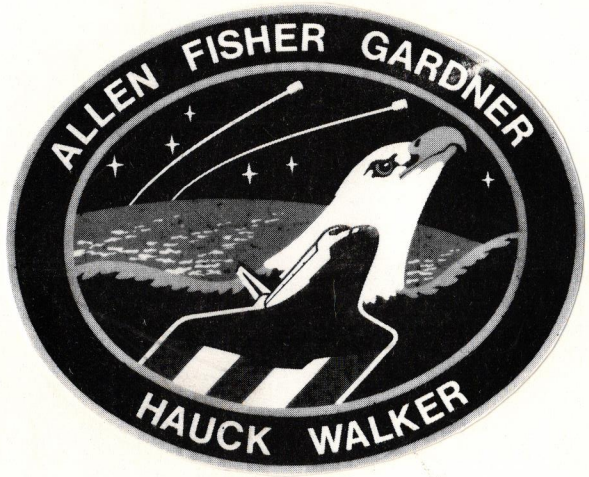


JUN 10 1985

MICROFILMED

RENDEZVOUS

STS 51-A

CONTENTS PAGE

FLIGHT PROFILE 1-1

DETAILED TIMELINE 2-1

RENDEZVOUS 1 2-3
RENDEZVOUS 2 2-35

CONTINGENCY OPERATIONS 3-1

RADAR FAIL 3-3
MMU RESCUE 3-5
LOSS OF VRCS 3-9

REFERENCE DATA 4-1

FLIGHT RULES 4-3
DAPS 4-7
RELATIVE MOTION PLOTS 4-9

RANGING CHARTS 5-1

CUE CARDS 6-1

~~NOTES ..... 7-1~~

~~CUE CARD CONFIGURATION ..... CC 8-1~~

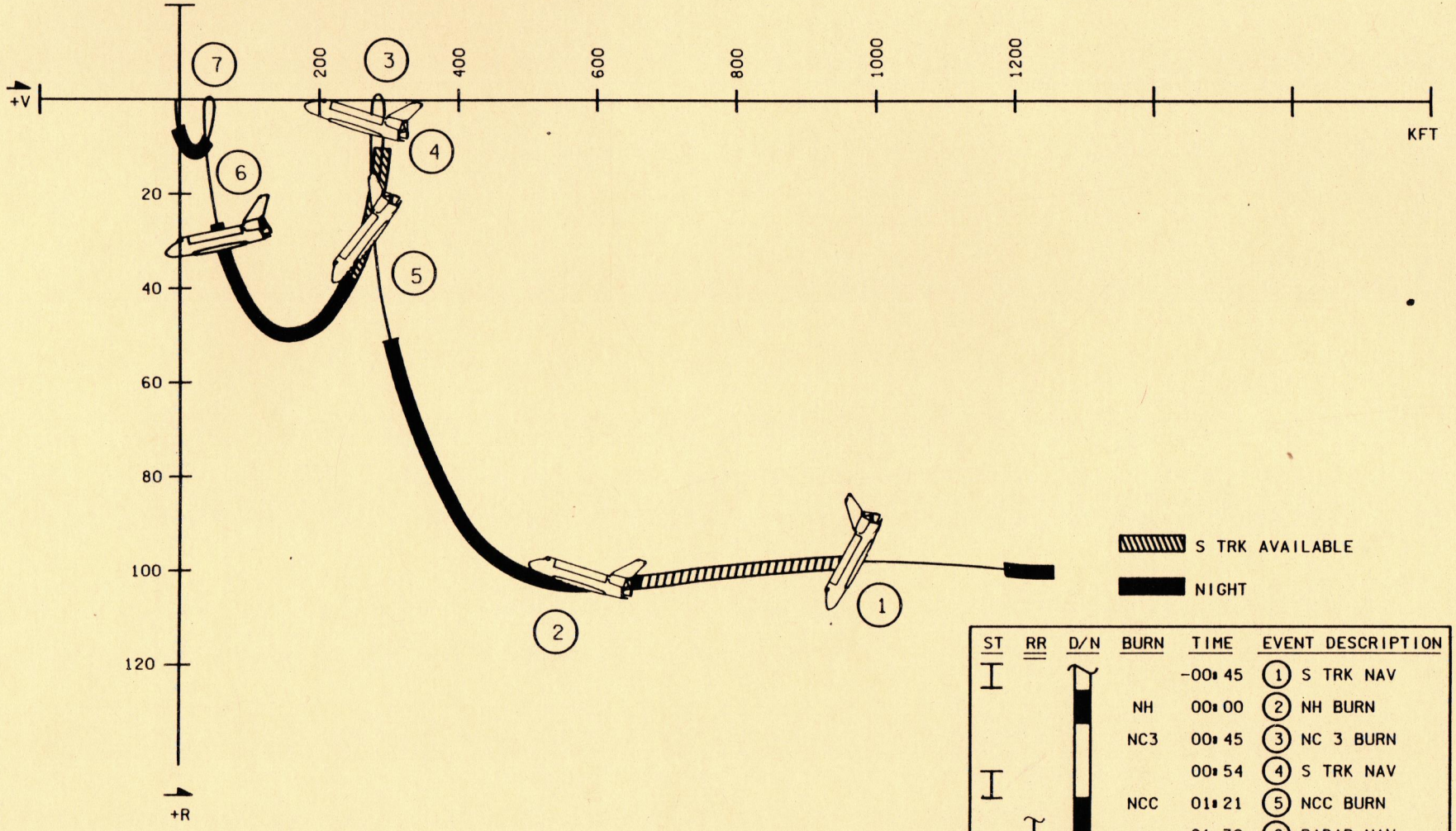
This Page Intentionally Blank

FLIGHT PROFILE

RENDEZVOUS PROFILE

RENDEZVOUS 1 CYCLE 5 TRAJECTORY DATA

(TARGET AT CENTER OF ROTATING LVLH REFERENCE FRAME)

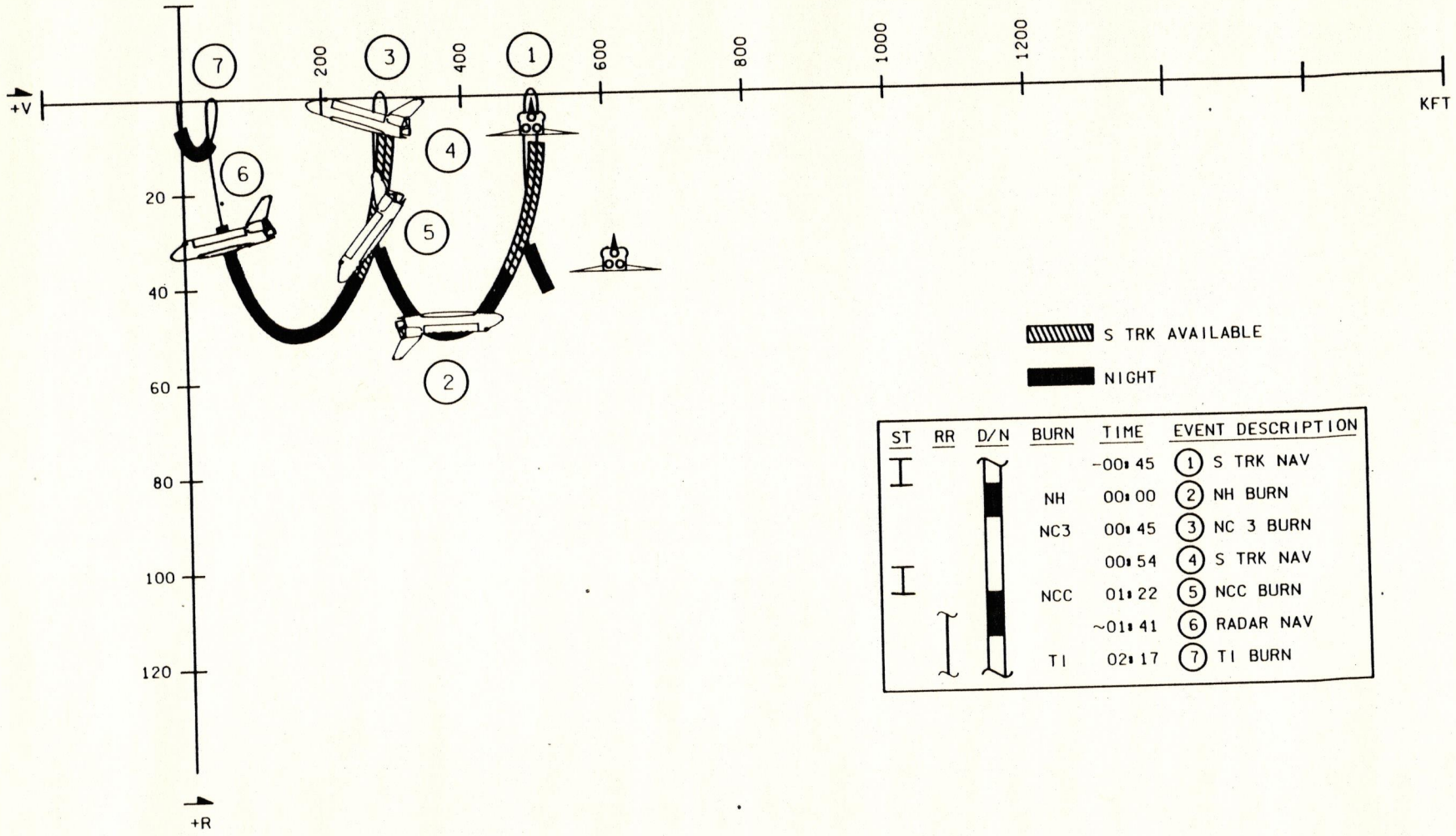


ST	RR	D/N	BURN	TIME	EVENT DESCRIPTION
I				-00:45	(1) S TRK NAV
			NH	00:00	(2) NH BURN
			NC3	00:45	(3) NC 3 BURN
I				00:54	(4) S TRK NAV
			NCC	01:21	(5) NCC BURN
	I			~01:39	(6) RADAR NAV
			TI	02:17	(7) TI BURN

RENDEZVOUS PROFILE

RENDEZVOUS 2 CYCLE 5 TRAJECTORY DATA

(TARGET AT CENTER OF ROTATING LVLH REFERENCE FRAME)

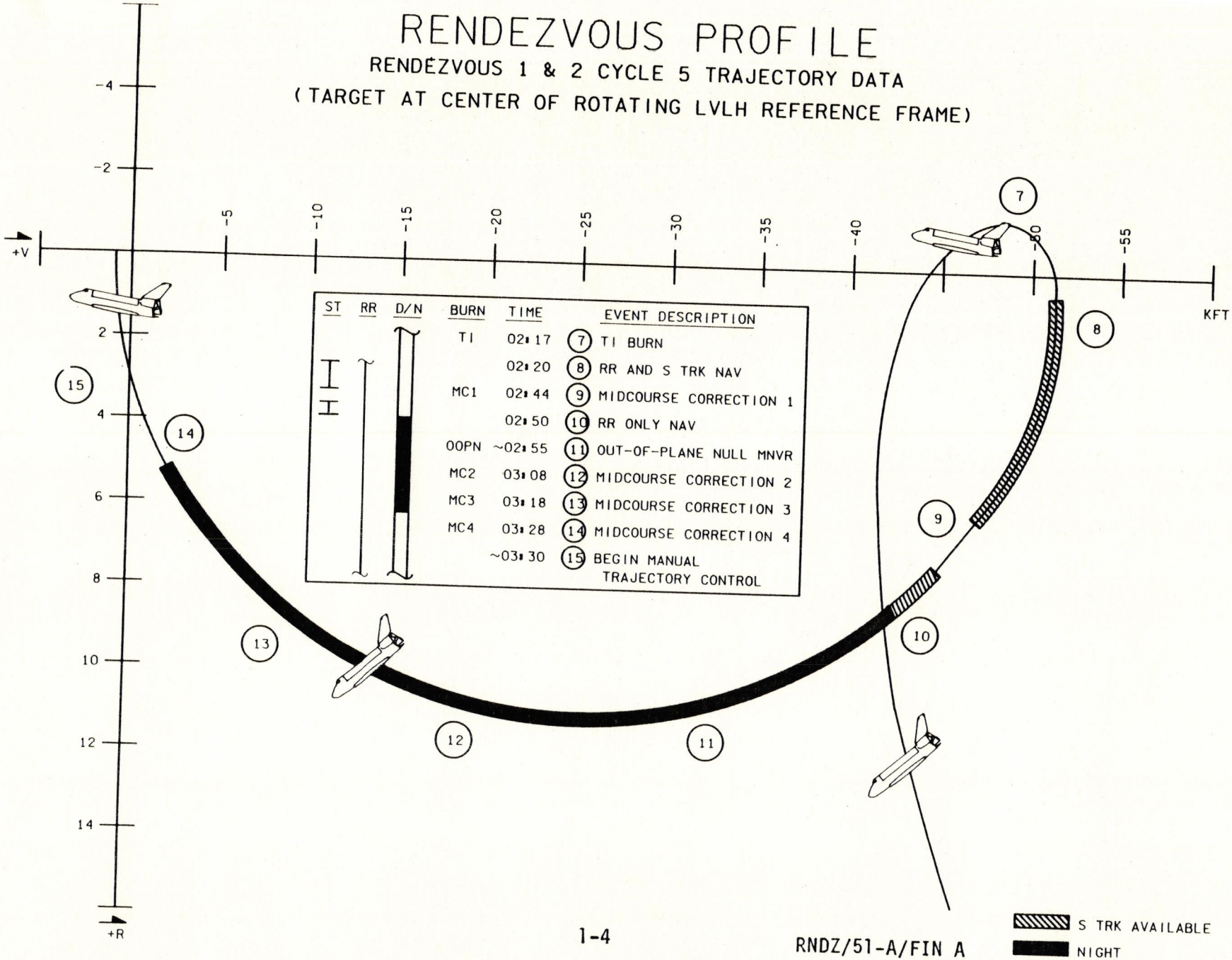


ST	RR	D/N	BURN	TIME	EVENT DESCRIPTION
I				-00: 45	(1) S TRK NAV
			NH	00: 00	(2) NH BURN
			NC3	00: 45	(3) NC 3 BURN
				00: 54	(4) S TRK NAV
I			NCC	01: 22	(5) NCC BURN
	I			~01: 41	(6) RADAR NAV
			TI	02: 17	(7) TI BURN

RENDEZVOUS PROFILE

RENDEZVOUS 1 & 2 CYCLE 5 TRAJECTORY DATA

(TARGET AT CENTER OF ROTATING LVLH REFERENCE FRAME)

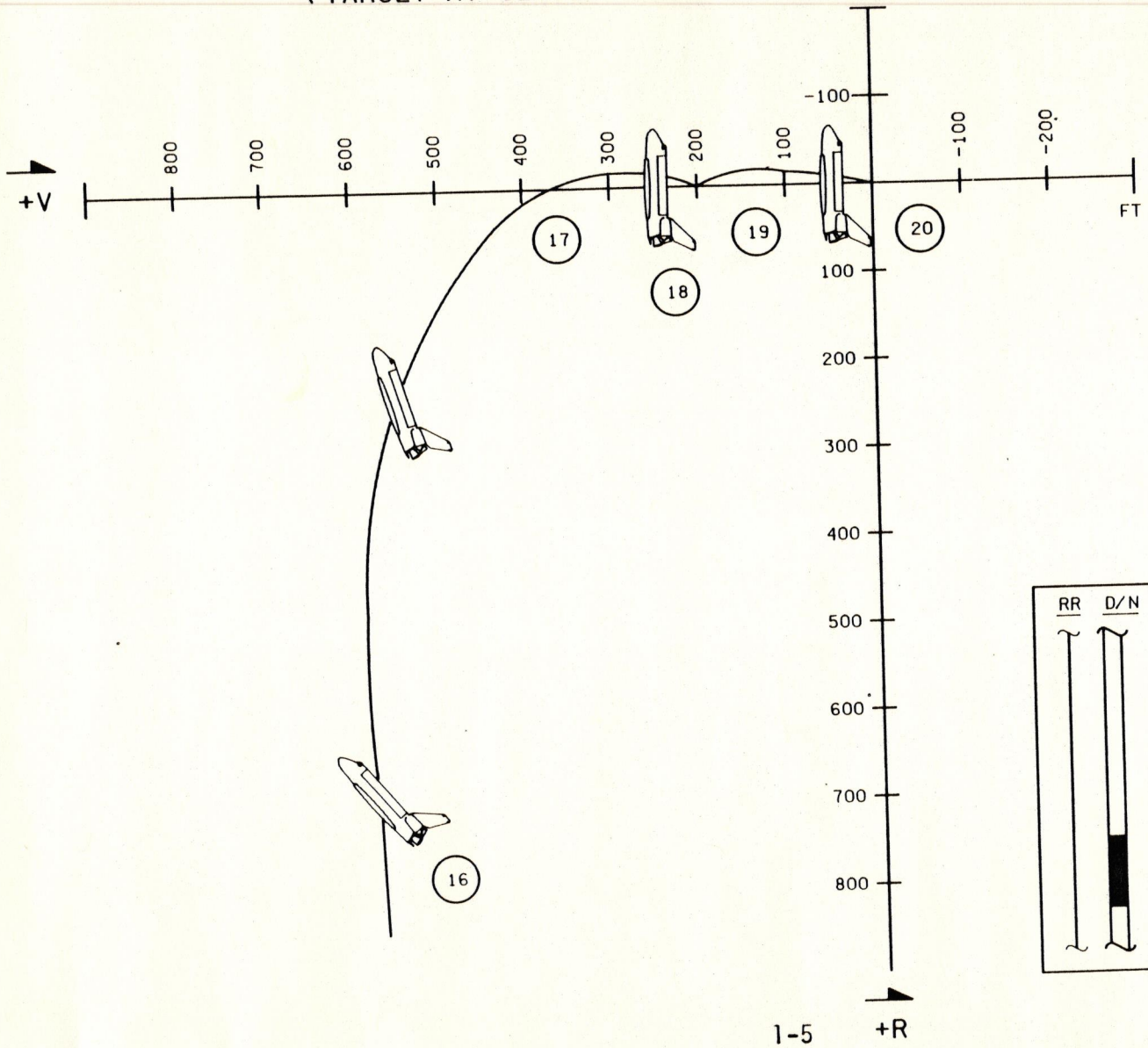


RNDZ/51-A/FIN A

RENDEZVOUS PROFILE

RENDEZVOUS 1 & 2 CYCLE 5 TRAJECTORY DATA

(TARGET AT CENTER OF ROTATING LVLH REFERENCE FRAME)



S TRK AVAILABLE

NIGHT

RR	D/N	TIME	EVENT DESCRIPTION
			(16) CONTINUATION OF MANUAL TRAJECTORY CONTROL
		~3:50	(17) ESTABLISH VBAR
		~4:00	(18) 200 FT LOW Z CLOSING RATE ADJUST
		~4:10	(19) ESTABLISH 35 FT STATIONKEEPING
		~5:15	(20) GRAPPLE OF HS376/MMU

RNDZ/51-A/FIN A

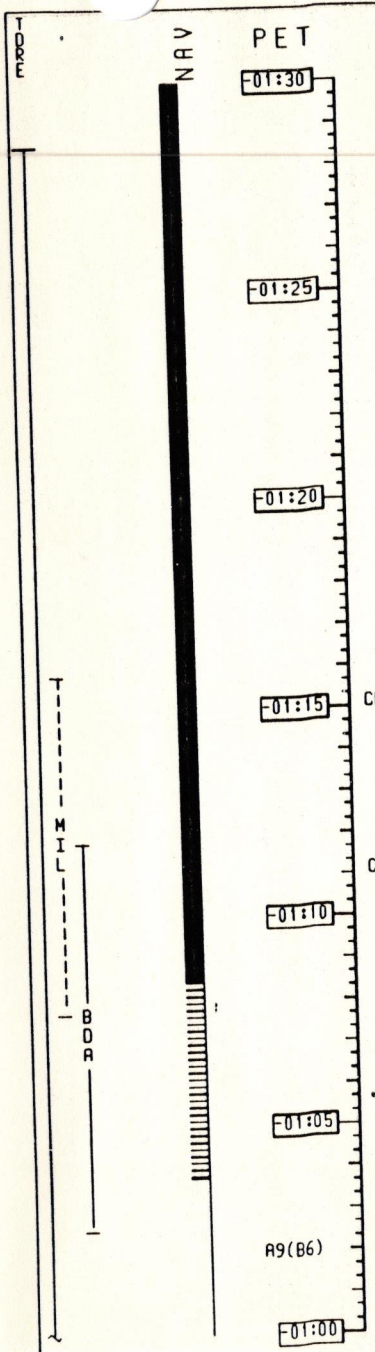
This Page Intentionally Blank

DETAILED TIMELINE

This Page Intentionally Blank

RENDEZVOUS 1

This Page Intentionally Blank



-01:15 COR Set SM TIMER counting to NH TIG

COR ENABLE RENDEZVOUS NAV [1]

M52 Config DAP A,B to A9, B6

ENABLE RENDEZVOUS NAV [1]

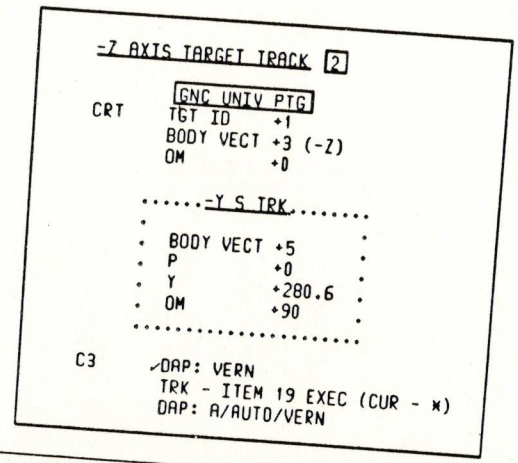
GNC 33 REL NAV

CRT
RNDZ NAV ENA - ITEM 1 EXEC (*)
✓SV SEL, ITEM 4 - PROP
✓INH RNG, ITEM 18 - (*)
RDOT, ITEM 21 - (*)
Angles, ITEM 24 - (*)
✓S TRK, ITEM 12 - (*)

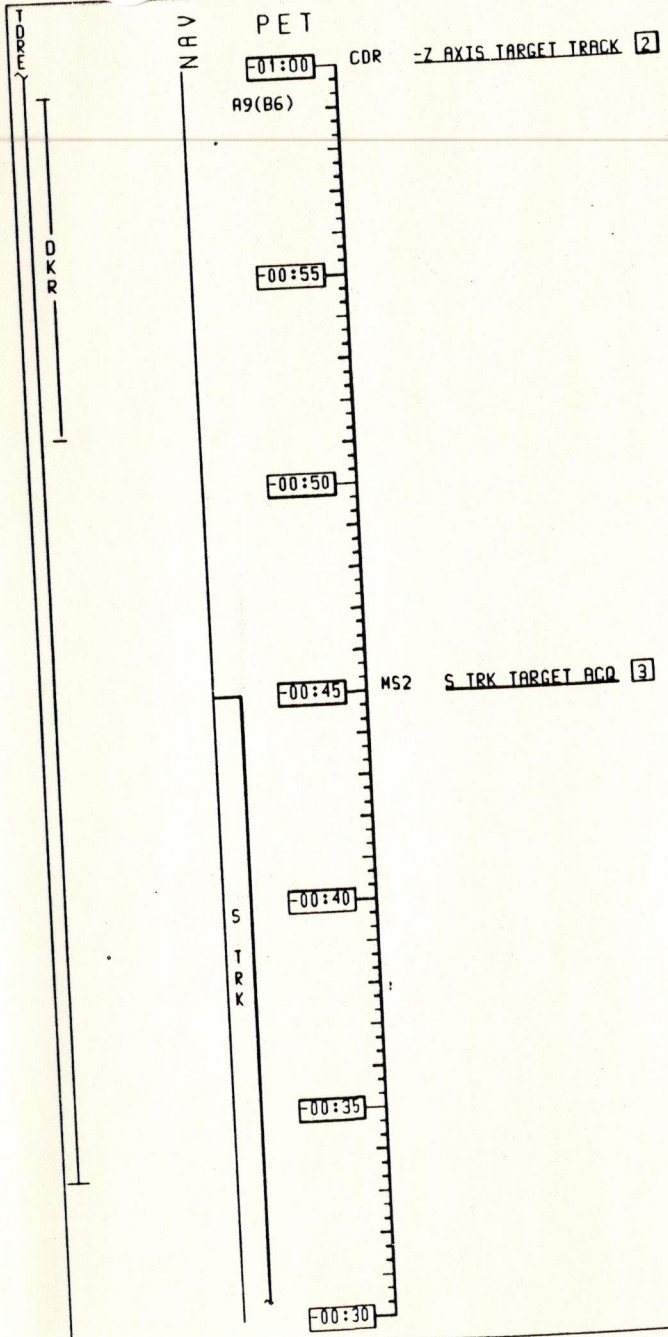
GNC 34 ORBIT TGT

TGT NO - ITEM 1 +1 EXEC
BASE TIME = (TI TIG, TI BURN PAD, 2-18)
LOAD - ITEM 26 EXEC

RNDZ/51-A/FIN A



RNDZ/51-A/FIN A



S TRK TARGET ACQ 3

GNC 21 IMU ALIGN

CRT IMU DES - ITEM 7 (8,9) EXEC (✱)
(NH BURN PAD, 2-8)

GNC 22 S TRK/COAS CNTL

CRT -Z(-Y) TGT TRK - ITEM 6(5) EXEC (✱)
✓STATUS - blank
✓SHUTTER - OP
✓S PRES - ✱

If SHUTTER - CL,
MAN OP - ITEM 16(15) EXEC (✱)

GNC 33 REL NAV
✓INH Angles, ITEM 24 - (✱)
✓S TRK, ITEM 12 - (✱)
✓SV SEL, ITEM 4 - PROP

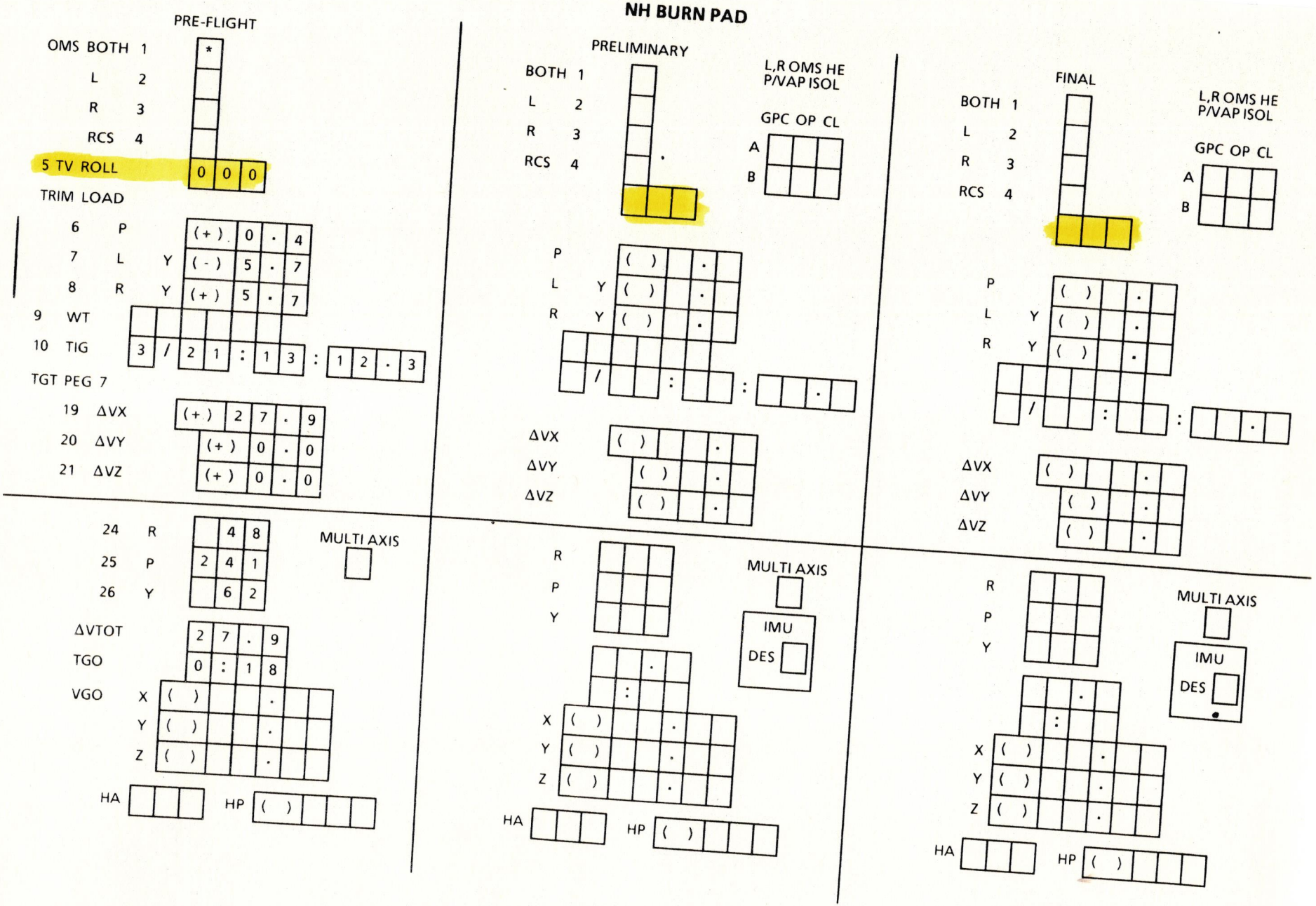
Monitor RESID V and H each NAV cycle

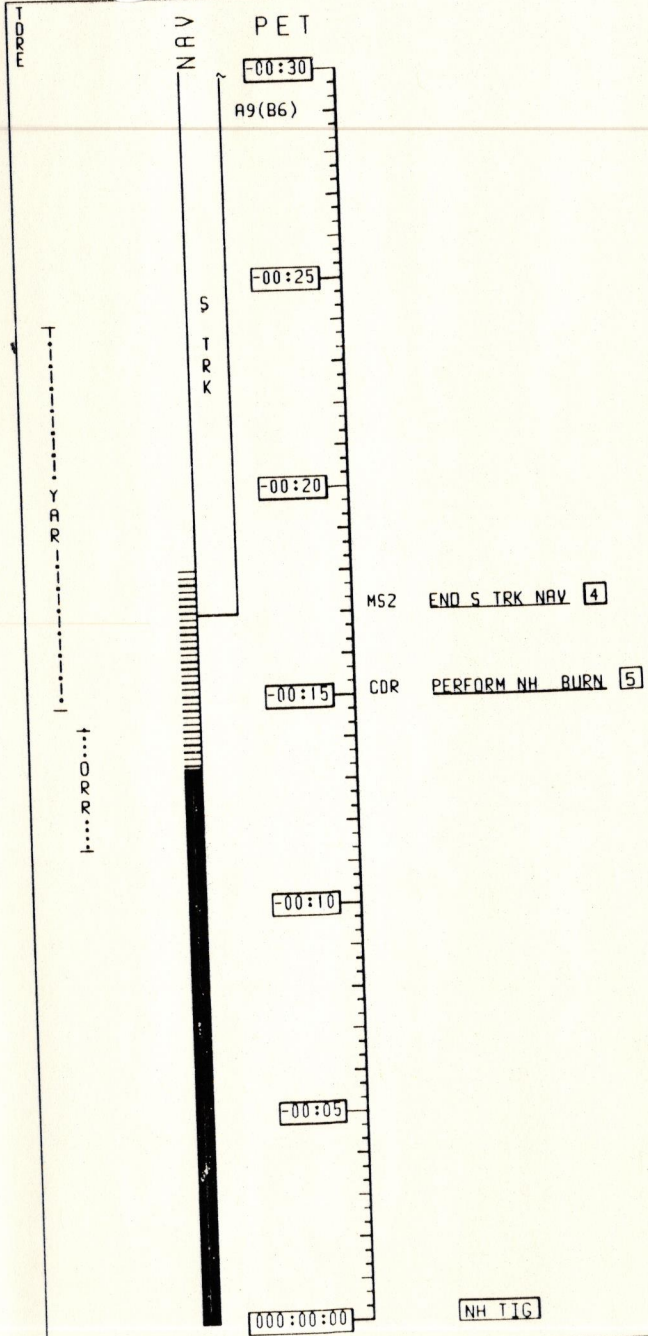
If RESID V and H change < .05 for
four consecutive NAV cycles,
If RATIO < 1.0,
AUTO Angles - ITEM 23 EXEC (✱)
If RATIO > 1.0,
FOR 3 Angle Marks
If RESID V or H changes by > .05,
GNC 22 S TRK/COAS CNTL
-Z(-Y) BREAK TRK - ITEM 8(7) EXEC

When SV UPDATE POS < 1.0
and MARK ACPT Angles > 9,
SV SEL - ITEM 4 EXEC (FLTR)

NOTE
If FLTR minus PROP changes by more than
40 K ft within a S TRK pass, then
SV SEL - ITEM 4 EXEC (PROP)
INHIBIT Angles - ITEM 24 EXEC (✱)
PROP to FLTR transfer - ITEM 9 EXEC
GNC 22 S TRK/COAS CNTL
-Z(-Y) BREAK TRK - ITEM 8(7) EXEC
Repeat S TRK ACQ

NH BURN PAD


PRE-FLIGHT
OMS BOTH 1
L 2
R 3
RCS 4
5 TV ROLL
0 0 0
TRIM LOAD
6 P
7 L Y
8 R Y
9 WT
10 TIG
3 / 2 1 : 1 3 : 1 2 . 3
TGT PEG 7
19 ΔVX
20 ΔVY
21 ΔVZ
24 R
25 P
26 Y
MULTI AXIS
ΔVTOT
2 7 . 9
TGO
0 : 1 8
VGO X Y Z
HA
HP
PRELIMINARY
BOTH 1
L 2
R 3
RCS 4
L,R OMS HE P/VAP ISOL
GPC OP CL
A
B
P
L Y
R Y
ΔVX
ΔVY
ΔVZ
IMU
DES
FINAL
BOTH 1
L 2
R 3
RCS 4
L,R OMS HE P/VAP ISOL
GPC OP CL
A
B
P
L Y
R Y
ΔVX
ΔVY
ΔVZ
MULTI AXIS
IMU
DES



END S TRK NAV [4]

GNC 33 REL NAV

CRT INH Angles - ITEM 24 EXEC (*)

GNC 22 S TRK/COAS CNTL

✓SHUTTER MAN OP, ITEM 15,16 - (no *)

GNC 21 IMU ALIGN

CRT IMU DES - ITEM 7 (8,9) EXEC (no *)

PERFORM NH BURN [5]

Install OMS 2/ORBIT OMS BURNS
Cue Cards (two) and OMS BURN MONITOR
Cue Cards (two) (F7,F8)

CRT OPS 202 PRO
GNC ORBIT MNVR EXEC
GNC SYS SUMM 2

Load TGT data per burn pad
LOAD - ITEM 22 EXEC
TIMER - ITEM 23 EXEC
✓Burn data per burn pad
✓At least one ADI in LVLH

C3 DAP: B/AUTO/NORM
DAP TRANS: as reqd
ROT: DISC/DISC/DISC

CRT MNVR - ITEM 27 EXEC (*)
When mnvr to att complete,
DAP: A/AUTO/VERN

08 ✓L,R OMS TK ISOL (four) - OP (tb-OP)
✓XFEED (four) - CL (tb-CL)
F7/F8 FLT CNTLR PWR (two) - ON

TIG -2:00 ..
Perform OMS 2/ORBIT OMS BURNS
Cue Card, then ..

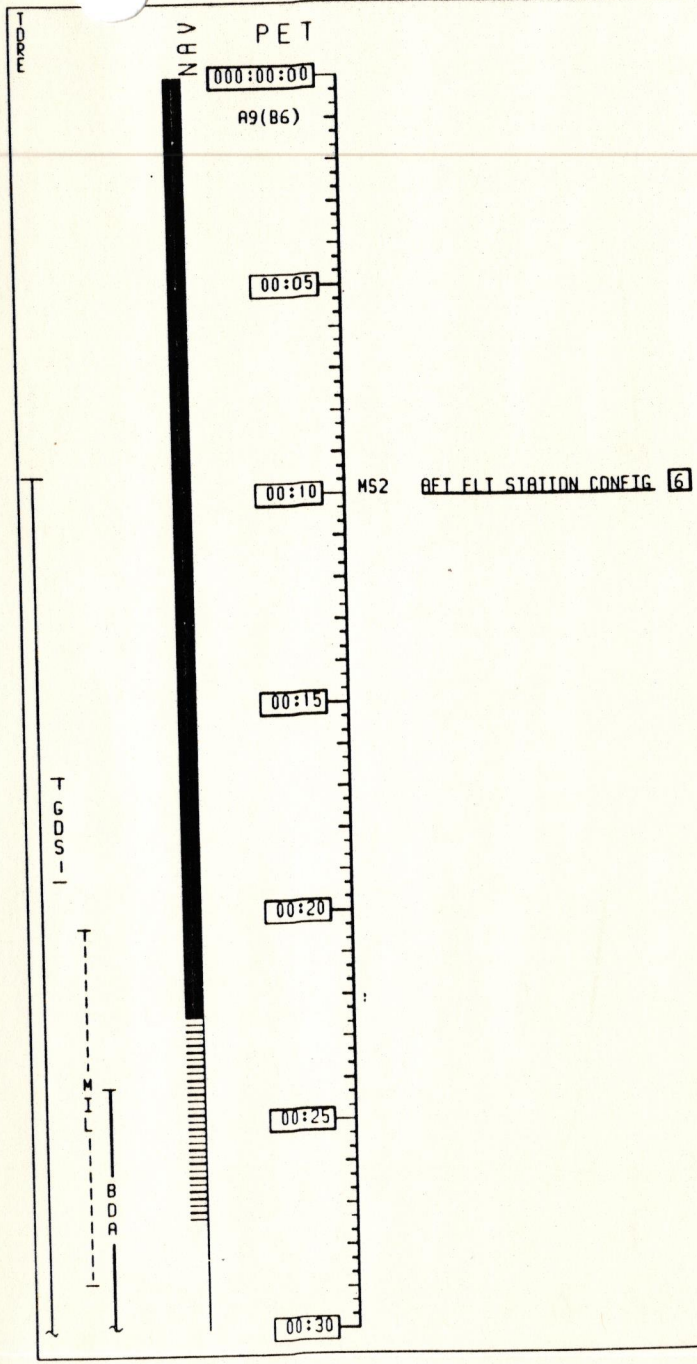
THC - Trim residuals < .2 fps
F7/F8 FLT CNTLR PWR (two) - OFF
08 L,R OMS He PRESS/VAP ISOL (four) - CL

CRT Perform OMS TVC GMBL CK as reqd

* If down arrow(s) or M(s), *
* select good GMBL *

C3 DAP: A/LVLH/VERN
CRT OPS 201 PRO

THIS PAGE INTENTIONALLY BLANK



AFT FLT STATION CONFIG 6

A6U ADI ATT - LVLH
ERR - MED
RATE - LO
SENSE - -Z

R13 ✓KU ANT - GND
A1U ✓PWR - ON
A2 ✓DIGI-DIS SEL - EL/AZ
A1U KU MODE - RDR PASSIVE
RADAR OUTPUT - HI
- MAN SLEW
CNTL - PNL
SIG STRENGTH sel - KU
SLEW RATE - as reqd
Slew Antenna to Elev 0, Az 0, then:
A2 DIGI-DIS SEL - R/RDOT
X-PNTR SCALE - X1

CRT SM ANTENNA
SELF TEST - ITEM 7 EXEC (*)

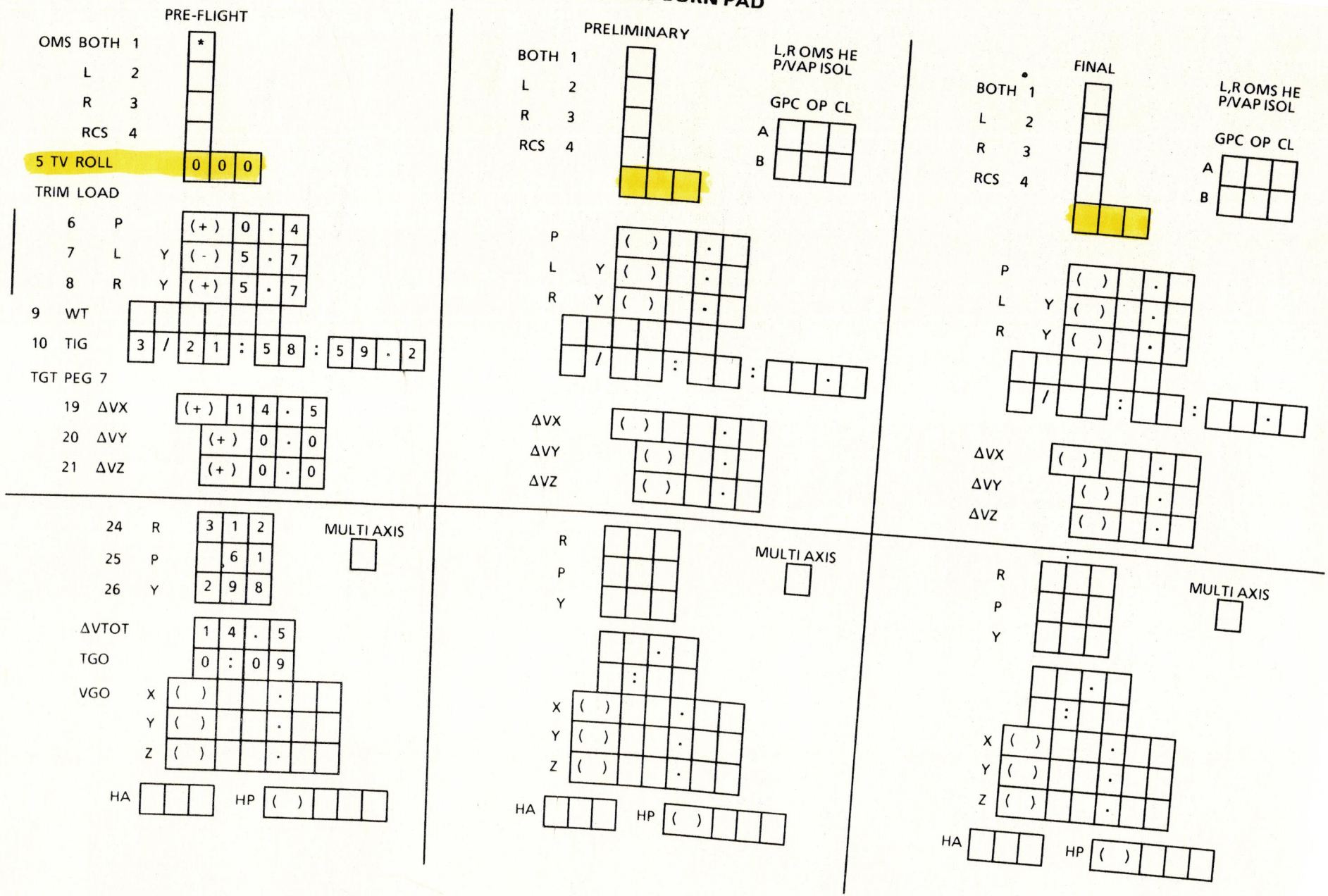
NOTE
SELF TEST runs about 3 min

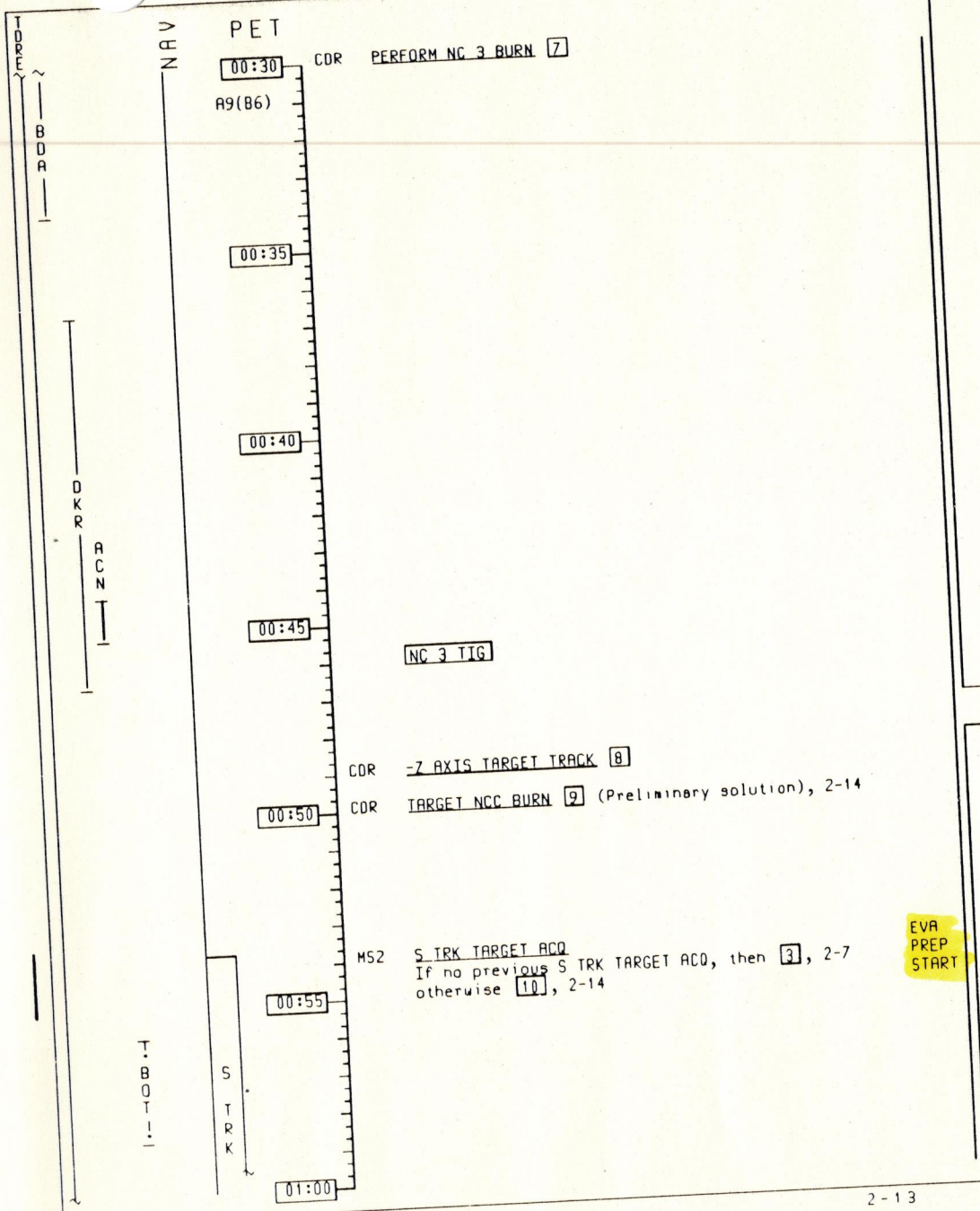
A1U ✓KU SCAN WARN tb - gray
✓TRACK tb - gray
✓SEARCH tb - gray
A2 ✓RANGE - 888.8
CRT SELF TEST - ITEM 7 EXEC (no *)
A2 DIGI-DIS SEL - EL/AZ

A1U KU MODE - COMM
KU - GPC
KU CNTL - CMD

Install -Z CORS
Install RNDZ OPS Cue Card (two)

NC3 BURN PAD


PRE-FLIGHT
OMS BOTH 1
L 2
R 3
RCS 4
5 TV ROLL
TRIM LOAD
6 P
7 L Y
8 R Y
9 WT
10 TIG
TGT PEG 7
19 ΔVX
20 ΔVY
21 ΔVZ
PRELIMINARY
BOTH 1
L 2
R 3
RCS 4
L,R OMS HE P/VAP ISOL
GPC OP CL
A
B
P
L Y
R Y
ΔVX
ΔVY
ΔVZ
FINAL
BOTH 1
L 2
R 3
RCS 4
L,R OMS HE P/VAP ISOL
GPC OP CL
A
B
P
L Y
R Y
ΔVX
ΔVY
ΔVZ
24 R
25 P
26 Y
MULTI AXIS
ΔVTOT
TGO
VGO X
Y
Z
HA
HP
R
P
Y
MULTI AXIS
X
Y
Z
HA
HP
R
P
Y
MULTI AXIS
X
Y
Z
HA
HP



PERFORM NC 3 BURN 7

CRT OPS 202 PRO
GNC ORBIT MNVR EXEC
GNC SYS SUMM 2

Load TGT data per burn pad
LOAD - ITEM 22 EXEC
TIMER - ITEM 23 EXEC
✓Burn data per burn pad
C3 DAP TRANS: as reqd
ROT: DISC/DISC/DISC
CRT MNVR - ITEM 27 EXEC (*)
DAP: A/AUTO/VERN

08 ✓L,R OMS TK ISOL (four) - OP (tb-OP)
✓XFEED (four) - CL (tb-CL)
F7/F8 FLT CNTLR PWR (two) - ON

TIG -2:00 ..
Perform OMS 2/ORBIT OMS BURNS
Cue Card, then ..

THC - Trim residuals < .2 fps
F7/F8 FLT CNTLR PWR (two) - OFF
08 L,R OMS He PRESS/VAP ISOL (four) - CL
CRT RCS SEL - ITEM 4 EXEC (*)

CRT Perform OMS TVC GMBL CK as reqd

* If down arrow(s) or M(s), *
* select good GMBL *

C3 DAP: B/AUTO/NORM
CRT OPS 201 PRO

-Z AXIS TARGET TRACK 8

GNC UNIV PTG

CRT ✓TGT ID +1
✓BODY VECT +3 (-Z)
✓OM +0

.....-Y S TRK.....
. .
. ✓BODY VECT +5 .
. ✓P +0 .
. ✓Y +280.6 .
. ✓OM +90 .
.....

✓TRK - ITEM 19 EXEC (CUR - *)
C3 ✓DAP: B/AUTO/NORM
When mnvr to att complete,
DAP: A/AUTO/VERN

EVA PREP START

RNDZ/51-A/FIN A

TARGET NCC BURN [9]

CRT ✓SV SEL correct
[GNC 34 ORBIT TGT]
TGT NO - ITEM 1 + 9 EXEC
✓TGT Set data:
T1 TIG = (BASE TIME -0/0:57:06)
EL + 0
ΔT + 57.1
ΔX - 48.60
ΔY + 0
ΔZ - 1.20
COMPUTE T1 - ITEM 27 EXEC

Note solution

.....Final solution.....
If FLTR converged (> 40 marks in current sensor pass & SV UPDATE POS < .5), Burn FLTR soln

If FLTR within ground solution limits, Burn FLTR soln

If PROP within ground solution limits, Burn PROP soln

If none of the above, Burn ground soln EXT ΔVs

NCC BURN SOLUTION

TIG | 0 | 0 | 3 | / | 2 | 2 | : | 3 | 3 | : | 2 | 8 |

PRELIMINARY

ΔVX	( )			.	
ΔVY	( )			.	
ΔVZ	( )			.	
ΔVT				.	

INTERMEDIATE

	( )			.	
	( )			.	
	( )			.	
				.	

FINAL

ΔVX	( )			.	
ΔVY	( )			.	
ΔVZ	( )			.	
ΔVT				.	

GROUND

	( )			.	
	( )			.	
	( )			.	
				.	

FINAL-GROUND LIMITS
(2 . 1)
(6 . 0)
(9 . 2)

S TRK TARGET ACQ [10]

[GNC 21 IMU ALIGN]
CRT IMU DES - ITEM 7 (8,9) EXEC (*)
(NH BURN Pad, 2-8)

[GNC 22 S TRK/COAS CNTL]
CRT -Z(-Y) TGT TRK, ITEM 6(5) - (*)
✓STATUS - blank
✓SHUTTER - OP
✓S PRES - *

If SHUTTER - CL,
MAN OP - ITEM 16(15) EXEC (*)

[GNC 33 REL NAV]
✓INH Angles, ITEM 24 - (*)
✓S TRK, ITEM 12 - (*)

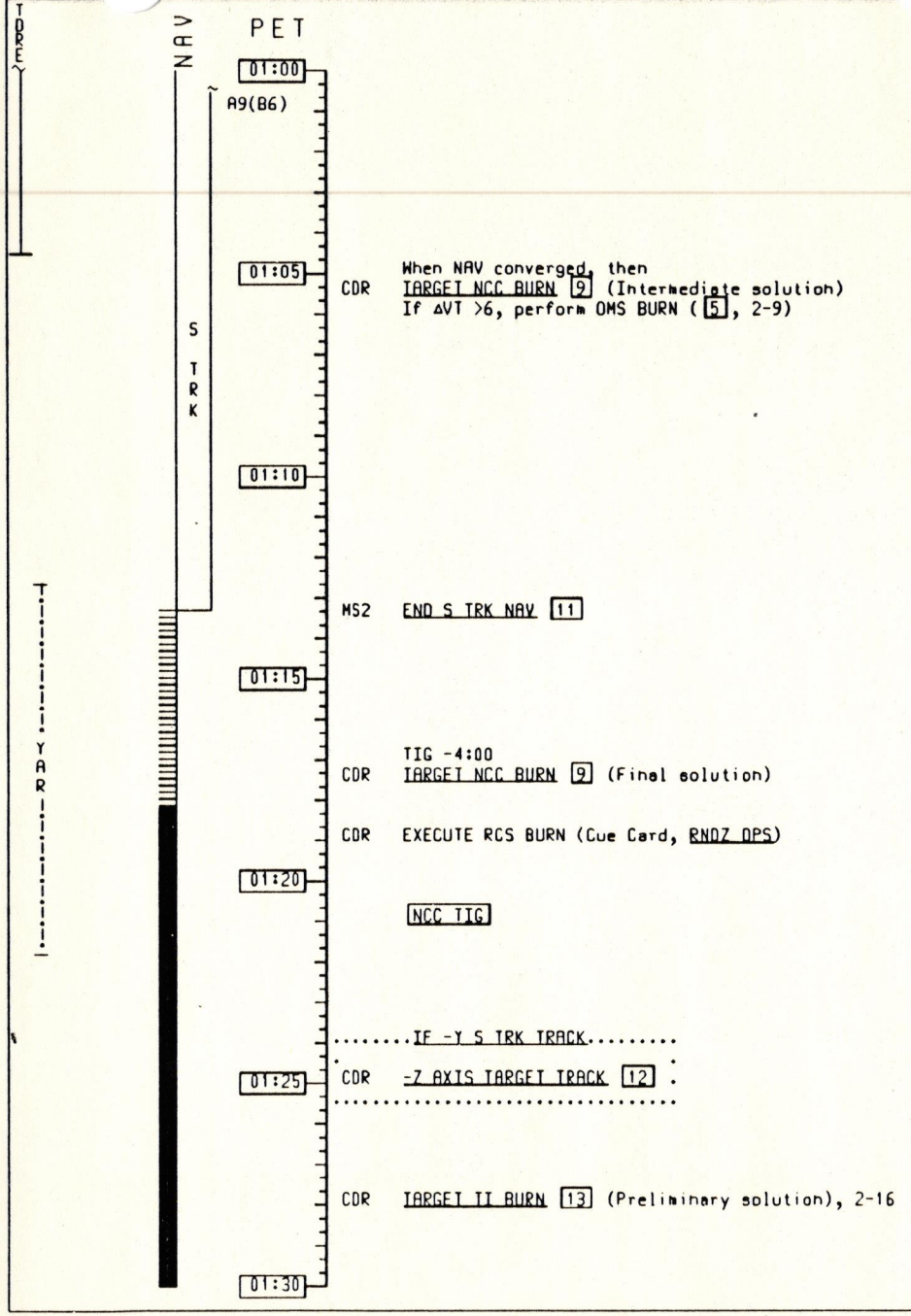
Monitor RESID V and H each NAV cycle

If V and H RESID change < .05 for four consecutive NAV cycles,
If RATIO < 1.0,
FLTR TO PROP - ITEM 8 EXEC
AUTO Angles - ITEM 23 EXEC (*)

If RATIO > 1.0,
1) COVAR REINIT - ITEM 16 EXEC
2) FOR 3 Angle Marks
3) PROP TO FLTR - ITEM 9 EXEC

If V and H RESID change > .05,
[GNC 22 S TRK/COAS CNTL]
-Z(-Y) BREAK TRK - ITEM 8(7) EXEC

NOTE
If FLTR minus PROP changes by more than 40 K ft within a S TRK pass, then
SV SEL - ITEM 4 EXEC (PROP)
INHIBIT Angles - ITEM 24 EXEC (*)
PROP to FLTR transfer - ITEM 9 EXEC
[GNC 22 S TRK/COAS CNTL]
-Z(-Y) BREAK TRK - ITEM 8(7) EXEC
Repeat S TRK ACQ



END S TRK NAV 11

GNC 33 REL NAV

CRT INH Angles - ITEM 24 EXEC (*)

GNC 22 S TRK/COAS CNTL

✓SHUTTER MAN OP, ITEM 15,16 - (no *)

GNC 21 IMU ALIGN

CRT IMU DES - ITEM 7 (8,9) EXEC (No *)

-Z AXIS IARGET TRACK 12

GNC UNIV PTG

CRT ✓TGT ID +1
BODY VECT +3 (-Z)
OM +0
TRK - ITEM 19 EXEC (CUR - *)

C3 ✓DAP: A/AUTO/VERN

LOAD DELAY BURN [17]

GNC 33 REL NAV

CRT INHIBIT RR ANGLES - ITEM 24 EXEC (*)

OPS 202 PRO

GNC ORBIT MNVR EXEC

Load Eng Sel, WT and Trims per TI pad, 2-18

✓TIG = TI TIG

Load Peg 7 TGTS per DELAY PAD, below

Go to EXECUTE TI BURN [19], 2-19

ΔVX	( )			.		( )			.	
ΔVY	( )			.		( )			.	
ΔVZ	( )			.		( )			.	

TARGET TI BURN [13]

GNC 34 ORBIT TGT

CRT TGT NO - ITEM 1 + L O EXEC

✓TGT Set data:

T1 TIG = (BASE TIME)

EL + 0

ΔT + 81.2

ΔX + 0

ΔY + 0

ΔZ + 0

COMPUTE T1 - ITEM 27 EXEC

Note solution in pad, 2-18

CONFIGURE FOR RR TARGET ACQ [14]

A1U KU MODE - RDR PASSIVE

✓KU - GPC

✓KU RADAR OUTPUT - HI

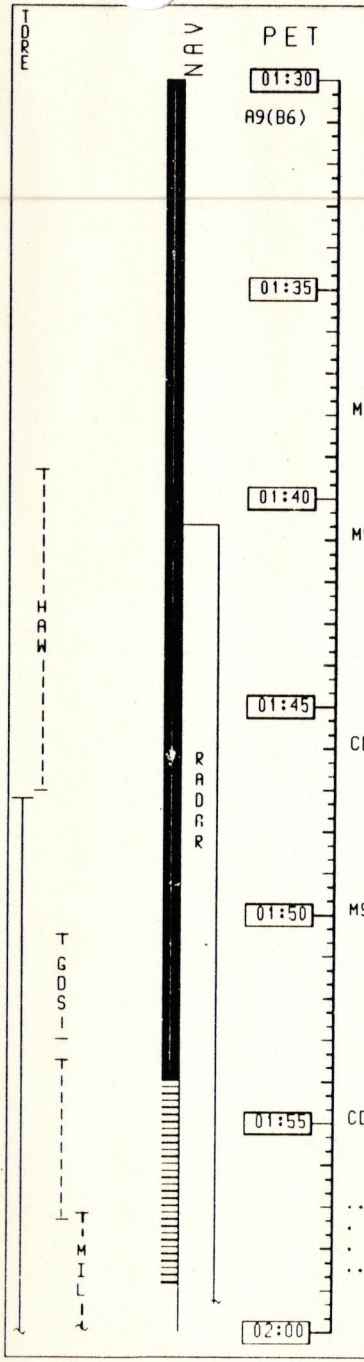
KU CNTL - PNL

GNC 33 REL NAV

CRT KU ANT ENA - ITEM 2 EXEC (*)

GNC, I/O RESET EXEC

A2 DIGI-DIS SEL - R/RDOT



MS2 When range < 150 kft,
CONFIGURE FOR RR TARGET ACQ [14]

MS2 When RR lock-on occurs,
RR NAVIGATION [15]

CDR When NAV converged,
TARGET TI BURN [13] (Intermediate solution),
If ΔVT >12, change ENG SEL to BOTH OMS

MS2 If no lock-on by R = 60 kft, perform
RR AUTO TRACK ACQ (Cue Card, RNDZ OPS)

CDR VERIFY PRPLT FOR TI/RNDZ DELAY [16]

.....If Rendezvous Delay .....
. .
. CDR LOAD DELAY BURN [17], 2-16 .
.....

RR NAVIGATION [15]

GNC 33 REL NAV

CRT RR - ITEM 13 EXEC (*)
✓Elev, Az approx 0

If RATIO < 1.0 for four NAV cycles,
- FLTR TO PROP - ITEM 8 EXEC
- AUTO RNG - ITEM 17 EXEC (*)
  - RDOT - ITEM 20 EXEC (*)
  - Angles - ITEM 23 EXEC (*)

.....IF SV SEL = PROP.....
. .
. When SV UPDATE POS < 0.3 .
. and MARK ACPT > 9, .
. SV SEL - ITEM 4 EXEC (FLTR) .
.....

If RATIO > 1.0 with previous S TRK,
1) COVAR REINIT - ITEM 16 EXEC
2) If NCC burned on FLTR vector,
   FLTR TO PROP - ITEM 8 EXEC
   FOR 3 Marks
3) PROP TO FLTR - ITEM 9 EXEC

If RATIO > 1.0 and no previous S TRK,
FOR 3 Marks

VERIFY PRPLT FOR TI/RNDZ DELAY [16]

The following deltas to the RENDEZVOUS OMS/RCS PRPLT PAD Cue Card apply:

To perform TI:

subtract from OMS/RCS QTY 1% + 1% per 6 fps TI

or add to AFT RCS QTY 5% + 1% per 1 fps TI

and

add to FWD RCS QTY 5%

To perform RNDZ DELAY:

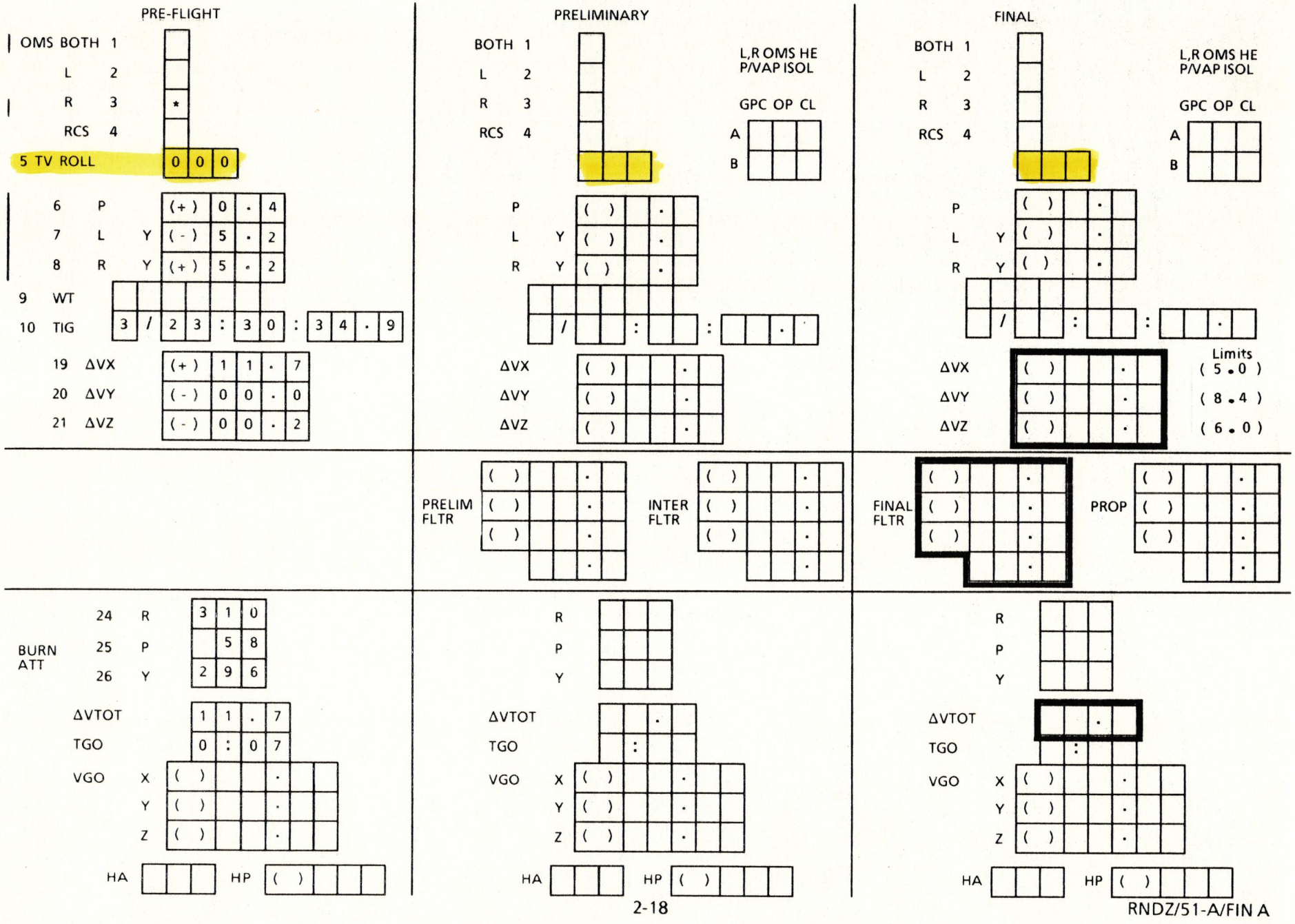
subtract from OMS/RCS QTY 2.2% _____

or add to AFT RCS QTY 14% _____,

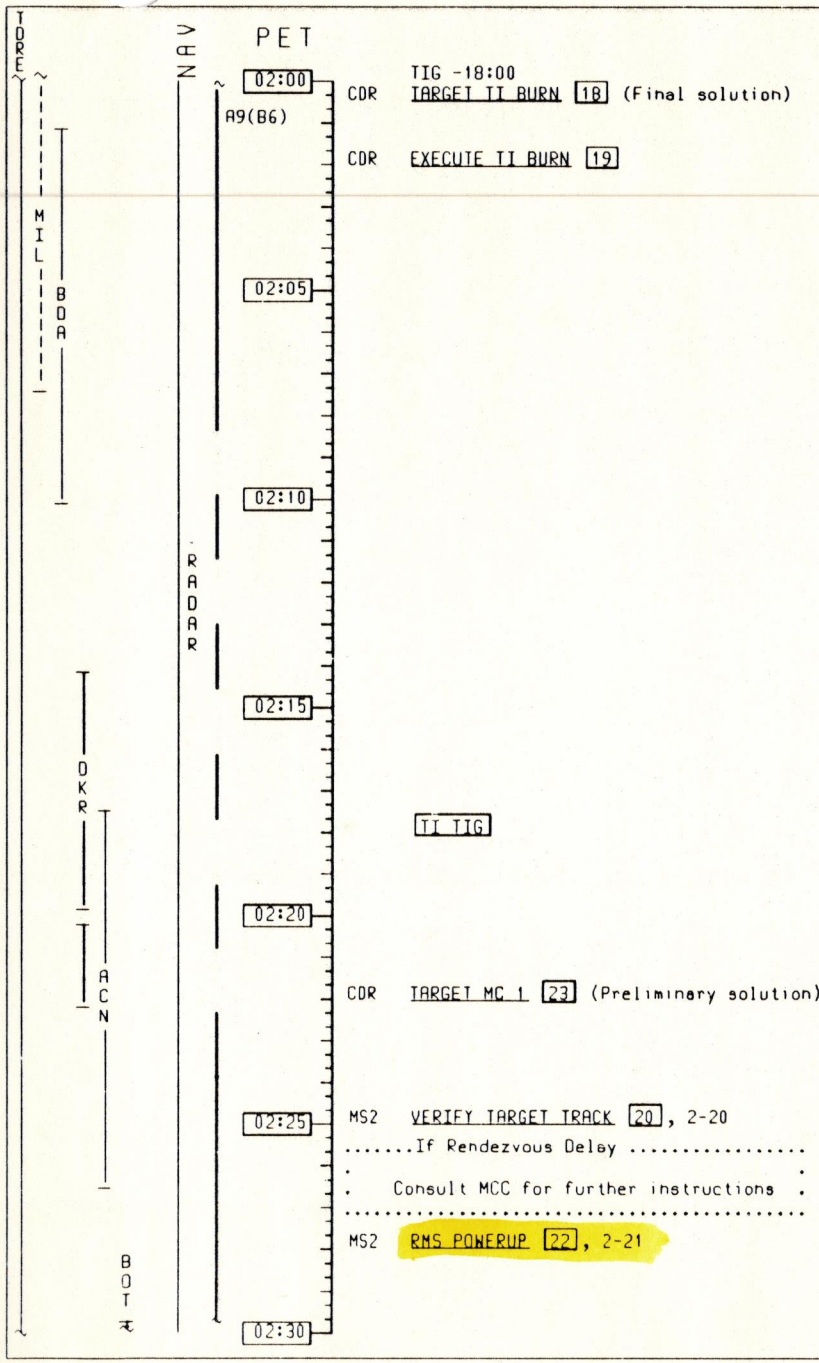
and

add to FWD RCS QTY 5% _____

TI BURN PAD



RNDZ/51-A/FIN A



TARGET TI BURN [18] (Final solution)

CRT OPS 202 PRO
[GNC ORBIT MNVR EXEC]
Load Eng Sel, WT and Trims for TI per pad, 2-18
LOAD - ITEM 22 EXEC
[GNC 33 REL NAV]
✓SV SEL correct
Inh RR Angles - ITEM 24 EXEC (*)
[GNC 34 ORBIT TGT]
TGT NO - ITEM 1 +1 0 EXEC
✓TGT Set data:
TI TIG = (BASE TIME)
EL + 0
ΔT + 81.2
ΔX + 0
ΔY + 0
ΔZ + 0
COMPUTE TI - ITEM 27 EXEC
Note solution in pad, 2-18

If FLTR converged (> 40 marks in current sensor pass & SV UPDATE POS < .5), Burn FLTR soln

If FLTR within ground solution limits, Burn FLTR soln

If PROP within ground solution limits, Burn PROP soln

If none of the above, Burn ground soln EXT ΔVs

EXECUTE TI BURN [19]

CRT [GNC ORBIT MNVR EXEC]
[GNC SYS SUMM 2]
LOAD - ITEM 22 EXEC
TIMER - ITEM 23 EXEC
C3 DAP TRANS: as reqd
ROT: DISC/DISC/DISC
✓DAP: A/AUTO/VERN
CRT MNVR - ITEM 27 EXEC (*)
08 ✓L,R OMS TK ISOL (four) - OP (tb-OP)
✓XFEED (four) - CL (tb-CL)
F7/F8 FLT CNTLR PWR (two) - ON

TIG -2:00 ··
Perform OMS 2/ORBIT OMS BURNS Cue Card, then ··

THC - Trim residuals < .2 fps
F7/F8 FLT CNTLR PWR (two) - OFF
08 L,R OMS He PRESS/VAP ISOL (four) - CL
CRT RCS SEL - ITEM 4 EXEC (*)
Perform OMS TVC GMBL CK as reqd
* If down arrow(s) or M(s), *
* select good GMBL *
DAP: A/AUTO/VERN
OPS 201 PRO
IF NO RR,
C3 DAP: B/AUTO/NORM

VERIFY TARGET TRACK [20]

✓Attitude mnvr complete
[GNC 33 REL NAV]

If RR Fail
| Go to S TRK TARGET ACQ - RR FAIL [21] >>
If KU TRACK tb - gray
CRT AUTO Angles - ITEM 23 EXEC (✱)
If KU TRACK tb - bp,
Perform RR AUTO TRACK ACQ (Cue Card, RNDZ OPS), then
If still no RR ACQ,
Inh RNG - ITEM 18 EXEC (✱)
RDOT - ITEM 21 EXEC (✱)
✓Angles - ITEM 24, (✱)
If -Z S TRK avail,
| Go to S TRK TARGET ACQ [10], 2-14 >>
If -Z S TRK failed,
Go to COAS NAVIGATION (Cue Card, RNDZ OPS)

S TRK TARGET ACQ - RR FAIL [21]

[GNC 21 IMU ALIGN]
CRT IMU DES - ITEM 7 (8,9) EXEC (✱)
(NH BURN PAD, 2-8)

✓DAP: A/AUTO/VERN
✓Tgt within 1° of COAS center

..IF POINTING ERROR > 1° AND -Z S TRK NOT ACQ ....
. .
. Perform COAS NAVIGATION, (Cue Card, RNDZ OPS) .
. until Angle RESIDs < .5 .
.....

.....IF -Y S TRK .....
. .
. [GNC UNIV PTG] .
. CRT ✓TGT ID +1 .
. BODY VECT +5 .
. P +0 .
. Y +280.6 .
. OM +90 .
. TRK - ITEM 19 EXEC .
. C3 DAP: B/AUTO/NORM .
. When mnvr complete, .
. DAP: A/AUTO/VERN .
.....

[GNC 22 S TRK/COAS CNTL]
CRT ✓-Z(-Y) TGT TRK, ITEM 6(5) - (✱)
✓STATUS - blank
✓SHUTTER - OP

If SHUTTER - CL,
MAN OP - ITEM 16(15) EXEC (✱)

When S PRES - (✱),
[GNC 33 REL NAV]
✓INH Angles - ITEM 24 - (✱)
✓ST - ITEM 12 EXEC (✱)

Monitor RESID V and H each NAV cycle
Use COAS to monitor acquisition

If RESID V and H change < .05 for four
| consecutive NAV cycles and COAS
| verifies tgt lock-on,
| If RATIO < 1.0,
| | FLTR TO PROP - ITEM 8 EXEC
| | AUTO Angles - ITEM 23 EXEC (✱)
| If RATIO > 1.0,
| 1) COVAR REINIT - ITEM 16 EXEC
| 2) FOR 3 Angle Marks
| 3) PROP to FLTR - ITEM 9 EXEC
If RESID V or H changes > .05 or COAS
verifies tgt not acquired,
[GNC 22 S TRK/COAS CNTL]
-Z(-Y) BREAK TRK - ITEM 8(7) EXEC

.....NO S TRK ACQ AFTER 5 MIN.....
. .
. ....IF -Y S TRK..... .
. . .
. . [GNC UNIV PTG] .
. . BODY VECT +3 .
. . OM +0 .
. . TRK - ITEM 19 EXEC (✱) .
. . DAP: B/AUTO/NORM .
. . When mnvr complete, .
. . DAP: A/AUTO/VERN .
. ...
. .
. Perform COAS NAVIGATION (Cue Card, RNDZ OPS) .
.....

RMS POWERUP 22
(Assumes RMS in TEMP MONITOR)

NOTE: If TI was a ground targeted burn or RR has failed, delay RMS Powerup until after MC1.

PLB LTS

A7 PL BAY FLOOD - as reqd

✓Physical integrity of arm, EE, blankets

RMS SEL (IDLE MODE)

✓BRAKES - ON (tb-ON)
✓RMS SEL - OFF
✓PWR - PRI

CRT SN 94 PDRS CONTROL
✓I/O ON, ITEM 5 - (*)
✓ENA, ITEM 9,11 - (*)

RMS SEL - PORT (if cradled, MA, C/W RCH LIM lt-on (SP,EP), SINGULAR lt-on (EP)

✓SAFING tb - gray

DEPLOY/RELEASE ARM

R13L PL BAY MECH PWR SYS (two) - ON
✓PORT RMS - DPY (tb-DPY)
PORT RMS RETEN LAT - REL (tb-REL) (16 sec max), then - OFF
PL BAY MECH PWR SYS (two) - OFF

ARM UNCRADLE

PARAM sel - JOINT ANGLE
BRAKES - OFF (tb-OFF)
Until clear of MPMs:
RATE sw - VERN (RATE MIN tb-ON)
MODE - SINGLE, ENTER

SINGLE DR to approx:

	SY	SP	EP	WP	WY	WR
1	0	0	0	+5	0	0
2			+1			
3		+25				
4			-25			

BRAKES - ON (tb-ON)

IARGET MC 1 [23]

CRT ✓SV SEL correct
[GNC 34 ORBIT TGT]
TGT NO - ITEM 1 +1 1 EXEC
✓TGT Set data:
T1 TIG = (BASE TIME +0/00:25:16)
EL + 0
ΔT + 55.9
ΔX + 0
ΔY + 0
ΔZ + 0
COMPUTE T1 - ITEM 27 EXEC

Note solution

MC 1 BURN SOLUTION

TIG 0 0 3 / 2 3 : 5 5 : 5 2

	PRELIMINARY	INTERMEDIATE
ΔVX	( ) .	( ) .
ΔVY	( ) .	( ) .
ΔVZ	( ) .	( ) .
ΔVT	.	.

	FINAL	3σ VARIATION
ΔVX	( ) .	(0 . 3)
ΔVY	( ) .	(0 . 3)
ΔVZ	( ) .	(1 . 2)
ΔVT	.	(1 . 3)

RMS ID POISE FOR CAPTURE [24]

CRT [SM 94 PDRS CONTROL]
PL ID, ITEM 3 + 1 EXEC
PL INIT ID, ITEM 24 + 1 EXEC

OPR CMD to POISE FOR CAPTURE

-940, -76, -800, 0, 60, 270

SY	SP	EP	WP	WY	WR
-9	+109	-79	-95	-69	-44

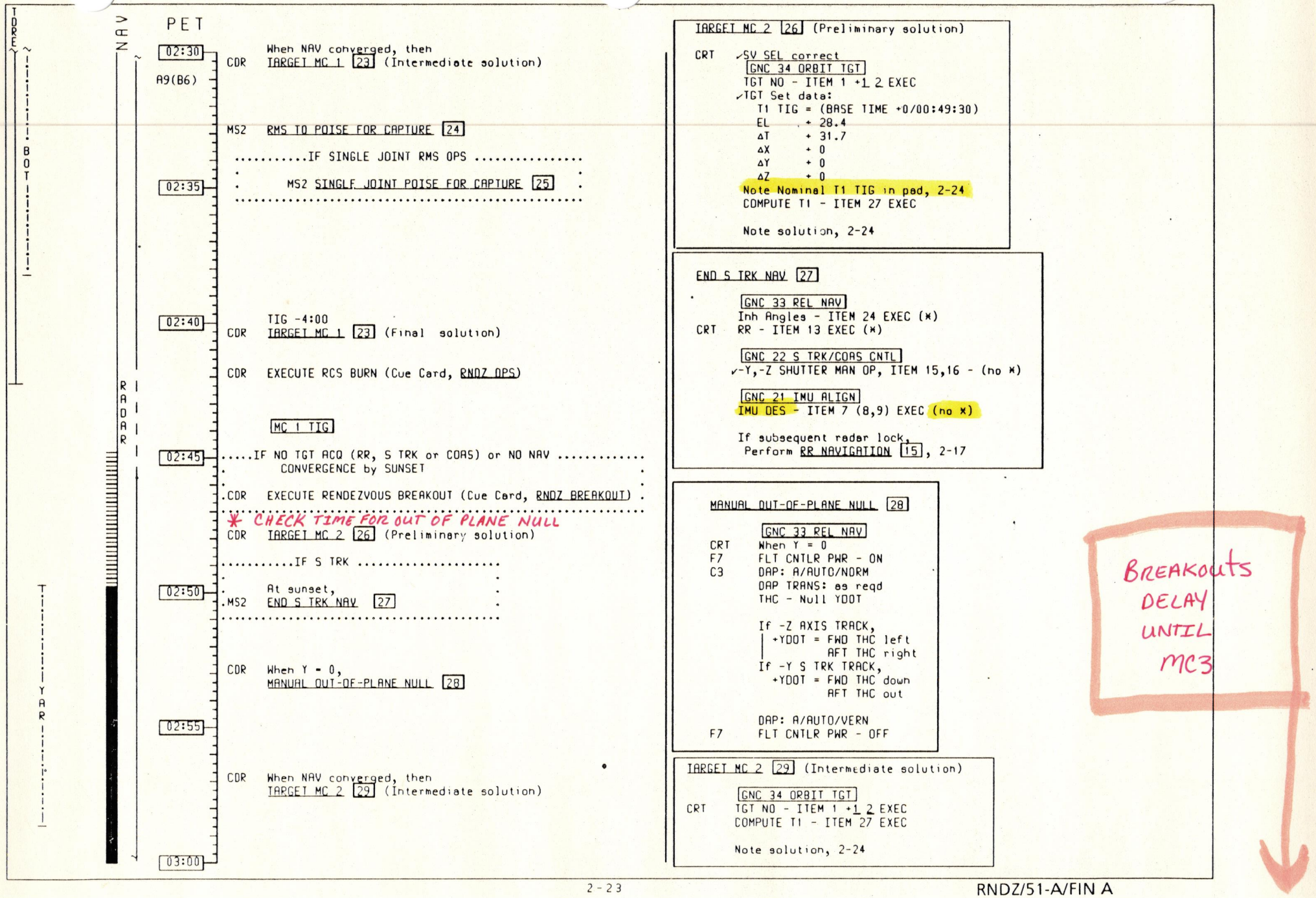
BRAKES - ON (tb - ON)

SINGLE JOINT POISE FOR CAPTURE [25]

CRT [SM 94 PDRS CONTROL]
PL ID, ITEM 3 + 1 EXEC

Mnvr to poise for capture orientation

SY	SP	EP	WP	WY	WR
-90	+123	-79	-64	0	+20


TDRE
BOT
NAV
RADAR
YAR
PET
02:30
When NAV converged, then
CDR IARGET MC 1 [23] (Intermediate solution)
A9(B6)
MS2 RMS TO POISE FOR CAPTURE [24]
.....IF SINGLE JOINT RMS OPS .....
MS2 SINGLE JOINT POISE FOR CAPTURE [25]
02:35
02:40
TIG -4:00
CDR IARGET MC 1 [23] (Final solution)
CDR EXECUTE RCS BURN (Cue Card, RNDZ OPS)
MC 1 TIG
02:45
.....IF NO TGT ACQ (RR, S TRK or COAS) or NO NAV .....
CONVERGENCE by SUNSET
.CDR EXECUTE RENDEZVOUS BREAKOUT (Cue Card, RNDZ BREAKOUT)
* CHECK TIME FOR OUT OF PLANE NULL
CDR IARGET MC 2 [26] (Preliminary solution)
.....IF S TRK .....
02:50
At sunset,
.MS2 END S TRK NAV [27]
CDR When Y = 0,
MANUAL OUT-OF-PLANE NULL [28]
02:55
CDR When NAV converged, then
IARGET MC 2 [29] (Intermediate solution)
03:00
IARGET MC 2 [26] (Preliminary solution)
CRT ✓SV SEL correct
GNC 34 ORBIT TGT
TGT NO - ITEM 1 +1 2 EXEC
✓TGT Set data:
T1 TIG = (BASE TIME +0/00:49:30)
EL + 28.4
ΔT + 31.7
ΔX + 0
ΔY + 0
ΔZ + 0
Note Nominal T1 TIG in pad, 2-24
COMPUTE T1 - ITEM 27 EXEC
Note solution, 2-24
END S TRK NAV [27]
GNC 33 REL NAV
Inh Angles - ITEM 24 EXEC (*)
CRT RR - ITEM 13 EXEC (*)
GNC 22 S TRK/COAS CNTL
✓-Y,-Z SHUTTER MAN OP, ITEM 15,16 - (no *)
GNC 21 IMU ALIGN
IMU DES - ITEM 7 (8,9) EXEC (no *)
If subsequent radar lock,
Perform RR NAVIGATION [15], 2-17
MANUAL OUT-OF-PLANE NULL [28]
GNC 33 REL NAV
CRT When Y = 0
F7 FLT CNTLR PWR - ON
C3 DAP: A/AUTO/NORM
DAP TRANS: as reqd
THC - Null YDOT
If -Z AXIS TRACK,
+YDOT = FWD THC left
AFT THC right
If -Y S TRK TRACK,
+YDOT = FWD THC down
AFT THC out
DAP: A/AUTO/VERN
F7 FLT CNTLR PWR - OFF
IARGET MC 2 [29] (Intermediate solution)
GNC 34 ORBIT TGT
CRT TGT NO - ITEM 1 +1 2 EXEC
COMPUTE T1 - ITEM 27 EXEC
Note solution, 2-24
BREAKOUTS DELAY UNTIL MC3

TARGET MC 2 [30] (Final solution)

CRT ✓SV SEL correct
[GNC 34 ORBIT TGT]
TGT NO - ITEM 1 +1 2 EXEC
COMPUTE T1 - ITEM 27 EXEC
✓TIG change between -3 and +7 min

.....TIG Change (<-3 or >+7 .....
. TGT NO - ITEM 1 + 1 2 EXEC .
. T1 TIG = (Nominal -3,+7 min as appropriate) .
. EL + 0 .
. BASE TIME = (same as T1 TIG) .
. LOAD - ITEM 26 EXEC .
. COMPUTE T1 - ITEM 27 EXEC .
.....

Set EVENT TIMER counting to MC 2 TIG

Note solution

CCTV CONFIG [31]

If reqd, pwr up CCTV, VTR per IV/VTR Cue Card

A3 MON 1,2 SCAN to UNDERSCAN
A7U MON 1 - Camr A
MON 2 - Camr B
Aim A at B and B at A
PAN/TILT - RESET for both; aim both at (or near) Elev 0, Az 0
Repeat for Camr C & D
Use A & B for data recording
Put new tapes in VTRs

MC 3 BURN SOLUTION

TIG 0 0 4 / 0 0 : 3 0 : 0 5

	PRELIMINARY	FINAL	3σ VARIATION
ΔVX	( ) .	( ) .	(0 . 3)
ΔVY	( ) .	( ) .	(0 . 3)
ΔVZ	( ) .	( ) .	(0 . 9)
ΔVT	.	.	(1 . 0)

TARGET MC 3 [32]

CRT ✓SV SEL correct
[GNC 34 ORBIT TGT]
TGT NO - ITEM 1 +1 3 EXEC
✓TGT Set data:
T1 TIG = (BASE TIME +0/00:10:00)
EL + 0
ΔT + 21.7
ΔX + 0
ΔY + 0
ΔZ + 0
COMPUTE T1 - ITEM 27 EXEC

Note solution

MC 2 BURN SOLUTION

TIG 0 0 4 / 0 0 : 2 0 : 0 5

	PRELIMINARY	INTERMEDIATE	FINAL	3σ VARIATION
ΔVX	( ) .	( ) .	( ) .	(0 . 3)
ΔVY	( ) .	( ) .	( ) .	(0 . 3)
ΔVZ	( ) .	( ) .	( ) .	(1 . 5)
ΔVT	.	.	.	(1 . 6)

		TIG SLIP (COMPUTED-NOM)
PREL	/ : :	__ __ : __ __
INTER	/ : :	__ __ : __ __
FINAL	/ : :	__ __ : __ __
NOMINAL	/ : :	

TORE

NAV

PET

03:00

A9(B6)

GWM

TIG -5:00

CDR TARGET MC 2 [30] (Final solution)

03:05

CDR EXECUTE RCS BURN (Cue Card, RNDZ OPS)

MC 2 TIG

MS2 CCTV CONFIG [31]

03:10

.....IF -Y S TRK TRACK.....

.CDR -Z AXIS TARGET TRACK [33] .

.....

TV @ HAW

RADAR

TIG -4:00

CDR TARGET MC 3 [32]

TV

03:15

CDR EXECUTE RCS BURN (Cue Card, RNDZ OPS)

MC 3 TIG

.....IF NO RR.....

.CDR Delete MC4; at sunrise perform .

ESTABLISH INERTIAL LOS RATES - RR FAIL [34], .

RADAR FAIL, 3-4 .

.....

HAW

03:20

TIG -4:00

CDR TARGET MC 4 [35]

03:25

CDR EXECUTE RCS BURN (Cue Card, RNDZ OPS)

MC 4 TIG

MANUAL TRAJECTORY CONTROL

TGDS

03:30

CDR ESTABLISH INERTIAL LOS RATES [36], 2-27

ET

-00:05

000:00:00

00:05

00:10

00:15

00:20

-Z AXIS TARGET TRACK [33]

GNC UNIV PTG

CRT ✓TGT ID +1

BODY VECT +3 (-Z)

OM +0

TRK - ITEM 19 EXEC (CUR - *)

C3 DAP: B/AUTO/NORM

When mnvr complete,

DAP: A/AUTO/VERN

TARGET MC 4 [35]

CRT ✓SV SEL correct

GNC 34 ORBIT TGT

TGT NO - ITEM 1 +1 4 EXEC

✓TGT Set data:

T1 TIG = (BASE TIME +0/00:20:00)

EL + 0

ΔT + 11.7

ΔX + 0

ΔY + 0

ΔZ + 0

COMPUTE T1 - ITEM 27 EXEC

Note solution

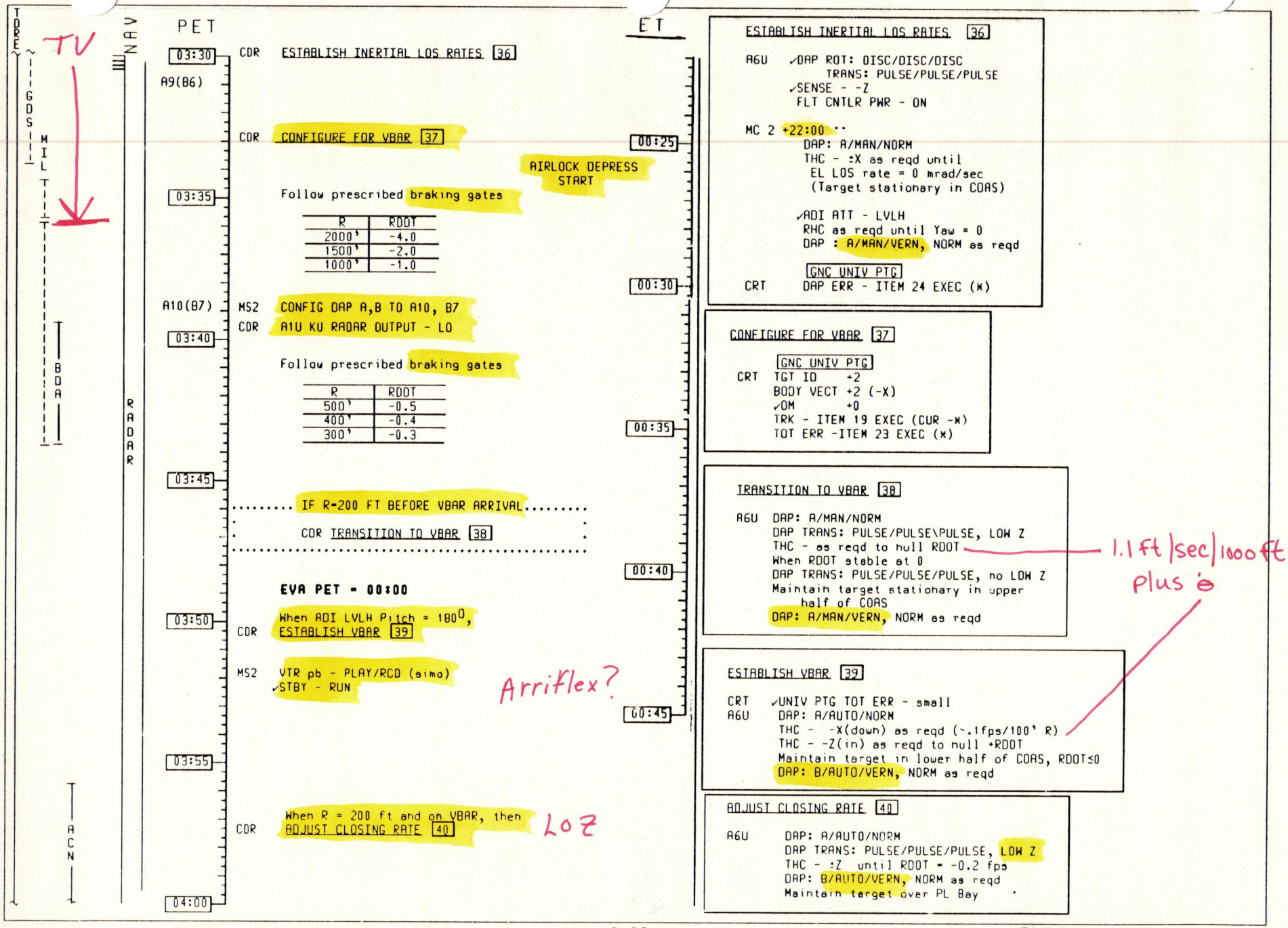
MC 4 BURN SOLUTION

TIG 0 0 4 / 0 0 : 4 0 : 0 5

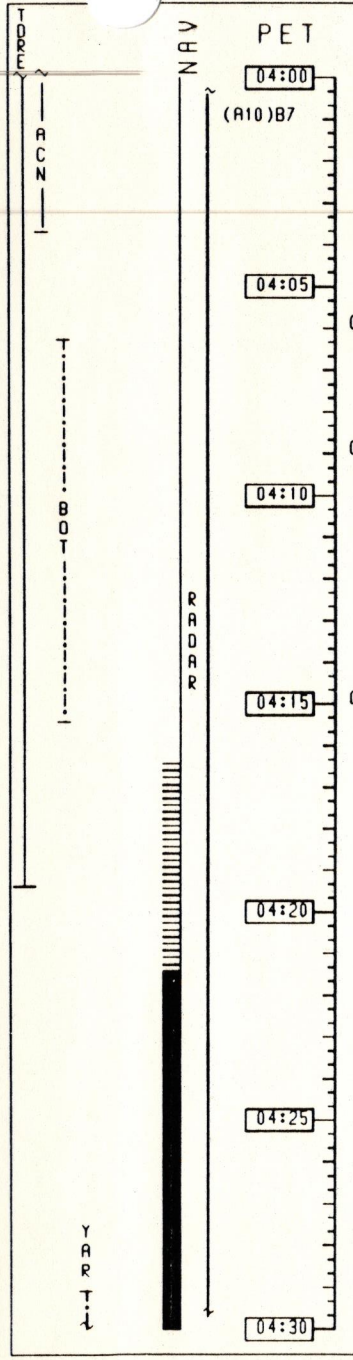
	PRELIMINARY	FINAL	3σ VARIATION
ΔVX	( ) .	( ) .	(0 . 6)
ΔVY	( ) .	( ) .	(0 . 9)
ΔVZ	( ) .	( ) .	(0 . 9)
ΔVT	.	.	(1 . 4)

Break-outs DELAY UNTIL MC3

THIS PAGE INTENTIONALLY BLANK


PET
ET
TV
TDRE
GDS
MIL
BDA
NAV
RADAR
ACN
03:30
COR ESTABLISH INERTIAL LOS RATES [36]
A9(B6)
COR CONFIGURE FOR VBAR [37]
AIRLOCK DEPRESS START
03:35
Follow prescribed braking gates
R | RDOT
2000' | -4.0
1500' | -2.0
1000' | -1.0
A10(B7)
MS2 CONFIG DAP A,B TO A10, B7
COR A1U KU RADAR OUTPUT - LO
03:40
Follow prescribed braking gates
R | RDOT
500' | -0.5
400' | -0.4
300' | -0.3
03:45
IF R-200 FT BEFORE VBAR ARRIVAL
COR TRANSITION TO VBAR [38]
EVA PET - 00:00
03:50
When ADI LVLH Pitch = 180°,
COR ESTABLISH VBAR [39]
MS2 VTR pb - PLAY/RCD (simo)
✓STBY - RUN
Arriflex?
03:55
COR When R = 200 ft and on VBAR, then ADJUST CLOSING RATE [40]
LOZ
04:00
00:25
00:30
00:35
00:40
00:45
ESTABLISH INERTIAL LOS RATES [36]
A6U ✓DAP ROT: DISC/DISC/DISC
TRANS: PULSE/PULSE/PULSE
✓SENSE - -Z
FLT CNTLR PWR - ON
MC 2 +22:00 ··
DAP: A/MAN/NORM
THC - ±X as reqd until
EL LOS rate = 0 mrad/sec
(Target stationary in COAS)
✓ADI ATT - LVLH
RHC as reqd until Yaw = 0
DAP : A/MAN/VERN, NORM as reqd
GNC UNIV PTG
CRT DAP ERR - ITEM 24 EXEC (×)
CONFIGURE FOR VBAR [37]
GNC UNIV PTG
CRT TGT ID +2
BODY VECT +2 (-X)
✓OM +0
TRK - ITEM 19 EXEC (CUR -×)
TOT ERR -ITEM 23 EXEC (×)
TRANSITION TO VBAR [38]
A6U DAP: A/MAN/NORM
DAP TRANS: PULSE/PULSE\PULSE, LOW Z
THC - as reqd to null RDOT
When RDOT stable at 0
DAP TRANS: PULSE/PULSE/PULSE, no LOW Z
Maintain target stationary in upper half of COAS
DAP: A/MAN/VERN, NORM as reqd
1.1 ft/sec/1000 ft plus ö
ESTABLISH VBAR [39]
CRT ✓UNIV PTG TOT ERR - small
A6U DAP: A/AUTO/NORM
THC - -X(down) as reqd (~.1fps/100' R)
THC - -Z(in) as reqd to null +RDOT
Maintain target in lower half of COAS, RDOT≤0
DAP: B/AUTO/VERN, NORM as reqd
ADJUST CLOSING RATE [40]
A6U DAP: A/AUTO/NORM
DAP TRANS: PULSE/PULSE/PULSE, LOW Z
THC - +Z until RDOT = -0.2 fps
DAP: B/AUTO/VERN, NORM as reqd
Maintain target over PL Bay

THIS PAGE INTENTIONALLY BLANK



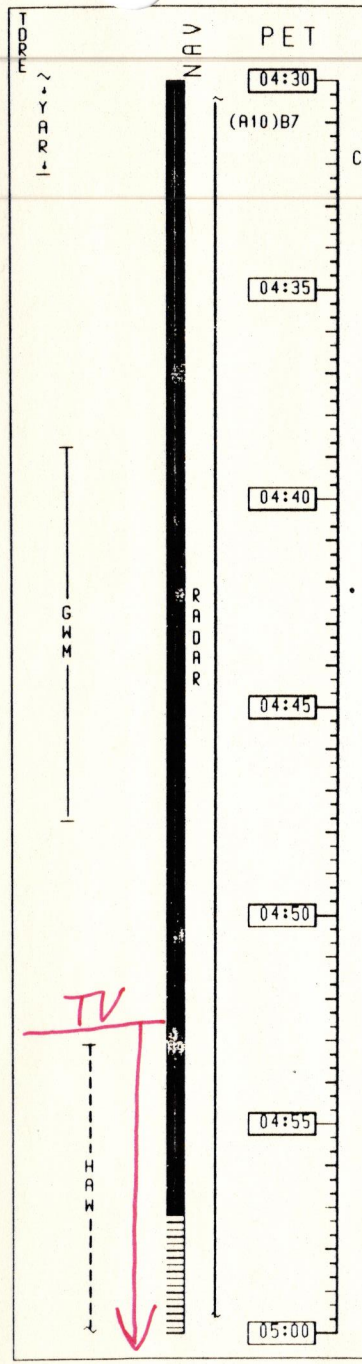
CDR When R = 60 ft, target centered over PL BAY, then
DAP TRANS: PULSE/PULSE/PULSE, NO LOW Z

CDR When Target in EE Camr, then
THC - +Z (out) to null rates and
establish 35 ft SK

Photos / TV

CDR A7U PL BAY FLOOD DOCKING - BRT

THIS PAGE INTENTIONALLY BLANK



COR VERIFY PRPLT FOR MMU FREE FLIGHT [41]

MMU CHECK FLIGHT

TV @ HAW

VERIFY PRPLT FOR MMU FREE FLIGHT [41]

The following deltas to the RENDEZVOUS OMS/RCS PRPLT PAD Cue Card apply:

To perform MMU free flight:

subtract from OMS/RCS QTY 3.6% _____

or add to AFT RCS QTY 21% _____

and

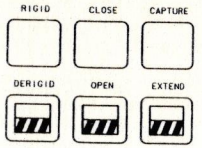
add to FWD RCS QTY 19% _____

TARGET CAPTURE [42]

BRAKES - OFF (tb-OFF)
MODE - END EFF, ENTER
EE MODE - AUTO

When grapple fixture in EE camera FOV,
DAP ROT: PULSE/PULSE/PULSE
DAP: B/MAN/VERN
EV1: CYCLE GYRO PWR

Mnvr to grapple envelope
EE CAPTURE sw - depress (mom)



(23 sec max)

BRAKES - ON (tb-ON)
EE MODE - OFF

Remain FREE DRIFT

SINGLE JOINT TARGET CAPTURE [43]

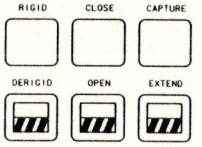
EE MODE - AUTO, if available

When grapple fixture in EE camera FOV,
DAP ROT: PULSE/PULSE/PULSE
DAP: B/MAN/VERN
EV1: CYCLE GYRO PWR

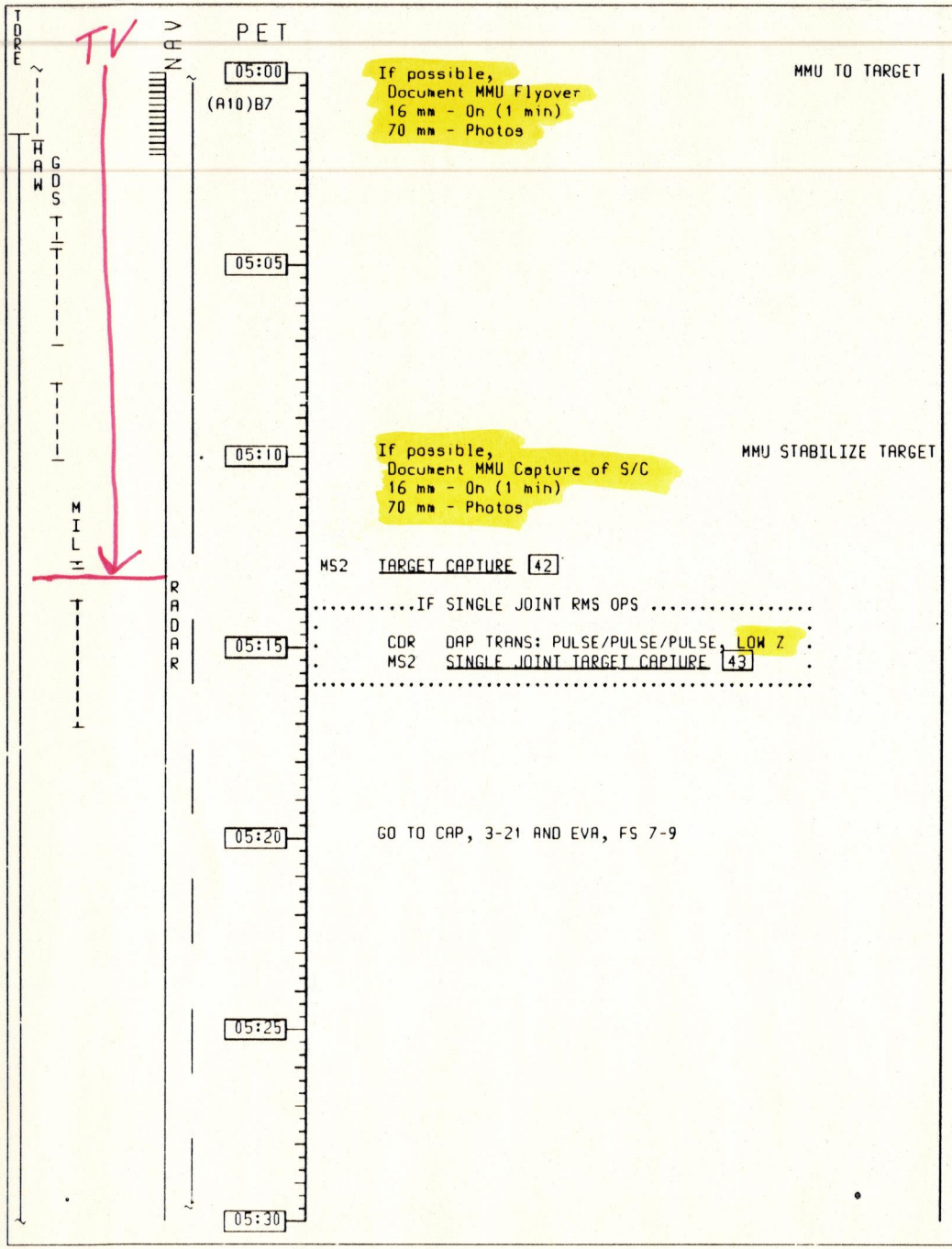
Mnvr to grapple envelope using control scheme below
(NOTE: Desired End Effector motion is in End Effector Axis System)

DESIRED EE MOTION	INPUT
$+X_{EE}$	-SP
$+Y_{EE}$	+SY
$+Z_{EE}$	-EP
$+P_{EE}$	+WP
$+Y_{EE}$	+WY
$+R_{EE}$	+WR

EE CAPTURE SW -DEPRESS (mom)



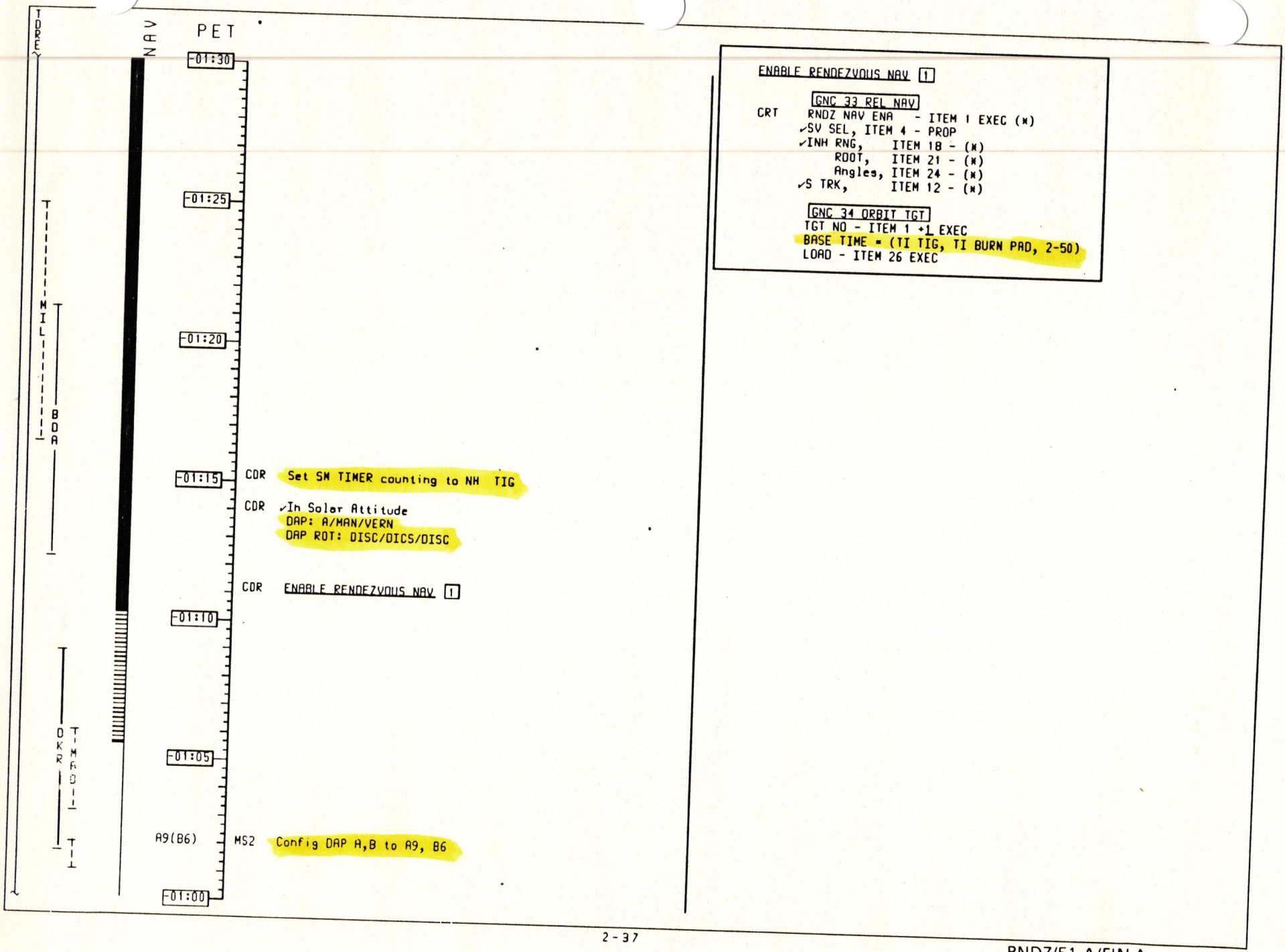
BRAKES - ON (tb-ON)
EE MODE - OFF

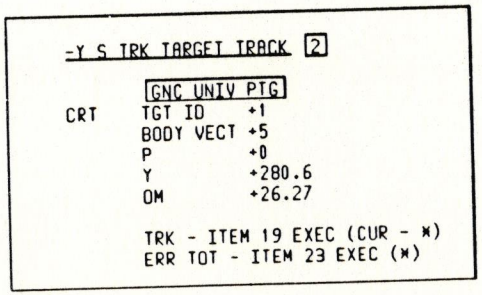

TDRE
TV
NAV
PET
05:00
(A10)B7
If possible,
Document MMU Flyover
16 mm - On (1 min)
70 mm - Photos
MMU TO TARGET
05:05
05:10
If possible,
Document MMU Capture of S/C
16 mm - On (1 min)
70 mm - Photos
MMU STABILIZE TARGET
MS2 TARGET CAPTURE 42
.....IF SINGLE JOINT RMS OPS .....
CDR DAP TRANS: PULSE/PULSE/PULSE, LOW Z
MS2 SINGLE JOINT TARGET CAPTURE 43
05:15
05:20
GO TO CAP, 3-21 AND EVA, FS 7-9
05:25
05:30
TAW
GDS
MILA
RADAR

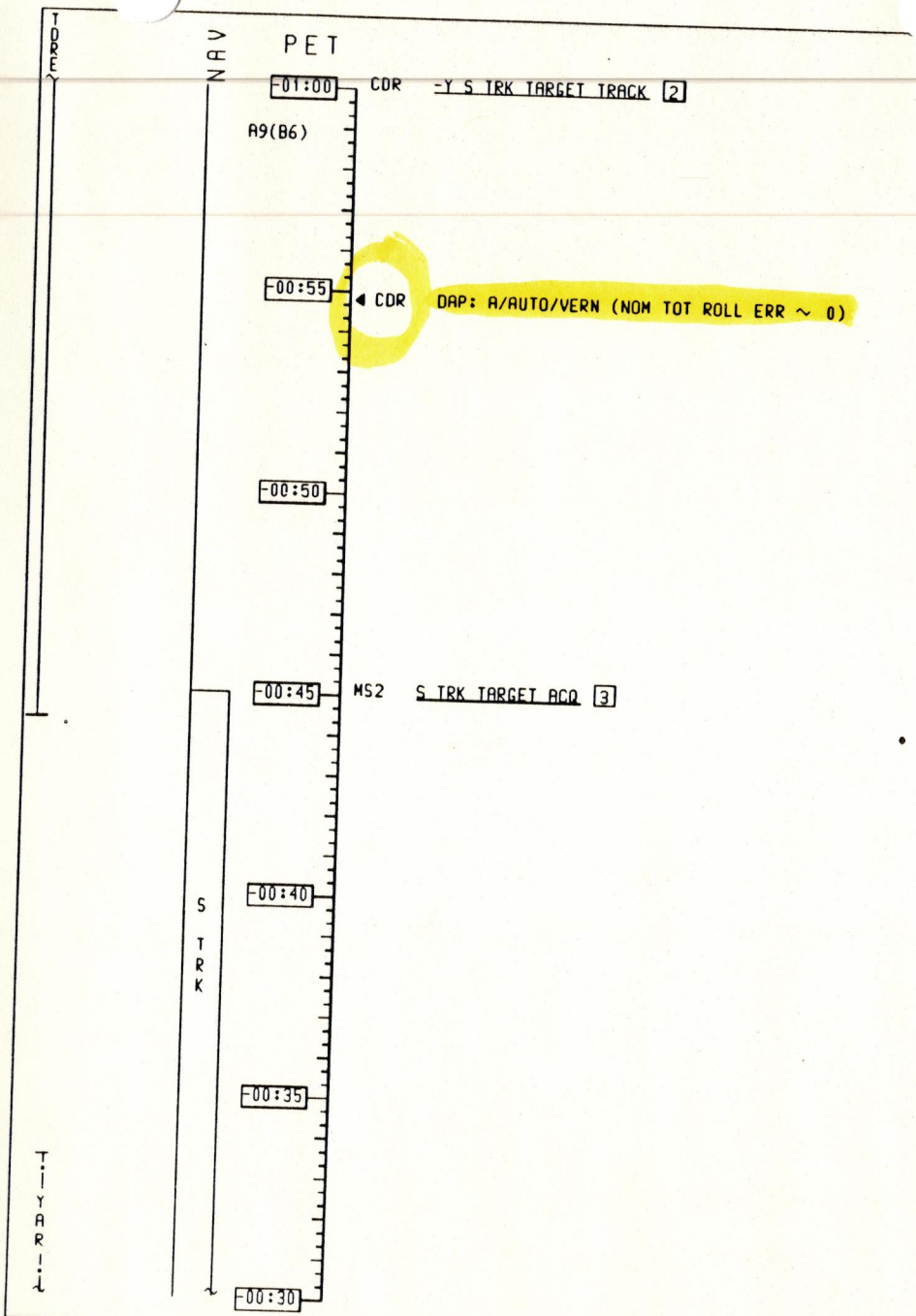
This Page Intentionally Blank

RENDEZVOUS 2

This Page Intentionally Blank


TDRS
NAV
PET
-01:30
-01:25
-01:20
-01:15
-01:10
-01:05
-01:00
MILA
BDA
DKR
TIMED TIL
CDR Set SM TIMER counting to NH TIG
CDR ✓In Solar Attitude
DAP: A/MAN/VERN
DAP ROT: DISC/DICS/DISC
CDR ENABLE RENDEZVOUS NAV 1
A9(B6) MS2 Config DAP A,B to A9, B6
ENABLE RENDEZVOUS NAV 1
GNC 33 REL NAV
CRT RNDZ NAV ENA - ITEM 1 EXEC (✱)
✓SV SEL, ITEM 4 - PROP
✓INH RNG, ITEM 18 - (✱)
RDOT, ITEM 21 - (✱)
Angles, ITEM 24 - (✱)
✓S TRK, ITEM 12 - (✱)
GNC 34 ORBIT TGT
TGT NO - ITEM 1 +1 EXEC
BASE TIME = (TI TIG, TI BURN PAD, 2-50)
LOAD - ITEM 26 EXEC


-Y S IRK IARGEI IRACK 2
GNC UNIV PTG
CRT
TGT ID +1
BODY VECT +5
P +0
Y +280.6
OM +26.27
TRK - ITEM 19 EXEC (CUR - *)
ERR TOT - ITEM 23 EXEC (*)



S TRK TARGET ACQ 3

CRT GNC 21 IMU ALIGN
IMU DES - ITEM 7 (8,9) EXEC (*)
(NH BURN PAD, 2-40)

CRT GNC 22 S TRK/COAS CNTL
-Z(-Y) TGT TRK - ITEM 6(5) EXEC (*)
✓STATUS - blank
✓SHUTTER - OP
✓S PRES - *

If SHUTTER - CL,
MAN OP - ITEM 16(15) EXEC (*)

GNC 33 REL NAV
✓INH Angles, ITEM 24 - (*)
✓S TRK, ITEM 12 - (*)
✓SV SEL, ITEM 4 - PROP

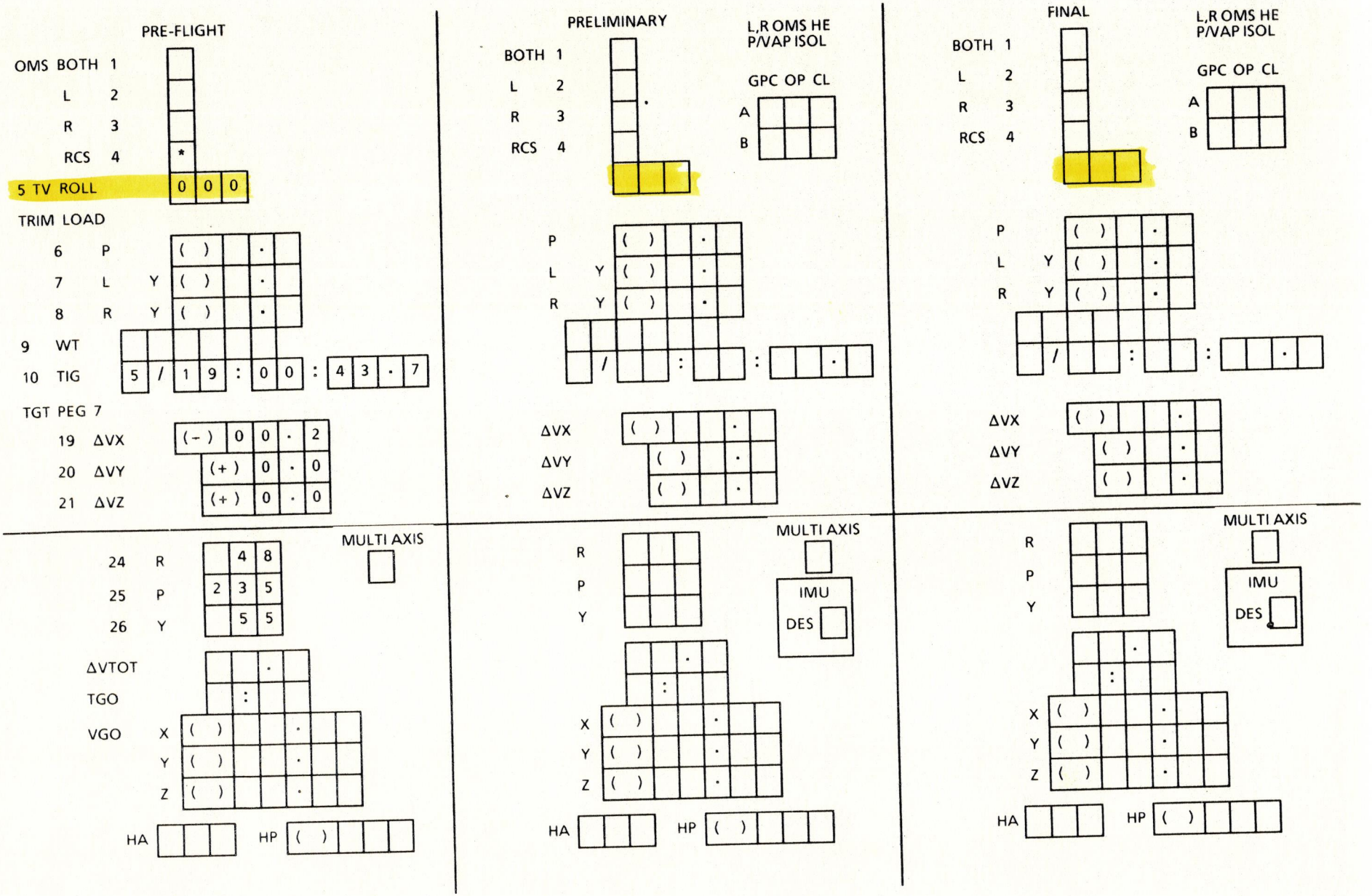
Monitor RESID V and H each NAV cycle

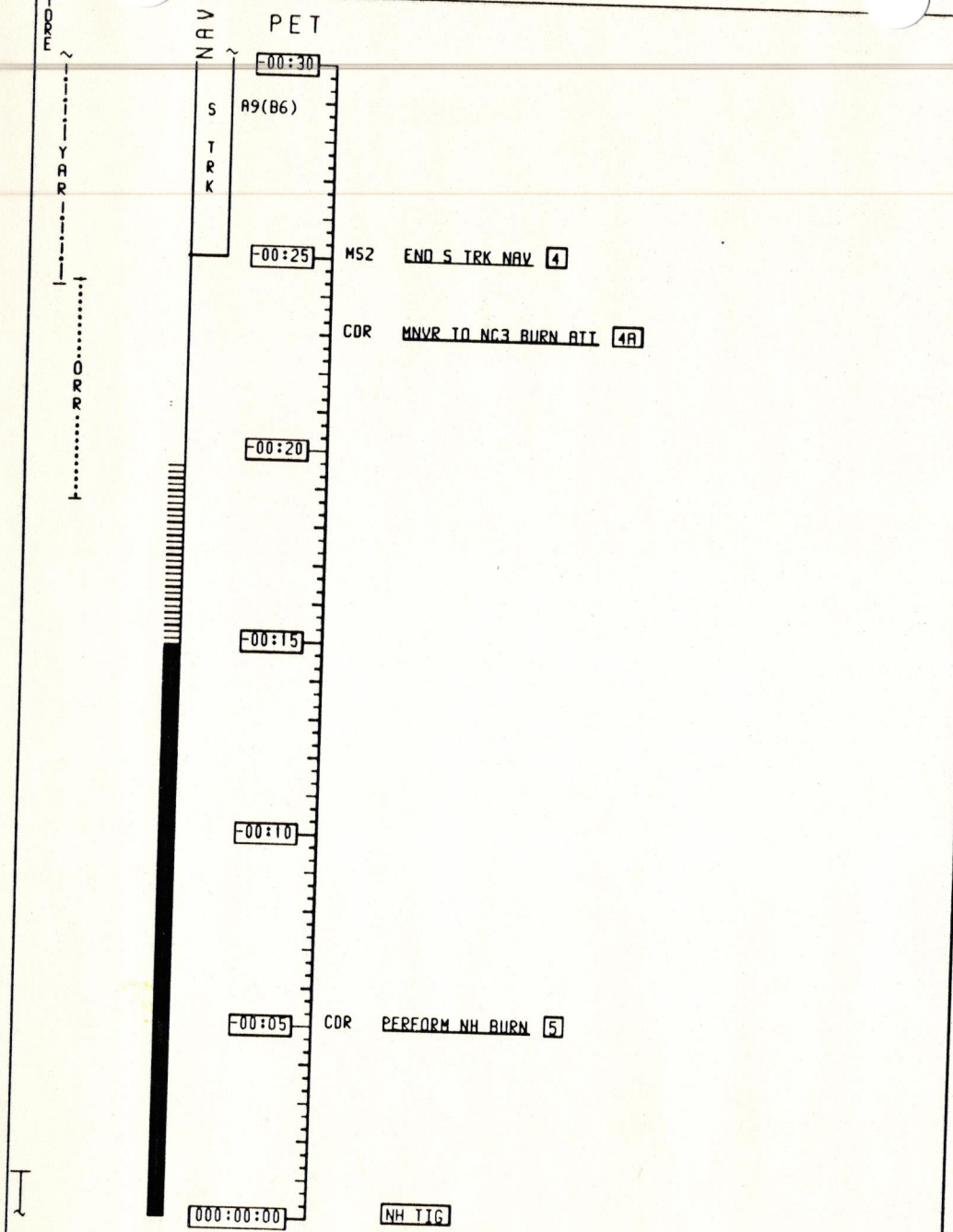
If RESID V and H change < .05 for
four consecutive NAV cycles,
If RATIO < 1.0,
AUTO Angles - ITEM 23 EXEC (*)
If RATIO > 1.0,
FOR 3 Angle Marks
If RESID V or H changes by > .05,
GNC 22 S TRK/COAS CNTL
-Z(-Y) BREAK TRK - ITEM 8(7) EXEC

When SV UPDATE POS < 1.0
and MARK ACPT Angles > 9,
SV SEL - ITEM 4 EXEC (FLTR)

NOTE
If FLTR minus PROP changes by more than
40 K ft within a S TRK pass, then
SV SEL - ITEM 4 EXEC (PROP)
INHIBIT Angles - ITEM 24 EXEC (*)
PROP to FLTR transfer - ITEM 9 EXEC
GNC 22 S TRK/COAS CNTL
-Z(-Y) BREAK TRK - ITEM 8(7) EXEC
Repeat S TRK ACQ

NH BURN PAD


PRE-FLIGHT
OMS BOTH 1
L 2
R 3
RCS 4
5 TV ROLL
TRIM LOAD
6 P
7 L Y
8 R Y
9 WT
10 TIG
TGT PEG 7
19 ΔVX
20 ΔVY
21 ΔVZ
PRELIMINARY
BOTH 1
L 2
R 3
RCS 4
L,R OMS HE P/VAP ISOL
GPC OP CL
A
B
P
L Y
R Y
ΔVX
ΔVY
ΔVZ
FINAL
BOTH 1
L 2
R 3
RCS 4
L,R OMS HE P/VAP ISOL
GPC OP CL
A
B
P
L Y
R Y
ΔVX
ΔVY
ΔVZ
MULTI AXIS
24 R
25 P
26 Y
ΔVTOT
TGO
VGO X
Y
Z
HA
HP
MULTI AXIS
IMU
DES
R
P
Y
X
Y
Z
HA
HP
MULTI AXIS
IMU
DES
R
P
Y
X
Y
Z
HA
HP



END S TRK NAV [4]

GNC 33 REL NAV
CRT INH Angles - ITEM 24 EXEC (*)

GNC 22 S TRK/COAS CNTL
✓SHUTTER MAN OP, ITEM 15,16 - (no *)

GNC 21 IMU ALIGN
CRT IMU DES - ITEM 7 (8,9) EXEC (no *)

MNVR TO NC3 BURN ATT [4A]

GNC UNIV PTG
Load burn att data pr NC3 BURN PAD, 2-44
CRT ITEM 5 +(Burn R) EXEC
ITEM 6 +(Burn P) EXEC
ITEM 7 +(Burn Y) EXEC
✓DAP: A/AUTO/VERN
START MNVR - ITEM 18 EXEC (CUR - *)

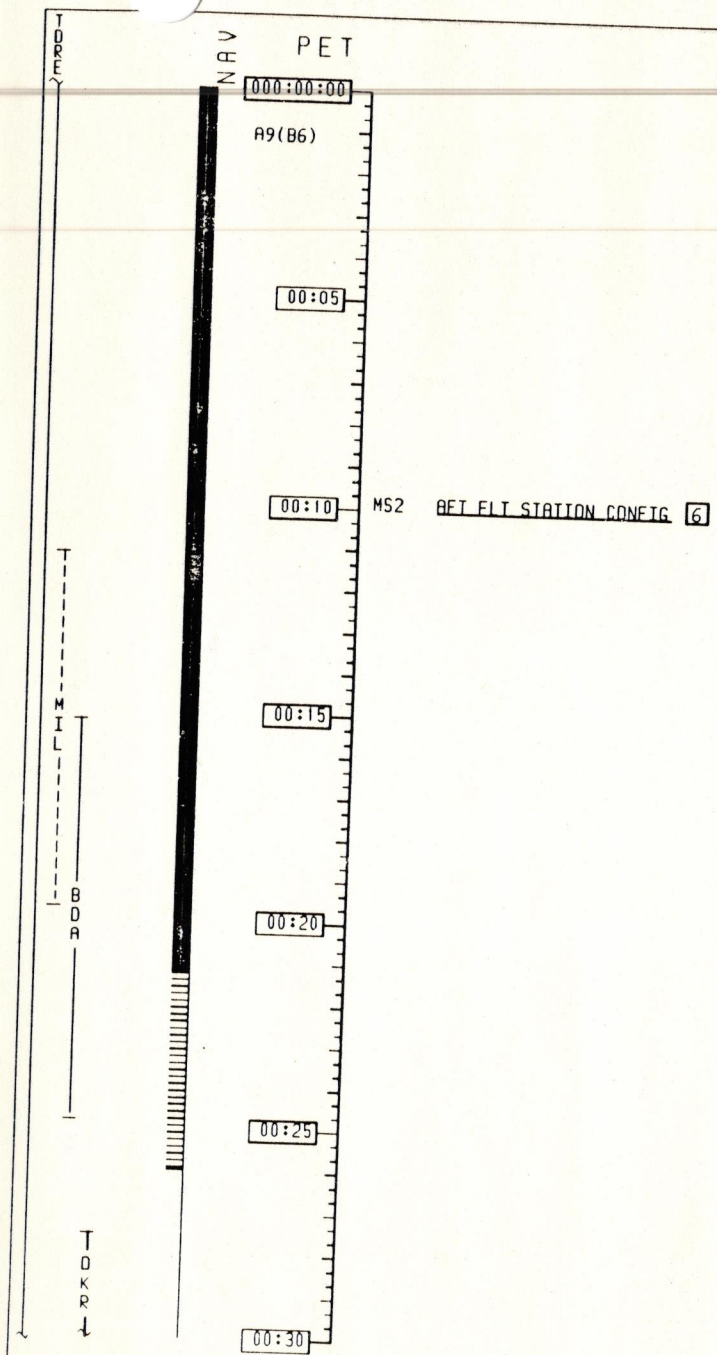
PERFORM NH BURN [5]

CRT OPS 202 PRO
GNC ORBIT MNVR EXEC

Load TGT data per burn pad
LOAD - ITEM 22 EXEC
TIMER - ITEM 23 EXEC
✓Burn data per pad
✓At least one ADI in LVLH

TIG -2:00 ..
Perform EXECUTE RCS BURN (Cue Card, RNDZ OPS)
C3 DAP: A/~~LVLH~~/VERN
AUTO

THIS PAGE INTENTIONALLY BLANK



AFT FLT STATION CONFIG 6

A6U ADI ATT - LVLH
ERR - MED
RATE - LO
SENSE - -Z

R13 ✓KU ANT - GND
A1U ✓PWR - ON
A2 ✓DIGI-DIS SEL - EL/AZ
A1U KU MODE - RDR PASSIVE
RADAR OUTPUT - HI
- MAN SLEW
CNTL - PNL
SIG STRENGTH sel - KU
SLEW RATE - as reqd
Slew Antenna to Elev 0, Az 0, then:
A2 DIGI-DIS SEL - R/ROOT
X-PNTR SCALE - X1

CRT SM ANTENNA
SELF TEST - ITEM 7 EXEC (x)

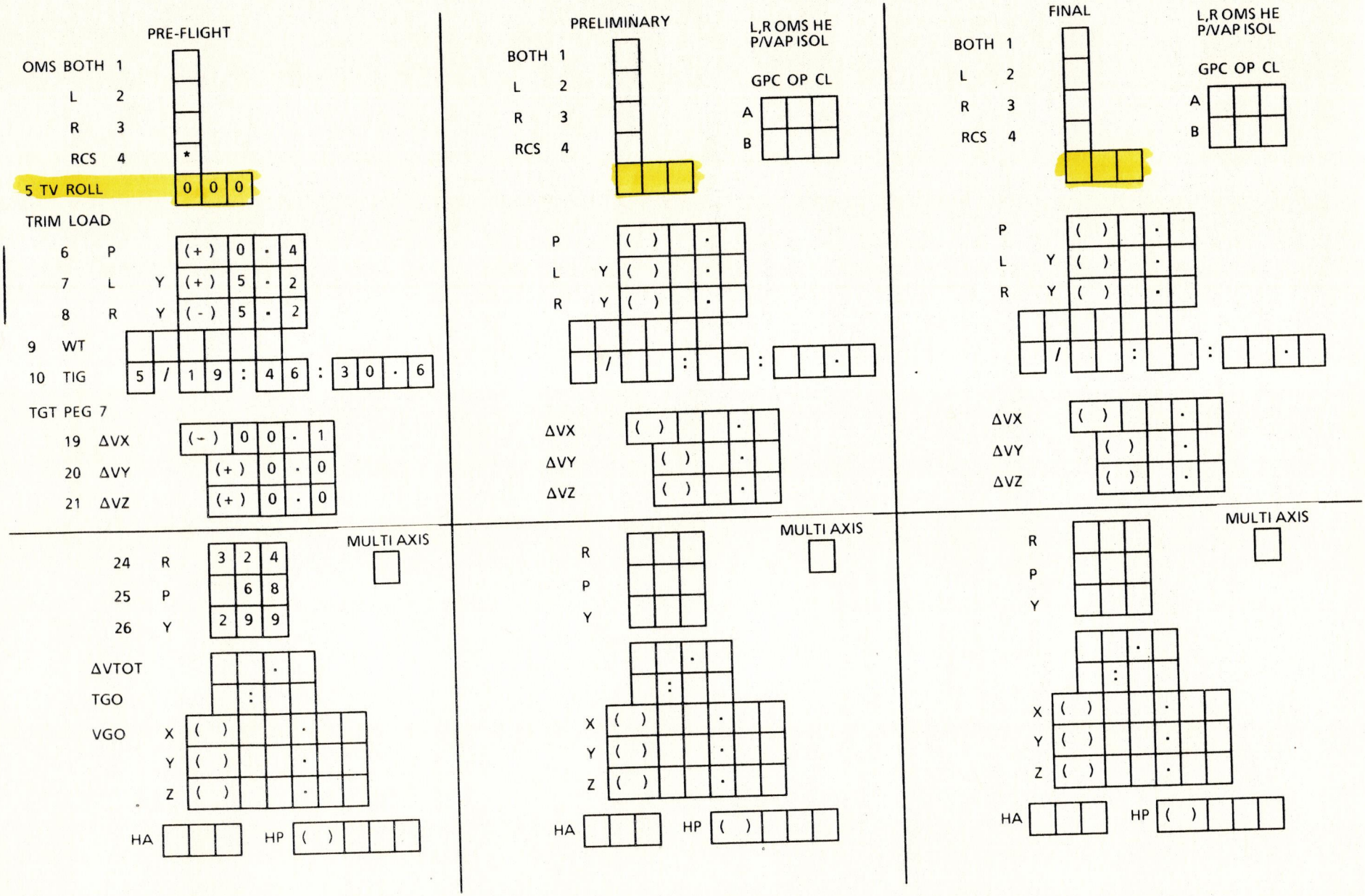
NOTE
SELF TEST runs about 3 min

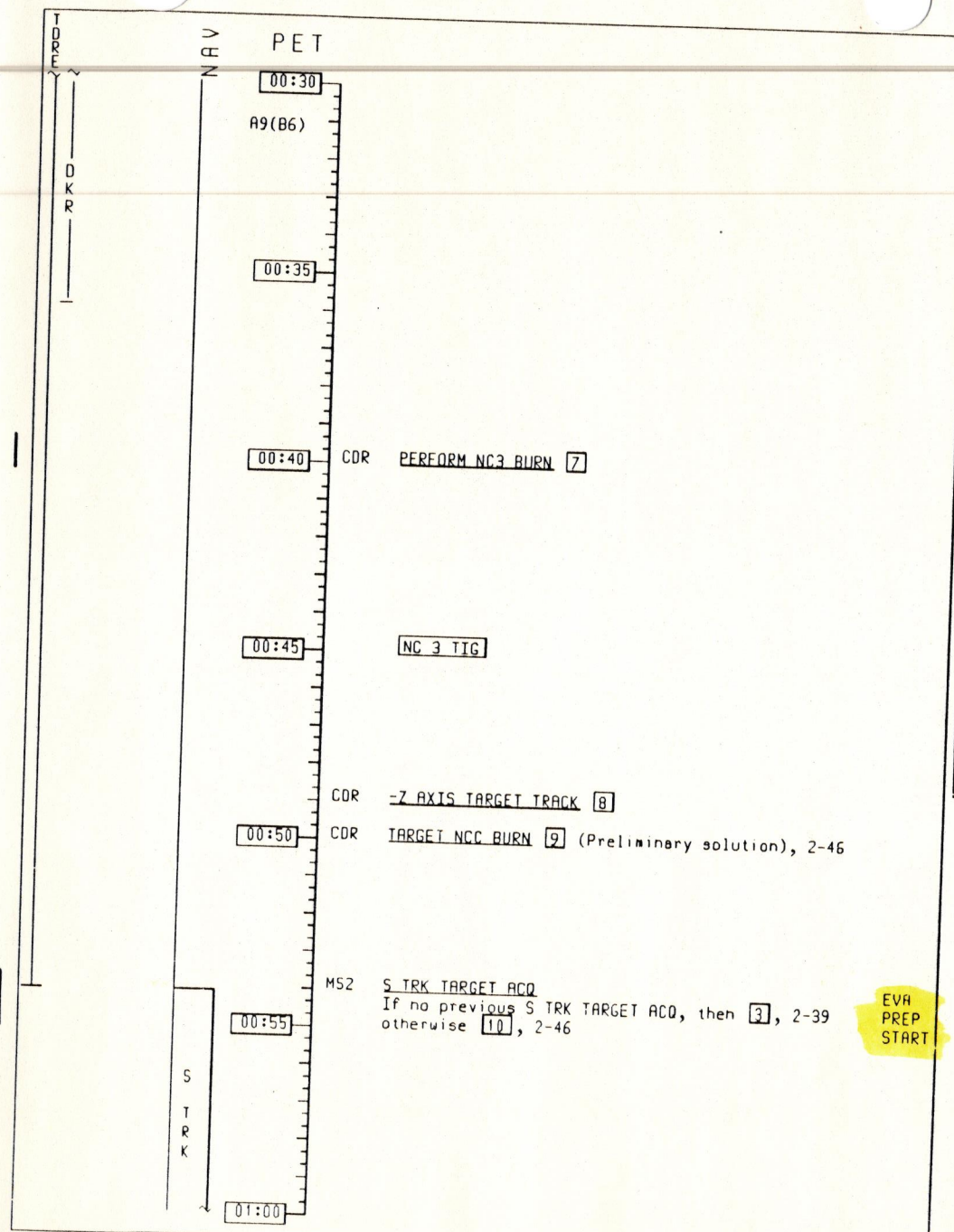
A1U ✓KU SCAN WARN tb - gray
✓TRACK tb - gray
✓SEARCH tb - gray
A2 ✓RANGE - 888.8
CRT SELF TEST - ITEM 7 EXEC (no x)
A2 DIGI-DIS SEL - EL/AZ

A1U KU MODE - COMM
KU - GPC
KU CNTL - CMD

Install -Z CORS
Install RNDZ OPS Cue Card (two)

NC3 BURN PAD


PRE-FLIGHT
OMS BOTH 1
L 2
R 3
RCS 4
5 TV ROLL
TRIM LOAD
6 P
7 L Y
8 R Y
9 WT
10 TIG
TGT PEG 7
19 ΔVX
20 ΔVY
21 ΔVZ
PRELIMINARY
L,R OMS HE P/VAP ISOL
GPC OP CL
A
B
FINAL
MULTI AXIS
24 R
25 P
26 Y
ΔVTOT
TGO
VGO
HA
HP



PERFORM NC3 BURN 7

CRT OPS 202 PRO
GNC ORBIT MNVR EXEC

Load TGT data per pad
LOAD - ITEM 22 EXEC
TIMER - ITEM 23 EXEC
✓Burn data per pad

TIG -2:00 ••
Perform EXECUTE RCS BURN (Cue Card, RNDZ OPS)
C3 DAP: B/AUTO/NORM

-Z AXIS TARGET TRACK 8

GNC UNIV PTG
CRT ✓TGT ID +1
✓BODY VECT +3 (-Z)
✓OM +0

.....-Y S TRK.....
. .
. ✓BODY VECT +5 .
. ✓P +0 .
. ✓Y +280.6 .
. ✓OM +26.27 .
.....

✓TRK - ITEM 19 EXEC (CUR - x)
C3 ✓DAP: B/AUTO/NORM
When mnvr to att complete,
DAP: A/AUTO/VERN

TARGET NCC BURN [9]

CRT ✓SV SEL correct
[GNC 34 ORBIT TGT]
TGT NO - ITEM 1 + 9 EXEC
✓TGT Set data:
T1 TIG = (BASE TIME -0/0:57:06)
EL + 0
ΔT + 57.1
ΔX - 48.60
ΔY + 0
ΔZ - 1.20
COMPUTE T1 - ITEM 27 EXEC

Note solution

.....Final solution.....
. If FLTR converged (> 40 marks in current sensor pass & SV UPDATE POS < .5), Burn FLTR soln .
. If FLTR within ground solution limits, Burn FLTR soln .
. If PROP within ground solution limits, Burn PROP soln .
. If none of the above, Burn ground soln EXT ΔVs .
.....

NCC BURN SOLUTION

TIG 005 / 20 : 20 : 54

	PRELIMINARY	INTERMEDIATE	FINAL	GROUND	FINAL-GROUND LIMITS
ΔVX	( ) .	( ) .	( ) .	( ) .	(2 . 1)
ΔVY	( ) .	( ) .	( ) .	( ) .	(6 . 0)
ΔVZ	( ) .	( ) .	( ) .	( ) .	(9 . 2)
ΔVT	.	.	.	.	

S TRK TARGET ACQ [10]

[GNC 21 IMU ALIGN]
CRT IMU DES - ITEM 7(8,9) EXEC (*)
(NH BURN PAD, 2-40)

[GNC 22 S TRK/COAS CNTL]
CRT -Z(-Y) TGT TRK, ITEM 6(5) - (*)
✓STATUS - blank
✓SHUTTER - OP
✓S PRES - *

If SHUTTER - CL,
MAN OP - ITEM 16(15) EXEC (*)

[GNC 33 REL NAV]
✓INH Angles, ITEM 24 - (*)
✓S TRK, ITEM 12 - (*)

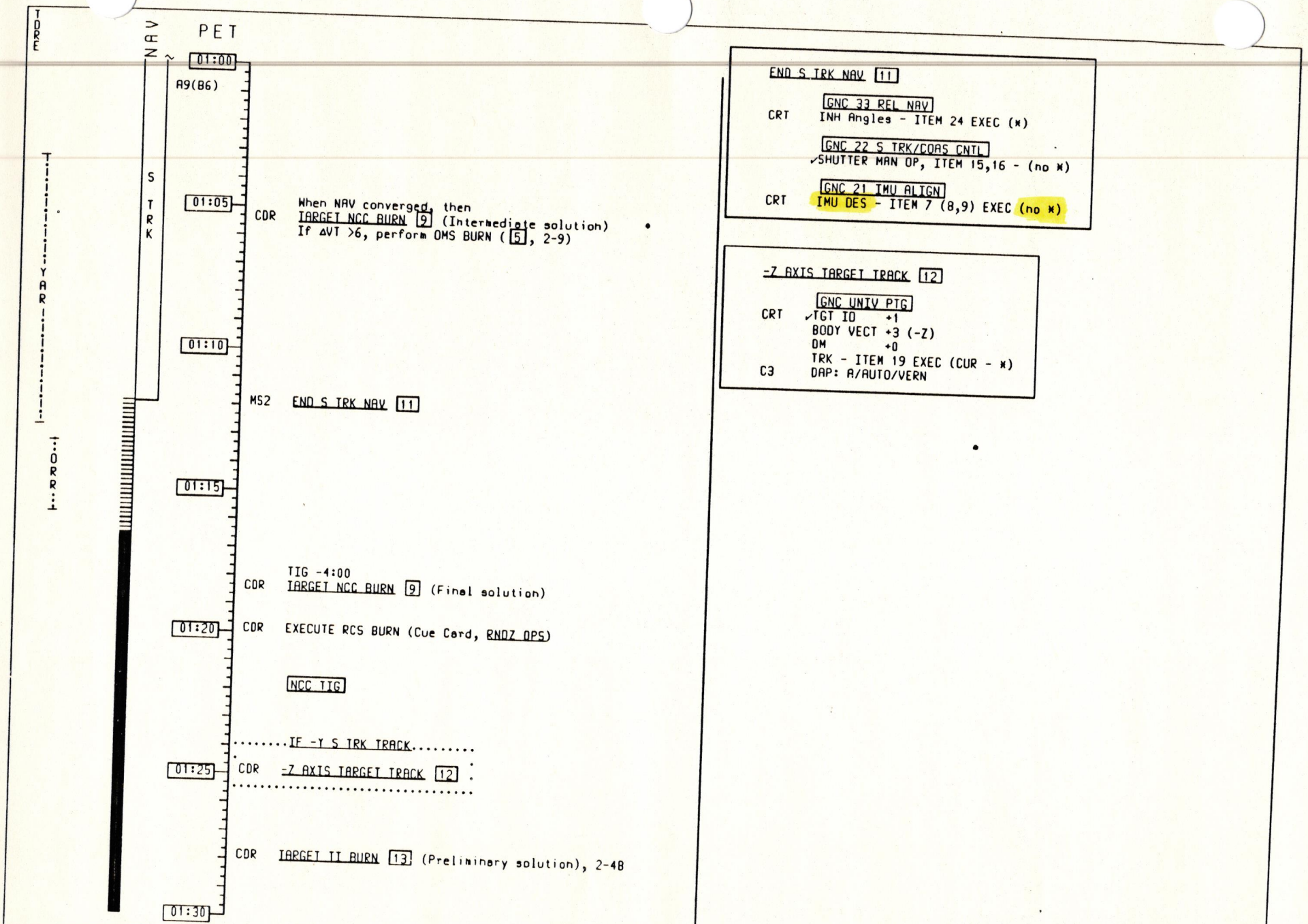
Monitor RESID V and H each NAV cycle

If V and H RESID change < .05 for four consecutive NAV cycles,
If RATIO < 1.0,
FLTR TO PROP - ITEM 8 EXEC
AUTO Angles - ITEM 23 EXEC (*)

If RATIO > 1.0,
1) COVAR REINIT - ITEM 16 EXEC
2) FOR 3 Angle Marks
3) PROP TO FLTR - ITEM 9 EXEC

If V and H RESID change > .05,
[GNC 22 S TRK/COAS CNTL]
-Z(-Y) BREAK TRK - ITEM 8(7) EXEC

NOTE
If FLTR minus PROP changes by more than 40 K ft within a S TRK pass, then
SV SEL - ITEM 4 EXEC (PROP)
INHIBIT Angles - ITEM 24 EXEC (*)
PROP to FLTR transfer - ITEM 9 EXEC
[GNC 22 S TRK/COAS CNTL]
-Z(-Y) BREAK TRK - ITEM 8(7) EXEC
Repeat S TRK ACQ


IDRE
NAV
PET
01:00
A9(B6)
S
T
R
K
01:05
CDR When NAV converged, then
TARGET NCC BURN [9] (Intermediate solution)
If ΔVT >6, perform OMS BURN ([5], 2-9)
01:10
MS2 END S TRK NAV [11]
01:15
TIG -4:00
CDR TARGET NCC BURN [9] (Final solution)
01:20
CDR EXECUTE RCS BURN (Cue Card, RNDZ OPS)
NCC TIG
.....IF -Y S TRK TRACK.....
01:25
CDR -Z AXIS TARGET TRACK [12]
CDR TARGET TI BURN [13] (Preliminary solution), 2-48
01:30
TIME YARD STICK
END S TRK NAV [11]
GNC 33 REL NAV
CRT INH Angles - ITEM 24 EXEC (*)
GNC 22 S TRK/COAS CNTL
✓SHUTTER MAN OP, ITEM 15,16 - (no *)
GNC 21 IMU ALIGN
CRT IMU DES - ITEM 7 (8,9) EXEC (no *)
-Z AXIS TARGET TRACK [12]
GNC UNIV PTG
CRT ✓TGT ID +1
BODY VECT +3 (-Z)
OM +0
TRK - ITEM 19 EXEC (CUR - *)
C3 DAP: A/AUTO/VERN

LOAD DELAY BURN [17]

[GNC 33 REL NAV]

CRT INHIBIT RR ANGLES - ITEM 24 EXEC (*)

OPS 202 PRO

[GNC ORBIT MNVR EXEC]

Load Eng Sel, WT and Trims per TI pad, 2-50

✓TIG = TI TIG

Load Peg 7 TGTS per DELAY PAD, below

Go to EXECUTE TI BURN [19], 2-51

ΔVX	( )			.		( )			.	
ΔVY	( )			.		( )			.	
ΔVZ	( )			.		( )			.	

TARGET TI BURN [13]

[GNC 34 ORBIT TGT]

CRT TGT NO - ITEM 1 +1 0 EXEC

✓TGT Set data:

TI TIG = (BASE TIME)

EL + 0

ΔT + 81.2

ΔX + 0

ΔY + 0

ΔZ + 0

COMPUTE TI - ITEM 27 EXEC

Note solution in pad, 2-50

CONFIGURE FOR RR TARGET ACQ [14]

A1U KU MODE - RDR PASSIVE

✓KU - GPC

✓KU RADAR OUTPUT - HI

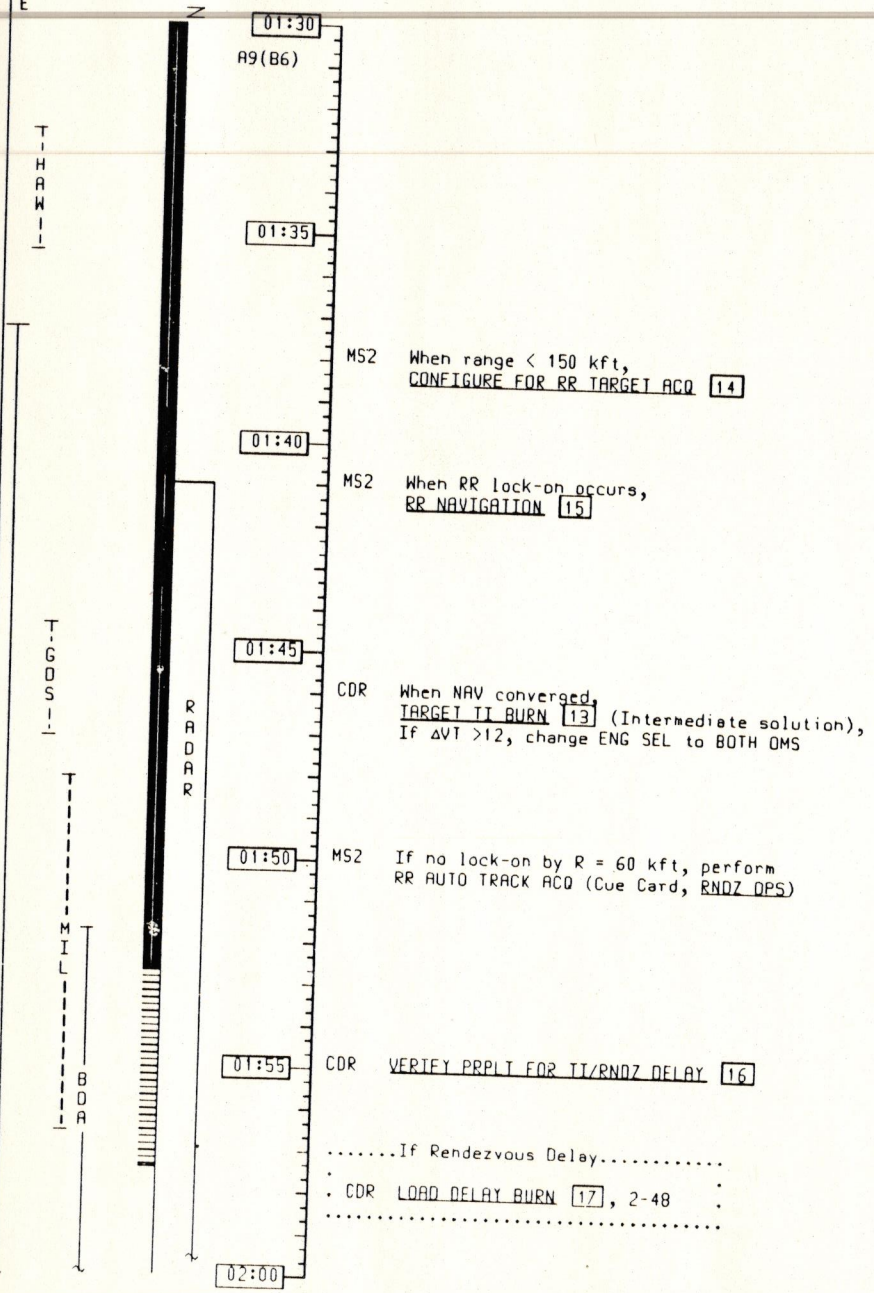
KU CNTL - PNL

[GNC 33 REL NAV]

CRT KU ANT ENA - ITEM 2 EXEC (*)

GNC, I/O RESET EXEC

A2 DIGI-DIS SEL - R/RDOT



RR NAVIGATION 15

GNC 33 REL NAV

CRT RR - ITEM 13 EXEC (*)
✓Elev, Az approx 0

If RATIO < 1.0 for four NAV cycles,
- FLTR TO PROP - ITEM 8 EXEC
- AUTO RNG - ITEM 17 EXEC (*)
  RDOT - ITEM 20 EXEC (*)
  Angles - ITEM 23 EXEC (*)

.....IF SV SEL = PROP.....
. When SV UPDATE POS < 0.3 and MARK ACPT > 9, SV SEL - ITEM 4 EXEC (FLTR) .

If RATIO > 1.0 with previous S TRK,
1) COVAR REINIT - ITEM 16 EXEC
2) If NCC burned on FLTR vector, FLTR TO PROP - ITEM 8 EXEC FOR 3 Marks
3) PROP TO FLTR - ITEM 9 EXEC

If RATIO > 1.0 and no previous S TRK, FOR 3 Marks

VERIFY PRPLT FOR TI/RNDZ DELAY 16

The following deltas to the RENDEZVOUS OMS/RCS PRPLT PAD Cue Card apply:

To perform TI:

subtract from OMS/RCS QTY 1% + 1% per 6 fps TI

or add to AFT RCS QTY 5% + 1% per 1 fps TI

and

add to FWD RCS QTY 5%

To perform RNDZ DELAY:

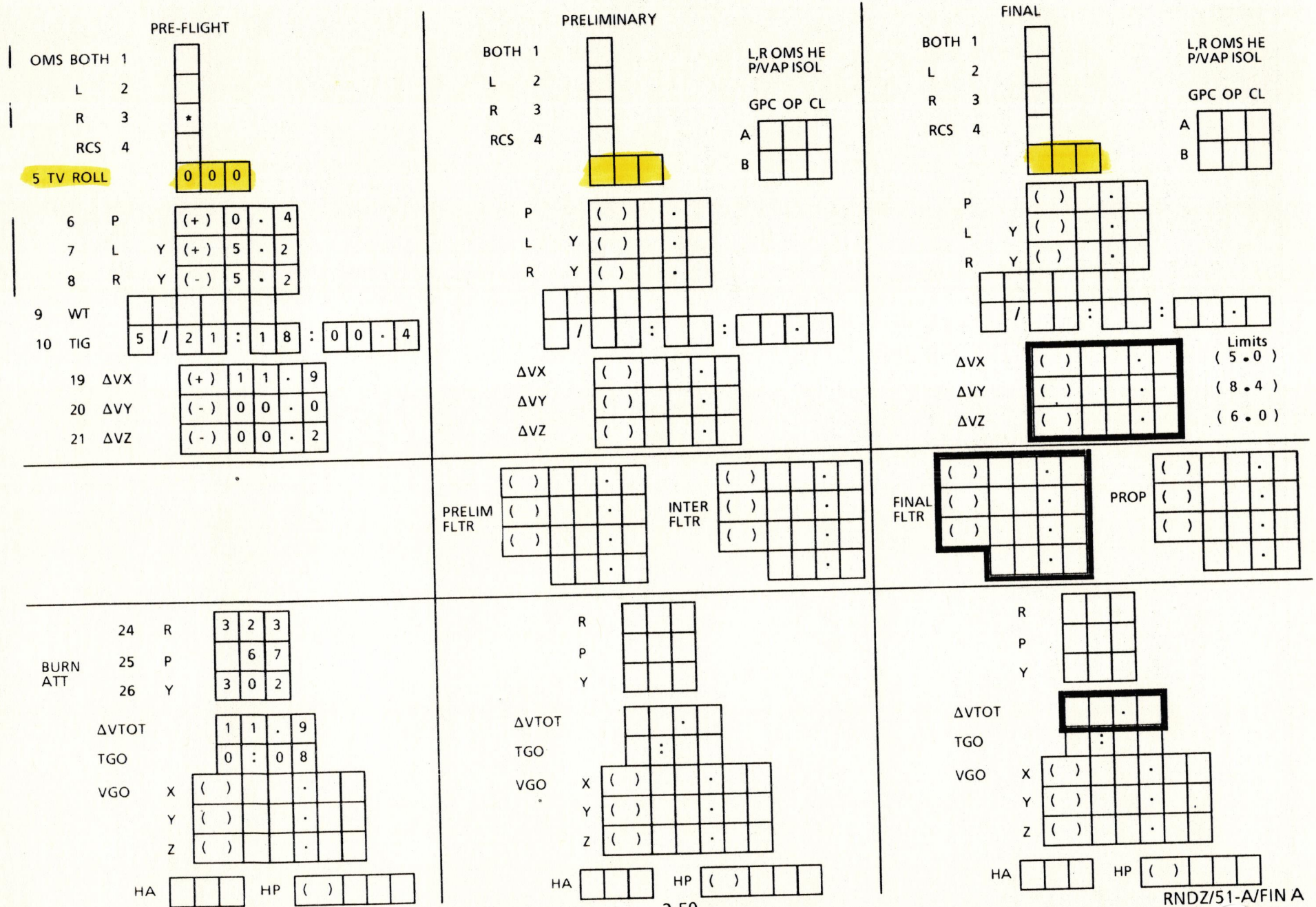
subtract from OMS/RCS QTY 2.2% _____

or add to AFT RCS QTY 14% _____

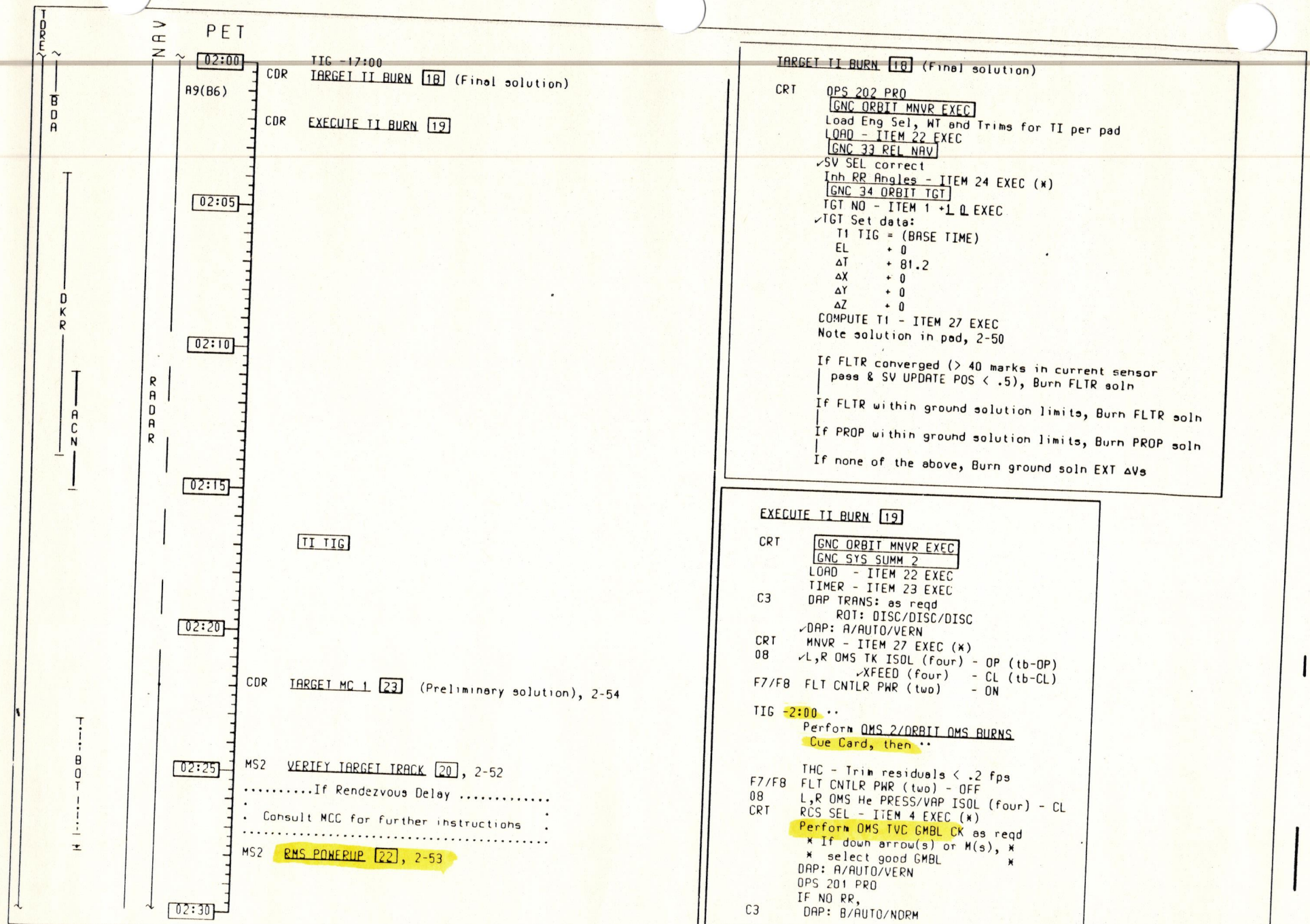
and

add to FWD RCS QTY 5% _____

TI BURN PAD



RNDZ/51-A/FIN A



IARGET II BURN [18] (Final solution)

CRT OPS 202 PRO
[GNC ORBIT MNVR EXEC]
Load Eng Sel, WT and Trims for TI per pad
LOAD - ITEM 22 EXEC
[GNC 33 REL NAV]
✓SV SEL correct
Inh RR Angles - ITEM 24 EXEC (✱)
[GNC 34 ORBIT TGT]
TGT NO - ITEM 1 +1 0 EXEC
✓TGT Set data:
T1 TIG = (BASE TIME)
EL + 0
ΔT + 81.2
ΔX + 0
ΔY + 0
ΔZ + 0
COMPUTE TI - ITEM 27 EXEC
Note solution in pad, 2-50

If FLTR converged (> 40 marks in current sensor pass & SV UPDATE POS < .5), Burn FLTR soln

If FLTR within ground solution limits, Burn FLTR soln

If PROP within ground solution limits, Burn PROP soln

If none of the above, Burn ground soln EXT ΔVs

EXECUTE TI BURN [19]

CRT [GNC ORBIT MNVR EXEC]
[GNC SYS SUMM 2]
LOAD - ITEM 22 EXEC
TIMER - ITEM 23 EXEC
C3 DAP TRANS: as reqd
ROT: DISC/DISC/DISC
✓DAP: A/AUTO/VERN
CRT MNVR - ITEM 27 EXEC (✱)
08 ✓L,R OMS TK ISOL (four) - OP (tb-OP)
✓XFEED (four) - CL (tb-CL)
F7/F8 FLT CNTLR PWR (two) - ON

TIG -2:00 ..
Perform OMS 2/ORBIT OMS BURNS Cue Card, then ..

THC - Trim residuals < .2 fps
F7/F8 FLT CNTLR PWR (two) - OFF
08 L,R OMS He PRESS/VAP ISOL (four) - CL
CRT RCS SEL - ITEM 4 EXEC (✱)
Perform OMS TVC GMBL CK as reqd
✱ If down arrow(s) or M(s), ✱
✱ select good GMBL ✱
DAP: A/AUTO/VERN
OPS 201 PRO
IF NO RR,
C3 DAP: B/AUTO/NORM

VERIFY TARGET TRACK [20]

✓Attitude mnvr complete
[GNC 33 REL NAV]

If RR Fail
| Go to S TRK TARGET ACQ - RR FAIL [21] >>
If KU TRACK tb - gray
CRT AUTO Angles - ITEM 23 EXEC (✱)
If KU TRACK tb - bp,
Perform RR AUTO TRACK ACQ (Cue Card, RNDZ OPS), then
If still no RR ACQ,
Inh RNG - ITEM 18 EXEC (✱)
RDOT - ITEM 21 EXEC (✱)
✓Angles - ITEM 24, (✱)
If -Z S TRK avail,
| Go to S TRK TARGET ACQ [10], 2-39 >>
If -Z S TRK failed,
Go to COAS NAVIGATION (Cue Card, RNDZ OPS)

S TRK TARGET ACQ - RR FAIL [21]

[GNC 21 IMU ALIGN]
CRT IMU DES - ITEM 7 (8,9) EXEC (✱)
(NH BURN PAD, 2-40)

✓DAP: A/AUTO/VERN
✓Tgt within 1° of COAS center

..IF POINTING ERROR > 1° AND -Z S TRK NOT ACQ ....
. Perform COAS NAVIGATION, (Cue Card, RNDZ OPS) .
. until Angle RESIDs < .5 .

.....IF -Y S TRK .....
[GNC UNIV PTG]
CRT ✓TGT ID +1
BODY VECT +5
P +0
Y +280.6
OM +90
TRK - ITEM 19 EXEC
C3 DAP: B/AUTO/NORM
When mnvr complete,
DAP: A/AUTO/VERN

[GNC 22 S TRK/COAS CNTL]
CRT ✓-Z(-Y) TGT TRK, ITEM 6(5) - (✱)
✓STATUS - blank
✓SHUTTER - OP

If SHUTTER - CL,
MAN OP - ITEM 16(15) EXEC (✱)

When S PRES - (✱),
[GNC 33 REL NAV]
✓INH Angles - ITEM 24 - (✱)
✓ST - ITEM 12 EXEC (✱)

Monitor RESID V and H each NAV cycle
Use COAS to monitor acquisition

If RESID V and H change < .05 for four
| consecutive NAV cycles and COAS
| verifies tgt lock-on,
| If RATIO < 1.0,
| | FLTR TO PROP - ITEM 8 EXEC
| | AUTO Angles - ITEM 23 EXEC (✱)
| If RATIO > 1.0,
| 1) COVAR REINIT - ITEM 16 EXEC
| 2) FOR 3 Angle Marks
| 3) PROP to FLTR - ITEM 9 EXEC
If RESID V or H changes > .05 or COAS
verifies tgt not acquired,
[GNC 22 S TRK/COAS CNTL]
-Z(-Y) BREAK TRK - ITEM 8(7) EXEC

.....NO S TRK ACQ AFTER 5 MIN.....
....IF -Y S TRK.....
[GNC UNIV PTG]
BODY VECT +3
OM +0
TRK - ITEM 19 EXEC (✱)
DAP: B/AUTO/NORM
When mnvr complete,
DAP: A/AUTO/VERN
Perform COAS NAVIGATION (Cue Card, RNDZ OPS)

RMS POWERUP [22]
(Assumes RMS in TEMP MONITOR)

NOTE: If TI was a ground targeted burn or RR has failed, delay RMS Powerup until after MC1.

PLB LTS

A7 PL BAY FLOOD - as reqd

✓Physical integrity of arm, EE, blankets

RMS SEL (IDLE MODE)

✓BRAKES - ON (tb-ON)
✓RMS SEL - OFF
✓PWR - PRI

CRT [SM 94 PDRS CONTROL]
✓I/O ON, ITEM 5 - (✱)
✓ENA, ITEM 9,11 - (✱)

RMS SEL - PORT (if cradled, MA, C/W RCH LIM lt-on (SP,EP), SINGULAR lt-on (EP)

✓SAFING tb - grey

DEPLOY/RELEASE ARM

R13L PL BAY MECH PWR SYS (two) - ON
✓PORT RMS - DPY (tb-DPY)
PORT RMS RETEN LAT - REL (tb-REL) (16 sec max), then - OFF
PL BAY MECH PWR SYS (two) - OFF

ARM UNCRADLE

PARAM sel - JOINT ANGLE
BRAKES - OFF (tb-OFF)
Until clear of MPMs:
RATE sw - VERN (RATE MIN tb-ON)
MODE - SINGLE, ENTER

SINGLE DR to approx:

	SY	SP	EP	WP	WY	WR
1	0	0	0	+5	0	0
2			+1			
3		+25				
4			-25			

BRAKES - ON (tb-ON)

IARGET MC 1 [23]

CRT ✓SV SEL correct
[GNC 34 ORBIT TGT]
TGT NO - ITEM 1 +1 1 EXEC
✓TGT Set data:
T1 TIG = (BASE TIME +0/00:25:16)
EL + 0
ΔT + 55.9
ΔX + 0
ΔY + 0
ΔZ + 0
COMPUTE T1 - ITEM 27 EXEC

Note solution

MC 1 BURN SOLUTION

TIG 0 0 5 / 2 1 : 4 3 : 1 7

	PRELIMINARY	INTERMEDIATE
ΔVX	( ) .	( ) .
ΔVY	( ) .	( ) .
ΔVZ	( ) .	( ) .
ΔVT	.	.

	FINAL	3σ VARIATION
ΔVX	( ) .	(0 . 3)
ΔVY	( ) .	(0 . 3)
ΔVZ	( ) .	(1 . 2)
ΔVT	.	(1 . 3)

RMS TO POISE FOR CAPTURE [24]

CRT [SM 94 PDRS CONTROL]
PL ID, ITEM 3 + 1 EXEC
PL INIT ID, ITEM 24 + 1 EXEC

OPR CMD to POISE FOR CAPTURE

-940, -76, -800, 0, 60, 270

SY	SP	EP	WP	WY	WR
-9	+109	-79	-95	-69	-44

BRAKES - ON (tb - ON)

SINGLE JOINT POISE FOR CAPTURE [25]

CRT [SM 94 PDRS CONTROL]
PL ID, ITEM 3 + 1 EXEC

Mnvr to poise for capture orientation

SY	SP	EP	WP	WY	WR
-90	+123	-79	-64	0	+20

TDRE

NAV

PET

02:30

A9(B6)

When NAV converged,

CDR TARGET MC 1 [23] (Intermediate solution)

MS2 RMS TO POISE FOR CAPTURE [24]

.....IF SINGLE JOINT RMS OPS .....

02:35

MS2 SINGLE JOINT POISE FOR CAPTURE [25]

TIG -4:00

CDR TARGET MC 1 [23] (Final solution)

02:40

CDR EXECUTE RCS BURN (Cue Card, RNDZ OPS)

MC 1 TIG

.....IF NO TGT ACQ (RR, S TRK or COAS) or NO NAV .....

CONVERGENCE by SUNSET

02:45

CDR EXECUTE RENDEZVOUS BREAKOUT (Cue Card, RNDZ BREAKOUT)

CDR TARGET MC 2 [26] (Preliminary solution)

* CHECK time for out of plane null

.....IF S TRK.....

At Sunset,

MS2 END S TRK NAV [27]

02:50

CDR When Y = 0,

MANUAL OUT-OF-PLANE NULL [28]

02:55

CDR When NAV converged, then

TARGET MC 2 [29] (Intermediate solution)

03:00

YAR

RADAR

TARGET MC 2 [26] (Preliminary solution)

CRT ✓SV SEL correct

GNC 34 ORBIT TGT

TGT NO - ITEM 1 +1 2 EXEC

✓TGT Set data:

T1 TIG = (BASE TIME +0/00:49:30)

EL + 28.4

ΔT + 31.7

ΔX + 0

ΔY + 0

ΔZ + 0

Note Nominal T1 TIG in pad, 2-56

COMPUTE T1 - ITEM 27 EXEC

Note solution, 2-56

END S TRK NAV [27]

GNC 33 REL NAV

CRT INH Angles - ITEM 24 EXEC (*)

RR - ITEM 13 EXEC (*)

GNC 22 S TRK/COAS CNTL

✓SHUTTER MAN OP, ITEM 15,16 - (no *)

GNC 21 IMU ALIGN

IMU DES - ITEM 7 (8,9) EXEC (no *)

If subsequent radar lock,

Perform RR NAVIGATION [15], 2-49

MANUAL OUT-OF-PLANE NULL [28]

GNC 33 REL NAV

CRT When Y = 0

F7 FLT CNTLR PWR - ON

C3 DAP: A/AUTO/NORM

DAP TRANS: as reqd

THC - Null YDOT

If -Z AXIS TRACK,

+YDOT = FWD THC left

AFT THC right

If -Y S TRK TRACK,

+YDOT = FWD THC down

AFT THC out

DAP: A/AUTO/VERN

F7 FLT CNTLR PWR - OFF

TARGET MC 2 [29] (Intermediate solution)

GNC 34 ORBIT TGT

CRT TGT NO - ITEM 1 +1 2 EXEC

COMPUTE T1 - ITEM 27 EXEC

Note solution, 2-56

Breakouts Delay till MC3

TARGET MC 2 [30] (Final solution)

CRT ✓SV SEL correct
GNC 34 ORBIT TGT
TGT NO - ITEM 1 +1 2 EXEC
COMPUTE T1 - ITEM 27 EXEC
✓TIG change between -3 and +7 min

.....TIG Change <-3 or >+7 .....
. .
. TGT NO - ITEM 1 + 1 2 EXEC .
. T1 TIG = (Nominal -3,+7 min as appropriate) .
. EL + 0 .
. BASE TIME = (same as T1 TIG) .
. LOAD - ITEM 26 EXEC .
. COMPUTE T1 - ITEM 27 EXEC .
.....

Set EVENT TIMER counting to MC 2 TIG

Note solution

CCTV CONFIG [31]

If reqd, pwr up CCTV, VTR per
IV/VTR Cue Card

A3 MON 1,2 SCAN to UNDERSCAN
A7U MON 1 - Camr A
MON 2 - Camr B
Aim A at B and B at A
PAN/TILT - RESET for both; aim
both at (or near) Elev 0° , Az 0°
Repeat for Camr C & D
Use A & B for data recording
Put new tapes in VTRs

MC 3 BURN SOLUTION

TIG 0 0 5 / 2 2 : 1 7 : 3 0

	PRELIMINARY	FINAL	3σ VARIATION
ΔVX	( )	( )	(0 . 3)
ΔVY	( )	( )	(0 . 3)
ΔVZ	( )	( )	(0 . 9)
ΔVT			(1 . 0)

MC 2 BURN SOLUTION

TIG 0 0 5 / 2 2 : 0 7 : 3 0

	PRELIMINARY	INTERMEDIATE	FINAL	3σ VARIATION
ΔVX	( )	( )	( )	(0 . 3)
ΔVY	( )	( )	( )	(0 . 3)
ΔVZ	( )	( )	( )	(1 . 5)
ΔVT			( )	(1 . 6)

		TIG SLIP (COMPUTED-NOM)
PREL	/ : :	___ : ___
INTER	/ : :	___ : ___
FINAL	/ : :	___ : ___
NOMINAL	/ : :	

TARGET MC 3 [32]

CRT ✓SV SEL correct
GNC 34 ORBIT TGT
TGT NO - ITEM 1 +1 3 EXEC
✓TGT Set data:
T1 TIG = (BASE TIME +0/00:10:00)
EL + 0
ΔT + 21.7
ΔX + 0
ΔY + 0
ΔZ + 0
COMPUTE T1 - ITEM 27 EXEC

Note solution

TV @ Haw

TV

Breakouts Delay till MC3

TORE | NAV | PET | ET

03:00 A9(B6)

TIG -5:00
CDR TARGET MC 2 [30] (Final solution)

03:05 CDR EXECUTE RCS BURN (Cue Card, RNDZ OPS)

MC 2 TIG

MS2 CCTV CONFIG [31]

03:10 .....IF -Y S TRK TRACK.....
CDR -Z AXIS TARGET TRACK [33]

TIG -4:00
CDR TARGET MC 3 [32]

03:15 CDR EXECUTE RCS BURN (Cue Card, RNDZ OPS)

MC 3 TIG

.....IF NO RR.....
03:20 CDR Delete MC4; at sunrise perform
ESTABLISH INERTIAL LOS RATES - RR FAIL [34],
RADAR FAIL, 3-4

TIG -4:00
CDR TARGET MC 4 [35]

03:25 CDR EXECUTE RCS BURN (Cue Card, RNDZ OPS)

MC 4 TIG

MANUAL TRAJECTORY CONTROL

CDR ESTABLISH INERTIAL LOS RATES [36], 2-59

03:30

HAW | RADAR | GDS | MIL | BDA

00:05 | 000:00:00 | 00:05 | 00:10 | 00:15 | 00:20

-Z AXIS TARGET TRACK [33]

GNC UNIV PTG
CRT ✓TGT ID +1
BODY VECT +3 (-Z)
DM +0
TRK - ITEM 19 EXEC (CUR - *)
C3 DAP: A/AUTO/VERN

When mnvr complete,
DAP: A/AUTO/VERN

TARGET MC 4 [35]

CRT ✓SV SEL correct
GNC 34 ORBIT TGT
TGT NO - ITEM 1 +1 4 EXEC
✓TGT Set data:
T1 TIG = (BASE TIME +0/00:20:00)
EL + 0
ΔT + 11.7
ΔX + 0
ΔY + 0
ΔZ + 0
COMPUTE T1 - ITEM 27 EXEC

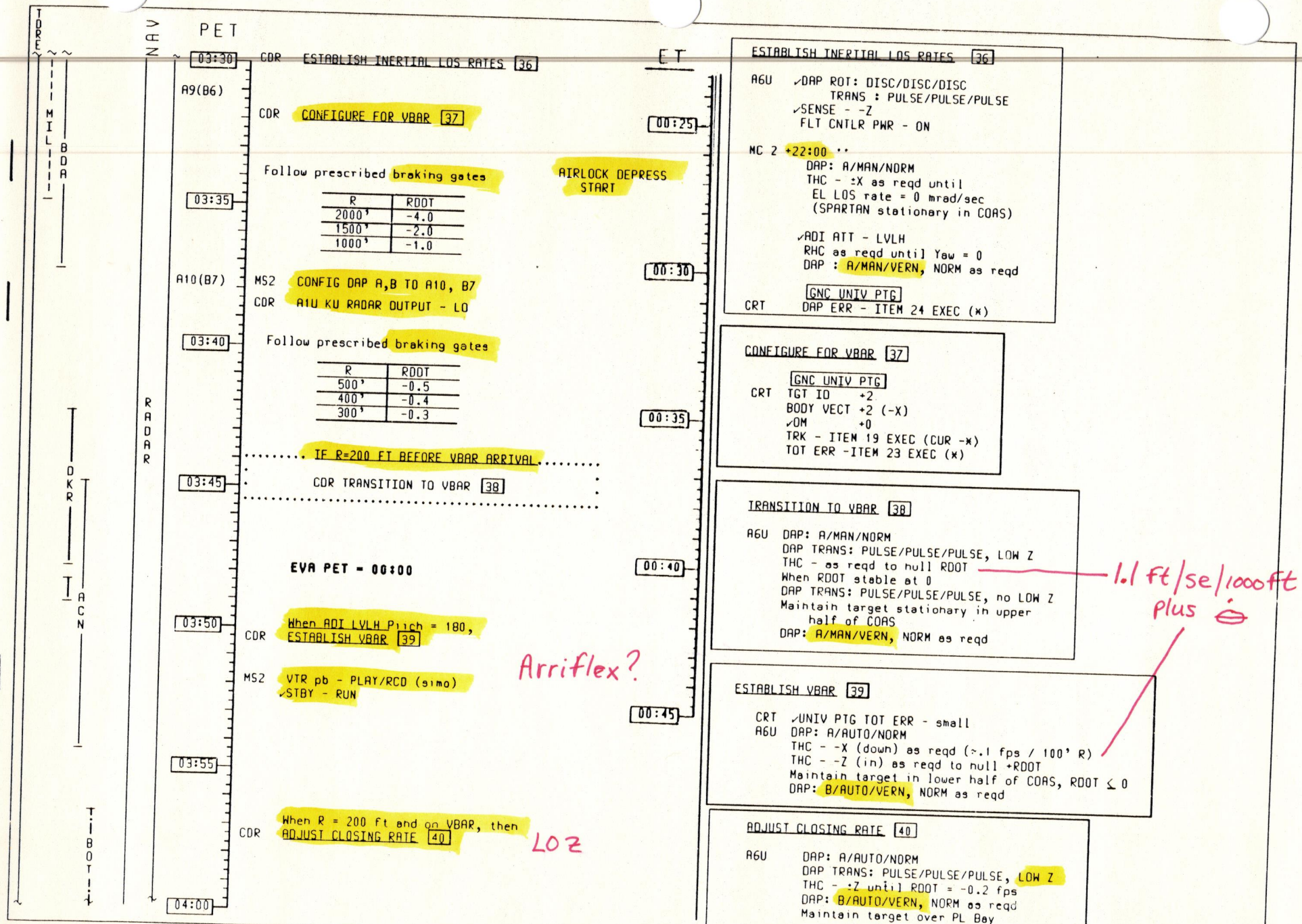
Note solution

MC 4 BURN SOLUTION

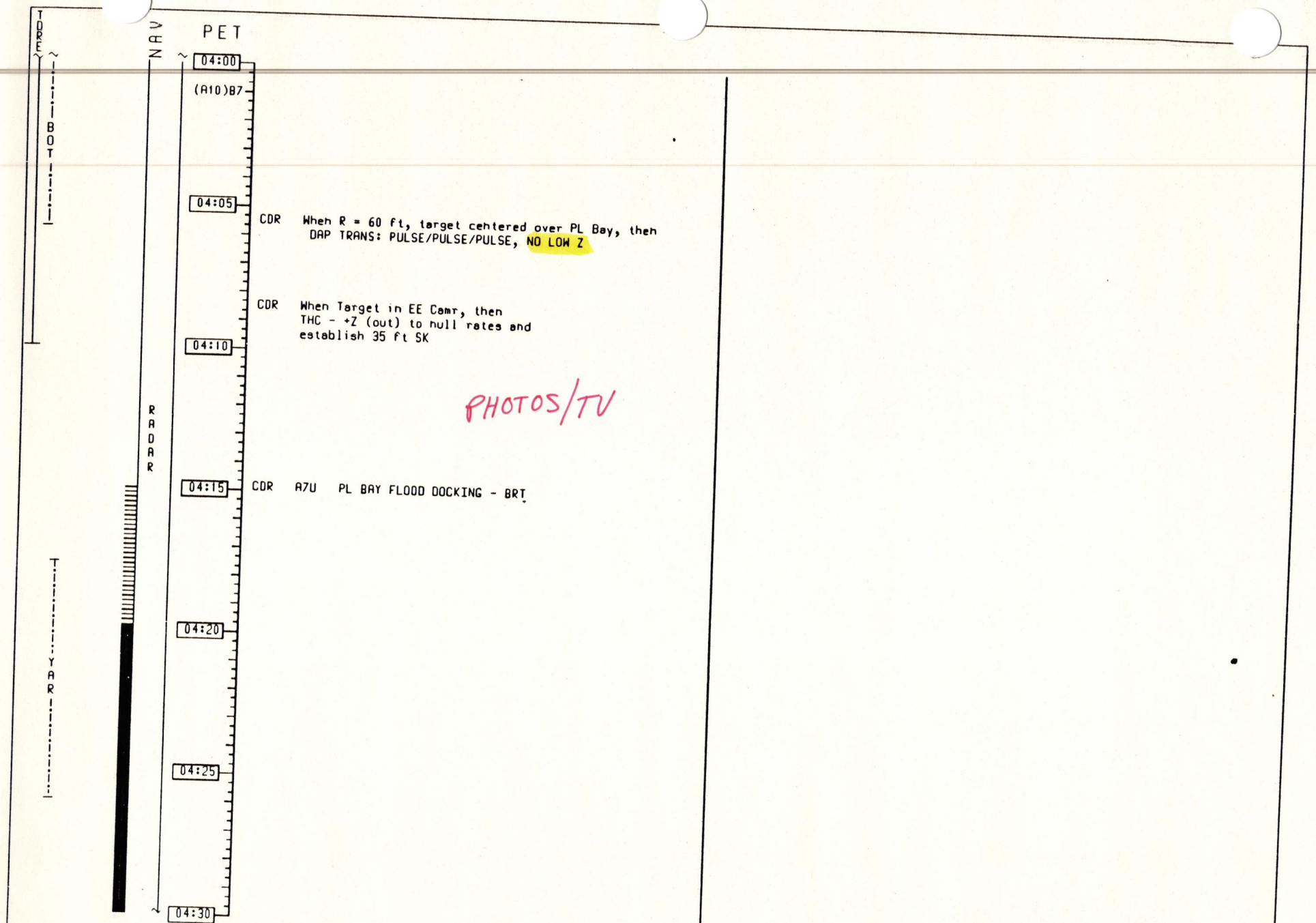
TIG 0 0 5 / 2 2 : 2 7 : 3 0

	PRELIMINARY	FINAL	3σ VARIATION
ΔVX	( ) .	( ) .	(0 . 6)
ΔVY	( ) .	( ) .	(0 . 9)
ΔVZ	( ) .	( ) .	(0 . 9)
ΔVT	.	.	(1 . 4)

THIS PAGE INTENTIONALLY BLANK


TDRE
MILA
BDA
NAV
RADAR
DKR
ACN
TIBOTI
PET
ET
03:30
CDR ESTABLISH INERTIAL LOS RATES [36]
A9(B6)
CDR CONFIGURE FOR VBAR [37]
Follow prescribed braking gates
AIRLOCK DEPRESS START
03:35
R | RDOT
2000' | -4.0
1500' | -2.0
1000' | -1.0
A10(B7)
MS2 CONFIG DAP A,B TO A10, B7
CDR A1U KU RADAR OUTPUT - LO
03:40
Follow prescribed braking gates
R | RDOT
500' | -0.5
400' | -0.4
300' | -0.3
IF R=200 FT BEFORE VBAR ARRIVAL
03:45
CDR TRANSITION TO VBAR [38]
EVA PET = 00:00
03:50
CDR When ADI LVLH Pitch = 180, ESTABLISH VBAR [39]
MS2 VTR pb - PLAY/RCD (simo)
✓STBY - RUN
Arriflex?
03:55
CDR When R = 200 ft and on VBAR, then ADJUST CLOSING RATE [40]
LOZ
04:00
00:25
00:30
00:35
00:40
00:45
ESTABLISH INERTIAL LOS RATES [36]
A6U ✓DAP ROT: DISC/DISC/DISC
TRANS : PULSE/PULSE/PULSE
✓SENSE - -Z
FLT CNTLR PWR - ON
MC 2 +22:00 ••
DAP: A/MAN/NORM
THC - ±X as reqd until
EL LOS rate = 0 mrad/sec
(SPARTAN stationary in COAS)
✓ADI ATT - LVLH
RHC as reqd until Yaw = 0
DAP : A/MAN/VERN, NORM as reqd
GNC UNIV PTG
CRT DAP ERR - ITEM 24 EXEC (*)
CONFIGURE FOR VBAR [37]
GNC UNIV PTG
CRT TGT ID +2
BODY VECT +2 (-X)
✓OM +0
TRK - ITEM 19 EXEC (CUR -*)
TOT ERR -ITEM 23 EXEC (*)
TRANSITION TO VBAR [38]
A6U DAP: A/MAN/NORM
DAP TRANS: PULSE/PULSE/PULSE, LOW Z
THC - as reqd to null RDOT
When RDOT stable at 0
DAP TRANS: PULSE/PULSE/PULSE, no LOW Z
Maintain target stationary in upper half of COAS
DAP: A/MAN/VERN, NORM as reqd
1.1 ft/se/1000ft
plus
ESTABLISH VBAR [39]
CRT ✓UNIV PTG TOT ERR - small
A6U DAP: A/AUTO/NORM
THC - -X (down) as reqd (≈.1 fps / 100' R)
THC - -Z (in) as reqd to null +RDOT
Maintain target in lower half of COAS, RDOT ≤ 0
DAP: B/AUTO/VERN, NORM as reqd
ADJUST CLOSING RATE [40]
A6U DAP: A/AUTO/NORM
DAP TRANS: PULSE/PULSE/PULSE, LOW Z
THC - ±Z until RDOT = -0.2 fps
DAP: B/AUTO/VERN, NORM as reqd
Maintain target over PL Bay

THIS PAGE INTENTIONALLY BLANK


TDRE
BOT
NAV
PET
04:00
(A10)B7
04:05
CDR When R = 60 ft, target centered over PL Bay, then
DAP TRANS: PULSE/PULSE/PULSE, NO LOW Z
CDR When Target in EE Camr, then
THC - +Z (out) to null rates and
establish 35 ft SK
04:10
PHOTOS/TV
RADAR
04:15
CDR A7U PL BAY FLOOD DOCKING - BRT
04:20
TIME/YAR
04:25
04:30

THIS PAGE INTENTIONALLY BLANK

TDRE

NAV

PET

04:30

04:35

04:40

04:45

04:50

04:55

05:00

T.

GWM

HAW

GDS

TV

CDR VERIFY PRPLT FOR MMU FREE FLIGHT [41]

PHOTOS

TV@HAW

MMU CHECK FLIGHT

If possible,
Document MMU Flyover
16 mm - On (1 min)
70 mm - Photos

MMU TO TARGET

VERIFY PRPLT FOR MMU FREE FLIGHT [41]

The following deltas to the RENDEZVOUS OMS/RCS PRPLT PAD Cue Card apply:

To perform MMU free flight:

subtract from OMS/RCS QTY 3.6% _____

or add to AFT RCS QTY 21% _____

and

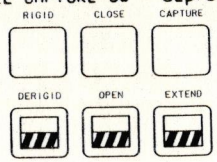
add to FWD RCS QTY 19% _____

TARGET CAPTURE [42]

BRAKES - OFF (tb-OFF)
MODE - END EFF, ENTER
EE MODE - AUTO

When grapple fixture in EE camera FOV,
DAP ROT: PULSE/PULSE/PULSE
DAP: B/MAN/VERN
EV1: CYCLE GYRO PWR

Mnvr to grapple envelope
EE CAPTURE sw - depress (mom)



(23 sec max)

BRAKES - ON (tb-ON)
EE MODE - OFF

SINGLE JOINT TARGET CAPTURE [43]

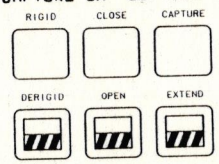
EE MODE - AUTO, if available

When grapple fixture in EE camera FOV,
DAP ROT: PULSE/PULSE/PULSE
DAP: B/MAN/VERN
EV1: CYCLE GYRO PWR

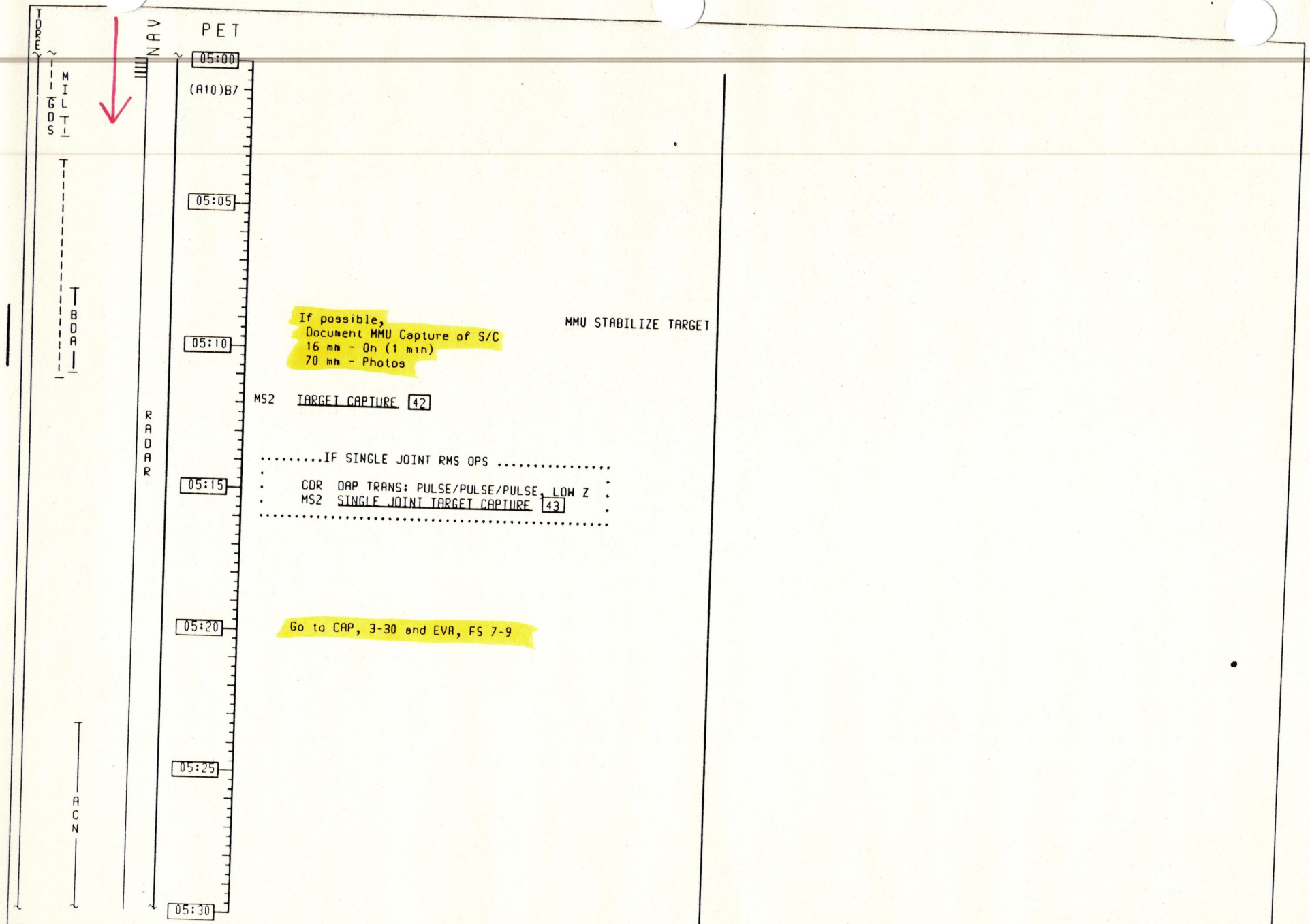
Mnvr to grapple envelope using control scheme below
(NOTE: Desired End Effector motion is in End Effector Axis System)

DESIRED EE MOTION	INPUT
$+X_{EE}$	-SP
$+Y_{EE}$	+SY
$+Z_{EE}$	-EP
$+P_{EE}$	+WP
$+Y_{EE}$	+WY
$+R_{EE}$	+WR

EE CAPTURE SW -DEPRESS (mom)



BRAKES - ON (tb-ON)
EE MODE - OFF


IDRE
GDS
MILTI
TBDA
ACN
NAV
RADAR
PET
05:00
(A10)B7
05:05
05:10
05:15
05:20
05:25
05:30
If possible,
Document MMU Capture of S/C
16 mm - On (1 min)
70 mm - Photos
MMU STABILIZE TARGET
MS2 TARGET CAPTURE 42
.....IF SINGLE JOINT RMS OPS .....
CDR DAP TRANS: PULSE/PULSE/PULSE, LOW Z
MS2 SINGLE JOINT TARGET CAPTURE 43
Go to CAP, 3-30 and EVA, FS 7-9

This Page Intentionally Blank

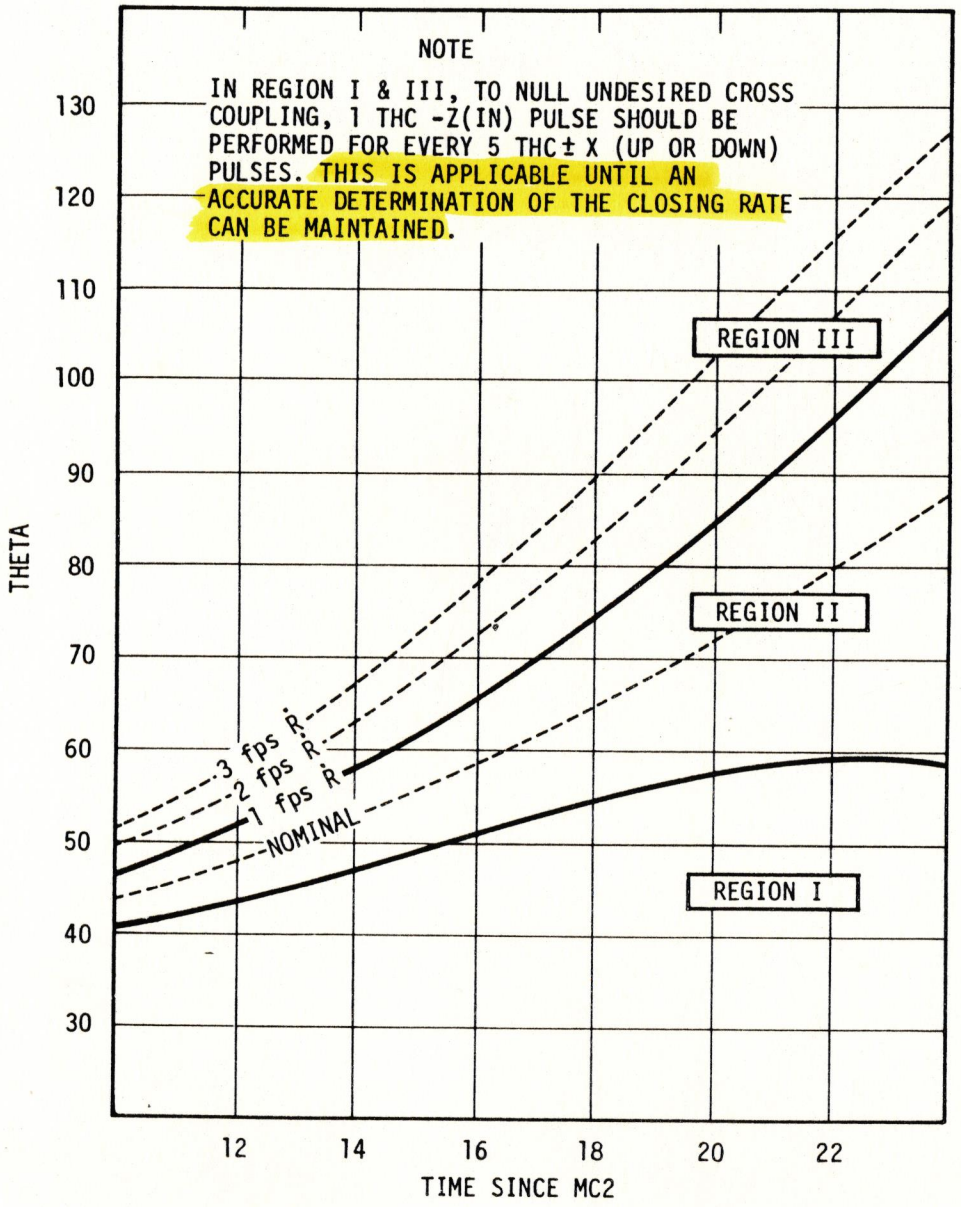
CONTINGENCY OPERATIONS

This Page Intentionally Blank

CONTINGENCY OPERATIONS

RADAR FAIL

RADAR FAIL



ESTABLISH INERTIAL LOS RATES - RR FAIL [34]

NOTE: If no visual (or RR) ACQ by MC2 + 25 min, EXECUTE RENDEZVOUS BREAKOUT, (Cue Card, RNDZ BREAKOUT)

A6U ✓DAP ROT: DISC/DISC/DISC
✓TRANS: PULSE/PULSE/PULSE
✓SENSE- -Z
✓ADI ATT- LVLH
FLT CNTLR PWR - ON
DAP: A/MAN/NORM
RHC - ±Pitch as reqd to place target on COAS horizontal
±Yaw as reqd until LVLH ADI Y_{aw} = 0

Use table to determine theta region

If Region I (very short case)
THC ±X as reqd to maintain target in upper half of COAS (1 THC -Z(in) per 5 ±X)
DAP: A/MAN/VERN, NORM as reqd

If Region II (nominal case)
THC - ±X as reqd to maintain target in upper half of COAS
DAP: A/MAN/VERN, NORM as reqd

If Region III (very long case)
THC - -Z(in) to perform RDOT correction from table ..
DAP: A/MAN/VERN, NORM as reqd
DAP ROT: DISC/PULSE/DISC
RHC - ±Pitch as reqd to maintain target on COAS horizontal
When target stable in COAS, monitor pitch rate

..IF PITCH RATE REACHES ZERO BEFORE VBAR ARRIVAL...
. DAP ROT: DISC/DISC/DISC .
. DAP: A/MAN/VERN, NORM as reqd .
. THC - ±X (up) as reqd to maintain target in upper half of COAS (THC -Z(in) per 5 ±X) .

Go to CONFIG FOR VBAR; Rndz 1, 2-27; Rndz 2, 2-59

MMU RESCUE

MMU RESCUE OMS/RCS PRPLT PAD

When L or R RCS QTY < [ ] :

I'CNECT: L OMS to RCS (ORB PKT, RCS)

When |G23| L OMS/RCS QTY > [ ] :

I'CNECT TK SWITCH: From L to R OMS FEED
(ORB PKT, RCS)

When |G23| R OMS/RCS QTY > [ ] :

I'CNECT RETURN (ORB PKT, RCS)

When L or R RCS QTY < [ ] :

Terminate MMU RESCUE

Note: When multiple FRCS JET FAIL OFF
messages received,
FRCS MANF (five) - CL (tb-CL)
DAP TRANS: PULSE/PULSE/PULSE, NO LOW Z

MMU RESCUE

√2nd EVA crewman secured
√DAP TRANS: PULSE/PULSE/PULSE, LOW Z if reqd
A1U √KU RADAR OUTPUT - LO

A6U FLT CNTLR PWR - ON

DAP: A/AUTO/VERN, NORM as reqd

.....IF MMU NOT VISIBLE.....
.
. DAP: A/LVLH/NORM (VERN) .
. RHC - as reqd until MMU is visible .
.
. DAP ROT: DISC/DISC/DISC .
.....

THC,RHC - as reqd to place/maintain MMU between Orbiter and satellite

THC - as reqd to null LOS rates

Monitor RNG, $\dot{R}$

DAP: B/AUTO/VERN, NORM as reqd

When MMU over payload bay, go to NORM Z

Adjust $\dot{R}$ for MMU contact at < -.2 fps

When MMU RESCUE complete,
THC - as reqd to maintain R ≤ 200' from satellite

If desired,
Maneuver to nearest Vbar SK position

	+VBAR	-VBAR
TGT ID	+2	+2
BODY VECT	+2	+2
OM	+0	+180

DAP: A/AUTO/NORM
THC - as reqd to maintain satellite in COAS

This Page Intentionally Blank

LOSS OF VRCS

LOSS OF VERNIERS

Use nominal rendezvous DAPS with TAIL ONLY CNTL from the beginning of the rendezvous up to the NCC burn. Use NOSE and TAIL CNTL during and after the NCC burn.

REFERENCE DATA

This Page Intentionally Blank

FLIGHT RULES

FAILURE	PROX OPS
GNC	
LOSS OF REDUNDANT +Z TRANS	NO GO
PRCS TRANS, ANY AXIS ↓	NO GO
PRCS ROT, ANY AXIS ↓	NO GO
AFT THC, ANY AXIS ↓ (1)	NO GO
AFT RHC, ANY AXIS ↓ (1)	NO GO
2 IMUs ↓	NO GO
VRCS ↓	GO
LOW Z ↓	GO
NAV SENSORS	
ALL NAV SENSORS ↓ (-Y ST, -Z ST, COAS, RR)	GO
DPS	
< 2 GNC GPCs	NO GO (2)
RMU	
1 KU ANTENNA STOW MOTOR↓	GO

NOTES:

(1) IFM FOR BOTH CONTROLLERS WILL BE CONSIDERED

(2) FOR LOSS OF ONE GNC GPC DURING TERMINAL PHASE RNDZ OR PROX OPS, APPROACHING TO WITHIN 200 FT OF THE TARGET, RECONFIGURATION TO A TWO-GNC REDUNDANT SET WILL BE DELAYED TO THE NEXT OPERATIONALLY CONVENIENT POINT.

LOSS OF ONE GNC GPC DURING PROX OPS WITHIN 200 FT WILL BE CAUSE TO SEPARATE TO 200 FT AND STATIONKEEP UNTIL RECONFIGURATION TO A TWO-GNC REDUNDANT SET IS COMPLETED.

FOR GNC OR SM GPC FAILURES, THE G3 FREEZE-DRY GPC MAY BE RECONFIGURED AS GNC OR SM IF TWO SOURCES OF THE G3 OVERLAY ARE AVAILABLE (MMU1, MMU2, G3 UPLINK).

ENGINE SELECTION CRITERIA

ΔV	ENGINES
< 6 FPS	RCS - PRIMARY TECHNIQUE IS SINGLE AXIS.
6 TO 12 FPS	SINGLE OMS
> 12 FPS	2 OMS

POST TI ABORT

THE ABORT MANEUVER SEQUENCE BETWEEN TI AND THE BEGINNING OF PROX OPS IS A 3 FPS OUT-OF-PLANE MANEUVER (NOMINALLY ORBITER Y BODY AXIS) AWAY FROM THE TARGET PLANE FOLLOWED 15 MINUTES LATER BY A 3 FPS RETROGRADE MANEUVER (ORBITER +X BODY AXIS). THE INITIATION OF THIS SEQUENCE IS AS FOLLOWS:

A. IF INSUFFICIENT PROP REMAINS TO PERFORM MIDCOURSE CORRECTION MANEUVERS OR IF NO TARGET SENSOR DATA (ST, COAS, VISUAL OR RR) HAS BEEN OBTAINED BY ORBITAL SUNSET THE ABORT MANEUVER SEQUENCE WILL BE INITIATED ASAP.

B. SUBSEQUENTLY, IF AN ABORT IS REQUIRED, THE SEQUENCE WILL BE INITIATED NO EARLIER THAN MC 3 BUT PRIOR TO THE BEGINNING OF PROX OPS.

C. IF NO RADAR OR VISUAL ACQUISITION HAS OCCURRED BY MC 4 +5 MINUTES THE ABORT SEQUENCE WILL BE INITIATED ASAP.

PROXIMITY OPERATIONS - ABORT

A. IF ON +VBAR, PERFORM 2 FPS POSIGRADE (NOMINALLY ORBITER Z BODY AXIS, NORM Z TRANSLATION MODE) ASAP. IF ON -VBAR, PERFORM 2 FPS RETROGRADE ASAP.

B. IF NOT ON +/- VBAR, CONTACT MCC FOR SPECIFIC SEPARATION PROCEDURE. IF UNABLE TO CONTACT MCC, PERFORM SEPARATION PROCEDURE (ORBIT OPS CHECKLIST) ASAP.

RENDEZVOUS MANEUVER SOURCE SELECTION

A. THE SOLUTIONS FOR THE NCC AND TI MANEUVERS WILL BE SELECTED ACCORDING TO THE FOLLOWING PRIORITIES.

1. ONBOARD FILTER SOLUTION IF THIS AGREES WITH THE GROUND SOLUTION OR IF REL NAV IS CONVERGED.

2. ONBOARD PROP SOLUTION IF THIS AGREES WITH THE GROUND SOLUTION.

3. GROUND SOLUTION.

MANEUVER SOLUTIONS ARE DEFINED TO BE IN AGREEMENT IF, FOR EACH AXIS, THE ΔV DIFFERS BY NO MORE THAN THE RSS OF THE PREMISSION GROUND AND ONBOARD 3σ VALUES. REL NAV IS DEFINED TO BE CONVERGED IF, FOR THE PRESENT SENSOR(S) IN ACQUISITION, 40 NAV MARKS HAVE BEEN ACCEPTED, WITH STATE VECTOR POSITION UPDATE LESS THAN 500 FT FOR THE LAST 10 MARKS.

B. ONBOARD SOLUTIONS WILL BE EXECUTED FOR FINAL PHASE MIDCOURSE MANEUVERS.

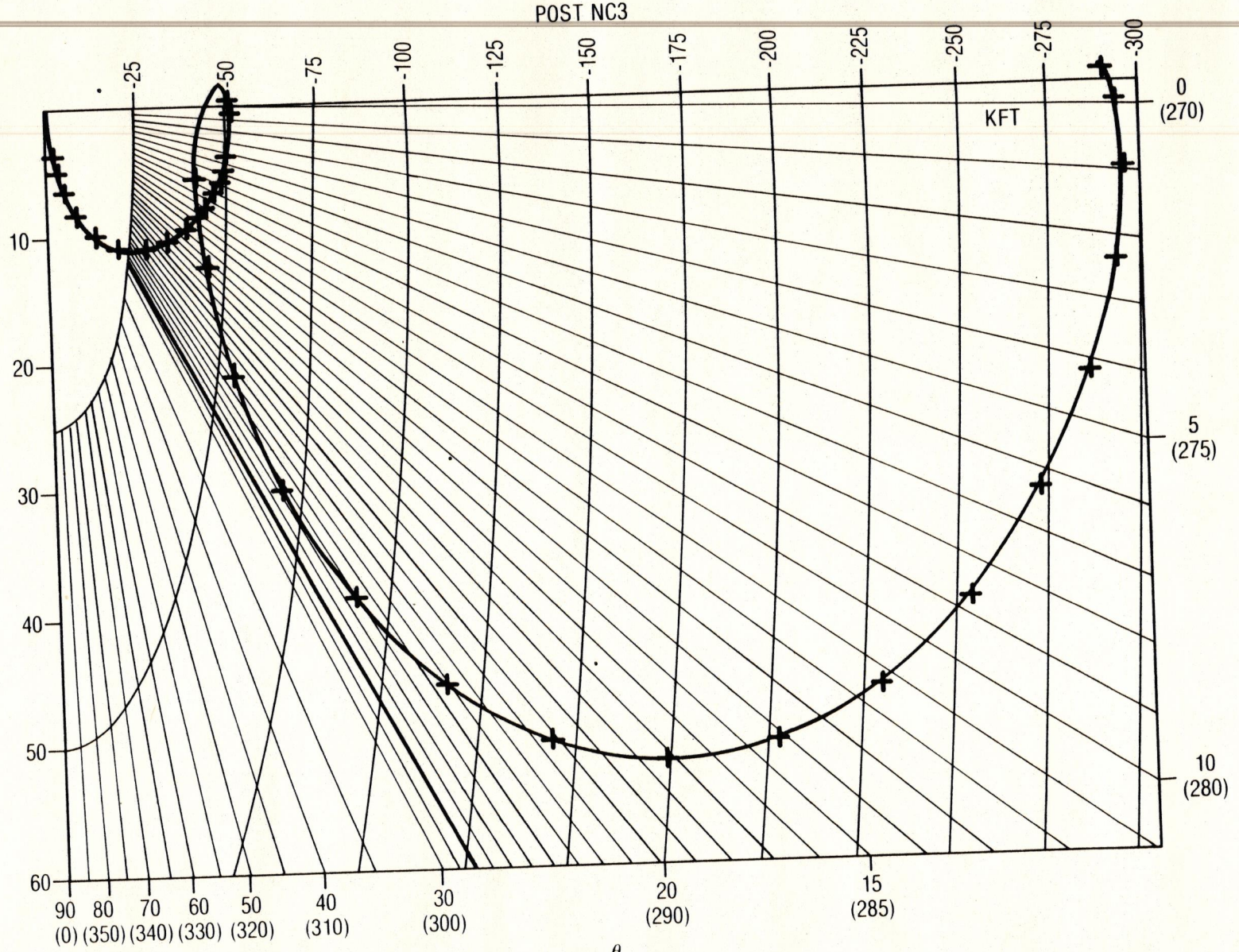
DAPS

		RENDEZVOUS		PROX OPS	
DAP		A9	B6	A10	B7
TRANSLATION					
PULSE FT/SEC		0.10	0.05	0.05	0.01
ROTATION					
DISC RT	NORM	0.200	0.500	0.200	0.200
	VERN	0.200	0.200	0.200	0.200
PULSE	NORM	0.10	0.04	0.10	0.04
	VERN	0.010	0.002	0.010	0.002
COMP	NORM	.00	.00	.00	.00
	VERN	.000	.000	.000	.000
DEADBAND					
ATT	NORM	2.00	2.00	2.00	2.00
	VERN	1.00	1.00	1.00	1.00
RATE	NORM	0.20	0.20	0.20	0.20
	VERN	.020	.020	.020	.020
JET OPT					
P		1	1	1	1
Y		1	1	1	1
CNTL ACCEL		0	0	0	0

RELATIVE MOTION PLOTS

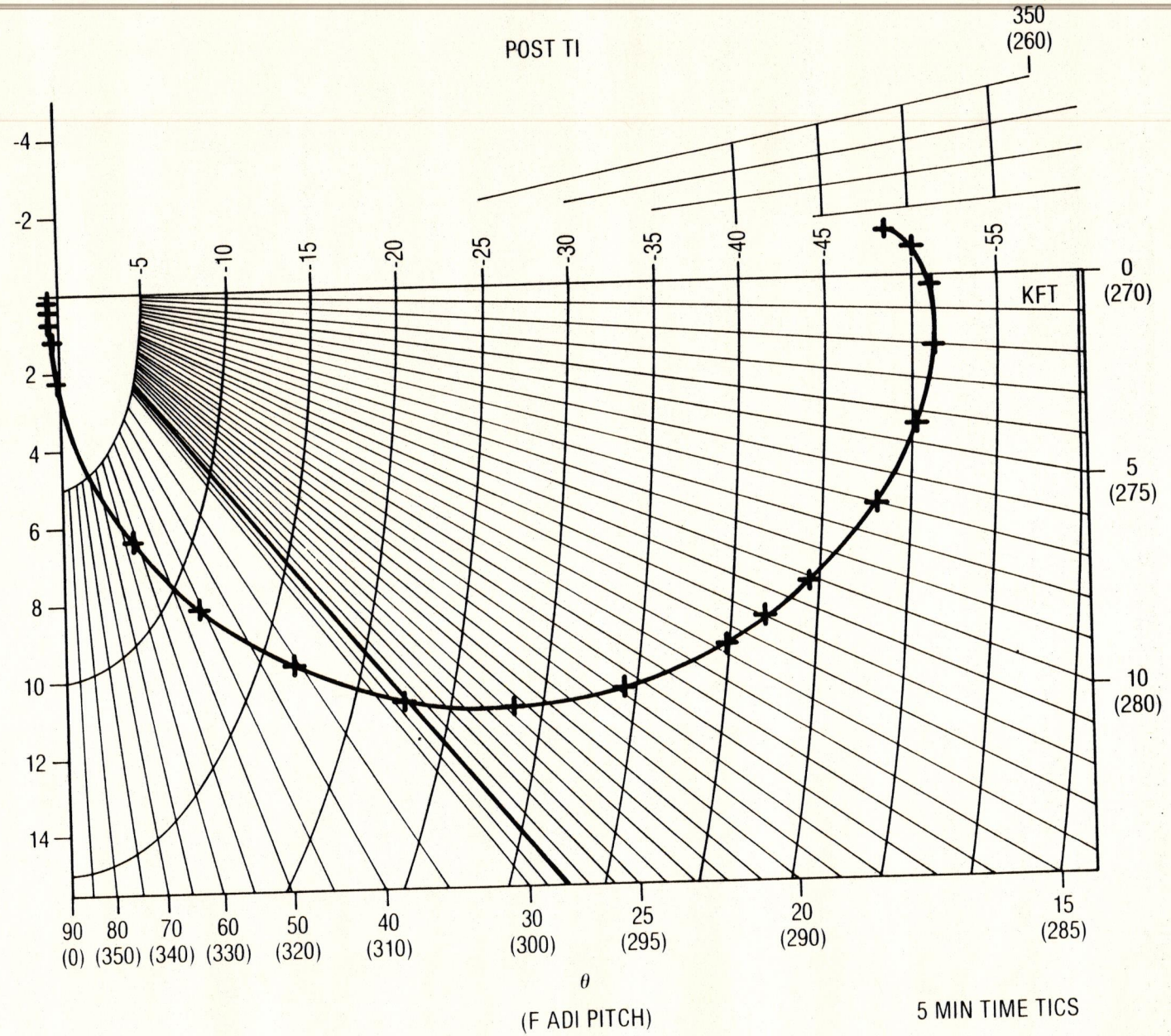
This Page Intentionally Blank

POST NC3



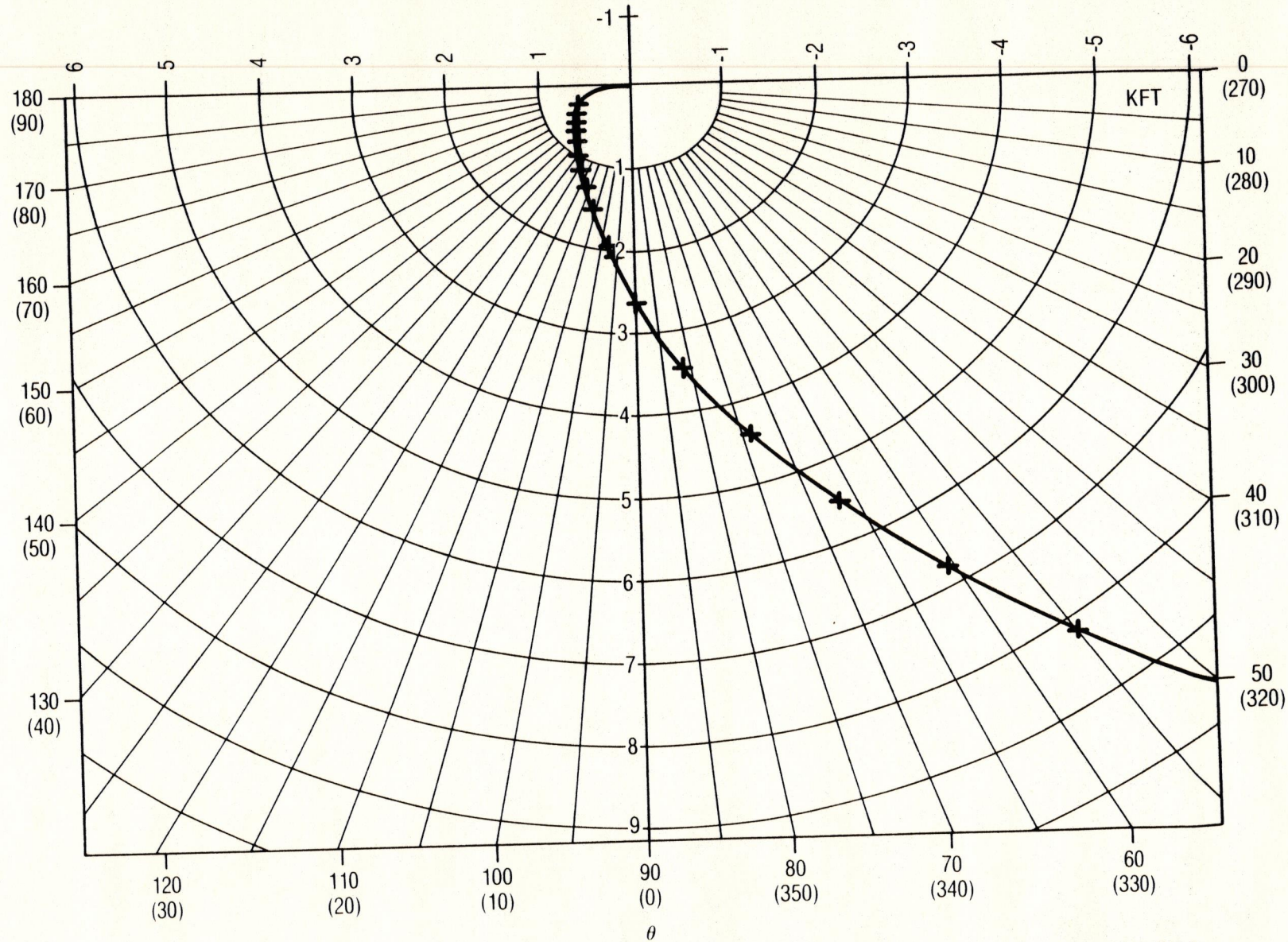
RNDZ/51-A/FIN A

This Page Intentionally Blank



RNDZ/51-A/FIN A

This Page Intentionally Blank



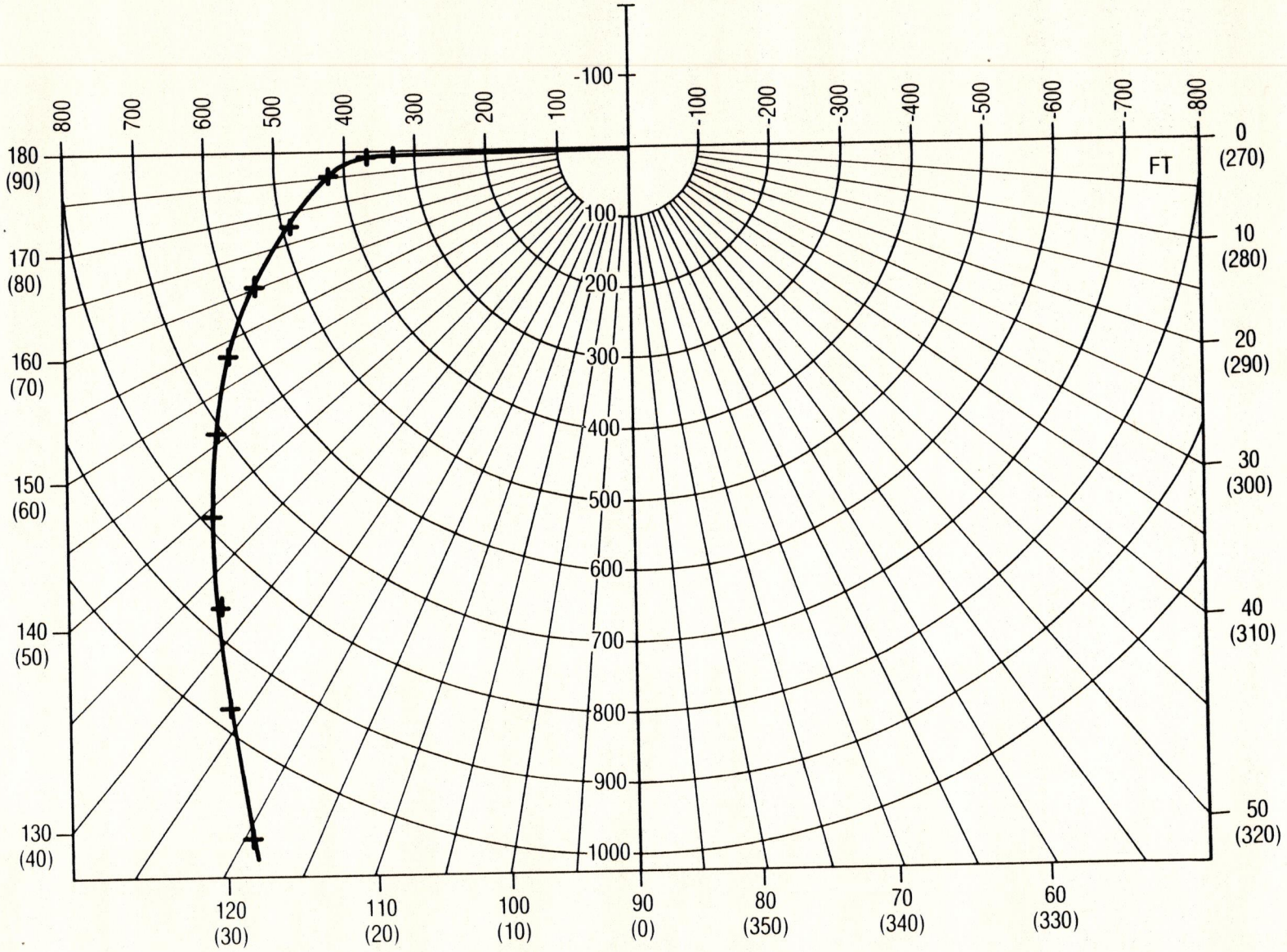
(F ADI PITCH)

2 MIN TIME TICS

RNDZ/51-A/FIN A

This Page Intentionally Blank

TERMINAL PHASE/PROX OPS



(F ADI PITCH)

2 MIN TIME TICS

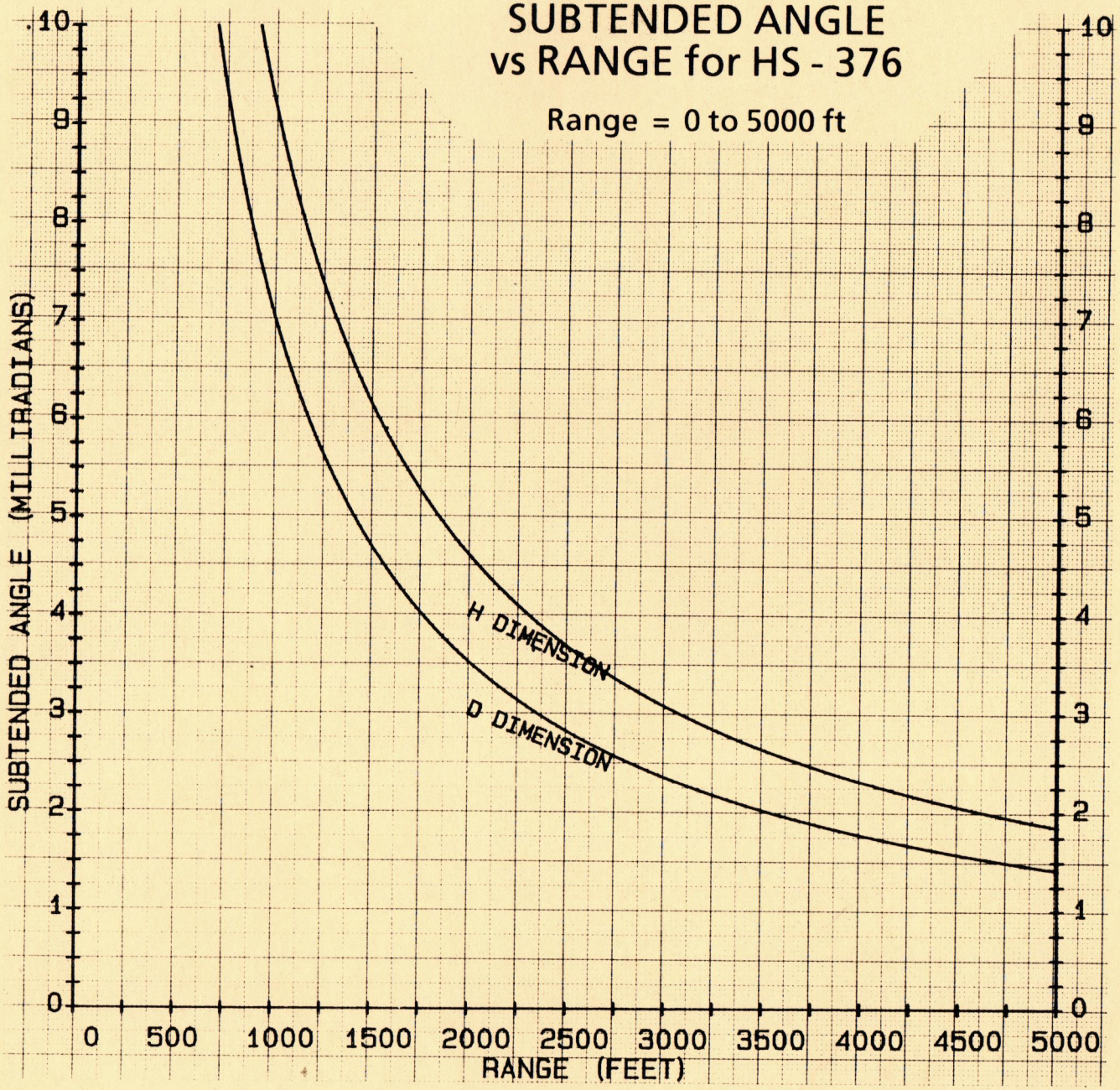
RNDZ/51-A/FIN A

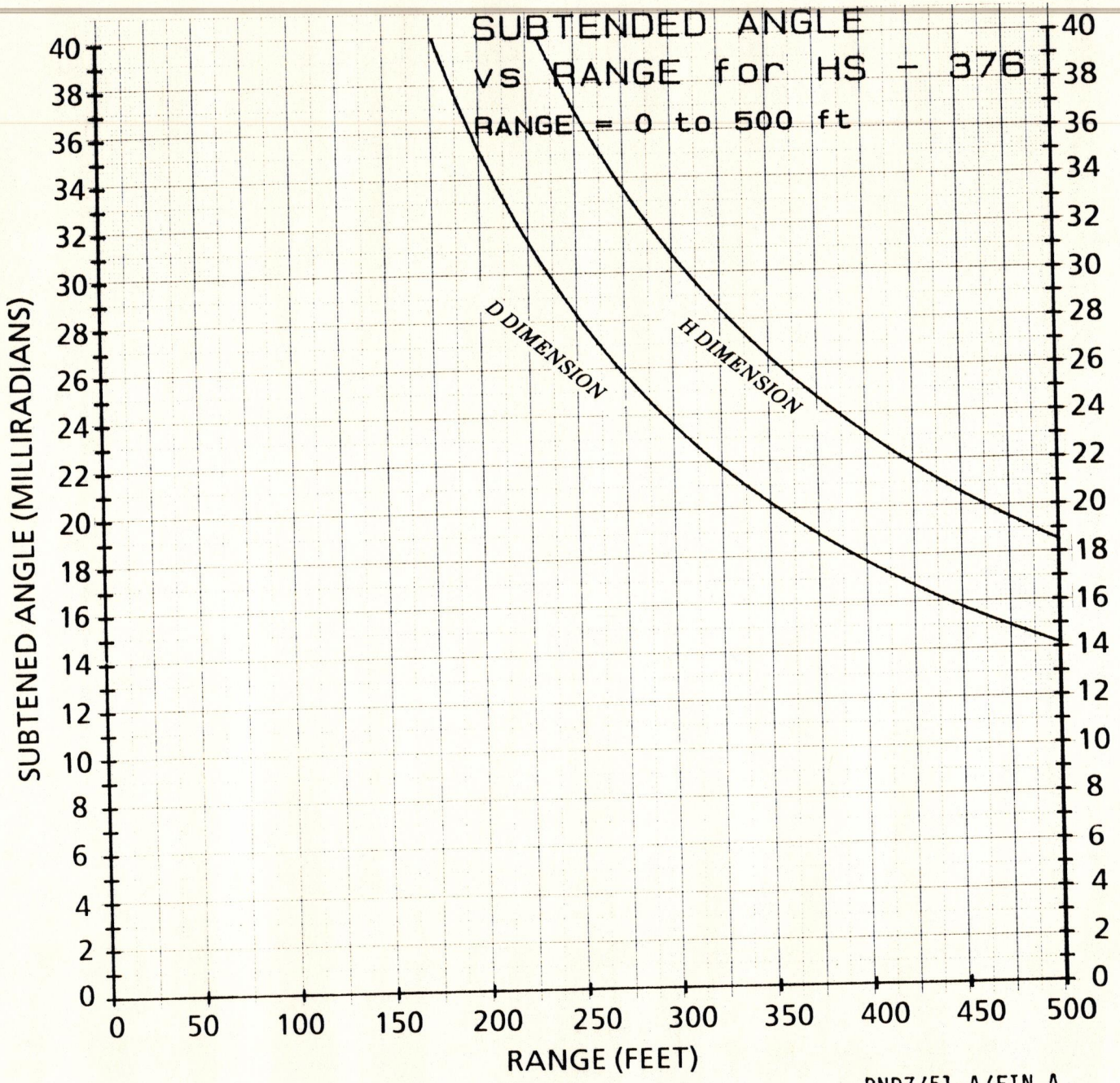
This Page Intentionally Blank

RANGING CHARTS

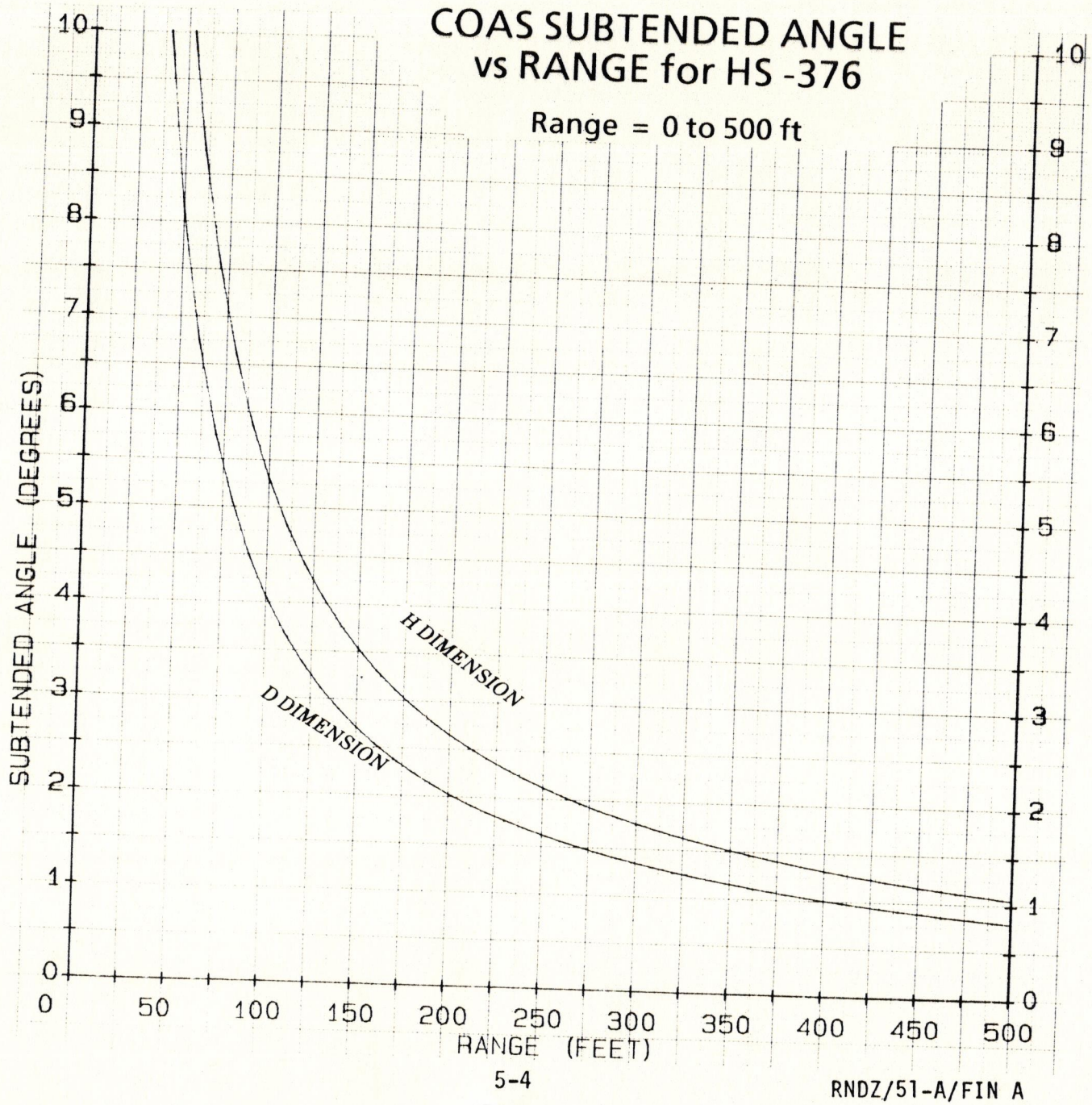
SUBTENDED ANGLE vs RANGE for HS - 376

Range = 0 to 5000 ft



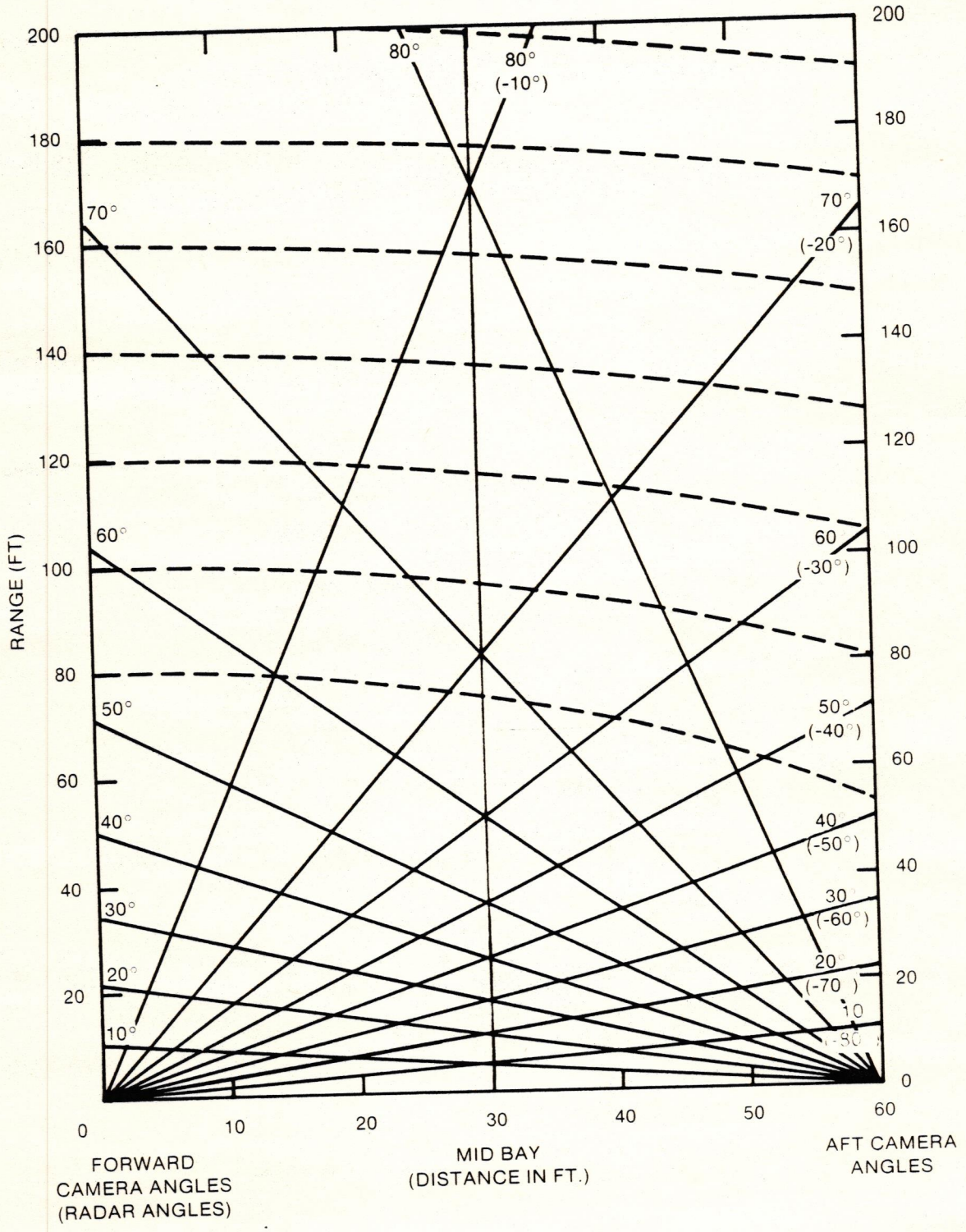


RNDZ/51-A/FIN A



RNDZ/51-A/FIN A

CAMERA ANGLES AND RADAR ANGLES RANGING CHART



This Page Intentionally Blank

CUE CARDS

EXECUTE RCS BURN

TIG -2:00 ··
OPS 202 PRO
GNC ORBIT MNVR EXEC
√TGT data loaded
LOAD - ITEM 22 EXEC
TIMER - ITEM 23 EXEC

TIG -0:30 ··
FLT CNTLR PWR - ON
DAP TRANS: as reqd
ROT: DISC/DISC/DISC
DAP: A/MAN/NORM

TIG ··
THC - Trim VGOs < .2 fps

If VGO Z is neg, Z,X,Y seq,
otherwise, X,Y,Z

OPS 201 PRO
DAP: A/AUTO/VERN
FLT CNTLR PWR - OFF

RR AUTO TRACK ACQ

KU - AUTO TRK
Slew antenna to Elev 0, Az 0
(or Elev, Az as seen in COAS)
√KU TRACK tb - gray
If no TRK,
KU SEARCH - SEARCH (tb-gray)
If no lock-on within one minute,
KU - GPC

COAS NAVIGATION

GNC 22 S TRK/COAS CNTL
COAS: SIGHT MODE - ITEM 22 EXEC
REQD ID - ITEM 21 +1 EXEC

GNC 33 REL NAV
INH Angles - ITEM 24 EXEC (*)
If tgt in COAS FOV,
FLTR TO PROP - ITEM 8 EXEC
COAS - ITEM 14 EXEC (*)
FLT CNTLR PWR - ON
DAP ROT: PULSE/PULSE/PULSE
DAP: as reqd
Center target in COAS
ATT REF pb - push
If mark acceptable,
FOR Angles - ITEM 25 EXEC
Repeat COAS marks as reqd

When COAS marks complete,
DAP: A/AUTO/VERN
DAP ROT: DISC/DISC/DISC
FLT CNTLR PWR - OFF

CUE CARDS

RENDEZVOUS OMS/RCS PRPLT PAD

When L or R RCS QTY < [ ] :

I'CNECT: L OMS to RCS (ORB PKT, RCS)

When [G23] L OMS/RCS QTY > [ ] :

I'CNECT TK SWITCH: From L to R OMS FEED
(ORB PKT, RCS)

When [G23] R OMS/RCS QTY > [ ] :

I'CNECT RETURN (ORB PKT, RCS)

When L or R RCS QTY < [ ] :

or when FRCS QTY < [ ] :

If prior to TI,
| Do not perform TI
|
If after TI, but prior to PROX OPS, (RDOT=0)
| Perform RNDZ BREAKOUT (over)
|
If during PROX OPS,
Perform PROX OPS BREAKOUT (over)

POST BREAKOUT RECONFIG

A6U	FLT CNTLR PWR - OFF
	GNC 22 S TRK/COAS CNTL
CRT	-Y, -Z STAR TRK - ITEM 3,4 EXEC (no *)
	ON MCC call,
	GNC 33 REL NAV
	KU ANT ENA - ITEM 2 EXEC (no *)
	RNDZ NAV ENA - ITEM 1 EXEC (no *)

RENDEZVOUS BREAKOUT

NOTE

This breakout has two periods of applicability, at the sunset after TI, and from MC3 until PROX OPS. If breakout criteria are met between sunset and MC3, breakout must be delayed until MC3

MANUAL PHASE BREAKOUT

Perform out of plane ΔV = 3 fps away from target plane
(THC - 12 sec in DAP TRANS: NORM)
After 15 min, perform retrograde ΔV = 3 fps

GNC ORBIT MNVR EXEC
√RCS SEL - ITEM 4 (*)
TV ROLL - ITEM 5 +0 EXEC
Set TIG to out-of-plane burn +15:00
TGT PEG 7 ΔVx - ITEM 19 -3 EXEC
ΔVy - ITEM 20 +0 EXEC
ΔVz - ITEM 21 +0 EXEC
LOAD - ITEM 22 EXEC
TIMER - ITEM 23 EXEC
DAP: B/AUTO/NORM (√ROT DISC RATE = .5)
At TIG -8:00; MNVR - ITEM 27 EXEC (*)
At TIG deflect THC to null VGOs

PROX OPS BREAKOUT

If on +Vbar,
Perform Posigrade ΔV = 2 fps
(THC - +Z, 5 sec in DAP TRANS: NORM)

If not on +Vbar,
If time permits, contact MCC for breakout

If insufficient time to contact MMC,
Perform SEP MANEUVER (ORB OPS)