

Hubble Space Telescope Deploy Checklist

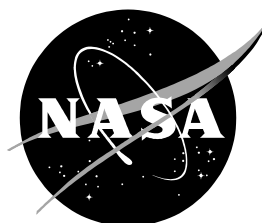
STS-125

**Mission Operations Directorate
Operations Division**

**Final
March 20, 2008**

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas



MISSION OPERATIONS DIRECTORATE

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

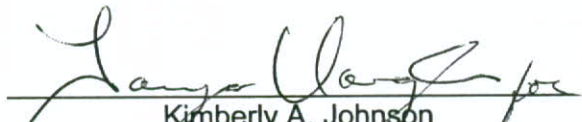
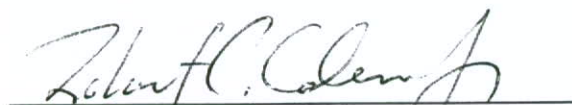
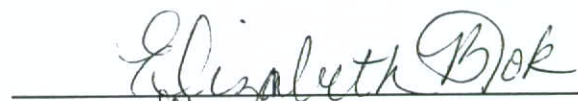
FINAL
March 20, 2008

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| | |
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| Incorporates the following: | |
| 482#: | HST_DPY-0073 HST_DPY-0074 HST_DPY-0075 |

AREAS OF TECHNICAL RESPONSIBILITY

| | | |
|------------------------------|-----------------|--------------|
| Book Manager | DO3/S. Pruzin | 281-483-7719 |
| 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

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| iii..... | * | 125/FIN | 5-3 | 125/FIN |
| iv..... | * | 125/FIN | 5-4 | 125/FIN |
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| 4-6 | | 125/FIN | 7-8 | 125/FIN |
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| 4-12 | | 125/FIN | | |

* – Omit from flight book

HST DEPLOY CUE CARDS

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| FSS/HST SJ UNBERTHING OVERLAY | CC 8-2 | HST DPY-1a/125/O/A |
| 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 disk is in RMS clearance posn

Review RMS QUICK DEPLOY (CONT OPS)

1. CAMR SETUP

A7 √PL BAY FLOODS FWD (two) – OFF
MID,AFT (four) – as reqd

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

VTR – √Adequate tape available

M 2. MNVR RMS TO PRE-GRAPPLE POSN

A7U VID OUT DTV pb – push
IN MIDDECK pb – push

L10 REC pb – push, hold
(VTR) PLAY pb – push, simo (red dot on LCD)

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

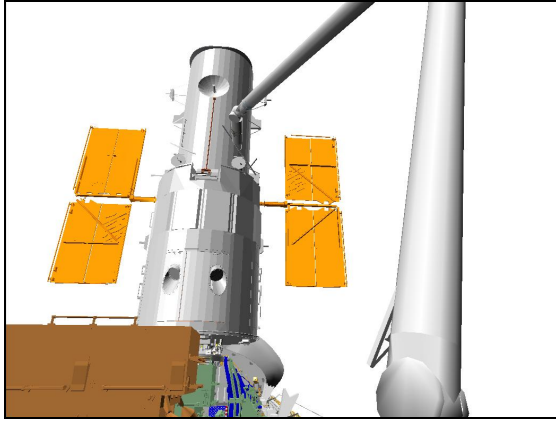
RHC RATE – as reqd (VERN within 10 ft)
A8U BRAKES – OFF (tb-OFF)
MODE – as desired

NOTE

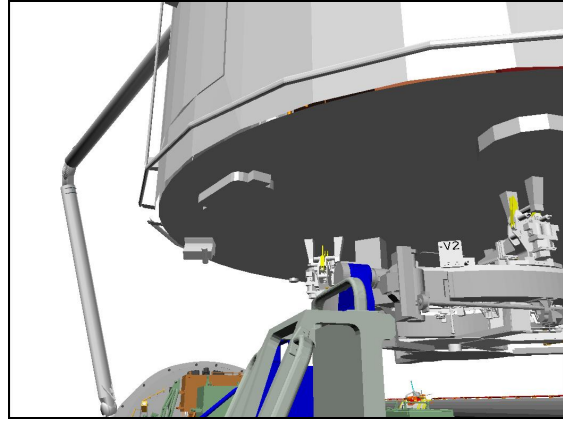
Clearance between RMS and -V3 HGA should be monitored

Mnvr to HST PRE-GRAPPLE posn:

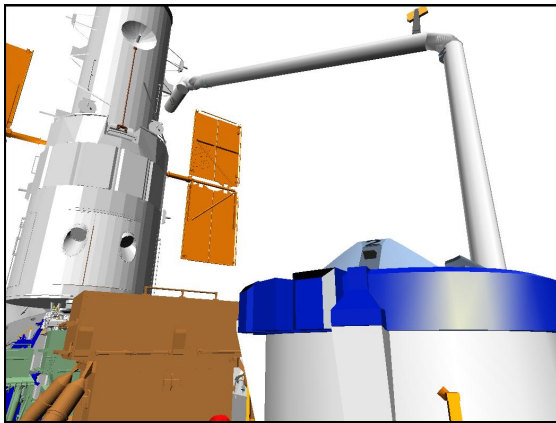
| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|------|-------|
| -1024 | -46 | -755 | 0 | 0 | 0 | 0 |
| SY | SP | EP | WP | WY | WR | |
| -29.3 | +83.2 | -79.6 | -3.6 | +29.3 | 0.0 | |



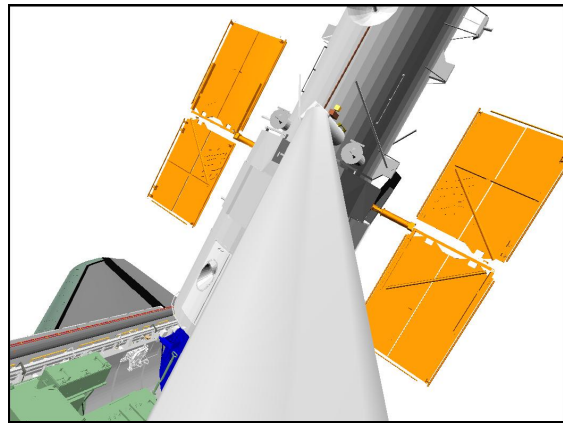
CCTV A (5,25)



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, HST OPS),
UNGRAPPLE HST section):

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

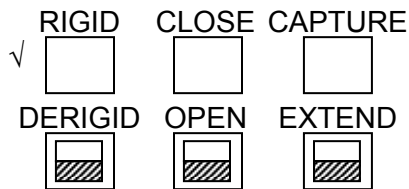
Mnvr to +V2 GF grapple envelope

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

UNBERTH

1. CAMR SETUP
 - A7
 - √PL BAY FLOODS FWD (two) – OFF
 - √MID,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 – ***

 - L12UR
 - √cb ST SW PWR – cl
 - √ESS BUS INT PWR tb – UP

 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

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

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) and complete step 6 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) *

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

I

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
- A7 √PL BAY FLOODS FWD (two) – OFF
 √MID,AFT (four) – as reqd
 √P/TV08 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 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 recording

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 +3 EXEC

– ITEM 48 +3 EXEC

√DAP: no LO Z

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

* (OFF-NOMINAL RMS OPS) *

RHC
A8U

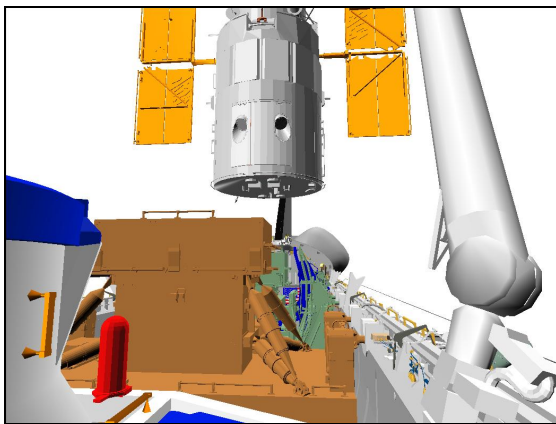
RATE – VERN (RATE MIN tb-ON)

BRAKES – OFF (tb-OFF)

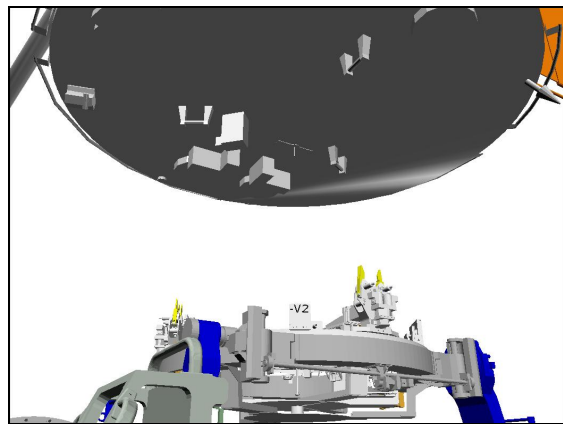
MODE – ORB LD, ENTER

Mnvr to FSS HOVER posn

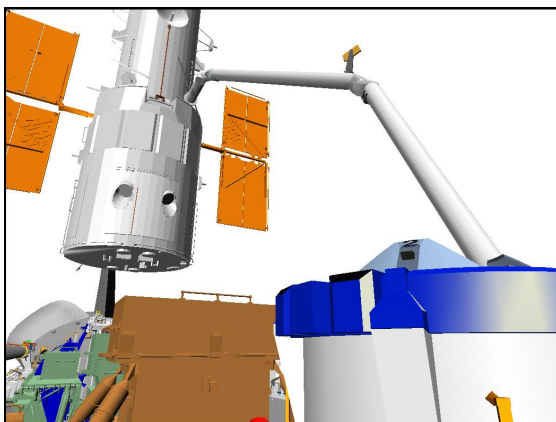
| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|------|-------|
| -1149 | 0 | -825 | 0 | 0 | 0 | 3 |
| -1128 | +12 | -567 | 0 | 0 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -28.0 | +61.3 | -36.9 | -24.4 | +28.0 | +0.5 | |



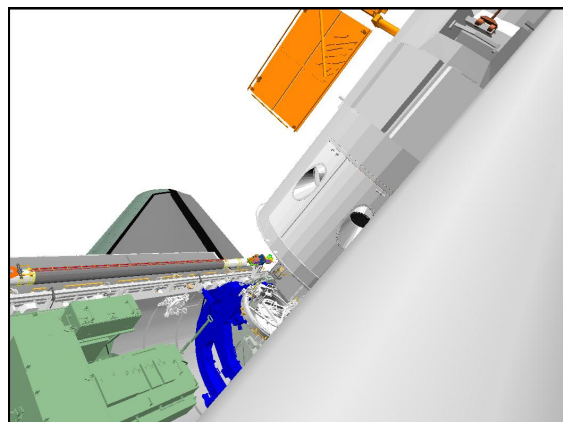
CCTV A (-5,10)



CCTV B (30,25)



CCTV D (30,20)



ELBOW (-35,-40)

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

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

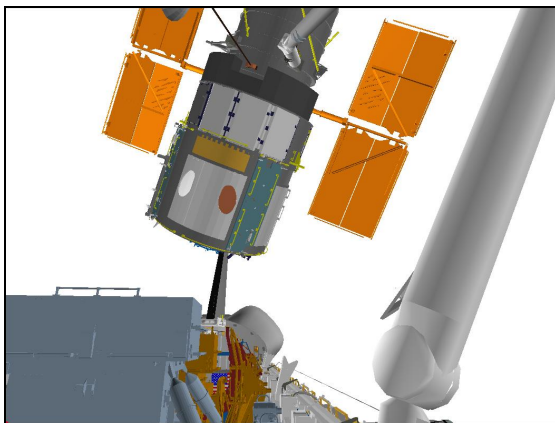
√DAP: FREE

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

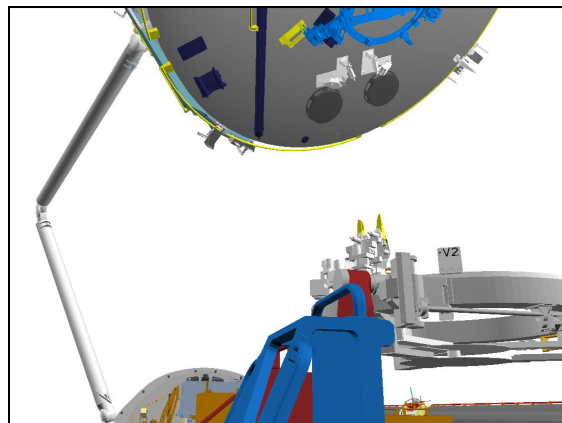
Mnvr to RNS INTERMEDIATE posn:

| 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 | |

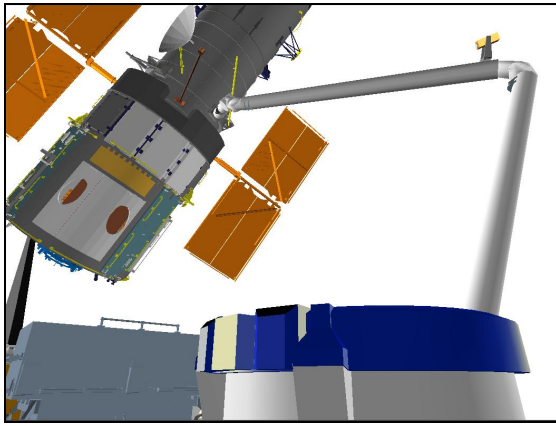
Notify MCC when RMS is in RNS Intermediate position
 Remain in posn for 1 min before continuing



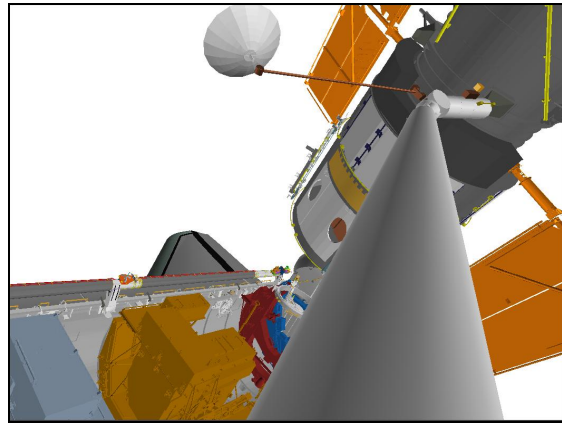
CCTV A (5,20)



CCTV B (15,20)



CCTV D (40,25)



ELBOW (-20,-20)

M 10. MNVR RMS TO HST RELEASE POSN

Load DAPs A15 and B12

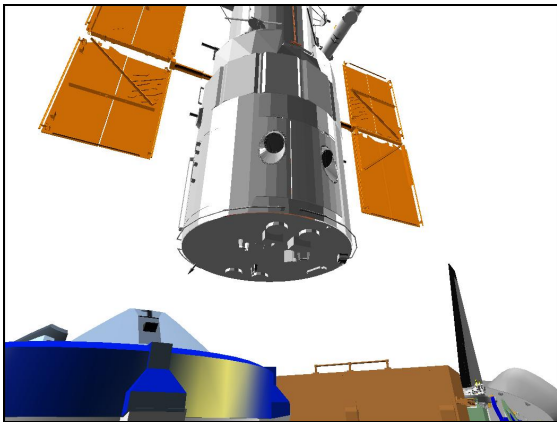
RHC √RATE – VERN (RATE MIN tb-ON)

A8U √BRAKES – OFF (tb-OFF)

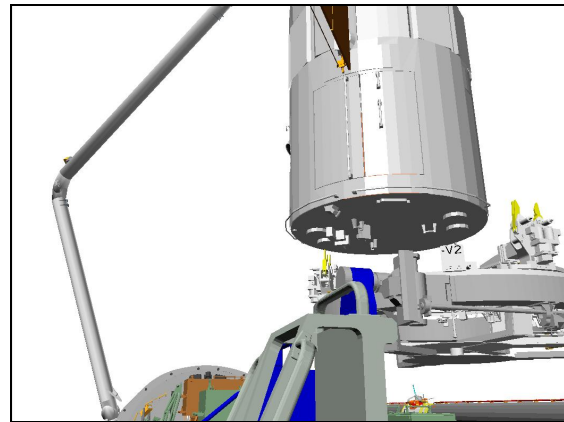
√MODE – ORB LD, ENTER

Mnvr to HST RELEASE posn:

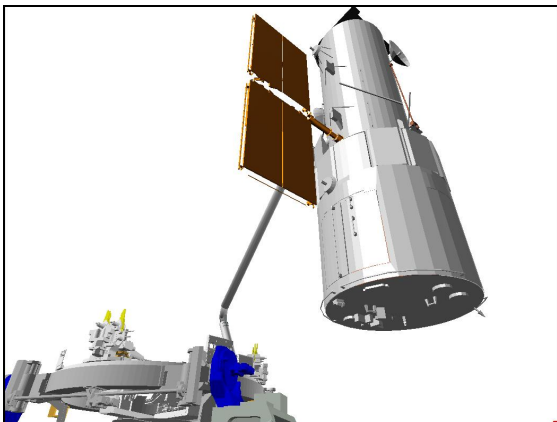
| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-----|------|-------|
| -878 | 112 | -853 | 0 | 305 | 0 | 3 |
| SY | SP | EP | WP | WY | WR | |
| -53.4 | +90.0 | -68.5 | -37.3 | 0.0 | +8.5 | |



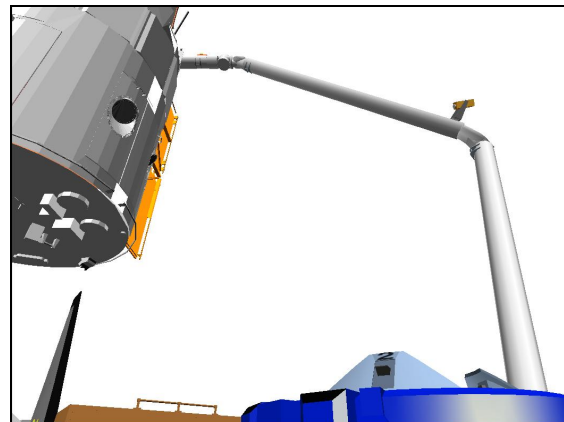
CCTV A (-30,30)



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 | 3-4 |

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

1. CAMR SETUP

A7 √PL BAY FLOODS FWD (two) – OFF
√MID,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)

M

3. ADI SETUP

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

O14:E, √cb DDU (six) – cl
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

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

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) A8U √BRAKES – OFF (tb-OFF) MODE – END EFF, ENTER</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>Monitor EE tb timing to prevent EE motor burnout</p> <hr/> <p>Monitor clearance between RMS and -V3 HGA during release and back-away mnvrs</p> </div> <p>* If manual release reqd: * * EE MODE – MAN * * EE MAN CONTR – DERIGID (hold until * * DERIGID tb-gray, * * 5 sec max) * * * * - :00:00 RELEASE sw – depress (hold until OPEN * * tb-gray, 3 sec max) * * * * Mnv r arm 5 ft (minimum) clear of HST * * * * EE MAN CONTR – DERIGID (hold until * * EXTEND tb-gray, * * 20 sec max) * * * * EE MODE – OFF *</p> | | |
| -:01:00 | | -:01:00 | <p>[GNC 33 REL NAV] 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> |
| -:00:30 | | -:00:30 | <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: * * * * * * * * * * * * * * * * - :00:00 √Release initiated * * Record Release MET ___/___:___:___ (release) *</p> |

| RMS and HST Systems | | Orbiter |
|---------------------|---|---|
| -:00:00 | RHC | -:00:00 |
| | EE MODE – AUTO RELEASE sw – REL (mom) | √Release initiated Record Release MET ___/___:___:___ (release) |
| | When OPEN tb – gray, mnvr arm 5 ft (minimum) clear of HST | |
| A8U | <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> RIGID DERIGID </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> CLOSE OPEN </div> <div style="text-align: center;"> <input checked="" type="checkbox"/> CAPTURE EXTEND </div> </div> <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 * * 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 = +4:30, command HST * * to Drift mode * * PCS MODE – ITEM 7+9 1(92) EXEC (DRFT) * * √PCS MODE – DRFT * * If PCS MODE not DRFT, repeat * * If PCS MODE still not DRFT, re-exec using * * alt cmd * * 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) *</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 = +4:30, command HST * * to Drift mode * * PCS MODE – ITEM 7+9 1(92) EXEC (DRFT) * * √PCS MODE – DRFT * * If PCS MODE not DRFT, repeat * * If PCS MODE still not DRFT, re-exec using * * alt cmd * * 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) *</p> |

| RMS and HST Systems | Orbiter |
|---|--|
| <p data-bbox="338 261 764 337"> M 4. <u>SEP 1 BURN</u> When RMS motion has stopped: ✓SEP 1 initiated </p> <div data-bbox="457 363 716 391" style="border: 1px solid black; padding: 2px; margin: 10px 0;"> SM 94 PDRS CONTROL </div> <p data-bbox="457 391 764 440"> PL ID – ITEM 3 +0 EXEC INIT ID – ITEM 24 +0 EXEC </p> <p data-bbox="457 565 695 613" style="margin-top: 100px;"> If reqd, BRAKES – ON (tb-ON) </p> | <p data-bbox="968 261 1745 363"> ASAP 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 data-bbox="1346 386 1633 435"> AFT FLT CNTLR PWR – OFF Report TIG to MCC </p> <p data-bbox="1314 461 1772 532"> When center of HST in bottom half of Keel Camr (REF BALL PITCH ~65 deg): DAP: INRTL </p> <p data-bbox="1314 558 1535 607"> When pitch rate nulled: DAP: VERN(ALT) </p> <p data-bbox="1083 630 1478 656" style="margin-top: 100px;"> A6U ADI ATT – LVLH </p> |

| RMS and HST Systems | Orbiter |
|--|--|
| <p data-bbox="338 261 653 321"> <input type="checkbox"/> 5. <u>HST TO SUNPOINT</u> <input type="checkbox"/> SM 210 HST SYS </p> <p data-bbox="443 345 659 373">√RCVR 1(2) LOCK – *</p> <p data-bbox="443 402 947 573"> * 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">+ :04:22 √SNPT DIS – YES >></p> <p data-bbox="443 701 730 747"> * If PCS MODE not SNPT, * * √MCC * </p> | <p data-bbox="1205 261 1598 321"> <input type="checkbox"/> 3. <u>HST TO SUNPOINT</u> √HST Sunpoint mode initiated </p> <p data-bbox="1205 362 1738 573"> <input type="checkbox"/> 4. <u>MNVR TO TARGET TRACK ATT</u> <input type="checkbox"/> GNC UNIV PTG TRK OPTION: TGT ID +1 BODY VECTOR +3 √P +90.0 √Y +0.0 OM + 180.0 _____.____.____ (per PAD) </p> <p data-bbox="978 889 1654 917">SEP 1 Init TRK – ITEM 19 EXEC (CUR-*)</p> <p data-bbox="978 941 1598 969">+ :05:00 DAP: A7/AUTO/VERN(ALT)</p> |

I

| RMS and HST Systems | Orbiter |
|-------------------------|--|
| <p>Actions Complete</p> | <p>5. <u>RADAR ACQUISITION</u> √Range ≥ 100 ft <div style="border: 1px solid black; display: inline-block; padding: 2px;">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; display: inline-block; padding: 2px;">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 > 400 ft, KU RDR OUTPUT – HI</p> <p>A1U</p> <p>F6 M</p> <p>F7</p> <p>7. <u>SEP 2 BURN</u> √ADI ATT – LVLH</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/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: <u>GNC 33 REL NAV</u> 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> |

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CONTINGENCY OPS

BACKAWAY DEPLOY 4-2
RMS QUICK DEPLOY 4-10

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

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

√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

F7,A4 SM 2 TIME
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-*)

- A6U 5. ADI SETUP
ADI ATT – LVLH
ERR – MED
RATE – LO
SENSE: –Z

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

CONT OPS

- A1U 6. 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) – (*)
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 – *
- A6U 10. FSS AMSB PWR ON
 √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, √MCC *
- R13L PL BAY MECH PWR SYS 1(2) – ON

11. 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

- CCTV Monitor HST position during rotation
- CRT ROTATOR SEL – ITEM 12 EXEC (* RDY)
- √AMSB DC AMPS: .035 to .125
- 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 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) *
- PL RETEN LAT 1(2) – OFF
- CRT √MECH – blank

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

13. UMB DISCONNECT
Perform HST UMB DISCONNECT steps 2,3,4,5,6 (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 +9 3(94) EXEC

√MODE – DRFT

√SNPT DIS – NO

* 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 *

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 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

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) *

* If HST Sunpoint macro not disabled by EVENT *

* TIMER = +3:30: *

* √PCS MODE – SNPT *

* At EVENT TIMER = +4:30, command HST to *

* Drift mode *

* PCS MODE – ITEM 7+9 1(92) EXEC (DRFT) *

* √PCS MODE – DRFT *

* If PCS MODE not DRFT, repeat *

* If PCS MODE still not DRFT, re-exec using *

* alt cmd *

* If still no joy, √MCC *

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
 +:04:22 √SNPT DIS – YES

18. 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 *

19. 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 > 400 ft,
 KU RDR OUTPUT – HI

20. 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 (*)

21. 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

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

CRT 24. AMSB PWRDN
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

25. 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

= 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"/> 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 | |
| CONFIG KU FOR COMM | |

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HST PADS

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

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| HST RMS RELEASE PAD | |
|---|---|
| RELEASE ORBIT <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> | |
| RETROGRADE/POSIGRADE | |
| WINDOW OPEN MET = | <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> / <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> : <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> : <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> |
| WINDOW CLOSE MET = | <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> / <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> : <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> : <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> |
| (NLT SS-10 MIN) | |
| ORBITER WEIGHT = | <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> (3-2) |
| RELEASE ATT RA | = <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> . <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> (2-10,3-14) |
| DEC | = <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> . <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> |
| OMICRON | = <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> . <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> |
| TGT TRK OMICRON | = <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> . <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> (3-7) |

| HST RMS RELEASE PAD | |
|---|---|
| RELEASE ORBIT <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> | |
| RETROGRADE/POSIGRADE | |
| WINDOW OPEN MET = | <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> / <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> : <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> : <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> |
| WINDOW CLOSE MET = | <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> / <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> : <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> : <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> |
| (NLT SS-10 MIN) | |
| ORBITER WEIGHT = | <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> (3-2) |
| RELEASE ATT RA | = <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> . <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> (2-10,3-14) |
| DEC | = <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> . <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> |
| OMICRON | = <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> . <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> |
| TGT TRK OMICRON | = <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> . <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> (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 | 6-9 |
| RELEASE | 6-21 |

**OFF-NOM
RMS OPS**

SJ HST GRAPPLE

M 1. SJ MNVR RMS TO PRE-GRAPPLE POSN

SM 210 HST SYS

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

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

SM 94 PDRS CONTROL

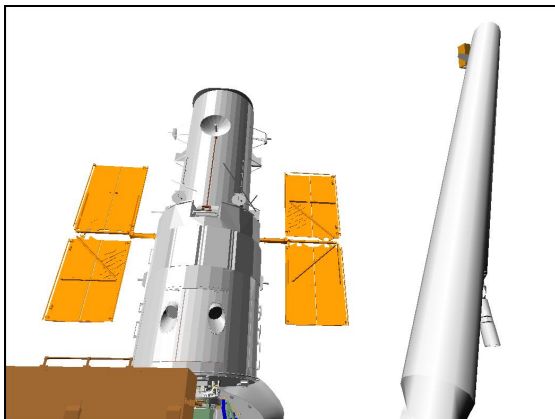
- √PL ID, ITEM 3: 0
- √INIT ID, ITEM 24: 0

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

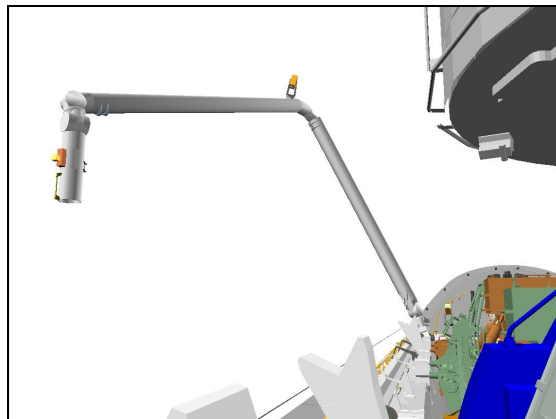
Mnvr to HST PRE-GRAPPLE posn:

| | SY | SP | EP | WP | WY | WR | |
|-----------------|-------|-------|-------|-------|-------|-------|-------|
| RMS Ext Park | +28.6 | +78.2 | -85.8 | -72.8 | +17.0 | -10.0 | |
| 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 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



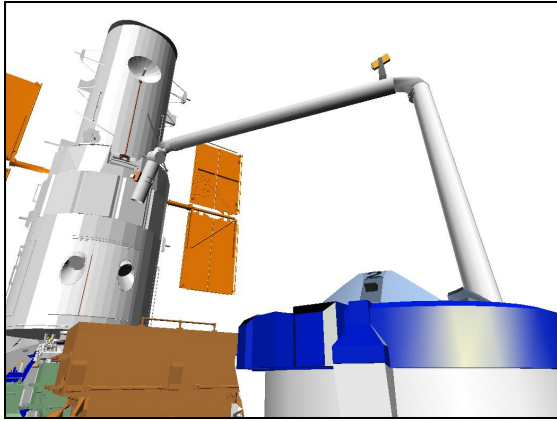
CCTV A (5,30)



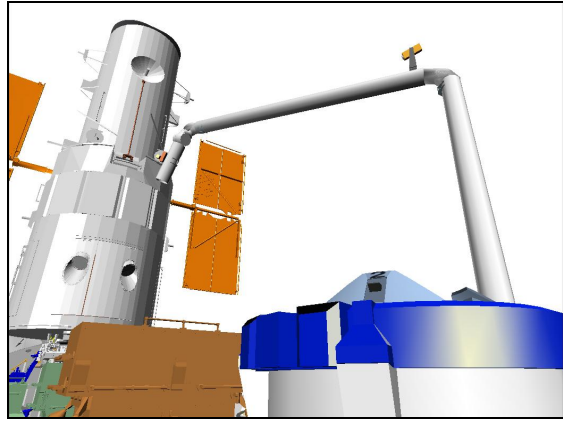
CCTV B (-15,10)

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

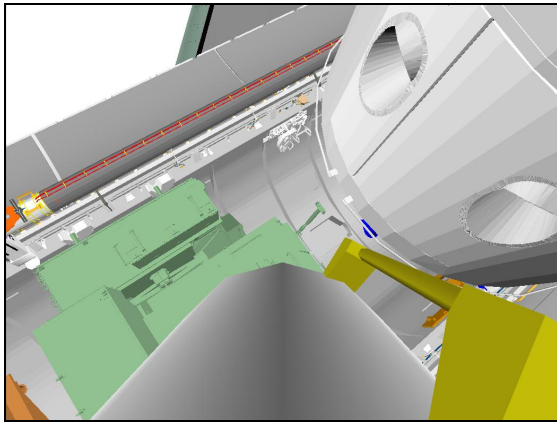
Step 2:
Drive +SP from +78.2° to +83.2°



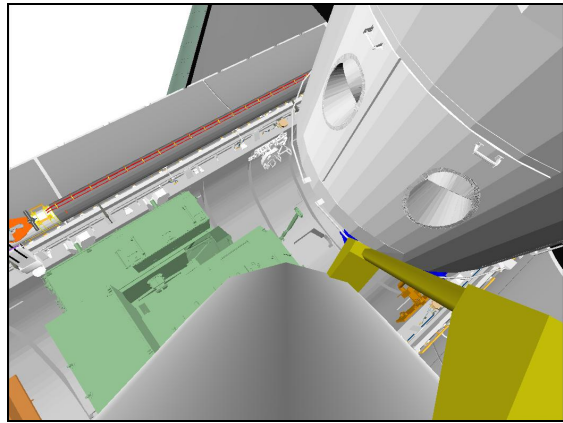
CCTV D (35,25)



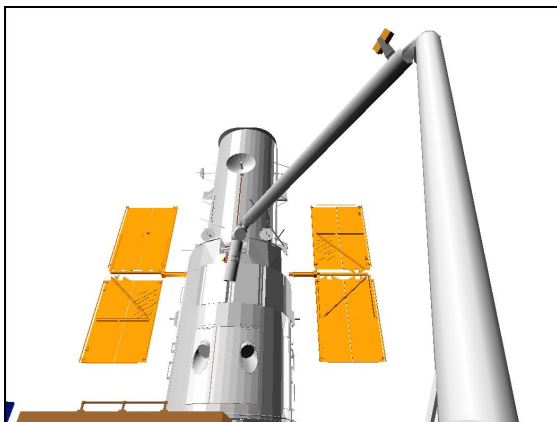
CCTV D (35,25)



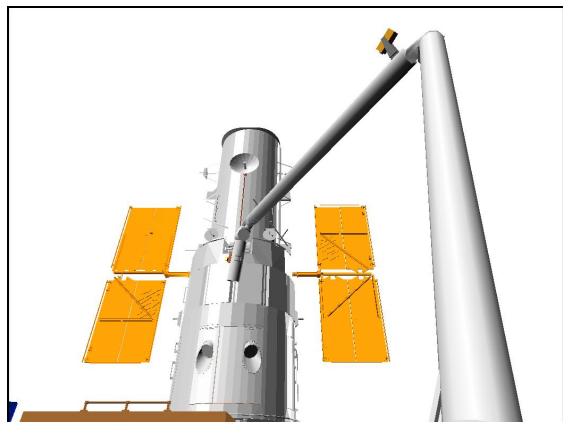
EE



EE

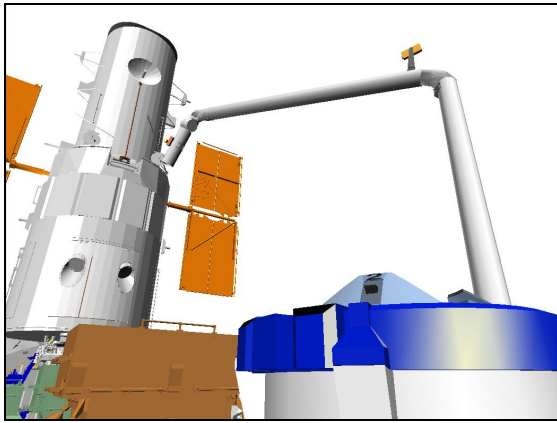


CCTV A (0,35)



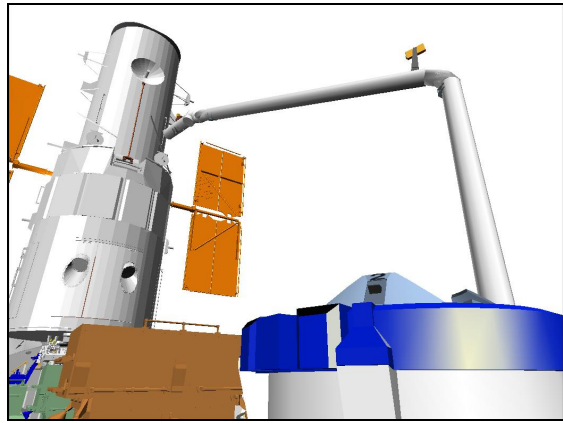
CCTV A (0,35)

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

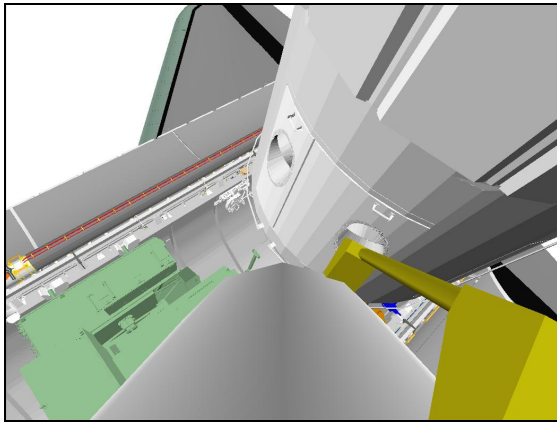


CCTV D (35,25)

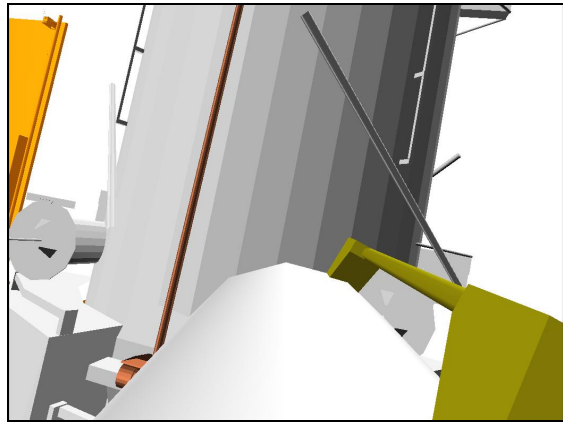
Step 4:
Drive +WP from -72.8° to -3.6°



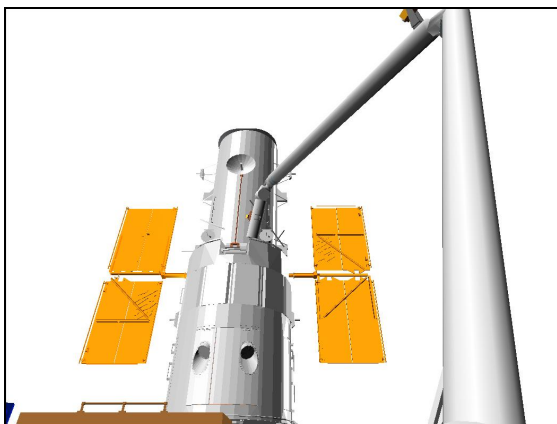
CCTV D (35,25)



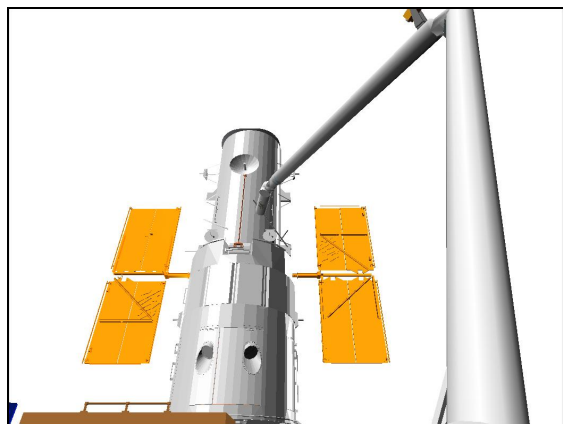
EE



EE

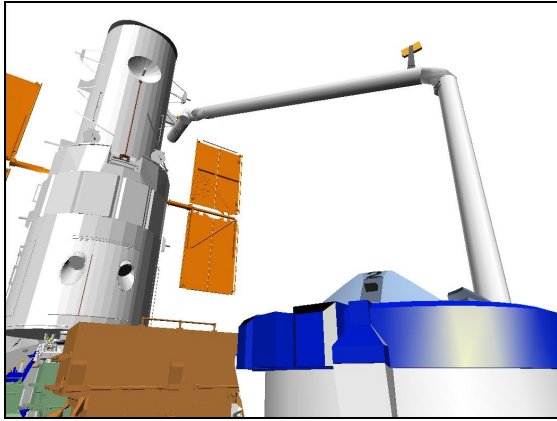


CCTV A (0,35)



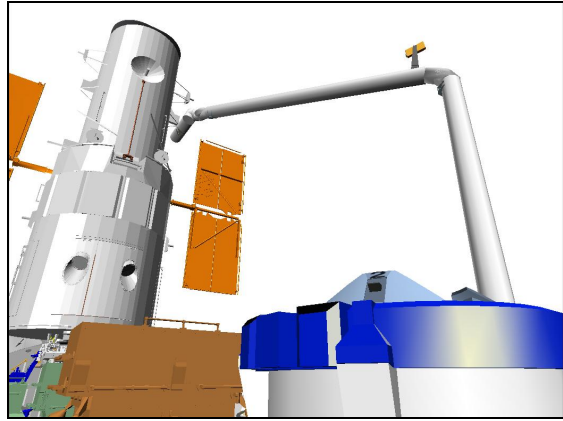
CCTV A (0,35)

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

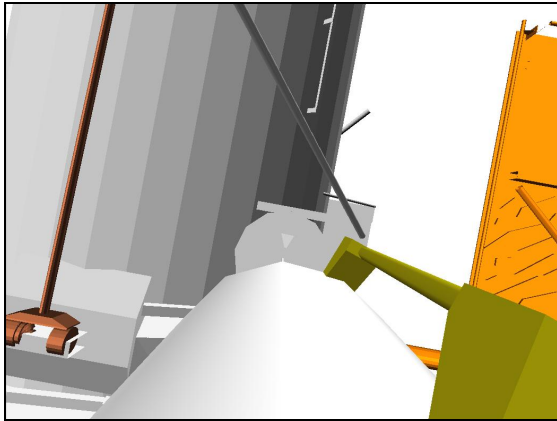


CCTV D (35,25)

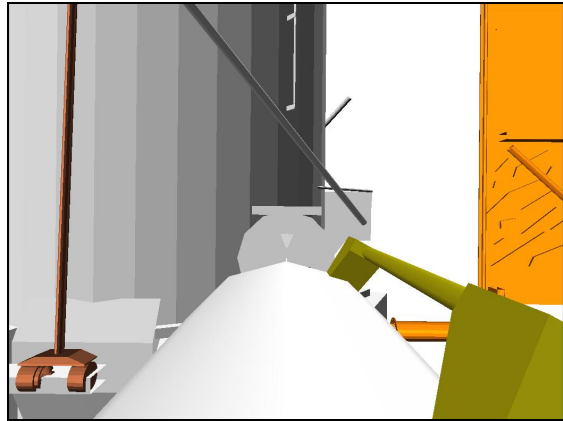
Step 6:
Drive +WR from -10.0° to +0.0°



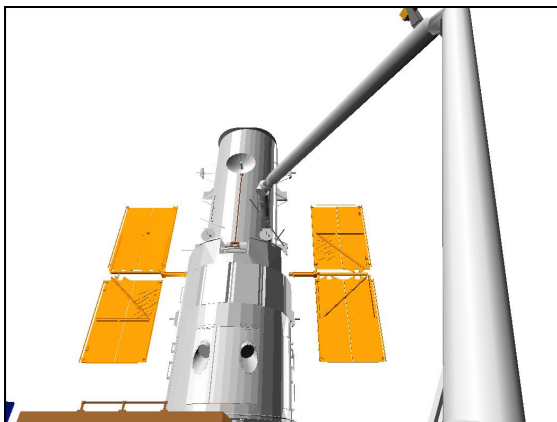
CCTV D (35,25)



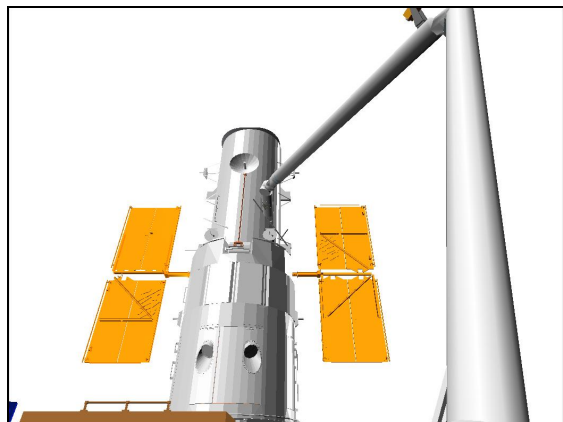
EE



EE



CCTV A (0,35)



CCTV A (0,35)

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

A7U M

2. 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

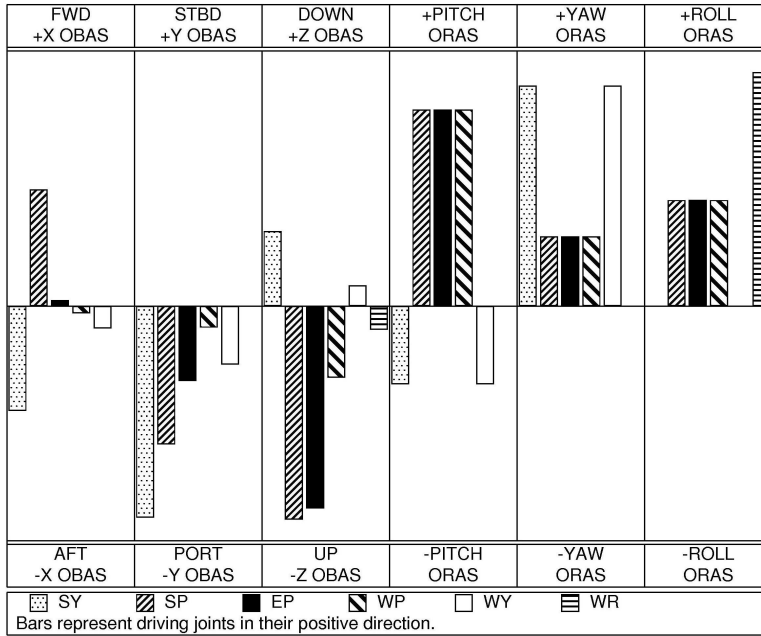
RATE – VERN (RATE MIN tb-ON)
 BRAKES – OFF (tb-OFF)
 MODE – best available

FSS LATCHED posn: (values recorded from PDRS FS)

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

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

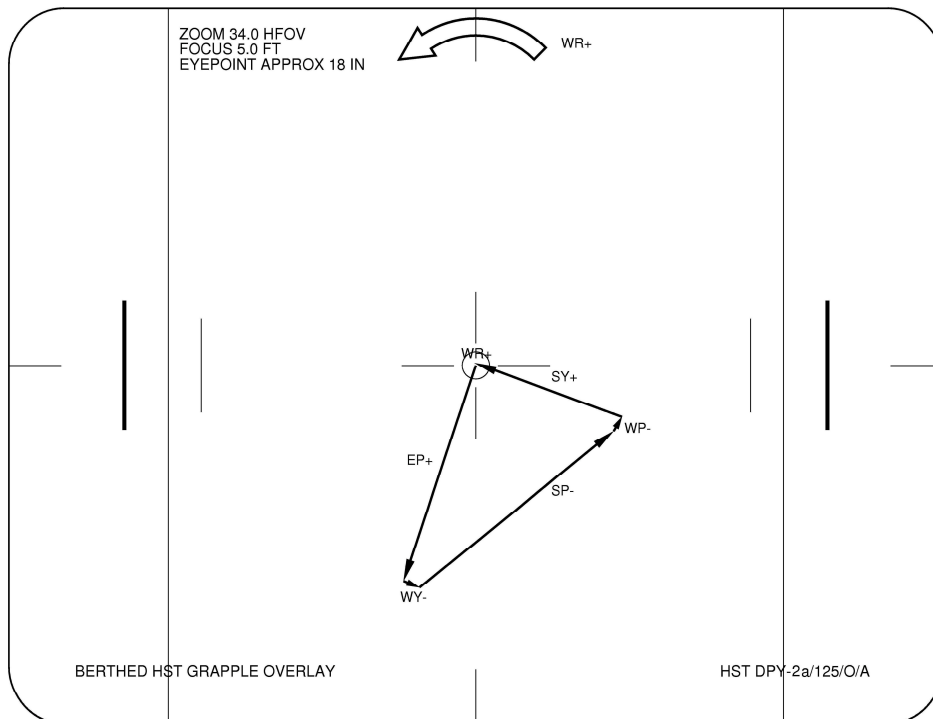
BERTHED HST GRAPPLE



| 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 |



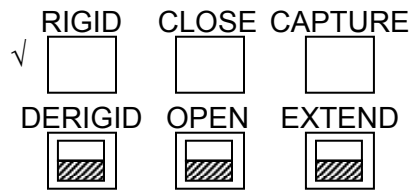
A6U

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

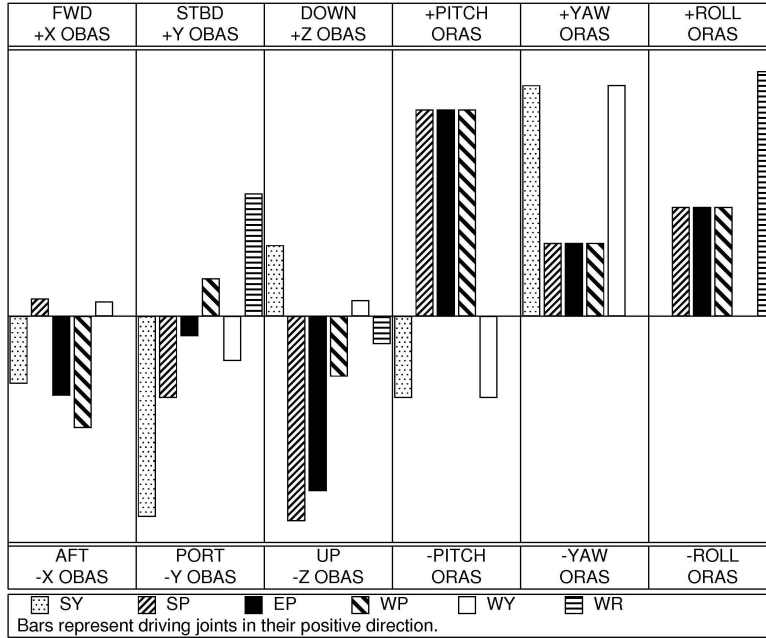
A3 M 1. SJ MNVR RMS TO FSS HOVER POSN
MON 1(2) – install FSS/HST SJ UNBERTHING OVERLAY
(CUE CARD CONFIG)
VID OUT – MON 1(2)
IN – FSS

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)

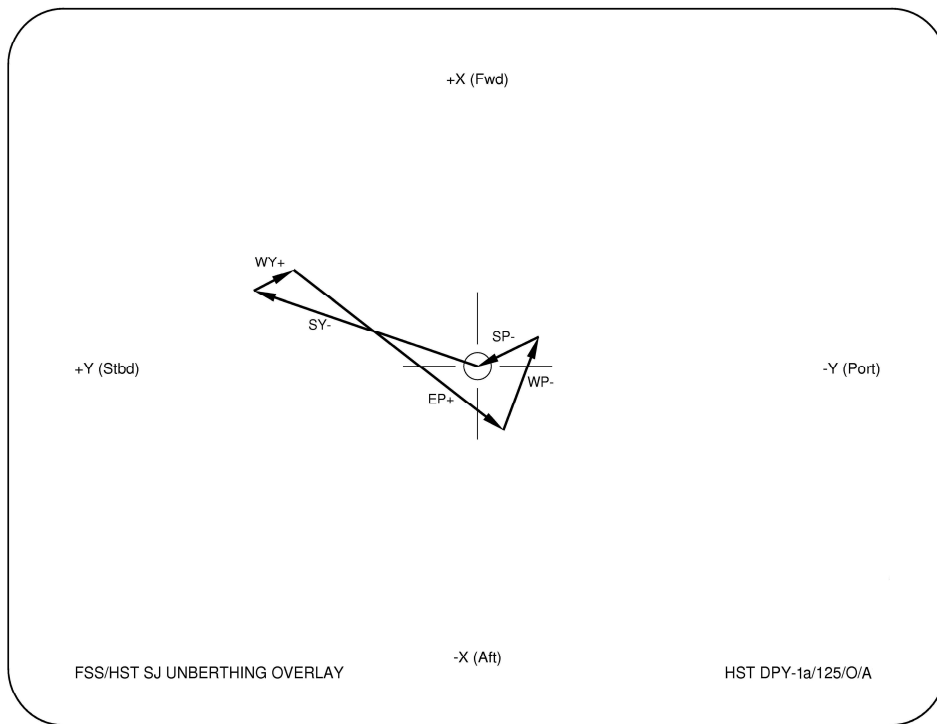
HST UNBERTH



| 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 |

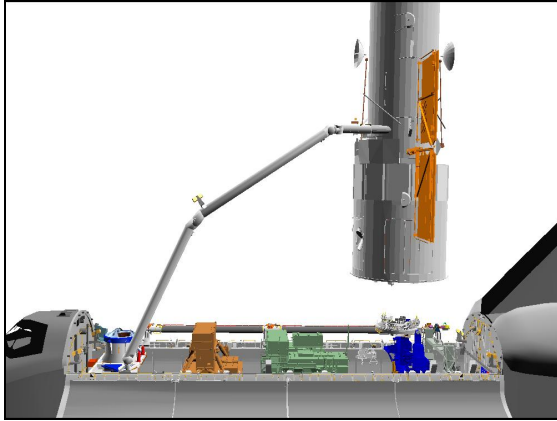
| Driving: | Results In: | Driving: | Results In: |
|----------|-----------------|----------|------------------|
| +SY | -Y (port), +YAW | +WP | -X (aft), +PITCH |
| +SP | -Z (up), +PITCH | +WY | -Y (port), +YAW |
| +EP | -Z (up), +PITCH | +WR | +Y (stbd), +ROLL |

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

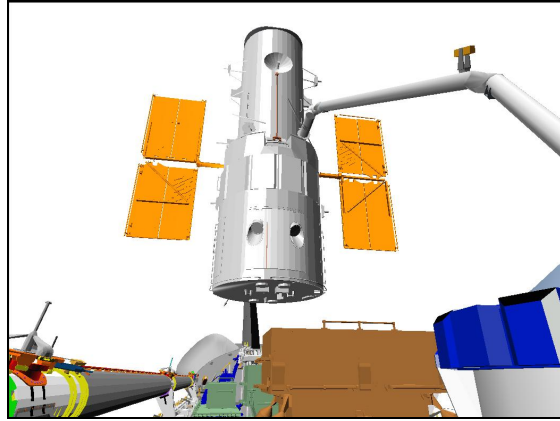


Mnvr to FSS HOVER posn:

| 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)

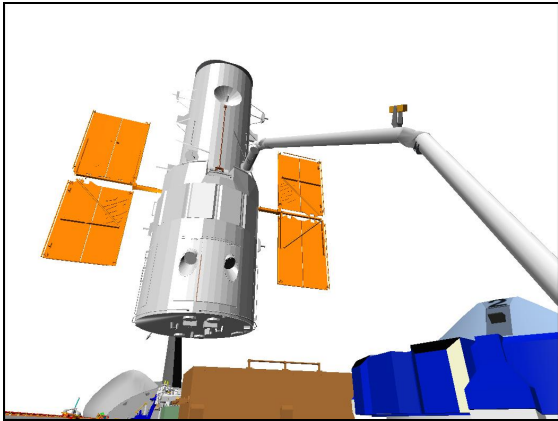
√BRAKES – OFF (tb-OFF)

MODE – best available

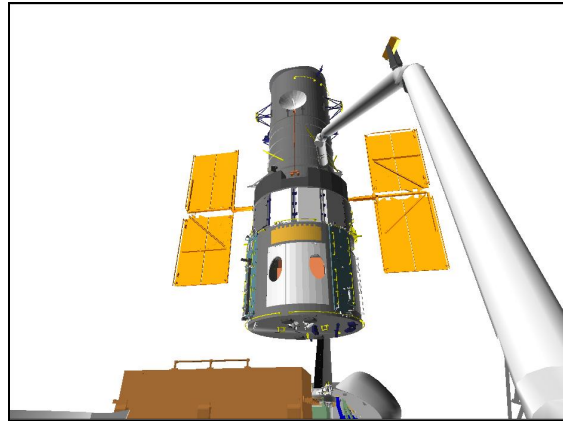
Mnvr to RNS INTERMEDIATE posn:

| | 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 |

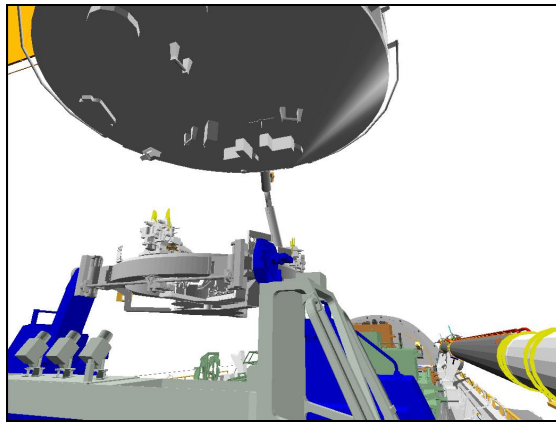
Start:
FSS Hover



CCTV D (20,30)



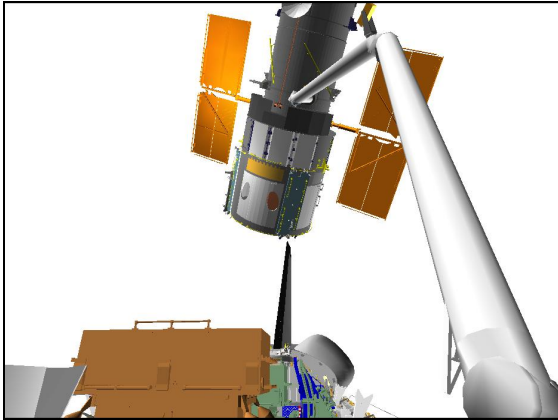
CCTV A (-5,25)



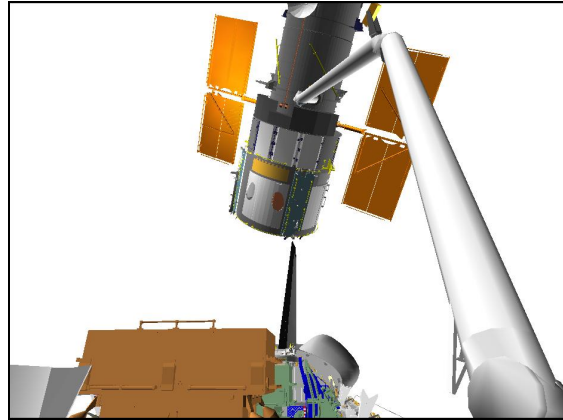
CCTV C (-20,20)

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

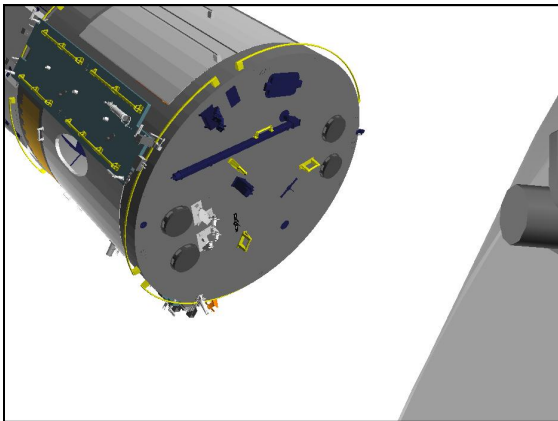
Step 2:
Drive WY (+) from +28.0 to +28.9



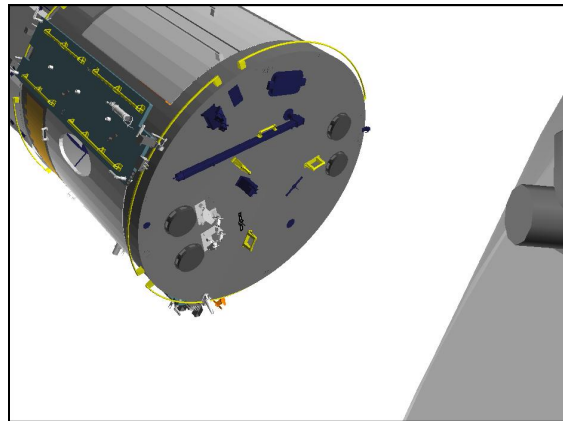
CCTV A (-5,25)



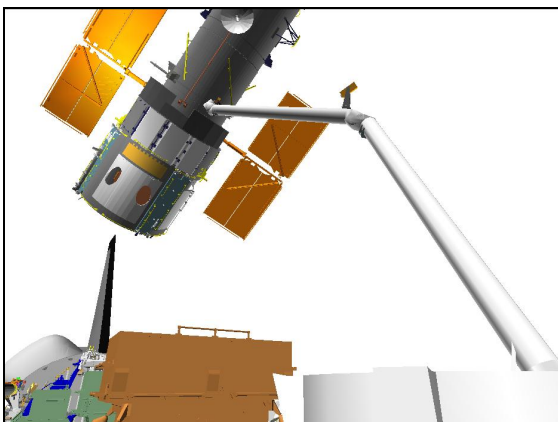
CCTV A (-5,25)



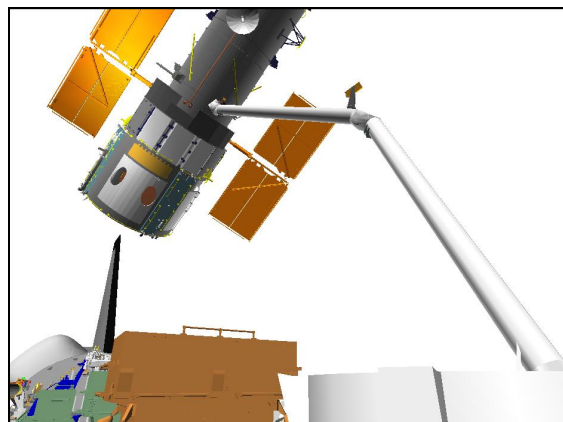
CCTV B (95,70)



CCTV B (95,70)

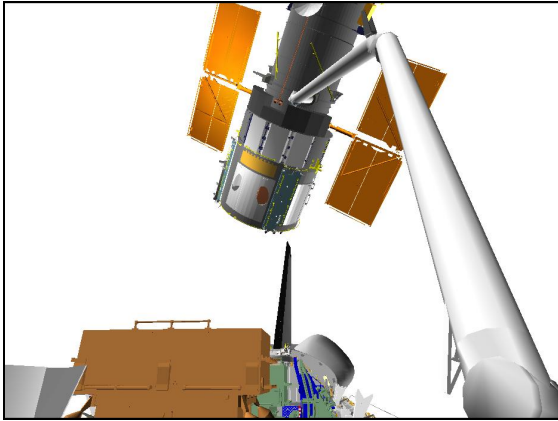


CCTV D (30,25)



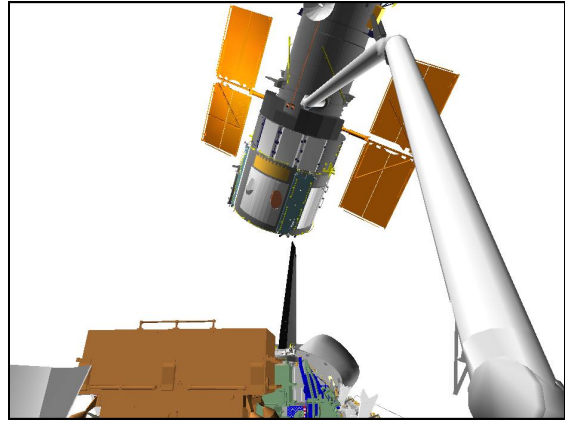
CCTV D (30,25)

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

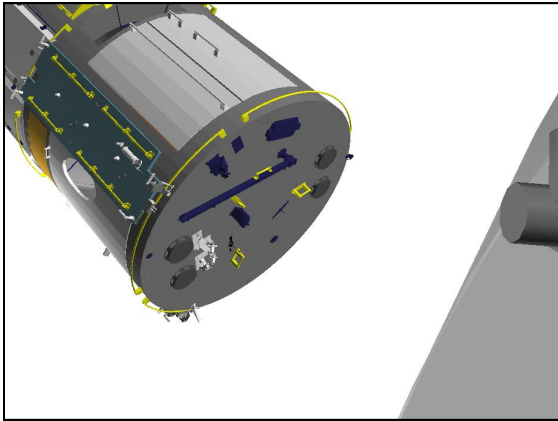


CCTV A (-5,25)

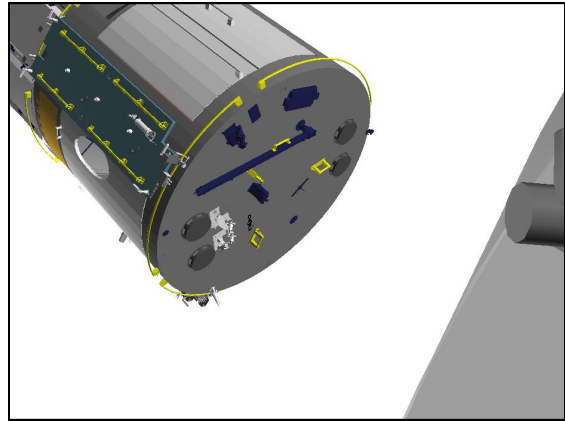
Step 4:
Drive SY (+) from -28.0 to -26.2



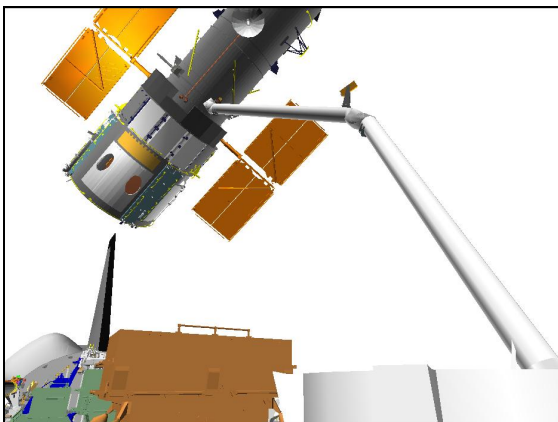
CCTV A (-5,25)



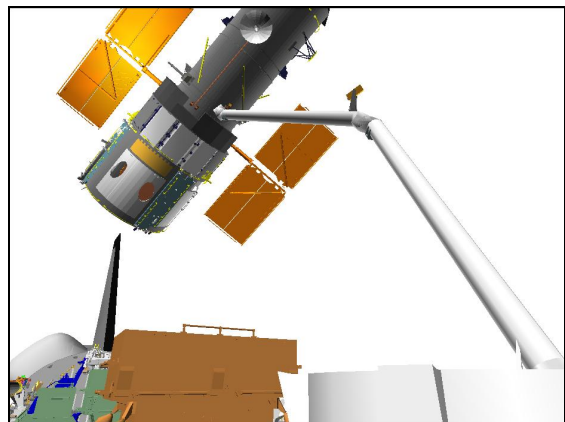
CCTV B (95,70)



CCTV B (95,70)



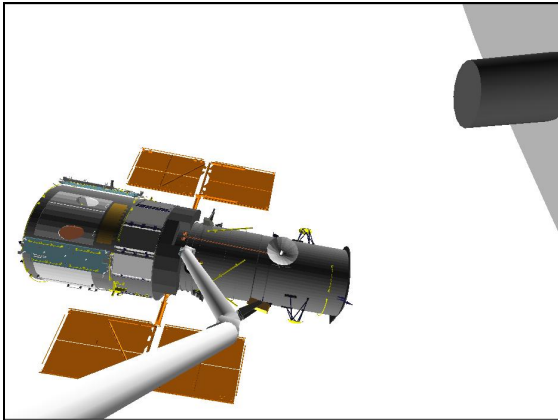
CCTV D (30,25)



CCTV D (30,25)

Step 5:

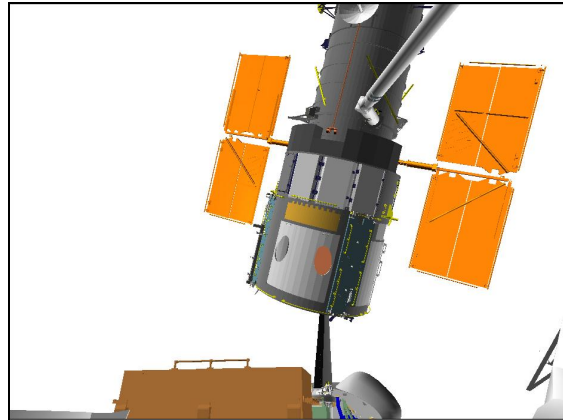
Drive SP (+) from +61.3 to +101.9



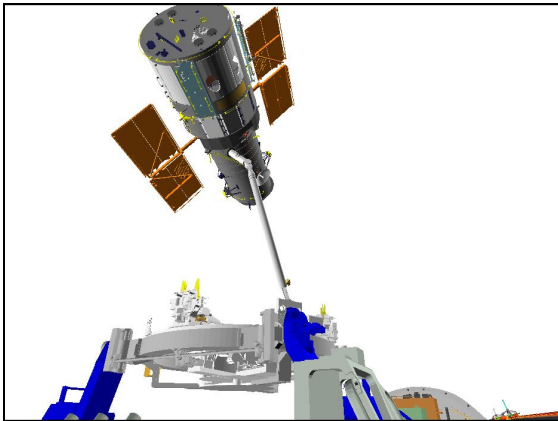
CCTV A (85,75)

Step 6:

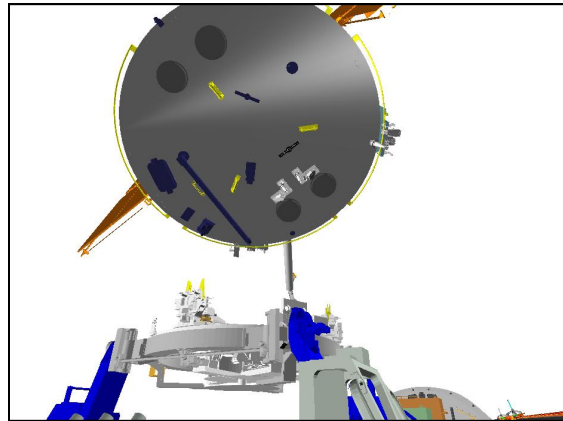
Drive EP (-) from -36.9 to -95.6



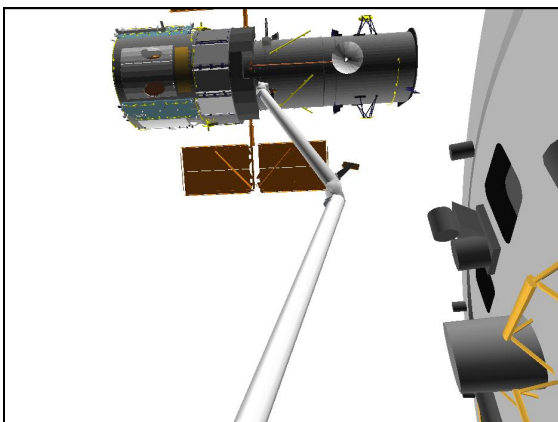
CCTV A (-10,30)



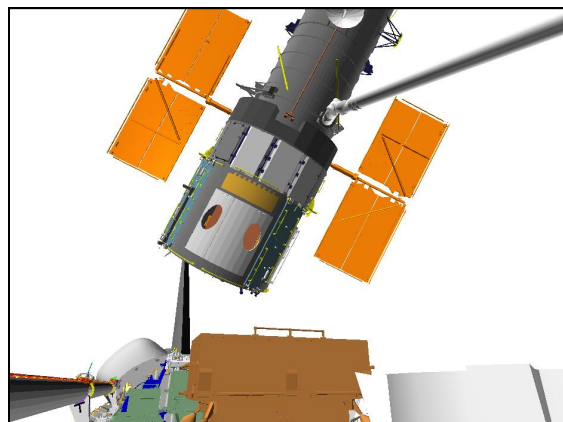
CCTV C (-25,30)



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

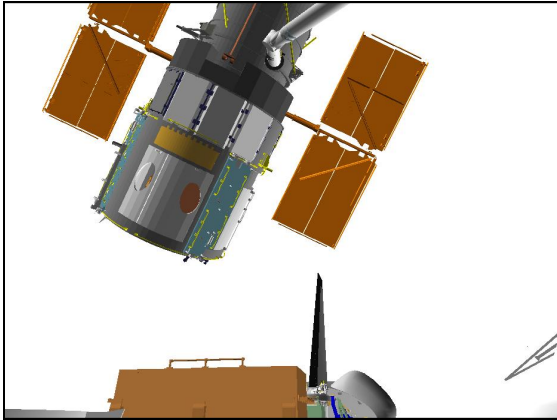
- √RATE – VERN (RATE MIN tb-ON)
- √BRAKES – OFF (tb-OFF)
- MODE – best available

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:

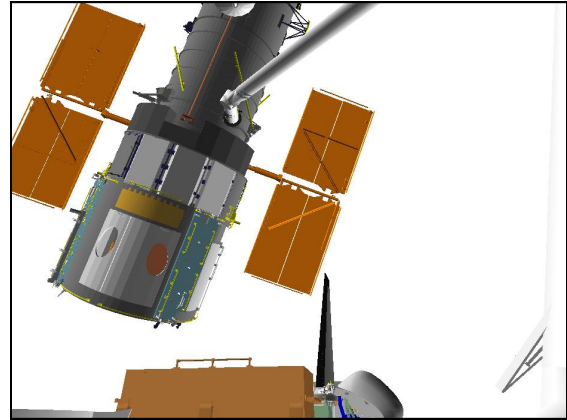
Drive SY (-) from -26.2 to -53.4



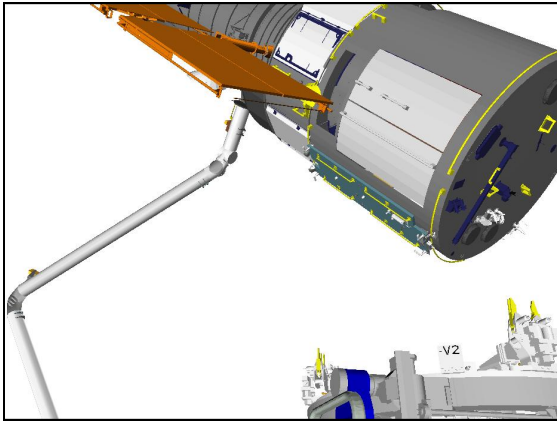
CCTV A (-10,30)

Step 2:

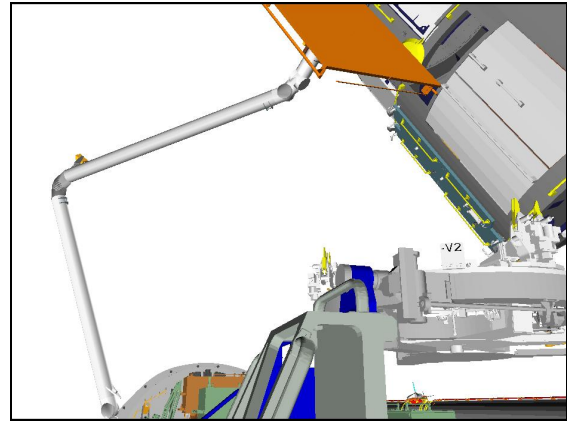
Drive SP (-) from +101.9 to +90.0



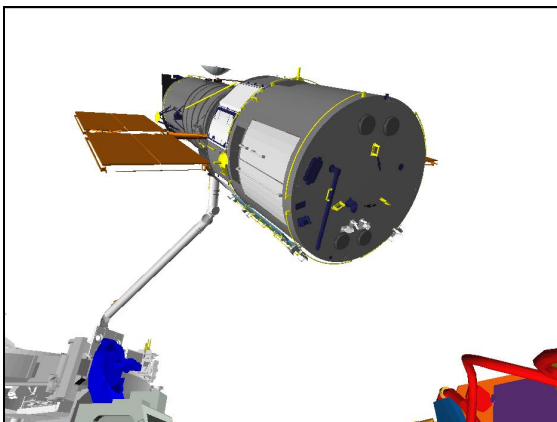
CCTV A (-10,30)



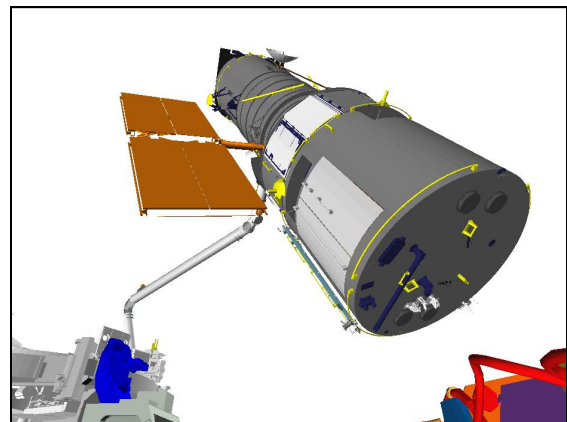
CCTV B (15,30)



CCTV B (15,20)



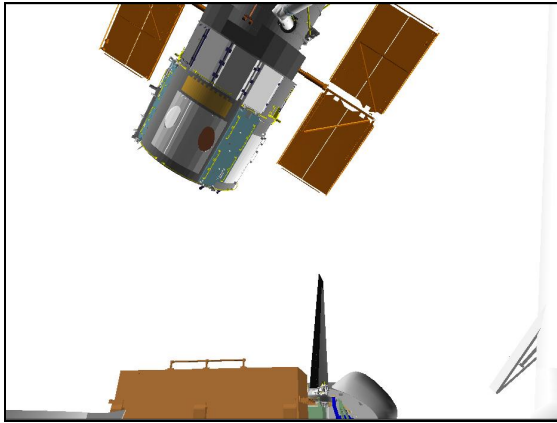
CCTV C (0,35)



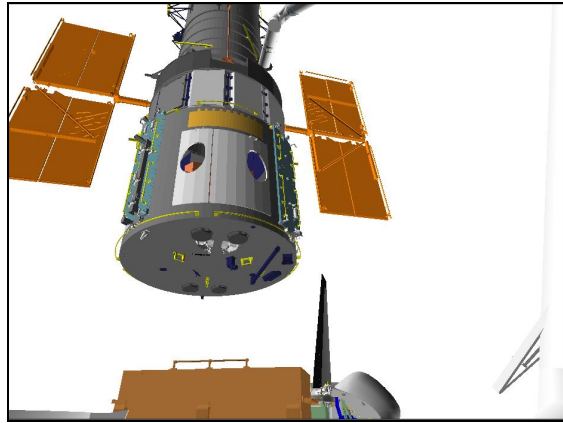
CCTV C (0,35)

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

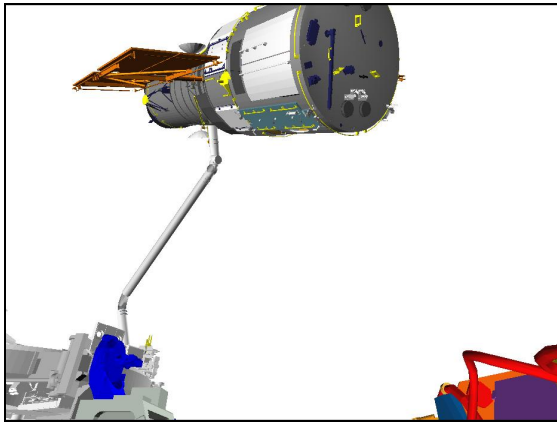
Step 4:
Drive WP (-) from +26.2 to -37.3



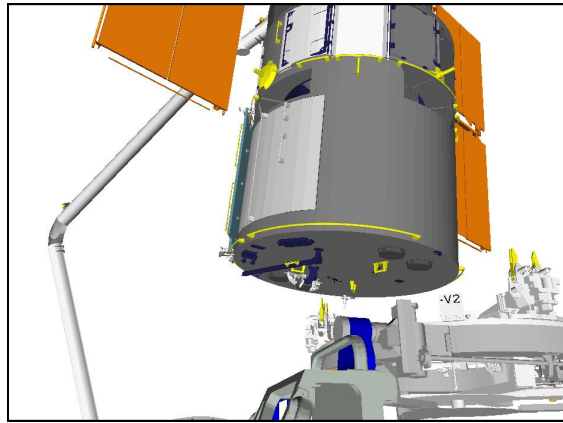
CCTV A (-10,30)



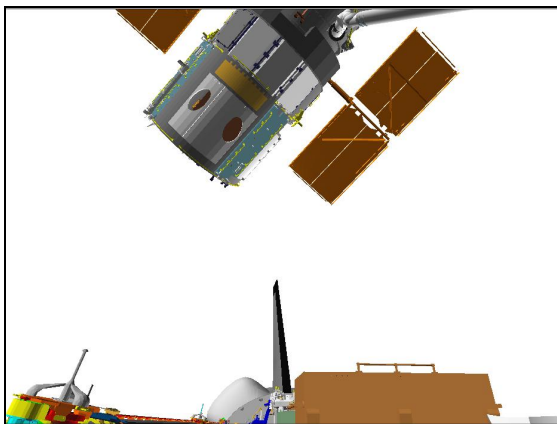
CCTV A (-10,30)



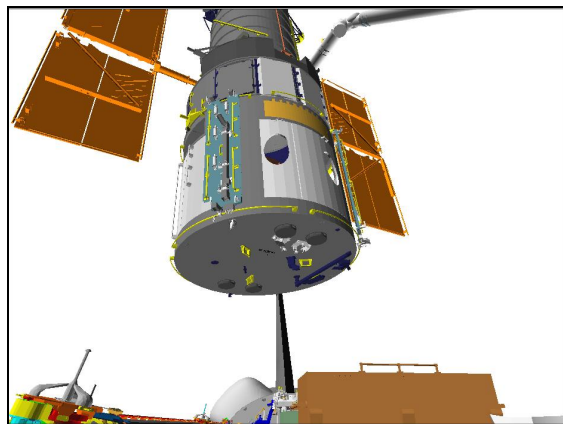
CCTV C (0,35)



CCTV B (15,25)

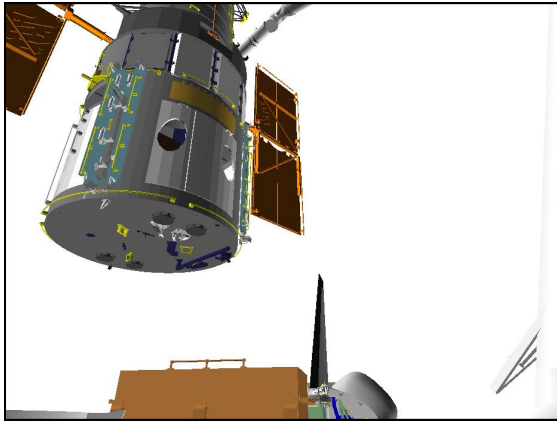


CCTV D (5,30)



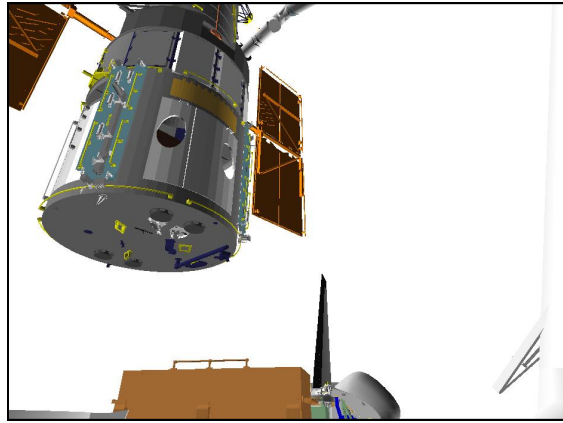
CCTV D (5,30)

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

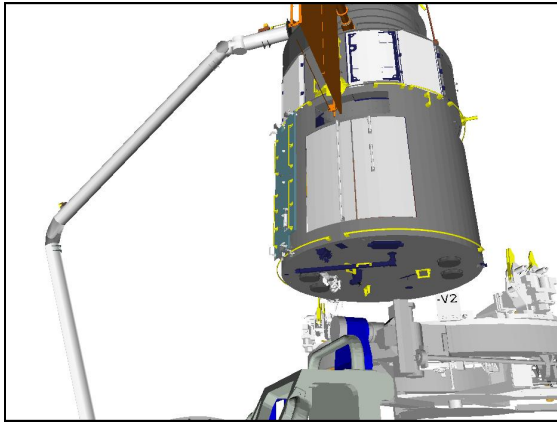


CCTV A (-10,30)

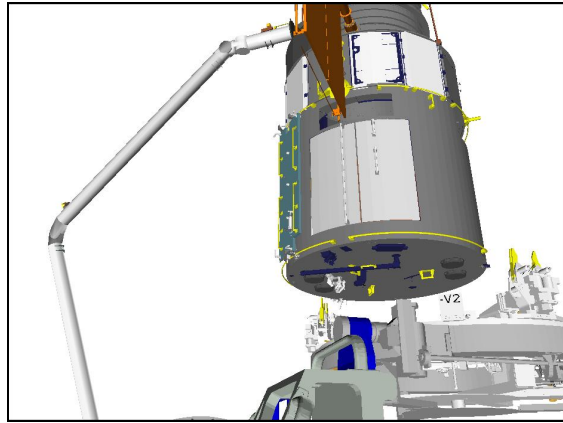
Step 6:
Drive WR (+) from +7.4 to +8.5



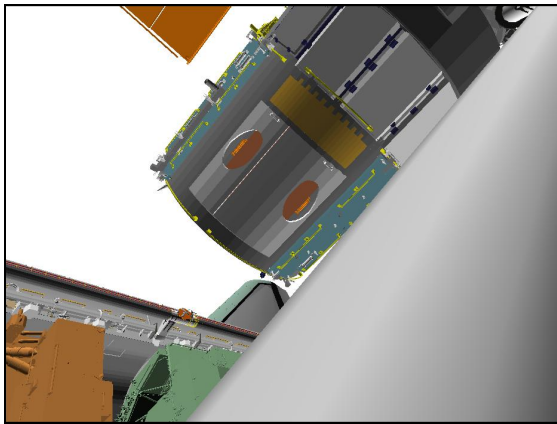
CCTV A (-10,30)



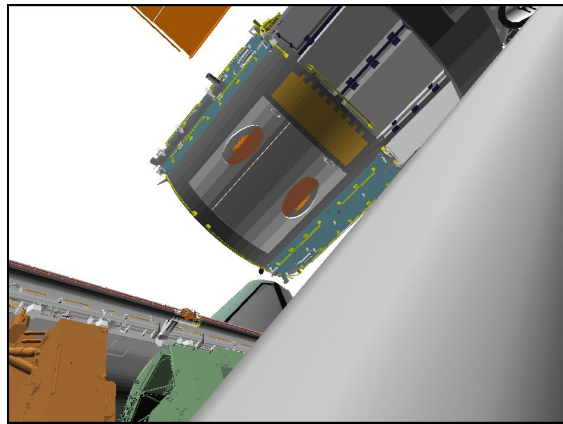
CCTV B (15,25)



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>[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: 5px; margin: 10px 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>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> <p>:-00:00</p> | <p>:-03:00</p> <p>[M] 1. <u>RELEASE</u></p> <div style="border: 1px solid black; padding: 5px; margin: 10px 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) * * If HST Sunpoint macro not disabled by EVENT * * TIMER = +3:30: * * √PCS MODE – SNPT * * At EVENT TIMER = +4:30, command HST * * to Drift mode * * PCS MODE – ITEM 7+9 1(92) EXEC (DRFT) * * √PCS MODE – DRFT * * If PCS MODE not DRFT, repeat * * If PCS MODE still not DRFT, re-exec using * * alt cmd * * 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 = +4:30, command HST * * to Drift mode * * PCS MODE – ITEM 7+9 1(92) EXEC (DRFT) * * √PCS MODE – DRFT * * If PCS MODE not DRFT, repeat * * If PCS MODE still not DRFT, re-exec using * * alt cmd * * 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="338 334 369 358">M</p> <p data-bbox="422 334 600 383">2. <u>SEP 1 BURN</u> √SEP 1 initiated</p> <div data-bbox="457 410 709 435" style="border: 1px solid black; padding: 2px; display: inline-block;"> <p data-bbox="457 410 709 435">SM 94 PDRS CONTROL</p> </div> <p data-bbox="457 440 758 488">PL ID – ITEM 3 +0 EXEC INIT ID – ITEM 24 +0 EXEC</p> | <p data-bbox="1199 261 1230 285">M</p> <p data-bbox="1276 261 1444 285">2. <u>SEP 1 BURN</u></p> <p data-bbox="1314 289 1703 337">When RMS motion has stopped: AFT THC: -X(dn) 10 pulses (1.0 fps)</p> <p data-bbox="1314 362 1696 435">Record Release MET: ___/___:___:___ AFT FLT CNTLR PWR – OFF Report TIG to MCC</p> <p data-bbox="1314 459 1776 532">When center of HST in bottom half of Keel Camr (REF BALL PITCH ~65deg): DAP: INRTL</p> <p data-bbox="1314 557 1535 605">When pitch rate nulled: DAP: VERN(ALT)</p> <p data-bbox="1314 630 1476 654">ADI ATT – LVLH</p> <p data-bbox="968 313 1024 337">ASAP</p> <p data-bbox="1083 630 1129 654">A6U</p> |

| RMS and HST Systems | Orbiter |
|--|--|
| <p data-bbox="338 261 653 318"> <input type="checkbox"/> M 3. <u>HST TO SUNPOINT</u> <input type="checkbox"/> SM 210 HST SYS </p> <p data-bbox="443 345 659 370">√RCVR 1(2) 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="107 599 653 623">+ :03:30 √PCS MODE – SNPT</p> <p data-bbox="107 649 659 673">+ :04:22 √SNPT DIS – YES >></p> <p data-bbox="493 699 779 745"> * If PCS MODE not SNPT, * * √MCC * </p> | <p data-bbox="1194 261 1587 318"> <input type="checkbox"/> 3. <u>HST TO SUNPOINT</u> √HST Sunpoint mode initiated </p> <p data-bbox="1194 363 1629 420"> <input type="checkbox"/> M 4. <u>MNVR TO TARGET TRACK ATT</u> <input type="checkbox"/> GNC UNIV PTG </p> <p data-bbox="1312 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="968 891 1644 915">SEP 1 Init TRK – ITEM 19 EXEC (CUR-*)</p> <p data-bbox="968 941 1587 966">+ :05:00 DAP: A7/AUTO/VERN(ALT)</p> |

I

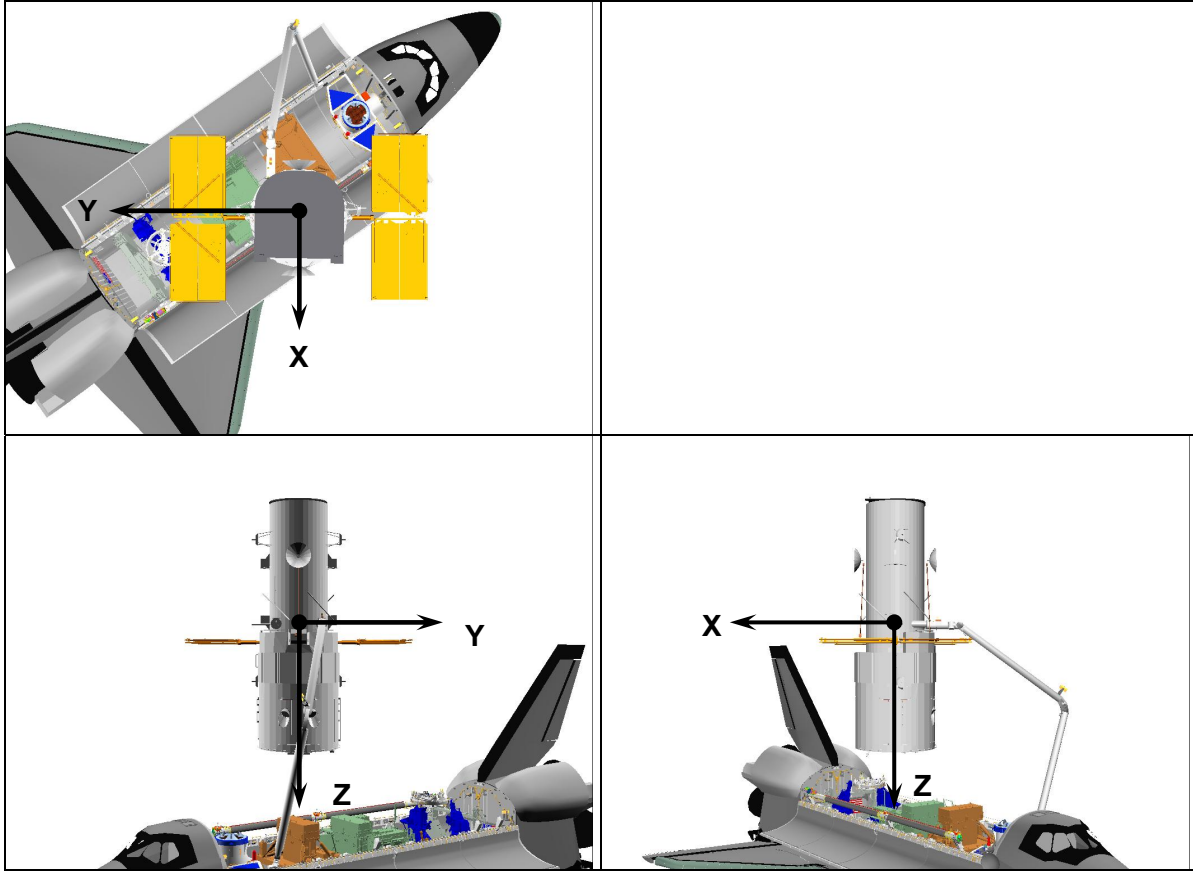
| RMS and HST Systems | Orbiter |
|-------------------------|--|
| <p>Actions Complete</p> | <p>When SV UPDATE POS < 0.03 and MARK ACPT > 9, SV SEL – ITEM 4 EXEC (FLTR)</p> <p>When R > 400 ft, KU RDR OUTPUT – HI</p> <p>A1U</p> <p>F6 M 7. <u>SEP 2 BURN</u> √ADI ATT – LVLH</p> <p>F7</p> <p>If SEP 1 was 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/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: <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 DAP: No LO Z Go to FLIGHT PLAN</p> |

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PL ID/POR DEFINITION – PL ID 3

REF DATA



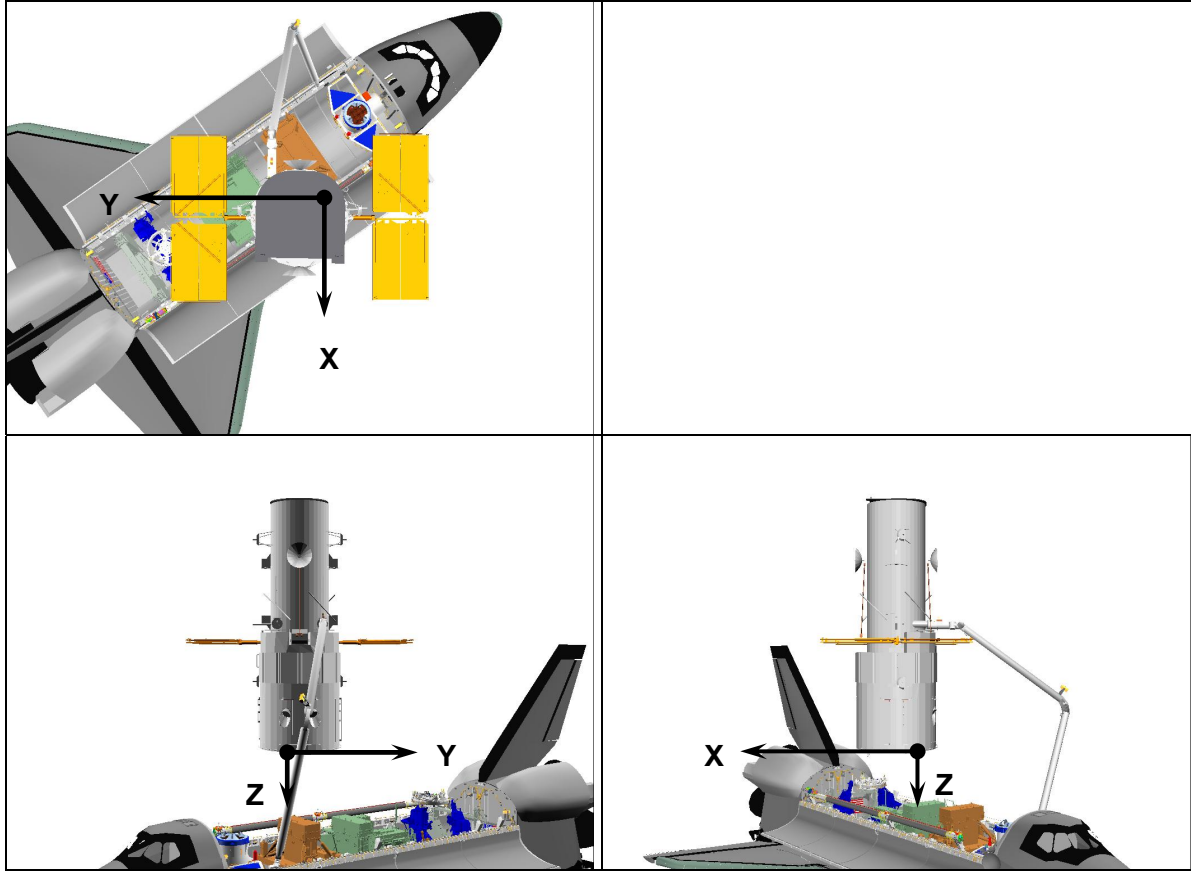
GF: +V2

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

PURPOSE: HST maneuvering/berthing

| RATES: | <u>COARSE</u> | <u>VERN</u> |
|-----------------|---------------|-------------|
| 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: COARSE VERN

| | | |
|-----------------|------|------|
| 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 • 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:

- 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
- 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 {A12.1.1-6G}, 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 | 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 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(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 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 | |

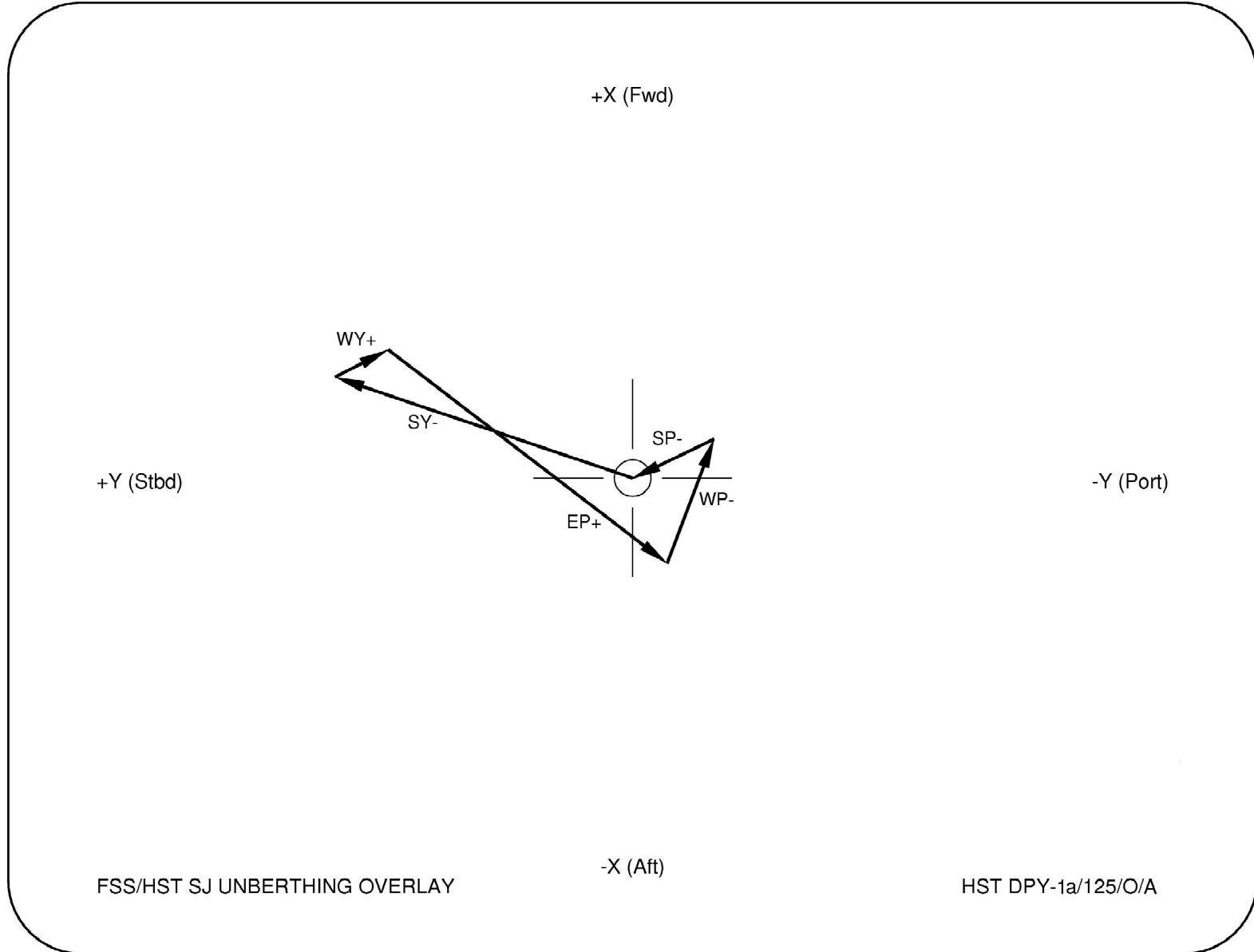
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CUE CARD CONFIGURATION

CUE CARD
CONFIG

CUE CARD CONFIG

Fabricate as transparency



FSS/HST SJ UNBERTHING OVERLAY

$-X$ (Aft)

HST DPY-1a/125/O/A

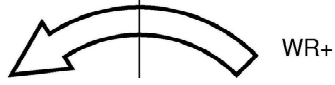
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CC 8-2

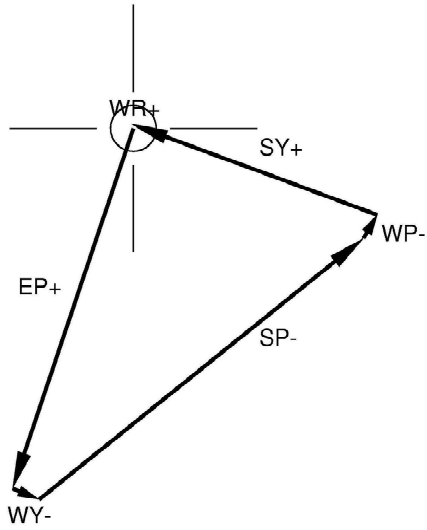
HST DPY/125/FIN

Fabricate as transparency

ZOOM 34.0 HFOV
FOCUS 5.0 FT
EYEPOINT APPROX 18 IN



WR+



WR+

SY+

WP-

EP+

SP-

WY-

BERTHED HST GRAPPLE OVERLAY

HST DPY-2a/125/O/A

(reduced copy)

CC 8-3

HST DPY/125/FIN

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HST DEPLOY CHECKLIST

STS
125