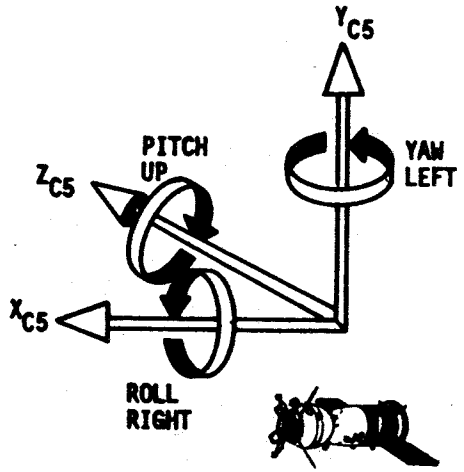
1. SAY AGAIN SLOWLY	ПОВТОРИТЕ МЕДЛЕННО
2. WE WILL COMPLY	БУДЕТ СДЕЛАНО
3. GO BACK TO STEP NO. _____	ВОЗВРАЩАЙТЕСЬ К ПУНКТУ № _____
4. PITCH UP (DOWN)	ТАНГАЖ ВВЕРХ / ВНИЗ /
5. ROLL LEFT (RIGHT)	КРЕН ВЛЕВО/ ВПРАВО /
6. YAW LEFT (RIGHT)	РЫСКАНЬЕ ВЛЕВО/ВПРАВО/
7. BACK AWAY	ОТОЙДИТЕ НАЗАД
8. STAND BY	БУДЬТЕ НА ПРИЕМЕ
9. CONTINUING NORMAL OPERATIONS	ПРОДОЛЖАЕМ ШТАТНЫЕ ОПЕРАЦИИ
10. MCC WILL REPORT ABOUT THE PROBLEM	ЦУП СООБЩИТ 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	МАРШЕВОЙ 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

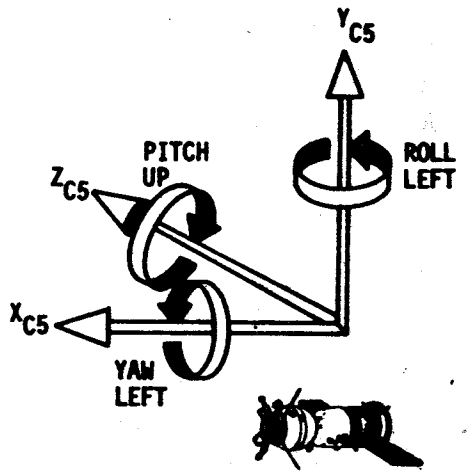
19. CANNOT (RECEIVE, TRANSMIT) ON VHF (AM, FM)	НЕ МОГУ /ПРИНИМАТЬ/ПЕРЕДАВАТЬ/ ПО УКВ /АМ, ЧМ/
20. VHF (AM, FM) COMMUNICATIONS ARE (WEAK, INTERMITTENT)	СВЯЗЬ ПО УКВ /АМ, ЧМ/, /СЛАБАЯ, ПРЕРЫВАЕТСЯ/.
21. GO OVER TO VHF (AM, FM) FOR COMMUNICATIONS	ПЕРЕЙДИТЕ НА УКВ /АМ, ЧМ/ ДЛЯ СВЯЗИ
22. WILL TRY (VHF AM, 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	МСС 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	МОЖЕТ ЛИ "СОЮЗ" ПОДДЕРЖИВАТЬ
(ORIENTATION FOR DOCKING INERTIAL ORIENTATION ORBITAL ORIENTATION)?	/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)

DESIRED SOYUZ ATTITUDE MNVR	SOYUZ ATTITUDE MNVR INSTRUCTION		SOYUZ AXES
	APPROACH MODE	ORIENTATION MODE	
ROLL RIGHT (LEFT)	ROLL RIGHT	YAW LEFT	X_{C5}
PITCH UP (DN)	PITCH UP	PITCH UP	Z_{C5}
YAW RIGHT (LEFT)	YAW RIGHT	ROLL RIGHT	Y_{C5}

SOYUZ ATTITUDE MNVR INSTRUCTIONS (DOCKED)

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

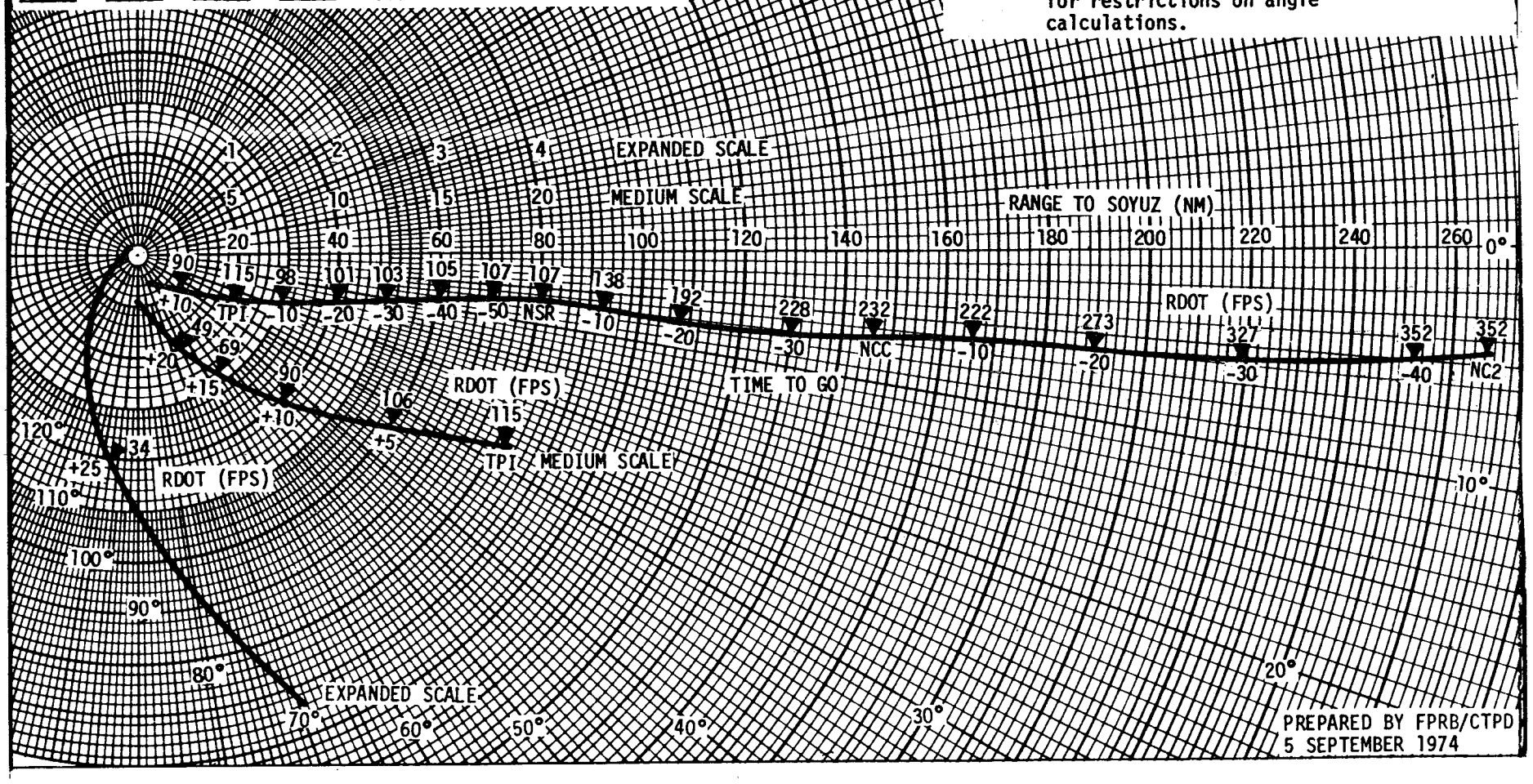
POLAR PLOT

T	R	RDOT	Ø/θ	T	R	RDOT	Ø/θ

FOR SXT TRACKING, RECORD Ø : 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.



NASA-JSC

POLAR PLOT

T	R	RDOT	Ø/Θ	T	R	RDOT	Ø/Θ

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

FOR COAS TRACKING, RECORD θ: FDAI ORDEAL PITCH
V83/N54
P37/N54
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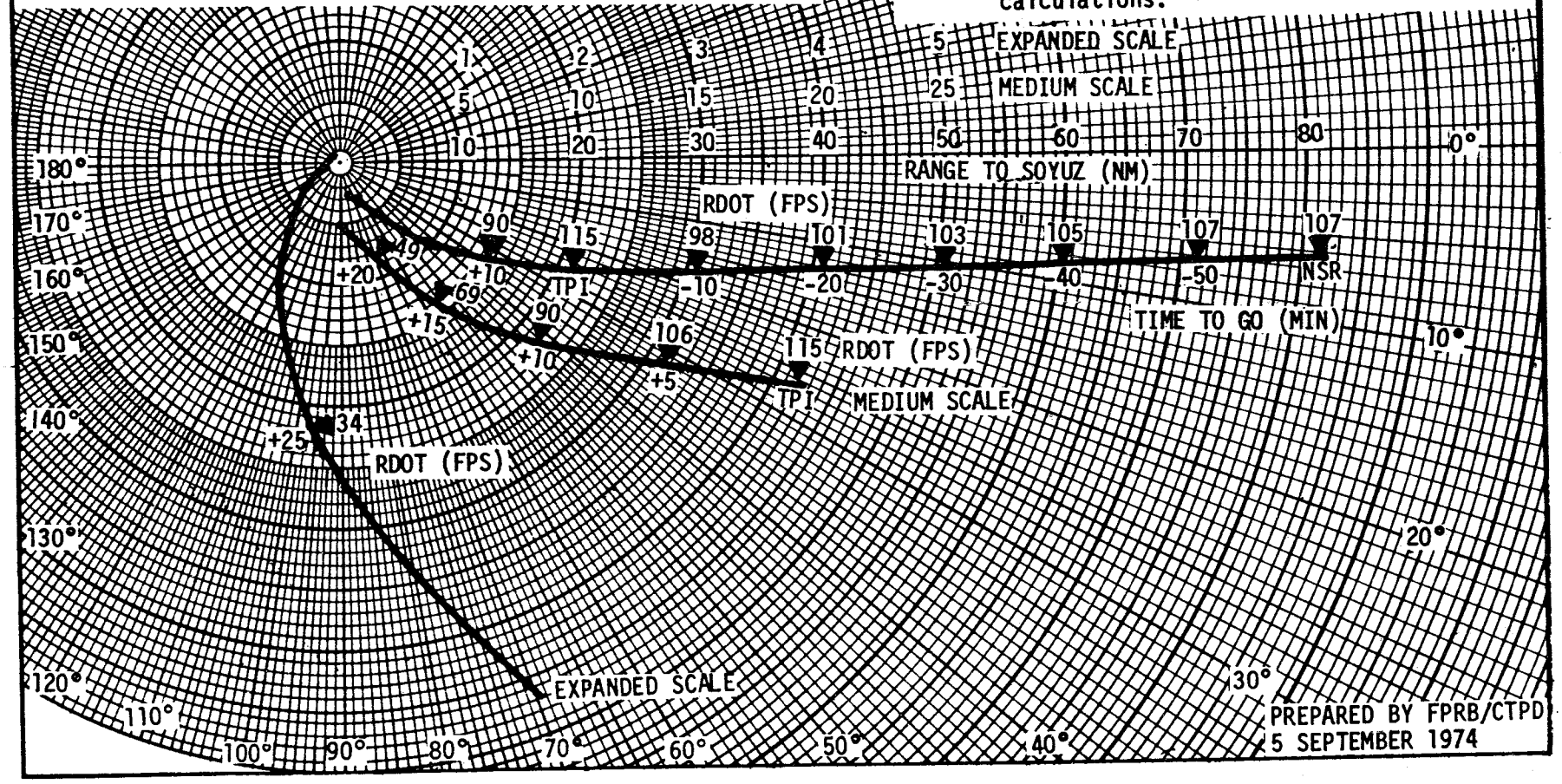
*NOTE: If data selected while running V76 in the optimizing mode, reference G&C C/L (G/4-7) for restrictions on angle calculations.



PREPARED BY FPRB/CTPD
5 SEPTEMBER 1974