

Hubble Space Telescope Deploy Checklist

STS-125

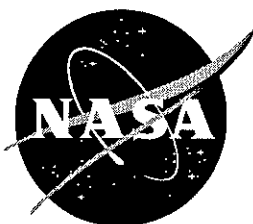
Mission Operations Directorate
Operations Division

Basic
January 16, 2008

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MISSION OPERATIONS DIRECTORATE

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

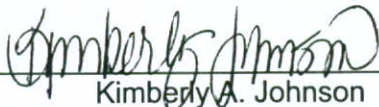
BASIC
January 16, 2008

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Incorporates the following:
482#: NONE – Establishes baseline

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	DM43/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

BASIC 01/16/08

Sign Off	*	125/BAS	5-1	125/BAS
ii	*	125/BAS	5-2	125/BAS
iii	*	125/BAS	5-3	125/BAS
iv	*	125/BAS	5-4	125/BAS
v		125/BAS	6-1	125/BAS
vi		125/BAS	6-2	125/BAS
1-1		125/BAS	6-3	125/BAS
1-2		125/BAS	6-4	125/BAS
1-3		125/BAS	6-5	125/BAS
1-4		125/BAS	6-6	125/BAS
2-1		125/BAS	6-7	125/BAS
2-2		125/BAS	6-8	125/BAS
2-3		125/BAS	6-9	125/BAS
2-4		125/BAS	6-10	125/BAS
2-5		125/BAS	6-11	125/BAS
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2-7		125/BAS	6-13	125/BAS
2-8		125/BAS	6-14	125/BAS
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2-10		125/BAS	6-16	125/BAS
2-11		125/BAS	6-17	125/BAS
2-12		125/BAS	6-18	125/BAS
3-1		125/BAS	6-19	125/BAS
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3-7		125/BAS	7-1	125/BAS
3-8		125/BAS	7-2	125/BAS
3-9		125/BAS	7-3	125/BAS
3-10		125/BAS	7-4	125/BAS
3-11		125/BAS	7-5	125/BAS
3-12		125/BAS	7-6	125/BAS
4-1		125/BAS	7-7	125/BAS
4-2		125/BAS	7-8	125/BAS
4-3		125/BAS	8-1	* 125/BAS
4-4		125/BAS	CC 8-2	* 125/BAS
4-5		125/BAS	CC 8-3	* 125/BAS
4-6		125/BAS	8-4	* 125/BAS
4-7		125/BAS		
4-8		125/BAS		
4-9		125/BAS		
4-10		125/BAS		
4-11		125/BAS		
4-12		125/BAS		

* – Omit from flight book

HST DEPLOY CUE CARDS

<u>Title</u>	<u>Ref. Page</u>	<u>Card No.</u>
FSS/HST SJ UNBERTHING OVERLAY	CC 8-2	HST DPY-1a/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
Review RMS QUICK DEPLOY (CONT OPS)

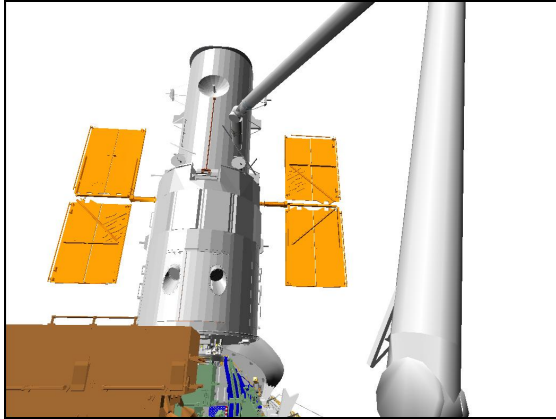
- A7 1. CAMR SETUP
 √PL BAY FLOODS FWD (two) – OFF
 MID,AFT (four) – as reqd
- √P/TV17 HST RELEASE, SETUP (PHOTO/TV FS, SCENES) complete
- VTR – √Adequate tape available
- MO58F 2. ACTIVATE KEEL CAMR
 √Keel Video CBL connected to PIGMY J2
 √TV PWR – ON
- L11U √cb KEEL CAM PWR – cl
 √cb SW PWR 2 – cl
 √KEEL CAM HTR/ILLUM – ON
 ENABLE – ON
- A7U MON 1(2) – MIDDECK
 If MAN GAIN pb not illuminated:
- L11U KEEL CAM ENABLE – OFF, wait 10 sec, then ON
 Repeat until MAN GAIN pb illuminated
- A7U LT LEVEL pb – press
 DAY(NIGHT) pb – press
 ALC pb – press
- M** 3. MNVR RMS TO PRE-GRAPPLE POSN
 √VTR PWR – ON
 √lt – on
 CNTL sw – STBY,REC
 √REC lt – on
- 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

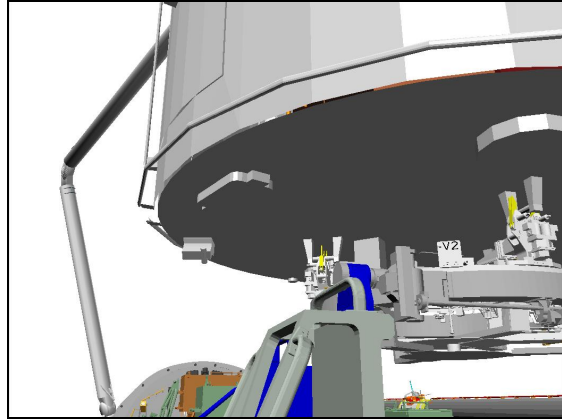
Clearance between RMS and -V3 HGA should be monitored

Mnvr to HST PRE-GRAPPLE posn:

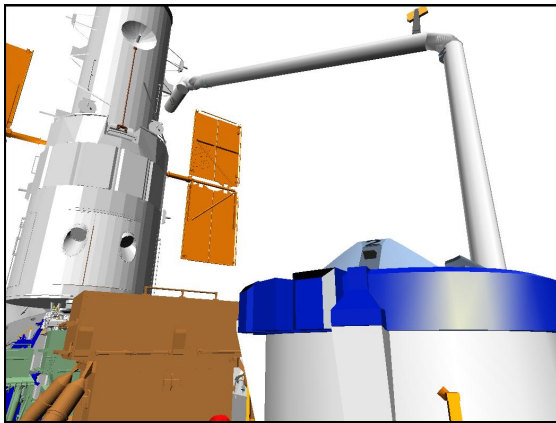
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1024	-46	-755	0	0	0	0
SY	SP	EP	WP	WY	WR	
-29.3	+83.2	-79.6	-3.6	+29.3	0.0	



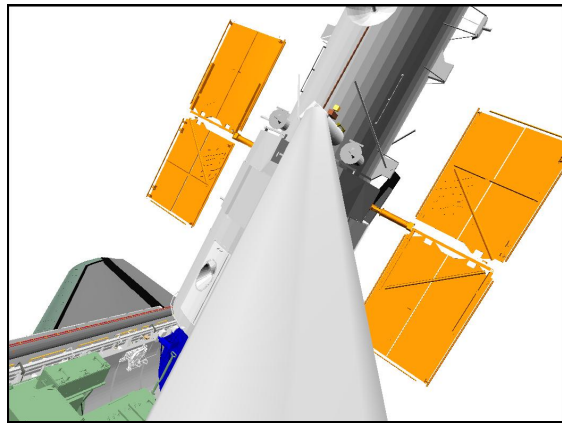
CCTV A (5,25)



CCTV B(15,20)



CCTV D(35,20)



ELBOW (-5,-20)

[M] 4. 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 PDRS FS):

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

Mnvr to +V2 GF grapple envelope

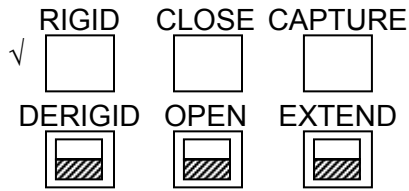
CAUTION
Monitor EE tb timing to prevent EE motor burnout

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/TV17 HST RELEASE, SETUP (PHOTO/TV FS, SCENES) complete

- 2. PWR XFER PRECHECKS

SM 210 HST SYS

- √TLM COUNT – incr
- √EPS INT ESS BUS ABC – (no *)

- 3. CONNECT BATTERIES TO ESS BUS

On MCC GO:

- ESS/MN SW ENA – ON (tb-gray)
- ESS BUS INT PWR – ON (tb-UP)

SM 210 HST SYS

- √EPS INT ESS BUS ABC – * * *

- * If ESS BUS INT PWR tb – bp or INT ESS BUS ABC not * * *, *
- * Perform 2.1a ESS BUS INT PWR tb – bp *
- * WHEN SHOULD BE tb – UP (WHEN CMDED) (PL SYS, HST) *

Notify MCC, ACTIVATE HST ESS BUS INTERNAL PWR complete

- 4. DEADFACE UMB

On MCC GO:

SM 210 HST SYS

- L12UR √TLM COUNT – incr
- ESS BUS EXT PWR – OFF (mom) (tb-bp)
- MN BUS EXT PWR – OFF (mom) (tb-bp)
- √IPCU RLY CL tb – bp
- √MN BUS PWR ON tb – gray

SM 210 HST SYS

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

SM 211 SSE OVERVIEW

- √DPC 1-12 VOLTS: 34.5 ± .8
- √AMPS: < 0.5
- PCU OFF – ITEM 2 EXEC (*)
- √PCU – blank/blank

L12UL √FSS PCU PWR CONTR A,B (two) – OFF

CRT √DPC 1-12: (no *)
 √1-12 VOLTS: < 0.5 (after 30 sec)
 √AMPS: < 0.5

Notify MCC, Umb deadface complete

M 5. SET UP UMB DISCONNECT

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

SM 212 SSE MECHANISMS

AMSB ON – ITEM 7 EXEC (A(B))

* If AMSB ON – blank, continue *

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

* If any param not as expected, perform SSE SSR-1 *
* FMDM SWAP A→B(B→A) (PL SYS, SSE), then *
* repeat SET UP UMB DISCONNECT on alternate *
* side and continue using alternate side *

R13L PL BAY MECH PWR SYS 1(2) – ON

WARNING

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

For any SM ALERT during FSS ops:

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

M 6. DISCONNECT UMB

L10 √VTR PWR It – on
 Control sw – REC
 √REC It – on

CRT UMB MN SEL – ITEM 17 EXEC (* MAT)

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

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

HST UNBERTH

CAUTION

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

1. SETUP

A7

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

2. PWR FSS CCTV

CAUTION

FSS CCTV limited to 2 hr continuous use

L12UL

- √CCTV HTR PWR – ON (tb-gray)

SM 211 SSE OVERVIEW

CCTV ENA ON – ITEM 3 EXEC (*)

PWR ON – ITEM 5 EXEC (*)

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

R12U

(VPU)

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

A7U

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

3. OPEN BERTHING LATCH 3

Set up CCTV to monitor opening of Latch 3

- √VTR recording

DAP: FREE

SM 212 SSE MECHANISMS

B LAT 3 SEL – ITEM 16 EXEC (* CL)

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

√AMSB DC AMPS: .02 to .08

√MECH – steady A(B)

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

√B LAT 1 STAT – OP

A6U

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

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

CRT √MECH – steady A(B)

M 5. OPEN BERTHING LATCH 2

Set up CCTV to monitor opening of Latch 2 (include FSS Camr)

√VTR recording

CRT B LAT 2 SEL – ITEM 15 EXEC (* CL)

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

√AMSB DC AMPS: .02 to .08

√MECH – steady A(B)

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

CCTV Visually monitor latch operation

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

- * If B LAT 2 STAT – CL, *
- * continue and expect (*) *
- * If stall condition observed (AMSB AC AMPS *
 - * > 2.0 and no mechanism motion): *
 - * PL RETEN LAT 1(2) – OFF *
 - * √MCC *

√B LAT 2 STAT – OP

A6U

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

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

CRT √MECH – steady A(B)

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

7. ENABLE RNS DATA RECORDING
√Timer > 2.5 minutes

L11U RNS GPS REC – START (mom) (tb-UP)
CAM REC – START (mom) (tb-UP)

* If any tb – bp, record and notify *
* MCC. Continue *

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

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

R13L PL BAY MECH PWR SYS 1(2) – OFF

M 9. MNVR RMS TO FSS HOVER POSN
CCTV – config for unberth

√VTR recording

√DAP: FREE
GNC 20 DAP CONFIG
Load DAPs A15 and B12
CNTL ACCEL – ITEM 28 +3 EXEC
– ITEM 48 +3 EXEC

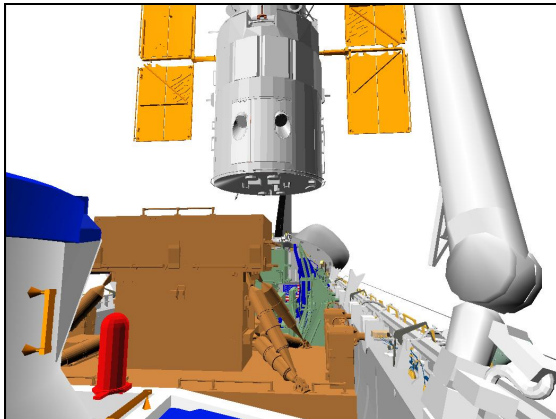
√DAP: no LO Z

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

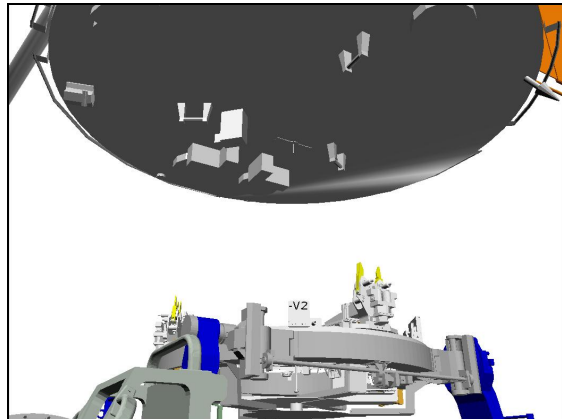
RHC RATE – VERN(RATE MIN tb-ON)
A8U BRAKES – OFF (tb-OFF)
MODE – ORB LD, ENTER

Mnvr to FSS HOVER posn

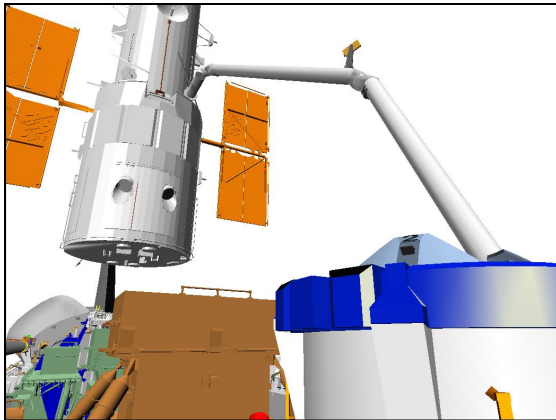
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1149	0	-825	0	0	0	3
SY	SP	EP	WP	WY	WR	
-28.0	+61.3	-36.9	-24.4	+28.0	+0.5	



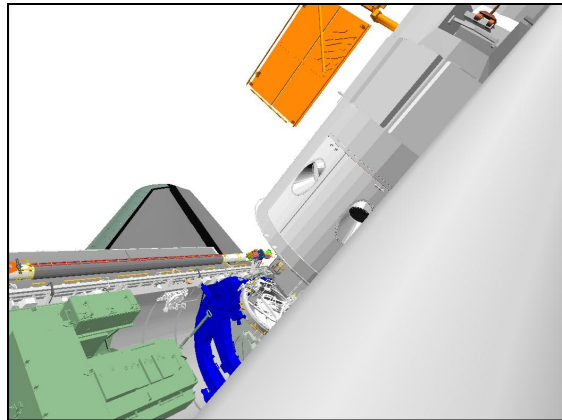
CCTV A (-5,20)



CCTV B (30,25)



CCTV D (30,20)



ELBOW (-35,-40)

If attitude maintenance reqd,
BRAKES – ON (tb-ON)
– OFF (tb-OFF)

A6U

DAP: A/AUTO/VERN (ALT)

10. UNPWR FSS CCTV

When FSS CCTV no longer reqd:

SM 211 SSE OVERVIEW

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

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

CCTV ENA OFF – ITEM 4 EXEC (*)

M 11. MNVR RMS TO HST RELEASE POSN

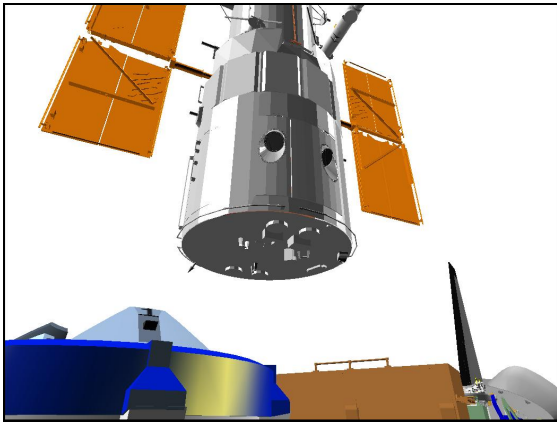
√VTR recording

√DAP: FREE

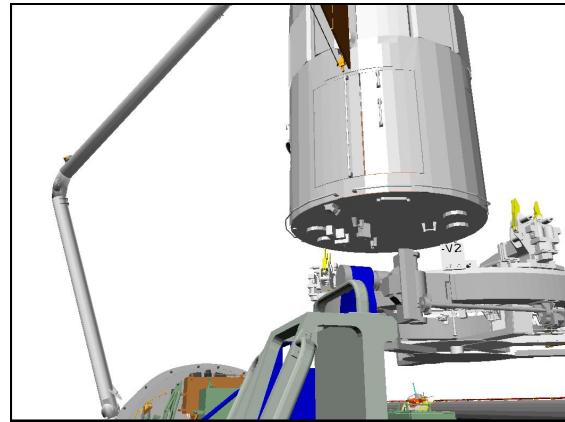
RHC
A8U
Load DAPs A15 and B12
RATE – VERN(RATE MIN tb-ON)
MODE – ORB LD, ENTER

Mnvr to HST RELEASE posn:

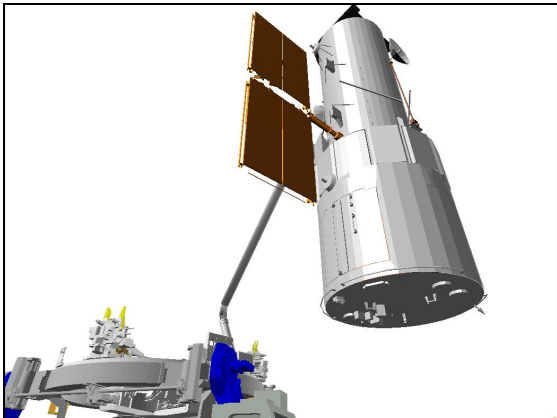
X	Y	Z	PITCH	YAW	ROLL	PL ID
-878	112	-853	0	305	0	3
SY	SP	EP	WP	WY	WR	
-53.4	+90.0	-68.5	-37.3	0.0	+8.5	



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 12. 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)

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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/TV17 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 5) – (*)

5. UPDATE ORBITER WEIGHT

GNC, OPS 202 PRO

GNC ORBIT MNVR EXEC

Load WT per PAD

√PEG 7 not all zero and TIG in future
LOAD – ITEM 22 EXEC
GNC, OPS 201 PRO

RELEASE
OPS

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> <p>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>* *</p> <p>* -00:00 RELEASE sw – depress (hold until OPEN *</p> <p>* tb-gray, 3 sec max) *</p> <p>* *</p> <p>* Mnvrs arm 5 ft (minimum) clear of HST *</p> <p>* *</p> <p>* EE MAN CONTR – DERIGID (hold until *</p> <p>* EXTEND tb-gray, *</p> <p>* 20 sec max) *</p> <p>* 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: *</p> <p>* *</p> <p>* *</p> <p>* *</p> <p>* *</p> <p>* *</p> <p>* -00:00 √Release initiated *</p> <p>* 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 *</p> <p>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 *</p> <p>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="338 256 764 337"> 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;"> <p data-bbox="457 363 716 391">SM 94 PDRS CONTROL</p> </div> <p data-bbox="457 391 764 440"> PL ID – ITEM 3 +0 EXEC INIT ID – ITEM 24 +0 EXEC </p> <p data-bbox="457 561 695 610" style="margin-top: 100px;"> If reqd, BRAKES – ON (tb-ON) </p>	<p data-bbox="968 256 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 383 1633 431"> AFT FLT CNTLR PWR – OFF Report TIG to MCC </p> <p data-bbox="1314 456 1776 529"> When center of HST in bottom half of Keel Camr (REF BALL PITCH ~65 deg): DAP: INRTL </p> <p data-bbox="1314 553 1535 602"> When pitch rate nulled: DAP: VERN(ALT) </p> <p data-bbox="1083 626 1478 651" style="margin-top: 100px;"> A6U ADI ATT – LVLH </p>

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> * If RATIO > 1.0, * * √MCC * 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/TV17 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

NOTE

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

1. CAMR SETUP

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

√P/TV17 HST RELEASE, SETUP (PHOTO/TV FS, SCENES) complete

2. VERIFY RMS CLEARANCE

- √RMS clear of payload envelope

3. DAP/TIMER SETUP

GNC 20 DAP CONFIG

- √DAP A,B set to A10,B10

SM 2 TIME

F7,A4

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

4. MNVR TO BACKAWAY DPY ATT

GNC UNIV PTG

TRK OPTION:

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

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

5. ADI SETUP

A6U

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

O14:E,
O15:E,
O16:E

- √cb DDU (six) – cl

6. KU RDR SETUP

A1U

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

A2

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

SM ANTENNA

- √RDR RNG AUTO (ITEM 5) – (*)

CONT
OPS

7. UPDATE ORBITER WEIGHT
GNC, OPS 202 PRO

GNC ORBIT MNVR EXEC

Load WT per PAD

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

GNC, OPS 201 PRO

8. ENABLE RNDZ NAV

When target vector onboard:

GNC 33 REL NAV

RNDZ NAV ENA – ITEM 1 EXEC (*)

√SV SEL (ITEM 4) – PROP

√INH RNG (ITEM 18) – (*)

√RDOT (ITEM 21) – (*)

√Angles (ITEM 24) – (*)

RR – ITEM 13 EXEC (*)

9. VERIFY RF LINK

SM 210 HST SYS

√TLM COUNT – incr

√PSP ENA ID: 1

√RCVR 1(2) LOCK – *

10. FSS AMSB PWR ON

WARNING

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

For any SM ALERT during FSS ops:

A6U PL RETEN LAT 1,2 (both) – OFF

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

√MCC

A6U

√PL RETEN LAT 1,2 – OFF

√LOGIC PWR SYS 2(SYS 1) – OFF

√PL SEL – 1

LOGIC PWR SYS 1(SYS 2) – ON

SM 212 SSE MECHANISMS

AMSB ON – ITEM 7 EXEC (A(B))

√AMSB DC AMPS < .03

√MECH – blank

√SEL (ITEMS 9-19) – no *

√STAT (ITEMS 9-19) – blank

√O/R DIS – *

* If any param not as expected, √MCC *

R13L

PL BAY MECH PWR SYS 1(2) – ON

11. HST ROTATION

CCTV Monitor HST position during rotation
DAP: FREE

CRT ROTATOR SEL – ITEM 12 EXEC (* RDY)

√AMSB DC AMPS: .02 to .08

A6U PL RETEN LAT 1(2) – LAT (tb-bp)

Mnvr to reqd posn:

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

CRT √MECH flashing A(B)
√ROTATOR STAT – RDY

CCTV √Rotator posn visually

CRT √ROTATOR TACH: >10 deg/min

√AMSB AMPS: 0.3 to 0.5

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

- * If ROTATE TACH < 0.9 deg/min and AMSB AC *
- * AMPS > 0.2: *

A6U * PL RETEN LAT 1(2) – OFF, then perform *

* 1.3a PRIMARY MOTOR FAILS TO DRIVE *

* MECHANISM (PL SYS, SSE) *

PL RETEN LAT 1(2) – OFF

CRT √MECH – blank

After 4 min,

DAP: A10/AUTO/VERN(ALT,LO Z)

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

12. PWR FSS CCTV

CAUTION
FSS CCTV limited to 2 hr continuous use

L12U √CCTV HTR PWR – ON (tb-gray)

SM 211 SSE OVERVIEW

CCTV ENA ON – ITEM 3 EXEC (*)

PWR ON – ITEM 5 EXEC (*)

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

R12U √Green Jumper – FSS

(VPU) √VPU PWR – ON (LED on)

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

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

M 14. HST SUNPOINT MACRO INIT

On MCC GO for release:

SM 210 HST SYS

√RCVR 1(2) LOCK – *

-:01:30

PCS MODE SNPT – ITEM 7 +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 MECHANISMS

B LAT 3 SEL – ITEM 16 EXEC (* CL)

A6U PL RETEN LAT 1(2) – REL

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

A6U PL RETEN LAT 1(2) – OFF

CRT B LAT 1 SEL – ITEM 14 EXEC (* CL)

A6U PL RETEN LAT 1(2) – REL

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

A6U PL RETEN LAT 1(2) – OFF

CRT B LAT 2 SEL – ITEM 15 EXEC (* CL)

A6U PL RETEN LAT 1(2) – REL

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

A6U PL RETEN LAT 1(2) – OFF

CCTV Visually verify LATCHES open and umbilical clear

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

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

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"/> <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"/> <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"/> <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"/> <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 6-17

**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

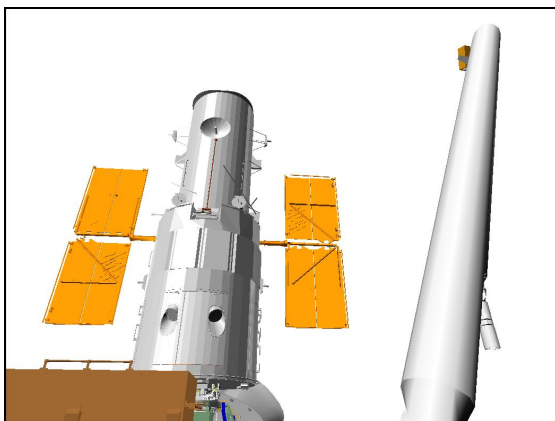
- √PL ID, ITEM 3: 0
- √INIT ID, ITEM 24: 0

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

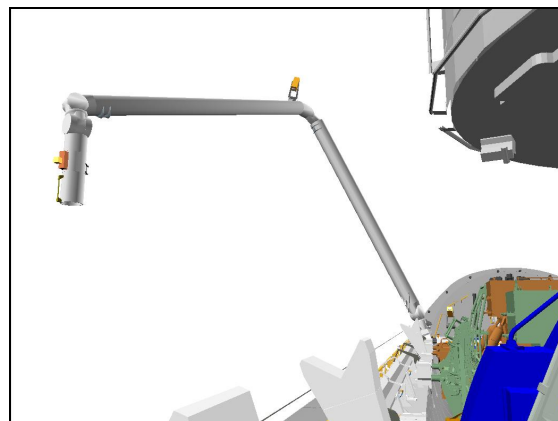
Mnvr to HST PRE-GRAPPLE posn:

	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



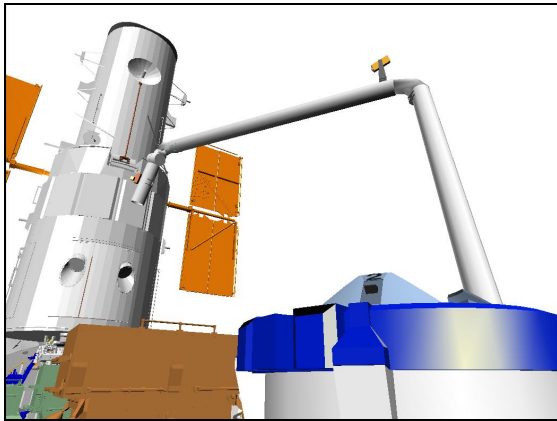
CCTV A (5,30)



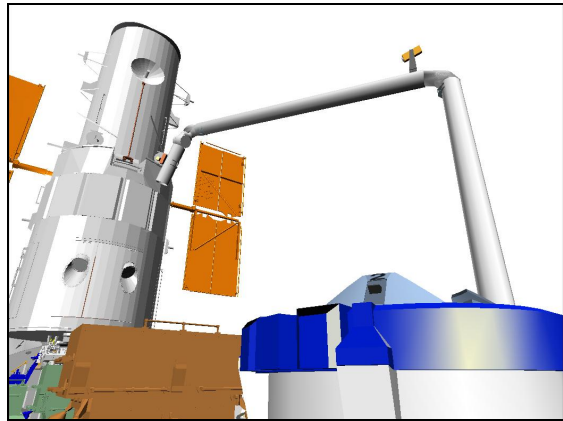
CCTV B (-15,10)

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

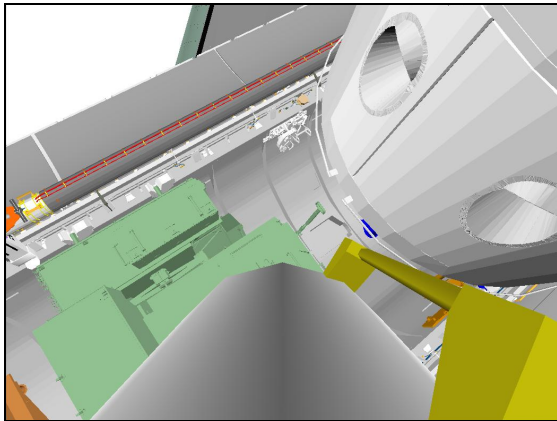
Step 2:
Drive +SP from +78.2° to +83.2°



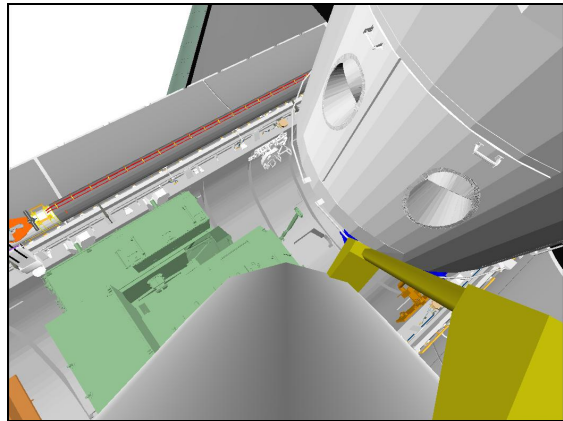
CCTV D (35,25)



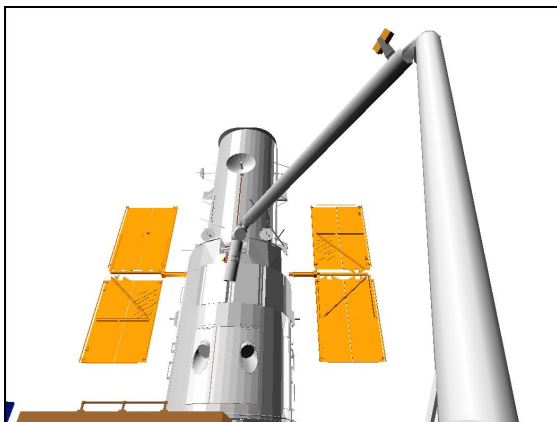
CCTV D (35,25)



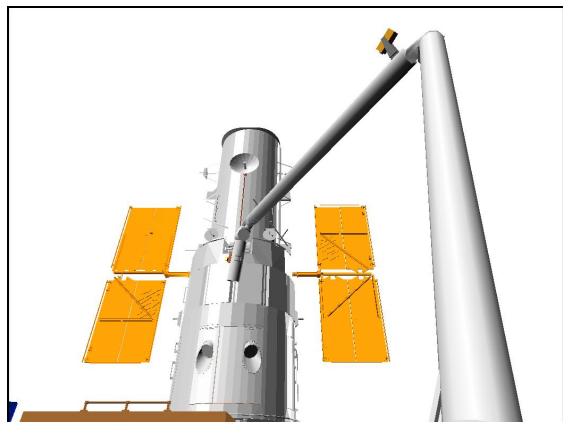
EE



EE

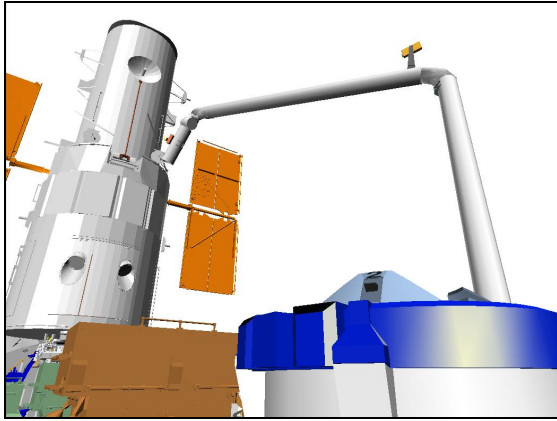


CCTV A (0,35)



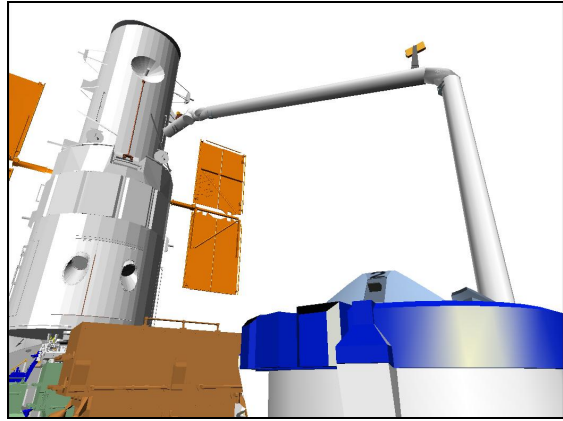
CCTV A (0,35)

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

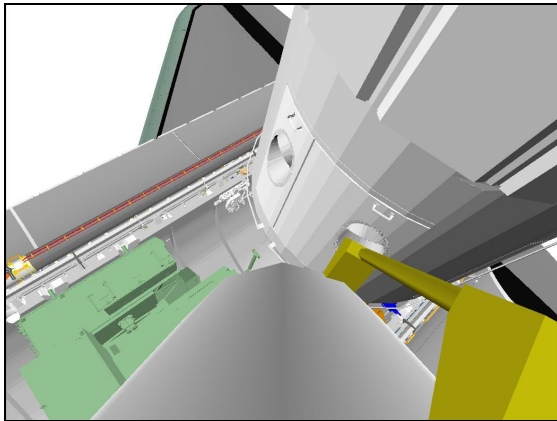


CCTV D (35,25)

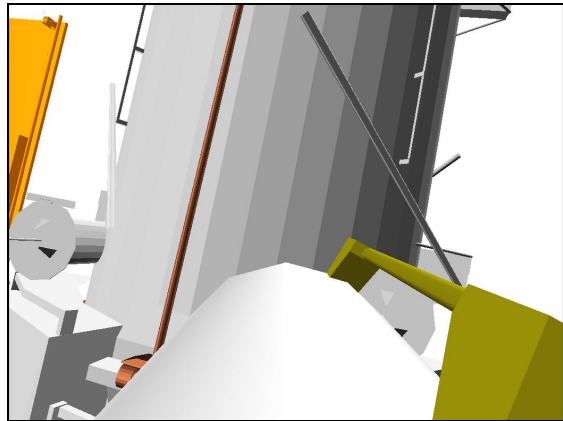
Step 4:
Drive +WP from -72.8° to -3.6°



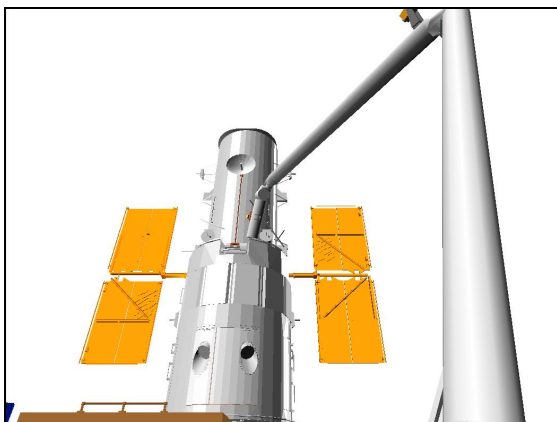
CCTV D (35,25)



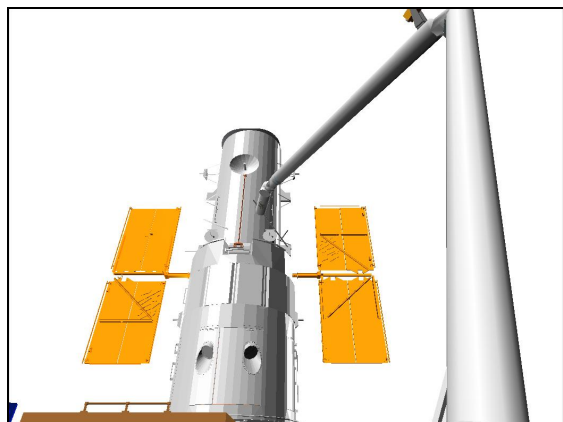
EE



EE

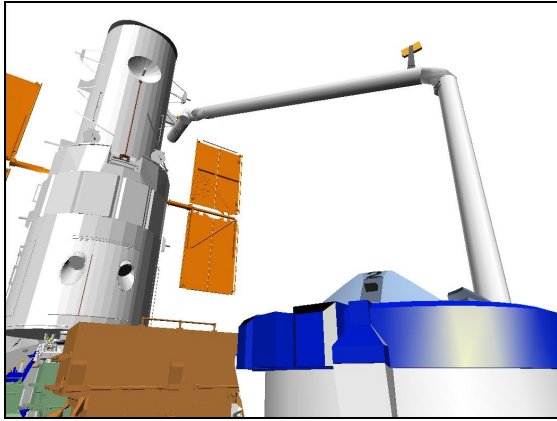


CCTV A (0,35)



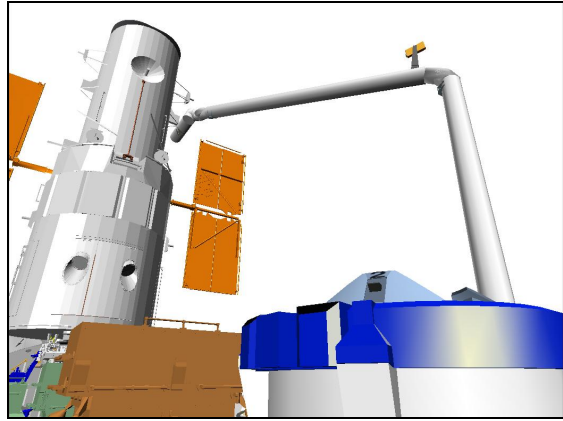
CCTV A (0,35)

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

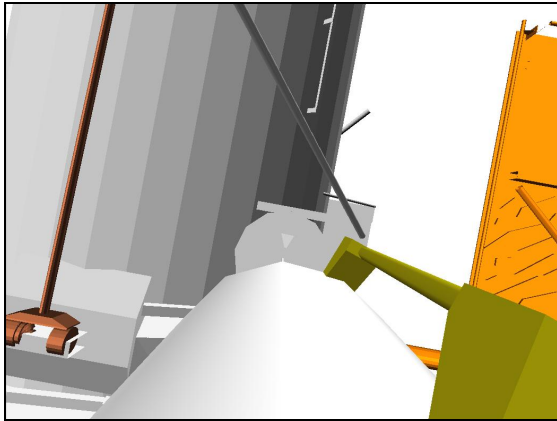


CCTV D (35,25)

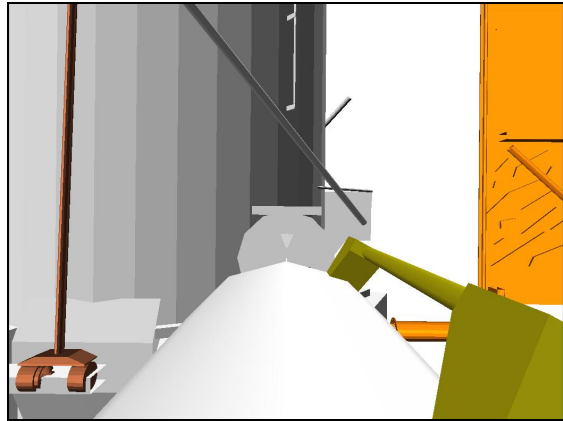
Step 6:
Drive +WR from -10.0° to +0.0°



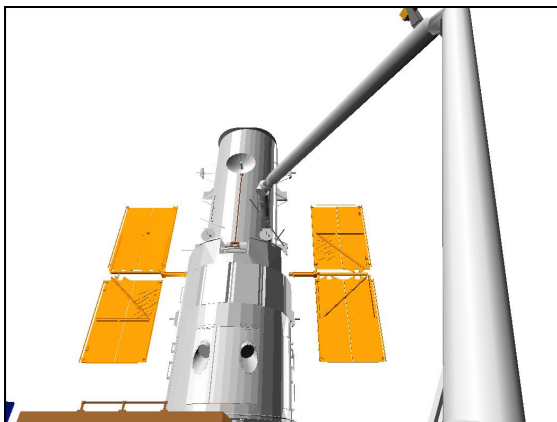
CCTV D (35,25)



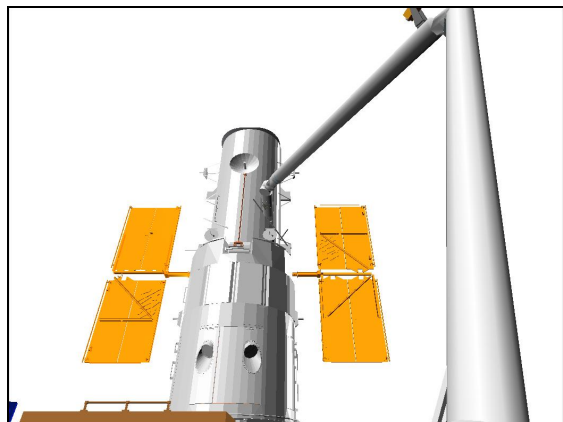
EE



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

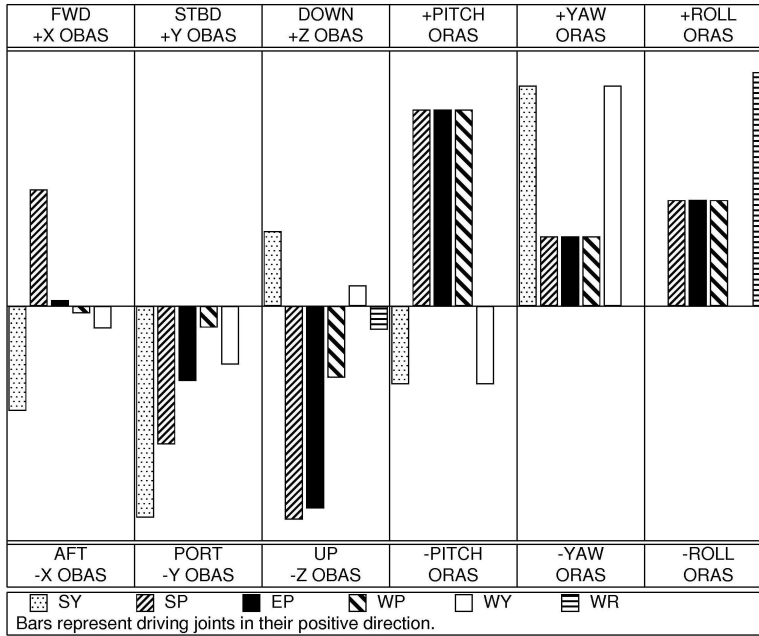
RATE – VERN (RATE MIN tb-ON)
 BRAKES – OFF (tb-OFF)
 MODE – best available

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

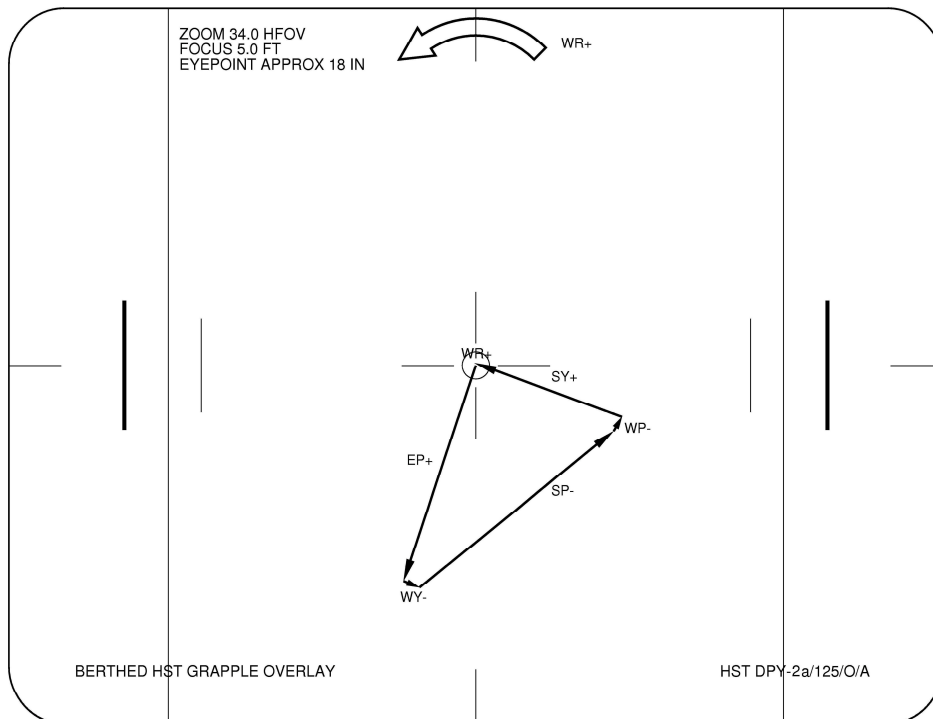
BERTHED HST GRAPPLE



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



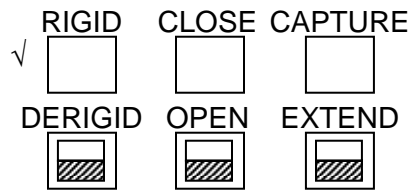
A6U

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

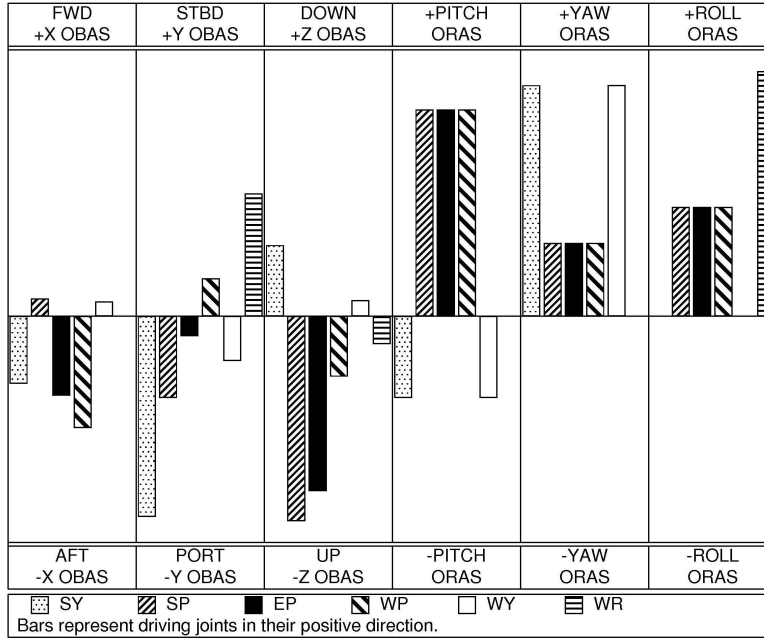
A3 M 1. SJ MNVR RMS TO FSS HOVER POSN
MON 1(2) – install FSS/HST SJ UNBERTHING OVERLAY
(CUE CARD CONFIG)
VID OUT – MON 1(2)
IN – FSS

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)

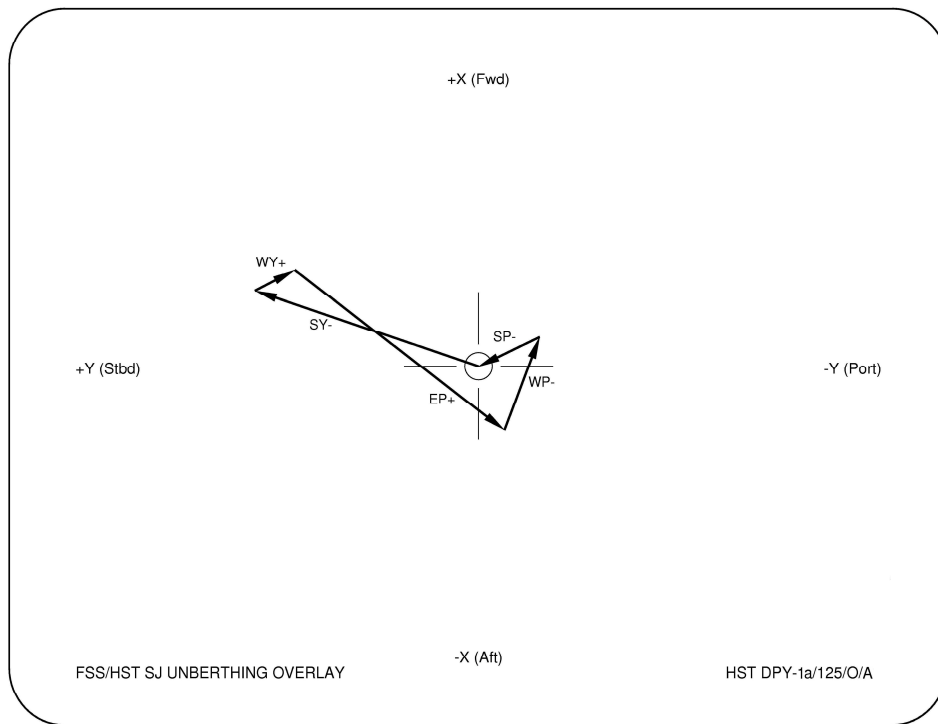
HST UNBERTH



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

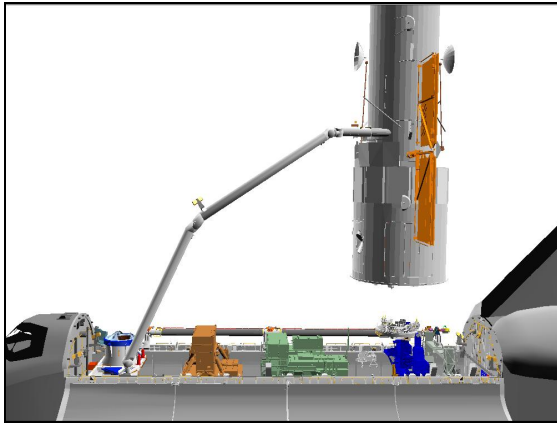
Driving:	Results In:	Driving:	Results In:
+SY	-Y (port), +YAW	+WP	-X (aft), +PITCH
+SP	-Z (up), +PITCH	+WY	-Y (port), +YAW
+EP	-Z (up), +PITCH	+WR	+Y (stbd), +ROLL

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

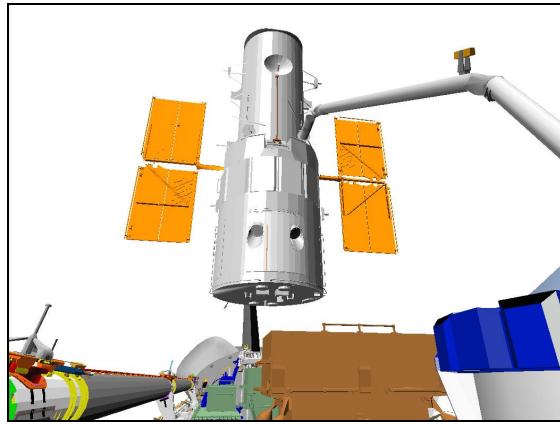


Mnvr to FSS Hover posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-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

A6U If attitude maintenance reqd,
DAP: A/AUTO/VERN(ALT)

2. UNPWR FSS CCTV

When FSS CCTV no longer reqd:

SM 211 SSE OVERVIEW

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

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

CCTV ENA OFF – ITEM 4 EXEC (*)

M 3. MNVR RMS TO HST RELEASE POSN

√VTR recording and timer

SM 94 PDRS CONTROL

PL ID – ITEM 3 +3 EXEC

INIT ID – ITEM 24 +3 EXEC

MON 1	
MON 2	
DNLK	

A6U √DAP: FREE

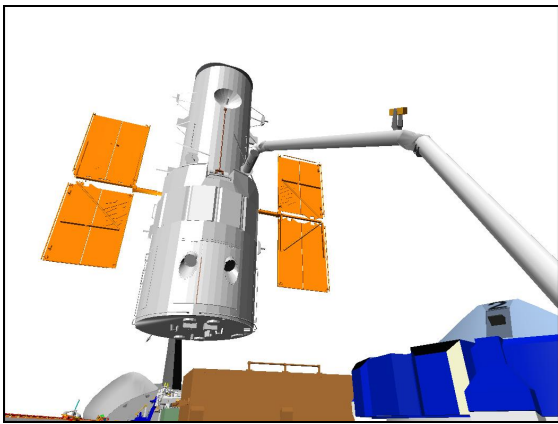
Load DAPs A15 and B12

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

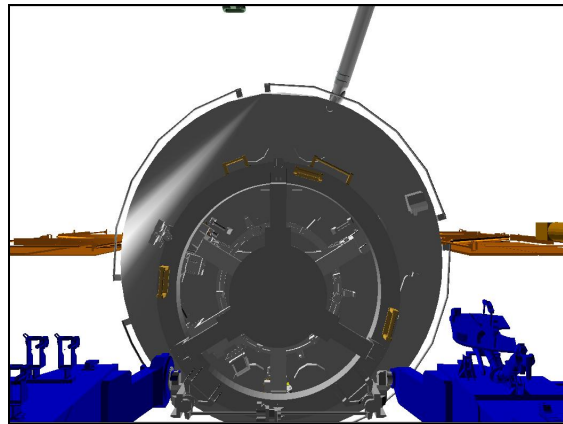
Mnvr to HST RELEASE posn:

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

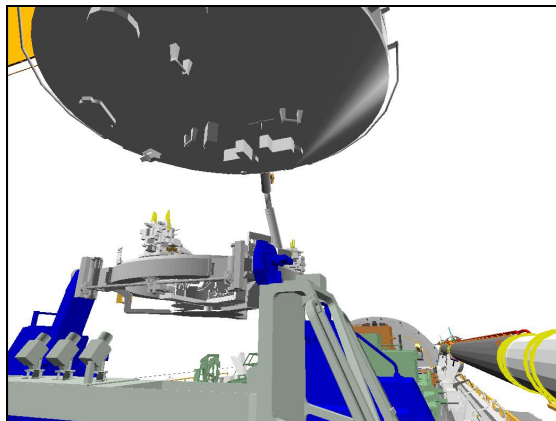
Start:
 FSS Hover



CCTV D (20,30)



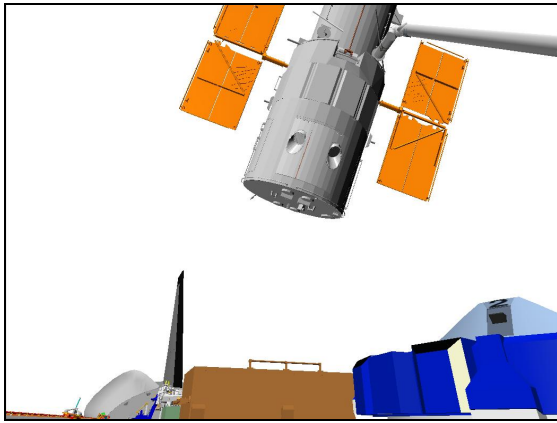
KEEL



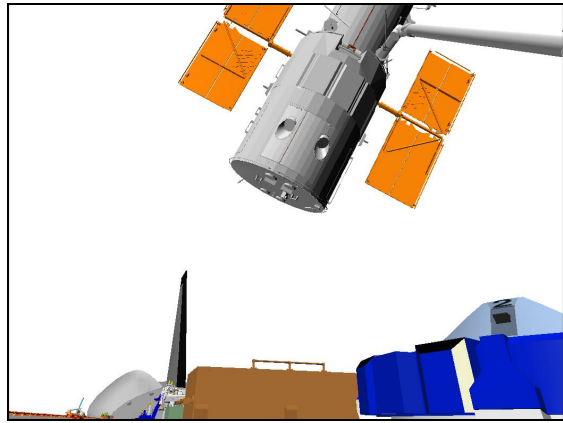
CCTV C (-20,20)

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

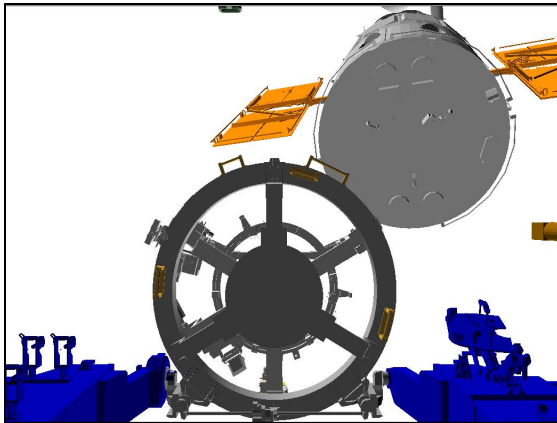
Step 2:
Drive +WR from +0.5° to +8.5°



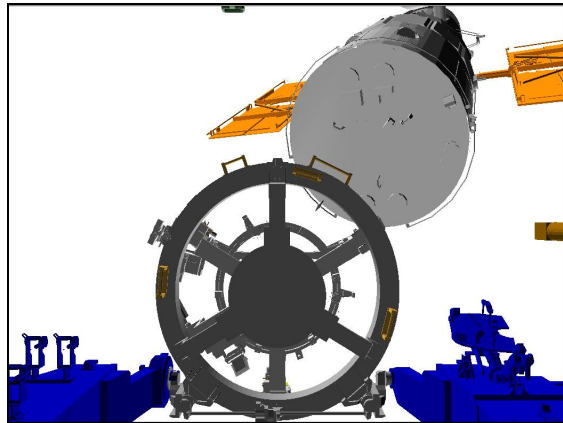
CCTV D (20,30)



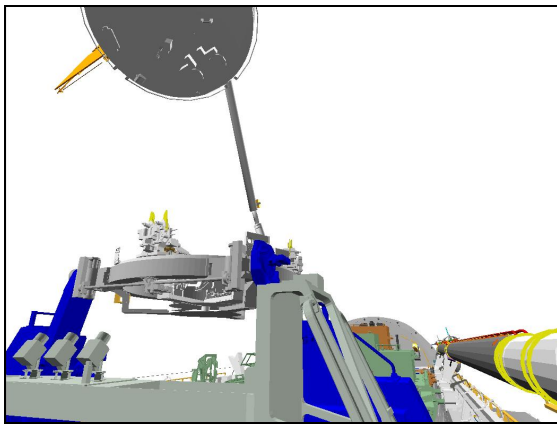
CCTV D (20,30)



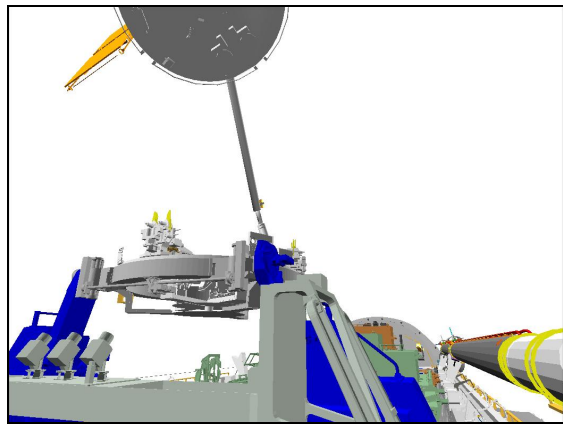
KEEL



KEEL



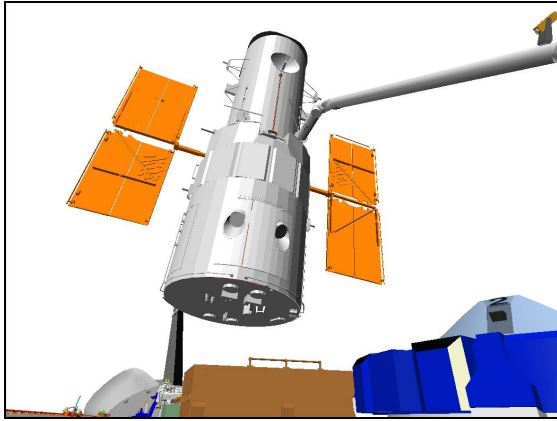
CCTV C (-20,20)



CCTV C (-20,20)

Step 3:

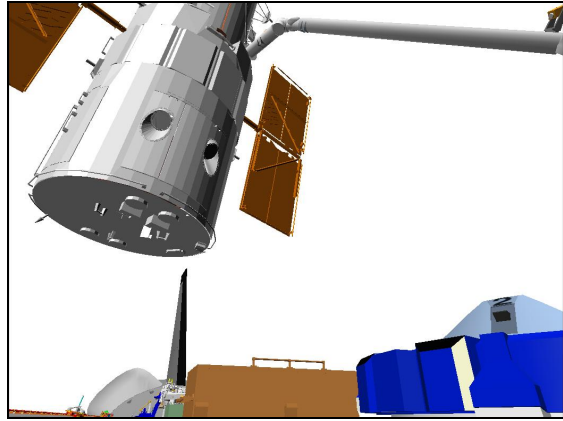
Drive -EP from -36.9° to -68.5°



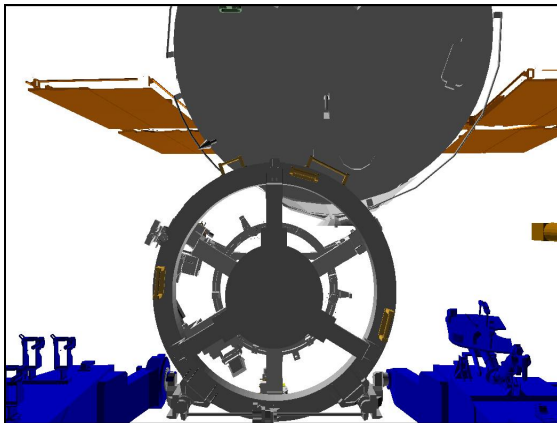
CCTV D (20,30)

Step 4:

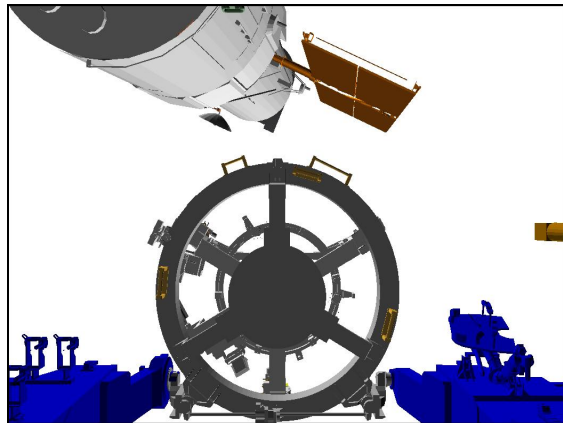
Drive -SY from -28.0° to -53.4°



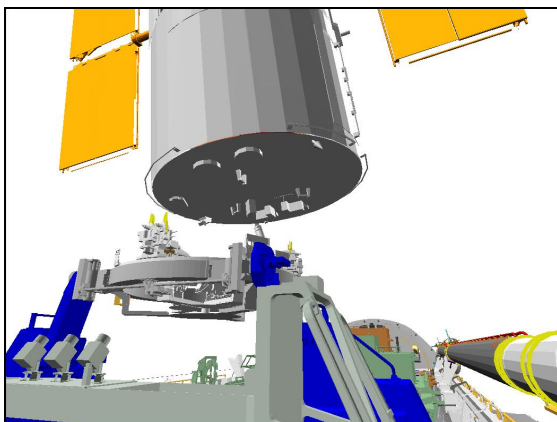
CCTV D (20,30)



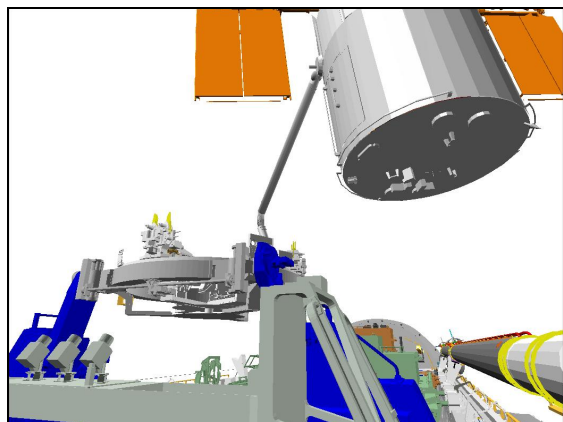
KEEL



KEEL

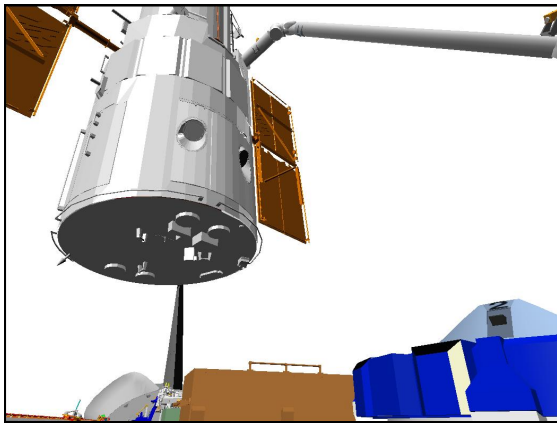


CCTV C (-20,20)



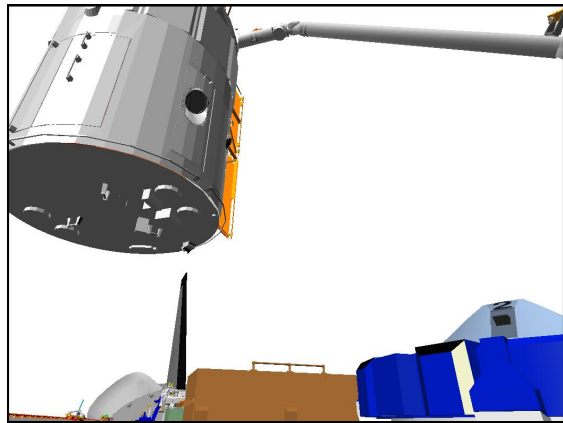
CCTV C (-20,20)

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

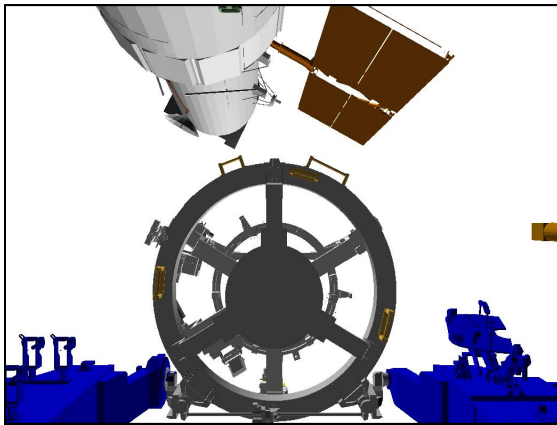


CCTV D (20,30)

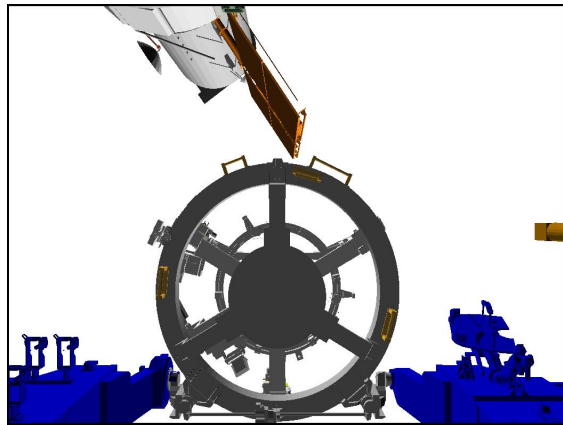
Step 6:
Drive -WY from $+28.0^\circ$ to $+0.0^\circ$



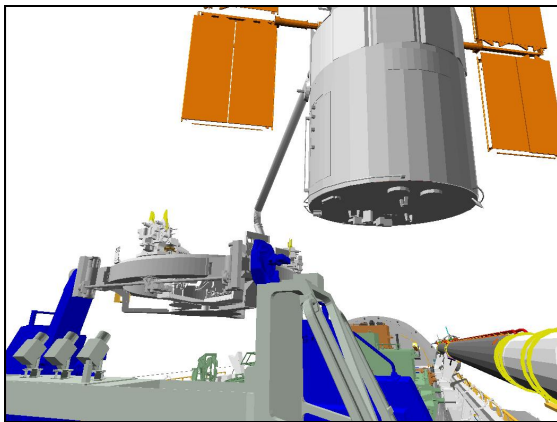
CCTV D (20,30)



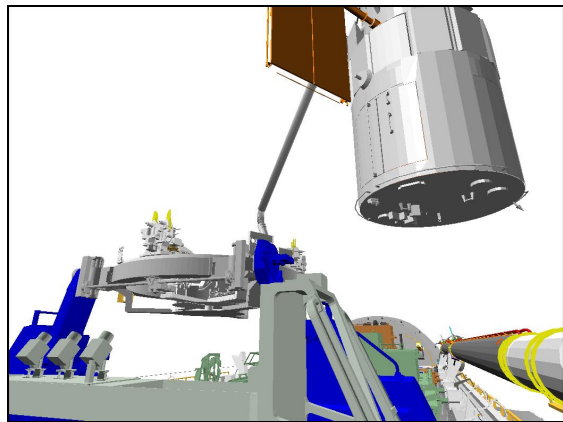
KEEL



KEEL



CCTV C (-20,20)



CCTV C (-20,20)

BRAKES – ON (tb-ON)

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

MODE – not DIRECT
JOINT – CRIT TEMP

VTR – STOP

M 4. MNVR ORBITER TO RELEASE ATT
GNC UNIV PTG

TRK OPTION:

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

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

Go to HST RELEASE PREP (RELEASE OPS)

RMS and HST Systems	Orbiter
<p>SJ HST RELEASE</p> <p>[M] 1. <u>RELEASE</u></p> <p>A7U</p> <ul style="list-style-type: none"> * If backup pwr reqd: * * √B/U PL REL – OFF * * √BRAKES – ON (tb-ON) * * * * <u>NOTE</u> * * Spurious fault msgs may occur * * when PORT RMS deselected * * * * RMS PWR – B/U * * SEL – OFF * * SEL – PORT * * B/U PL REL – ON (10 sec) * * – OFF * * Alternate joints until arm clear of GF pin: * * Drive B/U SP+ * * Drive B/U WP- * * When clear of GF pin: * * Drive B/U SY+ to mnvr arm 5 ft * * (minimum) clear of HST * <p>RHC/A8U</p> <p>If SINGLE MODE available: RATE – as reqd (VERN within 10 ft) √BRAKES – OFF (tb-OFF)</p> <p>A8U</p> <p>MODE – best available</p> <div style="border: 1px solid black; padding: 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 *</p> <p>GNC 20 DAP CONFIG LOAD DAPs A15 and B12 √DAP: no LO Z</p> <p>If SINGLE MODE available: √BRAKES – OFF (tb-OFF)</p> <p>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 *</p> <p>GNC 20 DAP CONFIG LOAD DAPs A15 and B12 √DAP: no LO Z</p> <p>If SINGLE MODE available: √BRAKES – OFF (tb-OFF)</p> <p>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="457 440 758 485">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 334">When RMS motion has stopped: AFT THC: -X(dn) 10 pulses (1.0 fps)</p> <p data-bbox="1314 362 1696 431">Record Release MET: ___/___:___:___ AFT FLT CNTLR PWR – OFF Report TIG to MCC</p> <p data-bbox="1314 459 1776 529">When center of HST in bottom half of Keel Camr (REF BALL PITCH ~65deg): DAP: INRTL</p> <p data-bbox="1314 557 1535 602">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="338 256 653 318"> <input type="checkbox"/> M 3. <u>HST TO SUNPOINT</u> <input type="checkbox"/> SM 210 HST SYS </p> <p data-bbox="443 342 659 370">√RCVR 1(2) LOCK – *</p> <p data-bbox="443 399 953 573"> * 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="107 646 659 673">+04:22 √SNPT DIS – YES >></p> <p data-bbox="495 695 779 743"> * If PCS MODE not SNPT, * * √MCC * </p>	<p data-bbox="1192 256 1587 318"> <input type="checkbox"/> 3. <u>HST TO SUNPOINT</u> √HST Sunpoint mode initiated </p> <p data-bbox="1192 358 1629 420"> <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>When SV UPDATE POS < 0.03 and MARK ACPT > 9, SV SEL – ITEM 4 EXEC (FLTR)</p> <p>When R > 400 ft, KU RDR OUTPUT – HI</p> <p>A1U</p> <p>F6 M 7. <u>SEP 2 BURN</u> √ADI ATT – LVLH</p> <p>F7</p> <p>If SEP 1 was posigrade: When orbiter on HST -Rbar (Fwd ADI Pitch = 0°deg): Fwd FLT CNTLR PWR – ON DAP: A/AUTO/PRI DAP TRANS: NORM/PULSE/PULSE, LO Z Fwd THC: -X(out) 10 sec (2.5 fps)</p> <p>If SEP 1 was retrograde: When orbiter on HST +Rbar (Fwd ADI Pitch = 0°deg): Fwd FLT CNTLR PWR – ON DAP: A/AUTO/PRI √DAP TRANS: PULSE/PULSE/PULSE, LO Z Fwd THC: -X(out) 10 pulses (1.0 fps)</p> <p>Record MET: ___/___:___:___ (burn init)</p> <p>Fwd FLT CNTLR PWR – OFF DAP: A/AUTO/VERN(ALT) DAP TRANS: PULSE/PULSE/PULSE</p> <p>Report TIG to MCC</p> <p>8. <u>P/TV DEACTIVATION</u> Go to P/TV17 HST RELEASE, DEACTIVATION (PHOTO/TV FS, <u>SCENES</u>)</p>

RMS and HST Systems	Orbiter
<p>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

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REF DATA

HST DEPLOY GO/NO-GO SUMMARY

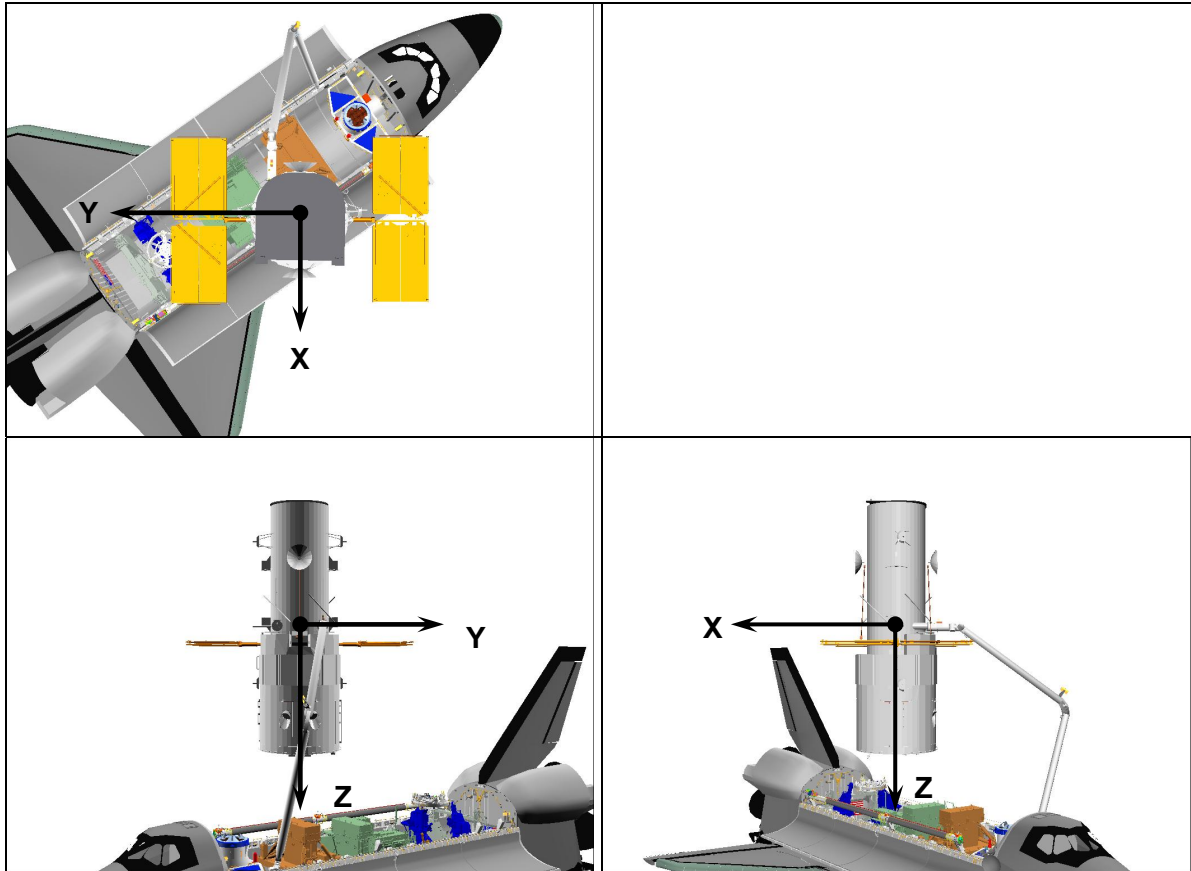
REF DATA

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

NOTES:

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

PL ID/POR DEFINITION – PL ID 3



GF: +V2

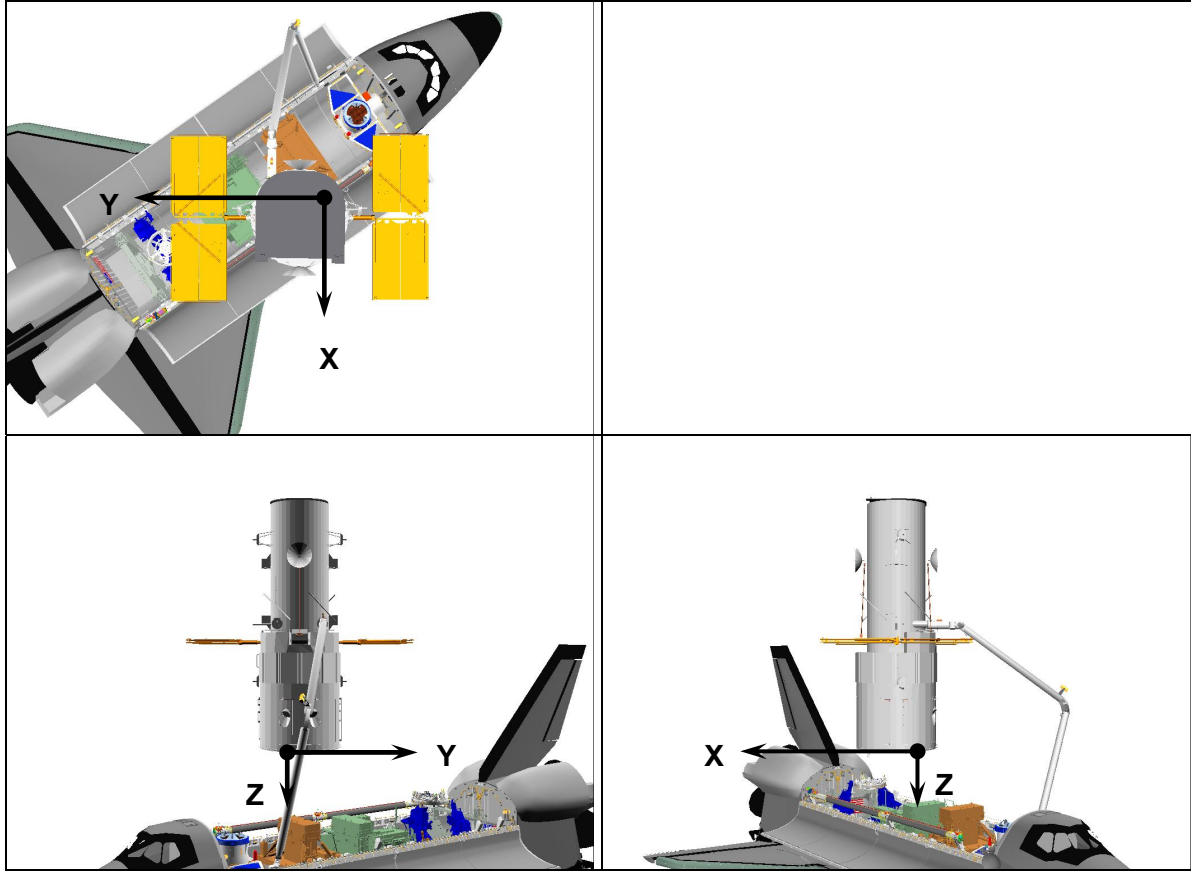
POR: Center of HST, along V1 axis, at level of GFs

PURPOSE: HST maneuvering/berthing

RATES:

	<u>COARSE</u>	<u>VERN</u>
TRAN LIM ft/sec	0.18	0.10
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	0.10
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]	A12.1.8-1
MPM STOW MOTORS (2)	2 ↓ [1]	A12.1.3-2
MRL LATCH CAPABILITY (3)	3 ↓ [1]	A12.1.3-3
MPM (4) STOWED IND (8)		
MPM (4) DEPLOY IND (8)	SH 1 ↓	
MRLs LATCHED (3)		
MAN AUG MODE (1)		
SINGLE MODE (1)	3 ↓ [4]	A12.1.5-1
DIRECT MODE (1)		
BACKUP MODE (1)		
BRAKES (6)	0 ↓	
AUTO BRAKES (1)	0 ↓ [5]	
CAPTURE AND RIGIDIZE (2)	1 ↓	
DERIGIDIZE (2)	2 ↓ [6]	A12.1.7-1
RELEASE (2)	2 ↓	A12.1.7-1
BACKUP RELEASE (1)		
THERMAL (DEG F) -20(0), 176(172), LED -20(0), 147(144), ABE(EE) -20(0), 110(106), ABE (SPA)	REQD	

NOTES:

- [1] EVA CAPABILITY EXISTS FOR THE FOLLOWING CONTINGENCIES:
- SHOULDER BRACE RELEASE
 - MPM DEPLOY/STOW
 - RMS STRAPDOWN
 - GRAPPLE FIXTURE (GF) RELEASE
- [2] IFM IS AVAILABLE TO RECOVER JETTISON SYSTEM; HIGH PRIORITY RMS ACTIVITIES MAY CONTINUE
- [3] CONTINUE OPERATIONS EVEN IF ONE FAILURE WILL RESULT IN THE INABILITY TO LATCH AT LEAST TWO 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	

HST RELEASE

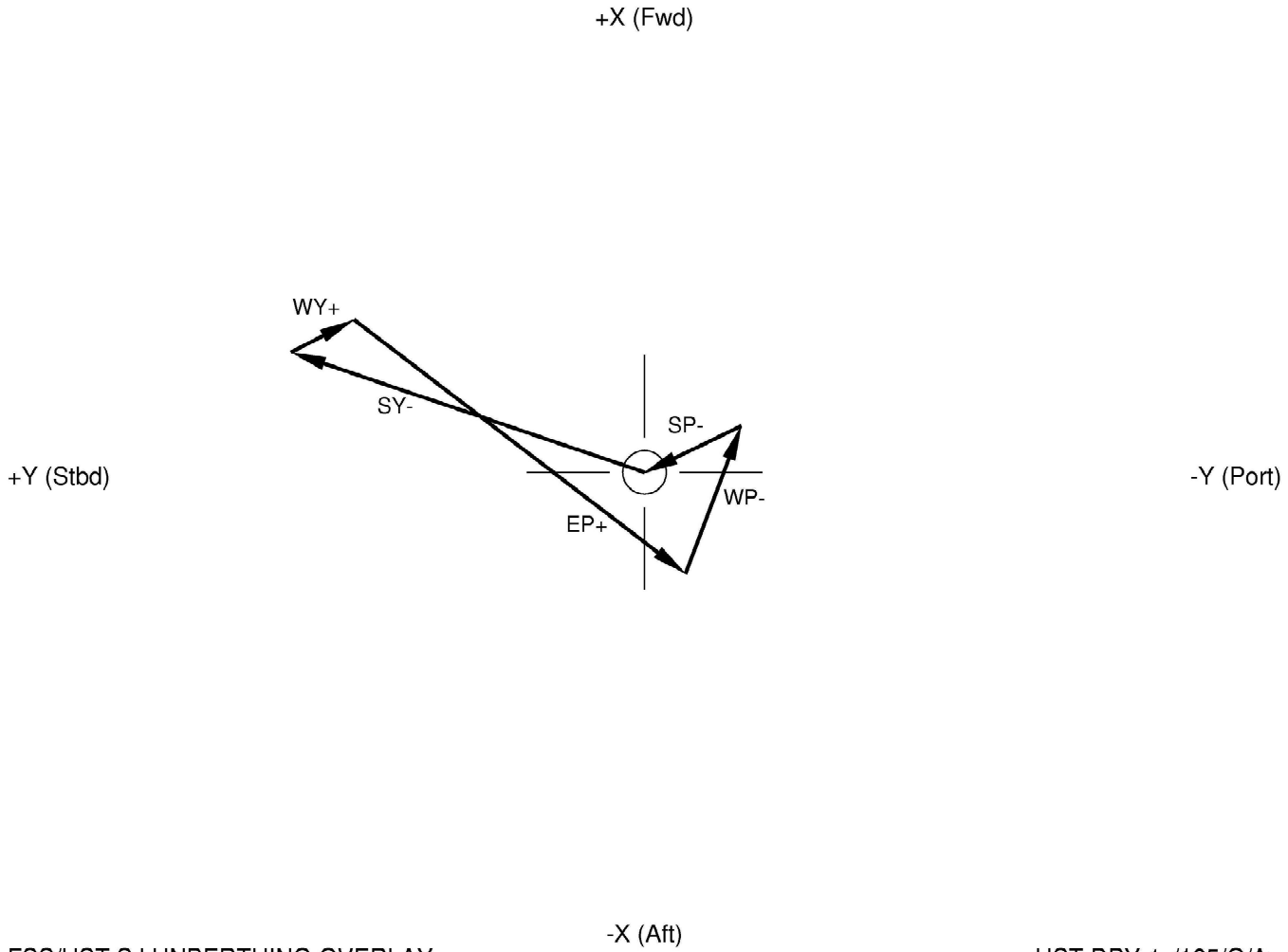
X	Y	Z	PITCH	YAW	ROLL	PL ID
-878	32	-853	0	305	0	0
-878	112	-853	0	305	0	3
-856	101	-595	0	305	0	4
SY	SP	EP	WP	WY	WR	
-53.4	+90.0	-68.5	-37.3	0.0	+8.5	

CUE CARD CONFIGURATION

CUE CARD
CONFIG

CUE CARD CONFIG

Fabricate as transparency



FSS/HST SJ UNBERTHING OVERLAY

HST DPY-1a/125/O/A

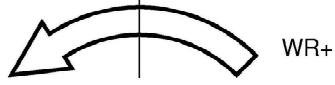
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CC 8-2

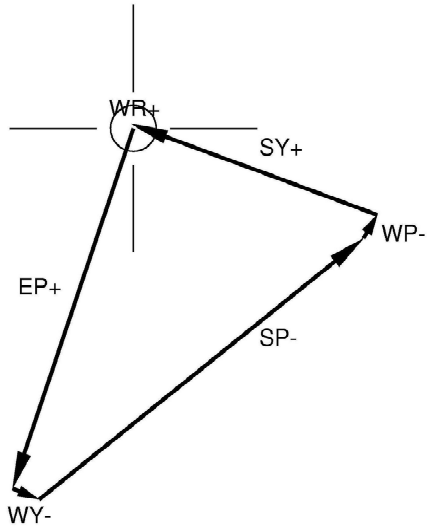
HST DPY/125/BAS

Fabricate as transparency

ZOOM 34.0 HFOV
FOCUS 5.0 FT
EYEPOINT APPROX 18 IN



WR+



BERTHED HST GRAPPLE OVERLAY

HST DPY-2a/125/O/A

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CC 8-3

HST DPY/125/BAS

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HST DEPLOY CHECKLIST

STS
125