

PDRS Operations Checklist

STS-134 Flight Supplement

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

**Final, Rev A
March 25, 2011**

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas



MISSION OPERATIONS DIRECTORATE

**PDRS OPERATIONS CHECKLIST
STS-134 FLIGHT SUPPLEMENT**

FINAL, REVISION A
March 25, 2011

PREPARED BY:



David W. Gruntz
Book Manager

APPROVED BY:



Aaron D. Goldenthal
Lead, Shuttle and Exploration Robotics
Operations Group



Quinn L. Carelock
Chief, Robotics Operations Branch

This document is under the configuration control of the Crew Procedures Control Board (CPCB). All proposed changes must be submitted via Change Request Workflow (CRW) to DO3/FDF Manager.

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

Incorporates the following:	
482#:	PDRS FS-00219 PDRS FS-00220 PDRS FS-00221 PDRS FS-00222 PDRS FS-00223 PDRS FS-00224

AREAS OF TECHNICAL RESPONSIBILITY

Book Manager	DX26/D. Gruntz	281-483-7507
Lead PDRS	DX25/Z. Drewry	281-244-7726
Lead MMACS (ROEU & PRLA)	DX421/L. Slovey	281-483-1685
Lead ACO (Payloads)	DO52/G. Humble	281-244-1070

PDRS OPERATIONS CHECKLIST
 STS-134 FLIGHT SUPPLEMENT

LIST OF EFFECTIVE PAGES

FINAL 08/25/10
 REV A 03/25/11

Sign Off.....*	134/FIN A	FS 2-21.....⊗	134/FIN A
FS ii.....*	134/FIN A	FS 2-22.....⊗	134/FIN A
FS iii.....*	134/FIN A	FS 2-23.....⊗	134/FIN A
FS iv.....*	134/FIN A	FS 2-24.....⊗	134/FIN A
FS v.....*	134/FIN A	FS 2-25.....	134/FIN A
FS vi.....*	134/FIN A	FS 2-26.....	134/FIN A
FS vii.....	134/FIN A	FS 2-27.....⊗	134/FIN A
FS viii.....	134/FIN A	FS 2-28.....	134/FIN A
FS 1-1.....	134/FIN A	FS 2-29.....⊗	134/FIN A
FS 1-2.....	134/FIN A	FS 2-30.....⊗	134/FIN A
FS 1-3.....⊗	134/FIN A	FS 2-31.....⊗	134/FIN A
FS 1-4.....	134/FIN A	FS 2-32.....⊗	134/FIN A
FS 1-5.....⊗	134/FIN A	FS 2-33.....⊗	134/FIN A
FS 1-6.....⊗	134/FIN A	FS 2-34.....⊗	134/FIN A
FS 1-7.....	134/FIN A	FS 2-35.....⊗	134/FIN A
FS 1-8.....	134/FIN A	FS 2-36.....⊗	134/FIN A
FS 1-9.....⊗	134/FIN A	FS 2-37.....	134/FIN A
FS 1-10.....⊗	134/FIN A	FS 2-38.....⊗	134/FIN A
FS 1-11.....⊗	134/FIN A	FS 2-39.....	134/FIN A
FS 1-12.....⊗	134/FIN A	FS 2-40.....	134/FIN A
FS 1-13.....⊗	134/FIN A	FS 2-41.....	134/FIN A
FS 1-14.....⊗	134/FIN A	FS 2-42.....	134/FIN A
FS 1-15.....⊗	134/FIN A	FS 3-1.....	134/FIN A
FS 1-16.....	134/FIN A	FS 3-2.....	134/FIN A
FS 1-17.....⊗	134/FIN A	FS 3-3.....⊗	134/FIN A
FS 1-18.....	134/FIN A	FS 3-4.....	134/FIN A
FS 2-1.....	134/FIN A	FS 3-5.....⊗	134/FIN A
FS 2-2.....	134/FIN A	FS 3-6.....	134/FIN A
FS 2-3.....⊗	134/FIN A	FS 4-1.....	134/FIN A
FS 2-4.....⊗	134/FIN A	FS 4-2.....	134/FIN A
FS 2-5.....⊗	134/FIN A	FS 4-3.....⊗	134/FIN A
FS 2-6.....⊗	134/FIN A	FS 4-4.....⊗	134/FIN A
FS 2-7.....	134/FIN A	FS 4-5.....	134/FIN A
FS 2-8.....⊗	134/FIN A	FS 4-6.....⊗	134/FIN A
FS 2-9.....⊗	134/FIN A	FS 4-7.....⊗	134/FIN A
FS 2-10.....⊗	134/FIN A	FS 4-8.....⊗	134/FIN A
FS 2-11.....⊗	134/FIN A	FS 4-9.....	134/FIN A
FS 2-12.....	134/FIN A	FS 4-10.....	134/FIN A
FS 2-13.....	134/FIN A	FS 4-11.....⊗	134/FIN A
FS 2-14.....	134/FIN A	FS 4-12.....⊗	134/FIN A
FS 2-15.....	134/FIN A	FS 4-13.....⊗	134/FIN A
FS 2-16.....	134/FIN A	FS 4-14.....⊗	134/FIN A
FS 2-17.....⊗	134/FIN A	FS 4-15.....⊗	134/FIN A
FS 2-18.....⊗	134/FIN A	FS 4-16.....⊗	134/FIN A
FS 2-19.....⊗	134/FIN A	FS 4-17.....⊗	134/FIN A
FS 2-20.....⊗	134/FIN A	FS 4-18.....⊗	134/FIN A

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

FS 4-19	⊗	134/FIN A	FS 6-5	⊗	134/FIN A
FS 4-20		134/FIN A	FS 6-6		134/FIN A
FS 5-1		134/FIN A	FS 7-1		134/FIN A
FS 5-2		134/FIN A	FS 7-2		134/FIN A
FS 5-3	⊗	134/FIN A	FS 7-3	⊗	134/FIN A
FS 5-4		134/FIN A	FS 7-4	⊗	134/FIN A
FS 5-5	⊗	134/FIN A	FS 7-5	⊗	134/FIN A
FS 5-6	⊗	134/FIN A	FS 7-6		134/FIN A
FS 5-7	⊗	134/FIN A	FS 7-7	⊗	134/FIN A
FS 5-8	⊗	134/FIN A	FS 7-8	⊗	134/FIN A
FS 5-9	⊗	134/FIN A	FS 7-9	⊗	134/FIN A
FS 5-10	⊗	134/FIN A	FS 7-10	⊗	134/FIN A
FS 5-11		134/FIN A	FS 7-11	⊗	134/FIN A
FS 5-12	⊗	134/FIN A	FS 7-12	⊗	134/FIN A
FS 5-13		134/FIN A	FS 7-13		134/FIN A
FS 5-14		134/FIN A	FS 7-14	⊗	134/FIN A
FS 5-15	⊗	134/FIN A	FS 7-15	⊗	134/FIN A
FS 5-16	⊗	134/FIN A	FS 7-16		134/FIN A
FS 5-17	⊗	134/FIN A	FS 7-17		134/FIN A
FS 5-18	⊗	134/FIN A	FS 7-18		134/FIN A
FS 5-19	⊗	134/FIN A	FS 8-1		134/FIN A
FS 5-20	⊗	134/FIN A	FS 8-2		134/FIN A
FS 5-21	⊗	134/FIN A	FS 8-3		134/FIN A
FS 5-22	⊗	134/FIN A	FS 8-4	⊗	134/FIN A
FS 5-23		134/FIN A	FS 8-5		134/FIN A
FS 5-24		134/FIN A	FS 8-6	⊗	134/FIN A
FS 5-25	⊗	134/FIN A	FS 8-7	⊗	134/FIN A
FS 5-26	⊗	134/FIN A	FS 8-8	⊗	134/FIN A
FS 5-27	⊗	134/FIN A	FS 8-9	⊗	134/FIN A
FS 5-28		134/FIN A	FS 8-10	⊗	134/FIN A
FS 5-29	⊗	134/FIN A	FS 8-11	⊗	134/FIN A
FS 5-30	⊗	134/FIN A	FS 8-12	⊗	134/FIN A
FS 5-31	⊗	134/FIN A	FS 8-13	⊗	134/FIN A
FS 5-32	⊗	134/FIN A	FS 8-14	⊗	134/FIN A
FS 5-33	⊗	134/FIN A	FS 8-15	⊗	134/FIN A
FS 5-34	⊗	134/FIN A	FS 8-16	⊗	134/FIN A
FS 5-35	⊗	134/FIN A	FS 8-17	⊗	134/FIN A
FS 5-36	⊗	134/FIN A	FS 8-18	⊗	134/FIN A
FS 5-37	⊗	134/FIN A	FS 8-19	⊗	134/FIN A
FS 5-38	⊗	134/FIN A	FS 8-20	⊗	134/FIN A
FS 5-39		134/FIN A	FS 8-21	⊗	134/FIN A
FS 5-40		134/FIN A	FS 8-22	⊗	134/FIN A
FS 5-41	⊗	134/FIN A	FS 8-23	⊗	134/FIN A
FS 5-42		134/FIN A	FS 8-24	⊗	134/FIN A
FS 5-43		134/FIN A	FS 8-25	⊗	134/FIN A
FS 5-44	⊗	134/FIN A	FS 8-26	⊗	134/FIN A
FS 5-45	⊗	134/FIN A	FS 8-27	⊗	134/FIN A
FS 5-46	⊗	134/FIN A	FS 8-28	⊗	134/FIN A
FS 6-1		134/FIN A	FS 8-29	⊗	134/FIN A
FS 6-2		134/FIN A	FS 8-30	⊗	134/FIN A
FS 6-3	⊗	134/FIN A	FS 8-31	⊗	134/FIN A
FS 6-4		134/FIN A	FS 8-32	⊗	134/FIN A

⊗ – Flight copies of this page contain color

FS 8-33	⊗	134/FIN A	FS 9-25		134/FIN A
FS 8-34	⊗	134/FIN A	FS 9-26	⊗	134/FIN A
FS 8-35	⊗	134/FIN A	FS 9-27	⊗	134/FIN A
FS 8-36	⊗	134/FIN A	FS 9-28	⊗	134/FIN A
FS 8-37	⊗	134/FIN A	FS 9-29		134/FIN A
FS 8-38		134/FIN A	FS 9-30		134/FIN A
FS 8-39	⊗	134/FIN A	FS 9-31	⊗	134/FIN A
FS 8-40	⊗	134/FIN A	FS 9-32		134/FIN A
FS 8-41	⊗	134/FIN A	FS 9-33	⊗	134/FIN A
FS 8-42	⊗	134/FIN A	FS 9-34	⊗	134/FIN A
FS 8-43	⊗	134/FIN A	FS 9-35	⊗	134/FIN A
FS 8-44	⊗	134/FIN A	FS 9-36	⊗	134/FIN A
FS 8-45	⊗	134/FIN A	FS 9-37		134/FIN A
FS 8-46	⊗	134/FIN A	FS 9-38	⊗	134/FIN A
FS 8-47	⊗	134/FIN A	FS 9-39	⊗	134/FIN A
FS 8-48	⊗	134/FIN A	FS 9-40	⊗	134/FIN A
FS 8-49		134/FIN A	FS 9-41	⊗	134/FIN A
FS 8-50	⊗	134/FIN A	FS 9-42		134/FIN A
FS 8-51	⊗	134/FIN A	FS 9-43	⊗	134/FIN A
FS 8-52	⊗	134/FIN A	FS 9-44	⊗	134/FIN A
FS 8-53	⊗	134/FIN A	FS 9-45		134/FIN A
FS 8-54	⊗	134/FIN A	FS 9-46	⊗	134/FIN A
FS 8-55	⊗	134/FIN A	FS 9-47	⊗	134/FIN A
FS 8-56	⊗	134/FIN A	FS 9-48	⊗	134/FIN A
FS 8-57	⊗	134/FIN A	FS 10-1		134/FIN A
FS 8-58	⊗	134/FIN A	FS 10-2		134/FIN A
FS 8-59	⊗	134/FIN A	FS 10-3		134/FIN A
FS 8-60	⊗	134/FIN A	FS 10-4		134/FIN A
FS 8-61	⊗	134/FIN A	FS 10-5		134/FIN A
FS 8-62		134/FIN A	FS 10-6		134/FIN A
FS 9-1		134/FIN A	FS 10-7		134/FIN A
FS 9-2		134/FIN A	FS 10-8		134/FIN A
FS 9-3	⊗	134/FIN A	FS 10-9		134/FIN A
FS 9-4	⊗	134/FIN A	FS 10-10		134/FIN A
FS 9-5	⊗	134/FIN A	FS 10-11	⊗	134/FIN A
FS 9-6	⊗	134/FIN A	FS 10-12	⊗	134/FIN A
FS 9-7	⊗	134/FIN A	FS 10-13	⊗	134/FIN A
FS 9-8	⊗	134/FIN A	FS 10-14	⊗	134/FIN A
FS 9-9	⊗	134/FIN A	FS 10-15		134/FIN A
FS 9-10		134/FIN A	FS 10-16		134/FIN A
FS 9-11		134/FIN A	FS 11-1		134/FIN A
FS 9-12	⊗	134/FIN A	FS CC 11-2		134/FIN A
FS 9-13	⊗	134/FIN A	FS CC 11-3		134/FIN A
FS 9-14		134/FIN A	FS CC 11-4		134/FIN A
FS 9-15	⊗	134/FIN A	FS CC 11-5		134/FIN A
FS 9-16	⊗	134/FIN A	FS CC 11-6		134/FIN A
FS 9-17	⊗	134/FIN A	FS CC 11-7		134/FIN A
FS 9-18	⊗	134/FIN A	FS CC 11-8	⊗	134/FIN A
FS 9-19	⊗	134/FIN A	FS CC 11-9	⊗	134/FIN A
FS 9-20	⊗	134/FIN A	FS CC 11-10		134/FIN A
FS 9-21		134/FIN A			
FS 9-22		134/FIN A			
FS 9-23	⊗	134/FIN A			
FS 9-24	⊗	134/FIN A			

⊗ – Flight copies of this page contain color

PDRS CUE CARDS

<u>Title</u>	<u>Ref. Page</u>	<u>Card No.</u>
ELC SJ GRAPPLE IN PLB WRIST CCTV OVERLAY ...	FS CC 11-2	PDRS-9a/134/O/B
ELC SJ UNGRAPPLE AT HANDOFF WRIST CCTV OVERLAY	FS CC 11-3	PDRS-10a/134/O/B
AMS SJ GRAPPLE IN PLB WRIST CCTV OVERLAY ..	FS CC 11-4	PDRS-11a/134/O/A
AMS SJ UNGRAPPLE AT HANDOFF WRIST CCTV OVERLAY	FS CC 11-5	PDRS-12a/134/O/A
OBSS SJ GRAPPLE AT HANDOFF WRIST CCTV OVERLAY	FS CC 11-6	PDRS-13a/134/O/A
OBSS SJ UNGRAPPLE FOR STOW WRIST CCTV OVERLAY	FS CC 11-7	PDRS-14a/134/O/B
OBSS DOCKED LDRI SCAN PATTERN CUE CARD – STBD & PORT (Front).....	FS CC 11-8	PDRS-15a/134/O/B
OBSS DOCKED LDRI SCAN PATTERN CUE CARD – NOSE CAP (Back)	FS CC 11-9	PDRS-15b/134/O/A
ROEU PANEL A6U OVERLAY	FS CC 11-10	PDRS-16a/134/O/A

<u>CONTENTS</u>	<u>PAGE</u>
<u>ELC NOMINAL</u>	FS 1-1
ELC GRAPPLE	FS 1-3
UNBERTH AND HANDOFF	FS 1-5
UNGRAPPLE AND VIEWING	FS 1-14
<u>ELC CONTINGENCY</u>	FS 2-1
ELC SJ GRAPPLE	FS 2-2
UNBERTH AND HANDOFF	FS 2-15
UNGRAPPLE AND VIEWING	FS 2-24
CONTINGENCY REBERTH	FS 2-32
<u>ELC REFERENCE</u>	FS 3-1
ELC PL ID UPLINK VERIFICATION	FS 3-2
COORDINATE SYSTEM – PL ID 3	FS 3-3
JOINT ANGLES VS POR COORDINATES	FS 3-4
PRLA CONFIG	FS 3-5
<u>AMS NOMINAL</u>	FS 4-1
AMS GRAPPLE	FS 4-3
UNBERTH AND HANDOFF	FS 4-8
UNGRAPPLE AND VIEWING	FS 4-14
VIEWING TO PRECRADLE	FS 4-19
<u>AMS CONTINGENCY</u>	FS 5-1
AMS SJ GRAPPLE	FS 5-3
UNBERTH AND HANDOFF	FS 5-13
UNGRAPPLE AND VIEWING	FS 5-22
CONTINGENCY REGRAPPLE	FS 5-33
REBERTH.....	FS 5-37
<u>AMS REFERENCE</u>	FS 6-1
AMS PL ID UPLINK VERIFICATION	FS 6-2
COORDINATE SYSTEM – PL ID 4	FS 6-3
JOINT ANGLES VS POR COORDINATES	FS 6-4
PRLA CONFIG	FS 6-5
<u>OBSS HANDOFF</u>	FS 7-1
OBSS HANDOFF TO SRMS – OBSS PRE-GRAPPLE	FS 7-3
– STBD MRL RELEASE	FS 7-5
– OBSS GRAPPLE	FS 7-8
UNGRAPPLE FOR STOW	FS 7-11
POST OBSS TRANSFER PWRDN	FS 7-15
<u>LATE INSPECTION</u>	FS 8-1
OBSS DOCKED LDRI RCC SURVEY – STBD.....	FS 8-2
– NOSE CAP	FS 8-38
– PORT	FS 8-48
<u>OBSS CONTINGENCY</u>	FS 9-1
OBSS SJ HANDOFF TO SRMS	FS 9-3
FOR STOW	FS 9-13
UNGRAPPLE FOR STOW	FS 9-19
HANDOFF FOR BERTHING – UNGRAPPLE	FS 9-25
– STBD MRL LATCH	FS 9-29
REGRAPPLE AT HANDOFF FOR STOW	FS 9-31
MNVR HANDOFF FOR STOW TO UNDOCK	FS 9-34
UNDOCK TO HOVER	FS 9-37
STORM CHASER.....	FS 9-43

<u>OBSS REFERENCE DATA</u>	FS 10-1
LATE INSPECTION ACAS UPLINK VERIFICATION	FS 10-2
OBSS JOINT ANGLES VS POR COORDINATES	FS 10-3
LATE INSPECTION AUTOSEQUENCES.....	FS 10-4
ITVC VIEW VERIFICATION.....	FS 10-11
EIBA REFERENCE.....	FS 10-14
<u>CUE CARD CONFIGURATION</u>	FS 11-1

ELC NOMINAL

ELC GRAPPLE.....	FS 1-3
UNBERTH AND HANDOFF.....	FS 1-5
UNGRAPPLE AND VIEWING.....	FS 1-14

**ELC
NOMINAL**

This Page Intentionally Blank

ELC GRAPPLE

1. SETUP

DNLK	Elbow(EE)
DTV	A
MON 1	B(C)
MON 2	D

SM 94 PDRS CONTROL

√ PL ID, ITEM 3: 0

√ INIT ID, ITEM 24: 0

Verify at 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	

RHC

2. MNVR TO ELC PRE-GRAPPLE

RATE – VERN (RATE MIN tb-ON)

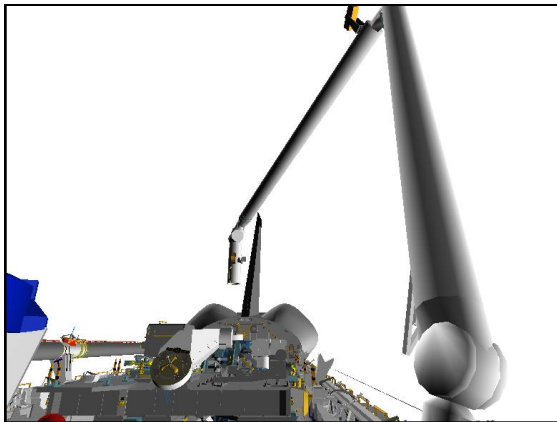
BRAKES – OFF (tb-OFF)

MODE – ORB UNL, ENTER

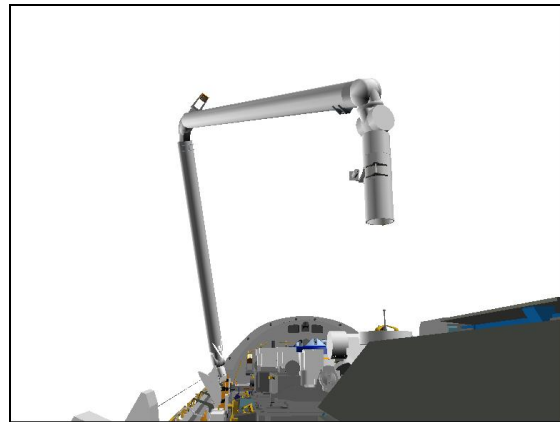
Mnvr to ELC PRE-GRAPPLE:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1021	-15	-516	270	0	180	0
	SY	SP	EP	WP	WY	WR	
	-20.9	+64.0	-90.0	-71.3	+18.1	+222.0	

BRAKES – ON (tb-ON)



CCTV A (0,20)



CCTV B (5,15)

3. ELC GRAPPLE

A7U

CCTV – configure 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)

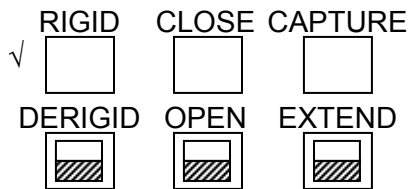
RHC RATE – VERN (RATE MIN tb-ON)
 BRAKES – OFF (tb-OFF)
 MODE – END EFF, ENTER

Mnvr to grapple envelope

CAUTION
 Monitor EE tb timing to prevent EE motor burnout

SM 169 PDRS STATUS
 Monitor EE msw status

EE MODE – AUTO
 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

- * If manual grapple reqd: *
- * EE MODE – MAN *
- * CAPTURE sw – depress (hold until CLOSE tb-gray, 3 sec max) *
- * MAN CONTR – RIGID (hold until RIGID tb-gray, 25 sec max) *

EE MODE – OFF

BRAKES – ON (tb-ON)

A6U ✓DAP: A1/AUTO/VERN(ALT)

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

Record POS/ATT and Joint Angles:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
							3
Expected	-937	0	-414	0	0	0	3
	SY	SP	EP	WP	WY	WR	
Expected	-18.1	+59.3	-95.5	-60.1	+18.5	+219.1	

Record POS/ATT and Joint Angles in ELC CONTINGENCY REBERTH
 (ELC CONTINGENCY)

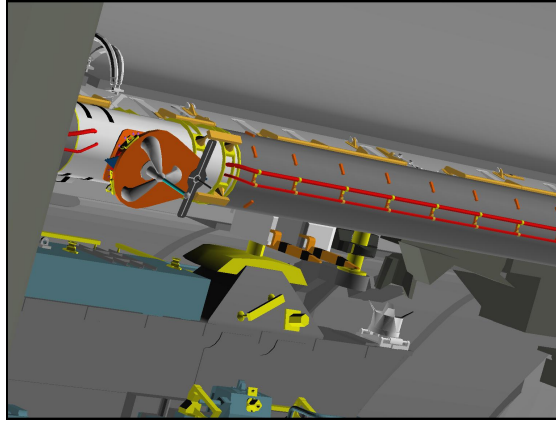
✓MODE – not DIRECT (lt off)

PARAM – PORT TEMP
 JOINT – CRIT TEMP

ELC UNBERTH AND HANDOFF

1. SETUP

DNLK	Mux B/C
DTV	A
MON 1	13: LAB(D)
MON 2	Elbow



**13: LAB (-48,-19)
Zoom: 5.0 (full in)**

SM 94 PDRS CONTROL

√ PL ID, ITEM 3: 3

√ INIT ID, ITEM 24: 3

Verify at ELC GRAPPLE posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
√ -937	0	-414	0	0	0	3
SY	SP	EP	WP	WY	WR	
√ -18.1	+59.3	-95.5	-60.1	+18.5	+219.1	

Review GENERIC END EFFECTOR CUE CARD – ISS/SHUTTLE DOCKED OPS

PCS

MSS: SSRMS: Thrusters: Thruster Controls for MSS Ops

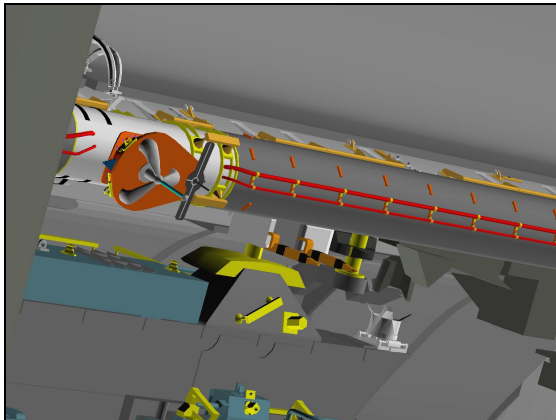
Verify 'Desat Request:' Inhibit

- * If using Shuttle attitude control, verify in attitude; *
- * DAP: FREE *

2. ROEU DEMATE

a. Setup

A7U CCTV – configure for ROEU demate (Lab or C)



13: LAB (-48,-19)
Full Zoom In



CCTV C (0,-5)
Full Zoom In

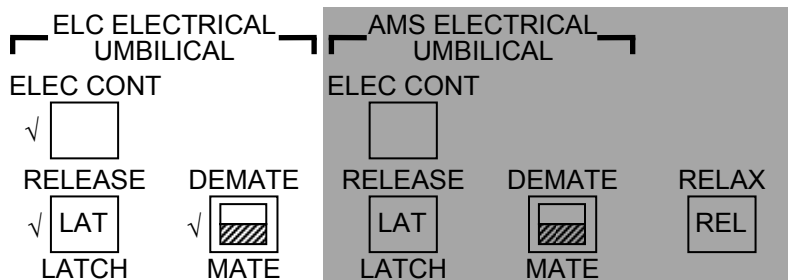
A6U ✓ROEU A6U PANEL OVERLAY installed

✓PL RETEN LAT 1,2,3,4,5 (five) – OFF
PL SEL – 2

SM 97 PL RETENTION

✓PL SEL 2 REL 1,2 (four): 0

- * If any REL msw shows '1', *
- * drive latch for single motor time *



b. Deadface ROEU

L12L
SSP2 ELC3 PWR – OFF
✓BUS 2/3 tb – bp
✓BUS 1 tb – bp
cb SW PWR 4 – op

R1 PL PRI MNC – OFF (tb-OFF)
✓MNB,FC3 (two) – ctr (tb-OFF)

c. Activate ROEU

NOTE

When MCA LOGIC switches taken OFF, KU will mode to standby. MPM and MRL tbs – bp

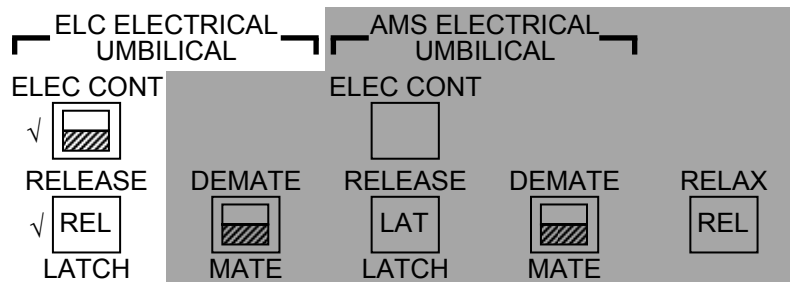
MA73C:A MCA LOGIC MNC MID 2 – OFF
:B MNB MID 4 – OFF

A6U PL RETEN LOGIC PWR SYS 1,2 (two) – ON
R13L BAY MECH PWR SYS 1,2 (two) – ON

d. Release Latches

Note single motor time (> 20 sec)

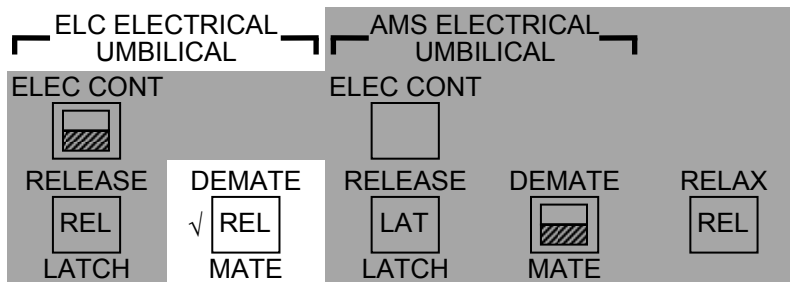
A6U ELC RELEASE/LATCH – REL (tb-REL), 40 sec max
– OFF



e. Demate ROEU

Note single motor time (> 18 sec)

ELC DEMATE/MATE – DEMATE (tb-REL), 36 sec max
– OFF



f. Deactivate ROEU

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

3. PRLA RELEASE

A6U a. Configure for PRLA Release
Remove ROEU A6U PANEL OVERLAY

√PL RETEN LAT 1,2,3,4,5 (five) – OFF
PL SEL – 1

SM 97 PL RETENTION

√PL SEL 1 RDY-FOR-LAT 1,2,3,4 (eight): 1
√LAT 1,2,3,4 (eight): 1

* If any REL msw shows '1', *
* expect single motor time (60 sec) *

R13L PL RETEN LOGIC PWR SYS 1,2 (two) – ON
BAY MECH PWR SYS 1,2 (two) – ON

A6U b. PRLA Release
√PL RETEN LAT 1,2,3,4 (four) tb – LAT
√RDY 1,2,3,4 (four) tb – gray

Note single motor times (> 30 sec)

PL RETEN LAT 1,2 (two) – REL (tb-REL), 60 sec max
– OFF
3,4 (two) – REL (tb-REL), 60 sec max
– OFF

R13L c. Deactivate Latches
PL RETEN LOGIC PWR SYS 1,2 (two) – OFF
BAY MECH PWR SYS 1,2 (two) – OFF

MA73C:A MCA LOGIC MNC MID 2 – ON
:B MNB MID 4 – ON

4. MNVR TO ELC HOVER

NOTE

Minimum clearance between stbd trunnions and OBSS is
3 inches at Z = -444 (REL = 131). Monitor with Lab
Camera and/or Camera D.

Clearance between SRMS and JPM is 31 inches at ELC
Hover. Monitor with Camera A

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

Mnvr ELC up until Z = -575

A6U √PL RETEN LAT RDY 1,2,3,4 tb (four) – bp

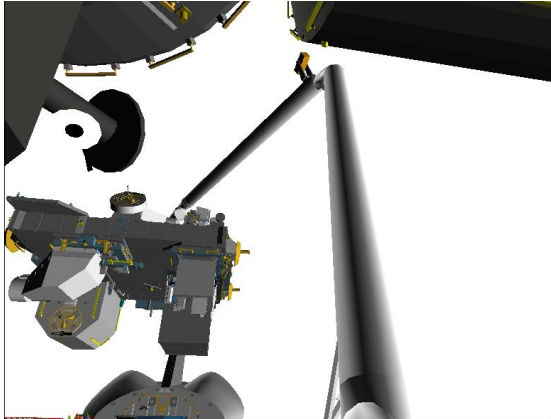
ELC HOVER posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-937	0	-575	0	0	0	3
SY	SP	EP	WP	WY	WR	
-25.8	+66.6	-72.6	-92.8	+17.5	+227.2	

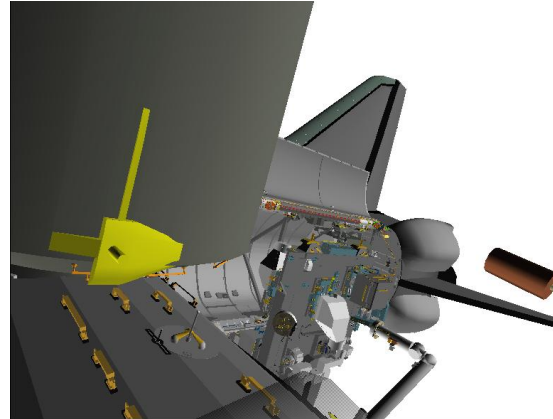
BRAKES – ON (tb-ON)

NOTE

SSRMS operator may use P1 LOOB to survey the STP payload on ELC while SRMS at ELC HOVER posn. Motion to ELC PORT posn should not begin until survey complete



CCTV A (10,30)

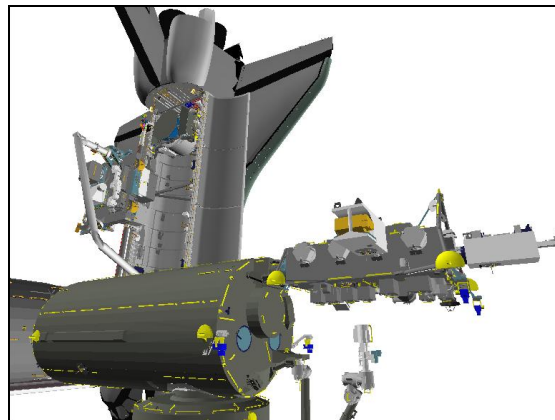


13: LAB (-48,-19)

- * If using Shuttle attitude control and attitude maintenance reqd: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *
- * When in attitude and rates damped: *
- * DAP: FREE *

5. MNVR TO ELC PORT

DNLK	B
DTV	A
MON 1	09: P1 LOOB(07: P1 LOIB)
MON 2	Elbow



09: P1 LOOB (150,20)

SM 94 PDRS CONTROL

END POS – ITEM 18 -9 7 5 -2 5 0 -5 7 5 EXEC
 ATT – ITEM 21 +0 +0 +0 EXEC
 CMD CK – ITEM 25 EXEC (GOOD)

NOTE

Minimum clearance between RMS boom and JPM is 26 inches
 at approx X = -950 (REL = 25). Monitor with Camera A

RHC

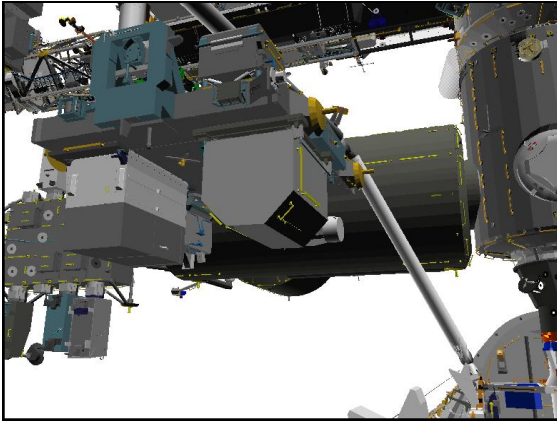
√RATE – VERN (RATE MIN tb-ON)
 BRAKES – OFF (tb-OFF)
 MODE – OPR CMD, ENTER (READY It on)

AUTO SEQ – PROCEED (IN PROG It on)

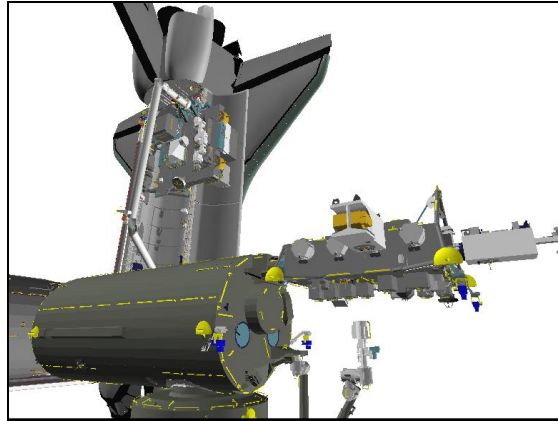
When AUTO SEQ IN PROG It – off:
 BRAKES – ON (tb-ON)

Verify at ELC PORT posn: (03:58)

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-975	-250	-575	0	0	0	3
	SY	SP	EP	WP	WY	WR	
√	+10.5	+64.3	-52.0	-98.6	+19.2	+188.9	



CCTV B (-20,15)



09: P1 LOOB (150,20)

- * If using Shuttle attitude control and attitude maintenance reqd: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *
- * When in attitude and rates damped: *
- * DAP: FREE *

6. MNVR TO INTERMEDIATE

SM 94 PDRS CONTROL

END POS – ITEM 18 -886 -594 -241 EXEC
 ATT – ITEM 21 +234 +318 +281 EXEC
 CMD CK – ITEM 25 EXEC (GOOD)

RHC

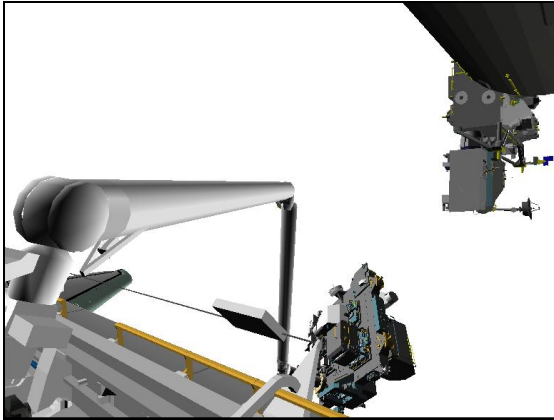
√RATE – VERN (RATE MIN tb-ON)
 BRAKES – OFF (tb-OFF)
 MODE – OPR CMD, ENTER (READY It on)

AUTO SEQ – PROCEED (IN PROG It on)

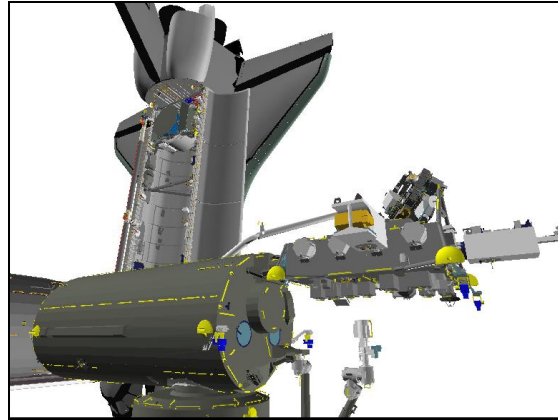
When AUTO SEQ IN PROG It – off:
 Verify position/joint angles

ELC INTERMEDIATE posn: (07:40)

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-886	-594	-241	234	318	281	3
	SY	SP	EP	WP	WY	WR	
√	+60.2	+21.3	-60.0	+19.9	+61.7	-0.1	



CCTV A (50,0)



09: P1 LOOB (150,20)

- * If using Shuttle attitude control and attitude maintenance reqd: *
- * BRAKES – ON (tb-ON) *
- * *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *
- * When in attitude and rates damped: *
- * DAP: FREE *
- * *
- * BRAKES – OFF (tb-OFF) *

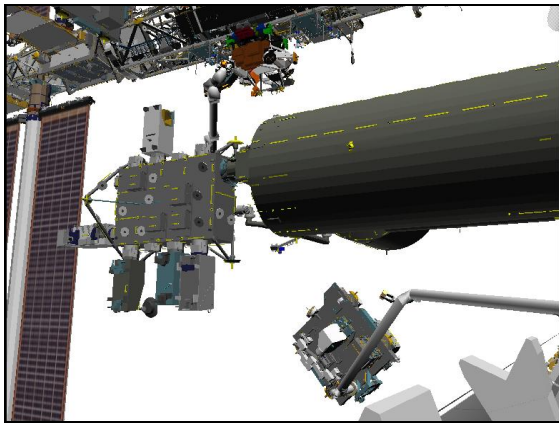
RHC 7. MNVR TO HANDOFF
 √RATE – VERN (RATE MIN tb-ON)
 MODE – SINGLE, ENTER

Mnvr to ELC HANDOFF posn:

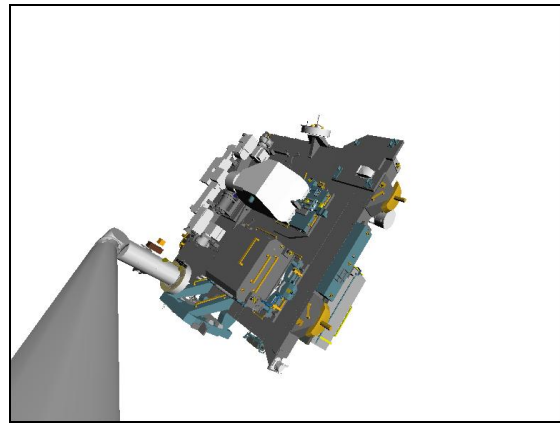
	SY	SP	EP	WP	WY	WR	
Intermediate	+60.2	+21.3	-60.0	+19.9	+61.7	-0.1	
1: SY +	+124.7						
2: EP +			-41.8				
Handoff	+124.7	+21.3	-41.8	+19.9	+61.7	-0.1	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-282	-538	-374	273	320	8	3

BRAKES – ON (tb-ON)

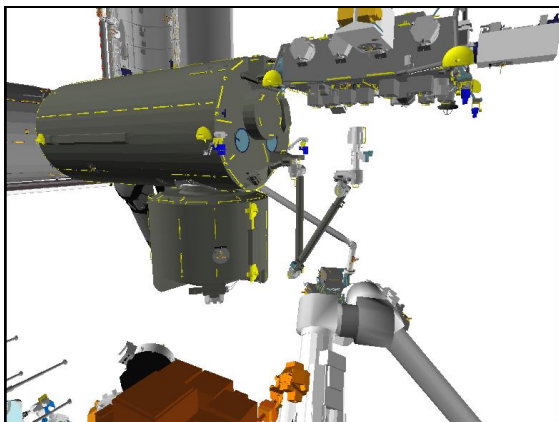
Notify SSRMS operator that SRMS at ELC Handoff posn with Brakes ON;
 GO for SSRMS grapple



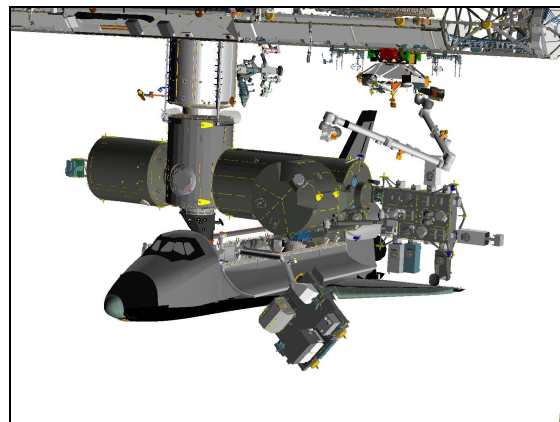
CCTV B (-30,10)



ELBOW (25,0)

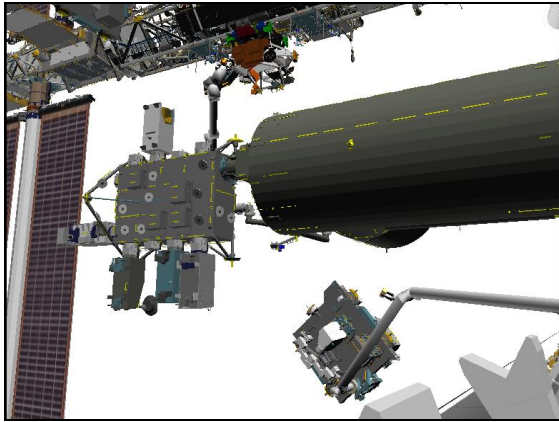


09: P1 LOOB (150,-10)

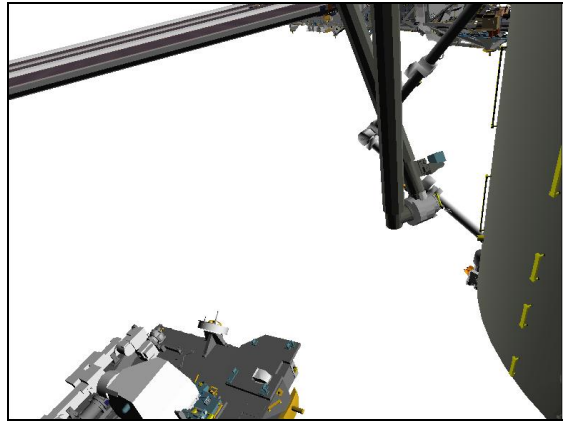


BIRD'S EYE

- * If using Shuttle attitude control and attitude maintenance reqd: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *



CCTV B (-30,10)



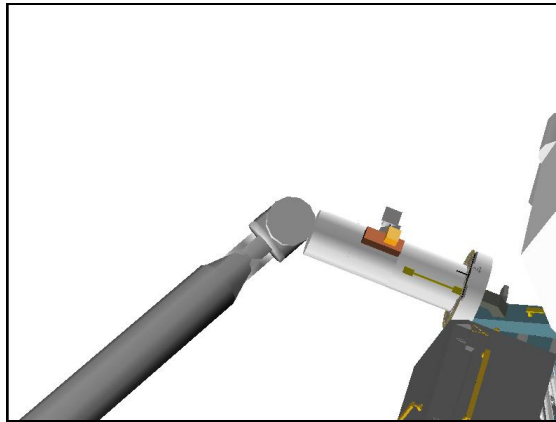
ELBOW (40,30)

Center & zoom on PVGF for grapple

ELC UNGRAPPLE AND VIEWING

- A7U 1. SETUP
 CCTV – configure for ungrapple
 – RMS WRIST, ZOOM: 34.0 HFOV
 FOCUS: 5 ft

DNLK	EE
DTV	B
MON 1	37: MBS Mast(03: S1LOOB)
MON 2	A



37: MBS Mast (-165,75)
Zoom: 3.0

2. ELC UNGRAPPLE
 On SSRMS operator GO, SSRMS grapple complete with brakes ON and ready for ELC release

NOTE

Clearance between RMS Elbow and JPM is 47 inches at ELC Backoff. Monitor with Camera B.

CONTR ERR It and 'S96 PDRS CNTL' msg may occur due to Consistency/Envelope Check error

RHC RATE – COARSE (RATE MIN tb-OFF)

SM 94 PDRS CONTROL

AUTO BRAKE INH – ITEM 10 EXEC (*)

BRAKES – OFF (tb-OFF)

MODE – TEST, ENTER

Wait 5 sec

BRAKES – ON (tb-ON)

SM 94 PDRS CONTROL

AUTO BRAKE ENA – ITEM 9 EXEC (*)

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

SM 169 PDRS STATUS

Monitor EE msw status

When OPEN tb – gray, mnvr arm clear of grapple pin (to X = -389)

EE MODE – AUTO

RELEASE sw – depress (mom)

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

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

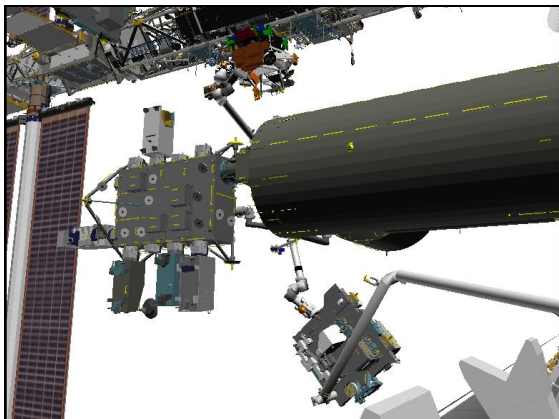
EE MODE – OFF

- * If manual release reqd: *
- * 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) *
- * *
- * Mnvr clear of grapple pin *
- * EE MAN CONTR – DERIGID (hold until EXTEND tb-gray, 20 sec max) *
- * MODE – OFF *

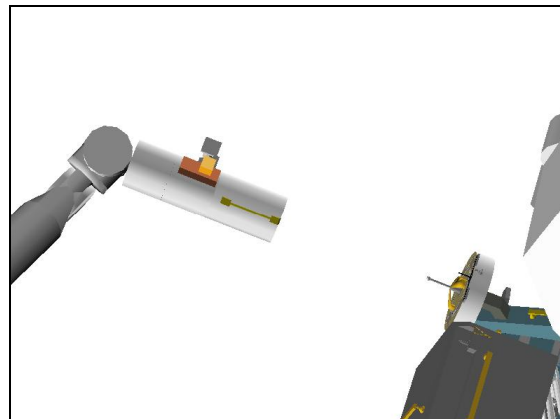
ELC BACKOFF posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-389	-507	-297	178	354	140	0
SY	SP	EP	WP	WY	WR	
+118.5	+28.8	-56.0	+26.4	+67.9	+0.1	

BRAKES – ON (tb-ON)



CCTV B (-30,10)



37: MBS MAST (-165,75)
Zoom: 3.0

3. MNVR TO ELC VIEWING

DNLK	Elbow
DTV	B
MON 1	37: MBS Mast(03: S1LOOB)
MON 2	A

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

Mnvr to ELC INSTALL VIEWING posn:

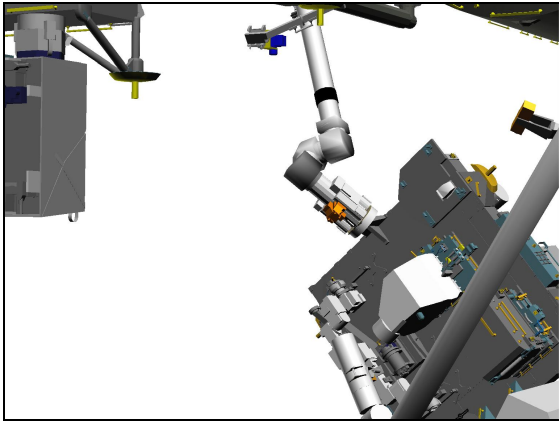
	SY	SP	EP	WP	WY	WR	
Backoff	+118.5	+28.8	-56.0	+26.4	+67.9	+0.1	
1: WY –					+1.5		
2: WP +				+105.0			
3: WR +						+140.0	
ELC Viewing	+118.5	+28.8	-56.0	+105.0	+1.5	+140.0	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-445	-534	-364	98	29	359	0

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

PARAM – PORT TEMP
 JOINT – CRIT TEMP

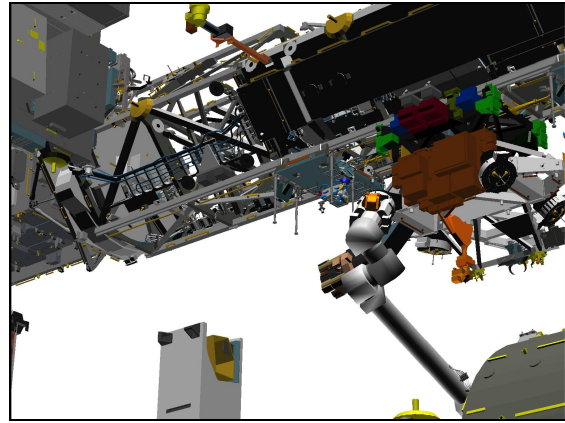
Notify SSRMS operator that SRMS at ELC Install Viewing, GO for ELC install

A7U CCTV – configure as required for ELC install (pictures next page) |

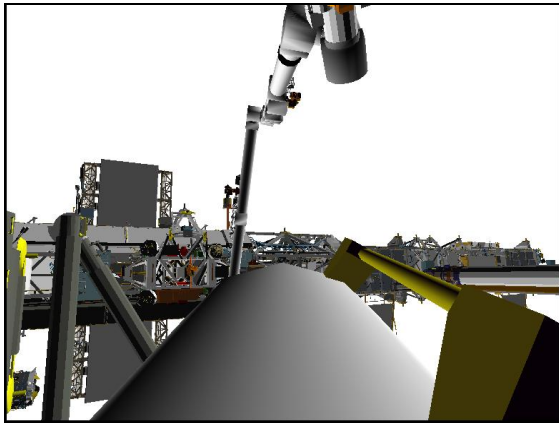


CCTV B (-30,0) HFOV: 20°
Track SSRMS wrist cluster until obscured by JEF, then

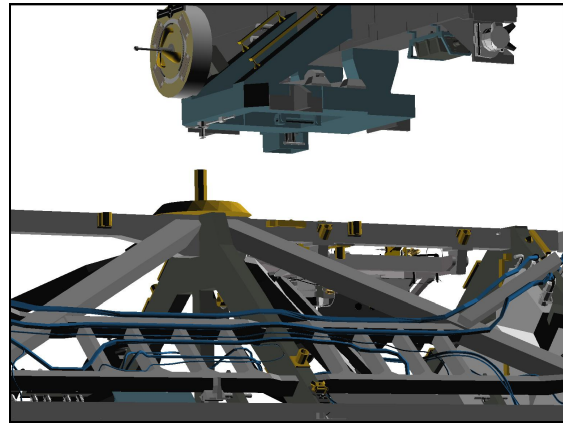
→



CCTV B (-40,25) HFOV: 20°
Center and zoom on SSRMS shoulder cluster



EE
Zoom out for big picture view



EE
Zoom in as reqd during install
(full zoom at -90 cm shown)

- | | |
|---|---|
| * If SSRMS operator requires EE view be adjusted: | * |
| * MON 2(DNLK) ← C (monitor RMS-JPM clearance) | * |
| * | * |
| * √RATE – VERN (RATE MIN tb-ON) | * |
| * BRAKES – OFF (tb-OFF) | * |
| * MODE – as desired | * |
| * | * |
| * Mnvr as required | * |
| * | * |
| * BRAKES – ON (tb-ON) | * |

This Page Intentionally Blank

ELC CONTINGENCY

ELC SJ GRAPPLE FS 2-2
UNBERTH AND HANDOFF FS 2-15
UNGRAPPLE AND VIEWING FS 2-24
CONTINGENCY REBERTH FS 2-32

ELC
CONTINGENCY

ELC SJ GRAPPLE

1. SETUP
 A7U CCTV – perform PAN/TILT reset
 – fully zoom out PLB & ELBOW cameras for SJ pictures
 – RMS WRIST, ZOOM: 34.0 HFOV
 FOCUS: 5 ft

DNLK	Elbow(EE)
DTV	A
MON 1	B(C)
MON 2	D

SM 94 PDRS CONTROL

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

If starting from OBSS PRE-GRAPPLE, go to step 2

SY	SP	EP	WP	WY	WR
-90.0	+87.6	-129.5	-57.5	0.0	+110.4

If starting from PRECRADLE, go to step 3

SY	SP	EP	WP	WY	WR
0.0	+25.0	-25.0	+5.0	0.0	0.0

2. MNVR OBSS PRE-GRAPPLE TO ELC PRE-GRAPPLE

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

MODE – best available

Mnvr to ELC PRE-GRAPPLE posn (reference pictures as reqd):

	SY	SP	EP	WP	WY	WR	
OBSS	-90.0	+87.6	-129.5	-57.5	0.0	+110.4	
1: EP +			-90.0				
2: SY +	-20.9						
3: SP –		+64.0					
4: WP –				-71.3			
5: WY +					+18.1		
6: WR +						+222.0	
ELC Pre-grap	-20.9	+64.0	-90.0	-71.3	+18.1	+222.0	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1021	-15	-516	270	0	180	0

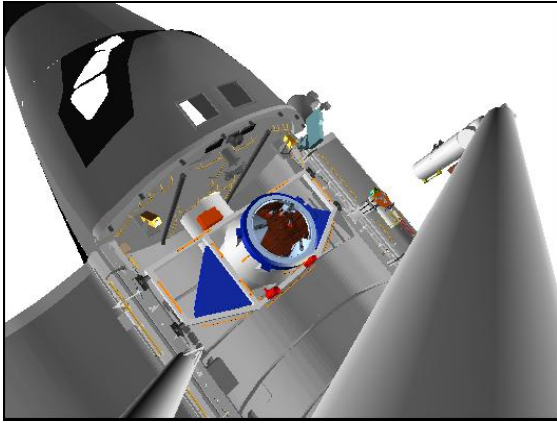
- BRAKES – ON (tb-ON)
- MODE – not DIRECT (It off)

Go to step 4

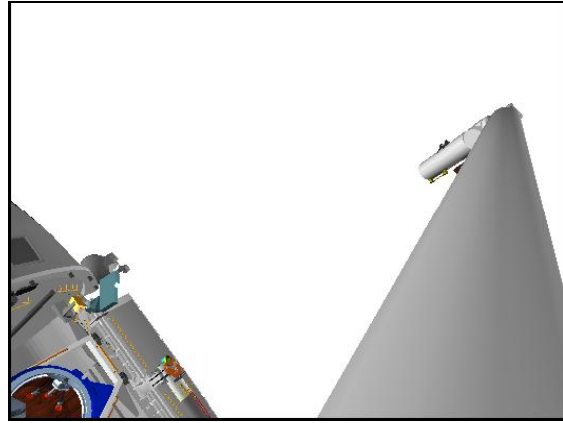
ELC CONTINGENCY

Start:
OBSS Pre-grapple

Step 1:
Drive EP+ (for 39.5°)
From -129.5 to -90.0



ELBOW (-30,-20)



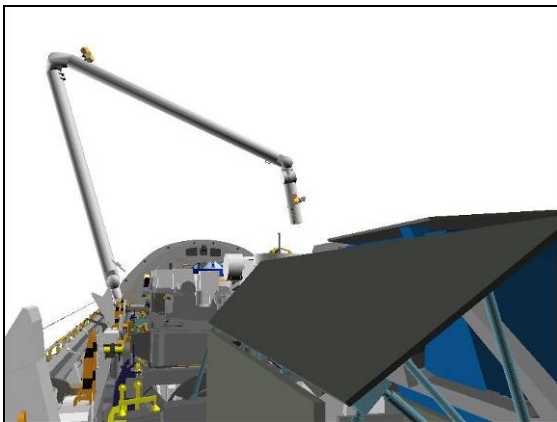
ELBOW (-30,-20)



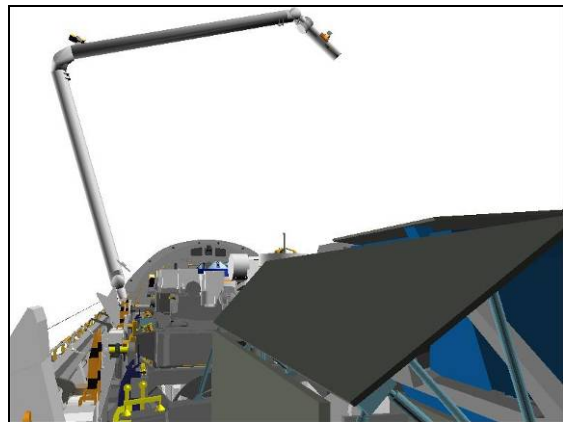
CCTV A (-5,45)



CCTV A (-5,45)



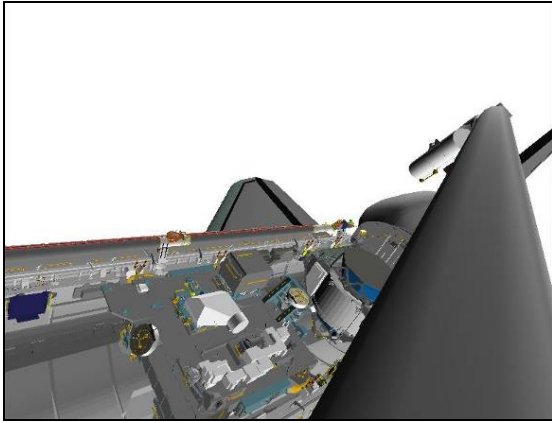
CCTV B (15,7)



CCTV B (15,7)

Step 2:

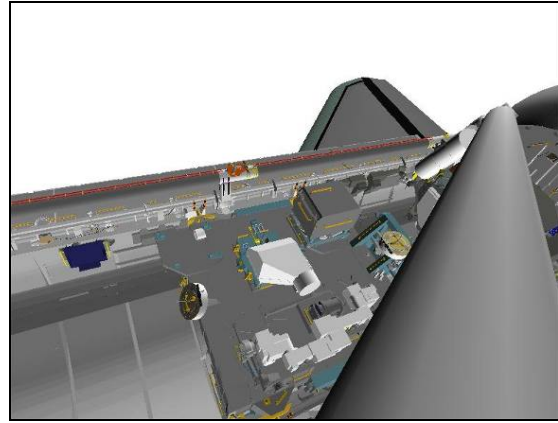
Drive SY+ (for 69.1°)
From -90.0 to -20.9



ELBOW (-30,-20)

Step 3:

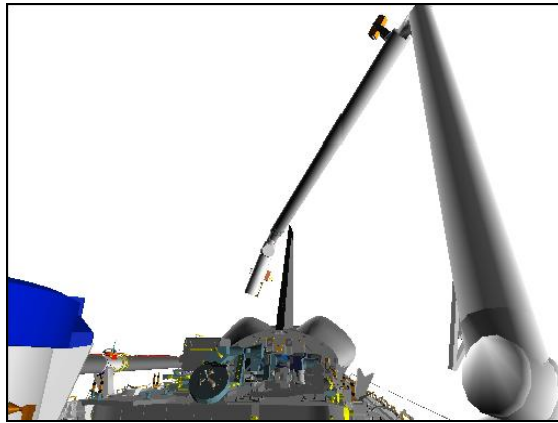
Drive SP- (for 23.6°)
From +87.6 to +64.0



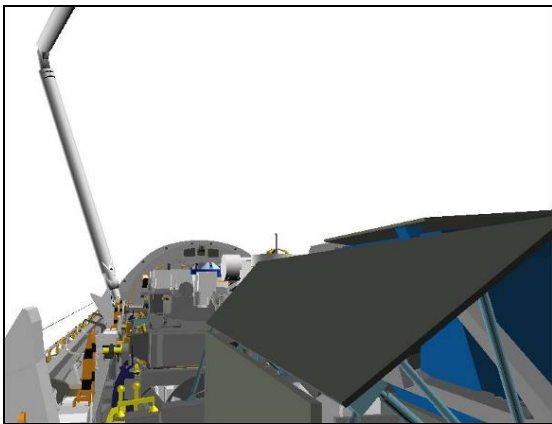
ELBOW (-30,-20)



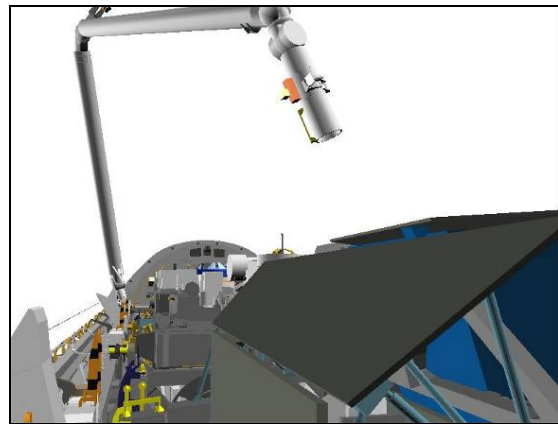
CCTV A (-5,45)



CCTV A (-5,22)



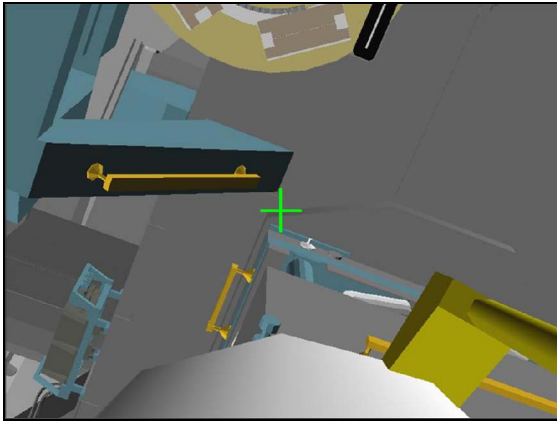
CCTV B (15,7)



CCTV B (15,7)

Step 4:

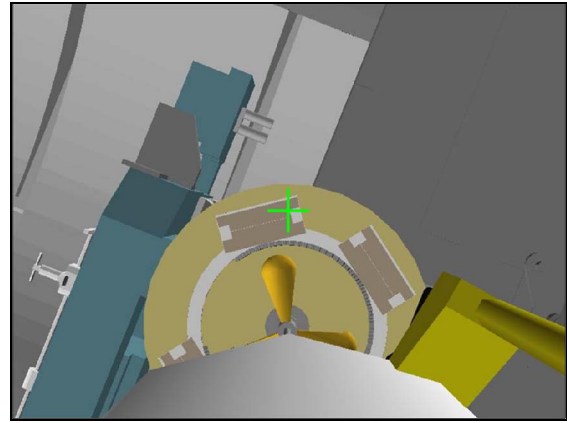
Drive WP- (for 13.8°)
From -57.5 to -71.3



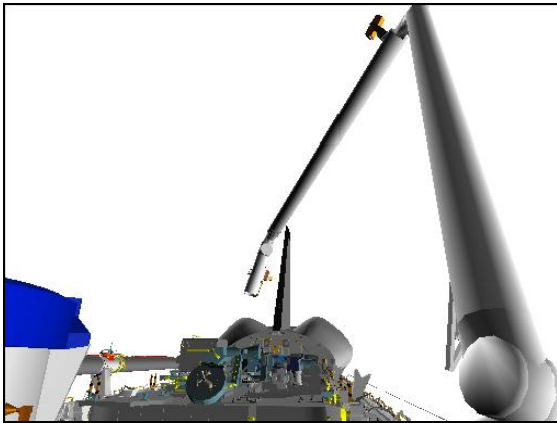
EE (HFOV = 34.0°)

Step 5:

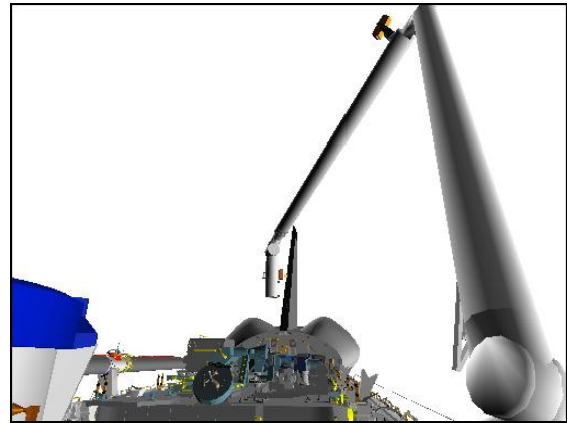
Drive WY+ (for 18.1°)
From 0.0 to +18.1



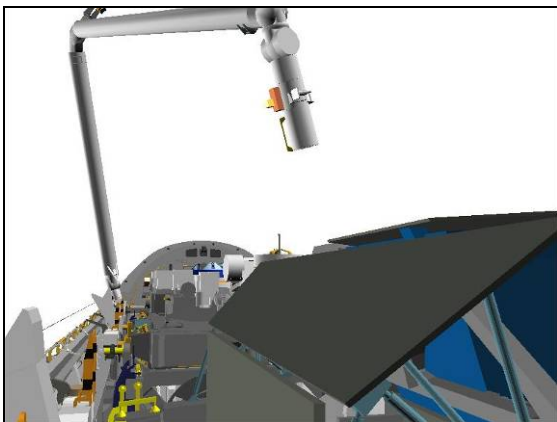
EE (HFOV = 34.0°)



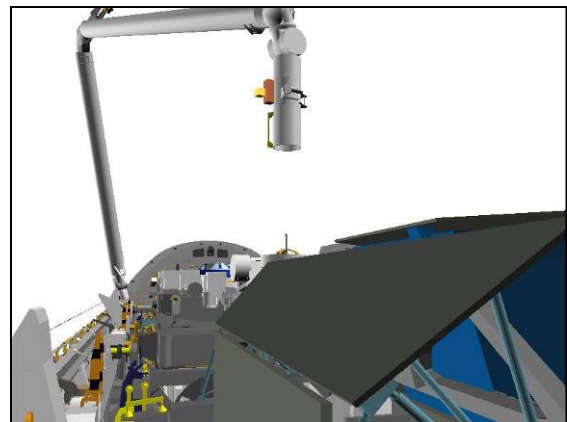
CCTV A (-5,22)



CCTV A (-5,22)



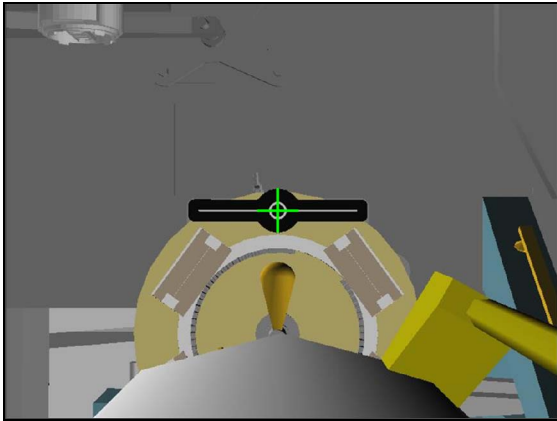
CCTV B (15,7)



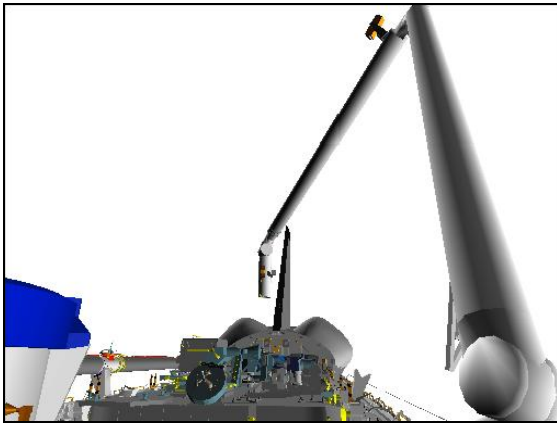
CCTV B (15,7)

Step 6:

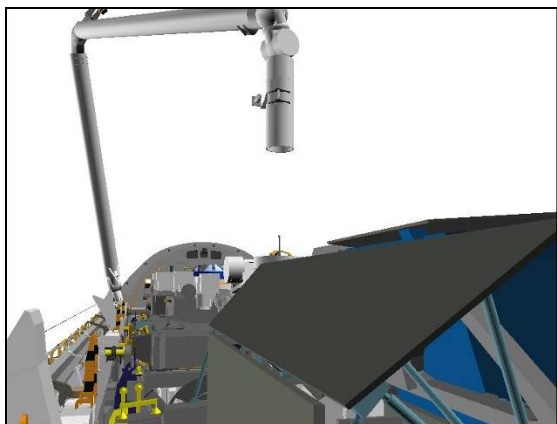
Drive WR+ (for 111.6°)
From +110.4 to +222.0



EE (HFOV = 34.0°)



CCTV A (-5,22)



CCTV B (15,7)

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

Go to step 4

3. MNVR PRECRADLE TO ELC PRE-GRAPPLE

NOTE

This sequence can be run docked or undocked (pictures show docked).

If docked, clearance between the SRMS boom and JPM is 40 inches at ELC Pre-grapple (clearance concern occurs in line 2 of SJ table). Monitor with Camera A

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

MODE – best available

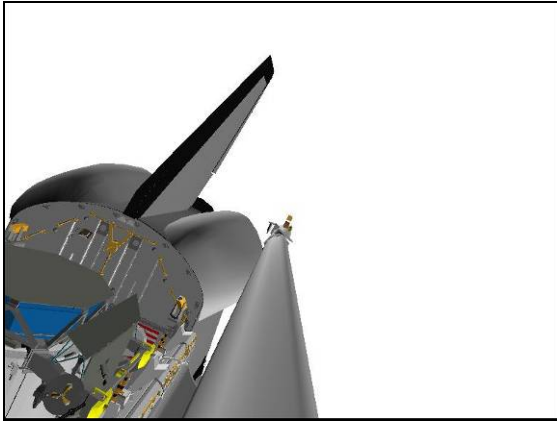
Mnvr to ELC PRE-GRAPPLE posn (reference pictures as reqd):

	SY	SP	EP	WP	WY	WR	
Precradle	0.0	+25.0	-25.0	+5.0	0.0	0.0	
1: SY –	-20.9						
2: SP +		+64.0					
3: EP –			-90.0				
4: WP –				-71.3			
5: WY +					+18.1		
6: WR +						+222.0	
ELC Pre-grap	-20.9	+64.0	-90.0	-71.3	+18.1	+222.0	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1021	-15	-516	270	0	180	0

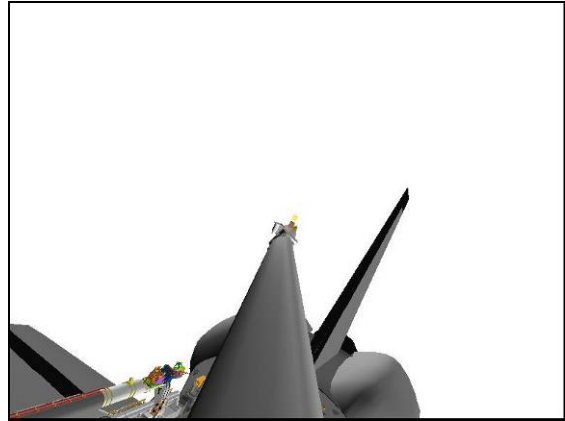
BRAKES – ON (tb-ON)
 MODE – not DIRECT (It off)

Start:
Precradle

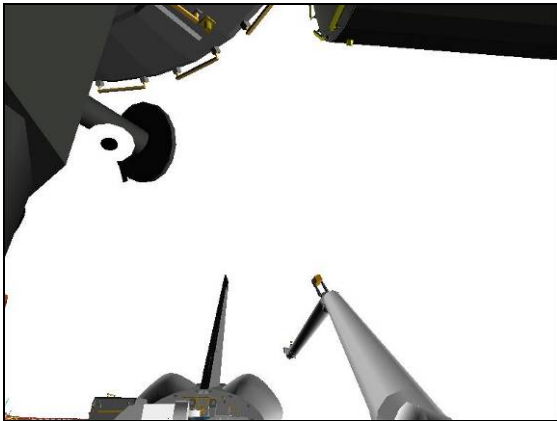
Step 1:
Drive SY- (for 20.9°)
From 0.0 to -20.9



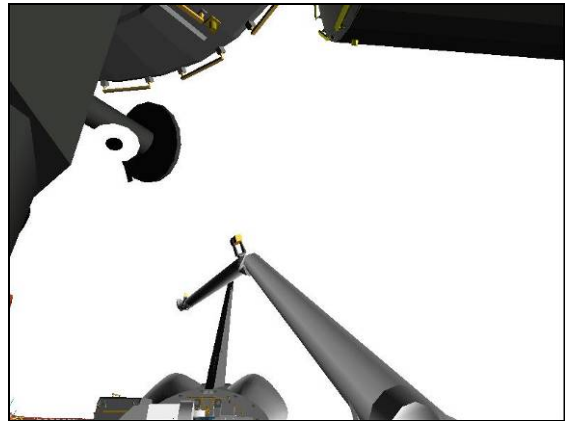
ELBOW (0,0)



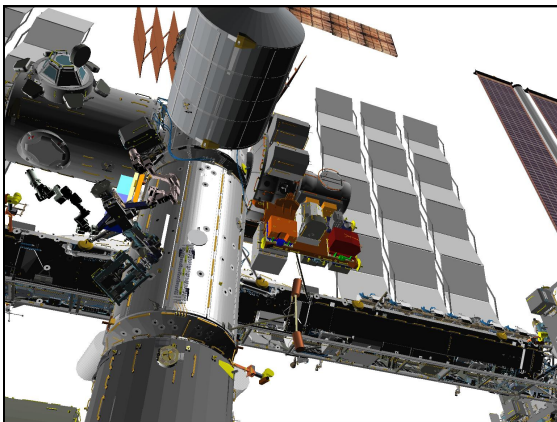
ELBOW (0,0)



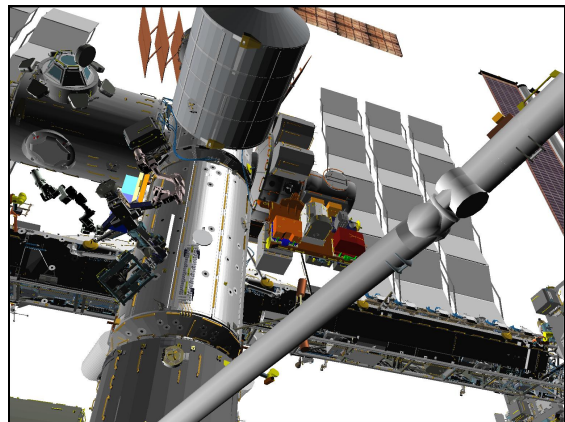
CCTV A (5,30)



CCTV A (5,30)



CCTV B (20,44)



CCTV B (20,44)

Step 2:

Drive SP+ (for 39.0°)

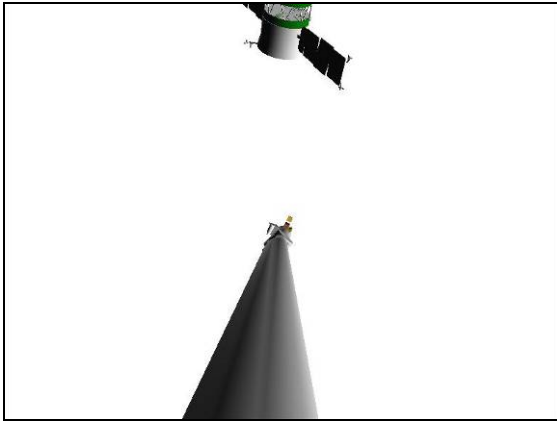
From +25.0 to +64.0

NOTE: SRMS-to-JPM is 40 inches

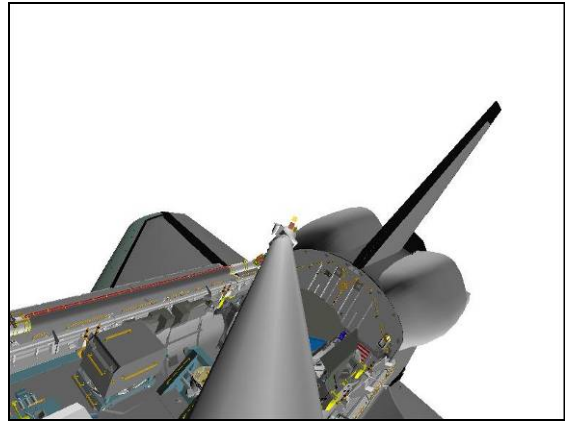
Step 3:

Drive EP- (for 65.0°)

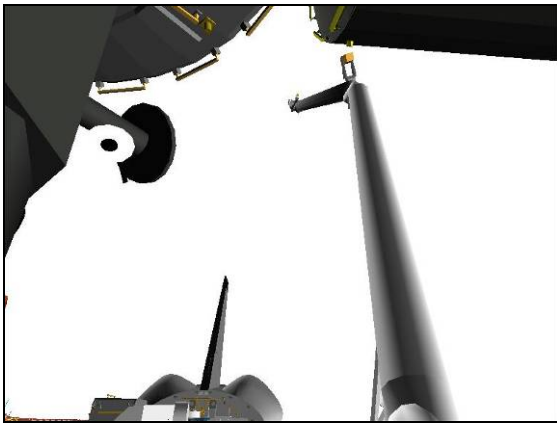
From -25.0 to -90.0



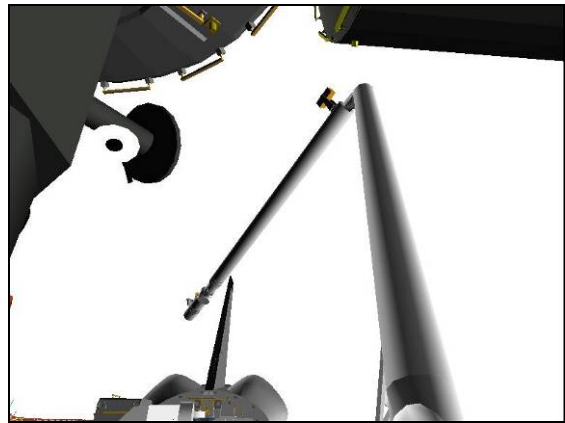
ELBOW (0,0)



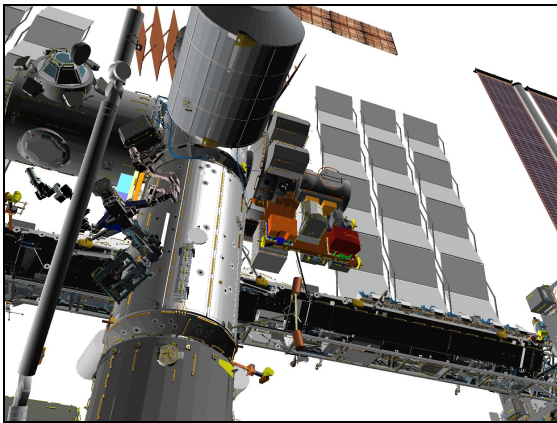
ELBOW (0,0)



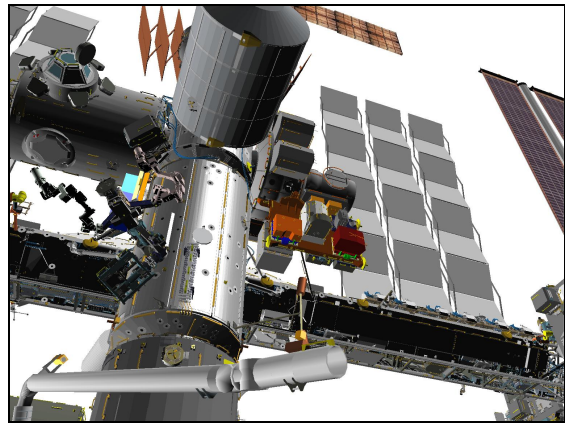
CCTV A (5,30)



CCTV A (5,30)



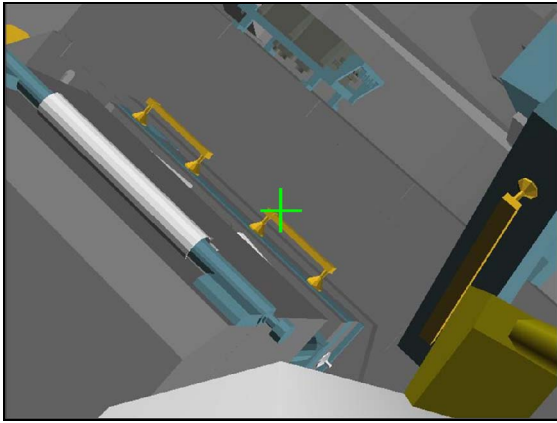
CCTV B (20,44)



CCTV B (20,44)

Step 4:

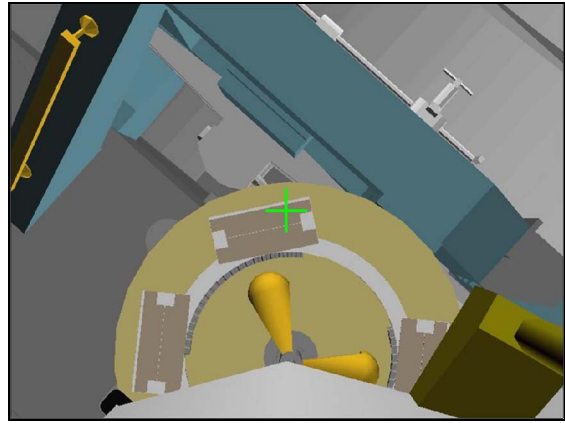
Drive WP- (for 76.3°)
From +5.0 to -71.3



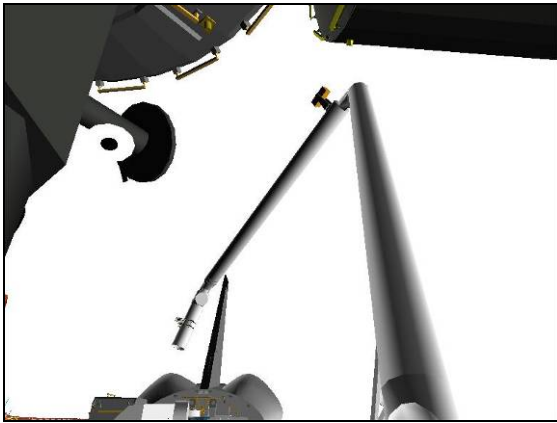
EE (HFOV = 34.0°)

Step 5:

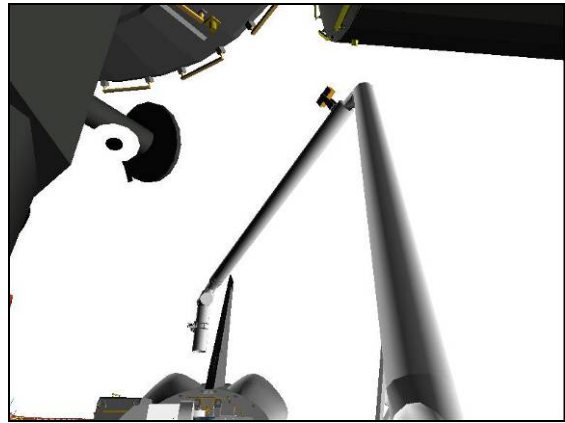
Drive WY+ (for 18.1°)
From 0.0 to +18.1



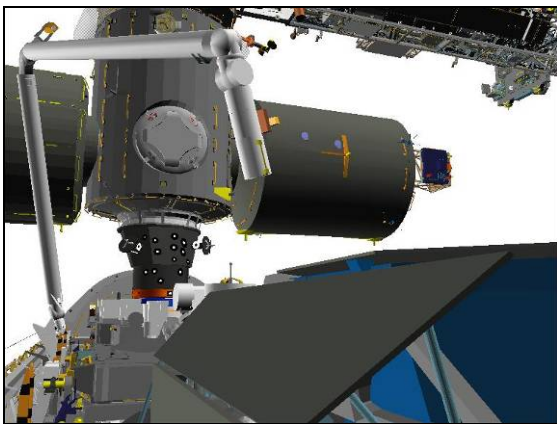
EE (HFOV = 34.0°)



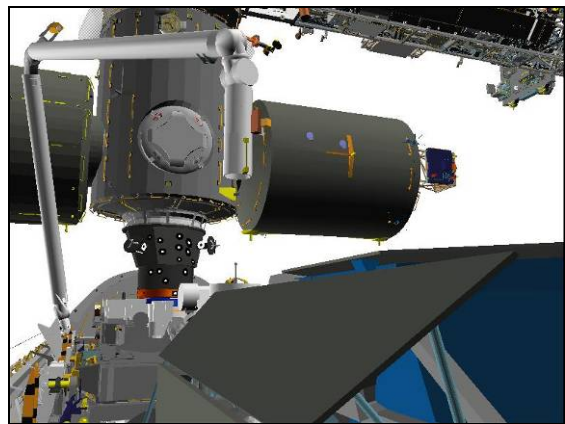
CCTV A (5,30)



CCTV A (5,30)



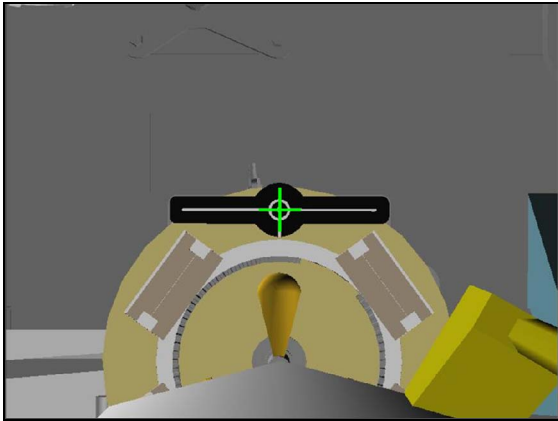
CCTV B (20,10)



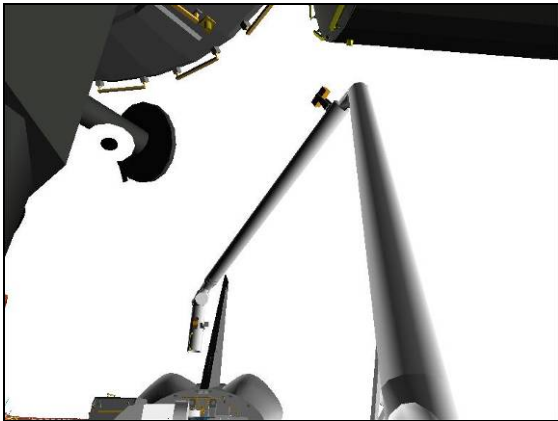
CCTV B (20,10)

Step 6:

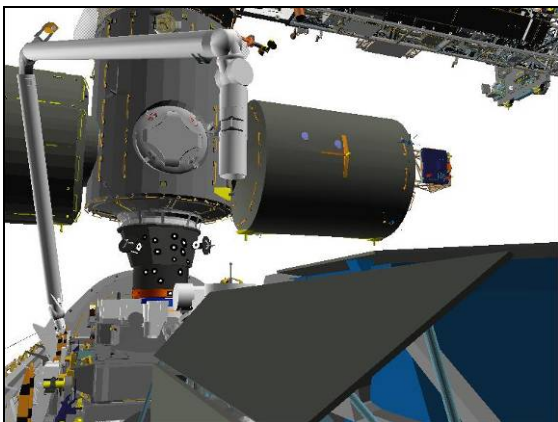
Drive WR+ (for 222.0°)
From 0.0 to +222.0



EE (HFOV: 34.0°)



CCTV A (5,30)



CCTV B (20,10)

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

- A7U 4. SJ MNVR TO GRAPPLE
 CCTV – configure for grapple
 – install ELC SJ GRAPPLE IN PLB WRIST CCTV OVERLAY
 – RMS WRIST, $\sqrt{\text{ZOOM}}$: 34.0 HFOV
 $\sqrt{\text{FOCUS}}$: 5 ft
 Maintain eyepoint ~18 in when using grapple overlay

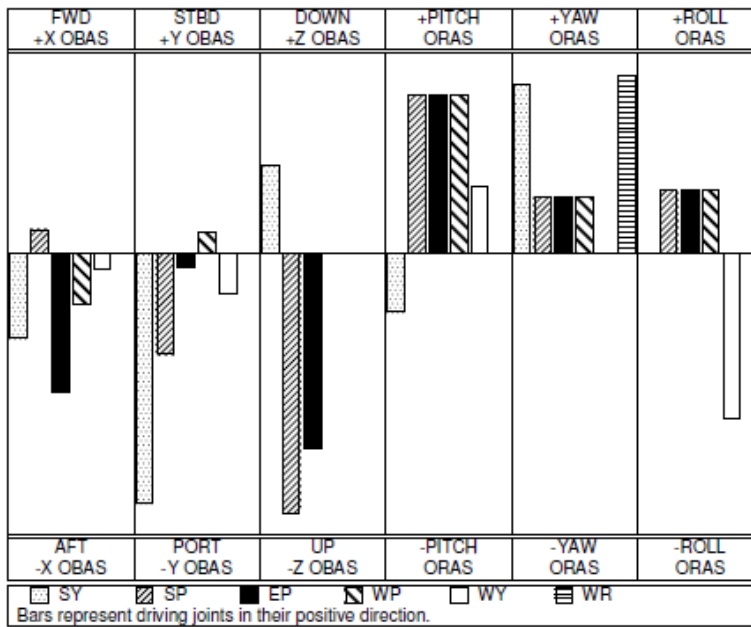
DNLK	EE
DTV	A
MON 1	B(C)
MON 2	D

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

MODE – best available

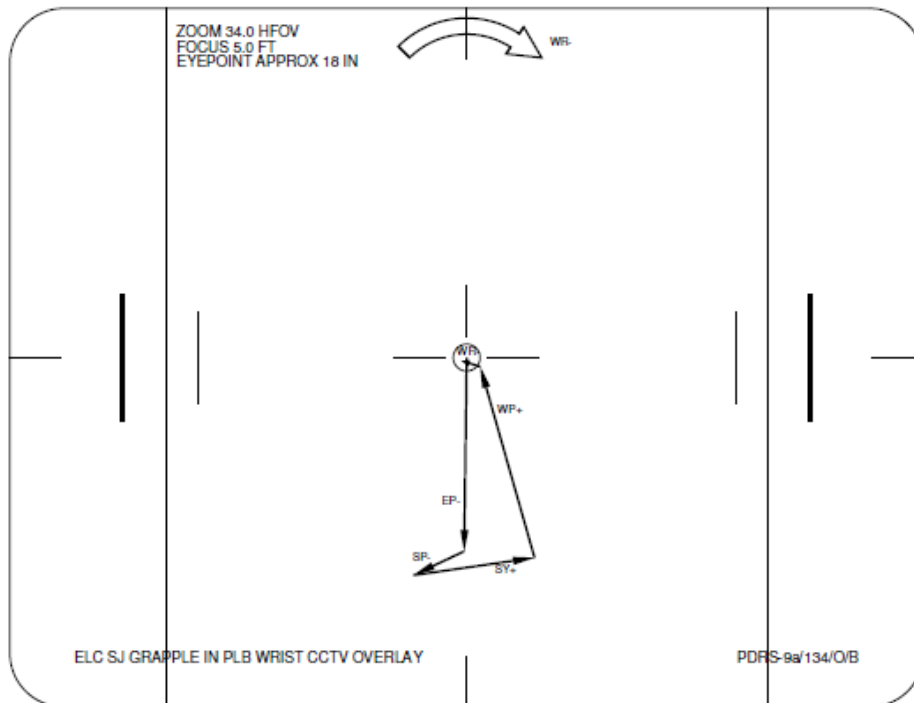
Drive joints per ELC SJ GRAPPLE IN PLB WRIST CCTV OVERLAY and histogram until EE within grapple envelope

ELC SJ GRAPPLE IN PLB



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

ΔSY	ΔSP	ΔEP	ΔWP	ΔWY	ΔWR
+2.8	-4.7	-5.4	+11.0	+0.3	-2.9



5. ELC GRAPPLE

If undocked or docked and using shuttle attitude control:

√DAP: VERN(FREE)

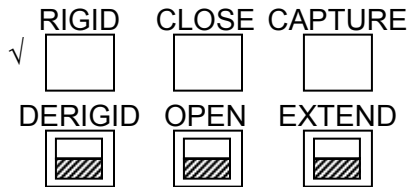
CAUTION
Monitor EE tb timing to prevent EE motor burnout

SM 169 PDRS STATUS

Monitor EE msw status

EE MODE – AUTO

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

- * If manual grapple reqd: *
- * EE MODE – MAN *
- * CAPTURE sw – depress (hold until CLOSE tb-gray, 3 sec max) *
- * MAN CONTR – RIGID (hold until RIGID tb-gray, 25 sec max) *

EE MODE – OFF

BRAKES – ON (tb-ON)

MODE – not DIRECT (It off)

DAP: as required

SM 94 PDRS CONTROL

PL ID – ITEM 3 +3 EXEC

INIT ID – ITEM 24 +3 EXEC

Record POS/ATT and Joint Angles:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
							3
Expected	-937	0	-414	0	0	0	3
	SY	SP	EP	WP	WY	WR	
Expected	-18.1	+59.3	-95.5	-60.1	+18.5	+219.1	

PARAM – PORT TEMP

JOINT – CRIT TEMP

ELC SJ UNBERTH AND HANDOFF

- A7U 1. SETUP, ROEU, AND PRLAs
CCTV – perform PAN/TILT reset

Perform ELC UNBERTH AND HANDOFF (ELC NOMINAL), steps 1-3

2. SJ UNBERTH

NOTE

Minimum clearance between stbd trunnions and OBSS is 3 inches at Z = -444 (REL = 131).
Monitor with Lab Camera and/or Camera D.

Clearance between SRMS and JPM is 40 inches at ELC SJ Hover. Monitor with Camera A

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

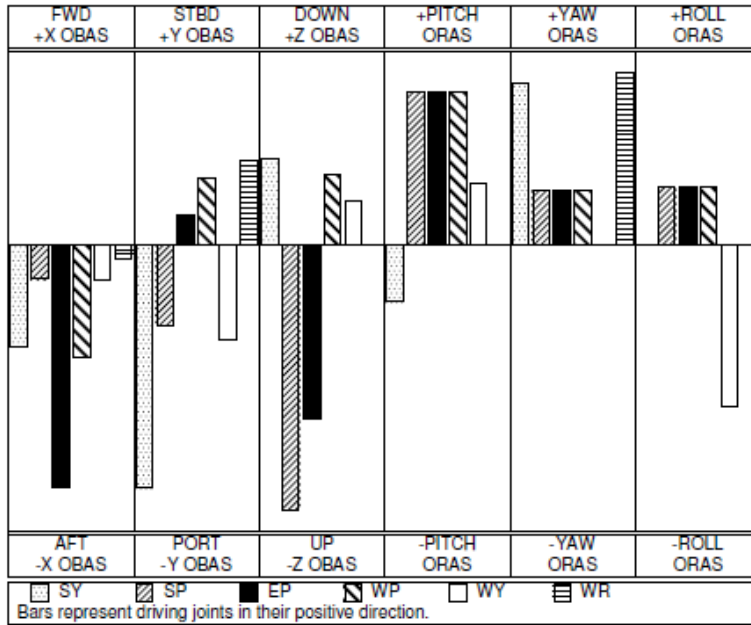
MODE – best available

Drive joints per ELC SJ UNBERTH table and histogram to ELC SJ HOVER
(until ATA clears ELC keel structure, Z = -474)

- A6U √PL RETEN LAT RDY 1,2,3,4,5 tb (five) – bp

ELC SJ UNBERTH

SUGGESTED JOINT ORDER
 SP+, SY-, WP+, EP+ (WR+, WY+ as req)



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

To get:	Drive:
+PITCH	+WP, +SP
+YAW	+WR, +SY
+ROLL	-WY

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

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

Δ SY	Δ SP	Δ EP	Δ WP	Δ WY	Δ WR
-3.0	+5.0	+5.9	-11.8	-0.4	+3.1

z	SY	SP	EP	WP	WY	WR
-414	-18.1	+59.3	-95.5	-60.1	+18.5	+219.1
-416	-18.2	+59.5	-95.4	-60.5	+18.5	+219.2
-418	-18.3	+59.7	-95.2	-60.8	+18.5	+219.3
-420	-18.4	+59.9	-95.1	-61.2	+18.4	+219.4
-422	-18.5	+60.1	-94.9	-61.6	+18.4	+219.5
-424	-18.6	+60.3	-94.8	-62.0	+18.4	+219.6
-426	-18.7	+60.5	-94.6	-62.4	+18.4	+219.7
-428	-18.8	+60.7	-94.4	-62.8	+18.4	+219.8
-430	-18.9	+60.9	-94.2	-63.2	+18.4	+219.9
-432	-19.0	+61.1	-94.1	-63.6	+18.4	+220.0
-434	-19.1	+61.3	-93.9	-64.0	+18.4	+220.1
-438	-19.3	+61.6	-93.5	-64.8	+18.3	+220.4
-442	-19.5	+62.0	-93.1	-65.5	+18.3	+220.6
-446	-19.7	+62.3	-92.8	-66.3	+18.3	+220.8
-450	-19.9	+62.6	-92.3	-67.1	+18.3	+221.0
-454	-20.1	+62.9	-91.9	-67.9	+18.2	+221.2
-458	-20.3	+63.2	-91.5	-68.7	+18.2	+221.4
-462	-20.5	+63.5	-91.1	-69.5	+18.2	+221.6
-466	-20.6	+63.8	-90.6	-70.3	+18.2	+221.8
-470	-20.8	+64.1	-90.1	-71.1	+18.1	+222.0
-474	-21.0	+64.3	-89.6	-71.9	+18.1	+222.2

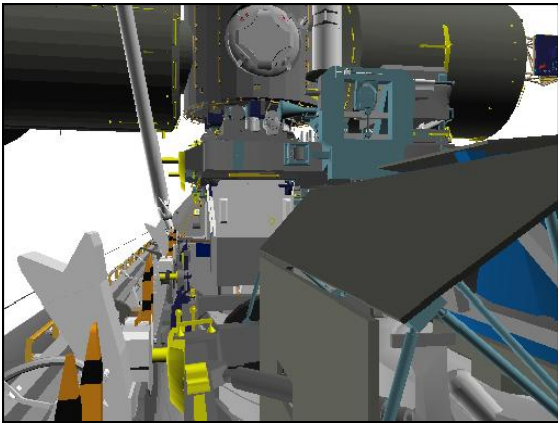
BRAKES – ON (tb-ON)
 MODE – not DIRECT (lt off)

ELC SJ HOVER posn:

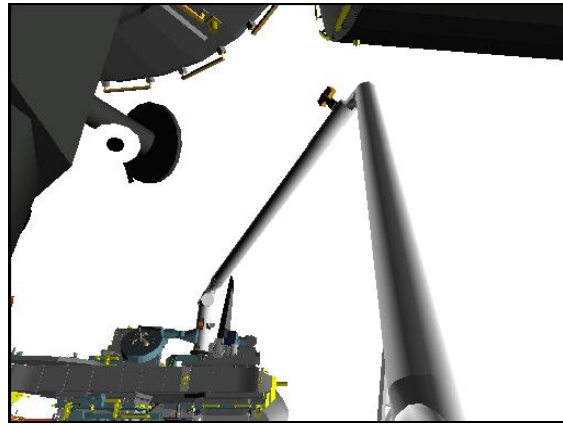
	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-937	0	-474	0	0	0	3
	SY	SP	EP	WP	WY	WR	
√	-21.0	+64.3	-89.7	-71.8	+18.1	+222.2	

NOTE

SSRMS operator may use P1 LOOB to survey the STP payload on ELC while SRMS at ELC SJ HOVER posn. Motion to ELC HANDOFF posn should not begin until survey complete



CCTV B (10,0)



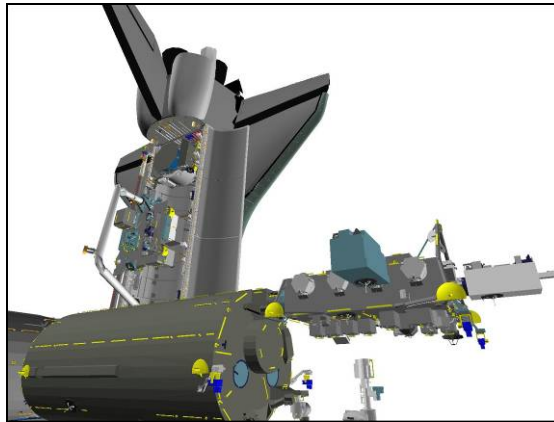
CCTV A (5,30)

3. SJ MNVR TO HANDOFF

A7U

CCTV – fully zoom out PLB and ELBOW cameras for SJ pictures

DNLK	Elbow
DTV	A
MON 1	09: P1 LOOB(C)
MON 2	B



09: P1 LOOB (150,25)

Tilt down to -10 when SRMS moves under JPM

NOTE

Minimum clearance between the SRMS and JPM is 39 inches in line 5 of SJ table. Monitor with Camera A.

In line 2, WR driven to +359.9° instead of -0.1° (as in nominal procedure) to decrease mnvr time

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

MODE – best available

Mnvr to ELC HANDOFF posn:

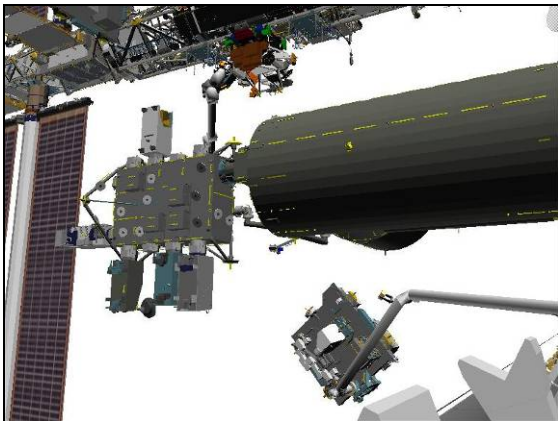
	SY	SP	EP	WP	WY	WR	
SJ Hover	-21.0	+64.3	-89.7	-71.8	+18.1	+222.2	
1: EP +			-60.0				
2: WR +						+359.9	
3: WY +					+61.7		
4: WP +				+19.9			
5: SY +	+40.0						
6: SP –		+21.3					
7: SY +	+124.7						
8: EP +			-41.8				
Handoff	+124.7	+21.3	-41.8	+19.9	+61.7	+359.9	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-282	-538	-374	273	320	8	3

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

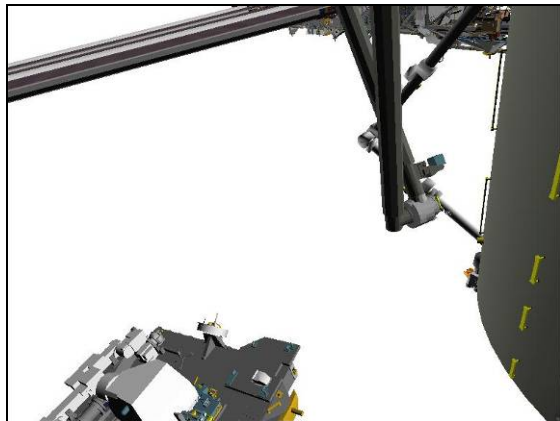
Notify SSRMS operator that SRMS at ELC Handoff posn with Brakes ON;
 GO for SSRMS grapple

- * If using Shuttle attitude control and attitude maintenance reqd: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *

A7U CCTV – config as required for SSRMS grapple



CCTV B (-30,10)

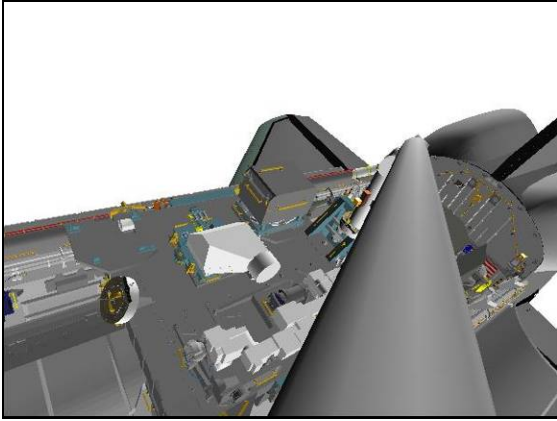


ELBOW (40,30)

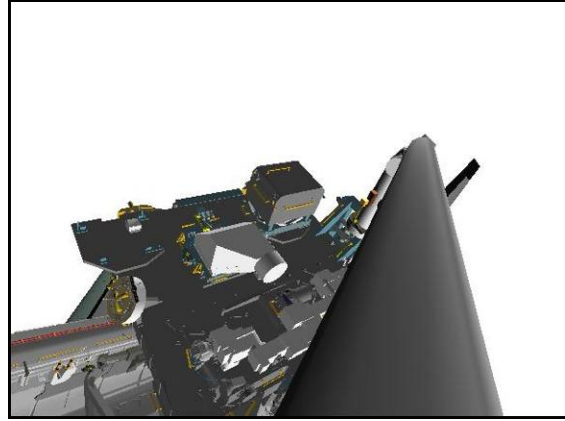
Center & zoom on PVGF for grapple

Start:
ELC SJ Hover

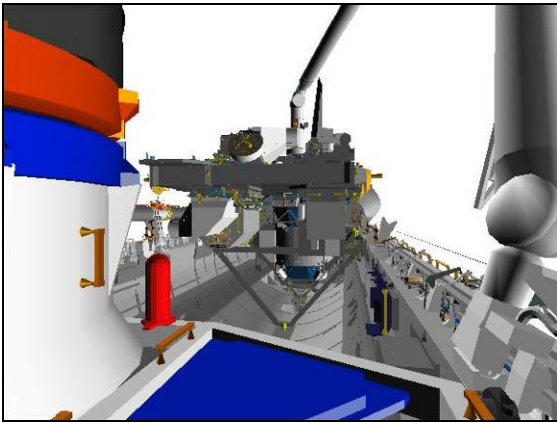
Step 1:
Drive EP+ (for 29.7°)
From -89.7 to -60.0



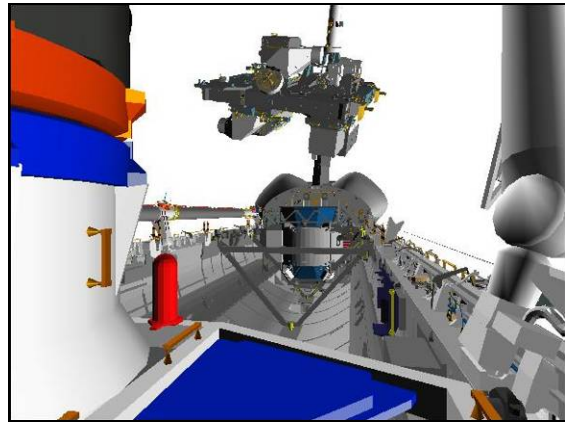
ELBOW (-20,-15)



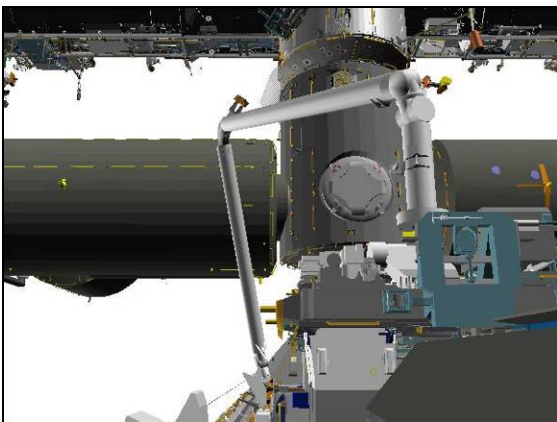
ELBOW (-20,-15)



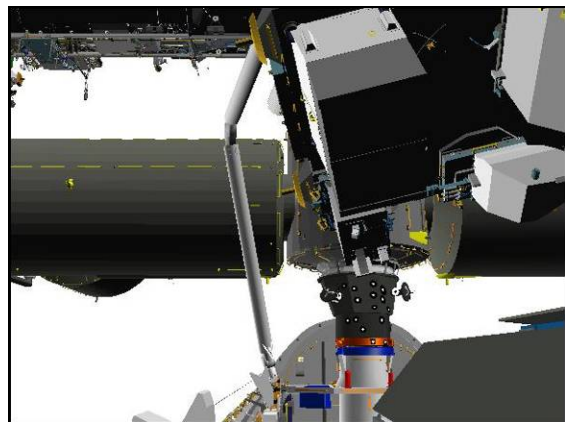
CCTV A (-10,0)



CCTV A (-10,0)



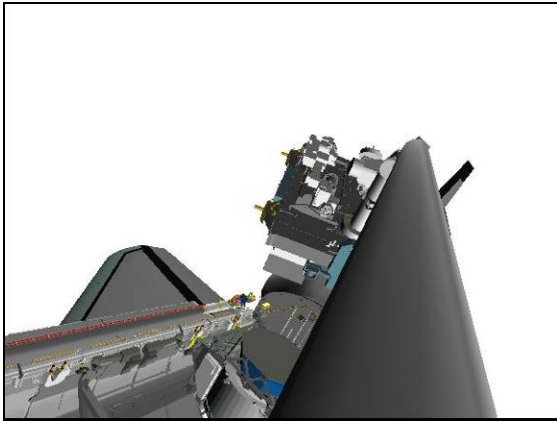
CCTV B (0,15)



CCTV B (0,15)

Step 2:

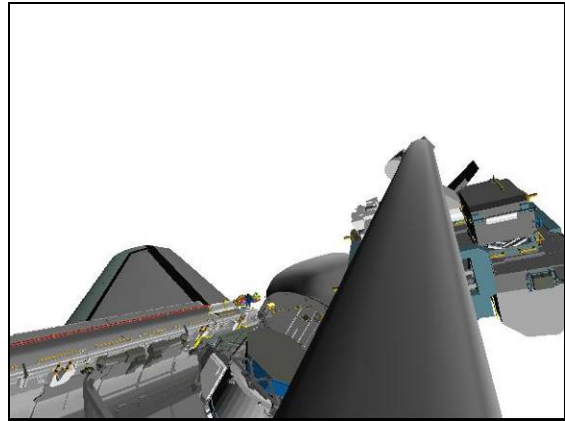
Drive WR+ (for 137.7°)
From +222.2 to +359.9



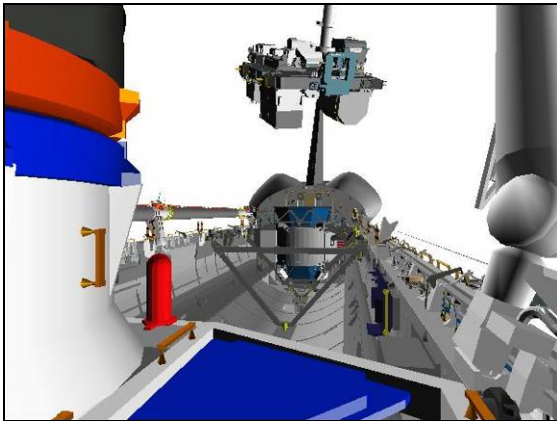
ELBOW (-20,-15)

Step 3:

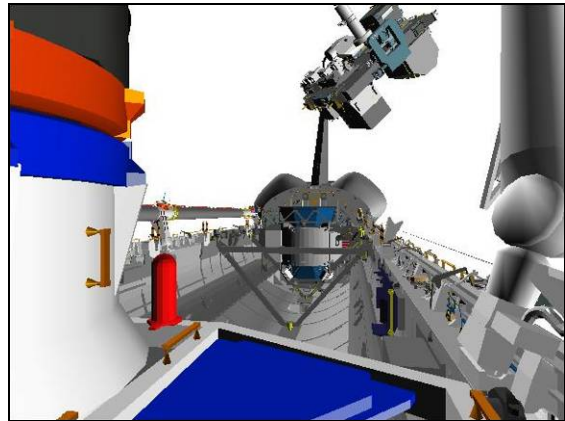
Drive WY+ (for 43.6°)
From +18.1 to +61.7



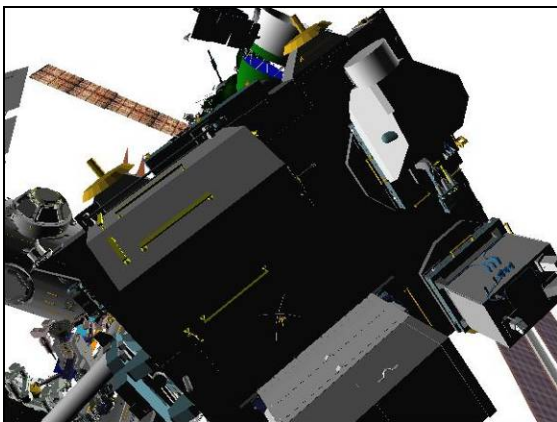
ELBOW (-20,-15)



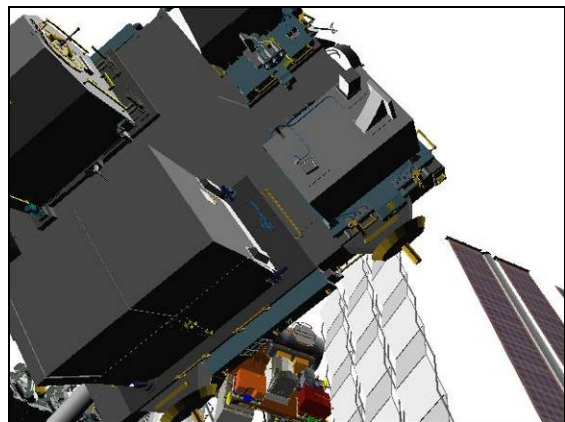
CCTV A (-10,0)



CCTV A (-10,0)



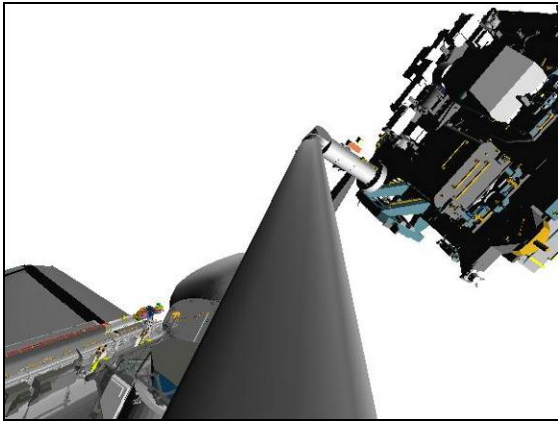
CCTV B (25,60)



CCTV B (25,60)

Step 4:

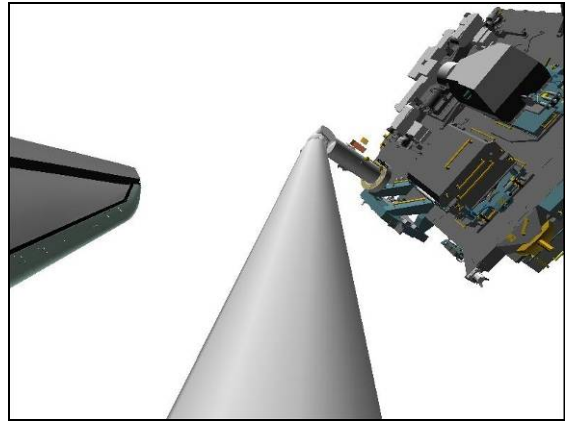
Drive WP+ (for 91.7°)
From -71.8 to +19.9



ELBOW (-5,-15)

Step 5:

Drive SY+ (for 61.0°)
From -21.0 to +40.0
NOTE: SRMS-to-JPM is 39 inches



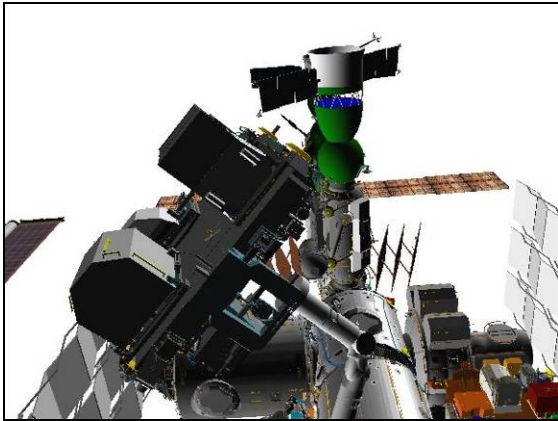
ELBOW (-5,-15)



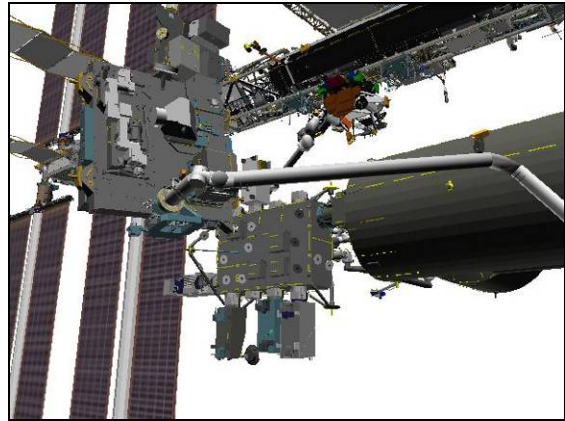
CCTV A (20,30)



CCTV A (20,30)



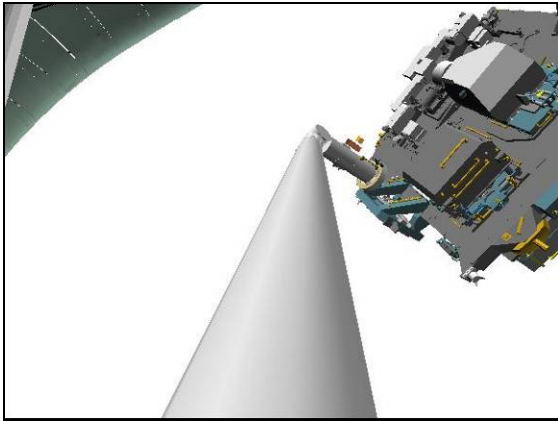
CCTV B (-5,65)



CCTV B (-40,15)

Step 6:

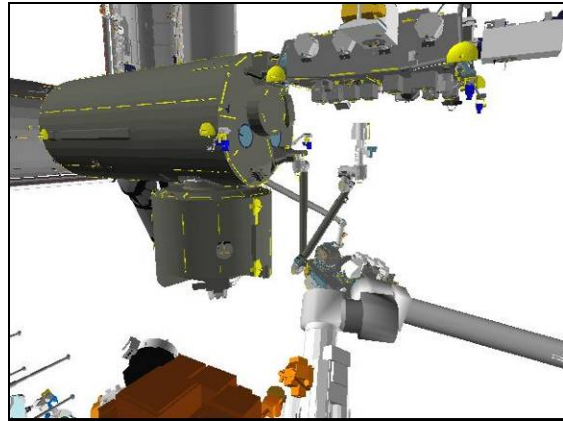
Drive SP- (for 43.0°)
From +64.3 to +21.3



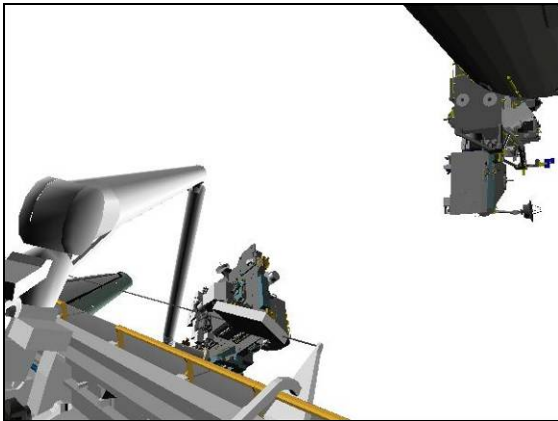
ELBOW (-5,-15)

Step 7:

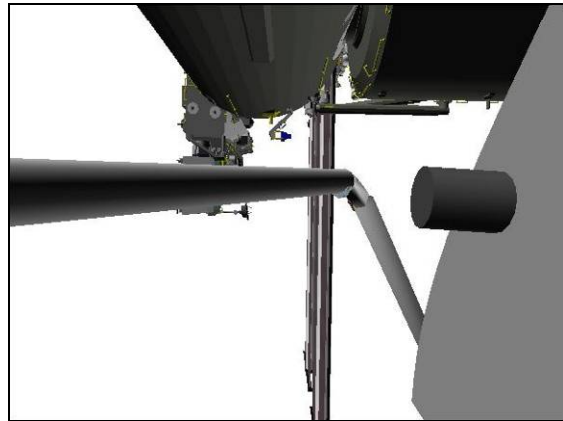
Drive SY+ (for 84.7°)
From +40.0 to +124.7



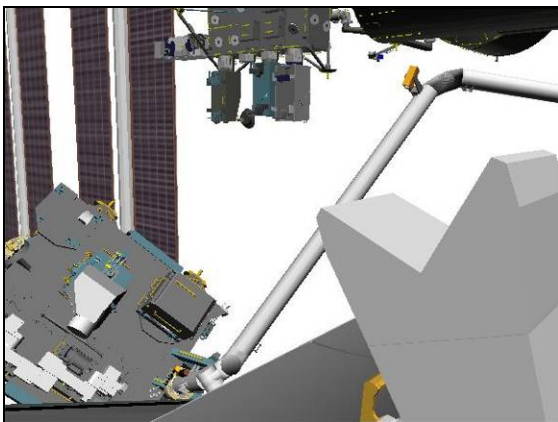
09: P1 LOOB (150,-10)



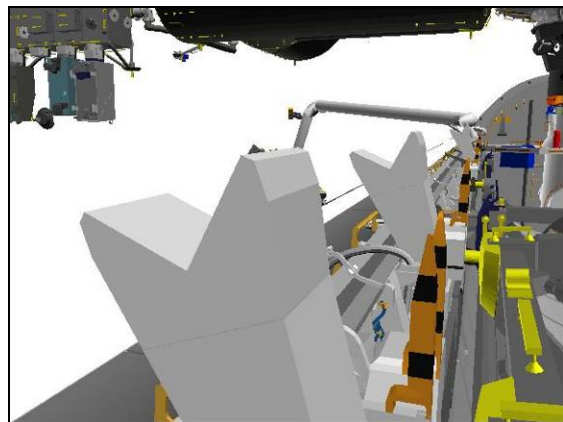
CCTV A (50,0)



CCTV A (90,0)



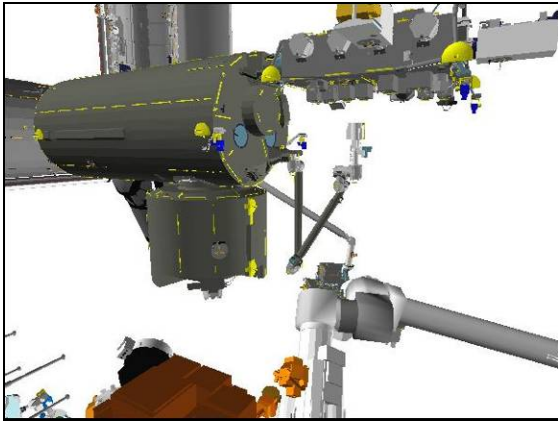
CCTV B (-40,-10)



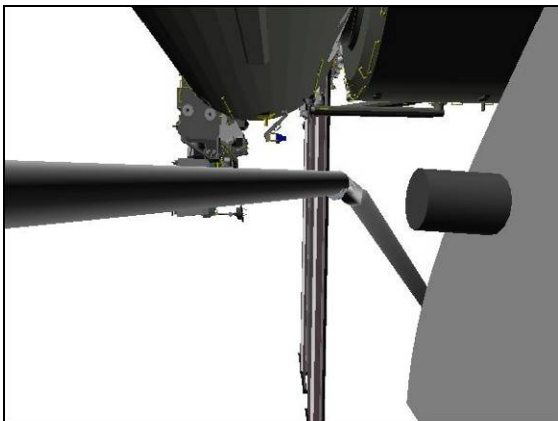
CCTV B (-20,-10)

Step 8:

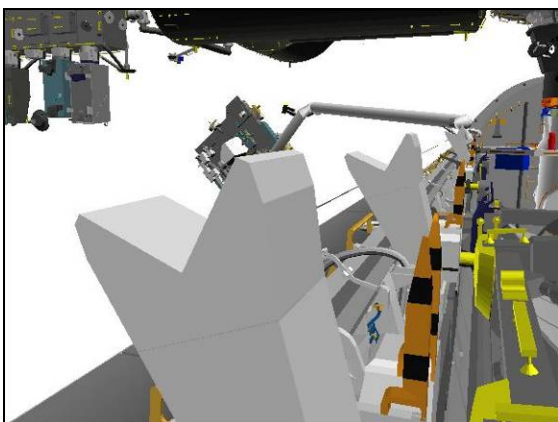
Drive EP+ (for 18.2°)
From -60.0 to -41.8



09: P1 LOOB (150,-10)



CCTV A (90,0)



CCTV B (-20,-10)

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

Notify SSRMS operator that SRMS at ELC Handoff posn with Brakes ON;
GO for SSRMS grapple

ELC SJ UNGRAPPLE AND VIEWING

1. SETUP

A7U

CCTV – configure for ungrapple

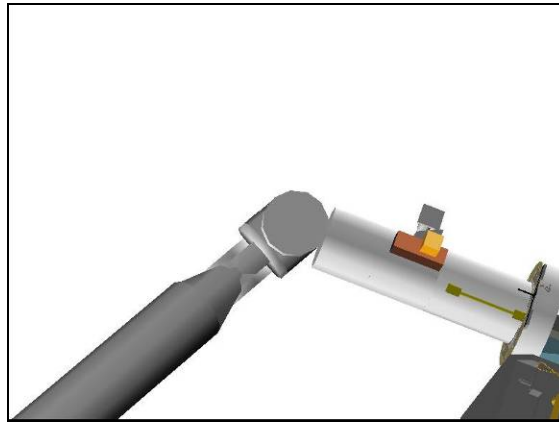
– install ELC SJ UNGRAPPLE AT HANDOFF WRIST CCTV OVERLAY

– RMS WRIST, ZOOM: 34.0 HFOV

FOCUS: 5 ft

Maintain eyepoint ~18 in when using grapple overlay

DNLK	EE
DTV	B
MON 1	37: MBS Mast(03: S1 LOOB)
MON 2	A



**37: MBS Mast (-165,75)
Zoom: 3.0**

SM 94 PDRS CONTROL

PL ID – ITEM 3 +0 EXEC

INIT ID – ITEM 24 +0 EXEC

2. ELC UNGRAPPLE

On SSRMS operator GO, SSRMS grapple complete with brakes ON and ready for ELC release

If SINGLE MODE available:

NOTE

CONTR ERR It and 'S96 PDRS CNTL' msg may occur due to Consistency/Envelope Check error

RHC

RATE – COARSE (RATE MIN tb-OFF)

SM 94 PDRS CONTROL

AUTO BRAKE INH – ITEM 10 EXEC (*)

BRAKES – OFF (tb-OFF)

MODE – TEST, ENTER

Wait 5 sec

BRAKES – ON (tb-ON)

SM 94 PDRS CONTROL

AUTO BRAKE ENA – ITEM 9 EXEC (*)

RHC

RATE – VERN (RATE MIN tb-ON)

BRAKES – OFF (tb-OFF)

MODE – best available

CAUTION

Monitor EE tb timing to prevent EE motor burnout

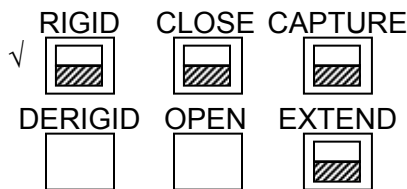
SM 169 PDRS STATUS

Monitor EE msw status

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 (8 sec total):

DERIGID tb – gray, 5 sec max, then

OPEN tb – gray, 3 sec max, then

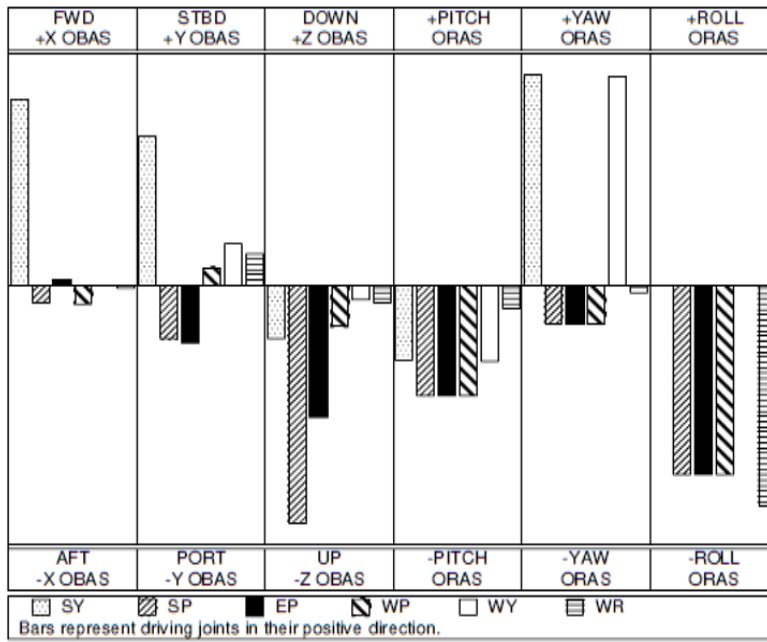
3. MNVR CLEAR OF ELC

NOTE

Clearance between RMS Elbow and JPM is 47 inches at ELC Backoff. Monitor with Camera B

Drive joints per ELC SJ UNGRAPPLE AT HANDOFF WRIST CCTV OVERLAY and histogram until EE clear of grapple fixture

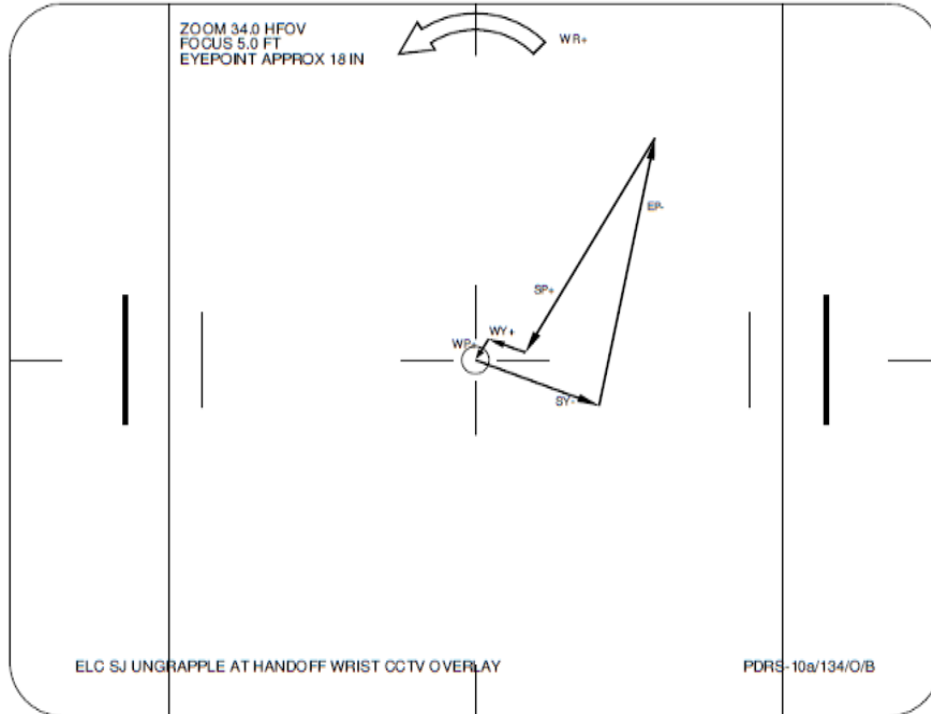
ELC SJ UNGRAPPLE AT HANDOFF



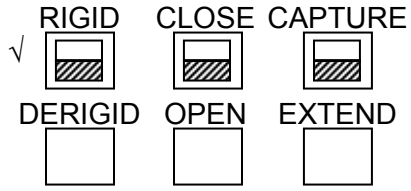
To get:	Drive:	To get:	Drive:
+X (fwd)	+SY	+PITCH	-WP, -EP
+Y (stbd)	+SY, -EP	+YAW	+WY, +SY
+Z (down)	-SP, -EP	+ROLL	-WR, -WP

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

ΔSY	ΔSP	ΔEP	ΔWP	ΔWY	ΔWR
-6.2	+7.5	-14.2	+6.5	+6.2	+0.2



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

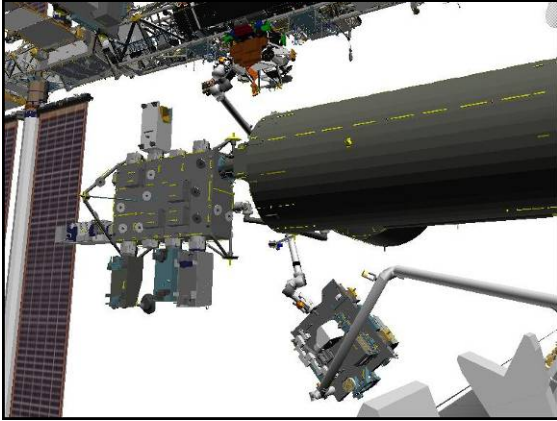


CRITICAL TIMES (20 sec total):
 EXTEND tb – gray, 20 sec max

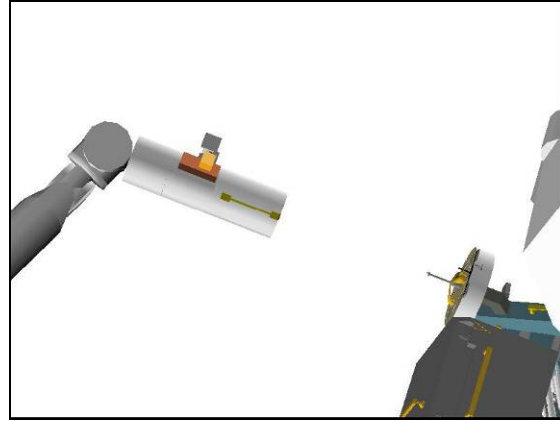
Mnvr to ELC BACKOFF posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-389	-507	-297	178	354	140	0
	SY	SP	EP	WP	WY	WR	
√	+118.5	+28.8	-56.0	+26.4	+67.9	+360.1	

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



CCTV B (-30,10)



37: MBS MAST (-165,75)
 Zoom: 3.0

4. MNVR TO ELC VIEWING

If SINGLE MODE available:

RHC

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

MODE – best available

Mnvr to ELC INSTALL VIEWING posn (reference pictures as reqd):

	SY	SP	EP	WP	WY	WR	
Backoff	+118.5	+28.8	-56.0	+26.4	+67.9	+360.1	
1: WY –					+1.5		
2: WP +				+105.0			
3: WR –						+140.0	
ELC Viewing	+118.5	+28.8	-56.0	+105.0	+1.5	+140.0	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-445	-534	-364	98	29	359	0

BRAKES – ON (tb-ON)

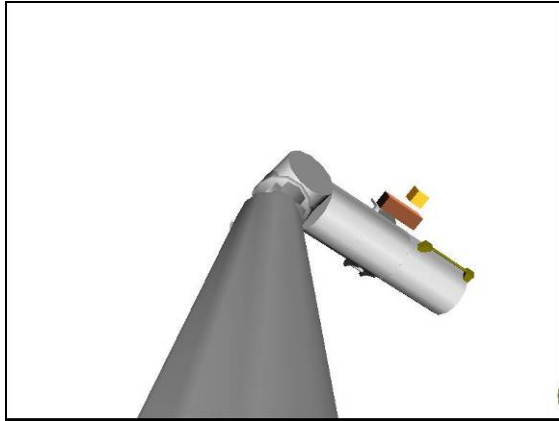
MODE – not DIRECT (It off)

PARAM – PORT TEMP

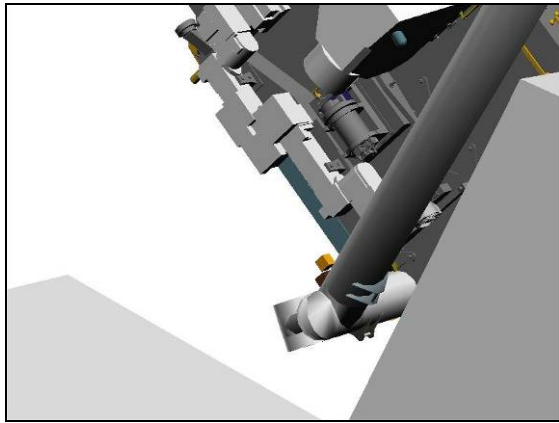
JOINT – CRIT TEMP

Notify SSRMS operator that SRMS at ELC Install Viewing, GO for ELC install (SSRMS camera config follows SJ pictures)

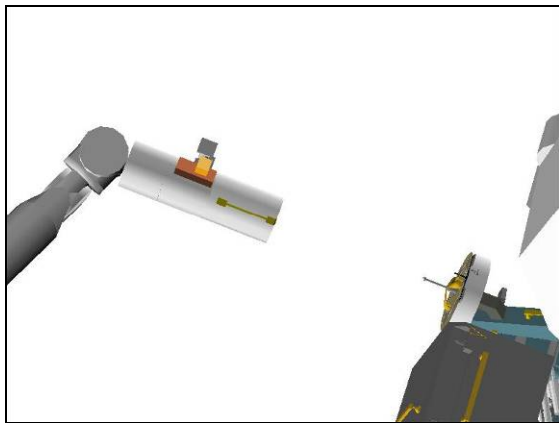
Start:
ELC Backoff



ELBOW (0,-5)
HFOV: 30.0°

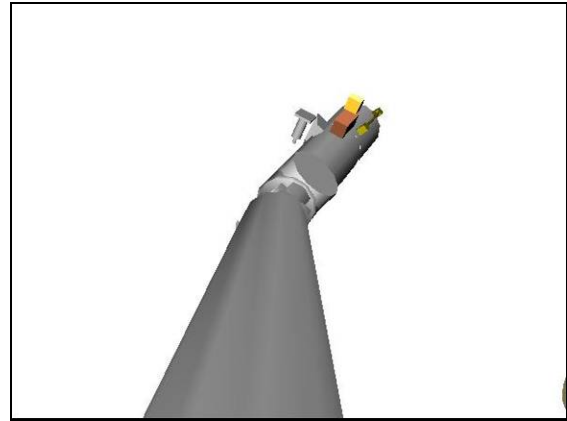


CCTV B (-27,-7)
HFOV: 10.0°

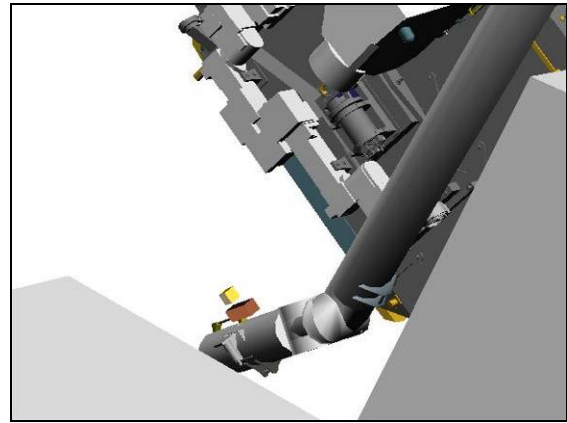


37: MBS MAST (-165,75)
Zoom: 3.0

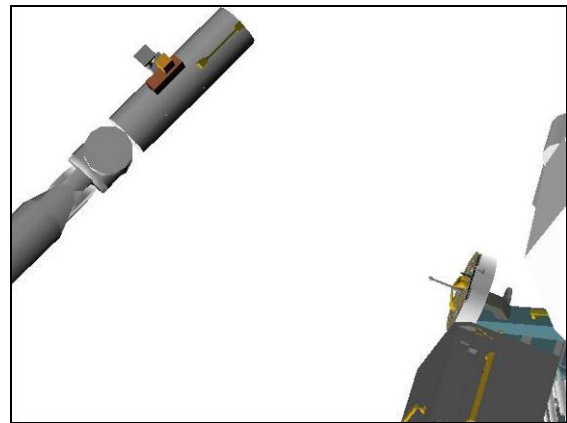
Step 1:
Drive WY- (for 66.4°)
From +67.9 to +1.5



ELBOW (0,-5)
HFOV: 30.0°



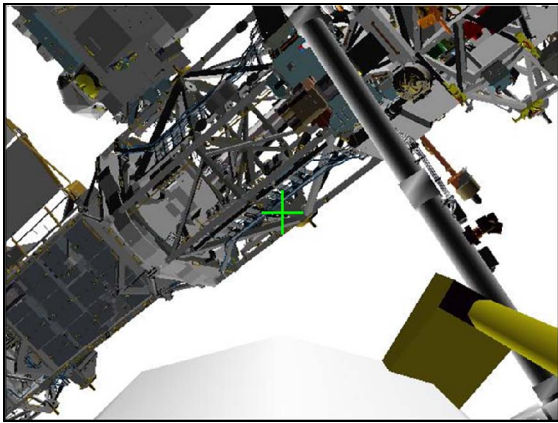
CCTV B (-27,-7)
HFOV: 10.0°



37: MBS MAST (-165,75)
Zoom: 3.0

Step 2:

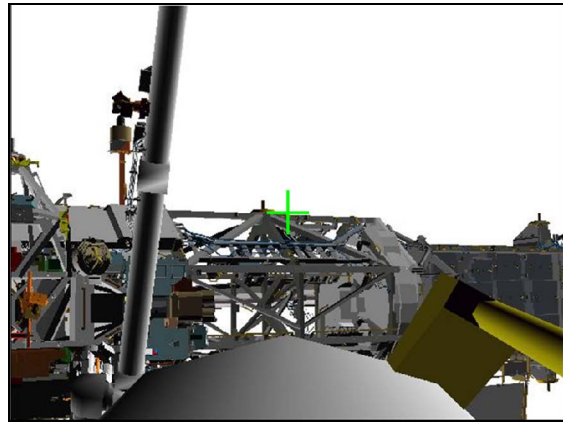
Drive WP+ (for 78.6°)
From +26.4 to +105.0



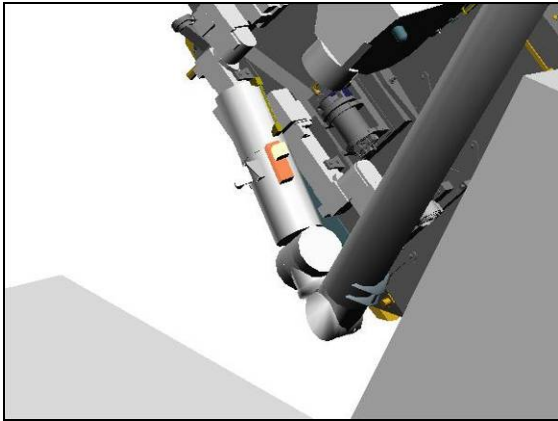
EE
HFOV: 34.0°

Step 3:

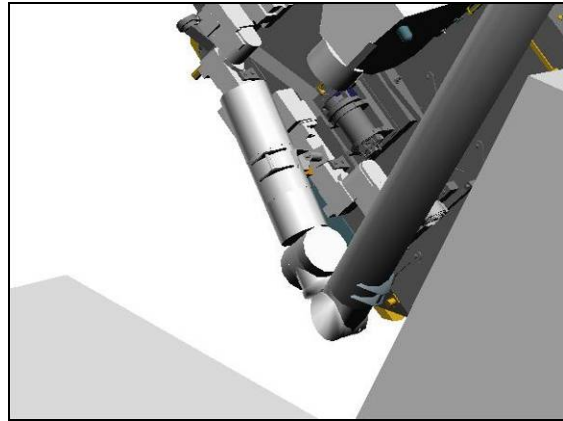
Drive WR- (for 220.1°)
From +360.1 to +140.0



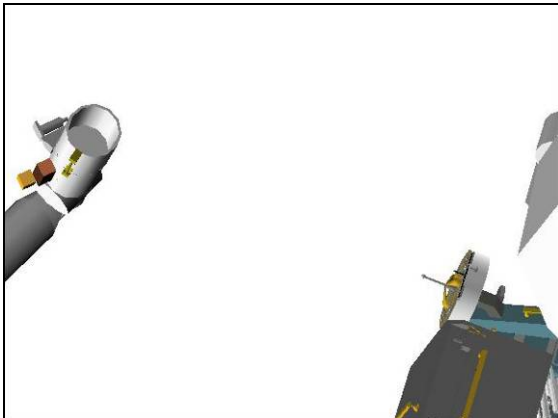
EE
HFOV: 34.0°



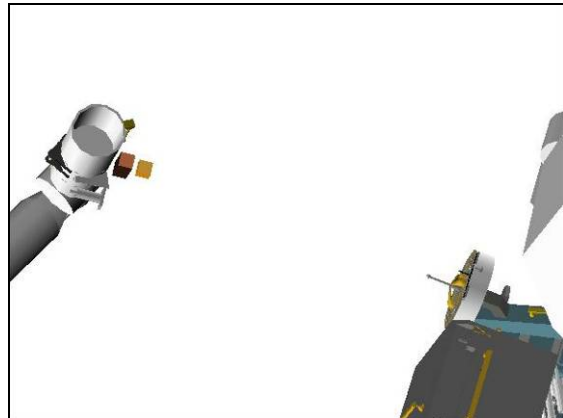
CCTV B (-27,-7)
HFOV: 10.0°



CCTV B (-27,-7)
HFOV: 10.0°



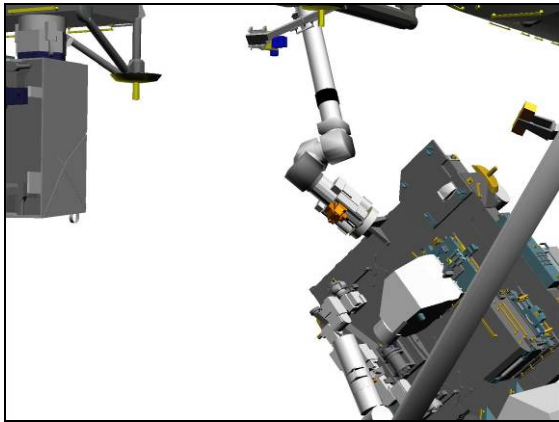
37: MBS MAST (-165,75)
Zoom: 3.0



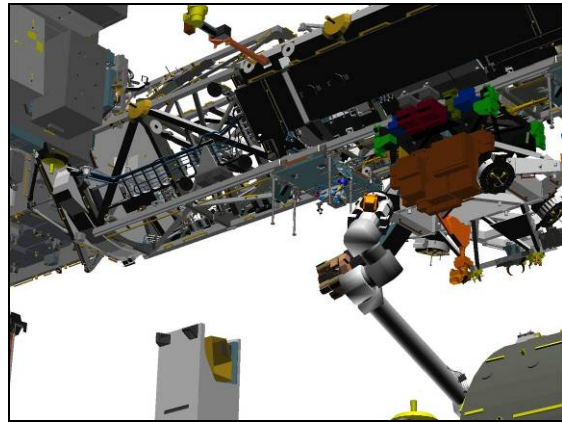
37: MBS MAST (-165,75)
Zoom: 3.0

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

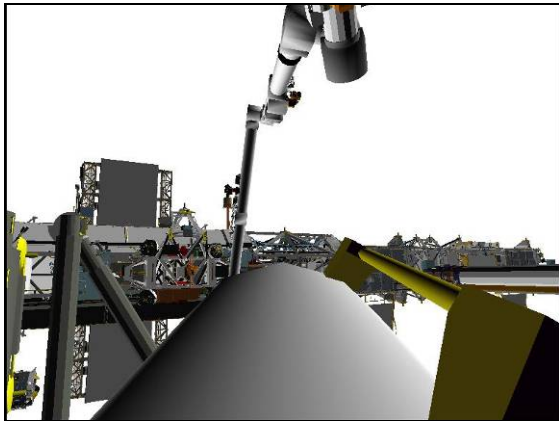
Notify SSRMS operator that SRMS at ELC Install Viewing, GO for ELC install



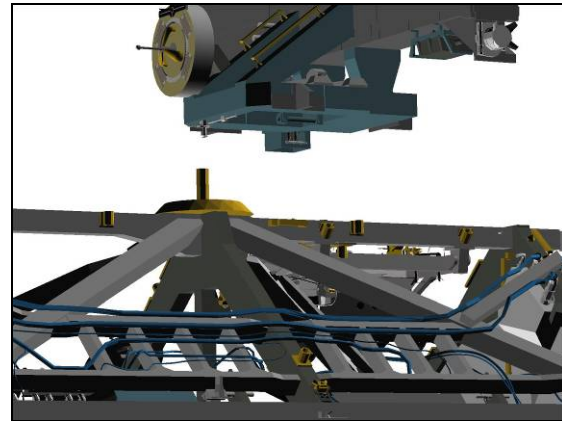
CCTV B (-30,0) HFOV: 20°
Track SSRMS wrist cluster until obscured by JEF, then



CCTV B (-40,25) HFOV: 20°
Center and zoom on SSRMS shoulder cluster



EE
Zoom out for big picture view



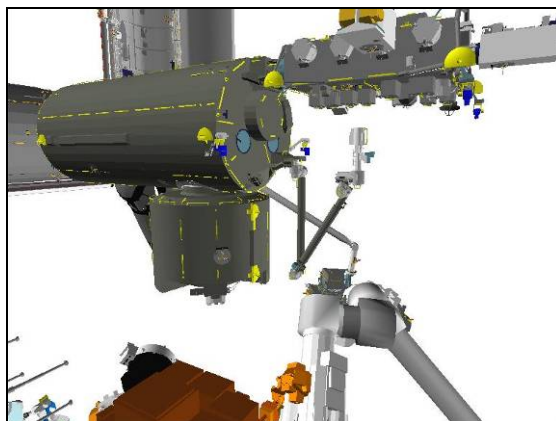
EE
Zoom in as reqd during install (full zoom at -90 cm shown)

- * If SSRMS operator requires EE view be adjusted: *
- * MON 2(DNLK) ← C (monitor RMS-JPM clearance) *
- * *
- * If SINGLE mode available: *
- * √RATE – VERN (RATE MIN tb-ON) *
- * BRAKES – OFF (tb-OFF) *
- * *
- * MODE – best available *
- * Drive joints (expect WY, WP) as required *
- * *
- * BRAKES – ON (tb-ON) *
- * MODE – not DIRECT *

ELC CONTINGENCY REBERTH

1. SETUP

DNLK	B(D)
DTV	A
MON 1	09: P1 LOOB(03: S1 LOOB)
MON 2	Elbow



09: P1 LOOB (150,-10)
Tilt up during SRMS mnvr

SM 94 PDRS CONTROL

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

ELC HANDOFF posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-282	-538	-374	273	320	8	3
	SY	SP	EP	WP	WY	WR	
√	+124.7	+21.3	-41.8	+19.9	+61.7	-0.1	

PCS

MSS: SSRMS: Thrusters: Thruster Controls for MSS Ops
Verify 'Desat Request:' Inhibit

- * If using Shuttle attitude control, verify in attitude; *
- * DAP: FREE *

RHC

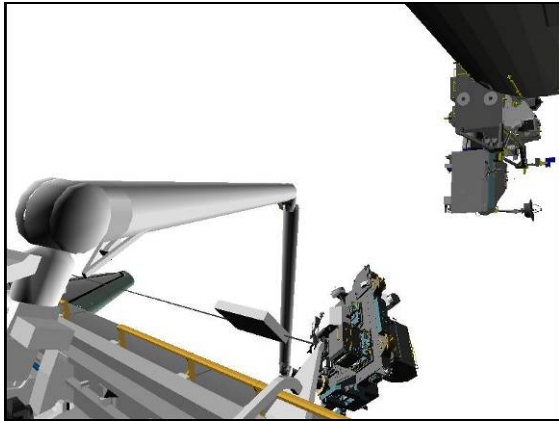
2. MNVR TO INTERMEDIATE

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

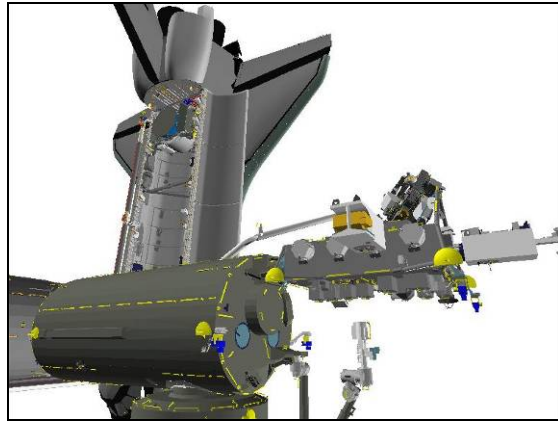
Mnvr to INTERMEDIATE posn:

	SY	SP	EP	WP	WY	WR	
Handoff	+124.7	+21.3	-41.8	+19.9	+61.7	-0.1	
1: EP –			-60.0				
2: SY –	+60.2						
Intermediate	+60.2	+21.3	-60.0	+19.9	+61.7	-0.1	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-886	-594	-241	234	318	281	3

BRAKES – ON (tb-ON)



CCTV A (50,0)



09: P1 LOOB (150,20)

- * If using Shuttle attitude control and attitude maintenance reqd: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *
- * When in attitude and rates damped: *
- * DAP: FREE *

3. MNVR TO ELC PORT

SM 94 PDRS CONTROL

END POS – ITEM 18 -9 7 5 -2 5 0 -5 7 5 EXEC

ATT – ITEM 21 +0 +0 +0 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)

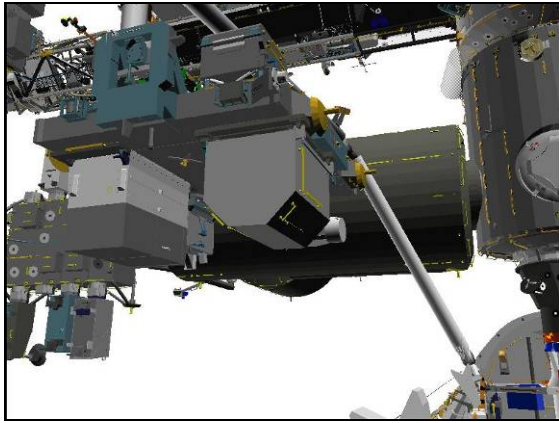
AUTO SEQ – PROCEED (IN PROG It on)

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

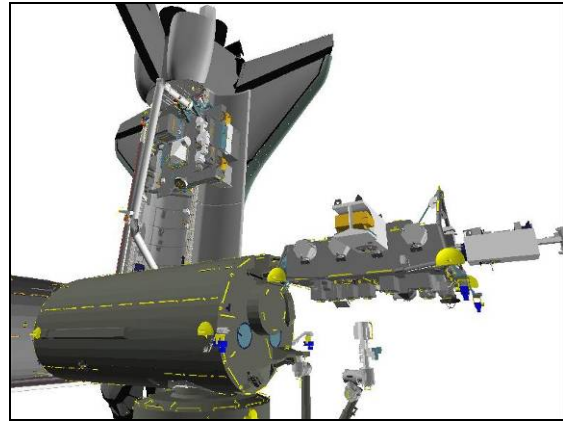
ELC PORT posn:

(07:40)

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-975	-250	-575	0	0	0	3
	SY	SP	EP	WP	WY	WR	
√	+10.5	+64.3	-52.0	-98.6	+19.2	+188.9	



CCTV B (-20,15)



09: P1 LOOB (150,20)

- * If using Shuttle attitude control and attitude maintenance reqd: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *
- * When in attitude and rates damped: *
- * DAP: FREE *

4. MNVR TO HOVER

SM 94 PDRS CONTROL

END POS – ITEM 18 -9 3 7 +0 -5 7 5 EXEC
 ATT – ITEM 21 +0 +0 +0 EXEC
 CMD CK – ITEM 25 EXEC (GOOD)

NOTE

Minimum clearance between RMS boom and JPM
 is 26 inches at approx. X = -950 (REL = -13).
 Monitor with Camera A

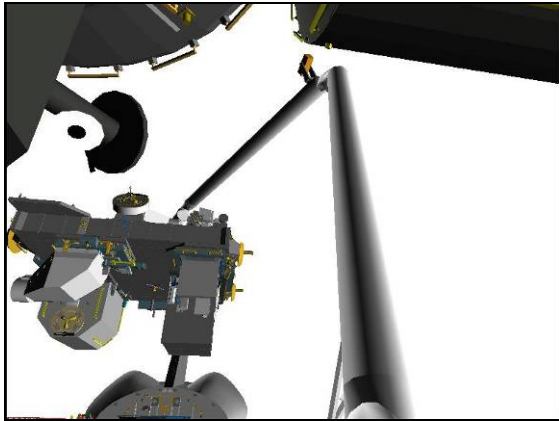
RHC √RATE – VERN (RATE MIN tb-ON) |
 BRAKES – OFF (tb-OFF)
 MODE – OPR CMD, ENTER (READY It on)

AUTO SEQ – PROCEED (IN PROG It on)

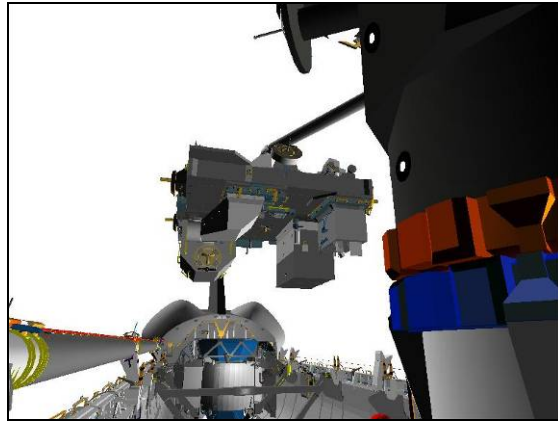
When AUTO SEQ IN PROG It – off:
 BRAKES – ON (tb-ON)

ELC HOVER posn: (03:58)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-937	0	-575	0	0	0	3
SY	SP	EP	WP	WY	WR	
-25.8	+66.6	-72.6	-92.8	+17.5	+227.2	



CCTV A (10,30)

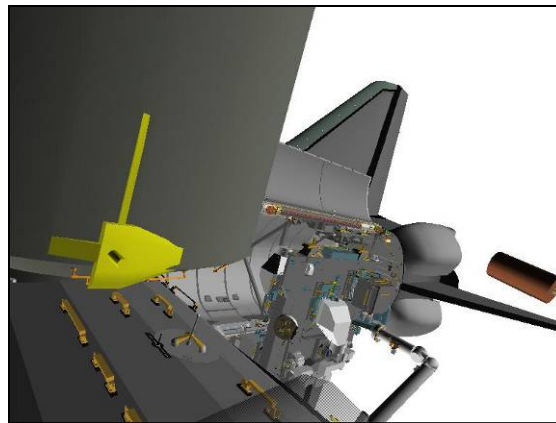


CCTV D (15,20)

- * If using Shuttle attitude control and attitude maintenance reqd: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *
- * When in attitude and rates damped: *
- * DAP: FREE *

5. BERTH ELC IN PLB

DNLK	Mux B/C
DTV	A(Mux D/A)
MON 1	13: LAB(09: P1 LOOB)
MON 2	Elbow



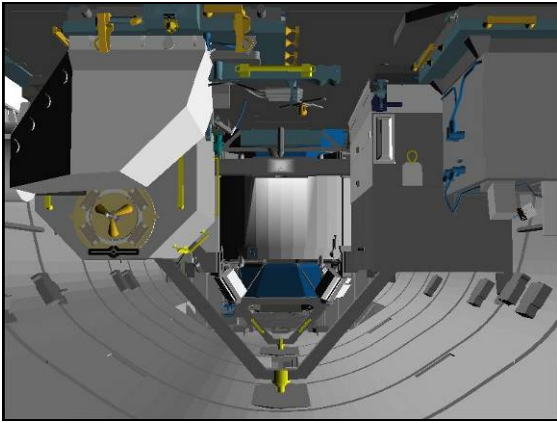
13: LAB (-48,-19)

Zoom in to Trunnion-OBSS clearance during berth

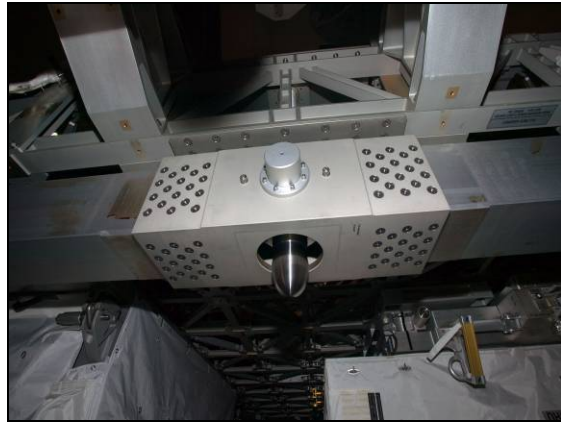
NOTE

Minimum clearance between stbd trunnions and OBSS is 3 inches at Z = -444 (REL = -30). Monitor with Lab Camera and/or Camera D.

ELC subtrunnion pin - used to constrain ELC to keel structure while berthed – enters guide shaft on keel at Z = -425 (REL = -11). POR must be within 2°/1° for proper insertion. Monitor with Camera A and via airlock hatch window. The keel yolk assembly has structural features useful for Y axis alignment (reference photos below)



Airlock window view at subtrunnion pin insertion (Z = -425)



Subtrunnion pin in Keel yolk assembly (ELC berthed)

A6U PL RETEN PL SEL – 1

SM 97 PL RETENTION

√PL SEL 1 RDY-FOR-LAT 1,2,3,4 (eight): 0

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

Mnvr ELC (THC down) to BERTH posn (Z = -414 expected)

ELC BERTH posn (insert data from ELC GRAPPLE):

X	Y	Z	PITCH	YAW	ROLL	PL ID
						3
√ -937	0	-414	0	0	0	3
SY	SP	EP	WP	WY	WR	
√ -18.1	+59.3	-95.5	-60.1	+18.5	+219.1	

A6U √PL RETEN LAT RDY 1,2,3,4 tb (four) – gray

SM 97 PL RETENTION

√PL SEL 1 RDY-FOR-LAT 1,2,3,4 (eight): 1

* If at ELC BERTH and any PL RETEN PL RDY tb – bp,
 * mnvr per table:

Missing RDY	RHC Input (with THC dwn)
1,2	+PITCH (up)
3,4	-PITCH (dwn)
1,3	+ROLL (right)
2,4	-ROLL (left)
1	+PITCH (up)/+ROLL (right)
2	+PITCH (up)/-ROLL (left)
3	-PITCH (dwn)/+ROLL (right)
4	-PITCH (dwn)/-ROLL (left)

* If more than two tb – bp or missing tb pattern not shown,
 * mnvr out of PRLA and realign

6. LATCH PRLAs
 a. PRLA Setup

NOTE

When MCA LOGIC switches taken OFF, KU will mode to standby. MPM and MRL tbs – bp

MA73C:A MCA LOGIC MNC MID 2 – OFF
 :B MNB MID 4 – OFF

A6U √PL RETEN PL SEL – 1
 √LAT 1,2,3,4 (four) tb – REL
 √RDY 1,2,3,4 (four) tb – gray

SM 97 PL RETENTION

√PL SEL 1 RDY-FOR-LAT 1,2,3,4 (eight): 1
 √LAT 1,2,3,4 (eight): 0

- * If any LAT msw shows '1', expect *
- * single motor time (60 sec) *

b. Activate Latches

R13L √PL RETEN LAT 1,2,3,4,5 (five) – OFF
 LOGIC PWR SYS 1,2 (two) – ON
 BAY MECH PWR SYS 1,2 (two) – ON

c. PRLA Latch

Note single motor times (> 30 sec)

A6U PL RETEN LAT 3,4 (two) – LAT (tb-LAT), 60 sec max
 – OFF

Verify PL RETEN LAT RDY 1,2,3,4 tb (four) – gray

PL RETEN LAT 1,2 (two) – LAT (tb-LAT), 60 sec max
 – OFF

BRAKES – ON (tb-ON)

d. Deactivate Latches

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

MA73C:A * If not mating ROEU: *

* MCA LOGIC MNC MID 2 – ON *

* MNB MID 4 – ON *

* If using Shuttle attitude control: *

* DAP: LVLH *

* When rates damped: *

* DAP: FREE > 2 sec *

* DAP: AUTO *

* Go to step 8 *

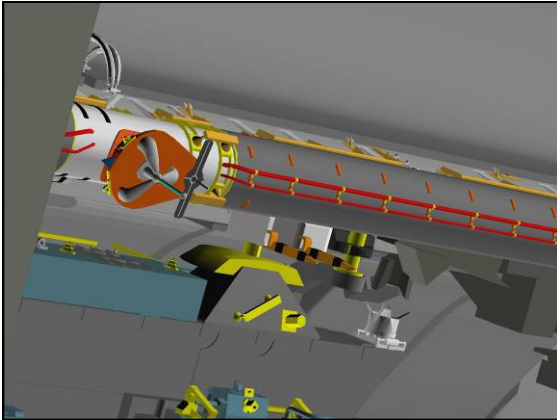
:B

7. ROEU MATE

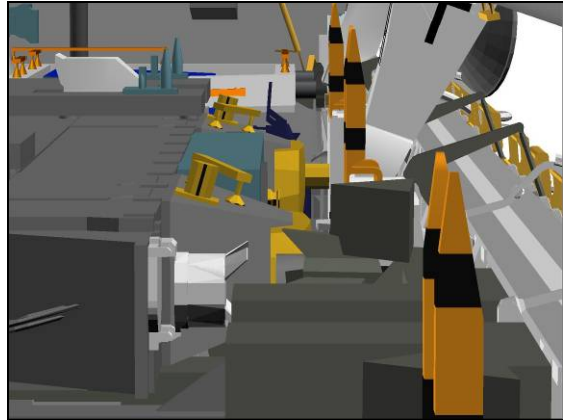
a. Setup for ROEU

A7U

CCTV – configure for ROEU mate (Lab or C)



13: LAB (-48,-19)
Full Zoom In



CCTV C (0,-5)
Full Zoom In

A6U

Install ROEU A6U PANEL OVERLAY

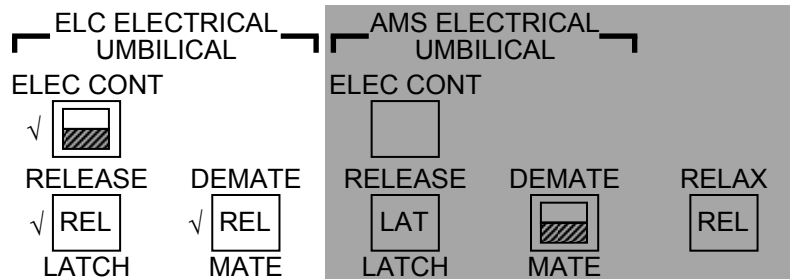
√PL RETEN LAT (five) – OFF
PL SEL – MON

SM 97 PL RETENTION

√PL SEL 1 LAT 5 (two): 0
√2 LAT 1,2 (four): 0

- * If any LAT msw shows '1', *
- * expect single motor time *

PL RETEN PL SEL – 2



L12L
SSP2

√ELC3 BUS 2/3 tb – bp
√BUS 1 tb – bp

R1

√PL PRI MNB,FC3,MNC (three) – ctr (tb-OFF)

A6U
R13L

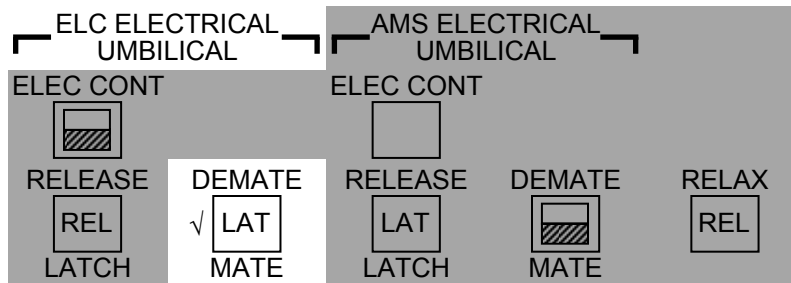
PL RETEN LOGIC PWR SYS 1,2 (two) – ON
BAY MECH PWR SYS 1,2 (two) – ON

b. Mate ROEU

Note single motor time (> 30 sec)

A6U

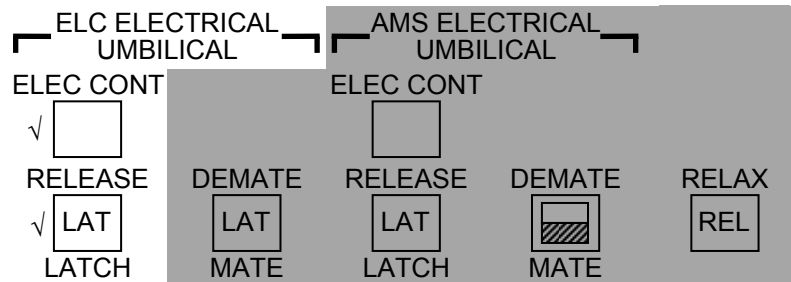
ELC DEMATE/MATE – MATE (tb-LAT), 60 sec max
– OFF



c. Latch ROEU

Note single motor time (> 20 sec)

ELC RELEASE/LATCH – LAT (tb-LAT), 40 sec max
– OFF



d. Relax ROEU

PL RETEN PL SEL – 1

Note single motor time (> 12 sec)

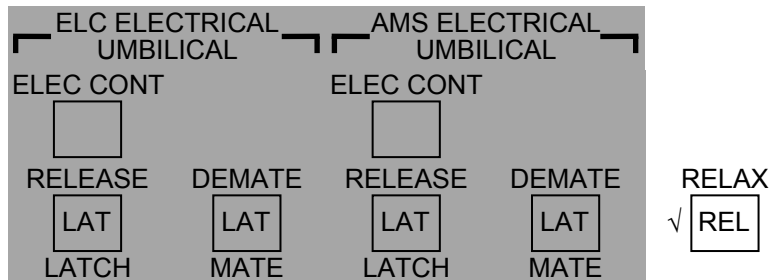
SM 97 PL RETENTION

Monitor PL SEL 1 LAT 5 REL msw status

RELAX – RELAX (tb-REL), 24 sec max

When PL SEL 1 LAT 5 REL A(B) msw changes to 1:

RELAX – OFF



e. Deactivate ROEU

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

MA73C:A MCA LOGIC MNC MID 2 – ON
:B MNB MID 4 – ON

- * If using Shuttle attitude control: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *

f. Activate ELC Power

R1 PL PRI MNC – ON (tb-ON)
L12L cb SW PWR 4 – cl
SSP2 ELC3 PWR – ON
√BUS 2/3 tb – UP
√BUS 1 tb – UP

8. ELC RELEASE

A7U CCTV – configure for ungrapple
– RMS WRIST, ZOOM: 34.0 HFOV
FOCUS: 5 ft

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

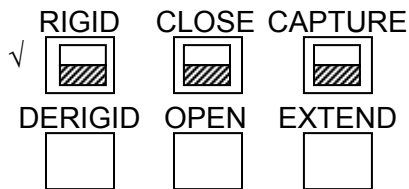
CAUTION
Monitor EE tb timing to prevent EE motor burnout

SM 169 PDRS STATUS

Monitor EE msw status

When OPEN tb – gray, mnvr arm clear of grapple pin (until Z = -516)

EE MODE – AUTO
RELEASE sw – depress (mom)



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

- * If manual release reqd: *
- * 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) *
- * *
- * Mnvr clear of grapple pin *
- * EE MAN CONTR – DERIGID (hold until EXTEND tb-gray, 20 sec max) *
- * MODE – OFF *

ELC PRE-GRAPPLE posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1021	-15	-516	270	0	180	0
SY	SP	EP	WP	WY	WR	
-20.9	+64.0	-90.0	-71.3	+18.1	+222.0	

BRAKES – ON (tb-ON)

RHC

9. MNVR TO PRECRADLE

RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – as desired (OCAS valid)

Mnvr to PRECRADLE:

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	0.0	

BRAKES – ON (tb-ON)

√MODE – not DIRECT (lt off)

PARAM – PORT TEMP

JOINT – CRIT TEMP

This Page Intentionally Blank

ELC REFERENCE

ELC PL ID UPLINK VERIFICATION	FS 3-2
COORDINATE SYSTEM – PL ID 3	FS 3-3
JOINT ANGLES VS POR COORDINATES	FS 3-4
PRLA CONFIG.....	FS 3-5

ELC
REF DATA

ELC PL ID UPLINK VERIFICATION

SM 94 PDRS CONTROL

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

	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	0.0	

SM 94 PDRS CONTROL

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

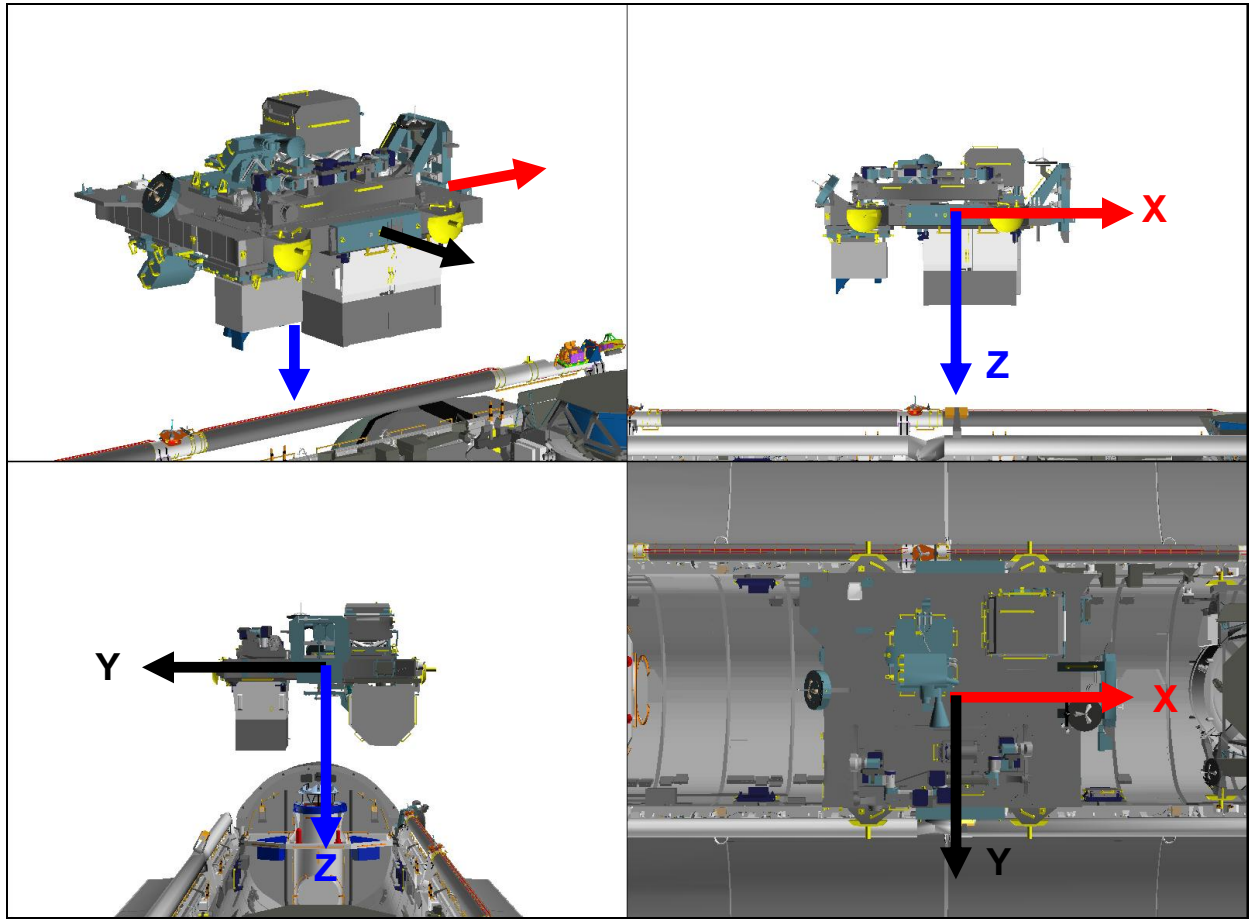
	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1299	-161	-639	275	1	182	3
	SY	SP	EP	WP	WY	WR	
√	0.0	+25.0	-25.0	+5.0	0.0	0.0	

SM 94 PDRS CONTROL

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

ELC
REF DATA

ELC COORDINATE SYSTEM – PL ID 3



POR: Centered at trunnion level, aligned with ORAS

PURPOSE: ELC Unberth and Handoff

RATES:	<u>COARSE</u>	<u>VERN</u>
TRANS LIM ft/sec	0.23	0.10
ROT LIM deg/sec	0.83	0.28

JOINT RATES:	<u>COARSE</u>	<u>VERN</u>
SHOULDER LIM deg/sec	0.40	0.13
ELBOW LIM deg/sec	0.56	0.19
WRIST LIM deg/sec	0.83	0.28

ELC JOINT ANGLES VS POR COORDINATES

ELC PREGRAPPLE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1021	-15	-516	270	0	180	0
SY	SP	EP	WP	WY	WR	
-20.9	+64.0	-90.0	-71.3	+18.1	+222.0	

ELC GRAPPLE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-937	0	-414	0	0	0	3
-1021	-15	-460	270	0	180	0
SY	SP	EP	WP	WY	WR	
-18.1	+59.3	-95.5	-60.1	+18.5	+219.1	

ELC HOVER

X	Y	Z	PITCH	YAW	ROLL	PL ID
-937	0	-575	0	0	0	3
-1021	-15	-620	270	0	180	0
SY	SP	EP	WP	WY	WR	
-25.8	+66.6	-72.6	-92.8	+17.5	+227.2	

ELC PORT

X	Y	Z	PITCH	YAW	ROLL	PL ID
-975	-250	-575	0	0	0	3
-1059	-265	-621	270	0	180	0
SY	SP	EP	WP	WY	WR	
+10.5	+64.3	-52.0	-98.6	+19.2	+188.9	

ELC INTERMEDIATE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-886	-594	-241	234	318	281	3
-885	-507	-200	218	47	103	0
SY	SP	EP	WP	WY	WR	
+60.2	+21.3	-60.0	+19.9	+61.7	-0.1	

ELC HANDOFF

X	Y	Z	PITCH	YAW	ROLL	PL ID
-282	-538	-374	273	320	8	3
-339	-500	-299	178	354	140	0
SY	SP	EP	WP	WY	WR	
+124.7	+21.3	-41.8	+19.9	+61.7	-0.1	

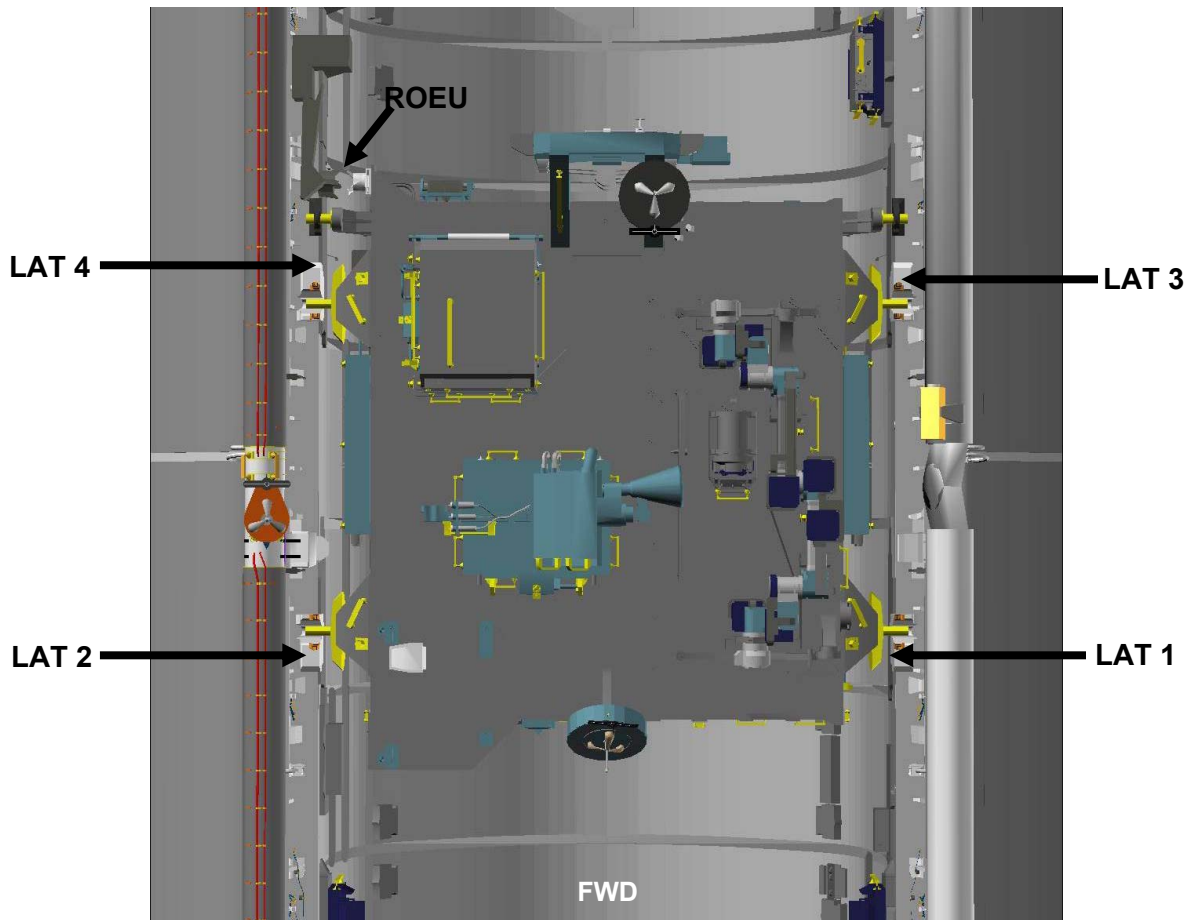
ELC BACKOFF

X	Y	Z	PITCH	YAW	ROLL	PL ID
-389	-507	-297	178	354	140	0
SY	SP	EP	WP	WY	WR	
+118.5	+28.8	-56.0	+26.4	+67.9	+0.1	

ELC INSTALL VIEWING

X	Y	Z	PITCH	YAW	ROLL	PL ID
-445	-534	-364	98	29	359	0
SY	SP	EP	WP	WY	WR	
+118.5	+28.8	-56.0	+105.0	+1.5	+140.0	

ELC PRLA CONFIG



NOTE

The ELC does not have an AKA. The keel structure remains in the PLB

ROEU		
Function	PL SEL	LAT/REL
Release/Latch	2	1
Demate/Mate	2	2
Relax	1	5

PRLA		
Release Sequence	PL SEL	LAT/REL
PRLA (fwd)	1	1,2
PRLA (aft)	1	3,4

This Page Intentionally Blank

AMS NOMINAL

AMS GRAPPLE	FS 4-3
UNBERTH AND HANDOFF	FS 4-8
UNGRAPPLE AND VIEWING	FS 4-14
VIEWING TO PRECRADLE.....	FS 4-19

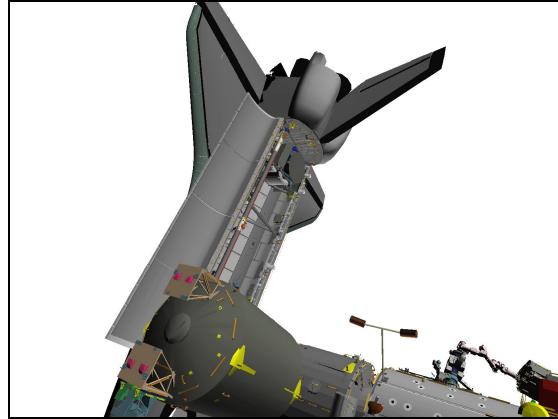
AMS
NOMINAL

This Page Intentionally Blank

AMS GRAPPLE

1. SETUP

DNLK	Elbow
DTV	B
MON 1	03: S1 LOOB(09: P1 LOOB)
MON 2	A



03: S1 LOOB (82,67)
 SRMS will come into FOV
 Zoom in on AMS FRGF during grapple

SM 94 PDRS CONTROL

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

END POS – ITEM 18 -1 0 9 9 -6 8 -5 3 0 EXEC
 ATT – ITEM 21 +3 4 0 +3 5 8 +1 2 6 EXEC
 CMD CK – ITEM 25 EXEC (GOOD)

Verify at ELC INSTALL VIEWING posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-445	-534	-364	98	29	359	0
	SY	SP	EP	WP	WY	WR	
√	+118.5	+28.8	-56.0	+105.0	+1.5	+140.0	

2. AMS PRE-GRAPPLE SETUP

NOTE

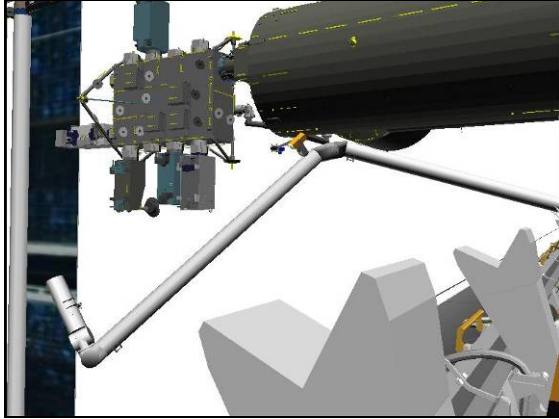
Minimum clearance between SRMS and JPM is 46 inches at SY = 115°. Monitor with Camera B

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

Mnvr to OCAS START posn:

ELC Viewing
1: SY –
OCAS Start

SY	SP	EP	WP	WY	WR		
+118.5	+28.8	-56.0	+105.0	+1.5	+140.0		
+50.0							
+50.0	+28.8	-56.0	+105.0	+1.5	+140.0		
X	Y	Z	PITCH	YAW	ROLL	PL ID	
-992	-484	-382	82	30	74	0	



CCTV B (-30,0)



CCTV A (40,10)

NOTE

Minimum clearance between the SRMS and JPM during OCAS is 37 inches at Y = -116. This increases to 43 inches at Pre-grapple Setup. Monitor with Camera A

RHC

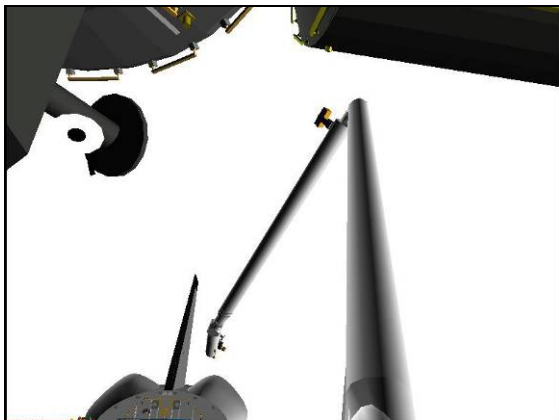
RATE – VERN (RATE MIN tb-ON)
MODE – OPR CMD, ENTER (READY It on)

AUTO SEQ – PROCEED (IN PROG It on)

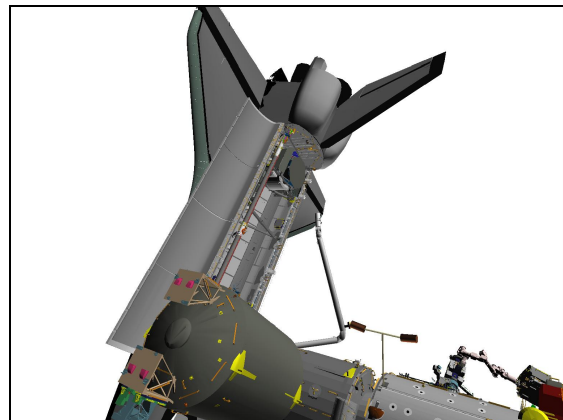
When AUTO SEQ IN PROG It – off:
BRAKES – ON (tb-ON)

AMS PRE-GRAPPLE SETUP posn: (01:25)

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1099	-68	-530	340	358	126	0
	SY	SP	EP	WP	WY	WR	
√	-10.9	+64.7	-94.4	+9.6	+15.1	+130.9	



CCTV A (10,30)



03: S1 LOOB (82,67)

3. SETUP FOR GRAPPLE

NOTE

Grapple setup performed here to avoid pausing at Pre-grapple due to the close clearances described in the clearance notes below

A7U

- CCTV – configure 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

DNLK	EE(Elbow)
DTV	B
MON 1	03: S1 LOOB(07: P1 LOIB)
MON 2	A(D)

4. AMS GRAPPLE

AMS Grapple Clearance Views	Cameras
Wrist to MISSE 8 [1] & Port Sill [2]	A, B, Elbow, 07: P1 LOIB
Wrist/Boom to ELC Keel [3]	03: S1 LOOB, A, D
EE to AMS Radiator [4]	03: S1 LOOB, Elbow

CLEARANCE NOTES

- [1] EE Camera-to-MISSE is 13 inches at pre-grapple with a minimum of 7 inches during mnvr to grapple (at X = -1111). WY-to-MISSE is 23 inches at grapple posn
- [2] EE Camera-to-Port Sill hardware is 22 inches at pre-grapple and closes to 10 inches at grapple posn
- [3] WP-to-ELC Keel is 36 inches at pre-grapple and increases during grapple. RMS Boom-to-ELC Keel is 51 inches at grapple posn
- [4] EE-to-AMS minimum 51 inches during mnvr to pre-grapple (at Z = -443)

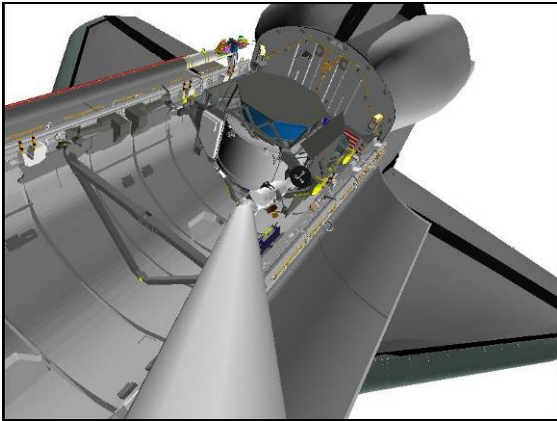
RHC

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

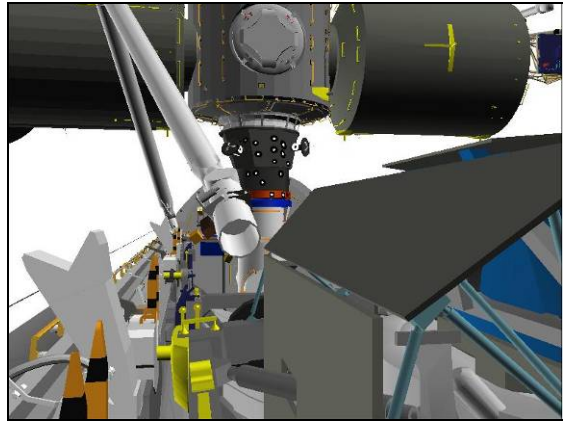
I

Mnvr to AMS PRE-GRAPPLE (THC down):

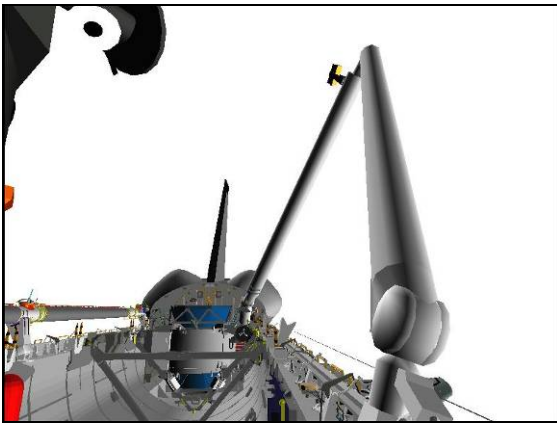
X	Y	Z	PITCH	YAW	ROLL	PL ID
-1099	-68	-436	340	358	126	0
SY	SP	EP	WP	WY	WR	
-6.1	+53.4	-99.3	+26.1	+10.5	+129.2	



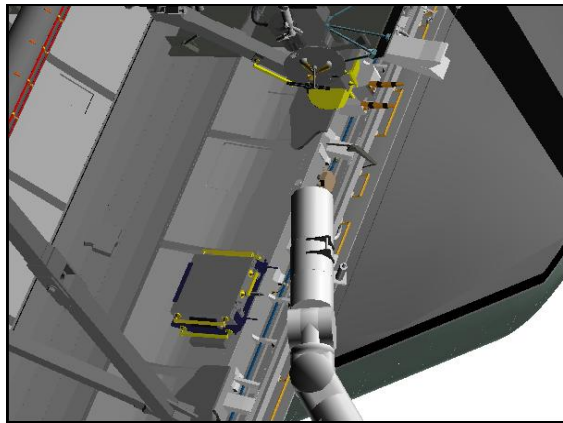
ELBOW (5,-5)



CCTV B (10,0)



CCTV A (5,15)



**03: S1 LOOB (82,67)
Zoom Full In**

MODE – END EFF, ENTER

Mnvr to grapple envelope

CAUTION
Monitor EE tb timing to prevent EE motor burnout

SM 169 PDRS STATUS
Monitor EE msw status

EE MODE – AUTO
CAPTURE sw – depress (mom)

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

CRITICAL TIMES (28 sec total):
 CAPTURE tb – gray, then
 CLOSE tb – gray, 3 sec max, then
 RIGID tb – gray, 25 sec max

- * If manual grapple reqd: *
- * EE MODE – MAN *
- * CAPTURE sw – depress (hold until CLOSE tb-gray, 3 sec max) *
- * MAN CONTR – RIGID (hold until RIGID tb-gray, 25 sec max) *

EE MODE – OFF

BRAKES – ON (tb-ON)

SM 94 PDRS CONTROL

PL ID – ITEM 3 +4 EXEC

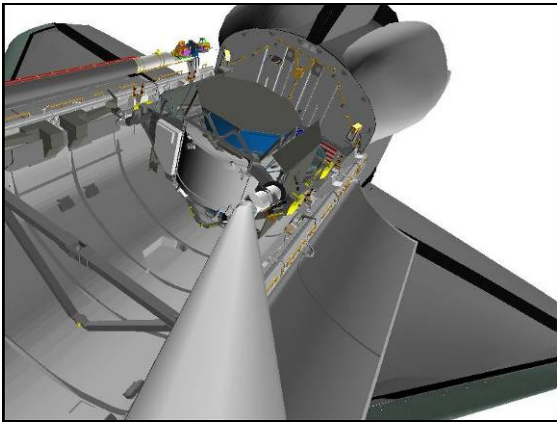
INIT ID – ITEM 24 +4 EXEC

Record POS/ATT and Joint Angles:

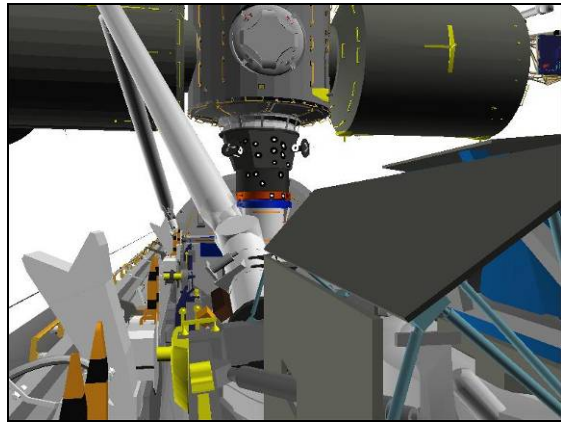
	X	Y	Z	PITCH	YAW	ROLL	PL ID
Expected							4
	-1203	0	-414	0	0	0	4
	SY	SP	EP	WP	WY	WR	
Expected	-4.6	+40.9	-81.7	+21.0	+9.3	+128.3	

Record POS/ATT and Joint Angles in AMS CONTINGENCY REBERTH
(AMS CONTINGENCY)

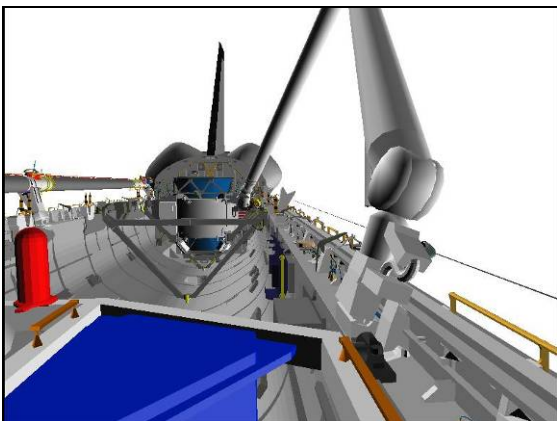
Review GENERIC END EFFECTOR CUE CARD – ISS/SHUTTLE DOCKED OPS



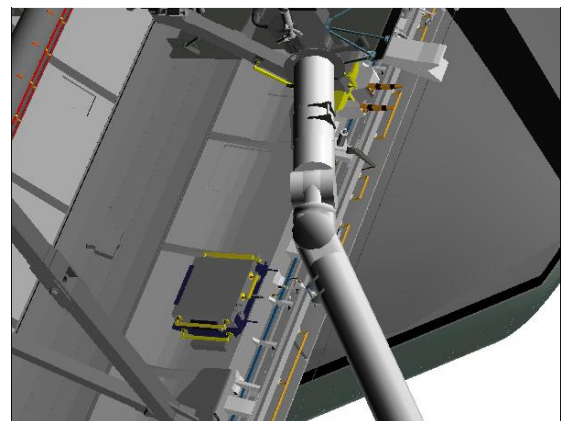
ELBOW (5,-5)



CCTV B (10,0)



CCTV A (5,-5)

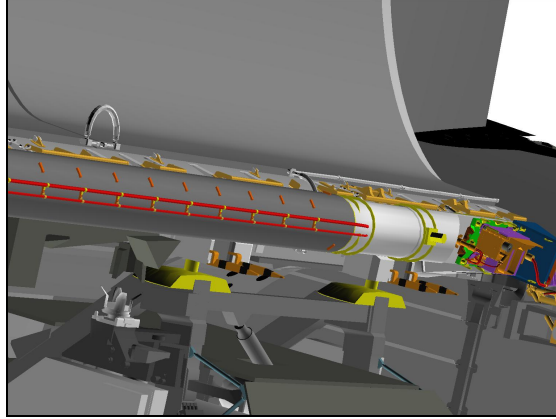


**03: S1 LOOB (82,67)
Zoom Full In**

AMS UNBERTH AND HANDOFF

1. SETUP

DNLK	Elbow
DTV	Mux B/C
MON 1	13: LAB(D)
MON 2	A



13: LAB (-37,-20)
Zoom Full In

SM 94 PDRS CONTROL

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

PCS

MSS: SSRMS: Thrusters: **Thruster Controls for MSS Ops**
Verify 'Desat Request:' Inhibit

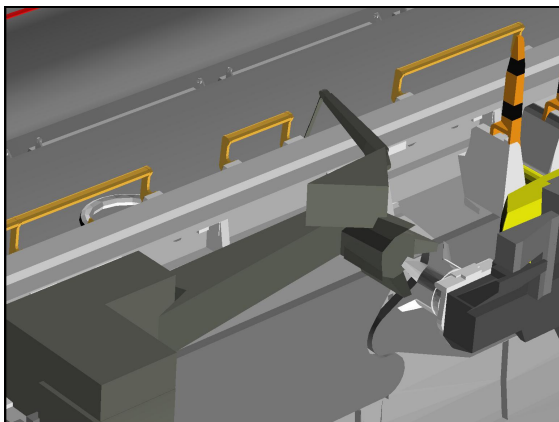
- * If using Shuttle attitude control, verify in attitude; *
- * DAP: FREE *

2. ROEU DEMATE

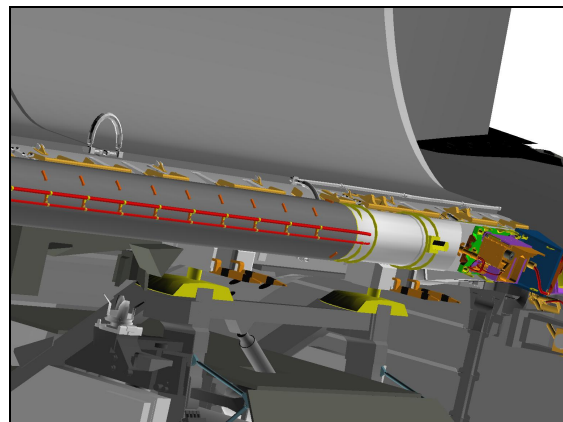
a. Setup

A7U

CCTV – configure for ROEU demate (Elbow or Lab)



ELBOW (-20,10)
Zoom Full In



13: LAB (-37,-20)
Zoom Full In

A6U

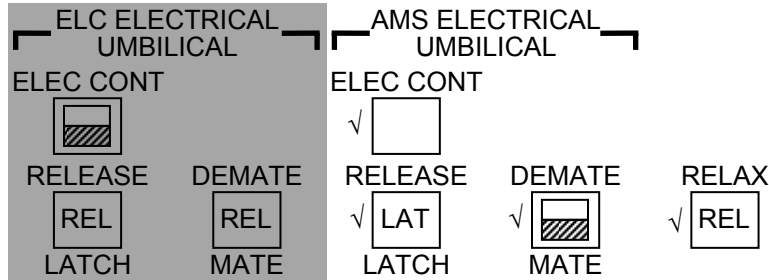
Install ROEU A6U PANEL OVERLAY

√PL RETEN LAT 1,2,3,4,5 (five) – OFF
PL SEL – 2

SM 97 PL RETENTION

√PL SEL 2 REL 3,4 (four): 0

- * If any REL msw shows '1', drive *
- * latch for single motor time *



L12L(SSP2) b. Deadface ROEU
√cb SW PWR 4 – op

A15 On MCC GO:
APCU 1,2 CONV (two) – OFF
1 OUTPUT – OFF

c. Activate ROEU

NOTE

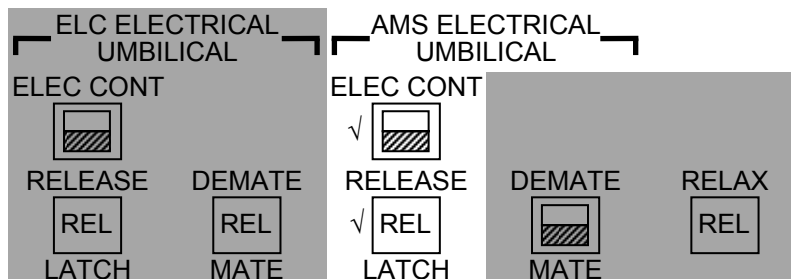
When MCA LOGIC switches taken OFF, KU will mode to standby. MPM and MRL tbs – bp

MA73C:A MCA LOGIC MNC MID 2 – OFF
:B MNB MID 4 – OFF

A6U PL RETEN LOGIC PWR SYS 1,2 (two) – ON
R13L BAY MECH PWR SYS 1,2 (two) – ON

d. Release Latches
Note single motor time (> 20 sec)

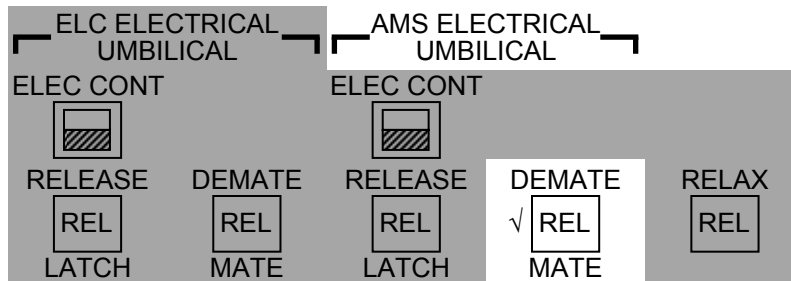
A6U AMS RELEASE/LATCH – REL (tb-REL), 40 sec max
– OFF



e. Demate ROEU

Note single motor time (> 18 sec)

AMS DEMATE/MATE – DEMATE (tb-REL), 36 sec max
– OFF



f. Deactivate ROEU

PL RETEN LOGIC PWR SYS 1,2 (two) – OFF
BAY MECH PWR SYS 1,2 (two) – OFF

R13L

3. PRLA RELEASE

a. Configure for PRLAs

Remove ROEU A6U PANEL OVERLAY

A6U

√PL RETEN LAT 1,2,3,4,5 (five) – OFF
PL SEL – 3

SM 97 PL RETENTION

√PL SEL 3 RDY-FOR-LAT 1,2,3,4,5 (ten): 1
√LAT 1,2,3,4,5 (ten): 1

- * If any REL msw shows '1', *
- * expect single motor time (60 sec) *

PL RETEN LOGIC PWR SYS 1,2 (two) – ON
BAY MECH PWR SYS 1,2 (two) – ON

R13L

b. AKA Release

√PL RETEN LAT 5 tb – LAT
√RDY 5 tb – gray

A6U

Note single motor times (> 30 sec)

PL RETEN LAT 5 – REL (tb-REL), 60 sec max
– OFF

c. PRLA Release

√PL RETEN LAT 1,2,3,4 (four) tb – LAT
√RDY 1,2,3,4 (four) tb – gray

Note single motor times (> 30 sec)

PL RETEN LAT 1,2 (two) – REL (tb-REL), 60 sec max
– OFF
3,4 (two) – REL (tb-REL), 60 sec max
– OFF

d. Deactivate Latches
 PL RETEN LOGIC PWR SYS 1,2 (two) – OFF
 BAY MECH PWR SYS 1,2 (two) – OFF

R13L

MA73C:A MCA LOGIC MNC MID 2 – ON
 :B MNB MID 4 – ON

4. MNVR TO AMS HOVER

NOTE

Minimum clearance between stbd trunnions and OBSS is 4 inches at Z = -448 (REL = 182).
 Monitor with Lab Camera.

Clearance between the SRMS and JPM is 60 inches at AMS Hover. Monitor with Camera A

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

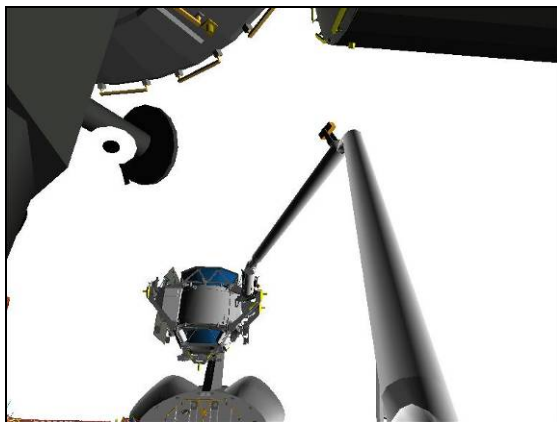
Mnvr AMS to Z = -630 (THC up)

A6U √PL RETEN LAT RDY 1,2,3,4 tb (four) – bp

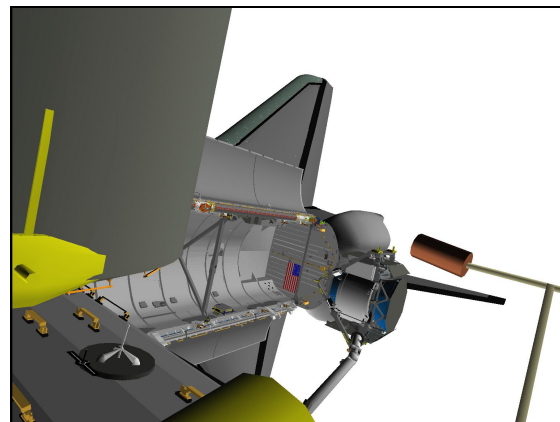
AMS HOVER posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1203	0	-630	0	0	0	4
	SY	SP	EP	WP	WY	WR	
√	-14.1	+56.7	-62.1	-15.1	+18.1	+132.1	

BRAKES – ON (tb-ON)



CCTV A (5,30)

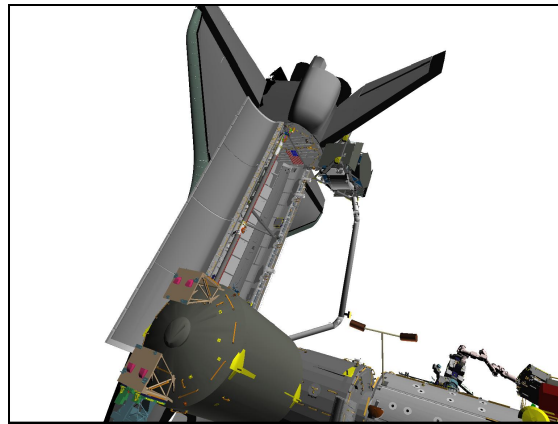


13: LAB (-37,-20)

- * If using Shuttle attitude control and attitude maintenance reqd: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *
- * When in attitude and rates damped: *
- * DAP: FREE *

5. MNVR TO HANDOFF

DNLK	Elbow
DTV	D
MON 1	03: S1 LOOB(09: P1 LOOB)
MON 2	A(C,B)



03: S1 LOOB (82,67)

SM 94 PDRS CONTROL

END POS – ITEM 18 -9 3 1 +3 7 6 -7 4 6 EXEC
 ATT – ITEM 21 +1 6 8 +3 0 7 +6 EXEC
 CMD CK – ITEM 25 EXEC (GOOD)

NOTE

At AMS Handoff, the clearance between the SRMS and PMA 2 grapple fixture is 28 inches and between the SRMS and Node 2 is 33 inches. Monitor with Elbow camera and/or Camera A

RHC

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

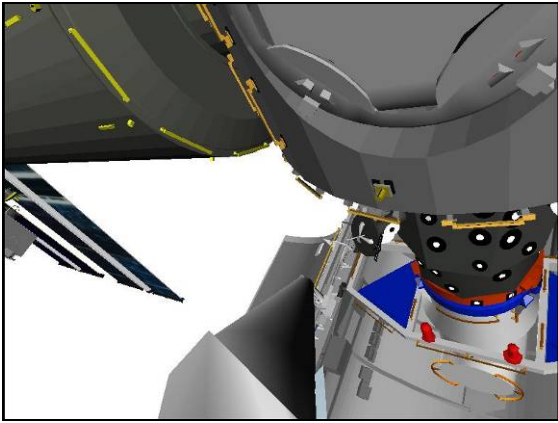
AUTO SEQ – PROCEED (IN PROG It on)

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

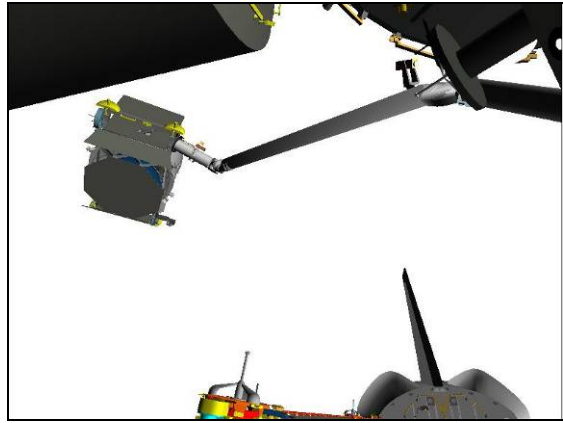
AMS HANDOFF posn: (11:10)

X	Y	Z	PITCH	YAW	ROLL	PL ID
√ -931	+376	-746	168	307	6	4
SY	SP	EP	WP	WY	WR	
√ -60.0	+34.8	-34.6	+14.7	-54.9	+5.4	

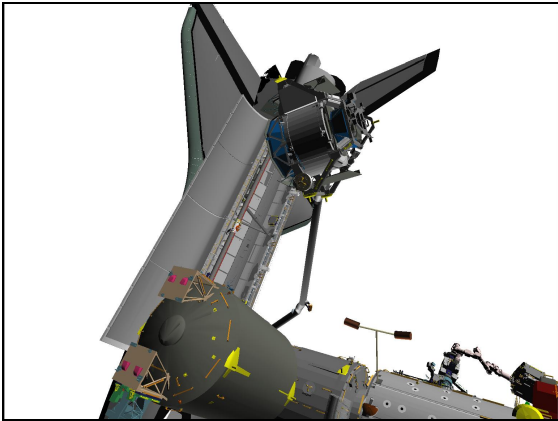
Notify SSRMS operator that SRMS at AMS Handoff with Brakes ON;
 GO for SSRMS AMS grapple



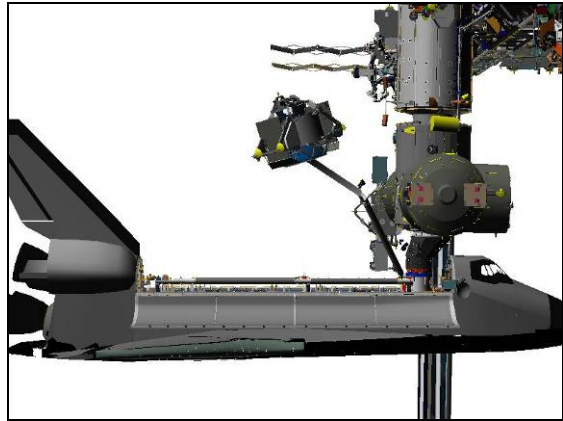
ELBOW (-160,-15)



CCTV D (-15,30)



03: S1 LOOB (82,67)

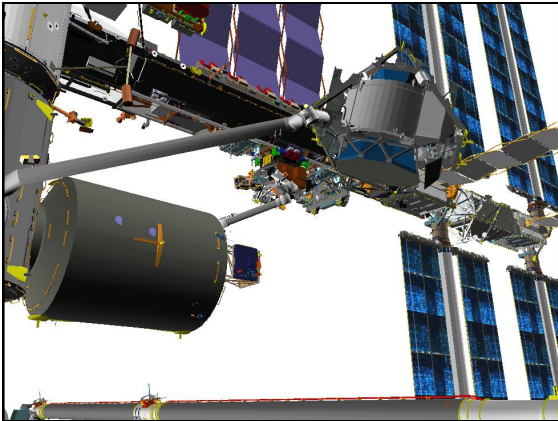


BIRD'S EYE

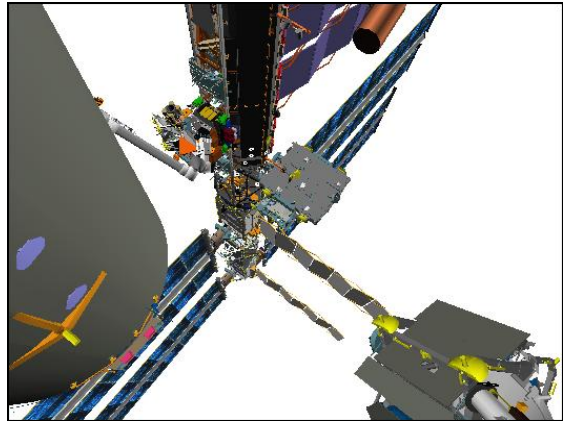
- * If using Shuttle attitude control and attitude maintenance reqd: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *

A7U

CCTV – config as required for SSRMS grapple



CCTV B (40,20)

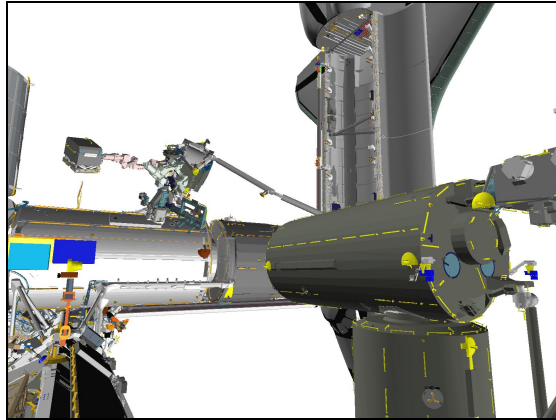


ELBOW (-30,30)

AMS UNGRAPPLE AND VIEWING

- A7U 1. SETUP
 CCTV – configure for ungrapple
 – RMS WRIST, ZOOM: 34.0 HFOV
 FOCUS: 5 ft

DNLK	EE(Elbow)
DTV	D
MON 1	09: P1 LOOB(07: P1 LOIB)
MON 2	B(A)



09: P1 LOOB (120,10)

2. AMS UNGRAPPLE
 On SSRMS operator GO, SSRMS grapple complete with Brakes ON,
 ready for SRMS release

NOTE

At AMS Backoff, the clearance between the SRMS and PMA 2 grapple fixture is 38 inches, SRMS and Node 2 is 40 inches, and SRMS and JPM is 53 inches. Monitor with Camera A, P1 LOOB, and/or Elbow (if not reqd for backoff).

CONTR ERR It and 'S96 PDRS CNTL' msg may occur due to Consistency/Envelope Check error

RHC RATE – COARSE (RATE MIN tb-OFF)

SM 94 PDRS CONTROL

AUTO BRAKE INH – ITEM 10 EXEC (*)

BRAKES – OFF (tb-OFF)

MODE – TEST, ENTER
 Wait 5 sec

BRAKES – ON (tb-ON)

SM 94 PDRS CONTROL

AUTO BRAKE ENA – ITEM 9 EXEC (*)

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

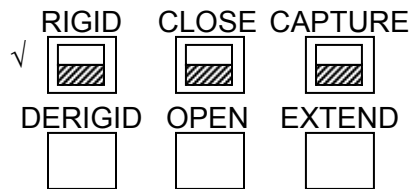
SM 169 PDRS STATUS

Monitor EE msw status

When OPEN tb – gray, mnvr arm clear of grapple pin (until Y = +251)

EE MODE – AUTO

RELEASE sw – depress (mom)



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

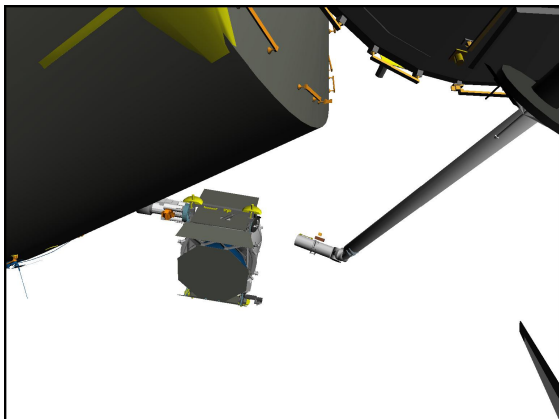
EE MODE – OFF

- * If manual release reqd: *
- * 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) *
- * *
- * Mnvr clear of grapple pin *
- * EE MAN CONTR – DERIGID (hold until EXTEND tb-gray, 20 sec max) *
- * MODE – OFF *

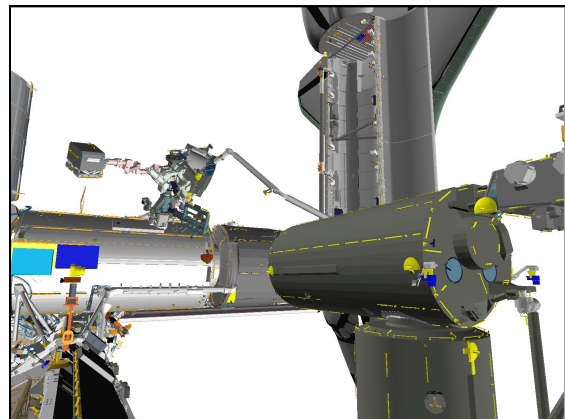
AMS BACKOFF posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-934	+251	-730	135	308	106	0
SY	SP	EP	WP	WY	WR	
-54.0	+44.8	-53.9	+27.1	-60.8	+8.4	

BRAKES – ON (tb-ON)



CCTV D (-30,40)



09: P1 LOOB (120,10)

- * If using Shuttle attitude control and attitude maintenance reqd: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *

3. AMS VIEWING SETUP

DNLK	Elbow
DTV	B(D)
MON 1	09: P1 LOOB(07: P1 LOIB)
MON 2	A

SM 94 PDRS CONTROL

END POS – ITEM 18 -1 0 9 7 +1 9 2 -6 2 1 EXEC
 ATT – ITEM 21 +3 4 1 +2 6 +2 9 9 EXEC
 CMD CK – ITEM 25 EXEC (GOOD)

NOTE

Minimum clearance between SRMS and JPM during OCAS is 46 inches at X = -980 (REL = 117). Monitor with Camera A and/or Elbow Camera

RHC

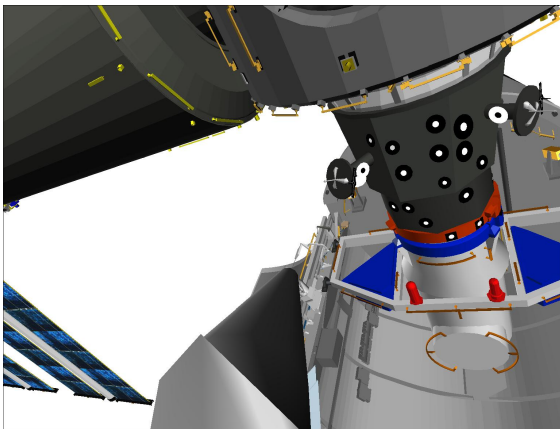
- √RATE – VERN (RATE MIN tb-ON)
- BRAKES – OFF (tb-OFF)
- MODE – OPR CMD, ENTER (READY lt on)

AUTO SEQ – PROCEED (IN PROG lt on)

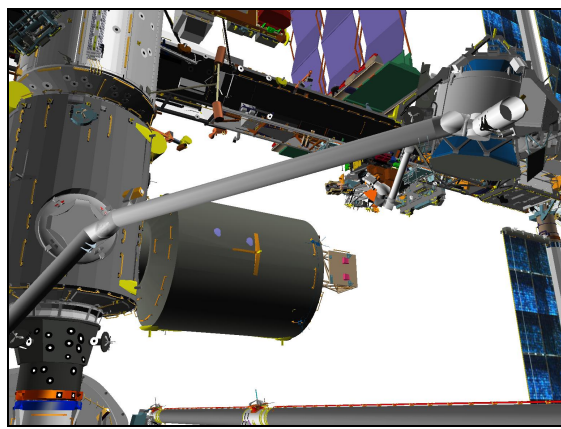
When AUTO SEQ IN PROG lt – off:
 BRAKES – ON (tb-ON)

INTERMEDIATE posn: (00:50)

X	Y	Z	PITCH	YAW	ROLL	PL ID
√ -1097	+192	-621	341	26	299	0
	SY	SP	EP	WP	WY	WR
√ -45.1	+25.2	-30.4	-23.4	+73.9	-39.8	



ELBOW (-160,-15)



CCTV B (30,20)

4. AMS VIEWING

NOTE

Minimum clearance between the SRMS boom and MAXI (on JEF) is 43 inches at SY = 88°. Monitor with Camera B and/or Elbow.

Minimum clearance between the SRMS Elbow Camera and the JLP is 57 inches at SY = 130°. Monitor with Camera B.

Expect C/W SINGULAR It during WY mnvr when $+75^\circ \leq WY \leq +105^\circ$

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

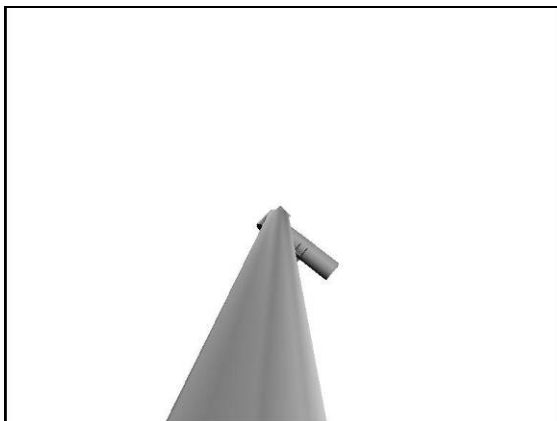
Mnvr to AMS INSTALL VIEWING posn:

	SY	SP	EP	WP	WY	WR	NOTES
Intermediate	-45.1	+25.2	-30.4	-23.4	+73.9	-39.8	
1: SY +	+170.0						
2: WY +					+111.5		MA, SINGULAR
AMS Viewing	+170.0	+25.2	-30.4	-23.4	+111.5	-39.8	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-173	-170	-511	72	301	347	0

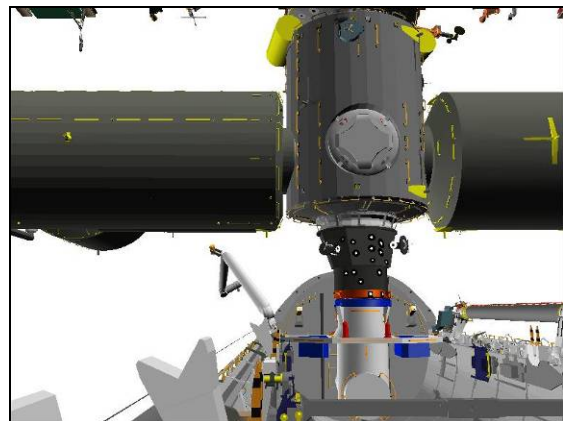
BRAKES – ON (tb-ON)
 ✓MODE – not DIRECT (It off)

PARAM – PORT TEMP
 JOINT – CRIT TEMP

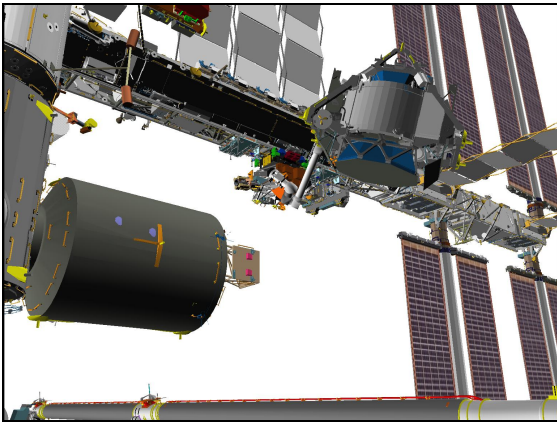
Notify SSRMS operator that SRMS at AMS Viewing posn, GO for install



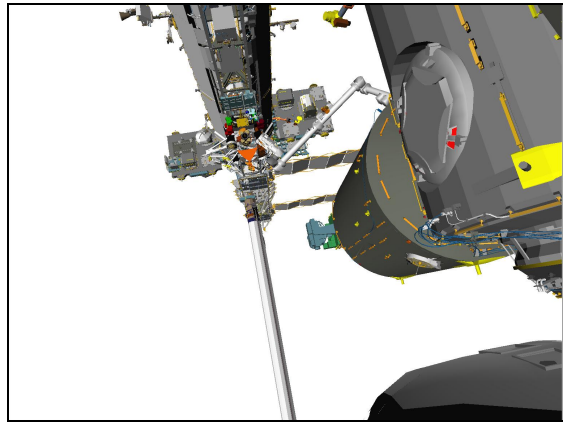
ELBOW (0,-5)



CCTV B (0,10)

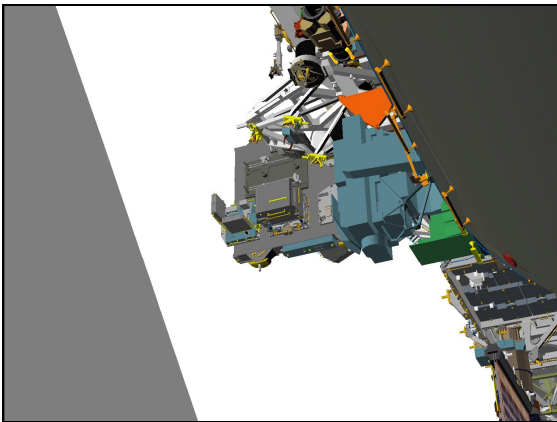


CCTV B (40,20)

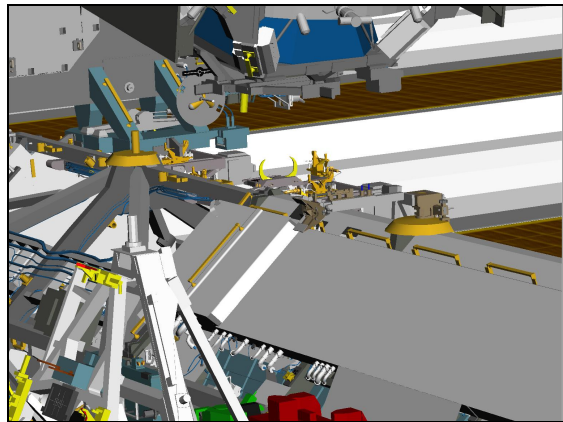


ELBOW (110,-50)

AMS Install



CCTV D (-113,32)
HFOV: 30°



EE

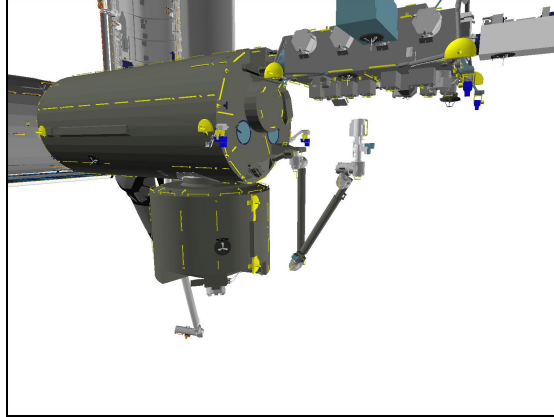
HFOV: 30° for big picture view
Zoom in as reqd during install
(full zoom at -90 cm shown)

- * If SSRMS operator requires EE view be adjusted: *
- * MON 2(DNLK) ← C (monitor RMS-JPM clearance) *
- * *
- * NOTE *
- * Expect REACH LIM It at WY = 114.6 *
- * Expect SINGULAR It at WY = 105.0 *
- * *
- * RATE – VERN (RATE MIN tb-ON) *
- * BRAKES – OFF (tb-OFF) *
- * MODE – as desired *
- * *
- * Mnvr as required *
- * *
- * BRAKES – ON (tb-ON) *

AMS VIEWING TO PRECRADLE

1. SETUP

DNLK	Elbow
DTV	B(C)
MON 1	09: P1 LOOB
MON 2	A



09: P1 LOOB (150,-10)

Tilt up to +30 as SRMS moves under JPM

SM 94 PDRS CONTROL

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

AMS INSTALL VIEWING posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-173	-170	-511	72	301	347	0
	SY	SP	EP	WP	WY	WR	
√	+170.0	+25.2	-30.4	-23.4	+111.5	-39.8	

2. MNVR TO PRECRADLE

On SSRMS operator GO, AMS release complete, ready for SRMS mnvr to Precradle

NOTE

Minimum clearance between the SRMS Elbow Camera and the JLP is 57 inches at SY = 130°. Monitor with Camera B.

Minimum clearance between the SRMS boom and MAXI (on JEF) is 43 inches at SY = 88°. Monitor with Camera B and/or Elbow.

Expect C/W SINGULAR It during WY mnvr when $+75^\circ \leq WY \leq +105^\circ$

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

Mnvr to PRECRADLE posn:

	SY	SP	EP	WP	WY	WR	NOTES
AMS Viewing	+170.0	+25.2	-30.4	-23.4	+111.5	-39.8	
1: SY –	0.0						
2: EP +			-25.0				
3: WP +				+5.0			
4: WY –					0.0		MA, SINGULAR
5: WR +						0.0	
Precradle	0.0	+25.2	-25.0	+5.0	0.0	0.0	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1261	-146	-551	5	2	0	0

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

PARAM – PORT TEMP
 JOINT – CRIT TEMP

AMS CONTINGENCY

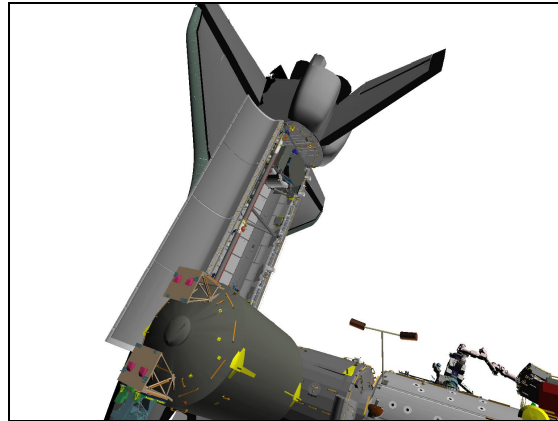
AMS SJ GRAPPLE	FS 5-3
UNBERTH AND HANDOFF	FS 5-13
UNGRAPPLE AND VIEWING	FS 5-22
CONTINGENCY REGRAPPLE	FS 5-33
REBERTH	FS 5-37

This Page Intentionally Blank

AMS SJ GRAPPLE

- A7U 1. SETUP
 CCTV – perform PAN/TILT reset
 – fully zoom out PLB & ELBOW cameras for SJ pictures
 – RMS WRIST, ZOOM: 34.0 HFOV
 FOCUS: 5 ft

DNLK	EE(Elbow)
DTV	B
MON 1	03: S1 LOOB(09: P1 LOOB)
MON 2	A



03: S1 LOOB (82,67)
 SRMS will come into FOV
 Zoom in on AMS FRGF during grapple

SM 94 PDRS CONTROL

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

Verify at ELC INSTALL VIEWING posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
√ -445	-534	-364	98	29	359	0
	SY	SP	EP	WP	WY	WR
√ +118.5	+28.8	-56.0	+105.0	+1.5	+140.0	

2. MNVR TO PRE-GRAPPLE SETUP

NOTE

Minimum clearance between SRMS and JPM is 46 inches at SY = 115° (in line 1). Monitor with Camera B.

Minimum clearance between SRMS and port sill is 50 inches at the end of line 5. Monitor with Camera B and S1 LOOB

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

MODE – best available

Mnvr to AMS SJ PRE-GRAPPLE SETUP posn:

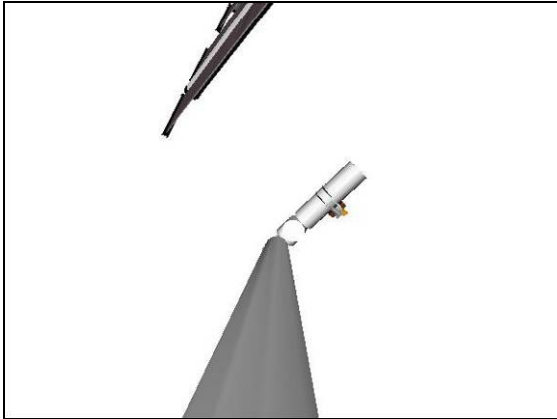
	SY	SP	EP	WP	WY	WR	
ELC View	+118.5	+28.8	-56.0	+105.0	+1.5	+140.0	
1: SY -	+40.0						
2: SP +		+53.4					
3: SY -	-6.1						
4: EP -			-90.0				
5: WP -				+26.1			
6: WY +					+10.7		
7: WR -						+129.2	
AMS Setup	-6.1	+53.4	-90.0	+26.1	+10.7	+129.2	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1131	-80	-480	349	1	128	0

BRAKES – ON (tb-ON)

MODE – not DIRECT (lt off)

Start:
ELC Install Viewing

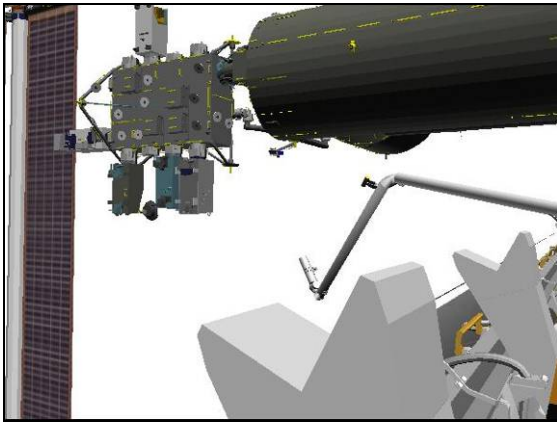
Step 1:
Drive SY- (for 78.5°)
From +118.5 to +40.0
NOTE: SRMS-to-JPM is 46 inches at 115°



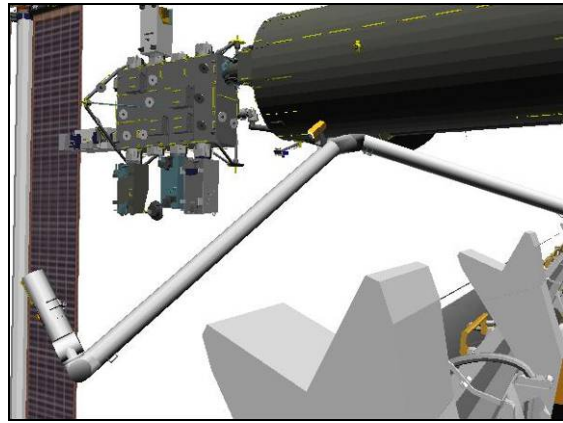
ELBOW (0,0)



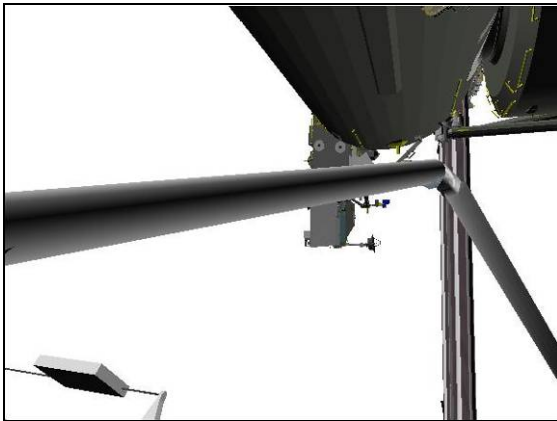
ELBOW (0,0)



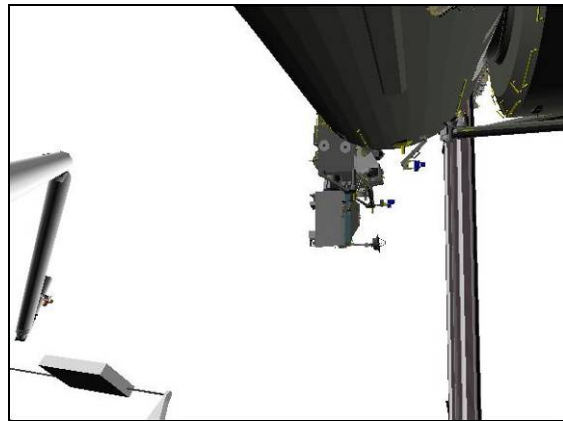
CCTV B (-30,0)



CCTV B (-30,0)



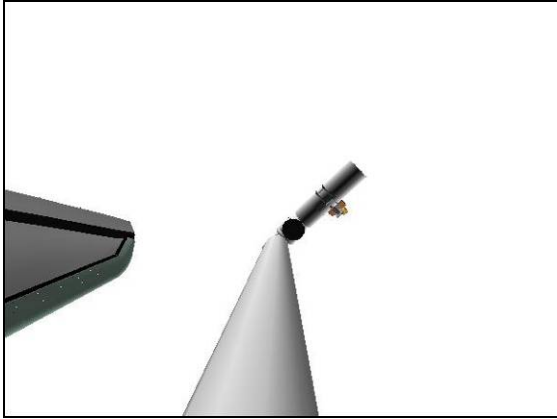
CCTV A (70,5)



CCTV A (70,5)

Step 2:

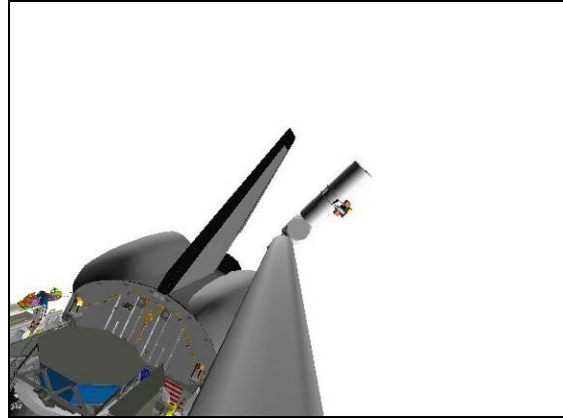
Drive SP+ (for 24.6°)
From +28.8 to +53.4



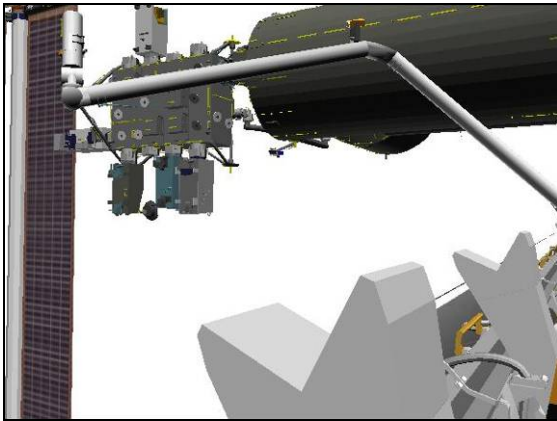
ELBOW (0,0)

Step 3:

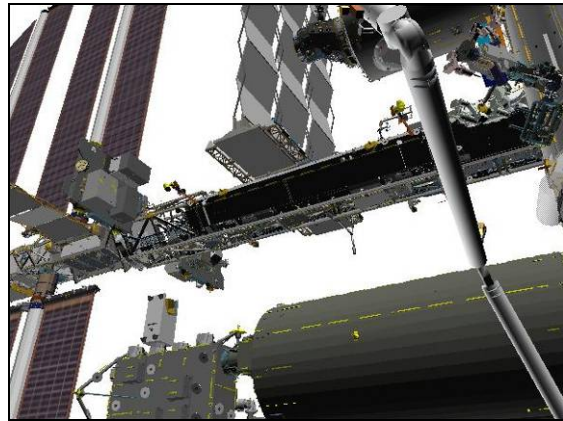
Drive SY- (for 46.1°)
From +40.0 to -6.1



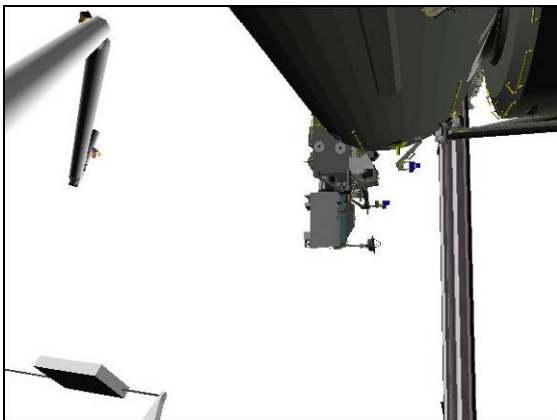
ELBOW (0,0)



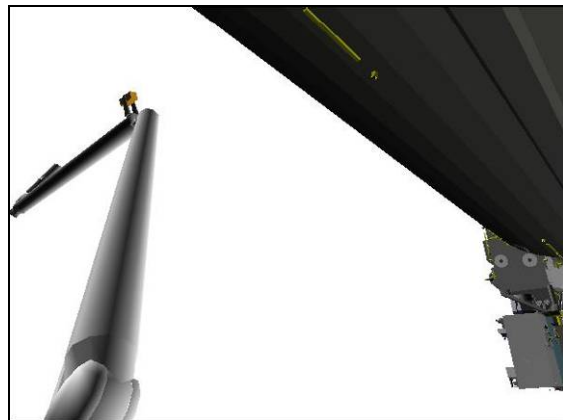
CCTV B (-30,0)



CCTV B (-30,30)



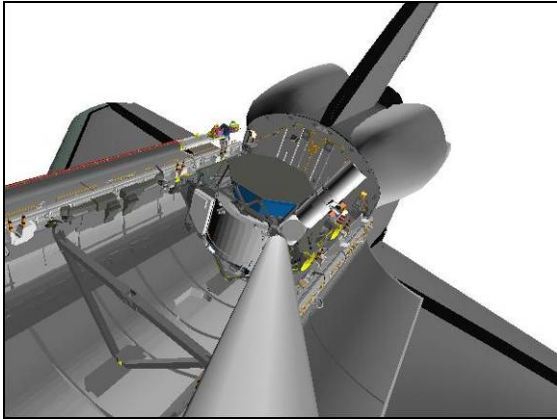
CCTV A (70,5)



CCTV A (45,25)

Step 4:

Drive EP- (for 34.0°)
From -56.0 to -90.0

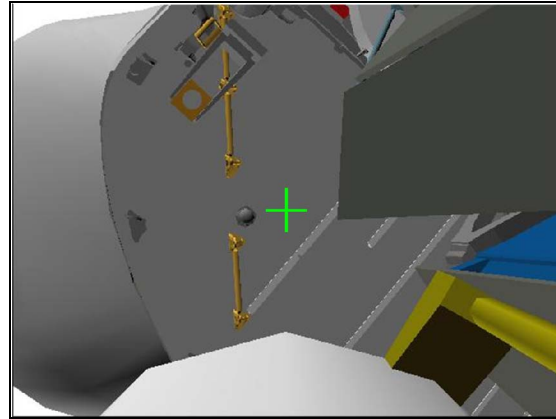


ELBOW (0,0)

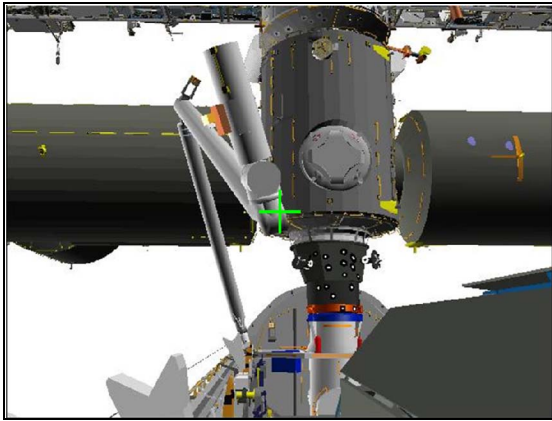
Step 5:

Drive WP- (for 78.9°)
From +105.0 to +26.1

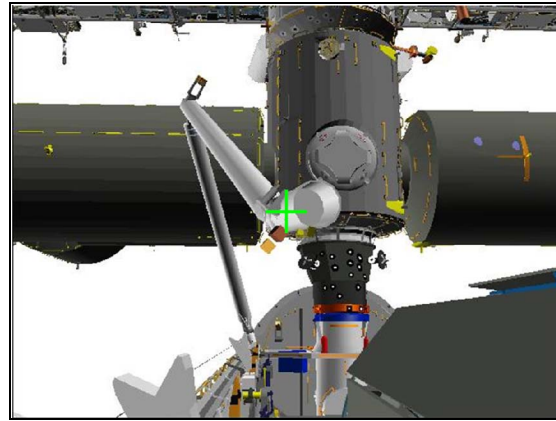
NOTE: SRMS-to-Sill is 50 inches at 26.1



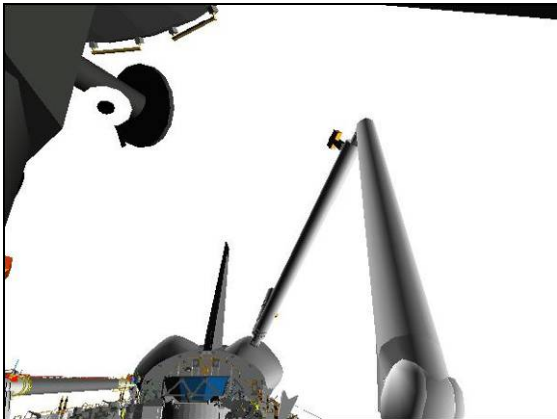
EE (HFOV: 34°)



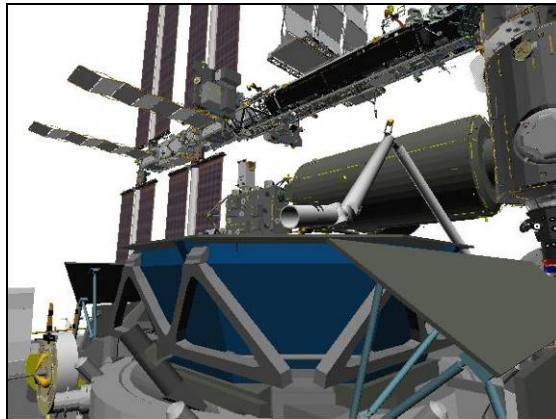
CCTV B (2,12)



CCTV B (2,12)



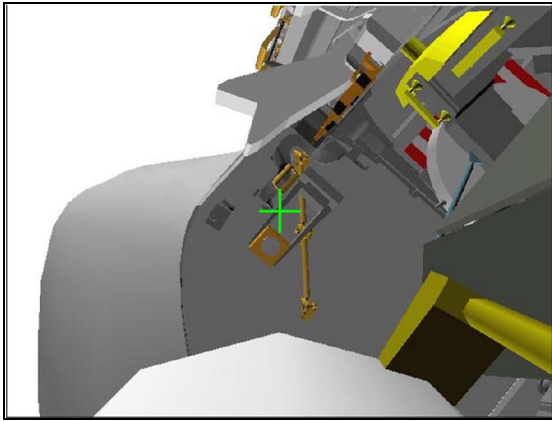
CCTV A (5,15)



CCTV C (-45,10)

Step 6:

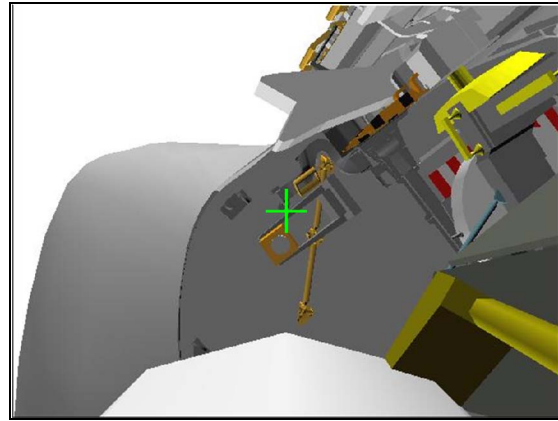
Drive WY+ (for 9.2°)
From +1.5 to +10.7



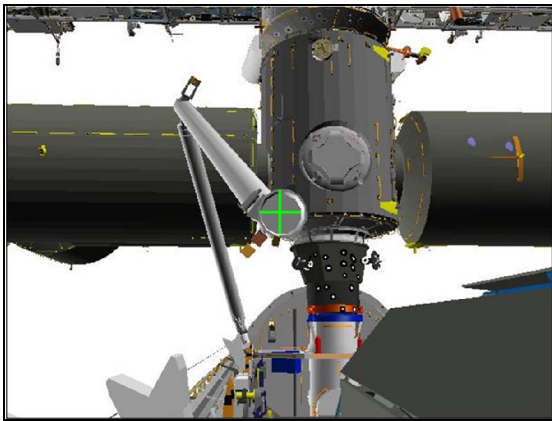
EE (HFOV: 34°)

Step 7:

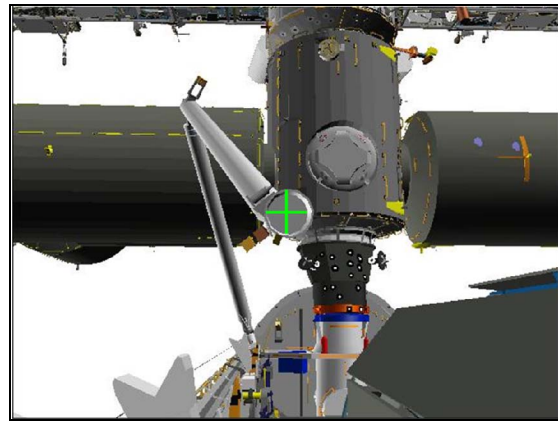
Drive WR- (for 10.8°)
From +140.0 to +129.2



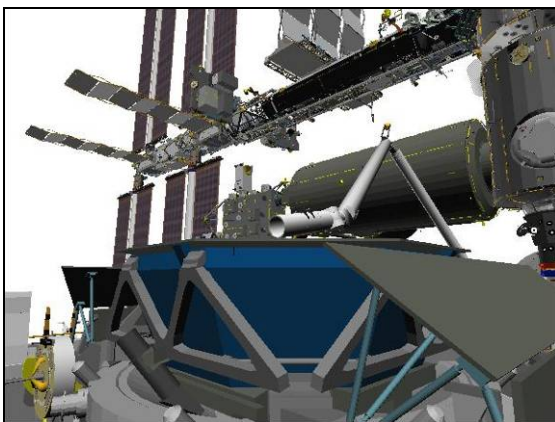
EE (HFOV: 34°)



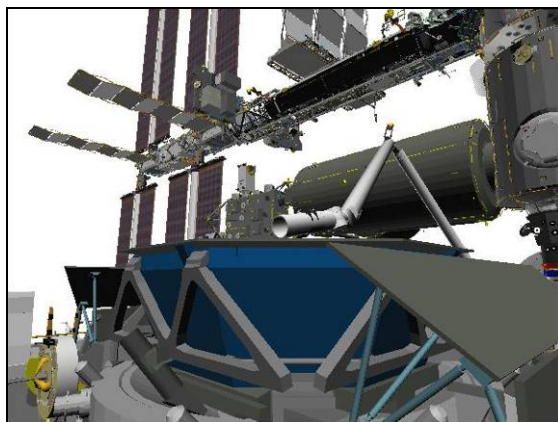
CCTV B (2,12)



CCTV B (2,12)



CCTV C (-45,10)



CCTV C (-45,10)

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

3. SETUP FOR GRAPPLE

NOTE

Grapple setup performed here to avoid pausing at Pre-grapple due to the close clearances described in the clearance notes below

A7U

CCTV – configure for grapple

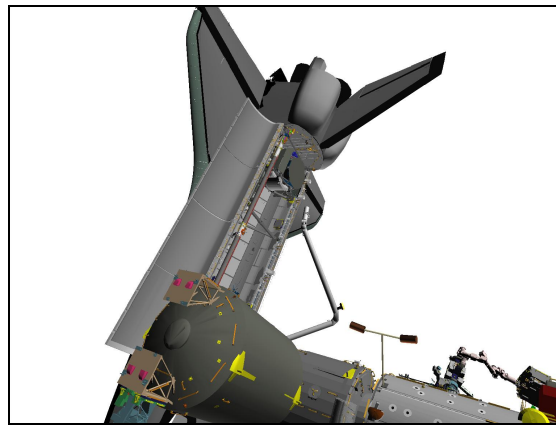
– install AMS SJ GRAPPLE IN PLB WRIST CCTV OVERLAY

– RMS WRIST, √ZOOM: 34.0 HFOV

√FOCUS: 5 ft

Maintain eyepoint ~18 in when using grapple overlay

DNLK	EE(Elbow)
DTV	B
MON 1	03: S1 LOOB(07: P1 LOIB)
MON 2	A



03: S1 LOOB (82,67)

4. AMS SJ GRAPPLE

AMS Grapple Clearance Views	Cameras
Wrist to MISSE 8 [1] & Port Sill [2]	A, B, Elbow, 07: P1 LOIB
Wrist/Boom to ELC Keel [3]	03: S1 LOOB, A, D
EE to AMS Radiator [4]	03: S1 LOOB, Elbow

CLEARANCE NOTES

[1] EE Camera-to-MISSE is 13 inches at pre-grapple.
WY-to-MISSE is 23 inches at grapple posn

[2] EE Camera-to-Port Sill hardware is 22 inches at pre-grapple and closes to 10 inches at grapple posn

[3] WP-to-ELC Keel is 36 inches at pre-grapple and increases during grapple. RMS Boom-to-ELC Keel is 51 inches at grapple posn

[4] EE-to-AMS minimum 35 inches during mnvr to pre-grapple at EP = -92.0°

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

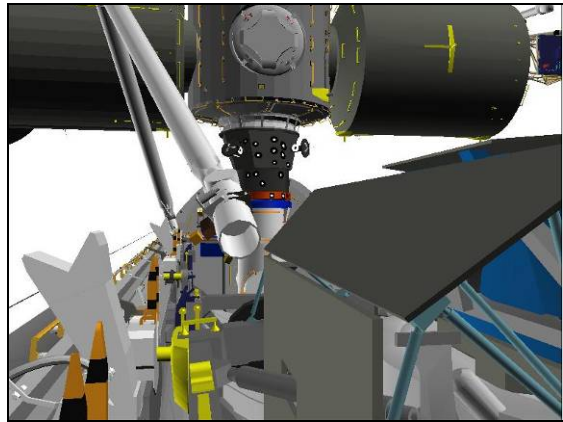
MODE – best available

Drive EP(-) to pre-grapple (reference pictures as required), then drive joints per AMS SJ GRAPPLE IN PLB WRIST CCTV OVERLAY and histogram until EE within grapple envelope

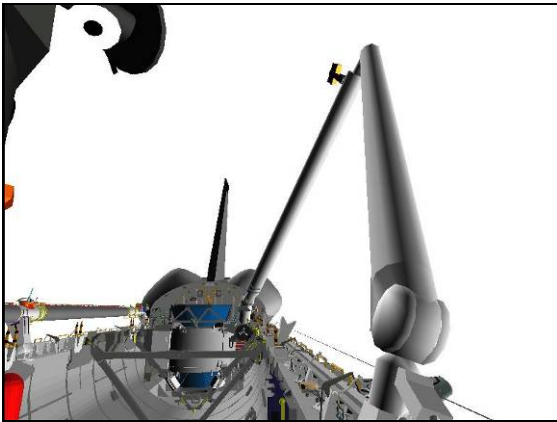
Drive EP- (for 9.3°) from -90.0 to -99.3



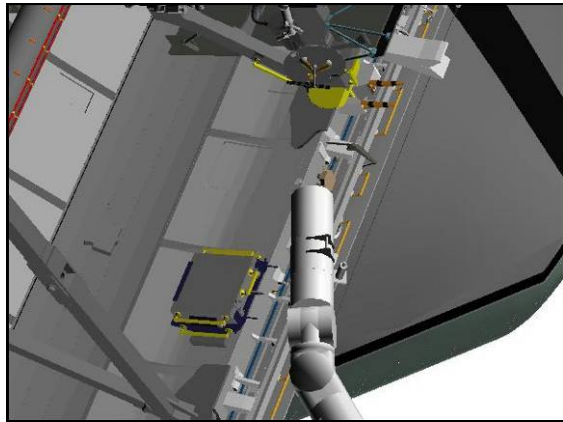
ELBOW (5,-5)



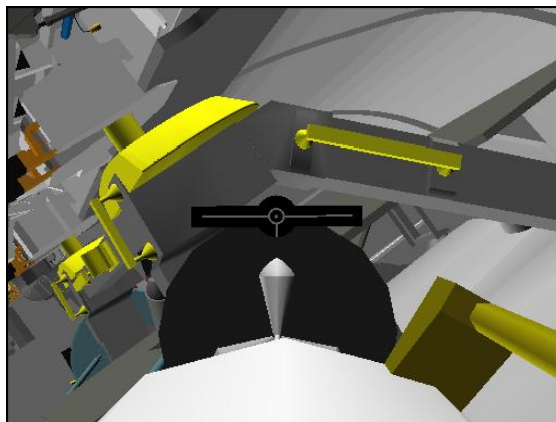
CCTV B (10,0)



CCTV A (5,15)

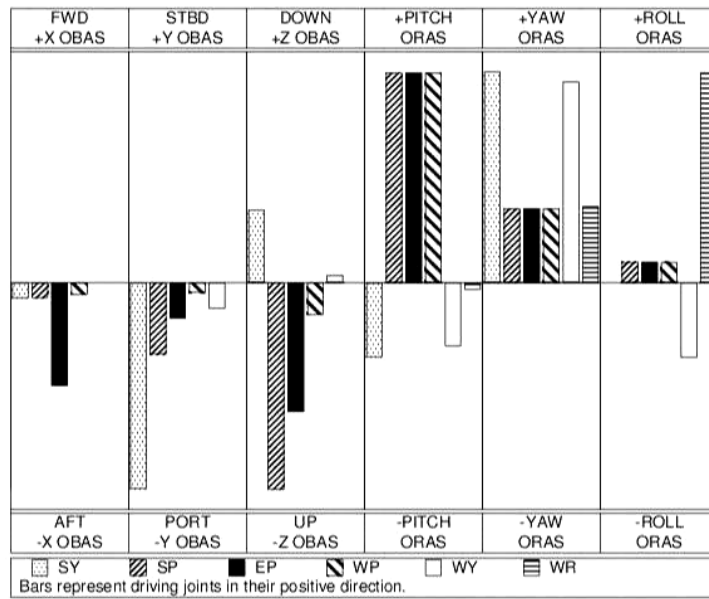


**03: S1 LOOB (82,67)
Zoom Full In**



EE (HFOV = 34.0°)

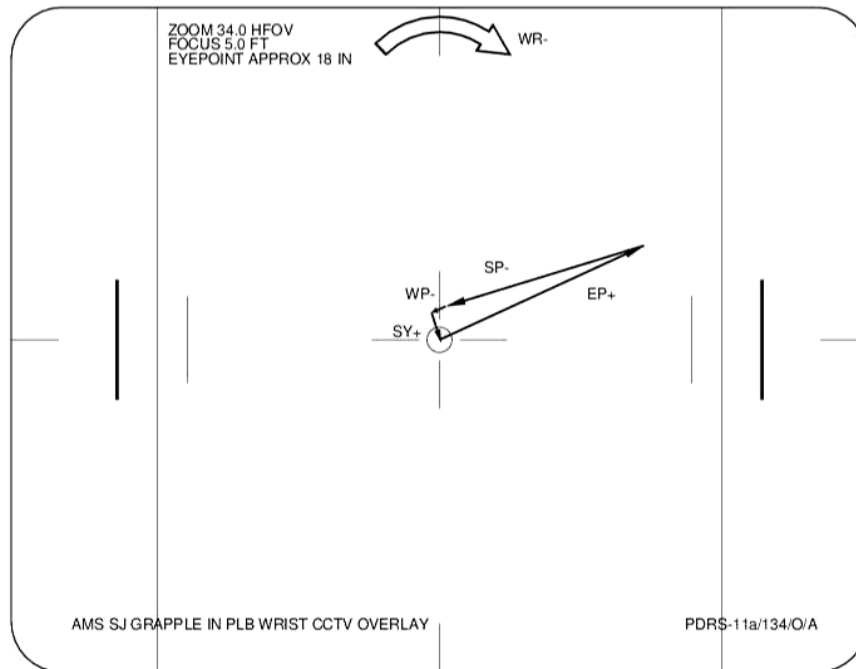
AMS SJ GRAPPLE IN PLB



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

ΔSY	ΔSP	ΔEP	ΔWP	ΔWY	ΔWR
+1.5	-12.5	+17.6	-4.9	-1.6	-0.5



5. AMS GRAPPLE

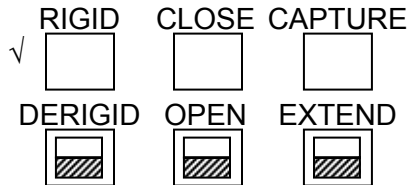
CAUTION
Monitor EE tb timing to prevent EE motor burnout

SM 169 PDRS STATUS

Monitor EE msw status

EE MODE – AUTO

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

- * If manual grapple reqd: *
- * EE MODE – MAN *
- * CAPTURE sw – depress (hold until CLOSE tb-gray, 3 sec max) *
- * MAN CONTR – RIGID (hold until RIGID tb-gray, 25 sec max) *

EE MODE – OFF

BRAKES – ON (tb-ON)

MODE – not DIRECT (It off)

SM 94 PDRS CONTROL

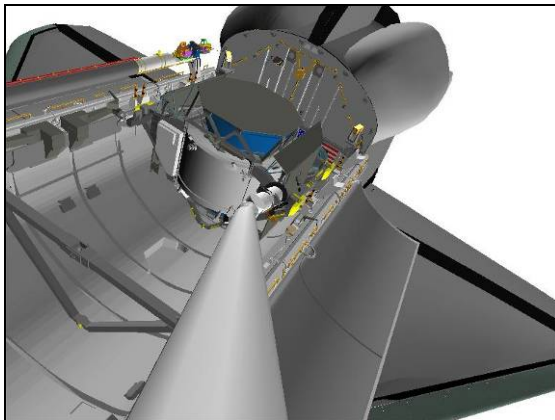
PL ID – ITEM 3 +4 EXEC

INIT ID – ITEM 24 +4 EXEC

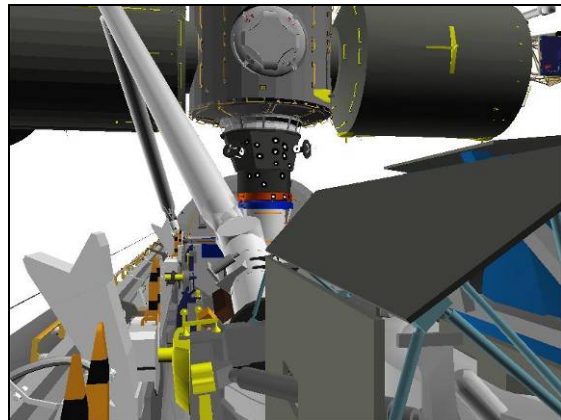
Record POS/ATT and Joint Angles:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
							4
Expected	-1203	0	-414	0	0	0	4
	SY	SP	EP	WP	WY	WR	
Expected	-4.6	+40.9	-81.7	+21.0	+9.3	+128.3	

Review GENERIC END EFFECTOR CUE CARD – ISS/SHUTTLE DOCKED OPS



ELBOW (5,-5)



CCTV B (10,0)

AMS SJ UNBERTH AND HANDOFF

1. SETUP, ROEU, AND PRLAS
Perform AMS UNBERTH AND HANDOFF (AMS NOMINAL), steps 1-3
2. SJ UNBERTH

NOTE

Minimum clearance between stbd trunnions and OBSS is
4 inches at Z = -448 (REL = 10). Monitor with Lab Camera

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

MODE – best available

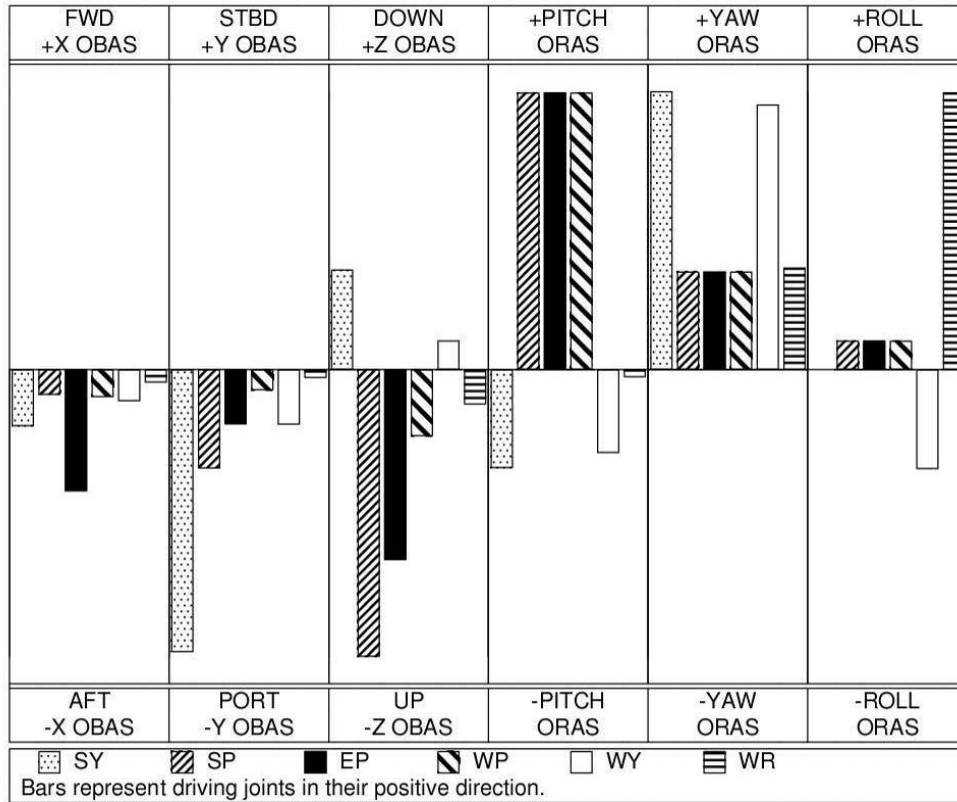
Drive joints per AMS SJ UNBERTH table and histogram to AMS SJ HOVER
(Z = -459)

A6U √PL RETEN LAT RDY 1,2,3,4,5 tb (five) – bp

AMS SJ UNBERTH

SUGGESTED JOINT ORDER

SP+, SY-, WP- (WY+ as req)



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

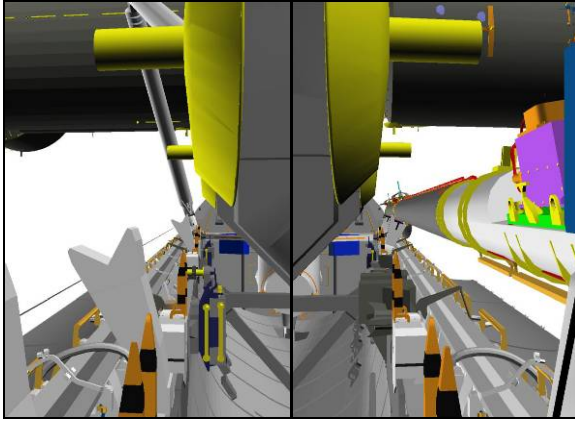
ΔSY	ΔSP	ΔEP	ΔWP	ΔWY	ΔWR
-2.0	+5.5	+0.8	-6.3	+2.1	+0.7

z	SY	SP	EP	WP	WY	WR
-414	-4.6	+40.9	-81.7	+21.0	+9.3	+128.3
-416	-4.7	+41.2	-81.7	+20.7	+9.4	+128.3
-418	-4.8	+41.5	-81.7	+20.4	+9.5	+128.4
-420	-4.9	+41.7	-81.7	+20.2	+9.6	+128.4
-422	-5.0	+42.0	-81.7	+19.9	+9.7	+128.4
-424	-5.1	+42.3	-81.7	+19.6	+9.8	+128.5
-426	-5.2	+42.5	-81.7	+19.3	+9.9	+128.5
-428	-5.3	+42.8	-81.6	+19.1	+10.0	+128.5
-430	-5.4	+43.0	-81.6	+18.8	+10.1	+128.6
-432	-5.4	+43.3	-81.6	+18.5	+10.2	+128.6
-434	-5.5	+43.5	-81.6	+18.2	+10.3	+128.6
-436	-5.6	+43.8	-81.5	+18.0	+10.3	+128.6
-439	-5.7	+44.1	-81.5	+17.5	+10.5	+128.7
-442	-5.9	+44.5	-81.4	+17.1	+10.6	+128.7
-445	-6.0	+44.8	-81.3	+16.7	+10.8	+128.8
-448	-6.1	+45.2	-81.2	+16.2	+10.9	+128.8
-451	-6.3	+45.5	-81.2	+15.8	+11.0	+128.9
-454	-6.4	+45.9	-81.1	+15.4	+11.2	+128.9
-457	-6.5	+46.2	-81.0	+14.9	+11.3	+129.0
-459	-6.6	+46.4	-80.9	+14.7	+11.4	+129.0

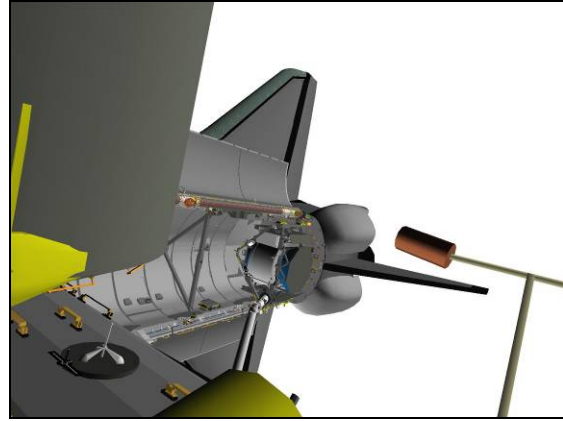
BRAKES – ON (tb-ON)
 MODE – not DIRECT (lt off)

AMS SJ HOVER posn:

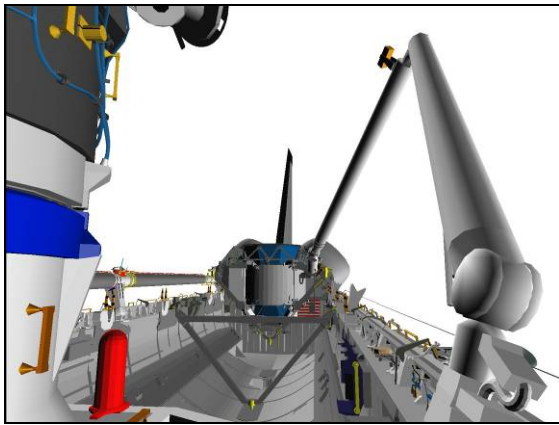
	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1203	0	-459	0	0	0	4
	SY	SP	EP	WP	WY	WR	
√	-6.6	+46.4	-80.9	+14.7	+11.4	+129.0	



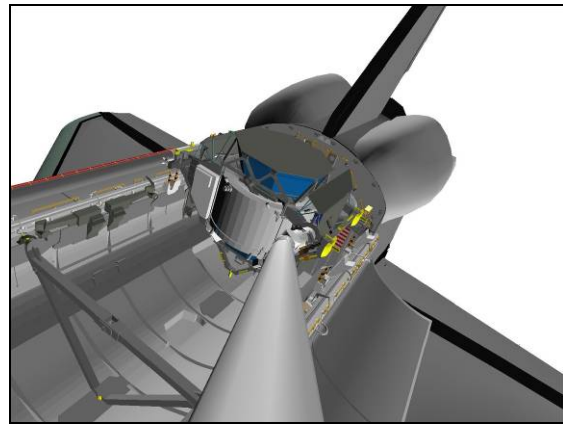
MUX B/C



13: LAB (-35,-20)



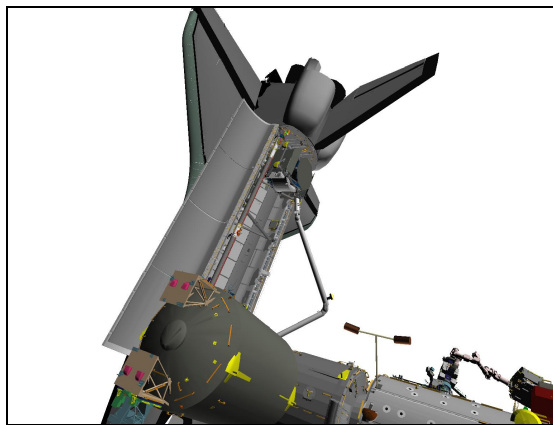
CCTV A (-15,10)



ELBOW (0,0)

- A7U 3. SJ MNVR TO HANDOFF
 CCTV – fully zoom out PLB and ELBOW cameras for SJ pictures

DNLK	B(C)
DTV	D
MON 1	03: S1 LOOB
MON 2	A



03: S1 LOOB (82,67)

NOTE

Minimum clearance between AMS and port V-guides is 5 inches at SP = 51° (during line 1 of SJ table). Monitor with Camera A,B. WR+ can be performed as reqd to improve clearance

At AMS Handoff (in line 7 of SJ table), the clearance between the SRMS and PMA 2 grapple fixture is 28 inches and between the SRMS and Node 2 is 33 inches. Monitor with Elbow camera and/or Camera A

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

MODE – best available

Mnvr to AMS HANDOFF posn:

	SY	SP	EP	WP	WY	WR	
SJ Hover	-6.6	+46.4	-80.9	+14.7	+11.4	+129.0	
1: SP +		+61.0					
2: SY -	-36.0						
3: EP +			-34.6				
4: SP -		+34.8					
5: WR -						+5.4	
6: WY -					-54.9		
7: SY -	-60.0						
AMS Handoff	-60.0	+34.8	-34.6	+14.7	-54.9	+5.4	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-931	+376	-746	168	307	6	4

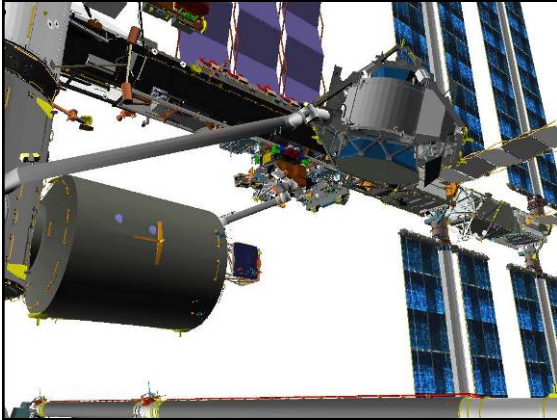
- BRAKES – ON (tb-ON)
 MODE – not DIRECT (lt off)

Notify SSRMS operator that SRMS at AMS Handoff posn with Brakes ON;
GO for SSRMS grapple

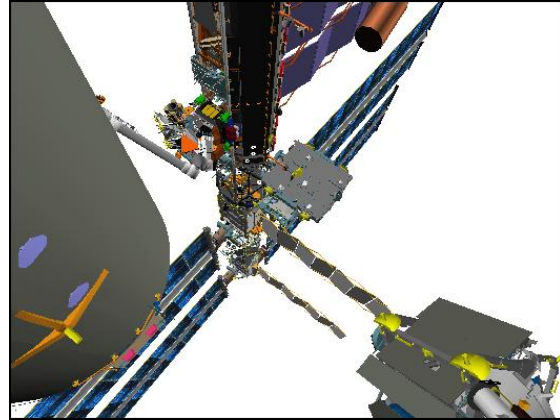
- * If using Shuttle attitude control and attitude maintenance reqd: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *

A7U

CCTV – config as required for SSRMS grapple



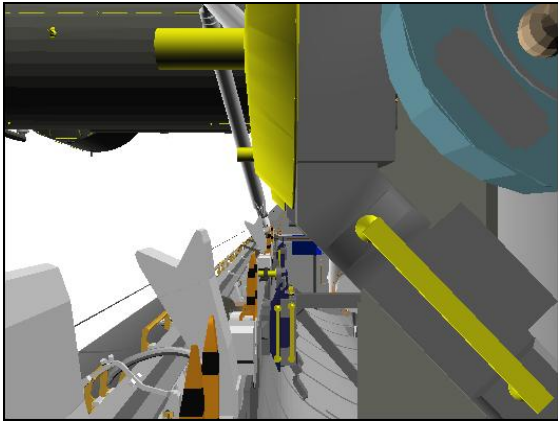
CCTV B (40,20)



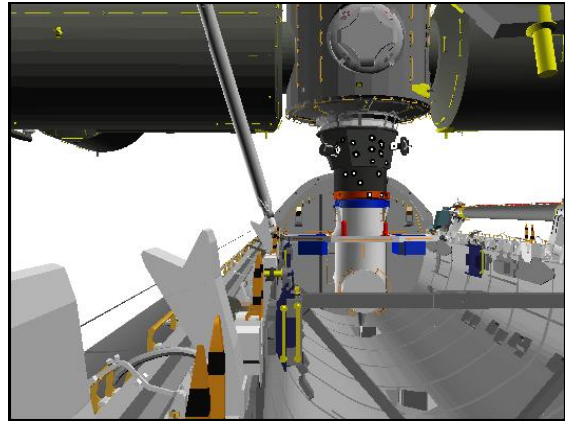
ELBOW (-30,30)

Start:
AMS SJ Hover

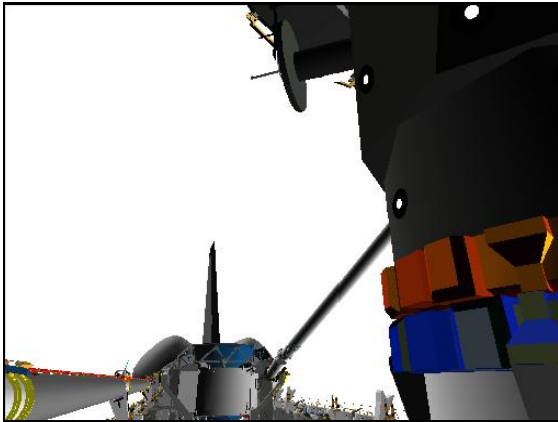
Step 1:
Drive SP+ (for 14.6°)
From +46.4 to +61.0
NOTE: AMS-to-V-guides is 5 inches
at 51°. If reqd, drive WR+ to
improve clearance



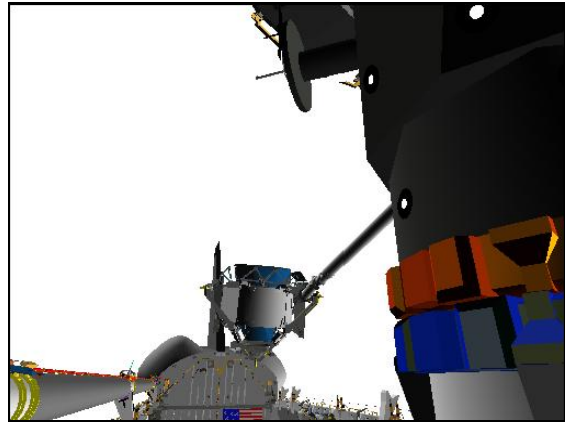
CCTV B (0,0)



CCTV B (0,0)



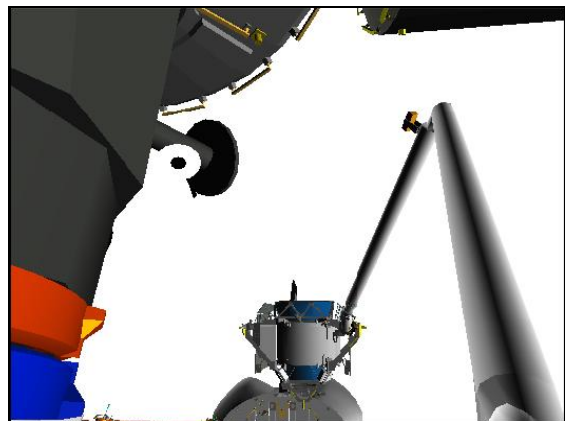
CCTV D (15,25)



CCTV D (15,25)



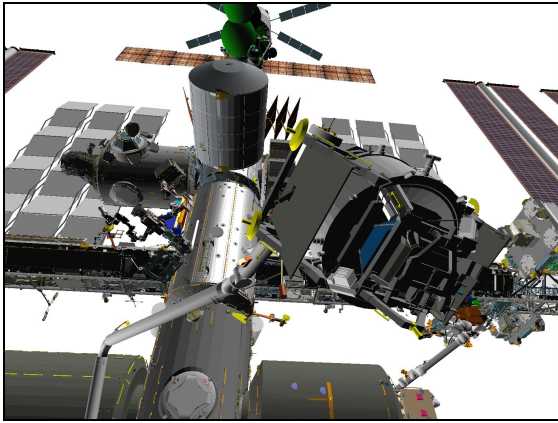
CCTV A (-5,30)



CCTV A (-5,30)

Step 2:

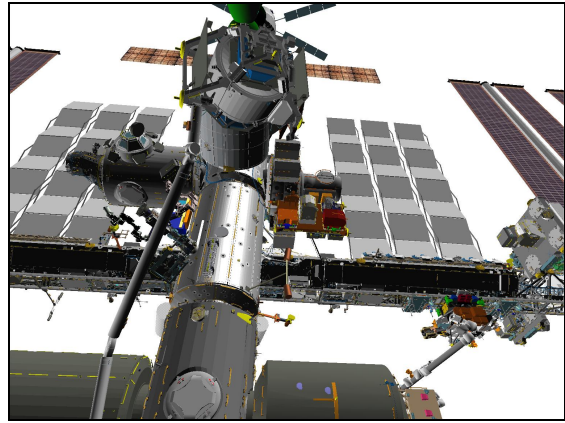
Drive SY- (for 29.4°)
From -6.6 to -36.0



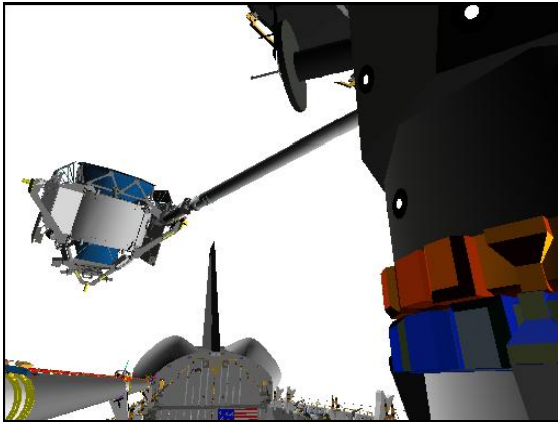
CCTV C (5,45)

Step 3:

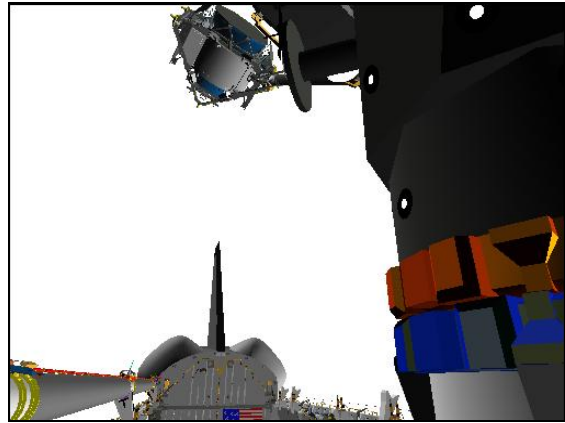
Drive EP+ (for 46.3°)
From -80.9 to -34.6



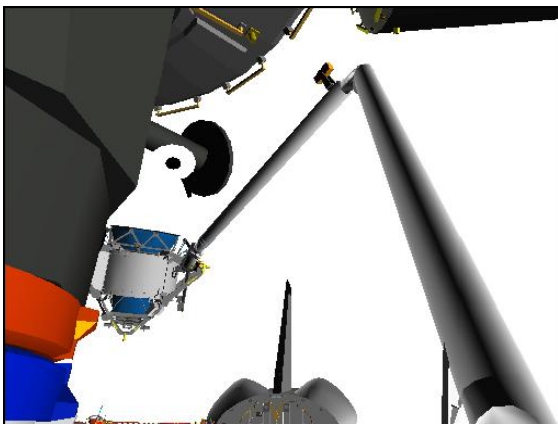
CCTV C (5,45)



CCTV D (15,25)



CCTV D (15,25)



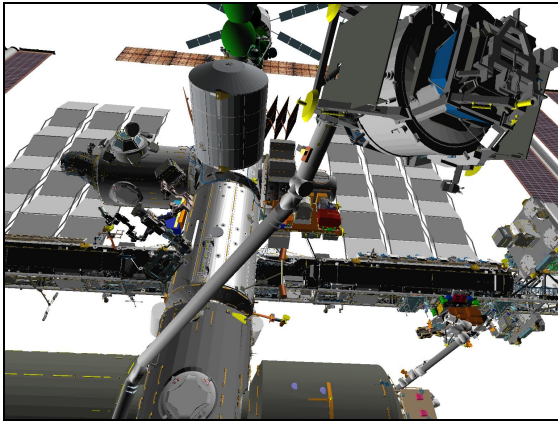
CCTV A (-5,30)



CCTV A (-5,30)

Step 4:

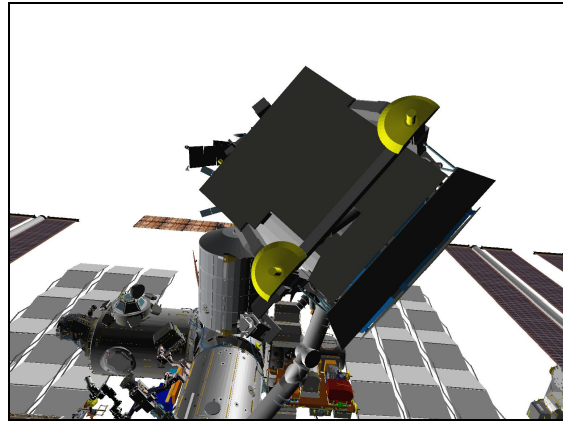
Drive SP- (for 26.2°)
From +61.0 to +34.8



CCTV C (5,45)

Step 5:

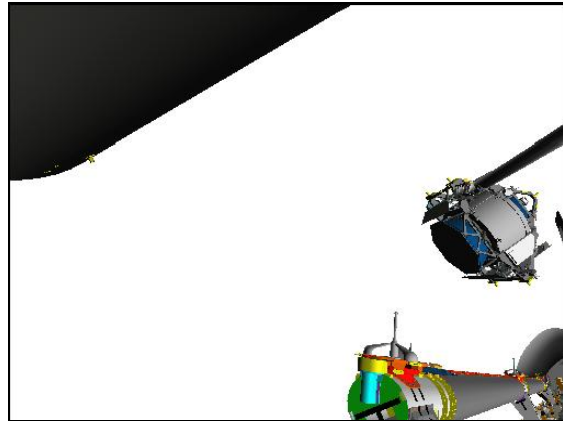
Drive WR- (for 123.6°)
From +129.0 to +5.4



CCTV C (5,70)



CCTV D (15,25)



CCTV D (-35,25)



CCTV A (-5,30)



ELBOW (-20,0)

Step 6:

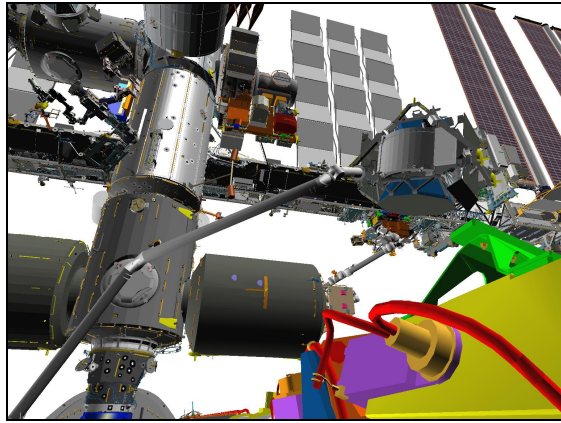
Drive WY- (for 66.3°)
From +11.4 to -54.9



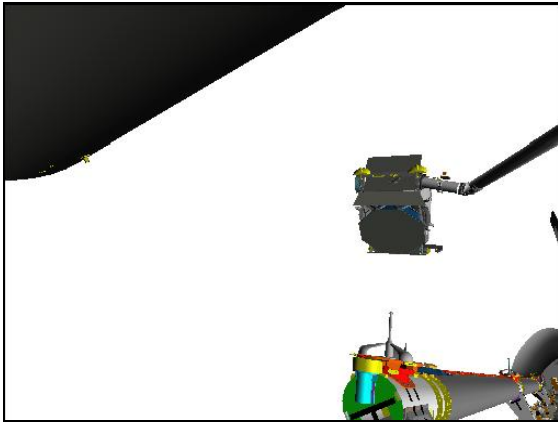
CCTV C (15,70)

Step 7:

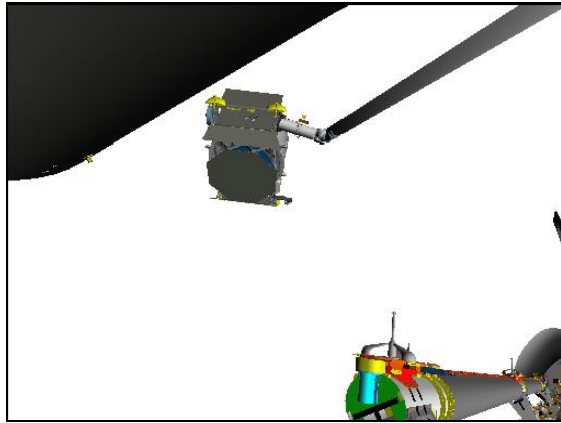
Drive SY- (for 24.0°)
From -36.0 to -60.0



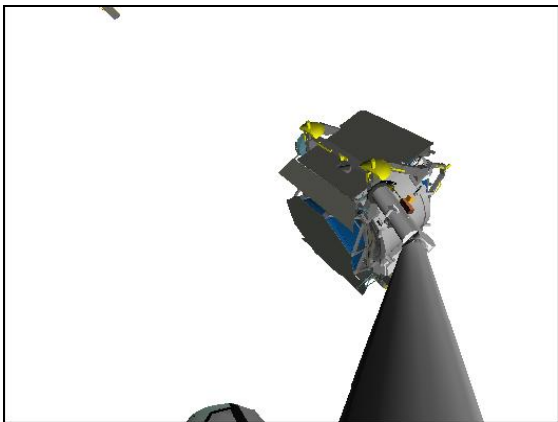
CCTV C (15,30)



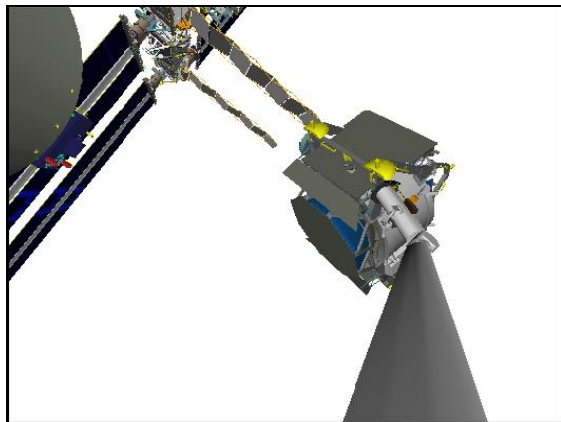
CCTV D (-35,25)



CCTV D (-35,25)



ELBOW (-20,0)



ELBOW (-20,0)

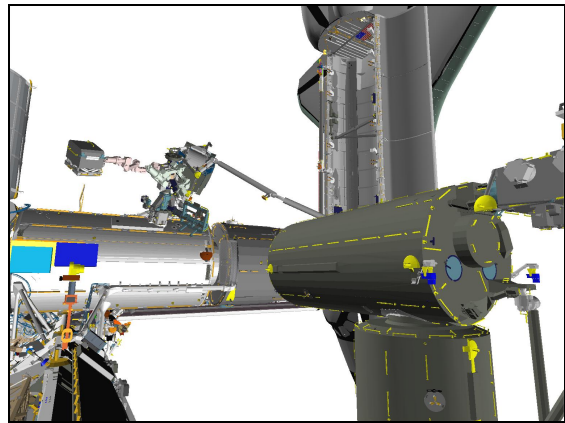
BRAKES – ON (tb-ON)
MODE – not DIRECT (lt off)

Notify SSRMS operator that SRMS at AMS Handoff posn with Brakes ON;
GO for SSRMS grapple

AMS SJ UNGRAPPLE AND VIEWING

1. SETUP
 A7U CCTV – configure for ungrapple
 – install AMS SJ UNGRAPPLE AT HANDOFF WRIST CCTV OVERLAY
 – RMS WRIST, ZOOM: 34.0 HFOV
 FOCUS: 5 ft
 Maintain eyepoint ~18 in when using grapple overlay

DNLK	EE(Elbow)
DTV	D
MON 1	09: P1 LOOB(07: P1 LOIB)
MON 2	B(A)



09: P1 LOOB (120,10)

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

2. AMS UNGRAPPLE
 On SSRMS operator GO, SSRMS grapple complete with Brakes ON, ready for SRMS ungrapple

If SINGLE MODE available:

NOTE

CONTR ERR It and 'S96 PDRS CNTL' msg may occur due to Consistency/Envelope Check error

RHC RATE – COARSE (RATE MIN tb-OFF)

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

BRAKES – OFF (tb-OFF)

MODE – TEST, ENTER
 Wait 5 sec

BRAKES – ON (tb-ON)

SM 94 PDRS CONTROL

AUTO BRAKE ENA – ITEM 9 EXEC (*)

RHC

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

MODE – best available

CAUTION
Monitor EE tb timing to prevent EE motor burnout

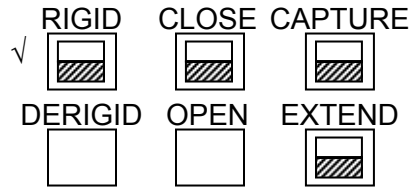
SM 169 PDRS STATUS

Monitor EE msw status

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 (8 sec total):

DERIGID tb – gray, 5 sec max, then

OPEN tb – gray, 3 sec max, then

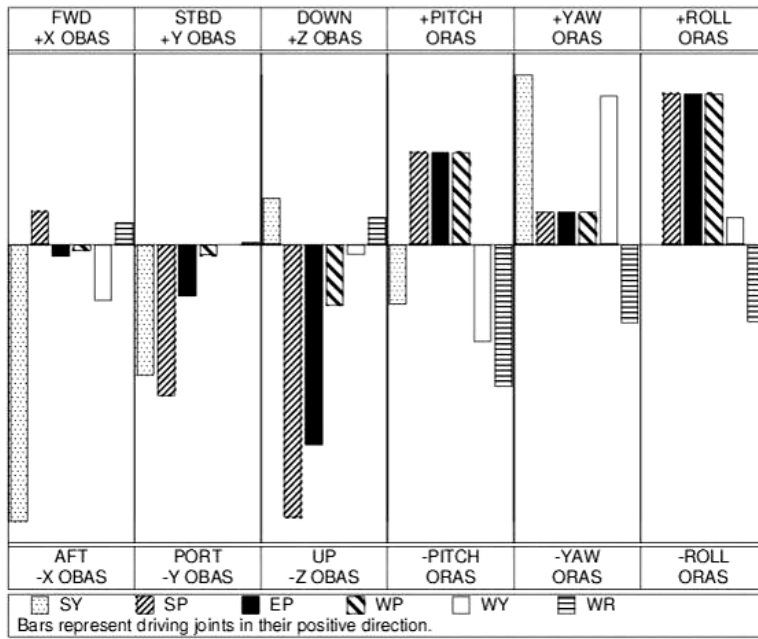
3. MNVR CLEAR OF AMS

NOTE

At AMS Backoff, the clearance between the SRMS and PMA 2 grapple fixture is 38 inches, SRMS and Node 2 is 40 inches, and SRMS and JPM is 53 inches. Monitor with Camera A and/or P1 LOIB

Drive joints per AMS SJ UNGRAPPLE AT HANDOFF WRIST CCTV OVERLAY and histogram until EE clear of grapple fixture

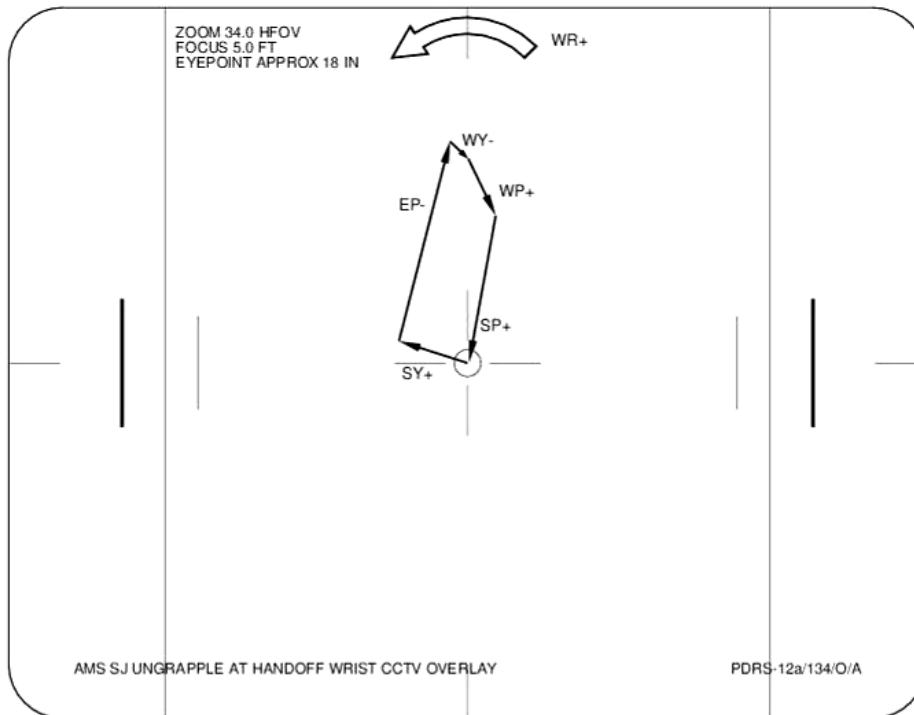
AMS SJ UNGRAPPLE AT HANDOFF



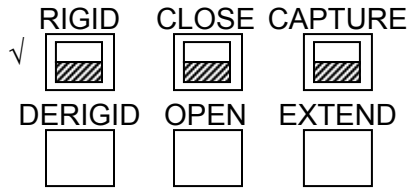
To get:	Drive:	To get:	Drive:
+X (fwd)	-SY	+PITCH	-WR, -WY
+Y (stbd)	-SP, -SY	+YAW	+WY, +SY
+Z (down)	-SP, -EP	+ROLL	+WP, +EP

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

ΔSY	ΔSP	ΔEP	ΔWP	ΔWY	ΔWR
+5.9	+10.0	-19.3	+12.4	-5.9	+3.0



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

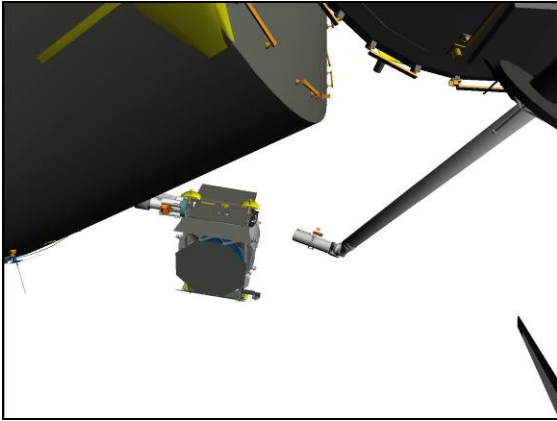


CRITICAL TIMES (20 sec total):
 EXTEND tb – gray, 20 sec max

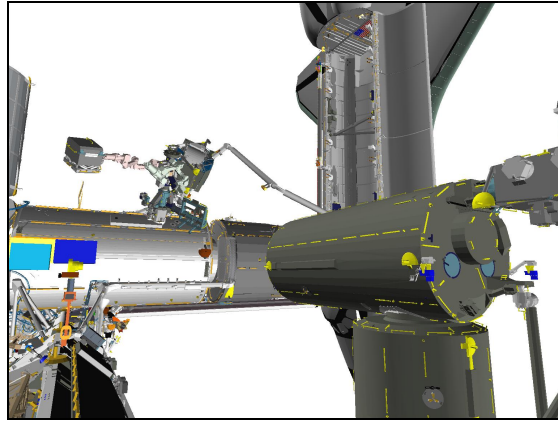
Mnvr to AMS BACKOFF posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-934	+251	-730	135	308	106	0
SY	SP	EP	WP	WY	WR	
-54.0	+44.8	-53.9	+27.1	-60.8	+8.4	

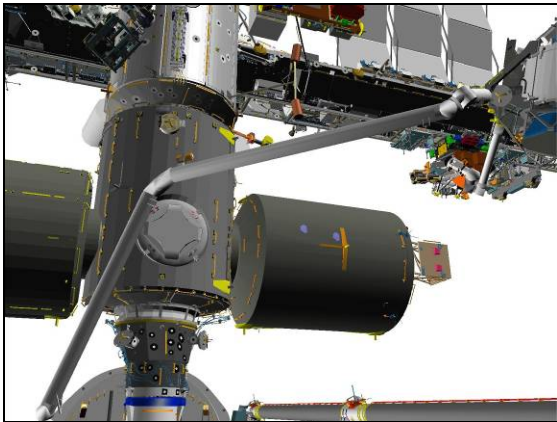
BRAKES – ON (tb-ON)
 MODE – not DIRECT (lt off)



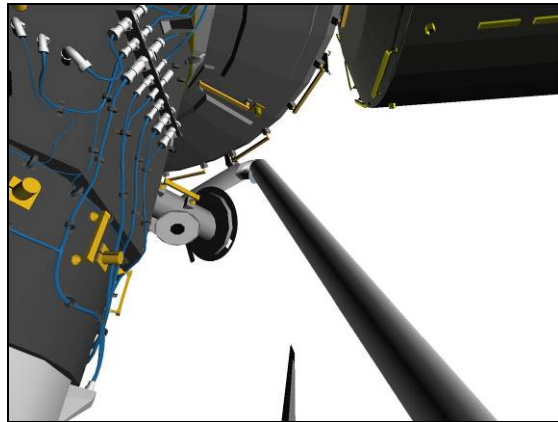
CCTV D (-30,40)



09: P1 LOOB (120,10)



CCTV B (20,20)

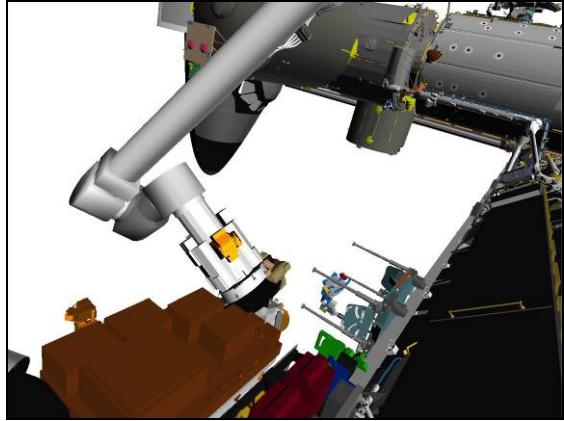


CCTV A (-5,40)

- * If using Shuttle attitude control and attitude maintenance reqd: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *

- A7U 4. MNVR TO AMS VIEWING
 CCTV – fully zoom out PLB and ELBOW cameras for SJ pictures

DNLK	B
DTV	A
MON 1	03: S1 LOOB
MON 2	Elbow



03: S1 LOOB (71,18)

NOTE

Minimum clearance between the SRMS boom and MAXI (on JEF) is 43 inches at SY = 88° (line 4 of SJ table).
 Monitor with Camera B and/or Elbow.

Minimum clearance between the SRMS Elbow Camera and the JLP is 57 inches at SY = 130° (line 4 of SJ table).
 Monitor with Camera B.

Expect C/W SINGULAR It during WY mnvr (line 5 of SJ table) when $+75^\circ \leq WY \leq +105^\circ$

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

MODE – best available

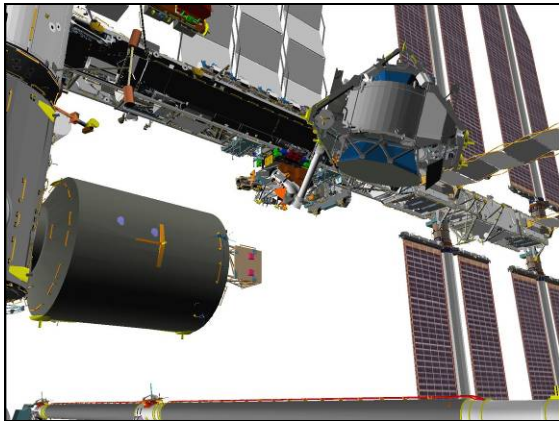
Mnvr to AMS INSTALL VIEWING posn (reference pictures as required):

	SY	SP	EP	WP	WY	WR	NOTES
AMS Backoff	-54.0	+44.8	-53.9	+27.1	-60.8	+8.4	
1: SY +	+20.0						
2: EP +			-30.4				
3: SP –		+25.2					
4: SY +	+170.0						
5: WY +					+111.5		MA, SINGULAR
6: WP –				-23.4			
7: WR –						-39.8	
AMS Viewing	+170.0	+25.2	-30.4	-23.4	+111.5	-39.8	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-173	-170	-511	72	301	347	0

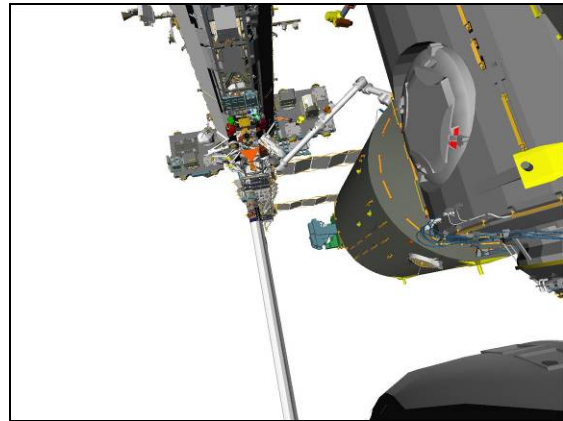
BRAKES – ON (tb-ON)
MODE – not DIRECT (lt off)
PARAM – PORT TEMP
JOINT – CRIT TEMP

Notify SSRMS operator that SRMS at AMS Viewing posn, GO for install

A7U CCTV – configure as required for AMS install

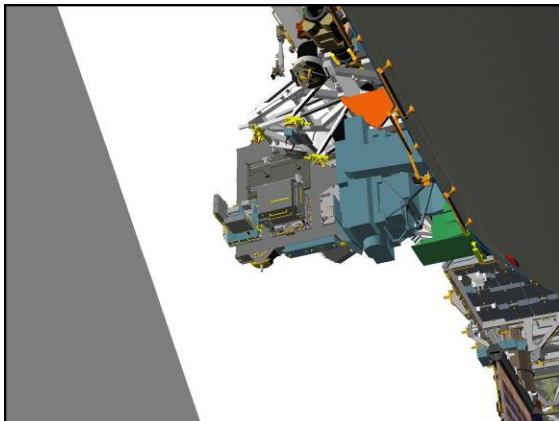


CCTV B (40,20)

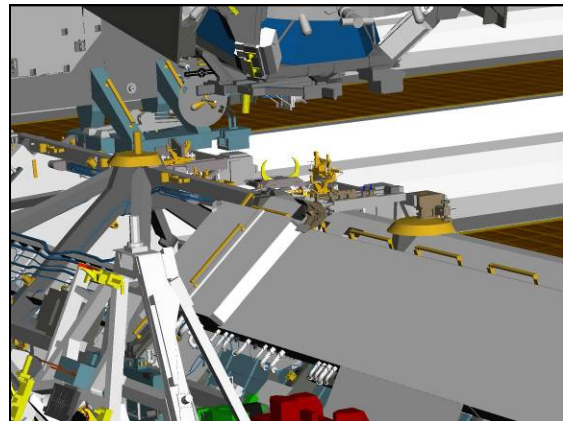


ELBOW (110,-50)

AMS Install



CCTV D (-113,32)
HFOV: 30°

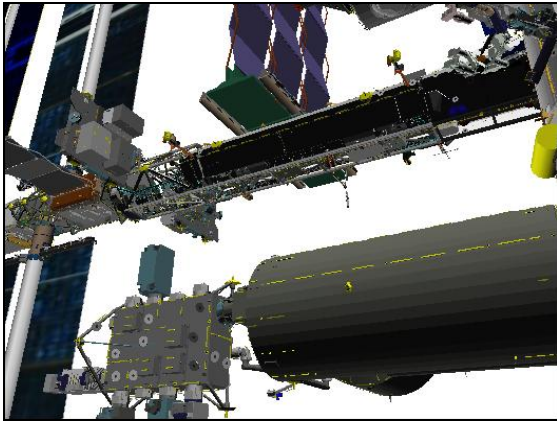


EE
HFOV: 30° for big picture view
Zoom in as reqd during install
(full zoom at -90 cm shown)

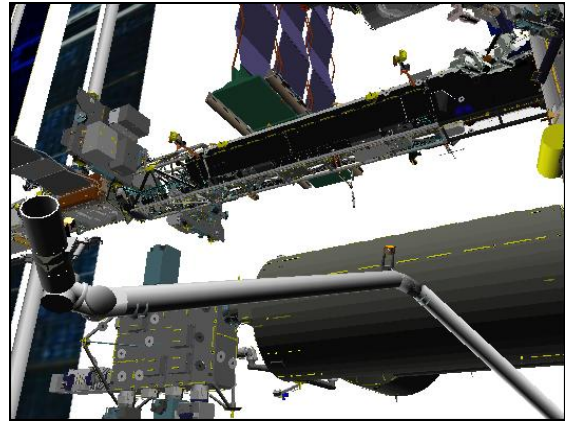
* If SSRMS operator requires EE view be adjusted:	*
* MON 2(DNLK) ← C (monitor RMS-JPM clearance)	*
*	*
* <u>NOTE</u>	*
* Expect REACH LIM It at WY = 114.6.	*
* Expect SINGULAR It at WY = 105.0	*
*	*
* If SINGLE mode available:	*
* RATE – VERN (RATE MIN tb-ON)	*
* BRAKES – OFF (tb-OFF)	*
*	*
* MODE – best available	*
* Drive WY,WP as required	*
*	*
* BRAKES – ON (tb-ON)	*
* MODE – not DIRECT	*

Start:
AMS Backoff

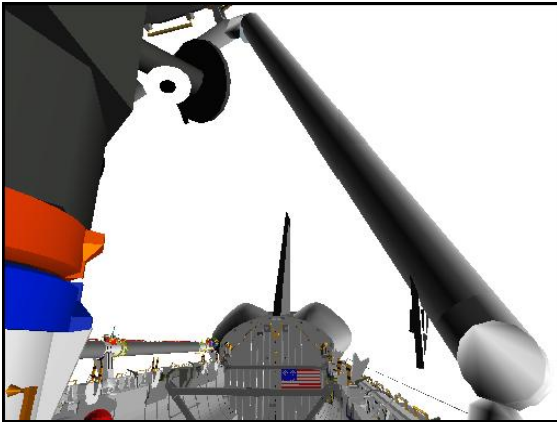
Step 1:
Drive SY+ (for 74.0°)
From -54.0 to +20.0



CCTV B (-30,25)



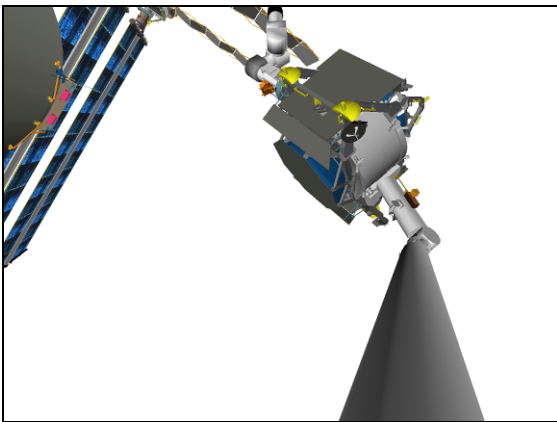
CCTV B (-30,25)



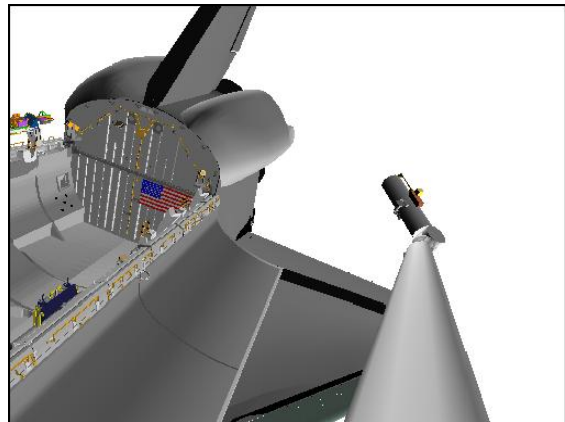
CCTV A (-5,20)



CCTV A (-5,20)



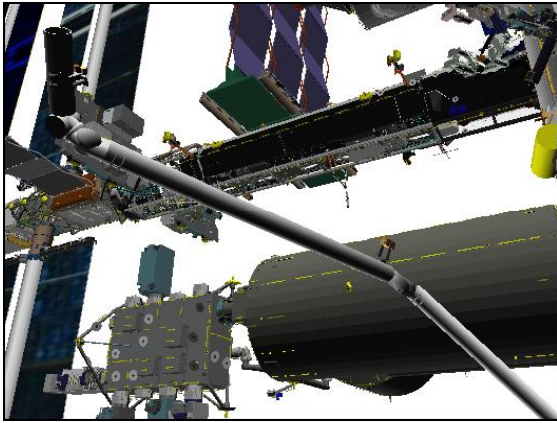
ELBOW (-20,0)



ELBOW (-20,0)

Step 2:

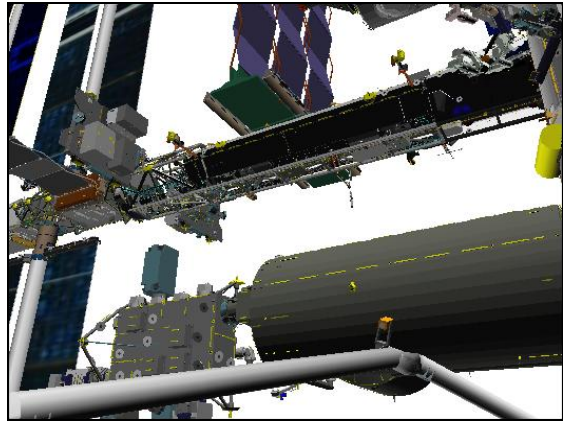
Drive EP+ (for 23.5°)
From -53.9 to -30.4



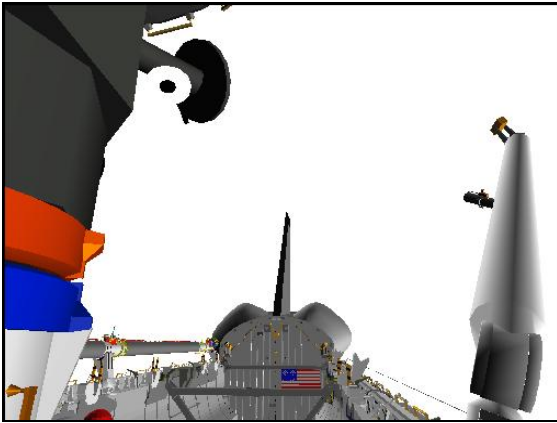
CCTV B (-30,25)

Step 3:

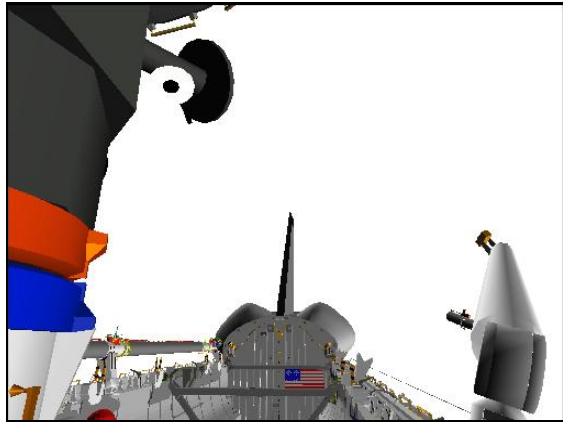
Drive SP- (for 19.6°)
From +44.8 to +25.2



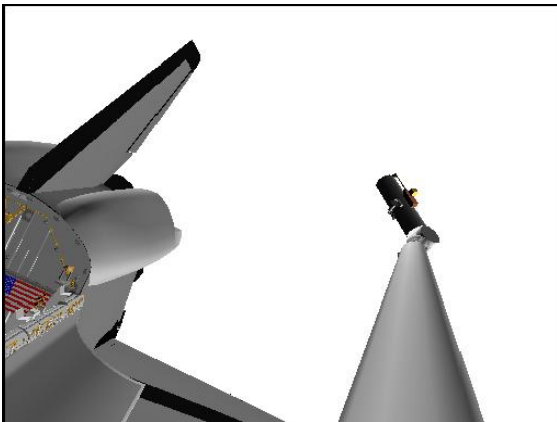
CCTV B (-30,25)



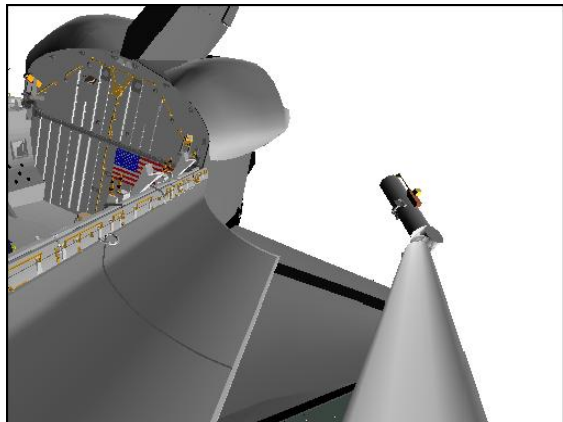
CCTV A (-5,20)



CCTV A (-5,20)



ELBOW (-20,0)

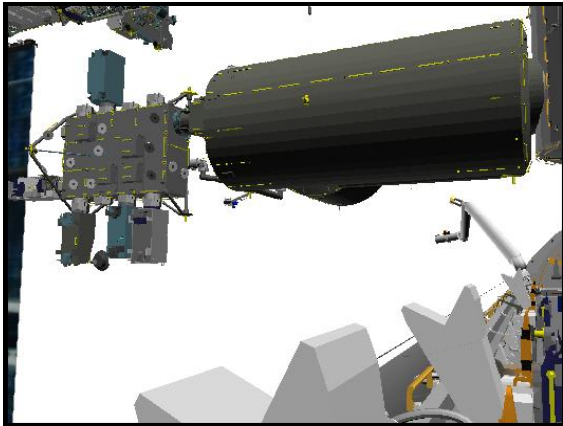


ELBOW (-20,0)

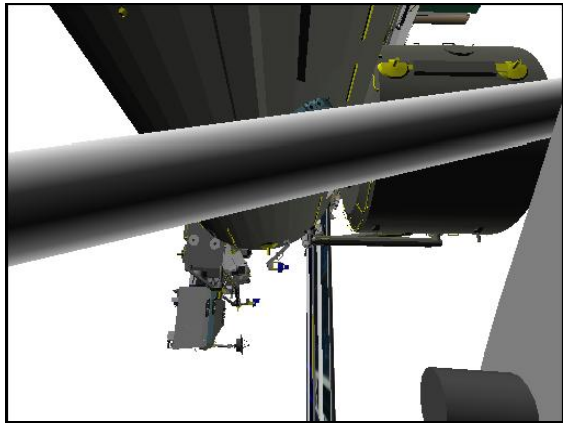
Step 4:

Drive SY+ (for 150.0°)
From +20.0 to +170.0

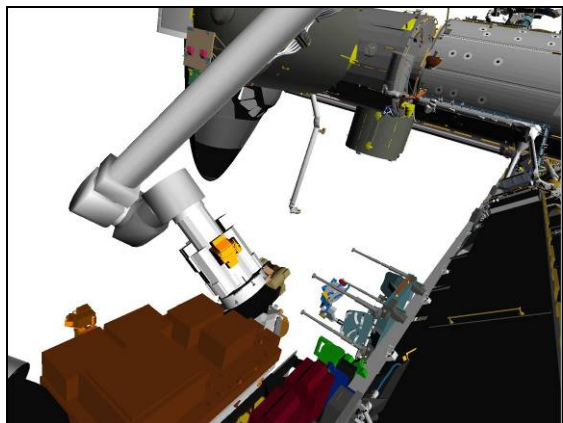
NOTE: SRMS-to-MAXI is 43 inches at 88°.
SRMS-to-JPL is 57 inches at 130°



CCTV B (-25,5)



CCTV A (95,20)

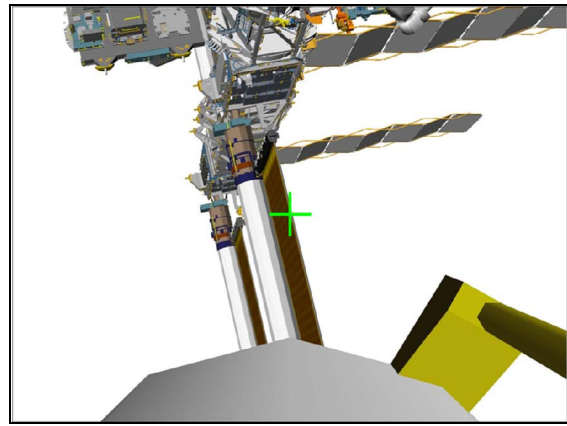


03: S1 LOOB (71,18)

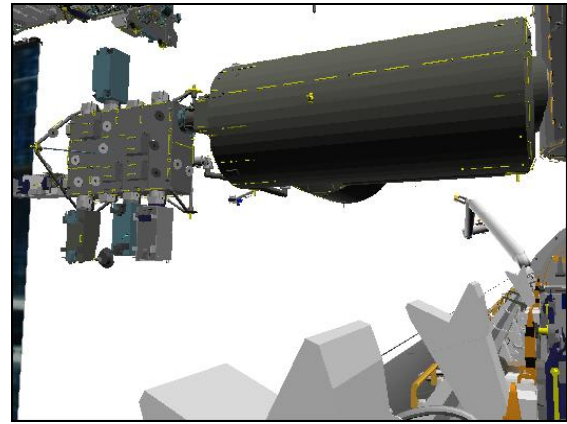
Step 5:

Drive WY+ (for 172.3°)
From -60.8 to +111.5

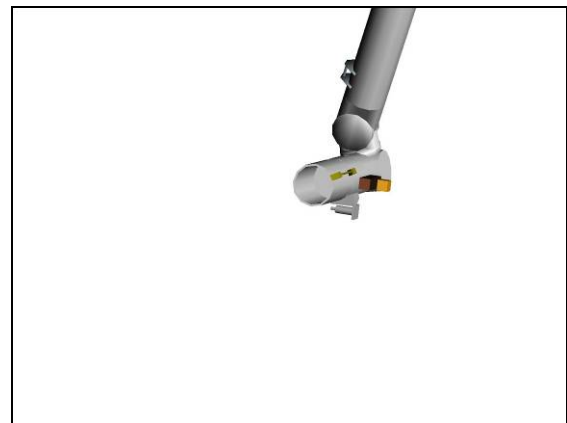
NOTE: Expect C/W SINGULAR It.
Picture may not reflect actual
SARJ position



EE (HFOV = 34.0°)



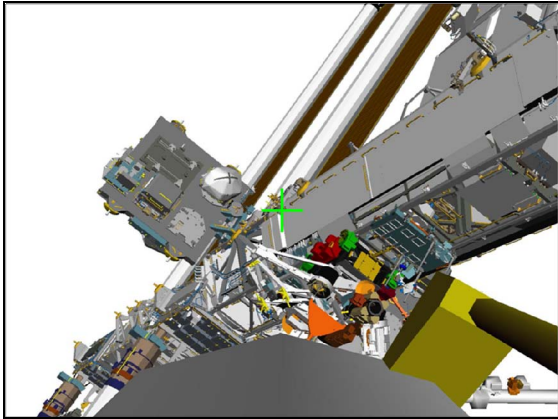
CCTV B (-25,5)



03: S1 LOOB (71,18)
Full Zoom In

Step 6:

Drive WP- (for 50.5°)
From +27.1 to -23.4

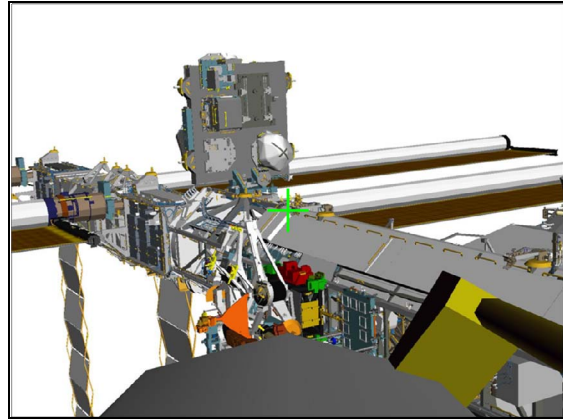


EE (HFOV = 34.0°)

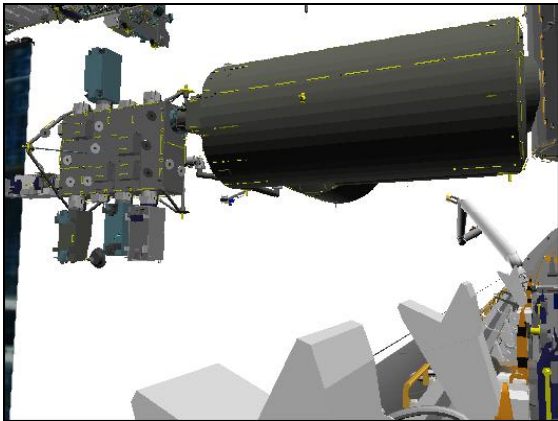
Step 7:

Drive WR- (for 48.2°)
From +8.4 to -39.8

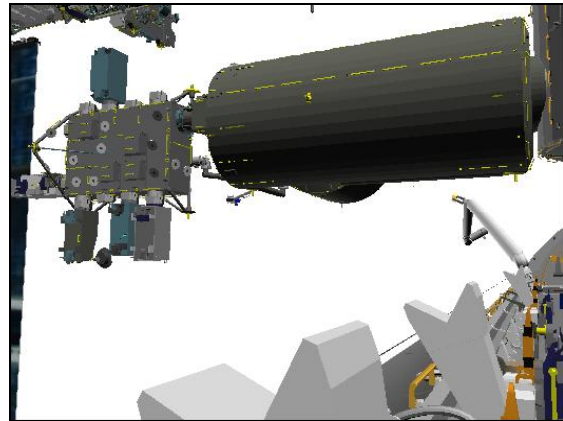
NOTE: Drive WY,WP as reqd to adjust view



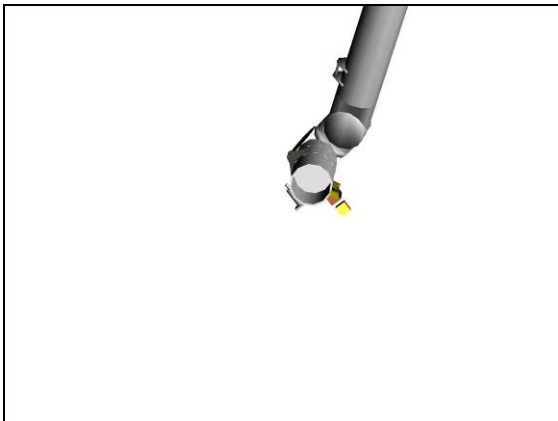
EE (HFOV = 34.0°)



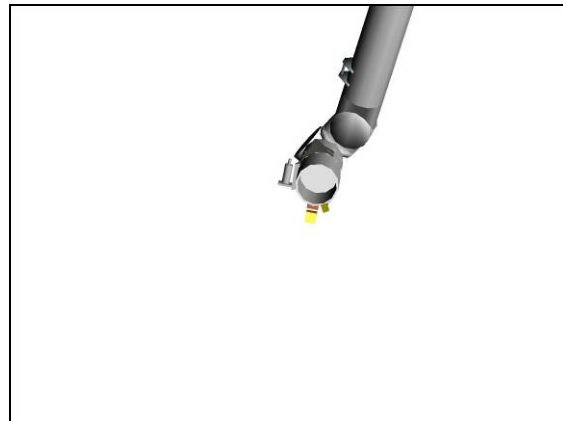
CCTV B (-25,5)



CCTV B (-25,5)



03: S1 LOOB (71,18)
Full Zoom In



03: S1 LOOB (71,18)
Full Zoom In

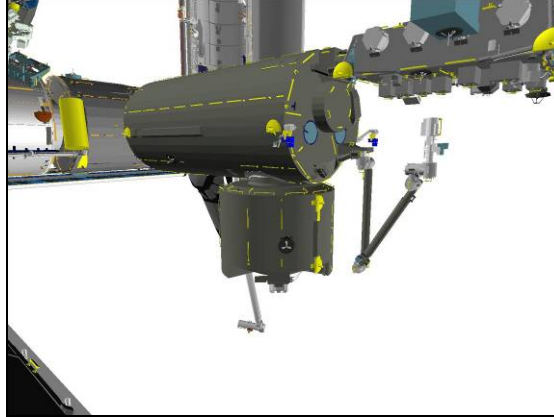
BRAKES – ON (tb-ON)
MODE – not DIRECT (It off)
PARAM – PORT TEMP
JOINT – CRIT TEMP

Notify SSRMS operator that SRMS at AMS Viewing posn, GO for install
(ref camera config setup before SJ picture tables for SSRMS ops support)

AMS CONTINGENCY REGRAPPLE

1. SETUP

DNLK	Elbow
DTV	B(D)
MON 1	09: P1 LOOB
MON 2	A



09: P1 LOOB (140,10)
Tilt up to track SRMS motion

SM 94 PDRS CONTROL

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

END POS – ITEM 18 -9 3 4 +2 5 1 -7 3 0 EXEC
 ATT – ITEM 21 +1 3 5 +3 0 8 +1 0 6 EXEC
 CMD CK – ITEM 25 EXEC (GOOD)

Verify AMS INSTALL VIEWING posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-173	-170	-511	72	301	347	0
	SY	SP	EP	WP	WY	WR	
√	+170.0	+25.2	-30.4	-23.4	+111.5	-39.8	

2. MNVR TO PRE-GRAPPLE

On SSRMS operator GO, SSRMS at AMS Handoff position and ready for SRMS grapple

NOTE

Expect C/W SINGULAR It during WY mnvr when $+75^\circ \leq WY \leq +105^\circ$.

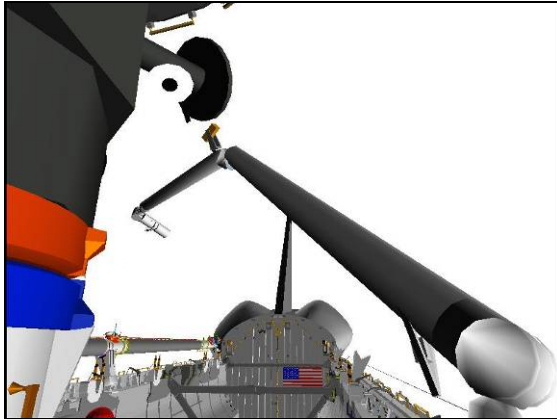
Minimum clearance between the SRMS Elbow Camera and the JLP is 57 inches at SY = 130°. Monitor with Camera B.

Minimum clearance between the SRMS boom and MAXI (on JEF) is 43 inches at SY = 88°. Monitor with Camera B and/or Elbow

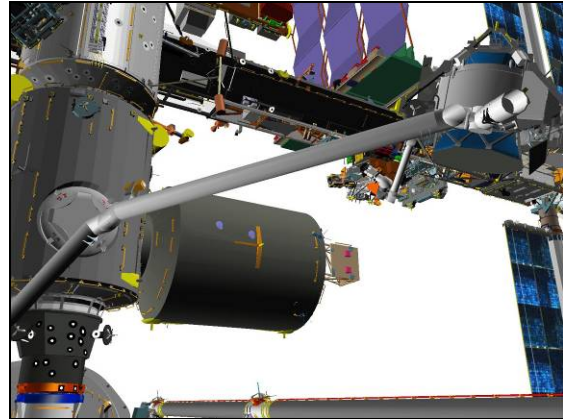
RHC RATE – as reqd (VERN within 10 ft)
 BRAKES – OFF (tb-OFF)
 MODE – SINGLE, ENTER

Mnvr to INTERMEDIATE posn:

	SY	SP	EP	WP	WY	WR	NOTE
AMS View	+170.0	+25.2	-30.4	-23.4	+111.5	-39.8	
1: WY –					+73.9		MA, SINGULAR
2: SY –	-45.1						
Intermediate	-45.1	+25.2	-30.4	-23.4	+73.9	-39.8	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1097	+192	-621	341	26	299	0



CCTV A (-5,20)



CCTV B (15,20)

NOTE

At AMS Pre-grapple, the clearance between the SRMS and PMA 2 grapple fixture is 38 inches, SRMS and Node 2 is 40 inches, and SRMS and JPM is 53 inches. Monitor with Camera A and/or P1 LOIB

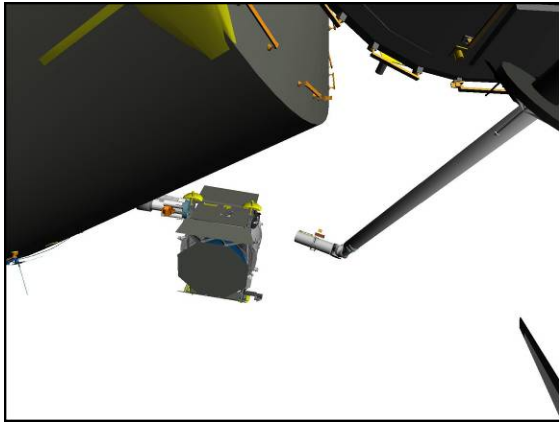
RHC RATE – VERN (RATE MIN tb-ON)
 MODE – OPR CMD, ENTER (READY It on)

AUTO SEQ – PROCEED (IN PROG It on)

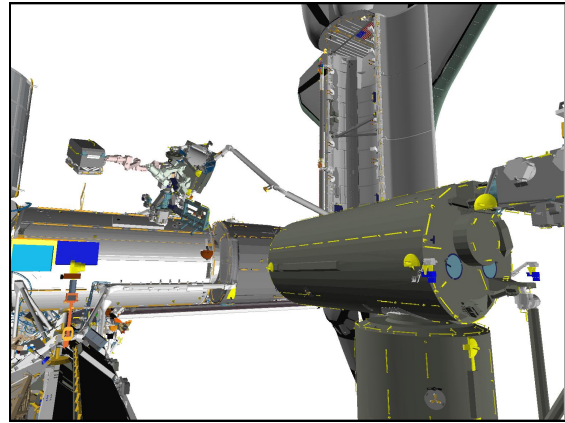
When AUTO SEQ IN PROG It – off:
 BRAKES – ON (tb-ON)

AMS PRE-GRAPPLE posn: (00:50)

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-934	+251	-730	135	308	106	0
	SY	SP	EP	WP	WY	WR	
√	-54.0	+44.8	-53.9	+27.1	-60.8	+8.4	



CCTV D (-30,40)



09: P1 LOOB (120,10)

3. AMS GRAPPLE

A7U

- CCTV – configure 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

DNLK	EE
DTV	D
MON 1	09: P1 LOOB(07: P1 LOIB)
MON 2	B(A)

PCS

MSS: SSRMS: Thrusters: Thruster Controls for MSS Ops
 Verify 'Desat Request:' Inhibit

- * If using Shuttle attitude control, verify in attitude; *
- * DAP: FREE *

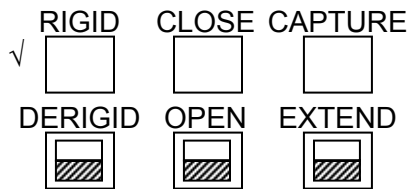
RHC

- √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 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

- * If manual grapple reqd: *
- * EE MODE – MAN *
- * CAPTURE sw – depress (hold until CLOSE tb-gray, 3 sec max) *
- * MAN CONTR – RIGID (hold until RIGID tb-gray, 25 sec max) *

EE MODE – OFF

MODE – TEST, ENTER

Wait 5 sec

BRAKES – ON (tb-ON)

SM 94 PDRS CONTROL

PL ID – ITEM 3 +4 EXEC

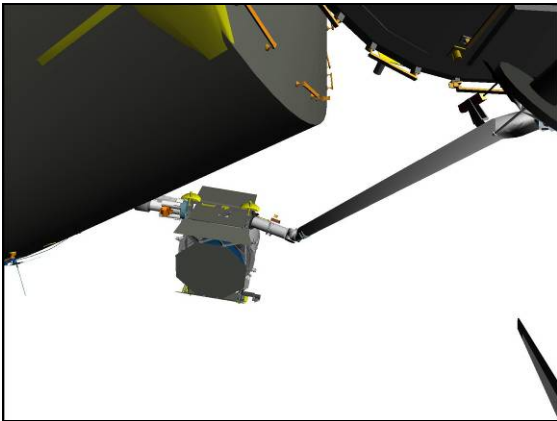
INIT ID – ITEM 24 +4 EXEC

Expected AMS HANDOFF posn:

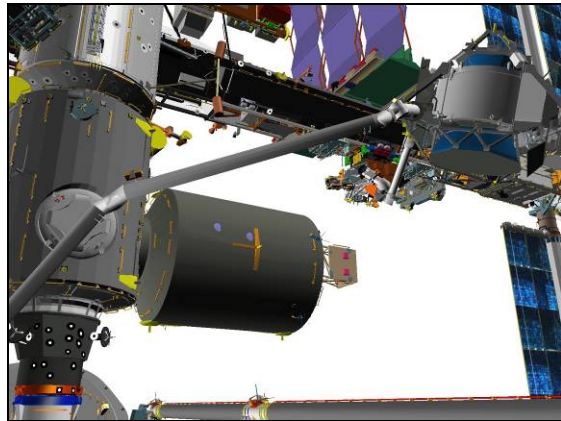
	X	Y	Z	PITCH	YAW	ROLL	PL ID
Expected	-931	+376	-746	168	307	6	4
	SY	SP	EP	WP	WY	WR	
Expected	-60.0	+34.8	-34.6	+14.7	-54.9	+5.4	

Review GENERIC END EFFECTOR CUE CARD – ISS/SHUTTLE DOCKED OPS

Notify SSRMS operator that AMS grapple complete with Brakes ON,
GO for SSRMS AMS release



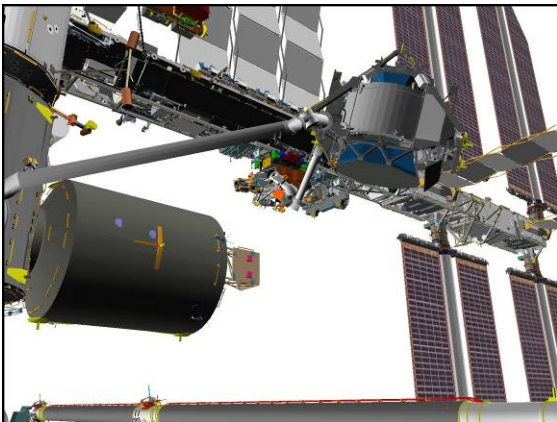
CCTV D (-30,40)



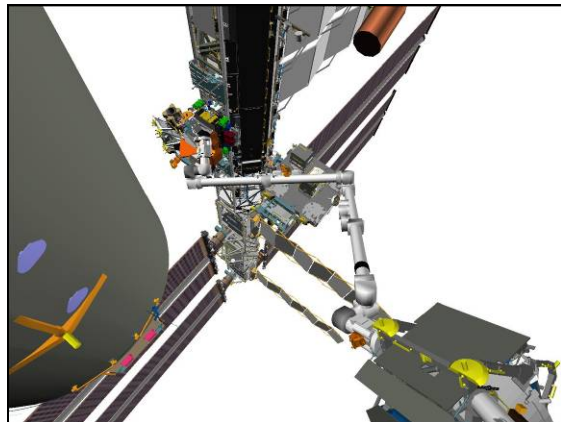
CCTV B (30,20)

A7U

CCTV – config as required for SSRMS release



CCTV B (40,20)

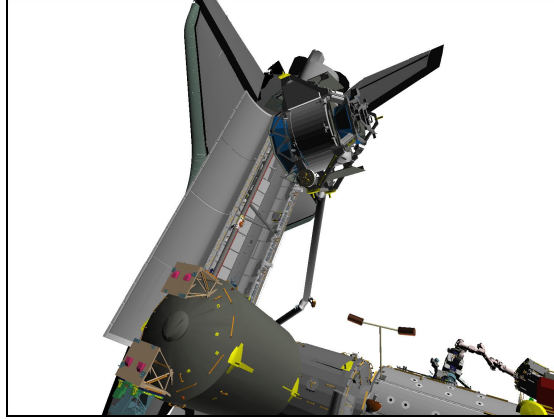


ELBOW (-30,30)

AMS CONTINGENCY REBERTH

1. SETUP

DNLK	Elbow
DTV	D
MON 1	03: S1 LOOB(09: P1 LOOB)
MON 2	A(C,B)



03: S1 LOOB (82,67)

PCS

MSS: SSRMS: Thrusters: Thruster Controls for MSS Ops
 Verify 'Desat Request:' Inhibit

- * If using Shuttle attitude control, verify in attitude; *
- * DAP: FREE *

SM 94 PDRS CONTROL

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

AMS HANDOFF posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-931	+376	-746	168	307	6	4
	SY	SP	EP	WP	WY	WR	
√	-60.0	+34.8	-34.6	+14.7	-54.9	+5.4	

2. MNVR TO HOVER

If taking AMS back from SSRMS, verify SSRMS operator GO for AMS berthing

SM 94 PDRS CONTROL

END POS – ITEM 18 -1 2 0 3 +0 -6 3 0 EXEC
 ATT – ITEM 21 +0 +0 +0 EXEC
 CMD CK – ITEM 25 EXEC (GOOD)

RHC

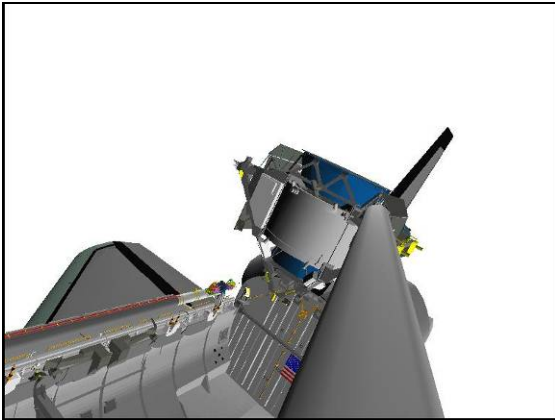
- √ RATE – VERN (RATE MIN tb-ON)
- BRAKES – OFF (tb-OFF)
- MODE – OPR CMD, ENTER (READY It on)

AUTO SEQ – PROCEED (IN PROG It on)

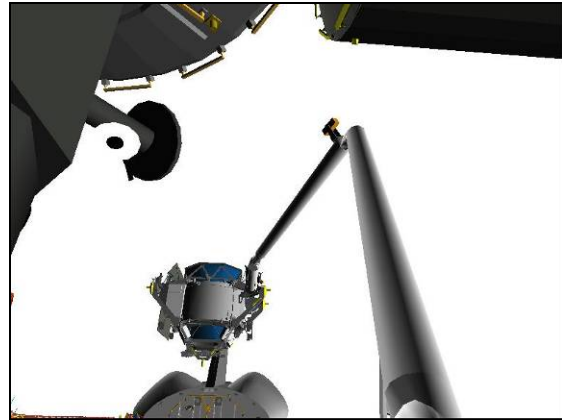
When AUTO SEQ IN PROG It – off:
 BRAKES – ON (tb-ON)

AMS HOVER posn: (11:10)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1203	0	-630	0	0	0	4
SY	SP	EP	WP	WY	WR	
-14.1	+56.7	-62.1	-15.1	+18.1	+132.1	



ELBOW (-15,-5)

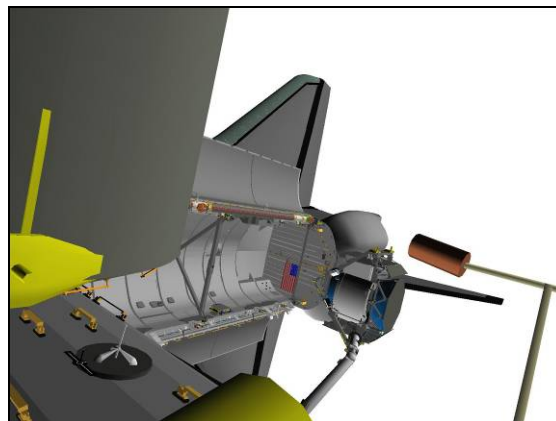


CCTV A (5,30)

- * If using Shuttle attitude control and attitude maintenance reqd: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *
- * When in attitude and rates damped: *
- * DAP: FREE *

3. BERTH AMS IN PLB

DNLK	Mux B/C
DTV	Mux D/A
MON 1	Elbow
MON 2	13: LAB(09: P1 LOOB)



13: LAB (-35,-20)

Zoom in to Trunnion-OBSS clearance during berth

NOTE

Minimum clearance between stbd trunnions and OBSS is 4 inches at Z = -448 (REL = -34). Monitor with Lab Camera.

Minimum clearance between the ROEU mate interfaces is 2 inches at Z = -416 (REL = -2). Monitor with Lab Camera or Camera D

A6U PL RETEN PL SEL – 3

SM 97 PL RETENTION

√ PL SEL 3 RDY-FOR-LAT 1,2,3,4 (eight) – 0

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

Mnvr AMS (THC down) to BERTH posn (Z = -414 expected)

AMS BERTH posn (insert data from AMS GRAPPLE):

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1203	0	-414	0	0	0	4
	SY	SP	EP	WP	WY	WR	
√	-4.6	+40.9	-81.7	+21.0	+9.3	+128.3	

A6U √ PL RETEN LAT RDY 1,2,3,4 tb (four) – gray

SM 97 PL RETENTION

√ PL SEL 3 RDY-FOR-LAT 1,2,3,4 (eight) – 1

* If at AMS BERTH and any PL RETEN PL RDY tb – bp,
 * mnvr per table:

Missing RDY	RHC Input (with THC dwn)
1,2	+PITCH (up)
3,4	-PITCH (dwn)
1,3	+ROLL (right)
2,4	-ROLL (left)
1	+PITCH (up)/+ROLL (right)
2	+PITCH (up)/-ROLL (left)
3	-PITCH (dwn)/+ROLL (right)
4	-PITCH (dwn)/-ROLL (left)

* If more than two tb – bp or missing tb pattern not shown,
 * mnvr out of PRLA and realign

4. LATCH PRLAs
 a. PRLA Setup

NOTE

When MCA LOGIC switches taken OFF, KU will mode to standby. MPM and MRL tbs – bp

MA73C:A MCA LOGIC MNC MID 2 – OFF
 :B MNB MID 4 – OFF

A6U √PL RETEN PL SEL – 3
 √LAT 1,2,3,4 tb (four) – REL
 √RDY 1,2,3,4 tb (four) – gray

SM 97 PL RETENTION

√PL SEL 3 RDY-FOR-LAT 1,2,3,4 (eight): 1
 √LAT 1,2,3,4,5 (ten): 0

- * If any LAT msw shows '1', *
- * expect single motor time (60 sec) *

b. Activate Latches

√PL RETEN LAT 1,2,3,4,5 (five) – OFF
 LOGIC PWR SYS 1,2 (two) – ON
 R13L BAY MECH PWR SYS 1,2 (two) – ON

c. AKA Latch

A6U √PL RETEN LAT 5 tb – REL
 √RDY 5 tb – bp

Note single motor times (> 30 sec)

PL RETEN LAT 5 – LAT (tb-LAT), 60 sec max
 – OFF

√PL RETEN LAT RDY 1,2,3,4,5 tb (five) – gray

- * If any PL RETEN LAT RDY tb – bp or any PL SEL 3 RDY-FOR-LAT: 0, *
- * √MCC for GO to perform following: *
- * *
- * PL RETEN LAT 5 – REL (tb-REL), 60 sec max *
- * – OFF *
- * *
- * PL RETEN LOGIC PWR SYS 1,2 (two) – OFF *
- * BAY MECH PWR SYS 1,2 (two) – OFF *
- * *
- * Mnvr to AMS BERTH posn (until PL RETEN LAT RDY 1,2,3,4 (four) *
- * tb-gray) *
- * *
- * Repeat steps b and c *

d. PRLA Latch

√PL RETEN LAT 1,2,3,4 tb (four) – REL
√RDY 1,2,3,4 tb (four) – gray

Note single motor times (> 30 sec)

PL RETEN LAT 3,4 (two) – LAT (tb-LAT), 60 sec max
– OFF

Verify PL RETEN LAT RDY 1,2,3,4 tb (four) – gray

PL RETEN LAT 1,2 (two) – LAT (tb-LAT), 60 sec max
– OFF

BRAKES – ON (tb-ON)

e. Deactivate Latches

PL RETEN LOGIC PWR SYS 1,2 (two) – OFF
BAY MECH PWR SYS 1,2 (two) – OFF

R13L

MA73C:A
:B

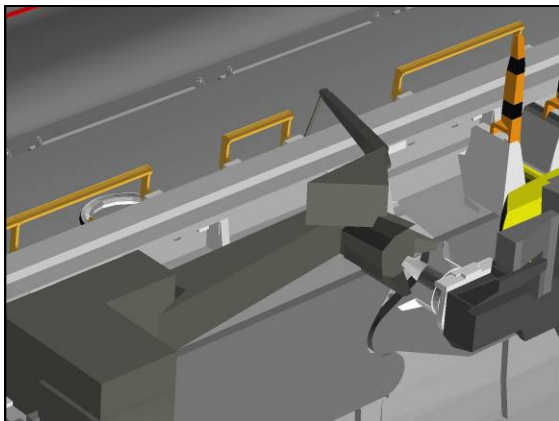
* If not mating ROEU: *
* MCA LOGIC MNC MID 2 – ON *
* MNB MID 4 – ON *
* *
* If using Shuttle attitude control: *
* DAP: LVLH *
* When rates damped: *
* DAP: FREE > 2 sec *
* DAP: AUTO *
* *
* Go to step 6 *

5. ROEU MATE

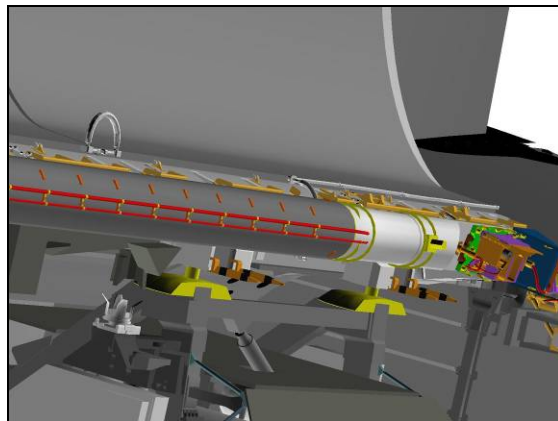
a. Setup for ROEU

A7U

CCTV – configure for ROEU mate (Elbow or Lab)



ELBOW (-20,10)
Zoom Full In



13: LAB (-37,-20)
Zoom Full In

A6U

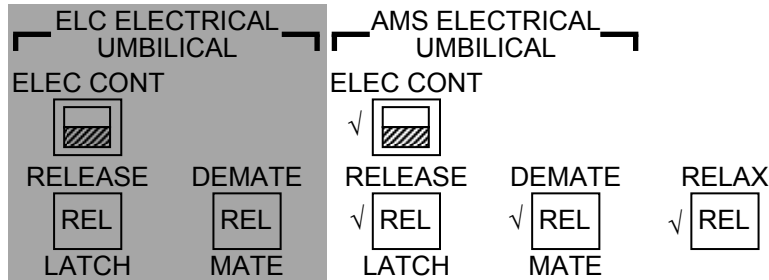
Install ROEU A6U PANEL OVERLAY

√PL RETEN LAT 1,2,3,4,5 (five) – OFF
PL SEL – 2

SM 97 PL RETENTION

√PL SEL 2 LAT 3,4,5 (six): 0

- * If any LAT msw shows '1', *
- * expect single motor time *



A15

√APCU 1,2 CONV (two) – OFF
√1 OUTPUT – OFF

A6U
R13L

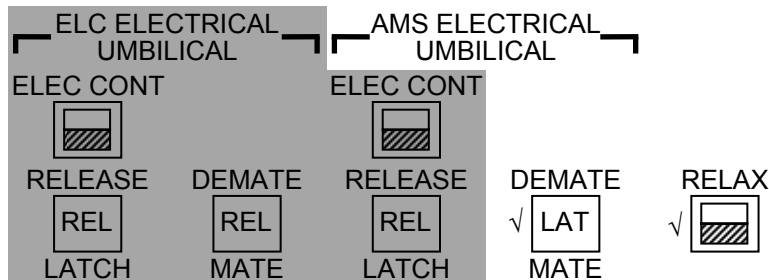
PL RETEN LOGIC PWR SYS 1,2 (two) – ON
BAY MECH PWR SYS 1,2 (two) – ON

b. Mate ROEU

Note single motor time (> 30 sec)

A6U

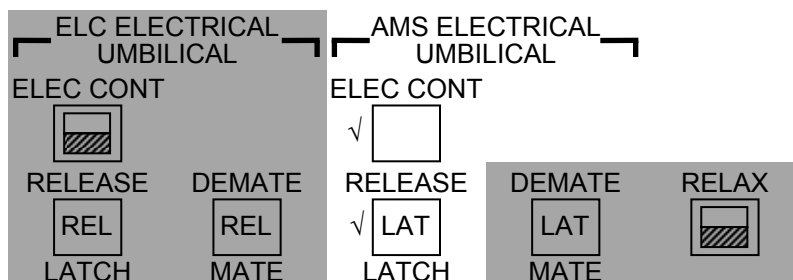
AMS DEMATE/MATE – MATE (tb-LAT), 60 sec max
– OFF



c. Latch ROEU

Note single motor time (> 20 sec)

AMS RELEASE/LATCH – LAT (tb-LAT), 40 sec max
– OFF

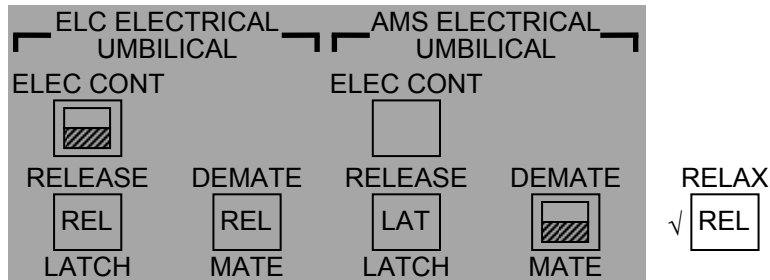


- d. Relax ROEU
 Note single motor time (> 12 sec)

SM 97 PL RETENTION

Monitor PL SEL 2 LAT 5 REL msw status

RELAX – RELAX (tb-REL), 24 sec max
 When PL SEL 2 LAT 5 REL A(B) msw changes to 1,
 RELAX – OFF



- e. Deactivate ROEU
 PL RETEN LOGIC PWR SYS 1,2 (two) – OFF
 BAY MECH PWR SYS 1,2 (two) – OFF

R13L

MA73C:A
 :B

MCA LOGIC MNC MID 2 – ON
 MNB MID 4 – ON

- * If using Shuttle attitude control: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *

- f. Activate AMS

NOTE

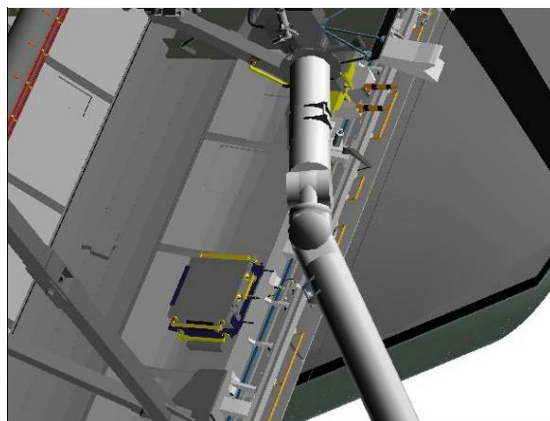
APCU CONV switches must be thrown simo
 due to AMS start-up loads

A15

APCU 1 OUTPUT – ON
 1,2 CONV (two simo) – ON

- A7U 6. AMS RELEASE
 CCTV – configure for ungrapple
 – RMS WRIST, ZOOM: 34.0 HFOV
 FOCUS: 5 ft

DNLK	EE(Elbow)
DTV	B
MON 1	03: S1 LOOB(07: P1 LOIB)
MON 2	A



**03: S1 LOOB (82,67)
 Zoom Full In**

AMS Grapple Clearance Views	Cameras
Wrist to MISSE 8 [1] & Port Sill [2]	A, B, Elbow, 07: P1 LOIB
Wrist/Boom to ELC Keel [3]	03: S1 LOOB, A
EE to AMS Radiator [4]	03: S1 LOOB, Elbow

CLEARANCE NOTES

- [1] WY-to-MISSE is 23 inches at grapple posn. EE Camera-to-MISSE closes to 7 inches during backoff (at X = -1111) and is 13 inches at backoff posn
- [2] EE Camera-to-Port Sill hardware is 10 inches at grapple posn and opens to 22 inches at backoff posn
- [3] RMS Boom-to-ELC Keel is 51 inches at grapple posn. WP-to-ELC Keel closes to 36 inches at backoff posn
- [4] EE-to-AMS minimum 51 inches during mnvr to AMS Clear posn at Z = -443

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

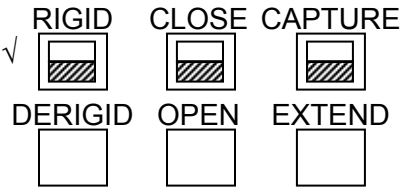
CAUTION
Monitor EE tb timing to prevent EE motor burnout

SM 169 PDRS STATUS

Monitor EE msw status

When OPEN tb – gray, mnvr arm clear of grapple pin (to X = -1099)

EE MODE – AUTO
RELEASE sw – depress (mom)



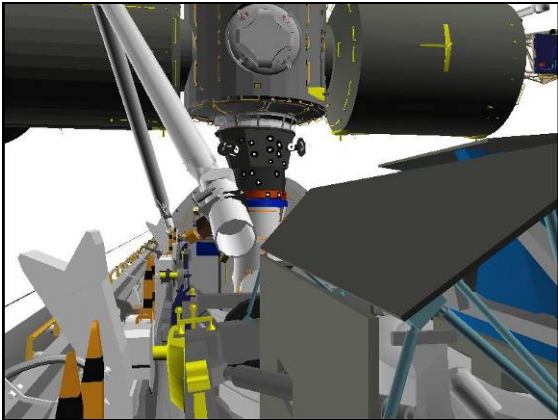
CRITICAL TIMES (28 sec total):
DERIGID tb – gray, 5 sec max, then
OPEN tb – gray, 3 sec max, then
EXTEND tb – gray, 20 sec max

EE MODE – OFF

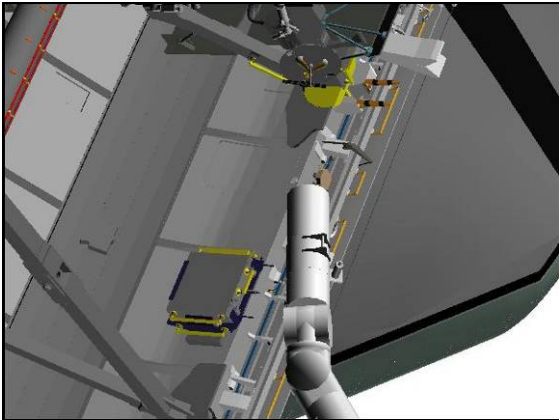
- * If manual release reqd: *
- * EE MODE – MAN *
- * MAN CONTR – DERIGID (hold until DERIGID tb-gray, 5 sec max) *
- * RELEASE sw – depress (hold until OPEN tb-gray, 3 sec max) *
- * *
- * Mnvr clear of grapple pin, then *
- * EE MAN CONTR – DERIGID (hold until EXTEND tb-gray, 20 sec max) *
- * MODE – OFF *

AMS BACKOFF posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1099	-68	-436	340	358	126	0
SY	SP	EP	WP	WY	WR	
-6.1	+53.4	-99.3	+26.1	+10.5	+129.2	



CCTV B (10,0)



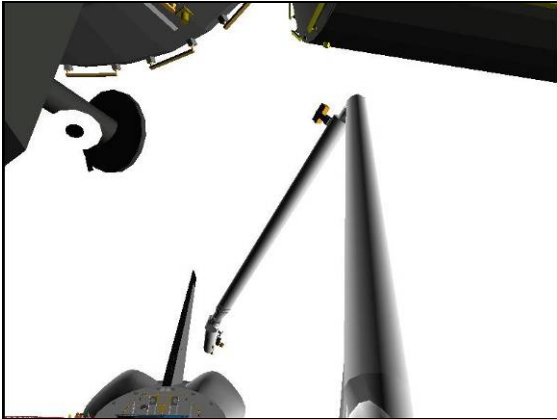
**03: S1 LOOB (82,67)
Zoom Full In**

MODE – ORB UNL, ENTER

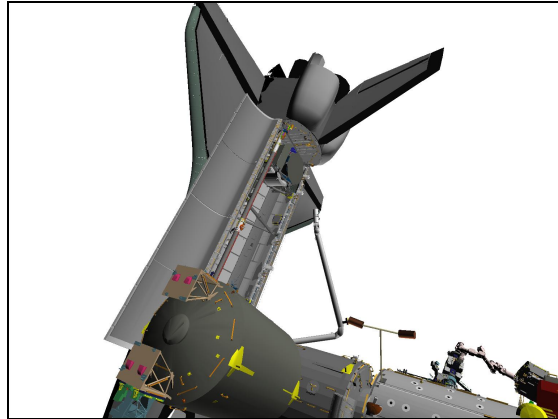
Mnvr to AMS CLEAR posn (THC up):

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1099	-68	-530	340	358	126	0
SY	SP	EP	WP	WY	WR	
-10.9	+64.7	-94.4	+9.6	+15.1	+130.9	

BRAKES – ON (tb-ON)



CCTV A (10,30)



03: S1 LOOB (82,67)

- RHC
7. MNVR TO PRECRADLE
RATE – as reqd (VERN within 10 ft)
BRAKES – OFF (tb-OFF)
MODE – as desired (OCAS valid)

Mnvr to PRECRADLE:

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	0.0	

BRAKES – ON (tb-ON)

√MODE – not DIRECT (It off)

PARAM – PORT TEMP

JOINT – CRIT TEMP

AMS REFERENCE

AMS PL ID UPLINK VERIFICATION FS 6-2
COORDINATE SYSTEM – PL ID 4 FS 6-3
JOINT ANGLES VS POR COORDINATES FS 6-4
PRLA CONFIG..... FS 6-5

AMS
REF DATA

AMS PL ID UPLINK VERIFICATION

AMS
REF DATA

SM 94 PDRS CONTROL

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

	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	0.0	

SM 94 PDRS CONTROL

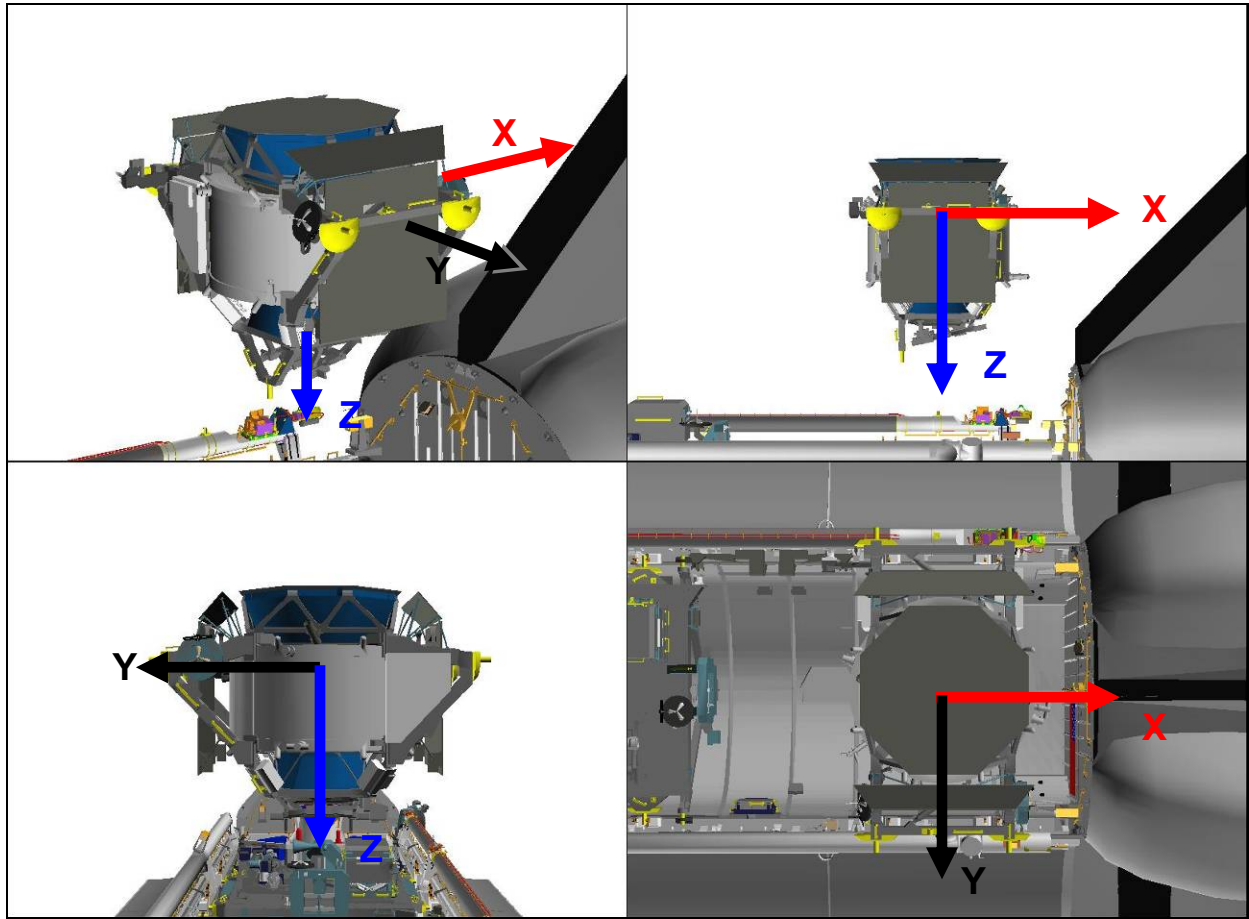
PL ID - ITEM 3 +4 EXEC
 INIT ID - ITEM 24 +4 EXEC

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1312	-173	-494	354	345	233	4
	SY	SP	EP	WP	WY	WR	
√	0.0	+25.0	-25.0	+5.0	0.0	0.0	

SM 94 PDRS CONTROL

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

AMS COORDINATE SYSTEM – PL ID 4



POR: Centered at trunnion level, aligned with ORAS

PURPOSE: ELC Unberth and Handoff

RATES:	<u>COARSE</u>	<u>VERN</u>
TRANS LIM ft/sec	0.22	0.10
ROT LIM deg/sec	0.78	0.29

JOINT RATES:	<u>COARSE</u>	<u>VERN</u>
SHOULDER LIM deg/sec	0.37	0.12
ELBOW LIM deg/sec	0.52	0.17
WRIST LIM deg/sec	0.78	0.26

AMS JOINT ANGLES VS POR COORDINATES

AMS PRE-GRAPPLE SETUP

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1099	-68	-530	340	358	126	0
SY	SP	EP	WP	WY	WR	
-10.9	+64.7	-94.4	+9.6	+15.1	+130.9	

AMS PRE-GRAPPLE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1099	-68	-436	340	358	126	0
SY	SP	EP	WP	WY	WR	
-6.1	+53.4	-99.3	+26.1	+10.5	+129.2	

AMS GRAPPLE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1203	+0	-414	0	0	0	4
-1156	+67	-415	340	358	126	0
SY	SP	EP	WP	WY	WR	
-4.6	+40.9	-81.7	+21.0	+9.3	+128.3	

AMS HOVER

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1203	+0	-630	0	0	0	4
-1156	+67	-631	340	358	126	0
SY	SP	EP	WP	WY	WR	
-14.1	+56.7	-62.1	-15.1	+18.1	+132.1	

AMS HANDOFF

X	Y	Z	PITCH	YAW	ROLL	PL ID
-931	+376	-746	168	307	6	4
-908	+298	-756	135	308	105	0
SY	SP	EP	WP	WY	WR	
-60.0	+34.8	-34.6	+14.7	-54.9	+5.4	

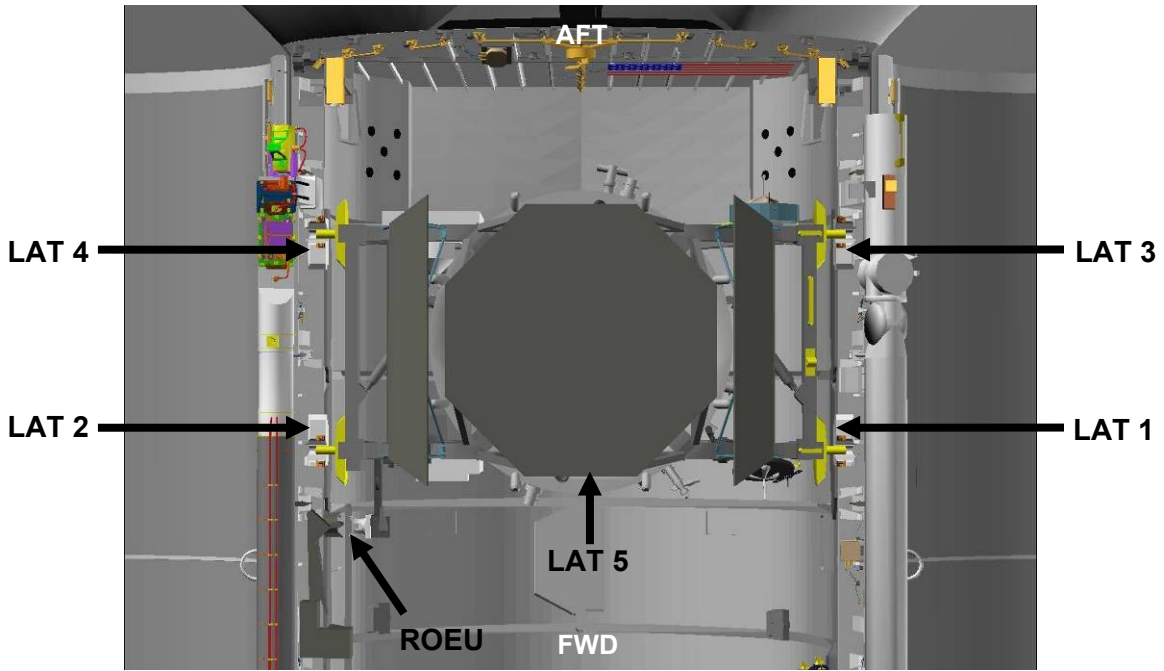
AMS BACKOFF

X	Y	Z	PITCH	YAW	ROLL	PL ID
-934	+251	-730	135	308	106	0
SY	SP	EP	WP	WY	WR	
-54.0	+44.8	-53.9	+27.1	-60.8	+8.4	

AMS INSTALL VIEWING

X	Y	Z	PITCH	YAW	ROLL	PL ID
-173	-170	-511	72	301	347	0
SY	SP	EP	WP	WY	WR	
+170.0	+25.2	-30.4	-23.4	+111.5	-39.8	

AMS PRLA CONFIG



ROEU		
Function	PL SEL	LAT/REL
Release/Latch	2	3
Demate/Mate	2	4
Relax	2	5

PRLA		
Release Sequence	PL SEL	LAT/REL
AKA	3	5
PRLA (fwd)	3	1,2
PRLA (aft)	3	3,4

This Page Intentionally Blank

OBSS HANDOFF

OBSS HANDOFF TO SRMS – OBSS PRE-GRAPPLE.....	FS 7-3
– STBD MRL RELEASE	FS 7-5
– OBSS GRAPPLE	FS 7-8
UNGRAPPLE FOR STOW	FS 7-11
POST OBSS TRANSFER PWRDN	FS 7-15

OBSS
HANDOFF

This Page Intentionally Blank

OBSS HANDOFF TO SRMS – OBSS PRE-GRAPPLE

1. SETUP

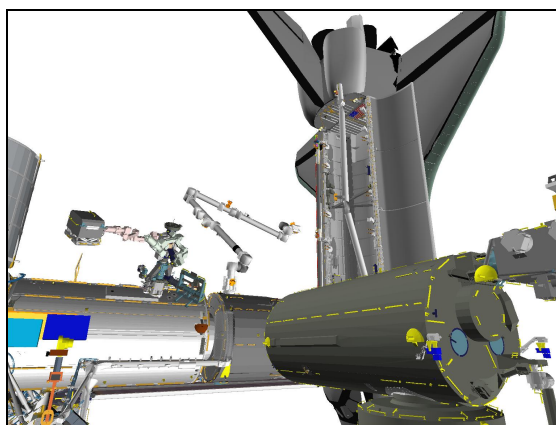
Verify SSRMS at OBSS PRE-GRAPPLE posn:

SR	SY	SP	EP	WP	WY	WR
-75.9	+126.4	-189.0	+133.6	+150.0	-180.0	+44.9

R12

√Green Jumper – ISS

DNLK	Elbow
DTV	B
MON 1	09: P1 LOOB
MON 2	A



09: P1 LOOB (120,20)

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 0

√INIT ID, ITEM 24: 0

END POS – ITEM 18 -1 0 1 8 -3 6 2 -6 7 6 EXEC

ATT – ITEM 21 +2 8 4 +0 +2 7 0 EXEC

CMD CK – ITEM 25 EXEC (GOOD)

Verify at PRECRADLE:

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	0.0	

2. MNVR TO OBSS PRE-GRAPPLE

NOTE

Clearance between the SRMS upper boom and JPM is 45 inches at pre-grapple. Monitor with Camera A

RHC

RATE – VERN (RATE MIN tb-ON)

BRAKES – OFF (tb-OFF)

MODE – OPR CMD, ENTER (READY lt on)

AUTO SEQ – PROCEED (IN PROG It on)

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

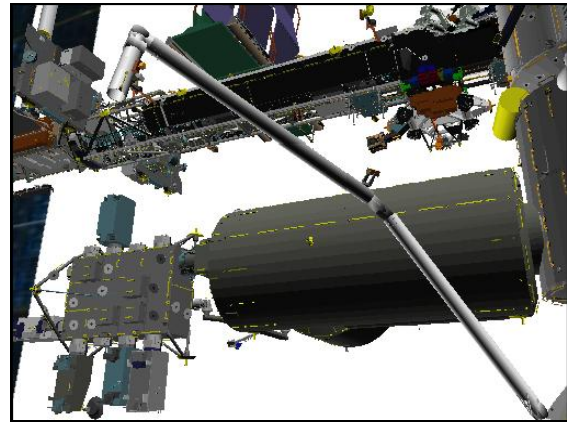
OBSS PRE-GRAPPLE posn: (01:05)

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1018	-362	-676	284	0	270	0
	SY	SP	EP	WP	WY	WR	
√	+24.0	+64.8	-34.4	-99.4	+11.3	-99.0	

Notify SSRMS Operator that SRMS at OBSS Handoff Pre-Grapple posn;
GO for OBSS Grapple



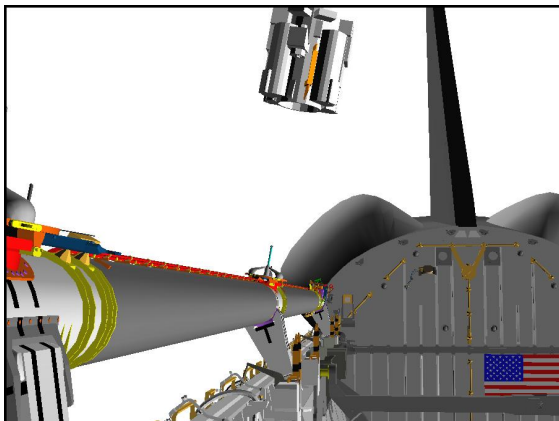
CCTV A (0,28)



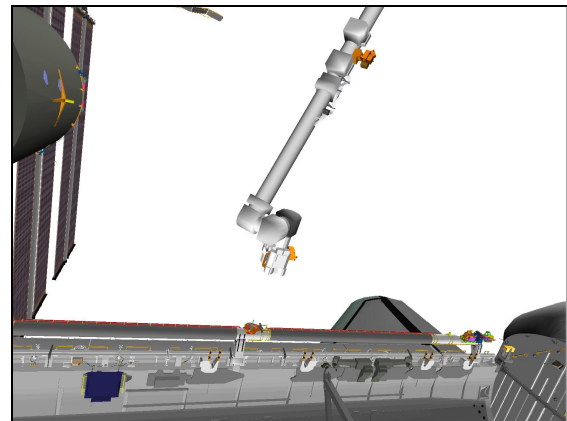
CCTV B (-25,20)

A7U

CCTV – config as required for SSRMS OBSS grapple



CCTV D (-5,5)
HFOV: 32°



ELBOW (-105,15)

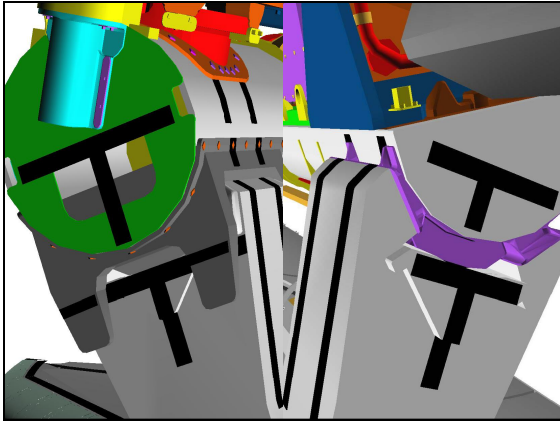
OBSS HANDOFF TO SRMS – STBD MRL RELEASE

1. CONFIGURE VIDEO

When SSRMS grapple complete:

A7U

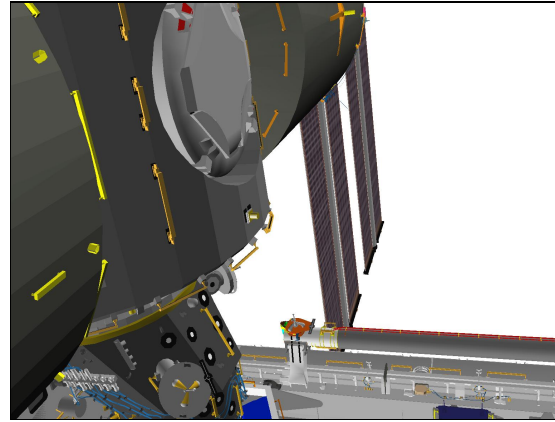
CCTV – configure as required for OBSS unberth



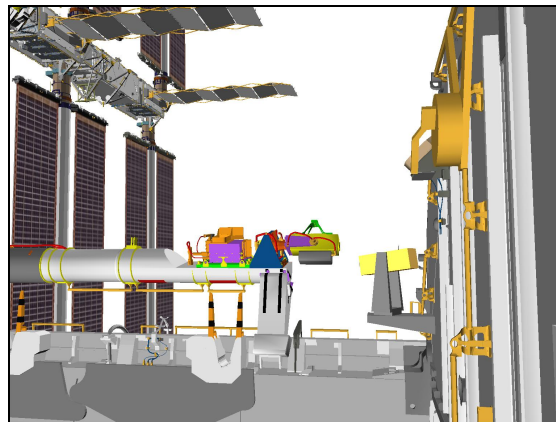
MUX D/C

CCTV D (-22,-3)
HFOV: 20°

CCTV C (26,-8)
HFOV: 47°



ELBOW (-145,10)
HFOV: 48°



CCTV B (80,5)
HFOV: 54°

2. CONFIGURE POWER

On SSRMS operator GO, OBSS grapple complete and ready for MRL release

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

MA73C:C

cb MCA PWR AC3 3Φ MID 2 – op

√AC2 3Φ MID 2 – op

:D

√AC3 3Φ MID 4 – op

R13L

PL BAY MECH PWR SYS (two) – ON

3. STBD MRL RELEASE

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

A8L STBD RMS RETEN LAT – REL (tb-REL) (18 sec max)
– OFF

If motor drive time > 18 sec, √MCC

SM 94 PDRS CONTROL

√STBD AFT, MID, FWD REL (six) = 1

4. 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

Notify SSRMS operator that MRLs released, GO for OBSS unberth

Monitor RFL Status

After OBSS Unberth:

SM 94 PDRS CONTROL

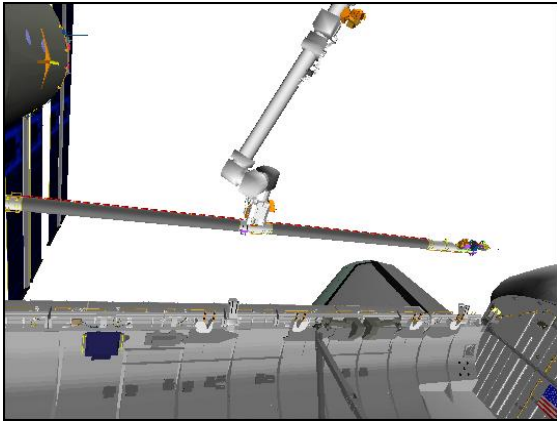
RMS PORT – ITEM 1 EXEC (*)

A7U CCTV – configure as required for mnvr to handoff (pictures next page) |

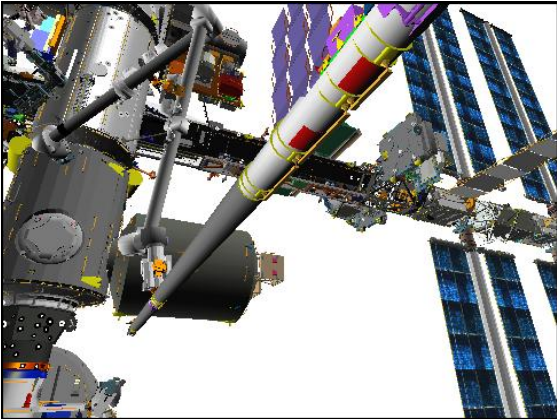
Track SSRMS/OBSS motion as required per SSRMS operator



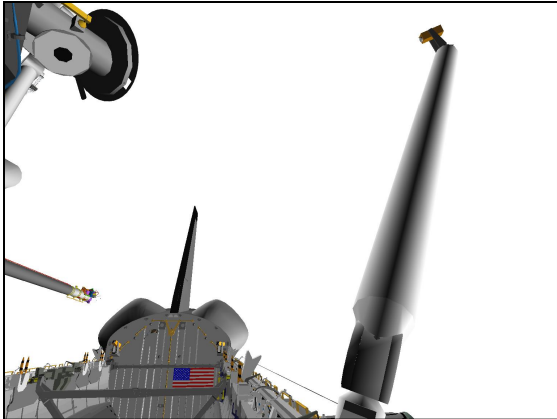
CCTV D (-20,25)



ELBOW (-105,10)
Track LEE



CCTV C (25,25)
Track OBSS Tip



CCTV A (10,20)
SSRMS/OBSS EFGF will come into FOV

OBSS HANDOFF TO SRMS – OBSS GRAPPLE

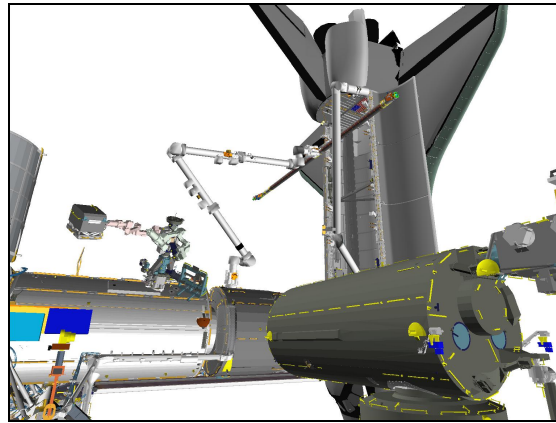
1. SETUP FOR GRAPPLE

A7U

- CCTV – configure 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

DNLK	EE
DTV	B(C)
MON 1	09: P1 LOOB(22: Base Elbow)
MON 2	A



09: P1 LOOB (120,20)

- R12(OBSS) ✓SPEE PWR – OFF
- A15 ✓APCU 2 OUTPUT – OFF

2. OBSS GRAPPLE AT HANDOFF POSN

On SSRMS Operator GO, SSRMS at OBSS Handoff posn with Brakes ON and ready for SRMS grapple

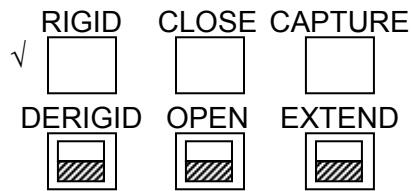
- RHC RATE – VERN (RATE MIN tb-ON)
- BRAKES – OFF (tb-OFF)
- MODE – END EFF, ENTER

Mnvr to grapple envelope

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

SM 169 PDRS STATUS Monitor EE msw status
--

- EE MODE – AUTO
- CAPTURE sw – depress (mom)



CRITICAL TIMES (28 sec total):
 CAPTURE tb – gray, then
 CLOSE tb – gray, 3 sec max, then
 RIGID tb – gray, 25 sec max

EE MODE – OFF

- * If manual capture required: *
- * EE MODE – MAN *
- * CAPTURE sw – depress (hold until CLOSE tb-gray, 3 sec max) *
- * MAN CONTR – RIGID (hold until RIGID tb-gray, 25 sec max) *
- * MODE – OFF *

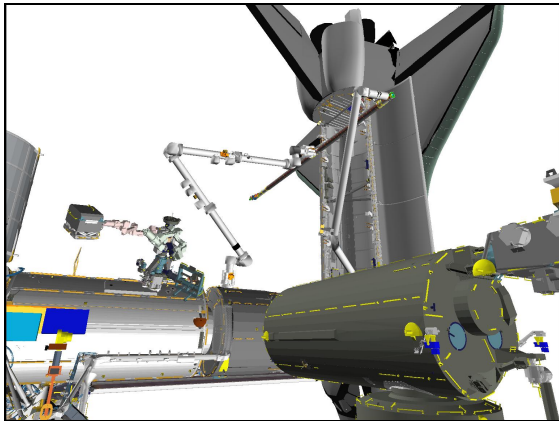
MODE – TEST, ENTER
 Wait 5 sec
 BRAKES – ON (tb-ON)

SM 94 PDRS CONTROL
 PL ID – ITEM 3 +2 EXEC
 INIT ID – ITEM 24 +2 EXEC

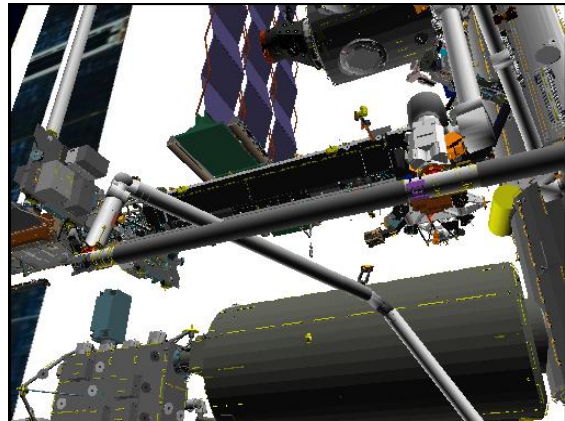
Expected OBSS HANDOFF posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1029	+229	-614	284	270	270	2
SY	SP	EP	WP	WY	WR	
+25.8	+66.3	-49.0	-85.9	+10.7	-100.7	

*Display singularity



09: P1 LOOB (120,20)

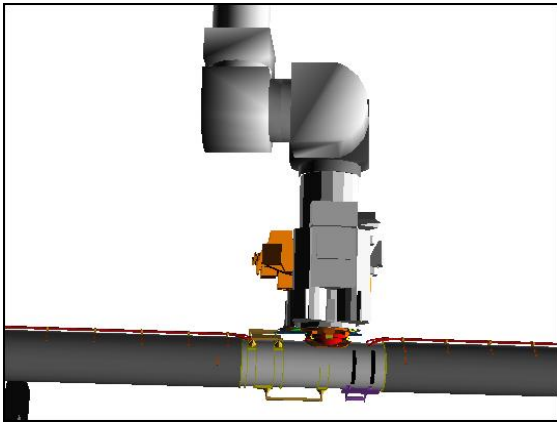


CCTV B (-25,30)

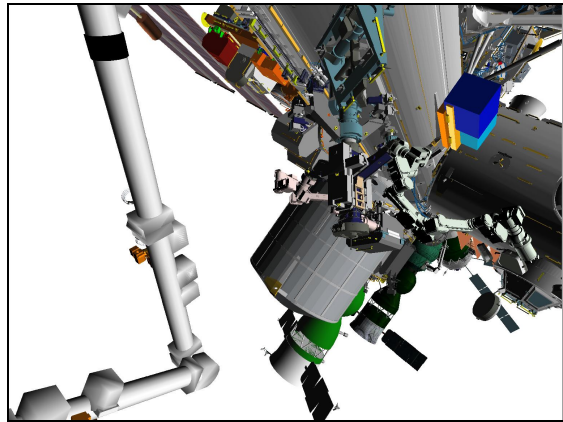
Notify SSRMS Operator that SRMS grapple complete with Brakes ON, GO for SSRMS release (camera config next page)

Review GENERIC END EFFECTOR CUE CARD – ISS/SHUTTLE DOCKED OPS

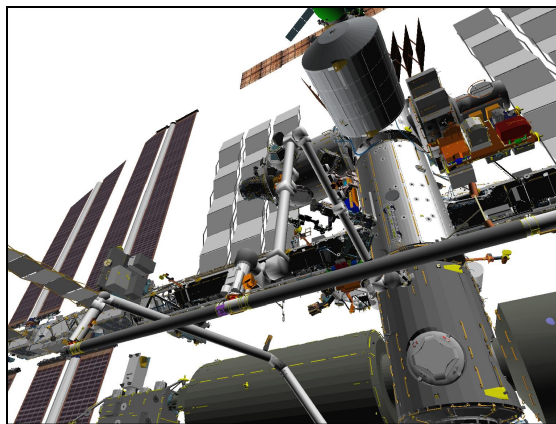
- Perform ACTIVATION (LDRI/ITVC (Cue Card), PHOTO/TV)
- LCH ACTIVATION (LCS (Cue Card), PHOTO/TV)
- LCC ACTIVATION (LCS (Cue Card), PHOTO/TV)
- LCC DEACTIVATION (LCS (Cue Card), PHOTO/TV), steps 1 and 2



CCTV A (5,25)
HFOV: 18°



ELBOW (5,95)



CCTV C (-30,40)

OBSS UNGRAPPLE FOR STOW

NOTE

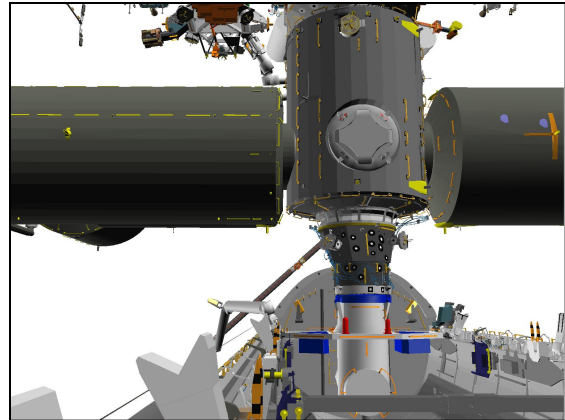
Steps 1-4 may be performed prior to, during, or after SSRMS mnvr and grapple

1. SETUP

A7U CCTV – configure video as required for SSRMS ops and sensor deactivation



ELBOW (75,0)



CCTV B (0,10)

SM 94 PDRS CONTROL

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

OBSS HANDOFF FOR STOW posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-104	-243	-372	172	11	230	0
	SY	SP	EP	WP	WY	WR	
√	+164.6	+6.0	-19.2	+24.2	+6.9	+85.7	

2. STOW PTU

R12 Green Jumper – LDRI/ITVC

A7U DTV ← PL 2
MUX 1 L ← MIDDECK

LDRI MODE 2 pb – push (ITVC video displayed)

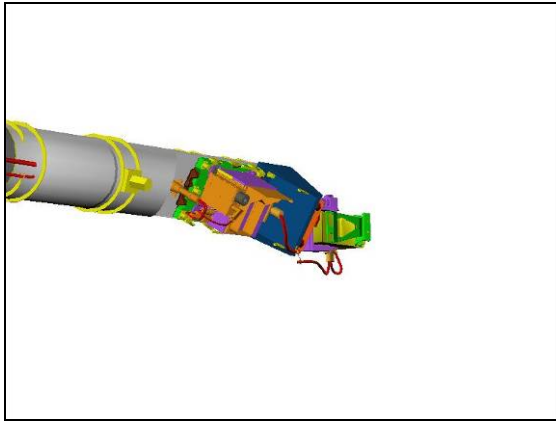
CAMR CMD PAN/TILT – HI RATE (LO within 10°)

PAN – L (to hard stop)
TILT – UP (to hard stop)

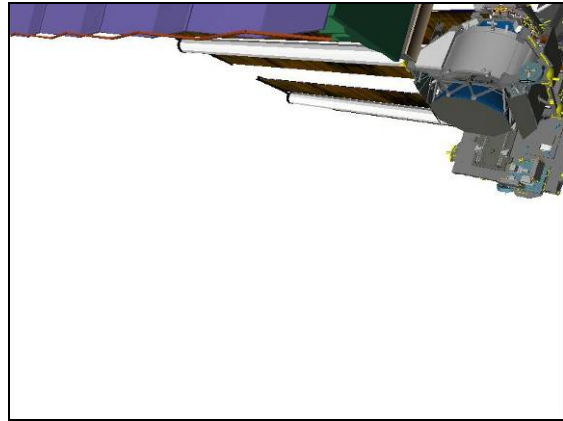
PAN/TILT – RESET

PAN: +108 (right)
TILT: -175 (down)

VIDEO OUT – not DTV
IN – not PL2



ELBOW (72,-23, full zoom in)



ITVC (108,-175)

3. SENSOR DEACTIVATION

- Perform LCC DEACTIVATION (LCS (Cue Card), PHOTO/TV)
- LCH DEACTIVATION (LCS (Cue Card), PHOTO/TV)
- DEACTIVATION (LDRI/ITVC (Cue Card), PHOTO/TV)

R12 Green Jumper – ISS

4. SETUP FOR UNGRAPPLE

- A7U CCTV – config for ungrapple
 - RMS WRIST, ZOOM: 34.0 HFOV
 - FOCUS: 5 ft

DNLK	EE
DTV	22: Base Elbow(09: P1 LOOB)
MON 1	B(C)
MON 2	A



22: BASE ELBOW (110,10)

5. OBSS UNGRAPPLE

On SSRMS operator GO, SSRMS grapple complete with Brakes ON and ready for SRMS release

NOTE

CONTR ERR It and 'S96 PDRS CNTL' msg may occur due to Consistency/Envelope Check error

RHC RATE – COARSE (RATE MIN tb-OFF)

SM 94 PDRS CONTROL

AUTO BRAKE INH – ITEM 10 EXEC (*)

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

BRAKES – ON (tb-ON)

SM 94 PDRS CONTROL

AUTO BRAKE ENA – ITEM 9 EXEC (*)

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

CAUTION

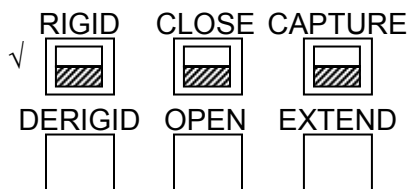
Monitor EE tb timing to prevent EE motor burnout

SM 169 PDRS STATUS

Monitor EE msw status

When OPEN tb – gray, mnvr arm clear of grapple pin (to X = -163)

EE MODE – AUTO
RELEASE sw – depress (mom)



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

- * If manual release reqd: *
- * 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) *
- * *
- * Mnvr arm clear of grapple pin, then *
- * EE MAN CONTR – DERIGID (hold until EXTEND tb-gray, 20 sec max) *
- * MODE – OFF *

OBSS STOW BACKOFF posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-163	-232	-364	173	11	230	0
	SY	SP	EP	WP	WY	WR	
√	+163.6	+25.3	-59.1	+44.7	+8.0	+86.2	

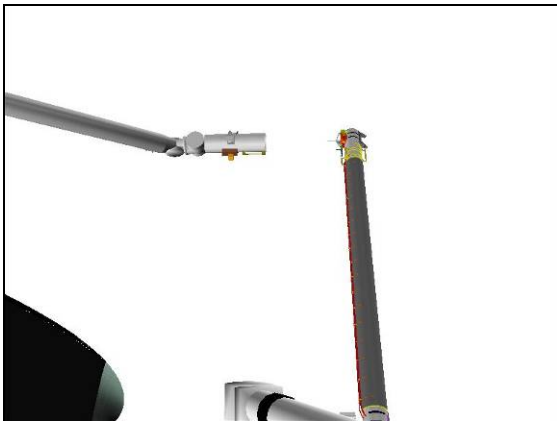
BRAKES – ON (tb-ON)

√MODE – not DIRECT (lt off)

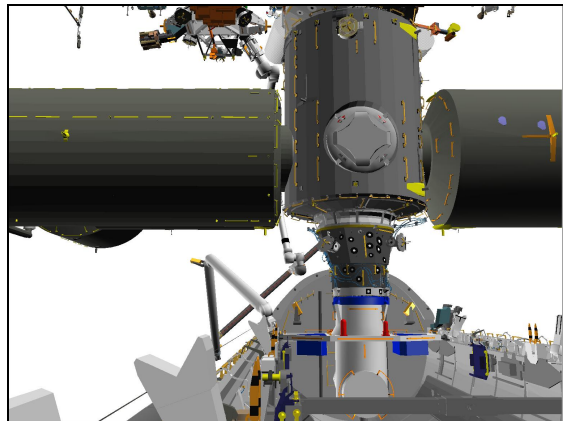
PARAM – PORT TEMP

JOINT – CRIT TEMP

Notify SSRMS operator that SRMS at OBSS Backoff with Brakes ON;
GO for OBSS stow



22: BASE ELBOW (110,10)

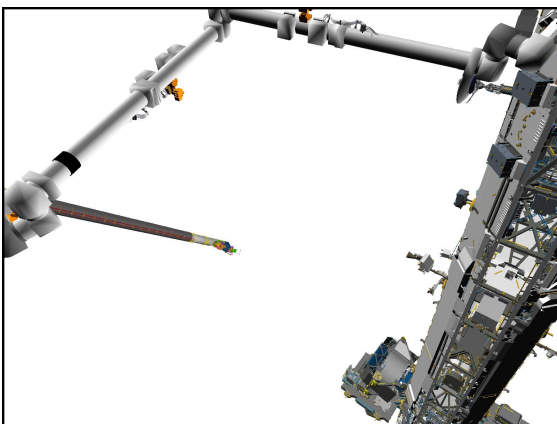


CCTV B (0,10)

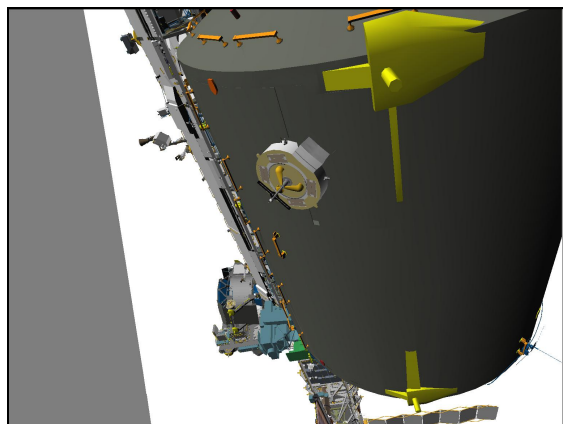
- * If using Shuttle attitude control and attitude maintenance reqd: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *

A7U

CCTV – configure cameras to support SSRMS OBSS ops



ELBOW (85,20)
Track SSRMS/OBSS motion

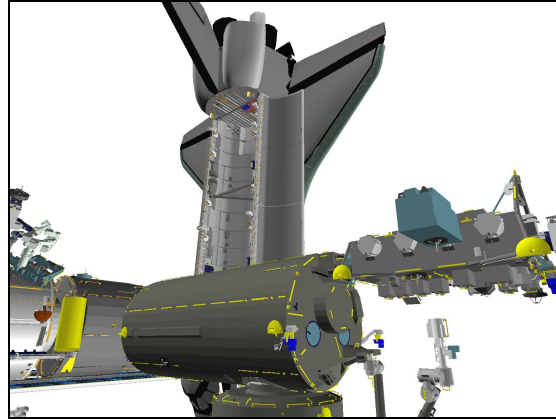


CCTV D (-105,50)
SSRMS/OBSS comes into FOV

POST OBSS TRANSFER PWRDN

1. SETUP

DNLK	A
DTV	B(C)
MON 1	09: P1 LOOB
MON 2	Elbow



09: P1 LOOB (140,20)
SRMS will come into FOV

SM 94 PDRS CONTROL

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

OBSS STOW BACKOFF:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-163	-232	-364	173	11	230	0
SY	SP	EP	WP	WY	WR	
+163.6	+25.3	-59.1	+44.7	+8.0	+86.2	

RHC

2. RMS PRECRADLE

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

Mnvr to PRECRADLE:

	SY	SP	EP	WP	WY	WR	
Backoff	+163.6	+25.3	-59.1	+44.7	+8.0	+86.2	
1: SY –	+60.0						
2: EP +			-25.0				
3: WP –				+5.0			
4: WY –					0.0		
5: WR –						0.0	
6: SY –	0.0						
Precradle	0.0	+25.3	-25.0	+5.0	0.0	0.0	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1261	-146	-551	5	2	0	0

BRAKES – ON (tb-ON)

3. RMS CRADLE

- * If using Shuttle attitude control, verify in attitude; *
- * √DAP: VERN(FREE) *

PARAM – JOINT ANGLE
 BRAKES – OFF (tb-OFF)
 MODE – SINGLE, ENTER

SINGLE DR to CRADLE position:

	SY	SP	EP	WP	WY	WR	NOTES
Precradle	0.0	+25.3	-25.0	+5.0	0.0	0.0	√WR R = 3(4)
1: EP +			+1.0				MA, SINGULAR, REACH, S/W STOP
2: SP –		0.0					MA
3: EP –			0.0				
4: WP –				0.0			
Cradle	0.0	0.0	0.0	0.0	0.0	0.0	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1282	-108	-445	0	0	0	0

√PORT RMS R-F-L tb (three) – gray

NOTE

Refer to SJ table in RMS PWRUP, step 6, if needed to obtain R-F-L indication

4. CONFIGURE POWER

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

R13L PL BAY MECH PWR SYS (two) – ON

5. PORT MRL LATCH

√PORT RMS R-F-L tb (three) – gray

SM 94 PDRS CONTROL

- √RMS PORT, ITEM 1 – (*)
- √PORT AFT,MID,FWD LAT (six) = 0

- * If any LAT MSW shows '1', ignore tb and *
- * drive MRL for single motor time (18 sec) *

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

If motor drive time > 8 sec, √MCC

BRAKES – ON (tb-ON)

6. STBD MRL LATCH

SM 94 PDRS CONTROL

RMS STBD – ITEM 2 EXEC (*)
√STBD AFT, MID, FWD LAT (six) = 0

- * If any LAT MSW shows '1', ignore tb and *
- * drive MRL for single motor time (18 sec) *

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

If motor drive time > 8 sec, √MCC

SM 94 PDRS CONTROL

√STBD AFT, MID, FWD LAT (six) = 1
RMS PORT – ITEM 1 EXEC (*)

R13L 7. RECONFIGURE POWER
PL BAY MECH PWR SYS (two) – OFF

8. CCTV, PLB LTS DEACT
Perform DEACTIVATION (TV (Cue Card), PHOTO/TV) as reqd

A7U PORT RMS CAMR – ELBOW

9. RMS TEMP MON
√BRAKES – ON (tb-ON)

RMS SEL – OFF
√PWR – PRI

SM 94 PDRS CONTROL

√I/O ON – ITEM 5 (*)

PARAM – PORT TEMP
JOINT – CRIT TEMP

√PORT RMS HTR A – AUTO
B – OFF

√STBD RMS HTR A,B (two) – OFF

This Page Intentionally Blank

LATE INSPECTION

OBSS DOCKED LDRI RCC SURVEY – STBD	FS 8-2
– NOSE CAP	FS 8-38
– PORT	FS 8-48

LATE
INSPECTION

WARNING
Stbd and Port radiator must be stowed

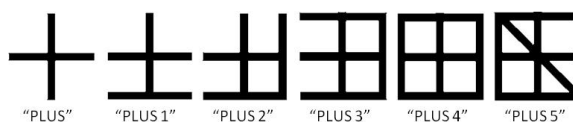
NOTE

In case of SPEE pwr loss, reset RSC Illuminator, reset PTU, select correct LDRI mode. Reference SPEE PWR DEACT CLEANUP ACTIONS (LDRI/ITVC (Cue Card), PHOTO/TV) as required.

For PL ID 1 & 2, the rates have been set such that Coarse is allowed within 10 ft of structure for all auto maneuvers.

Due to docked attitude constraints, the sun may enter the LDRI FOV causing it to temporarily shut down. (It will power up automatically after 20-30 sec.) MCC will predict which survey points/passes may be affected. If required, the survey will be paused at an ACAS pause point until the lighting concern has passed. When recording, crew will be prime to pause autosequence if image is lost or dark due to LDRI shutdown or sun in FOV.

Several panels have been marked with symbols (shown below) to aide with LDRI pointing. Symbols should only be used for coarse alignment; fine adjustments should be based on structural features of the RCC. ITVC may also be used for pointing, reference ITVC VIEW VERIFICATION(OBSS REF DATA) as required



PHOTO/TV NOTE

Pan and tilt of LDRI/ITVC requires that VIDEO IN PL2 light is illuminated with green VPU jumper in 'LDRI/ITVC'.

LDRI/ITVC view must be displayed on orbiter Monitors 1 or 2 to see pan and tilt values.

When pan and tilt of LDRI/ITVC finished, crew should ensure that the VIDEO IN PL2 light is not illuminated, to prevent inadvertant pan, tilt, or pan-tilt reset of LDRI/ITVC.

LDRI/ITVC pan and tilt operations used for taking survey data (recorders on) should be performed in LOW RATE. HIGH RATE allowed when not taking data (recorders off).

Some transitions are recorded for efficiency even though RCC is not in the FOV

LATE INSPECTION

1. SETUP

Verify SSRMS on MBS PDGF 2 at DLI VIEWING posn:

	SR	SY	SP	EP	WP	WY	WR
√	-66.2	+47.0	-134.9	-48.0	-15.8	-150.9	-90.6

Verify SPDM on Lab PDGF in PARK posn:

	SR	SY	SP	EP	WP	WY	WR
√Arm 1:	-90.0	-45.0	+80.0	+45.0	-30.0	+5.0	+90.0
√Arm 2:	+110.0	-37.0	+35.0	+45.0	-42.0	-12.0	+0.0
√Body:	-115.0						

SM 94 PDRS CONTROL

- √PL ID, ITEM 3: 2
- √INIT ID, ITEM 24: 2

Verify at OBSS HANDOFF posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1029	+229	-614	284	270	270	2
	SY	SP	EP	WP	WY	WR	
√	+25.8	+66.3	-49.0	-85.9	+10.7	-100.7	

*Display singularity

SM 94 PDRS CONTROL

AUTO MODES – ITEM 13 +1 +2 +3 +4 EXEC

END POS – ITEM 18 -1 2 4 7 +3 2 5 -5 5 0 EXEC

ATT – ITEM 21 +3 1 7 +2 8 8 +1 4 2 EXEC

CMD CK – ITEM 25 EXEC (GOOD)

2. MNVR TO DOCKED FLAT FIELDS

A7U

CCTV – config as reqd

RHC

RATE – COARSE (RATE MIN tb-OFF)

BRAKES – OFF (tb-OFF)

MODE – OPR CMD, ENTER (READY lt on)

AUTO SEQ – PROCEED (IN PROG lt on)

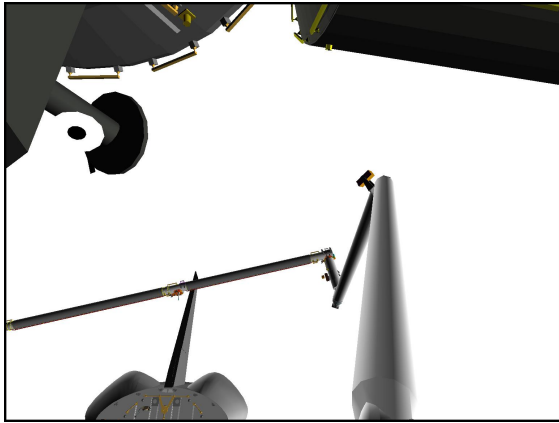
When AUTO SEQ IN PROG lt – off:

BRAKES – ON (tb-ON)

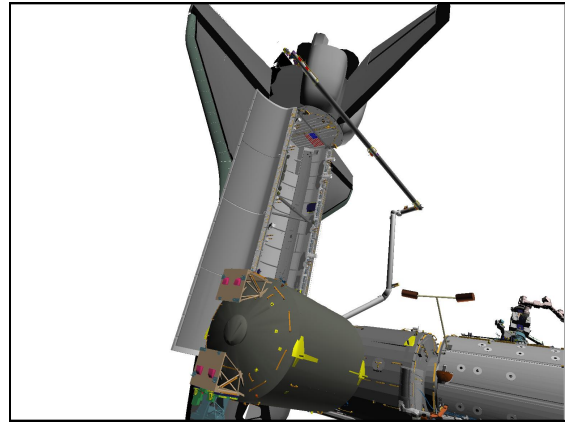
FLAT FIELDS INTERMEDIATE posn:

(02:00)

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1247	+325	-550	317	288	142	2
	SY	SP	EP	WP	WY	WR	
√	+9.9	+52.9	-55.1	+90.5	-31.1	-75.5	



CCTV A (10,30)



03: S1 LOOB (70,65)

SM 94 PDRS CONTROL

END POS – ITEM 18 -1247 +277 -392 EXEC

ATT – ITEM 21 +291 +329 +108 EXEC

CMD CK – ITEM 25 EXEC (GOOD)

BRAKES – OFF (tb-OFF)

MODE – OPR CMD, ENTER (READY It on)

AUTO SEQ – PROCEED (IN PROG It on)

When AUTO SEQ IN PROG It – off:

BRAKES – ON (tb-ON)

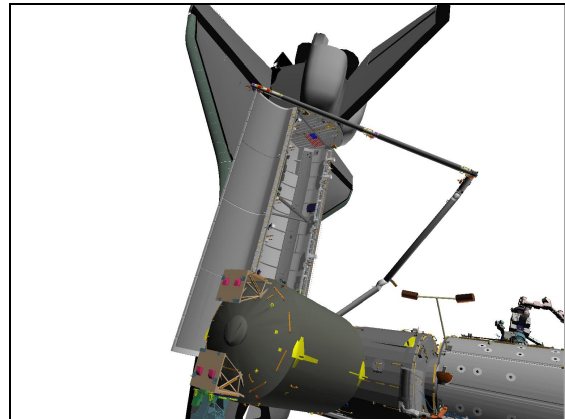
DOCKED FLAT FIELDS posn:

(02:00)

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1247	+277	-392	291	329	108	2
	SY	SP	EP	WP	WY	WR	
√	-22.7	+49.0	-15.2	-4.7	-57.2	-151.1	



CCTV A (10,30)



03: S1 LOOB (70,65)

3. CONFIGURE FOR SURVEYS
 R12(OBSS) RSC PWR – OFF, ON

Perform ACTIVATION (LDRI/ITVC (Cue Card), PHOTO/TV) steps 1, 3, 4, and 5

A7U MUX 1 L ← MIDDECK

LDRI MODE 6 pb – push (flickering LDRI displayed)

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: +70 (right)

TILT: -135 (down)

VID OUT – not DTV

IN – not PL2

For survey scan pattern, refer to OBSS DOCKED LDRI SCAN PATTERN CUE CARD – STBD & PORT

4. MNVR TO ACAS START

Mnvr to ACAS Start Clearance Views	Cameras
RMS-to-JPM	25: Tip LEE*, A, Elbow
OBSS-to-PLBD	RSC, D, C, Elbow

*SSRMS LEE is the prime ISS view for RMS-JPM clearance.
 SPDM Body 2 (DCP# 47) is available as a backup

NOTE

Clearance between RMS and JPM is:

19 inches at point 4,

53 inches at point 6, and

29 inches at point 7.

Expect C/W SINGULAR It during mnvr to point 7.

This C/W will extinguish during mnvr to point 9

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

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 ●)

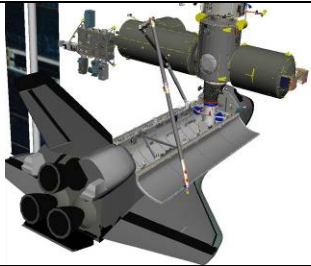
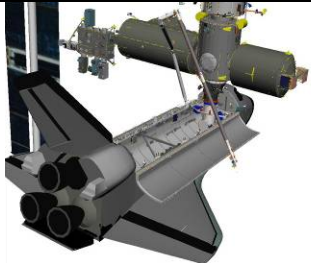
NOTE

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

AUTO SEQ – PROCEED (IN PROG It on)

Mnvr to ACAS Start

(03:15)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
1P	-1247	+277	-392	291	329	108	
2	-1240	+330	-392	291	329	108	
3	-1200	+320	-392	291	329	108	
4	-1182	+281	-392	291	329	108	
5	-1236	+280	-392	291	329	108	
6	-1236	+280	-418	292	324	110	
*7P	-940	+291	-363	267	331	64	

* – Expect MA, SINGULAR It

L10(VTR) When AUTO SEQ READY It – on:
 STOP pb – push (no red ●)

5. STBD LDRI ACAS, SECTION 1a

Section 1 Clearance Views	Cameras
RMS-to-JPM	25: Tip LEE, A, Elbow
OBSS-to-PLBD	RSC, C, D, Elbow

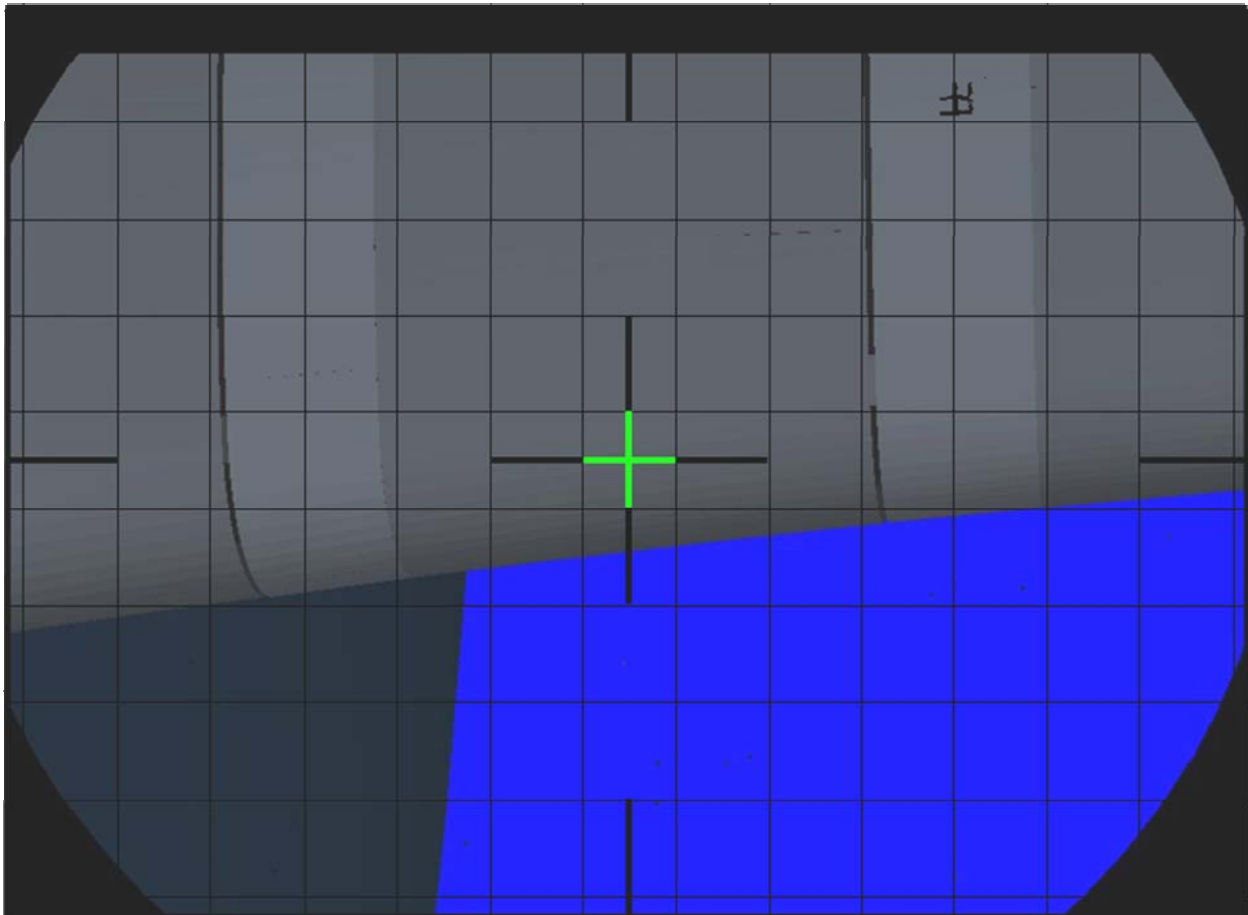
NOTE

Clearance between RMS and JPM is 25 inches at point 9

A7U

√DTV ← PL2

TILT to match LDRI view shown below (LOW RATE within 10°, note RCC marking)



LDRI: +70, -85 (up)

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

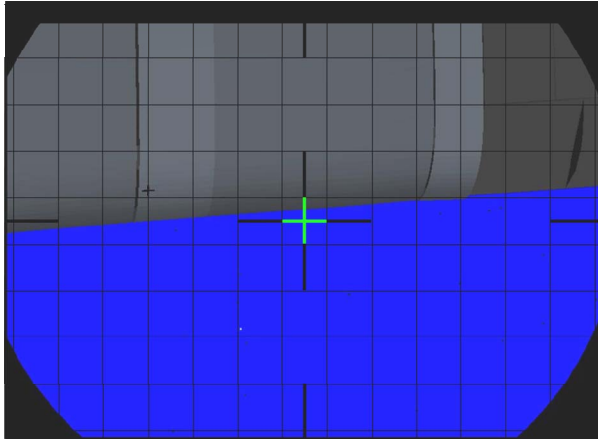
L10(VTR)

REC pb – push, hold

PLAY pb – push, simo (red ●)

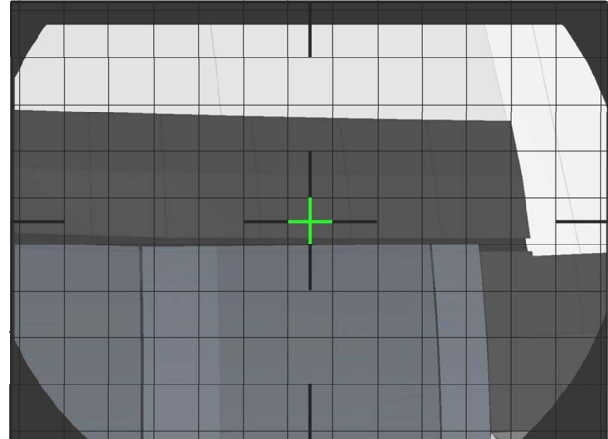
A7U CAMR CMD PAN/TILT – LOW RATE
 PAN/TILT as shown to match LDRI views below (note RCC marking)

1. PAN left to +52



LDRI: +52, -85

2. TILT up to -75



LDRI: +52, -75

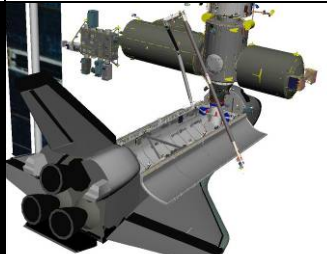
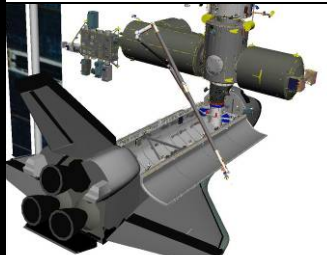
√MCC to verify correct coverage and view
 Note PAN/TILT: _____, _____

A7U √DTV ← PL2
 VID OUT – not DTV
 IN – not PL2

AUTO SEQ – PROCEED (IN PROG It on)

STBD SCAN section 1a

(01:35)

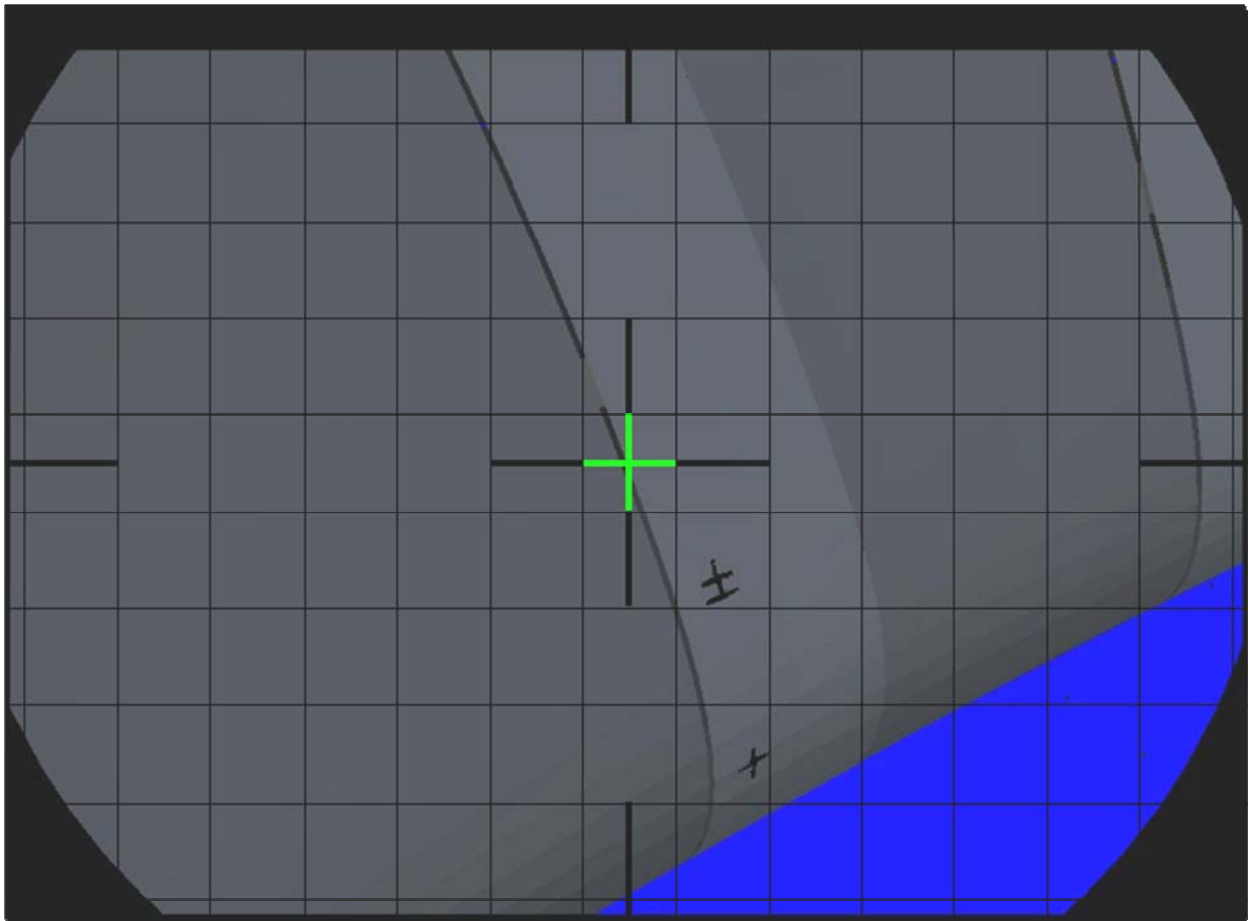
Pt	X	Y	Z	PITCH	YAW	ROLL	•
*7P	-940	+291	-363	267	331	64	
*8	-1036	+304	-344	272	326	63	
9	-971	+287	-376	270	322	61	
10P	-1055	+293	-373	273	322	63	

* – Expect SINGULAR It

When AUTO SEQ READY It – on:

A7U √DTV ← PL2
 √CAMR CMD PAN/TILT – LOW RATE

TILT to match LDRI view below (note RCC marking)



LDRI: +52, -88 (down)

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

A7U

VID OUT – not DTV
IN – not PL2

6. STBD LDRI ACAS, SECTION 1b and 1c

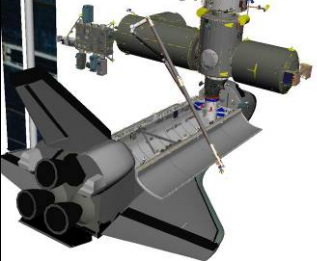
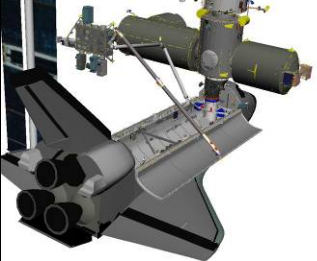
NOTE

Clearance between RMS boom and JPM is 19 inches
at point 11. Monitor with Tip LEE and Camera A(Elbow)

AUTO SEQ – PROCEED (IN PROG It on)

Section 1b

(01:05)

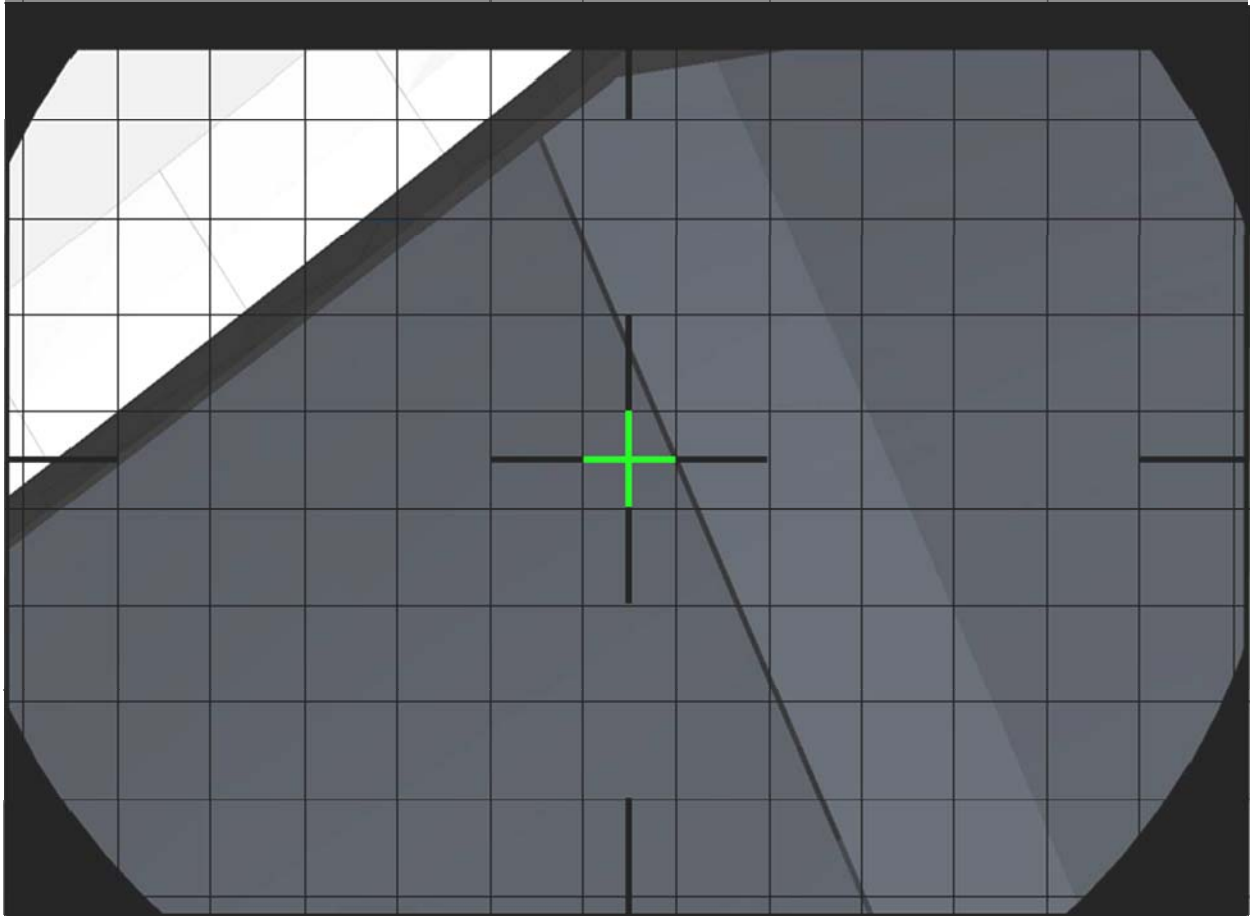
Pt	X	Y	Z	PITCH	YAW	ROLL	●
10P	-1055	+293	-373	273	322	63	
11P	-1020	+265	-407	268	308	95	

L10(VTR) When AUTO SEQ READY It – on:
STOP pb – push (no red ●)

A7U

√DTV ← PL2

PAN to match LDRI view shown below (LOW RATE within 10°)



LDRI: +110 (right), -88

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

A7U

√DTV ← PL2

VID OUT – not DTV

IN – not PL2

L10(VTR)

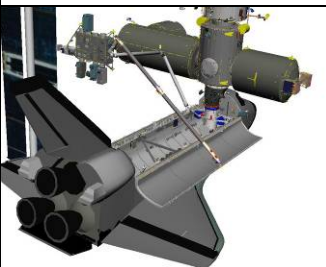
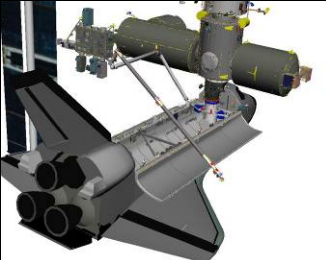
REC pb – push, hold

PLAY pb – push, simo (red ●)

AUTO SEQ – PROCEED (IN PROG It on)

STBD ACAS section 1c

(01:00)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
11P	-1020	+265	-407	268	308	95	
12P	-1104	+321	-383	274	305	101	

L10(VTR) When AUTO SEQ READY It – on:
STOP pb – push (no red ●)

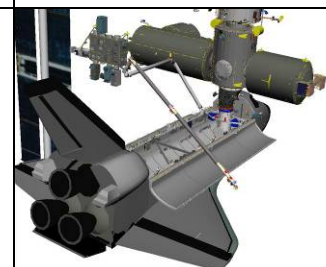
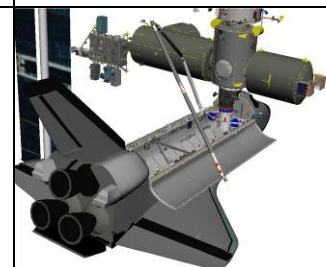
NOTE

Minimum clearance between RMS boom and JPM is 25 inches between points 13 & 14.
Monitor with Camera A(Elbow) and Tip LEE

AUTO SEQ – PROCEED (IN PROG It on)

Configure for section 1d

(01:35)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
12P	-1104	+321	-383	274	305	101	
13	-1180	+310	-395	277	309	116	
14P	-1106	+278	-397	275	323	154	

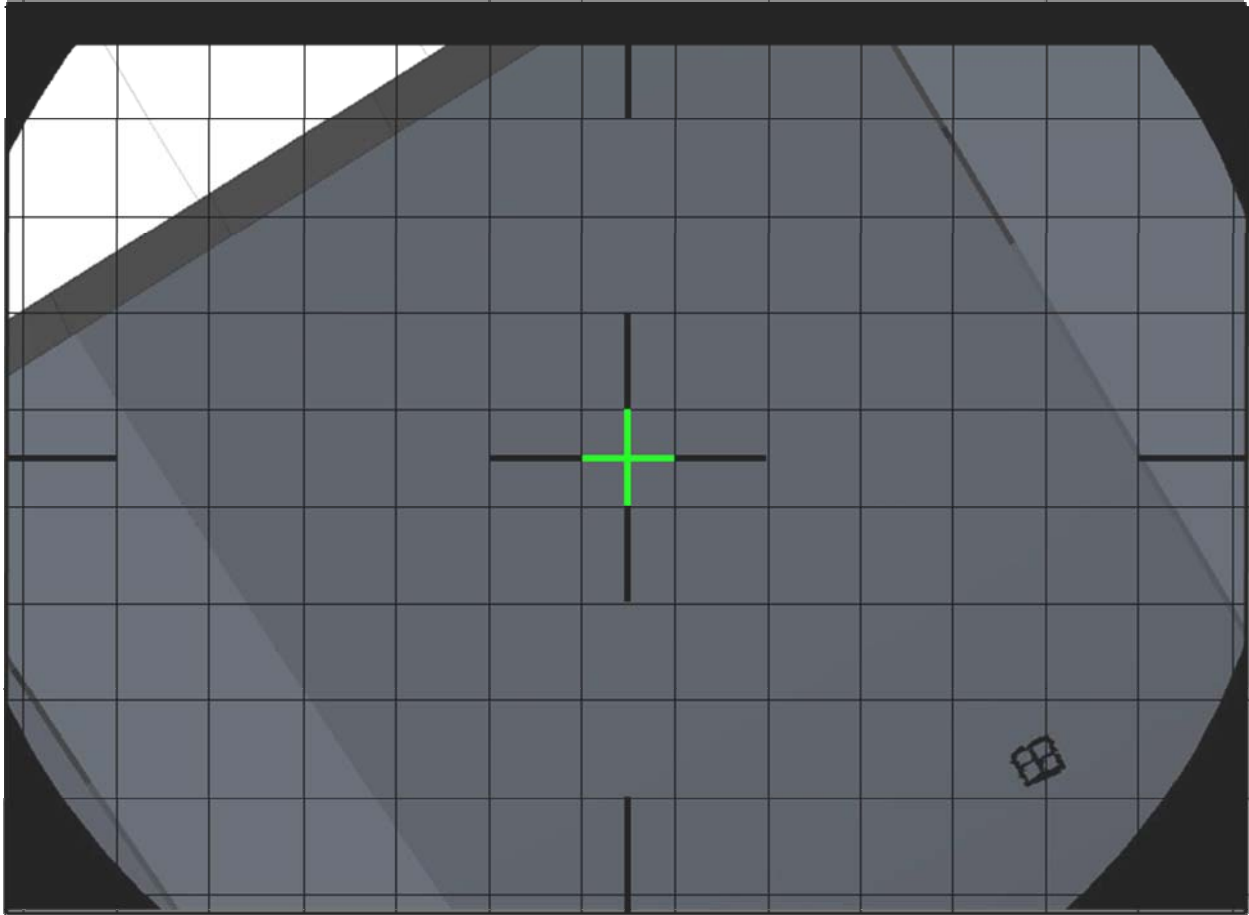
7. STBD LDRI ACAS, SECTION 1d

When AUTO SEQ READY It – on:

A7U

√DTV ← PL2

PAN/TILT to match LDRI view shown below (LOW RATE within 10°, note RCC marking)



LDRI: +162 (right), -130 (down)

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

A7U

√DTV ← PL2

VID OUT – not DTV

IN – not PL2

NOTE

Minimum clearance between RMS boom and JPM is 19 inches at point 16. Monitor with Tip LEE and Camera A(Elbow)

L10(VTR)

REC pb – push, hold

PLAY pb – push, simo (red ●)

AUTO SEQ – PROCEED (IN PROG It on)

STBD ACAS section 1d

(02:25)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
14P	-1106	+278	-397	275	323	154	
15	-1225	+417	-390	288	323	154	
16	-1219	+419	-386	295	327	164	
17	-1250	+448	-385	296	327	164	
18P	-1327	+464	-389	302	327	164	

When AUTO SEQ READY It – on:

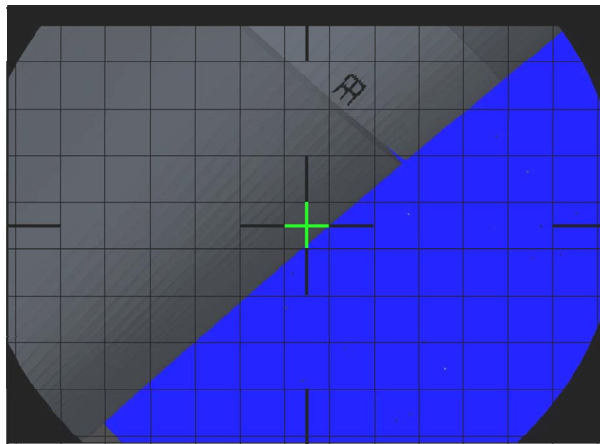
A7U

√DTV ← PL2

CAMR CMD PAN/TILT – LOW RATE

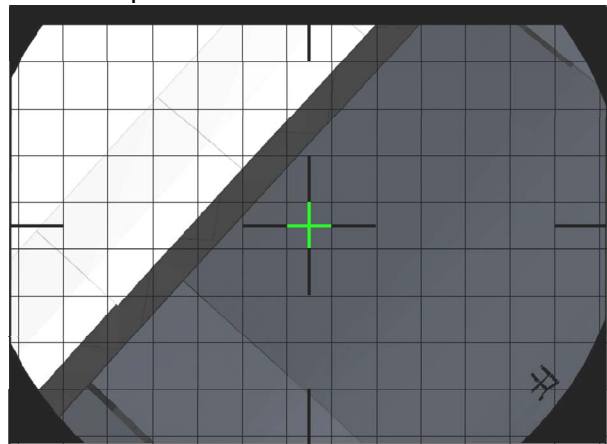
PAN/TILT as shown to match LDRI views below (note RCC marking)

1. PAN left to +120



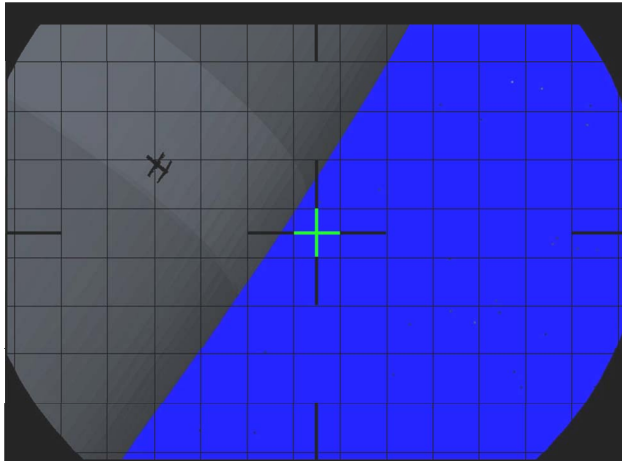
LDRI: +120, -130

2. TILT up to -115



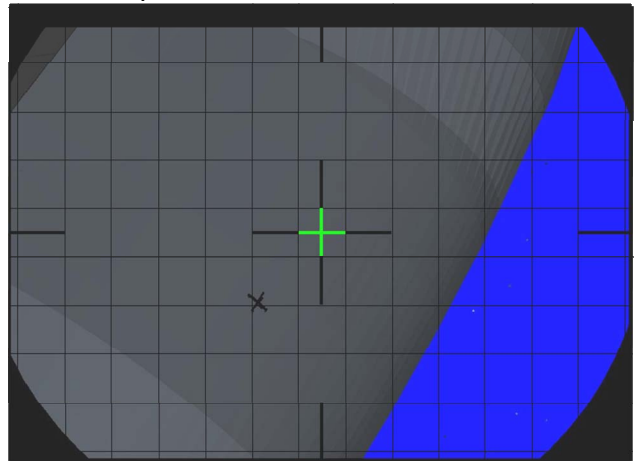
LDRI: +120, -115

3. PAN left to +100



LDRI: +100, -115

4. TILT up to -105



LDRI: +100, -105

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

L10(VTR) STOP pb – push (no red ●)

A7U VID OUT – not DTV
 IN – not PL2

AUTO SEQ – PROCEED (IN PROG It on)

Configure for section 2

(00:55)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
18P	-1327	+464	-389	302	327	164	
19	-1341	+495	-380	304	321	168	
20P	-1342	+517	-355	302	326	164	

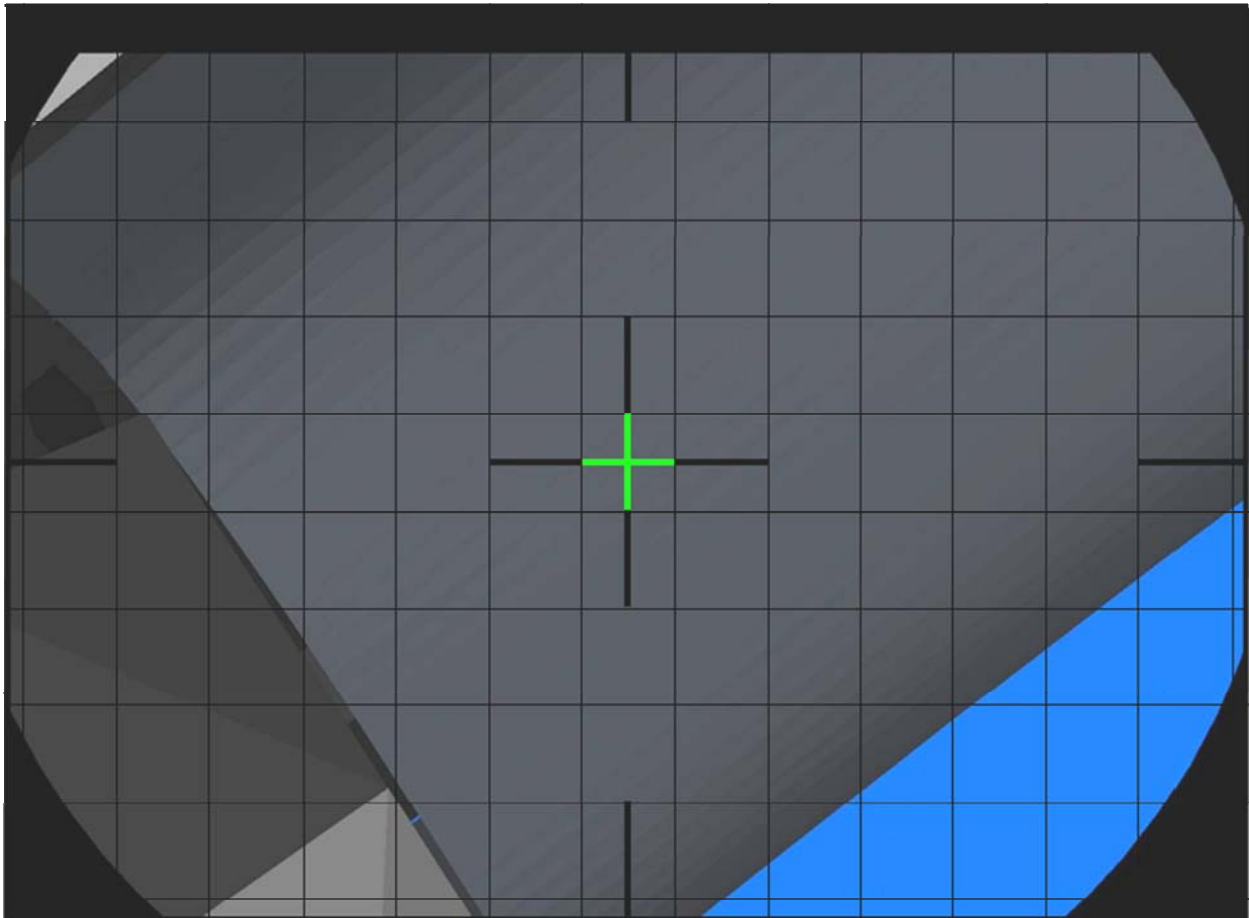
8. STBD LDRI ACAS, SECTION 2

When AUTO SEQ READY It – on:

A7U

√DTV ← PL2

PAN/TILT to match LDRI view shown below (LOW RATE within 10°)



LDRI: +140 (right), -83 (up)

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

A7U

√DTV ← PL2

VID OUT – not DTV

IN – not PL2

Section 2 Clearance Views	Cameras
RMS-to-JPM	25: Tip LEE, A, Elbow
OBSS-to-RCC	RSC, D, C, Elbow

NOTE

Minimum clearance between RMS boom
and JPM is 28 inches at points 24 and 25

L10(VTR)

REC pb – push, hold

PLAY pb – push, simo (red ●)

AUTO SEQ – PROCEED (IN PROG It on)

STBD ACAS section 2

(02:45)

Pt	X	Y	Z	PITCH	YAW	ROLL	•
20P	-1342	+517	-355	302	326	164	
21	-1240	+498	-354	294	315	136	
22	-1160	+422	-338	284	314	111	
23	-1122	+386	-331	280	323	108	
24	-1068	+334	-330	275	330	106	
25P	-1036	+304	-328	273	335	111	

When AUTO SEQ READY It – on:

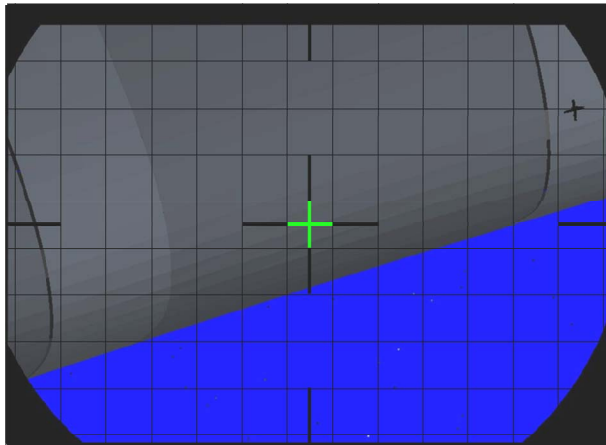
A7U

√DTV ← PL2

CAMR CMD PAN/TILT – LOW RATE

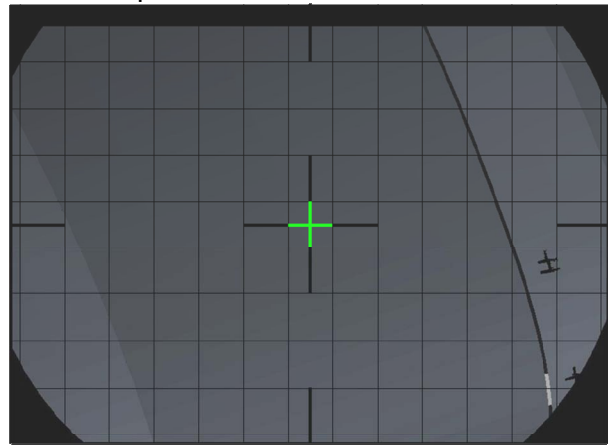
PAN/TILT as shown to match LDRI views below (note RCC marking)

1. PAN left to +120



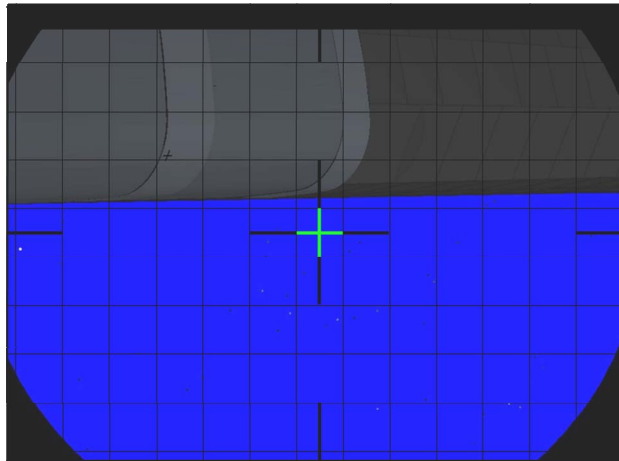
LDRI: +120, -83

2. TILT up to -75



LDRI: +120, -75

3. PAN left to +60



LDRI: +60, -75

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

L10(VTR) STOP pb – push (no red ●)

NOTE

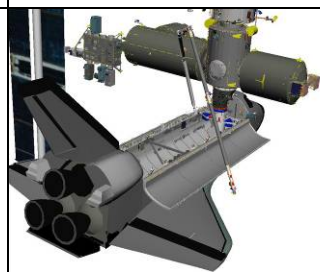
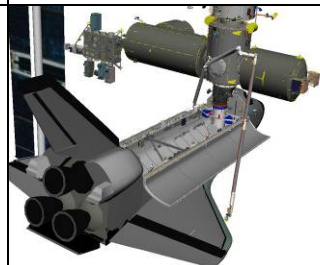
Minimum clearance between RMS boom and JPM is 24 inches between points 25 and 26. Monitor with Tip LEE and Camera A(Elbow).

At point 27, the clearance between the RMS and Node 2 is 27 inches and between RMS and PMA is 28 inches. Monitor with Tip LEE and Camera A(Elbow)

AUTO SEQ – PROCEED (IN PROG It on)

Configure for section 3

(02:30)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
25P	-1036	+304	-328	273	335	111	
26	-1066	+376	-193	274	334	111	
27P	-1053	+298	-210	290	354	34	

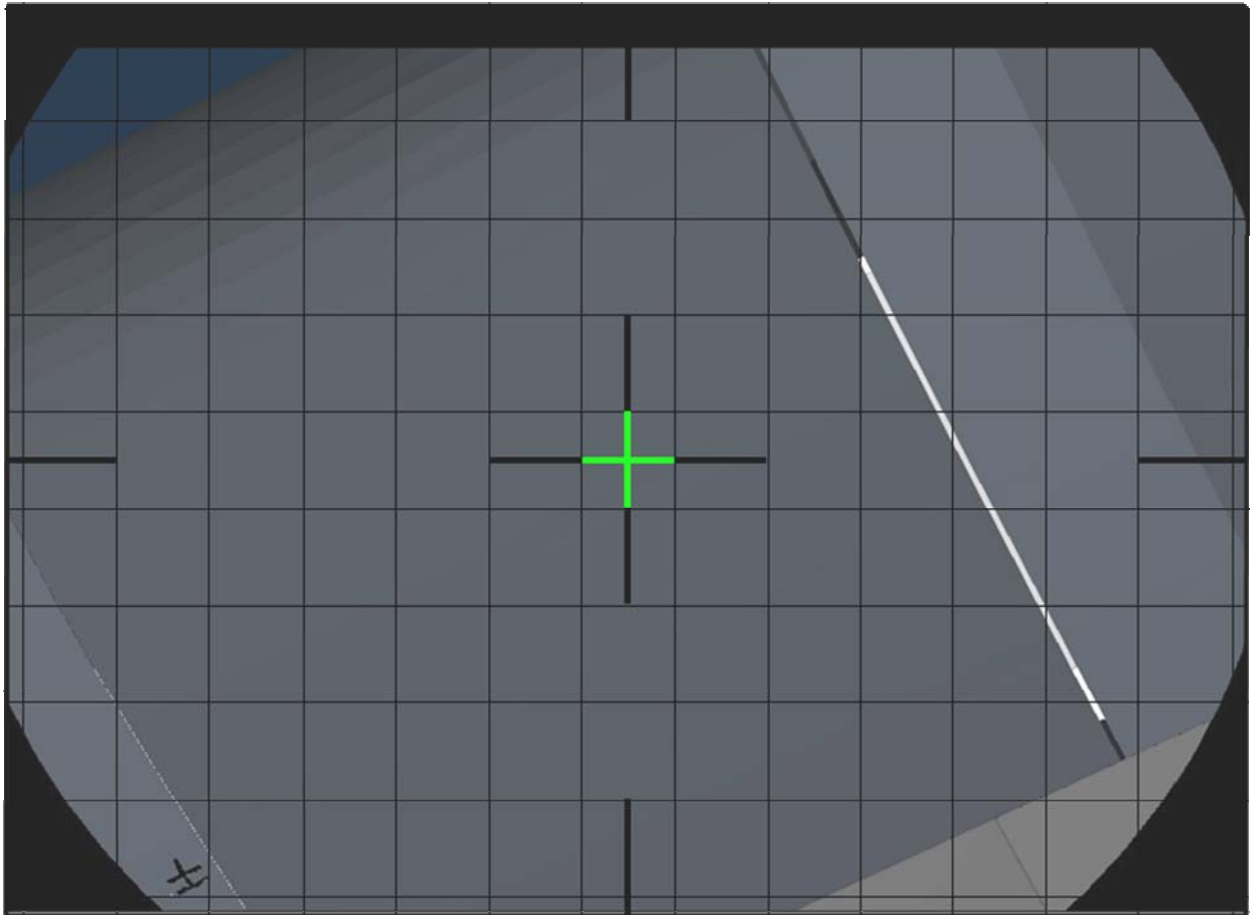
9. STBD LDRI ACAS, SECTION 3

When AUTO SEQ READY It – on:

A7U

√DTV ← PL2

PAN/TILT to match LDRI view shown below (LO RATE within 10°,
note RCC marking)



LDRI: +90 (right), -47 (up)

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

A7U

√DTV ← PL2

VID OUT – not DTV

IN – not PL2

Section 3 Clearance Views	Cameras
RMS-to-Node 2/PMA	Elbow, A, 25: Tip LEE
OBSS-to-RCC	RSC, D, C

NOTE

Clearance between OBSS and RCC is less than 60 inches throughout section 3 (minimum clearance of 43 inches at point 31).

Clearance between RMS and Node 2 and between RMS and PMA is less than 36 inches throughout section 3 with minimum of:

24 inches to Node 2 at point 29

22 inches to PMA 2 at point 32.

Points 30-31 are pause points to ensure correct trajectory for RCC coverage

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

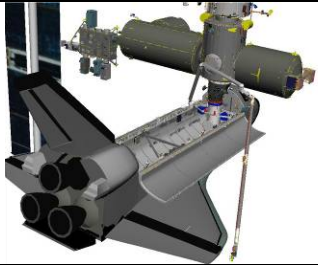
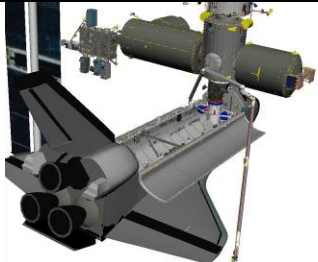
AUTO SEQ – PROCEED (IN PROG It on)

STBD ACAS section 3a

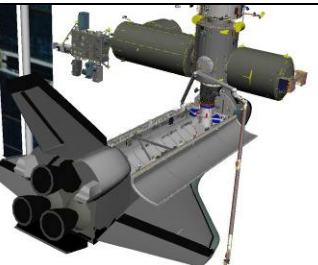
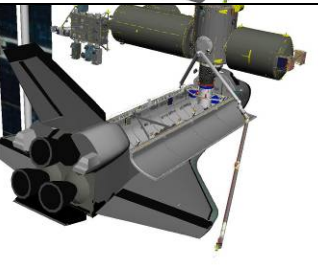
(02:00)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
27P	-1053	+298	-210	290	354	34	
28	-1075	+298	-213	293	354	33	
29	-1161	+370	-220	303	349	29	
30P	-1268	+460	-220	317	341	23	

When AUTO SEQ READY It – on:
AUTO SEQ – PROCEED (IN PROG It on)

Pt	X	Y	Z	PITCH	YAW	ROLL	•
30P	-1268	+460	-220	317	341	23	
31P	-1288	+474	-222	317	341	23	

When AUTO SEQ READY It – on:
 AUTO SEQ – PROCEED (IN PROG It on)

Pt	X	Y	Z	PITCH	YAW	ROLL	•
31P	-1288	+474	-222	317	341	23	
32P	-1342	+481	-221	337	341	23	

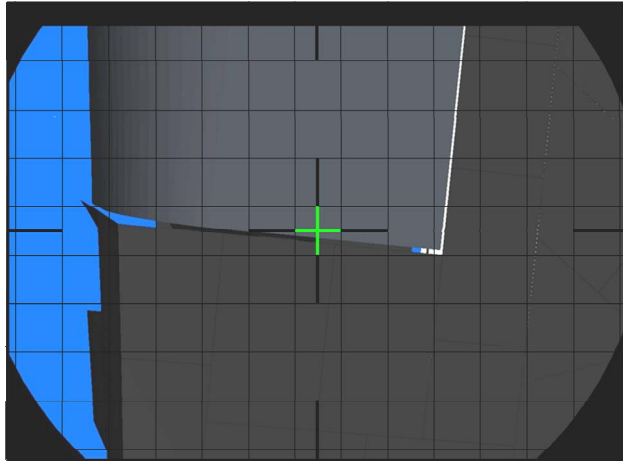
A7U

When AUTO SEQ READY It – on:

√DTV ← PL2

CAMR CMD PAN/TILT – LOW RATE

TILT down to -65 to match LDRI view below



LDRI: +90,-65 (down)

√MCC to verify correct coverage

Note PAN/TILT: _____, _____

L10(VTR) STOP pb – push (no red ●)

A7U VID OUT – not DTV
IN – not PL2

NOTE

Minimum clearance between RMS and PMA-2 is 18 inches during mnvr to point 33. Monitor with Elbow, A, and/or Tip LEE

AUTO SEQ – PROCEED (IN PROG It on)

Configure for section 4

(02:55)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
32P	-1342	+481	-221	337	341	23	
33	-1300	+521	-193	307	341	141	
34P	-1333	+541	-285	304	334	155	

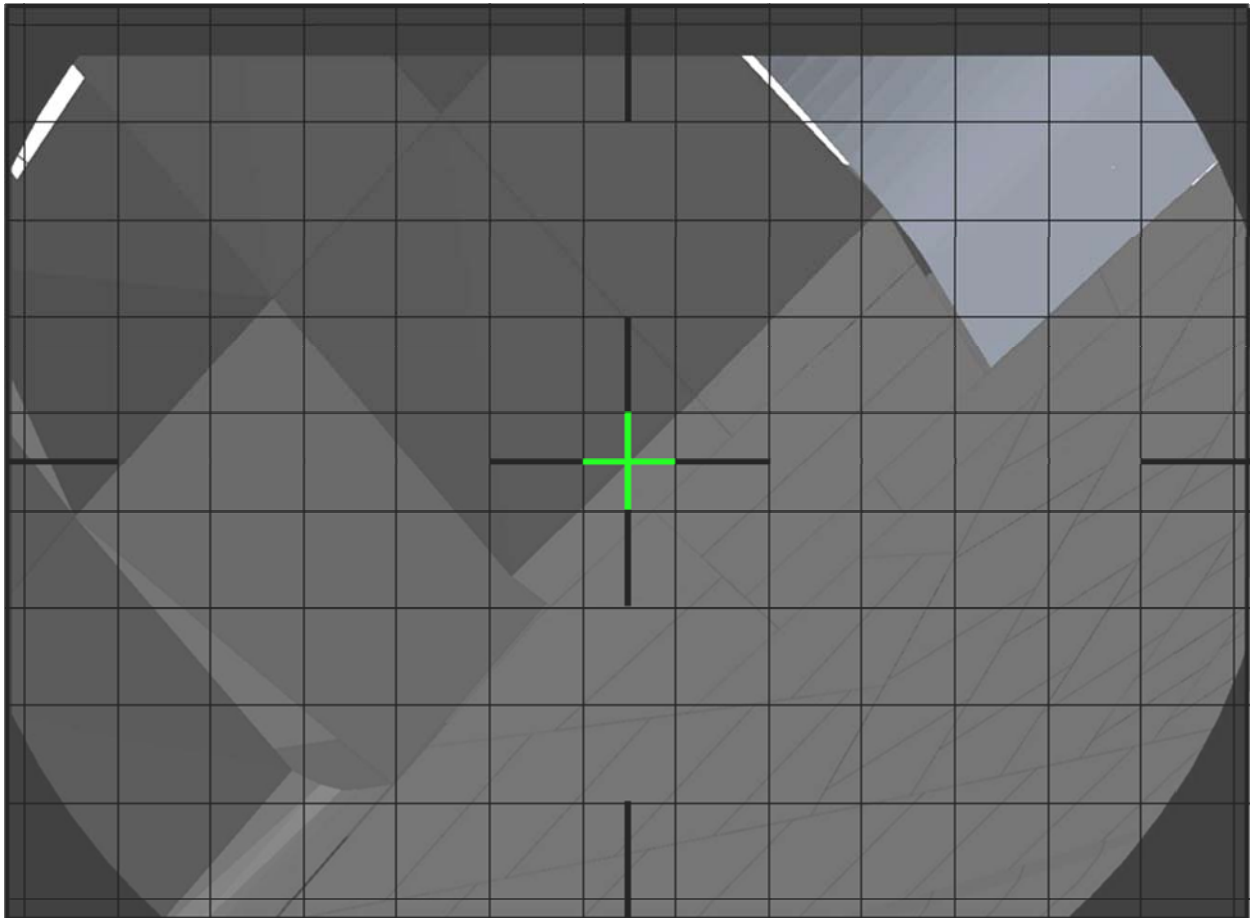
10. STBD LDRI ACAS, SECTION 4

When AUTO SEQ READY It – on:

A7U

√DTV ← PL2

PAN/TILT to match LDRI view shown below (LOW RATE within 10°)



LDRI: +170 (right),-61 (up)

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

A7U

√DTV ← PL2

VID OUT – not DTV

IN – not PL2

Section 4 Clearance Views	Cameras
RMS-to-JPM/Node 2/PMA	25: Tip LEE, A, Elbow
OBSS-to-RCC	RSC, D, C

NOTE

Minimum clearances between RMS and Node 2 (36 inches) and RMS and PMA (37 inches) occur at point 35.

Minimum clearances between the RMS and JPM are:

20 inches at point 37

24 inches at point 39

L10(VTR)

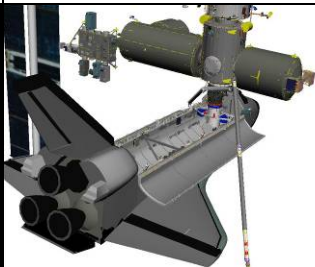
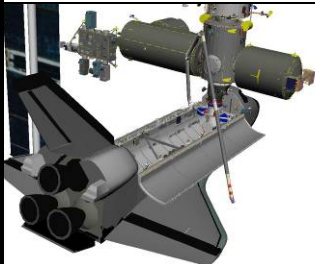
REC pb – push, hold

PLAY pb – push, simo (red ●)

AUTO SEQ – PROCEED (IN PROG It on)

STBD ACAS section 4a

(02:45)

Pt	X	Y	Z	PITCH	YAW	ROLL	•
34P	-1333	+541	-285	304	334	155	
35	-1281	+528	-295	305	331	157	
36	-1241	+505	-295	298	331	157	
37	-1173	+438	-293	292	332	157	
38	-1166	+448	-296	285	335	154	
39	-1083	+350	-291	279	338	151	
40P	-1058	+335	-293	275	340	145	

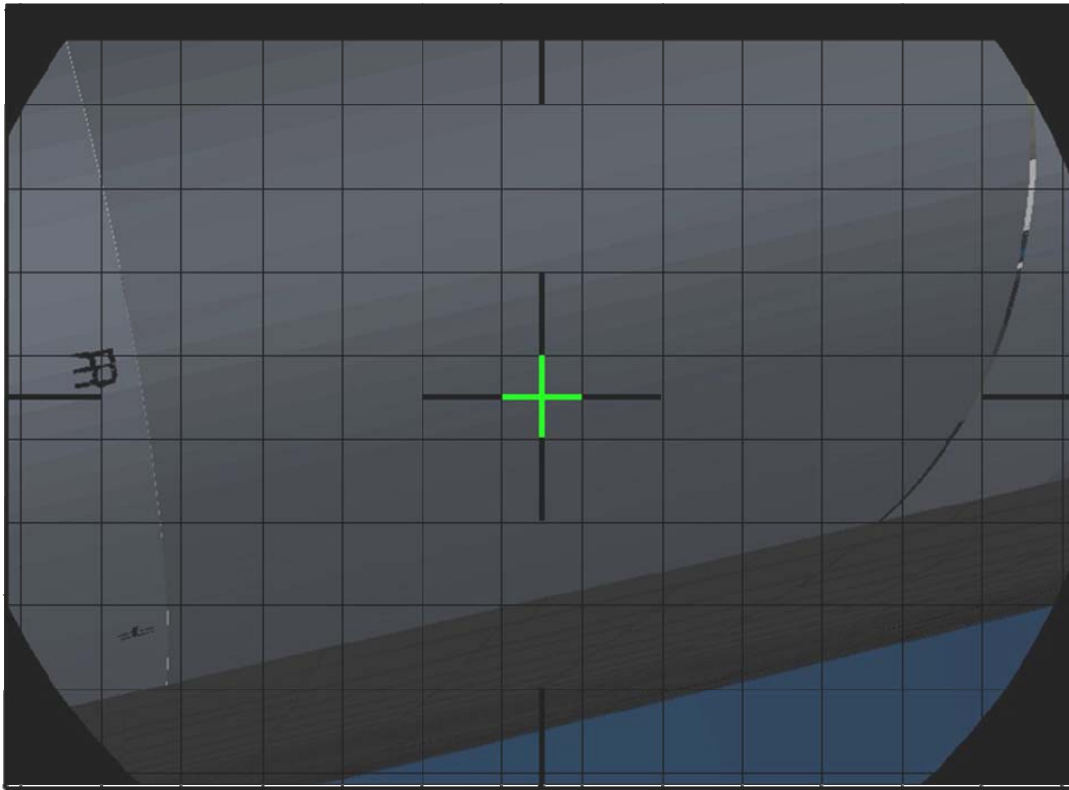
When AUTO SEQ READY It – on:

A7U

√DTV ← PL2

CAMR CMD PAN/TILT – LOW RATE

TILT to match LDRI view below (note RCC marking)



LDRI: +170, -70 (down)

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

A7U

√DTV ← PL2
VID OUT – not DTV
IN – not PL2

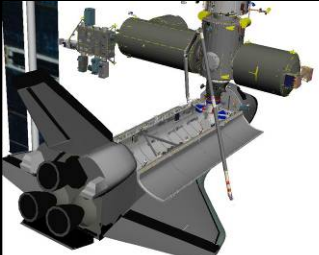
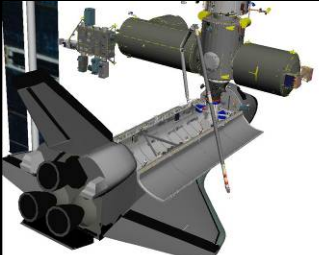
NOTE

Clearance between RMS and JPM is 18 inches at point 41.
 Monitor with Tip LEE and Camera A(Elbow)

AUTO SEQ – PROCEED (IN PROG It on)

STBD ACAS section 4b

(00:45)

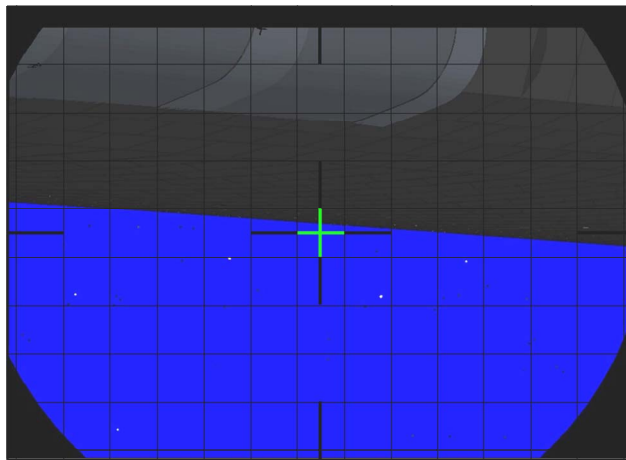
Pt	X	Y	Z	PITCH	YAW	ROLL	●
40P	-1058	+335	-293	275	340	145	
41P	-1021	+303	-294	273	340	140	

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

A7U

√DTV ← PL2
 CAMR CMD PAN/TILT – LOW RATE

PAN left to 95 to match LDRI view below



LDRI: +95, -70

L10(VTR)

STOP pb – push (no red ●)

11. CONFIGURE FOR STBD SURVEY PART 2
 RHC √RATE – COARSE (RATE MIN tb-OFF)
 BRAKES – OFF (tb-OFF)
 MODE – AUTO 2, ENTER (READY It on)

SM 94 PDRS CONTROL

√START PT, ITEM 17: 42

SM 169 PDRS STATUS

Monitor ACAS progress

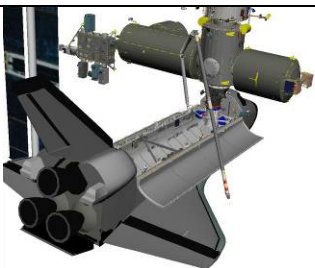
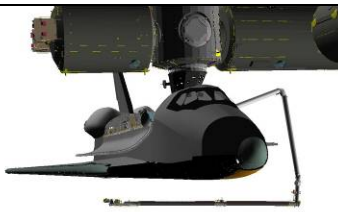
NOTE

Minimum clearances between RMS and JPM are 18 inches at point 42 (monitor with Tip LEE or Elbow camera) and 53 inches between points 43 & 44 (monitor with Camera A)

AUTO SEQ – PROCEED (IN PROG It on)

Configure for section 5

(18:35)

Pt	X	Y	Z	PITCH	YAW	ROLL	•
42P	-1021	+303	-294	273	340	140	
43	-1285	+500	-585	350	280	240	
44	-1225	+54	-585	36	295	290	
45	-1267	-200	-570	35	318	294	
46	-1406	-625	-549	24	1	274	
47	-1379	-587	-15	330	357	273	
48	-1192	-107	-68	333	310	336	
49P	-903	+180	-212	31	278	24	

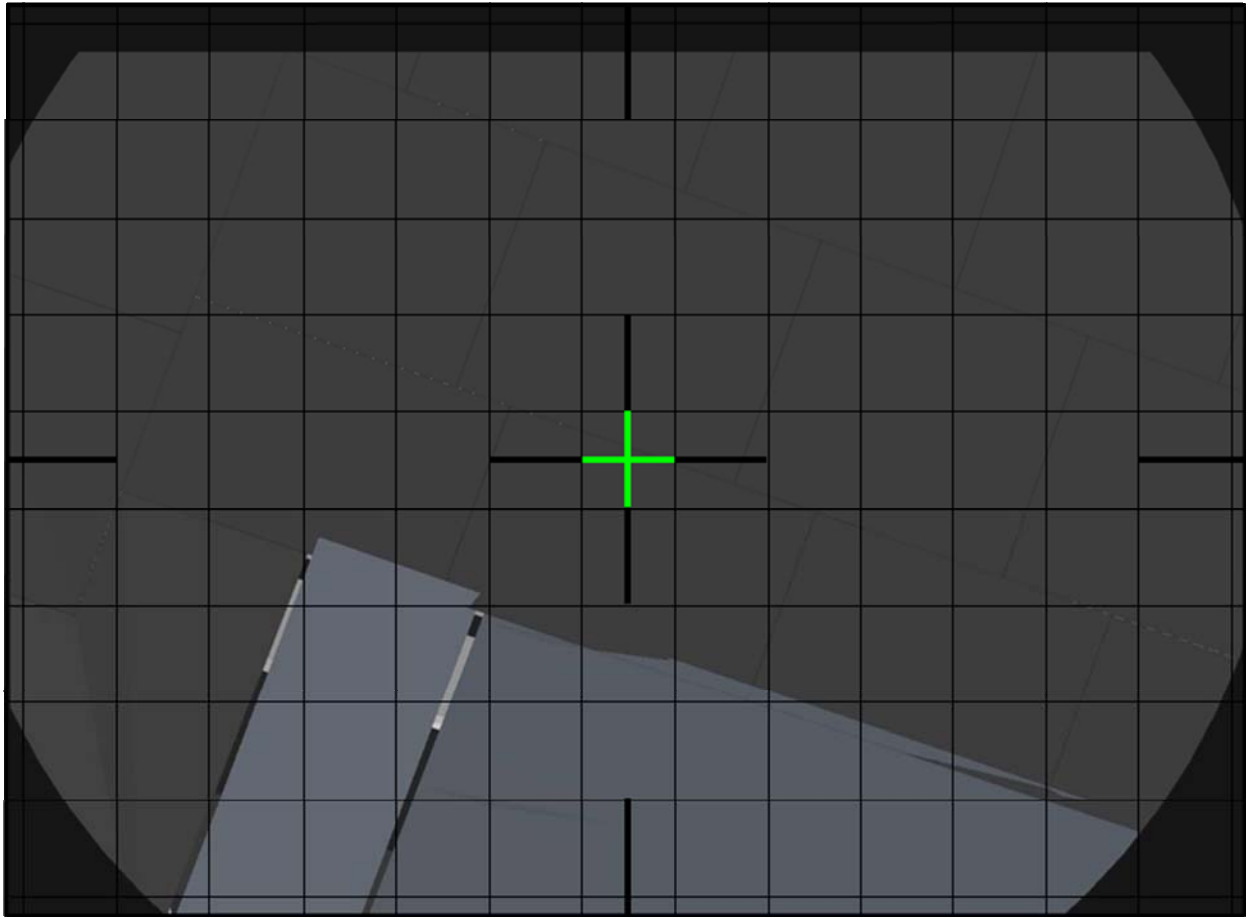
When AUTO SEQ IN PROG It – off:
 BRAKES – ON (tb-ON)

12. STBD LDRI ACAS, SECTION 5

A7U

√DTV ← PL2

PAN/TILT to match LDRI view shown below (LOW RATE within 10°)



LDRI: +52 (left), -72 (down)

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

A7U

√DTV ← PL2

VID OUT – not DTV

IN – not PL2

Section 5-7 Clearance Views	Cameras
RMS-to-JPM	A, B
RMS-to-PLBD	Elbow, A, B, 24: Tip Elbow
OBSS-to-RCC	RSC, 03: S1 LOOB

NOTE

Clearance between RMS and PLBD is 41 inches at point 53

RHC

√RATE – COARSE (RATE MIN tb-OFF)

BRAKES – OFF (tb-OFF)

MODE – AUTO 3, ENTER (READY lt on)

SM 94 PDRS CONTROL

√START PT, ITEM 17: 50

SM 169 PDRS STATUS


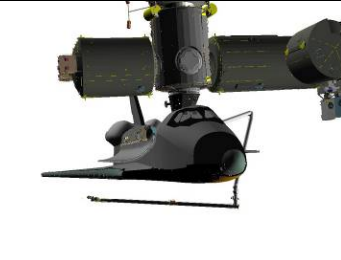
Monitor ACAS progress

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

AUTO SEQ – PROCEED (IN PROG It on)

STBD ACAS section 5

(01:45)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
50P	-903	+180	-212	31	278	24	
51	-1008	+201	-214	15	291	357	
52	-1062	+224	-214	15	291	357	
53P	-1128	+281	-208	11	298	345	

When AUTO SEQ READY It – on:

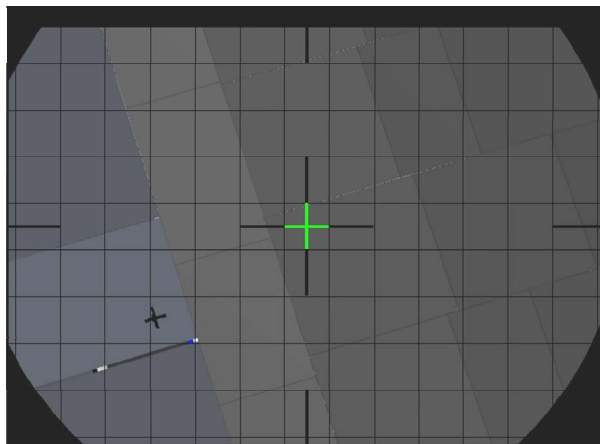
A7U

√DTV ← PL2

CAMR CMD PAN/TILT – LOW RATE

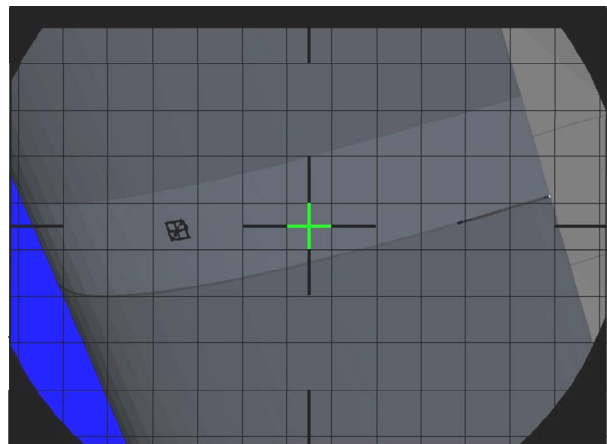
PAN/TILT as shown to match LDRI views below (note RCC marking)

1. PAN left to +43



LDRI: +43, -72

2. TILT down to -110



LDRI: +43, -110

√MCC to verify correct coverage



Note PAN/TILT: _____, _____

L10(VTR) STOP pb – push (no red ●)

AUTO SEQ – PROCEED (IN PROG It on)

Configure for section 6

(00:50)

Pt	X	Y	Z	PITCH	YAW	ROLL	•	
53P	-1128	+281	-208	11	298	345		
54	-1060	+295	-237	18	298	7		
55P	-1071	+307	-245	25	299	15		

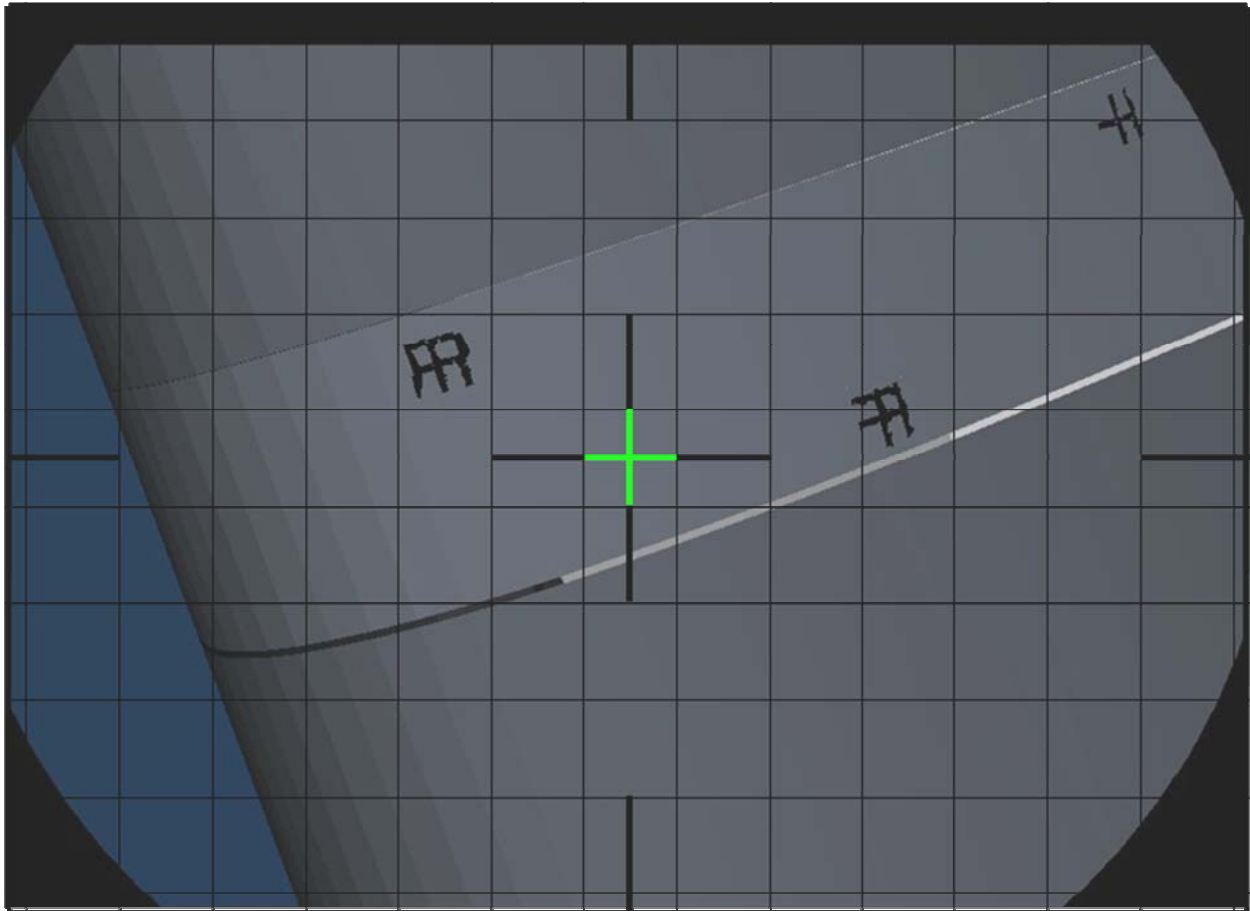
13. STBD LDRI ACAS, SECTION 6

When AUTO SEQ READY It – on:

A7U

√DTV ← PL2

PAN/TILT to match LDRI view shown below (LOW RATE within 10°, note RCC marking)



LDRI: +23 (left), -82 (up)

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

A7U

√DTV ← PL2

VID OUT – not DTV

IN – not PL2

L10(VTR)


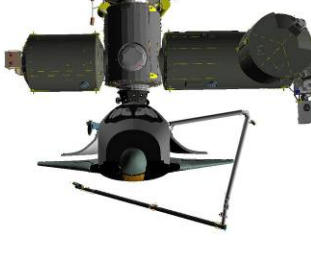
REC pb – push, hold

PLAY pb – push, simo (red ●)

AUTO SEQ – PROCEED (IN PROG It on)

STBD ACAS section 6a

(01:35)

Pt	X	Y	Z	PITCH	YAW	ROLL	•
55P	-1071	+307	-245	25	299	15	
56	-1043	+280	-238	18	298	7	
57	-1007	+255	-238	18	299	9	
58P	-924	+228	-241	21	302	14	

When AUTO SEQ READY It – on:

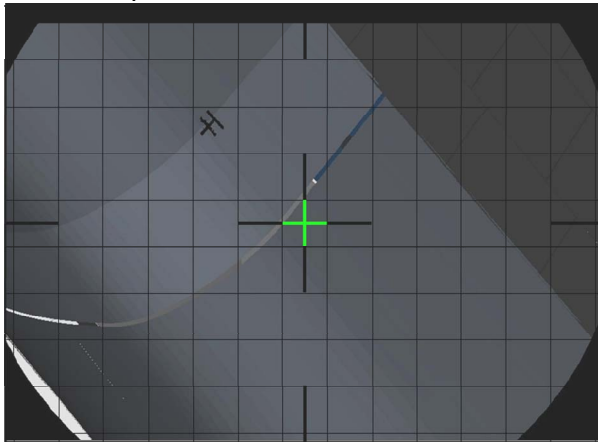
A7U

√DTV ← PL2

CAMR CMD PAN/TILT – LOW RATE

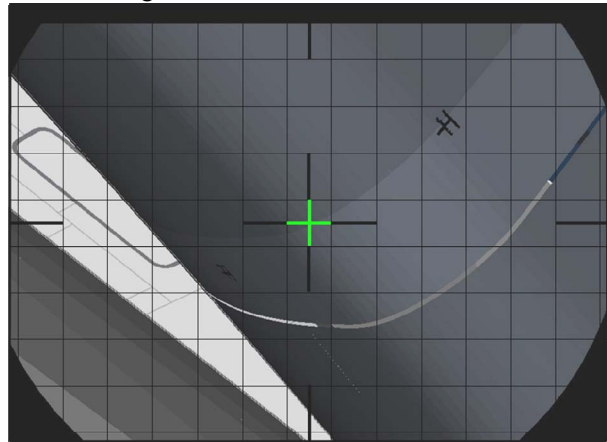
PAN/TILT as shown to match LDRI views below (note RCC marking)

1. TILT up to -72



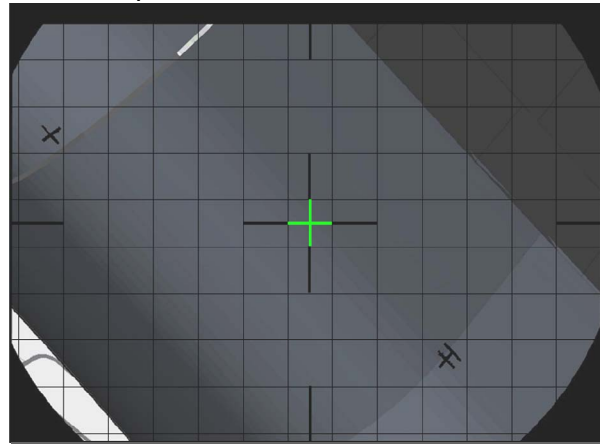
LDRI: +23, -72

2. PAN right to +30



LDRI: +30, -72

3. TILT up to -65



LDRI: +30, -65

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

A7U

√DTV ← PL2
 VID OUT – not DTV
 IN – not PL2



NOTE

Clearance between RMS and JPM is 32 inches at point 59.
 Monitor with Camera B

AUTO SEQ – PROCEED (IN PROG It on)

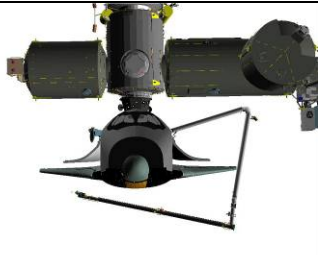

STBD ACAS section 6b

(00:35)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
58P	-924	+228	-241	21	302	14	
59P	-892	+222	-235	15	301	11	

L10(VTR) When AUTO SEQ READY It – on:
 STOP pb – push (no red ●)

AUTO SEQ – PROCEED (IN PROG It on)

Pt	X	Y	Z	PITCH	YAW	ROLL	•
59P	-892	+222	-235	15	301	11	
60P	-903	+241	-246	67	288	61	

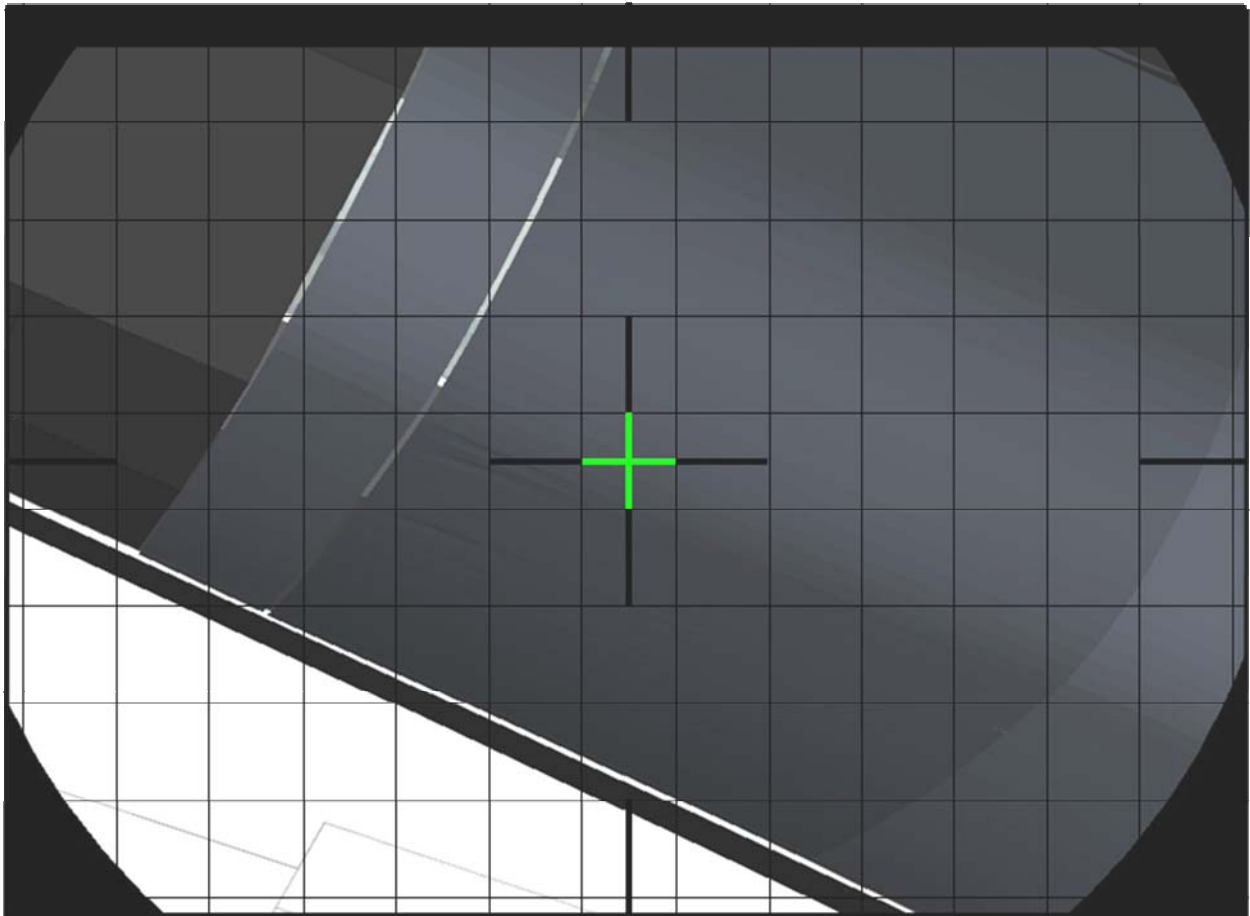
14. STBD LDRI ACAS, SECTION 7

When AUTO SEQ READY It – on:

A7U

√DTV ← PL2

PAN/TILT to match LDRI view shown below (LOW RATE within 10°)



LDRI: +47 (right), -49 (up)

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

A7U

√DTV ← PL2
VID OUT – not DTV
IN – not PL2

NOTE



Clearance between RMS and PLBD is 51 inches at point 62.
Monitor with Elbow and/or SSRMS Tip Elbow

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

AUTO SEQ – PROCEED (IN PROG It on)

STBD ACAS section 7a

(01:05)

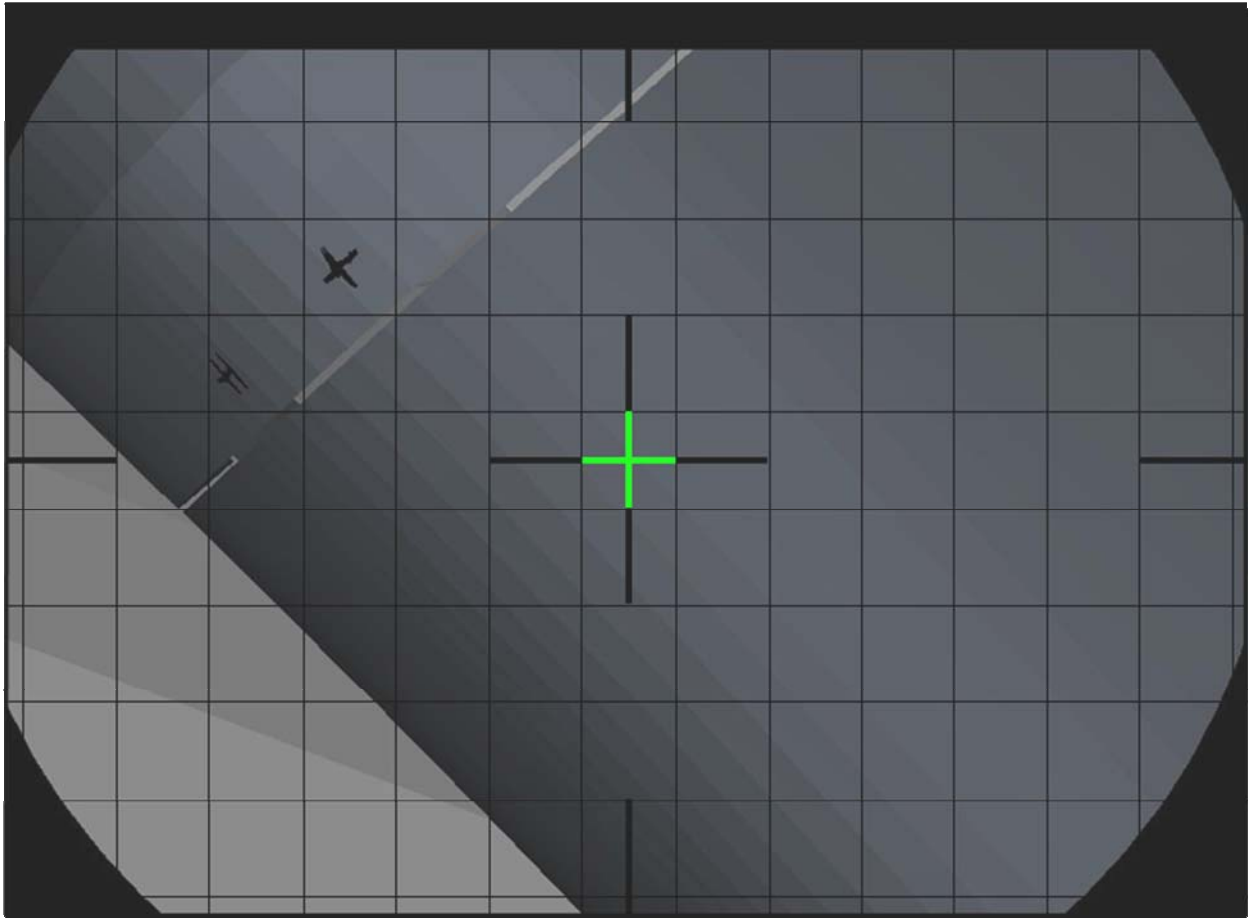
Pt	X	Y	Z	PITCH	YAW	ROLL	●
60P	-903	+241	-246	67	288	61	
61P	-1020	+276	-246	67	288	61	

A7U

When AUTO SEQ READY It – on:

√DTV ← PL2

PAN/TILT to match LDRI views shown below (LOW RATE within 10°,
note RCC marking)



LDRI: +35 (left), -60 (down)

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

A7U

√DTV ← PL2



VID OUT – not DTV

IN – not PL2

AUTO SEQ – PROCEED (IN PROG It on)

STBD ACAS section 7b

(00:35)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
61P	-1020	+276	-246	67	288	61	
62P	-1044	+306	-248	67	288	61	

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

L10(VTR) STOP pb – push (no red ●)

OBSS DOCKED LDRI RCC SURVEY – NOSE CAP

WARNING
Port PLBD radiator must be stowed

1. SETUP

SM 94 PDRS CONTROL

- √PL ID, ITEM 3: 2
- √INIT ID, ITEM 24: 2

- AUTO MODE – ITEM 13 +5 +6 +7 EXEC
- √AUTO MODE 4, ITEM 16: 4

A6U

2. INHIBIT NOSE JETS

- √DAP: FREE

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)

3. MNVR TO NOSE CAP START POSN

Nose Cap Clearance Views	Cameras
OBSS-to-Orbiter	RSC, 03: S1 LOOB (09: P1 LOOB), Elbow
RMS-to-JPM	A, B
RMS-to-PLBD	A, B, 37: MBS Mast

RHC

- RATE – COARSE (RATE MIN tb-OFF)
- BRAKES – OFF (tb-OFF)
- MODE – AUTO 4, ENTER (READY lt on)

SM 94 PDRS CONTROL

- √START PT, ITEM 17: 63

SM 169 PDRS STATUS

Monitor ACAS progress

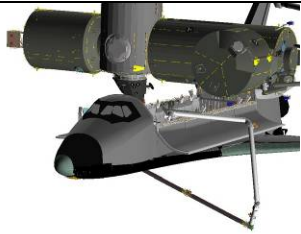

NOTE

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

AUTO SEQ – PROCEED (IN PROG It on)

Mnvr to NOSE CAP START posn:

(09:15)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
63P	-1044	+306	-248	67	288	61	
64	-1060	+310	-194	56	284	42	
65	-725	-226	+190	276	315	273	
66	-234	-149	-170	186	314	216	
67P	-236	-70	-244	169	316	191	

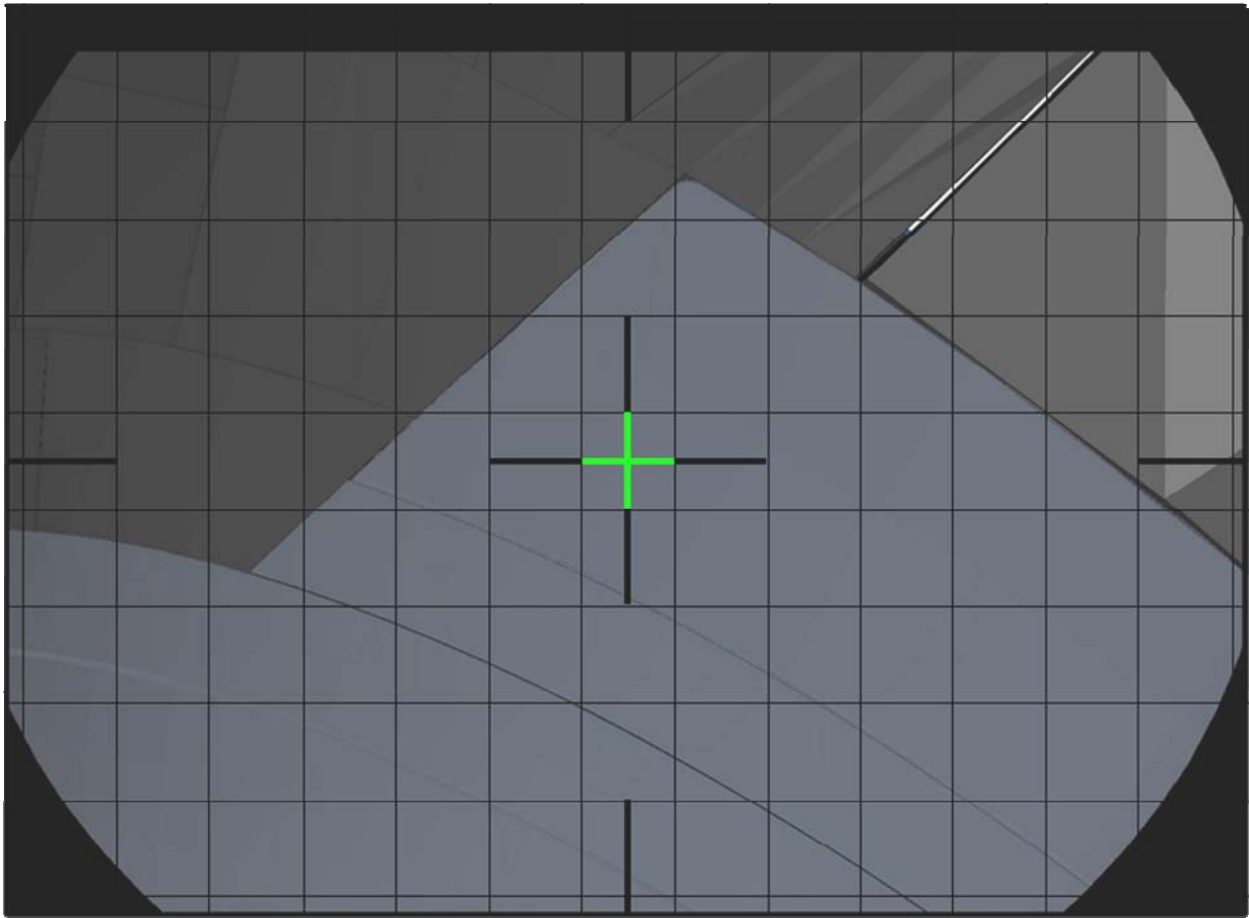
4. NOSE CAP LDRI ACAS, SECTION 1

When AUTO SEQ IN PROG It – off:

A7U

√DTV ← PL2

PAN/TILT to match LDRI view shown below (LOW RATE within 10°)



LDRI: +60 (right), -95 (down)

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

A7U

√DTV ← PL2

VID OUT – not DTV

IN – not PL2

For survey scan pattern, refer to OBSS DOCKED LDRI SCAN PATTERN CUE CARD – NOSE CAP

MODE – AUTO 1, ENTER (READY It on)

√START PT, ITEM 17: 68

Monitor ACAS progress

L10(VTR)

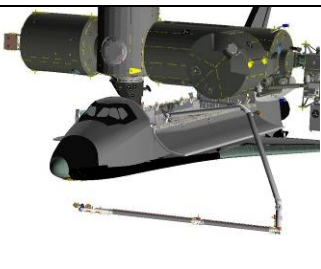
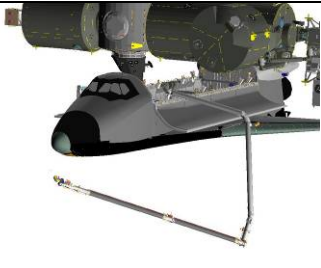
REC pb – push, hold

PLAY pb – push, simo (red ●)

AUTO SEQ – PROCEED (IN PROG It on)

NOSE CAP ACAS section 1

(01:10)


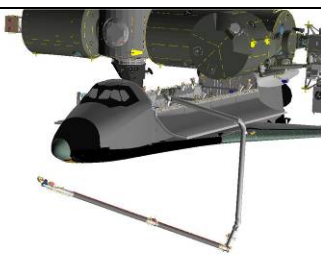
Pt	X	Y	Z	PITCH	YAW	ROLL	●	
68P	-236	-70	-244	169	316	191		
69P	-237	-2	-240	155	321	170		

When AUTO SEQ READY It – on:
L10(VTR) STOP pb – push (no red ●)

AUTO SEQ – PROCEED (IN PROG It on)

Configure for section 2

(00:40)

Pt	X	Y	Z	PITCH	YAW	ROLL	●	
69P	-237	-2	-240	155	321	170		
70	-237	+47	-240	159	319	177		
71P	-227	+44	-251	153	320	157		

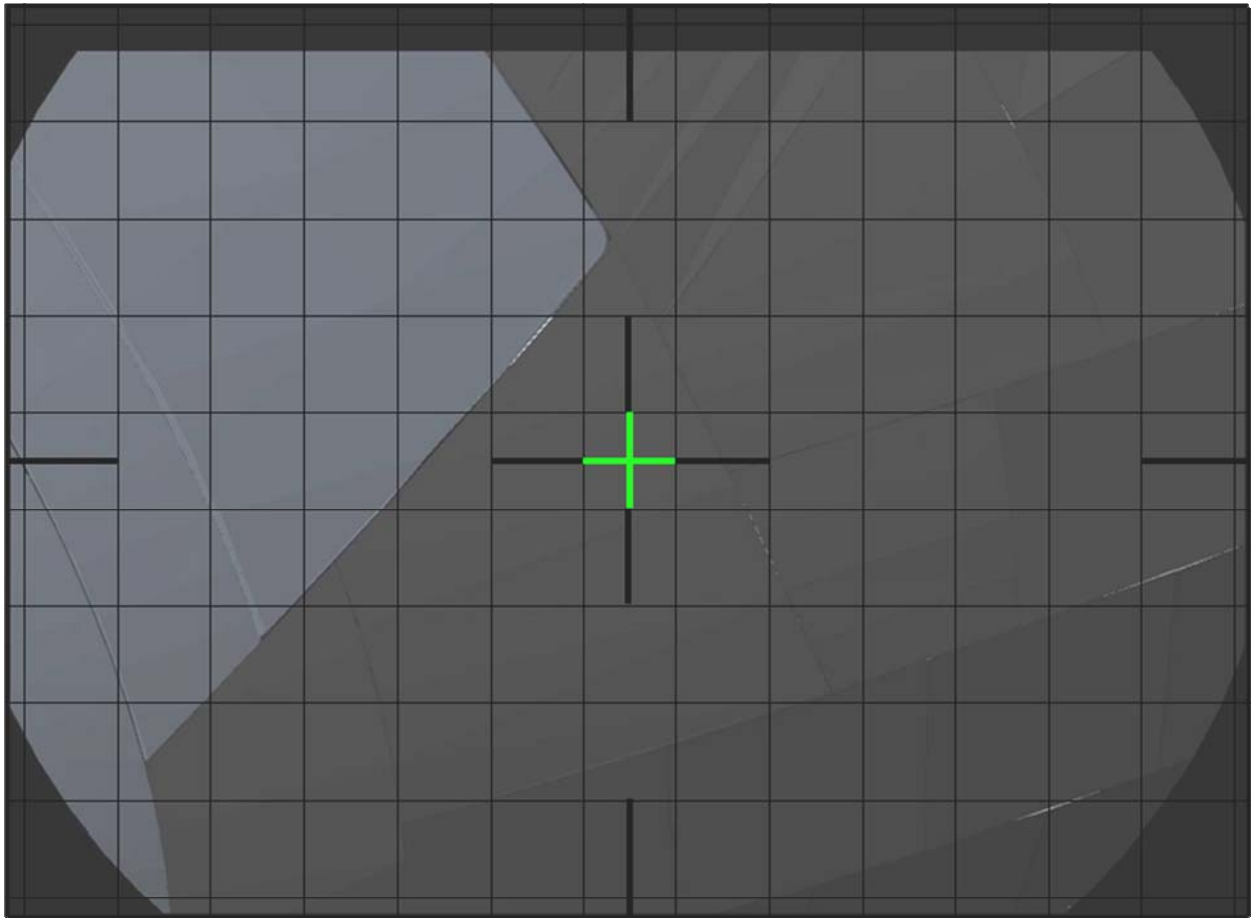
5. NOSE CAP LDRI ACAS, SECTION 2

When AUTO SEQ READY It – on:

A7U

√DTV ← PL2

TILT to match LDRI view shown below (LOW RATE within 10°)



LDRI: +60, -70 (up)

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

A7U

√DTV ← PL2

VID OUT – not DTV

IN – not PL2

L10(VTR)

REC pb – push, hold

PLAY pb – push, simo (red ●)

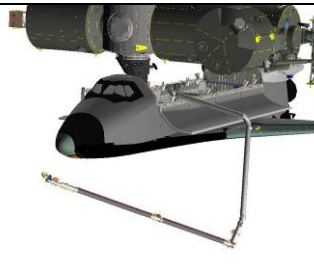
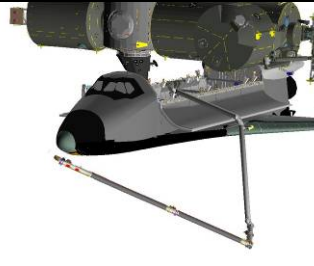
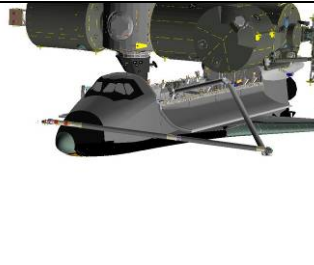
NOTE

Minimum clearance between RMS and JPM is 36 inches
between points 79 & 80. Monitor with Camera B

AUTO SEQ – PROCEED (IN PROG It on)

NOSE CAP ACAS section 2

(05:50)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
71P	-227	+44	-251	153	320	157	
72	-193	-3	-267	150	315	177	
73	-185	-76	-302	149	323	213	
74	-185	-76	-336	152	332	219	
75	-175	-40	-316	146	320	207	
76	-174	-16	-298	146	315	202	
77	-155	-20	-357	162	292	240	
78	-184	-74	-374	157	303	249	
79	-188	-4	-404	177	289	283	
80P	-180	+17	-400	168	289	274	

6. NOSE CAP LDRI ACAS, SECTION 3

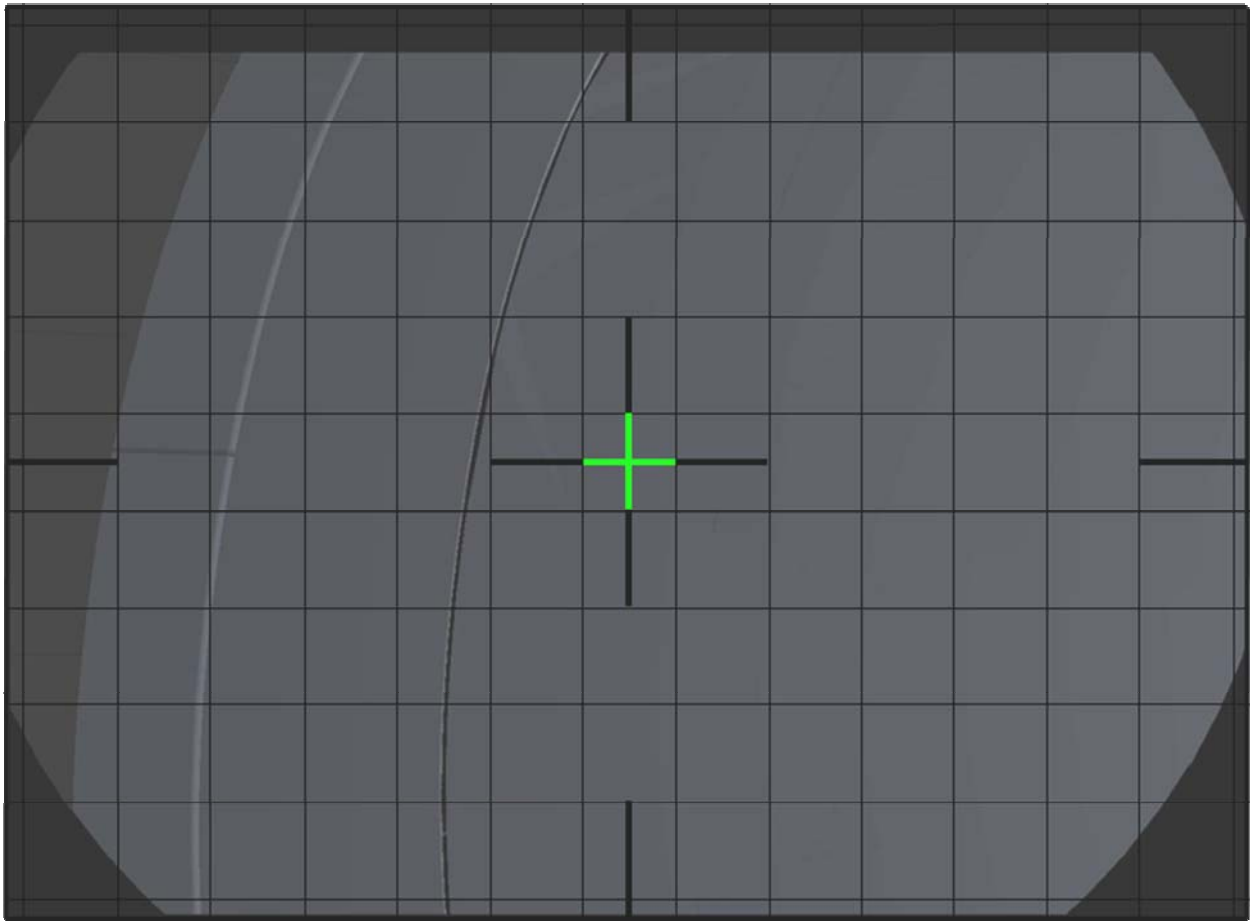
When AUTO SEQ READY It – on:

A7U

√DTV ← PL2

CAMR CMD PAN/TILT – LOW RATE

TILT to match LDRI view shown below



LDRI: +60, -50 (up)

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

A7U

√DTV ← PL2

VID OUT – not DTV

IN – not PL2

NOTE

Minimum clearances between RMS and JPM are 30 inches between points 80 & 81 and 43 inches between points 83 &84. Monitor with Camera B.

Clearance between OBSS and Nose Cap is less than 60 inches throughout section 3. Monitor with RSC and S1 LOOB(P1 LOOB).

Minimum clearances are:

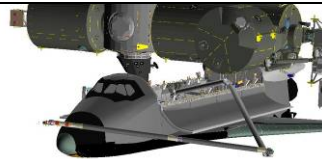
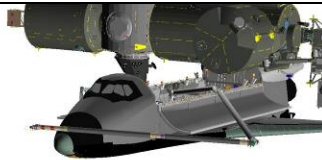
- 50 inches at point 84
- 44 inches at point 86
- 41 inches between points 86 & 87.

Points 85-86 are pause points to ensure correct trajectory RCC coverage

AUTO SEQ – PROCEED (IN PROG It on)

NOSE CAP ACAS section 3a

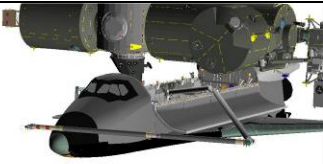
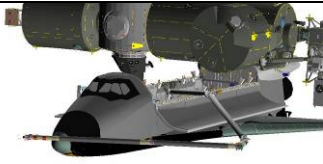
(02:00)

Pt	X	Y	Z	PITCH	YAW	ROLL	•
80P	-180	+17	-400	168	289	274	
81	-166	+52	-343	203	283	277	
82	-167	+42	-293	224	286	272	
83	-170	+9	-310	196	288	254	
84	-170	+21	-350	186	286	267	
85P	-181	+50	-386	183	281	280	

When AUTO SEQ READY It – on:
 AUTO SEQ – PROCEED (IN PROG It on)

NOSE CAP ACAS section 3b

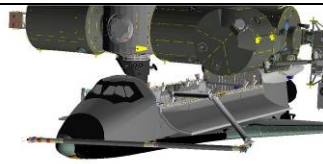
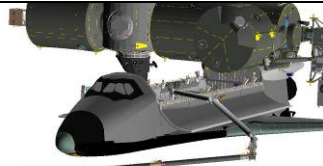
(00:35)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
85P	-181	+50	-386	183	281	280	
86P	-181	+64	-353	198	279	284	

When AUTO SEQ READY It – on:
 AUTO SEQ – PROCEED (IN PROG It on)

NOSE CAP ACAS section 3c

(01:05)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
86P	-181	+64	-353	198	279	284	
87	-180	+59	-293	215	281	280	
88P	-128	+25	-263	212	288	272	

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

L10(VTR) STOP pb – push (no red ●)

- RHC 7. MNVNR TO PORT LDRI ACAS START
 ✓RATE – COARSE (RATE MIN tb-OFF)
 BRAKES – OFF (tb-OFF)
 MODE – AUTO 2, ENTER (READY It on)

SM 94 PDRS CONTROL

- ✓START PT, ITEM 17: 89

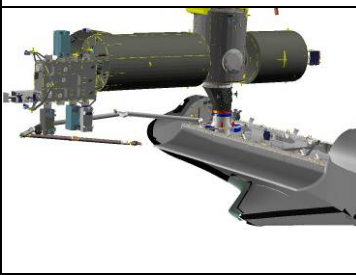
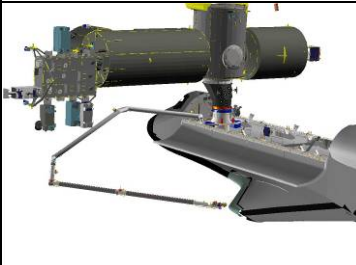
SM 169 PDRS STATUS

Monitor ACAS progress

AUTO SEQ – PROCEED (IN PROG It on)

Mnvr to PORT LDRI ACAS START posn:

(08:50)

Pt	X	Y	Z	PITCH	YAW	ROLL	•
89P	-128	+25	-263	212	288	272	
90	-24	-42	-182	214	302	262	
91	-310	-60	+70	212	304	210	
92	-610	-60	+70	283	301	292	
93	-708	-137	+70	323	326	343	
94P	-920	-177	-209	359	325	355	

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

8. ENABLE NOSE VERN JETS

GNC 23 RCS

RCS FWD – ITEM 1 EXEC (*)

MANF VLVS OVRD 5 – ITEM 44 EXEC (OP)

- * If Orbiter Control required: *
- * DAP: VERN *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *

OBSS DOCKED LDRI RCC SURVEY – PORT

WARNING
Port PLBD radiator must be stowed

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 2

√INIT ID, ITEM 24: 2

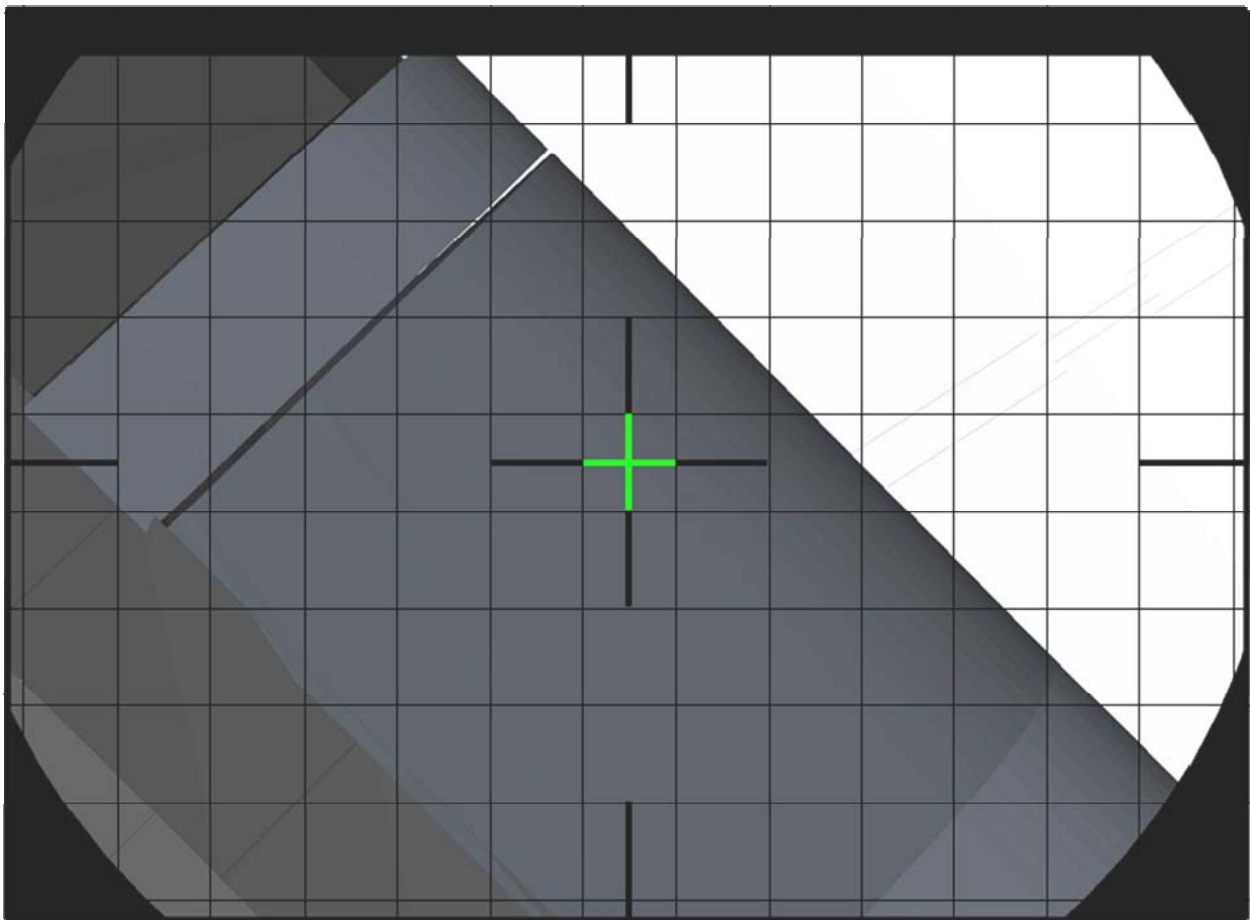
√AUTO MODE 3, ITEM 15: 7

2. PORT LDRI ACAS, SECTION 1

A7U

√DTV ← PL2

PAN/TILT to match LDRI view shown below (LOW RATE within 10°)



LDRI: +75 (right), -90 (down)

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

A7U

√DTV ← PL2

VID OUT – not DTV

IN – not PL2

For survey scan pattern, refer to OBSS DOCKED LDRI SCAN PATTERN CUE CARD – STBD & PORT

RHC √RATE – COARSE (RATE MIN tb-OFF)
 BRAKES – OFF (tb-OFF)
 MODE – AUTO 3, ENTER (READY lt on)

SM 94 PDRS CONTROL

√START PT, ITEM 17: 95

SM 169 PDRS STATUS

Monitor ACAS progress

Section 1-5 Clearance Views	Cameras
RMS-to-JPM	B, A
OBSS-to-RCC	RSC, Elbow, 24: Tip Elbow(09: P1 LOOB)

NOTE

Minimum clearances between RMS and JPM are:

37 inches between points 95 & 96

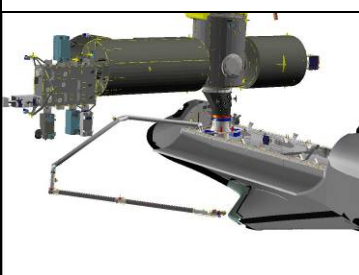
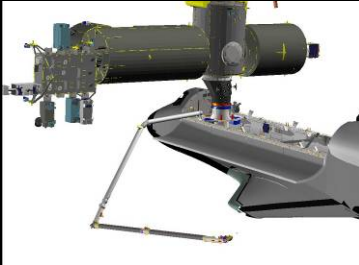
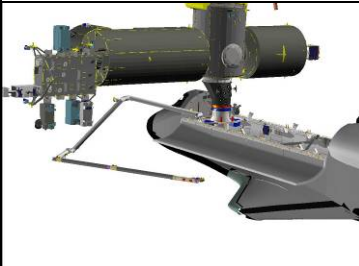
33 inches between points 105 & 106

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

AUTO SEQ – PROCEED (IN PROG It on)

PORT ACAS section 1 (Pts 95-101) and section 2 (Pts 102-107)

(09:50)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
95P	-920	-177	-209	359	325	355	
96	-1010	-186	-207	2	341	356	
97	-1070	-215	-204	4	356	356	
98	-1132	-275	-205	10	356	356	
99	-1295	-440	-213	10	356	356	
100	-1365	-456	-213	10	356	356	
101	-1365	-495	-233	8	353	325	
102	-1365	-525	-260	6	351	305	
103	-1297	-496	-250	7	352	310	
104	-1258	-478	-243	7	352	310	
105	-1193	-414	-243	6	357	310	
106	-1045	-260	-230	5	357	310	
107	-919	-232	-239	5	357	310	
108P	-899	-252	-284	2	341	289	

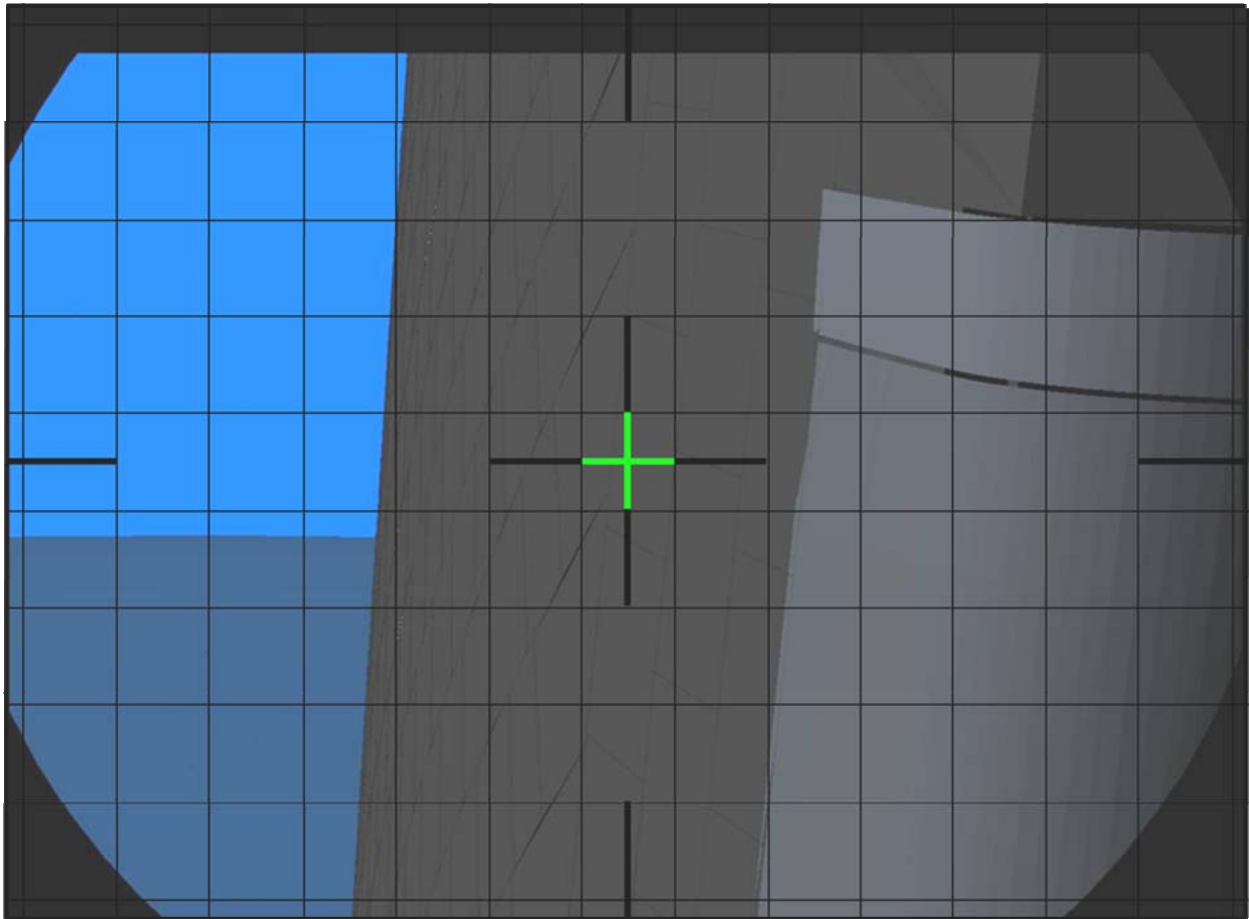
When AUTO SEQ READY It – on:
L10(VTR) STOP pb – push (no red ●)

3. PORT LDRI ACAS, SECTIONS 3 & 4

A7U

√DTV ← PL2

PAN/TILT to match LDRI view shown below (LOW RATE within 10°)



LDRI: +100 (right), -120 (down)

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

A7U

√DTV ← PL2

VID OUT – not DTV

IN – not PL2

L10(VTR)

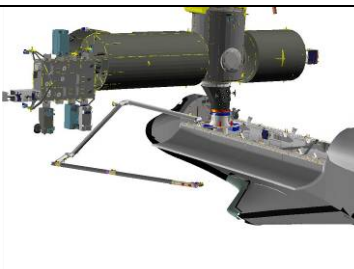
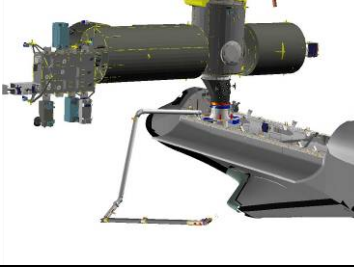
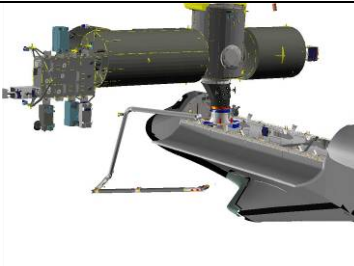
REC pb – push, hold

PLAY pb – push, simo (red ●)

AUTO SEQ – PROCEED (IN PROG It on)

PORT ACAS section 3 (Pts 108-114) and section 4 (Pts 115-118)

(07:20)

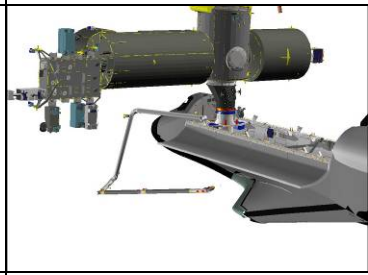
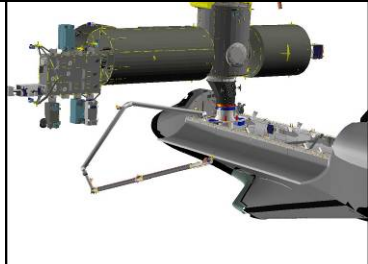
Pt	X	Y	Z	PITCH	YAW	ROLL	●
108P	-899	-252	-284	2	341	289	
109	-964	-254	-281	10	343	297	
110	-1027	-281	-267	13	347	304	
111	-1073	-322	-262	16	355	308	
112	-1208	-450	-257	15	7	319	
113	-1255	-500	-266	14	3	316	
114	-1312	-518	-269	12	3	313	
115	-1306	-526	-304	14	354	287	
116	-1224	-498	-304	14	354	287	
117	-1032	-293	-300	14	354	287	
118P	-919	-242	-270	12	356	305	

When AUTO SEQ READY It – on:
 L10(VTR) STOP pb – push (no red ●)

AUTO SEQ – PROCEED (IN PROG It on)

Configure for section 5

(01:50)

Pt	X	Y	Z	PITCH	YAW	ROLL	•
118P	-919	-242	-270	12	356	305	
119	-950	-353	-233	10	4	300	
120P	-976	-289	-366	20	352	22	

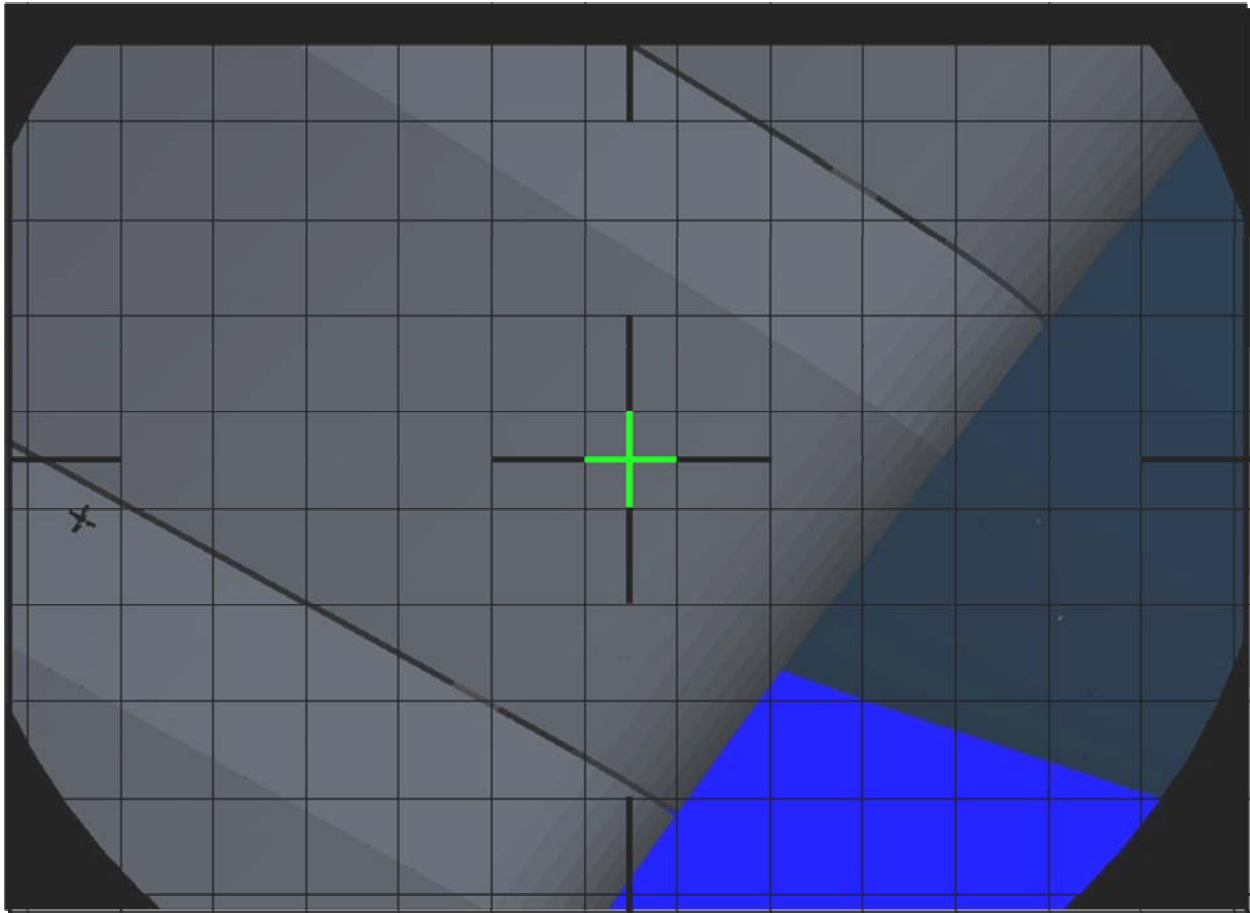
4. PORT LDRI ACAS, SECTION 5

When AUTO SEQ READY It – on:

A7U

√DTV ← PL2

PAN/TILT to match LDRI view shown below (LOW RATE within 10°, note RCC marking)



LDRI: +50 (left), -250 (down)

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

A7U

√DTV ← PL2

VID OUT – not DTV

IN – not PL2

L10(VTR)

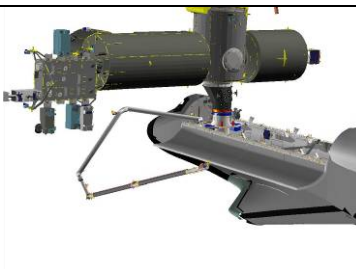
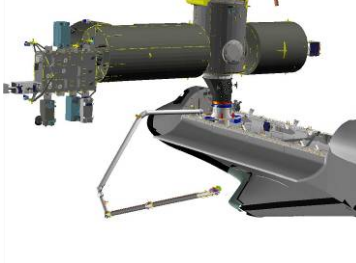
REC pb – push, hold

PLAY pb – push, simo (red ●)

AUTO SEQ – PROCEED (IN PROG It on)

PORT ACAS section 5

(03:00)

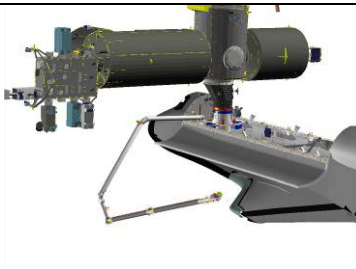
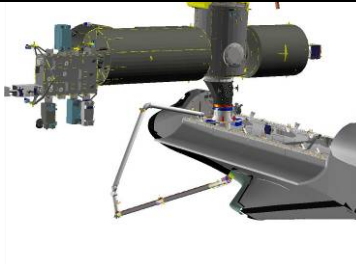
Pt	X	Y	Z	PITCH	YAW	ROLL	●
120P	-976	-289	-366	20	352	22	
121	-1036	-287	-350	19	350	17	
122	-1069	-313	-350	19	350	17	
123	-1194	-436	-352	19	350	17	
124	-1268	-502	-362	19	0	14	
125P	-1330	-514	-362	19	0	14	

When AUTO SEQ READY It – on:
L10(VTR) STOP pb – push (no red ●)

AUTO SEQ – PROCEED (IN PROG It on)

Configure for section 6

(00:45)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
125P	-1330	-514	-362	19	0	14	
126	-1330	-520	-400	22	359	0	
127P	-1330	-477	-400	22	359	0	

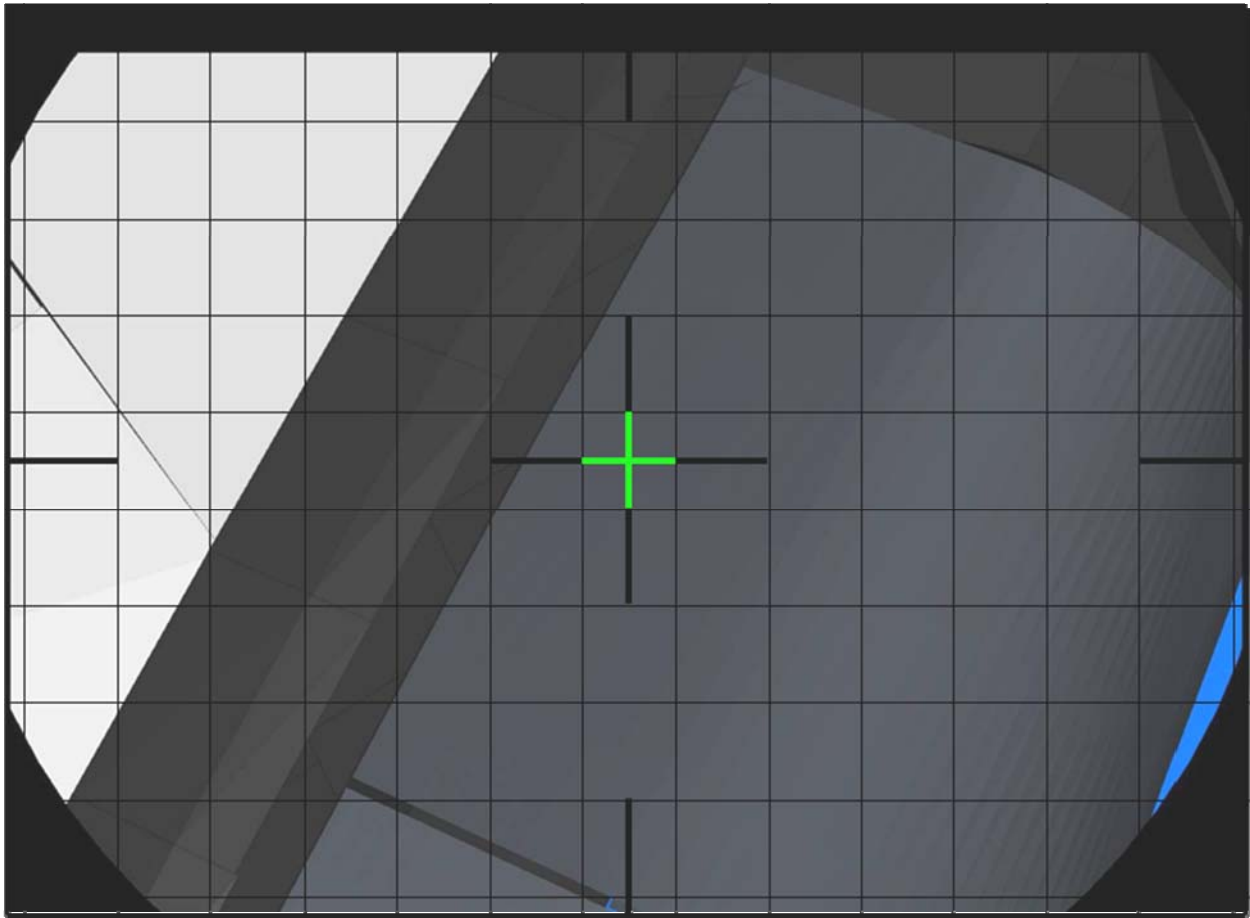
5. PORT LDRI ACAS, SECTION 6

When AUTO SEQ READY It – on:

A7U

√DTV ← PL2

PAN/TILT to match LDRI view shown below (LOW RATE within 10°)



LDRI: +60 (right), -270 (down)

√MCC to verify correct sensor view

Note PAN/TILT: _____, _____

A7U

√DTV ← PL2

VID OUT – not DTV

IN – not PL2

Section 6 Clearance Views	Cameras
OBSS-to-PLBD	RSC, Elbow, 24: Tip Elbow
RMS-to-JPM	A,B

NOTE

Clearance between OBSS and PLBD is less than 60 inches between points 130 and 133 (minimum clearance of 42 inches at point 133).

Minimum clearance between RMS and JPM is 30 inches between points 128 and 129. Monitor with Camera B or A.

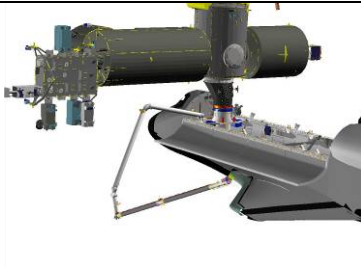
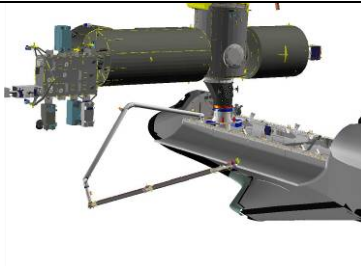
Points 130-132 are pause points to ensure correct trajectory for RCC coverage

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

AUTO SEQ – PROCEED (IN PROG It on)

PORT ACAS section 6a

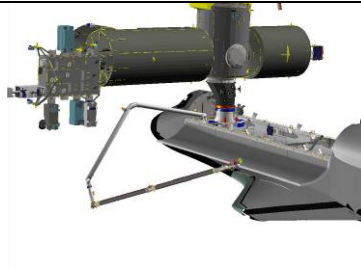
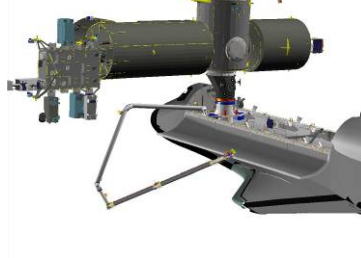
(02:10)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
127P	-1330	-477	-400	22	359	0	
128	-1270	-456	-392	22	359	0	
129	-1203	-386	-392	22	0	0	
130P	-1102	-280	-386	23	342	7	

When AUTO SEQ READY It – on:
 AUTO SEQ – PROCEED (IN PROG It on)

PORT ACAS section 6b

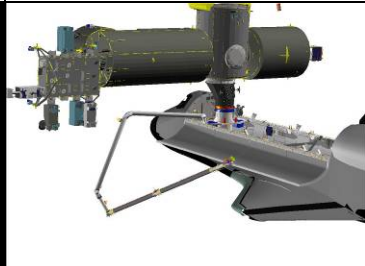
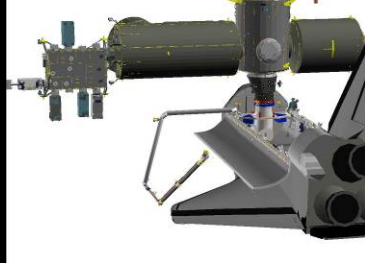
(00:50)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
130P	-1102	-280	-386	23	342	7	
131P	-1062	-275	-386	27	350	25	

When AUTO SEQ READY It – on:
 AUTO SEQ – PROCEED (IN PROG It on)

PORT ACAS section 6c

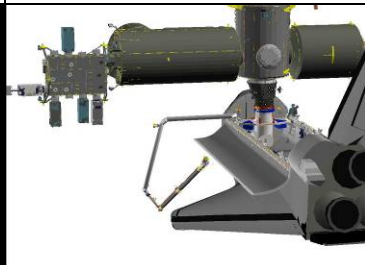
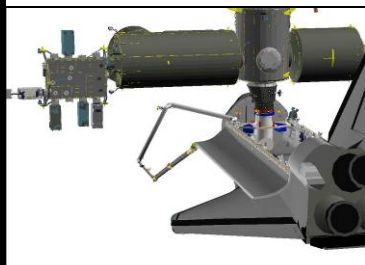
(00:55)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
131P	-1062	-275	-386	27	350	25	
132P	-980	-273	-380	29	356	35	

When AUTO SEQ READY It – on:
 AUTO SEQ – PROCEED (IN PROG It on)

PORT ACAS section 6d

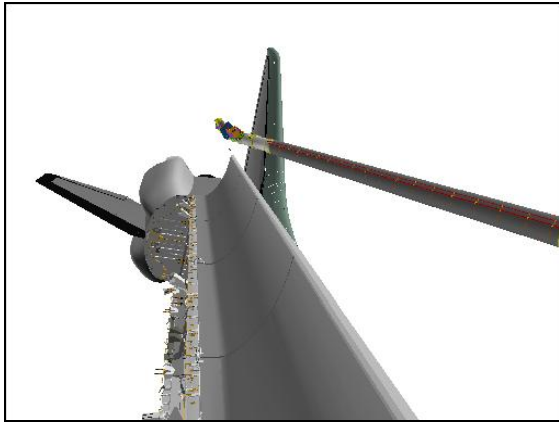
(01:15)

Pt	X	Y	Z	PITCH	YAW	ROLL	●
132P	-980	-273	-380	29	356	35	
133	-917	-273	-367	23	358	39	
134P	-917	-295	-420	23	358	39	

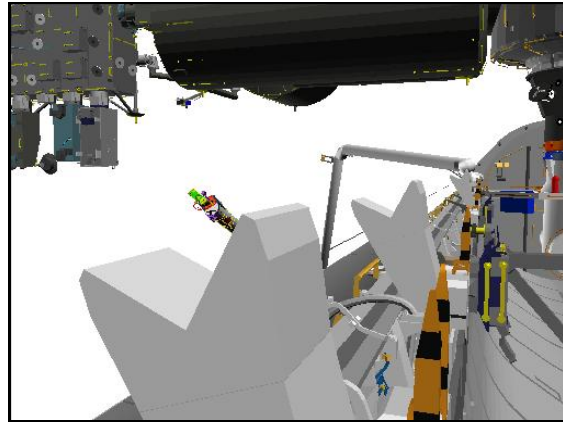
When AUTO SEQ IN PROG It – off:
 BRAKES – ON (tb-ON)

L10(VTR) STOP pb – push (no red ●)

A7U MUX 1 L ← MIDDECK
 LDRI MODE 2 pb – push (ITVC video displayed)



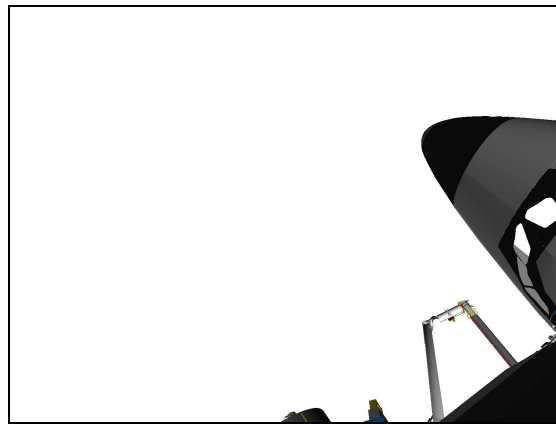
ELBOW (-110,-10)



CCTV B (-20,-5)

6. SETUP FOR MNVR TO HANDOFF

DNLK	B
DTV	Elbow
MON 1	RSC(OBSS ITVC)
MON 2	A
A31p	13: LAB(03: S1 LOOB)



13: LAB (-145,-15)

SM 94 PDRS CONTROL

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

END POS - ITEM 18 -3 7 4 -3 0 2 -1 8 0 EXEC
 ATT - ITEM 21 +2 4 2 +3 8 +9 7 EXEC
 CMD CK - ITEM 25 EXEC (GOOD)

Verify position/joint angles:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-379	-309	-176	23	358	9	1
	SY	SP	EP	WP	WY	WR	
√	+137.1	+19.5	-61.5	-74.6	+3.7	-129.4	

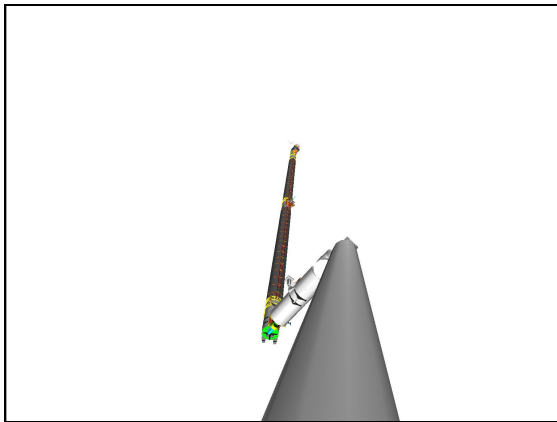
RHC 7. MNVR TO HANDOFF FOR STOW
 RATE – COARSE (RATE MIN tb-OFF)
 BRAKES – OFF (tb-OFF)
 MODE – OPR CMD, ENTER (READY It on)

AUTO SEQ – PROCEED (IN PROG It on)

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

Verify INTERMEDIATE posn: (02:42)

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-374	-302	-180	242	38	97	1
	SY	SP	EP	WP	WY	WR	
√	+137.1	+19.5	-61.5	-74.6	+3.7	0.0	



ELBOW (-10,0)



13: LAB (-145,-15)

NOTE

Minimum clearance between SRMS and JPM is 45 inches from X = -280 to -233 (REL = -194 to -147). Monitor with Cameras B and A

SM 94 PDRS CONTROL

END POS – ITEM 18 -8 6 -2 4 3 -3 7 1 EXEC
 ATT – ITEM 21 +9 5 +3 1 2 +1 6 7 EXEC
 CMD CK – ITEM 25 EXEC (GOOD)

BRAKES – OFF (tb-OFF)
 MODE – OPR CMD, ENTER (READY It on)

AUTO SEQ – PROCEED (IN PROG It on)

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

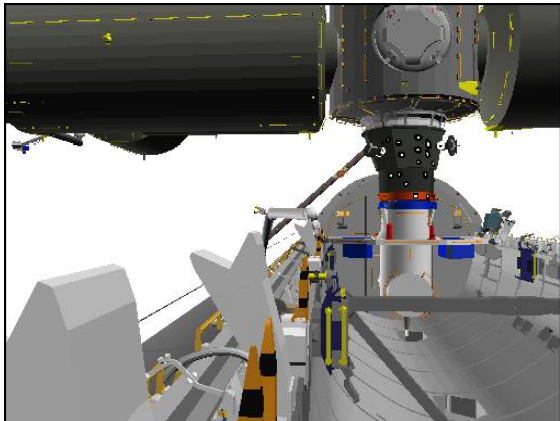
OBSS HANDOFF FOR STOW posn: (03:30)

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-86	-243	-371	95	312	167	1
	SY	SP	EP	WP	WY	WR	
√	+164.6	+6.0	-19.2	+24.2	+6.9	+85.7	

√MODE – not DIRECT

PARAM – PORT TEMP

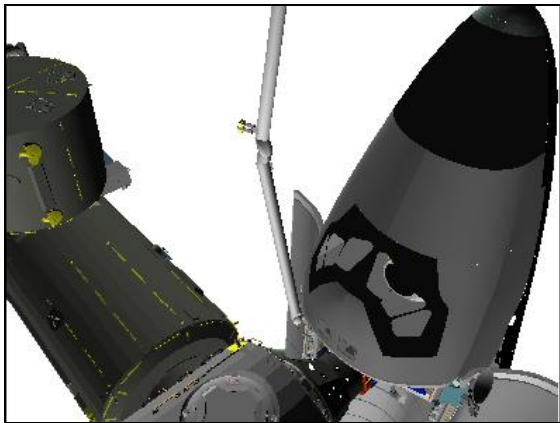
JOINT – CRIT TEMP



CCTV B (-5,0)



ELBOW (30,-20)



ITVC (90,-35)



13: LAB (-145,-15)

8. ENABLE NOSE JETS

GNC 23 RCS

√RCS FWD, ITEM 1: *

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)

This Page Intentionally Blank

OBSS CONTINGENCY

OBSS SJ HANDOFF TO SRMS	FS 9-3
FOR STOW	FS 9-13
UNGRAPPLE FOR STOW	FS 9-19
HANDOFF FOR BERTHING – UNGRAPPLE	FS 9-25
– STBD MRL LATCH.....	FS 9-29
REGRAPPLE AT HANDOFF FOR STOW.....	FS 9-31
MNVR HANDOFF FOR STOW TO UNDOCK	FS 9-34
UNDOCK TO HOVER	FS 9-37
STORRM CHASER	FS 9-43

**OBSS
CONTINGENCY**

This Page Intentionally Blank

OBSS SJ HANDOFF TO SRMS

1. SETUP

Verify SSRMS at OBSS PRE-GRAPPLE posn:

	SR	SY	SP	EP	WP	WY	WR
√	-75.9	+126.4	-189.0	+133.6	+150.0	-180.0	+44.9

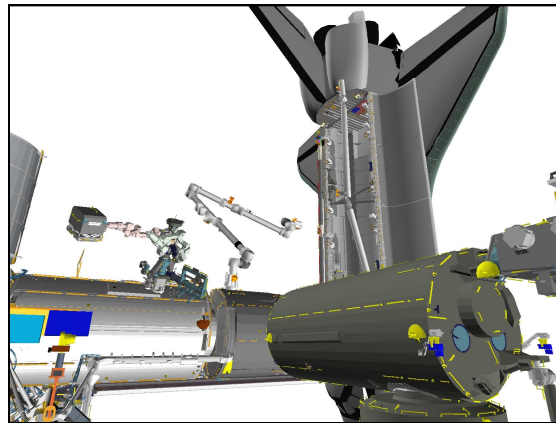
R12

√Green Jumper – ISS

A7U

CCTV – perform PAN/TILT RESET on PLB cameras
 – fully zoom out PLB & Elbow cameras for SJ pictures
 – RMS WRIST, ZOOM: 34.0 HFOV
 FOCUS: 5 ft

DNLK	A(D)
DTV	Elbow(EE)
MON 1	09: P1 LOOB
MON 2	B



09: P1 LOOB (120,20)

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 0

√INIT ID, ITEM 24: 0

2. SINGLE JOINT MANEUVER TO OBSS HANDOFF PRE-GRAPPLE

NOTE

Clearance between SRMS and JPM is 45 inches after SP mnvr (line 1). Monitor with Camera A

RHC

If SINGLE mode available:

RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – best available

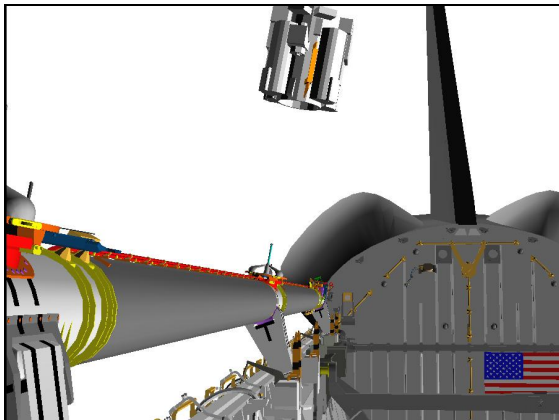
Mnvr to OBSS HANDOFF PRE-GRAPPLE posn:

	SY	SP	EP	WP	WY	WR	
Pre-cradle	0.0	+25.0	-25.0	+5.0	0.0	0.0	
1: SP +		+64.8					
2: WP -				-99.4			
3: WY +					+11.3		
4: WR -						-99.0	
5: EP -			-34.4				
6: SY +	+24.0						
Pre-grapple	+24.0	+64.8	-34.4	-99.4	+11.3	-99.0	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1018	-362	-676	284	0	270	0

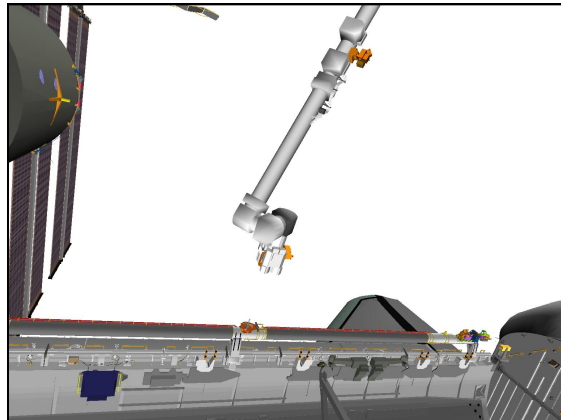
BRAKES – ON (tb-ON)
 MODE – not DIRECT
 JOINT – CRIT TEMP

Notify SSRMS Operator that SRMS at OBSS Handoff Pre-Grapple posn;
 SSRMS GO for OBSS Grapple

A7U CCTV – config as required for SSRMS OBSS grapple



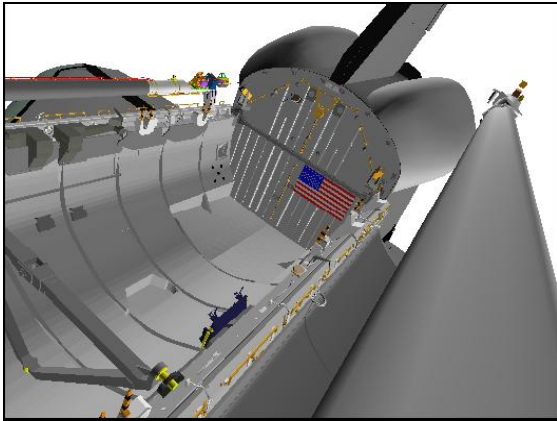
CCTV D (-5,5)
HFOV: 32°



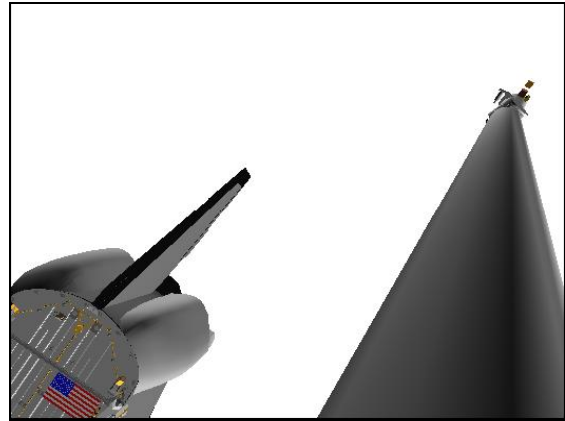
ELBOW (-105,15)

Start:
Pre-cradle

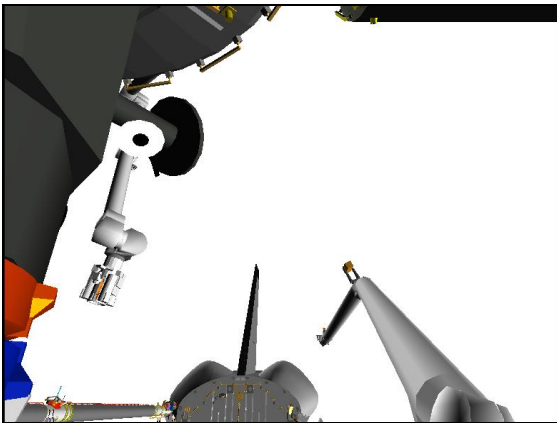
Step 1:
Drive SP+ (for 39.8°)
From +25.0 to +64.8
NOTE: SRMS-to-JPM is 45 inches



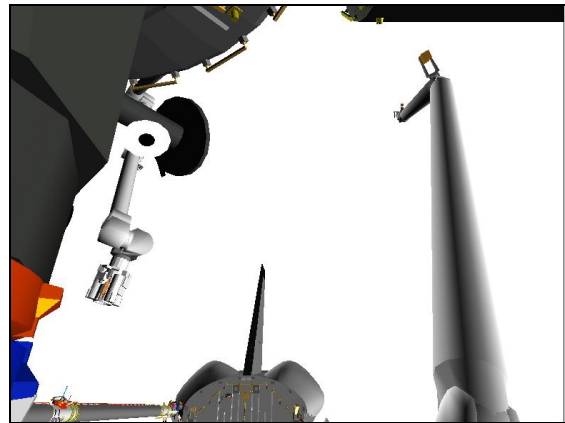
ELBOW (-30,-20)



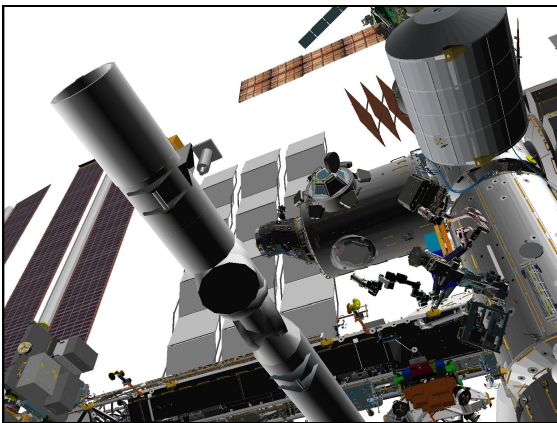
ELBOW (-30,-20)



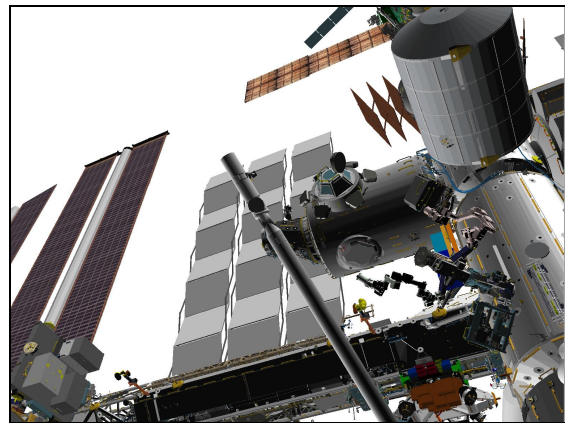
CCTV A (0,28)



CCTV A (0,28)



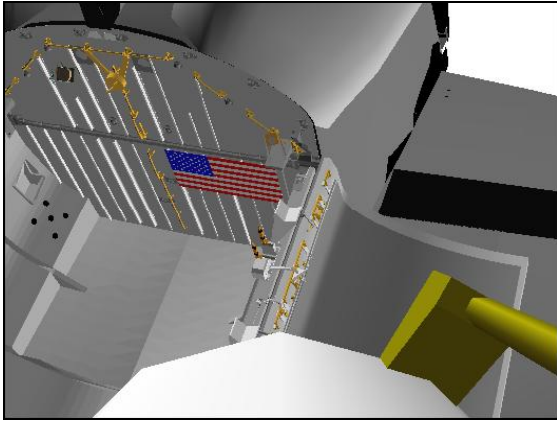
CCTV B (-25,50)



CCTV B (-25,50)

Step 2:

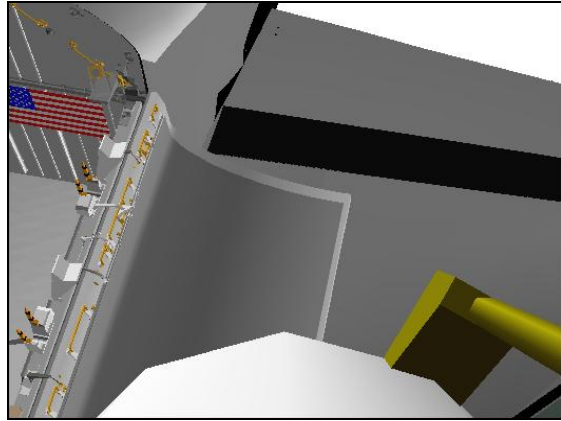
Drive WP- (for 104.4°)
From +5.0 to -99.4



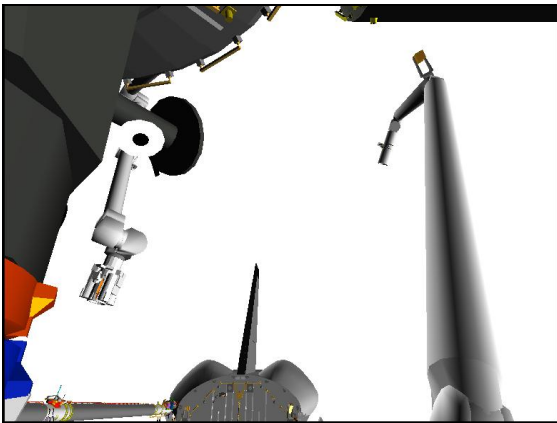
EE (HFOV = 34.0°)

Step 3:

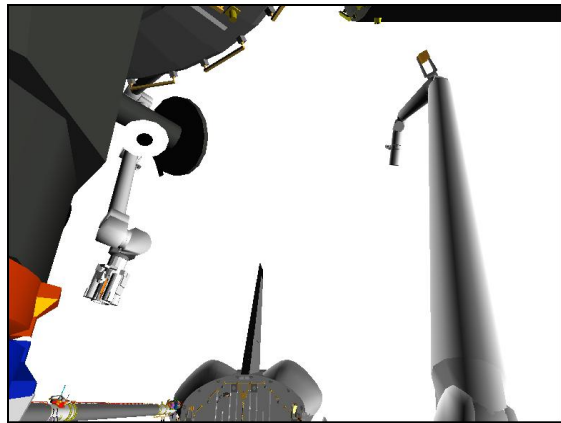
Drive WY+ (for 11.3°)
From 0.0 to +11.3



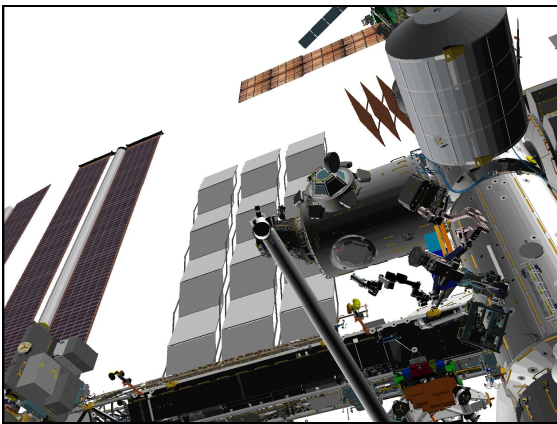
EE (HFOV = 34.0°)



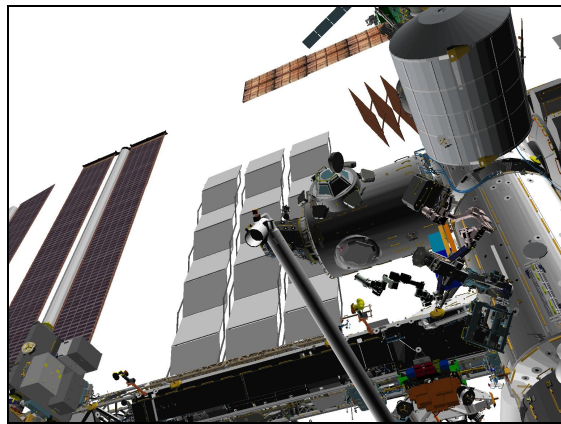
CCTV A (0,28)



CCTV A (0,28)



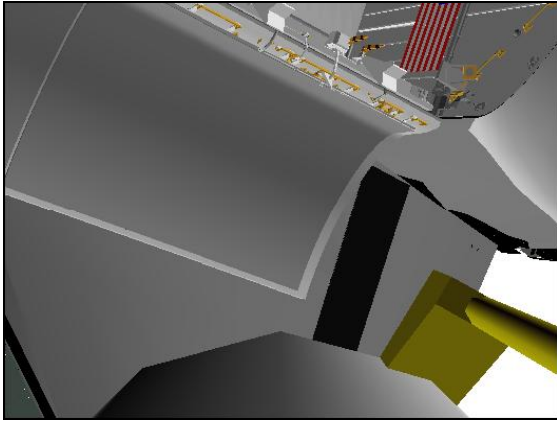
CCTV B (-25,50)



CCTV B (-25,50)

Step 4:

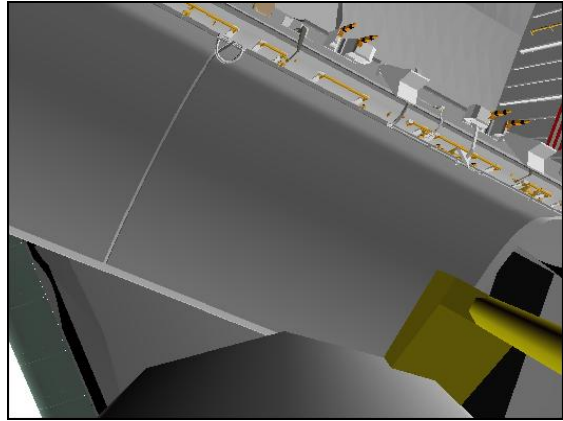
Drive WR- (for 99.0°)
From 0.0 to -99.0



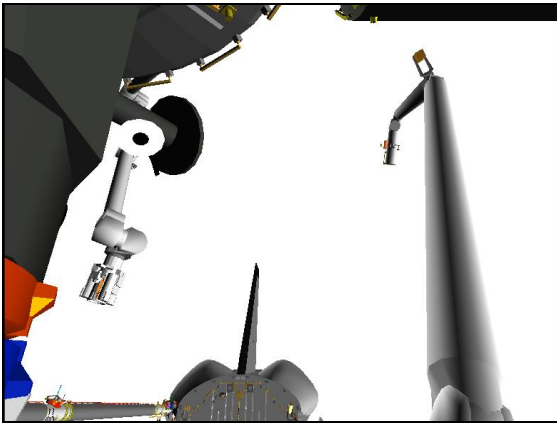
EE (HFOV = 34.0°)

Step 5:

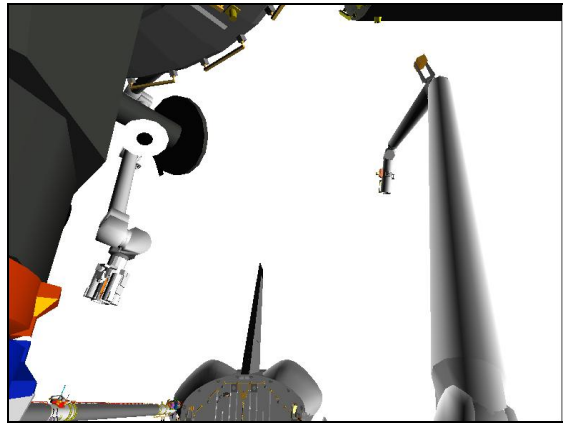
Drive EP- (for 9.4°)
From -25.0 to -34.4



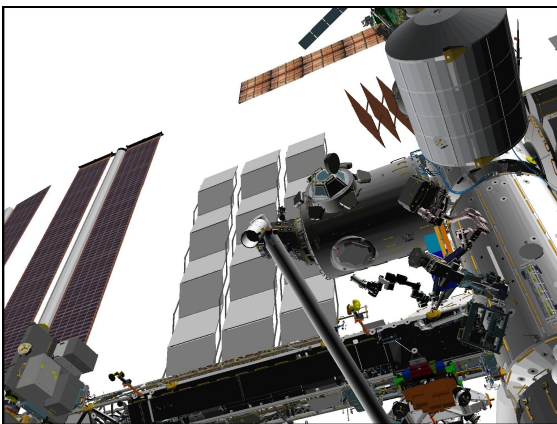
EE (HFOV = 34.0°)



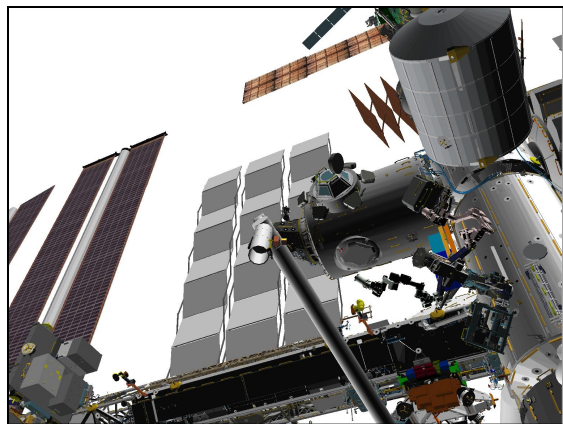
CCTV A (0,28)



CCTV A (0,28)



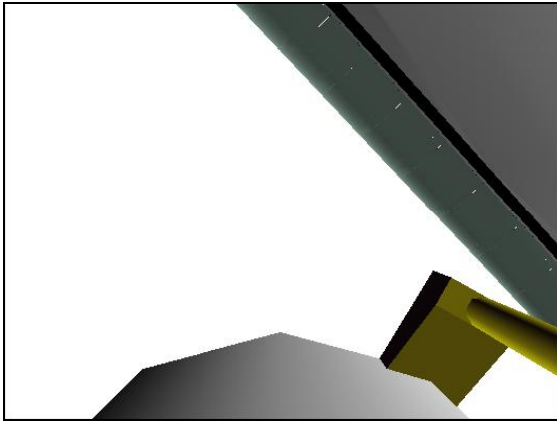
CCTV B (-25,50)



CCTV B (-25,50)

Step 6:

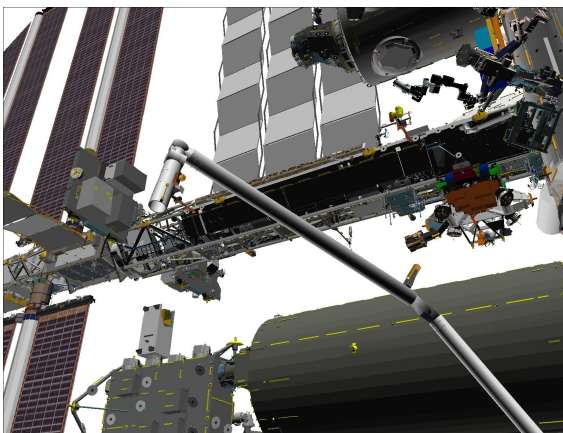
Drive SY+ (for 24.0°)
From 0.0 to +24.0



EE (HFOV = 34.0°)



CCTV A (0,28)



CCTV B (-30,30)

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

Notify SSRMS Operator that SRMS at OBSS Handoff Pre-Grapple posn;
SSRMS GO for OBSS Grapple

CCTV – config as required for OBSS grapple (pictures shown before SJ pictures) |

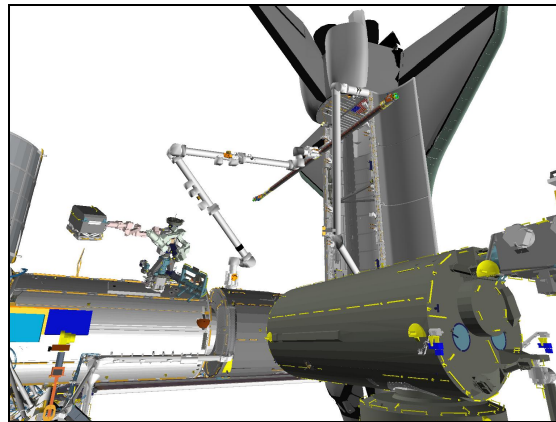
3. PRLA RELEASE
Perform OBSS HANDOFF TO SRMS – STBD MRL RELEASE
(OBSS HANDOFF)

A7U

4. SETUP FOR GRAPPLE
CCTV – configure for grapple
– install OBSS SJ GRAPPLE AT HANDOFF OVERLAY
– RMS WRIST, ZOOM: 34.0 HFOV
FOCUS: 5 ft

Maintain eyepoint ~18 in when using grapple overlay

DNLK	EE
DTV	B(C)
MON 1	09: P1 LOOB
MON 2	A



09: P1 LOOB (120,20)

R12(OBSS) √SPEE PWR – OFF
A15 √APCU 2 OUTPUT – OFF

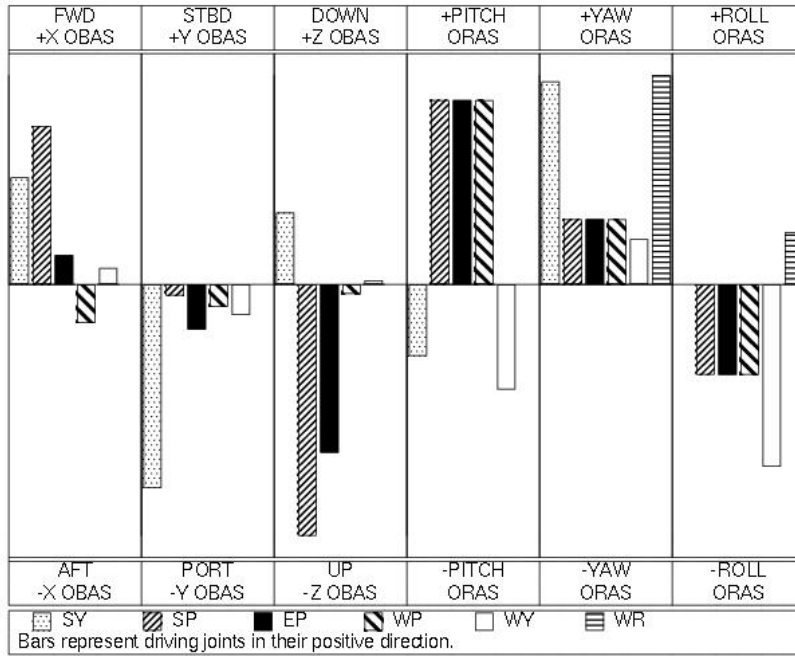
5. OBSS SJ GRAPPLE AT HANDOFF POSN
On SSRMS operator GO, SSRMS at OBSS Handoff posn with Brakes ON
and ready for SRMS grapple

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

MODE – best available

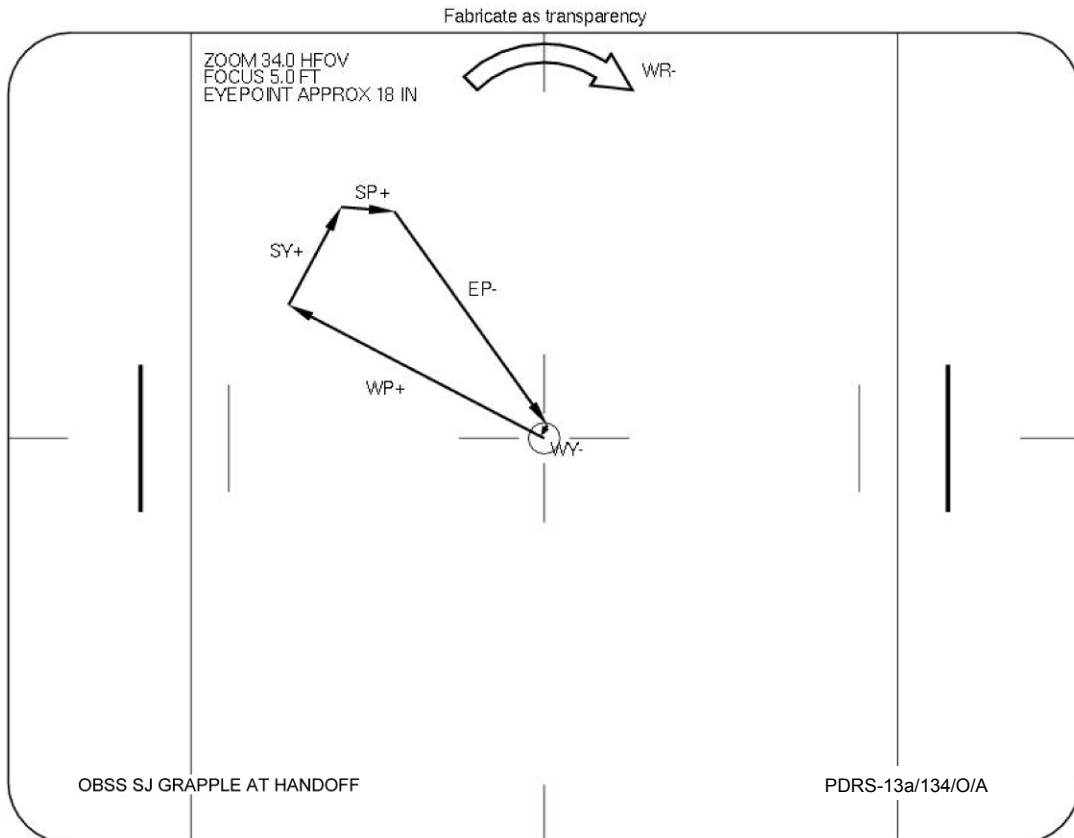
Drive joints per OBSS SJ GRAPPLE AT HANDOFF OVERLAY and diagram until EE within grapple envelope

OBSS SJ GRAPPLE AT HANDOFF



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

ΔSY	ΔSP	ΔEP	ΔWP	ΔWY	ΔWR
+1.8	+1.5	-14.6	+13.5	-0.6	-1.7



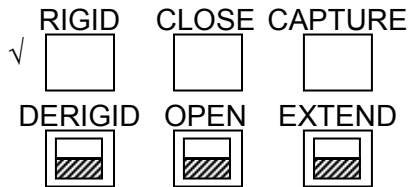
CAUTION
Monitor EE tb timing to prevent EE motor burnout

SM 169 PDRS STATUS

Monitor EE msw status

EE MODE – AUTO

CAPTURE sw – depress (mom)



CRITICAL TIMES (28 sec total):

CAPTURE tb – gray, then
CLOSE tb – gray, 3 sec max, then
RIGID tb – gray, 25 sec max

EE MODE – OFF

- * If manual capture required: *
- * EE MODE – MAN *
- * CAPTURE sw – depress (hold until CLOSE tb-gray, 3 sec max) *
- * MAN CONTR – RIGID (hold until RIGID tb-gray, 25 sec max) *
- * MODE – OFF *

If TEST mode available,
MODE – TEST, ENTER
Wait 5 sec

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

PARAM – PORT TEMP
JOINT – CRIT TEMP

If SINGLE MODE available:

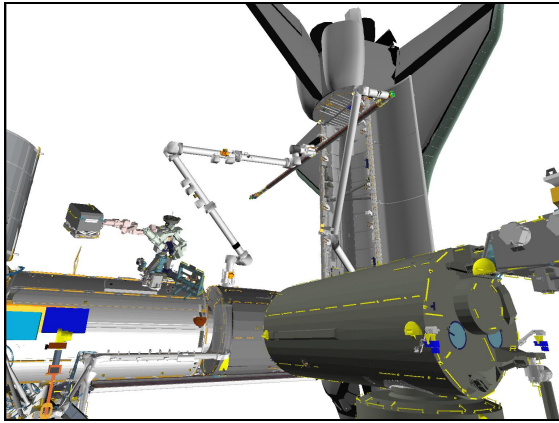
SM 94 PDRS CONTROL

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

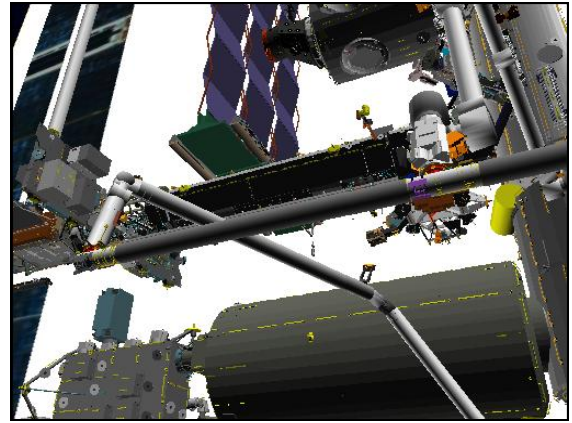
Expected OBSS HANDOFF posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID	
√	-1029	+229	-614	284	270	270	2	*
	SY	SP	EP	WP	WY	WR		
√	+25.8	+66.3	-49.0	-85.9	+10.7	-100.7		

*Display singularity



09: P1 LOOB (130,20)



CCTV B (-25,30)

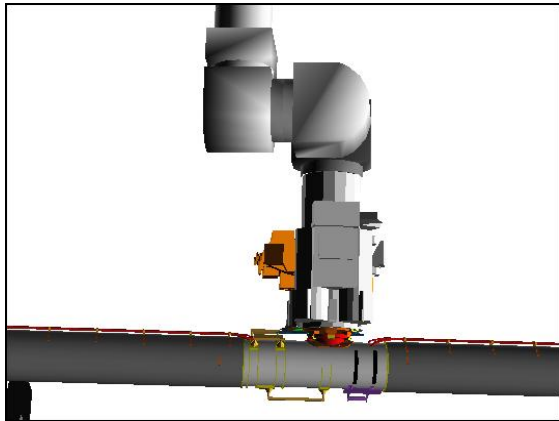
Notify SSRMS Operator that SRMS grapple complete with Brakes ON, GO for SSRMS release

Review GENERIC END EFFECTOR CUE CARD – ISS/SHUTTLE DOCKED OPS

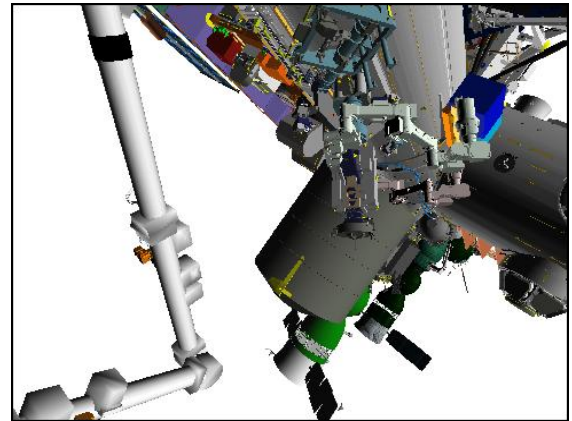
Perform ACTIVATION (LDRI/ITVC (Cue Card), PHOTO/TV)
 LCH ACTIVATION (LCS (Cue Card), PHOTO/TV)
 LCC ACTIVATION (LCS (Cue Card), PHOTO/TV)
 LCC DEACTIVATION (LCS (Cue Card), PHOTO/TV), steps 1 and 2

R12 Green Jumper – ISS

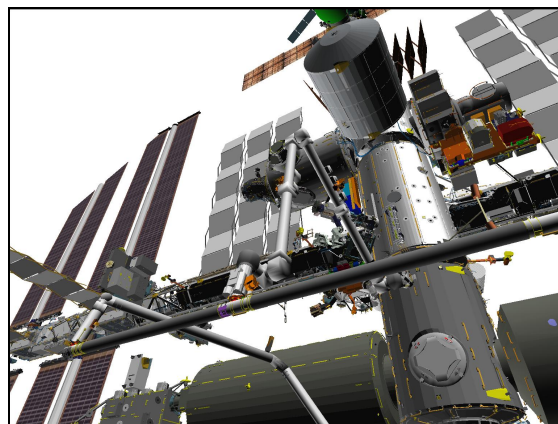
A7U CCTV – config as required for OBSS ungrapple and SPDM grapple



CCTV A (5,25) HFOV: 18°



ELBOW (5,95)



CCTV C (-30,40)

OBSS SJ HANDOFF FOR STOW

1. SETUP

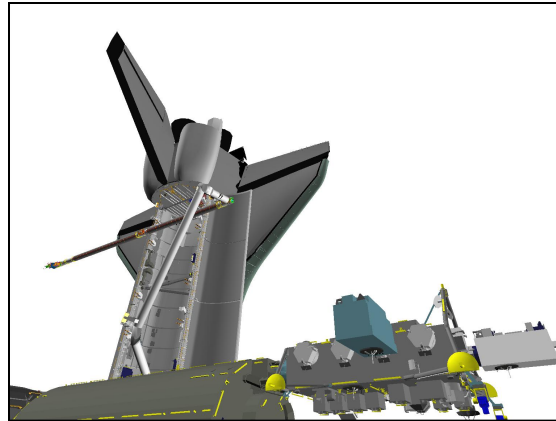
Verify SSRMS on MBS PDGF 2 at OBSS HANDOFF SETUP posn:

SR	SY	SP	EP	WP	WY	WR
+131.9	+115.0	-144.0	+150.0	-189.8	-185.6	-181.0

A7U

CCTV – perform PAN/TILT reset
– fully zoom out for SJ picture

DNLK	B
DTV	Elbow
MON 1	09: P1 LOOB
MON 2	A(RSC)



09: P1 LOOB (150,35)

If SINGLE MODE available:

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 2

√INIT ID, ITEM 24: 2

PCS

MSS: SSRMS: Thrusters: Thruster Controls for MSS Ops
Verify 'Desat Request:' Inhibit

2. MNVR TO HANDOFF FOR STOW

NOTE

Clearance between the OBSS and port wing is 43 inches at SP = 19° in line 4 of SJ table. Monitor with Camera B.

Minimum clearance between the SRMS and and MAXI (on JEF) is 53 inches at SY = 88° in line 5 of SJ table. Monitor with Camera B and/or A

RHC

If SINGLE MODE available:

RATE – VERN (RATE MIN tb-ON)

BRAKES – OFF (tb-OFF)

MODE – best available

Mnvr to OBSS HANDOFF FOR STOW posn (ref pictures as reqd):

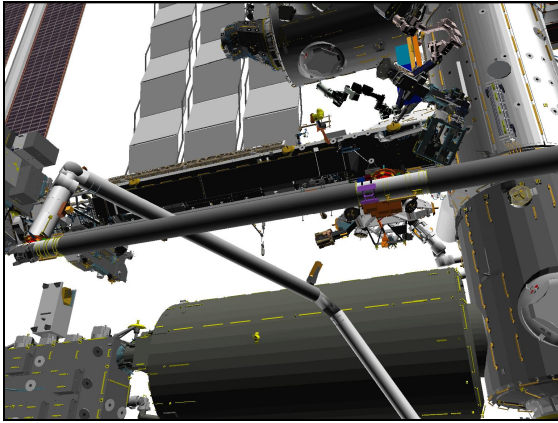
	SY	SP	EP	WP	WY	WR	
Handoff 1	+25.8	+66.3	-49.0	-85.9	+10.7	-100.7	
1: WY -					+6.9		
2: EP +			-19.2				
3: WR +						+85.7	
4: SP -		+19.0					
5: SY +	+164.6						
6: SP -		+6.0					
7: WP +				+24.2			
Handoff 2	+164.6	+6.0	-19.2	+24.2	+6.9	+85.7	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-65	+200	-371	95	312	167	2

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

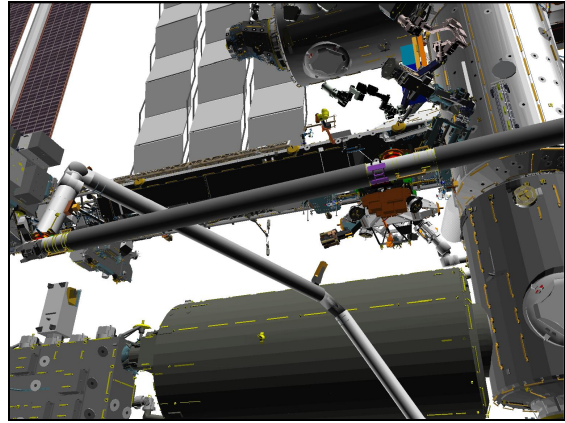
PARAM – PORT TEMP
 JOINT – CRIT TEMP

Start:
OBSS Handoff

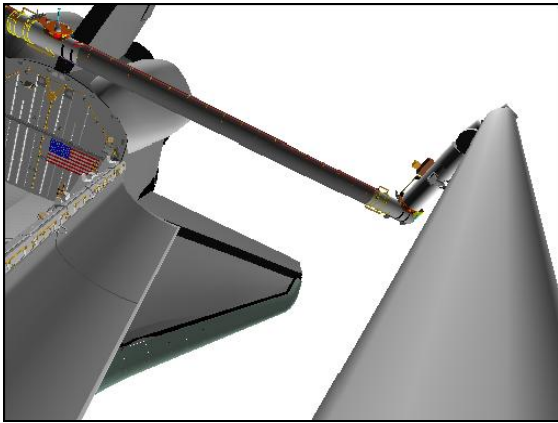
Step 1:
Drive WY- (for 3.8°)
From +10.7 to +6.9



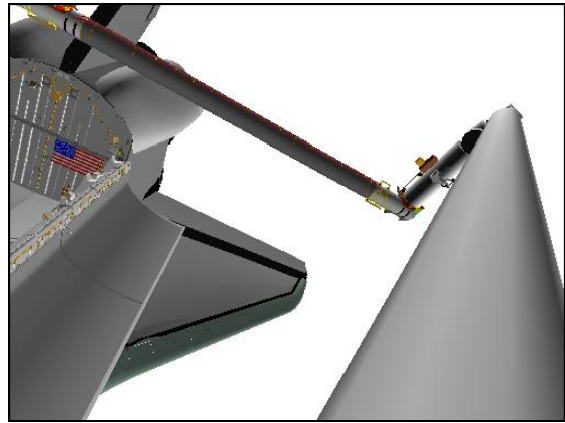
CCTV B (-20,30)



CCTV B (-20,30)



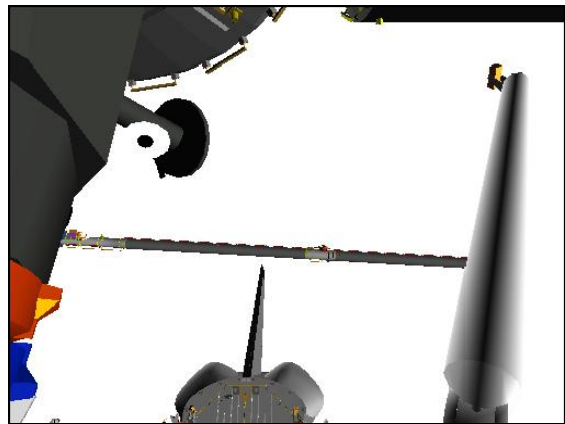
ELBOW (-30,-20)



ELBOW (-30,-20)



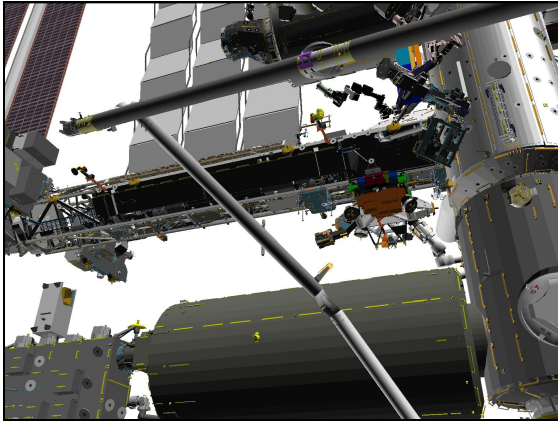
CCTV A (0,-28)



CCTV A (0,-28)

Step 2:

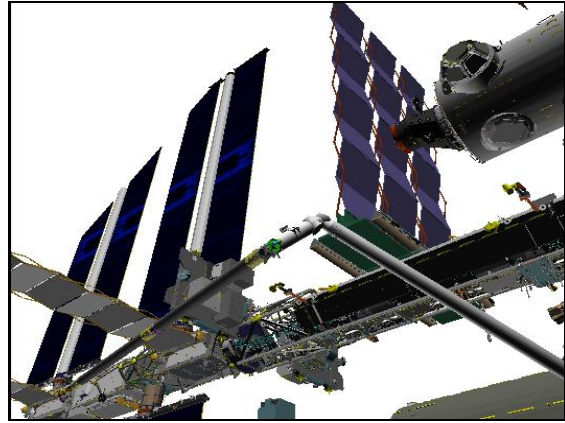
Drive EP+ (for 29.8°)
From -49.0 to -19.2



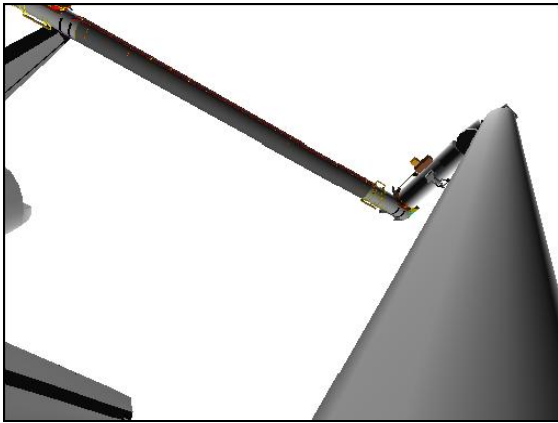
CCTV B (-20,30)

Step 3:

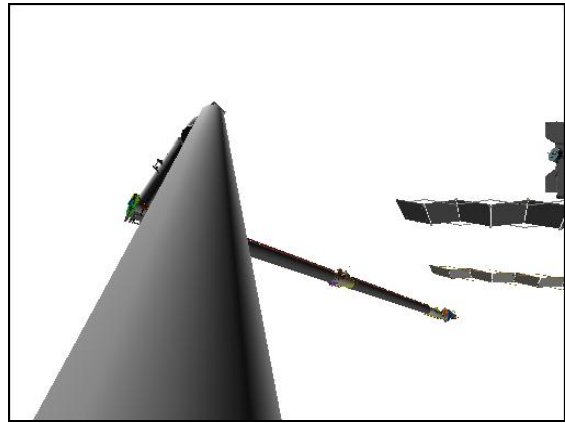
Drive WR+ (for 186.4°)
From -100.7 to +85.7



CCTV B (-40,40)



ELBOW (-30,-20)



ELBOW (-10,-20)



CCTV A (0,-28)

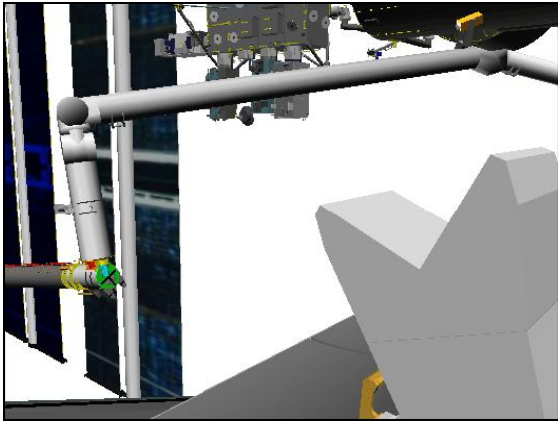


CCTV A (45,15)

Step 4:

Drive SP- (for 47.3°)
From +66.3 to +19.0

NOTE: OBSS-to-Wing is 43 inches

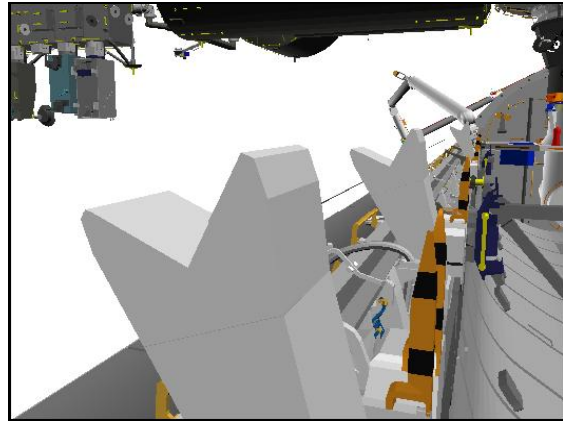


CCTV B (-40,-10)

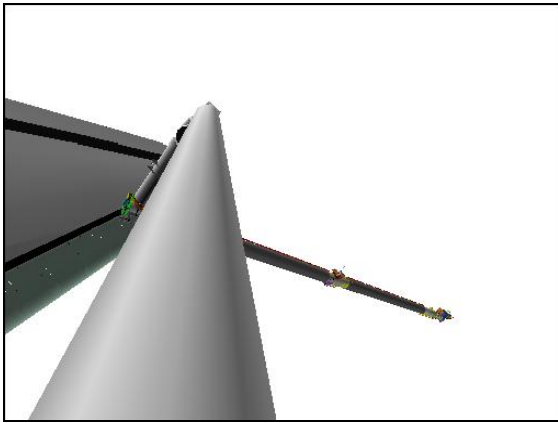
Step 5:

Drive SY+ (for 138.8°)
From +25.8 to +164.6

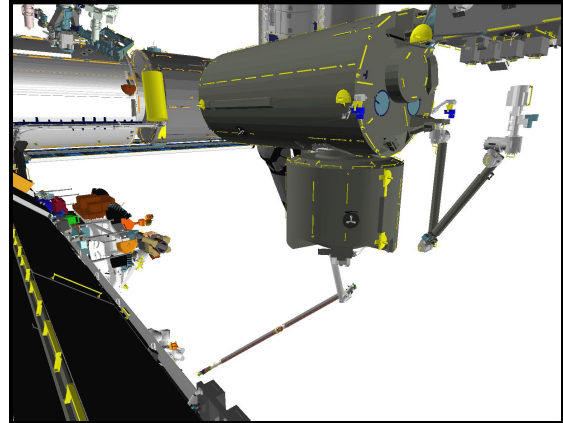
NOTE: SRMS-to-MAXI is 53 inches at 88°



CCTV B (-20,-10)



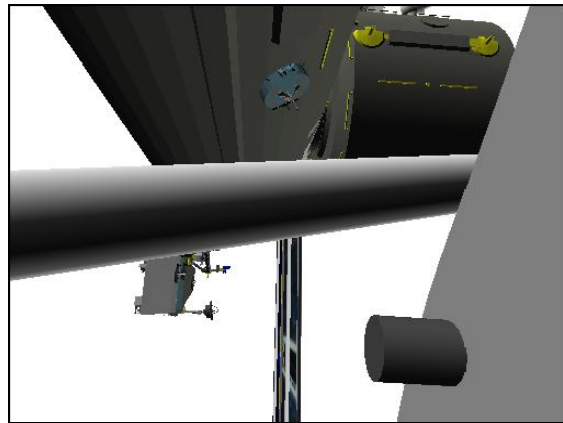
ELBOW (-10,-20)



09: P1 LOOB (130,-15)



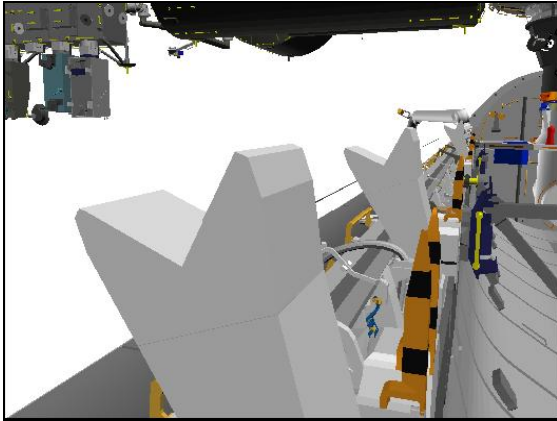
CCTV A (45,15)



CCTV A (95,15)

Step 6:

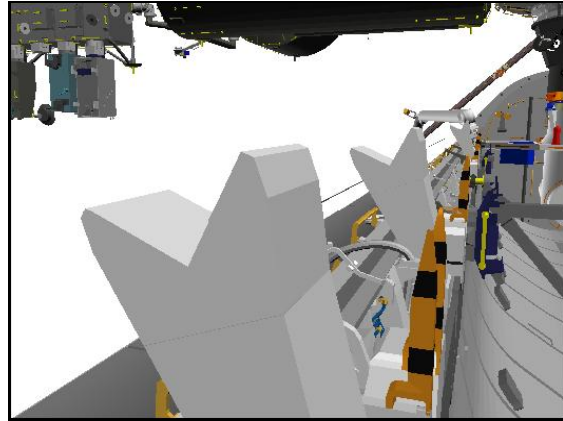
Drive SP- (for 13.0°)
From +19.0 to +6.0



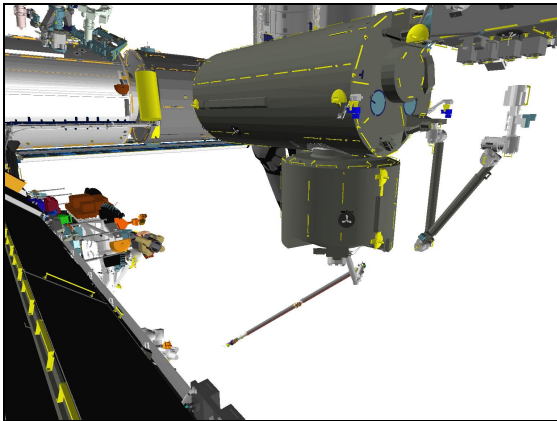
CCTV B (-20,-10)

Step 7:

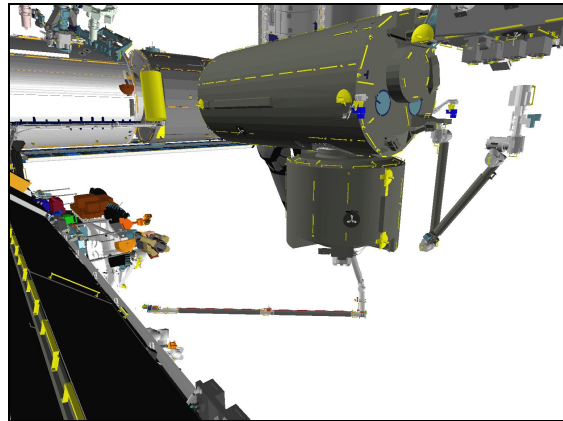
Drive WP+ (for 110.1°)
From -85.9 to +24.2



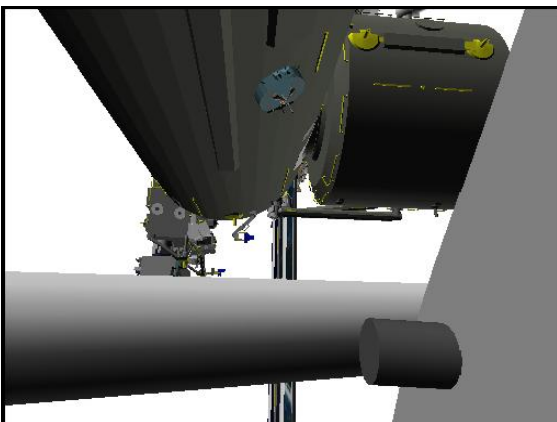
CCTV B (-20,-10)



09: P1 LOOB (130,-15)



09: P1 LOOB (130,-15)



CCTV A (95,15)



ELBOW (33,-28)

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

PARAM – PORT TEMP
JOINT – CRIT TEMP

OBSS SJ UNGRAPPLE FOR STOW

NOTE

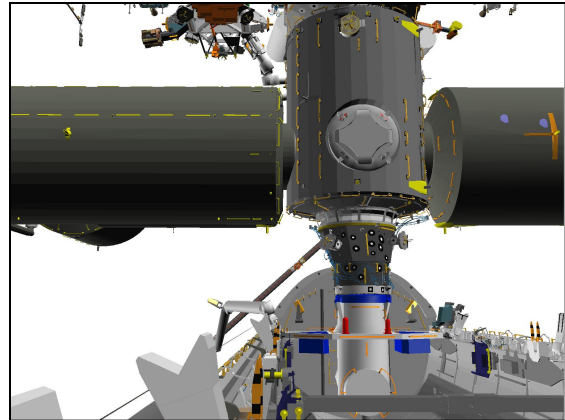
Steps 1-4 may be performed prior to, during, or after SSRMS mnvr and grapple

1. SETUP

A7U CCTV – configure video as required for SSRMS ops and sensor deactivation



ELBOW (752,0)



CCTV B (0,10)

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

OBSS HANDOFF FOR STOW posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-104	-243	-372	172	11	230	0
	SY	SP	EP	WP	WY	WR	
√	+164.6	+6.0	-19.2	+24.2	+6.9	+85.7	

2. STOW PTU

R12 Green Jumper – LDRI/ITVC

A7U DTV ← PL 2
MUX 1 L ← MIDDECK

LDRI MODE 2 pb – push (ITVC video displayed)

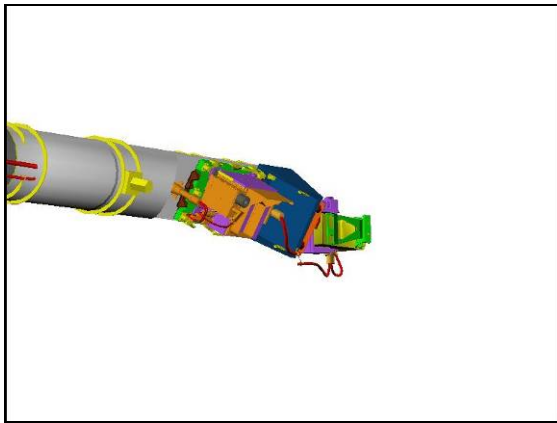
CAMR CMD PAN/TILT – HI RATE (LO within 10°)

PAN – L (to hard stop)
TILT – UP (to hard stop)

PAN/TILT – RESET

PAN: +108 (right)
TILT: -175 (down)

VIDEO OUT – not DTV
IN – not PL2



ELBOW (72,-23, full zoom in)



ITVC (108,-175)

3. SENSOR DEACTIVATION

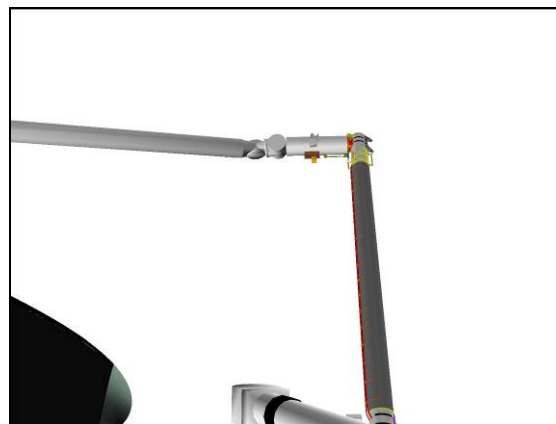
- Perform LCC DEACTIVATION (LCS (Cue Card), PHOTO/TV)
- LCH DEACTIVATION (LCS (Cue Card), PHOTO/TV)
- DEACTIVATION (LDRI/ITVC (Cue Card), PHOTO/TV)

R12 Green Jumper – ISS

4. SETUP FOR UNGRAPPLE

- A7U CCTV – configure for OBSS ungrapple
- install OBSS SJ UNGRAPPLE FOR STOW WRIST CCTV OVERLAY
 - RMS WRIST, ZOOM: 34.0 HFOV
 - FOCUS: 5 ft
- Maintain eyepoint approx 18 in when using grapple overlay

DNLK	EE(Elbow)
DTV	22: Base Elbow(09: P1 LOOB)
MON 1	B(C)
MON 2	A



22: BASE ELBOW (110,10)

5. OBSS UNGRAPPLE

On SSRMS operator GO, SSRMS grapple complete with Brakes ON and ready for SRMS release

If SINGLE MODE available:

NOTE

CONTR ERR It and 'S96 PDRS CNTL' msg may occur due to Consistency/Envelope Check error

RHC

RATE – COARSE (RATE MIN tb-OFF)

SM 94 PDRS CONTROL

AUTO BRAKE INH – ITEM 10 EXEC (*)

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

BRAKES – ON (tb-ON)

SM 94 PDRS CONTROL

AUTO BRAKE ENA – ITEM 9 EXEC (*)

RHC

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

MODE – best available

CAUTION

Monitor EE tb timing to prevent EE motor burnout

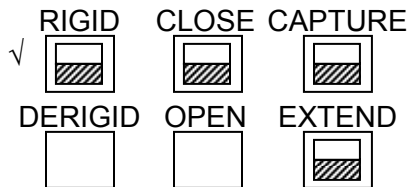
SM 169 PDRS STATUS

Monitor EE msw status

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)



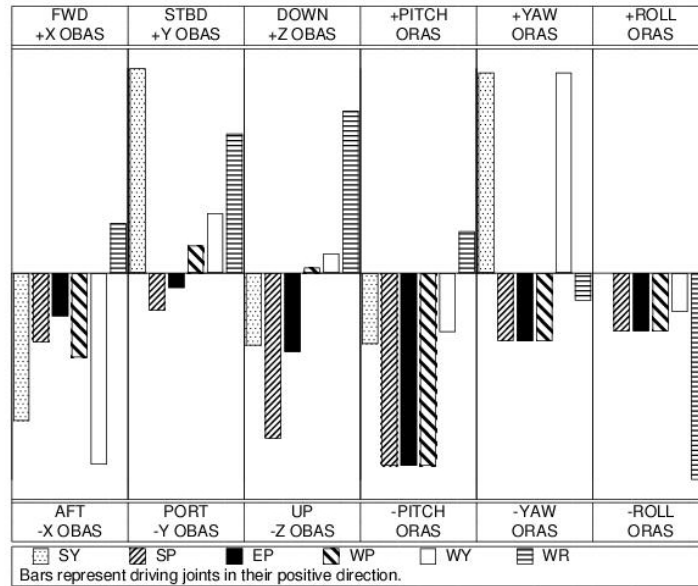
CRITICAL TIMES (8 sec total):

DERIGID tb – gray, 5 sec max, then

OPEN tb – gray, 3 sec max, then

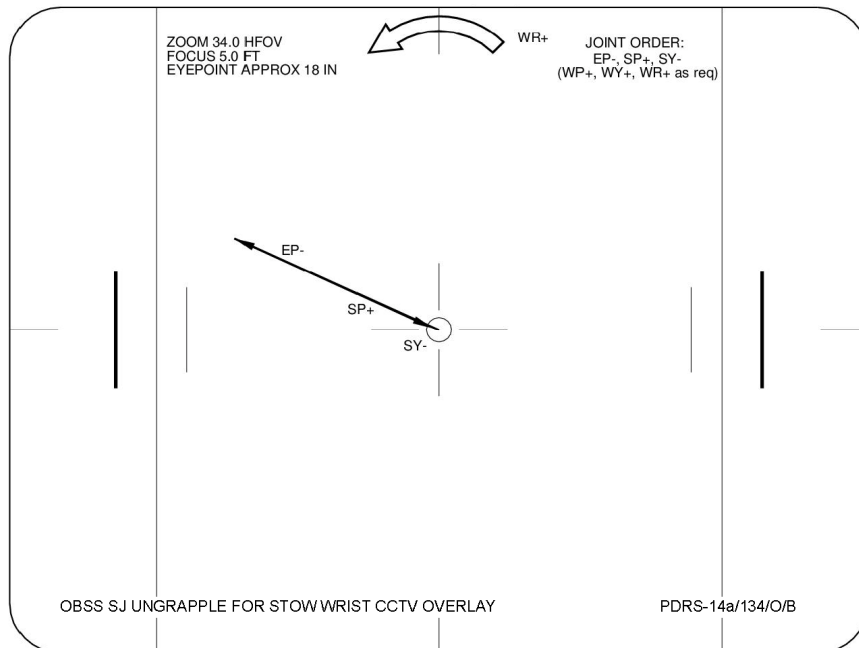
6. MNVR CLEAR OF OBSS
Drive joints per OBSS SJ UNGRAPPLE FOR STOW WRIST CCTV OVERLAY
 and histogram until EE clear of grapple fixture

OBSS SJ UNGRAPPLE FOR STOW

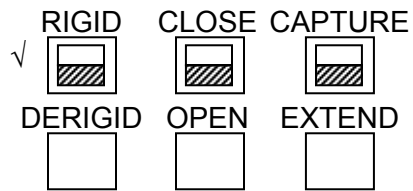


To get:	Drive:	To get:	Drive:	Driving:	Results In:	Driving:	Results In:
+X (fwd)	-WY, -SY	+PITCH	-WP, -EP	+SY	+Y (stbd), +YAW	+WP	-X (aft), -PITCH
+Y (stbd)	+SY, +WR	+YAW	+WY, +SY	+SP	-Z (up), -PITCH	+WY	-X (aft), +YAW
+Z (down)	-SP, +WR	+ROLL	-WR	+EP	-Z (up), -PITCH	+WR	+Z (down), -ROLL

ΔSY	ΔSP	ΔEP	ΔWP	ΔWY	ΔWR
-1.0	+19.3	-39.9	+20.5	+1.1	+0.5



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



CRITICAL TIMES (20 sec total):
EXTEND tb – gray, 20 sec max

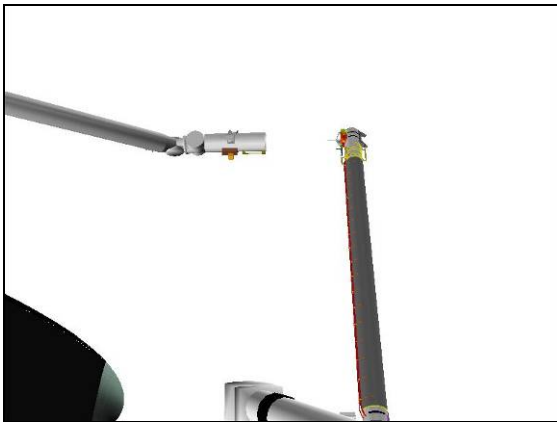
Mnvr to OBSS STOW BACKOFF posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-163	-232	-364	173	11	230	0
SY	SP	EP	WP	WY	WR	
+163.6	+25.3	-59.1	+44.7	+8.0	+86.2	

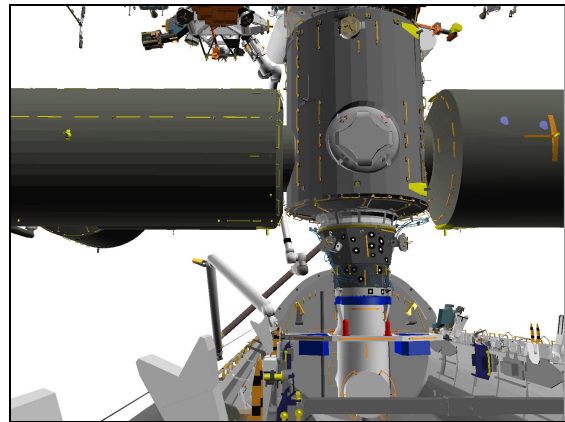
BRAKES – ON (tb-ON)
MODE – not DIRECT (It off)

PARAM – PORT TEMP
JOINT – CRIT TEMP

Notify SSRMS operator that SRMS at OBSS Backoff with Brakes ON;
GO for OBSS Stow

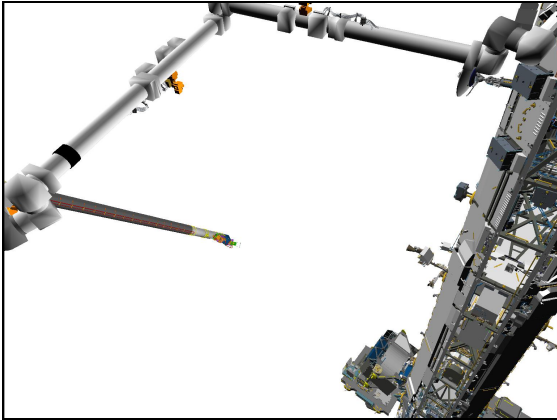


22: BASE ELBOW (110,10)

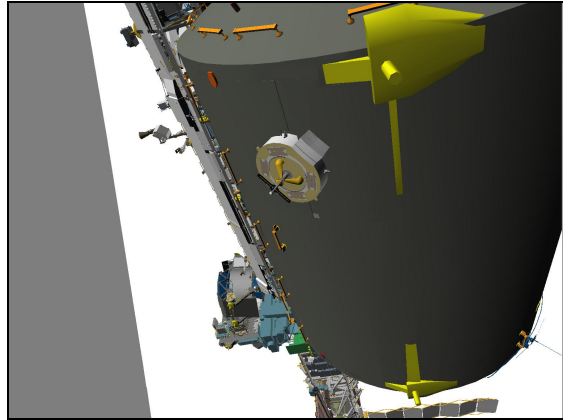


CCTV B (0,10)

- * If using Shuttle attitude control and attitude maintenance reqd: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *



ELBOW (85,20)
Track SSRMS/OBSS motion



CCTV D (-105,50)
SSRMS/OBSS comes into FOV

OBSS HANDOFF FOR BERTHING – UNGRAPPLE

1. SETUP

SM 94 PDRS CONTROL

√ PL ID, ITEM 3: 2

√ INIT ID, ITEM 24: 2

Verify SRMS at OBSS HANDOFF posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID	
√	-1029	+229	-614	284	270	270	2	*
	SY	SP	EP	WP	WY	WR		
√	+25.8	+66.3	-49.0	-85.9	+10.7	-100.7		

*Display singularity

Notify SSRMS operator that SRMS at OBSS Handoff with Brakes ON;
GO for SSRMS OBSS grapple

2. STOW PTU

R12 (VPU) Green Jumper – LDRI/ITVC

A7U DTV ← PL2

CAMR CMD PAN/TILT – HI RATE

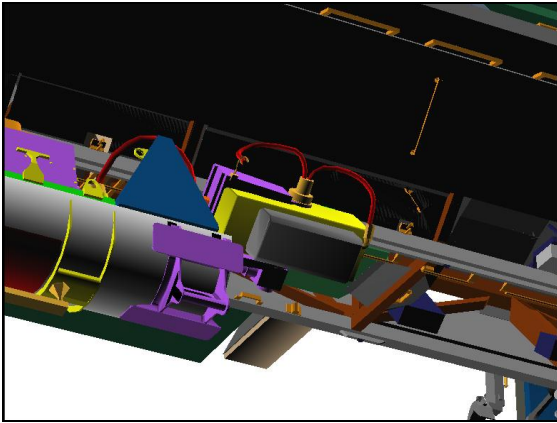
PAN – L (to hard stop)

TILT – UP (to hard stop)

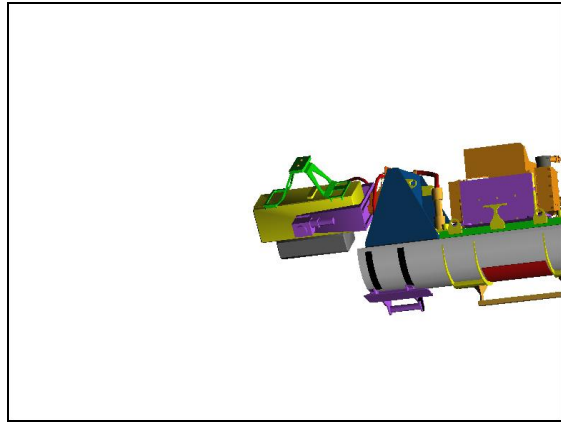
PAN/TILT – RESET

PAN: +108 (right)

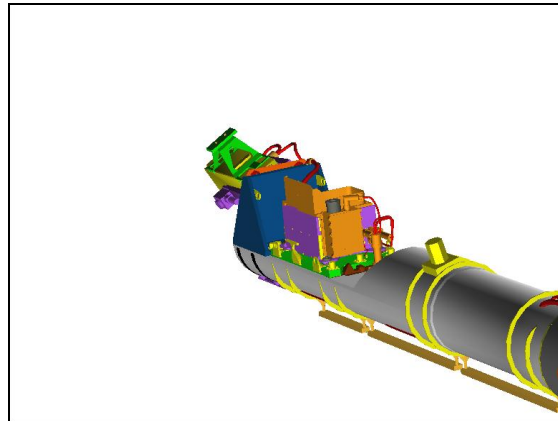
TILT: -175 (down)



**CCTV C (28,30)
Full Zoom In**



**CCTV D (-20,20)
Full Zoom In**



**ELBOW (-93,50)
Full Zoom In**

On SSRMS Operator GO, SSRMS grapple complete with Brakes ON and ready for SRMS OBSS ungrapple

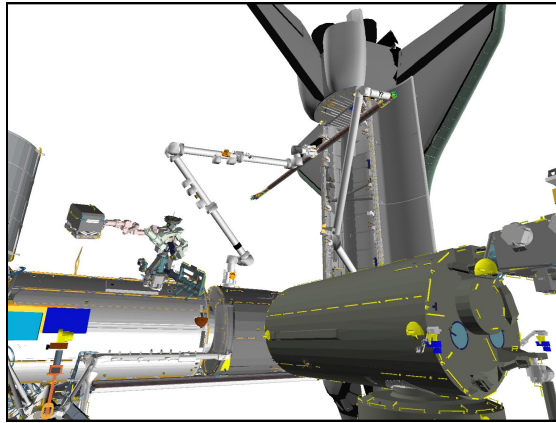
CAUTION
STBD RMS HTR power must be applied within 90 min to prevent sensor package damage

Perform LCC DEACTIVATION (LCS (Cue Card), PHOTO/TV)
LCH DEACTIVATION (LCS (Cue Card), PHOTO/TV)
DEACTIVATION (LDRI/ITVC (Cue Card), PHOTO/TV)

R12 Green Jumper – ISS

A7U 3. OBSS UNGRAPPLE
CCTV – configure for ungrapple
– RMS WRIST, ZOOM: 34.0 HFOV
FOCUS: 5 ft

DNLK	EE
DTV	B(C)
MON 1	09: P1 LOOB
MON 2	A



09: P1 LOOB (120,20)

NOTE

CONTR ERR It and 'S96 PDRS CNTL' msg may occur due to Consistency/Envelope Check error

RHC RATE – COARSE (RATE MIN tb-OFF)

SM 94 PDRS CONTROL

AUTO BRAKE INH – ITEM 10 EXEC (*)

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

BRAKES – ON (tb-ON)

SM 94 PDRS CONTROL

AUTO BRAKE ENA – ITEM 9 EXEC (*)

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

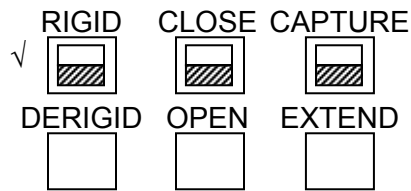
Monitor EE tb timing to prevent EE motor burnout

SM 169 PDRS STATUS

Monitor EE msw status

When OPEN tb – gray, mnvr arm clear of grapple pin (to Z = -676)

EE MODE – AUTO
RELEASE sw – depress (mom)



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

- * If manual release reqd: *
- * 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) *
- * *
- * Mnv r arm clear of grapple pin, then *
- * EE MAN CONTR – DERIGID (hold until EXTEND tb-gray, 20 sec max) *
- * MODE – OFF *

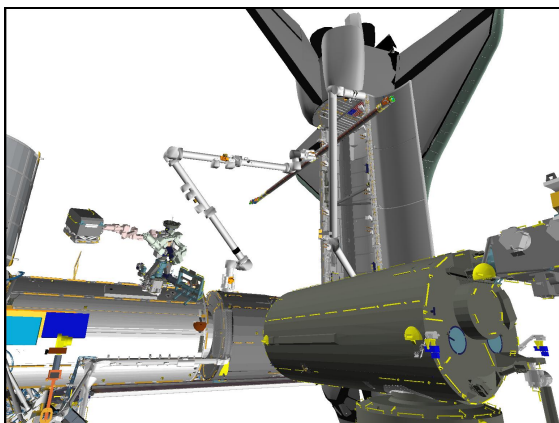
Mnv r to OBSS BACKOFF posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1018	-362	-676	284	0	270	0
SY	SP	EP	WP	WY	WR	
+24.0	+64.8	-34.4	-99.4	+11.3	-99.0	

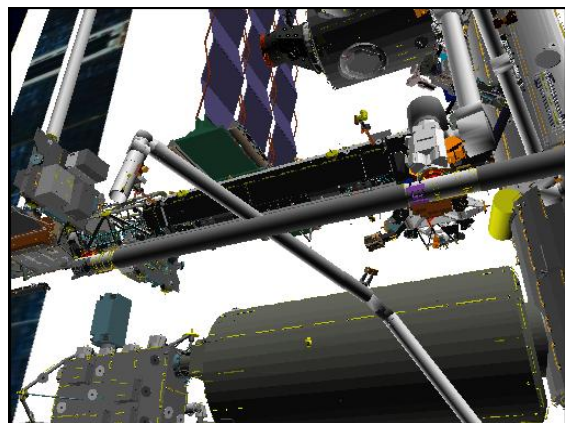
BRAKES – ON (tb-ON)

- * If using Shuttle attitude control and attitude maintenance reqd: *
- * DAP: LVLH *
- * When rates damped: *
- * DAP: FREE > 2 sec *
- * DAP: AUTO *

Notify SSRMS operator that SRMS at OBSS Backoff with Brakes ON;
 GO for SSRMS OBSS Berth



09: P1 LOOB (120,20)



CCTV B (-25,30)

A7U

CCTV – Configure as required for OBSS mnvr and berth

OBSS HANDOFF FOR BERTHING – STBD MRL LATCH

1. CONFIGURE CIRCUIT BREAKERS

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

2. CONFIGURE FOR MONITORING

On SSRMS Operator notification to watch for stbd RMS RFLs:

SM 94 PDRS CONTROL

RMS STBD – ITEM 2 EXEC (*)

Notify SSRMS operator when STBD RMS R-F-L tb (three) – gray

3. STBD MRL LATCH

On SSRMS Operator GO to latch stbd MRLs to Topological Capture:

√STBD RMS R-F-L tb (three) – gray

SM 94 PDRS CONTROL

√STBD AFT, MID, FWD LAT (six) = 0

Verify AOS for latching to Topological Capture

R13L PL BAY MECH PWR SYS (two) – ON

NOTE

Expect single motor drive time for MRL latching (18 sec max).

The following STBD RMS RETEN LAT – OFF and PL BAY MECH PWR SYS (two) – OFF actions are to be performed simo

STBD RMS RETEN LAT – LAT 6 sec only (tb-bp)
– OFF

R13L PL BAY MECH PWR SYS (two) – OFF

Notify SSRMS operator that MRLs latched to Topological Capture; GO to limp all SSRMS joints and derigidize

R13L On SSRMS Operator GO to complete stbd MRL latching:
 PL BAY MECH PWR SYS (two) – ON

STBD RMS RETEN LAT – LAT (tb-LAT) (12 sec max)
– OFF

4. RECONFIGURE POWER

R13L PL BAY MECH PWR SYS (two) – OFF

STBD RMS HTR A,B (two) – AUTO

A6U EVENT TIMER CNTL – STOP

SM 94 PDRS CONTROL

√STBD AFT, MID, FWD LAT (six) = 1
RMS PORT – ITEM 1 EXEC (*)

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

Notify SSRMS operator that MRLs latched, GO for OBSS ungrapple

A7U CCTV – Configure as required for OBSS ungrapple

|

OBSS REGRAPPLE AT HANDOFF FOR STOW

NOTE

Procedure also valid for grappling EIBA at Handoff for Stow posn

1. SETUP

A7U

CCTV – configure for grapple

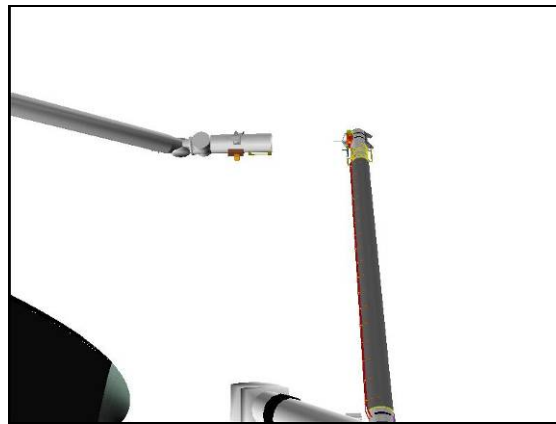
– install PDRS TARGET OVERLAY FOR CTVM

– RMS WRIST, ZOOM: 34.0 HFOV

FOCUS: 5 ft

Maintain eyepoint ~18 in when using grapple overlay

DNLK	EE(Elbow)
DTV	B
MON 1	22: Base Elbow(07: P1 LOIB)
MON 2	A



22: BASE ELBOW (110,10)

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 0

√INIT ID, ITEM 24: 0

OBSS STOW BACKOFF posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-163	-232	-364	173	11	230	0
SY	SP	EP	WP	WY	WR	
+163.6	+25.3	-59.1	+44.7	+8.0	+86.2	

R12(OBSS) √SPEE PWR – OFF

A15 √APCU 2 OUTPUT – OFF

2. GRAPPLE OBSS

On SSRMS operator GO, OBSS at Handoff posn with Brakes ON and ready for grapple:

- * If grappling EIBA PDGF: *
- * RATE – as req *
- * BRAKES – OFF (tb-OFF) *
- * MODE – SINGLE, ENTER *
- * *
- * Drive WR (-) to -49.5° to align with PDGF target *

RHC

RATE – VERN (RATE MIN tb-ON)

BRAKES – OFF (tb-OFF)

MODE – END EFF, ENTER

Mnvr to grapple envelope

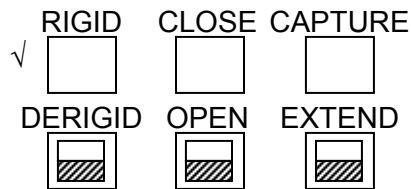
CAUTION
Monitor EE tb timing to prevent EE motor burnout

SM 169 PDRS STATUS

Monitor EE msw status

EE MODE – AUTO

CAPTURE sw – depress (mom)



CRITICAL TIMES (28 sec total):

CAPTURE tb – gray, then

CLOSE tb – gray, 3 sec max, then

RIGID tb – gray, 25 sec max

EE MODE – OFF

- * If manual capture required: *
- * EE MODE – MAN *
- * CAPTURE sw – depress (hold until CLOSE tb-gray, 3 sec max) *
- * MAN CONTR – RIGID (hold until RIGID tb-gray, 25 sec max) *
- * MODE – OFF *

MODE – TEST, ENTER

Wait 5 sec

BRAKES – ON (tb-ON)

NOTE

PLID 2 POR will differ for EIBA. MCC may uplink new PLID for EIBA ops

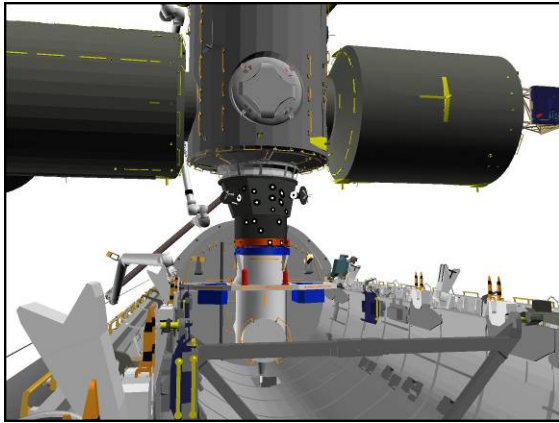
SM 94 PDRS CONTROL

PL ID – ITEM 3 +2 EXEC

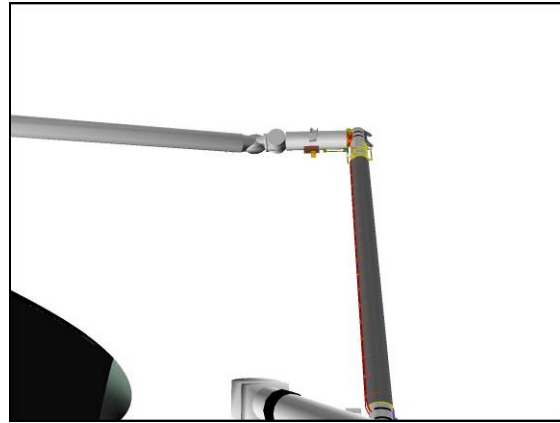
INIT ID – ITEM 24 +2 EXEC

Expected OBSS HANDOFF posn:

√	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-65	+200	-371	95	312	167	2
	SY	SP	EP	WP	WY	WR	
√	+164.6	+6.0	-19.2	+24.2	+6.9	+85.7	



CCTV B (10,5)



22: BASE ELBOW (110,10)

Review GENERIC END EFFECTOR CUE CARD – ISS/SHUTTLE DOCKED OPS

Notify SSRMS operator that OBSS grapple complete with Brakes ON;
GO for OBSS release

If grappled to EIBA PDGF, >>

3. SENSOR ACTIVATION

If > 90 min since sensor deactivation:

√MCC for sensor constraints or powerup deltas

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

LCH ACTIVATION (LCS (Cue Card), PHOTO/TV)

LCC ACTIVATION (LCS (Cue Card), PHOTO/TV)

LCC DEACTIVATION (LCS (Cue Card), PHOTO/TV), steps 1 and 2

R12

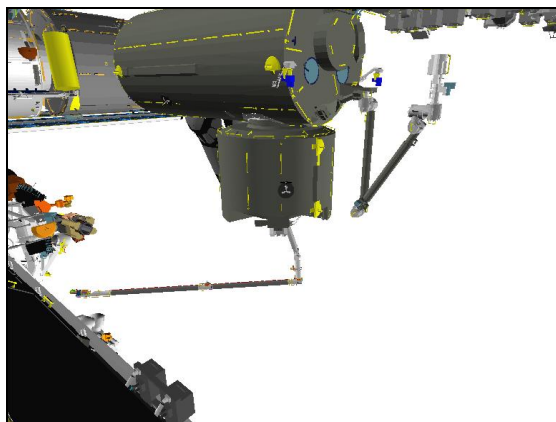
Green Jumper – ISS

OBSS MNVR HANDOFF FOR STOW TO UNDOCK

1. SETUP

Verify SSRMS clear of OBSS (mnvr valid with SSRMS on MBS PDGF 2 at OBSS HANDOFF SETUP, INTERMEDIATE, or PRE-GRAPPLE)

DNLK	Elbow
DTV	B
MON 1	09: P1 LOOB(03: S1 LOOB)
MON 2	A(RSC)



09: P1 LOOB (120,20)

SM 94 PDRS CONTROL

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

Verify at OBSS HANDOFF FOR STOW posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-86	-243	-371	95	312	167	1
	SY	SP	EP	WP	WY	WR	
√	+164.6	+6.0	-19.2	+24.2	+6.9	+85.7	

2. MNVR TO INTERMEDIATE

SM 94 PDRS CONTROL

- END POS – ITEM 18 -3 7 4 -3 0 2 -1 8 0 EXEC
- ATT – ITEM 21 +2 4 2 +3 8 +9 7 EXEC
- CMD CK – ITEM 25 EXEC (GOOD)

NOTE

Minimum clearance between the SRMS and JPM is 46 inches during OCAS. Monitor with Cameras B and A

RHC

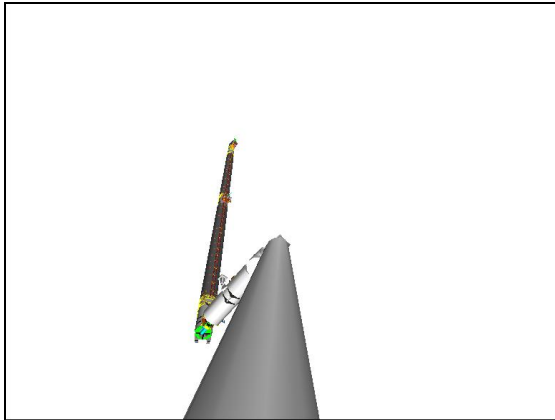
- RATE – COARSE (RATE MIN tb-OFF)
- BRAKES – OFF (tb-OFF)
- MODE – OPR CMD, ENTER (READY lt on)

AUTO SEQ – PROCEED (IN PROG lt on)

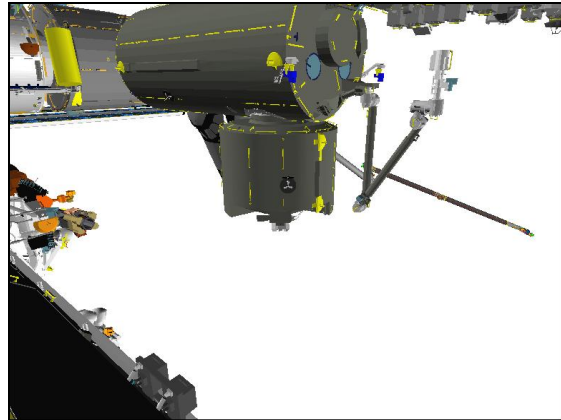
- When AUTO SEQ IN PROG lt – off:
- BRAKES – ON (tb-ON)

Verify INTERMEDIATE posn: (03:30)

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-374	-302	-180	242	38	97	1
	SY	SP	EP	WP	WY	WR	
√	+137.1	+19.5	-61.5	-74.6	+3.7	0.0	



ELBOW (0,0)



09: P1 LOOB (140,-20)

3. MNVR TO UNDOCK SETUP

SM 94 PDRS CONTROL

END POS – ITEM 18 -8 5 0 -4 3 0 -1 5 0 EXEC
 ATT – ITEM 21 +5 0 +3 4 5 +2 0 EXEC
 CMD CK – ITEM 25 EXEC (GOOD)

NOTE

Minimum clearance between the SRMS and JPM is 42 inches during OCAS. Monitor with Cameras B and A

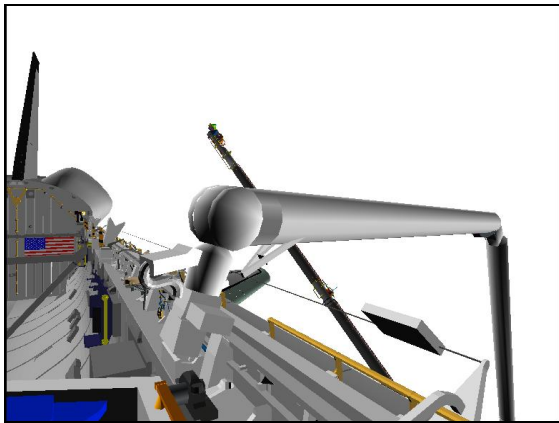
BRAKES – OFF (tb-OFF)
 MODE – OPR CMD, ENTER (READY It on)

AUTO SEQ – PROCEED (IN PROG It on)

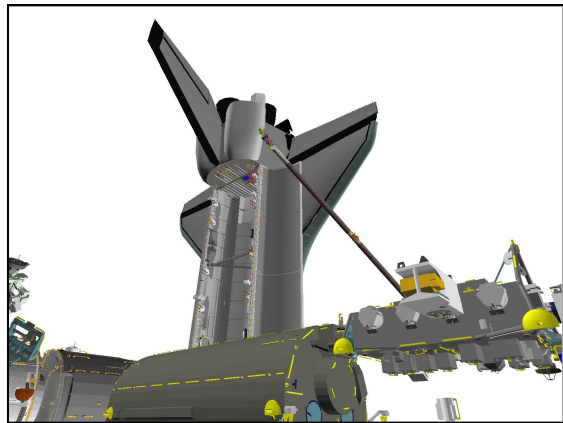
When AUTO SEQ IN PROG It – off:
 BRAKES – ON (tb-ON)

Verify UNDOCK SETUP posn: (03:50)

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-850	-430	-150	50	345	20	1
	SY	SP	EP	WP	WY	WR	
√	+72.2	+17.2	-54.8	-78.0	-30.2	-100.8	



CCTV A (30,0)



09: P1 LOOB (140,30)

4. MNVR TO UNDOCK

SM 94 PDRS CONTROL

END POS – ITEM 18 -1 0 4 1 -3 6 2 -6 0 2 EXEC

ATT – ITEM 21 +1 2 2 +2 7 0 +7 8 EXEC

CMD CK – ITEM 25 EXEC (GOOD)

NOTE

Clearance between SRMS boom and JPM is 40 inches at Undock. Monitor with Camera A

BRAKES – OFF (tb-OFF)

MODE – OPR CMD, ENTER (READY lt on)

AUTO SEQ – PROCEED (IN PROG lt on)

When AUTO SEQ IN PROG lt – off:

BRAKES – ON (tb-ON)

Verify at UNDOCK posn:

(03:50)

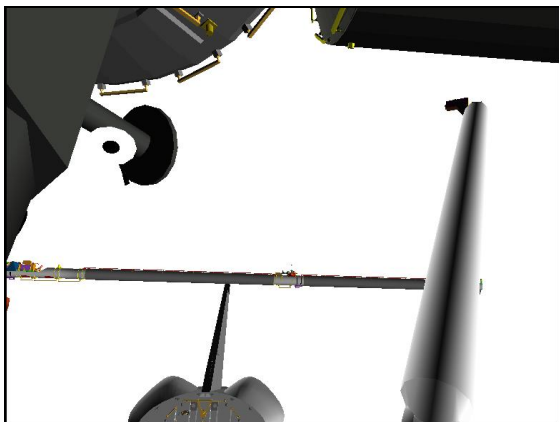
	X	Y	Z	PITCH	YAW	ROLL	PL ID	
√	-1041	-362	-602	122	270	78	1	*
	SY	SP	EP	WP	WY	WR		
√	+25.8	+66.3	-49.0	-85.9	+10.7	-100.7		

*Display singularity

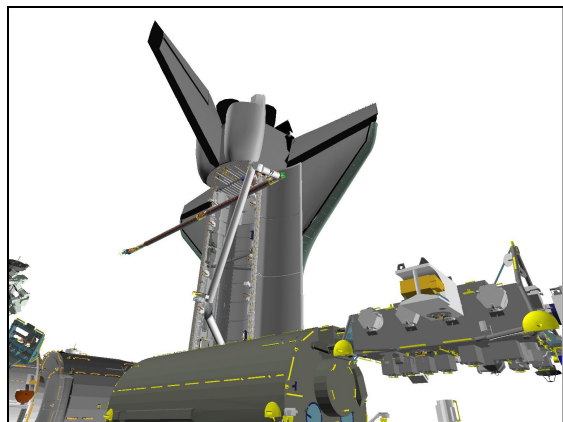
√MODE – not DIRECT (lt off)

PARAM – PORT TEMP

JOINT – CRIT TEMP



CCTV A (5,30)



09: P1 LOOB (140,30)

OBSS MNVR UNDOCK TO HOVER

WARNING
For UNDOCKED ops only

NOTE

SRMS configured to OBSS HOVER such that generic late inspection can be run. OBSS Berth (nom or SJ) can be run with WR off by -360°

1. SETUP

DNLK	B
DTV	A
MON 1	C
MON 2	Elbow

SM 94 PDRS CONTROL

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

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1041	-362	-602	122	270	78	1
	SY	SP	EP	WP	WY	WR	
√	+25.8	+66.3	-49.0	-85.9	+10.7	-100.7	

2. MNVR TO HOVER

If SINGLE MODE available:

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

MODE – best available

Mnvr to OBSS HOVER posn (ref pictures as reqd):

	SY	SP	EP	WP	WY	WR	
Undock	+25.8	+66.3	-49.0	-85.9	+10.7	-100.7	
1: SP +		+80.2					
2: SY -	-89.9						
3: WY -					0.0		
4: WP +				-20.0			
5: WR -						-250.1	
6: WP -				-59.8			
7: EP -			-118.8				
OBSS Hover	-89.9	+80.2	-118.8	-59.8	0.0	-250.1	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-680	+133	-517	0	0	341	1

BRAKES – ON (tb-ON)

MODE – not DIRECT (lt off)

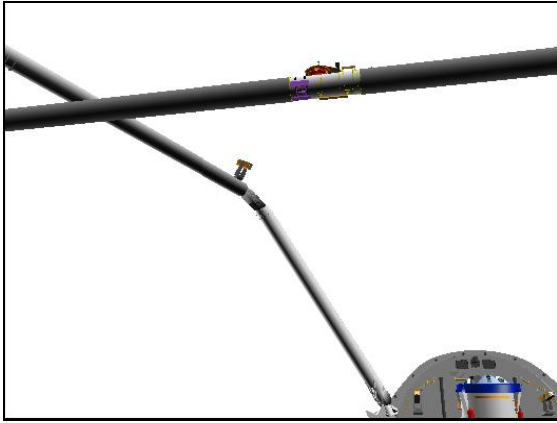
If performing standard undocked late inspection:
Go to step 3

If berthing OBSS and PL MODE available:
Go to OBSS BERTH (OBSS OPERATIONS) >>

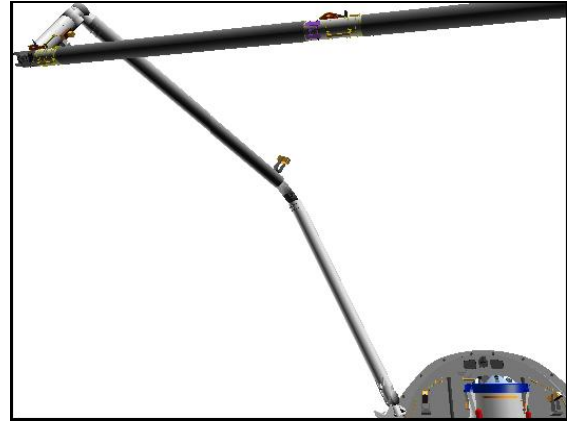
If berthing OBSS and PL MODE not available:
Go to OBSS SJ BERTH (OBSS OPERATIONS) >>

Start:
Undock

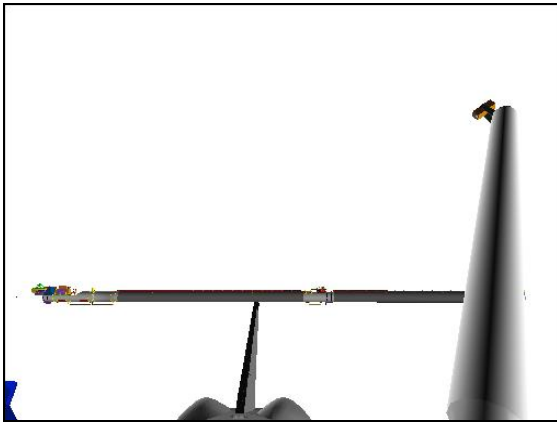
Step 1:
Drive SP+ (for 13.9°)
From +66.3 to +80.2



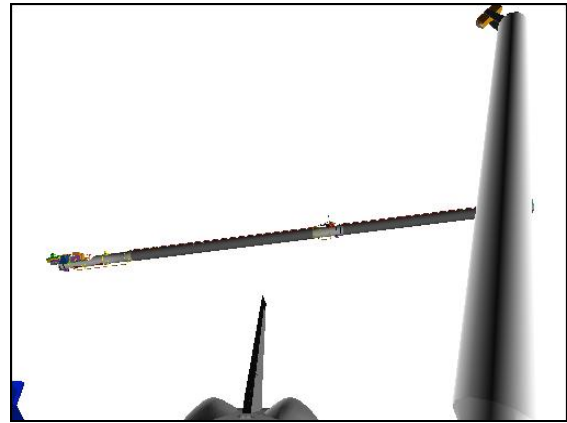
CCTV B (-12,19)



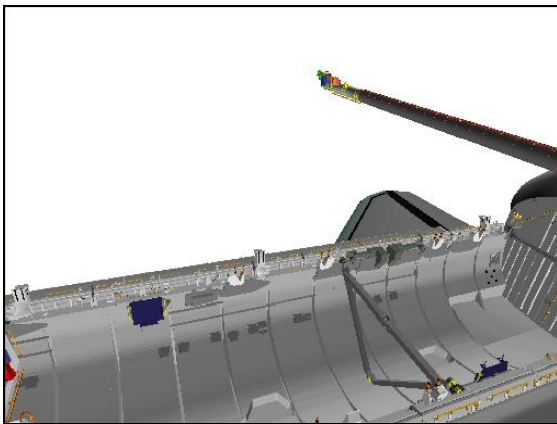
CCTV B (-12,19)



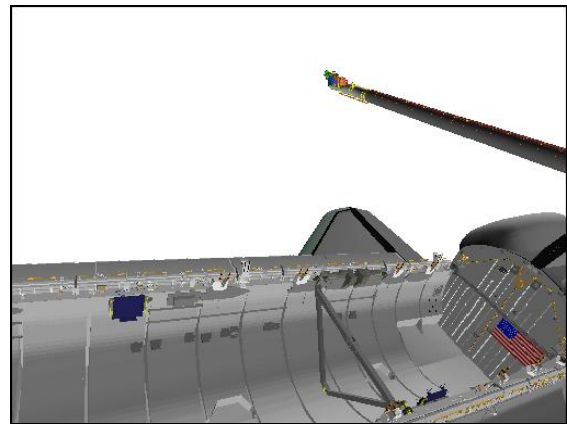
CCTV A (0,33)



CCTV A (0,33)



ELBOW (-100,0)



ELBOW (-100,0)

Step 2:

Drive SY- (for 115.7°)
From +25.8 to -89.9



CCTV B (-12,19)

Step 3:

Drive WY- (for 10.7°)
From 0.0 to +10.7



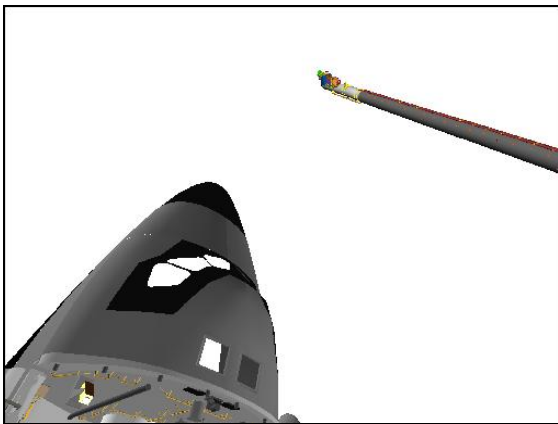
CCTV B (-12,19)



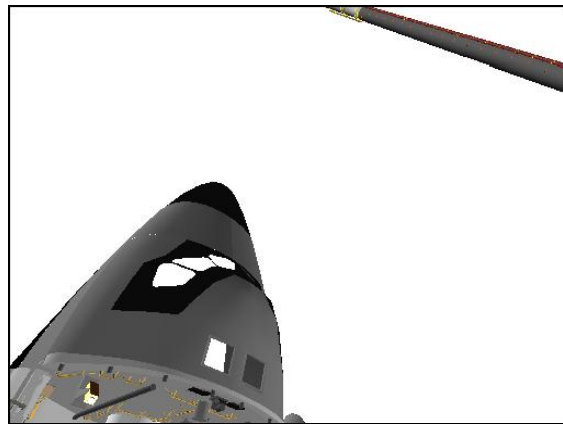
CCTV A (0,50)



CCTV A (0,50)



ELBOW (-100,0)



ELBOW (-100,0)

Step 4:

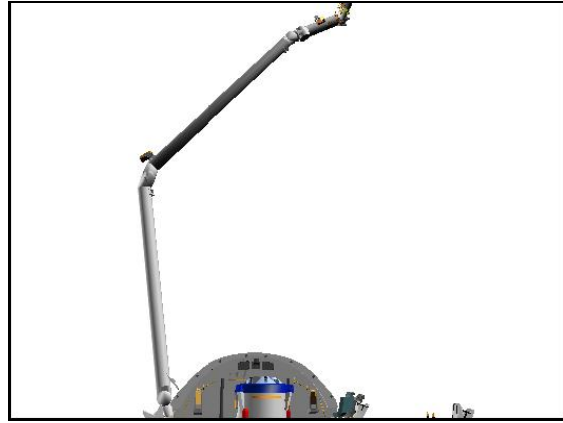
Drive WP+ (for 65.9°)
From -85.9 to -20



CCTV B (10,19)

Step 5:

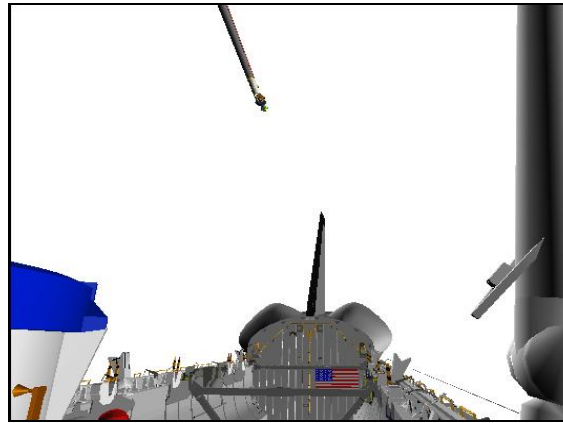
Drive WR- (for 149.4°)
From -100.7 to -250.1



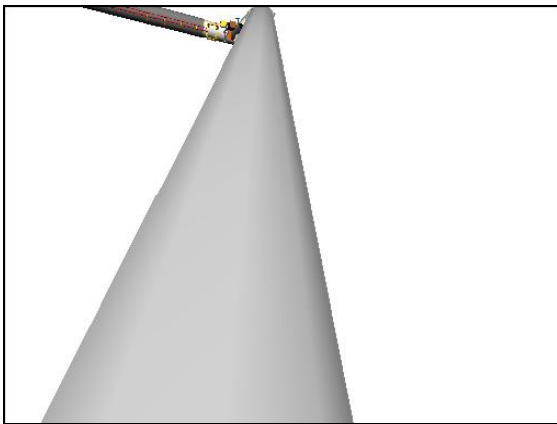
CCTV B (10,19)



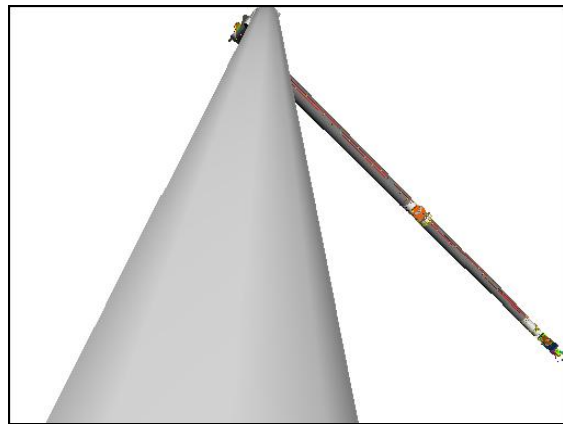
CCTV A (0,80)



CCTV A (-5,20)



ELBOW (2,-33)



ELBOW (2,-33)

Step 6:

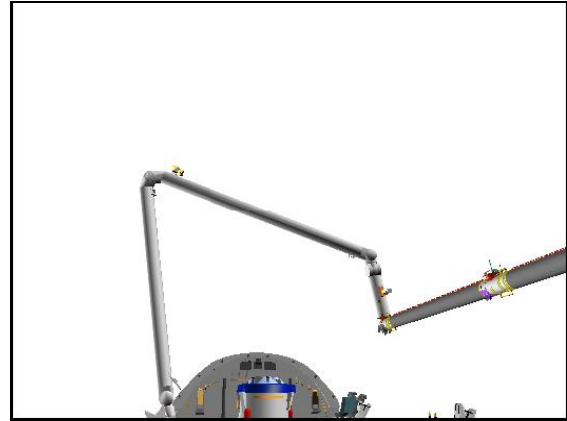
Drive WP- (for 39.8°)
From -20.0 to -59.8



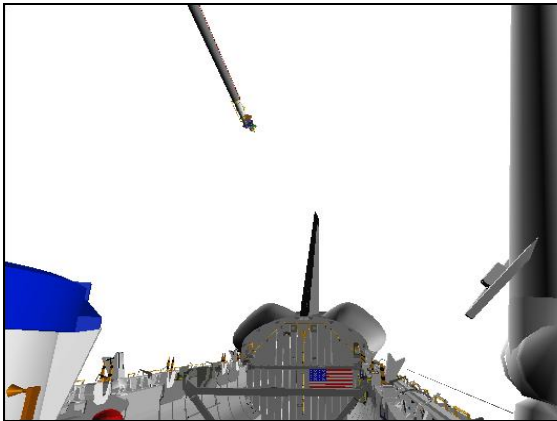
CCTV B (10,19)

Step 7:

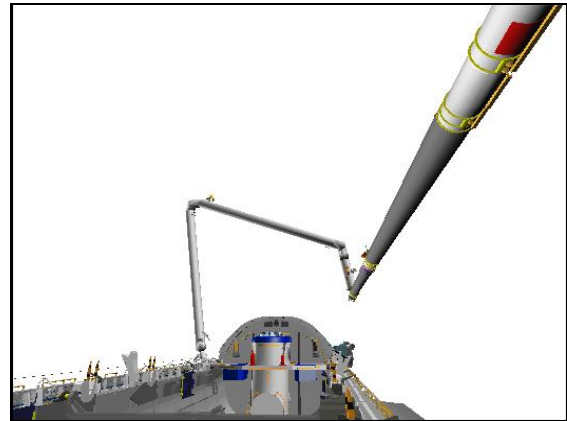
Drive EP- (for 69.8°)
From -49.0 to -118.8



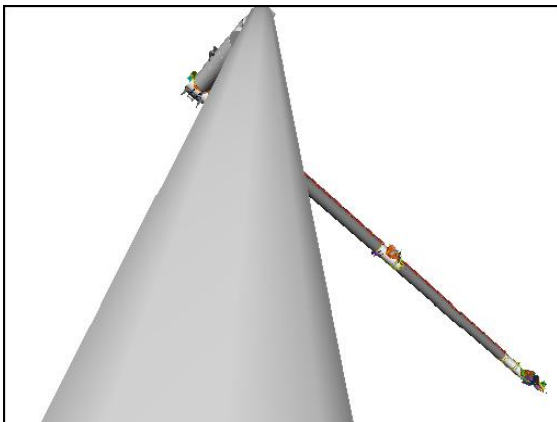
CCTV B (10,19)



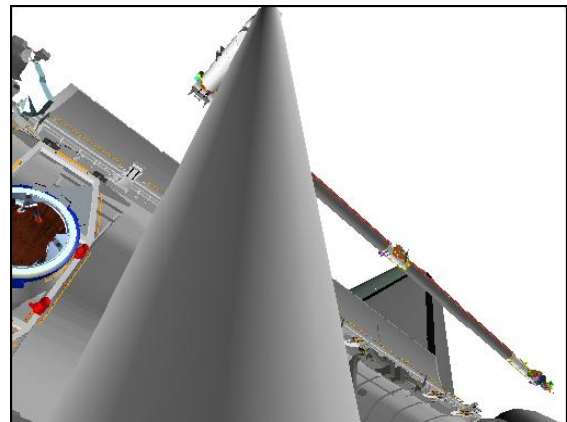
CCTV A (-5,20)



CCTV C (-5,20)



ELBOW (2,-33)



ELBOW (2,-33)

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

If berthing OBSS and PL MODE available:
Go to OBSS BERTH (OBSS OPERATIONS) >>

If berthing OBSS and PL MODE not available:
Go to OBSS SJ BERTH (OBSS OPERATIONS) >>

3. CONFIGURE FOR LATE INSPECTION
R12(OBSS) RSC PWR – OFF, ON

Perform ACTIVATION (LDRI/ITVC Cue Card, P/TV) steps 1, 3, 4, and 5

A15 APCU 2 CONV – OFF
Wait 10 sec
APCU 2 CONV – ON

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

A7U MUX 1 L ← MIDDECK
LDRI MODE 6 pb – push (flickering LDRI video)
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: +103 (right)
TILT: -260 (down)

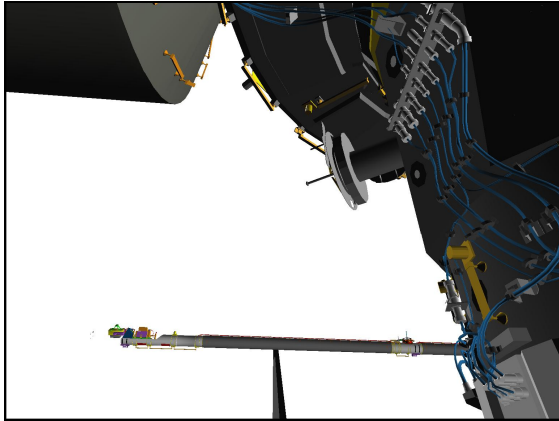
Go to OBSS LDRI/IDC RCC SURVEY – STBD (OBSS OPERATIONS)

OBSS STORM CHASER

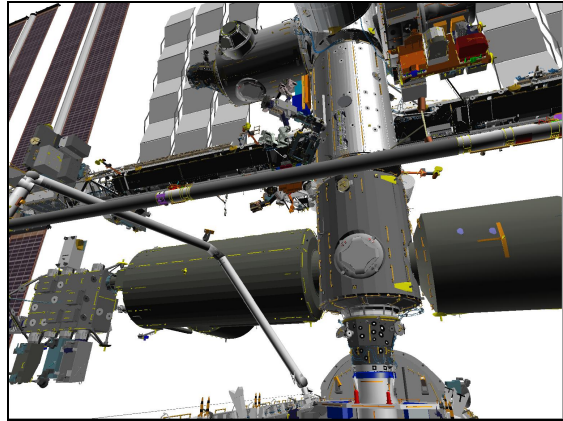
WARNING
 SRMS maneuvers for UNDOCKED ops only
 (step 1 may be performed prior to undock)

1. SETUP
 CCTV – config as required

A7U



CCTV D (5,40)



CCTV C (-20,25)

SM 94 PDRS CONTROL

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

Verify UNDOCK posn:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1041	-362	-602	122	270	78	1
	SY	SP	EP	WP	WY	WR	
√	+25.8	+66.3	-49.0	-85.9	+10.7	-100.7	

SM 94 PDRS CONTROL

END POS – ITEM 18 -9 4 8 -2 9 -5 2 9 EXEC
 ATT – ITEM 21 +9 0 +0 +1 5 EXEC
 CMD CK – ITEM 25 EXEC (GOOD)

2. MNVR TO STORM CHASER

When SEP 1 complete:

- √ MCC for DAP config

RHC

RATE – COARSE (RATE MIN tb-OFF)
 BRAKES – OFF (tb-OFF)
 MODE – OPR CMD, ENTER (READY It on)

AUTO SEQ – PROCEED (IN PROG It on)

When AUTO SEQ IN PROG It – off:

BRAKES – ON (tb-ON)

CONTINGENCY HOLD AND SUPPORT for EXTRA RNDZ posn: (02:55)

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-948	-29	-529	90	0	15	1
	SY	SP	EP	WP	WY	WR	
√	-14.9	+94.0	-134.7	+25.3	-27.6	-1.3	

PARAM – PORT TEMP
 JOINT – CRIT TEMP

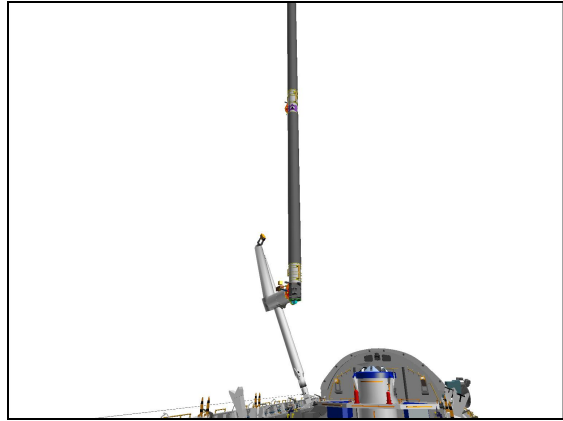
Notify CDR/PLT that SRMS is in good config for burns

NOTE

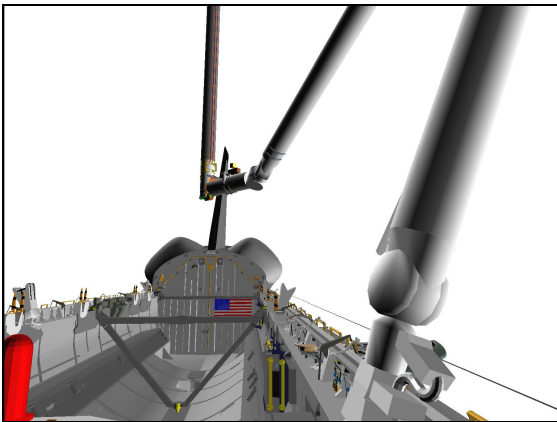
May receive CHECK CRT It and S96 PDRS SLIP message(s) during SEP/STORRM burns. Burn may be completed if resulting arm motion is benign or away from structure. SRMS should be reconfigured to STORRM CHASER posn before next burn (see starblock)



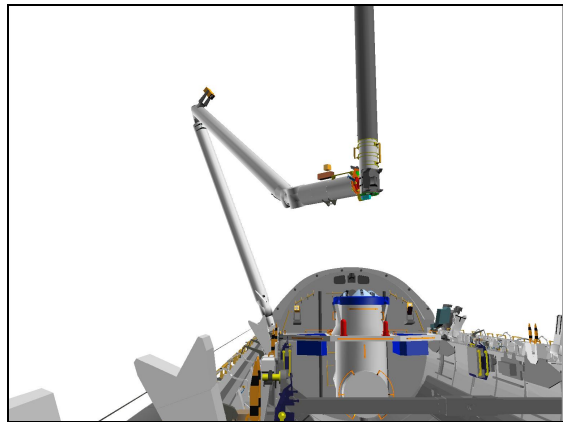
CCTV D (5,40)



CCTV C (-20,25)



CCTV A (5,10)



CCTV B (0,10)

- * If S96 PDRS SLIP (any) message annunciates: *
- * *
- *

SM 94 PDRS CONTROL

 *
- * √END POS/ATT, ITEM 18-23: *
- * ----- *
- * -948, -29, -529, 90, 0, 15 *
- * ----- *
- * √CMD CK, ITEM 25: GOOD *
- * *
- * BRAKES – OFF (tb-OFF) *
- * MODE – OPR CMD, ENTER (READY It on) *
- * *
- * AUTO SEQ – PROCEED (IN PROG It on) *
- * *
- * When AUTO SEQ IN PROG It – off: *
- * BRAKES – ON (tb-ON) *
- * *
- * Verify STORRM CHASER posn: *
- *

X	Y	Z	PITCH	YAW	ROLL	PL ID
-948	-29	-529	90	0	15	1
SY	SP	EP	WP	WY	WR	
-14.9	+94.0	-134.7	+25.3	-27.6	-1.3	

 *
- * √ *
- * *
- * *
- * Notify CDR/PLT that SRMS is in good config for burns *

When STORRM/SEP activities complete:

√MCC for DAP config

If berthing OBSS, go to step 3

If performing Late Inspection, go to step 4

3. MNVR TO HOVER (for OBSS Berth)

SM 94 PDRS CONTROL

END POS – ITEM 18 -6 8 0 +1 3 3 -5 1 7 EXEC
 ATT – ITEM 21 +0 +0 +3 4 1 EXEC
 CMD CK – ITEM 25 EXEC (GOOD)

RHC

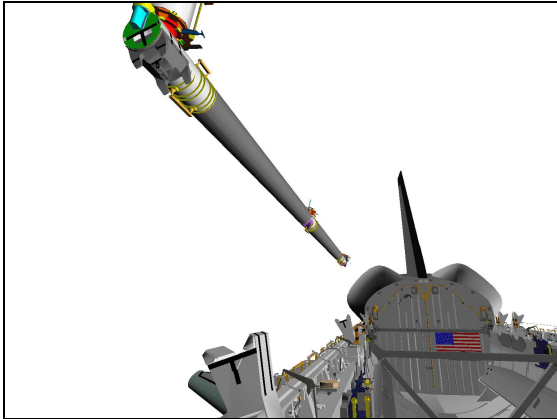
√RATE – COARSE (RATE MIN tb-OFF)
 BRAKES – OFF (tb-OFF)
 MODE – OPR CMD, ENTER (READY It on)

AUTO SEQ – PROCEED (IN PROG It on)

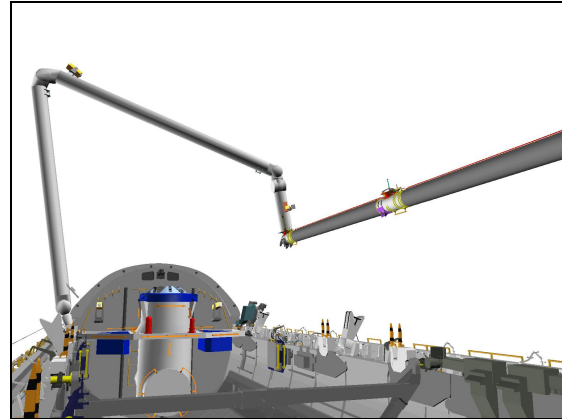
When AUTO SEQ IN PROG It – off:
 BRAKES – ON (tb-ON)

Verify OBSS HOVER posn: (02:35)

	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	



CCTV D (-15,15)



CCTV B (20,10)

Go to OBSS BERTH (OBSS OPERATIONS) >>

4. MNVR TO FLAT FIELD (for Late Inspection)

SM 94 PDRS CONTROL

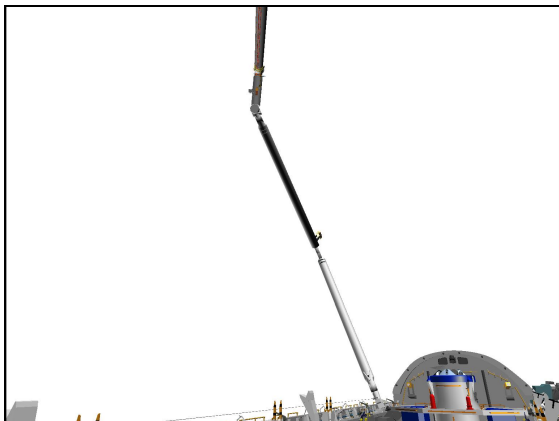
PL ID – ITEM 3 +2 EXEC
 INIT ID – ITEM 24 +2 EXEC

END POS – ITEM 18 -1 2 7 0 +3 5 0 -4 4 5 EXEC
 ATT – ITEM 21 +0 +0 +1 1 EXEC
 CMD CK – ITEM 25 EXEC (GOOD)

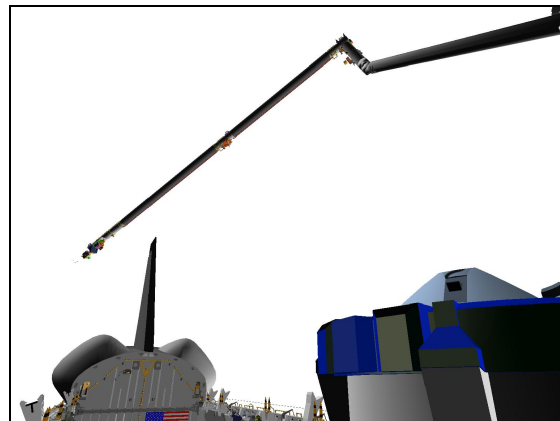
RHC RATE – as reqd (VERN within 10 ft)
 BRAKES – OFF (tb-OFF)
 MODE – SINGLE, ENTER

Mnvr to INTERMEDIATE posn:

	SY	SP	EP	WP	WY	WR	
CHASER	-14.9	+94.0	-134.7	+25.3	-27.6	-1.3	
1: EP +			-60.0				
2: WR +						-150.0	
Intermediate	-14.9	+94.0	-60.0	+25.3	-27.6	-150.0	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1351	+132	-671	330	328	161	2



CCTV C (-30,25)



CCTV D (25,25)

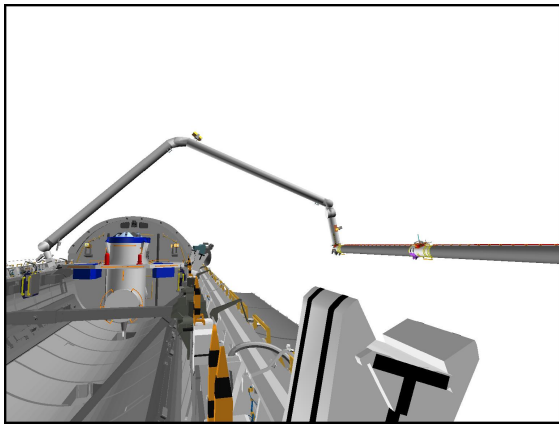
RHC RATE – COARSE (RATE MIN tb-OFF)
 MODE – OPR CMD, ENTER (READY It on)

AUTO SEQ – PROCEED (IN PROG It on)

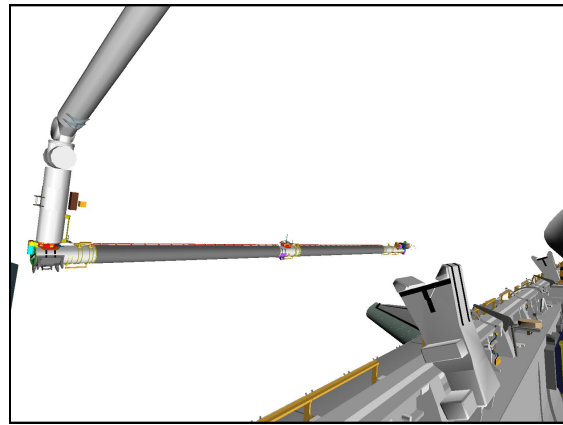
When AUTO SEQ IN PROG It – off:
 BRAKES – ON (tb-ON)

Verify FLAT FIELD posn: (05:20)

	X	Y	Z	PITCH	YAW	ROLL	PL ID
√	-1270	+350	-445	0	0	11	2
	SY	SP	EP	WP	WY	WR	
√	-90.1	+25.0	-65.8	-57.6	0.0	-249.9	



CCTV C (15,5)



CCTV D (-40,5)

5. CONFIGURE FOR LATE INSPECTION

SM 94 PDRS CONTROL

AUTO MODES – ITEM 13 +1 +2 +3 +4 EXEC

For survey scan pattern, refer to OBSS SCAN PATTERN CUE CARDS – STBD & PORT, AND WING GLOVE & CREW CABIN

R12(OBSS) RSC PWR – OFF, ON

Perform ACTIVATION (LDRI/ITVC Cue Card, P/TV) steps 1, 3, 4, and 5

A15 APCU 2 CONV – OFF
Wait 10 sec
APCU 2 CONV – ON

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

A7U MUX 1 L ← MIDDECK
LDRI MODE 6 pb – push (flickering LDRI video)
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: +103 (right)
TILT: -260 (down)

VIDEO OUT – not DTV
IN – not PL2

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

Go to OBSS LDRI/IDC RCC SURVEY – STBD (OBSS OPERATIONS), step 5.
Reference procedure notes prior to beginning surveys

OBSS REFERENCE DATA

LATE INSPECTION ACAS UPLINK VERIFICATION FS 10-2
OBSS JOINT ANGLES VS POR COORDINATES FS 10-3
 LATE INSPECTION AUTOSEQUENCES FS 10-4
 ITVC VIEW VERIFICATION FS 10-11
EIBA REFERENCE..... FS 10-14

LATE INSPECTION ACAS UPLINK VERIFICATION

SM 94 PDRS CONTROL

PL ID - ITEM 3 +2 EXEC
INIT ID - ITEM 24 +2 EXEC
AUTO MODES - ITEM 13 +1 +2 +3 +4 EXEC

BRAKES - OFF (tb-OFF)
MODE - AUTO 1, ENTER

SM 94 PDRS CONTROL

√START PT, ITEM 17: 1

MODE - AUTO 2, ENTER

SM 94 PDRS CONTROL

√START PT, ITEM 17: 42

MODE - AUTO 3, ENTER

SM 94 PDRS CONTROL

√START PT, ITEM 17: 50

MODE - AUTO 4, ENTER

SM 94 PDRS CONTROL

√START PT, ITEM 17: 63

BRAKES - ON (tb-ON)

SM 94 PDRS CONTROL

AUTO MODES - ITEM 13 +5 +6 +7 EXEC

BRAKES - OFF (tb-OFF)
MODE - AUTO 1, ENTER

SM 94 PDRS CONTROL

√START PT, ITEM 17: 68

MODE - AUTO 2, ENTER

SM 94 PDRS CONTROL

√START PT, ITEM 17: 89

MODE - AUTO 3, ENTER

SM 94 PDRS CONTROL

√START PT, ITEM 17: 95

BRAKES - ON (tb-ON)

SM 94 PDRS CONTROL

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

OBSS JOINT ANGLES VS POR COORDINATES

OBSS HANDOFF PRE-GRAPPLE

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1018	-362	-676	284	0	270	0
SY	SP	EP	WP	WY	WR	
+24.0	+64.8	-34.4	-99.4	+11.3	-99.0	

OBSS HANDOFF/UNDOCK

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1029	+229	-614	284	270	270	2
-1041	-362	-602	284	270	270	1
-1032	-362	-618	284	0	270	0
SY	SP	EP	WP	WY	WR	
+25.8	+66.3	-49.0	-85.9	+10.7	-100.7	

*Display singularity

OBSS HANDOFF FOR STOW

X	Y	Z	PITCH	YAW	ROLL	PL ID
-65	+195	-767	95	312	197	2
-86	-243	-371	95	312	167	1
-105	-243	-372	172	11	230	0
SY	SP	EP	WP	WY	WR	
+164.6	+6.0	-19.2	+24.2	+6.9	+85.7	

OBSS HANDOFF FOR STOW BACKOFF

X	Y	Z	PITCH	YAW	ROLL	PL ID
-163	-232	-364	173	11	230	0
SY	SP	EP	WP	WY	WR	
+163.6	+25.3	-59.1	+44.7	+8.0	+86.2	

OBSS LATE INSPECTION AUTOSEQUENCES

OBSS DOCKED LDRI RCC SURVEY – STBD PART 1 (PL ID 2)

Auto Seq ID	Auto Seq Pt	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
1	1	-1247	+277	-392	291	329	108	P
		-22.7	+49.0	-15.2	-4.7	-57.2	-151.1	
1	2	-1240	+330	-392	291	329	108	
		-29.2	+45.6	-13.2	-7.4	-51.3	-156.3	
1	3	-1200	+320	-392	291	329	108	
		-31.0	+63.4	-41.2	+1.9	-49.8	-157.4	
1	4	-1182	+281	-392	291	329	108	
		-27.4	+72.1	-50.5	+4.4	-52.0	-155.0	
1	5	-1236	+280	-392	291	329	108	
		-23.8	+55.3	-26.0	-1.0	-56.2	-152.1	
1	6	-1236	+280	-418	292	324	110	
		-18.3	+58.8	-30.9	+13.4	-58.1	-138.7	
1	7	-940	+291	-363	267	331	64	P
		-32.4	+65.4	-40.6	+27.9	-77.7	-109.5	
1	8	-1036	+304	-344	272	326	63	
		-23.1	+53.8	-31.3	+92.4	-76.7	-52.8	
1	9	-971	+287	-376	270	322	61	
		-19.5	+70.2	-50.8	+103.6	-70.7	-44.7	
1	10	-1055	+293	-373	273	322	63	P
		-17.3	+47.5	-16.4	+98.4	-70.4	-40.1	
1	11	-1020	+265	-407	268	308	95	P
		+4.4	+74.2	-65.2	+76.3	-57.8	-70.4	
1	12	-1104	+321	-383	274	305	101	P
		+1.1	+64.8	-65.5	+79.1	-53.6	-81.1	
1	13	-1180	+310	-395	277	309	116	
		-2.8	+52.7	-38.6	+39.1	-49.9	-106.1	
1	14	-1106	+278	-397	275	323	154	P
		-22.9	+65.7	-35.4	-18.3	-4.2	-145.4	
1	15	-1225	+417	-390	288	323	154	
		-36.3	+51.4	-32.9	+4.0	+2.8	-153.8	
1	16	-1219	+419	-386	295	327	164	
		-46.0	+62.1	-53.4	+18.2	+17.4	-164.1	
1	17	-1250	+448	-385	296	327	164	
		-46.4	+52.4	-42.0	+17.7	+17.6	-165.2	
1	18	-1327	+464	-389	302	327	164	P
		-44.1	+42.9	-33.1	+22.4	+11.7	-166.5	
1	19	-1341	+495	-380	304	321	168	
		-39.8	+46.4	-47.5	+36.2	+10.7	-159.3	
1	20	-1342	+517	-355	302	326	164	P
		-44.9	+30.5	-22.1	+24.2	+12.4	-166.0	
1	21	-1240	+498	-354	294	315	136	
		-32.5	+56.9	-65.9	+43.8	-20.5	-146.1	

OBSS DOCKED LDRI RCC SURVEY – STBD PART 1 (PL ID 2) (Cont)

Auto Seq ID	Auto Seq Pt	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
1	22	-1160	+422	-338	284	314	111	
		-21.4	+65.5	-72.4	+51.4	-46.9	-128.2	
1	23	-1122	+386	-331	280	323	108	
		-28.8	+66.2	-61.4	+23.1	-45.1	-143.4	
1	24	-1068	+334	-330	275	330	106	
		-32.8	+65.1	-49.2	-0.4	-42.4	-151.1	
1	25	-1036	+304	-328	273	335	111	P
		-37.4	+63.8	-42.1	-14.4	-32.6	-156.7	
1	26	-1066	+376	-193	274	334	111	
		-37.0	+62.3	-72.3	+18.8	-33.3	-156.3	
1	27	-1053	+298	-210	290	354	34	P
		-61.5	+42.5	-30.8	-99.0	-66.4	-246.3	
1	28	-1075	+298	-213	293	354	33	
		-62.2	+44.5	-35.6	-98.9	-63.9	-249.8	
1	29	-1161	+370	-220	303	349	29	
		-62.9	+42.2	-41.4	-99.0	-57.3	-266.0	
1	30	-1268	+460	-220	317	341	23	P
		-60.9	+40.1	-58.1	-90.2	-44.8	-288.0	
1	31	-1288	+474	-222	317	341	23	P
		-59.6	+33.9	-47.3	-95.6	-44.3	-289.8	
1	32	-1342	+481	-221	337	341	23	P
		-64.4	+32.6	-78.8	-52.4	-27.9	-287.1	
1	33	-1300	+521	-193	307	341	141	
		-59.4	+27.3	-50.1	+46.0	+1.6	-187.6	
1	34	-1333	+541	-285	304	334	155	P
		-53.2	+18.9	-15.9	+27.2	+9.9	-178.0	
1	35	-1281	+528	-295	305	331	157	
		-55.3	+43.4	-58.7	+48.2	+12.6	-177.2	
1	36	-1241	+505	-295	298	331	157	
		-53.8	+46.5	-54.7	+36.2	+16.0	-172.9	
1	37	-1173	+438	-293	292	332	157	
		-52.9	+61.5	-67.5	+29.1	+19.0	-169.9	
1	38	-1166	+448	-296	285	335	154	
		-51.8	+40.6	-28.2	+3.6	+19.1	-167.3	
1	39	-1083	+350	-291	279	338	151	
		-50.0	+60.4	-49.3	-2.1	+17.4	-164.8	
1	40	-1058	+335	-293	275	340	145	P
		-48.9	+54.5	-36.5	-13.7	+12.2	-163.2	
1	41	-1021	+303	-294	273	340	140	P
		-47.4	+64.3	-47.9	-13.8	+6.4	-161.7	

OBSS DOCKED LDRI RCC SURVEY – TRANSITION TO STBD PART 2 (PL ID 2)

Auto Seq ID	Auto Seq Pt	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
2	42	-1021	+303	-294	273	340	140	P
		-47.4	+64.3	-47.9	-13.8	+6.4	-161.7	
2	43	-1285	+500	-585	350	280	240	
		-9.9	+48.2	-64.5	+38.7	+10.6	-97.1	
2	44	-1225	+54	-585	36	295	290	
		+49.1	+49.4	-70.9	+44.5	-28.5	-62.7	
2	45	-1267	-200	-570	35	318	294	
		+68.3	+29.5	-50.8	+37.1	-26.6	-52.5	
2	46	-1406	-625	-549	24	1	274	
		+68.2	+28.3	-49.5	+37.7	+20.2	-52.0	
2	47	-1379	-587	-15	330	357	273	
		+68.3	+27.9	-48.1	+36.6	+19.8	-106.0	
2	48	-1192	-107	-68	333	310	336	
		+68.5	+28.5	-49.3	-38.8	+19.6	-106.0	
2	49	-903	+180	-212	31	278	24	P
		+67.9	+33.9	-88.3	-18.0	-0.7	-131.9	

OBSS DOCKED LDRI RCC SURVEY – STBD PART 2 (PL ID 2)

Auto Seq ID	Auto Seq Pt	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
3	50	-903	+180	-212	31	278	24	P
		+67.9	+33.9	-88.3	-18.0	-0.7	-131.9	
3	51	-1008	+201	-214	15	291	357	
		+71.0	+34.6	-103.9	+4.3	-10.3	-120.6	
3	52	-1062	+224	-214	15	291	357	
		+60.6	+32.8	-102.5	+6.1	-5.9	-111.2	
3	53	-1128	+281	-208	11	298	345	P
		+52.5	+27.6	-116.1	+34.0	-4.1	-96.9	
3	54	-1060	+295	-237	18	298	7	
		+61.7	+28.0	-121.5	+23.2	-3.0	-105.8	
3	55	-1071	+307	-245	25	299	15	P
		+58.1	+20.7	-115.6	+21.4	-3.6	-103.2	
3	56	-1043	+280	-238	18	298	7	
		+67.2	+29.5	-121.3	+21.1	-4.8	-110.9	
3	57	-1007	+255	-238	18	299	9	
		+79.1	+30.9	-120.4	+16.1	-7.1	-121.5	
3	58	-924	+228	-241	21	302	14	P
		+103.1	+26.9	-113.0	+5.6	-11.5	-143.0	
3	59	-892	+222	-235	15	301	11	P
		+109.5	+33.9	-115.2	+2.5	-9.8	-149.3	
3	60	-903	+241	-246	67	288	61	P
		+66.5	+15.5	-85.1	-14.0	-4.8	-129.0	

OBSS DOCKED LDRI RCC SURVEY – STBD PART 2 (PL ID 2) (Cont)

Auto Seq ID	Auto Seq Pt	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
3	61	-1020	+276	-246	67	288	61	P
		+47.7	+8.7	-70.7	-20.6	-2.7	-110.8	
3	62	-1044	+306	-248	67	288	61	P
		+42.1	+7.3	-70.3	-19.4	-2.0	-105.2	

OBSS DOCKED LDRI RCC SURVEY – TRANSITION TO NOSE CAP (PL ID 2)

Auto Seq ID	Auto Seq Pt	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
4	63	-1044	+306	-248	67	288	61	P
		+42.1	+7.3	-70.3	-19.4	-2.0	-105.2	
4	64	-1060	+310	-194	56	284	42	
		+42.4	+6.5	-69.9	-9.2	-2.8	-105.2	
4	65	-725	-226	+190	276	315	273	
		+90.0	+18.7	-34.4	-9.9	-1.3	-155.8	
4	66	-234	-149	-170	186	314	216	
		+92.2	+30.1	-59.4	-14.9	+18.1	-208.7	
4	67	-236	-70	-244	169	316	191	P
		+91.1	+31.0	-78.1	-14.7	+18.0	-209.2	

OBSS DOCKED LDRI RCC SURVEY – NOSE CAP (PL ID 2)

Auto Seq ID	Auto Seq Pt	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
5	68	-236	-70	-244	169	316	191	P
		+91.1	+31.0	-78.1	-14.7	+18.0	-209.2	
5	69	-237	-2	-240	155	321	170	P
		+91.3	+9.7	-74.9	-12.9	+18.2	-209.3	
5	70	-237	+47	-240	159	319	177	
		+91.3	+17.8	-92.4	+2.1	+18.6	-209.5	
5	71	-227	+44	-251	153	320	157	P
		+96.2	+9.6	-80.0	-16.2	+11.1	-210.5	
5	72	-193	-3	-267	150	315	177	
		+103.4	+8.5	-63.6	-11.8	+23.2	-217.8	
5	73	-185	-76	-302	149	323	213	
		+96.9	+5.6	-67.6	+32.7	+39.5	-242.0	
5	74	-185	-76	-336	152	332	219	
		+89.5	+13.0	-94.5	+56.2	+39.2	-247.6	
5	75	-175	-40	-316	146	320	207	
		+102.2	+6.7	-69.0	+29.8	+37.7	-240.8	
5	76	-174	-16	-298	146	315	202	
		+105.8	+5.8	-62.2	+18.7	+35.8	-234.8	
5	77	-155	-20	-357	162	292	240	
		+119.2	+17.8	-31.0	+5.2	+37.8	-233.7	

OBSS DOCKED LDRI RCC SURVEY – NOSE CAP (PL ID 2) (Cont)

Auto Seq ID	Auto Seq Pt	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
5	78	-184	-74	-374	157	303	249	
		+107.6	+22.9	-52.9	+41.4	+42.4	-253.1	
5	79	-188	-4	-404	177	289	283	
		+119.5	+34.1	-48.2	+44.0	+43.4	-252.9	
5	80	-180	+17	-400	168	289	274	P
		+121.2	+31.5	-51.5	+48.5	+41.6	-254.2	
5	81	-166	+52	-343	203	283	277	
		+130.6	+30.3	-34.6	-7.3	+31.2	-219.5	
5	82	-167	+42	-293	224	286	272	
		+133.0	+26.5	-20.2	-37.7	+11.7	-207.4	
5	83	-170	+9	-310	196	288	254	
		+124.2	+31.8	-38.4	-18.6	+23.9	-213.5	
5	84	-170	+21	-350	186	286	267	
		+124.7	+30.3	-40.5	+6.1	+37.0	-227.2	
5	85	-181	+50	-386	183	281	280	P
		+128.8	+25.7	-32.4	+20.5	+42.5	-239.3	
5	86	-181	+64	-353	198	279	284	P
		+131.4	+21.1	-23.3	+1.6	+39.1	-227.6	
5	87	-180	+59	-293	215	281	280	
		+131.6	+18.6	-18.1	-21.8	+27.3	-212.9	
5	88	-128	+25	-263	212	288	272	P
		+130.7	+17.4	-14.4	-24.4	+19.5	-212.4	

OBSS DOCKED LDRI RCC SURVEY – TRANSITION TO PORT (PL ID 2)

Auto Seq ID	Auto Seq Pt	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
6	89	-128	+25	-263	212	288	272	P
		+130.7	+17.4	-14.4	-24.4	+19.5	-212.4	
6	90	-24	-42	-182	214	302	262	
		+132.1	+13.8	-7.1	-28.8	-0.1	-212.7	
6	91	-310	-60	+70	212	304	210	
		+101.0	+6.3	-35.7	-26.1	-12.5	-197.6	
6	92	-610	-60	+70	283	301	292	
		+105.5	+31.0	-59.5	-12.1	-1.0	-163.5	
6	93	-708	-137	+70	323	326	343	
		+131.4	+18.7	-42.3	-23.4	-0.5	-145.2	
6	94	-920	-177	-209	359	325	355	P
		+119.5	+22.4	-44.2	-48.2	-13.0	-132.5	

OBSS DOCKED LDRI RCC SURVEY – PORT (PL ID 2)

Auto Seq ID	Auto Seq Pt	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
7	95	-920	-177	-209	359	325	355	P
		+119.5	+22.4	-44.2	-48.2	-13.0	-132.5	
7	96	-1010	-186	-207	2	341	356	
		+126.2	+33.7	-85.8	-20.7	-16.2	-123.3	
7	97	-1070	-215	-204	4	356	356	
		+133.9	+31.0	-107.0	+1.2	-19.2	-116.2	
7	98	-1132	-275	-205	10	356	356	
		+115.9	+21.0	-96.3	+2.4	-19.3	-98.4	
7	99	-1295	-440	-213	10	356	356	
		+86.9	+19.5	-66.6	-18.9	-9.0	-70.4	
7	100	-1365	-456	-213	10	356	356	
		+78.3	+15.8	-57.0	-23.7	-5.4	-62.5	
7	101	-1365	-495	-233	8	353	325	
		+79.0	+17.0	-50.6	-1.2	-1.6	-64.8	
7	102	-1365	-525	-260	6	351	305	
		+79.5	+16.8	-41.5	+9.6	-0.7	-67.5	
7	103	-1297	-496	-250	7	352	310	
		+86.9	+22.6	-59.0	+16.6	-7.7	-68.6	
7	104	-1258	-478	-243	7	352	310	
		+91.6	+23.8	-64.7	+20.8	-12.1	-70.3	
7	105	-1193	-414	-243	6	357	310	
		+102.7	+33.9	-97.0	+41.9	-18.1	-71.9	
7	106	-1045	-260	-230	5	357	310	
		+137.8	+27.1	-104.7	+45.7	-49.1	-91.2	
7	107	-919	-232	-239	5	357	310	
		+153.4	+19.7	-79.7	+13.8	-61.4	-108.5	
7	108	-899	-252	-284	2	341	289	P
		+138.2	+23.8	-59.1	+35.1	-66.6	-74.6	
7	109	-964	-254	-281	10	343	297	
		+131.3	+18.8	-68.2	+38.4	-60.5	-76.3	
7	110	-1027	-281	-267	13	347	304	
		+124.6	+16.2	-75.2	+39.9	-51.4	-77.4	
7	111	-1073	-322	-262	16	355	308	
		+121.0	+11.9	-82.3	+48.1	-43.0	-71.8	
7	112	-1208	-450	-257	15	7	319	
		+98.1	+19.2	-96.9	+47.5	-13.8	-59.0	
7	113	-1255	-500	-266	14	3	316	
		+90.8	+21.9	-82.8	+34.2	-8.7	-58.4	
7	114	-1312	-518	-269	12	3	313	
		+83.1	+25.3	-81.5	+33.1	+0.4	-56.4	
7	115	-1306	-526	-304	14	354	287	
		+84.5	+12.6	-49.6	+40.8	-4.2	-58.6	

OBSS DOCKED LDRI RCC SURVEY – PORT (PL ID 2) (Cont)

Auto Seq ID	Auto Seq Pt	X/ SY	Y/ SP	Z/ EP	PITCH/ WP	YAW/ WY	ROLL/ WR	Pause
7	116	-1224	-498	-304	14	354	287	
		+94.3	+16.7	-60.8	+48.4	-14.0	-57.9	
7	117	-1032	-293	-300	14	354	287	
		+130.0	+16.7	-88.3	+78.0	-49.5	-54.0	
7	118	-919	-242	-270	12	356	305	P
		+149.0	+10.8	-71.2	+24.9	-65.2	-92.8	
7	119	-950	-353	-233	10	4	300	
		+142.6	+9.3	-73.4	+46.2	-52.8	-73.5	
7	120	-976	-289	-366	20	352	22	P
		+128.2	+21.7	-65.5	-58.2	-10.4	-123.8	
7	121	-1036	-287	-350	19	350	17	
		+120.5	+26.1	-74.8	-47.5	-14.2	-116.7	
7	122	-1069	-313	-350	19	350	17	
		+114.9	+26.7	-73.4	-47.9	-14.7	-110.9	
7	123	-1194	-436	-352	19	350	17	
		+96.0	+15.5	-39.8	-65.2	-15.4	-91.3	
7	124	-1268	-502	-362	19	0	14	
		+88.7	+26.0	-62.1	-48.7	-18.3	-73.4	
7	125	-1330	-514	-362	19	0	14	P
		+81.2	+22.9	-55.1	-50.3	-17.5	-65.6	
7	126	-1330	-520	-400	22	359	0	
		+80.2	+25.2	-57.6	-34.9	-18.4	-61.3	
7	127	-1330	-477	-400	22	359	0	P
		+79.3	+31.3	-73.3	-24.8	-18.1	-60.4	
7	128	-1270	-456	-392	22	359	0	
		+87.1	+33.0	-81.0	-21.4	-21.0	-68.0	
7	129	-1203	-386	-392	22	0	0	
		+97.8	+37.6	-100.9	-10.4	-24.4	-78.1	
7	130	-1102	-280	-386	23	342	7	P
		+105.6	+28.6	-72.4	-40.1	-23.2	-107.2	
7	131	-1062	-275	-386	27	350	25	P
		+113.0	+20.2	-74.6	-49.7	-16.0	-114.5	
7	132	-980	-273	-380	29	356	35	P
		+125.7	+8.7	-63.9	-61.6	-7.0	-124.6	
7	133	-917	-273	-367	23	358	39	
		+137.3	+9.3	-55.0	-70.9	+3.7	-129.7	
7	134	-917	-295	-420	23	358	39	P
		+137.1	+19.5	-61.5	-74.6	+3.7	-129.4	

OBSS LATE INSPECTION ITVC VIEW VERIFICATION

NOTE

As a backup for the RCC targets, MCC may request ITVC (wider FOV) be used to verify LDRI pointed at correct panel. This is intended for coarse pointing only, fine alignments should be made based on LDRI images in procedure

On MCC GO:

A7U

MUX 1 L ← MIDDECK

LDRI MODE 2 pb – push (ITVC image displayed)

DTV ← PL2

ZOOM – full out

Match corresponding image below (LDRI FOV represented by pink box)

MUX 1 L ← MIDDECK

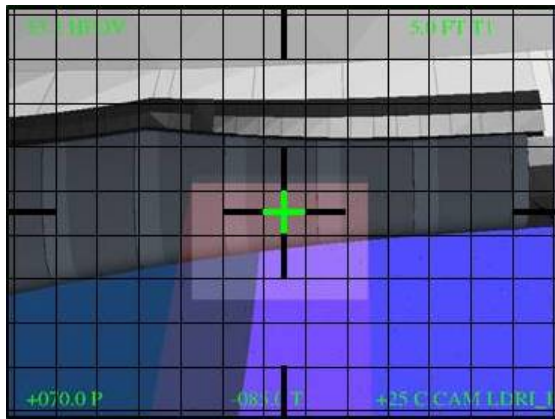
LDRI MODE 6 pb – push (flickering LDRI displayed)

DTV ← PL2

Match LDRI image in procedure

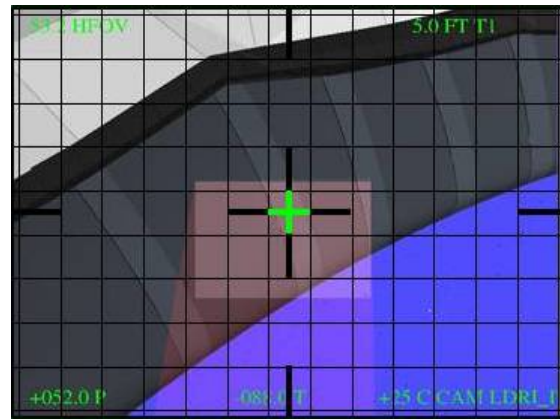
√MCC to verify correct view

Stbd Survey: **7P**



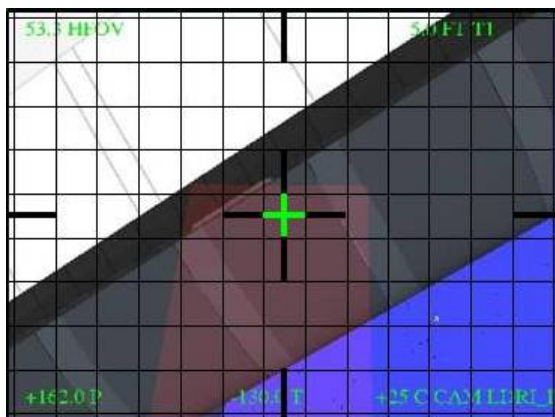
ITVC (+70,-85)

Stbd Survey: **10P**



ITVC (+52,-88)

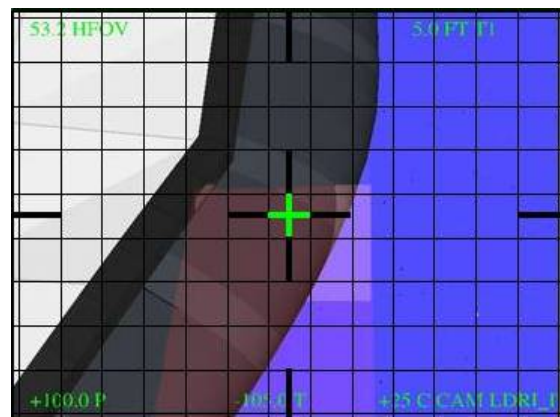
Stbd Survey: **14P**



ITVC (+162,-130)

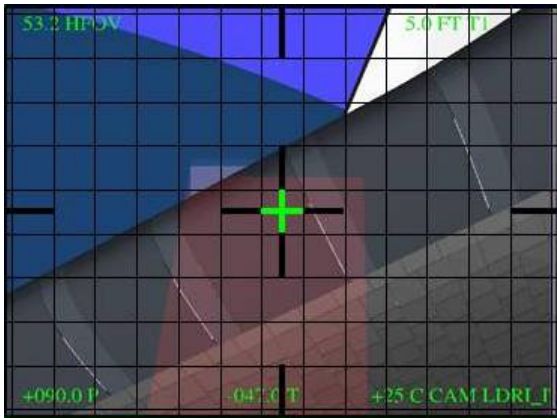
Stbd Survey: **18P**

(last frame in pan/tilt sequence)



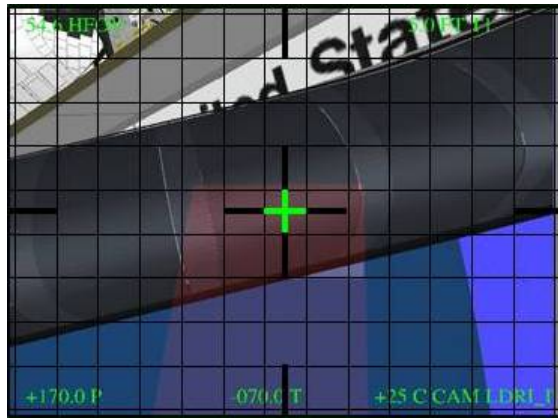
ITVC (+100,-105)

Stbd Survey: 27P



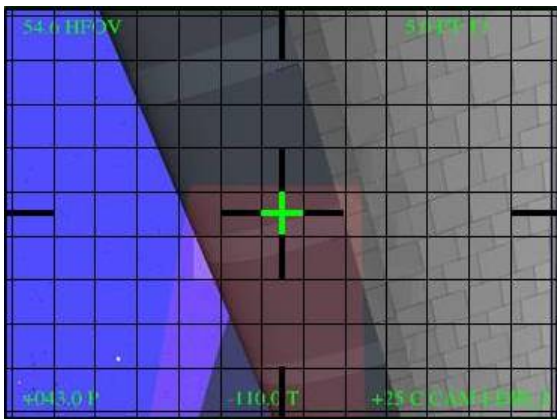
ITVC (+90,-47)

Stbd Survey: 40P



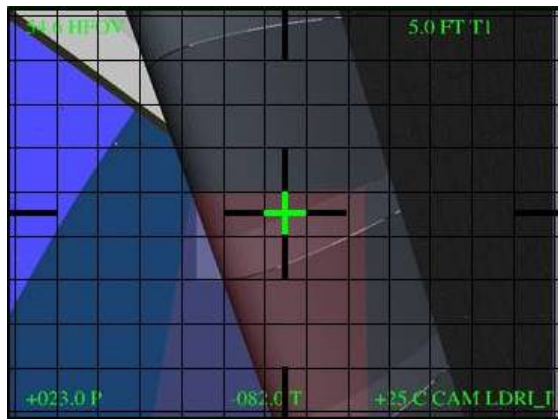
ITVC (+170,-70)

Stbd Survey: 53P
(last frame in pan/tilt sequence)



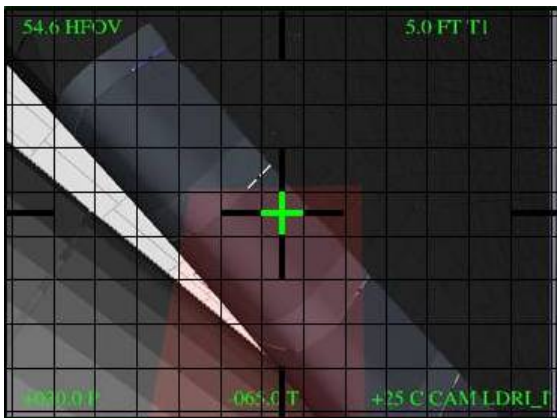
ITVC (+43,-110)

Stbd Survey: 55P



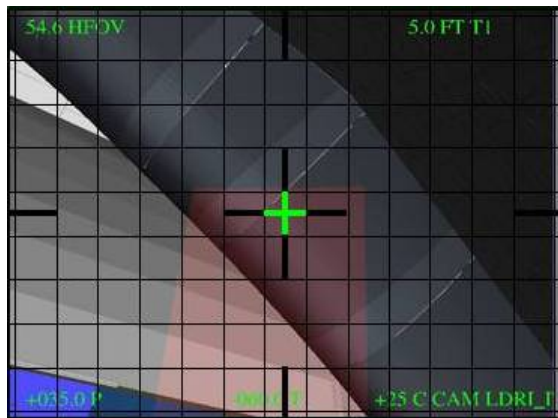
ITVC (+23,-82)

Stbd Survey: 58P
(last frame in pan/tilt sequence)



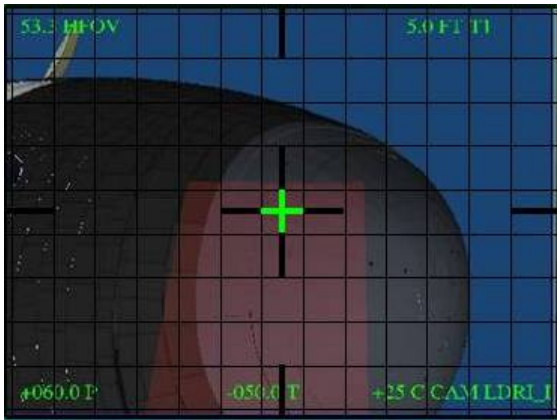
ITVC (+30,-65)

Stbd Survey: 61P



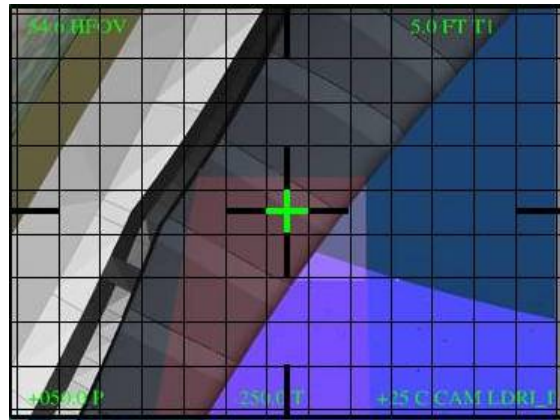
ITVC (+35,-60)

Nose Cap Survey: **80P**



ITVC (+60,-50)

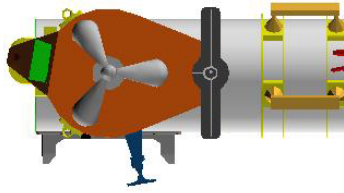
Port Survey: **120P**



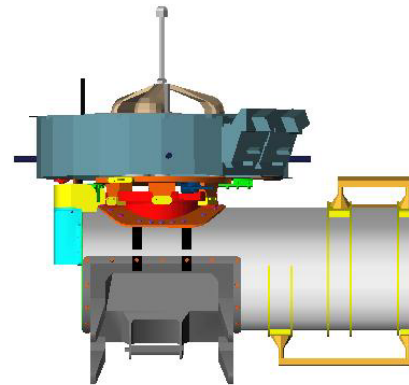
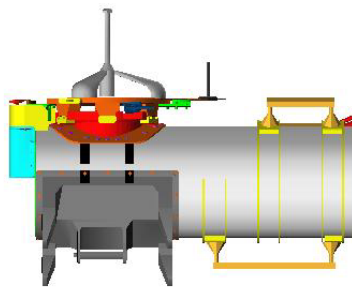
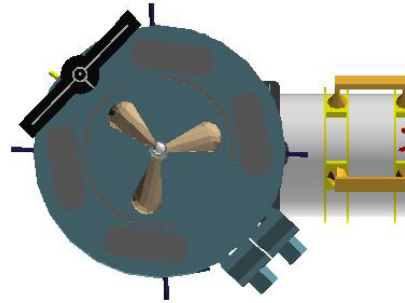
ITVC (+50,-250)

EIBA REFERENCE

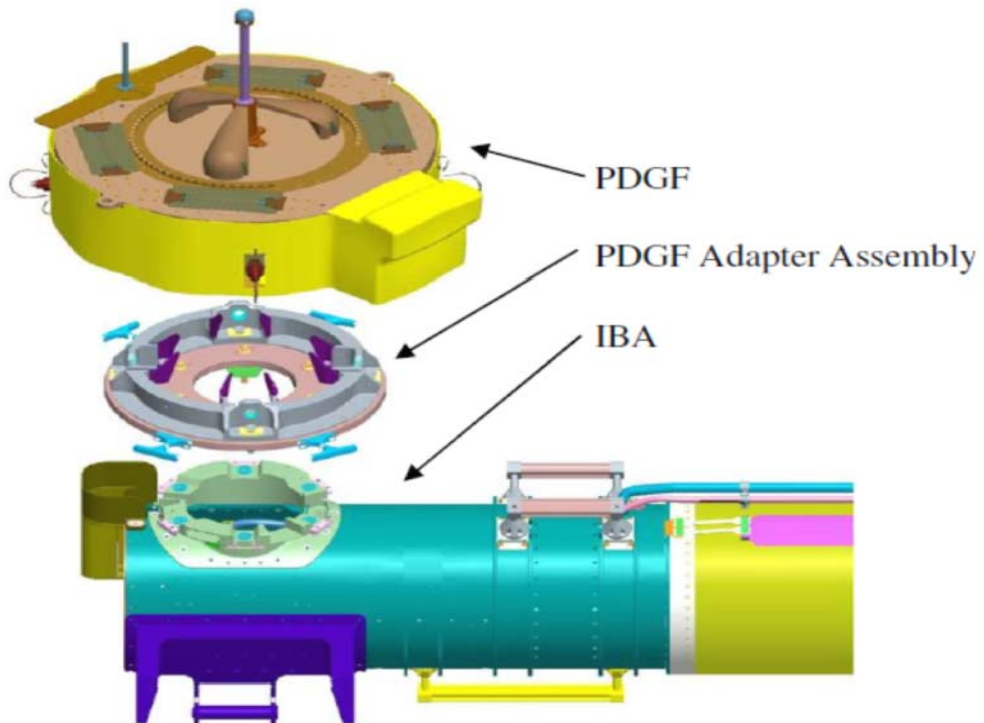
OBSS EFGF



EIBA PDGF



EIBA PDGF (Exploded View)



NOTE

The following shows Joint Angles and PL ID 1 & 2
POR for grappling EIBA at Handoff for Stow posn

EIBA HANDOFF FOR STOW PRE-GRAPPLE/BACKOFF

X	Y	Z	PITCH	YAW	ROLL	PL ID
-163	-232	-364	172	11	95	0
SY	SP	EP	WP	WY	WR	
+163.6	+25.3	-59.1	+44.7	+8.0	-49.5	

EIBA HANDOFF FOR STOW (expected)

X	Y	Z	PITCH	YAW	ROLL	PL ID
-230	-820	-397	11	78	252	2
-95	-245	-379	11	78	222	1
-111	-242	-372	172	11	94	0
SY	SP	EP	WP	WY	WR	
+164.5	+10.1	-27.1	+28.1	+7.0	-49.6	

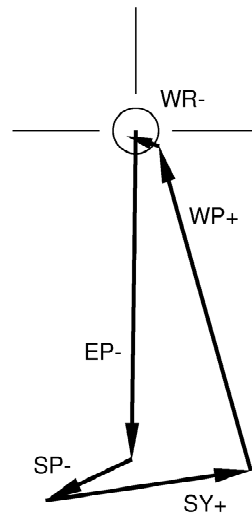
This Page Intentionally Blank

Fabricate as transparency

ZOOM 34.0 HFOV
FOCUS 5.0 FT
EYEPOINT APPROX 18 IN



WR-



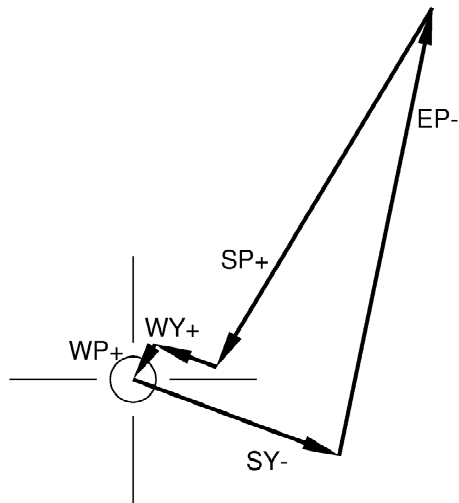
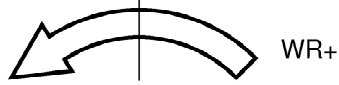
ELC SJ GRAPPLE IN PLB WRIST CCTV OVERLAY

PDRS-9a/134/O/B

I

Fabricate as transparency

ZOOM 34.0 HFOV
FOCUS 5.0 FT
EYEPOINT APPROX 18 IN

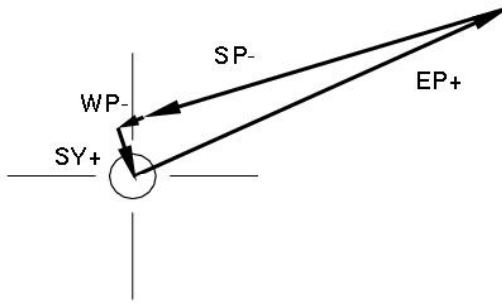


ELC SJ UNGRAPPLE AT HANDOFF WRIST CCTV OVERLAY

PDRS-10a/134/O/B

Fabricate as transparency

ZOOM 34.0 HFOV
FOCUS 5.0 FT
EYEPOINT APPROX 18 IN

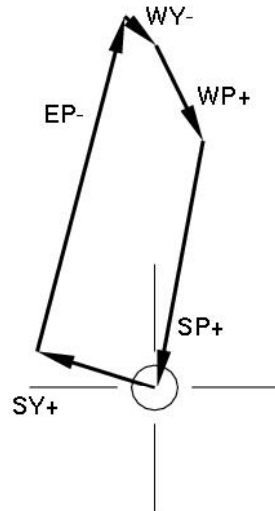


AMS SJ GRAPPLE IN PLB WRIST CCTV OVERLAY

PDRS-11a/134/O/A

Fabricate as transparency

ZOOM 34.0 HFOV
FOCUS 5.0 FT
EYEPOINT APPROX 18 IN

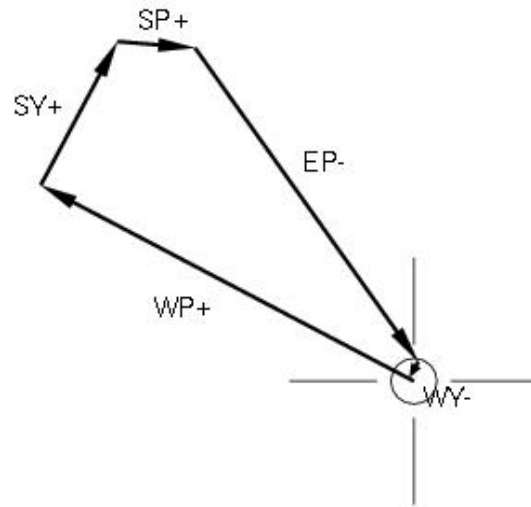


AMS SJ UNGRAPPLE AT HANDOFF WRIST CCTV OVERLAY

PDRS-12a/134/O/A

Fabricate as transparency

ZOOM 34.0 HFOV
FOCUS 5.0 FT
EYEPOINT APPROX 18 IN



OBSS SJ GRAPPLE AT HANDOFF WRIST CCTV OVERLAY

PDRS-13a/134/O/A

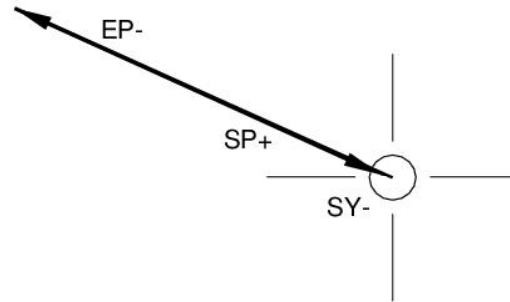
Fabricate as transparency

ZOOM 34.0 HFOV
FOCUS 5.0 FT
EYEPOINT APPROX 18 IN



WR+

JOINT ORDER:
EP-, SP+, SY-
(WP+, WY+, WR+ as req)



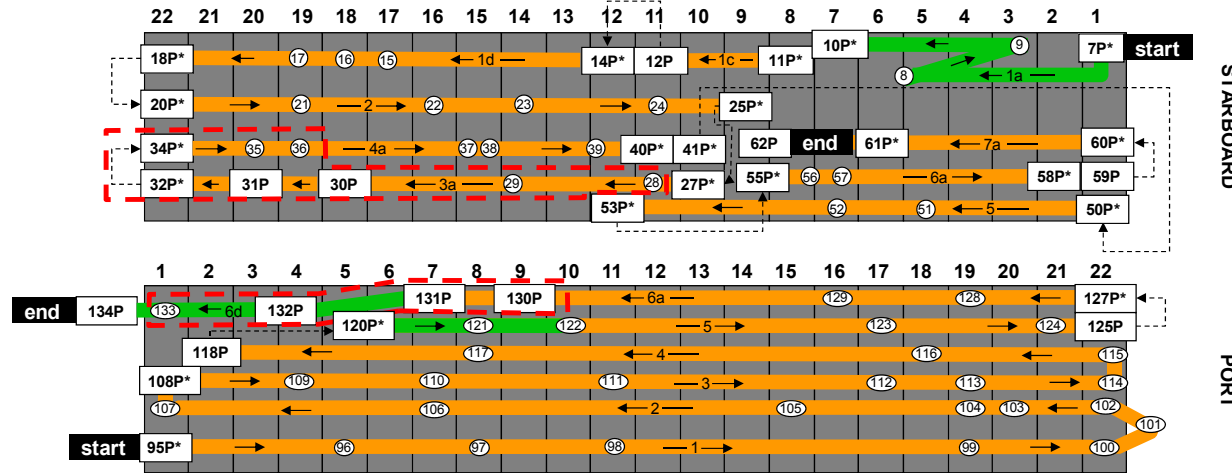
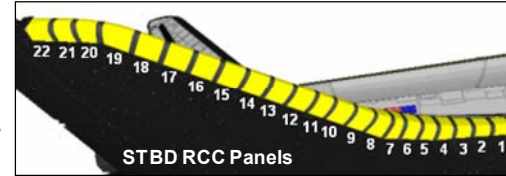
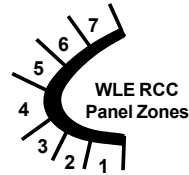
OBSS SJ UNGRAPPLE FOR STOW WRIST CCTV OVERLAY

PDRS-14a/134/O/B

TOP

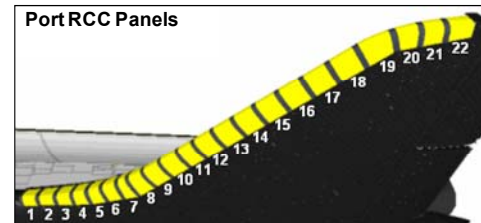
HOOK
VELCRO

OBSS DOCKED LDRI SCAN PATTERN CUE CARD STBD & PORT



= 1 in damage detection
 = 0.25 in damage & crack detection

= ACAS Pause Point
 = ACAS Fly-by Point
 = ACAS Section & Scan Direction
 = Reconfigure PTU
 = OBSS w/in 5 ft of Structure




PDRS-15a/134/O/B

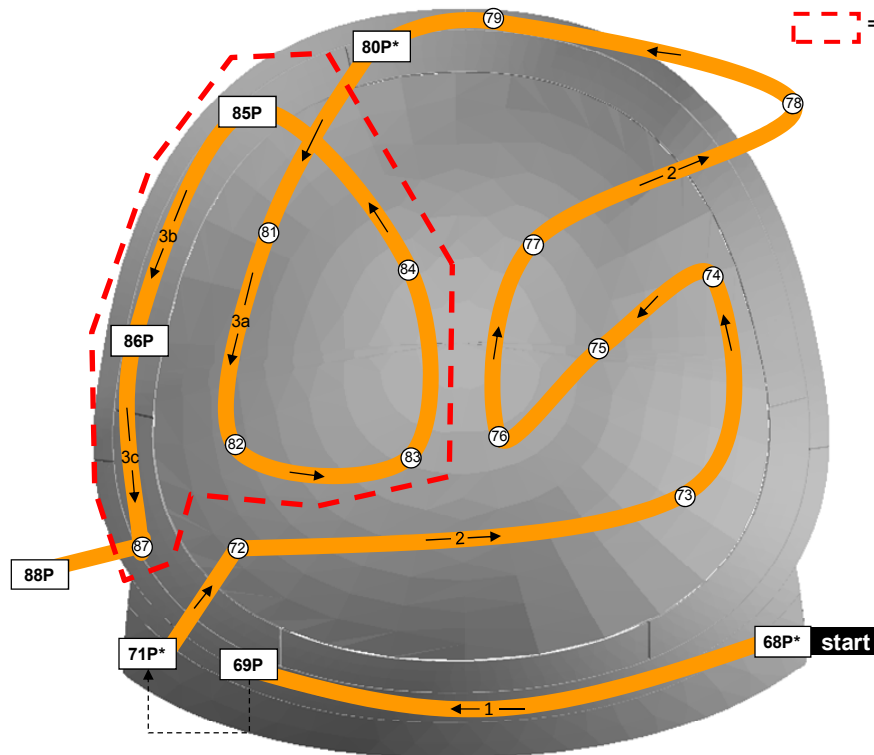
(reduced copy)

TOP
 Back of 'OBSS DOCKED LDRI SCAN PATTERN CUE CARD – STBD & PORT'

HOOK
 VELCRO

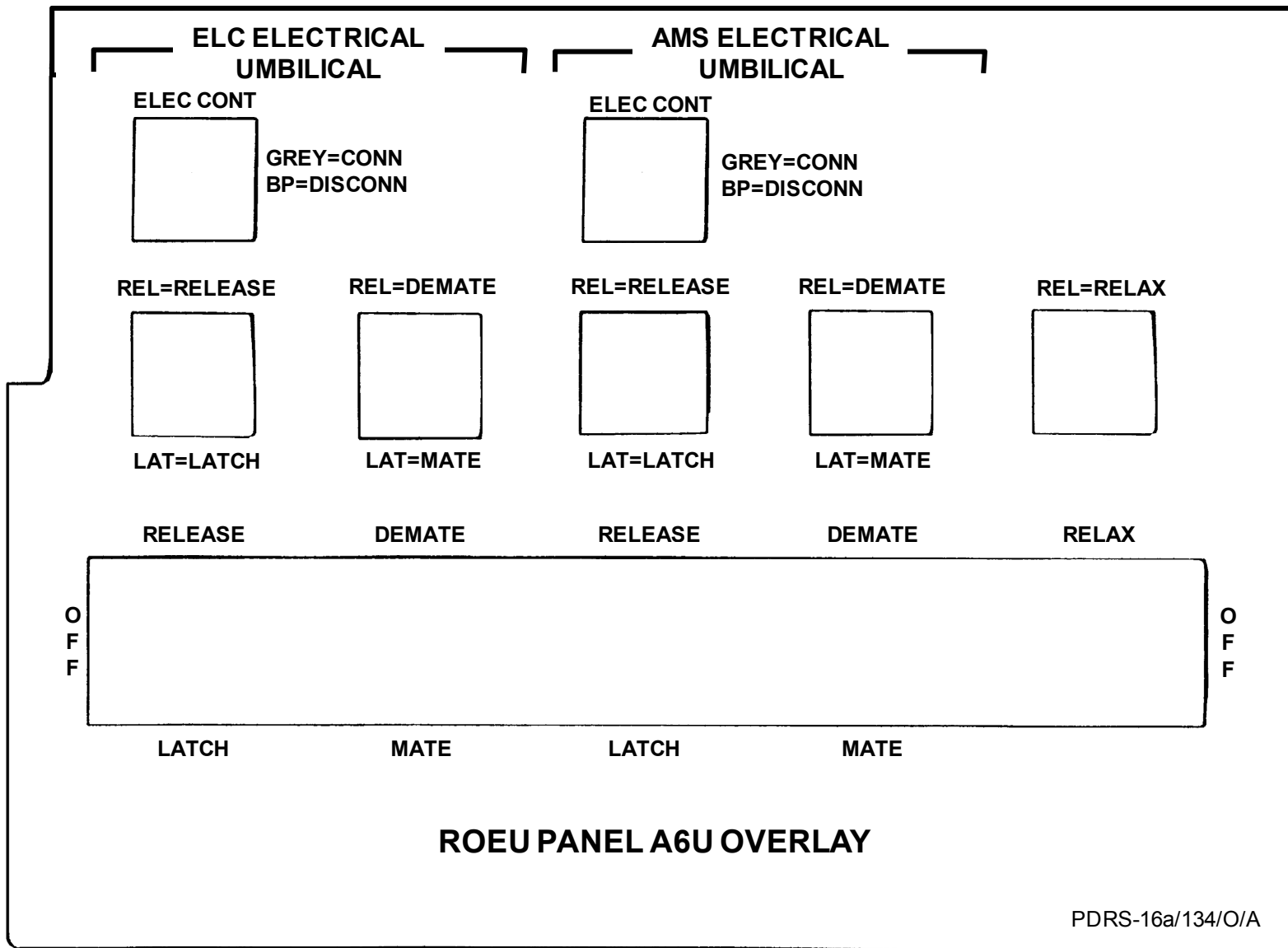
OBSS DOCKED LDRI SCAN PATTERN CUE CARD
 NOSE CAP

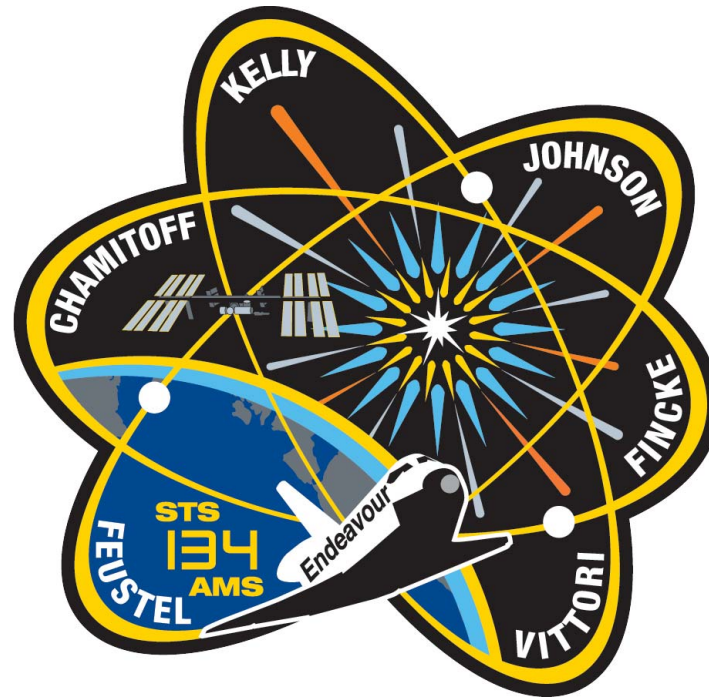
-  = 0.25 in damage and crack detection
- 1P = ACAS Pause Point
- ① = ACAS Fly-by Point
- 1 → = ACAS Section and Scan Direction
- * = Reconfigure PTU
- = OBSS within 5 ft of Structure



(reduced copy)

PDRS-15b/134/O/A





PDRS OPS C/L

**STS
134**