

Hubble Space Telescope Deploy Checklist

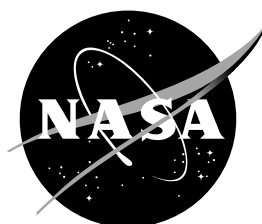
STS-125

**Mission Operations Directorate
Operations Division**

**Final, Rev B
April 23, 2009**

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas

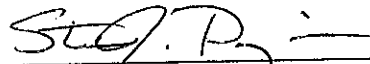


MISSION OPERATIONS DIRECTORATE

**HUBBLE SPACE TELESCOPE
DEPLOY CHECKLIST
STS-125**

FINAL, REVISION B
April 23, 2009

PREPARED BY:

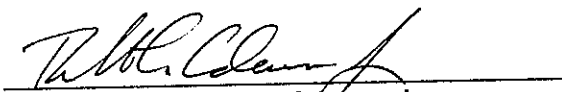



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482#:	HST_DPY-00089	HST_DPY-00092	HST_DPY-00095
	HST_DPY-00090	HST_DPY-00093	HST_DPY-00096
	HST_DPY-00091	HST_DPY-00094	

AREAS OF TECHNICAL RESPONSIBILITY

Book Manager	DO3/S. Pruzin	281-483-7719
Alternate Book Manager	DO3/Y. Fuller	281-244-1174
RMS Procedures	DX2/I. Mills	281-483-9574
Payload Operating Procedures	DO5/R. Adams	281-483-8191
Separation Procedures	DM34/N. O'Dosey	281-483-6178
Attitudes and Pointing	DO4/K. Lawson	281-244-1222

HUBBLE SPACE TELESCOPE DEPLOY CHECKLIST
STS-125

LIST OF EFFECTIVE PAGES

FINAL 03/20/08
REV B 04/23/09

Sign Off	*	125/FIN B	5-1	125/FIN B
ii.....	*	125/FIN B	5-2	125/FIN B
iii.....	*	125/FIN B	5-3	125/FIN B
iv.....	*	125/FIN B	5-4	125/FIN B
v		125/FIN B	6-1	125/FIN B
vi.....		125/FIN B	6-2	125/FIN B
1-1		125/FIN B	6-3	⊗ 125/FIN B
1-2		125/FIN B	6-4	⊗ 125/FIN B
1-3	⊗	125/FIN B	6-5	⊗ 125/FIN B
1-4		125/FIN B	6-6	⊗ 125/FIN B
2-1		125/FIN B	6-7	125/FIN B
2-2		125/FIN B	6-8	125/FIN B
2-3		125/FIN B	6-9	125/FIN B
2-4		125/FIN B	6-10	125/FIN B
2-5		125/FIN B	6-11	125/FIN B
2-6		125/FIN B	6-12	⊗ 125/FIN B
2-7		125/FIN B	6-13	⊗ 125/FIN B
2-8		125/FIN B	6-14	⊗ 125/FIN B
2-9	⊗	125/FIN B	6-15	⊗ 125/FIN B
2-10	⊗	125/FIN B	6-16	⊗ 125/FIN B
2-11	⊗	125/FIN B	6-17	125/FIN B
2-12		125/FIN B	6-18	⊗ 125/FIN B
3-1		125/FIN B	6-19	⊗ 125/FIN B
3-2		125/FIN B	6-20	⊗ 125/FIN B
3-3		125/FIN B	6-21	125/FIN B
3-4		125/FIN B	6-22	125/FIN B
3-5		125/FIN B	6-23	125/FIN B
3-6		125/FIN B	6-24	125/FIN B
3-7		125/FIN B	6-25	125/FIN B
3-8		125/FIN B	6-26	125/FIN B
3-9		125/FIN B	6-27	125/FIN B
3-10		125/FIN B	6-28	125/FIN B
3-11		125/FIN B	6-29	125/FIN B
3-12		125/FIN B	6-30	125/FIN B
4-1		125/FIN B	7-1	125/FIN B
4-2		125/FIN B	7-2	⊗ 125/FIN B
4-3		125/FIN B	7-3	⊗ 125/FIN B
4-4		125/FIN B	7-4	125/FIN B
4-5		125/FIN B	7-5	125/FIN B
4-6		125/FIN B	7-6	125/FIN B
4-7		125/FIN B	7-7	125/FIN B
4-8		125/FIN B	7-8	125/FIN B
4-9		125/FIN B	8-1	* 125/FIN B
4-10		125/FIN B	CC 8-2	* 125/FIN B
4-11		125/FIN B	CC 8-3	* 125/FIN B
4-12		125/FIN B	8-4	* 125/FIN B

* – Omit from flight book
⊗ – Flight copies of this page contain color

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/125/O/B
BERTHED HST GRAPPLE OVERLAY	CC 8-3	HST DPY-2a/125/O/A

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GRAPPLE

HST GRAPPLE..... 1-2

GRAPPLE

HST GRAPPLE

Visually verify FSS in berthing posn

√MCC

Verify -V3 HGA dish is in RMS clearance posn

Review RMS QUICK DEPLOY (CONT OPS)

A7U

1. CAMR SETUP

√PL BAY FLOODS MID (two) – OFF
FWD,AFT (four) – as reqd

√P/TV08 HST RELEASE, SETUP (PHOTO/TV FS, SCENES) complete

VTR – √Adequate tape available
– Start Recording

M 2. MNVR RMS TO PRE-GRAPPLE POSN
DAP: A10/AUTO(FREE)/VERN

- * If Single Joint RMS, go to SJ HST *
- * GRAPPLE (OFF-NOMINAL RMS OPS) *

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 0

√INIT ID, ITEM 24: 0

RHC
A8U

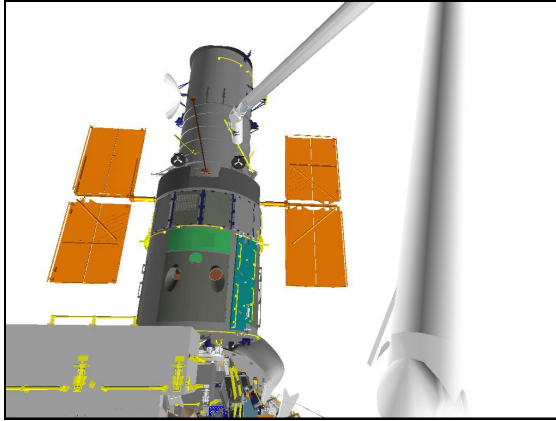
RATE – as reqd (VERN within 10 ft)
BRAKES – OFF (tb-OFF)
MODE – as desired

NOTE

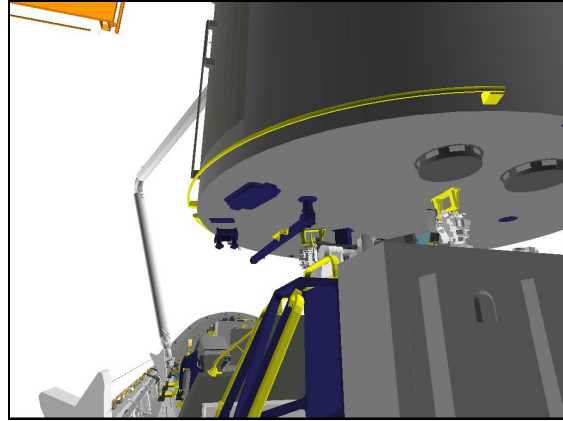
Clearance between RMS and -V3 HGA should be monitored

Mnvr to HST PRE-GRAPPLE posn:

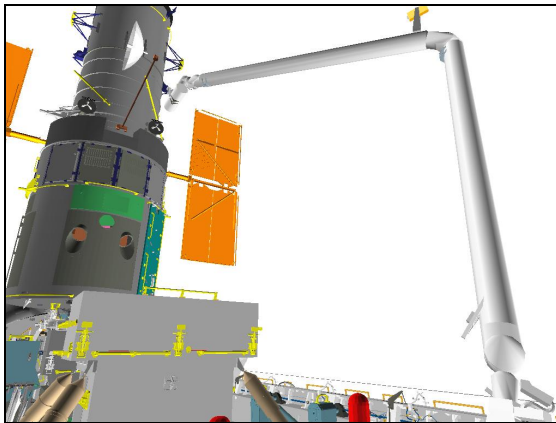
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1024	-46	-755	0	0	0	0
SY	SP	EP	WP	WY	WR	
-29.3	+83.2	-79.6	-3.6	+29.3	0.0	



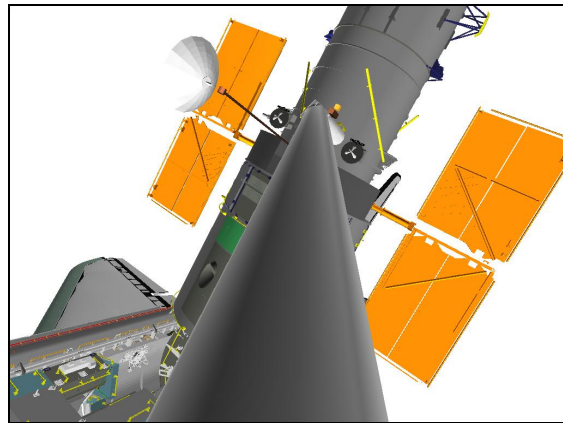
CCTV A (5,25)



CCTV B (15,20)



CCTV D (35,20)



ELBOW (-5,-20)

[M] 3. GRAPPLE

A7U

- CCTV – config for grapple
- install PDRS TARGET OVERLAY FOR CTVM
- RMS WRIST, zoom 34.0 HFOV
focus 5 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 HST BERTH (PDRS FS, NOMINAL HST RETRIEVAL), UNGRAPPLE HST step):

	X	Y	Z	PITCH	YAW	ROLL	PL ID
Expected							0
Expected							3
Expected							4
	SY	SP	EP	WP	WY	WR	
Expected							

Mnvr to +V2 GF grapple envelope

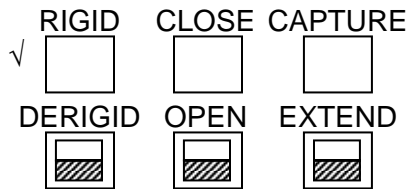
CAUTION
Monitor EE tb timing to prevent EE motor burnout

EE MODE – AUTO

RHC

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 +3 EXEC

INIT ID – ITEM 24 +3 EXEC

UNBERTH

HST UMB DISCONNECT	2-2
UNBERTH	2-5

UNBERTH

HST UMB DISCONNECT

1. CAMR SETUP

- A7U √PL BAY FLOODS MID (two) – OFF
 FWD,AFT (four) – as reqd
 √P/TV08 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

3. DEADFACE UMB

On MCC GO:

- L12UR ESS/MN SW ENA – ON (tb-gray)
 ESS BUS EXT PWR – OFF (tb-bp)
 MN BUS EXT PWR – OFF (tb-bp)
 √IPCU RLY CLOSED 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: 33.7 to 35.5
 √AMPS: < 0.5
 PCU OFF – ITEM 2 EXEC (*)
 √PCU – blank/blank
- L12UL √FSS PCU POWER 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

UNBERTH

M 4. SET UP UMB DISCONNECT

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 (two) – OFF R13 PL BAY MECH PWR SYS 1,2 (two) – OFF √MCC

CAUTION
Operating the umbilical in a stalled condition for greater than 30 sec may result in damage to unit. A stalled condition is indicated by AMSB AC AMPS > 0.6 and no mechanism motion

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 MECH/BPA/RNS
AMSB ON – ITEM 7 EXEC (A(B))

* If AMSB ON – blank, continue *

√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

M 5. DISCONNECT UMB

VTR – Start Recording

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) and complete step 5 on alternate side *
* If UMB MN STAT – RDY, continue *

√AMSB DC AMPS: .035 to .125

√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 1.2
√UMB MN STAT – RDY

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

* If UMB MN STAT – MAT and motion observed, *
* BOT sw failed *
* Continue and expect (*) *

Wait 8 sec,
√UMB MN STAT – REL

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

VTR – STOP

|

A6U √PL RETEN LAT 1(2) tb – REL (A-side only)
1(2) – OFF

CRT √MECH – steady A(B)
L12UR √MN BUS PWR ON tb – bp
√ESS BUS INT PWR tb – bp

SM 210 HST SYS
√UMB SG V INT MN BUS: 0
√ESS BUS: 0

Notify MCC, HST UMB DISCONNECT complete; report any anomalies

HST UNBERTH

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 (two) – OFF
R13 PL BAY MECH PWR SYS 1,2 (two) – OFF
√MCC

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 > 1.0 and no mechanism motion

1. SETUP

- A7U √PL BAY FLOODS MID (two) – OFF
FWD,AFT (four) – as reqd
√P/TV08 HST RELEASE, SETUP (PHOTO/TV FS, SCENES) complete

Review STS-125 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 MON 1(2) pb – push
IN PL2 pb – push
ALC AVG pb – push
GAMMA NORM pb – push

- [M] 3. OPEN BERTHING LATCH 3
Set up CCTV to monitor opening of Latch 3

VTR – Start Recording

I

DAP: FREE

SM 212 SSE MECH/BPA/RNS

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), then: *
- * Complete steps 3-7 on alt side *
- * If B LAT 3 STAT – RDY, continue *

√AMSB DC AMPS: .035 to .125

√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: 1.0 to 2.5
√B LAT 3 STAT – RDY

- * If stall condition observed (AMSB AC AMPS *
- * > 1.0 and no mechanism motion): *
- * PL RETEN LAT 1(2) – OFF *
- * √MCC *
- * If B LAT 3 STAT – CL and motion observed, *
- * BOT sw failed *
- * Continue and expect (*) *

Wait 15 sec,

√B LAT 3 STAT – OP

A6U * If B LAT 3 STAT – CL or RDY after 30 total sec, *
* PL RETEN LAT 1(2) OFF, perform *
* 1.3a PRIMARY MOTOR FAILS TO DRIVE *
* MECHANISM (PL SYS, SSE), then: *

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

CRT √MECH – steady A(B)

M 4. OPEN BERTHING LATCH 1
Set up CCTV to monitor opening of Latch 1

√VTR recording

CRT B LAT 1 SEL – ITEM 14 EXEC (* CL)

- * If B LAT 1 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), then: *
- * Complete steps 4-7 on alt side *
- * If B LAT 1 STAT – RDY, continue *

√AMSB DC AMPS: .035 to .125

√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: 1.0 to 2.5
√B LAT 1 STAT – RDY

- * If stall condition observed (AMSB AC AMPS *
- * > 1.0 and no mechanism motion): *
- * PL RETEN LAT 1(2) – OFF *
- * √MCC *

- * If B LAT 1 STAT – CL and motion observed, *
- * BOT sw failed *
- * Continue and expect (*) *

Wait 15 sec,

√B LAT 1 STAT – OP

A6U * If B LAT 1 STAT – CL or RDY after 30 total sec, *

- * PL RETEN LAT 1(2) – OFF, perform *
- * 1.3a PRIMARY MOTOR FAILS TO DRIVE *
- * MECHANISM (PL SYS, SSE), then: *

√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

√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), then: *
- * Complete steps 5-7 on alt side *
- * If B LAT 2 STAT – RDY, continue *

√AMSB DC AMPS: .035 to .125

√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: 1.0 to 2.5
√B LAT 2 STAT – RDY

- * If stall condition observed (AMSB AC AMPS *
* > 1.0 and no mechanism motion): *
- * PL RETEN LAT 1(2) – OFF *
- * √MCC *

- * If B LAT 2 STAT – CL and motion observed, *
- * BOT sw failed *
- * Continue and expect (*) *

Wait 15 sec,

√B LAT 2 STAT – OP

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

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

CRT √MECH – steady A(B)

6. AMSB PWRDN
CRT DESEL – ITEM 20 EXEC (√Items 9-19 – (no*))

- * If any MECH SEL – *, do not turn AMSB OFF; *
- * notify MCC, continue *

√AMSB DC AMPS: < 0.035
OFF – ITEM 8 EXEC (*)

A6U PL RETEN LOGIC PWR SYS 1(SYS 2) – OFF

R13L PL BAY MECH PWR SYS 1(2) – OFF

M 7. 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 +5 EXEC

– ITEM 48 +5 EXEC

√DAP: no LO Z

* If Single Joint RMS, go to SJ HST UNBERTH *

* (OFF-NOMINAL RMS OPS) *

RHC
A8U

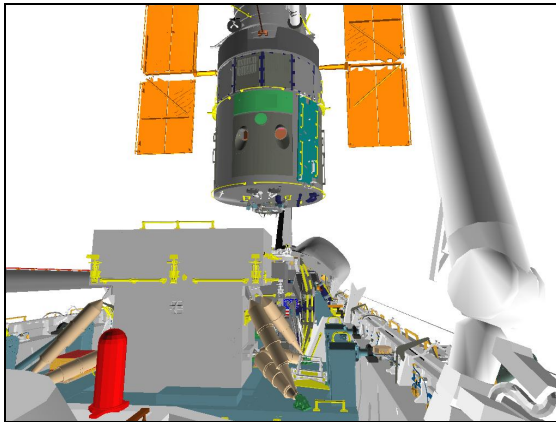
RATE – VERN (RATE MIN tb-ON)

BRAKES – OFF (tb-OFF)

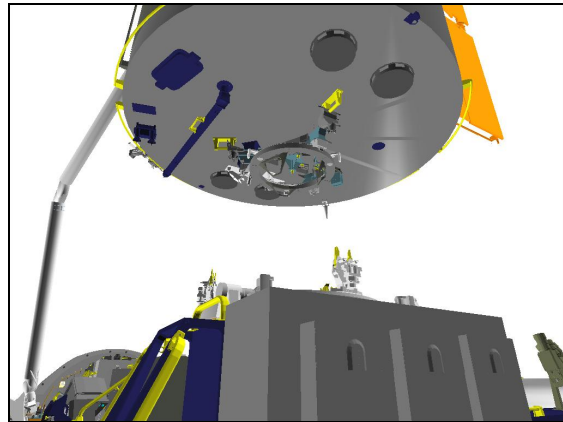
MODE – ORB LD, ENTER

Mnvr to FSS HOVER posn

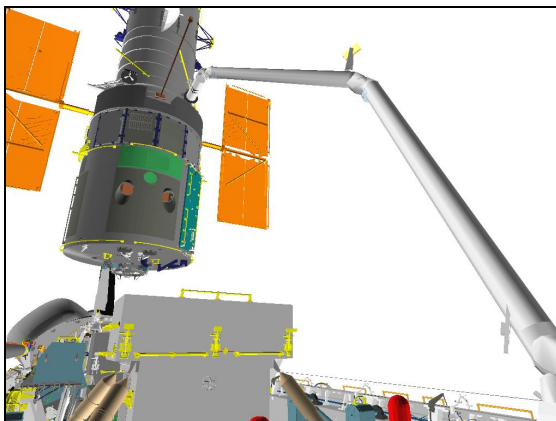
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1149	0	-825	0	0	0	3
-1128	+12	-567	0	0	0	4
SY	SP	EP	WP	WY	WR	
-28.0	+61.3	-36.9	-24.4	+28.0	+0.5	



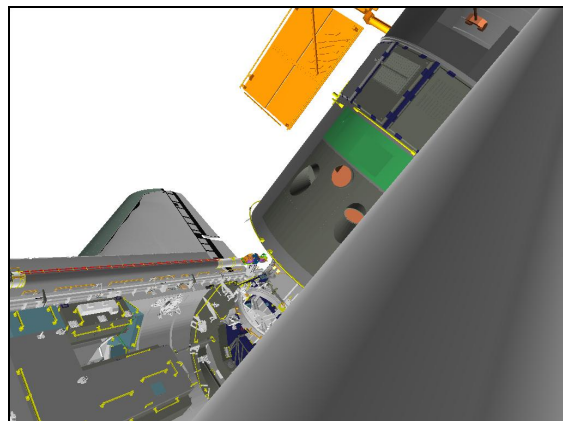
CCTV A (-5,10)



CCTV B (30,25)



CCTV D (30,20)



ELBOW (-35,-40)

If attitude maintenance reqd,

BRAKES – ON (tb-ON)

– OFF (tb-OFF)

DAP: A/AUTO/VERN (ALT)

A6U

8. 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 (*)

9. MNVR RMS TO RNS INTERMEDIATE POSITION

√VTR recording

√DAP: FREE

RHC
A8U

√RATE – VERN (RATE MIN tb-ON)

√BRAKES – OFF (tb-OFF)

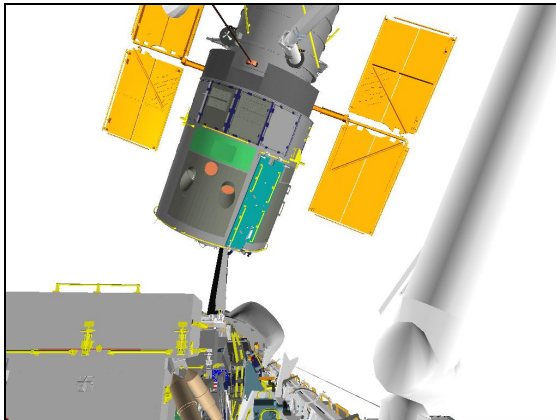
√MODE – ORB LD, ENTER

Mnvr to RNS INTERMEDIATE posn:

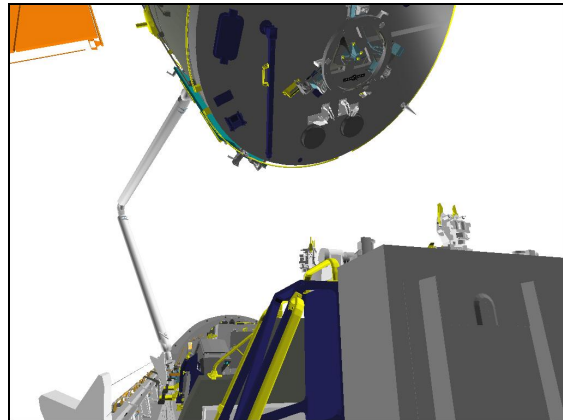
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1010	-93	-825	25	15	19	3
SY	SP	EP	WP	WY	WR	
-26.2	+101.9	-95.6	+26.2	+28.9	+7.4	

Notify MCC when RMS is in RNS Intermediate position

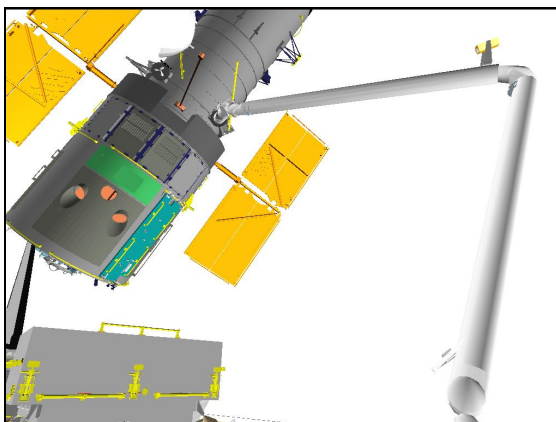
Remain in posn for 1 min before continuing



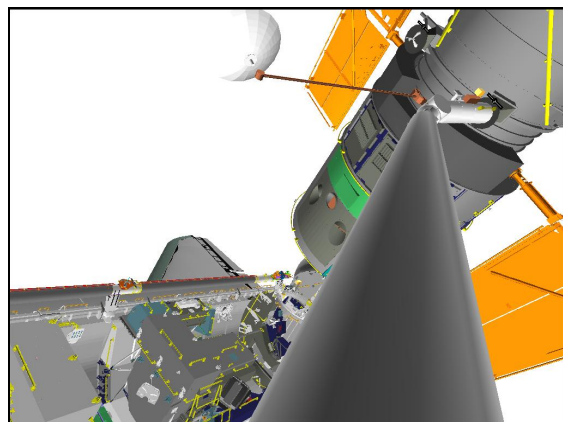
CCTV A (5,20)



CCTV B (15,20)



CCTV D (40,25)



ELBOW (-20,-20)

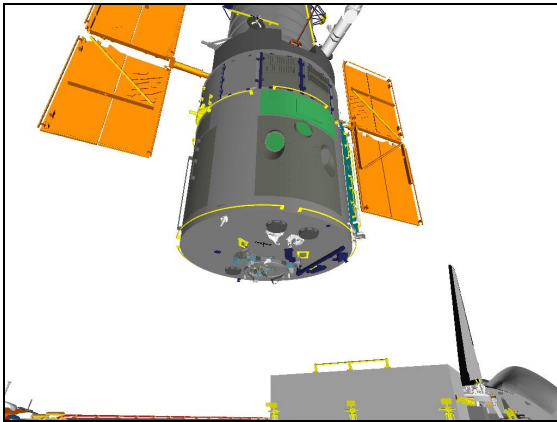
M 10. MNVR RMS TO HST RELEASE POSN

Load DAPs A15 and B12

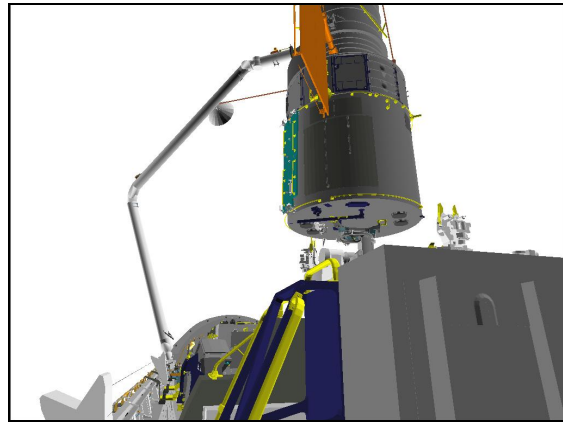
- RHC √RATE – VERN (RATE MIN tb-ON)
 A8U √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to HST RELEASE posn:

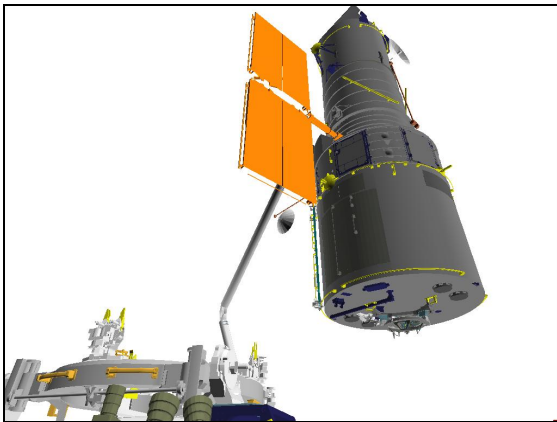
X	Y	Z	PITCH	YAW	ROLL	PL ID
-878	+112	-853	0	305	0	3
SY	SP	EP	WP	WY	WR	
-53.4	+90.0	-68.5	-37.3	0.0	+8.5	



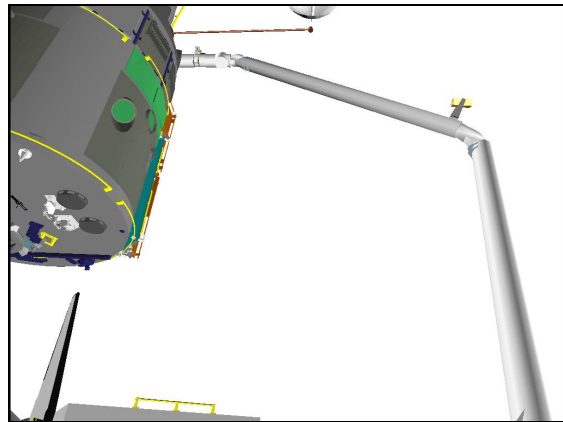
CCTV A (-30,30)



CCTV B (15,20)



CCTV C (-15,35)



CCTV D (35,35)

- √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)

Notify MCC, HST UNBERTH complete; report any anomalies

RELEASE OPS

HST RELEASE PREP	3-2
RELEASE	3-5

RELEASE
OPS

HST RELEASE PREP

NOTE

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

√MCC

Verify -V3 HGA dish is in RMS clearance posn

Install -Z COAS

- A7U
1. CAMR SETUP
√PL BAY FLOODS MID (two) – OFF
FWD,AFT (four) – as reqd

√P/TV08 HST RELEASE, SETUP (PHOTO/TV FS, SCENES) complete
 2. TIMER SETUP
SM 2 TIME
F7,A4 Set CRT and EVENT TIMERS counting down to release MET per PAD
(HST RMS RELEASE)
 3. ADI SETUP
A6U M ADI ATT – LVLH
ERR – MED
RATE – LO
SENSE: -Z
- O14:E,
O15:E,
O16:E
4. 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 16) – (*)- 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	3
	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 CCTV – config for ungrapple
 – install PDRS TARGET OVERLAY FOR CTVM
 – RMS WRIST, zoom 34.0 HFOV
 focus 5 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 (*)

M 8. RJD HEALTH STATUS

√MCC to verify comm

DAP: FREE

O14:F RJDA 1A L2/R2 DRIVER – OFF
 O16:F RJD MANF L5/F5/R5 DRIVER – OFF
 O14,15,16:F Pri RJD Logic (eight) – ON

√MCC for GO to powerup Vern and Pri DRIVERS
 RJD MANF L5/F5/R5 DRIVER – ON
 Pri RJD Driver (eight) – ON
 DAP: AUTO

9. VERIFY RF LINK AND PCS CONFIG

SM 210 HST SYS

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

10. 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 – Start 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 2(1) LOCK – *</p> <p>PCS MODE SNPT – ITEM 7 +9 4(93) EXEC √SNPT DIS – NO</p> <p>* If PCS SNPT DIS still YES after 3 sec: * * Reattempt ITEM 7 +9 4(93) EXEC * * √SNPT DIS – NO * * If no joy, attempt alt CDI cmd: * * ITEM 7 +9 3(94) 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 style="text-align: center;">* If Single Joint, go to SJ HST RELEASE * * step 3, (OFF-NOMINAL RMS OPS) *</p> <p>3. RELEASE DAP: FREE</p> <p>RHC/A8U RATE – as reqd (VERN within 10 ft) A8U √BRAKES – OFF (tb-OFF) MODE – END EFF, ENTER</p> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;">CAUTION</p> <p style="text-align: center;">Monitor EE tb timing to prevent EE motor burnout</p> <p style="text-align: center;">Monitor clearance between RMS and -V3 HGA during release and back-away mnvrs</p> </div> <p>* If manual release reqd: *</p> <p>* EE MODE – MAN *</p> <p>* EE MAN CONTR – DERIGID (hold until *</p> <p>* DERIGID tb-gray, *</p> <p>* 5 sec max) *</p> <p>* -:00:00 RELEASE sw – depress (hold until OPEN *</p> <p>* tb-gray, 3 sec max) *</p> <p>* Mnv r arm 5 ft (minimum) clear of HST *</p> <p>* EE MAN CONTR – DERIGID (hold until *</p> <p>* EXTEND tb-gray, *</p> <p>* 20 sec max) *</p> <p>* EE MODE – OFF *</p>	<p style="text-align: center;">* If Single Joint, go to SJ HST RELEASE * * step 3, (OFF-NOMINAL RMS OPS) *</p> <p>GNC 33 REL NAV ORB TO TGT – ITEM 10 EXEC</p> <p>DAP: FREE</p> <p>GNC 20 DAP CONFIG Change DAP A,B to A7,B7 DAP TRANS: PULSE/PULSE/PULSE, LO Z DAP: A7/FREE/PRI</p> <p>* If manual release reqd: *</p> <p>* √Release initiated *</p> <p>* -:00:00 Record Release MET ___/___:___:___ (release) *</p>

RMS and HST Systems			Orbiter
-:00:00	RHC	EE MODE – AUTO RELEASE sw – REL (mom)	-:00:00
		When OPEN tb – gray, mnvr arm 5 ft (minimum) clear of HST	√Release initiated Record Release MET ___/___:___:___ (release)
A8U	<input checked="" type="checkbox"/> RIGID <input type="checkbox"/> DERIGID	<input checked="" type="checkbox"/> CLOSE <input type="checkbox"/> OPEN	
	<input checked="" type="checkbox"/> CAPTURE <input type="checkbox"/> EXTEND	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	
		When clear of GF pin: EE MODE – OFF	
		* 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) * * If HST Sunpoint macro not disabled by EVENT * * TIMER = +3:30: * * √PCS MODE – SNPT * * At EVENT TIMER = +5:00, command HST * * to Drift mode * * PCS MODE – ITEM 7+9 2(91) EXEC (DRFT) * * √PCS MODE – DRFT * * If PCS MODE not DRFT, repeat * * If PCS MODE still not DRFT, re-exec using * * alt cmd – ITEM 7+9 1(92) EXEC (DRFT) * * If still no joy, √MCC * * * * GNC 20 DAP CONFIG * * LOAD DAPs A15 and B12 * * √DAP: no LO Z * * √BRAKES – OFF (tb-OFF) * * DAP: A/AUTO/VERN(ALT) *	* 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) * * If HST Sunpoint macro not disabled by EVENT * * TIMER = +3:30: * * √PCS MODE – SNPT * * At EVENT TIMER = +5:00, command HST * * to Drift mode * * PCS MODE – ITEM 7+9 2(91) EXEC (DRFT) * * √PCS MODE – DRFT * * If PCS MODE not DRFT, repeat * * If PCS MODE still not DRFT, re-exec using * * alt cmd – ITEM 7+9 1(92) EXEC (DRFT) * * If still no joy, √MCC * * * * GNC 20 DAP CONFIG * * LOAD DAPs A15 and B12 * * √DAP: no LO Z * * √BRAKES – OFF (tb-OFF) * * DAP: A/AUTO/VERN(ALT) *

RMS and HST Systems	Orbiter
<p data-bbox="338 256 373 284">M</p> <p data-bbox="422 261 590 284">4. <u>SEP 1 BURN</u></p> <p data-bbox="457 289 764 334">When RMS motion has stopped: √SEP 1 initiated</p> <p data-bbox="457 363 716 386">SM 94 PDRS CONTROL</p> <p data-bbox="457 391 758 436">PL ID – ITEM 3 +Q EXEC INIT ID – ITEM 24 +Q EXEC</p> <p data-bbox="457 561 695 607">If reqd, BRAKES – ON (tb-ON)</p>	<p data-bbox="968 261 1031 284">ASAP</p> <p data-bbox="1192 256 1228 284">M</p> <p data-bbox="1276 261 1444 284">2. <u>SEP 1 BURN</u></p> <p data-bbox="1312 289 1745 360">When RMS motion has stopped: AFT THC: -X(dn) 10 pulses (1.0 fps) Record MET: ___/___:___:___ (burn init)</p> <p data-bbox="1348 386 1633 431">AFT FLT CNTLR PWR – OFF Report TIG to MCC</p> <p data-bbox="1312 457 1776 529">When center of HST in bottom half of Keel Camr (REF BALL PITCH ~65 deg): DAP: INRTL</p> <p data-bbox="1312 555 1535 600">When pitch rate nulled: DAP: VERN(ALT)</p> <p data-bbox="1083 626 1129 649">A6U</p> <p data-bbox="1312 626 1478 649">ADI ATT – LVLH</p>

RMS and HST Systems	Orbiter
<p data-bbox="338 256 653 318"> <input type="checkbox"/> M 5. <u>HST TO SUNPOINT</u> <input type="checkbox"/> SM 210 HST SYS </p> <p data-bbox="443 342 659 370">√RCVR 2(1) LOCK – *</p> <p data-bbox="443 399 947 573"> * If RMS QUICK DEPLOY, activate hardware * * Sunpoint: * * PCS MODE SUNPOINT – ITEM 7 +9 5 EXEC * * – ITEM 7 +9 6 EXEC * * – ITEM 7 +9 7 EXEC * * * * Expect 'PDI DECOM FAIL' msg >> * </p> <p data-bbox="107 597 665 625">+ :03:30 √PCS MODE – SNPT</p> <p data-bbox="107 649 672 677">+ :04:58 √SNPT DIS – YES >></p> <p data-bbox="443 698 730 747"> * If PCS MODE not SNPT, * * √MCC * </p>	<p data-bbox="1203 256 1598 318"> <input type="checkbox"/> 3. <u>HST TO SUNPOINT</u> √HST Sunpoint mode initiated </p> <p data-bbox="1203 362 1640 423"> <input type="checkbox"/> M 4. <u>MNVR TO TARGET TRACK ATT</u> <input type="checkbox"/> GNC UNIV PTG </p> <p data-bbox="1318 423 1738 573"> TRK OPTION: TGT ID +1 BODY VECTOR +3 √P +90.0 √Y +0.0 OM + 180.0 ____ ____ ____ (per PAD) </p> <p data-bbox="974 889 1654 967"> SEP 1 Init TRK – ITEM 19 EXEC (CUR-*) + :05:00 DAP: A7/AUTO/VERN(ALT) </p>

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RMS and HST Systems	Orbiter
<p>Actions Complete</p>	<p>5. <u>RADAR ACQUISITION</u> √Range ≥ 100 ft <div style="border: 1px solid black; padding: 2px; display: inline-block;">GNC 33 REL NAV</div> KU ANT ENA – ITEM 2 EXEC (*) GNC I/O RESET</p> <p>A1U √KU RADAR OUTPUT – LO √sel – GPC √MODE – RDR PASSIVE √PWR – ON CNTL – PNL</p> <p>A2 √DIGI-DIS SEL – R/RDOT</p> <p>A1U * If no lock within 2 min: * * KU sel – AUTO TRACK * * SLEW ELEV – as seen in COAS * * AZ – as seen in COAS * * √EL, AZ angles < 30 deg * * KU SEARCH – SEARCH (tb-gray) * * Repeat slew and search as reqd * * If acquisition not successful, √MCC *</p> <p>6. <u>RR NAVIGATION</u> √KU TRACK tb – gray <div style="border: 1px solid black; padding: 2px; display: inline-block;">GNC 33 REL NAV</div> √RR (ITEM 13) – (*)</p> <p style="padding-left: 40px;">* If RATIO > 1.0, * * √MCC *</p> <p style="padding-left: 40px;">AUTO RNG – ITEM 17 EXEC (*) RDOT – ITEM 20 EXEC (*) Angles – ITEM 23 EXEC (*)</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 > 800 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> When RELEASE + 15 min: VTR – STOP Go to P/TV08 HST RELEASE, DEACTIVATION (PHOTO/TV FS, <u>SCENES</u>)</p>

RMS and HST Systems	Orbiter
<p>Actions Complete</p>	<p>9. <u>CONFIG KU FOR COMM</u> When RANGE > 5000 FT: <div style="border: 1px solid black; display: inline-block; padding: 2px;">GNC 33 REL NAV</div> INH RNG – ITEM 18 EXEC (*) RDOT – ITEM 21 EXEC (*) Angles – ITEM 24 EXEC (*) KU ANT ENA1 – 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 4-11

CONT
OPS

BACKAWAY DEPLOY

<u>WARNING</u>
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 (two) – OFF
R13 PL BAY MECH PWR SYS 1,2 (two) – OFF
√MCC

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

NLT
RELEASE
-40:00

- A7U
- CAMR SETUP
√PL BAY FLOODS MID (two) – OFF
FWD,AFT (four) – as reqd

√P/TV03 FSS OPS, SETUP (PHOTO/TV FS, SCENES) complete
√P/TV08 HST RELEASE, SETUP (PHOTO/TV FS, SCENES) complete
 - VERIFY RMS CLEARANCE
√RMS clear of payload envelope
 - 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)
 - 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-*)
 - ADI SETUP
A6U ADI ATT – LVLH
ERR – MED
RATE – LO
SENSE: –Z

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

CONT
OPS

6. RJD HEALTH STATUS

√MCC to verify comm

DAP: FREE
O14:F RJDA 1A L2/R2 DRIVER – OFF
O16:F RJD MANF L5/F5/R5 DRIVER – OFF
O14,15,16:F Pri RJD LOGIC (eight) – ON

√MCC for GO TO POWERUP Vern and Pri DRIVERS (Pri in step 13)
RJD MANF L5/F5/R5 DRIVER – ON
Wait 5 sec,
DAP: AUTO

7. 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 16) – (*)

8. 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

9. 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 (*)

10. VERIFY RF LINK

SM 210 HST SYS

√TLM COUNT – incr

√PSP ENA ID: 1

√RCVR 2(1) LOCK – (*)

11. FSS AMSB PWR ON
- 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 MECH/BPA/RNS
- AMSB ON – ITEM 7 EXEC (A(B))
 √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 FSS AMSB PWR ON on alternate side and *
 - * continue using alternate side *

R13L PL BAY MECH PWR SYS 1(2) – ON

12. HST ROTATION

CAUTION

Operating the rotator in a stalled condition for greater than 30 sec may result in damage to unit. A stalled condition is indicated by AMSB AC AMPS > 0.3 and no mechanism motion

VTR – Start Recording

- CCTV Monitor HST position during rotation
 CRT ROTATOR SEL – ITEM 12 EXEC (* RDY)
 A6U √AMSB DC AMPS: .035 to .125
 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 AC AMPS: 0.3 to 0.7

- * 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

O14:F, 13. PRI RJD POWERUP
 O15:F, Pri RJD DRIVER (eight) – ON
 O16:F

14. 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 MON 1(2) pb – push
 IN PL2 pb – push
 ALC AVG pb – push
 GAMMA NORM pb – push

15. UMB DISCONNECT
 Perform HST UMB DISCONNECT steps 2,3, & 5 (UNBERTH)

-:10:00 STOCC to perform 5 minutes of ground commanding

-:05:00 M 16. HST SUNPOINT MACRO INIT

On MCC GO for release:

SM 210 HST SYS

√RCVR 2(1) LOCK – *

-:01:30 PCS MODE SNPT – ITEM 7 +9 4(93) EXEC

√MODE – DRFT

√SNPT DIS – NO

- * If PCS SNPT DIS still YES after 3 sec: *
- * | Reattempt ITEM 7 +9 4(93) EXEC *
- * | √SNPT DIS – NO *
- * | If no joy, attempt alt CDI cmd: *
- * | ITEM 7 +9 3(94) EXEC *
- * | √SNPT DIS – NO *
- * | If still no joy, abort deploy and √MCC *

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

-:01:00

17. 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 MECH/BPA/RNS

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

CAUTION

Release of LATCH 2 will cause
physical separation of HST

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 by EVENT TIMER = +2:45, *
 * disable HST Sunpoint macro *
 * SM 210 HST SYS *
 * PCS SNPT DIS – ITEM 8 +9 9 EXEC (YES) *
 * If HST Sunpoint macro not disabled by EVENT *
 * TIMER = +3:30: *
 * √PCS MODE – SNPT *
 * At EVENT TIMER = +5:00, command HST to *
 * Drift mode *
 * PCS MODE – ITEM 7+9 2(91) EXEC (DRFT) *
 * √PCS MODE – DRFT *
 * If PCS MODE not DRFT, repeat *
 * If PCS MODE still not DRFT, re-exec using *
 * alt cmd – ITEM 7+9 1(92) EXEC (DRFT) *
 * If still no joy, √MCC *

18. SEP 1 BURN

A6U

√SENSE: -Z

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

AFT FLT CNTLR PWR – ON

+00:00

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 19. HST TO SUNPOINT

SM 210 HST SYS

√RCVR 2(1) LOCK – *

+03:30

√PCS MODE – SNPT

+04:58

√SNPT DIS – YES

20. RADAR ACQUISITION

√Range ≥ 100 ft

GNC 33 REL NAV

KU ANT ENA – ITEM 2 EXEC (*)

GNC I/O RESET

A1U

√KU RADAR OUTPUT – LO

√sel – GPC

√MODE – RDR PASSIVE

√PWR – ON

CNTL – PNL

A2 √DIGI-DIS SEL – R/RDOT

- A16
- * If no lock within 2 min: *
 - * KU sel – AUTO TRACK *
 - * SLEW ELEV – as seen in COAS *
 - * AZ – as seen in COAS *
 - * √EL, AZ angles < 30 deg *
 - * KU SEARCH – SEARCH (tb-gray) *
 - * Repeat slew and search as reqd *
 - * If acquisition not successful, √MCC *

21. RR NAVIGATION

A1U √KU TRACK tb – gray

GNC 33 REL NAV

√RR (ITEM 13) – (*)

- * If RATIO > 1.0, *
- * √MCC *

AUTO RNG – ITEM 17 EXEC (*)
 RDOT – ITEM 20 EXEC (*)
 Angles – ITEM 23 EXEC (*)

When SV UPDATE POS < 0.03 and MARK ACPT > 9,
 SV SEL – ITEM 4 EXEC (FLTR)

A1U When R > 800 ft,
 KU RDR OUTPUT – HI

22. MNVR TO SEP 2 ATT

GNC UNIV PTG

TRK OPTION:

TGT ID +2
 BODY VECTOR +5
 P +270.0
 Y +0.0
 OM +0.0

Init TRK – ITEM 19 EXEC (CUR-*)

RELEASE
 +:10:30

DAP: A7/AUTO/VERN(ALT)

√ERR TOT – ITEM 23 EXEC (*)

23. SEP 2 BURN (retrograde)
 DAP TRANS: PULSE/PULSE/PULSE, LO Z

A6U √SENSE: -Z
 AFT FLT CNTLR PWR – ON
 DAP: A/AUTO/PRI

+ :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

24. 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-*)

25. 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

26. AMSB PWRDN

SM 212 SSE MECH/BPA/RNS

CRT DESEL – ITEM 20 EXEC (√Items 9-19 – (no*))

* If any MECH SEL – *, do not turn AMSB OFF; *
* notify MCC, continue *

√AMSB DC AMPS: < 0.035
OFF – ITEM 8 EXEC (*)

A6U PL RETEN LOGIC PWR SYS 1(SYS 2) – OFF
R13L BAY MECH PWR SYS 1(2) – OFF

27. 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 (*)

28. P/TV DEACTIVATION
Perform P/TV08 HST RELEASE, DEACTIVATION (PHOTO/TV FS,
SCENES) then:

Go to FLIGHT PLAN

RMS QUICK DEPLOY

= 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> <p><input checked="" type="checkbox"/> MNVR RMS TO PRE-GRAPPLE POSN</p> <p><input checked="" type="checkbox"/> GRAPPLE</p>
U N B E R T H	<p>HST UMB DISCONNECT</p> <p><input type="checkbox"/> PWR XFER PRECHECKS</p> <p><input checked="" type="checkbox"/> DEADFACE UMB</p> <p><input checked="" type="checkbox"/> SET UP UMB DISCONNECT</p> <p><input checked="" type="checkbox"/> DISCONNECT UMB</p> <p>HST UNBERTH</p> <p><input checked="" type="checkbox"/> OPEN BERTHING LATCH 3</p> <p><input checked="" type="checkbox"/> OPEN BERTHING LATCH 1</p> <p><input checked="" type="checkbox"/> OPEN BERTHING LATCH 2</p> <p><input checked="" type="checkbox"/> MNVR RMS TO FSS HOVER POSN</p> <p><input checked="" type="checkbox"/> MNVR RMS TO HST RELEASE POSN</p> <p><input checked="" type="checkbox"/> MNVR ORBITER TO RELEASE ATT</p>

TAB	PROCEDURE
R E L E A S E O P S	HST RELEASE PREP
	<input type="checkbox"/> M ADI SETUP
	KU RDR SETUP
	UPDATE ORBITER WEIGHT
	<input type="checkbox"/> M RMS SETUP
	<input type="checkbox"/> M ENABLE RNDZ NAV
	<input type="checkbox"/> M RJD HEALTH STATUS
	<input type="checkbox"/> VERIFY RF LINK AND PCS CONFIG
	<input type="checkbox"/> TIGHTEN DEADBANDS
	HST RELEASE (RMS AND HST SYSTEMS)
	<input type="checkbox"/> M RELEASE PREPS
	<input type="checkbox"/> HST SUNPOINT MACRO INIT
	<input type="checkbox"/> M RELEASE
	<input type="checkbox"/> M SEP 1 BURN
	<input type="checkbox"/> M HST TO SUNPOINT
	HST RELEASE (ORBITER)
	<input type="checkbox"/> M RELEASE
	<input type="checkbox"/> M SEP 1 BURN
	<input type="checkbox"/> HST TO SUNPOINT
	<input type="checkbox"/> M MNVR TO TARGET TRACK ATT
RADAR ACQUISITION	
RR NAVIGATION	
<input type="checkbox"/> M SEP 2 BURN	
P/TV DEACTIVATION	
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 = . (2-12,3-5)

DEC = .

OMICRON = .

TGT TRK OMICRON = . (3-9)

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 = . (2-12,3-5)

DEC = .

OMICRON = .

TGT TRK OMICRON = . (3-9)

HST BACKAWAY DEPLOY PAD	
DEPLOY ORBIT <input type="text"/> <input type="text"/> <input type="text"/>	
WINDOW OPEN MET =	<input type="text"/> / <input type="text"/> <input type="text"/> : <input type="text"/> <input type="text"/> : <input type="text"/> <input type="text"/>
WINDOW CLOSE MET =	<input type="text"/> / <input type="text"/> <input type="text"/> : <input type="text"/> <input type="text"/> : <input type="text"/> <input type="text"/>
(NLT SS-10 MIN)	
RELEASE ATT RA	= <input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> <input type="text"/> (4-2)
DEC	= <input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> <input type="text"/>
OMICRON	= <input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> <input type="text"/>
ORBITER WEIGHT =	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> (4-3)

HST BACKAWAY DEPLOY PAD	
DEPLOY ORBIT <input type="text"/> <input type="text"/> <input type="text"/>	
WINDOW OPEN MET =	<input type="text"/> / <input type="text"/> <input type="text"/> : <input type="text"/> <input type="text"/> : <input type="text"/> <input type="text"/>
WINDOW CLOSE MET =	<input type="text"/> / <input type="text"/> <input type="text"/> : <input type="text"/> <input type="text"/> : <input type="text"/> <input type="text"/>
(NLT SS-10 MIN)	
RELEASE ATT RA	= <input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> <input type="text"/> (4-2)
DEC	= <input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> <input type="text"/>
OMICRON	= <input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> <input type="text"/>
ORBITER WEIGHT =	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> (4-3)

OFF-NOMINAL RMS OPS

SJ HST GRAPPLE.....	6-2
UNBERTH.....	6-10
RELEASE.....	6-22

**OFF-NOM
RMS OPS**

SJ HST GRAPPLE

OFF-NOM
RMS OPS

Visually verify FSS in berthing posn

√MCC

Verify -V3 HGA dish is in RMS clearance posn

Review RMS QUICK DEPLOY (CONT OPS)

A7U 1. CAMR SETUP

√PL BAY FLOODS MID (two) – OFF
FWD,AFT (four) – as reqd

√P/TV08 HST RELEASE, SETUP (PHOTO/TV FS, SCENES) complete

VTR – √Adequate tape available
– Start Recording

M 2. SJ MNVR RMS TO PRE-GRAPPLE POSN

SM 210 HST SYS

√TLM COUNT – Incr

MON 1	D
MON 2	A(B)
DNLK	EE (ELBOW)

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 0

√INIT ID, ITEM 24: 0

RATE – as reqd (VERN within 10 ft)

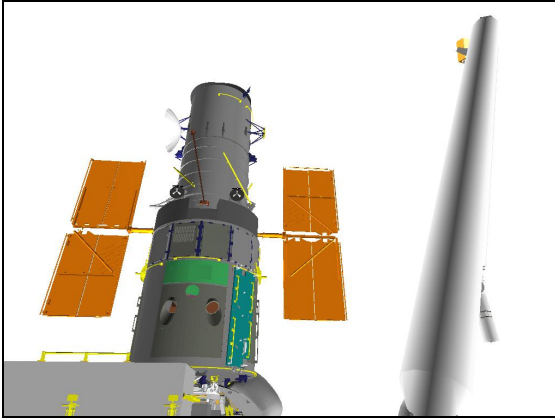
BRAKES – OFF (tb-OFF)

MODE – best available

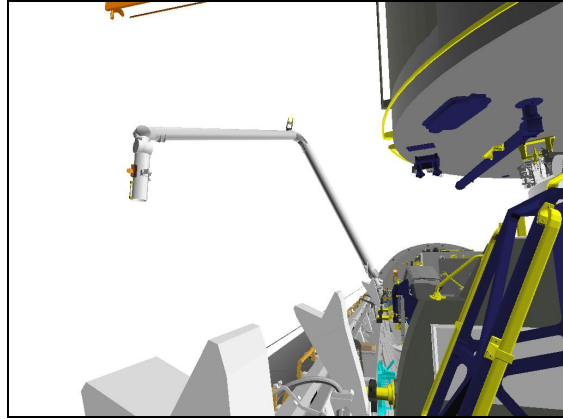
Mnvr to HST PRE-GRAPPLE posn:

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

Start:
RMS Ext Park



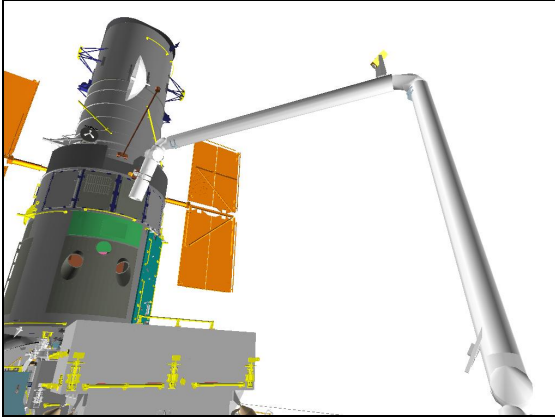
CCTV A (5,30)



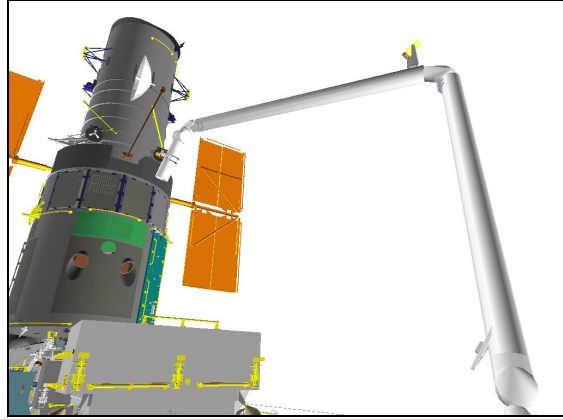
CCTV B (-15,10)

Step 1:
Drive -SY from +28.6° to -29.3°

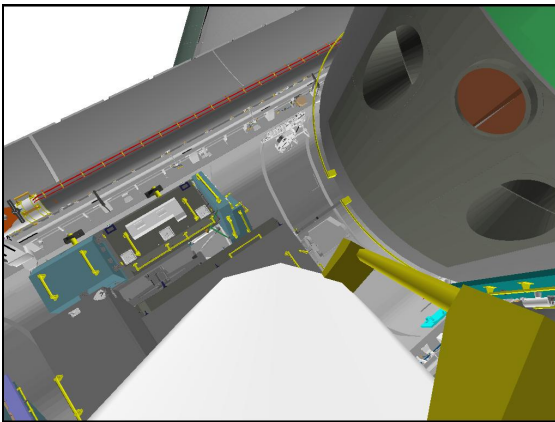
Step 2:
Drive +SP from +78.2° to +83.2°



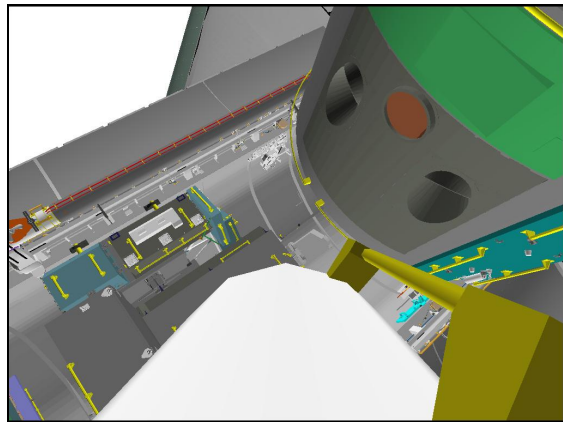
CCTV D (35,25)



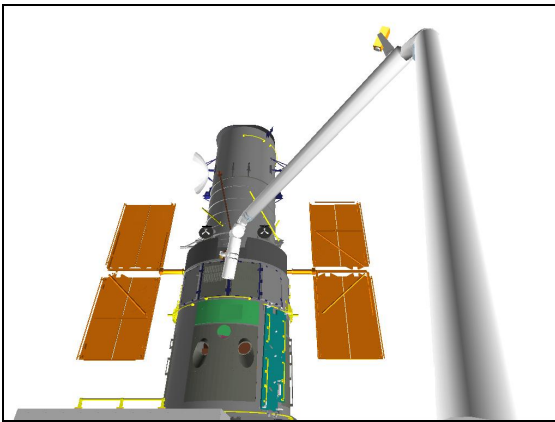
CCTV D (35,25)



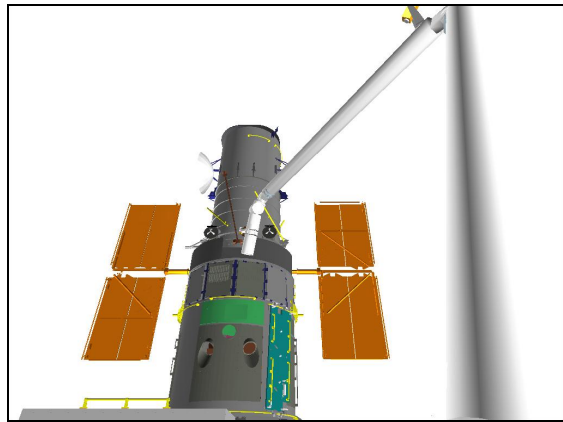
EE



EE

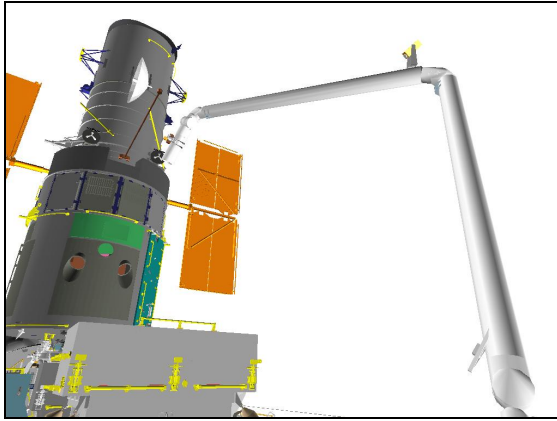


CCTV A (0,35)



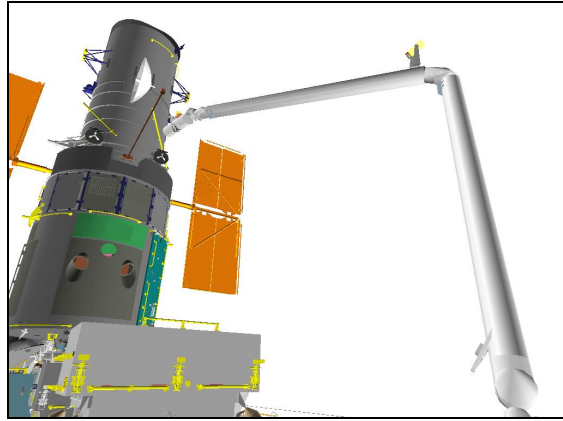
CCTV A (0,35)

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

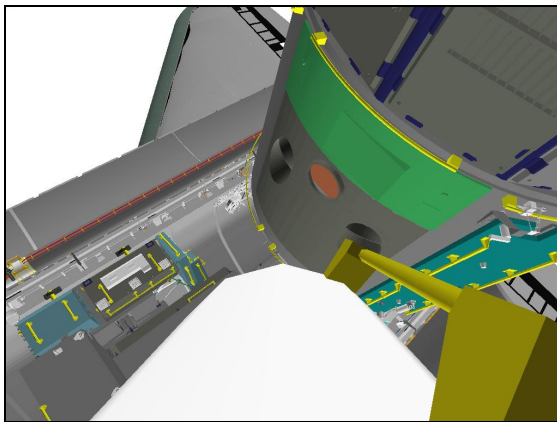


CCTV D (35,25)

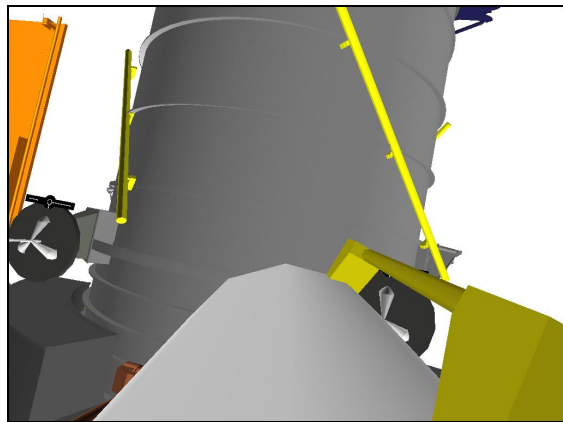
Step 4:
Drive +WP from -72.8° to -3.6°



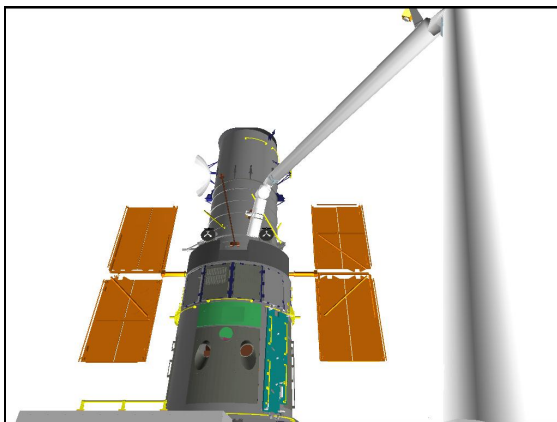
CCTV D (35,25)



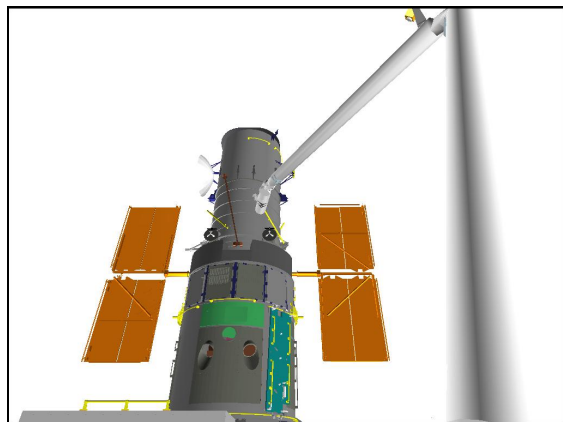
EE



EE

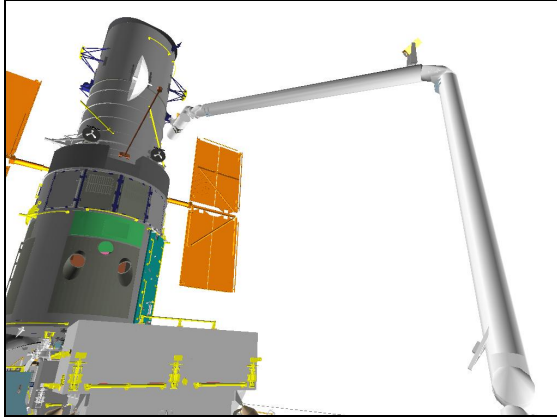


CCTV A (0,35)



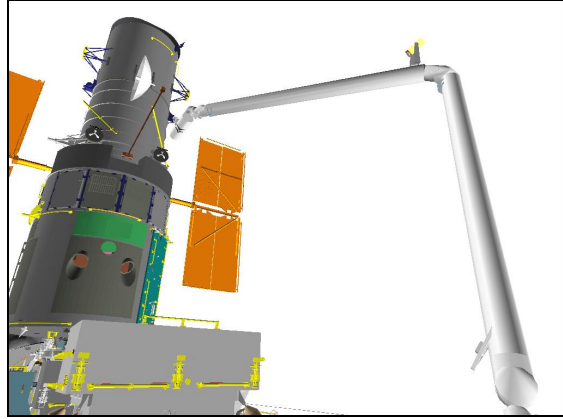
CCTV A (0,35)

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

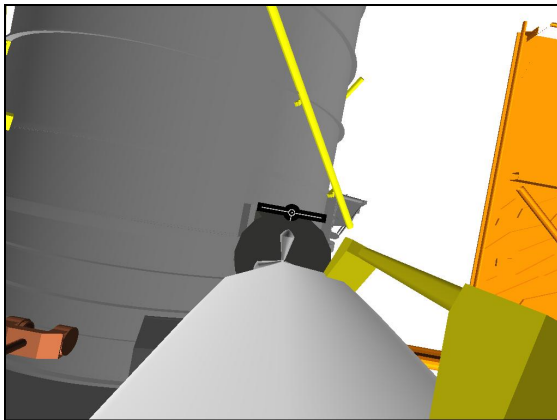


CCTV D (35,25)

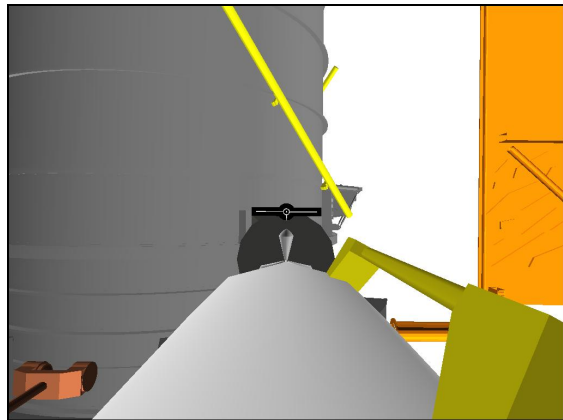
Step 6:
Drive +WR from -10.0° to +0.0°



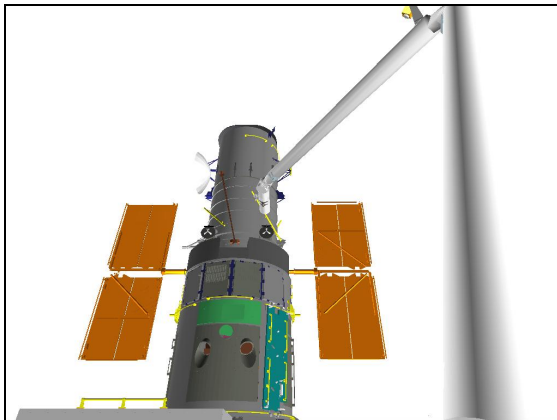
CCTV D (35,25)



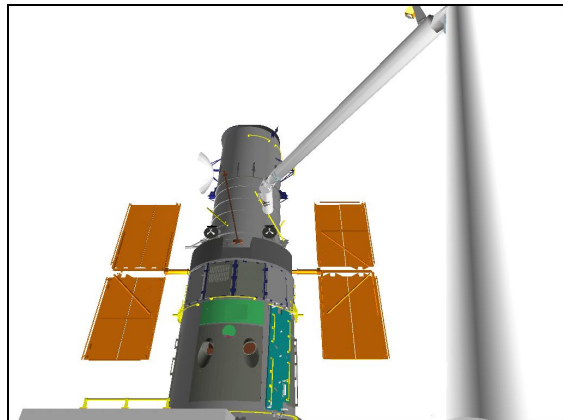
EE



EE



CCTV A (0,35)



CCTV A (0,35)

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

A7U M

3. SJ GRAPPLE

CCTV – config for grapple
 – install PDRS TARGET OVERLAY FOR CTVM
 – RMS WRIST, zoom 34.0 HFOV
 focus 5 ft

√DAP: A10/AUTO (FREE)/VERN

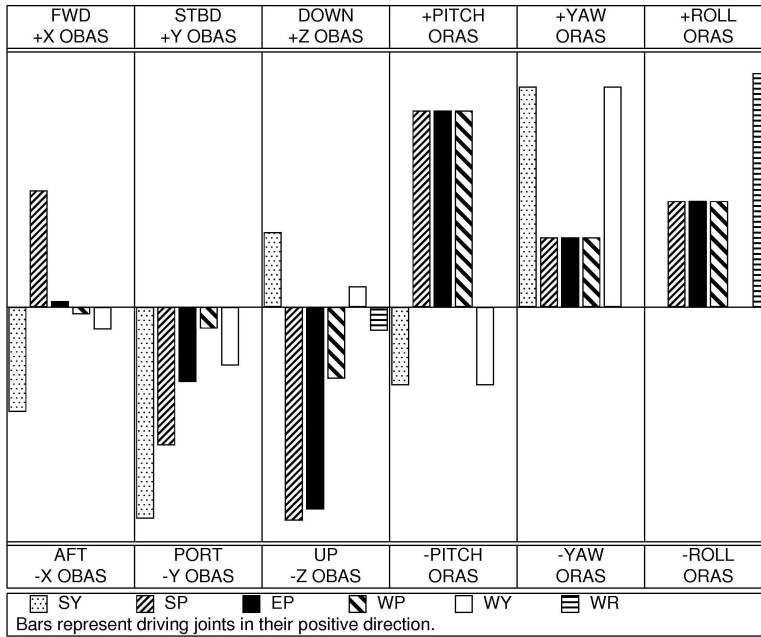
RATE – VERN (RATE MIN tb-ON)
 BRAKES – OFF (tb-OFF)
 MODE – best available

FSS LATCHED posn: (values recorded from HST BERTH (PDRS FS, NOMINAL HST RETRIEVAL), UNGRAPPLE HST step)

	X	Y	Z	PITCH	YAW	ROLL	PL ID
Expected							0
Expected							4
	SY	SP	EP	WP	WY	WR	
Expected							

Drive joints per BERTHED HST GRAPPLE OVERLAY and diagram until EE
 within +V2 GF grapple envelope

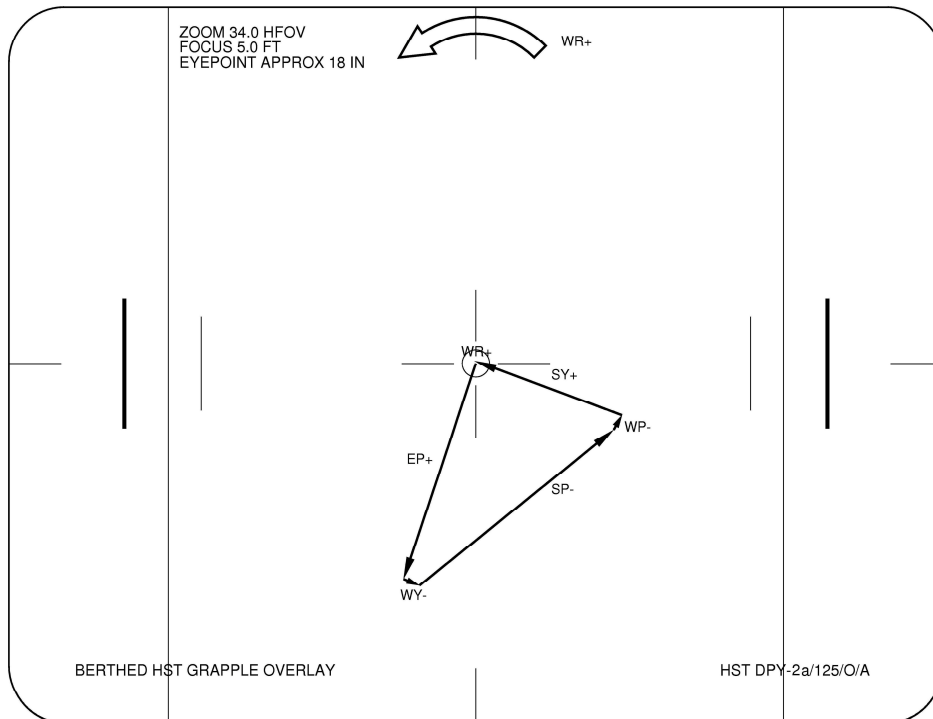
BERTHED HST GRAPPLE



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	-Z (up), +ROLL

ΔSY	ΔSP	ΔEP	ΔWP	ΔWY	ΔWR
+4.4	-12.9	+15.8	-2.9	-4.4	+0.5



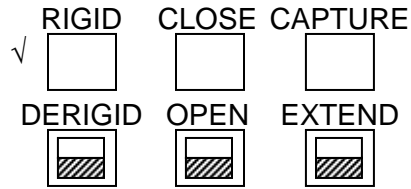
A6U

DAP: FREE

CAUTION
Monitor EE tb timing to prevent EE motor burnout

EE MODE – AUTO

EE CAPTURE sw – depress (mom)



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

- * 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 +4 EXEC
 INIT ID – ITEM 24 +4 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)

A7U VID OUT – MON 1(2)
IN – PL2

VTR – Start Recording

A6U √DAP: FREE

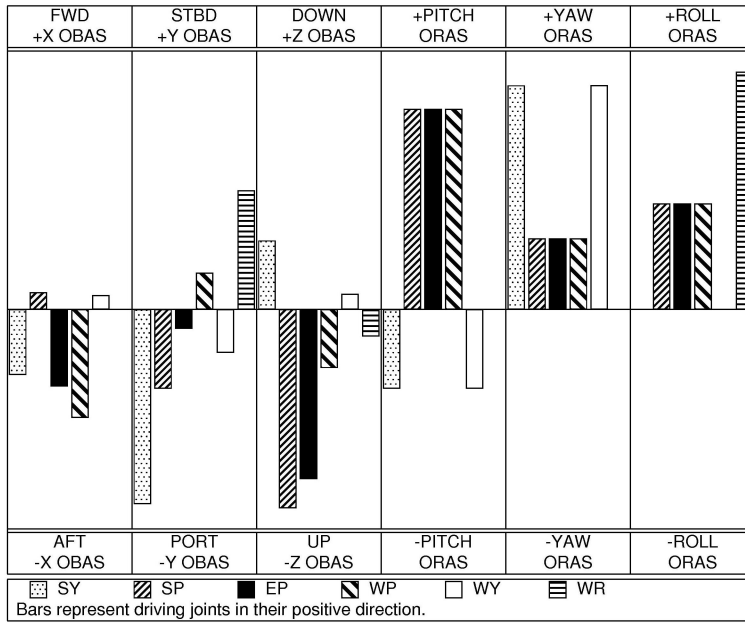
RATE – VERN (RATE MIN tb-ON)

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)

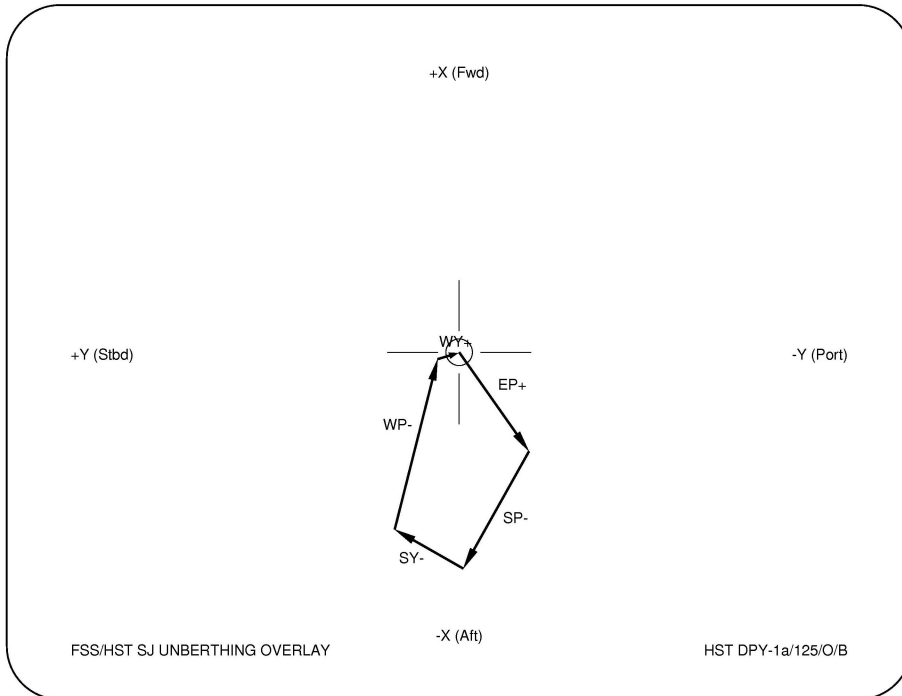
HST UNBERTH



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

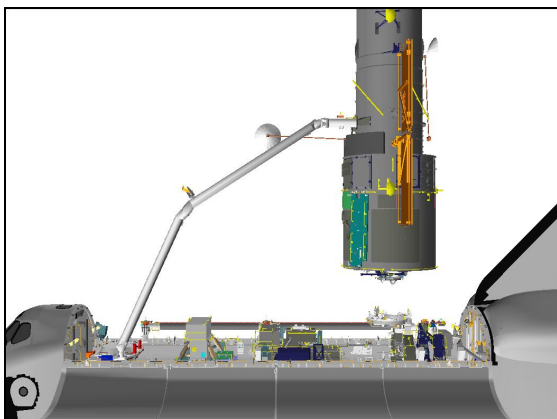
Driving:	Results In:	Driving:	Results In:
+SY	-Y (port), +YAW	+WP	-X (aft), +PITCH
+SP	-Z (up), +PITCH	+WY	-Y (port), +YAW
+EP	-Z (up), +PITCH	+WR	+Y (stbd), +ROLL

ΔSY	ΔSP	ΔEP	ΔWP	ΔWY	ΔWR
-3.1	-9.0	+26.9	-17.9	+3.1	+0.0

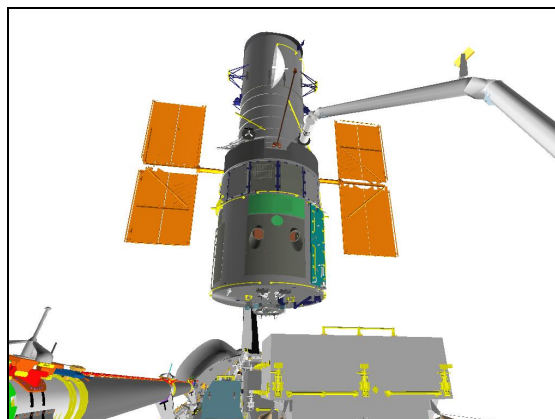


Mnvr to FSS HOVER posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1149	0	-825	0	0	0	3
-1128	+12	-567	0	0	0	4
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

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

A6U

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 (*)

3. MNVR RMS TO RNS INTERMEDIATE POSN

√VTR recording and timer

SM 94 PDRS CONTROL

PL ID – ITEM 3 +3 EXEC

INIT ID – ITEM 24 +3 EXEC

A6U

√DAP: FREE

√RATE – VERN (RATE MIN tb-ON)

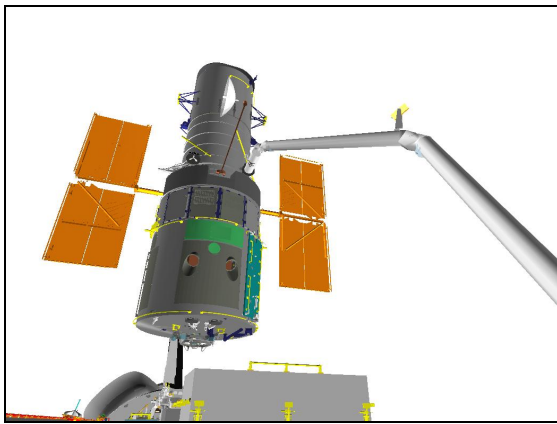
√BRAKES – OFF (tb-OFF)

MODE – best available

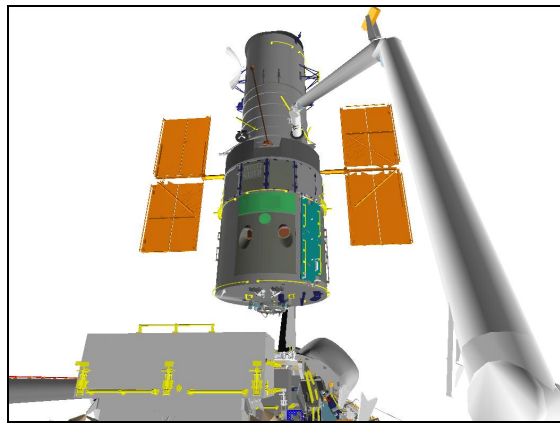
Mnvr to RNS INTERMEDIATE posn:

	SY	SP	EP	WP	WY	WR	
FSS Hover	-28.0	+61.3	-36.9	-24.4	+28.0	+0.5	
1: WP +				+26.2			
2: WY +					+28.9		
3: WR +						+7.4	
4: SY +	-26.2						
5: SP +		+101.9					
6: EP -			-95.6				
RNS Intermediate	-26.2	+101.9	-95.6	+26.2	+28.9	+7.4	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1010	-93	-825	25	15	19	3

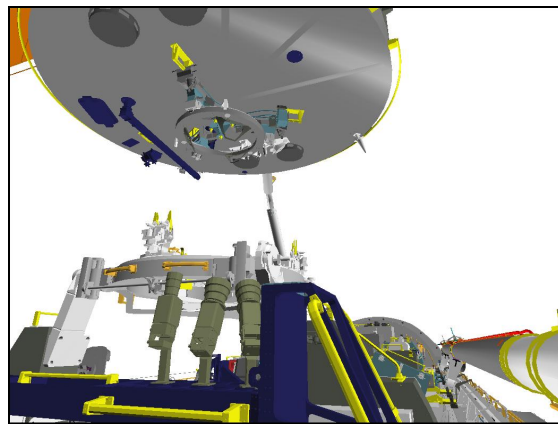
Start:
FSS Hover



CCTV D (20,30)



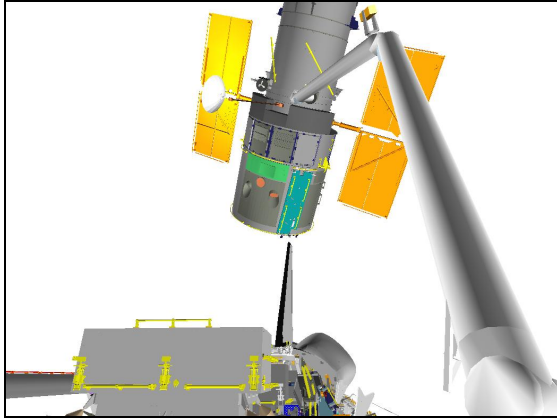
CCTV A (-5,25)



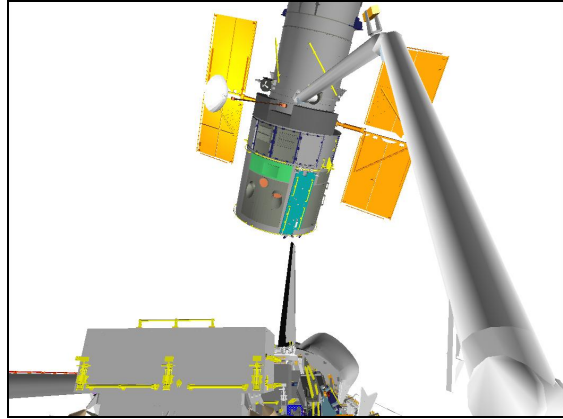
CCTV C (-20,20)

Step 1:
Drive WP (+) from -24.4 to +26.2

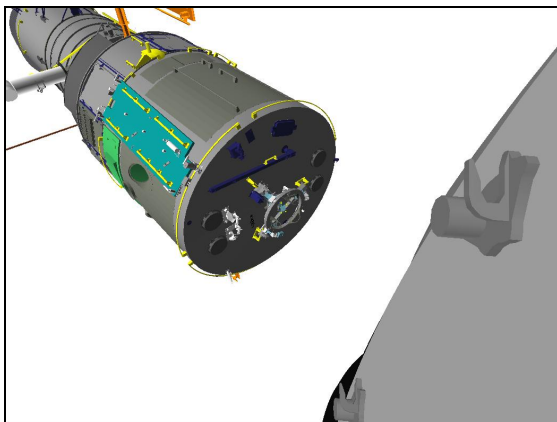
Step 2:
Drive WY (+) from +28.0 to +28.9



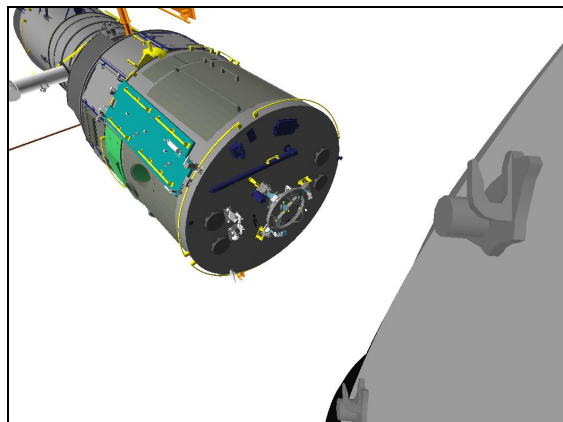
CCTV A (-5,25)



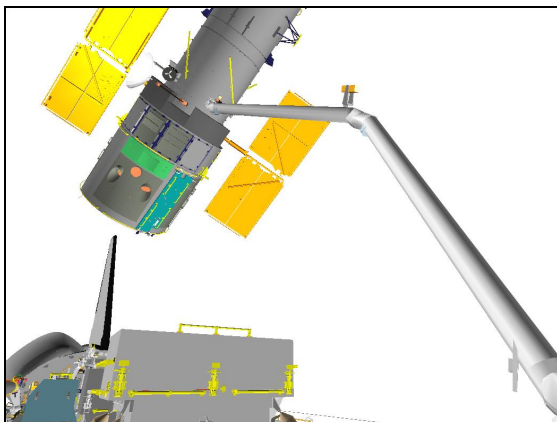
CCTV A (-5,25)



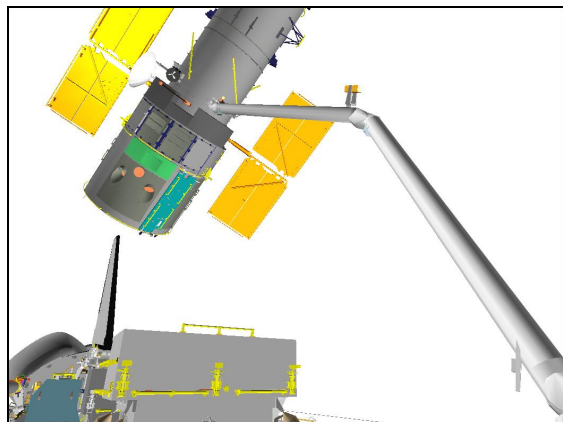
CCTV B (95,70)



CCTV B (95,70)



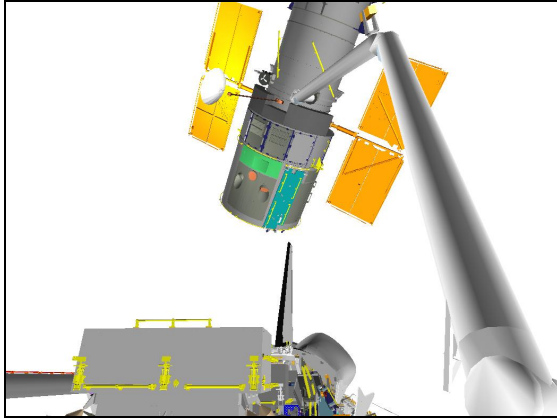
CCTV D (30,25)



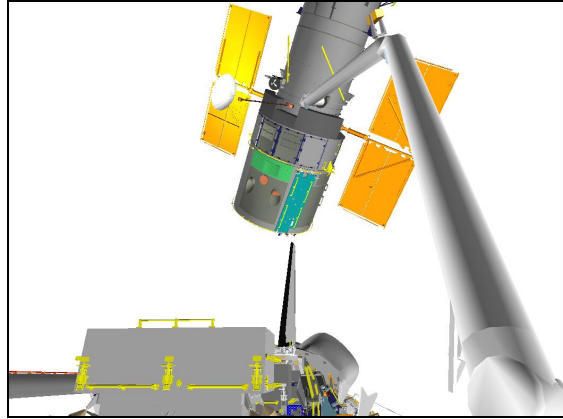
CCTV D (30,25)

Step 3:
Drive WR (+) from +0.5 to +7.4

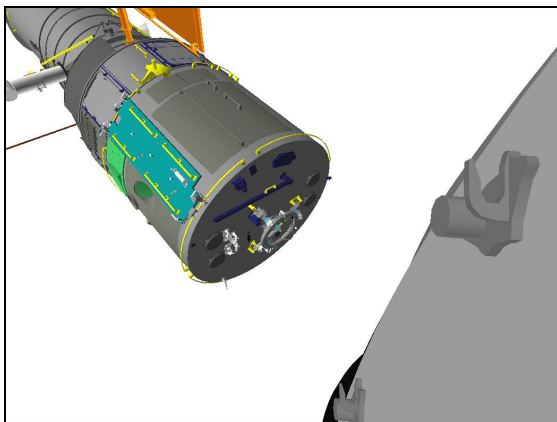
Step 4:
Drive SY (+) from -28.0 to -26.2



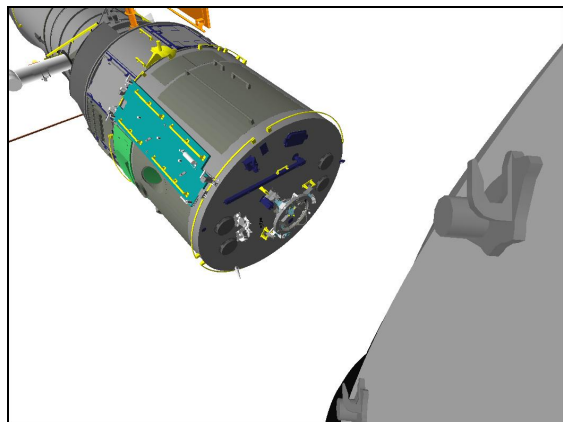
CCTV A (-5,25)



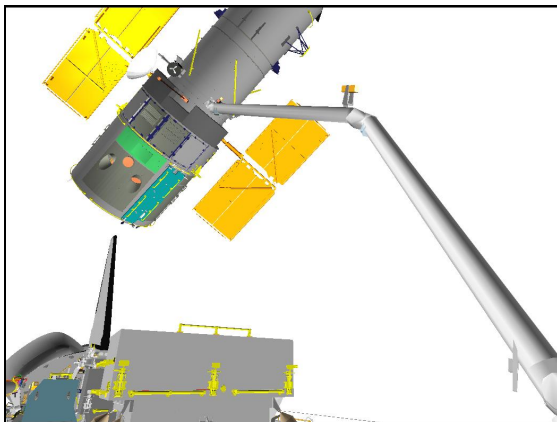
CCTV A (-5,25)



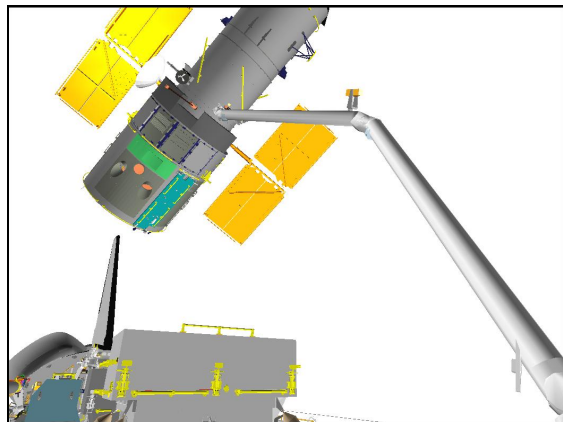
CCTV B (95,70)



CCTV B (95,70)

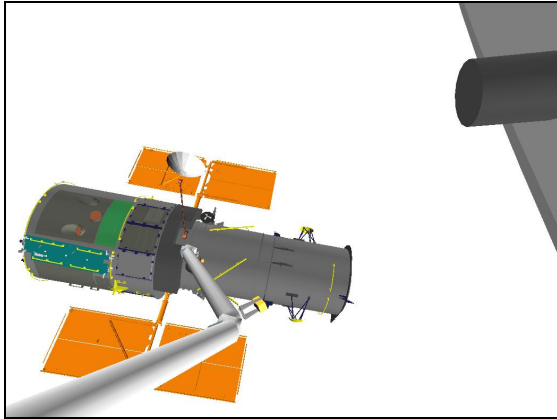


CCTV D (30,25)



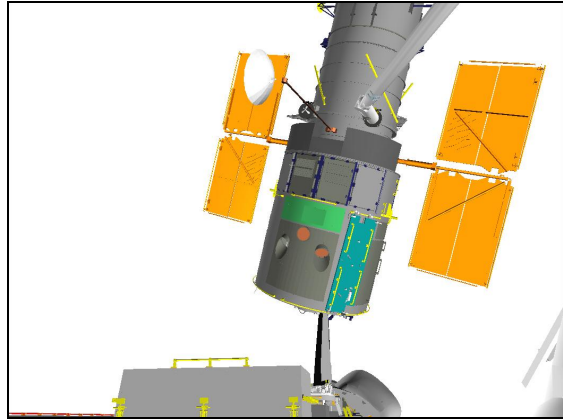
CCTV D (30,25)

Step 5:
Drive SP (+) from +61.3 to +101.9

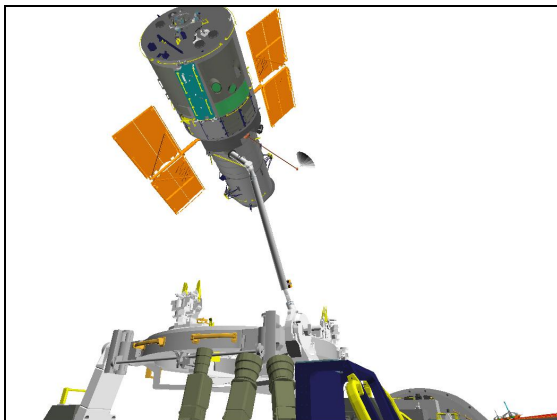


CCTV A (85,75)

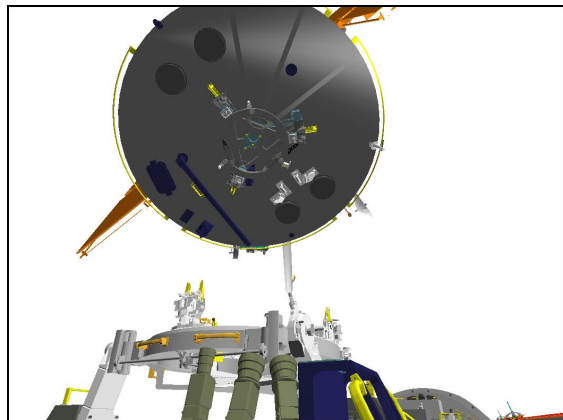
Step 6:
Drive EP (-) from -36.9 to -95.6



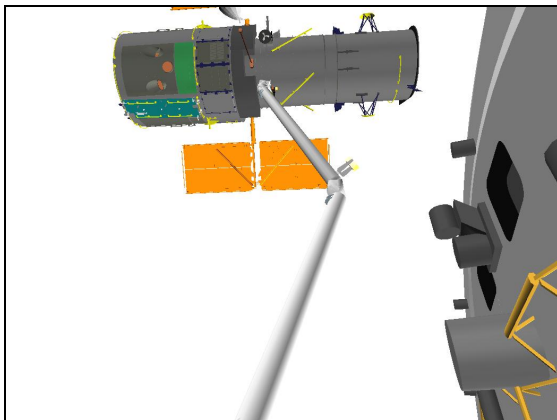
CCTV A (-10,30)



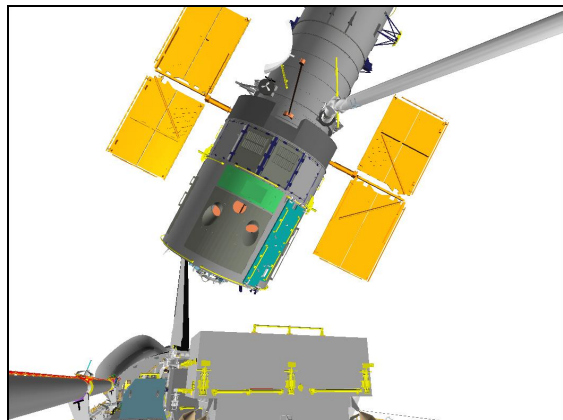
CCTV C (-25,30)



CCTV C (-25,30)



CCTV D (70,35)



CCTV D (20,25)

Notify MCC when RMS is in RNS Intermediate position
 Remain in position for 1 minute before continuing

M 4. MNVR RMS TO HST RELEASE POSN
 Load DAPs A15 and B12

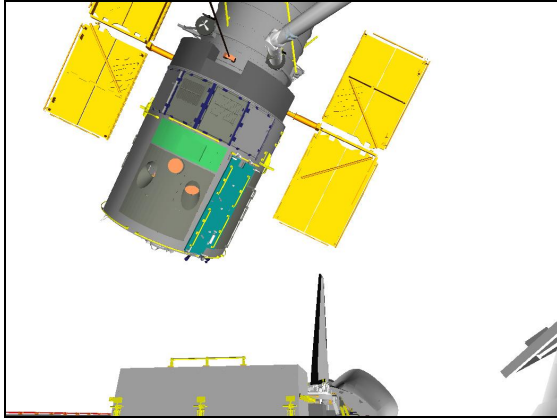
- √RATE – VERN (RATE MIN tb-ON)
- √BRAKES – OFF (tb-OFF)
- MODE – best available

Mnvr to HST RELEASE posn:

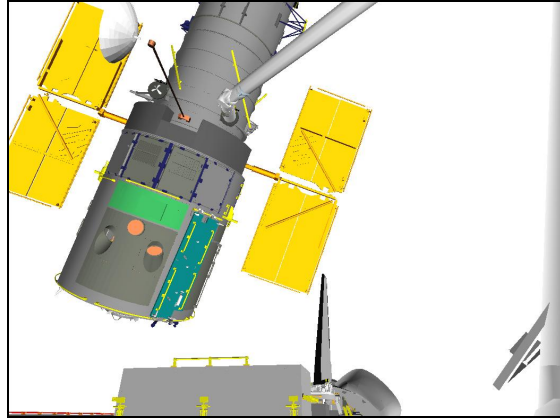
	SY	SP	EP	WP	WY	WR	
RNS Viewing	-26.2	+101.9	-95.6	+26.2	+28.9	+7.4	
1: SY –	-53.4						
2: SP –		+90.0					
3: EP +			-68.5				
4: WP –				-37.3			
5: WY –					0.0		
6: WR +						+8.5	
HST Release	-53.4	+90.0	-68.5	-37.3	0.0	+8.5	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-87	+112	-853	0	305	0	3

Step 1:
Drive SY (-) from -26.2 to -53.4

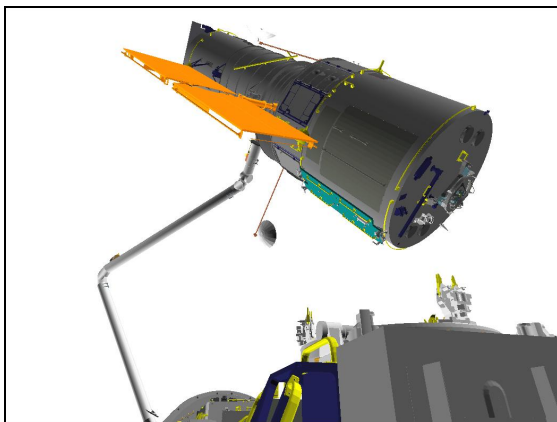
Step 2:
Drive SP (-) from +101.9 to +90.0



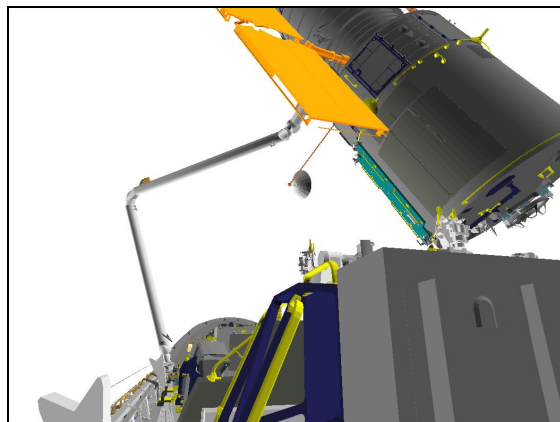
CCTV A (-10,30)



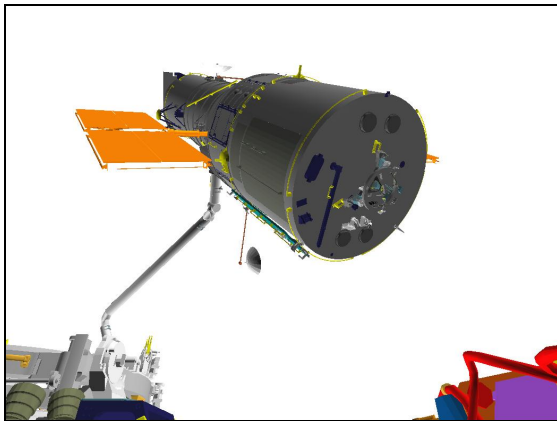
CCTV A (-10,30)



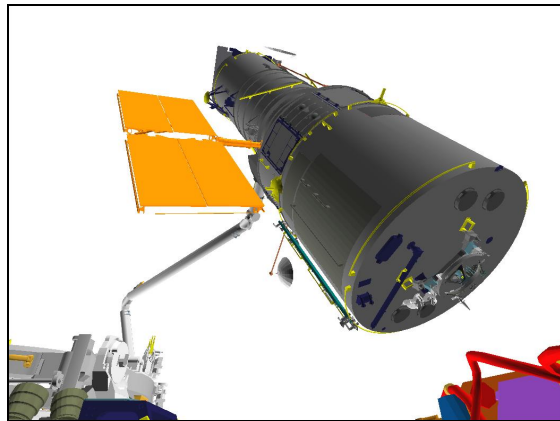
CCTV B (15,30)



CCTV B (15,20)



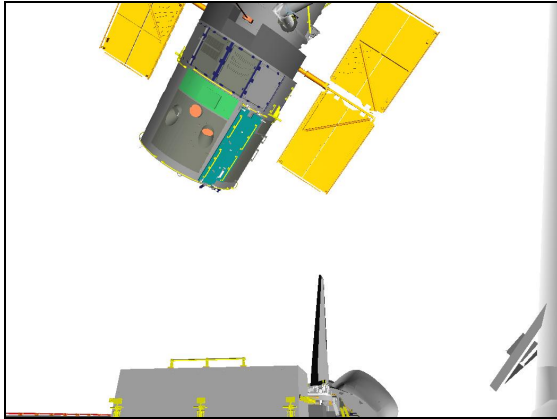
CCTV C (0,35)



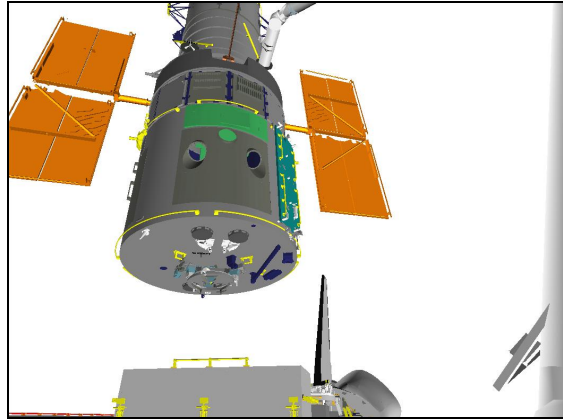
CCTV C (0,35)

Step 3:
Drive EP (+) from -95.6 to -68.5

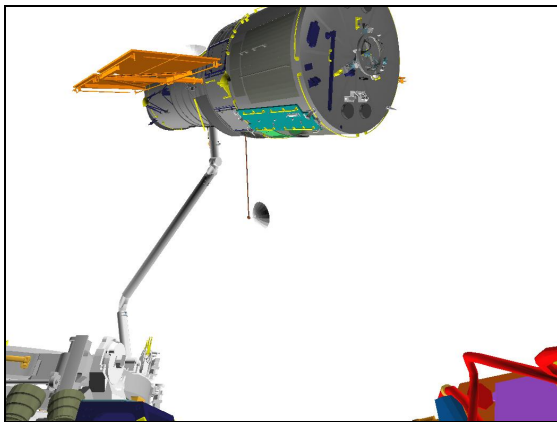
Step 4:
Drive WP (-) from +26.2 to -37.3



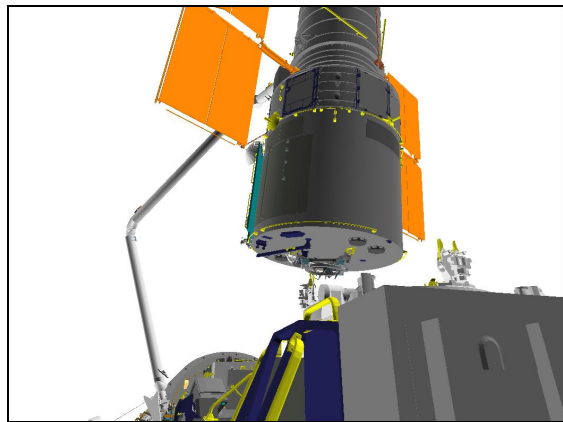
CCTV A (-10,30)



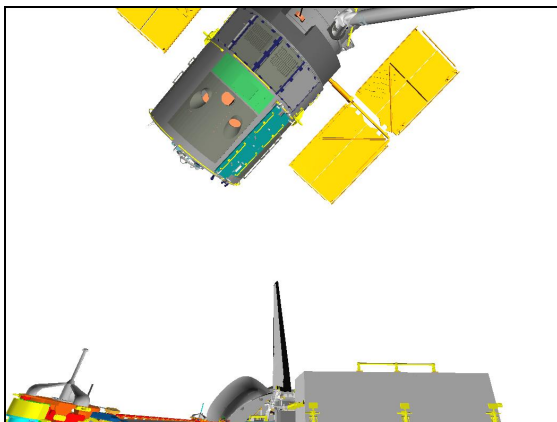
CCTV A (-10,30)



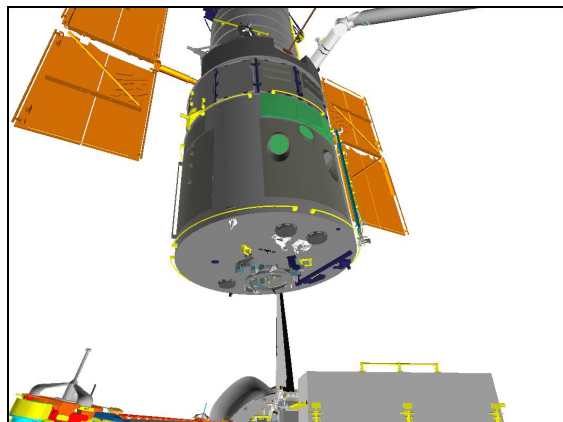
CCTV C (0,35)



CCTV B (15,25)



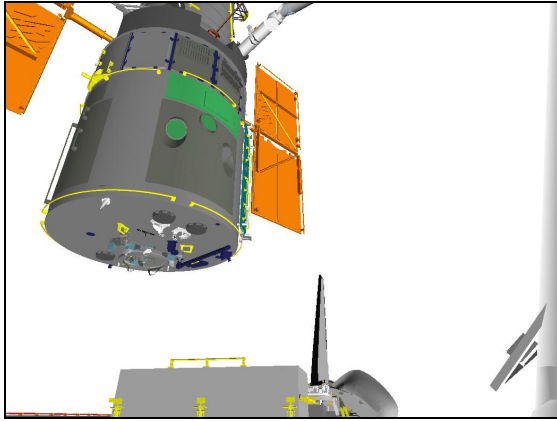
CCTV D (5,30)



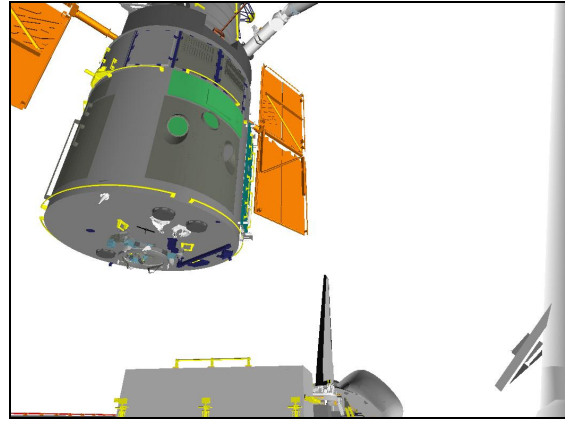
CCTV D (5,30)

Step 5:
Drive WY (-) from +28.9 to 0

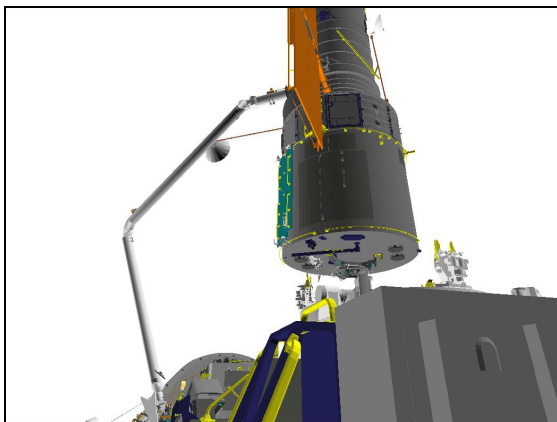
Step 6:
Drive WR (+) from +7.4 to +8.5



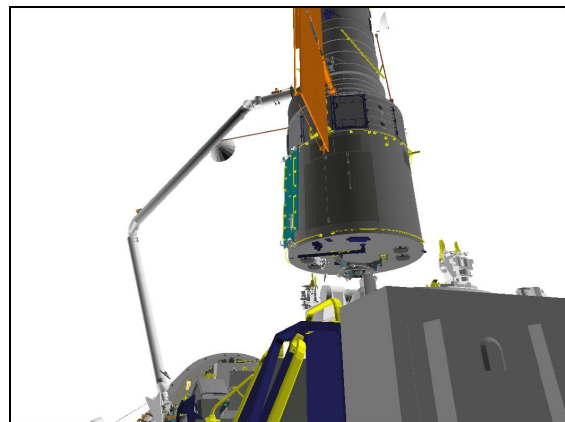
CCTV A (-10,30)



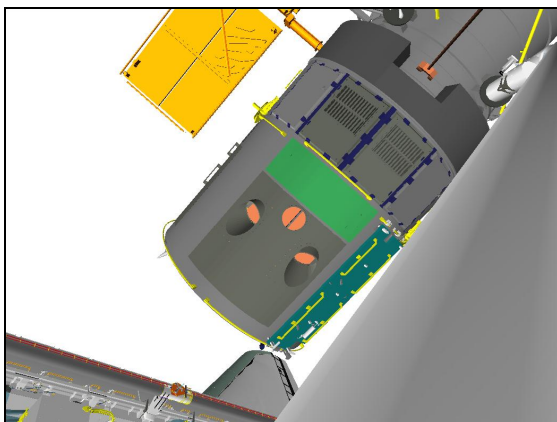
CCTV A (-10,30)



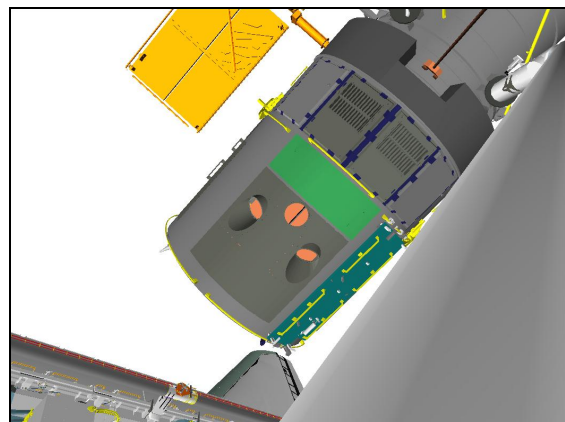
CCTV B (15,25)



CCTV B (15,25)



ELBOW (-35,-30)



ELBOW (-35,-30)

BRAKES – ON (tb-ON)

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

MODE – not DIRECT
JOINT – CRIT TEMP

VTR – STOP

M 5. 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><input checked="" type="checkbox"/> 1. <u>RELEASE PREPS</u> Review RMS QUICK DEPLOY (Cue Card) On MCC GO for Release: VTR – Start Recording</p> <p><input type="checkbox"/> 2. <u>HST SUNPOINT MACRO INIT</u> If RMS QUICK DPY, go to step 3 <input checked="" type="checkbox"/> <u>SM 210 HST SYS</u> √RCVR 2(1) LOCK – *</p> <p>-:01:30 PCS MODE SNPT – ITEM 7 +9 4(93) EXEC √SNPT DIS – NO</p> <p>* If PCS SNPT DIS still YES after 3 sec: * * Reattempt ITEM 7 +9 4(93) EXEC * * √SNPT DIS – NO * * If no joy, attempt alt CDI cmd: * * ITEM 7 +9 3(94) EXEC * * √SNPT DIS – NO * * If still no joy, abort deploy and √MCC *</p> <p>Record Sunpoint macro start MET ___/___:___:___</p>	<p>-:03:00 <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>A6U √ATT ERR < 2.0 deg √RATES < .1 deg/sec ADI ATT – REF ATT REF pb – push √ADI: 0,0,0 √SENSE: -Z</p> <p>AFT FLT CNTLR PWR – ON</p>

RMS and HST Systems		Orbiter	
-:00:30	<p>[M] 3. <u>RELEASE</u> DAP: FREE</p> <p>* If backup pwr reqd: *</p> <p>* √B/U PL REL – OFF *</p> <p>* √BRAKES – ON (tb-ON) *</p> <p>* *</p> <p>* <u>NOTE</u> *</p> <p>* Spurious fault msgs may occur *</p> <p>* when PORT RMS deselected *</p> <p>* RMS PWR – B/U *</p> <p>* SEL – OFF *</p> <p>* SEL – PORT *</p> <p>* B/U PL REL – ON (10 sec) *</p> <p>* – OFF *</p> <p>* Alternate joints until arm clear of GF pin: *</p> <p>* Drive B/U SP+ *</p> <p>* Drive B/U WP- *</p> <p>* When clear of GF pin: *</p> <p>* Drive B/U SY+ to mnvr arm 5 ft *</p> <p>* (minimum) clear of HST *</p> <p>If SINGLE MODE available: RATE – as reqd (VERN within 10 ft) √BRAKES – OFF (tb-OFF)</p> <p>RHC/A8U</p> <p>A8U</p> <p>MODE – best available</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>Monitor EE tb timing to prevent EE motor burnout</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <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>-:00:00</p> <p>EE 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>	-:00:30	<p>[GNC 33 REL NAV] ORB TO TGT – ITEM 10 EXEC DAP: FREE</p> <p>[GNC 20 DAP CONFIG] Change DAP A,B to A7,B7 DAP TRANS: PULSE/PULSE/PULSE, LO Z DAP: A7/FREE/PRI</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) * * If HST Sunpoint macro not disabled by EVENT * * TIMER = +3:30: * * √PCS MODE – SNPT * * At EVENT TIMER = +5:00, command HST * * to Drift mode * * PCS MODE – ITEM 7+9 2(91) EXEC (DRFT) * * √PCS MODE – DRFT * * If PCS MODE not DRFT, repeat * * If PCS MODE still not DRFT, re-exec using * * alt cmd – ITEM 7+9 1(92) EXEC (DRFT) * * If still no joy, √MCC * * * * 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>* 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) * * If HST Sunpoint macro not disabled by EVENT * * TIMER = +3:30: * * √PCS MODE – SNPT * * At EVENT TIMER = +5:00, command HST * * to Drift mode * * PCS MODE – ITEM 7+9 2(91) EXEC (DRFT) * * √PCS MODE – DRFT * * If PCS MODE not DRFT, repeat * * If PCS MODE still not DRFT, re-exec using * * alt cmd – ITEM 7+9 1(92) EXEC (DRFT) * * If still no joy, √MCC * * * * 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>

RMS and HST Systems	Orbiter
<p data-bbox="338 334 373 362">M</p> <p data-bbox="422 334 600 386">4. <u>SEP 1 BURN</u> √SEP 1 initiated</p> <div data-bbox="457 410 716 438" style="border: 1px solid black; padding: 2px;"> <p data-bbox="457 410 716 438">SM 94 PDRS CONTROL</p> </div> <p data-bbox="457 440 758 492">PL ID – ITEM 3 +0 EXEC INIT ID – ITEM 24 +0 EXEC</p>	<p data-bbox="1199 261 1234 289">M</p> <p data-bbox="1283 261 1444 289">2. <u>SEP 1 BURN</u></p> <p data-bbox="1314 290 1703 339">When RMS motion has stopped: AFT THC: -X(dn) 10 pulses (1.0 fps)</p> <p data-bbox="1314 363 1696 436">Record Release MET: ___/___:___:___ AFT FLT CNTLR PWR – OFF Report TIG to MCC</p> <p data-bbox="1314 461 1776 534">When center of HST in bottom half of Keel Camr (REF BALL PITCH ~65deg): DAP: INRTL</p> <p data-bbox="1314 558 1535 607">When pitch rate nulled: DAP: VERN(ALT)</p> <p data-bbox="1314 631 1478 659">ADI ATT – LVLH</p> <p data-bbox="968 315 1031 339">ASAP</p> <p data-bbox="1083 631 1136 656">A6U</p>

RMS and HST Systems	Orbiter
<p data-bbox="338 261 653 318"> <input type="checkbox"/> M 5. <u>HST TO SUNPOINT</u> <input type="checkbox"/> SM 210 HST SYS </p> <p data-bbox="443 342 659 370">√RCVR 2(1) LOCK – *</p> <p data-bbox="443 402 953 573"> * If RMS QUICK DEPLOY, activate hardware * * Sunpoint: * * PCS MODE SUNPOINT – ITEM 7 +9 5 EXEC * * – ITEM 7 +9 6 EXEC * * – ITEM 7 +9 7 EXEC * * * * Expect 'PDI DECOM FAIL' msg >> * </p> <p data-bbox="107 597 653 625">+ :03:30 √PCS MODE – SNPT</p> <p data-bbox="107 649 659 677">+ :04:58 √SNPT DIS – YES >></p> <p data-bbox="495 701 779 745"> * If PCS MODE not SNPT, * * √MCC * </p>	<p data-bbox="1192 261 1587 318"> <input type="checkbox"/> 3. <u>HST TO SUNPOINT</u> √HST Sunpoint mode initiated </p> <p data-bbox="1192 362 1629 418"> <input type="checkbox"/> M 4. <u>MNVR TO TARGET TRACK ATT</u> <input type="checkbox"/> GNC UNIV PTG </p> <p data-bbox="1314 423 1728 573"> TRK OPTION: TGT ID +1 BODY VECTOR +3 √P +90.0 √Y +0.0 OM + 180.0 ____ . ____ (per PAD) </p> <p data-bbox="968 889 1644 917">SEP 1 Init TRK – ITEM 19 EXEC (CUR-*)</p> <p data-bbox="968 938 1587 966">+ :05:00 DAP: A7/AUTO/VERN(ALT)</p>

RMS and HST Systems	Orbiter
<p>Actions Complete</p>	<p>5. <u>RADAR ACQUISITION</u> $\sqrt{\text{Range}} \geq 100 \text{ ft}$ GNC 33 REL NAV KU ANT ENA – ITEM 2 EXEC (*) GNC I/O RESET</p> <p>A1U $\sqrt{\text{KU RADAR OUTPUT}} - \text{LO}$ $\sqrt{\text{sel}} - \text{GPC}$ $\sqrt{\text{MODE}} - \text{RDR PASSIVE}$ $\sqrt{\text{PWR}} - \text{ON}$ CNTL – PNL</p> <p>A2 $\sqrt{\text{DIGI-DIS SEL}} - \text{R/RDOT}$</p> <p>A1U * If no lock within 2 min: * * KU sel – AUTO TRACK * * SLEW ELEV – as seen in COAS * AZ – as seen in COAS * * $\sqrt{\text{EL, AZ angles}} < 30 \text{ deg}$ * * KU SEARCH – SEARCH (tb-gray) * * Repeat slew and search as reqd * * If acquisition not successful, $\sqrt{\text{MCC}}$ *</p> <p>6. <u>RR NAVIGATION</u> $\sqrt{\text{KU TRACK tb}} - \text{gray}$ GNC 33 REL NAV $\sqrt{\text{RR (ITEM 13)}} - (*)$</p> <p>* If RATIO > 1.0, * * $\sqrt{\text{MCC}}$ *</p> <p>AUTO RNG – ITEM 17 EXEC (*) RDOT – ITEM 20 EXEC (*) Angles – ITEM 23 EXEC (*)</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 > 800 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></p> <p>VTR – Stop Recording</p> <p>Go to P/TV08 HST RELEASE, DEACTIVATION (PHOTO/TV FS, <u>SCENES</u>)</p>

RMS and HST Systems	Orbiter
<p>Actions Complete</p>	<p>9. <u>CONFIG KU FOR COMM</u> When RANGE > 5000 FT: <input type="checkbox"/> GNC 33 REL NAV 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 DAP: No LO Z Go to FLIGHT PLAN</p>

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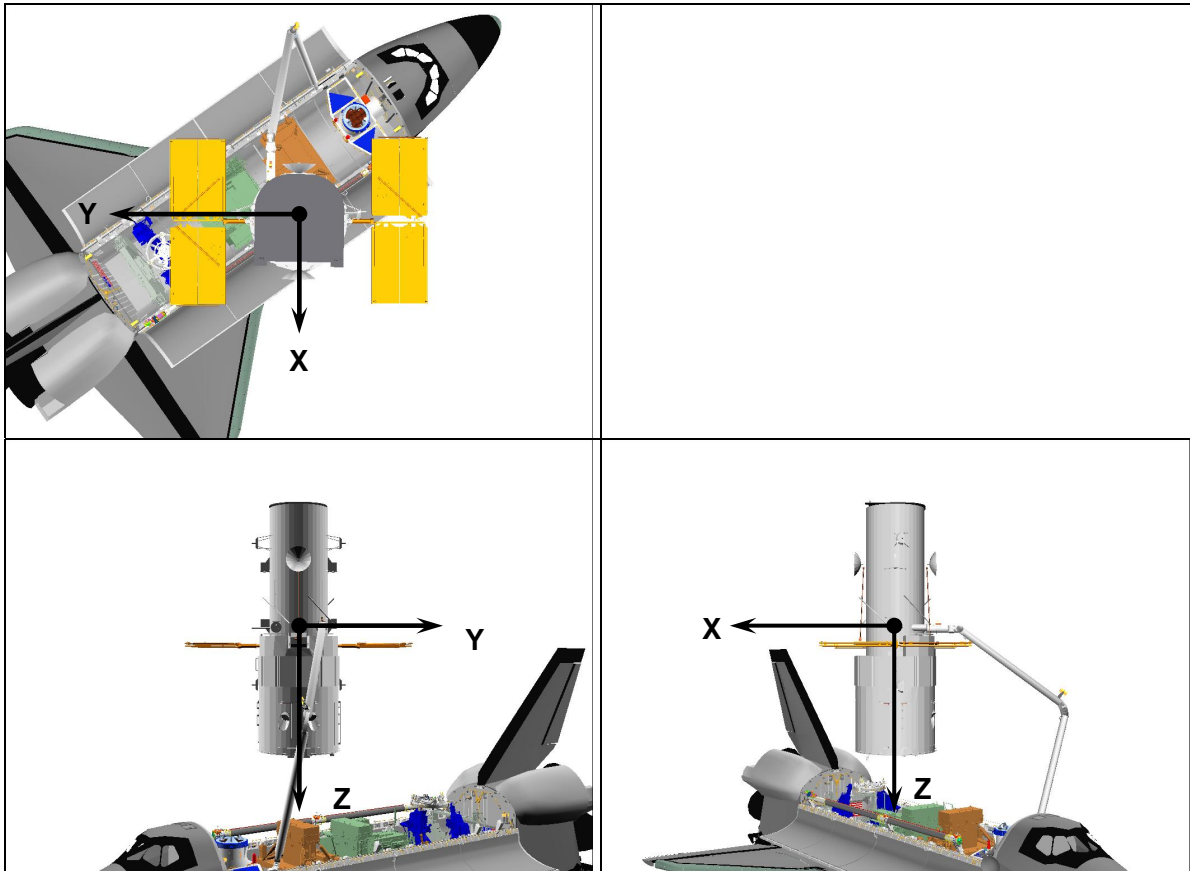
REFERENCE DATA

PL ID/POR DEFINITION – PL ID 3.....	7-2
4.....	7-3
RMS (HST) DAP CONSTRAINTS	7-4
CONFIGURATIONS	7-5
GO/NO-GO CRITERIA.....	7-6
JOINT ANGLES VS POR COORDINATES	7-7
RMS HST DEPLOY	7-7

REF DATA

PL ID/POR DEFINITION – PL ID 3

REF DATA



GF: +V2

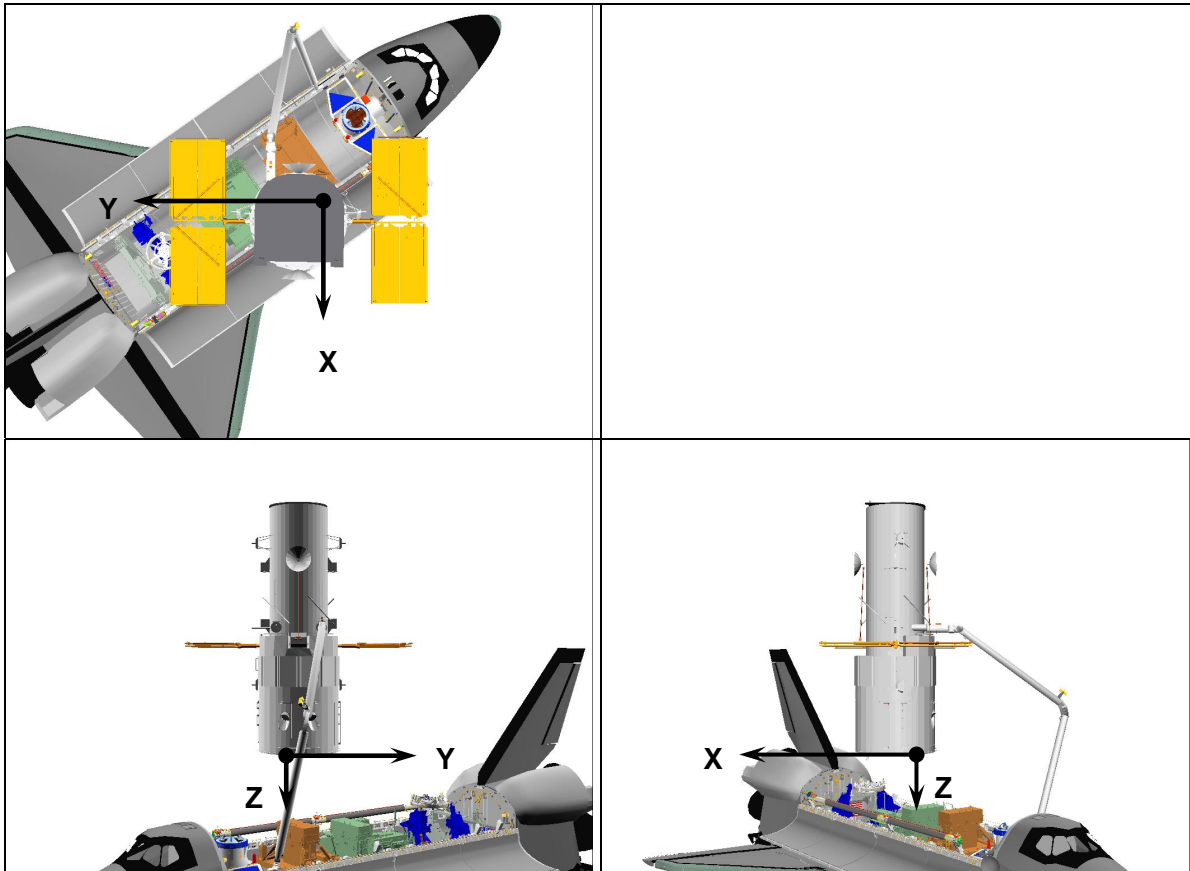
POR: Center of HST, along V1 axis, at level of GFs

PURPOSE: HST maneuvering/berthing

RATES: COARSE VERN

TRAN LIM ft/sec	0.18	0.07
ROT LIM deg/sec	0.61	0.20

PL ID/POR DEFINITION – PL ID 4



GF: +V2

POR: FSS target

PURPOSE: HST berthing and unberthing

RATES:	<u>COARSE</u>	<u>VERN</u>
TRAN LIM ft/sec	0.18	0.07
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	A15/4	A15/4	A15/4	TAIL	NORM Z**
AT FSS HOVER	A15/5	A15/5	A15/5	TAIL	NORM Z**
AT RELEASE POSITION					
• RMS POSN HOLD	A15/3	A15/3	A15/3	TAIL	NORM Z**
– DEADBAND COLLAPSE	B15/3	B15/3	B15/3	TAIL	NORM Z**
• RMS BRAKES ON	A15/3	A15/3*	A15/3*	TAIL	NORM Z**

NOTES:

- KEY: --- ATTITUDE CONTROL MODE NOT ALLOWED (FREE DRIFT)
X##/## DAP CONFIGURATION/CNTL ACCEL
* FOR CONTINGENCY ONLY – AVOID IF POSN HOLD AVAILABLE
** NORM Z IS PREFERRED FOR LOADS, BUT LOW Z IS ALSO ACCEPTABLE
- RMS/HST POSITIONS DEFINED IN REF DATA
- CONSTRAINTS ONLY APPLY TO GRAPPLE FIXTURE #1 (+V2 GF: PORT GF WHEN BERTHED ON FSS)
- TAIL-ONLY MODE REQD FOR GRAPPLED HST OPS AND DURING CREW SLEEP
- 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 {A12-6G}, OMS/RCS CONSTRAINTS, FOR USE OF VRCS IN UNPLANNED CONTINGENCY
- 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	TAIL	TAIL	TAIL
Y OPTION	TAIL	TAIL	TAIL
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	3-5	3	3-5

NOTES:

CNTL ACCELS:

- 3 – RELEASE POSN
- 4 – EXTENDED PARK
- 5 – FSS HOVER

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 AND DEPLOY OPS (HIGH PRIORITY)	FLT RULE REF
SHOULDER BRACE REL (1)	0 ↓ [1]	
JETTISON SYSTEM (2)	1 ↓ [2]	A12-181
MPM STOW MOTORS (2)	2 ↓ [1]	A12-72
MRL LATCH CAPABILITY (3)	3 ↓ [1]	A12-73
MPM (4) STOWED IND (8)		
MPM (4) DEPLOY IND (8)	SH 1 ↓	
MRLs LATCHED (3)		
MAN AUG MODE (1)		
SINGLE MODE (1)	3 ↓ [4]	A12-111
DIRECT MODE (1)		
BACKUP MODE (1)		
BRAKES (6)	0 ↓	
AUTO BRAKES (1)	0 ↓ [5]	
CAPTURE AND RIGIDIZE (2)	1 ↓	
DERIGIDIZE (2)	2 ↓ [6]	A12-143
RELEASE (2)	2 ↓	A12-143
BACKUP RELEASE (1)		
THERMAL (DEG F) -20(0), 176(172), LED -20(0), 147(144), ABE(EF) -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 MRLs (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	

HST 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	3
-1128	12	-497	0	0	0	4
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	3
-1128	12	-567	0	0	0	4
SY	SP	EP	WP	WY	WR	
-28.0	+61.3	-36.9	-24.4	+28.0	+0.5	

RNS INTERMEDIATE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-948	-118	-80	25	15	19	0
-1010	-93	-825	25	15	19	3
-1114	+5	-609	25	15	19	4
SY	SP	EP	WP	WY	WR	
-26.2	+101.9	-95.6	+26.2	+28.9	+7.4	

HST RELEASE

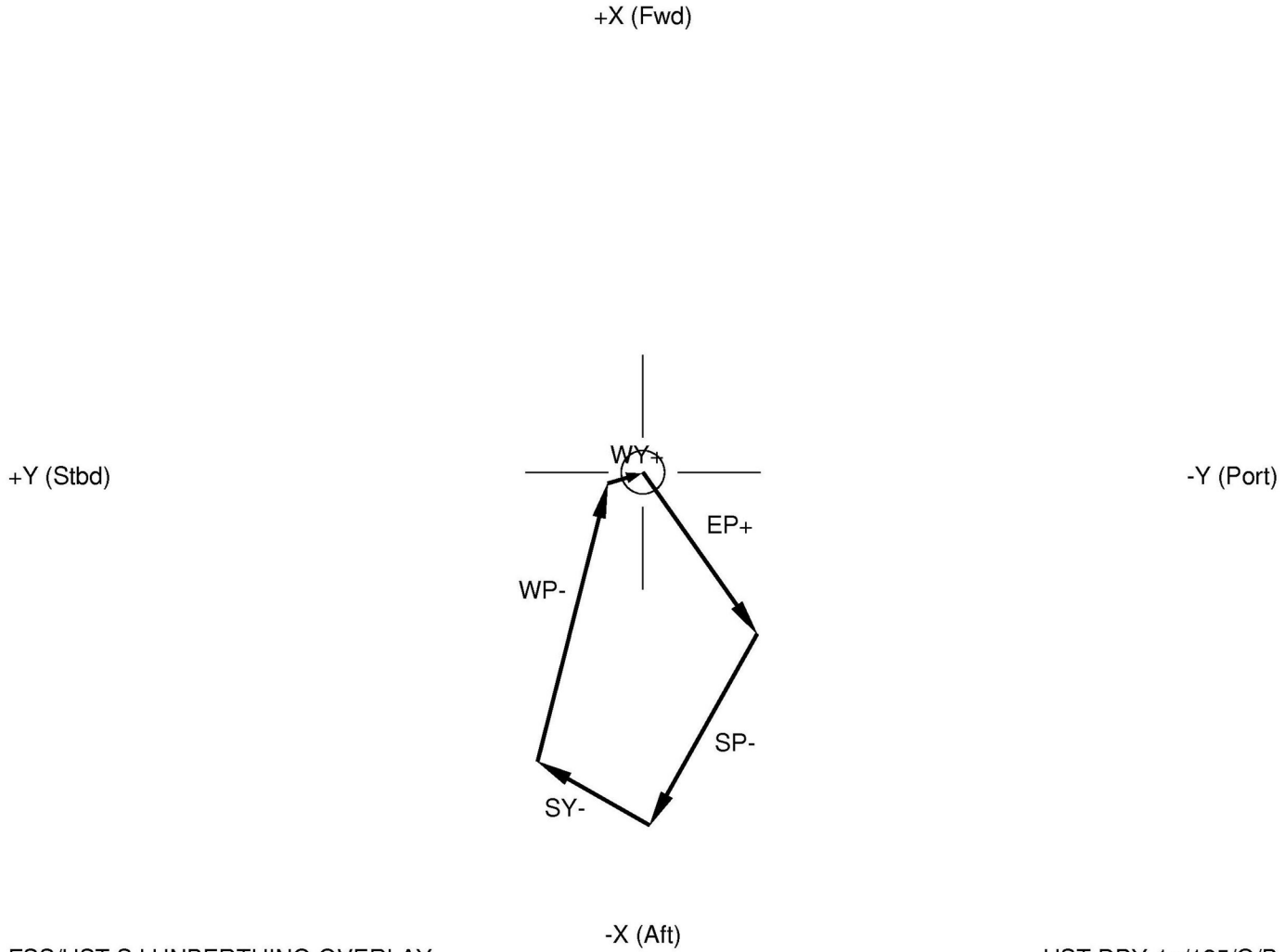
X	Y	Z	PITCH	YAW	ROLL	PL ID
-878	32	-853	0	305	0	0
-878	112	-853	0	305	0	3
-856	101	-595	0	305	0	4
SY	SP	EP	WP	WY	WR	
-53.4	+90.0	-68.5	-37.3	0.0	+8.5	

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CUE CARD CONFIGURATION

CUE CARD
CONFIG

CUE CARD CONFIG



FSS/HST SJ UNBERTHING OVERLAY

HST DPY-1a/125/O/B

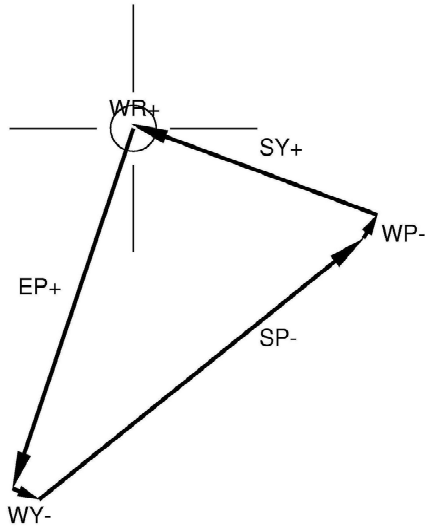
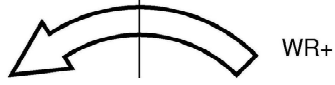
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CC 8-2

HST DPY/125/FIN B

Fabricate as transparency

ZOOM 34.0 HFOV
FOCUS 5.0 FT
EYEPOINT APPROX 18 IN



BERTHED HST GRAPPLE OVERLAY

HST DPY-2a/125/O/A

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CC-8-3

HST DPY/125/FIN B

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HST DEPLOY CHECKLIST

STS
125