

PDRS Operations Checklist

STS-103 Flight Supplement

**Mission Operations Directorate
EVA, Robotics, & Crew Systems
Operations Division**

**Final
August 20, 1999**

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas



PDRS OPS C/L, STS-103 FS**FINAL (Aug 20, 1999)****PCN-2 (Oct 11, 1999) Sheet 1 of 1**

List of Implemented Change Requests (482s):

PDRS-684A
PDRS-689
PDRS-691

Incorporate the following:

1. Replace FS iii & FS iv
2. Replace FS 4-13 & FS 4-14, FS 4-17 thru FS 4-26
After FS 4-26, add FS 4-27 & FS 4-28
3. Replace FS 6-5 & FS 6-6
4. Replace FS 8-1 & FS 8-2, FS 8-9 thru FS 8-16

Prepared by: _____
Book Manager

Approved by: _____
Lead, Robotics Systems Section Chief, Robotics Operations Branch

Encl: 28 pages

Verify this is the correct version for the pending operation (training, simulation or flight).
Electronic copies of FDF books are available. URL: <http://fltproc.jsc.nasa.gov/dfd>

File this PCN immediately behind the front cover as a permanent record

MISSION OPERATIONS DIRECTORATE

**PDRS OPERATIONS CHECKLIST
STS-103 FLIGHT SUPPLEMENT**

FINAL
August 20, 1999

PREPARED BY:

Leslie M. Hammond
Book Manager

APPROVED BY:

Angela R. Prince
Lead, Robotics Systems Section

Daniel D. Lindner
Chief, Robotics Operations Branch

This document is under the configuration control of the Crew Procedures Control Board (CPCB). All proposed changes must be submitted on JSC Form 482 to DO3/FDF Manager.

Additional distribution of this book for official use must be requested in writing to DO3/FDF Manager. The request must include justification and requester's name, organization, position, and phone number. Contractor requests are made through the NASA or DOD organization supported. Deletions, reduction in quantity, or change of address may be submitted to DO3/FDF Management Office, 281-244-1184.

| Incorporates the following: | | | | |
|-----------------------------|----------|----------|----------|----------|
| 482#: | PDRS-672 | PDRS-675 | PDRS-678 | PDRS-681 |
| | PDRS-673 | PDRS-676 | PDRS-679 | PDRS-682 |
| | PDRS-674 | PDRS-677 | PDRS-680 | PDRS-683 |

AREAS OF TECHNICAL RESPONSIBILITY

| | | |
|----------------|-----------------|--------------|
| Book Manager | DX22/L. Hammond | 281-483-0348 |
| RMS Procedures | DX22/L. Hammond | 281-483-0348 |
| RMS Analysis | DX24/D. Clark | 281-483-1103 |
| HST Pictorials | DO53/T. Arnold | 281-483-7431 |

PDRS OPERATIONS CHECKLIST
 STS-103 FLIGHT SUPPLEMENT

LIST OF EFFECTIVE PAGES

FINAL 08/20/99
 PCN-1 09/13/99
 PCN-2 10/11/99

| | | | |
|----------------|-------------|---------------|-----------|
| Sign Off | * 103/FIN | FS 4-20 | 103/FIN 2 |
| FS ii | * 103/FIN | FS 4-21 | 103/FIN 2 |
| FS iii | * 103/FIN 2 | FS 4-22 | 103/FIN 2 |
| FS iv | * 103/FIN 2 | FS 4-23 | 103/FIN 1 |
| FS v | 103/FIN | FS 4-24 | 103/FIN 2 |
| FS vi | 103/FIN | FS 4-25 | 103/FIN 2 |
| FS 1-1 | 103/FIN | FS 4-26 | 103/FIN 2 |
| FS 1-2 | 103/FIN | FS 4-27 | 103/FIN 2 |
| FS 1-3 | 103/FIN | FS 4-28 | 103/FIN 2 |
| FS 1-4 | 103/FIN | FS 5-1 | 103/FIN |
| FS 1-5 | 103/FIN | FS 5-2 | 103/FIN |
| FS 1-6 | 103/FIN | FS 5-3 | 103/FIN |
| FS 2-1 | 103/FIN | FS 5-4 | 103/FIN |
| FS 2-2 | 103/FIN | FS 5-5 | 103/FIN |
| FS 2-3 | 103/FIN | FS 5-6 | 103/FIN 1 |
| FS 2-4 | 103/FIN 1 | FS 5-7 | 103/FIN 1 |
| FS 2-5 | 103/FIN 1 | FS 5-8 | 103/FIN |
| FS 2-6 | 103/FIN 1 | FS 5-9 | 103/FIN |
| FS 3-1 | 103/FIN | FS 5-10 | 103/FIN |
| FS 3-2 | 103/FIN | FS 5-11 | 103/FIN 1 |
| FS 3-3 | 103/FIN | FS 5-12 | 103/FIN |
| FS 3-4 | 103/FIN | FS 5-13 | 103/FIN 1 |
| FS 3-5 | 103/FIN 1 | FS 5-14 | 103/FIN |
| FS 3-6 | 103/FIN 1 | FS 5-15 | 103/FIN 1 |
| FS 3-7 | 103/FIN 1 | FS 5-16 | 103/FIN |
| FS 3-8 | 103/FIN | FS 5-17 | 103/FIN 1 |
| FS 4-1 | 103/FIN | FS 5-18 | 103/FIN |
| FS 4-2 | 103/FIN | FS 5-19 | 103/FIN |
| FS 4-3 | 103/FIN | FS 5-20 | 103/FIN |
| FS 4-4 | 103/FIN | FS 6-1 | 103/FIN |
| FS 4-5 | 103/FIN | FS 6-2 | 103/FIN 1 |
| FS 4-6 | 103/FIN | FS 6-3 | 103/FIN 1 |
| FS 4-7 | 103/FIN 1 | FS 6-4 | 103/FIN 1 |
| FS 4-8 | 103/FIN | FS 6-5 | 103/FIN 2 |
| FS 4-9 | 103/FIN | FS 6-6 | 103/FIN |
| FS 4-10 | 103/FIN | FS 6-7 | 103/FIN |
| FS 4-11 | 103/FIN 1 | FS 6-8 | 103/FIN 1 |
| FS 4-12 | 103/FIN | FS 6-9 | 103/FIN 1 |
| FS 4-13 | 103/FIN 1 | FS 6-10 | 103/FIN |
| FS 4-14 | 103/FIN 2 | FS 6-11 | 103/FIN |
| FS 4-15 | 103/FIN 1 | FS 6-12 | 103/FIN |
| FS 4-16 | 103/FIN | FS 6-13 | 103/FIN |
| FS 4-17 | 103/FIN | FS 6-14 | 103/FIN |
| FS 4-18 | 103/FIN 2 | FS 7-1 | 103/FIN |
| FS 4-19 | 103/FIN 1 | FS 7-2 | 103/FIN 1 |

* - Omit from flight book

| | | | |
|---------------|-----------|------------------|-------------|
| FS 8-1 | 103/FIN 2 | FS 8-18 | 103/FIN 1 |
| FS 8-2 | 103/FIN 2 | FS 8-19 | 103/FIN |
| FS 8-3 | 103/FIN | FS 8-20 | 103/FIN 1 |
| FS 8-4 | 103/FIN | FS 8-21 | 103/FIN |
| FS 8-5 | 103/FIN 1 | FS 8-22 | 103/FIN 1 |
| FS 8-6 | 103/FIN | FS 8-23 | 103/FIN 1 |
| FS 8-7 | 103/FIN 1 | FS 8-24 | 103/FIN |
| FS 8-8 | 103/FIN | FS 9-1 | 103/FIN |
| FS 8-9 | 103/FIN 1 | FS 9-2 | 103/FIN 1 |
| FS 8-10 | 103/FIN 2 | FS 10-1 | 103/FIN |
| FS 8-11 | 103/FIN 1 | FS CC 10-2 | * 103/FIN |
| FS 8-12 | 103/FIN 2 | FS CC 10-3 | * 103/FIN |
| FS 8-13 | 103/FIN 2 | FS CC 10-4 | * 103/FIN |
| FS 8-14 | 103/FIN 1 | FS CC 10-5 | * 103/FIN 1 |
| FS 8-15 | 103/FIN 2 | FS CC 10-6 | * 103/FIN |
| FS 8-16 | 103/FIN | FS CC 10-7 | * 103/FIN |
| FS 8-17 | 103/FIN | FS CC 10-8 | * 103/FIN |

PDRS OPS CUE CARDS

| <u>TITLE</u> | <u>Ref. Page</u> | <u>Card No.</u> |
|---|------------------|------------------|
| HST BERTHING FSS CCTV OVERLAY | FS CC 10-2 | PDRS-7/103/O/A |
| BERTHED HST UNGRAPPLE WRIST CCTV OVERLAY | FS CC 10-3 | PDRS-8/103/O/A |
| BERTHED HST FSS CCTV OVERLAY | FS CC 10-4 | PDRS-9/103/O/A |
| CARGO BAY ARRANGEMENT (Front) | FS CC 10-5 | PDRS-10a/103/O/C |
| (Back) | FS CC 10-6 | PDRS-10b/103/O/A |
| HST FOOT RESTRAINT SOCKET LOCATIONS | | |
| (Front) | FS CC 10-7 | PDRS-11a/103/O/B |
| (Back) | FS CC 10-8 | PDRS-11b/103/O/A |

* - Omit from flight book

| <u>CONTENTS</u> | <u>PAGE</u> |
|--|-------------|
| <u>PHOTO SURVEYS</u> | FS 1-1 |
| SSE SURVEY | FS 1-2 |
| FSS UMBILICAL SURVEY | FS 1-3 |
| BERTHED HST SURVEY (-V3 FWD) | FS 1-4 |
| (-V2 FWD) | FS 1-5 |
| | |
| <u>NOMINAL HST RETRIEVAL OPS</u> | FS 2-1 |
| POISE FOR CAPTURE | FS 2-2 |
| HST CAPTURE | FS 2-3 |
| BERTH | FS 2-4 |
| | |
| <u>MFR OPS</u> | FS 3-1 |
| MFR PRE-GRAPPLE | FS 3-2 |
| GRAPPLE | FS 3-3 |
| RELEASE | FS 3-4 |
| SWAP | FS 3-5 |
| RMS/MFR EXTENDED PARK | FS 3-6 |
| MFR AIRLOCK INGRESS/EGRESS | FS 3-7 |
| | |
| <u>EVA OPS</u> | FS 4-1 |
| BSP | FS 4-2 |
| RSU CHANGEOUT | FS 4-3 |
| VIK INSTALLATION | FS 4-6 |
| COMPUTER CHANGEOUT | FS 4-7 |
| FGS-2 CHANGEOUT | FS 4-9 |
| SSAT-2 AND SSR-3 | FS 4-13 |
| NOBL REPAIR | FS 4-15 |
| SSRF MLI REPLACEMENT | FS 4-20 |
| +V2 AFT SHROUD DOOR LATCH REPAIR | FS 4-26 |
| CONTINGENCY POSNS | FS 4-27 |
| | |
| <u>OFF-NOMINAL HST RETRIEVAL OPS</u> | FS 5-1 |
| SJ POISE FOR CAPTURE | FS 5-2 |
| HST CAPTURE | FS 5-6 |
| BERTH | FS 5-7 |
| CONTINGENCY HST CAPTURE | FS 5-15 |
| -V3 HGA DEPLOYED CONTINGENCY BERTH | FS 5-17 |
| | |
| <u>OFF-NOMINAL HST DEPLOY OPS</u> | FS 6-1 |
| SJ HST GRAPPLE | FS 6-2 |
| UNBERTH | FS 6-8 |
| | |
| <u>HST EXTENDED PARK</u> | FS 7-1 |
| HST EXTENDED PARK | FS 7-2 |
| | |
| <u>REFERENCE DATA</u> | FS 8-1 |
| JOINT ANGLE VERSUS POR COORDINATES | FS 8-3 |
| POISE FOR CAPTURE | FS 8-3 |
| SJ POISE FOR CAPTURE | FS 8-3 |
| HST CAPTURE/RELEASE | FS 8-3 |
| EXTENDED PARK | FS 8-3 |
| FSS HOVER | FS 8-4 |
| BERTHED | FS 8-4 |
| BERTHED HST PRE-GRAPPLE | FS 8-4 |
| MFR PRE-GRAPPLE/RELEASE | FS 8-4 |
| AIRLOCK INGRESS/EGRESS | FS 8-5 |
| SWAP | FS 8-5 |
| RMS/MFR EXTENDED PARK | FS 8-5 |
| BAPS SUPPORT POST | FS 8-5 |

| | |
|--------------------------------------|---------|
| COPE – HEAD AFT | FS 8–6 |
| –V3 AFT SHROUD | FS 8–6 |
| RSU 1 CHANGEOUT (–V3 FWD) | FS 8–6 |
| HST BAY 3 (–V3 FWD) | FS 8–6 |
| 2 (–V3 FWD) | FS 8–7 |
| 1 (–V2 FWD) | FS 8–7 |
| LOPE | FS 8–7 |
| NPE – HEAD AFT | FS 8–7 |
| ORUC FWD FIXTURE | FS 8–8 |
| FSS HST PFR | FS 8–8 |
| FR11 PFR (+V3 FWD) | FS 8–8 |
| +V3 FGS WORKSITE | FS 8–8 |
| ORUC AFT FIXTURE | FS 8–9 |
| FSIPE | FS 8–9 |
| FGS–2R PREINSTALL | FS 8–9 |
| BAY 13 HST PFR | FS 8–9 |
| HST BAY C (+V3 FWD) | FS 8–10 |
| 5 – DOOR/SSR (+V3 FWD) | FS 8–10 |
| – SSAT (+V3 FWD) | FS 8–10 |
| COPE – HEAD PORT | FS 8–10 |
| NPE – HEAD PORT | FS 8–11 |
| HST BAY 6 (+V3 FWD) | FS 8–11 |
| 7 (+V3 FWD) | FS 8–11 |
| 8 (+V3 FWD) | FS 8–11 |
| 10 (+V3 FWD) | FS 8–12 |
| NPE – HEAD STARBOARD | FS 8–12 |
| HST BAY 9 (+V3 FWD) | FS 8–12 |
| SAFETY TETHER TRANSFER | FS 8–12 |
| ASIPE – SSRF | FS 8–13 |
| SSRF #5 | FS 8–13 |
| 6 | FS 8–13 |
| 7 | FS 8–13 |
| 1 | FS 8–14 |
| 2 | FS 8–14 |
| 3 | FS 8–14 |
| 4 | FS 8–14 |
| +V2 ASLR | FS 8–15 |
| ASIPE – HEAD STARBOARD | FS 8–15 |
| FORWARD | FS 8–15 |
| PL ID/POR DEFINITION – PL ID 1 | FS 8–16 |
| – PL ID 2 | FS 8–17 |
| – PL ID 3 | FS 8–18 |
| – PL ID 4 | FS 8–19 |
| – PL ID 5 | FS 8–20 |
| RMS AND PL DAP CONSTRAINTS | FS 8–21 |
| HST DAP CONFIGURATION TABLES | FS 8–22 |
| RMS GO/NO–GO CRITERIA | FS 8–23 |
| <u>OSVS</u> | FS 9–1 |
| OSVS POWERUP | FS 9–2 |
| POWERDOWN | FS 9–2 |
| <u>CUE CARD CONFIGURATION</u> | FS 10–1 |

PHOTO SURVEYS

| | |
|------------------------------------|--------|
| SSE SURVEY | FS 1-2 |
| FSS UMBILICAL SURVEY | FS 1-3 |
| BERTHED HST SURVEY (-V3 FWD) | FS 1-4 |
| (-V2 FWD) | FS 1-5 |

**PHOTO
SURVEYS**

SSE SURVEY

A7U CCTV – RMS WRIST, zoom out
 √VTR – REC

A6U DAP: as reqd

RATE – as reqd (VERN within 10 ft)
BRAKES – OFF (tb-OFF)
MODE – ORB UNL, ENTER

Mnvr to START posn:

| | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|
| X | Y | Z | PITCH | YAW | ROLL | PL ID |
| -1100 | -60 | -580 | 290 | 0 | 0 | 0 |
| SY | SP | EP | WP | WY | WR | |
| -15.1 | +58.9 | -67.1 | -66.2 | +23.0 | +27.8 | |

Perform PLB survey. When survey of FSS complete, mnvr PITCH = 270

PHOTO
SURVEYS

|

FSS UMBILICAL SURVEY

A7U CCTV – RMS WRIST, zoom out
 √VTR – REC

RATE – as reqd (VERN within 10 ft)
BRAKES – OFF (tb–OFF)
MODE – ORB UNL, ENTER

Mnvr to FSS UMBILICAL VIEWING posn:

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|-------|-------|
| -1039 | 0 | -612 | 303 | 0 | 0 | 0 |
| SY | SP | EP | WP | WY | WR | |
| -27.8 | +70.0 | -81.9 | -54.3 | +30.0 | +34.9 | |

Inspect FSS umbilicals

BRAKES – ON (tb–ON)

BERTHED HST SURVEY (-V3 FWD)

1. HST SURVEY
 A7U CCTV – RMS WRIST, zoom out
 √VTR – REC

RATE – as reqd (VERN within 10 ft)
 BRAKES – OFF (tb-OFF)
 MODE – ORB UNL, ENTER

Mnvr to START posn:

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|------|-------|
| -995 | -185 | -495 | 0 | 0 | 0 | 0 |
| SY | SP | EP | WP | WY | WR | |
| +12.1 | +84.0 | -124.5 | +40.5 | -12.1 | 0 | |

NOTE

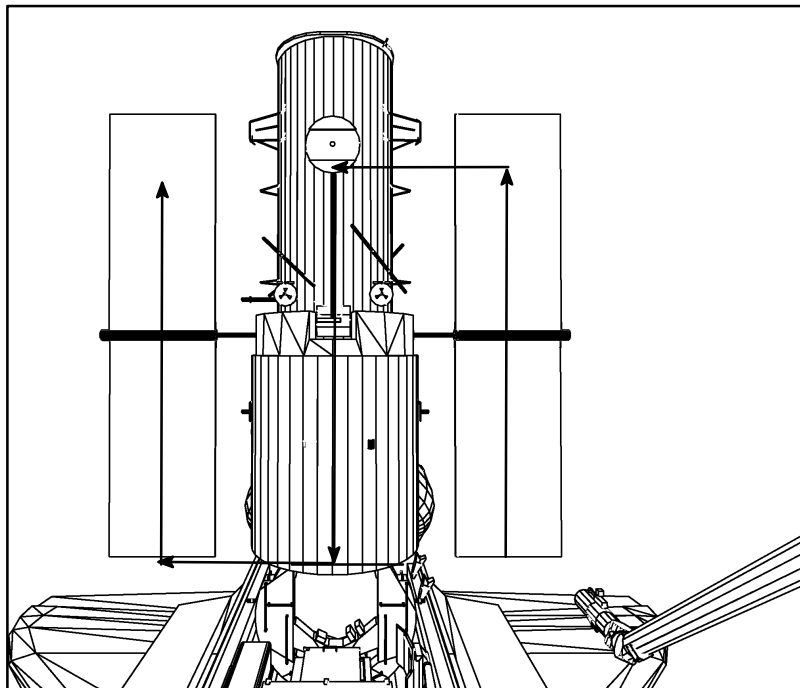
Record video of -V3 HGA penetration hole

Perform HST survey while maintaining X = -995. Adjust pitch as reqd to photo upper portion of HST

NOTE

Avoid singularity by maintaining EP < -7.6°
 Maintain Z < -506 when maneuvering over
 PLB to provide adequate clearance with ORUC

BRAKES – ON (tb-ON)



BERTHED HST SURVEY (-V2 FWD)

- 1. HST SURVEY
A7U CCTV – RMS WRIST, zoom out
√VTR – REC

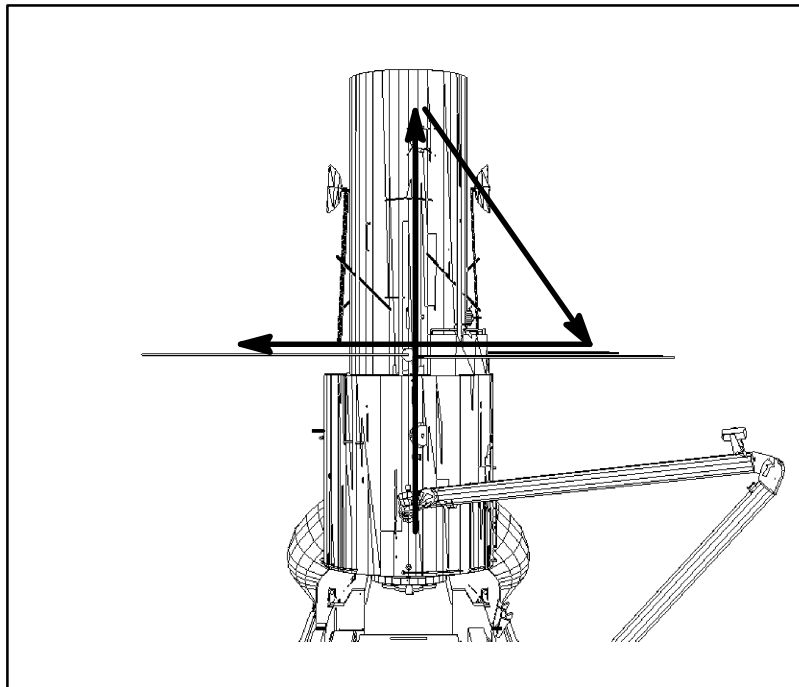
RATE – as reqd (VERN within 10 ft)
BRAKES – OFF (tb-OFF)
MODE – ORB UNL, ENTER

Mnvr to START posn:

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|--------|--------|-------|-------|-------|-------|
| -818 | 0 | -585 | 345 | 0 | 0 | 0 |
| SY | SP | EP | WP | WY | WR | |
| -61.2 | +113.3 | -138.7 | -6.7 | +62.6 | +28.4 | |

Perform HST survey while maintaining X = -818

BRAKES – ON (tb-ON)



NOTE

Avoid singularity by maintaining EP < 7.6°

This Page Intentionally Blank

NOMINAL HST RETRIEVAL OPS

| | |
|-------------------------|--------|
| POISE FOR CAPTURE | FS 2-2 |
| HST CAPTURE | FS 2-3 |
| BERTH | FS 2-4 |

**HST
RETRIEVE**

POISE FOR CAPTURE

SM 94 PDRS CONTROL

PL ID - ITEM 3 +1 EXEC
 INIT ID - ITEM 24 +1 EXEC

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

POISE FOR CAPTURE posn (OCAS valid):

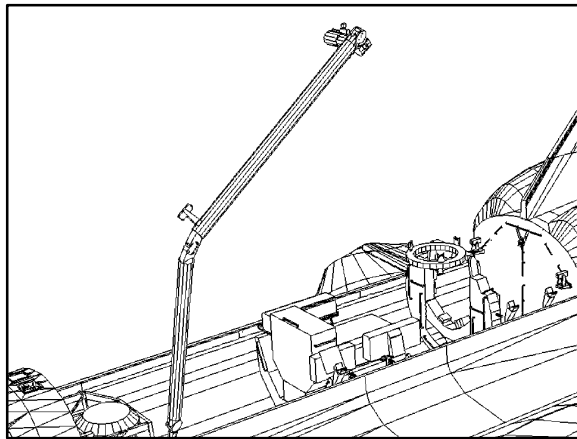
| | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|
| X | Y | Z | PITCH | YAW | ROLL | PL ID |
| -846 | -79 | -850 | 0 | 270 | 0 | 1 |
| SY | SP | EP | WP | WY | WR | |
| -12.7 | +92.7 | -54.4 | -96.4 | -66.9 | -35.9 | |

*

*Display singularity

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

HST
RETRIEVE



A7U

CCTV - install PDRS TARGET OVERLAY FOR CTVM
 - RMS WRIST, zoom to 34.0 HFOV
 focus 5.0 ft

Maintain eyepoint approx 18 in when using grapple overlay

* To mnvr from nominal POISE FOR CAPTURE posn to
 * SJ POISE FOR CAPTURE posn, perform following:

Mnvr to SJ POISE FOR CAPTURE posn:

| | | | | | | |
|---|-------|--------|-------|-------|-------|-------|
| | SY | SP | EP | WP | WY | WR |
| | -12.7 | +92.7 | -54.4 | -96.4 | -66.9 | -35.9 |
| √ | | | | -41.8 | 0 | +8.5 |
| 1 | | +101.0 | | | | |
| 2 | -53.4 | | -75.0 | | | |
| 3 | -53.4 | +101.0 | -75.0 | -41.8 | 0 | +8.5 |

* Go to SJ HST CAPTURE (OFF-NOM RETRIEVE)

HST CAPTURE

1. HST CAPTURE

Review GENERIC END EFFECTOR CUE CARD

SM 94 PDRS CONTROL

√ PL ID, ITEM 3: 1

√ INIT ID, ITEM 24: 1

RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – END EFF, ENTER

A6U

When grapple fixture in view and proximity ops stabilized,

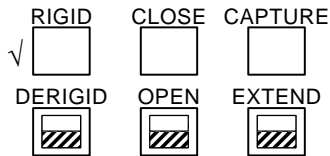
DAP: FREE

CAUTION
Monitor EE tb timing to
prevent EE motor burnout

EE MODE – AUTO

Mnvr to grapple envelope

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

BRAKES – ON (tb-ON)

Change DAP A,B to A9,B12

DAP: No LO Z

2. HST TO DRIFT MODE

NOTE

Step 2 needs to occur within 30 sec of HST snare

SM 210 HST SYS

√ RCVR LOCK 1(2) – *

√ TLM COUNT – incr

* If TLM COUNT not incr, MCC must verify following step *

PCS MODE DRIFT – ITEM 6 +9 1(92) EXEC

√ – DRFT

* If PCS MODE not DRFT, repeat step 2

*

* If PCS MODE still not DRFT, and other RCVR LOCK ‘*’,

* re-exec cmd using alternate command

*

* If still no joy, √ MCC before proceeding

√ SNPT DIS – YES

HST BERTH

1. MNVR TO FSS HOVER POSN

SM 94 PDRS CONTROL

- √ PL ID, ITEM 3: 1
- √ INIT ID, ITEM 24: 1

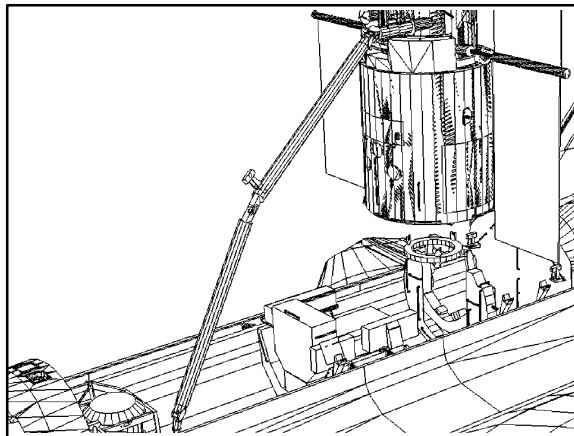
A6U

DAP: FREE

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

Mnvr to FSS HOVER posn (OCAS valid):

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|------|-------|
| -1149 | 0 | -816 | 0 | 0 | 0 | 1 |
| SY | SP | EP | WP | WY | WR | |
| -27.6 | +63.4 | -42.0 | -21.3 | +27.6 | +0.5 | |



BRAKES – ON (tb–ON)
 – OFF (tb–OFF)

If att maintenance reqd:

GNC 20 DAP CONFIG

CNTL ACCEL – ITEM 28 +3 EXEC
 – ITEM 48 +3 EXEC

DAP: A/AUTO/VERN(ALT)

2. FSS CCTV SETUP

CAUTION
 FSS CCTV limited to 2 hr continuous use

L12U

√ CCTV HTR PWR sw – ON (tb–gray)

SM 211 SSE CONTROL

CCTV ENA ON – ITEM 5 EXEC (*)
 PWR ON – ITEM 7 EXEC (*)

- * If CCTV ENA ON – (no *), retry ITEM 5: *
- * | If no joy, continue *
- * If CCTV PWR ON – (no *), retry ITEM 7: *
- * | If no joy, attempt to display camr image *
- * | on monitor. If no image, √MCC *

A7U VID OUT pb – MON 1(2)
 IN pb – PL 1
 ALC AVG pb – Press
 GAMMA NORM pb – Press

3. CONFIG FSS FOR HST BERTH
 Perform LATCH AND MATE HST, step 1 (PL OPS, RETRIEVAL OPS)

A7U 4. MNVR TO FSS BERTH POSN
 CCTV – config for berth

SM 94 PDRS CONTROL

√ PL ID, ITEM 3: 1(2)
 √ INIT ID, ITEM 24: 1(2)

A6U DAP: FREE

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

Mnvr to FSS BERTHED posn:

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|------|-------|
| -1149 | 0 | -755 | 0 | 0 | 0 | 1 |
| -1127 | 12 | -497 | 0 | 0 | 0 | 2 |
| SY | SP | EP | WP | WY | WR | |
| -24.9 | +70.3 | -63.8 | -6.5 | +24.9 | +0.5 | |

If using REL:

SM 94 PDRS CONTROL

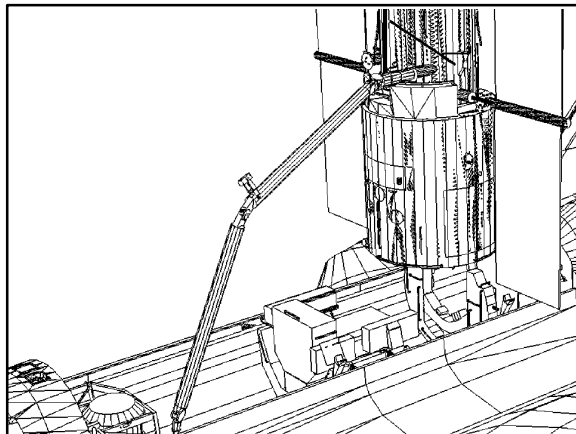
Enter target position and attitude (ITEMS 18–23)
 CMD CHK – ITEM 25 EXEC (GOOD)
 POR DISPLAY – ITEM 30 EXEC (REL)

When mnvr complete,

SM 94 PDRS CONTROL

POR DISPLAY – ITEM 30 EXEC (ORB)

BRAKES – ON (tb–ON)



5. LATCH HST TO FSS
Perform LATCH AND MATE HST, steps 2 thru 9 (PL OPS, RETRIEVAL OPS)

6. UNGRAPPLE HST

To relieve strain:

BRAKES – OFF (tb–OFF)
MODE – TEST, ENTER
Wait 5 sec, then
BRAKES – ON (tb–ON)

SM 94 PDRS CONTROL

PL ID – ITEM 3 +0 EXEC
INIT ID – ITEM 24 +0 EXEC

RATE – as reqd
BRAKES – OFF (tb–OFF)
MODE – END EFF, ENTER

CAUTION
Monitor EE tb timing to
prevent EE motor burnout

EE MODE – AUTO
RELEASE sw – REL (mom)
When OPEN tb – gray, mnvr arm clear of GF

| | | | |
|-------------------------------------|--------------------------|--------------------------|--|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <u>CRITICAL TIMES (28 sec total):</u> DERIGID tb – gray, 5 sec max, then OPEN tb – gray, 3 sec max, then EXTEND tb – gray, 20 sec max |
| RIGID | CLOSE | CAPTURE | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| DERIGID | OPEN | EXTEND | |

EE MODE – OFF
BRAKES – ON (tb–ON)
JOINT – CRIT TEMP

Config DAP A to A10 and reference FLIGHT PLAN for next mnvr & DAP
CONFIG

7. FSS CCTV POWEROFF

SM 211 SSE CONTROL

CCTV PWR OFF – ITEM 8 EXEC (*) (wait 15 sec)
ENA OFF – ITEM 6 EXEC (*)

MFR OPS

| | |
|----------------------------------|--------|
| MFR PRE-GRAPPLE | FS 3-2 |
| GRAPPLE | FS 3-3 |
| RELEASE | FS 3-4 |
| SWAP | FS 3-5 |
| RMS/MFR EXTENDED PARK | FS 3-6 |
| MFR AIRLOCK INGRESS/EGRESS | FS 3-7 |

MFR OPS

MFR PRE-GRAPPLE

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 0

√INIT ID, ITEM 24: 0

2. MNVR TO MFR PRE-GRAPPLE POSN

RATE – as reqd (VERN within 10 ft)

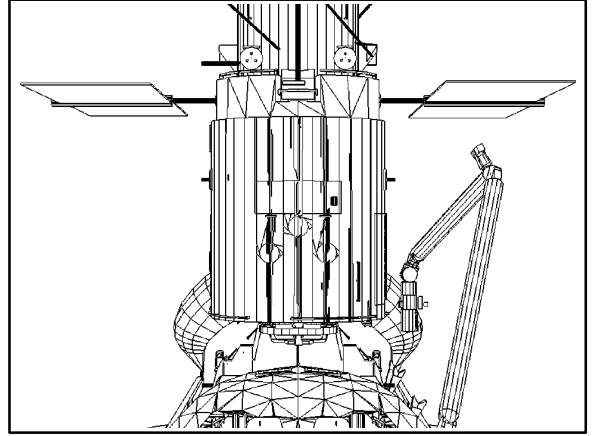
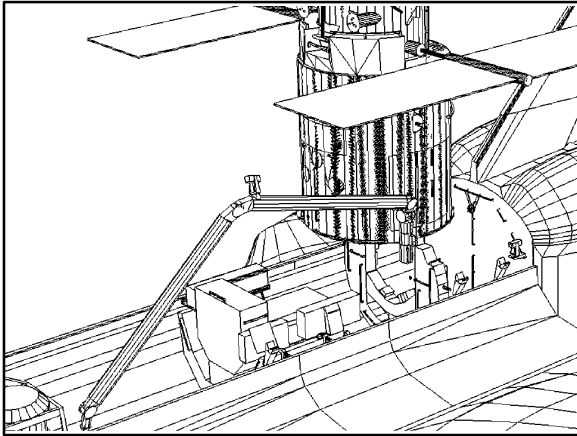
BRAKES – OFF (tb-OFF)

MODE – ORB UNL, ENTER

Mnvr to MFR PRE-GRAPPLE posn:

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1100 | -110 | -486 | 270 | 0 | 91 | 0 |
| SY | SP | EP | WP | WY | WR | |
| -4.2 | +52.5 | -71.6 | -72.4 | +19.4 | +114.9 | |

BRAKES – ON (tb-ON)



MFR OPS

MFR GRAPPLE

A6U DAP: VERN(FREE)

EV manage tethers and unlatch MFR from APC

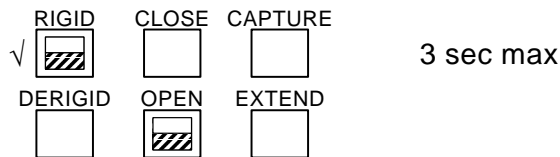
When MFR positioned for grapple:

On EV GO for MFR capture:

| |
|---|
| CAUTION Monitor EE tb timing to prevent EE motor burnout |
|---|

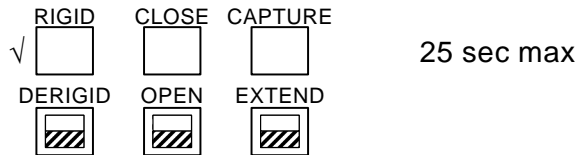
EE MODE – MAN

EE CAPTURE sw – depress (hold until CLOSE tb-gray)



On EV GO for rigidization:

EE MAN CONTR RIGID (hold until RIGID tb-gray)



EE MODE – OFF

DAP: as reqd

| |
|---------------------------|
| SM 94 PDRS CONTROL |
|---------------------------|

PL ID – ITEM 3 +4(3) EXEC

INIT ID – ITEM 24 +4(3) EXEC

EV attach MFR Tether to RMS EE handrail

MFR RELEASE

RATE – VERN (RATE MIN tb–ON)
 BRAKES – OFF (tb–OFF)
 MODE – ORB UNL, ENTER

Mnvr to MFR PRE–RELEASE posn:

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1101 | -50 | -464 | 270 | 0 | 270 | 3 |
| -1100 | -102 | -464 | 270 | 0 | 270 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -4.2 | +52.5 | -71.6 | -72.4 | +19.4 | +114.9 | |

A6U

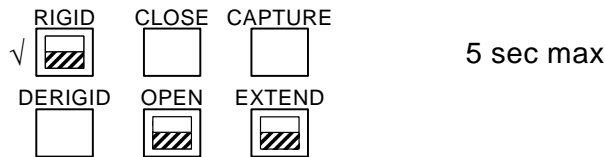
DAP: VERN(FREE)

Per EV cmds, mnvr to EV crew for MFR Ungrapple

EV remove MFR Tether from RMS EE handrail

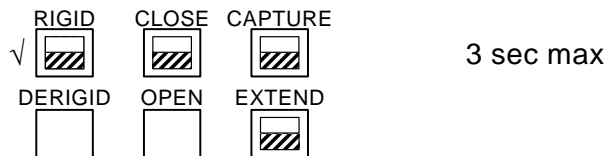
On EV GO for MFR derigidization:

EE MODE – MAN
 MAN CONTR – DERIGID (hold until DERIG tb–gray)



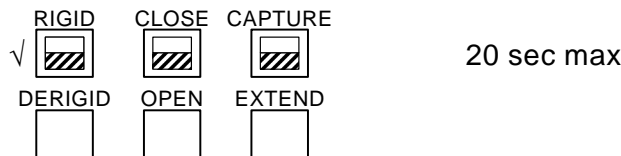
On EV GO for release:

EE RELEASE sw – depress (hold until OPEN tb–gray)



After EV has removed MFR:

EE MAN CONTR – DERIGID (hold until EXTEND tb–gray)



EE MODE – OFF

SM 94 PDRS CONTROL

PL ID – ITEM 3 +0 EXEC
 INIT ID – ITEM 24 +0 EXEC

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

DAP: as reqd

EV manage tethers and latch MFR to APC

MFR SWAP

RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – as desired

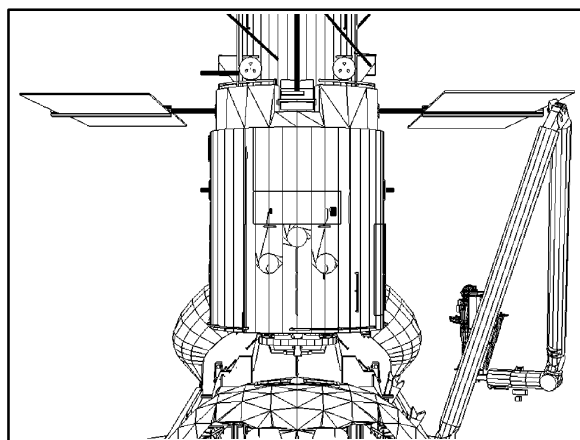
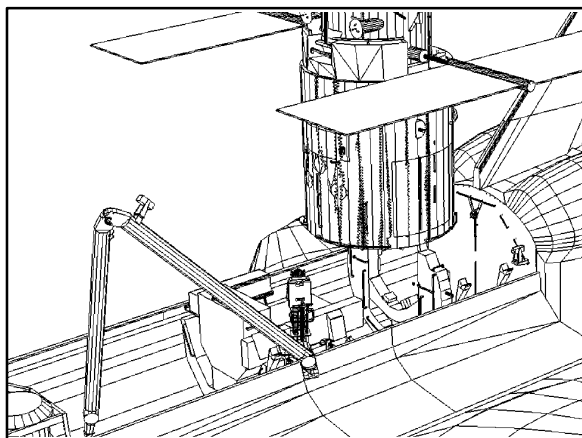
Mnvr to MFR SWAP:

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|--------|-------|
| -914 | -149 | -529 | 0 | 300 | 0 | 3 |
| -914 | -149 | -477 | 0 | 300 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| +25.7 | +92.4 | -132.7 | -31.2 | -72.3 | -240.6 | |

BRAKES – ON (tb-ON)

MODE – not DIRECT

JOINT – CRIT TEMP



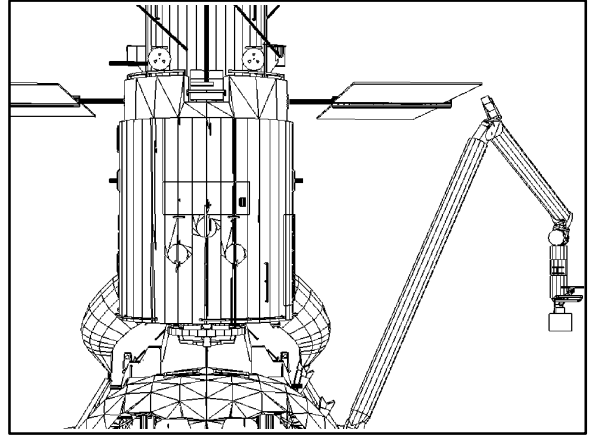
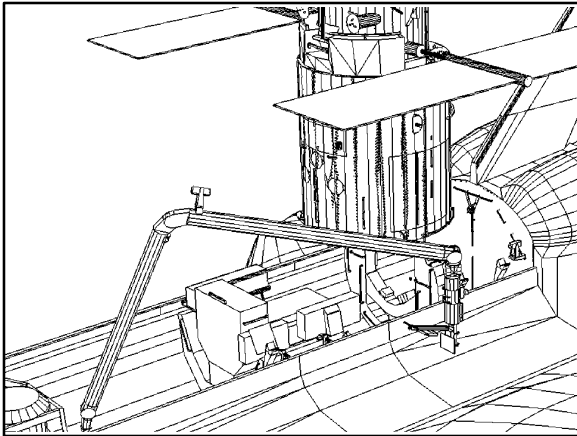
RMS/MFR EXTENDED PARK

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

Mnvr to RMS/MFR EXT PARK:

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|------|-------|
| -975 | -325 | -525 | 270 | 0 | 1 | 0 |
| -915 | -325 | -503 | 270 | 0 | 180 | 3 |
| -967 | -325 | -503 | 270 | 0 | 180 | 4 |
| SY | SP | EP | WP | WY | WR | |
| +28.3 | +78.5 | -85.2 | -73.8 | +17.1 | -9.7 | |

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



MFR AIRLOCK INGRESS/EGRESS

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 4

√INIT ID, ITEM 24: 4

RATE - as reqd (VERN within 10 ft)

BRAKES - OFF (tb-OFF)

MODE - ORB LD, ENTER

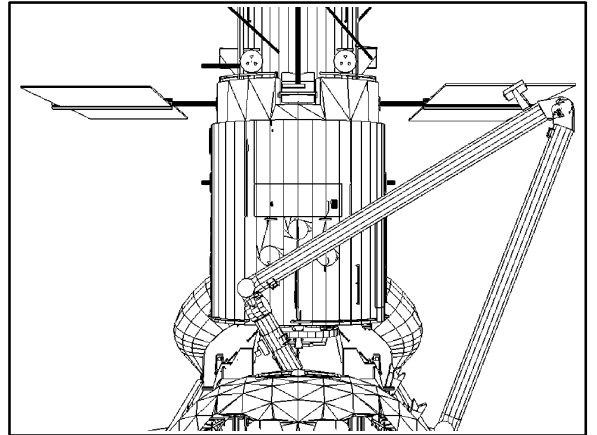
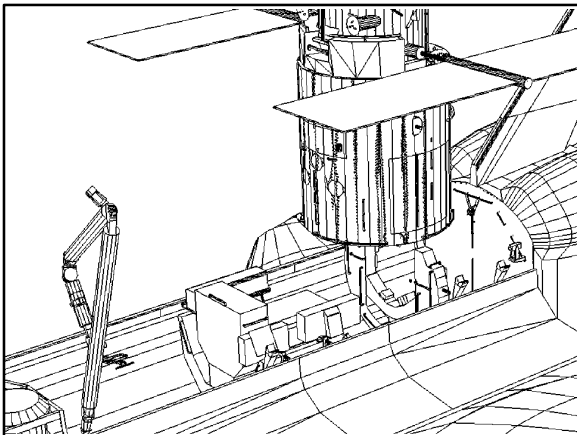
Mnvr to Airlock Pre-Ingress/Egress posn:

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|------|-------|
| -747 | 3 | -482 | 270 | 30 | 271 | 0 |
| -747 | -60 | -493 | 270 | 30 | 90 | 3 |
| -747 | -15 | -467 | 270 | 30 | 90 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -67.1 | +91.8 | -140.4 | -88.6 | +17.5 | +4.7 | |

BRAKES - ON (tb-ON)

MODE - not DIRECT

JOINT - CRIT TEMP



This Page Intentionally Blank

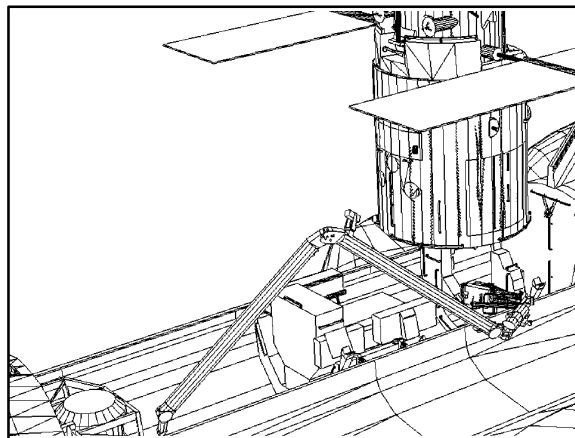
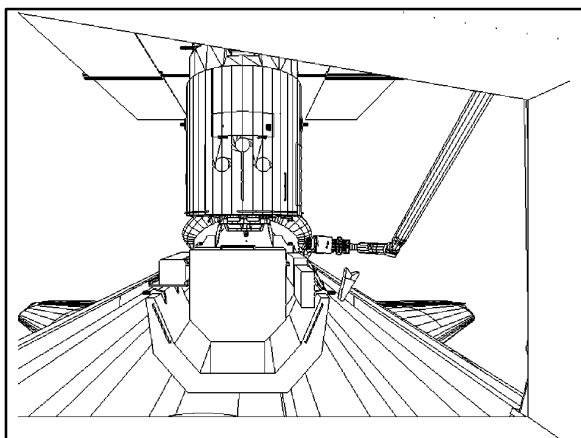
EVA OPS

| | |
|--|---------|
| BSP | FS 4-2 |
| RSU CHANGEOUT | FS 4-3 |
| VIK INSTALLATION | FS 4-6 |
| COMPUTER CHANGEOUT | FS 4-7 |
| FGS-2 CHANGEOUT | FS 4-9 |
| SSAT-2 AND SSR-3 | FS 4-13 |
| NOBL REPAIR | FS 4-15 |
| SSRF MLI REPLACEMENT | FS 4-20 |
| +V2 AFT SHROUD DOOR LATCH REPAIR | FS 4-26 |
| CONTINGENCY POSNS | FS 4-27 |

BSP

BAPS Support Post

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1094 | -107 | -455 | 0 | 330 | 275 | 3 |
| -1120 | -152 | -450 | 0 | 330 | 275 | 4 |
| SY | SP | EP | WP | WY | WR | |
| +12.4 | +55.9 | -93.8 | +25.2 | -40.3 | -270.3 | |



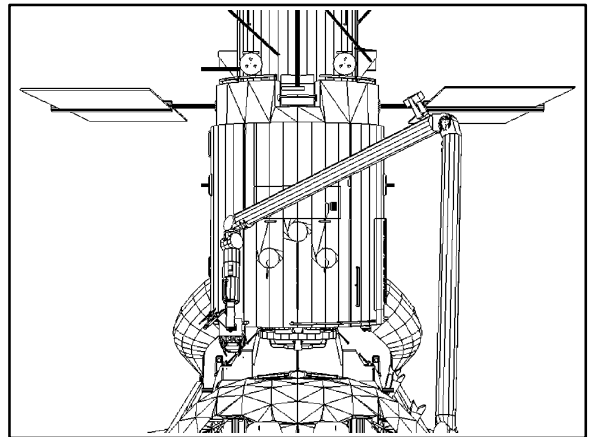
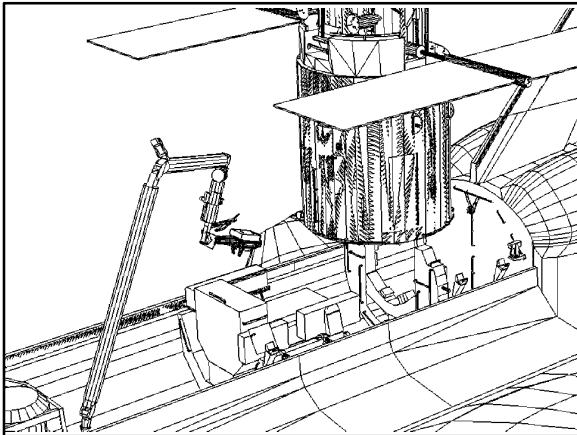
EVA OPS

RSU CHANGEOUT

Configuration assumptions: FSS Rotation: 180°, -V3 fwd
FSS Pivot: 90°, +V1 along -Z
Solar Arrays: Deployed, 0 deg

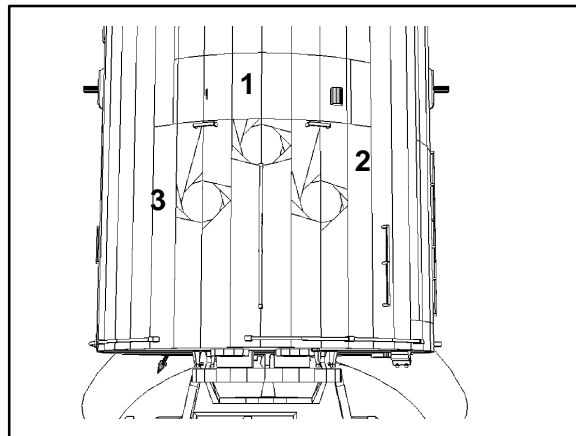
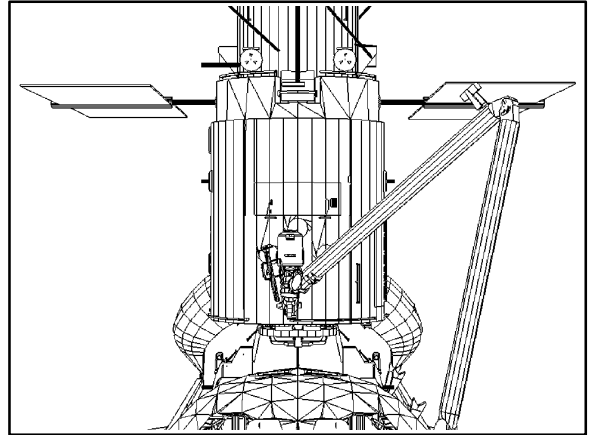
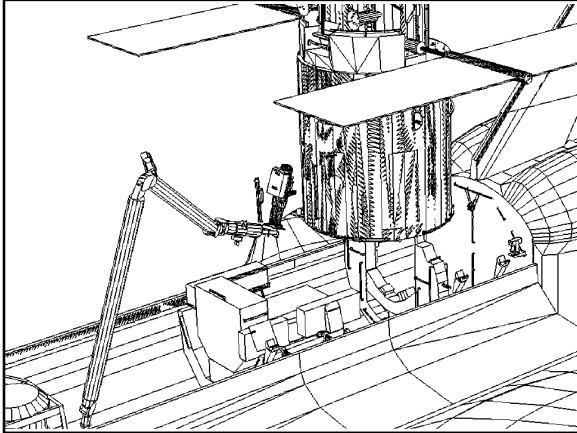
COPE – Head Aft

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|------|--------|-------|
| -997 | 60 | -487 | 250 | 0 | 0 | 3 |
| -948 | 60 | -504 | 250 | 0 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -35.3 | +63.6 | -93.8 | -87.2 | +3.3 | -120.5 | |



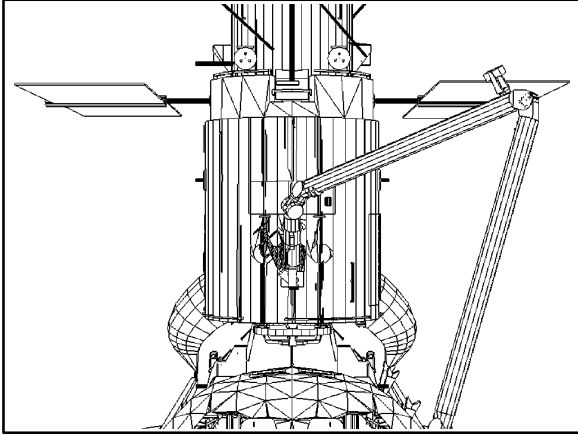
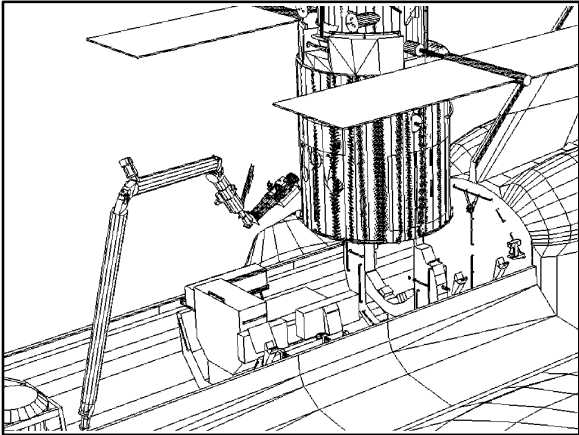
-V3 Aft Shroud

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|--------|-------|
| -1020 | 7 | -568 | 340 | 0 | 0 | 3 |
| -1002 | 7 | -519 | 340 | 0 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -29.5 | +77.3 | -120.7 | +20.5 | +34.2 | -167.3 | |



RSU 1 Changeout:

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|--------|-------|
| -1012 | 0 | -570 | 300 | 0 | 0 | 3 |
| -967 | 0 | -544 | 300 | 0 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -32.8 | +84.7 | -110.4 | -46.4 | +30.9 | -137.4 | |

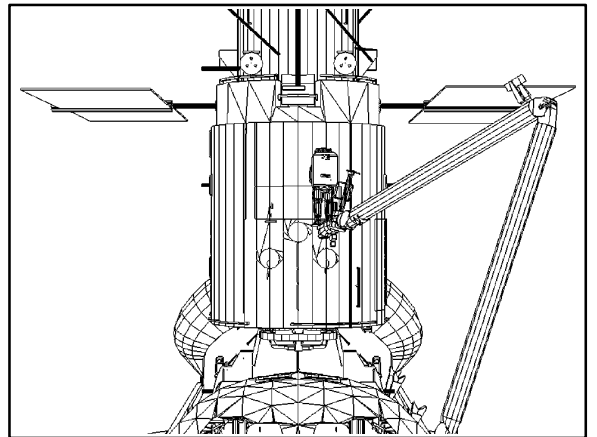
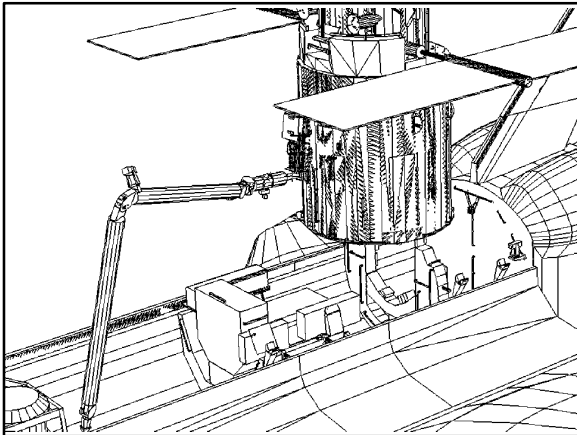


VIK INSTALLATION

Configuration assumptions: FSS Rotation: 180°, -V3 fwd
 FSS Pivot: 90°, +V1 along -Z
 Solar Arrays: Deployed, 0 deg

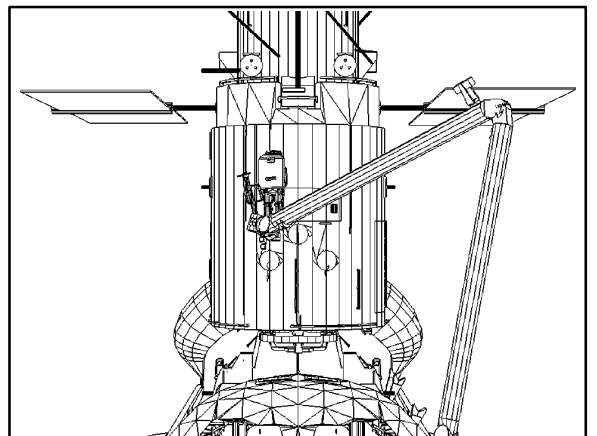
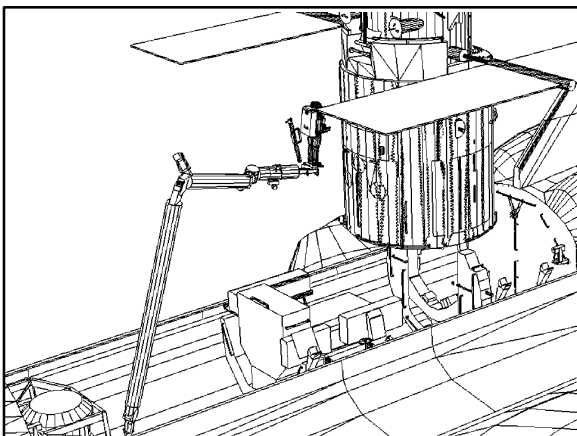
HST Bay 3

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|--------|-------|
| -1021 | -23 | -649 | 352 | 350 | 0 | 3 |
| -1014 | -23 | -598 | 352 | 350 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -24.8 | +87.4 | -115.2 | +16.6 | +17.6 | -174.7 | |



HST Bay 2

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|--------|-------|
| -1021 | 23 | -648 | 352 | 10 | 0 | 3 |
| -1014 | 23 | -597 | 352 | 10 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -36.1 | +76.9 | -109.2 | +26.2 | +48.1 | -176.0 | |

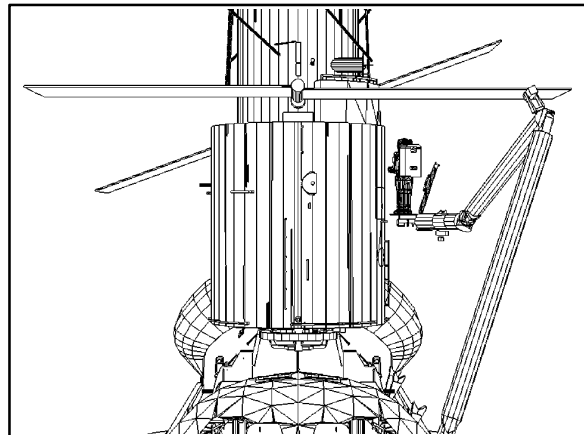
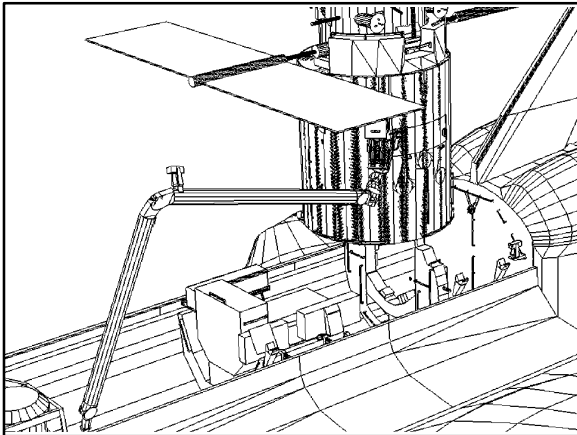


COMPUTER CHANGEOUT

Configuration assumptions: FSS Rotation: 90°, -V2 fwd
 FSS Pivot: 90°, +V1 along -Z
 Solar Arrays: Deployed, +V2: -20°, -V2: 0°

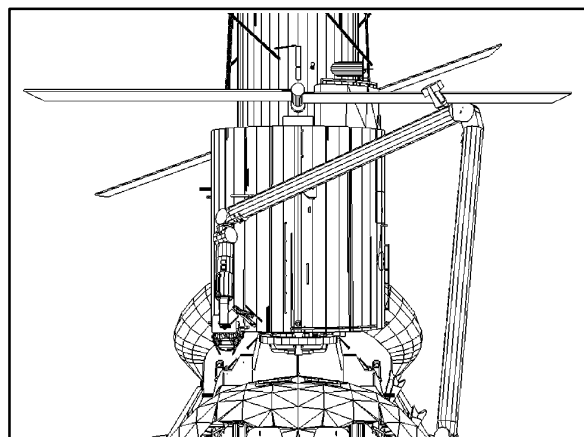
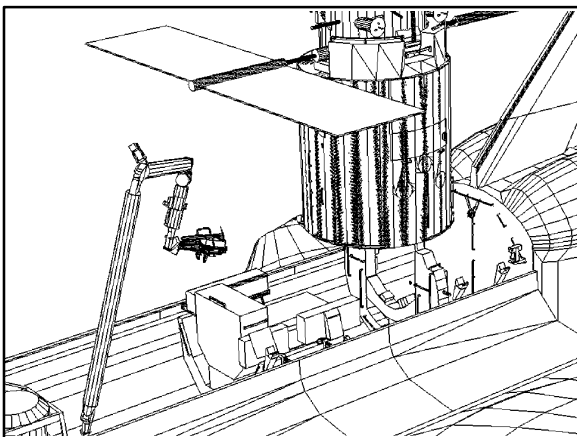
HST Bay 1

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1068 | -102 | -660 | 0 | 315 | 0 | 3 |
| -1068 | -102 | -608 | 0 | 315 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -1.0 | +80.0 | -97.5 | -0.7 | -40.9 | -186.2 | |



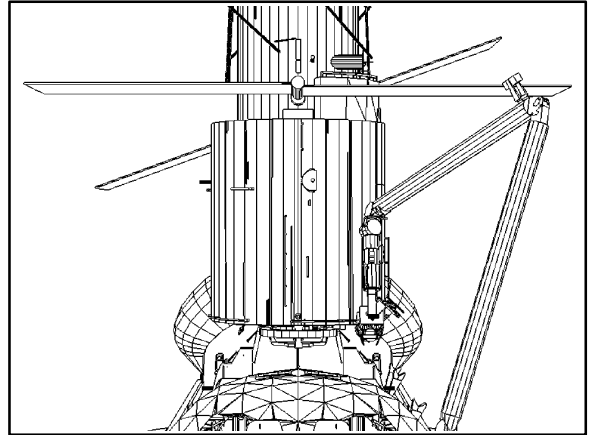
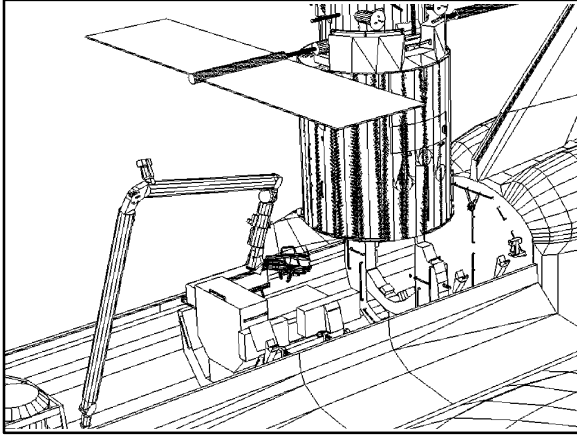
LOPE

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|------|--------|-------|
| -950 | 64 | -496 | 250 | 0 | 0 | 3 |
| -901 | 64 | -514 | 250 | 0 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -41.2 | +70.9 | -102.4 | -86.2 | +0.6 | -115.2 | |



NPE – Head Aft

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|--------|-------|
| -974 | -65 | -496 | 250 | 0 | 0 | 3 |
| -925 | -65 | -514 | 250 | 0 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -18.6 | +84.1 | -108.7 | -91.0 | +10.9 | -135.5 | |

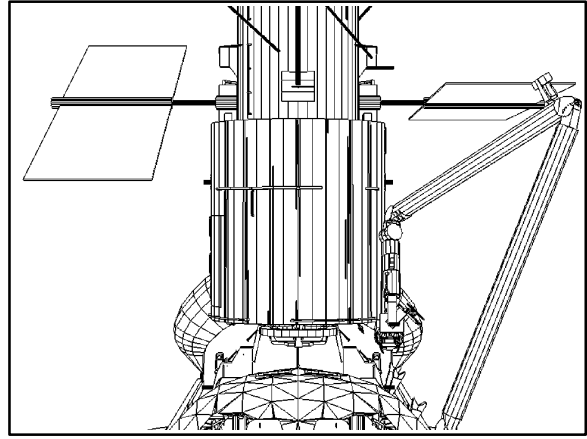
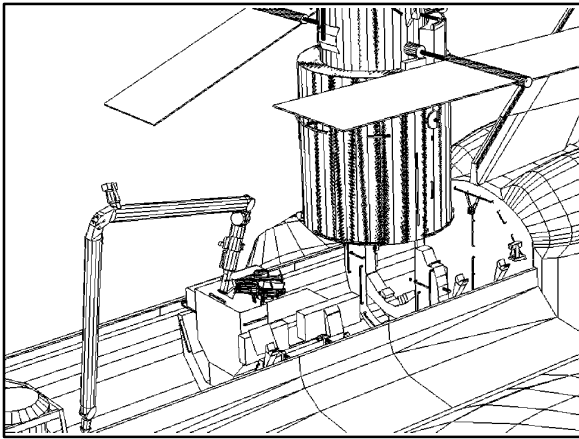


FGS-2 CHANGEOUT

Configuration assumptions: FSS Rotation: 360°, +V3 fwd
 FSS Pivot: 90°, +V1 along -Z
 Solar Arrays: Deployed, +V2: -20°, -V2: 0°

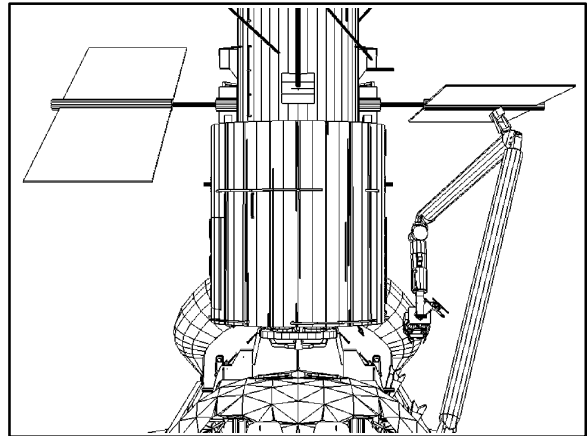
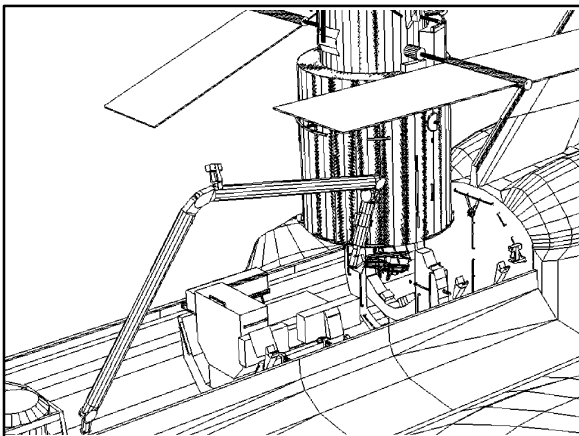
ORUC Fwd Fixture

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|--------|-------|
| -926 | -80 | -492 | 250 | 0 | 0 | 3 |
| -877 | -80 | -510 | 250 | 0 | 0 | 4 |
| -920 | -80 | -475 | 250 | 0 | 0 | 5 |
| SY | SP | EP | WP | WY | WR | |
| -18.7 | +95.5 | -120.2 | -90.9 | +10.8 | -135.3 | |



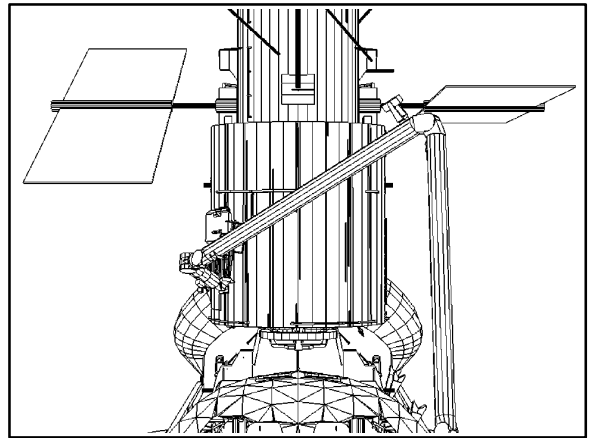
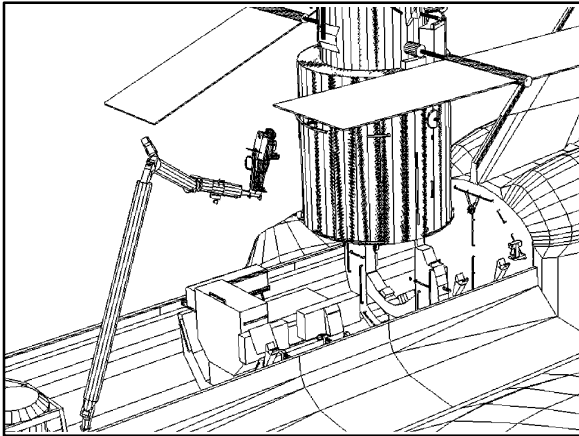
FSS HST PFR

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1075 | -115 | -492 | 250 | 0 | 0 | 3 |
| -1026 | -115 | -509 | 250 | 0 | 0 | 4 |
| -1069 | -115 | -475 | 250 | 0 | 0 | 5 |
| SY | SP | EP | WP | WY | WR | |
| -6.3 | +66.0 | -83.0 | -95.9 | +15.9 | -146.9 | |



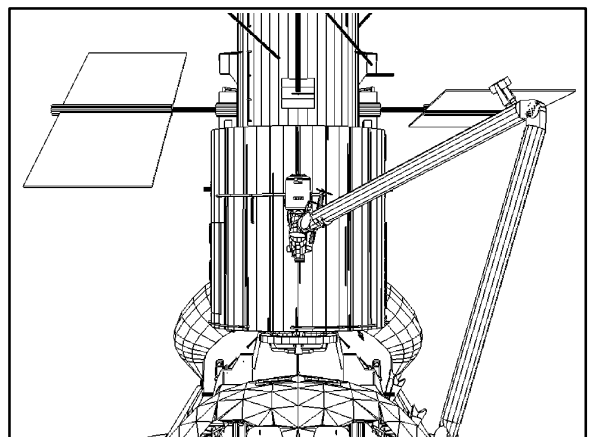
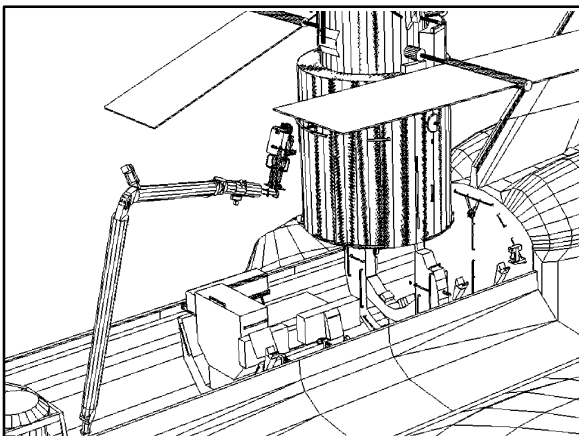
FR11 PFR

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1046 | 72 | -593 | 340 | 20 | 0 | 3 |
| -1028 | 72 | -544 | 340 | 20 | 0 | 4 |
| -1062 | 66 | -587 | 340 | 20 | 0 | 5 |
| SY | SP | EP | WP | WY | WR | |
| -40.2 | +61.4 | -99.9 | +12.9 | +64.0 | -162.2 | |



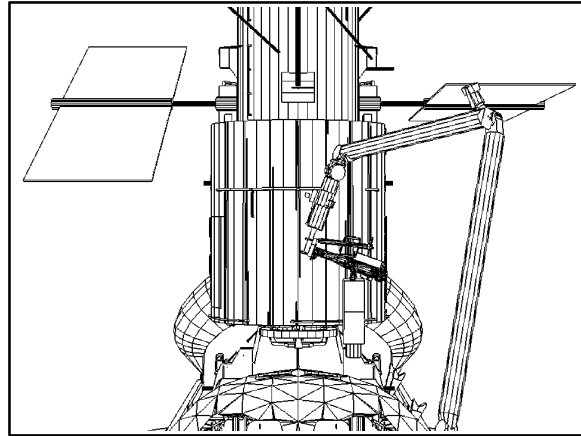
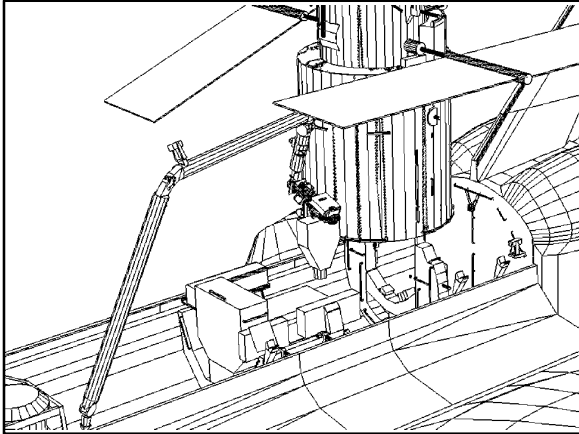
+V3 FGS Worksite

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|--------|-------|
| -1018 | 0 | -628 | 340 | 0 | 0 | 3 |
| -1000 | 0 | -579 | 340 | 0 | 0 | 4 |
| -1035 | 0 | -622 | 340 | 0 | 0 | 5 |
| SY | SP | EP | WP | WY | WR | |
| -32.0 | +84.9 | -114.9 | +6.4 | +36.5 | -166.0 | |



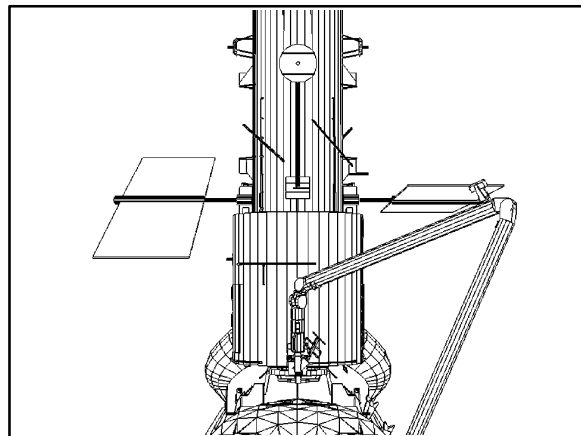
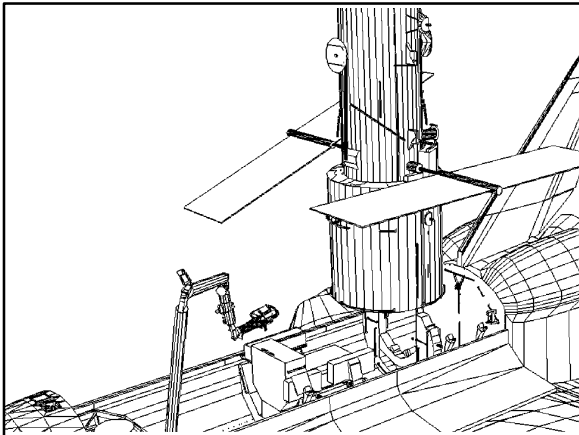
ORUC Aft Fixture

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|------|-------|-------|
| -1021 | -64 | -551 | 270 | 340 | 90 | 3 |
| -1020 | -16 | -568 | 270 | 340 | 90 | 4 |
| -1021 | -58 | -533 | 270 | 340 | 90 | 5 |
| SY | SP | EP | WP | WY | WR | |
| -21.7 | +69.5 | -81.4 | -77.9 | -0.5 | -48.7 | |



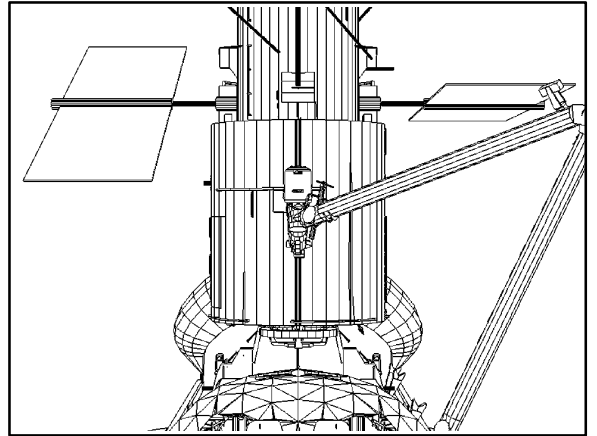
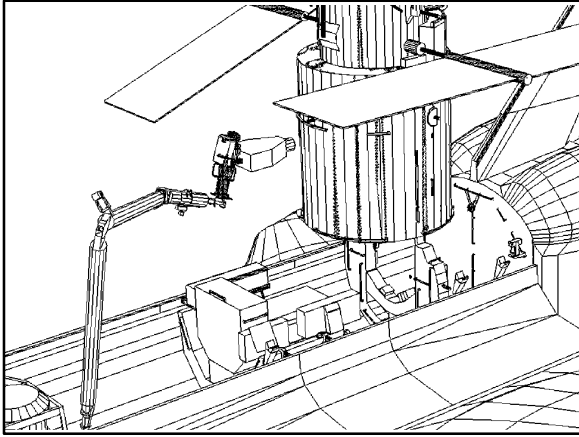
ORUC FSIPE

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|--------|-------|
| -915 | 0 | -517 | 280 | 0 | 0 | 3 |
| -864 | 0 | -508 | 280 | 0 | 0 | 4 |
| -918 | 0 | -499 | 280 | 0 | 0 | 5 |
| SY | SP | EP | WP | WY | WR | |
| -42.2 | +95.8 | -126.8 | -64.7 | +21.1 | -118.4 | |



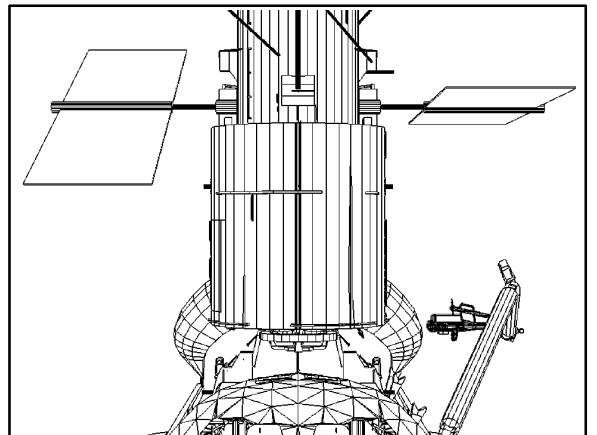
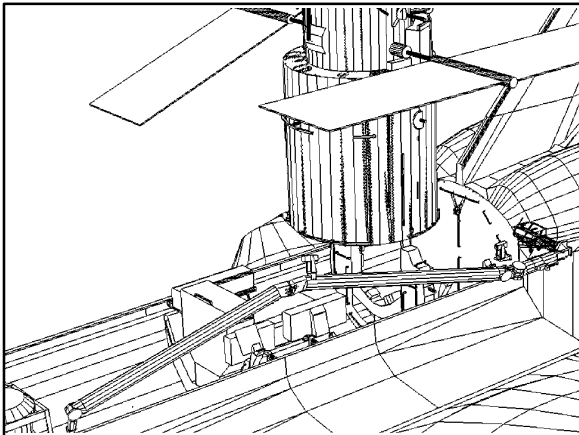
FGS-2R Pre-Install

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|--------|-------|
| -945 | 0 | -628 | 340 | 0 | 0 | 3 |
| -927 | 0 | -579 | 340 | 0 | 0 | 4 |
| -962 | 0 | -622 | 340 | 0 | 0 | 5 |
| SY | SP | EP | WP | WY | WR | |
| -41.7 | +98.3 | -128.0 | +2.4 | +45.2 | -160.5 | |



Bay 13 HST PFR

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1267 | -160 | -485 | 0 | 0 | 270 | 3 |
| -1267 | -212 | -485 | 0 | 0 | 270 | 4 |
| SY | SP | EP | WP | WY | WR | |
| +10.3 | +28.1 | -37.1 | +9.0 | -10.3 | -269.5 | |

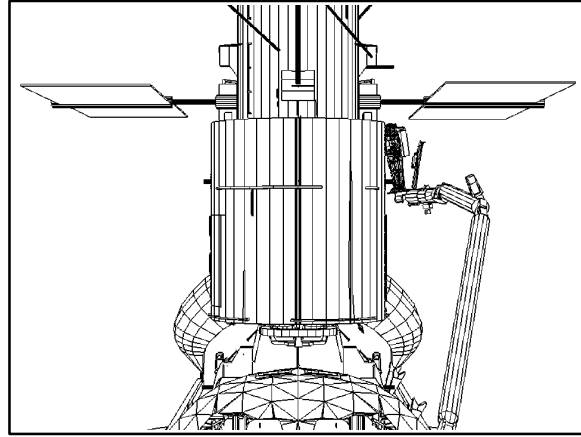
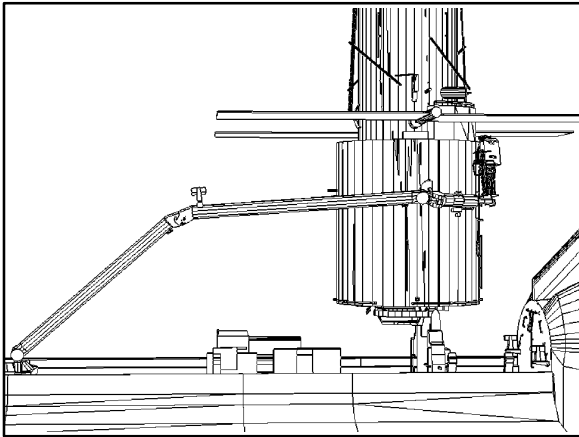


SSAT-2 AND SSR-3

Configuration assumptions: FSS Rotation: 0°, +V3 fwd
 FSS Pivot: 90°, +V1 along -Z
 Solar Arrays: Deployed, 0°

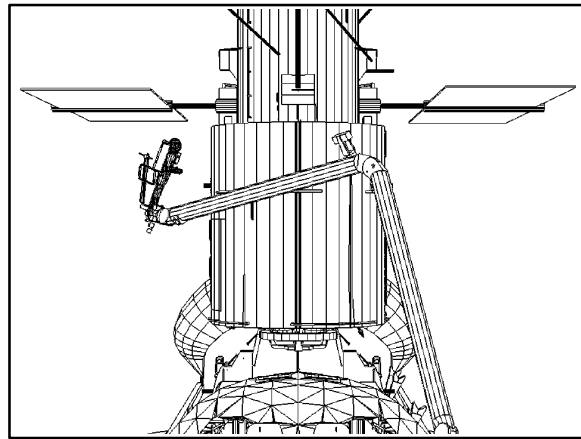
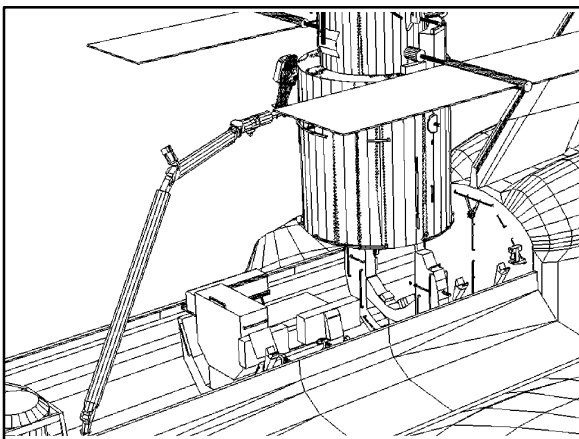
HST Bay C

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1228 | -99 | -680 | 358 | 330 | 349 | 3 |
| -1231 | -108 | -629 | 358 | 330 | 349 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -2.6 | +42.0 | -38.7 | -15.6 | -24.9 | -192.3 | |



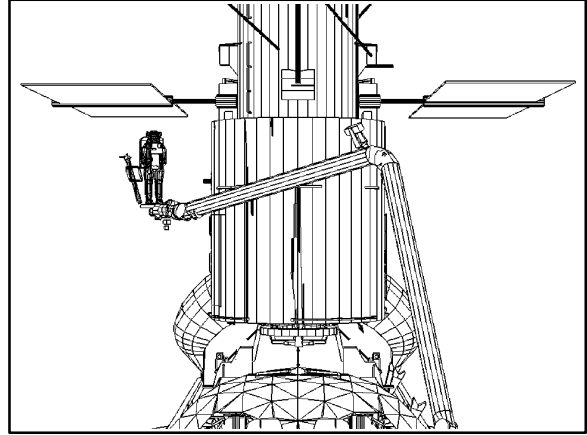
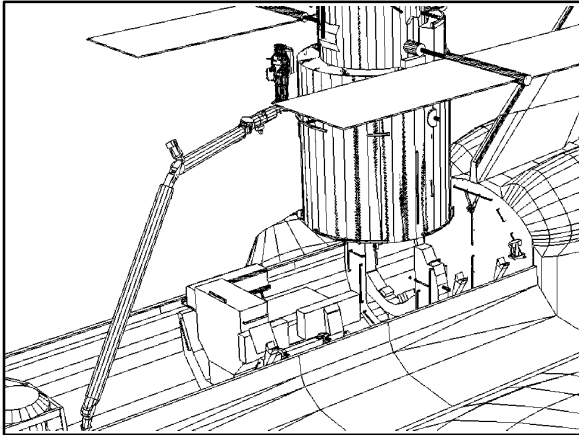
HST Bay 5 – Door/SSR

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1123 | 127 | -663 | 0 | 350 | 20 | 3 |
| -1120 | 144 | -614 | 0 | 350 | 20 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -37.8 | +44.7 | -66.9 | +18.9 | +28.3 | -157.4 | |



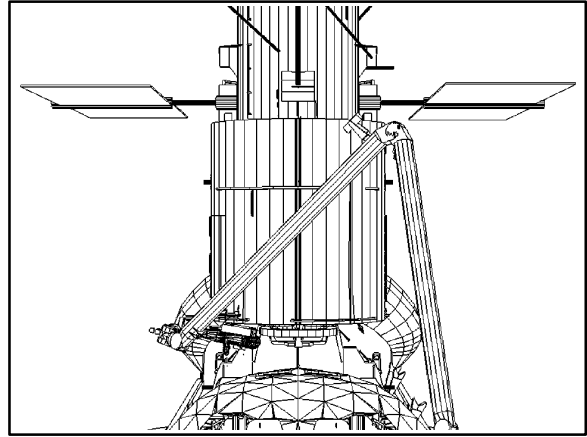
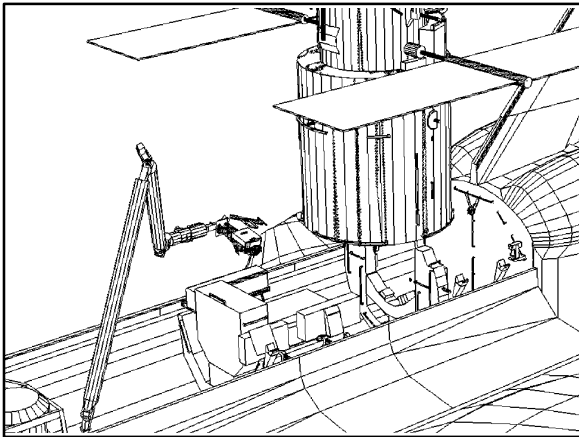
HST Bay 5 – SSAT

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1120 | 145 | -666 | 0 | 340 | 0 | 3 |
| -1120 | 145 | -614 | 0 | 340 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -36.0 | +46.6 | -68.8 | +15.4 | +17.0 | -176.4 | |



COPE – Head Port

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|-------|-------|
| -996 | 55 | -486 | 0 | 0 | 100 | 3 |
| -996 | 106 | -495 | 0 | 0 | 100 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -43.5 | +54.6 | -110.5 | +55.8 | +43.5 | -79.5 | |

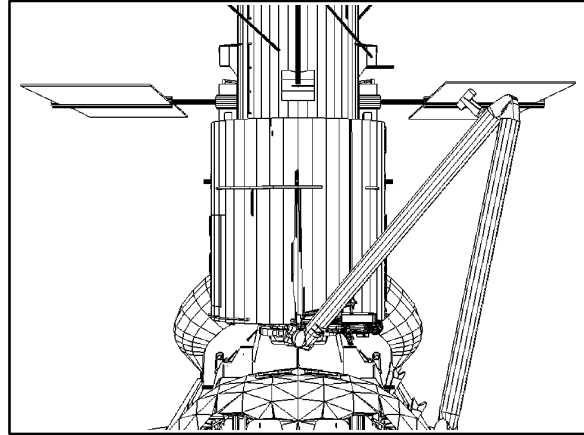
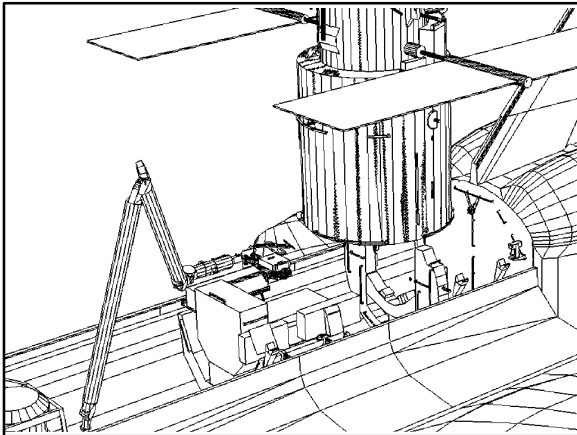


NOBL REPAIR

Configuration assumptions: FSS Rotation: 0°, +V3 fwd
 FSS Pivot: 90°, +V1 along -Z
 Solar Arrays: Deployed, 0°

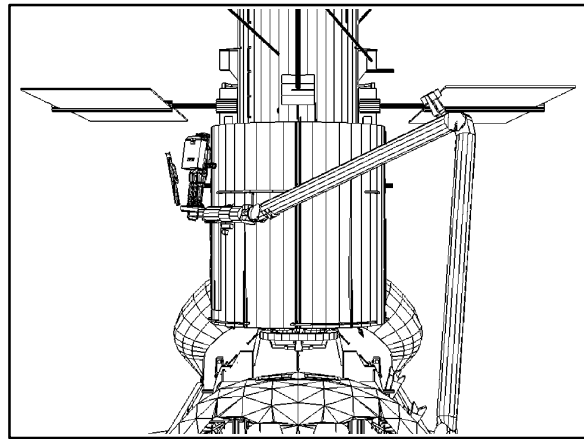
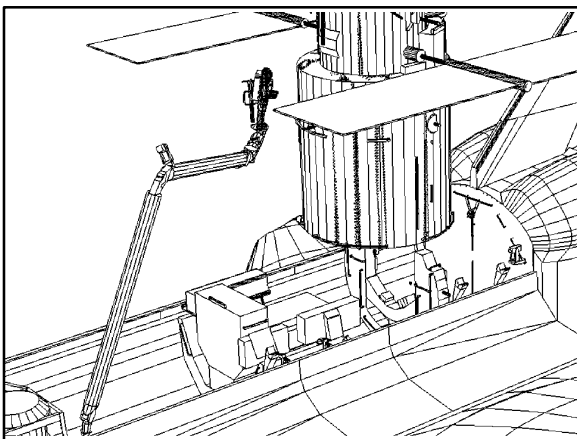
NPE – Head Port

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|-------|-------|
| -956 | -57 | -499 | 0 | 0 | 90 | 3 |
| -956 | -5 | -499 | 0 | 0 | 90 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -31.8 | +77.8 | -134.7 | +56.8 | +31.8 | -89.5 | |



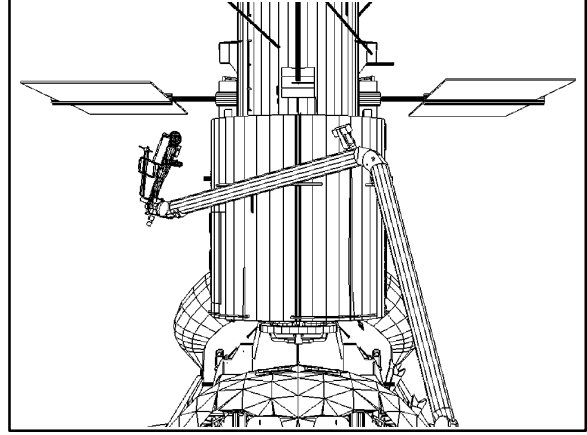
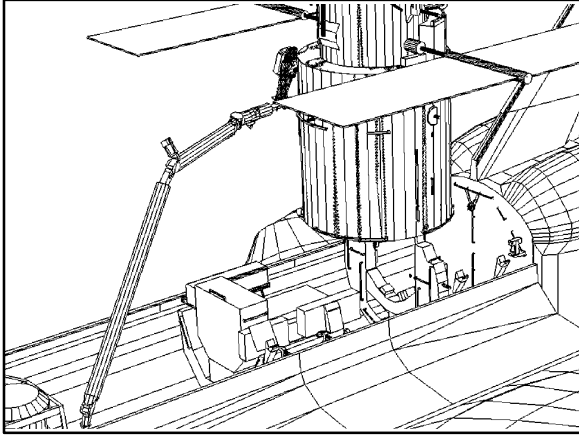
HST Bay 6

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1062 | 93 | -666 | 0 | 315 | 10 | 3 |
| -1056 | 99 | -614 | 0 | 315 | 10 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -31.8 | +65.7 | -92.7 | +13.2 | -11.2 | -166.8 | |



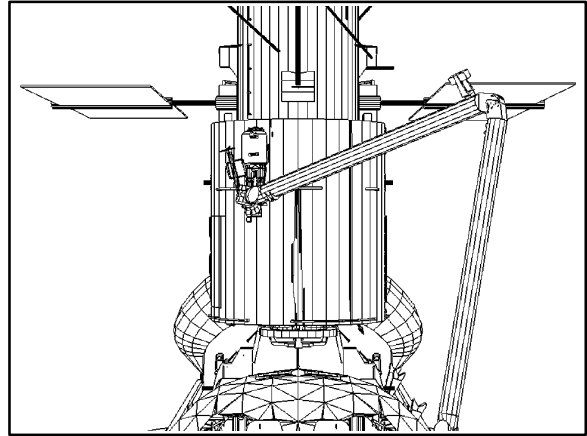
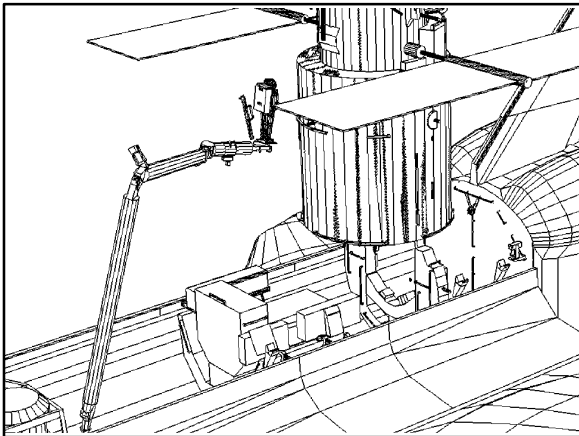
HST Bay 5 – Door/SSR

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1123 | 127 | -663 | 0 | 350 | 20 | 3 |
| -1120 | 144 | -614 | 0 | 350 | 20 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -37.8 | +44.7 | -66.9 | +18.9 | +28.3 | -157.4 | |



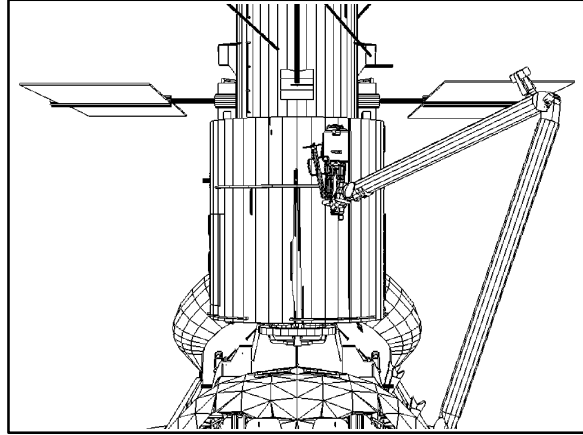
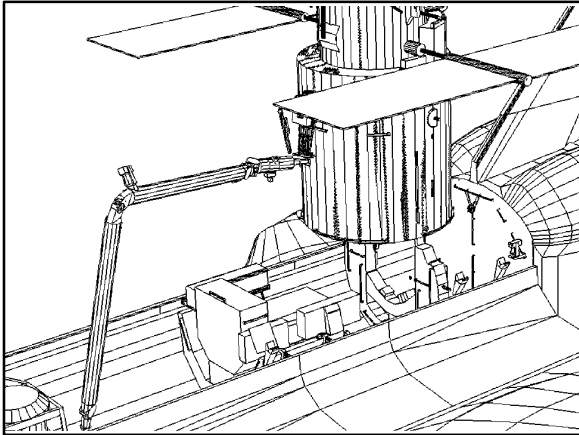
HST Bay 7

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|--------|-------|
| -1029 | 40 | -666 | 350 | 5 | 0 | 3 |
| -1020 | 40 | -615 | 350 | 5 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -37.9 | +75.9 | -103.8 | +17.0 | +45.5 | -172.6 | |



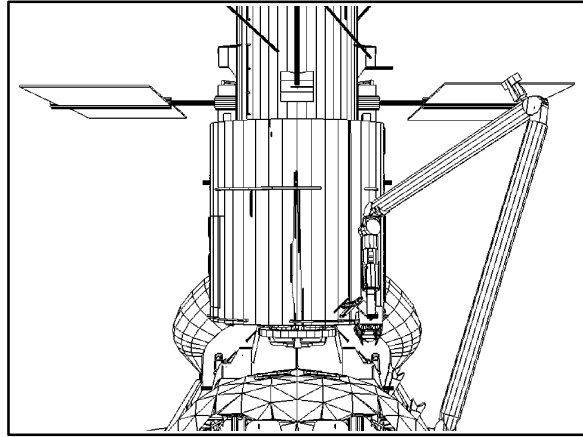
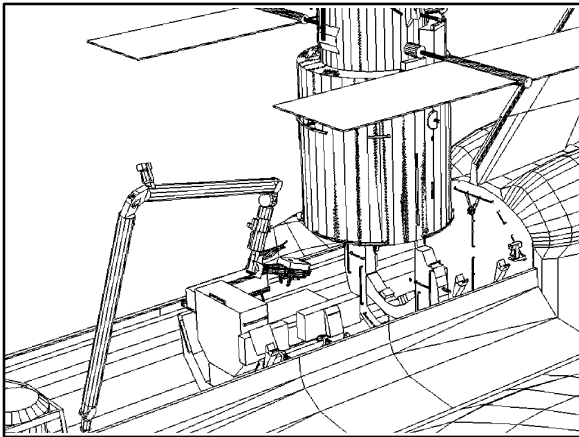
HST Bay 8

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|--------|-------|
| -1027 | -36 | -667 | 350 | 355 | 0 | 3 |
| -1018 | -36 | -615 | 350 | 355 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -24.8 | +88.7 | -111.7 | +11.1 | +22.9 | -174.2 | |



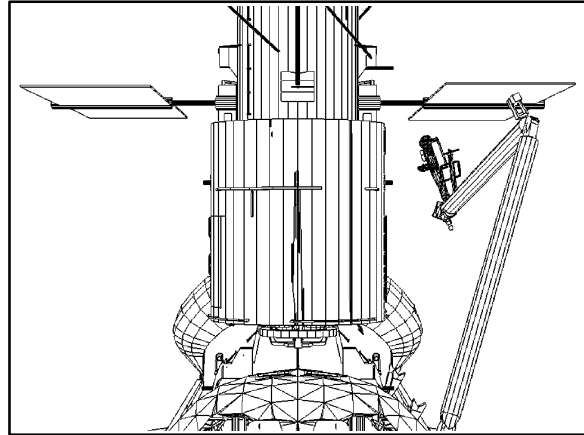
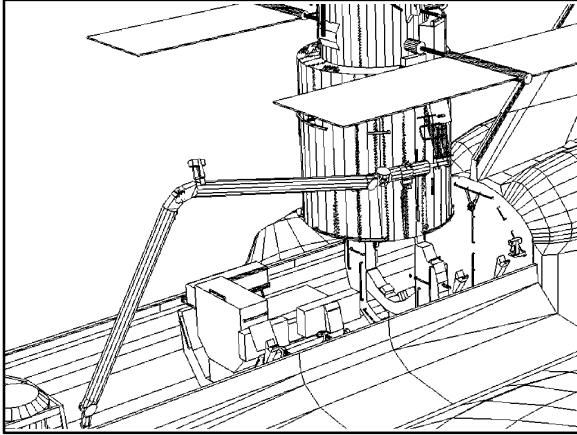
NPE – Head Aft

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|--------|-------|
| -974 | -65 | -496 | 250 | 0 | 0 | 3 |
| -925 | -65 | -514 | 250 | 0 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -18.6 | +84.1 | -108.7 | -91.0 | +10.9 | -135.5 | |



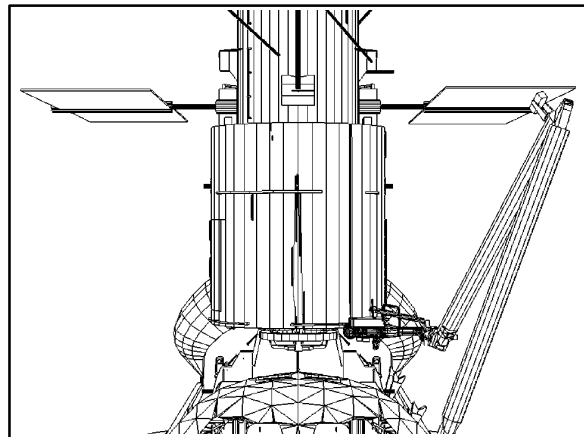
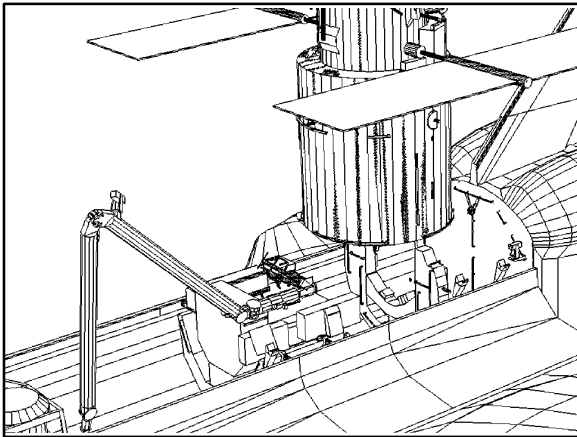
HST Bay 10

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1124 | -132 | -663 | 0 | 10 | 340 | 3 |
| -1121 | -149 | -614 | 0 | 10 | 340 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -4.0 | +72.8 | -90.0 | +20.7 | +13.4 | -200.0 | |



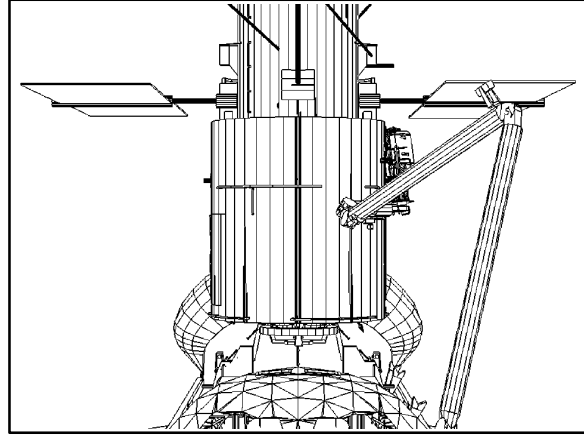
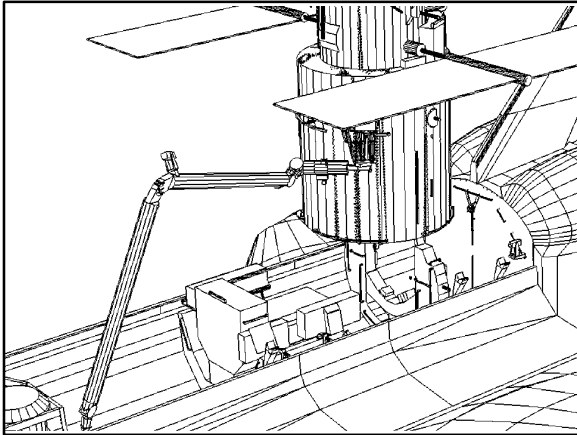
NPE – Head Starboard

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|-------|--------|-------|------|--------|-------|
| -956 | -60 | -499 | 0 | 0 | 270 | 3 |
| -956 | -112 | -499 | 0 | 0 | 270 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -2.0 | +95.4 | -141.1 | +45.6 | +2.0 | -269.5 | |



HST Bay 9

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|--------|-------|
| -1062 | -93 | -666 | 0 | 45 | 350 | 3 |
| -1056 | -99 | -615 | 0 | 45 | 350 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -19.5 | +74.8 | -101.0 | +54.1 | +59.8 | -208.7 | |

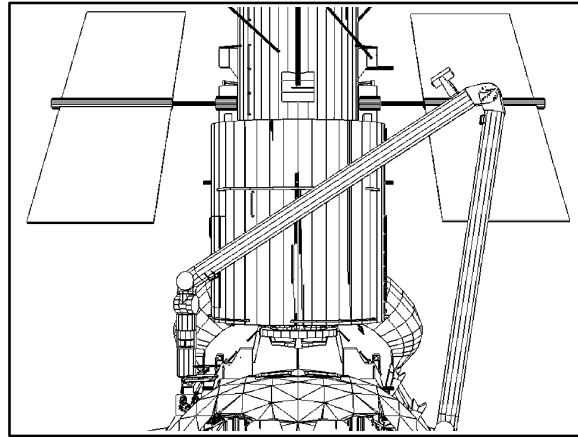
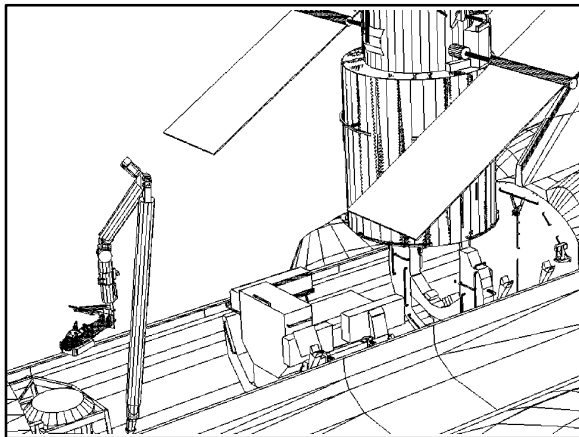


SSRF MLI REPLACEMENT

Configuration assumptions: FSS Rotation: 305°, +V3 55° Port
 FSS Pivot: 90°, +V1 along -Z
 Solar Arrays: Deployed, -30°

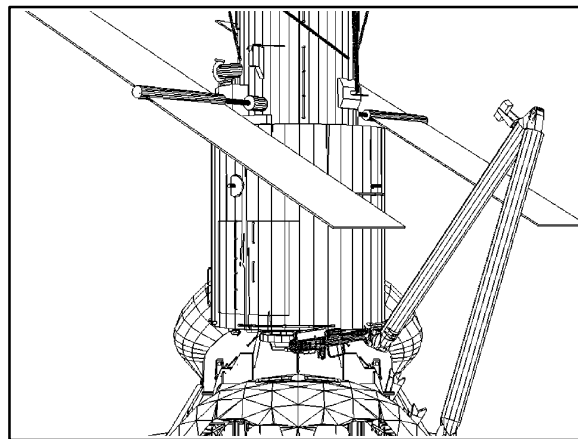
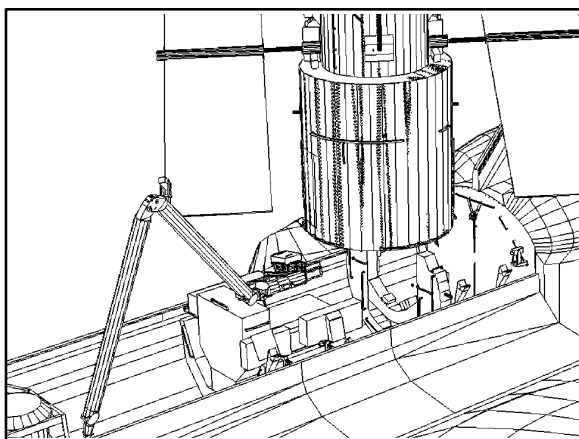
Safety Tether Transfer

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|------|-------|-------|
| -710 | 67 | -455 | 270 | 0 | 160 | 3 |
| -759 | 85 | -455 | 270 | 0 | 160 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -67.9 | +78.8 | -129.2 | -57.7 | +7.2 | +69.0 | |



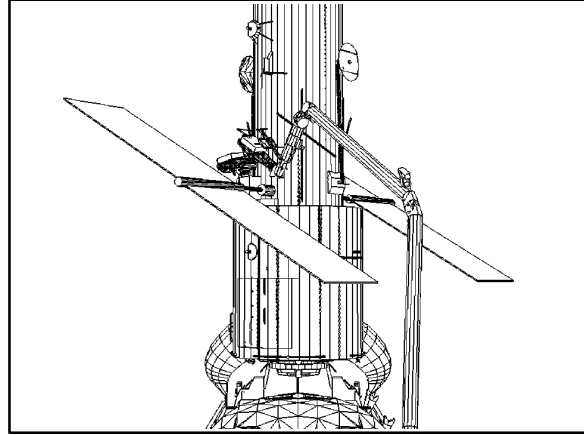
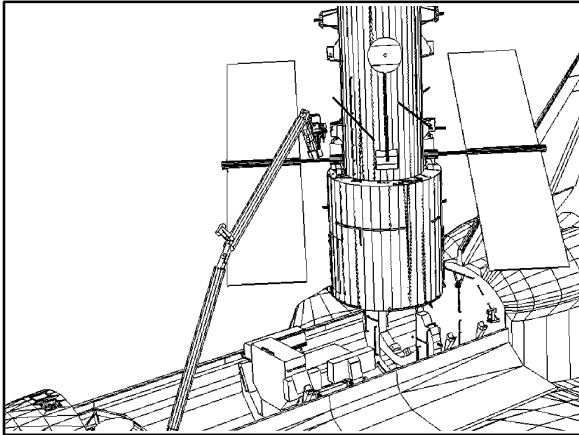
ASIPE – SSRF

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|-------|-------|
| -1000 | -11 | -487 | 0 | 0 | 260 | 3 |
| -1000 | -62 | -496 | 0 | 0 | 260 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -12.4 | +80.4 | -130.5 | +50.1 | +12.4 | +80.5 | |



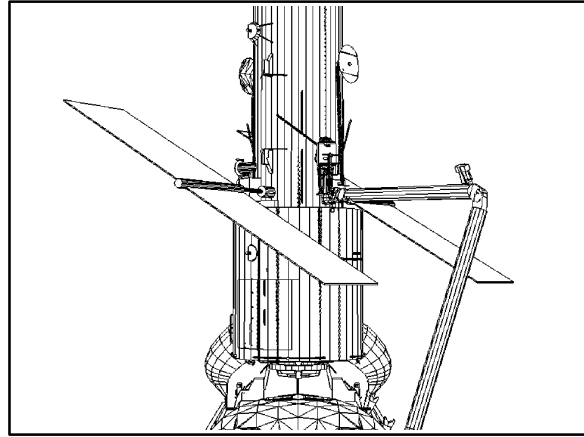
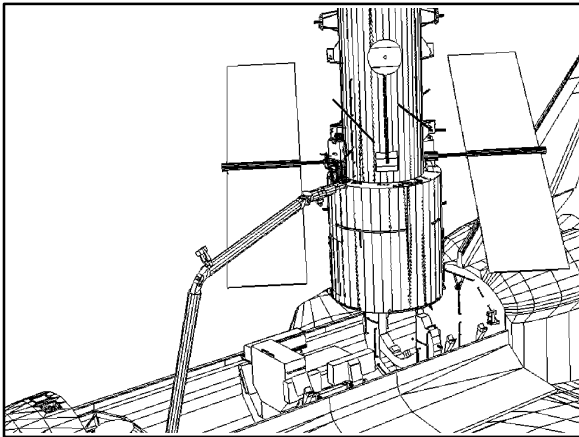
SSRF #5

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1065 | 63 | -769 | 300 | 340 | 315 | 3 |
| -1040 | 28 | -740 | 300 | 340 | 315 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -34.1 | +63.8 | -45.6 | -82.9 | +12.7 | +176.0 | |



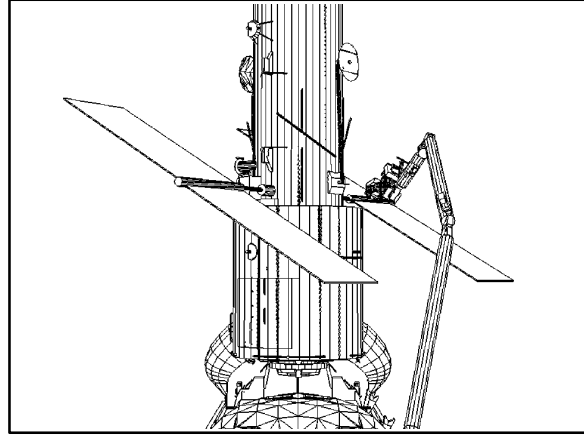
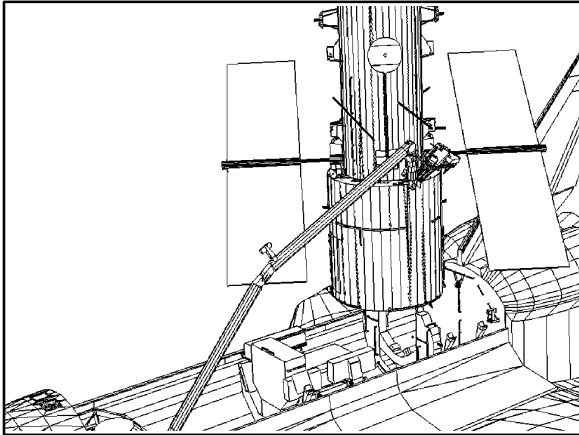
SSRF #6 – Rib Clamp

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1040 | -35 | -764 | 0 | 350 | 0 | 3 |
| -1040 | -35 | -712 | 0 | 350 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -26.7 | +86.1 | -92.3 | +2.6 | +17.2 | +181.8 | |



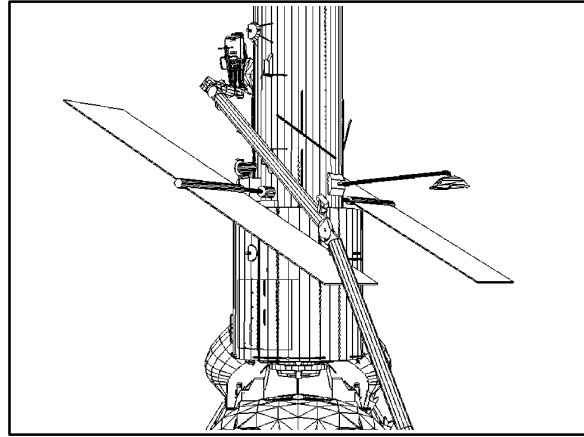
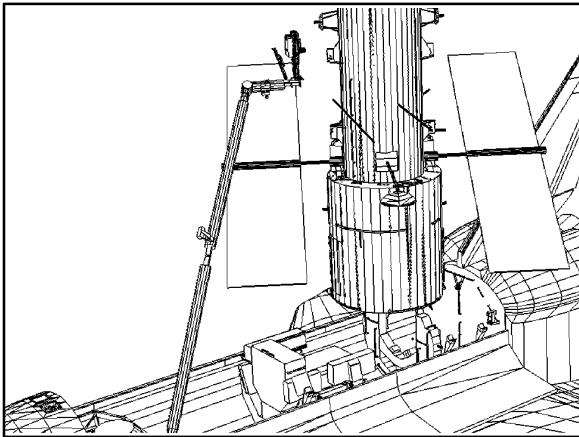
SSRF #7

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|------|--------|-------|
| -1150 | -125 | -739 | 300 | 330 | 0 | 3 |
| -1105 | -125 | -713 | 300 | 330 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -8.1 | +59.7 | -34.3 | -87.6 | -9.1 | +197.5 | |



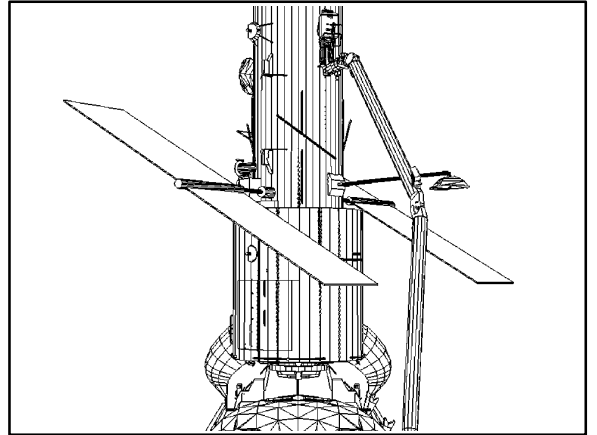
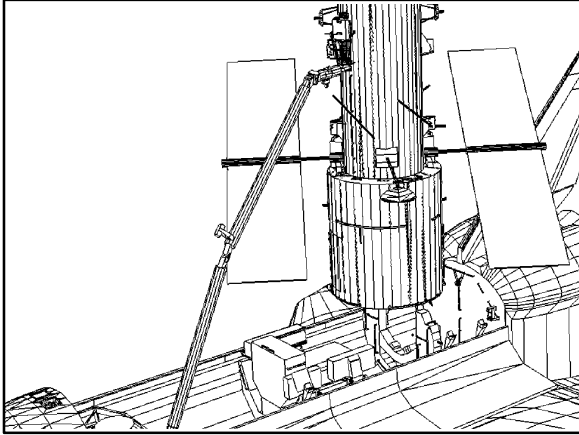
SSRF #1

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1048 | 78 | -902 | 0 | 25 | 0 | 3 |
| -1048 | 78 | -850 | 0 | 25 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -48.6 | +43.1 | -17.3 | -0.7 | +70.6 | -201.6 | |



SSRF #2

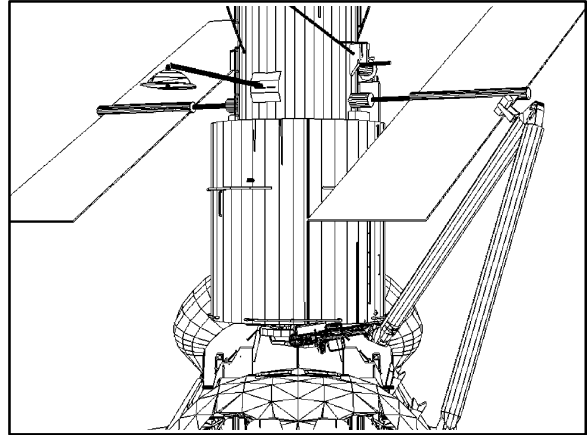
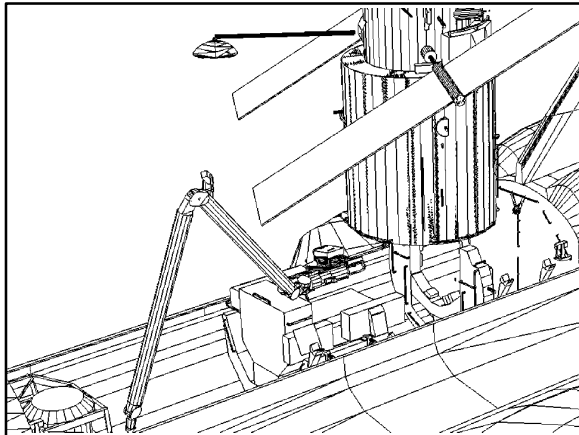
| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1055 | -37 | -932 | 0 | 345 | 0 | 3 |
| -1055 | -37 | -880 | 0 | 345 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -32.4 | +64.8 | -30.1 | -39.8 | +18.1 | -177.2 | |



Configuration assumptions: FSS Rotation: 30°, +V3 30° Starboard
 FSS Pivot: 90°, +V1 along -Z
 Solar Arrays: Deployed, -30°

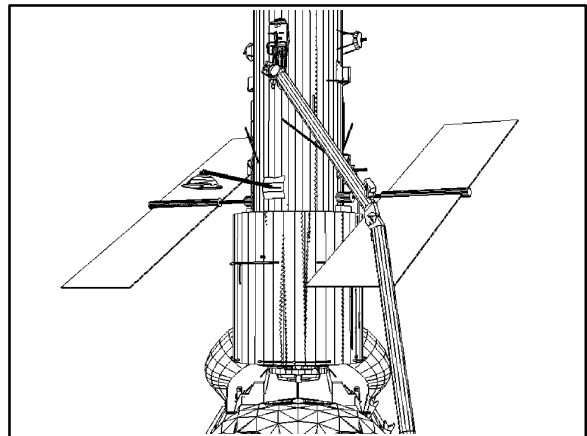
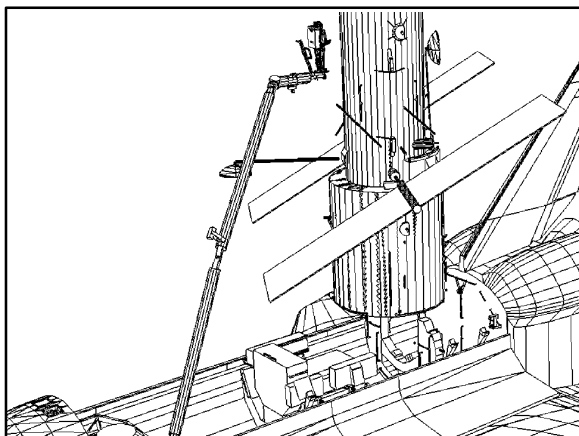
ASIPE – SSRF

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|--------|-------|
| -1000 | -11 | -487 | 0 | 0 | 260 | 3 |
| -1000 | -62 | -496 | 0 | 0 | 260 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -12.4 | +80.4 | -130.5 | +50.1 | +12.4 | -279.5 | |



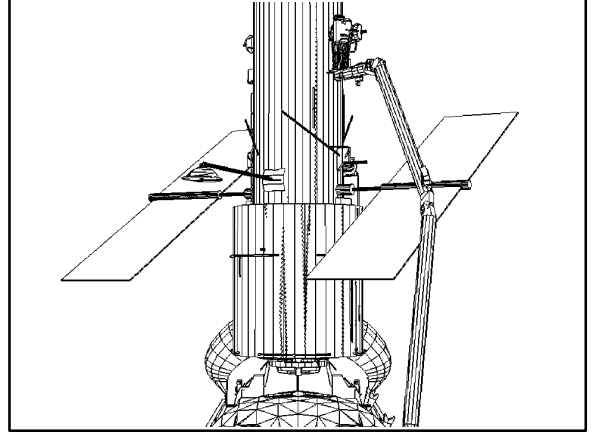
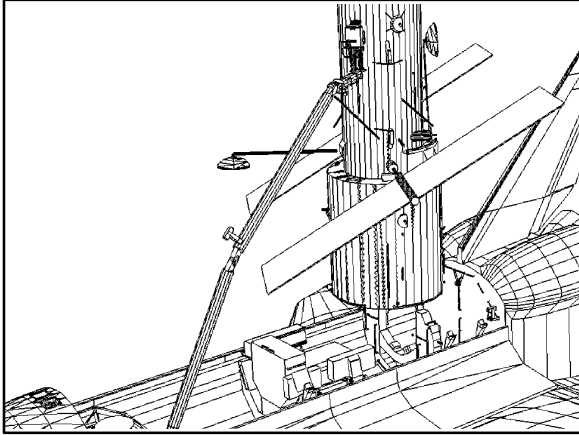
SSRF #3

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1051 | 24 | -926 | 0 | 9 | 0 | 3 |
| -1051 | 24 | -874 | 0 | 9 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -43.1 | +55.1 | -24.9 | -25.5 | +51.5 | -183.0 | |



SSRF #4

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|------|--------|-------|
| -1063 | -53 | -922 | 0 | 330 | 0 | 3 |
| -1063 | -53 | -870 | 0 | 330 | 0 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -26.1 | +65.1 | -29.7 | -45.0 | -2.4 | -177.4 | |

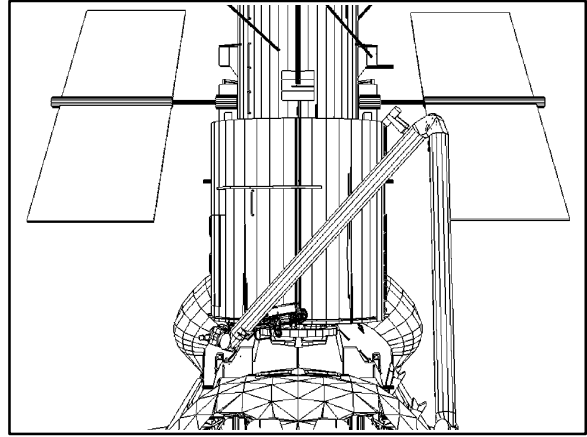
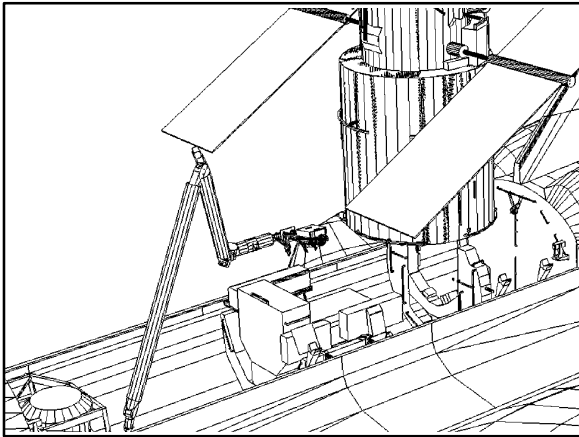


+V2 AFT SHROUD DOOR LATCH REPAIR

Configuration assumptions: FSS Rotation: 0°, +V3 fwd
 FSS Pivot: 90°, +V1 along -Z
 Solar Arrays: Deployed, -30°

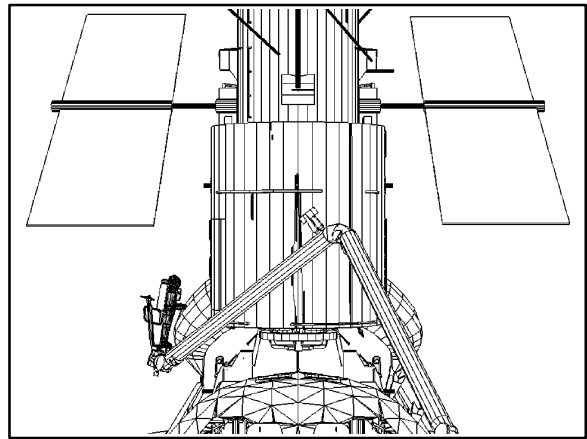
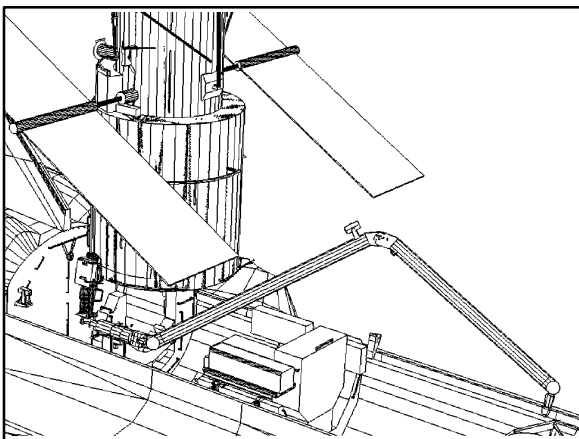
ASIPE – Head Port

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|-------|-------|
| -1000 | 11 | -505 | 0 | 0 | 80 | 3 |
| -1000 | 62 | -496 | 0 | 0 | 80 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -37.2 | +60.7 | -117.1 | +56.4 | +37.2 | -99.5 | |



+V2 ASLR

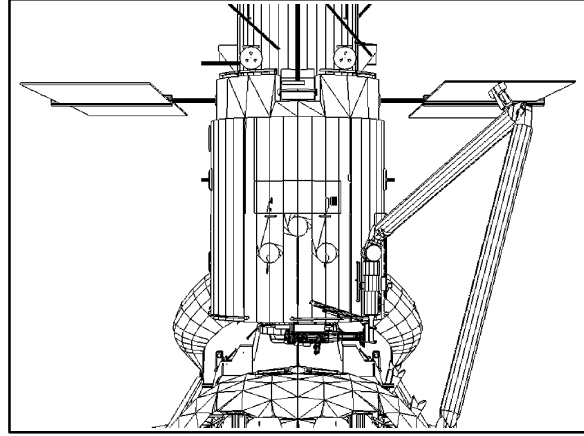
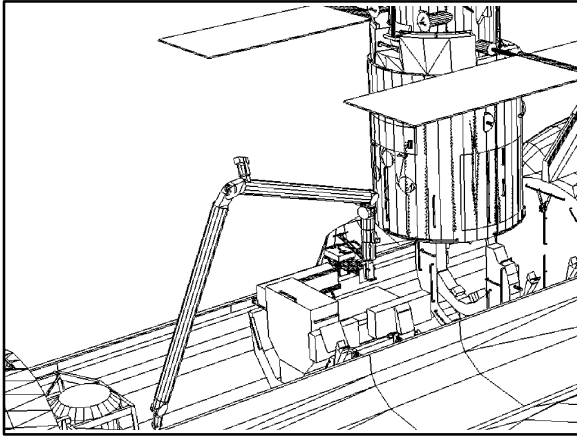
| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -1150 | 127 | -525 | 0 | 0 | 10 | 3 |
| -1149 | 136 | -473 | 0 | 0 | 10 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -31.3 | +28.0 | -68.1 | +39.9 | +31.3 | -169.4 | |



CONTINGENCY POSNS

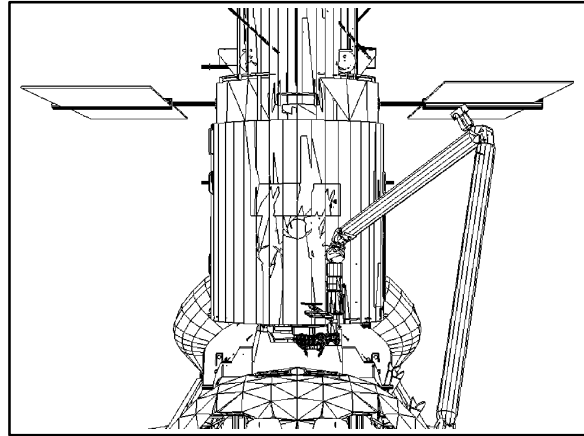
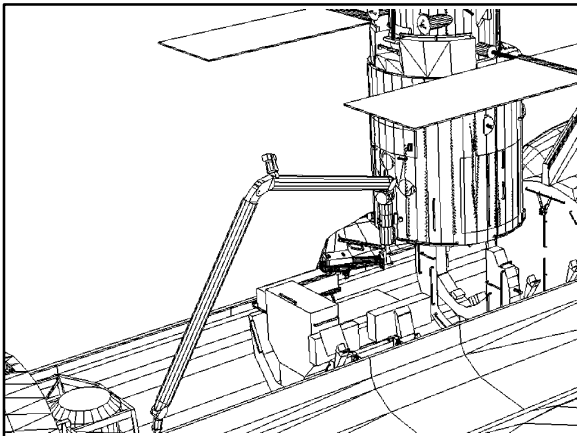
ASIPE – Head Starboard

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|--------|-------|-------|--------|-------|
| -980 | -7 | -488 | 270 | 0 | 270 | 3 |
| -980 | -59 | -488 | 270 | 0 | 270 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -14.7 | +76.7 | -104.5 | -67.3 | +18.8 | -234.4 | |



ASIPE – Head Forward

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -975 | -10 | -487 | 270 | 0 | 205 | 3 |
| -1022 | -32 | -487 | 270 | 0 | 205 | 4 |
| SY | SP | EP | WP | WY | WR | |
| -17.2 | +64.0 | -89.9 | -70.1 | +18.6 | -296.8 | |



This Page Intentionally Blank

OFF-NOMINAL HST RETRIEVAL OPS

| | |
|--|---------|
| SJ POISE FOR CAPTURE | FS 5-2 |
| HST CAPTURE | FS 5-6 |
| BERTH | FS 5-7 |
| CONTINGENCY HST CAPTURE | FS 5-15 |
| -V3 HGA DEPLOYED CONTINGENCY BERTH | FS 5-17 |

OFF-NOM
RETRIEVE

SJ POISE FOR CAPTURE

SM 94 PDRS CONTROL

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

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

MODE – best available

Mnvr to SJ POISE FOR CAPTURE posn:

| | SY | SP | EP | WP | WY | WR | |
|----------------------|-------|--------|-------|-------|-----|------|-------|
| Precradle | 0 | +25.0 | -25.0 | +5.0 | 0 | 0 | |
| 1 | | +80.0 | | | | | |
| 2 | | | -75.0 | | | | |
| 3 | | | | -41.8 | | | |
| 4 | | | | | | +8.5 | |
| 5 | | +101.0 | | | | | |
| 6 | -53.4 | | | | | | |
| SJ Poise for Capture | -53.4 | +101.0 | -75.0 | -41.8 | 0 | +8.5 | |
| | X | Y | Z | PITCH | YAW | ROLL | PL ID |
| | -844 | -17 | -853 | 0 | 305 | 0 | 0 |

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

A7U CCTV – install PDRS TARGET FOR CTVM
 – RMS WRIST, zoom 34.0 HFOV
 focus 5.0 ft
 Maintain eyepoint approx 18 in when using grapple overlay

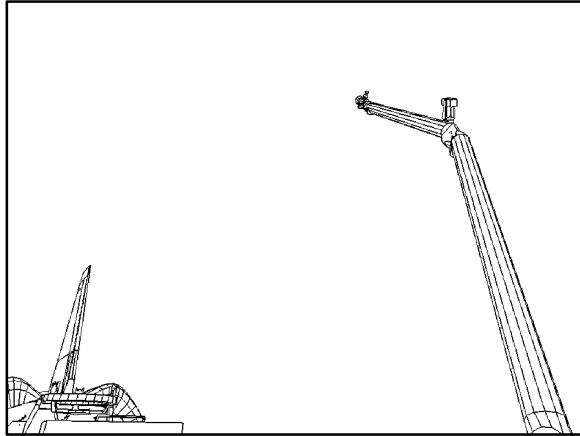
SM 94 PDRS CONTROL

PL ID – ITEM 3 +1 EXEC
 INIT ID – ITEM 24 +1 EXEC

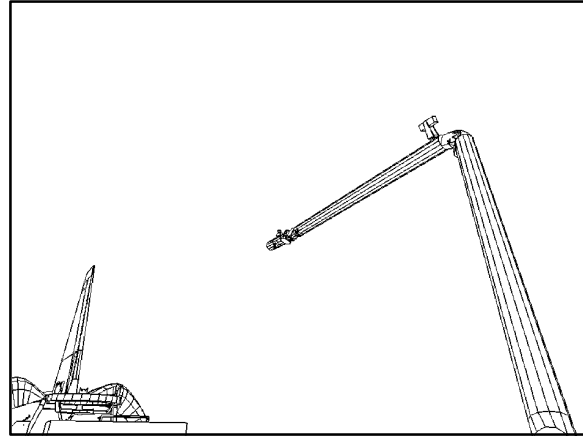
OFF-NOM
 RETRIEVE

Step 1:
Drive +SP (for 55.0°)

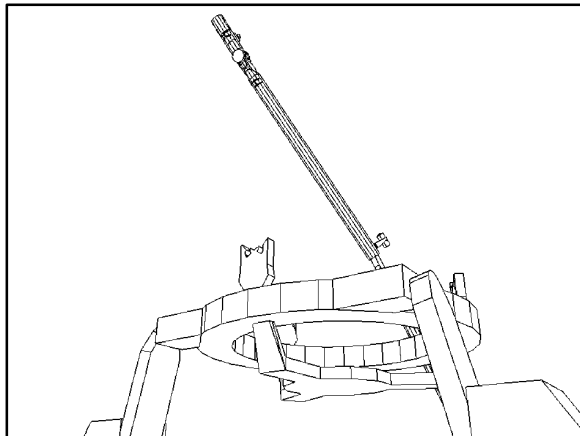
Step 2:
Drive -EP (for 50.0°)



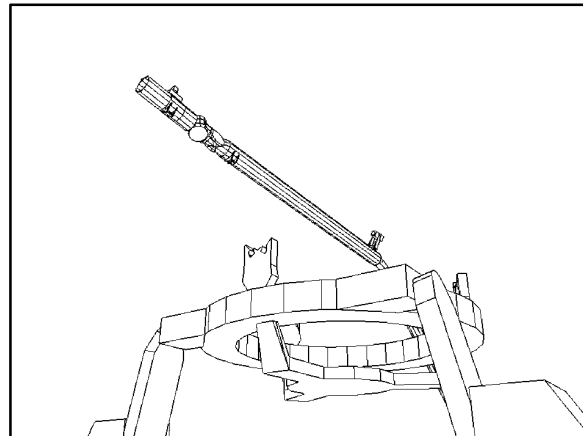
CCTV D (34,30)



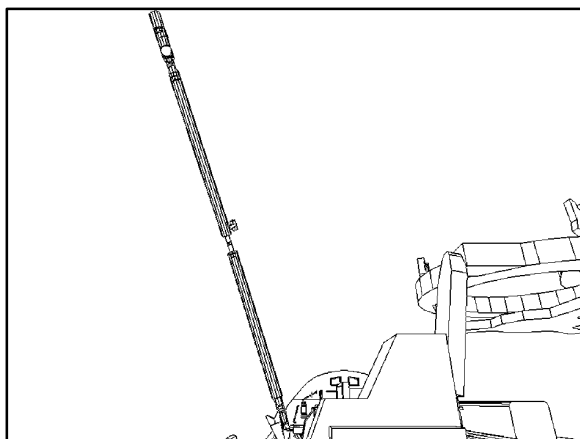
CCTV D (34,30)



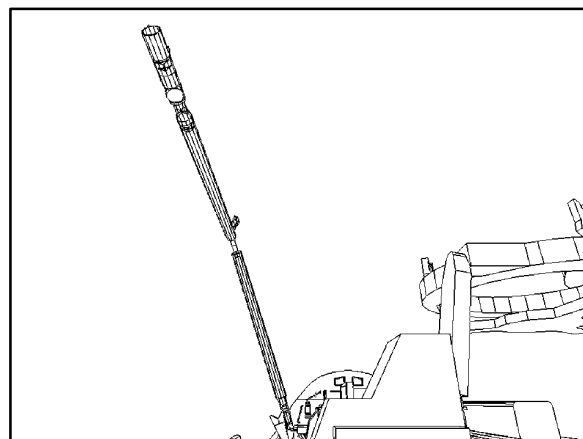
CCTV C (-35,25)



CCTV C (-35,25)

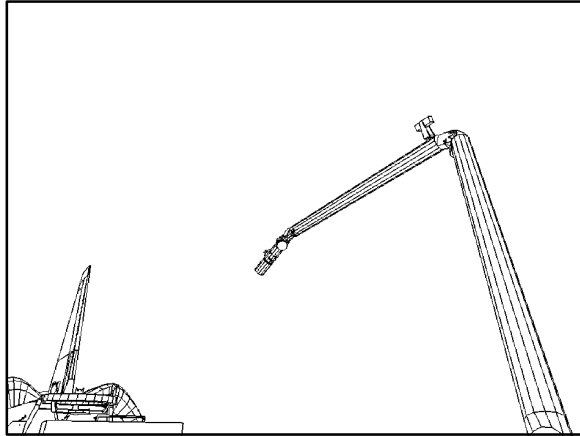


CCTV B (0,25)



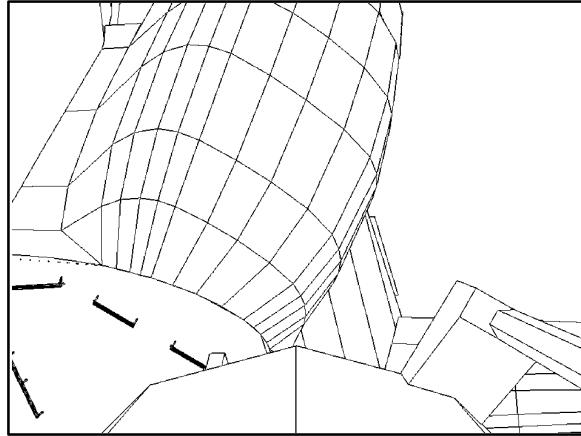
CCTV B (0,25)

Step 3:
Drive -WP (for 46.8°)

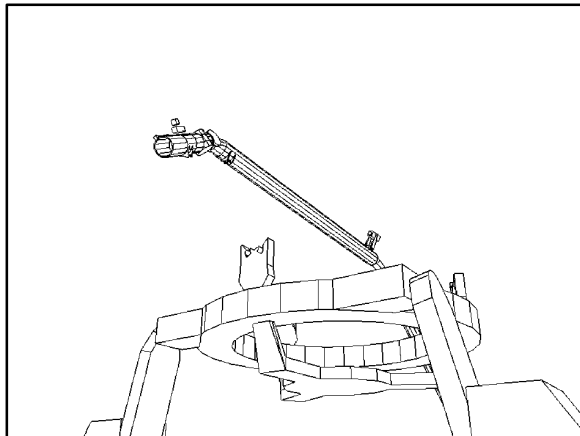


CCTV D (34,30)

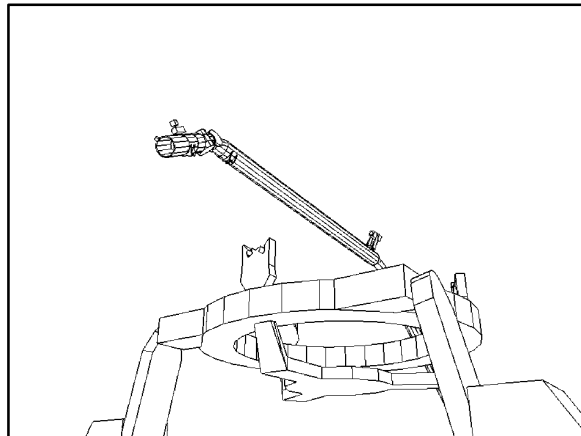
Step 4:
Drive +WR (for 8.5°)



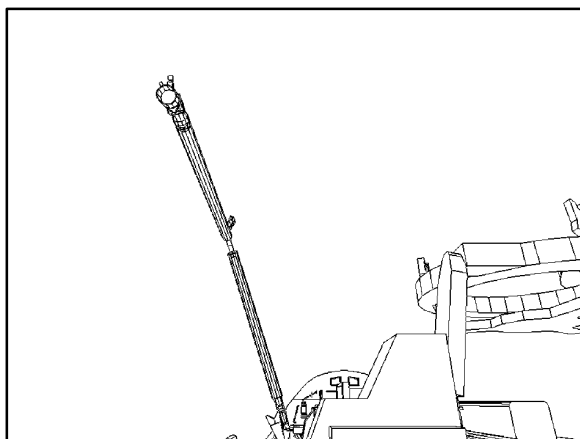
END EFF (34.0 HFOV)



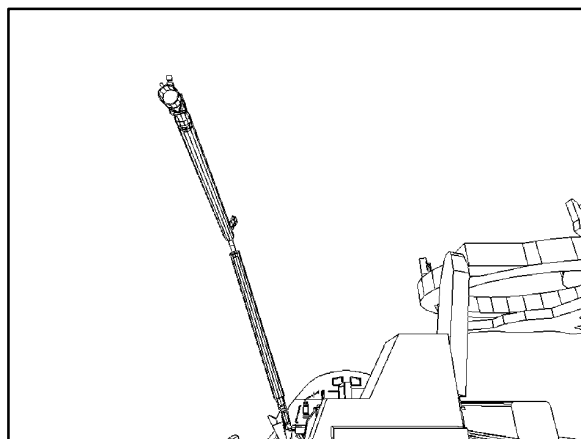
CCTV C (-35,25)



CCTV C (-35,25)

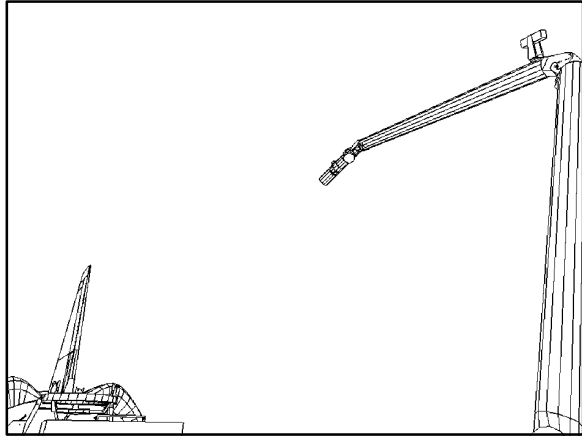


CCTV B (0,25)



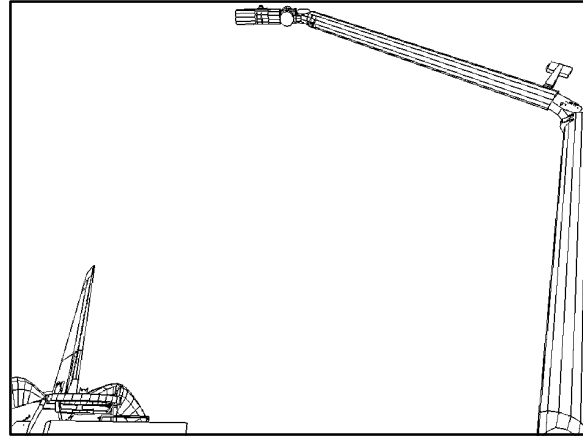
CCTV B (0,25)

Step 5:
Drive +SP (for 21.0°)

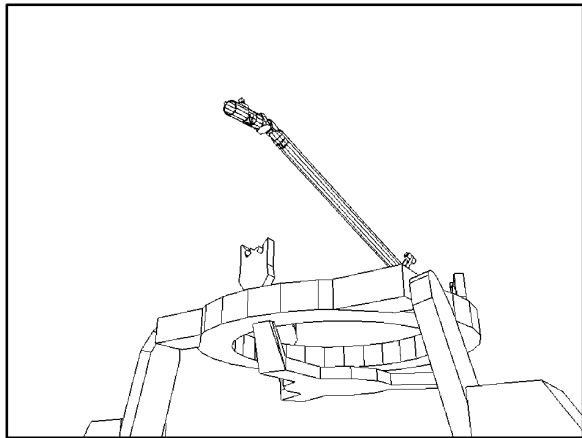


CCTV D (30,34)

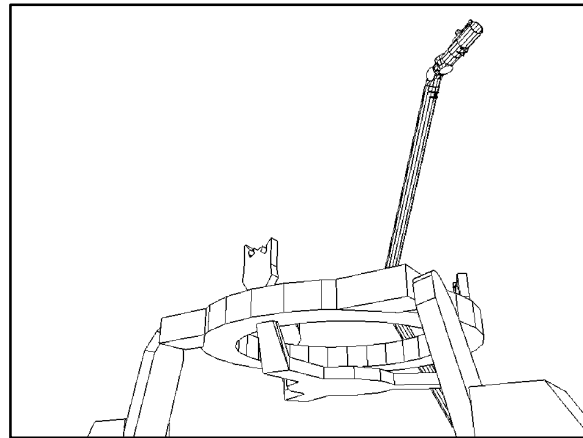
Step 6:
Drive -SY (for 53.4°)



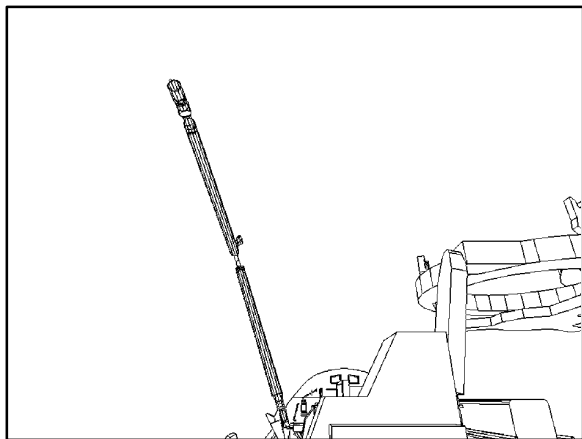
CCTV D (30,34)



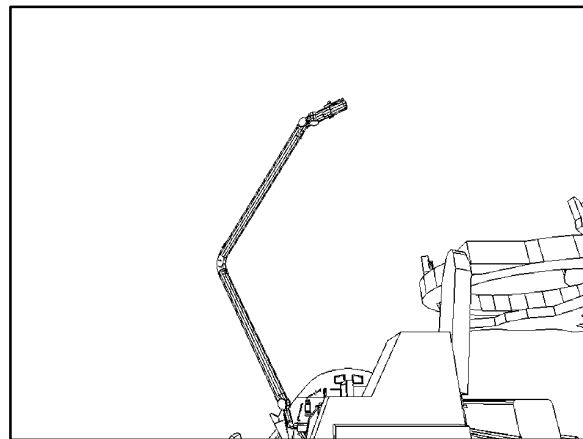
CCTV C (-35,25)



CCTV C (-35,25)



CCTV B (0,25)



CCTV B (0,25)

SJ HST CAPTURE

1. SJ HST CAPTURE

Review GENERIC END EFFECTOR (Cue Card)

SM 94 PDRS CONTROL

√ PL ID, ITEM 3: 1

√ INIT ID, ITEM 24: 1

If SINGLE MODE available:

RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – best available

When grapple fixture in view and proximity ops stabilized

DAP: FREE

A6U

CAUTION

Monitor EE tb timing to prevent
EE motor burnout

EE MODE – AUTO

Mnvr to grapple envelope using:

–SP to close distance

+WP, +EP to align grapple pin

EE CAPTURE sw – depress (mom)

| | | |
|-------------------------------------|-------------------------------------|-------------------------------------|
| √ <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| DERIGID | OPEN | EXTEND |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |

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)

MODE – not DIRECT

Config DAP A,B to A9,B12

DAP: No LO Z

2. HST TO DRIFT MODE

NOTE

Step 2 needs to occur within 30 sec of HST snare

SM 210 HST SYS

√ RCVR LOCK 1(2) – *

√ TLM COUNT – incr

* If TLM COUNT not incr, MCC must verify following step *

PCS MODE DRIFT – ITEM 6 +9 1(92) EXEC

√ – DRFT

* If PCS MODE not DRFT, repeat step 2

* If PCS MODE still not DRFT, and other RCVR LOCK

* ‘*’, re-exec cmd using alternate command

* If still no joy, √MCC before proceeding

√ SNPT DIS – YES

SJ HST BERTH

1. SJ MNVR TO FSS HOVER POSN

SM 94 PDRS CONTROL

√ PL ID, ITEM 3: 1

√ INIT ID, ITEM 24: 1

If SINGLE MODE available:

RATE – VERN (RATE MIN tb–ON)

BRAKES – OFF (tb–OFF)

MODE – best available

A6U

DAP: FREE

Mnvr to FSS HOVER posn:

| | SY | SP | EP | WP | WY | WR | |
|---------------|-------|-------|-------|-------|-------|------|-------|
| ~CAPT POSN | -53.4 | +90.0 | -68.5 | -37.3 | 0 | +8.5 | |
| 1 | | | | | +27.6 | | |
| 2 | | | | -21.3 | | | |
| 3 | -27.6 | | | | | | |
| 4 | | | -42.0 | | | | |
| 5 | | | | | | +0.5 | |
| 6 | | +63.4 | | | | | |
| FSS HOVER | -27.6 | +63.4 | -42.0 | -21.3 | +27.6 | +0.5 | |
| | X | Y | Z | PITCH | YAW | ROLL | PL ID |
| | -1149 | 0 | -816 | 0 | 0 | 0 | 1 |

BRAKES – ON (tb–ON)

If SINGLE MODE available:

BRAKES – OFF (tb–OFF)

MODE – not DIRECT

JOINT – CRIT TEMP

If att maintenance reqd:

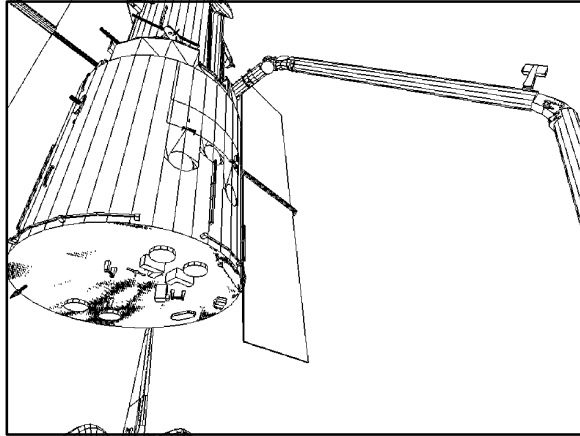
GNC 20 DAP CONFIG

CNTL ACCEL – ITEM 28 +3 EXEC

– ITEM 48 +3 EXEC

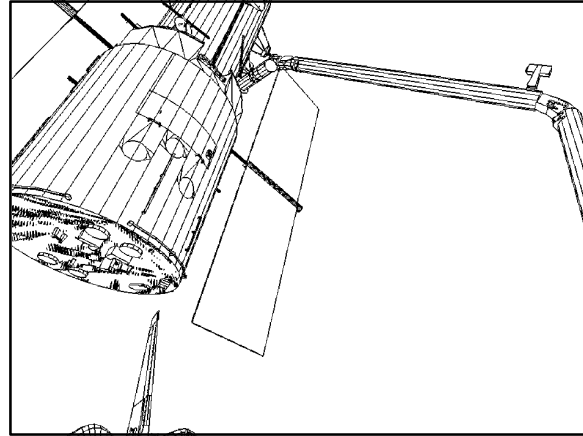
DAP: A/AUTO/VERN(ALT)

Step 1:
Drive +WY (for 27.6°)

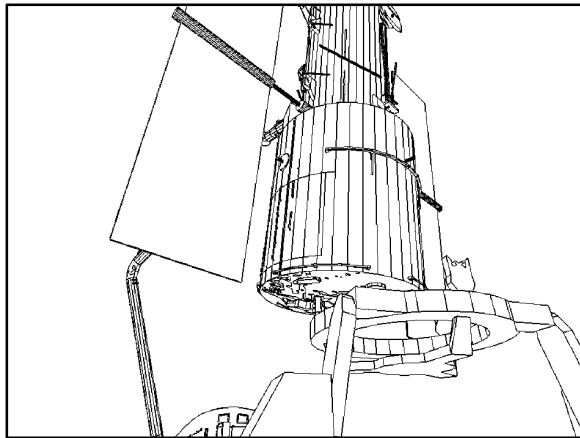


CCTV D (25,35)

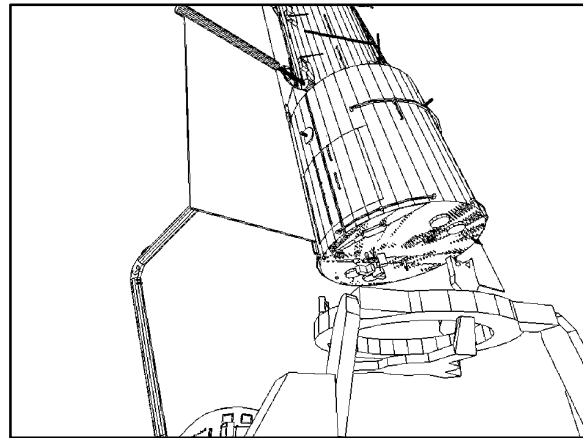
Step 2:
Drive +WP (for 16.0°)



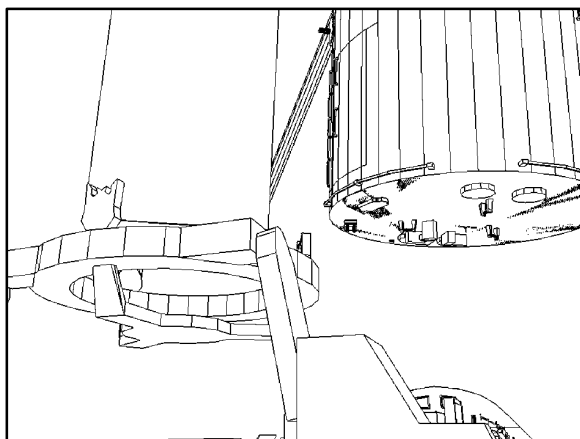
CCTV D (25,35)



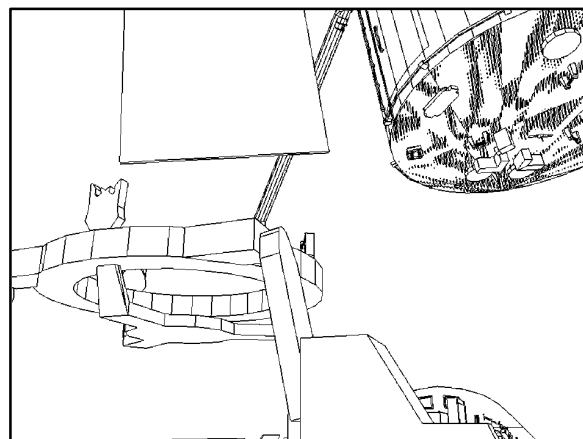
CCTV B (15,30)



CCTV B (15,30)

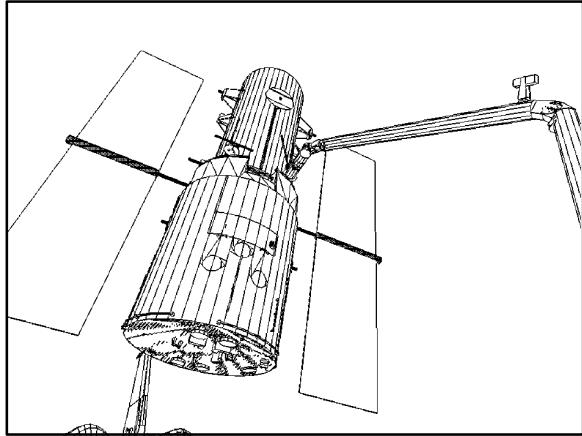


CCTV C (-20,20)



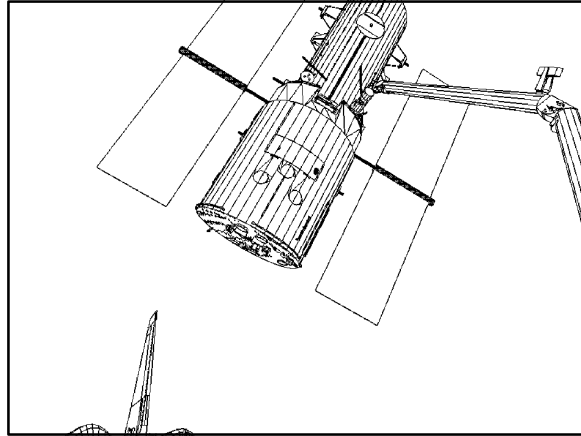
CCTV C (-20,20)

Step 3:
Drive +SY (for 25.8°)

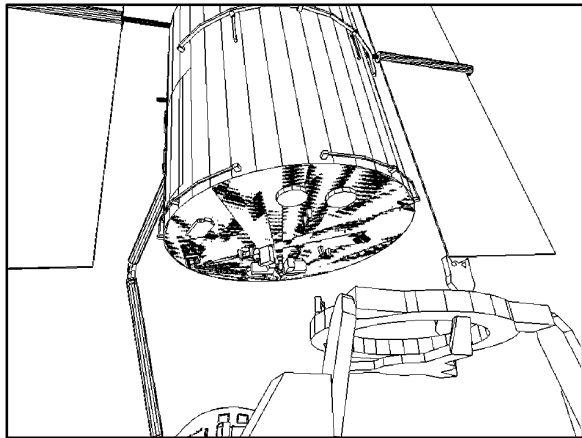


CCTV D (25,35)

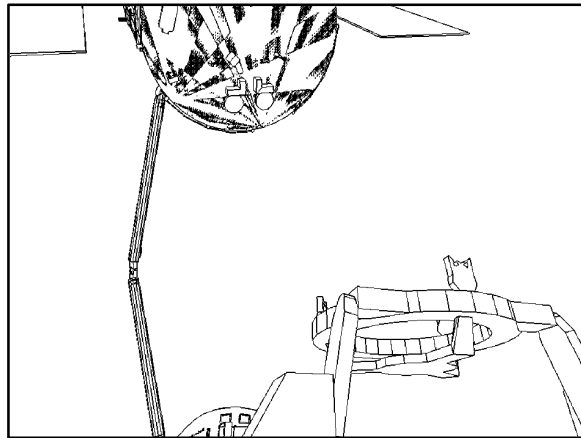
Step 4:
Drive +EP (for 26.5°)



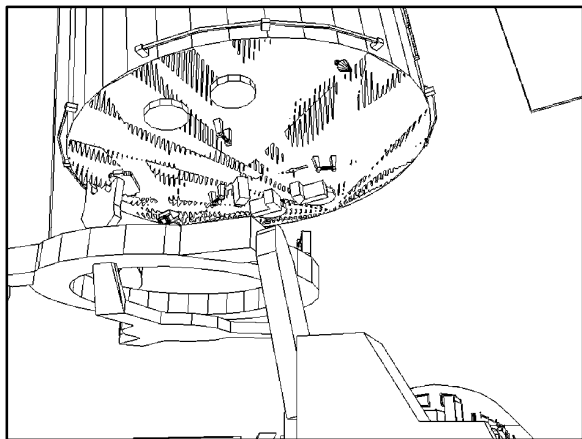
CCTV D (25,35)



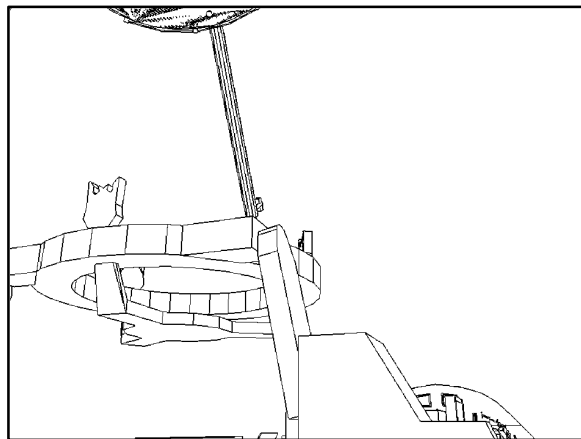
CCTV B (15,30)



CCTV B (15,30)

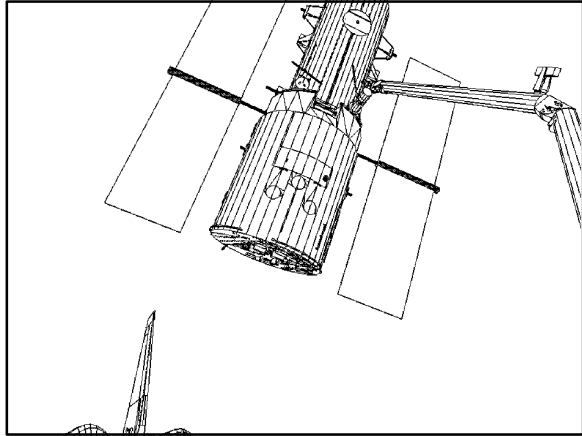


CCTV C (-20,20)



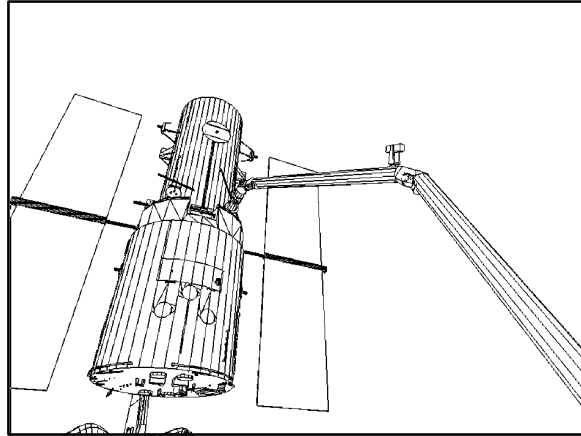
CCTV C (-20,20)

Step 5:
Drive -WR (for 8.0°)

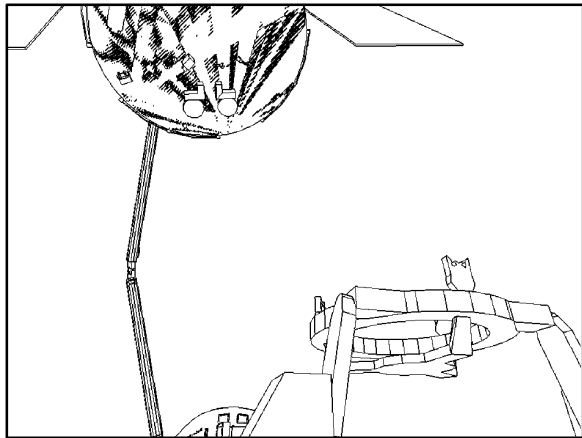


CCTV D (25,35)

Step 6:
Drive -SP (for 26.6°)



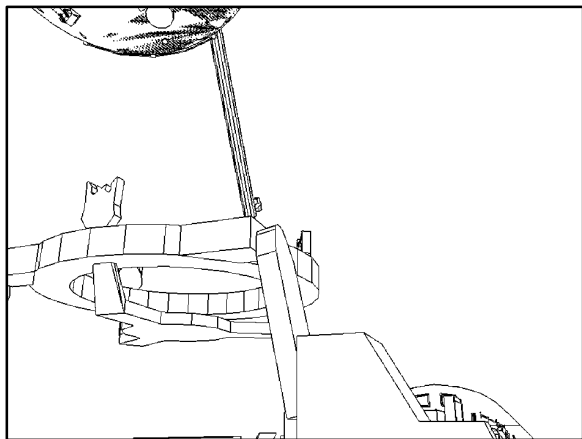
CCTV D (25,35)



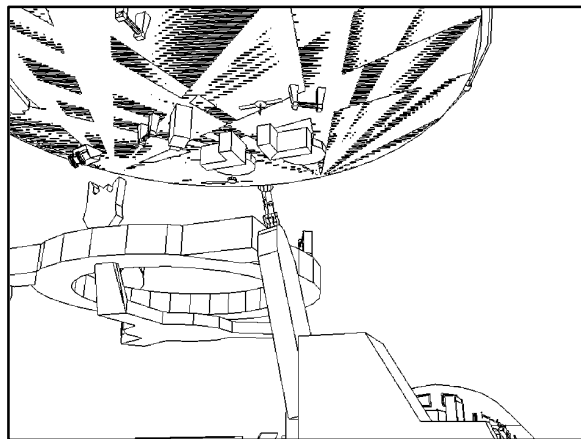
CCTV B (15,30)



CCTV B (15,30)



CCTV C (-20,20)



CCTV C (-20,20)

2. FSS CCTV SETUP

CAUTION
FSS CCTV limited to 2 hr continuous use

L12U √CCTV HTR PWR sw – ON (tb–gray)

SM 211 SSE CONTROL

CCTV ENA ON – ITEM 5 EXEC (*)
PWR ON – ITEM 7 EXEC (*)

* If CCTV ENA ON – (no *), retry ITEM 5: *
* | If no joy, continue *
* If CCTV PWR ON – (no *), retry ITEM 7: *
* If no joy, attempt to display camr image *
* on monitor. If no image, √MCC *

A7U VID OUT pb – MON 1(2)
 IN pb – PL 1
 ALC AVG pb – Press
 GAMMA NORM pb – Press

3. CONFIG FSS FOR HST BERTH

Perform LATCH AND MATE HST, step 1 (PL OPS, RETRIEVAL OPS), then:

4. SJ MNVR TO FSS BERTH POSN

√HST BERTHING FSS CCTV OVERLAY in place

A7U CCTV – config for berth

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 1
 √INIT ID, ITEM 24: 1

A6U DAP: FREE

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

MODE – best available

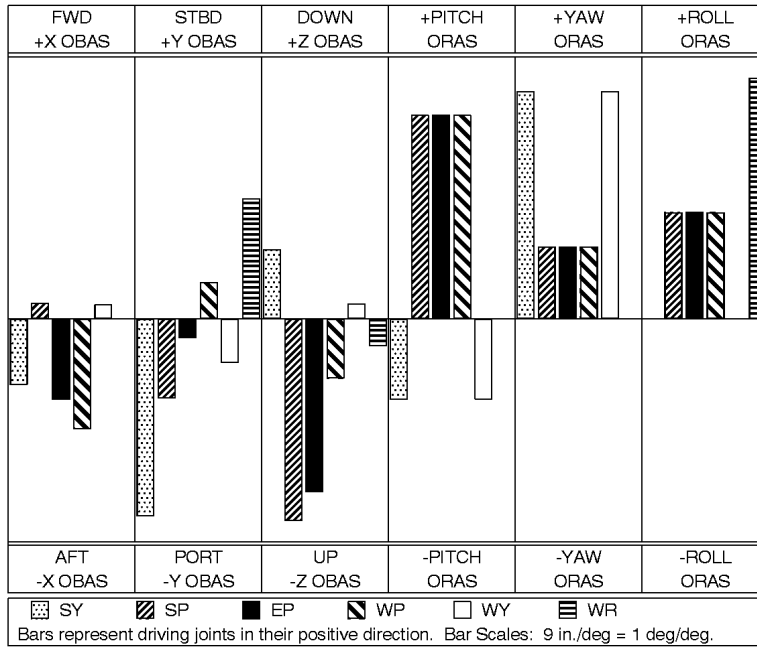
FSS BERTHED posn:

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|------|-------|
| –1149 | 0 | –755 | 0 | 0 | 0 | 1 |
| SY | SP | EP | WP | WY | WR | |
| –24.9 | +70.3 | –63.8 | –6.5 | +24.9 | +0.5 | |

Drive joints per HST BERTHING FSS CCTV OVERLAY and SJ mnvr tables to berth HST

BRAKES – ON (tb–ON)
MODE – not DIRECT

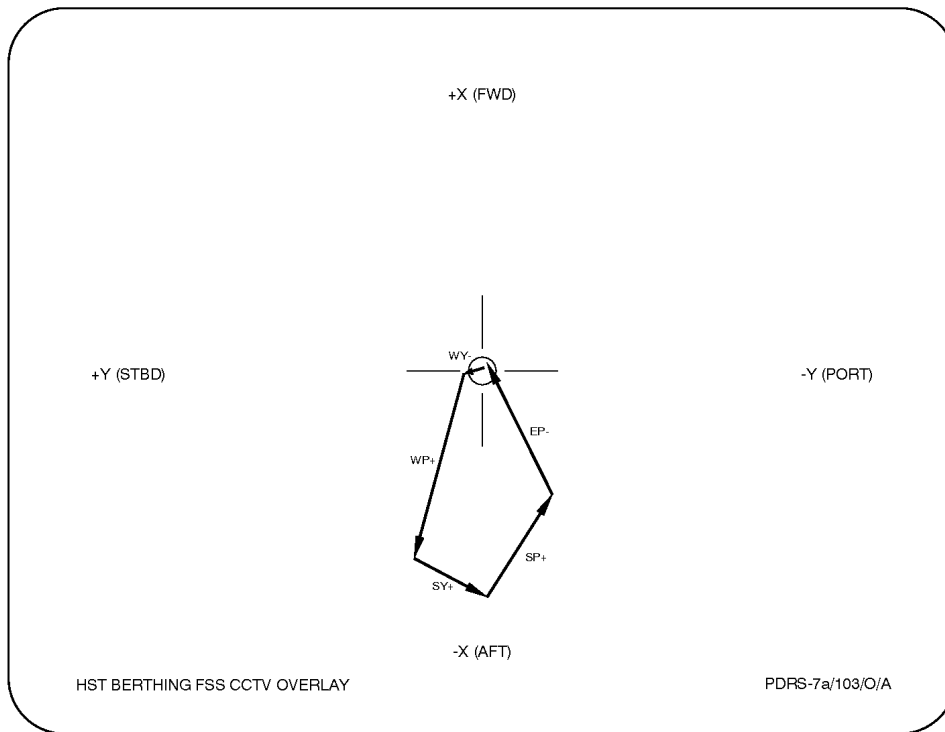
HST BERTHING



| 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 |
|-------------|-------------|-------------|-------------|-------------|-------------|
| +2.7 | +6.9 | -21.7 | +14.8 | -2.7 | +0.0 |



5. LATCH HST TO FSS
Perform LATCH AND MATE HST, steps 2 thru 9 (PL OPS, RETRIEVAL OPS)

6. SJ UNGRAPPLE HST
√BERTHED HST UNGRAPPLE EE CCTV OVERLAY in place

If SINGLE MODE available, to relieve strain:

BRAKES – OFF (tb–OFF)

MODE – TEST, ENTER

Wait 5 sec, then

BRAKES – ON (tb–ON)

SM 94 PDRS CONTROL

PL ID – ITEM 3 +0 EXEC

INIT ID – ITEM 24 +0 EXEC

If SINGLE MODE available:

RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb–OFF)

MODE – best available

CAUTION

Monitor EE tb timing to prevent
EE motor burnout

EE MODE – MAN

MAN CONTR – DERIGID (hold until DERIGID tb–gray, 5 sec max)

RELEASE sw – depress (hold until OPEN tb–gray, 3 sec max)

Drive joints per BERTHED HST UNGRAPPLE WRIST CCTV OVERLAY until
clear of grapple fixture

EE MAN CONTR – DERIGID (hold until EXTEND tb–gray, 20 sec max)

EE MODE – OFF

If SINGLE MODE available, BRAKES – ON (tb–ON)

Change DAP A to A10 and reference FLIGHT PLAN for next mnvr and DAP
CONFIG

MODE – not DIRECT

JOINT – CRIT TEMP

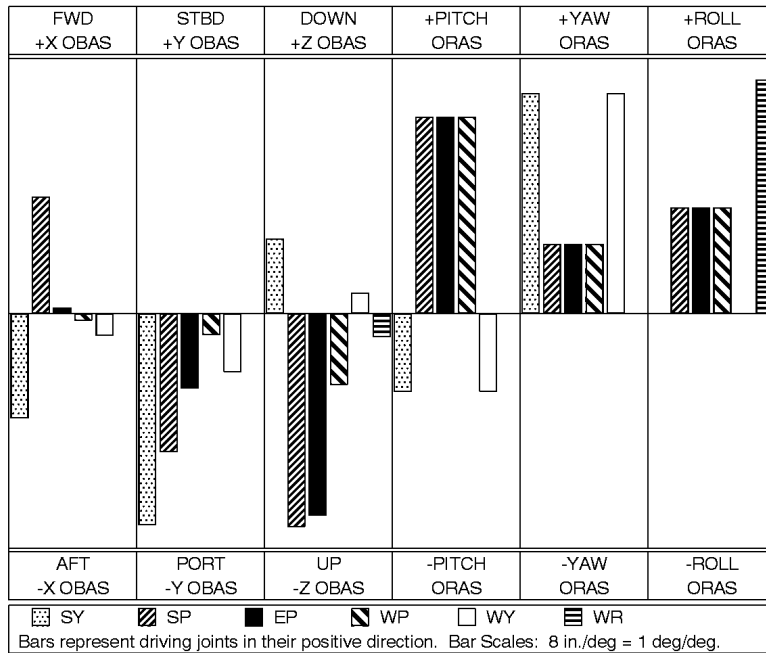
7. FSS CCTV POWEROFF

SM 211 SSE CONTROL

CCTV PWR OFF – ITEM 8 EXEC (*) (Wait 15 sec)

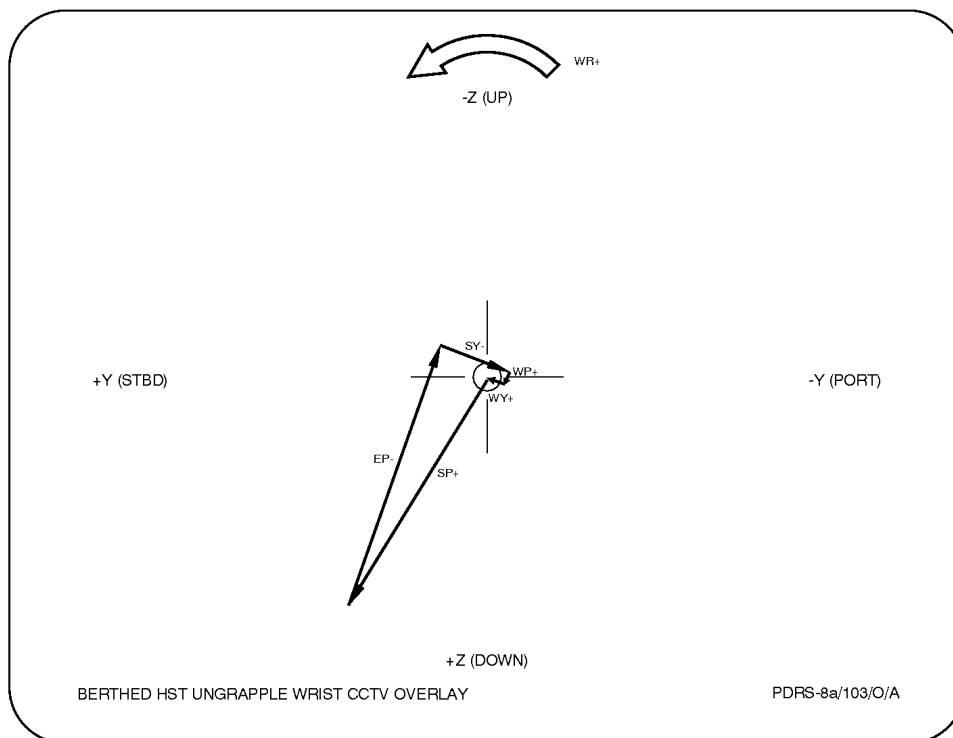
ENA OFF – ITEM 6 EXEC (*)

BERTHED HST UNGRAPPLE



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

| ΔSY | ΔSP | ΔEP | ΔWP | ΔWY | ΔWR |
|-------------|-------------|-------------|-------------|-------------|-------------|
| -4.4 | +13.0 | -16.0 | +3.0 | +4.4 | +0.0 |



CONTINGENCY HST CAPTURE

SM 94 PDRS CONTROL

- √ PL ID, ITEM 3: 1
- √ INIT ID, ITEM 24: 1

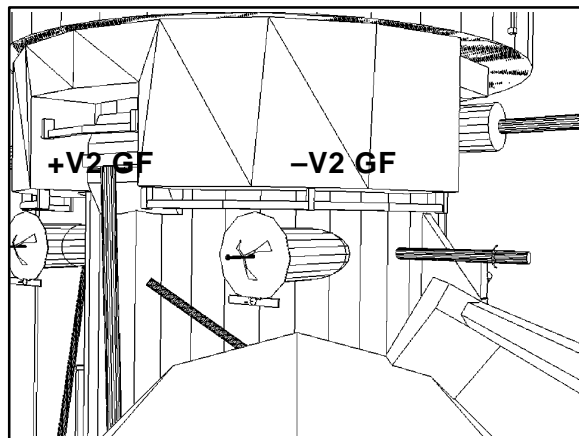
RATE – as reqd (VERN within 10 ft)
BRAKES – OFF (tb-OFF)
MODE – END EFF, ENTER

A6U DAP: FREE

CAUTION
Monitor EE tb timing to prevent
EE motor burnout

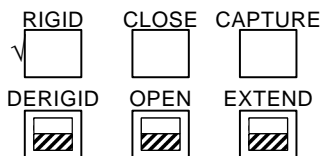
EE MODE – AUTO

Mnvr to +V2 GF grapple envelope



EE CCTV

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

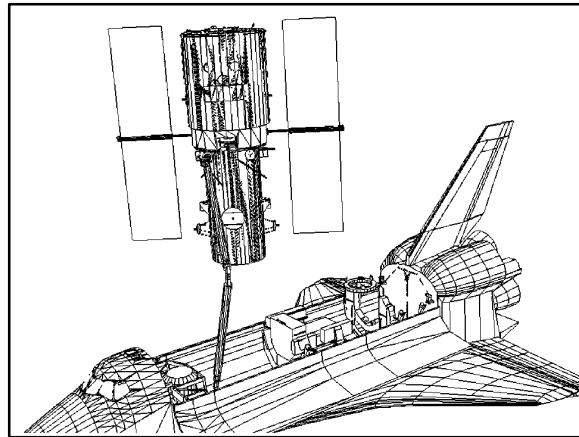
EE MODE – OFF
BRAKES – ON (tb-ON)

Perform HST CAPTURE, step 2 HST TO DRIFT MODE (HST RETRIEVE)

If -V3 HGA deployed, go to -V3 HGA DEPLOYED CONTINGENCY BERTH

RATE – VERN (RATE MIN tb-ON)
BRAKES – OFF (tb-OFF)
MODE – SINGLE, ENTER

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -878 | 112 | -853 | 0 | 305 | 180 | 1 |
| SY | SP | EP | WP | WY | WR | |
| -71.1 | +89.3 | -71.6 | -34.3 | +17.6 | +193.7 | |



Drive WR- to WR = +0.5°

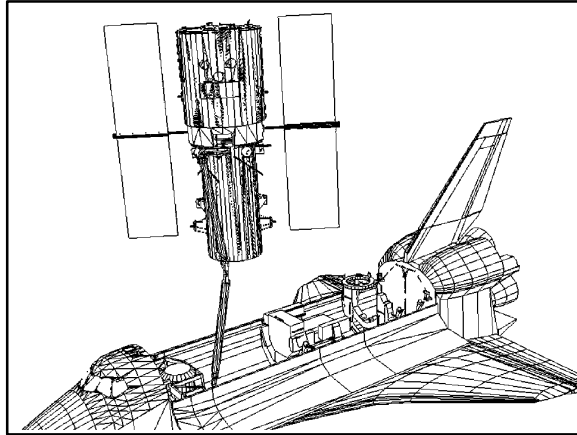
BRAKES – ON (tb-ON)
 MODE – not DIRECT
 JOINT – CRIT TEMP

Go to HST BERTH (HST RETRIEVE)

-V3 HGA DEPLOYED CONTINGENCY BERTH

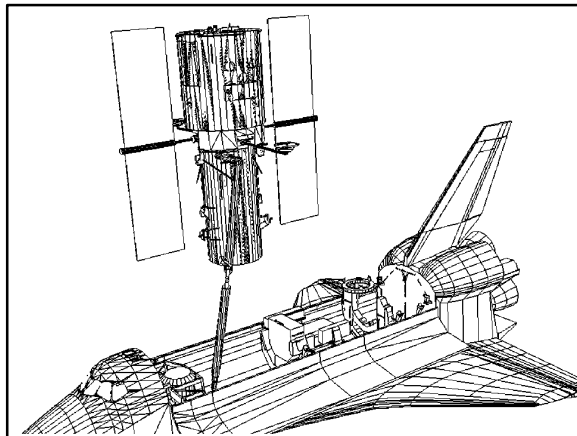
RATE – VERN (RATE MIN tb-ON)
 BRAKES – OFF (tb-OFF)
 MODE – ORB LD, ENTER

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -878 | 112 | -853 | 0 | 305 | 180 | 1 |
| SY | SP | EP | WP | WY | WR | |
| -71.7 | +89.3 | -71.6 | -34.3 | +17.6 | +193.7 | |



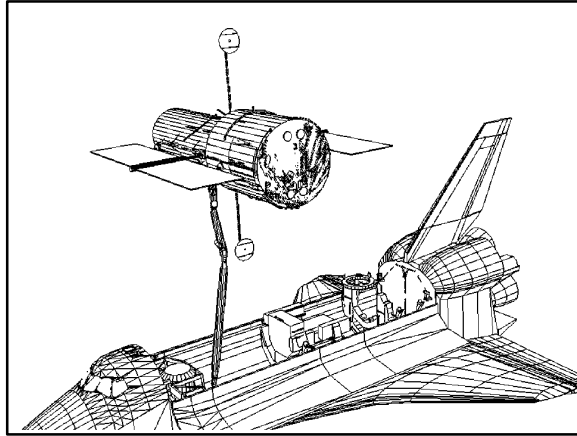
Mnvr to POSN 1:

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|--------|-------|
| -878 | 112 | -853 | 0 | 270 | 180 | 1 |
| SY | SP | EP | WP | WY | WR | |
| -56.4 | +90.8 | -69.2 | -44.6 | -31.5 | -172.5 | |



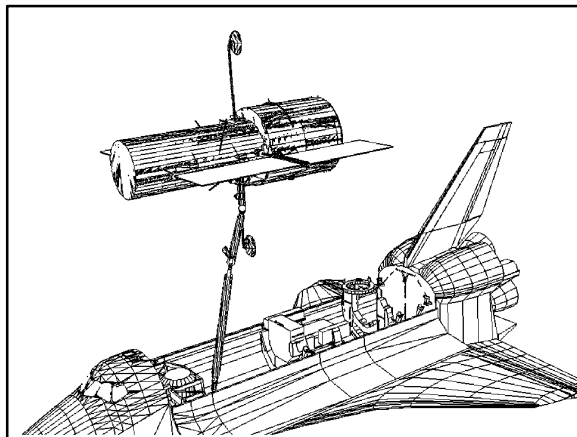
Mnvr to POSN 2:

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|------|--------|-------|
| -878 | 112 | -853 | 90 | 0 | 270 | 1 |
| SY | SP | EP | WP | WY | WR | |
| -63.3 | +76.8 | -91.2 | +86.8 | -8.6 | -134.7 | |



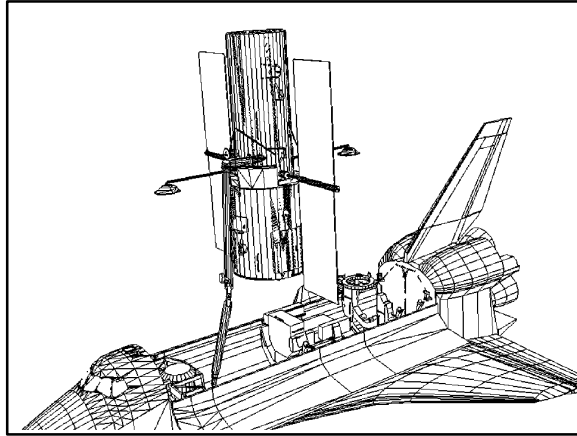
Mnvr to POSN 3:

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-------|-------|-------|-------|-------|-------|
| -878 | 112 | -853 | 90 | 0 | 0 | 1 |
| SY | SP | EP | WP | WY | WR | |
| -52.6 | +80.2 | -92.1 | +86.2 | -11.7 | -34.2 | |



Mnvr to POSN 4:

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|--------|-------|-------|-------|------|-------|
| -900 | 0 | -853 | 0 | 0 | 0 | 1 |
| SY | SP | EP | WP | WY | WR | |
| -63.0 | +103.2 | -79.2 | -24.0 | +63.0 | +0.5 | |



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

Go to HST BERTH (HST RETRIEVE)

This Page Intentionally Blank

OFF-NOMINAL HST DEPLOY OPS

| | |
|----------------------|--------|
| SJ HST GRAPPLE | FS 6-2 |
| UNBERTH | FS 6-8 |

**OFF-NOM
DEPLOY**

SJ HST GRAPPLE

1. MNVR TO SJ PRE-GRAPPLE POSN

SM 94 PDRS CONTROL

√ PL ID, ITEM 3: 0

√ INIT ID, ITEM 24: 0

If SINGLE MODE available:

RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – best available

Mnvr to SJ PRE-GRAPPLE posn:

| | SY | SP | EP | WP | WY | WR | |
|------------|-------|-------|-------|-------|-------|------|-------|
| MFR EXT PK | +28.3 | +78.5 | -85.2 | -73.8 | +17.1 | -9.7 | |
| 1 | -29.3 | | | | | | |
| 2 | | +83.3 | | | | | |
| 3 | | | -79.7 | | | | |
| 4 | | | | -3.6 | | | |
| 5 | | | | | +29.3 | | |
| 6 | | | | | | +0.5 | |
| PRE-GRAP | -29.3 | +83.3 | -79.7 | -3.6 | +29.3 | +0.5 | |
| | X | Y | Z | PITCH | YAW | ROLL | PL ID |
| | -1024 | -46 | -755 | 0 | 0 | 1 | 0 |

BRAKES – ON (tb-ON)

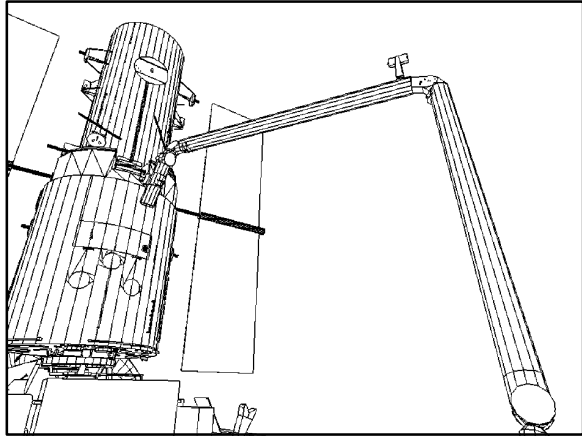
MODE – not DIRECT

JOINT – CRIT TEMP

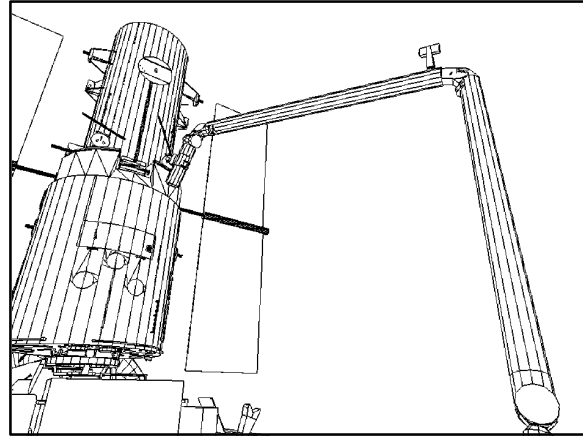
OFF-NOM
DEPLOY

Step 1:
Drive -SY (for 57.6°)

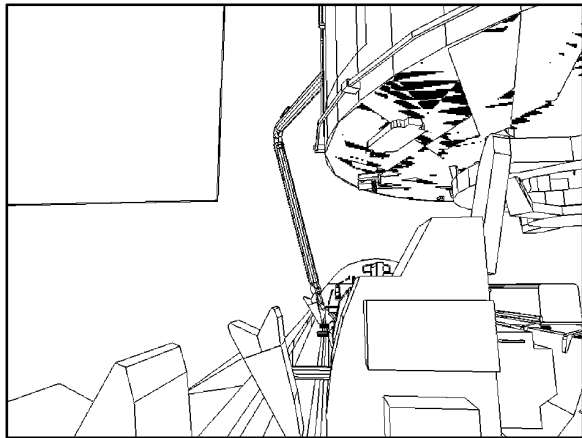
Step 2:
Drive +SP (for 4.8°)



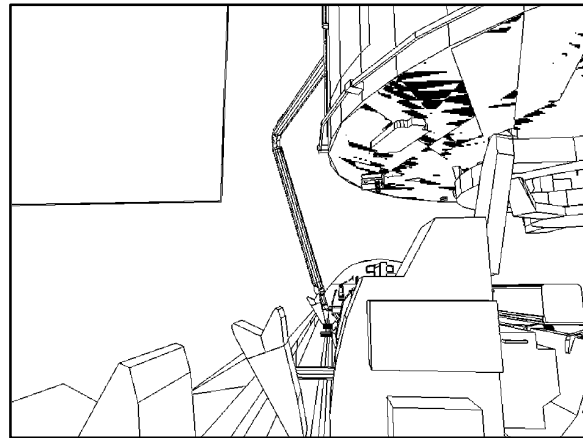
CCTV D (35,25)



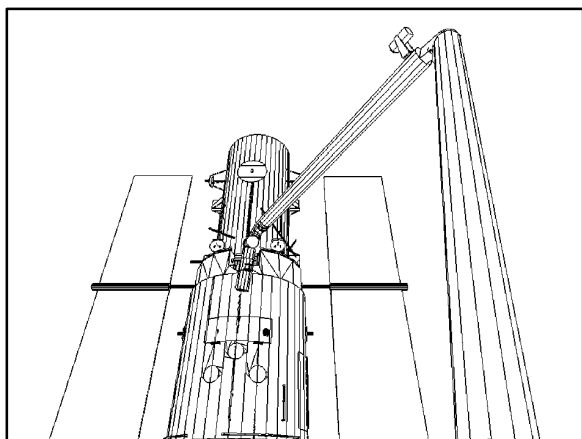
CCTV D (35,25)



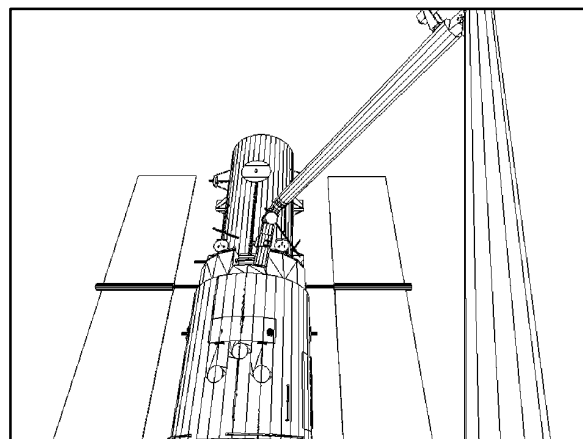
CCTV B (-5,10)



CCTV B (-5,10)

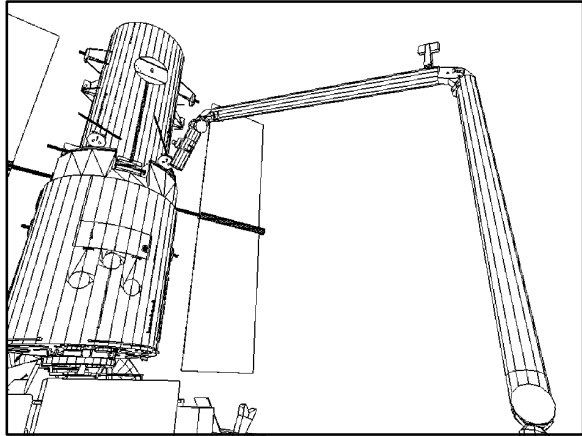


CCTV A (0,35)



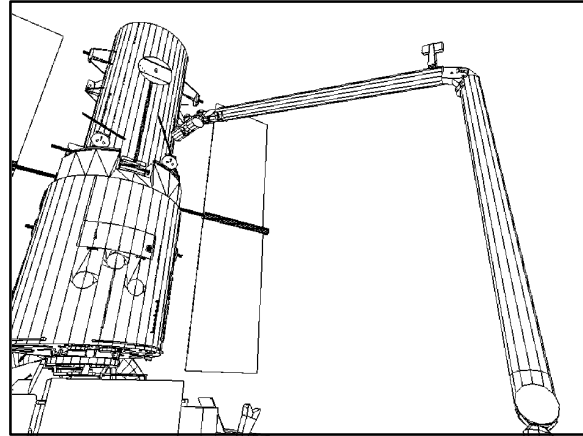
CCTV A (0,35)

Step 3:
Drive +EP (for 5.5°)

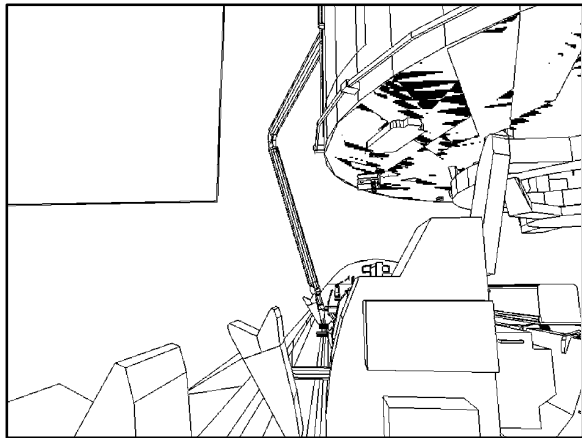


CCTV D (35,25)

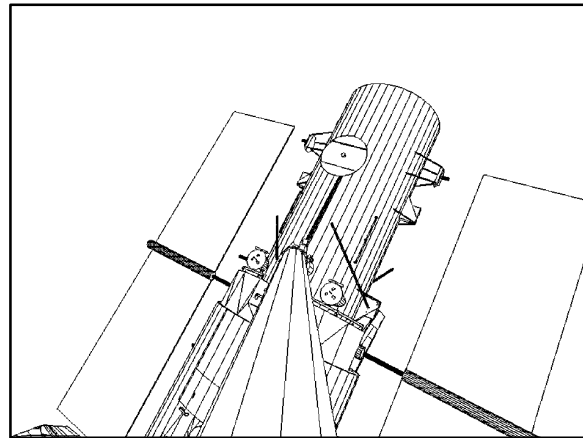
Step 4:
Drive +WP (for 70.2°)



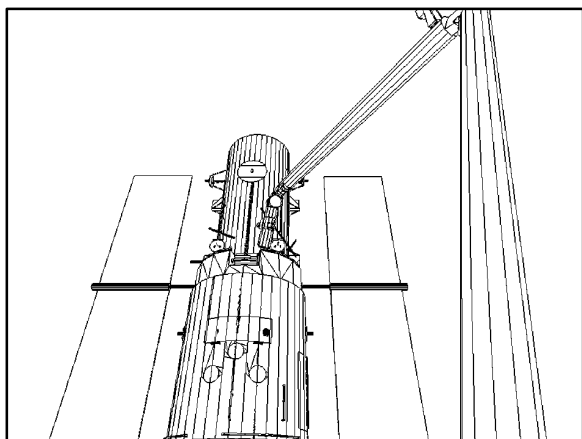
CCTV D (35,25)



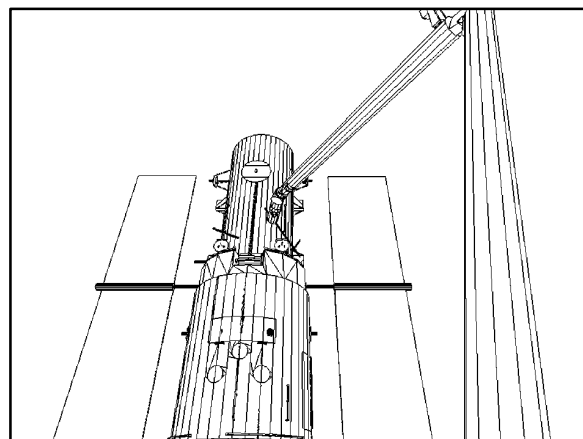
CCTV B (-5,10)



ELBOW (0,0)



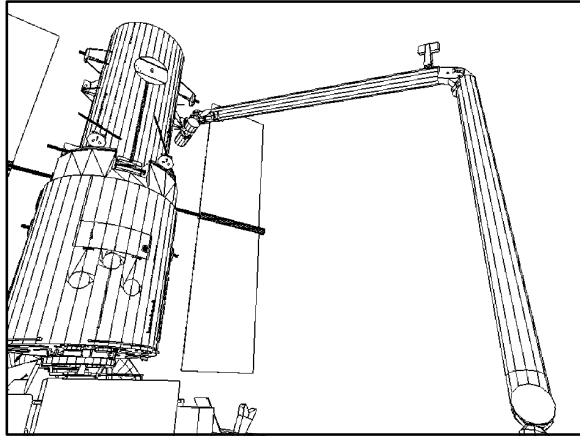
CCTV A (0,35)



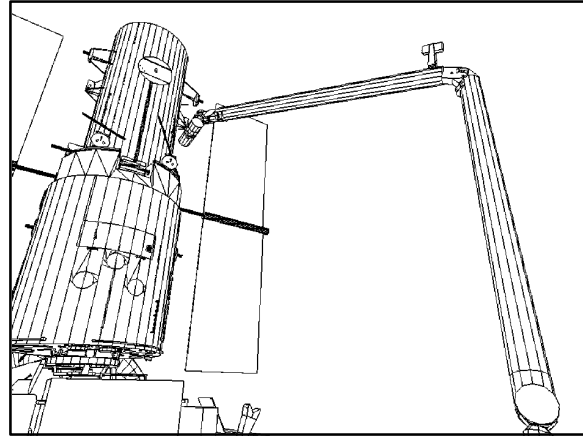
CCTV A (0,35)

Step 5:
Drive +WY (for 12.2°)

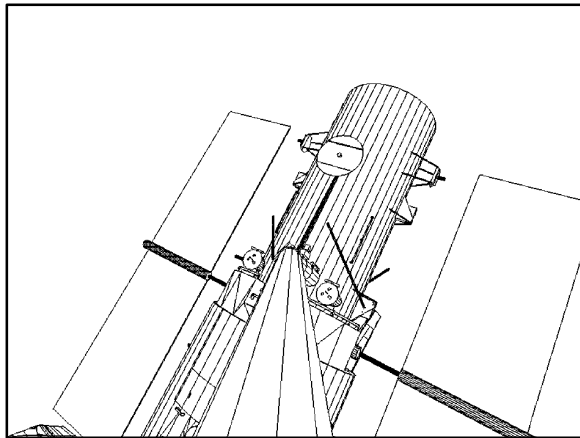
Step 6:
Drive +WR (for 10.2°)



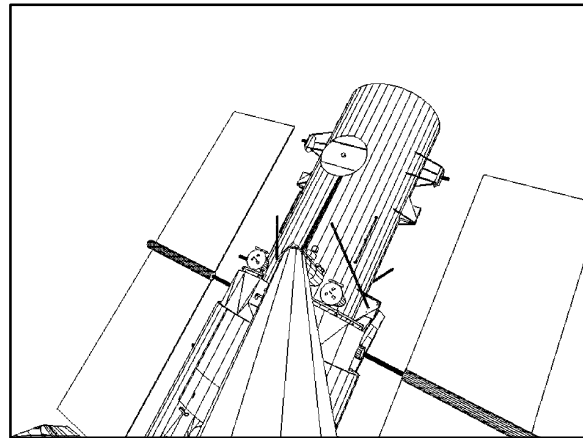
CCTV D (35,25)



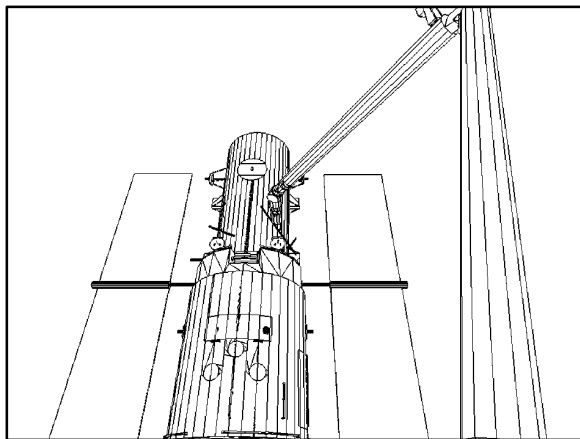
CCTV D (35,25)



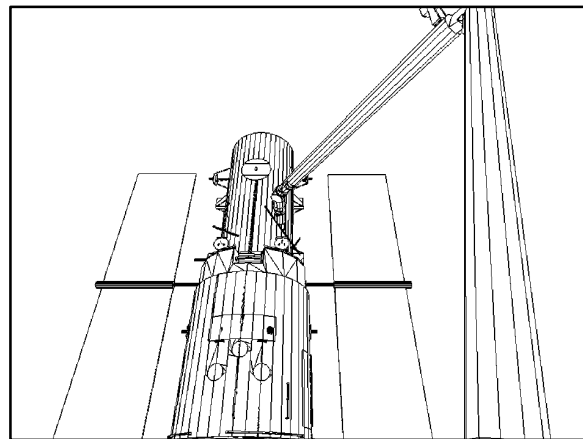
ELBOW (0,0)



ELBOW (0,0)



CCTV A (0,35)



CCTV A (0,35)

A7U 2. SJ HST GRAPPLE
CCTV – config for grapple

√ BERTHED HST GRAPPLE EE CCTV OVERLAY in place

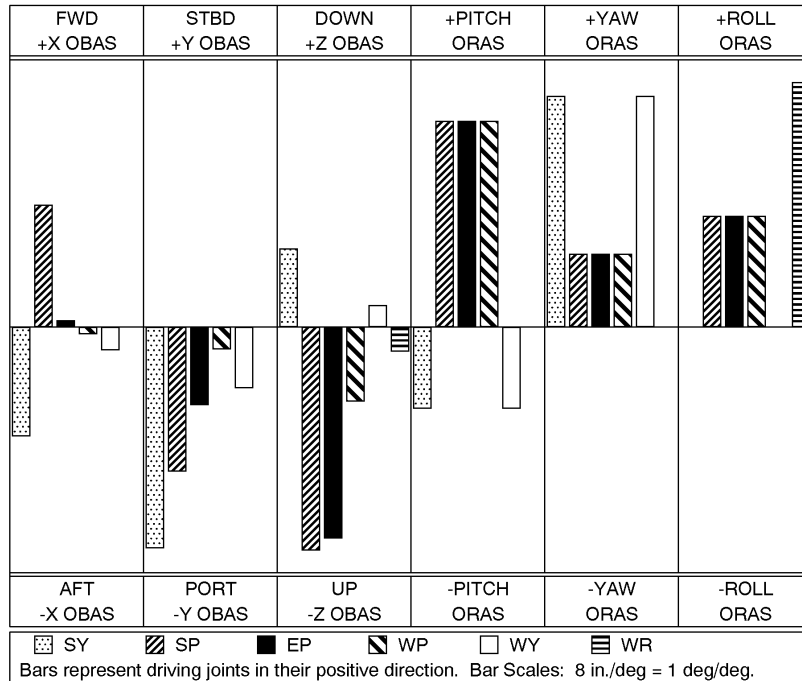
If SINGLE MODE available:

- RATE – as reqd
- BRAKES – OFF (tb-OFF)

MODE – best available

Drive joints in reverse order indicated on BERTHED HST UNGRAPPLE WRIST
CCTV OVERLAY and per SJ mnvr tables until EE within 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 | -13.0 | +16.0 | -3.0 | -4.4 | +0.0 |

A6U DAP: FREE

CAUTION
Monitor EE tb timing to prevent
EE motor burnout

EE MODE – AUTO

EE CAPTURE sw – depress (mom)

√ RIGID CLOSE CAPTURE
 DERIGID OPEN EXTEND

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

DAP: A10/AUTO/VERN(ALT)

| |
|--------------------|
| SM 94 PDRS CONTROL |
|--------------------|

PL ID – ITEM 3 +1 EXEC
INIT ID – ITEM 24 +1 EXEC

L10

VTR Control sw – STDBY
√REC It – off

Go to HST UNBERTH (HST DPY, UNBERTH)

|

SJ HST UNBERTH

1. SJ MNVR TO FSS HOVER POSN
 $\sqrt{\text{HST UNBERTHING FSS CCTV OVERLAY}}$ in place

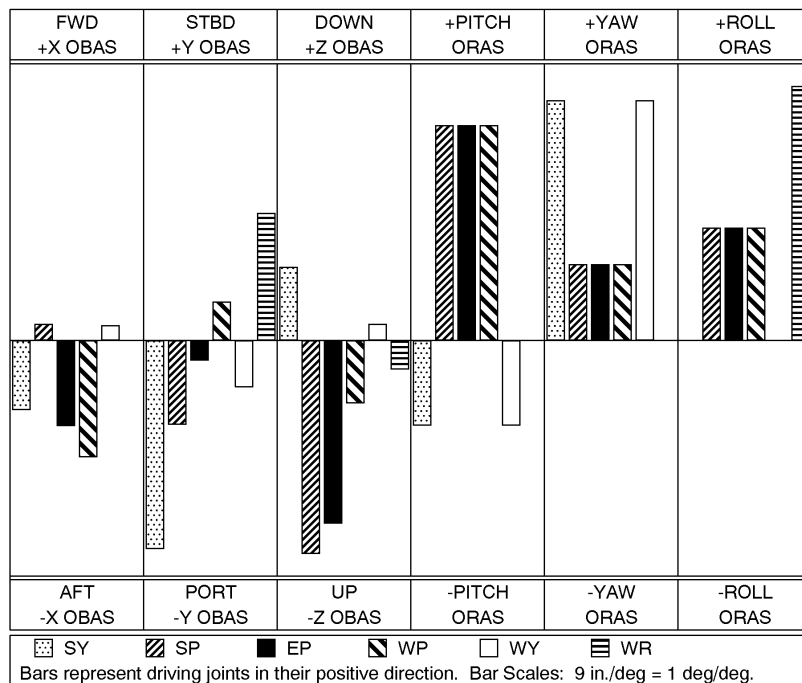
A6U DAP: FREE

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

MODE – best available

Drive joints in reverse order indicated on HST BERTHING FSS CCTV OVERLAY and SJ mnvr tables to obtain desired motion until berthing pins ~5 ft above guides (Z = -816)

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 |
|-------------|-------------|-------------|-------------|-------------|-------------|
| -2.7 | -6.9 | +21.7 | -14.8 | +2.7 | +0.0 |

Mnvr to FSS HOVER posn:

| | | | | | | |
|-------|-------|-------|-------|-------|------|-------|
| X | Y | Z | PITCH | YAW | ROLL | PL ID |
| -1149 | 0 | -816 | 0 | 0 | 0 | 1 |
| SY | SP | EP | WP | WY | WR | |
| -27.6 | +63.4 | -42.0 | -21.3 | +27.6 | +0.5 | |

BRAKES – ON (tb–ON)

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

MODE – not DIRECT

Config DAP A,B to A9,B12

GNC 20 DAP CONFIG

CNTL ACCEL – ITEM 28 +3 EXEC
– ITEM 48 +3 EXEC

DAP: A/AUTO/VERN(ALT)

Perform HST UNBERTH, steps 9–10 (HST DPY, UNBERTH)

2. MNVR TO HST RELEASE POSN

√VTR recording and timer

DAP: FREE

GNC 20 DAP CONFIG

CNTL ACCEL – ITEM 28 +1 EXEC
– ITEM 48 +1 EXEC

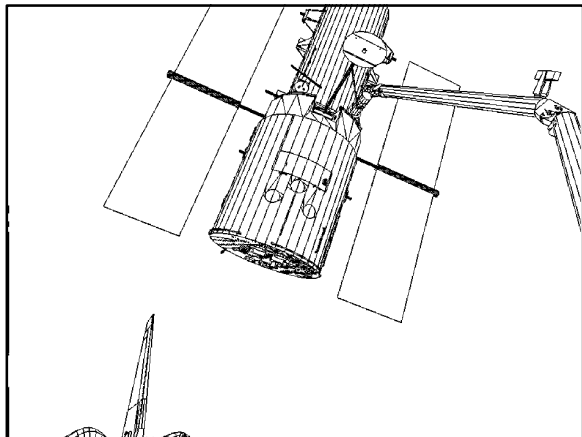
If SINGLE MODE available:
RATE – VERN (RATE MIN tb–ON)
BRAKES – OFF (tb–OFF)

MODE – best available

Mnvr to RELEASE posn:

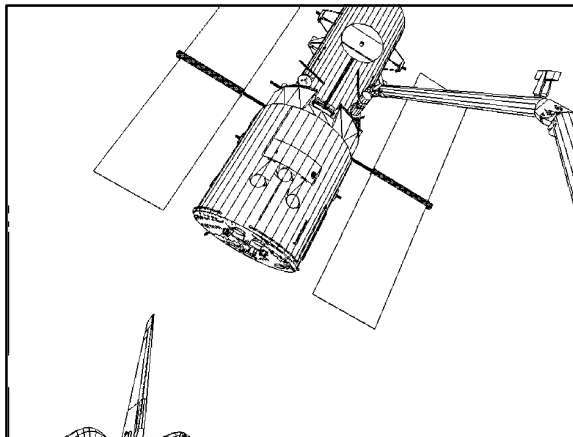
| | | | | | | | |
|-----------|-------|-------|-------|-------|-------|------|-------|
| | SY | SP | EP | WP | WY | WR | |
| FSS Hover | -27.6 | +63.4 | -42.0 | -21.3 | +27.6 | +0.5 | |
| 1 | | +90.0 | | | | | |
| 2 | | | | | | +8.5 | |
| 3 | | | -68.5 | | | | |
| 4 | -53.4 | | | | | | |
| 5 | | | | -37.3 | | | |
| 6 | | | | | 0 | | |
| Release | -53.4 | +90.0 | -68.5 | -37.3 | 0.0 | +8.5 | |
| | X | Y | Z | PITCH | YAW | ROLL | PL ID |
| | -878 | 112 | -853 | 0 | 305 | 0 | 1 |

Step 1:
Drive +SP (for 26.6°)

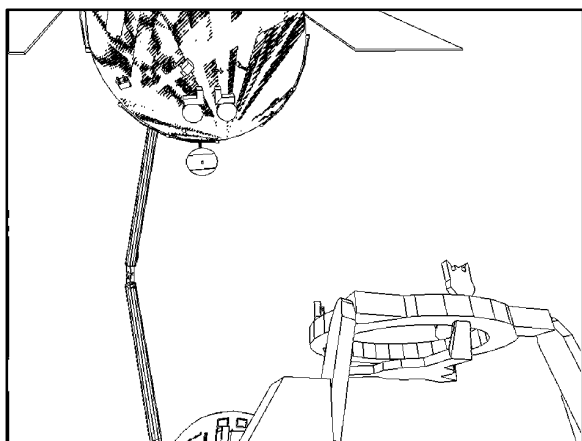


CCTV D (25,35)

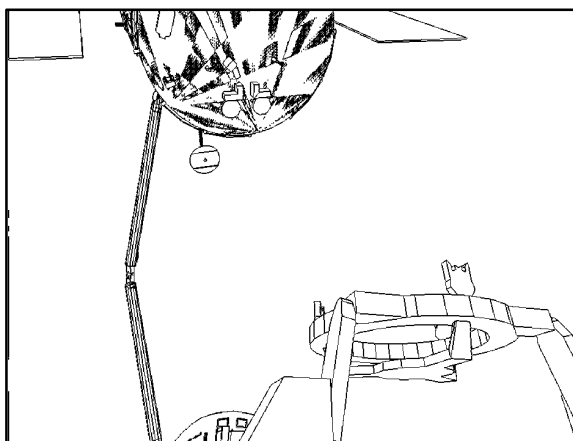
Step 2:
Drive +WR (for 8.0°)



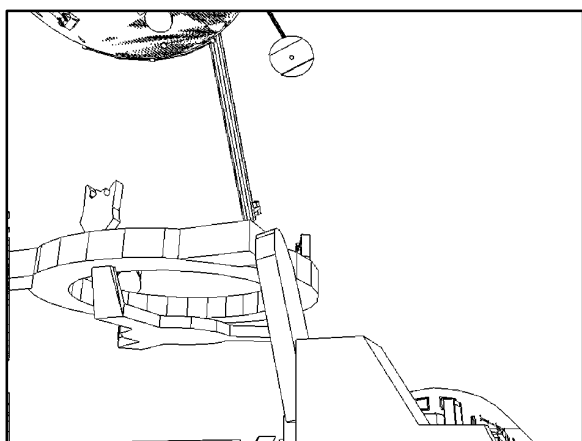
CCTV D (25,35)



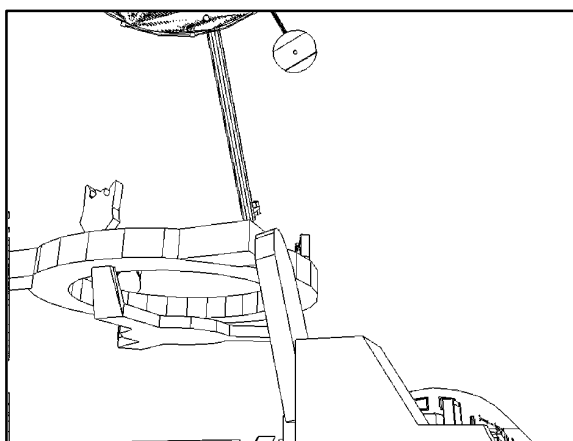
CCTV B (15,30)



CCTV B (15,30)

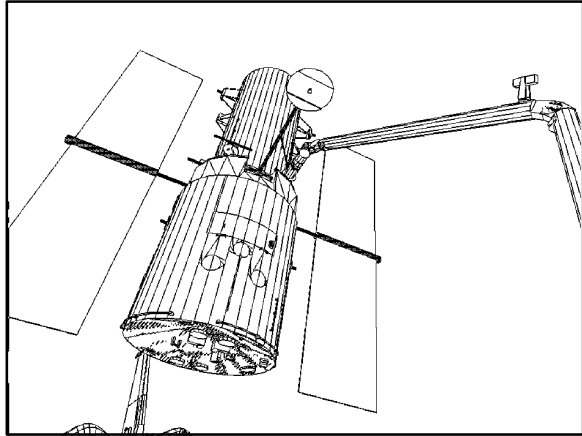


CCTV C (-20,20)



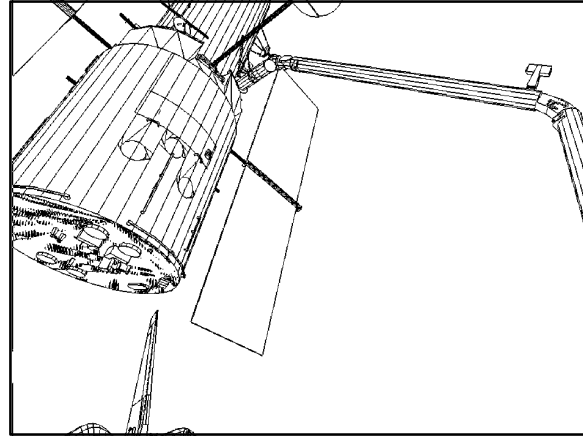
CCTV C (-20,20)

Step 3:
Drive -EP (for 26.5°)

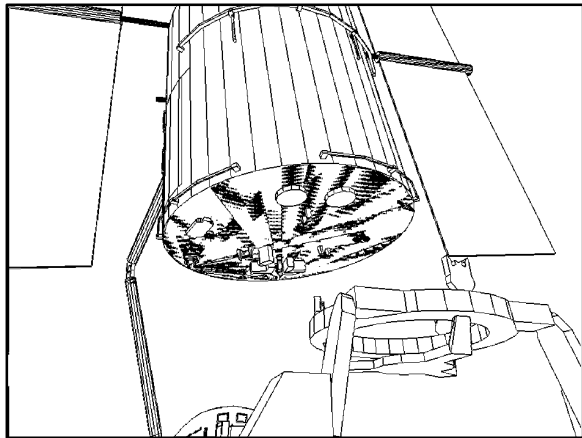


CCTV D (25,35)

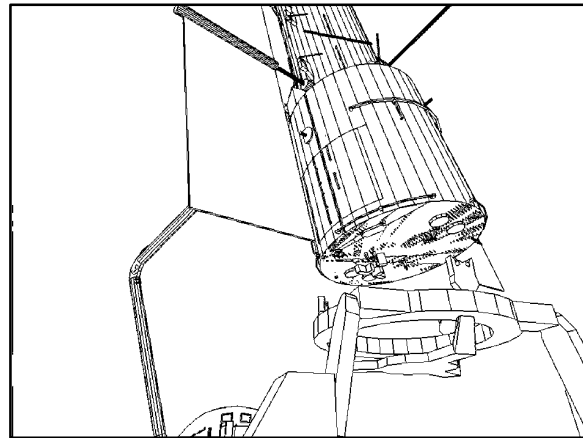
Step 4:
Drive -SY (for 25.8°)



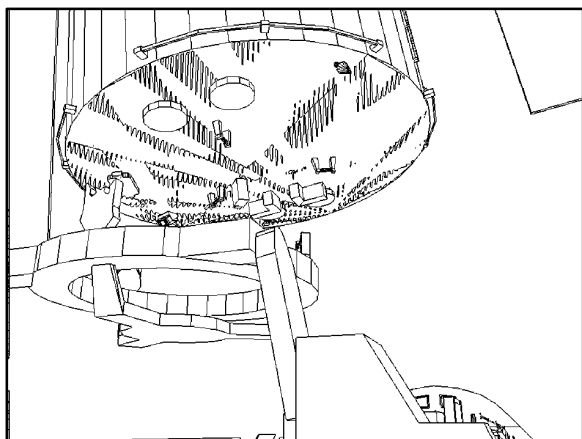
CCTV D (25,35)



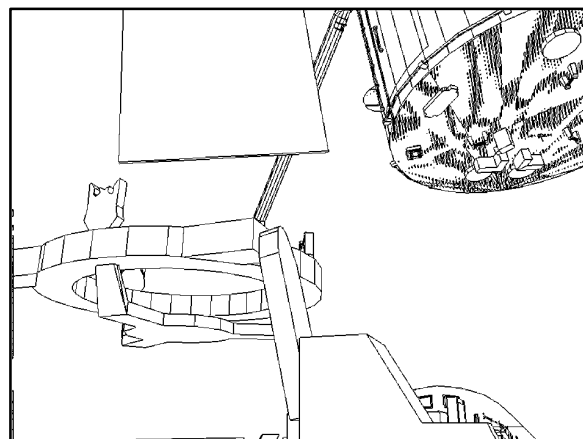
CCTV B (15,30)



CCTV B (15,30)

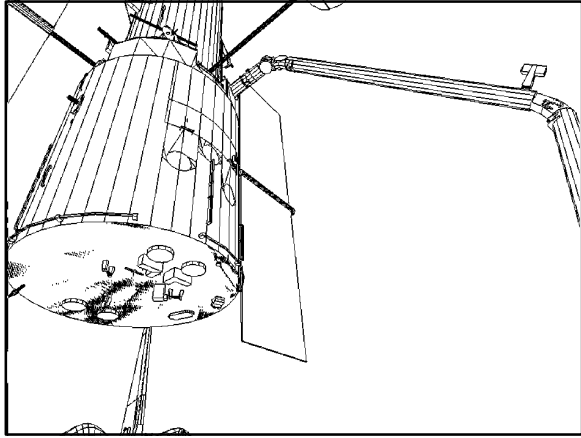


CCTV C (-20,20)



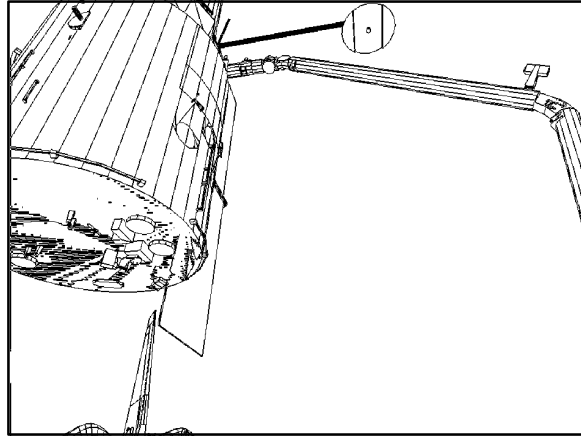
CCTV C (-20,20)

Step 5:
Drive -WP (for 16.0°)

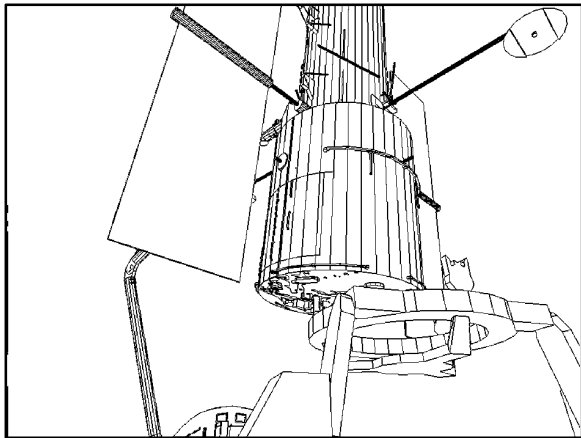


CCTV D (25,35)

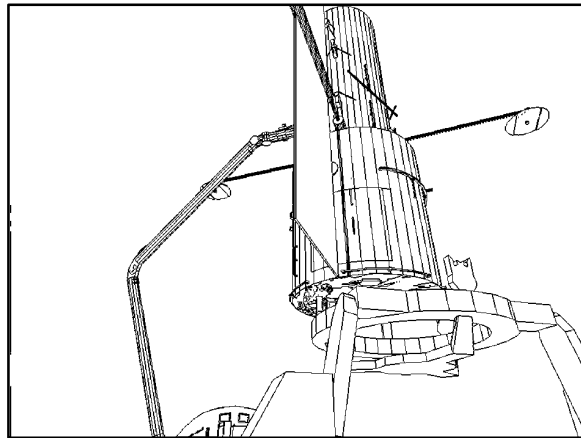
Step 6:
Drive -WY (for 27.6°)



CCTV D (25,35)



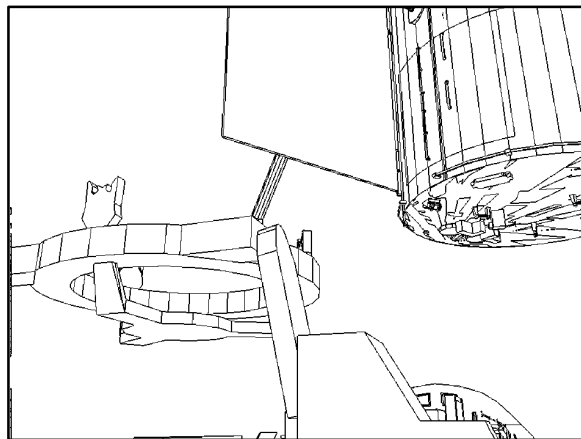
CCTV B (15,30)



CCTV B (15,30)



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

L10

VTR Control sw – STDBY
√REC It – off

Go to HST UNBERTH, step 12 (HST DPY, UNBERTH)

This Page Intentionally Blank

HST EXTENDED PARK

HST EXTENDED PARK FS 7-2

HST EXT PARK

HST EXTENDED PARK

1. SETUP
 A6U √DAP: FREE

GNC 20 DAP CONFIG

CNTL ACCEL – ITEM 28 +2 EXEC (If ALT, ITEM 28 +7 EXEC)
 – ITEM 48 +2 EXEC (If ALT, ITEM 48 +7 EXEC)

A7U CCTV – config as reqd

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 1
 √INIT ID, ITEM 24: 1

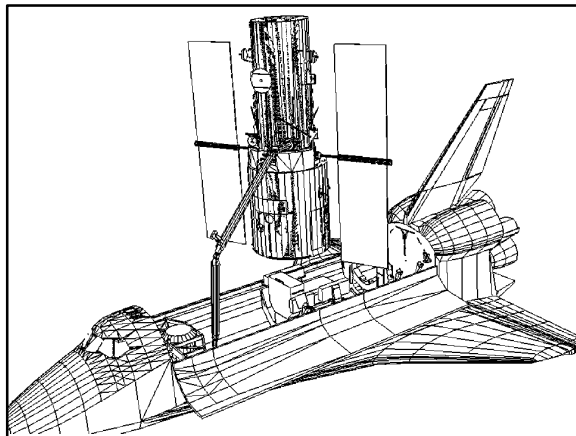
2. MNVR TO EXTENDED PARK
 RATE – VERN (RATE MIN tb–ON)
 BRAKES – OFF (tb–OFF)
 MODE – as desired

Mnvr to EXTENDED PARK:

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|--------|-------|-------|-------|------|-------|
| -961 | 10 | -792 | 0 | 336 | 0 | 1 |
| SY | SP | EP | WP | WY | WR | |
| -36.6 | +102.8 | -88.4 | -22.4 | +13.7 | +4.0 | |

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

A6U DAP: A/AUTO/VERN(ALT)



HST EXT PARK

REFERENCE DATA

| | |
|--|---------|
| JOINT ANGLE VERSUS POR COORDINATES | FS 8-3 |
| POISE FOR CAPTURE | FS 8-3 |
| SJ POISE FOR CAPTURE | FS 8-3 |
| HST CAPTURE/RELEASE | FS 8-3 |
| EXTENDED PARK | FS 8-3 |
| FSS HOVER | FS 8-4 |
| BERTHED | FS 8-4 |
| BERTHED HST PRE-GRAPPLE | FS 8-4 |
| MFR PRE-GRAPPLE/RELEASE | FS 8-4 |
| AIRLOCK INGRESS/EGRESS | FS 8-5 |
| SWAP | FS 8-5 |
| RMS/MFR EXTENDED PARK | FS 8-5 |
| BAPS SUPPORT POST | FS 8-5 |
| COPE - HEAD AFT | FS 8-6 |
| -V3 AFT SHROUD | FS 8-6 |
| RSU 1 CHANGEOUT (-V3 FWD) | FS 8-6 |
| HST BAY 3 (-V3 FWD) | FS 8-6 |
| 2 (-V3 FWD) | FS 8-7 |
| 1 (-V2 FWD) | FS 8-7 |
| LOPE | FS 8-7 |
| NPE - HEAD AFT | FS 8-7 |
| ORUC FWD FIXTURE | FS 8-8 |
| FSS HST PFR | FS 8-8 |
| FR11 PFR (+V3 FWD) | FS 8-8 |
| +V3 FGS WORKSITE | FS 8-8 |
| ORUC AFT FIXTURE | FS 8-9 |
| FSIPE | FS 8-9 |
| FGS-2R PREINSTALL | FS 8-9 |
| BAY 13 HST PFR | FS 8-9 |
| HST BAY C (+V3 FWD) | FS 8-10 |
| 5 - DOOR/SSR (+V3 FWD) | FS 8-10 |
| - SSAT (+V3 FWD) | FS 8-10 |
| COPE - HEAD PORT | FS 8-10 |
| NPE - HEAD PORT | FS 8-11 |
| HST BAY 6 (+V3 FWD) | FS 8-11 |
| 7 (+V3 FWD) | FS 8-11 |
| 8 (+V3 FWD) | FS 8-11 |
| 10 (+V3 FWD) | FS 8-12 |
| NPE - HEAD STARBOARD | FS 8-12 |
| HST BAY 9 (+V3 FWD) | FS 8-12 |
| SAFETY TETHER TRANSFER | FS 8-12 |
| ASIPE - SSRF | FS 8-13 |
| SSRF #5 | FS 8-13 |
| 6 | FS 8-13 |
| 7 | FS 8-13 |
| 1 | FS 8-14 |
| 2 | FS 8-14 |
| 3 | FS 8-14 |
| 4 | FS 8-14 |
| ASIPE - HEAD PORT | FS 8-15 |
| +V2 ASLR | FS 8-15 |
| ASIPE - HEAD STARBOARD | FS 8-15 |
| FORWARD | FS 8-15 |

REF DATA

| | |
|--------------------------------------|---------|
| PL ID/POR DEFINITION – PL ID 1 | FS 8–16 |
| – PL ID 2 | FS 8–17 |
| – PL ID 3 | FS 8–18 |
| – PL ID 4 | FS 8–19 |
| – PL ID 5 | FS 8–20 |
| RMS AND PL DAP CONSTRAINTS | FS 8–21 |
| HST DAP CONFIGURATION TABLES | FS 8–22 |
| RMS GO/NO–GO CRITERIA | FS 8–23 |

REF DATA

JOINT ANGLE VERSUS POR COORDINATES

POISE FOR CAPTURE

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|-------|-------|
| -12.7 | +92.7 | -54.4 | -96.4 | -66.9 | -35.9 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|------|------|-------|-----|------|-------|
| -892 | -144 | -850 | 0 | 270 | 0 | 0 |
| -846 | -79 | -850 | 0 | 270 | 0 | 1 |
| -834 | -100 | -592 | 0 | 270 | 0 | 2 |

*Display Singularity

SJ POISE FOR CAPTURE

| SY | SP | EP | WP | WY | WR |
|-------|--------|-------|-------|-----|-----|
| -53.4 | +101.0 | -75.0 | -41.8 | 0.0 | 8.5 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|-----|------|-------|-----|------|-------|
| -844 | -17 | -853 | 0 | 305 | 1 | 0 |
| -844 | 63 | -853 | 0 | 305 | 0 | 1 |
| -822 | 53 | -595 | 0 | 305 | 0 | 2 |

HST CAPTURE/RELEASE

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|-----|------|
| -53.4 | +90.0 | -68.5 | -37.3 | 0.0 | +8.5 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|-----|------|-------|-----|------|-------|
| -878 | 32 | -853 | 0 | 305 | 1 | 0 |
| -878 | 112 | -853 | 0 | 305 | 0 | 1 |
| -856 | 101 | -595 | 0 | 305 | 0 | 2 |

HST EXTENDED PARK

| SY | SP | EP | WP | WY | WR |
|-------|--------|-------|-------|-------|------|
| -36.6 | +102.8 | -88.4 | -22.4 | +13.7 | +4.0 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|-----|------|-------|-----|------|-------|
| -920 | -59 | -792 | 0 | 336 | 1 | 0 |
| -961 | 10 | -792 | 0 | 336 | 0 | 1 |
| -936 | 13 | -534 | 0 | 336 | 0 | 2 |

FSS HOVER

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|-------|------|
| -27.6 | +63.4 | -42.0 | -21.3 | +27.6 | +0.5 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-----|------|-------|-----|------|-------|
| -1083 | -46 | -815 | 0 | 0 | 1 | 0 |
| -1149 | 0 | -816 | 0 | 0 | 0 | 1 |
| -1128 | 12 | -557 | 0 | 0 | 0 | 2 |

FSS BERTHED

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|------|-------|------|
| -24.9 | +70.3 | -63.8 | -6.5 | +24.9 | +0.5 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-----|------|-------|-----|------|-------|
| -1084 | -46 | -755 | 0 | 0 | 1 | 0 |
| -1149 | 0 | -755 | 0 | 0 | 0 | 1 |
| -1127 | 12 | -497 | 0 | 0 | 0 | 2 |

BERTHED HST PRE-GRAPPLE

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|------|-------|------|
| -29.3 | +83.3 | -79.7 | -3.6 | +29.3 | +0.5 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-----|------|-------|-----|------|-------|
| -1024 | -46 | -755 | 0 | 0 | 1 | 0 |
| -1089 | 0 | -755 | 0 | 0 | 0 | 1 |
| -1067 | 12 | -497 | 0 | 0 | 0 | 2 |

MFR PRE-GRAPPLE/RELEASE

| SY | SP | EP | WP | WY | WR |
|------|-------|-------|-------|-------|--------|
| -4.2 | +52.5 | -71.6 | -72.4 | +19.4 | +114.9 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|------|------|-------|-----|------|-------|
| -1100 | -110 | -486 | 270 | 0 | 91 | 0 |
| -1101 | -50 | -464 | 270 | 0 | 270 | 3 |
| -1100 | -102 | -464 | 270 | 0 | 270 | 4 |
| -1101 | -50 | -446 | 270 | 0 | 270 | 5 |

MFR AIRLOCK INGRESS/EGRESS

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|------|
| -67.1 | +91.8 | -140.4 | -88.6 | +17.2 | +4.7 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|-----|------|-------|-----|------|-------|
| -747 | 3 | -482 | 270 | 30 | 271 | 0 |
| -747 | -60 | -493 | 270 | 30 | 90 | 3 |
| -747 | -15 | -467 | 270 | 30 | 90 | 4 |
| -747 | -69 | -477 | 270 | 30 | 90 | 5 |

MFR SWAP

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|--------|
| +25.7 | +92.4 | -132.7 | -31.2 | -72.3 | -240.6 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|------|------|-------|-----|------|-------|
| -903 | -168 | -469 | 0 | 300 | 181 | 0 |
| -914 | -149 | -529 | 0 | 300 | 0 | 3 |
| -914 | -149 | -477 | 0 | 300 | 0 | 4 |
| -923 | -133 | -529 | 0 | 300 | 0 | 5 |

RMS/MFR EXTENDED PARK

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|-------|------|
| +28.3 | +78.5 | -85.2 | -73.8 | +17.1 | -9.7 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|------|------|-------|-----|------|-------|
| -975 | -325 | -525 | 270 | 0 | 1 | 0 |
| -915 | -325 | -503 | 270 | 0 | 180 | 3 |
| -967 | -325 | -503 | 270 | 0 | 180 | 4 |
| -915 | -325 | -485 | 270 | 0 | 180 | 5 |

BAPS SUPPORT POST

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|-------|--------|
| +12.4 | +55.9 | -93.8 | +25.2 | -40.3 | -270.3 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|------|------|-------|-----|------|-------|
| -1105 | -170 | -450 | 0 | 330 | 95 | 0 |
| -1094 | -107 | -455 | 0 | 330 | 275 | 3 |
| -1120 | -152 | -450 | 0 | 330 | 275 | 4 |
| -1110 | -98 | -455 | 0 | 330 | 275 | 5 |

COPE – HEAD AFT

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|------|--------|
| -35.3 | +63.6 | -93.8 | -87.2 | +3.3 | -120.5 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|----|------|-------|-----|------|-------|
| -948 | 60 | -527 | 250 | 0 | 180 | 0 |
| -997 | 60 | -487 | 250 | 0 | 0 | 3 |
| -948 | 60 | -504 | 250 | 0 | 0 | 4 |
| -990 | 60 | -469 | 250 | 0 | 0 | 5 |

-V3 AFT SHROUD

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|--------|
| -29.5 | +77.3 | -120.7 | +20.5 | +34.2 | -167.3 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|---|------|-------|-----|------|-------|
| -979 | 7 | -519 | 340 | 0 | 181 | 0 |
| -1020 | 7 | -568 | 340 | 0 | 0 | 3 |
| -1002 | 7 | -519 | 340 | 0 | 0 | 4 |
| -1037 | 7 | -562 | 340 | 0 | 0 | 5 |

RSU 1 CHANGEOUT (-V3 FWD)

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|--------|
| -32.8 | +84.7 | -110.4 | -46.4 | +30.9 | -137.4 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|---|------|-------|-----|------|-------|
| -949 | 0 | -559 | 300 | 0 | 181 | 0 |
| -1012 | 0 | -570 | 300 | 0 | 0 | 3 |
| -967 | 0 | -544 | 300 | 0 | 0 | 4 |
| -1021 | 0 | -554 | 300 | 0 | 0 | 5 |

HST BAY 3 (-V3 FWD)

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|--------|
| -24.8 | +87.4 | -115.2 | +16.6 | +17.6 | -174.7 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-----|------|-------|-----|------|-------|
| -992 | -27 | -593 | 352 | 350 | 180 | 0 |
| -1021 | -23 | -649 | 352 | 350 | 0 | 3 |
| -1014 | -23 | -598 | 352 | 350 | 0 | 4 |
| -1039 | -20 | -647 | 352 | 350 | 0 | 5 |

HST BAY 2 (-V3 FWD)

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|--------|
| -36.1 | +76.9 | -109.2 | +26.2 | +48.1 | -176.0 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|----|------|-------|-----|------|-------|
| -992 | 27 | -592 | 352 | 10 | 181 | 0 |
| -1021 | 23 | -648 | 352 | 10 | 0 | 3 |
| -1014 | 23 | -597 | 352 | 10 | 0 | 4 |
| -1039 | 20 | -646 | 352 | 10 | 0 | 5 |

HST BAY 1 (-V2 FWD)

| SY | SP | EP | WP | WY | WR |
|------|-------|-------|------|-------|--------|
| -1.0 | +80.0 | -97.5 | -0.7 | -40.9 | -186.2 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|------|------|-------|-----|------|-------|
| -1053 | -117 | -600 | 0 | 315 | 181 | 0 |
| -1068 | -102 | -660 | 0 | 315 | 0 | 3 |
| -1068 | -102 | -608 | 0 | 315 | 0 | 4 |
| -1081 | -89 | -660 | 0 | 315 | 0 | 5 |

LOPE

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|------|--------|
| -41.2 | +70.9 | -102.4 | -86.2 | +0.6 | -115.2 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|----|------|-------|-----|------|-------|
| -901 | 64 | -537 | 250 | 0 | 181 | 0 |
| -950 | 64 | -496 | 250 | 0 | 0 | 3 |
| -901 | 64 | -514 | 250 | 0 | 0 | 4 |
| -943 | 64 | -479 | 250 | 0 | 0 | 5 |

NPE - HEAD AFT

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|--------|
| -18.6 | +84.1 | -108.7 | -91.0 | +10.9 | -135.5 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|-----|------|-------|-----|------|-------|
| -925 | -65 | -537 | 250 | 0 | 180 | 0 |
| -974 | -65 | -496 | 250 | 0 | 0 | 3 |
| -925 | -65 | -514 | 250 | 0 | 0 | 4 |
| -968 | -65 | -479 | 250 | 0 | 0 | 5 |

ORUC FWD FIXTURE

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|--------|
| -18.7 | +95.5 | -120.2 | -90.9 | +10.8 | -135.3 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|-----|------|-------|-----|------|-------|
| -877 | -80 | -533 | 250 | 0 | 181 | 0 |
| -926 | -80 | -492 | 250 | 0 | 0 | 3 |
| -877 | -80 | -510 | 250 | 0 | 0 | 4 |
| -920 | -80 | -475 | 250 | 0 | 0 | 5 |

FSS HST PFR

| SY | SP | EP | WP | WY | WR |
|------|-------|-------|-------|-------|--------|
| -6.3 | +66.0 | -83.0 | -95.9 | +15.9 | -146.9 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|------|------|-------|-----|------|-------|
| -1026 | -115 | -533 | 250 | 0 | 181 | 0 |
| -1075 | -115 | -492 | 250 | 0 | 0 | 3 |
| -1026 | -115 | -509 | 250 | 0 | 0 | 4 |
| -1069 | -115 | -475 | 250 | 0 | 0 | 5 |

FR11 PFR (+V3 FWD)

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|-------|--------|
| -40.2 | +61.4 | -99.9 | +12.9 | +64.0 | -162.2 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|----|------|-------|-----|------|-------|
| -1006 | 80 | -544 | 340 | 20 | 181 | 0 |
| -1046 | 72 | -593 | 340 | 20 | 0 | 3 |
| -1028 | 72 | -544 | 340 | 20 | 0 | 4 |
| -1062 | 66 | -587 | 340 | 20 | 0 | 5 |

+V3 FGS WORKSITE

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|------|-------|--------|
| -32.0 | +84.9 | -114.9 | +6.4 | +36.5 | -166.0 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|---|------|-------|-----|------|-------|
| -977 | 0 | -579 | 340 | 0 | 181 | 0 |
| -1018 | 0 | -628 | 340 | 0 | 0 | 3 |
| -1000 | 0 | -579 | 340 | 0 | 0 | 4 |
| -1035 | 0 | -622 | 340 | 0 | 0 | 5 |

ORUC AFT FIXTURE

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|------|-------|
| -21.7 | +69.5 | -81.4 | -77.9 | -0.5 | -48.7 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-----|------|-------|-----|------|-------|
| -1020 | -16 | -592 | 270 | 340 | 270 | 0 |
| -1021 | -64 | -551 | 270 | 340 | 90 | 3 |
| -1020 | -16 | -568 | 270 | 340 | 90 | 4 |
| -1021 | -58 | -533 | 270 | 340 | 90 | 5 |

ORUC FSIPE

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|--------|
| -42.2 | +95.8 | -126.8 | -64.7 | +21.1 | -118.4 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|---|------|-------|-----|------|-------|
| -852 | 0 | -528 | 280 | 0 | 181 | 0 |
| -915 | 0 | -517 | 280 | 0 | 0 | 3 |
| -864 | 0 | -508 | 280 | 0 | 0 | 4 |
| -918 | 0 | -499 | 280 | 0 | 0 | 5 |

FGS-2R PREINSTALL

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|------|-------|--------|
| -41.7 | +98.3 | -128.0 | +2.4 | +45.2 | -160.5 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|---|------|-------|-----|------|-------|
| -904 | 0 | -579 | 340 | 0 | 181 | 0 |
| -945 | 0 | -628 | 340 | 0 | 0 | 3 |
| -927 | 0 | -579 | 340 | 0 | 0 | 4 |
| -962 | 0 | -622 | 340 | 0 | 0 | 5 |

BAY 13 HST PFR

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|------|-------|--------|
| +10.3 | +28.1 | -37.1 | +9.0 | -10.3 | -269.5 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|------|------|-------|-----|------|-------|
| -1245 | -220 | -485 | 0 | 0 | 91 | 0 |
| -1267 | -160 | -485 | 0 | 0 | 270 | 3 |
| -1267 | -212 | -485 | 0 | 0 | 270 | 4 |
| -1285 | -160 | -485 | 0 | 0 | 270 | 5 |

HST BAY C (+V3 FWD)

| SY | SP | EP | WP | WY | WR |
|------|-------|-------|-------|-------|--------|
| -2.6 | +42.0 | -38.7 | -15.6 | -24.9 | -192.3 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|------|------|-------|-----|------|-------|
| -1213 | -120 | -622 | 358 | 330 | 170 | 0 |
| -1228 | -99 | -680 | 358 | 330 | 349 | 3 |
| -1231 | -108 | -629 | 358 | 330 | 349 | 4 |
| -1244 | -90 | -680 | 358 | 330 | 349 | 5 |

HST BAY 5 – DOOR/SSR (+V3 FWD)

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|-------|--------|
| -37.8 | +44.7 | -66.9 | +18.9 | +28.5 | -157.4 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-----|------|-------|-----|------|-------|
| -1098 | 144 | -607 | 0 | 350 | 201 | 0 |
| -1123 | 127 | -663 | 0 | 350 | 20 | 3 |
| -1120 | 144 | -614 | 0 | 350 | 20 | 4 |
| -1141 | 130 | -663 | 0 | 350 | 20 | 5 |

HST BAY 5 – SSAT (+V3 FWD)

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|-------|--------|
| -36.0 | +46.6 | -68.8 | +15.4 | +17.0 | -176.4 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-----|------|-------|-----|------|-------|
| -1100 | 137 | -606 | 0 | 340 | 181 | 0 |
| -1120 | 145 | -666 | 0 | 340 | 0 | 3 |
| -1120 | 145 | -614 | 0 | 340 | 0 | 4 |
| -1137 | 151 | -666 | 0 | 340 | 0 | 5 |

COPE – HEAD PORT

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|-------|
| -43.5 | +54.6 | -110.5 | +55.8 | +43.5 | -79.5 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-----|------|-------|-----|------|-------|
| -974 | 114 | -496 | 0 | 0 | 280 | 0 |
| -996 | 55 | -486 | 0 | 0 | 100 | 3 |
| -996 | 106 | -495 | 0 | 0 | 100 | 4 |
| -1014 | 55 | -486 | 0 | 0 | 100 | 5 |

NPE – HEAD PORT

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|-------|
| -31.8 | +77.8 | -134.7 | +56.8 | +31.8 | -89.5 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|-----|------|-------|-----|------|-------|
| -934 | 3 | -499 | 0 | 0 | 270 | 0 |
| -956 | -57 | -499 | 0 | 0 | 90 | 3 |
| -956 | -5 | -499 | 0 | 0 | 90 | 4 |
| -974 | -57 | -499 | 0 | 0 | 90 | 5 |

HST BAY 6 (+V3 FWD)

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|-------|--------|
| -31.8 | +65.7 | -92.7 | +13.2 | -11.2 | -166.8 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-----|------|-------|-----|------|-------|
| -1039 | 85 | -606 | 0 | 315 | 191 | 0 |
| -1062 | 93 | -666 | 0 | 315 | 10 | 3 |
| -1056 | 99 | -614 | 0 | 315 | 10 | 4 |
| -1075 | 106 | -666 | 0 | 315 | 10 | 5 |

HST BAY 7 (+V3 FWD)

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|--------|
| -37.9 | +75.9 | -103.8 | +17.0 | +45.5 | -172.6 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|----|------|-------|-----|------|-------|
| -997 | 42 | -611 | 350 | 5 | 181 | 0 |
| -1029 | 40 | -666 | 350 | 5 | 0 | 3 |
| -1020 | 40 | -615 | 350 | 5 | 0 | 4 |
| -1047 | 38 | -663 | 350 | 5 | 0 | 5 |

HST BAY 8 (+V3 FWD)

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|--------|
| -24.8 | +88.7 | -111.7 | +11.1 | +22.9 | -174.2 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-----|------|-------|-----|------|-------|
| -995 | -37 | -611 | 350 | 355 | 181 | 0 |
| -1027 | -36 | -667 | 350 | 355 | 0 | 3 |
| -1018 | -36 | -615 | 350 | 355 | 0 | 4 |
| -1045 | -34 | -663 | 350 | 355 | 0 | 5 |

HST BAY 10 (+V3 FWD)

| SY | SP | EP | WP | WY | WR |
|------|-------|-------|-------|-------|--------|
| -4.0 | +72.8 | -90.0 | +20.7 | +13.4 | -200.0 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|------|------|-------|-----|------|-------|
| -1099 | -148 | -607 | 0 | 10 | 161 | 0 |
| -1124 | -132 | -663 | 0 | 10 | 340 | 3 |
| -1121 | -149 | -614 | 0 | 10 | 340 | 4 |
| -1142 | -135 | -663 | 0 | 10 | 340 | 5 |

NPE – HEAD STARBOARD

| SY | SP | EP | WP | WY | WR |
|------|-------|--------|-------|------|--------|
| -2.0 | +95.4 | -141.1 | +45.6 | +2.0 | -269.5 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|------|------|-------|-----|------|-------|
| -934 | -120 | -500 | 0 | 0 | 91 | 0 |
| -956 | -60 | -499 | 0 | 0 | 270 | 3 |
| -956 | -112 | -499 | 0 | 0 | 270 | 4 |
| -974 | -60 | -499 | 0 | 0 | 270 | 5 |

HST BAY 9 (+V3 FWD)

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|--------|
| -19.5 | +74.8 | -101.0 | +54.1 | +59.8 | -208.7 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|------|------|-------|-----|------|-------|
| -1039 | -85 | -607 | 0 | 45 | 170 | 0 |
| -1062 | -93 | -666 | 0 | 45 | 350 | 3 |
| -1056 | -99 | -615 | 0 | 45 | 350 | 4 |
| -1075 | -106 | -666 | 0 | 45 | 350 | 5 |

SAFETY TETHER TRANSFER

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|------|-------|
| -67.9 | +78.8 | -129.2 | -57.7 | +7.2 | +69.0 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|----|------|-------|-----|------|-------|
| -766 | 88 | -477 | 270 | 0 | 341 | 0 |
| -710 | 67 | -455 | 270 | 0 | 160 | 3 |
| -759 | 85 | -455 | 270 | 0 | 160 | 4 |
| -710 | 67 | -437 | 270 | 0 | 160 | 5 |

ASIPE – SSRF

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|-------|
| -12.4 | +80.4 | -130.5 | +50.1 | +12.4 | +80.5 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-----|------|-------|-----|------|-------|
| -978 | -70 | -498 | 0 | 0 | 81 | 0 |
| -1000 | -11 | -487 | 0 | 0 | 260 | 3 |
| -1000 | -62 | -496 | 0 | 0 | 260 | 4 |
| -1018 | -11 | -487 | 0 | 0 | 260 | 5 |

SSRF #5

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|-------|--------|
| -34.1 | +63.8 | -45.6 | -82.9 | +12.7 | +176.0 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|----|------|-------|-----|------|-------|
| -1025 | 16 | -753 | 300 | 340 | 136 | 0 |
| -1065 | 63 | -769 | 300 | 340 | 315 | 3 |
| -1040 | 28 | -740 | 300 | 340 | 315 | 4 |
| -1074 | 69 | -754 | 300 | 340 | 315 | 5 |

SSRF #6

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|------|-------|--------|
| -26.7 | +86.1 | -92.3 | +2.6 | +17.2 | +181.8 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-----|------|-------|-----|------|-------|
| -1019 | -39 | -704 | 0 | 350 | 180 | 0 |
| -1040 | -35 | -764 | 0 | 350 | 0 | 3 |
| -1040 | -35 | -712 | 0 | 350 | 0 | 4 |
| -1058 | -31 | -764 | 0 | 350 | 0 | 5 |

SSRF #7

| SY | SP | EP | WP | WY | WR |
|------|-------|-------|-------|------|--------|
| -8.1 | +59.7 | -34.3 | -87.6 | -9.1 | +197.5 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|------|------|-------|-----|------|-------|
| -1089 | -136 | -725 | 300 | 330 | 181 | 0 |
| -1150 | -125 | -739 | 300 | 330 | 0 | 3 |
| -1105 | -125 | -713 | 300 | 330 | 0 | 4 |
| -1158 | -116 | -725 | 300 | 330 | 0 | 5 |

SSRF #1

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|------|-------|--------|
| -48.6 | +43.1 | -17.3 | -0.7 | +70.6 | -201.6 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|----|------|-------|-----|------|-------|
| -1029 | 87 | -842 | 0 | 25 | 181 | 0 |
| -1048 | 78 | -902 | 0 | 25 | 0 | 3 |
| -1048 | 78 | -850 | 0 | 25 | 0 | 4 |
| -1065 | 70 | -902 | 0 | 25 | 0 | 5 |

SSRF #2

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|-------|--------|
| -32.4 | +64.8 | -30.1 | -39.8 | +18.1 | -177.2 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-----|------|-------|-----|------|-------|
| -1034 | -43 | -872 | 0 | 345 | 181 | 0 |
| -1055 | -37 | -932 | 0 | 345 | 0 | 3 |
| -1055 | -37 | -880 | 0 | 345 | 0 | 4 |
| -1072 | -32 | -932 | 0 | 345 | 0 | 5 |

SSRF #3

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|-------|--------|
| -43.1 | +55.1 | -24.9 | -25.5 | +51.5 | -183.0 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|----|------|-------|-----|------|-------|
| -1030 | 27 | -866 | 0 | 9 | 180 | 0 |
| -1051 | 24 | -926 | 0 | 9 | 0 | 3 |
| -1051 | 24 | -874 | 0 | 9 | 0 | 4 |
| -1069 | 21 | -926 | 0 | 9 | 0 | 5 |

SSRF #4

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|------|--------|
| -26.1 | +65.1 | -29.7 | -45.0 | -2.4 | -177.4 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-----|------|-------|-----|------|-------|
| -1044 | -63 | -862 | 0 | 330 | 181 | 0 |
| -1063 | -53 | -922 | 0 | 330 | 0 | 3 |
| -1063 | -53 | -870 | 0 | 330 | 0 | 4 |
| -1079 | -44 | -922 | 0 | 330 | 0 | 5 |

ASIPE – HEAD PORT

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|-------|
| -37.2 | +60.7 | -117.1 | +56.4 | +37.2 | -99.5 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|----|------|-------|-----|------|-------|
| -978 | 70 | -495 | 0 | 0 | 261 | 0 |
| -1000 | 11 | -505 | 0 | 0 | 80 | 3 |
| -1000 | 62 | -496 | 0 | 0 | 80 | 4 |
| -1018 | 11 | -505 | 0 | 0 | 80 | 5 |

+V2 ASLR

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|-------|--------|
| -31.3 | +28.0 | -68.1 | +39.9 | +31.3 | -169.4 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-----|------|-------|-----|------|-------|
| -1128 | 137 | -466 | 0 | 0 | 191 | 0 |
| -1150 | 127 | -525 | 0 | 0 | 10 | 3 |
| -1149 | 136 | -473 | 0 | 0 | 10 | 4 |
| -1168 | 127 | -525 | 0 | 0 | 10 | 5 |

ASIPE – HEAD STARBOARD

| SY | SP | EP | WP | WY | WR |
|-------|-------|--------|-------|-------|--------|
| -14.7 | +76.7 | -104.5 | -67.3 | +18.8 | -234.4 |

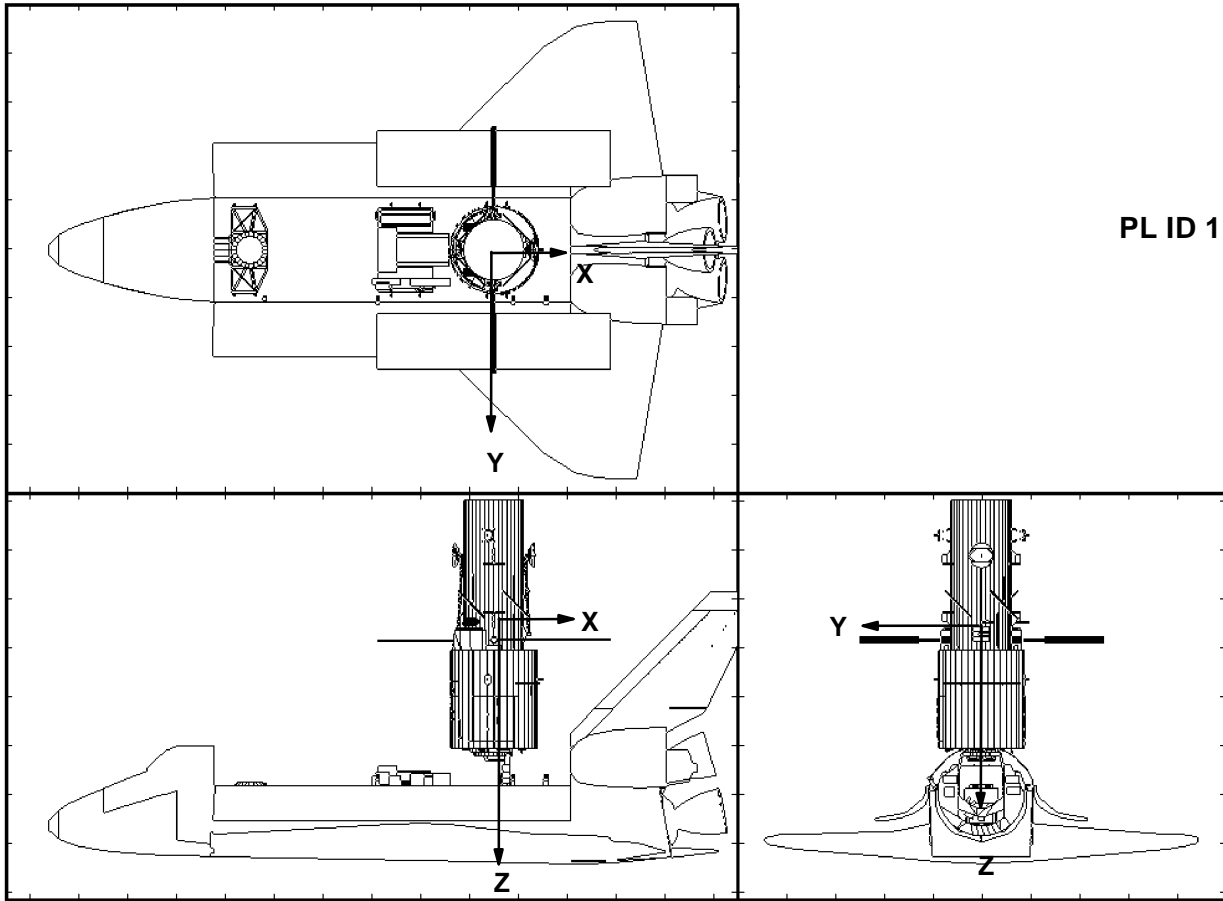
| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|------|-----|------|-------|-----|------|-------|
| -980 | -67 | -510 | 270 | 0 | 91 | 0 |
| -980 | -7 | -488 | 270 | 0 | 270 | 3 |
| -980 | -59 | -488 | 270 | 0 | 270 | 4 |
| -980 | -7 | -470 | 270 | 0 | 270 | 5 |

ASIPE – HEAD FORWARD

| SY | SP | EP | WP | WY | WR |
|-------|-------|-------|-------|-------|--------|
| -17.2 | +64.0 | -89.9 | -70.1 | +18.6 | -296.8 |

| X | Y | Z | PITCH | YAW | ROLL | PL ID |
|-------|-----|------|-------|-----|------|-------|
| -1029 | -36 | -509 | 270 | 0 | 26 | 0 |
| -975 | -10 | -487 | 270 | 0 | 205 | 3 |
| -1022 | -32 | -487 | 270 | 0 | 205 | 4 |
| -975 | -10 | -469 | 270 | 0 | 205 | 5 |

PL ID/POR DEFINITION



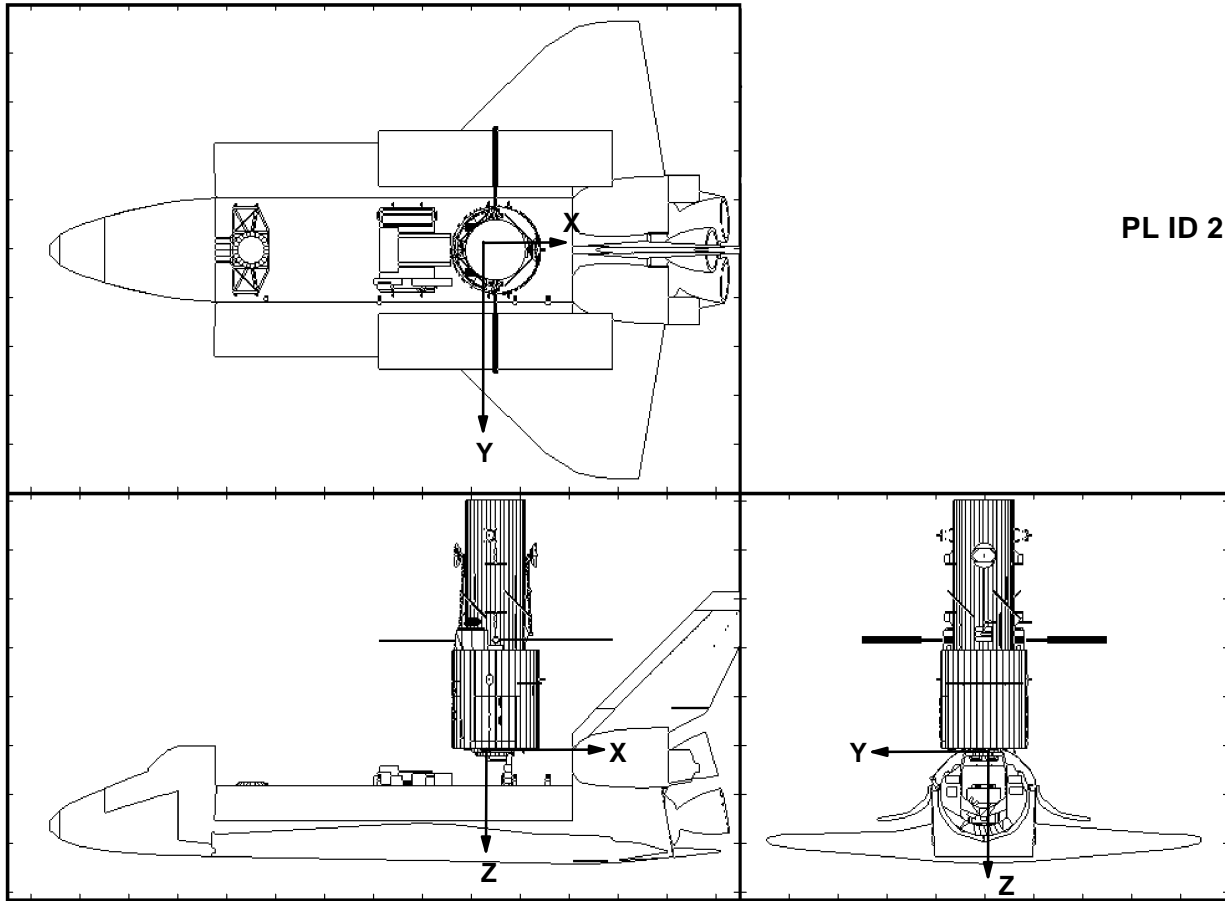
GF: 1

POR: CENTER OF PAYLOAD AT LEVEL OF GFs

PURPOSE: HST MANEUVERING

| | | |
|-----------------|--------|------|
| RATES: | COARSE | VERN |
| TRAN LIM ft/sec | 0.18 | 0.1 |
| ROT LIM deg/sec | 0.61 | 0.20 |

PL ID/POR DEFINITION



GF: 1

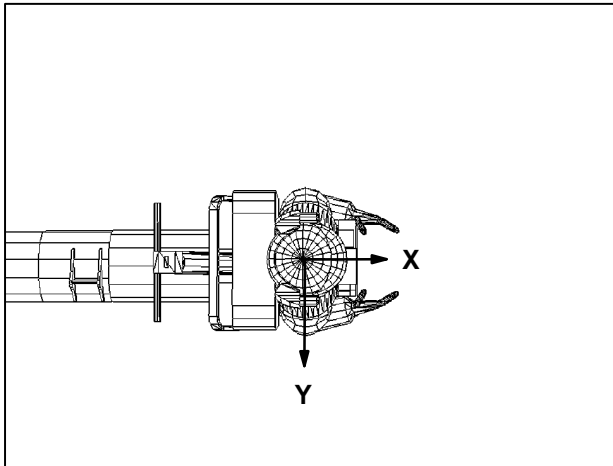
POR: FSS TARGET

PURPOSE: HST BERTHING AND UNBERTHING

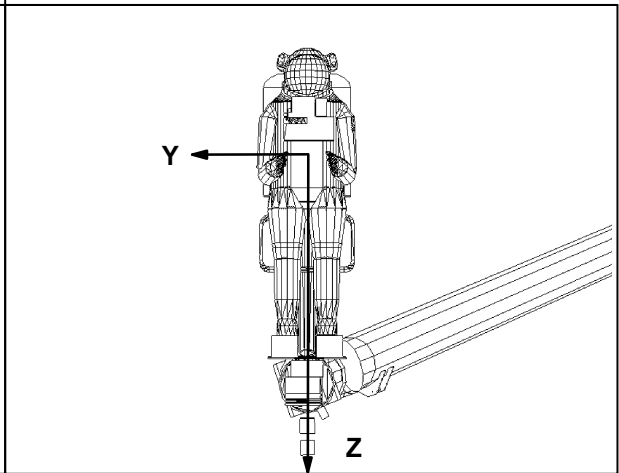
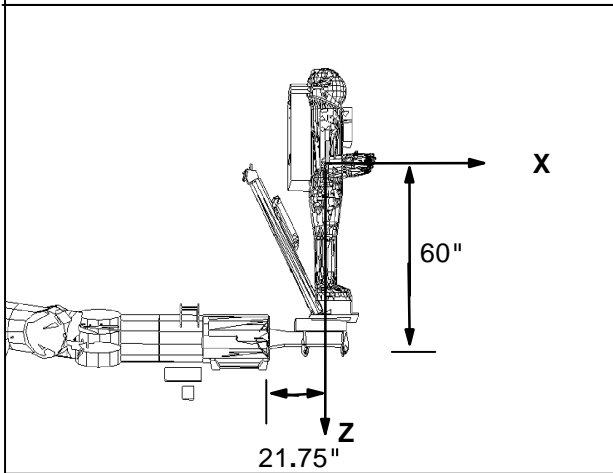
RATES: COARSE VERN

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

PL ID/POR DEFINITION



PL ID 3



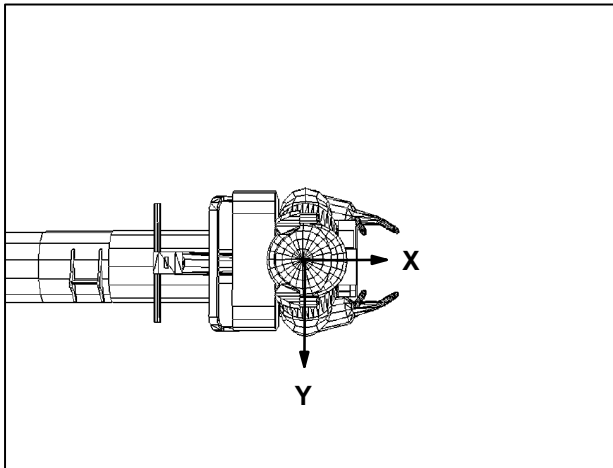
POR: CREWMEMBERs CHEST

PURPOSE: MFR OPS

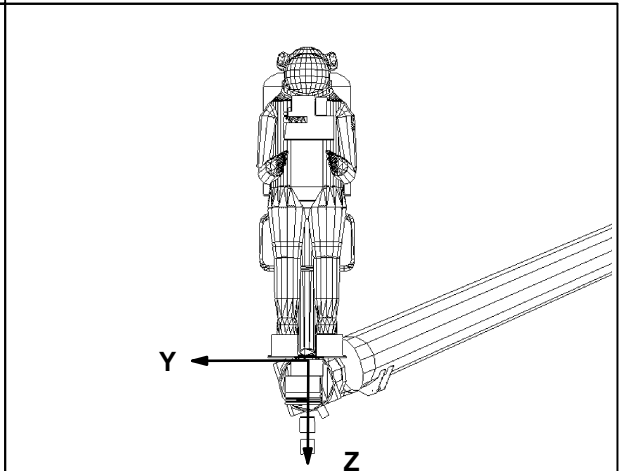
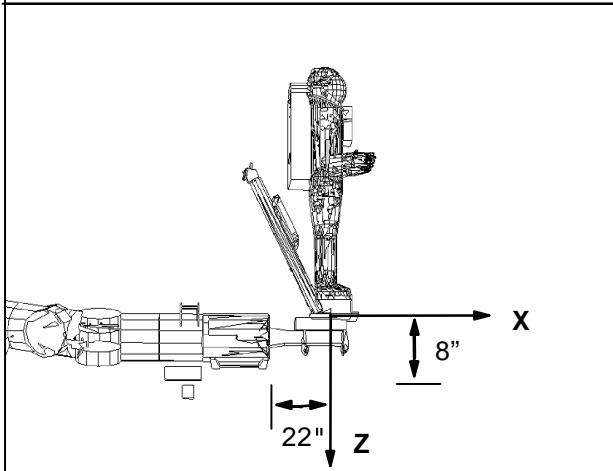
RATES: COARSE VERN

| | | |
|-----------------|------|------|
| TRAN LIM ft/sec | 0.54 | 0.18 |
| ROT LIM deg/sec | 2.17 | 0.72 |

PL ID/POR DEFINITION



PL ID 4



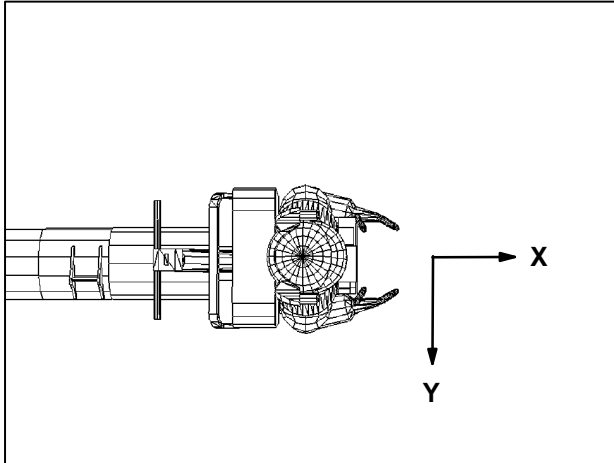
POR: CREWMEMBERs FEET

PURPOSE: MFR OPS

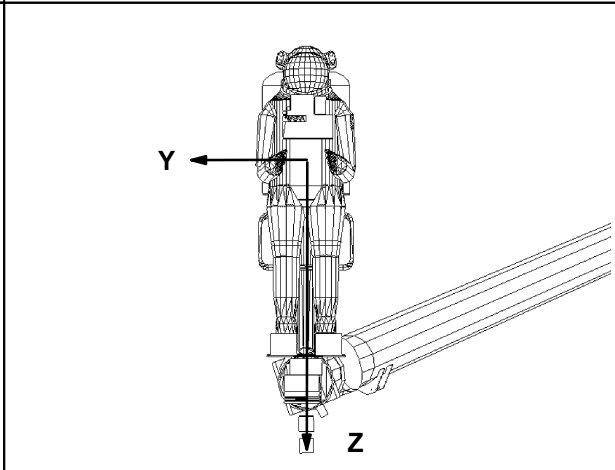
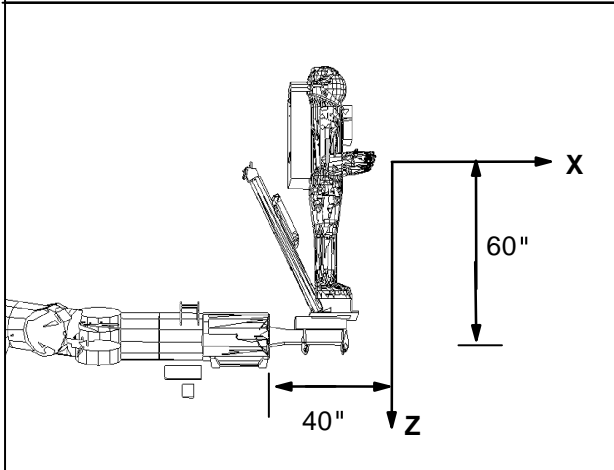
RATES: COARSE VERN

| | | |
|-----------------|------|------|
| TRAN LIM ft/sec | 0.54 | 0.18 |
| ROT LIM deg/sec | 2.17 | 0.72 |

PL ID/POR DEFINITION



PL ID 5



| | | | |
|-----------------|---------------|------|--|
| POR: | ORU | | |
| PURPOSE: | MFR OPS – FGS | | |
| RATES: | COARSE | VERN | |
| TRAN LIM ft/sec | 0.54 | 0.18 | |
| ROT LIM deg/sec | 2.17 | 0.72 | |

RMS AND PL DAP CONSTRAINTS

| PAYLOAD POSITIONS | VRCS | | ALT | | |
|---|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------------|
| | MAN | AUTO | AUTO | JET OPTION | MODE |
| AT EXTENDED PARK • POSN HOLD • BRAKES – ON | A9/2 A9/2 | A9/2 A9/2 | A9/2 A9/2 | TAIL TAIL | NORM Z NORM Z |
| AT FSS HOVER • POSN HOLD • BRAKES – ON | A9/3 A9/3 | A9/3 A9/3* | A9/3 A9/3 | TAIL TAIL | NORM Z NORM Z |
| AT RELEASE POSN • RMS POSN HOLD – DB COLLAPSE • RMS BRAKES ON – DB COLLAPSE | A9/1 B9/1 A9/1 — | A9/1 B9/1 A9/1 — | A9/1 B9/1 A9/1 — | TAIL TAIL TAIL — | NORM Z NORM Z NORM Z — |
| ALL MFR OPS | A10/4 | A10/4 | A10/4 | ALL OR TAIL | NORM Z, LO Z |

NOTES:

1. KEY: X_n DAP/CNTL ACCEL
 — ATTITUDE CONTROL MODE NOT ALLOWED
 * CHANGE VERN RATE DB = 0.10
2. RMS/PAYLOAD POSITIONS DEFINED IN REF DATA
3. CONSTRAINTS ONLY APPLY TO GF #1 (+V2 GF)
4. TAIL-ONLY MODE REQD FOR GRAPPLED HST OPS
5. DAP B12 IS A SLOW MNVR RATE DAP THAT IS INTERCHANGEABLE WITH DAP A9
6. DAP B11 IS A SLOW MNVR RATE DAP THAT IS INTERCHANGEABLE WITH DAP A10

HST DAP CONFIGURATION TABLES

| | A9 | A10 | B9 | B11 | B12 |
|------------------|-------|-------|-------|-------|--------|
| PRI | | | | | |
| ROT RATE (deg/s) | 0.10 | 0.10 | 0.05 | 0.05 | 0.05 |
| ATT DB (deg) | 5.0 | 10.0 | 2.0 | 10.0 | 5.0 |
| RATE DB (deg/s) | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| ROT PLS (deg/s) | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| COMP (deg/s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| P OPTION | 3 | 3 | 3 | 3 | 3 |
| Y OPTION | 3 | 3 | 3 | 3 | 3 |
| TRAN PLS (ft/s) | 0.05 | 0.05 | 0.01 | 0.05 | 0.05 |
| ALT | | | | | |
| RATE DB (deg) | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| JET OPT | TAIL | TAIL | TAIL | TAIL | TAIL |
| # JETS | 2 | 2 | 2 | 2 | 2 |
| ON TIME (sec) | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| DELAY (sec) | 7.5 | 12.3 | 7.5 | 12.3 | 7.5 |
| VERN | | | | | |
| ROT RATE (deg/s) | 0.10 | 0.10 | 0.024 | 0.016 | 0.0400 |
| ATT DB (deg) | 2.0 | 1.0 | 0.5 | 1.0 | 2.0 |
| RATE DB (deg/s) | 0.05 | 0.020 | 0.030 | 0.020 | 0.05 |
| ROT PLS (deg/s) | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 |
| COMP (deg/s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CNTL ACC | 1-3 | 4,5 | 1 | 4,5 | 1-3 |

CNTL ACCELS:

- 1 - RELEASE POSN
- 2 - EXTENDED PARK
- 3 - FSS HOVER
- 4 - HST BERTHED & FSS PIVOT = 90°
- 5 - HST BERTHED & FSS PIVOT = 46°

PRCS JET OPTIONS:

- 1 - ALL
- 2 - NOSE ONLY
- 3 - TAIL ONLY

DAP USAGE:

- A9,B12 - ALL HST OPS
- B9 - HST RELEASE DEADBAND COLLAPSE
- A10,B11 - ALL MFR OPS

RMS GO/NO-GO CRITERIA

| CONTINUE OPS IF: | UNCRADLE FOR C/O & SSE SURVEY | UNCRADLE FOR HST RETRIEVE, DEPLOYMENT | CONTINUE HST SM OPS POST UNCRADLE | FLT RULE REF |
|----------------------------|-------------------------------|---------------------------------------|-----------------------------------|--------------|
| SHOULDER BRACE REL (1) | 0 ↓ [1] | | | |
| JETTISON SYSTEM (2) | 0 ↓ [2] | 0 ↓ [2] | * 1 ↓ [2] | X12.1.2-2 |
| MPM STOW MOTORS (2) | * 2 ↓ [1] | * 2 ↓ [1] | * 2 ↓ [1] | X12.1.2-1 |
| MPM (4) DEPLOY IND (8) | SH 1 ↓ | SH 1 ↓ | SH 1 ↓ | |
| MPM (4) STOWED IND (8) | | | | |
| MRL LATCH CAPABILITY (3) | * 1 ↓ [3] | * 1 ↓ [3] | * 3 ↓ | X12.1.2-1 |
| THC (1) AXES (3) | | | | |
| RHC (1) AXES (3) | | | | |
| AUTO MODE (4) | | | | |
| OPR CMD MODE (1) | | | | |
| MAN AUG MODE (1) | | | | |
| SINGLE MODE (1) | * 2 ↓ [4] | * 2 ↓ [4] | * 3 ↓ | X12.1.1-5 |
| DIRECT MODE (1) | | | | |
| BACKUP MODE (1) | 0 ↓ | | | |
| BRAKES (6) | 0 ↓ | 0 ↓ | 0 ↓ | |
| AUTO BRAKES (1) | 0 ↓ [5] | 0 ↓ [5] | 0 ↓ [5] | |
| CAPTURE & RIGIDIZE (2) | | 1 ↓ | 1 ↓ | |
| DERIGIDIZE (2) | | * 2 ↓ | * 2 ↓ | X12.1.3-1 |
| RELEASE (2) | | * 2 ↓ [1] | * 2 ↓ [1] | X12.1.3-1 |
| BACKUP RELEASE (1) | | | | |
| THERMAL (DEGF) | | | | |
| -20(0), 176(172), LED | REQD | REQD | REQD | |
| -20(0), 110(106), ABE(SPA) | REQD | REQD | REQD | |
| -20(0), 147(144), ABE(E) | REQD | REQD | REQD | |

* EXCEPTIONS TO ALL VEHICLE FLIGHT RULES

NOTES: (1) EVA CAPABILITY EXISTS FOR FOLLOWING CONTINGENCIES:

- SHOULDER BRACE RELEASE
 - MPM DEPLOY/STOW
 - RMS STRAPDOWN
 - GRAPPLE FIXTURE (GF) RELEASE
- (2) IFM AVAILABLE TO RECOVER JETTISON SYSTEM; HIGH PRIORITY RMS ACTIVITIES MAY CONTINUE
- (3) CONTINUE OPS EVEN IF ONE FAILURE WILL RESULT IN INABILITY TO LATCH AT LEAST TWO MRLs (ASSUMES CURRENTLY HAVE TWO-LATCH CAPABILITY). EVA CAPABILITY REQD
- (4) ONE OF SINGLE, DIRECT, OR BACKUP REQD FOR UNCRADLING
- (5) OPS CAN CONTINUE IN DIRECT OR BACKUP WITH LOSS OF AUTO BRAKES. CAPTURE CAPABILITY DOES NOT EXIST IN BACKUP
- (6) SM 95 CAN BE USED TO WORK AROUND FAILED AXIS
- (7) ONE RIGIDIZE METHOD REQD FOR LOADED RATES

This Page Intentionally Blank

OSVS

| | |
|--------------------|--------|
| OSVS POWERUP | FS 9-2 |
| POWERDOWN | FS 9-2 |

OSVS POWERUP

NOTE

For second HDD swap, use ()
 For daily powerup, perform only step 2

- | | |
|--------------|---|
| ML60M R12 | 1. <u>OSVS HARDDRIVE</u> Obtain OSVS hard drive HDD #1(2) Remove Dummy OSVS hard drive (HDD #1) Install OSVS hard drive HDD #1(2), tighten thumbscrews |
| OPP | cb OSVS Power – cl |
| OPP OSVU | 2. <u>OSVS POWERUP</u> OSVS Power – ON √ OSVS Power It – ON Record GMT of Powerup |

| Powerup GMT |
|-------------|
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |

OSVS POWERDOWN

NOTE

For daily powerdown, perform only step 1

- | | |
|-------------|--|
| OPP OSVU | 1. <u>OSVS SHUTDOWN</u> OSVS Power – OFF √ OSVS Power It – OFF |
| OPP OSVU | 2. <u>OSVS HARDWARE STOW</u> cb OSVS Power – op If last pwrdn: Remove OSVS hard drive Install Dummy OSVS hard drive, tighten thumbscrews |

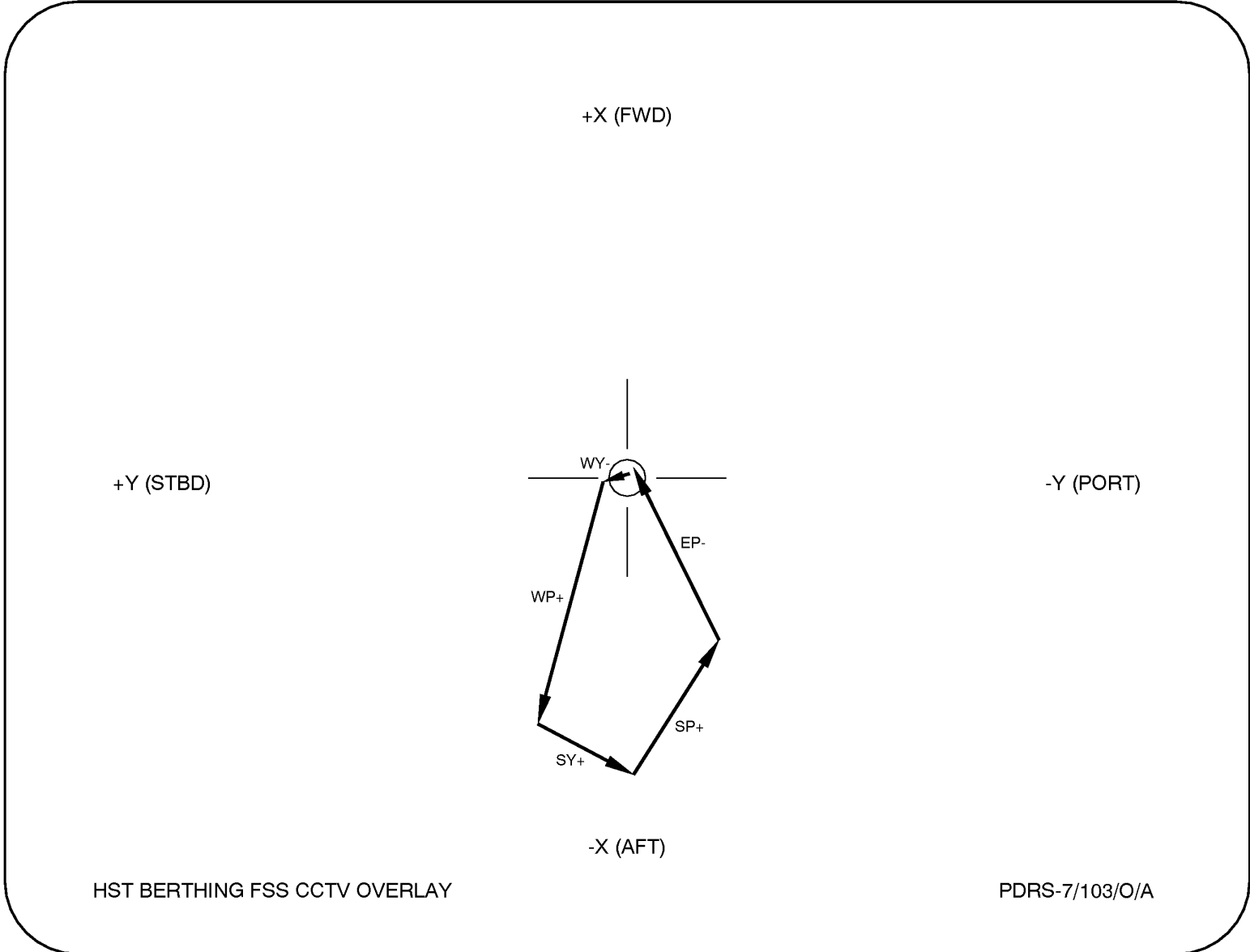
OSVS

CUE CARD CONFIGURATION

| | |
|--|------------|
| HST BERTHING FSS CCTV OVERLAY | FS CC 10-2 |
| BERTHED HST UNGRAPPLE WRIST CCTV OVERLAY | FS CC 10-3 |
| FSS CCTV OVERLAY | FS CC 10-4 |
| CARGO BAY ARRANGEMENT | FS CC 10-5 |
| HST FOOT RESTRAINT SOCKET LOCATIONS | FS CC 10-7 |

CUE CARD
CONFIG

Fabricate as transparency



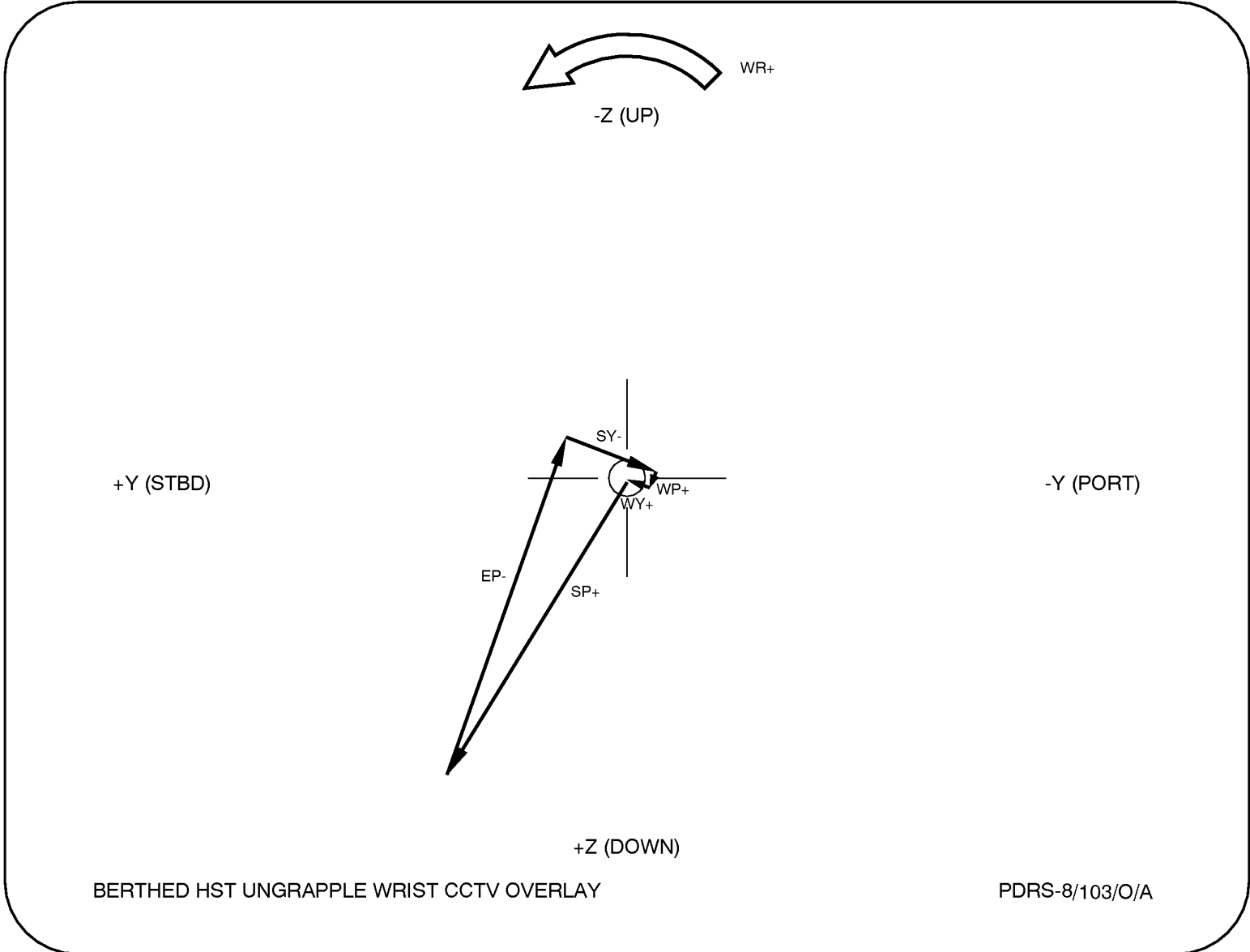
HST BERTHING FSS CCTV OVERLAY

PDRS-7/103/O/A

(reduced copy)
FS CC 10-2

PDRS/103/FIN

Fabricate as transparency



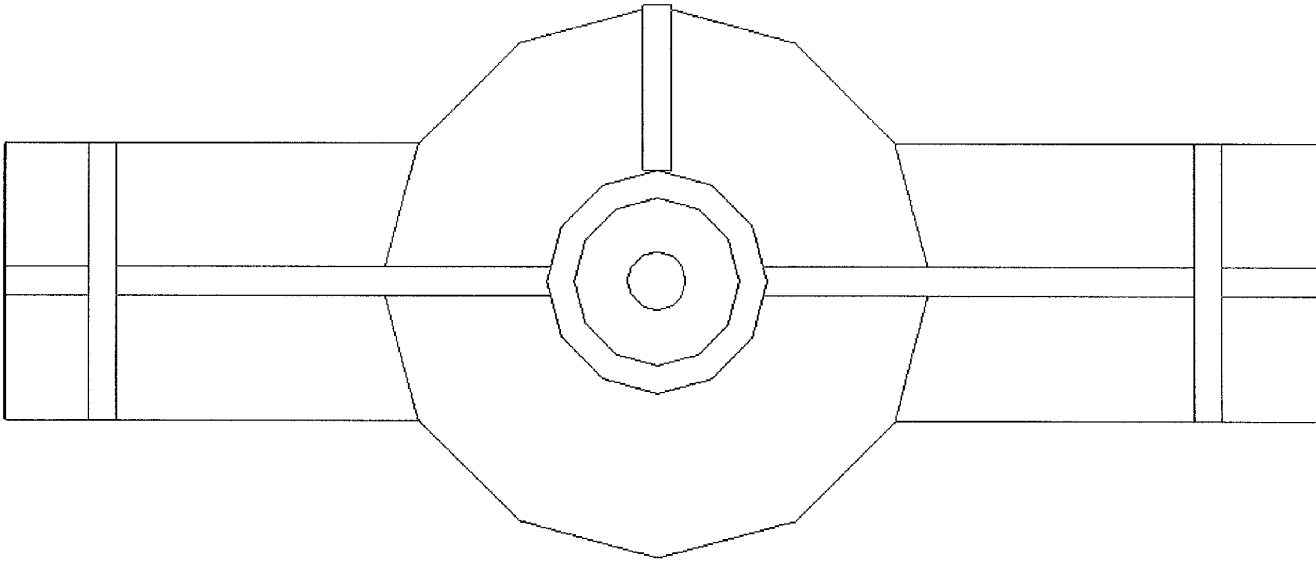
BERTHED HST UNGRAPPLE WRIST CCTV OVERLAY

PDRS-8/103/O/A

(reduced copy)
FS CC 10-3

PDRS/103/FIN

Note: Fabricate as transparency



BERTHED HST FSS CCTV OVERLAY

PDRS-9/103/O/A

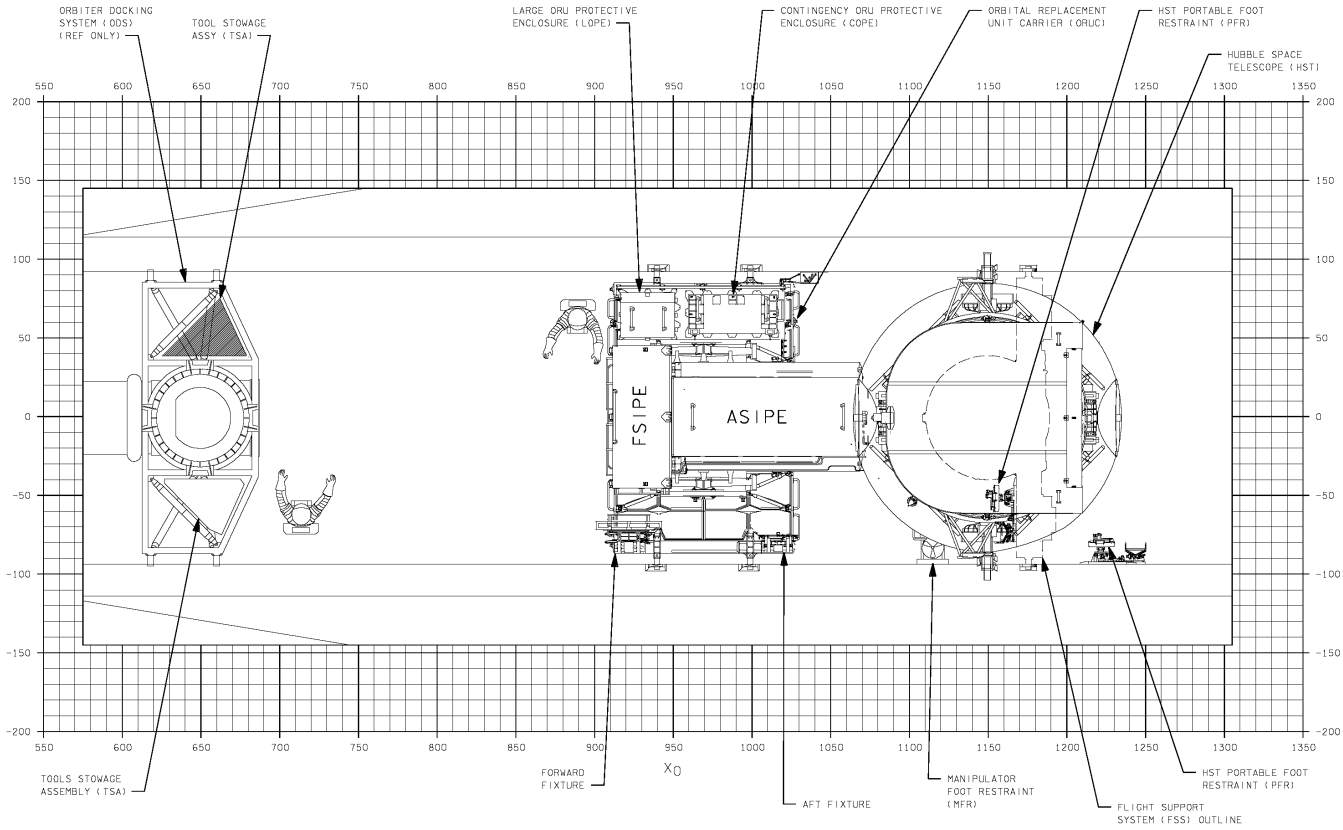
(reduced copy)

FS CC 10-4

PDRS/103/FIN

TOP

CARGO BAY ARRANGEMENT



480408202, ART. 4

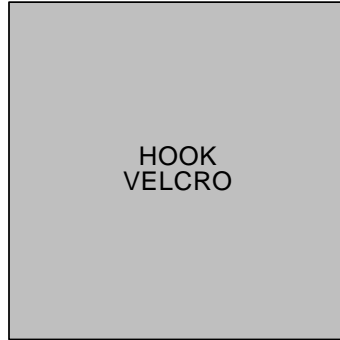
PDRS-10a/103/O/C

(reduced copy)

FS CC 10-5


PDRS/103/FIN 1

TOP
BACK OF 'CARGO BAY ARRANGEMENT'



HOOK
VELCRO



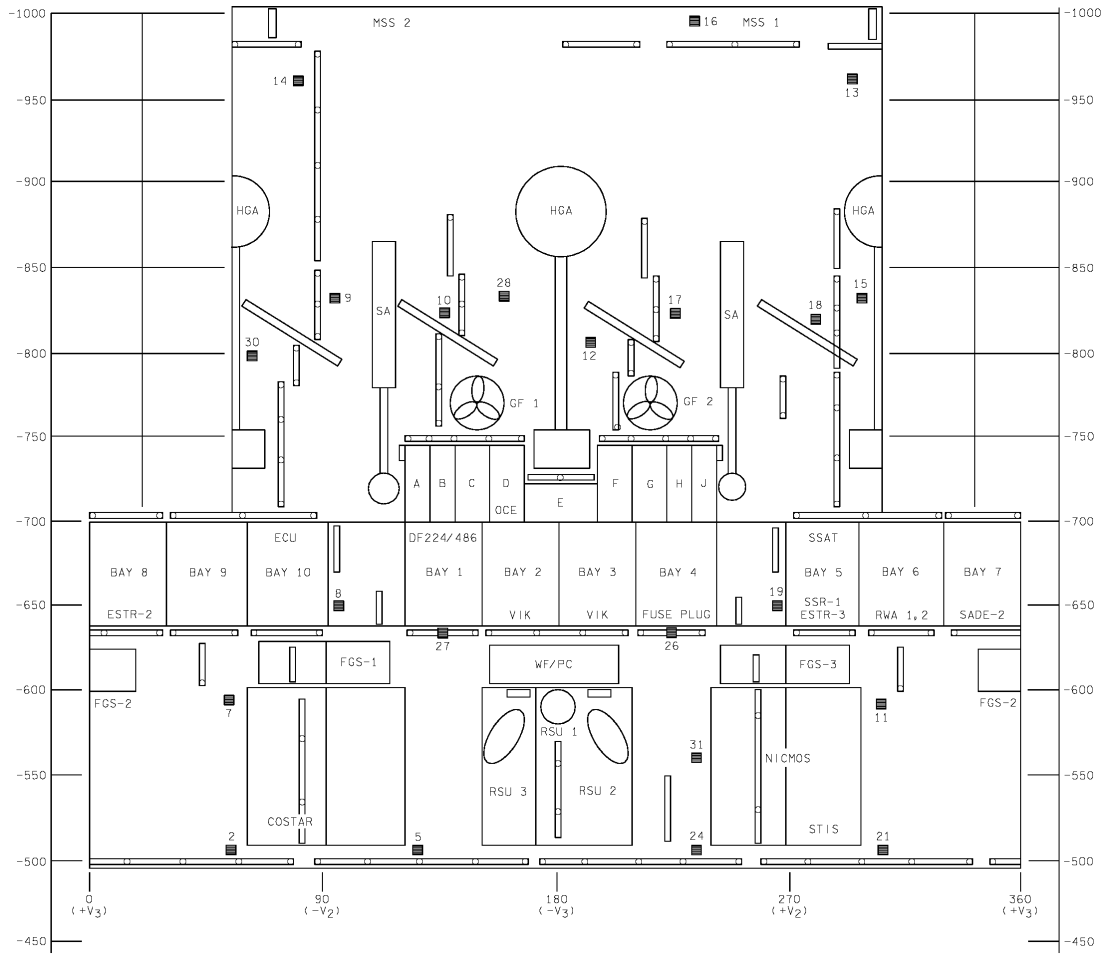
PDRS-10b/103/O/A 

(reduced copy)
FS CC 10-6

PDRS/103/FIN

TOP

HST FOOT RESTRAINT SOCKET LOCATIONS



48040CC1007. ART 3

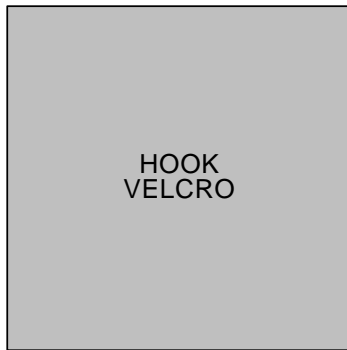
PDRS-11a/103/O/B


(reduced copy)

FS CC 10-7

PDRS/103/FIN

TOP
BACK OF 'HST FOOT RESTRAINT SOCKET LOCATIONS'



PDRS-11b/103/O/A 



PDRS OPS C/L

**STS
103**