

Flight Data File Rendezvous

41-B (STS-11)

Integrated Rendezvous Target (IRT)

Mission Operations Directorate
Operations Division

Final
December 23, 1983



National Aeronautics and
Space Administration


Lyndon B. Johnson Space Center
Houston, Texas

MISSION OPERATIONS DIRECTORATE

41-B (STS-11) RENDEZVOUS

FINAL
December 23, 1983

PREPARED BY:

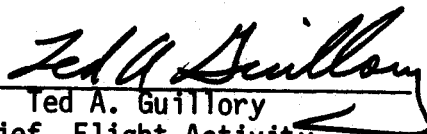


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TIMELINE FORMAT

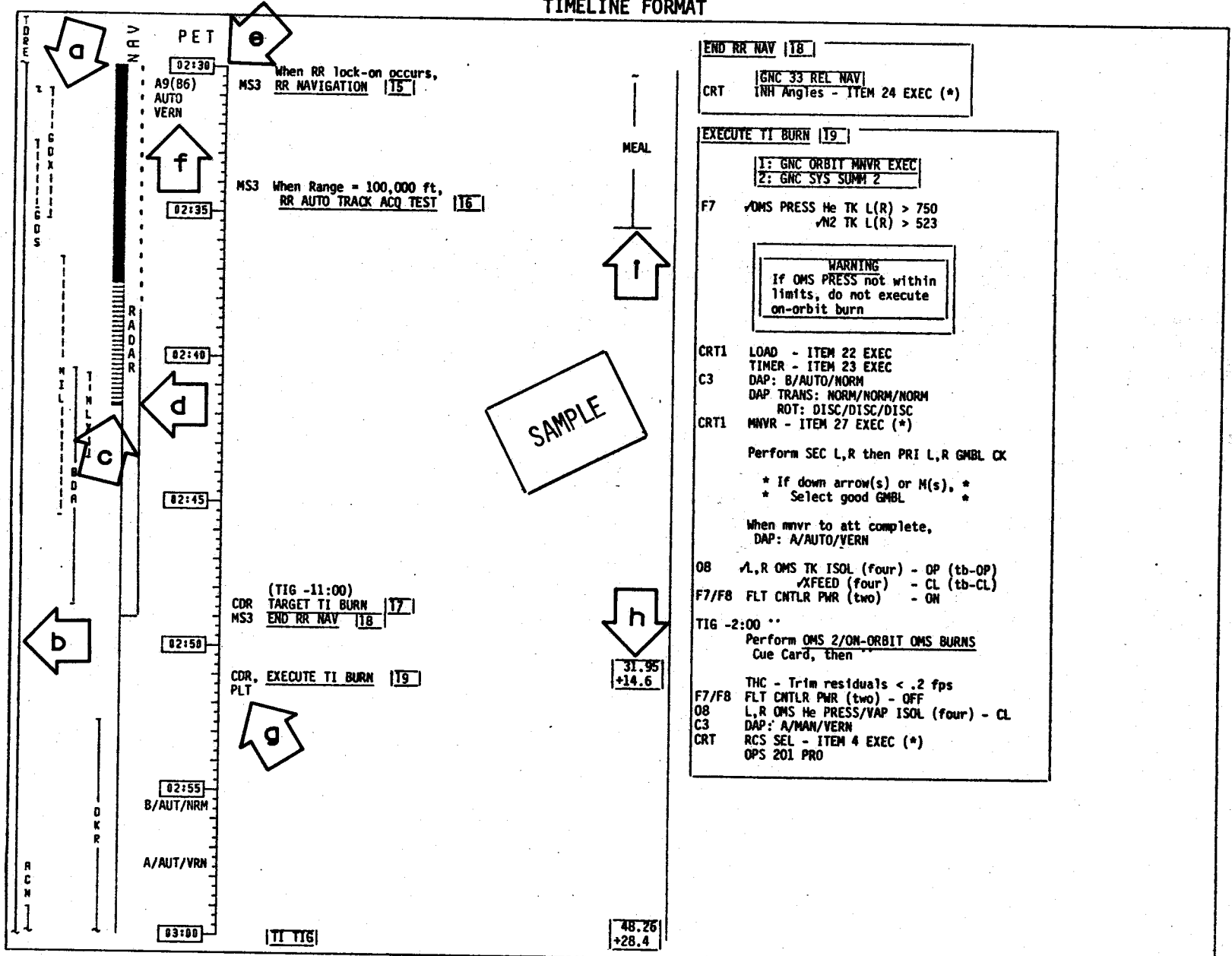


FIGURE 1

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STS-11/FIN

RENDEZVOUS TIMELINE FORMAT

The following notes (a-i) reference those highlighted in Figure 1

- a. **GSTDN COVERAGE** - In this column the GSTDN sites and their acquisition periods are identified. Each site acquisition period is annotated by a solid line, a dashed line or a dotted line. The different annotations indicate the following:

—

·
·
—
A site that has S-Band, UHF voice and TV capabilities (GDS, HAW, MIL)

|
|
|
|

A site with S-Band and UHF voice capabilities (BDA, GWM, ACN, DKR, MAD)

·
·
·
·

A site with only S-Band (no UHF or TV) capabilities (AGO, ORR)

|
·
·
|

A site with only UHF (no S-Band or TV) capabilities (BOT, YAR)

- b. **TDRS COVERAGE** - The TDRS communication coverage periods are identified in this area, with a horizontal line indicating when there is a line-of-sight between TDRS and the orbiter. These coverage periods have been computed utilizing the assumption that there is one TDRS operating in geosynchronous orbit at 41° west longitude and does not account for orbiter blockage or other attenuation of the KU- or S-band signal.
- c. **DAY/NIGHT CYCLE** - In this column a solid bar indicates the period when the orbiter and Earth are in darkness. A slashed line indicates when the orbiter is in daylight but the Earth beneath the orbiter is still in darkness (terminator).
- d. **NAVIGATION SENSOR** - This column indicates when sensor data are being used to update the on-board navigation state vectors. The callout inside the boxed-in area indicates whether star tracker (S TRK), rendezvous radar (RADAR) or crew optical alignment sight (COAS) data are being incorporated into navigation. Dashed lines indicate sensor acquisition occurs sometime during the indicated time frame.
- e. **PET TIMESCALE** - This format is a thirty-minute format referenced to rendezvous Phase Elapsed Time (PET). For Phase 1 of the rendezvous, the initial separation burn occurs at 0/00:00:00 PET and for Phase 2 the PET timescale 0/00:00:00 occurs at NC Burn TIG.
- f. **DAP CALLOUTS** - In the timescale a DAP A and DAP B CONFIG reference will be included. A number is associated with both DAPs A and B; each number indicates a particular DAP configuration for either DAP A or DAP B. The DAP reference without parenthesis indicates the 'active' DAP for that time period on the page.

- g. CREWMAN - The activities for the CDR, PLT, MS1 and MS3 are designated in this area.
- h. RANGE/RANGE RATE - This box includes reference range in kilofeet and range rate in feet per second from the orbiter to the IRT.
- i. NON-RENDEZVOUS ACTIVITIES - This area indicates intervals of time when crewman assigned to the rendezvous task are engaged in activities not directly associated with the rendezvous.

CHANGE CONTROL RECORD

STS-11 Rendezvous

CONTROL NO.	FDF EDITION INCORPORATED*		DISAPPROVED OR OTHER DISPOSITION
	TITLE	DATE	
	BASIC	10/19/83	
RNDZ(11)-2	FINAL	12/23/83	
RNDZ(ALL)-3	FINAL	12/23/83	
RNDZ(ALL)-4	FINAL	12/23/83	
RNDZ(ALL)-5	FINAL	12/23/83	
RNDZ(ALL)-6	FINAL	12/23/83	
RNDZ(ALL)-7	FINAL	12/23/83	
RNDZ(11)-11	FINAL	12/23/83	
RNDZ(ALL)-12	FINAL	12/23/83	
RNDZ(11)-13	FINAL	12/23/83	
RNDZ(11)-14	FINAL	12/23/83	
RNDZ(ALL)-15	FINAL	12/23/83	
RNDZ(ALL)-16	FINAL	12/23/83	
RNDZ(ALL)-17A	FINAL	12/23/83	
RNDZ(ALL)-18	FINAL	12/23/83	
RNDZ(11)-19	FINAL	12/23/83	
RNDZ(ALL)-20	FINAL	12/23/83	
RNDZ(ALL)-21	FINAL	12/23/83	
RNDZ(ALL)-22A	FINAL	12/23/83	
RNDZ(ALL)-23A	FINAL	12/23/83	
RNDZ(ALL)-24	FINAL	12/23/83	
RNDZ(11)-25	FINAL	12/23/83	
RNDZ(11)-26	FINAL	12/23/83	
RNDZ(11)-27	FINAL	12/23/83	
RNDZ(11)-28	FINAL	12/23/83	
RNDZ(11)-29	FINAL	12/23/83	
RNDZ(11)-30	FINAL	12/23/83	
RNDZ(11)-31	FINAL	12/23/83	
RNDZ(11)-32	FINAL	12/23/83	

*482 changes incorporated into current edition only are identified by change bars.

STS-11 RENDEZVOUS

LIST OF EFFECTIVE PAGES

FINAL 12/23/83

i.....	STS-11/FIN	3-36.....	STS-11/FIN
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3-19.....	STS-11/FIN	4-14.....	STS-11/FIN
3-20.....	STS-11/FIN	4-15.....	STS-11/FIN
3-21.....	STS-11/FIN	4-16.....	STS-11/FIN
3-22.....	STS-11/FIN	4-17.....	STS-11/FIN
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3-31.....	STS-11/FIN	6-2.....	STS-11/FIN
3-32.....	STS-11/FIN	6-3.....	STS-11/FIN
3-33.....	STS-11/FIN	6-4.....	STS-11/FIN
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8-2..... STS-11/FIN
8-3..... STS-11/FIN
8-4..... STS-11/FIN
CC 9-1..... STS-11/FIN
CC 9-2..... STS-11/FIN
CC 9-3..... STS-11/FIN
CC 9-4..... STS-11/FIN

RENDEZVOUS Cue Cards

RNDZ OPS
 (Front)..... CC 9-1 STS-11/FIN
 (Back)..... CC 9-2 STS-11/FIN
MMU NO ZOOM X AX, Z AX Ranging Ruler..... CC 9-3 STS-11/FIN
MMU NO ZOOM Y AX, Z AX Ranging Ruler..... CC 9-3 STS-11/FIN
MMU FULL ZOOM X AX, Z AX Ranging Ruler..... CC 9-3 STS-11/FIN
MMU FULL ZOOM Y AX, Z AX Ranging Ruler..... CC 9-3 STS-11/FIN
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BURN PADS

1-1

STS-11/FIN

BURN PADS

PRE-FLIGHT

OMS BOTH 1 *
 L 2
 R 3
 5 TV ROLL 1 8 0

6 P (+) 0 . 2
 7 L Y (-) 5 . 7
 8 R Y (+) 5 . 7
 9 WT 2 2 7 1 2 2
 10 TIG 2 / 2 0 : 1 6 : 2 4 . 0

19 ΔVX (-) 0 0 3 3 . 0
 20 ΔVY (+) 0 0 0 . 0
 21 ΔVZ (+) 0 0 0 . 0

24 R 1 9 4
 25 P 1 9 3
 26 Y 0 2 5

ΔV TOT 0 0 3 3 . 0
 TGO 0 0 : 2 0
 YGO X (+) 0 0 3 1 . 8 8
 Y (+) 0 0 0 . 0 0
 Z (+) 0 0 8 . 5 4

HA 1 5 5 HP (+) 1 3 5

NC BURN PAD
 PRELIMINARY

BOTH 1
 L 2
 R 3
 L,R OMS He
 P/VAP ISOL
 GPC OP CL
 A
 B

P () .
 L Y () .
 R Y () .
 / : : .

ΔVX () .
 ΔVY () .
 ΔVZ () .

R
 P
 Y

X () .
 Y () .
 Z () .

HA HP ()

FINAL

BOTH 1
 L 2
 R 3
 L,R OMS He
 P/VAP ISOL
 GPC OP CL
 A
 B

P () .
 L Y () .
 R Y () .
 / : : .

ΔVX () .
 ΔVY () .
 ΔVZ () .

R
 P
 Y

X () .
 Y () .
 Z () .

HA HP ()

PRE-FLIGHT

OMS BOTH 1

L 2

R 3

RCS 4 *

5 TV ROLL

1	8	0
---	---	---

TRIM LOAD

6 P

()	-	.	-
-----	---	---	---

7 L Y

()	-	.	-
-----	---	---	---

8 R Y

()	-	.	-
-----	---	---	---

9 WT

2	2	6	3	4	5
---	---	---	---	---	---

10 TIG

2	/	2	1	:	0	1	:	3	1	.	2
---	---	---	---	---	---	---	---	---	---	---	---

TGT PEG 7

19 ΔVX

(-)	0	0	0	5	.	0
-----	---	---	---	---	---	---

20 ΔVY

(+)	0	0	0	.	0
-----	---	---	---	---	---

21 ΔVZ

(+)	0	0	0	.	0
-----	---	---	---	---	---

24 R

1	6	9
---	---	---

 MULTI AXIS

--

25 P

0	1	9
---	---	---

--

26 Y

3	3	4
---	---	---

ΔVTOT

0	0	0	5	.	0
---	---	---	---	---	---

TGO

0	0	:	0	3
---	---	---	---	---

VGO X

(+)	0	0	0	4	.	8	3
-----	---	---	---	---	---	---	---

Y

(+)	0	0	0	.	0	0
-----	---	---	---	---	---	---

Z

(+)	0	0	1	.	2	9
-----	---	---	---	---	---	---

HA

1	5	2
---	---	---

 HP

(+)	1	3	5
-----	---	---	---

NH BURN PAD
PRELIMINARY

BOTH 1

L 2

R 3

RCS 4

P

()	.
-----	---

L Y

()	.
-----	---

R Y

()	.
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ΔVX

()				.
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ΔVY

()				.
-----	--	--	--	---

ΔVZ

()				.
-----	--	--	--	---

R

--	--	--

 MULTI AXIS

--

P

--	--	--

--

Y

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				.
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X

()				.
-----	--	--	--	---

Y

()				.
-----	--	--	--	---

Z

()				.
-----	--	--	--	---

HA

--	--	--

 HP

()			
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FINAL

BOTH 1

L 2

R 3

RCS 4

P

()	.
-----	---

L Y

()	.
-----	---

R Y

()	.
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ΔVX

()				.
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ΔVY

()				.
-----	--	--	--	---

ΔVZ

()				.
-----	--	--	--	---

R

--	--	--

 MULTI AXIS

--

P

--	--	--

--

Y

--	--	--

				.
--	--	--	--	---

X

()				.
-----	--	--	--	---

Y

()				.
-----	--	--	--	---

Z

()				.
-----	--	--	--	---

HA

--	--	--

 HP

()			
-----	--	--	--

TI BURN SOLUTION

PRE-FLIGHT

OMS BOTH 1		
L	2	*
R	3	
5 TV ROLL		0 0 0
6	P	| (+) 0 . 2
7	L Y	| (+) 5 . 2
8	R Y	| (-) 5 . 2
9	WT	| 2 2 6 2 0 0
10	TIG	| 2 / 2 3 : 1 6 : 1 2 . 0
19	ΔVX	| (+) 0 0 2 3 . 0
20	ΔVY	| (+) 0 0 0 . 1
21	ΔVZ	| (-) 0 1 1 . 6

PRELIMINARY

BOTH 1			L,R OMS He P/YAP ISOL								
L	2		GPC OP CL								
R	3		A <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr></table>								
P			B <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr></table>								
P			() .								
L	Y		() .								
R	Y		() .								
/			:								
/			:								
ΔVX			() .								
ΔVY			() .								
ΔVZ			() .								

FINAL

BOTH 1			L,R OMS He P/YAP ISOL								
L	2		GPC OP CL								
R	3		A <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr></table>								
P			B <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr></table>								
P			() .								
L	Y		() .								
R	Y		() .								
/			:								
/			:								
ΔVX			() .								
ΔVY			() .								
ΔVZ			() .								

3σ

(0 . 7)
(5 . 2)
(5 . 4)

()		()
(FLTR)	|	( )
()		()
()		()
()		()

()		()
(FLTR)	|	( )
()		()
()		()
()		()

()		()
(PROP)	|	( )
()		()
()		()
()		()

BURN ATT		24 R	|	1 5 3
		25 P	|	3 4 9
		26 Y	|	3 5 0
ΔVTOT			|	0 0 2 5 . 8
TGO			|	0 0 : 2 7
VGO	X	( )	|	. . . . .
	Y	( )	|	. . . . .
	Z	( )	|	. . . . .
HA		1 5 2	|	HP (+) 1 4 8

R		|	. . . . .
P		|	. . . . .
Y		|	. . . . .
/			:
X	( )	|	. . . . .
Y	( )	|	. . . . .
Z	( )	|	. . . . .
HA		|	HP ()

R		|	. . . . .
P		|	. . . . .
Y		|	. . . . .
/			:
X	( )	|	. . . . .
Y	( )	|	. . . . .
Z	( )	|	. . . . .
HA		|	HP ()

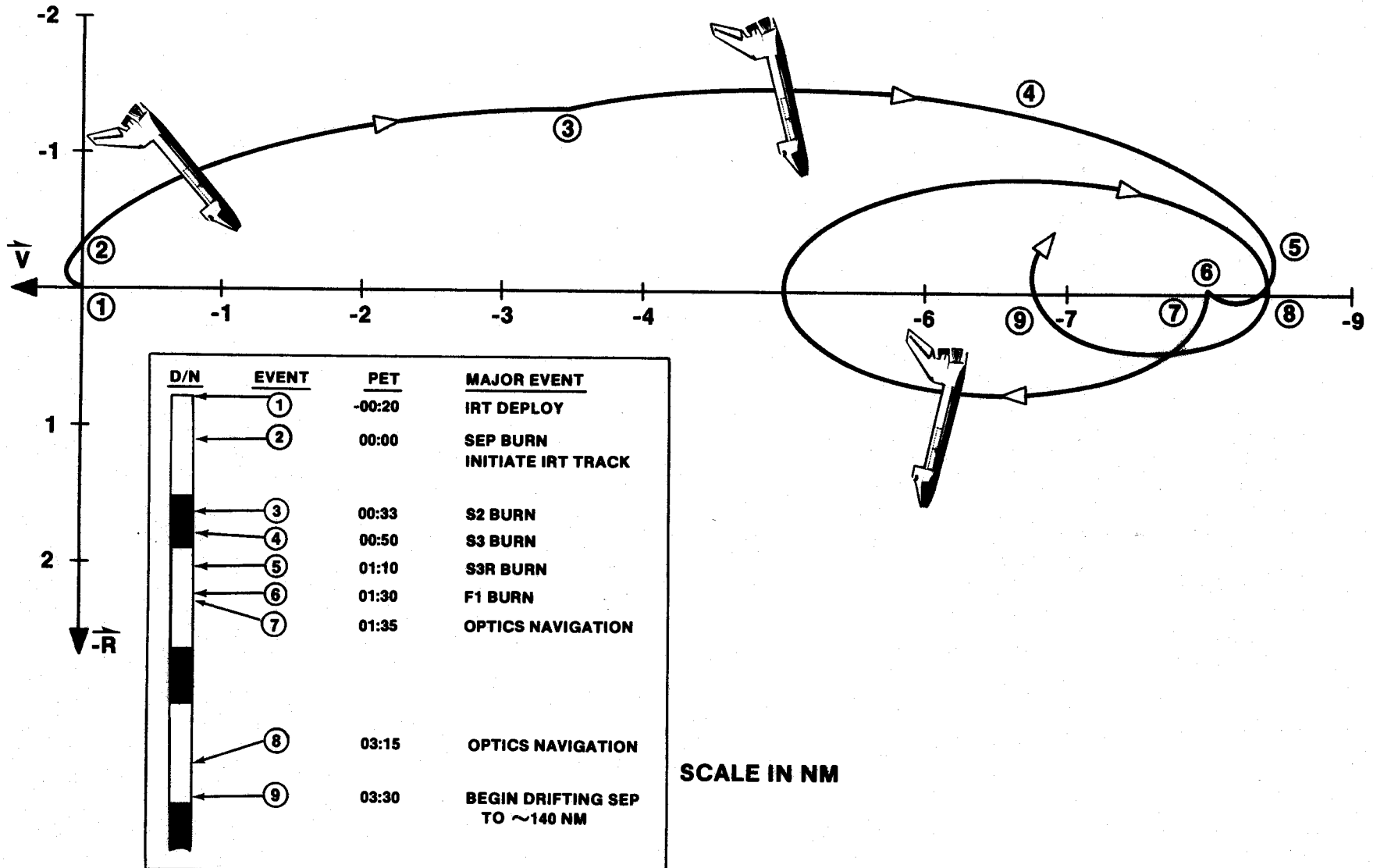
FLIGHT PROFILE

2-1

STS-11/FIN

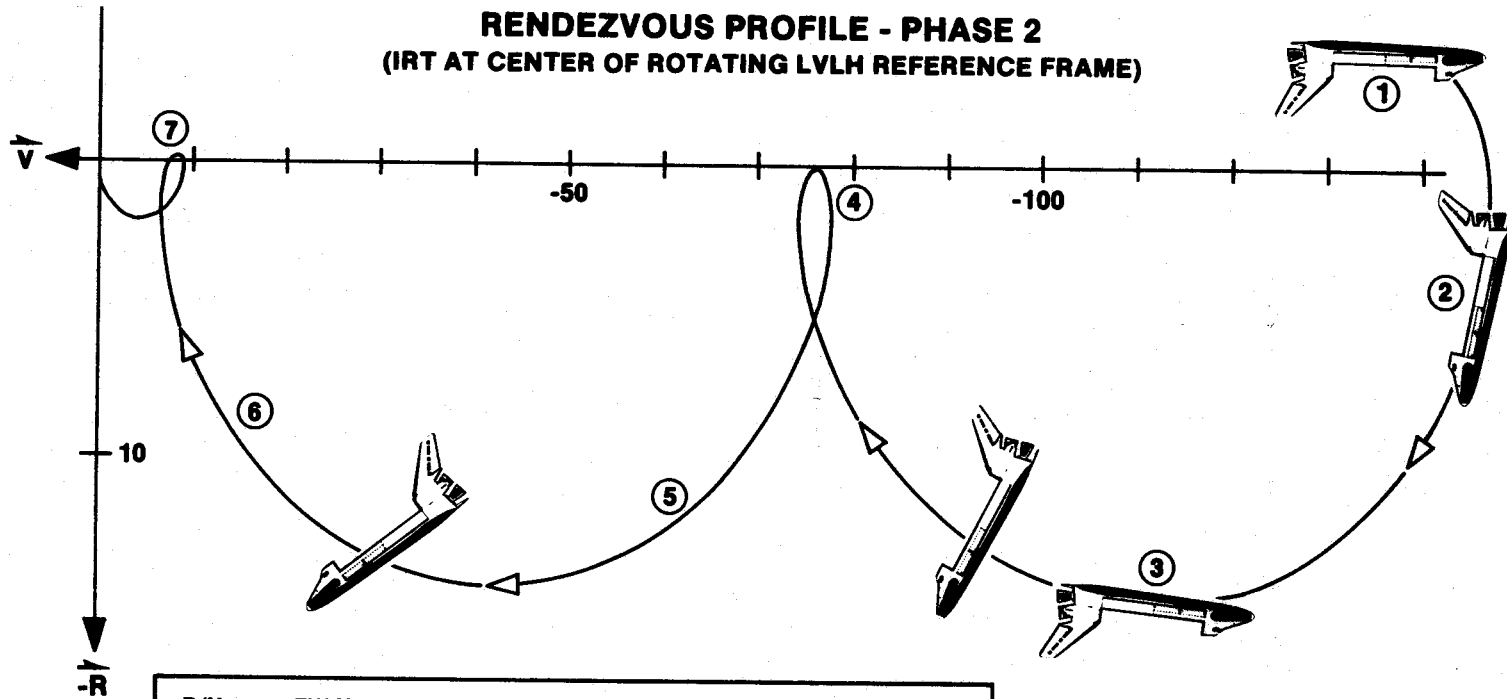
FLIGHT PROFILE

RENDEZVOUS PROFILE - PHASE 1
 (IRT AT CENTER OF ROTATING LVLH REFERENCE FRAME)



SCALE IN NM

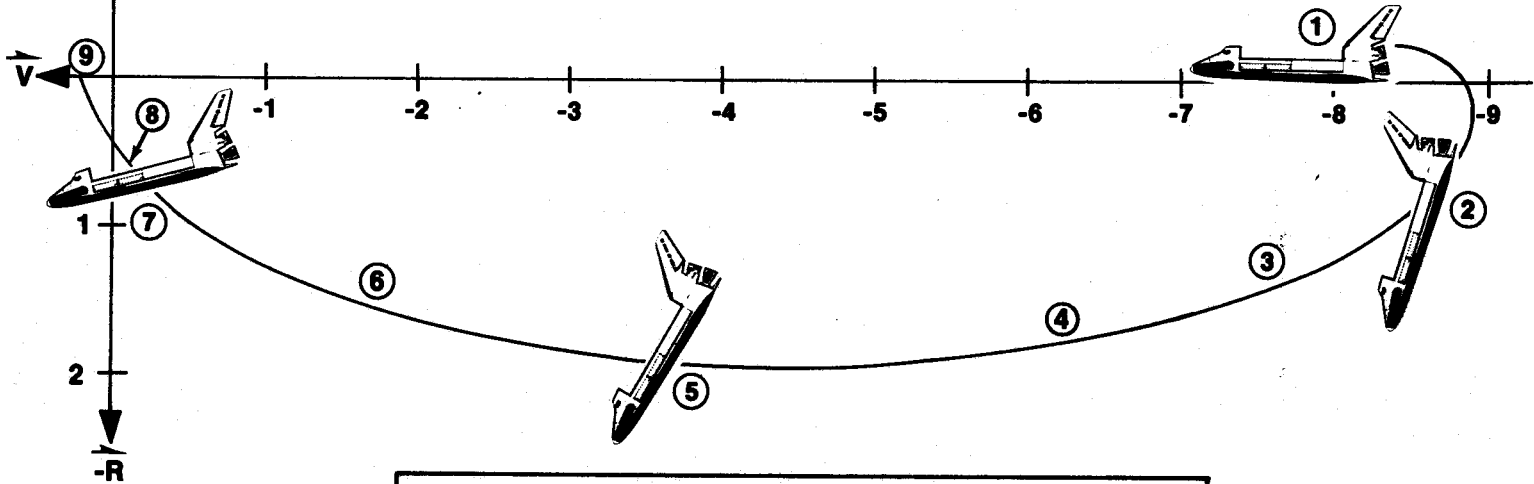
RENDEZVOUS PROFILE - PHASE 2
 (IRT AT CENTER OF ROTATING LVLH REFERENCE FRAME)



<u>D/N</u>	<u>EVENT</u>	<u>PET</u>	<u>MAJOR EVENT</u>
	①	00:00	NC BURN
	②	00:08	S TRK NAVIGATION
	③	00:45	NH BURN
	④	01:35	S TRK NAVIGATION
	⑤	02:03	NCC BURN
	⑥	02:30	RADAR NAVIGATION
	⑦	03:00	TRANSITION INITIATION (TI) BURN

SCALE IN NM
DISTANCES ARE APPROXIMATE

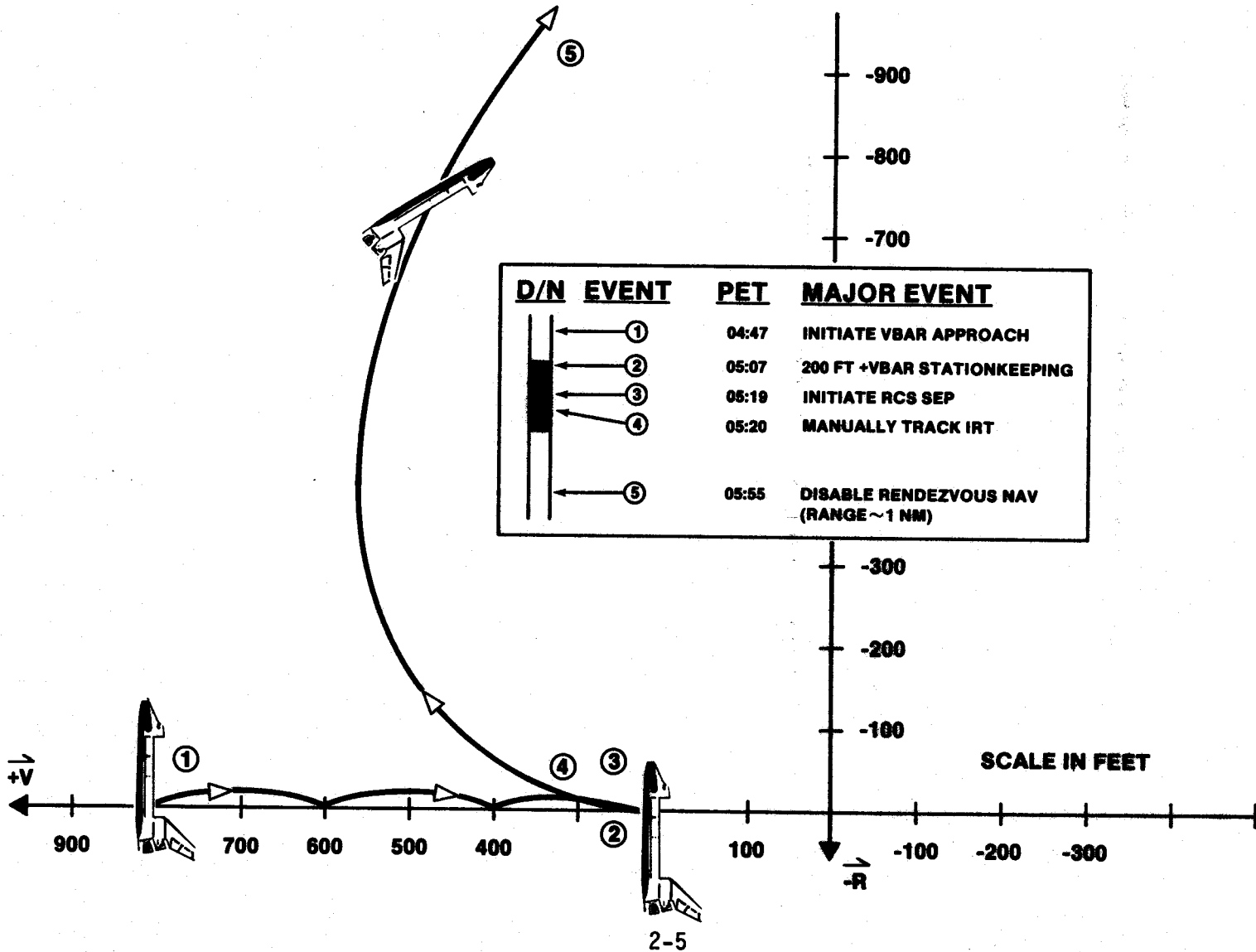
RENDEZVOUS PROFILE - PHASE 2
TI TO 800 FT
 (IRT AT CENTER OF ROTATING LVLH REFERENCE FRAME)



<u>D/N</u>	<u>EVENT</u>	<u>PET</u>	<u>MAJOR EVENT</u>
	①	03:00	TI BURN
	②	03:08	S TRK, RR NAVIGATION
	③	03:24	MIDCOURSE CORRECTION 1
	④	03:35	MANUAL OUT-OF-PLANE NULL
	⑤	03:51	MIDCOURSE CORRECTION 2
	⑥	04:01	MIDCOURSE CORRECTION 3
	⑦	04:11	MIDCOURSE CORRECTION 4
	⑧	04:13	MANUAL TRAJ CONTROL
	⑨	04:35	800 FT +VBAR STATION KEEPING

SCALE IN NM

**RENDEZVOUS PROFILE - PHASE 2
PROXIMITY OPERATIONS
(IRT AT CENTER OF ROTATING LVLH REFERENCE FRAME)**



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OPERATIONS TIMELINE

3-1

STS-11/FIN

OPERATIONS
TIMELINE

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OPERATIONS TIMELINE - PHASE 1

3-3

STS-11/FIN

IRY PREDEPLOY CHECKOUT | 1 |

L12 ✓PWR PRI/SEC - OFF
✓DPY ARM PRI/SEC - SAFE
✓FIRE PRI/SEC - OFF
✓JETT ARM PRI/SEC - SAFE
✓FIRE PRI/SEC - ctr

R1 ✓ESS 2CA - ON
✓IBC - ON

P/L AUX BUS - ON

L12 ✓DPY ARM PRI,SEC tb - bp
✓FIRE PRI,SEC tb - bp
✓JETT ARM PRI,SEC tb - bp
✓FIRE PRI,SEC tb - bp

AFT FLT STATION CONFIG | 2 |

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/R
X-PNTR SCALE - X1

CRT **SH ANTEENNA**
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 *)
RDR RNG MIN - ITEM 2 EXEC (*)

A2 DIGI-DIS SEL - EL/AZ
Slew Antenna to Elev 0, Az 0

A1U KU RADAR OUTPUT - LOW

Install -Z COAS

Install RNDZ OPS Cue Card (two)

Time

N RV

PET

-01:00

-00:55

-00:50

-00:45

-00:40

A9(B6)
AUTO
VERN

MS3 IRT PREDEPLOY CHECKOUT [1]

CDR AUTO MNVR TO DEPLOY ATTITUDE
CRT Config DAP to A9,B6
GNC UNIV PTG
TGT ID +2
BODY VECT +2 (-X)
OM +0
TRK - ITEM 19 EXEC (CUR - *)
C3 DAP: A/AUTO/VERN

-00:35

MS3 AFT FLT STATION CONFIG [2]

PLT Set EVENT TIMER counting to SEP TIG and
SM CRT TIMER to begin at TIG

-00:30

CDR LOAD SEP BURN SOLUTION [3]

LOAD SEP BURN SOLUTION [3]

CRT OPS 202 PRO
GNC ORBIT MNVR EXEC
Load TGT data per pad
LOAD - ITEM 22 EXEC
TIMER - ITEM 23 EXEC

OPS 201 PRO

RCS SEL 4 [*]

5 TVR [1 8 0]

9 WT [] [] [] [] [] []

10 TIG [] [] [] / [] [] : [] [] : [] [] [] []

TGT PEG 7

19	ΔVX	(+)	0	0	0	0	.	8
20	ΔVY	(+)	0	0	0	.	0	
21	ΔVZ	(+)	0	0	0	.	0	

CCTV CONFIG 4

Perform TV ACT and VTR ACT, TV/VTR
Cue Card

A7U MON 1 - Camr A
MON 2 - Camr B
Aim A at B and B at A
PAN/TILT - RESET for both
Repeat for Camr C & D
Aim Camr D at IRT - ZOOM IN full
B above IRT
A at Pan 0, Tilt 90 - ZOOM OUT

VTR RCD - D
Put new tape in VTR

A3 MON 1,2 SCAN - NORM

REL NAV AND COAS CONFIG 5

[GNC 33 REL NAV]

CRT RNDZ NAV ENA - ITEM 1 EXEC (*)
KU ANT ENA - ITEM 2 EXEC (*)
GNC, I/O RESET EXEC
✓SV SEL, ITEM 4 - PROP
RR - ITEM 13 EXEC (*)

[GNC 22 S TRK/COAS CNTL]

COAS: REOD ID - ITEM 21 +1 EXEC
SIGHT MODE - ITEM 22 EXEC (*)
✓POS -Z, ITEM 27 - (*)

NOTE

ATT REF pb is now
enabled for COAS
marks

IRT DEPLOY 6

L12 PWR PRI/SEC - ON (PRI(SEC) tb-gray)
EVENT TIME = -22:00 **

DPY ARM PRI/SEC - ARM (PRI(SEC) tb-gray)

A7U MON 2 - VTR PLAY

R11 VTR pb - PLAY/RCD (simo)
EVENT TIME = -20:00 **

L12 DPY FIRE PRI/SEC - FIRE (PRI(SEC) tb-gray)
Wait 10 sec

.....IF NO DEPLOYMENT.....

If no motion detected and
any DPY ARM, FIRE tb (four) - bp,

DPY FIRE PRI/SEC - OFF
ARM PRI/SEC - SAFE
✓PWR PRI/SEC - ON (tb-gray)
✓P/L AUX BUS - ON
✓ESS 2CA - ON
✓IBC - ON
Perform second deploy attempt
If still no deploy, JETTISON

If motion detected or all
DPY ARM, FIRE tb (four) - gray [JETTISON],

DPY FIRE PRI/SEC - OFF
ARM PRI/SEC - SAFE
JETT ARM PRI/SEC - ARM (PRI(SEC) tb-gray)
FIRE PRI/SEC - FIRE (PRI(SEC) tb-up)
Hold for 10 sec
JETT FIRE PRI/SEC - ctr (PRI,SEC tb-bp)
ARM PRI/SEC - SAFE (PRI,SEC tb-bp)

DPY FIRE PRI/SEC - OFF (PRI,SEC tb-bp)
ARM PRI/SEC - SAFE (PRI,SEC tb-bp)
PWR PRI/SEC - OFF (PRI,SEC tb-bp)
P/L AUX BUS - OFF

R1 Track IRT with CCTV Camr B
VTR RCD - B

EVENT TIME = -19:20 **

W8 16mm, 70mm Camrs - on

A6U FLT CNTRL PMR - ON
DAP ROT: DISC/PULSE/DISC
DAP: A/MAN/VERN

RHC - pitch as reqd to center IRT in COAS ±30
DAP ROT: DISC/DISC/DISC
Estimate IRT spin period _____

EVENT TIME = -17:30 **

W8 16mm, 70mm Camr - off

T
O
R
E

N
R
V

P
E
T

-00:30
A9(B6)
AUTO
VERN

MS1 CCTV CONFIG | 4 |

CDR REL NAV AND COAS CONFIG | 5 |

-00:25

MS3 IRT DEPLOY | 6 |

-00:20

DEPLOY

A/MAN/VRN
DISC

MS3 RADAR ACQUISITION | 7 |

-00:15

MS3 SELECT FLTR NAV STATE | 8 |

CDR -Z AXIS TARGET TRACK | 9 |

-00:10

A/AUTO/VRN

MS1 R11 VTR pb - STOP

-00:05

CDR EXECUTE RCS BURN, RNDZ OPS Cue Card
(delete if IRT jettisoned)

A/LVLH/NRM
DISC

000:00:00

INITIAL SEP

RADAR ACQUISITION | 7 |

A1U KU - GPC

When KU TRACK tb - gray

GNC 33 REL NAV

CRT AUTO RNG - ITEM 17 EXEC (*)
R - ITEM 20 EXEC (*)
Angles - ITEM 23 EXEC (*)

SM ANTENNA

RDR RNG AUTO - ITEM 1 EXEC (*)

A1U KU RADAR OUTPUT - HI

A2 DIGI-DIS SEL - R/R

SELECT FLTR NAV STATE | 8 |

GNC 33 REL NAV

CRT ✓MARK ACPT RNG, R, Angles > 9
✓SV UPDATE POS < 0.3
SV SEL - ITEM 4 EXEC (FLTR)

Rcd FLTR MINUS PROP

POS _____

VEL _____

-Z AXIS TARGET TRACK | 9 |

GNC UNIV PTE

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

A6U DAP: A/AUTO/VERN

FLT CNTLR PWR - OFF

T
H
A
M

T
S
D
S
I
G
N
A
L

T
M
I
L

R
A
D
A
R

```

COMPUTE SI 10
CRT ✓SV SEL correct
    GNC 34 ORBIT TGT
    BASE TIME (SEP TIG, pad 3-5)
    LOAD - ITEM 26 EXEC
    TGT NO - ITEM 1 +1 EXEC
    ✓TGT Set data
    T1 TIG (BASE TIME +0/0:10:0)
    EL +0
    ΔT +80.4
    ΔX -48.60
    ΔY +0
    ΔZ +0
    COMPUTE T1 - ITEM 27 EXEC

Note solution

ΔVX ( )
ΔVY ( )
ΔVZ ( )
ΔVT ( )

```

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

T
O
P
P
E
T
P
E
T
N
A
V
000:00:00
A9(B6)
AUTO
VERN

00:05 CDR COMPUTE S1 10

00:10 CDR TARGET S2 BURN 11 (preliminary solution)

MS3 COAS MARKS ON IRT
A6U DAP ROT: PULSE/PULSE/PULSE
FLT CNTLR PWR - ON
DAP: A/MAN/VERN
RHC - Center IRT in COAS
ATT REF pb - push

00:15
When 6 marks taken
DAP: A/AUTO/VERN
DAP ROT: DISC/DISC/DISC
FLT CNTLR PWR - OFF

00:20

00:25

00:30 CDR TARGET S2 BURN 11 (final solution)

T
R
C
N
I
R
A
D
A
R
A
/
M
A
N
/
V
R
N
P
U
L
S
E
A
/
A
U
T
O
/
V
R
N
B
O
T
T
O
M

TARGET S2 BURN 11

CRT ✓SV SEL correct
[GNC 34 ORBIT TGT]
TGT NO - ITEM 1 #2 EXEC
✓TGT Set data
T1 TIG (BASE TIME +0/0:32:38)
EL +0
ΔT +57.8
ΔX -48.60
ΔY +0
ΔZ +0
COMPUTE T1 - ITEM 27 EXEC

Note solution

S2 SOLUTION

3σ Variation

ΔVX	(-)	0	0	0	.	4	(	0	.	6)
ΔVY	(-)	0	0	.	1		(	0	.	0)
ΔVZ	(-)	0	3	.	0		(	0	.	9)
ΔVT	(+)	0	0	3	.	0	(	0	.	9)

TIG 0 0 2 / 0 4 : 1 6 : 5 9

	PRELIMINARY	FINAL
ΔVX	()	()
ΔVY	()	()
ΔVZ	()	()
ΔVT	()	()

TARGET S3 BURN | 12 |

CRT ✓SV SEL correct
 [GNC 34 ORBIT TGT]
 TGT NO - ITEM 1 +3 EXEC
 ✓TGT Set data
 T1 TIG (BASE TIME +0/0:50:13)
 EL +0
 ΔT +40.2
 ΔX -48.60
 ΔY +0
 ΔZ +0
 COMPUTE T1 - ITEM 27 EXEC

Note solution

S3 SOLUTION																	
										3σ Variation							
ΔVX	(+)	0	0	0	.	1				(0 . 3)							
ΔVY		(+)	0	0	.	2				(0 . 3)							
ΔVZ			(-)	0	0	.	6			(1 . 2)							
ΔVT	(+)	0	0	0	.	7				(0 . 9)							
TIG		0	0	2	/	0	4	:	3	4	:	3	4				
PRELIMINARY										FINAL							
ΔVX	()				.					()				.			
ΔVY		()			.					()				.			
ΔVZ			()		.					()				.			
ΔVT	()				.					()				.			

↑ TRD
↓ BOT

NAV
RADAR
RADAR
RADAR
RR

PET

00:30

A9(B6)
LVLH/DISC
NORM

CDR EXECUTE RCS BURN, RNDZ OPS Cue Card

|S2 TIG|

00:35

A/AUTO/VRN

CDR TARGET S3 BURN |I2| (preliminary solution)

MS3 RR GPC ACQ TEST |I3|

00:40

RADAR

00:45

(TIG -4:00)

CDR TARGET S3 BURN |I2| (final solution)

CDR EXECUTE RCS BURN, RNDZ OPS Cue Card

A/LVLH/NRM
DISC

00:50

|S3 TIG|

A/AUTO/VRN

CDR LOAD AND TARGET S3R BURN |I4| (preliminary solution)

00:55

MS3 RR AUTO TRACK ACQ TEST |I5|

01:00

RR GPC ACQ TEST |I3|

A1U KU - MAN SLEW
✓SLEW RATE - SLOW
SLEW ELEV - DN until
KU TRACK tb - bp

KU - GPC
✓KU SEARCH tb - gray
✓TRACK tb - gray

LOAD AND TARGET S3R BURN |I4|

CRT ✓SV SEL correct
|GNC 34 ORBIT TGT|
TGT NO - ITEM 1 +3 EXEC
Load TGT Set data
T1 TIG (BASE TIME +0/1:10:00)
EL +0
ΔT +20.4
ΔX -48.60
ΔY +0
ΔZ +0
LOAD - ITEM 26 EXEC

COMPUTE T1 - ITEM 27 EXEC

Note solution (pad, 3-12)

RR AUTO TRACK ACQ TEST |I5|

A1U KU - MAN SLEW
✓SLEW RATE - SLOW
SLEW AZM - R until
KU TRACK tb - bp
KU - AUTO TRACK

Slew RR to Elev 0, Az 0

KU SEARCH - SEARCH (tb-gray)
✓TRACK tb - gray
✓SEARCH tb - bp

KU - GPC

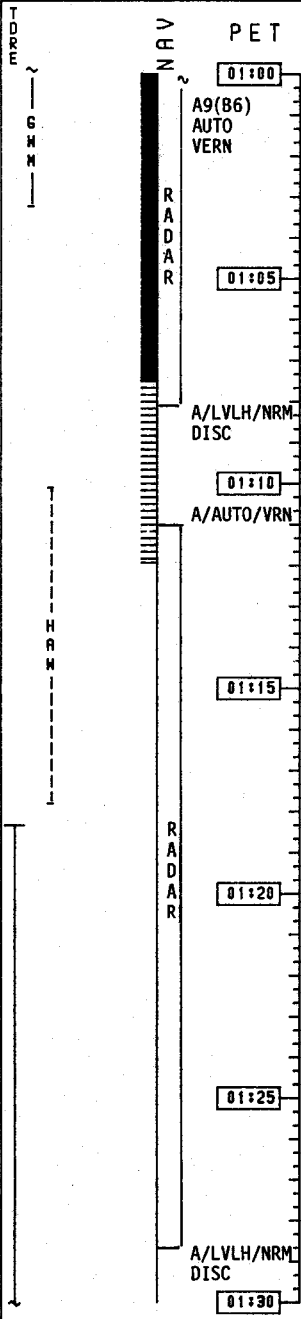
↑ CH
↓ H

TARGET S3R BURN |16|

CRT ✓SV SEL correct
 |GNC 34 ORBIT TGT|
 TGT NO - ITEM 1 +3 EXEC
 ✓TGT Set data
 T1 TIG (BASE TIME +0/1:10:00)
 EL +0
 ΔT +20.4
 ΔX -48.60
 ΔY +0
 ΔZ +0
 COMPUTE T1 - ITEM 27 EXEC

Note solution

S3R SOLUTION										3σ Variation				
ΔVX	(+)	0	0	0	.	4				(	0.9)	
ΔVY		(+)	0	0	.	0				(	0.0)	
ΔVZ		(+)	0	0	.	5				(	1.8)	
ΔVT	(+)	0	0	0	.	8				(	1.5)	
TIG		0	0	2	/	0	4	:	5	4	:	2	1	
PRELIMINARY													FINAL	
ΔVX	()				.					()				
ΔVY		()			.					()				
ΔVZ		()			.					()				
ΔVT	()				.					()				



PET

01:00

A9(B6)
AUTO
VERN

R
A
D
A
R

01:05

(TIG -4:00)
CDR TARGET S3R BURN 16 (final solution)

CDR EXECUTE RCS BURN, RNDZ OPS Cue Card

A/LVLH/NRM
DISC

01:10

S3R TIG

A/AUTO/VRN

CDR TARGET F1 BURN 17 (preliminary solution)

01:15

R
A
D
A
R

01:20

A/LVLH/NRM
DISC

01:25

(TIG -4:00)
CDR TARGET F1 BURN 17 (final solution)

CDR EXECUTE RCS BURN, RNDZ OPS Cue Card

01:30

TARGET F1 BURN 17

CRT ✓SV SEL correct
GNC 34 ORBIT TGT
TGT NO - ITEM 1 +1 1 EXEC
✓TGT Set data
T1 TIG (BASE TIME +0/1:30:24)
EL +0
ΔT +22.6
ΔX -39.49
ΔY +0
ΔZ +4.56
COMPUTE T1 - ITEM 27 EXEC

Note solution

F1 SOLUTION

3σ Variation

ΔVX	(-)	0	0	2	.	9	(0.9)
ΔVY	(+)	0	0	.	2		(0.6)
ΔVZ	(+)	0	7	.	2		(3.3)
ΔVT	(+)	0	0	7	.	8	(3.3)

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

	PRELIMINARY	FINAL
ΔVX	()	()
ΔVY	()	()
ΔVZ	()	()
ΔVT	()	()

INHIBIT RR NAV | 18 |

CRT **[GNC 33 REL NAV]**
 INH RNG - ITEM 18 EXEC (*)
 R - ITEM 21 EXEC (*)
 Angles - ITEM 24 EXEC (*)

S TRK TARGET ACQ | 19 |

.....IF -Y S TRK.....
 .
 . CRT **[GNC UNIV PTG]**
 . ✓TGT ID +1
 . BODY VECT +5
 . P +0
 . Y +280.6
 . OM +90
 . TRK - ITEM 19 EXEC (CUR - *)
 . 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) EXEC (*)
 ✓STATUS - blank
 ✓SHUTTER - OP
 ✓S PRES - (*)

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

[GNC 33 REL NAV]
 ✓INH RNG, ITEM 18 - (*)
 R, ITEM 21 - (*)
 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 KU TRACK tb - gray,
 AUTO RNG - ITEM 17 EXEC (*)
 R - ITEM 20 EXEC (*)

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

If RESID V or H changes > .05 or COAS
 verifies tgt not acquired,

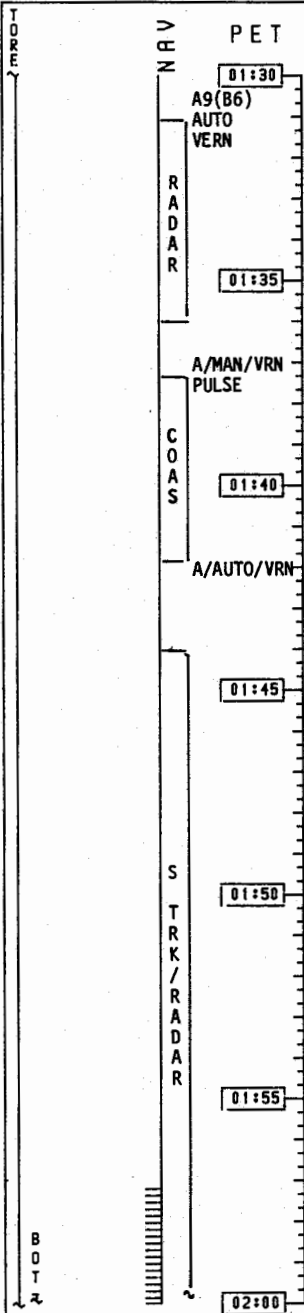
[GNC 22 S TRK/COAS CNTL]
 -Z(-Y) BREAK TRK - ITEM 8(7) EXEC

.....NO S TRK ACQ AFTER 5 MIN.....

.....IF -Y S TRK.....
 .
 . **[GNC UNIV PTG]**
 . BODY VECT +3
 . OM +0
 . TRK - ITEM 19 EXEC (CUR - *)
 . DAP: B/AUTO/NORM
 .
 . When mnvr complete,
 . DAP: A/AUTO/VERN
 .

If KU TRACK tb - gray,
 RR - ITEM 13 EXEC (*)
 AUTO RNG - ITEM 17 EXEC (*)
 R - ITEM 20 EXEC (*)
 Angles - ITEM 23 EXEC (*)

If KU TRACK tb - bp,
 Perform COAS NAVIGATION, RNDZ OPS
 Cue Card



F1 TIG

MS3 When IRT visible in COAS,
INHIBIT RR NAV I8

MS3 COAS NAVIGATION, RNDZ OPS Cue Card

MS3 When MARK ACPT Angles > 5 and RESIDS < .5,
S TRK TARGET ACQ I9

CDR COMPUTE F2 20

MS3 RR AUTO TRACK ACQ TEST #2 21
Delete if -Y S TRK being used

CDR COMPUTE F2 20 (retarget solution)

.....ONE DAY RNDZ OPS.....

. Go to ONE DAY CONT T/L, 4-17 .

.....

COMPUTE F2 20

CRT ✓SV SEL correct
[GNC 34 ORBIT TGT]
TGT NO - ITEM 1 +1 2 EXEC
✓TGT Set data
T1 TIG (BASE TIME +0/01:53:0)
EL +0
ΔT +22.6
ΔX -30.38
ΔY +0
ΔZ +0
COMPUTE T1 - ITEM 27 EXEC

Note solution

F2 SOLUTION

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

RETARGET

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

TIG [] [] [] / [] [] [] : [] [] [] : [] [] []

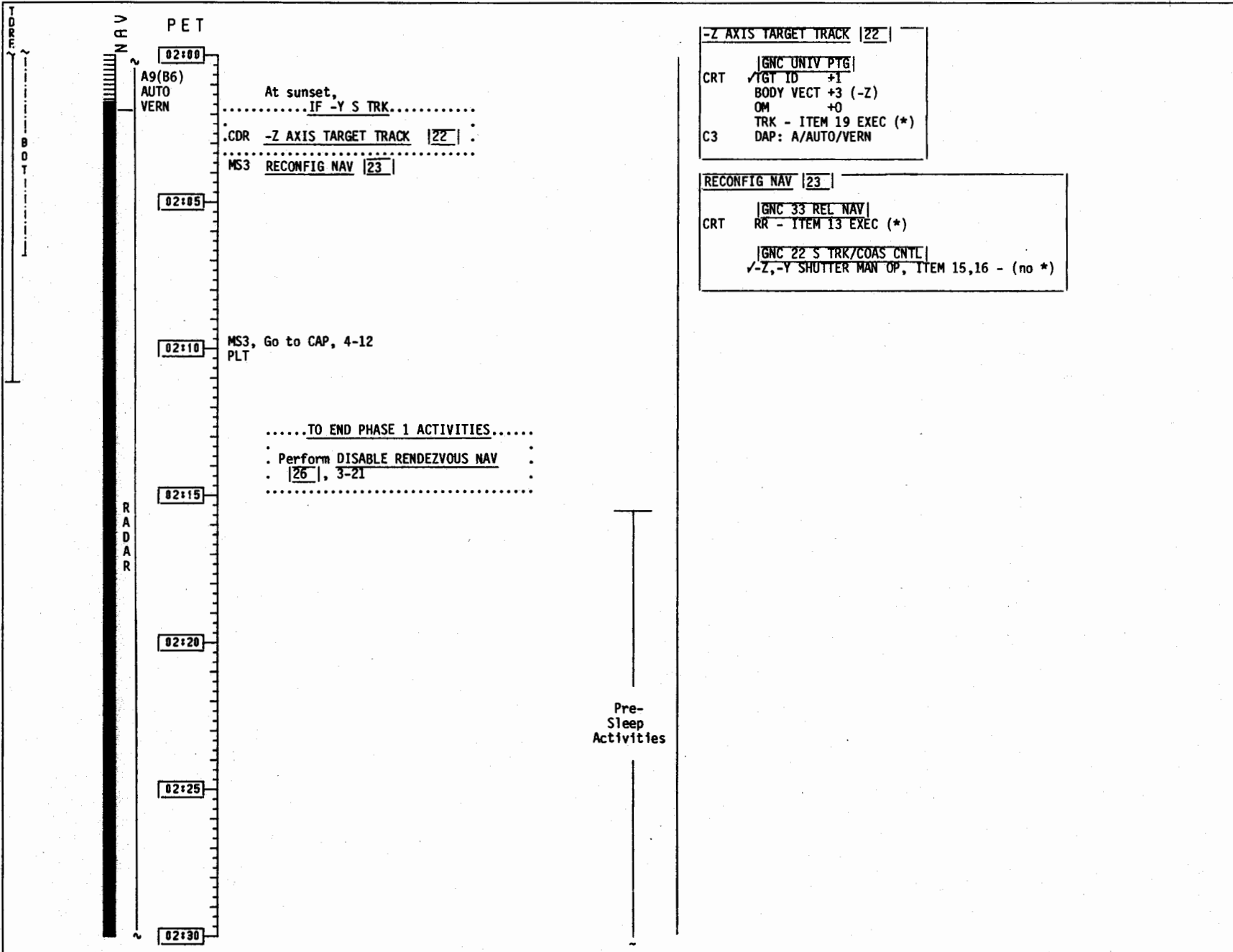
RR AUTO TRACK ACQ TEST #2 21

A1U KU - MAN SLEW
SLEW RATE - as reqd
ELEV - UP until +25° EL
✓KU TRACK tb - bp
KU - AUTO TRACK
KU SEARCH - SEARCH (tb-gray)
Monitor SIG STRENGTH
✓KU TRACK tb - gray
✓SEARCH tb - bp
✓AZ,EL approx 0

If no lock-on within 1 min,
MAN SLEW to +15° EL and
repeat SEARCH. If still
no lock-on repeat at +5° EL

KU - GPC

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PET

NAV

02:00

A9(B6)
AUTO
VERN

At sunset,
.....IF -Y S TRK.....

.CDR -Z AXIS TARGET TRACK 22 :

MS3 RECONFIG NAV 23 |

02:05

02:10

MS3, Go to CAP, 4-12
PLT

.....TO END PHASE 1 ACTIVITIES.....

. Perform DISABLE RENDEZVOUS NAV
| 26 |, 3-21 :
.....

02:15

02:20

02:25

02:30

R
A
D
A
R

Pre-
Sleep
Activities

-Z AXIS TARGET TRACK 22 |

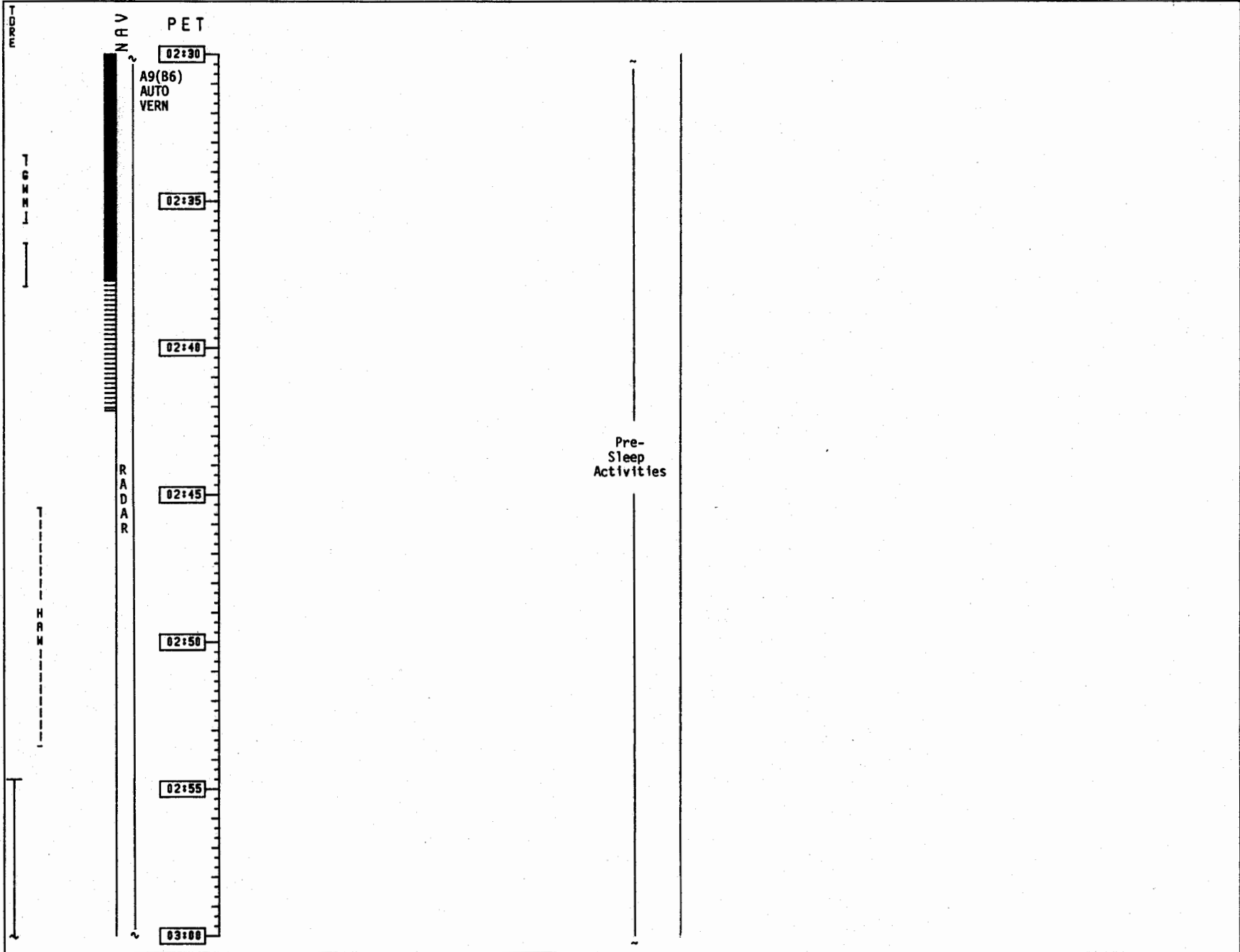
|GNC UNIV PTG|
CRT ✓TGT ID +1
BODY VECT +3 (-Z)
OM +0
TRK - ITEM 19 EXEC (*)
C3 DAP: A/AUTO/VERN

RECONFIG NAV 23 |

|GNC 33 REL NAV|
CRT RR - ITEM 13 EXEC (*)

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

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NAV

PET

A9(B6)
AUTO
VERN

02:30

02:35

02:40

02:45

02:50

02:55

03:00

R
A
D
A
R

Pre-
Sleep
Activities

T
D
R

T
C
M

H
R
M

S TRK TARGET ACQ | 25 |

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

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

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 EXEC (*)

GNC 33 REL NAV

✓INH RNG, ITEM 18 - (*)
 R, ITEM 21 - (*)
 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 KU TRACK tb - gray,
 AUTO RNG - ITEM 17 EXEC (*)
 R - ITEM 20 EXEC (*)

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

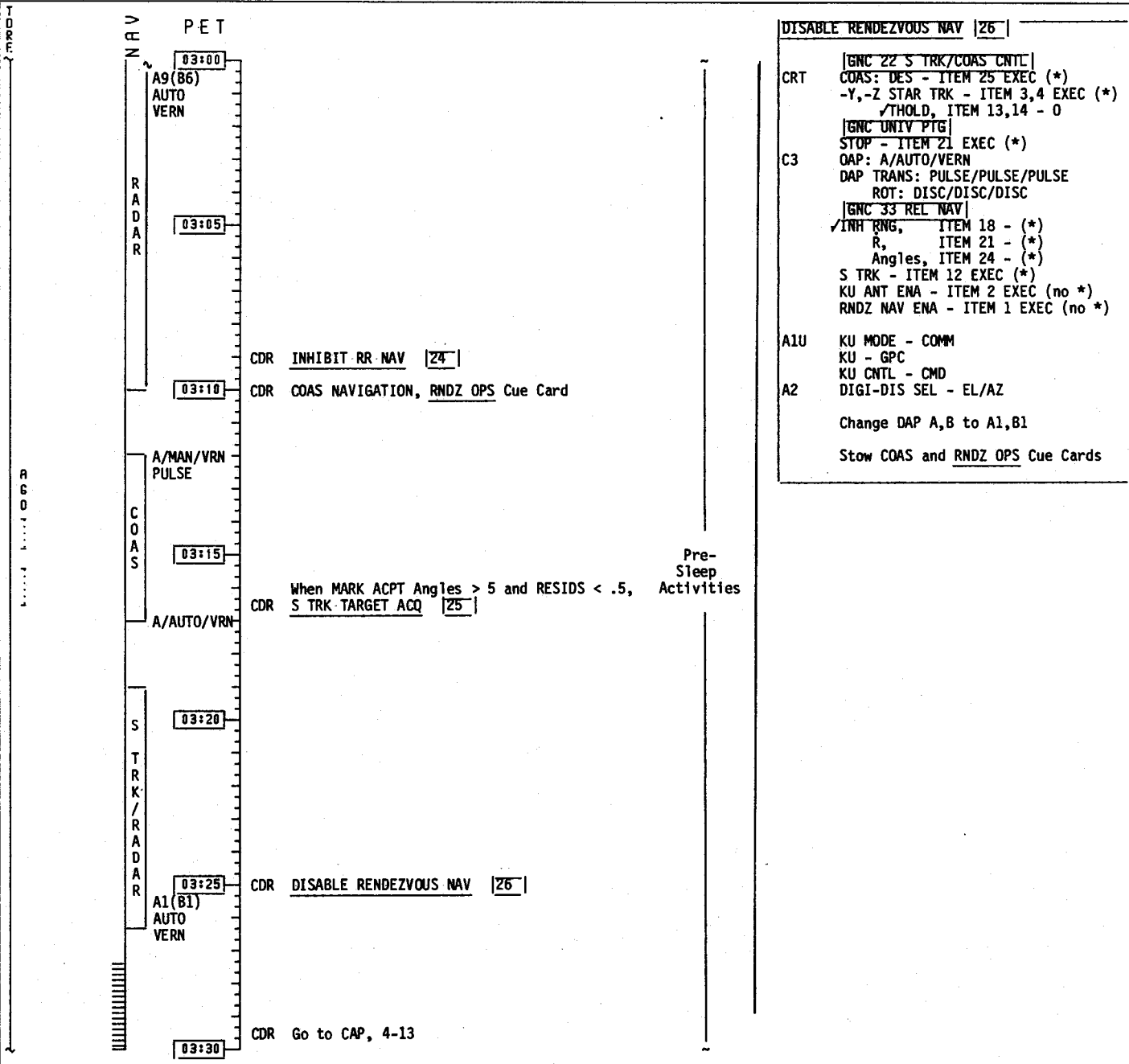
If RESID V or H changes > .05 or COAS
 verifies tgt not acquired,

GNC 22 S TRK/COAS CNTL
 -Z BREAK TRK - ITEM 8 EXEC

.....NO S TRK ACQ AFTER 5 MIN.....
 . Go to DISABLE RENDEZVOUS NAV | 26 | .

INHIBIT RR NAV | 24 |

GNC 33 REL NAV
 CRT INH RNG - ITEM 18 EXEC (*)
 R - ITEM 21 EXEC (*)
 Angles - ITEM 24 EXEC (*)



DISABLE RENDEZVOUS NAV [26]

CRT GNC 22 S TRK/COAS CNTL
COAS: DES - ITEM 25 EXEC (*)
-Y,-Z STAR TRK - ITEM 3,4 EXEC (*)
✓THOLD, ITEM 13,14 - 0

GNC UNIV PTG
STOP - ITEM 21 EXEC (*)

C3 OAP: A/AUTO/VERN
DAP TRANS: PULSE/PULSE/PULSE
ROT: DISC/DISC/DISC

GNC 33 REL NAV
✓INH RNG, ITEM 18 - (*)
R, ITEM 21 - (*)
Angles, ITEM 24 - (*)
S TRK - ITEM 12 EXEC (*)
KU ANT ENA - ITEM 2 EXEC (no *)
RNDZ NAV ENA - ITEM 1 EXEC (no *)

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

A2 DIGI-DIS SEL - EL/AZ

Change DAP A,B to A1,B1

Stow COAS and RNDZ OPS Cue Cards

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OPERATIONS TIMELINE - PHASE 2

3-23

STS-11/FIN

AFT FLT STATION CONFIG | 1 |

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 Eley 0, Az 0, then:
 A2 DIGI-DIS SEL - R/R
 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

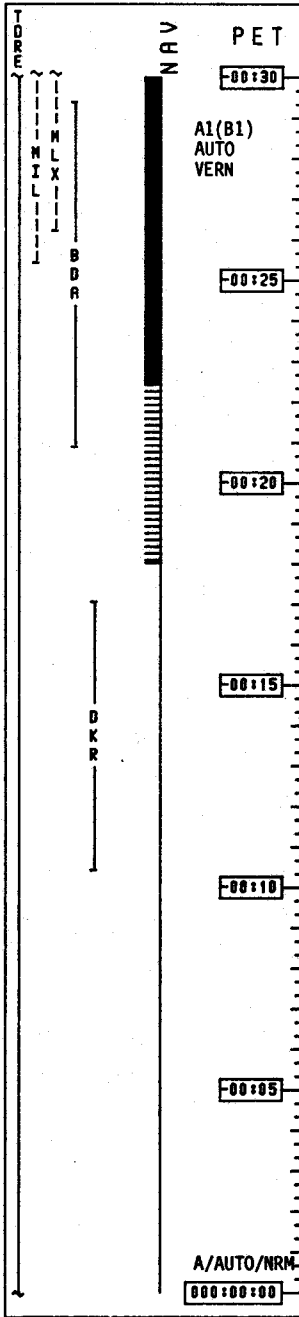
A1U KU MODE - COMM
 KU - GPC
 KU CNTL - CMD

Install -Z COAS
 Install RNDZ OPS Cue Cards (two)

ENABLE RENDEZVOUS NAV | 2 |

|GNC 33 REL NAV|
 CRT RNDZ NAV ENA - ITEM 1 EXEC (*)
 ✓SV SEL, ITEM 4 - PROP
 ✓INH RNG, ITEM 18 - (*)
 R, ITEM 21 - (*)
 Angles, ITEM 24 - (*)
 ✓S TRK, ITEM 12 - (*)

|GNC 34 ORBIT TGT|
 TGT NO - ITEM 1 *5 EXEC
 BASE TIME (TI TIG, BURN PADS, 1-4)
 LOAD - ITEM 26 EXEC



A1(B1)
AUTO
VERN

MS3 AFT FLT STATION CONFIG | 1 |
 CDR ENABLE RENDEZVOUS NAV | 2 |
 PLT Set EVENT TIMER counting to NC TIG and
 SM CRT TIMER to begin at TIG

CDR, PERFORM NC BURN | 3 |
 PLT

PERFORM NC BURN | 3 |

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

GNC UNIV PTE
 CRT STOP - ITEM 21 EXEC (*)
 OPS 202 PRO
1: GNC ORBIT MNVR EXEC
2: GNC SYS SUMM 2

CRT1 Load TGT data per BURN PADS, 1-2
 LOAD - ITEM 22 EXEC
 TIMER - ITEM 23 EXEC
 ✓Burn data per BURN PADS, 1-2
 C3 DAP: A/AUTO/VERN
 DAP TRANS: NORM/NORM/NORM
 ROT: DISC/DISC/DISC
 CRT1 MNVR - ITEM 27 EXEC (*)

Perform SEC L,R then PRI L,R GMBL CK

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

O8 ✓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/ON-ORBIT OMS BURNS
 Cue Card, then

THC - Trim residuals < .2 fps
 F7/F8 FLT CNTLR PWR (two) - OFF
 O8 L,R OMS He PRESS/VAP ISOL (four) - CL
 CRT OPS 201 PRO

IRT TRACKING ATTITUDE		4
[GNC UNIV PTC]		
CRT	TGT ID	+1
	BODY VECT	+3 (-Z)
	OM	+0
.....IF -Y S TRK.....		
	BODY VECT	+5
	P	+0
	Y	+280.6
	OM	+90
.....		
	TRK - ITEM 19 EXEC (CUR - *)	
C3	DAP: B/AUTO/NORM	

S TRK TARGET ACQ		5
[GNC 22 S TRK/COAS CNTL]		
	-Z(-Y) TGT TRK - ITEM 8(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)	

↑ RWDD

NAV PET

00:00:00

(A1)B1
AUTO
NORM

CDR IRT TRACKING ATTITUDE | 4 |

When mnvr to att complete,
DAP: A/AUTO/VERN

00:05

A/AUTO/VRN

MS3 S TRK TARGET ACQ | 5 |

00:10

A9(B6)
AUTO
VERN

CDR Config DAP A,B to A9,B6

00:15

S
T
R
K

CDR TARGET NCC° BURN | 6 | (preliminary solution)

00:20

00:25

CDR TARGET NCC° BURN | 6 | (final solution)

00:30

TARGET NCC° BURN | 6 |

CRT ✓SV SEL correct
|GNC 34 ORBIT TGT|
TGT NO - ITEM 1 +1 9 EXEC
✓TGT Set data:
T1 TIG (BASE TIME -0/2:26:54)
EL +0
ΔT +146.9
ΔX -48.60
ΔY +0
ΔZ -1.20
COMPUTE T1 - ITEM 27 EXEC

Note solution

NCC° BURN SOLUTION

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

TIG [] [] [] / [] [] [] : [] [] [] : [] [] []

PRELIMINARY

FINAL

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

()					.	
()					.	
()					.	
()					.	

↑ YARR

↑ ORR

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T
D
R
E

N
R
V

PET

00:30

A9(B6)
AUTO
VERN

MS3 END S TRK NAV 7

CDR, PERFORM NH BURN 8
PLT

00:35

00:40

A/LVLH/NRM
DISC

00:45

A/AUTO/VRN

NH TIG

00:50

00:55

01:00

END S TRK NAV 7

GNC 33 REL NAV
 INH Angles - ITEM 24 EXEC (*)
 GNC 22 S TRK/COAS CNTL
 SHUTTER MAN OP, ITEM 15,16 - (no *)

PERFORM NH BURN 8

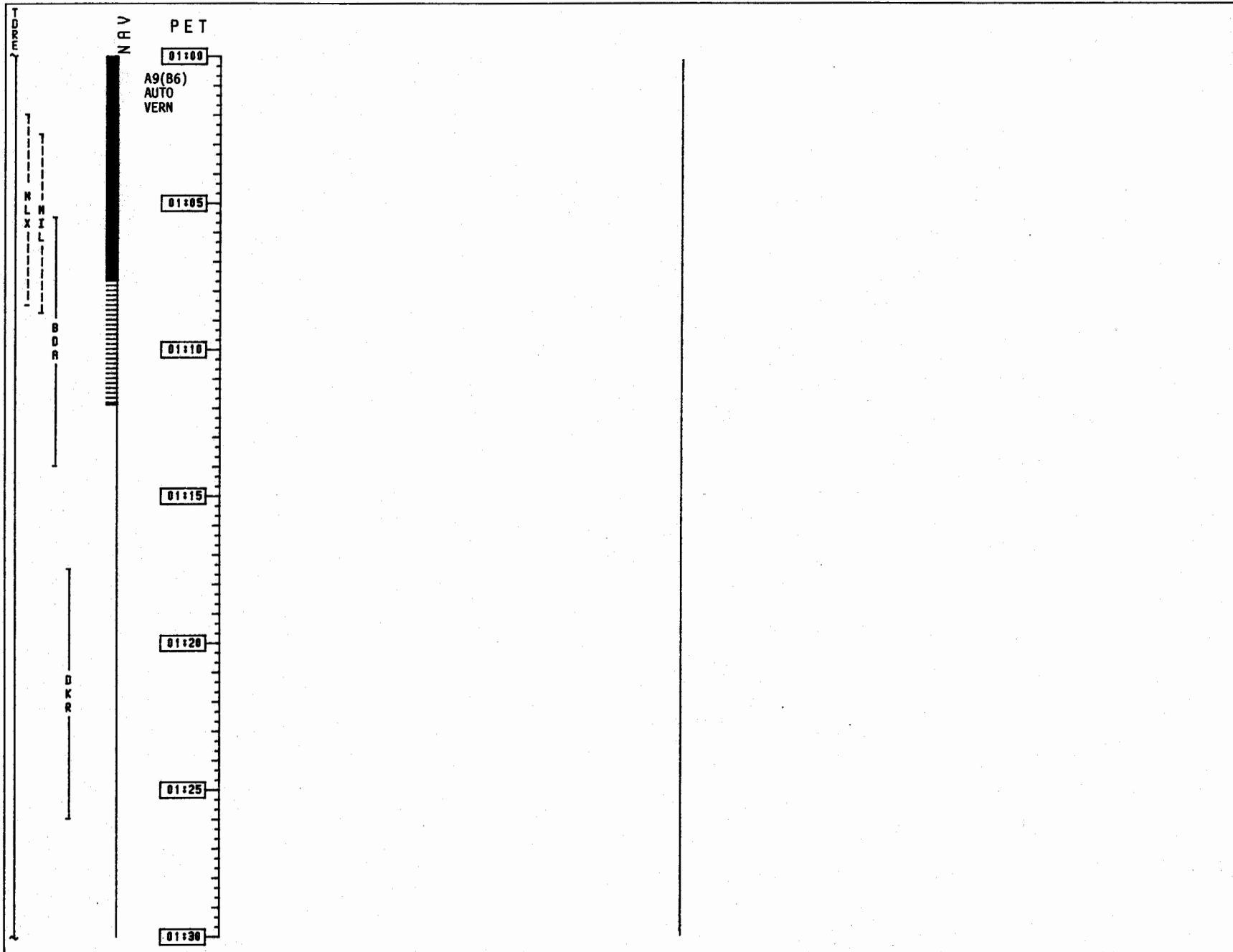
CRT OPS 202 PRO
 GNC ORBIT MNVR EXEC

Load TGT data per BURN PADS, 1-3
 LOAD - ITEM 22 EXEC
 TIMER - ITEM 23 EXEC
 Burn data per BURN PADS, 1-3
 DAP: A/AUTO/VRN
 MNVR - ITEM 27 EXEC (*)

NOTE
 If mnvr not complete by
 TIG -0:30, perform burn
 axis-by-axis in current
 attitude

Perform EXECUTE RCS BURN, RNDZ OPS
 Cue Card (begin at TIG -0:30)

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TARGET NCC BURN 9

CRT ✓SV SEL correct
 GNC 34 ORBIT TGT
 TGT NO - ITEM 1 +2 1 EXEC
 ✓TGT Set data:
 T1 TIG (BASE TIME -0/0:56:30)
 EL +0
 ΔT +56.5
 ΔX -48.60
 ΔY +0
 ΔZ -1.20
 COMPUTE T1 - ITEM 27 EXEC

Note solution

NCC BURN SOLUTION

3σ Variation

ΔVX	(+)	0	0	0	.	3		(1 . 8)
ΔVY	(+)	0	0	.	4		(2 . 1)	
ΔVZ	(-)	0	0	.	4		(3 . 9)	
ΔVT	(+)	0	0	1	.	5		(2 . 4)

TIG 0 0 2 / 2 2 : 1 9 : 4 2

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

VERTICAL TIME MARKER

NAV
S
T
R
K

PET

01:30

A9(B6)
AUTO
VERN

CDR TARGET NCC BURN 9 (preliminary solution)

01:35

MS3 S TRK TARGET ACQ 10

01:40

MS3 Note visibility of IRT at intervals until sunset

01:45

01:50

01:55

02:00

(TIG -4:00)
MS3 END S TRK NAV 11
CDR TARGET NCC BURN 9 (final solution)

S TRK TARGET ACQ 10

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

END S TRK NAV 11

CRT GNC 33 REL NAV
INH Angles - ITEM 24 EXEC (*)
GNC 22 S TRK/COAS CNTL
✓SHUTTER MAN OP, ITEM 16,15 - (no *)

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02:00
02:05
02:10
02:15
02:20
02:25
02:30

NAV

PET

02:00 CDR EXECUTE RCS BURN, RNDZ OPS Cue Card

A9(B6)
LVLH
NORM

NCC TIG

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

02:05 CDR -Z AXIS TARGET TRACK 12
A/AUTO/VRN

CDR TARGET TI BURN 13 (preliminary solution)

360.00
-156.7

02:10

02:15

02:20

MS3 When Range < 150,000 ft,
CONFIGURE FOR RR TARGET ACQ 14

02:25

02:30

MEAL

-Z AXIS TARGET TRACK 12

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

TARGET TI BURN 13

CRT SV SEL correct
GNC 34 ORBIT TGT
TGT NO - ITEM 1 +3 0 EXEC
 TGT Set data:
T1 TIG (BASE TIME)
EL +0
AT +80.4
ΔX +0
ΔY +0
ΔZ +0
COMPUTE T1 - ITEM 27 EXEC
Note solution, BURN PADS, 1-4

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/R

T
H
A
M
I
I

RR NAVIGATION | 15 |

CRT GNC 33 REL NAV
 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 (*)
 R - ITEM 20 EXEC (*)
 Angles - ITEM 23 EXEC (*)

If RATIO > 1.0,
 1) COVAR REINIT - ITEM 16 EXEC
 2) If NCC ΔVs within 3σ,
 FLTR TO PROP - ITEM 8 EXEC
 FOR 3 Angle Marks
 3) PROP TO FLTR - ITEM 9 EXEC

RR AUTO TRACK ACQ TEST | 16 |

AIU KU - MAN SLEW
 SLEW ELEV - UP until
 KU TRACK tb - bp
 Slew Antenna to Elev 0, Az 0
 KU - AUTO TRACK
 KU SEARCH - SEARCH (tb-gray)
 ✓TRACK tb - gray
 KU - GPC
 If no lock-on within one min,
 KU - GPC

TARGET TI BURN | 17 |

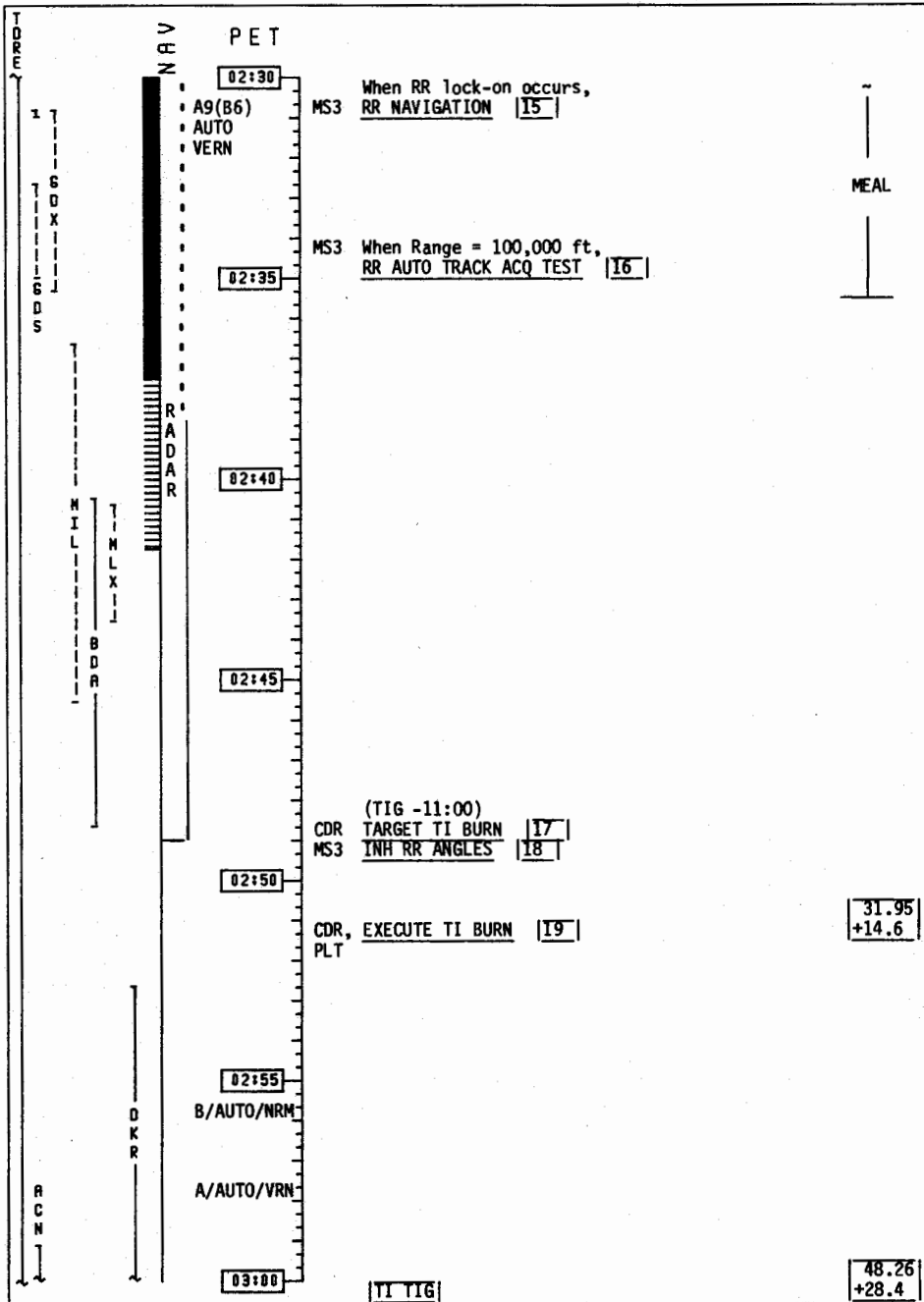
CRT OPS 202 PRO
GNC ORBIT MNRV EXEC
 Load Eng Sel, TVR, Trims and WT
 for TI per BURN PADS, 1-4
 LOAD - ITEM 22 EXEC

GNC 33 REL NAV
 ✓SV SEL correct

GNC 34 ORBIT TGT
 TGT NO - ITEM 1 +3 0 EXEC
 ✓TGT Set data:

T1 TIG (BASE TIME)
 EL +0
 ΔT +80.4
 ΔX +0
 ΔY +0
 ΔZ +0
 COMPUTE T1 - ITEM 27 EXEC

Note solution BURN PADS, 1-4



INH RR ANGLES |18|

GNC 33 REL NAV

CRT INH AngTes - ITEM 24 EXEC (*)

EXECUTE TI BURN |19|

1: GNC ORBIT MNVR EXEC

2: GNC SYS SUMM 2

CRT1 LOAD - ITEM 22 EXEC

TIMER - ITEM 23 EXEC

C3 DAP: B/AUTO/NORM

DAP TRANS: NORM/NORM/NORM

ROT: DISC/DISC/DISC

CRT1 MNVR - ITEM 27 EXEC (*)

Perform SEC L,R then PRI L,R GMBL CK

* If down arrow(s) or M(s), *

* Select good GMBL *

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/ON-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 (*)

OPS 201 PRO

C3 DAP: B/AUTO/NORM

VERIFY RR TARGET TRACK |20|

✓Attitude mnvr complete
 |GNC 33 REL NAV|
 If KU TRACK tb - gray,
 CRT | AUTO Angles - ITEM 23 EXEC (*)
 | If -Z S TRK avail,
 | Go to S TRK TARGET ACQ |21|

 If KU TRACK tb - bp,
 Perform RR AUTO TRACK ACQ, RNDZ OPS
 Cue Card
 If -Z S TRK avail,
 | Go to S TRK TARGET ACQ |21|
 If -Z S TRK failed,
 Go to COAS NAVIGATION, RNDZ OPS
 Cue Card

S TRK TARGET ACQ |21|

|GNC 22 S TRK/COAS CNTL|
 CRT ✓-Z TGT TRK, ITEM 6 - (*)
 ✓STATUS - blank
 ✓SHUTTER - OP

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

 When S PRES - (*),
 |GNC 33 REL NAV|
 INH RNG - ITEM 18 EXEC (*)
 R - ITEM 21 EXEC (*)
 Angles - ITEM 24 EXEC (*)
 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 KU TRACK tb - gray,
 | AUTO RNG - ITEM 17 EXEC (*)
 | R - ITEM 20 EXEC (*)

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

 If RESID V or H changes > .05 or COAS
 verifies tgt not acquired,
 |GNC 22 S TRK/COAS CNTL|
 -Z BREAK TRK - ITEM 8 EXEC

.....NO S TRK ACQ AFTER 5 MIN.....

. If KU TRACK tb - gray, .
 . RR - ITEM 13 EXEC (*) .
 . AUTO RNG - ITEM 17 EXEC (*) .
 . R - ITEM 20 EXEC (*) .
 . Angles - ITEM 23 EXEC (*) .
 .
 . If KU TRACK tb - bp, .
 . Perform COAS NAVIGATION, RNDZ OPS .
 . Cue Card .

P E T

03:00 (A9)B6
AUTO
NORM

03:05

03:10

03:15

03:20

03:25

03:30

T D R E

D K C H N

N A V

R A D A R

S T R K / R A D A R

T I I B O T T I I

A / L V L H / N R M
D I S C

S T R K / R A D A R

.....IF RR FAILED.....
: Go to RADAR FAIL, 4-3 :
.....

CDR When in attitude, DAP: A/AUTO/VERN

MS3 VERIFY RR TARGET TRACK | 20 |

MS3 S TRK TARGET ACQ | 21 |

CDR TARGET MC 1 | 22 | (preliminary solution)

50.47
+5.2

(TIG -4:00)
CDR TARGET MC 1 | 22 | (final solution)

CDR EXECUTE RCS BURN, RNDZ OPS Cue Card

50.02
-8.1

MC 1 TIG

CDR TARGET MC 2 | 23 | (preliminary solution)

TARGET MC 1 | 22 |

CRT ✓SV SEL correct
|GNC 34 ORBIT TGT|
TGT NO - ITEM 1 +3 1 EXEC
✓TGT Set data:
T1 TIG (BASE TIME +0/00:24:12)
EL +0
ΔT +56.2
ΔX +0
ΔY +0
ΔZ +0
COMPUTE T1 - ITEM 27 EXEC

Note solution

MC 1 BURN SOLUTION

3σ Variation

ΔVX	(+)	0	0	0	.	1	(0 . 3)
ΔVY	(-)	0	0	.	1		(1 . 5)
ΔVZ	(-)	0	0	.	3		(0 . 6)
ΔVT	(+)	0	0	0	.	5	(0 . 9)

TIG | 0 | 0 | 2 | / | 2 | 3 | : | 4 | 0 | : | 2 | 4 |

	PRELIMINARY	FINAL
ΔVX	()	()
ΔVY	()	()
ΔVZ	()	()
ΔVT	()	()

TARGET MC 2 | 23 |

CRT ✓SV SEL correct
|GNC 34 ORBIT TGT|
TGT NO - ITEM 1 +3 2 EXEC
✓TGT Set data:
T1 TIG (BASE TIME +0/00:51:24)
EL +28.4
ΔT +31.4
ΔX +0
ΔY +0
ΔZ +0

Note Nominal T1 TIG in pad, 3-40

COMPUTE T1 - ITEM 27 EXEC

Note solution in pad, 3-40

TARGET MC 2 26

CRT ✓SV SEL correct
 [GNC 34 ORBIT TGT]
 TGT NO - ITEM 1 +3 2 EXEC
 COMPUTE T1 - ITEM 27 EXEC
 ✓TIG slip < 5 min

.....TIG SLIP > 5 MIN.....
 . TGT NO - ITEM 1 +3 2 EXEC .
 . T1 TIG +(Nominal ± 5 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

CONFIG FOR RR ONLY NAV 24

CRT [GNC 33 REL NAV]
 RR - ITEM 13 EXEC (*)
 [GNC 22 S TRK/COAS CNTL]
 ✓-Y,-Z SHUTTER MAN OP.
 ITEM 15,16 - (no *)

MANUAL OUT-OF-PLANE NULL 25

CRT [GNC 33 REL NAV]
 When Y = 0
 F7 FLT CNTLR PWR - ON
 C3 DAP TRANS: as reqd
 DAP: A/AUTO/NORM
 THC - Null Y (+Y = FWD THC left)
 (AFT THC right)
 DAP: A/AUTO/VERN
 F7 FLT CNTLR PWR - OFF

MC 2 BURN SOLUTION

3 σ Variation

ΔV_X	(-)	0	0	0	.	2	(0 . 3)
ΔV_Y		(-)	0	0	.	0	(0 . 3)
ΔV_Z		(-)	0	0	.	7	(1 . 2)
ΔV_T	(+)	0	0	0	.	8	(0 . 9)

TIG 0 0 3 / 0 0 : 0 7 : 3 6

PRELIMINARY

ΔV_X	()			.	
ΔV_Y		()		.	
ΔV_Z		()		.	
ΔV_T	()			.	

FINAL

ΔV_X	()			.	
ΔV_Y		()		.	
ΔV_Z		()		.	
ΔV_T	()			.	

TIG SLIP
(COMPUTED - NOM)

PREL / : : : :

FINAL / : : : :

NOMINAL / : : : :

T
D
R
E

Y
R
R

T
H
R
N

NAV
RADAR
RADAR

PET

03:30
A9(B6)
AUTO
VERN
03:35
A/AUTO/NRM
A/AUTO/VRN
03:40
03:45
03:50
A/LVLH/NRM
DISC
A/AUTO/VRN
03:55
A/LVLH/NRM
DISC
04:00

MS3 At sunset,
CONFIG FOR RR ONLY NAV [24] (if reqd)

CDR When $Y \approx 0$,
MANUAL OUT-OF-PLANE NULL [25]

CDR (TIG -5:00)
TARGET MC 2 [26] (final solution)

CDR EXECUTE RCS BURN, RNDZ OPS Cue Card

MC 2 TIG

CDR (TIG -4:00)
TARGET MC 3 [27]

CDR EXECUTE RCS BURN, RNDZ OPS Cue Card

MC 2 ET

-00:05

00:00

00:05

TARGET MC 3 [27]

CRT ✓SV SEL correct
GNC 34 ORBIT TGT
TGT NO - ITEM 1 +3 3 EXEC
✓TGT Set data:
T1 TIG (BASE TIME +0/00:10:00)
EL +0
ΔT +21.4
ΔX +0
ΔY +0
ΔZ +0
COMPUTE T1 - ITEM 27 EXEC
Note solution

MC 3 BURN SOLUTION

3σ Variation

ΔVX	(+)	0	0	0	.	0	(0 . 6)
ΔVY	(+)	0	0	.	0		(0 . 3)
ΔVZ	(-)	0	0	.	2		(0 . 9)
ΔVT	(+)	0	0	0	.	4	(0 . 6)

TIG 0 0 3 / 0 0 : 1 7 : 3 6

PRELIMINARY

FINAL

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

TARGET MC 4 | 28 |

CRT ✓SV SEL correct
[GNC 34 ORBIT TGT]
TGT NO - ITEM 1 +3 4 EXEC
✓TGT Set data:
T1 TIG (BASE TIME +0/0:20:0)
EL +0
ΔT +11.4
ΔX +0
ΔY +0
ΔZ +0
COMPUTE T1 - ITEM 27 EXEC

Note solution

MC 4 BURN SOLUTION

3σ Variation

ΔVX	(+)	0	0	0	.	0	(0 . 6)
ΔVY		(+)	0	0	.	0	(0 . 3)
ΔVZ		(-)	0	0	.	1	(1 . 5)
ΔVT	(+)	0	0	0	.	5	(0 . 9)

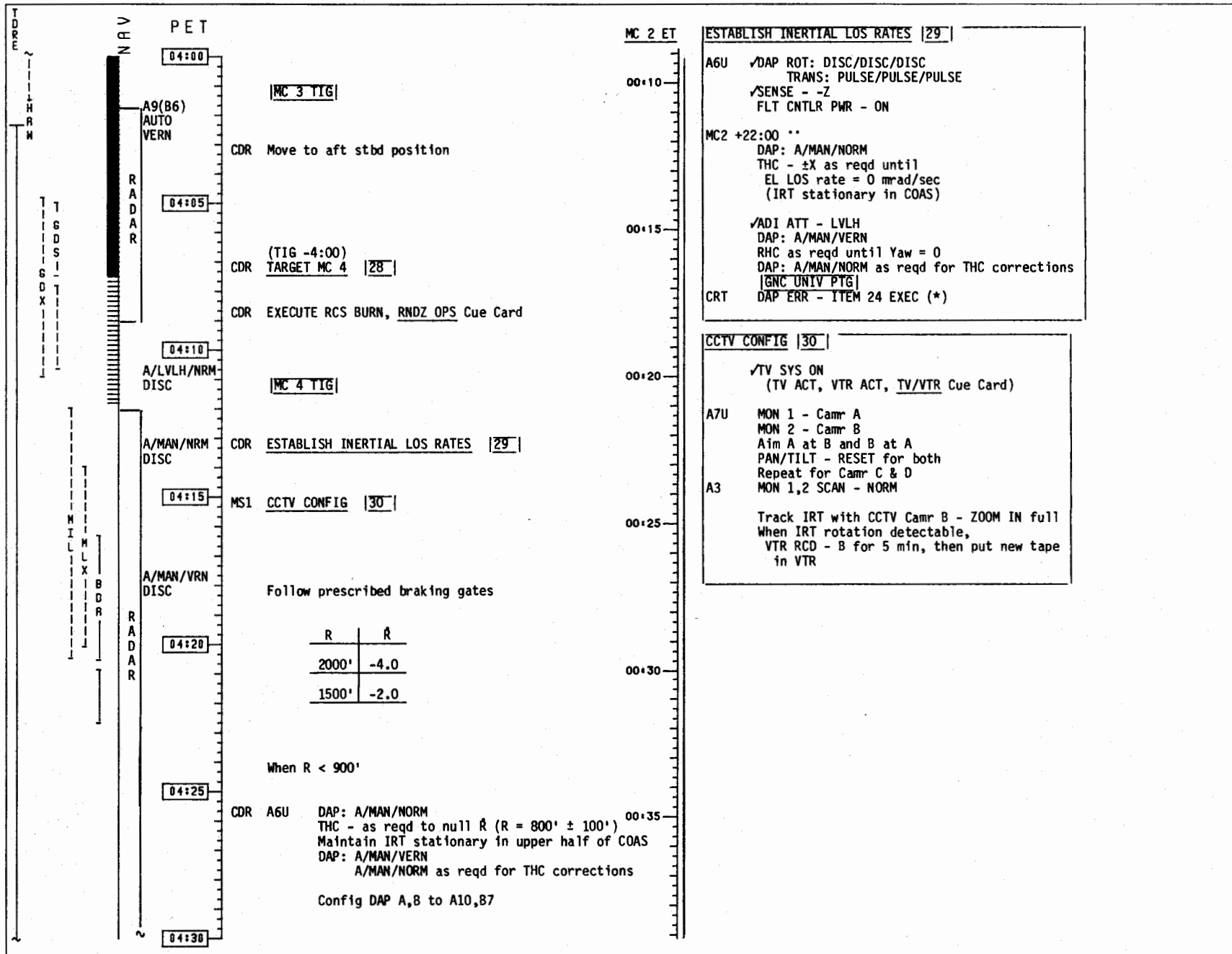
TIG 0 0 3 / 0 0 : 2 7 : 3 6

PRELIMINARY

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

FINAL

()			.	
()			.	
()			.	
()			.	



PET

04:00

A9(B6)
AUTO
VERN

MC 3 TIG

CDR Move to aft stbd position

04:05

(TIG -4:00)
CDR TARGET MC 4 28

CDR EXECUTE RCS BURN, RNDZ OPS Cue Card

04:10

A/LVLH/NRM
DISC

MC 4 TIG

CDR ESTABLISH INERTIAL LOS RATES 29

04:15

A/MAN/NRM
DISC

MSI CCTV CONFIG 30

Follow prescribed braking gates

R	\dot{R}
2000'	-4.0
1500'	-2.0

When R < 900'

04:25

CDR A6U DAP: A/MAN/NORM
THC - as reqd to null \dot{R} ($R = 800' \pm 100'$)
Maintain IRT stationary in upper half of COAS
DAP: A/MAN/VERN
A/MAN/NORM as reqd for THC corrections

Config DAP A,B to A10,B7

04:30

MC 2 ET

00:10

ESTABLISH INERTIAL LOS RATES 29

A6U DAP ROT: DISC/DISC/DISC
TRANS: PULSE/PULSE/PULSE
 SENSE - -Z
FLT CNTLR PWR - ON

MC2 +22:00 **
DAP: A/MAN/NORM
THC - $\pm X$ as reqd until
EL LOS rate = 0 mrad/sec
(IRT stationary in COAS)

ADI ATT - LVLH
DAP: A/MAN/VERN
RHC as reqd until Yaw = 0
DAP: A/MAN/NORM as reqd for THC corrections
 GNC UNIV PTG

CRT DAP ERR - ITEM 24 EXEC (*)

00:15

00:20

CCTV CONFIG 30

TV SYS ON
(TV ACT, VTR ACT, TV/VTR Cue Card)

A7U MON 1 - Camr A
MON 2 - Camr B
Aim A at B and B at A
PAN/TILT - RESET for both
Repeat for Camr C & D

A3 MON 1,2 SCAN - NORM

Track IRT with CCTV Camr B - ZOOM IN full
When IRT rotation detectable,
VTR RCD - B for 5 min, then put new tape
in VTR

00:25

00:30

00:35

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2
 N R V
 04:30
 A10(B7)
 MAN/VERN
 DISC
 04:35
 A/AUTO/NRM
 MS1
 04:40
 Record:
 RR E1 _____ Az _____
 COAS X _____ Y _____
 04:45
 CDR
 INITIATE CLOSING RATE
 32
 B/AUTO/VRN
 04:50
 Follow prescribed braking gates

R	\dot{R}
500'	-.5
400'	-.4
300'	-.3

 04:55
 MS3 A7U
 PL BAY FLOOD DOCKING - BRT
 05:00

PLT CONFIGURE FOR VBAR SK
 CRT GNC UNIV PTG
 TGT ID +2
 BODY VECT +2 (-X)
 OM +0
 TRK - ITEM 19 EXEC (CUR - *)
 TOT ERR - ITEM 23 EXEC (*)

CDR ESTABLISH VBAR SK (800 ± 100 FT) 31
 MS1 Track IRT with CCTV Camr B - ZOOM IN full
 VTR RCD - B for 5 min

RR GIMBAL BIAS CHECK
 Record:
 RR E1 _____ Az _____
 COAS X _____ Y _____

CDR INITIATE CLOSING RATE 32

Follow prescribed braking gates

R	\dot{R}
500'	-.5
400'	-.4
300'	-.3

MS3 A7U PL BAY FLOOD DOCKING - BRT

MC 2 ET
 00:40
 00:45
 00:50

ESTABLISH VBAR SK (800 ± 100 FT) 31

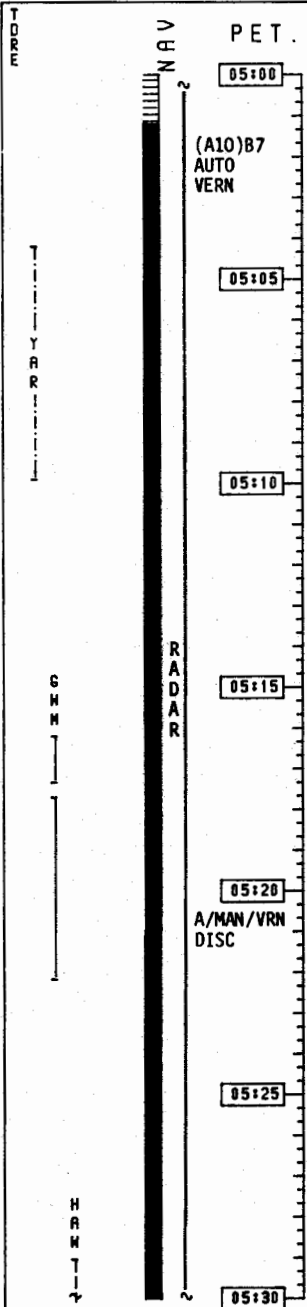
A6U When ADI PITCH = 180° (LVLH REF), then
 CRT UNIV PTG TOT ERR - small
 A6U DAP: A/AUTO/NORM
 When IRT at -3 ± 1 deg in COAS, then
 THC -X (down) as reqd until
 EL LOS rate = 1.14 mrad/sec
 (-18 pulses, .9 fps)
 THC -Z as reqd to null \dot{R}
 Initiate SK, maintain IRT in lower half of
 COAS, $\dot{R} = 0$
 DAP: B/AUTO/VERN
 B/AUTO/NORM as reqd for THC corrections

INITIATE CLOSING RATE 32

A6U DAP: A/AUTO/NORM
 DAP TRANS: PULSE/PULSE/PULSE
 THC -Z (in) until $\dot{R} = -0.8$ (15 DAP A pulses)
 -X (up) as reqd to maintain IRT in lower
 half of COAS
 DAP: B/AUTO/VERN
 B/AUTO/NORM as reqd for THC corrections

NOTE
 If visibility is lost, null \dot{R} ,
 wait until visibility improves
 and then resume approach

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(A10)B7
AUTO
VERN

05:00

05:05

When R = 200' ± 20',
CDR ESTABLISH 200 FT STATIONKEEPING |33|

05:10

MS1 ✓Track IRT with CCTV Camr B - ZOOM IN full
VTR RCD - B for 5 min

05:15

CDR INITIATE RCS SEP |34|

05:20

A/MAN/VRN
DISC

05:25

05:30

ESTABLISH 200 FT STATIONKEEPING |33|

A6U DAP TRANS: PULSE/PULSE/PULSE, LOW Z
DAP: B/AUTO/NORM
THC - NULL R

DAP: B/AUTO/VERN
B/AUTO/NORM as reqd for THC corrections
THC - Maintain R = 200' ± 20'

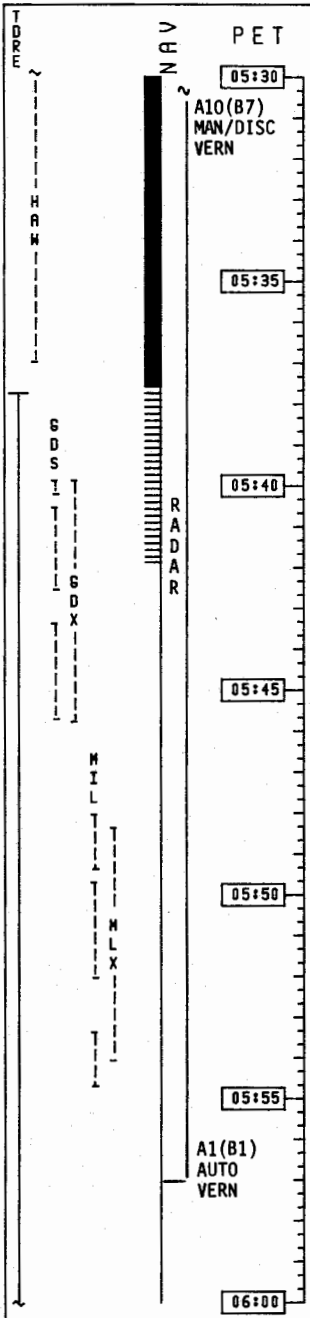
INITIATE RCS SEP |34|

A6U DAP: A/AUTO/NORM
✓DAP TRANS: PULSE/PULSE/PULSE, LOW Z
THC - +Z (out) until R = +.8 (25 DAP A pulses)

DAP ROT: DISC/DISC/DISC
DAP: A/MAN/VERN
RHC - pitch as reqd to keep IRT in view

Track IRT with CCTV Camr B

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05:30
A10(B7)
MAN/DISC
VERN

05:35

05:40

05:45

05:50

05:55

A1(B1)
AUTO
VERN

06:00

At sunrise,
MS1 ✓Track IRT with CCTV Camr C - ZOOM IN full
VTR RCD - C for 5 min

MS3 DISABLE RENDEZVOUS NAV 35

Go to CAP, 4-16

DISABLE RENDEZVOUS NAV 35

CRT GNC 22 S TRK/COAS CNTL
-Y, -Z STAR TRK - ITEM 3,4 EXEC (*)
GNC UNIV PTG
STOP - ITEM 21 EXEC (*)
C3 DAP: A/AUTO/VERN
✓DAP TRANS: PULSE/PULSE/PULSE, NO LOW Z
✓ROT: DISC/DISC/DISC
A6U FLT CNTLR PWR - OFF
GNC 33 REL NAV
CRT KU ANT ENA - ITEM 2 EXEC (no *)
RNDZ NAV ENA - ITEM 1 EXEC (no *)
A1U KU MODE - COMM
KU - GPC
KU CNTL - CMD
A2 DIGI-DIS SEL - EL/AZ

Change DAP A,B to A1,B1

Stow COAS
Stow OMS BURN and RNDZ OPS Cue Cards

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OPERATIONS TIMELINE - S TRKR

3-51

STS-11/FIN

OPS T/L
S TRKR

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NAV PET

000:00:00
00:05
00:10
00:15
00:20
00:25
00:30

(A1)B1
AUTO
NORM

A/AUT/VRN

S
T
R
K

ENABLE RENDEZVOUS NAV | 1 |

S TRK TARGET TRACK | 2 |

When mnvr to attitude complete,
DAP: A/AUTO/VERN

S TRK TARGET ACQ | 3 |

DISABLE RENDEZVOUS NAV | 4 |

ENABLE RENDEZVOUS NAV | 1 |

CRT |GNC 33 REL NAV|
 RNDZ NAV ENA - ITEM 1 EXEC (*)
 ✓SV SEL, ITEM 4 - PROP
 ✓INH RNG, ITEM 18 - (*)
 R, ITEM 21 - (*)
 Angles, ITEM 24 - (*)
 ✓S TRK, ITEM 12 - (*)

S TRK TARGET TRACK | 2 |

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

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

TRK - ITEM 19 EXEC (CUR - *)
 C3 DAP: B/AUTO/NORM

S TRK TARGET ACQ | 3 |

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 15(16) EXEC (*)

If RESID V and H change < .05 for four
 consecutive Nav cycles and RATIO < 1.0,
 AUTO Angles - ITEM 23 EXEC (*)
 If RESID V or H change > .05 or RATIO > 1.0,
 |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)

DISABLE RENDEZVOUS NAV | 4 |

CRT |GNC 22 S TRK/COAS CNTL|
 -Y,-Z STAR TRK - ITEM 3,4 EXEC (*)
 ✓-Y,-Z SHUTTER MAN OP, ITEM 15,16 - (no *)
 |GNC UNIV PTG|
 STOP - ITEM 21 EXEC (*)
 |GNC 33 REL NAV|
 RNDZ NAV ENA - ITEM 1 EXEC (no *)

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CONTINGENCY OPERATIONS

4-1

STS-11/FIN

CONTINGENCY
OPERATIONS

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RADAR FAIL

4-3

STS-11/FIN

RADAR FAIL

VERIFY NAV PTG ACCURACY |IR|

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

.....POINTING ERROR > 1°.....

• Perform COAS NAVIGATION,
 • RNDZ OPS Cue Card until
 • AngTe RESIDs < .5

S TRK TARGET ACQ |ZR|

.....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/VERM

CRT |GNC 22 S TRK/COAS CNL|
 ✓-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 - (*)
 ✓ST, ITEM 12 - (*)

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,

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

If RESID V or H changes > .05 or COAS verifies
 tgt not acquired,

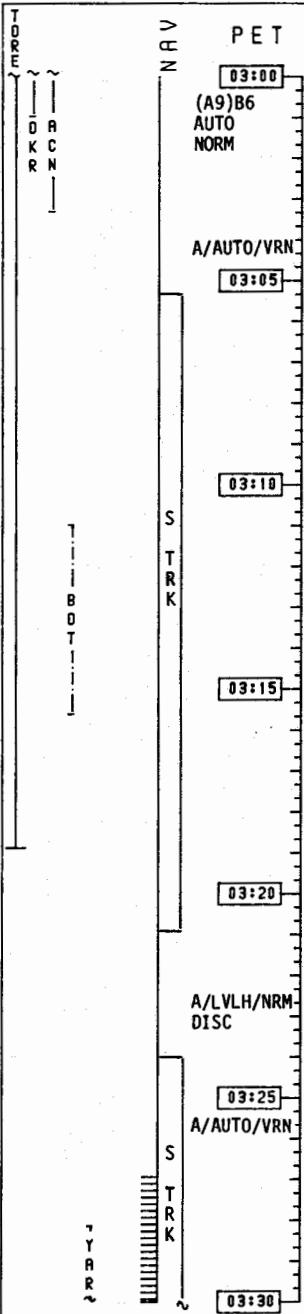
|GNC 22 S TRK/COAS CNL|
 -Z(-Y) BREAK TRK - ITEM 8(7) EXEC

.....NO S TRK ACQ AFTER 5 MIN.....

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

• |GNC UNIV PTG|
 • BODY VECT +5
 • OM +0
 • TRK - ITEM 19 EXEC
 • DAP: B/AUTO/NORM
 • When mnvr complete,
 • DAP: A/AUTO/VERM

• Perform COAS NAVIGATION, RNDZ OPS Cue Card



TARGET MC 1 [3R]

CRT ✓SV SEL correct
[GNC 34 ORBIT TGT]
TGT NO - ITEM 1 +3 1 EXEC
✓TGT Set data:
T1 TIG (BASE TIME +0/00:24:12)
EL +0
ΔT +56.2
ΔX +0
ΔY +0
ΔZ +0
COMPUTE T1 - ITEM 27 EXEC

Note solution

MC 1 BURN SOLUTION 3σ Variation

ΔVX	(+)	0	0	0	.	1	(0 . 6)
ΔVY	(-)	0	0	.	1		(2 . 7)
ΔVZ	(-)	0	0	.	3		(1 . 2)
ΔVT	(+)	0	0	0	.	9	(1 . 8)

TIG [0 0 2] / [2 3] : [4 0] : [2 4]

PRELIMINARY

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

FINAL

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

TARGET MC 2 [4R]

CRT ✓SV SEL correct
[GNC 34 ORBIT TGT]
TGT NO - ITEM 1 +3 2 EXEC
✓TGT Set data:
T1 TIG (BASE TIME +0/00:51:24)
EL +28.4
ΔT +31.4
ΔX +0
ΔY +0
ΔZ +0

Note Nominal T1 TIG in pad, 4-6

COMPUTE T1 - ITEM 27 EXEC

Note solution in pad, 4-6

TARGET MC 2 | 7R |

CRT ✓SV SEL correct
 [GNC 34 ORBIT TGT]
 TGT NO - ITEM 1 +3 2 EXEC
 COMPUTE T1 - ITEM 27 EXEC
 ✓TIG slip < 5 min

.....TIG SLIP > 5 MIN.....

. TGT NO - ITEM 1 +3 2 EXEC .
 . T1 TIG +(Nominal ±5 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

END S TRK NAV | 5R |

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

[GNC 22 S TRK/COAS CNTL]
 -Z(-Y) TERM/IDLE - ITEM 10(9) EXEC (*)
 ✓SHUTTER MAN OP, ITEM 15,16 - (no *)

MANUAL OUT-OF-PLANE NULL | 6R |

[GNC 33 REL NAV]
 CRT When Y = 0
 F7 FLT CNTLR PWR - ON
 C3 DAP: A/AUTO/NORM
 ✓DAP TRANS: as reqd
 THC - Null Y

If -Z AXIS TRACK,
 +Y = FWD THC left
 AFT THC right
 If -Y S TRK TRACK,
 +Y = FWD THC down
 AFT THC out

DAP: A/AUTO/VERN
 F7 FLT CNTLR PWR - OFF

MC 2 BURN SOLUTION 3σ Variation

ΔVX	(-) 0 0 0 . 2	(0 . 6)
ΔVY	(-) 0 0 . 0	(0 . 3)
ΔVZ	(-) 0 0 . 8	(2 . 1)
ΔVT	(+) 0 0 0 . 0	(1 . 8)

TIG 0 0 3 / 0 0 : 0 7 : 3 6

PRELIMINARY

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

FINAL

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

TIG SLIP
(COMPUTED - NOM)

PREL / : : : :

FINAL / : : : :

NOMINAL / : : : :

TDR

YARR

HAW

NAV

PET

03:30 A9(B6)
AUTO
VERN MS3 At sunset,
END S TRK NAV 5R

03:35 CDR When Y ≈ 0,
MANUAL OUT-OF-PLANE NULL 5R

A/AUTO/NRM

03:40 A/AUTO/VRN

03:45 CDR (TIG -5:00)
TARGET MC 2 7R (final solution)

CDR EXECUTE RCS BURN, RNDZ OPS Cue Card

03:50 A/LVLH/NRM
DISC MC 2 TIG

A/AUTO/VRN

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

CDR -Z AXIS TARGET TRACK 8R

03:55 CDR Move to aft stbd position

MS1 CCTV CONFIG 9R

04:00

-Z AXIS TARGET TRACK 8R

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

CCTV CONFIG 9R

✓TV SYS ON
(TV ACT, VTR ACT, TV/VTR Cue Card)

A7U MON 1 - Camr A
MON 2 - Camr B
Aim A at B and B at A
PAN/TILT - RESET for both
Repeat for Camr C & D

A3 MON 1,2 SCAN - NORM

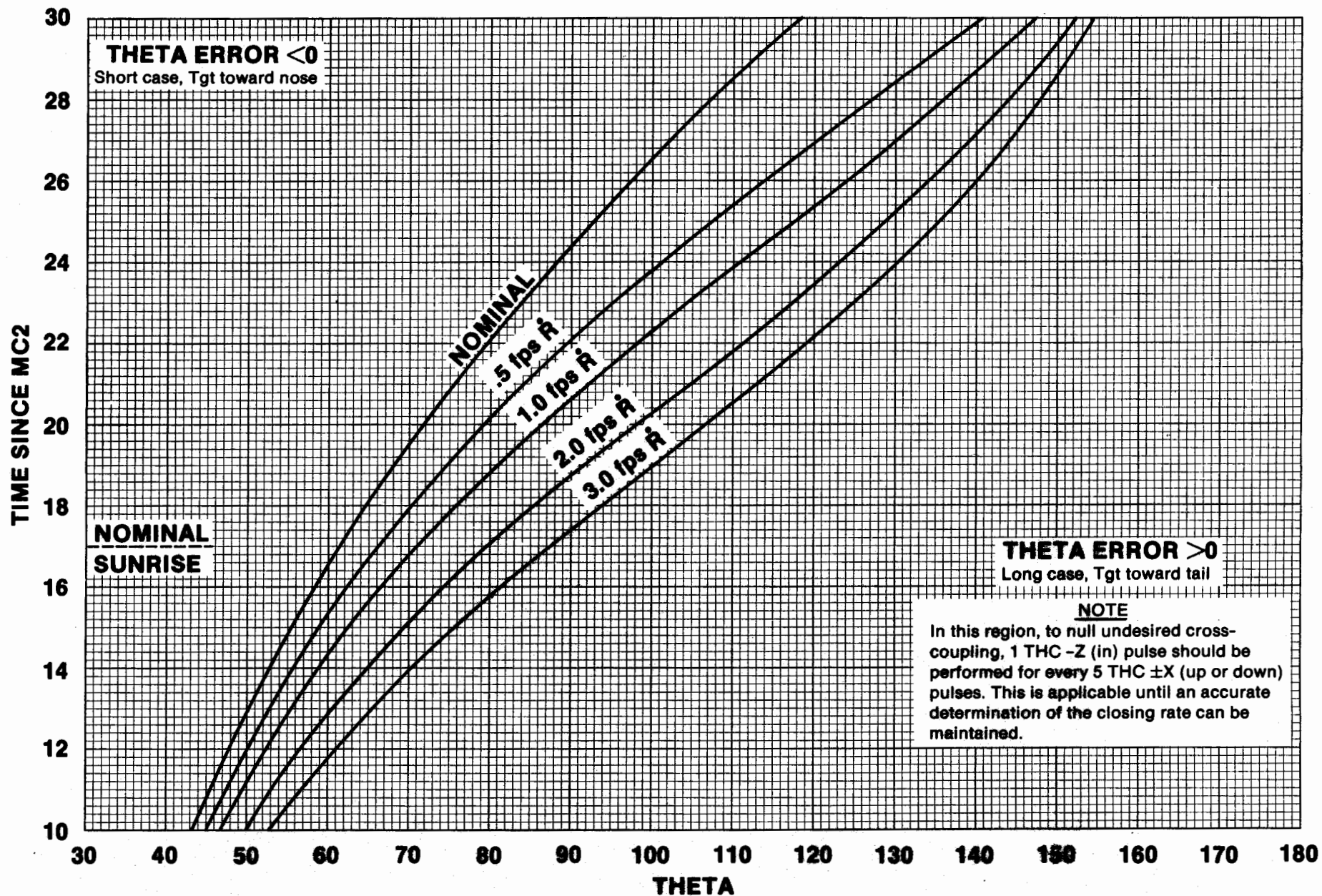
At sunrise,
Track IRT with CCTV Camr B - ZOOM IN full
When IRT rotation detectable,
VTR RCD - B for 5 min, then
put new tape in VTR

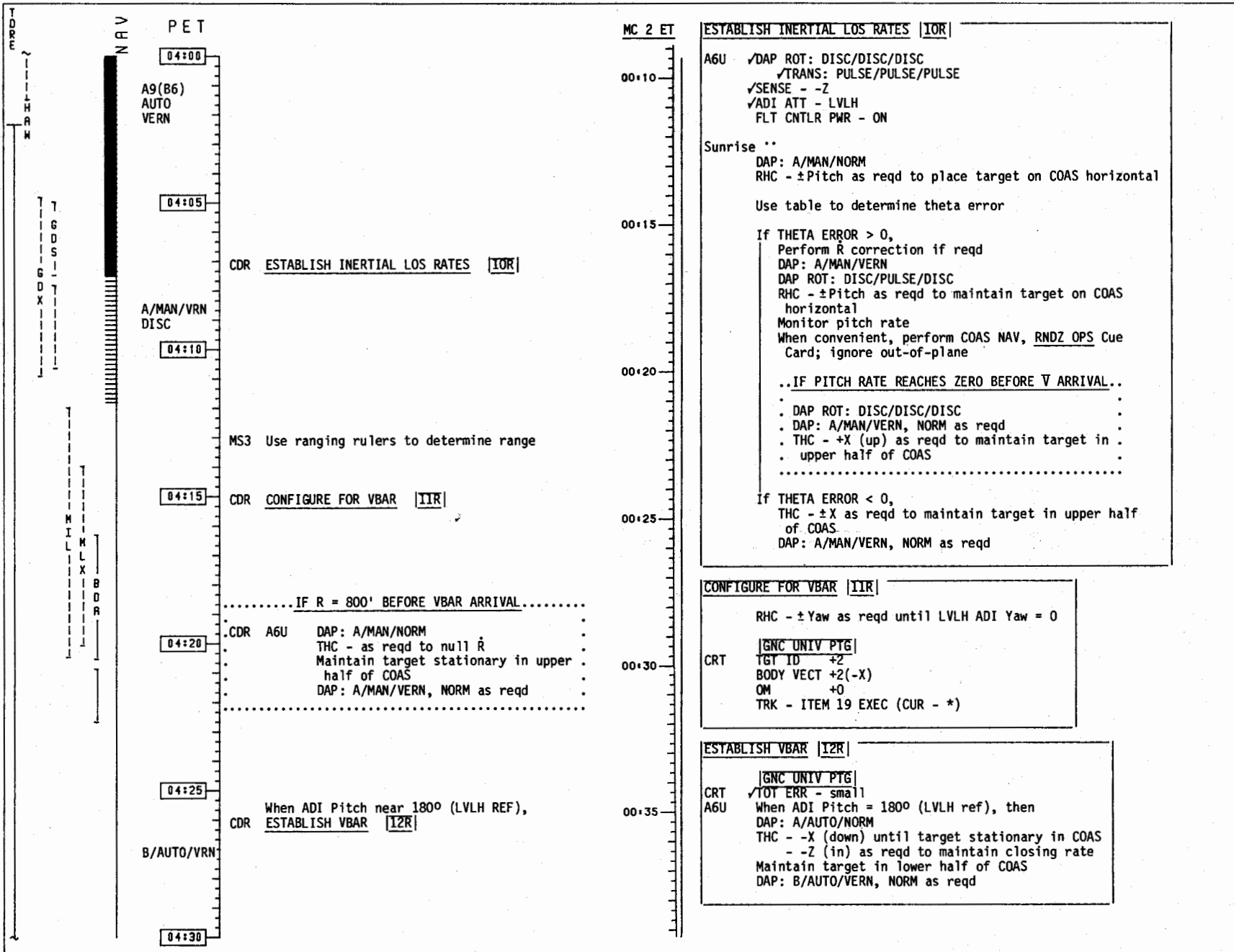
MC 2 ET

-00:05

00:00

00:05





MC 2 ET

ESTABLISH INERTIAL LOS RATES |IOR|

A6U ✓DAP ROT: DISC/DISC/DISC
 ✓TRANS: PULSE/PULSE/PULSE
 ✓SENSE - -Z
 ✓ADI ATT - LVLH
 FLT CNTLR PWR - ON

Sunrise **

DAP: A/MAN/NORM
 RHC - ±Pitch as reqd to place target on COAS horizontal

Use table to determine theta error

IF THETA ERROR > 0,
 Perform R correction if reqd
 DAP: A/MAN/VERN
 DAP ROT: DISC/PULSE/DISC
 RHC - ±Pitch as reqd to maintain target on COAS
 horizontal
 Monitor pitch rate
 When convenient, perform COAS NAV, RNDZ OPS Cue
 Card; ignore out-of-plane

..IF PITCH RATE REACHES ZERO BEFORE V 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 .

IF THETA ERROR < 0,
 THC - ±X as reqd to maintain target in upper half
 of COAS
 DAP: A/MAN/VERN, NORM as reqd

CONFIGURE FOR VBAR |IIR|

RHC - ±Yaw as reqd until LVLH ADI Yaw = 0

|GNC UNIV PTE|

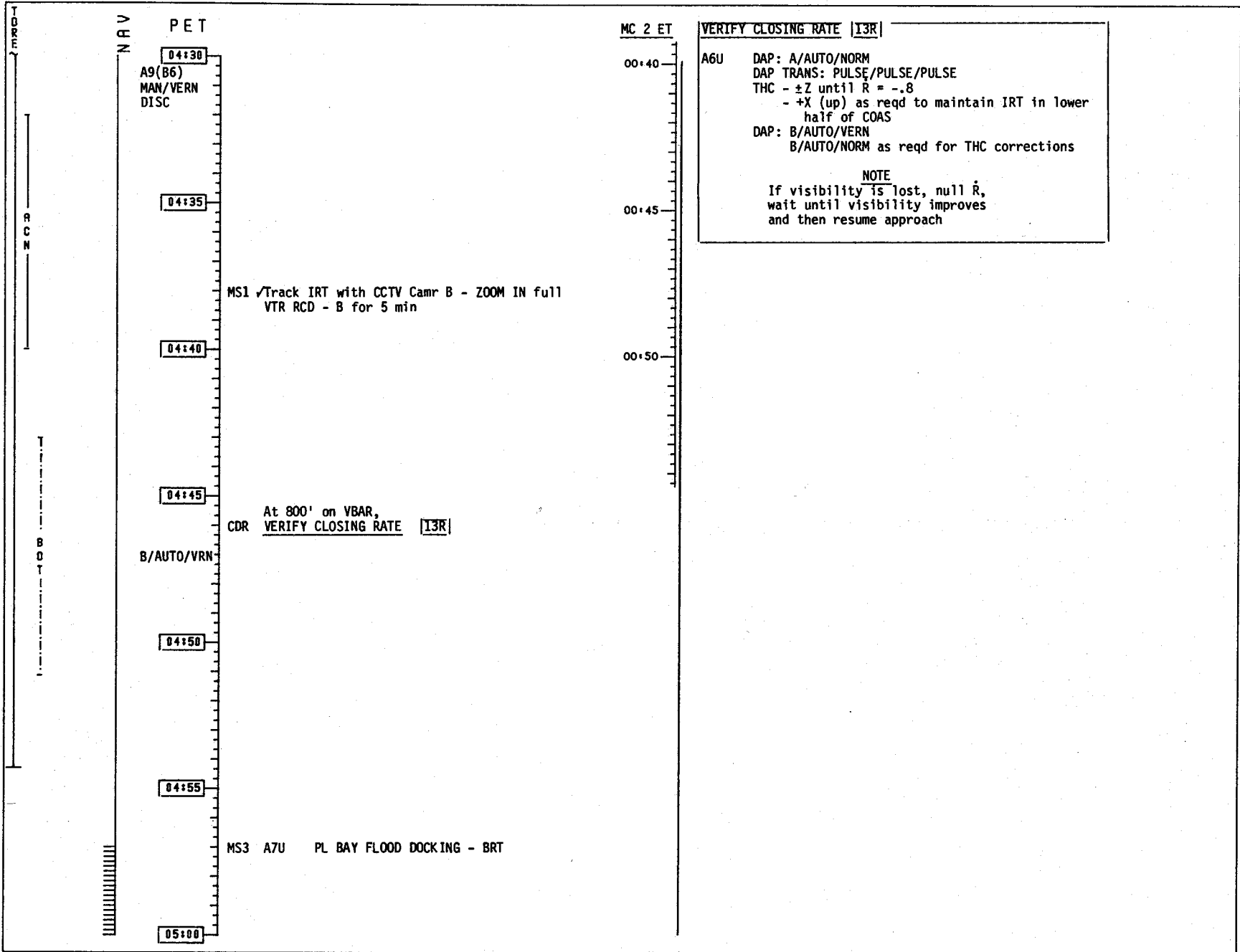
CRT TGT ID +2
 BODY VECT +2(-X)
 OM +0
 TRK - ITEM 19 EXEC (CUR - *)

ESTABLISH VBAR |I2R|

|GNC UNIV PTE|

CRT ✓TOT ERR - small
 A6U When ADI Pitch = 180° (LVLH ref), then
 DAP: A/AUTO/NORM
 THC - -X (down) until target stationary in COAS
 -Z (in) as reqd to maintain closing rate
 Maintain target in lower half of COAS
 DAP: B/AUTO/VERN, NORM as reqd

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PET

04:30
A9(B6)
MAN/VERN
DISC

04:35

MS1 Track IRT with CCTV Camr B - ZOOM IN full
VTR RCD - B for 5 min

04:40

At 800' on VBAR,
CDR VERIFY CLOSING RATE I3R

B/AUTO/VRN

04:50

04:55

MS3 A7U PL BAY FLOOD DOCKING - BRT

05:00

MC 2 ET

00:40

00:45

00:50

VERIFY CLOSING RATE I3R

A6U DAP: A/AUTO/NORM
DAP TRANS: PULSE/PULSE/PULSE
THC - ±Z until R = -.8
- +X (up) as reqd to maintain IRT in lower
half of COAS
DAP: B/AUTO/VERN
B/AUTO/NORM as reqd for THC corrections

NOTE
If visibility is lost, null R,
wait until visibility improves
and then resume approach

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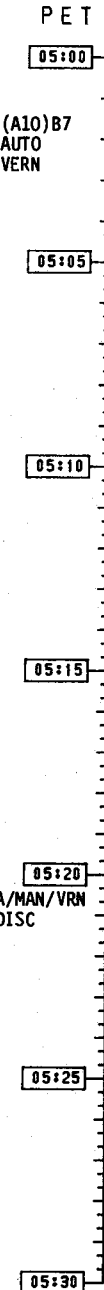
TIME

YEAR

GNW

HRT

NAV



05:00 PLT Config DAP A,B to A10,B7

05:05

CDR When R = 200' ± 20',
ESTABLISH 200 FT STATIONKEEPING [14R]

05:10 MS1 ✓Track IRT with CCTV Camr B - ZOOM IN full
VTR RCD - B for 5 min

05:15

CDR INITIATE RCS SEP [15R]

05:20
A/MAN/VRN
DISC

05:25

05:30

ESTABLISH 200 FT STATIONKEEPING [14R]

A6U DAP TRANS: PULSE/PULSE/PULSE, LOW Z
DAP: B/AUTO/NORM
THC - NULL R

DAP: B/AUTO/VERN
B/AUTO/NORM as reqd for THC corrections
THC - Maintain R = 200' ± 20'

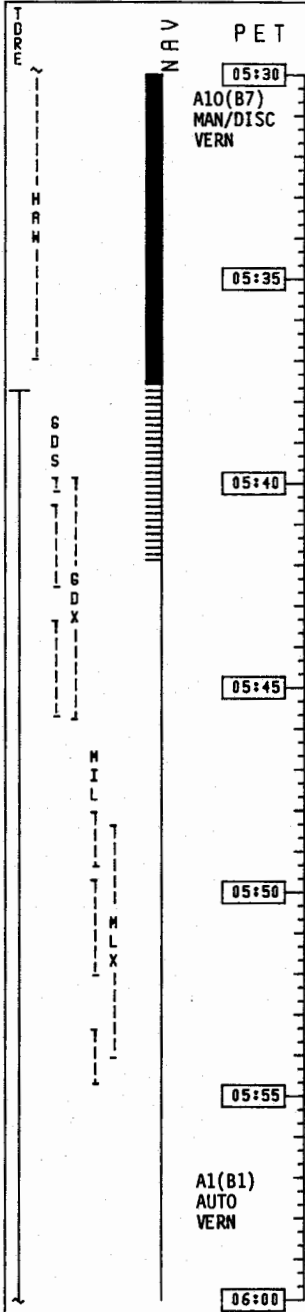
INITIATE RCS SEP [15R]

A6U DAP: A/AUTO/NORM
✓DAP TRANS: PULSE/PULSE/PULSE, LOW Z
THC - +Z (out) until R = +.8 (25 DAP A pulses)

DAP ROT: DISC/DISC/DISC
DAP: A/MAN/VERN
RHC - pitch as reqd to keep IRT in view

Track IRT with CCTV Camr B

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PET

05:30
A10(B7)
MAN/DISC
VERN

05:35

At sunrise,
MS1 ✓Track IRT with CCTV Camr C - ZOOM IN full
VTR RCD - C for 5 min

05:40

05:45

05:50

MS3 DISABLE RENDEZVOUS NAV I6R

A1(B1)
AUTO
VERN

06:00

Go to CAP, 4-16

DISABLE RENDEZVOUS NAV I6R

- CRT GNC 22 S TRK/COAS CNTL
-Y,-Z STAR TRK - ITEM 3,4 EXEC (*)
- C3 GNC UNIV PTG
STOP - ITEM 21 EXEC (*)
- A6U DAP: A/AUTO/VERN
DAP TRANS: PULSE/PULSE/PULSE, NO LOW Z
ROT: DISC/DISC/DISC
- CRT GNC 33 REL NAV
KU ANT ENA - ITEM 2 EXEC (no *)
RNDZ NAV ENA - ITEM 1 EXEC (no *)
- A1U KU MODE - COMM
KU - GPC
KU CNTL - CMD
- A2 DIGI-DIS SEL - EL/AZ
- R11 ✓VTR pb - STOP

Change DAP A,B to A1,B1

Stow COAS
Stow OMS BURN and RNDZ OPS Cue Cards

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ONE DAY CONTINGENCY TIMELINE

4-17

STS-11/FIN

ONE DAY CONT
T/L

-Z AXIS TARGET TRACK [1C]

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

CONFIG FOR RR ONLY WAY [2C]

[GNC 33 REL NAV]
 RR - ITEM 13 EXEC (*)
 [GNC 22 S TRK/COAS CNTL]
 ✓-Y,-Z SHUTTER MAN OP, ITEM 15,16 - (no *)

TARGET F3 BURN [3C]

CRT /SV SEL correct
 [GNC 34 ORBIT TGT]
 TGT NO - ITEM 1 +1 3 EXEC
 /TGT Set data
 T1 TIG (BASE TIME +0/02:15:36)
 EL +0
 ΔT +22.6
 ΔX -39.49
 ΔY +0
 ΔZ -4.56
 COMPUTE T1 - ITEM 27 EXEC

Note solution

F3 SOLUTION					3σ Variation	
ΔVX	()			.	()
ΔVY	()			.	()
ΔVZ	()			.	()
ΔVT	()			.	()
TIG				/		: : : : : : :
PRELIMINARY					FINAL	
ΔVX	()			.	()	
ΔVY	()			.	()	
ΔVZ	()			.	()	
ΔVT	()			.	()	

T
O
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I
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Y
R
R

NAV
2

PET

02:00

At sunset,
.....IF -Y-S-TRK.....
CDR -Z AXIS TARGET TRACK |IC| .

MS3 CONFIG FOR RR ONLY NAV |2C|

CDR TARGET F3 BURN |3C| (preliminary solution)

02:05

02:10

(TIG -4:00)
CDR TARGET F3 BURN |3C| (final solution)

CDR EXECUTE RCS BURN, RNDZ OPS Cue Card

02:15

|F3 TIG|

R
A
D
A
R

CDR RELOAD BASE TIME |4C|

CDR TARGET TI BURN |5C| (preliminary solution)

02:20

02:25

MEAL

02:30

RELOAD BASE TIME |4C|

CRT |GNC 34 ORBIT TGT|
TGT NO - ITEM 1 #5 EXEC
BASE TIME (TI TIG, BURN PADS, 1-4)
LOAD - ITEM 26 EXEC

TARGET TI BURN |5C|

CRT ✓SV SEL correct
|GNC 34 ORBIT TGT|
TGT NO - ITEM 1 #3 0 EXEC
✓TGT Set data:
TI TIG (BASE TIME)
EL +0
ΔT +80.4
ΔX +0
ΔY +0
ΔZ +0
COMPUTE TI - ITEM 27 EXEC

Note preliminary solution BURN PADS, 1-4

TARGET T1 BURN [6C]

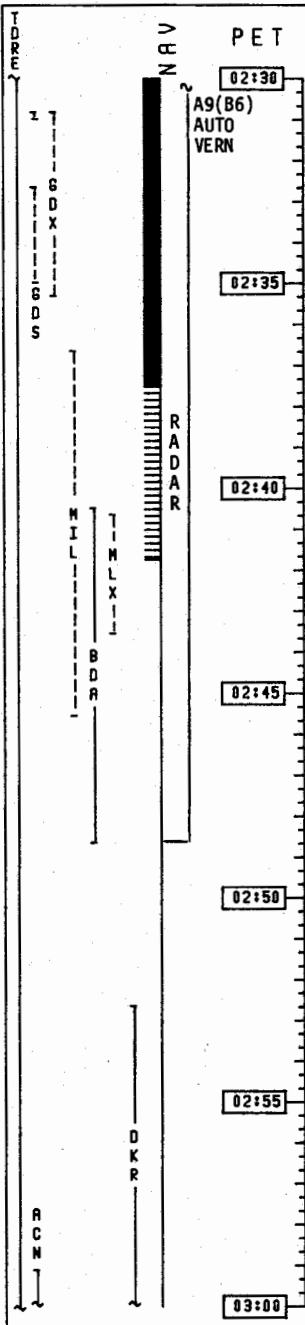
CRT OPS 202 PRO
[GNC ORBIT MNRV EXEC]
Load Eng Sel, TVR, Trims and
WT for T1 per BURN PADS, 1-4
LOAD - ITEM 22 EXEC
[GNC 33 REL NAV]
✓SV SEL correct

[GNC 34 ORBIT TGT]
TGT NO - ITEM 1 +3 0 EXEC
✓TGT Set data:
T1 TIG (BASE TIME)
EL +0
ΔT +80.4
ΔX +0
ΔY +0
ΔZ +0
COMPUTE T1 - ITEM 27 EXEC

Note solution BURN PADS, 1-4

END RR NAV [7C]

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



(TIG -11:00)
 CDR TARGET TI BURN [8C] (final solution)

MS3 END RR NAV [7C]

CDR, EXECUTE TI BURN [8C]
 PLT

[TI TIG]

MEAL

EXECUTE TI BURN [8C]

CRT
 1: GNC ORBIT MNVR EXEC
 2: GNC SYS SUMM 2

CRT1 LOAD - ITEM 22 EXEC
 TIMER - ITEM 23 EXEC

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

CRT1 MNVR - ITEM 27 EXEC (*)

Perform SEC L,R then PRI L,R GMBL CK

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

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/ON-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 (*)

OPS 201 PRO

C3 DAP: B/AUTO/NORM

Post TI, go to
 OPS T/L PHASE 2, 3-39

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REFERENCE DATA
(TBS)

REFERENCE
DATA

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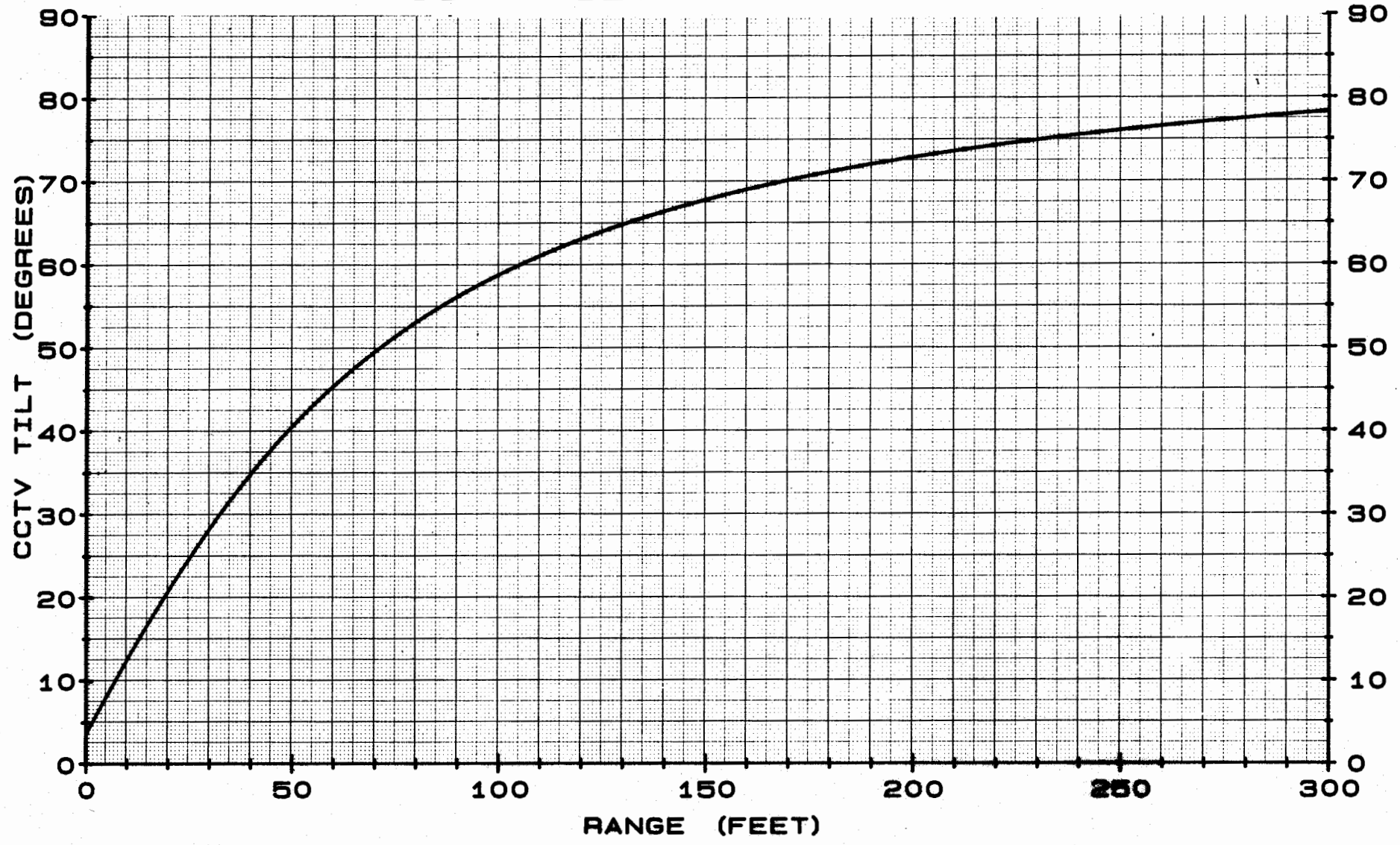
RANGING CHARTS

6-1

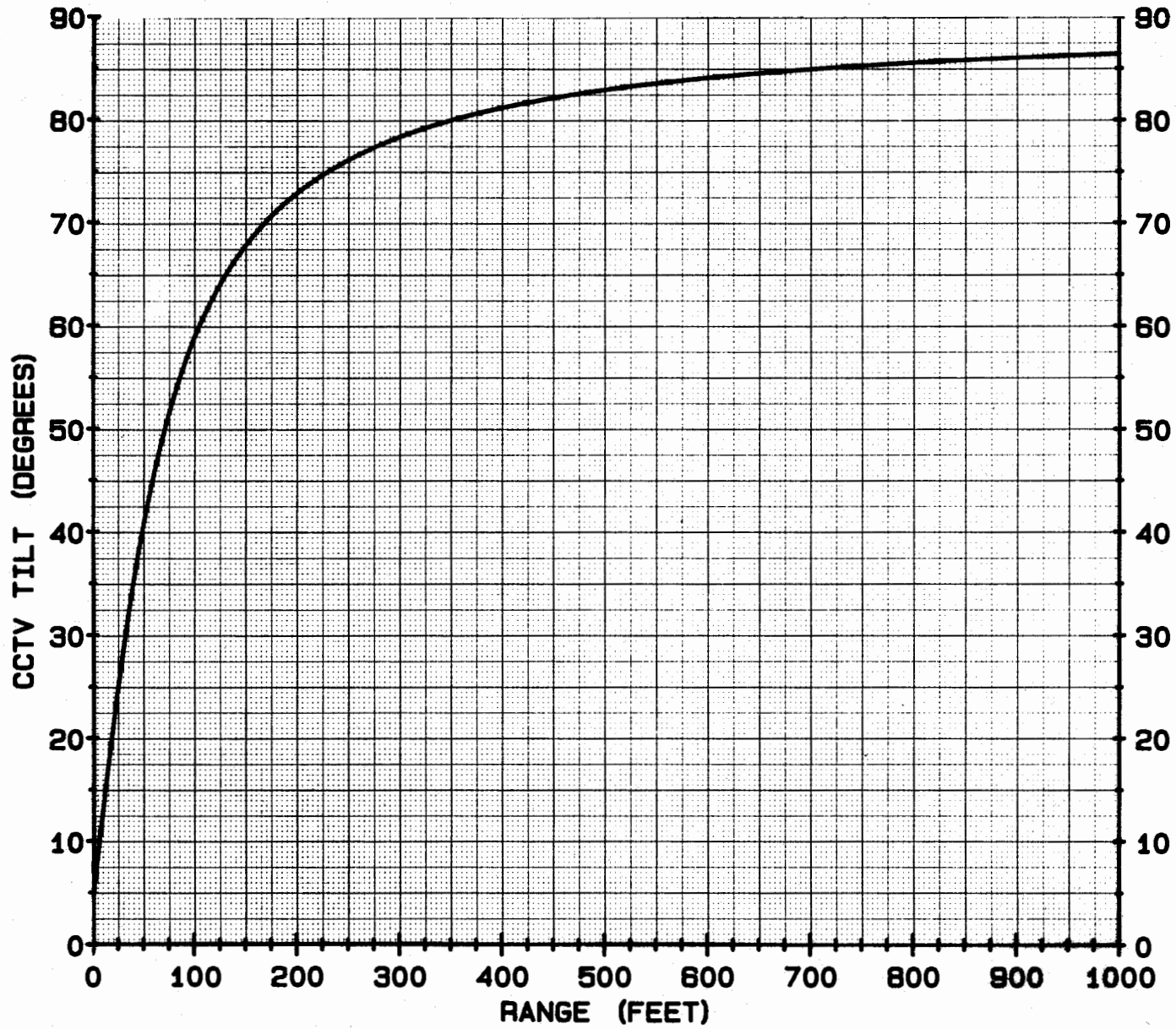
STS-11/FIN

RANGING CHARTS

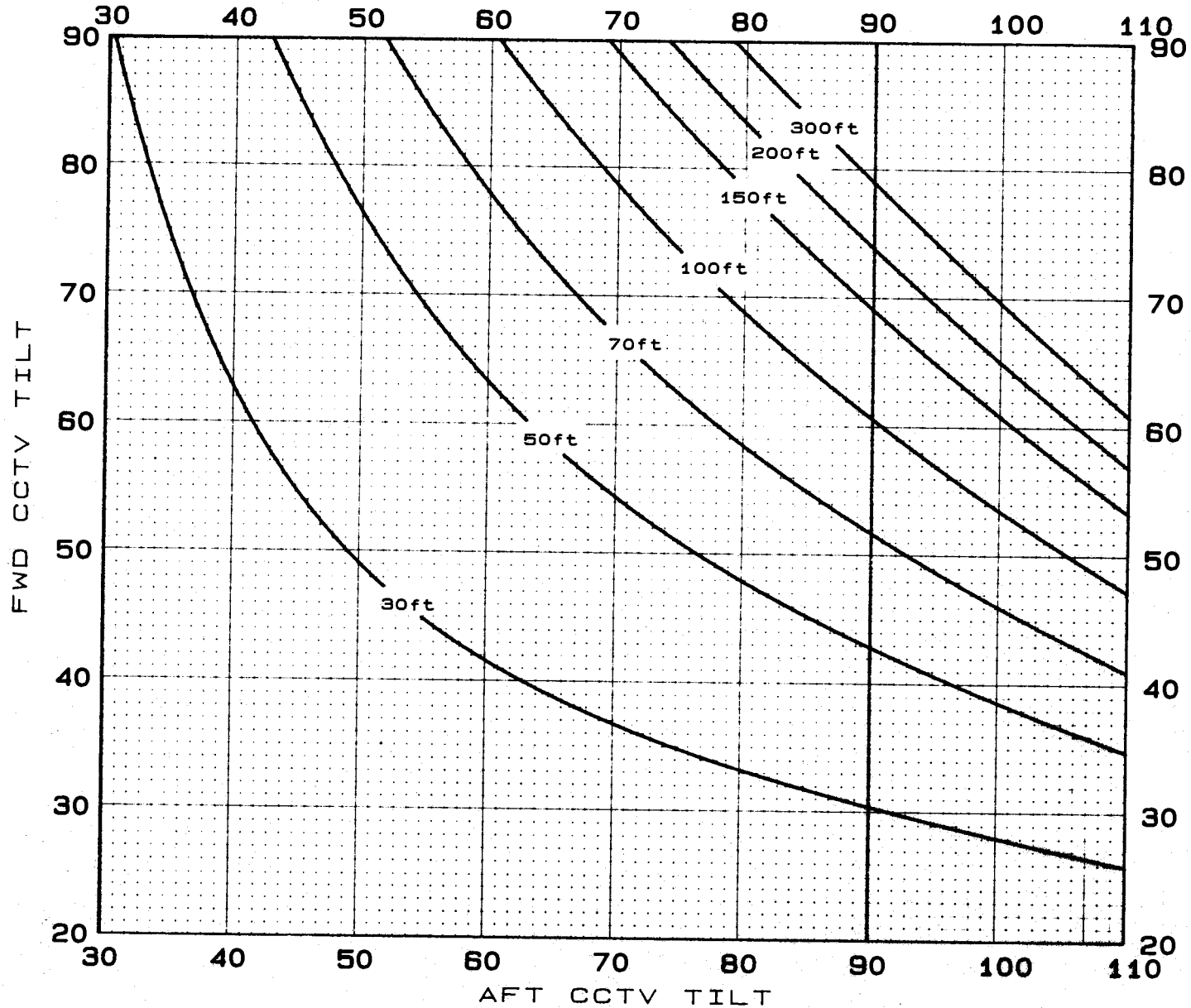
CCTV TILT ANGLE vs RANGE



CCTV TILT ANGLE vs RANGE

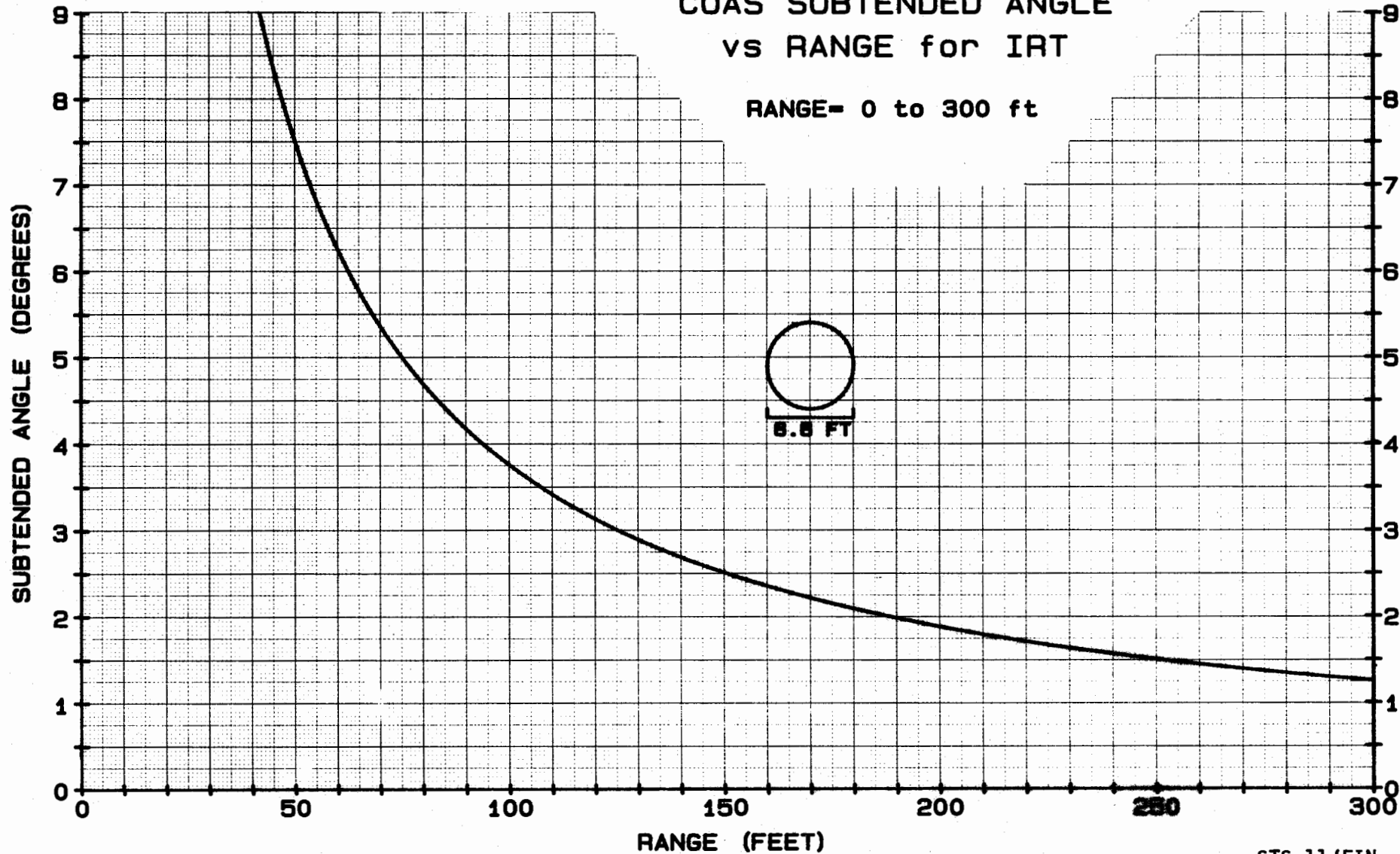


CCTV RANGING CHART - RANGE TO BULKHEAD



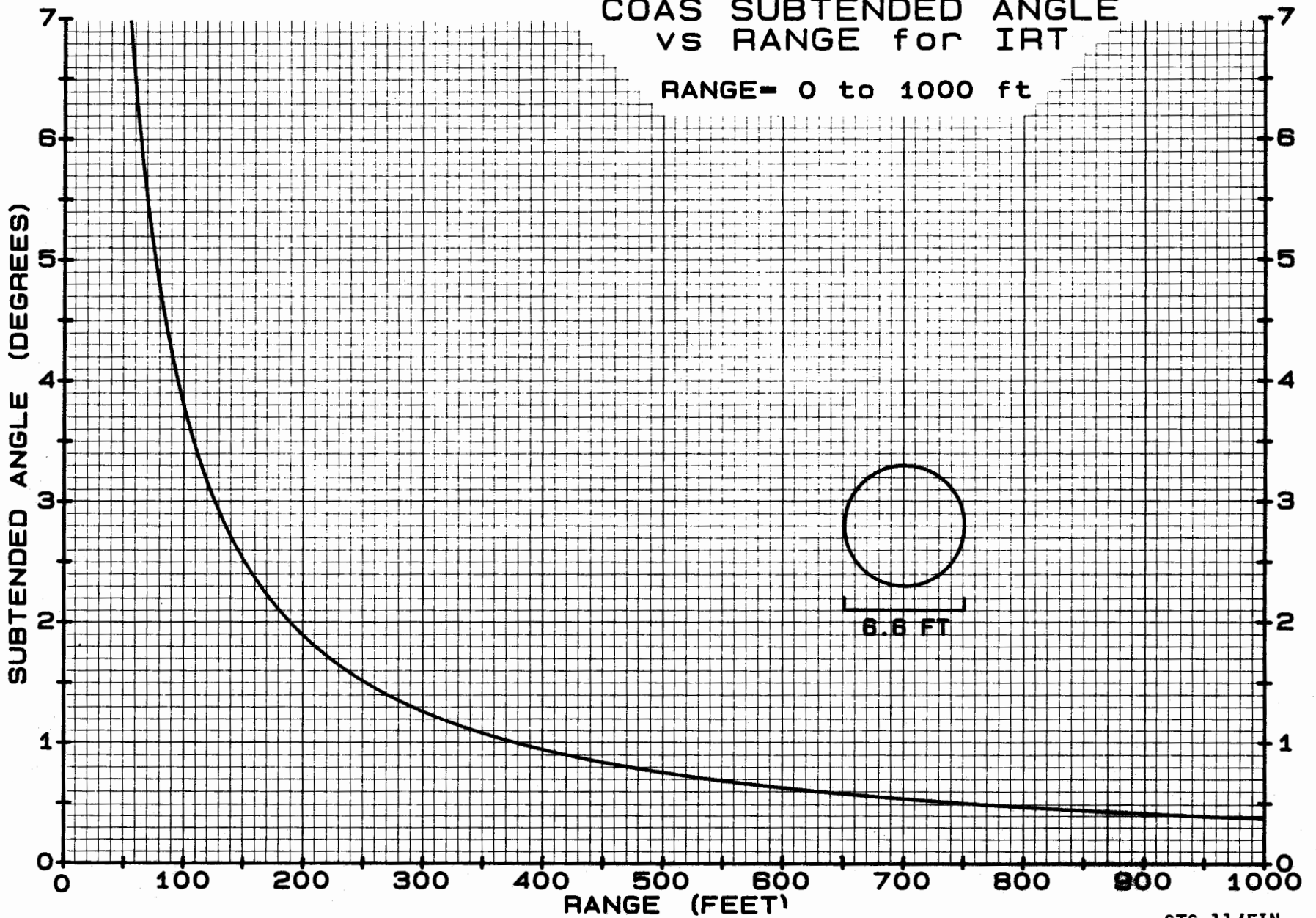
COAS SUBTENDED ANGLE vs RANGE for IRT

RANGE= 0 to 300 ft



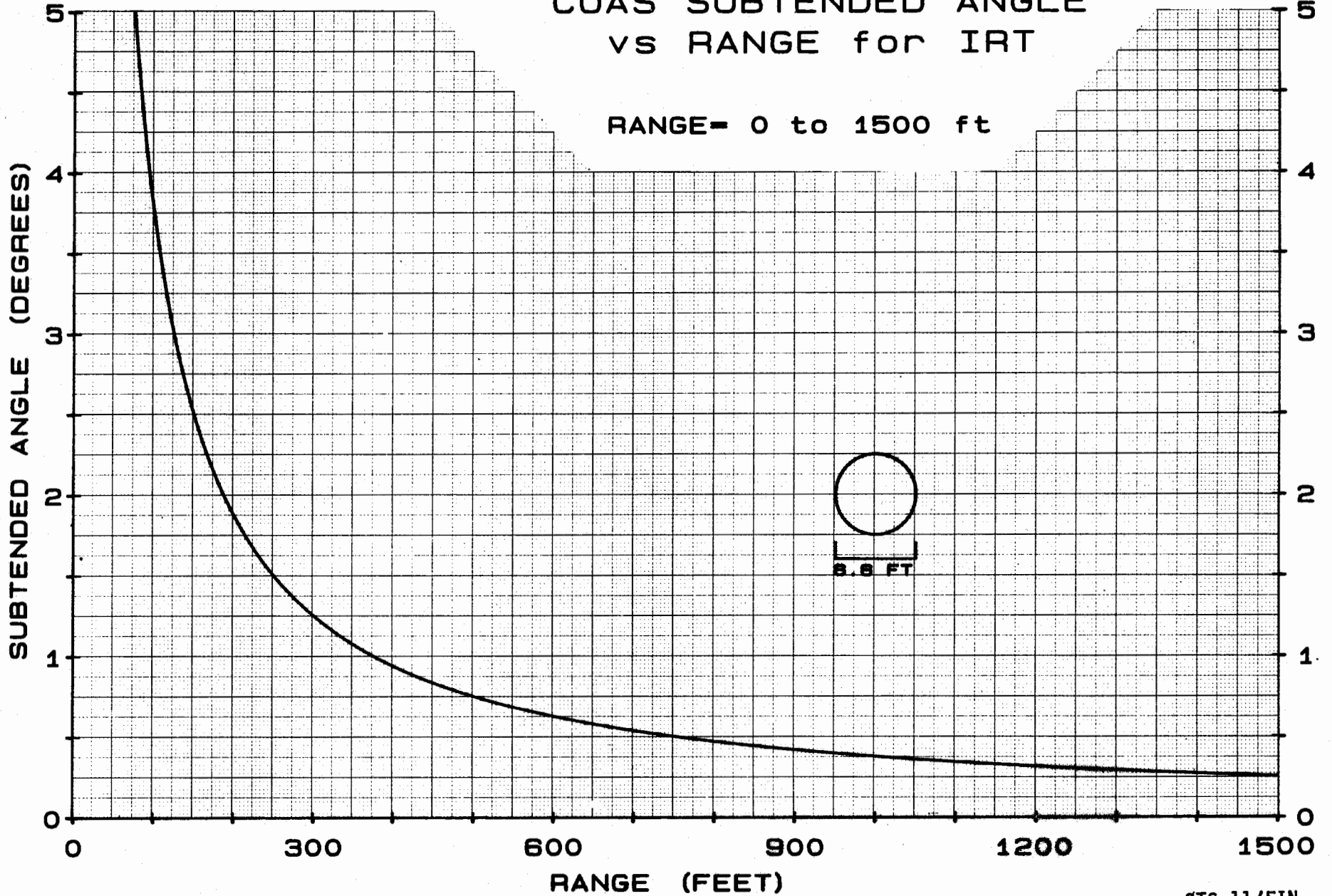
COAS SUBTENDED ANGLE
VS RANGE for IRT

RANGE= 0 to 1000 ft



COAS SUBTENDED ANGLE vs RANGE for IRT

RANGE = 0 to 1500 ft



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CUE CARD

RNDZ OPS

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/LVLH/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 - MAN SLEW
Slew antenna to Elev 0, Az 0
(or Elev, Az as seen in COAS)
KU - AUTO TRACK
KU SEARCH - SEARCH (tb-gray)
✓TRACK tb - gray
KU - GPC
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

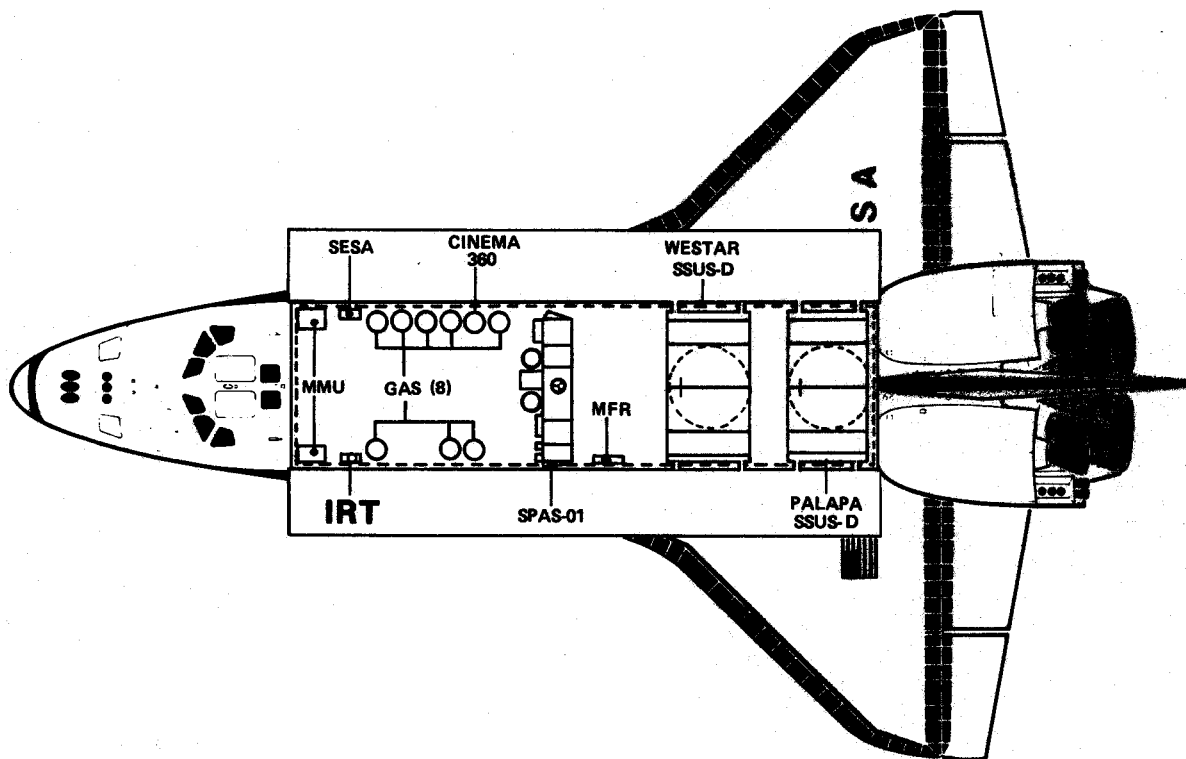
When COAS marks complete,
DAP: A/AUTO/VERN
DAP ROT: DISC/DISC/DISC
FLT CNTLR PWR - OFF

CUE CARD

NOTES

NOTES

A. STS-11 CARGO BAY LAYOUT



B. PRIMARY CREW ASSIGNMENTS

- CDR - Targeting, OMS/RCS burns, manual final phase rendezvous, proximity operations
- PLT - OMS burns, Orbiter systems
- MS1 - CCTVs, photography
- MS3 - Navigation, sensors, IRT deploy

C. DETAILED TEST OBJECTIVES (DTO)

- DTO 0812 - Rendezvous Systems and Sensors Performance - demonstration of closed loop integrated GN&C rendezvous

D. DETAILED SECONDARY OBJECTIVE (DSO)

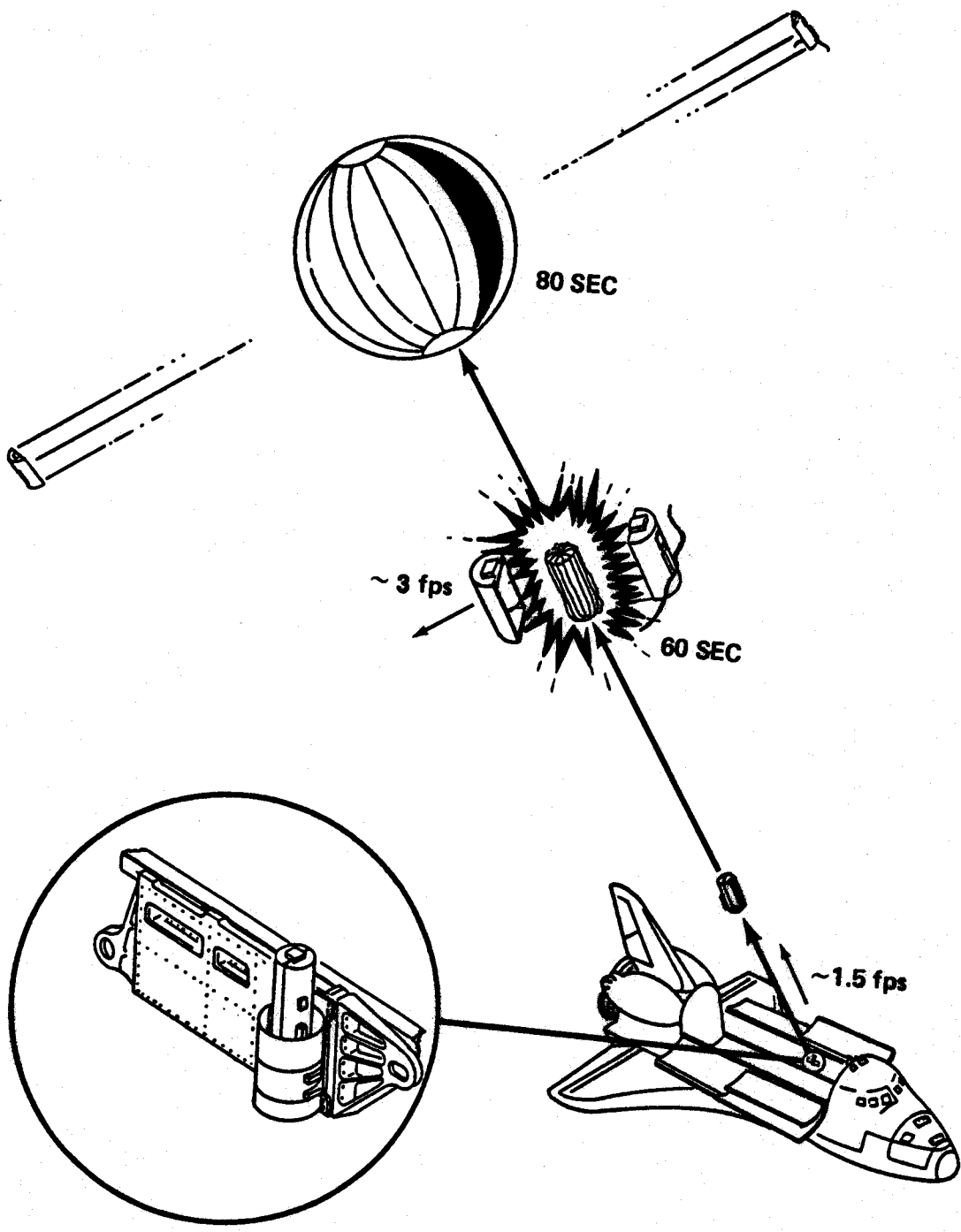
- DSO 0201 - Atmospheric Drag/Density Studies (ADDS) - investigation of the dynamic structures of atmospheric density and aerodynamic effects on an orbiting spherical target

E. INTEGRATED RENDEZVOUS TARGET (IRT)

The IRT balloon will be deployed along the Orbiter -Z axis with the Orbiter attitude such that deployment is pure retrograde. The package comes out at $1.5 \pm .5$ fps with a 6 revolutions per minute (RPM) spin rate, (which despins to 3 RPM after stave separation and balloon inflation). After 60 seconds the twin aluminum staves separate in opposite directions, normal to the balloon package trajectory. After 80 seconds the balloon inflates (in less than 2 seconds). The inflated balloon is 2 meters in diameter with an internal pressure of approximately 0.3 psia. It is painted flat white with one of 24 gores painted infrared black from pole to pole. The balloon consists of one mil thick aluminized mylar, inflation structure (nitrogen gas), and sintered tungsten ballast to bring total weight to 200 pounds. The inflated package center of gravity is only 8 inches from the balloon's south pole, which is expected to maintain a generally south pole forward LVLH attitude due to aerodynamic forces

F. TRAJECTORY DATA

This document contains Cycle 2, Rev A STS-11 trajectory data for a January 29, 1984, 13:00 GMT lift-off



TOP

++HOOK++
++VELCRO++
++++

++HOOK++
++VELCRO++
++++

RNDZ OPS

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/LVLH/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

STS-11/0/FIN

CUE CARD
CONFIGURATION

TOP
BACK OF 'RNDZ OPS'



HOOK
VELCRO

HOOK
VELCRO



RR AUTO TRACK ACQ

KU - MAN SLEW
Slew antenna to Elev 0, Az 0
(or Elev, Az as seen in COAS)
KU - AUTO TRACK
KU SEARCH - SEARCH (tb-gray)
✓TRACK tb - gray
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GNC 33 REL NAV
INH Angles - ITEM 24 EXEC (*)

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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

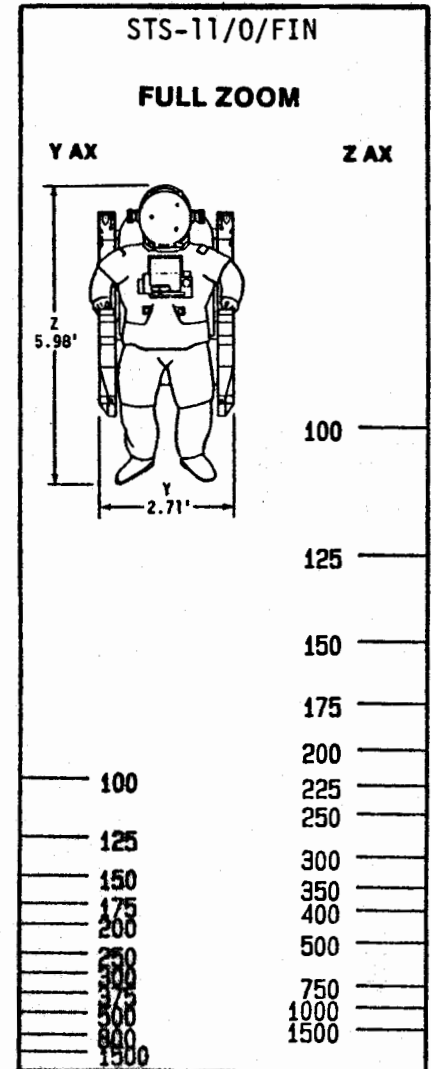
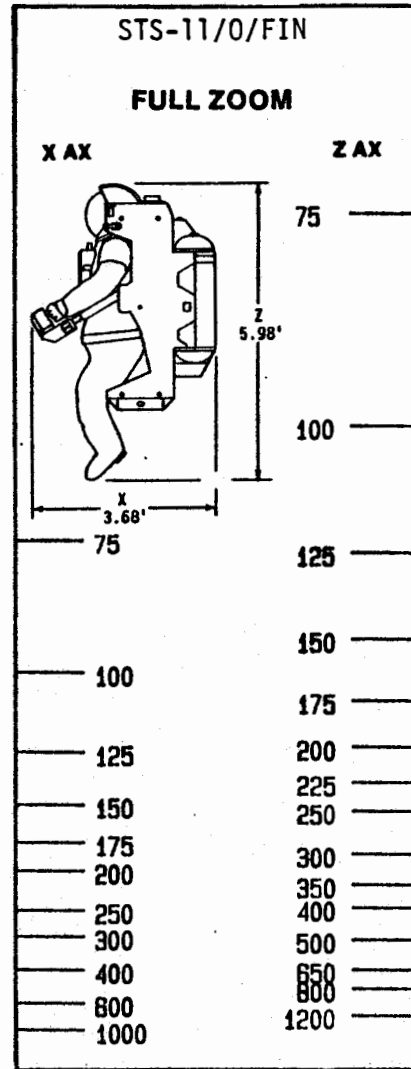
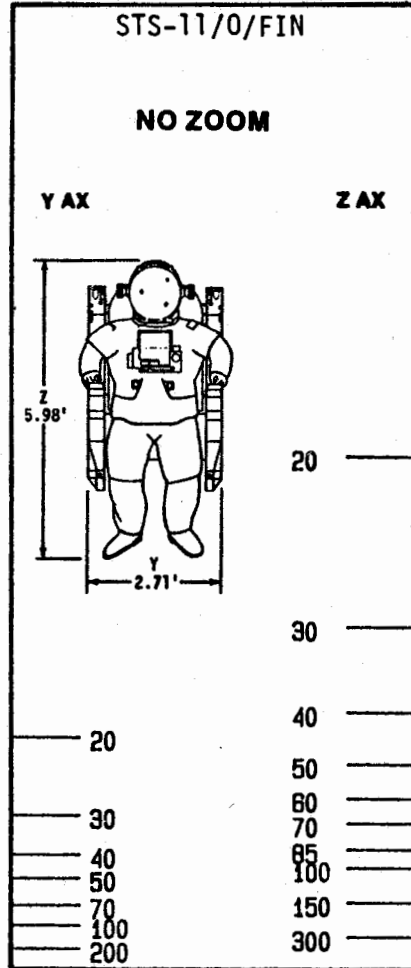
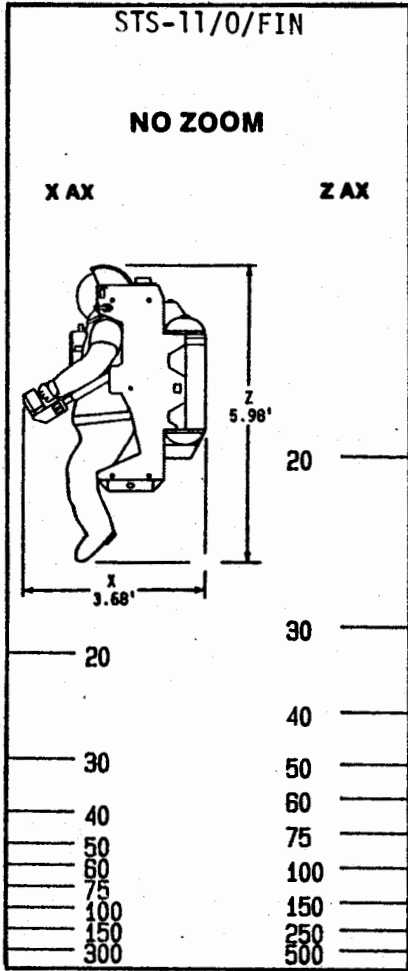
When COAS marks complete,
DAP: A/AUTO/VERN
DAP ROT: DISC/DISC/DISC
FLT CNTLR PWR - OFF

STS-11/O/FIN

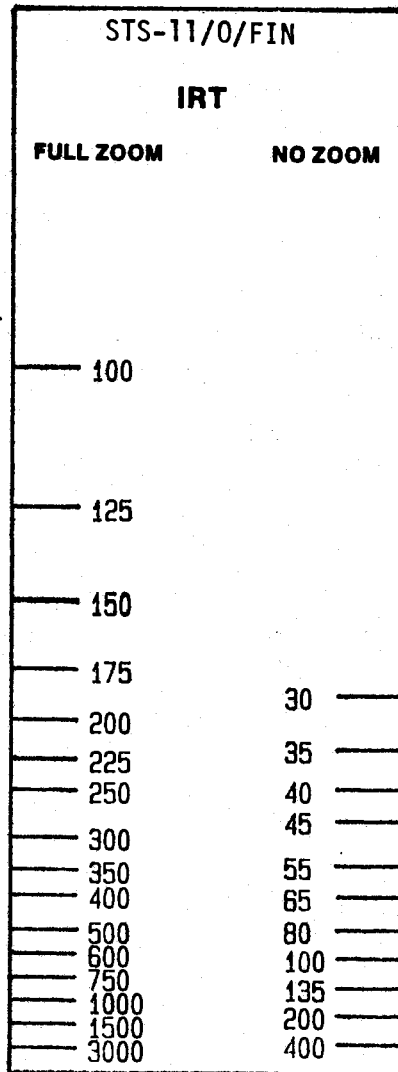


CUE CARD
CONFIGURATION

NOTE: FABRICATED AS TRANSPARENCIES WITH VELCRO ON TOP BACK



NOTE: FABRICATED AS A TRANSPARENCY WITH VELCRO ON TOP BACK



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MDTSCO, Bldg 4666,
SEOP/R. K. Keen

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P. Kachmar
T. Brand

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Air Force Flight Test Center
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Edwards AFB, CA 93523
236/R. G. Hoey

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