

# Rendezvous Checklist

**Mission Operations Directorate**  
**Flight Design and Dynamics Division**  
**Final**  
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National Aeronautics and  
Space Administration

Lyndon B. Johnson Space Center  
Houston, Texas



## FLIGHT RULES SUMMARY AND FLIGHT PROFILE

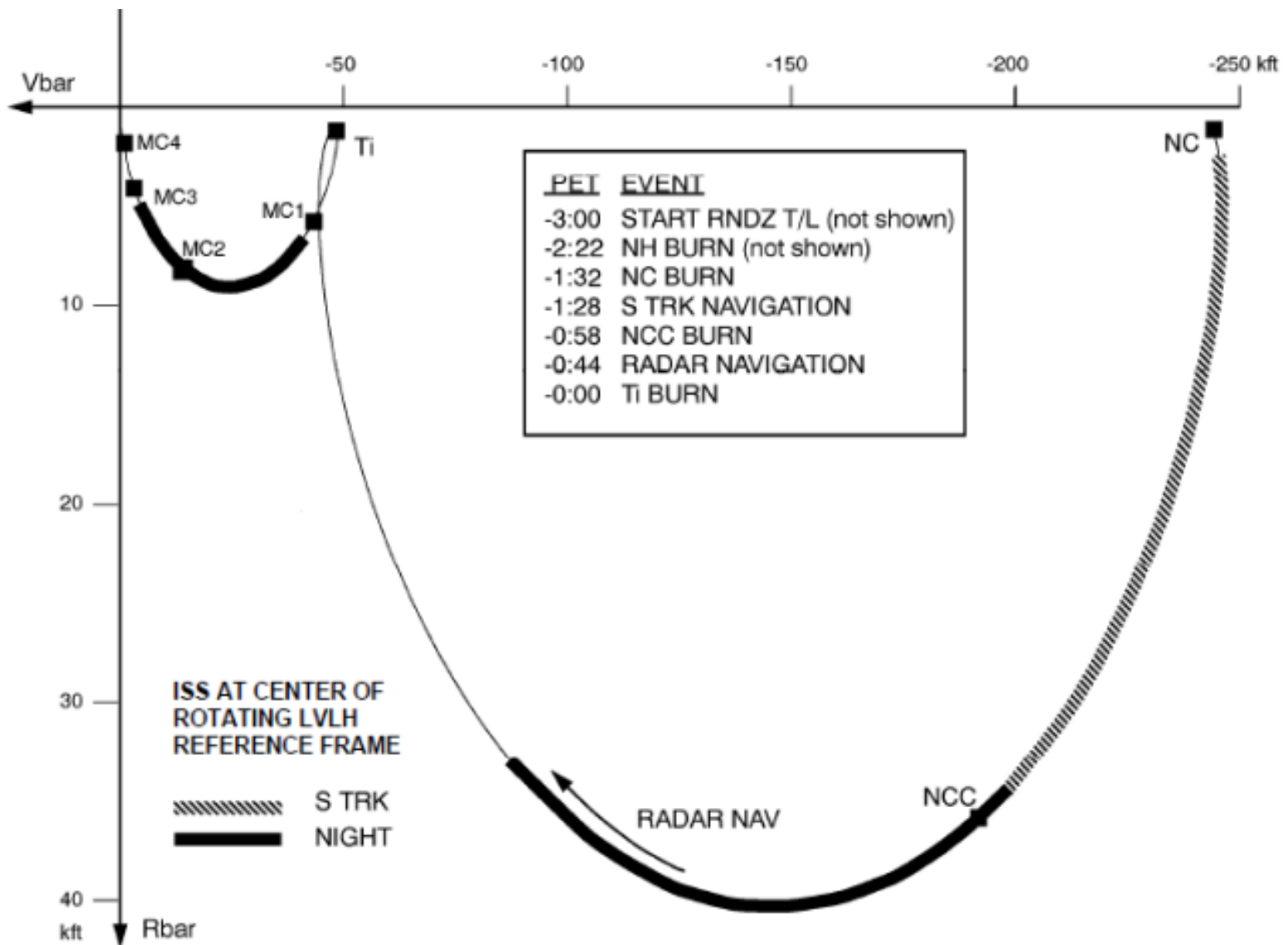
### RNDZ BURN SOLUTION SELECTION GUIDELINES

BURN	SOLUTION PRIORITY
All burns prior to, but not including, NCC	1) Ground solution
NCC & Ti	1) Onboard FLTR solution if STRK or RR NAV converged* (for COAS, use step 2 below) 2) Onboard FLTR solution if it agrees with ground solution** 3) Onboard PROP solution if it agrees with ground solution 4) Ground solution
Post-Ti midcourse corrections	1) Onboard solution

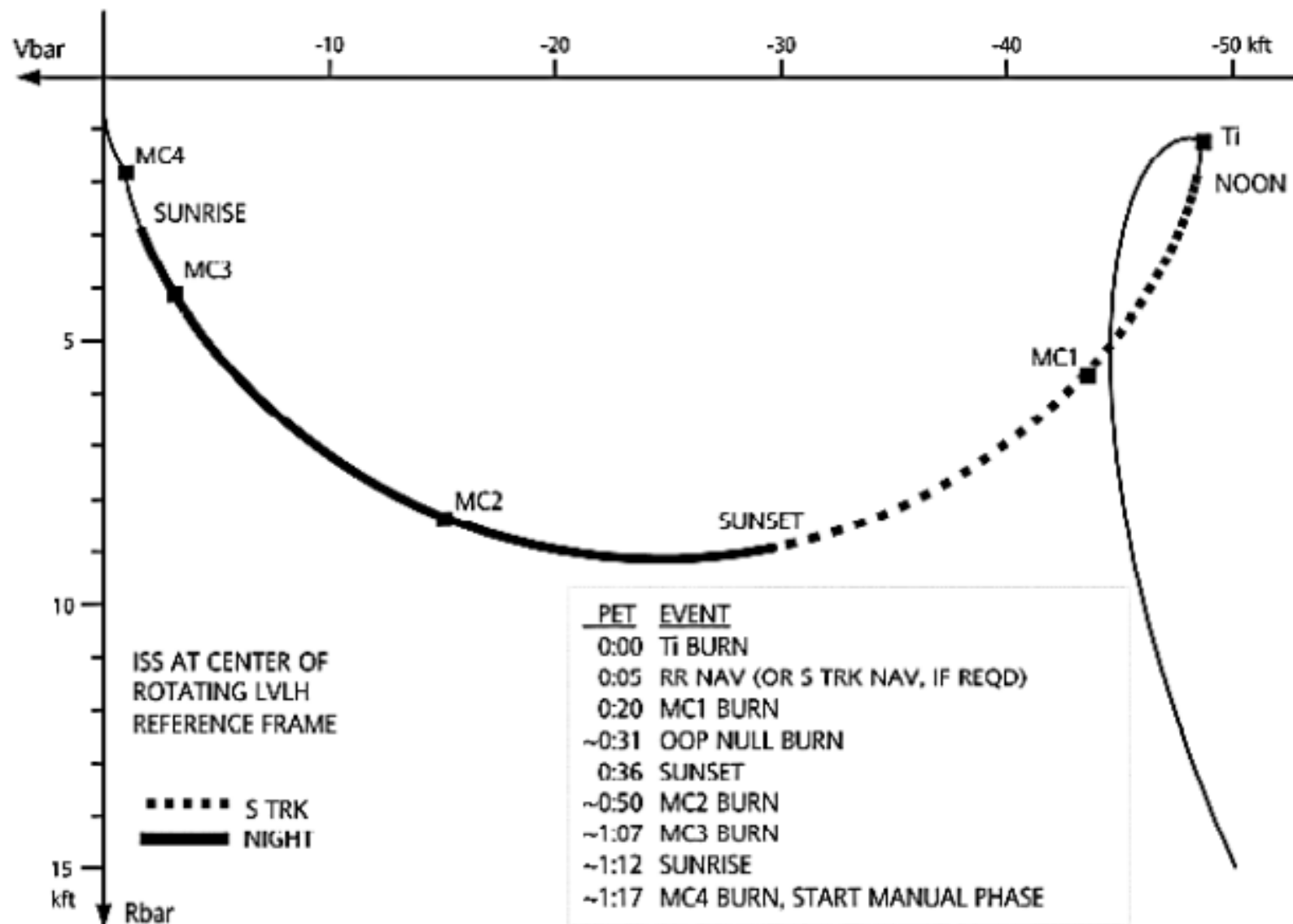
### RNDZ BURN ENGINE SELECTION GUIDELINES

DELTA V	ENGINE
< 4 fps	RCS – Primary technique is multi-axis
4 to 6 fps	RCS – Primary technique is +X
> 6 fps	OMS – Single engine

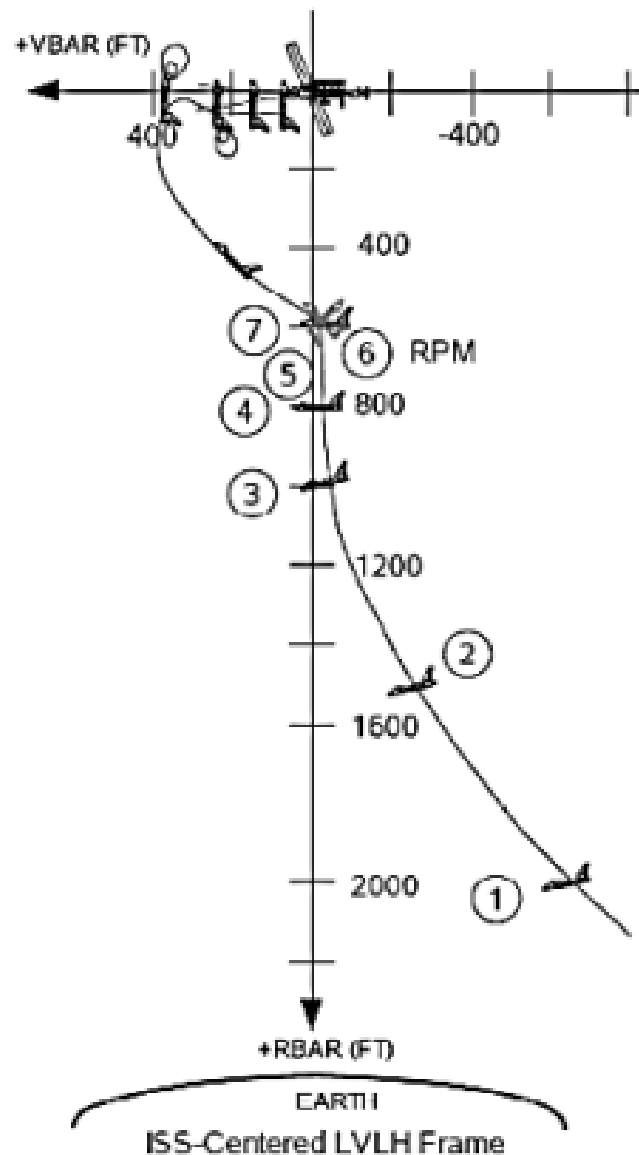
## ORBT RENDEZVOUS PROFILE



## ORBIT POST TI PROFILE

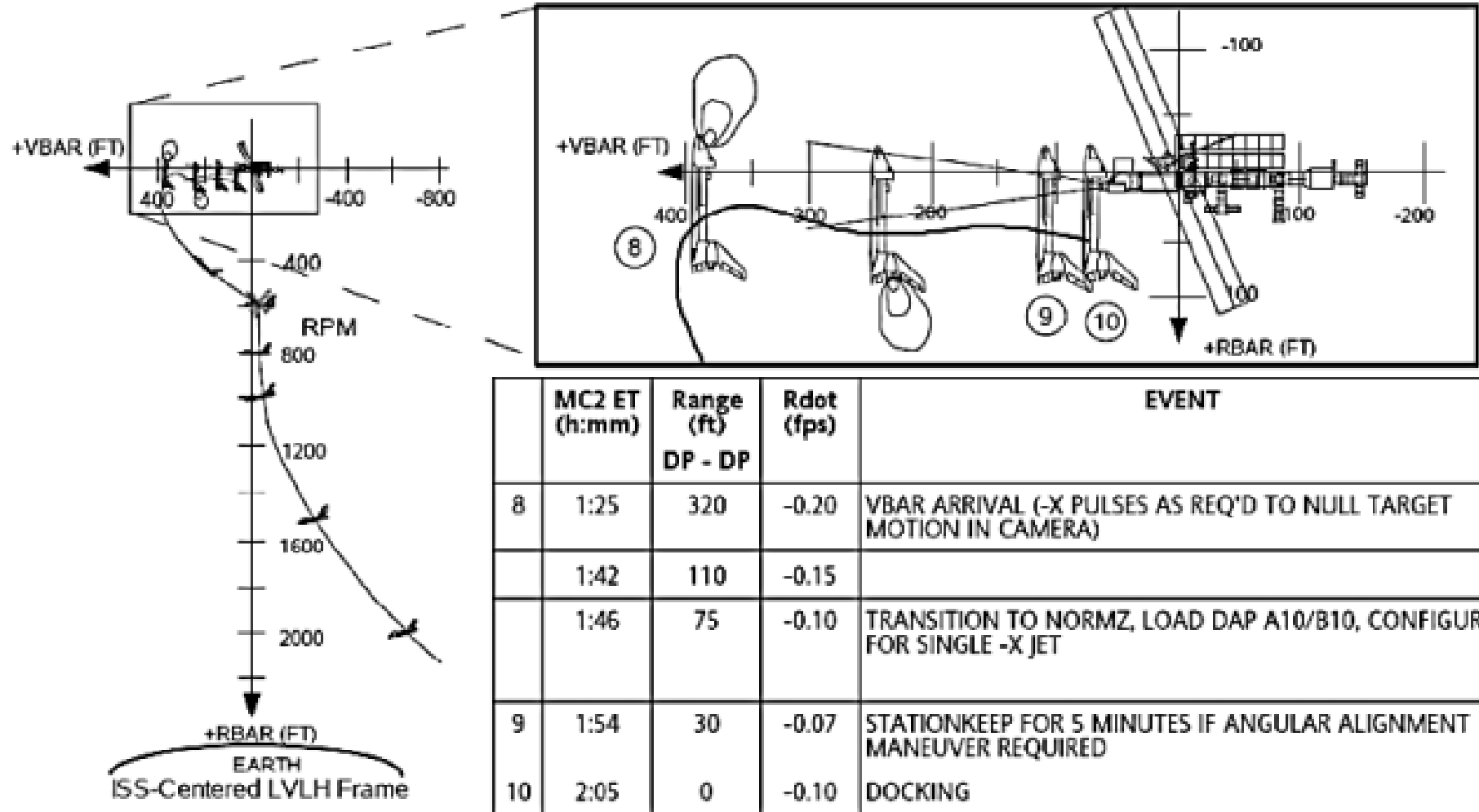


## TERMINAL PHASE, RPM, AND TORVA

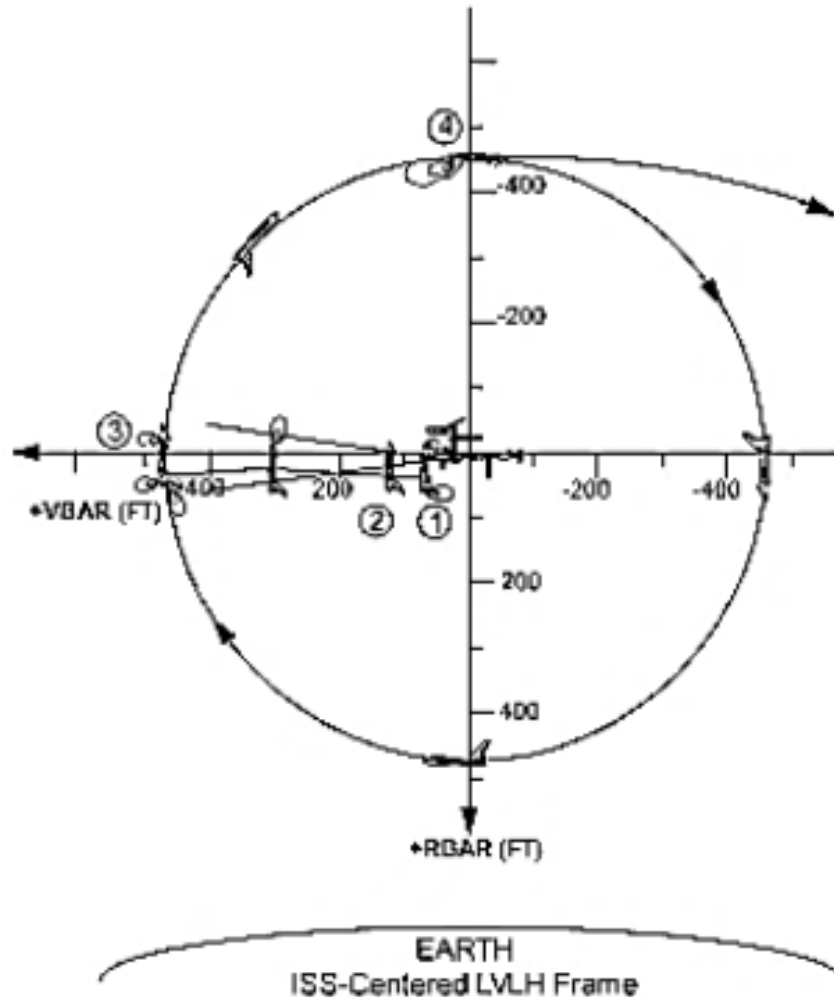


	MC2 ET (h:mm)	Range (ft) CG - CG	Rdot (fps)	EVENT
1	0:27	2000	-3.0	MANUAL PHASE TAKEOVER (POST-MC4)
	0:29	1700	-2.4	
2	0:31	1500	-2.1	
3	0:36	1000	-1.3	TRANSITION TO LOWZ
	0:37	900	-1.1	
4				WHEN IN RBAR ATTITUDE: LOAD DAP A9/B9 MOD DAP A PRI/VERN ROT RATE TO 0.75 DEG/SEC AND YAW JET OPTION TO BOTH NOSE & TAIL (ALL) LOAD UNIV PTG P=145 DEG
		800	-0.9	
		700	-0.6	
		650	0.4	
5	0:46	620	0.0	STATIONKEEP TO AVOID SHADOWING IF REQUIRED
6	1:00	OP 620 PT 600 IOW 580	-0.35 -0.25 -0.15	INITIATE RPM: DAP A/PRI ITEM 19 WHEN -Z ADI PITCH > 100 DEG; DAP A/VERN WHEN -Z ADI PITCH > 170 DEG; DAP FREE, RESET UNIV PTG P=270 DEG, ITEM 19, DAP PRI DIGITAL IMAGERY TAKEN FROM ISS SM WHEN -Z ADI PITCH > 10 DEG; DAP AUTO WHEN RPM COMPLETE: DAP VERN
7	1:11	OP 600 PT 550 IOW 500	-0.7 -0.6 -0.4	RELOAD DAP A9, LOAD UNIV PTG P=179 DEG, REESTABLISH RDOT PER TORVA ICs INITIATE TORVA: DAP A, ITEM 19 (+X PULSES AS REQ'D TO NULL TARGET MOTION IN CAMERA)

## VBAR APPROACH



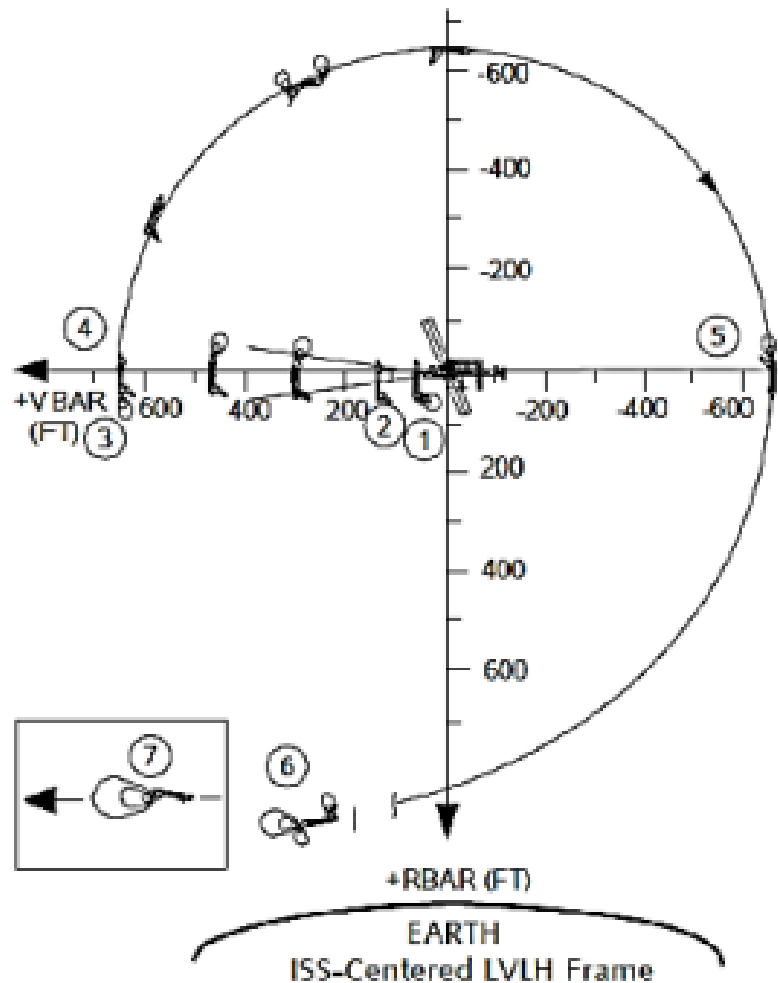
## UNDOCKING, TORF, AND FINAL SEPARATION



	APPROX PET (h:min)	EVENT
	-0:03	BEGIN UNHOOKING PROCESS - ORBITER & ISS IN FREE DRIFT (ISS LVLH 0,0,0 ATTITUDE)
1	0:00	AT SS-10 min, UNDOCK AT 2 FT - MODE TO LVLH HOLD & 4 DAP B (10 SEC INTERVALS) +Z NORM Z BURNS 3 MIN LATER & > 30 FT - +Z NORM Z BURNS (Rdot = +0.15 FPS) MAINTAIN THE 8 DEGREE CORRIDOR
	0:04	> 50 FT - RESELECT FRCS -X JETS (F1F & F2F)
2	0:07	75 FT - LOW Z
	0:14	150 FT - DAP TO AUTO (MANEUVER TO UNDOCKING ATT) MAINTAIN 8 DEG. CORRIDOR, Rdot = +0.15 FPS UNTIL CG-CG IS APPROXIMATELY R>400 FT
		450 FT - NULL Rdot
3	0:46*	POST SUNRISE & WITH R 400 - 500 FT CG-CG - INITIATE TORF CONTINUE FOR 1 & 1/4 LAP
4	1:44*	2 <sup>ND</sup> R BAR CROSSING - FINAL SEP BURN +X, LOW Z, 3 FPS RETROGRADE BURN

\*BASED ON ZERO DEGREE BETA ANGLE

## -RBAR SEPARATION



	UNDOCK ET (h:mm)	RANGE (ft) DP-DP	EVENT
	-0:03	0	ORBITER AND ISS IN FREE DRIFT TO BEGIN UNHOOKING (ISS LVLH PYR 0, 0, 0, ATTITUDE)
1	0:00	0 2	UNDOCKING; DAP B/ALT; MODE TO LVLH; MAINTAIN CORRIDOR
	0:01		SELECT VERN; PERFORM DAP B +Z NORMZ BURNS AT 10 SEC INTERVALS TO BUILD OPENING RATE TO 0.15 FT/S
	>0:03	>30	DAP B +Z NORMZ BURNS AT 10 SEC INTERVALS TO BUILD OPENING RATE TO 0.3 FT/S
		50	RE-SELECT -X JETS
2	0:05	75	TRANSITION TO LOWZ
3	0:32	>600 (CG-CG)	ISS BEGINS 90 DEG YAW TO +/-YVV ORBITER MODES TO AUTO AND BEGINS STATIONKEEPING BETWEEN 600 FT AND 700 FT
4	0:59	~650 (CG-CG)	BEGIN 1/2 LAP TORF BETWEEN 600 FT AND 700 FT
5	1:22		SEP 1: 1.5 FT/S +X RADIAL DOWN BURN
6	1:50	>6000 (CG-CG)	SEP 2: 7 FT/S -X RETROGRADE BURN
7	NEXT DAY		SEP 3: 7 FT/S SINGLE OMS RETROGRADE BURN



## RENDEZVOUS TIMELINE

## AFT FLT STATION CONFIG FOR RNDZ

Ti -03:00	A6U	ADI ATT	- LVLH
		ERR	- MED
		RATE	- MED
		SENSE	- minus Z
	R13	√KU ANT	- GND
	A1U	PWR	- STBY
		sel	- MAN
		MODE	- RDR
		RADAR OUTPUT	- HI
		CNTL	- PNL (wait
SLEW  PASSIVE   3 seconds)		PWR	- ON
		SIG STRENGTH sel	- KU
		SLEW RATE	- as reqd
	A2	DIGI-DIS sel	- R/RDOT
		X-PNTR SCALE	- X1
	A1U	√ KU SCAN WARN tb	- gray
		√ TRACK tb	- gray
		√ SEARCH tb	- gray
	A2	√ RANGE	- 888.8
		DIGI-DIS sel	-EL/AZ

A1U	KU MODE	- COMM
	sel	- GPC
	CNTL	- CMD

-02:23

**NH TIG** (If reqd)

## **RNDZ OPS INITIALIZATION**

C3            Config DAP A,B to A7,B7

-02:15

ENABLE RENDEZVOUS NAV

GNC SPEC 33 PRO (REL NAV)

RNDZ NAV ON – ITEM 1 EXEC

GNC SPEC 34 PRO (ORBIT TGT)

Set BASE TIME to Ti TIG

ITEM 2 \_\_\_\_ / \_\_\_\_ : \_\_\_\_ : \_\_\_\_

## RNDZ BURNS

(Ti TIG)

-02:00

### LOAD TARGET TRACK

C3       $\sqrt{\text{DAP: A/LVLH/VERN(ALT)}}$

CRT1      GNC OPS 201 PRO (UNIV PTG)

CNCL - ITEM 21 EXEC

TGT ID + 2 -Z AXIS -Y STRK

BODY VECT +5 (-Z)      +4

P                      +270       $\sqrt{+0}$

Y                      +0       $\sqrt{+280.57}$

OM                    +0      +90

Do not INITIATE TARGET TRACK until post NC

If OMS BURN, Perform RNDZ OMS BURN Cuecard

If +X RCS burn, Perform +XRCS BURN Cuecard

## NC TIG

-01:30

### INITIATE TARGET TRACK

GNC UNIV PTG (ORB MNVR EXEC)

TRK - ITEM 19 EXEC (CUR - \*)

DAP: B/AUTO/ALT

When MNVR complt

C3

DAP: A/AUTO/VERN (ALT)

### TARGET NCC BURN

-01:07

TIG – 10 min  $\sqrt{\text{burn type}}$

If  $\Delta VT > 6$  fps:

Perform RNDZ OMS BURN

If  $\Delta VT > 4$  fps:

Perform +X Burn, RCS BURN

-01:00

C3

DAP: A/AUTO/ALT(B/ALT as reqd)

## LOAD TGT DATA

CRT1            GNC OPS 202 PRO (ORBIT MNVR EXEC)

TV ROLL

If Posi Heads Up – ITEM 5 + 0 EXEC

If Posi Heads Dwn – ITEM 5 + 180 EXEC

Trim Load (\*1 eng)

P – ITEM 6 = + 0.4 \*(+ 0.4)

LY – ITEM 7 = - 5.7 \*(+ 5.2)

RY – ITEM 8 = + 5.7 \*(- 5.2)

GNC SPEC 34 PRO (ORBIT TGT)

√TGT Set data:

T1 TIG = NCC BURN SOLUTION

TGT NO – ITEM 1 + 9

TIG – ITEM 2 + \_\_\_ : \_\_\_ : \_\_\_ : \_\_\_

EL – ITEM 16 + 0

$\Delta T$  – ITEM 17 + 57.7

$\Delta X$  – ITEM 18 – 48.6

$\Delta Y$  – ITEM 19 + 0.0

$\Delta Z$  – ITEM 20 + 1.2

COMPUTE T1 – ITEM 28 EXEC

CRT1        GNC OPS 202 PRO (ORBIT MNVR EXEC)  
               LOAD – ITEM 22 EXEC  
               √TGT PEG 7 ( $\Delta V_x$ ,  $\Delta V_y$ ,  $\Delta V_z$  ,  $\Delta V_{tot}$ )  
               TIMER – ITEM 23 EXEC  
               √Eng sel  
               OMS BOTH – ITEM 1 EXEC  
               OMS L – ITEM 2 EXEC  
               OMS R – ITEM 3 EXEC

-Z AXIS TARGET TRACK

	GNC OPS 201 PRO (UNIV PTG)	
ELEV angle	CRT1        √ TGT ID	+ 2
	BODY VECT	+5 (–Z)
	P	+360 -
	Y	+0
	OM	+0

C3            DAP: B/AUTO/ALT

CRT1        TRK – ITEM 19 EXEC (CUR - \*)  
               When MNVR cmplt,

C3            DAP: A/AUTO/VERN(ALT)  
               Go to RNDVZ BURN CUECARDS

## KU OPS

-00:50

When NAV RNG < 150 KFT (45 Km):

### 1.CONFIGURE KU FOR RR TGT ACQ

PASSIVE      3 sec)	A2	DIGI-DIS sel	– R/RDOT
	A1U	KU PWR	– STBY
		MODE	– RDR
		RDR OUTPUT	– HI
		CNTL	– PNL (wait
		PWR	– ON
		KU SEL	– GPC

If no lock-on by 10 minutes after initial search:

Perform KU OPS step 2 below

### 2. AUTO TRK ACQ

TRK	KU SEL	– AUTO
(tb–gray)	KU SEARCH	– SEARCH

Repeat search as reqd

-00:40

When NAV RNG < 135 KFT (~41 Km):

Perform RR Navigation



-00:35

TARGET Ti BURN

CRT1 GNC OPS 202 PRO (ORBIT MNVR EXEC)  
Load Eng Sel, TVR, WT and Trims for Ti Burn  
LOAD – ITEM 22 EXEC

CRT1 GNC SPEC 34 (ORBIT TGT)  
√TGT Set data:  
TGT NO – ITEM 1 + 10  
T1 TIG = BASE TIME (ITEM 2)  
 $\Delta T$  – ITEM 17 + 76.9  
 $\Delta X$  – ITEM 18 – 0.9  
 $\Delta Y$  – ITEM 19 + 0  
 $\Delta Z$  – ITEM 20 + 1.8

COMPUTE T1 - ITEM 28 EXEC

-00:30

CRT1 GNC OPS 202 PRO (ORBIT MNVR EXEC)  
LOAD – ITEM 22 EXEC  
√TGT PEG 7 ( $\Delta V_x$ ,  $\Delta V_y$ ,  $\Delta V_z$ ,  $\Delta V_{tot}$ )  
TIMER – ITEM 23 EXEC  
√Eng sel  
OMS BOTH – ITEM 1 EXEC  
OMS L – ITEM 2 EXEC  
OMS R – ITEM 3 EXEC

Go to RNDVZ BURN CUECARDS

If Ti is +X RCS burn: Go to + X RCS BURN Cuecard

00:00

**Ti TIG**

**POST TI NAV**

-Z AXIS TARGET TRACK

A6U	√DAP: A/AUTO/VERN(ALT)	
CRT1	GNC OPS 201 PRO (UNIV PTG)	
	√ TGT ID	+ 2
	BODY VECT	+ 5 (-Z)
	P	+ 360 –
ELEV angle	Y	+ 0
	OM	+ 0

C3      DAP: B/AUTO/ALT

CRT1    TRK - ITEM 19 EXEC (CUR - \*)

When MNVR cmplt,

DAP: A/AUTO/VERN(ALT)

17:00 (MC1 TIG – 3 min)

A1U      KU sel      – GPC

If no RR ACQ, assume RR Fail

If RR Fail:

Perform COAS NAVIGATION

### 1.COAS NAV CONFIG

A6U      SENSE:      -Z

C3      DAP: B7/AUTO/VERN(ALT)

### 2.COAS MARKS

A6U      FLT CNTLR PWR      – ON

DAP: B/FREE/PRI

RHC: As reqd to move TGT near COAS center

and maintain BODY

YAW ERR < 10 deg

DAP: B/FREE/VERN

RHC: As reqd to maintain TGT at COAS

center and maintain BODY

YAW ERR < 10 deg

Repeat step 2 per schedule:

One mark every 10 to 20 sec until sunset Post-

Ti

At sunset,

### 3.END COAS NAV

A6U      DAP: A7/AUTO/VERN(ALT)

FLT CNTLR PWR                      – OFF

### TARGET MC 1 BURN

CRT1      GNC SPEC34 (ORBIT TGT)

√TGT Set data:

TGT NO – ITEM 1 + 11

+ 0/00:20:00)  
T1 TIG = MC1 BURN SOLUTION (BASETIME

$\Delta T$  – ITEM 17 + 56.9

$\Delta X$  – ITEM 18 – 0.9

$\Delta Y$  – ITEM 19 + 0

$\Delta Z$  – ITEM 20 + 1.8

COMPUTE T1 – ITEM 28 EXEC

CRT1      GNC OPS 202 PRO (ORBIT MNVR EXEC)

LOAD – ITEM 22 EXEC

√TGT PEG 7 ( $\Delta V_x$ ,  $\Delta V_y$ ,  $\Delta V_z$  ,  $\Delta V_{tot}$ )

TIMER – ITEM 23 EXEC

√Eng sel

OMS BOTH – ITEM 1 EXEC

OMS L – ITEM 2 EXEC

OMS R – ITEM 3 EXEC

Go to RNDVZ BURN CUECARDS

20:00

## MC1 TIG

45:00

MC2 TIG -5 min

### TARGET MC 2 BURN

CRT1 GNC SPEC34 (ORBIT TGT)

√TGT Set data:

TGT NO – ITEM 1 + 12

T1 TIG = BASE TIME

$\Delta T$  – ITEM 17 + 27.0

$\Delta X$  – ITEM 18 – 0.9

$\Delta Y$  – ITEM 19 + 0

$\Delta Z$  – ITEM 20 +1.8

COMPUTE T1 - ITEM 28 EXEC

GNC OPS 202 PRO (ORBIT MNVR EXEC)

LOAD – ITEM 22 EXEC

√TGT PEG 7 ( $\Delta V_x$ ,  $\Delta V_y$ ,  $\Delta V_z$  ,  $\Delta V_{tot}$ )

TIMER – ITEM 23 EXEC

√Eng sel

OMS BOTH – ITEM 1 EXEC

OMS L – ITEM 2 EXEC

OMS R – ITEM 3 EXEC

Set EVENT TIMER counting to MC 2 TIG

Go to RNDVZ BURN CUECARDS

00:50

MC2 TIG

01:00

If no RR TGT acquired:

GO TO RADAR FAIL PROCEDURE

### **RADAR FAIL PROCEDURE**

At MC2 TIG + 19:00:

A6U     FLT CNTLR PWR – ON

√SENSE -Z

DAP: A/LVLH/PRI

√COAS for TGT vertical position

THC: +X (or –X) per COAS LOGIC:

If TGT = N deg high in COAS, perform 2N +X (up) pulses

If TGT = N deg low in COAS, perform 1N –X (down) pulses

DAP: A/LVLH/VERN(PRI)

THC: As reqd to control out of plane motion and manage RDOT

Perform CONFIG FOR RBAR

At MC2 TIG + 24:00 or 2000 ft, whichever comes first:

CRT        GNC OPS 201 PRO (UNIV PTG)

TRK - ITEM 19 EXEC (CUR - \*)

A6U        DAP: A/AUTO/VERN (PRI)

THC: as reqd to stabilize and maintain TGT docking port  
between 0 and 10 deg high in COAS

At 2000 ft:

Perform APPROACH Cuecard

01:05

TARGET MC 3 BURN

CRT            GNC SPEC34 PRO (ORBIT TGT)  
                  $\sqrt{\text{TGT}}$  Set data:  
                 TGT NO – ITEM 1 + 13  
                 T1 TIG = BASE TIME + 0/00:17:00  
                  $\Delta T$  – ITEM 17 +10.0  
                  $\Delta X$  – ITEM 18 –0.9  
                  $\Delta Y$  – ITEM 19 +0  
                  $\Delta Z$  – ITEM 20 +1.8  
                 COMPUTE T1 - ITEM 28 EXEC  
  
                 GNC OPS 202 PRO (ORBIT MNVR EXEC)  
                 LOAD – ITEM 22 EXEC  
                  $\sqrt{\text{TGT}}$  PEG 7 ( $\Delta V_x$ ,  $\Delta V_y$ ,  $\Delta V_z$  ,  $\Delta V_{\text{tot}}$ )  
                 TIMER – ITEM 23 EXEC  
                  $\sqrt{\text{Eng sel}}$   
                 OMS BOTH – ITEM 1 EXEC  
                 OMS L – ITEM 2 EXEC  
                 OMS R – ITEM 3 EXEC  
                 Go to RNDVZ BURN CUECARDS

01:07

**MC3 TIG**

CRT      GNC OPS 201 PRO (UNIV PTG)  
√ERR TOT - ITEM 23 EXEC (\*)

When ERR <2 deg each axis

GNC SPEC 20 PRO (DAP CONFIG)  
Config DAP A,B to A8,B8

GNC OPS 201 PRO (UNIV PTG)

TGT ID	+2
BODY VECT	+5
P	+ 270
Y	+0
OM	+0

Do not initiate Target Track until ESTABLISH RBAR

MC4 TIG – 3 min



01:15

TARGET MC 4 BURN

GNC SPEC 34 PRO (ORBIT TGT)

√TGT Set data:

TGT NO – ITEM 1 + 14

T1 TIG = BASE TIME + 0/00:27:00

EL – ITEM 16 + 0

$\Delta T$  – ITEM 17 + 13.0

$\Delta X$  – ITEM 18 + 0

$\Delta Y$  – ITEM 19 + 0

$\Delta Z$  – ITEM 20 + 0.6

COMPUTE T1 - ITEM 28 EXEC

GNC OPS 202 PRO (ORBIT MNVR EXEC)

LOAD – ITEM 22 EXEC

√TGT PEG 7 ( $\Delta V_x$ ,  $\Delta V_y$ ,  $\Delta V_z$  ,  $\Delta V_{tot}$ )

TIMER – ITEM 23 EXEC

√Eng sel

OMS BOTH – ITEM 1 EXEC

OMS L – ITEM 2 EXEC

OMS R – ITEM 3 EXEC

Go to + RCS BURN

01:17

**MC4 TIG**

Go to ESTABLISH RBAR

## RNDVZ BURN CUECARDS

## OMS BURN

CRT1      Terminate –Z TARGET TRACK  
            CANCEL – ITEM 21 EXEC

### 1.MNVR TO BURN ATT

C3              DAP: If OPS 2, B/AUTO/VERN

CRT1      GNC OPS 202 PRO (ORB MNVR)  
            MNVR – ITEM 27 EXEC (\*)

### 2.PERFORM OMS BURN

CRT1      √ENG SEL

C3              √DAP TRANS – NORM

TIG-4   F6/F8      ADI RATE (two) – MED (1 deg/sec)  
                    FLT CNTLR PWR (two) – ON  
                    √DAP – AUTO(PASS)/DISC  
                    √GMBL TRIM

TIG-2   C3              SEL OMS ENG(s) – ARM PRESS

TIG-00:15 CRT1   EXEC

-00:58

(00:00)              TIG: start watch (√Pc, ΔVTOT, ENG VLVs)

CUTOFF

+00:02   C3              OMS ENG(s) – OFF

F6/F8      FLT CNTLR PWR (two) – OFF

C3              DAP: B/INRTL/VERN

CRT1      GNC OPS 201 PRO (UNIV PTG) (√DAP)

### 3.OMS POST BURN RECONFIGURATION

F6,F8    √FLT CNTLR PWR (two) – OFF

O8        √L,R OMS He PRESS/VAP ISOL (four) – CL

C3        DAP: B/INRTL/ALT  
          DAP TRANS: PULSE/PULSE/PULSE

CRT1     GNC OPS 202 PRO (ORB MNVR)  
          RCS SEL – ITEM 4 EXEC (\*)

### 4.MNVR TO POST BURN ATTITUDE

CRT1     GNC OPS 201 PRO (UNIV PTG)  
          Desired UNIV PTG load active

C3        DAP: B/AUTO/ALT

A1U       If RR ops, when ATT ERR < 30 deg:  
          KU sel – GPC  
          KU TRACK tb – gray

C3        When in attitude and rates nulled:  
          DAP: A/AUTO/VERN(ALT)

## +X RCS BURN

### 1. LOAD TGT DATA AND MNVR TO BURN ATT

C3      DAP: A/AUTO/ALT (B/ALT as reqd)

CRT1    GNC OPS 201 PRO (UNIV PTG)  
         CNCL – ITEM 21 EXEC  
         GNC OPS 202 PRO (ORBIT MNVR EXEC)  
         √RCS SEL, ITEM4 – (\*)

CRT2    GNC SYS SUMM  
         If onboard computed burn:

CRT1    Enter or verify TGT DATA  
         LOAD – ITEM 22 EXEC  
         TIMER – ITEM 23 EXEC  
         √BURN DATA  
         MNVR – ITEM 27 EXEC (\*)

### 2. BURN EXEC

TIG-3:00 F6(F8) ADI ERR – MED  
         ADI RATE – HI  
         ADI ATT – INRTL  
         √ADI ATT, then:  
         ATT – REF  
         REF pb – push  
F6(F8)    FLT CNTLR PWR – ON

C3      DAP TRANS: NORM/PULSE/PULSE  
TIG-0:30    DAP: A1/INRTL/PRI  
TIG      If VGO Z is neg Z,X,Y seq;  
         Otherwise X,Y,Z  
         THC Trim VGOs < 0.2 fps

### 3. POST BURN RECONFIG

F6(F8)    FLT CNTLR PWR – OFF

C3        DAP: A/AUTO/ALT (B/AUTO/ALT as reqd)  
          DAP TRANS: PULSE/PULSE/PULSE

CRT1     GNC OPS 201 PRO (UNIV PTG)  
          When in attitude:

C3        DAP: A/AUTO/VERN(ALT)

### **MULTI-AXIS RCS BURN**

#### 1. EXECUTE MULTI-AXIS BURN

C3        DAP: B1/AUTO/VERN(PRI)

CRT1     GNC OPS 202 PRO (ORBIT MNVR EXEC)

CRT2     GNC SYS SUMM

CRT1     Enter or verify TGT DATA  
          LOAD – ITEM 22 EXEC  
          TIMER – ITEM 23 EXEC  
          √BURN DATA

TIG-3:00 F6(F8)    FLT CTRL PWR – ON

C3        DAP TRANS: as reqd

TIG-0:30    DAP: A1/AUTO/PRI (B1/AUTO/PRI)

TIG        If VGO Z neg:  
          Z,X,Y THC sequence  
          If VGO Z not neg:  
          X,Y,Z THC sequence  
          THC: Trim VGOs < 0.2 fps

#### 2. POST BURN RECONFIG

F6(F8)    FLT CTRL PWR – OFF  
          GNC OPS 201 PRO (UNIV PTG)

C3        DAP: A/AUTO/ VERN

## CONFIG FOR RBAR

CRT	GNC SPEC 20 PRO (DAP CONFIG)	
	Config DAP A,B to A8,B8	
	GNC OPS 201 PRO (UNIV PTG)	
	TGT ID	+ 2
	BODY VECT	+5
	P	+270
	Y	+0
	OM	+0

Do not initiate Target Track until ESTABLISH RBAR

## ESTABLISH RBAR

A6U    FLT CNTLR PWR                      - ON

CRT      GNC OPS 201 PRO (UNIV PTG)  
TRK - ITEM 19 EXEC (CUR - \*)

C3      DAP: A/AUTO/VERN(PRI)  
THC: as reqd to control TGT motion in COAS

01:20 Perform APPROACH

## APPROACH

CG to CG RNG (ft)	RPM & CONT TORVA RDOT (ft/s)	MC2 ET w/ RPM (h:mm:ss)	DAP	EVENT	NO-RPM RDOT (ft/s)
2000	-3.0	0:27:00	A8/B8 AUTO/ VERN (PRI)	If RDOT falls below value for next gate, THC: -Z (in) as reqd to maintain RDOT	-3.0
1700	-2.4	0:29:00			-2.6
1500	-2.1	0:31:00			-2.3
1000	-1.3	0:36:00	LO Z	If Go for RPM, proceed inside 600 FT  If no-Go to proceed inside 600 ft, perform <b>CONTINGENCY</b> <b>600 FT TORVA [C]</b>	-1.5
900	-1.1	0:37:00		If Go for RPM, report to ISS: 10 min to RPM start F6, A6U ADI ATT – LVLH	-1.3
99800 700	-0.9 -0.6	0:38:00 0:41:00	A9/B9	A1U KU BD RDR OUTPUT – LOW When in Rbar attitude, config DAP to A9,B9 Null ISS rates in C/L camera If Go for RPM, perform <b>RPM</b> <b>SETUP [A]</b>	
650	-0.4	0:42:30		Report to ISS: Range 650 ft If Go for RPM	
620 600 580	-0.4 < Rdot < -0.3 -0.3 < Rdot < -0.2 -0.2 < Rdot < -0.1			Null Xdot to 0 ± 0.1 ft/sec prior to mnvr start If reqd: stationkeep at 600-620 ft until RPM window opens  Perform <b>RBAR PITCH MNVR [B]</b>	-0.8
600	-0.7	0:56:00	A9/B9	TORVA <b>GNC UNIV PTG</b>	-0.8 -0.7
550	-0.6			P ITEM 15 + 179 EXEC	
500	-0.4			TRK – ITEM 19 EXEC (CUR-*) THC: +X (up) as reqd to null tgt motion in C/L camr and initiate flyaround Maintain ISS within C/L camera FOV	-0.5
400	0.0 to			RPOP POR – Orb DP to Tgt DP	0.0 to





**RBAR PITCH MNVR [B]**

AFT (FWD) ADI Pitch	Actions	ISS Calls
P = 90 (0) (Rbar attitude)	A/AUTO/PRI TRK – ITEM 19 EXEC FLT CNTLR PWR – OFF	Initiating RPM (with mark)
P = 100 (10)	VERN (PRI) KU PWR – STBY	
P = 170 (80)	FREE P – ITEM 15 + 270 EXEC TRK – ITEM 19 EXEC	
P = 235 (145)		Start Photos
P = 305 (215)		End Photos
P = 10 (280)	PRI A/AUTO	
P = 60 (330)	KU PWR – ON	
P = 90 (0) (mnvr complete)	VERN (PRI) FLT CNTLR PWR – ON THC: set up for TORVA Reload DAP A9	

**CONTINGENCY 600 FT TORVA [C]**

If Go for RPM, perform nominal RPM actions per APPROACH cue card

Continue APPROACH cue card with the following deltas:

Initiate TORVA at range 700 ft Rdot -0.3 ft/s

(alternate range 650 ft Rdot -0.1 ft/s)

Maintain RNG > 600 ft (CG-CG) until VBAR arrival

On VBAR, stationkeep RNG 630-530 (DP-DP),

maintain ISS in C/L camr FOV

On MCC GO, perform **CONFIGURE FOR DOCKING [D]**  
and **VBAR APPROACH**

**CONFIGURE FOR DOCKING [D]**

Perform DOCKING MECHANISM POWERUP (APDS)

Perform DOCKING PREP (APDS)

## VBAR APPROACH

Interface RNG* (ft)	RDOT (ft/s)	Docking time	DAP	EVENT
250	-0.20 +/-0.05	-34:00	√LOZ	Maintain ISS docking tgt 8 deg corridor
170	-0.20 +/-0.05	-27:30	DAP: B	Note: DAP A allowed for +/-X and +/-Z THC If reqd THC: as reqd to null Rdot and Stationkeeping
110	-0.15 +/-0.05	-22:30		Perform <b><u>CONFIGURE KU FOR COMM [E]</u></b>
75	-0.10 +/-0.05	-18:30	No LO Z A10, B10	Note: DAP A allowed for +/-X and +/-Z THC √RCS FWD – ITEM 1 EXEC (*)
30 +/- 5	0.0	-11:00	√A10, B10 √DAP: B	√5° Corridor If Flyout reqd: THC: +Z (out) as reqd to Null Rdot
30	-0.07 +/-0.02	-06:00		√5° Corridor THC: as reqd to establish Rdot = -0.07 +/- 0.02 fps
3	-0.10 +/- 0.03	-00:30		Maintain 3 inch lateral alignment cylinder
CONTACT Or ~2 in	-0.10 +/- 0.03	-00:00		Perform <b><u>CAPTURE</u></b> Cuecard (p.24)

### **CONFIGURE KU FOR COMM [E]**

A1U	KU PWR	– STBY
	MODE	– COMM
	sel	– GPC
	CNTL	– CMD
A2	DIGI-DIS sel – EL/AZ	

## **CAPTURE**

START EVENT TIMER = 00:00:00

√ISS in FREE DRIFT

IF NO INDICATION OF ISS FREE DRIFT AT CAPTURE + 65 sec

Go to **FAILED CAPTURE** Cuecard

When capture confirmed and ISS in FREE DRIFT

A6U FLT CNTRL PWR – OFF

Go to **DOCKING SEQUENCE** (Dock Proc Step 5, p.30)

## **FAILED CAPTURE**

1. APDS CIRC PROT OFF pb – push

√CIRC PROT OFF It – on

OPEN LATCHED pb – push

√LATCHES CLOSED It – off

√LATCHES OPEN It – on

2. √DAP: NO LO Z

If petals clear:

DAP: A(B)/LVLH

3. THC: +Z (out) to establish 0.1 fps opening rate

√DAP: B/LVLH

If ISS in FREE DRIFT

Use ISS CG as a corridor reference

Maintain 8 degrees corridor

Maintain Opening Rate of at least 0.1 fps

4. Go to **VBAR CORRIDOR BACKOUT**, **CONTINGENCY OPS** (p.43)



APDS

# DOCKING PROCEDURE

## 1.DOCKING MECHANISM INITIALIZATION

-00:20	A7L	CONTROL PANEL POWER A,B,C (three)	– OFF
		HEATERS/DCU POWER (three)	– OFF
		APDS POWER ADS,BDS,CDS (three)	– OFF
		ADS,BDS,CDS It (three)	– OFF
		PYROS AP,BP,CP (three)	– OFF
(It off)		PYRO CIRCUIT PROTECT OFF It	– OFF
	A6L	ESS CNTL SYS PWR (two)	– IN
		DPR SYS VENT ISOL (two)	– IN
		DPR SYS VENT (two)	– IN
		DCK LIGHT TRUSS (two)	– IN
		DCK LIGHT VEST (two)	– IN
		MAIN A LOGIC (two)	– IN
		MAIN B LOGIC (two)	– IN
		MAIN C LOGIC (two)	– IN
		PMA 2/3 GRP 1 HOOKS (four)	– IN
		PMA 2/3 GRP 2 HOOKS (four)	– IN
		DCK SYS PWR (two) – ON	
		PYRO PWR (two) – ON	
		PSU PWR (two) – ON	

## 2.DOCKING MECHANISM POWERUP

push	A7L	HEATERS/DCU POWER (three)	– ON
		CONTROL PANEL POWER A,B,C (three)	– ON
		APDS POWER ADS,BDS,CDS (three)	– ON
		ADS,BDS,CDS It (three)	– ON
		LAMP TEST pb	–
		STATUS It (eighteen)	– ON
		PYRO CIRCUIT PROTECT OFF It	– ON

## 3.DOCKING PREP

push (It on)	A7L	POWER ON pb	–
		√RING ALIGNED It	– ON
		√HOOKS 1, HOOKS 2 OPEN It (two)	– ON
		√LATCHES CLOSED It	– ON
		√RING FINAL POSITION It	– ON

## 4.DOCKING RING EXTENSION

push	A7L	APDS CIRC PROT OFF pb	–
		CIRCUIT PROTECT OFF It	– It on
push		RING OUT pb	–
		RING INITIAL POSITION It	– I ton



## 5.DOCKING SEQUENCE

A7L	√CAPTURE	
push	RING IN pb	—
	RING INITIAL POSITION It	— OFF
push	CLOSE HOOKS pb	—
	RING FINAL POSITION It	— ON
push	POWER OFF pb	—
	STATUS It (eighteen)	— It off

## ORBITER CONFIG FOR MATED ATTITUDE CONTROL

A6U	√FLT CNTLR PWR	- OFF
CRT	GNC SPEC 20 PRO (DAP CONFIG)	
	Config DAP A,B to A12,B12	
	EDIT A9 - ITEM 3 + 9 EXEC	
	PRI RATE DB - ITEM 52 + 0.2 EXEC	
	LOAD - ITEM 5 EXEC	
	EDIT B9 - ITEM 4 + 9 EXEC	
	PRI RATE DB - ITEM 52 + 0.2 EXEC	
	LOAD - ITEM 5 EXEC	

C3        DAP: LO Z  
          If VERN:  
          DAP: LVLH

ORBITER CONFIG FOR MATED OPS

Perform DOCKING MECHANISM POWERDOWN

DOCKING MECHANISM POWERDOWN

A7L	STATUS It (eighteen)	– It off
	APDS POWER ADS,BDS,CDS (three)	– OFF
	ADS,BDS,CDS It (three)	– It off
	CONTROL PANEL POWER A,B,C (three)	– OFF
	HEATERS/DCU POWER (three)	–

OFF

TERMINATE RNDZ OPS:

## UNDOCKING/SEPARATION TIMELINE

(T Undocking)

-00:45

DPS config for Undocking Ops

When in undock attitude:

C3

DAP: B/AUTO/VERN

ENABLE RENDEZVOUS NAV

GNC SPEC 33 PRO (REL NAV)

RNDZ NAV ON – ITEM 1 EXEC

## UNDOCKING PROCEDURE

### 1.DOCKING MECHANISM POWERUP

A7L	HEATERS/DCU POWER (three)	– ON
	CONTROL PANEL POWER A,B,C (three)	– ON
	APDS POWER ADS,BDS,CDS (three)	– ON
	ADS,BDS,CDS It (three)	– on
	LAMP TEST pb	– push
	STATUS It (eighteen)	– on
	PYRO CIRCUIT PROTECT OFF It	– on

### 2.UNDOCKING PREP

-00:20	C3	DAP: FREE
		Wait 5 sec,
		DAP: AUTO

### 3.DOCKING RING EXTENSION

on)	A7L	POWER ON pb	– push (It
		√RING ALIGNED It	– on
		√HOOKS 1,HOOKS 2 OPEN It (two)	– on
		√LATCHES CLOSED It	– on
		√RING FINAL POSITION It	– on
		APDS CIRC PROT OFF pb	– push
		APDS CIRC PROT OFF It	– on
0:00		RING OUT pb	– push
0:10		RING FINAL POSITION It	– off

3:40

√RING INITIAL POSITION It

– on

#### 4.CONFIGURE FOR SEPARATION

GNC SPEC 20 PRO (DAP CONFIG)

CRT √DAP config: A12, B12

√DAP: LO Z

√DAP: A/AUTO/VERN

A6U ADI ATT - LVLH

ERR - MED

RATE - MED

SENSE - –Z

√FLT CNTLR PWR – OFF

CRT GNC OPS 201 PRO (UNIV PTG)

TGT ID

√2

BODY VECT

√5

P

√+180

Y

√+0

OM

√+0

√TRK - ITEM 19 EXEC

√ERR TOT - ITEM 23 EXEC (\*)

GNC OPS 202 PRO (ORB MNVR EXEC)

Set TIG to Undocking Time

Enter any non-zero  $\Delta V$

LOAD – ITEM 22 EXEC

TIMER– ITEM 23 EXEC

## 5.PREP FOR UNDOCKING

A6U FLT CNTLR PWR – ON

When ATT and RATES in limits:

ATT ERR (Each Axis)	$\leq 1.0$ deg
RATE: ROLL, YAW PITCH	$\leq 0.020$ deg/sec $-0.085 \leq \text{RATE} \leq -0.045$

$\sqrt{\text{SENSE}}$ :  $-Z$

## 7.COMMAND UNDOCKING

-02:20

A7L      UNDOCKING pb      – push  
[CTRL+D]

√HOOKS 1, HOOKS 2 CLOSED It (two) – It off

-00:30      √INTERF SEALED It      – off

√READY TO HOOK It      – off

00:00      √HOOKS 1, HOOKS 2 OPEN It (two)      – on

POWER OFF pb      – push

STATUS It (eighteen)      – It off

## 8.DOCKING MECHANISM POWERDOWN

A7L      STATUS It (eighteen)      – It off

APDS POWER ADS,BDS,CDS (three)      – OFF

ADS,BDS,CDS It (three)      – It off

CONTROL PANEL POWER A,B,C (three) – OFF

HEATERS/DCU POWER (three)      – OFF



A6L	DCK SYS PWR (two)	– OFF
	PYRO PWR (two)	– OFF
	PSU PWR (two)	– OFF
	ESS CNTL SYS PWR (two)	– OUT
	DPR SYS VENT ISOL (two)	– OUT
	DPR SYS VENT (two)	– OUT
	DCK LIGHT TRUSS (two)	– OUT
	DCK LIGHT VEST (two)	– OUT
	MAIN A LOGIC (two)	– OUT
	MAIN B LOGIC (two)	– OUT
	MAIN C LOGIC (two)	– OUT
	PMA 2/3 GRP 1 HOOKS (four)	– OUT
	PMA 2/3 GRP 2 HOOKS (four)	– OUT

## POST UNDOCKING

00:00

Physical Separation

When petals clear:

DAP: B/LVLH/ALT

√DAP TRANS: PULSE/PULSE/PULSE, NO LO Z

THC: as reqd to maintain C/L target within 8 deg  
corridor on C/L camera

Note: DAP A allowed for  $\pm X$  and  $-Z$  (in) THC

At physical sep + 1:00:

DAP: VERN(ALT)

0.15 fps

THC: +Z (out) pulses at 10 sec intervals to build to

\_\_\_ : \_\_\_

Record time (mm:ss) of VERN select or last pulse:

DP):

At last pulse TIG+2:00 and when RNG > 30 ft (DP-

establish

THC: +Z (out) pulses at 10 sec intervals as reqd to

and maintain RDOT > 0.3 fps

A7L

POWER OFF pb

- push

√STATUS It (eighteen)

- It off

Go to **SEP/FLYAROUND**

## SEP/FLYAROUND

1. When RNG > 75 ft (DP-DP):

A6U    **DAP: LO Z**

THC: Maintain RDOT > 0.3 fps

Maintain C/L tgt within 8 deg corridor on C/L camera

NOTE:

DAP A allowed for  $\pm X$  and  $\pm Z$  THC

2. When RNG > 150 ft (DP-DP):

If radar desired, perform KU OPS INIT RADAR ACQ

### CONFIGURE KU FOR RR TGT ACQ

A2	DIGI-DIS sel	– R/RDOT
A1U	KU PWR	– STBY
	MODE	– RDR PASSIVE
	RDR OUTPUT	– LOW
	CNTL	– PNL (wait 3
	PWR	– ON
	KU SEL	– GPC

sec)

### AUTO TRK ACQ

A1U	KU SEL	– AUTO TRK
	SLEW	– as reqd (as

seen in COAS)

$\sqrt{\text{EL, AZ}}$  angles < 30 deg

gray)

KU SEARCH

– SEARCH (tb–

CRT    GNC OPS 201 PRO (UNIV PTG)  
TGT ID  $\sqrt{\phantom{x}}$  + 2  
BODY VECT  $\sqrt{\phantom{x}}$  + 5  
P  $\sqrt{\phantom{x}}$  + 180 (+VBAR)  
Y  $\sqrt{\phantom{x}}$  + 0  
OM  $\sqrt{\phantom{x}}$  + 0  
 $\sqrt{\phantom{x}}$ ERR TOT – ITEM 23 (\*)  
TRK – ITEM 19 EXEC (CUR - \*)  
A6U    DAP: A(B)/AUTO/VERN(PRI)

5. If flyaround, stationkeep on +VBAR between 600 to 700 ft until ISS maneuver is complete

Go to **FLYAROUND**

6. If no flyaround:

A7U    DAP: A/LVLH/VERN(PRI)

CRT    GNC OPS 201 PRO (UNIV PTG)  
P + 80 (-RBAR)  
TRK – ITEM 19 EXEC (CUR - \*)  
Go to **SEP BURNS**

## SEP BURNS

### SEP 1

A6U      DAP TRANS: NORM/PULSE/PULSE  
          THC: +X (up) 6 sec (1.5 fps)  
          DAP: A/AUTO/VERN(PRI)  
          DAP TRANS: PULSE/PULSE/PULSE  
          FLT CNTLR PWR                      – OFF  
          Record Radial Burn TIG \_\_\_\_ / \_\_\_\_ : \_\_\_\_ : \_\_\_\_

28 min)      C3      Set TIMER counting to SEP 2 (Radial Burn TIG +  
  
                  CONFIG FOR SEP 2 At burn TIG – 1 minute:

A6U      √SENSE: –Z  
          FLT CNTRL PWR                      – ON

CRT1      GNC SPEC 20 PRO (DAP CONFIG)  
          Config DAP A,B to A7,B7

C3      DAP: A/AUTO/PRI  
          DAP TRANS: NORM/PULSE/PULSE  
          DAP: NO LO Z

## SEP 2 (Retrograde Burn)

At SEP 2 burn TIG:

If SEP 1 was on -VBAR

Aft THC: -X (Down) 30 sec (7.0 fps)

If SEP 1 was on +VBAR

Aft THC: +X (Up) 30 sec (7.0 fps)

A6U

DAP: A/AUTO/VERN(PRI)

DAP TRANS: PULSE/PULSE/PULSE

FLT CNTLR PWR – OFF

Go to **TERMINATE SEP OPS**

## TERMINATE SEP OPS

If KU MODE

– RDR PASSIVE

### CONFIGURE KU FOR COMM

A1U	KU PWR	– STBY
	MODE	– COMM
	sel	– GPC
	CNTL	– CMD
A2	DIGI-DIS sel	– EL/AZ
CRT1	GNC SPEC20 (DAP CONFIG)	
	Config DAP A,B to A1, B1	

## FLYAROUND

If Breakout required during flyaround

Go to SHUTTLE NOSE IN-PLANE BREAKOUT  
(CONTINGENCY OPS)

C3      $\sqrt{\text{DAP: A/AUTO/VERN(PRI)}}$

Flyaround start from +Vbar

CRT1    GNC OPS 201 PRO (UNIV PTG)

TGT ID                      $\sqrt{+ 2}$

BODY VECT                 $\sqrt{+ 5}$

P                            + 90 (-RBAR)

Y                             $\sqrt{+ 0}$

OM                          $\sqrt{+ 0}$

$\sqrt{\text{ERR TOT} - \text{ITEM 23}}$

TRK – ITEM 19 EXEC

Prior to –Rbar crossing (Aft ADI P = 270):

GNC OPS 201 PRO (UNIV PTG)

P + 0 (–VBAR)

TRK - ITEM 19 EXEC



Prior to –Vbar crossing (Aft ADI P = 0):

GNC OPS 201 PRO (UNIV PTG)

P + 282 (+RBAR)

TRK - ITEM 19 EXEC

tracking target:  
At flyaround completion – 10 minutes: If radar not

### **FULL LAP FLYAROUND**

If Breakout required during flyaround

Go to SHUTTLE NOSE IN-PLANE BREAKOUT  
(CONTINGENCY OPS)

C3 DAP: A/AUTO/VERN(PRI)

THC: Maintain ISS CG inside  $\pm 15$  degree vertical and  
 $\pm 20$  degrees horizontal on C/L camera

Prior to –Rbar crossing (Aft ADI P = 270):

CRT1 GNC OPS 201 PRO (UNIV PTG)

P + 0 (–VBAR)

TRK - ITEM 19 EXEC (CUR - \*)

When RNG > 600 ft (CG–CG):

THC: Maintain flyaround range of  $650 \pm 50$  ft (CG–CG)

Prior to –Vbar crossing (Aft ADI P = 0):

P + 270 (+RBAR)

TRK - ITEM 19 EXEC (CUR - \*)

Prior to +Rbar crossing (Aft ADI P = 90)

P + 180 (+VBAR)

TRK - ITEM 19 EXEC (CUR - \*)

Prior to +Vbar crossing (Aft ADI P = 180):

P + 80 (–RBAR)

TRK - ITEM 19 EXEC (CUR - \*)

Repeat steps 2 thru 5 as reqd to continue flyaround

At flyaround completion – 10 minutes:

If radar not tracking target:

Go to **INITIAL RADAR ACQ**

When flyaround complete (in +Vbar attitude)

Go to **SEPBURNS**

### **INITIAL RADAR ACQ**

When flyaround complete (in -Vbar attitude),

Go to SEP BURNS

A2	DIGI-DIS sel	- R/RDOT
----	--------------	----------

A1U	KU PWR	- STBY
	MODE	- RR PASSIVE
	RADAR OUTPUT	- LO
	√sel	- GPC
	CNTL	- PNL (wait 3 seconds)
	PWR	– ON

## CONTINGENCY OPS

## RNDZ/PROX OPS BREAKOUT PROCEDURES OVERVIEW

RANGE BREAKOUT REQD	BREAKOUT PROCEDURE AND SUMMARY
Prior to Ti	Discontinue RNDZ burns; specific breakout only on MCC call
Ti - 5 Minutes	If GO for Ti not received, Perform Ti Delay Burn, 5-27
Between Ti and TORVA init (+X burns to start TORVA are complete)	<u>RNDZ BREAKOUT (p.49)</u> 3 fps retrograde
Between TORVA init (+X burns to start TORVA are complete) and Vbar arrival	<u>SHUTTLE NOSE IN-PLANE BREAKOUT (p.47)</u> 1.5 fps X burn, followed in 30 min by 4.3/3.6 fps retrograde/out-of-plane burn (posigrade if second approach is desired)
Between Vbar arrival and contact OR Between undock and flyaround start	<u>VBAR BREAKOUT (p.44)</u> If RNG < 150 ft, back out to 150 ft. When RNG > 150 ft, perform 1.5 fps radial up burn in LO Z, followed in 28 min by 3.0 fps posigrade/retrograde burn
During flyaround	<u>SHUTTLE NOSE IN-PLANE BREAKOUT (p.47)</u> 1.5 fps X burn, followed in 30 min by 4.3/3.6 fps retrograde/out-of-plane burn (posigrade if second approach is desired)
Otherwise:	<u>SEP MANEUVER (ORB OPS)</u> , Perform 1 fps away from target, followed in 2 min by 2 fps out of plane, followed in 15 min by 3 fps posigrade
<b>SHUTTLE BACKOUT</b>	
Prior to docking	See <u>VBAR CORRIDOR BACKOUT</u>

### VBAR CORRIDOR BACKOUT

If RNG < 75 ft:

1. INITIATE CORRIDOR BACKOUT DAP:

B/LVLH/VERN(PRI), no LOZ

NOTE: DAP A allowed for X and -Z (in) THC

THC: +Z (out) to establish a +0.1 ft/sec opening rate

Maintain 8 deg corridor

If PCT ARMED:

F4 DISARM PCT: SPDBRK/THROT pb – AUTO It –

OFF

If 30 ft STATIONKEEPING desired:

Maintain tgt in 5 deg corridor

When RNG = 30 ft:

THC: -Z (in) as reqd establish 30 +/-5 ft

stationkeeping

When RNG > 50 ft:

A6U DAP config: A9/B9

If(When) RNG > 75 ft:

## 2.INITIA TE(CONTINUE) CORRIDOR BACKOUT

DAP: A(B)/LVLH/VERN(PRI), LO Z

NOTE: DAP A allowed for X and Z THC

THC: +Z (out) to establish a +0.1 ft/sec opening rate

Maintain 8 deg corridor

DAP: B(A)

When opening rate established and RNG > 150:

### 3.PERFORM CORRIDOR BACKOUT OR BREAKOUT

If BREAKOUT desired:

Go To VBAR BREAKOUT

Else:

Maintain 8 deg corridor

When desired stationkeeping range reached:

THC: -Z (in) as reqd to establish stationkeeping range

REAPPROACH DAP: AUTO

Go to VBAR APPROACH from current stationkeeping

range

#### **VBAR BREAKOUT**

Range < 1000 ft cg to cg

Tgt stable on orbiter -Z axis

Orbiter X and Z axes are in-plane

If RNG < 75 ft:

## 1.INITIAL CORRIDOR BACKOUT

DAP: B/LVLH/VERN(PRI), no LO Z

NOTE: DAP A allowed for X and -Z (in) THC

THC: +Z (out) to establish a +0.1 ft/sec opening rate

Maintain 8

deg corridor

When RNG > 50 ft:

A6U DAP config: A9/B9

If(When)  $75 < \text{RNG} < 150$  ft

## 2.INITIAL(CONTINUE) CORRIDOR BACKOUT

A6U DAP: A(B)/LVLH/VERN(PRI), LO Z

NOTE: DAP A allowed for X and Z THC

THC: +Z (out) to establish a +0.1 ft/sec opening rate

Maintain 8 deg corridor

DAP: B(A)

If(When)  $\text{RNG} > 150$  ft:

### 3.PERFORM RADIAL BURN ON VBAR

If Rdot negative (closing on the target):

THC: +Z (out) to null closing rate ( $R_{dot} \geq 0$  fps)

A6U DAP A,B to A7,B7

DAP: A/LVLH/VERN(PRI), LO Z

DAP TRANS: NORM/PULSE/PULSE

THC: +X (up) for 6 sec (1.5 fps)

DAP TRANS: PULSE/PULSE/PULSE

FLT CNTLR PWR – OFF

DAP: A/INRTL/VERN(ALT)

Record Radial Burn TIG \_\_\_\_ / \_\_\_\_ : \_\_\_\_ : \_\_\_\_

### 4.PERFORM POSIGRADE/RETROGRADE BURN

CRT GNC OPS 202 PRO (ORBIT MNVR EXEC)

RCS SEL – ITEM 4 EXEC (\*)

If radial burn from +Vbar:

TV ROLL – ITEM 5 +1 8 0 EXEC

If radial burn from -Vbar:

TV ROLL – ITEM 5 +0 EXEC

Set TIG to Radial Burn +28 min:



If Posigrade Sep:

TGT PEG 7 Vx – ITEM 19 +3 EXEC

Vy – ITEM 20 +0 EXEC

Vz – ITEM 21 +0 EXEC

If Retrograde Sep:

TGT PEG 7 Vx – ITEM 19 –3 EXEC

Vy – ITEM 20 +0 EXEC

Vz – ITEM 21 +0 EXEC

LOAD – ITEM 22 EXEC

TIMER – ITEM 23 EXEC

When RNG > 1000 ft:

DAP: NO LO Z

At TIG -8:00:

A6U DAP: B/AUTO/ALT

MNVR – ITEM 27 EXEC

At TIG -0:30:

DAP: A/INRTL/PRI

FLT CNTLR PWR – ON

At TIG, THC: Trim VGOs 0.2 fps

FLT CNTLR PWR – OFF

DAP: A/INRTL/VERN(ALT)

CRT GNC OPS 201 PRO (UNIV PTG)

## SHUTTLE NOSE IN-PLANE BREAKOUT (R < 700 ft)

If RNG < 75 ft

### 1.INITIAL CORRIDOR BACKOUT

A6U DAP: B/LVLH/VERN(PRI), no LO Z

NOTE

DAP A allowed for X and -Z (in) THC

THC: +Z (out) to establish a +0.1 ft/sec opening rate

Maintain 8 deg corridor

When RNG > 50 ft:

DAP: config: A9/B9

If(When) 75 < RNG < 150 ft:

### 2.INITIAL (CONTINUE) CORRIDOR BACKOUT

A6U DAP: A(B)/LVLH/VERN(PRI), LO Z

NOTE

DAP A allowed for X and Z THC

THC: +Z (out) to establish a +0.1 ft/sec opening rate

Maintain 8 deg corridor

DAP: B(A)

If(When) RNG > 150 ft:

### 3.PERFORM +X OR -X BURN

A6U      DAP TRANS: NORM/PULSE/PULSE

If Nose-Forward (TGT ID = 2 and OM = 0):

THC: +X (up) for 6 sec (1.5 fps)

If Tail-Forward (TGT ID = 2 and OM = 180):

THC: -X (down) for 6 sec (1.5 fps)

A6U      DAP TRANS: PULSE/PULSE/PULSE

DAP: A/INRTL/VERN(ALT)

Record ( X) Burn TIG \_\_\_\_ / \_\_\_\_ : \_\_\_\_ : \_\_\_\_

FLT CNTLR PWR – OFF

#### 4. PERFORM FINAL BURN (+X Burn, Posigrade/Retrograde and Out-of-Plane)

CRT      GNC OPS 202 PRO (MNVR EXEC)

RCS SEL – ITEM 4 EXEC (\*)

√breakout direction and TV ROLL

Set TIG to ( X ) burn + 30 min

If Posigrade Sep:

## TGT PEG 7 VX – ITEM 19 +4.3 EXEC

## VY – ITEM 20 +3.6 EXEC

VZ – ITEM 21 +0 EXEC

If Retrograde Sep:

## TGT PEG 7 VX – ITEM 19 -4.3 EXEC

## VY – ITEM 20 +3.6 EXEC

VZ – ITEM 21 +0 EXEC

TV ROLL – ITEM 5 + \_\_\_ EXEC

LOAD – ITEM 22 EXEC

## TIMER – ITEM 23 EXEC

C3 DAP A,B to A7,B7

At TIG -8 min:

DAP: B/ALT, NO LO Z

MNVR – ITEM 27 EXEC (\*)

DAP: AUTO

At TIG -0:30:

DAP TRANS: as reqd

DAP: A/INRTL/PRI

F7      FLT CNTLR PWR      – ON

At TIG, THC: Trim VGOs 0.2 fps

F7    FLT CNTLR PWR                      – OFF

DAP TRANS: PULSE/PULSE/PULSE

DAP: A/INRTL/VERN(ALT)

CRT GNC OPS 201 PRO (UNIV PTG)

Go to **TERMINATE SEP OPS**

## RNDZ BREAKOUT

## 1.BREAKOUT BURN PREP

A6U      DAP: A/AUTO/PRI

FLT CNTLR PWR – ON

## 2.3 FPS RETROGRADE

CRT      GNC OPS 202 PRO (ORBIT MNVR EXEC)

RCS SEL – ITEM 4 (\*)

## Set TIG to current time

TGT PEG 7 Vx – ITEM 19 -3 EXEC

## Vy – ITEM 20 +0 EXEC

Vz - ITEM 21 +0 EXEC

LOAD – ITEM 22 EXEC

## TIMER – ITEM 23 EXEC

## Do not maneuver to burn attitude

DAP TRANS: as reqd

## Deflect THC to null VGOs

CRT GNC OPS 201 PRO (UNIV PTG)  
DAP: A/AUTO/VERN(ALT)

## SHUTTLE EMERGENCY SEPARATION

## Orbiter DAP and RCS config

### 1.INITIAL SEPARATION SEQUENCE When petals clear:

CRT      DAP: B9/LVLH/ALT

√DAP TRANS: PULSE/PULSE/PULSE, no LO Z

THC: as reqd to maintain target within 8 degree corridor on C/L camera or COAS

At physical sep + 1:00:

DAP: VERN(ALT)

THC: +Z (out) pulses at 10s intervals to establish

RDOT>0.1fps

At physical sep + 3:00 and when RNG > 30 ft (DP-DP):

THC: +Z (out) as reqd at 10 sec intervals to establish and maintain RDOT > 0.2 fps

When RNG > 75 ft (DP-DP):

A6U      DAP: LO Z

When RNG > 100 ft (DP-DP):

If radar desired, perform INIT RADAR ACQ, Perform  
DOCKING MECHANISM POWERDOWN

## 2.PERFORM RADIAL BURN ON $\pm$ VBAR

When RNG > 150 ft (DP-DP):

DAP: A/LVLH/VERN(PRI), LO Z

DAP TRANS: NORM/PULSE/PULSE

THC: +X (up) for 12 sec (3.0 fps)

DAP TRANS: PULSE/PULSE/PULSE

A6U      FLT CNTLR PWR – OFF DAP: A/INRTL/VERN(ALT)

Record Radial Burn TIG \_\_\_\_ / \_\_\_\_ : \_\_\_\_ : \_\_\_\_

At radial burn TIG + 6 min or when RNG > 1000 ft

confirmed:

CRT      GNC SPEC 20 PRO (DAP CONFIG)

A6U      Config DAP A,B to A7,B7

DAP: no LO Z

### 3.PERFORM FINAL BURN

#### NOTE:

#### OMS burns:

NET Radial

If initial sep from +Vbar attitude, Final burn TIG should be

Burn TIG + 13 min and NLT Radial Burn TIG + 60 min

NET Radial

If initial sep from -Vbar attitude, Final burn TIG should be

Burn TIG + 13 min and NLT Radial Burn TIG + 40 min

#### + X burns:

Final Burn TIG is Radial Burn TIG + 13 min

If performing emergency deorbit:

√MCC/PGSC for deorbit burn TIG/PAD

TV ROLL ITEM 5 +1 8 0 EXEC

Go to EMERGENCY DEORBIT PREP/ENTRY (CONT  
DEORBIT, EMERGENCY)

Use single OMS burn procedures

If other OMS burn:

Go to RNDZ OMS BURN, use single OMS burn

procedures



If +X burn:

CRT GNC OPS 202 PRO (ORB MNVR EXEC)  
√RCS SEL – ITEM 4 EXEC (\*)

If posigrade sep desired:

TGT PEG 7 Vx – ITEM 19 +3 EXEC  
Vy – ITEM 20 +0 EXEC  
Vz – ITEM 21 +0 EXEC

If retrograde sep desired:

TGT PEG 7 Vx – ITEM 19 –3 EXEC  
Vy – ITEM 20 +0 EXEC  
Vz – ITEM 21 +0 EXEC  
LOAD – ITEM 22 EXEC  
TIMER – ITEM 23 EXEC  
MNVR – ITEM 27 EXEC (\*)

A6U DAP: B/AUTO/PRI

At TIG -0:30:

A6U FLT CNTLR PWR – ON  
DAP: A/INRTL/PRI

At TIG:

THC: Trim VGOs 0.2 fps

A6U FLT CNTLR PWR OFF  
DAP: A/INRTL/VERN(ALT)

CRT GNC OPS 201 PRO (UNIV PTG)  
Go to TERMINATE SEP OPS

## **ANY ATTITUDE SEPARATION**

### **1.CONFIGURE FOR UNDOCKING**

	ISS: FREE DRIFT	
A6U	DAP: FREE	
	SENSE:	-Z
	AFT ADI ATT	– LVLH
	ERR	– MED
	RT	– MED
CRT	GNC SPEC 20 PRO (DAP CONFIG)	
	Config DAP A,B to A9/B9	
	X Jets ROT ENA – ITEM 7 EXEC (no *)	
	DAP: B/FREE/ALT, no LO Z	
	DAP TRANS: PULSE/PULSE/PULSE	

### **2.COMMAND SEPARATION**

Perform UNDOCKING PREP

When -0.12 ROLL, PITCH, YAW RATE 0.12

Perform UNDOCKING OPERATIONS step 7

### 3.INITIAL SEPARATION SEQUENCE

A6U      FLT CNTLR PWR      – ON

When petals clear:

DAP: B/LVLH/ALT, no LO Z

THC: as reqd to maintain target within 8 deg corridor on

C/L camera

At physical sep +1:00:

DAP: LVLH/VERN(PRI)

THC: as reqd to maintain target within 8 degree corridor

on C/L camera

THC: +Z (out) pulses at 10 sec intervals to establish

RDOT >

0.1 fps, then no +Z (out) pulses until 30 ft step

NOTE: DAP A allowed for  $\pm X$  and -Z (in) THC

If Rdot falls below 0.02 fps

establish opening rate  $\leq 0.05$  fps using +Z (out) pulses  
at 10 second intervals, then wait > 2 min to perform 30 ft step

At physical sep +3:00 and when RNG > 30 ft (DP-DP):

THC: +Z (out) as reqd at 10 sec intervals to establish  
and maintain RDOT > 0.2 fps

When RNG > 75 ft (DP-DP):

DAP: LO Z

NOTE: DAP A allowed for  $\pm X$  and  $\pm Z$  THC

When RNG > 100 ft (DP-DP):

If radar desired, perform INITIAL RADAR ACQ

A7L POWER OFF pb – push

Perform DOCKING MECHANISM POWERDOWN (APDS)

#### 4.PERFORM +X BURN AT RNG > 150 FT

When RNG > 150 ft (DP-DP):

A6U DAP: A/LVLH/VERN(PRI), LO Z

DAP TRANS: NORM/PULSE/PULSE

THC: +X (up) for 8 sec (2.0 fps)

DAP TRANS: PULSE/PULSE/PULSE

Record +X Burn TIG \_\_\_ / \_\_\_ : \_\_\_ : \_\_\_

Stop maintaining 8 deg corridor

## 5.ROTATE TO PLACE AND MAINTAIN ISS IN OVHD WINDOW

A6U      DAP: A/INRTL/PRI

Perform manual pitch rotation as reqd:

DAP ROT: DISC/PULSE/DISC

RHC: PITCH as reqd to place and maintain ISS in

OVHD Window

When RNG > 1000 ft (CG-CG): DAP: no LO Z

## 6.PERFORM OUT-OF-PLANE BURN

CRT      GNC SPEC 20 PRO (DAP CONFIG)

Config DAP A,B to A7/B7

GNC OPS 202 PRO (ORB MNVR EXEC)

RCS SEL – ITEM 4 EXEC (\*)

Set TIG to +X Burn TIG + 22 min

TGT PEG 7 Vx – ITEM 19 +0 EXEC

Vy – ITEM 20 +2.5 EXEC

Vz – ITEM 21 +0 EXEC

LOAD – ITEM 22 EXEC

TIMER – ITEM 23 EXEC

If VGO Z is negative:

TGT PEG 7 VY – ITEM 20 -2.5 EXEC

LOAD – ITEM 22 EXEC

TIMER – ITEM 23 EXEC

VGO Z = 0

Do not maneuver to burn attitude

At TIG:

RNG > 1500 ft (CG-CG)

A6U      FLT CNTLR PWR – OFF  
DAP ROT: DISC/DISC/DISC

F6          FLT CNTLR PWR – ON  
THC: trim VGOs 0.2 fps  
FLT CNTLR PWR – OFF  
Record Out-of-Plane Burn TIG \_\_\_\_/\_\_\_\_:\_\_\_\_:\_\_\_\_

## 7.PERFORM FINAL BURN

If single OMS burn:

Perform **RNDZ OMS BURN** Cuecard

If + X burn:

If posigrade sep desired:

If VY from Out-of-Plane burn (step 3) was positive:

TV ROLL – ITEM 5 +2 7 0 EXEC

If VY from Out-of-Plane burn (step 3) was negative:

TV ROLL – ITEM 5 +9 0 EXEC

TGT PEG 7 Vx – ITEM 19 +7.0 EXEC

Vy – ITEM 20 +0 EXEC

Vz – ITEM 21 +0 EXEC

If retrograde sep desired:

If VY from Out-of-Plane burn (step 4) was positive:

TV ROLL – ITEM 5 +9 0 EXEC

If VY from Out-of-Plane burn (step 4) was negative:

TV ROLL – ITEM 5 +2 7 0 EXEC

TGT PEG 7 Vx – ITEM 19 +7.0 EXEC

Vy – ITEM 20 +0 EXEC

Vz – ITEM 21 +0 EXEC

Set TIG to Out-of-Plane Burn TIG + 22 min

LOAD – ITEM 22 EXEC

TIMER – ITEM 23 EXEC

MNVR – ITEM 27 EXEC (\*)

A6U DAP: B/AUTO/PRI

At TIG -0:30:

F6 FLT CNTLR PWR – ON

A6U DAP: A/INRTL/PRI

At TIG:

THC: trim VGOs 0.2 fps

F6 FLT CNTLR PWR – OFF

A6U DAP: A/INRTL/VERN(ALT)

CRT GNC OPS 201 PRO (UNIV PTG)

Go to **TERMINATE SEP OPS**

## REFERENCE TABLES



## UNIV PTG

TGT ID       = 1 Orbiting Vehicle  
               = 2 Earth Center  
               = 3 Earth Target  
                   Input LAT ( $\pm 90$ )  
                   LON ( $\pm 180$ , + = East)  
                   ALT (-3444.0 to 20000.0 nm)  
               = 4 Sun Center  
               = 5 Celestial Target  
                   Input RA (0-359.99)  
                   DEC ( $\pm 90$ )  
               = 11-110 Nav Stars

BODY VECTOR   = 1 +X\*  
                   = 2 -X\*  
                   = 3 -Z\*  
                   = 4 -Y Star Tracker\*  
                   = 5 Selectable  
                   Input P (0-359.99)  
                           Y (270-359.99, 0-90)  
 \*Input OM →       OM (0-359.99)

MON AXIS   = 1 +X  
               = 2 -X

## DAP OVERVIEW

### DAP – Purpose

A1 – Nominal

A2 – PTC

A3 – GG

A4 –

A5 – Loss of VERN (All)

A6 – Loss of VERN (Tail Only)

A7 – Rendezvous

A8 – Terminal Phase

A9 – PROX OPS/Flyaround

A10 – Docking

A11 – Auto Reboost

A12 – Mated Stack (Mnvrs, Robotics & Att Hold)

A13 –

A14 – Orbiter alone SRMS/OBSS Ops

A15 –

### DAP – Purpose

B1 – OMS & RCS Burns (ORB OPS)

B2 – Loss of VERN (Tail Only)

B3 – Loss of VERN (All)

B4 –

B5 – COAS/HUD CAL

B6 –

B7 – Rendezvous

B8 – Terminal Phase

B9 – Flyaround

B10 – Docking

B11 –

B12 – Mated Stack (Undocking and  
Att Hold)

B13– Mated Stack (VRCS Deadband  
Collapse)

B14 –

B15

## DAP A1 THROUGH A8 CONFIGURATIONS

	ITEM #	A1	A2	A3	A4	A5	A6	A7	A8
<b>PRI</b>									
ROT RATE	10(50)	0.2000	0.4000	0.2000	0.5000	0.2000	0.2000	0.2000	0.0500
ATT DB	11(51)	5.00	1.00	0.30	3.00	5.00	5.00	2.00	2.00
RATE DB	12(52)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
ROT PLS	13(53)	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
COMP	14(54)	.000	.000	.000	.000	.000	.000	.000	.000
P OPTION	15(55)	ALL	ALL	ALL	ALL	ALL	TAIL	ALL	ALL
Y OPTION	16(56)	ALL	ALL	TAIL	ALL	ALL	TAIL	ALL	ALL
TRAN PLS	17(57)	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
<b>ALT</b>									
RATE DB	18(58)	0.200	0.200	0.070	0.200	0.070	0.070	0.100	0.100
JET OPT	19(59)	ALL	ALL	ALL	ALL	ALL	TAIL	ALL	ALL
# JETS	20(60)	2	2	1	2	1	1	2	2
ON TIME	21(61)	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
DELAY	22(62)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>VERN</b>									
ROT RATE	23(63)	0.2000	0.4000	0.0080	0.2000	0.0500	0.0500	0.0160	0.0500
ATT DB	24(64)	1.000	1.000	0.070	1.000	1.000	1.000	1.000	1.000
RATE DB	25(65)	.020	.020	.010	.020	.020	.020	.020	.020
ROT PLS	26(66)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.050
COMP	27(67)	.000	.000	.000	.000	.000	.000	.000	.000
CNTL ACC	28(68)	0	0	0	0	0	0	0	0
PURPOSE		NOMINAL	PTC	GG	PRE/POST DEPLOY	LOSS OF VERN (ALL)	LOSS OF VERN (TAIL ONLY)	RNDZ	TERMINAL PHASE

## DAP A9 THROUGH A13 CONFIGURATIONS

	ITEM #	A9	A10	A11	A12	A13
<b>PRI</b>						
ROT RATE	10(50)	0.1300	0.0500	<b>0.1000</b>	<b>0.1000</b>	<b>0.1000</b>
ATT DB	11(51)	1.00	0.50	<b>15.00</b>	5.00	5.00
RATE DB	12(52)	0.10	0.10	0.20	0.20	0.20
ROT PLS	13(53)	0.100	0.100	0.100	<b>0.040</b>	<b>0.040</b>
COMP	14(54)	.000	.000	.000	.000	.000
P OPTION	15(55)	TAIL	TAIL	<b>TAIL</b>	<b>TAIL</b>	<b>TAIL</b>
Y OPTION	16(56)	TAIL	TAIL	<b>TAIL</b>	<b>TAIL</b>	<b>TAIL</b>
TRAN PLS	17(57)	0.050	0.050	0.100	<b>0.010</b>	<b>0.100</b>
<b>ALT</b>						
RATE DB	18(58)	0.100	0.100	<b>0.070</b>	<b>0.070</b>	<b>0.070</b>
JET OPT	19(59)	TAIL	TAIL	<b>TAIL</b>	<b>TAIL</b>	<b>TAIL</b>
# JETS	20(60)	2	2	<b>3</b>	<b>3</b>	<b>3</b>
ON TIME	21(61)	0.08	0.08	0.08	0.08	0.08
DELAY	22(62)	0.00	0.00	<b>12.00</b>	<b>12.00</b>	<b>11.04</b>
<b>VERN</b>						
ROT RATE	23(63)	0.1300	0.0500	<b>0.1000</b>	<b>0.2000</b>	<b>0.1000</b>
ATT DB	24(64)	1.000	0.500	<b>5.000</b>	<b>1.000</b>	<b>3.000</b>
RATE DB	25(65)	.020	.020	<b>.050</b>	<b>.020</b>	<b>.080</b>
ROT PLS	26(66)	0.050	0.050	0.010	0.010	<b>0.002</b>
COMP	27(67)	.000	.000	.000	.000	.000
CNTL ACC	28(68)	0	0	<b>1,2*</b>	<b>1,2*</b>	<b>3,4**</b>
PURPOSE		PROX OPS/ FLYAROUND	DOCKING	AUTO REBOOST	MATED STACK AND RMS OPS	A/L DEPRESS ATTITUDE CONTROL

## DAP B1 THROUGH B8 CONFIGURATIONS

	ITEM #	B1	B2	B3	B4	B5	B6	B7	B8
<b>PRI</b>									
ROT RATE	10(50)	0.5000	0.2000	0.2000	0.2000	0.2000	0.5000	0.5000	0.0500
ATT DB	11(51)	3.00	3.00	3.00	0.30	3.00	3.00	2.00	2.00
RATE DB	12(52)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
ROT PLS	13(53)	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
COMP	14(54)	.000	.000	.000	.000	.000	.000	.000	.000
P OPTION	15(55)	ALL	TAIL	ALL	TAIL	TAIL	ALL	ALL	ALL
Y OPTION	16(56)	ALL	TAIL	ALL	TAIL	TAIL	ALL	ALL	ALL
TRAN PLS	17(57)	0.100	0.020	0.020	0.020	0.020	0.020	0.050	0.050
<b>ALT</b>									
RATE DB	18(58)	0.200	0.070	0.070	0.100	0.200	0.200	0.100	0.100
JET OPT	19(59)	ALL	TAIL	ALL	ALL	ALL	ALL	ALL	ALL
# JETS	20(60)	2	1	1	2	2	2	2	2
ON TIME	21(61)	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
DELAY	22(62)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>VERN</b>									
ROT RATE	23(63)	0.2000	0.2000	0.2000	0.0080	0.0160	0.2000	0.2000	0.0500
ATT DB	24(64)	1.000	1.000	1.000	0.100	0.033	1.000	1.000	1.000
RATE DB	25(65)	.020	.020	.020	.010	.020	.020	.020	.020
ROT PLS	26(66)	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.020
COMP	27(67)	.000	.000	.000	.000	.000	.000	.000	.000
CNTL ACC	28(68)	0	0	0	0	0	0	0	0
PURPOSE		NOMINAL	PTC	GG	PRE/POST DEPLOY	LOSS OF VERN (ALL)	LOSS OF VERN (TAIL ONLY)	RNDZ	TERMINAL PHASE

## DAP B9 THROUGH B13 CONFIGURATIONS

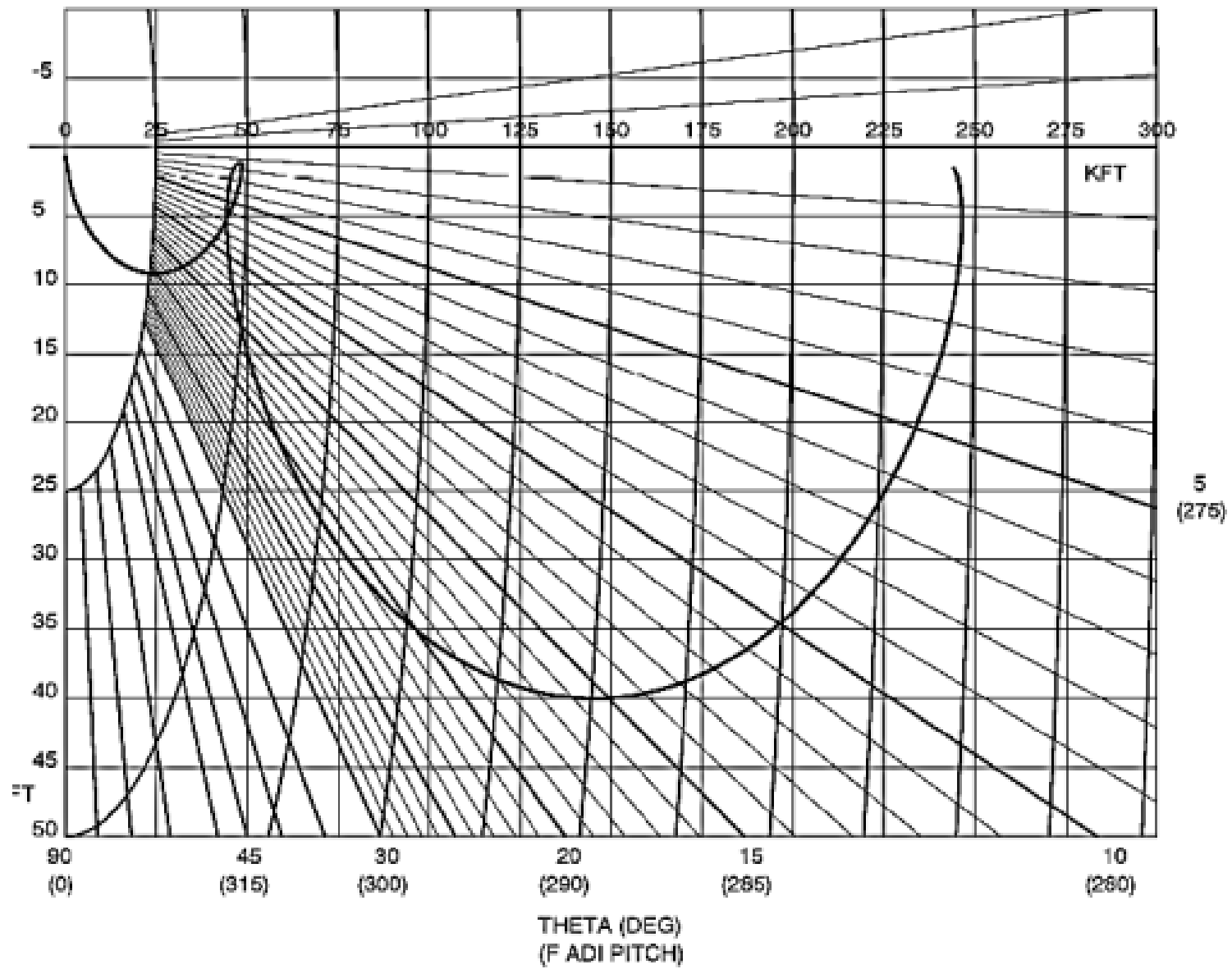
	ITEM #	B9	B10	B12	B13
<b>PRI</b>					
ROT RATE	10(50)	0.1300	0.0500	<b>0.1000</b>	<b>0.1000</b>
ATT DB	11(51)	1.00	0.50	<b>5.00</b>	<b>40.00</b>
RATE DB	12(52)	0.10	0.10	0.20	0.20
ROT PLS	13(53)	0.040	0.040	0.040	0.040
COMP	14(54)	.000	.000	.000	.000
P OPTION	15(55)	TAIL	TAIL	<b>TAIL</b>	<b>TAIL</b>
Y OPTION	16(56)	TAIL	TAIL	<b>TAIL</b>	<b>TAIL</b>
TRAN PLS	17(57)	0.010	0.010	<b>0.010</b>	<b>0.010</b>
<b>ALT</b>					
RATE DB	18(58)	0.100	0.100	<b>0.070</b>	<b>0.070</b>
JET OPT	19(59)	TAIL	TAIL	<b>TAIL</b>	<b>TAIL</b>
# JETS	20(60)	2	2	<b>3</b>	<b>3</b>
ON TIME	21(61)	0.08	0.08	0.08	0.08
DELAY	22(62)	0.00	0.00	<b>11.04</b>	<b>11.04</b>
<b>VERN</b>					
ROT RATE	23(63)	0.1300	0.0500	<b>0.1000</b>	<b>0.1000</b>
ATT DB	24(64)	1.000	0.500	<b>3.000</b>	<b>40.000</b>
RATE DB	25(65)	.020	.020	<b>.050</b>	<b>.080</b>
ROT PLS	26(66)	0.020	0.020	0.002	0.002
COMP	27(67)	.000	.000	.000	.000
CNTL ACC	28(68)	0	0	<b>2</b>	<b>3,4*</b>
PURPOSE		PROX OPS/ FLYAROUND	DOCKING	MATED STACK AND RMS OPS	A/L DEPRESS RATE DUMPING

SPEC 34 ITEM NO	1			6	17	18	19	20	
TGT ALTITUDE	TGT NO	DESCRIPTION	T1 REL TO BASETIME	EL (DEG)	DT (MIN)	DX (KFT)	DY (KFT)	DZ (KFT)	NOTES
130	9	NCC	-0/00:55:48	0	55.8	-48.6	0	+1.2	BASETIME = TI TIG
	10	TI	0/00:00:00	0	74.4	-0.9	0	+1.8	
	11	MC1	0/00:20:00	0	54.4	-0.9	0	+1.8	
	12	MC2	0/00:47:24	28.45	27.0	-0.9	0	+1.8	BASETIME = MC2 TIG
	13	MC3	0/00:17:00	0	10.0	-0.9	0	+1.8	
	14	MC4	0/00:27:00	0	13.0	0	0	+0.6	
	19	MC2 ON TIME	0/00:00:00	0	27.0	-0.9	0	+1.8	
150	9	NCC	-0/00:56:18	0	56.3	-48.6	0	+1.2	BASETIME = TI TIG
	10	TI	0/00:00:00	0	75.1	-0.9	0	+1.8	
	11	MC1	0/00:20:00	0	55.1	-0.9	0	+1.8	
	12	MC2	0/00:48:06	28.46	27.0	-0.9	0	+1.8	BASETIME = MC2 TIG
	13	MC3	0/00:17:00	0	10.0	-0.9	0	+1.8	
	14	MC4	0/00:27:00	0	13.0	0	0	+0.6	
	19	MC2 ON TIME	0/00:00:00	0	27.0	-0.9	0	+1.8	
170	9	NCC	-0/00:56:48	0	56.8	-48.6	0	+1.2	BASETIME = TI TIG
	10	TI	0/00:00:00	0	75.7	-0.9	0	+1.8	
	11	MC1	0/00:20:00	0	55.7	-0.9	0	+1.8	
	12	MC2	0/00:48:42	28.66	27.0	-0.9	0	+1.8	BASETIME = MC2 TIG
	13	MC3	0/00:17:00	0	10.0	-0.9	0	+1.8	
	14	MC4	0/00:27:00	0	13.0	0	0	+0.6	
	19	MC2 ON TIME	0/00:00:00	0	27.0	-0.9	0	+1.8	
190	9	NCC	-0/00:57:12	0	57.2	-48.6	0	+1.2	BASETIME = TI TIG
	10	TI	0/00:00:00	0	76.3	-0.9	0	+1.8	
	11	MC1	0/00:20:00	0	56.3	-0.9	0	+1.8	
	12	MC2	0/00:49:18	28.85	27.0	-0.9	0	+1.8	BASETIME = MC2 TIG
	13	MC3	0/00:17:00	0	10.0	-0.9	0	+1.8	
	14	MC4	0/00:27:00	0	13.0	0	0	+0.6	
	19	MC2 ON TIME	0/00:00:00	0	27.0	-0.9	0	+1.8	
210	9	NCC	-0/00:57:42	0	57.7	-48.6	0	+1.2	BASETIME = TI TIG
	10	TI	0/00:00:00	0	76.9	-0.9	0	+1.8	
	11	MC1	0/00:20:00	0	56.9	-0.9	0	+1.8	
	12	MC2	0/00:49:54	29.07	27.0	-0.9	0	+1.8	BASETIME = MC2 TIG
	13	MC3	0/00:17:00	0	10.0	-0.9	0	+1.8	
	14	MC4	0/00:27:00	0	13.0	0	0	+0.6	
	19	MC2 ON TIME	0/00:00:00	0	27.0	-0.9	0	+1.8	

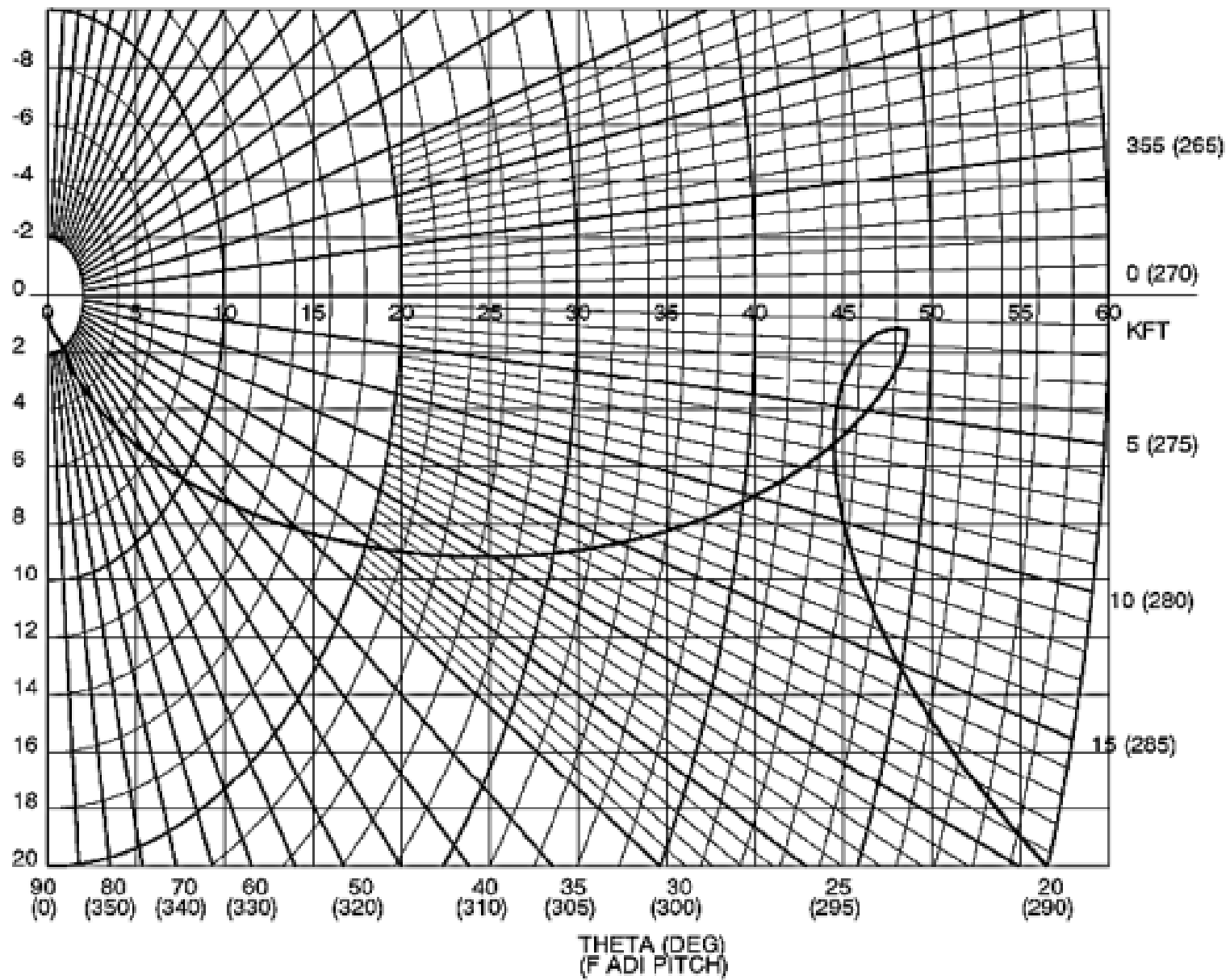
SPEC 34 ITEM NO	1			6	17	18	19	20	
TGT ALTITUDE	TGT NO	DESCRIPTION	T1 REL TO BASETIME	EL (DEG)	DT (MIN)	DX (KFT)	DY (KFT)	DZ (KFT)	NOTES
230	9	NCC	-0/00:58:12	0	58.2	-48.6	0	+1.2	BASETIME = Ti TIG
	10	Ti	0/00:00:00	0	77.6	-0.9	0	+1.8	
	11	MC1	0/00:20:00	0	57.6	-0.9	0	+1.8	
	12	MC2	0/00:50:36	29.32	27.0	-0.9	0	+1.8	BASETIME = MC2 TIG
	13	MC3	0/00:17:00	0	10.0	-0.9	0	+1.8	
	14	MC4	0/00:27:00	0	13.0	0	0	+0.6	
	19	MC2 ON TIME	0/00:00:00	0	27.0	-0.9	0	+1.8	
250	9	NCC	-0/00:58:42	0	58.7	-48.6	0	+1.2	BASETIME = Ti TIG
	10	Ti	0/00:00:00	0	78.2	-0.9	0	+1.8	
	11	MC1	0/00:20:00	0	58.2	-0.9	0	+1.8	
	12	MC2	0/00:51:12	29.55	27.0	-0.9	0	+1.8	BASETIME = MC2 TIG
	13	MC3	0/00:17:00	0	10.0	-0.9	0	+1.8	
	14	MC4	0/00:27:00	0	13.0	0	0	+0.6	
	19	MC2 ON TIME	0/00:00:00	0	27.0	-0.9	0	+1.8	
270	9	NCC	-0/00:59:06	0	59.1	-48.6	0	+1.2	BASETIME = Ti TIG
	10	Ti	0/00:00:00	0	78.9	-0.9	0	+1.8	
	11	MC1	0/00:20:00	0	58.9	-0.9	0	+1.8	
	12	MC2	0/00:51:54	29.80	27.0	-0.9	0	+1.8	BASETIME = MC2 TIG
	13	MC3	0/00:17:00	0	10.0	-0.9	0	+1.8	
	14	MC4	0/00:27:00	0	13.0	0	0	+0.6	
	19	MC2 ON TIME	0/00:00:00	0	27.0	-0.9	0	+1.8	
290	9	NCC	-0/00:59:36	0	59.6	-48.6	0	+1.2	BASETIME = Ti TIG
	10	Ti	0/00:00:00	0	79.5	-0.9	0	+1.8	
	11	MC1	0/00:20:00	0	59.5	-0.9	0	+1.8	
	12	MC2	0/00:52:30	30.03	27.0	-0.9	0	+1.8	BASETIME = MC2 TIG
	13	MC3	0/00:17:00	0	10.0	-0.9	0	+1.8	
	14	MC4	0/00:27:00	0	13.0	0	0	+0.6	
	19	MC2 ON TIME	0/00:00:00	0	27.0	-0.9	0	+1.8	
310	9	NCC	-0/00:60:06	0	60.1	-48.6	0	+1.2	BASETIME = Ti TIG
	10	Ti	0/00:00:00	0	80.1	-0.9	0	+1.8	
	11	MC1	0/00:20:00	0	60.1	-0.9	0	+1.8	
	12	MC2	0/00:53:06	30.25	27.0	-0.9	0	+1.8	BASETIME = MC2 TIG
	13	MC3	0/00:17:00	0	10.0	-0.9	0	+1.8	
	14	MC4	0/00:27:00	0	13.0	0	0	+0.6	
	19	MC2 ON TIME	0/00:00:00	0	27.0	-0.9	0	+1.8	



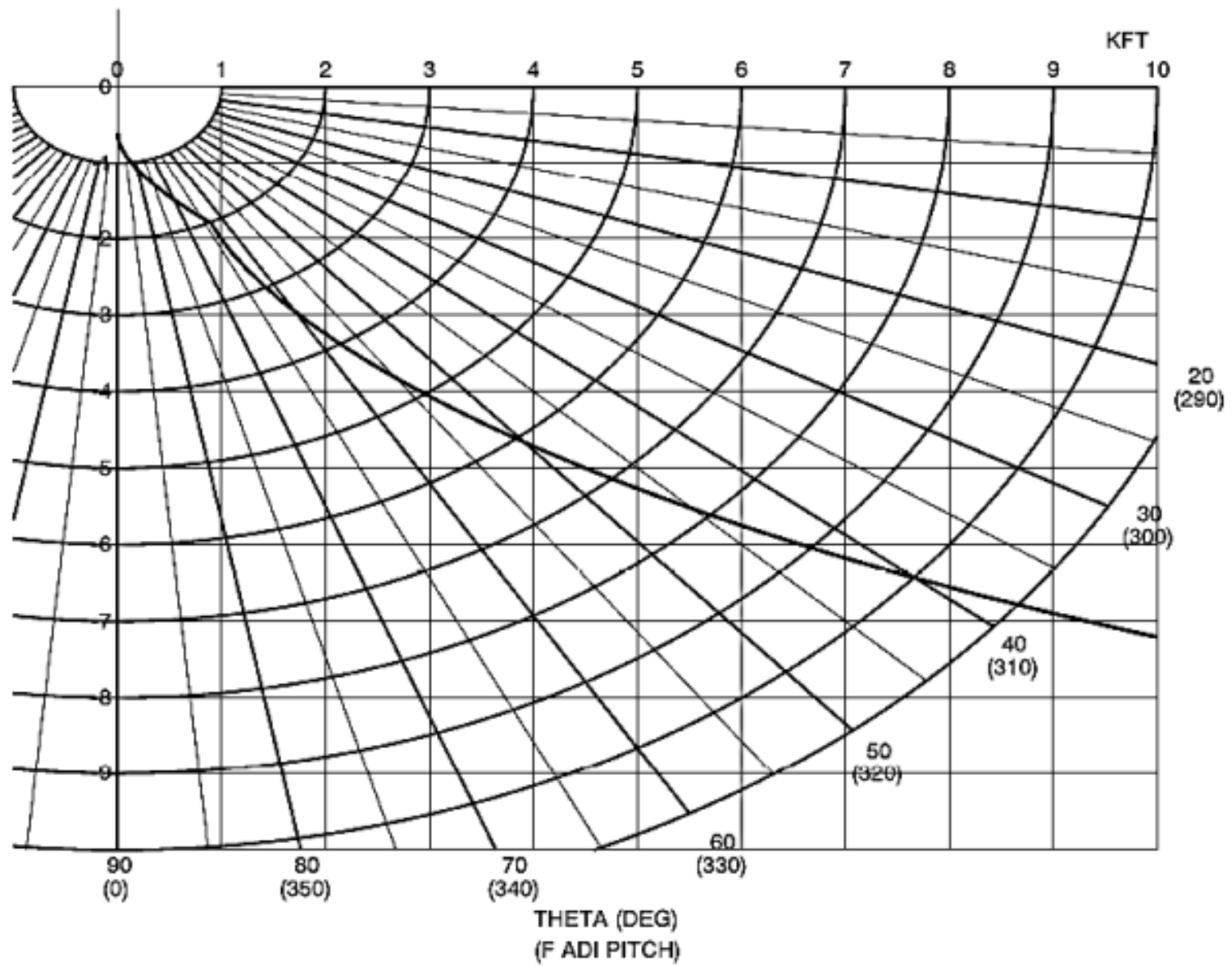
# POST NC



# POST TI



# POST MC-3





<b>RENDEZVOUS CHECKLIST</b>	<b>STS ALL</b>
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BACK COVER