

Hubble Space Telescope Deploy Checklist

STS-109

Mission Operations Directorate
Operations Division

Final, Rev B
January 28, 2002

National Aeronautics and
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MISSION OPERATIONS DIRECTORATE

**HUBBLE SPACE TELESCOPE
DEPLOY CHECKLIST
STS-109**

FINAL, REVISION B
January 28, 2002

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482#:	HST DPY-70B HST DPY-71A	MULTI-1583A MULTI-1576

AREAS OF TECHNICAL RESPONSIBILITY

Book Manager	DO5/B. Janda	281-244-0237
RMS Procedures	DX22/M. Lipsky	281-483-2450
Payload Operating Procedures	DO5/T. Arnold	281-483-7431
Separation Procedures	DM43/S. Walker	281-483-1665
Attitudes and Pointing	DO4/S. Remko	281-244-5658

HUBBLE SPACE TELESCOPE DEPLOY CHECKLIST
STS-109

LIST OF EFFECTIVE PAGES

FINAL 09/18/01
REV B 01/28/02

Sign Off	* 109/FIN B	5-1	109/FIN B
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iii	* 109/FIN B	5-3	109/FIN B
iv	* 109/FIN B	5-4	109/FIN B
v	109/FIN B	6-1	109/FIN B
vi	109/FIN B	6-2	109/FIN B
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* - Omit from flight book

HST DEPLOY CUE CARDS

<u>TITLE</u>	<u>Ref. Page</u>	<u>Card No.</u>
FSS/HST SJ UNBERTHING OVERLAY	CC 8-2	HST DPY-1a/109/O/A

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GRAPPLE

HST GRAPPLE 1-2

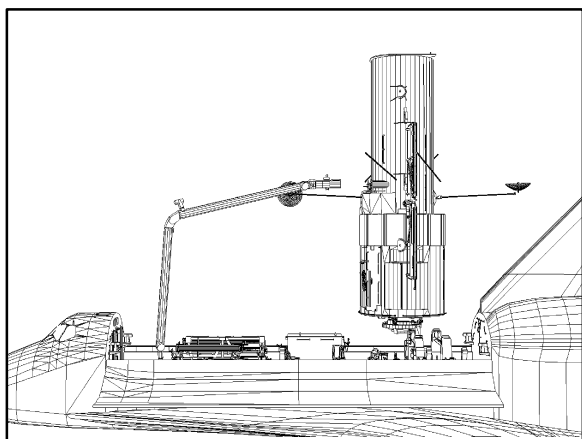
GRAPPLE

NOTE

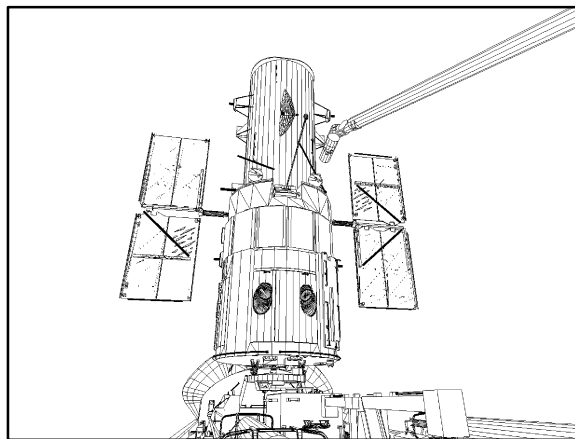
Clearance between RMS and -V3 HGA should be monitored

Mnvr to pre-grapple posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1024	-46	-755	0	0	0	0
SY	SP	EP	WP	WY	WR	
-29.3	+83.2	-79.6	-3.6	+29.3	0.0	



PORT



CCTV D (10,25)

- M** 4. GRAPPLE
 A3 MON 1(2) – install PDRS TARGET OVERLAY FOR CTVM (PDRS OPS)
 A7U VID OUT – MON 1(2)
 IN – RMS WRIST
 ZOOM: 34.0 HFOV
 FOCUS: 5.0 ft

Maintain eyepoint ~18 in when using grapple overlay
 ✓DAP: A10/AUTO(FREE)/VERN

- RHC/A8U RATE – VERN (RATE MIN tb-ON)
 MODE – END EFF, ENTER

FSS Latched posn (values recorded from PDRS FS):

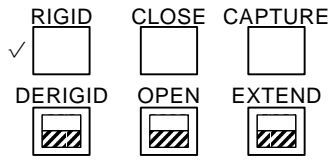
	X	Y	Z	PITCH	YAW	ROLL	PL ID
Expected							0
Expected							1
	SY	SP	EP	WP	WY	WR	
Expected							

Mnvr to +V2 GF grapple envelope

CAUTION
 Monitor EE tb timing to prevent EE motor burnout

- RHC EE MODE – AUTO
 CAPTURE sw – depress (mom)

A8U



CRITICAL TIMES (28 sec total):

CAPTURE tb - gray, then
CLOSE tb - gray, 3 sec max, then
RIGID tb - gray, 25 sec max

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

A6U

DAP: A10/AUTO/VERN(ALT)

VTR - STOP

SM 94 PDRS CONTROL

PL ID - ITEM 3 +1 EXEC

INIT ID - ITEM 24 +1 EXEC

UNBERTH

HST UMB DISCONNECT	2-2
UNBERTH	2-5

UNBERTH

HST UMB DISCONNECT

UNBERTH

- A7 1. CAMR SETUP
✓PL BAY FLOODS FWD (two) – OFF
 ✓MID,AFT (four) – as reqd
✓P/TV17 HST RELEASE, SETUP (PHOTO/TV FS, SCENES) complete

2. PWR XFER PRECHECKS

SM 210 HST SYS

- ✓TLM COUNT – incr
✓EPS INT ESS BUS ABC – * * *
✓MAIN BUS A,B,C – INT,INT,OFF
L12UR ✓ESS BUS EXT PWR tb – UP
 ✓INT PWR tb – UP
✓cb SPACE TEL SW PWR – cl

M 3. DEADFACE UMB

On MCC GO:

- ESS/MN SW ENA – ON (tb-gray)
ESS BUS EXT PWR – OFF (mom) (tb-bp)
MN BUS EXT PWR – OFF (mom) (tb-bp)
✓IPCU RLY CL tb – bp
✓MN BUS PWR ON tb – gray

SM 210 HST SYS

- ✓UMB SG V EXT MN BUS: 0
 ✓ESS BUS: 0
L12UR FHST SHUTTER – OP (tb-bp)
✓RSU SURV HTR PWR – OFF (tb-bp)
ESS/MN SW ENA – OFF (tb-bp)
✓SSM WK LTS – OFF
cb SPACE TEL SW PWR – op

SM 211 SSE OVERVIEW

- ✓DPC 1-12 VOLTS: 34.5 ± .8
 ✓AMPS: < 0.5

PCU OFF – ITEM 2 EXEC (*)
✓PCU – blank/blank
L12UL ✓PCU PWR CONTR A,B (two) – OFF
CRT ✓DPC 1-12: (no *)
 ✓1-12 VOLTS: < 0.5 (after 30 sec)
 ✓AMPS: < 0.5

Notify MCC, Umb deadface complete

M 4. SET UP UMB DISCONNECT

- A6U ✓PL RETEN LAT 1,2 – OFF
 ✓LOGIC PWR SYS 2(SYS 1) – OFF
 ✓PL SEL – 1
 LOGIC PWR SYS 1(SYS 2) – ON

SM 212 SSE MECHANISMS

AMSB ON – ITEM 7 EXEC (A(B))

* If AMSB ON – blank, continue *

- ✓AMSB DC AMPS: < .03
- ✓MECH – blank
 - ✓SEL (ITEMS 9–19) – (no *)
 - ✓STAT (ITEMS 9–19) – blank
- ✓O/R DIS – (*)
 - * If any param not as expected, perform SSE SSR–1 *
 - * FMDM SWAP A→B(B→A) (PL SYS, SSE), then *
 - * repeat SET UP UMB DISCONNECT on alternate *
 - * side and continue using alternate side *

R13L PL BAY MECH PWR SYS 1(2) – ON

WARNING

Operation of two FSS mechanisms may result in HST collision with orbiter

For any SM ALERT during FSS ops:

A6U PL RETEN LAT 1,2 (both) – OFF

R13 PL BAY MECH PWR SYS 1,2 (both) – OFF

✓MCC

M 5. DISCONNECT UMB

- L10 ✓VTR PWR It – on
 Control sw – REC
 ✓REC It – on

CRT UMB MN SEL – ITEM 17 EXEC (* MAT)

- * If UMB MN STAT – *, *
- * DESEL – ITEM 20 EXEC (ITEMS 9–19 – no *), *
- * perform SSE SSR–1 FMDM SWAP A→B(B→A) *
- * (PL SYS, SSE) *
- * If UMB MN STAT – RDY, continue *

- ✓AMSB DC AMPS: .02 to .08
- ✓MECH – steady A(B)

A6U ✓PL RETEN LAT 1 tb – LAT (A–side only)
 1(2) – REL (tb–bp)

CRT ✓MECH – flashing A(B)
 ✓AMSB AC AMPS: 0.6 to 1.0
 ✓UMB MN STAT – RDY (wait 8 sec)

- * If UMB MN STAT – MAT, *
- * continue and expect (*) at end of travel *

- * If stall condition observed (AMSB AC AMPS *
- * > 0.6 and no mechanism motion): *
- * PL RETEN LAT 1(2) – OFF *
- * ✓MCC *

✓UMB MN STAT – REL

- * If UMB MN STAT – RDY or MAT after 20 sec, *
- * PL RETEN LAT 1(2) – OFF, perform *
- * 1.3a PRIMARY MOTOR FAILS TO DRIVE *
- * MECHANISM (PL SYS, SSE) *

HST UNBERTH

CAUTION

Operating a berthing latch in a stalled condition for greater than 30 sec may result in damage to unit. A stalled condition is indicated by AMSB AC AMPS > 2.0 and no mechanism motion

1. SETUP

- A7
- ✓ PL BAY FLOODS FWD (two) – OFF
 - ✓ MID, AFT (four) – as reqd
 - ✓ P/TV17 HST RELEASE, SETUP (PHOTO/TV FS, SCENES) complete
- Review GENERIC END EFFECTOR CUE CARD (PDRS OPS)

2. PWR FSS CCTV

CAUTION

FSS CCTV limited to 2 hr continuous use

- L12UL
- ✓ CCTV HTR PWR – ON (tb-gray)

SM 211 SSE OVERVIEW

- CCTV ENA ON – ITEM 3 EXEC (*)
- PWR ON – ITEM 5 EXEC (*)

- * If CCTV ENA ON – (no *), retry ITEM 3: *
- * | If no joy, continue *
- * If CCTV PWR ON – (no *), retry ITEM 5: *
- * | If no joy, attempt to display camr image *
- * | on monitor. If no image, ✓MCC *

R12U
(VPU)

- ✓ Green Jumper – FSS
- ✓ VPU PWR – ON (LED on)

- A7U
- VID OUT pb – MON 1(2)
 - IN pb – PL2
 - ALC AVG pb – press
 - GAMMA NORM pb – press

M 3. OPEN BERTHING LATCH 3

- Set up CCTV to monitor opening of Latch 3
- ✓ VTR recording

DAP: FREE

SM 212 SSE MECHANISMS

- B LAT 3 SEL – ITEM 16 EXEC (* CL)

- * If B LAT 3 STAT – * and visually observed closed, *
- * | then BOT sw failure: *
- * | DESEL – ITEM 20 EXEC (ITEMS 9–19 – no *), *
- * | perform SSE SSR–1 FMDM SWAP A→B(B→A) *
- * | (PL SYS, SSE) and complete steps 3–7 on alt side *
- * | If B LAT 3 STAT – RDY, continue *

- ✓ AMSB DC AMPS: .02 to .08
- ✓ MECH – steady A(B)

* If stall condition observed (AMSB AC AMPS *
 * > 2.0 and no mechanism motion): *
 * PL RETEN LAT 1(2) – OFF *
 * ✓MCC *

✓B LAT 1 STAT – OP

A6U * If B LAT 1 STAT – CL or RDY after 30 sec, *
 * PL RETEN LAT 1(2) – OFF, perform *
 * 1.3a PRIMARY MOTOR FAILS TO DRIVE *
 * MECHANISM (PL SYS, SSE) *

✓PL RETEN LAT 1(2) tb – REL (A–side only)
 1(2) – OFF

CRT ✓MECH – steady A(B)

M 5. OPEN BERTHING LATCH 2
 Set up CCTV to monitor opening of Latch 2 (include FSS Camr)

✓VTR recording

CRT B LAT 2 SEL – ITEM 15 EXEC (* CL)

* If B LAT 2 STAT – * and visually observed closed, *
 * then BOT sw failure: *
 * DESEL – ITEM 20 EXEC (ITEMS 9–19 – no *), *
 * perform SSE SSR–1 FMDM SWAP A→B(B→A) *
 * (PL SYS, SSE) and complete steps 5–7 on alt side *
 * If B LAT 2 STAT – RDY, continue *

✓AMSB DC AMPS: .02 to .08
 ✓MECH – steady A(B)

A6U ✓PL RETEN LAT 1 tb – LAT (A–side only)
 1(2) – REL (tb–bp)

CCTV Visually monitor latch operation

CRT ✓MECH – flashing A(B)
 ✓AMSB AC AMPS: 2.0 to 3.75
 ✓B LAT 2 STAT – RDY (wait 18 sec)

* If B LAT 2 STAT – CL, *
 * continue and expect (*) *

* If stall condition observed (AMSB AC AMPS *
 * > 2.0 and no mechanism motion): *
 * PL RETEN LAT 1(2) – OFF *
 * ✓MCC *

✓B LAT 2 STAT – OP

A6U * If B LAT 2 STAT – CL or RDY after 30 sec, *
 * PL RETEN LAT 1(2) – OFF, perform *
 * 1.3a PRIMARY MOTOR FAILS TO DRIVE *
 * MECHANISM (PL SYS, SSE) *

✓PL RETEN LAT 1(2) tb – REL (A–side only)
 1(2) – OFF

CRT ✓MECH – steady A(B)

CRT 6. DESELECT BERTHING LATCHES
 DESEL – ITEM 20 EXEC
 ✓AMSB DC AMPS: < 0.03

7. PWRDN FSS MECH SYSTEMS
 AMSB OFF – ITEM 8 EXEC (*)

A6U ✓PL RETEN LAT 1,2 – OFF
 LOGIC PWR SYS 1(SYS 2) – OFF
 ✓PL SEL – 1

R13L PL BAY MECH PWR SYS 1(2) – OFF

M 8. MNVR RMS TO FSS HOVER POSN
 CCTV – config for unberth

✓VTR recording

✓DAP: FREE

GNC 20 DAP CONFIG

Load DAPs A15 and B12
 CNTL ACCEL – ITEM 28 +3 EXEC
 – ITEM 48 +3 EXEC

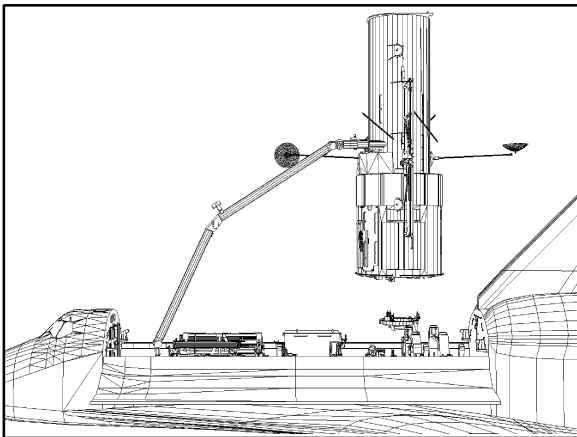
✓DAP: no LO Z

* If Single Joint RMS, go to SJ HST UNBERTH *
 * (OFF–NOMINAL RMS OPS) *

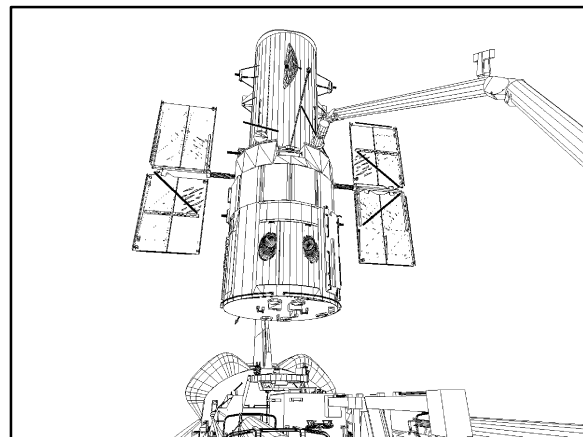
RHC RATE – VERN(RATE MIN tb–ON)
 A8U BRAKES – OFF (tb–OFF)
 MODE – ORB LD, ENTER

Mnvr to FSS Hover posn

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1149	0	-825	0	0	0	1
SY	SP	EP	WP	WY	WR	
-28.0	+61.3	-36.9	-24.4	+28.0	+0.5	



PORT



CCTV D (10,25)

A6U If attitude maintenance reqd,
BRAKES – ON (tb–ON)
– OFF (tb–OFF)
DAP: A/AUTO/VERN (ALT)

9. UNPWR FSS CCTV

When FSS CCTV no longer reqd:

SM 211 SSE OVERVIEW

CCTV PWR OFF – ITEM 6 EXEC (*) (wait 15 sec)

* If CCTV PWR OFF, not (*), do not *
* perform CCTV ENA – OFF *

CCTV ENA OFF – ITEM 4 EXEC (*)

M 10. MNVR RMS TO HST RELEASE POSN

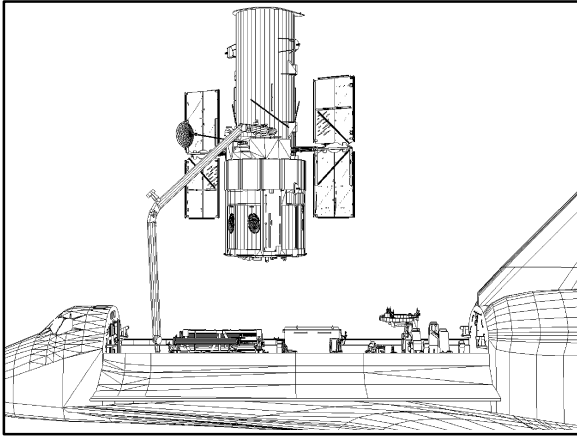
✓VTR recording

✓DAP: FREE

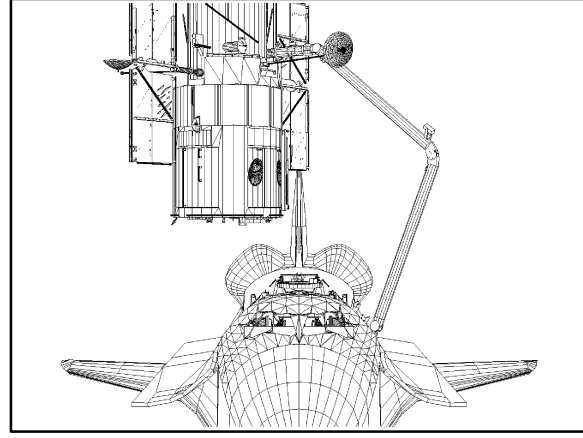
RHC Load DAPs A15 and B12
A8U RATE – VERN(RATE MIN tb–ON)
MODE – ORB LD, ENTER

Mnvr to HST Release posn:

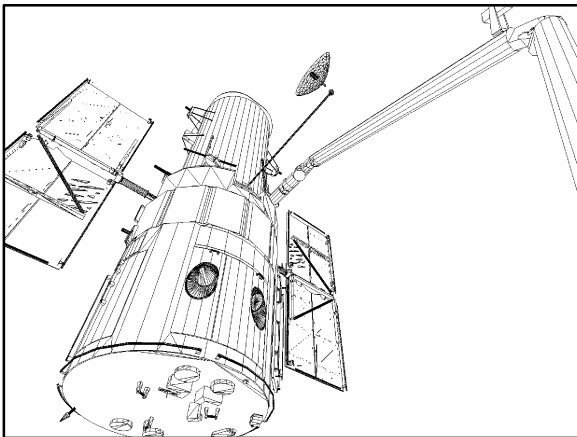
X	Y	Z	PITCH	YAW	ROLL	PL ID
-878	112	-853	0	305	0	1
SY	SP	EP	WP	WY	WR	
-53.4	+90.0	-68.5	-37.3	0.0	+8.5	



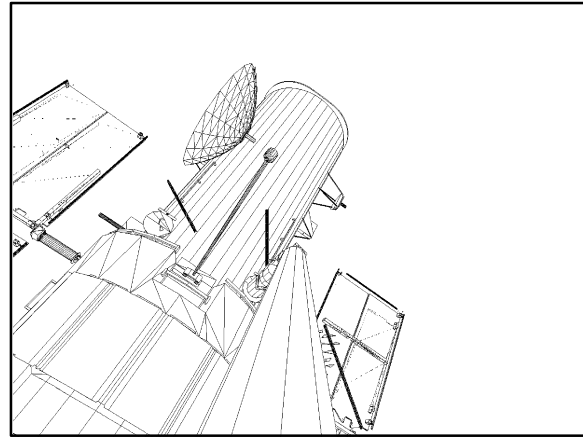
PORT



FRONT



CCTV A (-15,50)



ELBOW (0,0)

BRAKES - OFF (tb-OFF)
 MODE - END EFF
 JOINT - CRIT TEMP

VTR - STOP

M 11. MNVR ORBITER TO RELEASE ATT
GNC UNIV PTG

TRK OPTION:

TGT ID +5
 RA _____ (per PAD)
 DEC _____ (per PAD)
 BODY VECTOR +5
 P +1 8 0.0
 Y +5 5.0
 OM _____ (per PAD)

Init TRK - ITEM 19 EXEC (CUR - *)
 DAP: A15/AUTO/VERN(ALT)

RELEASE OPS

HST RELEASE PREP 3-2
RELEASE 3-4

RELEASE
OPS

HST RELEASE PREP

NOTE

Prep procedures to be completed by release -:04:00

✓MCC
Verify -V3 HGA disk is in RMS clearance posn

Install -Z COAS

A7 1. CAMR SETUP
✓PL BAY FLOODS FWD (two) - OFF
✓MID,AFT (four) - as reqd
✓P/TV17 HST RELEASE, SETUP (PHOTO/TV FS, SCENES) complete

F7,A4 2. TIMER SETUP
SM 2 TIME
Set CRT and EVENT TIMERS counting down to release
MET per PAD (HST RMS RELEASE)

A6U M 3. ADI SETUP
ADI ATT - LVLH
ERR - MED
RATE - LO
SENSE: -Z

O14:E, ✓cb DDU (six) - cl
O15:E,
O16:E

A1U 4. KU RDR SETUP
✓KU CNTL - CMD
✓PWR - ON
MODE - RDR PASSIVE
RADAR OUTPUT - LO
sel - GPC
✓SIG STRENGTH sel - KU
SLEW RATE - as reqd

A2 DIGI-DIS sel - R/RDOT
✓X-PNTR SCALE - X1
SM ANTENNA
✓RDR RNG AUTO (ITEM 5) - (*)

5. UPDATE ORBITER WEIGHT
GNC, OPS 202 PRO
GNC ORBIT MNVR EXEC
Load WT per PAD
✓PEG 7 not all zero and TIG in future
LOAD - ITEM 22 EXEC

GNC, OPS 201 PRO

RELEASE
OPS

M 6. RMS SETUP
A8U HST Release posn

X	Y	Z	PITCH	YAW	ROLL	PL ID
-878	112	-853	0	305	0	1
SY	SP	EP	WP	WY	WR	
-53.4	+90.0	-68.5	-37.3	0.0	+8.5	

- ✓ SAFING tb – gray
- PARAM sel – JOINT ANGLE
- JOINT – SP
- B/U JOINT – SP

A7U VID OUT – MON 1(2)
IN – RMS WRIST
ZOOM: 34.0 HFOV
FOCUS: 5.0 ft

M 7. ENABLE RNDZ NAV
When target vector onboard,
 GNC 33 REL NAV
RNDZ NAV ENA – ITEM 1 EXEC (*)

- ✓ SV SEL (ITEM 4) – PROP
- ✓ INH RNG (ITEM 18) – (*)
 - ✓ RDOT (ITEM 21) – (*)
 - ✓ Angles (ITEM 24) – (*)

✓ RR – ITEM 13 EXEC (*)

8. VERIFY RF LINK AND PCS CONFIG
 SM 210 HST SYS

- ✓ TLM COUNT – incr
- ✓ PSP ENA ID: 1
- ✓ RCVR 1(2) LOCK – *
- ✓ PCS MODE – DRFT
- ✓ SNPT DIS – YES

9. TIGHTEN DEADBANDS
 GNC 20 DAP CONFIG

Load DAP B15

–:17:00
A8U

If ALT:
 ✓ BRAKES – OFF (tb-OFF)
 DAP: B15/AUTO/ALT
 Expect 12 min to dampen
 arm motion and minimize orbiter rates

–:08:00

If VRCS:
 If posn hold avail
 ✓ BRAKES – OFF (tb-OFF)
 DAP: B15/AUTO/VERN
 Expect 3–min to dampen
 arm motion and minimize orbiter rates
 If posn hold not avail:
 BRAKES – ON (tb-ON)
 DAP: A15/AUTO/VERN
 Continue, deadband collapse not reqd

RMS and HST Systems	Orbiter
<p>HST RELEASE</p> <p><input checked="" type="checkbox"/> 1. <u>RELEASE PREPS</u> Review RMS QUICK DEPLOY (Cue Card) On MCC GO for Release: √VTR Recording</p> <p><input type="checkbox"/> 2. <u>HST SUNPOINT MACRO INIT</u> If RMS QUICK DPY, go to step 3 <u>SM 210 HST SYS</u> √RCVR 1(2) LOCK - *</p> <p>PCS MODE SNPT - ITEM 7 +9 3(94) EXEC √SNPT DIS - NO</p> <p>* If PCS SNPT DIS still YES after 3 sec: * * Reattempt ITEM 7 +9 3(94) EXEC * * √SNPT DIS - NO * * If no joy, attempt alt CDI cmd: * * ITEM 7 +9 4(93) EXEC * * √SNPT DIS - NO * * If still no joy, abort deploy and √MCC *</p> <p>Record Sunpoint macro start MET ___/___:___:___</p> <p>-:01:30</p>	<p>-03:00</p> <p><input checked="" type="checkbox"/> 1. <u>RELEASE</u> √Orbiter in release attitude: TRK OPTION: √TGT ID +5 RA ___ . ___ . ___ (per PAD) DEC ___ . ___ . ___ (per PAD) √BODY VECTOR +5 P +1 8 0.0 Y +5 5.0 OM ___ . ___ . ___ (per PAD) √DAP: B15/AUTO/VERN(ALT)</p> <p>√ATT ERR < 2.0 deg √RATES < .1 deg/sec ADI ATT - REF ATT REF pb - push √ADI: 0,0,0 √SENSE: -Z</p> <p>A6U</p> <p>AFT FLT CNTLR PWR - ON</p>

RMS and HST Systems		Orbiter	
	<p>[M] 3. <u>RELEASE</u> If VRCS, DAP: FREE If ALT, DAP: FREE</p> <p>* If Single Joint, go to SJ HST RELEASE * * (OFF-NOMINAL RMS OPS) *</p> <p>RHC/A8U RATE – as reqd (VERN within 10 ft) √BRAKES – OFF (tb-OFF) A8U MODE – END EFF, ENTER</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>Monitor EE tb timing to prevent EE motor burnout</p> <p>Monitor clearance between RMS and -V3 HGA during release and back-away mnvrs</p> </div> <p>* If manual release reqd: * * EE MODE – MAN * * MAN CONTR – DERIGID (hold until DERIGID tb-gray, 5 sec max) * * * * -:00:00 RELEASE sw – depress (hold until OPEN tb-gray, 3 sec max) * * * * Mnvrs arm 5 ft (minimum) clear of HST * * * * EE MAN CONTR – DERIGID (hold until EXTEND tb-gray, 20 sec max) * * * * MODE – OFF *</p>		
:-01:00		:-01:00	<p><u>GNC 33 REL NAV</u> ORB TO TGT – ITEM 10 EXEC If VRCS, DAP: FREE If ALT, DAP: FREE</p> <p>* If Single Joint, go to SJ HST RELEASE * * (OFF-NOMINAL RMS OPS) *</p> <p><u>GNC 20 DAP CONFIG</u> Change DAP A,B to A7,B7 DAP TRANS: PULSE/PULSE/PULSE, LO Z DAP: A7/FREE/PRI</p>
:-00:30		:-00:30	
			<p>* If manual release reqd: * * * * * * * * * * -:00:00 √Release initiated * * Record Release MET ___/___:___:___ (release) *</p>

RMS and HST Systems		Orbiter																																					
<p>EE MODE – AUTO RELEASE sw – REL (mom)</p> <p>When OPEN tb – gray, mnvr arm 5 ft (minimum) clear of HST</p> <p>A8U</p> <table border="0"> <tr> <td><input checked="" type="checkbox"/></td> <td>RIGID</td> <td><input checked="" type="checkbox"/></td> <td>CLOSE</td> <td><input checked="" type="checkbox"/></td> <td>CAPTURE</td> </tr> <tr> <td><input type="checkbox"/></td> <td>DERIGID</td> <td><input type="checkbox"/></td> <td>OPEN</td> <td><input type="checkbox"/></td> <td>EXTEND</td> </tr> </table> <p>CRITICAL TIMES (28-sec total): DERIGID tb – gray, 5-sec max, then OPEN tb – gray, 3-sec max, then EXTEND tb – gray, 20-sec max</p> <p>When clear of GF pin: EE MODE – OFF</p> <p>* If HST not released by EVENT TIMER = +2:45, * * disable HST Sunpoint macro * * <u>SM 210 HST SYS</u> * * <u>PCS SNPT DIS – ITEM 8 +9 9 EXEC (YES)</u> * * <u>GNC 20 DAP CONFIG</u> * * LOAD DAPs A15 and B12 * * √DAP: no LO Z * * √BRAKES – OFF (tb-OFF) * * DAP: A/AUTO/VERN(ALT) *</p> <p>M 4. <u>SEP 1 BURN</u> When RMS motion has stopped: √SEP 1 initiated</p> <p><u>SM 94 PDRS CONTROL</u> PL ID – ITEM 3 +0 EXEC INIT ID – ITEM 24 +0 EXEC</p> <p>If reqd, BRAKES – ON (tb-ON)</p>	<input checked="" type="checkbox"/>	RIGID	<input checked="" type="checkbox"/>	CLOSE	<input checked="" type="checkbox"/>	CAPTURE	<input type="checkbox"/>	DERIGID	<input type="checkbox"/>	OPEN	<input type="checkbox"/>	EXTEND		<p>EE MODE – AUTO RELEASE sw – REL (mom)</p> <p>When OPEN tb – gray, mnvr arm 5 ft (minimum) clear of HST</p> <p>A8U</p> <table border="0"> <tr> <td><input checked="" type="checkbox"/></td> <td>RIGID</td> <td><input checked="" type="checkbox"/></td> <td>CLOSE</td> <td><input checked="" type="checkbox"/></td> <td>CAPTURE</td> </tr> <tr> <td><input type="checkbox"/></td> <td>DERIGID</td> <td><input type="checkbox"/></td> <td>OPEN</td> <td><input type="checkbox"/></td> <td>EXTEND</td> </tr> </table> <p>CRITICAL TIMES (28-sec total): DERIGID tb – gray, 5-sec max, then OPEN tb – gray, 3-sec max, then EXTEND tb – gray, 20-sec max</p> <p>When clear of GF pin: EE MODE – OFF</p> <p>* If HST not released by EVENT TIMER = +2:45, * * disable HST Sunpoint macro * * <u>SM 210 HST SYS</u> * * <u>PCS SNPT DIS – ITEM 8 +9 9 EXEC (YES)</u> * * <u>GNC 20 DAP CONFIG</u> * * LOAD DAPs A15 and B12 * * √DAP: no LO Z * * √BRAKES – OFF (tb-OFF) * * DAP: A/AUTO/VERN(ALT) *</p> <p>M 2. <u>SEP 1 BURN</u> When RMS motion has stopped: AFT THC: -X(dn) 10 pulses (1.0 fps) Record MET: ___/___:___:___ (burn init)</p> <p>AFT FLT CNTLR PWR – OFF Report TIG to MCC</p> <p>When center of HST in bottom half of Keel Camr (REF BALL PITCH ~65deg): DAP: INRTL</p> <p>When pitch rate nulled: DAP: VERN(ALT)</p>	<input checked="" type="checkbox"/>	RIGID	<input checked="" type="checkbox"/>	CLOSE	<input checked="" type="checkbox"/>	CAPTURE	<input type="checkbox"/>	DERIGID	<input type="checkbox"/>	OPEN	<input type="checkbox"/>	EXTEND	<p>EE MODE – AUTO RELEASE sw – REL (mom)</p> <p>When OPEN tb – gray, mnvr arm 5 ft (minimum) clear of HST</p> <p>A8U</p> <table border="0"> <tr> <td><input checked="" type="checkbox"/></td> <td>RIGID</td> <td><input checked="" type="checkbox"/></td> <td>CLOSE</td> <td><input checked="" type="checkbox"/></td> <td>CAPTURE</td> </tr> <tr> <td><input type="checkbox"/></td> <td>DERIGID</td> <td><input type="checkbox"/></td> <td>OPEN</td> <td><input type="checkbox"/></td> <td>EXTEND</td> </tr> </table> <p>CRITICAL TIMES (28-sec total): DERIGID tb – gray, 5-sec max, then OPEN tb – gray, 3-sec max, then EXTEND tb – gray, 20-sec max</p> <p>When clear of GF pin: EE MODE – OFF</p> <p>* If HST not released by EVENT TIMER = +2:45, * * disable HST Sunpoint macro * * <u>SM 210 HST SYS</u> * * <u>PCS SNPT DIS – ITEM 8 +9 9 EXEC (YES)</u> * * <u>GNC 20 DAP CONFIG</u> * * LOAD DAPs A15 and B12 * * √DAP: no LO Z * * √BRAKES – OFF (tb-OFF) * * DAP: A/AUTO/VERN(ALT) *</p> <p>M 2. <u>SEP 1 BURN</u> When RMS motion has stopped: AFT THC: -X(dn) 10 pulses (1.0 fps) Record MET: ___/___:___:___ (burn init)</p> <p>AFT FLT CNTLR PWR – OFF Report TIG to MCC</p> <p>When center of HST in bottom half of Keel Camr (REF BALL PITCH ~65deg): DAP: INRTL</p> <p>When pitch rate nulled: DAP: VERN(ALT)</p>	<input checked="" type="checkbox"/>	RIGID	<input checked="" type="checkbox"/>	CLOSE	<input checked="" type="checkbox"/>	CAPTURE	<input type="checkbox"/>	DERIGID	<input type="checkbox"/>	OPEN	<input type="checkbox"/>	EXTEND
<input checked="" type="checkbox"/>	RIGID	<input checked="" type="checkbox"/>	CLOSE	<input checked="" type="checkbox"/>	CAPTURE																																		
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		<p>ASAP</p> <p>A6U</p>	<p>ADI ATT – LVLH</p>																																				

RMS and HST Systems	Orbiter
<p data-bbox="411 256 730 310"> <input type="checkbox"/> M 5. <u>HST TO SUNPOINT</u> <u>SM 210 HST SYS</u> </p> <p data-bbox="527 342 753 367">√RCVR 1(2) LOCK - *</p> <p data-bbox="533 394 1041 540"> * If RMS QUICK DEPLOY, activate hardware * * Sunpoint: * * PCS MODE SUNPOINT - ITEM 7 +9 5 EXEC * * - ITEM 7 +9 6 EXEC * * * * Expect 'PDI DECOM FAIL' msg >> * </p> <p data-bbox="186 573 264 594">+03:30</p> <p data-bbox="527 573 743 594">√PCS MODE - SNPT</p> <p data-bbox="186 625 264 646">+03:52</p> <p data-bbox="527 625 751 646">√SNPT DIS - YES >></p> <p data-bbox="548 673 831 721"> * If PCS MODE not SNPT, * * √MCC * </p>	<p data-bbox="1276 256 1675 310"> <input type="checkbox"/> 3. <u>HST TO SUNPOINT</u> √HST Sunpoint mode initiated </p> <p data-bbox="1276 358 1717 412"> <input type="checkbox"/> M 4. <u>MNVR TO TARGET TRACK ATT</u> <u>GNC UNIV PTG</u> </p> <p data-bbox="1402 412 1818 558"> TRK OPTION: TGT ID +1 BODY VECTOR +3 √P +90.0 √Y +0.0 OM + 180.0 _____.____ (per PAD) </p> <p data-bbox="1054 886 1115 907">SEP 1</p> <p data-bbox="1402 886 1766 907">Init TRK - ITEM 19 EXEC (CUR - *)</p> <p data-bbox="1054 937 1129 958">+05:00</p> <p data-bbox="1402 937 1682 958">DAP: A7/AUTO/VERN(ALT)</p>

RMS and HST Systems	Orbiter
<p>Actions Complete</p>	<p>When SV UPDATE POS < 0.03 and MARK ACPT > 9, SV SEL – ITEM 4 EXEC (FLTR)</p> <p>When R > 400 ft, KU RDR OUTPUT – HI</p> <p>A1U</p> <p>F6 M 7. <u>SEP 2 BURN</u> √ADI ATT – LVLH</p> <p>F7</p> <p>If SEP 1 was posigrade: When orbiter on HST -Rbar (Fwd ADI Pitch = 0 deg): Fwd FLT CNTLR PWR – ON DAP: A/AUTO/PRI DAP TRANS: NORM/PULSE/PULSE, LO Z Fwd THC: -X(out) 10 sec (2.5 fps)</p> <p>If SEP 1 was retrograde: When orbiter on HST +Rbar (Fwd ADI Pitch = 0 deg): Fwd FLT CNTLR PWR – ON DAP: A/AUTO/PRI √DAP TRANS: PULSE/PULSE/PULSE, LO Z Fwd THC: -X(out) 10 pulses (1.0 fps)</p> <p>Record MET: ___/___:___:___ (burn init)</p> <p>Fwd FLT CNTLR PWR – OFF DAP: A/AUTO/VERN(ALT) DAP TRANS: PULSE/PULSE/PULSE</p> <p>Report TIG to MCC</p> <p>8. <u>P/TV DEACTIVATION</u> Go to P/TV17 HST RELEASE, DEACTIVATION (PHOTO/TV FS, <u>SCENES</u>)</p>

RMS and HST Systems	Orbiter
<p style="text-align: center;">Actions Complete</p>	<p>9. <u>CONFIG KU FOR COMM</u> When RANGE > 5000 FT: <u>GNC 33 REL NAV</u> INH RNG - ITEM 18 EXEC (*) RDOT - ITEM 21 EXEC (*) Angles - ITEM 24 EXEC (*) KU ANT ENA - ITEM 2 EXEC (no *)</p> <p>A1U KU MODE - COMM √SEL - GPC CNTL - CMD</p> <p>A2 DIGI-DIS SEL - EL/AZ</p> <p>DAP: No LO Z</p> <p>Go to FLIGHT PLAN</p>

CONTINGENCY OPS

BACKAWAY DEPLOY 4-2
RMS QUICK DEPLOY 4-9

CONT
OPS

BACKAWAY DEPLOY

NOTE

STOCC will cmd LGA switch. Expect 'S62 PDI DECOM FAIL' msg

1. CAMR SETUP

- ✓ PL BAY FLOODS FWD (two) – OFF
- ✓ MID,AFT (four) – as reqd
- ✓ P/TV17 HST RELEASE, SETUP (PHOTO/TV FS, SCENES) complete

2. VERIFY RMS CLEARANCE

- ✓ RMS clear of payload envelope

3. DAP/TIMER SETUP

GNC 20 DAP CONFIG

- ✓ DAP A,B set to A10,B10

SM 2 TIME

F7,A4 Set CRT and EVENT TIMERS counting down to release MET per PAD (HST BACKAWAY DEPLOY)

4. MNVR TO BACKAWAY DPY ATT

GNC UNIV PTG

TRK OPTION:

- ✓ TGT ID +5
- RA ___ .___ (per PAD)
- DEC ___ .___ (per PAD)
- ✓ BODY VECTOR +5
- P +1 7 5.0
- Y 0.0
- OM ___ .___ (per PAD)

DAP: A10/AUTO/VERN (ALT,LO Z)
Init TRK – ITEM 19 EXEC (CUR – *)

5. ADI SETUP

A6U ADI ATT – LVLH
ERR – MED
RATE – LO
SENSE: –Z

O14:E, ✓cb DDU (six) – cl
O15:E,
O16:E

6. KU RDR SETUP

A1U ✓KU CNTL – CMD
✓PWR – ON
MODE – RDR PASSIVE
RADAR OUTPUT – LO
sel – GPC
✓SIG STRENGTH sel – KU
SLEW RATE – as reqd

A2 DIGI-DIS sel – R/RDOT
✓X-PNTR SCALE – X1

SM ANTENNA

- ✓RDR RNG AUTO (ITEM 5) – (*)

CONT
OPS

7. UPDATE ORBITER WEIGHT
GNC, OPS 202 PRO

GNC ORBIT MNVR EXEC

Load WT per PAD

- ✓PEG 7 not all zero and TIG in future
- LOAD – ITEM 22 EXEC

GNC, OPS 201 PRO

8. ENABLE RNDZ NAV

When target vector onboard:

GNC 33 REL NAV

RNDZ NAV ENA – ITEM 1 EXEC (*)

- ✓SV SEL (ITEM 4) – PROP
- ✓INH RNG (ITEM 18) – (*)
 - ✓RDOT (ITEM 21) – (*)
 - ✓Angles (ITEM 24) – (*)

RR – ITEM 13 EXEC (*)

9. VERIFY RF LINK

SM 210 HST SYS

- ✓TLM COUNT – incr
- ✓PSP ENA ID: 1
- ✓RCVR 1(2) LOCK – *

10. FSS AMSB PWR ON

WARNING

Operation of two FSS mechanisms may result in HST collision with orbiter

For any SM ALERT during FSS ops:

- A6U PL RETEN LAT 1,2 (both) – OFF
- R13 PL BAY MECH PWR SYS 1,2 (both) – OFF
- ✓MCC

- A6U
 - ✓PL RETEN LAT 1,2 – OFF
 - ✓LOGIC PWR SYS 2(SYS 1) – OFF
 - ✓PL SEL – 1
 - LOGIC PWR SYS 1(SYS 2) – ON

SM 212 SSE MECHANISMS

AMSB ON – ITEM 7 EXEC (A(B))

- ✓AMSB DC AMPS < .03
- ✓MECH – blank
 - ✓SEL (ITEMS 9–19) – no *
 - ✓STAT (ITEMS 9–19) – blank
- ✓O/R DIS – *

* If any param not as expected, ✓MCC *

- R13L PL BAY MECH PWR SYS 1(2) – ON

11. HST ROTATION

- CCTV Monitor HST position during rotation
DAP: FREE
- CRT ROTATOR SEL – ITEM 12 EXEC (* RDY)
- ✓AMSB DC AMPS: .02 to .08
- A6U PL RETEN LAT 1(2) – LAT (tb–bp)

Mnvr to reqd posn:

POSN	DURATION (MM:SS)	ROTATION DIRECTION	POSN IND REF
30° ccw from berthing	02:05	CCW	HST 150°

- CRT ✓MECH flashing A(B)
- ✓ROTATOR STAT – RDY

- CCTV ✓Rotator posn visually
- CRT ✓ROTATOR TACH: > 10 deg/min
- ✓AMSB AMPS: 0.3 to 0.5

- * If FDA 'S212 ROT STALL' received, *
- * PL RETEN LAT 1(2) – OFF *
- * Perform 1.3e 'S212 PVT(ROT) STALL' (PL SYS, SSE) *

- * If ROTATE TACH < 0.9 deg/min and AMSB AC *
- * AMPS < 0.2: *
- A6U * PL RETEN LAT 1(2) – OFF, then perform *
- * 1.3a PRIMARY MOTOR FAILS TO DRIVE *
- * MECHANISM (PL SYS, SSE) *

- CRT PL RETEN LAT 1(2) – OFF
- ✓MECH – blank
- After 4 min,
- DAP: A10/AUTO/VERN(ALT,LO Z)

- * For any observed uncontrolled SA motion: *
- * SM 210 HST SYS *
- * SADE OFF – ITEM 11 +9 9 EXEC (OFF) *
- * Notify MCC *

12. PWR FSS CCTV

CAUTION
FSS CCTV limited to 2 hr continuous use

- L12U ✓CCTV HTR PWR – ON (tb–gray)
- SM 211 SSE OVERVIEW
- CCTV ENA ON – ITEM 3 EXEC (*)
- PWR ON – ITEM 5 EXEC (*)

- * If CCTV ENA ON – (no *), retry ITEM 3: *
- * | If no joy, continue *
- * If CCTV PWR ON – (no *), retry ITEM 5: *
- * | If no joy, attempt to display camr image *
- * on monitor. If no image, ✓MCC *

- R12U ✓Green Jumper – FSS
- (VPU) ✓VPU PWR – ON (LED on)

A7U VID OUT pb – MON 1(2)
IN pb – PL2
ALC AVG pb – press
GAMMA NORM pb – press

13. UMB DISCONNECT
Perform HST UMB DISCONNECT steps 2,3,4,5 (UNBERTH)

M 14. HST SUNPOINT MACRO INIT
On MCC GO for release:

SM 210 HST SYS
✓RCVR 1(2) LOCK – *

–:01:30 PCS MODE SNPT – ITEM 7 +93(94) EXEC
✓MODE – DRFT
✓SNPT DIS – NO

* If PCS SNPT DIS still YES after 3 sec: *
* Reattempt ITEM 7 +93(94) EXEC *
* ✓SNPT DIS – NO *
* If no joy, attempt alt CDI cmd: *
* ITEM 7 +94(93) EXEC *
* ✓SNPT DIS – NO *
* If still no joy, abort deploy and ✓MCC *

Record Sunpoint macro start MET ____/____:____:____

–01:00 15. OPEN BERTHING LATCHES

NOTE

Perform SEP 1 BURN ASAP once LATCH 2
open and verified clear

✓VTR recording

GNC 33 REL NAV
ORB TO TGT – ITEM 10 EXEC

GNC UNIV PTG
✓ATT ERR < 5.0 deg
✓RATES < .1 deg/sec

DAP: FREE

GNC 20 DAP CONFIG
Change DAP A,B to A7,B7

SM 212 SSE MECHANISMS
B LAT 3 SEL – ITEM 16 EXEC (* CL)

A6U PL RETEN LAT 1(2) – REL

CRT ✓B LAT 3 STAT – RDY (wait 18 sec)
✓3 STAT – OP

A6U PL RETEN LAT 1(2) – OFF

CRT B LAT 1 SEL – ITEM 14 EXEC (* CL)

A6U PL RETEN LAT 1(2) – REL

CRT ✓B LAT 1 STAT – RDY (wait 18 sec)
✓1 STAT – OP

A6U PL RETEN LAT 1(2) – OFF

CRT B LAT 2 SEL – ITEM 15 EXEC (* CL)

A6U PL RETEN LAT 1(2) – REL

CRT ✓B LAT 2 STAT – RDY (wait 18 sec)
✓2 STAT – OP

A6U PL RETEN LAT 1(2) – OFF

CCTV Visually verify LATCHES open and umbilical clear

* If any B LAT fails to open, disable HST sunpointing *
* mnvr capability prior to EVENT TIMER = +3:30: *
* SM 210 HST SYS *
* PCS SNPT DIS – ITEM 8 +9 9 EXEC (YES) *
* *
* *

16. SEP 1 BURN

A6U ✓SENSE: –Z

✓DAP: A7/FREE/VERN(PRI)
DAP TRANS: PULSE/PULSE/PULSE, LO Z

AFT FLT CNTLR PWR – ON

ASAP AFT THC: +Z (out) 1 pulse (0.1 fps),
DAP: A7/INRTL/VERN(PRI)

AFT THC: +Z (out) 5 pulses (0.5 fps)

Record MET: ___/___:___:___

AFT FLT CNTLR PWR – OFF

M 17. HST TO SUNPOINT

SM 210 HST SYS

✓RCVR 1(2) LOCK – *
+ :03:30 ✓PCS MODE – SNPT
+ :03:52 ✓SNPT DIS – YES

18. RADAR ACQUISITION

✓Range ≥ 100 ft

GNC 33 REL NAV

KU ANT ENA – ITEM 2 EXEC (*)
GNC I/O RESET

+ :30:30

AFT THC: -X (dn) 10 pulses (1.0 fps)

Record MET: ___/___:__:___ (burn init)

AFT FLT CNTLR PWR - OFF
DAP: A/AUTO/VERN(ALT)

Report TIG to MCC

When HST no longer in CCTV FOV:
VTR - STOP

22. INITIATE TGT TRACK

GNC UNIV PTG

TRK OPTION:

TGT ID +1
BODY VECTOR +3
OM +0.0

√ DAP: A7/AUTO/VERN(ALT)
Init TRK - ITEM 19 EXEC (CUR - *)

23. CONFIG KU FOR COMM

When RANGE > 5000 ft:

GNC 33 REL NAV

INH RNG - ITEM 18 EXEC (*)
RDOT - ITEM 21 EXEC (*)
Angles - ITEM 24 EXEC (*)
KU ANT ENA - ITEM 2 EXEC (no *)

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

A2 DIGI-DIS SEL - EL/AZ
DAP: No LO Z

24. DESELECT BERTHING LATCHES

SM 212 SSE MECHANISMS

DESEL - ITEM 20 EXEC

√ AMSB DC AMPS: < .03

25. PWRDN FSS MECH SYSTEMS

AMSB OFF - ITEM 8 EXEC (*)

A6U √ PL RETEN LAT 1,2 - OFF
LOGIC PWR SYS 1(SYS 2) - OFF
√ PL SEL - 1

R13L PL BAY MECH PWR SYS 1(2) - OFF

26. UNPWR FSS CCTV

SM 211 SSE OVERVIEW

CCTV PWR OFF - ITEM 6 EXEC (*) (wait 15 sec)

* If CCTV PWR OFF, not (*), do not *
* perform CCTV ENA - OFF *

CCTV ENA OFF - ITEM 4 EXEC (*)

Go to FLIGHT PLAN

RMS QUICK DEPLOY

M = MANDATORY items: Must be successfully completed for deploy
 = Items which enhance mission capabilities: Attempt and press

TAB	PROCEDURE
G R A P P L E	<p>HST GRAPPLE</p> <ul style="list-style-type: none"> <input type="checkbox"/> M MNVR RMS TO PRE-GRAPPLE POSN <input type="checkbox"/> M GRAPPLE
U N B E R T H	<p>HST UMB DISCONNECT</p> <ul style="list-style-type: none"> <input type="checkbox"/> PWR XFER PRECHECKS <input type="checkbox"/> M DEADFACE UMB <input type="checkbox"/> M SET UP UMB DISCONNECT <input type="checkbox"/> M DISCONNECT UMB <p>HST UNBERTH</p> <ul style="list-style-type: none"> <input type="checkbox"/> M OPEN BERTHING LATCH 3 <input type="checkbox"/> M OPEN BERTHING LATCH 1 <input type="checkbox"/> M OPEN BERTHING LATCH 2 <input type="checkbox"/> M MNVR RMS TO FSS HOVER POSN <input type="checkbox"/> M MNVR RMS TO HST RELEASE POSN <input type="checkbox"/> M MNVR ORBITER TO RELEASE ATT

TAB	PROCEDURE
R E L E A S E O P S	<p>HST RELEASE PREP</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> ADI SETUP KU RDR SETUP UPDATE ORBITER WEIGHT <input checked="" type="checkbox"/> RMS SETUP <input checked="" type="checkbox"/> ENABLE RNDZ NAV <input type="checkbox"/> VERIFY RF LINK AND PCS CONFIG <input type="checkbox"/> TIGHTEN DEADBANDS <p>HST RELEASE (RMS AND HST SYSTEMS)</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> RELEASE PREPS <input type="checkbox"/> HST SUNPOINT MACRO INIT <input checked="" type="checkbox"/> RELEASE <input checked="" type="checkbox"/> SEP 1 BURN <input checked="" type="checkbox"/> HST TO SUNPOINT <p>HST RELEASE (ORBITER)</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> RELEASE <input checked="" type="checkbox"/> SEP 1 BURN <input type="checkbox"/> HST TO SUNPOINT <input checked="" type="checkbox"/> MNVR TO TARGET TRACK ATT RADAR ACQUISITION RR NAVIGATION <input checked="" type="checkbox"/> SEP 2 BURN CONFIG KU FOR COMM

HST PADS

HST RMS RELEASE PADS	5-3
BACKAWAY DEPLOY PADS	5-4

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HST RMS RELEASE PAD
 RELEASE ORBIT
 RETROGRADE/POSIGRADE

WINDOW OPEN MET = / : :

WINDOW CLOSE MET = / : :
 (NLT SS-10 MIN)

ORBITER WEIGHT = (3-2)

RELEASE ATT RA = . (2-10,3-4)

DEC = .

OMICRON = .

TGT TRK OMICRON = . (3-7)

|
|
|

HST RMS RELEASE PAD
 RELEASE ORBIT
 RETROGRADE/POSIGRADE

WINDOW OPEN MET = / : :

WINDOW CLOSE MET = / : :
 (NLT SS-10 MIN)

ORBITER WEIGHT = (3-2)

RELEASE ATT RA = . (2-10,3-4)

DEC = .

OMICRON = .

TGT TRK OMICRON = . (3-7)

|
|
|

HST BACKAWAY DEPLOY PAD

DEPLOY ORBIT

WINDOW OPEN MET = / : :

WINDOW CLOSE MET = / : :
(NLT SS-10 MIN)

RELEASE ATT RA = . (4-2)

DEC = .

OMICRON = .

ORBITER WEIGHT = (4-3)

HST BACKAWAY DEPLOY PAD

DEPLOY ORBIT

WINDOW OPEN MET = / : :

WINDOW CLOSE MET = / : :
(NLT SS-10 MIN)

RELEASE ATT RA = . (4-2)

DEC = .

OMICRON = .

ORBITER WEIGHT = (4-3)

OFF-NOMINAL RMS OPS

SJ HST GRAPPLE	6-2
UNBERTH	6-8
RELEASE	6-16

**OFF-NOM
RMS OPS**

SJ HST GRAPPLE

OFF-NOM
RMS OPS

M 1. SJ MNVR RMS TO PRE-GRAPPLE POSN

SM 210 HST SYS

- ✓TLM COUNT – Incr
- ✓HGA –V3 HNG – STWD

SM 94 PDRS CONTROL

- ✓PL ID, ITEM 3: 0
- ✓INIT ID, ITEM 24: 0

If SINGLE MODE available:

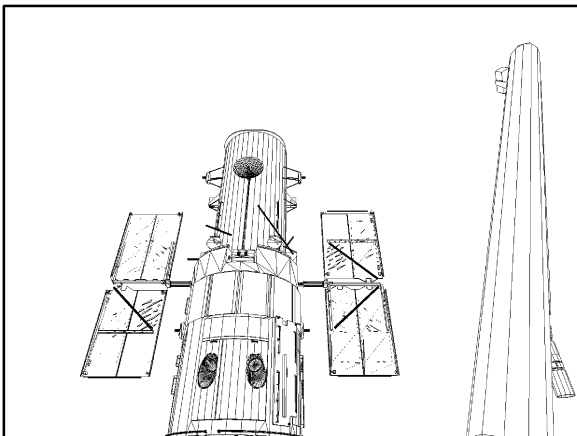
- RATE – as reqd (VERN within 10 ft)
- BRAKES – OFF (tb-OFF)

MODE – best available

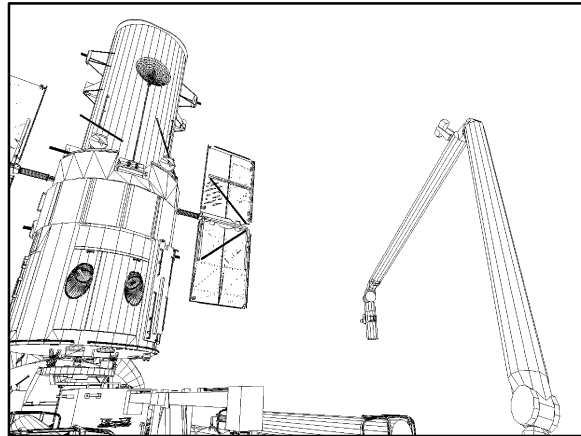
Mnvr to pre-grapple posn:

	SY	SP	EP	WP	WY	WR	
RMS Ext Park	+28.6	+78.2	-85.8	-72.8	+17.0	-10.0	
1	-29.3						
2		+83.2					
3			-79.6				
4				-3.6			
5					+29.3		
6						+0.0	
Pre-Grapple	-29.3	+83.2	-79.6	-3.6	+29.3	+0.0	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1024	-46	-755	0	0	0	0

Start:
RMS Ext Park



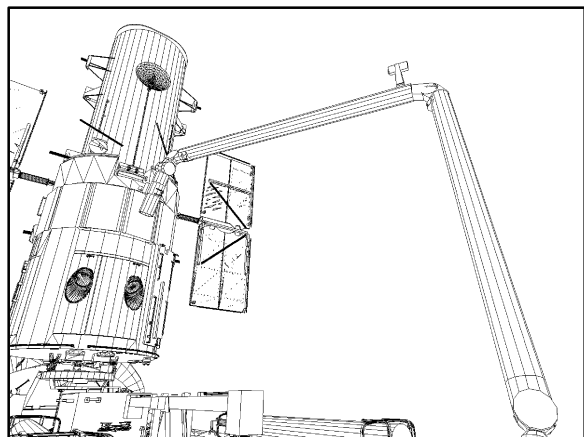
CCTV A (0,35)



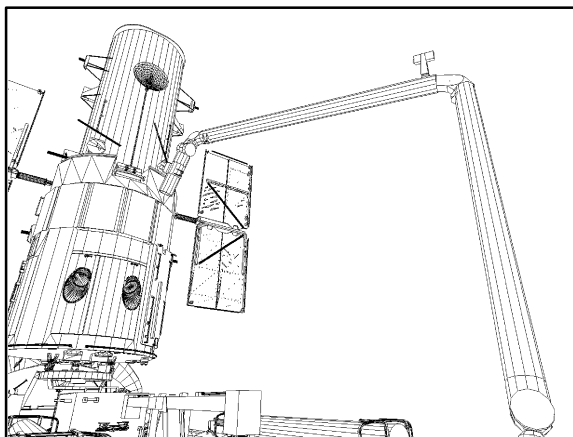
CCTV D (35,25)

Step 1:
Drive $-SY$ from $+28.6^\circ$ to -29.3°

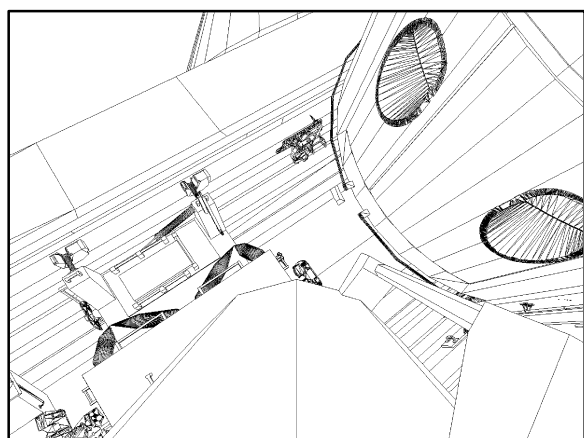
Step 2:
Drive $+SP$ from $+78.2^\circ$ to $+83.2^\circ$



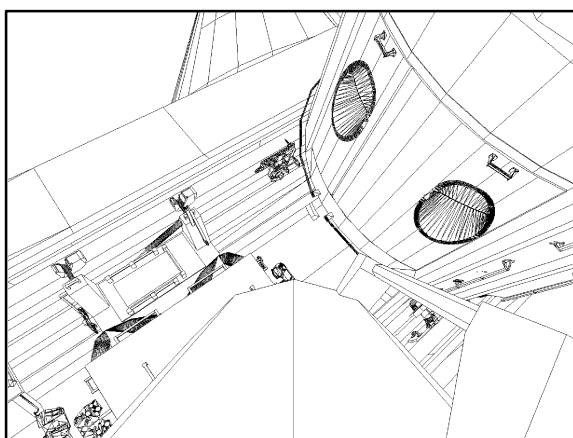
CCTV D (35,25)



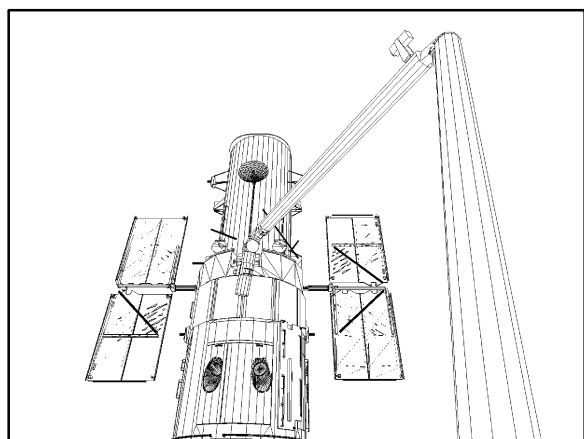
CCTV D (35,25)



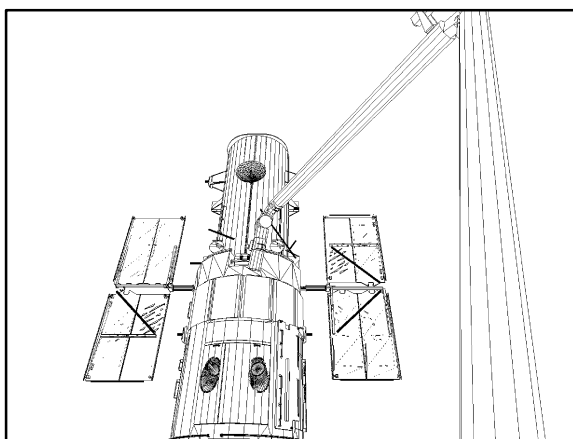
WRIST



WRIST



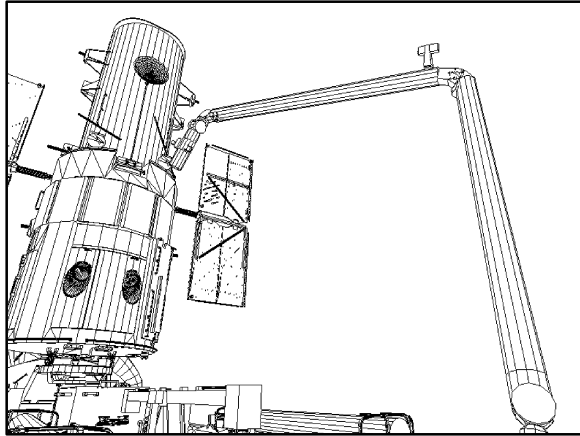
CCTV A (0,35)



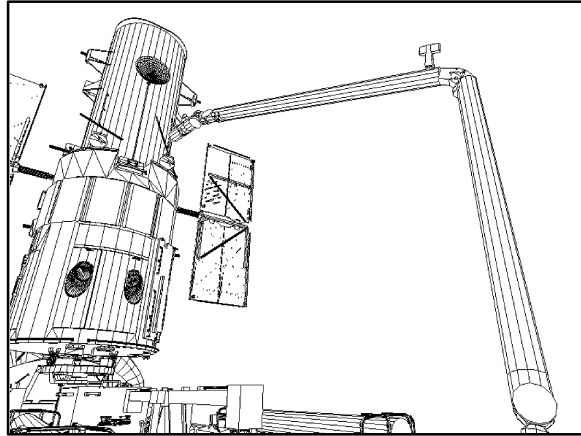
CCTV A (0,35)

Step 3:
Drive +EP from -85.8° to -79.6°

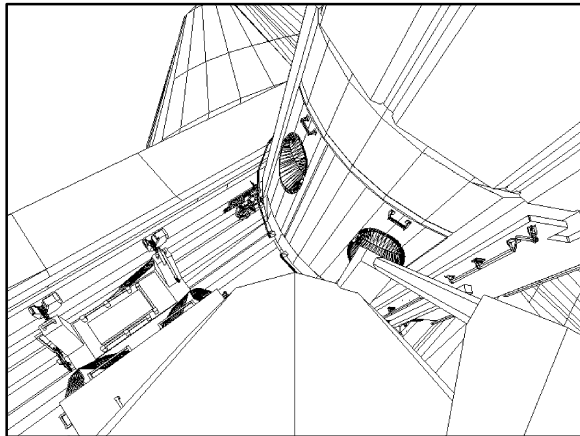
Step 4:
Drive +WP from -72.8° to -3.6°



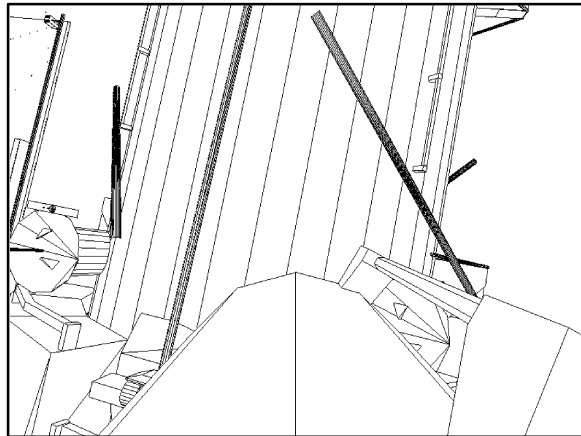
CCTV D (35,25)



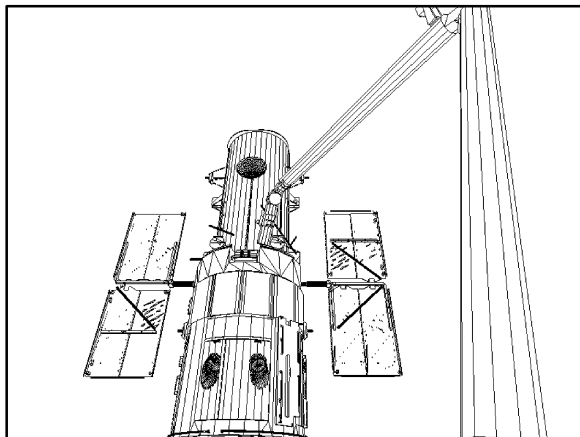
CCTV D (35,25)



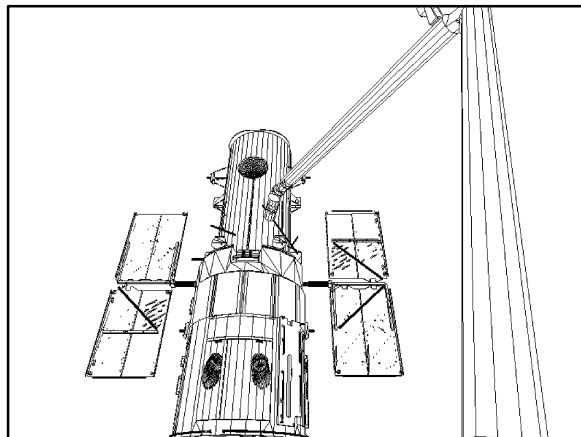
WRIST



WRIST

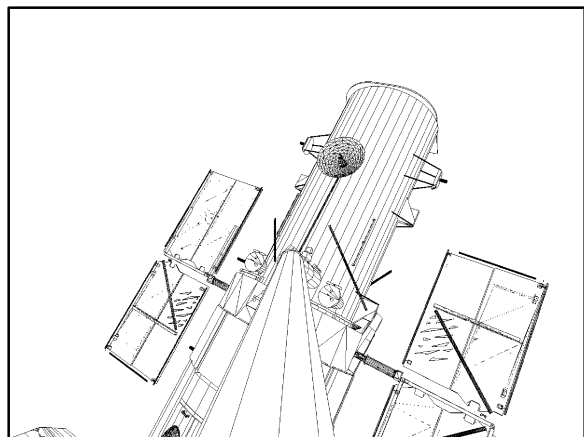


CCTV A (0,35)



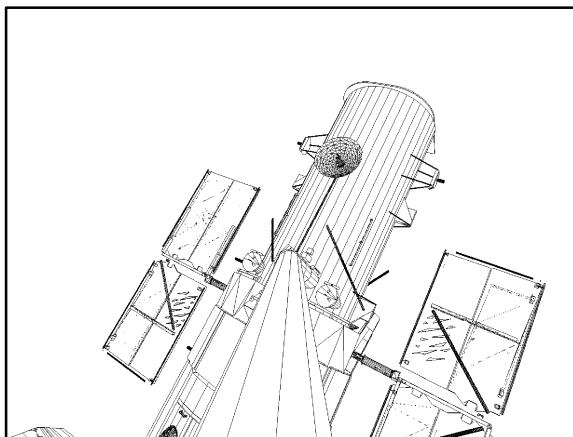
CCTV A (0,35)

Step 5:
Drive +WY from +17.0° to +29.3°

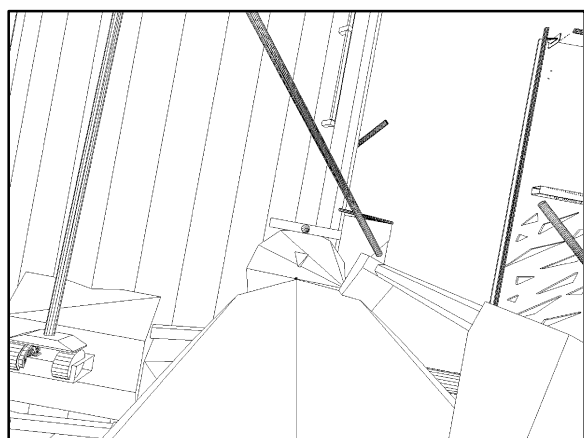


ELBOW (0,0)

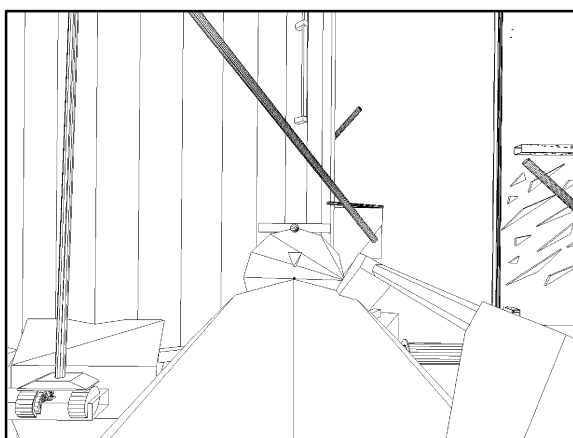
Step 6:
Drive +WR from -10.0° to +0.0°



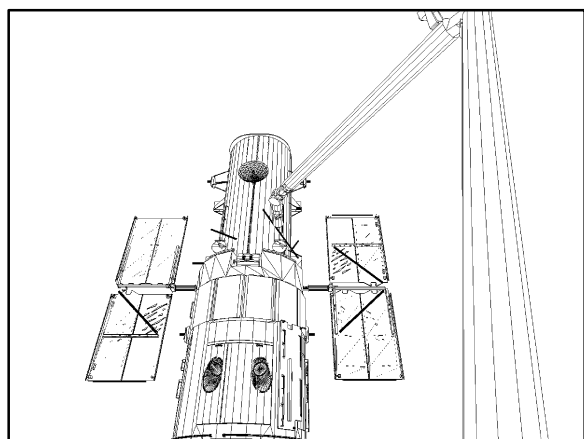
ELBOW (0,0)



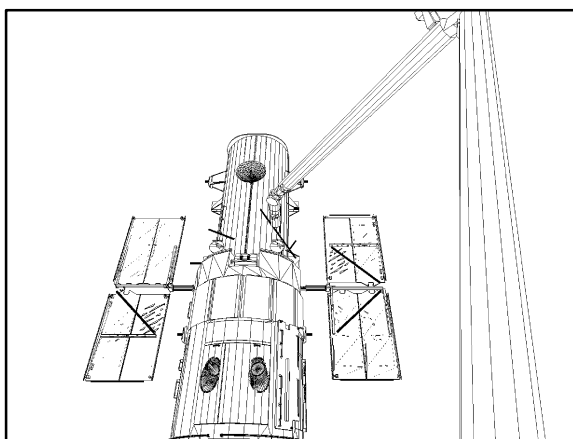
WRIST



WRIST



CCTV A (0,35)



CCTV A (0,35)

BRAKES – ON (tb-ON)
 MODE – not DIRECT
 JOINT – CRIT TEMP

M 2. SJ GRAPPLE

MON 1(2) – install PDRS TARGET OVERLAY FOR CTVM (PDRS OPS)
 VID OUT – MON 1(2)
 IN – RMS WRIST

✓DAP: A10/AUTO (FREE)/VERN

If SINGLE MODE available:

RATE – VERN (RATE MIN tb-ON)
 BRAKES – OFF (tb-OFF)

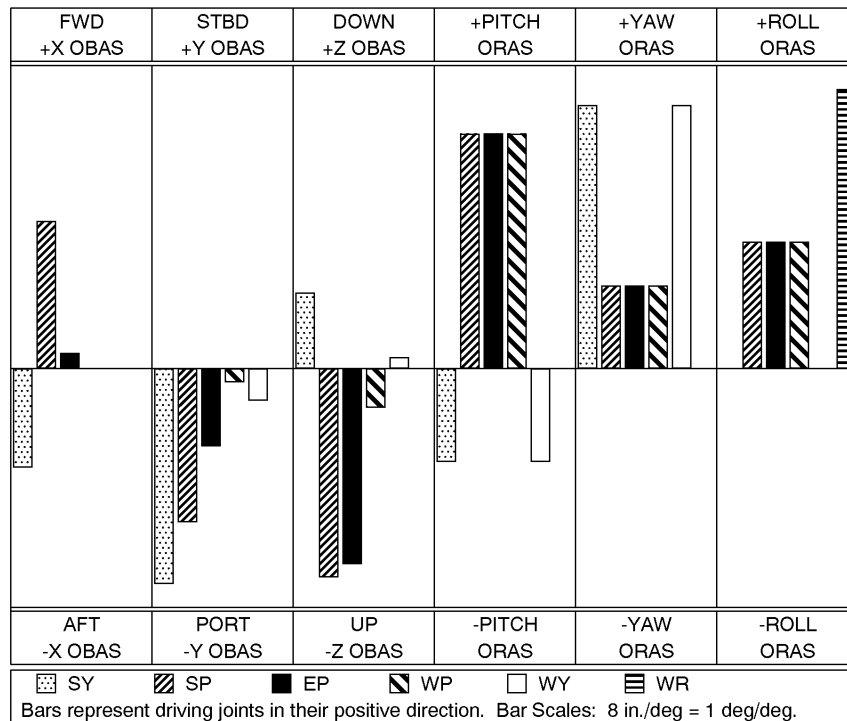
MODE – best available

FSS Latched posn: (values recorded from PDRS FS)

	X	Y	Z	PITCH	YAW	ROLL	PL ID
Expected							0
Expected							2
	SY	SP	EP	WP	WY	WR	
Expected							

Drive joints per histogram until EE within +V2 GF grapple envelope

BERTHED HST GRAPPLE



To get:	Drive:	To get:	Drive:
+X (fwd)	+SP, -SY	+PITCH	+WP, +EP
+Y (stbd)	-SY, -SP	+YAW	+WY, +SY
+Z (down)	-EP, -SP	+ROLL	+WR

Driving:	Results In:	Driving:	Results In:
+SY	-Y (port), +YAW	+WP	-Z (up), +PITCH
+SP	-Z (up), +PITCH	+WY	-Y (port), +YAW
+EP	-Z (up), +PITCH	+WR	+ROLL

Δ SY	Δ SP	Δ EP	Δ WP	Δ WY	Δ WR
+4.4	-13.0	+16.0	-3.0	-4.4	+0.0

A6U

DAP: FREE

CAUTION
Monitor EE tb timing to prevent EE motor burnout

EE MODE – AUTO

EE CAPTURE sw – depress (mom)

<input checked="" type="checkbox"/> RIGID <input type="checkbox"/> DERIGID	<input type="checkbox"/> CLOSE <input type="checkbox"/> OPEN	<input type="checkbox"/> CAPTURE <input type="checkbox"/> EXTEND	<p>CRITICAL TIMES (28 sec total): CAPTURE tb – gray, then CLOSE tb – gray, 3 sec max, then RIGID tb – gray, 25 sec max</p>
---	---	---	--

EE MODE – OFF

- * If limping not available: *
- * BRAKES – OFF (tb-OFF) (if available) *
- * MODE – TEST, ENTER *
- * Wait 5 sec *

BRAKES – ON (tb-ON)
 MODE – not DIRECT

A6U

DAP: A10/AUTO/VERN(ALT)

VTR – STOP

SM 94 PDRS CONTROL

PL ID – ITEM 3 +2 EXEC
 INIT ID – ITEM 24 +2 EXEC

Go to HST UMB DISCONNECT (UNBERTH)

SJ HST UNBERTH

A3 M 1. SJ MNVR RMS TO FSS HOVER POSN
MON 1(2) – install FSS/HST SJ UNBERTHING OVERLAY
(CUE CARD CONFIG)
VID OUT – MON 1(2)
IN – FSS

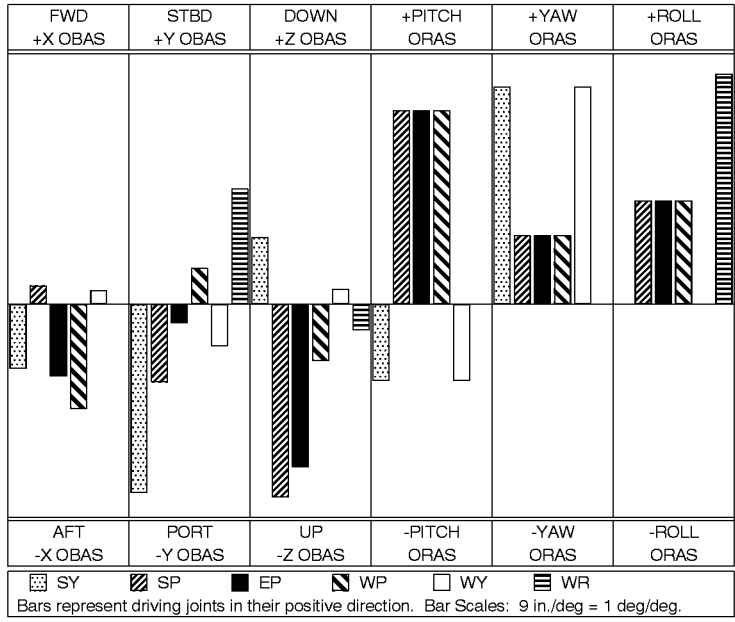
A6U ✓DAP: FREE

If SINGLE MODE available:
RATE – VERN (RATE MIN tb–ON)
BRAKES – OFF (tb–OFF)

MODE – best available

Drive joints in order indicated on FSS/HST SJ UNBERTHING OVERLAY and
per histogram until berthing pins ~5 ft above guides (Z = -567)

HST UNBERTH



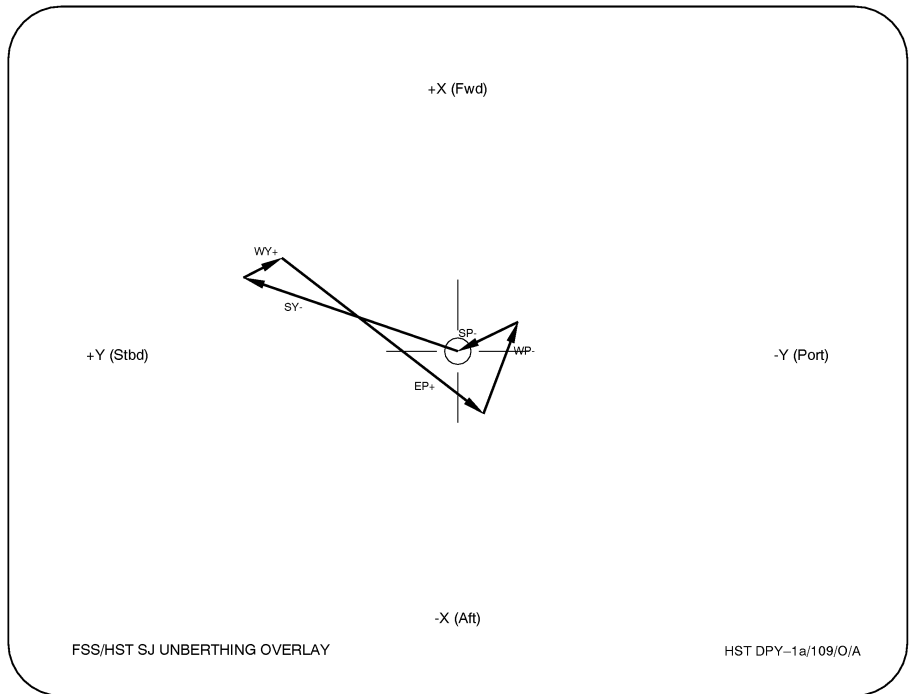
To get:	Drive:
+X (fwd)	-WP, -EP
+Y (stbd)	-SY, +WR
+Z (down)	-SP, -EP

To get:	Drive:
+PITCH	+WP, +EP
+YAW	+WY, +SY
+ROLL	+WR

Driving:	Results In:
+SY	-Y (port), +YAW
+SP	-Z (up), +PITCH
+EP	-Z (up), +PITCH

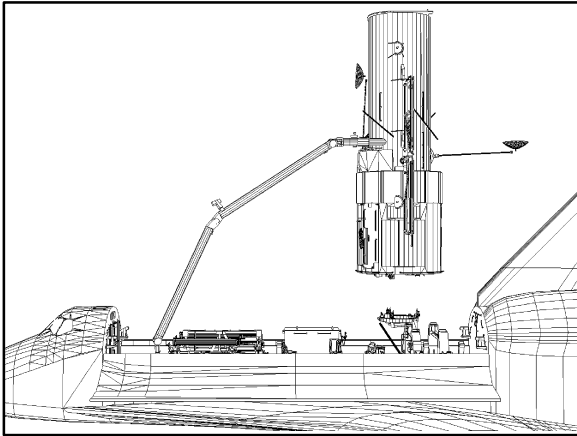
Driving:	Results In:
+WP	-X (aft), +PITCH
+WY	-Y (port), +YAW
+WR	+Y (stbd), +ROLL

ΔSY	ΔSP	ΔEP	ΔWP	ΔWY	ΔWR
-3.1	-9.0	+27.0	-18.0	+3.1	+0.0

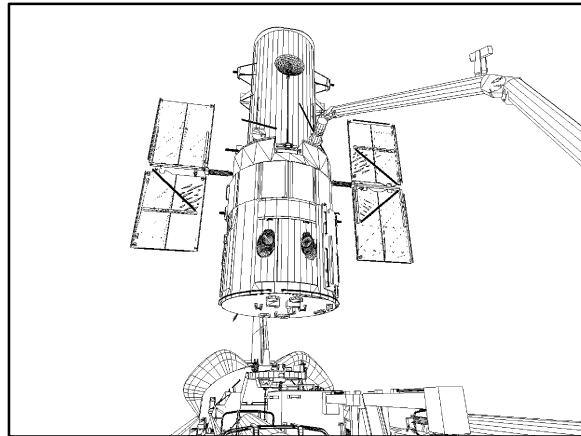


Mnvr to FSS Hover posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1128	12	-567	0	0	0	2
SY	SP	EP	WP	WY	WR	
-28.0	+61.3	-36.9	-24.4	+28.0	+0.5	



PORT



CCTV D (10,25)

BRAKES – ON (tb-ON)

If SINGLE MODE available:
BRAKES – OFF (tb-OFF)

MODE – not DIRECT

A6U

If attitude maintenance reqd,
DAP: A/AUTO/VERN(ALT)

2. UNPWR FSS CCTV

When FSS CCTV no longer reqd:

SM 211 SSE OVERVIEW

CCTV PWR OFF – ITEM 6 EXEC (*) (wait 15 sec)

* If CCTV PWR OFF, not (*), do not *
 * perform CCTV ENA – OFF *

CCTV ENA OFF – ITEM 4 EXEC (*)

M

3. MNVR RMS TO HST RELEASE POSN

✓VTR recording and timer

SM 94 PDRS CONTROL

PL ID – ITEM 3 +1 EXEC

INIT ID – ITEM 24 +1 EXEC

A6U

✓DAP: FREE

Load DAPs A15 and B12

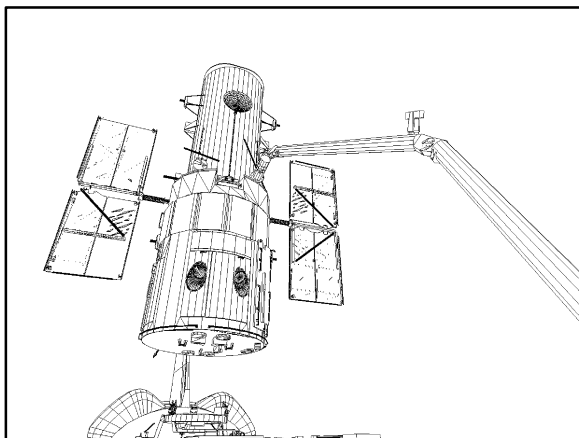
If SINGLE MODE available:
 RATE - VERN (RATE MIN tb-ON)
 BRAKES - OFF (tb-OFF)

MODE - best available

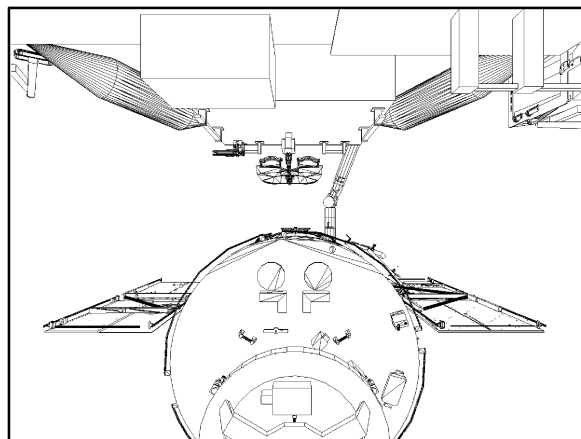
Mnvr to Release posn:

	SY	SP	EP	WP	WY	WR	
FSS Hover	-28.0	+61.3	-36.9	-24.4	+28.0	+0.5	
1		+90.0					
2						+8.5	
3			-68.5				
4	-53.4						
5				-37.3			
6					+0.0		
Release	-53.4	+90.0	-68.5	-37.3	+0.0	+8.5	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-878	112	-853	0	305	0	1

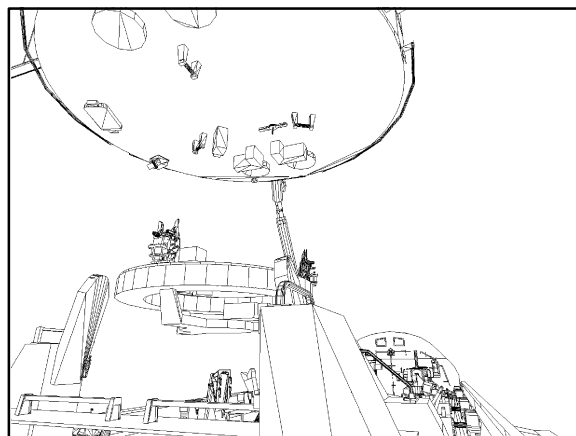
Start:
 FSS Hover



CCTV D (20,30)



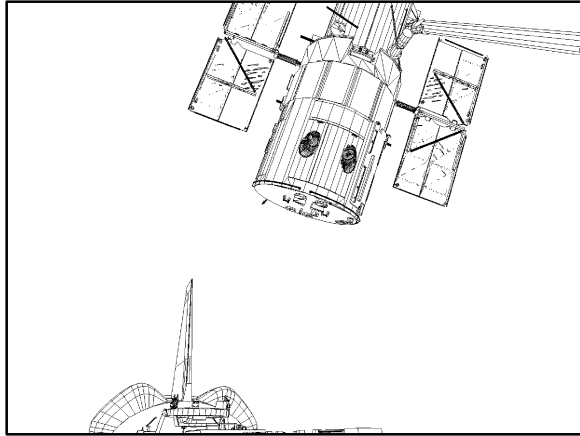
KEEL



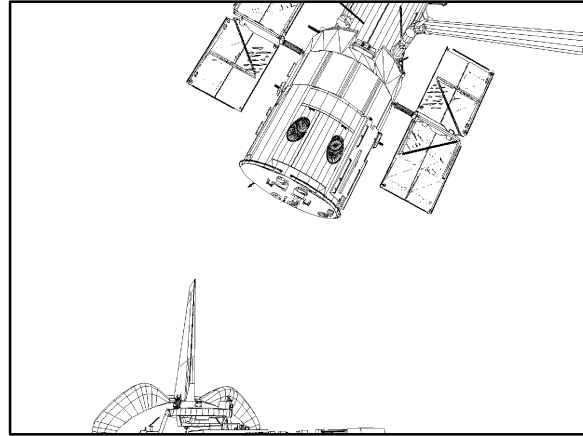
CCTV C (-20,20)

Step 1:
Drive +SP from +61.3° to +90.0°

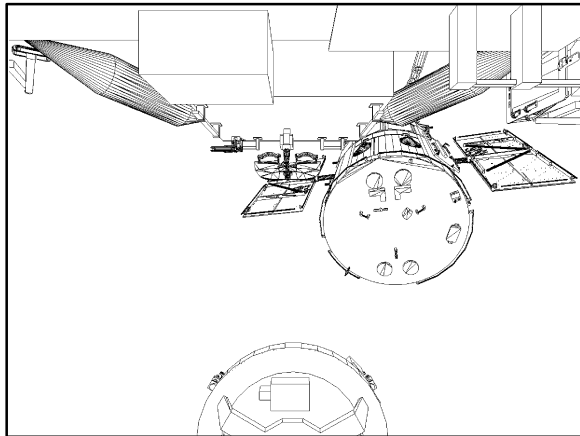
Step 2:
Drive +WR from +0.5° to +8.5°



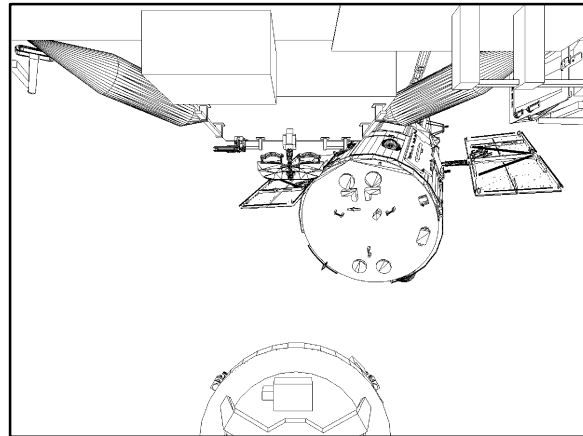
CCTV D (20,30)



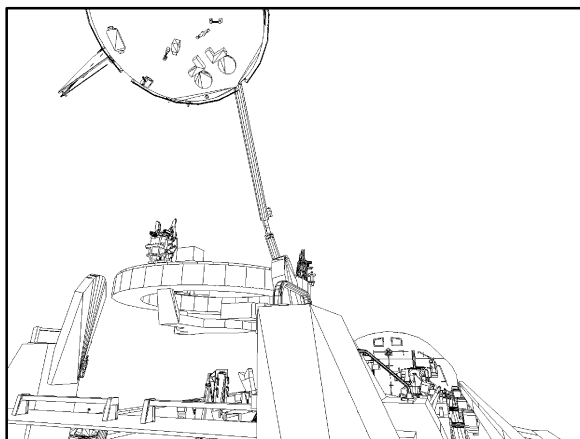
CCTV D (20,30)



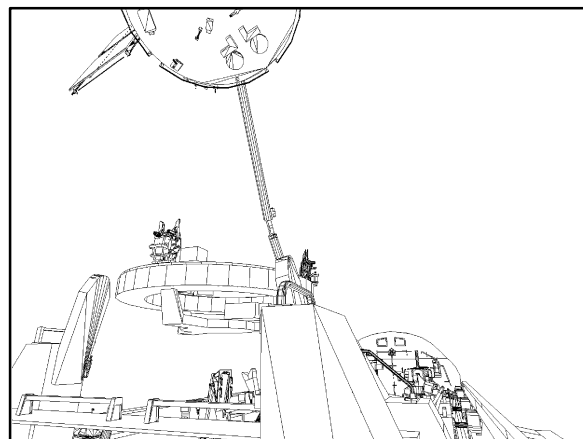
KEEL



KEEL

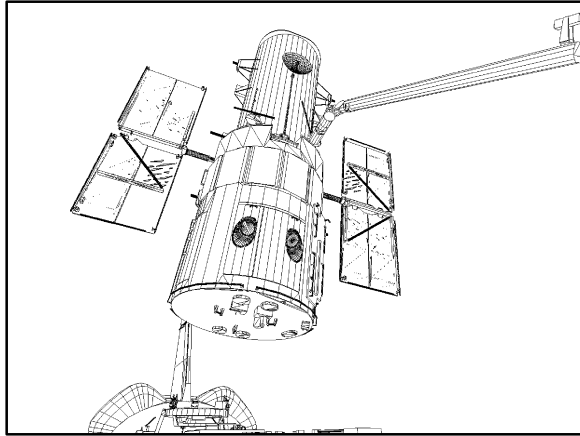


CCTV C (-20,20)



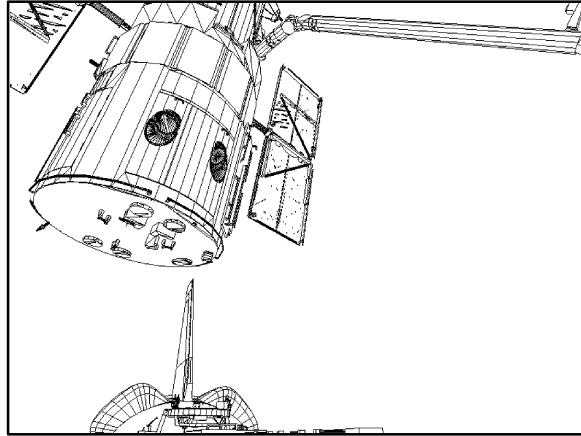
CCTV C (-20,20)

Step 3:
Drive -EP from -36.9° to -68.5°

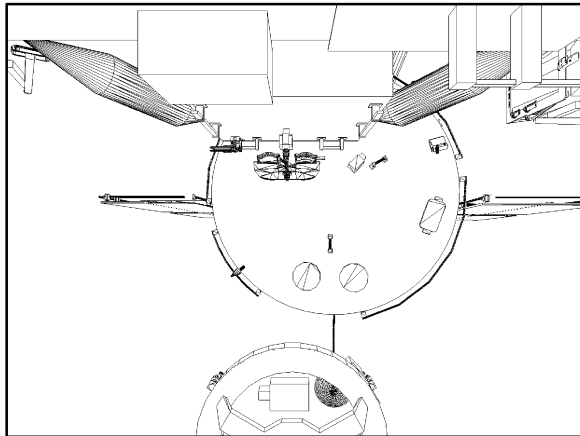


CCTV D (20,30)

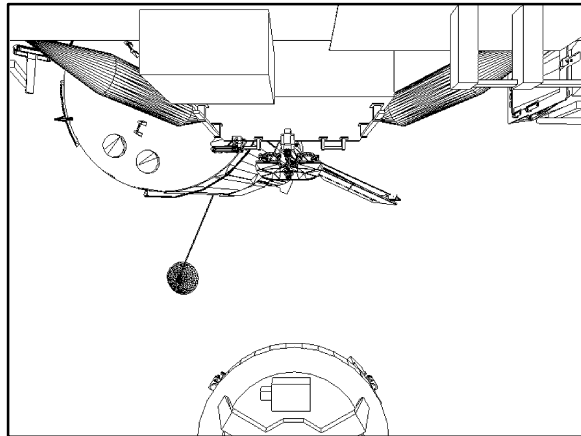
Step 4:
Drive -SY from -28.0° to -53.4°



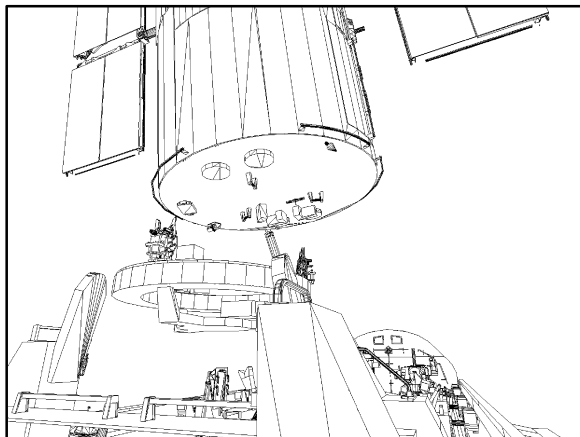
CCTV D (20,30)



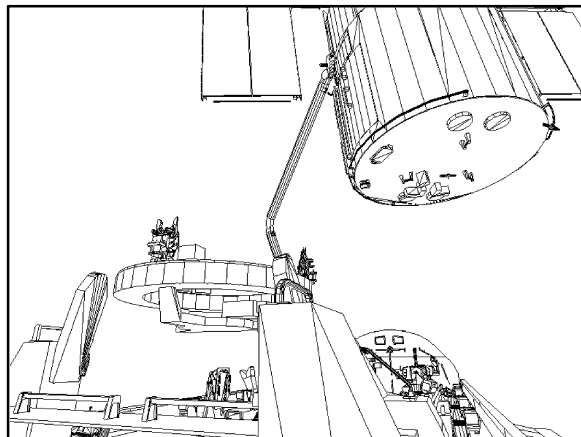
KEEL



KEEL

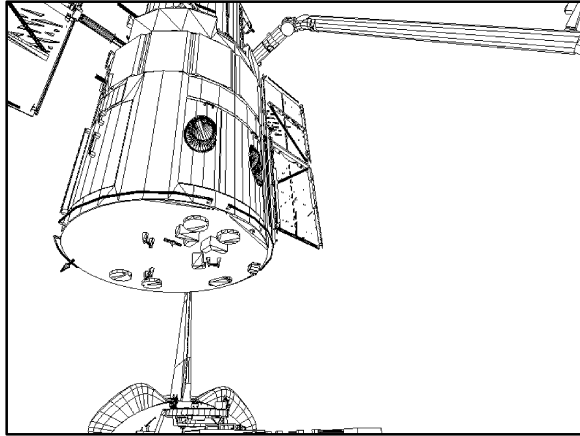


CCTV C (-20,20)



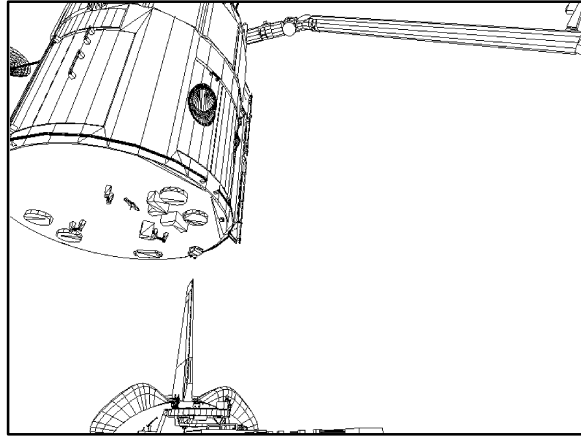
CCTV C (-20,20)

Step 5:
Drive $-WP$ from -24.4° to -37.3°

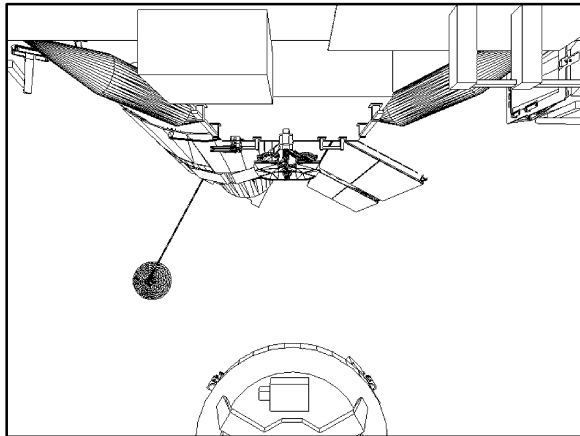


CCTV D (20,30)

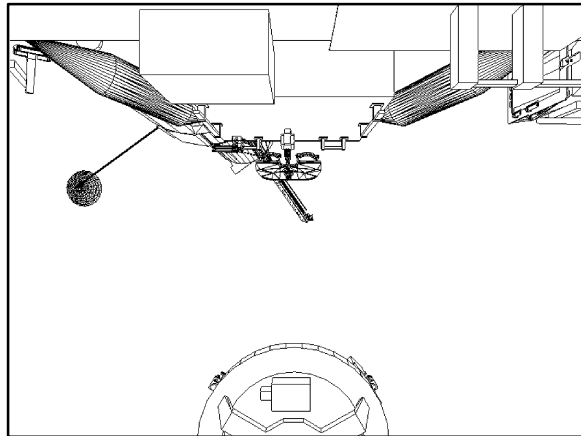
Step 6:
Drive $-WY$ from $+28.0^\circ$ to $+0.0^\circ$



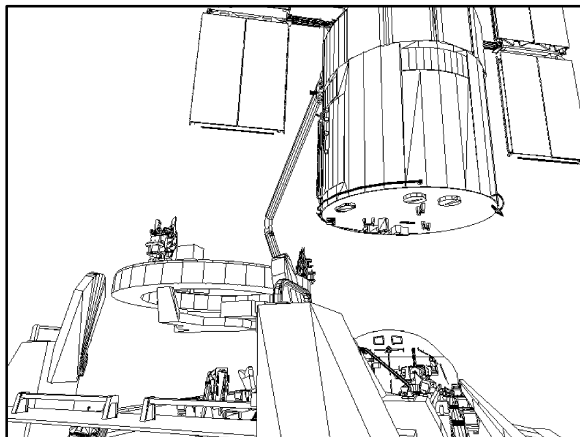
CCTV D (20,30)



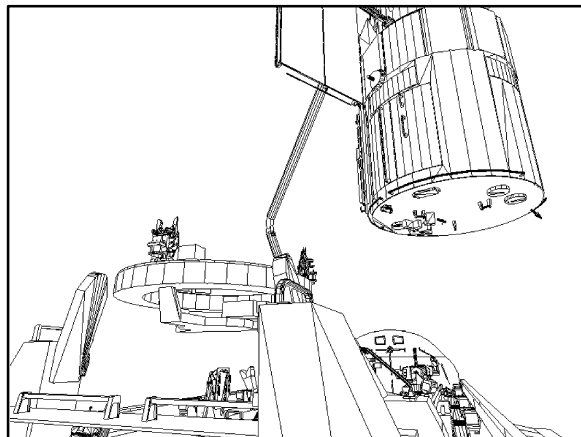
KEEL



KEEL



CCTV C (-20,20)



CCTV C (-20,20)

BRAKES – ON (tb-ON)

If SINGLE MODE available:
BRAKES – OFF (tb-OFF)

MODE – not DIRECT
JOINT – CRIT TEMP

VTR – STOP

M 4. MNVR ORBITER TO RELEASE ATT

GNC UNIV PTG

TRK OPTION:

✓TGT ID +5
RA ___ ___ ___ . ___ (per PAD)
DEC ___ ___ ___ . ___ (per PAD)
✓BODY VECTOR +5
P +1 8 0.0
Y +5 5.0
OM ___ ___ ___ . ___ (per PAD)

Init TRK – ITEM 19 EXEC (CUR – *)
DAP: A15/AUTO/VERN(ALT)

Go to HST RELEASE PREP (RELEASE OPS)

RMS and HST Systems	Orbiter
<p>SJ HST RELEASE</p> <p>[M] 1. <u>RELEASE</u></p> <p>A7U</p> <ul style="list-style-type: none"> * If backup pwr reqd: * * √B/U PL REL – OFF * * √BRAKES – ON (tb-ON) * * <u>NOTE</u> * * Spurious fault msgs may occur * * when PORT RMS deselected * * RMS PWR – B/U * * SEL – OFF * * SEL – PORT * * B/U PL REL – ON (10 sec) * * – OFF * * Alternate joints until arm clear of GF pin: * * Drive B/U SP+ * * Drive B/U WP- * * When clear of GF pin: * * Drive B/U SY+ to mnvr arm 5 ft * * (minimum) clear of HST * <p>RHC/A8U</p> <p>If SINGLE MODE available: RATE – as reqd (VERN within 10 ft) √BRAKES – OFF (tb-OFF)</p> <p>A8U</p> <p>MODE – best available</p> <div style="border: 1px solid black; padding: 2px; margin: 5px 0;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>Monitor EE tb timing to prevent EE motor burnout</p> <p>Monitor clearance between RMS and -V3 HGA during release and back-away mnvrs</p> </div> <p>EE MODE – MAN MAN CONTR – DERIGID (hold until DERIGID tb-gray, 5 sec max)</p> <p>RELEASE sw – depress (hold until OPEN tb-gray, 3 sec max)</p> <p>Alternate joints until arm clear of GF pin: Drive SP+ Drive WP-</p> <p>-:00:00</p>	<p>-03:00</p> <p>[M] 1. <u>RELEASE</u></p> <div style="border: 1px solid black; padding: 2px; margin: 5px 0;"> <p style="text-align: center;"><u>GNC 20 DAP CONFIG</u></p> <p>Change DAP A,B to A7,B7 DAP TRANS: PULSE/PULSE/PULSE, LO Z DAP: A7/FREE/PRI</p> </div> <p>-00:00</p> <p>√Release initiated Record Release MET ___/___:___:___ (release)</p>

RMS and HST Systems	Orbiter
<p>When clear of GF pin: Drive SY+ to mnvr arm 5 ft (minimum) clear of HST</p> <p>EE MAN CONTR – DERIGID (hold until EXTEND tb-gray, 20 sec max)</p> <p>MODE – OFF</p> <p>BRAKES – ON (tb-ON) MODE – not DIRECT JOINT – CRIT TEMP</p> <p>* If HST not released by EVENT TIMER = +2:45, * * disable HST Sunpoint macro * * SM 210 HST SYS * * PCS SNPT DIS – ITEM 8 +9 9 EXEC (YES) * * GNC 20 DAP CONFIG * * LOAD DAPs A15 and B12 * * √DAP: no LO Z * * * * If SINGLE MODE available: * * √BRAKES – OFF (tb-OFF) * * * * DAP: A/AUTO/VERN(ALT) * * √BRAKES – ON (tb-ON) *</p> <p>M 2. <u>SEP 1 BURN</u> √SEP 1 initiated</p> <p>SM 94 PDRS CONTROL PL ID – ITEM 3 +0 EXEC INIT ID – ITEM 24 +0 EXEC</p>	<p>* If HST not released by EVENT TIMER = +2:45, * * disable HST Sunpoint macro * * SM 210 HST SYS * * PCS SNPT DIS – ITEM 8 +9 9 EXEC (YES) * * GNC 20 DAP CONFIG * * LOAD DAPs A15 and B12 * * √DAP: no LO Z * * * * If SINGLE MODE available: * * √BRAKES – OFF (tb-OFF) * * * * DAP: A/AUTO/VERN(ALT) * * √BRAKES – ON (tb-ON) *</p> <p>M 2. <u>SEP 1 BURN</u> When RMS motion has stopped: AFT THC: -X(dn) 10 pulses (1.0 fps)</p> <p>Record Release MET: ___/___:___:___ AFT FLT CNTLR PWR – OFF Report TIG to MCC</p> <p>When center of HST in bottom half of Keel Camr (REF BALL PITCH -65deg): DAP: INRTL</p> <p>When pitch rate nulled: DAP: VERN(ALT)</p> <p>A6U ADI ATT – LVLH</p>

RMS and HST Systems	Orbiter
<p data-bbox="411 256 730 310"> <input type="checkbox"/> M 3. <u>HST TO SUNPOINT</u> <u>SM 210 HST SYS</u> </p> <p data-bbox="527 342 753 367">√RCVR 1(2) LOCK - *</p> <p data-bbox="533 394 1041 540"> * If RMS QUICK DEPLOY, activate hardware * * Sunpoint: * * PCS MODE SUNPOINT - ITEM 7 +9 5 EXEC * * - ITEM 7 +9 6 EXEC * * * * Expect 'PDI DECOM FAIL' msg >> * </p> <p data-bbox="186 573 264 594">+03:30</p> <p data-bbox="527 573 743 594">√PCS MODE - SNPT</p> <p data-bbox="186 625 264 646">+03:52</p> <p data-bbox="527 625 751 646">√SNPT DIS - YES >></p> <p data-bbox="548 673 831 721"> * If PCS MODE not SNPT, * * √MCC * </p>	<p data-bbox="1276 256 1675 310"> <input type="checkbox"/> 4. <u>HST TO SUNPOINT</u> √HST Sunpoint mode initiated </p> <p data-bbox="1276 358 1717 412"> <input type="checkbox"/> M 5. <u>MNVR TO TARGET TRACK ATT</u> <u>GNC UNIV PTG</u> </p> <p data-bbox="1402 412 1814 558"> TRK OPTION: TGT ID +1 BODY VECTOR +3 √P +90.0 √Y +0.0 OM + 180.0 _____.____ (per PAD) </p> <p data-bbox="1054 886 1115 907">SEP 1</p> <p data-bbox="1402 886 1759 907">Init TRK - ITEM 19 EXEC (CUR - *)</p> <p data-bbox="1054 937 1129 958">+05:00</p> <p data-bbox="1402 937 1675 958">DAP: A7/AUTO/VERN(ALT)</p>

RMS and HST Systems	Orbiter
<p>Actions Complete</p>	<p>When SV UPDATE POS < 0.03 and MARK ACPT > 9, SV SEL – ITEM 4 EXEC (FLTR)</p> <p>When R > 400 ft, KU RDR OUTPUT – HI</p> <p>A1U</p> <p>F6 M 8. <u>SEP 2 BURN</u> √ADI ATT – LVLH</p> <p>F7</p> <p>If SEP 1 was posigrade: When orbiter on HST -Rbar (Fwd ADI Pitch = 0 deg): Fwd FLT CNTLR PWR – ON DAP: A/AUTO/PRI DAP TRANS: NORM/PULSE/PULSE, LO Z Fwd THC: -X(out) 10 sec (2.5 fps)</p> <p>If SEP 1 was retrograde: When orbiter on HST +Rbar (Fwd ADI Pitch = 0 deg): Fwd FLT CNTLR PWR – ON DAP: A/AUTO/PRI √DAP TRANS: PULSE/PULSE/PULSE, LO Z Fwd THC: -X(out) 10 pulses (1.0 fps)</p> <p>Record MET: ___/___:___:___ (burn init)</p> <p>Fwd FLT CNTLR PWR – OFF DAP: A/AUTO/VERN(ALT) DAP TRANS: PULSE/PULSE/PULSE</p> <p>Report TIG to MCC</p> <p>9. <u>P/TV DEACTIVATION</u> Go to P/TV17 HST RELEASE, DEACTIVATION (PHOTO/TV FS, <u>SCENES</u>)</p>

RMS and HST Systems	Orbiter
<p style="text-align: center;">Actions Complete</p>	<p>10. <u>CONFIG KU FOR COMM</u> When RANGE > 5000 FT: <u>GNC 33 REL NAV</u> INH RNG - ITEM 18 EXEC (*) RDOT - ITEM 21 EXEC (*) Angles - ITEM 24 EXEC (*) KU ANT ENA - ITEM 2 EXEC (no *)</p> <p>A1U KU MODE - COMM √SEL - GPC CNTL - CMD</p> <p>A2 DIGI-DIS SEL - EL/AZ</p> <p> DAP: No LO Z</p> <p> Go to FLIGHT PLAN</p>

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REF DATA

HST DEPLOY GO/NO-GO SUMMARY

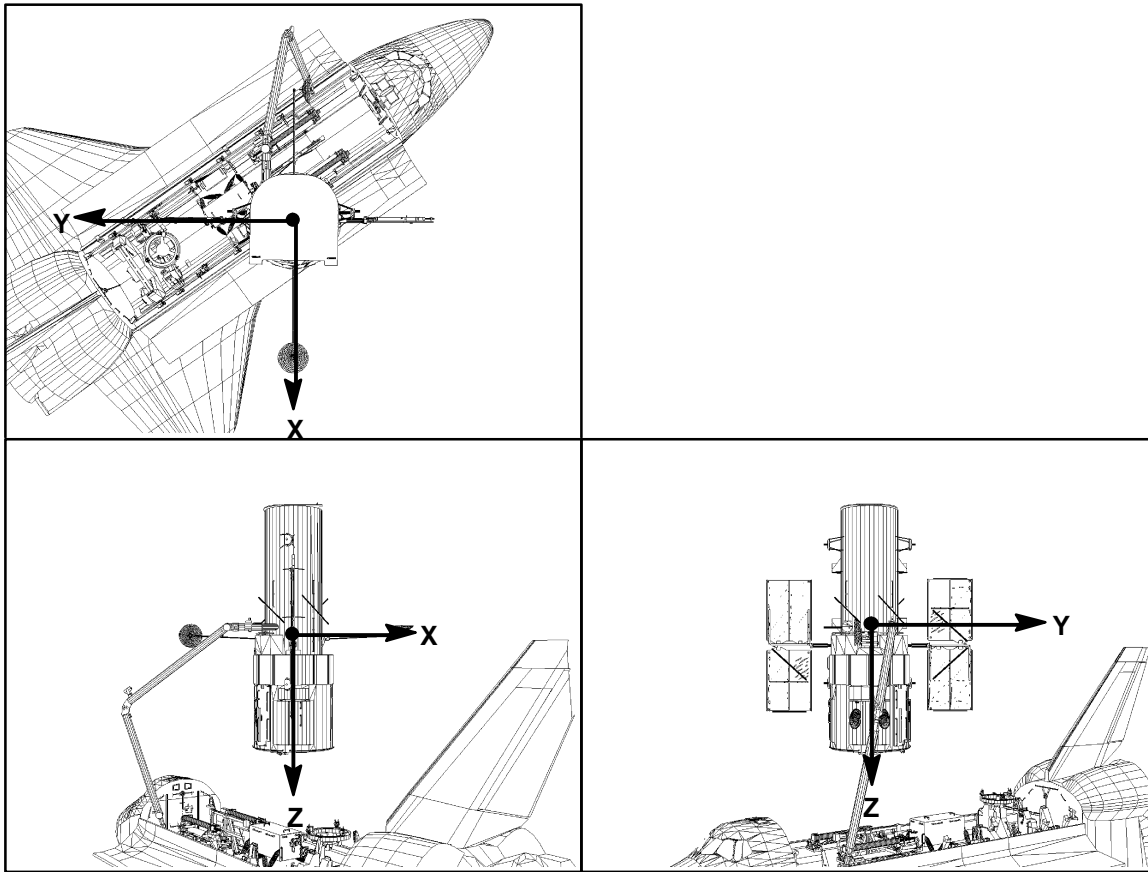
REF DATA

SYSTEM	FAILURE/CONSTRAINT	DPLY [1]	RULE REF
HST	PCS ↓ COMM ↓ AD FAILED CLOSED BATTERY SOC < 265 A-HR	DLY DLY DLY DLY	109_2A-42 109_2A-42 109_2A-42
COMM	1 PSP ↓ 2 PSP ↓ 1 PI ↓ 2 PI ↓ PDI TELEMETRY DOWNLINK ↓ RNDZ RADAR ↓	GO DLY GO DLY DLY GO	
PROP RCS	VRCS ↓ PRCS ROT, ANY AXIS ↓ PRCS TRANS, -X AXIS ↓ PRCS TRANS, +X OR Y AXIS OR -Z ↓ PRCS TRANS, LOSS OF +Z REDUND PRCS TRANS, LOW-Z ↓ RCS LEAK FRCS ↓	GO [12] DLY [12] DLY [2] DLY GO GO [3] DLY [4] DLY [5]	
PROP OMS	1 OME ↓ 1 HE TK LEAK/FAIL PROP TK LEAK/FAIL	GO GO [6] GO [6]	
GNC	1 IMU ↓ 2 IMU ↓ OR IMU DLMA AFT THC CONTACTS: 3 ±X ↓ OR 3 ±Y ↓ OR 2 -Z ↓ FWD & AFT THC CNTCS: 4 +Z ↓ [19] AFT RHC CHANNELS: 3 ↓ ANY AXIS 2 STAR TRACKER ↓ RNDZ RADAR ↓ COAS ↓ LOW-Z ATT CTL ↓	GO DLY [11] DLY DLY GO GO GO GO GO [12]	109_2A-45
PDRS	RMS ↓ MCIU ↓ EE ↓	DLY [7] GO [8] DLY [7]	109_12A-2 109_12A-15
DPS	1 OF 2 GNC GPC'S ↓ 1 OF 3 GNC GPC'S ↓ SM GPC ↓ ANY 2 GPC'S ↓ (OR RS SPLIT) 1 MDM (FF, FA, PL) ↓	DLY [9] GO [10] DLY [9] DLY GO	

NOTES:

- [1] HST MUST ULTIMATELY BE DEPLOYED SINCE IT CANNOT BE RETURNED TO EARTH
- [2] IF NOT RECOVERABLE, DEPLOY USING NORM Z +Z SEP OR GENERIC NO FRCS TECHNIQUE
- [3] USE NOMINAL DEPLOY PROCEDURES (SINGLE -X JET IS ALL THAT IS REQUIRED), RETAIN LOW Z DAP SELECTION FOR ATTITUDE CONTROL
- [4] DEPLOY WITH APERTURE DOOR CLOSED
- [5] DEPLOY USING GENERIC NO FRCS TECHNIQUE
- [6] EXPEDITE DEPLOY
- [7] IF NOT RECOVERABLE, DEPLOY USING BACKAWAY DEPLOY
- [8] PRIOR TO UNBERTH, PERFORM MCIU IFM UNLESS IT CAUSES ALL RELEASE OPPORTUNITIES TO BE MISSED FOR THE DAY
- [9] DELAY TO INSURE MINIMUM GNC/SM GPC REQUIREMENTS (DUAL GNC GPC & SINGLE SM GPC REQUIRED)
- [10] RESTRING TO RECOVER ALL STRINGS
- [11] GO WITH ONE IMU IF SEP1 HAS ENOUGH IN-PLANE VELOCITY COMPONENT TO AVOID RECONTACT WITHOUT SEP-2 BEING PERFORMED
- [12] EITHER VERNIER OR PRCS LOW Z ROTATIONAL CONTROL MUST BE AVAILABLE (REF. RULE {109_2A-TBD}, PAYLOAD DEPLOY - STS REQUIREMENTS, FOR CHANGES TO THE DEPLOY WINDOW)

PL ID/POR DEFINITION – PL ID 1



GF: +V2

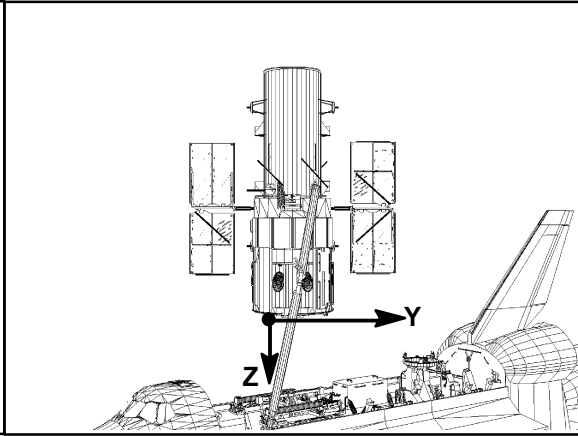
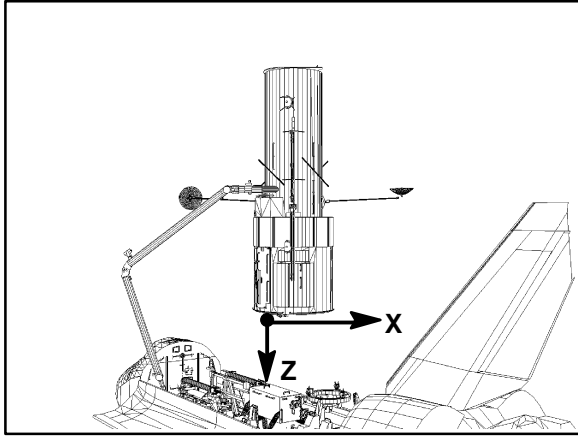
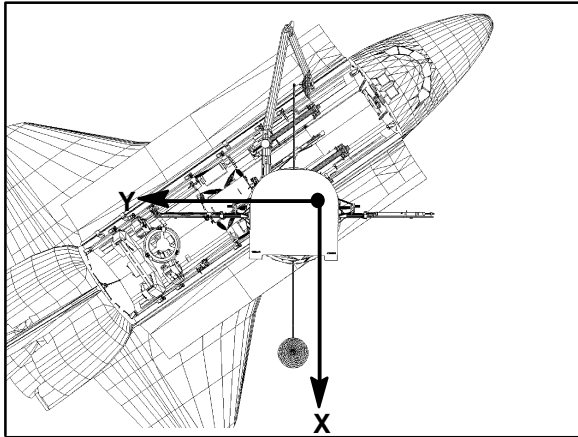
POR: Center of HST, along V1 axis, at level of GFs

PURPOSE: HST maneuvering/berthing

RATES: COARSE VERN

TRAN LIM ft/sec	0.18	0.1
ROT LIM deg/sec	0.61	0.20

PL ID/POR DEFINITION – PL ID 2



GF:	+V2	
POR:	FSS target	
PURPOSE:	HST berthing and unberthing	
RATES:	<u>COARSE</u>	<u>VERN</u>
TRAN LIM ft/sec	0.18	0.1
ROT LIM deg/sec	0.61	0.20

RMS (HST) DAP CONSTRAINTS

PAYLOAD POSITIONS	VRCS		ALT		
	MAN	AUTO	AUTO	JET OPTION	MODE
AT EXTENDED PARK • POSITION HOLD • BRAKES – ON	A15/2 A15/2	A15/2 A15/2	A15/2 A15/2	TAIL TAIL	NORM Z NORM Z
AT FSS HOVER • POSITION HOLD • BRAKES – ON	A15/3 A15/3	A15/3 A15/3*	A15/3 A15/3**	TAIL TAIL	NORM Z NORM Z
AT RELEASE POSITION • RMS POSN HOLD – DEADBAND COLLAPSE • RMS BRAKES ON – DEADBAND COLLAPSE	A15/1 B15/1 A15/1 -----	A15/1 B15/1 A15/1** B15/1**	A15/1 B15/1 A15/1** -----	TAIL TAIL TAIL -----	NORM Z NORM Z NORM Z -----

NOTES:

1. KEY: --- ATTITUDE CONTROL MODE NOT ALLOWED (FREE DRIFT)
X##/## DAP CONFIGURATION/CNTL ACCEL
* CHANGE VERN RATE DB = 0.10
** FOR CONTINGENCY ONLY – AVOID IF POSN HOLD AVAILABLE
2. RMS/HST POSITIONS DEFINED IN REF DATA
3. CONSTRAINTS ONLY APPLY TO GRAPPLE FIXTURE #1 (+V2 GF: PORT GF WHEN BERTHED ON FSS)
4. TAIL-ONLY MODE REQD FOR GRAPPLED HST OPS AND DURING CREW SLEEP
5. TO CONSERVE PROPELLANT, THE ORBITER WILL NOMINALLY BE IN FREE DRIFT FOR ALL RMS/HST POSITIONS NOT LISTED ABOVE. FOR CONTINGENCY SITUATIONS, MANUAL ATTITUDE CONTROL MAY BE ATTEMPTED USING A DAP CONFIGURATION BEST SUITED FOR THE CONTINGENCY. REFERENCE ALL FLIGHTS RULE {A12.1.1-6G}, OMS/RCS CONSTRAINTS, FOR USE OF VRCS IN UNPLANNED CONTINGENCY
6. DAP B12 IS SLOW MANEUVER RATE DAP THAT IS USED FOR LOADS MITIGATION AND IS INTERCHANGEABLE WITH DAP A15

RMS (HST) DAP CONFIGURATIONS

	A15	B15	B12
PRI			
ROT RATE (deg/s)	0.10	0.05	0.05
ATT DB (deg)	5.0	2.0	5.0
RATE DB (deg/s)	0.20	0.20	0.20
ROT PLS (deg/s)	0.04	0.04	0.04
COMP (deg/s)	0.0	0.0	0.0
P OPTION	3	3	3
Y OPTION	3	3	3
TRAN PLS (s)	0.05	0.01	0.05
ALT			
RATE DB (deg)	0.10	0.10	0.10
JET OPT	TAIL	TAIL	TAIL
# JETS	2	2	2
ON TIME (sec)	0.08	0.08	0.08
DELAY (sec)	7.5	7.5	7.5
VERN			
ROT RATE (deg/s)	0.10	0.024	0.040
ATT DB (deg)	2.0	0.5	2.0
RATE DB (deg/s)	0.050	0.030	0.050
ROT PLS (deg/s)	0.005	0.005	0.005
COMP (deg/s)	0.0	0.0	0.0
CNTL ACC	1-3	1	1-3

NOTES:

CNTL ACCELS:

- 1 - RELEASE POSN
- 2 - EXTENDED PARK
- 3 - FSS HOVER

PRCS JET OPTIONS:

- 1 - NOSE AND TAIL
- 2 - NOSE ONLY
- 3 - TAIL ONLY

DAP USAGE:

- A15,B12 - ALL RMS/HST OPS
- B15 - HST RELEASE DEADBAND COLLAPSE

RMS (HST) GO/NO-GO CRITERIA

THIS TABLE DOES NOT CONTAIN ANY FLIGHT SPECIFIC FLIGHT RULE EXCEPTIONS

CONTINUE OPS IF:	HST RETRIEVE & DEPLOY OPS (HIGH PRIORITY)	FLT RULE REF
SHOULDER BRACE REL (1)	0 ↓ [1]	
JETTISON SYSTEM (2)	1 ↓ [2]	A12.1.8-1
MPM STOW MOTORS (2)	2 ↓ [1]	A12.1.3-2
MRL LATCH CAPABILITY (3)	3 ↓ [1]	A12.1.3-3
MPM (4) STOWED IND (8)		
MPM (4) DEPLOY IND (8)	SH 1 ↓	
MRL's LATCHED (3)		
MAN AUG MODE (1)	3 ↓ [4]	A12.1.5-1
SINGLE MODE (1)		
DIRECT MODE (1)		
BACKUP MODE (1)		
BRAKES (6)	0 ↓	
AUTO BRAKES (1)	0 ↓ [5]	
CAPTURE & RIGIDIZE (2)	1 ↓	
DERIGIDIZE (2)	2 ↓ [6]	A12.1.7-1
RELEASE (2)	2 ↓	A12.1.7-1
BACKUP RELEASE (1)		
THERMAL (DEG F) -20(0), 176(172), LED -20(0), 147(144), ABE(EE) -20(0), 110(106), ABE (SPA)	REQD	

NOTES:

- [1] EVA CAPABILITY EXISTS FOR THE FOLLOWING CONTINGENCIES:
- SHOULDER BRACE RELEASE
 - MPM DEPLOY/STOW
 - RMS STRAPDOWN
 - GRAPPLE FIXTURE (GF) RELEASE
- [2] IFM IS AVAILABLE TO RECOVER JETTISON SYSTEM; HIGH PRIORITY RMS ACTIVITIES MAY CONTINUE
- [3] CONTINUE OPERATIONS EVEN IF ONE FAILURE WILL RESULT IN THE INABILITY TO LATCH AT LEAST TWO MRL'S (ASSUMES CURRENTLY HAVE TWO-LATCH CAPABILITY). EVA CAPABILITY REQUIRED
- [4] ONE OF SINGLE, DIRECT, OR BACKUP REQUIRED FOR UNCRADLING.
- [5] OPERATIONS CAN CONTINUE IN DIRECT OR BACKUP WITH THE LOSS OF AUTO BRAKES. CAPTURE CAPABILITY DOES NOT EXIST IN BACKUP
- [6] WITHOUT THE CAPABILITY TO DERIGIDIZE/EXTEND THE SNARE CARRIAGE, FUTURE CAPTURE CAPABILITY IS LOST

JOINT ANGLES VS POR COORDINATES

RMS HST DEPLOY

RMS Extended Park

X	Y	Z	PITCH	YAW	ROLL	PL ID
-975	-325	-520	270	0	0	0
SY	SP	EP	WP	WY	WR	
+28.6	+78.2	-85.8	-72.8	+17.0	-10.0	

Pre-grapple

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1024	-46	-755	0	0	0	0
SY	SP	EP	WP	WY	WR	
-29.3	+83.2	-79.6	-3.6	+29.3	0.0	

FSS Latched (expected values)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1084	-46	-755	0	0	0	0
-1149	0	-755	0	0	0	1
-1128	12	-497	0	0	0	2
SY	SP	EP	WP	WY	WR	
-24.9	+70.3	-63.8	-6.5	+24.9	+0.5	

FSS Hover

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1084	-46	-825	0	0	0	0
-1149	0	-825	0	0	0	1
-1128	12	-567	0	0	0	2
SY	SP	EP	WP	WY	WR	
-28.0	+61.3	-36.9	-24.4	+28.0	+0.5	

HST Release

X	Y	Z	PITCH	YAW	ROLL	PL ID
-878	32	-853	0	305	0	0
-878	112	-853	0	305	0	1
-856	102	-595	0	305	0	2
SY	SP	EP	WP	WY	WR	
-53.4	+90.0	-68.5	-37.3	0.0	+8.5	

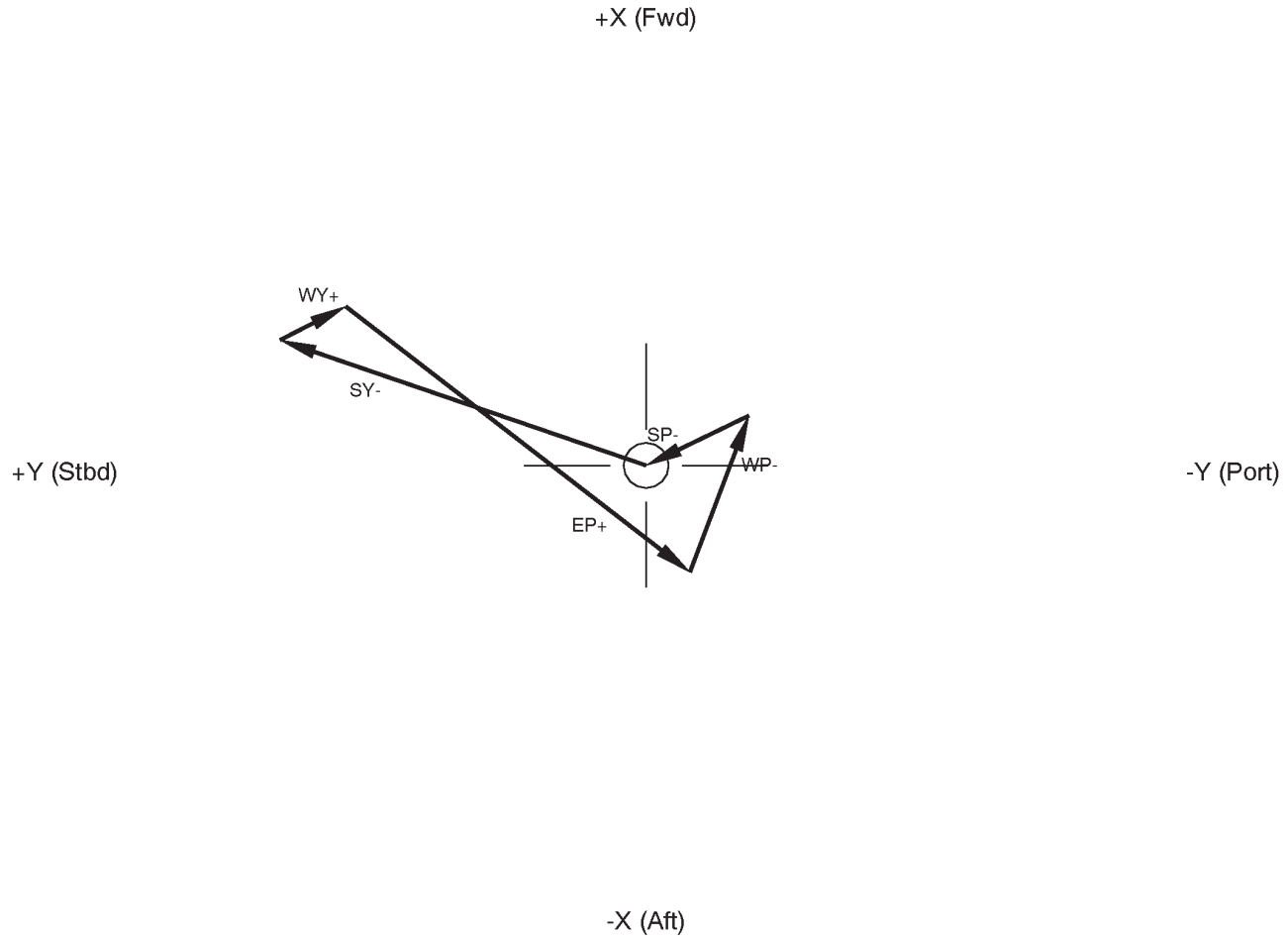
CUE CARD CONFIGURATION

|

**CUE CARD
CONFIG**

CUE CARD CONFIG

Fabricate as transparency



FSS/HST SJ UNBERTHING OVERLAY

HST DPY-1a/109/O/A

(reduced copy)

CC 8-2

HST DPY/109/FIN B



HST DEPLOY CHECKLIST

STS
109