

PDRS Operations Checklist

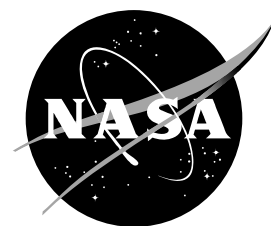
STS-125 Flight Supplement

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

**Final, Rev A
April 24, 2009**

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas



MISSION OPERATIONS DIRECTORATE

**PDRS OPERATIONS CHECKLIST
STS-125 FLIGHT SUPPLEMENT**

FINAL, REVISION A
April 24, 2009

PREPARED BY:

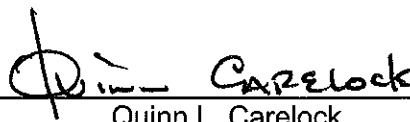


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	PDRS FS-00124	PDRS FS-00129	
	PDRS FS-00125	PDRS FS-00130	
	PDRS FS-00126	PDRS FS-00131	

AREAS OF TECHNICAL RESPONSIBILITY

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DX/S. Freier

281-483-7529

PDRS OPERATIONS CHECKLIST
 STS-125 FLIGHT SUPPLEMENT

LIST OF EFFECTIVE PAGES

FINAL 09/15/08
 REV A 04/24/09

Sign Off	*	125/FIN A	FS 2-25	⊗	125/FIN A
FS ii	*	125/FIN A	FS 2-26	⊗	125/FIN A
FS iii	*	125/FIN A	FS 2-27	⊗	125/FIN A
FS iv	*	125/FIN A	FS 2-28	⊗	125/FIN A
FS v	*	125/FIN A	FS 2-29		125/FIN A
FS vi	*	125/FIN A	FS 2-30		125/FIN A
FS vii	*	125/FIN A	FS 2-31	⊗	125/FIN A
FS viii	*	125/FIN A	FS 2-32	⊗	125/FIN A
FS ix		125/FIN A	FS 2-33		125/FIN A
FS x		125/FIN A	FS 2-34	⊗	125/FIN A
FS xi		125/FIN A	FS 2-35	⊗	125/FIN A
FS xii		125/FIN A	FS 2-36	⊗	125/FIN A
FS 1-1		125/FIN A	FS 2-37	⊗	125/FIN A
FS 1-2	⊗	125/FIN A	FS 2-38	⊗	125/FIN A
FS 1-3		125/FIN A	FS 2-39	⊗	125/FIN A
FS 1-4		125/FIN A	FS 2-40	⊗	125/FIN A
FS 1-5	⊗	125/FIN A	FS 2-41	⊗	125/FIN A
FS 1-6		125/FIN A	FS 2-42		125/FIN A
FS 1-7	⊗	125/FIN A	FS 2-43	⊗	125/FIN A
FS 1-8	⊗	125/FIN A	FS 2-44	⊗	125/FIN A
FS 1-9	⊗	125/FIN A	FS 2-45	⊗	125/FIN A
FS 1-10	⊗	125/FIN A	FS 2-46	⊗	125/FIN A
FS 2-1		125/FIN A	FS 2-47		125/FIN A
FS 2-2	⊗	125/FIN A	FS 2-48		125/FIN A
FS 2-3	⊗	125/FIN A	FS 2-49	⊗	125/FIN A
FS 2-4	⊗	125/FIN A	FS 2-50		125/FIN A
FS 2-5	⊗	125/FIN A	FS 2-51	⊗	125/FIN A
FS 2-6	⊗	125/FIN A	FS 2-52	⊗	125/FIN A
FS 2-7	⊗	125/FIN A	FS 2-53	⊗	125/FIN A
FS 2-8		125/FIN A	FS 2-54		125/FIN A
FS 2-9	⊗	125/FIN A	FS 2-55	⊗	125/FIN A
FS 2-10	⊗	125/FIN A	FS 2-56		125/FIN A
FS 2-11		125/FIN A	FS 2-57		125/FIN A
FS 2-12	⊗	125/FIN A	FS 2-58		125/FIN A
FS 2-13	⊗	125/FIN A	FS 2-59		125/FIN A
FS 2-14	⊗	125/FIN A	FS 2-60	⊗	125/FIN A
FS 2-15	⊗	125/FIN A	FS 3-i		125/FIN A
FS 2-16	⊗	125/FIN A	FS 3-ii		125/FIN A
FS 2-17	⊗	125/FIN A	FS 3-1		125/FIN A
FS 2-18	⊗	125/FIN A	FS 3-2	⊗	125/FIN A
FS 2-19	⊗	125/FIN A	FS 3-3	⊗	125/FIN A
FS 2-20	⊗	125/FIN A	FS 3-4		125/FIN A
FS 2-21	⊗	125/FIN A	FS 3-5	⊗	125/FIN A
FS 2-22	⊗	125/FIN A	FS 3-6		125/FIN A
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			FS 3-9	⊗	125/FIN A
			FS 3-10	⊗	125/FIN A

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FS 3-11	⊗	125/FIN A	FS 6-3.....	⊗	125/FIN A
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FS 3-13		125/FIN A	FS 6-5.....	⊗	125/FIN A
FS 3-14		125/FIN A	FS 6-6.....	⊗	125/FIN A
FS 4-1		125/FIN A	FS 6-7.....	⊗	125/FIN A
FS 4-2		125/FIN A	FS 6-8.....	⊗	125/FIN A
FS 4-3	⊗	125/FIN A	FS 7-1		125/FIN A
FS 4-4	⊗	125/FIN A	FS 7-2.....	⊗	125/FIN A
FS 4-5	⊗	125/FIN A	FS 7-3.....	⊗	125/FIN A
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FS 4-7	⊗	125/FIN A	FS 7-5.....	⊗	125/FIN A
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FS 4-13	⊗	125/FIN A	FS 7-11.....	⊗	125/FIN A
FS 4-14		125/FIN A	FS 7-12.....	⊗	125/FIN A
FS 4-15	⊗	125/FIN A	FS 7-13.....	⊗	125/FIN A
FS 4-16		125/FIN A	FS 7-14.....	⊗	125/FIN A
FS 4-17	⊗	125/FIN A	FS 7-15.....	⊗	125/FIN A
FS 4-18	⊗	125/FIN A	FS 7-16.....		125/FIN A
FS 4-19	⊗	125/FIN A	FS 7-17.....	⊗	125/FIN A
FS 4-20	⊗	125/FIN A	FS 7-18.....	⊗	125/FIN A
FS 4-21		125/FIN A	FS 7-19.....	⊗	125/FIN A
FS 4-22		125/FIN A	FS 7-20.....		125/FIN A
FS 4-23	⊗	125/FIN A	FS 8-1		125/FIN A
FS 4-24		125/FIN A	FS 8-2.....	⊗	125/FIN A
FS 4-25		125/FIN A	FS 8-3.....	⊗	125/FIN A
FS 4-26		125/FIN A	FS 8-4.....	⊗	125/FIN A
FS 4-27	⊗	125/FIN A	FS 8-5.....	⊗	125/FIN A
FS 4-28	⊗	125/FIN A	FS 8-6.....	⊗	125/FIN A
FS 4-29	⊗	125/FIN A	FS 8-7	⊗	125/FIN A
FS 4-30	⊗	125/FIN A	FS 8-8.....	⊗	125/FIN A
FS 4-31	⊗	125/FIN A	FS 8-9.....	⊗	125/FIN A
FS 4-32		125/FIN A	FS 8-10.....	⊗	125/FIN A
FS 4-33	⊗	125/FIN A	FS 8-11.....	⊗	125/FIN A
FS 4-34	⊗	125/FIN A	FS 8-12.....	⊗	125/FIN A
FS 4-35	⊗	125/FIN A	FS 8-13.....	⊗	125/FIN A
FS 4-36	⊗	125/FIN A	FS 8-14.....	⊗	125/FIN A
FS 4-37	⊗	125/FIN A	FS 8-15.....	⊗	125/FIN A
FS 4-38		125/FIN A	FS 8-16.....	⊗	125/FIN A
FS 5-1		125/FIN A	FS 9-1		125/FIN A
FS 5-2	⊗	125/FIN A	FS 9-2.....	⊗	125/FIN A
FS 5-3	⊗	125/FIN A	FS 9-3.....	⊗	125/FIN A
FS 5-4		125/FIN A	FS 9-4	⊗	125/FIN A
FS 5-5	⊗	125/FIN A	FS 9-5.....	⊗	125/FIN A
FS 5-6	⊗	125/FIN A	FS 9-6.....	⊗	125/FIN A
FS 6-i.....		125/FIN A	FS 9-7.....	⊗	125/FIN A
FS 6-ii.....		125/FIN A	FS 9-8.....	⊗	125/FIN A
FS 6-1		125/FIN A	FS 9-9.....	⊗	125/FIN A
FS 6-2	⊗	125/FIN A	FS 9-10.....		125/FIN A

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FS 9-11	⊗	125/FIN A	FS 12-5		125/FIN A
FS 9-12	⊗	125/FIN A	FS 12-6	⊗	125/FIN A
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FS 9-14		125/FIN A	FS 13-2	⊗	125/FIN A
FS 10-1		125/FIN A	FS 13-3	⊗	125/FIN A
FS 10-2	⊗	125/FIN A	FS 13-4	⊗	125/FIN A
FS 10-3	⊗	125/FIN A	FS 13-5	⊗	125/FIN A
FS 10-4	⊗	125/FIN A	FS 13-6		125/FIN A
FS 10-5	⊗	125/FIN A	FS 13-7	⊗	125/FIN A
FS 10-6	⊗	125/FIN A	FS 13-8	⊗	125/FIN A
FS 10-7	⊗	125/FIN A	FS 13-9	⊗	125/FIN A
FS 10-8	⊗	125/FIN A	FS 13-10	⊗	125/FIN A
FS 10-9	⊗	125/FIN A	FS 13-11	⊗	125/FIN A
FS 10-10	⊗	125/FIN A	FS 13-12	⊗	125/FIN A
FS 10-11	⊗	125/FIN A	FS 13-13	⊗	125/FIN A
FS 10-12	⊗	125/FIN A	FS 13-14		125/FIN A
FS 10-13	⊗	125/FIN A	FS 13-15	⊗	125/FIN A
FS 10-14	⊗	125/FIN A	FS 13-16	⊗	125/FIN A
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FS 10-16		125/FIN A	FS 13-18		125/FIN A
FS 11-1		125/FIN A	FS 13-19	⊗	125/FIN A
FS 11-2	⊗	125/FIN A	FS 13-20		125/FIN A
FS 11-3	⊗	125/FIN A	FS 13-21	⊗	125/FIN A
FS 11-4	⊗	125/FIN A	FS 13-22		125/FIN A
FS 11-5	⊗	125/FIN A	FS 13-23	⊗	125/FIN A
FS 11-6		125/FIN A	FS 13-24	⊗	125/FIN A
FS 11-7	⊗	125/FIN A	FS 13-25	⊗	125/FIN A
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FS 11-18	⊗	125/FIN A	FS 13-36		125/FIN A
FS 11-19	⊗	125/FIN A	FS 14-i		125/FIN A
FS 11-20	⊗	125/FIN A	FS 14-ii		125/FIN A
FS 11-21	⊗	125/FIN A	FS 14-1		125/FIN A
FS 11-22	⊗	125/FIN A	FS 14-2	⊗	125/FIN A
FS 11-23	⊗	125/FIN A	FS 14-3	⊗	125/FIN A
FS 11-24	⊗	125/FIN A	FS 14-4	⊗	125/FIN A
FS 11-25	⊗	125/FIN A	FS 14-5	⊗	125/FIN A
FS 11-26	⊗	125/FIN A	FS 14-6	⊗	125/FIN A
FS 11-27	⊗	125/FIN A	FS 14-7	⊗	125/FIN A
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FS 12-1		125/FIN A	FS 14-9		125/FIN A
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FS 12-3	⊗	125/FIN A	FS 14-11		125/FIN A
FS 12-4	⊗	125/FIN A	FS 14-12		125/FIN A

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FS 14-13	125/FIN A
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FS 14-22	125/FIN A
FS 15-1	125/FIN A
FS 15-2	⊗ 125/FIN A
FS 15-3	⊗ 125/FIN A
FS 15-4	125/FIN A
FS 15-5	125/FIN A
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FS 15-10	125/FIN A
FS 15-11	125/FIN A
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FS 15-13	125/FIN A
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FS 15-15	125/FIN A
FS 15-16	125/FIN A
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FS 15-19	125/FIN A
FS 15-20	125/FIN A
FS 15-21	125/FIN A
FS 15-22	125/FIN A
FS 15-23	125/FIN A
FS 15-24	125/FIN A
FS 16-1	125/FIN A
FS CC 16-2	125/FIN A
FS CC 16-3	125/FIN A
FS CC 16-4	⊗ 125/FIN A
FS CC 16-5	⊗ 125/FIN A
FS CC 16-6	125/FIN A
FS CC 16-7	125/FIN A
FS CC 16-8	125/FIN A
FS CC 16-9	⊗ 125/FIN A
FS CC 16-10	125/FIN A

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PDRS CUE CARDS

<u>Title</u>	<u>Ref. Page</u>	<u>Card No.</u>
FSS/HST SJ BERTHING OVERLAY	FS CC 16-2	PDRS-9a/125/O/B
UNGRAPPLE BERTHED HST OVERLAY.....	FS CC 16-3	PDRS-10a/125/O/A
OBSS ITVC SCAN PATTERN CUE CARD		
STBD BELLY TILE SURVEY (Front)	FS CC 16-4	PDRS-11a/125/O/B
PORT BELLY TILE SURVEY (Back)	FS CC 16-5	PDRS-11b/125/O/C
RMS SURVEY TIMELINE CUE CARD (Front)	FS CC 16-6	PDRS-12a/125/O/C
STS-125 END EFFECTOR CUE CARD (Back).....	FS CC 16-7	PDRS-12b/125/O/B
FSS/HST TARGET OVERLAY FOR CTVM.....	FS CC 16-8	PDRS-13a/125/O/B
OBSS SCAN PATTERN CUE CARD		
IDC RCC SURVEY – PORT (Front).....	FS CC 16-9	PDRS-14a/125/O/A
(Back).....	FS CC 16-10	PDRS-14b/125/O/A

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<u>CONTENTS</u>	<u>PAGE</u>
PHOTO SURVEYS	FS 1-1
SSE SURVEY	FS 1-2
FSS UMBILICAL SURVEY.....	FS 1-5
HST SURVEY	FS 1-7
ORBITER SURVEY OPS.....	FS 2-1
OBSS ITVC BELLY TILE SURVEY – STBD	FS 2-2
– PORT.....	FS 2-9
RMS EE CREW CABIN SURVEY	FS 2-31
T0 UMBILICAL AND OMS POD SURVEYS – STBD	FS 2-39
– PORT.....	FS 2-43
OBSS IDC RCC SURVEY – PORT.....	FS 2-47
MODIFIED OBSS UNBERTH FOR FOCUSED INSPECTION	FS 2-57
<u>HST OPS</u>	FS 3-i
NOMINAL HST RETRIEVAL.....	FS 3-1
POISE FOR CAPTURE.....	FS 3-2
HST CAPTURE	FS 3-5
BERTH.....	FS 3-9
OFF-NOMINAL HST RETRIEVAL	FS 4-1
SJ POISE FOR CAPTURE (FROM PRECRADLE).....	FS 4-2
(FROM NOM POISE FOR CAPTURE)	FS 4-7
HST CAPTURE	FS 4-13
BERTH.....	FS 4-17
CONTINGENCY HST CAPTURE.....	FS 4-27
CONTINGENCY HST BERTH (-V3 HGA DEPLOYED)	FS 4-33
MNVR TO INTERMEDIATE 1 POSN	FS 4-34
2 POSN	FS 4-35
3 POSN	FS 4-36
4 POSN	FS 4-37
EXTENDED PARK.....	FS 5-1
HST EXTENDED PARK.....	FS 5-2
RMS EXTENDED PARK.....	FS 5-5
<u>EVA OPS</u>	FS 6-i
EVA SETUP	FS 6-1
MFR SETUP.....	FS 6-2
DAILY SETUP	FS 6-7
EVA 1 – WFC 3, SI C&DH, LOCK INSTALL (-V3 FWD).....	FS 7-1
WFC R&R.....	FS 7-2
SI C&DH R&R	FS 7-13
LOCK INSTALL	FS 7-17
EVA 2 – RSU, BAY 2 BATT (-V3 FWD).....	FS 8-1
RSU.....	FS 8-2
BAY 2 BATTERY R&R	FS 8-13
EVA 3 – COS, ACS PART 1 (-V2 FWD)	FS 9-1
COS.....	FS 9-2
ACS PART 1	FS 9-11

EVA 4 – STIS, NOBL (+V2 FWD)	FS 10-1
STIS	FS 10-2
NOBL 8.....	FS 10-11
EVA 5 – BAY 3 BATT, FGS-2, NOBL 5, ACS PART 2	FS 11-1
BAY 3 BATTERY R&R (+V2 FWD)	FS 11-2
FGS-2 (+V2 FWD).....	FS 11-7
NOBL 5 (+V2 FWD).....	FS 11-15
BAY 3 BATTERY R&R (-V3 FWD)	FS 11-17
ACS PART 2 (-V3 FWD)	FS 11-21
NOBL 5 (-V3 FWD).....	FS 11-25
EVA CLOSEOUT	FS 12-1
EGRESS AT AIRLOCK	FS 12-2
MFR RELEASE	FS 12-3
UNSCHEDULED EVA TASKS	FS 13-1
TPS REPAIR WITH EVA ON OBSS	FS 13-2
NOBL 7.....	FS 13-7
ECU R&R	FS 13-9
VIC R&R	FS 13-15
COPE RSU RETRIEVE	FS 13-17
HGA MANUAL RETRACT/DEPLOY	FS 13-19
APERTURE DOOR MANUAL OPEN/CLOSE	FS 13-21
JETTISON.....	FS 13-23
SOLAR ARRAY MANUAL SLEW AND LOCK	FS 13-27
PDU FUSE R&R.....	FS 13-29
EP/TCE FUSE R&R	FS 13-33
PL ID/POR DEFINITION – PL ID 3	FS 13-35
<u>REFERENCE DATA</u>	FS 14-i
HST REFERENCE DATA	FS 14-1
PL ID/POR DEFINITION – PL ID 0	FS 14-2
HST PL ID/POR DEFINITION – PL ID 3A.....	FS 14-3
4A.....	FS 14-4
ORBITER SURVEYS PL ID/POR DEFINITION – PL ID 5A.....	FS 14-5
5B (UPLINK)	FS 14-6
5C (UPLINK)	FS 14-7
RMS (HST) DAP CONSTRAINTS.....	FS 14-8
CONFIGURATIONS	FS 14-9
JOINT ANGLES VS POR COORDINATES.....	FS 14-10
PHOTO SURVEYS.....	FS 14-10
ORBITER SURVEYS.....	FS 14-10
NOMINAL HST RETRIEVAL	FS 14-12
OFF-NOMINAL HST RETRIEVAL	FS 14-12
EXTENDED PARK	FS 14-13
OBSS BELLY TILE SURVEY AUTOSEQUENCES	FS 14-15
CREW CABIN EE SURVEY AUTOSEQUENCES	FS 14-19
OBSS IDC RCC SURVEY AUTOSEQUENCES	FS 14-20
EVA REFERENCE DATA	FS 15-1
PL ID/POR DEFINITION – PL ID 3B	FS 15-2
– PL ID 4B.....	FS 15-3
RMS (EVA) DAP CONSTRAINTS.....	FS 15-4
CONFIGURATIONS	FS 15-5

JOINT ANGLES VS POR COORDINATES.....	FS 15-6
EVA SETUP.....	FS 15-6
1 – WFC 3, SI C&DH, LOCK (-V3 FWD).....	FS 15-6
2 – RSU, BAY 2 BATT (-V3 FWD)	FS 15-9
3 – COS, ACS PART 1 (-V2 FWD).....	FS 15-11
4 – STIS, NOBL 8 (+V2 FWD).....	FS 15-13
5 – BAY 3 BATT, FGS-2, NOBL 5, ACS PART 2 (+V3 FWD).....	FS 15-15
CLOSEOUT.....	FS 15-17
UNSCHEDULED EVA TASK.....	FS 15-19
CUE CARD CONFIGURATION	FS 16-1

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PHOTO SURVEYS

SSE SURVEY FS 1-2
FSS UMBILICAL SURVEY FS 1-5
HST SURVEY FS 1-7

**PHOTO
SURVEYS**

SSE SURVEY

1. SETUP

√P/TV02 SSE SURVEY; SETUP (PHOTO/TV FS, SCENES) complete

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 0

√INIT ID, ITEM 24: 0

MON 1	A
MON 2	C (B)
DWNLNK	EE

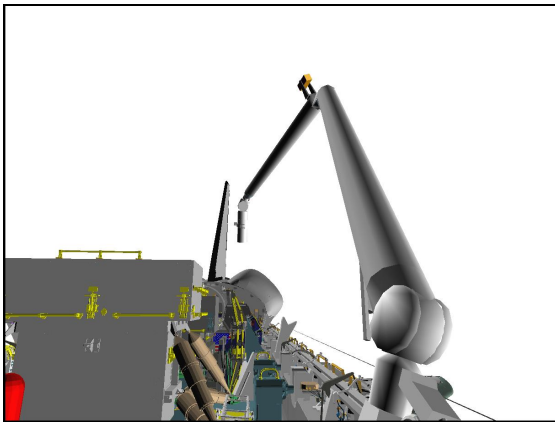
L10(VTR) REC pb – push, hold
PLAY pb – push, simo (red ● on LCD)

2. MNVR TO SSE SURVEY

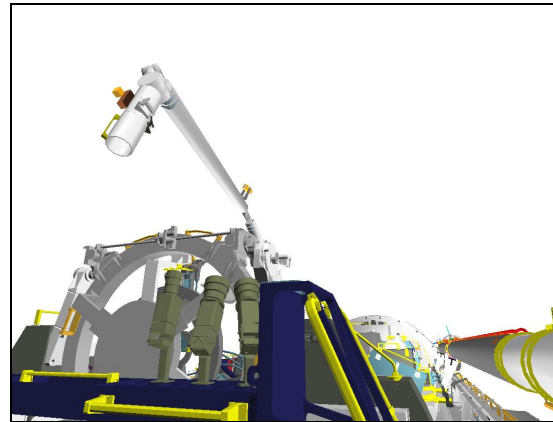
RHC RATE – as reqd (VERN within 10 ft)
BRAKES – OFF (tb-OFF)
MODE – ORB UNL, ENTER

Mnvr to SSE SURVEY posn:

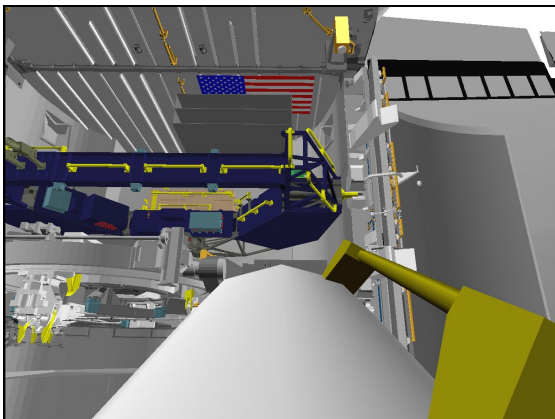
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1155	-60	-550	290	0	0	0
SY	SP	EP	WP	WY	WR	
-12.1	+44.2	-49.7	-67.6	+22.2	+24.8	



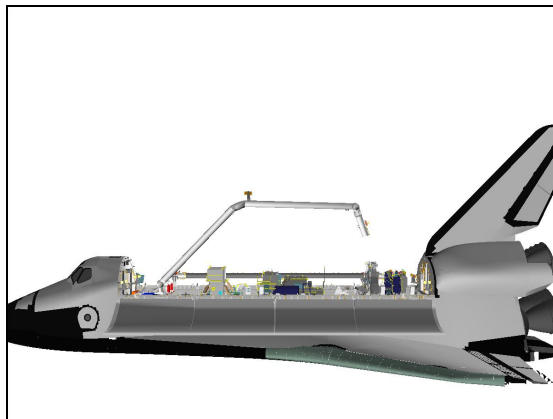
CCTV A (5,15)



CCTV C (-20,20)



EE



PORT

NOTE

If the FSS SSE checkout begins anytime during this survey,
perform FSS UMBILICAL SURVEY (PHOTO SURVEYS).
Continue SSE SURVEY when umbilical checkout complete

Perform P/TV02 SSE SURVEY; OPS (PHOTO/TV FS, SCENES)

When SSE survey complete,
BRAKES – ON (tb-ON)

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FSS UMBILICAL SURVEY

1. SETUP

√P/TV03 FSS OPS; SETUP (PHOTO/TV FS, SCENES) complete

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 0

√INIT ID, ITEM 24: 0

MON 1	A
MON 2	C (B)
DWNLNK	EE

√VTR recording

RHC

2. MNVR TO UMBILICAL SURVEY

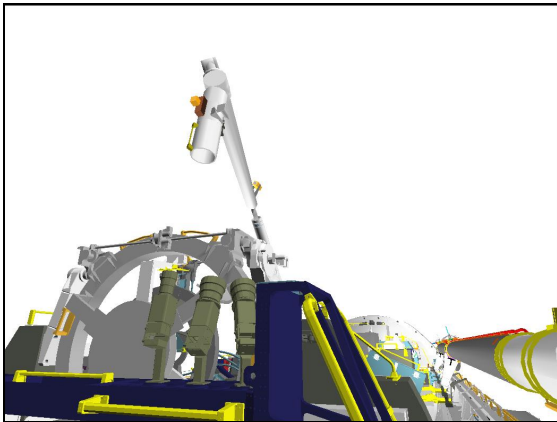
RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

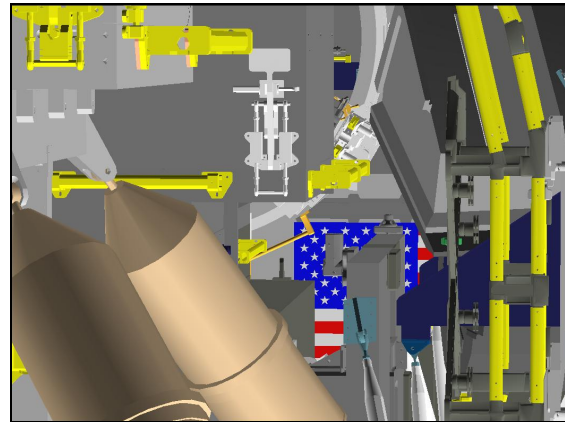
MODE – ORB UNL, ENTER

Mnvr to FSS UMBILICAL SURVEY posn:

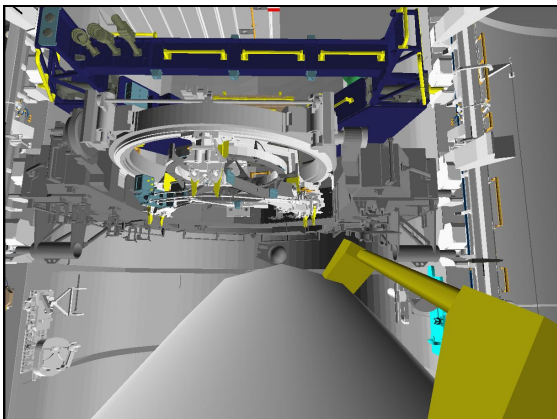
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1130	-20	-550	280	0	0	0
SY	SP	EP	WP	WY	WR	
-17.2	+44.3	-52.0	-78.1	+21.4	+34.2	



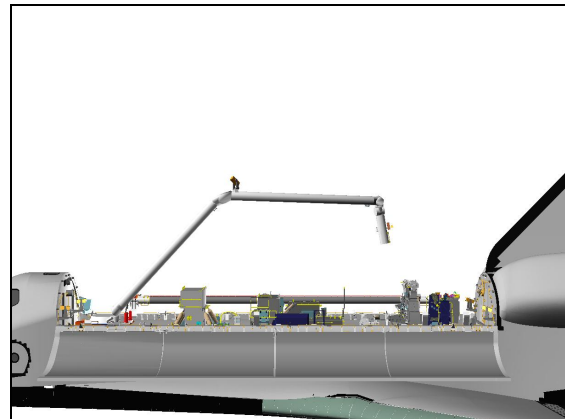
CCTV C (-20,20)



CCTV A (-5,-3, ZOOM – full IN)



EE



PORT

If reqd:

BRAKES – ON (tb-ON)

Go to P/TV03 FSS OPS; OPS, FSS CONFIG FOR BERTHING (PHOTO/TV FS, SCENES)

HST SURVEY

1. SETUP

HST CONFIGURATION

FSS Rotation: 180°, -V3 fwd
 FSS Pivot: 90°, +V1 along -Z
 SA Slew: 90°

√P/TV05 HST SURVEY; SETUP (PHOTO/TV FS, SCENES) complete

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 0

√INIT ID, ITEM 24: 0

MON 1	A (Elbow)
MON 2	D
DWNLNK	EE

√VTR recording

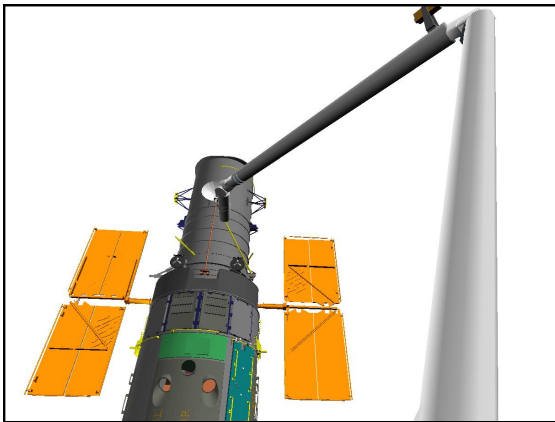
RHC

2. MNVR TO HST SURVEY

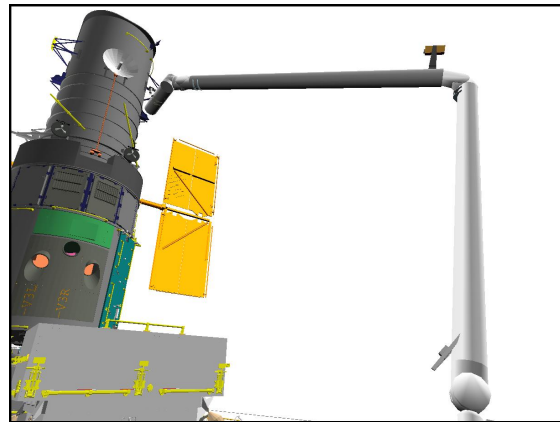
RATE – as reqd (VERN within 10 ft)
 BRAKES – OFF (tb-OFF)
 MODE – ORB UNL, ENTER

Mnvr to HST SURVEY posn:

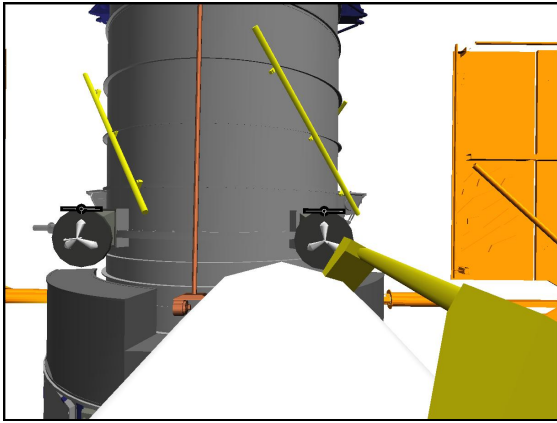
X	Y	Z	PITCH	YAW	ROLL	PL ID
-970	-30	-755	0	0	0	0
SY	SP	EP	WP	WY	WR	
-37.0	+91.8	-89.9	-1.9	+37.0	0.0	



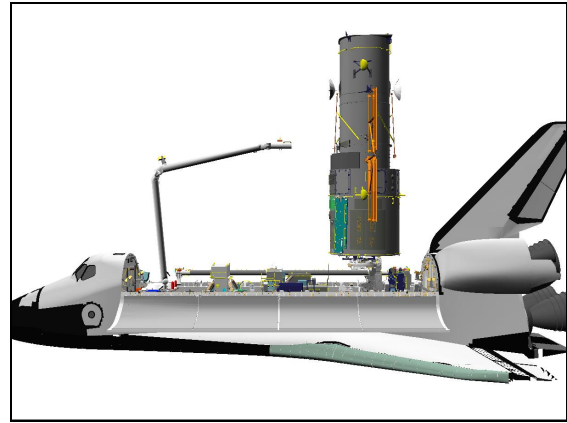
CCTV A (5,40)



CCTV D (40,25)

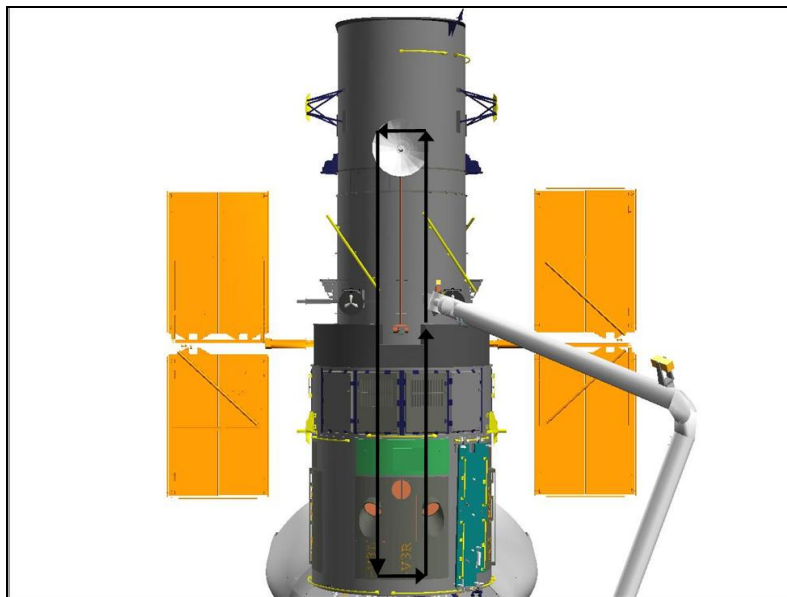


EE



PORT

Refer to P/TV05 HST SURVEY; OPS, -V3 SURVEY (PHOTO/TV FS, SCENES)
for survey requirements



FRONT

Perform HST survey while maintaining $X = -970$ and adjust Zoom as reqd:

Mnvr up until $Z \approx -900$

To avoid EP singularity, pitch EE up to view upper portion of fwd light shield

Mnvr stbd until $Y = +30$

Pitch EE down until $PITCH = 0$

Mnvr down until $Z = -500$

Mnvr port until $Y = -30$. Monitor clearance between RMS and FSIPE

Mnvr up until $Z \approx -755$

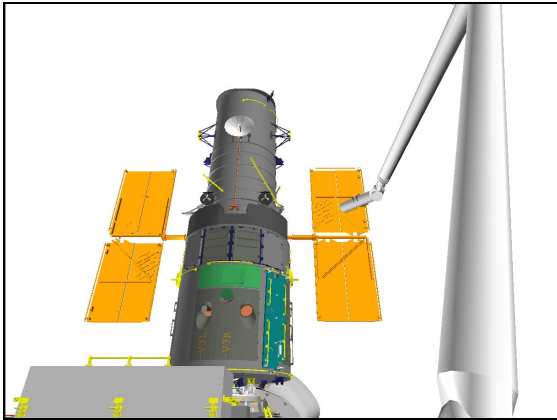
If reqd:

BRAKES – ON (tb-ON)

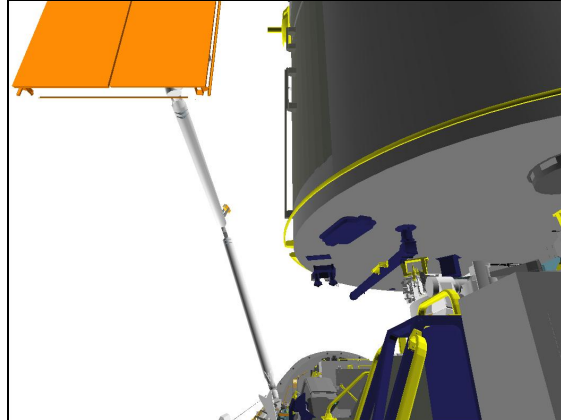
- RHC
3. MNVR TO +V2 SADM SURVEY
 RATE – as reqd (VERN within 10 ft)
 ✓BRAKES – OFF (tb-OFF)
 ✓MODE – ORB UNLD, ENTER

Mnvr to +V2 SADM SURVEY posn:

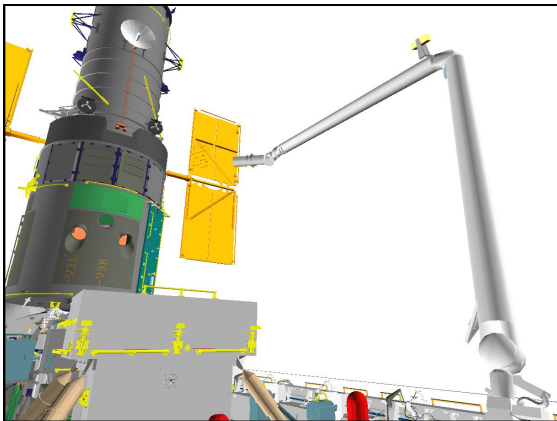
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1047	-160	-716	1	314	91	0
SY	SP	EP	WP	WY	WR	
-0.6	+82.9	-75.3	-25.7	-42.5	+83.6	



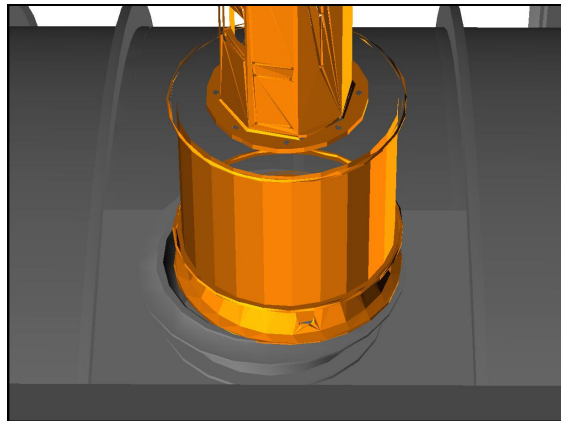
CCTV A (0,30)



CCTV B (0,25)



CCTV D (35,20)



EE HFOV: 10.0

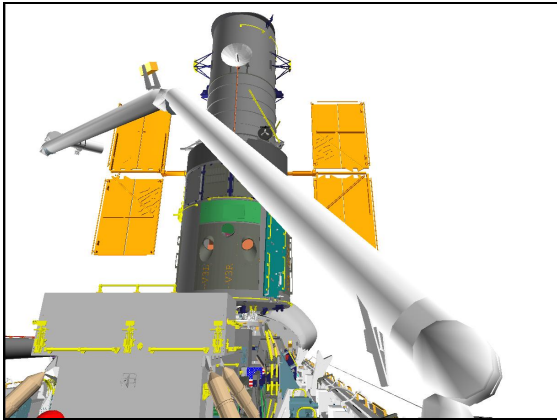
If reqd:
 BRAKES – ON (tb-ON)

RHC

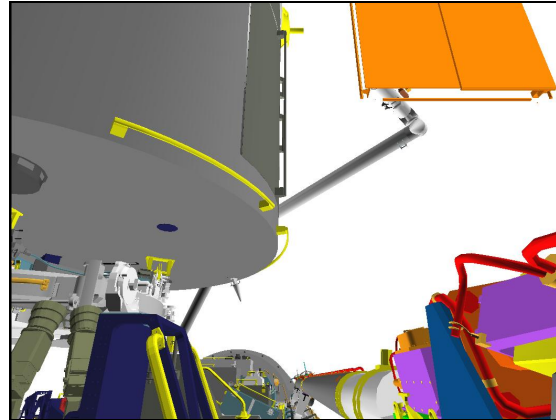
4. MNVR TO -V2 SADM SURVEY
RATE – as reqd (VERN within 10 ft)
√BRAKES – OFF (tb-OFF)
√MODE – ORB UNLD, ENTER

Mnvr to -V2 SADM SURVEY posn:

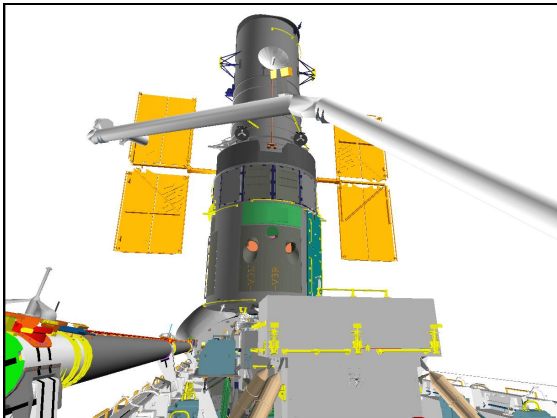
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1032	+172	-698	9	45	270	0
SY	SP	EP	WP	WY	WR	
-50.8	+30.2	-34.0	+101.5	+69.9	+183.3	



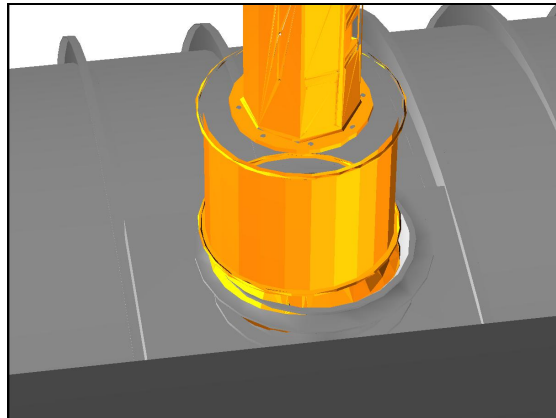
CCTV A (0,20)



CCTV C (0,25)



CCTV D (10,20)



EE HFOV: 10

When survey complete,
BRAKES – ON (tb-ON)

ORBITER SURVEY OPS

OBSS ITVC BELLY TILE SURVEY – STBD.....	FS 2-2
– PORT	FS 2-9
RMS EE CREW CABIN SURVEY	FS 2-31
T0 UMBILICAL AND OMS POD SURVEYS – STBD.....	FS 2-39
– PORT	FS 2-43
OBSS IDC RCC SURVEY – PORT	FS 2-47
MODIFIED OBSS UNBERTH FOR FOCUSED INSPECTION	FS 2-57

OBSS ITVC BELLY TILE SURVEY – STBD (26 min)

WARNING
 Stbd PLBD radiator must be stowed
 APAS Docking Ring must be retracted

NOTE

Assumed starting posn is OBSS LDRI/IDC RCC Survey – Stbd, Point 13P.

For PL ID 5, rates have been set such that Coarse is used for all Tile Acreage Surveying. Vern rates required to survey following areas: ET door seals, landing gear door seals, Elevon Cove

ORBITER SURVEY OPS

1. SETUP

L10(VTR) BRAKES – ON (tb-ON)
 STOP pb – push (no red ● on LCD)

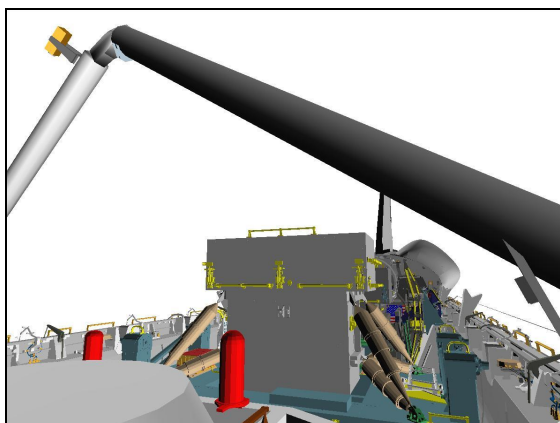
SM 94 PDRS CONTROL

PL ID – ITEM 3 +5 EXEC
 INIT ID – ITEM 24 +5 EXEC
 AUTO MODES – ITEM 13 +7 EXEC

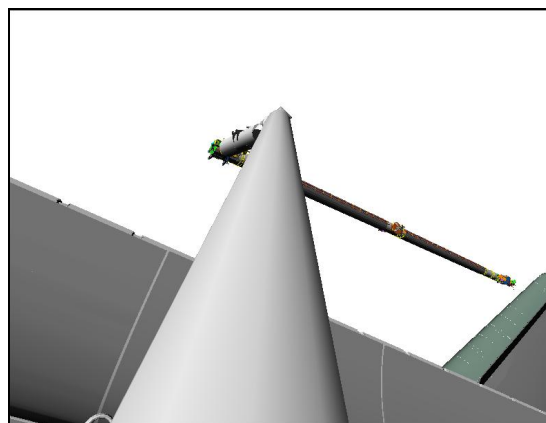
For survey scan pattern, refer to OBSS SCAN PATTERN CUE CARD – STBD & PORT ITVC BELLY TILE

Verify Stbd LDRI ACAS, Point 13P:

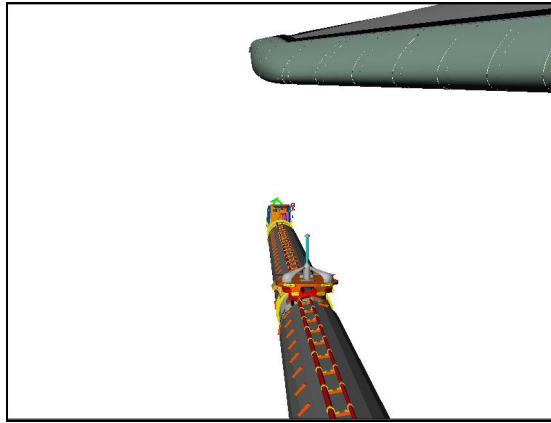
	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1328	+464	-221	348	346	12	5
	SY	SP	EP	WP	WY	WR	
√	-74.9	+16.3	-74.3	-43.0	-12.2	-276.6	



CCTV A (-20,10)



ELBOW (0,-20)



RSC

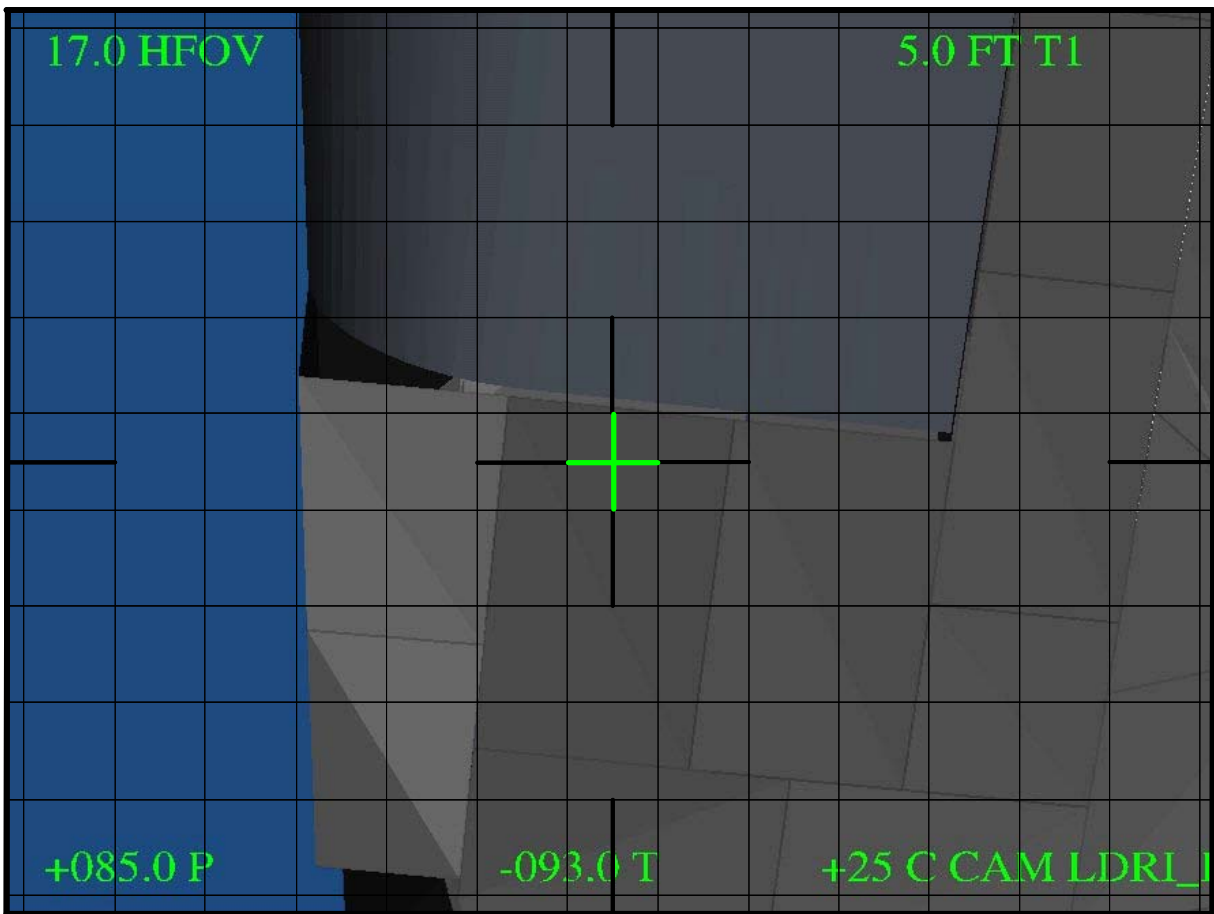
A7U

√MUX 1 L ← MIDDECK

LDRI MODE 2 pb – push (ITVC video)
 ZOOM: 17.0 HFOV
 FOCUS: 17 ft

√DTV ← PL2

PAN/TILT to match ITVC view shown below



ITVC (85,-93)

√MCC to verify correct sensor view
 Note PAN/TILT: _____, _____

VID OUT – not DTV
 VID IN – not PL2

2. STBD ITVC BELLY TILE ACAS, SECTION 1

Stbd ITVC Belly Tile Clearance Views	Cameras
OBSS-to-PLBD	ELBOW, C, D
OBSS-to-Stbd Wing	ELBOW, RSC
RMS-to-PLB Structures	ELBOW, A, D

RHC √RATE – COARSE (RATE MIN tb-OFF)
 BRAKES – OFF (tb-OFF)
 MODE – AUTO 1, ENTER

- * If unable to enter AUTO mode (no AUTO READY It): *
- * √POR coordinates and adjust as reqd *

SM 94 PDRS CONTROL

√START PT, ITEM 17: 148

SM 169 PDRS STATUS

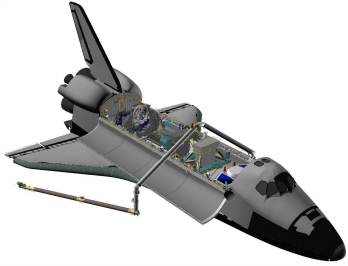
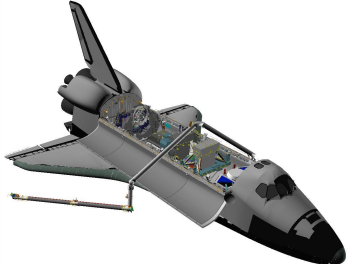
Monitor ACAS progress

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

LCC/PGSC sel ‘Scan Hi-Res’

AUTO SEQ – PROCEED (IN PROG It on)

ACAS, pause pts **shaded in bold**, ● col indicates data recording (black = VTR on) (04:45)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
148P Δ	-1328 -37	+464 +6	-221 -130	348 +14	346 +2	12 +1	
149 Δ	-1291 +48	+458 +235	-91 -19	334 +4	345 -22	10 +5	
150 Δ	-1339 -65	+223 +38	-72 -9	332 +1	7 -3	16 +4	
151 Δ	-1274 +55	+185 -309	-63 +130	331 -9	12 +25	14 -14	
152P Δ	-1329 0	+494 +247	-193 -35	343 +2	344 -20	19 +13	

3. STBD ITVC BELLY TILE ACAS, SECTION 2

When AUTO SEQ READY It – on:

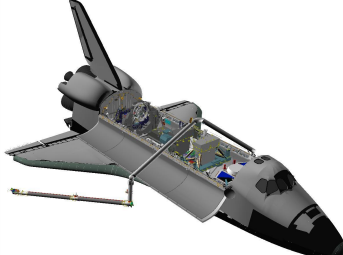
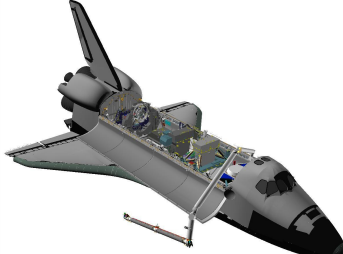
RHC RATE – VERN (RATE MIN tb-ON)

A7U √DTV ← PL2
 FOCUS: 12 ft

VID OUT – not DTV
 VID IN – not PL2

AUTO SEQ – PROCEED (IN PROG It on)

ACAS, pause pts **shaded in bold**, ● col indicates data recording (black = VTR on) (11:15)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
152P Δ	-1329 0	+494 +247	-193 -35	343 +2	344 -20	19 +13	
153 Δ	-1329 -86	+247 +86	-158 -61	343 +1	7 -9	13 +2	
154 Δ	-1243 -98	+161 +13	-97 +57	342 +1	16 -8	14 -3	
155 Δ	-1145 -170	+148 -7	-154 +5	339 +3	22 +1	20 -3	
156 Δ	-975 +3	+155 -52	-159 +7	335 0	20 +2	23 -4	
157 Δ	-978 +174	+207 +37	-166 -13	334 -5	16 +1	26 +13	
158 Δ	-1152 -9	+170 -54	-153 +11	343 +4	19 +1	13 -5	
159 Δ	-1143 -182	+224 -6	-164 +7	338 +3	16 -3	17 -8	
160P Δ	-961 +69	+230 -35	-171 -46	332 -2	15 +9	26 +7	

4. STBD ITVC BELLY TILE ACAS, SECTION 3

When AUTO SEQ READY It – on:

RHC RATE – COARSE (RATE MIN tb-OFF)

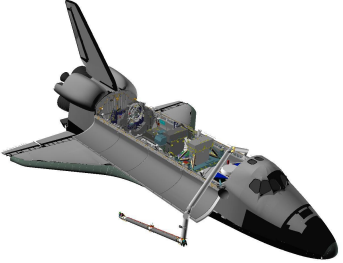
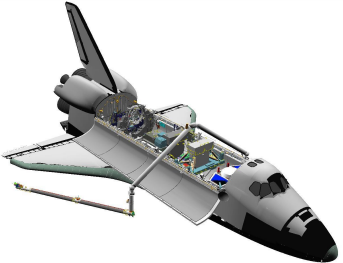
A7U √DTV ← PL2
FOCUS: 13 ft

VID OUT – not DTV

VID IN – not PL2

AUTO SEQ – PROCEED (IN PROG It on)

ACAS, pause pts **shaded in bold**, ● col indicates data recording (black = VTR on) (10:00)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
160P Δ	-961 +69	+230 -35	-171 -46	332 -2	15 +9	26 +7	
161 Δ	-1030 +115	+265 +9	-125 -16	336 -3	10 +2	16 +3	
162 Δ	-1145 +1	+256 +72	-109 -5	340 -2	9 -10	12 -5	
163 Δ	-1146 +56	+184 -41	-104 0	340 0	17 +3	20 -2	
164 Δ	-1202 +55	+225 -20	-104 +2	340 0	14 +5	21 +5	
165 Δ	-1257 -72	+245 +25	-106 -1	341 0	11 0	15 +2	
166 Δ	-1185 -36	+220 -48	-105 +4	341 +1	12 +3	13 0	
167 Δ	-1149 +138	+268 -9	-109 -5	340 -2	9 +5	12 -3	
168 Δ	-1287 -8	+277 -60	-104 +4	342 -1	3 +4	13 -1	
169 Δ	-1279 -261	+337 +47	-108 +16	343 +8	359 -7	13 +4	
170 Δ	-1018 +142	+290 -95	-124 0	335 -4	7 +5	12 -9	
171 Δ	-1160 +118	+385 +10	-124 -4	339 -2	359 +4	19 +4	
172 Δ	-1278 -10	+375 -54	-120 +6	341 -1	357 +4	14 -3	
173 Δ	-1268 -108	+429 +69	-126 -10	342 -3	352 -1	15 +15	
174 Δ	-1160 +115	+360 -95	-116 +9	344 +4	357 +2	1 -15	
175 Δ	-1275 +53	+455 -9	-125 +96	342 -7	350 +4	14 +1	
176P Δ	-1328 0	+464 0	-221 0	348 0	346 0	12 0	

5. RECONFIGURE FOR OBSS LDRI/IDC RCC SURVEY – STBD

When AUTO SEQ IN PROG It – off:

LCC/PGSC sel 'Stop Scan'
L10(VTR) STOP pb – push (no red ●)

BRAKES – ON (tb-ON)

Verify mnvr to Stbd LDRI ACAS, Point 13P complete:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1328	+464	-221	348	346	12	5
SY	SP	EP	WP	WY	WR	
-74.9	+16.3	-74.3	-43.0	-12.2	-276.6	

SM 94 PDRS CONTROL

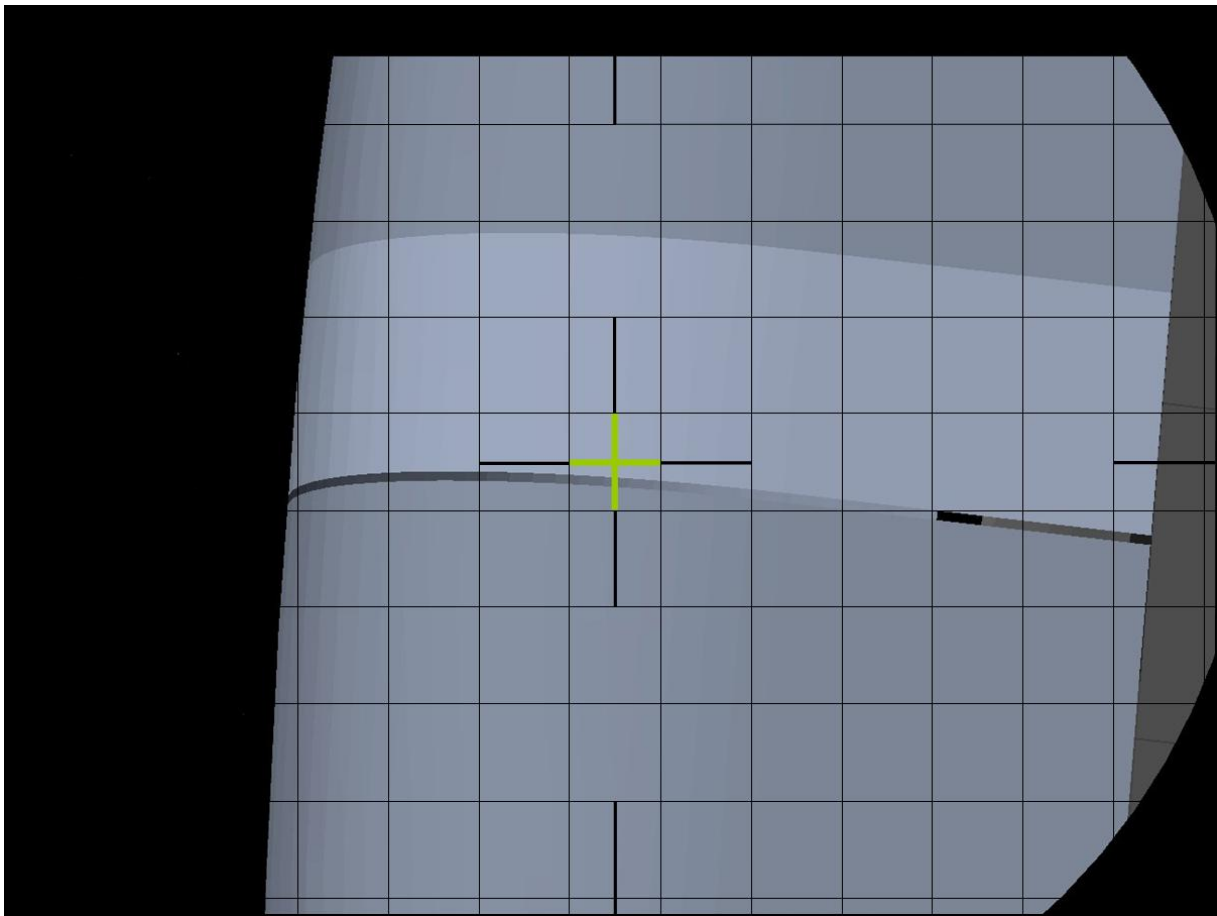
PL ID – ITEM 3 +2 EXEC
INIT ID – ITEM 24 +2 EXEC
AUTO MODES – ITEM 13 +1 EXEC

A7U

MUX 1 L ← MIDDECK
LDRI MODE 6 pb – push (brighter flickering LDRI video)

DTV ← PL2

PAN/TILT to match ITVC view shown below



LDRI: +85,-60

√MCC to verify correct sensor view
Note PAN/TILT: _____, _____

IF CONTINUING OBSS OPS WITH STBD RCC SURVEY

Go to OBSS LDRI/IDC RCC SURVEY – STBD, step 5b

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OBSS ITVC BELLY TILE SURVEY – PORT (115 min)

I

WARNING
Port PLBD radiator must be stowed

NOTE

Assumed starting posn is OBSS LDRI/IDC RCC
Survey – Port, Point 114P.

For PL ID 5, the rates have been set such that Coarse is used for all Tile Acreage Surveying. Vern rates required to survey the following areas: ET door seals, landing gear door seals, Elevon Cove.

Uplink of new autosequence required

1. SETUP
BRAKES – ON (tb-ON)

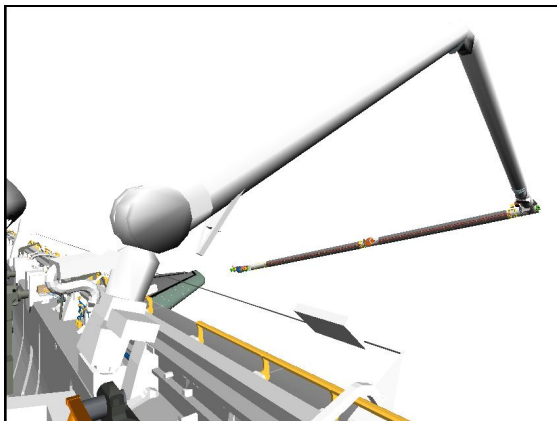
SM 94 PDRS CONTROL

PL ID – ITEM 3 +5 EXEC
 INIT ID – ITEM 24 +5 EXEC
 AUTO MODES – ITEM 13 +1 EXEC

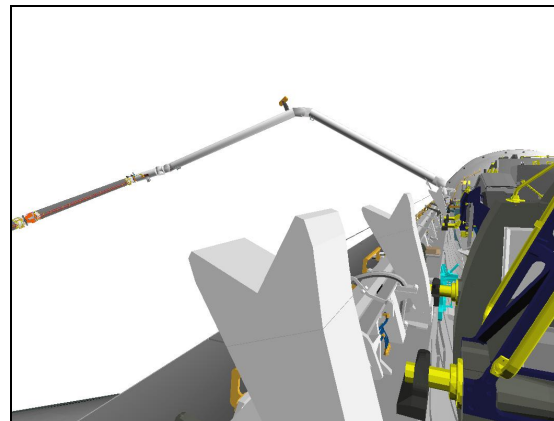
For survey scan pattern, refer to OBSS SCAN PATTERN CUE CARD – PORT ITVC BELLY TILE

Verify Port LDRI ACAS, Point 114P:

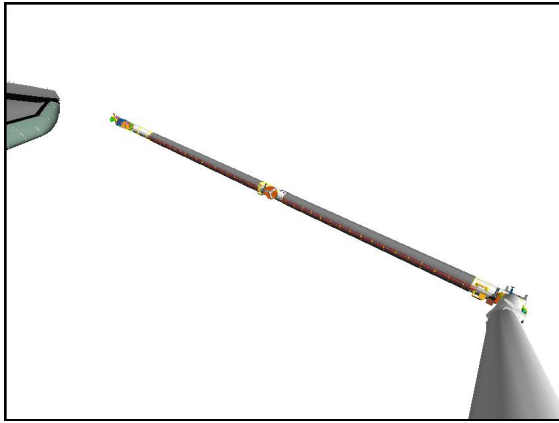
	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1323	-537	-315	346	348	282	5
	SY	SP	EP	WP	WY	WR	
√	+80.9	+49.1	-50.2	+5.9	+0.6	-87.1	



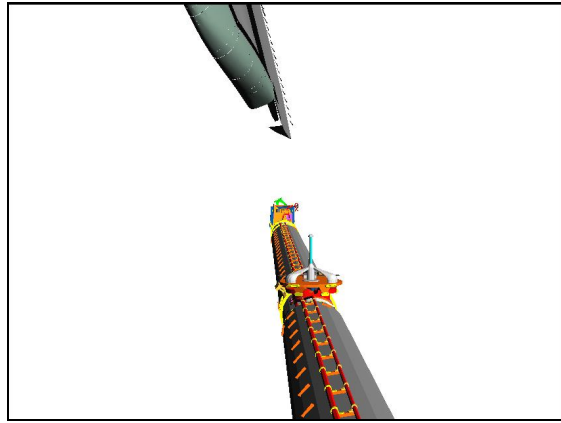
CCTV A (40,0)



CCTV B (-25,-5)



ELBOW (-30,10)



RSC

A7U

√MUX 1 L ← MIDDECK

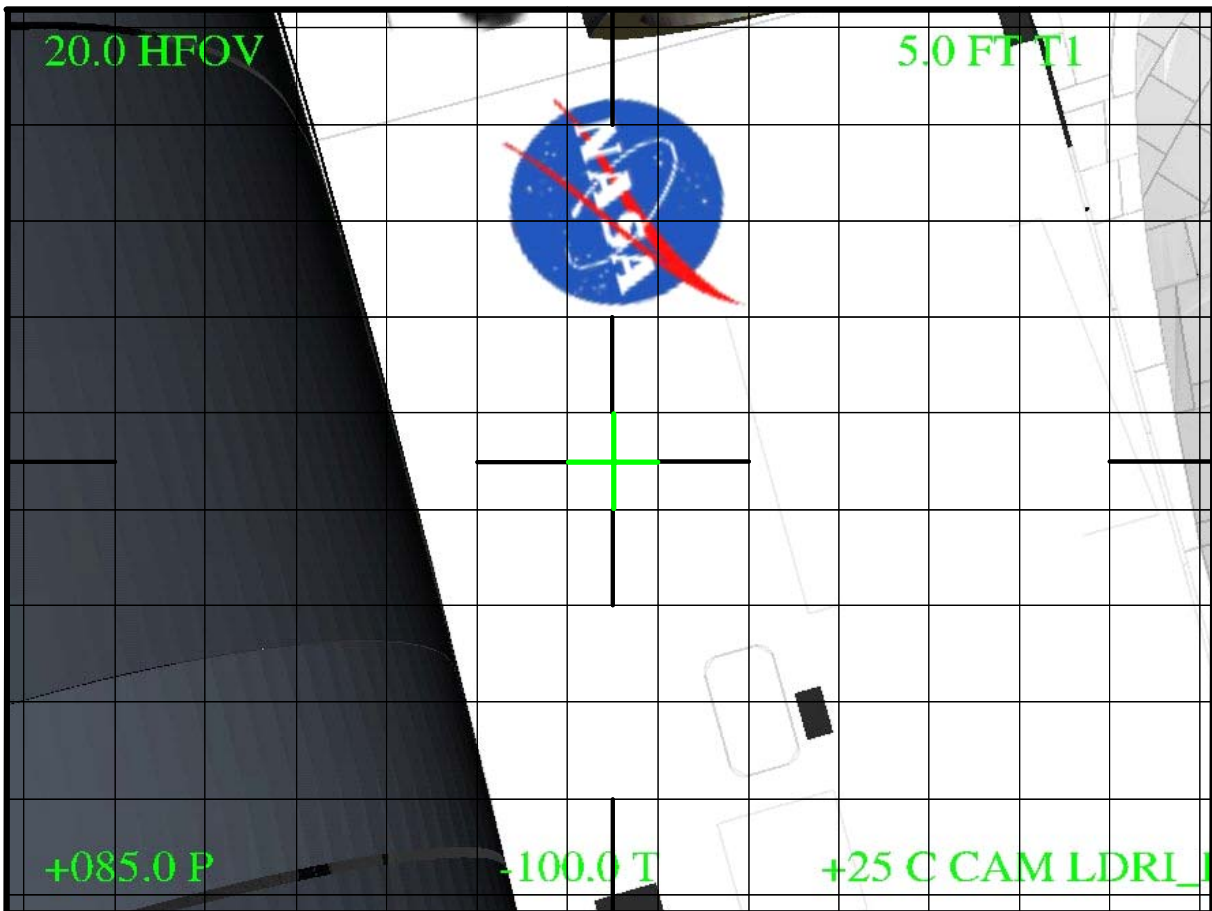
LDRI MODE 2 pb – push (ITVC video)

ZOOM: 20.0 HFOV

FOCUS: 13 ft

√DTV ← PL2

PAN/TILT to match ITVC view shown below



ITVC (85,-100)

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

VID OUT – not DTV
 VID IN – not PL2

2. PORT ITVC BELLY TILE ACAS, SECTION 1

Port ITVC Belly Tile Clearance Views	Cameras
RMS-to-PLBD	ELBOW, A, B
OBSS-to-Stbd Wing	ELBOW, RSC
RMS-to-PLB Structures	A, B

RHC √RATE – COARSE (RATE MIN tb-OFF)
 BRAKES – OFF (tb-OFF)
 MODE – AUTO 1, ENTER

- * If unable to enter AUTO mode (no AUTO READY It): *
- * √POR coordinates and adjust as reqd *

SM 94 PDRS CONTROL

√START PT, ITEM 17: 1

SM 169 PDRS STATUS

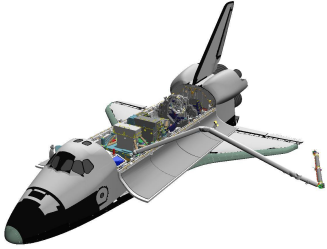
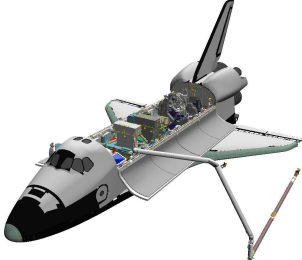
Monitor ACAS progress

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

LCC/PGSC sel ‘Scan Hi-Res’

 AUTO SEQ – PROCEED (IN PROG It on)

ACAS, pause pts **shaded in bold**, ● col indicates data recording (black = VTR on) (13:45)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
1P Δ	-1323 +41	-537 -67	-315 -218	346 -16	348 -15	282 -81	
2 Δ	-1364 +68	-470 -353	-97 -19	357 -3	2 +25	3 -1	
3 Δ	-1432 +113	-117 +30	-78 +2	0 +1	337 -1	4 +7	
4 Δ	-1545 -20	-147 -216	-80 +5	356 +10	338 +12	356 -10	
5 Δ	-1525 -88	+69 -49	-85 +3	351 -5	324 +12	4 +1	
6 Δ	-1437 -69	+118 +65	-88 -29	355 -2	312 -10	2 -2	
7 Δ	-1368 +130	+53 +19	-59 +12	359 0	322 -10	5 0	
8 Δ	-1498 -38	+34 +102	-71 +9	359 +2	332 +1	5 -5	
9 Δ	-1460 -70	-68 0	-80 0	0 0	331 0	11 0	
10 Δ	-1390 +25	-68 -123	-80 +2	0 0	331 0	11 0	
11 Δ	-1415 -47	+55 +15	-82 -24	0 -2	331 -2	11 +4	
12 Δ	-1368 +3	+40 +518	-58 +133	0 -7	333 -27	7 +5	
13P Δ	-1371 +2	-478 -467	-191 -35	6 +6	359 +36	359 -10	

3. PORT ITVC BELLY TILE ACAS, SECTION 2

When AUTO SEQ READY It – on:

RHC RATE – VERN (RATE MIN tb-ON)

A7U √DTV ← PL2
FOCUS: 9 ft

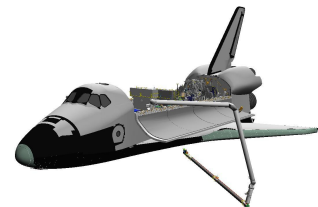
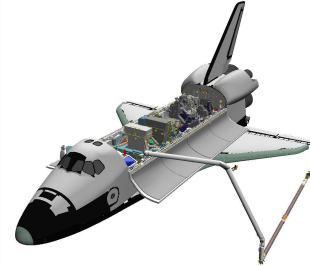
VID OUT – not DTV

VID IN – not PL2

AUTO SEQ – PROCEED (IN PROG It on)

ACAS, pause pts **shaded in bold**, ● col indicates data recording (black = VTR on) (13:00)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
13P Δ	-1371 +2	-478 -467	-191 -35	6 +6	359 +36	359 -10	
14 Δ	-1373 +13	-11 -211	-156 +20	8 -8	324 +16	12 +14	
15 Δ	-1386 -50	+200 +85	-176 -16	3 +6	306 -7	357 -9	
16 Δ	-1336 0	+115 +240	-160 -1	7 +1	313 -17	11 +2	
17 Δ	-1336 -44	-125 -6	-159 0	4 0	330 +1	7 -2	
18 Δ	-1292 +12	-119 -219	-159 0	5 +2	329 +18	9 -4	
19P Δ	-1304 -52	+100 +35	-159 -53	8 +2	311 -4	16 -3	



4. PORT ITVC BELLY TILE ACAS, SECTION 3

When AUTO SEQ READY It – on:

RHC RATE – COARSE (RATE MIN tb-OFF)

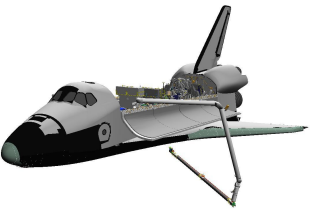
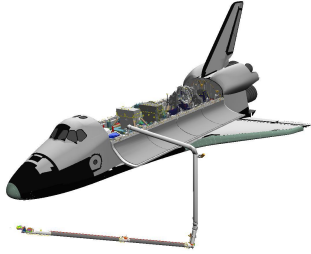
A7U √DTV ← PL2
FOCUS: 13 ft

VID OUT – not DTV

VID IN – not PL2

AUTO SEQ – PROCEED (IN PROG It on)

ACAS, pause pts **shaded in bold**, ● col indicates data recording (black = VTR on) (08:00)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
19P Δ	-1304 -52	+100 +35	-159 -53	8 +2	311 -4	16 -3	
20 Δ	-1252 -252	+65 +52	-106 +7	8 -9	315 +14	19 +14	
21 Δ	-1000 -32	+13 -115	-113 +22	359 +14	299 -6	359 +1	
22 Δ	-968 -206	+128 +44	-135 -3	346 -3	305 +36	0 -6	
23 Δ	-762 -341	+84 +27	-132 +2	207 -5	272 +52	216 -10	
24 Δ	-421 -151	+57 +36	-134 +66	174 +15	324 0	173 +1	
25P Δ	-270 +110	+21 +46	-200 -22	160 +6	324 -3	174 +19	

5. PORT ITVC BELLY TILE ACAS, SECTION 4

When AUTO SEQ READY It – on:

RHC RATE – VERN (RATE MIN tb-ON)

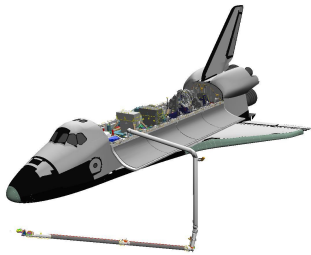
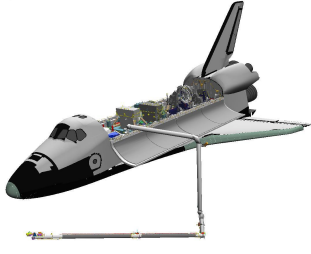
A7U √DTV ← PL2
FOCUS: 9 ft

VID OUT – not DTV

VID IN – not PL2

AUTO SEQ – PROCEED (IN PROG It on)

ACAS, pause pts **shaded in bold**, ● col indicates data recording (black = VTR on) (03:30)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
25P Δ	-270 +110	+21 +46	-200 -22	160 +6	324 -3	174 +19	
26 Δ	-380 +5	-25 +40	-178 +2	169 -2	315 +5	196 +3	
27 Δ	-385 -129	-65 -14	-180 +22	174 +9	319 +10	201 -3	
28P Δ	-256 +188	-51 +83	-202 -60	165 -13	329 -4	201 +7	

6. PORT ITVC BELLY TILE ACAS, SECTION 5

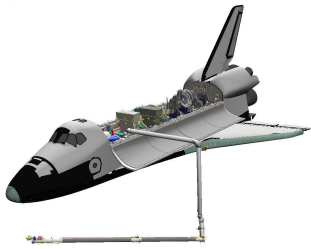

When AUTO SEQ READY It – on:

RHC RATE – COARSE (RATE MIN tb-OFF)

A7U √DTV ← PL2
 FOCUS: 13 ft

VID OUT – not DTV
VID IN – not PL2

AUTO SEQ – PROCEED (IN PROG It on)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
28P Δ	-256 +188	-51 +83	-202 -60	165 -13	329 -4	201 +7	
29 Δ	-444 -26	-134 -119	-142 -13	183 -4	325 -12	209 -6	
30 Δ	-418 +515	-15 -90	-129 0	182 -15	313 -78	202 -2	
31 Δ	-933 -18	+75 +88	-129 -11	344 +1	307 -17	358 -2	
32P Δ	-915 +352	-13 -23	-118 -12	349 -8	323 -6	6 -1	

Note PAN/TILT: _____, _____

7. ET DOORS ITVC SURVEY

When AUTO SEQ READY It – on:

A7U

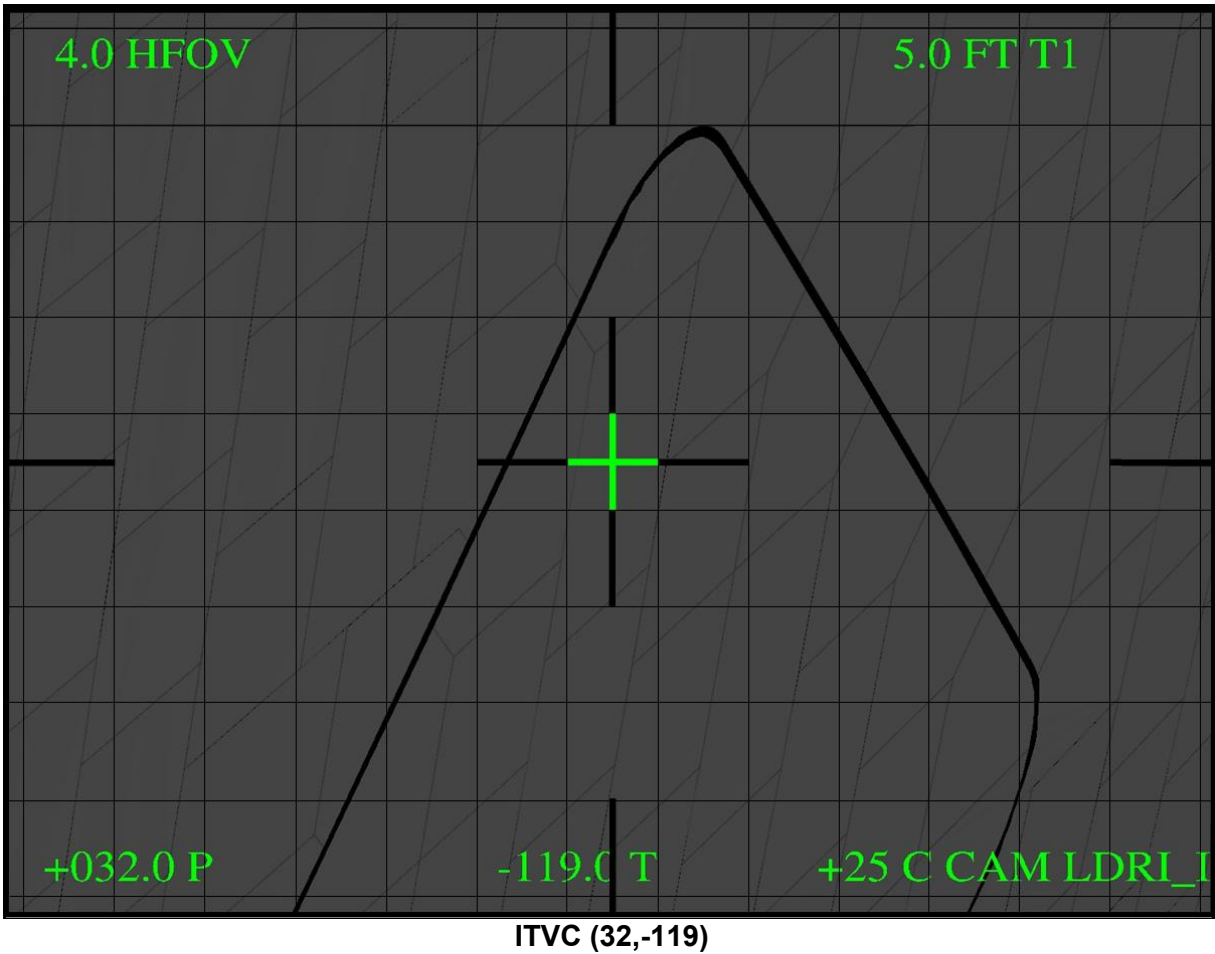
√MUX 1 L ← MIDDECK
√DTV ← PL2

CAMR CMD PAN: +32
TILT: -119

ZOOM: 4.0 HFOV
FOCUS: best focus (~35 ft)

LT LEVEL pb – push
NIGHT pb – push

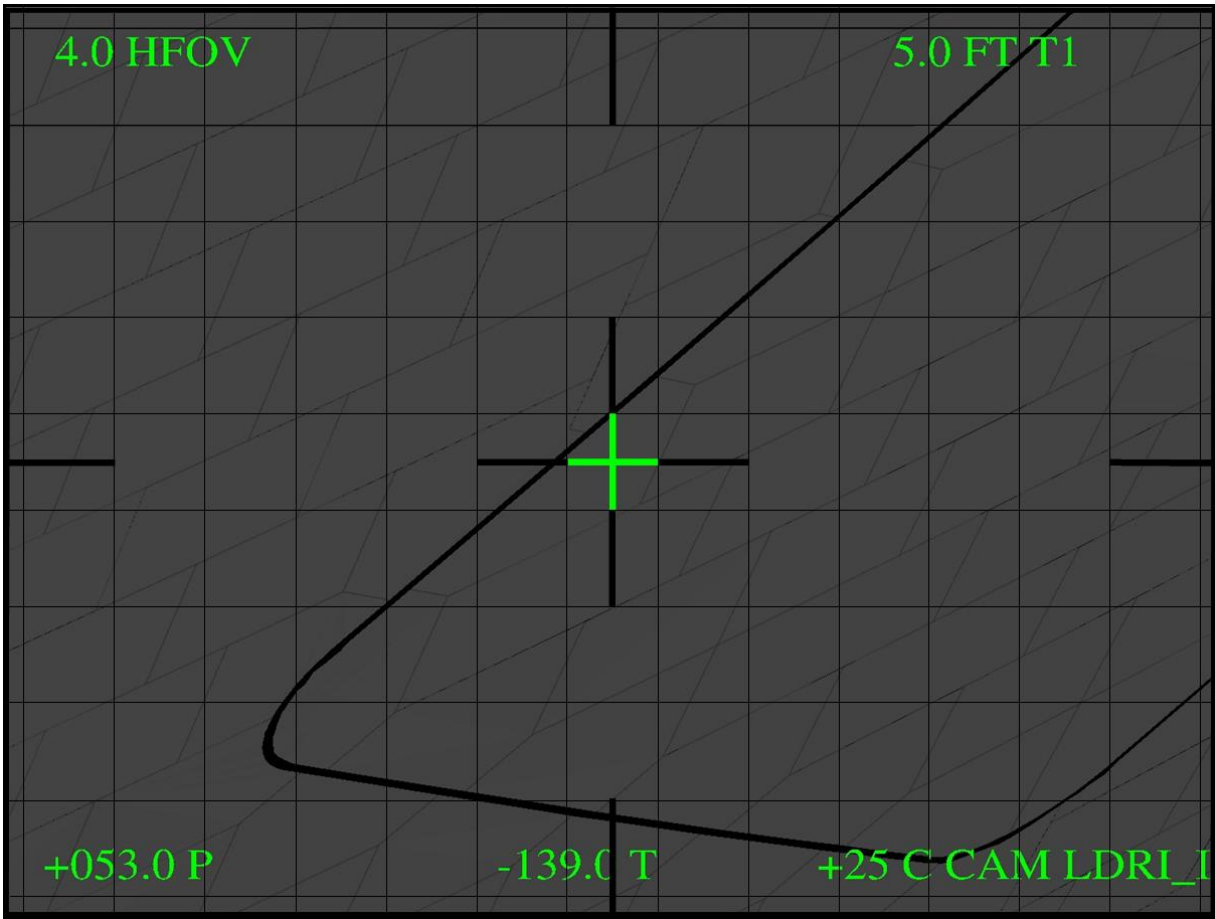
PAN/TILT to match ITVC view shown below



√MCC to verify correct sensor view
Note PAN/TILT: _____, _____

ZOOM: 18.0 HFOV
CAMR CMD PAN: +53
 TILT: -139
ZOOM: 4.0 HFOV
FOCUS: best focus (~35 ft)

PAN/TILT to match ITVC view shown below



ITVC (53,-139)

√MCC to verify correct sensor view
Note PAN/TILT: _____, _____

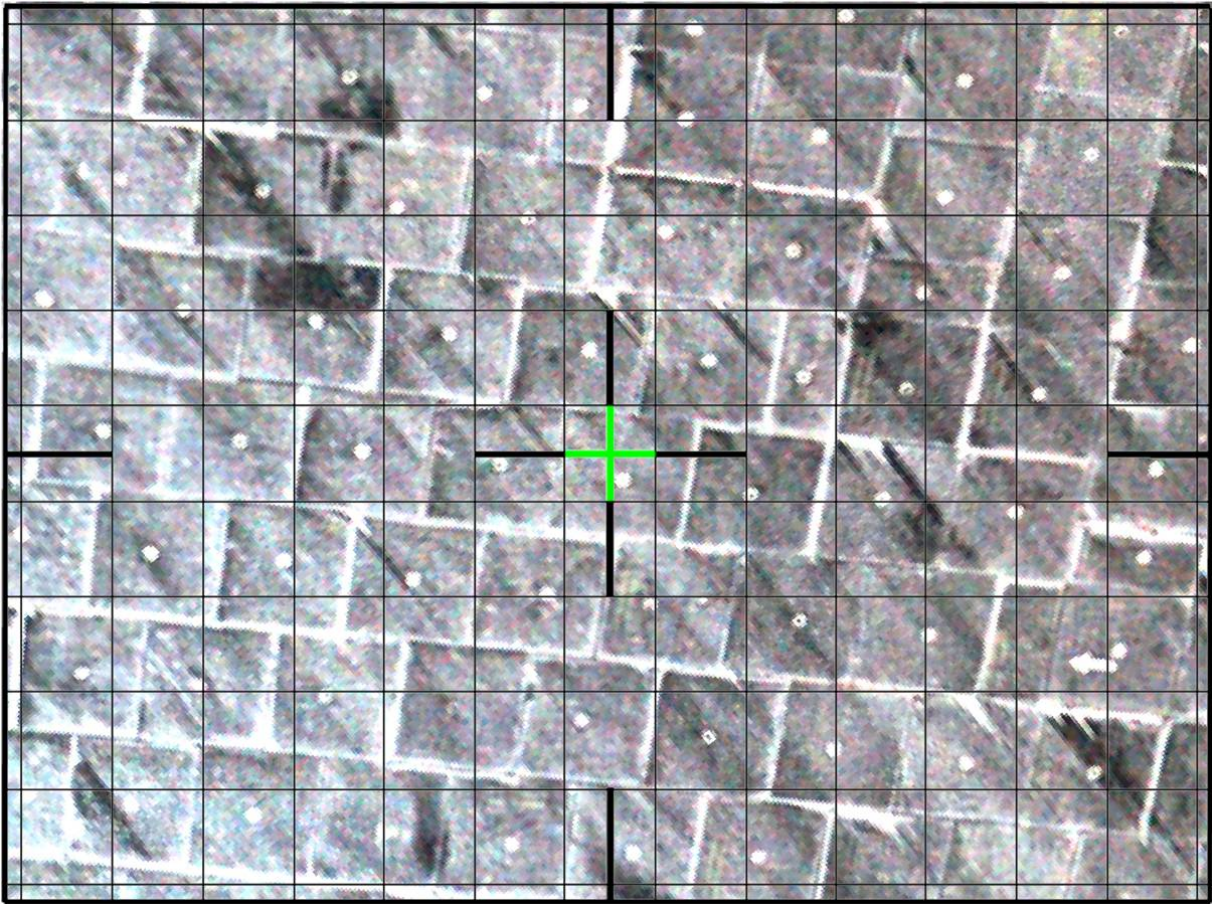
A7U

√MUX 1 L ← MIDDECK
√DTV ← PL2

ZOOM: 20.0 HFOV
CAMR CMD PAN: +85
 TILT: -100
FOCUS: 13 ft

LT LEVEL pb – push
DAY pb – push

PAN/TILT to match ITVC view shown below



ITVC (85,-100)

√MCC to verify correct sensor view

8. PORT ITVC BELLY TILE ACAS, SECTION 6

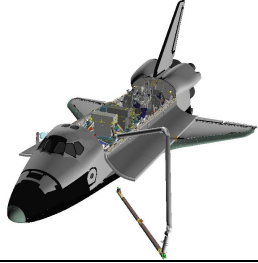
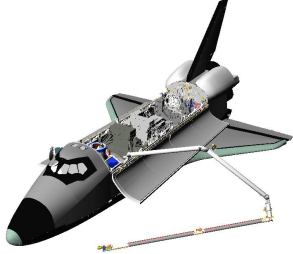
VID OUT – not DTV

VID IN – not PL2

RHC √RATE – COARSE (RATE MIN tb-OFF)

AUTO SEQ – PROCEED (IN PROG It on)

ACAS, pause pts **shaded in bold**, ● col indicates data recording (black = VTR on) (09:45)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
32P Δ	-915 +352	-13 -23	-118 -12	349 -8	323 -6	6 -1	
33 Δ	-1267 -40	+10 +47	-106 +3	358 +5	329 -7	8 -8	
34 Δ	-1227 -345	-37 +61	-109 +16	357 -2	335 +16	18 +22	
35 Δ	-882 0	-98 -133	-125 +3	341 -1	323 +11	350 -5	
36 Δ	-882 -386	+35 +109	-128 +14	344 -3	311 +69	352 +10	
37 Δ	-496 +4	-74 +91	-142 +12	211 0	304 +7	213 +6	
38 Δ	-500 +66	-165 -13	-154 -10	213 +7	313 +3	216 -5	
39 Δ	-566 -22	-152 -74	-144 -11	200 0	314 -8	208 -2	
40P Δ	-544 -18	-78 +44	-133 -3	201 -1	306 +4	210 +3	

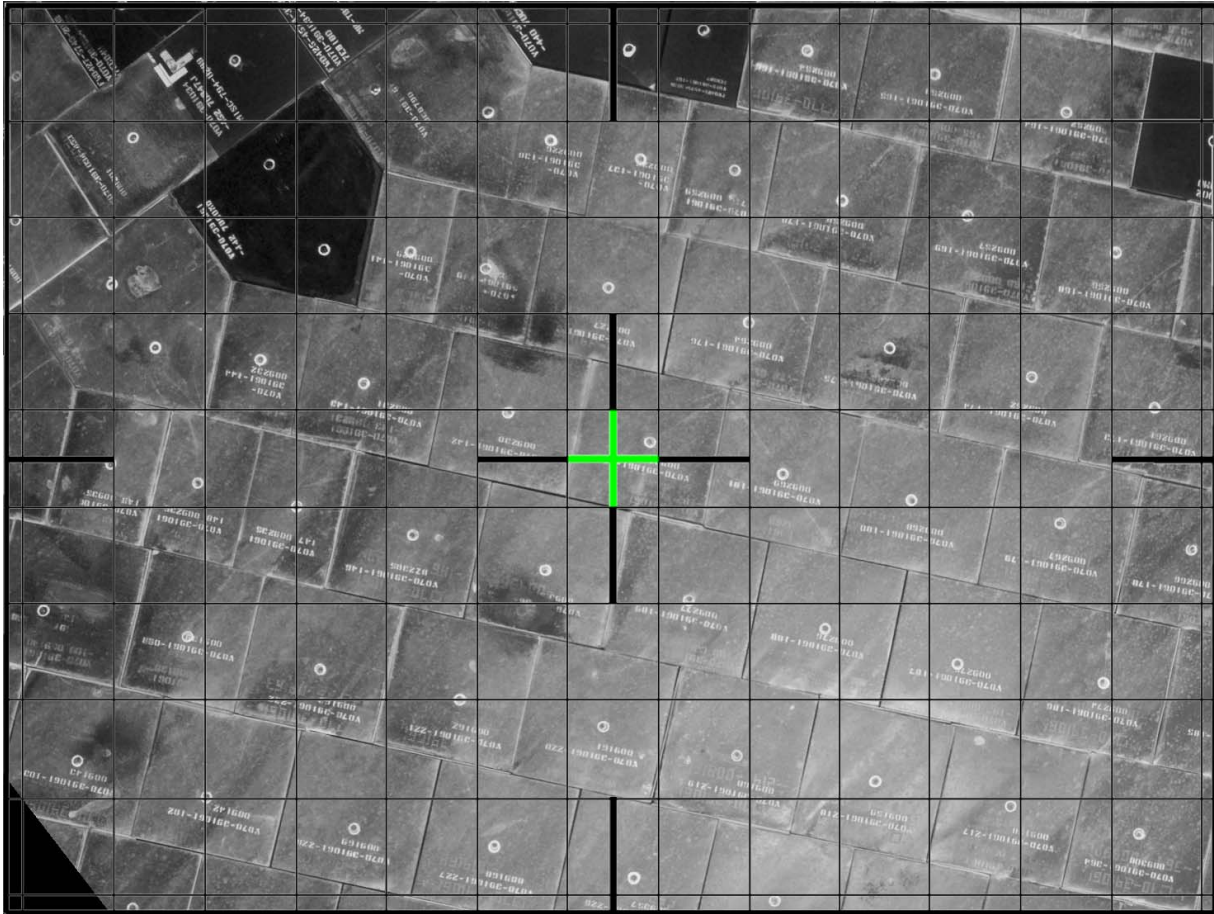
When AUTO SEQ READY It – on:

A7U

√MUX 1 L ← MIDDECK

√DTV ← PL2

PAN/TILT to match ITVC view shown below



ITVC (85,-75)

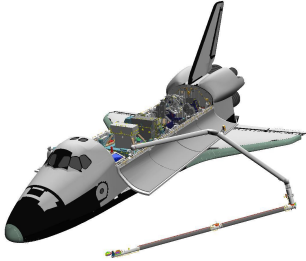
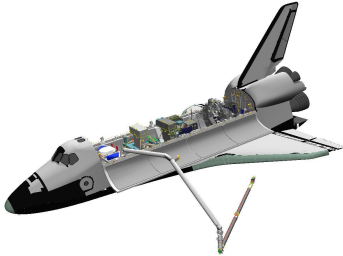
√MCC to verify correct sensor view
Note PAN/TILT: _____, _____

VID OUT – not DTV
VID IN – not PL2

RHC √RATE – COARSE (RATE MIN tb-OFF)

AUTO SEQ – PROCEED (IN PROG It on)

ACAS, pause pts **shaded in bold**, ● col indicates data recording (black = VTR on) (19:15)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
40P Δ	-544 -18	-78 +44	-133 -3	201 -1	306 +4	210 +3	
41 Δ	-526 +46	-122 +27	-130 +9	203 -3	311 -2	212 +7	
42 Δ	-572 -22	-149 -155	-139 -26	213 +4	313 -6	222 -15	
43 Δ	-550 +324	+6 -27	-113 -9	192 0	302 -38	202 +5	
44 Δ	-874 +16	+33 +56	-104 +5	302 -1	283 -5	314 +4	
45 Δ	-890 -286	-23 +37	-109 +10	308 +1	289 +31	319 +3	
46 Δ	-604 +6	-60 +96	-119 +15	223 -2	296 +2	231 +12	
47 Δ	-610 +60	-156 +39	-134 +16	235 -1	307 -5	243 +7	
48 Δ	-670 -17	-195 -103	-150 -26	246 +2	311 -2	255 -13	
49 Δ	-653 +294	-92 -44	-124 -19	237 -29	299 -48	247 -29	
50 Δ	-947 +48	-48 +52	-105 +2	348 +1	310 -5	353 0	
51 Δ	-995 -350	-100 +63	-107 +25	349 +10	315 +27	355 +18	
52 Δ	-645 +355	-163 +7	-132 -19	297 -11	307 -21	307 -17	
53 Δ	-1000 -13	-170 -100	-113 -9	337 0	313 +10	348 -5	
54 Δ	-987 +326	-70 +1	-104 -2	338 -1	302 -23	349 -4	
55 Δ	-1313 -48	-71 +84	-102 +1	349 0	323 -6	4 +10	
56 Δ	-1265 +124	-155 -6	-103 -1	344 -9	331 -15	354 -4	
57 Δ	-1389 -14	-149 +53	-102 +4	355 0	345 -3	0 -1	
58 Δ	-1375 -170	-202 -28	-106 +1	355 +1	348 0	1 +1	
59P Δ	-1220 -50	-167 -7	-147 +13	354 -3	321 +1	0 0	

9. PORT ITVC BELLY TILE ACAS, SECTION 7

When AUTO SEQ READY It – on:

RHC

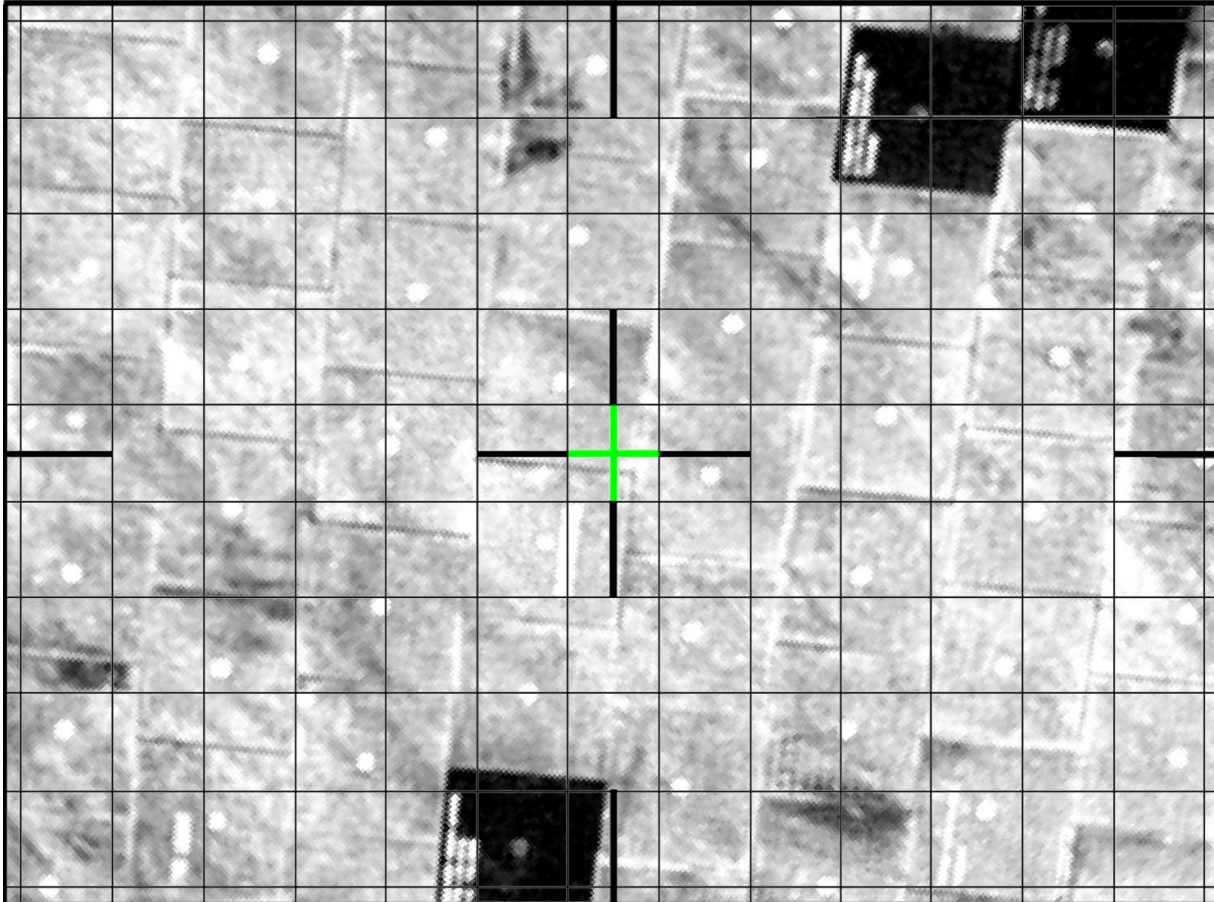
RATE – VERN (RATE MIN tb-ON)

A7U

√MUX 1 L ← MIDDECK

√DTV ← PL2

PAN/TILT to match ITVC view shown below



ITVC (85,-100)

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

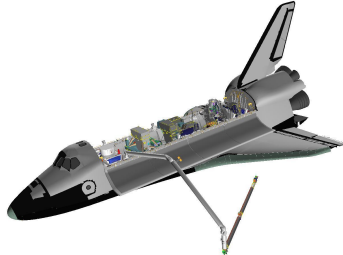
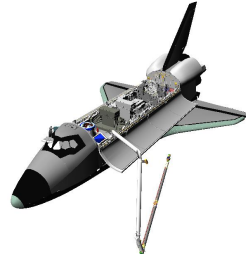
FOCUS: 9 ft

VID OUT – not DTV

VID IN – not PL2

AUTO SEQ – PROCEED (IN PROG It on)

ACAS, pause pts **shaded in bold**, ● col indicates data recording (black = VTR on) (07:30)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
59P Δ	-1220 -50	-167 -7	-147 +13	354 -3	321 +1	0 0	
60 Δ	-1170 +28	-160 -30	-160 +5	351 -14	320 -16	0 -5	
61 Δ	-1198 -182	-130 +6	-165 0	6 +1	336 0	4 +5	
62 Δ	-1016 +4	-136 +48	-165 +6	3 0	336 -5	359 0	
63 Δ	-1020 +175	-184 -32	-171 -10	3 -1	341 0	359 -9	
64 Δ	-1195 -14	-152 +48	-161 +4	7 -1	342 -3	8 +2	
65 Δ	-1181 -175	-200 +9	-165 +16	7 -1	345 +1	6 +18	
66P Δ	-1006 +12	-209 +76	-181 -44	2 +7	342 -17	347 +4	

10. PORT ITVC BELLY TILE ACAS, SECTION 8

When AUTO SEQ READY It – on:

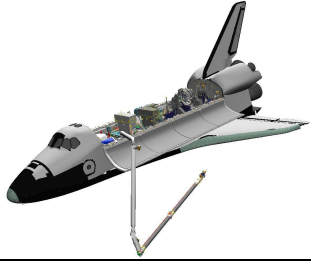
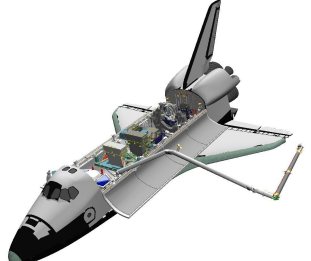
RHC RATE – COARSE (RATE MIN tb-OFF)

A7U √DTV ← PL2
FOCUS: 13 ft

VID OUT – not DTV
VID IN – not PL2

AUTO SEQ – PROCEED (IN PROG It on)

ACAS, pause pts **shaded in bold**, ● col indicates data recording (black = VTR on) (12:15)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
66P Δ	-1006 +12	-209 +76	-181 -44	2 +7	342 -17	347 +4	
67 Δ	-1018 +321	-285 -32	-137 -21	355 0	359 +6	345 -15	
68 Δ	-1339 -29	-253 +63	-116 +9	357 0	352 0	0 0	
69 Δ	-1310 -265	-316 +9	-125 +10	357 0	352 -7	0 +15	
70 Δ	-1045 +115	-325 +19	-135 -10	357 -2	0 -7	345 -15	
71 Δ	-1160 +173	-344 +10	-125 +15	357 0	6 +14	0 -1	
72 Δ	-1333 -14	-354 +61	-140 0	357 0	352 0	0 0	
73 Δ	-1319 -149	-415 -55	-140 -12	357 -6	352 -19	0 -9	
74 Δ	-1170 +157	-360 +115	-128 +9	1 1	11 11	8 13	
75 Δ	-1327 -12	-475 -20	-137 0	0 0	0 0	355 0	
76 Δ	-1315 +8	-455 +82	-137 +178	0 -7	0 +17	355 +73	
77P Δ	-1323 0	-537 0	-315 0	346 0	348 0	282 0	

11. T0 UMBILICAL SURVEY POINT 1 – PORT

When AUTO SEQ IN PROG It – off:

LCC/PGSC

sel 'Stop Scan'

BRAKES – ON (tb-ON)

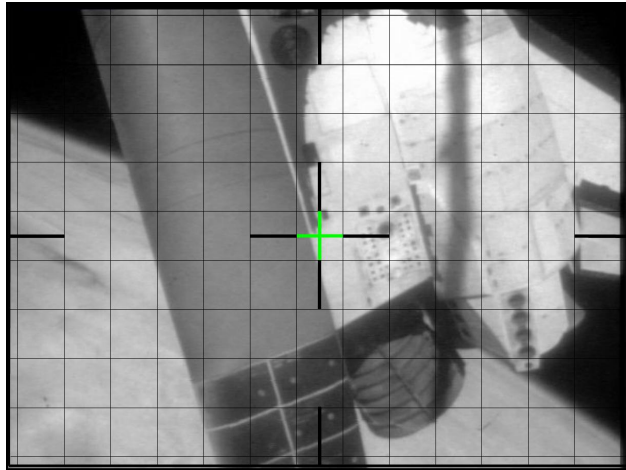
Verify mnvr to Port LDRI ACAS, Point 114P complete:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1323	-537	-315	346	348	282	5
	SY	SP	EP	WP	WY	WR	
√	+80.9	+49.1	-50.2	+5.9	+0.6	-87.1	

a. PAN/TILT to match ITVC view shown below

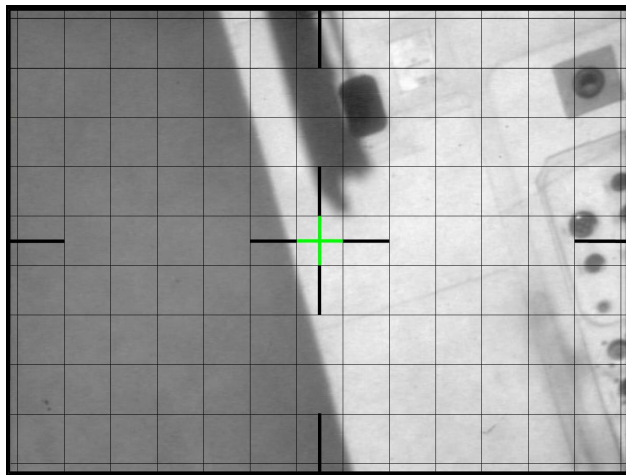
NOTE

All PAN/TILT operations should be done in LOW RATE while viewing T-0 area. Ensure field of view is in focus at each point



ITVC: +85,-110

b. Zoom ITVC to HFOV = 10°
√MCC to verify correct camera view

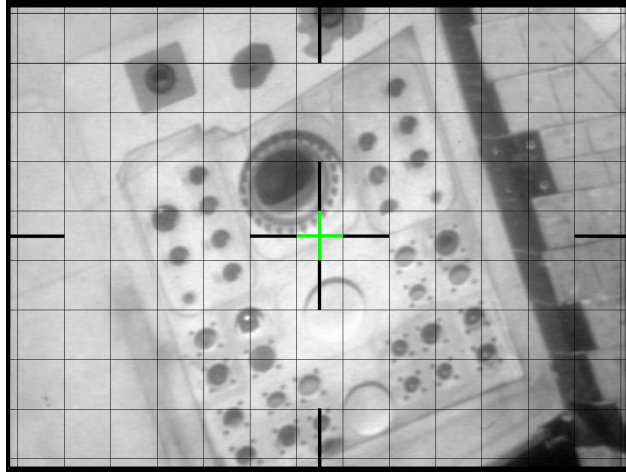


ITVC: +85,-110 HFOV: 10

c. PAN left to +75

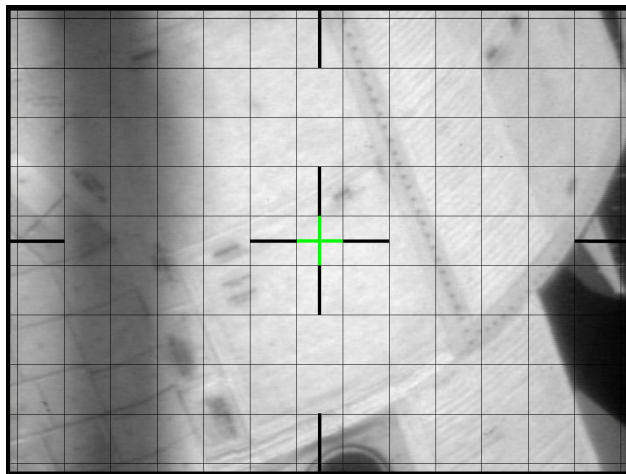
NOTE

Stop PAN motion for 5 sec when
PORT umbilical in center of view



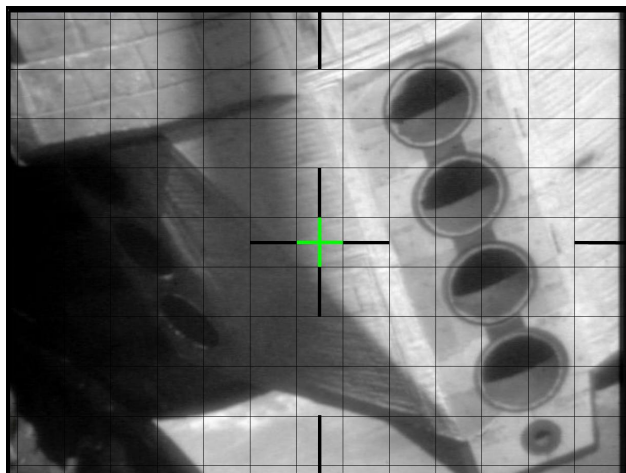
ITVC: +75,-110 HFOV: 10

d. PAN left to +64



ITVC: +64,-110 HFOV: 10

e. TILT down to -117

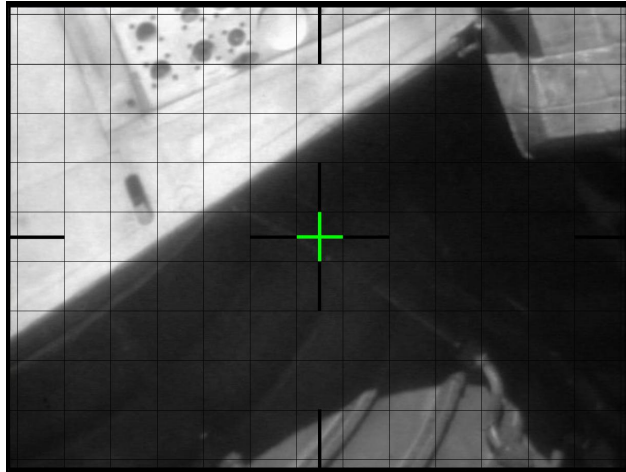


ITVC: +64,-117 HFOV: 10

f. PAN right to +74

NOTE

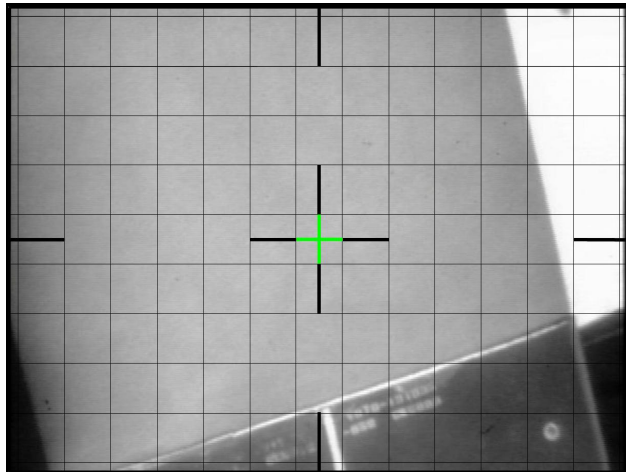
Stop PAN motion for 5 sec when
PORT umbilical in center of view



ITVC: +74,-117 HFOV: 10

g. PAN right to +88

√MCC to verify adequate coverage, then
STOP pb – push (no red •)



ITVC: +88,-117 HFOV: 10

h. Zoom ITVC fully out

12. RECONFIGURE FOR OBSS LDRI/IDC RCC SURVEY – PORT

SM 94 PDRS CONTROL

PL ID – ITEM 3 +2 EXEC
INIT ID – ITEM 24 +2 EXEC
AUTO MODES – ITEM 13 +5 EXEC
START PT – ITEM 17 +1 1 4 EXEC

RHC √RATE – COARSE (RATE MIN tb-OFF)
 BRAKES – OFF (tb-OFF)
 MODE – AUTO 1, ENTER

* If unable to enter AUTO mode (no AUTO READY lt): *
* √POR coordinates and adjust as reqd *

SM 94 PDRS CONTROL

√START PT, ITEM 17: 114

SM 169 PDRS STATUS

Monitor ACAS progress

A7U MUX 1 L ← MIDDECK
 LDRI MODE 6 pb – push (brighter flickering LDRI video)

IF CONTINUING OBSS OPS WITH PORT RCC SURVEY

Go to OBSS LDRI/IDC RCC SURVEY – PORT, step 6

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I

RMS EE CREW CABIN SURVEY (50 min)

NOTE

Assumed starting posn Pre-Cradle.

Daylight required while survey data being taken.

Uplink of a new PLID required.

Coarse rates allowed within 10 ft since Coarse rates set to calculated vernier rates. Vernier rates set to required scan rate

1. SETUP

SM 94 PDRS CONTROL

√ PL ID, ITEM 3: 0

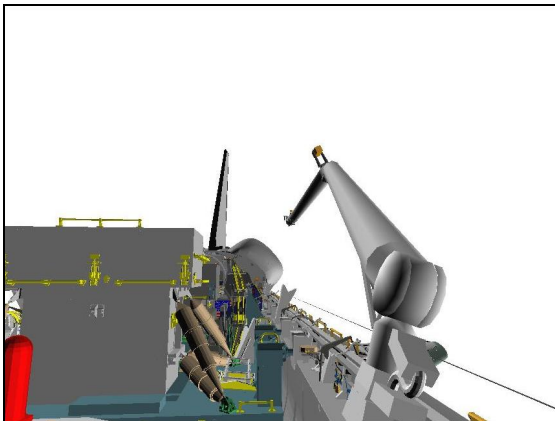
√ INIT ID, ITEM 24: 0

PRE-CRADLE posn:

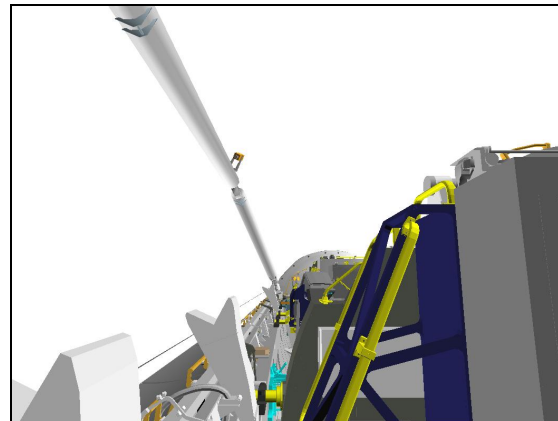
	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1261	-146	-551	5	2	0	0
	SY	SP	EP	WP	WY	WR	
√	0.0	+25.0	-25.0	+5.0	0	0	

SM 94 PDRS CONTROL

AUTO MODES – ITEM 13 +2 +7 +3 +8 EXEC



CCTV A (5,10)



CCTV B (0,10)

2. MNVR TO STBD SURVEY ACAS START

SM 94 PDRS CONTROL

END POS – ITEM 18 -5 0 1 +1 5 1 -5 8 6 EXEC

ATT – ITEM 21 +2 8 1 +2 5 +3 0 7 EXEC

CMD CK – ITEM 25 EXEC (GOOD)

RHC

RATE – VERN (RATE MIN tb-ON)

BRAKES – OFF (tb-OFF)

MODE – OPR CMD, ENTER (READY It on)

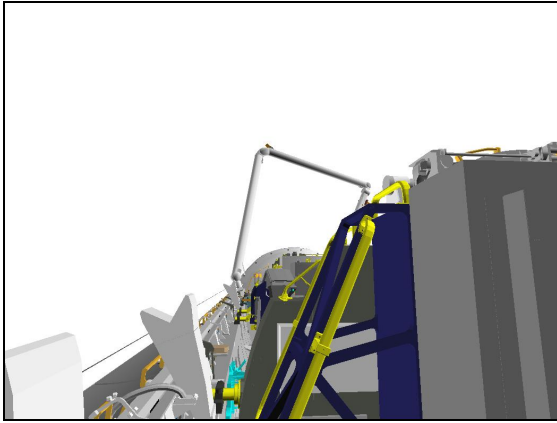
┌ After PROCEED, if motion no longer apparent but POR within ┐
 │ 1 in/1 deg and IN PROG It – on: │
 └ AUTO SEQ – STOP ┘

AUTO SEQ – PROCEED (IN PROG It on)

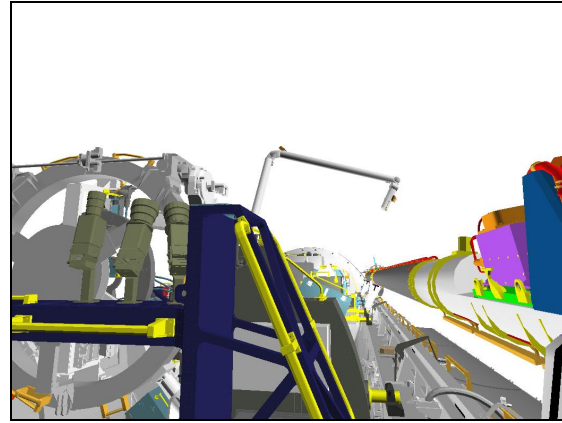
When AUTO SEQ IN PROG It – off:
BRAKES – ON (tb-ON)

STBD SURVEY ACAS START posn:

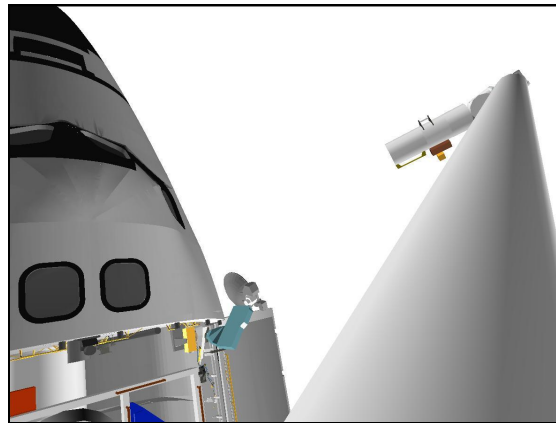
	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-501	+151	-586	281	25	307	0
	SY	SP	EP	WP	WY	WR	
√	-119.7	+58.1	-82.9	-109.8	-11.2	+82.1	



CCTV B (5,10)



CCTV C (-10,10)



ELBOW (-30,-25)

3. INHIBIT NOSE JETS
 O14:F, Pri RJDA LOGIC,DRIVER (eight) – ON
 O15:F, √Pri RJDF LOGIC,DRIVER (eight) – OFF
 O16:F
 A6U DAP: A14/AUTO/ALT (Tail Only)

NOTE

Expect DAP RECONFIG message after
FRCS manifold 5 status overridden to close

GNC 23 RCS

- RCS FWD – ITEM 1 EXEC (*)
 MANF VLVS OVRD 1 – ITEM 40 EXEC (CL)
 2 – ITEM 41 EXEC (CL)
 3 – ITEM 42 EXEC (CL)
 4 – ITEM 43 EXEC (CL)
 5 – ITEM 44 EXEC (CL)

4. STBD SURVEY ACAS

NOTE

Lighting is critical for survey data. Wait for daylight prior to Auto sequence proceed

SM 94 PDRS CONTROL

PL ID – ITEM 3 +5 EXEC
INIT ID – ITEM 24 +5 EXEC

SM 95 PDRS OVERRIDE

LOADED RATE – ITEM 14 EXEC (*)

STBD SURVEY ACAS START posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-501	+151	-586	281	25	307	5
	SY	SP	EP	WP	WY	WR	
√	-119.7	+58.1	-82.9	-109.8	-11.2	+82.1	

A7U

√DTV ← RMS

CCTV – RMS WRIST, ZOOM: 20.0 HFOV

L10(VTR)

REC pb – push, hold

PLAY pb – push, simo (red ● on LCD)

RHC

√RATE – VERN (RATE MIN tb-ON)

BRAKES – OFF (tb-OFF)

MODE – AUTO 1, ENTER (READY It on)

* If unable to enter AUTO mode (no AUTO READY It): *

* √Joint angles and adjust as reqd *

SM 94 PDRS CONTROL

√START PT, ITEM 17: 78

SM 169 PDRS STATUS

Monitor ACAS progress

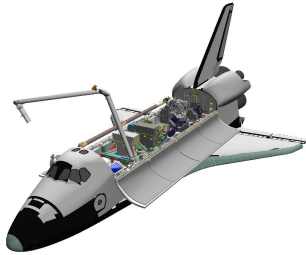
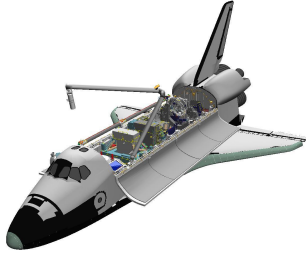
Stbd EE ACAS Clearance Views	Cameras
RMS-to-Fwd Bulkhead	A,D
RMS overview	B,C

NOTE

Clearance between Upper Boom and Forward Bulkhead is 21.6 inches at point 79

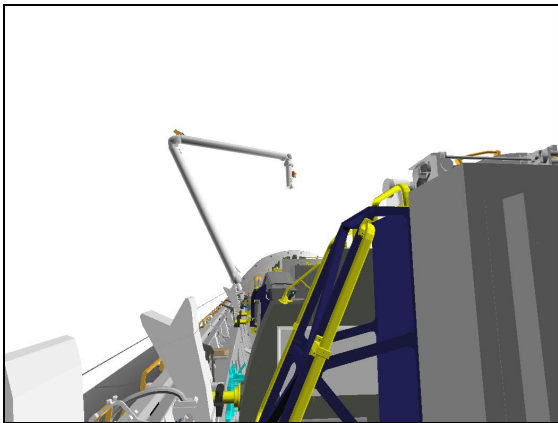
AUTO SEQ – PROCEED (IN PROG It on)

ACAS, pause pts **shaded in bold**, ● col indicates data recording (black = VTR on): (08:55)

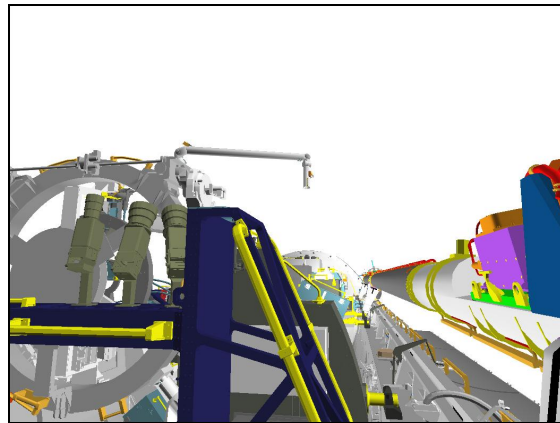
Pt	X	Y	Z	PITCH	YAW	ROLL	●
78P	-501	+151	-586	281	25	307	
79	-249	+91	-502	270	24	305	
80	-247	+30	-517	271	7	305	
81	-493	+109	-638	281	17	306	
82	-533	+38	-645	281	4	317	
83	-246	+16	-519	270	7	305	
84	-417	-9	-612	288	1	315	
85P	-536	-4	-638	281	359	318	

When AUTO SEQ IN PROG It – off:
BRAKES – ON (tb-ON)

L10(VTR) STOP pb – push (no red ●)



CCTV B (5,10)



CCTV C (-10,10)



EE HFOV: 20.0

5. MNV R TO PORT SURVEY ACAS START

SM 94 PDRS CONTROL

PL ID – ITEM 3 +0 EXEC

INIT ID – ITEM 24 +0 EXEC

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

MODE – AUTO 2, ENTER (READY It on)

- * If unable to enter AUTO mode (no AUTO READY It): *
- * √Joint angles and adjust as reqd *

SM 94 PDRS CONTROL

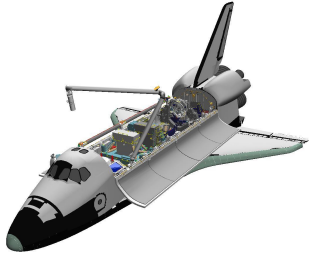
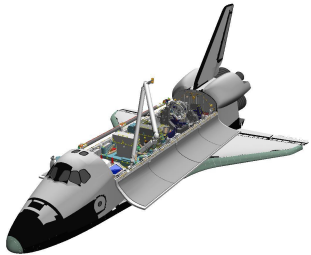
√START PT, ITEM 17: 148

SM 169 PDRS STATUS

Monitor ACAS progress

AUTO SEQ – PROCEED (IN PROG It on)

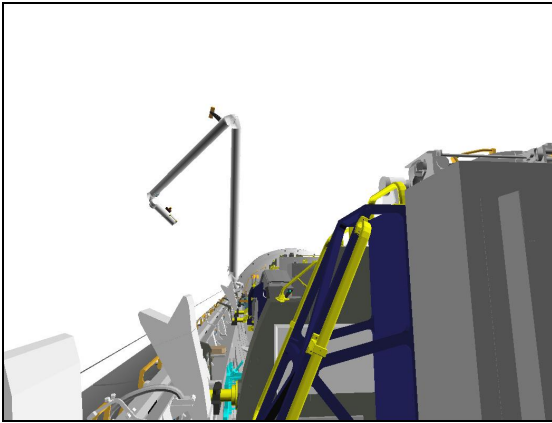
ACAS, pause pts **shaded in bold**, ● col indicates data recording (black = VTR on): (03:10)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
148P	-536	-4	-638	281	359	318	
149	-761	+32	-651	259	359	17	
150	-1042	-345	-580	323	24	333	
151P	-553	-230	-551	257	314	288	

When AUTO SEQ IN PROG It – off:
BRAKES – ON (tb-ON)

Verify PORT SURVEY ACAS START posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-553	-230	-551	257	314	288	0
	SY	SP	EP	WP	WY	WR	
√	+138.2	+119.0	-123.3	-97.8	+26.7	-179.8	



CCTV B (0,10)



CCTV D (70,25)



EE HFOV: 20.0

6. PORT SURVEY ACAS

NOTE

Lighting is critical for survey data. Wait for daylight prior to Auto sequence proceed

SM 94 PDRS CONTROL

PL ID – ITEM 3 +5 EXEC
INIT ID – ITEM 24 +5 EXEC

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

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

MODE – AUTO 3, ENTER (READY It on)

- * If unable to enter AUTO mode (no AUTO READY It): *
- * √Joint angles and adjust as reqd *

SM 94 PDRS CONTROL

√START PT, ITEM 17: 86

SM 169 PDRS STATUS

Monitor ACAS progress

Port EE ACAS Clearance Views	Cameras
RMS-to-Fwd Bulkhead	A,D
RMS overview	B

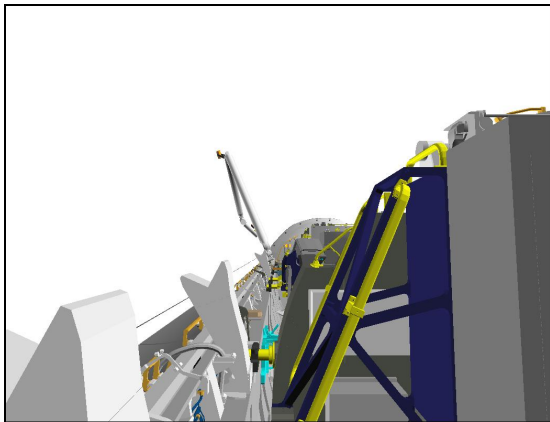
AUTO SEQ – PROCEED (IN PROG It on)

ACAS, pause pts **shaded in bold**, ● col indicates data recording (black = VTR on): (06:35)

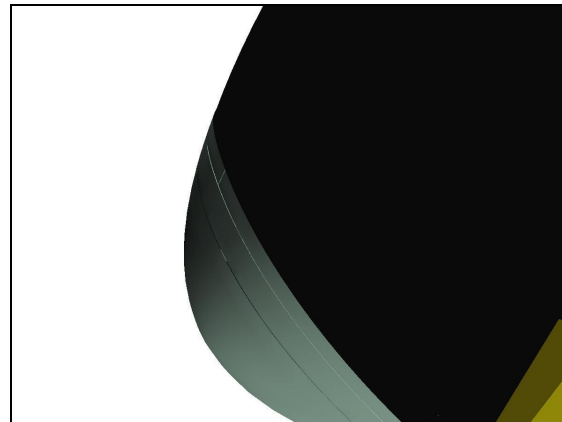
Pt	X	Y	Z	PITCH	YAW	ROLL	●
86P	-553	-230	-551	257	314	288	●
87	-279	-148	-473	259	313	271	
88	-514	-212	-591	268	313	291	
89	-582	-153	-610	268	313	277	
90	-524	-157	-610	268	313	277	
91P	-276	-146	-473	259	313	292	●

When AUTO SEQ IN PROG It – off:
BRAKES – ON (tb-ON)

L10(VTR) STOP pb – push (no red ●)



CCTV B (0,5)



EE HFOV: 20.0

7. MNVR TO PRE-CRADLE

SM 95 PDRS OVERRIDE

LOADED RATE – ITEM 14 EXEC (no *)

SM 94 PDRS CONTROL

PL ID – ITEM 3 +0 EXEC

INIT ID – ITEM 24 +0 EXEC

RHC

√RATE – VERN (RATE MIN tb-ON)
 BRAKES – OFF (tb-OFF)
 MODE – AUTO 4, ENTER (READY It on)

- * If unable to enter AUTO mode (no AUTO READY It): *
- * √Joint angles and adjust as reqd *

SM 94 PDRS CONTROL

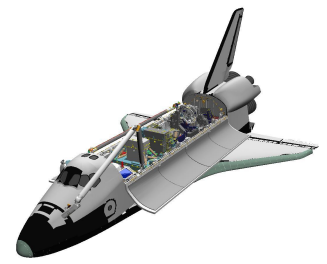
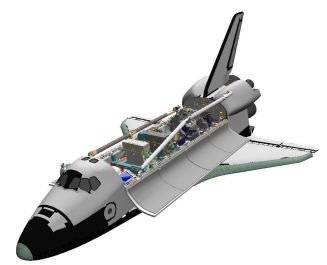
√START PT, ITEM 17: 152

SM 169 PDRS STATUS

Monitor ACAS progress

AUTO SEQ – PROCEED (IN PROG It on)

ACAS, pause pts **shaded in bold**, ● col indicates data recording (black = VTR on): (03:20)

Pt	X	Y	Z	PITCH	YAW	ROLL	●	
152P	-276	-146	-473	259	313	292		
153	-881	-572	-547	263	32	9		
154P	-1261	-146	-551	5	2	0		

When AUTO SEQ IN PROG It – off:
 BRAKES – ON (tb-ON)

PRE-CRADLE posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1261	-146	-551	5	2	0	0
	SY	SP	EP	WP	WY	WR	
√	0.0	+25.0	-25.0	+5.0	0	0	

A7U

PORT RMS CAMERA – ELBOW

8. ENABLE VERN NOSE JETS

GNC 23 RCS

- √RCS FWD – ITEM 1 EXEC (*)
- MANF VLVS OVRD 1 – ITEM 40 EXEC (OP)
- 2 – ITEM 41 EXEC (OP)
- 3 – ITEM 42 EXEC (OP)
- 4 – ITEM 43 EXEC (OP)
- 5 – ITEM 44 EXEC (OP)

A6U

DAP: VERN(ALT)

O14:F,
 O15:F,
 O16:F

Pri RJDA LOGIC,DRIVER (eight) – OFF
 RJDA 1A L2/R2 DRIVER – ON

T0 UMBILICAL AND OMS POD SURVEYS – STBD (10 min)

I

1. STBD T0 UMBILICAL SURVEY

NOTE

All PAN/TILT operations should be done in LOW RATE while viewing T-0 area. Ensure field of view is in focus at each point

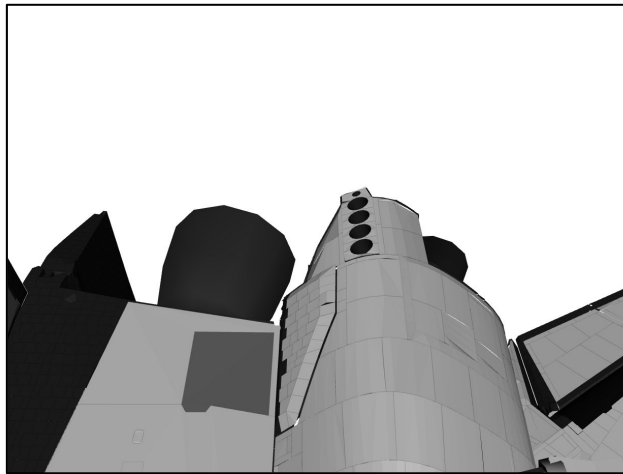
- a. At the end of the OBSS LDRI/IDC RCC SURVEY – STBD, step 2, MNVR TO FLAT FIELD POSN while at the FLAT FIELD posn

A7U

MUX 1L ← MIDDECK
LDRI MODE 2 pb – push (ITVC video)
DTV ← PL2

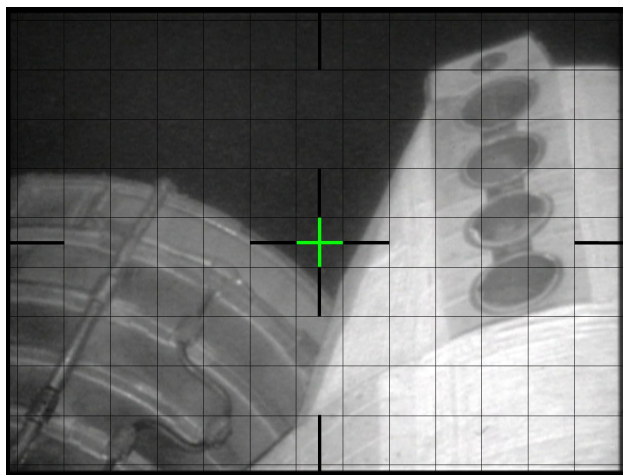
Record PAN: _____
TILT: _____

PAN/TILT to match ITVC view shown below



ITVC: +177,-213

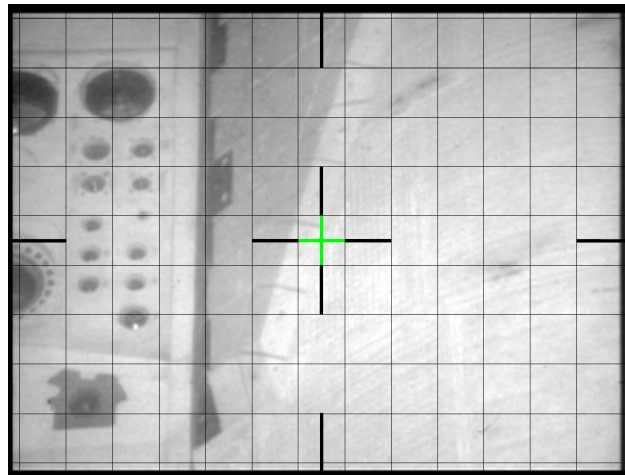
- b. Zoom ITVC to HFOV = 14°
√MCC to verify correct camera view



ITVC: +177,-213 HFOV: 14

L10(VTR) √Recorders – ON

c. TILT down to -226

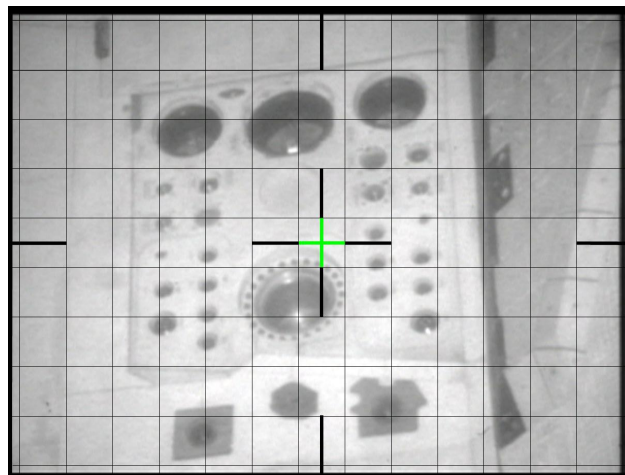


ITVC: +177,-226 HFOV: 14

d. PAN left to +167

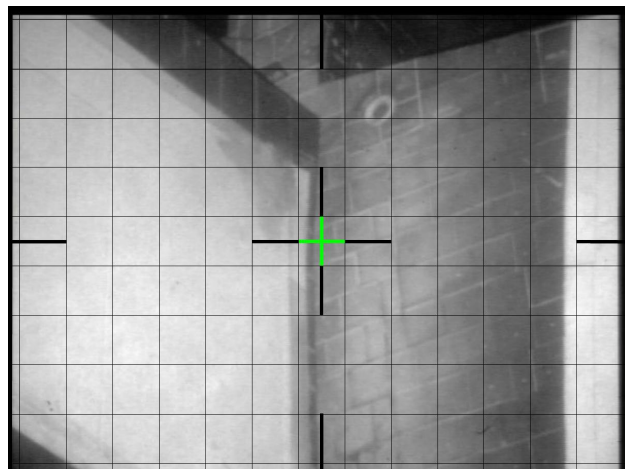
NOTE

Stop PAN motion for 5 sec when STBD umbilical
in center of view



ITVC: +167,-226 HFOV: 14

e. PAN left to +144
√MCC to verify adequate coverage

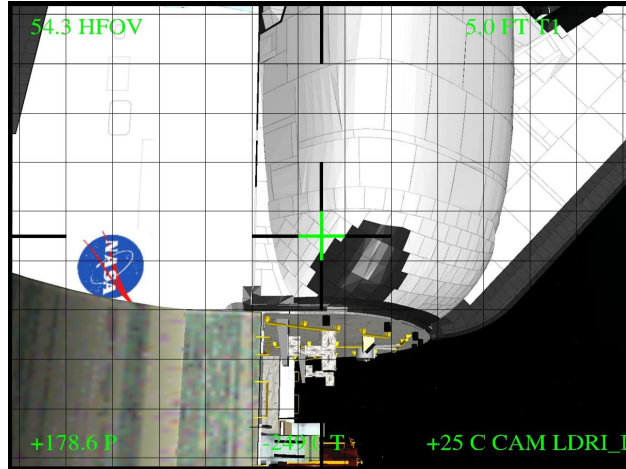


ITVC: +144,-226 HFOV: 14

f. Zoom ITVC fully out

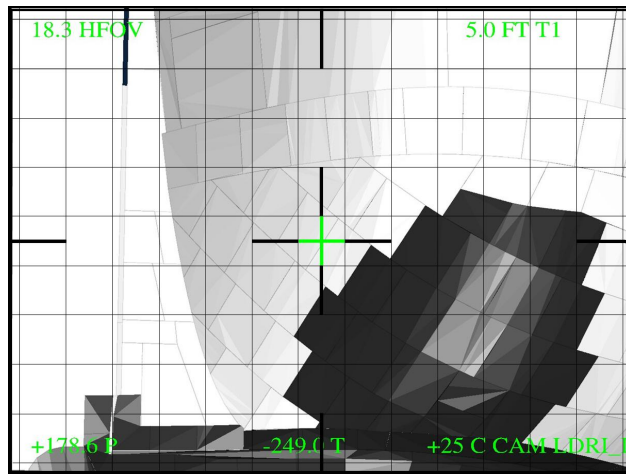
2. STBD OMS POD SURVEY

- a. PAN/TILT to match ITVC view shown below



ITVC: +178.6,-249

- b. Zoom ITVC to HFOV = 18.3°
Focus ITVC to 20 ft
√MCC to verify correct camera view



ITVC: +178.6,-249 HFOV: 18.3

L10(VTR)

- √Recorders – ON
View will need to be recorded for at least 10 sec

- c. Zoom ITVC fully out
PAN/TILT to values recorded at start of procedure (+103,-260)

A7U

- MUX 1L ← MIDDECK
LDRI MODE 6 pb – push (brighter flickering LDRI video)
√DTV ← PL2
VID OUT – not DTV
VID IN – not PL2

Continue with OBSS LDRI/IDC RCC SURVEY – STBD, step 3,
MNVR TO STBD LDRI ACAS START POSN

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I

T0 UMBILICAL AND OMS POD SURVEYS – PORT (20 min)

I

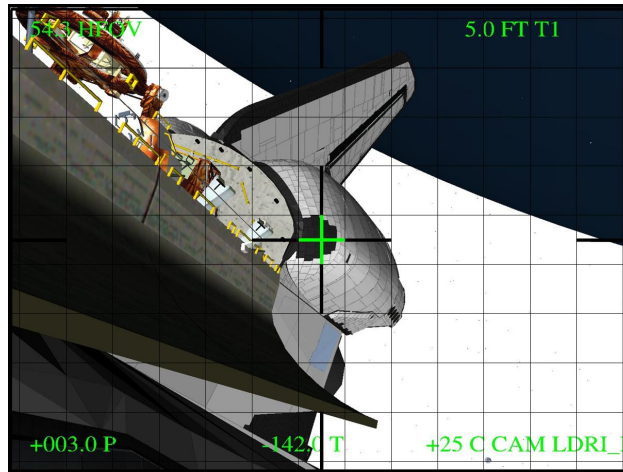
1. PORT OMS POD SURVEY SETUP

NOTE

All PAN/TILT operations should be done in LOW RATE while viewing T-0 area. Ensure field of view is in focus at each point

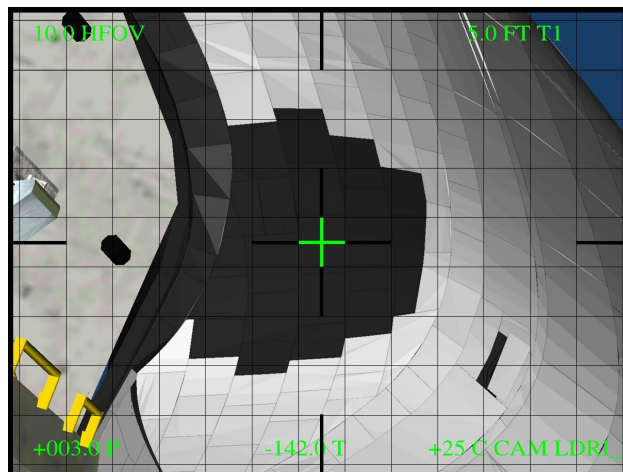
- a. At the end of the OBSS LDRI/IDC RCC SURVEY – PORT, step 10, PORT LDRI ACAS, SECTIONS 6 AND 7 while at pause point 144

PAN/TILT to match ITVC view shown below



ITVC: +3,-142

- b. Zoom ITVC to HFOV = 10°
√MCC to verify correct camera view



ITVC: +3,-142 HFOV: 10

L10(VTR)

REC pb – push, hold

PLAY pb – push, simo (red ●)

Ensure recorders ON for 10 sec and zoom out until OMS pod fills up FOV

2. MNVR TO OBSS HOVER

NOTE

Wait 5-10 sec between PTU adjustments to avoid blurring image.

Center ITVC on black tiles while maneuvering

Mnvr to OBSS Hover Clearance Views	Cameras
OBSS-to-PLBD	ELBOW, B, A[1]
OBSS-to-Tail	A, ELBOW, RSC[2], B
RMS-to-Orbiter	C, B, A
OBSS-to-RMS	B, ELBOW
[1] Good after X ~ -1014(pt 145)	[2] Tail leaves FOV at X ~ -1505(pt 145) and re-enters at X ~ -1541(pt 146)

RHC

√RATE – COARSE (RATE MIN tb-OFF)
MODE – AUTO 2, ENTER (READY It on)

√START PT, ITEM 17: 145

Monitor ACAS progress

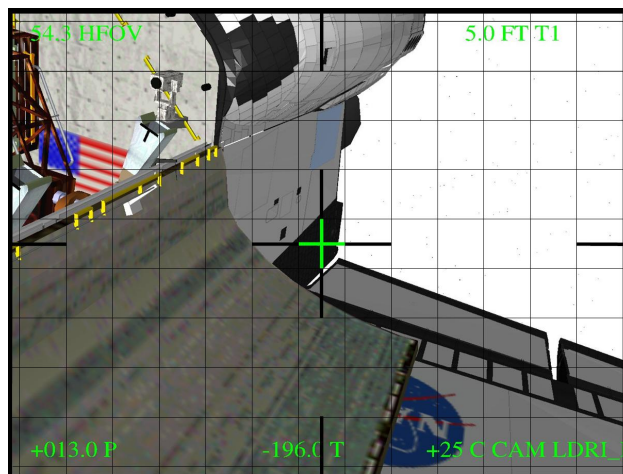
AUTO SEQ – PROCEED (IN PROG It on)

When Y ≈ -219:
AUTO SEQ – STOP

Record PAN: _____
TILT: _____

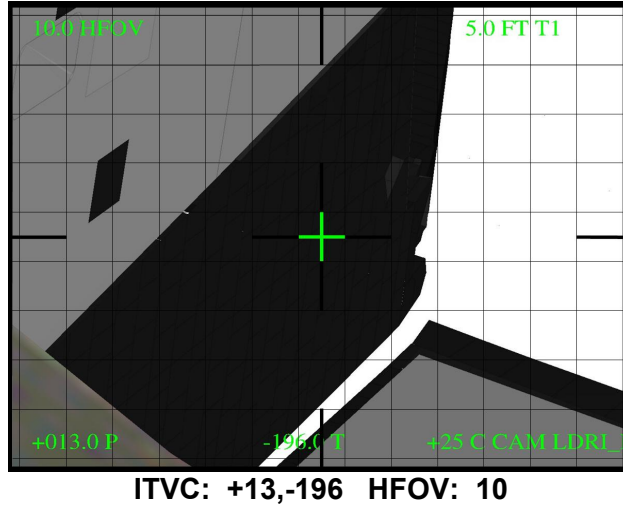
3. PORT TO UMBILICAL SURVEY POINT 2

a. Zoom ITVC fully out
PAN/TILT to match ITVC view shown below



ITVC: +13,-196

- b. Zoom ITVC to HFOV = 10°
√MCC to verify correct camera view



L10(VTR) √Recorders – ON
 √MCC to verify adequate coverage

- c. Zoom ITVC to HFOV = 10°
 PAN/TILT to values recorded in step 2 (center ITVC on black tiles)

4. PORT OMS POD AND VERTICAL STABILIZER SURVEY

NOTE

Continue centering ITVC on Port OMS Pod black tiles.

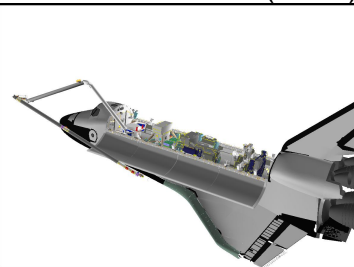
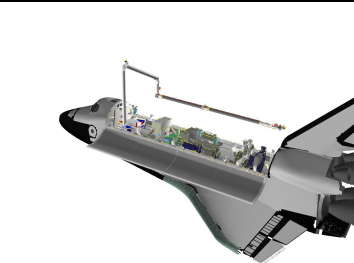
When OMS Pod black tiles out of view, pan/tilt to follow vertical stabilizer

RHC √RATE – COARSE (RATE MIN tb-OFF)

SM 169 PDRS STATUS

Monitor ACAS progress

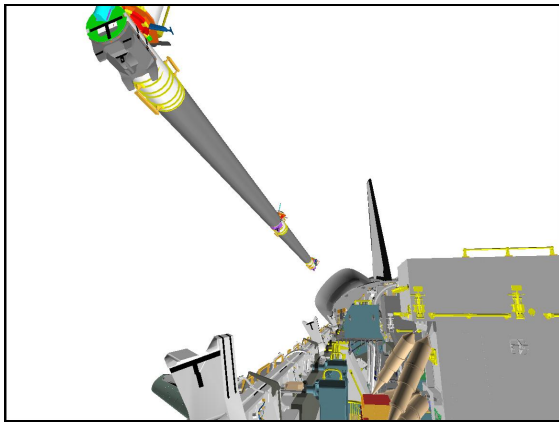
AUTO SEQ – PROCEED (IN PROG It on)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
145P Δ	-892 +708	-294 -319	-364 +621	342 +1	353 +29	255 -120	
146 Δ	-1600 -329	+25 -109	-985 -453	40 +40	0 0	11 0	
147P Δ	-1271 0	+134 0	-532 0	0 0	0 0	11 0	

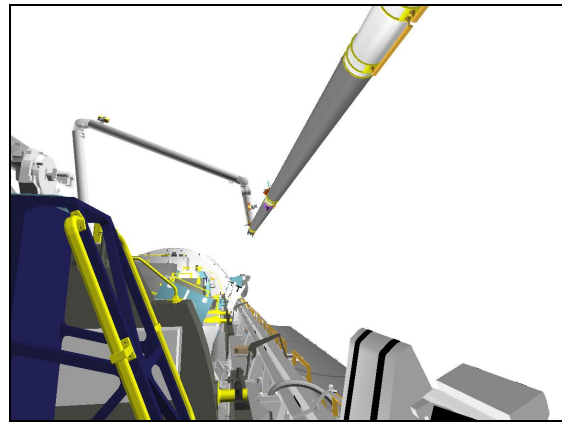
When AUTO SEQ IN PROG It – off:

Verify mnvr to OBSS HOVER posn complete:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1271	+134	-532	0	0	11	2
	SY	SP	EP	WP	WY	WR	
√	-89.9	+80.2	-118.8	-59.8	+0.0	+109.9	



CCTV D (-10,15)



CCTV C (10,10)

BRAKES – ON (tb-ON)

Go to OBSS BERTH

OBSS IDC RCC SURVEY – PORT

WARNING
 For UNDOCKED ops only
 Port PLBD radiator must be stowed

NOTE

Assumed starting posn is OBSS LDRI/IDC RCC Survey – Port,
 Point 144P

1. SETUP

SM 94 PDRS CONTROL

PL ID – ITEM 3: 5

INIT ID – ITEM 24: 5

Verify Port LDRI ACAS, Point 144

	X	Y	Z	PITCH	YAW	ROLL	PLID
√	-854	-296	-371	228	287	335	5
	SY	SP	EP	WP	WY	WR	
√	+155.7	+62.3	-81.8	+91.5	-57.0	-23.9	

2. MNVR TO PORT IDC ACAS START POSN

RHC

RATE – VERN (RATE MIN tb-ON)

√BRAKES – OFF (tb-OFF)

MODE – SINGLE, ENTER

OCAS Start Posn:

Port LDRI
 ACAS, 144P
 1: WR –
 OCAS Start

	SY	SP	EP	WP	WY	WR	
	+155.7	+62.3	-81.8	+91.5	-57.0	-23.9	
						-33.0	
	+155.7	+62.3	-81.8	+91.5	-57.0	-33.0	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-823	-319	-292	228	287	344	5

SM 94 PDRS CONTROL

END POS – ITEM 18 -1 0 4 3 -2 2 4 -2 2 3 EXEC

ATT – ITEM 21 +8 2 +3 3 9 +2 2 3 EXEC

CMD CK – ITEM 25 EXEC (GOOD)

RHC

RATE – COARSE (RATE MIN tb-OFF)

√BRAKES – OFF (tb-OFF)

MODE – OPR CMD, ENTER

√AUTO SEQ READY It – on

```

* If error found in destination entries (Items 18-23): *
*   BRAKES – ON (tb-ON) *
* *
*   Enter corrected destination (Items 18-23) *
* *
*   CMD CK, ITEM 25 EXEC (GOOD) *
* *
*   BRAKES – OFF (tb-OFF) *
*   MODE – OPR CMD, ENTER *
* *
* √AUTO SEQ READY It – on *

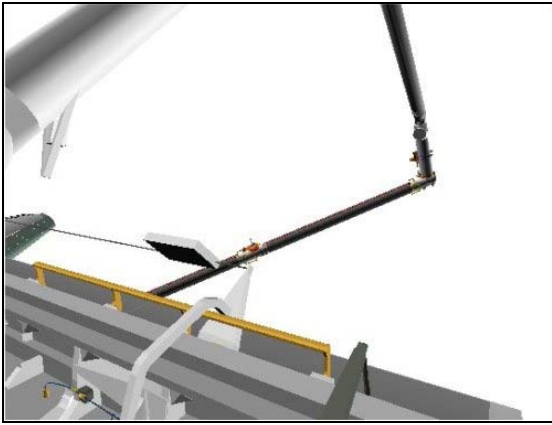
```

AUTO SEQ – PROCEED (IN PROG It on)

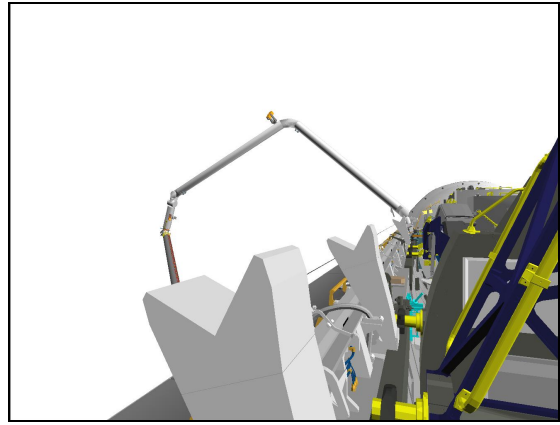
When AUTO SEQ IN PROG It – off:
BRAKES – ON (tb-ON)

PORT IDC ACAS START posn:

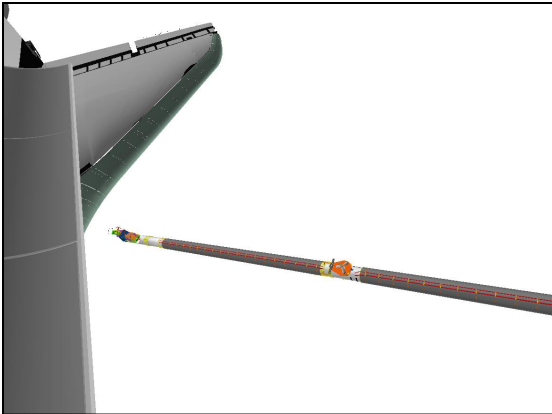
	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1043	-224	-223	82	339	223	5
	SY	SP	EP	WP	WY	WR	
√	+91.2	+60.1	-68.1	-41.3	+6.8	-116.8	



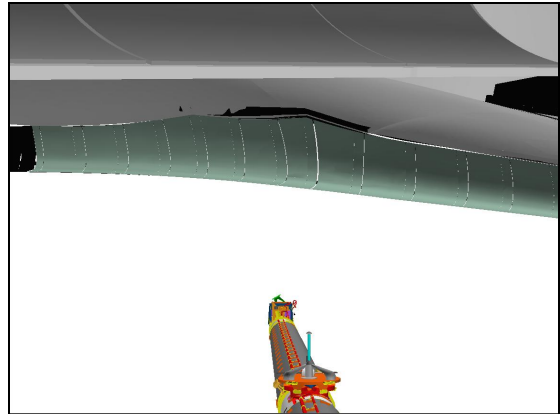
CCTV A (60,-10)



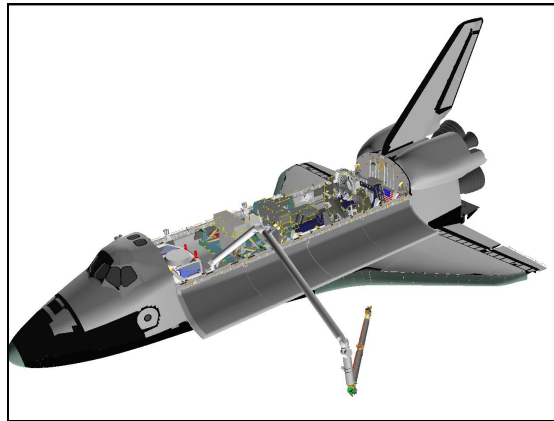
CCTV B (-20,0)



ELBOW (-60,0)



RSC



BIRD'S EYE

3. PORT IDC ACAS, SECTION 1
AUTO MODE 3, ITEM 15: 7

RHC RATE – VERN (RATE MIN tb-ON)

- * If unable to enter AUTO mode (no AUTO READY lt): *
- * √Joint angles and adjust as reqd *

BRAKES – OFF (tb-OFF)
MODE – AUTO 3, ENTER (READY lt on)

SM 94 PDRS CONTROL

√START PT, ITEM 17: 148

SM 169 PDRS STATUS

Monitor ACAS progress

NOTE

Section 1 scans RCC Zones 1-2, Panels 7 → 11

Section 1 Clearance Views	Cameras
RMS Upper Arm to PLBD	A, B
OBSS-to-PLBD	ELBOW
OBSS-to-Wing	ELBOW, RSC

LCC/PGSC On MCC GO:
Sel 'Power On'

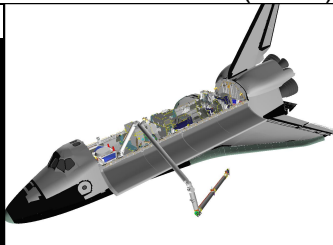
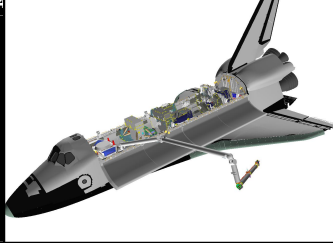
- √Black and White self-test image displayed
- √'Waiting for User Command' displayed
- √'AE' checked

- Sel 'Scan Lo-Res'
- √AE box centered in view (pause 2 sec)
- √MCC for acceptability of scene content and lighting
- Sel 'Scan Hi-Res'

AUTO SEQ – PROCEED (IN PROG It on)

ACAS, pause pts **shaded in bold**, ● col indicates data recording

(01:40)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
148P	-1043	-224	-223	82	339	223	
149	-1064	-233	-219	82	339	223	
150P	-1131	-308	-228	78	336	222	

LCC/PGSC When AUTO SEQ READY It – on:
sel 'Stop Scan'

4. PORT IDC ACAS, SECTION 2

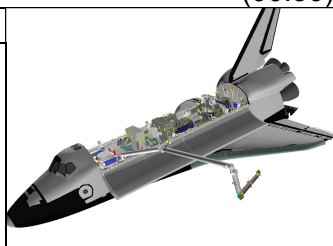
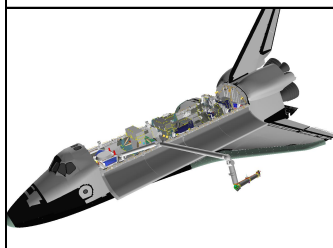
NOTE

Between points 150 and 151, arm adjusts to survey RCC zones 2-3. Section 2 then scans panels 11 → 7

Section 2 Clearance Views	Cameras
RMS Upper Arm-to-PLBD	A, B
OBSS-to-PLBD	ELBOW
OBSS-to-Wing	ELBOW, RSC

AUTO SEQ – PROCEED (IN PROG It on)

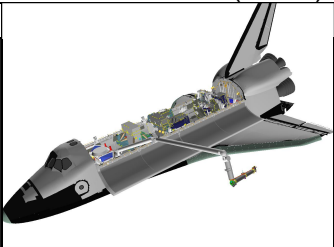
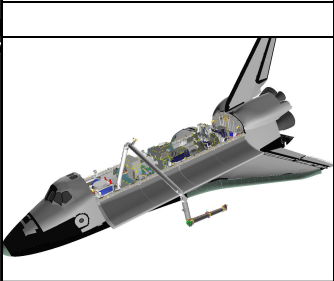
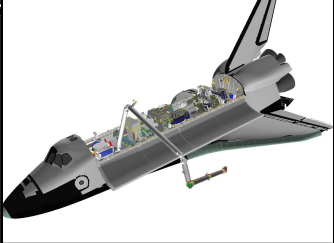
(00:30)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
150P	-1131	-308	-228	78	336	222	
151P	-1123	-315	-234	76	334	221	

LCC/PGSC When AUTO SEQ READY It – on:
Sel 'Scan Lo-Res'
√AE box centered in view (pause 2 sec)
Sel 'Scan Hi-Res'

AUTO SEQ – PROCEED (IN PROG It on)

(01:50)

Pt	X	Y	Z	PITCH	YAW	ROLL	•
151P	-1123	-315	-234	76	334	221	
152	-1057	-250	-226	76	334	221	
153P	-1032	-239	-227	76	334	221	

LCC/PGSC When AUTO SEQ READY It – on:
 sel 'Stop Scan'

5. PORT IDC ACAS, SECTION 3

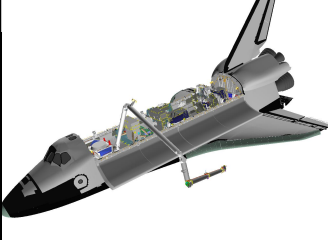
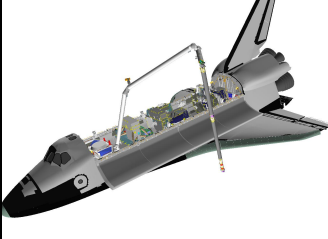
NOTE

Between points 153 and 154, arm adjust to survey RCC zones 3-4.
Section 3 then scans panels 7 → 11

Section 3 Clearance Views	Cameras
RMS Upper Arm-to-PLBD	A, B
OBSS-to-PLBD	ELBOW
OBSS-to-Wing	ELBOW, RSC

AUTO SEQ – PROCEED (IN PROG It on)

(02:40)

Pt	X	Y	Z	PITCH	YAW	ROLL	•
153P	-1032	-239	-227	76	334	221	
154P	-1008	-268	-262	44	311	213	

When AUTO SEQ READY It – on:

LCC/PGSC

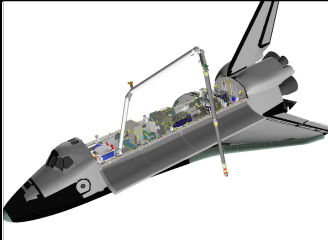
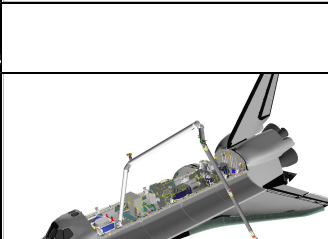

Sel 'Scan Lo-Res'

√AE box centered in view (pause 2 sec)

Sel 'Scan Hi-Res'

AUTO SEQ – PROCEED (IN PROG It on)

(01:15)

Pt	X	Y	Z	PITCH	YAW	ROLL	•
154P	-1008	-268	-262	44	311	213	
155	-1028	-284	-258	44	311	213	
156	-1054	-306	-258	42	312	206	
157P	-1098	-339	-265	41	315	198	

LCC/PGSC When AUTO SEQ READY It – on:
 sel ‘Stop Scan’

 sel ‘Power off’
 sel ‘Yes’

BRAKES – ON (tb-ON)

6. MNVR TO PORT LDRI ACAS, POINT 145P

SM 94 PDRS CONTROL

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

PORT IDC ACAS END posn:

	X	Y	Z	PITCH	YAW	ROLL	PLID
√	-1116	-336	-231	298	347	314	2
	SY	SP	EP	WP	WY	WR	
√	+44.1	+81.2	-43.5	-85.4	+74.1	-88.1	

SM 94 PDRS CONTROL

END POS – ITEM 18 -8 9 2 -2 9 4 -3 6 4 EXEC
 ATT – ITEM 21 +3 4 2 +3 5 3 +2 5 5 EXEC
 CMD CK – ITEM 25 EXEC (GOOD)

RHC RATE – COARSE (RATE MIN tb-OFF)
 BRAKES – OFF (tb-OFF)
 MODE – OPR CMD, ENTER

√AUTO SEQ READY It – on

```

* If error found in destination entries (Items 18-23): *
*   BRAKES – ON (tb-ON)                               *
*                                                     *
*   Enter corrected destination (Items 18-23)         *
*                                                     *
*   CMD CK, ITEM 25 EXEC (GOOD)                       *
*                                                     *
*   BRAKES – OFF (tb-OFF)                             *
*   MODE – OPR CMD, ENTER                             *
*                                                     *
* √AUTO SEQ READY It – on                             *
  
```

AUTO SEQ – PROCEED (IN PROG It on)

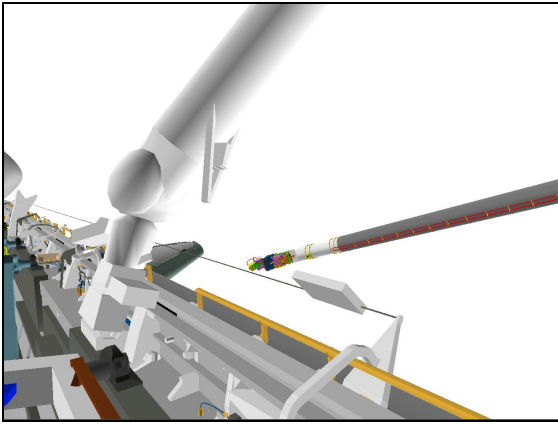
When AUTO SEQ IN PROG It – off:
 BRAKES – ON (tb-ON)

Port LDRI ACAS, Point 145:

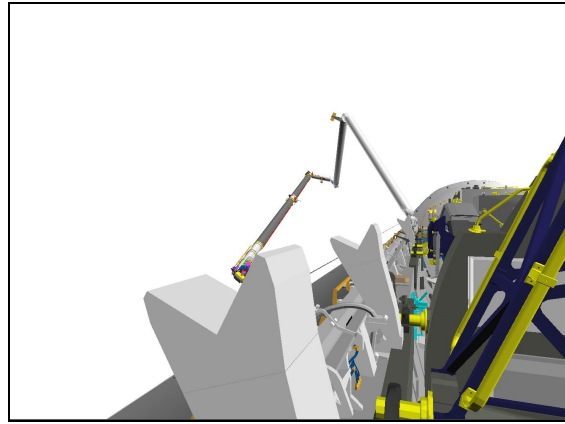
	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-892	-294	-364	342	353	255	2
	SY	SP	EP	WP	WY	WR	
√	+155.7	+62.3	-81.8	+91.5	-57.0	-23.9	

A6U DAP: as reqd

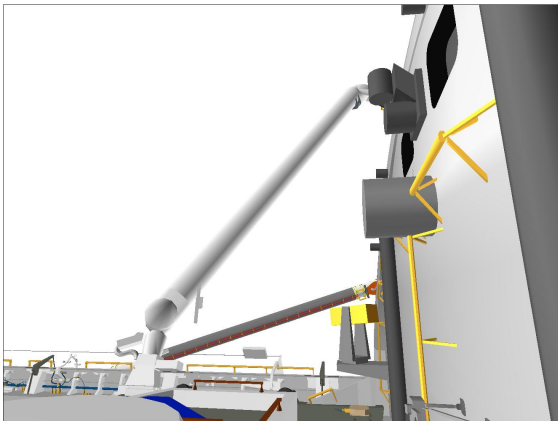
Port LDRI ACAS, Point 145 posn:



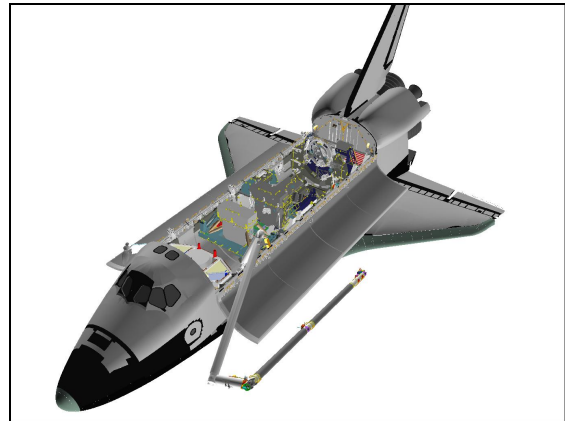
CCTV A (40,-5)



CCTV B (-20,0)



CCTV D (80,15)



BIRD'S EYE

IF CONTINUING OBSS OPS WITH PORT RCC SURVEY
Go to OBSS LDRI/IDC RCC SURVEY – PORT, step 11

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MODIFIED OBSS UNBERTH FOR FOCUSED INSPECTION

I

NOTE

Stbd MPMs assumed deployed

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 0

√INIT ID, ITEM 24: 0

2. MNVR TO OBSS PRE-GRAPPLE

RHC

On MCC GO for OBSS Grapple,
RATE – as reqd (VERN within 10 ft)
BRAKES – OFF (tb-OFF)
MODE – ORB UNL, ENTER

Mnvr to OBSS PRE-GRAPPLE posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-680	+96	-513	270	350	1	0
SY	SP	EP	WP	WY	WR	
-90.0	+87.6	-129.5	-57.5	0.0	+110.4	

BRAKES – ON (tb-ON)

CAUTION

SPEE power must be applied within 90 min
to prevent sensor package damage

STBD RMS HTR A,B (two) – OFF

A6U

EVENT TIMER MODE – UP
CNTL – START

R12(OBSS) √SPEE PWR – OFF

SSP2 √APCU 1, 2 CONV (two) – OFF (tb-bp)

3. OBSS GRAPPLE

A7U

CCTV – config for grapple
– install PDRS TARGET OVERLAY FOR CTVM
– RMS WRIST, ZOOM: 34.0 HFOV
FOCUS: 5 ft

Maintain eyepoint ~18 in when using grapple overlay

A6U

DAP: VERN(FREE)

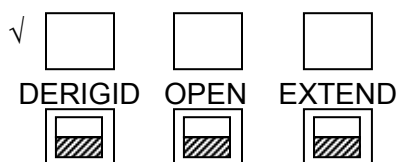
RHC

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

Mnvr to grapple envelope

CAUTION
Monitor EE tb timing to prevent EE motor burnout

EE MODE – AUTO
CAPTURE – 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)

SM 94 PDRS CONTROL

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

Record POSN/ATT and Joint Angles in table below and in OBSS BERTH, step 4:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
Expected	-680	+105	-436	0	0	341	1
	SY	SP	EP	WP	WY	WR	
Expected	-90.0	+76.5	-134.6	-40.9	0.0	+110.0	

Review GENERIC END EFFECTOR CUE CARD – SHUTTLE NOT DOCKED OPS

4. CONFIGURE POWER

MA73C:C cb MCA PWR AC3 3Φ MID 2 – op
 √AC2 3Φ MID 2 – op
MA73C:D √AC3 3Φ MID 4 – op

R13L PL BAY MECH PWR SYS (two) – ON

5. STBD MRL RELEASE

A7U CCTV – config for unberth

A6U DAP: FREE

SM 94 PDRS CONTROL

RMS STBD – ITEM 2 EXEC (*)

√STBD AFT, MID, FWD REL (six) = 0

NOTE

Expect single motor drive time for MRL release

STBD RMS RETEN LAT – REL (tb-REL) (18 sec max)
– OFF

If motor drive time > 18 sec, √MCC

SM 94 PDRS CONTROL
RMS PORT – ITEM 1 EXEC (*)

6. RECONFIGURE POWER

R13L PL BAY MECH PWR SYS (two) – OFF

MA73C:C cb MCA PWR AC3 3Φ MID 2 – cl
√AC2 3Φ MID 2 – op

MA73C:D √AC3 3Φ MID 4 – op

Record joint angles:

SY	SP	EP	WP	WY	WR

7. MNVR TO OBSS OVERNIGHT PARK

NOTE

For PL ID 1, the rates have been set such that Coarse is allowed within 10 feet of structure for all maneuvers

RHC RATE – COARSE (RATE MIN tb-OFF)
BRAKES – OFF (tb-OFF)
MODE – PL, ENTER

Mnvr OBSS up (-Z) to OBSS MODIFIED HOVER, Z = -517

X	Y	Z	PITCH	YAW	ROLL	PL ID
-680	+133	-517	0	0	341	1
SY	SP	EP	WP	WY	WR	
-89.9	+80.2	-118.8	-59.8	+0.0	+109.9	

NOTE

Minimum clearance during the following maneuver is with the HST solar array at 90 deg and is 25 inches

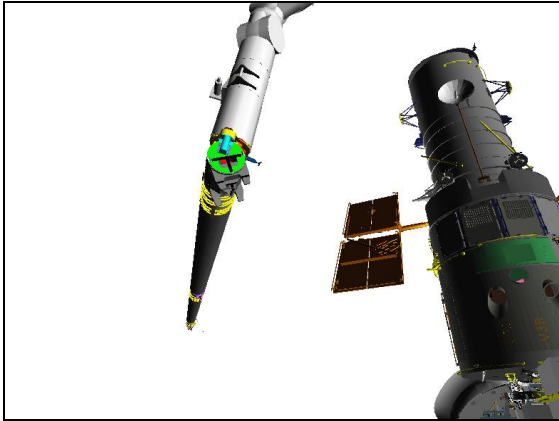
RHC RATE – as reqd (VERN within 10 ft)
MODE – SINGLE, ENTER

Mnvr to OBSS OVERNIGHT PARK posn:

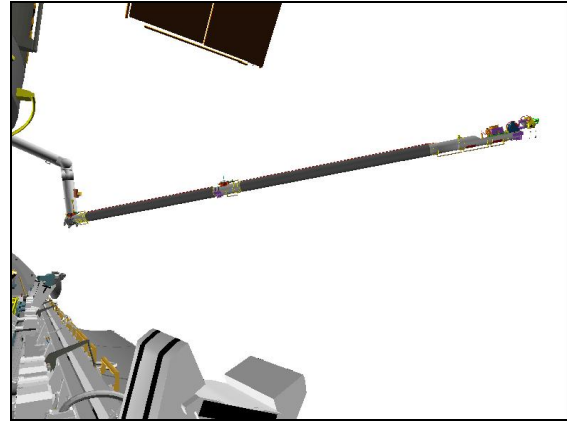
Modified Hover
1: WR –
Overnight Park

SY	SP	EP	WP	WY	WR	
-89.9	+80.2	-118.8	-59.8	0.0	+109.9	
					+70.0	
-89.9	+80.2	-118.8	-59.8	0.0	+70.0	
X	Y	Z	PITCH	YAW	ROLL	PL ID
-683	+134	-517	9	321	344	1

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



CCTV D (-25,30)



CCTV C (35,10)

GNC 20 DAP CONFIG

ITEM 2 +1 0 EXEC
ITEM 45 + 0 2 EXEC

If VRCS:

DAP: B/AUTO/VERN

√RSC Video Cable connected between R12/OPP-RSC Video (J105) and
R12/VPU-CCTV PL3

R12(OBSS) RSC PWR – OFF, ON

A6U If Verns failed, DAP: AUTO/ALT

NOTE

In the ACTIVATION (LDRI/ITVC Cue Card) procedure,
start 15-min timer upon applying SPEE power and inform
MCC when timer is started

Perform ACTIVATION (LDRI/ITVC Cue Card, P/TV)

LCH ACTIVATION (LCS Cue Card, P/TV)

LCC ACTIVATION (LCS Cue Card, P/TV)

IDC ACTIVATION (IDC Cue Card, P/TV)

SOFTWARE ACTIVATION, steps 1 and 2 (IDC Cue Card, P/TV)

A7U 8. RESET PTU
DTV ← PL2

CAMR CMD PAN/TILT – HI RATE

PAN – L (to hard stop)

TILT – UP (to hard stop)

PAN/TILT – RESET, HI RATE (LO within 10°)

PAN: +85 (right)

TILT: -57 (down)

HST OPS

-----HST OPS-----

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NOMINAL HST RETRIEVAL

POISE FOR CAPTURE FS 3-2
HST CAPTURE..... FS 3-5
 BERTH..... FS 3-9

**NOMINAL
HST RETRIEVAL**

POISE FOR CAPTURE

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 0

√INIT ID, ITEM 24: 0

Mon 1	D
DwnInk	Elbow (EE)
Mon 2	C
DTV	A

2. POISE FOR CAPTURE

NOTE

OCAS Valid from Pre-Cradle

RATE – as required (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – as desired

Mnvr to POISE FOR CAPTURE posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-890	-145	-850	0	270*	0	0
SY	SP	EP	WP	WY	WR	
-12.7	+93.2	-54.8	-96.5	-66.9	-36.5	

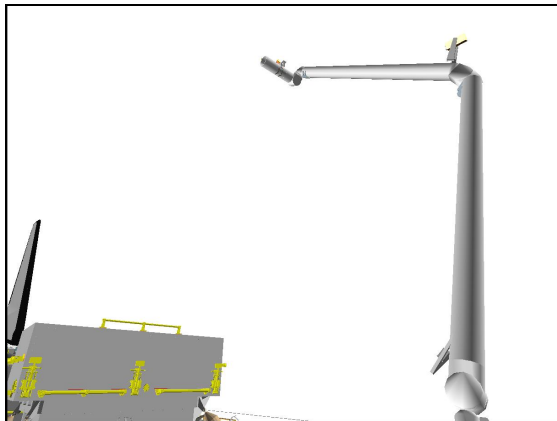
*Display singularity

BRAKES – ON (tb-ON)

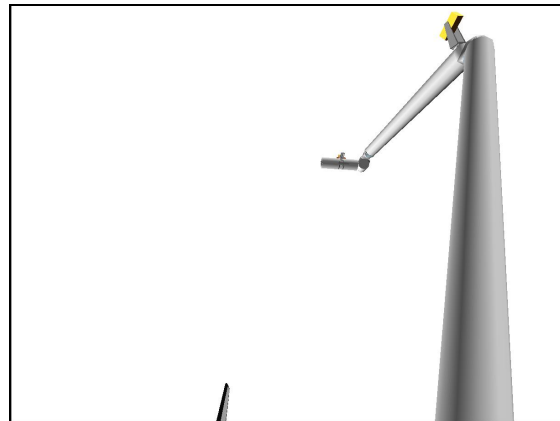
√MODE – not DIRECT

PARAM – PORT TEMP

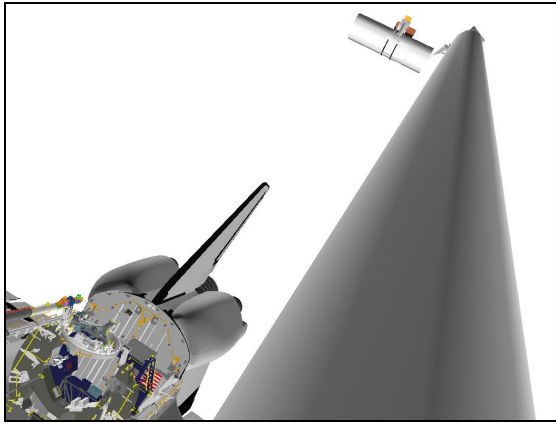
JOINT – CRIT TEMP



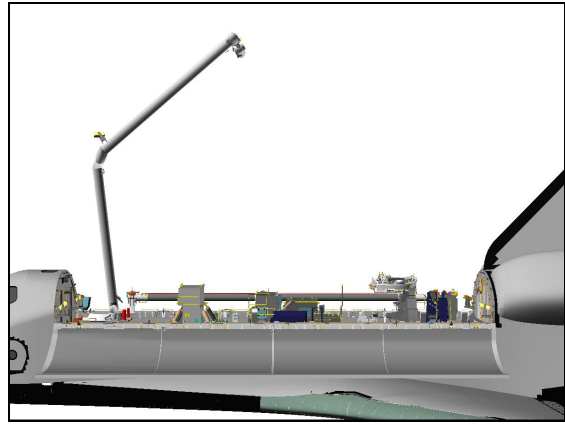
CCTV D (40,25)



CCTV A (5,45)



ELBOW (-25,-30)



PORT

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HST CAPTURE

1. SETUP

A3
A7U

MON 1(2) – install PDRS TARGET OVERLAY FOR CTVM
CCTV – config for Capture

Maintain eyepoint approx 18 in when using grapple overlay

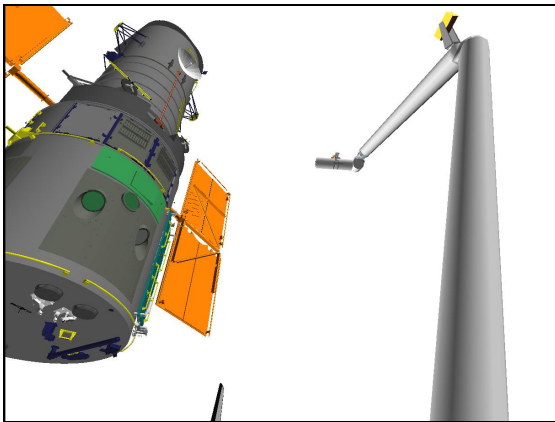
Mon 1	D
DwnInk	EE (Elbow)
Mon 2	C
DTV	A

Review STS-125 END EFFECTOR CUE CARD

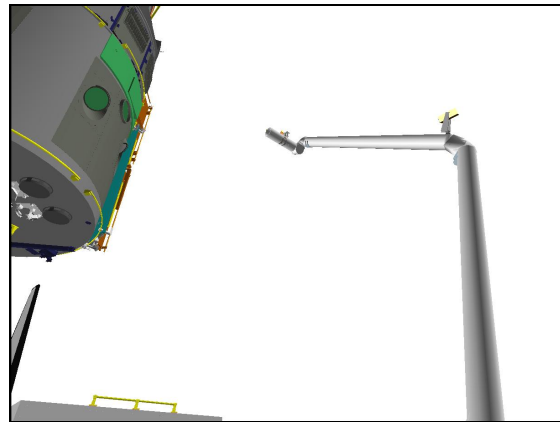
Verify POISE FOR CAPTURE posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-890	-145	-850	0	270*	0	0
	SY	SP	EP	WP	WY	WR	
√	-12.7	+93.2	-54.8	-96.5	-66.9	-36.5	

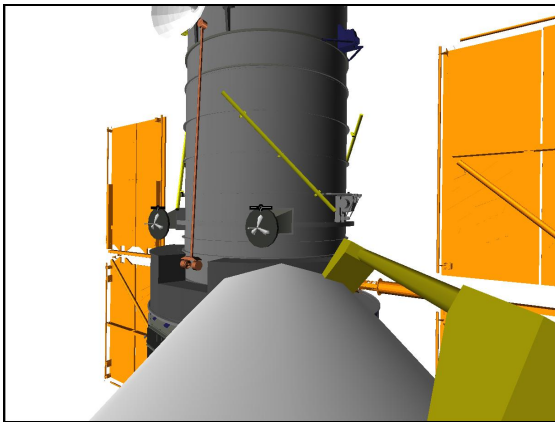
*Display singularity



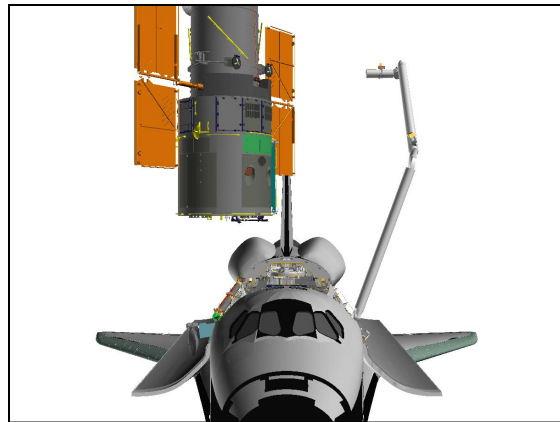
CCTV A (5,45)



CCTV D (40,35)



EE



FRONT

2. HST CAPTURE

A7U When grapple fixture in view and proximity ops stabilized,
 ZOOM – 34.0 HFOV
 FOCUS – 5.0 ft
 A6U DAP: FREE

CAUTION
 Monitor EE tb timing to prevent EE motor burnout

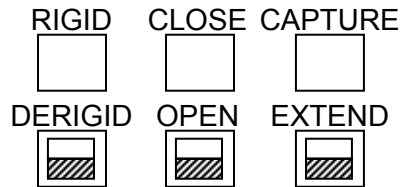
NOTE
 Step 3 needs to occur within 30 sec of HST
 Capture and/or Close indication and may be
 completed in conjunction with remainder of step 2

RHC RATE – VERN (RATE MIN tb-ON)
 BRAKES – OFF (tb-OFF)
 MODE – END EFF, ENTER

EE MODE – AUTO

Mnvr to +V2 GF 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)

SM 94 PDRS CONTROL

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

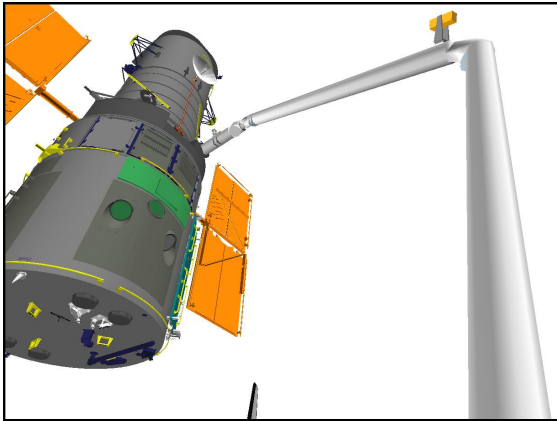
Change DAP A,B to A15,B12

A6U DAP: No LO Z

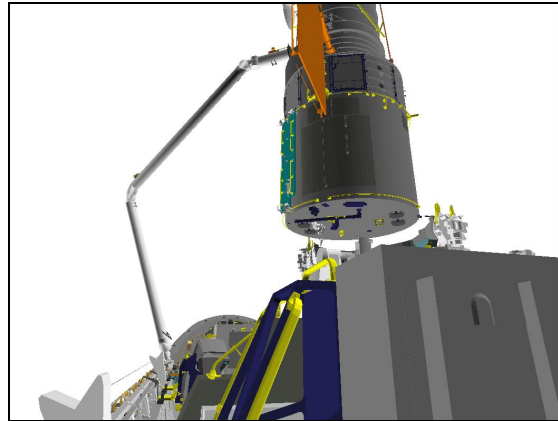
Record POSN/ATT and Joint Angles in table below:

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

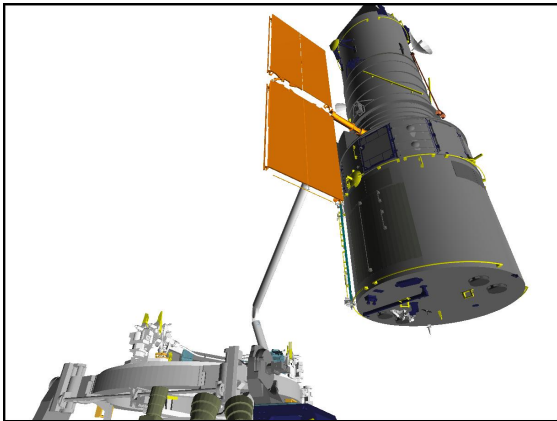
Review STS-125 END EFFECTOR CUE CARD



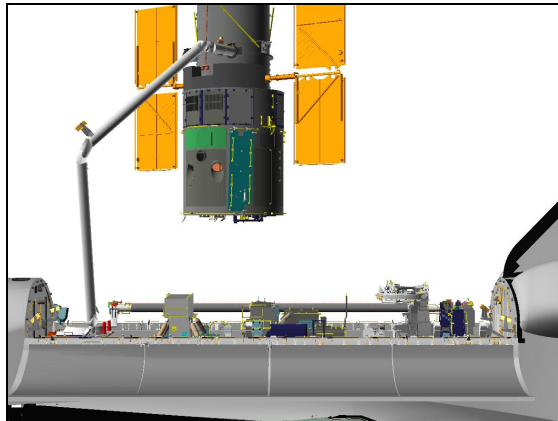
CCTV A (0,45)



CCTV B (15,20)



CCTV C (-20,35)



PORT

3. HST TO DRIFT MODE

SM 210 HST SYS

- √TLM COUNT – incr
- √RCVR LOCK 2(1) – *

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

PCS MODE – ITEM 7 +9 2(91) EXEC (DRFT)

- * If PCS MODE not DRFT, repeat step 3 *
- * *
- * If PCS MODE still not DRFT, and other RCVR LOCK ‘*’, *
- * re-execute command using alternate command *
- * *
- * If still no joy, √MCC before proceeding *

√PCS SNPT DIS – YES

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HST BERTH

1. MNVR TO FSS HOVER POSN

Mon 1	C
Dwnlnk	Elbow
Mon 2	D/A
DTV	B

SM 94 PDRS CONTROL

√ PL ID, ITEM 3: 3

√ INIT ID, ITEM 24: 3

Expected CAPTURE posn:

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

A6U

DAP: FREE

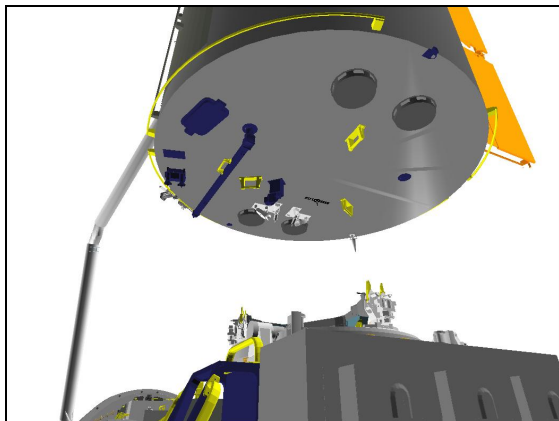
RATE – VERN (RATE MIN tb-ON)

BRAKES – OFF (tb-OFF)

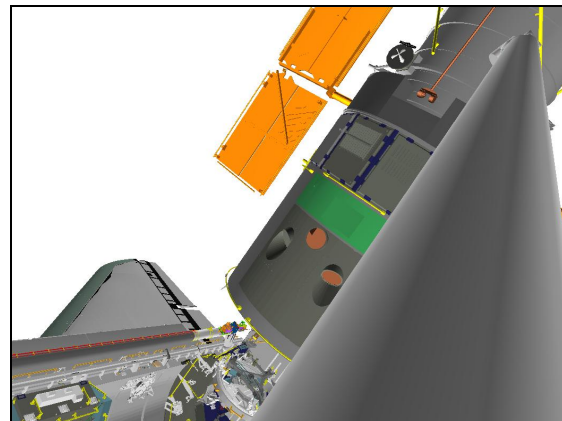
MODE – ORB LD, ENTER

Mnvr to FSS HOVER posn:

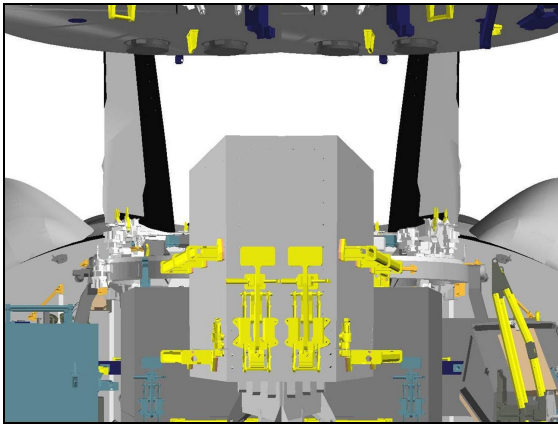
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1149	0	-825	0	0	0	3
SY	SP	EP	WP	WY	WR	
-28.0	+61.3	-36.9	-24.4	+28.0	+0.5	



CCTV B (25,30)

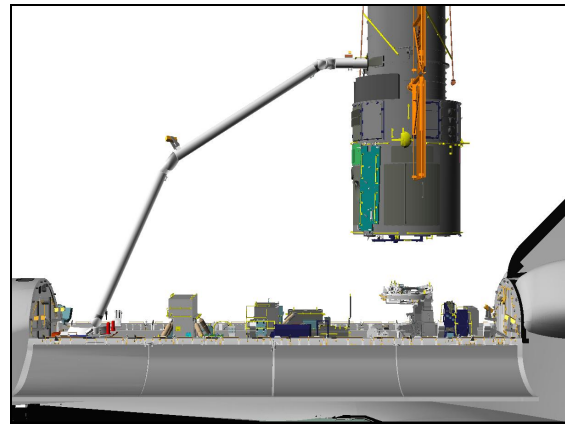


ELBOW (-30,-30)



**CCTV D (5,5)
(20 HFOV)**

**CCTV A (-5,5)
(20 HFOV)**



PORT

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

GNC 20 DAP CONFIG
CNTL ACCEL – ITEM 28 +5 EXEC
– ITEM 48 +5 EXEC

A6U 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 OVERVIEW
CCTV ENA ON – ITEM 3 EXEC (*)
PWR ON – ITEM 5 EXEC (*)

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

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

A3 MON 1(2) – install FSS/HST TARGET OVERLAY FOR CTVM

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

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

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

MON 1	A (D)
Dwnlnk	Elbow
MON 2	FSS
DTV	B (C)

SM 94 PDRS CONTROL

- √PL ID, ITEM 3: 3(4)
- √INIT ID, ITEM 24: 3(4)

FSS HOVER posn:

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

A6U

√DAP: FREE

√RATE – VERN (RATE MIN tb-ON)

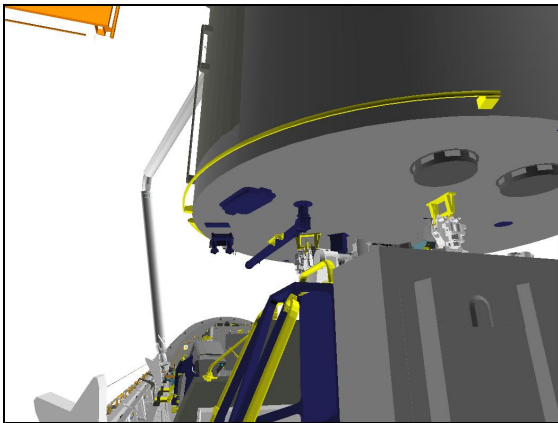
√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

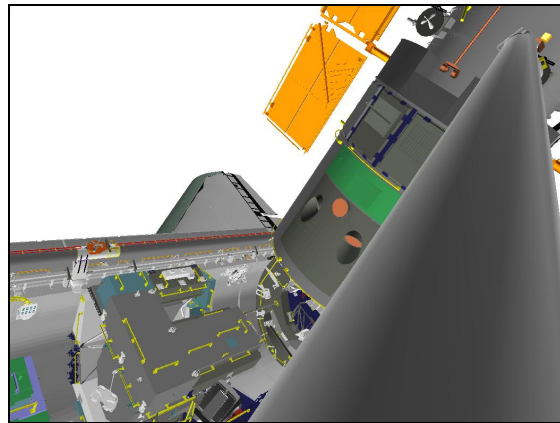
Mnvr to FSS BERTHED posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1149	0	-755	0	0	0	3
	-1128	+12	-497	0	0	0	4
	SY	SP	EP	WP	WY	WR	
	-24.9	+70.3	-63.8	-6.5	+24.9	+0.5	

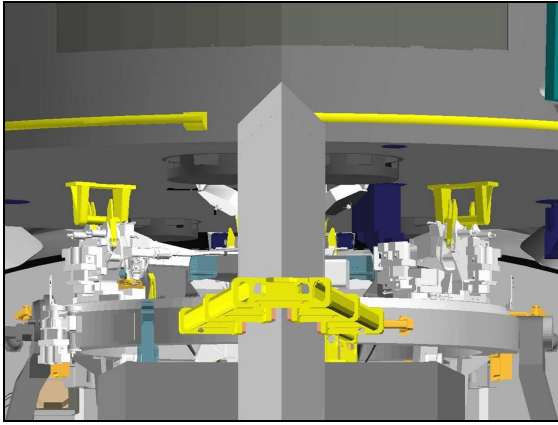
BRAKES – ON (tb-ON)



CCTV B (15,20)

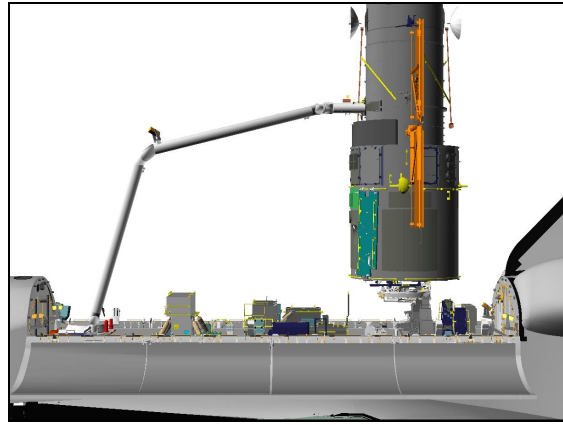


ELBOW (-30,-30)



**CCTV D (5,5)
(ZOOM - full IN)**

**CCTV A (-5,5)
(ZOOM - full IN)**



PORT

5. BERTHING LATCH PARTIAL CLOSURE

NOTE

CHK CRT may occur due to joint slip during latching.
CNTL ERR may occur due to Consistency/Envelope Check error

Perform LATCH AND MATE HST, steps 2 and 3 (PL OPS, RETRIEVAL OPS)

RHC

6. LATCH HST TO FSS

RATE - COARSE (RATE MIN tb-OFF)

SM 94 PDRS CONTROL

AUTO BRAKE INH - ITEM 10 EXEC (*)

BRAKES - OFF (tb-OFF)

MODE - TEST, ENTER

Perform LATCH AND MATE HST, steps 4 thru 6 (PL OPS, RETRIEVAL OPS)

NOTE

Remainder of this procedure can be completed in conjunction with
LATCH AND MATE HST, steps 7 thru 9 (PL OPS, RETRIEVAL OPS)

BRAKES - ON (tb-ON)

SM 94 PDRS CONTROL

AUTO BRAKE ENA - ITEM 9 EXEC (*)

7. UNGRAPPLE HST

Record FSS LATCHED posn:

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

SM 94 PDRS CONTROL

PL ID - ITEM 3 +0 EXEC

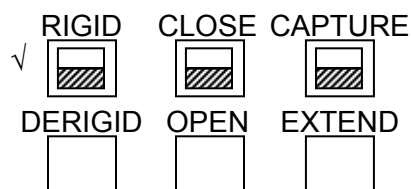
INIT ID - ITEM 24 +0 EXEC

RHC

RATE – VERN (RATE MIN tb-ON)
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 5 ft (minimum) clear of HST



CRITICAL TIMES (28 sec total):
DERIGID tb – gray, 5 sec max, then
OPEN tb – gray, 3 sec max, then
EXTEND tb – gray, 20 sec max

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

Config DAP A,B to A10,B11 and reference FLIGHT PLAN for next mnvr and DAP config

Expected HST BERTHED UNGRAPPLE posn:

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

8. FSS CCTV POWEROFF

SM 211 SSE OVERVIEW

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

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

CCTV ENA OFF – ITEM 4 EXEC (*)

9. TRANSFER DATA

Transfer data to FSS Latched posn tables in following procedures:
HST GRAPPLE, step 3 (HST DEPLOY, GRAPPLE) and SJ HST GRAPPLE,
step 2 (HST DEPLOY, OFF-NOMINAL RMS OPS)

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OFF-NOMINAL HST RETRIEVAL

SJ POISE FOR CAPTURE (FROM PRECRADLE)..... FS 4-2
(FROM NOM POISE FOR CAPTURE)..... FS 4-7
HST CAPTURE FS 4-13
BERTH FS 4-17
CONTINGENCY HST CAPTURE FS 4-27
CONTINGENCY HST BERTH (-V3 HGA DEPLOYED)..... FS 4-33
MNVR TO INTERMEDIATE 1 POSN..... FS 4-34
2 POSN..... FS 4-35
3 POSN..... FS 4-36
4 POSN..... FS 4-37

OFF-NOMINAL
HST RETRIEVAL

SJ POISE FOR CAPTURE (FROM PRECRADLE)

1. SETUP

- CCTV – perform PAN/TILT RESET
- fully zoom out for SJ pictures

SM 94 PDRS CONTROL

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

Mon 1	D
DwnInk	Elbow (EE)
Mon 2	C
DTV	B

2. SJ POISE FOR CAPTURE

If SINGLE MODE available:

- RATE – as required (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	0.0	+25.0	-25.0	+5.0	0.0	0.0	
1: SP +		+80.0					
2: EP -			-75.0				
3: WP -				-41.8			
4: WR +						+8.5	
5: SP +		+101.0					
6: SY -	-53.4						
SJ Poise for Capture	-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

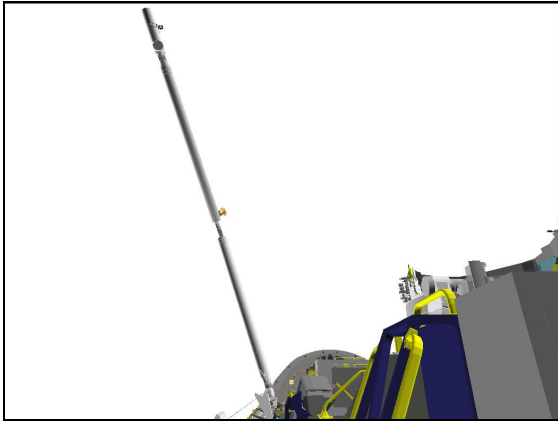
BRAKES – ON (tb-ON)

- √MODE – not DIRECT
- JOINT – CRIT TEMP

OFF-NOMINAL
HST RETRIEVAL

Step 1:

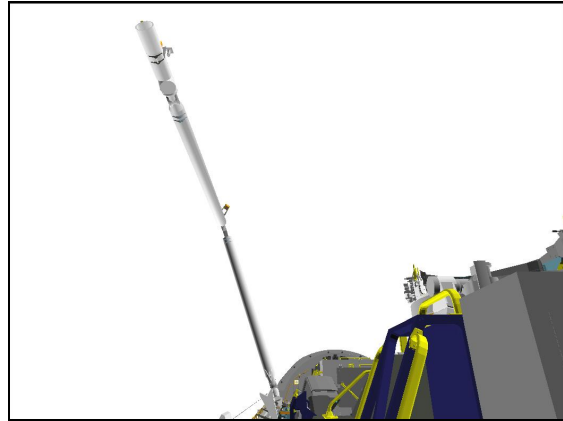
Drive SP + (for 55.0°)
From +25.0° to +80.0°



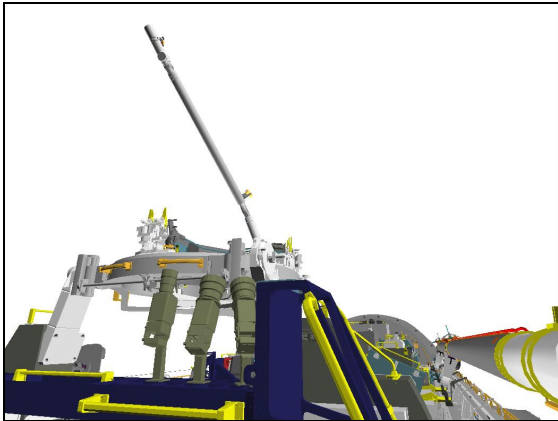
CCTV B (0,25)

Step 2:

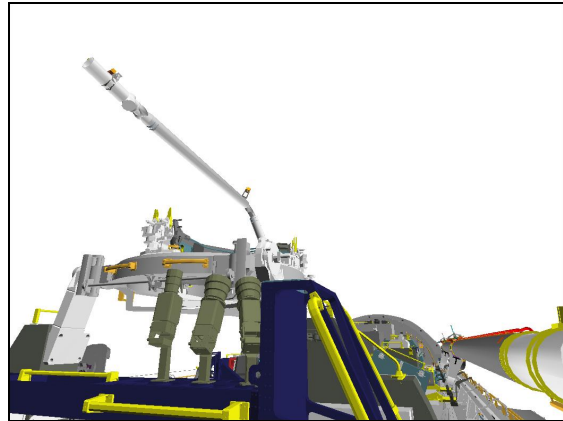
Drive EP - (for 50.0°)
From -25.0° to -75.0°



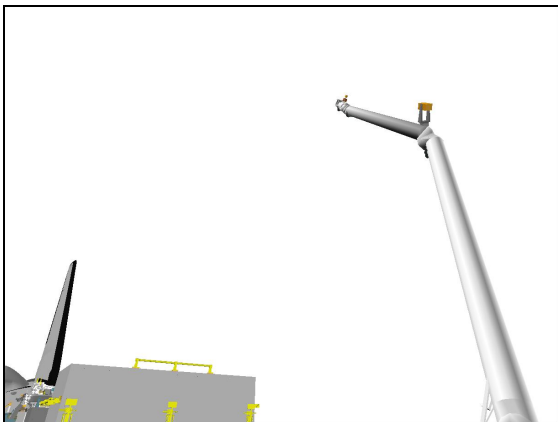
CCTV B (0,25)



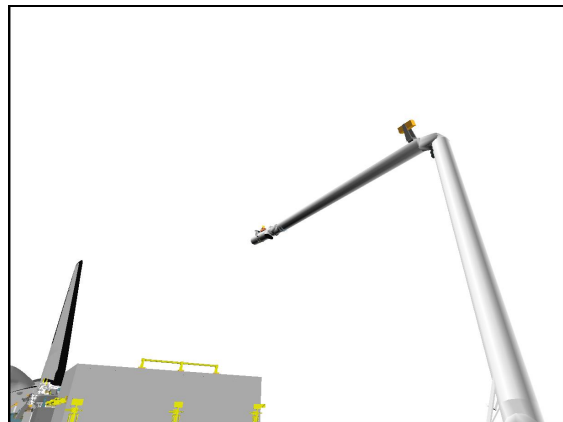
CCTV C (-20,20)



CCTV C (-20,20)



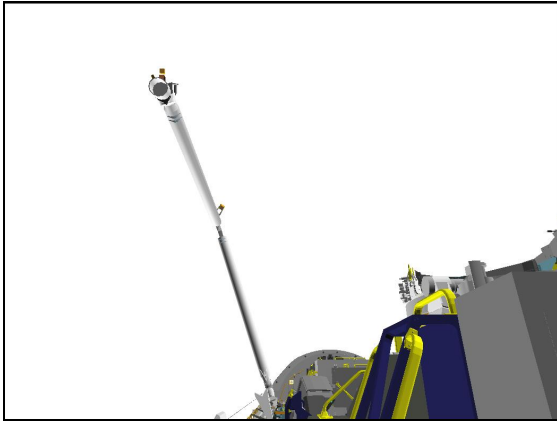
CCTV D (35,30)



CCTV D (35,30)

Step 3:

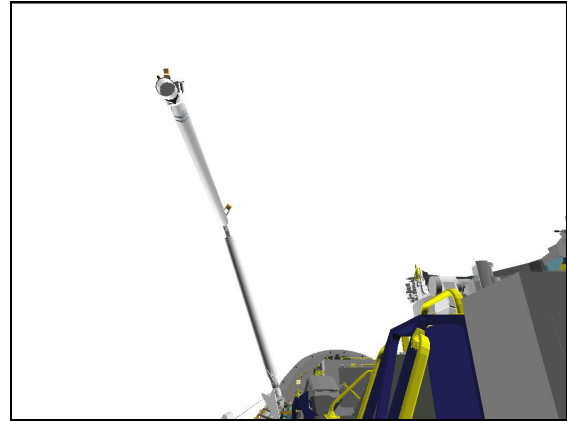
Drive WP - (for 46.8°)
From +5.0° to -41.8°



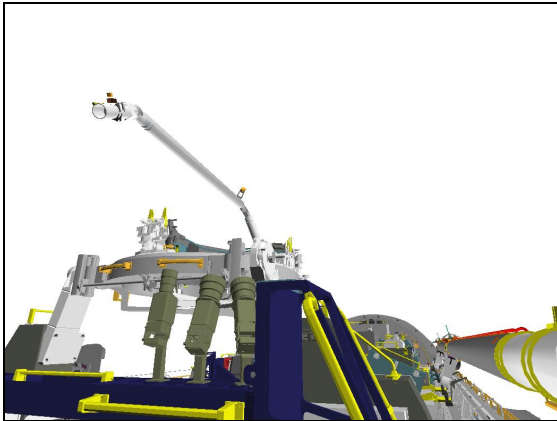
CCTV B (0,25)

Step 4:

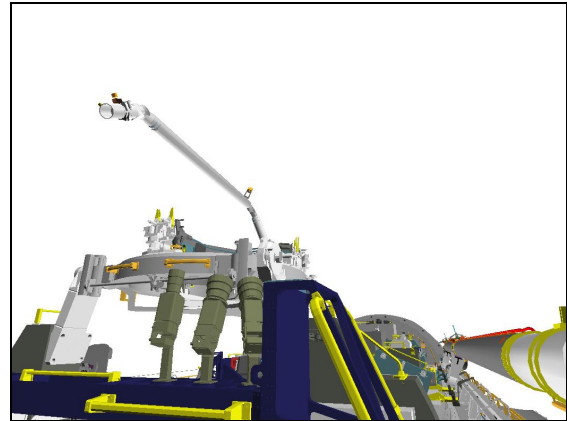
Drive WR + (for 8.5°)
From 0° to +8.5°



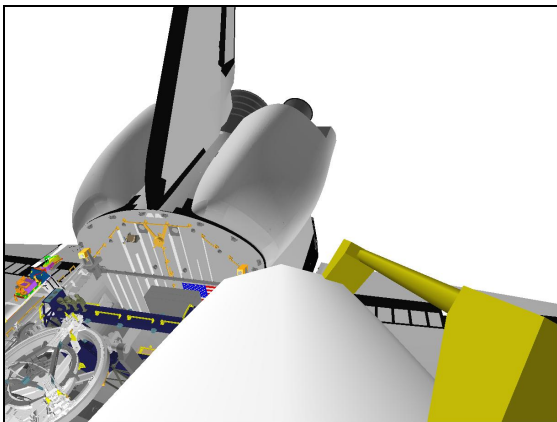
CCTV B (0,25)



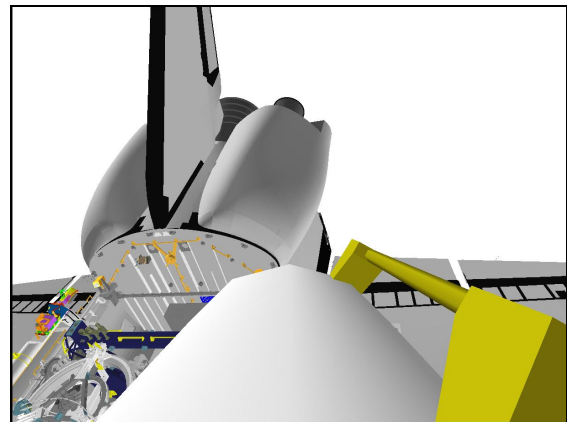
CCTV C (-20,20)



CCTV C (-20,20)



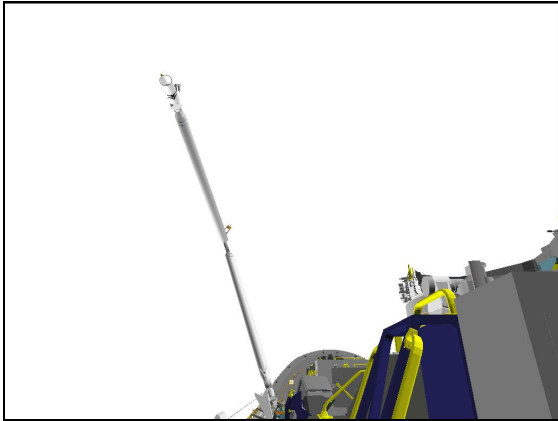
EE



EE

Step 5:

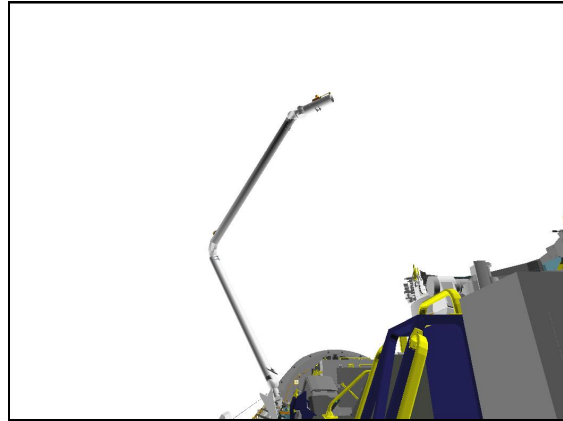
Drive SP + (for 21.0°)
From +80.0° to +101.0°



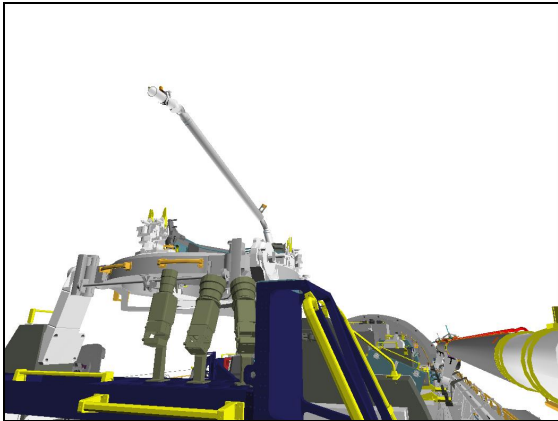
CCTV B (0,25)

Step 6:

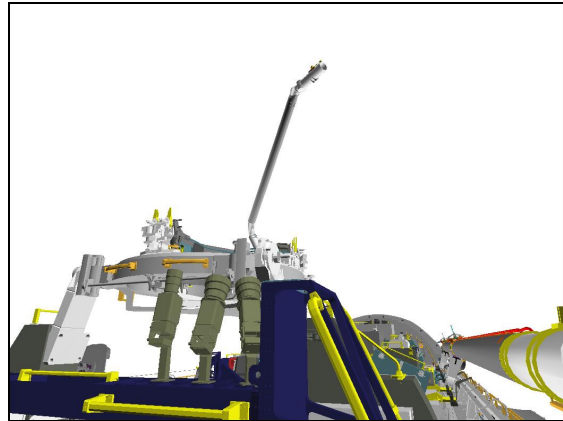
Drive SY - (for 53.4°)
From 0° to -53.4°



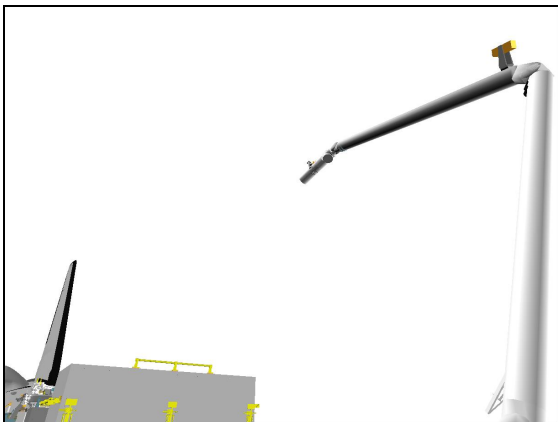
CCTV B (0,25)



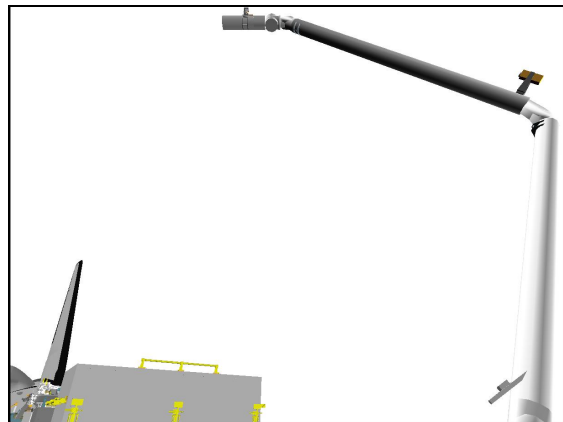
CCTV C (-20,20)



CCTV C (-20,20)



CCTV D (35,30)



CCTV D (35,30)

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SJ POISE FOR CAPTURE (FROM NOM POISE FOR CAPTURE)

1. SETUP

- CCTV – perform PAN/TILT RESET
- fully zoom out for SJ pictures

SM 94 PDRS CONTROL

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

Mon 1	D
DwnInk	Elbow (EE)
Mon 2	C
DTV	B

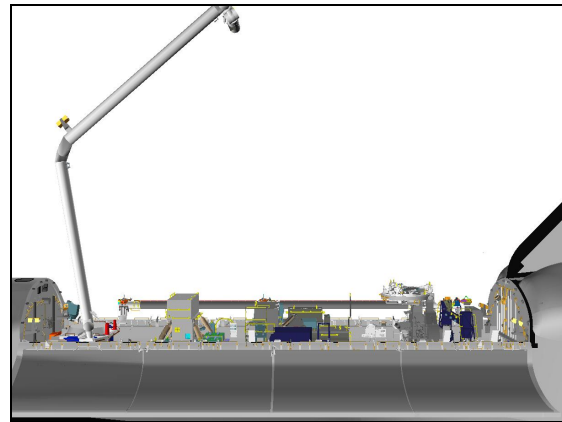
Verify NOMINAL POISE FOR CAPTURE posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-890	-145	-850	0	270*	0	0
	SY	SP	EP	WP	WY	WR	
√	-12.7	+93.2	-54.8	-96.5	-66.9	-36.5	

*Display singularity



CCTV D (60,25)



PORT

2. SJ POISE FOR CAPTURE

If SINGLE MODE available:

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

MODE – best available

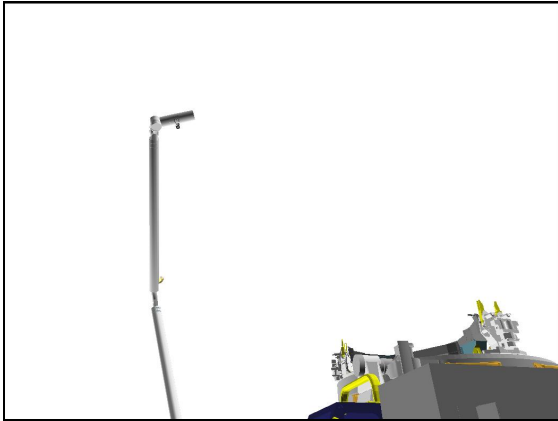
Mnvr to SJ POISE FOR CAPTURE posn:

	SY	SP	EP	WP	WY	WR	
Nom Poise for Capture	-12.7	+93.2	-54.8	-96.5	-66.9	-36.5	
1: WP +				-41.8			
2: WY +					0.0		
3: WR +						+8.5	
4: SP +		+101.0					
5: SY -	-53.4						
6: EP -			-75.0				
SJ Poise for Capture	-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

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

Step 1:

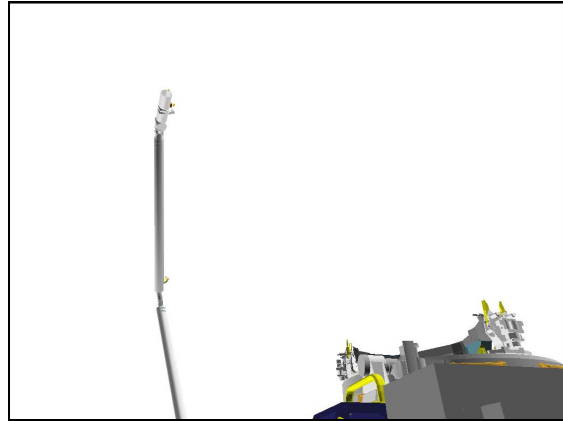
Drive WP + (for 54.7°)
From -96.5° to -41.8°



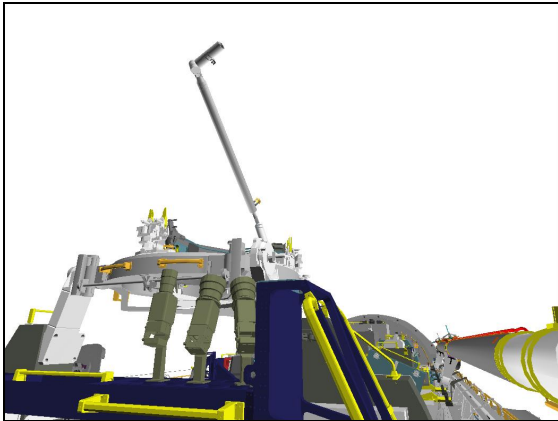
CCTV B (10,35)

Step 2:

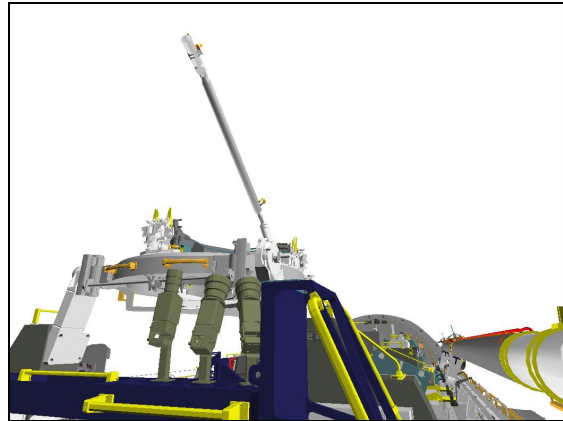
Drive WY + (for 66.9°)
From -66.9° to 0°



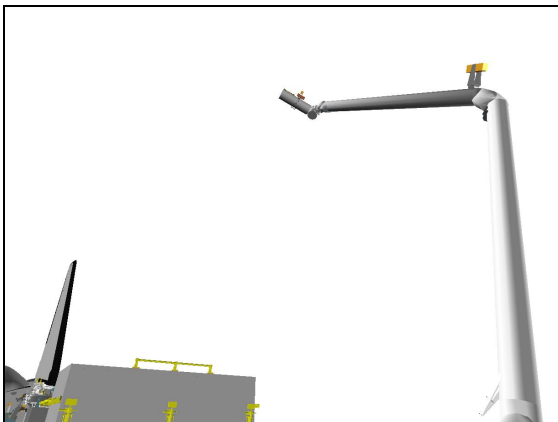
CCTV B (10,35)



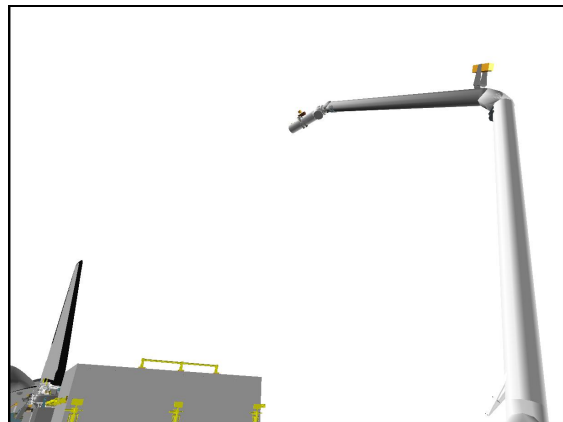
CCTV C (-20,20)



CCTV C (-20,20)



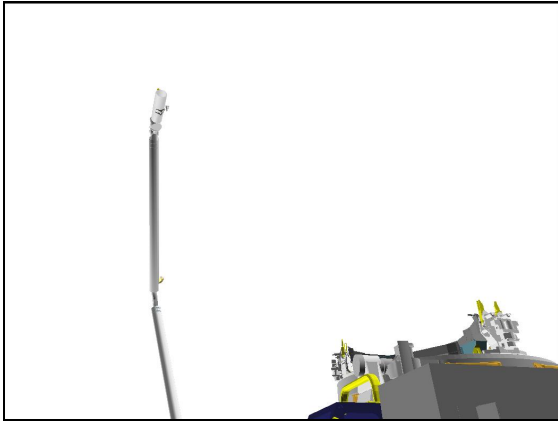
CCTV D (35,30)



CCTV D (35,30)

Step 3:

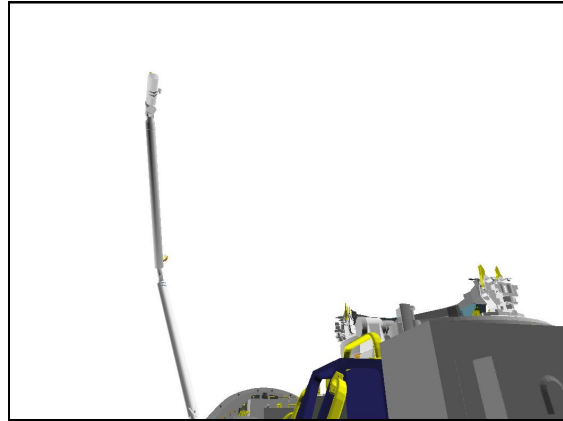
Drive WR + (for 45°)
From -36.5° to +8.5°



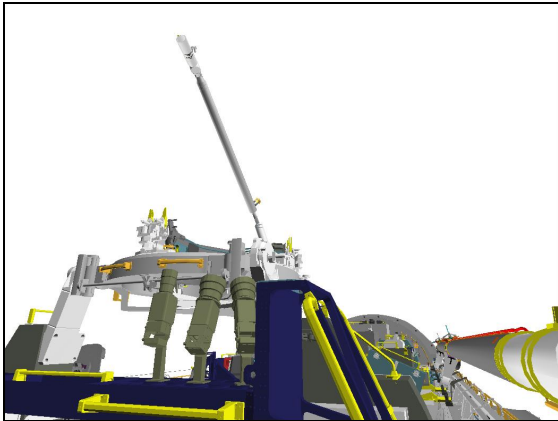
CCTV B (10,35)

Step 4:

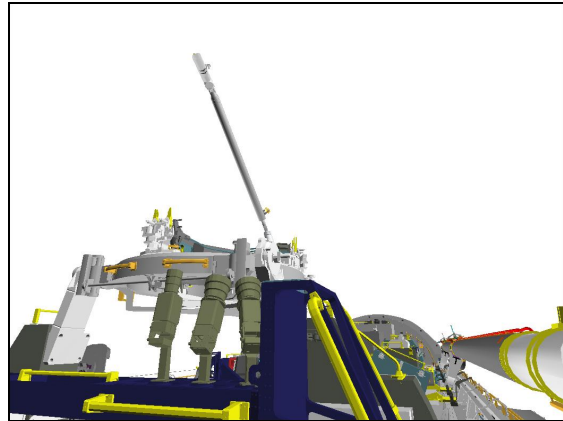
Drive SP + (for 7.8°)
From +93.2 to +101.0



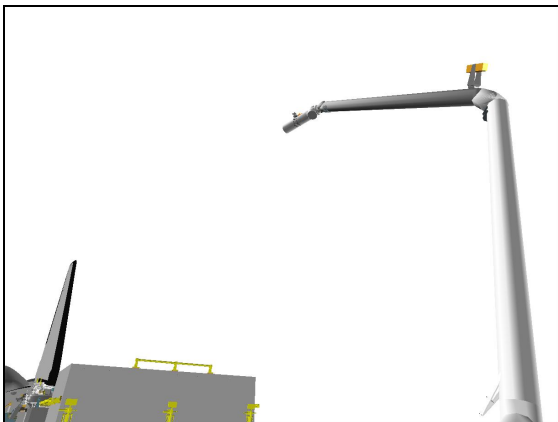
CCTV B (10,30)



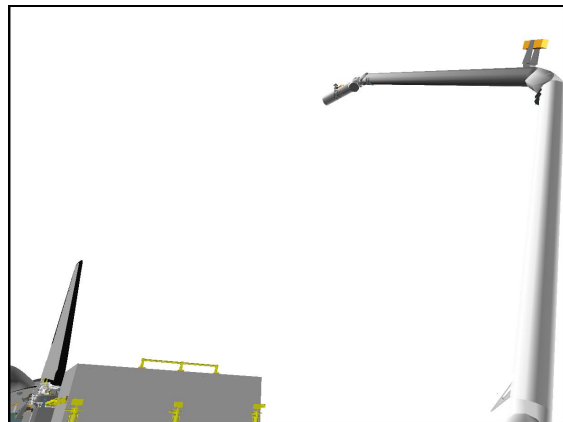
CCTV C (-20,20)



CCTV C (-20,20)



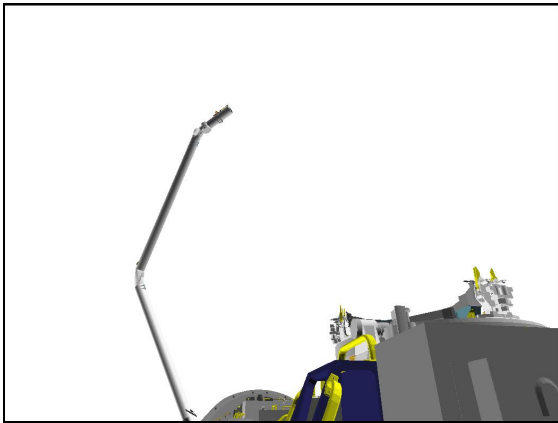
CCTV D (35,30)



CCTV D (35,30)

Step 5:

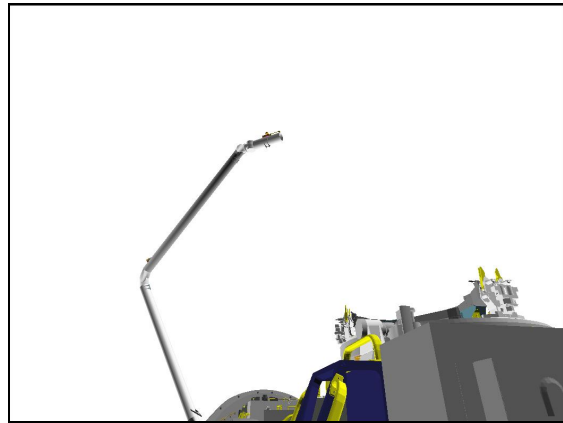
Drive SY - (for 40.7°)
From -12.7° to -53.4°



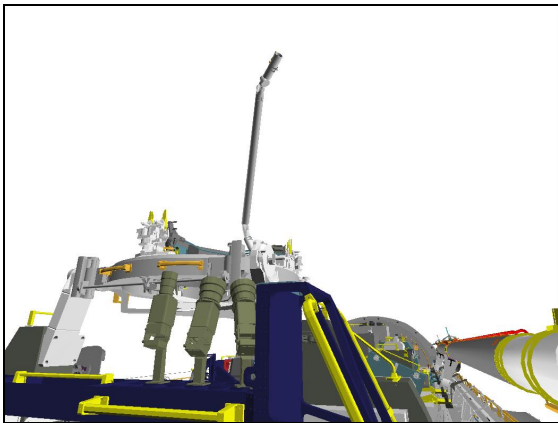
CCTV B (10,30)

Step 6:

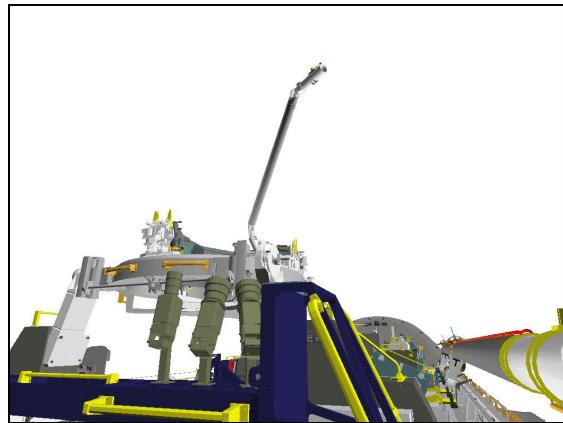
Drive EP - (for 20.2°)
From -54.8° to -75.0°



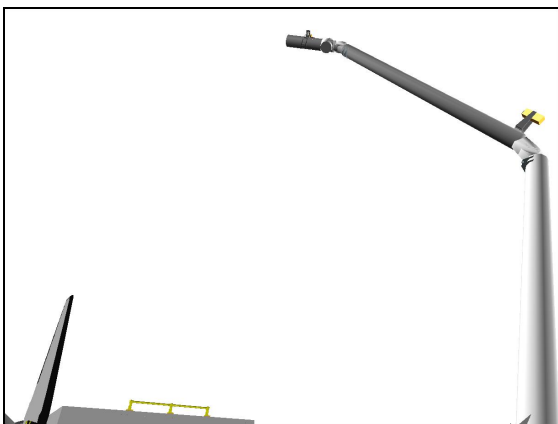
CCTV B (10,30)



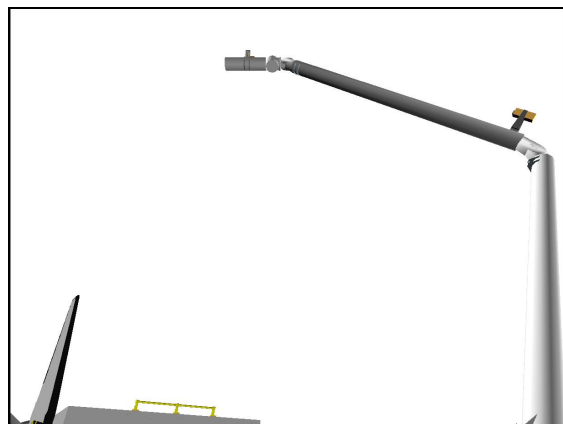
CCTV C (-20,20)



CCTV C (-20,20)



CCTV D (35,35)



CCTV D (35,35)

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SJ HST CAPTURE

1. SETUP

A3
A7U

MON 1(2) – install PDRS TARGET OVERLAY FOR CTVM
CCTV – config for Capture

Maintain eyepoint approx 18 in when using grapple overlay

Mon 1	D
DwnInk	EE (Elbow)
Mon 2	B
DTV	A

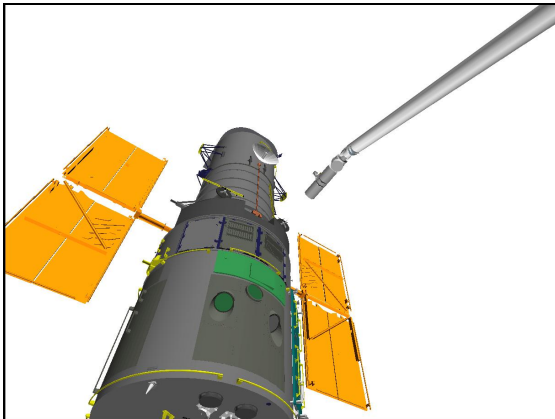
Review STS-125 END EFFECTOR CUE CARD

SM 94 PDRS CONTROL

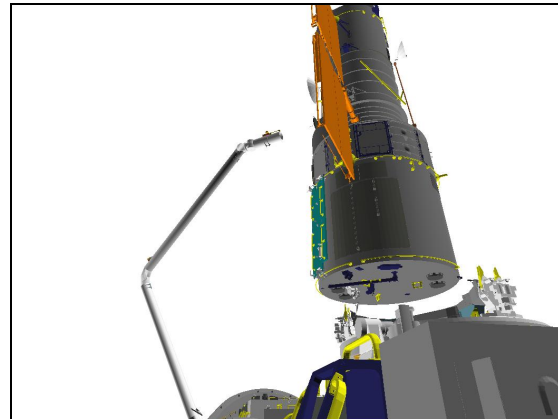
√ PL ID, ITEM 3: 0
√ INIT ID, ITEM 24: 0

Verify SJ POISE FOR CAPTURE posn:

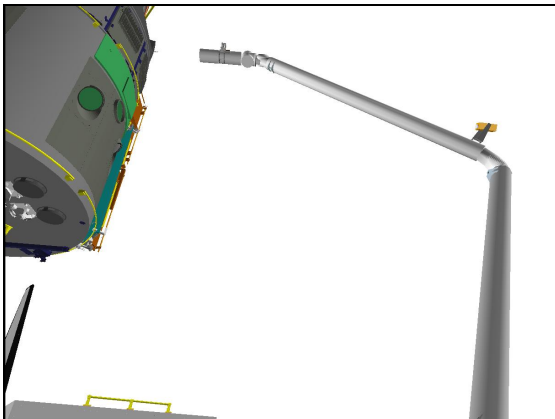
	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-844	-17	-853	0	305	1	0
	SY	SP	EP	WP	WY	WR	
√	-53.4	+101.0	-75.0	-41.8	0.0	+8.5	



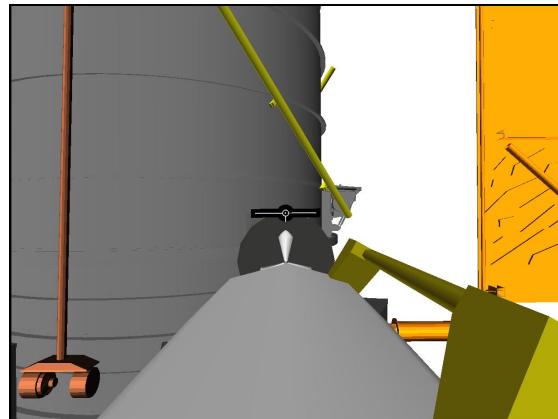
CCTV A (-20,55)



CCTV B (10,30)



CCTV D (40,35)



EE

2. SJ HST CAPTURE

A7U When grapple fixture in view and proximity ops stabilized,
 ZOOM – 34.0 HFOV
 FOCUS – 5.0 ft
 A6U DAP: FREE

CAUTION
 Monitor EE tb timing to prevent EE motor burnout

NOTE

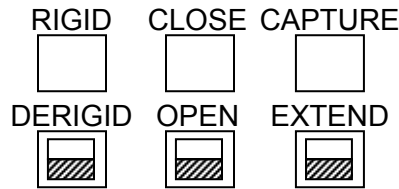
Step 3 needs to occur within 30 sec of HST Capture and/or Close indication and may be completed in conjunction with remainder of step 2

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

EE MODE – AUTO

Mnvr to +V2 GF grapple envelope using:
 -SP to close distance
 +WP, +EP to align grapple pin

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)
 MODE – not DIRECT (It off)

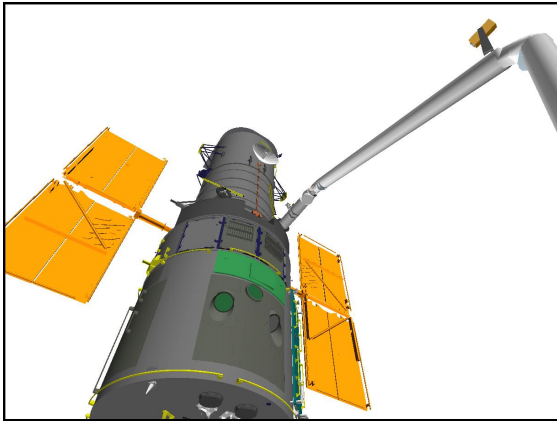
SM 94 PDRS CONTROL
 PL ID – ITEM 3 +3 EXEC
 INIT ID – ITEM 24 +3 EXEC

Change DAP A,B to A15,B12

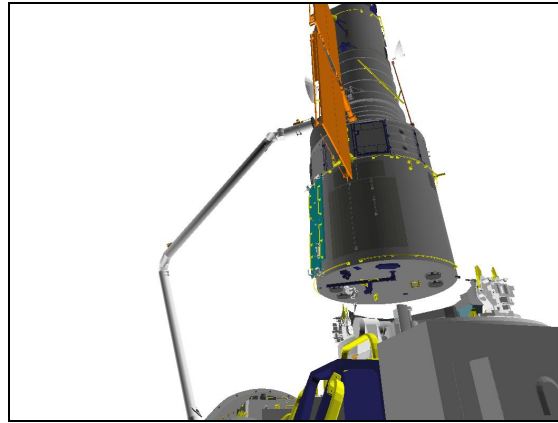
A6U DAP: No LO Z

Record POSN/ATT and Joint Angles in table below:

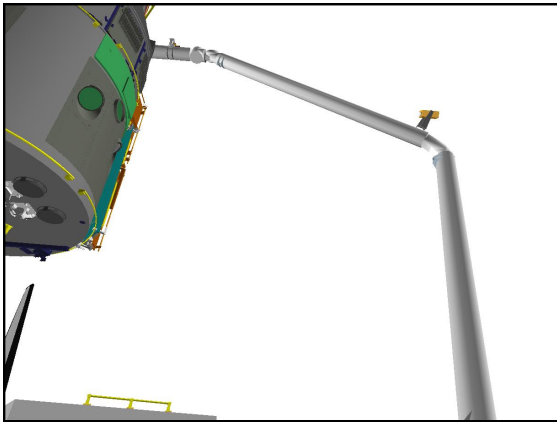
	X	Y	Z	PITCH	YAW	ROLL	PL ID
							3
Expected	-878	+112	-853	0	305	0	3
	SY	SP	EP	WP	WY	WR	
Expected	-53.4	+90.0	-68.5	-37.3	0.0	+8.5	



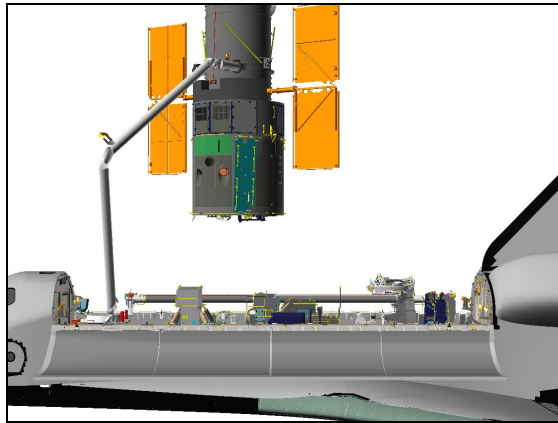
CCTV A (-20,55)



CCTV B (10,30)



CCTV D (40,35)



PORT

3. HST TO DRIFT MODE

SM 210 HST SYS

- √TLM COUNT – incr
- √RCVR LOCK 2(1) – *

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

PCS MODE – ITEM 7 +9 2(91) EXEC (DRFT)

- * If PCS MODE not DRFT, repeat step 3 *
- * *
- * If PCS MODE still not DRFT, and other RCVR LOCK ‘*’, *
- * re-execute command using alternate command *
- * *
- * If still no joy, √MCC before proceeding *

√PCS SNPT DIS – YES

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SJ HST BERTH

1. SETUP

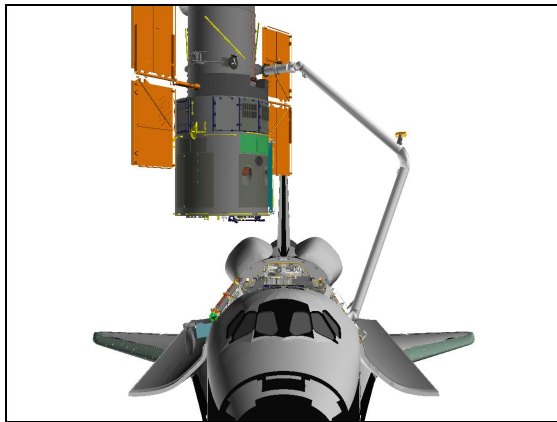
- CCTV – perform PAN/TILT RESET
- fully zoom out for SJ pictures

SM 94 PDRS CONTROL

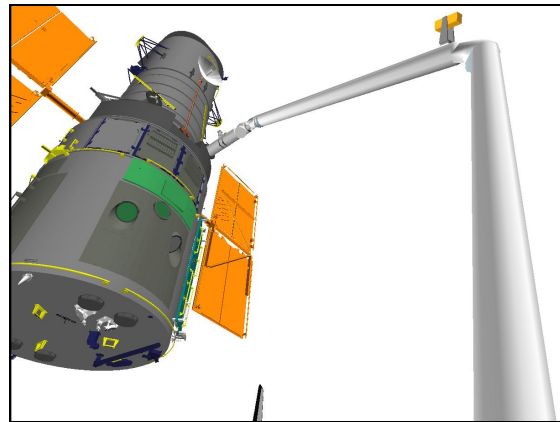
- √ PL ID, ITEM 3: 3
- √ INIT ID, ITEM 24: 3

Verify HST CAPTURE posn:

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



FRONT



CCTV A (-20,55)

2. FSS HOVER

If SINGLE MODE available:

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

MODE – best available

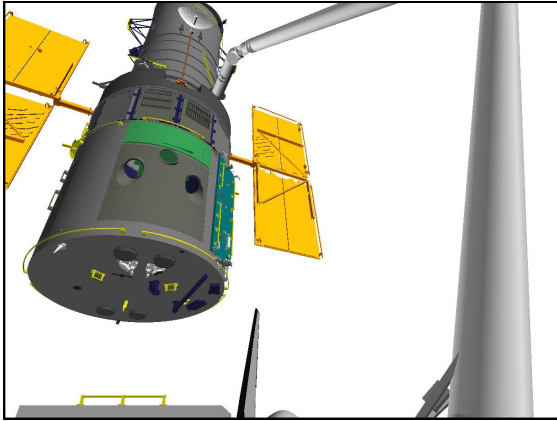
Mnvr to FSS HOVER posn:

	SY	SP	EP	WP	WY	WR	
Capture	-53.4	+90.0	-68.5	-37.3	0.0	+8.5	
1: WY +					+28.0		
2: WP +				-24.4			
3: SY +	-28.0						
4: EP +			-36.9				
5: WR –						+0.5	
6: SP –		+61.3					
FSS Hover	-28.0	+61.3	-36.9	-24.4	+28.0	+0.5	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1149	0	-825	0	0	0	3
	-1128	+12	-567	0	0	0	4

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

Step 1:

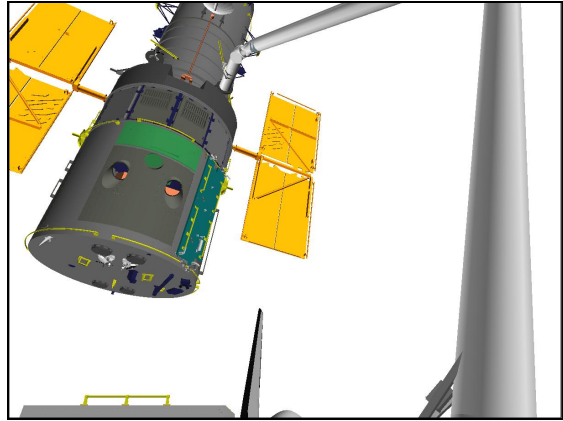
Drive WY + (for 28.0°)
From 0° to +28.0°



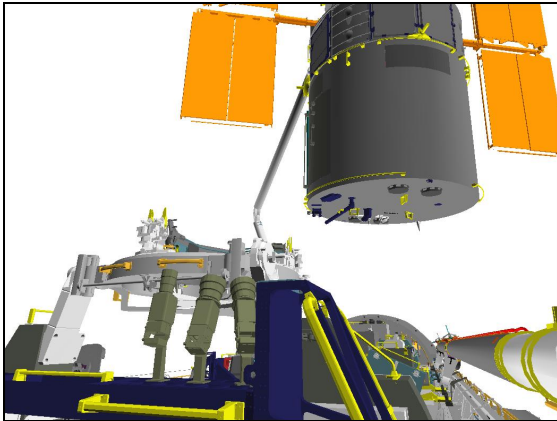
CCTV A (0,35)

Step 2:

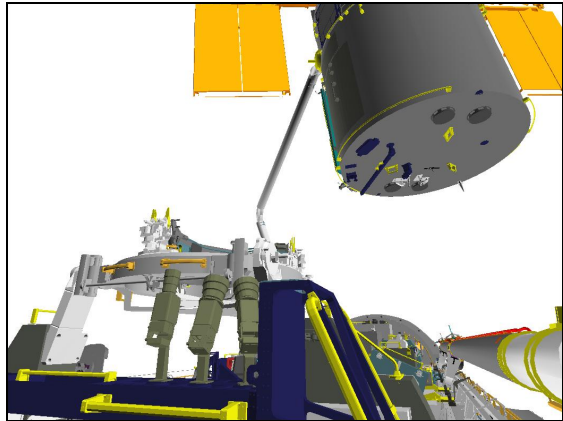
Drive WP + (for 12.9°)
From -37.3° to -24.4°



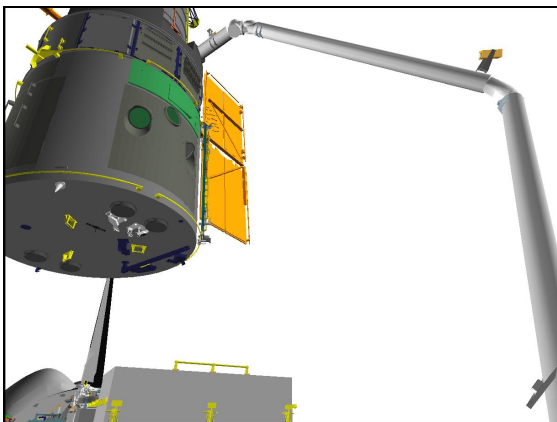
CCTV A (0,35)



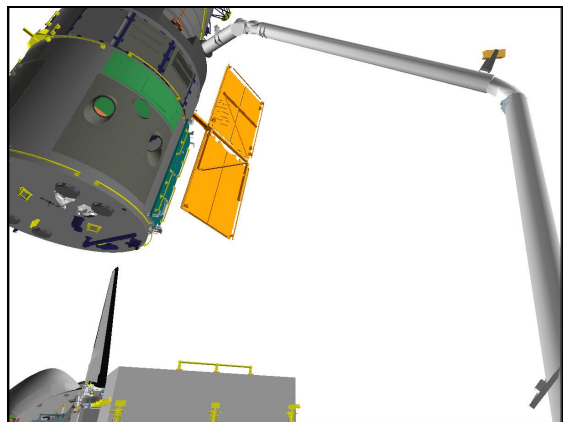
CCTV C (-20,20)



CCTV C (-20,20)



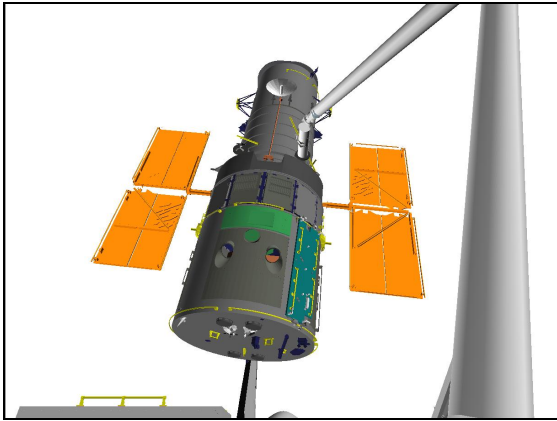
CCTV D (30,30)



CCTV D (30,30)

Step 3:

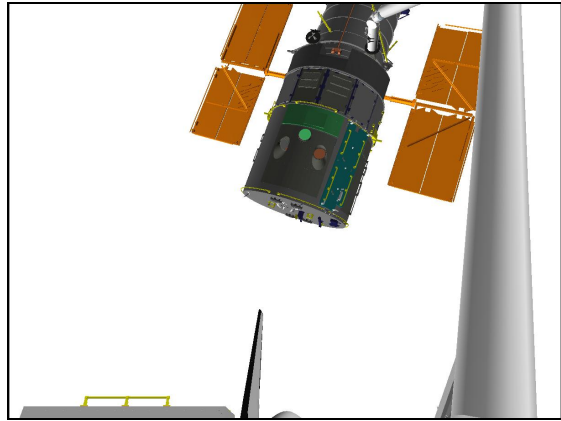
Drive SY + (for 25.4°)
From -53.4° to -28.0°



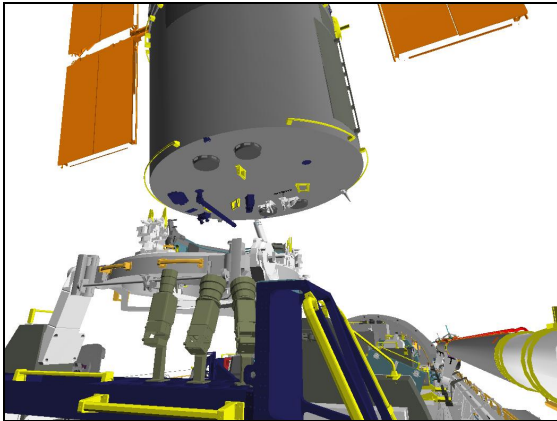
CCTV A (0,35)

Step 4:

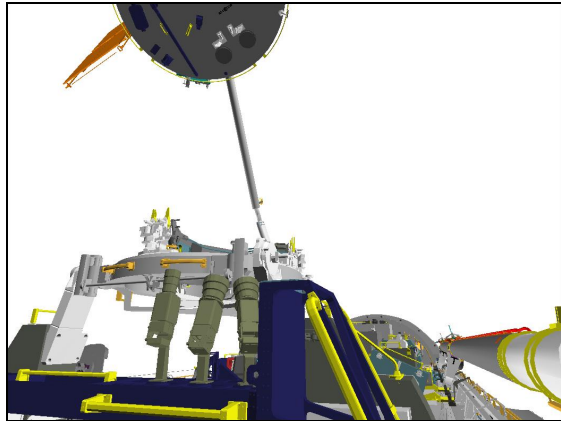
Drive EP + (for 31.6°)
From -68.5° to -36.9°



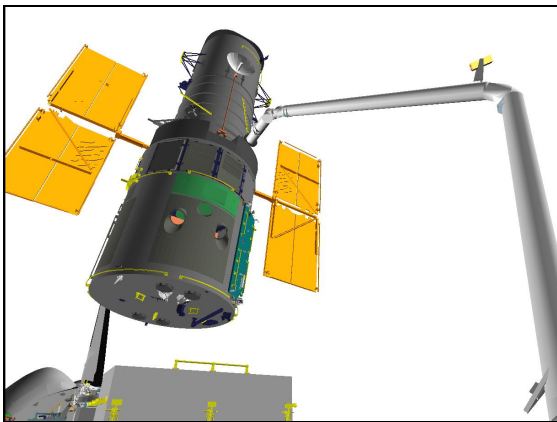
CCTV A (0,35)



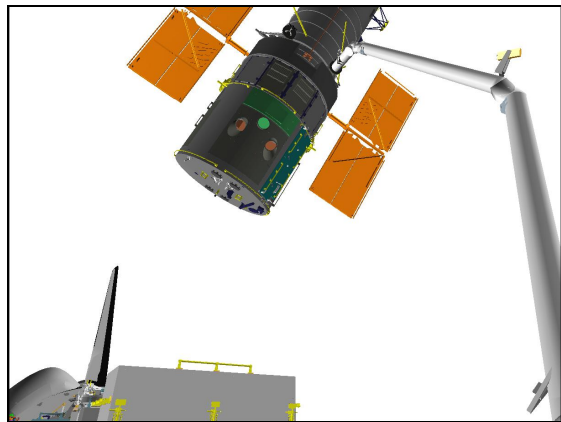
CCTV C (-20,20)



CCTV C (-20,20)



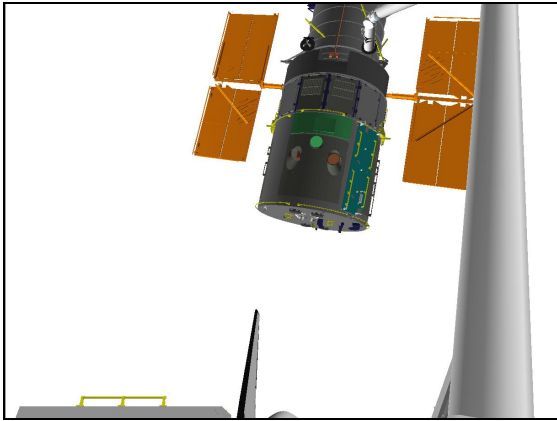
CCTV D (30,30)



CCTV D (30,30)

Step 5:

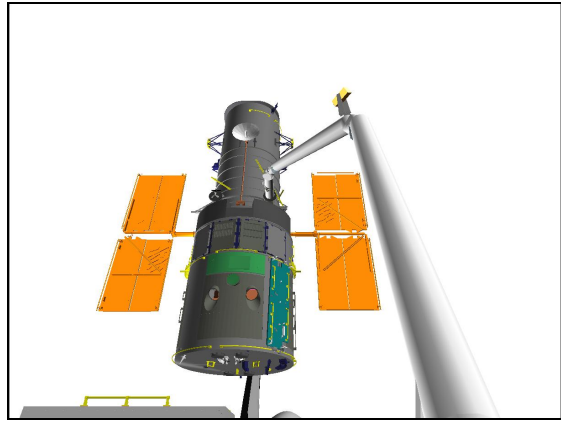
Drive WR - (for 8.0°)
From +8.5° to +0.5°



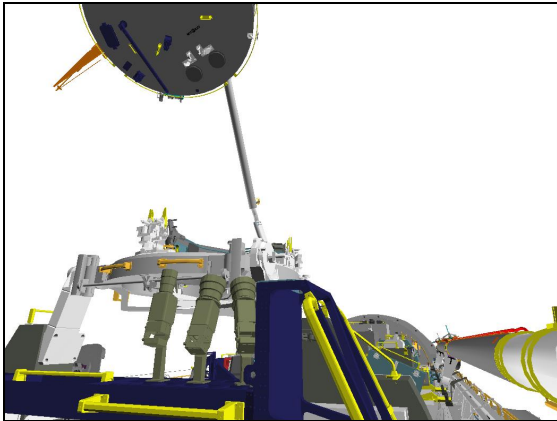
CCTV A (0,35)

Step 6:

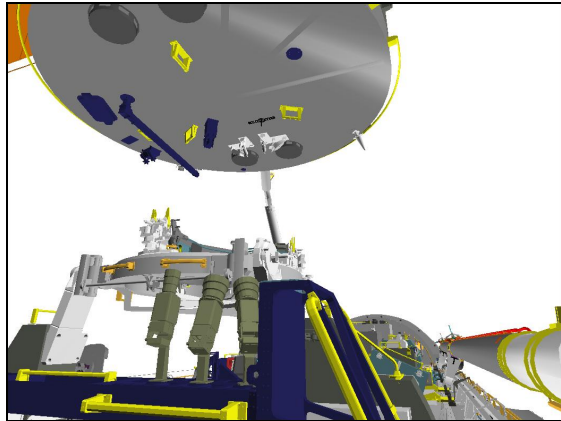
Drive SP - (for 28.7°)
From +90.0° to +61.3°



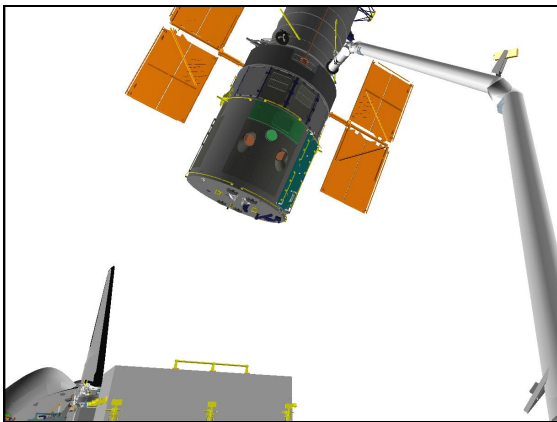
CCTV A (0,35)



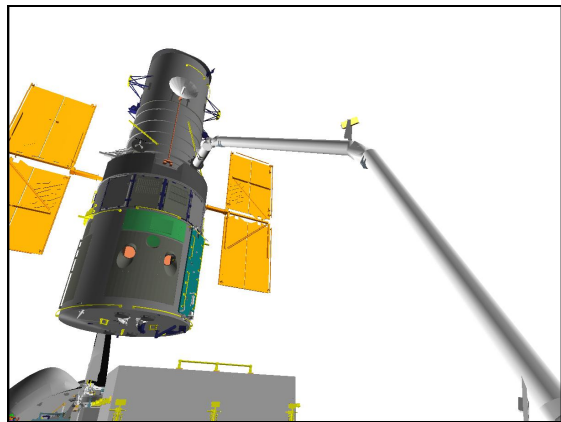
CCTV C (-20,20)



CCTV C (-20,20)



CCTV D (30,30)



CCTV D (30,30)

3. ATTITUDE MAINTENANCE

If attitude maintenance reqd:

- BRAKES – ON (tb-ON)
- OFF (tb-OFF)

GNC 20 DAP CONFIG

- CNTL ACCEL – ITEM 28 +5 EXEC
- ITEM 48 +5 EXEC

A6U DAP: A/AUTO/VERN(ALT)

4. FSS CCTV SETUP

CAUTION
FSS CCTV limited to 2 hr continuous use

L12U √CCTV HTR PWR sw – ON (tb-gray)

SM 211 SSE OVERVIEW

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

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

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

A3 MON 1(2) – install FSS/HST TARGET OVERLAY FOR CTVM

MON 1(2) – install FSS/HST SJ BERTHING OVERLAY

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

5. CONFIG FSS FOR HST BERTH

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

6. MNVR TO FSS BERTH POSN

CCTV – config for berth

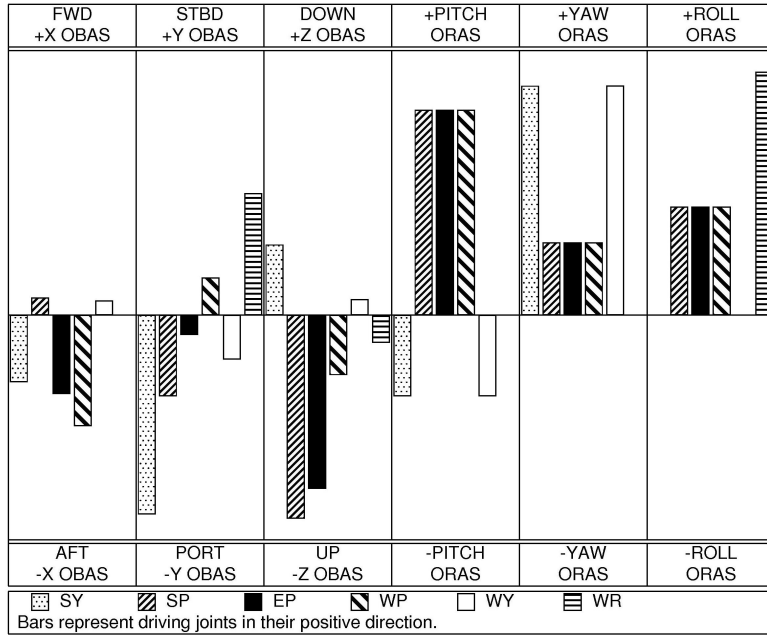
MON 1	A
DwnInk	Elbow
MON 2	FSS
DTV	B (C)

SM 94 PDRS CONTROL

- √PL ID, ITEM 3: 3 (4)
- √INIT ID, ITEM 24: 3 (4)

Drive joints in order indicated on FSS/HST SJ BERTHING OVERLAY and per histogram until RTL indications observed

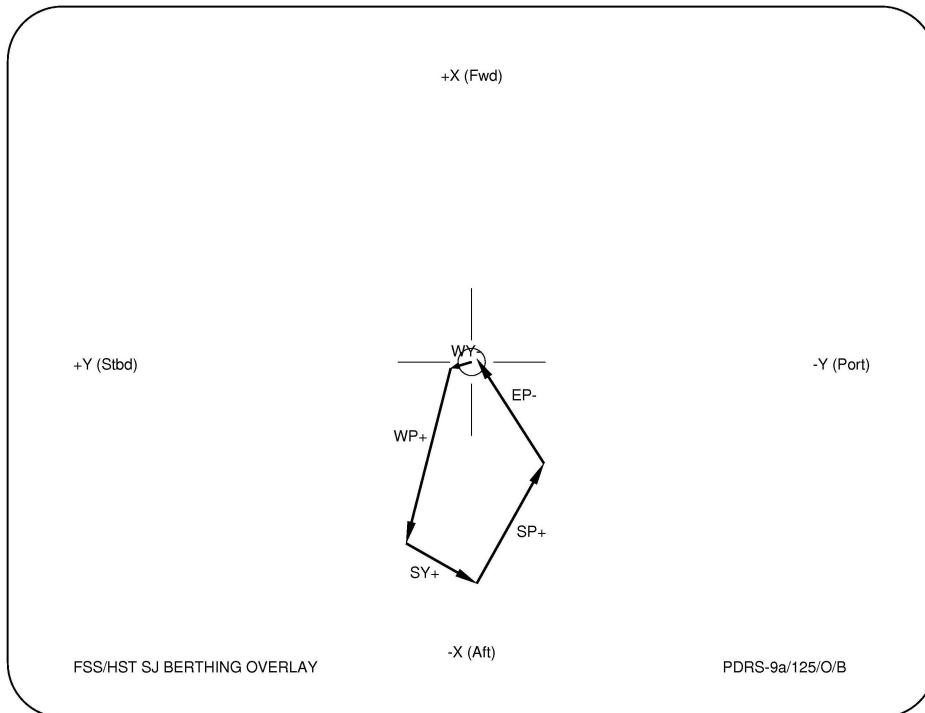
FSS/HST SJ BERTHING OVERLAY



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

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

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



A6U

√DAP: FREE

If SINGLE MODE available:

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

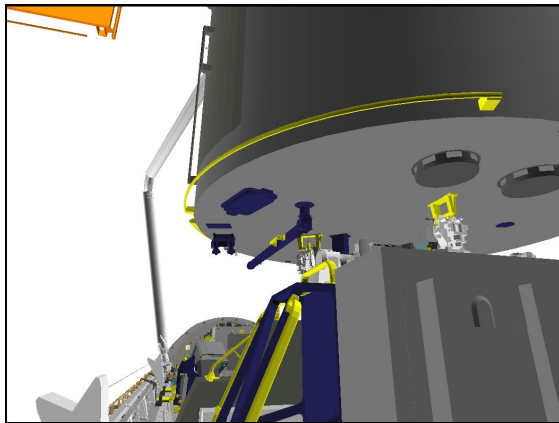
MODE – best available

Mnvr to FSS BERTHED posn:

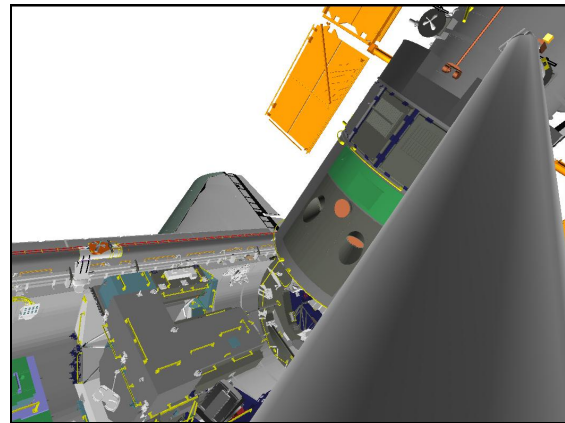
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1149	0	-755	0	0	0	3
-1128	+12	-497	0	0	0	4
SY	SP	EP	WP	WY	WR	
-24.9	+70.3	-63.8	-6.5	+24.9	+0.5	

BRAKES – ON (tb-ON)

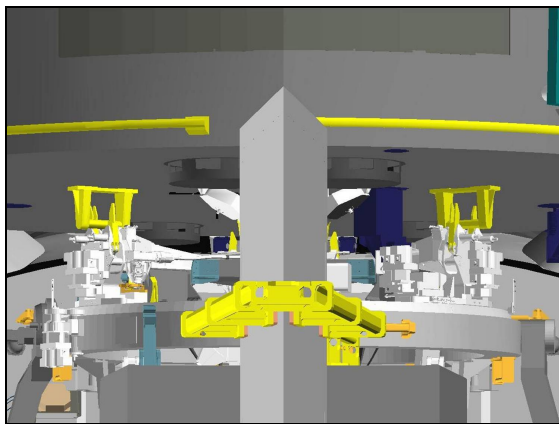
MODE – not DIRECT (It off)



CCTV B (15,20)

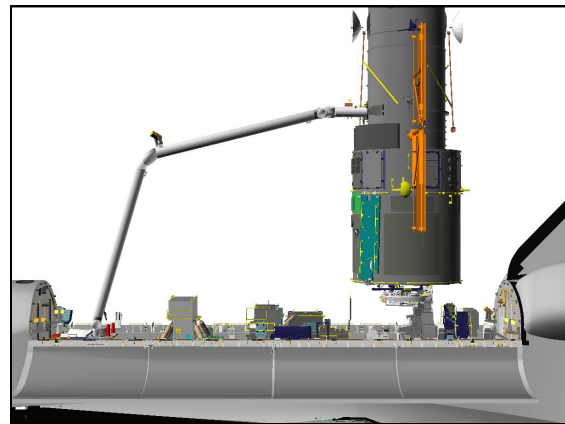


ELBOW (-30,-30)



**CCTV D (5,5)
(ZOOM – full IN)**

**CCTV A (-5,5)
(ZOOM – full IN)**



PORT

7. BERTHING LATCH PARTIAL CLOSURE

NOTE

CHK CRT may occur due to joint slip during latching.

CNTL ERR may occur due to Consistency/Envelope Check error

Perform LATCH AND MATE HST, steps 2 and 3 (PL OPS, RETRIEVAL OPS)

RHC

- 8. LATCH HST TO FSS
 RATE – COARSE (RATE MIN tb-OFF)
 If TEST MODE available:

SM 94 PDRS CONTROL
 AUTO BRAKE INH – ITEM 10 EXEC (*)

BRAKES – OFF (tb-OFF)
 MODE – TEST, ENTER

Perform LATCH AND MATE HST, steps 4 thru 6 (PL OPS, RETRIEVAL OPS)

NOTE

Remainder of this procedure can be completed in conjunction with
 LATCH AND MATE HST, steps 7 thru 9 (PL OPS, RETRIEVAL OPS)

If TEST MODE available:
 BRAKES – ON (tb-ON)

SM 94 PDRS CONTROL
 AUTO BRAKE ENA – ITEM 9 EXEC (*)

- 9. UNGRAPPLE HST
 Record FSS LATCHED posn:

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

A3

MON 1(2) – install UNGRAPPLE BERTHED HST OVERLAY

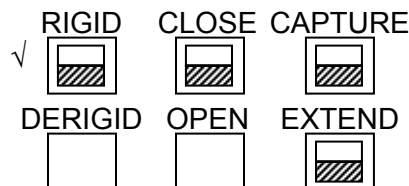
SM 94 PDRS CONTROL
 PL ID – ITEM 3 +0 EXEC
 INIT ID – ITEM 24 +0 EXEC

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

MODE – best available

CAUTION
 Monitor EE tb timing to prevent EE motor burnout

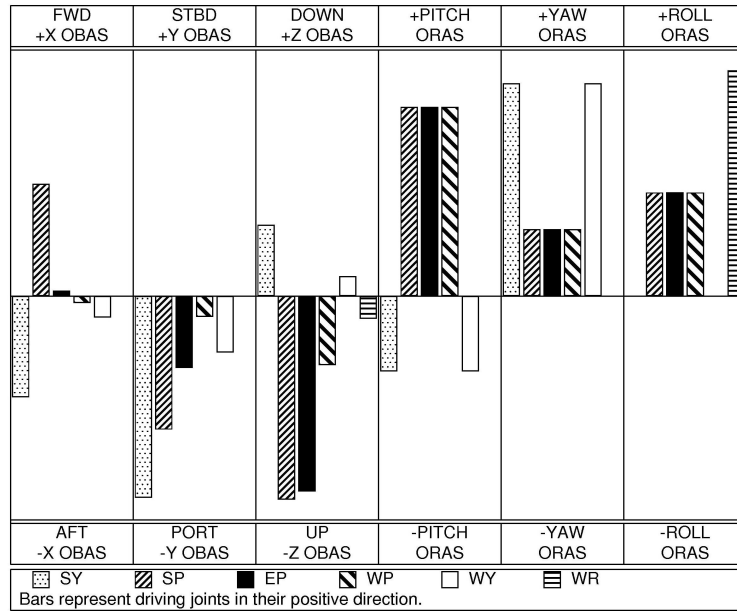
EE MODE – MAN
 MAN CONTR – DERIGID (hold until DERIGID tb-gray, 5 sec max)
 RELEASE sw – depress (hold until OPEN tb-gray, 3 sec max)



CRITICAL TIMES (28 sec total):
 DERIGID tb – gray, 5 sec max, then
 OPEN tb – gray, 3 sec max, then

Drive joints in order indicated on UNGRAPPLE BERTHED HST OVERLAY and per histogram until clear of GF pin

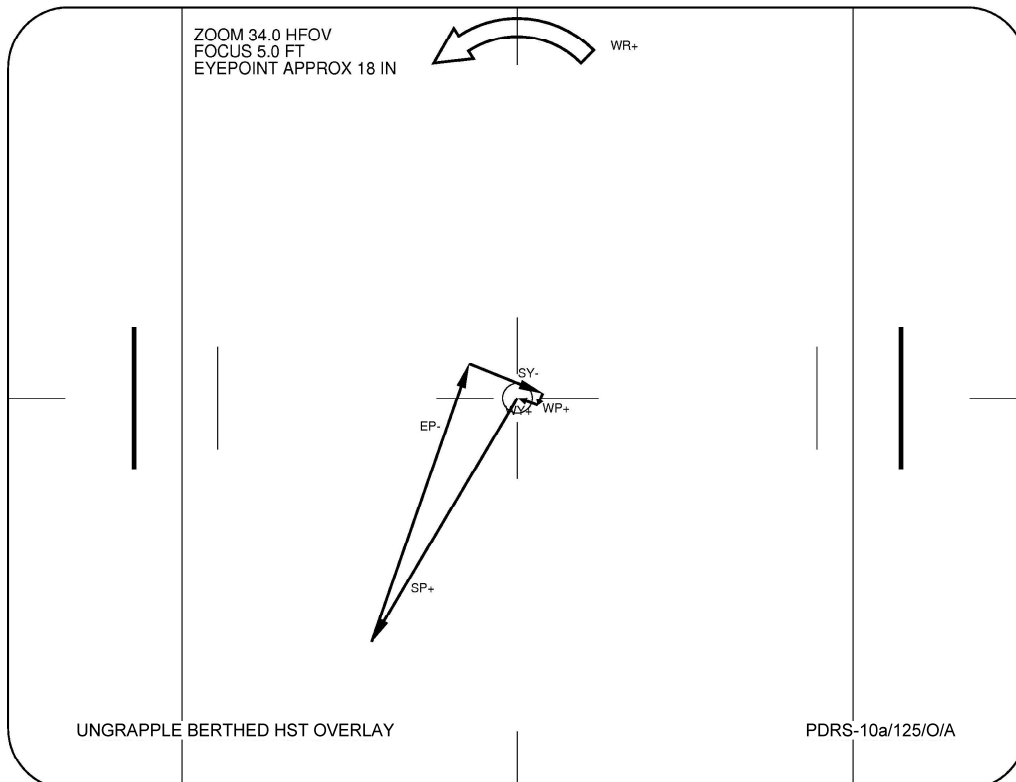
UNGRAPPLE BERTHED HST OVERLAY



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

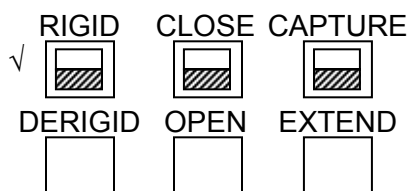
ΔSY	ΔSP	ΔEP	ΔWP	ΔWY	ΔWR
-5.3	+15.0	-18.2	+3.2	+5.3	+0.0



When clear of GF pin:

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

MODE – OFF



CRITICAL TIMES (28 sec total):

EXTEND tb – gray, 20 sec max

Continue maneuvering RMS until 5 ft (minimum) clear of HST

If SINGLE MODE available:

BRAKES – ON (tb-ON)

MODE – not DIRECT (It off)

JOINT – CRIT TEMP

Config DAP A,B to A10,B11 and reference FLIGHT PLAN for next mnvr and DAP config

Expected HST BERTHED UNGRAPPLE posn:

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

10. FSS CCTV POWEROFF

SM 211 SSE OVERVIEW

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

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

CCTV ENA OFF – ITEM 4 EXEC (*)

11. TRANSFER DATA

Transfer data to FSS Latched posn tables in following procedures:

HST GRAPPLE, step 3 (HST DEPLOY, GRAPPLE) and SJ HST GRAPPLE,
step 2 (HST DEPLOY, OFF-NOMINAL RMS OPS)

CONTINGENCY HST CAPTURE

NOTE

This procedure may be used if HST attitude off-nominal or if -V3 HGA deployed

1. SETUP

A3
A7U

MON 1(2) – install PDRS TARGET OVERLAY FOR CTVM
CCTV – config for Capture

Maintain eyepoint approx 18 in when using grapple overlay

Mon 1	EE (Elbow)
DwnInk	A
Mon 2	B (C)
DTV	D

SM 94 PDRS CONTROL

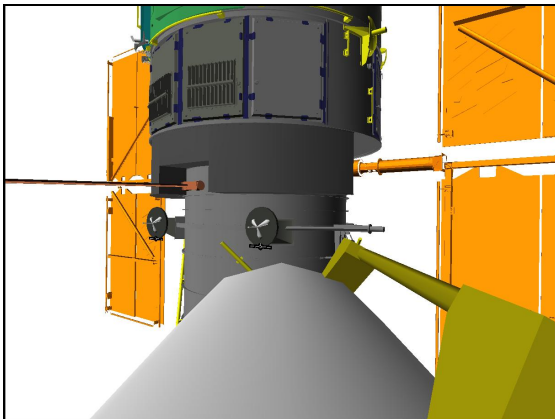
√ PL ID, ITEM 3: 0
√ INIT ID, ITEM 24: 0

Verify POISE FOR CAPTURE posn:

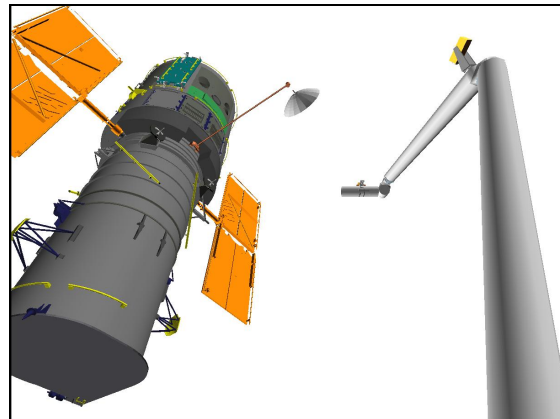
	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-890	-145	-850	0	270*	0	0
	SY	SP	EP	WP	WY	WR	
√	-12.7	+93.2	-54.8	-96.5	-66.9	-36.5	

*Display singularity

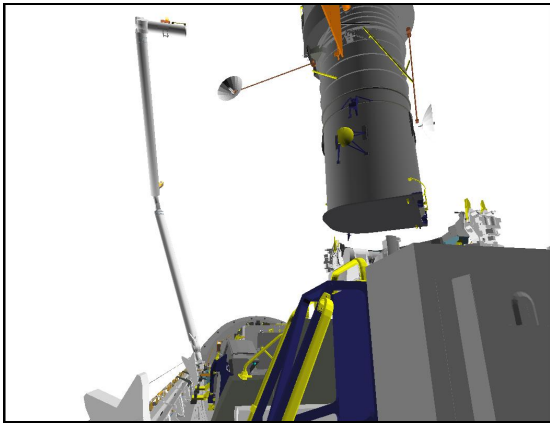
Review STS-125 END EFFECTOR CUE CARD



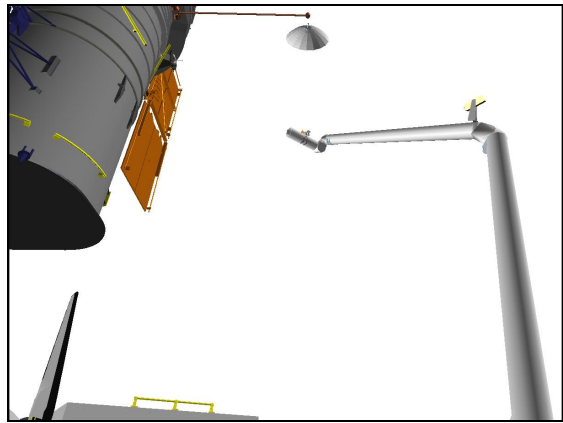
EE



CCTV A (0,50)



CCTV B (10,20)



CCTV D (35,35)

2. HST CAPTURE

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

Mnvr RMS until grapple fixture in view

A7U
 When grapple fixture in view and proximity ops stabilized,
 ZOOM – 34.0 HFOV
 FOCUS – 5.0 ft
 A6U
 DAP: FREE

CAUTION

Monitor EE tb timing to prevent EE motor burnout
 Monitor clearance between RMS and -V3 HGA if deployed

NOTE

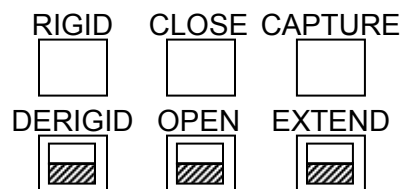
Step 3 needs to occur within 30 sec of HST Capture and/or Close indication and may be completed in conjunction with remainder of step 2.

WR value should be positive at grapple posn

EE MODE – AUTO

Mnvr to +V2 GF 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)
 MODE – not DIRECT (lt off)

SM 94 PDRS CONTROL

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

Change DAP A,B to A15,B12

A6U

DAP: No LO Z

3. HST TO DRIFT MODE

SM 210 HST SYS

√TLM COUNT – incr
√RCVR LOCK 2(1) – *

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

PCS MODE – ITEM 7 +9 2(91) EXEC (DRFT)

- * If PCS MODE not DRFT, repeat step 3 *
- * *
- * If PCS MODE still not DRFT, and other RCVR LOCK ‘*’, *
- * re-execute command using alternate command *
- * *
- * If still no joy, √MCC before proceeding *

√PCS SNPT DIS – YES

RHC

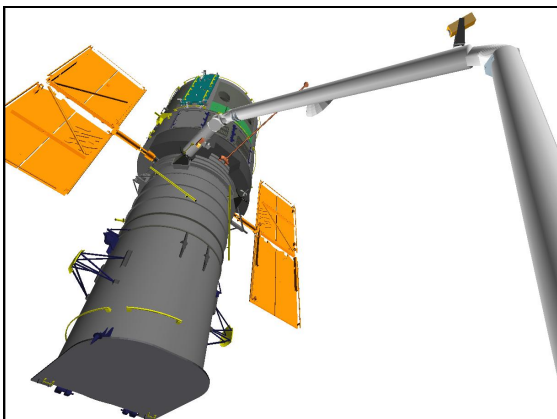
4. MNVR TO CONTINGENCY HST CAPTURE POSN

RATE – VERN (RATE MIN tb-ON)
BRAKES – OFF (tb-OFF)
MODE – as desired

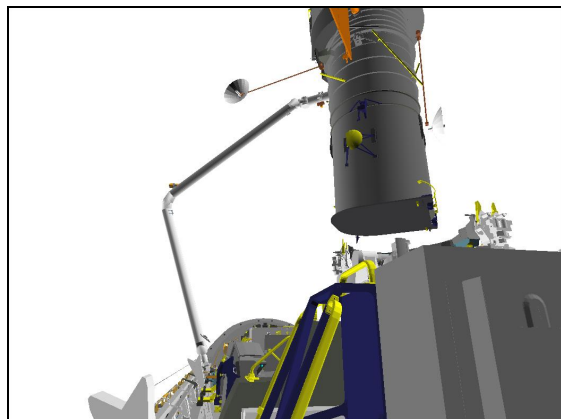
Mnvr to CONTINGENCY HST CAPTURE posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-878	+112	-853	0	305	180	3
SY	SP	EP	WP	WY	WR	
-71.7	+89.3	-71.6	-34.3	+17.6	+193.7	

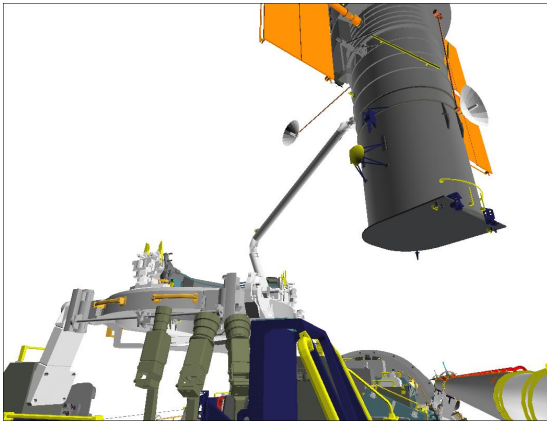
BRAKES – ON (tb-ON)
MODE – not DIRECT (lt off)



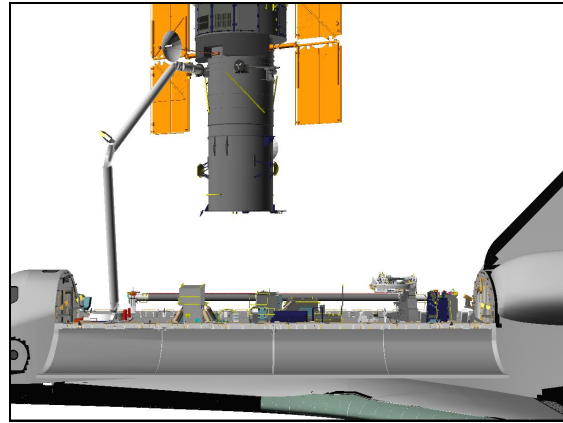
CCTV A (-10,50)



CCTV B (10,20)



CCTV C (-20,25)



PORT

5. MNVR HST PRE-BERTHING POSN

If -V3 HGA deployed, go to CONTINGENCY HST BERTH (-V3 HGA DEPLOYED)

BRAKES – OFF (tb-OFF)

MODE – SINGLE, ENTER

Mnvr to PRE-BERTHING posn:

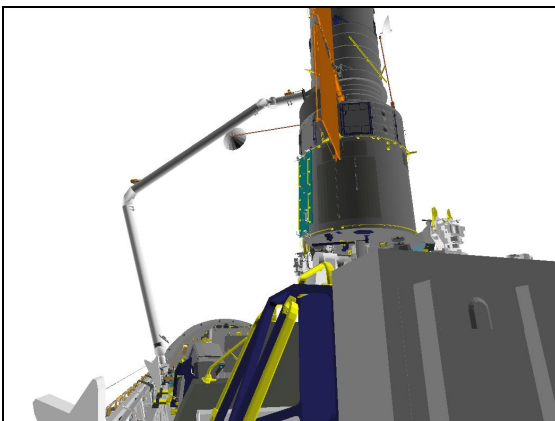
Cont HST Capture
1: WR –
Pre-Berthing

SY	SP	EP	WP	WY	WR	
-71.7	+89.3	-71.6	-34.3	+17.6	+193.7	
					+14.0	
-71.7	+89.3	-71.6	-34.3	+17.6	+14.0	
X	Y	Z	PITCH	YAW	ROLL	PL ID
-802	+165	-853	0	305	0	3

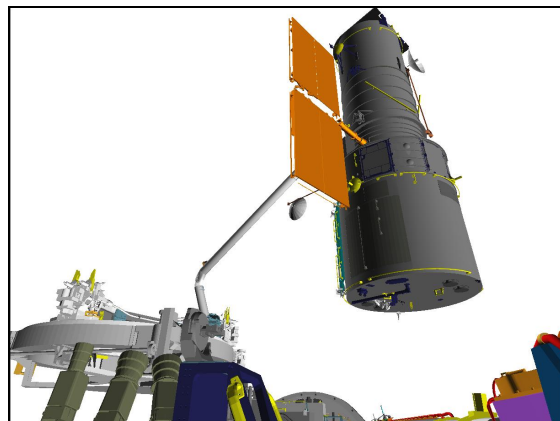
BRAKES – ON (tb-ON)

MODE – not DIRECT (lt off)

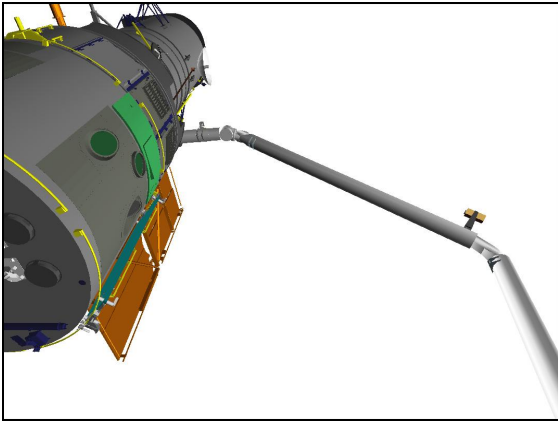
Go to HST BERTH (NOMINAL HST RETRIEVAL)



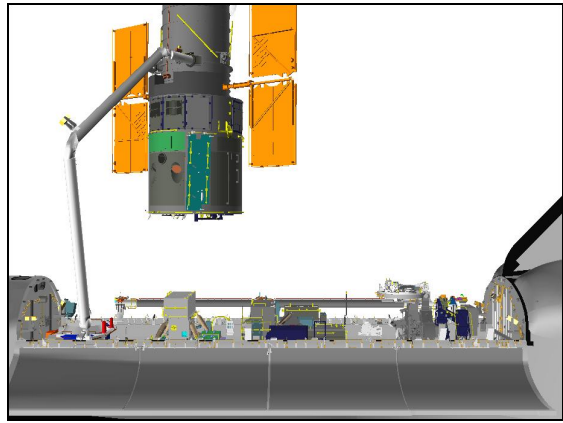
CCTV B (15,20)



CCTV C (-10,30)



CCTV D (30,55)



PORT

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CONTINGENCY HST BERTH (-V3 HGA DEPLOYED)

NOTE

This procedure may be used if HST -V3 HGA is deployed

1. SETUP

A7U

CCTV – config for Berth

Mon 1	D
DwnInk	EE (Elbow)
Mon 2	C
DTV	A

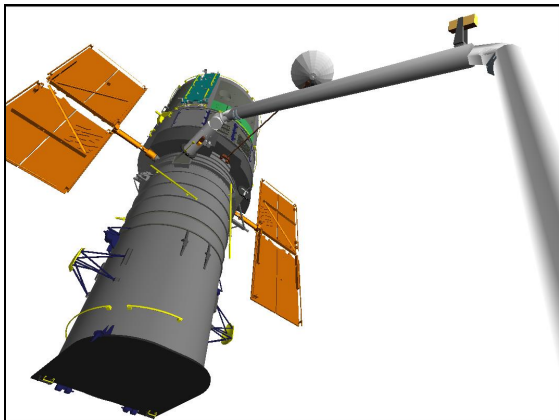
SM 94 PDRS CONTROL

√ PL ID, ITEM 3: 3

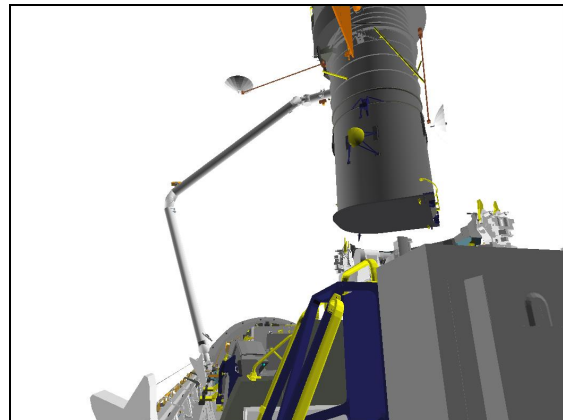
√ INIT ID, ITEM 24: 3

Verify CONTINGENCY CAPTURE posn:

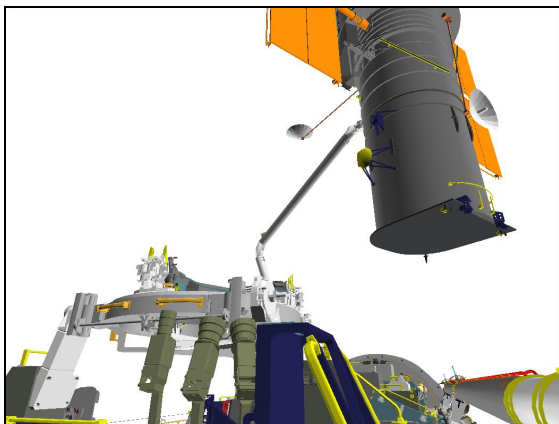
	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-878	+112	-854	0	305	180	3
	SY	SP	EP	WP	WY	WR	
√	-71.7	+89.3	-71.6	-34.3	+17.6	+193.7	



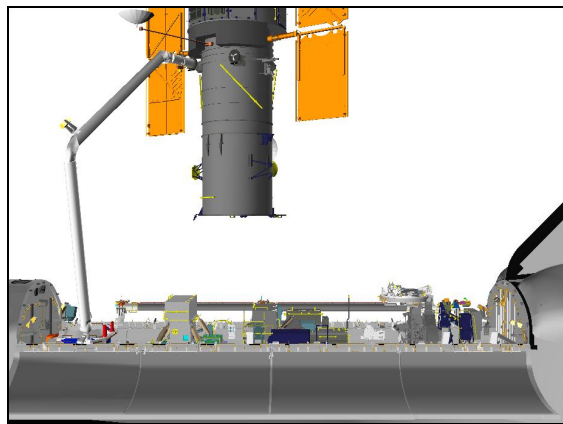
CCTV A (-10,50)



CCTV B (10,20)



CCTV C (-20,25)



PORT

2. MNVR TO INTERMEDIATE 1 POSN

NOTE

OCAS valid from CONTINGENCY CAPTURE
posn to INTERMEDIATE 1 posn

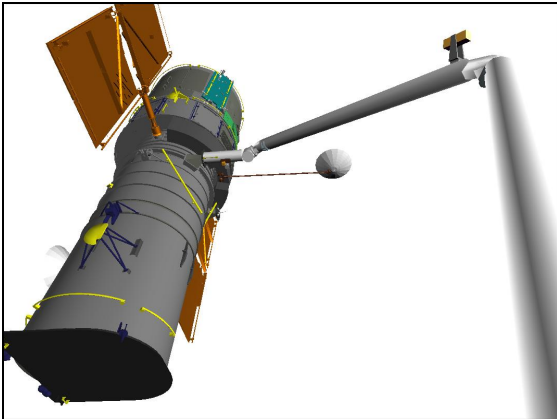
RHC RATE – as reqd (VERN within 10 ft)
BRAKES – OFF (tb-OFF)
MODE – ORB LD, ENTER

Mnvr to INTERMEDIATE 1 posn:

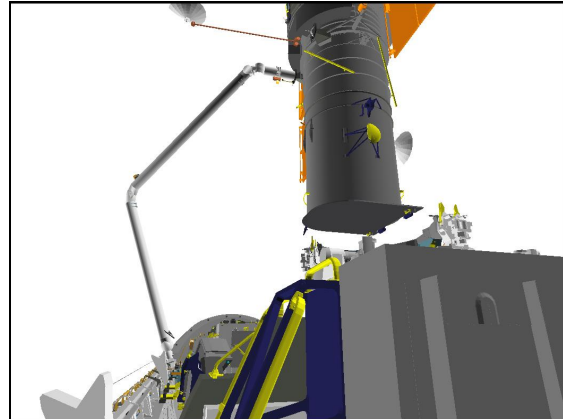
X	Y	Z	PITCH	YAW	ROLL	PL ID
-878	+112	-853	0	270*	180	3
SY	SP	EP	WP	WY	WR	
-56.4	+90.8	-69.2	-44.6	-31.5	+187.5	

*Display singularity

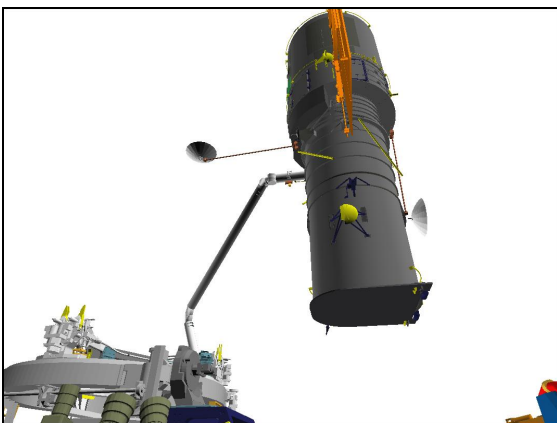
If reqd:
BRAKES – ON (tb-ON)



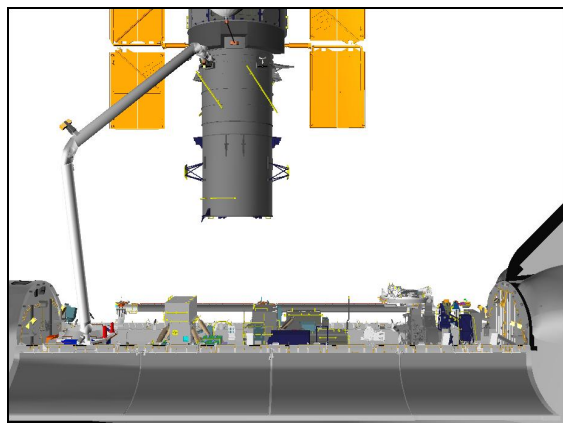
CCTV A (-5,50)



CCTV B (15,20)



CCTV C (-10,35)



PORT

3. MNVR TO INTERMEDIATE 2 POSN

NOTE

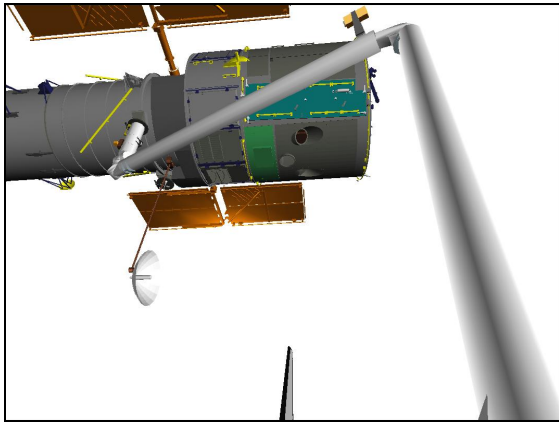
OCAS valid from INTERMEDIATE 1 posn to INTERMEDIATE 2 posn

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

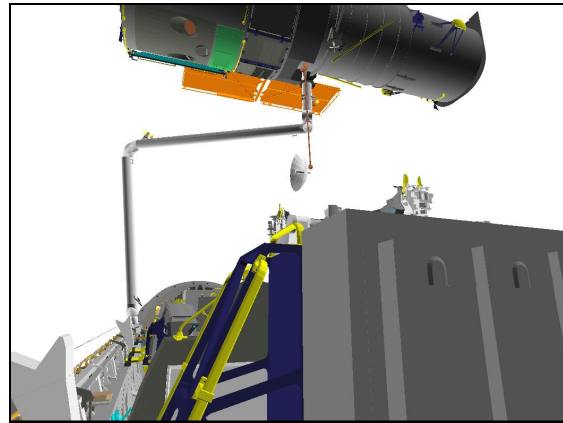
Mnvr to INTERMEDIATE 2 posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-878	+112	-853	90	0	270	3
SY	SP	EP	WP	WY	WR	
-63.3	+76.8	-91.2	+86.8	-8.6	+225.4	

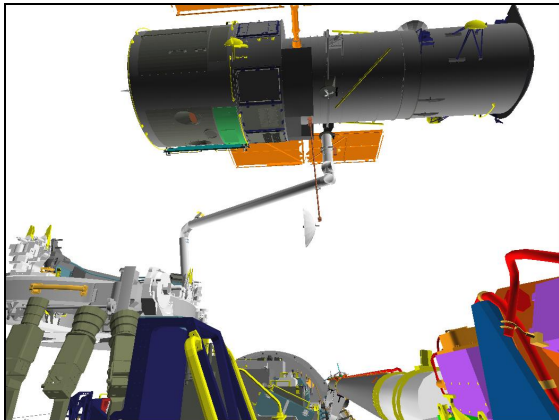
If reqd:
 BRAKES – ON (tb-ON)



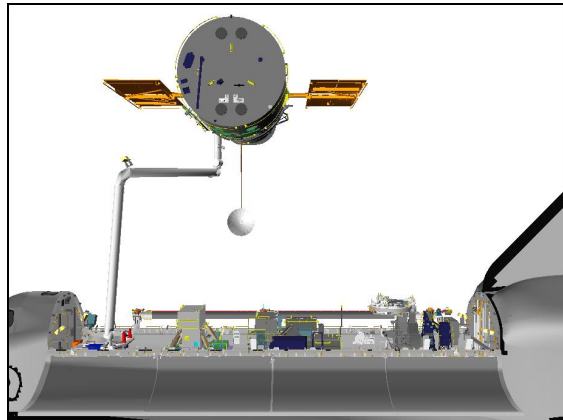
CCTV A (-5,40)



CCTV B (20,15)



CCTV C (-5,25)



PORT

4. MNVR TO INTERMEDIATE 3 POSN

NOTE

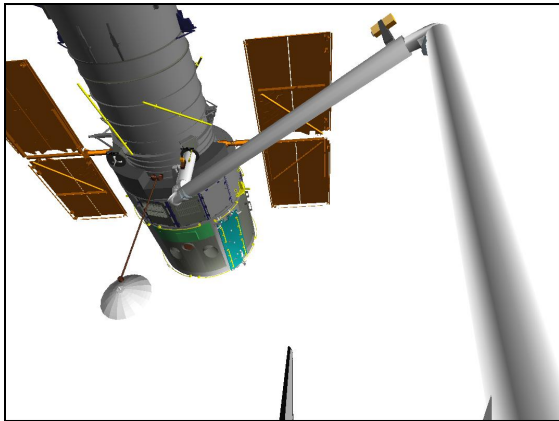
OCAS valid from INTERMEDIATE 2 posn to INTERMEDIATE 3 posn

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

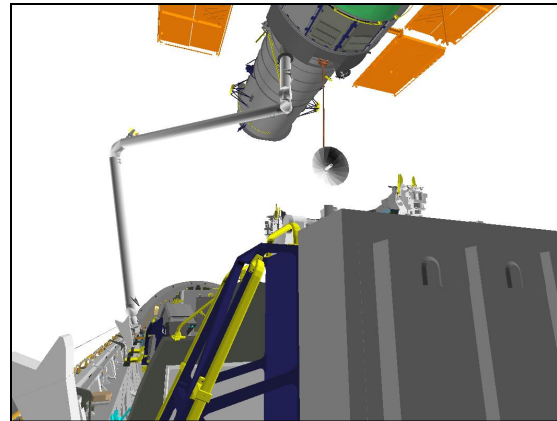
Mnvr to INTERMEDIATE 3 posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-878	+112	-853	90	0	0	3
SY	SP	EP	WP	WY	WR	
-52.6	+80.2	-92.1	+86.2	-11.7	+325.8	

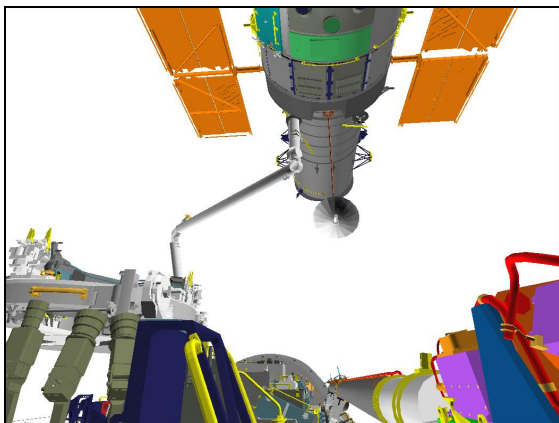
If reqd:
 BRAKES – ON (tb-ON)



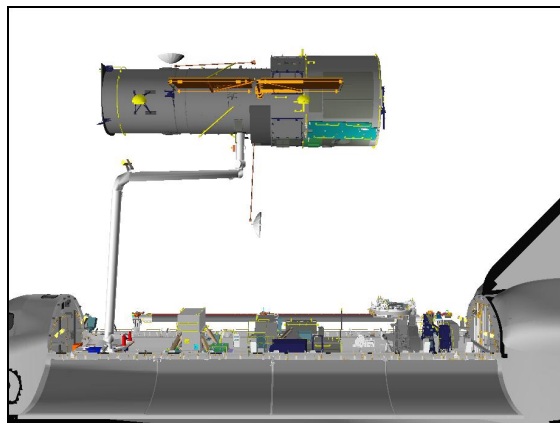
CCTV A (-5,40)



CCTV B (20,15)



CCTV C (-5,25)



PORT

5. MNVR TO INTERMEDIATE 4 POSN

NOTE

OCAS valid from INTERMEDIATE 3 posn to INTERMEDIATE 4 posn

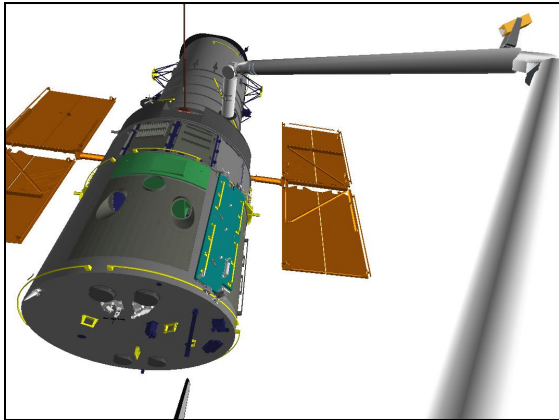
RHC RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 MODE – ORB LD, ENTER

Mnvr to INTERMEDIATE 4 posn:

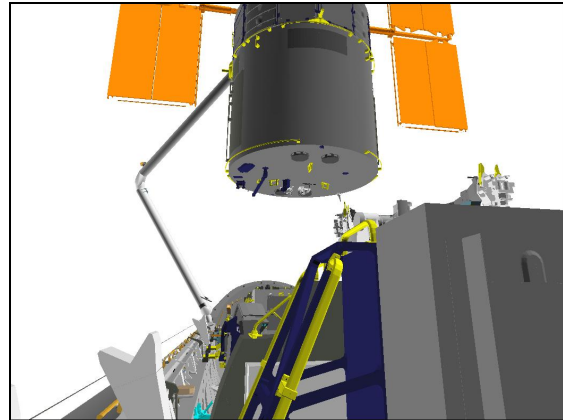
X	Y	Z	PITCH	YAW	ROLL	PL ID
-900	0	-853	0	0	0	3
SY	SP	EP	WP	WY	WR	
-63.0	+103.2	-79.2	-24.0	+63.0	+360.5	

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

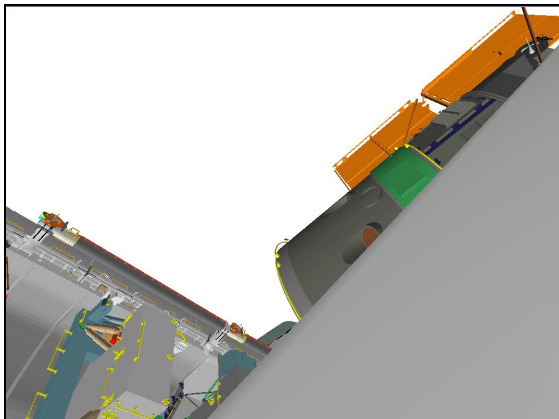
Perform HST BERTH (NOMINAL HST RETRIEVAL)



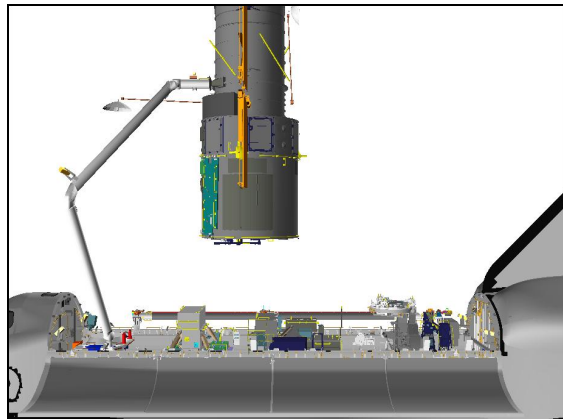
CCTV A (10,45)



CCTV B (10,15)



ELBOW (-40,-40)



PORT

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EXTENDED PARK

HST EXTENDED PARK FS 5-2
RMS EXTENDED PARK..... FS 5-5

EXTENDED PARK

HST EXTENDED PARK

1. SETUP

A6U √DAP: FREE

GNC 20 DAP CONFIG
 CNTL ACCEL – ITEM 28 +4 EXEC
 – ITEM 48 +4 EXEC

A7U CCTV – config as reqd

Mon 1	A
DwnInk	B (C)
Mon 2	ELBOW
DTV	D

SM 94 PDRS CONTROL

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

2. MNVR TO HST EXTENDED PARK POSN

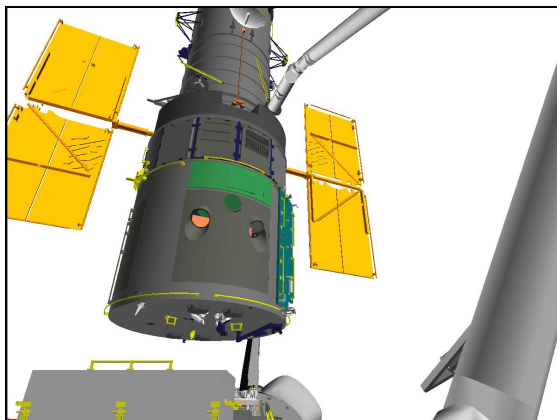
RHC RATE – VERN (RATE MIN tb-ON)
 BRAKES – OFF (tb-OFF)
 MODE – as desired

Mnvr to HST EXTENDED PARK posn:

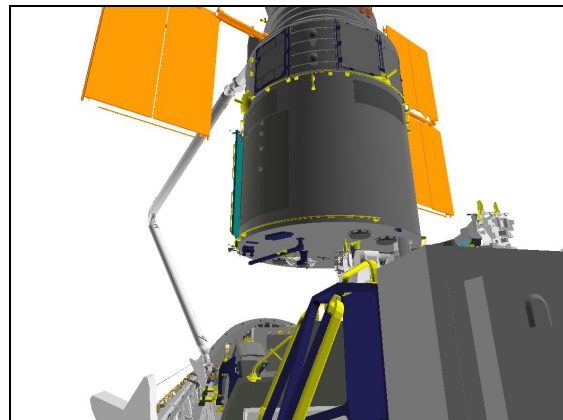
X	Y	Z	PITCH	YAW	ROLL	PL ID
-961	+10	-792	0	336	0	3
SY	SP	EP	WP	WY	WR	
-36.6	+102.8	-88.4	-22.4	+13.7	+4.0	

BRAKES – ON (tb-ON)
 MODE – not DIRECT (lt off)
 PARAM – PORT TEMP
 JOINT – CRIT TEMP

A6U DAP: A/AUTO/VERN(ALT)

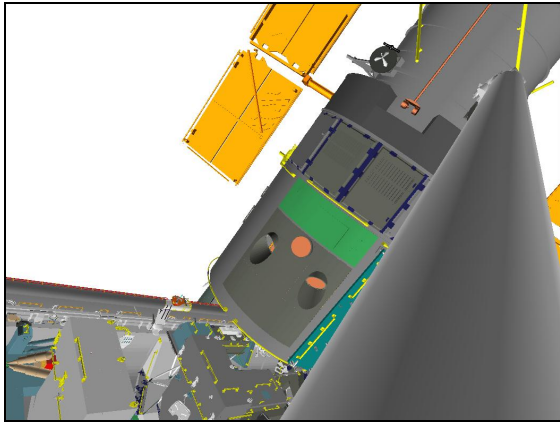


CCTV A (0,30)

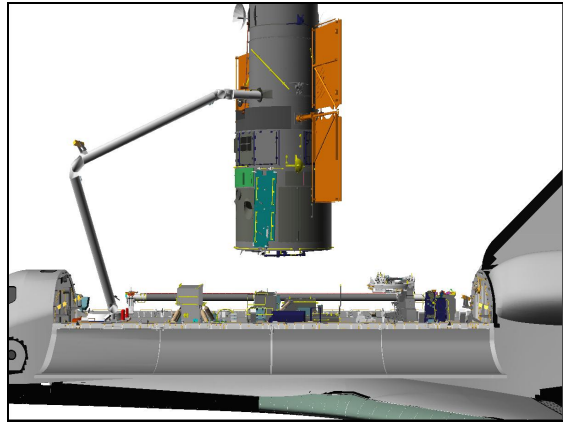


CCTV B (10,20)

EXTENDED PARK



ELBOW (-30,-25)



PORT

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RMS EXTENDED PARK

- A7U 1. SETUP
CCTV – config as reqd

Mon 1	A
Dwnlnk	ELBOW
Mon 2	B
DTV	D

SM 94 PDRS CONTROL

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

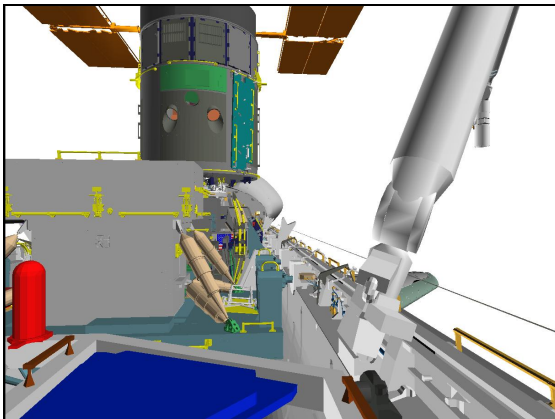
- RHC 2. MNVr TO RMS EXTENDED PARK POSN
RATE – VERN (RATE MIN tb-ON)
BRAKES – OFF (tb-OFF)
MODE – ORB UNL, ENTER

Mnvr to RMS EXTENDED PARK posn:

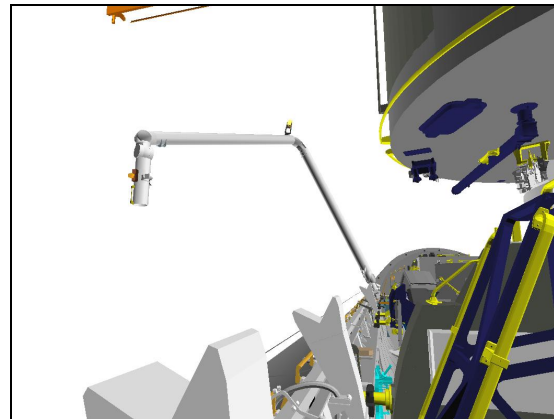
X	Y	Z	PITCH	YAW	ROLL	PL ID
-975	-325	-520	270	0	0	0
-915	-326	-498	270	0	180	3
SY	SP	EP	WP	WY	WR	
+28.6	+78.2	-85.8	-72.8	+17.0	-10.5	

- BRAKES – ON (tb-ON)
√MODE – not DIRECT (lt off)
PARAM – PORT TEMP
JOINT – CRIT TEMP

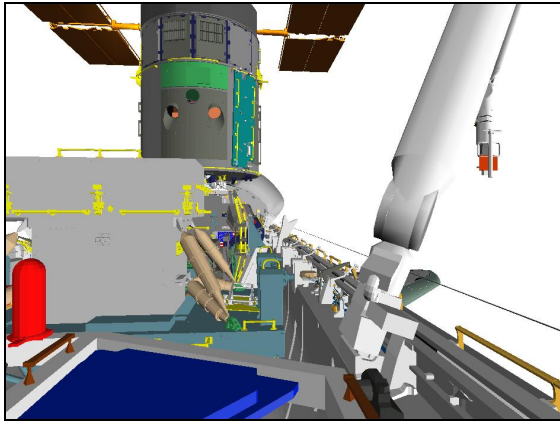
- √PORT RMS HTR (two) – AUTO



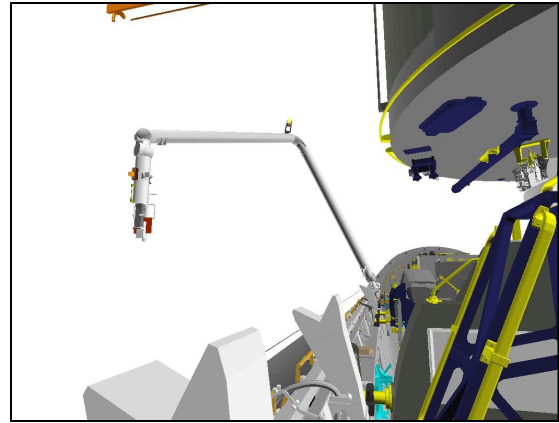
CCTV A (5,0)



CCTV B (-15,10)



CCTV A (5,0)



CCTV B (-15,10)

EVA OPS

-----EVA OPS-----

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EVA SETUP

MFR SETUP FS 6-2
DAILY SETUP..... FS 6-7

MFR SETUP

1. SETUP

SM 94 PDRS CONTROL

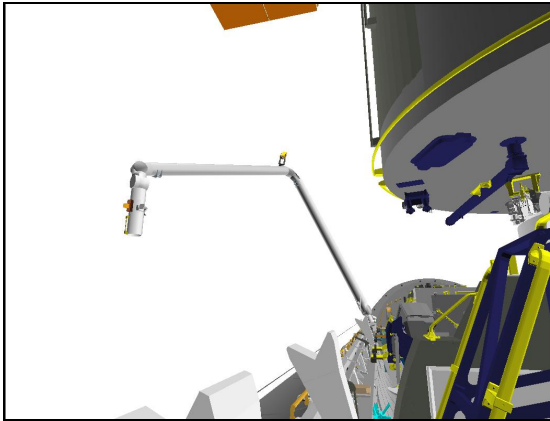
√PL ID, ITEM 3: 0

√INIT ID, ITEM 24: 0

HST CONFIG: FSS Rotation: 180°, -V3 fwd, FSS Pivot: 85°, SA Slew: 0°

Verify EXTENDED PARK posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-975	-325	-520	270	0	0	0
	SY	SP	EP	WP	WY	WR	
√	+28.6	+78.2	-85.8	-72.8	+17.0	-10.5	



CCTV B (-15,15)



CCTV D (40,15)

2. MFR PRE-GRAPPLE

RHC

RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB UNL, ENTER

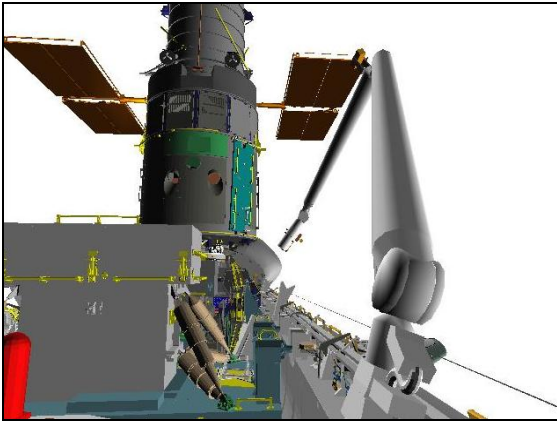
Mnvr to MFR PRE-GRAPPLE posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1125	-120	-485	270	325	90	0
	SY	SP	EP	WP	WY	WR	
	+1.7	+47.0	-61.9	-75.6	-15.5	+107.8	

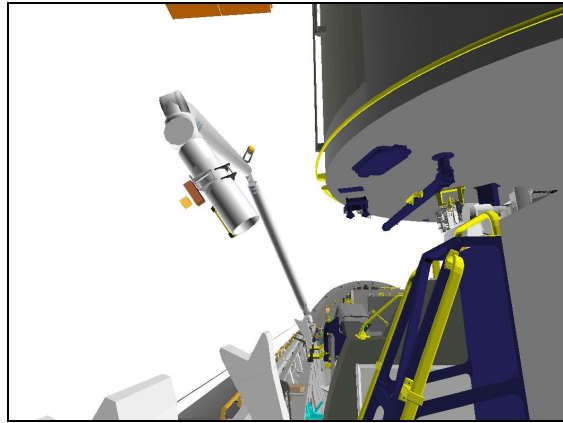
If reqd:

BRAKES – ON (tb-ON)

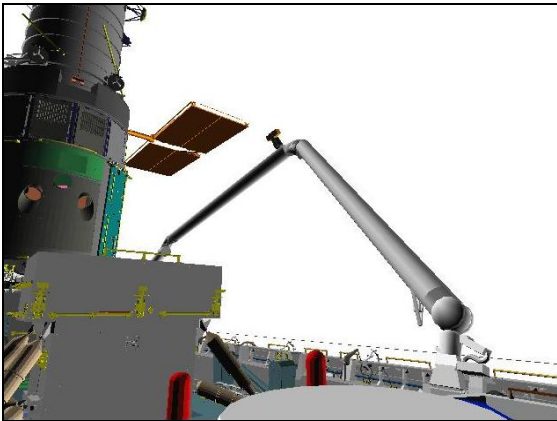
√MODE – not DIRECT



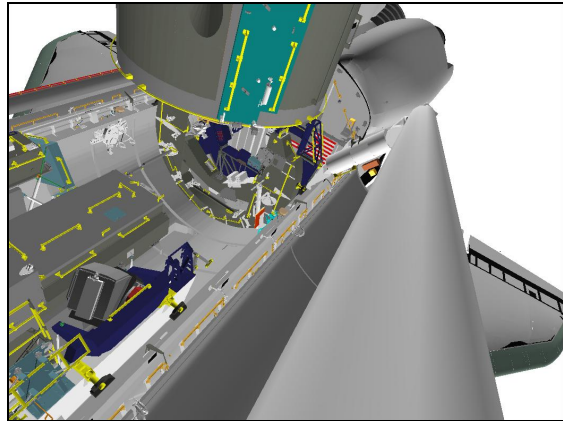
CCTV A (5,10)



CCTV B (-5,15)



CCTV D (40,15)



ELBOW (-20,-20)

A6U

3. MFR GRAPPLE
DAP: VERN(FREE)

√BRAKES – OFF (tb-OFF)

EV GCA to MFR capture envelope
On EV GO for MFR capture:

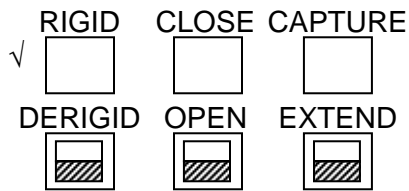
CAUTION
Monitor EE tb timing to prevent EE motor burnout

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

√	RIGID <input checked="" type="checkbox"/>	CLOSE <input type="checkbox"/>	CAPTURE <input type="checkbox"/>
	DERIGID <input type="checkbox"/>	OPEN <input checked="" type="checkbox"/>	EXTEND <input type="checkbox"/>

CRITICAL TIMES:
CAPTURE tb – gray, then
CLOSE tb – gray, 3 sec max, then

On EV GO for rigidization:
EE MAN CONTR RIGID (hold until RIGID tb-gray)



CRITICAL TIMES:
RIGID tb – gray, 25 sec max

EE MODE – OFF

A6U DAP: AUTO/VERN(ALT)

EV retrieve lg/sm RET from APC

4. MNVR TO AIRLOCK SETUP

On EV GO:

RHC RATE – as reqd (VERN within 10 ft)
MODE – ORB UNL, ENTER

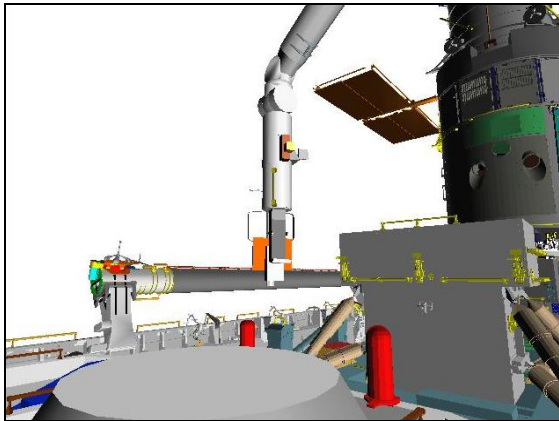
Mnvr to ATTACH EV2 TETHER posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-730	+50	-480	270	0	120	0
SY	SP	EP	WP	WY	WR	
-74.3	+91.4	-138.9	-61.3	+5.2	+214.6	

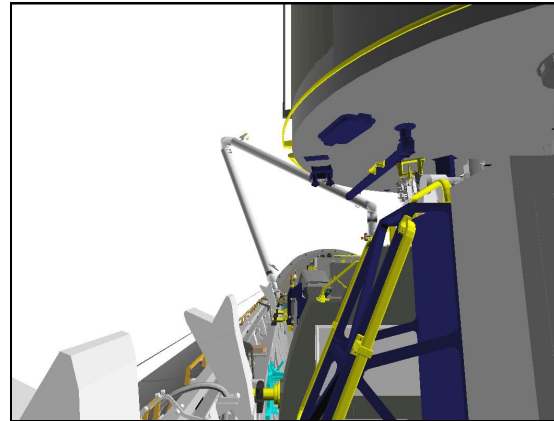
EV GCA to install MFR Tool Handle

NOTE

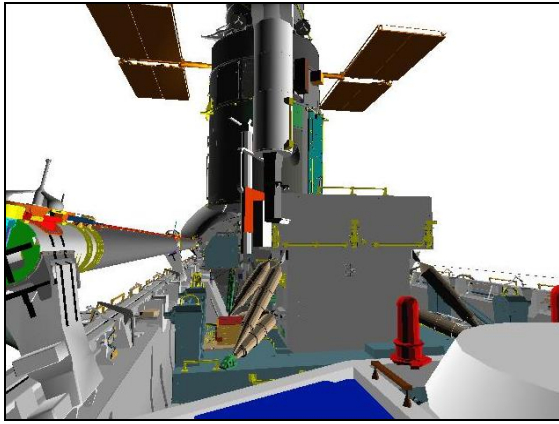
Coarse rates ok for Roll mnvr to MFR Tool Hdl posn



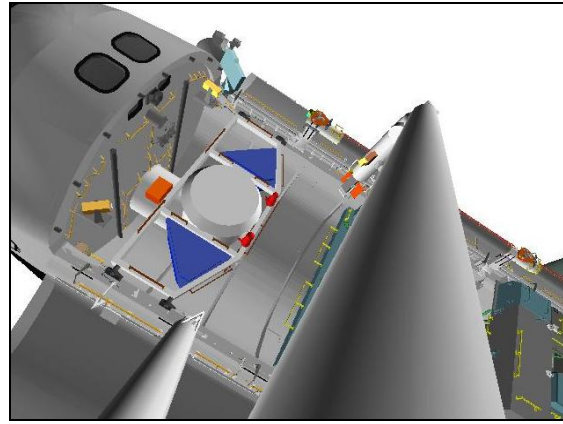
CCTV A (-40,10)



CCTV B (0,10)



CCTV D (10,5)



ELBOW (-20,-20)

5. MNVR TO EV INGRESS

Prior to RMS EV ingressing MFR:

SM 94 PDRS CONTROL

PL ID – ITEM 3 +3 EXEC

INIT ID – ITEM 24 +3 EXEC

RHC

On EV GO:

RATE – as reqd (VERN within 10 ft)

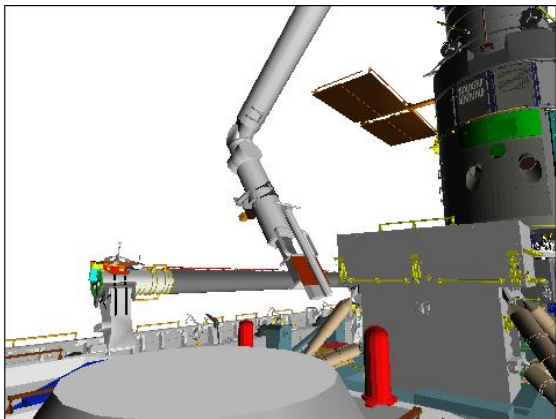
MODE – ORB UNL, ENTER

Mnvr to EV INGRESS posn:

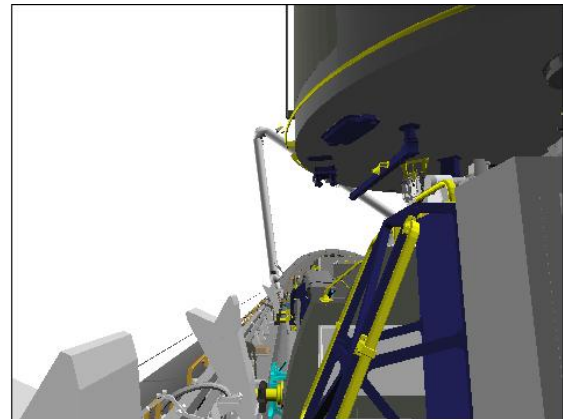
X	Y	Z	PITCH	YAW	ROLL	PL ID
-735	+50	-465	270	30	271	0
-735	-13	-477	270	30	90	3
SY	SP	EP	WP	WY	WR	
-74.4	+77.4	-133.8	-82.0	+11.8	+9.7	

EV GCA to Ingress

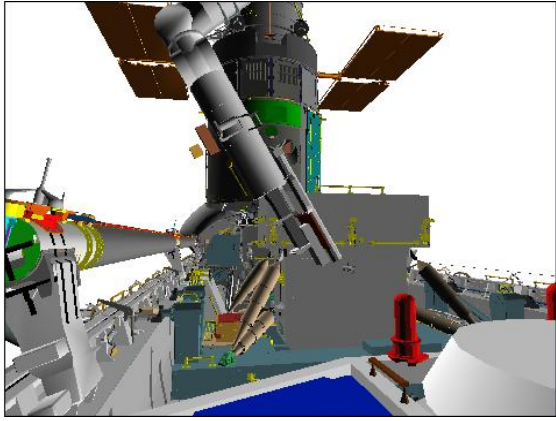
BRAKES – ON (tb-ON)



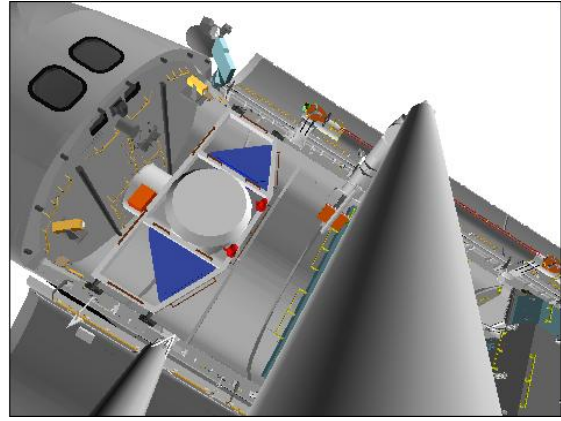
CCTV A (-40,10)



CCTV B (0,10)



CCTV D (10,5)



ELBOW (-20,-20)

DAILY SETUP

1. SETUP

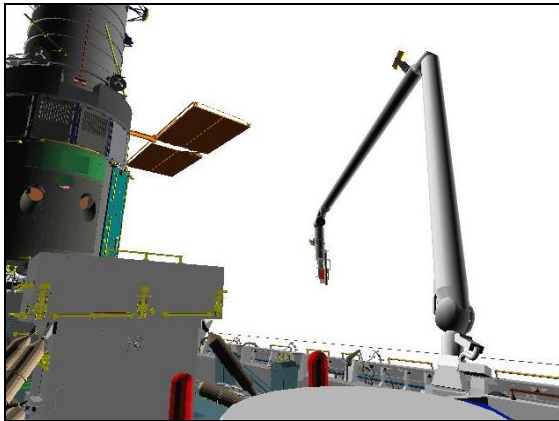
SM 94 PDRS CONTROL

√PL ID, ITEM 3: 0

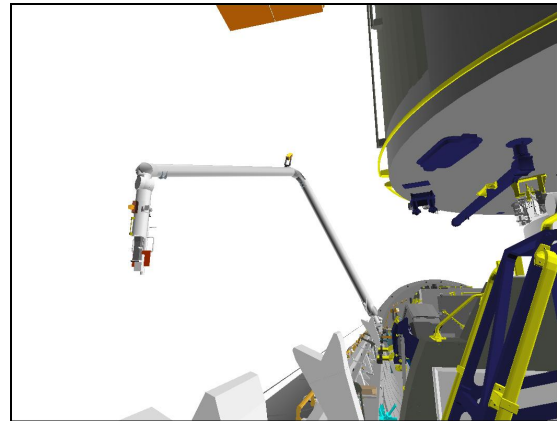
√INIT ID, ITEM 24: 0

Verify EXTENDED PARK posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-975	-325	-520	270	0	0	0
√	-915	-326	-498	270	0	180	3
	SY	SP	EP	WP	WY	WR	
√	+28.6	+78.2	-85.8	-72.8	+17.0	-10.5	



CCTV D (40,15)



CCTV B (-15,15)

2. EV INGRESS

RHC

RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB UNL, ENTER

Mnvr to AIRLOCK MFR INGRESS posn:

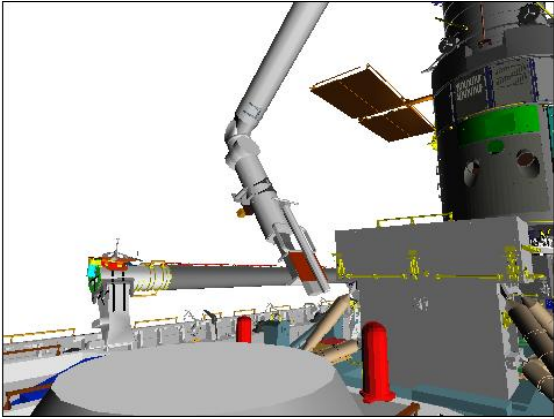
X	Y	Z	PITCH	YAW	ROLL	PL ID
-735	+50	-465	270	30	271	0
-735	-13	-477	270	30	90	3
SY	SP	EP	WP	WY	WR	
-74.4	+77.4	-133.8	-82.0	+11.8	+9.7	

EV GCA to install MFR Tool Handle and Ingress

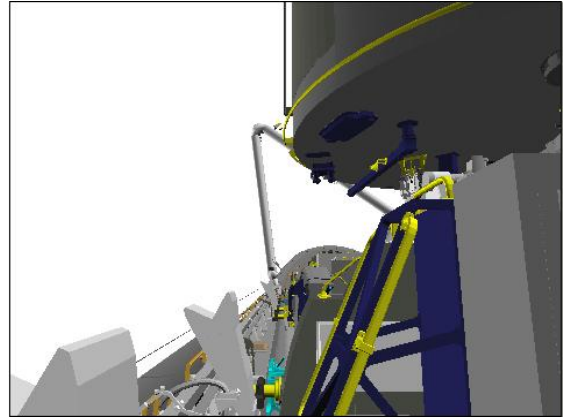
If reqd:

BRAKES – ON (tb-ON)

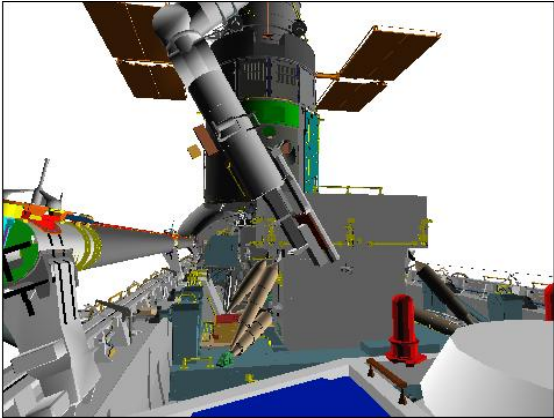
√MODE – not DIRECT



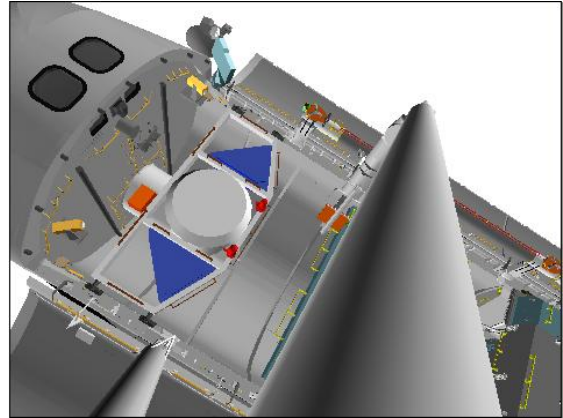
CCTV A (-40,10)



CCTV B (0,10)



CCTV D (10,5)



ELBOW (-20,-20)

EVA 1 – WFC 3, SI C&DH, LOCK INSTALL (-V3 FWD)

I

WFC R&R	FS 7-2
SI C&DH R&R.....	FS 7-13
LOCK INSTALL.....	FS 7-17

EVA 1

WFC R&R

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 180°, -V3 fwd, FSS Pivot: 90°, SA Slew: 0°

2. FORWARD FIXTURE

RHC

RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB LD, ENTER

Mnvr to FORWARD FIXTURE posn:

S: 135L B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-918	-94	-491	277	0	30	3
SY	SP	EP	WP	WY	WR	
-24.4	+102.6	-132.3	-61.9	+20.6	-106.5	

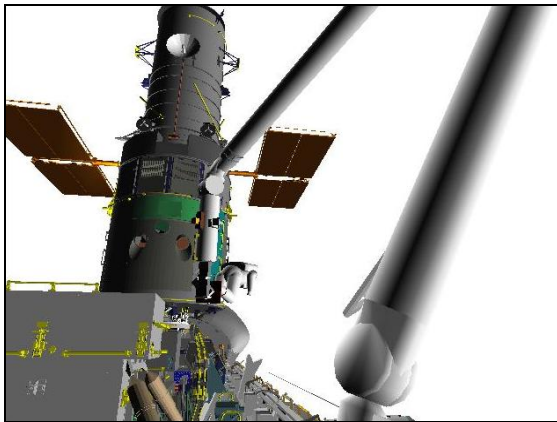
EV GCA to forward fixture and retrieve FGS Handhold:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
Actual							3

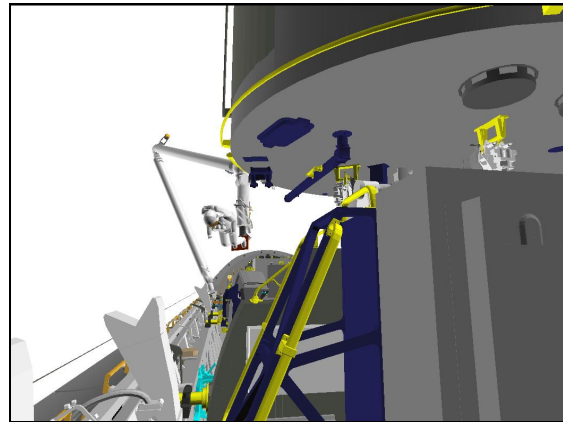
If reqd:

BRAKES – ON (tb-ON)

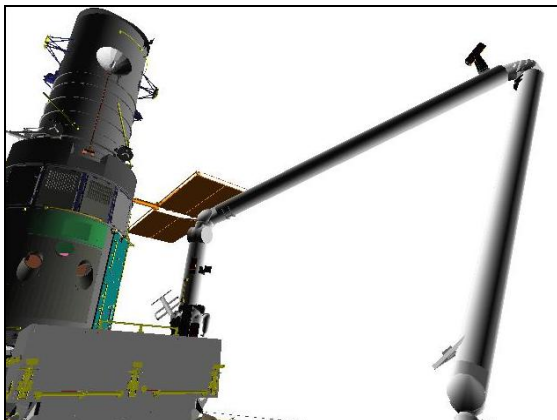
√MODE – not DIRECT



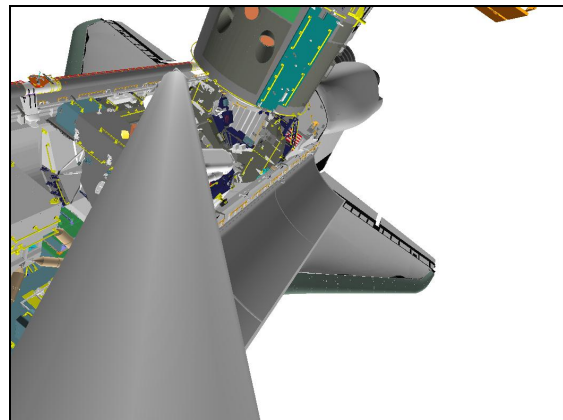
CCTV A (10,20)



CCTV B (10,10)



CCTV D (40,25)



ELBOW (15,-25)

EVA 1

- RHC
3. WFPC 2 REMOVAL
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

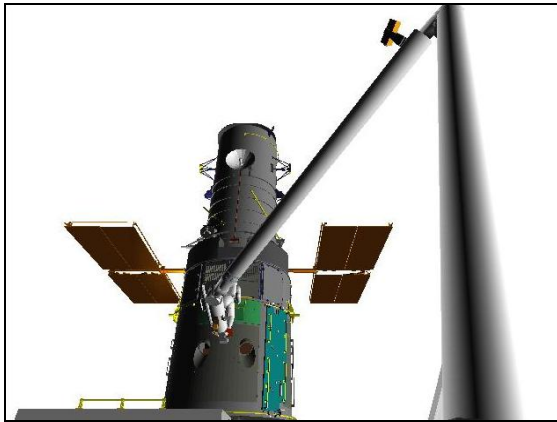
Mnvr to WFPC 2 REMOVAL SETUP posn: S: 135L B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1030	-5	-628	345	0	0	3
SY	SP	EP	WP	WY	WR	
-29.3	+82.1	-113.6	+14.5	+33.2	-170.6	

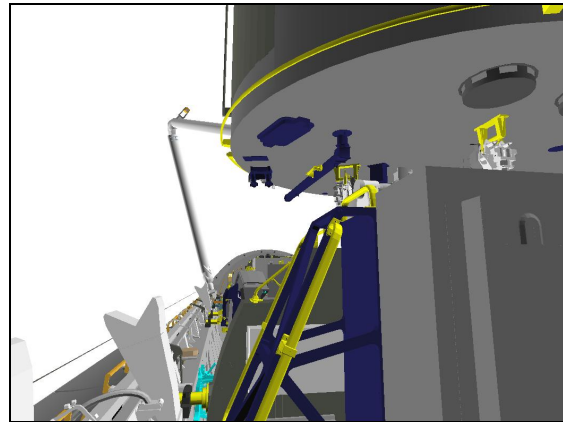
EV GCA to attach FGS Handhold and remove WFPC 2:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
WFPC 2 Release	-1030	-5	-643	345	0	0	3
Mirror Clear	-965						
Actual							

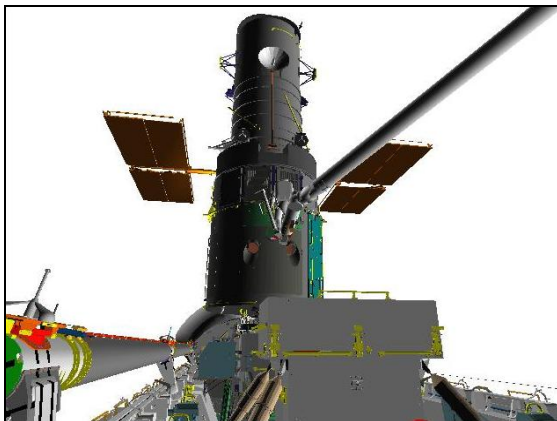
- If reqd:
 BRAKES – ON (tb-ON)
 √MODE – not DIRECT



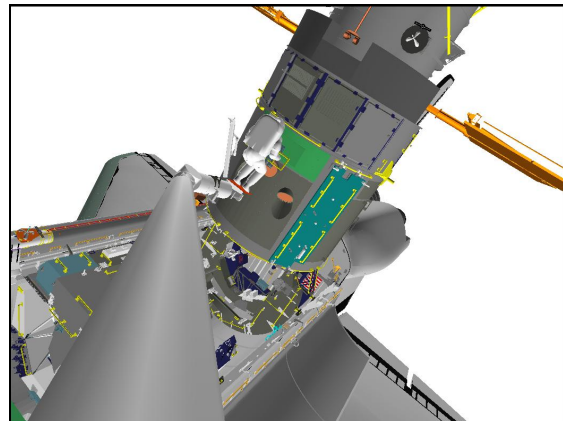
CCTV A (0,35)



CCTV B (10,10)



CCTV D (10,20)



ELBOW (15,-10)

- RHC 4. WFPC 2 TEMP STOW
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to WFPC 2 TEMP STOW SETUP posn: S: 135L B: 0

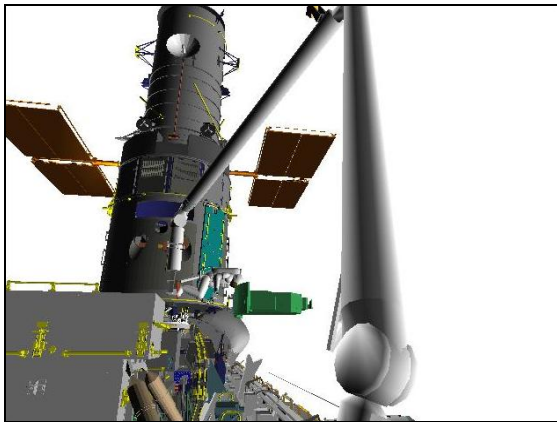
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1012	-85	-505	270	0	90	3
SY	SP	EP	WP	WY	WR	
-20.5	+67.5	-91.9	-72.6	+18.2	-48.4	

EV GCA to stow WFPC 2 on Aft Fixture:

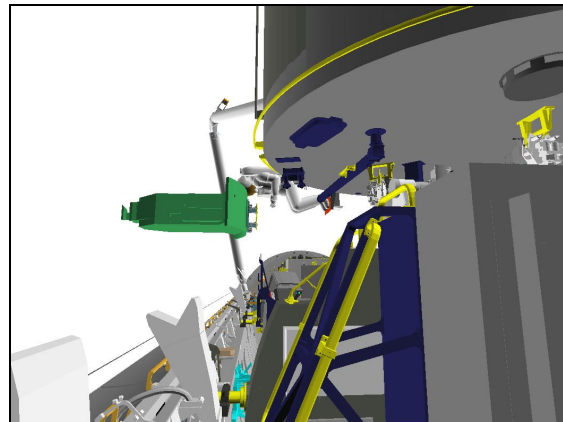
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
WFPC 2 Temp Stow	-1012	-85	-487	270	0	90	3
Actual							

If reqd:

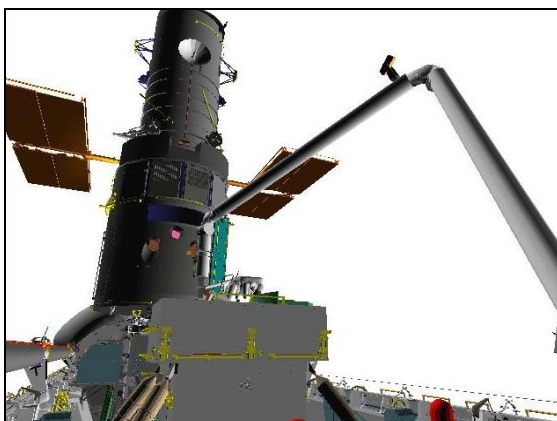
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT



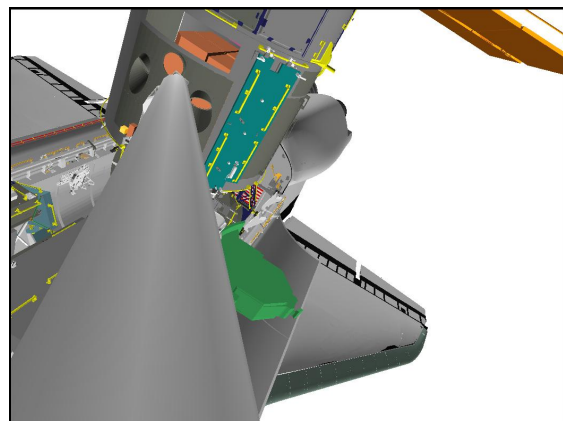
CCTV A (10,20)



CCTV B (5,10)



CCTV D (25,20)



ELBOW (15,-25)

RHC 5. WFC HANDHOLD RETRIEVE AT FORWARD FIXTURE

RATE – as reqd (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to WFC HANDHOLD RETRIEVE posn:

S: 135L B: 0

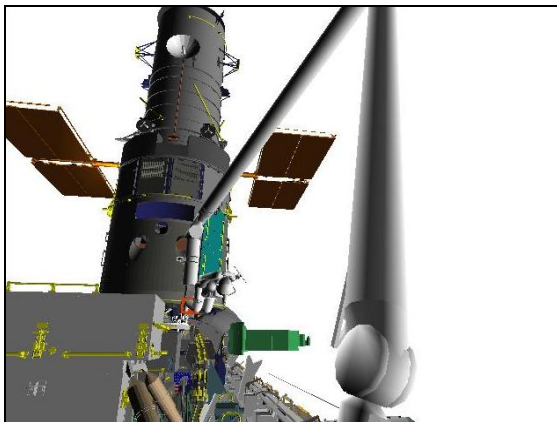
X	Y	Z	PITCH	YAW	ROLL	PL ID
-938	-75	-487	270	0	150	3
SY	SP	EP	WP	WY	WR	
-17.8	+72.6	-101.1	-67.6	+18.5	+8.8	

EV GCA to retrieve WFC Handhold

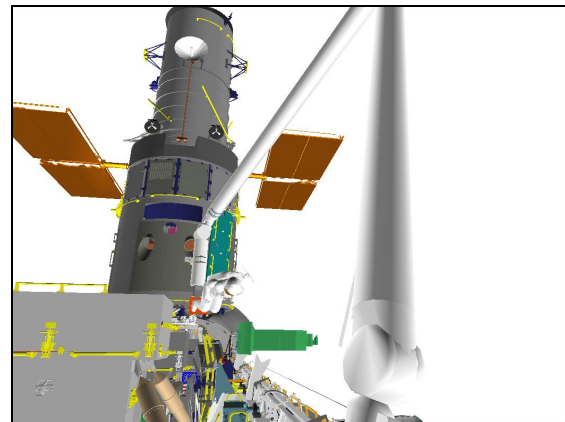
If reqd:

BRAKES – ON (tb-ON)

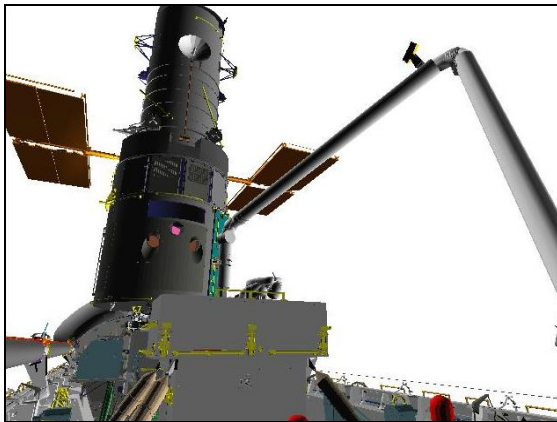
√MODE – not DIRECT



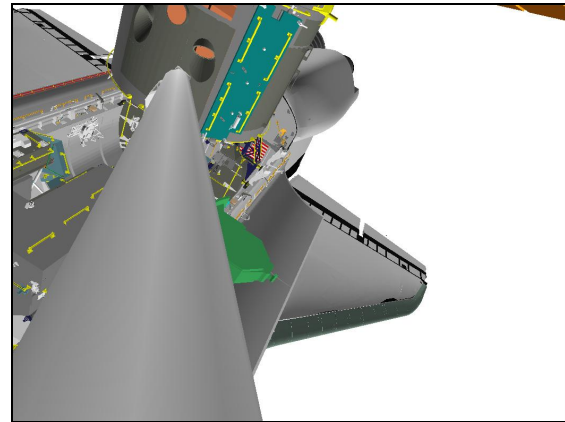
CCTV A (10,20)



CCTV B (5,10)



CCTV D (25,20)



ELBOW (15,-25)

- RHC 6. WFC 3 RETRIEVAL AT WSIPE
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to WFC 3 RETRIEVAL posn:

S: 135L B: 0

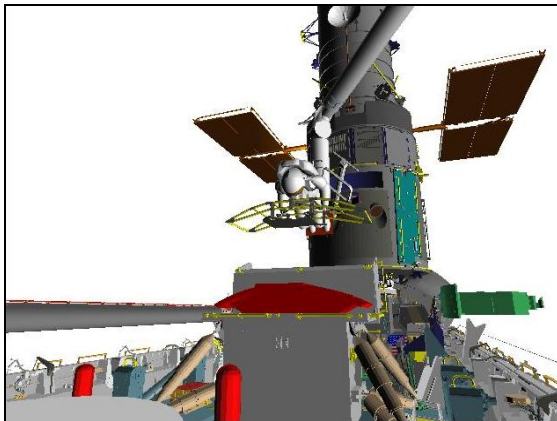
X	Y	Z	PITCH	YAW	ROLL	PL ID
-802	-4	-510	270	0	180	3
SY	SP	EP	WP	WY	WR	
-38.6	+92.9	-122.8	-72.5	+15.1	+60.3	

EV GCA to install WFC Handhold and remove WFC 3:

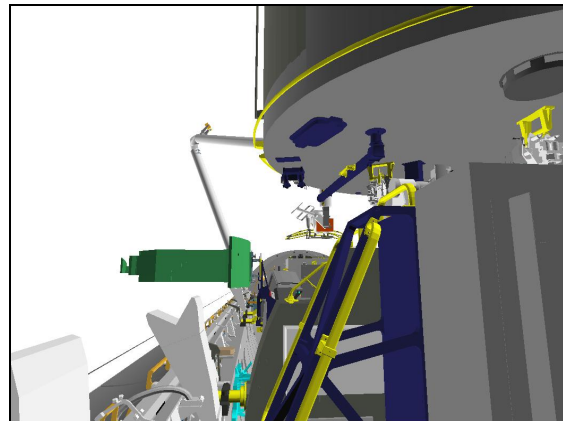
Expected: Clear of lid opening	X	Y	Z	PITCH	YAW	ROLL
			-560			

If reqd:

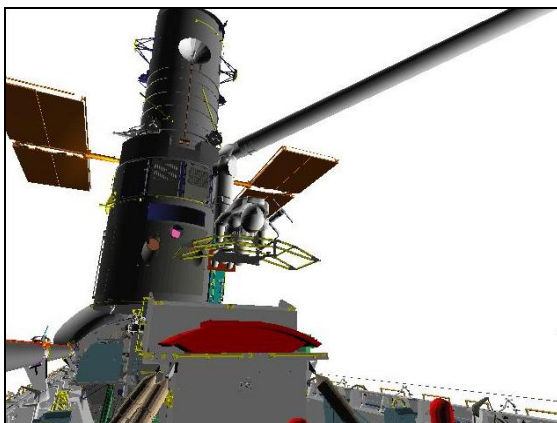
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT



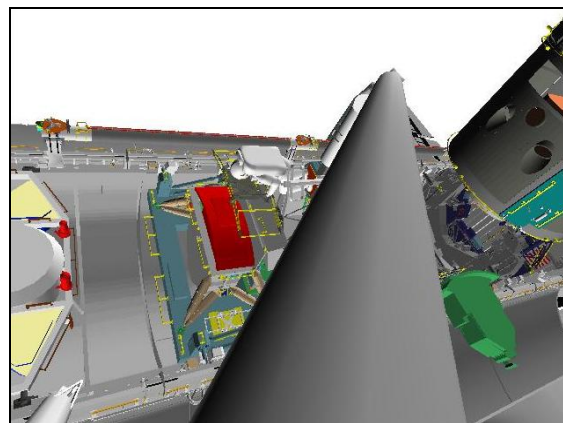
CCTV A (-20,15)



CCTV B (5,10)



CCTV D (25,20)



ELBOW (-15,-25)

7. WFC 3 INSTALL

RHC

RATE – as reqd (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to WFC 3 PRE-INSTALL posn:

S: 135L B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-931	-8	-637	345	0	0	3
SY	SP	EP	WP	WY	WR	
-42.2	+102.0	-130.7	+8.4	+45.4	-165.3	

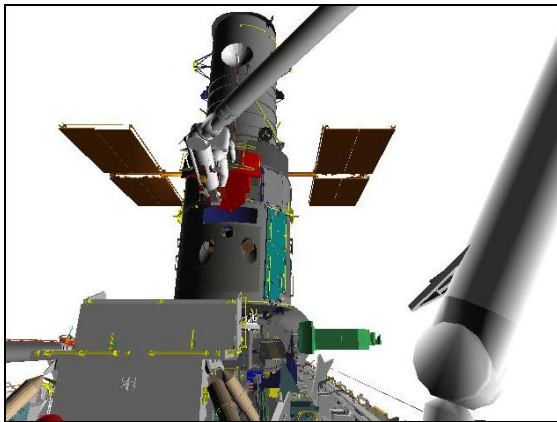
EV GCA to install WFC 3 and remove WFC Handhold:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
WFC 3 Install	-1020	-8	-629	346	0	0	3
Actual from WFPC remove							

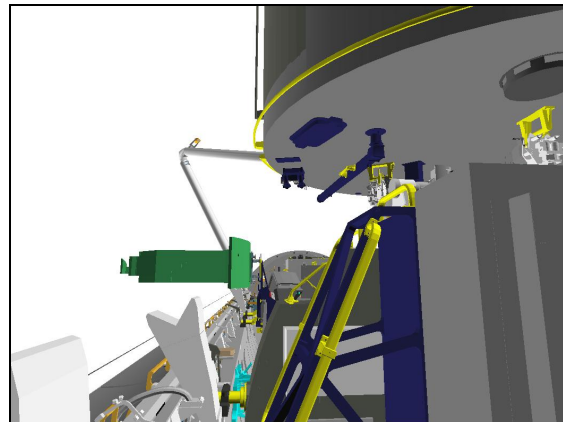
If reqd:

BRAKES – ON (tb-ON)

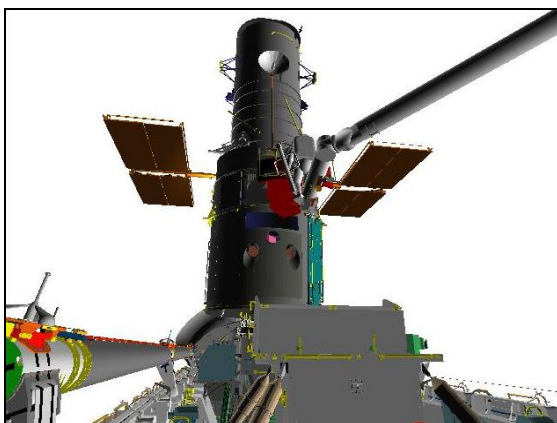
√MODE – not DIRECT



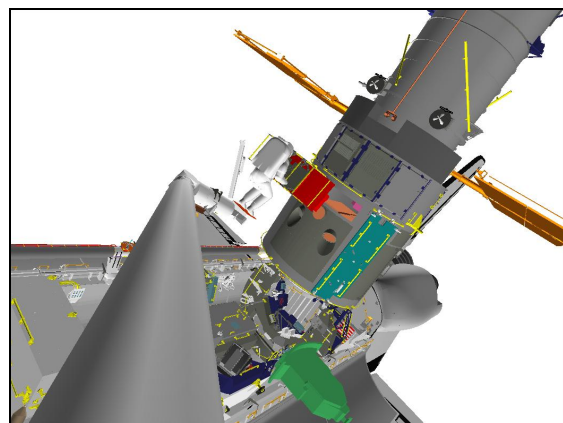
CCTV A (0,20)



CCTV B (5,10)



CCTV D (10,20)



ELBOW (15,-10)

RHC 8. HANDHOLD STOW AT FORWARD FIXTURE

RATE – as reqd (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to WFC HANDHOLD HANDOFF SETUP posn: S: 135L B: 0

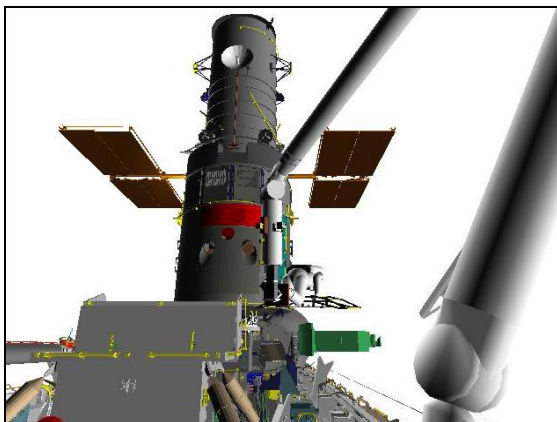
X	Y	Z	PITCH	YAW	ROLL	PL ID
-918	-94	-491	277	0	30	3
SY	SP	EP	WP	WY	WR	
-24.4	+102.6	-132.3	-61.9	+20.6	-106.5	

EV GCA to transfer WFC Handhold to Forward Fixture EV

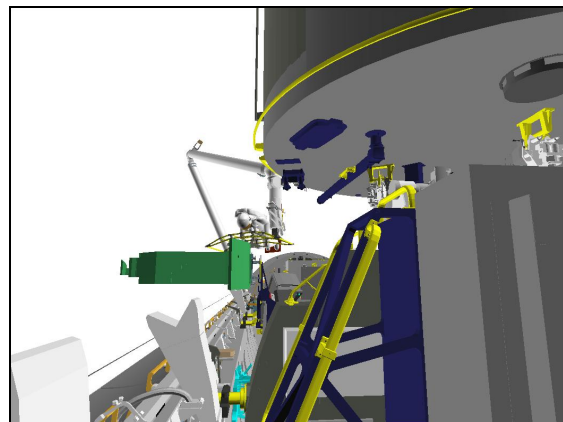
If reqd:

BRAKES – ON (tb-ON)

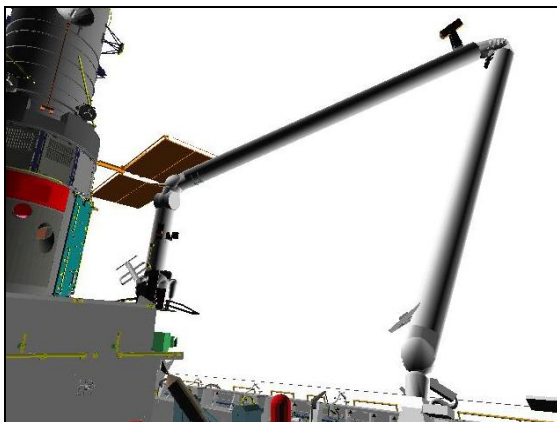
√MODE – not DIRECT



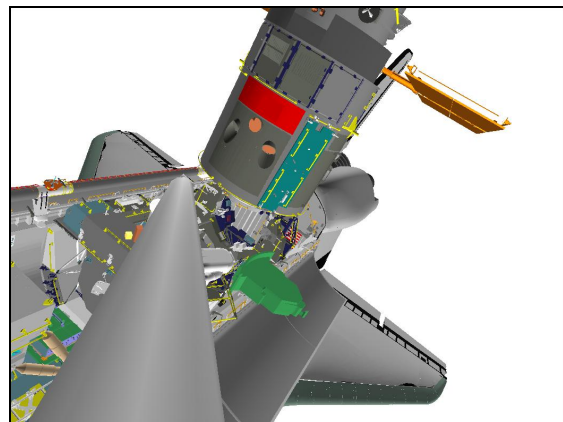
CCTV A (0,20)



CCTV B (5,10)



CCTV D (45,20)



ELBOW (15,-10)

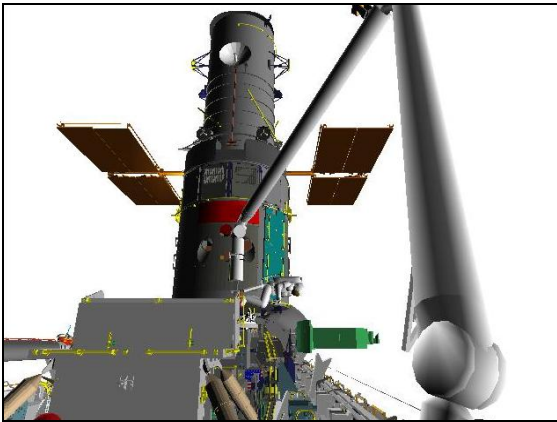
- RHC
9. WFPC 2 TEMP STOW RETRIEVE
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to WFPC 2 TEMP STOW RETRIEVE SETUP posn: S: 135L B: 0

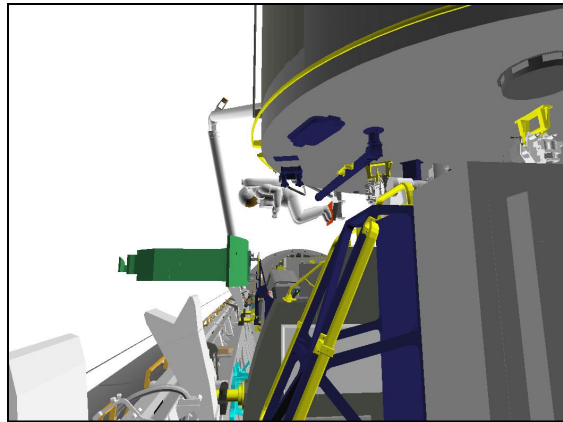
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1012	-82	-495	270	0	90	3
SY	SP	EP	WP	WY	WR	
-20.4	+66.6	-93.0	-70.7	+18.2	-48.7	

EV GCA to retrieve WFPC 2 from Aft Fixture

- If reqd:
 BRAKES – ON (tb-ON)
 √MODE – not DIRECT



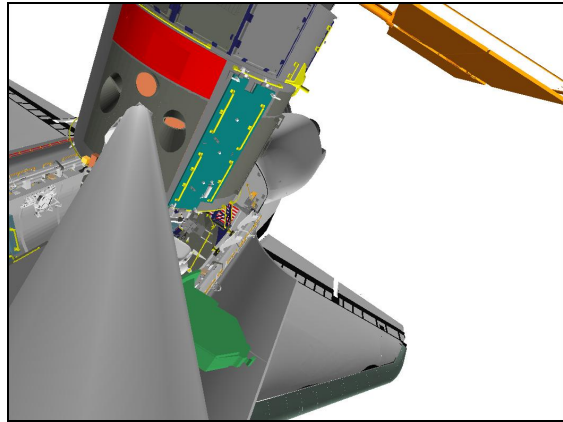
CCTV A (0,20)



CCTV B (5,10)



CCTV D (35,20)



ELBOW (20,-20)

10. WFPC 2 STOW IN WSIPE
 RHC RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to WFPC 2 STOW SETUP posn: S: 135L B: 0

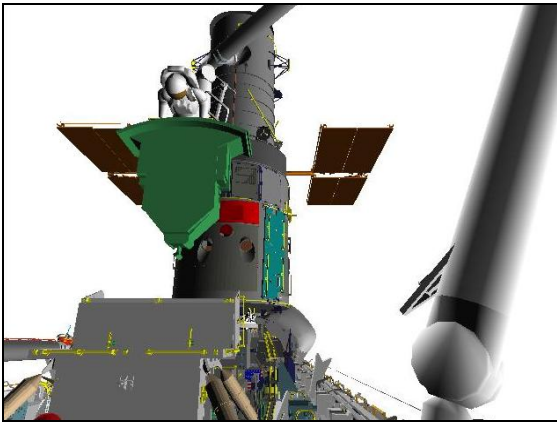
X	Y	Z	PITCH	YAW	ROLL	PL ID
-802	-4	-595	270	0	180	3
SY	SP	EP	WP	WY	WR	
-43.6	+95.1	-107.3	-91.5	+14.0	+65.3	

EV GCA to insert WFPC 2 into WSIPE:

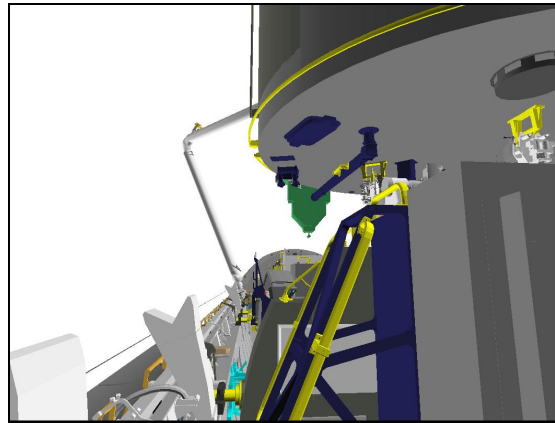
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
WFPC 2 Stowed	-802	-4	-510	270	0	178	3

If reqd:

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



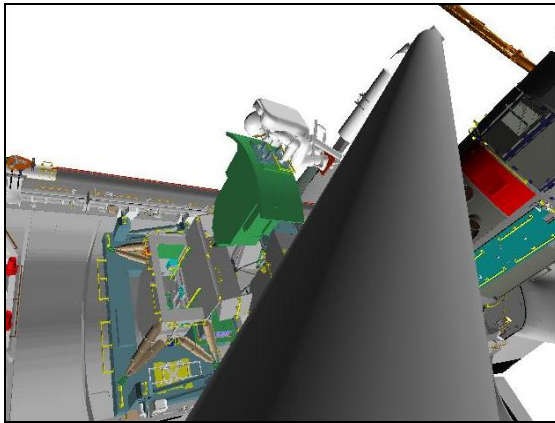
CCTV A (0,20)



CCTV B (5,10)



CCTV D (35,20)



ELBOW (-20,-30)

11. FGS HANDHOLD STOW ON FORWARD FIXTURE

RHC

RATE – as reqd (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to FGS HANDHOLD STOW posn:

S: 135L B: 0

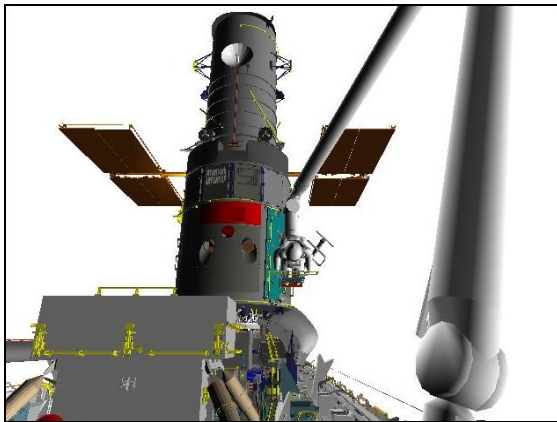
X	Y	Z	PITCH	YAW	ROLL	PL ID
-904	-81	-510	270	0	180	3
SY	SP	EP	WP	WY	WR	
-14.4	+82.7	-106.1	-71.7	+18.8	+35.3	

EV GCA to stow FGS Handhold

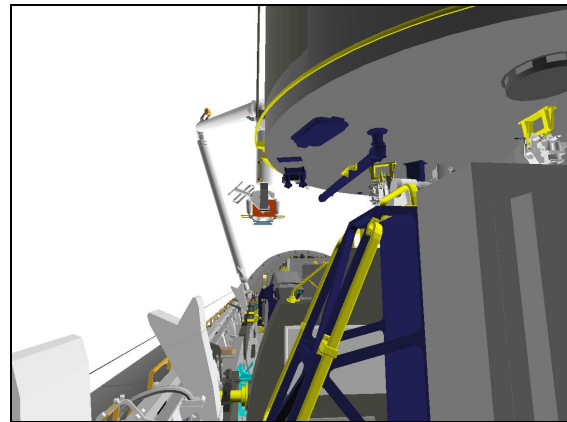
If reqd:

BRAKES – ON (tb-ON)

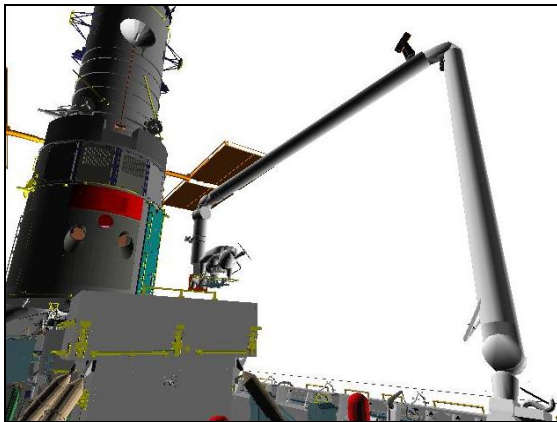
√MODE – not DIRECT



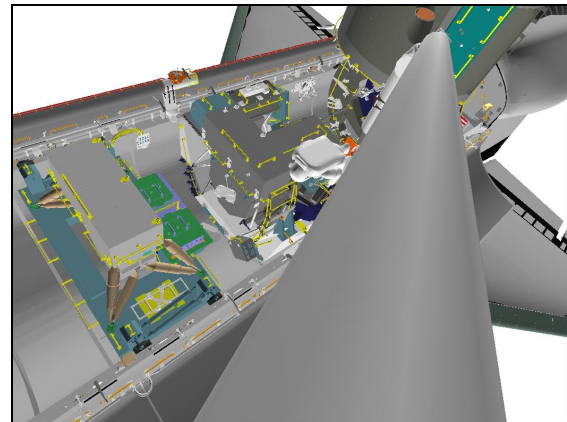
CCTV A (0,20)



CCTV B (5,10)



CCTV D (35,20)



ELBOW (-20,-30)

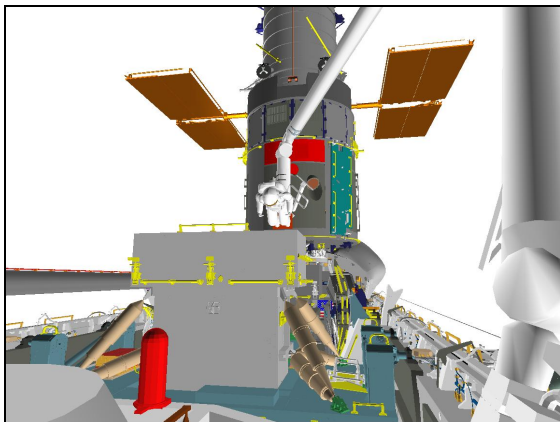
- RHC 12. TOOL HANDOFF AT FSIPE
 RATE – as reqd (VERN within 10 ft)
 ✓BRAKES – OFF (tb-OFF)
 ✓MODE – ORB LD, ENTER

Mnvr to TOOL HANDOFF AT FSIPE posn: S: 135L B: 0

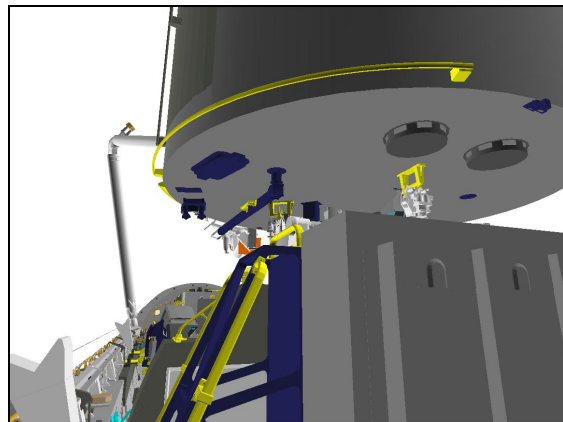
X	Y	Z	PITCH	YAW	ROLL	PL ID
-913	-4	-506	270	0	180	3
SY	SP	EP	WP	WY	WR	
-26.2	+72.6	-100.2	-71.2	+17.4	+47.6	

EV GCA to hand off EV tools

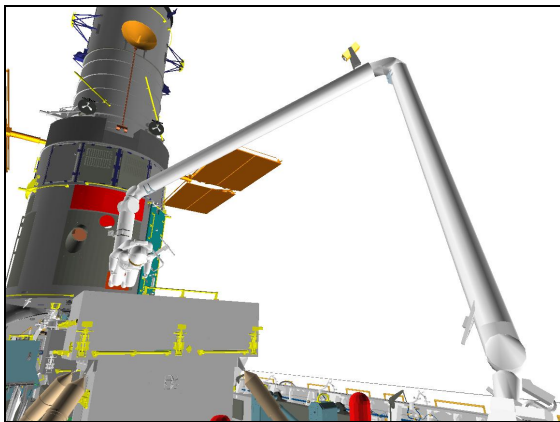
- If reqd:
 BRAKES – ON (tb-ON)
 ✓MODE – not DIRECT



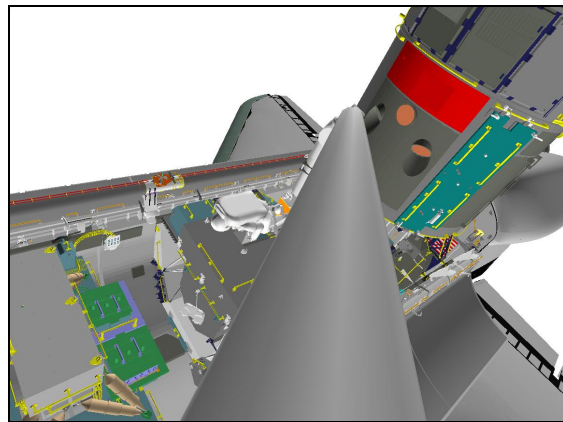
CCTV A (-10,10)



CCTV B (20,15)



CCTV D (35,20)



ELBOW (-10,-20)

SI C&DH R&R

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 180°, -V3 fwd, FSS Pivot: 90°, SA Slew: 0°

2. BAY 10 DOOR

RHC

RATE – as reqd (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to BAY 10 DOOR SETUP posn:

S: 135L B: 90R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1162	+124	-661	0	10	0	3
SY	SP	EP	WP	WY	WR	
-34.9	+34.9	-51.7	+21.5	+44.3	-182.4	

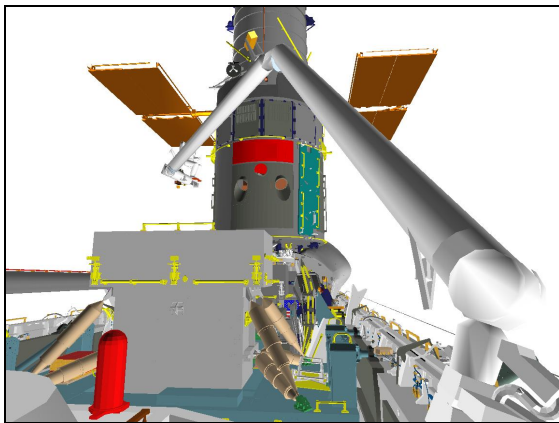
EV GCA to remove SI C&DH:

Expected:	X	Y	Z	PITCH	YAW	ROLL	Boot Plate
Bay 10		+118	-692			8	90R
SI C&DH R&R	-1162	+100				8	0

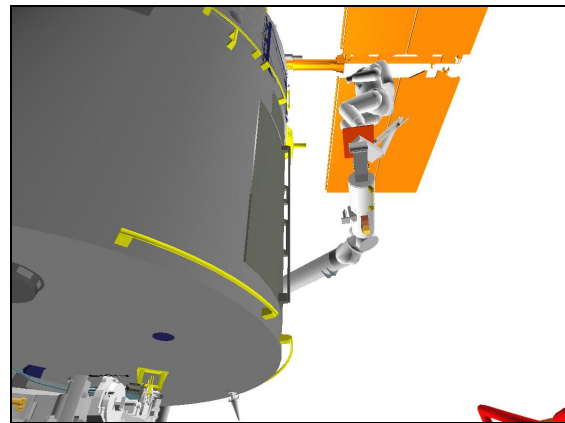
If reqd:

BRAKES – ON (tb-ON)

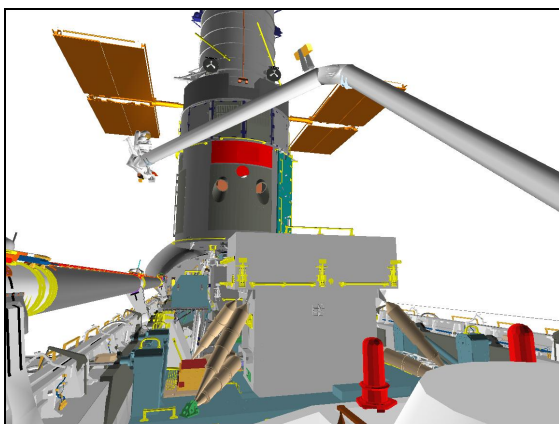
√MODE – not DIRECT



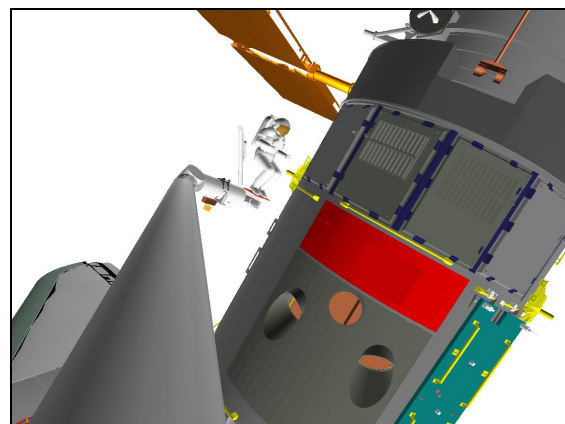
CCTV A (-5,10)



CCTV C (0,40)



CCTV D (15,10)



ELBOW (15,-5)

- RHC 3. SI C&DH HANDOFF AT MULE
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to SI C&DH HANDOFF AT MULE posn: S: 135L B: 30R

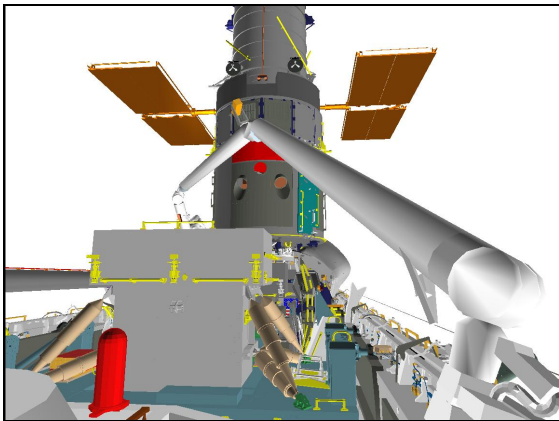
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1211	+125	-528	300	7	0	3
SY	SP	EP	WP	WY	WR	
-31.3	+21.4	-30.2	-65.6	+36.9	-137.3	

EV GCA to retrieve SI C&DH:

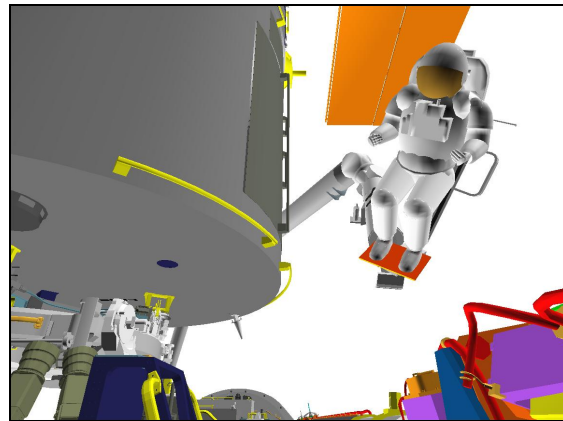
Expected: Handoff	X	Y	Z	PITCH	YAW	ROLL	PL ID
		+117					3

If reqd:

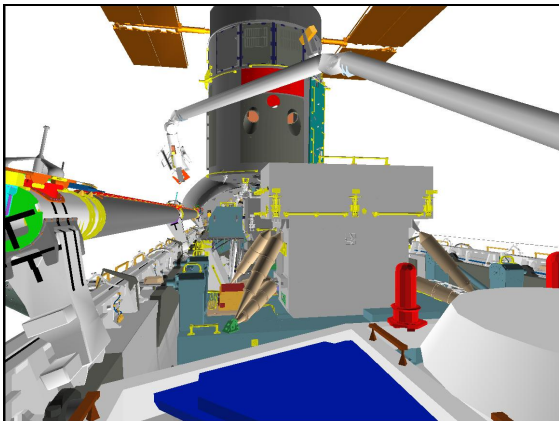
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT



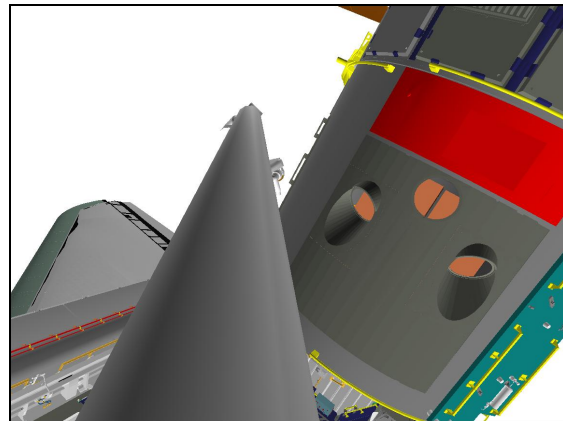
CCTV A (-5,10)



CCTV C (0,30)



CCTV D (10,0)



ELBOW (5,-20)

- RHC 4. SI C&DH-R INSTALL
 RATE – as reqd (VERN within 10 ft)
 ✓BRAKES – OFF (tb-OFF)
 ✓MODE – ORB LD, ENTER

Mnvr to BAY 10 DOOR posn:

S: 135L B: 90R

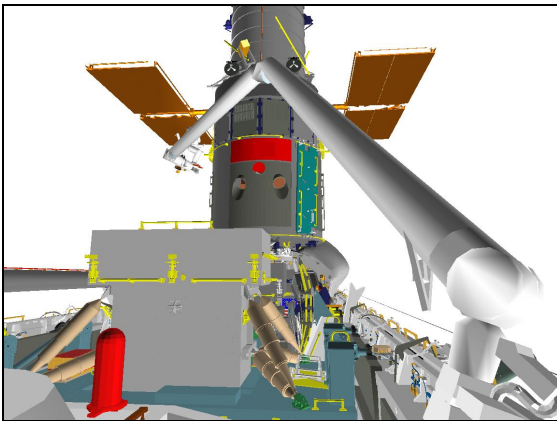
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1171	+115	-685	0	10	9	3
SY	SP	EP	WP	WY	WR	
-35.0	+32.1	-41.9	+14.4	+44.4	-173.5	

EV GCA to install SI C&DH:

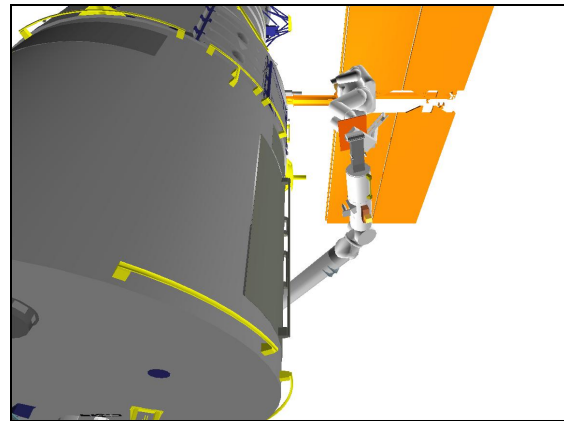
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Install	-1183	+90	-660			55	3

If reqd:

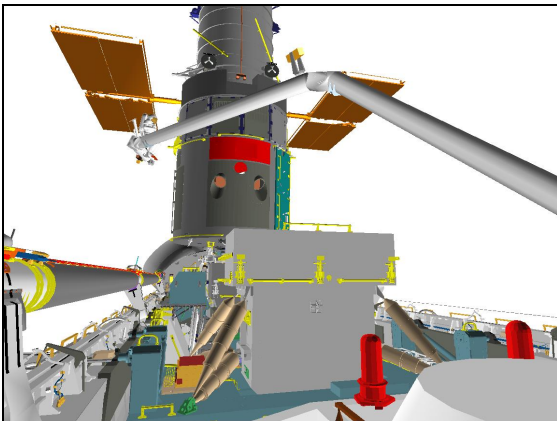
- BRAKES – ON (tb-ON)
 ✓MODE – not DIRECT



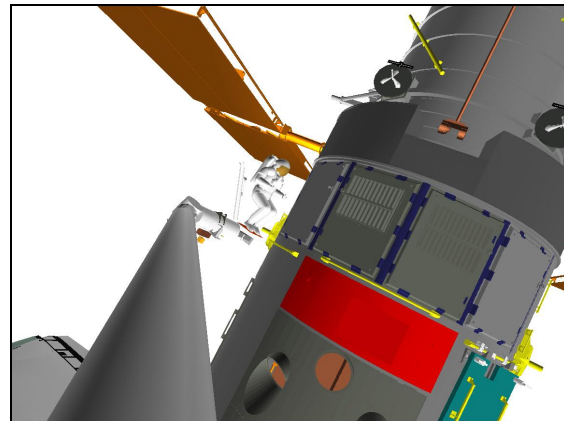
CCTV A (-5,10)



CCTV C (0,45)



CCTV D (15,10)



ELBOW (15,-5)

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LOCK INSTALL

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 180°, -V3 fwd, FSS Pivot: 90°, SA Slew: 0°

2. GET AHEAD – BAY 2 DOOR BOLTS

NOTE

Monitor clearance to radiator when translating to Bay 2 Door

RHC

RATE – as reqd (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to BAY 2 DOOR BOLT posn:

S: 135L B: 30R

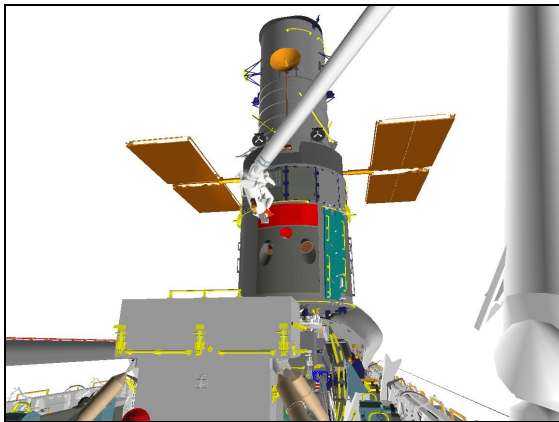
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1025	+20	-654	346	0	0	3
SY	SP	EP	WP	WY	WR	
-34.7	+81.0	-108.8	+10.9	+38.3	-169.4	

EV GCA to Bay 2 Door Bolts

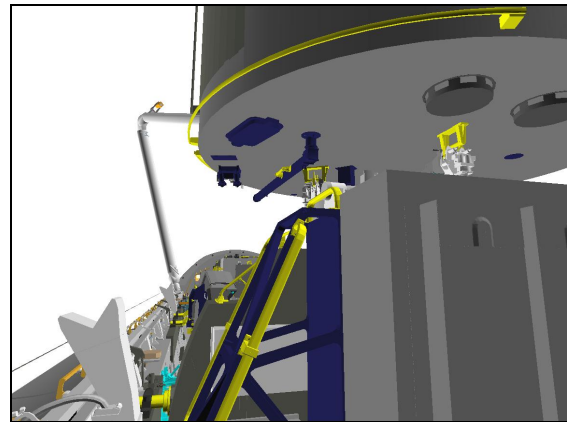
If reqd:

BRAKES – ON (tb-ON)

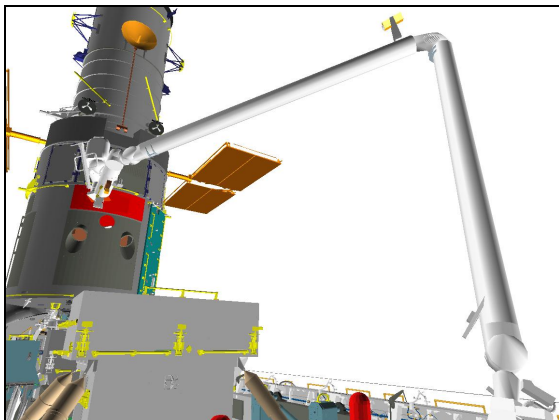
√MODE – not DIRECT



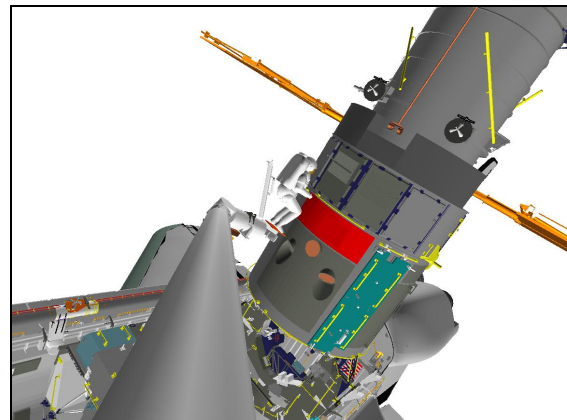
CCTV A (-10,20)



CCTV B (15,10)



CCTV D (35,20)



ELBOW (10,-5)

3. LOCK RETRIEVAL AT MULE

NOTE

Monitor clearance to MPMs and telescope during maneuver

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

Mnvr to LOCK RETRIEVAL AT MULE posn: S: 180 B: 90L

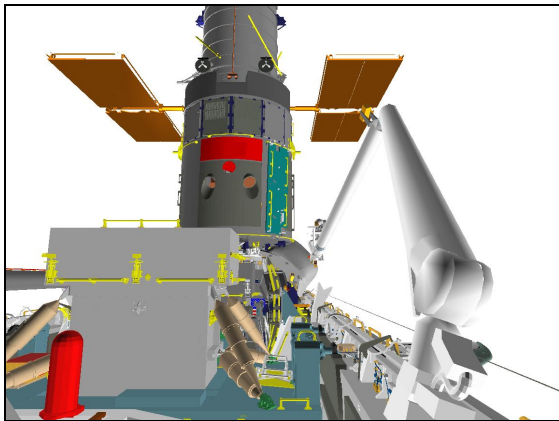
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1248	-123	-535	353	0	0	3
SY	SP	EP	WP	WY	WR	
+0.1	+36.2	-58.2	+15.4	+2.2	-179.3	

EV GCA to retrieve LOCKs:

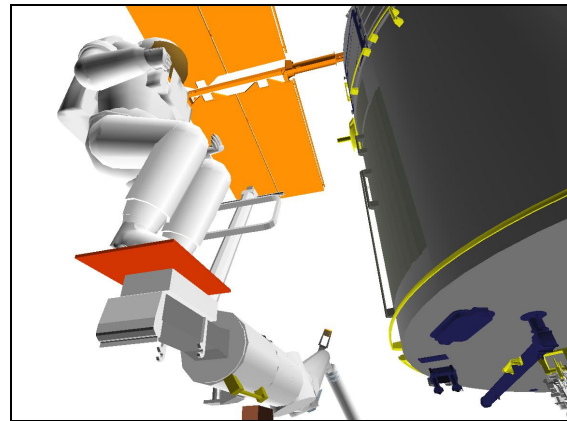
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Retrieve			-500			335	3

If reqd:

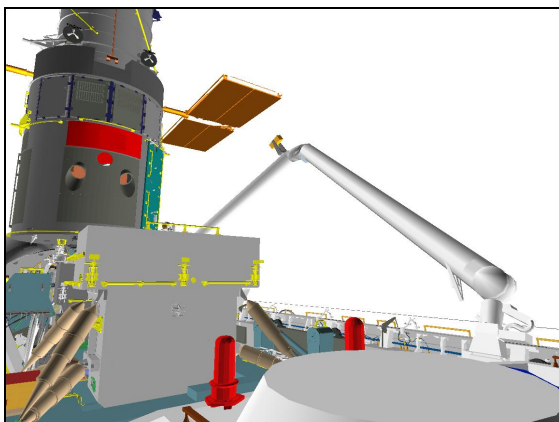
BRAKES – ON (tb-ON)
 ✓MODE – not DIRECT



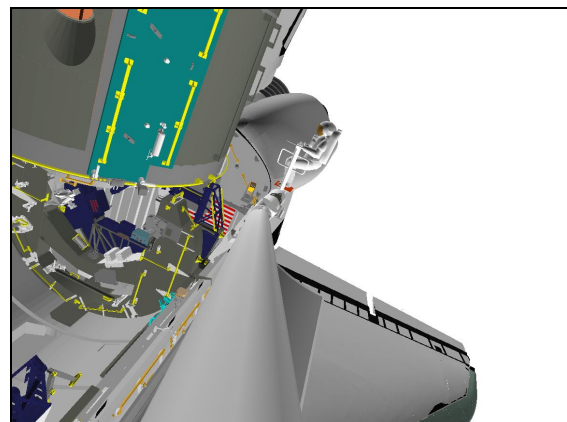
CCTV A (0,10)



CCTV B (-15,40)



CCTV D (35,10)



ELBOW (5,-5)

- RHC 4. LOCK INSTALL AT -V2 DOORS
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

NOTE

Watch clearance from MFR to OBSS at bottom bolt posn

Mnvr to LOCK INSTALL AT -V2 DOORS posn: S: 180 B: 90R

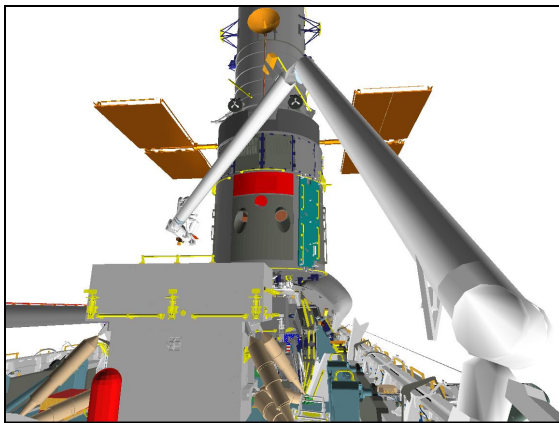
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1147	+120	-613	355	0	0	3
SY	SP	EP	WP	WY	WR	
-33.4	+40.7	-68.5	+22.1	+34.9	-176.2	

EV GCA to install LOCKs on -V2 door:

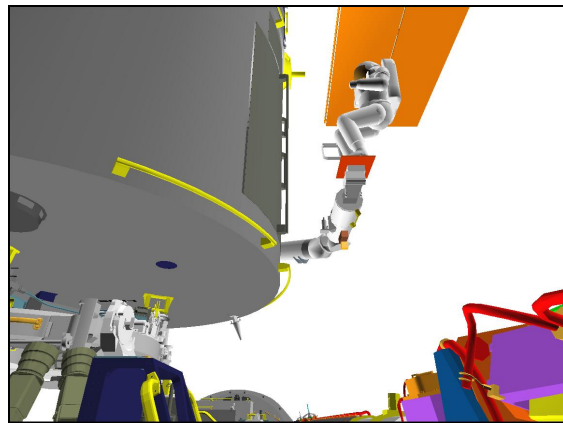
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Top Bolt		+103					3
Lower Middle	-1152		-555				
Bottom		+93	-528			30	

If reqd:

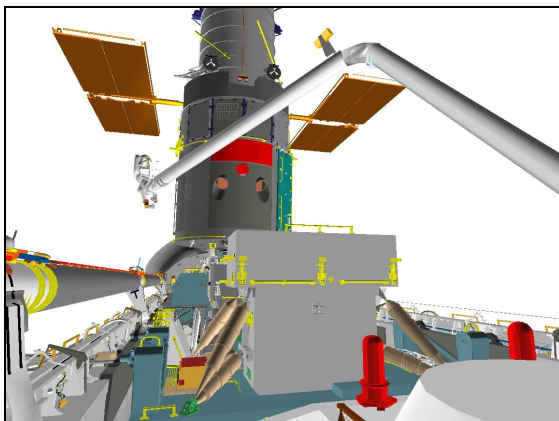
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT



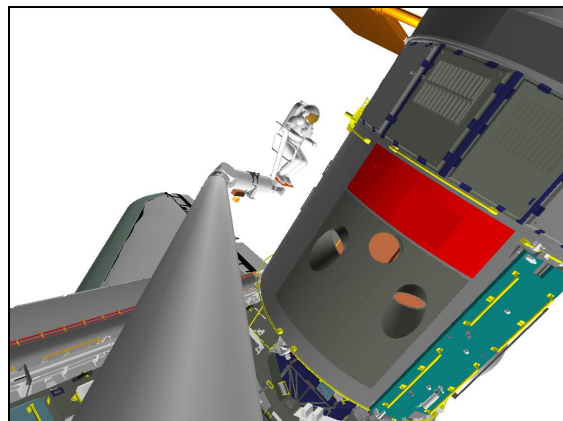
CCTV A (-5,15)



CCTV C (0,30)



CCTV D (15,10)



ELBOW (10,-10)

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EVA 2 – RSU, BAY 2 BATT (-V3 FWD)

RSU	FS 8-2
BAY 2 BATTERY R&R.....	FS 8-13

RSU

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 180°, -V3 fwd, FSS Pivot: 90°, SA Slew: 0°

RHC

2. MNVR TO SOPE FOR RSU-2R PICKUP

RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB LD, ENTER

Mnvr to RSU-2R PICKUP AT SOPE posn:

S: 135L B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1003	+58	-495	270	0	0	3
SY	SP	EP	WP	WY	WR	
-37.1	+68.2	-101.6	-68.6	+15.4	-121.3	

EV GCA to remove RSU-2R from SOPE and receive PIK STIK:

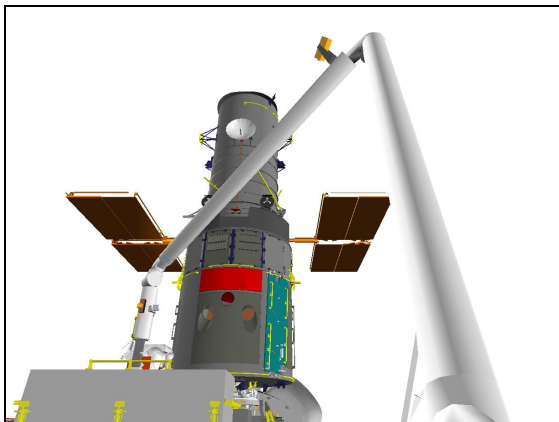
Expected: Pickup Posn	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1003	+58	-481	270	0	0	3

If reqd:

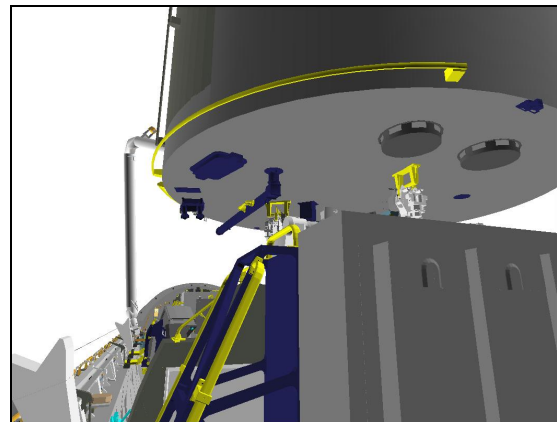
BRAKES – ON (tb-ON)

√MODE – not DIRECT (lt off)

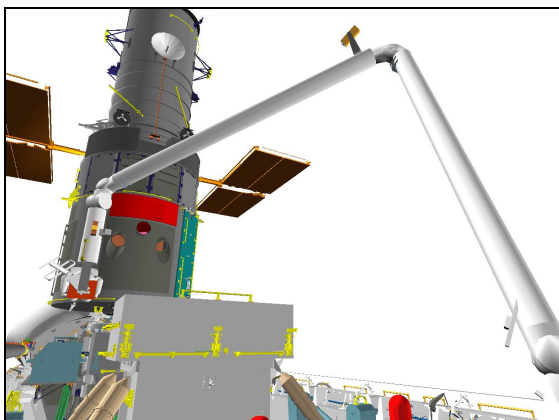
EVA 2



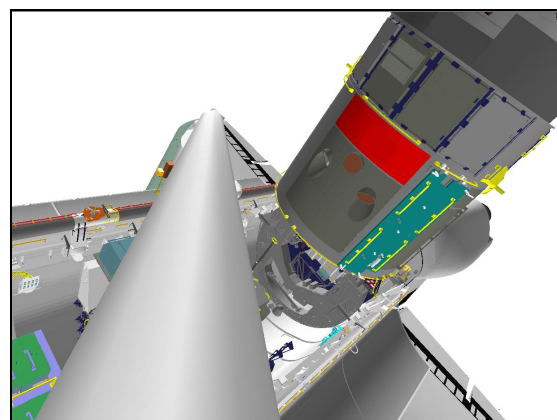
CCTV A (0,30)



CCTV B (20,15)



CCTV D (30,20)



ELBOW (10,-20)

- RHC 3. SET UP AND OPEN -V3 DOORS
 RATE – as reqd (VERN within 10 ft)
 ✓BRAKES – OFF (tb-OFF)
 ✓MODE – ORB LD, ENTER

Mnvr to SET UP AND OPEN -V3 DOORS posn: S: 135L B: 30R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1026	+42	-565	0	0	0	3
SY	SP	EP	WP	WY	WR	
-31.0	+63.2	-114.9	+51.7	+31.0	-179.5	

NOTE

Mnvr up from telescope prior to translating to Right FHST Seal Retract posn, for clearance to center TSA.

Right door may only open 90° due to radiator

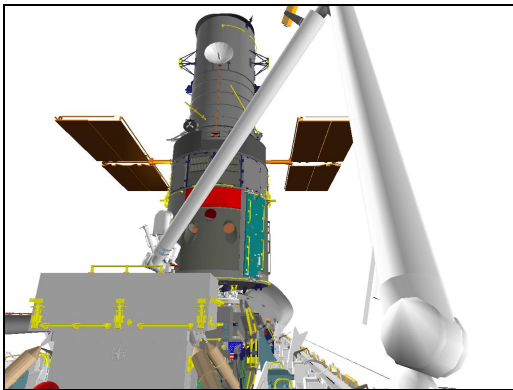
EV GCA to retract FHST Seals, temp stow 80" Tether, and open -V3 Doors:

Expected:	X	Y	Z	PITCH	YAW	ROLL	Boot Plate
Left FHST	-1026	+42	-549	0	0	0	30R
Right FHST		-54			0		30L
80" Tether Stow		-15	-542				30L
Open -V3 Door:							
Bottom	-1044	+36	-525	345			0
Middle			-582				
Top			-599				
Handle		-30	-561				
Door Open		-4					

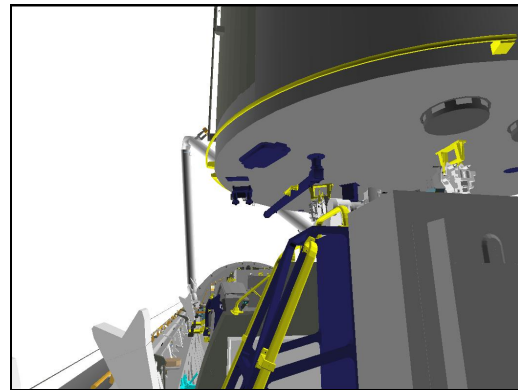
If reqd:

BRAKES – ON (tb-ON)

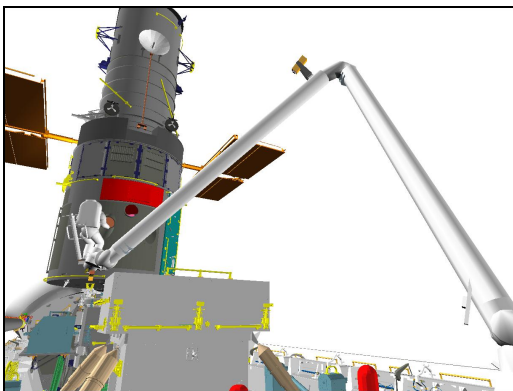
✓MODE – not DIRECT (It off)



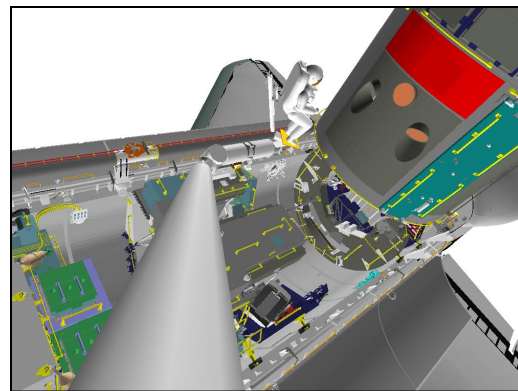
CCTV A (0,20)



CCTV B (10,15)



CCTV D (30,20)



ELBOW (10,-10)

4. CASH RELOCATE

NOTE

Monitor clearance from RMS EV head to Star Tracker

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

Mnvr to CASH RELOCATE posn:

S: 135L B: 0

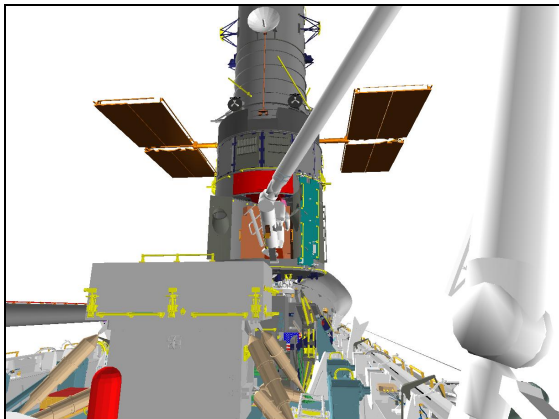
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1030	-25	-551	323	0	0	3
SY	SP	EP	WP	WY	WR	
-24.2	+82.4	-120.0	-3.7	+30.7	-159.8	

EV GCA to relocate CASH to Lower Angled Handrail:

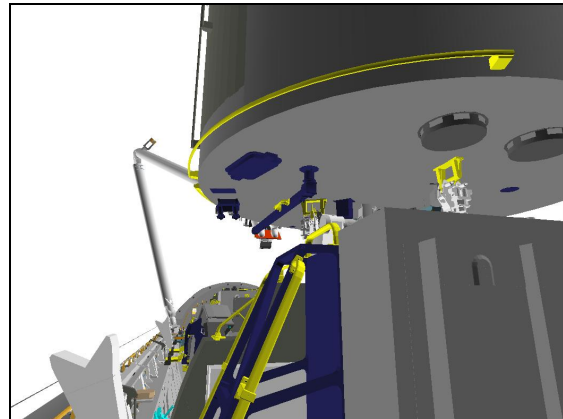
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
CASH Relocate	-1066	-25	-551	323	0	0	3
PFR Install	-1060	-19	-528				
PFR Ingress Assist	-1051	-15					

If reqd:

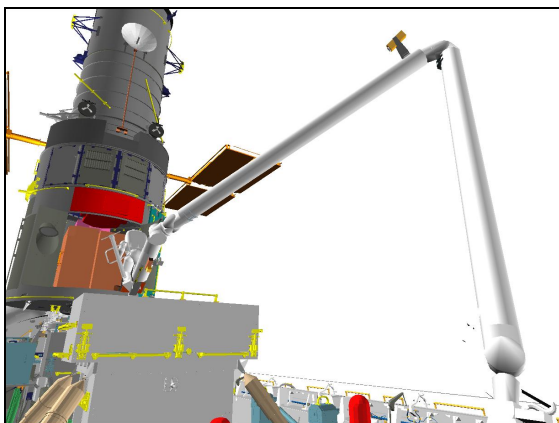
BRAKES – ON (tb-ON)
 √MODE – not DIRECT (lt off)



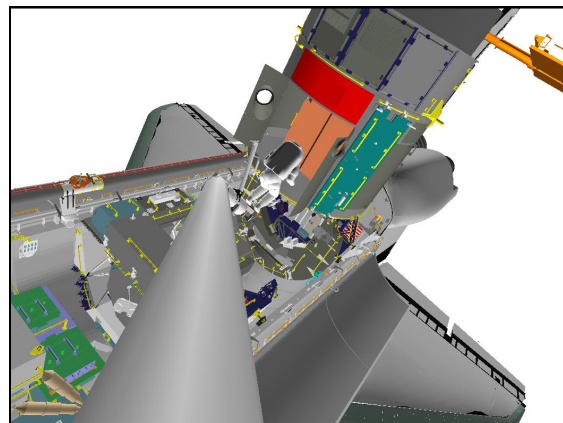
CCTV A (-5,15)



CCTV B (15,15)



CCTV D (35,20)



ELBOW (10,-10)

5. RSU-2 R&R
 RHC RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to RSU-2 R&R posn:

S: 135L B: 0

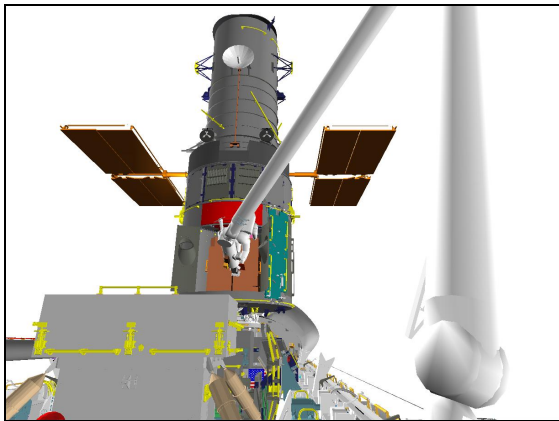
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1042	-25	-588	345	0	10	3
SY	SP	EP	WP	WY	WR	
-24.4	+77.3	-116.1	+22.7	+28.5	-162.2	

EV GCA for RSU-2 R&R:

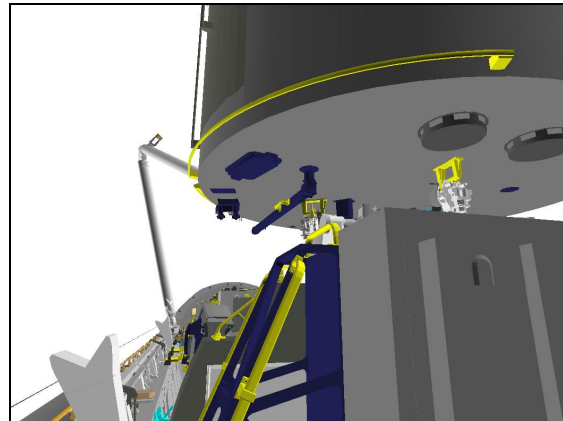
Expected: RSU-2 R&R	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1042	-36	-588	345	0	10	3

If reqd:

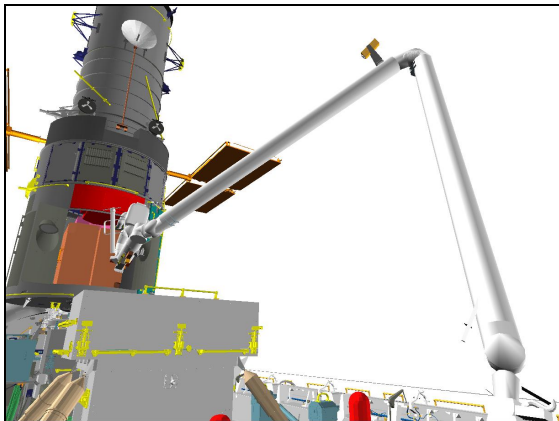
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT (lt off)



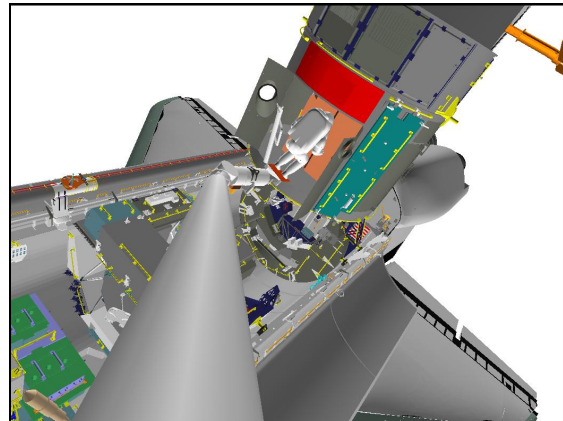
CCTV A (0,20)



CCTV B (15,15)



CCTV D (35,20)



ELBOW (10,-10)

- RHC 6. MNVR TO SOPE FOR RSU-2 DROPOFF, RSU-3R PICKUP
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

NOTE

Monitor clearance from RMS EV head to Transport Module

Mnvr to SWAP RSU-2 FOR RSU-3R posn: S: 135L B: 0

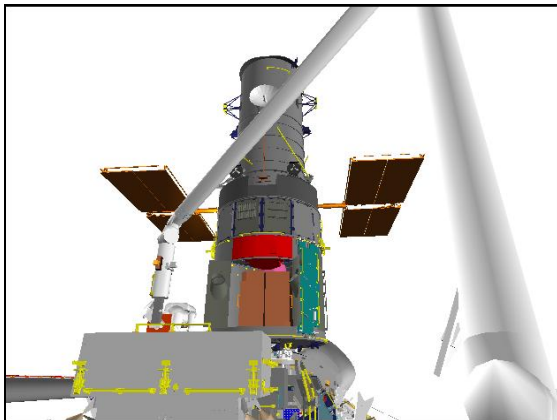
X	Y	Z	PITCH	YAW	ROLL	PL ID
-967	+64	-495	270	0	0	3
SY	SP	EP	WP	WY	WR	
-42.0	+72.6	-108.2	-67.7	+14.3	-116.3	

EV GCA to hand off RSU-2 and pick up RSU-3R:

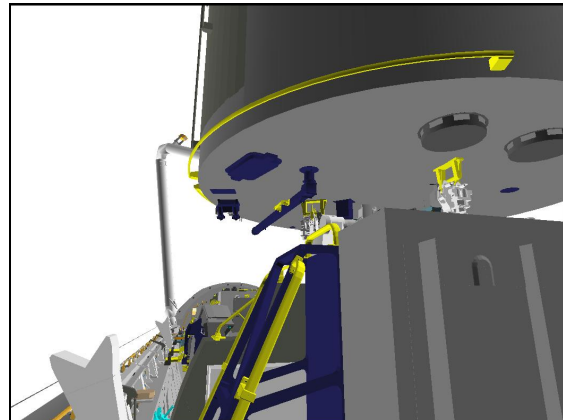
Expected: RSU-3R Pickup	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-967	+64	-481	270	0	0	3

If reqd:

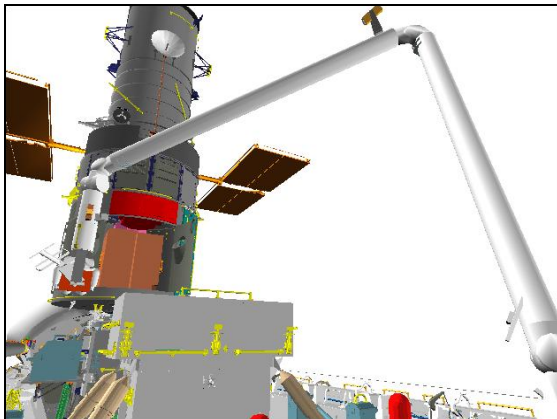
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT (lt off)



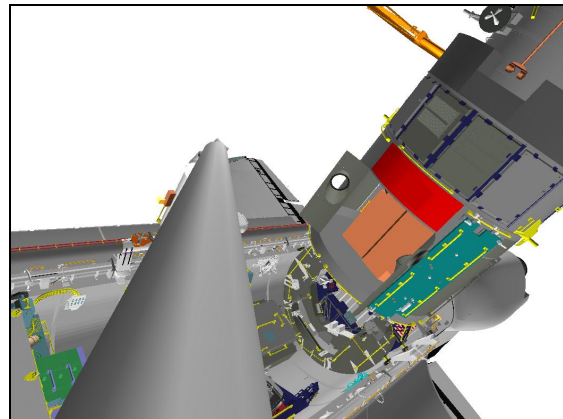
CCTV A (-5,25)



CCTV B (15,15)



CCTV D (30,20)



ELBOW (10,-15)

- RHC 7. ASSIST EV1 INTO PFR
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to ASSIST EV1 INTO PFR posn: S: 135L B: 0

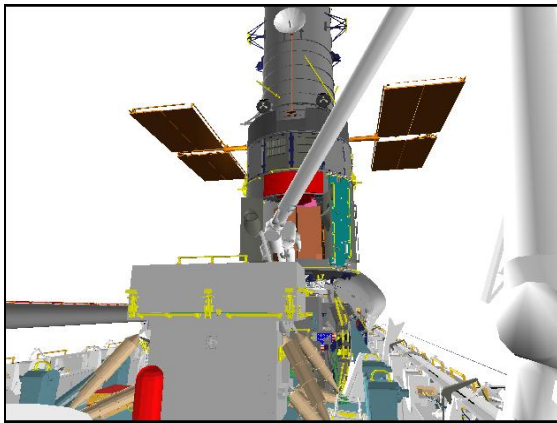
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1035	0	-528	325	0	0	3
SY	SP	EP	WP	WY	WR	
-26.4	+74.8	-119.4	+4.8	+32.4	-159.3	

EV GCA to assist EV1 into PFR:

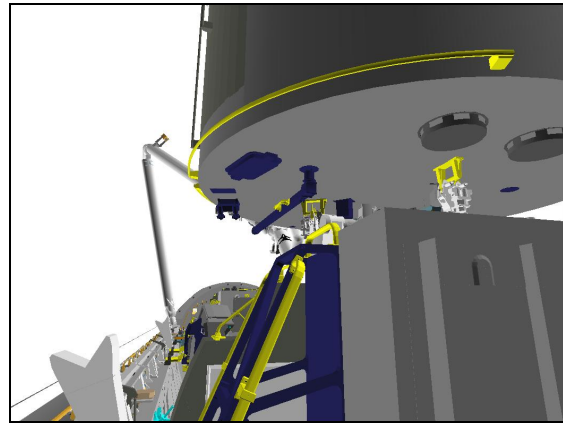
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Assist Posn	-1052	0	-528	325	0	0	3

If reqd:

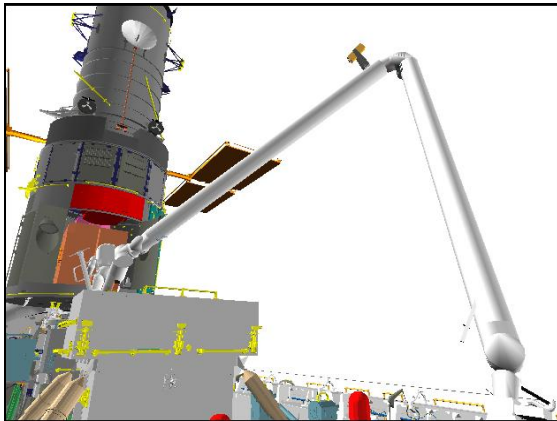
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT (lt off)



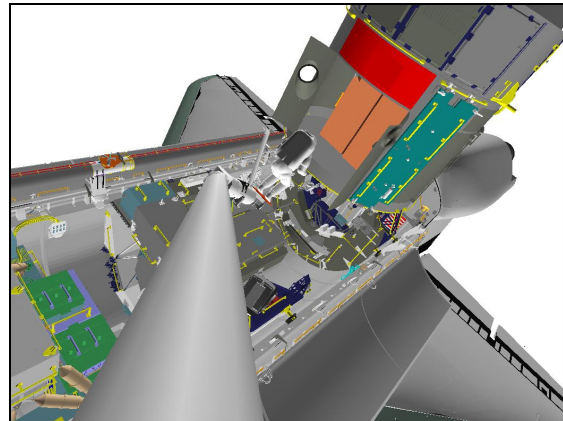
CCTV A (-10,15)



CCTV B (15,15)



CCTV D (35,20)



ELBOW (10,-10)

- RHC 8. INSTALL RSU-3R
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to RSU-3 R&R posn:

S: 135L B: 0

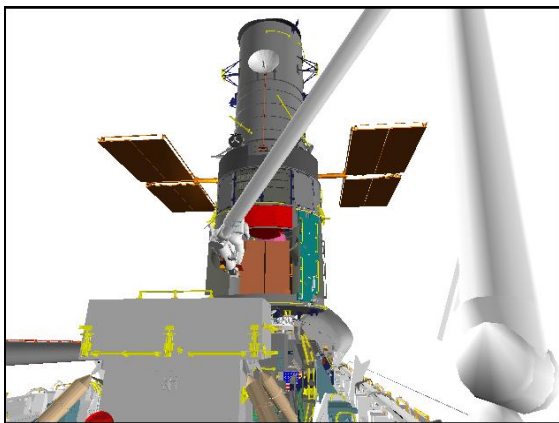
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1032	+24	-589	345	0	0	3
SY	SP	EP	WP	WY	WR	
-31.4	+73.8	-114.8	+23.6	+35.2	-169.9	

EV GCA to remove RSU-3 and install RSU-3R:

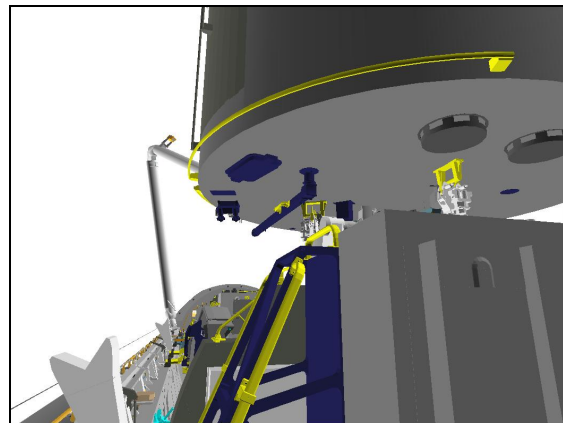
Expected: RSU-3 R&R	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1043	+24	-589	345	0	0	3

If reqd:

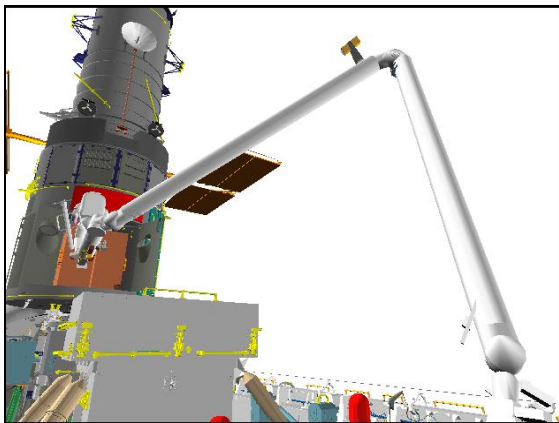
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT (lt off)



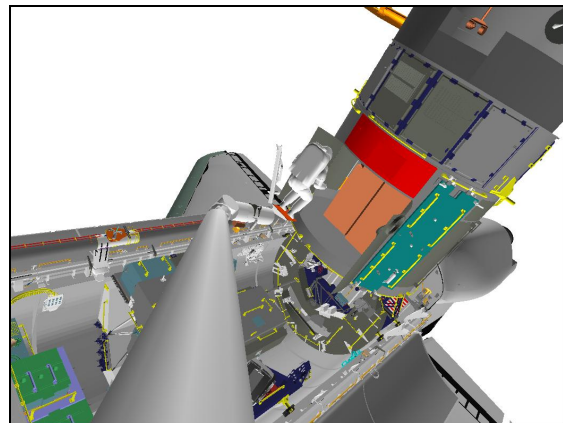
CCTV A (-5,20)



CCTV B (15,15)



CCTV D (35,20)



ELBOW (10,-5)

RHC 9. MNVR TO SOPE FOR RSU-3 DROPOFF, RSU-1R PICKUP

RATE – as reqd (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to SWAP RSU-3 FOR RSU-1R posn:

S: 135L B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-986	+59	-500	270	0	0	3
SY	SP	EP	WP	WY	WR	
-39.3	+71.0	-104.5	-69.2	+15.0	-119.0	

EV GCA to hand off RSU-3 and pick up RSU-1R:

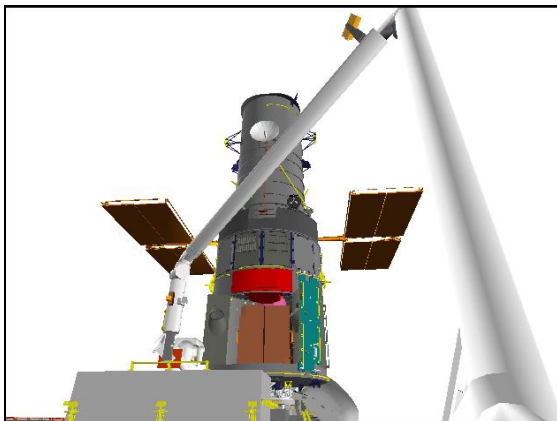
Expected:
Pickup RSU-1R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-986	+59	-481	270	0	0	3

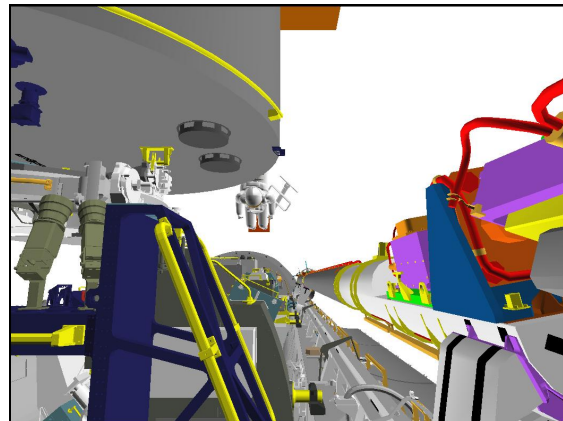
If reqd:

BRAKES – ON (tb-ON)

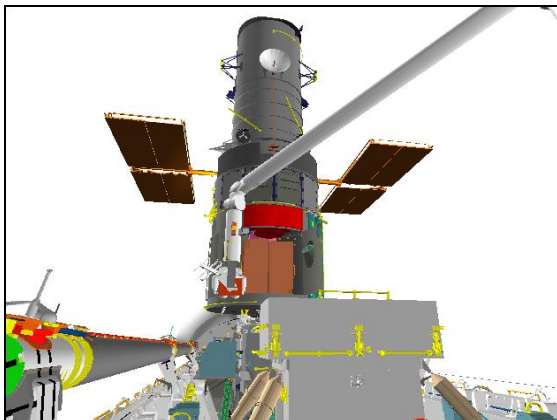
√MODE – not DIRECT (lt off)



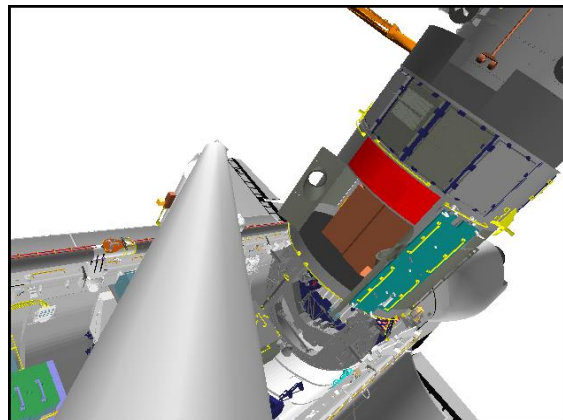
CCTV A (-5,30)



CCTV C (0,10)



CCTV D (10,20)



ELBOW (10,-15)

10. RSU-1 CHANGEOUT
 RHC RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to RSU-1 R&R posn:

S: 135L B: 180

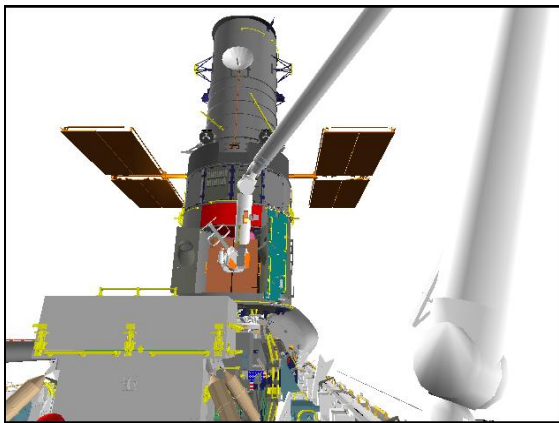
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1005	-14	-557	300	355	345	3
SY	SP	EP	WP	WY	WR	
-26.3	+90.0	-116.3	-40.8	+23.9	-160.1	

EV GCA to install RSU-1R and remove RSU-1:

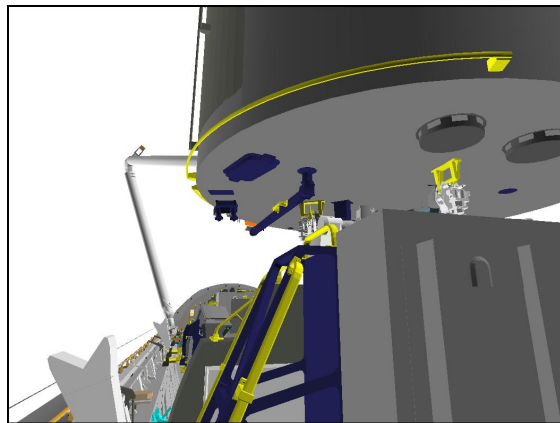
Expected: RSU-1 R&R	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1079	-14	-557	300	355	345	3

If reqd:

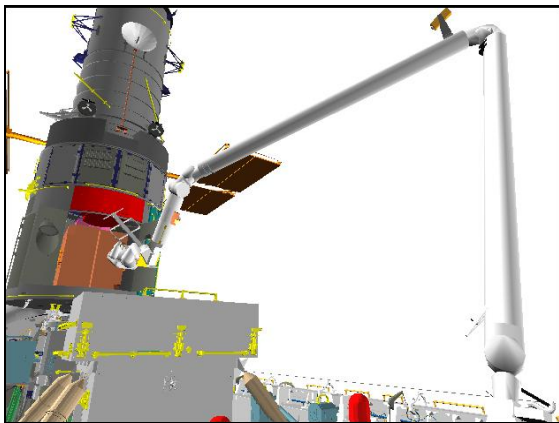
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT (lt off)



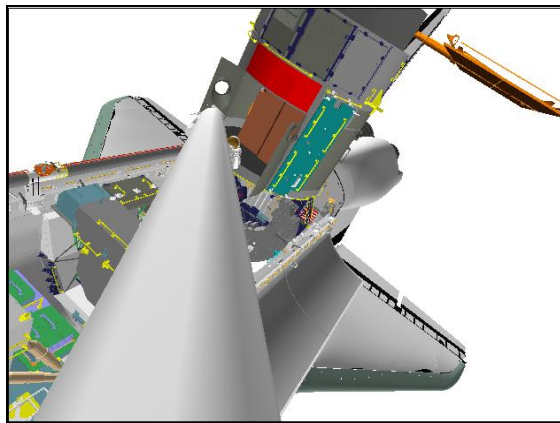
CCTV A (0,20)



CCTV B (15,15)



CCTV D (35,20)



ELBOW (10,-20)

11. PIE INSTALL (GET-AHEAD) CASH RELOCATE

NOTE

Monitor clearance from RMS EV head to Star Tracker

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

Mnvr to CASH RELOCATE posn: S: 180 B: 0

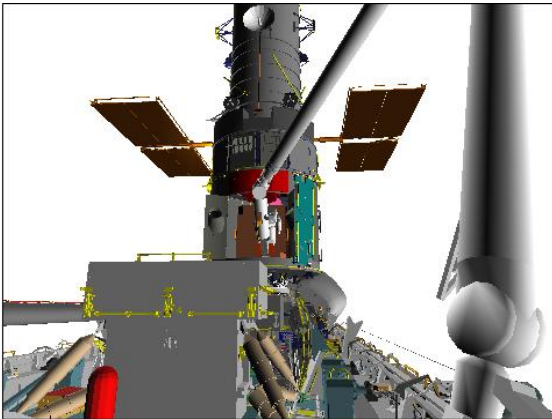
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1060	-18	-550	310	0	0	3
SY	SP	EP	WP	WY	WR	
-24.0	+77.3	-108.7	-24.8	+29.7	-152.3	

EV GCA to reposition CASH

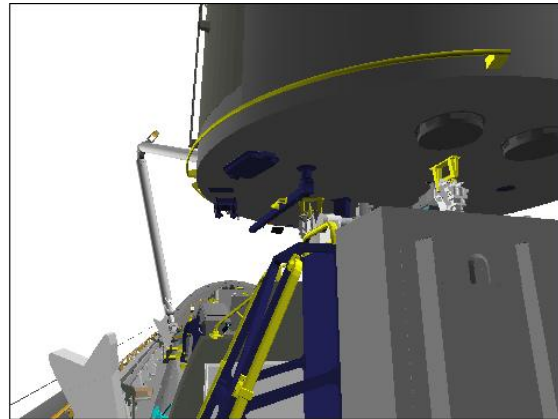
Expected: CASH Relocate	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1066	-18	-550	310	0	0	3

If reqd:

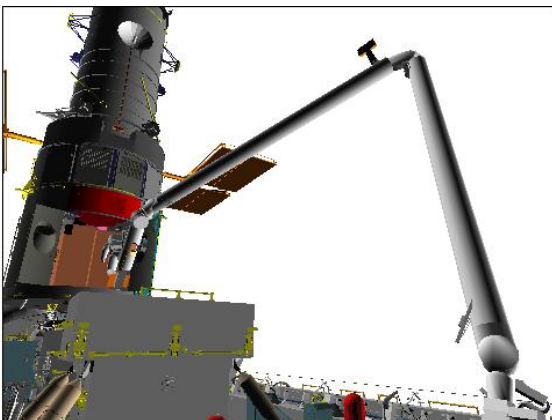
BRAKES – ON (tb-ON)
 ✓MODE – not DIRECT (lt off)



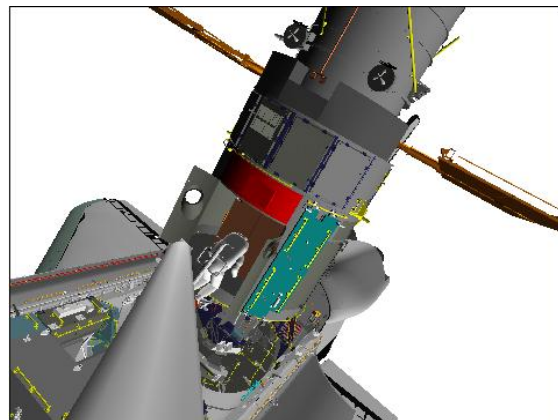
CCTV A (-5,15)



CCTV B (15,15)



CCTV D (35,20)



ELBOW (10,-15)

12. CLOSE -V3 DOOR
 RHC RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to CLOSE -V3 DOORS posn:

S: 180 B: 0

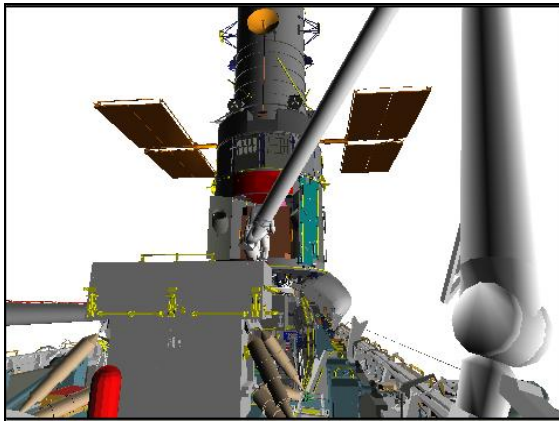
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1025	-8	-550	345	0	0	3
SY	SP	EP	WP	WY	WR	
-24.6	+74.0	-122.7	+32.4	+28.7	-172.2	

EV GCA to close -V3 Doors:

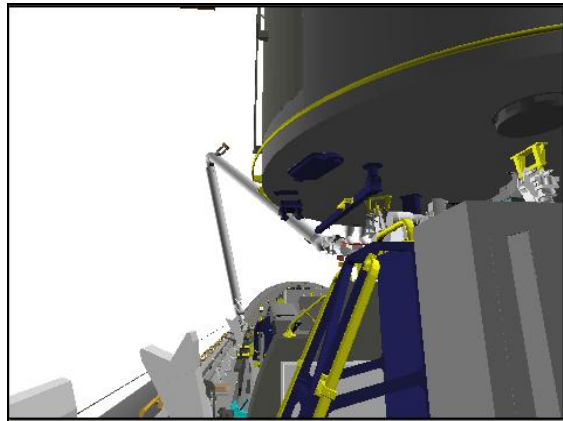
Expected:	X	Y	Z	PITCH	YAW	ROLL	Boot Plate
Door Receive	-1025	-8	-550	345	0	0	0
Pip Pin/Handle	-1044	-20	-561				
Top		+36	-599				
Bottom			-525				
80" Tether		-15	-542				
Right FHST	-1026	-54	-549	0			30L
Left FHST		+42					30R

If reqd:

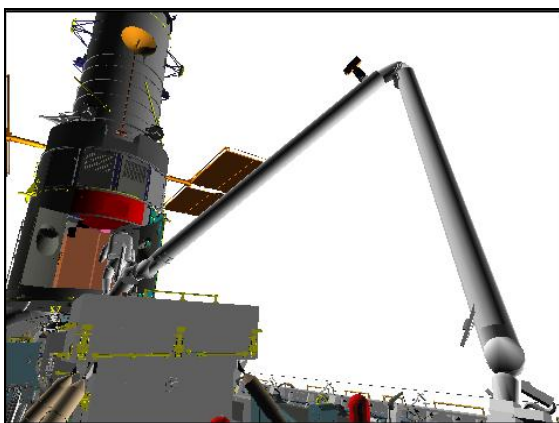
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT (lt off)



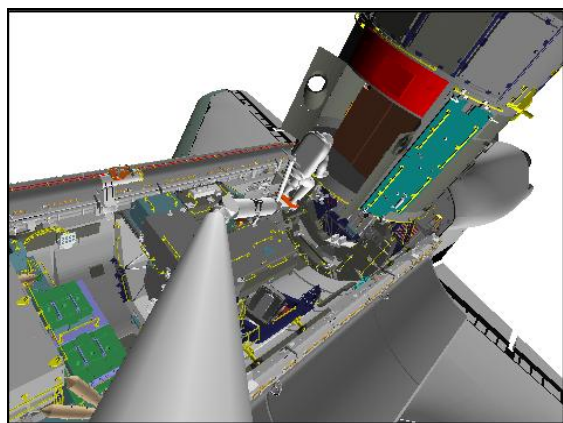
CCTV A (-5,15)



CCTV B (5,15)



CCTV D (35,20)



ELBOW (10,-5)

BAY 2 BATTERY R&R

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 180°, -V3 fwd, FSS Pivot: 90°, SA Slew: 0°

2. BAY 2 SETUP

RHC

RATE – as reqd (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to BAY 2 posn:

S: 90L B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1015	+9	-670	0	0	15	3
SY	SP	EP	WP	WY	WR	
-35.0	+79.4	-109.0	+29.6	+35.0	-164.5	

EV GCA to open Bay 2 Door:

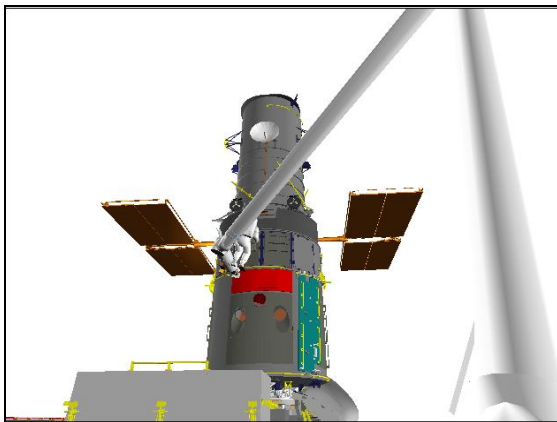
Expected:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1028	+29	-650	0	0	15	3

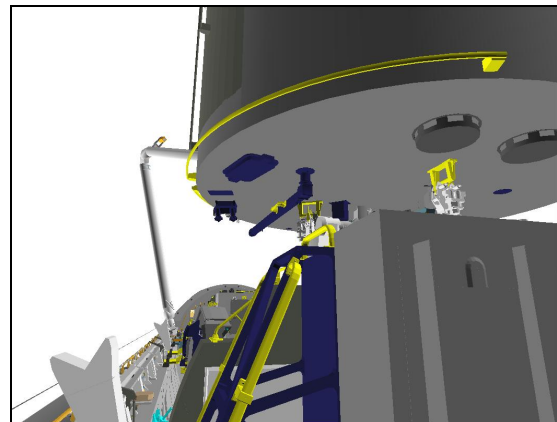
If reqd:

BRAKES – ON (tb-ON)

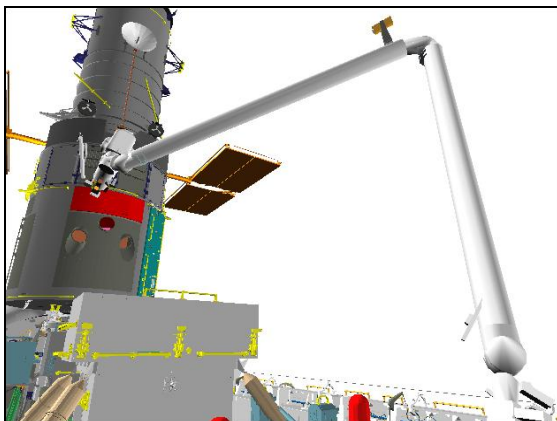
√MODE – not DIRECT



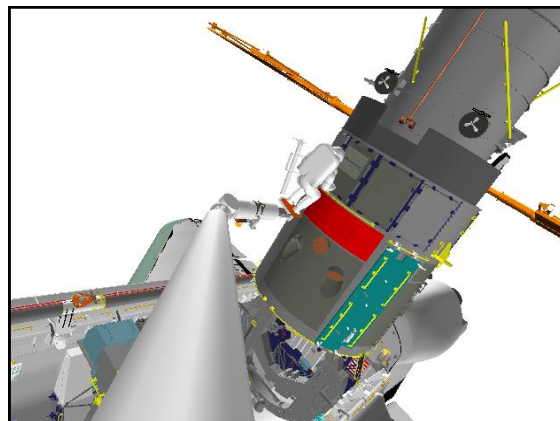
CCTV A (-5,30)



CCTV B (15,15)



CCTV D (35,20)



ELBOW (10,-5)

- RHC 3. BATTERY REMOVAL
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to BATTERY REMOVAL posn:

S: 90L B: 90R

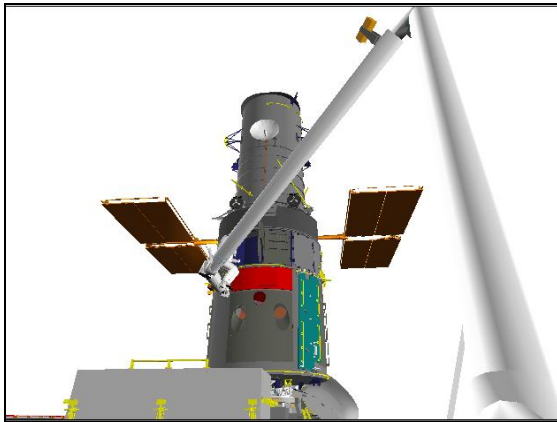
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1034	+25	-650	0	0	15	3
SY	SP	EP	WP	WY	WR	
-34.3	+72.3	-105.8	+33.4	+34.3	-164.5	

EV GCA to remove Bay 2 Battery:

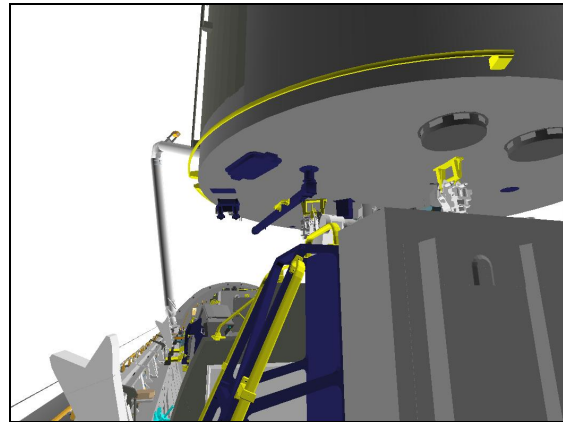
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1045	+8	-650	0	0	15	3
Actual Remove Posn							

If reqd:

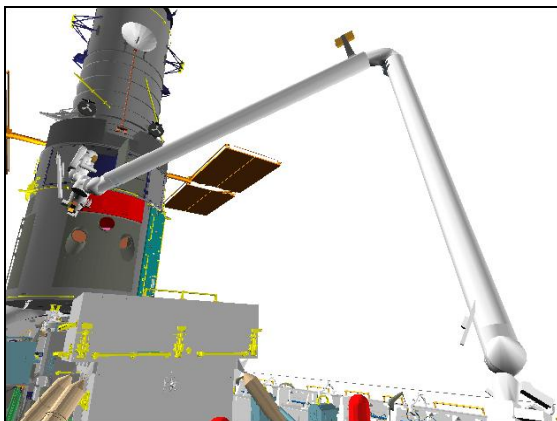
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT



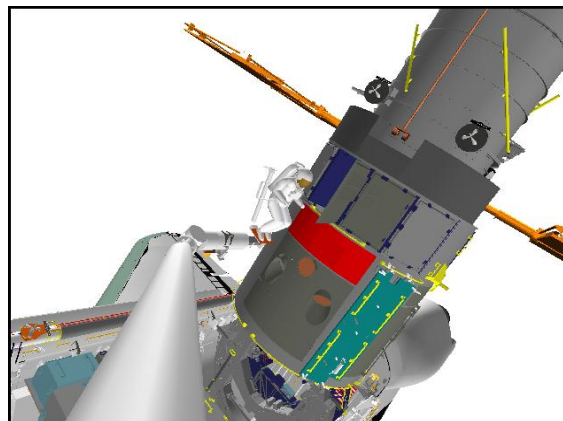
CCTV A (-5,30)



CCTV B (15,15)



CCTV D (35,20)



ELBOW (10,-5)

RHC

4. BATTERY HANDOFF AT SLIC
RATE – as reqd (VERN within 10 ft)
√BRAKES – OFF (tb-OFF)
√MODE – ORB LD, ENTER

Mnvr to BATTERY HANDOFF posn:

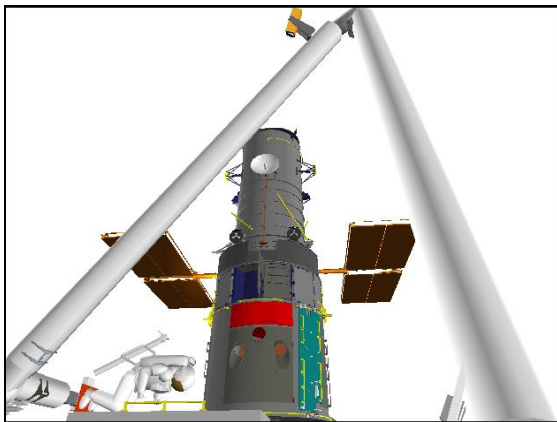
S: 90L B: 90R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-850	+26	-487	0	0	90	3
SY	SP	EP	WP	WY	WR	
-64.8	+69.2	-138.3	+69.1	+64.8	-89.5	

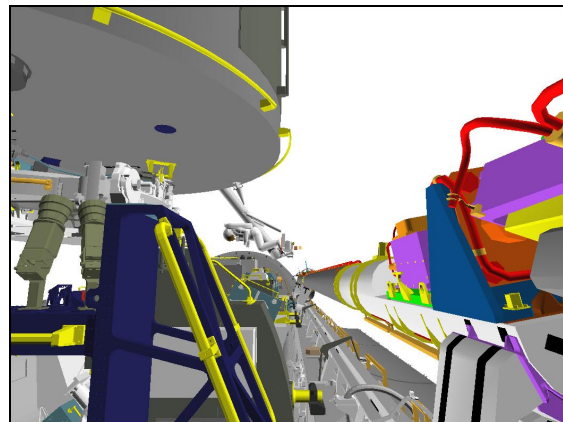
EV GCA to swap Bay 2 Battery with FF EV

If reqd:

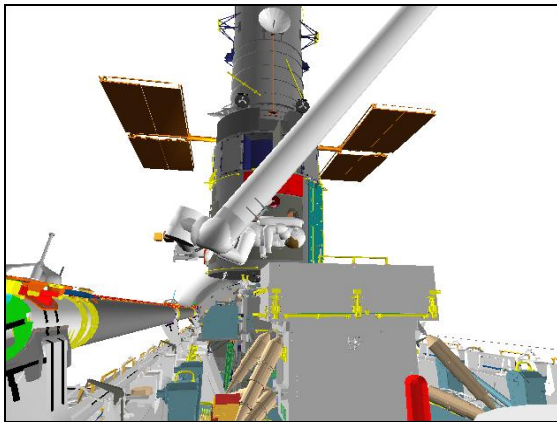
- BRAKES – ON (tb-ON)
√MODE – not DIRECT



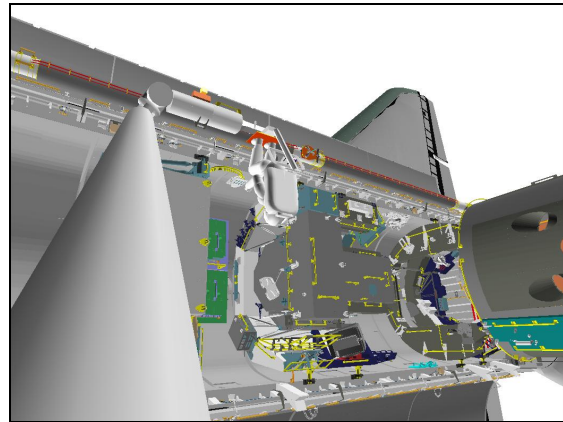
CCTV A (-5,35)



CCTV C (-5,10)



CCTV D (10,15)



ELBOW (20,-20)

- RHC
5. BATTERY-R INSTALL
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to BATTERY-R INSTALL posn:

S: 90L B: 90R

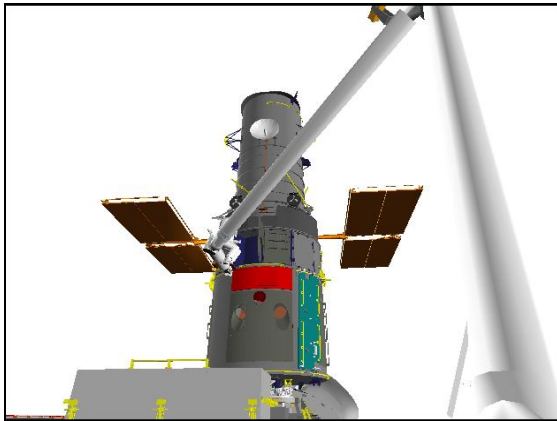
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1030	+25	-676	0	0	12	3
SY	SP	EP	WP	WY	WR	
-35.5	+75.2	-103.7	+28.4	+35.5	-167.5	

EV GCA to install Battery-R and close Bay 2 Door:

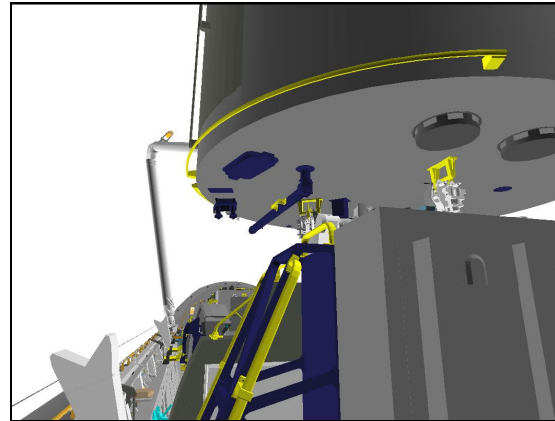
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Install	-1033	+11	-676	0	0	12	3
Close Door	-1038	+25	-671	0	0	12	

If reqd:

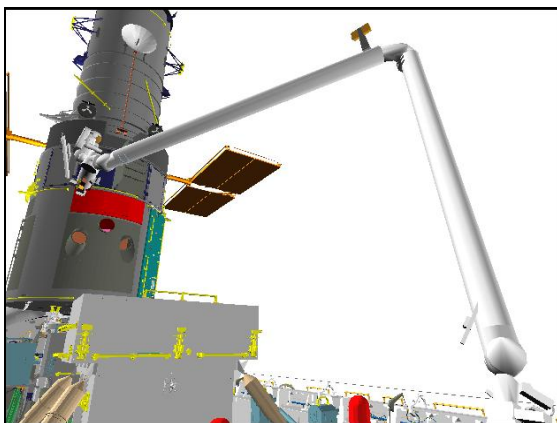
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT



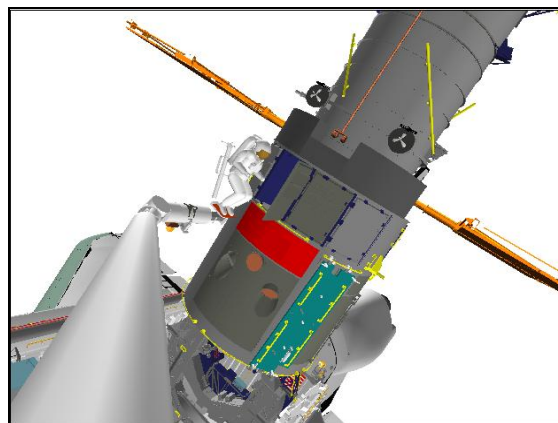
CCTV A (-5,30)



CCTV B (15,15)



CCTV D (35,20)



ELBOW (20,-5)

EVA 3 – COS, ACS PART 1 (-V2 FWD)

COS	FS 9-2
ACS PART 1	FS 9-11

COS

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 90°, -V2 fwd, FSS Pivot: 90°, SA Slew: 0°

RHC

2. -V2 AFT SHROUD DOORS

RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB LD, ENTER

Mnvr to -V2 AFT SHROUD DOORS SETUP posn: S: 180 B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1034	-1	-550	345	0	0	3
SY	SP	EP	WP	WY	WR	
-25.1	+71.7	-120.0	+32.1	+29.2	-172.0	

NOTE

If LOCKs installed during get ahead, start at top of -V2 door

EV GCA to open -V2 Aft Shroud Doors:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Bottom Bolt	-1034	-1	-533	345	0	0	3
Latch Bolt		-23					
Mid Bolt			-550				
Top Bolt	-1046		-592				
Handle Bolt		-7	-570				
Pip Pin		-16					

If reqd:

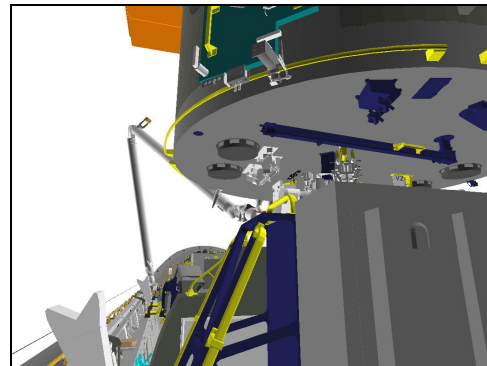
BRAKES – ON (tb-ON)

√MODE – not DIRECT (lt off)

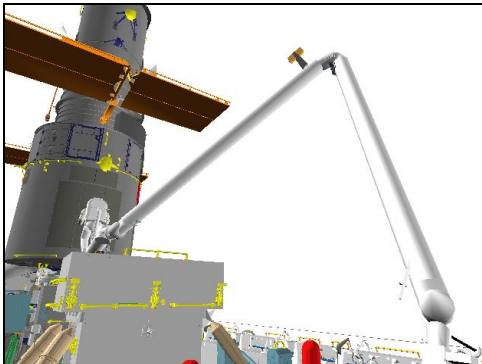
EVA 3



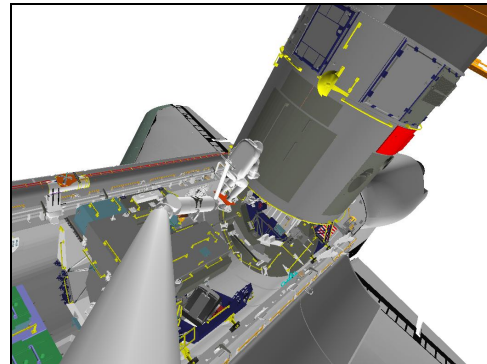
CCTV A (0,30)



CCTV B (15,15)



CCTV D (35,20)



ELBOW (15,0)

- RHC 3. COSTAR REMOVAL
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

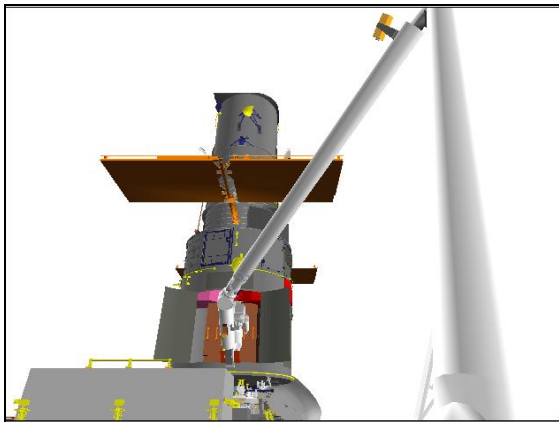
Mnvr to COSTAR REMOVAL SUPPORT SETUP posn: S: 180 B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1050	-15	-552	320	0	0	3
SY	SP	EP	WP	WY	WR	
-24.6	+78.0	-113.8	-9.1	+30.9	-157.6	

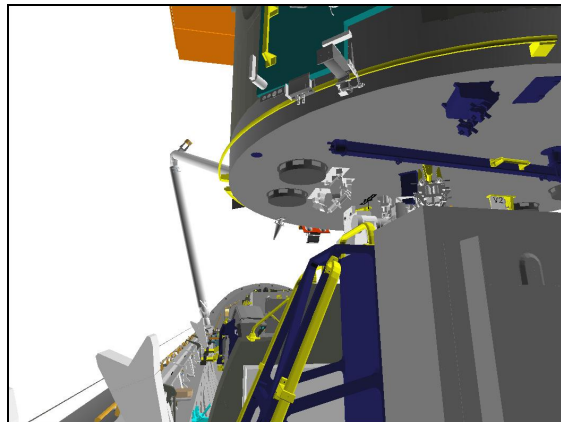
EV GCA to remove COSTAR:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Stabilize FF EV	-1068	-15	-552	320	0	0	3
COSTAR Removal	-1085	+6	-575	330			
Actual							

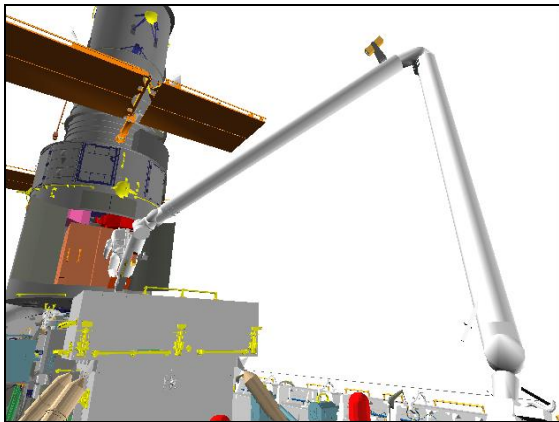
- If reqd:
 BRAKES – ON (tb-ON)
 √MODE – not DIRECT (lt off)



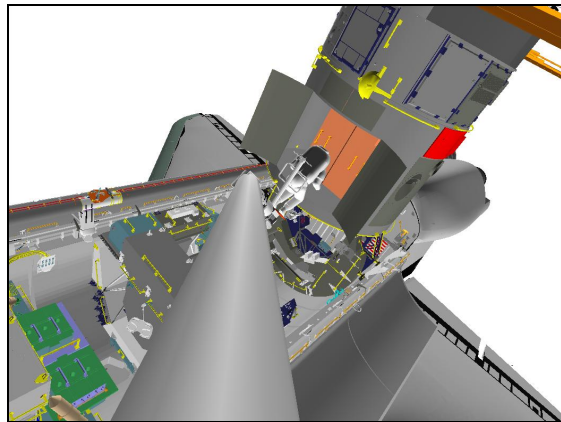
CCTV A (0,30)



CCTV B (10,15)



CCTV D (35,20)



ELBOW (5,-10)

- RHC 4. COSTAR TEMP STOW
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to COSTAR TEMP STOW SETUP posn: S: 180 B: 0

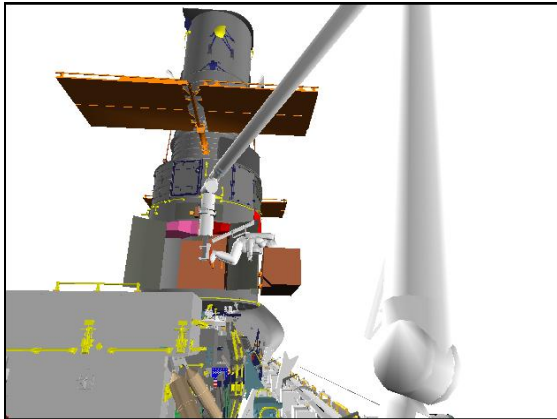
X	Y	Z	PITCH	YAW	ROLL	PL ID
-980	-83	-535	270	0	90	3
SY	SP	EP	WP	WY	WR	
-24.4	+75.0	-95.9	-77.5	+17.7	-44.3	

EV GCA to temp stow COSTAR on aft fixture:

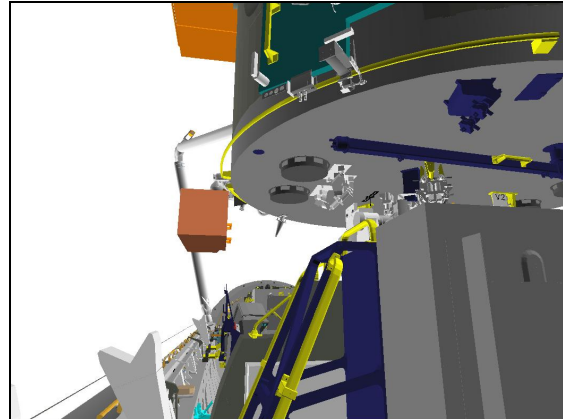
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Temp Stow	-1006	-83	-483	270	0	90	3
Actual							

If reqd:

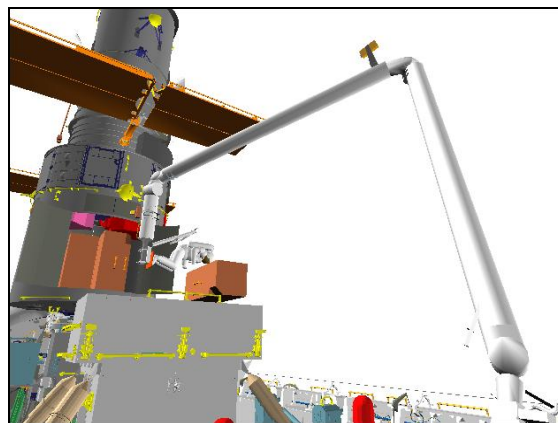
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT (lt off)



CCTV A (5,20)



CCTV B (10,15)



CCTV D (35,20)

5. COS RETRIEVAL
 RHC RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to COS RETRIEVAL SETUP posn: S: 180 B: 0

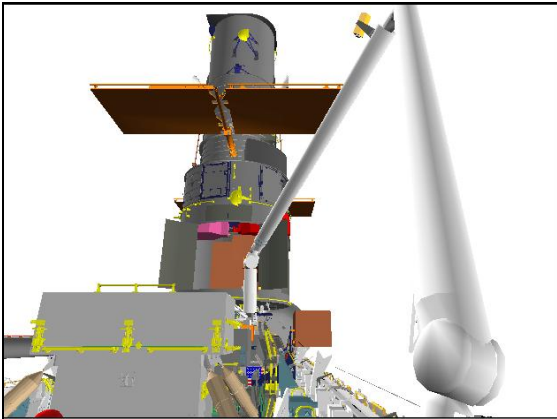
X	Y	Z	PITCH	YAW	ROLL	PL ID
-976	-6	-452	278	0	211	3
SY	SP	EP	WP	WY	WR	
-16.1	+64.9	-97.4	-54.9	+20.8	+65.3	

EV GCA to retrieve COS at ASIPE:

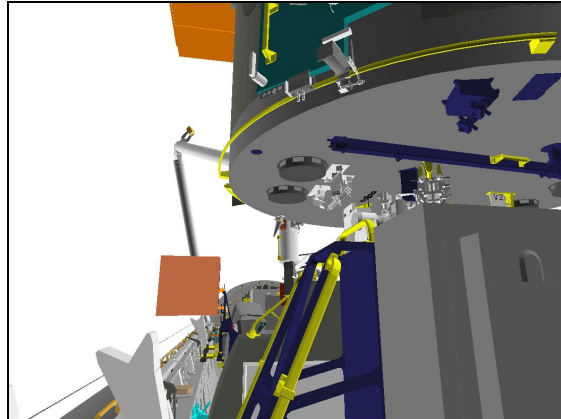
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
ASIPE A Latch	-976	-6	-440	270	0	211	3
ASIPE B Latch	-989		-444			220	
Actual Retrieve							

If reqd:

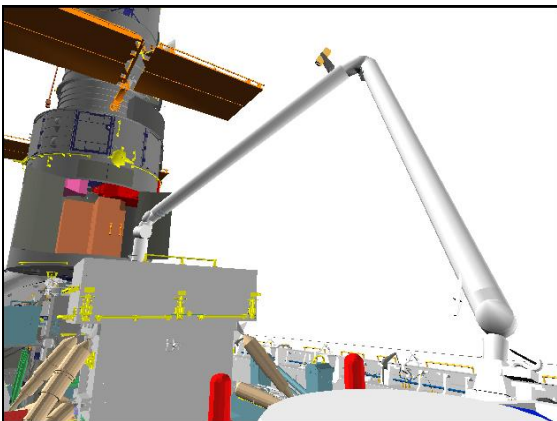
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT (lt off)



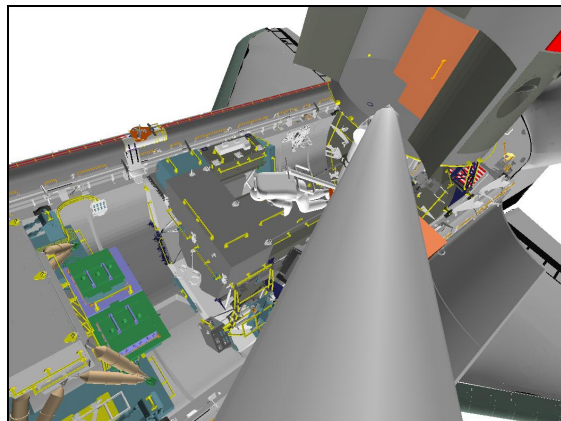
CCTV A (0,20)



CCTV B (10,15)



CCTV D (35,15)



ELBOW (-15,-20)

- RHC 6. COS INSTALL
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to COS INSTALL SETUP posn: S: 180 B: 0

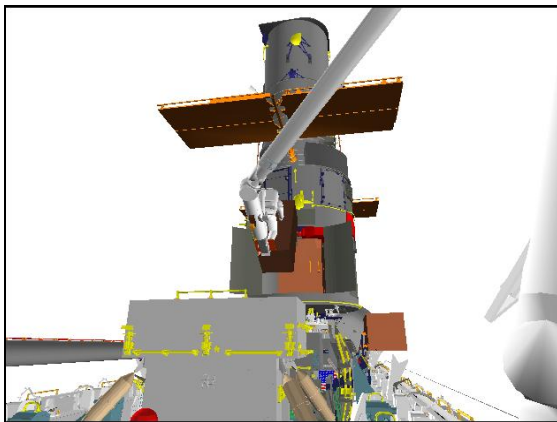
X	Y	Z	PITCH	YAW	ROLL	PL ID
-980	+11	-593	330	0	0	3
SY	SP	EP	WP	WY	WR	
-37.7	+89.1	-123.4	-4.6	+41.4	-154.1	

EV GCA to install COS:

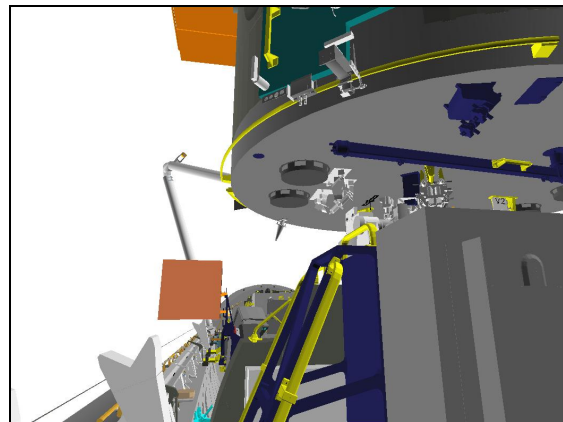
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Install	-1084	+11	-585	330	0	0	3
A-latch	-1089		-590	340			
FF Connector Assist	-1061	-7		300			

If reqd:

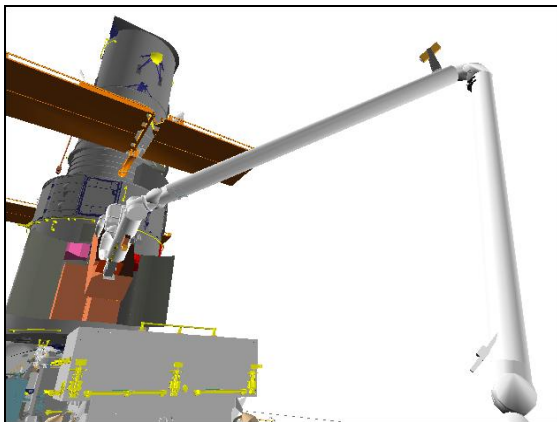
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT (lt off)



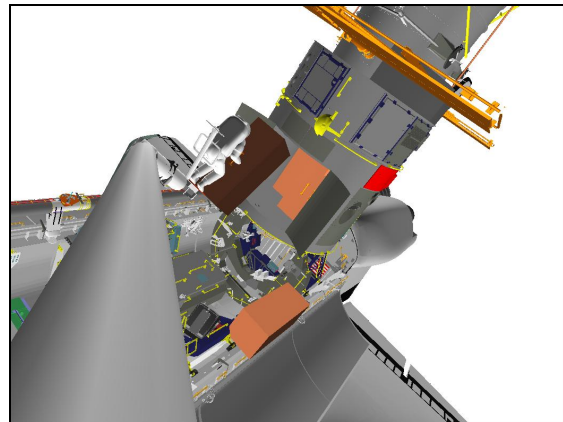
CCTV A (-10,20)



CCTV B (10,15)



CCTV D (35,25)



ELBOW (20,-15)

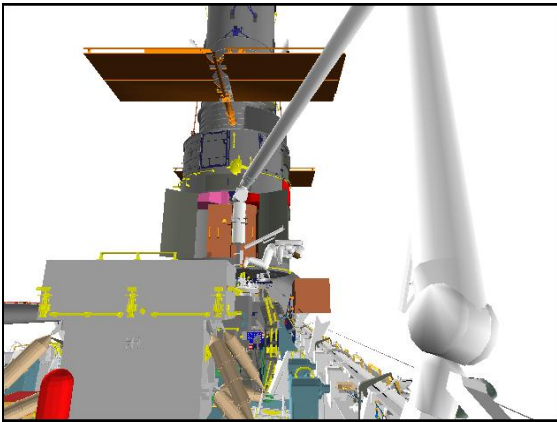
- RHC
7. COSTAR RETRIEVAL
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to COSTAR RETRIEVAL SETUP posn: S: 180 B: 0

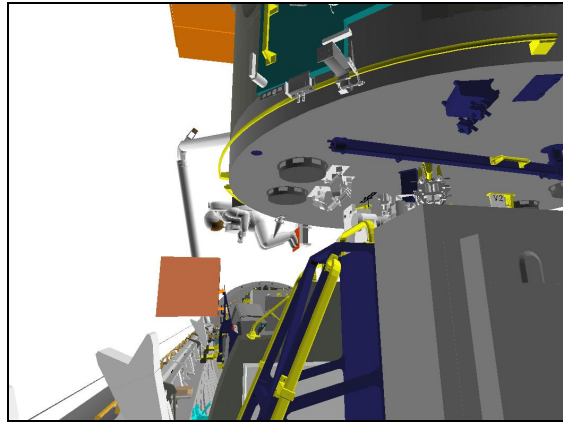
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1015	-83	-500	270	0	88	3
SY	SP	EP	WP	WY	WR	
-20.5	+66.8	-92.2	-71.7	+18.2	-50.4	

EV GCA to retrieve COSTAR from Aft Fixture

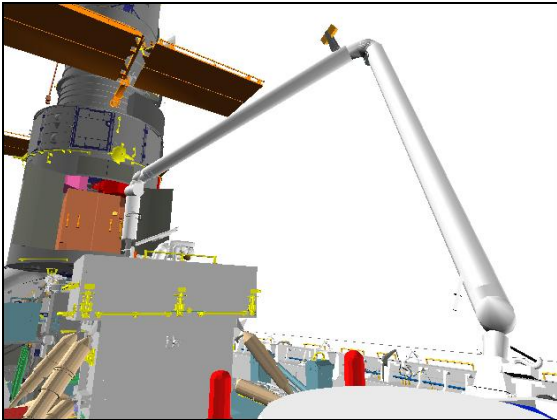
- If reqd:
 BRAKES – ON (tb-ON)
 √MODE – not DIRECT (lt off)



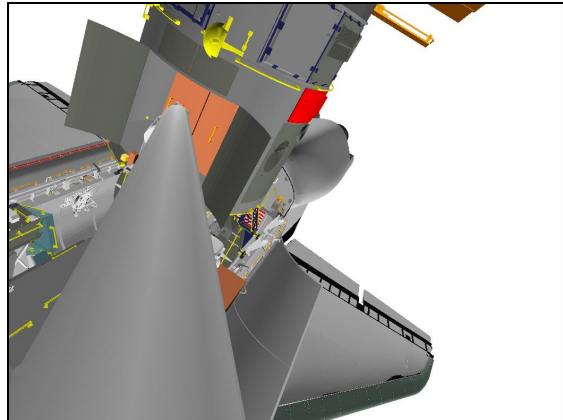
CCTV A (0,15)



CCTV B (10,15)



CCTV D (35,15)



ELBOW (15,-20)

8. COSTAR STOW
 RHC RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to COSTAR STOW SETUP posn: S: 180 B: 0

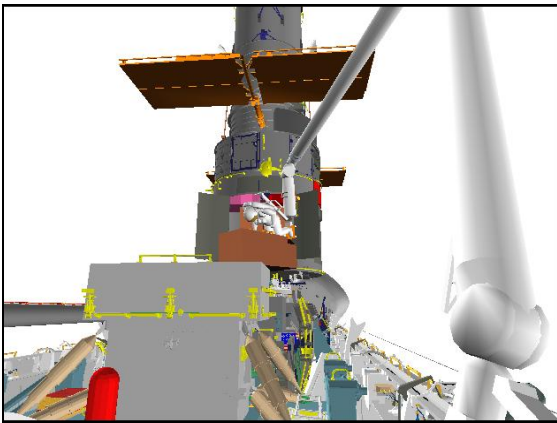
X	Y	Z	PITCH	YAW	ROLL	PL ID
-975	-12	-535	270	3	215	3
SY	SP	EP	WP	WY	WR	
-19.0	+68.1	-85.0	-80.8	+21.2	+75.4	

EV GCA to stow COSTAR in ASIPE:

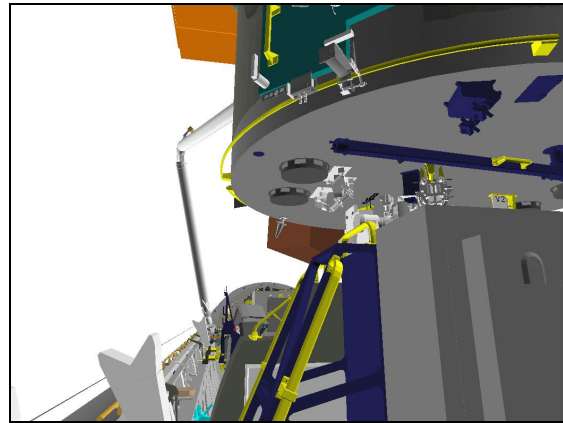
Expected: COSTAR Stow	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-982	-11	-437	270	0	205	3

If reqd:

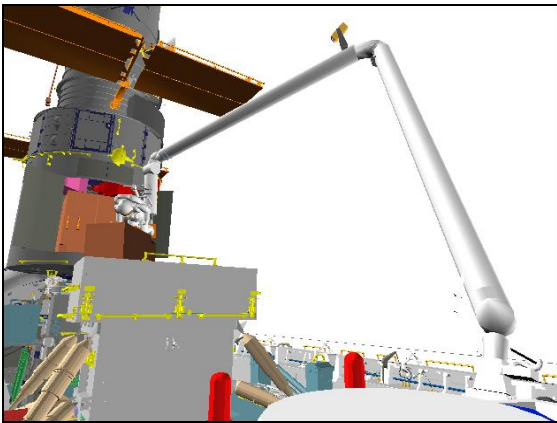
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT (lt off)



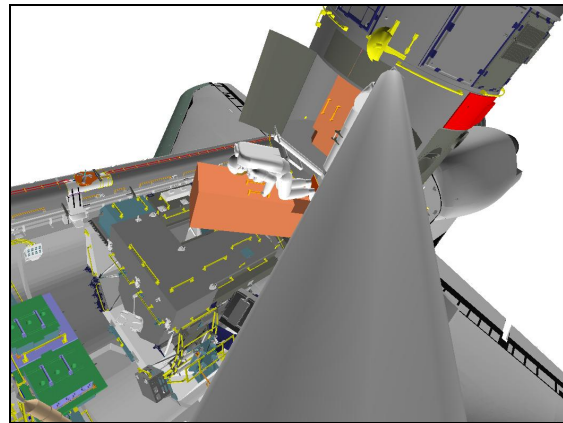
CCTV A (-5,15)



CCTV B (10,15)



CCTV D (35,15)



ELBOW (-15,-25)

9. MFR SWAP

RHC

RATE – as reqd (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to MFR EGRESS posn:

S: 180 B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-930	0	-555	345	0	0	3
SY	SP	EP	WP	WY	WR	
-38.2	+89.6	-140.8	+32.1	+41.7	-167.1	

EV GCA to MFR EGRESS posn:

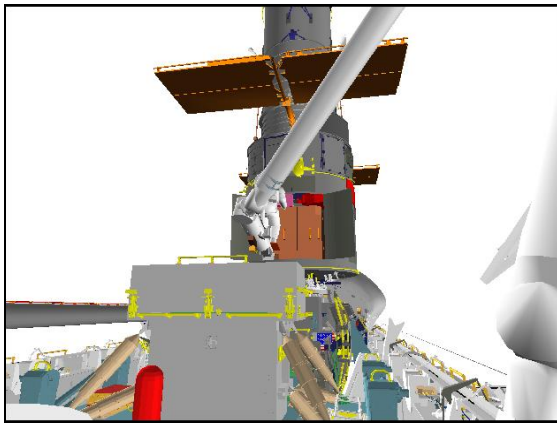
Expected:
MFR Swap

X	Y	Z	PITCH	YAW	ROLL	PL ID
-930	0	-550	345	0	0	3

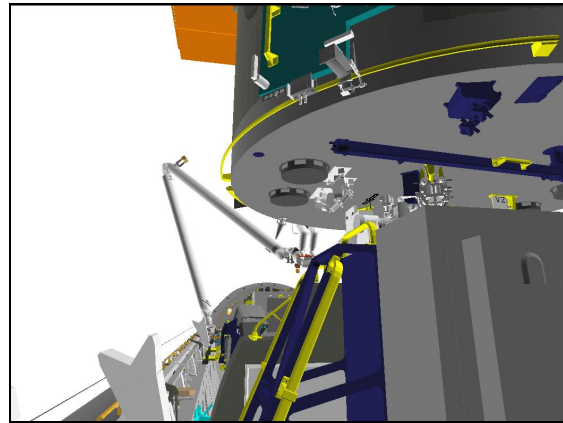
If reqd:

BRAKES – ON (tb-ON)

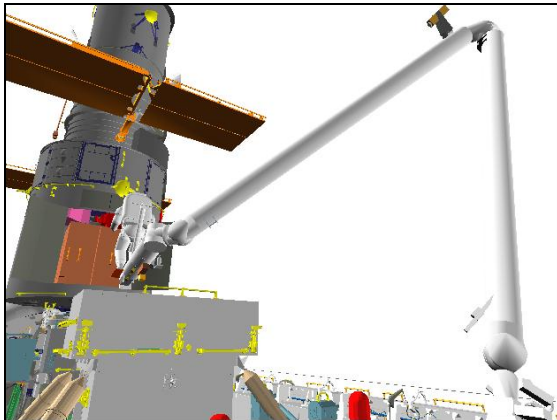
√MODE – not DIRECT (lt off)



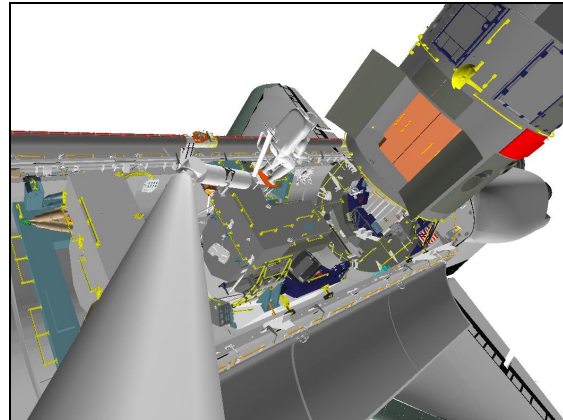
CCTV A (-10,15)



CCTV B (10,15)



CCTV D (35,20)



ELBOW (15,-10)

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ACS PART 1

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 90°, -V2 fwd, FSS Pivot: 90°, SA Slew: 0°

2. ACS REPAIR

RHC

RATE – as reqd (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to AFT SHROUD SETUP posn:

S: 0 B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-976	-25	-600	345	10	0	3
SY	SP	EP	WP	WY	WR	
-32.1	+90.1	-128.5	+23.3	+45.8	-171.2	

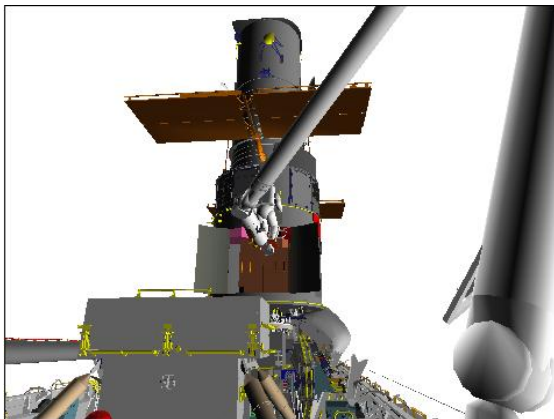
EV GCA into aft shroud and assist FF EV:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Aft Shroud	-1017	-25	-600	345	10	0	3

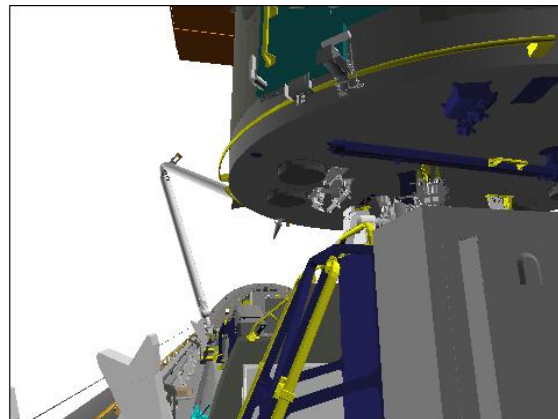
If reqd:

BRAKES – ON (tb-ON)

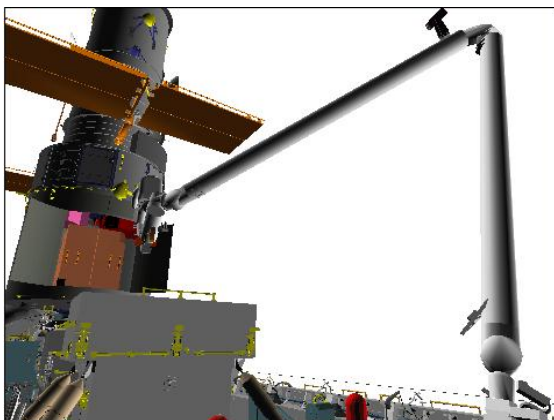
√MODE – not DIRECT



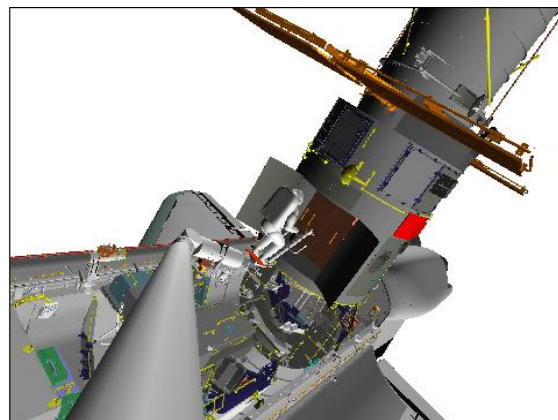
CCTV A (-5,20)



CCTV B (10,15)



CCTV D (35,20)



ELBOW (15,0)

3. GET-AHEAD – LOPE ACCESS

NOTE

If continuing with ACS task run this step,
otherwise go to step 4, door close

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

Mnvr to LOPE ACCESS posn:

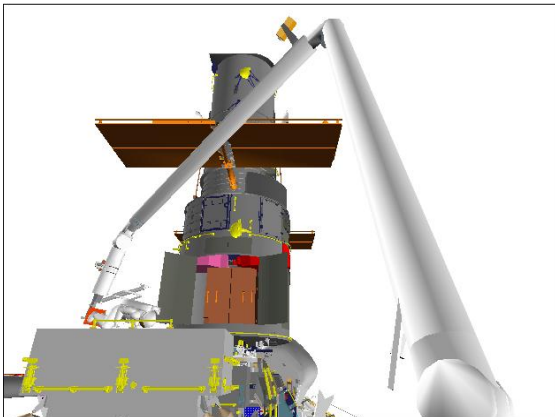
S: 180 B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-949	+62	-491	275	345	110	3
SY	SP	EP	WP	WY	WR	
-40.2	+60.9	-91.7	-58.4	+6.5	-11.3	

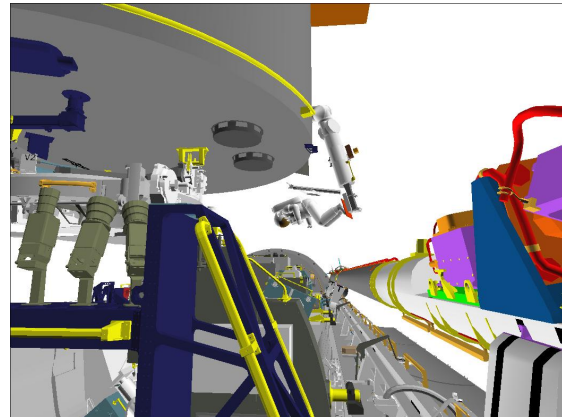
EV GCA to retrieve LVPS and CEB-R from LOPE

Return to Aft Shroud (step 2) for handoff and FF assist

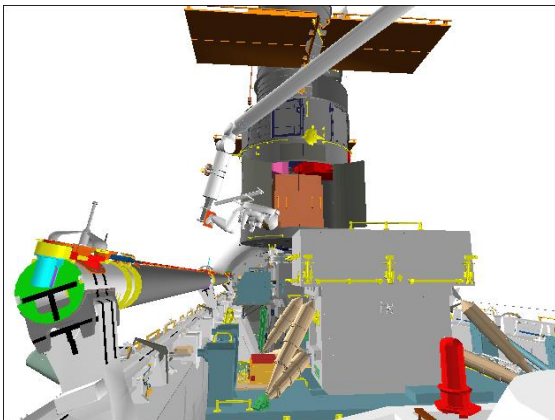
If reqd:
BRAKES – ON (tb-ON)



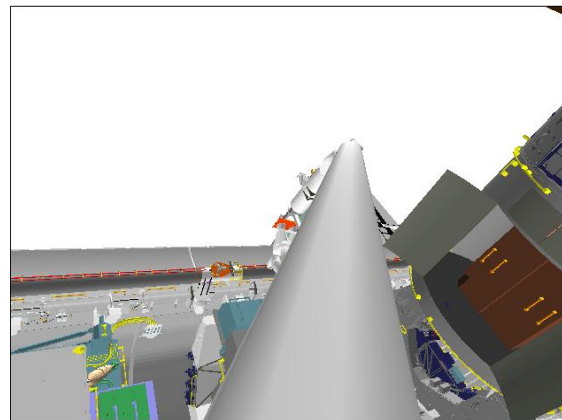
CCTV A (0,25)



CCTV C (-5,10)



CCTV D (5,10)



ELBOW (-10,-15)

- RHC 4. CLOSE -V2 DOORS
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

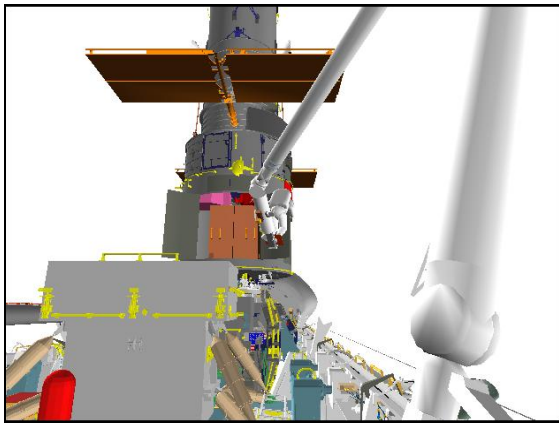
Mnvr to CLOSE -V2 DOORS SETUP posn: S: 135L B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1037	-73	-569	323	10	13	3
SY	SP	EP	WP	WY	WR	
-20.6	+84.7	-117.0	-7.2	+38.0	-149.7	

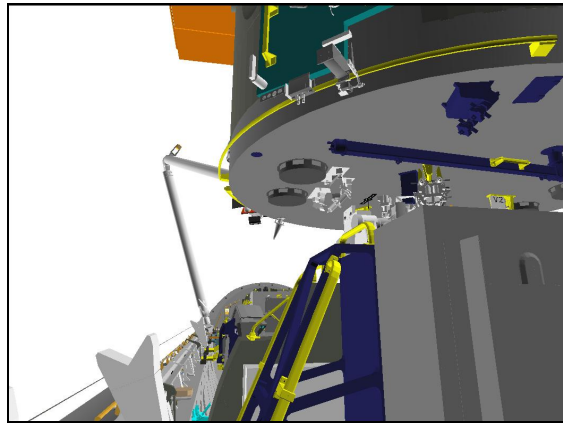
EV GCA to close -V2 doors:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Rt Door	-1060	-73	-569	323	10	13	3
Handle Bolt	-1046	-7	-570	345	0	0	
Pip Pin		-16					
Top Bolt		-23	-592				
Mid Bolt	-1034		-550				
Latch Bolt			-533				

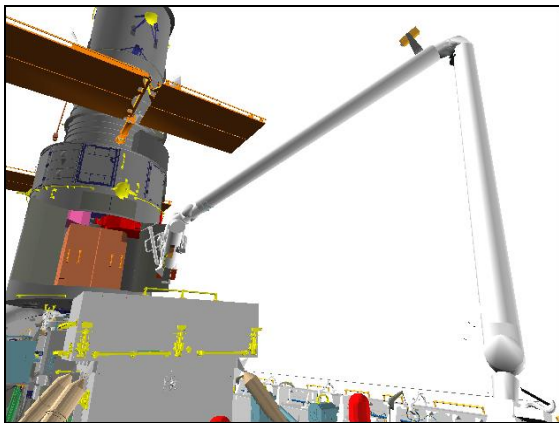
- If reqd:
 BRAKES – ON (tb-ON)
 √MODE – not DIRECT



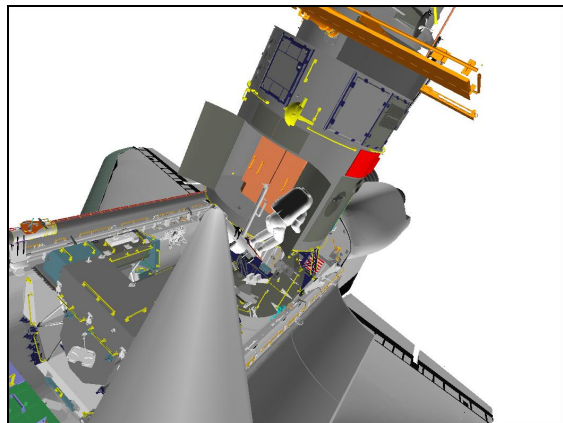
CCTV A (0,15)



CCTV B (10,15)



CCTV D (35,20)



ELBOW (10,-5)

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EVA 4 – STIS, NOBLs (+V2 FWD)

STIS FS 10-2
NOBL 8 FS 10-11

STIS

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 270°, +V2 fwd, FSS Pivot: 90°, SA Slew: 0°

2. FCP RECEIVE POSN

RATE – as required (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB LD, ENTER

Mnvr to FCP RECEIVE posn:

S: 135R B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1005	+62	-515	270	0	0	3
SY	SP	EP	WP	WY	WR	
-38.3	+68.6	-98.0	-73.0	+15.2	-120.1	

EV GCA to receive FCP from FF EV

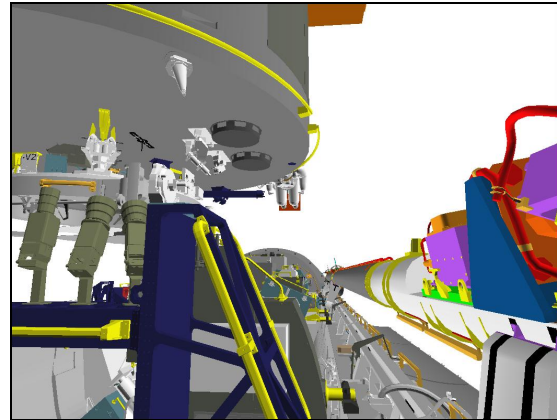
If reqd:

BRAKES – ON (tb-ON)

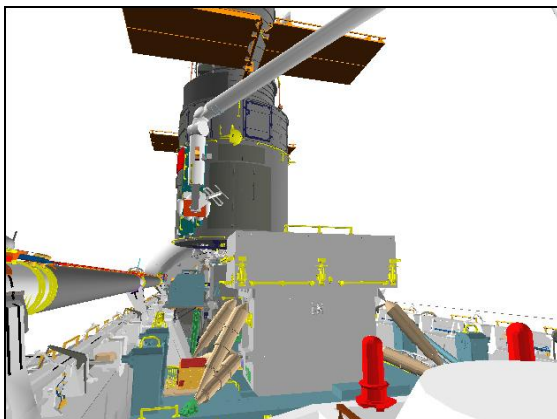
√MODE – not DIRECT



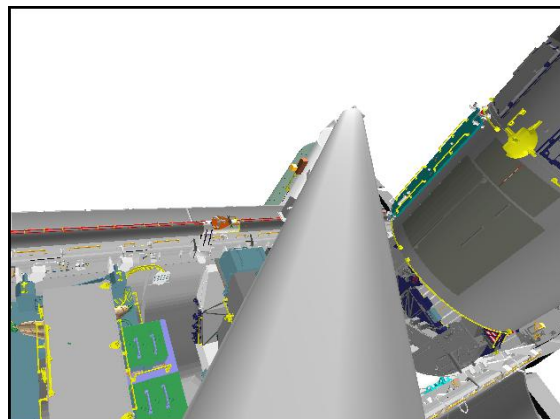
CCTV A (-5,30)



CCTV C (-5,10)



CCTV D (15,10)



ELBOW (-10,-20)

EVA 4

3. +V2 AFT SHROUD DOORS
 RATE – as required (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

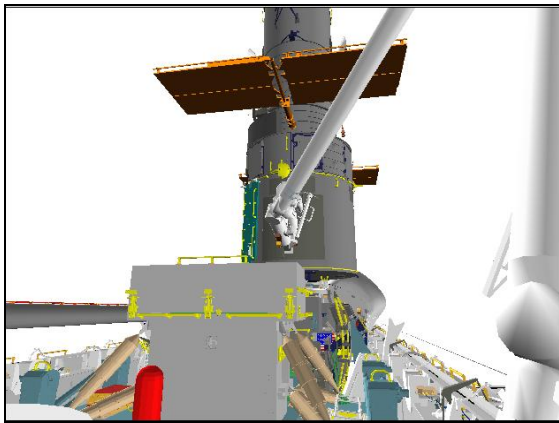
Mnvr to +V2 AFT SHROUD DOORS posn: S: 135R B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1007	-6	-573	345	0	0	3
SY	SP	EP	WP	WY	WR	
-28.1	+80.3	-124.6	+27.6	+32.0	-171.0	

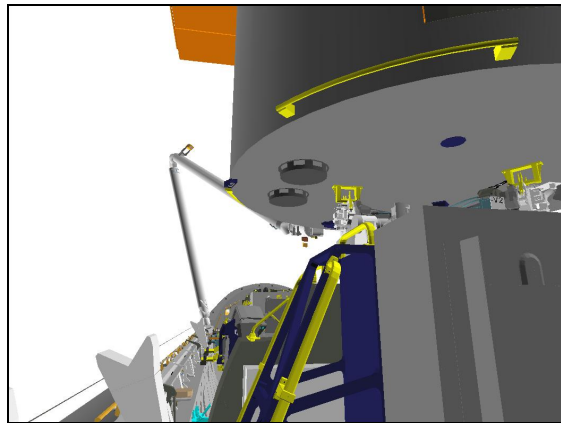
EV GCA to open +V2 Aft Shroud Doors:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
ASLR Bolt	-1051	+25	-531	345	0	0	3
ASLR Latch	-1045	-10	-534				
Lower Middle	-1037	-36	-557				
Top Bolt			-608				
Handle Bolt		+17	-574				
PFR Handoff	-1031		-528	315			

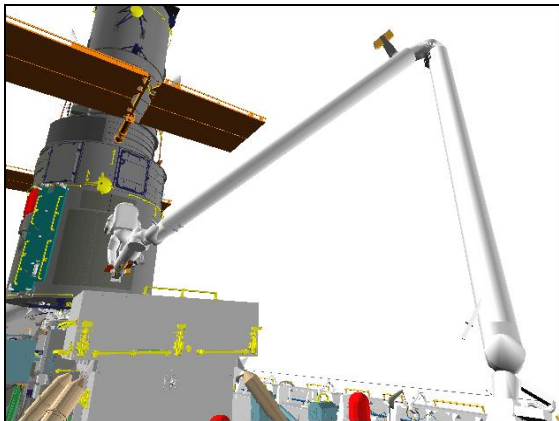
- If reqd:
 BRAKES – ON (tb-ON)
 √MODE – not DIRECT



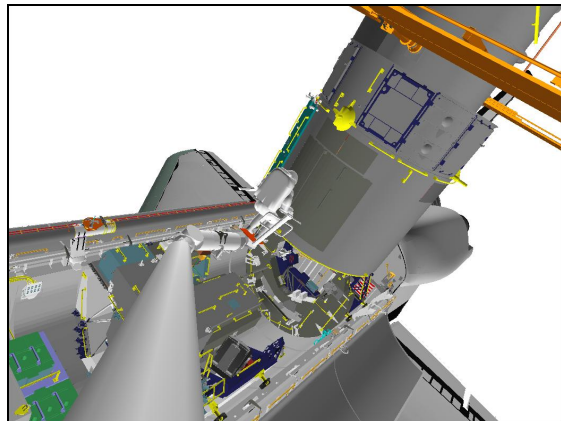
CCTV A (-10,15)



CCTV B (10,15)



CCTV D (35,20)



ELBOW (15,0)

4. MEB COVER REMOVAL

NOTE

Monitor FCP clearance to upper edge of telescope opening

- RATE – as required (VERN within 10 ft)
- √BRAKES – OFF (tb-OFF)
- √MODE – ORB LD, ENTER

Mnvr to TOOL CONFIG & SUPPORT posn:

S: 135R B: 0

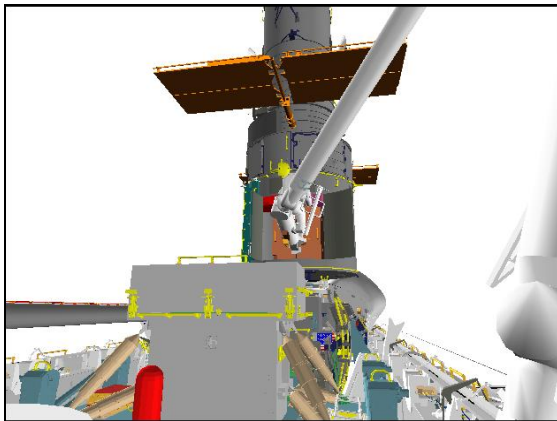
X	Y	Z	PITCH	YAW	ROLL	PL ID
-966	-20	-566	345	0	0	3
SY	SP	EP	WP	WY	WR	
-29.5	+88.9	-135.0	+29.2	+33.4	-170.6	

EV GCA to assist FF EV with MEB Cover Removal:

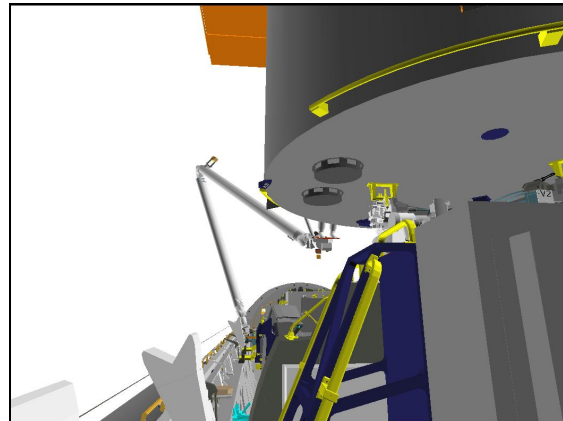
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
FF Support	-1012	-5	-597	345	0	0	3
Solo Support	-1063	+20	-590				

If reqd:

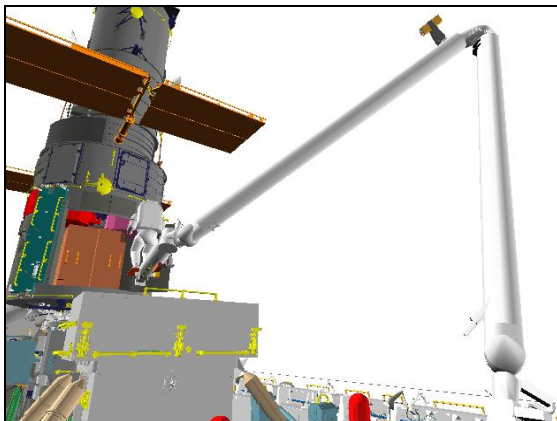
- BRAKES – ON (tb-ON)
- √MODE – not DIRECT



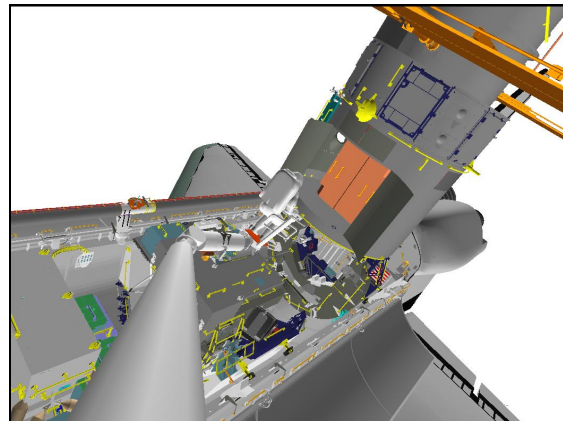
CCTV A (-10,15)



CCTV B (5,15)



CCTV D (35,20)



ELBOW (15,0)

5. CLEAR AFT SHROUD

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to CLEAR AFT SHROUD posn:

S: 45R B: 0

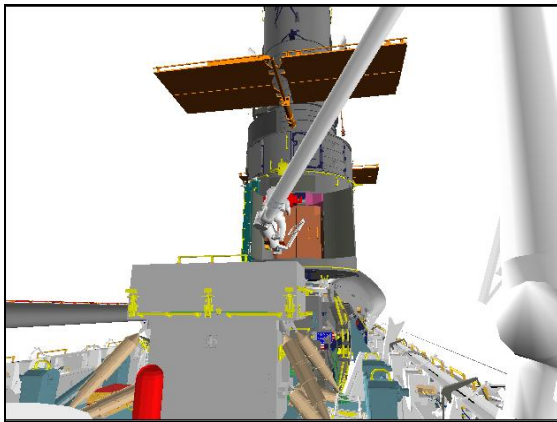
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1034	+12	-576	347	0	0	3
SY	SP	EP	WP	WY	WR	
-28.4	+72.9	-116.8	+29.5	+31.9	-172.2	

RMS EV GCA to clear RMS of Aft Shroud

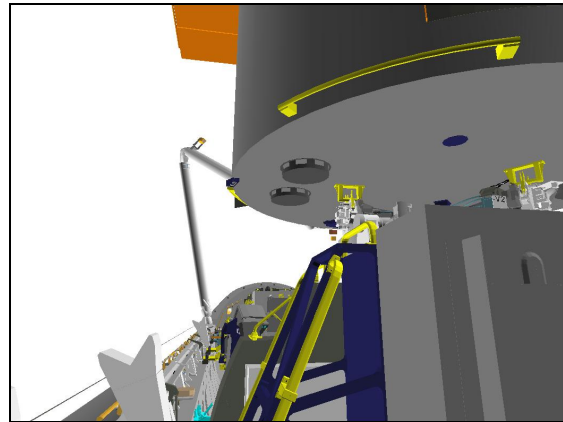
If reqd:

BRAKES – ON (tb-ON)

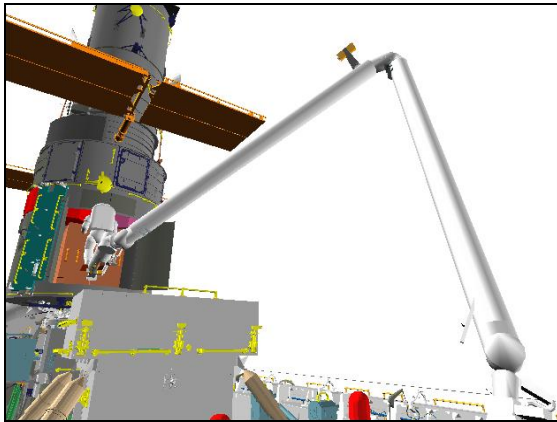
√MODE – not DIRECT



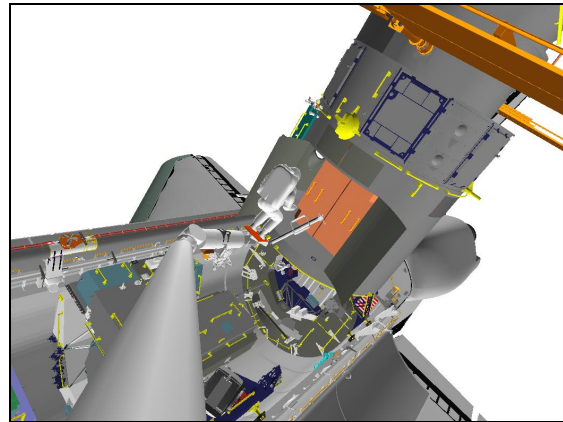
CCTV A (-10,15)



CCTV B (10,15)



CCTV D (35,20)



ELBOW (15,0)

6. MNVR TO FCP STOW
 RATE – as required (VERN within 10 ft)
 ✓BRAKES – OFF (tb-OFF)
 ✓MODE – ORB LD, ENTER

NOTE

RMS EV can assist with clearance from MFR to HST door

Mnvr to FCP STOW posn:

S: 135R B: 60L

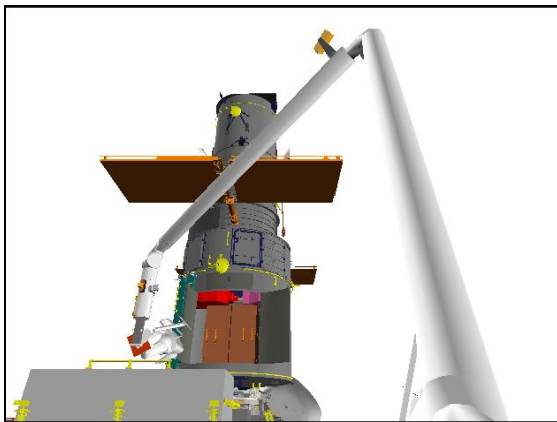
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1005	+62	-515	270	0	0	3
SY	SP	EP	WP	WY	WR	
-38.3	+68.6	-98.0	-73.0	+15.2	-120.1	

EV GCA to stow FCP/MEB Cover in enclosure:

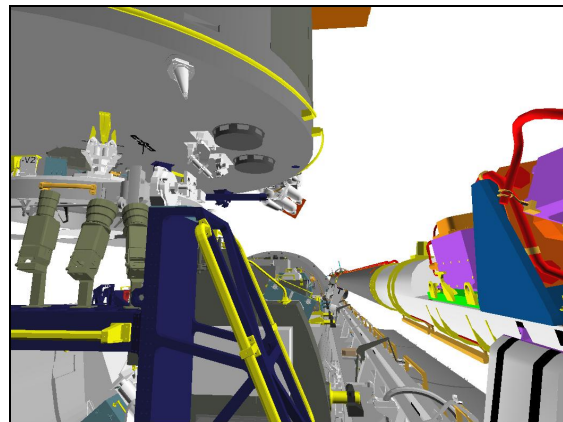
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Stowed	-1005	+62	-500	256	0	0	3

If reqd:

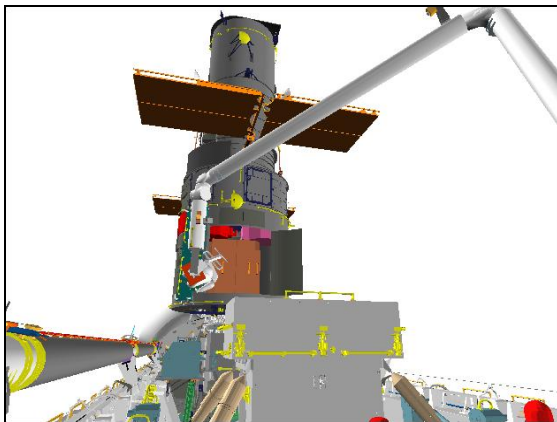
- BRAKES – ON (tb-ON)
 ✓MODE – not DIRECT



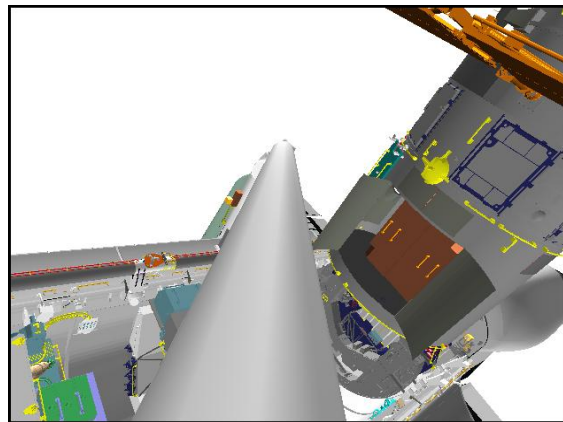
CCTV A (0,30)



CCTV C (-5,10)



CCTV D (15,20)



ELBOW (0,-15)

7. RETURN TO STIS AFT SHROUD

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to STIS AFT SHROUD posn:

S: 135R B: 0

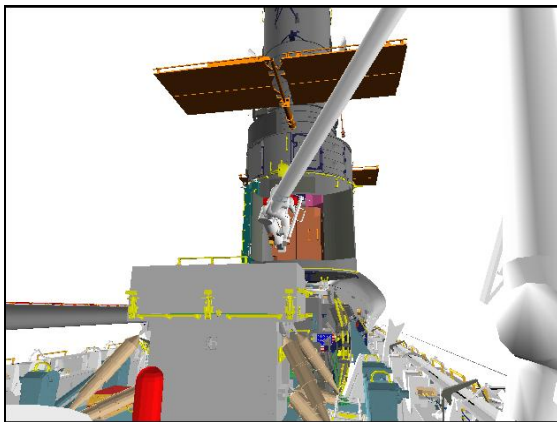
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1035	+7	-580	345	0	0	3
SY	SP	EP	WP	WY	WR	
-28.0	+74.6	-116.7	+25.4	+32.0	-171.1	

EV GCA for FF EV support

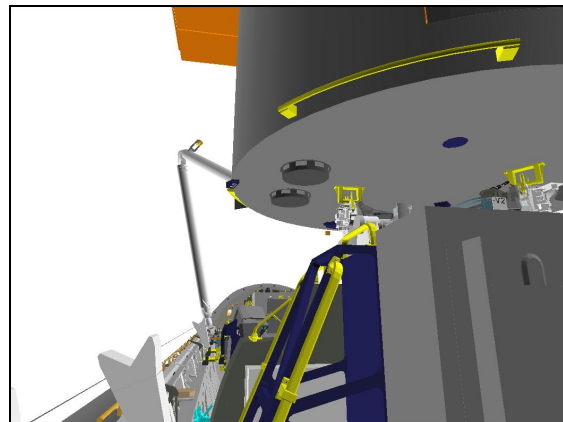
If reqd:

BRAKES – ON (tb-ON)

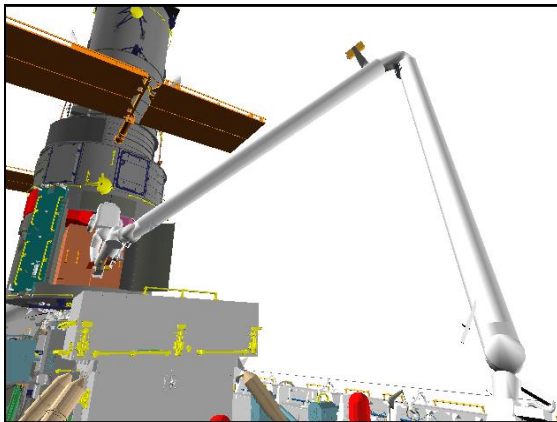
√MODE – not DIRECT



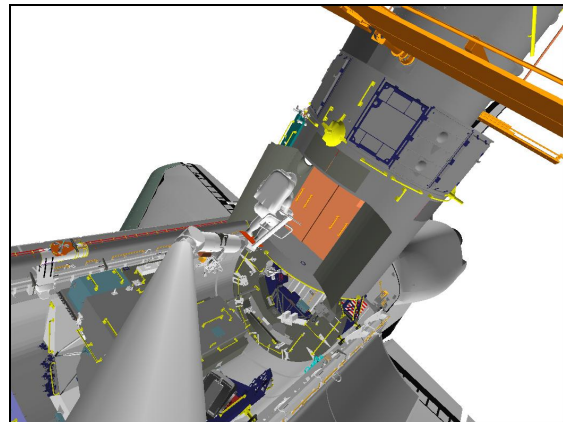
CCTV A (-10,15)



CCTV B (10,15)



CCTV D (35,20)



ELBOW (15,0)

8. MNVR TO MEB-R COVER HANDOFF
 RATE – as required (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

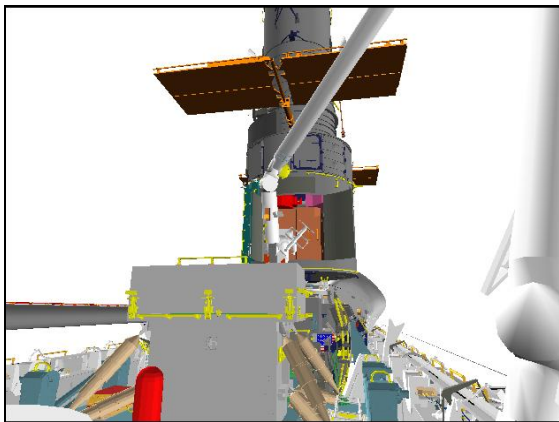
Mnvr to MEB-R COVER RETRIEVAL (ASIPE LID) posn: S: 135R B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1000	0	-513	290	0	0	3
SY	SP	EP	WP	WY	WR	
-30.9	+81.9	-116.3	-47.1	+26.4	-134.6	

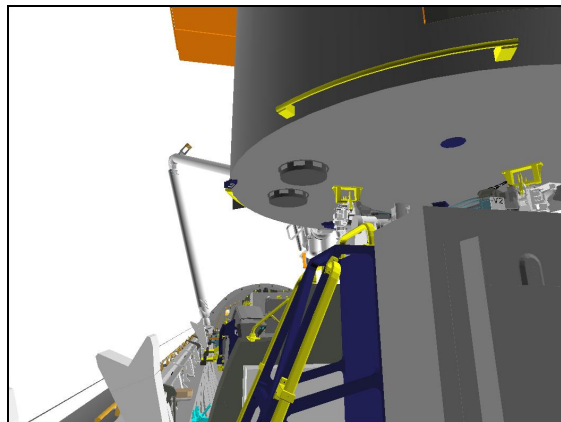
EV GCA to receive MEB-R Cover from FF EV

If reqd:

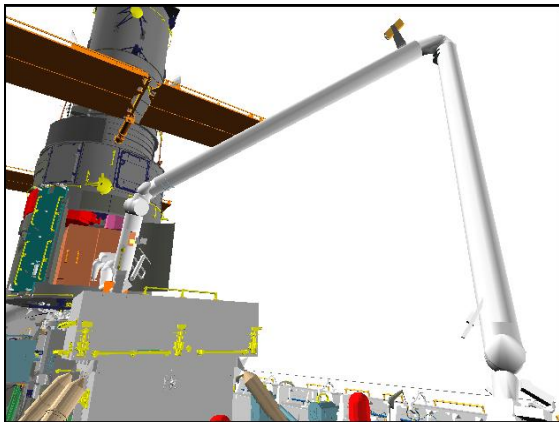
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT



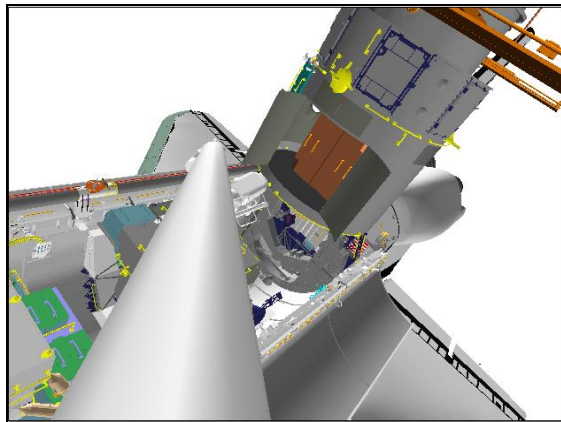
CCTV A (-10,15)



CCTV B (10,15)



CCTV D (35,20)



ELBOW (10,-15)

9. RETURN TO AFT SHROUD

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to AFT SHROUD posn:

S: 135R B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1035	+7	-580	345	0	0	3
SY	SP	EP	WP	WY	WR	
-28.0	+74.6	-116.7	+25.4	+32.0	-171.1	

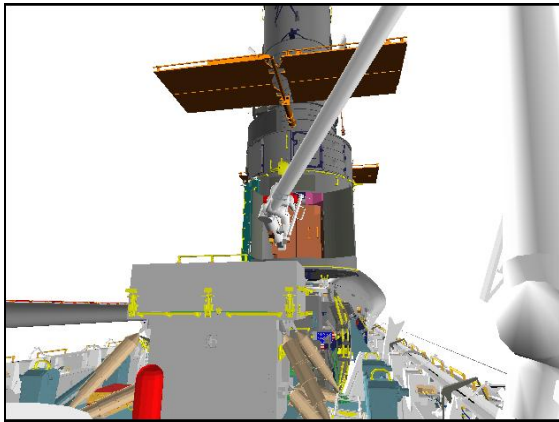
EV GCA to transfer MEB-R Cover to FF EV and clear Aft Shroud:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Clear of aft shroud	-1023	+7	-580	345	0	0	3
MEB-R Cover Handoff	-1048	+5	-576				

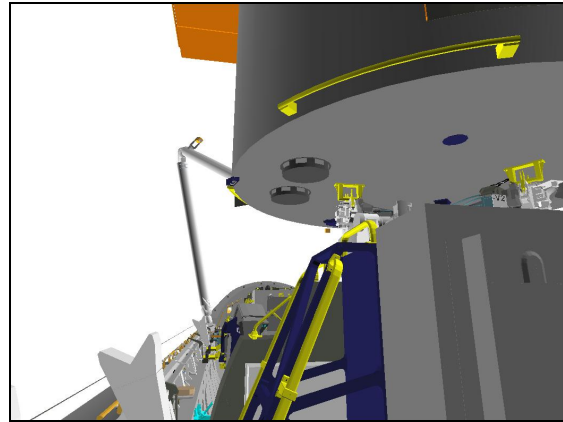
If reqd:

BRAKES – ON (tb-ON)

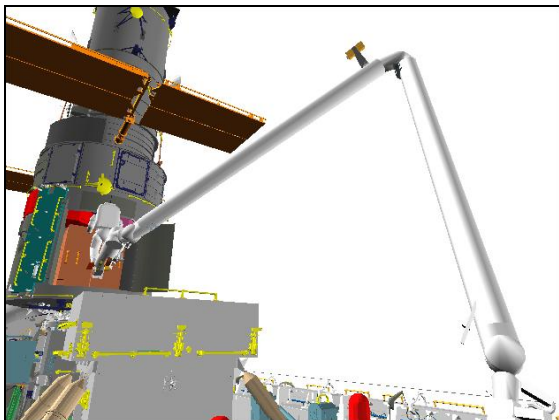
√MODE – not DIRECT



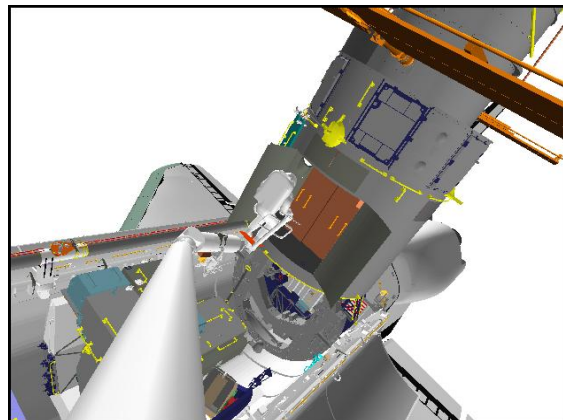
CCTV A (-10,15)



CCTV B (10,15)



CCTV D (35,20)



ELBOW (15,0)

10. CLOSE +V2 DOORS

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to +V2 AFT SHROUD DOORS posn:

S: 135L B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1010	+6	-557	346	0	0	3
SY	SP	EP	WP	WY	WR	
-28.7	+75.2	-124.2	+33.3	+32.5	-171.5	

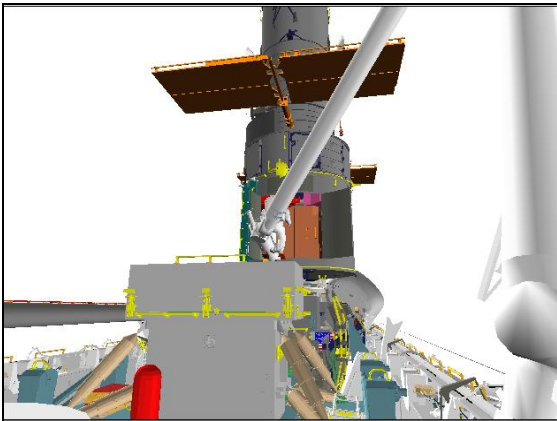
EV GCA to close Right Door then Left Door and Bolt:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Doors Close	-1036	-15	-575	346	0	0	3
Handle Engage	-1045	+25	-577				
Handle Bolt		-36	-608				
Top Bolt			-557				
Lower Middle ASLR PIP Pin		-10	-534				
ASLR Bolt		+25	-531				

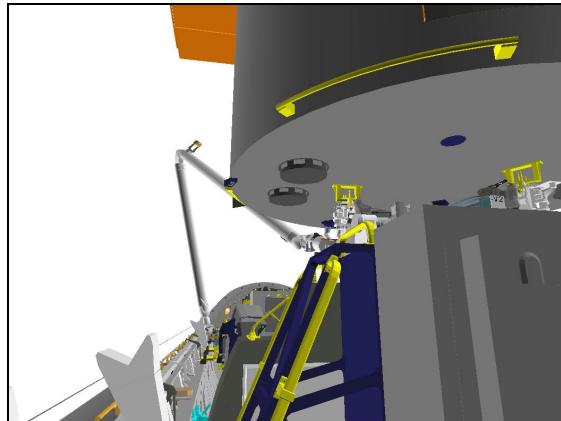
If reqd:

BRAKES – ON (tb-ON)

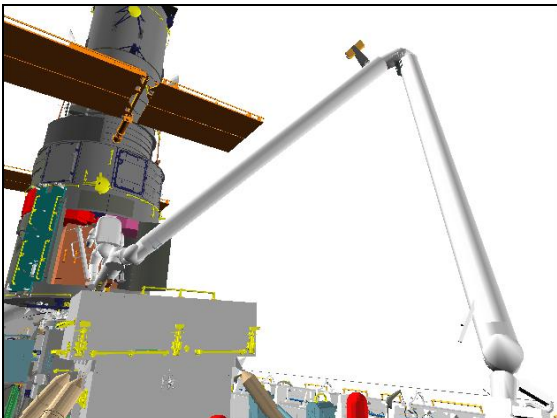
√MODE – not DIRECT



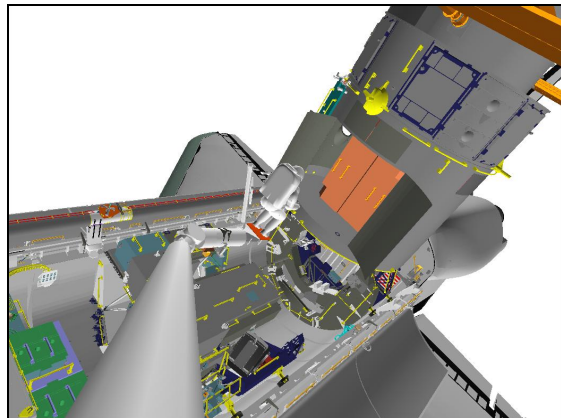
CCTV A (-10,15)



CCTV B (10,15)



CCTV D (35,20)



ELBOW (15,0)

NOBL 8

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 270°, +V2 fwd, FSS Pivot: 90°, SA Slew: 0°

2. RETRIEVE NOBL AT MULE

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to MINC NOBL RETRIEVE posn:

S: 180 B: 90L

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1248	-100	-510	353	0	315	3
SY	SP	EP	WP	WY	WR	
+2.5	+35.4	-57.0	+14.9	-0.2	-224.6	

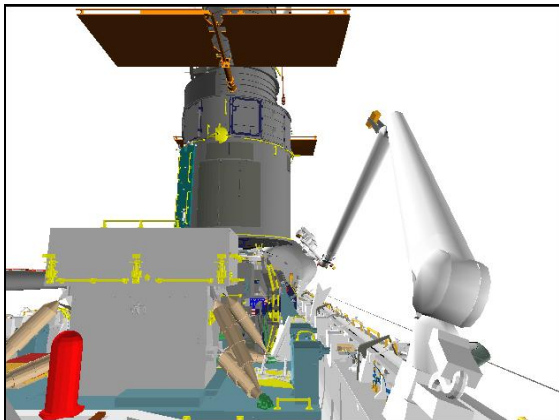
EV GCA to receive NOBL 8 from FF EV:

Expected: NOBL Receive	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1248	-79	-510	353	0	315	3

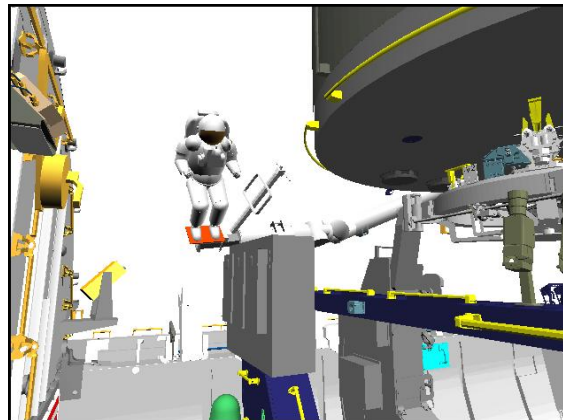
If reqd:

BRAKES – ON (tb-ON)

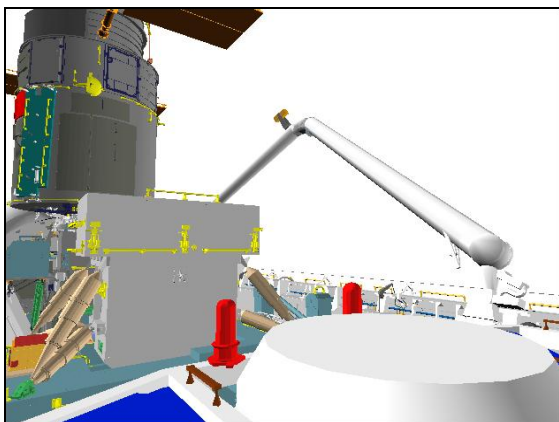
√MODE – not DIRECT



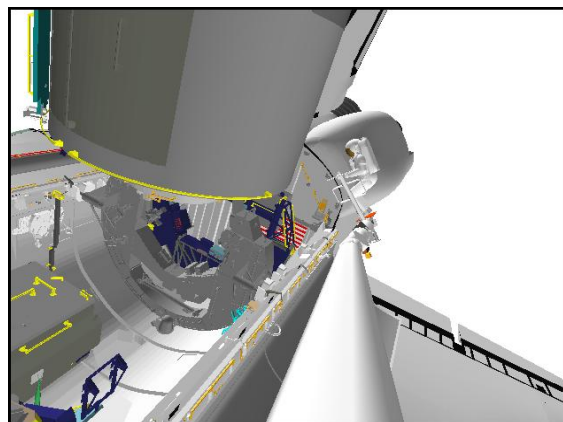
CCTV A (0,10)



CCTV C (-65,15)



CCTV D (35,5)



ELBOW (-10,0)

3. BAY 8 POSN

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

NOTE

RMS EV can watch clearance to keel pin

Mnvr to BAY 8 posn:

S: 45R B: 90L

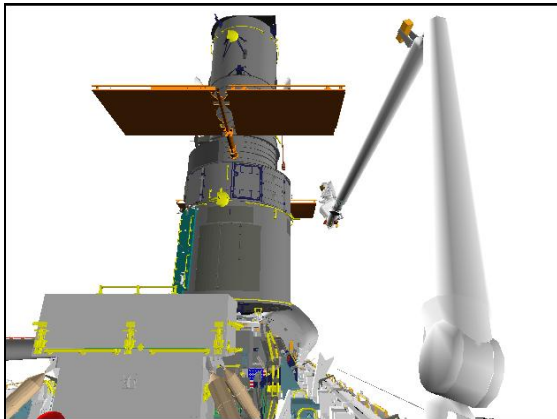
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1166	-133	-691	0	0	345	3
SY	SP	EP	WP	WY	WR	
-3.4	+64.0	-71.9	+7.9	+3.4	-194.5	

EV GCA to assist FF EV with NOBL 8 Install

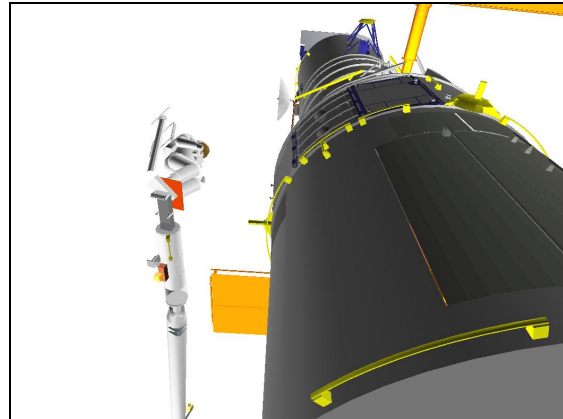
If reqd:

BRAKES – ON (tb-ON)

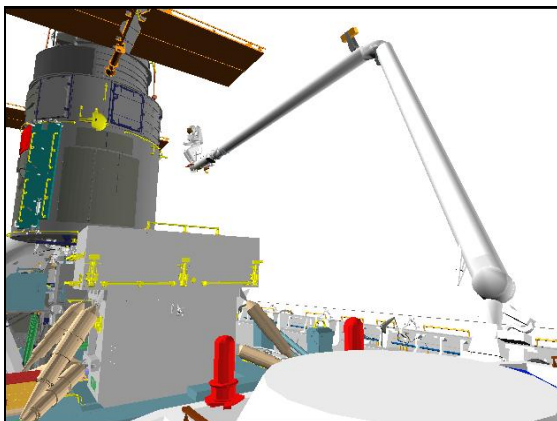
√MODE – not DIRECT



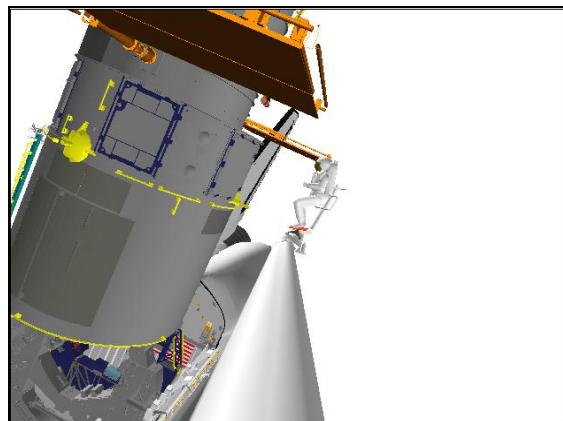
CCTV A (0,20)



CCTV B (5,55)



CCTV D (35,10)



ELBOW (0,0)

4. BAY 8 NOBL INSTALL

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to BAY 8 NOBL INSTALL posn:

S: 45R B: 90L

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1182	-120	-691	0	355	345	3
SY	SP	EP	WP	WY	WR	
-4.1	+59.5	-65.7	+4.5	-0.6	-194.4	

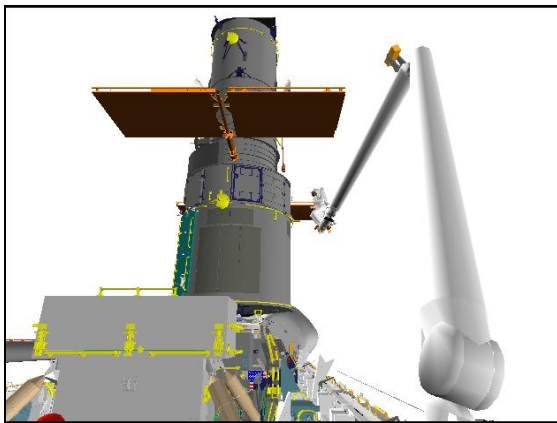
EV GCA to install Bay 8 NOBL:

Expected: NOBL 8 Install	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1182	-110	-691	0	355	345	3

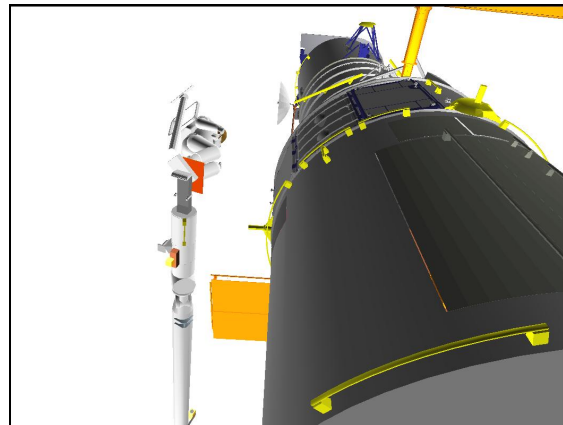
If reqd:

BRAKES – ON (tb-ON)

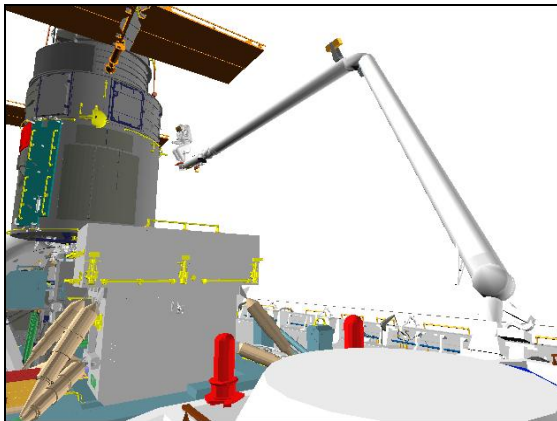
√MODE – not DIRECT



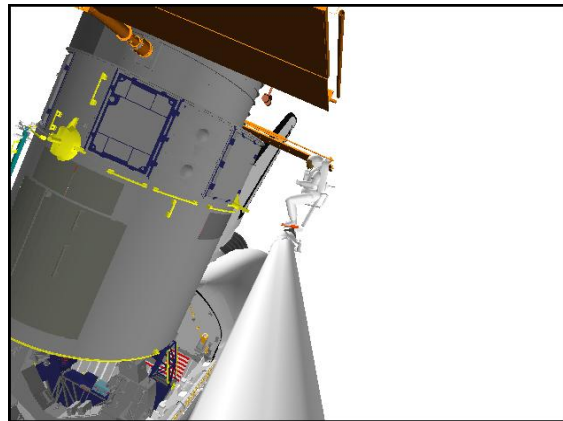
CCTV A (0,20)



CCTV B (5,55)



CCTV D (35,10)



ELBOW (0,0)

- * If continuing EVA 4 ops with Bay 7 NOBL Install: *
- * Proceed to UNSCHEDULED EVA TASKS, NOBL 7 *
- * *
- * If continuing EVA 4 ops with Bay 5 NOBL Install: *
- * Proceed to step 5 *
- * *
- * If EVA 4 tasks complete: *
- * Proceed to EVA CLOSEOUT, Egress at Airlock *

5. BAY 5 POSN

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to BAY 5 posn:

S: 90R B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1010	-25	-670	355	355	0	3
SY	SP	EP	WP	WY	WR	
-27.5	+89.7	-114.7	+18.0	+24.3	-176.2	

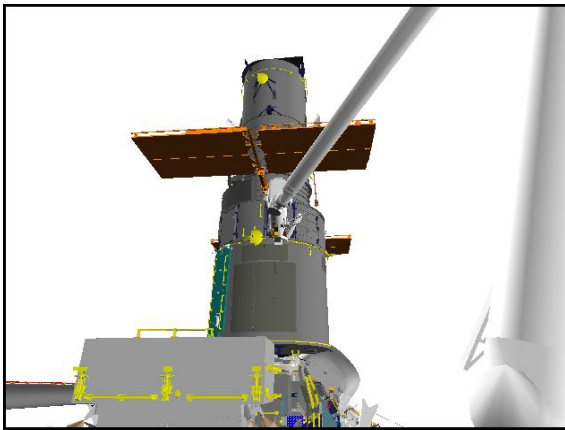
EV GCA to assist FF EV with NOBL 5 Install:

Expected: Bay 5 Posn	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1037	-25	-670	355	355	0	3

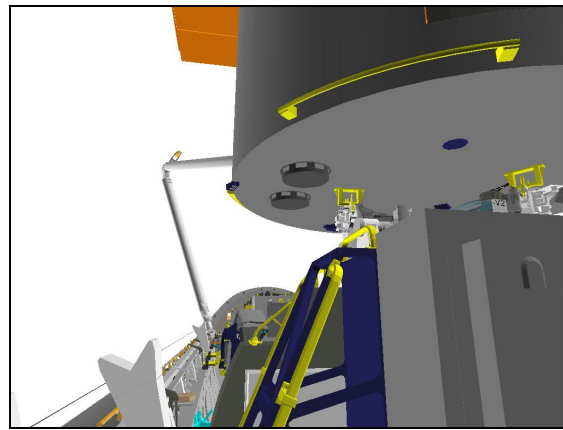
If reqd:

BRAKES – ON (tb-ON)

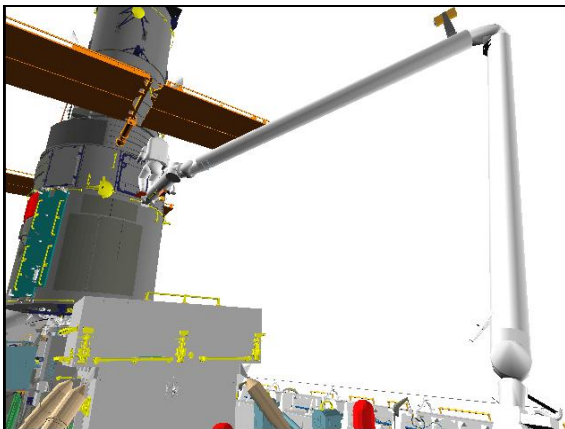
√MODE – not DIRECT



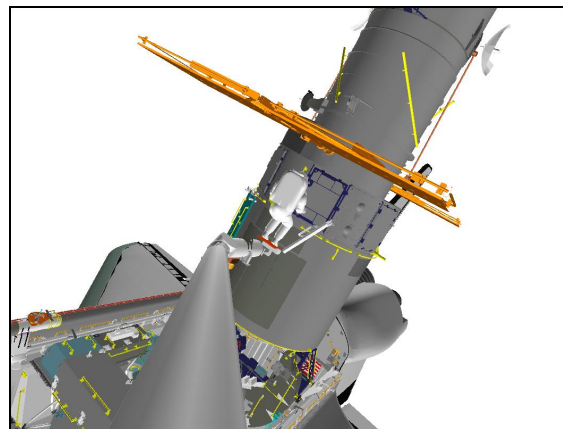
CCTV A (-5,25)



CCTV B (10,15)



CCTV D (35,20)



ELBOW (10,0)

6. BAY 5 NOBL INSTALL

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to BAY 5 NOBL INSTALL posn:

S: 45R B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1010	-25	-662	355	355	0	3
SY	SP	EP	WP	WY	WR	
-27.0	+89.2	-115.8	+19.7	+23.8	-176.3	

EV GCA to install Bay 5 NOBL:

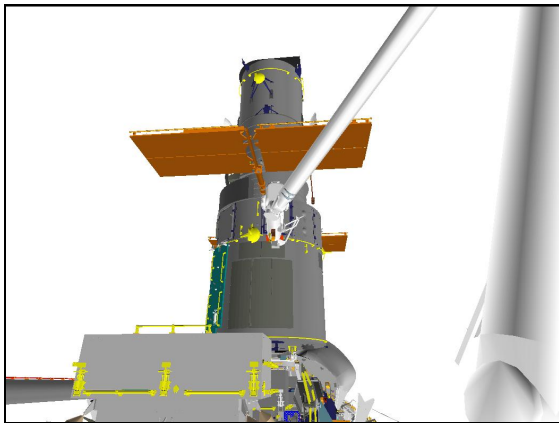
Expected:
NOBL 5 Install

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1029	-25	-662	355	355	0	3

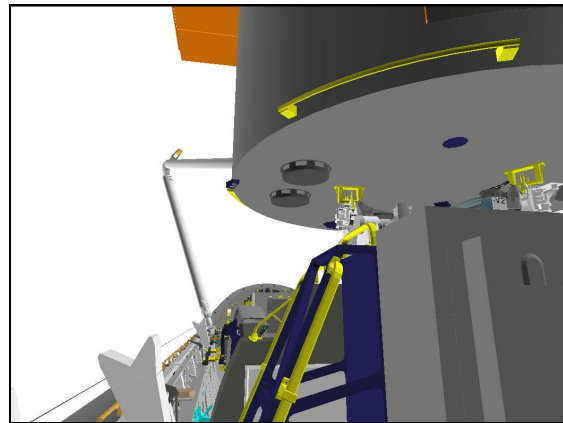
If reqd:

BRAKES – ON (tb-ON)

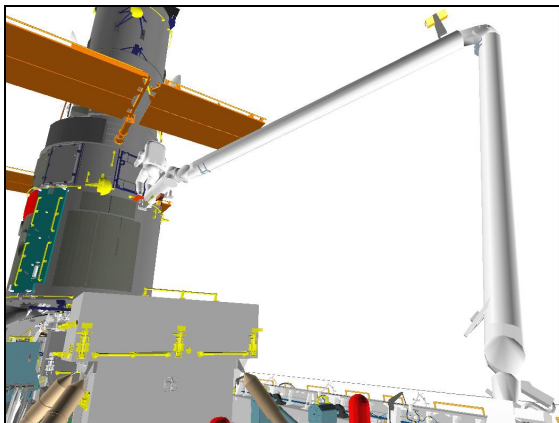
√MODE – not DIRECT



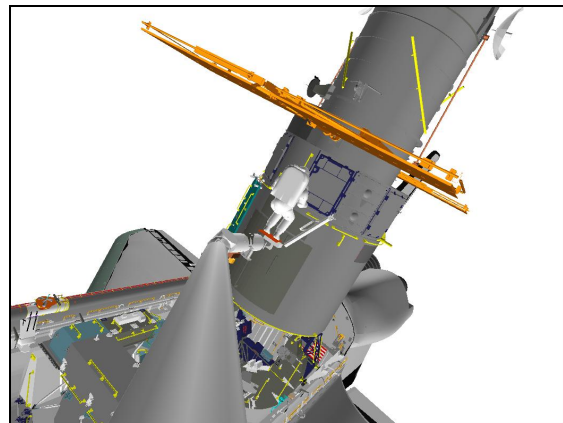
CCTV A (-5,25)



CCTV B (10,15)



CCTV D (35,20)



ELBOW (10,0)

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EVA 5 – BAY 3 BATT, FGS-2, NOBL 5, ACS PART 2

BAY 3 BATTERY R&R (+V2 FWD).....	FS 11-2
FGS-2 (+V2 FWD)	FS 11-7
NOBL 5 (+V2 FWD)	FS 11-15
BAY 3 BATTERY R&R (-V3 FWD)	FS 11-17
ACS PART 2 (-V3 FWD).....	FS 11-21
NOBL 5 (-V3 FWD).....	FS 11-25

EVA 5

BAY 3 BATTERY R&R (+V2 FWD)

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 270°, +V2 fwd, FSS Pivot: 90°, SA Slew: 0°

2. BAY 3 SETUP

RHC

RATE – as reqd (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to BAY 3 SETUP posn:

S: 180 B: 90R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1120	+122	-662	0	345	15	3
SY	SP	EP	WP	WY	WR	
-36.3	+47.8	-71.3	+18.1	+22.0	-161.9	

EV GCA to open Bay 3 Door:

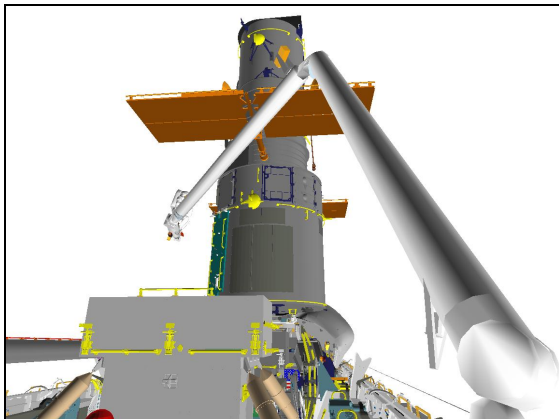
X	Y	Z	PITCH	YAW	ROLL	PL ID
	+110					3

Bay 3 Door

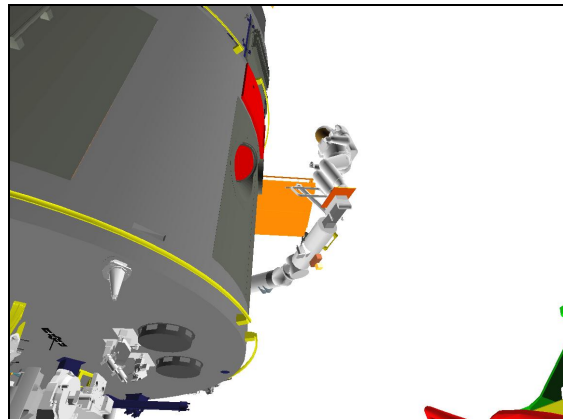
If reqd:

BRAKES – ON (tb-ON)

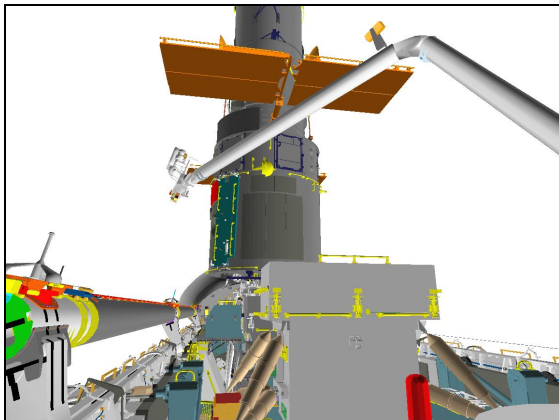
√MODE – not DIRECT



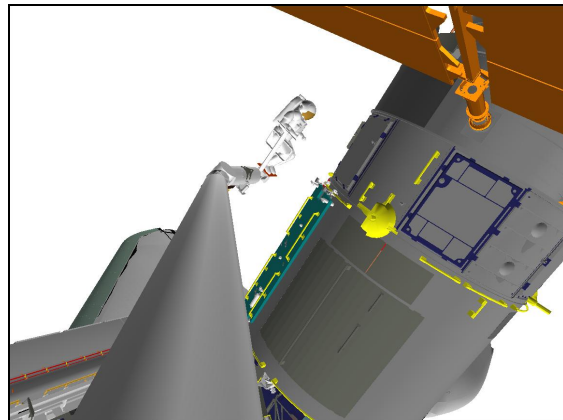
CCTV A (-5,20)



CCTV C (5,40)



CCTV D (10,15)



ELBOW (10,-10)

- RHC
3. BATTERY REMOVAL
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to BATTERY REMOVAL posn: S: 180 B: 0

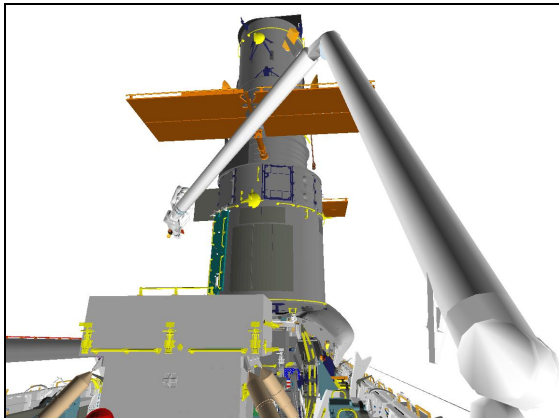
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1105	+116	-660	0	345	15	3
SY	SP	EP	WP	WY	WR	
-36.8	+51.3	-77.1	+20.4	+22.5	-161.8	

EV GCA to remove Battery from Bay 3:

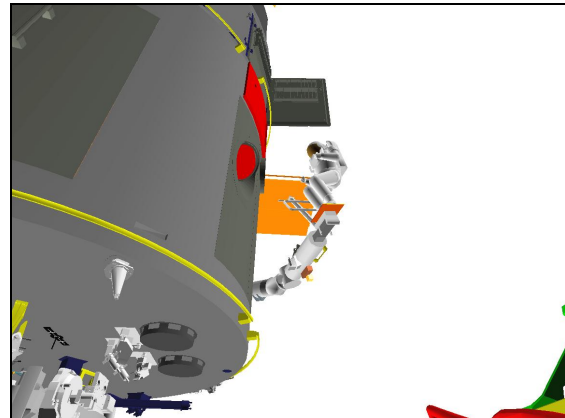
X	Y	Z	PITCH	YAW	ROLL	PL ID
						3

Actual Removal Posn

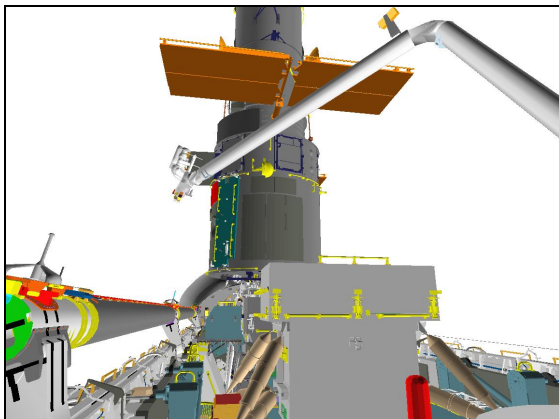
- If reqd:
 BRAKES – ON (tb-ON)
 √MODE – not DIRECT



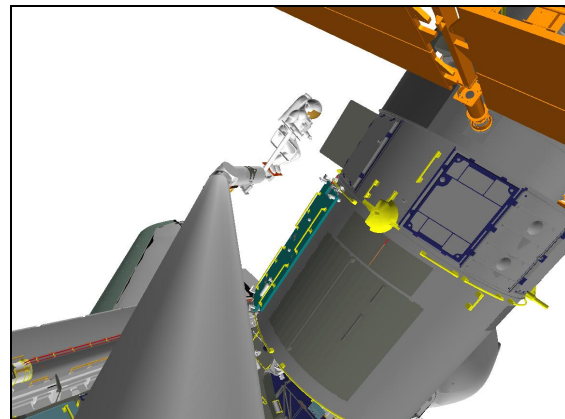
CCTV A (-5,20)



CCTV C (5,40)



CCTV D (10,15)



ELBOW (10,-10)

- RHC 4. BATTERY SWAP AT SLIC
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to BATTERY SWAP AT SLIC SETUP posn: S: 180 B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-858	-29	-516	280	0	5	3
SY	SP	EP	WP	WY	WR	
-49.7	+111.3	-137.4	-72.4	+20.2	-105.5	

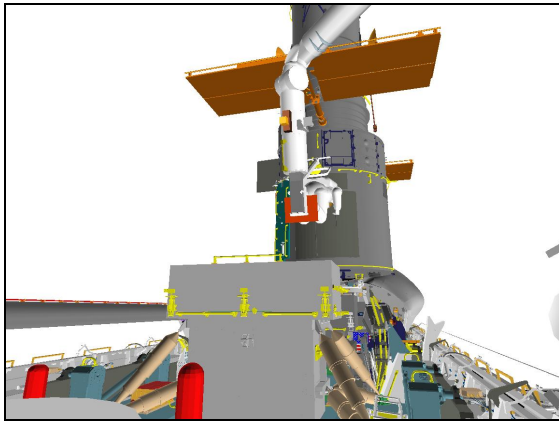
EV GCA to Battery Swap position:

X	Y	Z	PITCH	YAW	ROLL	PL ID
		-507				3

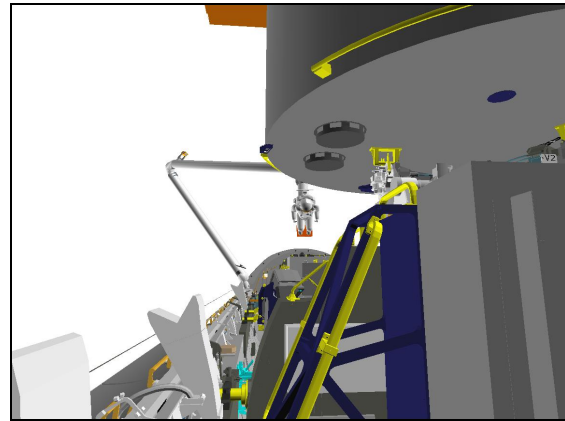
Battery Swap

If reqd:

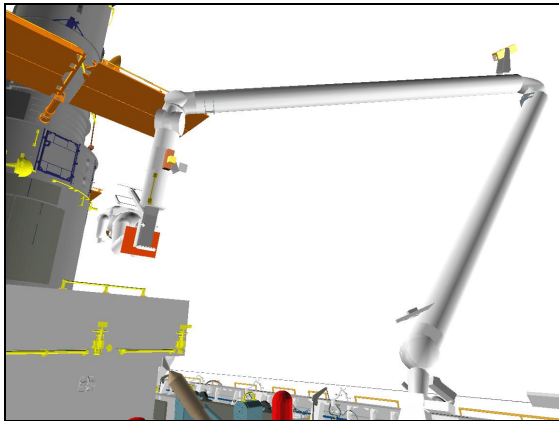
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT



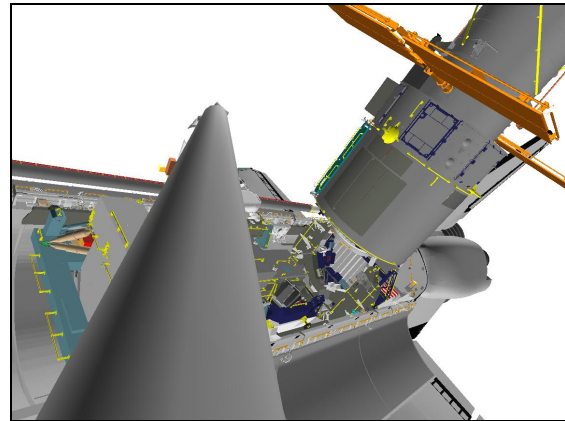
CCTV A (-15,15)



CCTV B (5,10)



CCTV D (45,20)



ELBOW (10,-20)

- RHC
5. BATTERY-R INSTALL
 RATE – as reqd (VERN within 10 ft)
 ✓BRAKES – OFF (tb-OFF)
 ✓MODE – ORB LD, ENTER

Mnvr to BATTERY-R INSTALL posn:

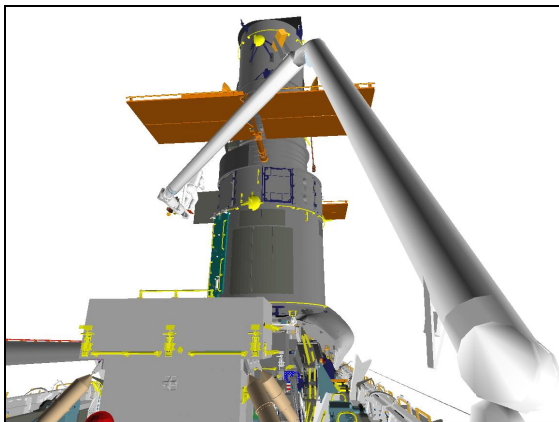
S: 180 B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1109	+110	-698	0	0	5	3
SY	SP	EP	WP	WY	WR	
-38.0	+50.9	-69.5	+18.6	+38.0	-174.5	

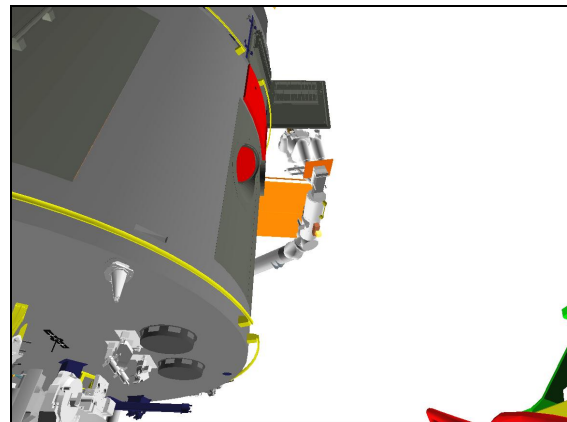
EV GCA to install Battery-R

If reqd:

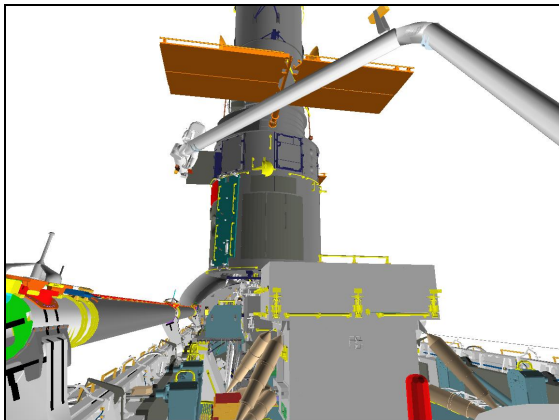
- BRAKES – ON (tb-ON)
 ✓MODE – not DIRECT



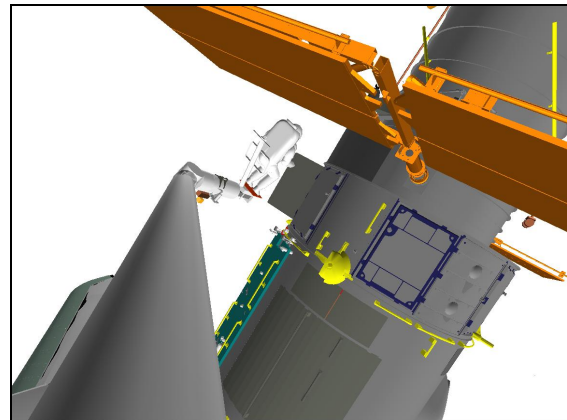
CCTV A (-5,20)



CCTV C (5,40)



CCTV D (10,15)



ELBOW (15,-10)

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FGS-2 (+V2 FWD)

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 270°, +V2 fwd, FSS Pivot: 90°, SA Slew: 0°

2. FORWARD FIXTURE

RHC

RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB LD, ENTER

Mnvr to FORWARD FIXTURE SETUP posn: S: 135R B: 0

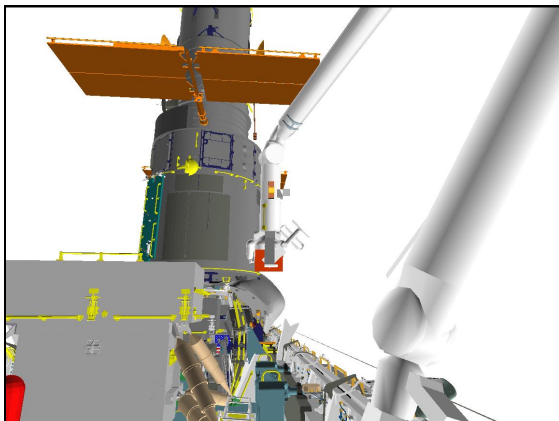
X	Y	Z	PITCH	YAW	ROLL	PL ID
-918	-85	-491	277	0	0	3
SY	SP	EP	WP	WY	WR	
-19.6	+107.6	-134.7	-62.7	+20.6	-141.6	

EV GCA to retrieve FGS Handhold:

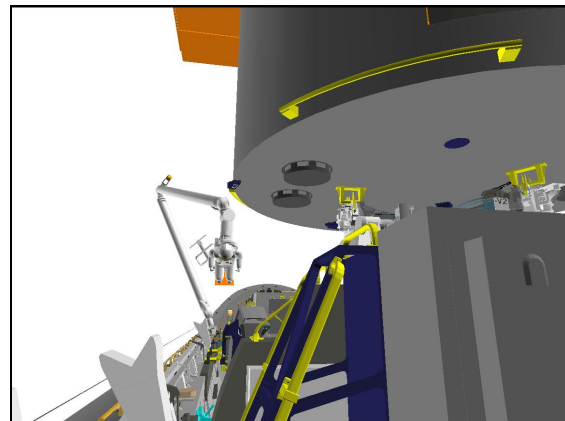
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Fwd Fixture	-918	-85	-462	277	0	0	3

If reqd:

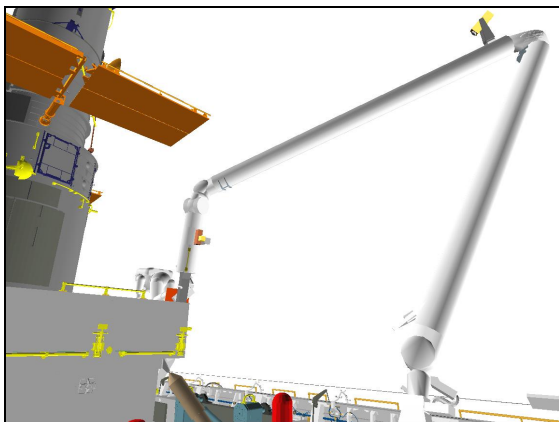
BRAKES – ON (tb-ON)



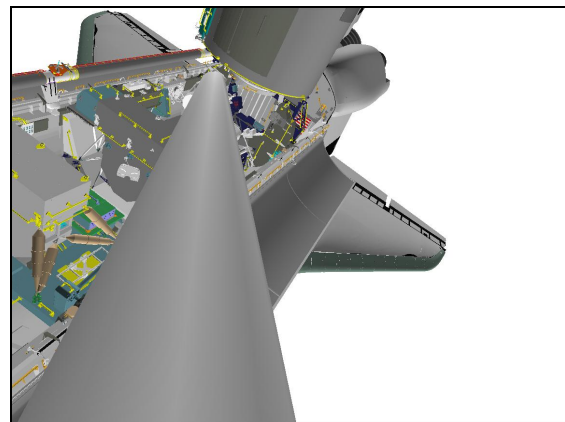
CCTV A (5,15)



CCTV B (10,15)



CCTV D (45,20)



ELBOW (10,-25)

3. FGS-2 BAY

NOTE

Monitor clearance to keel pin during maneuver

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

Mnvr to FGS-2 BAY SETUP posn:

S: 135R B: 90L

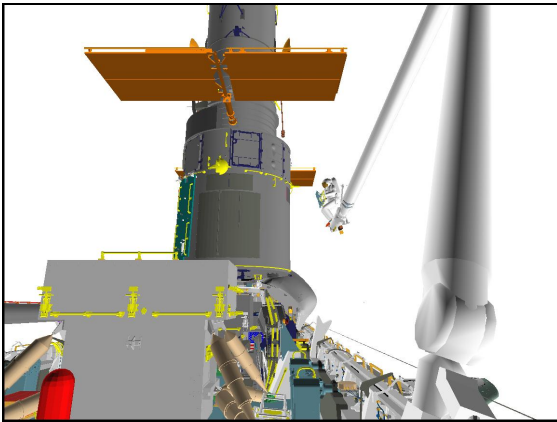
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1118	-130	-621	0	0	345	3
SY	SP	EP	WP	WY	WR	
-0.6	+70.9	-95.7	+24.8	+0.6	+165.5	

EV GCA to open Doors and retrieve FGS-2:

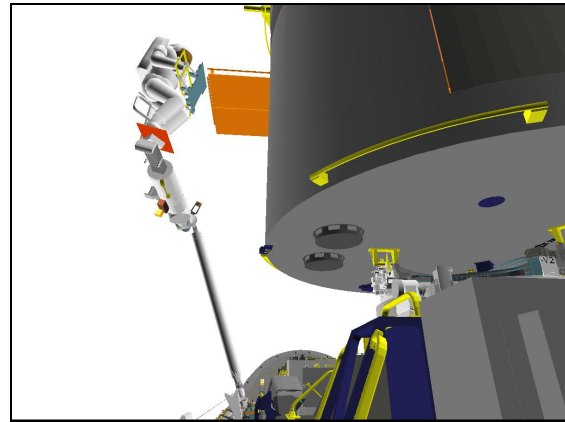
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Mirror Clear		-176					3

If reqd:

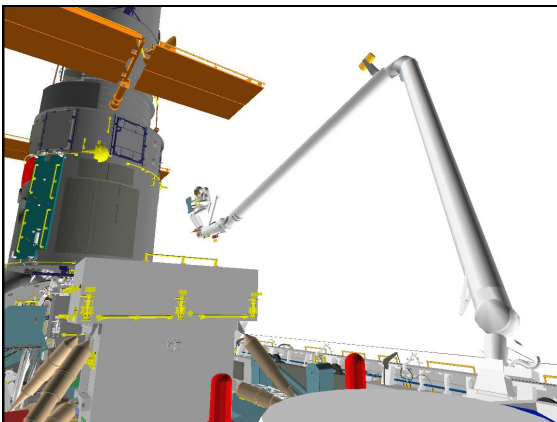
BRAKES – ON (tb-ON)



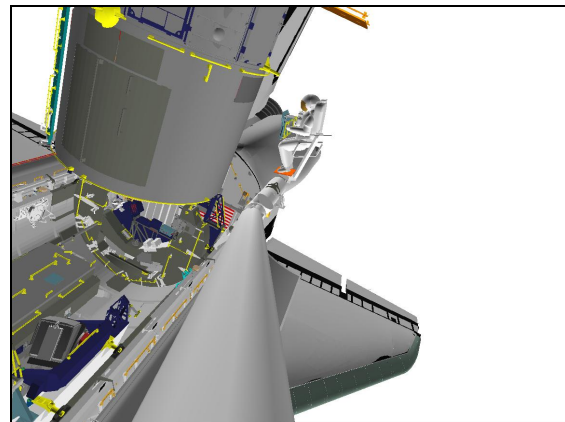
CCTV A (0,15)



CCTV B (5,25)



CCTV D (35,15)



ELBOW (5,-5)

- RHC 4. FGS-2 TEMP STOW
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

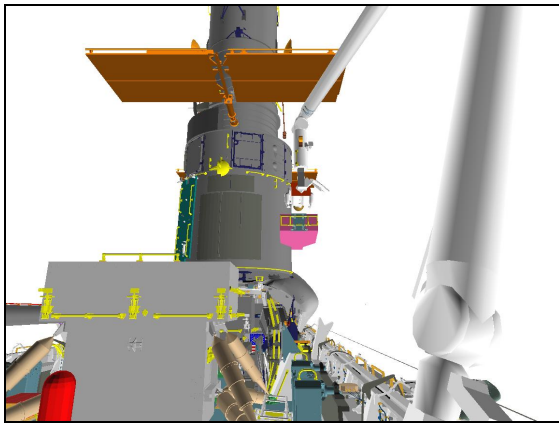
Mnvr to FGS-2 TEMP STOW SETUP posn: S: 135R B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1020	-90	-565	260	0	0	3
SY	SP	EP	WP	WY	WR	
-16.3	+82.9	-92.7	-95.7	+15.5	-139.9	

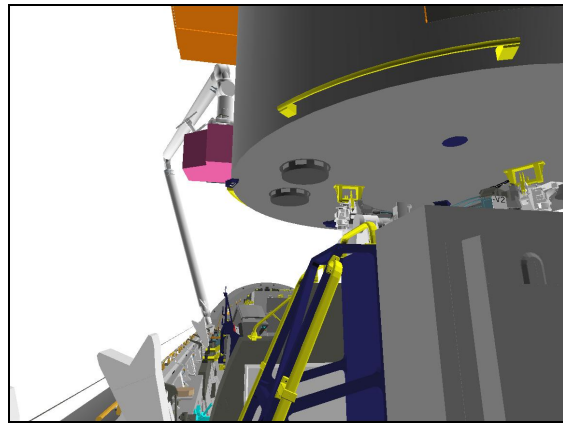
EV GCA to temp stow FGS-2 on Aft Fixture:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Stow	-1020	-90	-478	260	0	0	3

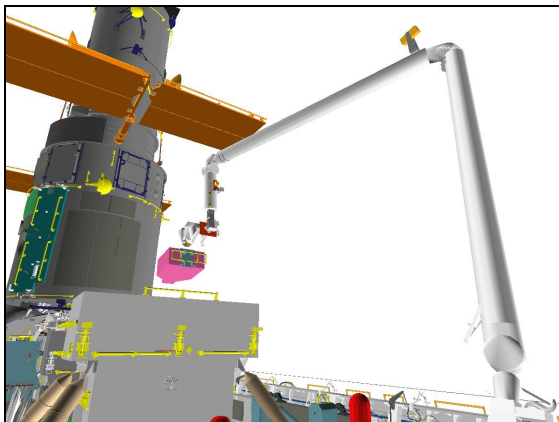
If reqd:
 BRAKES – ON (tb-ON)



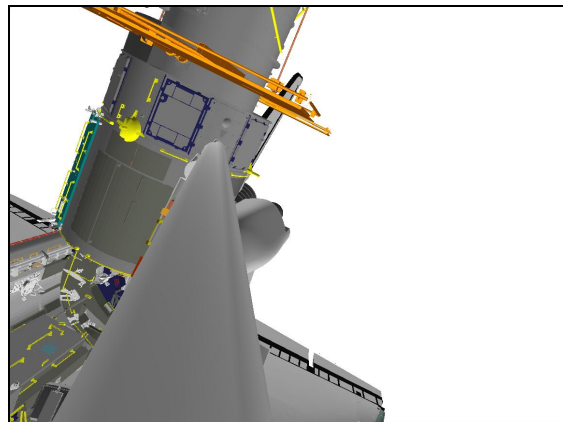
CCTV A (0,15)



CCTV B (10,15)



CCTV D (35,20)



ELBOW (10,-15)

5. FGS-2R RETRIEVAL

NOTE

Monitor clearance from RMS EV MWS to lid

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

Mnvr to FGS-2R RETRIEVAL SETUP posn:

S: 180 B: 0

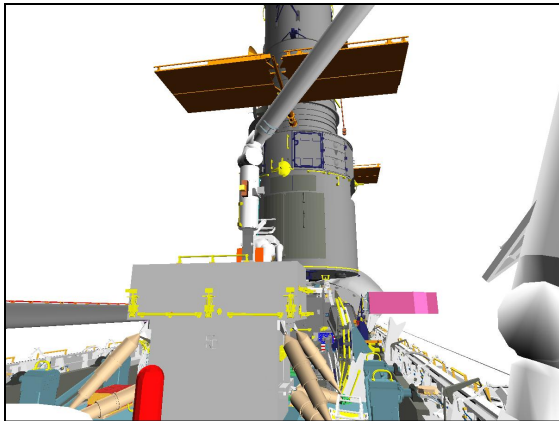
X	Y	Z	PITCH	YAW	ROLL	PL ID
-915	+2	-485	270	0	0	3
SY	SP	EP	WP	WY	WR	
-39.2	+90.8	-127.0	-66.5	+15.0	-119.2	

EV GCA to retrieve FGS-2R:

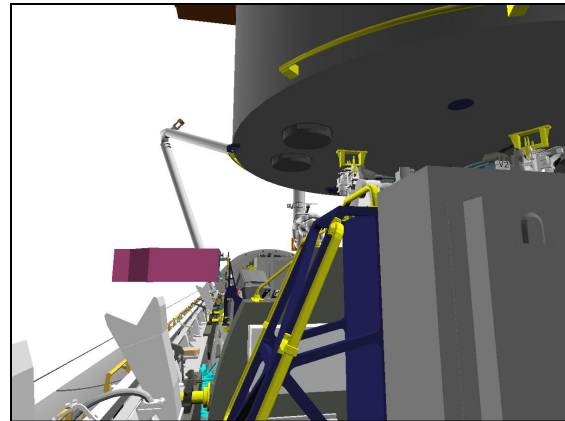
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
FGS-2R Unlatch	-915	+2	-471	270	0	0	3
Retrieval			-465				
Clear of lid			-560				

If reqd:

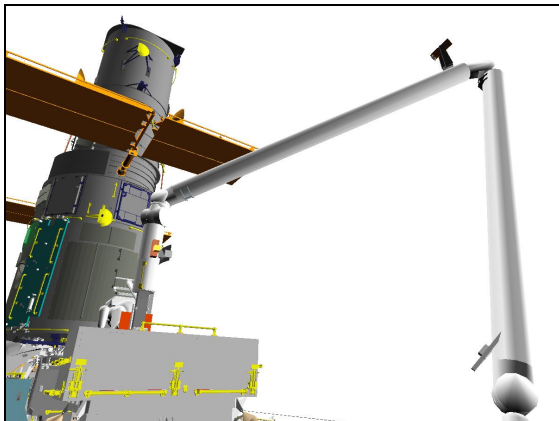
BRAKES – ON (tb-ON)



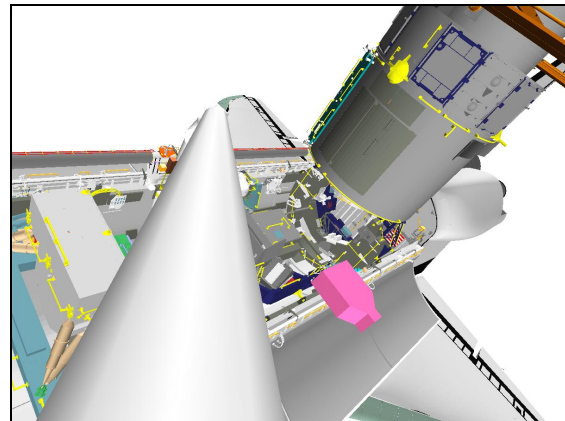
CCTV A (-10,15)



CCTV B (10,10)



CCTV D (35,25)



ELBOW (10,-20)

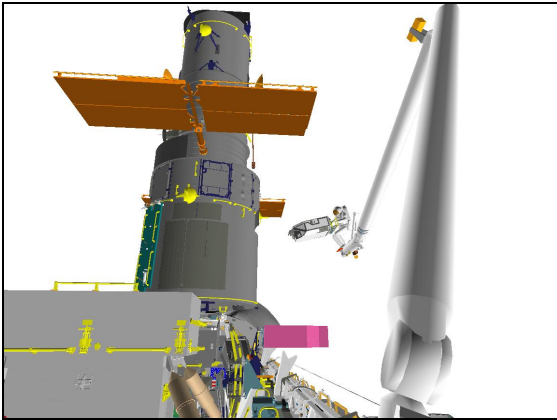
- RHC
6. FGS-2R INSTALLATION
 RATE – as reqd (VERN within 10 ft)
 ✓BRAKES – OFF (tb-OFF)
 ✓MODE – ORB LD, ENTER

Mnvr to FGS-2R INSTALLATION SETUP posn: S: 135R B: 90L

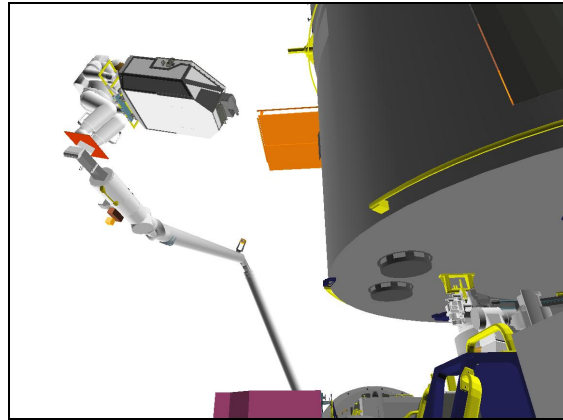
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1137	-200	-637	0	0	345	3
SY	SP	EP	WP	WY	WR	
+8.5	+68.7	-84.4	+15.7	-8.5	+165.5	

EV GCA to install FGS-2R

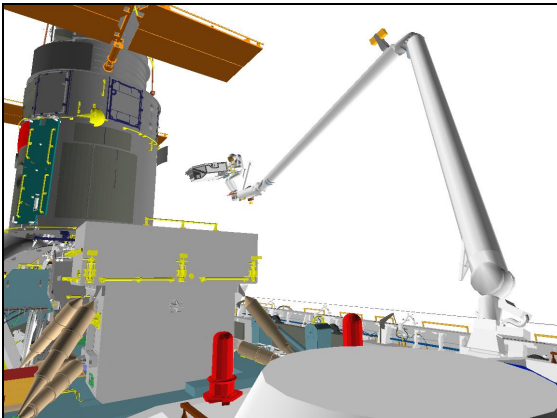
If reqd:
 BRAKES – ON (tb-ON)



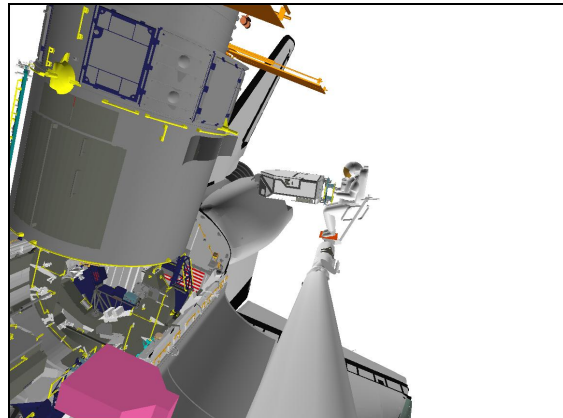
CCTV A (5,20)



CCTV B (-5,30)



CCTV D (35,10)



ELBOW (-5,5)

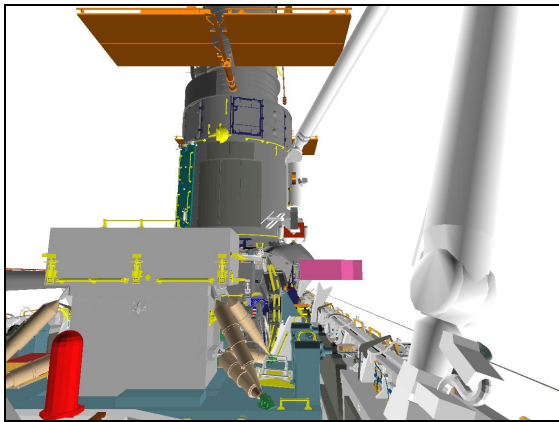
- RHC
7. FGS-2 RETRIEVAL SETUP
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to FGS-2 RETRIEVAL SETUP posn: S: 135L B: 0

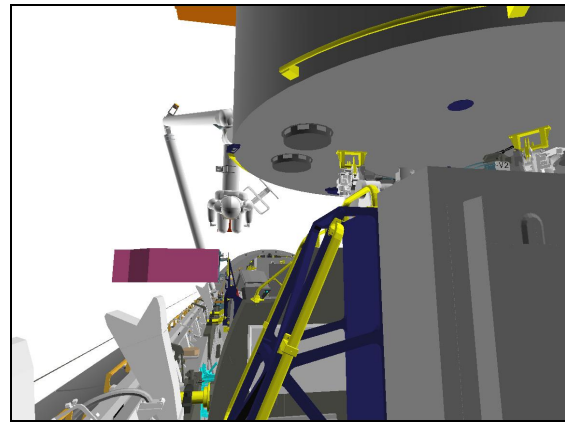
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1016	-82	-485	260	0	0	3
SY	SP	EP	WP	WY	WR	
-13.0	+79.7	-105.8	-78.5	+16.3	-143.2	

EV GCA to retrieve FGS-2

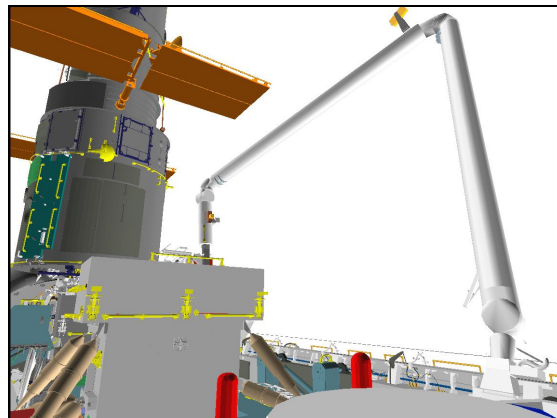
If reqd:
 BRAKES – ON (tb-ON)



CCTV A (0,10)



CCTV B (10,10)



CCTV D (35,15)

8. FGS-2 STOW
 RHC RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to FGS-2 STOW SETUP posn:

S: 135L B: 0

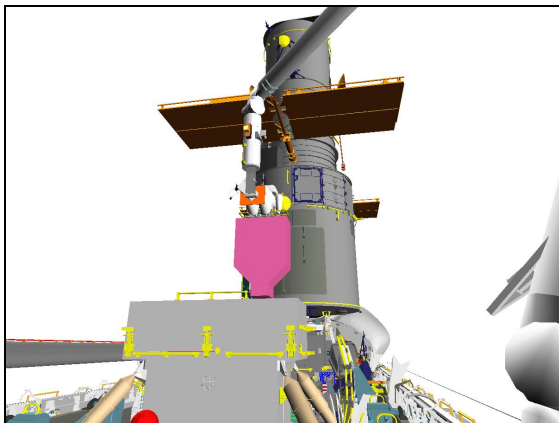
X	Y	Z	PITCH	YAW	ROLL	PL ID
-915	+2	-565	270	0	0	3
SY	SP	EP	WP	WY	WR	
-44.0	+95.2	-113.9	-85.2	+13.9	-114.3	

EV GCA to stow FGS-2:

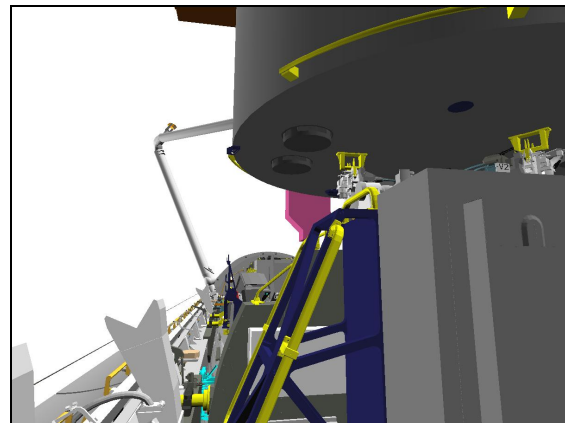
Expected: FGS-2 Stow	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-915	+2	-465	270	0	0	3

If reqd:

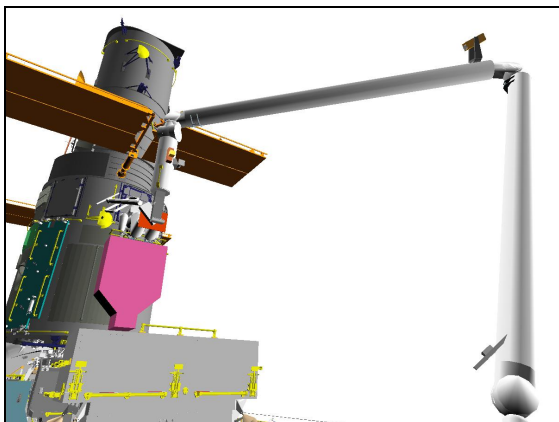
BRAKES – ON (tb-ON)



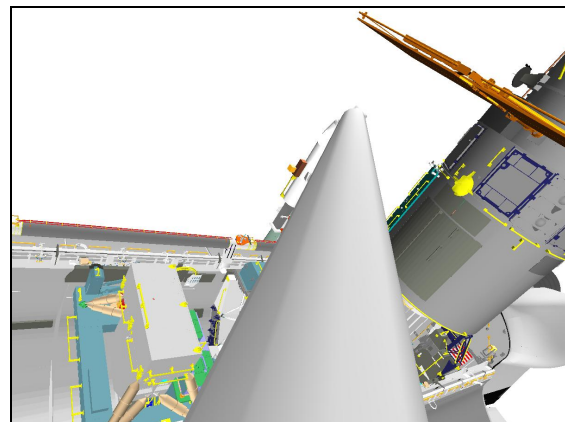
CCTV A (-10,20)



CCTV B (10,10)



CCTV D (35,25)



ELBOW (-10,-20)

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NOBL 5 (+V2 FWD)

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 270°, +V2 fwd, FSS Pivot: 90°, SA Slew: 0°

2. RETRIEVE NOBL AT MULE

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to MINC NOBL RETRIEVE posn: S: 180 B: 90L

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1248	-100	-510	353	0	315	3
SY	SP	EP	WP	WY	WR	
+2.5	+35.4	-57.0	+14.9	-0.2	-224.6	

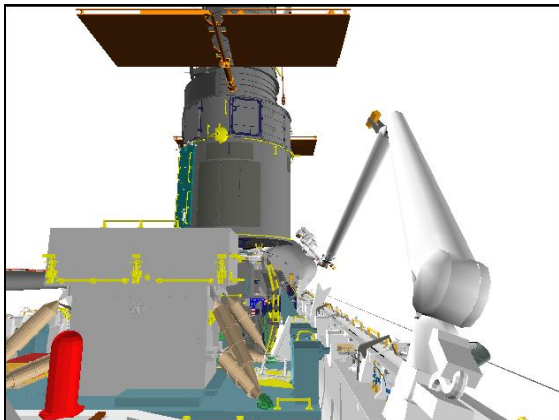
EV GCA to receive NOBL 5 from FF EV:

Expected: NOBL Receive	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1248	-79	-510	353	0	315	3

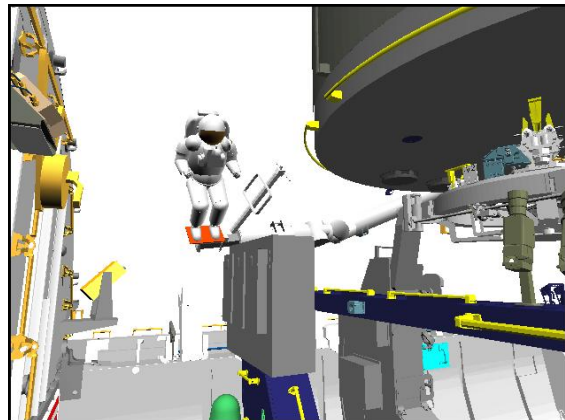
If reqd:

BRAKES – ON (tb-ON)

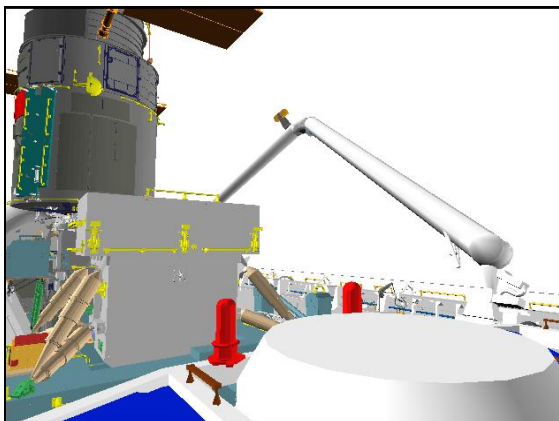
√MODE – not DIRECT



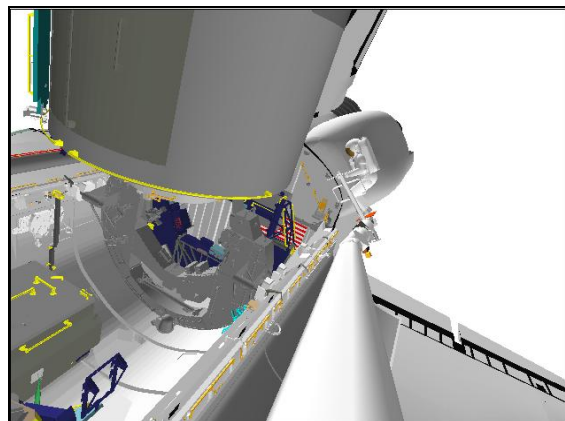
CCTV A (0,10)



CCTV C (-65,15)



CCTV D (35,5)



ELBOW (-10,0)

3. **BAY 5 POSN**

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to BAY 5 posn:

S: 135R B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1010	-25	-670	355	355	0	3
SY	SP	EP	WP	WY	WR	
-27.5	+89.7	-114.7	+18.0	+24.3	-176.2	

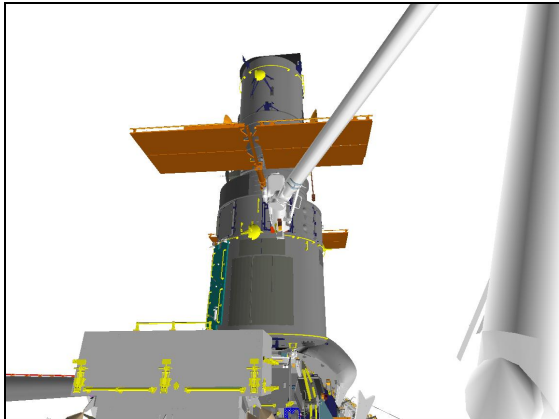
EV GCA to assist FF EV with NOBL 5 Install:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Bay 5 Posn	-1037	-25	-670	355	355	0	3
NOBL 5 Install	-1029		-662				

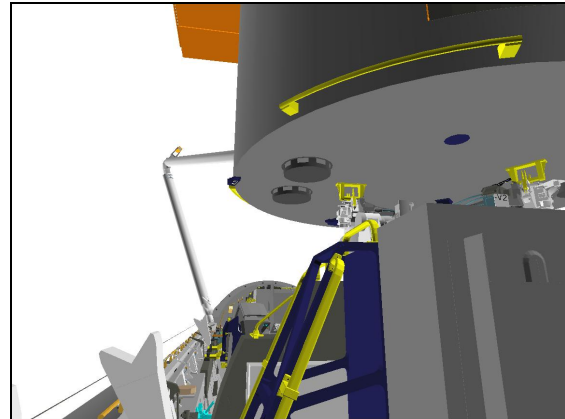
If reqd:

BRAKES – ON (tb-ON)

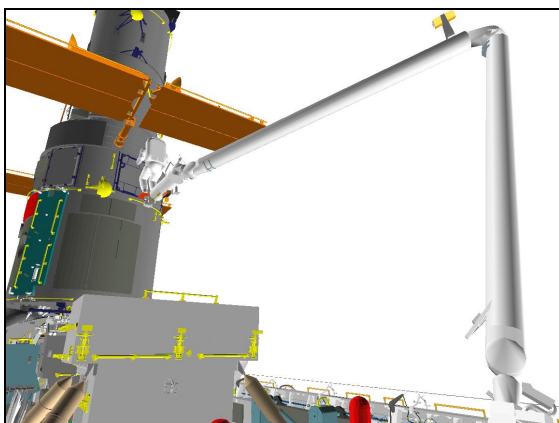
√MODE – not DIRECT



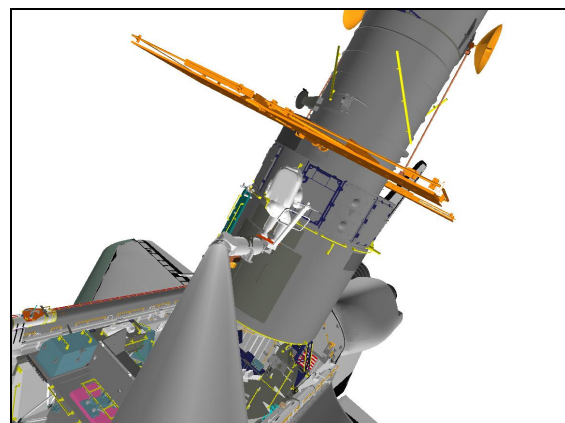
CCTV A (-5,25)



CCTV B (10,15)



CCTV D (35,20)



ELBOW (10,0)

- * If continuing EVA 5 ops with Bay 7 NOBL Install: *
- * Proceed to UNSCHEDULED EVA TASKS, NOBL 7 *
- * *
- * If EVA 5 tasks complete: *
- * Proceed to EVA CLOSEOUT, EGRESS AT AIRLOCK *

BAY 3 BATTERY R&R (-V3 FWD)

I

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 180°, -V3 fwd, FSS Pivot: 90°, SA Slew: 0°

2. BAY 3 SETUP

RHC

RATE – as reqd (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to BAY 3 SETUP posn:

S: 180 B: 90R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1030	-50	-695	0	270*	30	3
SY	SP	EP	WP	WY	WR	
-8.4	+81.8	-90.8	-58.5	-68.8	+164.0	

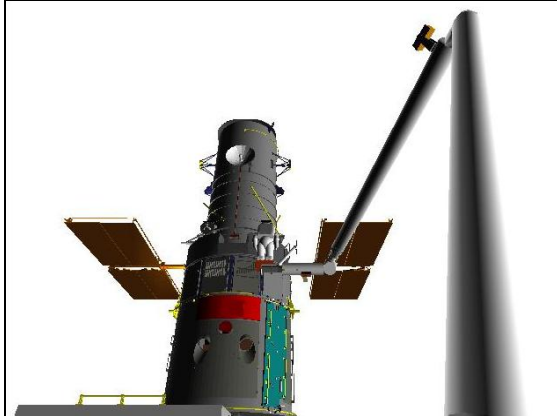
*Display singularity

EV GCA to open Bay 3 Door

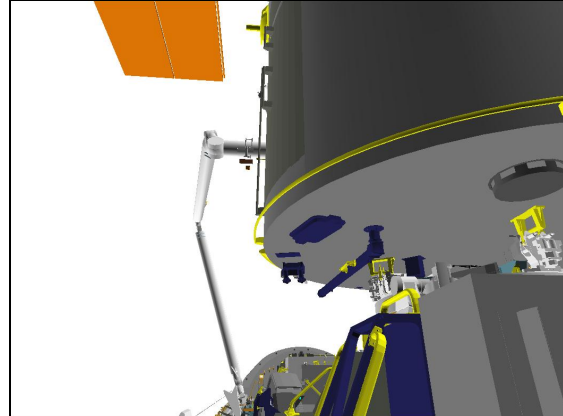
If reqd:

BRAKES – ON (tb-ON)

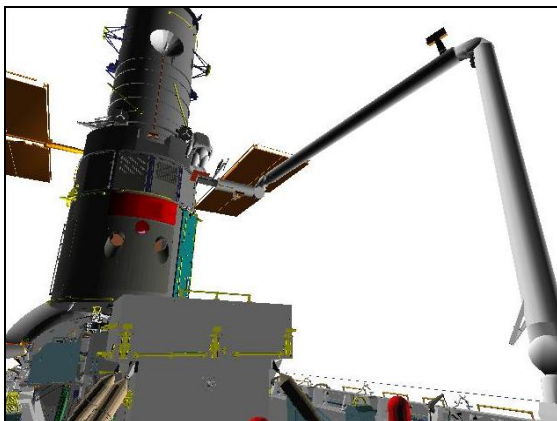
√MODE – not DIRECT



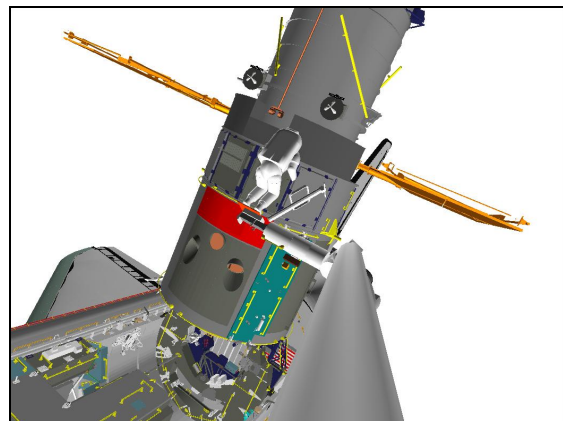
CCTV A (0,35)



CCTV B (5,25)



CCTV D (30,20)



ELBOW (-10,0)

- RHC
3. BATTERY REMOVAL
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to BATTERY REMOVAL posn: S: 180 B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1040	-44	-660	20	270*	35	3
SY	SP	EP	WP	WY	WR	
-6.5	+74.5	-90.4	-56.3	-69.5	+143.9	

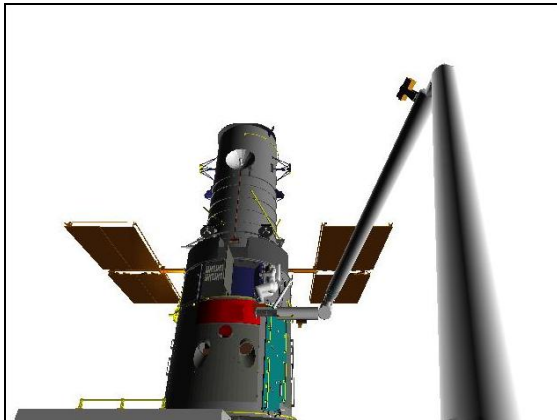
*Display singularity

EV GCA to remove Battery from Bay 3:

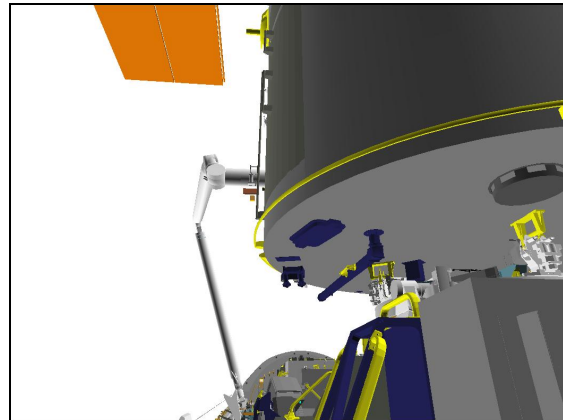
X	Y	Z	PITCH	YAW	ROLL	PL ID
						3

Actual Removal Posn

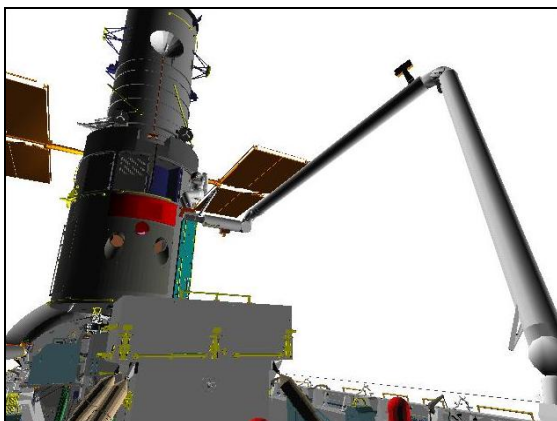
- If reqd:
 BRAKES – ON (tb-ON)
 √MODE – not DIRECT



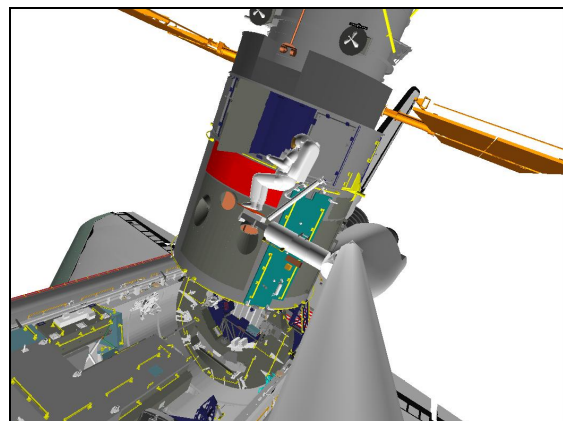
CCTV A (0,35)



CCTV B (5,25)



CCTV D (30,20)



ELBOW (-10,0)

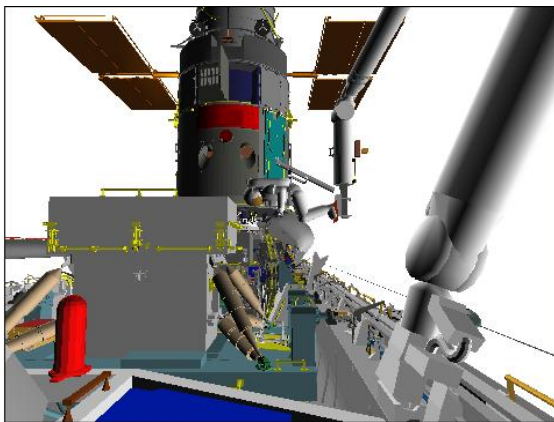
- RHC
4. BATTERY SWAP AT SLIC
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to BATTERY SWAP AT SLIC SETUP posn: S: 180 B: 0

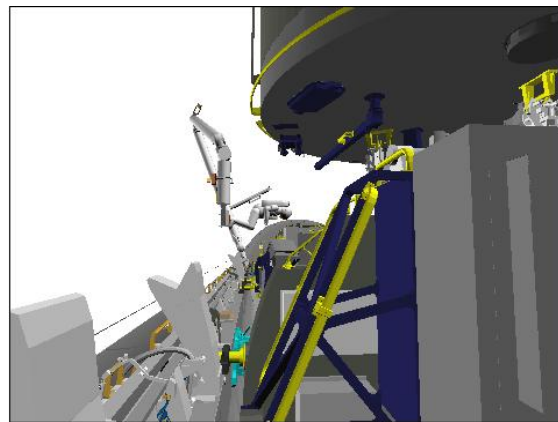
X	Y	Z	PITCH	YAW	ROLL	PL ID
-875	-60	-473	270	0	270	3
SY	SP	EP	WP	WY	WR	
-7.0	+103.1	-130.8	-64.7	+19.3	+117.4	

EV GCA to Battery Swap position

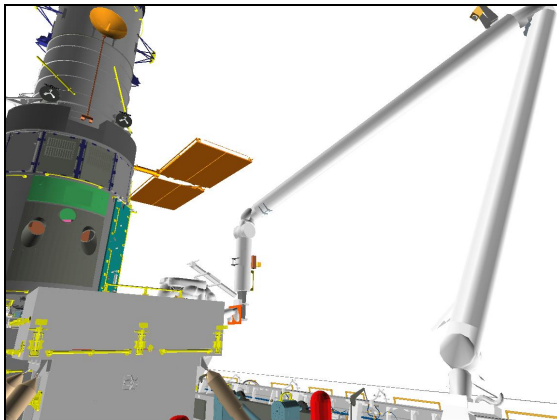
- If reqd:
 BRAKES – ON (tb-ON)
 √MODE – not DIRECT



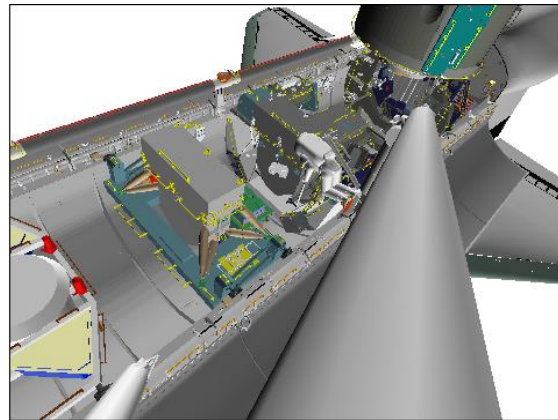
CCTV A (0,5)



CCTV B (5,5)



CCTV D (40,20)



ELBOW (-20,-20)

- RHC
5. BATTERY-R INSTALL
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to BATTERY-R INSTALL posn:

S: 180 B: 0

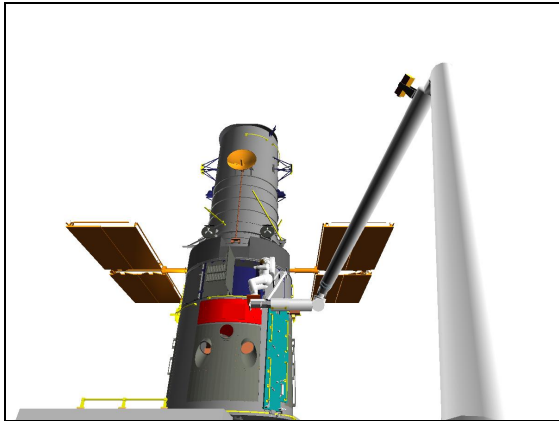
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1040	-35	-670	20	270*	35	3
SY	SP	EP	WP	WY	WR	
-8.5	+74.8	-89.6	-52.7	-68.8	+149.0	

*Display singularity

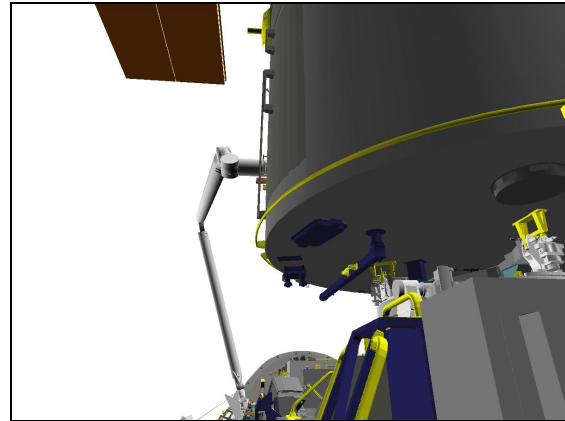
EV GCA to install Battery-R

If reqd:

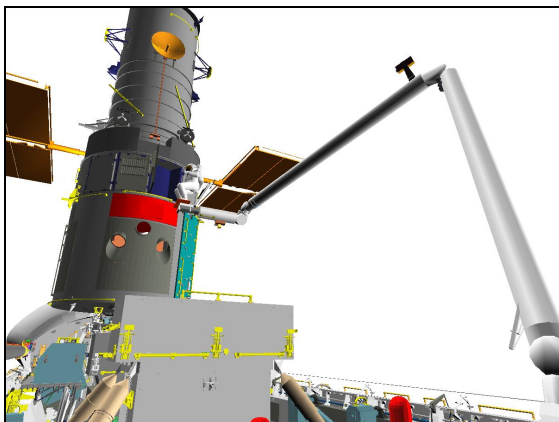
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT



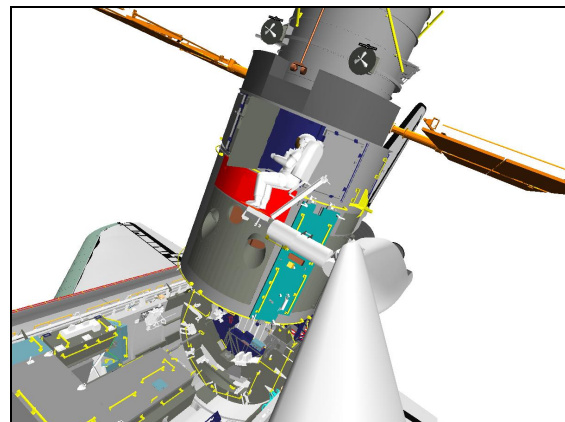
CCTV A (0,35)



CCTV B (5,25)



CCTV D (30,20)



ELBOW (-10,0)

ACS PART 2 (-V3 FWD)

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 180°, -V3 fwd, FSS Pivot: 90°, SA Slew: 0°

2. PFR HANDOFF

RHC

RATE – as reqd (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to PFR HANDOFF posn:

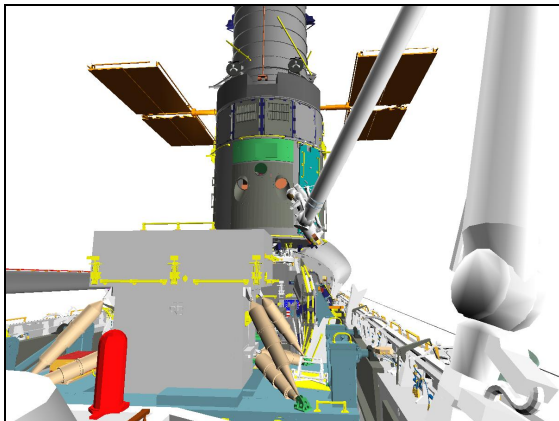
S: 135R B: 90L

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1035	-39	-536	350	10	325	3
SY	SP	EP	WP	WY	WR	
-13.7	+76.3	-124.3	+41.4	+26.4	+146.9	

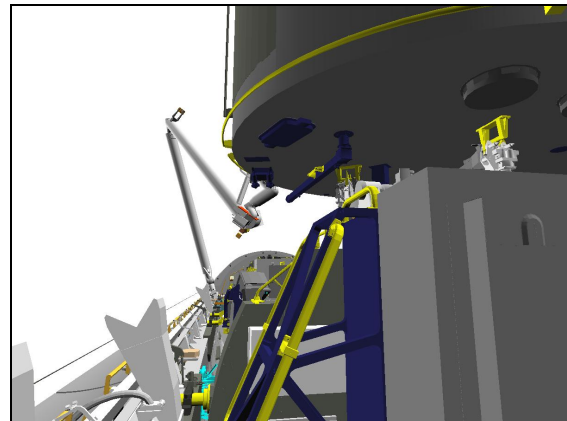
EV GCA to receive PFR

If reqd:

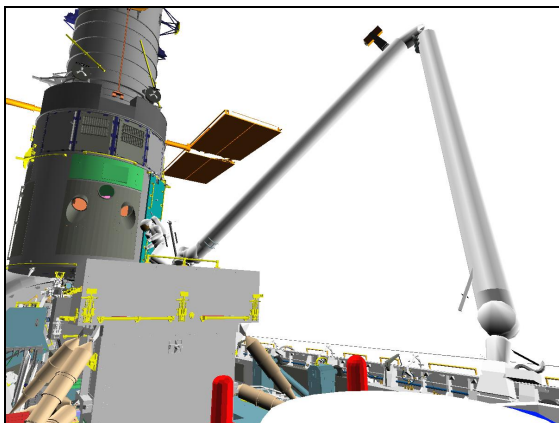
BRAKES – ON (tb-ON)



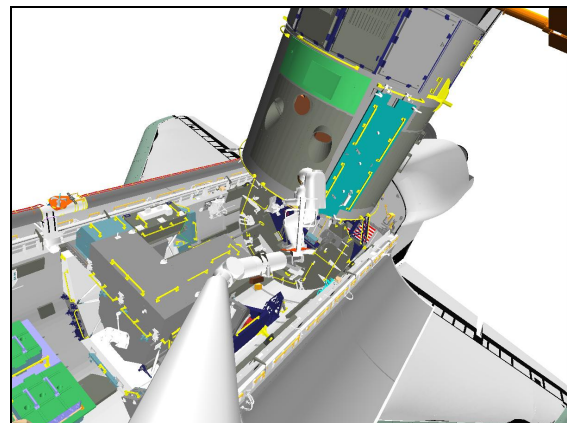
CCTV A (-5,10)



CCTV B (10,10)



CCTV D (35,15)



ELBOW (10,5)

- RHC 3. -V2 AFT SHROUD DOORS
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 √MODE – ORB LD, ENTER

Mnvr to -V2 AFT SHROUD DOORS posn: S: 90L B: 90R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1156	+110	-583	0	20	18	3
SY	SP	EP	WP	WY	WR	
-33.8	+27.1	-54.7	+38.3	+52.2	+191.1	

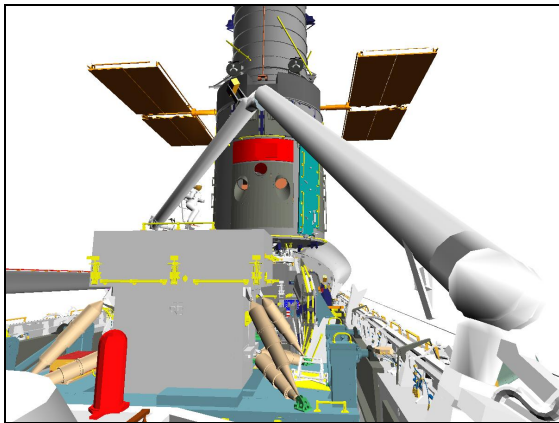
NOTE

Use WY to remain clear of door as approaching for ACS support

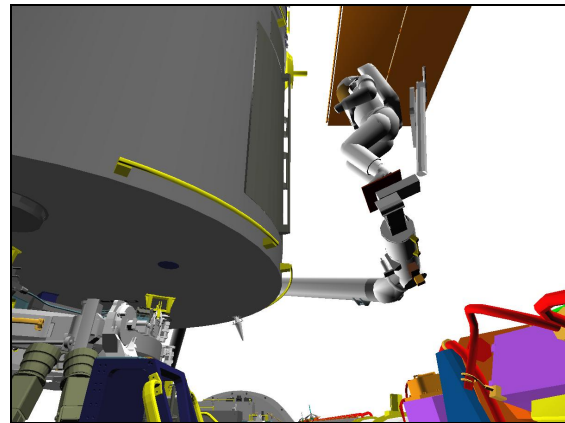
EV GCA to open -V2 Aft Shroud Doors:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Bottom Latch	-1159	+118	-525	0	20	18	3
Door Handle	-1184		-575				
Top Latch			-600				
Assist	-1129	+123	-585		335	0	

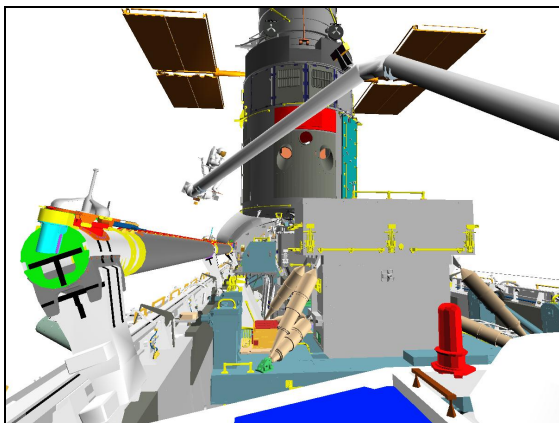
If reqd:
 BRAKES – ON (tb-ON)



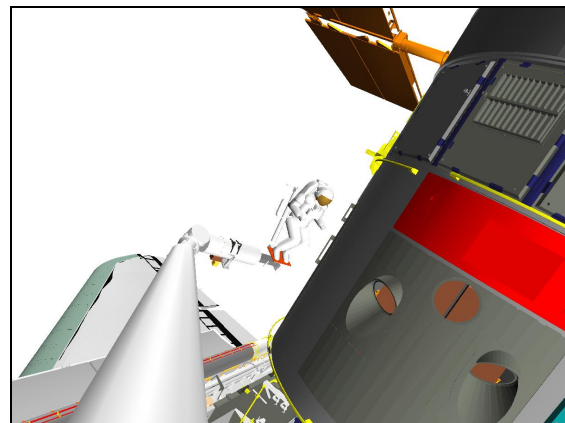
CCTV A (-5,10)



CCTV C (0,30)



CCTV D (5,5)



ELBOW (15,0)

- RHC
4. LOPE ACCESS
 RATE – as reqd (VERN within 10 ft)
 ✓BRAKES – OFF (tb-OFF)
 ✓MODE – ORB LD, ENTER

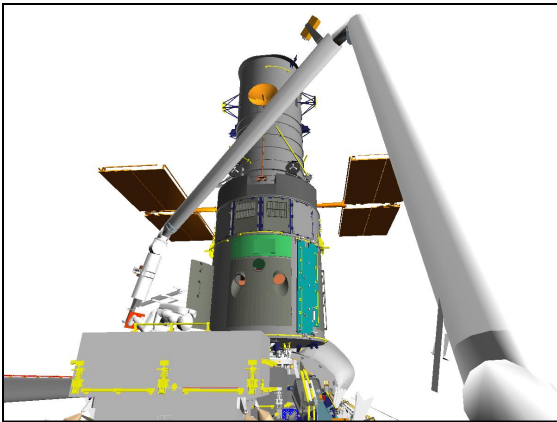
Mnvr to LOPE ACCESS posn:

S: 180 B: 0

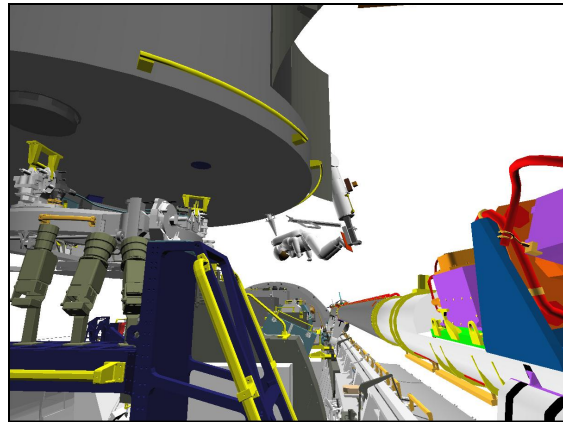
X	Y	Z	PITCH	YAW	ROLL	PL ID
-949	+62	-491	275	345	110	3
SY	SP	EP	WP	WY	WR	
-40.2	+60.9	-91.7	-58.4	+6.5	+348.7	

EV GCA to retrieve LVPS and CEB-R from LOPE

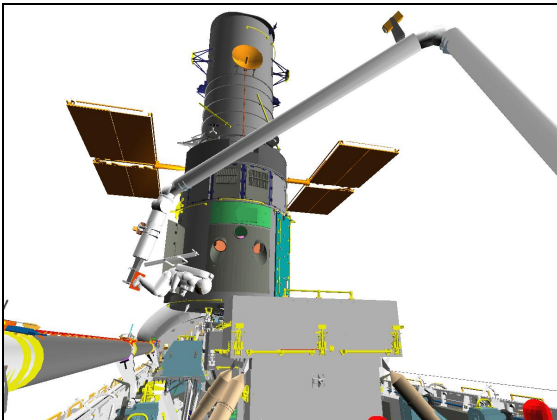
If reqd:
 BRAKES – ON (tb-ON)



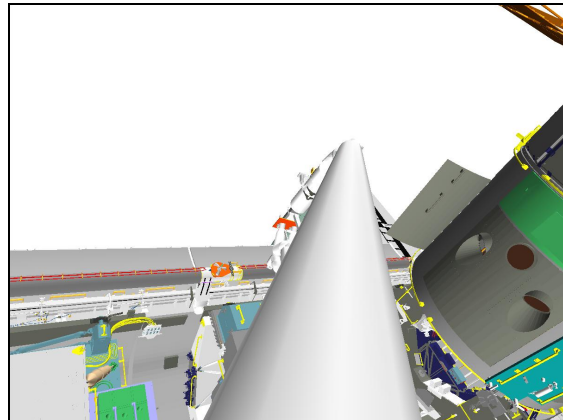
CCTV A (-5,25)



CCTV C (-5,15)



CCTV D (15,20)



ELBOW (-10,-15)

- RHC
5. -V2 AFT SHROUD DOORS CLOSING
 RATE – as reqd (VERN within 10 ft)
 BRAKES – OFF (tb-OFF)
 MODE – ORB LD, ENTER

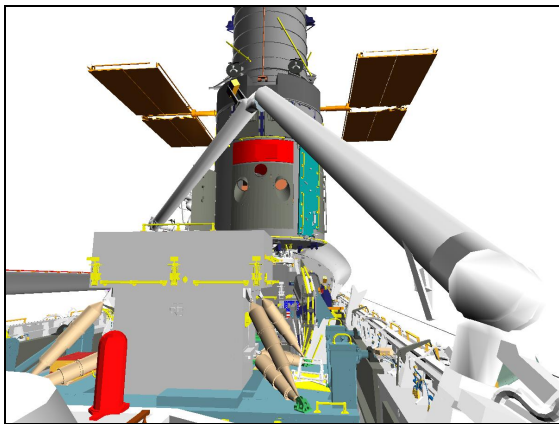
Mnvr to -V2 AFT SHROUD DOORS CLOSING posn: S: 135L B: 90R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1156	+110	-583	0	20	18	3
SY	SP	EP	WP	WY	WR	
-33.8	+27.1	-54.7	+38.3	+52.2	+191.1	

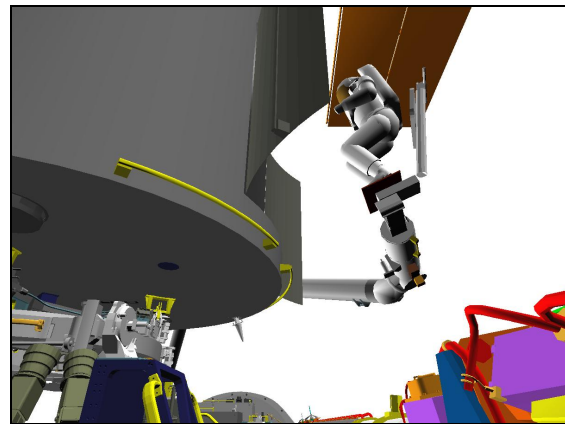
EV GCA to close -V2 Doors:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Door Handle	-1184	+118	-575	0	20	18	3
Bottom Latch	-1159		-525				
Top Latch	-1184		-600				

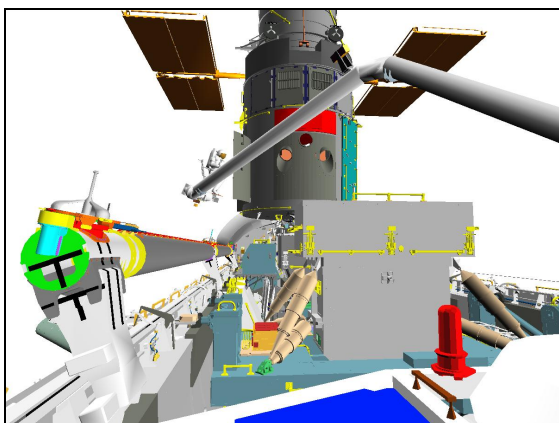
If reqd:
 BRAKES – ON (tb-ON)



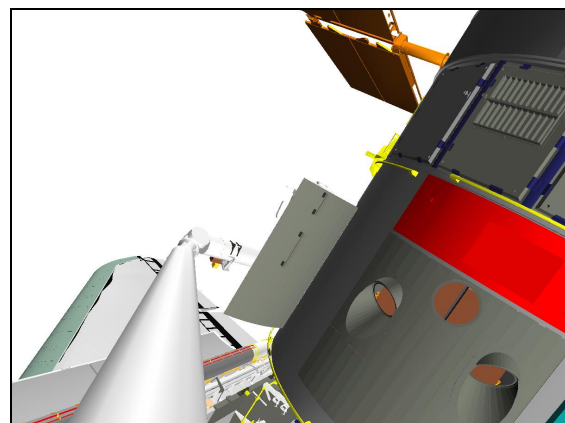
CCTV A (-5,10)



CCTV C (0,30)



CCTV D (5,5)



ELBOW (15,0)

NOBL 5 (-V3 FWD)

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 180°, -V3 fwd, FSS Pivot: 90°, SA Slew: 0°

2. RETRIEVE NOBL AT MULE

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to MINC NOBL RETRIEVE posn: S: 180 B: 90L

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1248	-100	-510	353	0	315	3
SY	SP	EP	WP	WY	WR	
+2.5	+35.4	-57.0	+14.9	-0.2	+135.4	

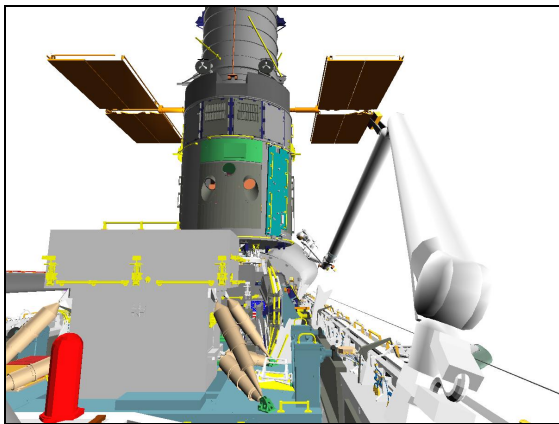
EV GCA to receive NOBL 5 from FF EV:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
NOBL Receive	-1248	-79	-510	353	0	315	3

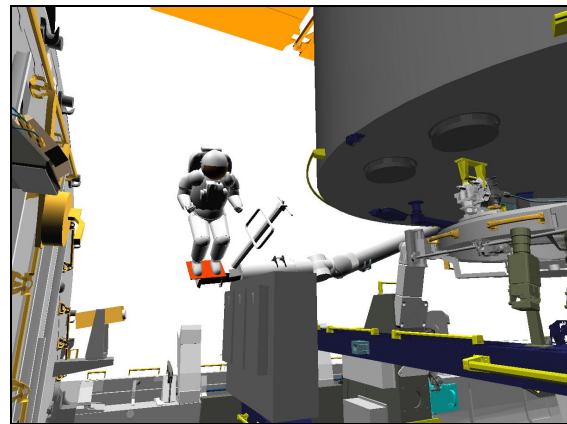
If reqd:

BRAKES – ON (tb-ON)

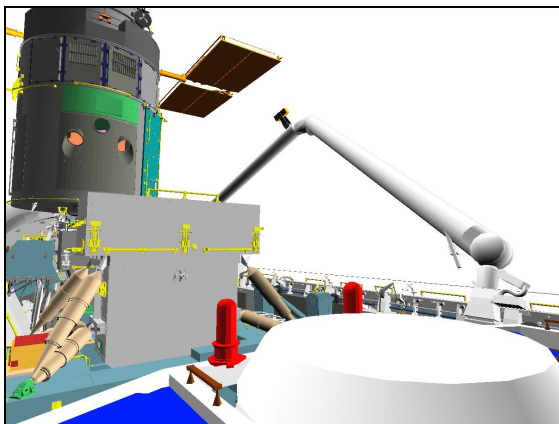
√MODE – not DIRECT



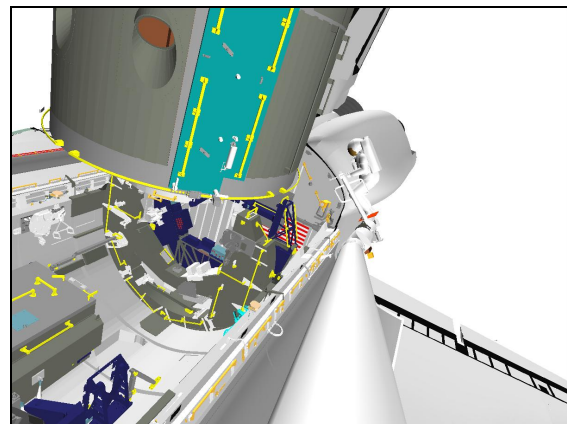
CCTV A (0,10)



CCTV C (-65,15)



CCTV D (35,5)



ELBOW (-10,0)

3. BAY 5 POSN

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to BAY 5 posn:

S: 90R B: 90L

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1174	-141	-670	0	0	355	3
SY	SP	EP	WP	WY	WR	
-2.6	+61.4	-72.7	+11.3	+2.6	+175.5	

EV GCA to remove Bay 5 NOBL

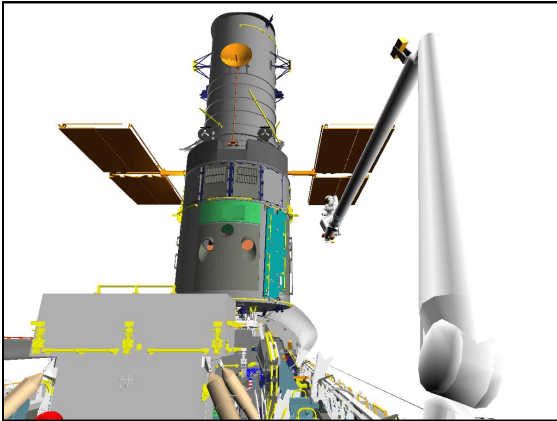
Expected:
NOBL rmvl

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1190	-120	-675	0	0	0	3
-1168						

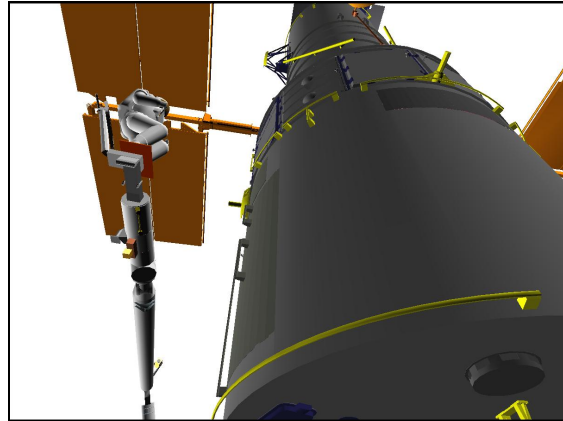
If reqd:

BRAKES – ON (tb-ON)

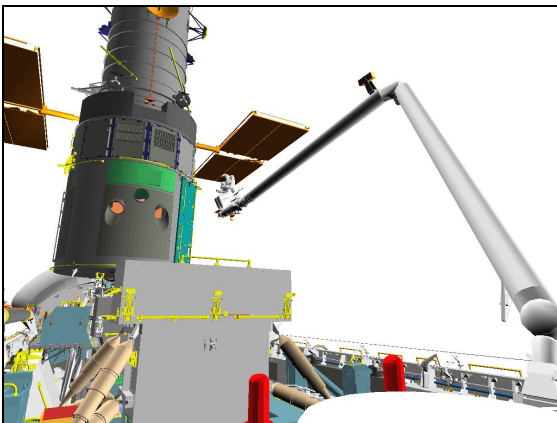
√MODE – not DIRECT



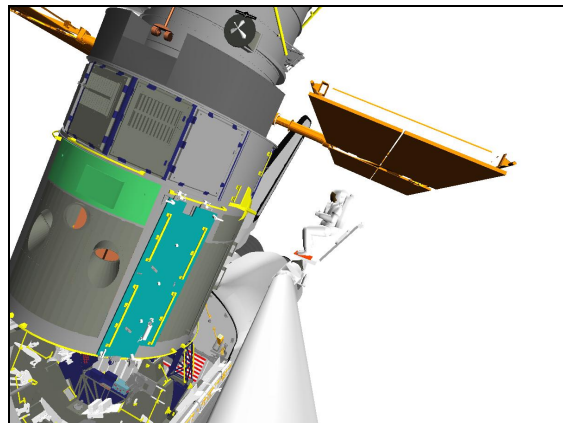
CCTV A (0,20)



CCTV B (10,50)



CCTV D (30,15)



ELBOW (0,5)

4. BAY 5 NOBL INSTALL

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to BAY 5 NOBL INSTALL posn:

S: 0 B: 90L

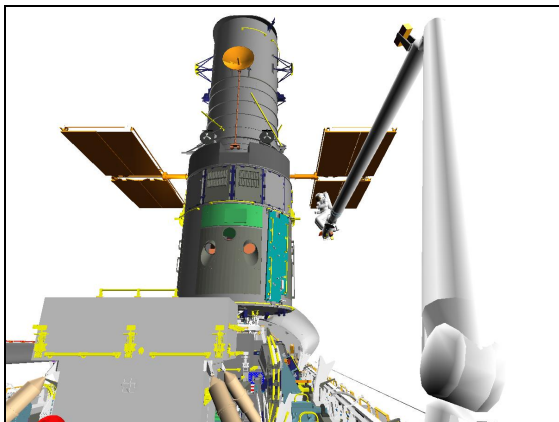
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1163	-123	-675	0	0	345	3
SY	SP	EP	WP	WY	WR	
-4.0	+64.0	-75.7	+11.7	+4.0	+165.5	

EV GCA to install Bay 8 NOBL

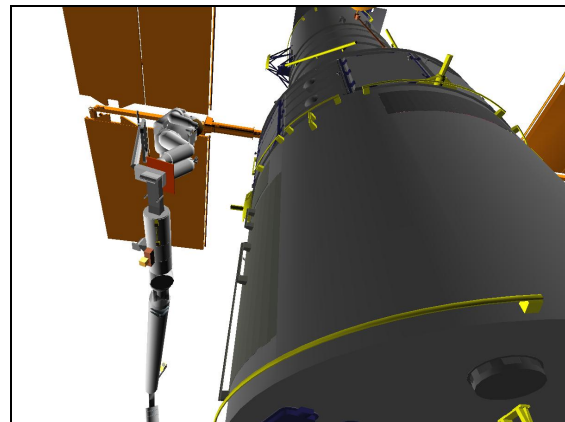
If reqd:

BRAKES – ON (tb-ON)

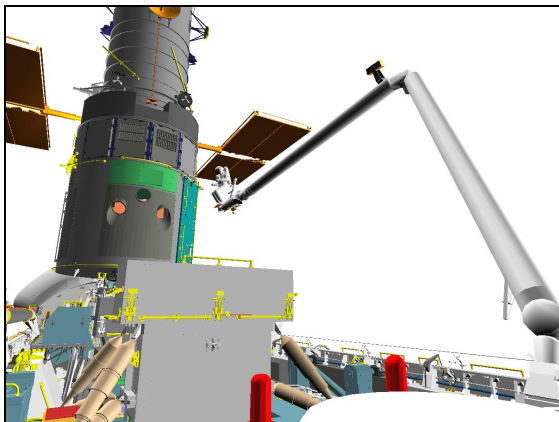
√MODE – not DIRECT



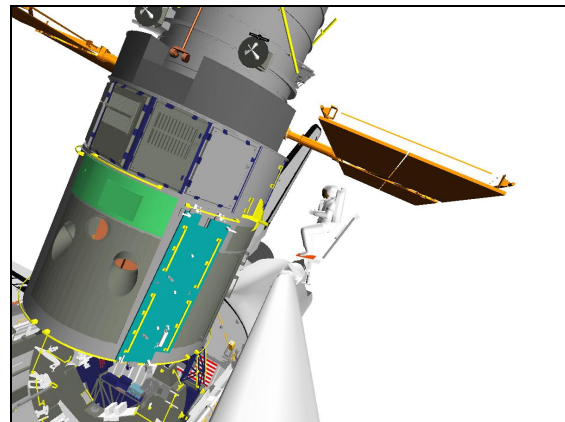
CCTV A (0,20)



CCTV B (10,50)



CCTV D (30,15)



ELBOW (0,5)

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EVA CLOSEOUT

EGRESS AT AIRLOCK..... FS 12-2
MFR RELEASE..... FS 12-3

**EVA
CLOSEOUT**

EGRESS AT AIRLOCK

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

2. MFR EGRESS

RHC

RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB LD, ENTER

Mnvr to MFR EGRESS SETUP posn:

S: 0 B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-735	-13	-477	270	30	90	3
SY	SP	EP	WP	WY	WR	
-74.4	+77.4	-133.8	-82.0	+11.8	+9.7	

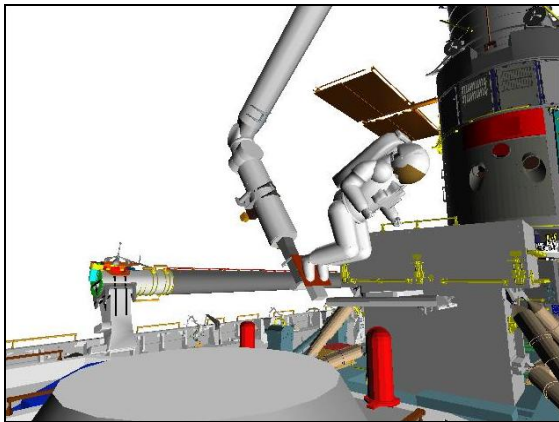
EV GCA to MFR Egress

If reqd:

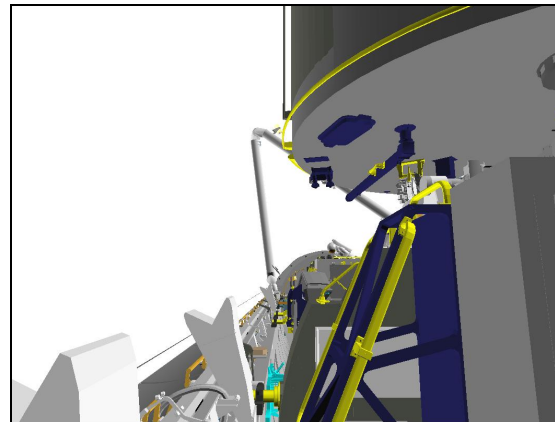
BRAKES – ON (tb-ON)

MODE – not DIRECT (lt off)

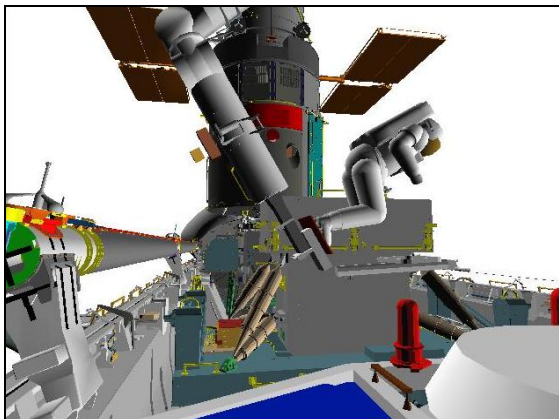
When MFR egress complete and EVA GO, perform RMS EXTENDED PARK
(EXTENDED PARK)



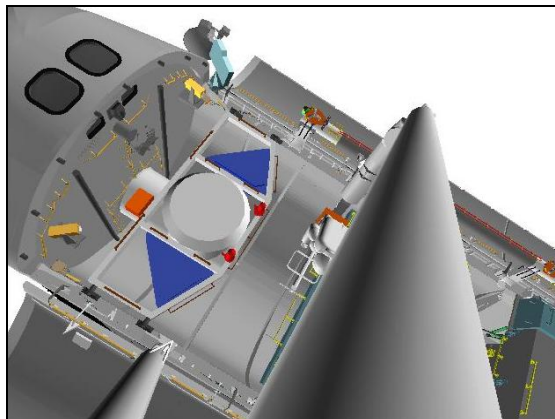
CCTV A (40,10)



CCTV B (0,10)



CCTV D (10,5)



ELBOW (-20,-20)

EVA
CLOSEOUT

MFR RELEASE

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

2. MFR EGRESS

RHC

RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB LD, ENTER

Mnvr to MFR EGRESS SETUP posn:

S: 0 B: 0

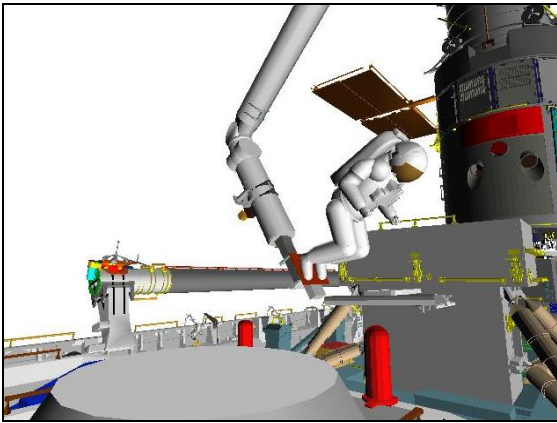
X	Y	Z	PITCH	YAW	ROLL	PL ID
-735	-13	-477	270	30	90	3
SY	SP	EP	WP	WY	WR	
-74.4	+77.4	-133.8	-82.0	+11.8	+9.7	

EV GCA to MFR Egress

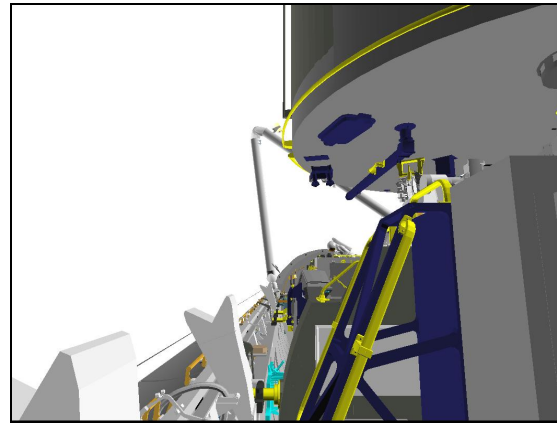
If reqd:

BRAKES – ON (tb-ON)

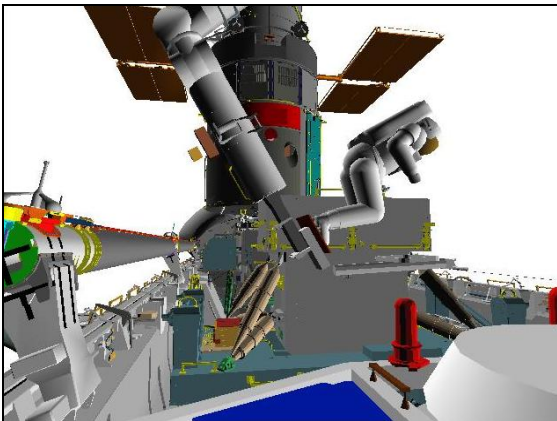
MODE – not DIRECT (It off)



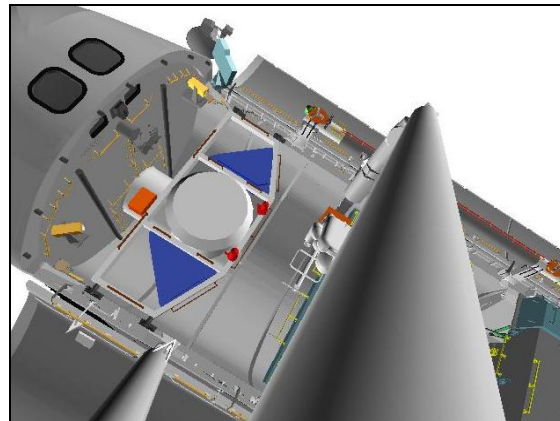
CCTV A (40,10)



CCTV B (0,10)



CCTV D (10,5)



ELBOW (-20,-20)

When MFR egress complete and EVA GO for mnvr to MFR Release posn:

SM 94 PDRS CONTROL

PL ID – ITEM 3 +0 EXEC

INIT ID – ITEM 24 +0 EXEC

3. MFR RELEASE

RHC

RATE – as reqd (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

MODE – ORB UNL, ENTER

Mnvr to MFR RELEASE SETUP posn:

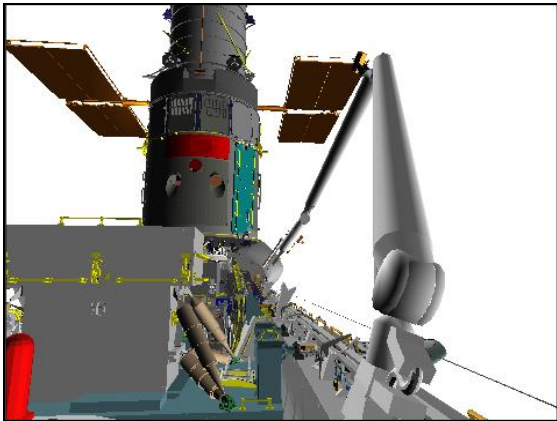
(MFR: 0/0/0)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1125	-120	-485	270	325	90	0
SY	SP	EP	WP	WY	WR	
+1.7	+47.0	-61.9	-75.6	-15.5	-107.8	

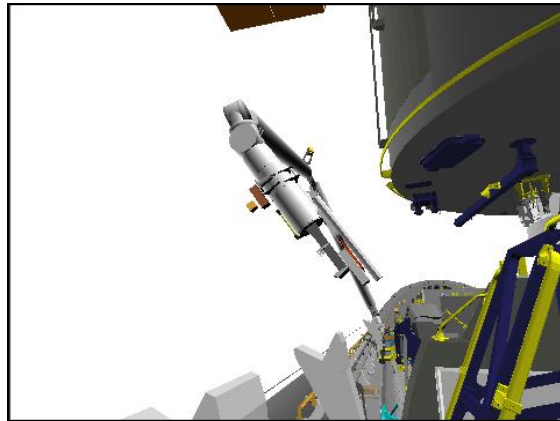
If reqd:

BRAKES – ON (tb-ON)

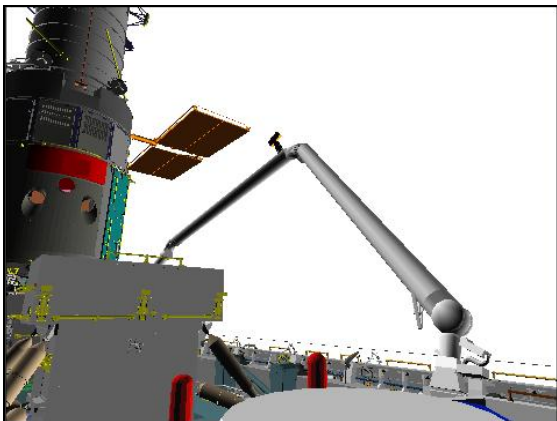
MODE – not DIRECT (lt off)



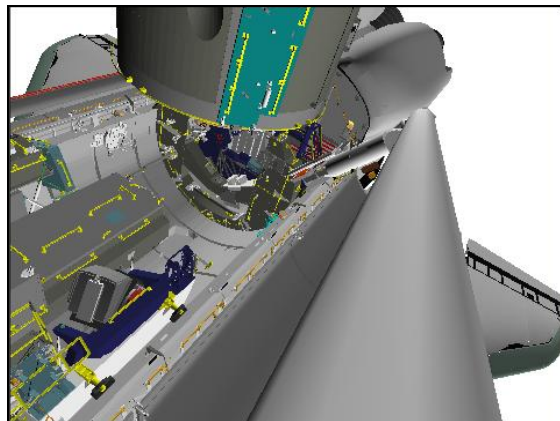
CCTV A (5,10)



CCTV B (-15,15)



CCTV D (40,15)



ELBOW (-20,-20)







4. MFR UNGRAPPLE
 ✓BRAKES – OFF (tb-OFF)

EV GCA to MFR Release posn







On EV GO for MFR Release:

CAUTION
 Monitor EE tb timing to prevent EE motor burnout







EE MODE – MAN
 MAN CONTR – DERIGID until DERIGID tb – gray

✓	RIGID 	CLOSE 	CAPTURE 	<u>CRITICAL TIMES:</u> RIGID tb – bp, then DERIGID tb – gray, 5 sec
	DERIGID 	OPEN 	EXTEND 	

On EV GO for snare release:
 EE RELEASE sw – depress (hold until OPEN tb-gray)

✓	RIGID 	CLOSE 	CAPTURE 	<u>CRITICAL TIMES:</u> CLOSE tb – bp, and CAPTURE tb – bp, then OPEN tb – gray, 3 sec
	DERIGID 	OPEN 	EXTEND 	

On EV GO for carriage extension:
 EE MAN CONTR – DERIGID until EXTEND tb – gray

✓	RIGID 	CLOSE 	CAPTURE 	<u>CRITICAL TIMES:</u> EXTEND tb – gray, 20 sec
	DERIGID 	OPEN 	EXTEND 	

EE MODE – OFF

If reqd:
 BRAKES – ON (tb-ON)
 MODE – not DIRECT (It off)

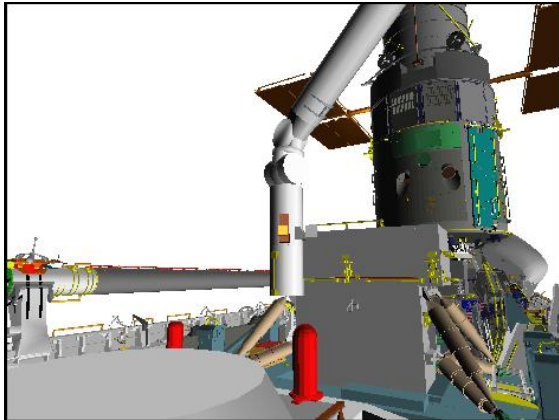
- RHC
5. AIRLOCK DROPOFF
 RATE – as reqd (VERN within 10 ft)
 √BRAKES – OFF (tb-OFF)
 MODE – ORB UNL, ENTER

On EV GO, mnvr to AIRLOCK DROPOFF posn:

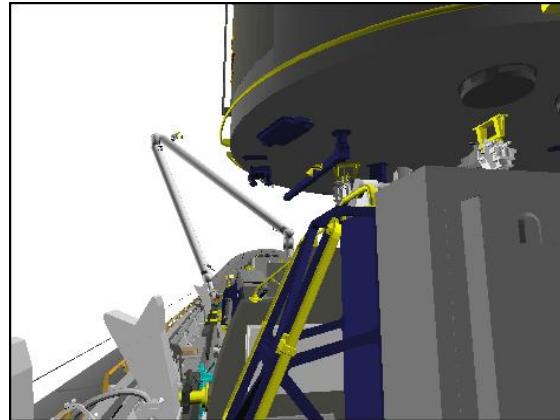
X	Y	Z	PITCH	YAW	ROLL	PL ID
-738	+13	-439	270	0	155	0
SY	SP	EP	WP	WY	WR	
-65.9	+94.1	-150.0	-52.0	+7.8	-118.4	

If reqd:

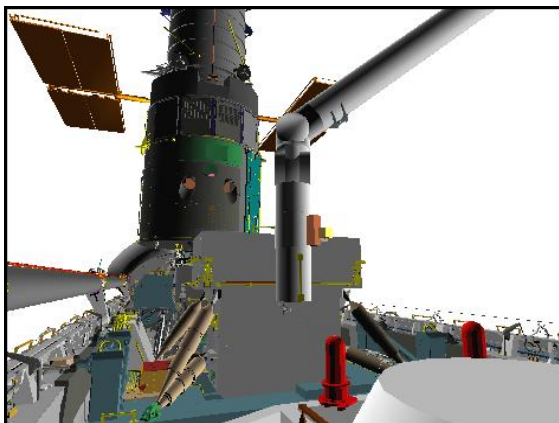
- BRAKES – ON (tb-ON)
 MODE – not DIRECT (lt off)



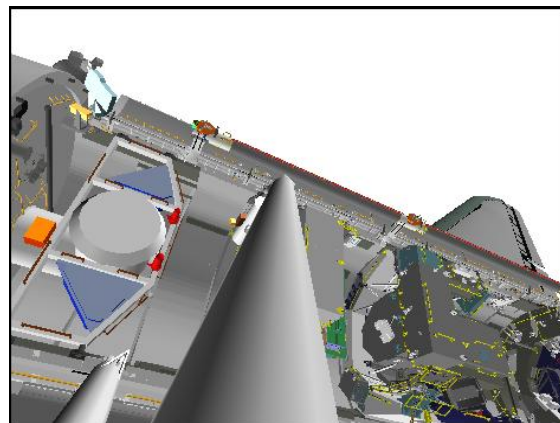
CCTV A (-30,10)



CCTV B (10,10)



CCTV D (20,10)



ELBOW (0,-10)

When mnvr to Airlock for EV dropoff complete and EVA GO, then go to RMS EXTENDED PARK (EXTENDED PARK)

UNSCHEDULED EVA TASKS

TPS REPAIR WITH EVA ON OBSS	FS 13-2
NOBL 7	FS 13-7
ECU R&R	FS 13-9
VIC R&R	FS 13-15
COPE RSU RETRIEVE	FS 13-17
HGA MANUAL RETRACT/DEPLOY	FS 13-19
APERTURE DOOR MANUAL OPEN/CLOSE	FS 13-21
JETTISON	FS 13-23
SOLAR ARRAY MANUAL SLEW AND LOCK	FS 13-27
PDU FUSE R&R	FS 13-29
EP/TCE FUSE R&R	FS 13-33
PL ID/POR DEFINITION – PL ID 3	FS 13-35

TPS REPAIR WITH EVA ON OBSS

1. SETUP

SM 94 PDRS CONTROL

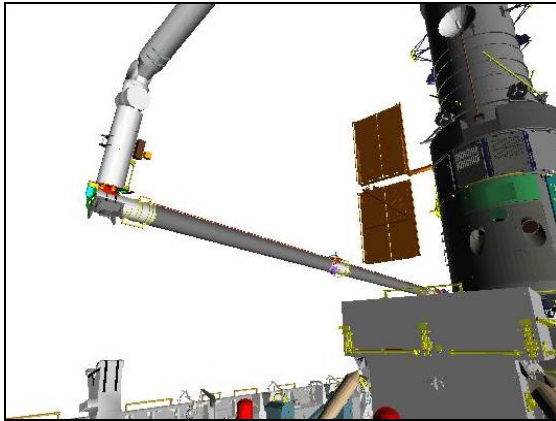
√ PL ID, ITEM 3: 2

√ INIT ID, ITEM 24: 2

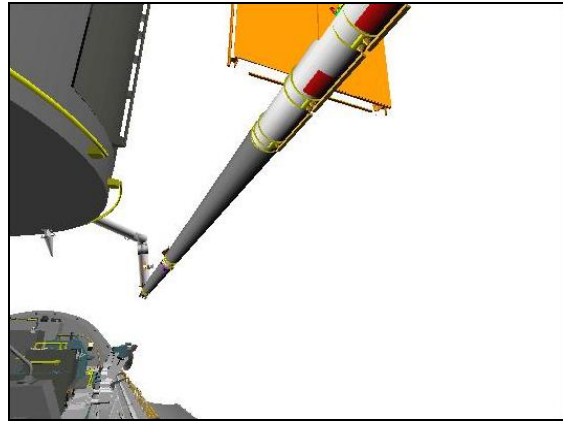
HST CONFIG: FSS Rotation: 180°, -V3 fwd, FSS Pivot: 90°, SA Slew: Any

Verify OBSS HOVER posn:

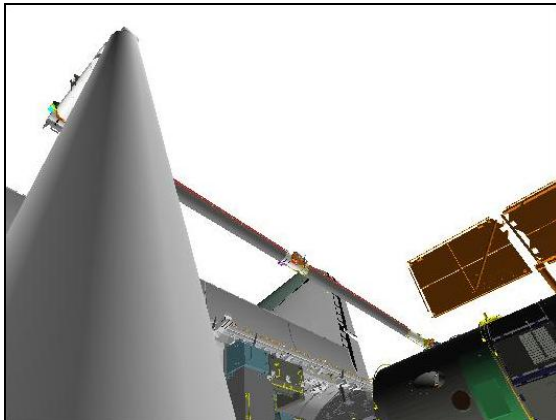
	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1271	+134	-532	0	0	11	2
	SY	SP	EP	WP	WY	WR	
√	-89.9	+80.2	-118.8	-59.8	+0.0	+109.9	



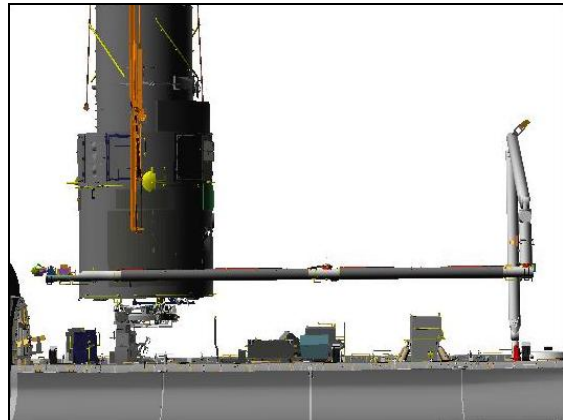
CCTV A (-40,20)



CCTV C (25,20)



ELBOW (20,-30)



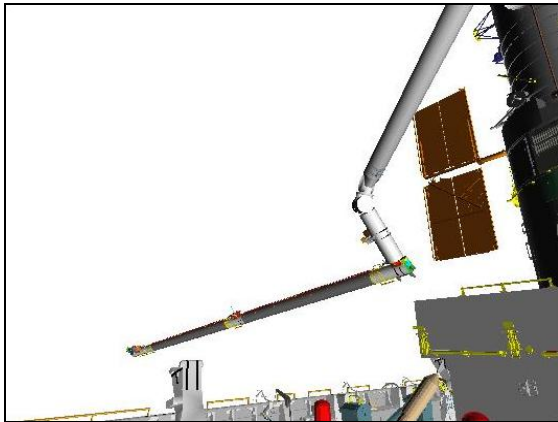
STARBOARD

UNSCHEMATIC
EVA TASKS

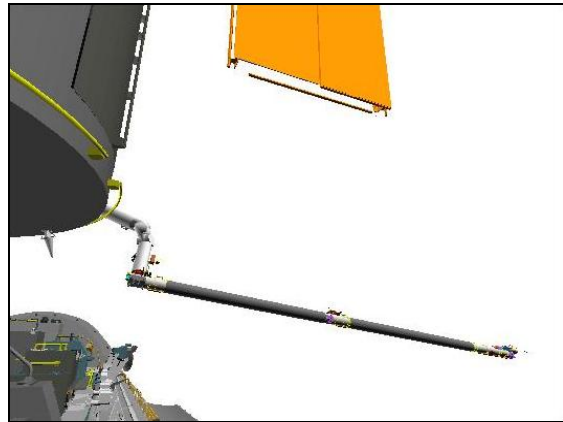
RHC 2. SAFETY TETHER HOVER POSN
 RATE – as reqd (VERN within 10 ft)
 BRAKES – OFF (tb-OFF)
 MODE – SINGLE, ENTER

	SY	SP	EP	WP	WY	WR	
OBSS Hover	-89.9	+80.2	-118.8	-59.8	0.0	+109.9	
1: WR –						-23.3	
2: WY +					+43.4		
3: WP +				-47.2			
4: EP +			-113.0				
5: SP –		+71.4					
6: SY +	-57.9						
Safety Tether Hover	-57.9	+71.4	-113.0	-47.2	+43.4	-23.3	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-856	+698	-439	257	278	221	2

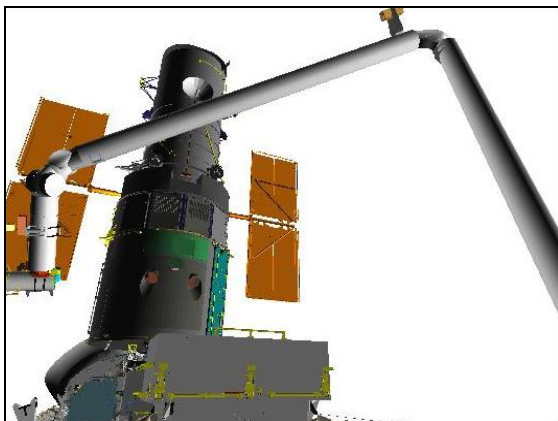
BRAKES – ON (tb-ON)
 MODE – not DIRECT (lt off)



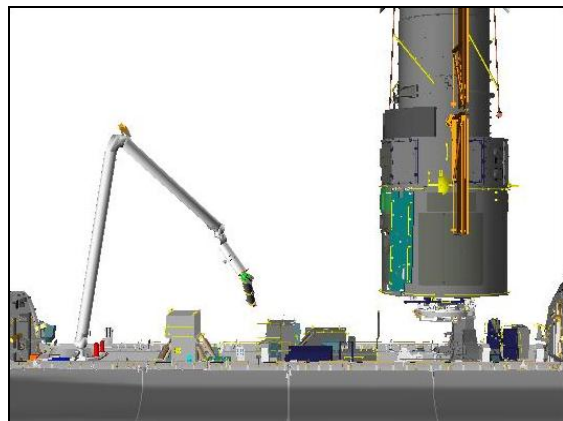
CCTV A (-50,20)



CCTV C (25,20)



CCTV D (25,25)



PORT

3. SAFETY TETHER INSTALL

When EV crewmembers ready:

RATE – VERN (RATE MIN tb-ON)

BRAKES – OFF (tb-OFF)

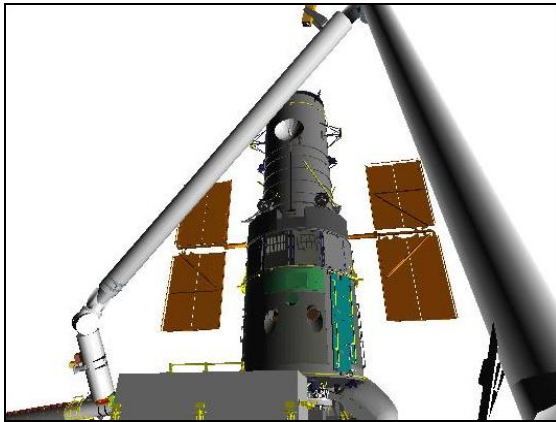
MODE – ORB LD, ENTER

GCA to SAFETY TETHER posn THC Z (down):

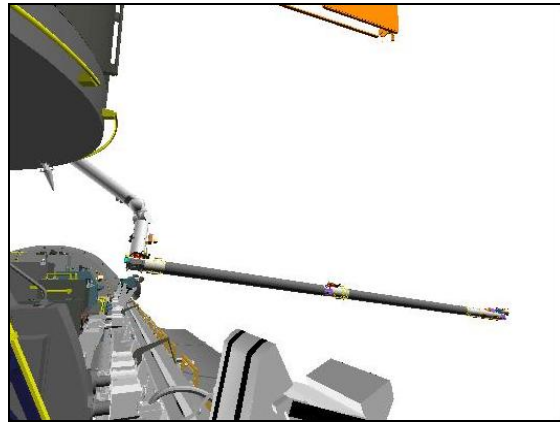
	X	Y	Z	PITCH	YAW	ROLL	PL ID
Expected	-856	+698	-387	257	278	221	2
	SY	SP	EP	WP	WY	WR	
	-56.0	+65.1	-117.9	-34.4	+43.3	-26.0	

BRAKES – ON (tb-ON)

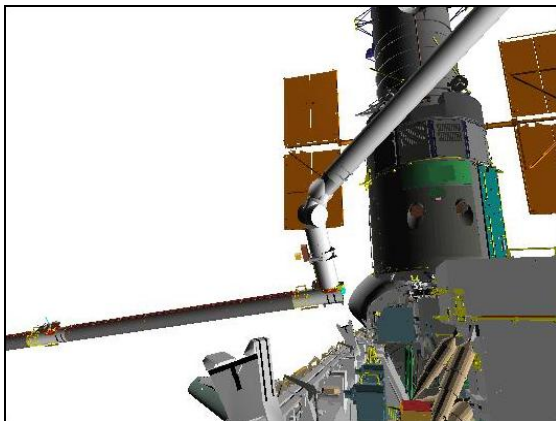
EV crewmembers install safety tethers



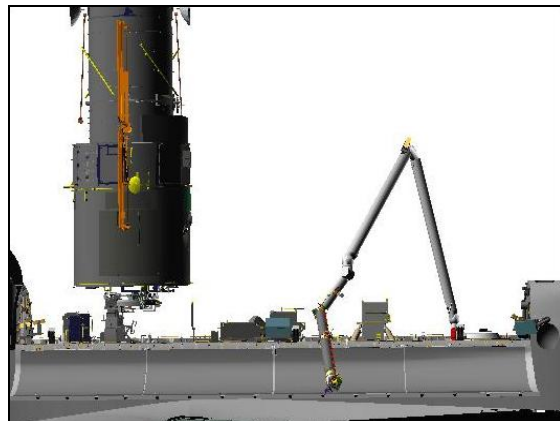
CCTV A (-10,30)



CCTV C (25,10)



CCTV D (-15,15)



STARBOARD

4. HST PFR HOVER

When EV crewmembers ready:

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

NOTE

The following maneuver is scripted to ensure OBSS and SRMS clearance to the orbiter and HST

THC

Mnvr Z to -485 (up)
Mnvr Y to +155 (right)

HST PFR HOVER posn:

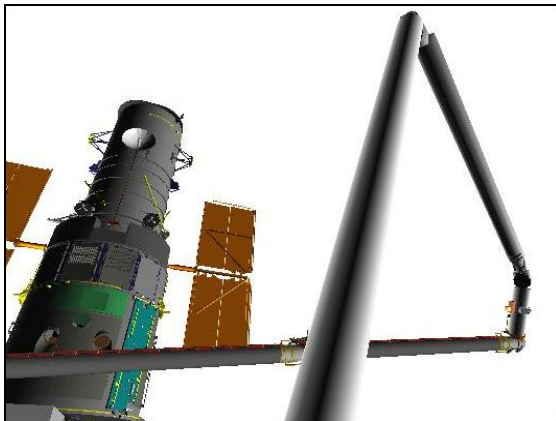
	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-856	+155	-485	257	278	221	3
	SY	SP	EP	WP	WY	WR	
√	+56.7	+90.8	-86.8	-53.6	-17.4	-131.1	

EV GCA to STBD SILL ACCESS posn to install PAD

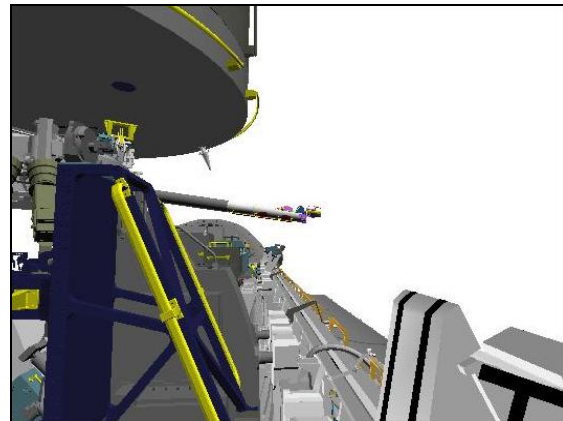
BRAKES – ON (tb-ON)

NOTE

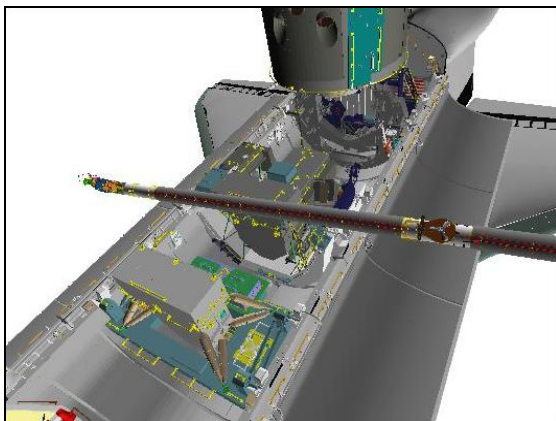
Approximate HST PFR setting NN,B,BB,6



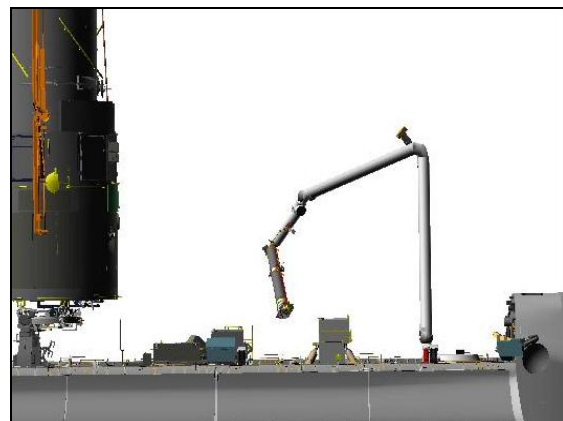
CCTV A (20,35)



CCTV C (5,5)



ELBOW (-85,-10)



STARBOARD

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NOBL 7

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 270°, +V2 fwd, and 360°, +V3 fwd

FSS Pivot: 90°, SA Slew: 0°

If FSS Rotation 270°, +V2 Fwd:

2. BAY 7 POSN (+V2 FWD)

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

NOTE

RMS EV can watch clearance to keel pin

Mnvr to BAY 7 (+V2 FWD) posn:

S: 45R B: 90L

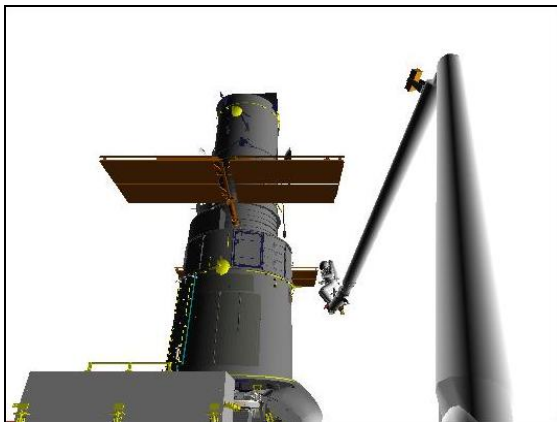
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1127	-125	-654	0	355	345	3
SY	SP	EP	WP	WY	WR	
-2.1	+71.1	-88.9	+16.1	-2.6	-194.5	

EV GCA to assist FF EV with NOBL 7 Install

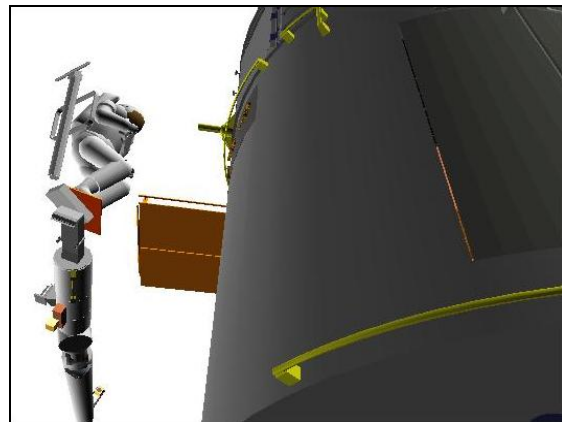
If reqd:

BRAKES – ON (tb-ON)

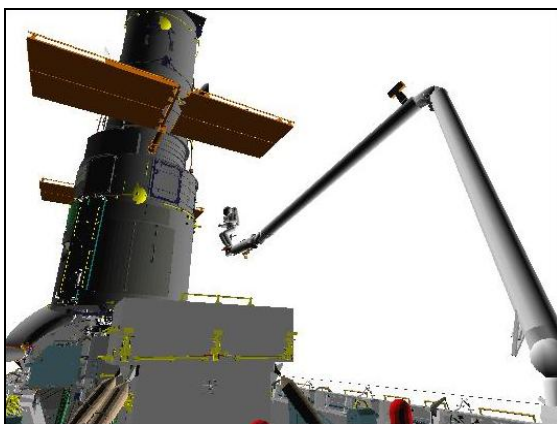
√MODE – not DIRECT



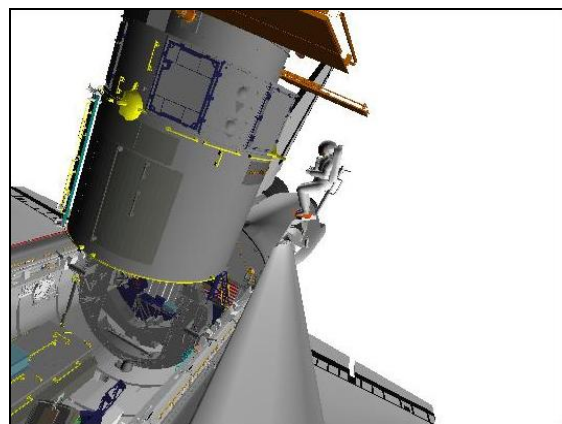
CCTV A (0,30)



CCTV B (10,45)



CCTV D (30,20)



ELBOW (0,0)

If FSS Rotation 360°, +V3 Fwd:

3. BAY 7 POSN (+V3 FWD)

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

NOTE

RMS EV can watch clearance to keel pin

Mnvr to BAY 7 (+V3 FWD) posn:

S: 135R B: 0

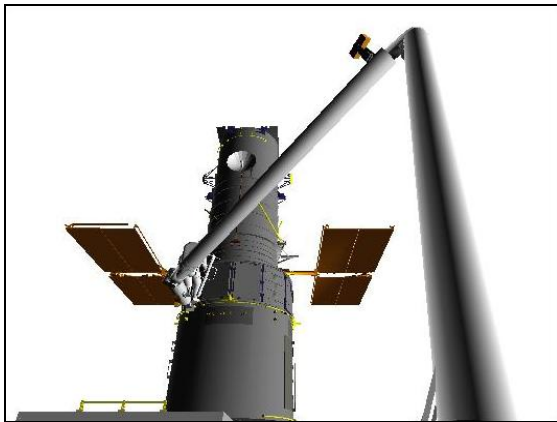
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1015	+40	-670	0	0	0	3
SY	SP	EP	WP	WY	WR	
-37.1	+76.9	-107.6	+30.7	+37.1	-179.5	

EV GCA to assist FF EV with NOBL 7 Install

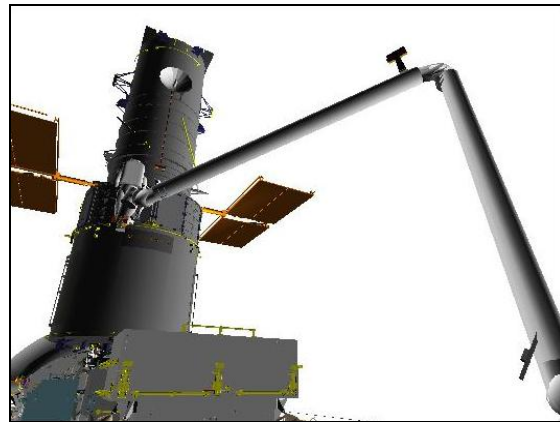
If reqd:

BRAKES – ON (tb-ON)

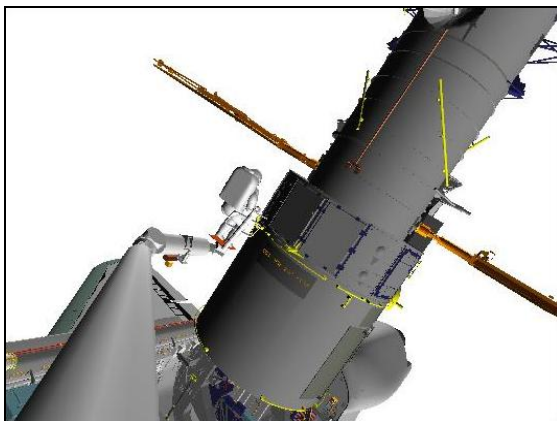
√MODE – not DIRECT



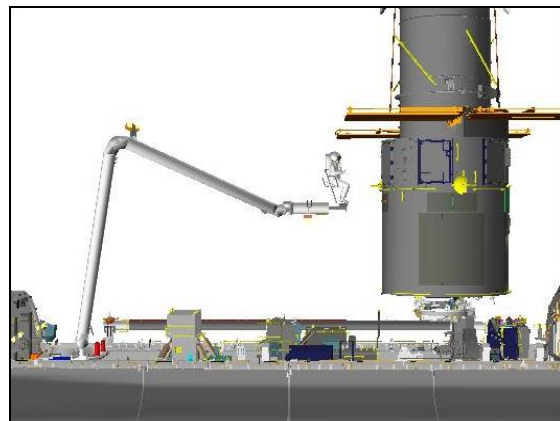
CCTV A (0,35)



CCTV D (30,25)



ELBOW (20,0)



PORT

ECU R&R

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 180°, -V3 fwd, FSS Pivot: 90°, SA Slew: 0°

FSS Rotation: 360°, +V3 fwd

FSS Rotation: 90°, -V2 fwd

2. ECU RETRIEVAL AT MULE POSN

RATE – as required (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB LD, ENTER

Mnvr to ECU RETRIEVAL AT MULE posn: S: 180 B: 90L

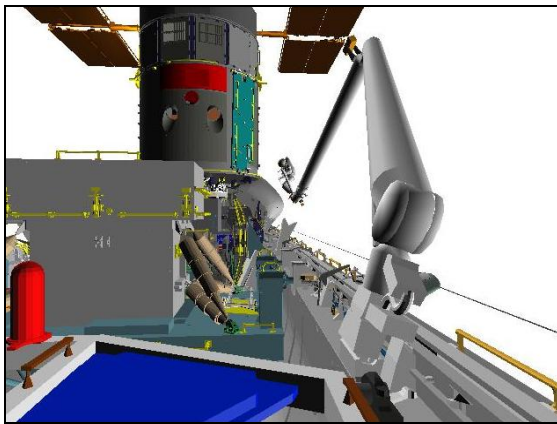
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1248	-123	-524	353	0	333	3
SY	SP	EP	WP	WY	WR	
+3.3	+36.2	-57.2	+14.4	-1.0	-206.7	

EV GCA to retrieve ECU at MULE

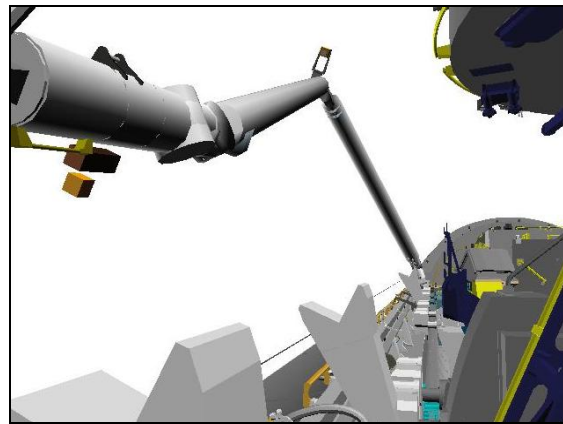
If reqd:

BRAKES – ON (tb-ON)

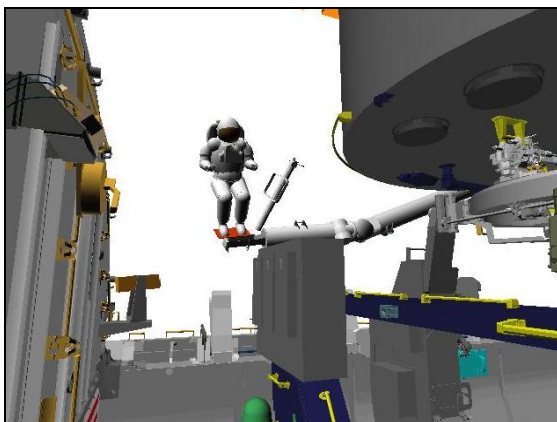
√MODE – not DIRECT



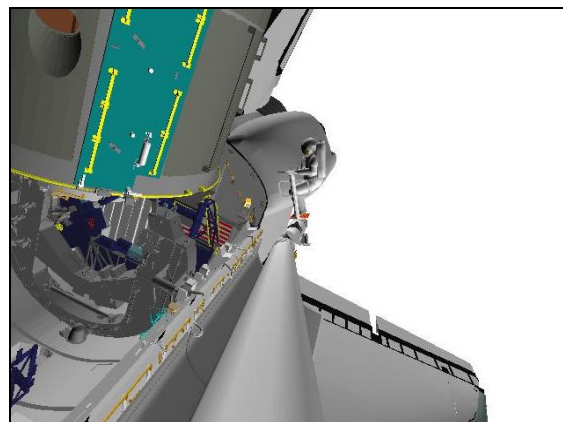
CCTV A (5,0)



CCTV B (-15,5)



CCTV C (-70,10)



ELBOW (0,0)

If FSS Rotation 180°, -V3 Fwd:

3. BAY 10 POSN (-V3 FWD)

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to BAY 10 (-V3 FWD) posn:

S: 135L B: 90R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1160	+130	-670	0	0	0	3
SY	SP	EP	WP	WY	WR	
-34.8	+37.3	-53.3	+16.0	+34.8	-179.5	

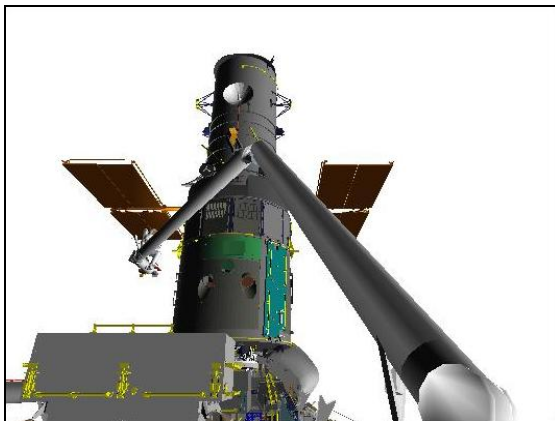
EV GCA to Bay 10 for ECU R&R

If reqd:

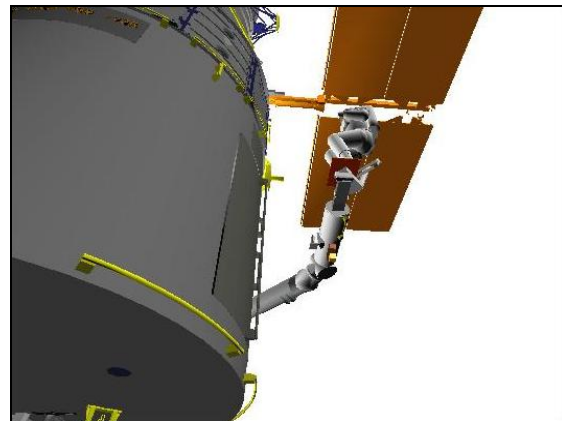
BRAKES – ON (tb-ON)

√MODE – not DIRECT

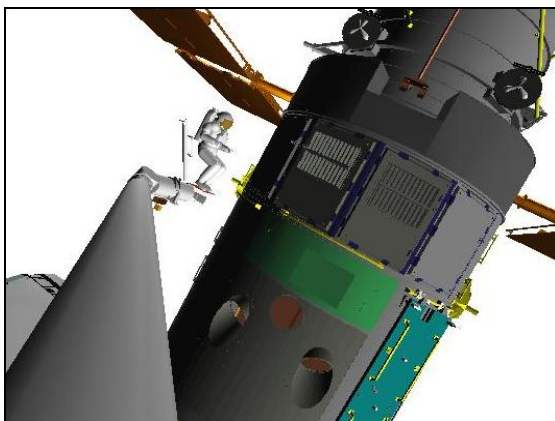
Go to step 6



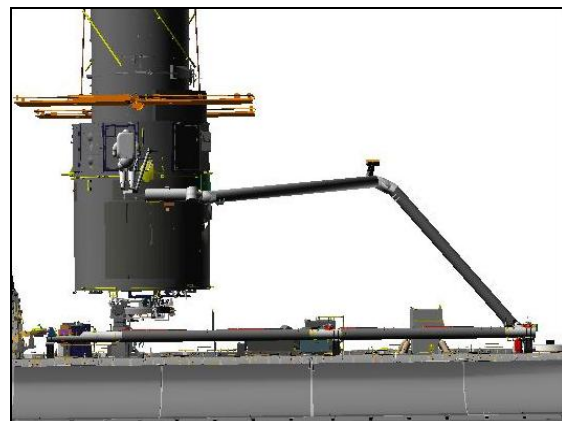
CCTV A (0,25)



CCTV C (5,45)



ELBOW (20,-10)



STARBOARD

If FSS Rotation 360°, +V3 Fwd:

4. BAY 10 POSN (+V3 FWD)

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to BAY 10 (+V3 FWD) posn:

S: 135R B: 90L

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1127	-125	-654	0	355	345	3
SY	SP	EP	WP	WY	WR	
-2.1	+71.1	-88.9	+16.1	-2.6	-194.5	

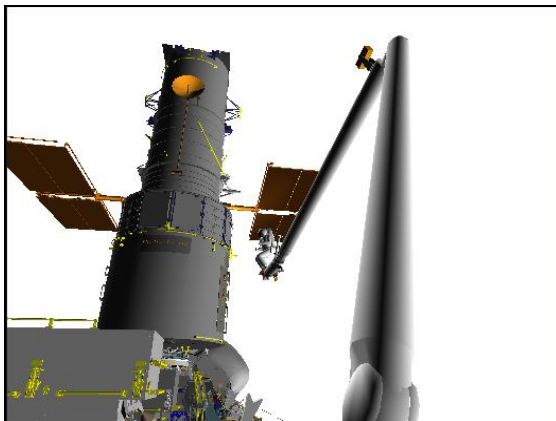
EV GCA to Bay 10 for ECU R&R

If reqd:

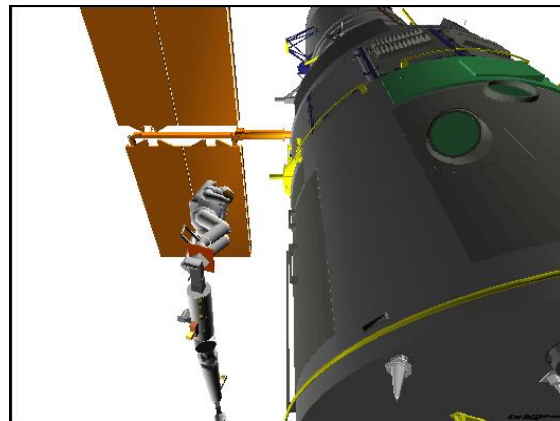
BRAKES – ON (tb-ON)

√MODE – not DIRECT

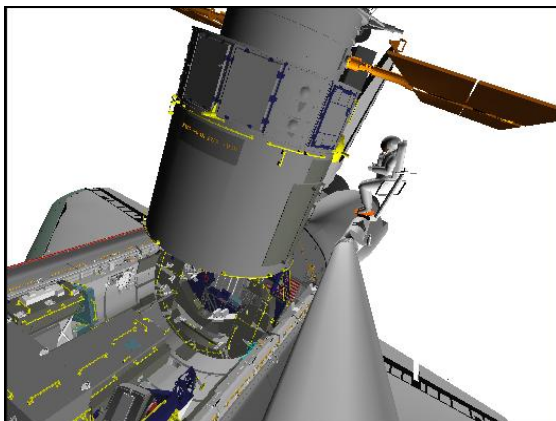
Go to step 6



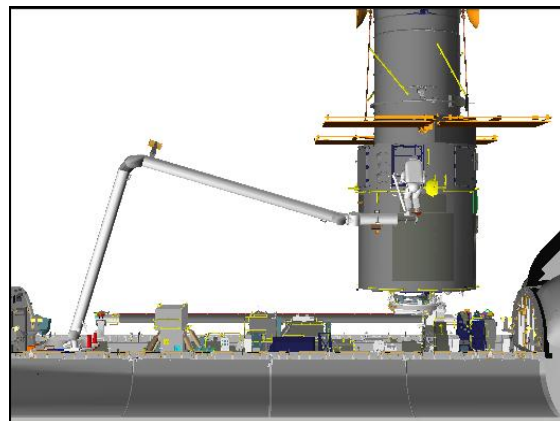
CCTV A (10,25)



CCTV B (0,50)



ELBOW (-10,0)



PORT

If FSS Rotation 90°, -V2 Fwd:

5. BAY 10 POSN (-V2 FWD)

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to BAY 10 (-V2 FWD) posn:

S: 180 B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1015	+15	-670	0	0	0	3
SY	SP	EP	WP	WY	WR	
-33.6	+80.7	-110.2	+29.6	+33.6	-179.5	

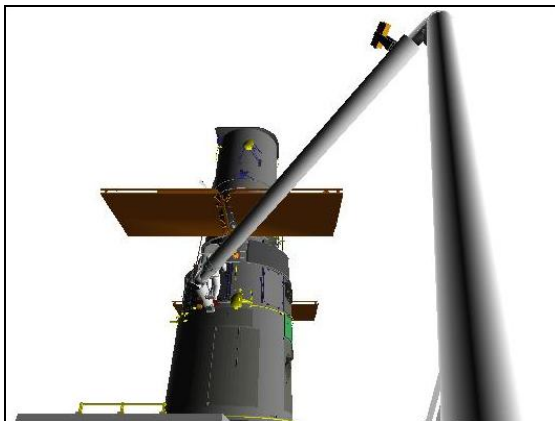
EV GCA to Bay 10 for ECU R&R

If reqd:

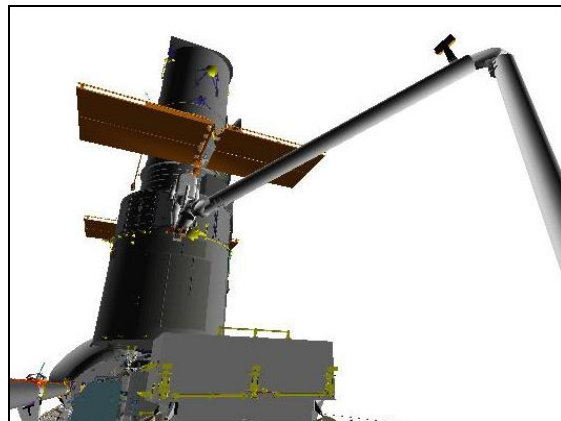
BRAKES – ON (tb-ON)

√MODE – not DIRECT

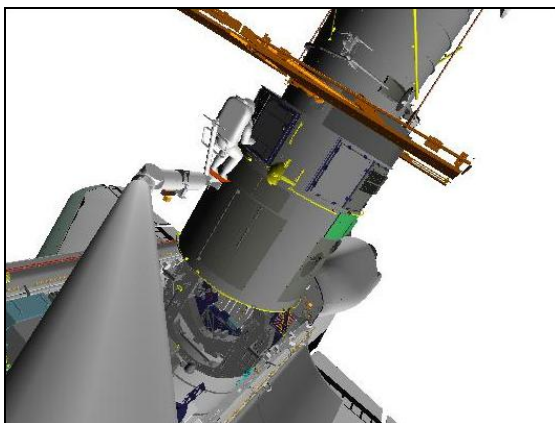
Go to step 6



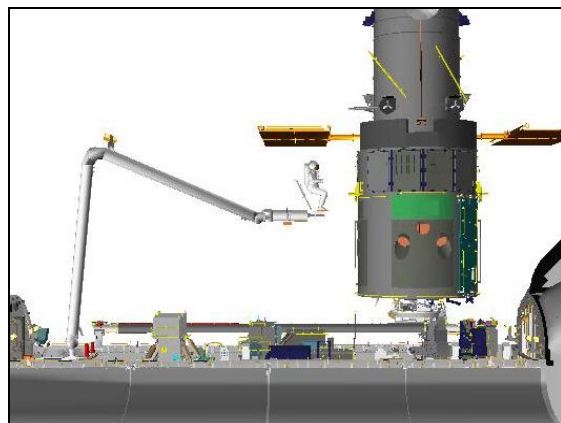
CCTV A (0,35)



CCTV D (25,25)



ELBOW (20,-10)



PORT

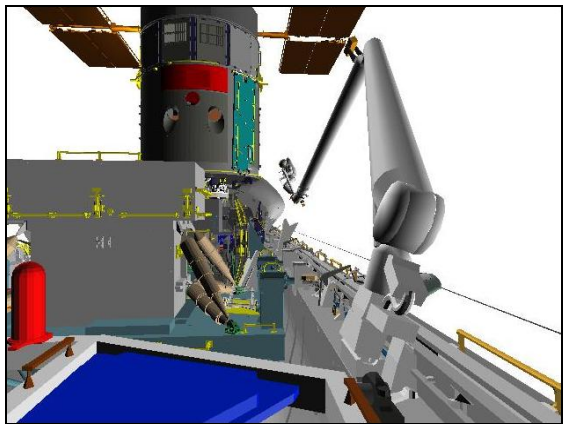
6. ECU HANDOFF AT MULE POSN
 RATE – as required (VERN within 10 ft)
 BRAKES – OFF (tb-OFF)
 MODE – ORB LD, ENTER

Mnvr to ECU HANDOFF AT MULE posn: S: 180 B: 90L

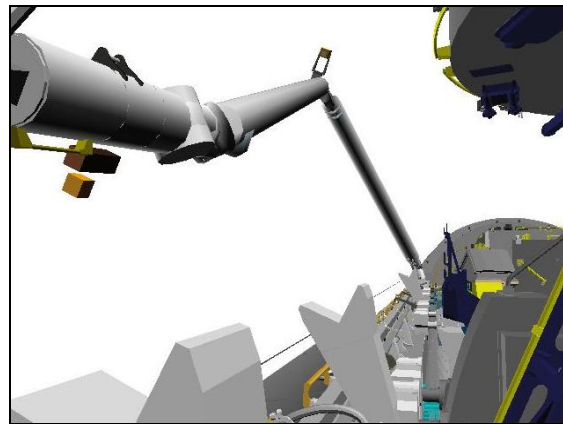
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1248	-123	524	353	0	333	3
SY	SP	EP	WP	WY	WR	
+3.3	+36.2	-57.2	+14.4	-1.0	-206.7	

EV GCA to hand off ECU at MULE

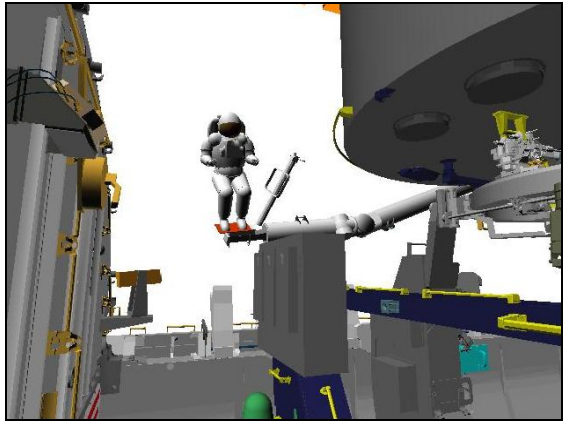
- If reqd:
 BRAKES – ON (tb-ON)
 √MODE – not DIRECT



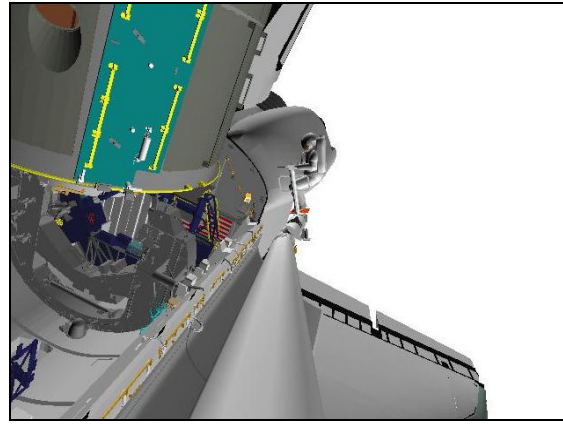
CCTV A (5,0)



CCTV B (-15,5)



CCTV C (-70,10)



ELBOW (0,0)

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VIC R&R

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 180°, -V3 fwd, FSS Pivot: 90°
SA Slew: +SA: 160°, -SA: +180°

2. BAY 2 POSN

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to BAY 2 posn:

S: 180 B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1015	+9	-670	0	0	15	3
SY	SP	EP	WP	WY	WR	
-35.0	+79.4	-109.0	+29.6	+35.0	-164.5	

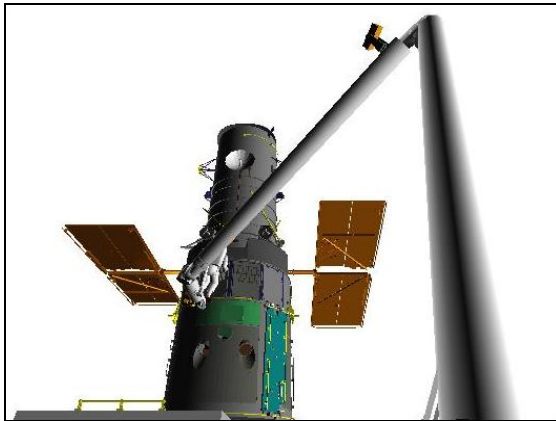
EV GCA to Bay 2 for VIC R&R:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Bay 2 Door	-1028	+29	-650	0	0	15	3
Bay 2 R&R	-1044	+29	-660				

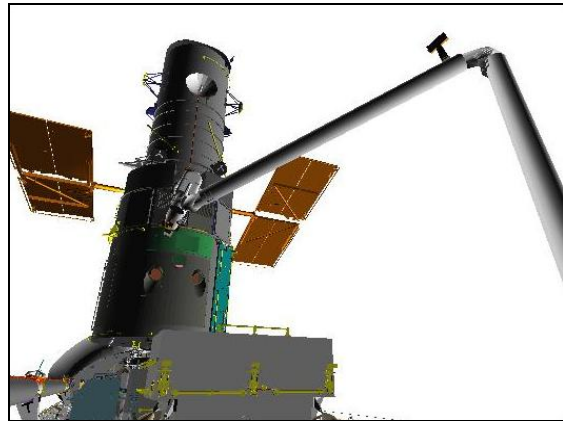
If reqd:

BRAKES – ON (tb-ON)

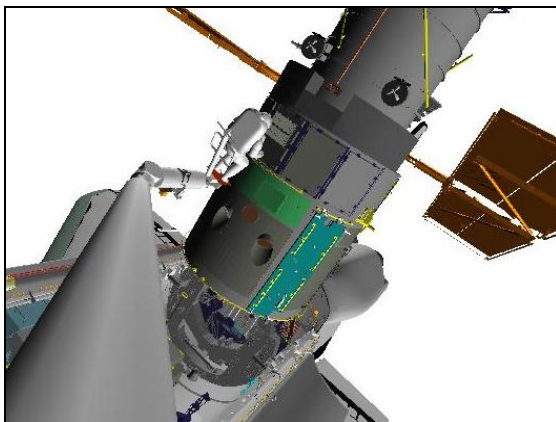
√MODE – not DIRECT



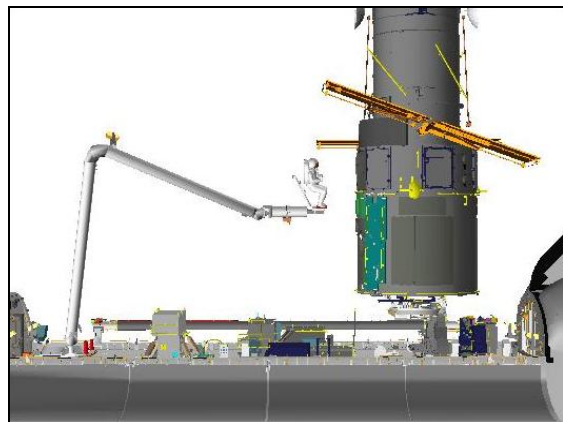
CCTV A (0,35)



CCTV D (25,25)



ELBOW (20,-10)



PORT

3. BAY 3 POSN

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to BAY 3 posn:

S: 180 B: 90R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1034	-40	-680	345	270*	15	3
SY	SP	EP	WP	WY	WR	
-9.1	+80.2	-92.6	-53.5	-68.6	-194.4	

* Display Singularity

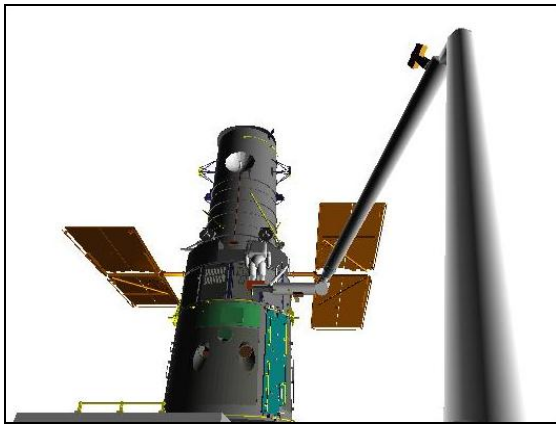
EV GCA to Bay 3 for VIC R&R:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Bay 3 Door	-1030	-50	-695				3
Bay 3 R&R	-1052	-36	-668				

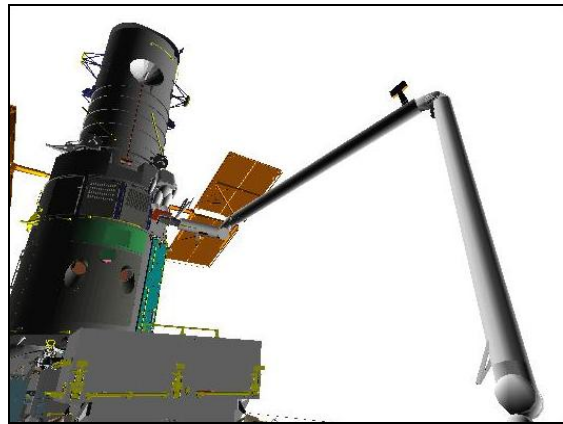
If reqd:

BRAKES – ON (tb-ON)

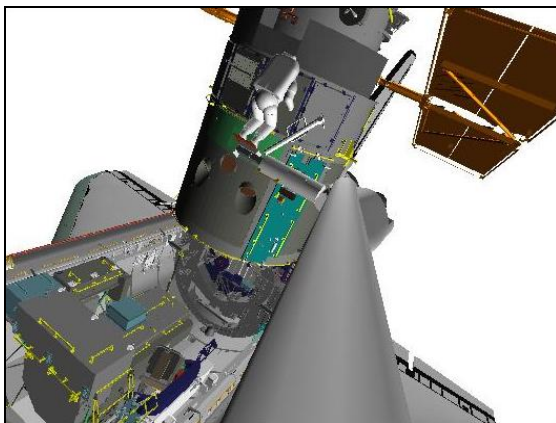
√MODE – not DIRECT



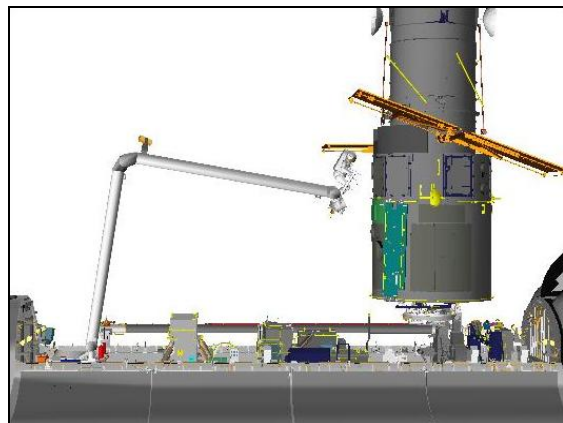
CCTV A (0,35)



CCTV D (35,25)



ELBOW (-10,-10)



PORT

COPE RSU RETRIEVE

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 180°, -V3 fwd, FSS Pivot: 90°, SA Slew: 0°

2. ECU RETRIEVAL AT MULE POSN

RATE – as required (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB LD, ENTER

Mnvr to SPARE RSU RETRIEVAL AT MULE posn: S: 180 B: 90L

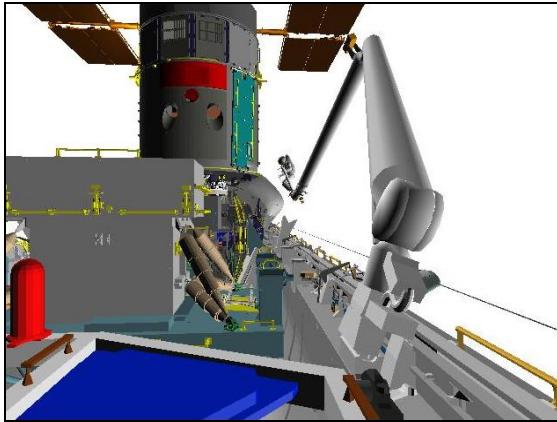
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1248	-123	-524	353	0	333	3
SY	SP	EP	WP	WY	WR	
+3.3	+36.2	-57.2	+14.4	-1.0	-206.7	

EV GCA to retrieve spare RSU at MULE

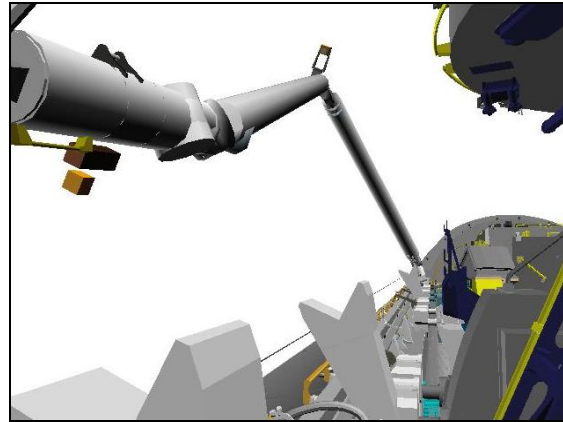
If reqd:

BRAKES – ON (tb-ON)

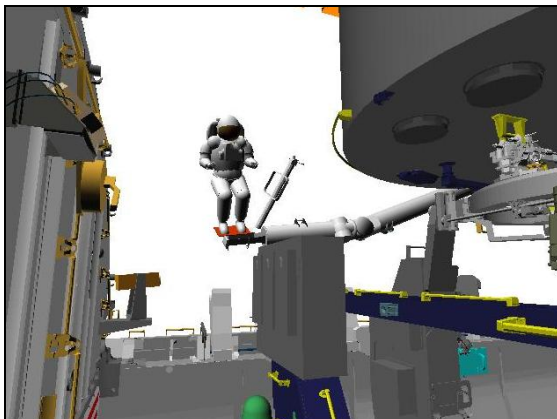
√MODE – not DIRECT



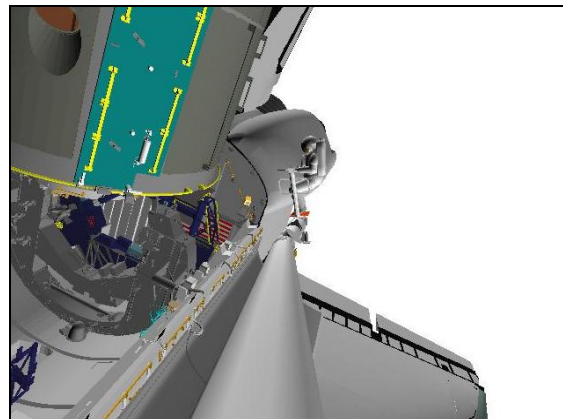
CCTV A (5,0)



CCTV B (-15,5)



CCTV C (-70,10)



ELBOW (0,0)

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HGA MANUAL RETRACT/DEPLOY

1. SETUP

SM 94 PDRS CONTROL

PL ID, ITEM 3: 3

INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 180°, -V3 fwd, FSS Pivot: 90°, SA Slew: Any

2. HGA MANUAL RETRACT/DEPLOY POSN

RATE – as required (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB LD, ENTER

Mnvr to HGA MANUAL RETRACT/DEPLOY posn: S: 180 B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1026	-40	-740	338	334	350	3
SY	SP	EP	WP	WY	WR	
-22.9	+93.1	-94.6	-26.2	+2.7	-178.0	

EV GCA to manually retract or deploy HGA

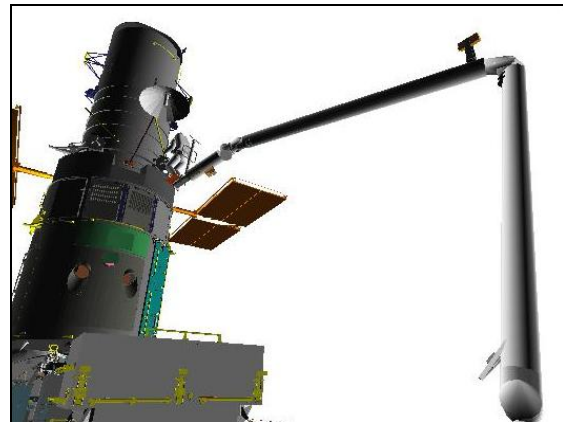
If reqd:

BRAKES – ON (tb-ON)

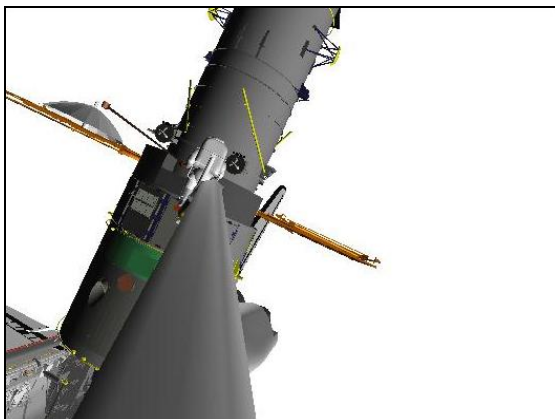
MODE – not DIRECT



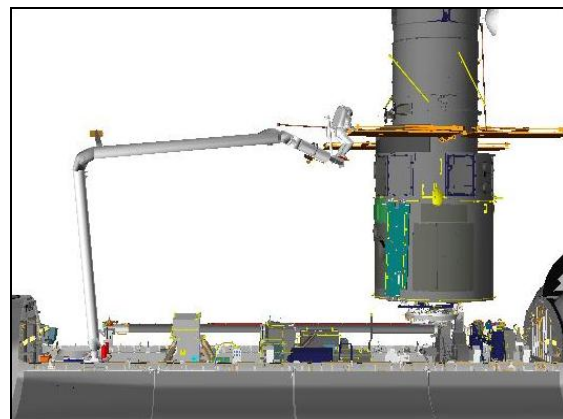
CCTV A (0,30)



CCTV D (35,25)



ELBOW (10,-10)



PORT

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APERTURE DOOR MANUAL OPEN/CLOSE

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 360°, +V3 fwd, FSS Pivot: 75°, SA Slew: Any

2. APERTURE DOOR POSN

RATE – as required (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB LD, ENTER

Mnvr to APERTURE DOOR posn:

S: 180 B: 0

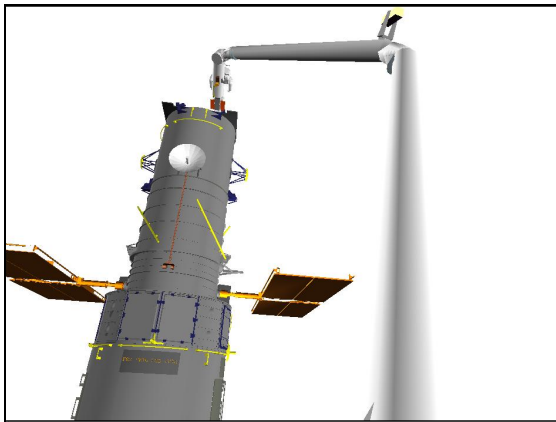
X	Y	Z	PITCH	YAW	ROLL	PL ID
-912	-32	-970	0	0	0	3
SY	SP	EP	WP	WY	WR	
-55.7	+84.0	-49.0	-35.0	+55.7	-179.5	

EV GCA to manually open or close aperture door

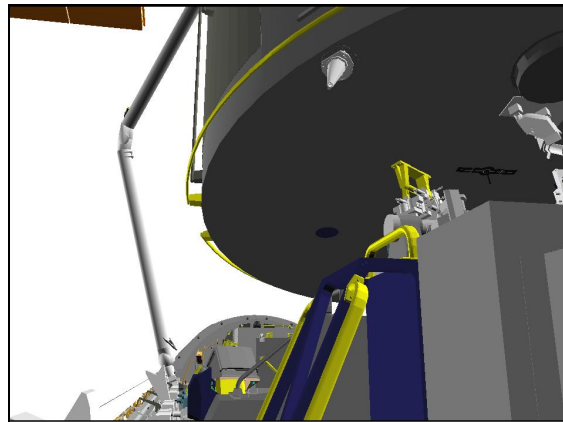
If reqd:

BRAKES – ON (tb-ON)

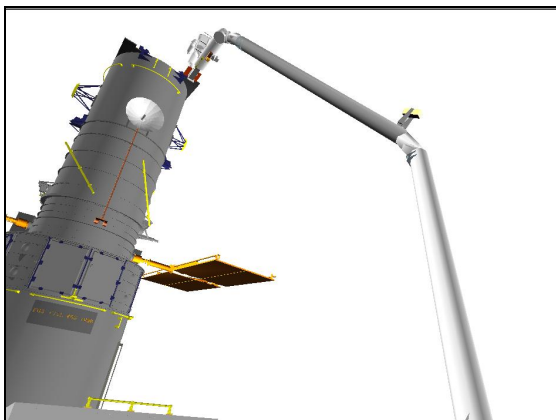
√MODE – not DIRECT



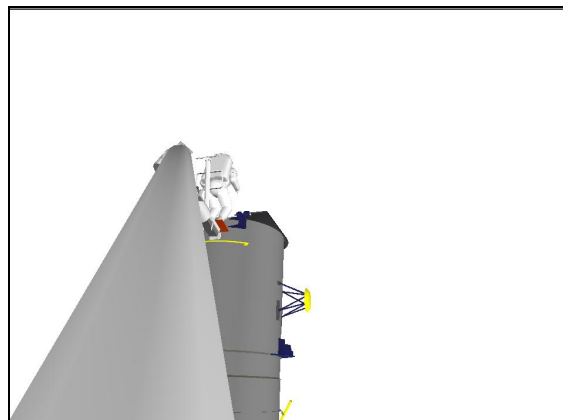
CCTV A (10,40)



CCTV D (10,15)



CCTV D (40,35)



ELBOW (15,-15)

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APERTURE DOOR JETTISON

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 360°, +V3 fwd, FSS Pivot: 75°, SA Slew: Any

2. JETTISON HANDLE RETRIEVAL POSN

RATE – as required (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB LD, ENTER

Mnvr to JETTISON HANDLE RETRIEVAL posn: S: 180 B: 90L

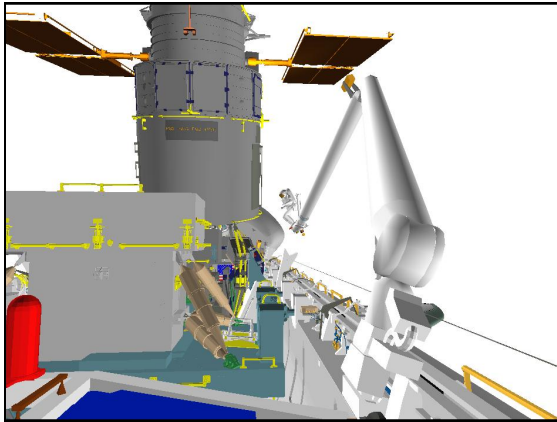
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1248	-123	-524	353	0	333	3
SY	SP	EP	WP	WY	WR	
+3.3	+36.2	-57.2	+14.4	-1.0	-206.7	

EV GCA to retrieve jettison handle at MULE

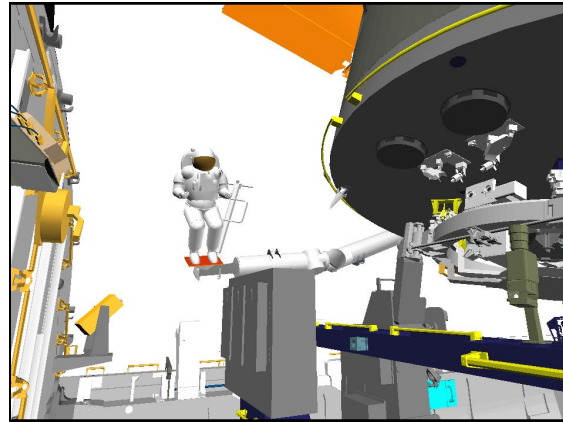
If reqd:

BRAKES – ON (tb-ON)

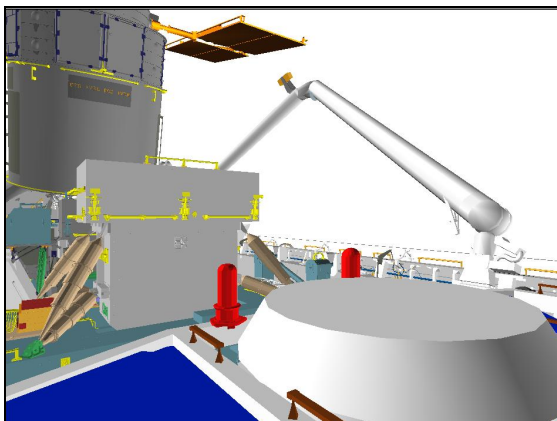
√MODE – not DIRECT



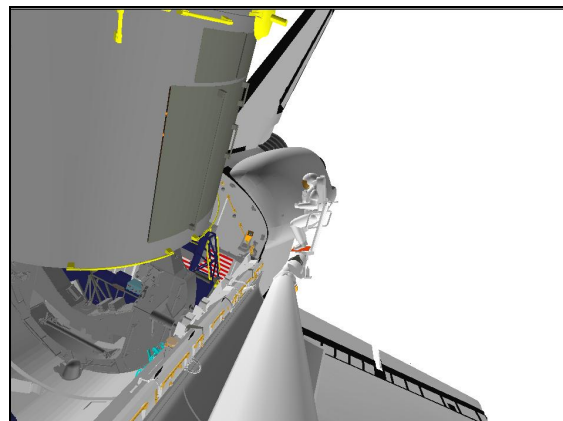
CCTV A (5,5)



CCTV C (-65,15)



CCTV D (35,0)



ELBOW (0,5)

3. APERTURE DOOR POSN

RATE – as required (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB LD, ENTER

Mnvr to APERTURE DOOR posn:

S: 45L B: 180

X	Y	Z	PITCH	YAW	ROLL	PL ID
-955	0	-990	102	330	180	3
SY	SP	EP	WP	WY	WR	
-43.7	+71.0	-35.5	+22.7	-42.0	-37.4	

EV GCA to install jettison handle on aperture door:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Jettison Bolt			-984				3
Handle Install	-961	-57	-988				

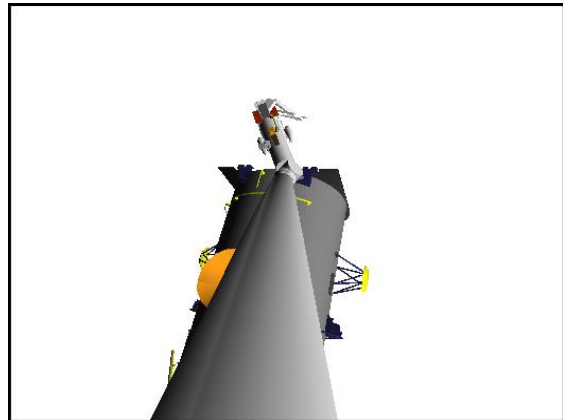
If reqd:

BRAKES – ON (tb-ON)

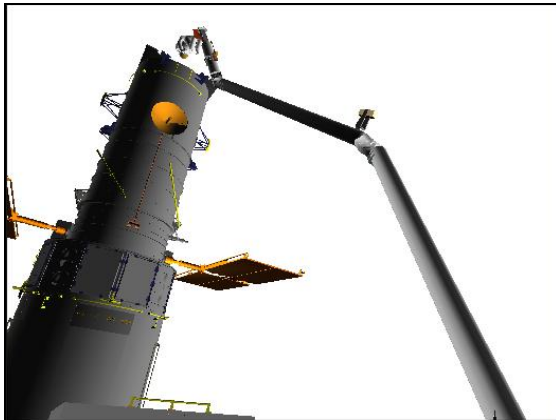
√MODE – not DIRECT



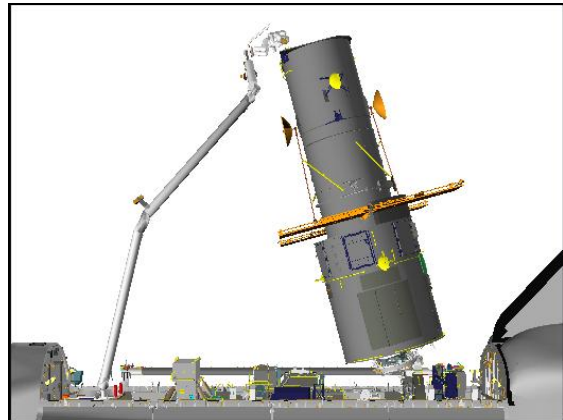
CCTV A (0,35)



ELBOW (0,-10)



CCTV D (35,35)



PORT

4. APERTURE DOOR JETTISON POSN
 RATE – as required (VERN within 10 ft)
 BRAKES – OFF (tb-OFF)
 MODE – ORB LD, ENTER

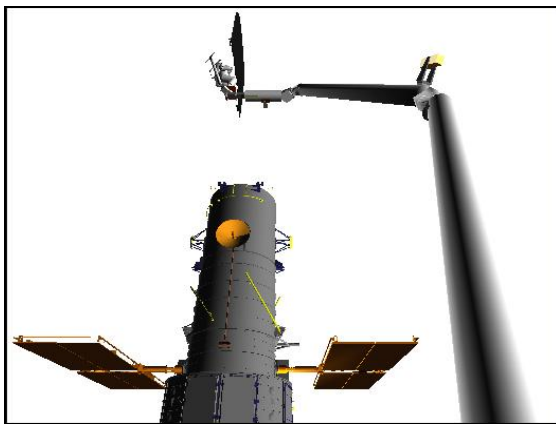
Mnvr to APERTURE DOOR JETTISON posn: S: 45L B: 180

X	Y	Z	PITCH	YAW	ROLL	PL ID
-778	0	-998	30	270	20	3
SY	SP	EP	WP	WY	WR	
-60.6	+85.4	-36.7	-70.8	-27.6	-180.6	

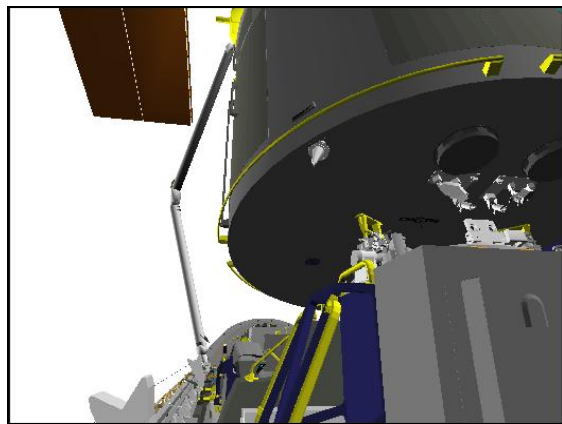
EV GCA to jettison aperture door

If reqd:

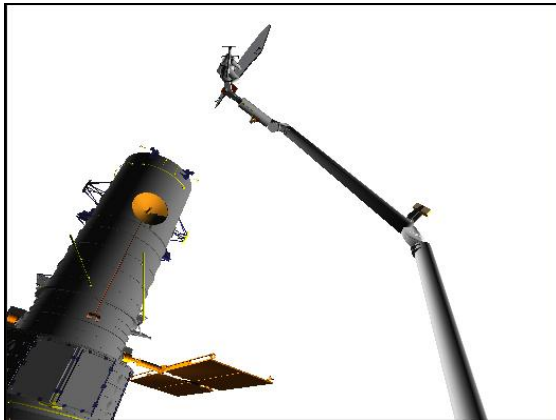
- BRAKES – ON (tb-ON)
 √MODE – not DIRECT



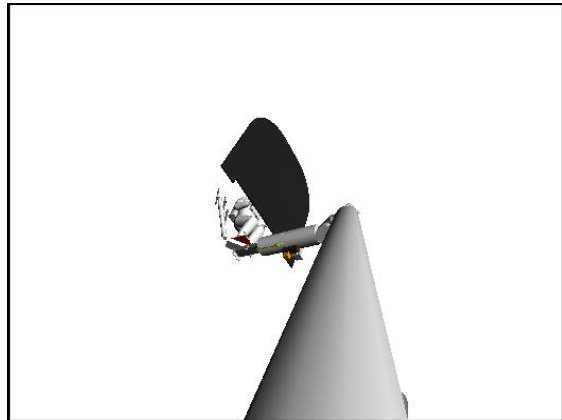
CCTV A (0,50)



CCTV B (10,20)



CCTV D (40,50)



ELBOW (-10,-5)

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SOLAR ARRAY MANUAL SLEW AND LOCK

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 180°, -V3 fwd, FSS Pivot: 90°, SA Slew: Any

2. +V2 SOLAR ARRAY POSN

RATE – as required (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB LD, ENTER

Mnvr to +V2 SOLAR ARRAY posn:

S: 180 B: 30L

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1098	-101	-820	346	356	6	3
SY	SP	EP	WP	WY	WR	
-20.0	+76.4	-61.7	-30.2	+20.0	-167.6	

NOTE

At SA slew of ~20°, clearance to RMS is 5.9 inches

EV GCA to manually slew and lock solar array:

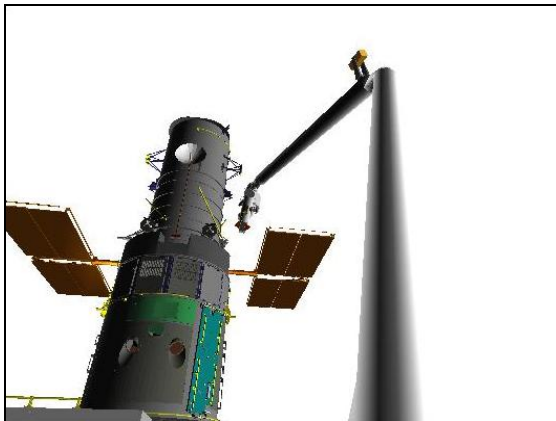
Expected:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1137	-101	-735	303	356	6	3

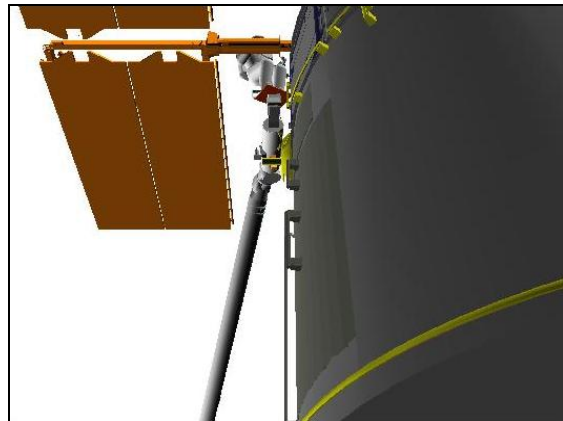
If reqd:

BRAKES – ON (tb-ON)

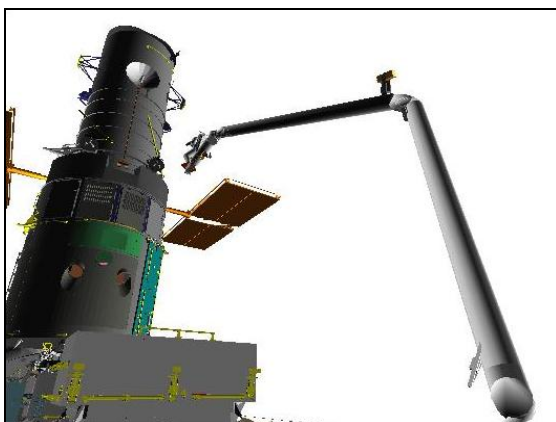
√MODE – not DIRECT



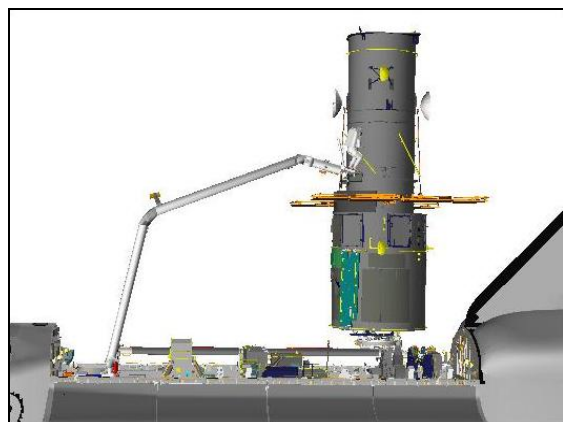
CCTV A (10,35)



CCTV B (0,45)



CCTV D (35,25)



PORT

3. -V2 SOLAR ARRAY POSN

RATE – as required (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB LD, ENTER

Mnvr to -V2 SOLAR ARRAY posn:

S: 180 B: 30R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1024	+69	-731	340	0	6	3
SY	SP	EP	WP	WY	WR	
-45.8	+74.9	-86.7	-17.6	+48.9	-151.6	

NOTE

EVA Crewmember has closest clearance to HST and SA ~4 inches

MFR to HST is ~11 inches at expected posn

RMS to SA is ~23 inches at expected posn

EV GCA to manually slew and lock solar array:

Expected:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1134	+97	-731	340	0	6	3

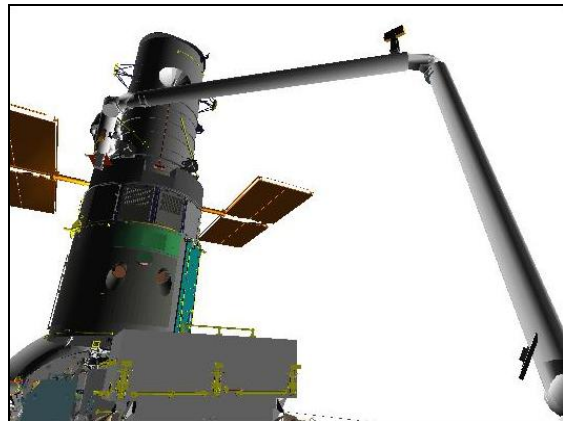
If reqd:

BRAKES – ON (tb-ON)

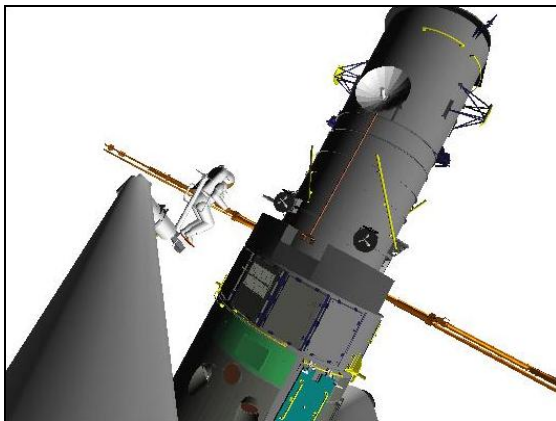
√MODE – not DIRECT



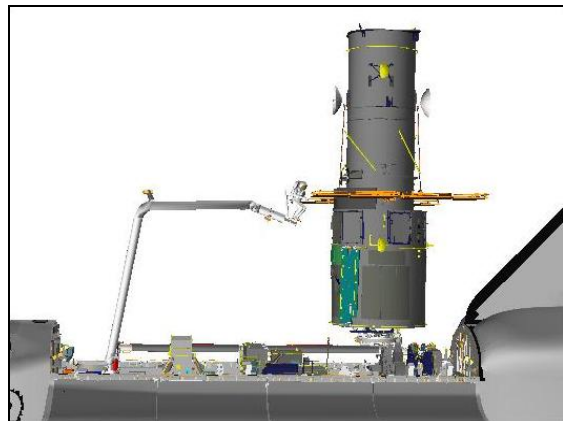
CCTV A (-10,25)



CCTV D (30,25)



ELBOW (20,-10)



PORT

PDU FUSE R&R

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 180°, -V3 fwd, FSS Pivot: 90°, SA Slew: 0°

FSS Rotation: 90°, -V2 fwd

FSS Rotation: 270°, +V2 fwd

If FSS Rotation 180°, -V3 Fwd:

2. PDU FUSE R&R AT BAY 4 POSN (-V3 FWD)

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to PDU FUSE R&R AT BAY 4 (-V3 FWD) posn: S: 135L B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1054	-79	-677	345	315	345	3
SY	SP	EP	WP	WY	WR	
-5.0	+84.7	-96.6	-17.2	-32.9	+164.2	

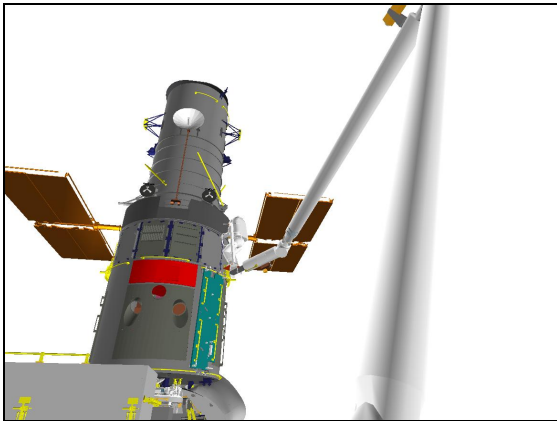
EV GCA to open bay 4 door and R&R PDU Fuse (-V3 FWD):

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Bay 4 Door	-1086	-79	-677	345	315	345	3

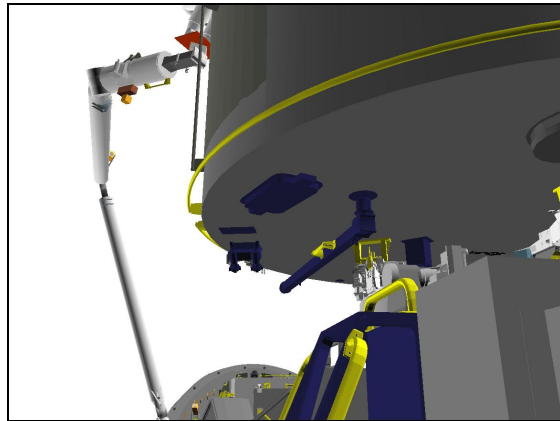
If reqd:

BRAKES – ON (tb-ON)

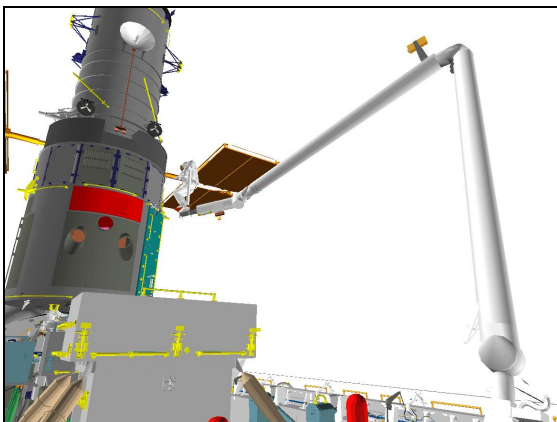
√MODE – not DIRECT



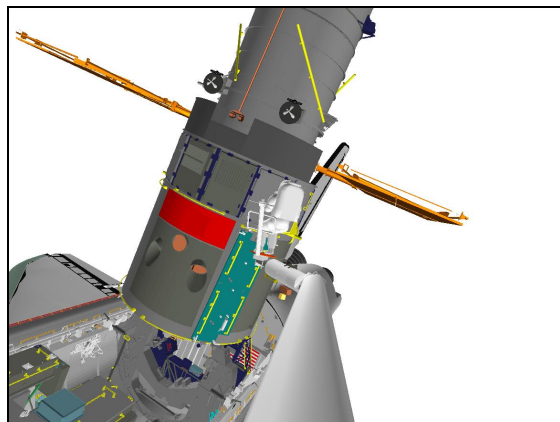
CCTV A (10,30)



CCTV B (10,20)



CCTV D (35,20)



ELBOW (-5,5)

If FSS Rotation 90°, -V2 Fwd:

3. PDU FUSE R&R AT BAY 4 POSN (-V2 FWD)

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to PDU FUSE R&R AT BAY 4 (-V2 FWD) posn: S: 135R B: 90L

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1227	-96	-677	0	315	345	3
SY	SP	EP	WP	WY	WR	
-0.8	+32.8	-22.1	-28.8	-41.0	+158.8	

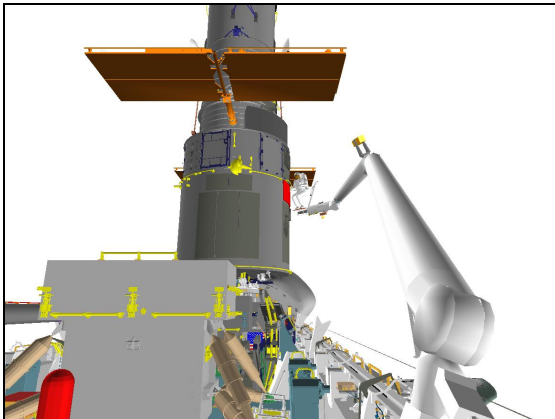
EV GCA to open bay 4 door and R&R PDU Fuse (-V2 FWD):

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Bay 4 Door	-1227	-54	-677	0	315	345	3

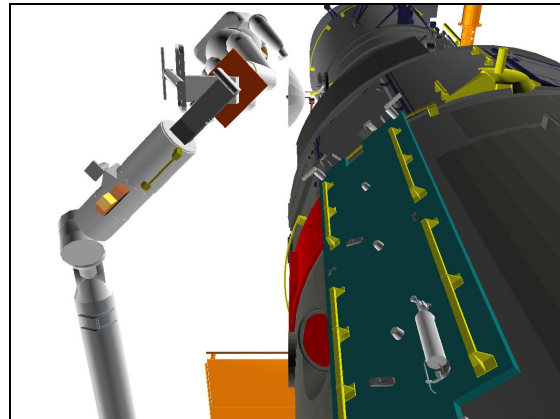
If reqd:

BRAKES – ON (tb-ON)

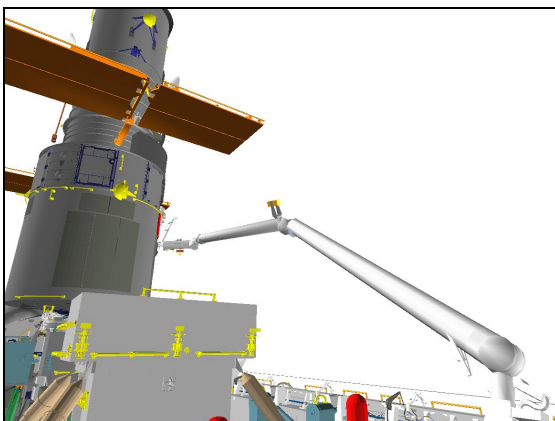
√MODE – not DIRECT



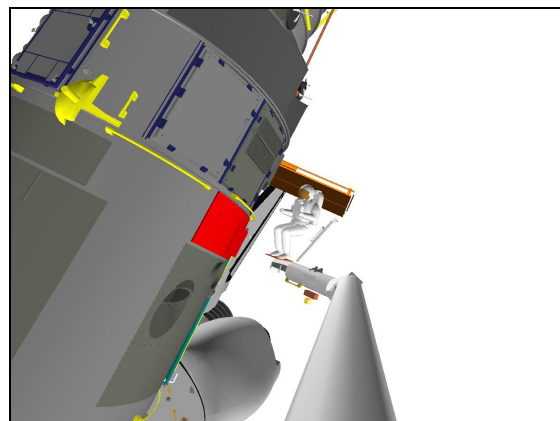
CCTV A (0,15)



CCTV B (0,60)



CCTV D (35,20)



ELBOW (-10,5)

If FSS Rotation 270°, +V2 Fwd:

- 4. PDU FUSE R&R AT BAY 4 POSN (+V2 FWD)
- RATE – as required (VERN within 10 ft)
- √BRAKES – OFF (tb-OFF)
- √MODE – ORB LD, ENTER

Mnvr to PDU FUSE R&R AT BAY 4 (+V2 FWD) posn: S: 135L B: 60R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1045	+54	-677	350	340	15	3
SY	SP	EP	WP	WY	WR	
-36.3	+74.8	-98.8	+7.5	+19.4	-154.9	

EV GCA to open bay 4 door and R&R PDU Fuse (+V2 FWD):

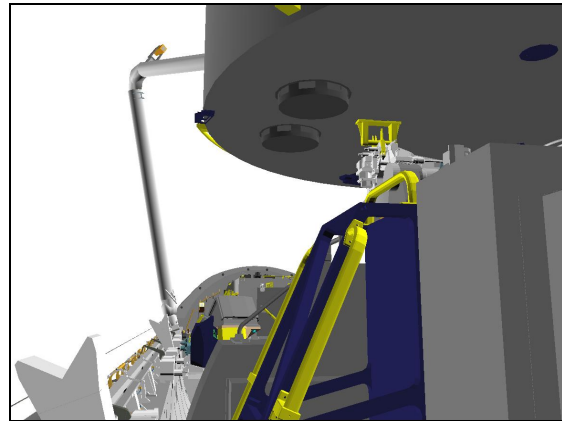
Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Bay 4 Door	-1070	+54	-677	350	340	15	3

If reqd:

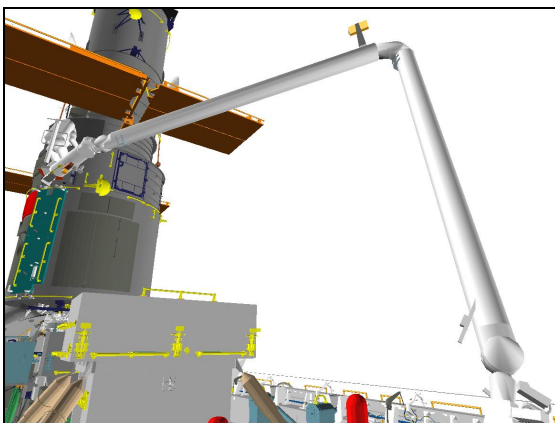
- BRAKES – ON (tb-ON)
- √MODE – not DIRECT



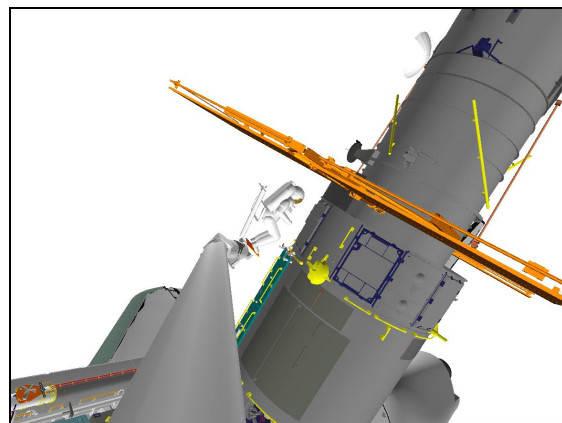
CCTV A (0,25)



CCTV B (10,10)



CCTV D (35,20)



ELBOW (10,0)

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EP/TCE FUSE R&R

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 3

√INIT ID, ITEM 24: 3

HST CONFIG: FSS Rotation: 270°, +V2 fwd and 180°, -V3 fwd

FSS Pivot: 90°, SA Slew: 90°

If FSS Rotation 270°, +V2 Fwd:

2. EP/TCE FUSE R&R AT BAY H POSN (+V2 FWD)

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

NOTE

Approaching Singularity at Bay H posn

Mnvr to EP/TCE FUSE R&R AT BAY H (+V2 FWD) posn: S: 135L B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1050	+69	-721	355	35	5	3
SY	SP	EP	WP	WY	WR	
-43.3	+57.9	-76.9	+49.9	+76.0	+156.0	

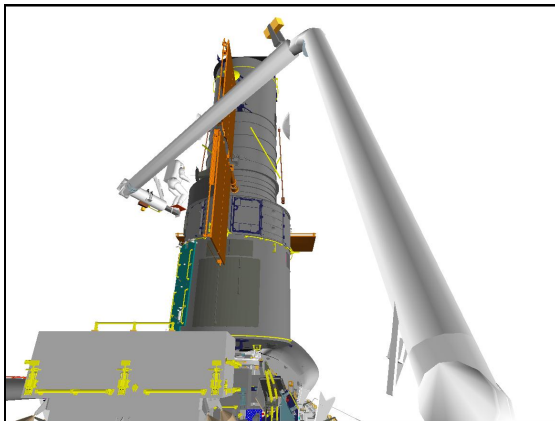
EV GCA to open Bay H door and R&R EP/TCE Fuse:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Bay H Door	-1078	+69	-721	355	35	5	3

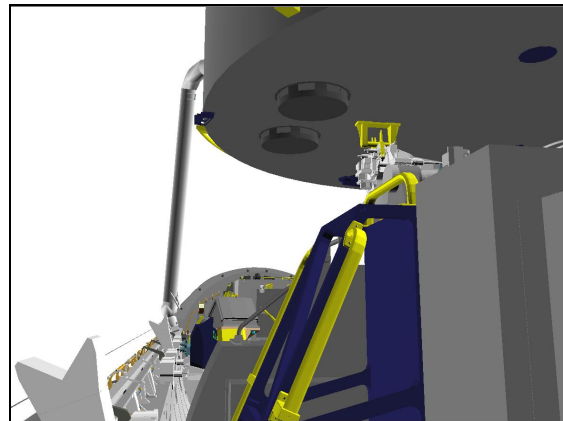
If reqd:

BRAKES – ON (tb-ON)

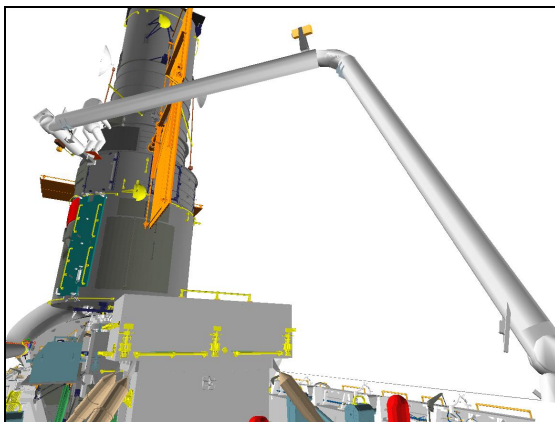
√MODE – not DIRECT



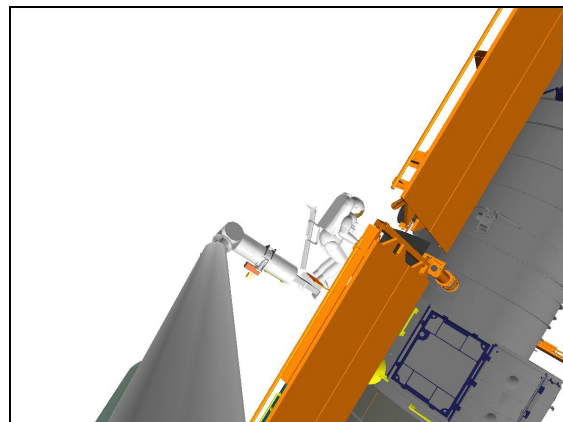
CCTV A (0,25)



CCTV B (10,10)



CCTV D (30,20)



ELBOW (-10,5)

If FSS Rotation 180°, -V3 Fwd:

3. EP/TCE FUSE R&R AT BAY H POSN (-V3 FWD)

RATE – as required (VERN within 10 ft)

√BRAKES – OFF (tb-OFF)

√MODE – ORB LD, ENTER

Mnvr to EP/TCE FUSE R&R AT BAY H (-V3 FWD) posn: S: 135L B: 0

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1060	-62	-725	345	315	345	3
SY	SP	EP	WP	WY	WR	
-10.5	+83.4	-87.0	-24.0	-28.1	+167.2	

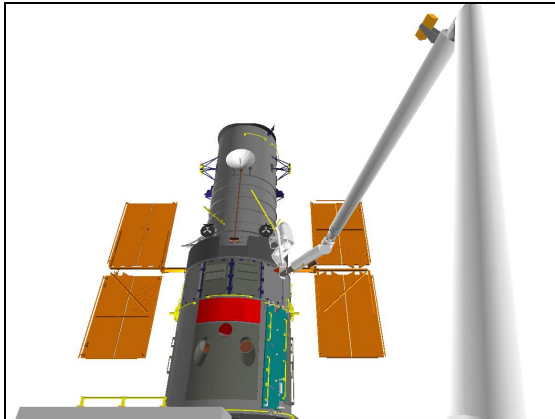
EV GCA to open Bay H door and R&R EP/TCE Fuse:

Expected:	X	Y	Z	PITCH	YAW	ROLL	PL ID
Bay H Door	-1081	-62	-725	345	315	345	3

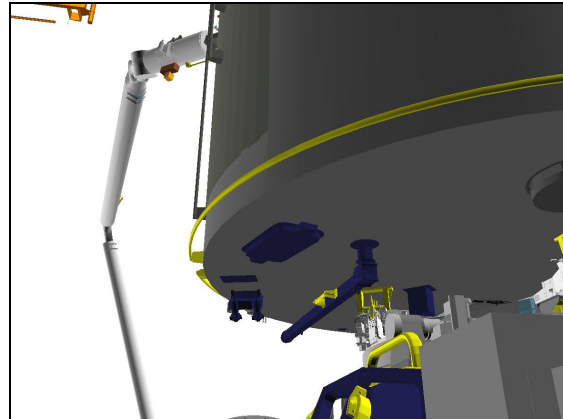
If reqd:

BRAKES – ON (tb-ON)

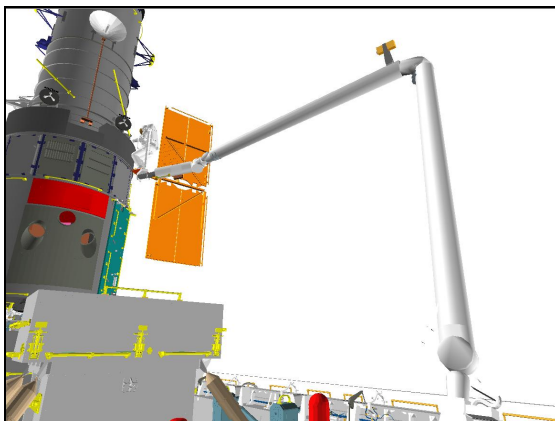
√MODE – not DIRECT



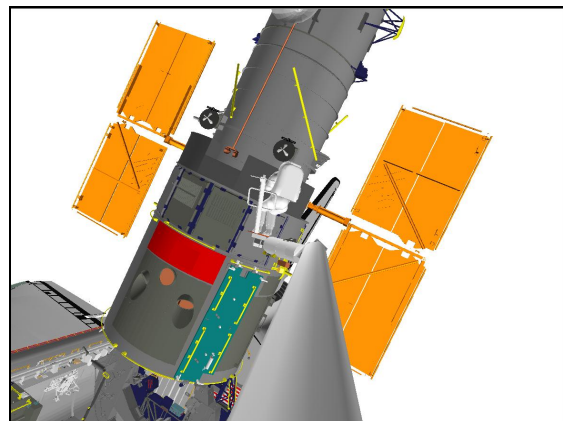
CCTV A (0,35)



CCTV B (10,25)

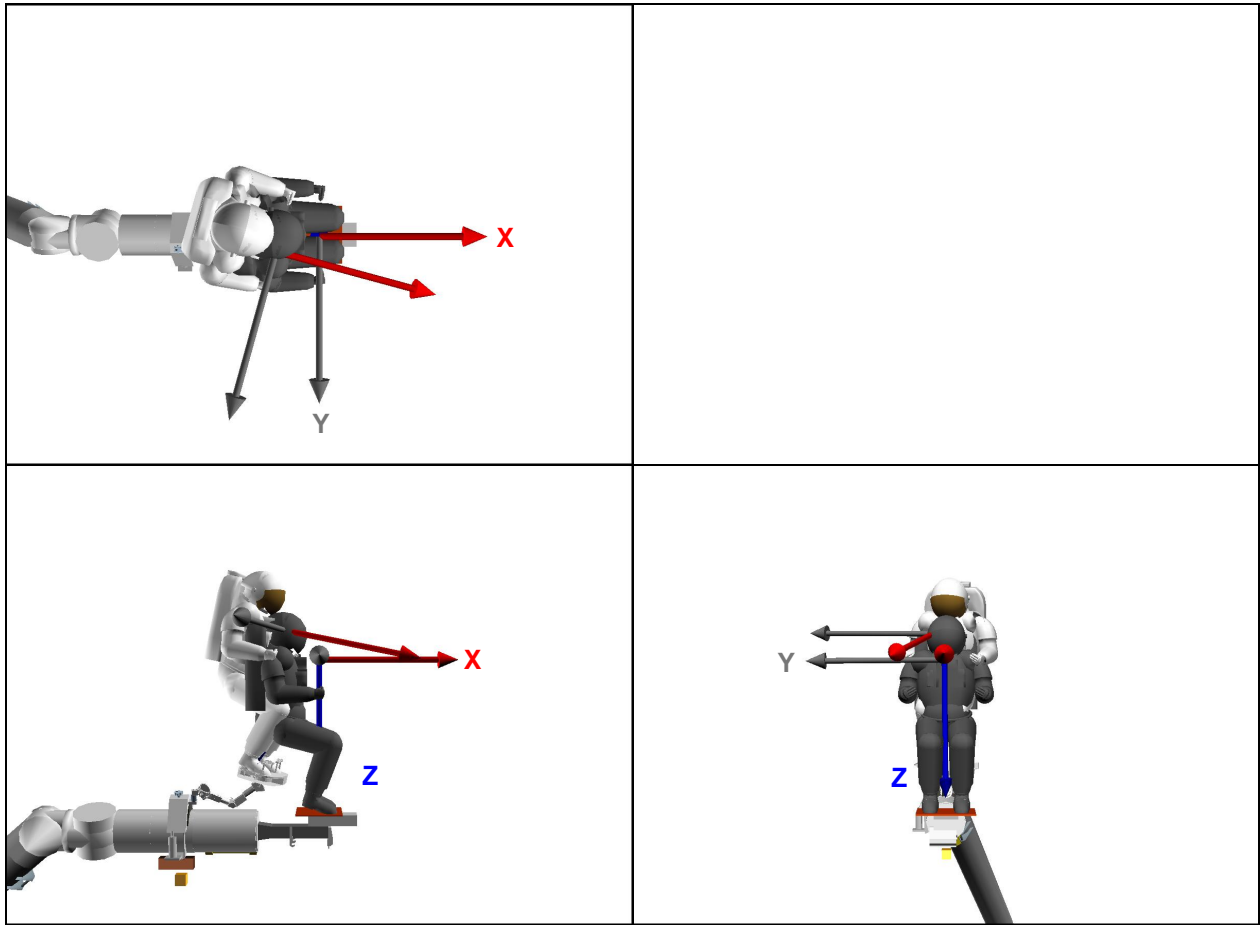


CCTV D (40,20)



ELBOW (-5,0)

PL ID/POR DEFINITION – PL ID 3



POR: PL ID 3 is located at center of MFR crewmember's chest

MFR SETTING: Boot plate = 0°

HST PFR SETTING: 15R, PP, S, CC, 1

TRANSFORMATION: From PL ID 3 to POR located at center of HST FPR crewmember's chest:

X	Y	Z	PITCH	YAW	ROLL
-12	+4	-10	-12.4	+15.4	+1.5

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REFERENCE DATA

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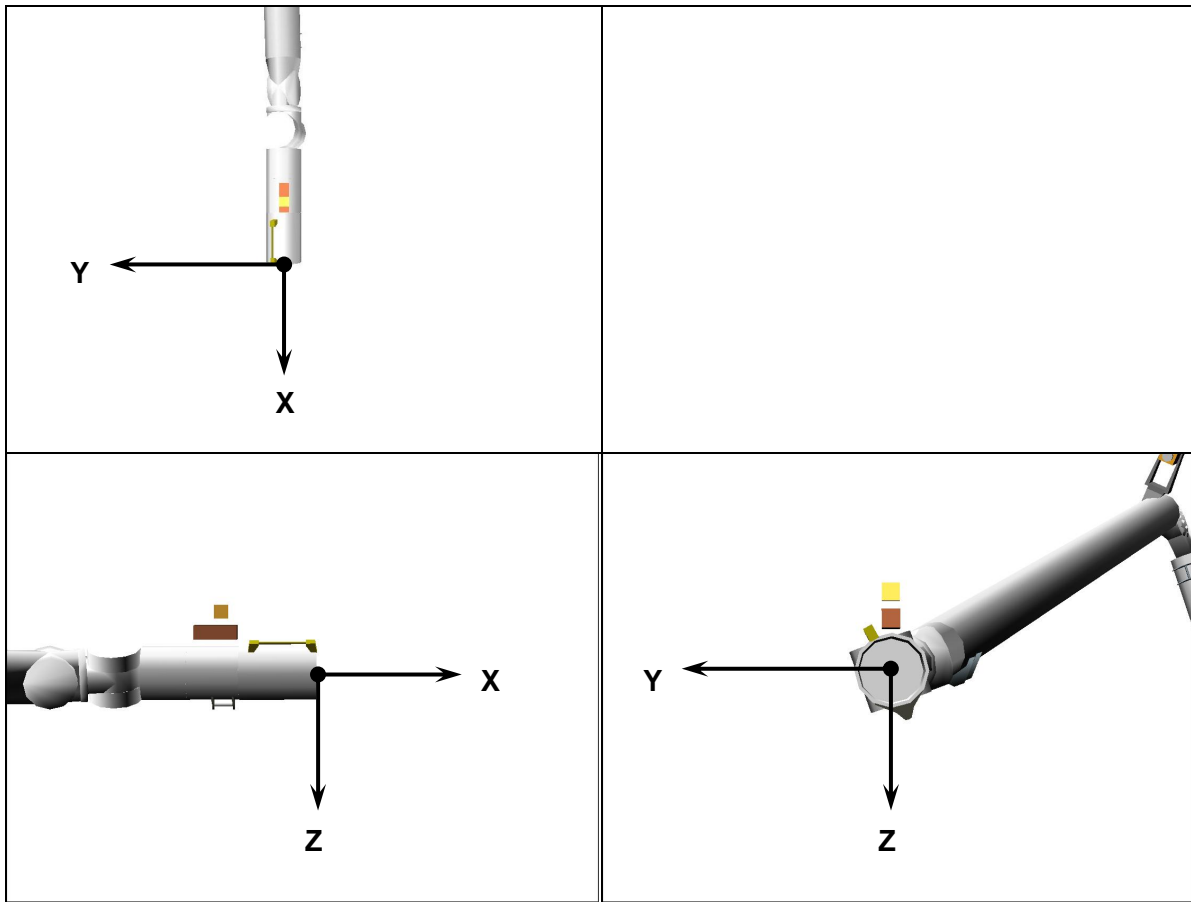
HST REFERENCE DATA

PL ID/POR DEFINITION – PL ID 0.....	FS 14-2
HST PL ID/POR DEFINITION – PL ID 3A	FS 14-3
4A	FS 14-4
ORBITER SURVEYS PL ID/POR DEFINITION – PL ID 5A	FS 14-5
5B (UPLINK)	FS 14-6
5C (UPLINK).....	FS 14-7
RMS (HST) DAP CONSTRAINTS	FS 14-8
CONFIGURATIONS	FS 14-9
JOINT ANGLES VS POR COORDINATES	FS 14-10
PHOTO SURVEYS	FS 14-10
ORBITER SURVEYS	FS 14-10
NOMINAL HST RETRIEVAL.....	FS 14-12
OFF-NOMINAL HST RETRIEVAL	FS 14-12
EXTENDED PARK.....	FS 14-13
OBSS BELLY TILE SURVEY AUTOSEQUENCES.....	FS 14-15
CREW CABIN EE SURVEY AUTOSEQUENCES.....	FS 14-19
OBSS IDC RCC SURVEY AUTOSEQUENCES.....	FS 14-20

HST
REF DATA

PL ID/POR DEFINITION – PL ID 0

HST
REF DATA



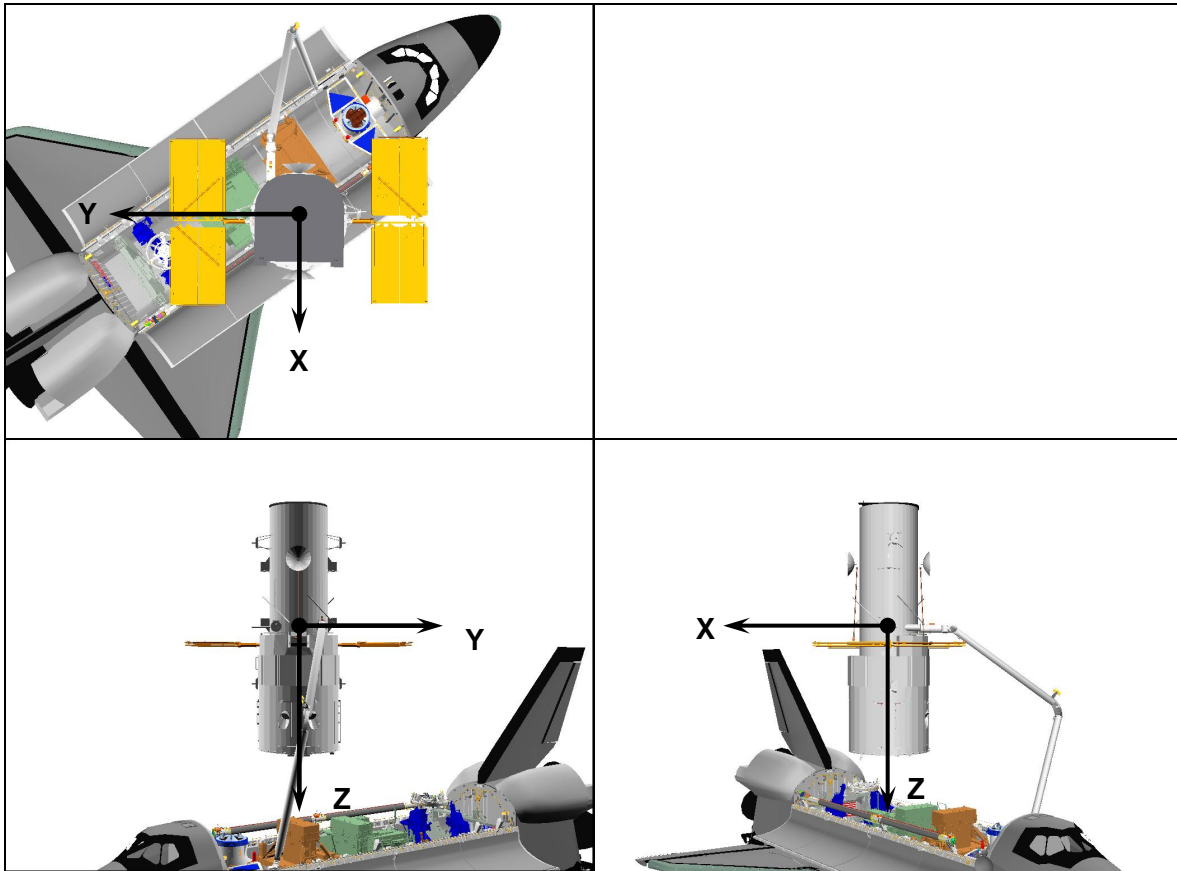
POR: Centered at tip of RMS EE

PURPOSE: Unloaded maneuvering

RATES:	<u>COARSE</u>	<u>VERN</u>
TRANS LIM ft/sec	2.00	0.61 (0.35)*
ROT LIM deg/sec	4.76	4.76

*Value in parenthesis is maximum component trans rate in any single commanded axis.
If not specified, maximum component trans rate = maximum resultant trans rate

HST PL ID/POR DEFINITION – PL ID 3A



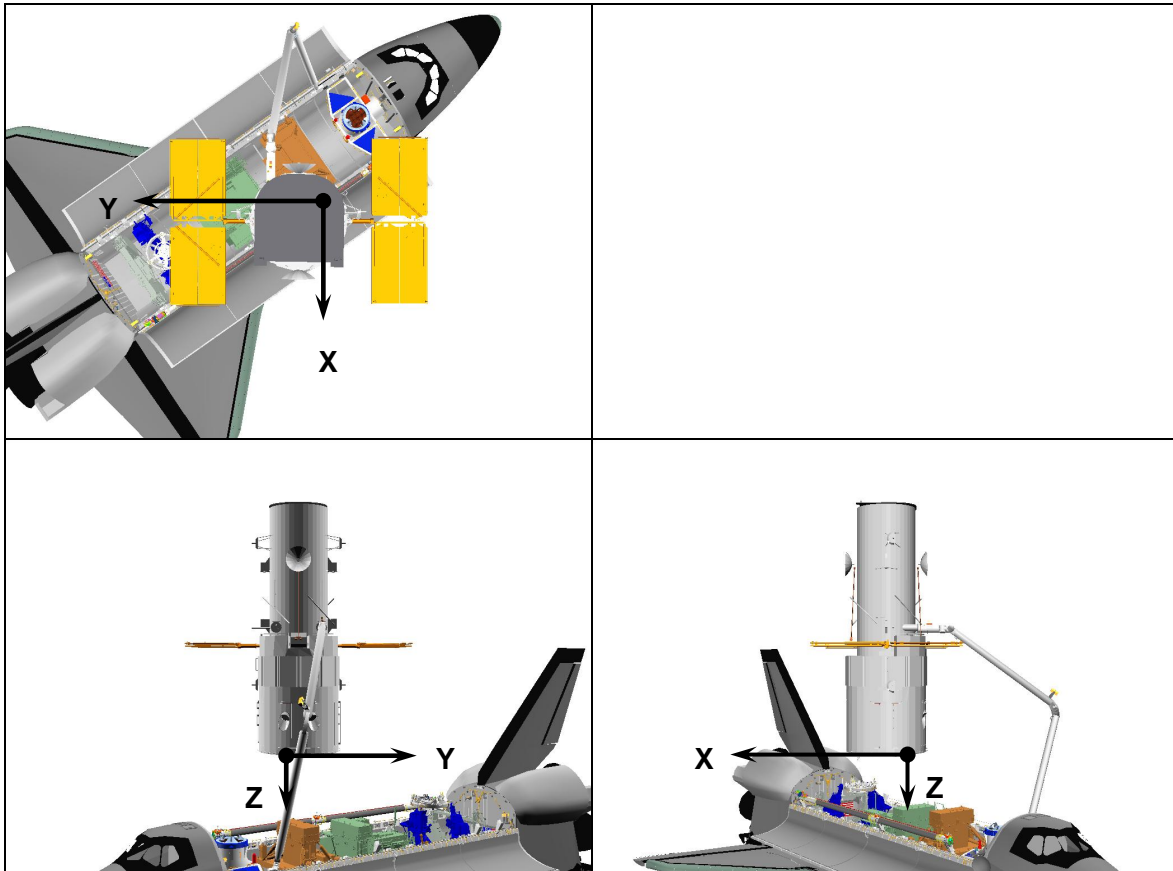
GF: +V2

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

PURPOSE: HST maneuvering/berthing

RATES:	<u>COARSE</u>	<u>VERN</u>
TRANS LIM ft/sec	0.18	0.07
ROT LIM deg/sec	0.59	0.20

HST PL ID/POR DEFINITION – PL ID 4A



GF: +V2

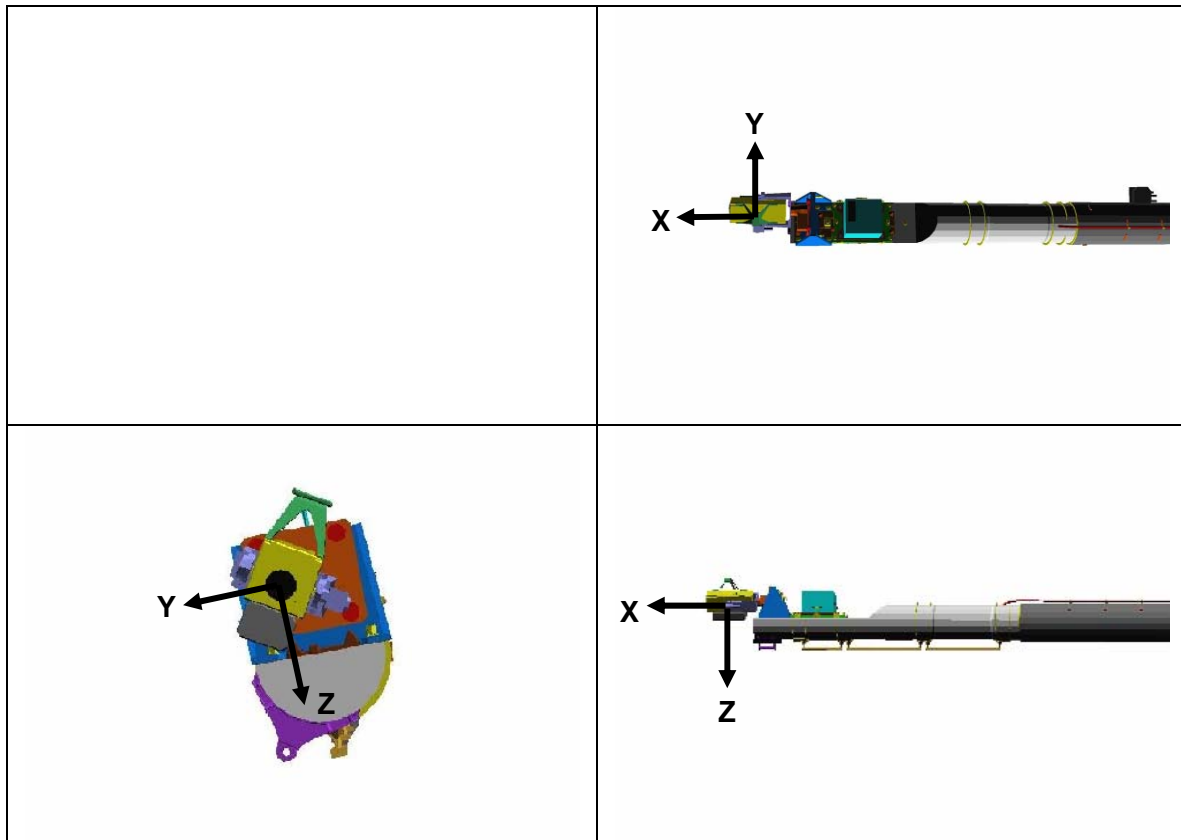
POR: FSS target

PURPOSE: HST berthing and unberthing

RATES:

	<u>COARSE</u>	<u>VERN</u>
TRANS LIM ft/sec	0.18	0.07
ROT LIM deg/sec	0.59	0.20

ORBITER SURVEYS PL ID/POR DEFINITION – PL ID 5A



POR: POR at OBSS ITVC/LDRI PTU Pivot Point

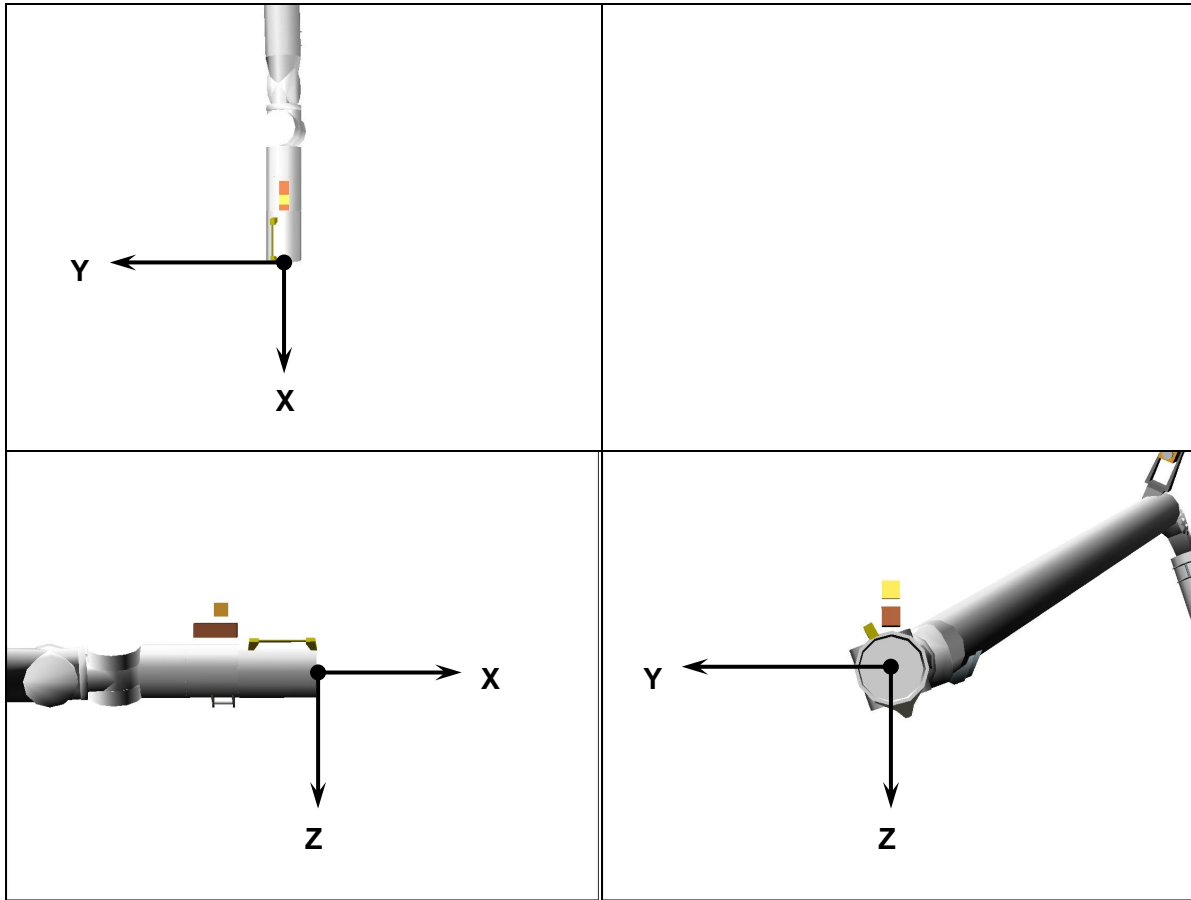
PURPOSE: OBSS Surveys of Belly Tile using LDRI/ITVC

RATES:	<u>COARSE</u>	<u>VERN</u>
TRANS LIM ft/sec	0.24	0.14
ROT LIM deg/sec	2.64	0.88

JOINT RATES:	<u>COARSE</u>	<u>VERN</u>
SHOULDER LIM deg/sec	1.27	0.42
ELBOW LIM deg/sec	1.78	0.59
WRIST LIM deg/sec	2.64	0.88

RATIONALE: LDRI scan rate is 4.3 M/min (0.25 ft/s), while IDC scan rate is 3.6 M/min (0.20 ft/s)

ORBITER SURVEYS PL ID/POR DEFINITION – PL ID 5B (UPLINK)



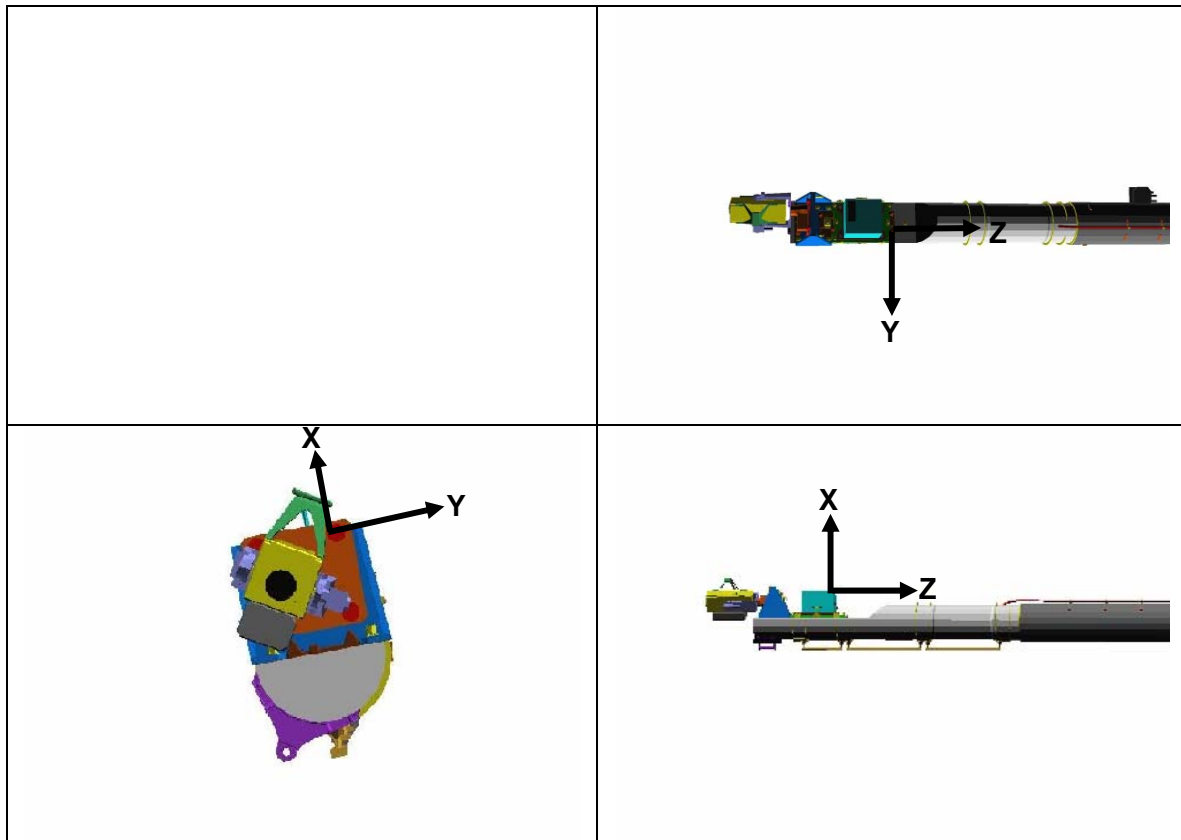
POR: Centered at tip of RMS EE

PURPOSE: Unloaded EE Crew Cabin Surveys with Reduced Translational Vernier Rates

RATES:	<u>COARSE</u>	<u>VERN</u>
TRANS LIM ft/sec	0.31	0.22
ROT LIM deg/sec	4.76	4.76

ORBITER SURVEYS PL ID/POR DEFINITION – PL ID 5C (UPLINK)

I



POR: POR at OBSS IDC Eye Point

PURPOSE: OBSS Surveys of RCC using IDC

RATES:	<u>COARSE</u>	<u>VERN</u>
TRANS LIM ft/sec	0.23	0.20
ROT LIM deg/sec	2.64	0.88

JOINT RATES:	<u>COARSE</u>	<u>VERN</u>
SHOULDER LIM deg/sec	0.42	0.42
ELBOW LIM deg/sec	0.59	0.59
WRIST LIM deg/sec	0.88	0.88

RATIONALE: LDRI scan rate is 4.3 M/min (0.25 ft/s), while IDC scan rate is 3.6 M/min (0.20 ft/s)

RMS (HST) DAP CONSTRAINTS

PAYLOAD POSITIONS	VRCS		ALT		
	MAN	AUTO	AUTO	JET OPTION	MODE
AT EXTENDED PARK	A 15/4	A 15/4	A 15/4	TAIL	NORM Z**
AT FSS HOVER	A 15/5	A 15/5	A 15/5	TAIL	NORM Z**
AT RELEASE POSN					
• RMS POSN HOLD	A 15/3	A 15/3	A 15/3	TAIL	NORM Z**
– Deadband Collapse	B 15/3	B 15/3	B 15/3	TAIL	NORM Z**
• RMS BRAKES ON	A 15/3	A 15/3*	A 15/3*	TAIL	NORM Z**

Legend:

* For Contingency Only – Avoid if posn hold available

** Norm Z is preferred for loads, but low Z is also acceptable

1. RMS/HST Positions Defined in REF DATA
2. Constraints apply only to Grapple Fixture #1 (+V2 GF: Port GF when berthed on FSS)
3. Tail-only mode required for grappled HST ops and during crew sleep
4. To conserve propellant, Orbiter nominally in Free Drift for all RMS/HST positions not listed above. For contingencies, manual attitude control may be attempted using DAP config best suited for contingency. Reference All-Flight Rule {A12-6 G}, OMS/RCS Constraints, for use of VRCS in unplanned contingency
5. DAP B12 is a slow maneuver rate DAP used for loads mitigation and is interchangeable with DAP A15

RMS (HST) DAP CONFIGURATIONS

	A15	B15	B12
PRI			
ROT RATE (deg/s)	0.10	0.05	0.05
ATT DB (deg)	5.0	2.0	5.0
RATE DB (deg/s)	0.20	0.20	0.20
ROT PLS (deg/s)	0.04	0.04	0.04
COMP (deg/s)	0.0	0.0	0.0
P OPTION	TAIL	TAIL	TAIL
Y OPTION	TAIL	TAIL	TAIL
TRAN PLS (s)	0.05	0.01	0.05
ALT			
RATE DB (deg)	0.10	0.10	0.10
JET OP	TAIL	TAIL	TAIL
# JETS	2	2	2
ON TIME (sec)	0.08	0.08	0.08
DELAY (sec)	7.5	7.5	7.5
VERN			
ROT RATE (deg/s)	0.10	0.024	0.040
ATT DB (deg)	2.0	0.5	2.0
RATE DB (deg/s)	0.050	0.030	0.050
ROT PLS (deg/s)	0.005	0.005	0.005
COMP (deg/s)	0.0	0.0	0.0
CNTL ACC	3-5	3	3-5

NOTES

CNTL ACCELS:

- 3-Release Posn
- 4-Extended Park
- 5-FSS Hover

DAP Usage:

- A15, B12 – All RMS/HST Ops
- B15 – HST Release Deadband Collapse

JOINT ANGLES VS POR COORDINATES

PHOTO SURVEYS

SSE Survey

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1155	-60	-550	290	0	0	0
SY	SP	EP	WP	WY	WR	
-12.1	+44.2	-49.7	-67.6	+22.2	+24.8	

FSS Umbilical Survey

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1130	-20	-550	280	0	0	0
SY	SP	EP	WP	WY	WR	
-17.2	+44.3	-52.0	-78.1	+21.4	+34.2	

HST Survey

X	Y	Z	PITCH	YAW	ROLL	PL ID
-970	-30	-755	0	0	0	0
SY	SP	EP	WP	WY	WR	
-37.0	+91.8	-89.9	-1.9	+37.0	0.0	

+V2 SADM Survey

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1047	-160	-716	1	314	91	0
SY	SP	EP	WP	WY	WR	
-0.6	+82.9	-75.3	-25.7	-42.5	+83.6	

-V2 SADM Survey

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1032	+172	-698	9	45	270	0
SY	SP	EP	WP	WY	WR	
-50.8	+30.2	-34.0	+101.5	+69.9	+183.3	

ORBITER SURVEYS

Stbd LDRI ACAS, Point 13P

X	Y	Z	PITCH	YAW	ROLL	PL ID
-767	+322	-343	255	348	346	0
-764	+321	-325	348	346	342	1
-1328	+464	-221	348	346	12	2
-1328	+464	-221	348	346	12	5
SY	SP	EP	WP	WY	WR	
-74.9	+16.3	-74.3	-43.0	-12.2	-276.6	

Port LDRI ACAS, Point 114P

X	Y	Z	PITCH	YAW	ROLL	PL ID
-761	-657	-455	301	73	315	0
-765	-675	-455	346	348	252	1
-1323	-537	-315	346	348	282	2
-1323	-537	-315	346	348	282	5
SY	SP	EP	WP	WY	WR	
+80.9	+49.1	-50.2	+5.9	+0.6	-87.1	

ORBITER SURVEYS (Cont)

Stbd Survey ACAS Start

X	Y	Z	PITCH	YAW	ROLL	PL ID
-501	+151	-586	281	25	307	0
-501	+151	-586	281	25	307	5
SY	SP	EP	WP	WY	WR	
-119.7	+58.1	-82.9	-109.8	-11.2	+82.1	

Port Survey ACAS Start

X	Y	Z	PITCH	YAW	ROLL	PL ID
-553	-230	-551	257	314	288	0
-553	-230	-551	257	314	288	5
SY	SP	EP	WP	WY	WR	
+138.2	+119.0	-123.3	-97.8	+26.7	-179.8	

OCAS START

X	Y	Z	PITCH	YAW	ROLL	PL ID
-333	-363	-544	48	74	197	0
-339	-379	-552	333	356	224	1
-860	-319	-279	333	356	254	2
-823	-319	-292	228	287	344	5
SY	SP	EP	WP	WY	WR	
+155.7	+62.3	-81.8	+91.5	-57.0	-33.0	

PORT IDC ACAS START

X	Y	Z	PITCH	YAW	ROLL	PL ID
-663	-578	-412	262	21	318	0
-665	-588	-397	334	321	303	1
-1072	-204	-206	334	321	333	2
-1043	-224	-223	82	339	223	5
SY	SP	EP	WP	WY	WR	
+91.2	+60.1	-68.1	-41.3	+6.8	-116.8	

PORT IDC ACAS END

X	Y	Z	PITCH	YAW	ROLL	PL ID
-846	-463	-741	221	45	343	0
-840	-478	-733	298	347	284	1
-1116	-336	-231	298	347	314	2
-1098	-339	-265	41	315	198	5
SY	SP	EP	WP	WY	WR	
+44.1	+81.2	-43.5	-85.4	+74.1	-88.1	

OBSS Modified Hover

X	Y	Z	PITCH	YAW	ROLL	PL ID
-680	+134	-535	270	349	0	0
-680	+133	-517	0	0	341	1
-1271	+134	-532	0	0	11	2
SY	SP	EP	WP	WY	WR	
-89.9	+80.2	-118.8	-59.8	+0.0	+109.9	

OBSS Overnight Park

X	Y	Z	PITCH	YAW	ROLL	PL ID
-680	+135	-535	270	349	321	0
-683	+134	-517	9	321	344	1
-1134	+506	-605	9	321	14	2
SY	SP	EP	WP	WY	WR	
-89.9	+80.2	-118.8	-59.8	0.0	+70.0	

NOMINAL HST RETRIEVAL

Poise for Capture

X	Y	Z	PITCH	YAW	ROLL	PL ID
-890	-145	-850	0	270*	0	0
SY	SP	EP	WP	WY	WR	
-12.7	+93.2	-54.8	-96.5	-66.9	-36.5	

*Display singularity

HST Capture

X	Y	Z	PITCH	YAW	ROLL	PL ID
-803	+85	-853	0	305	1	0
-878	+112	-853	0	305	0	3
-856	+101	-595	0	305	0	4
SY	SP	EP	WP	WY	WR	
-53.4	+90.0	-68.5	-37.3	0.0	+8.5	

FSS Hover

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1084	-46	-825	0	0	1	0
-1149	0	-825	0	0	0	3
-1128	+12	-567	0	0	0	4
SY	SP	EP	WP	WY	WR	
-28.0	+61.3	-36.9	-24.4	+28.0	+0.5	

FSS Berthed

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1084	-46	-755	0	0	1	0
-1149	0	-755	0	0	0	3
-1128	+12	-497	0	0	0	4
SY	SP	EP	WP	WY	WR	
-24.9	+70.3	-63.8	-6.5	+24.9	+0.5	

HST Berthed Ungrapple

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

OFF-NOMINAL HST RETRIEVAL

SJ Poise for Capture

X	Y	Z	PITCH	YAW	ROLL	PL ID
-844	-17	-853	0	305	0	0
SY	SP	EP	WP	WY	WR	
-53.4	+101.0	-75.0	-41.8	0.0	+8.5	

Contingency HST Capture

X	Y	Z	PITCH	YAW	ROLL	PL ID
-803	+85	-853	0	305	181	0
-878	+112	-853	0	305	180	3
-876	+87	-1111	0	305	180	4
SY	SP	EP	WP	WY	WR	
-71.7	+89.3	-71.6	-34.3	+17.6	+193.7	

OFF-NOMINAL HST RETRIEVAL (Cont)

Pre-Berthing

X	Y	Z	PITCH	YAW	ROLL	PL ID
-803	+85	-853	0	305	0	0
-802	+165	-853	0	305	0	3
-779	+155	-595	0	305	0	4
SY	SP	EP	WP	WY	WR	
-71.7	+89.3	-71.6	-34.3	+17.6	+14.0	

Intermediate 1

X	Y	Z	PITCH	YAW	ROLL	PL ID
-832	+47	-853	180	270*	0	0
-878	+112	-853	0	270*	180	3
-891	+91	-1111	0	270*	180	4
SY	SP	EP	WP	WY	WR	
-56.4	+90.8	-69.2	-44.6	-31.5	+187.5	

*Display singularity

Intermediate 2

X	Y	Z	PITCH	YAW	ROLL	PL ID
-832	+112	-788	90	0	271	0
-878	+112	-853	90	0	270	3
-891	-146	-832	90	0	270	4
SY	SP	EP	WP	WY	WR	
-63.3	+76.8	-91.2	+86.8	-8.6	+225.4	

Intermediate 3

X	Y	Z	PITCH	YAW	ROLL	PL ID
-878	+66	-787	90	0	1	0
-878	+112	-853	90	0	0	3
-1136	+125	-831	90	0	0	4
SY	SP	EP	WP	WY	WR	
-52.6	+80.2	-92.1	+86.2	-11.7	+325.8	

Intermediate 4

X	Y	Z	PITCH	YAW	ROLL	PL ID
-835	-46	-853	0	0	1	0
-900	0	-853	0	0	0	3
-878	+12	-595	0	0	0	4
SY	SP	EP	WP	WY	WR	
-63.0	+103.2	-79.2	-24.0	+63.0	+360.5	

EXTENDED PARK

HST Extended Park

X	Y	Z	PITCH	YAW	ROLL	PL ID
-920	-59	-792	0	336	0	0
-961	+10	-792	0	336	0	3
-936	+13	-534	0	336	0	4
SY	SP	EP	WP	WY	WR	
-36.6	+102.8	-88.4	-22.4	+13.7	+4.0	

EXTENDED PARK (Cont)

RMS Extended Park

X	Y	Z	PITCH	YAW	ROLL	PL ID
-975	-325	-520	270	0	0	0
-915	-326	-498	270	0	180	3
-967	-325	-498	270	0	180	4
SY	SP	EP	WP	WY	WR	
+28.6	+78.2	-85.8	-72.8	+17.0	-10.5	

I

OBSS BELLY TILE SURVEY AUTOSEQUENCES

STBD BELLY TILE (PL ID 5)

Auto Seq ID	Auto posn	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
7	148	-1328	+464	-221	348	346	12	P
		-74.9	+16.3	-74.3	-43.1	-12.2	-276.6	
7	149	-1291	+458	-91	334	345	10	
		-70.9	+17.1	-76.0	-48.7	-23.8	-280.7	
7	150	-1339	+223	-72	332	7	16	
		-64.6	+19.2	-77.0	-45.1	-21.6	-262.6	
7	151	-1274	+185	-63	331	12	14	
		-72.5	+18.4	-78.3	-42.1	-22.7	-250.0	
7	152	-1329	+494	-193	343	344	19	P
		-71.7	+17.0	-71.3	-42.5	-20.2	-279.0	
7	153	-1329	+247	-158	343	7	13	
		-74.3	+15.3	-75.1	-40.1	-12.8	-255.3	
7	154	-1243	+161	-97	342	16	14	
		-84.0	+6.7	-74.5	-29.2	-13.0	-236.3	
7	155	-1145	+148	-154	339	22	20	
		-94.5	+11.5	-64.0	-37.0	-12.5	-217.9	
7	156	-975	+155	-159	335	20	23	
		-114.5	+13.0	-54.4	-39.3	-12.9	-196.9	
7	157	-978	+207	-166	334	16	26	
		-114.1	+12.3	-49.1	-40.4	-12.4	-199.8	
7	158	-1152	+170	-153	343	19	13	
		-96.8	+6.4	-61.8	-40.0	-13.1	-220.8	
7	159	-1143	+224	-164	338	16	17	
		-95.9	+9.8	-54.6	-45.9	-16.6	-222.2	
7	160	-961	+230	-171	332	15	26	P
		-114.1	+9.3	-38.6	-46.4	-14.3	-199.6	
7	161	-1030	+265	-125	336	10	16	
		-110.7	+7.5	-52.0	-40.4	-19.9	-211.5	
7	162	-1145	+256	-109	340	9	12	
		-99.4	+7.6	-66.2	-35.3	-18.6	-227.1	
7	163	-1146	+184	-104	340	17	20	
		-97.4	+5.9	-66.4	-27.7	-13.0	-219.7	
7	164	-1202	+225	-104	340	14	21	
		-90.3	+4.7	-63.6	-29.6	-13.8	-229.5	
7	165	-1257	+245	-106	341	11	15	
		-83.5	+4.3	-63.4	-36.9	-15.0	-241.2	
7	166	-1185	+220	-105	341	12	13	
		-9.7	+6.9	-69.3	-32.8	-16.2	-230.2	
7	167	-1149	+268	-109	340	9	12	
		-98.6	+5.1	-61.4	-38.0	-18.5	-228.0	
7	168	-1287	+277	-104	342	3	13	
		-79.6	+11.0	-79.6	-30.3	-15.5	-253.6	
7	169	-1279	+337	-108	343	359	13	
		-81.9	+7.2	-73.3	-32.2	-15.8	-255.4	
7	170	-1018	+290	-124	335	7	12	
		-111.7	+8.3	-50.9	-44.4	-23.7	-214.0	
7	171	-1160	+385	-124	339	359	19	
		-96.9	+7.8	-61.0	-33.5	-19.9	-236.5	
7	172	-1278	+375	-120	341	357	14	
		-81.2	+9.2	-68.8	-38.0	-18.2	-257.3	

OBSS BELLY TILE SURVEY AUTOSEQUENCES (Cont)

STBD BELLY TILE (PL ID 5) (Cont)

Auto Seq ID	Auto posn	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
7	173	-1268	+429	-126	342	352	15	
		-82.4	+8.2	-68.3	-36.1	-18.8	-260.9	
7	174	-1160	+360	-116	344	357	1	
		-100.6	+3.8	-65.8	-43.2	-19.1	-242.0	
7	175	-1275	+455	-125	342	350	14	
		-81.1	+6.3	-64.8	-39.4	-18.9	-264.6	
7	176	-1328	+464	-221	348	346	12	P
		-74.9	+16.3	-74.3	-43.0	-12.2	-276.6	

PORT BELLY TILE (PL ID 5)

Auto Seq ID	Auto posn	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
1	1	-1323	-537	-315	346	348	282	P
		+80.9	+49.1	-50.2	+5.9	+0.6	-87.1	
1	2	-1364	-470	-97	357	2	3	
		+76.6	+23.9	-73.6	-25.0	+6.6	-54.9	
1	3	-1432	-117	-78	0	337	4	
		+57.7	+12.2	-72.8	-16.8	+9.7	-61.5	
1	4	-1545	-147	-80	356	338	356	
		+45.8	+9.4	-52.5	-31.6	+17.8	-49.9	
1	5	-1525	+69	-85	351	324	4	
		+31.9	+12.3	-55.7	-48.0	+19.6	-45.4	
1	6	-1437	+118	-88	355	312	2	
		+38.1	+4.7	-44.7	-43.8	+18.2	-65.9	
1	7	-1368	+53	-59	359	322	5	
		+53.0	+9.2	-73.9	-15.3	+12.6	-71.4	
1	8	-1498	+34	-71	359	332	5	
		+37.9	+6.6	-70.5	-19.4	+13.9	-46.1	
1	9	-1460	-68	-80	0	331	11	
		+52.0	+6.4	-56.2	-35.8	+10.2	-60.4	
1	10	-1390	-68	-80	0	331	11	
		+59.9	+12.6	-71.6	-25.1	+9.5	-68.5	
1	11	-1415	+55	-82	0	331	11	
		+45.4	+11.4	-88.1	-10.1	+10.7	-53.8	
1	12	-1368	+40	-58	0	333	7	
		+54.2	+7.5	-92.8	+4.2	+10.3	-61.4	
1	13	-1371	-478	-191	6	359	359	P
		+77.6	+20.7	-63.1	-26.4	-1.6	-59.2	
1	14	-1373	-11	-156	8	324	12	
		+57.6	+13.4	-69.8	-24.9	+4.5	-74.7	
1	15	-1386	+200	-176	3	306	357	
		+33.6	+17.9	-69.3	-21.8	+14.4	-70.6	
1	16	-1336	+115	-160	7	313	11	
		+49.0	+16.7	-76.1	-22.2	+8.7	-76.9	
1	17	-1336	-125	-159	4	330	7	
		+69.5	+22.7	-74.8	-25.2	+4.2	-80.2	
1	18	-1292	-119	-159	5	329	9	
		+74.8	+22.1	-75.6	-25.1	+2.7	-86.5	

OBSS BELLY TILE SURVEY AUTOSEQUENCES (Cont)

PORT BELLY TILE (PL ID 5) (Cont)

Auto Seq ID	Auto posn	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
1	19	-1304	+100	-159	8	311	16	P
		+53.3	+15.2	-70.5	-29.9	+8.7	-82.7	
1	20	-1252	+65	-106	8	315	19	
		+65.3	+6.7	-67.5	-26.0	+7.6	-90.5	
1	21	-1000	+13	-113	359	299	359	
		+85.9	+17.8	-58.1	-29.8	+1.5	-127.1	
1	22	-968	+128	-135	346	305	0	
		+95.3	+50.3	-115.9	-3.7	+12.2	-130.1	
1	23	-762	+84	-132	207	272	216	
		+76.6	+20.1	-57.0	-34.9	+13.5	-148.9	
1	24	-421	+57	-134	174	324	173	
		+52.0	+13.5	-82.4	-11.3	+9.9	-176.2	
1	25	-270	+21	-200	160	324	174	P
		+80.4	+7.5	-82.0	-4.1	+18.6	-202.6	
1	26	-380	-25	-178	169	315	196	
		+71.9	+16.4	-68.7	-14.0	+30.5	-190.6	
1	27	-385	-65	-180	174	319	201	
		+67.1	+21.9	-70.8	-14.5	+31.5	-191.0	
1	28	-256	-51	-202	165	329	201	P
		+74.5	+13.6	-87.6	+16.2	+33.9	-211.4	
1	29	-444	-134	-142	183	325	209	
		+56.7	+19.4	-55.7	-22.1	+34.2	-188.5	
1	30	-418	-15	-129	182	313	202	
		+68.3	+25.7	-76.3	-11.3	+25.4	-184.9	
1	31	-933	+75	-129	344	307	358	
		+103.0	+50.0	-106.2	-10.5	+9.5	-135.6	
1	32	-915	-13	-118	349	323	6	P
		+124.6	+39.3	-92.4	-16.8	+4.0	-139.4	
1	33	-1267	+10	-106	358	329	8	
		+72.1	+26.6	-107.0	+0.5	+9.7	-82.8	
1	34	-1227	-37	-109	357	335	18	
		+85.1	+29.8	-111.3	-6.4	+10.6	-88.1	
1	35	-882	-98	-125	341	323	350	
		+123.2	+45.6	-79.6	-25.9	-3.6	-138.3	
1	36	-882	+35	-128	344	311	352	
		+115.9	+47.1	-96.8	-13.8	-1.5	-143.6	
1	37	-496	-74	-142	211	304	213	
		+77.6	+47.0	-67.3	-32.7	+4.9	-178.8	
1	38	-500	-165	-154	213	313	216	
		+71.0	+45.1	-50.7	-41.6	+8.4	-181.2	
1	39	-566	-152	-144	200	314	208	
		+59.4	+11.7	-8.5	-59.2	+19.3	-175.8	
1	40	-544	-78	-133	201	306	210	P
		+66.9	+31.6	-51.9	-36.6	+17.2	-174.1	
1	41	-526	-122	-130	203	311	212	
		+65.6	+32.3	-48.1	-37.8	+17.3	-177.8	
1	42	-572	-149	-139	213	313	222	
		+62.0	+38.4	-44.0	-41.5	+20.3	-174.8	

OBSS BELLY TILE SURVEY AUTOSEQUENCES (Cont)

PORT BELLY TILE (PL ID 5) (Cont)

Auto Seq ID	Auto posn	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
1	43	-550	+6	-113	192	302	202	
		+66.7	+26.3	-63.1	-26.8	+18.1	-170.6	
1	44	-874	+33	-104	302	283	314	
		+73.5	+29.8	-57.3	-37.8	+20.1	-137.6	
1	45	-890	-23	-109	308	289	319	
		+77.8	+32.9	-51.4	-42.3	+18.3	-137.2	
1	46	-604	-60	-119	223	296	231	
		+75.9	+37.7	-53.2	-36.8	+13.5	-167.6	
1	47	-610	-156	-134	235	307	243	
		+73.3	+45.5	-41.0	-44.3	+15.2	-169.6	
1	48	-670	-195	-150	246	311	255	
		+70.8	+43.7	-22.8	-54.2	+19.7	-165.1	
1	49	-653	-92	-124	237	299	247	
		+73.5	+43.2	-49.1	-40.5	+18.0	-163.5	
1	50	-947	-48	-105	348	310	353	
		+102.8	+31.5	-70.8	-25.9	+1.3	-132.4	
1	51	-995	-100	-107	349	315	355	
		+101.1	+29.9	-65.5	-30.5	+3.0	-125.8	
1	52	-645	-163	-132	297	307	307	
		+112.0	+34.1	-16.0	-57.5	-2.6	-157.8	
1	53	-1000	-170	-113	337	313	348	
		+94.3	+31.3	-44.7	-47.8	+12.0	-123.5	
1	54	-987	-70	-104	338	302	349	
		+86.6	+29.2	-52.7	-41.8	+14.0	-126.6	
1	55	-1313	-71	-102	349	323	4	
		+63.5	+34.3	-80.3	-35.5	+19.2	-79.4	
1	56	-1265	-155	-103	344	331	354	
		+74.1	+49.8	-95.9	-23.3	+19.2	-85.1	
1	57	-1389	-149	-102	355	345	0	
		+60.7	+32.0	-107.1	-0.2	+13.8	-56.7	
1	58	-1375	-202	-106	355	348	1	
		+66.1	+34.1	-106.1	-3.0	+12.2	-58.7	
1	59	-1220	-167	-147	354	321	0	P
		+79.2	+27.3	-56.2	-42.9	+9.5	-98.7	
1	60	-1170	-160	-160	351	320	0	
		+83.5	+35.4	-63.8	-43.3	+11.1	-103.8	
1	61	-1198	-130	-165	6	336	4	
		+93.9	+24.9	-93.2	-6.2	-5.4	-98.1	
1	62	-1016	-136	-165	3	336	359	
		+121.7	+24.8	-81.5	-17.5	-13.5	-124.4	
1	63	-1020	-184	-171	3	341	359	
		+123.6	+24.8	-79.8	-19.6	-14.0	-121.3	
1	64	-1195	-152	-161	7	342	8	
		+98.5	+20.9	-95.1	-4.7	-6.2	-97.1	
1	65	-1181	-200	-165	7	345	6	
		+102.0	+21.4	-91.5	-7.6	-8.1	-97.4	
1	66	-1006	-209	-181	2	342	347	P
		+126.2	+27.0	-79.1	-14.7	-23.2	-120.2	
1	67	-1018	-285	-137	355	359	345	
		+137.1	+34.4	-101.0	+4.9	-21.1	-112.6	

OBSS BELLY TILE SURVEY AUTOSEQUENCES (Cont)

PORT BELLY TILE (PL ID 5) (Cont)

Auto Seq ID	Auto posn	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
1	68	-1339	-253	-116	357	352	0	
		+75.1	+33.0	-106.7	+1.8	+7.8	-63.8	
1	69	-1310	-316	-125	357	352	0	
		+82.0	+34.7	-96.4	-9.4	+5.6	-70.4	
1	70	-1045	-325	-135	357	0	345	
		+130.1	+31.2	-97.4	+5.7	-19.0	-104.9	
1	71	-1160	-344	-125	357	6	0	
		+113.3	+33.2	-115.7	+11.7	-4.8	-85.9	
1	72	-1333	-354	-140	357	352	0	
		+79.3	+35.4	-88.1	-18.6	+6.5	-67.8	
1	73	-1319	-415	-140	357	352	0	
		+82.5	+29.8	-70.5	-30.4	+5.5	-70.9	
1	74	-1170	-360	-128	1	11	8	
		+112.0	+22.7	-112.2	+9.4	-6.7	-80.9	
1	75	-1327	-475	-137	0	0	355	
		+82.4	+25.8	-73.6	-17.9	+3.1	-63.1	
1	76	-1315	-455	-137	0	0	355	
		+83.7	+27.7	-80.1	-13.3	+2.6	-64.3	
1	77	-1323	-537	-315	346	348	282	P
		+80.9	+49.1	-50.2	+5.9	+0.6	-87.1	

CREW CABIN EE SURVEY AUTOSEQUENCES

STBD CREW CABIN (PL ID 5)

Auto Seq ID	Auto posn	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
2	78	-501	+151	-586	281	25	307	P
		-119.7	+58.1	-82.9	-109.8	-11.2	+82.1	
2	79	-249	+91	-502	270	24	305	
		-150.3	+24.7	-37.4	-102.5	-36.7	+106.3	
2	80	-247	+30	-517	271	7	305	
		-157.5	+38.1	-51.8	-88.0	-23.9	+119.4	
2	81	-493	+109	-638	281	17	306	
		-123.1	+67.8	-82.0	-112.9	-9.7	+85.1	
2	82	-533	+38	-645	281	4	317	
		-124.8	+89.3	-99.7	-105.2	-3.9	+98.9	
2	83	-246	+16	-519	270	7	305	
		-159.0	+40.0	-53.8	-86.4	-24.6	+121.2	
2	84	-417	-9	-612	288	1	315	
		-149.0	+77.3	-89.5	-103.9	-7.3	+118.9	
2	85	-536	-4	-638	281	359	318	P
		-130.6	+98.8	-106.8	-103.2	-3.3	+105.5	

CREW CABIN EE SURVEY AUTOSEQUENCES (Cont)

MNVR TO PORT CREW CABIN (PL ID 0)

Auto Seq ID	Auto posn	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
7	148	-536	-4	-638	281	359	318	P
		-130.6	+98.8	-106.8	-103.2	-3.3	+105.5	
7	149	-761	+32	-651	259	359	17	
		-67.1	+98.9	-106.8	-103.3	-3.1	+105.0	
7	150	-1042	-345	-580	323	24	333	
		+24.5	+77.8	-80.9	-20.0	+12.3	-37.7	
7	151	-553	-230	-551	257	314	288	P
		+138.3	+118.9	-123.3	-97.5	+26.2	-180.8	

PORT CREW CABIN (PL ID 5)

Auto Seq ID	Auto posn	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
3	86	-553	-230	-551	257	314	288	P
		+138.3	+118.9	-123.3	-97.5	+26.2	-180.8	
3	87	-279	-148	-473	259	313	271	
		+172.1	+58.2	-81.2	-62.7	+28.7	-236.5	
3	88	-514	-212	-591	268	313	291	
		+155.4	+113.3	-113.1	-101.1	+25.5	-201.3	
3	89	-582	-153	-610	268	313	277	
		+172.2	+135.3	-124.6	-103.2	+27.5	-233.9	
3	90	-524	-157	-610	268	313	277	
		+173.7	+120.3	-117.4	-94.6	+27.5	-235.7	
3	91	-276	-146	-473	259	313	292	P
		+172.5	+57.5	-80.4	-62.7	+28.6	-215.9	

MNVR TO PRE-CRADLE (PL ID 0)

Auto Seq ID	Auto posn	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
8	152	-276	-146	-473	259	313	292	P
		+172.5	+57.5	-80.4	-62.7	+28.6	-215.9	
8	153	-881	-572	-547	263	32	9	
		+60.0	+57.8	-40.3	-62.1	+28.6	-44.6	
8	154	-1261	-146	-551	5	2	0	P
		0	+25.0	-25.0	+5	0	0	

OBSS IDC RCC SURVEY AUTOSEQUENCES

PORT RCC (PL ID 5)

Auto Seq ID	Auto posn	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
7	148	-1043	-224	-223	82	339	223	P
		+91.2	+60.1	-68.1	-41.3	+6.8	-116.8	
7	149	-1064	-233	-219	82	339	223	
		+88.4	+57.6	-64.5	-42.7	+8.7	-114.6	
7	150	-1131	-308	-228	78	336	222	P
		+78.7	+36.7	-16.4	-68.7	+18.8	-108.3	
7	151	-1123	-315	-234	76	334	221	P
		+78.6	+41.8	-20.3	-67.9	+20.8	-108.7	

OBSS IDC RCC SURVEY AUTOSEQUENCES (Cont)

PORT RCC (PL ID 5)

Auto Seq ID	Auto posn	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
7	152	-1057	-250	-226	76	334	221	
		+86.3	+67.3	-66.2	-45.7	+15.3	-114.6	
7	153	-1032	-239	-227	76	334	221	P
		+90.0	+70.2	-70.7	-43.5	+12.7	-117.2	
7	154	-1008	-268	-262	44	311	213	P
		+43.6	+79.6	-39.2	-75.9	+72.1	-112.4	
7	155	-1028	-284	-258	44	311	213	
		+43.2	+70.6	-26.5	-80.3	+72.4	-111.7	
7	156	-1054	-306	-258	+42	312	206	
		+43.3	+77.8	-37.9	-78.7	+73.7	-103.8	
7	157	-1098	-339	-265	41	315	198	P
		+44.1	+81.2	-43.5	-85.4	+74.1	-88.1	

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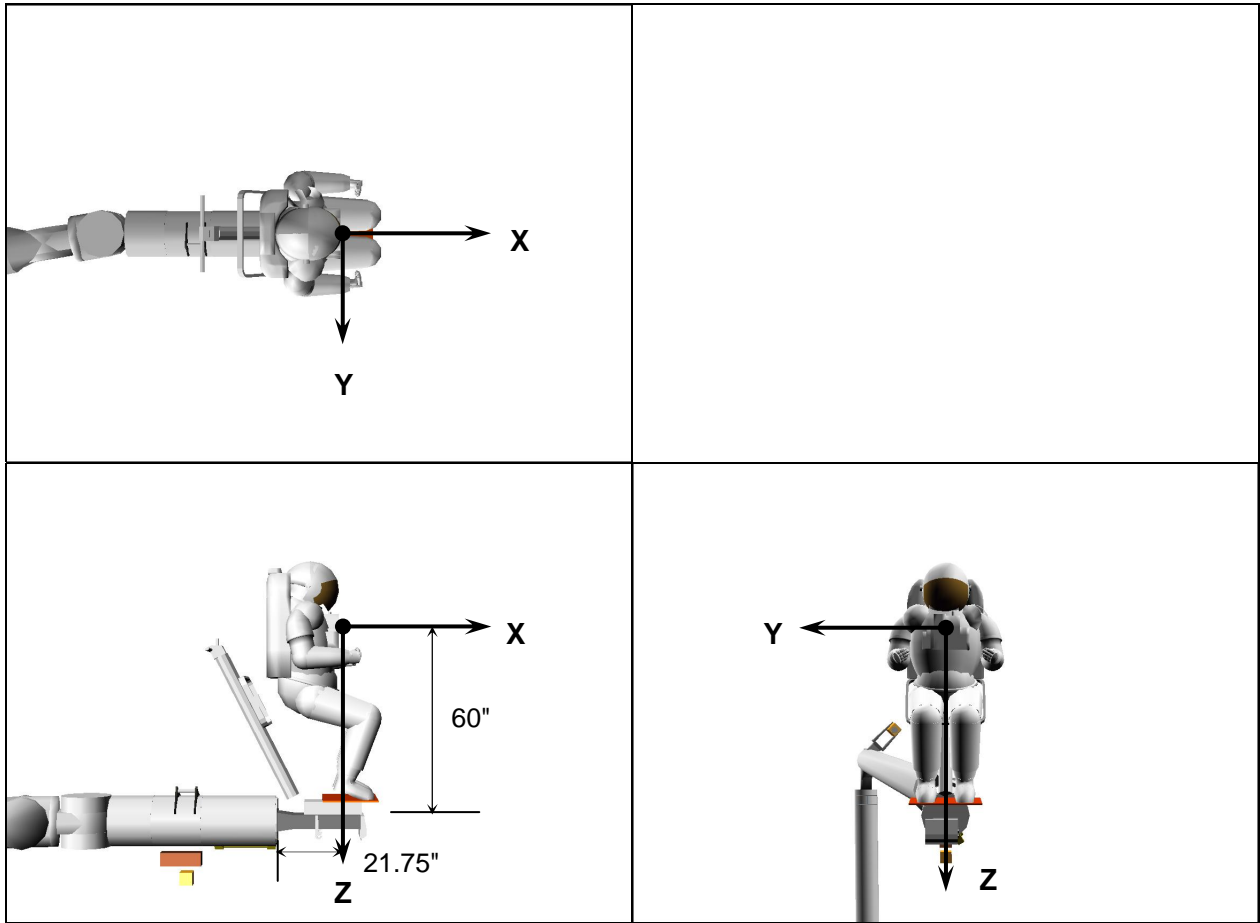
EVA REFERENCE DATA

PL ID/POR DEFINITION – PL ID 3B FS 15-2
 4B FS 15-3
RMS (EVA) DAP CONSTRAINTS FS 15-4
 CONFIGURATIONS FS 15-5
JOINT ANGLES VS POR COORDINATES FS 15-6
EVA SETUP FS 15-6
 1 – WFC 3, SI C&DH, LOCK (-V3 FWD)..... FS 15-6
 2 – RSU, BAY 2 BATT (-V3 FWD) FS 15-9
 3 – COS, ACS PART 1 (-V2 FWD) FS 15-11
 4 – STIS, NOBL 8 (+V2 FWD) FS 15-13
 5 – BAY 3 BATT, FGS-2, NOBL 5, ACS PART 2 (+V3 FWD)..... FS 15-15
 CLOSEOUT..... FS 15-17
UNSCHEDULED EVA TASK..... FS 15-19

**EVA
REF DATA**

PL ID/POR DEFINITION – PL ID 3B

EVA
REF DATA

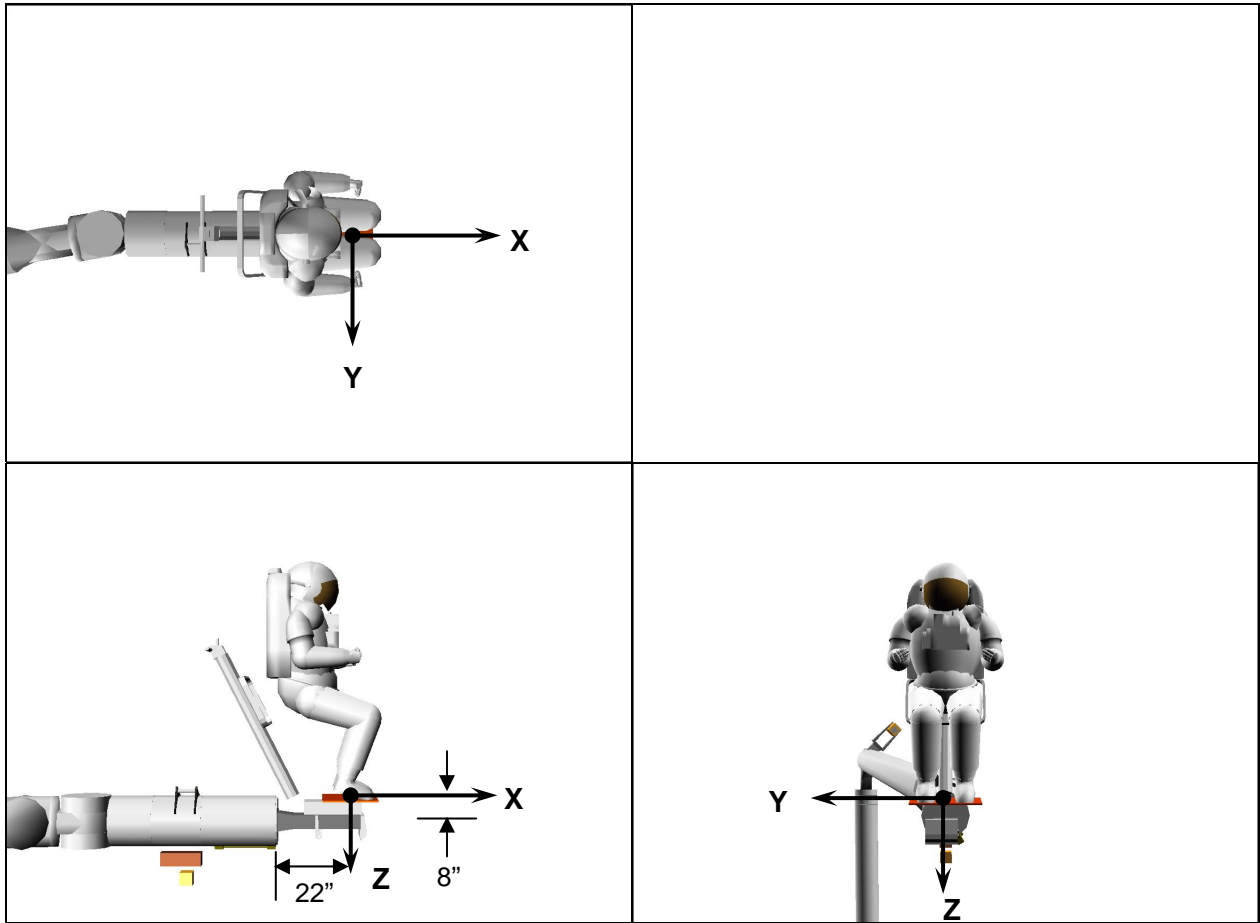


POR: MFR Ops – Crewmember's chest

PURPOSE: MFR Ops w/900 lb payload

RATES:	<u>COARSE</u>	<u>VERN</u>
TRANS LIM ft/sec	0.53	0.18
ROT LIM deg/sec	2.15	0.72

PL ID/POR DEFINITION – PL ID 4B



POR: MFR Ops – Crewmember's feet

PURPOSE: MFR Ops w/900 lb payload

RATES:	<u>COARSE</u>	<u>VERN</u>
TRANS LIM ft/sec	0.53	0.18
ROT LIM deg/sec	2.15	0.72

RMS (EVA) DAP CONSTRAINTS

PAYLOAD POSITIONS	VRCS		ALT		
	MAN	AUTO	AUTO	JET OPTION	MODE
All MFR Ops	A10/2	A10/2	A10/2	Tail	Norm Z, Lo Z

Notes:

1. Key X#/# DAP Configuration/Cntl Accel
2. RMS/HST Positions Defined in REF DATA
3. To conserve propellant, Orbiter nominally in Free Drift for all RMS/MFR positions not listed above. For contingencies, manual attitude control may be attempted using DAP config best suited for contingency. Reference All-Flights Rule {A12-6 G}, OMS/RCS Constraints, for use of VRCS in unplanned contingency
4. DAP B11 is a slow maneuver rate DAP used for loads mitigation and is interchangeable with DAP A10

RMS (EVA) DAP CONFIGURATIONS

	A10	B11
PRI		
ROT RATE (deg/s)	0.10	0.05
ATT DB (deg)	3.0	10.0
RATE DB (deg/s)	0.20	0.20
ROT PLS (deg/s)	0.04	0.04
COMP (deg/s)	0.0	0.0
P OPTION	ALL	TAIL
Y OPTION	ALL	TAIL
TRAN PLS (s)	0.05	0.05
ALT		
RATE DB (deg)	0.10	0.10
JET OPT	TAIL	TAIL
# JETS	2	2
ON TIME (sec)	0.08	0.08
DELAY (sec)	12.7	12.7
VERN		
ROT RATE (deg/s)	0.10	0.016
ATT DB (deg)	1.0	1.0
RATE DB (deg/s)	0.020	0.020
ROT PLS (deg/s)	0.005	0.005
COMP (deg/s)	0.0	0.0
CNTL ACC	2	2

NOTE

DAP Usage:

A10, B11 – HST Berthed/MFR Operations

JOINT ANGLES VS POR COORDINATES

EVA SETUP

MFR PRE-GRAPPLE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1125	-120	-485	270	325	90	0
SY	SP	EP	WP	WY	WR	
+1.7	+47.0	-61.9	-75.6	-15.5	+107.8	

ATTACH EV2 TETHER

X	Y	Z	PITCH	YAW	ROLL	PL ID
-730	+50	-480	270	0	120	0
-760	+102	-458	270	0	300	3
-734	+57	-458	270	0	300	4
SY	SP	EP	WP	WY	WR	
-74.3	+91.4	-138.9	-61.3	+5.2	+214.6	

EV INGRESS

X	Y	Z	PITCH	YAW	ROLL	PL ID
-735	+50	-465	270	30	271	0
-735	-13	-477	270	30	90	3
-735	+32	-451	270	30	90	4
SY	SP	EP	WP	WY	WR	
-74.4	+77.4	-133.8	-82.0	+11.8	+9.7	

AIRLOCK MFR INGRESS

X	Y	Z	PITCH	YAW	ROLL	PL ID
-735	+50	-465	270	30	271	0
-735	-13	-477	270	30	90	3
-735	+32	-451	270	30	90	4
SY	SP	EP	WP	WY	WR	
-74.4	+77.4	-133.8	-82.0	+11.8	+9.7	

EVA 1 – WFC 3, SI C&DH, LOCK (-V3 FWD)

FORWARD FIXTURE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-864	-64	-506	277	0	211	0
-918	-94	-491	277	0	30	3
-873	-68	-486	277	0	30	4
SY	SP	EP	WP	WY	WR	
-24.4	+102.6	-132.3	-61.9	+20.6	-106.5	

WFPC 2 REMOVAL SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-994	-5	-576	345	0	181	0
-1030	-5	-628	345	0	0	3
-1017	-5	-578	345	0	0	4
SY	SP	EP	WP	WY	WR	
-29.3	+82.1	-113.6	+14.5	+33.2	-170.6	

WFPC 2 TEMP STOW SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1012	-25	-527	270	0	271	0
-1012	-85	-505	270	0	90	3
-1012	-33	-505	270	0	90	4
SY	SP	EP	WP	WY	WR	
-20.5	+67.5	-91.9	-72.6	+18.2	-48.4	

WFC HANDHOLD RETRIEVE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-990	-45	-509	270	0	331	0
-938	-75	-487	270	0	150	3
-983	-49	-487	270	0	150	4
SY	SP	EP	WP	WY	WR	
-17.8	+72.6	-101.1	-67.6	+18.5	+8.8	

WFC 3 RETRIEVAL

X	Y	Z	PITCH	YAW	ROLL	PL ID
-862	-4	-532	270	0	0	0
-802	-4	-510	270	0	180	3
-854	-4	-510	270	0	180	4
SY	SP	EP	WP	WY	WR	
-38.6	+92.9	-122.8	-72.5	+15.1	+60.3	

WFC 3 PRE-INSTALL

X	Y	Z	PITCH	YAW	ROLL	PL ID
-895	-8	-585	345	0	181	0
-931	-8	-637	345	0	0	3
-918	-8	-587	345	0	0	4
SY	SP	EP	WP	WY	WR	
-42.2	+102.0	-130.7	+8.4	+45.4	-165.3	

WFC HANDHOLD HANDOFF SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-864	-64	-506	277	0	211	0
-918	-94	-491	277	0	30	3
-873	-68	-486	277	0	30	4
SY	SP	EP	WP	WY	WR	
-24.4	+102.6	-132.3	-61.9	+20.6	-106.5	

WFPC 2 TEMP STOW RETRIEVE SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1012	-22	-517	270	0	270	0
-1012	-82	-495	270	0	90	3
-1012	-30	-495	270	0	90	4
SY	SP	EP	WP	WY	WR	
-20.4	+66.6	-93.0	-70.7	+18.2	-48.7	

WFPC 2 STOW SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-862	-4	-617	270	0	0	0
-802	-4	-595	270	0	180	3
-854	-4	-595	270	0	180	4
SY	SP	EP	WP	WY	WR	
-43.6	+95.1	-107.3	-91.5	+14.0	+65.3	

FGS HANDHOLD STOW

X	Y	Z	PITCH	YAW	ROLL	PL ID
-964	-81	-532	270	0	1	0
-904	-81	-510	270	0	180	3
-956	-81	-510	270	0	180	4
SY	SP	EP	WP	WY	WR	
-14.4	+82.7	-106.1	-71.7	+18.8	+35.3	

TOOL HANDOFF AT FSIPE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-973	-4	-528	270	0	0	0
-913	-4	-506	270	0	180	3
-965	-4	-506	270	0	180	4
SY	SP	EP	WP	WY	WR	
-26.2	+72.6	-100.2	-71.2	+17.4	+47.6	

BAY 10 DOOR SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1141	+128	-601	0	10	180	0
-1162	+124	-661	0	10	0	3
-1162	+124	-609	0	10	0	4
SY	SP	EP	WP	WY	WR	
-34.9	+34.9	-51.7	+21.5	+44.3	-182.4	

SI C&DH HANDOFF AT MULE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1148	+128	-517	300	7	180	0
-1211	+125	-528	300	7	0	3
-1166	+125	-502	300	7	0	4
SY	SP	EP	WP	WY	WR	
-31.3	+21.4	-30.2	-65.6	+36.9	-137.3	

BAY 10 DOOR

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1151	+128	-626	0	10	190	0
-1171	+115	-685	0	10	9	3
-1172	+123	-634	0	10	9	4
SY	SP	EP	WP	WY	WR	
-35.0	+32.1	-41.9	+14.4	+44.4	-173.5	

GET-AHEAD – BAY 2 DOOR BOLT

X	Y	Z	PITCH	YAW	ROLL	PL ID
-989	+20	-601	346	0	180	0
-1025	+20	-654	346	0	0	3
-1012	+20	-604	346	0	0	4
SY	SP	EP	WP	WY	WR	
-34.7	+81.0	-108.8	+10.9	+38.3	-169.4	

LOCK RETRIEVAL AT MULE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1219	-123	-478	353	0	180	0
-1248	-123	-535	353	0	0	3
-1248	-123	-483	353	0	0	4
SY	SP	EP	WP	WY	WR	
+0.1	+36.2	-58.2	+15.4	+2.2	-179.3	

LOCK INSTALL AT -V2 DOORS

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1120	+120	-555	355	0	180	0
-1147	+120	-613	355	0	0	3
-1143	+120	-561	355	0	0	4
SY	SP	EP	WP	WY	WR	
-33.4	+40.7	-68.5	+22.1	+34.9	-176.2	

EVA 2 – RSU, BAY 2 BATT (-V3 FWD)

RSU-2R PICKUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-943	+58	-517	270	0	180	0
-1003	+58	-495	270	0	0	3
-951	+58	-495	270	0	0	4
SY	SP	EP	WP	WY	WR	
-37.1	+68.2	-101.6	-68.6	+15.4	-121.3	

SETUP AND OPEN -V3 DOORS

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1004	+42	-505	0	0	180	0
-1026	+42	-565	0	0	0	3
-1026	+42	-513	0	0	0	4
SY	SP	EP	WP	WY	WR	
-31.0	+63.2	-114.9	+51.7	+31.0	-179.5	

CASH RELOCATE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-977	-25	-516	323	0	180	0
-1030	-25	-551	323	0	0	3
-999	-25	-509	323	0	0	4
SY	SP	EP	WP	WY	WR	
-24.2	+82.4	-120.0	-3.7	+30.7	-159.8	

RSU-2 R&R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1006	-15	-537	345	0	190	0
-1042	-25	-588	345	0	10	3
-1029	-16	-539	345	0	10	4
SY	SP	EP	WP	WY	WR	
-24.4	+77.3	-116.1	+22.7	+28.5	-162.2	

SWAP RSU-2 FOR RSU-3R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-907	+64	-517	270	0	180	0
-967	+64	-495	270	0	0	3
-915	+64	-495	270	0	0	4
SY	SP	EP	WP	WY	WR	
-42.0	+72.6	-108.2	-67.7	+14.3	-116.3	

ASSIST EV1 INTO PFR

X	Y	Z	PITCH	YAW	ROLL	PL ID
-983	0	-491	325	0	180	0
-1035	0	-528	325	0	0	3
-1005	0	-485	325	0	0	4
SY	SP	EP	WP	WY	WR	
-26.4	+74.8	-119.4	+4.8	+32.4	-159.3	

RSU-3 R&R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-996	+24	-537	345	0	180	0
-1032	+24	-589	345	0	0	3
-1019	+24	-539	345	0	0	4
SY	SP	EP	WP	WY	WR	
-31.4	+73.8	-114.8	+23.6	+35.2	-169.9	

SWAP RSU-3 FOR RSU-1R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-926	+59	-522	270	0	180	0
-986	+59	-500	270	0	0	3
-934	+59	-500	270	0	0	4
SY	SP	EP	WP	WY	WR	
-39.3	+71.0	-104.5	-69.2	+15.0	-119.0	

RSU-1 R&R

X	Y	Z	PITCH	YAW	ROLL	PL ID
-945	-31	-546	300	355	166	0
-1005	-14	-557	300	355	345	3
-962	-27	-531	300	355	345	4
SY	SP	EP	WP	WY	WR	
-26.3	+90.0	-116.3	-40.8	+23.9	-160.1	

GET-AHEAD – CASH RELOCATE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1000	-18	-528	310	0	180	0
-1060	-18	-550	310	0	0	3
-1020	-18	-517	310	0	0	4
SY	SP	EP	WP	WY	WR	
-24.0	+77.3	-108.7	-24.8	+29.7	-152.3	

CLOSE -V3 DOORS

X	Y	Z	PITCH	YAW	ROLL	PL ID
-989	-8	-498	345	0	180	0
-1025	-8	-550	345	0	0	3
-1012	-8	-500	345	0	0	4
SY	SP	EP	WP	WY	WR	
-24.6	+74.0	-122.7	+32.4	+28.7	-172.2	

BAY 2

X	Y	Z	PITCH	YAW	ROLL	PL ID
-993	+25	-612	0	0	196	0
-1015	+9	-670	0	0	15	3
-1015	+23	-620	0	0	15	4
SY	SP	EP	WP	WY	WR	
-35.0	+79.4	-109.0	+29.6	+35.0	-164.5	

BATTERY REMOVAL

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1012	+41	-592	0	0	195	0
-1034	+25	-650	0	0	15	3
-1034	+39	-600	0	0	15	4
SY	SP	EP	WP	WY	WR	
-34.3	+72.3	-105.8	+33.4	+34.3	-164.5	

BATTERY HANDOFF

X	Y	Z	PITCH	YAW	ROLL	PL ID
-828	+86	-487	0	0	270	0
-850	+26	-487	0	0	90	3
-850	+78	-487	0	0	90	4
SY	SP	EP	WP	WY	WR	
-64.8	+69.2	-138.3	+69.1	+64.8	-89.5	

BATTERY-R INSTALL

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1008	+38	-617	0	0	193	0
-1030	+25	-676	0	0	12	3
-1030	+36	-625	0	0	12	4
SY	SP	EP	WP	WY	WR	
-35.5	+75.2	-103.7	+28.4	+35.5	-167.5	

EVA 3 – COS, ACS PART 1 (-V2 FWD)

-V2 AFT SHROUD DOORS SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-998	-1	-498	345	0	188	0
-1034	-1	-550	345	0	0	3
-1021	-1	-500	345	0	0	4
SY	SP	EP	WP	WY	WR	
-25.1	+71.7	-120.0	+32.1	+29.2	-172.0	

COSTAR REMOVAL SUPPORT SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-995	-15	-520	320	0	180	0
-1050	-15	-552	320	0	0	3
-1064	-15	-552	320	0	0	4
SY	SP	EP	WP	WY	WR	
-24.6	+78.0	-113.8	-9.1	+30.9	-157.6	

COSTAR TEMP STOW SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-980	-23	-557	270	0	270	0
-980	-83	-535	270	0	90	3
-980	-31	-535	270	0	90	4
SY	SP	EP	WP	WY	WR	
-24.4	+75.0	-95.9	-77.5	+17.7	-44.3	

COS RETRIEVAL SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1024	-37	-481	278	0	32	0
-976	-6	-452	278	0	211	3
-1020	-33	-458	278	0	211	4
SY	SP	EP	WP	WY	WR	
-16.1	+64.9	-97.4	-54.9	+20.8	+65.3	

COS INSTALL SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-931	+11	-552	330	0	180	0
-980	+11	-593	330	0	0	3
-954	+11	-548	330	0	0	4
SY	SP	EP	WP	WY	WR	
-37.7	+89.1	-123.4	-4.6	+41.4	-154.1	

COSTAR RETRIEVAL SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1013	-23	-522	270	0	269	0
-1015	-83	-500	270	0	88	3
-1013	-31	-500	270	0	88	4
SY	SP	EP	WP	WY	WR	
-20.5	+66.8	-92.2	-71.7	+18.2	-50.4	

COSTAR STOW SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1024	-45	-559	270	3	35	0
-975	-12	-535	270	3	215	3
-1018	-42	-537	270	3	215	4
SY	SP	EP	WP	WY	WR	
-19.0	+68.1	-85.0	-80.8	+21.2	+75.4	

MFR EGRESS

X	Y	Z	PITCH	YAW	ROLL	PL ID
-894	0	-503	345	0	181	0
-930	0	-555	345	0	0	3
-917	0	-505	345	0	0	4
SY	SP	EP	WP	WY	WR	
-38.2	+89.6	-140.8	+32.1	+41.7	-167.1	

AFT SHROUD SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-940	-21	-548	345	10	180	0
-976	-25	-600	345	10	0	3
-963	-25	-550	345	10	0	4
SY	SP	EP	WP	WY	WR	
-32.1	+90.1	-128.5	+23.3	+45.8	-171.2	

GET-AHEAD – LOPE ACCESS

X	Y	Z	PITCH	YAW	ROLL	PL ID
-966	+111	-528	275	345	290	0
-949	+62	-491	275	345	110	3
-966	+109	-505	275	345	110	4
SY	SP	EP	WP	WY	WR	
-40.2	+60.9	-91.7	-58.4	+6.5	-11.3	

CLOSE -V2 DOORS SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-987	-56	-534	323	10	194	0
-1037	-73	-569	323	10	13	3
-1008	-62	-527	323	10	13	4
SY	SP	EP	WP	WY	WR	
-20.6	+84.7	-117.0	-7.2	+38.0	-149.7	

EVA 4 – STIS, NOBL 8 (+V2 FWD)

FCP RECEIVE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-945	+62	-537	270	0	181	0
-1005	+62	-515	270	0	0	3
-953	+62	-515	270	0	0	4
SY	SP	EP	WP	WY	WR	
-38.3	+68.6	-98.0	-73.0	+15.2	-120.1	

+V2 AFT SHROUD DOORS

X	Y	Z	PITCH	YAW	ROLL	PL ID
-971	-6	-521	345	0	181	0
-1007	-6	-573	345	0	0	3
-994	-6	-523	345	0	0	4
SY	SP	EP	WP	WY	WR	
-28.1	+80.3	-124.6	+27.6	+32.0	-171.0	

TOOL CONFIG & SUPPORT

X	Y	Z	PITCH	YAW	ROLL	PL ID
-930	-20	-514	345	0	181	0
-966	-20	-566	345	0	0	3
-953	-20	-516	345	0	0	4
SY	SP	EP	WP	WY	WR	
-29.5	+88.9	-135.0	+29.2	+33.4	-170.6	

CLEAR AFT SHROUD

X	Y	Z	PITCH	YAW	ROLL	PL ID
-999	+12	-522	347	0	181	0
-1034	+12	-576	347	0	0	3
-1022	+12	-525	347	0	0	4
SY	SP	EP	WP	WY	WR	
-28.4	+72.9	-116.8	+29.5	+31.9	-172.2	

FCP STOW

X	Y	Z	PITCH	YAW	ROLL	PL ID
-945	+62	-537	270	0	181	0
-1005	+62	-515	270	0	0	3
-953	+62	-515	270	0	0	4
SY	SP	EP	WP	WY	WR	
-38.3	+68.6	-98.0	-73.0	+15.2	-120.1	

STIS AFT SHROUD

X	Y	Z	PITCH	YAW	ROLL	PL ID
-999	+7	-528	345	0	180	0
-1035	+7	-580	345	0	0	3
-1022	+7	-530	345	0	0	4
SY	SP	EP	WP	WY	WR	
-28.0	+74.6	-116.7	+25.4	+32.0	-171.1	

MEB-R COVER RETRIEVAL (ASIFE LID)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-936	0	-513	290	0	181	0
-1000	0	-513	290	0	0	3
-951	0	-495	290	0	0	4
SY	SP	EP	WP	WY	WR	
-30.9	+81.9	-116.3	-47.1	+26.4	-134.6	

AFT SHROUD

X	Y	Z	PITCH	YAW	ROLL	PL ID
-999	+7	-528	345	0	180	0
-1035	+7	-580	345	0	0	3
-1022	+7	-530	345	0	0	4
SY	SP	EP	WP	WY	WR	
-28.0	+74.6	-116.7	+25.4	+32.0	-171.1	

+V2 AFT SHROUD DOORS

X	Y	Z	PITCH	YAW	ROLL	PL ID
-974	+6	-504	346	0	181	0
-1010	+6	-557	346	0	0	3
-997	+6	-507	346	0	0	4
SY	SP	EP	WP	WY	WR	
-28.7	+75.2	-124.2	+33.3	+32.5	-171.5	

MINC NOBL RETRIEVE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1221	-142	-471	353	0	135	0
-1248	-100	-510	353	0	315	3
-1244	-137	-473	353	0	315	4
SY	SP	EP	WP	WY	WR	
+2.5	+35.4	-57.0	+14.9	-0.2	-224.6	

BAY 8

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1144	-149	-633	0	0	165	0
-1166	-133	-691	0	0	345	3
-1166	-147	-641	0	0	345	4
SY	SP	EP	WP	WY	WR	
-3.4	+64.0	-71.9	+7.9	+3.4	-194.5	

BAY 8 NOBL INSTALL

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1162	-137	-633	0	355	165	0
-1182	-120	-691	0	355	345	3
-1183	-133	-641	0	355	345	4
SY	SP	EP	WP	WY	WR	
-4.1	+59.5	-65.7	+4.5	-0.6	-194.4	

BAY 5

X	Y	Z	PITCH	YAW	ROLL	PL ID
-983	-27	-612	355	355	180	0
-1010	-25	-670	355	355	0	3
-1006	-25	-618	355	355	0	4
SY	SP	EP	WP	WY	WR	
-27.5	+89.7	-114.7	+18.0	+24.3	-176.2	

BAY 5 NOBL INSTALL

X	Y	Z	PITCH	YAW	ROLL	PL ID
-983	-27	-604	355	355	180	0
-1010	-25	-662	355	355	0	3
-1006	-25	-610	355	355	0	4
SY	SP	EP	WP	WY	WR	
-27.0	+89.2	-115.8	+19.7	+23.8	-176.3	

EVA 5 – BAY 3 BATT, FGS-2, NOBL 5, ACS PART 2

BAY 3 SETUP (+V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1095	+131	-604	0	345	195	0
-1120	+122	-662	0	345	15	3
-1117	+135	-612	0	345	15	4
SY	SP	EP	WP	WY	WR	
-36.3	+47.8	-71.3	+18.1	+22.0	-161.9	

BATTERY REMOVAL (+V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1080	+125	-602	0	345	195	0
-1105	+116	-660	0	345	15	3
-1102	+129	-610	0	345	15	4
SY	SP	EP	WP	WY	WR	
-36.8	+51.3	-77.1	+20.4	+22.5	-161.8	

BATTERY SWAP AT SLIC SETUP (+V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-795	-24	-527	280	0	185	0
-858	-29	-516	280	0	5	3
-807	-25	-507	280	0	5	4
SY	SP	EP	WP	WY	WR	
-49.7	+111.3	-137.4	-72.4	+20.2	-105.5	

BATTERY-R INSTALL (+V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1087	+115	-638	0	0	185	0
-1109	+110	-698	0	0	5	3
-1109	+115	-646	0	0	5	4
SY	SP	EP	WP	WY	WR	
-38.0	+50.9	-69.5	+18.6	+38.0	-174.5	

FORWARD FIXTURE SETUP (+V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-856	-85	-505	277	0	180	0
-918	-85	-491	277	0	0	3
-866	-85	-485	277	0	0	4
SY	SP	EP	WP	WY	WR	
-19.6	+107.6	-134.7	-62.7	+20.6	-141.6	

FGS-2 BAY SETUP (+V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1096	-146	-563	0	0	165	0
-1118	-130	-621	0	0	345	3
-1118	-144	-571	0	0	345	4
SY	SP	EP	WP	WY	WR	
-0.6	+70.9	-95.7	+24.8	+0.6	+165.5	

FGS-2 TEMP STOW SETUP (+V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-965	-90	-597	260	0	180	0
-1020	-90	-565	260	0	0	3
-969	-90	-574	260	0	0	4
SY	SP	EP	WP	WY	WR	
-16.3	+82.9	-92.7	-95.7	+15.5	-139.9	

FGS-2R RETRIEVAL SETUP (+V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-855	+2	-507	270	0	180	0
-915	+2	-485	270	0	0	3
-863	+2	-485	270	0	0	4
SY	SP	EP	WP	WY	WR	
-39.2	+90.8	-127.0	-66.5	+15.0	-119.2	

FGS-2R INSTALLATION SETUP (+V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1115	-216	-579	0	0	165	0
-1137	-200	-637	0	0	345	3
-1137	-214	-587	0	0	345	4
SY	SP	EP	WP	WY	WR	
+8.5	+68.7	-84.4	+15.7	-8.5	+165.5	

FGS-2 RETRIEVAL SETUP (+V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-961	-82	-517	260	0	180	0
-1016	-82	-485	260	0	0	3
-965	-82	-494	260	0	0	4
SY	SP	EP	WP	WY	WR	
-13.0	+79.7	-105.8	-78.5	+16.3	-143.2	

FGS-2 STOW SETUP (+V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-855	+2	-587	270	0	180	0
-915	+2	-565	270	0	0	3
-863	+2	-565	270	0	0	4
SY	SP	EP	WP	WY	WR	
-44.0	+95.2	-113.9	-85.2	+13.9	-114.3	

MINC NOBL RETRIEVE (+V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1221	-142	-471	353	0	135	0
-1248	-100	-510	353	0	315	3
-1244	-137	-473	353	0	315	4
SY	SP	EP	WP	WY	WR	
+2.5	+35.4	-57.0	+14.9	-0.2	-224.6	

BAY 5 (+V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-983	-27	-612	355	355	180	0
-1010	-25	-670	355	355	0	3
-1006	-25	-618	355	355	0	4
SY	SP	EP	WP	WY	WR	
-27.5	+89.7	-114.7	+18.0	+24.3	-176.2	

BAY 3 SETUP (-V3 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1000	-72	-643	0	270*	210	0
-1030	-50	-695	0	270*	30	3
-1004	-50	-650	0	270	30	4
SY	SP	EP	WP	WY	WR	
-8.4	+81.8	-90.8	-58.5	-68.8	+164.0	

*Display singularity

BATTERY REMOVAL (-V3 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1025	-66	-602	165	270*	0	0
-1040	-44	-660	20	270*	35	3
-1027	-44	-610	20	270*	35	4
SY	SP	EP	WP	WY	WR	
-6.5	+74.5	-90.4	-56.3	-69.5	+143.9	

*Display singularity

BATTERY SWAP AT SLIC SETUP (-V3 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-875	-120	-495	270	0	90	0
-875	-60	-473	270	0	270	3
-875	-112	-473	270	0	270	4
SY	SP	EP	WP	WY	WR	
-7.0	+103.1	-130.8	-64.7	+19.3	+117.4	

BATTERY-R INSTALL (-V3 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1025	-57	-612	165	270*	0	0
-1040	-35	-670	20	270*	35	3
-1027	-35	-620	20	270*	35	4
SY	SP	EP	WP	WY	WR	
-8.5	+74.8	-89.6	-52.7	-68.8	+149.0	

*Display singularity

PFR HANDOFF (-V3 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1000	-69	-492	350	10	145	0
-1035	-39	-536	350	10	325	3
-1023	-68	-495	350	10	325	4
SY	SP	EP	WP	WY	WR	
-13.7	+76.3	-124.3	+41.4	+26.4	+146.9	

-V2 AFT SHROUD DOORS (-V3 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1142	+135	-526	0	20	198	0
-1156	+110	-583	0	20	18	3
-1162	+125	-534	0	20	18	4
SY	SP	EP	WP	WY	WR	
-33.8	+27.1	-54.7	+38.3	+52.2	+191.1	

LOPE ACCESS (-V3 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-966	+111	-528	275	345	290	0
-949	+62	-491	275	345	110	3
-966	+109	-505	275	345	110	4
SY	SP	EP	WP	WY	WR	
-40.2	+60.9	-91.7	-58.4	+6.5	+348.7	

-V2 AFT SHROUD DOORS CLOSING (-V3 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1142	+135	-526	0	20	198	0
-1156	+110	-583	0	20	18	3
-1161	+125	-534	0	20	18	4
SY	SP	EP	WP	WY	WR	
-33.8	+27.1	-54.7	+38.3	+52.2	+191.1	

MINC NOBL RETRIEVE (-V3 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1221	-142	-471	353	0	135	0
-1248	-100	-510	353	0	315	3
-1244	-137	-473	353	0	315	4
SY	SP	EP	WP	WY	WR	
+2.5	+35.4	-57.0	+14.9	-0.2	+135.4	

BAY 5 (-V3 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1152	-146	-610	0	0	175	0
-1174	-141	-670	0	0	355	3
-1174	-146	-618	0	0	355	4
SY	SP	EP	WP	WY	WR	
-2.6	+61.4	-72.7	+11.3	+2.6	+175.5	

BAY 5 NOBL INSTALL (-V3 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1141	-139	-617	0	0	165	0
-1163	-123	-675	0	0	345	3
-1163	-137	-625	0	0	345	4
SY	SP	EP	WP	WY	WR	
-4.0	+64.0	-75.7	+11.7	+4.0	+165.5	

EVA CLOSEOUT

MFR EGRESS SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-735	+50	-466	270	30	270	0
-735	-13	-477	270	30	90	3
-735	+32	-451	270	30	90	4
SY	SP	EP	WP	WY	WR	
-74.4	+77.4	-133.8	-82.0	+11.8	+9.7	

MFR RELEASE SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1125	-120	-485	270	325	90	0
-1125	-58	-502	270	325	270	3
-1125	-101	-472	270	325	270	4
SY	SP	EP	WP	WY	WR	
+1.7	+47.0	-61.9	-75.6	-15.5	+107.8	

UNSCHEDULED EVA TASKS

SAFETY TETHER HOVER

X	Y	Z	PITCH	YAW	ROLL	PL ID
-871	+112	-520	306	5	265	0
-885	+111	-509	257	278	191	1
-856	+698	-439	257	278	221	2
SY	SP	EP	WP	WY	WR	
-57.9	+71.4	-113.0	-47.2	+43.4	-23.3	

SAFETY TETHER

X	Y	Z	PITCH	YAW	ROLL	PL ID
-872	+113	-469	306	5	265	0
-886	+112	-458	257	278	191	1
-856	+698	-387	257	278	221	2
SY	SP	EP	WP	WY	WR	
-56.0	+65.1	-117.9	-34.4	+43.3	-26.0	

HST PFR HOVER

X	Y	Z	PITCH	YAW	ROLL	PL ID
-872	-430	-567	306	5	265	0
-886	-431	-555	257	278	191	1
-856	+155	-485	257	278	221	2
SY	SP	EP	WP	WY	WR	
+56.7	+90.8	-86.8	-53.6	-17.4	-131.1	

BAY 7 (+V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1107	-142	-596	0	355	165	0
-1127	-125	-654	0	355	345	3
-1128	-138	-604	0	355	345	4
SY	SP	EP	WP	WY	WR	
-2.1	+71.1	-88.9	+16.1	-2.6	-194.5	

BAY 7 (+V3 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-993	+40	-610	0	0	180	0
-1015	+40	-670	0	0	0	3
-1015	+40	-618	0	0	0	4
SY	SP	EP	WP	WY	WR	
-37.1	+76.9	-107.6	+30.7	+37.1	-179.5	

ECU RETRIEVAL AT MULE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1220	-150	-473	353	0	153	0
-1248	-123	-524	353	0	333	3
-1242	-147	-478	353	0	333	4
SY	SP	EP	WP	WY	WR	
+3.3	+36.2	-57.2	+14.4	-1.0	-206.7	

BAY 10 (-V3 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1138	+130	-610	0	0	180	0
-1160	+130	-670	0	0	0	3
-1160	+130	-618	0	0	0	4
SY	SP	EP	WP	WY	WR	
-34.8	+37.3	-53.3	+16.0	+34.8	-179.5	

BAY 10 (+V3 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1107	-142	-596	0	355	165	0
-1127	-125	-654	0	355	345	3
-1128	-138	-604	0	355	345	4
SY	SP	EP	WP	WY	WR	
-2.1	+71.1	-88.9	+16.1	-2.6	-194.5	

BAY 10 (-V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-993	+15	-611	0	0	180	0
-1015	+15	-670	0	0	0	3
-1015	+15	-619	0	0	0	4
SY	SP	EP	WP	WY	WR	
-33.6	+80.7	-110.2	+29.6	+33.6	-179.5	

ECU HANDOFF AT MULE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1220	-150	-473	353	0	153	0
-1248	-123	524	353	0	333	3
-1242	-147	-478	353	0	333	4
SY	SP	EP	WP	WY	WR	
+3.3	+36.2	-57.2	+14.4	-1.0	-206.7	

BAY 2

X	Y	Z	PITCH	YAW	ROLL	PL ID
-993	+24	-612	0	0	195	0
-1015	+9	-670	0	0	15	3
-1015	+22	-620	0	0	15	4
SY	SP	EP	WP	WY	WR	
-35.0	+79.4	-109.0	+29.6	+35.0	-164.5	

BAY 3

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1004	-62	-628	150	270*	0	0
-1034	-40	-680	345	270*	15	3
-1008	-40	-635	345	270*	15	4
SY	SP	EP	WP	WY	WR	
-9.1	+80.2	-92.6	-53.5	-68.6	-194.4	

*Display singularity

SPARE RSU RETRIEVAL AT MULE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1220	-150	-473	353	0	153	0
-1248	-123	-524	353	0	333	3
-1242	-147	-478	353	0	333	4
SY	SP	EP	WP	WY	WR	
+3.3	+36.2	-57.2	+14.4	-1.0	-206.7	

MANUAL RETRACT/DEPLOY

X	Y	Z	PITCH	YAW	ROLL	PL ID
-990	-59	-691	338	334	170	0
-1026	-40	-740	338	334	350	3
-1011	-48	-691	338	334	350	4
SY	SP	EP	WP	WY	WR	
-22.9	+93.1	-94.6	-26.2	+2.7	-178.0	

APERTURE DOOR (MANUAL OPEN/CLOSE)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-890	-32	-910	0	0	180	0
-912	-32	-970	0	0	0	3
-912	-32	-918	0	0	0	4
SY	SP	EP	WP	WY	WR	
-55.7	+84.0	-49.0	-35.0	+55.7	-179.5	

JETTISON HANDLE RETRIEVAL

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1220	-150	-473	353	0	153	0
-1248	-123	-524	353	0	333	3
-1242	-147	-478	353	0	333	4
SY	SP	EP	WP	WY	WR	
+3.3	+36.2	-57.2	+14.4	-1.0	-206.7	

APERTURE DOOR (RETRIEVE)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-901	-11	-960	101	330	0	0
-955	0	-990	102	330	180	3
-905	0	-979	102	330	180	4
SY	SP	EP	WP	WY	WR	
-43.7	+71.0	-35.5	+22.7	-42.0	-37.4	

APERTURE DOOR JETTISON

X	Y	Z	PITCH	YAW	ROLL	PL ID
-788	-22	-939	190	270	0	0
-778	0	-998	30	270	20	3
-778	0	-998	30	270	20	4
SY	SP	EP	WP	WY	WR	
-60.6	+85.4	-36.7	-70.8	-27.6	-180.6	

+V2 SOLAR ARRAY

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1062	-96	-767	346	356	186	0
-1098	-101	-820	346	356	6	3
-1085	-96	-770	346	356	6	4
SY	SP	EP	WP	WY	WR	
-20.0	+76.4	-61.7	-30.2	+20.0	-167.6	

-V2 SOLAR ARRAY

X	Y	Z	PITCH	YAW	ROLL	PL ID
-983	+75	-682	340	0	186	0
-1024	+69	-731	340	0	6	3
-1006	+74	-682	340	0	6	4
SY	SP	EP	WP	WY	WR	
-45.8	+74.9	-86.7	-17.6	+48.9	-151.6	

PDU FUSE R&R AT BAY 4 (-V3 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1035	-105	-622	345	315	165	0
-1054	-79	-677	345	315	345	3
-1050	-89	-626	345	315	345	4
SY	SP	EP	WP	WY	WR	
-5.0	+84.7	-96.6	-17.2	-32.9	+164.2	

PDU FUSE R&R AT BAY 4 (-V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1223	-123	-620	0	315	165	0
-1227	-96	-677	0	315	345	3
-1236	-106	-627	0	315	345	4
SY	SP	EP	WP	WY	WR	
-0.8	+32.8	-22.1	-28.8	-41.0	+158.8	

PDU FUSE R&R AT BAY 4 (+V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1010	+61	-624	350	340	195	0
-1045	+54	-677	350	340	15	3
-1032	+67	-628	350	340	15	4
SY	SP	EP	WP	WY	WR	
-36.3	+74.8	-98.8	+7.5	+19.4	-154.9	

EP/TCE FUSE R&R AT BAY H (+V2 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1030	+86	-663	355	35	185	0
-1050	+69	-721	355	35	5	3
-1048	+73	-669	355	35	5	4
SY	SP	EP	WP	WY	WR	
-43.3	+57.9	-76.9	+49.9	+76.0	+156.0	

EP/TCE FUSE R&R AT BAY H (-V3 FWD)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1041	-88	-670	345	315	165	0
-1060	-62	-725	345	315	345	3
-1056	-72	-674	345	315	345	4
SY	SP	EP	WP	WY	WR	
-10.5	+83.4	-87.0	-24.0	-28.1	+167.2	

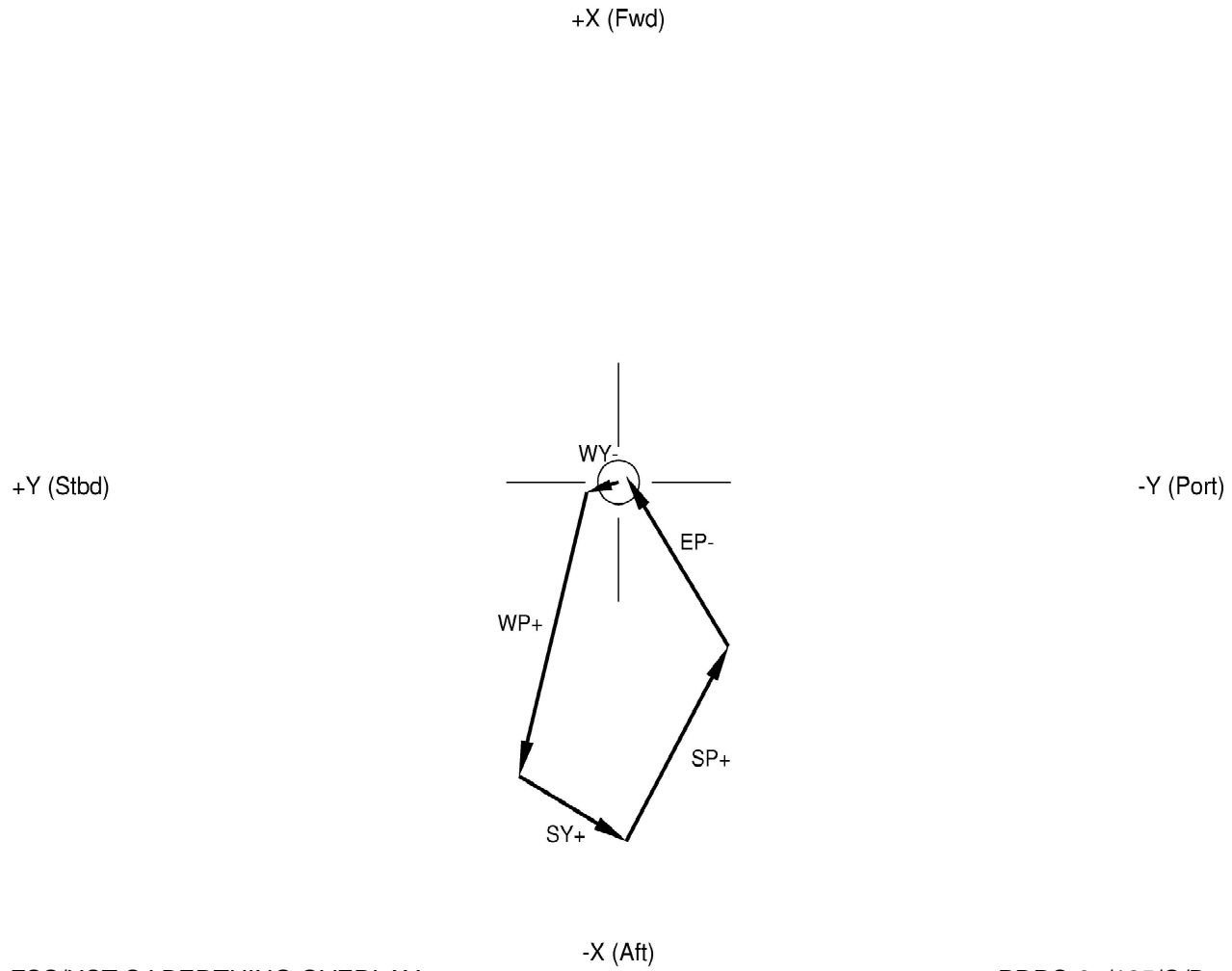
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CUE CARD CONFIGURATION

CUE CARD
CONFIG

CUE CARD CONFIG

Fabricate as transparency



FSS/HST SJ BERTHING OVERLAY

PDRS-9a/125/O/B

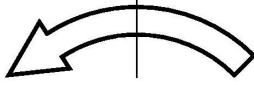
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FS CC 16-2

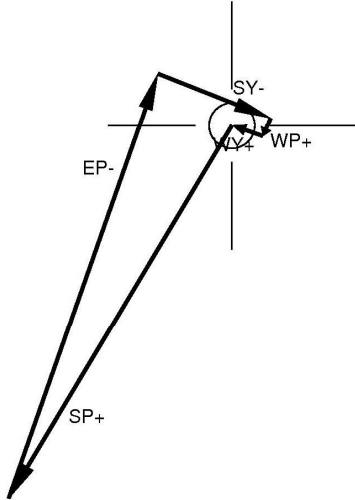
PDRS/125/FIN A

Fabricate as transparency

ZOOM 34.0 HFOV
FOCUS 5.0 FT
EYEPOINT APPROX 18 IN



WR+



UNGRAPPLE BERTHED HST OVERLAY

PDRS-10a/125/O/A

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FS CC 16-3

PDRS/125/FIN A

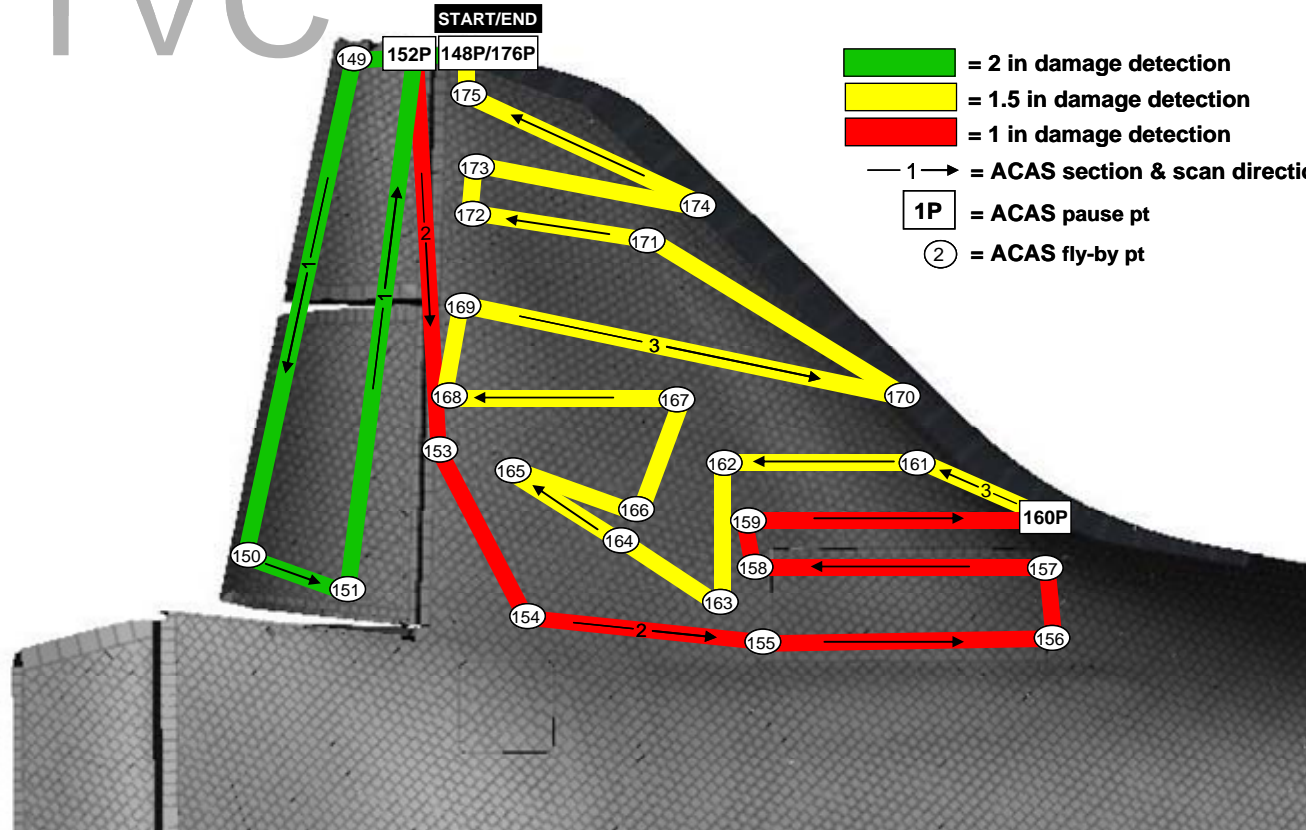
TOP

HOOK
VELCRO

OBSS ITVC SCAN PATTERN CUE CARD STBD BELLY TILE SURVEY

ITVC

- = 2 in damage detection
- = 1.5 in damage detection
- = 1 in damage detection
- 1 → = ACAS section & scan direction
- 1P = ACAS pause pt
- ② = ACAS fly-by pt



PDRS-11a/125/O/B

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FS CC 16-4



PDRS/125/FIN A

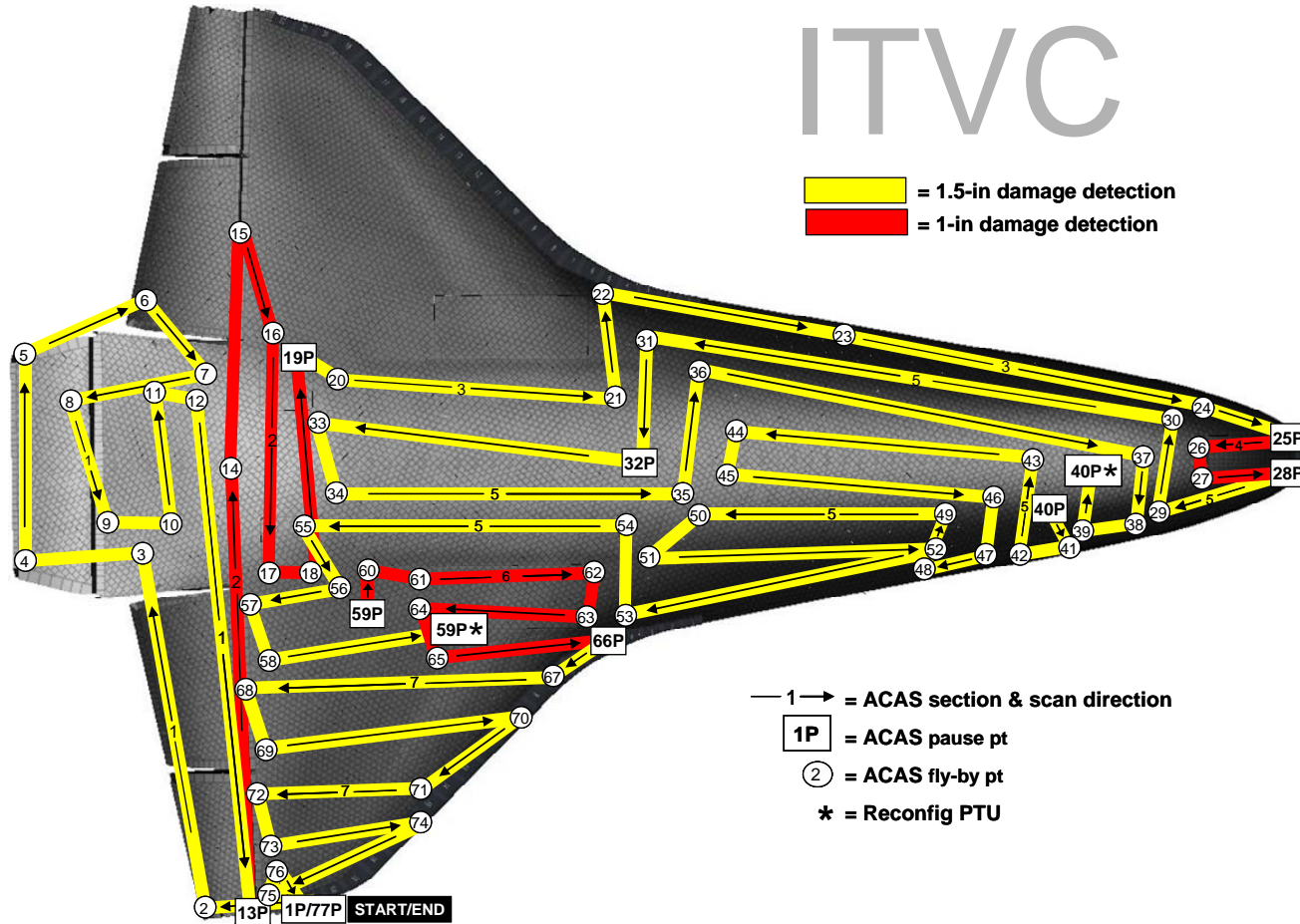
TOP
Back of 'OBSS ITVC SCAN PATTERN CUE CARD STBD BELLY TILE SURVEY'

HOOK
VELCRO

OBSS ITVC SCAN PATTERN CUE CARD PORT BELLY TILE SURVEY

ITVC

 = 1.5-in damage detection
 = 1-in damage detection



— 1 → = ACAS section & scan direction
1P = ACAS pause pt
 ② = ACAS fly-by pt
 * = Reconfig PTU

PDRS-11b/125/O/C

(reduced copy)

FS CC 16-5

PDRS/125/FIN A

TOP

HOOK
VELCRO

RMS SURVEY TIMELINE CUE CARD

<u>PROCEDURE</u>	<u>STEPS</u>
OBSS UNBERTH (PDRS GEN 7-3)	ALL
OBSS LDRI/IDC RCC SURVEY – STBD (PDRS GEN 7-9)	1 - 2
T0 UMBILICAL AND OMS POD SURVEY - STBD (PDRS FS 2-39)	ALL
OBSS LDRI/IDC RCC SURVEY – STBD (PDRS GEN 7-11)	3-4
OBSS ITVC BELLY TILE SURVEY – STBD (PDRS FS 2-2)	ALL
OBSS LDRI/IDC RCC SURVEY – STBD (PDRS GEN 7-15)	5 - END
OBSS LDRI/IDC RCC SURVEY – NOSE CAP (PDRS GEN 7-27)	ALL
OBSS LDRI/IDC RCC SURVEY – PORT (PDRS GEN 7-35)	1 - 5
OBSS ITVC BELLY TILE SURVEY – PORT (PDRS FS 2-9)	ALL
OBSS LDRI/IDC RCC SURVEY – PORT (PDRS GEN 7-42)	6 - 10
T0 UMBILICAL AND OMS POD SURVEY - PORT (PDRS FS 2-43)	ALL
OBSS BERTH (PDRS GEN 7-52)	ALL

PDRS-12a/125/O/C

(reduced copy)

HOOK
VELCRO

STS-125 END EFFECTOR CUE CARD

MA – RELEASE OR PL/EE INTERFACE SUSPECT

Stop maneuver
DAP: FREE
If PL/EE interface suspect and RMS/PL config unsafe:
PULL TEST (PL follows RMS or pin clear of EE)
If expedited release required:
MAN OPEN ($\sqrt{\text{OPEN}}$ tb-gray, 3 sec max)
If no joy, B/U RELEASE (10 sec)
Maneuver arm to safe distance

MA – DERIGIDIZE

Stop maneuver
DAP: FREE
If OBSS grappled:
R12 SPEE PWR – OFF
MAN RIGIDIZE ($\sqrt{\text{RIGID}}$ tb-gray, 25 sec max)

RMS – GENERIC RELEASE

NO AUTO RELEASE (2 or 3 snare tbs wrong: OPEN, CLOSE, CAPTURE)

MAN OPEN ($\sqrt{\text{OPEN}}$ tb-gray, 3 sec max) >>
B/U RELEASE (10 sec)

MANUAL RELEASE (Auto release available)

NO MANUAL DERIGID

MAN OPEN ($\sqrt{\text{OPEN}}$ tb-gray, 3 sec max) >>
B/U RELEASE (10 sec)

NO MANUAL RELEASE (2 or 3 tbs wrong: OPEN, CLOSE, CAPTURE)

AUTO RELEASE ($\sqrt{\text{OPEN}}$ tb-gray, 3 sec max) >>
B/U RELEASE (10 sec)

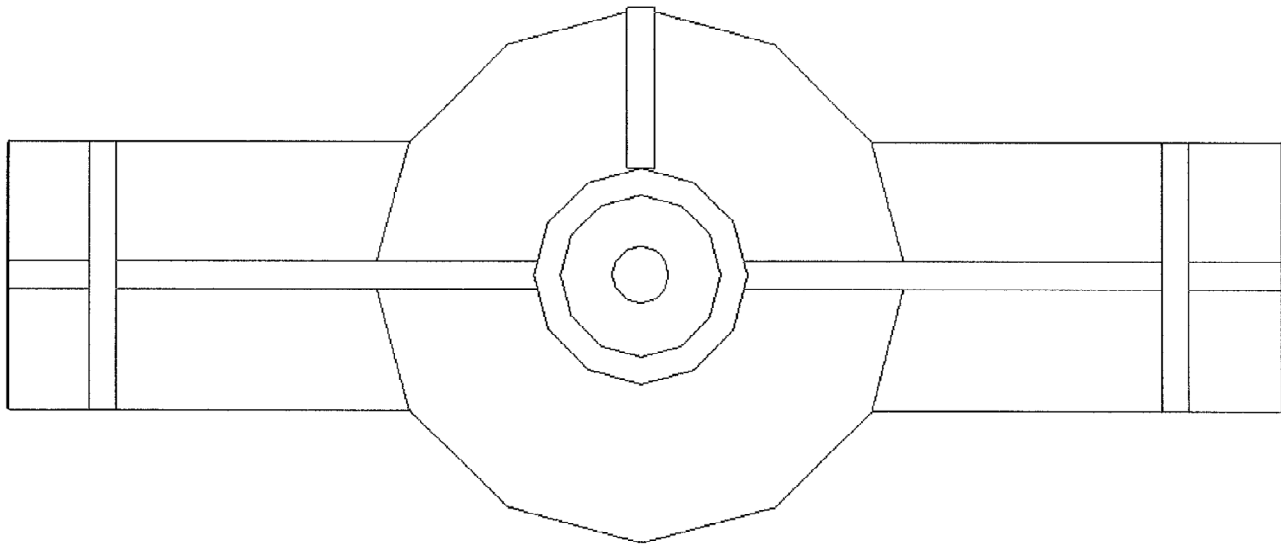
RMS – CAPTURE

MISSED GRAPPLE OR AUTO CAPTURE SEQUENCE ABORTED

Complete in manual:
If CLOSE tb – bp, MAN CLOSE ($\sqrt{\text{CLOSE}}$ tb-gray, 3 sec max)
If CAPTURE tb – bp, PULL TEST (PL follows RMS or pin clear of EE)
If PL snared, MAN RIGIDIZE ($\sqrt{\text{RIGID}}$ tb-gray, 25 sec max)

PDRS-12b/125/O/B

Fabricate as transparency



FSS/HST TARGET OVERLAY FOR CTVM

PDRS-13a/125/O/B

I

(reduced copy)

FSS CC 16-8

PDRS/125/FIN A

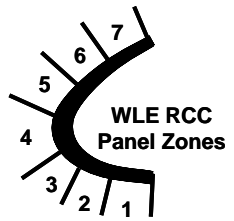
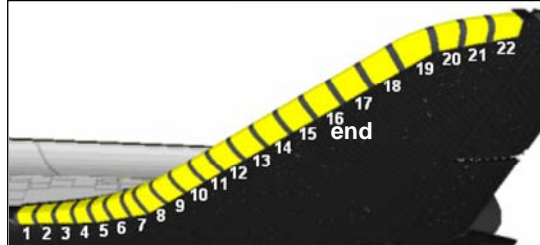


TOP

HOOK
VELCRO



OBSS SCAN PATTERN CUE CARD
IDC RCC SURVEY – PORT

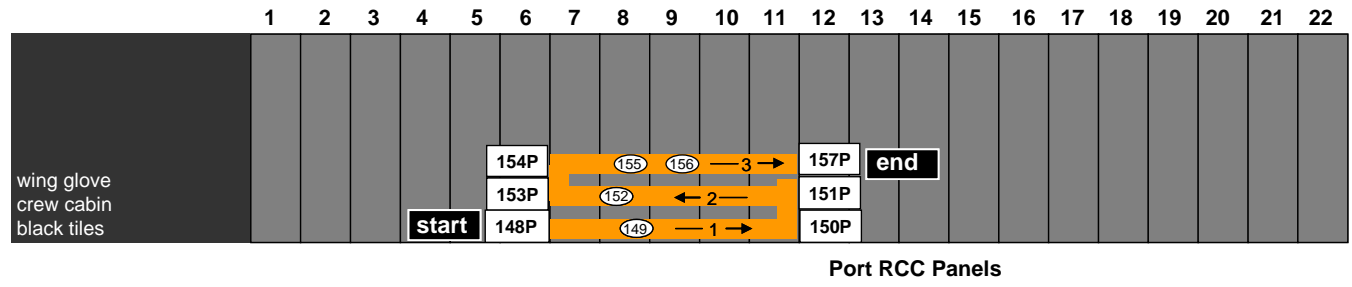


(reduced copy)

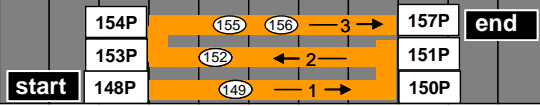
FS CC 16-9

1P = ACAS pause pt — 1 → = ACAS section and scan direction

Ⓛ = ACAS fly-by pt * = Reconfigure PTU



wing glove
crew cabin
black tiles



PDRS-14a/125/O/A



PDRS/125/FIN A

TOP

Back of 'OBSS SCAN PATTERN CUE CARD IDC RCC SURVEY – PORT'

HOOK
VELCRO



PDRS-14b/125/O/A

(reduced copy)

FS CC 16-10

PDRS/125/FIN A

Space Shuttle Program
FLIGHT DATA FILE

JSC-48040-125
FINAL, REV A



PDRS OPS C/L

**STS
125**