

# Flight Data File Rendezvous STS 51-I

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SYNCOM Salvage

Mission Operations Directorate  
Operations Division

Final  
July 5, 1985



National Aeronautics and  
Space Administration

Lyndon B. Johnson Space Center  
Houston, Texas

## MISSION OPERATIONS DIRECTORATE

STS 51-I RENDEZVOUS

FINAL  
July 5, 1985

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This document is under the configuration control of the Crew Procedures Control Board (CPCB). All proposed changes must be submitted on standard JSC form 482 to DH4/FDF Manager, Bldg 4, Room 352, 713-483-2868.

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## ACRONYMS

AZ, AZM	Azimuth
D/N	Day/Night
EL, ELEV	Elevation
IAH	Inertial Attitude Hold
INRTL	Inertial
LOS	Line of Sight
LVLH	Local Vertical, Local Horizontal
$\dot{R}$ , RDOT	Range Rate
$\vec{R}$ , RBAR	Radius Vector (toward Earth)
RR	Rendezvous Radar
SK	Stationkeep
ST, S TRK	Star Tracker
SYNCOM	Synchronous Communications Satellite
V, VBAR	Velocity Vector (direction of orbital travel)
$\pm X, Y, ZLV$	$\pm X, Y, \text{ or } Z$ Local Vertical ( $\pm X, Y, \text{ or } Z$ toward Earth)
$X, Y, ZPOP$	$X, Y, \text{ or } Z$ Perpendicular to Orbit Plane (aligned with the angular momentum vector)
$\pm X, Y, ZVV$	$\pm X, Y, \text{ or } Z$ Velocity Vector

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3-5.....	⊗ RNDZ/51-I/FIN		
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3-7.....	RNDZ/51-I/FIN		
3-8.....	RNDZ/51-I/FIN		
4-1.....	RNDZ/51-I/FIN		
4-2.....	RNDZ/51-I/FIN		
4-3.....	RNDZ/51-I/FIN		
4-4.....	RNDZ/51-I/FIN		
4-5.....	RNDZ/51-I/FIN		
4-6.....	RNDZ/51-I/FIN		

# RENDEZVOUS CUE CARDS

RNDZ OPS		
(Front).....⊗	CC 8-1	RNDZ/51-I/O/FIN
(Back).....	CC 8-2	RNDZ/51-I/O/FIN
RNDZ BREAKOUT		
(Front).....	CC 8-3	RNDZ/51-I/O/FIN
(Back).....	CC 8-4	RNDZ/51-I/O/FIN
H&D AXIS NO ZOOM/FULL ZOOM Ranging Rulers....	CC 8-5	RNDZ/51-I/O/FIN
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FLIGHT PROFILE  
(TBS)

1-1

RNDZ/51-I/FIN

FLIGHT  
PROFILE

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DETAILED TIMELINE

2-1

RNDZ/51-I/FIN

DETAILED  
TIMELINE

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NAV

PET

-03:00

A:(B1)

-02:55

-02:50

-02:45

PLT DPS CONFIG for RNOZ OPS:  
Strings 1 and 3 to GPC 1  
Strings 2 and 4 to GPC 2

-02:40

-02:35

PLT Set SM TIMER counting to NCS TIG  
(Spec 2)

-02:30

..... Z 30.....



# NH2 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


( )		.	
( )		.	
( )		.	

2	1	5	3	4	2						
5	/	1	9	:	1	0	:	4	7	.	9

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

## 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

ΔVTOT

TGO

VGO


MULTIAXIS

x
---

0	.	0	0
0	:	0	0

X	(+)	0	0	.	0	0
Y	(+)	0	0	.	0	0
Z	(+)	0	0	.	0	0

HA	2	3	5	HP	(+)	1	7	0
----	---	---	---	----	-----	---	---	---

R

P

Y

MULTIAXIS

--

.			
:			

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

HA				HP	( )			
----	--	--	--	----	-----	--	--	--

R

P

Y

MULTIAXIS

--

.			
:			

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

HA				HP	( )			
----	--	--	--	----	-----	--	--	--

T  
M  
I  
D

NAV

PET

-02:30 MS2 Config DAP A, B to A9, B6

A9(B6)

-02:25 PLT ENABLE RENDEZVOUS NAV 1

-02:20 PLT LOAD -7 AXIS TARGET TRACK 2

-02:15 PLT PERFORM NH2 BURN 3 (if reqd)

-02:10

-02:05

-02:00

NH2 TIG (If reqd)

ENABLE RENDEZVOUS NAV 1

GNC 33 REL NAV

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

GNC 34 ORBIT TGT

TGT NO - ITEM 1 +1 EXEC  
 BASE TIME + (TI TIG, TI Burn pad, 2-18)  
 LOAD - ITEM 26 EXEC

LOAD -7 AXIS TARGET TRACK 2

GNC UNIV PTG

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

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

. BODY VECT +5 .  
 . P +0 .  
 . Y +280.6 .  
 . DM +90 .  
 .....

PERFORM NH2 BURN 3

CRT OPS 202 PRO

GNC ORBIT MNVR EXEC

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

TIG -2:00 \*\*

Perform EXECUTE RCS BURN (Cue Card, RNDZ OPS)

T  
M  
I  
D  
B  
O  
A  
R

### NSR BURN PAD

#### PRE-FLIGHT

OMS BOTH 1

x
0
0
0

L 2

R 3

RCS 4

5 TV ROLL

TRIM LOAD

6 P (+) 0 . 4

7 L Y (-) 5 . 7

8 R Y (+) 5 . 7

9 WT 2 1 5 3 4 2

10 TIG 5 / 1 9 : 5 6 : 4 5 . 9

TGT PEG 7

19 ΔVX (+) 1 6 . 1

20 ΔVY (-) 0 5 . 3

21 ΔVZ (+) 0 3 . 3

#### 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

2	9	7
3	5	7
3	2	7

25 P

26 Y

ΔVTOT 1 7 . 2

TGO 0 : 1 3

VGO X (+) 1 6 . 5 9

Y (-) 0 0 . 0 0

Z (+) 0 4 . 7 0

HA 2 4 1 HP (+) 1 7 0

R


P

Y

IMU	
DES	

( ) .

:

X ( ) .

Y ( ) .

Z ( ) .

HA HP ( )

R


P

Y

IMU	
DES	

( ) .

:

X ( ) .

Y ( ) .

Z ( ) .

HA HP ( )



MAX-T

MILLI-ROAD

PKO

NAV

PET

-02:00

A9(B6)

-01:55

-01:50

-01:45

-01:40

PLT PERFORM NSR BURN 4

-01:35

-01:30

PERFORM NSR BURN 4

Install OMS 2/ORBIT OMS BURNS  
Cue Cards (two) and OMS BURN MONITOR  
Cue Cards (two) (F7, F9)

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

C3 Burn data per burn pad  
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

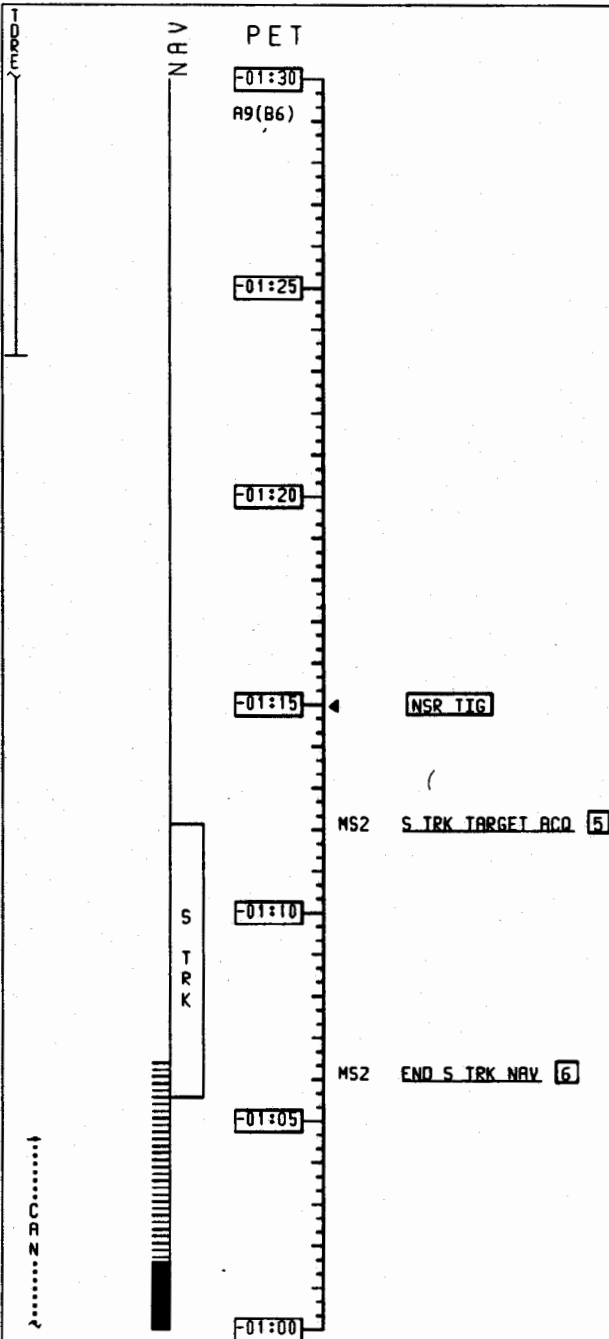
Perform OMS TVC GMBL CK as reqd  
(Delay until after 5 TRK pass)

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

C3 DAP: B/AUTO/NORM  
CRT OPS 201 PRO  
GNC UNTV PTC  
TRK - ITEM 19 EXEC (Cur - \*)

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

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S TRK TARGET ACQ 5

CRT GNC 21 IMU ALIGN  
IMU DES - ITEM 7 (8,9) EXEC (x)  
(NSR BURN PAD, 2-6)

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

GNC 33 REL NAV  
✓INH Angles, ITEM 24 - (x)  
✓S TRK, ITEM 12 - (x)  
✓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 (32 Sec),  
If RATIO < 1.0,  
| AUTO Angles - ITEM 23 EXEC (x)  
If RATIO > 1.0,  
FORCE 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)  
INH Angles - ITEM 24 EXEC (x)  
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

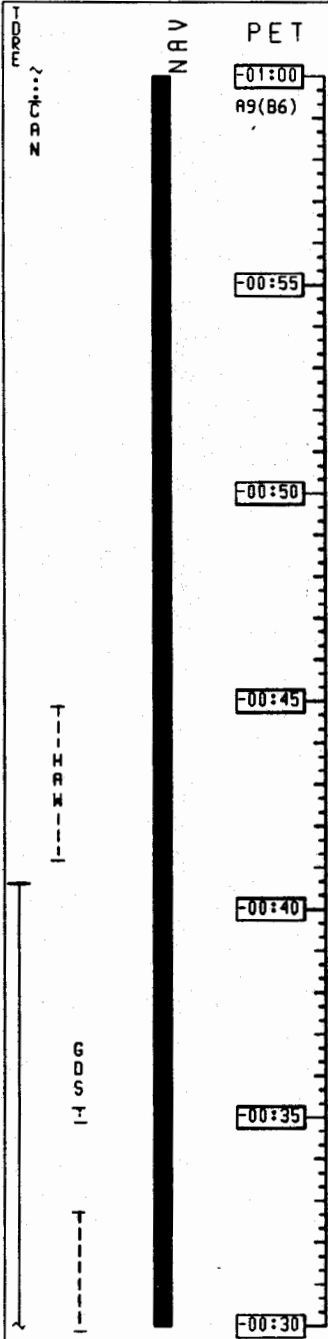
END S TRK NAV 6

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

GNC 22 S TRK/COAS CNTL  
-Z(-Y) TERM/IDLE - ITEM 10(9) EXEC (x)

GNC 22 S TRK/COAS CNTL  
IMU DES - ITEM 7 (8,9) EXEC (no x)

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PET

NAV

01:00

A9(B6)

00:55

00:50

00:45

00:40

00:35

00:30

PLT CONFIG RET FLT STATION FOR RNDZ [7]

CONFIG RET FLT STATION FOR RNDZ [7]

- AGU ROI ATT - LVLH
  - ERR - MED
  - RATE - LO
  - SENSE - -Z
- R13 ✓KU ANT - GND
- A1U ✓PWR - ON
- A1U KU MODE - RDR PASSIVE
  - RDR OUTPUT - HIGH
  - MAN SLEW - PNL
  - CNTL - PNL
- A2 SIG STRENGTH sel - KU
- A2 DIGI-DIS SEL - R/ROOT
- A2 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
- A1U ✓TRACK tb - gray
- A1U ✓SEARCH tb - gray
- A2 ✓RANGE - 888.8
- CRT SELF TEST - ITEM 7 EXEC (no x)
- A2 DIGI-DIS SEL - As Req'd
- A1U KU MODE - COMM
- ✓KU - MAN SLEW
- KU CNTL - CMD

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

# NCS 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

*		
1	8	0

(+)	0	.	4
(-)	5	.	7
(+)	5	.	7

2	1	4	9	6	6
---	---	---	---	---	---

5	/	2	1	:	1	1	:	5	8	.	3
---	---	---	---	---	---	---	---	---	---	---	---

(+)	0	8	.	8
(+)	1	0	.	4
(+)	0	7	.	4

24 R

25 P

26 Y

MULTIAXIS

--

ΔVTOT

TGO

VGO

2	9	5
3	2	9
0	2	8

1	5	.	5
---	---	---	---

0	:	1	1
---	---	---	---

(+)	1	4	.	9	1
(+)	0	0	.	0	0
(+)	0	4	.	2	3

HA

2	3	6
---	---	---

HP

(+)	1	6	7
-----	---	---	---

## PRELIMINARY

BOTH 1

L 2

R 3

RCS 4

P

L Y

R Y

ΔVX

ΔVY

ΔVZ

L/R OMS HE  
P/VAP ISOL

GPC OP CL

A

B


( )		.	
( )		.	
( )		.	


( )		.	
( )		.	
( )		.	

R

P

Y

MULTIAXIS

--

X

Y

Z

HA

--	--	--

HP

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

## FINAL

BOTH 1

L 2

R 3

RCS 4

P

L Y

R Y

ΔVX

ΔVY

ΔVZ

L/R OMS HE  
P/VAP ISOL

GPC OP CL

A

B


( )		.	
( )		.	
( )		.	

/											

( )		.	
( )		.	
( )		.	

R

P

Y

MULTIAXIS

--

X

Y

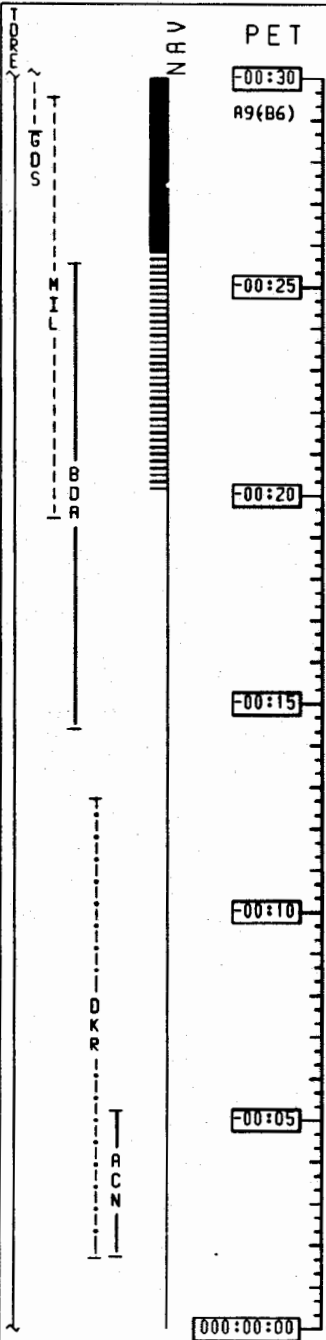
Z

HA

--	--	--

HP

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



PET

00:30

A9(B6)

00:25

00:20

00:15

00:10

00:05

000:00:00

PLT PERFORM NCS BURN [B]

NCS TIG

PERFORM NCS BURN [B]

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: 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 RCS SEL - ITEM 4 EXEC (\*)

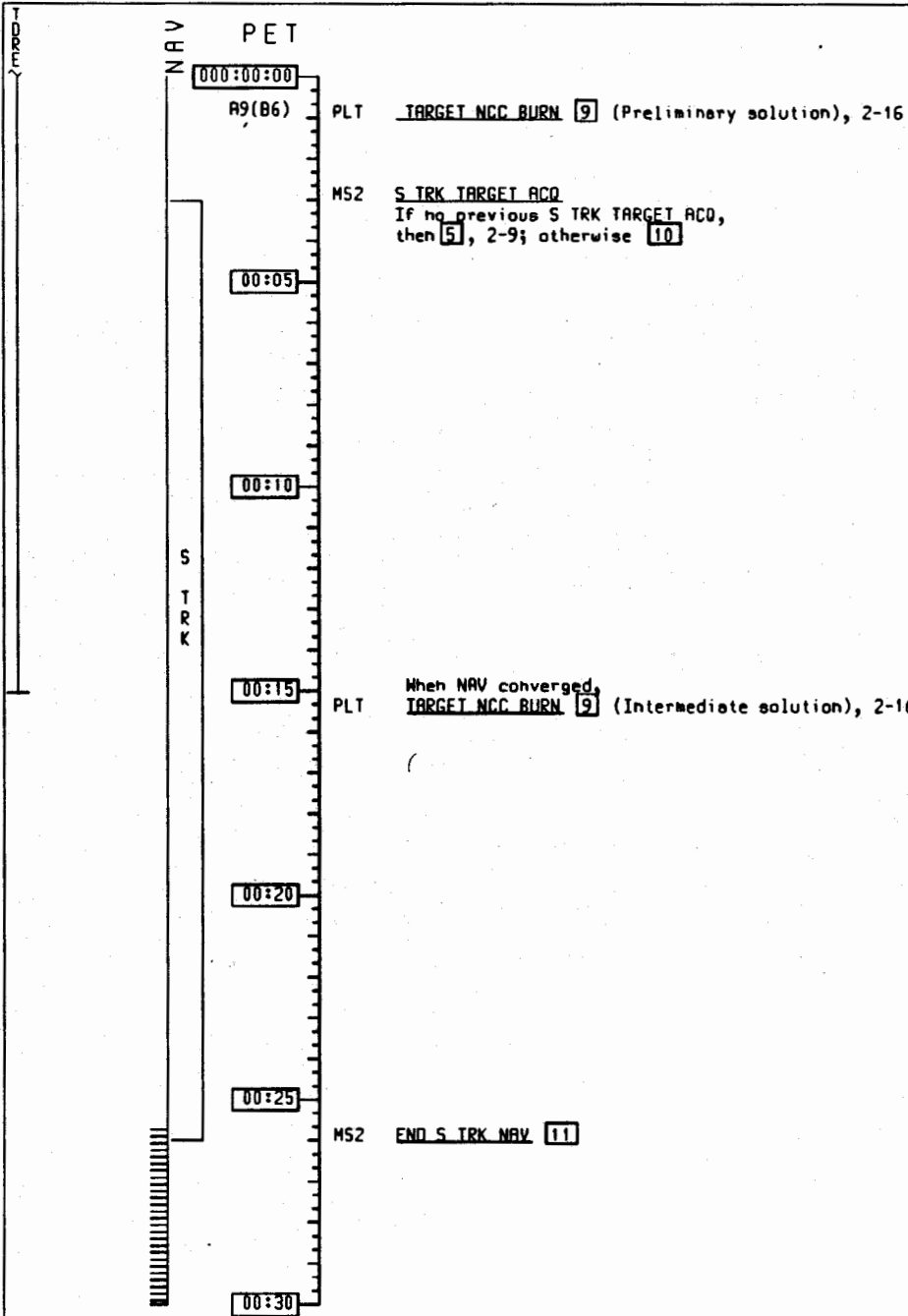
Perform OMS TVC GMBL CK as reqd  
 \* If down arrow(s) or M(s), \*  
 \* Select good GMBL \*

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

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

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S TRK TARGET ACQ 10

CRT GNC 21 IMU ALIGN  
IMU DES - ITEM 7 (8,9) EXEC (x)  
(NSR BURN Ped, 2-6)

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

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

Monitor RESID V and H each NAV cycle

If RESID V and H change < .05 for four  
consecutive NAV cycles (32 Sec),  
If RATIO < 1.0,  
FLTR TO PROP - ITEM 8 EXEC  
AUTO Angles - ITEM 23 EXEC (x)  
If RATIO > 1.0,  
1) COVAR REINIT - ITEM 16 EXEC  
2) FORCE 3 Angle Marks  
3) PROP TO FLTR - ITEM 9 EXEC

If RESID V and H 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)  
INH Angles - ITEM 24 EXEC (x)  
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

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

GNC 22 S TRK/COAS CNTL  
-Z(-Y) TERM/IDLE - ITEM 10(9) EXEC (x)

GNC 22 S TRK/COAS CNTL  
IMU DES - ITEM 7 (8,9) EXEC (no x)

**TARGET NCC BURN 9**

CRT ✓SV SEL correct  
**GNC 34 ORBIT TGT**  
 TGT NO - ITEM 1 + 2 EXEC  
 ✓TGT Set data:  
 T1 TIG +(BASE TIME -0/0:58:00)  
 EL +0  
 ΔT +58.0  
 ΔX -48.60  
 ΔY +0  
 ΔZ -1.67  
 COMPUTE T1 - ITEM 27 EXEC

Note solution

.....**Final solution**.....  
 IF FLTR converged (> 120 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  
 .....

**-Z AXIS TARGET TRACK 12**

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

**TARGET T1 BURN 13**

**GNC 34 ORBIT TGT**  
 CRT TGT NO - ITEM 1 + 1 Q EXEC  
 ✓TGT Set data:  
 T1 TIG +(BASE TIME)  
 EL +0  
 ΔT +81.9  
 ΔX +0  
 ΔY +0  
 ΔZ +0  
 COMPUTE T1 - ITEM 27 EXEC

Note solution in pad

**NCC BURN SOLUTION**

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

**PRELIMINARY**

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

**INTERMEDIATE**

( )				.	
( )				.	
( )				.	
				.	

**FINAL**

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

**GROUND**

( )				.	
( )				.	
( )				.	
				.	

**FINAL - GROUND LIMITS**

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

**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 (X)  
 RR - ITEM 13 EXEC (X)  
 GNC, I/O RESET EXEC  
 A2 DIGI-OIS SEL - R/ROOT

TIME

NAV

PET

00:30 PLT TIG -4:00  
A9(B6) TARGET NCC BURN 9 (Final solution)

CDR EXECUTE RCS BURN (Cue Card, RNDZ OPS)

NCC TIG

00:35

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

PLT -Z AXIS TARGET TRACK 12

00:40

PLT TARGET TI BURN 13 (Preliminary solution)

00:45

MS2 When range < 164 kft,  
CONFIGURE FOR RR TARGET ACQ 14

00:50

MS2 When RR lock-on occurs,  
RR NAVIGATION 15

00:55

RR  
RR  
RR  
RR

01:00

RR NAVIGATION 15

GNC 33 REL NAV

CRT 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  
FORCE 3 Marks  
3) PROP TO FLTR - ITEM 9 EXEC

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

LOAD DELAY BURN 16

GNC 33 REL NAV

CRT INH Angles - ITEM 24 EXEC (\*)

OPS 202 PRO

GNC ORBIT MNRV EXEC

Load Eng Sel, TVR, WT and Trims per TI Ped

TIG = TI TIG

Load Peg 7 TGts per DELAY PRO, below

Go to EXECUTE TI BURN 18, 2-19

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

H  
A  
M

# TI BURN PAD

## PRE-FLIGHT

OMS BOTH 1  
L 2  
R 3  
RCS 4  
5 TV ROLL

x			
0	0	0	

6	P	(+)	0	.	4	
7	L	Y	(+)	5	.	7
8	R	Y	(-)	5	.	7

9	WT	2	1	4	6	2	8						
10	TIG	5	/	2	2	:	4	3	:	5	9	.	3

19	ΔVX	(-)	0	6	.	1
20	ΔVY	(-)	0	7	.	9
21	ΔVZ	(-)	0	6	.	8

## 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	( )	.		Limits	( . )
ΔVY	( )	.			( . )
ΔVZ	( )	.			( . )

PRELIM  
FLTR

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( )	.	
	.	

INTER  
FLTR

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	.	

FINAL  
FLTR

( )	.	
( )	.	
( )	.	
	.	

(PROP)

( )	.	
( )	.	
( )	.	
	.	

BURN  
ATT

24	R	0	8	2
25	P	1	6	9
26	Y	3	2	5

ΔVTOT	1	2	.	1
TGO	0	:	1	6

VGO	X	(+)	1	1	.	3	9
	Y	(-)	0	2	.	5	2
	Z	(+)	0	3	.	2	3

HA	2	4	0	HP	(+)	1	6	9
----	---	---	---	----	-----	---	---	---

R			
P			
Y			

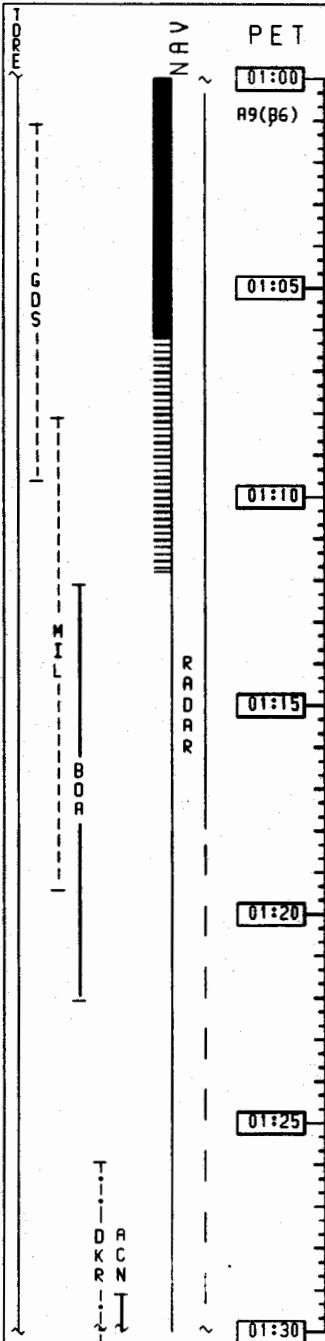
		.	
	:		
X	( )	.	
Y	( )	.	
Z	( )	.	

HA				HP	( )		
----	--	--	--	----	-----	--	--

R			
P			
Y			

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

HA				HP	( )		
----	--	--	--	----	-----	--	--



**PET**

01:00 A9(B6) PLT When NAV converged, TARGET II BURN 13 (Intermediate solution), 2-16

01:05 MS2 If no lock-on by R = 60 kft, perform RR AUTO TRACK ACQ (Cue Card, RNDZ OPS)

..... IF RNDZ DELAY .....  
 PLT LOAD DELAY BURN 16, 2-17 .....

01:10

01:15 TIG -17:00 PLT TARGET II BURN 17 (Final solution)

PLT EXECUTE II BURN 18

01:20

01:25

01:30

**TARGET II BURN 17 (Final solution)**

CRT OPS 202 PRO  
 GNC ORBIT MNVR EXEC  
 Load Eng Sel, TVR, WT and Trims for TI per pad  
 LOAD - ITEM 22 EXEC  
 GNC 33 REL NAV  
 ✓ SV SEL correct  
 Inh RR Angles - ITEM 24 EXEC (x)  
 GNC 34 ORBIT TGT  
 TGT NO - ITEM 1 +1 Q EXEC  
 ✓ TGT Set data:  
 T1 TIG +(BASE TIME)  
 EL +0  
 ΔT +81.9  
 ΔX +0  
 ΔY +0  
 ΔZ +0  
 COMPUTE T1 - ITEM 27 EXEC  
 Note solution in pad

..... Final solution .....  
 . If FLTR converged (> 120 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 II BURN 18**

CRT GNC ORBIT MNVR EXEC  
 GNC SYS SUMM 2  
 LOAD - ITEM 22 EXEC  
 TIMER - ITEM 23 EXEC  
 DAP TRANS: as reqd  
 ROT: DISC/DISC/DISC  
 ✓ DAP: A/AUTO/VERN  
 MNVR - ITEM 27 EXEC (x)  
 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 (x)  
 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

TARGET MC 1 **19**

CRT ✓SV SEL correct  
**GNC 34 ORBIT TGT**  
 TGT NO - ITEM 1 +1 L EXEC  
 ✓TGT Set data:  
 T1 TIG +(BASE TIME +0/00:22:42)  
 EL +0  
 ΔT +59.2  
 ΔX +0  
 ΔY +0  
 ΔZ +0  
 COMPUTE T1 - ITEM 27 EXEC  
 Note solution

MC 1 BURN SOLUTION

TIG 

0	0	5
---	---	---

 / 

2	3
---	---

 : 

0	6
---	---

 : 

4	1
---	---

PRELIMINARY

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

INTERMEDIATE

( )				.	
( )				.	
( )				.	
				.	

FINAL

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

3σ VARIATION

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

RR  
K  
K  
R  
A  
C  
N

NAV  
R  
A  
D  
A  
R

PET

01:30

A9(B6)

TIG

01:35

PLT TARGET MC 1 19 (Preliminary solution)

01:40

CDR VERIFY TARGET TRACK 20

.....IF RENDEZVOUS DELAY.....  
Consult MCC for further instructions  
.....

01:45

PLT TARGET MC 1 19 (Intermediate solution)

01:50

TIG -4:00  
PLT TARGET MC 1 19 (Final solution)

CDR EXECUTE RCS BURN (Cue Card, RNDZ OPS)

01:55

MC 1 TIG

.....If No TGT ACQ (RR, STRK or COAS) or No NAV.....  
CONVERGENCE by SUNSET

PLT EXECUTE RENDEZVOUS BREAKOUT (Cue Card, RNDZ BREAKOUT)

02:00

PLT TARGET MC 2 21 (Preliminary solution), 2-22

EVA PREP  
START

VERIFY TARGET TRACK 20

✓Attitude mnvr complete  
GNC 33 REL NAV

If RR Fail  
| Go to S TRK TARGET ACQ - RR FAIL, 3-4 >>  
If KU TRACK tb - gray  
| AUTO Angles - ITEM 23 EXEC (x)  
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 (x)  
| RDOT - ITEM 21 EXEC (x)  
| ✓Angles - ITEM 24, (x)  
If -Z S TRK avail,  
| Go to S TRK TARGET ACQ 10, 2-15 >>  
If -Z STRK failed,  
Go to COAS NAVIGATION (Cue Card, RNDZ OPS)

TARGET MC 2 [21] (Preliminary solution)

CRT ✓SV SEL correct  
 [GNC 34 ORBIT TGT]  
 TGT NO - ITEM 1 +1 2 EXEC  
 ✓TGT Set data:  
 T1 TIG +(BASE TIME +0/00:49:12)  
 EL +28.6  
 ΔT +32.7  
 ΔX +0  
 ΔY +0  
 ΔZ +0  
 Note Nominal T1 TIG in pad, 2-23  
 COMPUTE T1 - ITEM 27 EXEC

Note solution in pad

END S TRK NAV [22]

[GNC 33 REL NAV]  
 CRT INH Angles - ITEM 24 EXEC (X)  
 RR - ITEM 13 EXEC (X)  
 [GNC 22 S TRK/CORS CNTL]  
 -Y, -Z TERM/IDLE - ITEM 9,10 EXEC (X)  
 ✓-Y, -Z SHUTTER MAN DP, ITEM 15,16 - (no X)  
 [GNC 21 IMU ALIGN]  
 IMU DES - ITEM 7 (8,9) EXEC (no X)

If subsequent radar lock,  
Perform RR NAVIGATION [15], 2-17

MANUAL OUT-OF-PLANE NULL [23]

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

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

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

TARGET MC 2 [24] (Intermediate solution)

[GNC 34 ORBIT TGT]  
 CRT TGT NO - ITEM 1 +1 2 EXEC  
 COMPUTE T1 - ITEM 27 EXEC

Note solution

TARGET MC 2 [25] (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



T  
R  
A  
C  
K

NAV

PET

02:00 ..... IF S TRK .....  
 At Sunset,  
 A9(B6) CDR END S TRK NAV [22] :  
 .....

PLT When Y = 0,  
 MANUAL OUT-OF-PLANE NULL [23]

02:05

PLT When NAV converged, then  
 TARGET MC 2 [24] (Intermediate solution)

02:10

02:15

PLT TIG -5:00  
 TARGET MC 2 [25] (Final solution)

CDR EXECUTE RCS BURN (Cue Card, RNDZ OPS)

02:20

MC 2 TIG

02:25

..... IF -Y S TRK TRACK.....  
 PLT -Z AXIS TARGET TRACK [26] :  
 .....

PLT TIG -4:00  
 TARGET MC 3 [27], 2-24

CDR EXECUTE RCS BURN (Cue Card, RNDZ OPS)

02:30

R  
A  
D  
A  
R

||

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I  
↓

MC 2 ET

00:00

00:05

MC 2 BURN SOLUTION

TIG 

0	0	5
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 / 

2	3
---	---

 : 

3	3
---	---

 : 

1	1
---	---

PRELIMINARY

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

INTERMEDIATE

( )			.	
( )			.	
( )			.	
			.	

FINAL

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

3σ VARIATION

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

TIG SLIP  
(COMPUTED-NOM)

PREL	□ / □□	: □□	: □□	: □□	
INTER	□ / □□	: □□	: □□	: □□	_____ : _____
FINAL	□ / □□	: □□	: □□	: □□	_____ : _____
NOMINAL	□ / □□	: □□	: □□	: □□	_____ : _____

-Z AXIS TARGET TRACK [26]

GNC UNIV PTG

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

CCTV CONFIG [28]

If reqd, pwr up CCTV, VTR per  
TV/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

TARGET MC 3 [27]

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 +22.7  
ΔX +0  
ΔY +0  
ΔZ +0  
COMPUTE T1 - ITEM 27 EXEC  
  
Note solution

TARGET MC 4 [31]

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 +12.7  
ΔX +0  
ΔY +0  
ΔZ +0  
COMPUTE T1 - ITEM 27 EXEC  
  
Note solution

MC 3 BURN SOLUTION

TIG 

0	0	5
---	---	---

 / 

2	3
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 : 

4	3
---	---

 : 

1	1
---	---

	PRELIMINARY	FINAL	3σ VARIATION								
ΔVX	( ) <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td>.</td><td></td></tr></table>			.		( ) <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td>.</td><td></td></tr></table>			.		( . . )
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ΔVY	( ) <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td>.</td><td></td></tr></table>			.		( ) <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td>.</td><td></td></tr></table>			.		( . . )
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ΔVT	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td>.</td><td></td></tr></table>			.		<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td>.</td><td></td></tr></table>			.		
		.									
		.									

MC 4 BURN SOLUTION

TIG 

0	0	5
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 / 

2	3
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 : 

5	3
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 : 

1	1
---	---

	PRELIMINARY	FINAL	3σ VARIATION								
ΔVX	( ) <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td>.</td><td></td></tr></table>			.		( ) <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td>.</td><td></td></tr></table>			.		( . . )
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ΔVY	( ) <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td>.</td><td></td></tr></table>			.		( ) <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td>.</td><td></td></tr></table>			.		( . . )
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ΔVZ	( ) <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td>.</td><td></td></tr></table>			.		( ) <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td>.</td><td></td></tr></table>			.		( . . )
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ΔVT	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td>.</td><td></td></tr></table>			.		<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td></td><td></td><td>.</td><td></td></tr></table>			.		
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 R  
 A  
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 A  
 R

NAV  
 R  
 A  
 D  
 A  
 R

PET

02:30 MS2 CCTV CONEIG [28] BEGIN  
 A9(B6) PREBREATHE  
 MC 3 TIG

MS2 RMS POWERUP [29], 2-26

..... If NO RR .....

CDR Delete MC4; at sunrise perform  
 ESTABLISH INERTIAL LOS RATES - RR FAIL  
 RADAR FAIL, 3-5

02:35

MS2 RMS MNVR TO POISE FOR PROX-OPS [30], 2-26

TIG -4:00

CDR TARGET MC 4 [31]

CDR EXECUTE RCS BURN (Cue Card, RNDZ OPS)

02:40

MC 4 TIG

MANUAL TRAJECTORY CONTROL

CDR ESTABLISH INERTIAL LOS RATES [32]

02:45

CDR CONFIGURE FOR VBAR [33]

Follow prescribed braking gates

R	ROOT
2000 <sup>3</sup>	-4.0
1500 <sup>3</sup>	-2.0
1000 <sup>3</sup>	-1.0

02:50

A10(B7) PLT CONFIG DAP A, B to A10, B7

CDR A10 KU RADAR OUTPUT - LO

Follow prescribed braking gates

R	ROOT
500 <sup>3</sup>	-0.5
400 <sup>3</sup>	-0.4
300 <sup>3</sup>	-0.3

..... If R=200 ft before VBAR arrival .....

CDR TRANSITION TO VBAR [34]

03:00

MC 2 ET

00:10 ESTABLISH INERTIAL LOS RATES [32]

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 (\*)

00:20 CONFIGURE FOR VBAR [33]

GNC UNIV PTG

CRT TGT ID +2  
 BODY VECT +2 (-X)  
 ✓OM +0  
 TRK - ITEM 19 EXEC (CUR -X)  
 TOT ERR -ITEM 23 EXEC (X)

00:25

00:30 TRANSITION TO VBAR [34]

A6U DAP: A/MAN/NORM  
 DAP TRANS: PULSE/PULSE/PULSE, LOW Z  
 THC - as reqd to null ROOT  
 When ROOT 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

00:35

**RMS POWERUP [29]**

(Assumes RMS in TEMP MONITOR)

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 - (κ)  
 ✓ ENA, ITEM 9,11 - (κ)  
 RMS SEL - PORT (if cradled, MA, C/W RCH LIM lt-on (SP,EP),  
 SINGULAR lt-on (EP))  
 ✓ SAFING tb - grey

DEPLOY/RELEASE ARM

MA73C: A MCA LOGIC MNA MID 1 - ON  
           MNB MID 2 - ON  
       : B MCA LOGIC MNB MID 4 - ON  
           MNC MID 4 - ON  
 R13L PL BAY MECH PWR SYS (two) - ON

NOTE

DAP: VRCS or free drift while in reach limit or singularity  
 Note any single motor time (>8 sec)  
 PORT RMS RETEN LAT - REL (tb-REL) (16 sec max), then  
                                   - 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 OR 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)

DAP: As Reqd

MA73C: A MCA LOGIC MNA MID 1 - OFF  
           MNB MID 2 - OFF  
       : B MCA LOGIC MNB MID 4 - OFF  
           MNC MID 4 - OFF

**RMS MNVR TO POISE FOR PROX-OPS [30]**

CRT **SM 94 PDRS CONTROL**

PL ID - ITEM 3 + Q EXEC  
 PL INIT ID - ITEM 24 + Q EXEC

A7 CCTV - RMS/Wrist (ZOOM OUT)

OPR CMD to POISE FOR PROX OPS

-----  
 -900,   -120,   -750,   0,   270,   0  
 -----

SY	SP	EP	WP	WY	WR
-9.7	+102.9	-87.3	-80.2	-68.3	-43.4

BRAKES - ON (tb - ON)

↑ PWR ↓  
↑ ACN ↓

NAV  
RADAR

### PET

03:00

A10 (B7)

03:05

CDR When AOI LVLH Pitch = 180°,  
ESTABLISH VBAR [35]

03:10

CDR Visually determine TGT Attitude

03:15

CDR When R = 200 ft and on VBAR,  
ADJUST CLOSING RATE [36]

... If TGT Aligned Prior to 35 ft SK ...  
CDR Inertial Approach  
DAP: B/MAN/VERN, NORM as reqd  
DAP ROT: DISC/DISC/DISC

03:20

CDR When RR drops lock or range = 80 ft,  
KU PWR - STBY

03:25

CDR When R = 60 ft,  
DAP TRANS: PULSE/PULSE/PULSE, NO LOW Z

CDR A7U PL BAY FLOOD DOCKING - BRT

03:30

CDR When Target in EE Camr, then  
THC - +Z (out) to null rates

### MC 2 ET

00:40

ESTABLISH VBAR [35]  
CRT ✓ UNIV PTG TOT ERR - small  
A6U DAP: A/AUTO/NORM  
THC - -X(down) as reqd (~.1fps/100 FT 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

00:45

ADJUST CLOSING RATE [36]  
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

PREBREATHE  
COMPLETE

EVA PET - 0

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↑ 1000

NAV

PET

03:30

(A10)B7

CDR

When TGT in or near desired alignment,  
DAP: B/MAN/VERN, NORM as reqd  
DAP ROT: DISC/DISC/DISC

03:35

CDR

TRIM ORBITER/TGT ALIGNMENT 37 (If reqd)

03:40

03:45

03:50

When in stable Inertial SK,  
Go to EVA, TBD

03:55

04:00

↓ 1000

TRIM ORBITER/TGT ALIGNMENT 37

AGU ✓SENSE - -Z  
✓DAP TRANS: PULSE/PULSE/PULSE  
DAP: B/MAN/NORM

ALIGN ROLL, if reqd  
DAP ROT: PULSE/DISC/DISC  
RHC (ROLL) and THC as reqd  
When Aligned,  
DAP ROT: DISC/DISC/DISC

ALIGN PITCH, if reqd  
DAP ROT: DISC/PULSE/DISC  
RHC (PITCH) and THC as reqd  
When Aligned,  
DAP ROT: DISC/DISC/DISC

Repeat ALIGN ROLL, ALIGN PITCH as reqd

IF SUN ANGLE A PROBLEM,  
\* Rotate around TGT: \*  
\* DAP ROT: DISC/DISC/PULSE \*  
\* RHC (YAW) and THC as reqd \*  
\* to rotate far enough to \*  
\* remove sun from CDR and \*  
\* EE Camr view (appx 20 °) \*

DAP: B/MAN/VERN, NORM as reqd

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CONTINGENCY OPERATIONS

3-1

RNDZ/51-I/FI

CONTINGENCY  
OPERATIONS

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RADAR FAIL

3-3

RNDZ/51-I/FI

RADAR  
FAIL

RADAR  
FAIL

S TRK TARGET ACQ - RR FAIL

GNC 21 IMU ALIGN  
CRT IMU DES - ITEM 7(8,9) EXEC (X)  
per NSR burn pad, 2-6

C3 ✓DAP: A/AUTO/VERN

.....IF TGT NOT WITHIN 1 DEG OF COAS CENTER.....  
AND NO -Z S TRK ACQ

Perform COAS NAVIGATION, (Cue Card, RNDZ OPS)  
until Angle RESIDs < 0.5

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

GNC UNIV PTG  
CRT ✓TGT ID +1  
BODY VECT +5  
P +0  
Y +280.6  
DM +90  
TRK - ITEM 19 EXEC (CUR - X)  
C3 DAP: B/AUTO/NORM  
When attitude mnvr complete,  
DAP: A/AUTO/VERN

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

When S PRES - (X)

GNC 33 REL NAV

✓INH Angles, ITEM 24 - (X)  
✓ST - ITEM 12 EXEC (X)

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

If RESID V and H change < .05 for four  
consecutive NAV cycles (32 Sec) and COAS  
verifies TGT lock-on,

If RATIO < 1.0

FLTR TO PROP - ITEM 8 EXEC

AUTO Angles - ITEM 23 EXEC (X)

If RATIO > 1.0

1) COVAR REINIT - ITEM 16 EXEC

2) FORCE 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

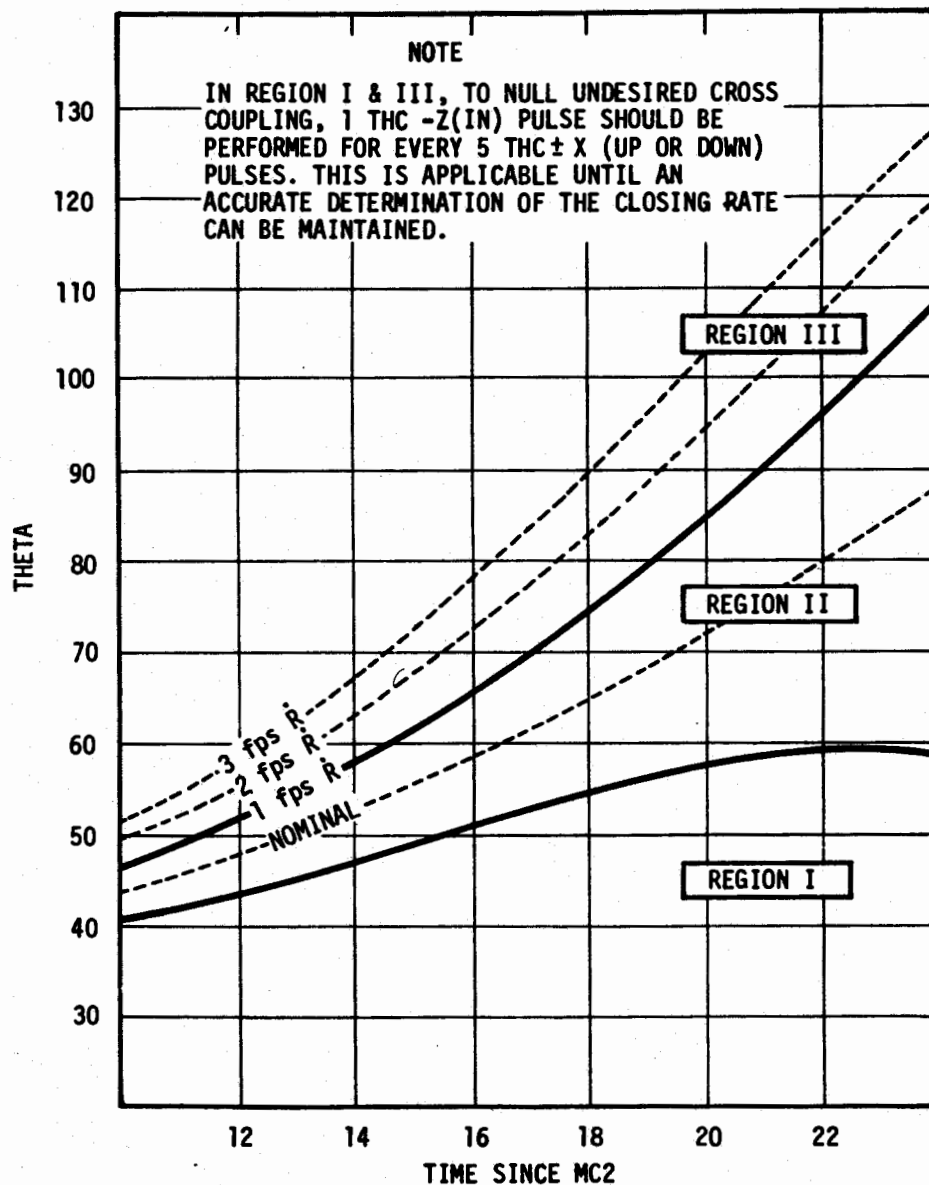
-Z(-Y) BREAK TRK - ITEM 8(7) EXEC

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

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

GNC UNIV PTG  
CRT BODY VECT +3  
DM +0  
TRK - ITEM 19 EXEC (CUR - X)  
C3 DAP: B/AUTO/NORM  
When mnvr complete,  
DAP: A/AUTO/VERN

Perform COAS NAVIGATION (Cue Card, RNDZ OPS)



**ESTABLISH INERTIAL LOS RATES - RR FAIL**

**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 Yaw = 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 ROOT 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**; 2-25

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LOSS OF VRCS  
TBS

3-7

RNDZ/51-I/FIN

LOSS OF  
VRCS

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REFERENCE DATA

4-1

RNDZ/51-I/FIN

REFERENCE  
DATA

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**FLIGHT RULES**  
**(TBS)**

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TARGETING DATA

4-5

RNDZ/51-I/FIN

TARGETING  
DATA

**TARGETING  
DATA**

**51-I TARGETING DATA**

TGT SET	DESCRIPTION	T1 REL TO BASETIME	EL (deg)	DT (min)	X (kft)	Y (kft)	Z (kft)	LAMBERT	$\omega T$	NOTES
1-8	CW Blanks	0	0	0	0	0	0		--	
9	NCC	-58.0	0	58.0	-48.6	0	-1.67	✓		BASETIME = TI TIG
10	TI	0	0	81.9	0	0	0	✓		
11	MC1	22.7	0	59.2	0	0	0	✓		
12	MC2	49.2	28.6	32.7	0	0	0	✓		
13	MC3	10.0	0	22.7	0	0	0	✓		
14	MC4	20.0	0	12.7	0	0	0	✓		
15-18	CW Blanks	0	0	0	0	0	0			
19	MC2 on TIME	0	0	32.7	0	0	0	✓		BASETIME = MC2 TIG
20-40	Lamb Blank	0	0	0	0	0	0	✓		

NOTE: Nominal TI TIG = 5 days, 22 hrs, 43 min, 59.3 sec MET  
 MC 2 TIG = 5 days, 23 hrs, 33 min, 11.3 sec MET

**DAP CONFIGURATIONS**

4-7

RNDZ/51-I/FIN

**DAP  
CONFIGURATIONS**

DAP  
CONFIGURATIONS

51-I DAP CONFIGURATIONS

DAP	RENDEZVOUS		PROX OPS	
	A9	B6	A10	B7
<u>TRANSLATION</u>				
PULSE FT/SEC	0.10	0.05	0.05	0.01
<u>ROTATION</u>				
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
<u>DEADBAND</u>				
ATT NORM	2.00	2.00	2.00	2.00
VERN	1.000	1.000	1.000	1.000
RATE NORM	0.20	0.20	0.20	0.20
VERN	.020	.020	.020	.020
<u>JET OPT</u>				
P	1	1	1	1
Y	1	1	1	1
<u>CNTL ACCEL</u>				
	0	0	0	0



RELATIVE MOTION PLOTS  
TBS

4-9

RNDZ/51-I/FIN

RELATIVE  
MOTION PLOTS

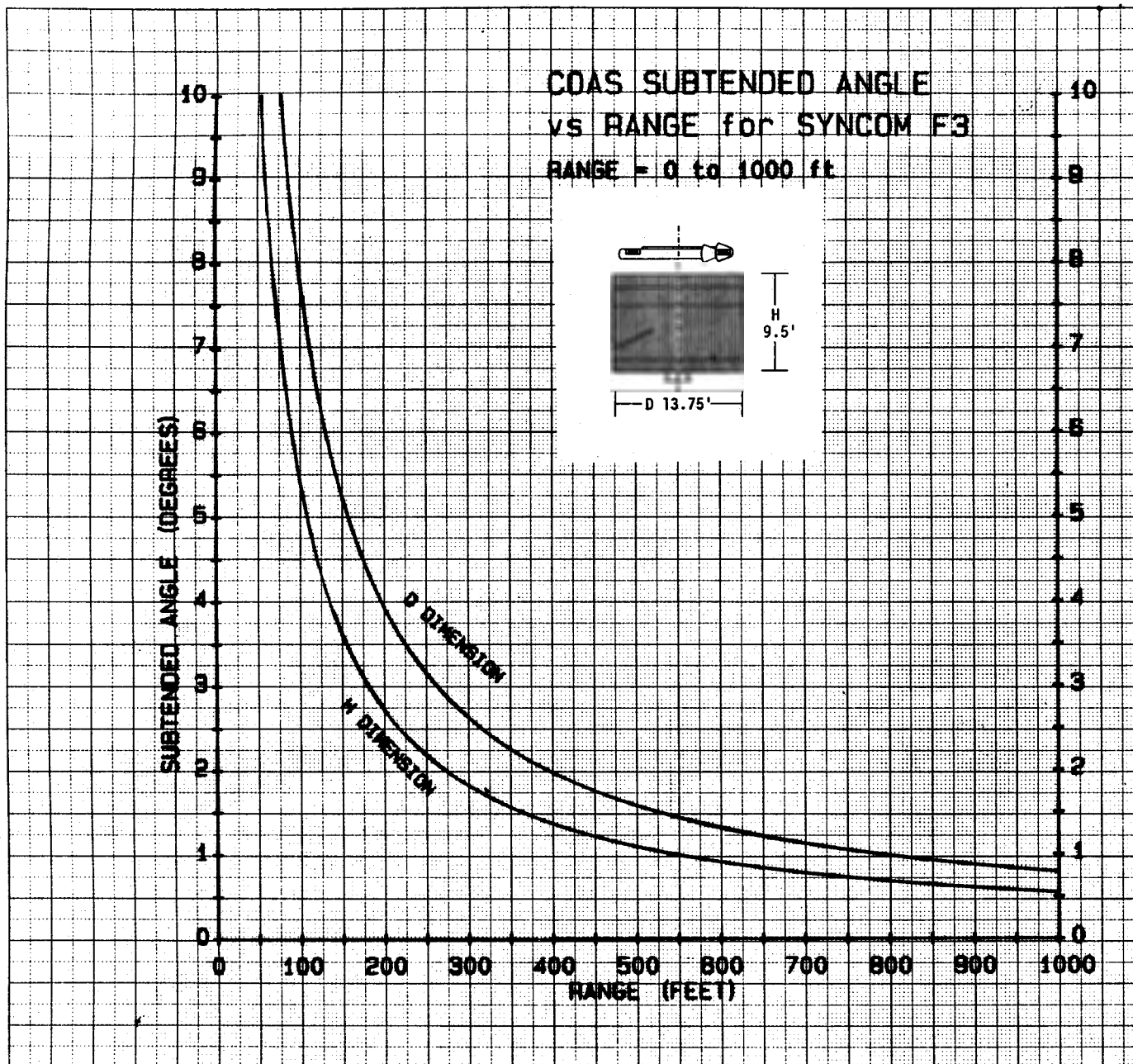
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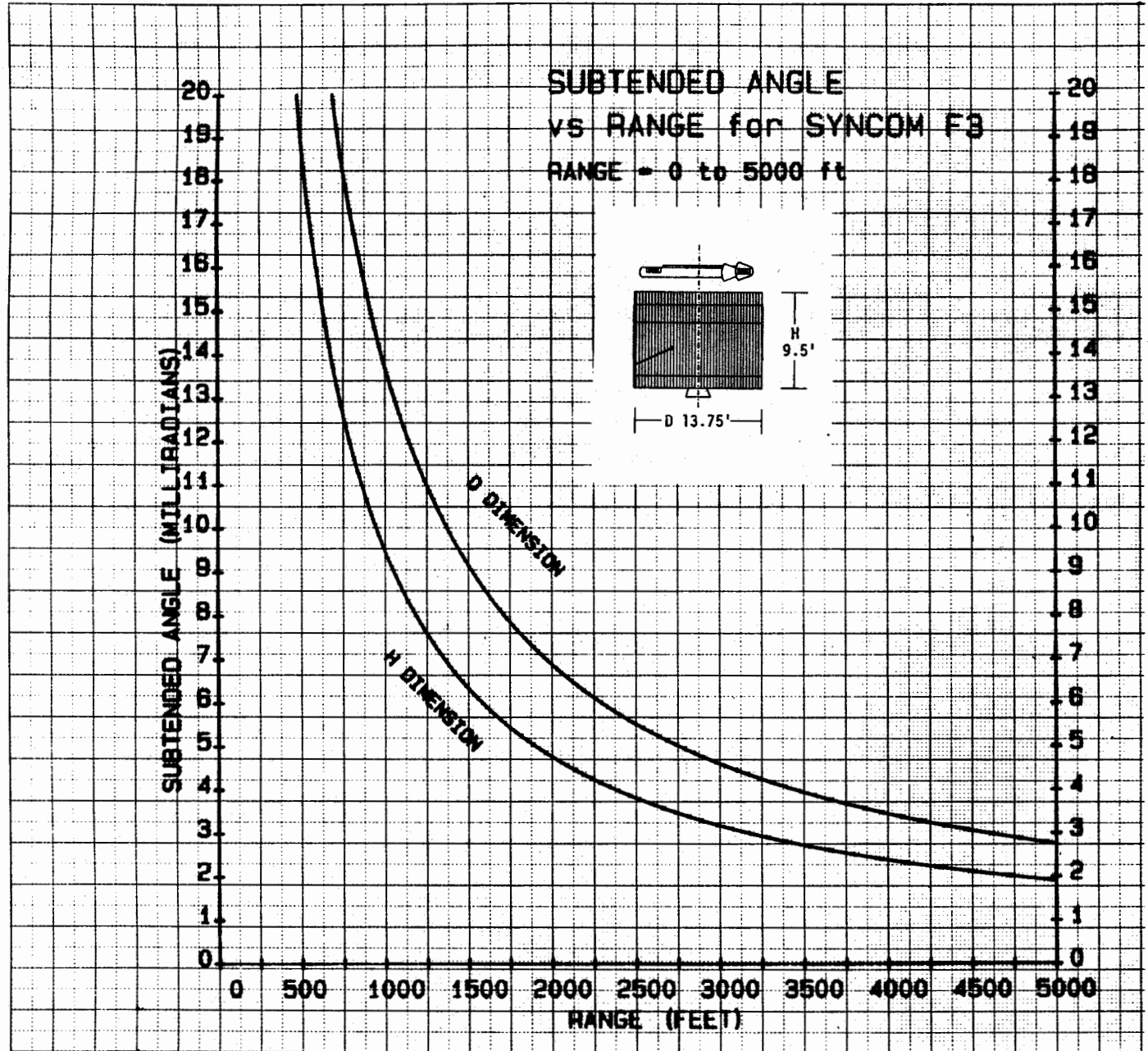
RANGING CHARTS

5-1

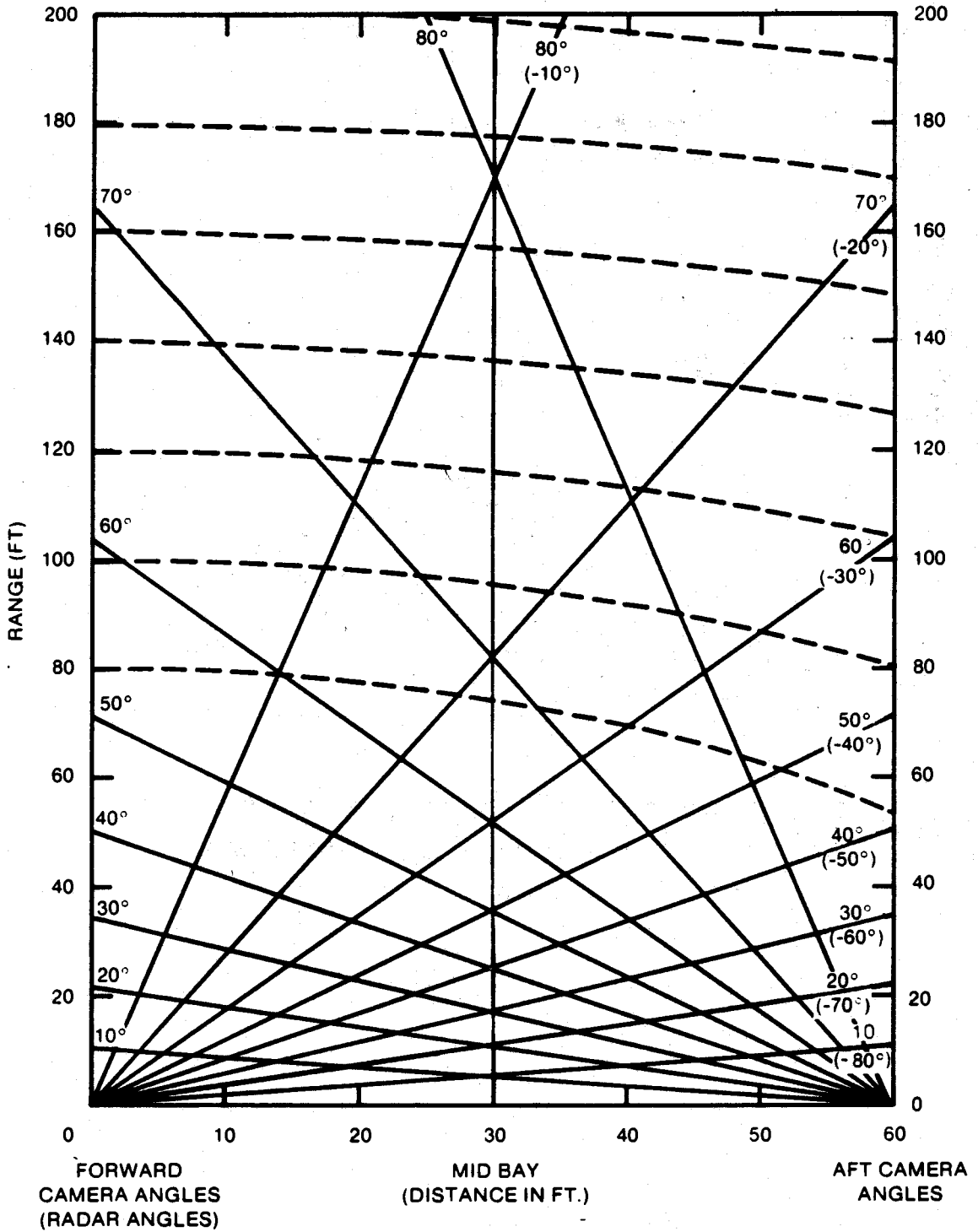
RNDZ/51-I/FIN

RANGING  
CHARTS





# CAMERA ANGLES AND RADAR ANGLES RANGING CHART



CUE CARDS

**RNDZ OPS**

**EXECUTE RCS BURN**

TIG -2:00 ..

OPS 202 PRO

IGNC 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

CUE  
CARDS



## 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,  
FORCE 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

## RENDEZVOUS OMS/RCS PRPLT PAD

When L or R RCS QTY <  :

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

When  G23 L OMS/RCS QTY >  :

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

When  G23 R OMS/RCS QTY >  :

I'CONNECT RETURN (ORB PKT, RCS)

---

When L or R RCS QTY <  :

or when FRCS QTY <  :

DAP: NO LOW Z

---

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

IGNC 22 S TRK/COAS CNTL

CRT -Y, -Z STAR TRK - ITEM 3,4 EXEC (\*)

ON MCC call,

IGNC 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

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

### OPS 202 PRO

IGNC ORBIT MNVR EXEC

$\sqrt{\text{RCS SEL - ITEM 4 (*)}$

TV ROLL - ITEM 5 +0 EXEC

Set TIG to out-of-plane burn +15:00

TGT PEG 7  $\Delta V_x$  - ITEM 19 -3 EXEC

$\Delta V_y$  - ITEM 20 +0 EXEC

$\Delta V_z$  - ITEM 21 +0 EXEC

LOAD - ITEM 22 EXEC

TIMER - ITEM 23 EXEC

At TIG -8:00; MNVR - ITEM 27 EXEC (\*)

DAP: B/AUTO/NORM ( $\sqrt{\text{ROT DISC RATE}} = .5$ )

At TIG deflect THC to null VGOs

### PROX OPS BREAKOUT

If on +Vbar,

Perform Posigrade  $\Delta V = 2$  fps

(THC - +Z, 5 sec in DAP TRANS: NORM)

If not on +Vbar,

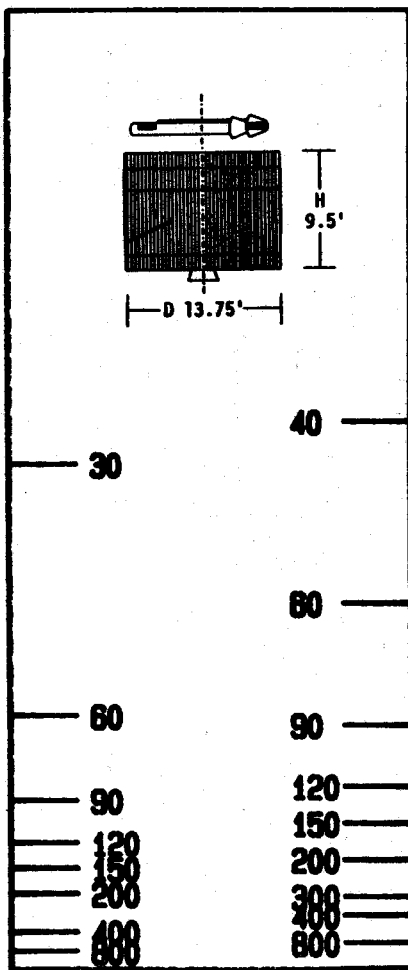
If time permits, contact MCC for breakout

If insufficient time to contact MCC,

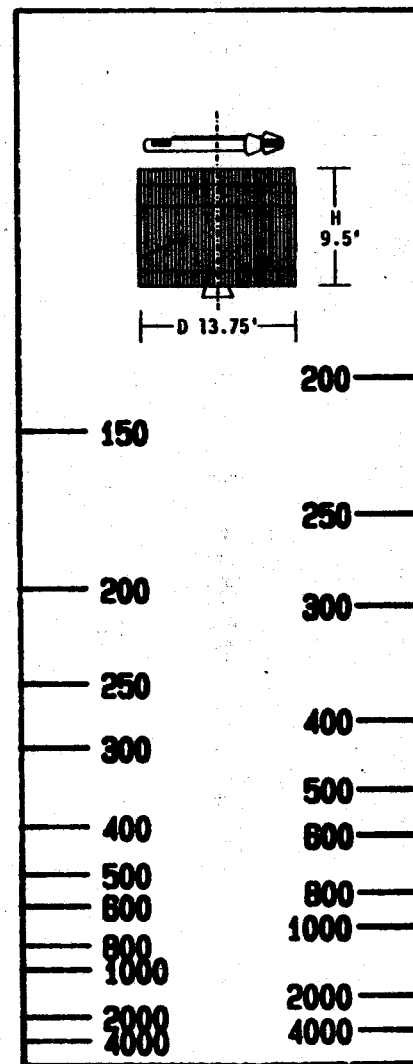
Perform SEP MANEUVER (ORB OPS)

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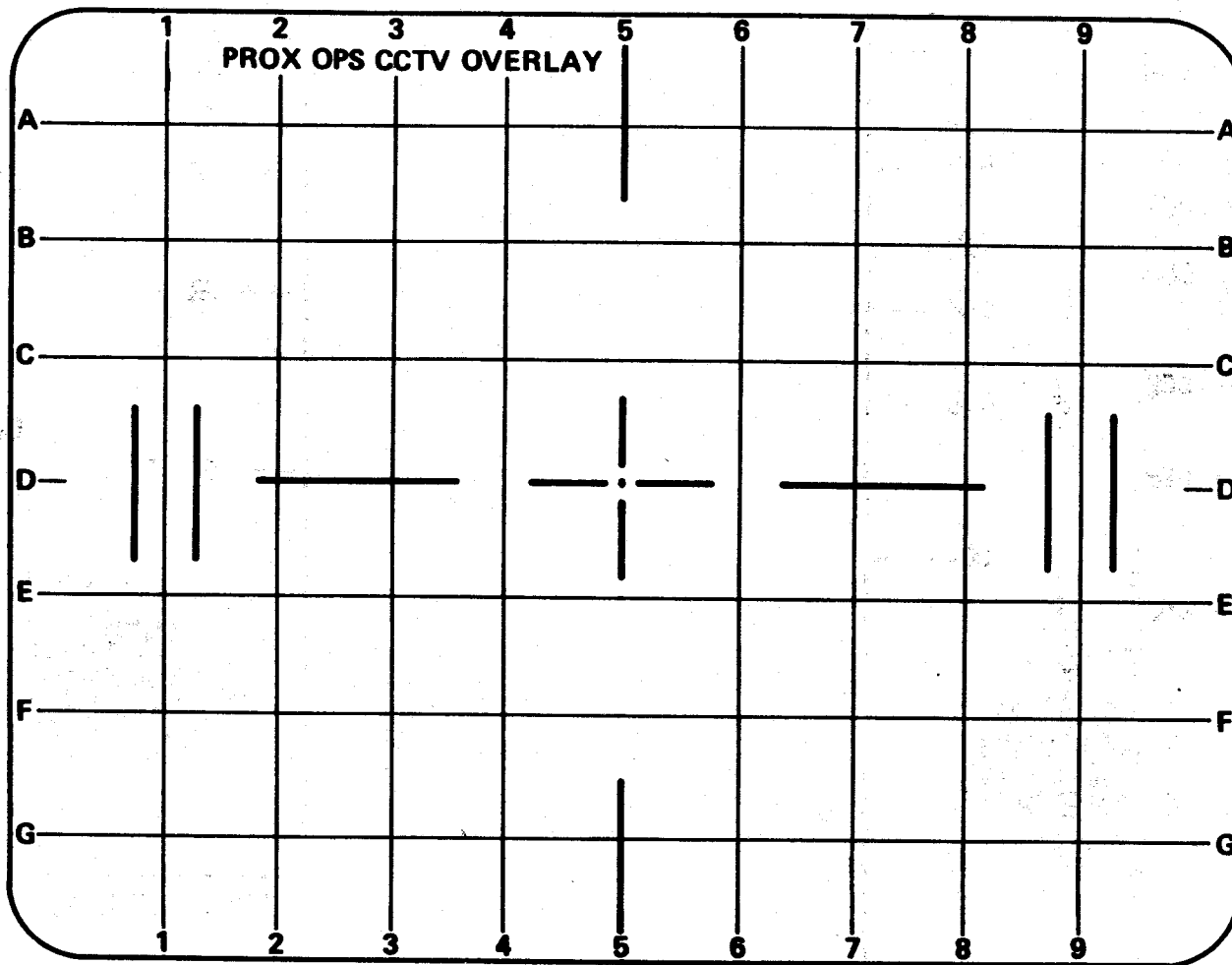
H Axis No Zoom D Axis



H Axis Full Zoom D Axis



Note: Fabricated as a transparency



NOTES  
(TBS)

NOTES

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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/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

RNDZ/51-I/O/FIN

CUE CARD  
CONFIGURATION



HOOK  
VELCRO

HOOK  
VELCRO



### 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

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

IGNC 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,  
FORCE 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

RNDZ/51-I/O/FIN



CUE CARD  
CONFIGURATION

HOOK  
VELCRO

HOOK  
VELCRO

**RENDEZVOUS OMS/RCS PRPLT PAD**

When L or R RCS QTY <  :

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

When  G23 L OMS/RCS QTY >  :

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

When  G23 R OMS/RCS QTY >  :

I'CONNECT RETURN (ORB PKT, RCS)

When L or R RCS QTY <  :

or when FRCS QTY <  :

DAP: NO LOW Z

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 (\*)

ON MCC call,

GNC 33 REL NAV

KU ANT ENA - ITEM 2 EXEC (no \*)

RNDZ NAV ENA - ITEM 1 EXEC (no \*)

RNDZ/51-I/O/FIN

HOOK  
VELCRO

HOOK  
VELCRO

## 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

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

### OPS 202 PRO

#### IGNC 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  $\Delta V_x$  - ITEM 19 -3 EXEC

$\Delta V_y$  - ITEM 20 +0 EXEC

$\Delta V_z$  - ITEM 21 +0 EXEC

LOAD - ITEM 22 EXEC

TIMER - ITEM 23 EXEC

At TIG -8:00; MNVR - ITEM 27 EXEC (\*)

DAP: B/AUTO/NORM (✓ROT DISC RATE = .5)

At TIG deflect THC to null VGOs

## PROX OPS BREAKOUT

If on +Vbar,

Perform Posigrade  $\Delta V = 2$  fps

(THC - +Z, 5 sec in DAP TRANS: NORM)

If not on +Vbar,

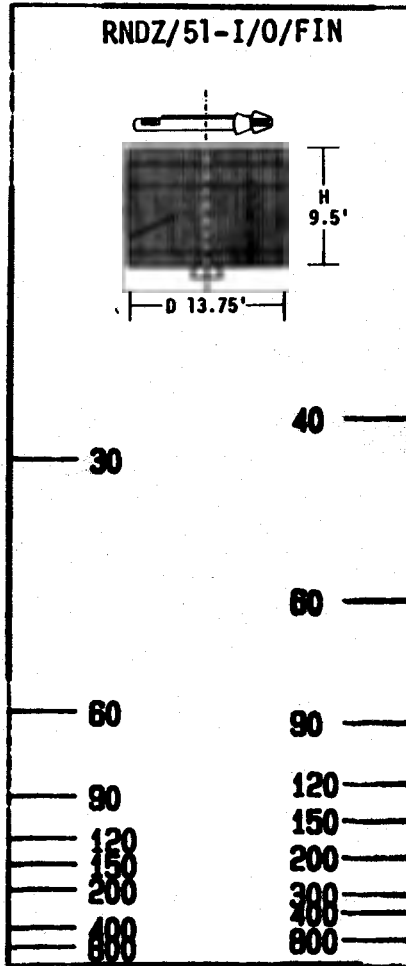
If time permits, contact MCC for breakout

If insufficient time to contact MCC,

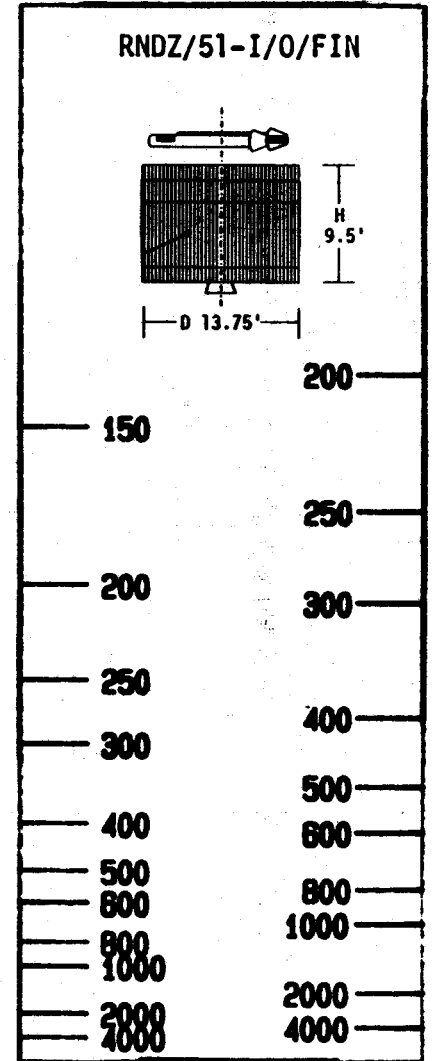
Perform SEP MANEUVER (ORB OPS)

RNDZ/51-I/O/FIN

H Axis No Zoom D Axis

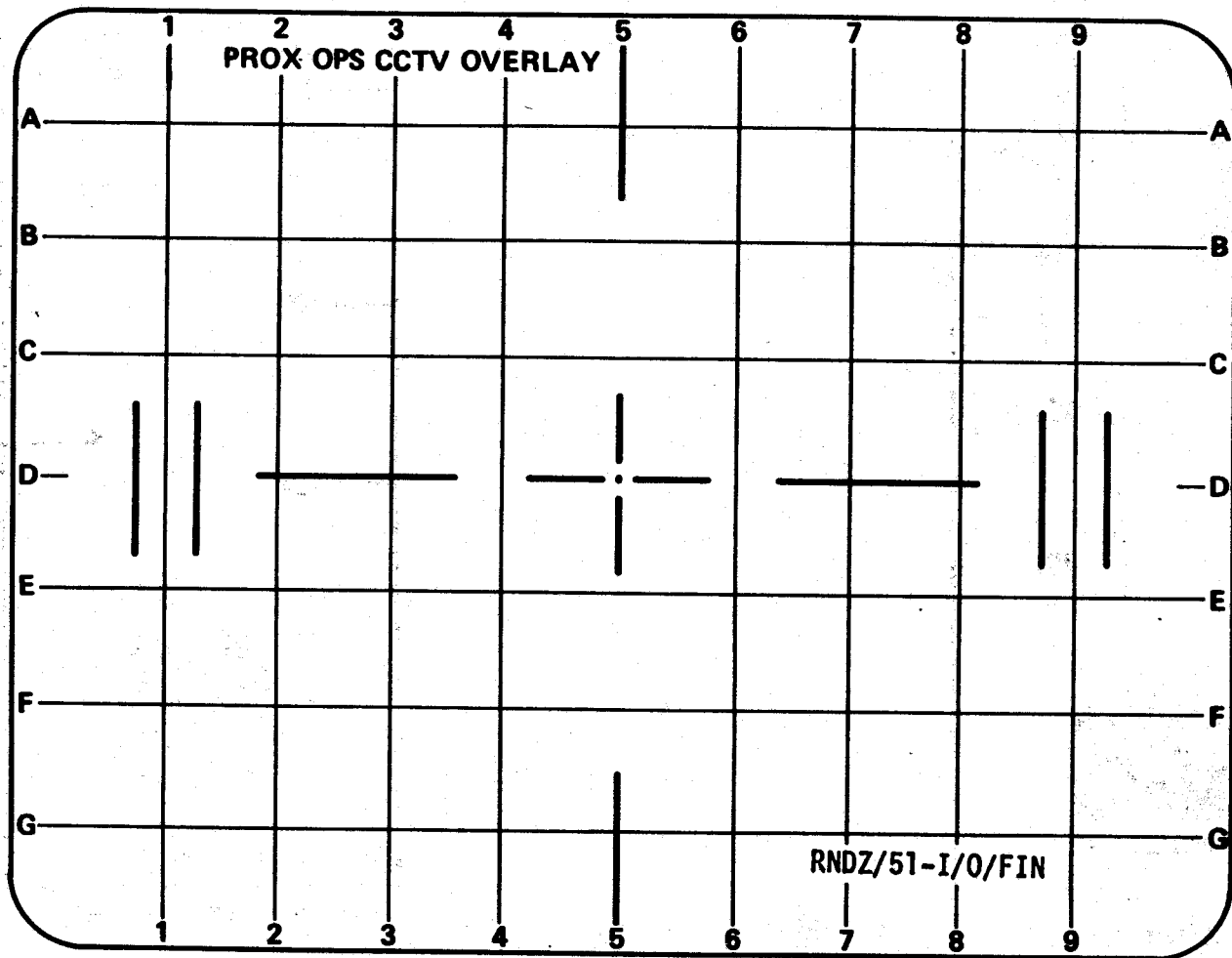


H Axis Full Zoom D Axis



Note: Fabricated as transparencies

Note: Fabricated as a transparency



NOT FLOWN

CC 8-6

NASA-JSC

FLIGHT DATA FILE  
CORE DISTRIBUTION  
06/28/85

ZK-25/Rockwell Tech Data  
LS0-233/A. Grenville

Marshall Space Flight Center  
MDTSCO, Bldg 4666,  
DCCL. White  
MS12A/K. Jackson  
SA82/R. R. Pride  
EE45/R. Marmann  
PMIC/TBE/J. Humphrey  
17C/J. R. Hutchins

Goddard Space Flight Center  
405/J. B. Hartmann

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MR5/R. R. Frazer  
PL14/H. Kuznicki

McDonnell Douglas - Houston  
A2/L. T. Guderian  
A3/G. Venables  
D3/M. Pipher (2)  
D4/H. Stegall  
R. DeVall

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