

# EVA Checklist

## STS-126 Flight Supplement

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

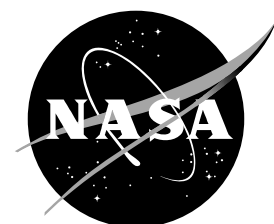
**Final  
October 30, 2008**

### **NOTE**

This supplement is to be integrated into the generic edition to provide a complete document for the specific flight. Some pages in the generic edition may be replaced with supplemental pages identified as 'TEMP'. These generic pages, if any, must be retained for use on future flights.

National Aeronautics and  
Space Administration

**Lyndon B. Johnson Space Center**  
Houston, Texas





MISSION OPERATIONS DIRECTORATE

**EVA CHECKLIST  
STS-126 FLIGHT SUPPLEMENT**

FINAL  
October 30, 2008

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482#:	EVA FS-0185(S) EVA FS-0201A EVA FS-0202 EVA FS-0203A EVA FS-0204 EVA FS-0205A	MULTI-1827

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AREAS OF TECHNICAL RESPONSIBILITY

Book Manager

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EVA CHECKLIST  
STS-126 FLIGHT SUPPLEMENT

**LIST OF EFFECTIVE PAGES**

FINAL      10/30/08

Sign Off .....	*	126/FIN	FS 2-19 .....	126/FIN
FS ii .....	*	126/FIN	FS 2-20 .....	126/FIN
iii .....	*	generic	3-1 .....	generic
iv .....	*	generic	3-2 .....	generic
FS v .....	*	126/FIN	3-3 .....	generic
FS vi .....	*	126/FIN	3-4 .....	generic
FS vii .....	*	126/FIN	3-5 .....	generic
FS viii .....	*	126/FIN	3-6 .....	generic
FS ix .....	*	126/FIN	3-7 .....	generic
FS x .....	*	126/FIN	3-8 .....	generic
FS xi .....	*	126/FIN	3-9 .....	generic
FS xii .....	*	126/FIN	CC 3-10 .....	generic
FS xiii .....		126/FIN	CC 3-11 .....	generic
FS xiv .....		126/FIN	3-12 .....	generic
FS xv .....		126/FIN	TEMP FS 4-1 .....	126/FIN
FS xvi .....		126/FIN	TEMP FS 4-2 .....	ALL/FIN
FS xvii .....		126/FIN	TEMP FS 4-3 .....	126/FIN
FS xviii .....		126/FIN	TEMP FS 4-4 .....	ALL/FIN
FS xix .....		126/FIN	4-5 .....	generic
FS xx .....		126/FIN	4-6 .....	generic
TEMP FS 1-1 .....		126/FIN	4-7 .....	generic
TEMP FS 1-2 .....		126/FIN	4-8 .....	generic
TEMP FS 1-3 .....		126/FIN	4-9 .....	generic
TEMP FS 1-4 .....		ALL/FIN	4-10 .....	generic
TEMP FS 1-5 .....		ALL/FIN	4-11 .....	generic
TEMP FS 1-6 .....		126/FIN	4-12 .....	generic
1-7 .....		generic	5-1 .....	generic
1-8 .....		generic	5-2 .....	generic
1-9 .....		generic	5-3 .....	generic
1-10 .....		generic	5-4 .....	generic
TEMP FS 2-1 .....		126/FIN	A6-1 .....	generic
TEMP FS 2-2 .....		ALL/FIN	CC A6-2 .....	generic
2-3 .....		generic	6-3 .....	generic
2-4 .....		generic	CC 6-4 .....	generic
TEMP FS 2-5 .....		126/FIN	FS 7-1 .....	126/FIN
TEMP FS 2-6 .....		ALL/FIN	FS 7-2 .....	126/FIN
FS 2-7 .....		126/FIN	FS 7-3 .....	126/FIN
FS 2-8 .....		126/FIN	FS 7-4 .....	126/FIN
FS 2-9 .....		126/FIN	FS 7-5 .....	126/FIN
FS 2-10 .....		126/FIN	FS 7-6 .....	126/FIN
FS 2-11 .....		126/FIN	FS 7-7 .....	126/FIN
FS 2-12 .....		126/FIN	FS 7-8 .....	126/FIN
FS 2-13 .....		126/FIN	FS 7-9 .....	126/FIN
FS 2-14 .....		126/FIN	FS 7-10 .....	126/FIN
FS 2-15 .....		126/FIN	FS 7-11 .....	126/FIN
FS 2-16 .....		126/FIN	FS 7-12 .....	126/FIN
FS 2-17 .....		126/FIN	FS 7-13 .....	126/FIN
FS 2-18 .....		126/FIN	FS 7-14 .....	126/FIN

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FS 7-15	⊗	126/FIN	FS 7-71		126/FIN
FS 7-16	⊗	126/FIN	FS 7-72	⊗	126/FIN
FS 7-17	⊗	126/FIN	FS 7-73		126/FIN
FS 7-18		126/FIN	FS 7-74		126/FIN
FS 7-19	⊗Δ	126/FIN	FS 7-75		126/FIN
FS 7-20	⊗Δ	126/FIN	FS 7-76		126/FIN
FS 7-21	⊗	126/FIN	FS 7-77		126/FIN
FS 7-22	⊗	126/FIN	FS 7-78		126/FIN
FS 7-23		126/FIN	FS 7-79	⊗	126/FIN
FS 7-24		126/FIN	FS 7-80		126/FIN
FS 7-25	⊗	126/FIN	FS 7-81	⊗	126/FIN
FS 7-26	⊗	126/FIN	FS 7-82		126/FIN
FS 7-27	⊗	126/FIN	FS 7-83		126/FIN
FS 7-28	⊗	126/FIN	FS 7-84	⊗	126/FIN
FS 7-29	⊗	126/FIN	FS 7-85		126/FIN
FS 7-30	⊗	126/FIN	FS 7-86		126/FIN
FS 7-31	⊗	126/FIN	FS 7-87		126/FIN
FS 7-32		126/FIN	FS 7-88		126/FIN
FS 7-33	⊗	126/FIN	FS 7-89		126/FIN
FS 7-34		126/FIN	FS 7-90		126/FIN
FS CC 7-35	⊗	126/FIN	FS 7-91		126/FIN
FS CC 7-36	⊗	126/FIN	FS 7-92		126/FIN
FS 7-37		126/FIN	FS 7-93	⊗	126/FIN
FS 7-38	⊗	126/FIN	FS 7-94		126/FIN
FS 7-39		126/FIN	FS 7-95		126/FIN
FS 7-40		126/FIN	FS 7-96	⊗	126/FIN
FS 7-41		126/FIN	FS 7-97	⊗	126/FIN
FS 7-42		126/FIN	FS 7-98	⊗	126/FIN
FS 7-43		126/FIN	FS 7-99	⊗	126/FIN
FS 7-44		126/FIN	FS 7-100		126/FIN
FS 7-45		126/FIN	FS 7-101		126/FIN
FS 7-46	⊗	126/FIN	FS 7-102	⊗	126/FIN
FS 7-47	⊗	126/FIN	FS 7-103	⊗	126/FIN
FS 7-48	⊗	126/FIN	FS 7-104		126/FIN
FS 7-49	⊗	126/FIN	FS 7-105	⊗	126/FIN
FS 7-50	⊗	126/FIN	FS 7-106		126/FIN
FS 7-51	⊗	126/FIN	FS 7-107	⊗	126/FIN
FS 7-52	⊗	126/FIN	FS 7-108	⊗	126/FIN
FS 7-53	⊗	126/FIN	FS 7-109		126/FIN
FS 7-54	⊗	126/FIN	FS 7-110	⊗	126/FIN
FS 7-55	⊗	126/FIN	FS 7-111	⊗	126/FIN
FS 7-56		126/FIN	FS 7-112		126/FIN
FS 7-57	⊗Δ	126/FIN	FS 7-113		126/FIN
FS 7-58	⊗Δ	126/FIN	FS 7-114	⊗	126/FIN
FS 7-59	⊗	126/FIN	FS 7-115	⊗	126/FIN
FS 7-60		126/FIN	FS 7-116		126/FIN
FS 7-61		126/FIN	FS 7-117		126/FIN
FS 7-62	⊗	126/FIN	FS 7-118		126/FIN
FS 7-63	⊗	126/FIN	FS 7-119		126/FIN
FS 7-64	⊗	126/FIN	FS 7-120		126/FIN
FS 7-65	⊗	126/FIN	FS 7-121	⊗	126/FIN
FS 7-66		126/FIN	FS 7-122		126/FIN
FS 7-67	⊗	126/FIN	FS 7-123	⊗	126/FIN
FS 7-68	⊗	126/FIN	FS 7-124	⊗	126/FIN
FS 7-69	⊗	126/FIN	FS 7-125	⊗	126/FIN
FS 7-70	⊗	126/FIN	FS 7-126		126/FIN

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FS 7-127 .....	⊗	126/FIN	11-3 .....	generic
FS 7-128 .....		126/FIN	11-4 .....	generic
FS 7-129 .....		126/FIN	12-i.....	generic
FS 7-130 .....	⊗	126/FIN	12-ii.....	generic
FS 7-131 .....		126/FIN	TEMP FS 12-1 .....	126/FIN
FS 7-132 .....	⊗	126/FIN	TEMP FS 12-2.....	ALL/FIN
FS 7-133 .....	⊗	126/FIN	12-3 .....	generic
FS 7-134 .....	⊗	126/FIN	12-4 .....	generic
FS 7-135 .....	⊗	126/FIN	12-5 .....	generic
FS 7-136 .....		126/FIN	12-6 .....	generic
TEMP FS 8-1 .....		126/FIN	12-7 .....	generic
TEMP FS 8-2 .....		ALL/FIN	12-8 .....	generic
8-3 .....		generic	12-9 .....	generic
8-4 .....		generic	12-10 .....	generic
8-5 .....		generic	12-11 .....	generic
8-6 .....		generic	12-12 .....	generic
8-7 .....		generic	12-13 .....	generic
8-8 .....		generic	12-14 .....	generic
FS 8-9 .....	⊗	126/FIN	12-15 .....	generic
FS 8-10 .....	⊗	126/FIN	12-16 .....	generic
FS 8-11 .....		126/FIN	12-17 .....	generic
FS 8-12 .....	⊗	126/FIN	12-18 .....	generic
FS 8-13 .....		126/FIN	12-19 .....	generic
FS 8-14 .....		126/FIN	12-20 .....	generic
FS 8-15 .....		126/FIN	12-21 .....	generic
FS 8-16 .....		126/FIN	12-22 .....	generic
FS 8-17 .....		126/FIN	12-23 .....	generic
FS 8-18 .....		126/FIN	12-24 .....	generic
FS 8-19 .....		126/FIN	12-25 .....	generic
FS 8-20 .....		126/FIN	12-26 .....	generic
9-1 .....		generic	FS 12-27.....	126/FIN
9-2 .....		generic	FS 12-28.....	126/FIN
9-3 .....		generic	FS 12-29.....	126/FIN
9-4 .....		generic	FS CC 12-30.....	126/FIN
9-5 .....		generic	FS CC 12-31.....	126/FIN
9-6 .....		generic	FS 12-32.....	⊗ 126/FIN
TEMP FS 10-1 .....		126/FIN	FS 13-1.....	126/FIN
TEMP FS 10-2 .....		ALL/FIN	FS 13-2.....	126/FIN
10-3 .....		generic	14-1 .....	generic
10-4 .....		generic	14-2 .....	generic
10-4a.....		generic	14-3 .....	generic
10-4b.....		generic	14-4 .....	generic
10-5 .....		generic	14-5 .....	generic
10-6 .....		generic	14-6 .....	generic
10-7 .....		generic	14-7 .....	generic
10-8 .....		generic	14-8 .....	generic
10-9 .....		generic	14-9 .....	generic
10-10.....		generic	14-10 .....	generic
10-11.....		generic	14-11 .....	generic
10-12.....		generic	14-12 .....	generic
10-13.....		generic	14-13 .....	generic
10-14.....		generic	14-14 .....	generic
FS CC 10-15.....		126/FIN	14-15 .....	generic
FS CC 10-16.....	⊗	126/FIN	14-16 .....	generic
11-1 .....		generic	14-17 .....	generic
11-2.....		generic	14-18 .....	generic

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14-19.....	generic	FS 16-37.....	126/FIN
14-20.....	generic	FS 16-38.....	126/FIN
14-21.....	generic	FS 16-39.....	126/FIN
14-22.....	generic	FS 16-40.....	126/FIN
15-1.....	generic	FS 16-41.....	126/FIN
15-2.....	generic	FS 16-42.....	126/FIN
15-3.....	generic	FS 16-43.....	126/FIN
15-4.....	generic	FS 16-44.....	126/FIN
15-5.....	generic	FS 16-45.....	126/FIN
15-6.....	generic	FS 16-46.....	126/FIN
15-7.....	generic	FS 16-47.....	126/FIN
15-8.....	generic	FS 16-48.....	126/FIN
15-9.....	generic	FS 16-49.....	126/FIN
15-10.....	generic	FS 16-50.....	126/FIN
15-11.....	generic	FS 16-51.....	126/FIN
15-12.....	generic	FS 16-52.....	126/FIN
15-13.....	generic	FS 16-53.....	126/FIN
15-14.....	generic	FS 16-54.....	126/FIN
16-i.....	generic	FS 16-55.....	126/FIN
16-ii.....	generic	FS 16-56.....	126/FIN
TEMP FS 16-1.....	126/FIN	FS 16-57.....	126/FIN
TEMP FS 16-2.....	126/FIN	FS 16-58.....	126/FIN
FS 16-3.....	126/FIN	FS 16-59.....	126/FIN
FS 16-4.....	126/FIN	FS 16-60.....	126/FIN
FS 16-5.....	126/FIN	17-1.....	generic
FS 16-6.....	126/FIN	17-2.....	generic
FS 16-7.....	126/FIN	FS 18-1.....	126/FIN
FS 16-8.....	126/FIN	FS 18-2.....	126/FIN
FS 16-9.....	126/FIN	FS 18-3.....	126/FIN
FS 16-10.....	126/FIN	FS 18-4.....	126/FIN
FS 16-11.....	126/FIN	FS 18-5.....	126/FIN
FS 16-12.....	126/FIN	FS 18-6.....	126/FIN
FS 16-13.....	126/FIN	FS 18-7.....	126/FIN
FS 16-14.....	126/FIN	FS 18-8.....	126/FIN
FS 16-15.....	126/FIN	FS 18-9.....	126/FIN
FS 16-16.....	126/FIN	FS 18-10.....	126/FIN
FS 16-17.....	126/FIN	FS 18-11.....	126/FIN
FS 16-18.....	126/FIN	FS 18-12.....	126/FIN
FS 16-19.....	126/FIN	FS 18-13.....	126/FIN
FS 16-20.....	126/FIN	FS 18-14.....	126/FIN
FS 16-21.....	126/FIN	FS 18-15.....	126/FIN
FS 16-22.....	126/FIN	FS 18-16.....	126/FIN
FS 16-23.....	126/FIN	FS 18-17.....	126/FIN
FS 16-24.....	126/FIN	FS 18-18.....	126/FIN
FS 16-25.....	126/FIN	FS 18-19.....	126/FIN
FS 16-26.....	126/FIN	FS 18-20.....	126/FIN
FS 16-27.....	126/FIN	FS 18-21.....	126/FIN
FS 16-28.....	126/FIN	FS 18-22.....	126/FIN
FS 16-29.....	126/FIN	FS 18-23.....	126/FIN
FS 16-30.....	126/FIN	FS 18-24.....	126/FIN
FS 16-31.....	126/FIN	FS 18-25.....	126/FIN
FS 16-32.....	126/FIN	FS 18-26.....	126/FIN
FS 16-33.....	126/FIN	FS 18-27.....	126/FIN
FS 16-34.....	126/FIN	FS 18-28.....	126/FIN
FS 16-35.....	126/FIN	FS 18-29.....	126/FIN
FS 16-36.....	126/FIN	FS 18-30.....	126/FIN

⊗ – Flight copies of this page contain color



FS 18-31 .....	⊗	126/FIN
FS 18-32 .....	⊗	126/FIN
FS 18-33 .....	⊗	126/FIN
FS 18-34 .....	⊗	126/FIN
FS 18-35 .....		126/FIN
FS 18-36 .....		126/FIN
FS 18-37 .....		126/FIN
FS 18-38 .....		126/FIN
FS 18-39 .....	⊗	126/FIN
FS 18-40 .....		126/FIN
FS 18-41 .....		126/FIN
FS 18-42 .....		126/FIN
FS 18-43 .....		126/FIN
FS 18-44 .....		126/FIN
FS 18-45 .....		126/FIN
FS 18-46 .....		126/FIN
FS 18-47 .....		126/FIN
FS 18-48 .....		126/FIN
FS 18-49 .....		126/FIN
FS 18-50 .....		126/FIN
FS 18-51 .....	⊗	126/FIN
FS 18-52 .....		126/FIN
FS 18-53 .....		126/FIN
FS 18-54 .....		126/FIN
FS 18-55 .....	⊗	126/FIN
FS 18-56 .....	⊗	126/FIN
FS 18-57 .....	⊗	126/FIN
FS 18-58 .....	⊗	126/FIN
FS 18-59 .....	⊗	126/FIN
FS 18-60 .....	⊗	126/FIN
19-i .....		generic
19-ii .....		generic
19-1 .....		generic
19-2 .....		generic
19-3 .....		generic
19-4 .....		generic
19-5 .....		generic
19-6 .....		generic
19-7 .....		generic
19-8 .....		generic
19-9 .....		generic
19-10 .....		generic
19-11 .....		generic
19-12 .....		generic
19-13 .....		generic
19-14 .....		generic
20-1 .....	*	generic
20-2 .....	*	generic

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## EVA CUE CARDS

<u>Title</u>	<u>Ref. Page</u>	<u>Card No.</u>
SAFER CHECKOUT RESULTS (Front).....	CC 3-10	generic
SAFER STATUS TROUBLESHOOTING (Back) .....	CC 3-11	generic
DEPRESS/REPRESS (NOM A/L) (Front).....	CC A6-2	generic
FAILED LEAK CHECK (Back of DEPRESS/REPRESS) .....	CC 6-4	generic
STBD SARJ CUE CARD (Front).....	FS CC 7-35	EVA-4a/126/O/A
PORT SARJ CUE CARD (Back).....	FS CC 7-36	EVA 4b/126/O/A
CONSUMABLES TRACKING CUE CARD (Front) .....	FS CC 10-15	EVA-6a/126/O/A
BATTERY RECHARGE CUE CARD (Back) .....	FS CC 10-16	EVA-6b/126/O/A
EMERGENCY UNDOCKING EVA TRANSFER (Front) .....	FS CC 12-30	EVA-5a/126/O/A
EXPEDITED SUIT DOFFING CUE CARD (Back) .....	FS CC 12-31	EVA-5b/126/O/A

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CONTENTS

PAGE

10.2 PSI CABIN .....	TEMP FS 1-1
MASK PREBREATHE INITIATE .....	TEMP FS 1-2
PREP FOR 10.2 PSI CABIN .....	TEMP FS 1-3
CABIN DEPRESS TO 10.2 PSI.....	TEMP FS 1-4
10.2 PSIA DEPRESS CHART.....	TEMP FS 1-5
10.2 PSI CABIN CONFIG.....	TEMP FS 1-6
MASK PREBREATHE TERMINATE .....	TEMP FS 1-6
10.2 PSI MAINTENANCE.....	1-7
CABIN REPRESS TO 14.7 PSI.....	1-8
14.7 PSI CABIN CONFIG.....	1-9
AIRLOCK CONFIG.....	TEMP FS 2-1
AIRLOCK PREP .....	TEMP FS 2-2
EMU SWAP.....	2-3
BOOSTER FAN DEACTIVATION/REMOVAL.....	2-4
BOOSTER FAN INSTALLATION/ACTIVATION.....	2-4
EMU REMOVAL.....	2-4
EMU INSTALLATION.....	2-4
EMU CHECKOUT PREP.....	TEMP FS 2-5
LTA RESTRAINT STRAP REMOVAL.....	TEMP FS 2-6
LTA RESTRAINT STRAP INSTALLATION.....	TEMP FS 2-6
EMU PREP FOR ISS TRANSFER.....	FS 2-7
POST-DOCKING EVA TRANSFER AND RECONFIG.....	FS 2-9
EMU SWAP FOR EVA 2.....	FS 2-12
EMU SWAP FOR EVA 3.....	FS 2-13
EMU SWAP FOR EVA 4.....	FS 2-14
POST EVA EMU RECONFIGURATION AND TRANSFER.....	FS 2-15
EVA TRANSFER TO SHUTTLE.....	FS 2-18
EVA UNPACK AND STOW.....	FS 2-19
CHECKOUTS.....	3-1
EMU CHECKOUT .....	3-2
EMU POWERUP AND COMM CHECK.....	3-2
PRIMARY REGULATOR/FAN/PUMP CHECK.....	3-4
SOP CHECK.....	3-5
BATTERY CHARGE CHECK INIT.....	3-6
BATTERY CHARGE CHECK TERM.....	3-6
EMU SWAP DURING CHECKOUT.....	3-7
POST EMU C/O RECONFIG.....	3-7
SAFER CHECKOUT .....	3-8
SELF TEST SEQUENCE.....	3-9
SAFER CHECKOUT RESULTS.....	CC 3-10
SAFER STATUS TROUBLESHOOTING.....	CC 3-11
REBA POWERED HARDWARE CHECKOUT.....	3-12
EVA PREP .....	TEMP FS 4-1
MIDDECK PREP .....	TEMP FS 4-2
EVA PREP.....	TEMP FS 4-3
PREP FOR DONNING.....	TEMP FS 4-3
EMU DONNING.....	4-5
EMU CHECK.....	4-7
EMU PURGE.....	4-7

EMU PREBREATHE .....	4-8
SAFER DOWNING .....	4-8
EVA COMM CONFIG .....	4-10
EVA COMM DECONFIG .....	4-10
APPROVED NON-EMU HARDWARE MATRIX.....	4-11
EMU STATUS .....	5-1
EMU STATUS .....	5-2
DEPRESS/REPRESS .....	A6-1
DEPRESS/REPRESS (NOM A/L) .....	CC A6-2
FAILED LEAK CHECK.....	6-3
FAILED LEAK CHECK (5 PSI) .....	CC 6-4
FAILED LEAK CHECK (14.7/10.2 PSI) .....	CC 6-4
TIMELINES .....	FS 7-1
EVA SUMMARY TIMELINES .....	FS 7-3
EVA 1	
EVA 1 SUMMARY TIMELINE.....	FS 7-4
EVA 1 PRE TOOL CONFIG.....	FS 7-5
EVA 1 BRIEFING CARD.....	FS 7-7
EVA 1 INHIBIT PAD.....	FS 7-9
EVA 1 NOTES/CAUTIONS/WARNINGS.....	FS 7-11
EVA 1 EGRESS/SETUP.....	FS 7-14
EVA 1 ORU TRANSFER .....	FS 7-15
EVA 1 SSRMS CLEANUP/EFBM COVER REMOVAL.....	FS 7-17
EVA 1 SARJ .....	FS 7-18
EVA 1 SARJ – TBA REMOVE/INSTALL .....	FS 7-19
EVA 1 SARJ – CLEAN/LUBE RACE RING .....	FS 7-20
EVA 1 SARJ – SLR REMOVAL.....	FS 7-21
EVA 1 CLEANUP/INGRESS.....	FS 7-22
EVA 1 POST TOOL CONFIG .....	FS 7-23
STBD SARJ CUE CARD .....	FS CC 7-35
POST SARJ CUE CARD .....	FS CC 7-36
EVA 2	
EVA 2 SUMMARY TIMELINE.....	FS 7-37
EVA 2 PRE TOOL CONFIG.....	FS 7-38
EVA 2 BRIEFING CARD.....	FS 7-40
EVA 2 INHIBIT PAD.....	FS 7-42
EVA 2 NOTES/CAUTIONS/WARNINGS.....	FS 7-44
EVA 2 EGRESS/SETUP.....	FS 7-46
EVA 2 CETA CART RELOCATE .....	FS 7-47
EVA 2 LEE A LUBRICATION .....	FS 7-52
EVA 2 SARJ .....	FS 7-56
EVA 2 SARJ – TBA REMOVE/INSTALL .....	FS 7-57
EVA 2 SARJ – CLEAN/LUBE RACE RING .....	FS 7-58
EVA 2 CLEANUP/INGRESS.....	FS 7-59
EVA 2 POST TOOL CONFIG .....	FS 7-60
EVA 3	
EVA 3 SUMMARY TIMELINE.....	FS 7-71
EVA 3 PRE TOOL CONFIG.....	FS 7-72
EVA 3 BRIEFING CARD.....	FS 7-74
EVA 3 INHIBIT PAD.....	FS 7-76
EVA 3 NOTES/CAUTIONS/WARNINGS.....	FS 7-77
EVA 3 EGRESS/SETUP.....	FS 7-79
EVA 3 SARJ .....	FS 7-80

EVA 3 CLEANUP/INGRESS.....	FS 7-81
EVA 3 POST TOOL CONFIG .....	FS 7-82
EVA 4	
EVA 4 SUMMARY TIMELINE.....	FS 7-83
EVA 4 PRE TOOL CONFIG.....	FS 7-84
EVA 4 BRIEFING CARD.....	FS 7-86
EVA 4 INHIBIT PAD.....	FS 7-88
EVA 4 NOTES/CAUTIONS/WARNINGS.....	FS 7-90
EVA 4 EGRESS/SETUP.....	FS 7-93
EVA 4 REMOVE P3 MLI COVERS.....	FS 7-94
EVA 4 PORT SARJ LUBE .....	FS 7-95
EVA 4 EFBM COVER INSTALL/JEM RMS GROUNDING TABS .....	FS 7-97
EVA 4 INSTALL JEM HANDRAILS AND WIFs .....	FS 7-98
EVA 4 GPS ANTENNA INSTALL .....	FS 7-99
EVA 4 JEM CLEANUP.....	FS 7-100
EVA 4 ETVCG INSTALL.....	FS 7-101
EVA 4 S1/P1 RADIATOR IMAGERY.....	FS 7-103
EVA 4 P3 MLI COVER INSTALL/TUS CABLE PICTURES/ GET-AHEAD LIST .....	FS 7-104
EVA 4 CLEANUP/INGRESS.....	FS 7-105
EVA 4 POST TOOL CONFIG .....	FS 7-106
GET-AHEADS	
INHIBIT PAD.....	FS 7-118
SSAS BBC RECONFIG.....	FS 7-119
S1/S3 AND P1/P3 FLUID JUMPER INSTALL.....	FS 7-122
PHRC P-CLAMP RELEASE .....	FS 7-124
S3 ZENITH OUTBOARD CAS DEPLOY .....	FS 7-128
TOOLS AND STOWAGE .....	TEMP FS 8-1
PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA).....	TEMP FS 8-2
PGT CHECKOUT .....	8-3
PGSC-PGT CONNECTION (A31P AND 760XD).....	8-4
PROGRAM PGT SETTINGS.....	8-5
DOWNLOAD/ERASE EVENT LOG.....	8-5
PGT CONTINGENCIES .....	8-6
PGT STANDARD SETTINGS .....	8-7
ULF2 J NOZZLE GREASE GUN PREP FOR EVA 1 .....	FS 8-9
ULF2 GREASE GUN CARTRIDGE SWAP .....	FS 8-10
ULF2 TOOL STOW FOR MPLM TRANSFER.....	FS 8-13
APFR MANAGEMENT – STS-126/ULF2 .....	FS 8-14
SAFETY TETHERS – STS-126 (ULF2) .....	FS 8-15
TOOLBOX STOWAGE – STS-126 (ULF2) .....	FS 8-16
TOOLBOX PANEL AND SLOT LABELS.....	FS 8-17
Z1 TOOLBOX INTERNAL LAYOUT .....	FS 8-18
AIRLOCK TOOLBOX INTERNAL LAYOUT .....	FS 8-19
POST EVA .....	9-1
POST EVA.....	9-2
SUIT DOFFING.....	9-2
SAFER DOFFING.....	9-2
EMU WATER RECHARGE.....	9-3
SAFER STOW.....	9-3
SUIT DRYING/SEAL WIPE .....	9-4
OXYGEN RECHARGE VERIFICATION.....	9-4
WATER FILL VERIFICATION.....	9-4
EMU POWERDOWN/OVERNIGHT STOW.....	9-5

EMU MAINT/RECHARGE .....	TEMP FS	10-1
WATER RECHARGE .....	TEMP FS	10-2
EMU POWERUP .....	TEMP FS	10-2
WATER FILL.....	TEMP FS	10-2
WATER FILL VERIFICATION.....	TEMP FS	10-2
EMU LiOH CHANGEOUT .....		10-4
MIDDECK EMU BATTERY RECHARGE (STAND-ALONE) .....		10-4a
MIDDECK EMU BATTERY RECHARGE/LiOH REPLACEMENT .....		10-5
INITIATE .....		10-5
TERMINATE .....		10-6
IN-SUIT EMU BATTERY RECHARGE/CHARGE VERIFICATION .....		10-7
INITIATE .....		10-7
TERMINATE .....		10-7
EMU POWERDOWN.....		10-7
HELMET LIGHT/PGT BATTERY RECHARGE .....		10-8
INITIATE .....		10-8
TERMINATE .....		10-9
REBA BATTERY INSTALLATION.....		10-9
EMU BATTERY REMOVAL/INSTALL.....		10-10
HELMET LIGHT BULB CHANGEOUT .....		10-11
REBA BATTERY RECHARGE .....		10-12
INITIATE .....		10-12
TERMINATE .....		10-13
CONSUMABLES TRACKING CUE CARD.....	FS CC	10-15
BATTERY RECHARGE CUE CARD.....	FS CC	10-16
POST EVA ENTRY PREP .....		11-1
POST EVA ENTRY PREP .....		11-2
SAFER ENTRY STOW .....		11-2
POST ISS EVA ENTRY PREP.....		11-3
<u>OFF-NOMINAL PROCEDURES</u> .....		12-i
EMU CONTINGENCY PROCS .....	TEMP FS	12-1
DISPLAY LOSS DURING POWER TRANSFER		
(WARM RESTART) .....	TEMP FS	12-2
VACUUM H2O RECHARGE (MANNED) .....	TEMP FS	12-2
LiOH REPLACEMENT (MANNED) .....		12-3
BATTERY REPLACEMENT (MANNED) .....		12-4
WATER DUMP .....		12-6
SCU SWAP (UNMANNED) .....		12-7
(MANNED) .....		12-7
EMU COLD RESTART (MANNED).....		12-7
12.1 STS EVA DECONTAMINATION .....		12-8
CONTAMINATION TEST .....		12-15
SAFER BATTERY CHANGEOUT .....		12-18
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (IN-SUIT).....		12-19
BTA PREP .....		12-19
TREATMENT .....		12-19
BENDS TREATMENT ADAPTER (BTA) INSTALLATION		
(POST SUIT DOFFING) .....		12-21
BTA PREP .....		12-21
TREATMENT .....		12-21
EMU RESIZE.....		12-24
STS-126 NOMINAL EMU SIZING .....	FS	12-27
EMU CONTINGENCY RESIZE MATRIX (STS-126/ULF2) .....	FS	12-29
EMERGENCY UNDOCKING EVA TRANSFER CUE CARD .....	FS CC	12-30
EXPEDITED SUIT DOFFING CUE CARD .....	FS CC	12-31
EMU PREP FOR TPS REPAIR.....	FS	12-32



TPS REPAIR.....	FS 13-1
ORBITER CONTINGENCY EVA.....	14-1
PAYLOAD BAY EVA NOMENCLATURE .....	14-2
RMS/PRLA CONTINGENCY EVA .....	14-3
96 BOLT PRE-EVA TOOL CONFIG.....	14-13
96 BOLT EVA TIMELINE .....	14-14
CAPTURE LATCH MANUAL RELEASE (ODS/PMA).....	14-19
96 BOLT EVA LAYOUT.....	14-21
PLBD LATCH TOOL PLACEMENT WITH DUAL LATCH GANG FAILURES.....	14-22
EVA CUFF CHECKLIST (CIL) .....	15-1
NORMAL EVA STATUS.....	15-2
DCM CONFIGURATION .....	15-2
EMU MALFUNCTION INDEX.....	15-2
DECOMPRESSION SICKNESS (DCS) .....	15-3
DECOMPRESSION SICKNESS (DCS) (CONT).....	15-3
ABORT EVA.....	15-3
TERMINATE EVA.....	15-3
SUIT P EMERG.....	15-4
SOP O2 ON.....	15-4
BATT AMPS HIGH .....	15-4
BATT V DECAY OR BATT VDC LOW .....	15-4
SUIT P LOW.....	15-5
SUIT P HIGH.....	15-5
SOP P LOW .....	15-5
O2 USE HIGH .....	15-5
SUBLM PRESS.....	15-6
H2O GP LOW.....	15-6
RESRV H2O ON .....	15-6
H2O WP HIGH .....	15-6
NO VENT FLOW .....	15-7
CO2 HIGH OR MONITOR CO2 .....	15-7
CO2 SNSR BAD.....	15-7
COMM FAILURE.....	15-7
AIR FLOW CONTAMINATION .....	15-8
LOSS OF COOLING .....	15-8
RLF V FAIL.....	15-8
MISC MSGS 1 .....	15-8
MISC MSGS (CONT)/TIME LF.....	15-9
AIRLOCK LATCH DISCONNECT .....	15-9
AIRLOCK INGRESS.....	15-9

FOLLOWING PAGES NOT IN EV CUFF

RADIATOR ACTUATOR DISCONNECT .....	15-9
PLBD DRIVE CUT.....	15-10
DOOR DRIVE RESTRAINT .....	15-10
DOOR DRIVE DISCONNECT .....	15-10
WINCH OPERATIONS.....	15-10
WINCH OPERATIONS (CONT) .....	15-11
3-PT TOOL INSTALLATION .....	15-11
CL LATCH TOOL .....	15-11
RMS JOINT ALIGN .....	15-11
MPM STOW/DEPLOY .....	15-12
RMS TIEDOWN.....	15-12

RMS FLIGHT RELEASABLE GRAPPLE FIXTURE RELEASE .....	15-12
PRLA OPEN/CLOSE .....	15-12
PRLA OPEN/CLOSE (CONT) .....	15-13
KU ANTENNA STOW.....	15-13
KU ANTENNA STOW (CONT) .....	15-13
AIRLOCK EGRESS.....	15-13
<b><u>FLIGHT SPECIFIC REFERENCE</u></b> .....	16-i
UNSCCHEDULED/CONTINGENCY EVA TASKS .....	TEMP FS 16-1
ULF2 WORKAROUNDS CRIBSHEET .....	FS 16-3
EFBM CONTINGENCY CHECKOUT INHIBIT PAD.....	FS 16-22
EFBM CONTINGENCY CHECKOUT .....	FS 16-23
RELEASE ROEU LATCHES .....	FS 16-30
LATCH ROEU LATCHES.....	FS 16-33
STOW ROEU ARM .....	FS 16-36
MATE ROEU ARM .....	FS 16-39
ROEU OVERVIEW.....	FS 16-41
DLA REMOVE AND REPLACE.....	FS 16-42
RJMC REMOVE AND REPLACE.....	FS 16-50
GENERIC EVA INHIBIT PAD.....	FS 16-51
GENERIC NOTES, CAUTIONS, AND WARNINGS.....	FS 16-55
 GENERIC EVA REFERENCE.....	 17-1
 FLIGHT SPECIFIC EVA REFERENCE.....	 FS 18-1
PAYLOAD BAY LAYOUT .....	FS 18-3
FHRC ON LMC.....	FS 18-4
NTA ON LMC .....	FS 18-5
CPK ON LMC .....	FS 18-6
ESP-3 ZENITH VIEW .....	FS 18-7
ESP-3 NADIR VIEW.....	FS 18-8
ESP-3 HANDRAILS AND WIFs – ZENITH VIEW .....	FS 18-9
ESP-3 HANDRAILS AND WIFs – NADIR VIEW .....	FS 18-10
FRAM/FSE/ORU ASSEMBLY .....	FS 18-11
ACTIVE FRAM SOFT CAPTURE MECHANISM.....	FS 18-12
ESP-3 NTA MLI.....	FS 18-14
NODE 2 ZENITH PORT HANDRAILS.....	FS 18-15
NODE 2 NADIR STBD HANDRAILS.....	FS 18-16
NODE 2 PORT NADIR HANDRAILS .....	FS 18-17
NODE 2 STBD ZENITH HANDRAILS .....	FS 18-18
NODE 2 FWD END CONE .....	FS 18-19
JPM – AFT FACE .....	FS 18-20
JPM – PORT ENDCONE .....	FS 18-21
JPM OVERALL DIMENSIONS AND MASS INFORMATION .....	FS 18-23
TRUNDLE BEARING ASSEMBLY .....	FS 18-24
TIEDOWN: SARJ TBA .....	FS 18-32
TIEDOWN: S3 AFT-NADIR CLAMSHELL AND STUB .....	FS 18-34
CETA CART – TOP VIEW.....	FS 18-35
CETA CART – SWING ARMS AND WIF MARKINGS .....	FS 18-36
CETA CART – COUPLERS .....	FS 18-37
CETA CART – WHEEL BOGIES.....	FS 18-38
P1 MT STOP.....	FS 18-39
P3 OVERVIEW.....	FS 18-40
P3/P4 OVERVIEW .....	FS 18-41
P3 TRUSS SEGMENT (FACE 1, 2, & 6 – TOP VIEW) .....	FS 18-43
P3 TRUSS SEGMENT (FACE 1, 2, & 3 – PORT END VIEW) .....	FS 18-44

P3 TRUSS SEGMENT (FACE 3 & 4 – STBD END VIEW).....	FS 18-45
P3 TRUSS SEGMENT (FACE 5 & 6 – STBD END VIEW).....	FS 18-46
P3 SARJ STRUCTURE (STBD SIDE – UTA SIDE AND PORT SIDE – DMA SIDE).....	FS 18-47
JLP FWD SIDE VIEW.....	FS 18-48
JLP PORT SIDE VIEW.....	FS 18-49
JLP ZENITH ENDCONE VIEW.....	FS 18-50
ULF2 EVA PROX GPSAA INSTALLATION OPS FLOW – CABLE/CONNECTOR LOCATION AND ID.....	FS 18-51
ETVCG DUMMY BOX.....	FS 18-52
ETVCG.....	FS 18-53
TIEDOWN: ETVCG TO VSSA (GENERIC).....	FS 18-57
TIEDOWN: DUMMY BOX SECURED TO VSSA.....	FS 18-58
FHRC STINGER BOX (TRRJ AT -90 DEG).....	FS 18-59
FHRC HOSE BOX.....	FS 18-60
<u>EVA EMERGENCY</u> .....	19-i
EMERGENCY PROCEDURES.....	19-1
EMERGENCY AIRLOCK REPRESS.....	19-3
EMERGENCY AIRLOCK REPRESS.....	19-4
POST EMERGENCY AIRLOCK REPRESS.....	19-4
SAFER RESCUE.....	19-5
SAFER RESCUE.....	19-6
DAP/EVA RESCUE/RETRIEVE.....	19-7
EVA ORBITER CONFIG.....	19-7
EVA RESCUE/RETRIEVE.....	19-9
19.1 DCS TREATMENT.....	19-10
CONTINGENCY SHUTTLE AIRLOCK INGRESS FROM ISS.....	19-13
CUE CARD CONFIGURATION.....	20-1

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10.2 PSI CABIN

MASK PREBREATHE INITIATE.....	TEMP FS 1-2
PREP FOR 10.2 PSI CABIN.....	TEMP FS 1-3
CABIN DEPRESS TO 10.2 PSI.....	TEMP FS 1-4
10.2 PSIA DEPRESS CHART.....	TEMP FS 1-5
10.2 PSI CABIN CONFIG.....	TEMP FS 1-6
MASK PREBREATHE TERMINATE.....	TEMP FS 1-6
10.2 PSI MAINTENANCE.....	1-7
CABIN REPRESS TO 14.7 PSI.....	1-8
14.7 PSI CABIN CONFIG.....	1-9

**MASK PREBREATHE INITIATE**

1. Take one aspirin tablet (325 mg) if not taken previously
2. Configure quick don mask, HIU, and 14 ft comm/O2 umbilicals (two)
- C7 3. √LEH O2 SPLY 1,2 vlv (two) – OP
- C6, MO32M, MO69M 4. LEH O2 4(5,6,7) outlet – connect O2 hose
- MO10W MO39M 5. O2 XOVR SYS 2 – CL
6. MIDDECK COMM CCU PWR – OFF  
outlet – connect comm cable  
CCU PWR – ON
7. Decrease HIU volume control
- C6, MO32M, MO69M 8. LEH O2 4(5,6,7) vlv – OP

**WARNING**

Positive mask O2 pressure and fit are necessary to ensure adequate prebreathe

9. Verify black plates in top of mask are seated in silicon
10. Don mask
11. Set mask O2 control to EMERGENCY
12. Momentarily pull mask away from face and verify O2 flow  
\* If no positive O2 flow, contact MCC \*
13. √Comm
14. Configure ATU for PTT/PTT as reqd to alleviate comm noise

**WARNING**

Do not terminate prebreathe until cabin pressure at 10.2 psia and 1 hr prebreathe completed

15. Note time and continue mask prebreathe at least 1 hr

### PREP FOR 10.2 PSI CABIN

#### PRESS/CRYO SYS CONFIG

- L2
- √O2 SYS 1,2 SPLY (two) – ctr (tb-OP)  
√XOVR SYS 1 – OP
  - √N2 SYS 1,2 SPLY (two) – ctr (tb-OP)  
√REG INLET (two) – ctr (tb-OP)
  - O2/N2 CNTLR VLV SYS 1 – OP (N2)  
2 – CL (O2)
- SM 88 APU/ENVIRON THERM**
- L1
- If FLASH EVAP CNTLR PRI A,B – OFF:  
If FREON LOOP 1,2 EVAP OUT T between 41-47 degF:  
RAD CNTLR OUT TEMP – HI  
When FREON EVAP OUT TEMP > 50 degF,  
RAD CNTLR OUT TEMP – NORM (then immediately)  
FLASH EVAP CNTLR PRI A(B) – ON  
After ~1 min  
√FREON EVAP OUT TEMP ~39 degF  
If FREON LOOP 1,2 EVAP OUT T not between 41-47 degF:  
FLASH EVAP CNTLR PRI A(B) – ON
- L1
- If FLASH EVAP CNTLR PRI A(B) – ON, continue:

#### AIRLOCK/MIDDECK PREP

- MO10W
- O2 REG INLET SYS 1 vlv – CL  
2 vlv – OP  
XOVR SYS 2 – CL
- AW18A
- √N2 XOVER vlv – CL
- DCM
- LTG FLOOD (four) – ON
  - √PURGE vlv – op (up)
- AW82B
- Remove LTA Restraint Bag (1 ea EMU)
  - AIRLK DEPRESS vlv cap – vent, remove

#### RESET FDA & C/W LIMITS

**X: SM 60 SM TABLE MAINT**

- Contact MCC for uplink of B/U C/W and SM ALERT TMBU (if desired)  
Changes enclosed in

PARAMETER NAME	C/W CHL	H/W C/W		H/W & B/U ENA/INH	PARA ID	B/U C/W	
		LO V	HI V			LO EU	HI EU
CABIN PRESS (OV103)	4	2.50	3.85	ENA	0612405	10.0	15.2
(OV104)	4	2.50	3.85	ENA	0612405	10.0	15.2
(OV105)	4	2.45	3.80	ENA	0612405	10.0	15.2
O2 FLOW (OV103,5)							
1	14		4.90	INH	0612105		4.9
2	24		4.90	INH	0612205		4.9
PPO2 A	34	2.55	3.60	ENA	0612511	2.55	3.6
B	44	2.55	3.60	ENA	0612513	2.55	3.6
N2 FLOW (OV103,5)							
1	54		4.90	INH	0612553		4.9
2	64		4.90	INH	0612554		4.9
FAN ΔP	74	1.75	4.25	ENA	0612556	2.8	6.8

PARAMETER NAME	ENA/INH	PARA ID	SM ALERT	
			LOW	HIGH
OV-103				
AV BAY 1 FAN ΔP	ENA	0612642	2.40	4.80
AV BAY 2 FAN ΔP	ENA	0612647	1.90	4.60
AV BAY 3 FAN ΔP	ENA	0612658	2.50	4.90
OV-104				
AV BAY 1 FAN ΔP	ENA	0612642	1.90	4.90
AV BAY 2 FAN ΔP	ENA	0612647	1.90	4.80
AV BAY 3 FAN ΔP	ENA	0612658	2.40	5.00
OV-105				
AV BAY 1 FAN ΔP	ENA	0612642	2.40	4.80
AV BAY 2 FAN ΔP	ENA	0612647	1.90	4.60
AV BAY 3 FAN ΔP	ENA	0612658	2.50	5.00
IMU FAN ΔP	ENA	0612869	2.7	4.95
CABIN O2 CONCENTRATION	ENA	0922104		28.5
AIRLK P	INH	0640101	13.8	15.7
EXT AIRLK P	INH	0640126	13.8	15.7

## CABIN DEPRESS TO 10.2 PSI

### WARNING

Do not initiate depress until EV1 and EV2 have completed 45 min of mask prebreathe

Do not terminate prebreathe until cabin pressure at 10.2 psia and 1 hr mask prebreathe completed

- EV
1. Momentarily pull mask away from face and verify O2 flow  
\* If no positive O2 flow, contact MCC \*
  2. Plot initial CABIN P vs PPO2 on 10.2 PSIA DEPRESS CHART using SM SYS SUMM 1

### WARNING

Cabin O2 concentration (SM SYS SUMM 1) must be maintained below 28.5% to protect against increased flammability risk

Terminate all WCS activity while flowing N2 thru 14.7 CAB REG INLET SYS 1

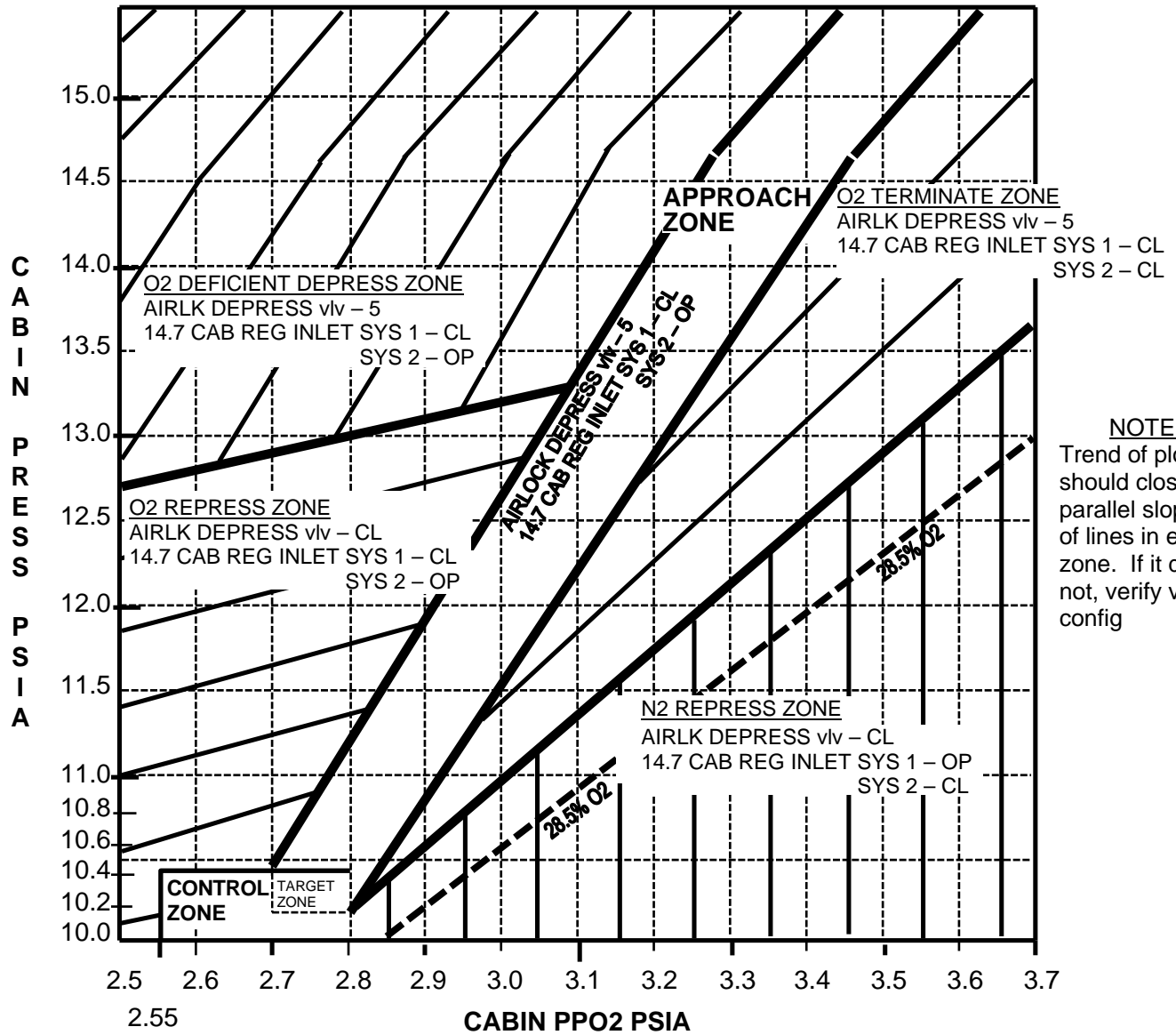
### NOTE

Expect klaxon each time airlock depress valve opened

- AW82B, MO10W
3. START DEPRESS  
Config vlvs per DEPRESS CHART
  4. Continue plotting CABIN P vs PPO2 every 60 sec using SM SYS SUMM 1. Reconfig vlvs when plot transitions into different zone
  5. STOP DEPRESS  
When CABIN P and PPO2 are in CONTROL ZONE (TARGET ZONE preferred), stop depress by configuring as listed at lower left of 10.2 PSIA DEPRESS CHART



### 10.2 PSIA DEPRESS CHART



**NOTE**  
 Trend of plot should closely parallel slope of lines in each zone. If it does not, verify valve config

When in **CONTROL ZONE**  
 (**TARGET ZONE** preferred):  
STOP DEPRESS  
 AIRLK DEPRESS vlv - CL  
 Install AIRLK DEPRESS vlv Cap  
 14.7 CAB REG INLET SYS 1 - CL  
 SYS 2 - CL

## 10.2 PSI CABIN CONFIG

X: SM 60 SM TABLE MAINT

- R13
- Reset FDA & C/W limits  
Changes enclosed in
  - Contact MCC for uplink of B/U C/W and SM ALERT TMBU (if desired)

PARAMETER NAME	C/W CHL	H/W C/W		H/W & B/U ENA/INH	PARA ID	B/U C/W	
		LO V	HI V			LO EU	HI EU
CABIN PRESS (OV103)	4	2.50	2.70	ENA	0612405	10.0	10.6
(OV104)	4	2.50	2.70	ENA	0612405	10.0	10.6
(OV105)	4	2.45	2.65	ENA	0612405	10.0	10.6
PPO2 A	34	2.55	2.90	ENA	0612511	2.55	2.9
B	44	2.55	2.90	ENA	0612513	2.55	2.9
FAN ΔP	74	1.75	3.05	ENA	0612556	2.8	4.88

PARAMETER NAME	ENA/INH	PARA ID	SM ALERT	
			LOW	HIGH
OV-103				
AV BAY 1 FAN ΔP	ENA	0612642	2.40	3.80
AV BAY 2 FAN ΔP	ENA	0612647	1.90	3.60
AV BAY 3 FAN ΔP	ENA	0612658	2.50	3.80
OV-104				
AV BAY 1 FAN ΔP	ENA	0612642	1.90	3.80
AV BAY 2 FAN ΔP	ENA	0612647	1.90	3.70
AV BAY 3 FAN ΔP	ENA	0612658	2.40	3.90
OV-105				
AV BAY 1 FAN ΔP	ENA	0612642	2.40	3.80
AV BAY 2 FAN ΔP	ENA	0612647	1.90	3.60
AV BAY 3 FAN ΔP	ENA	0612658	2.50	3.90
IMU FAN ΔP	ENA	0612869	2.7	3.8

- Perform SM CHECKPOINT INITIATE (ORB OPS, DPS)
- MO10W/L2
- O2 XOVR SYS 2 – OP
- MO69M
- If O2 bleed orifice not installed:  
√LEH O2 vlv 8 – CL  
Unstow and insert O2 bleed orifice in O2 QD  
LEH O2 vlv 8 – OP

## MASK PREBREATHE TERMINATE

### WARNING

Do not terminate prebreathe until cabin pressure at 10.2 psia and 1 hr prebreathe completed

- EV
- When mask prebreathe complete:
- Momentarily pull mask away from face to verify O2 flow  
  
\* If no positive O2 flow, contact MCC \*
  - Set mask O2 control to NORMAL
  - Doff mask
- C6,  
MO32M,  
MO69M
- LEH O2 4(5,6,7) vlv – CL
- MO39M
- MIDDECK COMM CCU PWR – OFF  
outlet – Disconnect comm cable  
CCU PWR – ON
  - Depress Mask O2 control
- C6,  
MO32M,  
MO69M
- LEH O2 4(5,6,7) outlet – Disconnect hose
  - Stow mask, HIU, and 14 ft comm/O2 umbilical

AIRLOCK CONFIG

AIRLOCK PREP .....	TEMP FS 2-2
EMU SWAP .....	2-3
BOOSTER FAN DEACTIVATION/REMOVAL .....	2-4
BOOSTER FAN INSTALLATION/ACTIVATION .....	2-4
EMU REMOVAL .....	2-4
EMU INSTALLATION .....	2-4
EMU CHECKOUT PREP .....	TEMP FS 2-5
LTA RESTRAINT STRAP REMOVAL .....	TEMP FS 2-6
LTA RESTRAINT STRAP INSTALLATION .....	TEMP FS 2-6
EMU PREP FOR ISS TRANSFER .....	FS 2-7
POST-DOCKING EVA TRANSFER AND RECONFIG .....	FS 2-9
EMU SWAP FOR EVA 2.....	FS 2-12
EMU SWAP FOR EVA 3.....	FS 2-13
EMU SWAP FOR EVA 4.....	FS 2-14
POST EVA EMU RECONFIGURATION AND TRANSFER.....	FS 2-15
EVA TRANSFER TO SHUTTLE .....	FS 2-18
EVA UNPACK AND STOW .....	FS 2-19

**AIRLOCK  
CONFIG**

## AIRLOCK PREP (50 min)

	Retrieve or unstow following equipment:
MF28G	3/8-in breaker bar, 4-in ext w/3/8-in drive
IFM Tool Kit	1/2-in socket w/3/8-in drive
Vol H	EMU Equipment Bag – attach to middeck wall
	Helmet Lights
	EVA Bag
	Contamination Detection Kit (location flight specific)
<hr/> FDF Locker	Cuff Checklists (2) – stow in EMU Equipment Bag
	<u>DEPRESS/REPRESS</u> Cue Card

- AW18A
1. ✓ Inner hatch Equal vlv (two) – OFF
  2. LTG FLOOD (four) – ON
  3. Remove from airlock, as reqd:
    - Airlock Stowage Bag
    - Airlock Floor Pallet using 3/8-in breaker bar, 4-in ext w/3/8-in drive, and 1/2-in socket w/3/8-in drive
  4. Stow Vol H Bags in Vol H
  5. Transfer to airlock:
    - EVA Bag – install on airlock wall
    - DEPRESS/REPRESS Cue Card
    - Helmet Lights
    - Contamination Detection Kit – install on airlock wall
  6. Install IVA foot restraint, as reqd
  7. Unbuckle SCU straps, Velcro SCU to wall
  8. Install EMU lights on helmets (EMU 1, EMU 2)
  9. Disconnect helmets from Airlock EMUs, temp stow
  10. Remove comm caps from LTA Restraint Bags and connect to electrical harnesses
  11. Install helmets (not reqd if proceeding directly to EMU Checkout)
  12. Remove LTA Restraint Bags
  13. Disconnect waist rings; remove and stow any equipment stowed in HUT/LTA
  14. Stow LTA Restraint Bags on AAPs
  15. ✓ Thermal cover clear of waist ring
  16. Waist ring – engage posn
  17. Connect LTA to HUT, lock
  18. Remove 20-g Crash Bag from middeck EMU, as reqd

AIRLOCK  
CONFIG

## EMU CHECKOUT PREP (30 min)

I

- Airlock
  - 1. LTG FLOOD (four) → on
  - 2. Remove External Airlock Floor Bag from Airlock
  - 3. Unbuckle SCU straps, Velcro SCU to wall
  - 4. Disconnect helmets from EMUs, temp stow
  - 5. ✓DIDB restraint bags installed
  - 6. Remove comm caps (4) from LTA Restraint Bag kangaroo pouches; temp stow PP2 and BW2
  - 7. Connect comm caps PP1 and BW1 to electrical harnesses
  - 8. Remove LTA Restraint Bags (reference LTA Restraint Strap Removal, next page, as reqd)
  - 9. Disconnect waist rings; remove ECOKs/LCVGs – temp stow LCVGs for EMU Checkout
  - 10. Stow CCAs PP2 and BW2 in ECOKs
  - 11. Temp stow ECOKs for EVA Prep for Transfer to ISS
  - 12. Stow LTA Restraint Bags on AAPs
  - 13. ✓Thermal cover clear of waist rings
  - 14. Waist rings – engage position
  - 15. Connect LTAs to HUTs, lock
- Middeck
  - 16. Unpack and temp stow for EVA Prep for Transfer to ISS:
    - Vol H
      - EMU Equipment Bag Crew Specific Compartments (1)
      - EMU Servicing Kit (Yellow Tag)
  - 17. Remove SCOFs (2) from EMU Equipment Bag for EMU Checkout
  - 18. Stow Vol H Bags in Vol H  
(SCOFs (2) will be stowed back in EMU Equipment Bag after EMU Checkout)

## LTA RESTRAINT STRAP REMOVAL (15 min)

### NOTE

May be performed on EMU 1 and 2 simultaneously.  
Perform steps as reqd for current EMU config

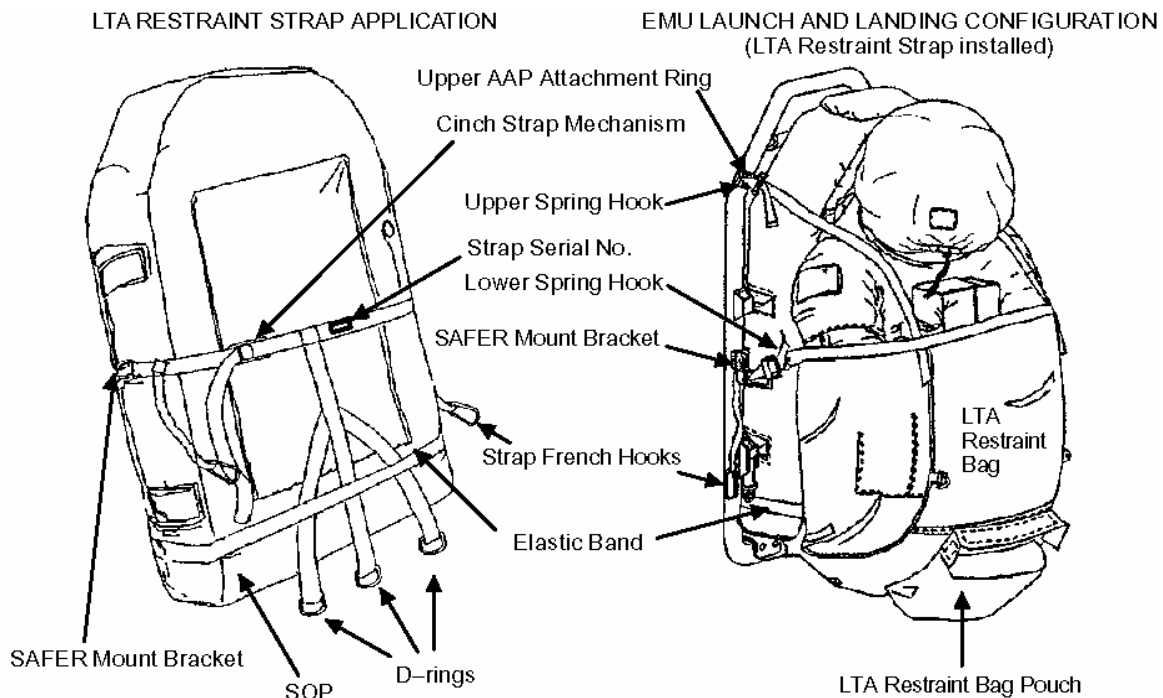
1. As reqd, remove comm cap from LTA Restraint Bag; temp stow
2. Remove EMU from AAP
3. Disconnect all restraint attachments from SAFER mount brackets (two)
4. Loosen cinch strap mechanism, remove SAFER mount brackets
5. Remove strap from PLSS
6. Stow strap in LTA Restraint Bag Pouch with D-rings (three) connected
7. Engage EMU in AAP
8. Stow LTA Restraint Bag/strap

## LTA RESTRAINT STRAP INSTALLATION (15 min)

### NOTE

May be performed on EMU 1 and 2 simultaneously. Perform steps as reqd for current EMU config. Procedure written to install in Launch/Landing config shown below

1. Unstow LTA Restraint Bag/strap
2. Remove EMU from AAP
3. Install SAFER mount brackets (two)
4. Install elastic band of strap around SOP
5. Tighten cinch strap mechanism
6. Attach strap French hooks (two) to SAFER mount brackets
7. Engage EMU in AAP
8. Stow LTA, suit arms inside LTA Restraint Bag
9. Connect upper spring hooks (two) over suit shoulders to upper AAP attachment rings (two)
10. Connect lower spring hooks (two) around suit arms to SAFER mount brackets (two)
11. Tighten all LTA bag straps with bag as high as possible on EMU



### NOTE

French hooks should be attached to SAFER mount brackets for launch and landing

## EMU PREP FOR ISS TRANSFER (60 min)

I

- BOTH 1. √PWR – SCU  
 EMUs 2. √PURGE vlv – op (up)  
 3. √O2 ACT – OFF  
 4. √WATER – OFF, switch guard installed  
 5. √Helmet sunshades down, cover installed  
 6. Configure/verify items stowed in tables below  
 Kb ECOK 7. Retrieve EVA Systems Transfer Bag

<b><u>EMU 3005 (M) (Pp)</u></b>	<b><u>EMU 3011 (L) (Bw)</u></b>
<input type="checkbox"/> Helmet (Pp) s/n 1077 <input type="checkbox"/> Valsalva <input type="checkbox"/> LTA (Pp) (attached) <input type="checkbox"/> PP1 gloves s/n 6225 <input type="checkbox"/> Wrist Mirrors (2) <input type="checkbox"/> LTA Restraint Strap installed, if desired	<input type="checkbox"/> Helmet (Bw) s/n 1073 <input type="checkbox"/> Fresnel Lens (1) <input type="checkbox"/> Valsalva <input type="checkbox"/> LTA (Bw) (attached) <input type="checkbox"/> BW1 gloves s/n 6252 <input type="checkbox"/> Wrist Mirrors (2) <input type="checkbox"/> LTA Restraint Strap installed, if desired
<b>EMU Crew Options Kit (Pp)</b>	<b>EMU Crew Options Kit (Bw)</b>
<input type="checkbox"/> LCVG (PP1) <input type="checkbox"/> CCA PP2 <input type="checkbox"/> Pp EVA 1 & 2 Ziplock Bags <ul style="list-style-type: none"> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 2 MAGs</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> TCUs (top, bottom)</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Socks</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Wristlets</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Comfort Gloves</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moleskin</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Hair Restraint</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Sports Bra</li> <li><input type="checkbox"/> X X Patch, Stripes, National Flag</li> </ul> <p>From Kb ECOK  <input type="checkbox"/> Pp EVA 3 Ziplock Bag</p>	<input type="checkbox"/> LCVG (BW1) <input type="checkbox"/> CCA BW2 <input type="checkbox"/> Bw EVA 1 & 3 Ziplock Bags <ul style="list-style-type: none"> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 2 MAGs</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> TCUs (top, bottom)</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Socks</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Wristlets</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Comfort Gloves</li> <li><input type="checkbox"/> X X Fresnel Lens</li> <li><input type="checkbox"/> X X Croakie</li> <li><input type="checkbox"/> X X Patch, Stripes, National Flag</li> </ul> <p>From Kb ECOK  <input type="checkbox"/> Bw EVA 4 Ziplock Bag</p>

## EMU PREP FOR ISS TRANSFER (60 min) (Cont)

<p>From MD Ceiling Stbd 1 Bag G <b>EMU Crew Options Kit (Kb)</b></p> <p><input type="checkbox"/> LCVG  <input type="checkbox"/> 1 Mesh Bag – Spare  <input type="checkbox"/> Kb EVA 2 &amp; 4 Ziplock Bags</p> <p style="padding-left: 20px;"><input type="checkbox"/> 2 MAGs  <input type="checkbox"/> TCUs (top, bottom)  <input type="checkbox"/> Socks  <input type="checkbox"/> Wristlets  <input type="checkbox"/> Comfort Gloves  <input checked="" type="checkbox"/> X Patch, Stripes, National Flag  <input type="checkbox"/> Mole Skin</p> <p><input type="checkbox"/> CCA KB1 &amp; KB2  <input type="checkbox"/> EV3 (Kb) Prime Gloves s/n 6144</p>	
---	--

<b>EVA Systems Transfer Bag</b>	
Current Location	Item
Vol H – Previously gathered on FD2	<input type="checkbox"/> EMU Servicing Kit (Yellow Tag) <input type="checkbox"/> EMU Equipment Bag Crew Specific Compartments (1)
FDF Locker	<input type="checkbox"/> <u>STS-126 CONSUMABLES TRACKING</u> Cue Card (1 of 1) <input type="checkbox"/> <u>EMERGENCY UNDOCKING EVA TRANSFER</u> Cue Card (1 of 1) <input type="checkbox"/> STS-126 EVA Checklist (1 of 2)
SODF Locker	<input type="checkbox"/> STS-126 ISS EVA Systems Checklists (1 of 2) colored <input type="checkbox"/> ISS EVA Cuff Checklist (3) <input type="checkbox"/> Joint Emergency Egress Cue Card (1) <input type="checkbox"/> Ammonia Contamination Cue Card (1)
MD Floor Stbd 1 Bag G	<input type="checkbox"/> 8 DIDBs <input type="checkbox"/> EMU Battery s/n 2037
Locker MA16G	<input type="checkbox"/> 1 BTA

<b>EVA Large ORU Bag</b>	
Current Location	Item
MD Floor Stbd 1 Bag C	<input type="checkbox"/> Large ORU Bag (s/n 1016) (1) <input type="checkbox"/> EVA Grease Gun (J Nozzle) (2) <input type="checkbox"/> J Nozzle Valve Assembly (2)
KB ECOK	<input type="checkbox"/> Tools mesh bags (3)

<b>3 CTB</b>	
Current Location	Item
External Airlock Floor Bag	<input type="checkbox"/> 3 CTB <input type="checkbox"/> Adjustable Equipment Tethers (6) <input type="checkbox"/> EVA Gap Gauge (s/n 1006) (1) <input type="checkbox"/> EVA Large Trash Bag (s/n 1011) (1) <input type="checkbox"/> Trundle Bearing Assemblies (4) <input type="checkbox"/> Trundle Bearing Assembly Bags (6) <input type="checkbox"/> EVA Wipes (4 dry, 4 wet) <input type="checkbox"/> EVA Wipe Caddies (full) <input type="checkbox"/> SARJ Debris Containers (2) <input type="checkbox"/> SARJ Scrapers (2) <input type="checkbox"/> Braycote Cartridges (2) <input type="checkbox"/> P T/V Equipment



## POST-DOCKING EVA TRANSFER AND RECONFIG (90 min)

### NOTE

This procedure assumes that transfer items were preconfigured per EMU PREP FOR TRANSFER TO ISS

1. Transfer following EVA equipment to ISS and update transfer list:

Item	Destination	Transfer Status
EMU 3005 (Pp↑)	Node 1	
EMU 3011 (Bw↑)	Node 1	
ECOK (Pp)	E-Lk	
ECOK (Bw)	E-Lk	
ECOK (Kb)	E-Lk	
EVA Systems Transfer Bag	E-Lk	
EVA Large ORU Bag	E-Lk	
3 CTB from Ext A/L Floor Bag	E-Lk	

EVA Systems  
Transfer Bag

2. Unstow following items and position in E-Lk:
  - EMU Equipment Bag Crew Specific Compartment (1) for Pp
  - STS-126 CONSUMABLES TRACKING Cue Card
  - EMERGENCY UNDOCKING EVA TRANSFER Cue Card
  - STS-126 EVA Checklist
  - STS-126 ISS EVA Systems Checklist (1) colored
  - Joint Emergency Egress Cue Card
  - ISS EVA Cuff C/L (3) → temp in EMU Equipment Bag
  - Ammonia Contamination Cue Card → CDK in C-Lk IV bag
  - EMU Battery → M-02 s/n 1038, EVA Prep and Ops
3. Stow following currently on ISS for return on STS-126
  - Ammonia Contamination Cue Card (old)
  - ISS EVA Systems Checklist (old)
  - ISS EVA Cuff C/L (4)

EMU 3003

4. ✓ EMU installed on fwd EDDA
5. Confirm EMU Battery, REBA, and Metox per STS-126 CONSUMABLES TRACKING Cue Card

### CONFIGURE EMU 3018 FOR Kb (15 min)

EMU 3018

6. ✓ EMU installed on aft EDDA

BOTH EMUS

7. Install EV2 & EV3 Cuff C/L (left arm)

EMU 3018

8. Install following items from Kb ECOK:
  - STS-126 Mission Patch, Stripes, National Flag
  - Gloves (KB1)
9. Install (2) Wrist Mirrors from EMU Equipment Bag
10. Remove Helmet lights and EMU TV assembly; report ID to MCC-H as comm permits; temp stow for installation on EMU 3005
11. Disconnect/Reconnect Helmet to install:
  - CCA KB1 from Kb ECOK
  - Valsalva from EMU Servicing Kit
12. ✓ Helmet sunshades down, cover installed
13. Confirm cam configuration per STS-126 NOMINAL EMU SIZING (EMU CONTINGENCY PROCS)

HEATED GLOVE CHECKOUT (10 min)

- EMU 3018
14. ✓Upper arm connections mated (located under TMG covering; unzip shoulder TMG as reqd for access, then reconfigure)
  15. ✓Glove heater sw – OFF
  16. Connect lower arm pwr harness to gloves (remove Kapton tape as reqd)

NOTE

To avoid excessive battery consumption and heat buildup, deactivate heaters once heat detected at fingertips

17. REBA sw – ON, pull tab toward right arm of suit
  18. Glove heater sw (one per glove) – ON
- When heat detected on all outside fingertips:
19. Glove heater sw (one per glove) – OFF
  20. REBA sw – OFF, pull tab toward left arm of suit
  21. Disconnect lower arm pwr harness from gloves
  22. Stow lower arm and glove pwr harness connectors under TMG
23. Remove from aft EDDA; transfer EMU to Node 1

CONFIGURE EMU 3003 FOR Bw (30 min)

- EMU 3011
24. Install on aft EDDA
  25. Perform 1.330 LTA Restraint Installation/Removal - Removal  
Stow LTA Restraint Bag in Bw ECOK
  26. Remove EMU Battery, stow in M-02 s/n 1038, EVA Prep and Ops
  27. Remove LiOH, cap; stow in Bw ECOK for EVA 3  
Verify s/n per STS-126 CONSUMABLES TRACKING Cue Card  
Install vent port plugs from EMU Equipment Bag
  28. Disconnect/Reconnect Helmet to remove:
    - CCA BW1
    - Fresnel lens – note location
- EMU 3003
29. ✓Helmet sunshades down, cover installed
  30. Disconnect/Reconnect Helmet to install:
    - CCA BW1
    - Fresnel lens
    - Valsalva from EMU Servicing Kit
  31. Remove Waist/Brief; temp stow
  32. Install following from EMU 3011:
    - Complete LTA (s/n 2057; Waist s/n 007)
    - Gloves (Bw1)
    - STS-126 Mission Patch, Stripes, National Flag
  33. Confirm cam configuration per STS-126 NOMINAL EMU SIZING  
(EMU CONTINGENCY PROCS)
- EMU 3011
34. Install temp stowed Waist/Brief
  35. Remove from aft EDDA; transfer EMU to Node 1

CONFIGURE EMU 3005 FOR Pp (20 min)

- EMU 3005
36. Install on aft EDDA
  37. Install Helmet Lights and EMU TV assembly (temp stowed in step 10)
  38. If required, perform 1.330 LTA Restraint Installation/Removal - Removal  
Stow LTA Restraint Bag in Pp ECOK
  39. Install EV1 Cuff checklist on EMU left arm. If needed, remove left glove

40. Remove EMU Battery, stow in M-02 s/n 1038, EVA Prep and Ops
41. Remove LiOH, cap; stow in Pp ECOK for EVA 3  
Verify s/n per STS-126 CONSUMABLES TRACKING Cue Card
42. Install EMU Battery and Metox per STS-126 CONSUMABLES TRACKING  
Cue Card
43. Populate ISS EMU Equipment Bag crew specific compartments,  
as desired

## EMU SWAP FOR EVA 2 (Bw → Kb) (15 min)

### NOTE

This procedure assumes the following procedures have been completed following EVA 1:  
{1.240 POST EVA} (SODF: ISS EVA SYS: EVA PREP/POST)  
{1.605 BSA BATTERY RECHARGE - term} (SODF: ISS EVA SYS: BATTERY OPS)  
{1.605 BSA BATTERY RECHARGE - init} (SODF: ISS EVA SYS: BATTERY OPS)

- |           |                          |  |
|-----------|--------------------------|--|
| Both EMUs | <input type="checkbox"/> | 1. Connect waist ring to HUT                                   |
|           | <input type="checkbox"/> | 2. Reconnect gloves and boots                                  |
| EMU 3003  | <input type="checkbox"/> | 3. Remove Helmet Lights and EMU TV and temp stow               |
|           | <input type="checkbox"/> | 4. ✓Helmet installed, sun shades down, cover installed         |
|           | <input type="checkbox"/> | 5. Remove EMU from fwd EDDA<br>Transfer EMU to Node 1          |
|           | <input type="checkbox"/> | 6. Transfer Bw ECOK to Node 1                                  |
| EMU 3018  | <input type="checkbox"/> | 7. Transfer EMU and Kb ECOK to E-Lk<br>Install EMU on fwd EDDA |
|           | <input type="checkbox"/> | 8. Install Helmet Lights and EMU TV                            |

## EMU SWAP FOR EVA 3 (Kb → Bw) (Bw AFT, Pp FWD) (30 min)

### NOTE

This procedure assumes the following procedures have been completed following EVA 2:  
{1.240 POST EVA} (SODF: ISS EVA SYS: EVA PREP/POST)  
{1.605 BSA BATTERY RECHARGE - term} (SODF: ISS EVA SYS: BATTERY OPS)

- |           |                          |   |
|-----------|--------------------------|---|
| Both EMUs | <input type="checkbox"/> | 1. Connect waist ring to HUT                                    |
|           | <input type="checkbox"/> | 2. Reconnect gloves and boots                                   |
|           | <input type="checkbox"/> | 3. Remove REBAs; temp stow in M-02 s/n 1038 for xfer to MPLM    |
| EMU 3018  | <input type="checkbox"/> | 4. Remove EMU Battery for Battery Recharge Init                 |
|           | <input type="checkbox"/> | 5. Remove Helmet Lights and EMU TV and temp stow                |
|           | <input type="checkbox"/> | 6. ✓Helmet installed, sunshades down, cover installed           |
|           | <input type="checkbox"/> | 7. Install REBA s/n 1006  |
|           | <input type="checkbox"/> | 8. Remove EMU from fwd EDDA<br>Transfer EMU to Node 1           |
|           | <input type="checkbox"/> | 9. Transfer Kb ECOK to Node 1                                   |
| EMU 3005  | <input type="checkbox"/> | 10. Remove EMU from aft EDDA; Install on fwd EDDA               |
|           | <input type="checkbox"/> | 11. Install REBA s/n 1008                                       |
| EMU 3003  | <input type="checkbox"/> | 12. Transfer EMU and Bw ECOK to E-Lk<br>Install EMU on aft EDDA |
|           | <input type="checkbox"/> | 13. Install Helmet Lights and EMU TV                            |

## EMU SWAP FOR EVA 4 (Pp → Kb) (Kb AFT, Bw FWD) (30 min)

### NOTE

This procedure assumes the following procedures have been completed following EVA 3:

{1.240 POST EVA} (SODF: ISS EVA SYS: EVA PREP/POST)

{1.605 BSA BATTERY RECHARGE - term} (SODF: ISS EVA SYS: BATTERY OPS)

{1.605 BSA BATTERY RECHARGE - init} (SODF: ISS EVA SYS: BATTERY OPS)

- |           |                          |  |
|-----------|--------------------------|--|
| Both EMUs | <input type="checkbox"/> | 1. Connect waist ring to HUT   |
|           | <input type="checkbox"/> | 2. Reconnect gloves and boots  |
| EMU 3005  | <input type="checkbox"/> | 3. Remove; stow: <ul style="list-style-type: none"><li><input type="checkbox"/> Helmet Lights and EMU TV – temp stow</li><li><input type="checkbox"/> LiOH – cap and temp stow in Pp ECOK; install Vent Port Plugs</li><li><input type="checkbox"/> REBA – stow in M-02 s/n 1038</li><li><input type="checkbox"/> CCA – stow in Pp ECOK</li><li><input type="checkbox"/> Patch, Stripes, National Flag – stow in Pp ECOK</li><li><input type="checkbox"/> Cuff C/L – cut out FS pages, stow in EMU Equipment Bag</li></ul> |
|           | <input type="checkbox"/> | 4. ✓Helmet installed, sunshades down, cover installed  |
|           | <input type="checkbox"/> | 5. Remove EMU from fwd EDDA<br>Transfer EMU to Node 1  |
|           | <input type="checkbox"/> | 6. Transfer Pp ECOK to Node 1  |
| EMU 3003  | <input type="checkbox"/> | 7. Remove EMU from aft EDDA; install on fwd EDDA   |
| EMU 3018  | <input type="checkbox"/> | 8. Transfer EMU and Kb ECOK to E-Lk<br>Install EMU on aft EDDA   |
|           | <input type="checkbox"/> | 9. Install Helmet Lights and EMU TV temp stowed in step 3  |

## POST EVA EMU RECONFIGURATION AND TRANSFER (180 min)

I

### NOTE

This procedure assumes the following procedures have been completed following EVA 4:  
{1.240 POST EVA} (SODF: ISS EVA SYS: EVA PREP/POST)  
{1.605 BSA BATTERY RECHARGE - term} (SODF: ISS EVA SYS: BATTERY OPS)  
{1.515 METOX BATTERY REPLACEMENT} (SODF: ISS EVA SYS: EMU MAINTENANCE)

1. Retrieve new ISS EVA Systems Checklist from STS; deploy in C-Lk
- EVA Systems  
Transfer Bag 2. Stow EMU Servicing Kit s/n 5005 on E-Lk Wall  
Retrieve EMU Servicing Kit s/n 5002 for return  
Transfer signal conditioners s/n 110 and 111 to kit s/n 5005
3. Stow Bends Treatment Adapter s/n 1004 in M-02 s/n 1038 outer pocket  
Retrieve Bends Treatment Adapter s/n 1009 for return
4. Configure/verify contents of EVA Systems Transfer Bag per following table

#### **EVA Systems Transfer Bag**

- EMU Servicing Kit **s/n 5002**
- BTA **s/n 1009**
- EMU Battery **s/n 2067**
- ISS Cuff Checklist (**4 of 4**)
- ISS EVA Systems Checklist (**old**)
- Ammonia Contamination Cue Card (**old**)
- STS-126 CONSUMABLES TRACKING Cue Card
- EMERGENCY UNDOCKING EVA TRANSFER Cue Card
- Joint Emergency Egress Cue Card (1)
- STS-126 ISS EVA Systems Checklist (1), colored
- STS-126 EVA Checklist
- Crew Specific Compartments (1)

### CONFIGURE EMUs FOR RETURN

- EMU 3018/3003 5. √DIDB Restraint Bag installed
- DCM 6. √O2 ACT – OFF  
√PWR – SCU  
√DCM Purge vlv – Op (up)  
√WATER – OFF, Switch Guard installed
- EMUs 7. Remove following:
  - Helmet Lights and EMU TV; stow on ISS
  - REBAs; stow in M-02
  - Cuff C/L – cut out FS pages, stow in EMU Equipment Bag
  - CCAs – temp stow Bw until LTA restraint installed
  - Patches, Stripes, National Flag – stow in ECOK
  - Tethers/Tools
8. Verify/reconfigure EMUs and ECOK per the following table  
(NOTE: underlined items differ from pre-docking config)

<p style="text-align: center;"><b>EMU 3018 (Pp)</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> EMU Battery (s/n 2072)</li> <li><input type="checkbox"/> LiOH (<u>used</u>)</li> <li><input type="checkbox"/> Helmet (s/n 1076), cover installed</li> <li><input type="checkbox"/> Pp ECOK</li> <li><input type="checkbox"/> LTA (s/n 2082)</li> <li><input type="checkbox"/> Gloves (Pp)</li> <li><input type="checkbox"/> Wrist Mirrors (2)</li> <li><input type="checkbox"/> LTA Restraint installed</li> <li><input type="checkbox"/> CCA PP1 &amp; PP2 → LTA Restraint pouch</li> </ul>	<p style="text-align: center;"><b>EMU 3003 (Bw)</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> EMU Battery (s/n 2073)</li> <li><input type="checkbox"/> LiOH (<u>used</u>)</li> <li><input type="checkbox"/> Helmet (s/n 1071), cover installed</li> <li><input type="checkbox"/> Bw ECOK</li> <li><input type="checkbox"/> LTA (s/n 2057)</li> <li><input type="checkbox"/> Gloves (Bw)</li> <li><input type="checkbox"/> Wrist Mirrors (2)</li> <li><input type="checkbox"/> LTA Restraint installed</li> <li><input type="checkbox"/> CCA BW1 &amp; BW2 → LTA Restraint pouch</li> </ul>
<p style="text-align: center;"><b>EMU Crew Options Kit (Pp)</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pp EVA 1 &amp; 2 Ziplock Bags <ul style="list-style-type: none"> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 2 MAGs (<u>less used items</u>)</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> TCUs (top, bottom)</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Socks</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Wristlets</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Comfort Gloves</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Moleskin</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Hair Restraint</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Sports Bra</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> X X Patch, Stripes, National Flag</li> </ul> </li> <li>Stow in Kb ECOK <ul style="list-style-type: none"> <li><input type="checkbox"/> Pp EVA 3 Ziplock Bag</li> </ul> </li> <li><input type="checkbox"/> LCVG (PP) (w/biomed sternal harness and signal conditioner)</li> </ul>	<p style="text-align: center;"><b>EMU Crew Options Kit (Bw)</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bw EVA 1 &amp; 3 Ziplock Bags <ul style="list-style-type: none"> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 2 MAGs (<u>less used items</u>)</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> TCUs (top, bottom)</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Socks</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Wristlets</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Comfort Gloves</li> <li><input type="checkbox"/> <input type="checkbox"/> X X Fresnel Lens</li> <li><input type="checkbox"/> <input type="checkbox"/> X Croakie</li> <li><input type="checkbox"/> <input type="checkbox"/> X X Patch, Stripes, National Flag</li> </ul> </li> <li>Stow in Kb ECOK <ul style="list-style-type: none"> <li><input type="checkbox"/> Bw EVA 4 Ziplock Bag</li> </ul> </li> <li><input type="checkbox"/> LCVG (BW) (w/biomed sternal harness and signal conditioner)</li> </ul>
<p style="text-align: center;"><b>EMU Crew Options Kit (Kb)</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> EVA 2 &amp; 4 Ziplock Bags <ul style="list-style-type: none"> <li><input type="checkbox"/> <input type="checkbox"/> 2 MAGs (<u>less used items</u>)</li> <li><input type="checkbox"/> <input type="checkbox"/> TCUs (top, bottom)</li> <li><input type="checkbox"/> <input type="checkbox"/> Socks</li> <li><input type="checkbox"/> <input type="checkbox"/> Wristlets</li> <li><input type="checkbox"/> <input type="checkbox"/> Comfort Gloves</li> </ul> </li> <li><input type="checkbox"/> Pp EVA 3 Ziplock Bag</li> <li><input type="checkbox"/> Bw EVA 4 Ziplock Bag</li> <li><input type="checkbox"/> Remaining Mesh Bags</li> <li><input type="checkbox"/> CCA KB1 &amp; KB2</li> <li><input type="checkbox"/> LCVG (KB) (w/biomed sternal harness and signal conditioner)</li> <li><input type="checkbox"/> EV3 Gloves</li> </ul>	

EMU 3003            9. Temp stow in Node 2

- EMU 3005            10. Install on EDDA
11. Remove following:
- Complete LTA (s/n 2082/Waist s/n 039)
  - Arm Rings, Arms, Gloves
  - Cuff C/L – cut out FS pages, stow in EMU Equipment Bag



- EMU 3018
12. Remove following:
    - Complete LTA (s/n 2054/Waist s/n 019)
    - Arms – stow in M-02
    - Gloves – stow in Kb ECOK
  13. Install following from EMU 3005:
    - Complete LTA (s/n 2082/Waist s/n 039)
    - Arm Rings, Arms, Gloves
- EMU 3005
14. Install following:
    - Helmet Lights and EMU TV
    - Arm leg covers
    - Complete LTA (s/n 2054/Waist s/n 019)
- EMU 3018
15. Temp stow in Node 2

## EVA TRANSFER TO SHUTTLE (30 min)

1. Configure/verify contents of EVA External Airlock Floor Bag per following table

<b>EVA Large ORU Bag</b>
<input type="checkbox"/> Adjustable Equipment Tethers (s/n 1010,1013,1014, 1015,1036,1037) (6)
<input type="checkbox"/> Large ORU Bag (s/n 1016) (1)
<input type="checkbox"/> Red RETs (16)

2. Transfer items in table below to Shuttle; report status to MCC when complete

### TRANSFER TO SHUTTLE

<b>Item</b>	<b>Destination</b>	<b>Transfer Status</b>
EMU 3018 (M) with ECOK	Temp stow Middeck	
EMU 3003 (XL) with ECOK	Temp stow Middeck	
Kb ECOK	Temp stow Middeck	
EVA Systems Transfer Bag	Temp stow Middeck	
EVA Large ORU Bag	Temp stow Middeck	

## EVA UNPACK AND STOW (90 min)

1. Unpack and stow items per table below; report status to MCC when complete

### EMU SYSTEMS TRANSFER BAG UNPACK AND STOW

Item	Final Location
EMU 3018 (Pp)	Ext A/L (Stbd AAP)
EMU 3003 (Bw)	Ext A/L (Port AAP)
Kb ECOK; unpack to fit <input type="checkbox"/> ECOK <input type="checkbox"/> CCA KB1 & KB2 <input type="checkbox"/> LCVG (KB) <input type="checkbox"/> EV3 Gloves	MD Ceiling Stbd 1 Bag G
<b>EVA Systems Transfer Bag</b>	MD Ceiling Stbd 1 Bag G
<input type="checkbox"/> <u>STS-126 CONSUMABLES TRACKING</u> Cue Card (1 of 1) <input type="checkbox"/> <u>EMERGENCY UNDOCKING EVA TRANSFER</u> Cue Card (1 of 1) <input type="checkbox"/> STS-126 EVA Checklist (1 of 2)	FDF Locker
<input type="checkbox"/> STS-126 ISS EVA Systems Checklists (1 of 2), colored <input type="checkbox"/> ISS EVA Systems Checklists (old) <input type="checkbox"/> ISS Cuff Checklist (4) (old) <input type="checkbox"/> Joint Emergency Egress Cue Card <input type="checkbox"/> Ammonia Contamination Cue Card (old)	SODF Locker
<input type="checkbox"/> EMU Battery s/n 2067	MD Floor Stbd 1 Bag G
<input type="checkbox"/> BTA (s/n 1009)	Locker MA16G
<input type="checkbox"/> EMU Servicing Kit (s/n 5002) <input type="checkbox"/> EMU Equipment Bag Crew Specific Compartments (1)	Vol H
<b>EVA Large ORU Bag</b> , unpack to fit	MD Floor Stbd 1 Bag C

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EVA PREP

MIDDECK PREP..... TEMP FS 4-2  
EVA PREP ..... TEMP FS 4-3  
    PREP FOR DONNING ..... TEMP FS 4-3  
    EMU DONNING ..... 4-5  
    EMU CHECK..... 4-7  
EMU PURGE ..... 4-7  
EMU PREBREATHE..... 4-8  
    SAFER DONNING ..... 4-8  
EVA COMM CONFIG ..... 4-10  
EVA COMM DECONFIG ..... 4-10  
APPROVED NON-EMU HARDWARE MATRIX ..... 4-11

**WARNING**

Payload bay floods exceed EMU thermal limits during operation. If EVA crew will be operating in vicinity of PLB floods, floods must be turned off now. Cooldown time may be as long as 6 hr

**NOTE**

Wireless Video Heater pwr should be activated at least 4 hr before EVA to ensure quality video

**MIDDECK PREP (30 min)**

- A7 1. WIRELESS VID HTR – ON
- Vol H 2. Unstow EMU Servicing Kit
- AW18A 3. LTG FLOOD (four) – ON
- 4. √EVA Bag installed in airlock
- 5. √Contamination Detection Kit installed in airlock
- 6. √REBA sw – OFF (toward left arm of suit)
- 7. √Helmet lights, helmet light batteries, and EMU TVs installed on helmets  
If EMU TV:
- PLSS 8. √EMU TV power cable demated, connected to ground plug
- 9. Disconnect helmets, temp stow
- HUT 10. Remove Drink Bag Restraint Bag

**NOTE**

Drink bag should be used within 24 hr if filled with non-iodinated water

- 11. Fill drink bag from galley with cold water, remove gas and insert drink bag in Restraint Bag
- 12. Install Drink Bag Restraint Bag in HUT and dispose of fill tool in wet trash
- 13. Unstow comm cap and inspect moisture barrier earphone diaphragms (MBEDs) (two) for damage. Replace if reqd (EMU Servicing Kit)
- 14. Apply anti-fog (EMU Servicing Kit), wipe off:  
Helmets (not Fresnel lens)  
EV glasses, attach to comm cap
- 15. Stow EMU Servicing Kit
- 16. Install helmets, lock
- 17. Attach Cuff C/L to EMUs
- 18. √Wrist mirrors installed
- 19. Stage crew preference items in EMU Equipment Bag as reqd

**CAUTION**

EV crewmembers should minimize application of hygiene and hydrocarbon-based products prior to EVA day to avoid introduction of irritants into EMU. Reference APPROVED NON-EMU HARDWARE MATRIX, 4-11, for acceptable items in EMU

**EVA PREP (90 min)**

MET ____/____:____	MET ____/____:____	MET ____/____:____
--------------------	--------------------	--------------------

X: SM 60 SM TABLE MAINT

1. Contact MCC for uplink of SM ALERT TMBU (if desired)  
Changes enclosed in

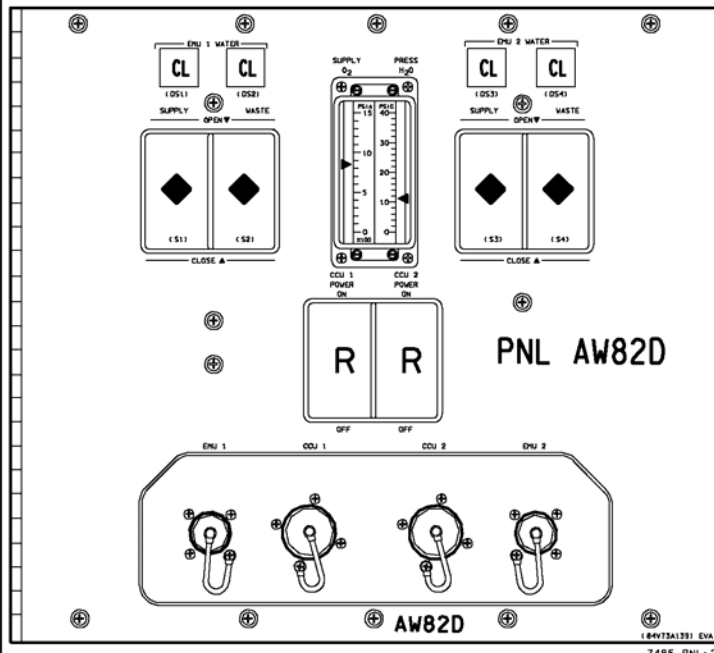
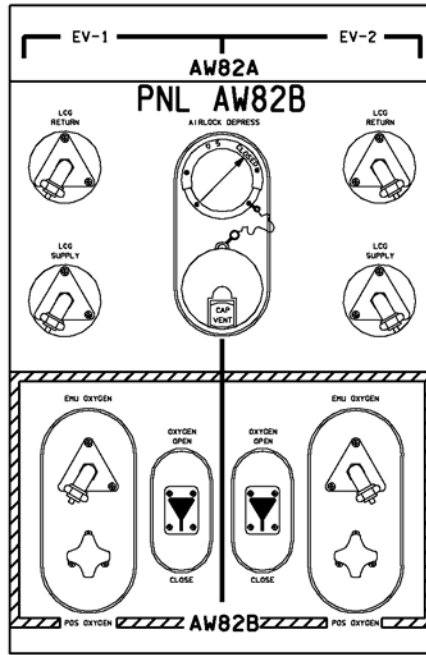
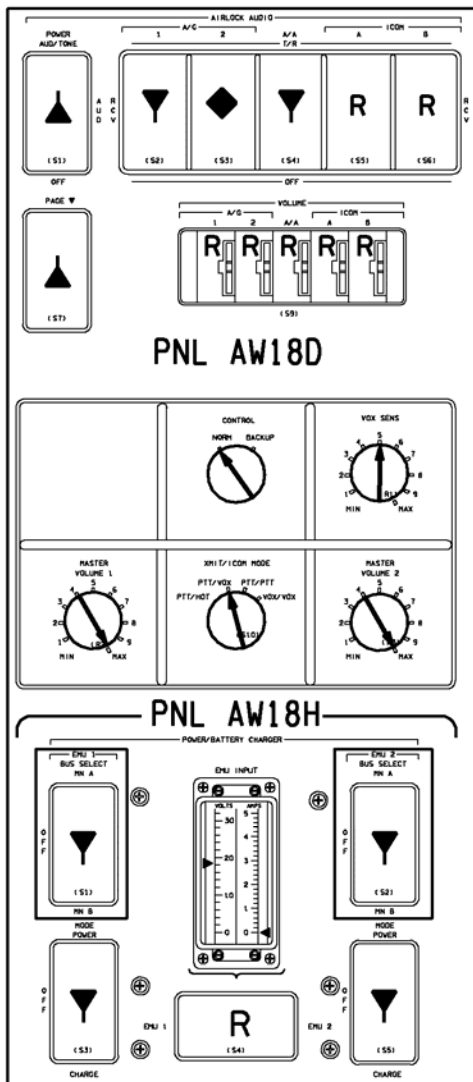
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LCG 2 SPLY ZN 1 T	0640182	<input style="width: 40px; text-align: center;" type="text" value="36"/>	<input style="width: 40px; text-align: center;" type="text" value="85"/>
H2O LINE T 2			
SPLY ZN 2 T	0640184	48	<input style="width: 40px; text-align: center;" type="text" value="100"/>
LCG 2 SPLY ZN 2 T	0640185	<input style="width: 40px; text-align: center;" type="text" value="36"/>	<input style="width: 40px; text-align: center;" type="text" value="82"/>
O2 LN T			
SPLY ZN 2 T	0640186	OSL	<input style="width: 40px; text-align: center;" type="text" value="80"/>

**PREP FOR DONNING (30 min)**

- |      |          |  |   |
|------|----------|--|---|
| BOTH | DCM      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 2. Retrieve, position SCU; remove DCM cover           |
|      |          | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 3. Connect SCU to DCM, $\checkmark$ locked            |
|      | AW82B    | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 4. EV-1, EV-2 O2 vlv (two) – op                       |
|      | MO13Q    | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 5. $\checkmark$ ARLK H2O S/O VLV – OPEN (tb-OP)       |
|      | MD(flr)  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 6. $\checkmark$ EMU O2 ISOL VLV – OP                  |
|      | ML86B:C  | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 7. $\checkmark$ cb MNC EXT ARLK HTR ZN 1,2 (two) – op |
|      | L2/MO10W | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 8. $\checkmark$ O2 XOVR SYS 1,2 (two) – OP            |
| BOTH | DCM      | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 9. PWR – BATT   |

**CAUTION**  
EMU must be on BATT pwr when  
airlock power supply turned on

- |       |  |   |
|-------|--|---|
| AW18H | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 10. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR<br>BUS SEL (two) – MNA(MNB)  |
| DCM   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 11. PWR – SCU   |
|       | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 12. $\checkmark$ STATUS: <input style="width: 60px; text-align: center;" type="text" value="BATT VDC"/> $\geq$ 20.3 |
|       | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 13. Verify panels as shown next page  |





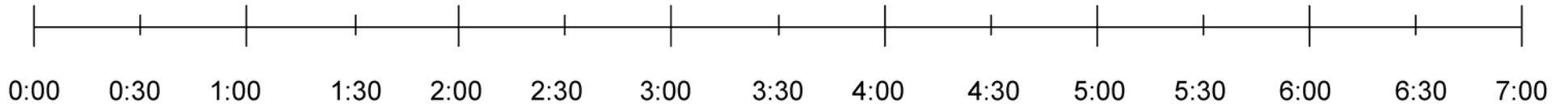
TIMELINES

EVA SUMMARY TIMELINES .....	FS 7-3
EVA 1	
EVA 1 SUMMARY TIMELINE .....	FS 7-4
EVA 1 PRE TOOL CONFIG .....	FS 7-5
EVA 1 BRIEFING CARD .....	FS 7-7
EVA 1 INHIBIT PAD .....	FS 7-9
EVA 1 NOTES/CAUTIONS/WARNINGS .....	FS 7-11
EVA 1 EGRESS/SETUP .....	FS 7-14
EVA 1 ORU TRANSFER .....	FS 7-15
EVA 1 SSRMS CLEANUP/EFBM COVER REMOVAL .....	FS 7-17
EVA 1 SARJ .....	FS 7-18
EVA 1 SARJ – TBA REMOVE/INSTALL .....	FS 7-19
EVA 1 SARJ – CLEAN/LUBE RACE RING .....	FS 7-20
EVA 1 SARJ – SLR REMOVAL .....	FS 7-21
EVA 1 CLEANUP/INGRESS .....	FS 7-22
EVA 1 POST TOOL CONFIG .....	FS 7-23
STBD SARJ CUE CARD .....	FS CC 7-35
POST SARJ CUE CARD .....	FS CC 7-36
EVA 2	
EVA 2 SUMMARY TIMELINE .....	FS 7-37
EVA 2 PRE TOOL CONFIG .....	FS 7-38
EVA 2 BRIEFING CARD .....	FS 7-40
EVA 2 INHIBIT PAD .....	FS 7-42
EVA 2 NOTES/CAUTIONS/WARNINGS .....	FS 7-44
EVA 2 EGRESS/SETUP .....	FS 7-46
EVA 2 CETA CART RELOCATE .....	FS 7-47
EVA 2 LEE A LUBRICATION .....	FS 7-52
EVA 2 SARJ .....	FS 7-56
EVA 2 SARJ – TBA REMOVE/INSTALL .....	FS 7-57
EVA 2 SARJ – CLEAN/LUBE RACE RING .....	FS 7-58
EVA 2 CLEANUP/INGRESS .....	FS 7-59
EVA 2 POST TOOL CONFIG .....	FS 7-60
EVA 3	
EVA 3 SUMMARY TIMELINE .....	FS 7-71
EVA 3 PRE TOOL CONFIG .....	FS 7-72
EVA 3 BRIEFING CARD .....	FS 7-74
EVA 3 INHIBIT PAD .....	FS 7-76
EVA 3 NOTES/CAUTIONS/WARNINGS .....	FS 7-77
EVA 3 EGRESS/SETUP .....	FS 7-79
EVA 3 SARJ .....	FS 7-80
EVA 3 CLEANUP/INGRESS .....	FS 7-81
EVA 3 POST TOOL CONFIG .....	FS 7-82
EVA 4	
EVA 4 SUMMARY TIMELINE .....	FS 7-83
EVA 4 PRE TOOL CONFIG .....	FS 7-84
EVA 4 BRIEFING CARD .....	FS 7-86
EVA 4 INHIBIT PAD .....	FS 7-88
EVA 4 NOTES/CAUTIONS/WARNINGS .....	FS 7-90
EVA 4 EGRESS/SETUP .....	FS 7-93
EVA 4 REMOVE P3 MLI COVERS .....	FS 7-94
EVA 4 PORT SARJ LUBE .....	FS 7-95
EVA 4 EFBM COVER INSTALL/JEM RMS GROUNDING TABS .....	FS 7-97
EVA 4 INSTALL JEM HANDRAILS AND WIFs .....	FS 7-98
EVA 4 GPS ANTENNA INSTALL .....	FS 7-99

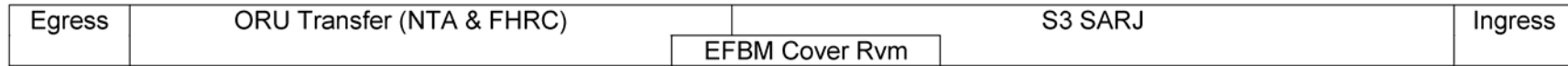
TIMELINES

EVA 4 JEM CLEANUP .....	FS 7-100
EVA 4 ETVCG INSTALL .....	FS 7-101
EVA 4 S1/P1 RADIATOR IMAGERY .....	FS 7-103
EVA 4 P3 MLI COVER INSTALL/TUS CABLE PICTURES/GET-AHEAD LIST ...	FS 7-104
EVA 4 CLEANUP/INGRESS .....	FS 7-105
EVA 4 POST TOOL CONFIG.....	FS 7-106
GET-AHEADS	
INHIBIT PAD .....	FS 7-118
SSAS BBC RECONFIG .....	FS 7-119
S1/S3 AND P1/P3 FLUID JUMPER INSTALL .....	FS 7-122
PHRC P-CLAMP RELEASE.....	FS 7-124
S3 ZENITH OUTBOARD CAS DEPLOY.....	FS 7-128

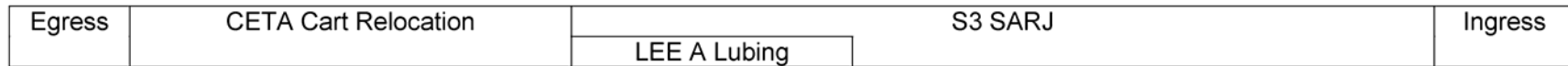
# EVA 1 SUMMARY TIMELINES



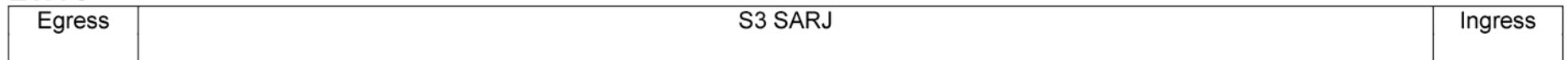
## EVA 1



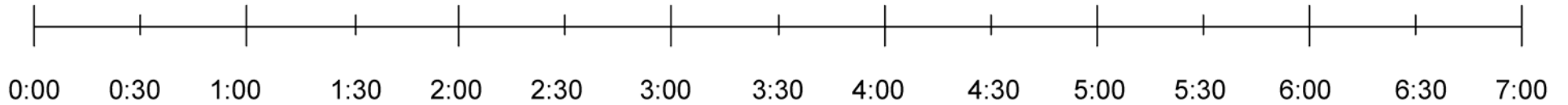
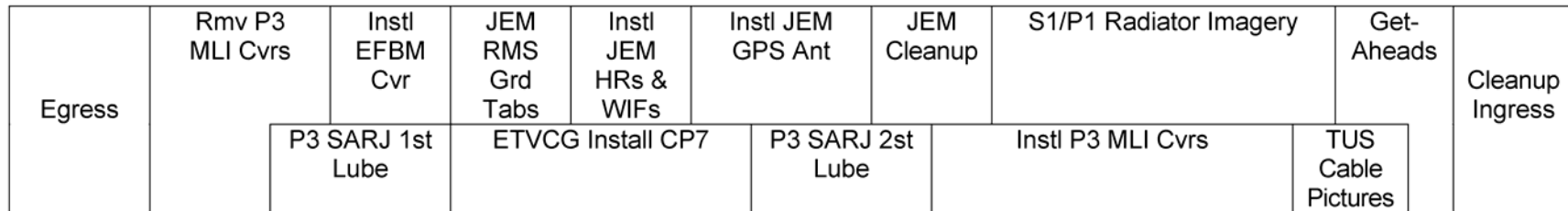
## EVA 2



## EVA 3



## EVA 4



# EVA 1

## EVA 1 SUMMARY TIMELINE

PET HR : MIN	IV/SSRMS	EV1 (Pp)	EV2 (Bw)	
00:00		POST DEPRESS (00:05) EGRESS/SETUP (00:25)	POST DEPRESS (00:05) EGRESS/SETUP (00:25)	00:00
01:00		ORU TRANSFER (02:15) NTA Remove (00:45) NTA Install (00:30) FHRC Remove (00:30) FHRC Install (00:30)	ORU TRANSFER (02:15) NTA Remove (00:45) NTA Install (00:30) FHRC Remove (00:30) FHRC Install (00:30)	01:00
02:00				02:00
03:00		SSRMS CLEANUP (00:15) SARJ (03:00) SARJ Setup Cover 8 Remove TBA 10 Remove Clean Lube TBA 10 Install Cover 8 Install Cover 9/10 Remove TBA 11 Remove Clean Lube Cover 9/10 Install Get-Ahead: Cover 11	EFBM COVER REMOVAL (01:00) SARJ (02:15) SARJ Setup Cover 22/1 Remove TBA 6 Remove Clean Lube TBA 6 Install Cover 22/1 Install Get-Ahead: SLR 4A	03:00
04:00				04:00
05:00				05:00
06:00		CLEANUP/INGRESS (00:25) PREREPRESS (00:05)	CLEANUP/INGRESS (00:25) PREREPRESS (00:05)	06:00

# EVA 1 PRE TOOL CONFIG

## EV1

- MWS
- BRT (L)
- RET (eq-eq)
- Wire Tie (2)
- T-Bar
- RET (eq-eq)
- WIF Adapter
- RET (eq-eq) w/PIP Pin
- Adj Equip Tether (2)
- Wire Tie
- Small Shuttle Trash Bag
- Swing Arm (R)
- RET (eq-eq)
- PGT [A4 6.3ft-lb, CAL, MTL 30.5] s/n \_\_\_\_\_
- PGT Battery s/n \_\_\_\_\_
- 7/16 (wobble) Socket-6 ext
- Camera (on integral RET)
- Camera Bracket
- D-ring Extender (1, R D-ring)
- 55-ft Safety Tether (R D-ring Ext)
- 55-ft Safety Tether (R D-ring Ext)
- Waist Tether (2, R & L on D-ring)
- SAFER
- WVS

## EV2

- MWS
- BRT (L)
- RET (eq-eq)
- Wire Tie (2)
- T-Bar
- RET (eq-eq) (to R D-ring Ext)
- RET (eq-eq) w/PIP Pin
- Adj Equip Tether (2)
- Wire Tie (2)
- Small ISS Trash Bag
- Swing Arm (R)
- RET (eq-eq)
- PGT [A6 8.3 ft-lb, CAL, MTL 30.5] s/n \_\_\_\_\_
- PGT Battery s/n \_\_\_\_\_
- 7/16 (wobble) Socket-6 ext
- D-ring Extender (2, R & L D-ring)
- 85-ft Safety Tether (R D-ring Ext)
- Spare 85-ft Safety Tether (L D-ring)
- Waist Tether (1, L on D-ring Ext)
- SAFER
- WVS

## AIRLOCK CONFIG

- RET (Lg-eq)
- Large ORU Transfer Bag
- Adj Equip Tether (on outside)
- Fish Stringer Tether (Heide)
- TBA Bag
- TBA Bearing Package (on bag tether)
- NOTE: Engage tether hook from inside of mount**
- TBA Dust Cap
- TBA Mount Package (on bag tether)
- NOTE: Match s/n's of Bearing and Mount Packages**
- TBA Bag
- TBA Dust Cap (on bag tether)
- SARJ Dust Cap (on bag tether)
- TBA Bag
- TBA Bearing Package (on bag tether)
- TBA Dust Cap
- TBA Mount Package (on bag tether)
- Crewlock Bag
- RET (eq-eq) (spare on outside door handle)
- Adj Equip Tether (2) (on outside)
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/Straight Nozzle
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/J Nozzle
- EVA Wipe Caddy (int RET)
- EVA Wipes (6) (2 wet, 4 dry)
- Scraper Debris Container (int RET)
- RET (eq-eq)
- Scraper
- Large Trash Bag (int RET)
- EVA Wipe Caddy
- EVA Wipes (6) (2 wet, 4 dry)
- Camera w/Flash (on integral RET)
- Camera Bracket

Tether Counts: (Red RETs)  
 RETs (eq-eq) = 15      RETs (PIP Pin) = 2  
 RETs (Lg-eq) = 3      Adj Equip Tethers = 10

## AIRLOCK CONFIG (Cont)

- Large ORU Transfer Bag (Cont)
- Fish Stringer Tether (Steve)
- TBA Bag
- TBA Bearing Package (on bag tether)
- TBA Dust Cap
- TBA Mount Package (on bag tether)
- TBA Bag
- TBA Dust Cap (on bag tether)
- SARJ Dust Cap (on bag tether)
- Crewlock Bag
- RET (eq-eq) (spare on outside door handle)
- Adj Equip Tether (2) (on outside)
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/Straight Nozzle
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/J Nozzle
- EVA Wipe Caddy (int RET)
- EVA Wipes (6) (2 wet, 4 dry)
- Scraper Debris Container (int RET)
- RET (eq-eq)
- Scraper
- Large Trash Bag (int RET)
- RET (Lg-eq)
- Crewlock Bag (for EFBM Covers)
- RET (eq-eq)
- Adj Equip Tether (on outside)

**NOTE:** Prior to use, inspect the following hardware:  
 RET cords for fraying  
 Safety Tether/Waist Tether LAS: No Red Visible  
 ISS Trash Bag: Bristle deformation/damage, after having stowed tools in trash bag  
 Prime Grease Guns w/J Nozzle

# EVA 1 PRE TOOL CONFIG (Cont)

## AIRLOCK CONFIG (Cont)

- Staging Bag
- Fish Stringer Tether
- Wire Tie Caddy
- Velcro/Tape Caddy
- PGT
- PGT Battery
- 7/16 (wobble) Socket-6 ext
- Vise Grips
- Ratchet Wrench
- 7/16 (rigid) Socket-9 ext
- Needle Nose Pliers
- Spare 55-ft Safety Tether
- Spare WIF Adapter
- Fish Stringer
- Connector Cleaner Tool Kit
- Pin Straightener Assy
- Probe
- Pry Bar
- MWS Key Strap Assy
- Long Duration Tie Down Tethers (2)
- Wheel Bogie PIP Pin

s/n \_\_\_\_\_  
s/n \_\_\_\_\_

- RET (Lg-eq)
- Crewlock Bag
- EVA Wipe Caddy
- EVA Wipes (6 wet)
- Fish Stringer Tether
- EVA Wipes (6 dry)

## AIRLOCK CONFIG (Cont)

- IV Bag
- Towels (2)
- Contamination Detection Kit
- GP Caddy (2)
- Adjustable Thermal Mittens (2)
- Socket Caddy (hatch cont) w/RET (eq-eq) (Black)
- 1/2 Socket-8 ext
- 7/16 (wobble) Socket-6 ext (spare)
- DCM Plug (SAFER Hardmount) (2)
- RET (eq-eq) (2) (Black)

## EXTERIOR CONFIG

- S0 HR 3529 – 55-ft Safety Tether
- S0 HR 3539 – 55-ft Safety Tether

# EVA 1 BRIEFING CARD

Aft EDDA \_\_\_\_\_  
Fwd EDDA \_\_\_\_\_  
Suit IV \_\_\_\_\_  
Task IV \_\_\_\_\_  
M1/M2 \_\_\_\_\_

Hygiene Break Reprass (GMT) \_\_\_\_\_:\_\_\_\_\_  
Depress to 10.2 \_\_\_\_\_:\_\_\_\_\_  
Start Purge \_\_\_\_\_:\_\_\_\_\_  
PET 00:00 \_\_\_\_\_:\_\_\_\_\_  
\_\_\_\_\_

## General Briefing

### 1. Hygiene Break & EVA Prep – Suit IV

- Get-up Plan
- Prebreathe protocol review (Notes and Warnings)
- Equipment lock activities – IV responsibilities
- Suit donning plan – special requests
- SAFER, MWS, Safety tethers, bag stowage
- Airlock depress review

### 2. EV Crew Procedure Review – EV CMs

- Egress Plan, √Safety tethers
- Review first post-egress steps
- Order of tasks (summary timeline)
- Translation plan, fairleads, and tether swaps
- Hazards
- Ingress Plan

### 3. Other Procedure Review – Task IV

- Get-ahead tasks
- Constraints – ground and flight
- Notes, Cautions, and Warnings review
- Contingency procedures – cribsheet

### 4. Communications – Task IV

- Overall setup: Big loop, A/G2, S/G2, ICOM, remind EV crew when mode swapping
- EV/IV comm protocol review – Use EV1/2/3 for DCM sw throws (all time in A/L), use first names otherwise

### 5. Robotics – M1/M2

- SRMS/SSRMS initial position, maneuvers, clearances
- Coordinate Frames
- SRMS/SSRMS comm protocol review – expected calls, use first names
- GCA – Give direction and approx distance
- Positive handover who is giving GCA
- Cameras

### 6. Emergencies Review – Suit IV/Task IV

- Emergency suit doff and power down
  - √Expedited Suit Doffing cue card pre-positioned for EVA day
- Loss of comm
- EMU malfunctions
- Lost tools
- Lost crewmember
- DCS
- Abort and Terminate scenarios, protocols
- Hand signal reviews

### 7. Post EVA – Suit IV

- Suit doffing responsibilities
- Post EVA plan

### 8. Reminders – Task IV

- Translate slow (then space is like water). Relax grip
  - Be extra careful on non-standard routes or orientations
  - Don't hop
- Monitor safety tether
- Prior to moving and ingress, √BRT & Swingarm stowed
- If you get a mal, read the caution and warning message so everyone knows what it is
- Be disciplined when tired
- Openness: When you have boot or glove pain let us know
- OK for IV and ground to check on us. If you need update, ask
- Let mistakes pass
- Manage frustration (slow down, if needed)
- Cold soak before ingress
- Verify PGT settings. PGT collars are easy to bump
- Translation Adaptation plan

## EVA 1 BRIEFING CARD (Cont)

### Generic Calls:

- ❑ Day/Night Cycles
  - √Lights, visors, gloves, tethers, and tools
  - Glove Checks: Report any damaged/missing RTV, Vetran condition
- ❑ Tether swaps:
  - Crew Report: **“Gate closed, slider locked”**
  - Tether Shuttle – Crew Report: **“Slider locked”**
- ❑ Equipment Tether Discipline
  - “Make before you break”
  - Check all gates closed
- ❑ √Both SAFER valves down at egress
  - Crew Report: **“Both handles down”**
- ❑ √APFR locking collar Black-on-black and pull test
  - Crew Report: **“Black-on-black, good pull test”**
- ❑ √PGT Green light on for bolt engage
  - May get Lo Torque msg at bolt release
  - Crew Report: **“XX turns, XX ft-lb, green light”**
- ❑ √Connectors for no bent pins, no FOD, check EMI band and inhibits in place
  - EV Report: **“Pins good, no FOD, Good EMI Band”**
  - IV: √MCC **“Are inhibits in place?”**
- ❑ √Tethers and Tools clear prior to SSRMS ORU movement
  - Each EV report: **“Tethers and tools clear”**
- ❑ Tool inventory (when leaving worksite)
  - Bags: EV call out items, IV check off on Tool Matrix
  - MWS: EV call out, BRT – MWS – Swing Arm
  - Confirm all changes from the checklist are accounted for



# EVA 1 INHIBIT PAD

## Orbiter

TCS	
L12	<ol style="list-style-type: none"> <li>√TCS POWER – OFF</li> <li>√Switch guard in place</li> </ol>
KU-BAND ANTENNA	
MCC-H	<ol style="list-style-type: none"> <li>√KU-BAND Mask – active</li> <li>√KU-BAND EVA Protect Box – active</li> </ol>
RCS	
IV	If EV crew < 27 ft from FRCS
O14,15,16	<ol style="list-style-type: none"> <li>√DAP: VERN, FREE, LO Z (flt specific check with GNC)</li> <li>√RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF LOGIC (four) – OFF</li> </ol>
MCC-H	3. √Above RCS config
IV	<ol style="list-style-type: none"> <li>√RCS F – ITEM 1 EXEC (*)</li> <li>√JET DES F1U – ITEM 17 (*)</li> <li>F3U – ITEM 19 (*)</li> <li>F2U – ITEM 21 (*)</li> </ol>
S-BAND ANTENNAS	
<u>NOTE</u>	
Possible loss of comm when forced LL FWD antenna	
IV	If EV crew < 2 ft from S-Band antenna
A1R	<ol style="list-style-type: none"> <li>S-BAND FM ANT – XMIT LOWER/RCVR UPPER</li> <li>√MCC, lower antenna selected</li> </ol>
C3	If no comm, or on MCC GO
C3	<ol style="list-style-type: none"> <li>S-BAND PM ANT – LL FWD</li> </ol>
C3	When EVA crewmember at least 2 ft away from all S-Band upper antennas
C3	<ol style="list-style-type: none"> <li>S-BAND PM ANT – GPC</li> </ol>
LMC	
R1	1. PL AFT MNC – OFF

## Ground

All EVAs	
Ground Radar MCC-H	1. √FIDO console, ground radar restrictions in place for EVA

## USOS

PCU	
<u>NOTE</u>	
PCUs may require up to 1 hr warm-up period before they are operational	
MCC-H	<ol style="list-style-type: none"> <li>√PCUs (two) operational in discharge mode and one of the following: <ol style="list-style-type: none"> <li>CCS PCU EVA hazard control FDIR enabled</li> <li>No more than two arrays unshunted and oriented &lt; 105 deg from the velocity vector</li> </ol> </li> </ol>
If one or both PCUs failed:	
<ol style="list-style-type: none"> <li>No more than two arrays unshunted and oriented &lt; 105 deg from velocity vector</li> </ol>	
Mobile Transporter	
MCC-H	1. √MT latched
TUS	
MCC-H	1. Verify RPCM S04B_F RPC 17 – OPEN
ESP-3 (required prior to releasing NTA from ESP-3)	
MCC-H	<ol style="list-style-type: none"> <li>CRPCM 2P CRPC 5 – OPEN</li> <li>CRPCM 2R CRPC 5 – OPEN</li> </ol>

## EVA 1 INHIBIT PAD (Cont)

### USOS (Cont)

S3 SARJ  
MCC-H SARJ at 105 deg  
1. √DLA (1) – LOCKED  
2. All motor setpoints set to zero  
3. All motors deselected

SSPTS  
MCC-H  
1. RPCM LA1A4A D RPC 3 – Open, Close Cmd Inhibit  
2. RPCM LA2A3B D RPC 1 – Open, Close Cmd Inhibit  
3. RPCM Z14B A RPC 2 – Open, Close Cmd Inhibit  
4. RPCM Z13B A RPC 2 – Open, Close Cmd Inhibit

### RSOS

SM Antennas  
IV  
1. GTS – Deactivate  
2. ARISS (Ham Radio) – Deactivate or VHF  
(144-146 MHz) TX only

### JEM

JPM Window  
IV Close JPM window shutters (2)

EFBM  
SSIPC PDB A2 RPC01 – Op

JEMRMS  
SSIPC RIP MA Brake – On  
MDP Main Mode – Stby Mode

HTV PROX Antenna  
SSIPC √TRX Power – OFF  
√TX Power – OFF

### COL

EuTEF  
COL-CC Verify PLEGPAY Power Status (ETF\_PLEGPAY\_Pwr\_Stat) – OFF

## EVA 1 NOTES/CAUTIONS/WARNINGS

### NOTES

1. Bolt install: Report torque and turns
2. Bolt release: Report torque and turns if different from published range
3. EVA connectors: After disconnection and prior to connection; verify pin and EMI band integrity; verify connector free of FOD
4. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity

### CAUTION

#### **ISS Constraints**

- A. Avoid inadvertent contact with
1. Grapple fixture shafts (drylube)
  2. PIP pins
  3. TCS Reflectors [PMA2,PMA3]
  4. APAS hardware [PMA2,PMA3]
  5. CETA Lights (Z-93 paint) [LAB,S1, Node 1]
  6. Passive UMAs
  7. MBS/SSRMS/SPDM/JEMRMS taped radiative surfaces: VDU, ACU, JEU, JEMRMS EE, LEU, MCU, CRPCMs, and Cameras
  8. Deployed TUS cable [Nadir CETA rail]
  9. SPDM SJEU, EP, OTCM, LEU, and LEE VDU Radiator surfaces
  10. Open CBM petal covers, LAB window shutter, and JPM window shutter
  11. JTVE Cameras
  12. S0/Node 2 Fluid Tray hardlines at Node 2 end are limited to 25 lb
  13. JEM Airlock target and pin
- B. Electrical cables
1. Avoid bend radii < 10 times cable diameter
- C. For structural reasons
1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
  2. Avoid performing shaking motions (sinusoidal functions) more than four cycles
  3. Avoid kicking S1/P1 radiator beam. If any of these occur, wait 2 to 5 min to allow structural response to dissipate

### CAUTION

#### **ISS Constraints (Cont)**

- D. SARJ Hardware
1. During MLI cover fastener release: Limit turn count to minimum required, minimize side loading bolt head, and maintain axial force on fastener to compress spring during rotation
  2. Avoid scratching or nicking the Race Ring while working on repair
  3. Two TBAs can only be out at the same time at 90, 120, or 180 deg
  4. Port SARJ must be locked for EVA ops outboard of starboard AJIS Struts
- E. Other
1. WIS Antennas: Do not use as handholds [Node 1,LAB]
  2. MLI handholds are not rated for crewmember translation loads
  3. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged
- Shuttle Constraints**
- F. Avoid inadvertent contact with
1. WVS Antenna [ODS Truss & PLB Sill]
  2. Payload Bay and Camera wire harnesses, cables, cable guides, and connectors
- G. No touch
1. OBSS saddle contacts (when OBSS unberthed) [OBSS]
  2. Monkey fur [PLB]
  3. Cameras: Metallic surfaces [PLB]
  4. Ku-Band Antenna black dish and gold thermal blankets [PLB]

## EVA 1 NOTES/CAUTIONS/WARNINGS (Cont)

### WARNING

#### ISS Constraints

- A. Avoid inadvertent contact with
  - 1. Grapple fixture targets and target pins
  - 2. Stay inboard of SARJ when active
  - 3. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate
- B. Handrails
  - 1. Handrails previously used for MISSE attachment may not be used as a safety tether point [A/L endcone 564 & 566, A/L Tank 2 nad/fwd & port/fwd, P6 5389]
- C. Pinch
  - 1. NZGL connector linkage. Use caution when mating/locking
  - 2. EV side of IV Hatch during Hatch operation (also snag hazard) [A/L]
  - 3. LAB window shutter and CBM petal cover and JPM window shutter linkages during operation
  - 4. JEMRMS HRM capture latches
  - 5. JEM Cameras (JTVEs, EVE, WVE)
  - 6. JEM EFBM capture latches
- D. RF radiation exposure
  - 1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1]
  - 2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1]
  - 3. Stay 1 ft from UHF Antenna when powered [LAB,P1]

### WARNING

#### ISS Constraints (Cont)

- E. Sharp Edges
  - 1. Inner edges of WIF probes
  - 2. APFR active WIF probes
  - 3. Mating surfaces of EVA connectors  
Avoid side loads during connector mating
  - 4. Spring loaded captive EVA fasteners (e.g., 6B-boxes, SARJ Covers); end of spring may protrude
  - 5. PMA umbilical launch restraints-exposed bolt threads
  - 6. SPDM OTCM gripper jaws
  - 7. Keep hands away from SSRMS/POA/SPDM LEE/JEMRMS EE opening, snares, and PDGF curvic coupling (teeth)
  - 8. Port/Aft portion of A/L circular HR [HR 0506]
  - 9. Interior of JEMRMS HRMs
  - 10. JEM A/L hatch corners

### WARNING

#### ISS Constraints (Cont)

- F. Thermal
  - 1. EVA connectors with booties may become hot if left uncovered. Handling may need to be limited.
  - 2. PMA handrails may be hot. Handling may need to be limited
  - 3. Turn off glove heaters when comfortable temp reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
  - 4. Uncovered trunnion pins may be hot
  - 5. SSRMS/MBS/SPDM/JEMRMS/JTVE operating cameras and lights may radiate large amounts of heat
  - 6. Stay  $\geq 1$  ft away from PMAs and MMOD shields  $> 270$  degF if EMU sun visor up; limit time to 15 min or less if  $> 300$  degF
  - 7. Stay at least 0.5 ft away from PMA and MMOD shields  $> 325$  degF
  - 8. Do not touch EMU protective visor if temp has been  $< -134$  degF for  $> 15$  min
  - 9. No EMU TMG contact with PMAs and MMOD shields  $> 320$  degF
  - 10. No EMU boot contact with foot restraint when temp  $< -120$  degF or  $> 200$  degF
  - 11. Columbus end cones may violate touch temperature constraints when  $-75 \leq \beta \leq -60$  or  $60 \leq \beta \leq 75$
  - 12. JPM port end cones may violate touch temperature constraints when  $\beta > 60$  deg

## EVA 1 NOTES/CAUTIONS/WARNINGS (Cont)

### **WARNING**

#### **ISS Constraints (Cont)**

##### **G. Electrical Shock**

1. Stay  $\geq 2$  ft from ungrounded floating connectors if not unpowered
  - SSPTS connectors include NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA2 Stbd and Port
  - MBS Cross-Connect jumpers (translate past these using UMA handrails) Include S0 EVA Power Cables (inside S0 Bay 00 Face 4, Bay 01 Face 3) ESP-2 jumper (inside S0 Bay 03 Face 4)
2. Do not touch SPDM CLPA 1 electrical connector prior to camera installation
3. Do not touch blemishes on zenith TUS cable

##### **H. SARJ Hardware**

1. Sharp edge potential on TBA bearing package and mount
2. SARJ must be locked to prevent rotation when EV crew is within 2 ft of rotational plane

### **WARNING**

#### **Shuttle Constraints**

##### **I. Arcing/Molten Debris**

1. Stay  $\geq 2$  ft from exposed Stbd Fwd MPM contacts [PLB]
2. Stay above PLB sill when within 1 ft of powered ROEU connector [PLB]

##### **J. Pinch**

1. PRLA operation [PLB]

##### **K. RF radiation exposure**

1. Stay 3.28 ft from S-Band Antenna when powered
2. Stay 0.33 ft from top and side of UHF PLB Antenna radome surface when in low powered mode [ODS truss]
3. Remain below the level of the PLB door mold line for first 20 in Aft of Fwd bulkhead when S-Band Antenna powered [PLB]
4. Remain on the inboard side of the Stbd slidewire (sill handrails if slidewire not installed) for first 20 ft Aft of Fwd bulkhead when Ku-Band Antenna powered [PLB]

### **WARNING**

#### **Shuttle Constraints (Cont)**

##### **L. Sharp Edges**

1. PRLA grounding wipers [PLB]
2. TCS connector backshells have exposed threads [ODS]

##### **M. Thermal**

1. Illuminated PLB lights; do not touch
2. OBSS grapple fixture shafts/cams may be hot. Limit handling if required
3. Stay 27 ft from PRCS when powered
4. Stay 3 ft from VRCS when powered
5. Stay 3 ft from APU when operating

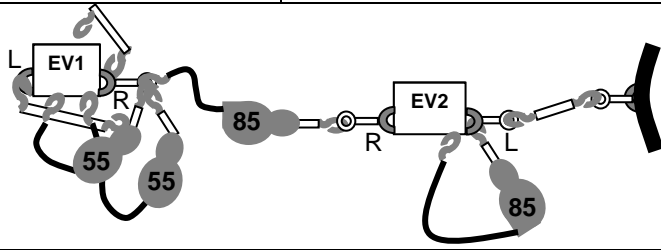
##### **N. Contamination**

1. Stay out of the immediate vicinity of leaking jet or APU


##### **O. Lasers**

1. Do not look at LDRI diffuser or LCS laser aperture window


# EVA 1 EGRESS/SETUP (00:25)

IV/SSRMS	EV1	EV2
	<p>Initial Config: EV2 85-ft Safety Tether to R D-ring Ext</p> 	<p>Initial Config: Waist Tether from L D-ring Ext to A/L D-ring Ext, 85-ft Safety Tether from R D-ring Ext to EV1's R D-ring Ext</p>
<p>1. Post crew egress: WVS Software:     Select page – RF camera     Sel 'Advanced Controls'     S-Band Level (two) – Max</p>	<p><u>EGRESS</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Open A/L thermal cover</li> <li>2. Egress A/L</li> <li>3. √SAFER MAN ISOL vlv – Open (down)</li> <li>4. √SAFER HCM – Closed (down)</li> <li>5. Receive Crewlock Bag from EV2</li> <li>6. Retrieve APFR from Stbd A/L toolbox [12, NN, F, 6]; stow on BRT</li> <li>7. Translate to S0 Tether Shuttles</li> <li>8. Retrieve Tether Shuttles (2)</li> <li>9. Install EV1 Tether Shuttle onto nadir CETA rail (stbd); verify Locked</li> <li>10. Install EV2 Tether Shuttle onto nadir CETA rail (port); verify Locked</li> <li>11. Attach EV1 55-ft Safety Tether to stbd Tether Shuttle</li> <li>12. Verify locking hooks – Gate Closed, Slider Locked</li> <li>13. Attach EV2 85-ft Safety Tether to port Tether Shuttle</li> <li>14. Verify locking hooks – Gate Closed, Slider Locked</li> <li>15. Give EV2 GO to disconnect waist tether</li> </ol> <p><u>SETUP</u> (00:10)</p> <ol style="list-style-type: none"> <li>16. Translate to stbd CETA Cart</li> <li>17. Temp stow Crewlock Bag and camera on stbd CETA Cart grid E</li> </ol>	<p><u>EGRESS</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Transfer Crewlock Bag to EV1</li> <li>2. Egress A/L</li> <li>3. √SAFER MAN ISOL vlv – Open (down)</li> <li>4. √SAFER HCM – Closed (down)</li> <li>5. Perform translation adaptation as reqd</li> <li>6. Retrieve Large ORU Bag; stow on BRT</li> </ol> <p>7. On EV1 GO, disconnect waist tether</p> <p>8. Close A/L thermal cover</p> <p><u>SETUP</u> (00:10)</p> <ol style="list-style-type: none"> <li>9. Temp stow Large ORU Bag at S3 Face 1/Face 4 HR _____</li> <li>10. Translate to ESP-3</li> </ol>
<p><b>WARNING</b> Do not touch blemishes on zenith TUS cable</p>		

## EVA 1 ORU TRANSFER (02:15)

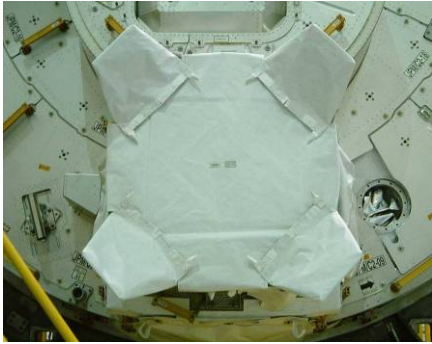
IV/SSRMS	EV1	EV2
<p>1. ✓ESP-3 Inhibits in place</p> <p>2. SSRMS: Mnvr as reqd for APFR install</p> <p>3. SSRMS: Mnvr as reqd for APFR ingress</p> <p>4. SSRMS: Mnvr as reqd for NTA removal</p> <p>5. <b>On EV1 GO</b>, SSRMS: Mnvr to PLB</p> <p>6. SSRMS: Once clear of ESP-3, <b>give EV1 GO</b> to reposition arms</p> <p>7. ✓LMC Inhibits in place</p>	<p><u>NTA REMOVE</u> (00:45)</p> <ol style="list-style-type: none"> <li>Translate to ESP-3 HR 8310</li> <li>Perform Glove Inspection</li> <li>GCA SSRMS as reqd for APFR install</li> <li>Install WIF adapter, tether point toward EE</li> <li>Install WIF adapter hitch pin</li> <li>Install APFR [12, NN, F, 6]                ✓Locking collar black-on-black                ✓Good pull test</li> <li>Perform Safety Tether swap onto SSRMS; verify locking hook – Gate Closed, Slider Locked</li> <li>Stow EV1 Tether Shuttle 55-ft Safety Tether on ESP-3 HR 8307</li> <li>GCA SSRMS as reqd for APFR ingress</li> <li>Attach MWS EE to ingress aid</li> <li>Ingress APFR; use MWS EE to restrain ingress aid</li> <li>GCA SSRMS as reqd for NTA removal (tether to NTA)</li> <li><b>PGT[A4 6.3 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Release primary FRAM bolt, 11 turns to hardstop</li> <li>Release NTA from softdock</li> <li><b>Give SSRMS GO</b> to mnvr to PLB</li> <li><b>On SSRMS GO</b>, reposition arms</li> </ol>	<p><u>NTA REMOVE</u> (00:45)</p> <ol style="list-style-type: none"> <li>When EV1 directed to install WIF adapter, translate to ESP-3</li> <li>Perform Glove Inspection</li> <li>Translate to ESP-3 forward edge</li> <li>Assist EV1 with releasing NTA from soft dock</li> <li>Monitor clearances between NTA and ESP-3</li> <li>Retrieve camera from stbd CETA Cart grid E</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Avoid inadvertent contact with Fluid Tray hardlines</p> </div> <ol style="list-style-type: none"> <li>Translate to Node 2 Zenith CBM</li> <li>Close hatch window flap; engage snap</li> <li>Fold Velcro cover over Velcro;  WVS Survey</li> <li>Translate to PMA2 HR 0402</li> <li>Perform Safety Tether swap onto spare 85-ft Safety Tether; verify locking hook – Gate Closed, Slider Locked</li> <li>Stow EV2 85-ft Tether Shuttle Safety Tether on PMA2 HR 0402</li> </ol> <div style="border: 3px double black; padding: 5px; text-align: center; margin: 10px 0;"> <p><b>WARNING</b> Stay &gt; 1 ft from ROEU</p> </div> <ol style="list-style-type: none"> <li>Translate to LMC</li> <li>Perform Glove Inspection</li> </ol>

**EVA 1 ORU TRANSFER (02:15) (Cont)**

IV/SSRMS	EV1	EV2
<p>8. <b>On EV2 GO</b>, SSRMS: Mnvr to NTA install</p> <p>NTA: Turns _____ Torque _____</p> <p>9. SSRMS: Mnvr as reqd for FHRC removal</p> <p>10. <b>On EV1 GO</b>, SSRMS: Mnvr to PLB hover position</p> <p>11. SSRMS: <b>Give EV1 GO</b> to rotate FHRC</p> <p>12. <b>On EV1 GO</b>, SSRMS: Mnvr to ESP-3</p> <p>13. SSRMS: <b>Give EV1 GO</b> to reposition arms</p> <p>14. SSRMS: Mnvr as reqd for FHRC install</p> <p>FHRC: Turns _____ Torque _____</p>	<p><u>NTA INSTALL</u> (00:30)</p> <p>17. Install NTA to softdock on LMC PFRAM</p> <p>18. <b>PGT[A4 6.3 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</b>: Drive primary FRAM bolt, 11 turns to hardstop</p> <p>19. Perform pull test on NTA; release tether</p> <p><u>FHRC REMOVAL</u> (00:30)</p> <p>20. GCA SSRMS as reqd for FHRC removal (tether to FHRC)</p> <p>21. <b>PGT[A4 6.3 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16</b>: Release primary FRAM bolt, 11 turns to hardstop</p> <p>22. Release FHRC from softdock</p> <p>23. <b>Give SSRMS GO</b> to mnvr to PLB hover position</p> <p>24. <b>On SSRMS GO</b>, rotate FHRC</p> <p>25. <b>Give SSRMS GO</b> to mnvr to ESP-3</p> <p><u>FHRC INSTALL</u> (00:30)</p> <p>26. <b>On SSRMS GO</b>, reposition arms</p> <p>27. Install FHRC to softdock on ESP-3 PFRAM</p> <p>28. <b>PGT[A4 6.3 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</b>: Drive primary FRAM bolt, 11 turns to hardstop</p> <p>29. Perform pull test on FHRC; release tether</p>	<p><u>NTA INSTALL</u> (00:30)</p> <p>15. <b>Give SSRMS GO</b> to mnvr to NTA install; GCA SSRMS as reqd</p> <p>16. Assist EV1 with clearances for NTA install</p> <p><u>FHRC REMOVAL</u> (00:30)</p> <p>17. Monitor SSRMS clearances</p> <p>18. Assist EV1 with releasing FHRC from softdock</p> <p>19. Monitor SSRMS clearances</p> <p>20.  WVS Survey of LMC: PFRAM and NTA</p> <p>21. Translate to PMA2 HR 0402</p> <p>22. Perform Safety Tether swap onto EV2 85-ft Tether Shuttle Safety Tether; verify locking hook – Gate Closed, Slider Locked</p> <p>23. Retrieve spare 85-ft Safety Tether; stow on MWS</p> <p>24. Translate to ESP-3</p> <p>25. Perform Glove Inspection</p> <p><u>FHRC INSTALL</u> (00:30)</p> <p>26. GCA SSRMS as reqd for FHRC install</p> <p>27. Assist EV1 with clearances for FHRC install</p> <p>28. Perform Tool inventory</p> <p>29. Retrieve Crewlock Bag from CETA Cart</p> <p>30. Translate to JEM; use fairleads as required to keep tether clear of SSRMS translation path</p>



## EVA 1 SSRMS CLEANUP (00:15)/EFBM COVER REMOVAL (01:00)

IV/SSRMS	EV1	EV2
<p>1. SSRMS: Mnvr as reqd for APFR egress</p> <p>2. Verify with MCC-H JEM Inhibit Pad in place</p> <p>3. <b>On EV1 GO</b>, SSRMS: Mnvr as reqd to overnight clearance position</p> <p>Cover Removal:</p> <p><input type="checkbox"/> Fwd/Zenith      <input type="checkbox"/> Aft/Zenith</p> <p><input type="checkbox"/> Fwd/Nadir      <input type="checkbox"/> Aft/Nadir</p> <p><input type="checkbox"/> Center</p> 	<p><u>SSRMS CLEAN-UP (00:15)</u></p> <ol style="list-style-type: none"> <li>GCA SSRMS as reqd for APFR egress</li> <li>Egress APFR</li> <li>Tether to APFR, reconfig APFR: [6, QQ, F, 6] <ul style="list-style-type: none"> <li>√ Locking collar black-on-black</li> <li>√ Good pull test</li> </ul> </li> <li>Perform Safety Tether swap onto EV1 55-ft Tether Shuttle Safety Tether; verify locking hook – Gate Closed, Slider Locked</li> <li>Retrieve spare 55-ft Safety Tether; stow on MWS</li> <li>Verify SSRMS clear of ESP-3</li> <li><b>Give SSRMS GO</b> to mnvr to overnight clearance position</li> <li><input type="checkbox"/> WVS Survey of FHRC on ESP-3</li> <li>Perform Tool inventory</li> <li>Translate to S3; retrieve Large ORU Bag from S1 Face 1, stow on BRT</li> </ol>	<p><u>EFBM COVER REMOVAL (01:00)</u></p> <ol style="list-style-type: none"> <li>Translate to JEM HR 1106</li> <li>Perform Safety Tether swap onto spare 85-ft Safety Tether; verify locking hook – Gate Closed, Slider Locked</li> <li>Stow EV2 85-ft Tether Shuttle Safety Tether on JEM HR 1105</li> <li>Translate to EFBM on port end of JEM</li> <li>Stow Crewlock Bag on JEM HR 1215 and 1218</li> <li>Perform Glove Inspection</li> </ol> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b></p> <p>Avoid pinch point on EFBM capture latch</p> </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b></p> <p>Avoid inadvertent contact with the EFBM berthing mechanism (silver Teflon), EFBM guide vane (solid lubricant), and EFBM base</p> </div> <ol style="list-style-type: none"> <li>Use integral RETs inside Crewlock Bag to remove petal covers (4); make sure to recover Velcro points; stow each cover inside Crewlock Bag</li> <li>Tether to center cover</li> <li>Remove center cover; secure with wire tie and adj equip tether to JEM HR 1185 and 1179</li> <li>Verify Velcro config (grounding tabs)</li> <li><input type="checkbox"/> WVS Survey of EFBM</li> <li>Perform Final Bag and Tool inventory</li> <li>Retrieve Crewlock Bag; stow on BRT</li> <li>Translate to JEM HR 1105 and 1106</li> <li>Perform Safety Tether swap onto EV2 85-ft Tether Shuttle Safety Tether; verify locking hook – Gate Closed, Slider Locked</li> <li>Retrieve spare 85-ft Safety Tether; stow on the outside of Crewlock Bag</li> <li>Translate to S0</li> <li>Stow Crewlock Bag and spare 85-ft Safety Tether on S0 Face 1</li> </ol>

**EVA 1 SARJ (03:00)**

IV/SSRMS	EV1	EV2
	<p><u>S3 SARJ SETUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to S3 Face 4; stow Large ORU Bag</li> <li>2. Perform Glove Inspection</li> <li>3. Retrieve EV2 Fish Stringer Tether; stow at Face 2/3 interface</li> <li>4. Stow 55-ft Safety Tether in Large ORU Bag</li> </ol> <p><u>S3 SARJ WORK</u></p> <p>Refer to <u>STBD SARJ CUE CARD</u>, FS CC 7-35, for SARJ checklist:            Covers 7/8 and TBA 10            Covers 9/10 and TBA 11            Get-Ahead: Cover 11</p> <p>Refer to SARJ – TBA REMOVE/INSTALL, FS 7-19, for steps to remove and install a TBA</p> <p>Refer to SARJ – CLEAN/LUBE RACE RING, FS 7-20, for steps to clean and to lubricate the race ring</p> <p><u>SARJ BAG PACKING</u></p> <ol style="list-style-type: none"> <li>5. Stow Fish Stringer Tether in Large ORU Bag</li> <li>6. Verify TBA Bags are rolled and folded</li> <li>7. Perform Final Bag inventory</li> </ol>	<p><u>S3 SARJ SETUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to S3 SARJ, Face 2/3 Interface</li> <li>2. Perform Glove Inspection</li> </ol> <p><u>S3 SARJ WORK</u></p> <p>Refer to <u>STBD SARJ CUE CARD</u>, FS CC 7-35, for SARJ checklist:            Covers 22/1 and TBA 6            Get-Ahead: SLR 4A Removal</p> <p>Refer to SARJ – TBA REMOVE/INSTALL, FS 7-19, for steps to remove and install a TBA</p> <p>Refer to SARJ – CLEAN/LUBE RACE RING, FS 7-20, for steps to clean and to lubricate the race ring</p> <p><u>SARJ BAG PACKING</u></p> <ol style="list-style-type: none"> <li>3. Retrieve Fish Stringer Tether; stow in Large ORU Bag</li> <li>4. Verify TBA Bags are rolled and folded</li> <li>5. Perform Final Bag inventory</li> </ol>

# EVA 1 SARJ – TBA REMOVE/INSTALL

## Remove

### WARNING

Potential exists for sharp edge hazards on the bearing package and mount. Attempt to limit contact to tether points only

1. Verify failed TBA serial number
2. Demate TBA connector P1 from inboard receptacle on SARJ ring
3. Install SARJ dust cap on receptacle
4. Install TBA dust cap on TBA connector
5. Tether to bearing package
6. Tether to mount

### CAUTION

Two TBAs cannot be out at the same time unless the two TBAs are 90, 120, or 180 deg apart from each other

7. **PGT [B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:**  
Break torque on TBA bolts (3), 1 turn each
8. **PGT[B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:**  
Loosen bolt 3 (mount bolt), 1 turn
9. **PGT[B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:**  
Loosen bolt 1 (bearing preload bolt), 6 turns
10. **PGT[B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:**  
Release bolt 2 (draw bolt), 12 turns until preload arm swings open (into SARJ bearing package will also move away from SARJ and mount)
11. Verify TBA bag in open position
12. Stow bearing package in TBA bag

### NOTE

Do not push in while turning mount bolt 3; will cause mount clamping leg to side load bolt 3 and increase torque

13. **PGT[B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:**  
Release bolt 3 (mount bolt), 4 turns
14. Engage mount bolt 3 with PGT and press to open mount clamping leg
15. Remove mount from race ring
16. Stow mount in TBA Bag
17. Secure bag closed, stow in ORU Bag
18. Clean and Lube Race Ring as required, refer to FS 7-20

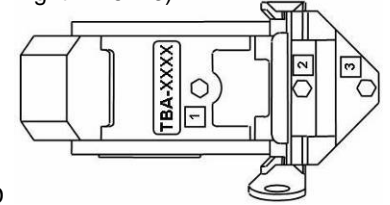
\*Indicates mount package steps to skip when removing and installing the same TBA

## Install

### NOTE

Limit force to engage mount bolt 3; too much force opens mount clamping leg

1. Retrieve new mount package from bag; report serial number
2. Verify mount clamping leg is open
3. Engage mount onto race ring, aligning mount boss with slot in race ring
4. Close mount clamping leg
5. **PGT[A2 3.8 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:** Engage bolt 3 (mount bolt), 2 turns
6. Retrieve bearing package; report serial number
7. Engage bearing package onto race ring, guiding bearing arm through race ring
8. **PGT[A3 4.8 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:** Engage bolt 2 (draw bolt), ~10.5-13 turns to torque until preload arm engages race ring (bearing package will also move toward SARJ and mount package)
9. **PGT[B1 12.0\* ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16: (\*Flight = A5 7.0)**  
Engage bolt 1 (bearing preload bolt), ~5-7 turns to torque
10. **PGT[A2 3.8 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:**  
Tighten bolt 3 (mount bolt), ~2-4 turns to torque
11. Remove dust cap on inboard receptacle; stow in TBA bag
12. Remove TBA connector dust cap; stow in TBA bag



### NOTE

Verify pin and EMI band integrity; connector free of FOD

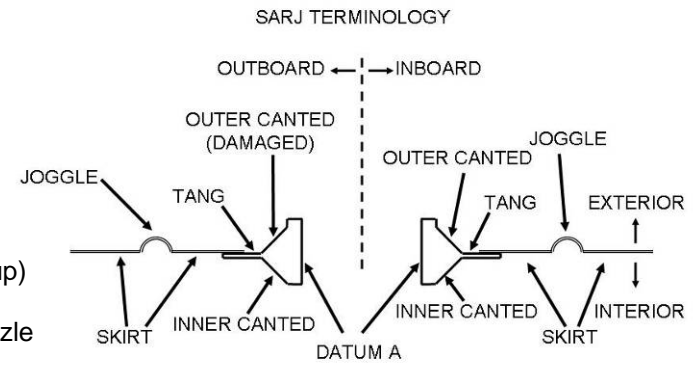
13. Mate connector to inboard receptacle on SARJ race ring
14. WVS Survey of work area; clean up work area; reinstall MLI cover

Outboard ← → Inboard





TBA	S/N *Flight = 1018,1026	Bolt 2		Bolt 1		Bolt 3	
		Turns (~10.5-13)	Torque (4.8)	Turns (~5-7)	Torque (7.0)	Turns (~2-4)	Final Torque (3.8)
1							
2							
3							
4							
5							
6 (1st)							
6 (2nd)							
7							
8							
9							
10							
11							
12							

# EVA 1 SARJ – CLEAN/LUBE RACE RING

IV/SSRMS	EV1/EV2
	<p><u>CLEAN STEPS</u></p> <ol style="list-style-type: none"> <li>1. Wet wipe outboard ring inner canted and datum A</li> <li>2. Wet wipe any obvious debris on skirts, joggles, etc</li> <li>3. Wet wipe DLA surfaces (if applicable)</li> <li>4. Wet wipe outer canted surface of outboard ring</li> <li>5. Stow wet wipe in large trash bag</li> <li>6. Prep straight nozzle gun:             <ol style="list-style-type: none"> <li>a. Engage teeth by rotating plunger 180 deg (black triangle up)</li> <li>b. Remove MLI tip cover</li> <li>c. Rotate shutoff knob such that FLOW pointing towards nozzle</li> </ol> </li> <li>7. Lay bead of grease on outer canted surface of outboard ring</li> <li>8. Safe and stow straight nozzle gun:             <ol style="list-style-type: none"> <li>a. Disengage teeth by rotating plunger 180 deg (black triangle down)</li> <li>b. Rotate shutoff knob such that FLOW is perpendicular to nozzle</li> <li>c. Install MLI tip cover</li> </ol> </li> <li>9. Retrieve dry wipe</li> <li>10. Use scraper to remove debris from outer canted surface of outboard ring</li> <li>11. Clean scraper in scraper debris container</li> <li>12. Close scraper debris container</li> <li>13. Use dry wipe to remove residue from cleaning the ring</li> <li>14. Use dry wipe to clean mount package area on inboard ring</li> <li>15. Stow dry wipe in large trash bag</li> </ol> <p><u>LUBE STEPS (Outboard ring)</u></p> <ol style="list-style-type: none"> <li>16. Retrieve dry wipe</li> <li>17. Use j-hook nozzle gun to grease inner canted surface. Apply approx 1 sharpie mark/click per section between TBAs</li> <li>18. Use straight nozzle gun to grease outer canted and Datum A surfaces. Apply approx 1/8" thick bead per section between TBAs</li> <li>19. Use dry wipes as required to clean up EMU and tools</li> </ol> <p>*Indicates mount package steps to skip when revisiting a SARJ worksite (TBA 5, 6, and 11)</p>



## EVA 1 SARJ – SLR REMOVAL (00:15)

IV/SSRMS	EV1/2
	<p data-bbox="709 272 1314 298"><u>REMOVE SARJ LAUNCH RESTRAINT 4A</u> (00:15)</p> <ol data-bbox="709 332 1858 391" style="list-style-type: none"><li>1. <b>PGT[B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16:</b> Release retaining bolts (2) 9 turns</li><li>2. Tether to clamshell and rail stub</li></ol> <div data-bbox="785 423 1335 492" style="border: 1px solid black; padding: 5px; text-align: center;"><p data-bbox="999 431 1121 456"><u>CAUTION</u></p><p data-bbox="793 464 1327 488">Do not exceed 9 turns on clam shell jack bolt</p></div> <ol data-bbox="709 526 1934 735" style="list-style-type: none"><li>3. If both clamshells not loosened on “mushroom-shaped” fittings – <b>PGT[B7 25.5ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16:</b> Release jack bolt (1) up to 3 turns</li><li>4. <b>PGT[B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16:</b> Release retaining bolts (2) (~9 turns)</li><li>5. Remove clamshell from “mushroom-shaped” fitting</li><li>6.  WVS Survey of SLR rail</li><li>7. Stow clamshell in large trash bag</li><li>8. Stow rail stub in Large ORU Bag</li></ol> <div data-bbox="789 769 1314 1159"></div> <div data-bbox="1388 769 1913 1159"></div>

## EVA 1 CLEANUP/INGRESS (00:25)

IV/SSRMS	EV1	EV2
<p>1. Perform prior to crew ingress: WVS PWRDN (PHOTO/TV, <u>WVS CUE CARD</u>)</p>	<p><u>CLEANUP</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Perform Tool inventory</li> <li>2. Translate to A/L; fairlead Safety Tether as reqd</li> <li>3. Retrieve Crewlock Bag and spare 85-ft Safety Tether from S0 Face 1</li> </ol> <p><u>INGRESS</u> (00:15)</p> <ol style="list-style-type: none"> <li>4. <b>On EV2 GO</b>, perform Safety Tether swap onto EV2's 85-ft Safety Tether; verify locking hook – Gate Closed, Slider Locked</li> <li>5. Retrieve EV1 55-ft Safety Tether; stow on MWS</li> <li>6. Retrieve Tether Shuttles (2); stow on S0 bracket; verify Locked</li> <li>7. Translate to A/L</li> <li>8. Transfer Crewlock Bag to EV2</li> <li>9. <b>On EV2 GO</b>, ingress A/L</li> <li>10. Remove SCU from stowage pouch Remove DCM cover Connect SCU to DCM, check locked</li> <li>11. Water – OFF (fwd); expect "H2O IS OFF" msg</li> <li>12. Close thermal cover, attach Velcro strap</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not close hatch until EMU water off for 2 min</p> </div> <ol style="list-style-type: none"> <li>13. Verify no hardware blocking hatch</li> <li>14. EV Hatch Handle – verify position per hatch decal</li> <li>15. EV Hatch – close and lock</li> <li>16. Go to PRE-REPRESS (<u>DEPRESS/REPRESS</u> Cue Card)</li> </ol>	<p><u>CLEANUP</u> (00:10)</p> <ol style="list-style-type: none"> <li>1. Perform Tool inventory</li> <li>2. Translate to A/L; fairlead Safety Tether as reqd</li> </ol> <p><u>INGRESS</u> (00:15)</p> <ol style="list-style-type: none"> <li>3. Open thermal cover</li> <li>4. Attach Waist Tether to Airlock D-ring extender; verify locking hook – Gate Closed, Slider Locked</li> <li>5. <b>Give EV1 GO</b> to attach to EV2's 85-ft Safety Tether</li> <li>6. Stow Large ORU Bag in A/L</li> <li>7. Ingress A/L</li> </ol> <ol style="list-style-type: none"> <li>8. Receive Crewlock Bag from EV1</li> <li>9. <b>Give EV1 GO</b> to ingress</li> <li>10. Remove SCU from stowage pouch Remove DCM cover Connect SCU to DCM, check locked</li> <li>11. Water – OFF (fwd); expect "H2O IS OFF" msg</li> </ol>

# EVA 1 POST TOOL CONFIG

## EV1 MWS

- BRT (L)
- RET (eq-eq)
- Wire Tie (2)
- T-Bar
- RET (eq-eq) (2)
- RET (eq-eq) w/PIP Pin
- Adj Equip Tether (2)
- Wire Tie
- Small Shuttle Trash Bag
- Swing Arm (R)
- RET (eq-eq)
- PGT
- PGT Battery
- 7/16 (wobble) Socket-6 ext
- 55-ft Safety Tether (R D-ring Ext)
- Waist Tether (2, R & L on D-ring)

## EV2 MWS

- BRT (L)
- RET (eq-eq)
- Wire Tie (2)
- T-Bar
- RET (eq-eq)
- RET (eq-eq) w/PIP Pin
- Adj Equip Tether (1)
- Wire Tie (2)
- Small ISS Trash Bag
- Swing Arm (R)
- RET (eq-eq)
- PGT
- PGT Battery
- 7/16 (wobble) Socket-6 ext
- 85-ft Safety Tether (R D-ring Ext)
- Waist Tether (2, R on D-ring, L on extender)

Tether Counts: (Red RETs)	
RETs (eq-eq) = 15	RETs (PIP Pin) = 2
RETs (Lg-eq) = 3	Adj Equip Tethers = 9 int/1 ext

## AIRLOCK CONFIG

- Large ORU Transfer Bag
- Adj Equip Tether (on outside)
- Fish Stringer Tether (Heide)
- TBA Bag
- TBA Bearing Package (on bag tether)
- TBA Dust Cap
- TBA Mount Package (on bag tether)
- TBA Bag
- TBA Bearing Package (on bag tether)
- TBA Dust Cap
- TBA Mount Package (on bag tether)
- TBA Bag (spare)
- TBA Bearing Package (on bag tether)
- TBA Dust Cap
- TBA Mount Package (on bag tether)
- Crewlock Bag
- Adj Equip Tether (2) (on outside)
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/Straight Nozzle
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/J Nozzle
- EVA Wipe Caddy (int RET)
- EVA Wipes (\_\_\_ wet, \_\_\_ dry)
- Scraper Debris Container (int RET)
- RET (eq-eq)
- Scraper
- Large Trash Bag (int RET) (outside)
- EVA Wipe Caddy
- EVA Wipes (\_\_\_ wet, \_\_\_ dry)
- Camera w/Flash (on integral RET)
- Camera Bracket
- 55-ft Safety Tether

## AIRLOCK CONFIG (Cont)

- Large ORU Transfer Bag (Cont)
- Fish Stringer Tether (Steve)
- TBA Bag
- TBA Bearing Package (on bag tether)
- TBA Dust Cap
- TBA Mount Package (on bag tether)
- TBA Bag
- TBA Dust Cap (on bag tether)
- SARJ Dust Cap (on bag tether)
- Crewlock Bag
- RET (eq-eq) (spare on outside door handle)
- Adj Equip Tether (2) (on outside)
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/Straight Nozzle
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/J Nozzle
- EVA Wipe Caddy (int RET)
- EVA Wipes (\_\_\_ wet, \_\_\_ dry)
- Scraper Debris Container (int RET)
- RET (eq-eq)
- Scraper
- Large Trash Bag
- SLR 4A
- Rail Stub
- Camera
- Camera Bracket
- Crewlock Bag (EFBM Covers)
- 4 EFBM Petal Covers
- 85-ft Safety Tether (outside)
- RET (eq-eq)

## EXTERIOR CONFIG

- JEM
- EFBM Center Disk Cover
- Wire Tie (1) (JEM HR 1179)
- Adj Equip Tether (1) (JEM HR 1185)
- S3 SARJ
- SARJ Dust Cap on J19 (under Cover 10)

## EVA 1 ORU TRANSFER – TASK DATA

### Estimated Task Duration:

	With RMS	Without RMS
One EVA Crew	N/A	N/A
Two EVA Crew	02:30	N/A

### Tools:

EV1	EV2
PGT w/6"-ext 7/16"	
WIF Adapter	
APFR	
Ingress Aid	
RET	

### EVA Fasteners:

Fastener Name	Label	Qty	Head Size	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
FRAM Primary Drive Bolt	FRAM Activation Drive Lock	1	7/16"	6.3	6.3	21	11	30

### Foot Restraints:

Task	WIF	Setting
ORU Transfer	SSRMS	12,NN,F,6
Contingency Transfer	LMC	10,PP,F,12 (ingress) 10,PP,E,12 (NTA install) 10,PP,H,12 (FHRC remove)

### ORU Identification:

ORU	Mass (ORU + FSE + FRAM)	Part Number	Serial Number
NTA	1105	1F96000-1	0002 (ESP3↓)
FHRC	1106	5849811-501	1004 (PLB↑)

### Notes:

None

### Cautions:

None

### Warnings:

1. Crew must keep a foot or more away from the ROEU



## EVA 1 ORU TRANSFER – TASK DATA (Cont)

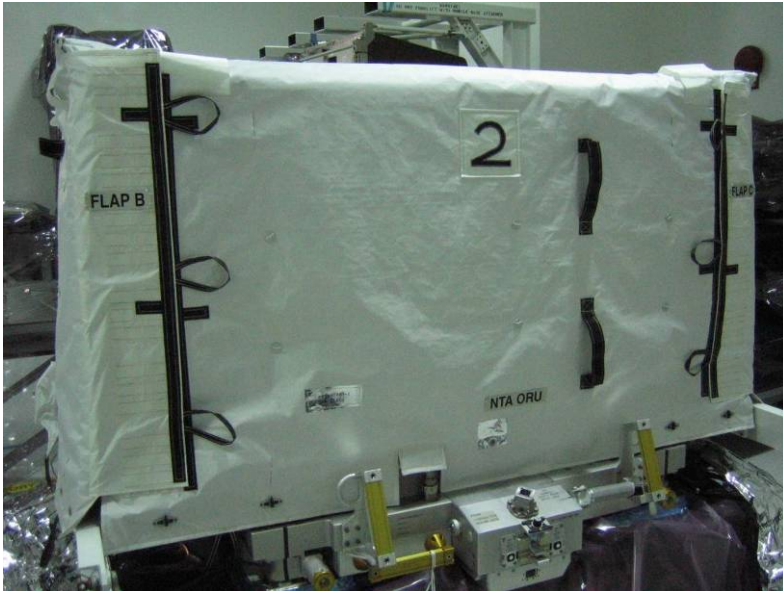


Figure 1. NTA on FRAM – Front View



Figure 2. NTA on FRAM – Back View

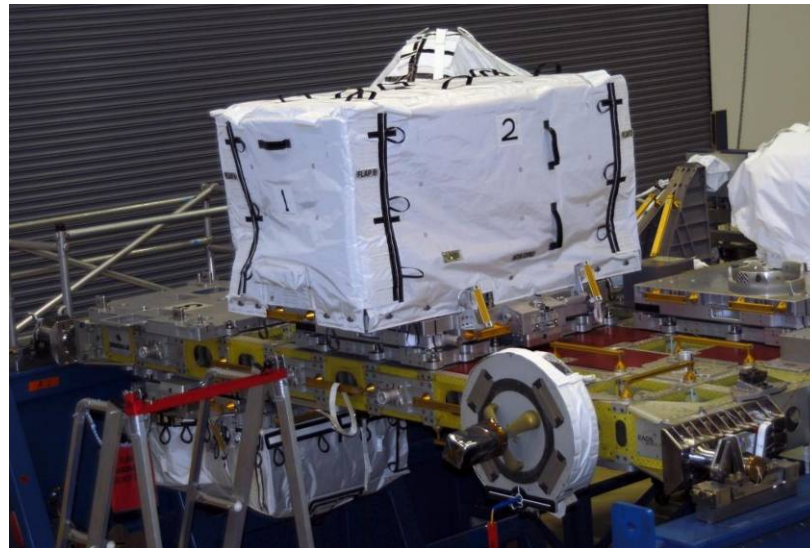


Figure 3. NTA on ESP-3

## EVA 1 ORU TRANSFER – TASK DATA (Cont)

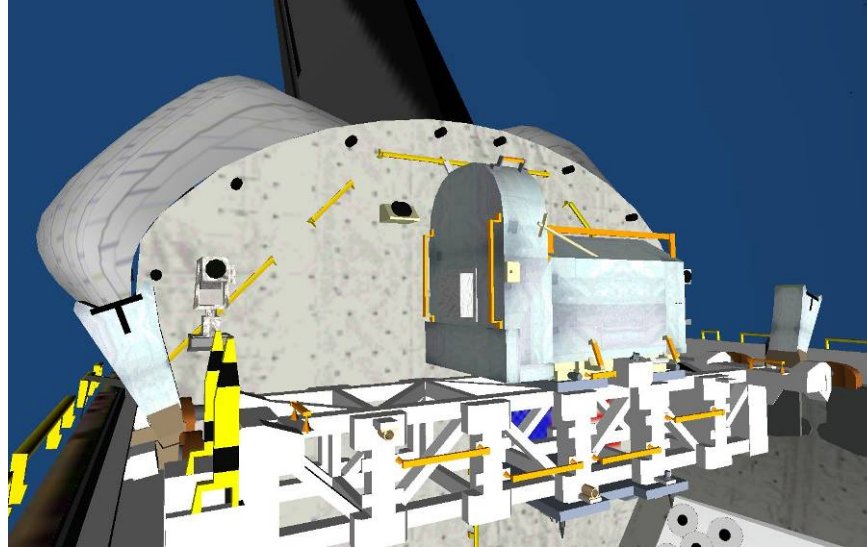


Figure 4. FHRM on LMC in PLB



Figure 5. FHRM on FRAM without MLI

## EVA 1 EFBM COVER REMOVAL – TASK DATA

### Estimated Task Duration:

	With RMS	Without RMS
One EVA Crew	N/A	01:00
Two EVA Crew	N/A	N/A

### Tools:

EV2
Crewlock Bag
RET
Adj Equip Tether
Wire Tie

### Notes:

None

### Cautions:

1. Avoid inadvertent contact with the EFBM berthing mechanism (silver Teflon), EFBM guide vane (solid lubricant), and EFBM base

### Warnings:

1. Avoid pinch point on EFBM capture latch

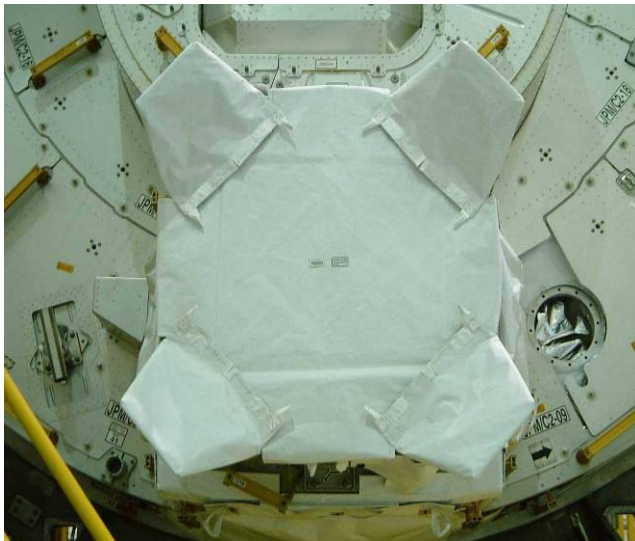


Figure 1. EFBM – All Covers On

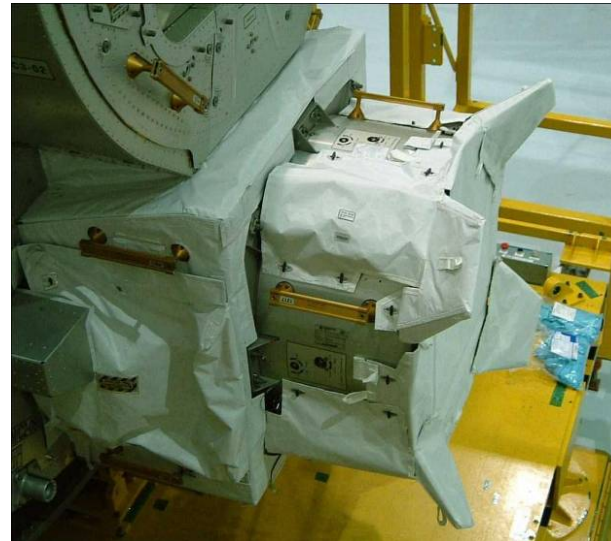


Figure 2. EFBM – Side View

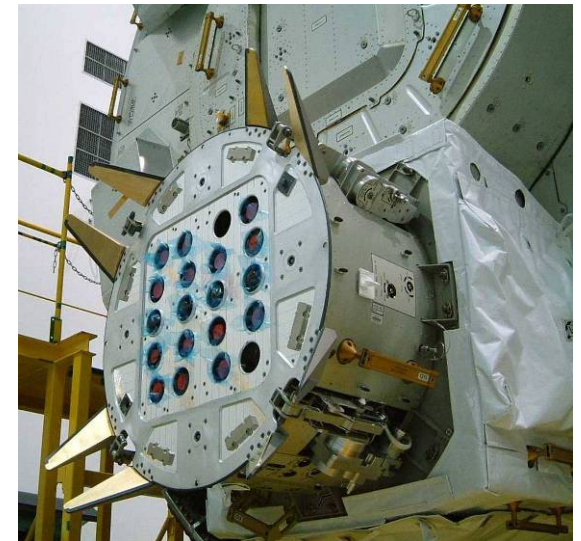


Figure 3. EFBM – No Covers

## EVA 1 SARJ – TASK DATA

### Estimated Task Duration:

	With RMS	Without RMS
One EVA Crew	N/A	
Two EVA Crew	N/A	

### Tools:

EV1	EV2
PGT w/6" ext-7/16	PGT w/6" ext-7/16
Large ORU Bag	Fish Stringer
Fish Stringer	Crewlock Bag
Crewlock Bag	Grease Gun – Straight Nozzle
Grease Gun – Straight Nozzle	Grease Gun – J Nozzle
Grease Gun – J Nozzle	EVA Wipe Caddy
EVA Wipe Caddy	EVA Wipes (dry)
EVA Wipes (dry)	EVA Greased Wipes (wet)
EVA Greased Wipes (wet)	Scraper Debris Container
Scraper Debris Container	Scraper
Scraper	Large Trash Bag
Large Trash Bag	Camera
Camera w/Flash	

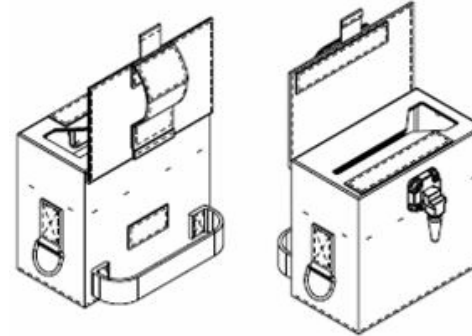


Figure 1. Scraper Debris Container

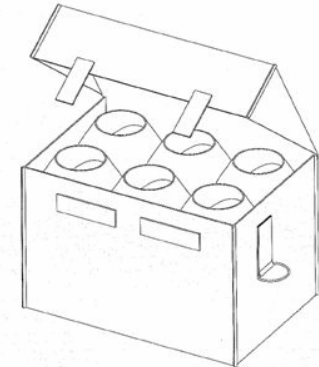


Figure 2. EVA Wipe Caddy



Figure 3. Grease Gun w/J Nozzle

### EVA Fasteners:

Fastener Name	Label	Qty	Head Size	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
TBA Bearing Preload Bolt	1	1	7/16"	STA: 12.0 Flight: 7.0	18.4	Remv: 21.2 Install: STA: 13.2 Flight: 8.3	5-7	30
TBA Draw Bolt	2	1	7/16"	4.8	18.4	Remv: 21.2 Install: 6.6	10.5-13	30
TBA Mount Bolt	3	1	7/16"	3.8	12.0	Remv: 14.6 Install: 5.1	4-6	30

### EVA Connectors:

Harness	From	To	Conn Size	Function
TBA electrical harness P1	Hardwired to TBA	SARJ connector J__ (see TBA Reference Info)	15	Power and data to TBA



Figure 4. TBA Bag

## EVA 1 SARJ – TASK DATA (Cont)

### TBA Reference Info:

TBA #	S3 TBA Serial Number	S3 Inboard SARJ Label
1	TBA-1032	J9
2	TBA-1029	J10
3	TBA-1033	J11
4	TBA-1035	J12
5	TBA-1026	J13
6	TBA-1017	J14
7	TBA-1036	J15
8	TBA-1031	J16
9	TBA-1030	J17
10	TBA-1037	J18
11	TBA-1023	J19
12	TBA-1034	J20

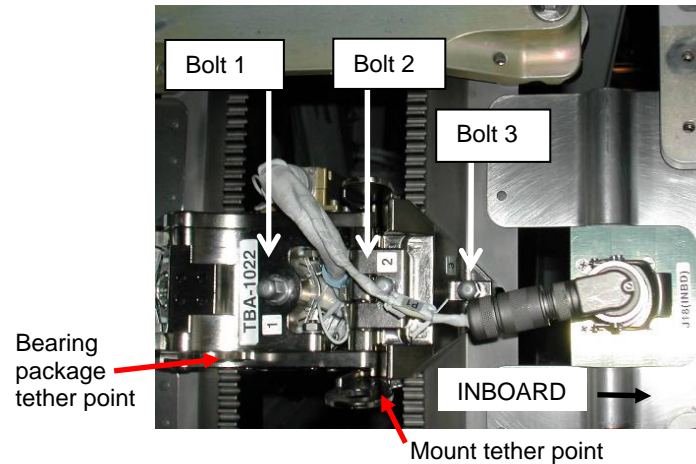


Figure 5. Trundle Bearing Assembly – Labeled



Figure 6. Fairchild Fastener

### Notes:

- Each TBA ORU consists of a bearing package and a mount assembly, which are a matched drilled set. They are always removed and replaced together, but must be separated to do so
- The mount bolt (Bolt 3) is springloaded. When depressed with enough force (approximately 2 lb), the bolt end pushes against the threaded interface, overcoming the two ball detents that hold the clamping leg in the closed position. The clamping leg will then spring open, freeing the mount from the race ring. In order to engage the threads during TBA installation, rotation of the bolt must begin prior to pressing in on the fastener to preclude inadvertent opening of the clamping leg
- The mount bolt (Bolt 3) must be partially released during bearing installation and removal to increase tolerance between the bearing and mount interface
- Tether hook must be removed from mount during bearing package installation and removal due to interference
- Clamping leg closure is accomplished by placing gloved hand through gap in the two race rings and pressing clamp against ring
- The spare SARJ dust cap tether point is top mounted; the SARJ dust cap tether point on the outboard receptacles are side mounted
- EVA Wipe Caddy O-rings may fail during extreme cold conditions such that EVA wipes cannot be retrieved from the caddy; such thermal extremes should not be reached during EVAs on STS-126/ULF-2

### Cautions:

- To prevent loss of inboard MLI cover fasteners during removal:
  - Limit turn count to minimum required for fastener release
  - Minimize side loading bolt head
  - Maintain axial force on fastener to compress spring during rotation
- SARJ Race Ring is not tolerant to nicks and scratches. Exercise care within the vicinity of the Race Ring while handling components
- Two TBAs cannot be out at the same time unless the two TBAs are 90, 120, or 180 deg apart from each other
- The port SARJ must be locked for EVA ops outboard of the starboard AJIS struts

## EVA 1 SARJ – TASK DATA (Cont)

### Warnings:

1. Potential exists for sharp edge hazards on the TBA bearing package and mount. Attempt to limit contact to tether points only
2. Verify SARJ is locked (one DLA locked, one DLA engaged) to prevent rotation while EV crew is in vicinity of rotational plane plus 2 feet

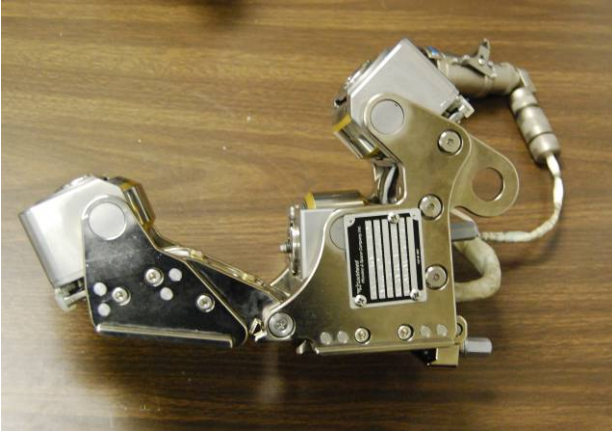


Figure 7. Bearing Package Assembly



Figure 8. Mount Assembly

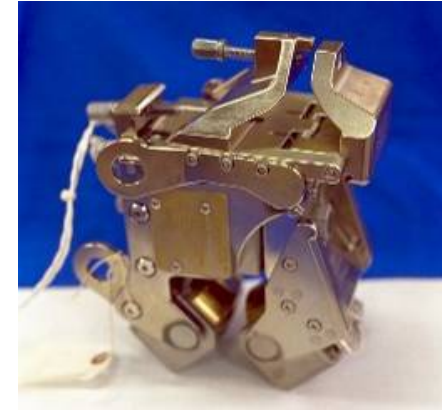


Figure 9. Trundle Bearing Assembly

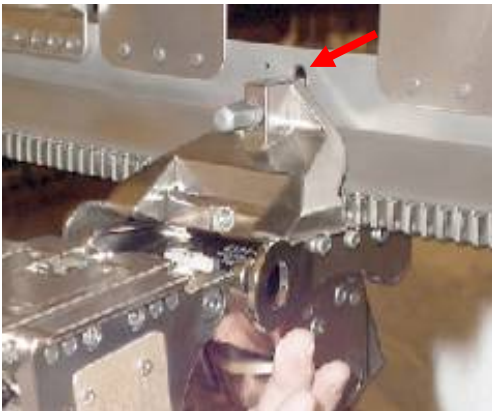


Figure 10. Slot in Race Ring to Align Mount



Figure 11. Mount Assy on Race Ring, mount leg clamp open (initial position)



Figure 12. Mount Assy on Race Ring, mount leg clamp closed (final position)

EVA 1 SARJ – TASK DATA (Cont)

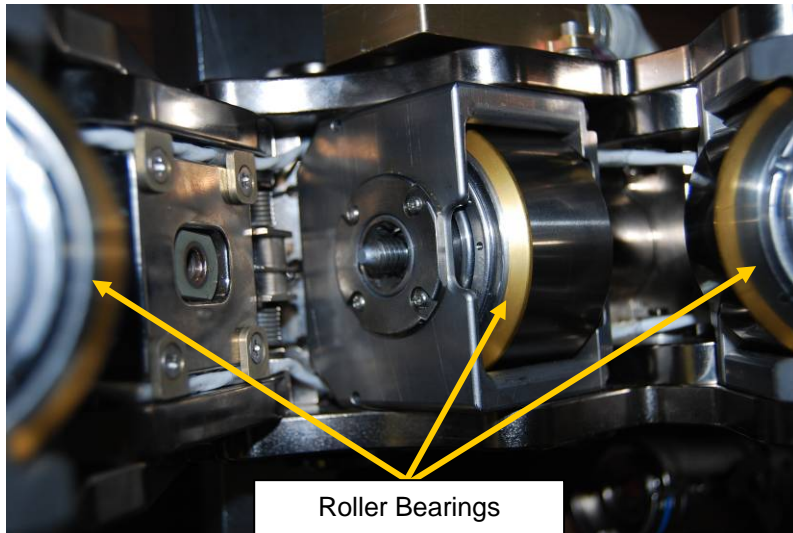


Figure 13. TBA Roller Bearings

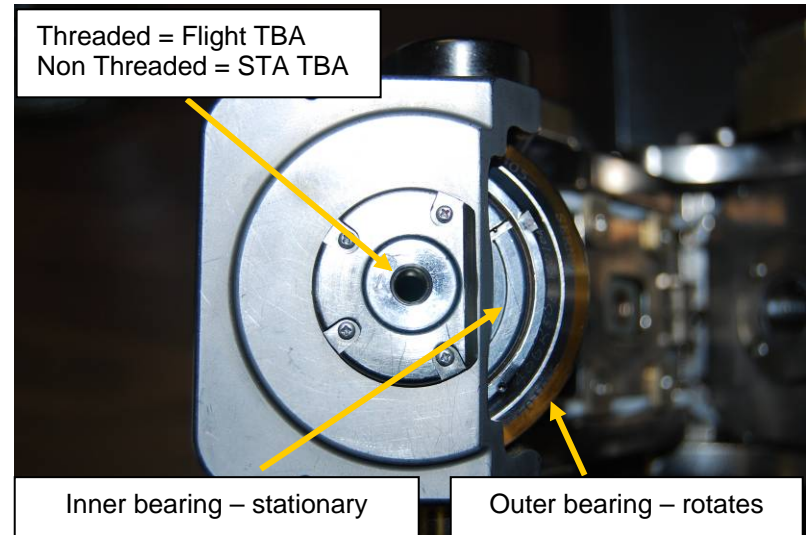


Figure 14. Roller Bearing Close-Up

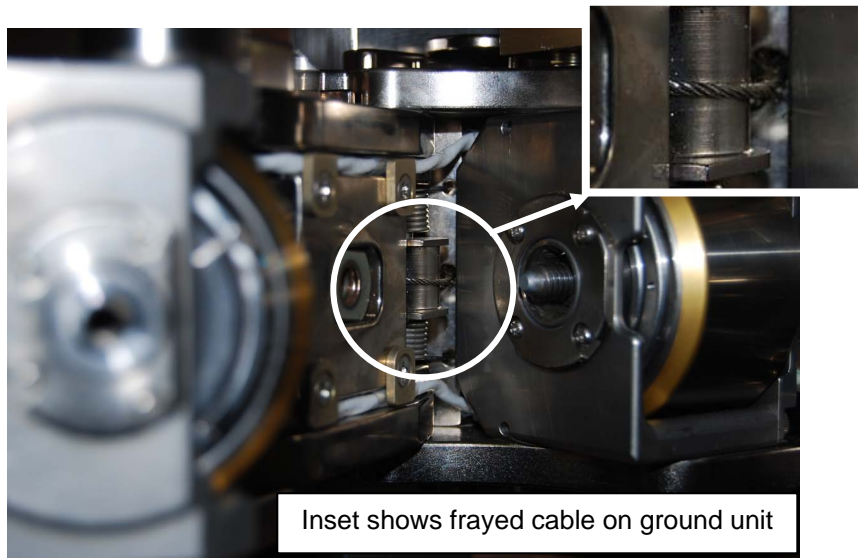


Figure 15. Bearing Package Cable

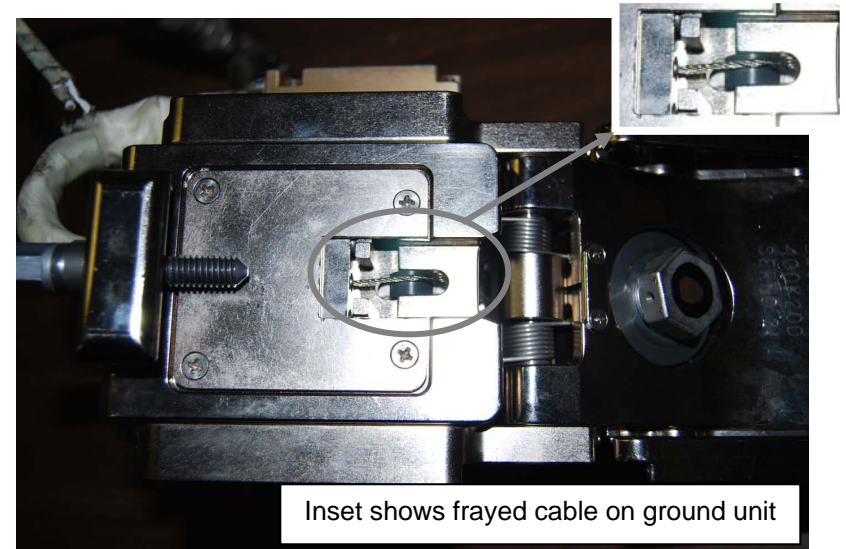


Figure 16. Bearing Package Cable – Open View

EVA 1 SARJ – TASK DATA (Cont)

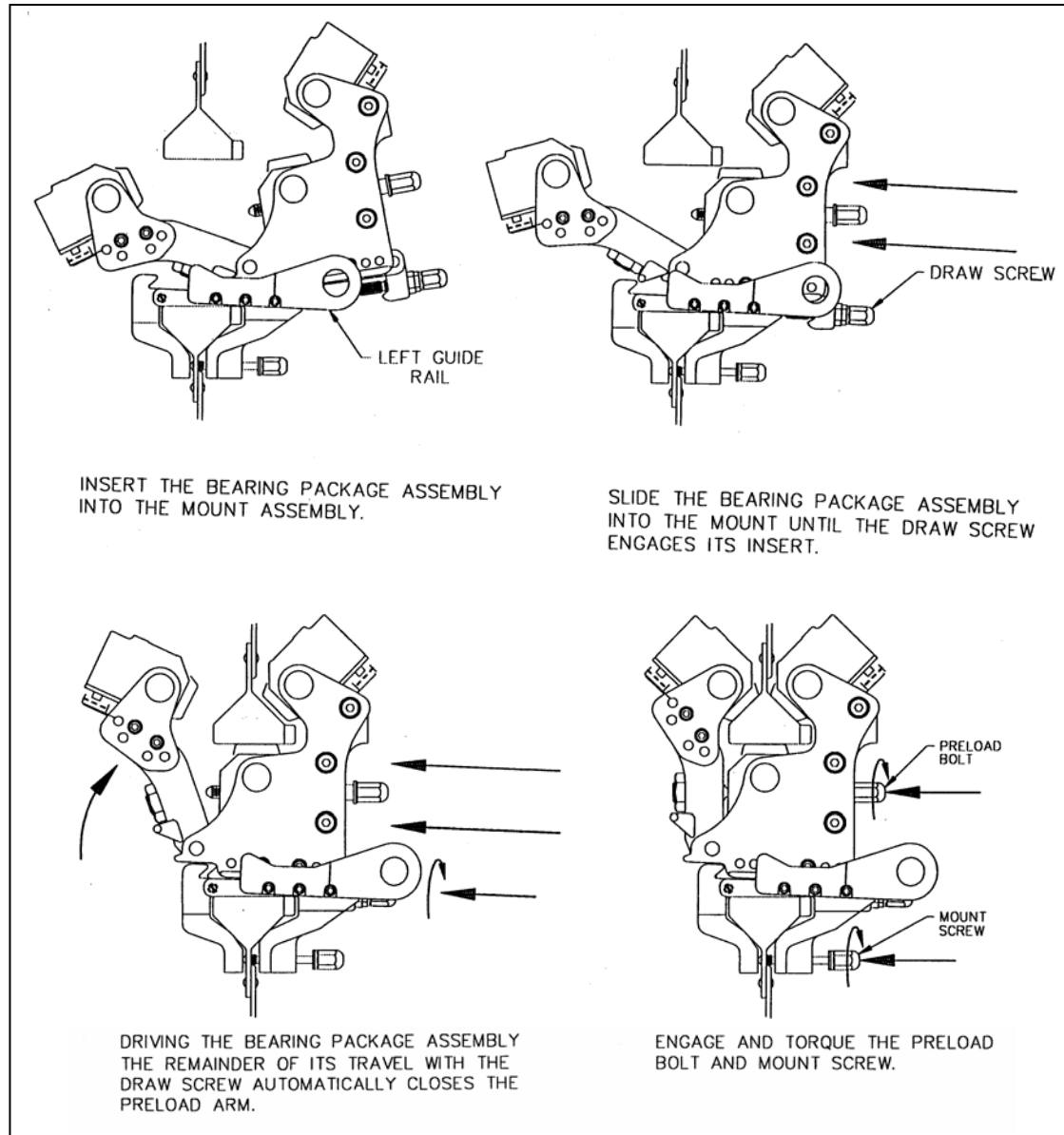


Figure 17. TBA Install Sequence



## EVA 1 SLR REMOVAL – TASK DATA

### Estimated Task Duration:

	With RMS	Without RMS
One EVA Crew	N/A	00:15
Two EVA Crew	N/A	N/A

### Tools:

EV1/2/3
PGT w/6" ext-7/16
RET
Large Trash Bag
Large ORU Bag

### EVA Fasteners:

Fastener Name	Label	Qty	Head Size	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
SLR Fastener	NA	2	7/16"	52.1-56.3	Expect: 25.5	165.2	17	30
SLR Jack Bolt	NA	1	7/16"	3.9-12.5	12.0	139.3	3 (9 max)	30

### Notes:

- The SARJ Launch Restraint (SLR) comes off in three attached pieces via lanyards. The SLR consists of two clamshell halves retained by two captive EVA bolts on the outer edges, with a central EVA jack bolt and a EVA tether loop on the upper half of the clamshell assembly

### Cautions:

- Do not exceed 9 turns on clamshell jack bolt. Half "moon-shaped" nuts on jack bolt may become detached if turned more than 9 turns

### Warnings:

None



Figure 1. SLR Together



Figure 2. SLR Apart



Figure 3. Mushroom Shaped Fitting



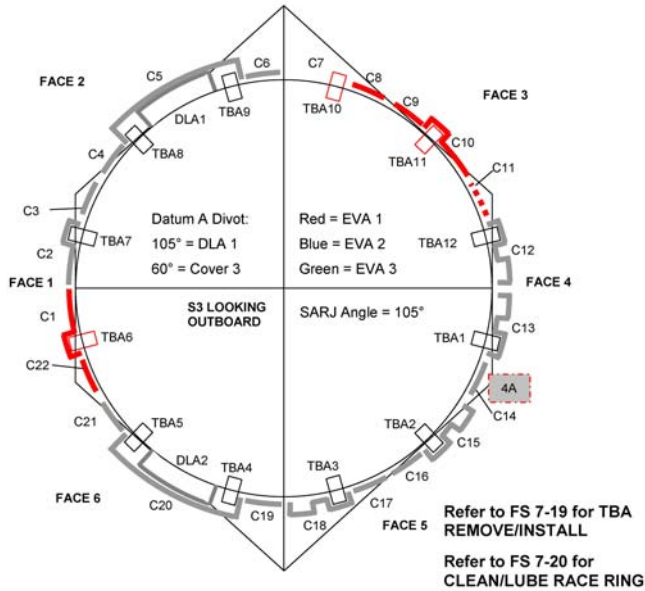
Figure 4. SLR Installed

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**HOOK  
VELCRO**

**STBD SARJ CUE CARD**



Refer to FS 7-19 for TBA REMOVE/INSTALL  
Refer to FS 7-20 for CLEAN/LUBE RACE RING

Get-Aheads:  
Can leave covers 15-18 off between EVAs 2 and 3.  
Can leave 13 and 14 off but cannot remove covers 5-12 on EVA 3

**MLI COVERS**

**CAUTION**

To prevent loss of inboard MLI cover fasteners during removal:  
Limit turn count to minimum required for fastener release  
Minimize side loading bolt head  
Maintain axial force on fastener to compress spring during rotation

- REMOVE: Tether to cover; PGT[A6 8.3 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16: Release inboard MLI cover fasteners, 9 turns
- INSTALL: PGT[A1 2.5 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16: Engage MLI cover fasteners, 9 turns

SARJ Angle	Cover #	# of Bolts	Cover Removed	Item Under Cover	S/N	TBA Removed	SARJ Cleaned	SARJ Lubed	TBA Installed	Cover Installed
105	7	6		TBA 10	1037					
	8	4								
	9	4								
	10	6		TBA 11**	1023					
	11	4								
	1	6		TBA 6	1017					
	22	4								
60	4	4								
	5	4		TBA 8	1031					
				DLA 1***	1004					
				TBA 9	1030					
	6	4								
	7	6		TBA 10*						
	8	4								
	9	4								
	10	6		TBA 11**						
	11	4								
	12	6		TBA 12	1034					
	19	4								
				TBA 4	1035					
	20	4		DLA 2***	1005					
				TBA 5*	1039					
	21	4								
	22	4								
	1	6		TBA 6*						
	2	6		TBA 7	1036					
	3	4								
	13	6		TBA 1	1032					
	14	4								
15	6		TBA 2	1029						
16	4									
17	4									
18	5/6		TBA 3	1033						

\*These TBAs are clean already, so only the bearing package needs to be removed to enable cleaning and lubing of outboard ring

\*\*TBA 11 is removed on EVA 1, installed on EVA 2

\*\*\*DLA cleaning should occur prior to installing second TBA by DLA

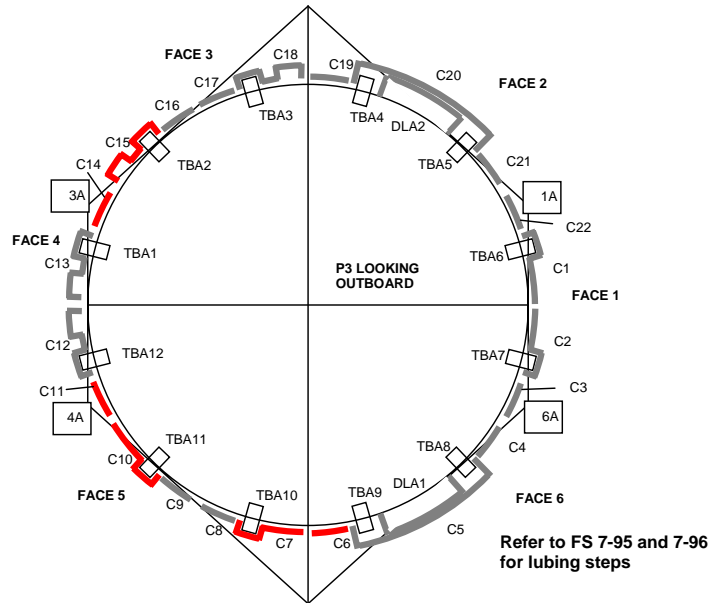
EVA-4a/126/O/A

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BACK OF 'STBD SARJ CUE CARD'

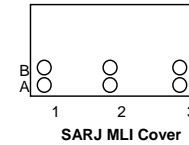
**HOOK  
VELCRO**

**PORT SARJ CUE CARD**



Set	Cover #	# of Bolts	Cover Removed	SARJ Angle						Cover Installed
				210			30			
				Inner Cantcd (J-hook)	Datum A (Straight)	Outer Cantcd (Straight)	Inner Cantcd (J-hook)	Datum A (Straight)	Outer Cantcd (Straight)d	
Zenith	14	4								
	15	6								
Middle	11	4								
	10	6								
Nadir	7	6								
	6	4								

- Remove MLI covers: Refer to FS 7-94
  - Covers 14 & 15 (EV3)
  - Covers 10 & 11 (EV2)
  - Covers 6 & 7 (EV2)
- First lubrication of Port SARJ:
  - J-hook nozzle under Covers 14&15
  - J-hook nozzle under Covers 10&11, and 6&7
  - Straight nozzle under Covers 14&15
  - Straight nozzle under Covers 10&11, and 6&7
- Perform the following until MCC gives GO to continue port SARJ lubing (port SARJ locked at 210 or 30 deg):
  - ETVCG Install: Refer to FS 7-101
  - Get-Aheads as listed on FS 7-102
- Second lubrication of Port SARJ:
  - J-hook nozzle under Covers 14&15, 10&11, and 6&7
  - Straight nozzle under Covers 14&15, 10&11, and 6&7
- Cleanup Tools
- Install MLI Covers: Refer to FS 7-104
  - Covers 14 & 15
  - Covers 10 & 11
  - Covers 6 & 7
- Perform the following get-aheads:
  - P1-P3 Fluid Jumper Install: Refer to FS 7-122
  - P1 FHRC P-Clamp Release (Hose Box): Refer to FS 7-124
  - APFR relocate: Lab WIF 7 to P3 WIF 29



**MLI COVERS**

**CAUTION**

To prevent loss of inboard MLI cover fasteners during removal:  
 Limit turn count to minimum required for fastener release  
 Minimize side loading bolt head  
 Maintain axial force on fastener to compress spring during rotation

- REMOVE: Tether to cover; **PGT[A6 8.3 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:** Release inboard MLI cover fasteners, 9 turns
- INSTALL: **PGT[A1 2.5 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:** Engage MLI cover fasteners, 9 turns

EVA-4b/126/O/A

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# EVA 2 SUMMARY TIMELINE

ET HR : MIN	IV/SRMS	EV1 (Pp)	EV3 (Kb)	
00:00		POST DEPRESS (00:05)	POST DEPRESS (00:05)	00:00
		EGRESS/SETUP (00:25)	EGRESS/SETUP (00:25)	
01:00		CETA CART RELOCATION (01:50)	CETA CART RELOCATION (01:50)	01:00
		CETA Prep SSMRS Pictures CETA 1 Relocate CETA 2 Prep TUS Cable Pictures CETA 1 Install SSAS BBC Reconfig P1 to P3 CETA 2 Relocate Stage SARJ Bags and Tools CETA 2 Install SSRMS Cleanup	CETA Prep CETA 1 Relocate CETA 1 Install CETA 2 Prep CETA 2 Relocate CETA 2 Install SSRMS Cleanup	
02:00				02:00
03:00		SARJ (03:45)	LEE A LUBRICATION (01:15)	03:00
		SARJ Setup Remove Cover 9/10 Clean Lube Install TBA 11 Install Cover 9/10 Remove Cover 4/5 Remove TBA 8 Clean (DLA 1 as reqd) Lube Install TBA 8 Install Cover 4 Remove TBA 9 Install TBA 9 Install Cover 5 SARJ Cleanup	LEE Setup LEE A Snare Repair LEE Cleanup	
04:00			SARJ (02:20)	04:00
		If reqd: Remove Cover 8 Clean Lube Install Cover 8 SARJ Get-Aheads: Remove Cover 1/22 Remove TBA 6 (bearing package only) Clean Lube Install TBA 6 (bearing package only) Install Cover 1/22	SARJ Setup Remove Cover 11/12 Remove TBA 12 Clean Lube Install TBA 12 Install Cover 11/12 SARJ Cleanup SARJ Get-Aheads: Remove Cover 13/14 Remove TBA 1 Clean Lube Install TBA 1 Install Cover 13/14	
05:00				05:00
06:00		CLEANUP/INGRESS (00:30)	CLEANUP/INGRESS (00:30)	06:00
		PREREPRESS (00:05)	PREREPRESS (00:05)	

# EVA 2

## EVA 2 PRE TOOL CONFIG

- EV1**
- MWS
  - BRT (L)
  - RET (eq-eq)
  - Wire Tie (2)
  - T-Bar
  - RET (eq-eq)
  - RET (eq-eq) w/PIP Pin
  - Adj Equip Tether (2)
  - Wire Tie
  - Small Shuttle Trash Bag
  - Swing Arm (R)
  - RET (eq-eq)
  - PGT [A6 8.3 ft-lb, CAL, MTL 30.5] s/n \_\_\_\_\_
  - PGT Battery s/n \_\_\_\_\_
  - 7/16 (wobble) Socket-6 ext
  - Camera (on integral RET)
  - Camera Bracket
  - D-ring Extender (1, R D-ring)
  - 85-ft Safety Tether (R D-ring Ext)
  - Waist Tether (2, R & L on D-ring)
  - SAFER
  - WVS

- EV3**
- MWS
  - BRT (L)
  - RET (eq-eq) w/PIP Pin
  - Wire Tie (2)
  - T-Bar
  - RET (eq-eq) (2)
  - Adj Equip Tether (2)
  - Wire Tie (2)
  - Small ISS Trash Bag
  - Swing Arm (R)
  - RET (eq-eq)
  - PGT [A6 8.3 ft-lb, CAL, MTL 30.5] s/n \_\_\_\_\_
  - PGT Battery s/n \_\_\_\_\_
  - 7/16 (wobble) Socket-6 ext
  - D-ring Extender (2, R & L D-ring)
  - 85-ft Safety Tether (L D-ring Ext)
  - 55-ft Safety Tether (R D-ring Ext)
  - Waist Tether (1, R on D-ring Ext)
  - SAFER
  - WVS

- AIRLOCK CONFIG**
- RET (Lg-eq)
  - Large ORU Transfer Bag
  - Adj Equip Tether (on outside)
  - Fish Stringer Tether (Heide)
  - TBA Bag
  - TBA Bearing Package (on bag tether)
  - NOTE: Engage tether hook from inside of mount**
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
  - NOTE: Match s/n of Bearing and Mount Package**
  - TBA Bag
  - TBA Bearing Package (on bag tether)
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
  - TBA Bag
  - TBA Bearing Package (on bag tether)
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
  - TBA Bag
  - TBA Bearing Package (on bag tether)
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
  - EVA Wipe Caddy
  - EVA Wipes (6) (2 wet, 4 dry)
  - Crewlock Bag (SARJ) (to D-ring on wipe caddy)
  - RET (eq-eq) (spare on outside door handle)
  - Adj Equip Tether (2) (on outside)
  - Wire Tie (to secure grease gun)
  - RET (eq-eq) (on outside)
  - Grease Gun w/Straight Nozzle
  - Wire Tie (to secure grease gun)
  - RET (eq-eq) (on outside)
  - Grease Gun w/J Nozzle
  - EVA Wipe Caddy
  - EVA Wipes (6) (2 wet, 4 dry)
  - Scraper Debris Container (int RET)
  - RET (eq-eq)
  - Scraper
  - Large Trash Bag (int RET)
  - Camera w/Flash (on integral RET)
  - Camera Bracket

Tether Counts: (Red RETs)  
 RETs (eq-eq) = 14      RETs (PIP Pin) = 2  
 RETs (Lg-eq) = 3      Adj Equip Tethers = 12 int/1 ext

- AIRLOCK CONFIG (Cont)**
- Large ORU Transfer Bag (Cont)
  - Fish Stringer Tether (Shane)
  - TBA Bag
  - TBA Bearing Package (on bag tether)
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
  - TBA Bag
  - TBA Dust Cap (on bag tether)
  - SARJ Dust Cap (on bag tether)
  - Crewlock Bag (SARJ)
  - RET (eq-eq) (spare on outside door handle)
  - Adj Equip Tether (2) (on outside)
  - Wire Tie (2) (to secure grease guns)
  - RET (eq-eq) (on outside)
  - Grease Gun w/J Nozzle
  - EVA Wipe Caddy
  - EVA Wipes (6) (2 wet, 4 dry)
  - Scraper Debris Container (int RET)
  - RET (eq-eq)
  - Scraper
  - Large Trash Bag (int RET)
  - RET (Lg-eq)
  - Crewlock Bag (LEE Lubing) (Shane)
  - Adj Equip Tether (on outside) (2)
  - Needle Nose Pliers (int RET) (Kapton tape & zip-tie)
  - RCC Gap Gauge (int RET)
  - Adj Equip Tether (int RET)
  - EVA Wipes (2 dry)
  - Wire Tie (to secure grease gun)
  - RET (eq-eq) (on outside)
  - Grease Gun w/Straight Nozzle

**NOTE:** Prior to use, inspect the following hardware:

- RET cords for fraying
- Safety Tether/Waist Tether LAS: No Red Visible
- ISS Trash Bag: Bristle deformation/damage, after having stowed tools in trash bag
- EMU and Tools for excessive grease
- Prime Grease Guns w/J Nozzle

## EVA 2 PRE TOOL CONFIG (Cont)

### AIRLOCK CONFIG (Cont)

- Staging Bag
  - Fish Stringer Tether
  - Wire Tie Caddy
  - Velcro/Tape Caddy
  - PGT s/n \_\_\_\_\_
  - PGT Battery s/n \_\_\_\_\_
  - 7/16 (wobble) Socket-6 ext
  - Vise Grips
  - Ratchet Wrench
  - 7/16 (rigid) Socket-9 ext
  - Needle Nose Pliers – removed for EVA 2 LEE Lube
  - Spare 55-ft Safety Tether
  - Spare WIF Adapter
  - Fish Stringer
  - Connector Cleaner Tool Kit
  - Pin Straightener Assy
  - Probe
  - Pry Bar
  - MWS Key Strap Assy
  - Long Duration Tie Down Tethers (2)
  - Wheel Bogie PIP Pin
- 
- RET (Lg-eq)
  - Crewlock Bag
  - EVA Wipe Caddy
  - EVA Wipes (6 wet)
  - Fish Stringer Tether
  - EVA Wipes (6 dry)

### AIRLOCK CONFIG (Cont)

- IV Bag
- Towels (2)
- Contamination Detection Kit
- GP Caddy (2)
- Adjustable Thermal Mittens (2)
- Socket Caddy (hatch cont) w/RET (eq-eq) (Black)
- 1/2 Socket-8 ext
- 7/16 (wobble) Socket-6 ext (spare)
- DCM Plug (SAFER Hardmount) (2)

### EXTERIOR CONFIG

- S0 HR 3529 – 55-ft Safety Tether
  - S0 HR 3539 – 55-ft Safety Tether
- JEM
- EFBM Center Disk Cover
  - Wire Tie (1) (JEM HR 1179)
  - Adj Equip Tether (1) (JEM HR 1185)
- S3 SARJ
- SARJ Dust Cap on J19 (under Cover 10)

## EVA 2 BRIEFING CARD

Aft EDDA \_\_\_\_\_  
Fwd EDDA \_\_\_\_\_  
Suit IV \_\_\_\_\_  
Task IV \_\_\_\_\_  
M1/M2 \_\_\_\_\_

Hygiene Break Repress (GMT) \_\_\_\_\_:\_\_\_\_\_  
Depress to 10.2 \_\_\_\_\_:\_\_\_\_\_  
Start Purge \_\_\_\_\_:\_\_\_\_\_  
PET 00:00 \_\_\_\_\_:\_\_\_\_\_  
\_\_\_\_\_

### General Briefing

#### 1. Hygiene Break & EVA Prep – Suit IV

- Get-up Plan
- Prebreathe protocol review (Notes and Warnings)
- Equipment lock activities – IV responsibilities
- Suit donning plan – special requests
- SAFER, MWS, Safety tethers, bag stowage
- Airlock depress review

#### 2. EV Crew Procedure Review – EV CMs

- Egress Plan, √Safety tethers
- Review first post-egress steps
- Order of tasks (summary timeline)
- Translation plan, fairleads, and tether swaps
- Hazards
- Ingress Plan

#### 3. Other Procedure Review – Task IV

- Get-ahead tasks
- Constraints – ground and flight
- Notes, Cautions, and Warnings review
- Contingency procedures – cribsheet

#### 4. Communications – Task IV

- Overall setup: Big loop, A/G2, S/G2, ICOM, remind EV crew when mode swapping
- EV/IV comm protocol review – Use EV1/2/3 for DCM sw throws (all time in A/L), use first names otherwise

#### 5. Robotics – M1/M2

- SRMS/SSRMS initial position, maneuvers, clearances
- Coordinate Frames
- SRMS/SSRMS comm protocol review – expected calls, use first names
- GCA – Give direction and approx distance
- Positive handover who is giving GCA
- Cameras

#### 6. Emergencies Review – Suit IV/Task IV

- Emergency suit doff and power down
  - √Expedited Suit Doffing cue card pre-positioned for EVA day
- Loss of comm
- EMU malfunctions
- Lost tools
- Lost crewmember
- DCS
- Abort and Terminate scenarios, protocols
- Hand signal reviews

#### 7. Post EVA – Suit IV

- Suit doffing responsibilities
- Post EVA plan

#### 8. Reminders – Task IV

- Translate slow (then space is like water). Relax grip
  - Be extra careful on non-standard routes or orientations
  - Don't hop
- Monitor safety tether
- Prior to moving and ingress, √BRT & Swingarm stowed
- If you get a mal, read the caution and warning message so everyone knows what it is
- Be disciplined when tired
- Openness: When you have boot or glove pain let us know
- OK for IV and ground to check on us. If you need update, ask
- Let mistakes pass
- Manage frustration (slow down, if needed)
- Cold soak before ingress
- Verify PGT settings. PGT collars are easy to bump
- Translation Adaptation plan



## EVA 2 BRIEFING CARD (Cont)

### Generic Calls:

- ❑ Day/Night Cycles
  - √Lights, visors, gloves, tethers, and tools
  - Glove Checks: Report any damaged/missing RTV, Vetran condition
- ❑ Tether swaps:
  - Crew Report: **"Gate closed, slider locked"**
  - Tether Shuttle – Crew Report: **"Slider locked"**
- ❑ Equipment Tether Discipline
  - "Make before you break"
  - Check all gates closed
- ❑ √Both SAFER valves down at egress
  - Crew Report: **"Both handles down"**
- ❑ √APFR locking collar Black-on-black and pull test
  - Crew Report: **"Black-on-black, good pull test"**
- ❑ √PGT Green light on for bolt engage
  - May get Lo Torque msg at bolt release
  - Crew Report: **"XX turns, XX ft-lb, green light"**
- ❑ √Connectors for no bent pins, no FOD, check EMI band and inhibits in place
  - EV Report: **"Pins good, no FOD, Good EMI Band"**
  - IV: √MCC **"Are inhibits in place?"**
- ❑ √Tethers and Tools clear prior to SSRMS ORU movement
  - Each EV report: **"Tethers and tools clear"**
- ❑ Tool inventory (when leaving worksite)
  - Bags: EV call out items, IV check off on Tool Matrix
  - MWS: EV call out, BRT – MWS – Swing Arm
  - Confirm all changes from the checklist are accounted for

## EVA 2 INHIBIT PAD

### Orbiter

#### KU-BAND ANTENNA

- MCC-H
1. √KU-BAND Mask – active
  2. √KU-BAND EVA Protect Box – active

#### RCS

- If EV crew < 27 ft from FRCS
- IV
1. √DAP: VERN, FREE, LO Z (flt specific check with GNC)
- O14,15,16
2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF  
LOGIC (four) – OFF
- MCC-H
3. √Above RCS config
- IV
4. √RCS F – ITEM 1 EXEC (\*)  
√JET DES F1U – ITEM 17 (\*)  
F3U – ITEM 19 (\*)  
F2U – ITEM 21 (\*)

#### S-BAND ANTENNAS

##### NOTE

Possible loss of comm when forced LL FWD antenna

- IV
- If EV crew < 2 ft from S-Band antenna
- A1R
1. S-BAND FM ANT – XMIT LOWER/RCVR UPPER
  2. √MCC, lower antenna selected
- If no comm, or on MCC GO
- C3
3. S-BAND PM ANT – LL FWD
- When EVA crewmember at least 2 ft away from all S-Band upper antennas
- C3
4. S-BAND PM ANT – GPC

### Ground

#### All EVAs

#### Ground Radar

- MCC-H
1. √FIDO console, ground radar restrictions in place for EVA

### USOS

#### PCU

##### NOTE

PCUs may require up to 1 hr warm-up period before they are operational

#### MCC-H

1. √PCUs (two) operational in discharge mode and one of the following:
    - a. CCS PCU EVA hazard control FDIR enabled
    - b. No more than two arrays unshunted and oriented < 105 deg from the velocity vector
- If one or both PCUs failed:
2. No more than two arrays unshunted and oriented < 105 deg from velocity vector

#### Mobile Transporter

- MCC-H
1. √MT latched

#### TUS

#### MCC-H

1. Verify RPCM S04B\_F RPC 17 – OPEN

#### S3 SARJ

#### MCC-H

- SARJ at 60 deg
1. √DLA (1) – LOCKED
  2. All motor setpoints set to zero
  3. All motors deselected

#### P1 TRRJ

#### MCC-H

- TRRJ at 0 deg
1. √DLA (1) – LOCKED

## EVA 2 INHIBIT PAD (Cont)

### COL

EuTEF	
COL-CC	Verify PLEGPAY Power Status (ETF_PLEGPAY_Pwr_Stat) – OFF

### RSOS

SM Antennas	
IV	<ol style="list-style-type: none"><li>1. GTS – Deactivate</li><li>2. ARISS (Ham Radio) – Deactivate or VHF (144-146 MHz) TX only</li></ol>

## EVA 2 NOTES/CAUTIONS/WARNINGS

### NOTES

1. Bolt install: Report torque and turns
2. Bolt release: Report torque and turns if different from published range
3. EVA connectors: After disconnection and prior to connection; verify pin and EMI band integrity; verify connector free of FOD
4. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
5. Ensure safety tethers are clear of structure during CETA cart install
6. Grease should not extend more than ¼ inch from bearing on the LEE snares

### CAUTION

#### **ISS Constraints**

- A. Avoid inadvertent contact with
  1. Grapple fixture shafts (drylube)
  2. PIP pins
  3. CETA Lights (Z-93 paint) [LAB,S1, Node 1]
  4. Passive UMAs
  5. MBS/SSRMS/SPDM/JEMRMS taped radiative surfaces: VDU, ACU, JEU, JEMRMS EE, LEU, MCU, CRPCMs, and Cameras
  6. Deployed TUS cable [Nadir CETA rail]
  7. GPS Antennas (S13 paint) [S0]
  8. UHF Antennas [LAB,P1]
  9. SPDM SJEU, EP, OTCM, LEU, and LEE VDU Radiator surfaces
  10. Avoid inadvertent contact with LEE grounding springs, torsional springs, latch covers, shrouds, and camera
- B. Electrical cables
  1. Avoid bend radii < 10 times cable diameter
- C. For structural reasons
  1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
  2. Avoid performing shaking motions (sinusoidal functions) more than four cycles
  3. Avoid kicking S1/P1 radiator beam.  
If any of these occur, wait 2 to 5 min to allow structural response to dissipate

### CAUTION

#### **ISS Constraints (Cont)**

- D. SARJ Hardware
  1. During MLI cover fastener release: Limit turn count to minimum required, minimize side loading bolt head, and maintain axial force on fastener to compress spring during rotation
  2. Avoid scratching or nicking the Race Ring while working on repair
  3. Two TBAs can only be out at the same time at 90, 120, or 180 deg
  4. Port SARJ must be locked for EVA ops outboard of starboard AJIS Struts
- E. Other
  1. MLI handholds are not rated for crewmember translation loads
  2. Do not impart loads into CETA cart with less than 3 of 4 wheel bogies engaged
  3. Do not stress torsional spring more than 90 deg (rod-end perpendicular to LEE housing) when exercising bearing

## EVA 2 NOTES/CAUTIONS/WARNINGS (Cont)

### WARNING

#### ISS Constraints

- A. Avoid inadvertent contact with
1. Grapple fixture targets and target pins
  2. Stay inboard of SARJ when active
  3. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate
- B. Handrails
1. Handrails previously used for MISSE attachment may not be used as a safety tether point [A/L endcone 564 & 566, A/L Tank 2 nad/fwd & port/fwd, P6 5389]
- C. Pinch
1. NZGL connector linkage. Use caution when mating/locking
  2. EV side of IV Hatch during Hatch operation (also snag hazard) [A/L]
- D. RF radiation exposure
1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1]
  2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1]
  3. Stay 1 ft from UHF Antenna when powered [LAB,P1]

### WARNING

#### ISS Constraints (Cont)

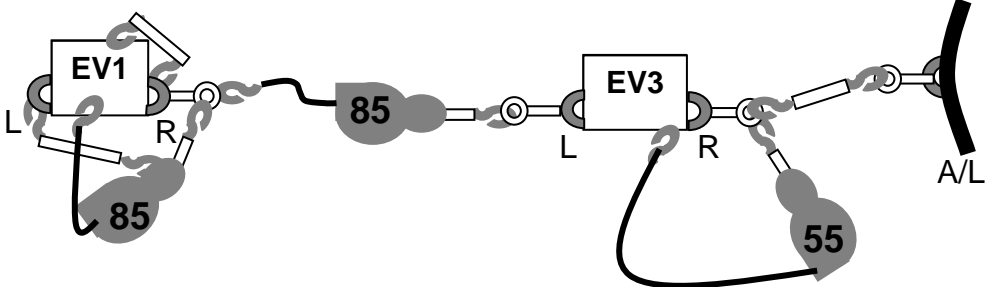
- E. Sharp Edges
1. Inner edges of WIF probes
  2. APFR active WIF probes
  3. Mating surfaces of EVA connectors  
Avoid side loads during connector mating
  4. Spring loaded captive EVA fasteners (e.g., 6B-boxes, SARJ Covers); the end of the spring may protrude
  5. Keep hands away from SSRMS/POA/SPDM LEE/JEMRMS EE opening, snares, and PDGF curvic coupling (teeth)
  6. Port/Aft portion of A/L circular HR [HR 0506]
  7. LEE grounding springs and internal mechanisms inside LEE with gloved hand
- F. Thermal
1. EVA connectors with booties may become hot if left uncovered. Handling may need to be limited
  2. Turn off glove heaters when comfortable temp reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
  3. Uncovered trunnion pins may be hot
  4. SSRMS/MBS/SPDM/JEMRMS operating cameras and lights may radiate large amounts of heat
  5. Stay  $\geq 1$  ft away from PMAs and MMOD shields  $> 270$  degF if EMU sun visor up; limit time to 15 min or less if  $> 300$  degF

### WARNING

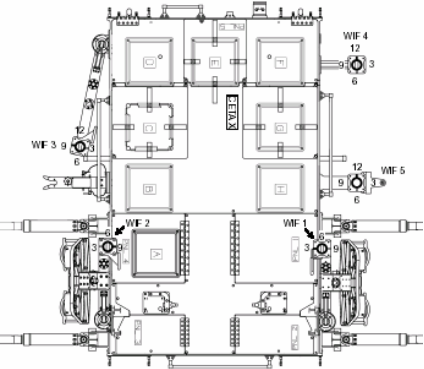
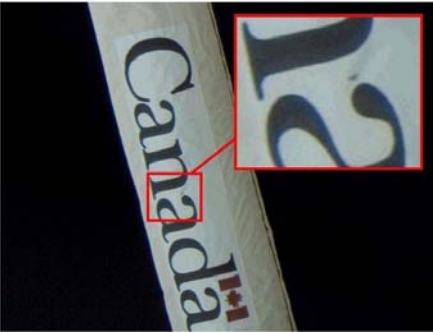

#### ISS Constraints (Cont)

- F. Thermal (Cont)
6. Stay at least 0.5 ft away from PMA and MMOD shields  $> 325$  degF
  7. Do not touch EMU protective visor if temp has been  $< -134$  degF for  $> 15$  min
  8. No EMU TMG contact with PMAs and MMOD shields  $> 320$  degF
  9. No EMU boot contact with foot restraint when temp  $< -120$  degF or  $> 200$  degF
- G. Electrical Shock
1. Stay  $\geq 2$  ft from ungrounded floating connectors if not unpowered
    - SSPTS connectors include NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA2 Stbd and Port
    - MBS Cross-Connect jumpers (translate past these using UMA handrails) Include S0 EVA Power Cables (inside S0 Bay 00 Face 4, Bay 01 Face 3) ESP-2 jumper (inside S0 Bay 03 Face 4)
  2. Do not touch blemishes on zenith TUS cable
- H. SARJ Hardware
1. Sharp edge potential on TBA bearing package and mount
  2. SARJ must be locked to prevent rotation when EV crew is within 2 ft of rotational plane


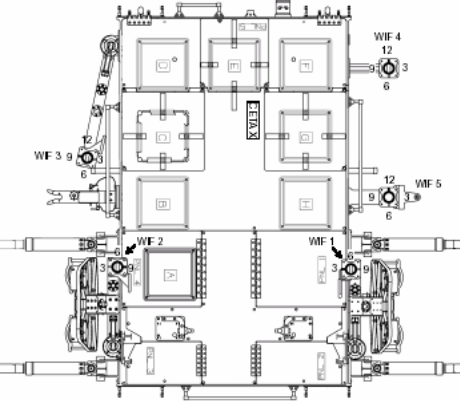

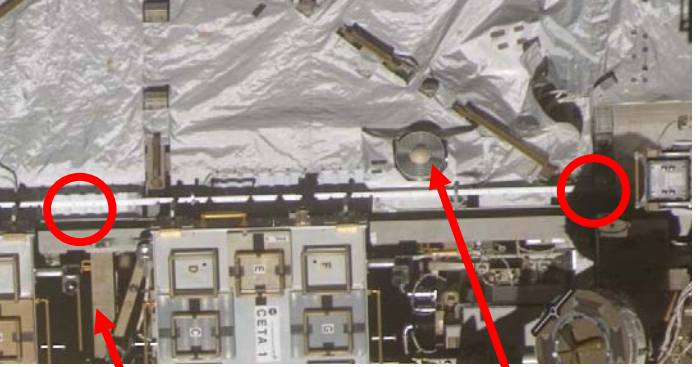
## EVA 2 EGRESS/SETUP (00:25)

IV/SSRMS	EV1	EV3
	<p>Initial Config: EV3 85-ft Safety Tether to R D-ring Ext</p> 	<p>Initial Config: R Waist Tether from R D-Ring Ext to Airlock D-ring Ext, 85-ft Safety Tether from L D-ring Ext to EV1's R D-ring Ext</p>
<p>1. Post crew egress: WVS Software:</p> <p>Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max</p>	<p><u>EGRESS</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Open A/L thermal cover</li> <li>2. Egress A/L</li> <li>3. √SAFER MAN ISOL vlv – Open (down)</li> <li>4. √SAFER HCM – Closed (down)</li> <li>5. Receive Large ORU Bag from EV3; stow on BRT</li> <li>6. Translate to S0 Tether Shuttles</li> <li>7. Retrieve Tether Shuttles (2)</li> <li>8. Install EV1 Tether Shuttle onto nadir CETA rail (stbd); verify Locked</li> <li>9. Install EV3 Tether Shuttle onto nadir CETA rail (port); verify Locked</li> <li>10. Attach EV1 85-ft Safety Tether to Tether Shuttle</li> <li>11. Verify locking hooks – Gate Closed, Slider Locked</li> <li>12. Attach EV3 85-ft Safety Tether to Tether Shuttle</li> <li>13. Verify locking hooks – Gate Closed, Slider Locked</li> <li>14. Give EV3 GO to disconnect waist tether</li> </ol> <p><u>SETUP</u> (00:10)</p> <ol style="list-style-type: none"> <li>15. Translate to S1 HR 3203 (or 3204)</li> <li>16. Temp stow Large ORU Bag on S1 HR 3203</li> <li>17. Translate to CETA 2</li> <li>18. Perform Glove Inspection</li> </ol>	<p><u>EGRESS</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Transfer Large ORU Bag to EV1</li> <li>2. Egress A/L</li> <li>3. Retrieve Crewlock Bag</li> <li>4. Stow Crewlock Bag on BRT</li> <li>5. √SAFER MAN ISOL vlv – Open (down)</li> <li>6. √SAFER HCM – Closed (down)</li> <li>7. Perform translation adaptation as reqd</li> <li>8. On EV1 GO, disconnect waist tether</li> <li>9. Close A/L thermal cover</li> </ol> <p><b>WARNING</b> Do not touch blemishes on zenith TUS cable</p> <p><u>SETUP</u> (00:10)</p> <ol style="list-style-type: none"> <li>10. Translate to CETA 2/CETA 1 interface</li> <li>11. Perform Glove Inspection</li> </ol>

## EVA 2 CETA CART RELOCATE (01:50)


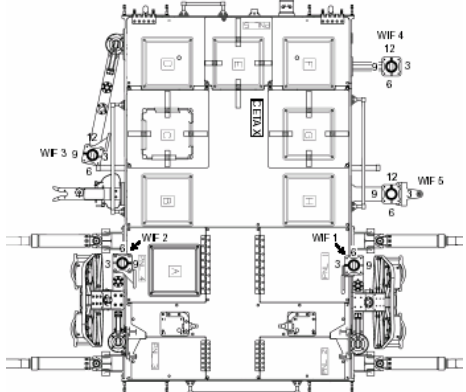
IV/SSRMS	EV1	EV3
 <ol style="list-style-type: none"> <li>1. <b>On EV3 GO</b>, SSRMS: Mnvtr to APFR reconfig position</li> <li>2. SSRMS: Mnvtr as reqd to reconfigure APFR</li> <li>3. SSRMS: Mnvtr as reqd for Safety Tether swap and APFR ingress</li> </ol> <p>Area of Interest on SSRMS</p> 	<p><u>CETA PREP</u> (00:20)</p> <ol style="list-style-type: none"> <li>1. <b>On EV3 GO</b>, translate CETA 2 starboard <ul style="list-style-type: none"> <li>• Stbd TFR at CETA marker 7650</li> <li>• Port TFR at CETA marker 7800</li> </ul> </li> <li>2. Engage CETA 2 parking brake (left handle) <ul style="list-style-type: none"> <li><input type="checkbox"/> Reconfigure CETA 2 WIF 1 Y/P [12, GG] (WIF straight fwd &amp; bumper port)</li> </ul> </li> <li>3. Translate to CETA 1</li> <li>4.  Take photos of SSRMS blemish between N and second A in CANADA (daylight opportunity)</li> <li>5. Prep CETA 1 for relocate <ul style="list-style-type: none"> <li><input type="checkbox"/> <input checked="" type="checkbox"/> Brake handles (4) straight/up and collars Locked</li> <li><input type="checkbox"/> <input checked="" type="checkbox"/> Swingarms (3) stowed</li> <li><input type="checkbox"/> Fairlead EV3's safety tether clear of CETA 2</li> <li><input type="checkbox"/> Verify energy absorbers (2) fully extended</li> <li><input type="checkbox"/> Release parking brake once EV3 has CETA 1 tethered (tap petal twice)</li> </ul> </li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b></p> <p>Do not impart loads into CETA cart with less than 3 of 4 wheel bogies engaged</p> </div> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">Ensure safety tethers are clear of structure during CETA cart install</p>	<p><u>CETA PREP</u> (00:20)</p> <ol style="list-style-type: none"> <li>1. Take CETA 1 coupler to UNLOCK</li> <li>2. <b>Give EV1 GO</b> to translate CETA 2</li> <li>3. Take CETA 1 coupler to CAPTURE</li> <li>4. Translate to CETA 1/MT interface</li> <li>5. Take MT coupler to UNLOCK</li> <li>6. Translate CETA 1 starboard (center on 04 beam) <ul style="list-style-type: none"> <li>• Stbd TFR at CETA marker 8070</li> <li>• Port TFR at CETA marker 8250</li> </ul> </li> <li>7. Engage CETA 1 parking brake (left handle)</li> <li>8. <b>Give SSRMS GO</b> to mnvtr to APFR reconfig position</li> <li>9. Take MT coupler to CAPTURE</li> <li>10. Translate to CETA 1</li> <li>11. GCA SSRMS as reqd to reconfigure APFR</li> <li>12. Reconfigure APFR on SSRMS: [12, FF, F, 12] <ul style="list-style-type: none"> <li>✓ Locking collar black-on-black</li> <li>✓ Good pull test</li> </ul> </li> <li>13. GCA SSRMS as reqd for Safety Tether swap and APFR ingress</li> <li>14. Perform 55-ft Safety Tether swap onto SSRMS; verify locking hook – Gate Closed, Slider Locked</li> <li>15. Stow 85-ft Safety Tether on S0 HR 3416</li> <li>16. Ingress APFR</li> <li>17. Attach MWS EE to ingress aid</li> <li>18. Tether to CETA 1 with RET</li> <li>19. Hold CETA 1 at grids C and G</li> </ol>

## EVA 2 CETA CART RELOCATE (01:50) (Cont)

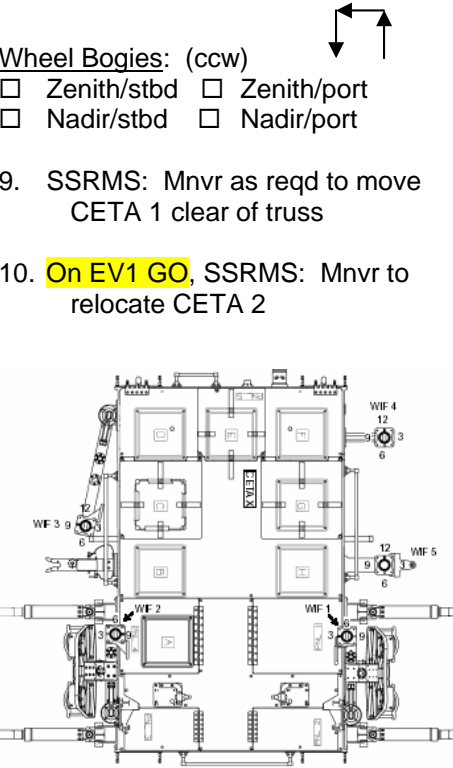
IV/SSRMS	EV1	EV3
<p><u>Wheel Bogs:</u> (ccw) </p> <ul style="list-style-type: none"><li><input type="checkbox"/> Zenith/stbd <input type="checkbox"/> Zenith/port</li><li><input type="checkbox"/> Nadir/stbd <input type="checkbox"/> Nadir/port</li></ul> <ol style="list-style-type: none"><li>4. SSRMS: Mnvr as reqd to move CETA 1 clear of truss</li><li>5. <b>On EV1 GO</b>, SSRMS: Mnvr to relocate CETA 1</li></ol> 	<p><u>CETA 1 RELOCATE</u> (00:10)</p> <ol style="list-style-type: none"><li>6. <b>On EV3 GO</b>, release CETA 1 wheel bogies (4)</li><li>7. <b>Give EV3 GO</b> to remove CETA 1 from rails</li><li>8. Assist EV3 with clearances as reqd</li><li>9. GCA SSRMS as reqd to move CETA 1 clear of truss</li><li>10. <b>Give SSRMS GO</b> to mnvr to relocate CETA 1</li><li>11. Relocate EV3's safety tether from S0 HR 3416 to S0 HR 3530 (or port strut)</li></ol> <p><u>CETA 2 PREP</u> (00:15)</p> <ol style="list-style-type: none"><li>12.  Take photos of TUS Cable interest areas (daylight opportunity)</li><li>13. Translate to CETA 2 (S0 Bay 0)</li><li>14. Release CETA 2 brakes (tap pedal twice)</li><li>15. Translate CETA 2 port (center on 04 beam)<ul style="list-style-type: none"><li>• Stbd TFR at CETA marker 8070</li><li>• Port TFR at CETA marker 8250</li></ul></li><li>16. Engage CETA 2 parking brake<ul style="list-style-type: none"><li><input type="checkbox"/> √Brake handles (4) straight/up and collars Locked</li><li><input type="checkbox"/> √Swingarms (3) stowed</li><li><input type="checkbox"/> Verify energy absorbers (2) fully extended</li><li><input type="checkbox"/> Reconfigure CETA 2 WIF 1 Y/P [12, GG] (WIF straight fwd &amp; bumper port)</li></ul></li><li>18. Fairlead Safety Tether zenith and around CETA 2</li><li>19. As time permits, transfer Large ORU Bag to Stbd SARJ</li></ol>	<p><u>CETA 1 RELOCATE</u> (00:25)</p> <ol style="list-style-type: none"><li>20. <b>Give EV1 GO</b> to release wheel bogies</li><li>21. <b>On EV1 GO</b>, remove CETA 1 from MT rails; remove CETA 1 from rails station forward until wheel bogies clear rail</li></ol> <p style="text-align: center;">OCAS Time = 00:15</p> <p style="text-align: center;"><u>Areas of Interest on the TUS Cable</u></p>  <p style="text-align: center;">04 Beam <span style="margin-left: 400px;">GPS Antenna 3</span></p>





## EVA 2 CETA CART RELOCATE (01:50) (Cont)

IV/SSRMS	EV1	EV3
<p>6. SSRMS: Mnv'r as req'd to CETA 1 drop-off position</p> <p>Wheel Bogies: (cw) </p> <p><input type="checkbox"/> Zenith/stbd   <input type="checkbox"/> Zenith/port  <input type="checkbox"/> Nadir/stbd   <input type="checkbox"/> Nadir/port</p> <p>7. <b>On EV1 GO</b>, SSRMS: Mnv'r to retrieve CETA 2</p> <p>8. SSRMS: Mnv'r as req'd to CETA 2 pickup position</p> 	<p><u>CETA 1 INSTALL</u> (00:10)</p> <p>20. Perform Glove Inspection (if req'd)  21. GCA SSRMS as req'd to CETA 1 drop-off position  22. Guide CETA 1 onto MT rails  23. Install wheel bogies (4)  24. CETA 1 coupler in CAPTURE  25. Release EV3 RET and attach it to EVA camera with bracket  26. Transfer EVA camera to EV3  27. <b>Give SSRMS GO</b> to mnvr to retrieve CETA 2  28. Couple CETA 1 to MT  29. Take CETA 1 coupler to LOCK</p> <p><u>SSAS BBC RECONFIG P1 TO P3</u> (00:15)</p> <p>30. As time permits, perform SSAS BBC RECONFIG, FS 7-119  31. Translate to CETA 2  32. Release parking brake once EV3 has CETA 2 tethered (tap petal twice)</p>	<p><u>CETA 1 INSTALL</u> (00:20)</p> <p>22. Install CETA 1 on MT rails</p> <p>23. Receive EVA camera from EV1; stow on swing arm</p> <p style="text-align: center;">OCAS Time = 00:15</p> <p><u>CETA 2 PREP</u> (00:05)</p> <p>24. GCA SSRMS as req'd to CETA 2 pickup position  25. Tether to CETA 2 with RET  26. Hold CETA 2 at grids C and G</p> <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px auto; width: fit-content;"> <p><b>CAUTION</b></p> <p>Do not impart loads into CETA cart with less than 3 of 4 wheel bogies engaged</p> </div> <p style="text-align: center;"><b>NOTE</b></p> <p style="text-align: center;">Ensure safety tethers are clear of structure during CETA cart install</p>

## EVA 2 CETA CART RELOCATE (01:50) (Cont)

IV/SSRMS	EV1	EV3
<p>Wheel Bogies: (ccw)</p> <p><input type="checkbox"/> Zenith/stbd   <input type="checkbox"/> Zenith/port</p> <p><input type="checkbox"/> Nadir/stbd   <input type="checkbox"/> Nadir/port</p> <p>9. SSRMS: Mnvr as reqd to move CETA 1 clear of truss</p> <p>10. <b>On EV1 GO</b>, SSRMS: Mnvr to relocate CETA 2</p>  <p>11. SSRMS: Mnvr as reqd to CETA 2 drop-off position</p> <p>Wheel Bogies: (ccw)</p> <p><input type="checkbox"/> Zenith/stbd   <input type="checkbox"/> Zenith/port</p> <p><input type="checkbox"/> Nadir/stbd   <input type="checkbox"/> Nadir/port</p> <p>12. SSRMS: Mnvr as reqd to CETA 2 clearance position</p>	<p><u>CETA 2 RELOCATE</u> (00:05)</p> <p>33. <b>On EV3 GO</b>, release CETA 2 wheel bogies (4)</p> <p>34. <b>Give EV3 GO</b> to remove CETA 2 from rails</p> <p>35. Assist EV3 with clearances as reqd</p> <p>36. GCA SSRMS as reqd to move CETA 2 clear of truss</p> <p>37. <b>Give SSRMS GO</b> to mnvr to relocate CETA 2</p> <p><u>STAGE STBD SARJ BAGS AND TOOLS</u> (00:20)</p> <p>38. As time permits, stage Stbd SARJ Bags and Tools</p> <p>39. Retrieve EV3's 85-ft Safety Tether from S0 HR 3530</p> <p>40. Transfer EV3's 85-ft Safety Tether to P1 HR 3652 (drag link)</p> <p><u>CETA 2 INSTALL</u> (00:10)</p> <p>41. Perform Glove Inspection</p> <p>42. Translate outboard of CETA 2 drop-off position</p> <p>43. ✓Tether clear of CETA 2 Install</p> <p>44. GCA SSRMS as reqd to CETA 2 drop-off position</p> <p>45. Guide CETA 2 onto MT rails</p> <p>46. Install wheel bogies (4)</p> <p>47. ✓CETA 2 coupler in CAPTURE</p> <p>48. Relocate EV3's 85-ft safety tether to toe clip on CETA 2 stbd TFR</p> <p>49. <b>Give EV3 GO</b> to release CETA 2</p> <p>50. GCA SSRMS as reqd to CETA 2 clearance position</p> <p>51. Retrieve tether fairlead from around CETA 2</p> <p>52. Couple CETA 2 to CETA 1</p> <p>53. Take CETA 2 coupler to LOCK</p>	<p><u>CETA 2 RELOCATE</u> (00:25)</p> <p>27. <b>Give EV1 GO</b> to release wheel bogies</p> <p>28. <b>On EV1 GO</b>, remove CETA 2 from MT rails; lift CETA 2 from rails due forward until wheel bogies clear rail</p> <p style="text-align: center;">OCAS Time = 00:15</p> <p><u>CETA 2 INSTALL</u> (00:10)</p> <p>29. Install CETA 2 on MT rails</p> <p>30. <b>On EV1 GO</b>, release CETA 2 tether</p>

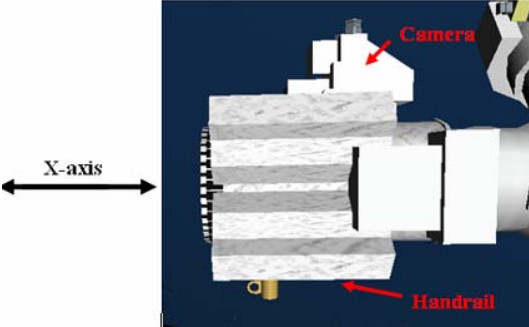
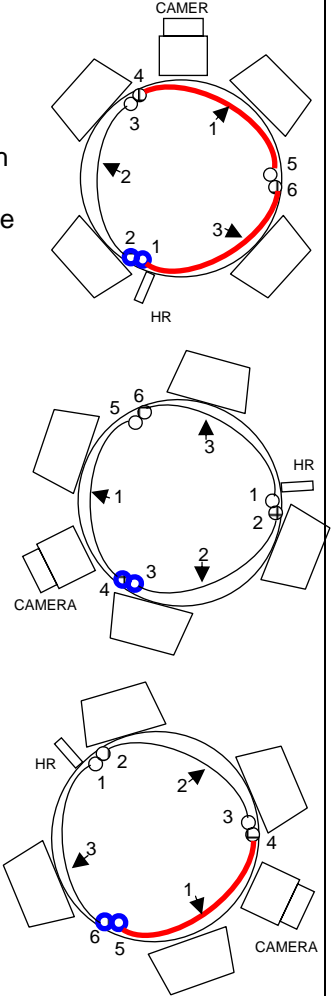
**EVA 2 CETA CART RELOCATE (01:50) (Cont)**

IV/SSRMS	EV1	EV3
<p>13. <b>On EV3 GO</b>, SSRMS: Mnvr to APFR egress position</p> <p>14. SSRMS: Mnvr as reqd to APFR egress position</p>	<p><u>SSRMS CLEANUP</u> (00:05)</p> <p>54.  WVS Survey of CETA Carts</p> <p>55. Translate to Stbd SARJ</p>	<p><u>SSRMS CLEANUP</u> (00:05)</p> <p>31.  WVS Survey of CETA Carts</p> <p>32. <b>Give SSRMS GO</b> to mnvr to APFR egress position</p> <p>33. GCA SSRMS as reqd to APFR egress position</p> <p>34. Egress APFR</p>

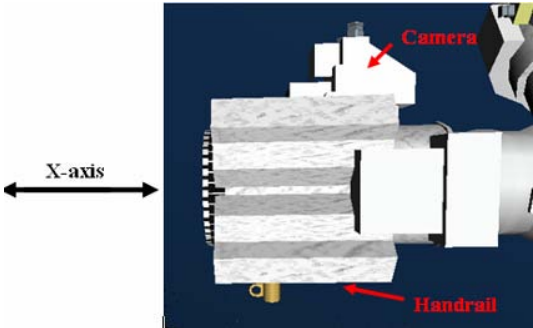
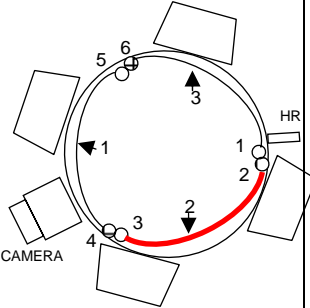
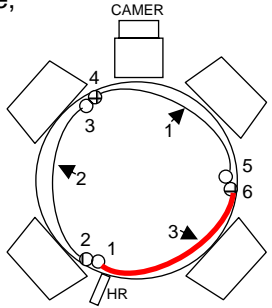
## EVA 2 LEE A LUBRICATION (01:15)

IV/SSRMS	EV3
<p>1. SSRMS: Mnv as reqd for Safety Tether swap and APFR relocate</p> <p>2. <b>On EV3 GO</b>, SSRMS: Mnv to LEE setup position</p> <p>3. <b>On EV3 GO</b>, SSRMS: Mnv to LEE lube position</p> <p>4. SSRMS: Mnv as reqd to LEE repair position</p> <div data-bbox="241 836 661 1380"> <p>○ Inner Bearing ⊗ Outer Bearing</p> </div>	<p><u>LEE SETUP</u> (00:20)</p> <ol style="list-style-type: none"> <li>GCA SSRMS as reqd for Safety Tether swap and APFR relocate</li> <li>Perform Safety Tether swap onto EV3 85-ft Safety Tether temp stowed on HR 3652 (drag link) <ul style="list-style-type: none"> <li>√Fairlead on CETA Cart clear of MCU and VDU surfaces on MBS</li> <li>√Verify locking hook: Gate Closed; Slider Locked</li> </ul> </li> <li>Deploy CETA 2 port parking brake handles down (pointing port)</li> <li>Relocate APFR to CETA 2 WIF 1; APFR [6, II, F, 6] (WIF 1 Y/P [12, GG]; bumper port) <ul style="list-style-type: none"> <li>√Locking collar black-on-black</li> <li>√Good pull test</li> </ul> </li> <li>Remove WIF adapter</li> <li>Fairlead Safety Tether along CETA rail</li> <li><b>Give SSRMS GO</b> to mnvr to LEE setup position</li> <li>Ingress APFR; attach MWS EE to ingress aid</li> <li><b>Give SSRMS GO</b> to mnvr to the LEE lube position</li> <li>Stow spare 55-ft Safety Tether in Crewlock Bag</li> <li>Stow WIF adapter in Crewlock Bag</li> <li>Retrieve Camera from Crewlock Bag</li> <li>GCA SSRMS as reqd to LEE repair position</li> <li><input checked="" type="checkbox"/> Take pictures of LEE (4) <ul style="list-style-type: none"> <li>Each pair of bearings (3)</li> <li>Overall view of LEE</li> </ul> </li> </ol> <div data-bbox="892 958 1669 1063" style="border: 2px solid black; padding: 5px;"> <p style="text-align: center;"><b>WARNING</b></p> <p>Avoid touching LEE curvic coupling, grounding springs, snares, and internal mechanisms inside LEE with gloved hand</p> </div> <div data-bbox="892 1096 1669 1258" style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>CAUTION</b></p> <p>Avoid inadvertent contact with LEE grounding springs, torsional springs, latch covers, shrouds, and camera</p> <p>Do not stress torsional spring more than 90 deg (rod-end perpendicular to LEE housing) when exercising bearing</p> </div> <div data-bbox="892 1291 1669 1388" style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>NOTE</b></p> <p>Grease should not extend more than ¼ inch from bearing</p> </div>


## EVA 2 LEE A LUBRICATION (01:15) (Cont)

IV/SSRMS	EV3
<ol style="list-style-type: none"> <li>5. <b>On EV3 GO</b>, SSRMS: Mnv'r to close and open the snares</li> <li>6. SSRMS: <b>Give EV3 GO</b> for LEE work</li>   <li>7. <b>On EV3 GO</b>, SSRMS: Mnv'r +120 deg wrist roll</li> <li>8. SSRMS: <b>Give EV3 GO</b> for LEE work</li>   <li>9. <b>On EV3 GO</b>, SSRMS: Mnv'r +120 deg wrist roll</li> <li>10. SSRMS: <b>Give EV3 GO</b> for LEE work</li>   <li>11. SSRMS: Mnv'r as req'd to LEE repair position</li> <li>12. If GCA in IV/SSRMS step #11 performed, SSRMS: <b>Give EV3 GO</b> for LEE work</li> </ol>	<p><u>LEE A SNARE REPAIR</u> (00:40)</p> <ol style="list-style-type: none"> <li>15. <b>Give SSRMS GO</b> to close and open the snares</li> <li>16. Report to MCC: Snare condition (in or out of groove)</li> <li>17. <b>On SSRMS GO</b>, push <b>top right and bottom right snares</b> into groove with needle nose pliers</li> <li>18. Exercise bearing the <b>lower left outer bearing</b> in x-axis using needle nose pliers [15 sec]</li> <li>19. Push left snare into groove with needle nose pliers</li> <li>20. Prep grease gun</li> <li>21. Apply grease to <b>lower left bearings (2)</b> (rectangular pattern)</li>   <li>22. <b>Give SSRMS GO</b> to mnv'r a +120 deg wrist roll</li> <li>23. <b>On SSRMS GO</b>, apply grease to <b>lower left bearings (2)</b> (rectangular pattern)</li>   <li>24. <b>Give SSRMS GO</b> to mnv'r a +120 deg wrist roll</li> <li>25. <b>On SSRMS GO</b>, apply grease to <b>lower left bearings (2)</b> (rectangular pattern)</li> <li>26. Stow grease gun</li>   <li>27. GCA SSRMS as req'd addition wrist roll; if GCA performed wait for <b>SSRMS GO</b> prior to step 27</li> <li>28. Pull <b>lower right snare</b> fully out into C-curve with gap gauge, apply force perpendicular to rod-end</li> <li>29. Prep grease gun</li> <li>30. Apply grease to rod-end/fork interface to lower left bearing</li> <li>31. Apply grease to rod-end/fork interface to right bearing</li> <li>32. Stow grease gun</li> <li>33. Exercise lower left bearing in x-axis using needle nose pliers, for 1 min (40 cycles)</li> <li>34. Report to MCC: Any noticeable change in bearing motion</li> <li>35. Exercise right bearing in x-axis using needle nose pliers, for 1 min (40 cycles)</li> <li>36. Report to MCC: Any noticeable change in bearing motion</li> <li>37. Push lower right snare into groove with needle nose pliers</li> </ol>
	

EVA 2 LEE A LUBRICATION (01:15) (Cont)

IV/SSRMS	EV3
<p>13. On EV3 GO, SSRMS: Mnvr -120 deg wrist roll</p> <p>14. SSRMS: Give EV3 GO for LEE work</p> <p>15. On EV3 GO, SSRMS: Mnvr -120 deg wrist roll</p> <p>16. SSRMS: Give EV3 GO for LEE work</p> 	<p>38. Give SSRMS GO to mnvr a -120 deg wrist roll</p> <p>39. On SSRMS GO, pull lower right snare fully out into C-curve with gap gauge, apply force perpendicular to rod-end</p> <p>40. Prep grease gun</p> <p>41. Apply grease to rod-end/fork interface to lower left bearing</p> <p>42. Apply grease to rod-end/fork interface to right bearing</p> <p>43. Stow grease gun</p> <p>44. Exercise lower left bearing in x-axis using needle nose pliers, for 1 min (40 cycles)</p> <p>45. Report to MCC: Any noticeable change in bearing motion</p> <p>46. Exercise right bearing in x-axis using needle nose pliers, for 1 min (40 cycles)</p> <p>47. Report to MCC: Any noticeable change in bearing motion</p> <p>48. Push lower right snare into groove with needle nose pliers</p> <p>49. Give SSRMS GO to mnvr a -120 deg wrist roll</p> <p>50. On SSRMS GO, pull lower right snare fully out into C-curve with gap gauge, apply force perpendicular to rod-end</p> <p>51. Prep grease gun</p> <p>52. Apply grease to rod-end/fork interface to lower left bearing</p> <p>53. Apply grease to rod-end/fork interface to right bearing</p> <p>54. Stow grease gun</p> <p>55. Exercise lower left bearing in x-axis using needle nose pliers, for 1 min (40 cycles)</p> <p>56. Report to MCC: Any noticeable change in bearing motion</p> <p>57. Exercise right bearing in x-axis using needle nose pliers, for 1 min (40 cycles)</p> <p>58. Report to MCC: Any noticeable change in bearing motion</p> <p>59. Push lower right snare into groove with needle nose pliers</p> <p>60. If reqd, use gap gauge to pack excess grease into bearing</p> <p>61. Clean tools and gloves as necessary with EVA wipe</p>  

**EVA 2 LEE A LUBRICATION (01:15) (Cont)**

IV/SSRMS	EV3
<p>17. <b>On EV3 GO</b>, SSRMS: Mnv to close and open the snares</p> <p>18. <b>On EV3 GO</b>, SSRMS: Mnv to back-off position</p>	<p><u>LEE A CLEANUP</u> (00:15)</p> <p>62. <b>Give SSRMS GO</b> to close and open the snares</p> <p>63.  Take pictures of LEE           <ul style="list-style-type: none"> <li>• Each pair of bearings (3)</li> <li>• Overall view of LEE</li> </ul> </p> <p>64. Report to MCC: Snare condition (in or out of groove)</p> <p>65. <b>Give SSRMS GO</b> to mnvr to back-off position</p> <p>66. Egress APFR</p> <p>67. Perform Tool inventory</p> <p>68. Stow ingress aid</p> <p>69. Stow CETA 2 port parking brake handles (straight/up)</p> <p>70. Translate to Stbd SARJ</p>

**EVA 2 SARJ (03:45/02:20)**

IV/SSRMS	EV1	EV3
	<p><u>S3 SARJ SETUP</u> (00:30)</p> <ol style="list-style-type: none"> <li>1. Translate to S3 Face 1; stow Large ORU Bag</li> <li>2. Perform Glove Inspection</li> <li>3. Retrieve EV3 Fish Stringer Tether; stow for EV3 use on Face 3</li> </ol> <p><u>S3 SARJ WORK</u> (02:45)</p> <p>Refer to <u>STBD SARJ CUE CARD</u>, FS CC 7-35, for SARJ checklist:            Covers 9/10 and TBA 11            Covers 4/5 and TBA 8            Cover 5 and TBA 9            Cover 8 (if reqd)</p> <p>Get-Ahead:            Covers 1/22 and TBA 6 (bearing package only)</p> <p>Refer to SARJ – TBA REMOVE/INSTALL, FS 7-57, for steps to remove and install a TBA</p> <p>Refer to SARJ – CLEAN/LUBE RACE RING, FS 7-58, for steps to clean and to lubricate the race ring</p> <p><u>S3 SARJ BAG PACKING</u> (00:30)</p> <ol style="list-style-type: none"> <li>4. Stow SARJ Crewlock Bag on Fish Stringer Tether in Large ORU Bag</li> <li>5. Stow Fish Stringer Tether in Large ORU Bag</li> <li>6. Verify TBA Bags are rolled and folded</li> <li>7. Perform Large ORU Bag inventory</li> </ol>	<p><u>S3 SARJ SETUP</u> (00:30)</p> <ol style="list-style-type: none"> <li>1. Translate to S3 SARJ Large ORU Bag</li> <li>2. Perform Glove Inspection</li> <li>3. Retrieve straight nozzle grease gun and RET from LEE Crewlock Bag; stow on SARJ Crewlock Bag</li> <li>4. Temp stow LEE Crewlock Bag on HR___ near Large ORU Bag</li> </ol> <p><u>S3 SARJ WORK</u> (01:20)</p> <p>Refer to <u>STBD SARJ CUE CARD</u>, FS CC 7-35, for SARJ checklist            Covers 11/12 and TBA 12</p> <p>Get-Ahead:            Covers 13/14 and TBA 1</p> <p>Refer to SARJ – TBA REMOVE/INSTALL, FS 7-57, for steps to remove and install a TBA</p> <p>Refer to SARJ – CLEAN/LUBE RACE RING, FS 7-58, for steps to clean and to lubricate the race ring</p> <p><u>S3 SARJ BAG PACKING</u> (00:30)</p> <ol style="list-style-type: none"> <li>5. Stow SARJ Crewlock Bag on Fish Stringer Tether</li> <li>6. Retrieve Fish Stringer Tether</li> <li>7. Stow Fish Stringer Tether in Large ORU Bag</li> <li>8. Verify TBA Bags are rolled and folded</li> <li>9. Perform Large ORU Bag inventory</li> </ol>



# EVA 2 SARJ – TBA REMOVE/INSTALL

## Remove

### WARNING

Potential exists for sharp edge hazards on the bearing package and mount. Attempt to limit contact to tether points only

1. Verify failed TBA serial number
2. Demate TBA connector P1 from inboard receptacle on SARJ ring
3. Install SARJ dust cap on receptacle
4. Install TBA dust cap on TBA connector
5. Tether to bearing package
6. Tether to mount

### CAUTION

Two TBAs cannot be out at the same time unless the two TBAs are 90, 120, or 180 deg apart from each other

7. **PGT [B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:**  
Break torque on TBA bolts (3), 1 turn each
8. **PGT[B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:**  
Loosen bolt 3 (mount bolt), 1 turn
9. **PGT[B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:**  
Loosen bolt 1 (bearing preload bolt), 6 turns
10. **PGT[B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:**  
Release bolt 2 (draw bolt), 12 turns until preload arm swings open (into SARJ bearing package will also move away from SARJ and mount)
11. Verify TBA bag in open position
12. Stow bearing package in TBA bag

### NOTE

Do not push in while turning mount bolt 3; will cause mount clamping leg to side load bolt 3 and increase torque

13. **PGT[B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:**  
Release bolt 3 (mount bolt), 4 turns
14. Engage mount bolt 3 with PGT and press to open mount clamping leg
15. Remove mount from race ring
16. Stow mount in TBA Bag
17. Secure bag closed, stow in ORU Bag
18. Clean and Lube Race Ring as required, refer to FS 7-20

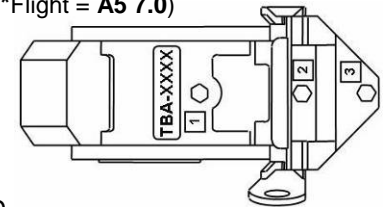
\*Indicates mount package steps to skip when removing and installing the same TBA

## Install

### NOTE

Limit force to engage mount bolt 3; too much force opens mount clamping leg

1. Retrieve new mount package from bag; report serial number
2. Verify mount clamping leg is open
3. Engage mount onto race ring, aligning mount boss with slot in race ring
4. Close mount clamping leg
5. **PGT[A2 3.8 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:** Engage bolt 3 (mount bolt), 2 turns
6. Retrieve bearing package; report serial number
7. Engage bearing package onto race ring, guiding bearing arm through race ring
8. **PGT[A3 4.8 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:** Engage bolt 2 (draw bolt), ~10.5-13 turns to torque until preload arm engages race ring (bearing package will also move toward SARJ and mount package)
9. **PGT[B1 12.0\* ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16: (\*Flight = A5 7.0)**  
Engage bolt 1 (bearing preload bolt), ~5-7 turns to torque
10. **PGT[A2 3.8 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:**  
Tighten bolt 3 (mount bolt), ~2-4 turns to torque
11. Remove dust cap on inboard receptacle; stow in TBA bag
12. Remove TBA connector dust cap; stow in TBA bag



### NOTE

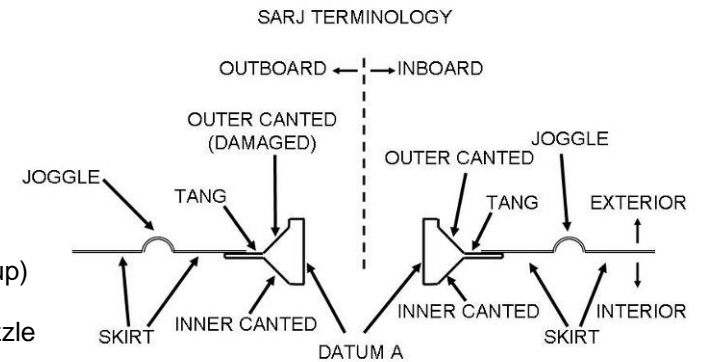
Verify pin and EMI band integrity; connector free of FOD

13. Mate connector to inboard receptable on SARJ race ring
14.  WVS Survey of work area; clean up work area; reinstall MLI cover

TBA	S/N *Flight = 1018,1026	Bolt 2		Bolt 1		Bolt 3	
		Turns (~10.5-13)	Torque (4.8)	Turns (~5-7)	Torque (7.0)	Turns (~2-4)	Final Torque (3.8)
1							
2							
3							
4							
5							
6 (1st)							
6 (2nd)							
7							
8							
9							
10							
11							
12							

## EVA 2 SARJ – CLEAN/LUBE RACE RING

IV/SSRMS	EV1/EV2
	<p><u>CLEAN STEPS</u></p> <ol style="list-style-type: none"> <li>1. Wet wipe outboard ring inner canted and datum A</li> <li>2. Wet wipe any obvious debris on skirts, joggles, etc</li> <li>3. Wet wipe DLA surfaces (if applicable)</li> <li>4. Wet wipe outer canted surface of outboard ring</li> <li>5. Stow wet wipe in large trash bag</li> <li>6. Prep straight nozzle gun:             <ol style="list-style-type: none"> <li>a. Engage teeth by rotating plunger 180 deg (black triangle up)</li> <li>b. Remove MLI tip cover</li> <li>c. Rotate shutoff knob such that FLOW pointing towards nozzle</li> </ol> </li> <li>7. Lay bead of grease on outer canted surface of outboard ring</li> <li>8. Safe and stow straight nozzle gun:             <ol style="list-style-type: none"> <li>a. Disengage teeth by rotating plunger 180 deg (black triangle down)</li> <li>b. Rotate shutoff knob such that FLOW is perpendicular to nozzle</li> <li>c. Install MLI tip cover</li> </ol> </li> <li>9. Retrieve dry wipe</li> <li>10. Use scraper to remove debris from outer canted surface of outboard ring</li> <li>11. Clean scraper in scraper debris container</li> <li>12. Close scraper debris container</li> <li>13. Use dry wipe to remove residue from cleaning the ring</li> <li>14. Use dry wipe to clean mount package area on inboard ring</li> <li>15. Stow dry wipe in large trash bag</li> </ol> <p><u>LUBE STEPS (Outboard ring)</u></p> <ol style="list-style-type: none"> <li>16. Retrieve dry wipe</li> <li>17. Use j-hook nozzle gun to grease inner canted surface. Apply approx 1 sharpie mark/click per section between TBAs</li> <li>18. Use straight nozzle gun to grease outer canted and Datum A surfaces. Apply approx 1/8" thick bead per section between TBAs</li> <li>19. Use dry wipes as required to clean up EMU and tools</li> </ol> <p>*Indicates mount package steps to skip when revisiting a SARJ worksite (TBA 5, 6, and 11)</p>



## EVA 2 CLEANUP/INGRESS (00:30)

IV/SSRMS	EV1	EV3
<p>1. Perform prior to crew ingress:  <u>WVS PWRDN (PHOTO/TV, WVS CUE CARD)</u></p>	<p><u>CLEANUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>Retrieve LEE Crewlock Bag; stow on BRT</li> <li>Perform Tool inventory</li> <li>Translate to S0</li> </ol> <p><u>INGRESS</u> (00:15)</p> <ol style="list-style-type: none"> <li><b>On EV3 GO</b>, perform Safety Tether swap onto EV3's 85-ft Safety Tether; verify locking hook – Gate Closed, Slider Locked</li> <li>Retrieve EV1 85-ft Safety Tether; stow on MWS</li> <li>Retrieve Tether Shuttles (2); stow on S0 bracket; verify Locked</li> <li>Translate to A/L</li> <li>Transfer Crewlock Bag to EV3</li> <li><b>On EV3 GO</b>, ingress A/L</li> <li>Remove SCU from stowage pouch Remove DCM cover Connect SCU to DCM, check Locked</li> <li>Water – OFF (fwd); expect "H2O IS OFF" msg</li> <li>Close thermal cover, attach Velcro strap</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not close hatch until EMU water off for 2 min</p> </div> <ol style="list-style-type: none"> <li>Verify no hardware blocking hatch</li> <li>EV Hatch Handle – verify position per hatch decal</li> <li>EV Hatch – close and lock</li> <li>Go to PRE-REPRESS (<u>DEPRESS/REPRESS</u> Cue Card)</li> </ol>	<p><u>CLEANUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>Retrieve Large ORU Bag; stow on BRT</li> <li>Perform Tool inventory</li> <li>Translate to A/L; fairlead Safety Tether as reqd</li> </ol> <p><u>INGRESS</u> (00:15)</p> <ol style="list-style-type: none"> <li>Open thermal cover</li> <li>Stow Large ORU Bag in A/L</li> <li>Attach Waist Tether to Airlock D-ring extender; verify locking hook – Gate Closed, Slider Locked</li> <li>Ingress A/L</li> <li><b>Give EV1 GO</b> to attach to EV3's 85-ft Safety Tether</li> </ol> <ol style="list-style-type: none"> <li>Receive Crewlock Bag; stow in A/L</li> <li><b>Give EV1 GO</b> to ingress</li> <li>Remove SCU from stowage pouch Remove DCM cover Connect SCU to DCM, check Locked</li> <li>Water – OFF (fwd); expect "H2O IS OFF" msg</li> </ol>

# EVA 2 POST TOOL CONFIG

## EV1 MWS

- BRT (L)
- RET (eq-eq)
- Wire Tie (2)
- T-Bar
- RET (eq-eq) (2)
- RET (eq-eq) w/PIP Pin
- Adj Equip Tether (2)
- Wire Tie
- Small Shuttle Trash Bag
- Swing Arm (R)
- RET (eq-eq)
- PGT
- PGT Battery
- 7/16 (wobble) Socket-6 ext
- 85-ft Safety Tether (R D-ring Ext)
- Waist Tether (2, R & L on D-ring)

## EV3 MWS

- BRT (L)
- RET (eq-eq) w/PIP Pin
- Wire Tie (2)
- T-Bar
- RET (eq-eq) (2)
- Adj Equip Tether (2)
- Wire Tie (2)
- Small ISS Trash Bag
- Swing Arm (R)
- RET (eq-eq)
- PGT
- PGT Battery
- 7/16 (wobble) Socket-6 ext
- 85-ft Safety Tether (L D-ring Ext)
- Waist Tether (1, R on D-ring Ext)

## AIRLOCK CONFIG

- Large ORU Transfer Bag
- Adj Equip Tether (on outside)
- Fish Stringer Tether (Heide)
- TBA Bag
- TBA Bearing Package (on bag tether)
- TBA Dust Cap
- TBA Mount Package (on bag tether)
- TBA Bag
- TBA Bearing Package (on bag tether)
- TBA Dust Cap
- TBA Mount Package (on bag tether)
- TBA Bag
- TBA Bearing Package (on bag tether)
- TBA Dust Cap
- TBA Mount Package (on bag tether)
- TBA Bag
- TBA Dust Cap (on bag tether)
- SARJ Dust Cap (on bag tether)
- EVA Wipe Caddy
- EVA Wipes (\_\_\_ wet, \_\_\_ dry)
- Crewlock Bag (SARJ)
- Adj Equip Tether (2) (on outside)
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/Straight Nozzle
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/J Nozzle
- EVA Wipe Caddy
- EVA Wipes (\_\_\_ wet, \_\_\_ dry)
- Scraper Debris Container (int RET)
- RET (eq-eq)
- Scraper
- Large Trash Bag (int RET)
- Camera w/Flash (on integral RET)
- Camera Bracket

## AIRLOCK CONFIG (Cont)

- Large ORU Transfer Bag (Cont)
- Fish Stringer Tether (Shane)
- TBA Bag
- TBA Bearing Package (on bag tether)
- TBA Dust Cap
- TBA Mount Package (on bag tether)
- TBA Bag
- TBA Dust Cap (on bag tether)
- SARJ Dust Cap (on bag tether)
- Crewlock Bag (SARJ)
- RET (eq-eq) (spare on outside door handle)
- Adj Equip Tether (2) (on outside)
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/Straight Nozzle
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/J Nozzle
- EVA Wipe Caddy
- EVA Wipes (\_\_\_ wet, \_\_\_ dry)
- Scraper Debris Container (int RET)
- RET (eq-eq)
- Scraper
- Large Trash Bag (int RET)
- Crewlock Bag (LEE Lubing) (Shane)
- Adj Equip Tether (on outside) (2)
- Needle Nose Pliers (int RET) (Kapton tape & zip-tie)
- RCC Gap Gauge (int RET)
- Adj Equip Tether (int RET)
- EVA Wipes (2)
- Camera (on integral RET)
- Camera Bracket
- Wire Tie (to secure grease gun)
- RET (eq-eq)
- WIF Adapter
- 55-ft Safety Tether

Tether Counts: (Red RETs)	
RETs (eq-eq) = 14	RETs (PIP Pin) = 2
RETs (Lg-eq) = 3	Adj Equip Tethers = 12 int/1 ext

## CETA CART RELOCATION – TASK DATA

### Estimated Task Duration:

	With SSRMS	Without SSRMS
One EV Crew	N/A	N/A
Two EV Crew	01:45	N/A

### Tools:

EV3
RET

### Foot Restraints:

Task	WIF	APFR Setting
CETA Cart Removal/Install	SSRMS	12,FF,F,12

EVA Fasteners: N/A

EVA Connectors: N/A

CETA cart Mass = ~ 560 lb (with launch bolts)/254 kg

### Notes:

1. Ensure safety tethers are clear of CETA cart during safety tether swap, CETA cart relocation, and CETA cart install
2. 3 of 4 wheel bogies are required to be installed prior to untethering (from a safety, fault-tolerance standpoint)

### Cautions:

1. Do not impart loads into CETA cart with less than 3 of 4 wheel bogies engaged
2. CETA to MT max coupling rate is 0.5 ft/sec
3. CETA to CETA max coupling rate is 1 inch/sec

### Warnings:

None

### Timeline Considerations:

1. Some EV1 tasks may be postponed if OCAS times are shorter than estimated
2. Pictures of Zenith TUS cable may be taken by EV1 during OCAS mnvr

CETA CART RELOCATION – TASK DATA (Cont)

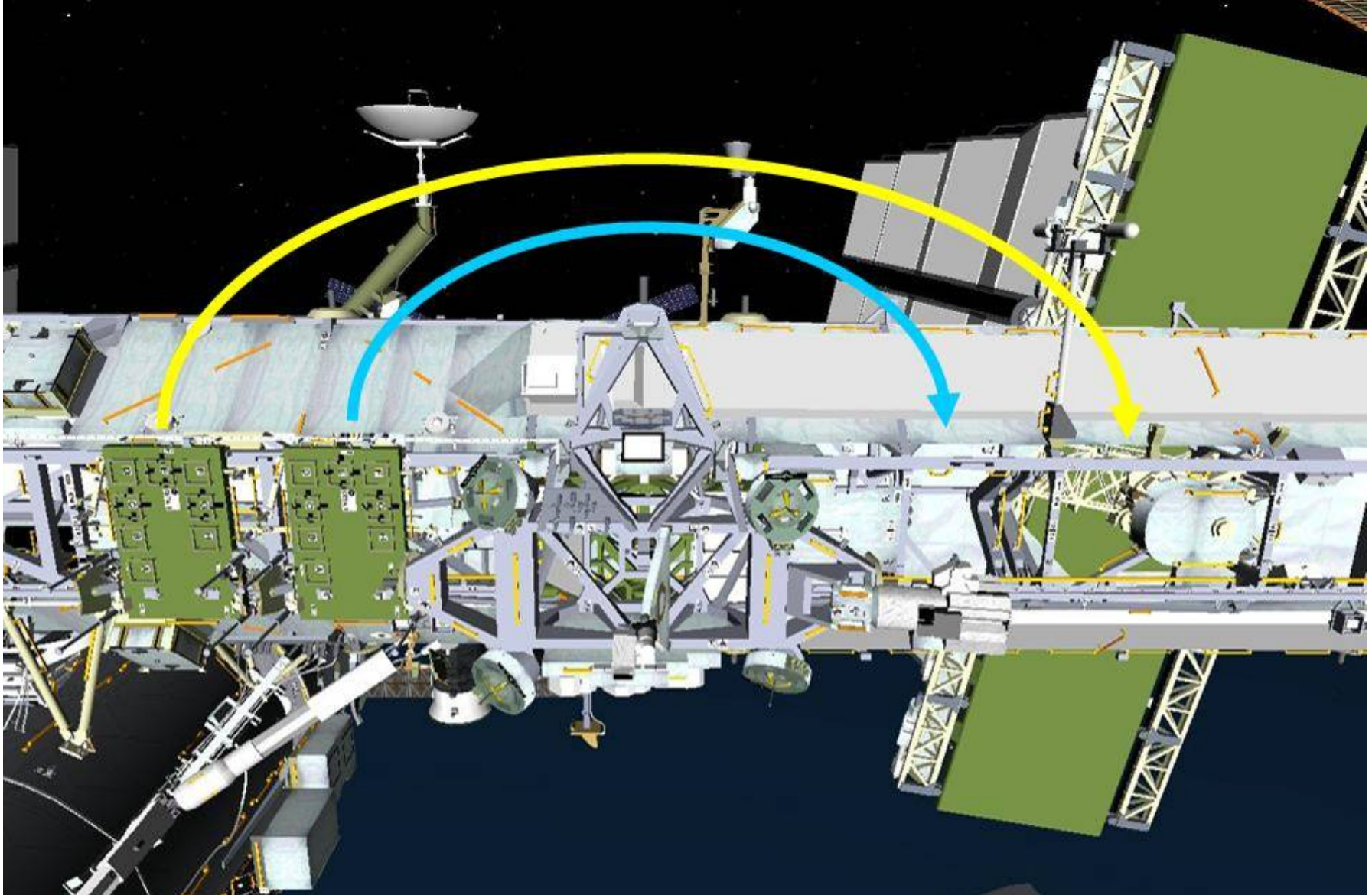
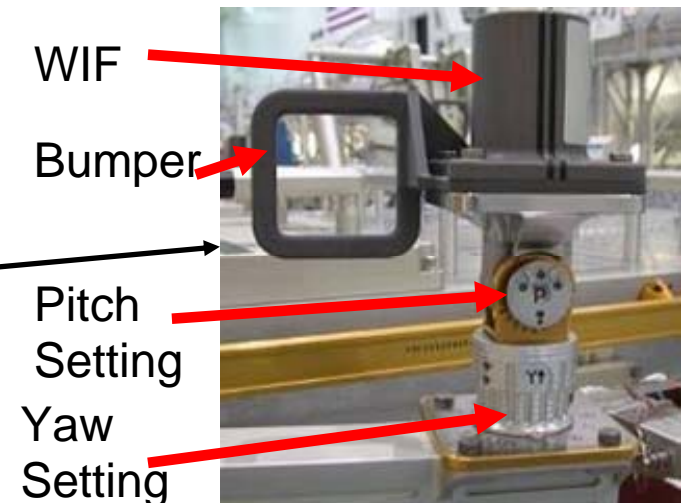
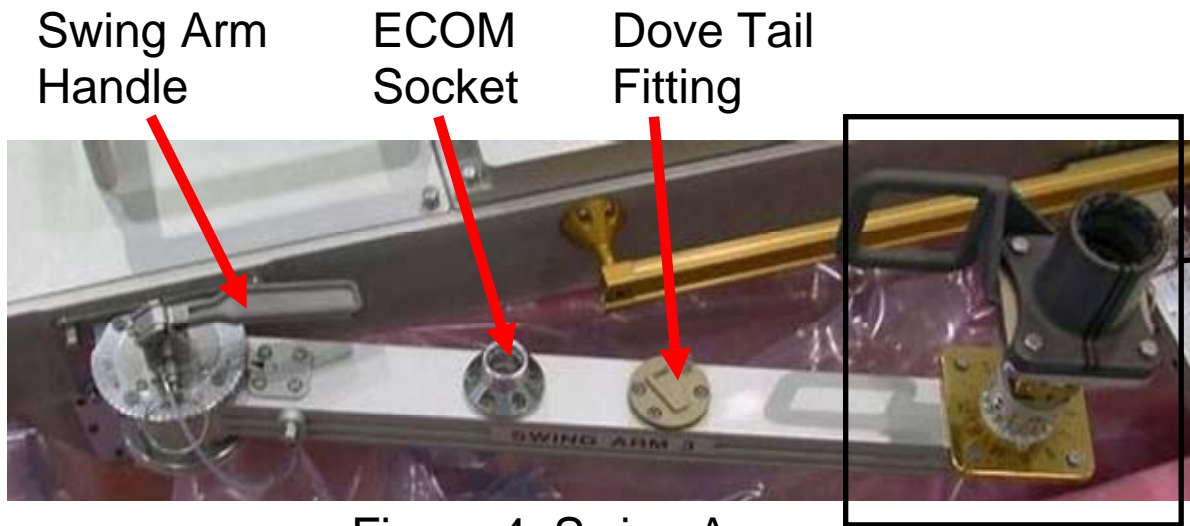
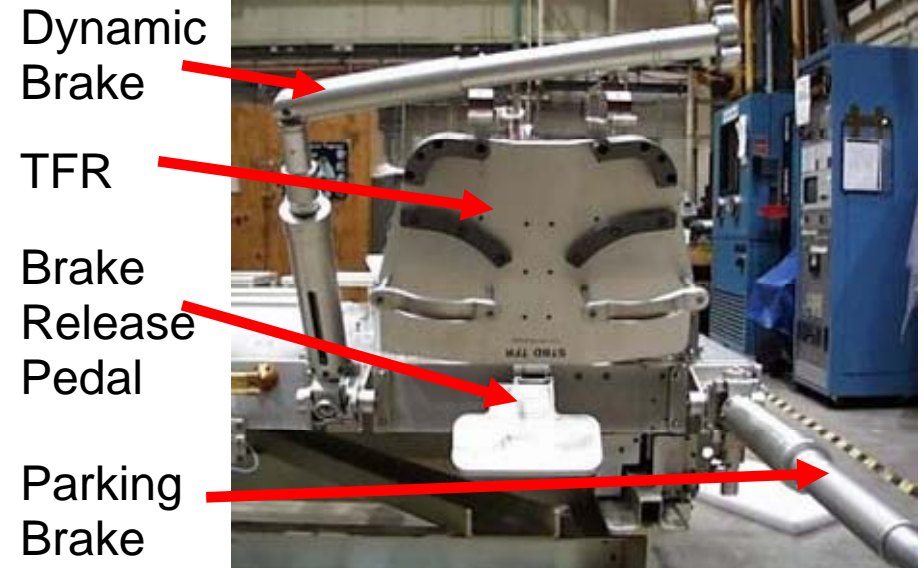
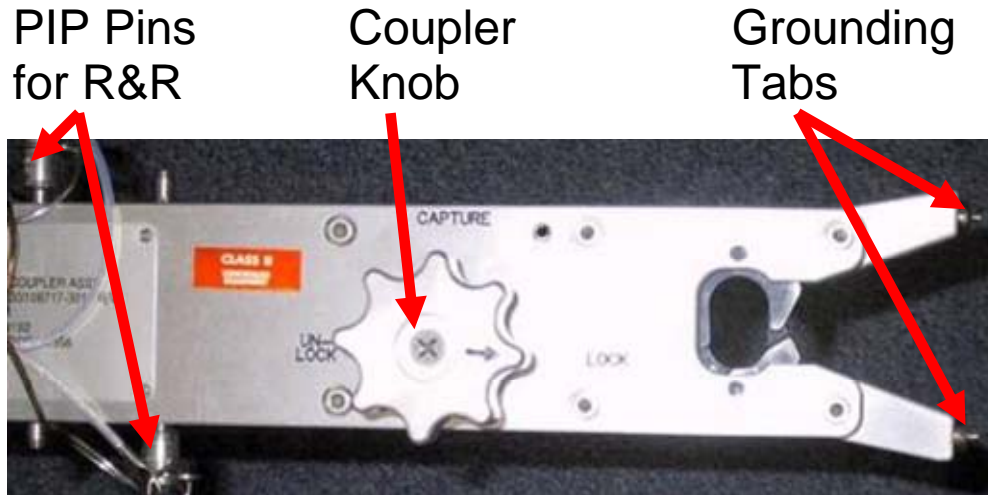


Figure 1. CETA CART Relocate Plan

CETA CART RELOCATION – TASK DATA (Cont)



CETA CART RELOCATION – TASK DATA (Cont)

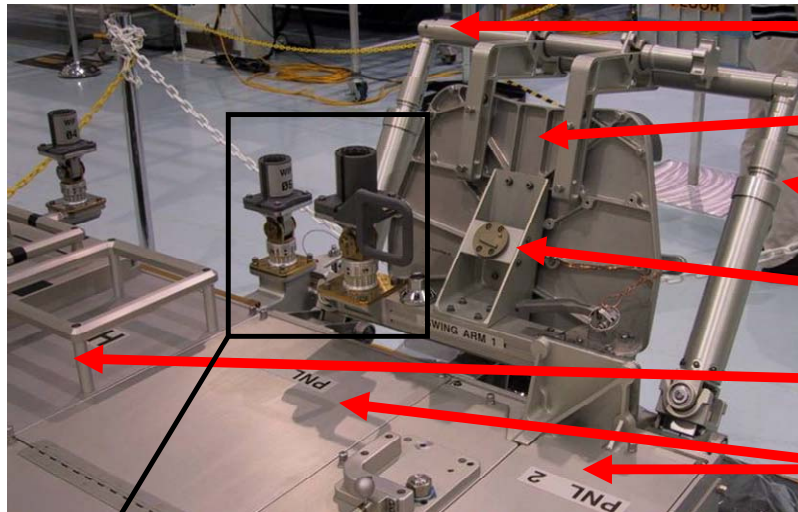


Figure 6. Port TFR and WIFs

- Parking Break
- TFR
- Dynamic Break
- Dove Tail Fitting
- Square Grid
- Break Panels



Figure 7. Passive Coupler

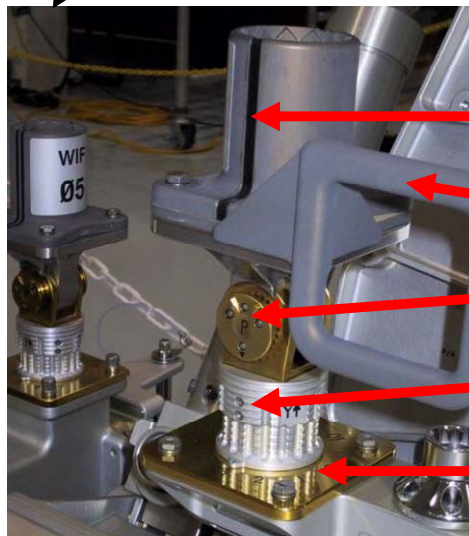
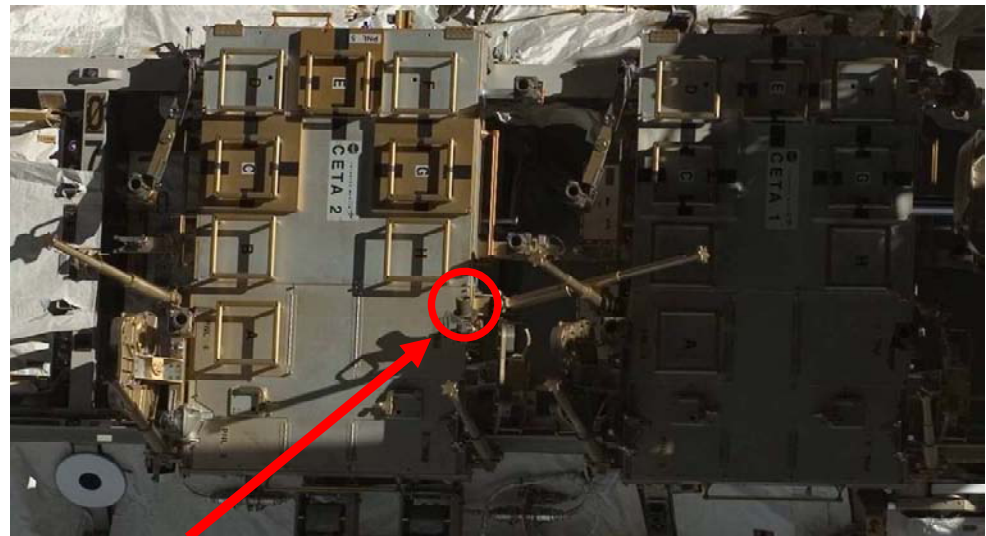


Figure 8. WIF 1

- Primary Clocking/ Yaw Line
- Bumper
- Pitch Setting
- Yaw Collar
- Yaw Setting



WIF 1

Figure 9. Current ISS



Wheel Bogies

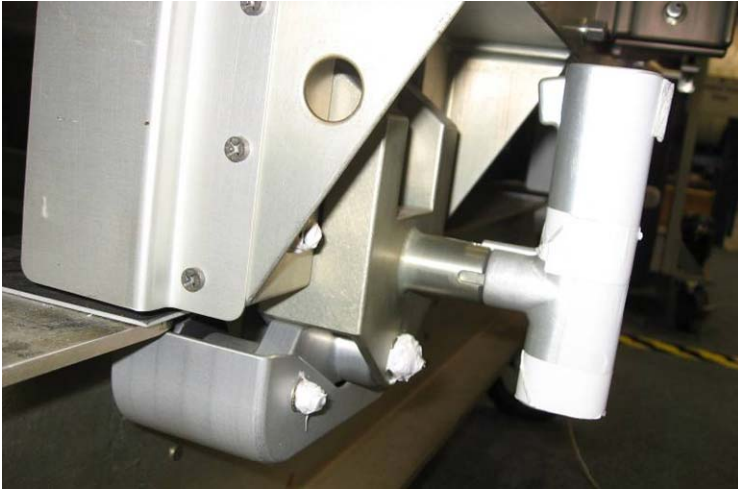


Figure 10. Stowed Position

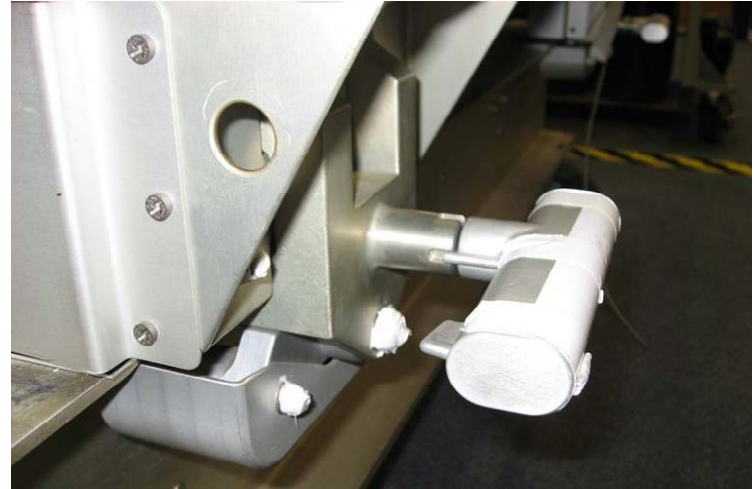


Figure 11. Handle Rotated in Unlock



Figure 12. Partially Deployed



Figure 13. Backside

## LEE SNARE REPAIR – TASK DATA

### Estimated Task Duration:

	With SSRMS	Without SSRMS
One EV Crew	01:00	N/A
Two EV Crew	N/A	N/A

### Tools:

EV3	
Crewlock Bag	RETs (2)
Gap gauge	Grease Gun w/Straight Nozzle
Needle nose pliers w/ Kapton tape	EVA Wipes (2)
EVA Camera	

### Foot Restraints:

Task	WIF	Y/P Setting	APFR Setting
LEE A SNARE REPAIR	CETA 2 WIF 1	12, GG	6, II, F, 6

EVA Fasteners: N/A

EVA Connectors: N/A

LEE Mass = ~ 460 lb/209 kg

### Notes:

- Grease should not extend more than ¼ inch from bearing

### Cautions:

- Avoid inadvertent contact with LEE grounding springs, torsional springs, latch covers, shrouds, and camera
- Do not stress torsional spring more than 90 deg (rod-end perpendicular to LEE housing) when exercising bearing

### Warnings:

- Avoid touching LEE curvic coupling, grounding springs, snares, and internal mechanisms inside LEE with gloved hand

### Timeline Considerations:

- Photos shall be taken as best effort, noting that it is possible that the LEE may be in an eclipse
- Inhibits for SSRMS brakes and trigger-safe are controlled in Robotics procedures. SSRMS will give EV3 a GO each time inhibits are in place and ready for EVA LEE work

### Grease Gun Steps:

Prep grease gun

- Engage teeth by rotating plunger 180 deg (black triangle up)
- Remove MLI; stow on gun in way to prevent contact with LEE
- Rotate shutoff knob such that FLOW points toward nozzle

Stow grease gun

- Rotate shutoff knob such that FLOW points perpendicular to nozzle
- Disengage teeth by rotating plunger 180 deg (black triangle down)
- Install MLI tip cover

LEE SNARE REPAIR – TASK DATA (Cont)

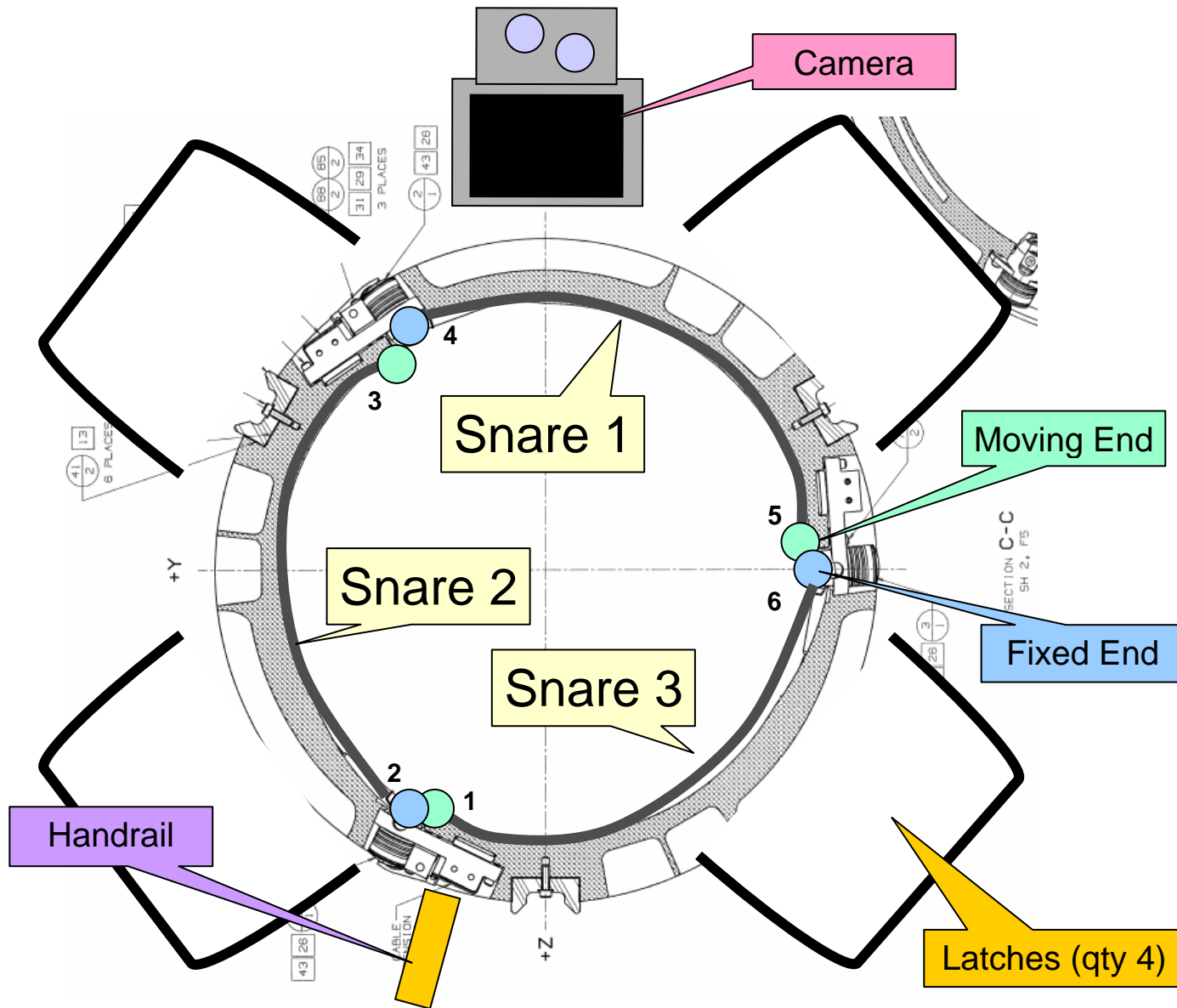


Figure 1. LEE Face

LEE SNARE REPAIR – TASK DATA (Cont)

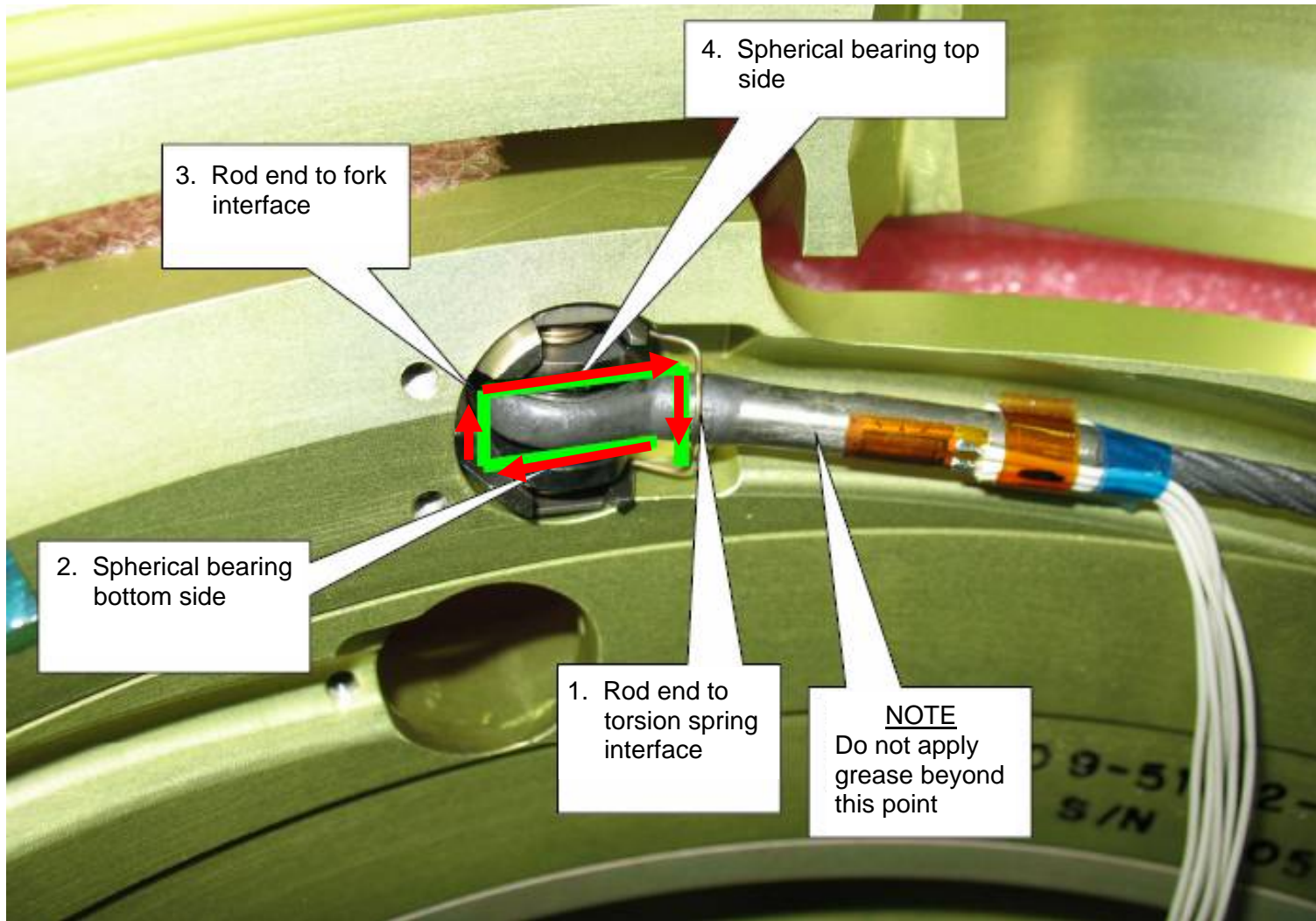


Figure 2. LEE Lubing Pattern

LEE SNARE REPAIR – TASK DATA (Cont)

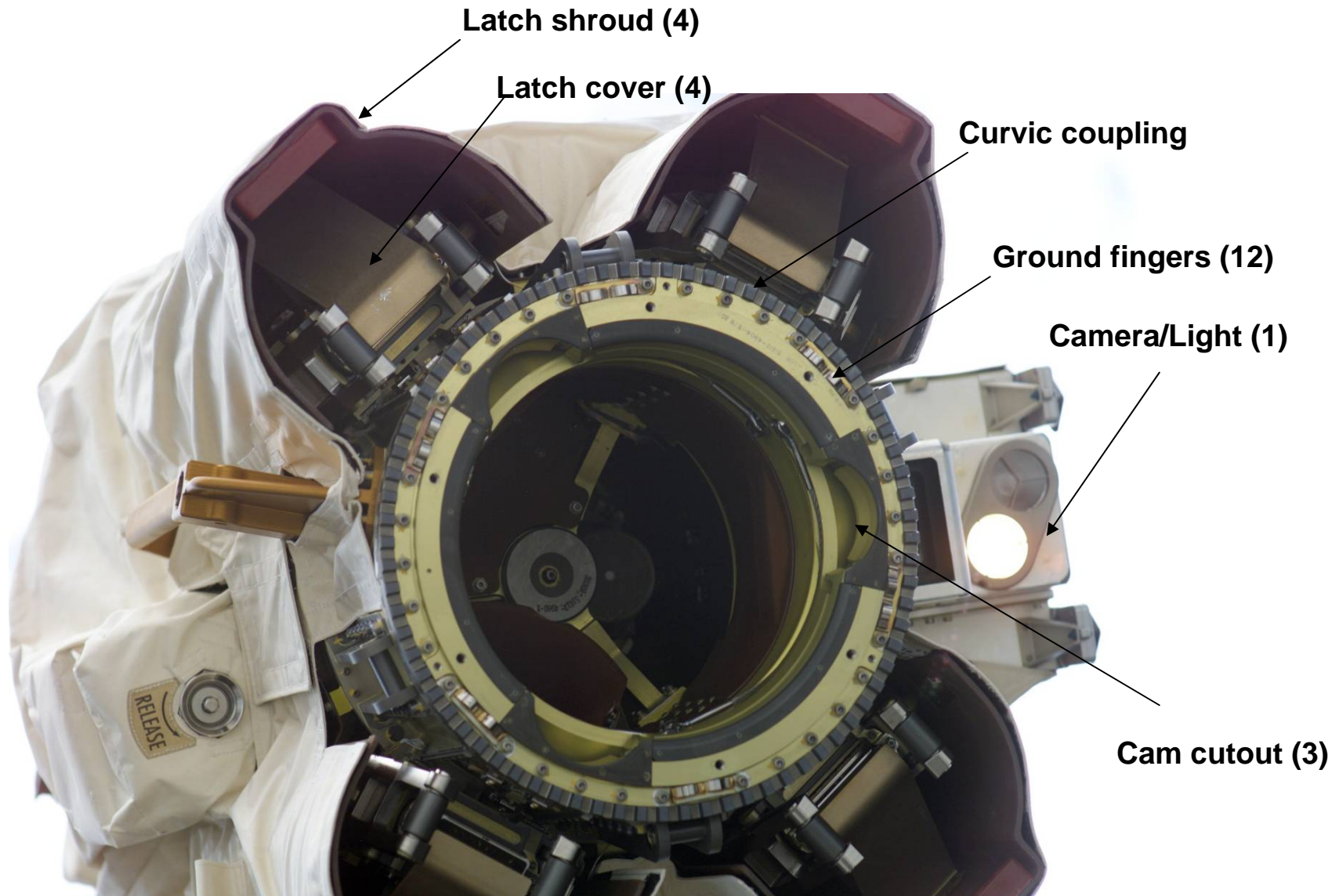


Figure 3. LEE Face

LEE SNARE REPAIR – TASK DATA (Cont)

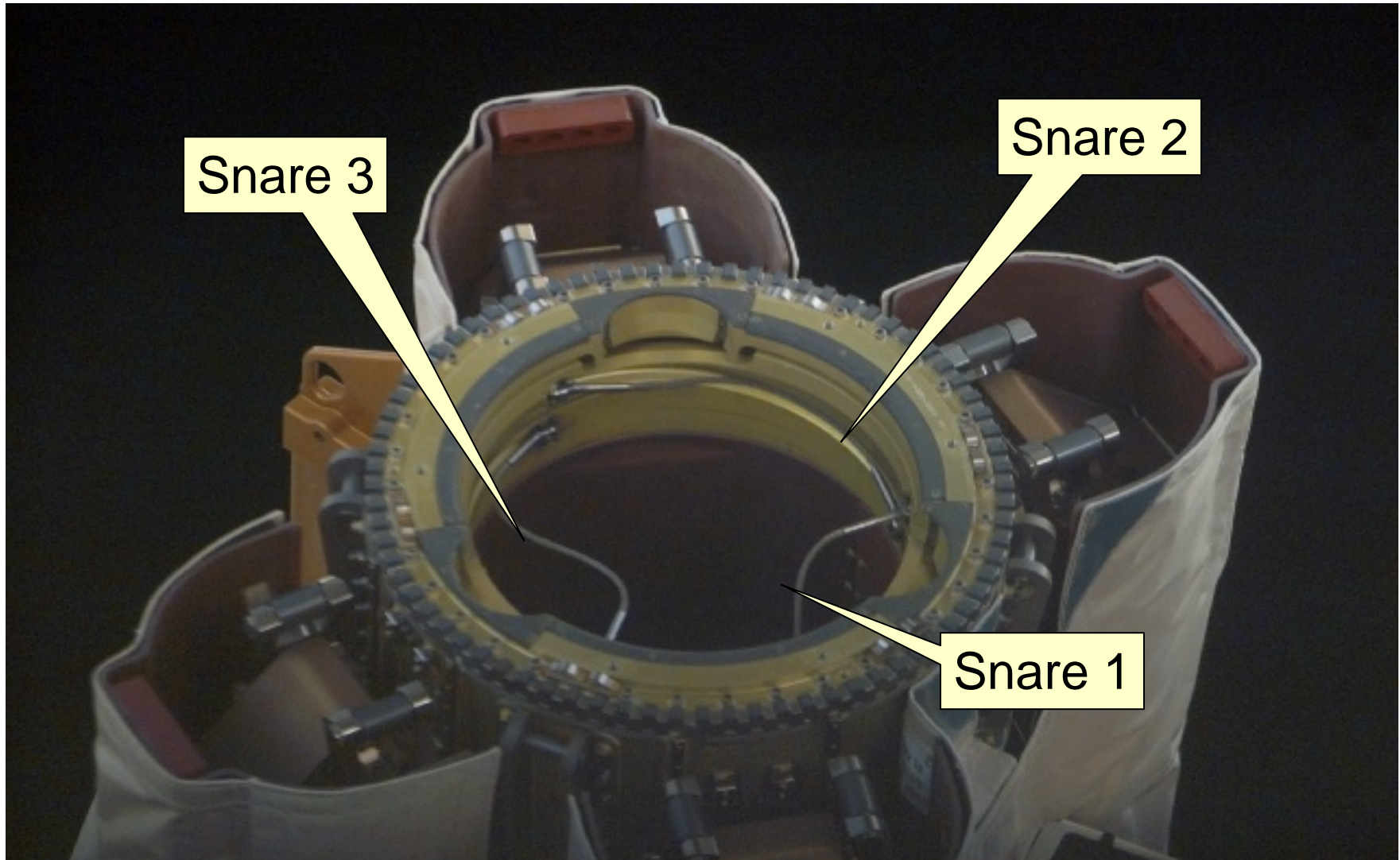


Figure 4. LEE A – March 2008

# EVA 3 SUMMARY TIMELINE

PET HR : MIN	IV/SRMS	EV1 (Pp)	EV2 (Bw)	
00:00		POST DEPRESS (00:05) EGRESS/SETUP (00:30)	POST DEPRESS (00:05) EGRESS/SETUP (00:30)	00:00
01:00	**each double+single set ~1:45 to complete**	SARJ (05:50) Remove Covers 13 and 14 Remove TBA 1 Clean Lube Install TBA 1 Install Covers 13 and 14	SARJ (05:50) Remove Cover 19 Remove Cover 20 Remove TBA 4 Clean Lube Install TBA 4 Install Cover 19	01:00
02:00		Remove Covers 15 and 16 Remove TBA 2 Clean Lube Install TBA 2 Install Covers 15 and 16	Remove Cover 21 Remove TBA 5 Bearing Package Only Clean Clean DLA Lube Install TBA 5 Bearing Package Install Cover 21	02:00
03:00		Remove Covers 17 and 18 Remove TBA 3 Clean Lube Install TBA 3 Install Covers 17 and 18	Remove Covers 22 and 1 Remove TBA 6 Bearing Package Only Clean Lube Install TBA 6 Bearing Package Install Covers 22 and 1	03:00
04:00		Install Cover 20 If Not Completed on EVA 2: Remove Cover 8 Clean Lube Install Cover 8	Remove Covers 2 and 3 Remove TBA 7 Clean Lube Install TBA 7 Install covers 2 and 3  Install Cover 20	04:00
05:00				05:00
06:00				06:00
		CLEANUP/INGRESS (00:30)	CLEANUP/INGRESS (00:30)	
07:00		PREREPRESS (00:05)	PREREPRESS (00:05)	07:00

# EVA 3

## EVA 3 PRE TOOL CONFIG

- EV1**
- MWS
  - BRT (L)
  - RET (eq-eq)
  - Wire Tie (2)
  - T-Bar
  - RET (eq-eq)
  - RET (eq-eq) w/PIP pin
  - Adj Equip Tether (2)
  - Wire Tie
  - Small Shuttle Trash Bag
  - Swing Arm (R)
  - RET (eq-eq)
  - PGT [A6 8.3 ft-lb, CAL, MTL 30.5] s/n \_\_\_\_\_
  - PGT Battery s/n \_\_\_\_\_
  - 7/16 (wobble) Socket-6 ext
  - D-ring Extender (1, R D-ring)
  - 85-ft Safety Tether (R D-ring Ext)
  - Waist Tether (2, R and L on D-ring)
  - SAFER
  - WVS

- EV2**
- MWS
  - BRT (L)
  - RET (eq-eq)
  - Wire Tie (2)
  - T-Bar
  - RET (eq-eq) (2)
  - RET (eq-eq) w/PIP Pin
  - Adj Equip Tether (2)
  - Wire Tie (2)
  - Small ISS Trash Bag
  - Swing Arm (R)
  - RET (eq-eq)
  - PGT [A6 8.3 ft-lb, CAL, MTL 30.5] s/n \_\_\_\_\_
  - PGT Battery s/n \_\_\_\_\_
  - 7/16 (wobble) Socket-6 ext
  - D-ring Extender (2, R & L D-ring)
  - 85-ft Safety Tether (R D-ring Ext)
  - Waist Tether (1, L on D-ring Ext)
  - SAFER
  - WVS

- AIRLOCK CONFIG**
- RET (Lg-eq)
  - Large ORU Transfer Bag (Heide)
  - Adj Equip Tether (on outside)
  - Fish Stringer Tether
  - TBA Bag
  - TBA Bearing Package (on bag tether)
  - NOTE: Engage tether hook from inside of mount**
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
  - NOTE: Match s/n's of Bearing and Mount Packages**
  - TBA Bag
  - TBA Bearing Package (on bag tether)
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
  - TBA Bag
  - TBA Bearing Package (on bag tether)
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
  - TBA Bag
  - TBA Bearing Package (on bag tether)
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
  - TBA Bag
  - TBA Dust Cap (on bag tether)
  - SARJ Dust Cap (on bag tether)
  - Crewlock Bag
  - RET (eq-eq) (spare on outside door handle)
  - Adj Equip Tether (2) (on outside)
  - Wire Tie (to secure grease gun)
  - RET (eq-eq) (on outside)
  - Grease Gun w/Straight Nozzle
  - Wire Tie (to secure grease gun)
  - RET (eq-eq) (on outside)
  - Grease Gun w/J Nozzle
  - EVA Wipe Caddy (int RET)
  - EVA Wipes (6) (2 wet, 4 dry)
  - Scraper Debris Container (int RET)
  - RET (eq-eq)
  - Scraper
  - Large Trash Bag (int RET)
  - EVA Wipe Caddy
  - EVA Wipes (6) (2 wet, 4 dry)
  - Camera w/Flash (on integral RET)
  - Camera Bracket

Tether Counts: (Red RETs)  
 RETs (eq-eq) = 15      RETs (PIP Pin) = 2  
 RETs (Lg-eq) = 3      Adj Equip Tethers = 10 int/1 ext

- AIRLOCK CONFIG (Cont)**
- RET (Lg-eq)
  - Medium ORU Transfer Bag (Steve)
  - Adj Equip Tether (on outside)
  - Fish Stringer Tether
  - TBA Bag
  - TBA Bearing Package (on bag tether)
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
  - TBA Bag
  - TBA Bearing Package (on bag tether)
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
  - TBA Bag
  - TBA Dust Cap (on bag tether)
  - SARJ Dust Cap (on bag tether)
  - Crewlock Bag
  - RET (eq-eq) (spare on outside door handle)
  - Adj Equip Tether (2) (on outside)
  - Wire Tie (to secure grease gun)
  - RET (eq-eq) (on outside)
  - Grease Gun w/Straight Nozzle
  - Wire Tie (to secure grease gun)
  - RET (eq-eq) (on outside)
  - Grease Gun w/J Nozzle
  - EVA Wipe Caddy (int RET)
  - EVA Wipes (6) (2 wet, 4 dry)
  - Scraper Debris Container (int RET)
  - RET (eq-eq)
  - Scraper
  - Large Trash Bag (int RET)
  - EVA Wipe Caddy
  - EVA Wipes (6) (2 wet, 4 dry)
  - Camera (on integral RET)
  - Camera Bracket

**NOTE:** Prior to use, inspect the following hardware:

- RET cords for fraying
- Safety Tether/Waist Tether LAS: No Red Visible
- ISS Trash Bag: Bristle deformation/damage, after having stowed tools in trash bag
- EMU and tools for excessive grease
- Prime Grease Guns w/J Nozzle



## EVA 3 PRE TOOL CONFIG (Cont)

### AIRLOCK CONFIG (Cont)

<input type="checkbox"/>	Staging Bag	
<input type="checkbox"/>	Fish Stringer Tether	
<input type="checkbox"/>	Wire Tie Caddy	
<input type="checkbox"/>	Velcro/Tape Caddy	
<input type="checkbox"/>	PGT	s/n _____
<input type="checkbox"/>	PGT Battery	s/n _____
<input type="checkbox"/>	7/16 (wobble) Socket-6 ext	
<input type="checkbox"/>	Vise Grips	
<input type="checkbox"/>	Ratchet Wrench	
<input type="checkbox"/>	7/16 (rigid) Socket-9 ext	
<input type="checkbox"/>	Needle Nose Pliers	
<input type="checkbox"/>	Spare 55-ft Safety Tether	
<input type="checkbox"/>	Spare WIF Adapter	
<input type="checkbox"/>	Fish Stringer	
<input type="checkbox"/>	Connector Cleaner Tool Kit	
<input type="checkbox"/>	Pin Straightener Assy	
<input type="checkbox"/>	Probe	
<input type="checkbox"/>	Pry Bar	
<input type="checkbox"/>	MWS Key Strap Assy	
<input type="checkbox"/>	Long Duration Tie Down Tethers (2)	
<input type="checkbox"/>	Wheel Bogie PIP Pin	

<input type="checkbox"/>	RET (Lg-eq)
<input type="checkbox"/>	Crewlock Bag
<input type="checkbox"/>	Fish Stringer Tether
<input type="checkbox"/>	EVA Wipes (6 dry)
<input type="checkbox"/>	Fish Stringer Tether
<input type="checkbox"/>	EVA Wipes (6 wet)

### AIRLOCK CONFIG (Cont)

<input type="checkbox"/>	IV Bag
<input type="checkbox"/>	Towels (2)
<input type="checkbox"/>	Contamination Detection Kit
<input type="checkbox"/>	GP Caddy (2)
<input type="checkbox"/>	Adjustable Thermal Mittens (2)
<input type="checkbox"/>	Socket Caddy (hatch cont) w/RET (eq-eq) (Black)
<input type="checkbox"/>	1/2 Socket-8 ext
<input type="checkbox"/>	7/16 (wobble) Socket-6 ext (spare)
<input type="checkbox"/>	DCM Plug (SAFER Hardmount) (2)

### EXTERIOR CONFIG

JEM	
<input type="checkbox"/>	EFBM Center Disk Cover
<input type="checkbox"/>	Wire Tie (1) (JEM HR 1179)
<input type="checkbox"/>	Adj Equip Tether (1) (JEM HR 1185)
<input type="checkbox"/>	S0 HR 3529 – 55-ft Safety Tether
<input type="checkbox"/>	S0 HR 3539 – 55-ft Safety Tether

## EVA 3 BRIEFING CARD

Aft EDDA \_\_\_\_\_  
Fwd EDDA \_\_\_\_\_  
Suit IV \_\_\_\_\_  
Task IV \_\_\_\_\_  
M1/M2 \_\_\_\_\_

Hygiene Break Repress (GMT) \_\_\_\_\_:\_\_\_\_\_  
Depress to 10.2 \_\_\_\_\_:\_\_\_\_\_  
Start Purge \_\_\_\_\_:\_\_\_\_\_  
PET 00:00 \_\_\_\_\_:\_\_\_\_\_  
\_\_\_\_\_

### General Briefing

#### 1. Hygiene Break & EVA Prep – Suit IV

- Get-up Plan
- Prebreathe protocol review (Notes and Warnings)
- Equipment lock activities – IV responsibilities
- Suit donning plan – special requests
- SAFER, MWS, Safety tethers, bag stowage
- Airlock depress review

#### 2. EV Crew Procedure Review – EV CMs

- Egress Plan, √Safety tethers
- Review first post-egress steps
- Order of tasks (summary timeline)
- Translation plan, fairleads, and tether swaps
- Hazards
- Ingress Plan

#### 3. Other Procedure Review – Task IV

- Get-ahead tasks
- Constraints – ground and flight
- Notes, Cautions, and Warnings review
- Contingency procedures – cribsheet

#### 4. Communications – Task IV

- Overall setup: Big loop, A/G2, S/G2, ICOM, remind EV crew when mode swapping
- EV/IV comm protocol review – Use EV1/2/3 for DCM sw throws (all time in A/L), use first names otherwise

#### 5. Robotics – M1/M2

- SRMS/SSRMS initial position, maneuvers, clearances
- Coordinate Frames
- SRMS/SSRMS comm protocol review – expected calls, use first names
- GCA – Give direction and approx distance
- Positive handover who is giving GCA
- Cameras

#### 6. Emergencies Review – Suit IV/Task IV

- Emergency suit doff and power down
  - √Expedited Suit Doffing cue card pre-positioned for EVA day
- Loss of comm
- EMU malfunctions
- Lost tools
- Lost crewmember
- DCS
- Abort and Terminate scenarios, protocols
- Hand signal reviews

#### 7. Post EVA – Suit IV

- Suit doffing responsibilities
- Post EVA plan

#### 8. Reminders – Task IV

- Translate slow (then space is like water). Relax grip
  - Be extra careful on non-standard routes or orientations
  - Don't hop
- Monitor safety tether
- Prior to moving and ingress, √BRT & Swingarm stowed
- If you get a mal, read the caution and warning message so everyone knows what it is
- Be disciplined when tired
- Openness: When you have boot or glove pain let us know
- OK for IV and ground to check on us. If you need update, ask
- Let mistakes pass
- Manage frustration (slow down, if needed)
- Cold soak before ingress
- Verify PGT settings. PGT collars are easy to bump
- Translation Adaptation plan

## EVA 3 BRIEFING CARD (Cont)

### Generic Calls:

- ❑ Day/Night Cycles
  - √Lights, visors, gloves, tethers, and tools
  - Glove Checks: Report any damaged/missing RTV, Vetran condition
- ❑ Tether swaps:
  - Crew Report: **"Gate closed, slider locked"**
  - Tether Shuttle – Crew Report: **"Slider locked"**
- ❑ Equipment Tether Discipline
  - "Make before you break"
  - Check all gates closed
- ❑ √Both SAFER valves down at egress
  - Crew Report: **"Both handles down"**
- ❑ √APFR locking collar Black-on-black and pull test
  - Crew Report: **"Black-on-black, good pull test"**
- ❑ √PGT Green light on for bolt engage
  - May get Lo Torque msg at bolt release
  - Crew Report: **"XX turns, XX ft-lb, green light"**
- ❑ √Connectors for no bent pins, no FOD, check EMI band and inhibits in place
  - EV Report: **"Pins good, no FOD, Good EMI Band"**
  - IV: √MCC **"Are inhibits in place?"**
- ❑ √Tethers and Tools clear prior to SSRMS ORU movement
  - Each EV report: **"Tethers and tools clear"**
- ❑ Tool inventory (when leaving worksite)
  - Bags: EV call out items, IV check off on Tool Matrix
  - MWS: EV call out, BRT – MWS – Swing Arm
  - Confirm all changes from the checklist are accounted for

## EVA 3 INHIBIT PAD

### Orbiter

#### KU-BAND ANTENNA

- MCC-H
1. √KU-BAND Mask – active
  2. √KU-BAND EVA Protect Box – active

#### RCS

- If EV crew < 27 ft from FRCS
- IV
1. √DAP: VERN, FREE, LO Z (flt specific check with GNC)
  2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF  
LOGIC (four) – OFF
- O14,15,16
- MCC-H
3. √Above RCS config
- IV
4. √RCS F – ITEM 1 EXEC (\*)  
√JET DES F1U – ITEM 17 (\*)  
F3U – ITEM 19 (\*)  
F2U – ITEM 21 (\*)

#### S-BAND ANTENNAS

##### NOTE

Possible loss of comm when forced LL FWD antenna

- IV
- If EV crew < 2 ft from S-Band antenna
- A1R
1. S-BAND FM ANT – XMIT LOWER/RCVR UPPER
  2. √MCC, lower antenna selected
- If no comm, or on MCC GO
- C3
3. S-BAND PM ANT – LL FWD
- When EVA crewmember at least 2 ft away from all S-Band upper antennas
- C3
4. S-BAND PM ANT – GPC

### RSOS

#### All EVAs

#### SM Antennas

- IV
1. GTS – Deactivate
  2. ARISS (Ham Radio – Deactivate or VHF (144-146 MHz) TX only

### Ground

#### All EVAs

#### Ground Radar

- MCC-H
1. √FIDO console, ground radar restrictions in place for EVA

### USOS

#### PCU

##### NOTE

PCUs may require up to 1 hr warm-up period before they are operational

#### MCC-H

1. √PCUs (two) operational in discharge mode and one of the following:
    - a. CCS PCU EVA hazard control FDIR enabled
    - b. No more than two arrays unshunted and oriented < 105 deg from the velocity vector
- If one or both PCUs failed:
2. No more than two arrays unshunted and oriented < 105 deg from velocity vector

#### S3 SARJ

#### MCC-H

- SARJ at 60 deg
1. √DLA (1) – LOCKED
  2. All motor setpoints set to zero
  3. All motors deselected

### COL

#### EuTEF

#### COL-CC

- Verify PLEGPAY Power Status (ETF\_PLEGPAY\_Pwr\_Stat) – OFF

## EVA 3 NOTES/CAUTIONS/WARNINGS

### NOTES

1. Bolt install: Report torque and turns
2. Bolt release: Report torque and turns if different from published range
3. EVA connectors: After disconnection and prior to connection; verify pin and EMI band integrity; verify connector free of FOD
4. Inspect QDs for damage prior to mating
5. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity

### CAUTION

#### **ISS Constraints**

- A. Avoid inadvertent contact with
1. Grapple fixture shafts (drylube)
  2. PIP pins
  3. CETA Lights (Z-93 paint) [S1]
  4. Passive UMAs
  5. Deployed TUS cable [Nadir CETA rail]
  6. ETCS Radiator flexhoses and panels [S1,P1]
  7. EETCS/PV Radiator flexhoses, bellows and panels [P6,P4,S4,S6]
  8. SASA RF Group [S1,P1]
- B. Electrical cables
1. Avoid bend radii < 10 times cable diameter
- C. Fluid line flex hoses and QDs
1. Avoid bend radii < 5 in for hoses with diameter < 1 in on LAB, S0, S1, P1, and 10 in for hoses with diameter < 1 in on all other elements
  2. Avoid bend radii < 14 in for hoses with a diameter  $\geq$  1 in
  3. Additional care should be taken to not exceed bend radii when applying loads at the flexible hose to rigid tube stub interfaces
  4. Ensure fluid QD booties are fully closed prior to leaving worksite; wire tie if reqd

### CAUTION

#### **ISS Constraints (Cont)**

- D. For structural reasons
1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
  2. Avoid performing shaking motions (sinusoidal functions) more than four cycles
  3. Avoid kicking S1/P1 radiator beam.
  4. If any of these occur, wait 2 to 5 min to allow structural response to dissipate
- E. SARJ Hardware
1. During MLI cover fastener release: Limit turn count to minimum required, minimize side loading bolt head, and maintain axial force on fastener to compress spring during rotation
  2. Avoid scratching or nicking the Race Ring while working on repair
  3. Two TBAs can only be out at the same time at 90, 120, or 180 deg
  4. Port SARJ must be locked for EVA ops outboard of starboard AJIS Struts
- F. Other
1. MLI handholds are not rated for crewmember translation loads

## EVA 3 NOTES/CAUTIONS/WARNINGS (Cont)

### WARNING

#### ISS Constraints

- A. Avoid inadvertent contact with
  - 1. Grapple fixture targets and target pins
  - 2. Stay inboard of SARJ when active
  - 3. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate
- B. Handrails
  - 1. Handrails previously used for MISSE attachment may not be used as a safety tether point [A/L endcone 564 & 566, A/L Tank 2 nad/fwd & port/fwd, P6 5389]
- C. Pinch
  - 1. NZGL connector linkage. Use caution when mating/locking
  - 2. EV side of IV Hatch during Hatch operation (also snag hazard) [A/L]
- D. QDs
  - 1. If QD is in FID when valve is opened (bail fwd), QD will leak and fluid line may whip
  - 2. Do not rotate if in mated/valve open config

### WARNING

#### ISS Constraints (Cont)

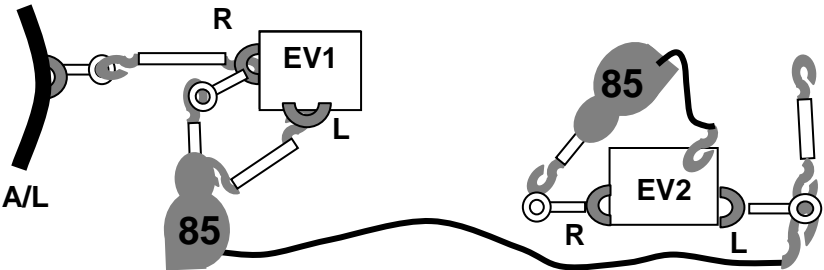
- E. RF radiation exposure
  - 1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1]
  - 2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1]
  - 3. Stay 1 ft from UHF Antenna when powered [LAB,P1]
- F. Sharp Edges
  - 1. Inner edges of WIF probes
  - 2. APFR active WIF probes
  - 3. Mating surfaces of EVA connectors  
Avoid side loads during connector mating
  - 4. Spring loaded captive EVA fasteners (e.g., 6B-boxes, SARJ Covers); the end of the spring may protrude
  - 5. Port/Aft portion of A/L circular HR [HR 0506]
- G. Thermal
  - 1. EVA connectors with booties may become hot if left uncovered. Handling may need to be limited
  - 2. Turn off glove heaters when comfortable temp reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
  - 3. Uncovered trunnion pins may be hot
  - 4. Stay  $\geq 1$  ft away from PMAs and MMOD shields  $> 270$  degF if EMU sun visor up; limit time to 15 min or less if  $> 300$  degF
  - 5. Stay at least 0.5 ft away from PMA and MMOD shields  $> 325$  degF

### WARNING

#### ISS Constraints (Cont)

- G. Thermal (Cont)
  - 6. Do not touch EMU protective visor if temp has been  $< -134$  degF for  $> 15$  min
  - 7. No EMU TMG contact with PMAs and MMOD shields  $> 320$  degF
  - 8. No EMU boot contact with foot restraint when temp  $< -120$  degF or  $> 200$  degF
- H. Electrical Shock
  - 1. Stay  $\geq 2$  ft from ungrounded floating connectors if not unpowered
    - MBS Cross-Connect jumpers (translate past these using UMA handrails) Include S0 EVA Power Cables (inside S0 Bay 00 Face 4, Bay 01 Face 3) ESP2 jumper (inside S0 Bay 03 Face 4)
- I. SARJ Hardware
  - 1. Sharp edge potential on TBA bearing package and mount
  - 2. SARJ must be locked to prevent rotation when EV crew is within 2 ft of rotational plane

## EVA 3 EGRESS/SETUP (00:30)

IV/SSRMS	EV1	EV2
	<p>Initial Config: EV1 R Waist Tether from R D-ring to A/L D-ring Ext, 85-ft Safety Tether from R D-ring Ext to EV2, L Waist Tether to 85-ft Safety Tether</p> 	<p>Initial Config: 85-ft Safety Tether from R D-ring Ext to MWS, EV1 85-ft Safety Tether to L D-ring Ext, L Waist Tether to L D-ring Ext</p>
<p>1. Post crew egress: WVS Software: Select page – RF camera Sel ‘Advanced Controls’ S-Band Level (two) – Max</p>	<p><u>EGRESS</u> (00:15)</p> <ol style="list-style-type: none"> <li>Transfer Med ORU Bag to EV2</li> <li>Egress A/L with Large ORU Bag</li> <li>√SAFER MAN ISOL vlv – Open (down)</li> <li>√SAFER HCM – Closed (down)</li> <li>Stow Large ORU Bag on BRT</li> <li><b>On EV2 GO</b>, disconnect waist tether</li> <li>Close A/L thermal cover</li> </ol> <p><u>SETUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>Translate to S3 SARJ; fairlead around S3 trunnion pin</li> <li>Perform Glove Inspection</li> <li>Stow Large ORU Bag on S3 HR 3043; open lid straps to S3 HR 3041 (Face 4)</li> </ol>	<p><u>EGRESS</u> (00:15)</p> <ol style="list-style-type: none"> <li>Open A/L thermal cover</li> <li>Egress A/L</li> <li>√SAFER MAN ISOL vlv – Open (down)</li> <li>√SAFER HCM – Closed (down)</li> <li>Receive Med ORU Bag from EV1; stow on BRT</li> <li>Translate to S0 Tether Shuttles</li> <li>Retrieve Tether Shuttles (2)</li> <li>Install EV2 Tether Shuttle onto nadir CETA rail (stbd); verify Locked</li> <li>Install EV1 Tether Shuttle onto nadir CETA rail (port); verify Locked</li> <li>Attach EV2 85-ft Safety Tether to Tether Shuttle</li> <li>Verify locking hooks – Gate Closed, Slider Locked</li> <li>Attach EV1 85-ft Safety Tether to Tether Shuttle</li> <li>Verify locking hooks – Gate Closed, Slider Locked</li> <li><b>Give EV1 GO</b> to disconnect waist tether</li> </ol> <p><u>SETUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>Translate to S3 SARJ</li> <li>Perform Glove Inspection</li> <li>Secure Tether Shuttle in place via wire tie</li> <li>Stow Med ORU Bag on S3 HR 3046 and 3038 (Face 1)</li> </ol>

**EVA 3 SARJ (05:50)**

<b>IV/SSRMS</b>	<b>EV1</b>	<b>EV2</b>
	<p><u>S3 SARJ WORK</u></p> <p>Refer to <u>STBD SARJ CUE CARD</u>, FS CC 7-35, for SARJ checklist:            Covers 13/14 and TBA 1            Covers 15/16 and TBA 2            Covers 17/18 and TBA 3            Cover 8 (If reqd)            Install Cover 20 with EV2</p> <p>Refer to SARJ – TBA REMOVE/INSTALL, FS 7-19, for steps to remove and install a TBA</p> <p>Refer to SARJ – CLEAN/LUBE RACE RING, FS 7-20, for steps to clean and to lubricate the race ring</p> <p><u>SARJ BAG PACKING</u></p> <ol style="list-style-type: none"> <li>1. Stow Fish Stringer Tether in Large ORU Bag</li> <li>2. Verify TBA Bags are rolled and folded</li> <li>3. Perform Final Bag inventory</li> </ol>	<p><u>S3 SARJ WORK</u></p> <p>Refer to <u>STBD SARJ CUE CARD</u>, FS CC 7-35, for SARJ checklist:            Covers 19/20 and TBA 4            Covers 20/21 and TBA 5 (Bearing Package Only)            Covers 22/1 and TBA 6 (Bearing Package Only)            Covers 2/3 and TBA 7            Install Cover 20 with EV1</p> <p>Refer to SARJ – TBA REMOVE/INSTALL, FS 7-19, for steps to remove and install a TBA</p> <p>Refer to SARJ – CLEAN/LUBE RACE RING, FS 7-20, for steps to clean and to lubricate the race ring</p> <p><u>SARJ BAG PACKING</u></p> <ol style="list-style-type: none"> <li>1. Stow Fish Stringer Tether in Med ORU Bag</li> <li>2. Verify TBA Bags are rolled and folded</li> <li>3. Perform Final Bag inventory</li> </ol>



## EVA 3 CLEANUP/INGRESS (00:30)

IV/SSRMS	EV1	EV2
<p>1. Perform prior to crew ingress: WVS PWRDN (PHOTO/TV, <u>WVS CUE CARD</u>)</p>	<p><u>CLEANUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Perform Tool inventory</li> <li>2. Retrieve Large ORU Bag; stow on BRT</li> <li>3. Translate to A/L; fairlead Safety Tether as reqd</li> </ol> <p><u>INGRESS</u> (00:15)</p> <ol style="list-style-type: none"> <li>4. Open thermal cover</li> <li>5. Attach Waist Tether to Airlock D-ring extender; verify locking hook – Gate Closed, Slider Locked</li> <li>6. Give EV2 GO to attach to EV1's 85-ft Safety Tether</li> <li>7. Stow Large ORU Bag in A/L</li> <li>8. Receive Med ORU Bag; stow in A/L</li> <li>9. Give EV2 GO to ingress</li> <li>10. Remove SCU from stowage pouch Remove DCM cover Connect SCU to DCM, check locked</li> <li>11. Water – OFF (fwd); expect "H2O IS OFF" msg</li> </ol>	<p><u>CLEANUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>1. Perform Tool inventory</li> <li>2. Retrieve Med ORU Bag; stow on BRT</li> <li>3. Translate to S0</li> </ol> <p><u>INGRESS</u> (00:15)</p> <ol style="list-style-type: none"> <li>4. On EV1 GO, perform Safety Tether swap onto EV1's 55-ft Safety Tether; verify locking hook – Gate Closed, Slider Locked</li> <li>5. Retrieve EV2 85-ft Safety Tether; stow on MWS</li> <li>6. Retrieve Tether Shuttles (2); stow on S0 bracket; verify locked</li> <li>7. Translate to A/L</li> <li>8. Transfer Med ORU Bag to EV2</li> <li>9. On EV1 GO, ingress A/L</li> <li>10. Remove SCU from stowage pouch Remove DCM cover Connect SCU to DCM, check locked</li> <li>11. Water – OFF (fwd); expect "H2O IS OFF" msg</li> <li>12. Close thermal cover, attach Velcro strap</li> </ol> <div data-bbox="1388 1078 1982 1162" style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not close hatch until EMU water off for 2 min</p> </div> <ol style="list-style-type: none"> <li>13. Verify no hardware blocking hatch</li> <li>14. EV Hatch Handle – verify position per hatch decal</li> <li>15. EV Hatch – close and lock</li> <li>16. Go to PRE-REPRESS (<u>DEPRESS/REPRESS</u> Cue Card)</li> </ol>

# EVA 3 POST TOOL CONFIG

## EV1 MWS

- BRT (L)
- RET (eq-eq)
- Wire Tie (2)
- T-Bar
- RET (eq-eq) (2)
- RET (eq-eq) w/PIP pin
- Adj Equip Tether (2)
- Wire Tie
- Small Shuttle Trash Bag
- Swing Arm (R)
- RET (eq-eq)
- PGT
- PGT Battery
- 7/16 (wobble) Socket-6 ext
- 85-ft Safety Tether (R D-ring ext)
- Waist Tether (2, R and L on D-ring)

## EV2 MWS

- BRT (L)
- RET (eq-eq)
- Wire Tie
- T-Bar
- RET (eq-eq) (2)
- RET (eq-eq) w/PIP Pin
- Adj Equip Tether (2)
- Wire Tie (2)
- Small Station Trash Bag
- Swing Arm (R)
- RET (eq-eq)
- PGT
- PGT Battery
- 7/16 (wobble) Socket-6 ext
- 85-ft Safety Tether (R D-ring ext)
- Waist Tether (L on D-ring)

## AIRLOCK CONFIG

- Large ORU Transfer Bag (Heide)
- Adj Equip Tether (on outside)
- Fish Stringer Tether
- TBA Bag
- TBA Bearing Package (on bag tether)
- TBA Dust Cap
- TBA Mount Package (on bag tether)
- TBA Bag
- TBA Bearing Package (on bag tether)
- TBA Dust Cap
- TBA Mount Package (on bag tether)
- TBA Bag
- TBA Bearing Package (on bag tether)
- TBA Dust Cap
- TBA Mount Package (on bag tether)
- TBA Bag
- TBA Dust Cap (on bag tether)
- SARJ Dust Cap (on bag tether)
- Crewlock Bag
- Adj Equip Tether (2) (on outside)
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/Straight Nozzle
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/J Nozzle
- EVA Wipe Caddy
- EVA Wipes (\_\_\_ wet, \_\_\_ dry)
- Scraper Debris Container (int RET)
- RET (eq-eq)
- Scraper
- Large Trash Bag (int RET) (outside of bag)
- EVA Wipe Caddy
- EVA Wipes (\_\_\_ wet, \_\_\_ dry)
- Camera w/Flash (on integral RET)
- Camera Bracket

## A/L EXTERIOR

- Medium ORU Transfer Bag (Steve)
- Adj Equip Tether (on outside)
- Fish Stringer Tether
- TBA Bag
- TBA Bearing Package (on bag tether)
- TBA Dust Cap
- TBA Mount Package (on bag tether)
- TBA Bag
- TBA Bearing Package (on bag tether)
- TBA Dust Cap
- TBA Mount Package (on bag tether)
- TBA Bag
- TBA Dust Cap (on bag tether)
- SARJ Dust Cap (on bag tether)
- Crewlock Bag
- RET (eq-eq) (spare on outside door handle)
- Adj Equip Tether (2) (on outside)
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/Straight Nozzle
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/J Nozzle
- EVA Wipe Caddy (int RET)
- EVA Wipes (\_\_\_ wet, \_\_\_ dry)
- Scraper Debris Container (int RET)
- RET (eq-eq)
- Scraper
- Large Trash Bag
- EVA Wipe Caddy
- EVA Wipes (\_\_\_ wet, \_\_\_ dry)
- Camera (on integral RET)
- Camera Bracket

Tether Counts: (Red RETs)  
 RETs (eq-eq) = 15    RETs (PIP Pin) = 2  
 RETs (Lg-eq) = 3    Adj Equip Tethers = 10 int/1 ext

# EVA 4 SUMMARY TIMELINE

TIME HR : MIN	IV/SRMS	EV2 (Bw)	EV3 (Kb)	
00:00		<u>POST DEPRESS</u> (00:05)	<u>POST DEPRESS</u> (00:05)	00:00
		<u>EGRESS/SETUP</u> (00:30)	<u>EGRESS/SETUP</u> (00:30)	
01:00		<u>REMOVE P3 MLI COVERS</u> (00:45) Cover 11 Cover 10 Cover 7 Cover 6	<u>REMOVE P3 MLI COVERS</u> (00:30) Cover 14 Cover 15	01:00
		<u>INSTALL EFBM COVER</u> (00:30)	<u>PORT SARJ LUBE – 1st</u> (00:45) Expect SARJ at 210°	
02:00		<u>JEMRMS EE GROUNDING TABS</u> (00:30)	<u>ETVCG INSTALL CP 7</u> (01:15)	02:00
		<u>INSTALL JEM HANDRAILS AND WIFS</u> (00:30)		
03:00		<u>GPS ANTENNA INSTALL</u> (00:45)	<u>PORT SARJ LUBE – 2nd</u> (00:45) Expect SARJ at 30°	03:00
		<u>JEM CLEANUP</u> (00:30)	<u>INSTALL P3 MLI COVERS</u> (01:30)	
04:00		<u>S1/P1 RADIATOR IMAGERY</u> (01:30)		04:00
05:00		<u>GET-AHEADS</u> (00:25) BBC Reconfig (00:10); P-Clamps (00:35); Fluid Line (00:45)	<u>TUS CABLE PICTURES</u> (00:25)	05:00
		<u>CLEANUP/INGRESS</u> (00:25)	<u>GET-AHEADS</u> (00:15)	
06:00		<u>PREREPRESS</u> (00:05)	<u>CLEANUP/INGRESS</u> (00:25)	06:00
			<u>PREREPRESS</u> (00:05)	

**EVA 4 PRE TOOL CONFIG**

- EV2**
- MWS
  - BRT (L)
  - RET (eq-eq)
  - Wire Tie (2)
  - T-Bar
  - RET (eq-eq) (2)
  - RET (eq-eq) w/PIP pin
  - Adj Equip Tether (4)
  - Wire Tie (2)
  - Small ISS Trash Bag
  - Swing Arm (R)
  - RET (eq-eq)
  - PGT [A6 8.3 ft-lb, CAL, MTL 30.5] s/n \_\_\_\_\_
  - PGT Battery s/n \_\_\_\_\_
  - 7/16 (wobble) Socket-6 ext
  - Camera (on integral RET)
  - Camera Bracket
  - D-ring Extender (2, R & L D-ring)
  - 85-ft Safety Tether (R D-ring Ext)
  - Spare 55-ft Safety Tether (L D-ring)
  - Waist Tether (1, L on D-ring Ext)
  - SAFER
  - WVS

- EV3**
- MWS
  - BRT (L)
  - RET (eq-eq) w/PIP Pin
  - Wire Tie (2)
  - T-Bar
  - RET (eq-eq) (2)
  - Adj Equip Tether (2)
  - Wire Tie (2)
  - Small ISS Trash Bag
  - Swing Arm (R)
  - RET (eq-eq)
  - PGT [A6 8.3 ft-lb, CAL, MTL 30.5] s/n \_\_\_\_\_
  - PGT Battery s/n \_\_\_\_\_
  - 7/16 (wobble) Socket-6 ext
  - D-ring Extender (2, R & L D-ring)
  - 85-ft Safety Tether (R D-ring Ext)
  - Waist Tether (1, R on D-ring Ext)
  - SAFER
  - WVS

**AIRLOCK CONFIG**

- RET (Lg-eq)
- Large ORU Bag (ETVCG) (Shane)
- Adj Equip Tether (on outside)
- RET (Lg-eq)
- ETVCG
- NOTE: Verify connector cover removed**
- Round Scoop
- RET (Lg-eq) (for dummy box)
- 
- RET (Lg-eq)
- Large ORU Bag (Steve)
- Adj Equip Tether (on outside)
- Fish Stringer (2 hooks to loops inside bag)
- OI WIF 36
- OIH 1206
- OIH 1204
- OI WIF 43
- OIH 116
- Medium ORU Bag (Steve – GPS)
- Adj Equip Tether (on outside)
- RET (eq-eq)
- GPS Antenna
- Wire Tie (long)
- Connector Caps (2)
- RET (eq-eq)
- GPS Antenna
- Wire Tie (long)
- Connector Caps (2)

Tether Counts: (Red RETs)  
 RETs (eq-eq) = 12                      RETs (PIP Pin) = 2  
 RETs (Lg-eq) = 6                        Adj Equip Tethers = 11 int/1 ext

**AIRLOCK CONFIG (Cont)**

- RET (Lg-eq)
- Crewlock Bag (SARJ) (Shane)
- RET (eq-eq) (spare on outside door handle)
- Adj Equip Tether (2) (on outside)
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/Straight Nozzle
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/J Nozzle
- EVA Wipe Caddy (int RET)
- EVA Wipes (6) (dry)
- Large Trash Bag (int RET)
- Camera (on integral RET)
- Camera Bracket
- 
- RET (Lg-eq)
- Crewlock Bag
- Ratchet Wrench
- Socket Caddy
- 7/16 (wobble) Socket-12 ext
- 7/16 (rigid) Socket-9 ext
- 7/16 (rigid) Socket-2 ext
- IR Camera **NOTE:** Prior to egress, turn Master switch ON. Wait until LED on back of camera is solid green (~45 sec). Hold enable switch UP for 5 sec, verify LED – OFF

**NOTE:** Prior to use, inspect the following hardware:

- RET cords for fraying
- Safety Tether/Waist Tether LAS: No Red Visible
- ISS Trash Bag: Bristle deformation/damage, after having stowed tools in trash bag
- EMU and tools for excessive grease
- Prime Grease Guns w/J Nozzle

## EVA 4 PRE TOOL CONFIG (Cont)

### AIRLOCK CONFIG (Cont)

- Staging Bag
- Fish Stringer Tether
- Wire Tie Caddy
- Velcro/Tape Caddy
- PGT
- PGT Battery
- 7/16 (wobble) Socket-6 ext
- Vise Grips
- Ratchet Wrench
- 7/16 (rigid) Socket-9 ext
- Needle Nose Pliers
- Spare 55-ft Safety Tether
- Spare WIF Adapter
- Fish Stringer
- Connector Cleaner Tool Kit
- Pin Straightener Assy
- Probe
- Pry Bar
- MWS Key Strap Assy
- Long Duration Tie Down Tethers (2)
- Wheel Bogie PIP Pin

s/n \_\_\_\_\_  
s/n \_\_\_\_\_

- Fish Stringer Tether
- Grease Gun w/Straight Nozzle (spare)
- Grease Gun w/J Nozzle (spare)
- EVA Wipes (5) (dry)

### AIRLOCK CONFIG (Cont)

- IV Bag
- Towels (2)
- Contamination Detection Kit
- GP Caddy (2)
- Adjustable Thermal Mittens (2)
- Socket Caddy (hatch cont) w/RET (eq-eq) (Black)
- 1/2 Socket-8 ext
- 7/16 (wobble) Socket-6 ext (spare)
- DCM Plug (SAFER Hardmount) (2)

### EXTERIOR CONFIG

- JEM
- EFBM Center Cover
- Wire Tie (1) (JEM HR 1179)
- Adj Equip Tether (1) (JEM HR 1185)
- S0 HR 3529 – 55-ft Safety Tether
- S0 HR 3539 – 55-ft Safety Tether

## EVA 4 BRIEFING CARD

Aft EDDA \_\_\_\_\_  
Fwd EDDA \_\_\_\_\_  
Suit IV \_\_\_\_\_  
Task IV \_\_\_\_\_  
M1/M2 \_\_\_\_\_

Hygiene Break Reprress (GMT) \_\_\_\_\_:\_\_\_\_\_  
Depress to 10.2 \_\_\_\_\_:\_\_\_\_\_  
Start Purge \_\_\_\_\_:\_\_\_\_\_  
PET 00:00 \_\_\_\_\_:\_\_\_\_\_  
\_\_\_\_\_

### General Briefing

#### 1. Hygiene Break & EVA Prep – Suit IV

- Get-up Plan
- Prebreathe protocol review (Notes and Warnings)
- Equipment lock activities – IV responsibilities
- Suit donning plan – special requests
- SAFER, MWS, Safety tethers, bag stowage
- Airlock depress review

#### 2. EV Crew Procedure Review – EV CMs

- Egress Plan, √Safety tethers
- Review first post-egress steps
- Order of tasks (summary timeline)
- Translation plan, fairleads, and tether swaps
- Hazards
- Ingress Plan

#### 3. Other Procedure Review – Task IV

- Get-ahead tasks
- Constraints – ground and flight
- Notes, Cautions, and Warnings review
- Contingency procedures – cribsheet

#### 4. Communications – Task IV

- Overall setup: Big loop, A/G2, S/G2, ICOM, remind EV crew when mode swapping
- EV/IV comm protocol review – Use EV1/2/3 for DCM sw throws (all time in A/L), use first names otherwise

#### 5. Robotics – M1/M2

- SRMS/SSRMS initial position, maneuvers, clearances
- Coordinate Frames
- SRMS/SSRMS comm protocol review – expected calls, use first names
- GCA – Give direction and approx distance
- Positive handover who is giving GCA
- Cameras

#### 6. Emergencies Review – Suit IV/Task IV

- Emergency suit doff and power down
  - √Expedited Suit Doffing cue card pre-positioned for EVA day
- Loss of comm
- EMU malfunctions
- Lost tools
- Lost crewmember
- DCS
- Abort and Terminate scenarios, protocols
- Hand signal reviews

#### 7. Post EVA – Suit IV

- Suit doffing responsibilities
- Post EVA plan

#### 8. Reminders – Task IV

- Translate slow (then space is like water). Relax grip
  - Be extra careful on non-standard routes or orientations
  - Don't hop
- Monitor safety tether
- Prior to moving and ingress, √BRT & Swingarm stowed
- If you get a mal, read the caution and warning message so everyone knows what it is
- Be disciplined when tired
- Openness: When you have boot or glove pain let us know
- OK for IV and ground to check on us. If you need update, ask
- Let mistakes pass
- Manage frustration (slow down, if needed)
- Cold soak before ingress
- Verify PGT settings. PGT collars are easy to bump
- Translation Adaptation plan

## EVA 4 BRIEFING CARD (Cont)

### Generic Calls:

- ❑ Day/Night Cycles
  - √Lights, visors, gloves, tethers, and tools
  - Glove Checks: Report any damaged/missing RTV, Vetran condition
- ❑ Tether swaps:
  - Crew Report: **"Gate closed, slider locked"**
  - Tether Shuttle – Crew Report: **"Slider locked"**
- ❑ Equipment Tether Discipline
  - "Make before you break"
  - Check all gates closed
- ❑ √Both SAFER valves down at egress
  - Crew Report: **"Both handles down"**
- ❑ √APFR locking collar Black-on-black and pull test
  - Crew Report: **"Black-on-black, good pull test"**
- ❑ √PGT Green light on for bolt engage
  - May get Lo Torque msg at bolt release
  - Crew Report: **"XX turns, XX ft-lb, green light"**
- ❑ √Connectors for no bent pins, no FOD, check EMI band and inhibits in place
  - EV Report: **"Pins good, no FOD, Good EMI Band"**
  - IV: √MCC **"Are inhibits in place?"**
- ❑ √Tethers and Tools clear prior to SSRMS ORU movement
  - Each EV report: **"Tethers and tools clear"**
- ❑ Tool inventory (when leaving worksite)
  - Bags: EV call out items, IV check off on Tool Matrix
  - MWS: EV call out, BRT – MWS – Swing Arm
  - Confirm all changes from the checklist are accounted for

## EVA 4 INHIBIT PAD

### Orbiter

#### KU-BAND ANTENNA

- MCC-H
1. √KU-BAND Mask – active
  2. √KU-BAND EVA Protect Box – active

#### RCS

- If EV crew < 27 ft from FRCS
- IV
1. √DAP: VERN, FREE, LO Z (flt specific check with GNC)
  2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF  
LOGIC (four) – OFF
- O14,15,16
- MCC-H
3. √Above RCS config
  4. √RCS F – ITEM 1 EXEC (\*)
- IV
- √JET DES F1U – ITEM 17 (\*)
  - F3U – ITEM 19 (\*)
  - F2U – ITEM 21 (\*)

#### S-BAND ANTENNAS

##### NOTE

Possible loss of comm when forced LL FWD antenna

- IV
- If EV crew < 2 ft from S-Band antenna
1. S-BAND FM ANT – XMIT LOWER/RCVR UPPER
  2. √MCC, lower antenna selected
- A1R
- If no comm, or on MCC GO
3. S-BAND PM ANT – LL FWD
- C3
- When EVA crewmember at least 2 ft away from all S-Band upper antennas
4. S-BAND PM ANT – GPC
- C3

### Ground

#### All EVAs

- Ground Radar
- MCC-H
1. √FIDO console, ground radar restrictions in place for EVA

### USOS

#### PCU

##### NOTE

PCUs may require up to 1 hr warm-up period before they are operational

- MCC-H
1. √PCUs (two) operational in discharge mode and one of the following:
    - a. CCS PCU EVA hazard control FDIR enabled
    - b. No more than two arrays unshunted and oriented < 105 deg from the velocity vector
- If one or both PCUs failed:
2. No more than two arrays unshunted and oriented < 105 deg from velocity vector

#### Mobile Transporter

- MCC-H
1. √MT latched

#### TUS

- MCC-H
1. Verify RPCM S04B\_F RPC 17 – OPEN

#### P3 SARJ

- MCC-H
- SARJ at 210 deg or 30 deg
1. √DLA (1) – LOCKED
  2. All motor setpoints set to zero
  3. All motors deselected

#### SSPTS

- MCC-H
1. RPCM LA1A4A D RPC 3 – Open, Close Cmd Inhibit
  2. RPCM LA2A3B D RPC 1 – Open, Close Cmd Inhibit
  3. RPCM Z14B A RPC 2 – Open, Close Cmd Inhibit
  4. RPCM Z13B A RPC 2 – Open, Close Cmd Inhibit

#### P1 TRRJ

1. √DLA (1) – LOCKED at 0 deg

#### ETVCG (prior to ETVCG install)

- MCC-H
1. RPCM P11A\_B RPC 2 – Open, Close Cmd Inhibit
  2. RPCM P11A\_B RPC 12 – Open, Close Cmd Inhibit
  3. RPCM P12B\_B RPC 1 – Open, Close Cmd Inhibit
  4. RPCM P12B\_B RPC 13 – Open, Close Cmd Inhibit



## EVA 4 INHIBIT PAD (Cont)

### RSOS

SM Antennas IV	<ol style="list-style-type: none"> <li>1. GTS – Deactivate</li> <li>2. ARISS (Ham Radio) – Deactivate or VHF (144-146 MHz) TX only</li> </ol>
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### IR IMAGERY ON PMA1

FGB Thrusters MCC-M	<ol style="list-style-type: none"> <li>1. √FGB MCS unpowered</li> <li>2. √All FGB Attitude Control Thruster Valves (eighty) – closed</li> <li>3. √FGB Attitude Control Manifold Valves – closed КШК1, КШК2, КШК4, КШК5, КШК9, ОКО3, ОКГ3, ОКО6, ОКГ6, ОКО7, ОКГ7, ОКО8, ОКГ8</li> </ol>
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Soyuz Thrusters MCC-M	<ol style="list-style-type: none"> <li>1. √Soyuz manifolds (four) – closed ЭКО1, ЭКО2, ЭКГ1, ЭКГ2</li> <li>2. √Soyuz MCS unpowered</li> <li>3. √Soyuz Attitude Control Thruster Valves (fifty-two) – closed</li> <li>4. √Soyuz Main Engine Valves (K1, K2, K3, K4, K5, K6) – closed</li> </ol>
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FGB Antennas MCC-M	<ol style="list-style-type: none"> <li>1. √FGB KURS P [КУРС P] – Deactivated</li> </ol>
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Soyuz Antennas MCC-M	<ol style="list-style-type: none"> <li>1. √Soyuz KURS A [КУРС A] – Deactivated</li> </ol>
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### JEM

JPM Window IV	Close JPM window shutters (2)
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EFBM IV SSIPC	√P011B on jumper cable disconnected for BEP PDB A2 RPC01 – Open
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JEMRMS SSIPC	RIP MA Brake – On MDP Main Mode – Stby Mode PDB RMS Ext4 Vout: 0.0V VCU_B TVC WVE Sig Stat – No Signal
Signal	VLU EE Pwr – Open JEU Interlock – Inhibit JEU RT – Inhibit MDP Ang/Mtr Cross Ck – Inhibit

PROX GPS Antennas (prior to connector mates) SSIPC	<ol style="list-style-type: none"> <li>1. PDB A2 RPC4 – OPEN</li> <li>2. PDB B1 RPC5 – OPEN</li> </ol>
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HTV PROX Antenna SSIPC	√TRX Power – OFF √TX Power – OFF
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### COL

EuTEF COL-CC	Verify PLEGPAY Power Status (ETF_PLEGPAY_Pwr_Stat) – OFF
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## EVA 4 NOTES/CAUTIONS/WARNINGS

### NOTES

1. Bolt install: Report torque and turns
2. Bolt release: Report torque and turns if different from published range
3. EVA connectors: After disconnection and prior to connection; verify pin and EMI band integrity; verify connector free of FOD
4. Inspect QDs for damage prior to mating
5. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
6. Avoid contact with OBSS striker bars (Vitrolube coating)

### CAUTION

#### ISS Constraints

- A. Avoid inadvertent contact with
  1. Grapple fixture shafts (drylube)
  2. PIP pins
  3. CETA Lights (Z-93 paint) [LAB,S1, Node 1]
  4. Passive UMAs
  5. MBS/SSRMS/SPDM/JEMRMS taped radiative surfaces: VDU, ACU, JEU, LEU, MCU, CRPCMs, and Cameras
  6. Deployed TUS cable [Nadir CETA rail]
  7. GPS Antennas (S13 paint) [S0]
  8. UHF Antennas [LAB,P1]
  9. ETCS Radiator flexhoses and panels [S1,P1]
  10. EETCS/PV Radiator flexhoses, bellows and panels [P6,P4,S4,S6]
  11. SPDM SJEU, EP, OTCM, LEU, and LEE VDU Radiator surfaces
  12. Open CBM petal covers, LAB window shutter, and JPM window shutter
  13. JTVE Cameras [JEM]
  14. S0/Node 2 Fluid Tray hardlines at Node 2 end are limited to 25 lb
  15. JEM Airlock target and pin

### CAUTION

#### ISS Constraints (Cont)

- B. Electrical cables
  1. Avoid bend radii < 10 times cable diameter
- C. Fiber optic cables
  1. Avoid bend radii < 10 times cable diameter
  2. Avoid pulling on cable during mate/demate
- D. Fluid line flex hoses and QDs
  1. Avoid bend radii < 5 in for hoses with diameter < 1 in on LAB, S0, S1, P1, and 10 in for hoses with diameter < 1 in on all other elements
  2. Avoid bend radii < 14 in for hoses with a diameter ≥ 1 in
  3. Additional care should be taken to not exceed bend radii when applying loads at the flexible hose to rigid tube stub interfaces
  4. Ensure fluid QD booties are fully closed prior to leaving worksite; wire tie if reqd
- E. For structural reasons
  1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
  2. Avoid performing shaking motions (sinusoidal functions) more than four cycles
  3. Avoid kicking S1/P1 radiator beam. If any of these occur, wait 2 to 5 min to allow structural response to dissipate

## EVA 4 NOTES/CAUTIONS/WARNINGS (Cont)

### CAUTION

#### ISS Constraints (Cont)

##### F. SARJ Hardware

1. During MLI cover fastener release:  
Limit turn count to minimum required, minimize side loading bolt head, and maintain axial force on fastener to compress spring during rotation
2. Avoid scratching or nicking the Race Ring while working on repair

##### G. Other

1. WIS Antennas: Do not use as handholds [Node 1,LAB,P6,Z1]
2. Lubricant from Ku-Band SGANT gimbals [Z1], CMGs [Z1], and RTAS Ground Strap fasteners [P6,P4,S4,S6] can contaminate EMU
3. MLI handholds are not rated for crewmember translation loads

### WARNING

#### ISS Constraints

##### A. Avoid inadvertent contact with

1. Grapple fixture targets and target pins
2. SSU, ECU, beta gimbal platform, mast canister, SAW blanket boxes unless the beta gimbal is locked and the motor is turned off
3. Stay inboard of SARJ when active
4. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate
5. SOLAR and EuTEF [COL EPF]

##### B. Handrails

1. Handrails previously used for MISSE attachment may not be used as a safety tether point [A/L endcone 564 & 566, A/L Tank 2 nad/fwd & port/fwd, P6 5389]

##### C. Pinch

1. NZGL connector linkage. Use caution when mating/locking
2. EV side of IV Hatch during Hatch operation (also snag hazard) [A/L]
3. LAB window shutter and CBM petal cover and JPM window shutter linkages during operation
4. JEMRMS HRM capture latches
5. JEM Cameras (JTVEs, EVE, WVE)
6. JEM EFBM capture latches

##### D. QDs

1. If QD is in FID when valve is opened (bail fwd), QD will leak and fluid line may whip
2. Do not rotate if in mated/valve open config

### WARNING

#### ISS Constraints (Cont)

##### E. RF radiation exposure

1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1]
2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1]
3. Stay 1 ft from UHF Antenna when powered [LAB,P1]

##### F. Sharp Edges

1. Inner edges of WIF probes
2. APFR active WIF probes
3. Mating surfaces of EVA connectors  
Avoid side loads during connector mating
4. Spring loaded captive EVA fasteners (e.g., 6B-boxes, BMRRM, RTAS, SARJ Covers); the end of the spring may protrude
5. PMA umbilical launch restraints-exposed bolt threads
6. Adjustable Fuse Tether (Fish Stringer) buckles stowed in Node Bag
7. Nickel coated braided copper Ground Straps may contain frayed wires [P6,P4,S4,S6]
8. SPDM OTCM gripper jaws
9. Keep hands away from SSRMS LEE/POA/SPDM LEE/JEMRMS EE opening, snares, and PDGF curvic coupling (teeth)
10. P2 connector on EWIS box TAA-06 [Zenith/Forward Corner 1 of P5 – SARJ at 0 deg]
11. Port/Aft portion of A/L circular HR [HR 0506]
12. Interior of JEMRMS HRMs
13. JEM A/L hatch corners

## EVA 4 NOTES/CAUTIONS/WARNINGS (Cont)

### **WARNING**

#### **ISS Constraints (Cont)**

##### G. Thermal

1. EVA connectors with booties may become hot if left uncovered. Handling may need to be limited.
2. PMA handrails may be hot. Handling may need to be limited
3. Turn off glove heaters when comfortable temp reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
4. Uncovered trunnion pins may be hot
5. SSRMS/MBS/SPDM/JEMRMS operating cameras and lights may radiate large amounts of heat
6. Stay  $\geq 1$  ft away from PMAs and MMOD shields  $> 270$  degF if EMU sun visor up; limit time to 15 min or less if  $> 300$  degF
7. Stay at least 0.5 ft away from PMA and MMOD shields  $> 325$  degF
8. Do not touch EMU protective visor if temp has been  $< -134$  degF for  $> 15$  min
9. No EMU TMG contact with PMAs and MMOD shields  $> 320$  degF
10. No EMU boot contact with foot restraint when temp  $< -120$  degF or  $> 200$  degF
11. Columbus end cones may violate touch temperature constraints when  $-75 \leq \beta \leq -60$  or  $60 \leq \beta \leq 75$
12. PDGF surfaces may not meet touch temperature requirements for unlimited contact when  $\beta \leq -70$  or  $\beta \geq 70$
13. JPM port end cones and JLP port nadir may violate touch temperature constraints when  $\beta > 60$  deg

### **WARNING**

#### **ISS Constraints (Cont)**

##### H. Electrical Shock

1. Stay  $\geq 2$  ft from ungrounded floating connectors if not unpowered
  - SSPTS connectors include NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA 2 Stbd and Port
  - MBS Cross-Connect jumpers (translate past these using UMA handrails) Include S0 EVA Power Cables (inside S0 Bay 00 Face 4, Bay 01 Face 3) ESP2 jumper (inside S0 Bay 03 Face 4)
2. Do not touch SPDM CLPA 1 electrical connector prior to camera installation
3. Do not touch blemishes on zenith TUS cable

##### I. SARJ Hardware

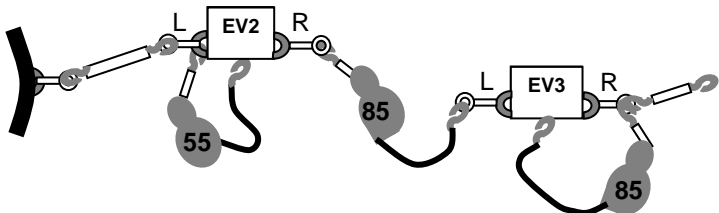
1. Sharp edge potential on TBA bearing package and mount
2. SARJ must be locked to prevent rotation when EV crew is within 2 ft of rotational place

#### Shuttle Constraints

##### J. Thermal

1. Stay 27 ft from PRCS when powered
2. Stay 3 ft from VRCS when powered
3. Stay 3 ft from APU when operating

## EVA 4 EGRESS/SETUP (00:30)

IV/SSRMS	EV2	EV3
	<p>Initial Config: Waist Tether from L D-ring Ext to Airlock D-ring Ext, 85-ft Safety Tether to EV3's L D-ring Ext</p>  <p>Initial Config: EV2 85-ft Safety Tether to L D-ring Ext</p>	
<p>1. Post crew egress: WVS Software: Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max</p>	<p><u>EGRESS</u> (00:15)</p> <ol style="list-style-type: none"> <li>Transfer SARJ Crewlock Bag to EV3</li> <li>Egress A/L</li> <li>Retrieve Large ORU Bag (Handrails and GPS); stow on BRT</li> <li>√SAFER MAN ISOL vlv – Open (down)</li> <li>√SAFER HCM – Closed (down)</li> <li><b>On EV3 GO</b>, disconnect waist tether</li> <li>Close A/L thermal cover</li> </ol> <p><u>SETUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>Translate to S0 port strut</li> <li>Stow Large ORU Bag on S0 port strut handrail</li> <li>Translate to P3 SARJ</li> </ol>	<p><u>EGRESS</u> (00:15)</p> <ol style="list-style-type: none"> <li>Open A/L thermal cover</li> <li>Egress A/L</li> <li>√SAFER MAN ISOL vlv – Open (down)</li> <li>√SAFER HCM – Closed (down)</li> <li>Receive SARJ Crewlock Bag from EV2; stow on BRT</li> <li>Translate to S0 Tether Shuttles</li> <li>Retrieve Tether Shuttles</li> <li>Install EV3 Tether Shuttle onto nadir CETA rail (port); verify Locked</li> <li>Install EV2 Tether Shuttle onto nadir CETA rail (stbd); verify Locked</li> <li>Attach EV3 85-ft Safety Tether to port Tether Shuttle</li> <li>Verify locking hooks – Gate Closed, Slider Locked</li> <li>Attach EV2 85-ft Safety Tether to stbd Tether Shuttle</li> <li>Verify locking hooks – Gate Closed, Slider Locked</li> <li><b>Give EV2 GO</b> to disconnect waist tether</li> </ol> <p><u>SETUP</u> (00:15)</p> <ol style="list-style-type: none"> <li>Translate to P3 SARJ; fairlead Safety Tether as reqd</li> </ol>

## EVA 4 REMOVE P3 MLI COVERS (00:45)

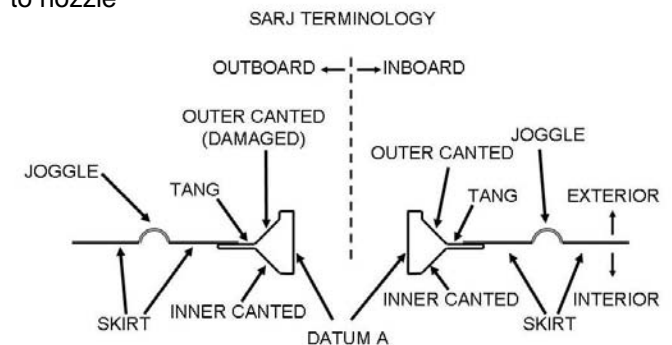
IV/SSRMS	EV2	EV3
<p>1. √Inhibits in place</p>	<p><u>REMOVE P3 MLI Covers</u> (00:45)</p> <ol style="list-style-type: none"> <li>1. Translate to P3 Port SARJ, Face 6</li> <li>2. Perform Glove Inspection</li> </ol> <div data-bbox="884 402 1717 578" style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><b>CAUTION</b></p> <p>To prevent loss of inboard MLI cover fasteners during removal:            Limit turn count to minimum required for fastener release            Minimize side loading bolt head            Maintain axial force on fastener to compress spring during rotation</p> </div> <ol style="list-style-type: none"> <li>3. REMOVE: <b>PGT[A6 8.3 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Release inboard MLI cover fasteners, 9 turns:               <ul style="list-style-type: none"> <li><input type="checkbox"/> Cover 7 (P3 HR 3845)</li> <li><input type="checkbox"/> Cover 6 (P3 HR 3845 and 3851)</li> <li><input type="checkbox"/> Cover 11 (P3 HR 3850)</li> <li><input type="checkbox"/> Cover 10 (P3 HR 3843 and diagonal truss)</li> </ul> </li> <li>4. Perform Tool Inventory</li> <li>5. Translate to S0 port strut handrail</li> </ol> <p>Refer to FS 7-97 for start of JAXA tasks</p>	<p><u>REMOVE P3 MLI Covers</u> (00:30)</p> <ol style="list-style-type: none"> <li>1. Translate to P3 Port SARJ, Face 3/4</li> <li>2. Perform Glove Inspection</li> </ol> <ol style="list-style-type: none"> <li>3. Stow SARJ Crewlock Bag on P3 HR 3855</li> <li>4. REMOVE: <b>PGT[A6 8.3 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Release inboard MLI cover fasteners, 9 turns:               <ul style="list-style-type: none"> <li><input type="checkbox"/> Cover 14 (P3 HR 3849)</li> <li><input type="checkbox"/> Cover 15 (P3 HR 3848)</li> </ul> </li> <li>5. Retrieve spare RET from SARJ Crewlock Bag as reqd</li> <li>6. Retrieve EVA wipe from wipe caddy</li> <li>7. Stow large trash bag outside of Crewlock Bag</li> </ol> <p>Refer to FS 7-95 for steps to lubricate the inner canted surface</p> <p>Refer to FS 7-96 for steps to lubricate the datum A and outer canted surfaces</p>

# EVA 4 PORT SARJ LUBE

IV/SSRMS	EV3
	<p><u>INNER CANTED SURFACES</u> (00:20)</p> <ol style="list-style-type: none"> <li>1. Retrieve J-hook nozzle gun</li> <li>2. Prep J-hook nozzle gun:             <ol style="list-style-type: none"> <li>a. Engage teeth by rotating plunger 180 deg (black triangle up)</li> <li>b. Remove MLI tip cover</li> <li>c. Rotate shut off knob such that FLOW pointing towards nozzle</li> </ol> </li> <li>3. Grease inner canted surface under Covers 14 and 15 (zenith set)</li> <li>4. Safe J-hook nozzle gun:             <ol style="list-style-type: none"> <li>a. Disengage teeth by rotating plunger 180 deg (black triangle down)</li> <li>b. Wipe nozzle as required</li> </ol> </li> <li>5. Translate to Covers 11 and 10 (middle set)</li> <li>6. Prep J-hook nozzle gun: Engage teeth by rotating plunger 180 deg (black triangle up)</li> <li>7. Grease inner canted surface under Covers 11 and 10</li> <li>8. Safe J-hook nozzle gun:             <ol style="list-style-type: none"> <li>a. Disengage teeth by rotating plunger 180 deg (black triangle down)</li> <li>b. Wipe nozzle as required</li> </ol> </li> <li>9. Translate to Covers 7 and 6 (nadir set)</li> <li>10. Prep J-hook nozzle gun: Engage teeth by rotating plunger 180 deg (black triangle up)</li> <li>11. Grease inner canted surface under Covers 7 and 6</li> <li>12. Safe and stow J-hook nozzle gun:             <ol style="list-style-type: none"> <li>a. Disengage teeth by rotating plunger 180 deg (black triangle down)</li> <li>b. Rotate shut off knob such that FLOW is perpendicular to nozzle</li> <li>c. Wipe nozzle as required</li> <li>d. Install MLI tip cover</li> </ol> </li> <li>13. Use dry wipe as required to clean up EMU and tools</li> <li>14. Stow J-hook nozzle gun on SARJ Crewlock Bag</li> </ol> <div data-bbox="1323 998 1963 1339" style="text-align: center;"> <p>SARJ TERMINOLOGY</p> <p>OUTBOARD ← → INBOARD</p> <p>JOGGLE, SKIRT, TANG, INNER CANTED, DATUM A, JOGGLE, TANG, EXTERIOR, INNER CANTED, SKIRT, INTERIOR</p> </div>

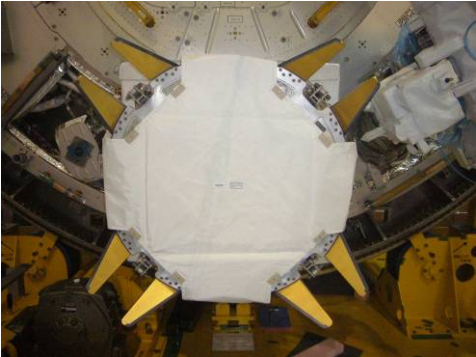
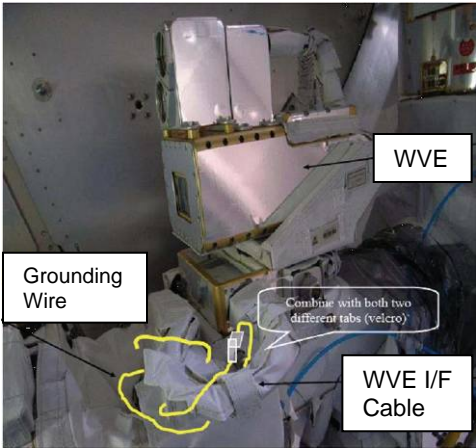

## EVA 4 PORT SARJ LUBE (Cont)

IV/SSRMS	EV3
<p>1. MCC-H: <b>On EV3 GO</b>, rotate P3 SARJ</p>	<p><u>DATUM A/OUTER CANTED SURFACES</u> (00:25)</p> <ol style="list-style-type: none"> <li>Retrieve straight nozzle grease gun</li> <li>Prep straight nozzle gun:             <ol style="list-style-type: none"> <li>Engage teeth by rotating plunger 180 deg (black triangle up)</li> <li>Remove MLI tip cover</li> <li>Rotate shut off knob such that FLOW pointing towards nozzle</li> </ol> </li> <li>Grease datum A and outer canted surface under Covers 14 and 15</li> <li>Safe straight nozzle gun:             <ol style="list-style-type: none"> <li>Disengage teeth by rotating plunger 180 deg (black triangle down)</li> <li>Wipe nozzle as required</li> </ol> </li> <li>Translate to Covers 11 and 10</li> <li>Prep straight nozzle gun: Engage teeth by rotating plunger 180 deg (black triangle up)</li> <li>Grease datum A and outer canted surface under Covers 11 and 10</li> <li>Safe straight nozzle gun:             <ol style="list-style-type: none"> <li>Disengage teeth by rotating plunger 180 deg (black triangle down)</li> <li>Wipe nozzle as required</li> </ol> </li> <li>Translate to Covers 7 and 6</li> <li>Prep straight nozzle gun: Engage teeth by rotating plunger 180 deg (black triangle up)</li> <li>Grease datum A and outer canted surface under Covers 7 and 6</li> <li>Safe and stow straight nozzle gun:             <ol style="list-style-type: none"> <li>Disengage teeth by rotating plunger 180 deg (black triangle down)</li> <li>Rotate shut off knob such that FLOW is perpendicular to nozzle</li> <li>Wipe nozzle as required</li> <li>Install MLI tip cover</li> </ol> </li> <li>Use dry wipe as required to clean up EMU and tools</li> <li>Stow straight nozzle grease gun on SARJ Crewlock Bag</li> </ol> <p>Prior to leaving worksite after 1st lubrication:</p> <ol style="list-style-type: none"> <li>Ensure P3 SARJ interface is clear of all tethers, etc</li> <li>Verify 3 tethers on MWS</li> <li><b>Give MCC GO</b> to rotate P3 SARJ</li> </ol>



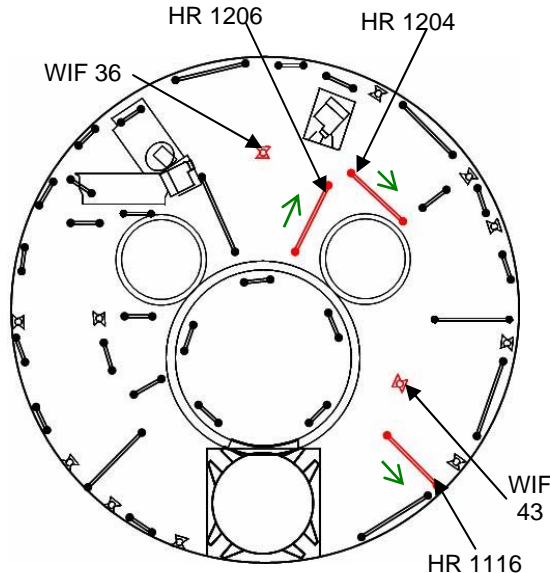




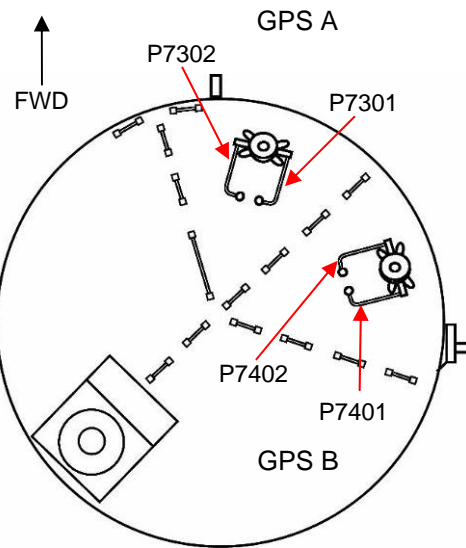
# EVA 4 EFBM COVER INSTALL (00:30)/JEM RMS GROUNDING TABS (00:30)

IV/SSRMS	EV2
<p>1. Verify with MCC-H JEM Inhibit Pad complete</p>  	<p><u>EFBM COVER REINSTALL</u> (00:30)</p> <ol style="list-style-type: none"> <li>Retrieve Large ORU Bag from S0 port strut handrail</li> </ol> <div data-bbox="682 354 1312 418" style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Avoid inadvertent contact with Fluid Tray hardlines</p> </div> <ol style="list-style-type: none"> <li>Translate to EFBM on port end of JEM</li> <li>Perform Glove Inspection</li> <li>Stow Large ORU Bag on JEM HR 1185</li> <li>Retrieve EFBM center cover from JEM HR 1185 and HR 1179</li> <li>Stow wire tie in trash bag</li> </ol> <div data-bbox="682 604 1201 685" style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b> Avoid pinch point on EFBM capture latch</p> </div> <div data-bbox="682 701 1491 799" style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Avoid inadvertent contact with the EFBM berthing mechanism (silver Teflon), EFBM guide vane (solid lubricant), and EFBM base</p> </div> <ol style="list-style-type: none"> <li>Reinstall center cover           <ul style="list-style-type: none"> <li><input type="checkbox"/> Four 1/4 turn fasteners</li> <li><input type="checkbox"/> Verify Velcro config (grounding tabs)</li> </ul> </li> <li>Stow adj equip tether on MWS</li> <li><input type="checkbox"/> WVS Survey of EFBM</li> </ol> <p><u>JEMRMS GROUNDING TABS</u> (00:30)</p> <ol style="list-style-type: none"> <li>Translate to JEMRMS EE</li> <li>BRT to JEM HR 1201</li> </ol> <div data-bbox="682 1136 1201 1230" style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> If JEM RMS movement required, EV crew must stay aft of fwd JEM window</p> </div> <ol style="list-style-type: none"> <li>Wrap protruding EE grounding tabs (2) around WVE I/F cables</li> <li>Attach grounding tabs (2) to each other via Velcro</li> <li>If reqd, use wire tie around grounding tabs to secure in place</li> <li><input type="checkbox"/> WVS Survey of grounding tabs</li> <li><b>Give MCC-H GO</b> to check grounding tabs</li> </ol> 

## EVA 4 INSTALL JEM HANDRAILS AND WIFs (00:30)

IV/SSRMS				EV2																													
<table border="1"> <thead> <tr> <th>HR</th> <th>Mount Bolt #</th> <th>Turns</th> <th>Torque</th> </tr> </thead> <tbody> <tr> <td>1116</td> <td>6 (zenith)</td> <td></td> <td></td> </tr> <tr> <td></td> <td>5 (nadir)</td> <td></td> <td></td> </tr> <tr> <td>1204</td> <td>3 (zenith)</td> <td></td> <td></td> </tr> <tr> <td></td> <td>4 (nadir)</td> <td></td> <td></td> </tr> <tr> <td>1206</td> <td>2 (zenith)</td> <td></td> <td></td> </tr> <tr> <td></td> <td>1 (nadir)</td> <td></td> <td></td> </tr> </tbody> </table>				HR	Mount Bolt #	Turns	Torque	1116	6 (zenith)				5 (nadir)			1204	3 (zenith)				4 (nadir)			1206	2 (zenith)				1 (nadir)			<p><u>JEM OIHs AND OI WIFs</u> (00:30)</p> <ol style="list-style-type: none"> <li>Translate to Large ORU Bag on JEM HR 1185</li> <li>Retrieve Med ORU Bag; stow on JEM HR 1184</li> </ol> <p style="text-align: center;"><b>NOTE</b></p> <p>Tether hook may become entrapped between OIH standoff point and pressurized module; ensure tether hook is above OIH interface on standoff point when installing to softdock</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b></p> <p>Avoid inadvertent contact with JEM Airlock target and pin</p> </div> <ol style="list-style-type: none"> <li>Retrieve and install OIHs and OI WIFs in following order: <ul style="list-style-type: none"> <li><input type="checkbox"/> OIH 1116</li> <li><input type="checkbox"/> OI WIF 43</li> <li><input type="checkbox"/> OIH 1204</li> <li><input type="checkbox"/> OIH 1206</li> </ul> </li> <li>Retrieve Med ORU Bag and Fish Stringer; stow on BRT</li> <li>Retrieve OI WIF 36 from Large ORU Bag</li> <li>Install OI WIF 36</li> <li>Translate to JLP</li> <li>Perform Safety Tether swap onto spare 55-ft Safety Tether, anchor at JLP HR 1239; verify locking hooks – Gate Closed, Slider Locked</li> <li>Stow 85-ft Safety Tether on JLP HR 1239</li> </ol> <p>Install OIH:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> ✓ Handrail soft dock armed (push both buttons)</li> <li><input type="checkbox"/> Install and soft dock handrail (arrow on bottom, align HR# to mount #, push in to soft dock)</li> <li><input type="checkbox"/> <b>PGT[A2 3.8 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Tighten handrail bolts (2), ~8 turns</li> <li><input type="checkbox"/>  WVS Survey of OIH</li> </ul> <p>Install OI WIF:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Slide WIF into dovetail fitting</li> <li><input type="checkbox"/> Verify tabs (2) secure (down)</li> <li><input type="checkbox"/>  WVS Survey of OI WIF</li> </ul>	
				HR	Mount Bolt #	Turns	Torque																										
				1116	6 (zenith)																												
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				1204	3 (zenith)																												
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1206	2 (zenith)																																
	1 (nadir)																																
 <p style="text-align: right;">→ = Soft Dock Direction</p>																																	

## EVA 4 GPS ANTENNA INSTALL (00:45)

IV/SSRMS	EV2
<p>1. Verify with MCC-H JEM PROX GPS Antennas Inhibit Pad complete</p>  <p>2. MCC-H: <b>On EV2 GO</b>, begin checkout of GPS Antennas</p>	<p><u>GPS ANTENNA INSTALL</u> (00:45)</p> <ol style="list-style-type: none"> <li>Translate to JLP HR 1275; fairlead Safety Tether out to center of JLP</li> <li>Stow Med ORU Bag on JLP HR 1275; stow Fish Stringer between GPS antennas</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Avoid inadvertent contact with GPS Antenna (paint)</p> </div> <ol style="list-style-type: none"> <li>Remove MLI cover for GPS Antenna A (fwd); stow on Fish Stringer</li> <li>Install GPS Antenna A onto dovetail; perform pull test</li> <li>Verify GPS Antenna tabs (2) are secure (down)</li> <li>Open connector MLI covers for GPS Antenna</li> <li>Remove dust caps (2) and stow on Fish Stringer</li> <li>Release wire tie on cables; secure around P7301 dust cap; stow on Fish Stringer</li> </ol> <p style="text-align: center;"><u>NOTE</u> For all connector ops, verify pin and EMI band integrity; verify connector free of FOD</p> <ol style="list-style-type: none"> <li>Mate connectors: □P7301→ ←J7301 (stbd)</li> <li>Reattach MLI covers to P7301 grounding Velcro; black on black</li> <li>Remove P7302 dust cap; stow on Fish Stringer</li> <li>Mate connectors: □P7302→ ←J7302 (port)</li> <li>Reattach MLI covers to P7302 grounding Velcro; black on black</li> <li>Remove MLI cover for GPS Antenna B (stbd); stow on Fish Stringer</li> <li>Install GPS Antenna B onto dovetail; perform pull test</li> <li>Open connector MLI covers for GPS Antenna</li> <li>Remove dust caps (2) and stow on Fish Stringer</li> <li>Release wire tie on cables; secure around P7401 dust cap; stow on RET</li> <li>Mate connectors: □P7401→ ←J7401 (aft)</li> <li>Reattach MLI covers to P7401 grounding Velcro; black on black</li> <li>Remove P7402 dust cap; stow on Fish Stringer</li> <li>Mate connectors: □P7402→ ←J7402 (fwd)</li> <li>Reattach MLI covers to P7402 grounding Velcro; black on black</li> <li>WVS Survey of GPS Antennas A and B</li> <li><b>Give MCC GO</b> to checkout GPS Antennas</li> </ol>



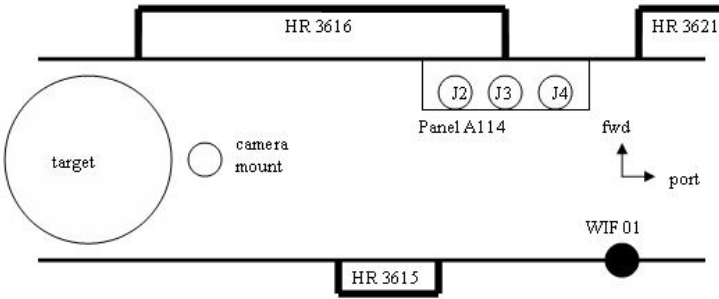
**EVA 4 JEM CLEANUP (00:30)**

IV/SSRMS	EV2
<p>IR Camera Warmup start: _____</p>	<p><u>JEM CLEANUP</u> (00:30)</p> <ol style="list-style-type: none"> <li>1. Retrieve Med ORU Bag; stow on BRT</li> <li>2. Translate to JLP HR 1239</li> <li>3. Perform tether swap onto 85-ft Safety Tether; verify locking hooks – Gate Closed, Slider Locked</li> <li>4. Stow spare 55-ft Safety Tether outside Med ORU Bag</li> <li>5. Stow Med ORU Bag inside Large ORU Bag</li> <li>6. Retrieve Large ORU Bag; stow on BRT</li> <li>7. Perform Final Bag and Tool inventory</li> <li>8. Translate to A/L</li> <li>9. Perform Glove Inspection</li> <li>10. Open thermal cover</li> <li>11. Stow Large ORU Bag in Airlock</li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">IR Camera requires 5-min warm up after power up and prior to use</p> <ol style="list-style-type: none"> <li>12. Retrieve IR Camera Crewlock Bag from Airlock</li> <li>13. √sw MASTER – ON, √LED – OFF</li> <li>14. Press and release ENABLE switch to initiate camera warmup (IV start 5-min timer), √LED – ON</li> <li>15. Restow camera in Crewlock Bag</li> <li>16. Stow Crewlock Bag on BRT</li> <li>17. Close thermal cover</li> </ol> <p>Refer to FS 7-103 for S1/P1 Radiator Imagery steps</p>

## EVA 4 ETVCG INSTALL (01:15)

IV/SSRMS	EV3												
<p>1. Verify with MCC-H ETVCG Inhibit Pad in place</p> <p>2. Start ETVCG thermal clock (02:00 without ORU Bag)</p> <p>ETVCG Installation:</p> <table border="1" data-bbox="142 987 548 1149"> <thead> <tr> <th>Bolt</th> <th>Turns</th> <th>Torque</th> </tr> </thead> <tbody> <tr> <td>Center</td> <td></td> <td></td> </tr> <tr> <td>Outer (fwd)</td> <td></td> <td></td> </tr> <tr> <td>Outer (aft)</td> <td></td> <td></td> </tr> </tbody> </table>	Bolt	Turns	Torque	Center			Outer (fwd)			Outer (aft)			<p><u>CAMERA INSTALL</u> (01:15)</p> <ol style="list-style-type: none"> <li>Translate to P1 CP 7</li> <li>Tether to dummy box</li> <li><b>PGT[B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Release dummy box outer bolts (2), ~7-12 turns</li> <li><b>PGT[B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Release center jacking bolt, ~24-30 turns</li> <li>Remove dummy box; temp stow on MWS</li> <li>Verify blind mate connector on stanchion mount is clear of FOD and debris</li> <li>Translate to Airlock; open thermal cover</li> <li>Stow dummy box in Airlock</li> </ol> <div data-bbox="682 604 1453 699" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>CAUTION</u></p> <p style="text-align: center;">Avoid contact with P1 radiator beam</p> <p style="text-align: center;">Avoid contact with light (Z-93 paint) and camera (silver Teflon)</p> </div> <ol style="list-style-type: none"> <li>Retrieve ETVCG from Large ORU Bag; stow on BRT</li> <li>Close thermal cover</li> <li>Translate to P1 CP 7</li> <li>Perform Glove Inspection</li> <li>Inspect blind mate connector on stanchion and camera; verify clear of FOD and debris</li> <li>Install ETVCG on stanchion</li> <li>Release Round Scoop; temp stow on MWS RET</li> <li><b>PGT[A7 9.2 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Engage center jacking bolt to torque stall, ~24-30 turns</li> <li><b>PGT[A7 9.2 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Engage outer bolts (2) to torque stall, ~7-12 turns</li> <li>Release RET from ETVCG</li> <li>Take camera pan/tilt lever to UNLOCKED</li> <li>Release TA clamps (2) on stanchion</li> </ol>
Bolt	Turns	Torque											
Center													
Outer (fwd)													
Outer (aft)													

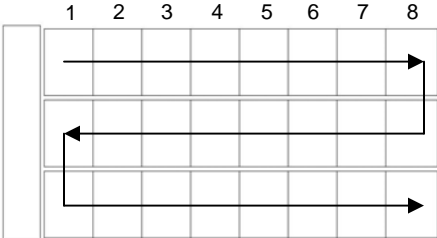
## EVA 4 ETVCG INSTALL (01:15) (Cont)

IV/SSRMS	EV3
<p>3. MCC-H: <b>On EV GO</b>, perform ETVCG power-up</p>	<p style="text-align: center;"><b>NOTE</b></p> <p style="text-align: center;">For all connector ops verify pin and EMI band integrity; verify connector free of FOD</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><b>CAUTION</b></p> <p style="text-align: center;">Avoid bend radii &lt; 10 times cable diameter. Avoid pulling on cable during mate/demate</p> </div> <ol style="list-style-type: none"> <li>21. Demate the following caps from Panel A114 (HR 3616/3621); temp stow on MWS               <ul style="list-style-type: none"> <li><input type="checkbox"/> Cap ← → A114 J4</li> <li><input type="checkbox"/> Dead-face Connector ← → A114 J3</li> <li><input type="checkbox"/> Dead-face Connector ← → A114 J2</li> </ul> </li> <li>22. Release stanchion connectors P2, P3, and P4</li> <li>23. BRT to P1 HR 3621</li> <li>24. Perform the following connector mates:               <ul style="list-style-type: none"> <li><input type="checkbox"/> P4 → ← A114 J4</li> <li><input type="checkbox"/> P3 → ← A114 J3</li> <li><input type="checkbox"/> P2 → ← A114 J2</li> </ul> </li> <li>25. Install the following caps on stanchion receptacles:               <ul style="list-style-type: none"> <li><input type="checkbox"/> Dead-face Connector → ← Stanchion J2</li> <li><input type="checkbox"/> Dead-face Connector → ← Stanchion J3</li> <li><input type="checkbox"/> Cap → ← Stanchion J4</li> </ul> </li> <li>26.  WVS Survey of ETVCG, connectors, and surrounding truss area</li> <li>27. <b>Give IV GO</b> for ETVCG power-up</li> <li>28. Perform Bag and Tool inventory</li> <li>29. If P3 SARJ not in position, perform the following get-aheads as time permits:               <ul style="list-style-type: none"> <li><input type="checkbox"/> Transfer Large ORU Bag to Airlock</li> <li><input type="checkbox"/> Relocate APFR: Lab WIF 7 to P3 WIF 29, report settings</li> <li><input type="checkbox"/> P1-P3 Fluid Jumper Install, FS 7-122</li> </ul> </li> </ol> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div data-bbox="606 1101 1100 1398">  </div> <div data-bbox="1167 1101 1881 1398">  </div> </div>

# EVA 4 S1/P1 RADIATOR IMAGERY (01:30)

**IV**

IR Camera Warmup start: \_\_\_\_\_



Panel numbers and movie sequence  
(pause 2-3 sec on each panel)

Give EV2 25 sec time hacks during movie recording

**Give MCC GO** for TRRJ rotation

Radiator Side	IR	Digital
P1 RBVM		
P1 Non-RBVM		
S1 RBVM		
S1 Non-RBVM		

**EV2 (BW)**

NOTE

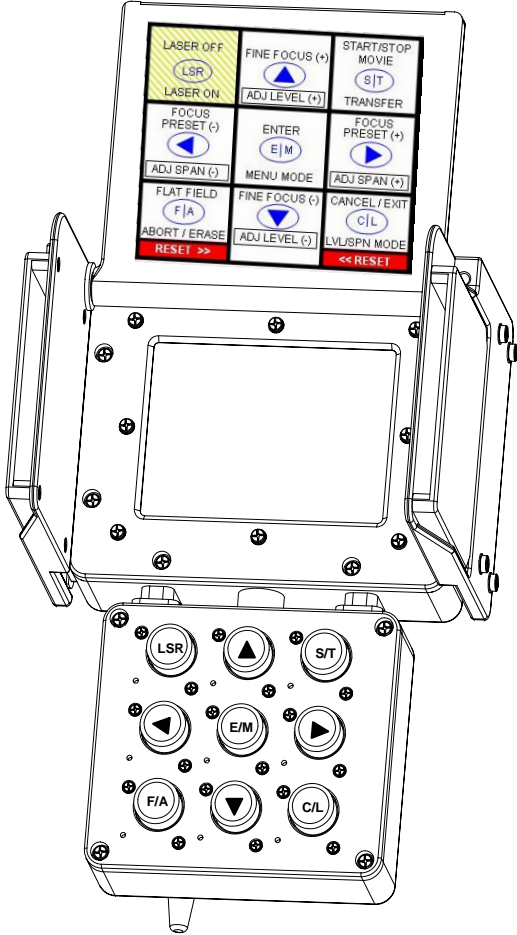
IR Camera is set to auto stop a movie after 150 frames (75 sec).

Each row of 8 panels should be roughly 50 frames

1. Translate to PMA1 HR0002 for S1 radiator imagery (PMA1 HR0011 for P1)
2. Reconfigure APFR in PMA1 WIF2: [6, KK, F, 12]
3. Ingress APFR; use Tool Stanchion as reqd (yaw handle)
4. Retrieve IR Camera from Crewlock Bag
5. Remove camera lens cover
6. Set camera focus on middle radiator panels 4 and 5 using arrow keys (can be done during warm up)
  - a. Right arrow Course Focus (+)
  - b. Left arrow Course Focus (-)
  - c. Up arrow Fine Focus (+)
  - d. Down arrow Fine Focus (-)
7. Verify with IV 5-min camera warmup complete
8. Perform Flat Field correction (Press and release F|A button)
9. Record 150-frame movie of radiator:
  - a. Press and release the S|T button to start the movie
  - b. Start with zenith radiator panels 1-8, then middle radiator panels 8-1, and finally nadir radiator panels 1-8
  - c. Pause for 2-3 sec centered on each radiator panel
  - d. The movie will auto stop after 150 frames, or if complete with all panels prior to 150 frames press and release the S|T button to stop the movie
10. Transfer movie to flash card (Press and hold S|T button. Expect 75 sec to complete the transfer)
11. Close lens cover
12. If daylight present, map radiators with EVA camera
13. **Give IV GO** for TRRJ rotation
14. Repeat steps 4-13 for both sides of S1 and P1 radiators; yaw APFR and Tool Stanchion as reqd

When complete with all IR imagery of both S1 and P1 radiators,



15. Press and hold ENABLE switch for 5 sec to put IR Camera in Standby mode (display reads 'Shutting down...' and LED-OFF)
16. Close lens cover and LCD cover
17. Stow IR Camera in crewlock bag



NOTE

Press and release for top function.  
Press and hold ~3 sec for bottom function

**EVA 4 P3 MLI COVER INSTALL (01:30)/TUS CABLE PICTURES (00:25)/GET-AHEAD LIST (02:15)**

IV/SSRMS	EV2	EV3
	<p><u>GET-AHEAD LIST</u> (00:25)</p> <p>Perform the following Get-Aheads as time permits:</p> <ol style="list-style-type: none"> <li>Starboard SSAS BCC Reconfig, FS 7-119</li> <li>Starboard Fluid Jumper Install, FS 7-122</li> <li>Starboard FRHC P-Clamps, FS 7-124</li> <li>Assist EV3 with installing P3 MLI Covers</li> </ol>	<ol style="list-style-type: none"> <li>Translate to P3 SARJ</li> <li>Perform Glove Inspection</li> <li>Stow scoop and RET (Lg-eq) in SARJ Crewlock Bag</li> <li>Perform 2nd P3 SARJ lubing per FS 7-92 and 7-93</li> </ol> <p><u>INSTALL P3 MLI COVERS</u> (01:30)</p> <ol style="list-style-type: none"> <li><b>PGT[A1 2.5 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Engage MLI cover fasteners, 9 turns:             <ul style="list-style-type: none"> <li><input type="checkbox"/> Cover 15</li> <li><input type="checkbox"/> Cover 14</li> <li><input type="checkbox"/> Cover 11</li> <li><input type="checkbox"/> Cover 10</li> <li><input type="checkbox"/> Cover 7</li> <li><input type="checkbox"/> Cover 6</li> </ul> </li> <li> WVS Survey of P3 SARJ</li> </ol> <p><u>TUS CABLE PICTURES</u> (00:25)</p> <div style="border: 3px double black; padding: 5px; text-align: center;"> <p><b>WARNING</b> Do not touch blemishes on zenith TUS cable</p> </div> <ol style="list-style-type: none"> <li>Translate to starboard side of MT</li> <li>Perform Glove Inspection</li> <li> Take photos of blemishes on zenith TUS cable (daylight opportunity)</li> </ol> <p><u>GET-AHEAD LIST</u> (00:15)</p> <p>Perform the following Get-Aheads as time permits:</p> <ol style="list-style-type: none"> <li>Port SSAS BBC Reconfig, FS 7-119 (if not already performed on EVA 2)</li> <li>Port Fluid Jumper Install, FS 7-122</li> <li>Port FHRC P-Clamps, FS 7-124</li> </ol>



## EVA 4 CLEANUP/INGRESS (00:25)

IV/SSRMS	EV2	EV3
<ol style="list-style-type: none"> <li>Perform prior to crew ingress: WVS PWRDN (PHOTO/TV, <u>WVS CUE CARD</u>)</li> <li>Check Airlock Bags: <ul style="list-style-type: none"> <li><input type="checkbox"/> ETVCG/dummy box/Large ORU Bag</li> <li><input type="checkbox"/> Large ORU Bag/Med ORU Bag</li> <li><input type="checkbox"/> SARJ Crewlock Bag</li> <li><input type="checkbox"/> Get-Ahead Crewlock Bag</li> </ul> </li> </ol>	<p><u>CLEANUP</u> (00:10)</p> <ol style="list-style-type: none"> <li>Perform Final Bag and Tool inventory</li> <li>Translate to A/L</li> </ol> <p><u>INGRESS</u> (00:15)</p> <ol style="list-style-type: none"> <li>Open thermal cover</li> <li>Attach Waist Tether to Airlock D-ring extender; verify locking hook – Gate Closed, Slider Locked</li> <li><b>Give EV3 GO</b> to attach to EV2's 85-ft Safety Tether</li> <li><b>Give EV3 GO</b> to ingress</li> <li>Remove SCU from stowage pouch Remove DCM cover Connect SCU to DCM, check locked</li> <li>Water – OFF (fwd); expect "H2O IS OFF" msg</li> </ol>	<p><u>CLEANUP</u> (00:10)</p> <ol style="list-style-type: none"> <li>Perform Final Bag and Tool inventory</li> <li>Translate to S0 CETA Spur</li> </ol> <p><u>INGRESS</u> (00:15)</p> <ol style="list-style-type: none"> <li><b>On EV2 GO</b>, perform Safety Tether swap onto EV2's 85-ft Safety Tether; verify locking hook – Gate Closed, Slider Locked</li> <li>Retrieve EV3 85-ft Safety Tether; stow on MWS</li> <li>Retrieve Tether Shuttles (2); stow on S0 bracket; verify Locked</li> <li>Translate to A/L</li> <li><b>On EV2 GO</b>, ingress A/L</li> <li>Remove SCU from stowage pouch Remove DCM cover Connect SCU to DCM, check locked</li> <li>Water – OFF (fwd); expect "H2O IS OFF" msg</li> <li>Close thermal cover, attach Velcro strap</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not close hatch until EMU water off for 2 min</p> </div> <ol style="list-style-type: none"> <li>Verify no hardware blocking hatch</li> <li>EV Hatch Handle – verify position per hatch decal</li> <li>EV Hatch – close and lock</li> <li>Go to PRE-REPRESS (<u>DEPRESS/REPRESS</u> Cue Card)</li> </ol>

# EVA 4 POST TOOL CONFIG

## EV2 MWS

- BRT (L)
- RET (eq-eq)
- Wire Tie (2)
- T-Bar
- RET (eq-eq) (\_\_\_)
- RET (eq-eq) w/PIP pin
- Adj Equip Tether (\_\_\_)
- Wire Tie (2)
- Small ISS Trash Bag
- Swing Arm (R)
- RET (eq-eq)
- PGT
- PGT Battery
- 7/16 (wobble) Socket-6 ext
- Camera (on integral RET)
- Camera Bracket
- 85-ft Safety Tether (R D-ring Ext)
- Waist Tether (1, L on D-ring Ext)

## EV3 MWS

- BRT (L)
- RET (eq-eq) w/PIP Pin
- Wire Tie (2)
- T-Bar
- RET (eq-eq) (\_\_\_)
- Adj Equip Tether (\_\_\_)
- Wire Tie (2)
- Small ISS Trash Bag
- Swing Arm (R)
- RET (eq-eq)
- PGT
- PGT Battery
- 7/16 (wobble) Socket-6 ext
- 85-ft Safety Tether (R D-ring Ext)
- Waist Tether (1, R on D-ring Ext)

Tether Counts: (Red RETs)	
RETs (eq-eq) = 12	RETs (PIP Pin) = 2
RETs (Lg-eq) = 6	Adj Equip Tethers = 12

## AIRLOCK CONFIG

- Large ORU Transfer Bag (ETVCG) (Shane)
- Adj Equip Tether (on outside)
- RET (Lg-eq)
- Dummy Box
  
- Large ORU Bag (Steve)
- Adj Equip Tether (on outside)
- Fish Stringer
- Medium ORU Bag
- Adj Equip Tether (on outside)
- Fish Stringer
- MLI Covers (2)
- Connector Caps (2)
- Jack Caps (4)
- RET (eq-eq)
- Wire Tie (long)
- Connector Cap
- RET (eq-eq)
- Wire Tie (long)
- Connector Cap
- Spare 55-ft Safety Tether

## AIRLOCK CONFIG (Cont)

- Crewlock Bag
- RET (eq-eq) (spare on outside door handle)
- Adj Equip Tether (2) (on outside)
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/Straight Nozzle
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/J Nozzle
- EVA Wipe Caddy (int RET)
- EVA Wipes (\_\_\_ dry)
- Large Trash Bag (int RET)
- Camera (on integral RET)
- Camera Bracket
- Adj Equip Tether (\_\_\_) (from covers)
- RET (Lg-eq)
- Round Scoop
  
- Crewlock Bag
- Ratchet Wrench
- Socket Caddy
- 7/16 (rigid) Socket-9 ext
- 7/16 (wobble) Socket-12 ext
- 7/16 (rigid) Socket-2 ext
- IR Camera **NOTE:** Post ingress, turn Master switch OFF (LED-ON)

## EVA 4 EFBM COVER INSTALL – TASK DATA

### Estimated Task Duration:

	With RMS	Without RMS
One EVA Crew	N/A	00:30
Two EVA Crew	N/A	N/A

### Tools:

EV2
Adj Equip Tether
Wire Tie

### Notes:

None

### Cautions:

1. Avoid inadvertant contact with the EFBM berthing mechanism (silver Teflon), EFBM guide vane (solid lubricant), and EFBM base

### Warnings:

1. Avoid pinch point on EFBM capture latch



Figure 1. EFBM Covers Removed



Figure 2. EFBM Center Disk Cover Installed

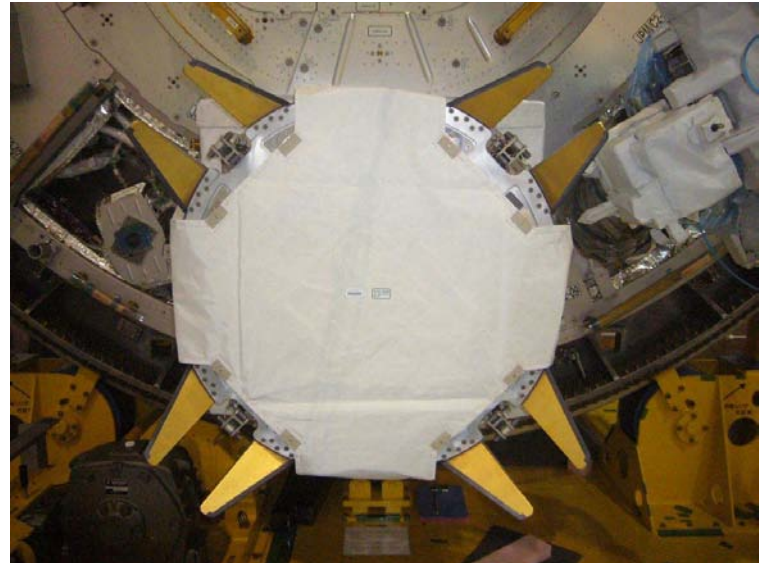


Figure 3. EFBM Center Disk Cover Installed View 2

## EVA 4 JEM RMS GROUNDING TABS – TASK DATA

### Estimated Task Duration:

	With RMS	Without RMS
One EVA Crew	N/A	00:30
Two EVA Crew	N/A	N/A

### Tools:

EV2
Wire Tie

### Notes:

1. Grounding tabs Velcro must be orientated so that will stick to each other

### Cautions:

1. If JEM RMS movement required, EV crewmember must be outside KOZ illustrated in Figure 3 (aft of the fwd JEM window)

### Warnings:

None



Figure 1. Grounding Tab Obstructing Camera View



Figure 2. Grounding Tabs

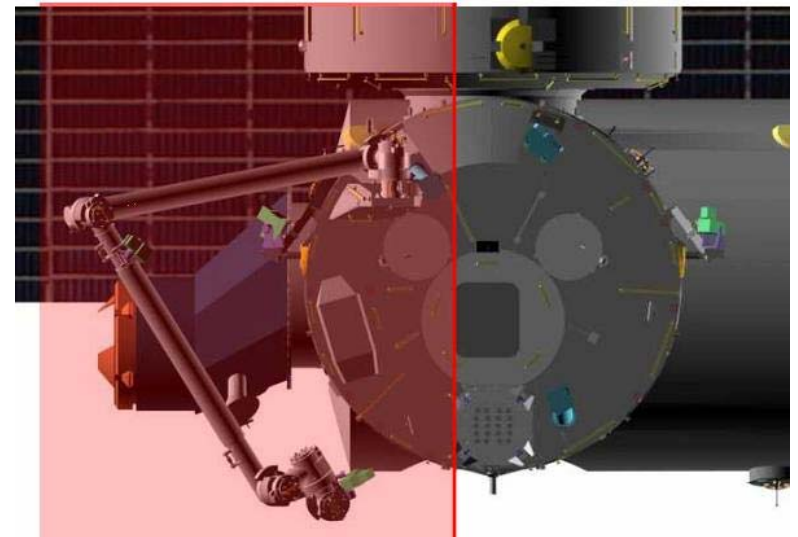


Figure 3. JEM RMS KOZ

## EVA 4 GPS ANTENNA INSTALL – TASK DATA

### Estimated Task Duration:

	With RMS	Without RMS
One EVA Crew	N/A	00:45
Two EVA Crew	N/A	N/A

### Tools:

GPS Antenna Install
Spare Safety Tether – 55'
Medium ORU Bag
Fish Stringer

### EVA Connectors:

GPS Antenna	Harness	From	To	Conn Size	Function
A	P7301 – P7351	J1	J7301	25	Power, Data
A	P7302 – P7352	J2	J7302	25	Power, Data
B	P7401 – P7451	J1	J7401	25	Power, Data
B	P7402 – P7452	J2	J7402	25	Power, Data

### Notes:

1. GPS Antennas are attached to mounting bracket via IV procedure (see JAXA SODF), and therefore use a dovetail fitting to install on JLP
2. GPS Antenna A is fwd on the JLP, GPS Antenna B is stbd on the JLP
3. Connector receptacle J7302 is port of receptacle J7301 for GPS Antenna A. Connector receptacle J7402 is fwd of receptacle J7401 for GPS Antenna B.
4. Potential sharp edge exists on underside of GPS Antenna bracket. The plate nut retainers have sharp edges that have been taped over with Glass Tape P213 (a.k.a., BETA Cloth Tape). The surface of the bracket was cleaned with IPA prior to applying the tape in order to ensure good adhesion. There are several layers of tape in a box formation over each nut plate, which provides a cushion over the sharp edge areas. This configuration should last in the long term; however, if the tape becomes loose, crew must avoid touching under the bracket due to the potential of exposed sharp edges
5. Connector pins are 8 and 20 gauge

### Cautions:

1. Avoid inadvertent contact with GPA Antenna (paint)

### Warnings:

None

**EVA 4 GPS ANTENNA INSTALL – TASK DATA (Cont)**



Figure 1. GPS Antenna MLI Covers



Figure 2. GPS Antenna MLI Covers Opened



Figure 3. Close up of Connector MLI Closed



Figure 4. Close up of Connector MLI Open

**EVA 4 GPS ANTENNA INSTALL – TASK DATA (Cont)**

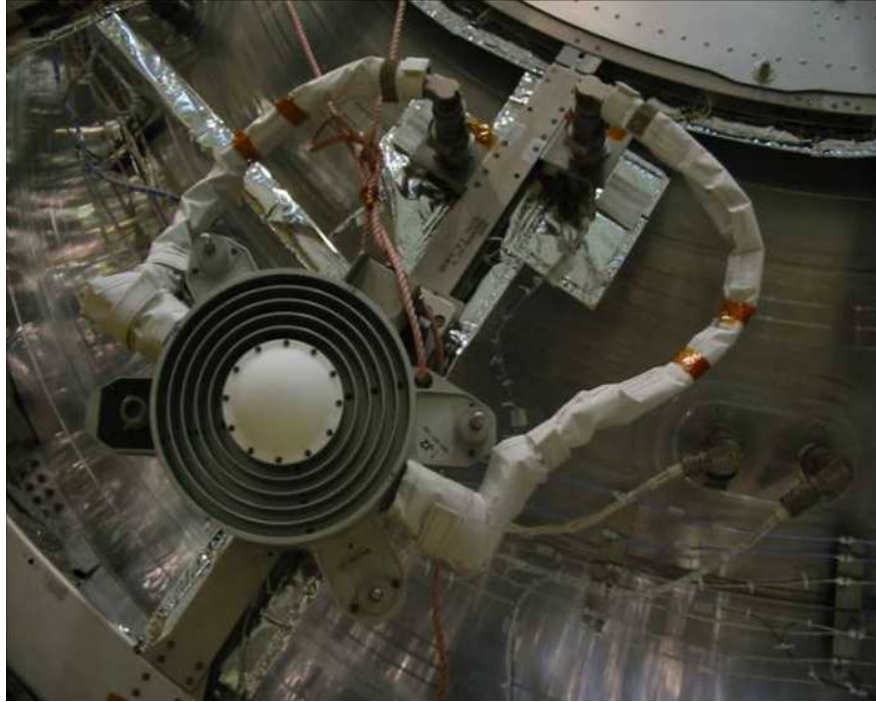


Figure 5. GPS Antenna Installed (MMOD Shield, connector MLI not installed)

## EVA 4 ETVCG INSTALL – TASK DATA

### Estimated Task Duration:

	With RMS	Without RMS
One EVA Crew	N/A	01:00
Two EVA Crew	N/A	N/A

### Tools:

\*Can be performed by either crewmember

EV1 (FF)	EV2
PGT w/6"ext-7/16"	N/A
Round Scoop	
BRT	

### EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Outer bolts	7/16"	2	9.2 (release and install)	Release: 14.8 Install: 13.2	6-12 (release and install)	30
Center (Jack) Bolt	7/16"	1	9.2 (release and install)	Release: 14.8 Install: 13.2	24-30 (release and install)	30

### EVA Connectors:

Harness	From	To	Conn Size	Function
VSSA P2	VSSA J2	P1 A114 J2	15	Video, ETVCG Power, luminaire power
VSSA P3	VSSA J3	P1 A114 J3	13	ETVCG heater power, luminaire heater power
VSSA P4	VSSA J4	P1 A114 J4	15	Data

### Connector Inhibits:

Task	Inhibit
P1 – J1 Blind mate	RPCM P11A_B RPC 2 OPEN AND CLOSE INH RPCM P11A_B RPC 12 OPEN AND CLOSE INH RPCM P12B_B RPC 1 OPEN AND CLOSE INH RPCM P12B_B RPC 13 OPEN AND CLOSE INH



## EVA 4 ETVCG INSTALL – TASK DATA (Cont)

### Mass and Dimensions:

Item	Mass(lb)	Dimensions (in)
ETVCG	37.5	22.6x9.9x7.5
Dummy Box	6.85	14.8x10.1x6.3

### Notes:

1. The Camera bolts have no hard stop. They free spin when released
2. There is no anti-rotation device on the camera bolts
3. Camera soft dock force is ~10 lb
4. An equipment hook will not fit around camera tether point; light tether point must be used
5. Pan/tilt unit lock lever requires a push to turn the lever 90 deg to go from lock to unlock, and from unlock back to lock. Both unlock and lock positions sit in detents
6. If pan/tilt lock lever becomes unlocked, pan/tilt joints can begin to move and back-drive motor. This is undesirable and can damage the hardware
7. Pan/tilt lock lever can only be locked if pan/tilt mechanism is in home position (camera lens facing TVCIC bolt box)
8. Thermal clock of 2 hr without MLI Bag; 2.75 hr with MLI Bag

### Cautions:

1. Avoid contact with light (Z-93 paint) and camera (silver Teflon)

### Warnings:

None

## EVA 4 ETVCG INSTALL – TASK DATA (Cont)

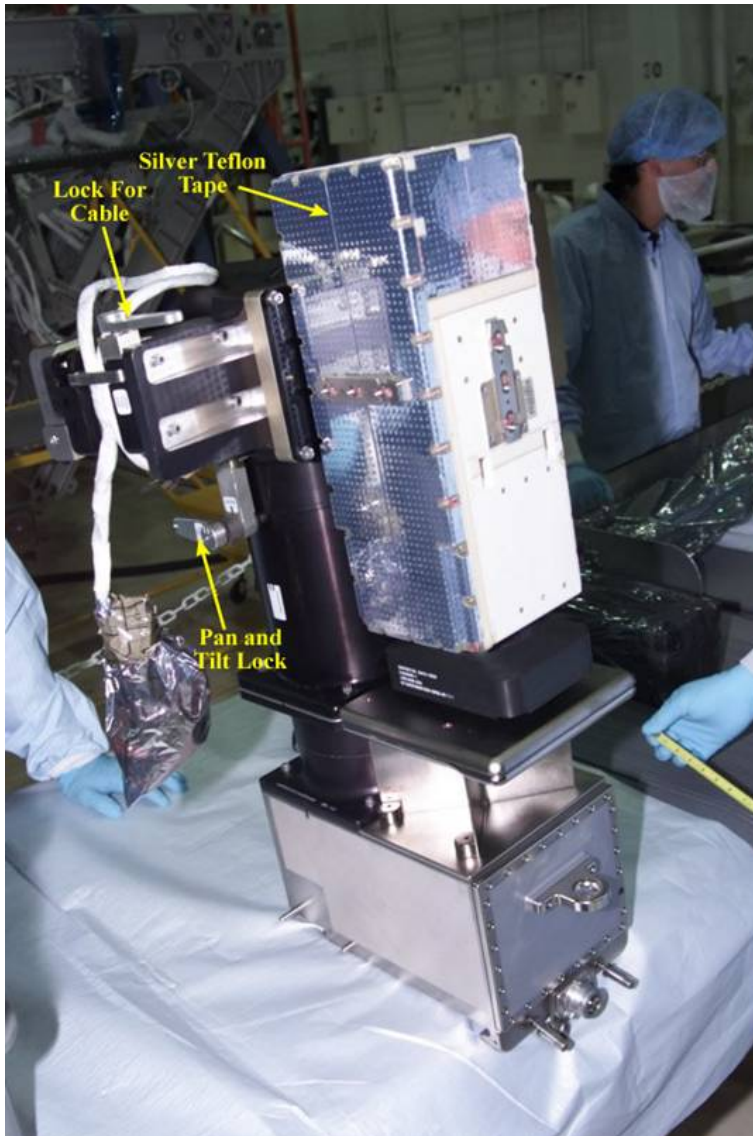


Figure 1. ETVCG (Partially Assembled)

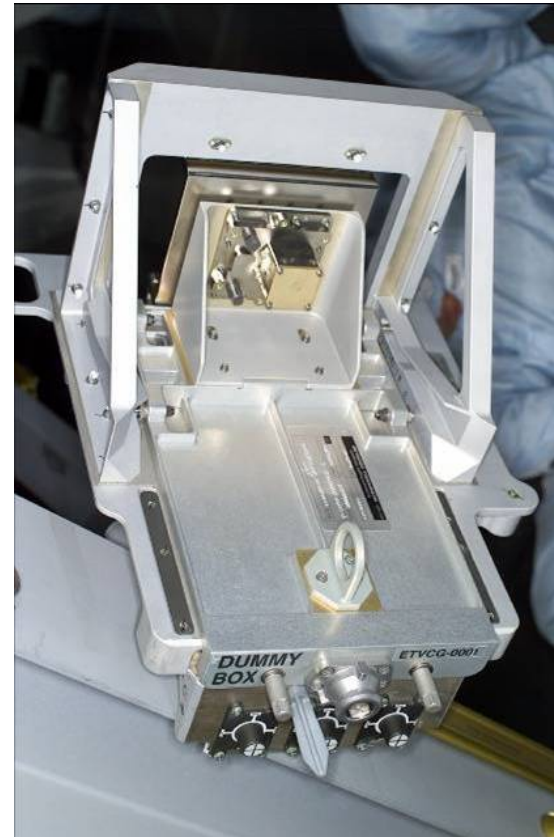


Figure 2. Dummy Box

EVA 4 ETVCG INSTALL – TASK DATA (Cont)



Figure 3. Luminaire

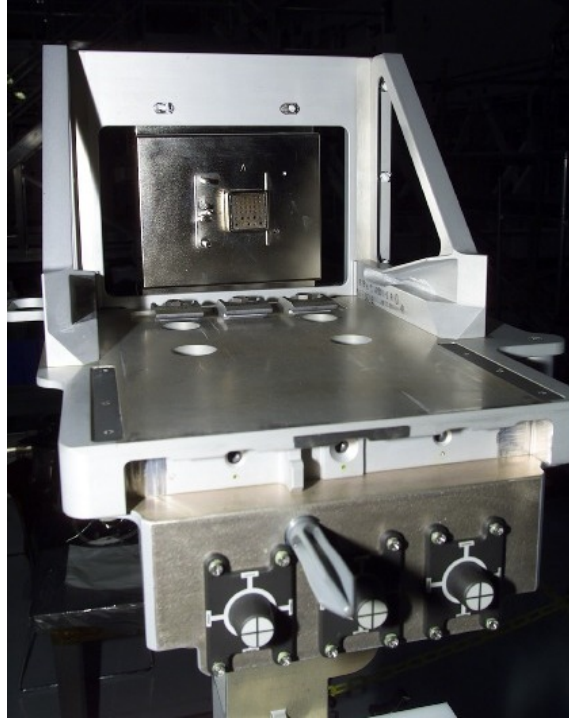


Figure 4. VSSA Stanchion



Figure 5. Close Up of Pan/Tilt Lock

## EVA 4 S1/P1 RADIATOR IMAGERY – TASK DATA

### Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	01:30
Two EV Crew	N/A	N/A

### Tools:

EV1 (FF)
IR Camera
EVA Camera
BRT

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

### EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
N/A					

### Foot Restraints:

Task	WIF	APFR Setting
N/A		

### Notes:

1. Enable Switch (momentary switch): Top
2. Master Switch: Bottom
3. Master Switch must remain in the "ON" position throughout the duration of the EVA to keep the camera heaters active
4. Battery Life: 5 hr full power, 15-16 hr in standby
5. IR camera requires 5 min warm up after power up and prior to use
6. LED will blink red/green for 25-30 sec after power up while camera is booting up. LED solid green after boot up
7. Camera has to complete boot up (solid green LED) prior to being put in standby
8. Camera is put in standby by pressing and holding the ENABLE switch for 5 sec. LED will go OFF when camera in standby
9. IR camera should be put in standby when not in use to preserve battery power
10. Movies must be transferred to flash card prior to putting IR camera into standby
11. IR camera is configured to auto stop each movie after 150 frames (75 seconds)
12. Each row of 8 panels should take roughly 50 frames in order to get the entire side of the radiator in one movie (includes 2-3 second pause on each panel)

### Cautions:

1. Do not touch IR camera lens, install lens cover when not in use
2. Tether camera body, remote control unit or connecting cable to camera bracket or MWS

### Warnings:

None



GET-AHEADS

INHIBIT PAD .....	FS 7-118
SSAS BBC RECONFIG .....	FS 7-119
S1/S3 AND P1/P3 FLUID JUMPER INSTALL .....	FS 7-122
FHRC P-CLAMP RELEASE .....	FS 7-124
S3 ZENITH OUTBOARD CAS DEPLOY .....	FS 7-128

GET-AHEADS

# GET-AHEADS

## INHIBIT PAD

### USOS

#### P1/P3 BBC CONNECTORS

- MCC-H
1. P1 TRRJ – √DLA (1) LOCKED
  2. RPCM P13A G RPC 1 – Open, Close Cmd Inhibit
  3. RPCM P13A G RPC 5 – Open, Close Cmd Inhibit
  4. RPCM P13A G RPC 13 – Open, Close Cmd Inhibit
  5. RPCM P13A G RPC 14 – Open, Close Cmd Inhibit
  6. RPCM P13A G RPC 15 – Open, Close Cmd Inhibit
  7. RPCM P12B A RPC 3 – Open, Close Cmd Inhibit
  8. RPCM P12B A RPC 4 – Open, Close Cmd Inhibit
  9. RPCM P12B A RPC 13 – Open, Close Cmd Inhibit
  10. RPCM P14B G RPC 1 – Open, Close Cmd Inhibit
  11. RPCM P14B G RPC 2 – Open, Close Cmd Inhibit
  12. RPCM P14B G RPC 13 – Open, Close Cmd Inhibit
  13. RPCM P14B G RPC 14 – Open, Close Cmd Inhibit
  14. RPCM P14B G RPC 15 – Open, Close Cmd Inhibit
  15. RPCM P11A A RPC 5 – Open, Close Cmd Inhibit
  16. RPCM P11A A RPC 11 – Open, Close Cmd Inhibit
  17. RPCM P11A A RPC 13 – Open, Close Cmd Inhibit

#### S1/S3 BBC CONNECTORS

- MCC-H
1. S1 TRRJ – √DLA (1) LOCKED
  2. RPCM S13A G RPC 1 – Open, Close Cmd Inhibit
  3. RPCM S13A G RPC 2 – Open, Close Cmd Inhibit
  4. RPCM S13A G RPC 13 – Open, Close Cmd Inhibit
  5. RPCM S13A G RPC 14 – Open, Close Cmd Inhibit
  6. RPCM S13A G RPC 15 – Open, Close Cmd Inhibit
  7. RPCM S12B A RPC 5 – Open, Close Cmd Inhibit
  8. RPCM S12B A RPC 11 – Open, Close Cmd Inhibit
  9. RPCM S12B A RPC 13 – Open, Close Cmd Inhibit
  10. RPCM S14B G RPC 1 – Open, Close Cmd Inhibit
  11. RPCM S14B G RPC 5 – Open, Close Cmd Inhibit
  12. RPCM S14B G RPC 13 – Open, Close Cmd Inhibit
  13. RPCM S14B G RPC 14 – Open, Close Cmd Inhibit
  14. RPCM S14B G RPC 15 – Open, Close Cmd Inhibit
  15. RPCM S11A A RPC 3 – Open, Close Cmd Inhibit
  16. RPCM S11A A RPC 4 – Open, Close Cmd Inhibit
  17. RPCM S11A A RPC 13 – Open, Close Cmd Inhibit

### USOS

#### S1/S3 & P1/P3 FLUID JUMPER INSTALL

- MCC-H
1. S1/P1 TRRJ – √DLA (1) LOCKED at 0°


#### FHRC P-CLAMP RELEASE

- MCC-H
1. S1/P1 TRRJ – √DLA (1) LOCKED at 0°

#### S3 ZENITH OUTBOARD PAS DEPLOY

- MCC-H
1. RPCM S34B\_E RPC 1 – Open, Close Cmd Inhibit
  2. RPCM S34B\_E RPC 2 – Open, Close Cmd Inhibit
  3. RPCM S34B\_E RPC 3 – Open, Close Cmd Inhibit
  4. RPCM S34B\_E RPC 4 – Open, Close Cmd Inhibit
  5. RPCM S33A\_E RPC 1 – Open, Close Cmd Inhibit
  6. RPCM S33A\_E RPC 2 – Open, Close Cmd Inhibit
  7. RPCM S33A\_E RPC 3 – Open, Close Cmd Inhibit
  8. RPCM S33A\_E RPC 4 – Open, Close Cmd Inhibit

## SSAS BBC RECONFIG (00:10 PER TRUSS SIDE)

IV/SSRMS	EV1/2/3																								
<p>√Proper Inhibits in place before swapping connectors</p>	<p><u>SSAS BBC CONNECTOR SWAPS</u> (00:10 per truss side)</p> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">For all connector ops verify pin and EMI band integrity; verify connector free of FOD</p> <p>1. Perform the following demate connectors and swap with terminator caps:</p> <table border="0" style="width: 100%;"> <tr> <td colspan="2">S1 to S3:</td> <td colspan="2">P1 to P3:</td> </tr> <tr> <td>Panel A102 (Zenith):</td> <td>Panel A103 (Nadir):</td> <td>Panel A102 (Nadir):</td> <td>Panel A103 (Zenith):</td> </tr> <tr> <td><input type="checkbox"/> Cap ← → J195</td> <td><input type="checkbox"/> Cap ← → J196</td> <td><input type="checkbox"/> Cap ← → J195</td> <td><input type="checkbox"/> Cap ← → J196</td> </tr> <tr> <td><input type="checkbox"/> P116 ← → J116</td> <td><input type="checkbox"/> P121 ← → J121</td> <td><input type="checkbox"/> P116 ← → J116</td> <td><input type="checkbox"/> P121 ← → J121</td> </tr> <tr> <td><input type="checkbox"/> P116 → ← J195</td> <td><input type="checkbox"/> P121 → ← J196</td> <td><input type="checkbox"/> P116 → ← J195</td> <td><input type="checkbox"/> P121 → ← J196</td> </tr> <tr> <td><input type="checkbox"/> Cap → ← J116</td> <td><input type="checkbox"/> Cap → ← J121</td> <td><input type="checkbox"/> Cap → ← J116</td> <td><input type="checkbox"/> Cap → ← J121</td> </tr> </table> <p>2.  WVS Survey of BBC Panels</p>	S1 to S3:		P1 to P3:		Panel A102 (Zenith):	Panel A103 (Nadir):	Panel A102 (Nadir):	Panel A103 (Zenith):	<input type="checkbox"/> Cap ← → J195	<input type="checkbox"/> Cap ← → J196	<input type="checkbox"/> Cap ← → J195	<input type="checkbox"/> Cap ← → J196	<input type="checkbox"/> P116 ← → J116	<input type="checkbox"/> P121 ← → J121	<input type="checkbox"/> P116 ← → J116	<input type="checkbox"/> P121 ← → J121	<input type="checkbox"/> P116 → ← J195	<input type="checkbox"/> P121 → ← J196	<input type="checkbox"/> P116 → ← J195	<input type="checkbox"/> P121 → ← J196	<input type="checkbox"/> Cap → ← J116	<input type="checkbox"/> Cap → ← J121	<input type="checkbox"/> Cap → ← J116	<input type="checkbox"/> Cap → ← J121
S1 to S3:		P1 to P3:																							
Panel A102 (Zenith):	Panel A103 (Nadir):	Panel A102 (Nadir):	Panel A103 (Zenith):																						
<input type="checkbox"/> Cap ← → J195	<input type="checkbox"/> Cap ← → J196	<input type="checkbox"/> Cap ← → J195	<input type="checkbox"/> Cap ← → J196																						
<input type="checkbox"/> P116 ← → J116	<input type="checkbox"/> P121 ← → J121	<input type="checkbox"/> P116 ← → J116	<input type="checkbox"/> P121 ← → J121																						
<input type="checkbox"/> P116 → ← J195	<input type="checkbox"/> P121 → ← J196	<input type="checkbox"/> P116 → ← J195	<input type="checkbox"/> P121 → ← J196																						
<input type="checkbox"/> Cap → ← J116	<input type="checkbox"/> Cap → ← J121	<input type="checkbox"/> Cap → ← J116	<input type="checkbox"/> Cap → ← J121																						

## SSAS BBC RECONFIG – TASK DATA

### Estimated Task Duration:

	With RMS	Without RMS
One EVA Crew	N/A	00:15 (per side)
Two EVA Crew	N/A	N/A

### Tools:

EV1/2/3
RET

### EVA Connectors:

Truss	Harness	From	To	Conn Size	Function
S1/S3	W5111 – P116	A102/J116	A102/J195		
S1/S3	W5112 – P121	A103/J121	A103/J196		
P1/P3	W5111 – P116	A102/J116	A102/J195		
P1/P3	W5112 – P121	A103/J121	A103/J196		

### SSAS BBC Reference:

Truss	Inhibits: Panel A102	Inhibits: Panel A103
S1/S3	RPCM S14B G RPC 1 RPCM S14B G RPC 5 RPCM S14B G RPC 13 RPCM S14B G RPC 14 RPCM S14B G RPC 15 RPCM S11A A RPC 3 RPCM S11A A RPC 4 RPCM S11A A RPC 13	RPCM S13A G RPC 1 RPCM S13A G RPC 2 RPCM S13A G RPC 13 RPCM S13A G RPC 14 RPCM S13A G RPC 15 RPCM S12B A RPC 5 RPCM S12B A RPC 11 RPCM S12B A RPC 13
P1/P3	RPCM P13A G RPC 1 RPCM P13A G RPC 5 RPCM P13A G RPC 13 RPCM P13A G RPC 14 RPCM P13A G RPC 15 RPCM P12B A RPC 3 RPCM P12B A RPC 4 RPCM P12B A RPC 13	RPCM P14B G RPC 1 RPCM P14B G RPC 2 RPCM P14B G RPC 13 RPCM P14B G RPC 14 RPCM P14B G RPC 15 RPCM P11A A RPC 5 RPCM P11A A RPC 11 RPCM P11A A RPC 13

### Notes:

None

### Cautions:

None

### Warnings:

None



## SSAS BBC RECONFIG – TASK DATA (Cont)

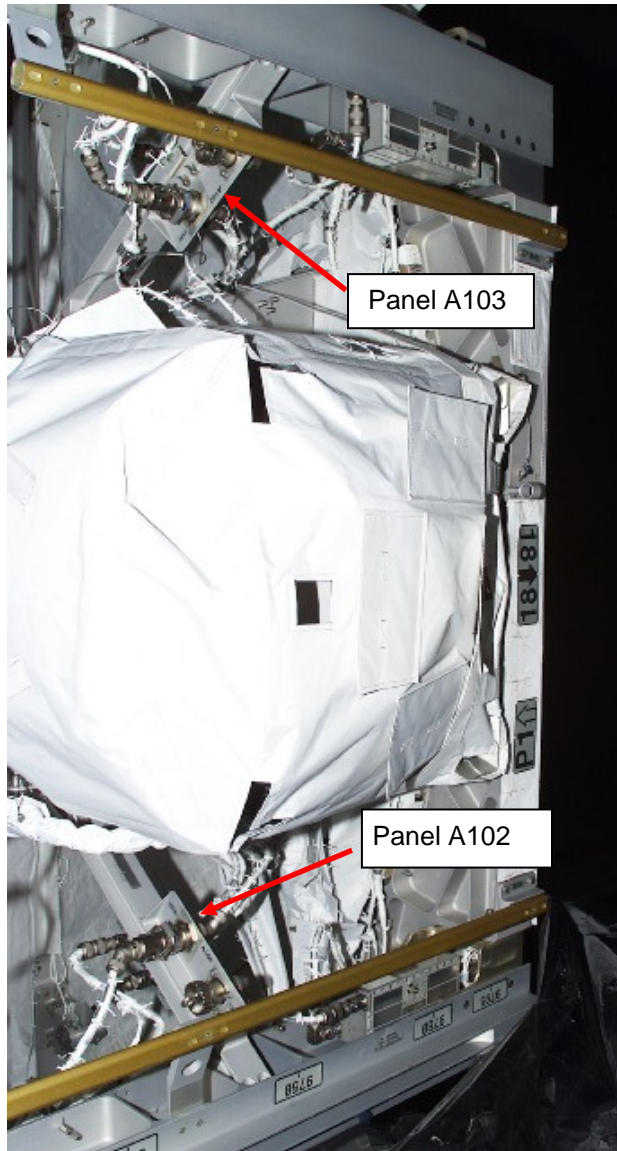


Figure 1. P1 BBC Connectors





Figure 2. P1 BBC Connectors, A103 Panel



Figure 3. P1 BBC Connectors, Panel A102

## S1/S3 AND P1/P3 FLUID JUMPER INSTALL (00:30)

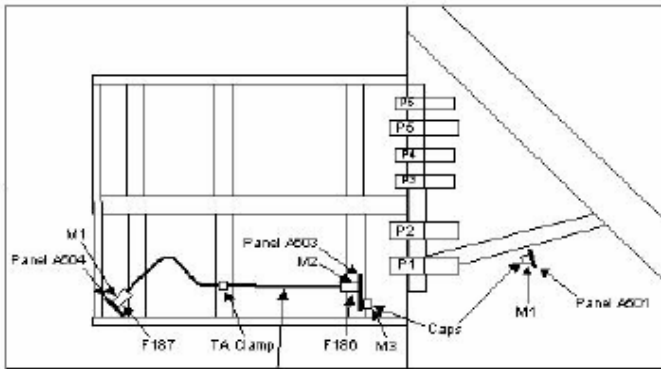
IV	EV1/EV2/EV3	
<p>IV: √S1 (P1) TRRJ locked</p> <p><b>DEMATE QD</b></p> <ol style="list-style-type: none"> <li>√Fwd white band visible, button up</li> <li>Demate QD (pull back on release ring)</li> </ol> <p><b>MATE QD</b></p> <ol style="list-style-type: none"> <li>Inspect QDs for FOD or damage</li> <li>√Detent button up</li> <li>√Fwd white band not visible</li> <li>Assess side loads</li> <li>Mate QD; √Fwd white band visible</li> <li>Perform snap back test (√Fwd white band visible)</li> <li>Perform pull test</li> <li>Perform gap check (visual)</li> </ol> <p><b>OPEN QD VALVE</b></p> <ol style="list-style-type: none"> <li>Press button, move bail fwd (open valve)</li> <li>√Aft white band visible, button up</li> <li>Verify detent button can be depressed</li> </ol>	<div data-bbox="598 280 1236 451" style="border: 2px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b></p> <p>The 2 ft KOZ for the S1 Radiator Beam begins just nadir of the umbilical tray. If TRRJ can not be locked, then body position must be maintained on tray or zenith</p> </div> <div data-bbox="598 483 1220 605" style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b></p> <p>QDs expsed to direct sun can overtemp in 6 min. Shading by EMU or thermal shrouds can lengthen acceptable time with bootie removed</p> </div> <p><u>S1/S3 Fluid Jumper Install (00:30)</u></p> <ol style="list-style-type: none"> <li>Translate to S1/S3 Face 6 (nadir) interface</li> <li>Open shroud on S1 nadir umbilical tray</li> <li>Open TA clamp</li> <li>BRT to S1 HR 3215</li> <li>For QDs F56 &amp; F57, open thermal booties and perform <u>DEMATE QD</u> steps in IV column (removes Fluid Jumper from S1)</li> <li>Open thermal bootie and remove QD cap from M3 on S1 panel A503; stow in trash bag</li> <li>Perform <u>MATE QD</u> steps (IV column) to mate QD F57 to M3 on S1 panel A503</li> <li>For QD F57, perform <u>OPEN VALVE</u> steps (IV column)</li> <li>Reinstall thermal booties</li> <li>BRT to S1 HR 3010</li> <li>Open thermal bootie and remove QD cap from M1 on S3 panel A501; stow in trash bag</li> <li>Perform <u>MATE QD</u> steps (IV column) to mate QD F56 to M1 on S3 panel A501</li> <li>For QD F56, perform <u>OPEN VALVE</u> steps (IV column)</li> <li>Reinstall thermal booties</li> <li> Perform WVS survey of jumper connections</li> <li>Close TA clamp</li> <li>Replace S1 nadir umbilical tray shroud</li> </ol>	<div data-bbox="1312 280 1950 451" style="border: 2px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b></p> <p>The 2 ft KOZ for the P1 Radiator Beam begins just nadir of the umbilical tray. If TRRJ can not be locked, then body position must be maintained on tray or zenith</p> </div> <div data-bbox="1312 483 1955 605" style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b></p> <p>QDs expsed to direct sun can overtemp in 6 min. Shading by EMU or thermal shrouds can lengthen acceptable time with bootie removed</p> </div> <p><u>P1/P3 Fluid Jumper Install (00:30)</u></p> <ol style="list-style-type: none"> <li>Translate to P1/P3 Face 6 (nadir) interface</li> <li>Open shroud on P1 nadir umbilical tray</li> <li>Open TA clamp</li> <li>BRT to P1 HR 3688</li> <li>For QDs F186 &amp; F187, open thermal booties and perform <u>DEMATE QD</u> steps in IV column (removes Fluid Jumper from P1) F186 is on M2 Panel A503; F187 is on M1 Panel A504</li> <li>Open thermal bootie and remove QD cap from M3 on P1 panel A503; stow in trash bag</li> <li>Perform <u>MATE QD</u> steps (IV column) to mate QD F186 to M3 on P1 panel A503</li> <li>For QD F186, perform <u>OPEN VALVE</u> steps (IV column)</li> <li>Reinstall thermal booties</li> <li>BRT to P1 HR 3810</li> <li>Open thermal bootie and remove QD cap from M1 on P3 panel A501; stow in trash bag</li> <li>Perform <u>MATE QD</u> steps (IV column) to mate QD F187 to M1 on P3 panel A501</li> <li>For QD F187, perform <u>OPEN VALVE</u> steps (IV column)</li> <li>Reinstall thermal booties</li> <li> Perform WVS survey of jumper connections</li> <li>Close TA clamp</li> <li>Replace P1 nadir umbilical tray shroud</li> </ol>

**S1/S3 AND P1/P3 FLUID JUMPER INSTALL (00:30) (Cont)**

**P1 to P3 Fluid Line – Stowed Config**

↑ FACE 1

FACE 6

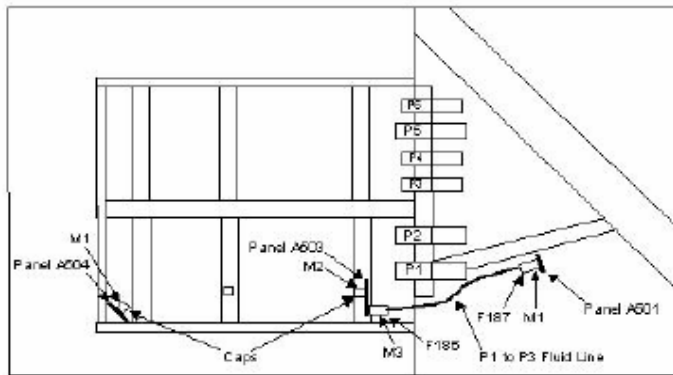


P1 to P3 Fluid Line ← P1 P3 →

**P1 to P3 Fluid Line – Deployed Config**

↑ FACE 1

FACE 6

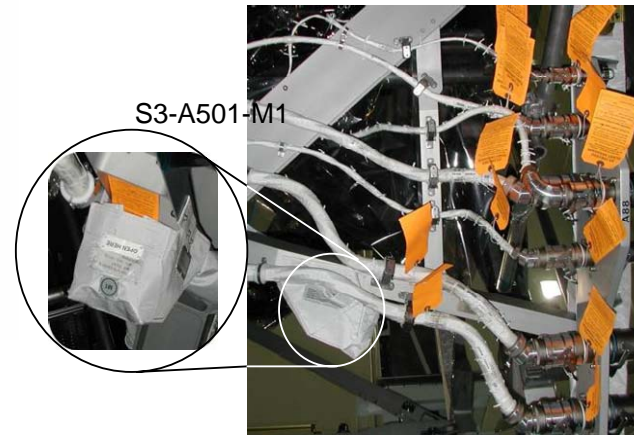


← P1 P3 →

**NOTE**

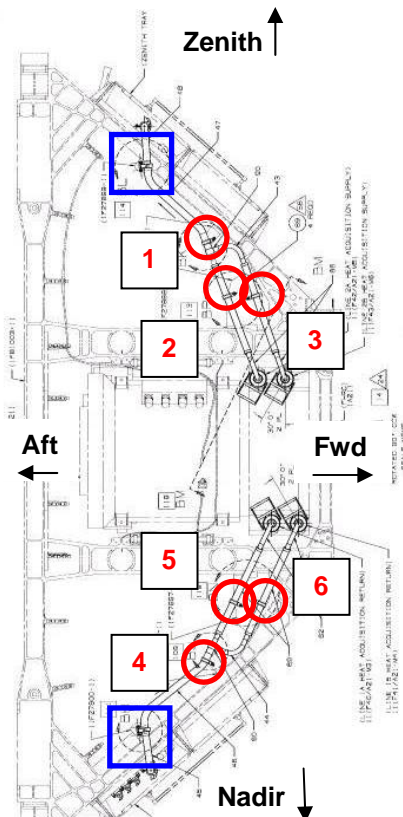
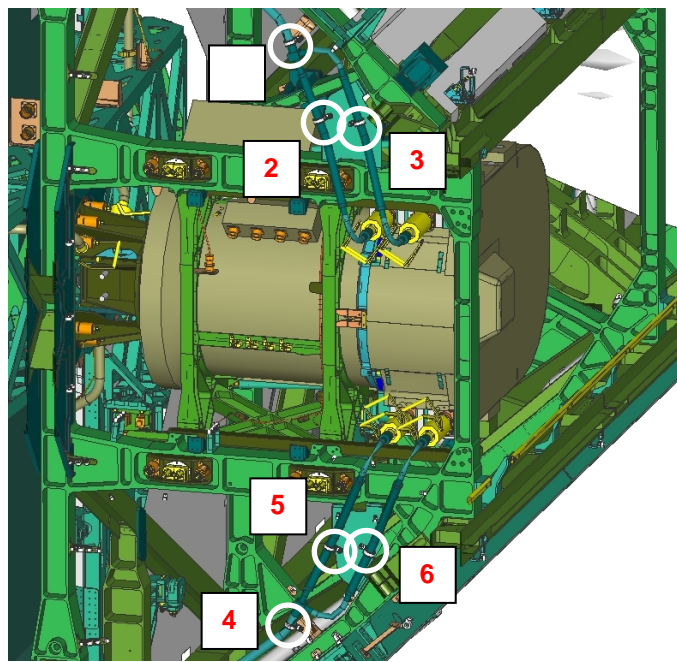
No ammonia in jumper or behind any males; lines contain nitrogen only – no risk of contamination

Fluid Jumper Install Location (M3)

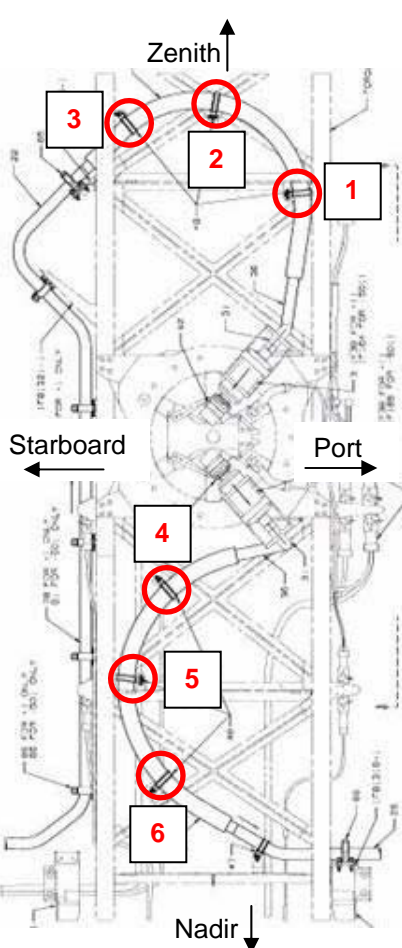
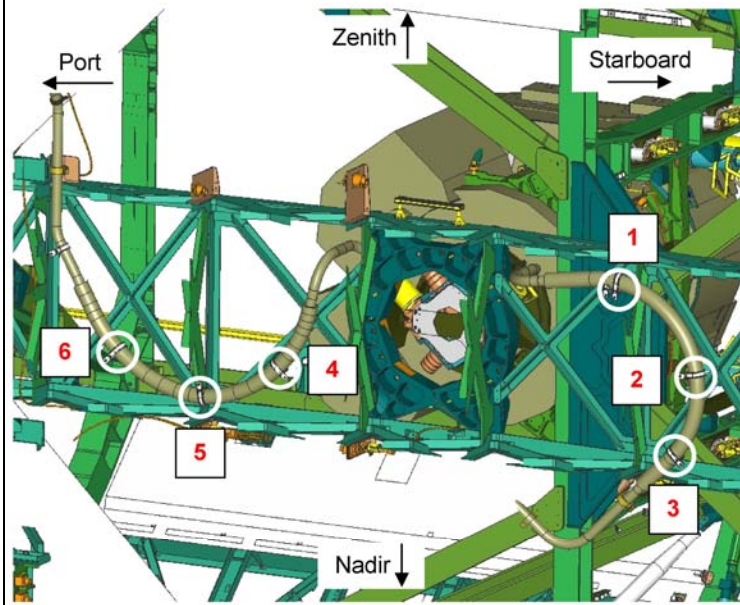


Ammonia Jumper Connection (S3-A501-M1)

# FHRC P-CLAMP RELEASE

IV	EV2/EV3																																									
<p>S1 FHRC P-Clamps:                      Bay 13 Hose Box (6)                      Bay 11 Stinger (6)</p> <p>P1 FHRC P-Clamps                      Bay 14 Hose Box (6)                      Bay 12 Stinger (6)</p>  <p style="font-size: small;">□ = TA Clamp, do NOT release</p>	<p><b>RELEASE FHRC P-CLAMPS [HOSE BOX]</b></p> <ol style="list-style-type: none"> <li>1. Temp stow any items on BRT prior to ingressing the truss</li> <li>2. Locate hose box P-Clamps in bay 13/14 (S1/P1)</li> <li>3. Release hose box P-Clamps (6), ~6-12.5 turns:                             <ul style="list-style-type: none"> <li>If using ratchet wrench, <b>CCW</b> (remove palm wheel as reqd)</li> <li>If using PGT: <b>PGT[A7 9.2 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16</b></li> </ul> </li> <li>4.  WVS Survey of P-Clamps</li> <li>5. Check SAFER Handles</li> </ol> <div style="display: flex; justify-content: space-around; align-items: center;">  <table border="1" style="border-collapse: collapse;"> <thead> <tr> <th>P-Clamp</th> <th>Recommended Tools</th> <th>Completed</th> </tr> </thead> <tbody> <tr> <td rowspan="6" style="text-align: center; vertical-align: middle;">S1</td> <td>1</td> <td>Ratchet w/2ext 7/16 PGT w/6ext 7/16</td> <td></td> </tr> <tr> <td>2</td> <td>Ratchet w/2ext 7/16</td> <td></td> </tr> <tr> <td>3</td> <td>Ratchet w/2ext 7/16</td> <td></td> </tr> <tr> <td>4</td> <td>Ratchet w/2ext 7/16 PGT w/6ext 7/16</td> <td></td> </tr> <tr> <td>5</td> <td>Ratchet w/2ext 7/16</td> <td></td> </tr> <tr> <td>6</td> <td>Ratchet w/2ext 7/16</td> <td></td> </tr> <tr> <td rowspan="6" style="text-align: center; vertical-align: middle;">P1</td> <td>1</td> <td>Ratchet w/2ext 7/16 PGT w/6 ext 7/16</td> <td></td> </tr> <tr> <td>2</td> <td>Ratchet w/2ext 7/16</td> <td></td> </tr> <tr> <td>3</td> <td>Ratchet w/2ext 7/16</td> <td></td> </tr> <tr> <td>4</td> <td>Ratchet w/2ext 7/16 PGT w/6ext 7/16</td> <td></td> </tr> <tr> <td>5</td> <td>Ratchet w/2ext 7/16</td> <td></td> </tr> <tr> <td>6</td> <td>Ratchet w/2ext 7/16</td> <td></td> </tr> </tbody> </table> <p style="text-align: center;">View from outboard looking inboard</p> </div>	P-Clamp	Recommended Tools	Completed	S1	1	Ratchet w/2ext 7/16 PGT w/6ext 7/16		2	Ratchet w/2ext 7/16		3	Ratchet w/2ext 7/16		4	Ratchet w/2ext 7/16 PGT w/6ext 7/16		5	Ratchet w/2ext 7/16		6	Ratchet w/2ext 7/16		P1	1	Ratchet w/2ext 7/16 PGT w/6 ext 7/16		2	Ratchet w/2ext 7/16		3	Ratchet w/2ext 7/16		4	Ratchet w/2ext 7/16 PGT w/6ext 7/16		5	Ratchet w/2ext 7/16		6	Ratchet w/2ext 7/16	
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# FHRC P-CLAMP RELEASE (Cont)

IV	EV2/EV3																																										
 <p style="text-align: center;">View from fwd looking aft (S1 TRRJ at 0°)</p>	<p style="text-align: center;"><b>RELEASE FHRC P-CLAMPS [TORQUE BOX]</b></p> <p style="text-align: center;"><b>NOTE</b></p> <p style="text-align: center;">After EVA 2, CETA Cart 2 will have to be moved further port to have access to torque box P-Clamps</p> <ol style="list-style-type: none"> <li>1. Temp stow any items on BRT prior to ingressing truss</li> <li>2. Locate torque box P-Clamps</li> <li>3. Release torque box P-clamps (6), ~7-12.5 turns:                      If using ratchet wrench, <b>CCW</b> (remove palm wheel as required)                      If using PGT: <b>PGT[A7 9.2 ft-lb, CCW2 30 RPM, MTL 30.5]</b>                      If using PGT with RAD: <b>PGT[A5 7.0 ft-lb, CCW2 30 RPM, MTL 30.5]</b> </li> <li>4. Perform any necessary tool clean-up to stow additional sockets</li> <li>5.  WVS Survey of P-Clamps</li> <li>6. Check SAFER handles</li> </ol>  <p style="text-align: center;">View from aft looking fwd, radiator removed (S1 TRRJ at -90°)</p>																																										
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">P-Clamp</th> <th style="width: 70%;">Recommended Tools</th> <th style="width: 20%;">Completed</th> </tr> </thead> <tbody> <tr> <td rowspan="6" style="text-align: center; vertical-align: middle;">S1</td> <td>1</td> <td>Ratchet w/o wheel w/2ext 7/16 PGT w/12ext 7/16</td> <td></td> </tr> <tr> <td>2</td> <td>PGT w/6 or 9ext 7/16 PGT w/12ext 7/16</td> <td></td> </tr> <tr> <td>3</td> <td>PGT w/6 or 9ext 7/16 PGT w/12ext 7/16</td> <td></td> </tr> <tr> <td>4</td> <td>PGT w/12ext 7/16</td> <td></td> </tr> <tr> <td>5</td> <td>Ratchet w/9ext 7/16 PGT w/12ext 7/16</td> <td></td> </tr> <tr> <td>6</td> <td>PGT w/12ext 7/16</td> <td></td> </tr> <tr> <td rowspan="6" style="text-align: center; vertical-align: middle;">P1</td> <td>1</td> <td>Ratchet w/o wheel w/2ext 7/16 PGT w/12ext 7/16</td> <td></td> </tr> <tr> <td>2</td> <td>PGT w/6 or 9ext 7/16 PGT w/12ext 7/16</td> <td></td> </tr> <tr> <td>3</td> <td>PGT w/6 or 9ext 7/16 PGT w/12ext 7/16</td> <td></td> </tr> <tr> <td>4</td> <td>PGT w/12ext 7/16</td> <td></td> </tr> <tr> <td>5</td> <td>Ratchet w/9ext 7/16 PGT w/12ext 7/16</td> <td></td> </tr> <tr> <td>6</td> <td>PGT w/12ext 7/16</td> <td></td> </tr> </tbody> </table>	P-Clamp	Recommended Tools	Completed	S1	1	Ratchet w/o wheel w/2ext 7/16 PGT w/12ext 7/16		2	PGT w/6 or 9ext 7/16 PGT w/12ext 7/16		3	PGT w/6 or 9ext 7/16 PGT w/12ext 7/16		4	PGT w/12ext 7/16		5	Ratchet w/9ext 7/16 PGT w/12ext 7/16		6	PGT w/12ext 7/16		P1	1	Ratchet w/o wheel w/2ext 7/16 PGT w/12ext 7/16		2	PGT w/6 or 9ext 7/16 PGT w/12ext 7/16		3	PGT w/6 or 9ext 7/16 PGT w/12ext 7/16		4	PGT w/12ext 7/16		5	Ratchet w/9ext 7/16 PGT w/12ext 7/16		6	PGT w/12ext 7/16		
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## FHRC P-CLAMP RELEASE – TASK DATA

### Estimated Task Duration:

	With SSRMS	Without SSRMS
One EV Crew	N/A	01:00
Two EV Crew	N/A	N/A

### ORU Specs:

ORU	Dimensions (inches)	Mass (lbm)
FHRC	60.27 X 30.4 X 36.5	Dry – 397 Wet – 457

### Tools:

EV1/2/3	
PGT w/6" ext-7/16	2" ext 7/16
Ratchet Wrench	9" ext 7/16
Socket Caddy	

### Fasteners:

Fastener Name	Label	Qty	Head Size	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Hose Box P-Clamps	NA	6	7/16"	5.4 (Ground Install)	9.2 (PGT) 7.0 (PGT + RAD)	12.6	6-12.5	30
Torque Box P-Clamps	NA	6	7/16"	5.4 (Ground Install)	9.2 (PGT) 7.0 (PGT + RAD)	12.6	7-12.5	30

### Notes:

1. TRRJ must be locked to access hose box P-clamps. TRRJ must be locked at 0 to access torque box P-clamps
2. PGT w/12 ext 7/16 socket was the only tool config fit checked on the torque box P-clamps

### Cautions:

None

### Warnings:

None

## FHRC P-CLAMP RELEASE – TASK DATA (Cont)



Figure 1. Hose Box P-Clamps

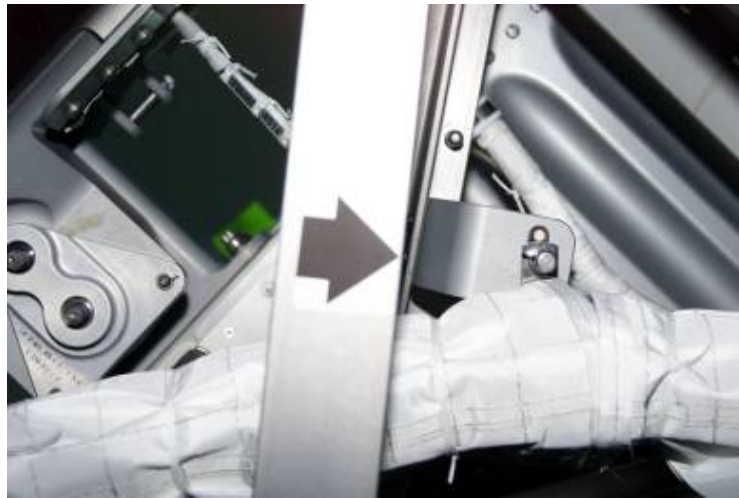


Figure 2. Torque Box P-Clamps have Arrow Labels on Torque Box

## S3 ZENITH OUTBOARD CAS DEPLOY

IV/SSRMS	EV1/EV2	EV2/EV3
<p>1. Verify S3/S4 SARJ locked with MCC-H</p> <p>2. √MCC-H PAS inhibits in place:  RPCM S34B_E RPC 1 – Open, Close Cmd Inh  RPC 2 – Open, Close Cmd Inh  RPC 3 – Open, Close Cmd Inh  RPC 4 – Open, Close Cmd Inh  RPCM S33A_E RPC 1 – Open, Close Cmd Inh  RPC 2 – Open, Close Cmd Inh  RPC 3 – Open, Close Cmd Inh  RPC 4 – Open, Close Cmd Inh</p>	<p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">The following steps to prep for CAS deploy may be done by a single crewmember, in any order</p> <p><u>CAS PREP</u></p> <ol style="list-style-type: none"> <li>1. Remove/swivel deploy clevis bracket: <ul style="list-style-type: none"> <li><input type="checkbox"/> <b>PGT[B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Release deploy clevis fasteners (4), 10 turns on all bolts except bolt 4, 8 turns</li> <li><input type="checkbox"/> Swivel deploy clevis bracket clear, use RET to S3 HR 3056 to stow bracket</li> </ul> </li> <li>2. Remove hinge line ADPs (2), insert in stowage hole, √lock bracket engaged <ul style="list-style-type: none"> <li><input type="checkbox"/> Inboard</li> <li><input type="checkbox"/> Outboard</li> </ul> </li> <li>3. Release SARJ brace: <ul style="list-style-type: none"> <li><input type="checkbox"/> <b>PGT[B6 24.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Release SARJ brace cup-cone bolt, 35 turns, do not exceed 37 turns</li> <li><input type="checkbox"/> Release SARJ brace launch restraint bolt, 1-3 turns ccw</li> <li><input type="checkbox"/> Attach SARJ brace to diagonal strut, hand tighten launch restraint bolt 1 turn cw</li> </ul> <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p><u>CAUTION</u></p> <p>Do not lift diagonal brace more than ~7 deg out of rotation plane to prevent damage to hinge end</p> </div> </li> <li>4. <b>PGT[B6 24.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Release SARJ diagonal strut cup-cone bolt, 35 turns, do not exceed 37 turns</li> <li>5. Move diagonal strut; temp stow clear using RET to S3 HR 3040</li> <li>6. Attach adj/gap spanner/adj to S3 HR 3047</li> <li>7. Route adj/gap spanner/adj to yoke <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p><u>CAUTION</u></p> <p>When attempting to remove the yoke PIP pin and ADP, do not impart more than 10 lbf  Yoke ADP does not have stowage hole. Do not close ADP lock bracket when ADP is not inserted in a stowage/clevis hole</p> </div> </li> <li>8. Release the yoke PIP pin; secure using pre-installed wire tie</li> <li>9. Release ADP; secure using pre-installed wire tie</li> </ol>	



### S3 ZENITH OUTBOARD CAS DEPLOY (Cont)

IV/SSRMS	EV1/EV2	EV2/EV3																																							
<p>3. Record torque and turns for stow clevis bracket:</p> <table border="1" data-bbox="109 683 579 781"> <thead> <tr> <th>Bolt#</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>Torque</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Turns</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>4. Record torque and turns for deploy clevis bracket:</p> <table border="1" data-bbox="109 862 579 959"> <thead> <tr> <th>Bolt#</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>Torque</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Turns</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>5. Record torque and turns for brace and diagonal strut:</p> <table border="1" data-bbox="109 1130 579 1284"> <thead> <tr> <th></th> <th>Torque</th> <th>Turns</th> </tr> </thead> <tbody> <tr> <td>Diagonal Strut</td> <td></td> <td></td> </tr> <tr> <td>SARJ Brace</td> <td></td> <td></td> </tr> </tbody> </table>	Bolt#	1	2	3	4	Torque					Turns					Bolt#	1	2	3	4	Torque					Turns						Torque	Turns	Diagonal Strut			SARJ Brace			<p><u>CAS DEPLOY</u></p> <p style="text-align: center;"><u>NOTE</u> The following tasks for CAS deploy require two crewmembers</p> <ol style="list-style-type: none"> <li>1. Swing yoke inside truss to provide room for removal of stow clevis bracket</li> <li>2. <b>PGT[B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Release stow clevis fasteners (4), 10 turns on all bolts except bolt 7, 8 turns</li> <li>3. Swivel stow clevis bracket clear, tether to structure as reqd</li> <li>4. Once yoke clear, finger start all stow clevis bracket bolts (4), 1-2 turns</li> <li>5. <b>PGT[B2 16.0 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Engage stow clevis bolts (4), 10 turns, to hardstop</li> <li>6. Orient deploy clevis bracket with alignment marks</li> <li>7. Finger start all deploy clevis bracket bolts (4), 1-2 turns</li> <li>8. <b>PGT[B2 16.0 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Engage deploy clevis bolts (4), 10 turns, to hardstop</li> <li>9. <b>PGT[RCW, MTL 30.5]-6ext 7/16:</b> Engage deploy clevis bracket bolts (4), two clicks each bolts</li> <li>10. Release RET on diagonal strut; rotate to install</li> <li>11. Pull yoke gap spanner to unfold yoke</li> <li>12. Rotate CAS out of detent</li> <li>13. Lower yoke into deploy clevis</li> <li>14. Release wire ties securing PIP pin and yoke ADP</li> <li>15. Install yoke ADP, √lock bracket engaged</li> <li>16. Install yoke PIP pin</li> <li>17. Retrieve adj/gap spanner/adj</li> </ol>	<ol style="list-style-type: none"> <li>1. Deploy CAS to detent, tend with adj/gap spanner/adj, lead with yoke (10 deg past vertical)</li> <li>2. Assist EV2 with diagonal strut reposition</li> <li>3. Release adj/gap spanner/adj on S3 HR 3047 (leave on yoke), temp stow free end</li> <li>4. <b>PGT[B2 16.0 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Engage diagonal strut cup-cone bolt to hard stop, ~38 turns</li> <li>5. Release SARJ brace launch restraint bolt, 1 turn</li> <li>6. Rotate SARJ brace away from diagonal strut</li> <li>7. Re-insert launch restraint bolt, hand tighten 1 turn</li> <li>8. <b>PGT[B2 16.0 ft-lb, CW3 60 RPM, MTL 30.5]-6ext 7/16:</b> Engage SARJ brace cup-cone bolt to hardstop, ~38 turns</li> </ol>
Bolt#	1	2	3	4																																					
Torque																																									
Turns																																									
Bolt#	1	2	3	4																																					
Torque																																									
Turns																																									
	Torque	Turns																																							
Diagonal Strut																																									
SARJ Brace																																									

### S3 ZENITH OUTBOARD CAS DEPLOY (Cont)

IV/SSRMS	EV1/EV2	EV2/EV3
<p>6. Perform RTL verification</p> <p>7. Notify EV: RTL verification complete</p>	<p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">The following steps for CAS cleanup may be done by a single crewmember or both crewmembers</p> <p style="text-align: center;"> </p> <p><u>CAS CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to each guide vane (3) and perform the following:               <ul style="list-style-type: none"> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Remove launch restraint PIP pin from guide vane, stow in trash bag</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Inform MCC-H/IV: Ready for RTL checkout</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <b>On IV GO:</b> Depress and hold RTL for 15 seconds, then release</li> <li><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <b>On IV GO:</b> Move to next guide vane</li> </ul> </li> <li>2. Translate to CAS UMA</li> <li>3. Tether to EVA OVERRIDE anti-rotation cap hitch pin; remove</li> <li>4. Remove anti-rotation cap; stow in trash bag</li> <li>5. Fold MLI target cover back</li> <li>6. <input type="checkbox"/> <input type="checkbox"/> WVS Survey of S3 Zenith Outboard PAS</li> </ol>	

### S3 ZENITH OUTBOARD CAS DEPLOY – TASK DATA

**Estimated Task Duration:**

	Without SSRMS
One EV Crew	NA
Two EV Crew	01:00

**Tools:**

EV1	EV2
PGT	PGT
7/16-6-in socket ext	7/16-6-in socket ext
	Adj - 45-72 in Gap Spanner (Large) - Adj

**EVA Fasteners:**

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
SARJ Brace Launch Lock Bolt	7/16	1	16.0	21.5	32.3	9-13.5
SARJ Brace cup/cone Bolt	7/16	1	16.0	28.8	14.0 and 31.6	37-40
Diagonal cup/cone bolt	7/16	1	16.0	22.7	14.0 and 31.6	37-40
Stowage Clevis	7/16	4	16.0	25.5	46.7	9-16.5
Deploy Clevis	7/16	4	30.5	25.5	106.6	7-10.5

**Inhibits:**

Inhibit
S3/S4 SARJ Locked
RPCM S34B_E RPC 1 – Open, Close Cmd Inh
RPC 2 – Open, Close Cmd Inh
RPC 3 – Open, Close Cmd Inh
RPC 4 – Open, Close Cmd Inh
RPCM S33A_E RPC 1 – Open, Close Cmd Inh
RPC 2 – Open, Close Cmd Inh
RPC 3 – Open, Close Cmd Inh
RPC 4 – Open, Close Cmd Inh

**Notes:**

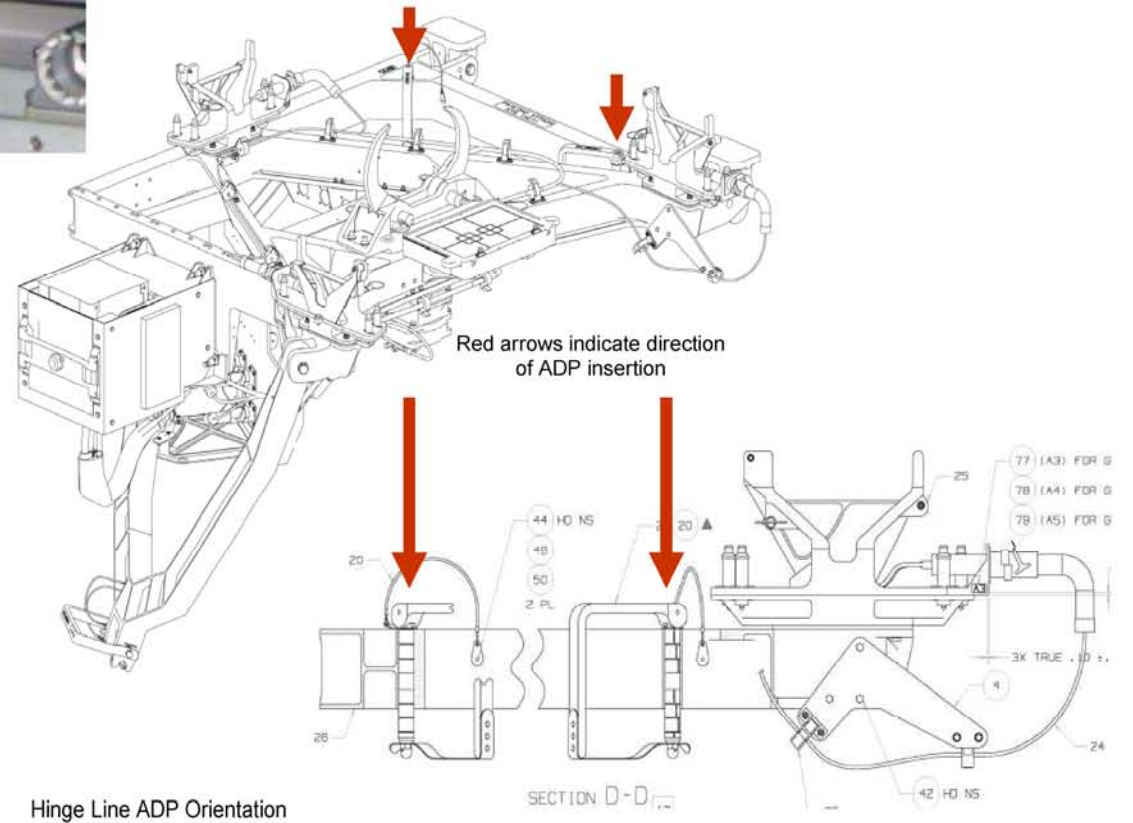
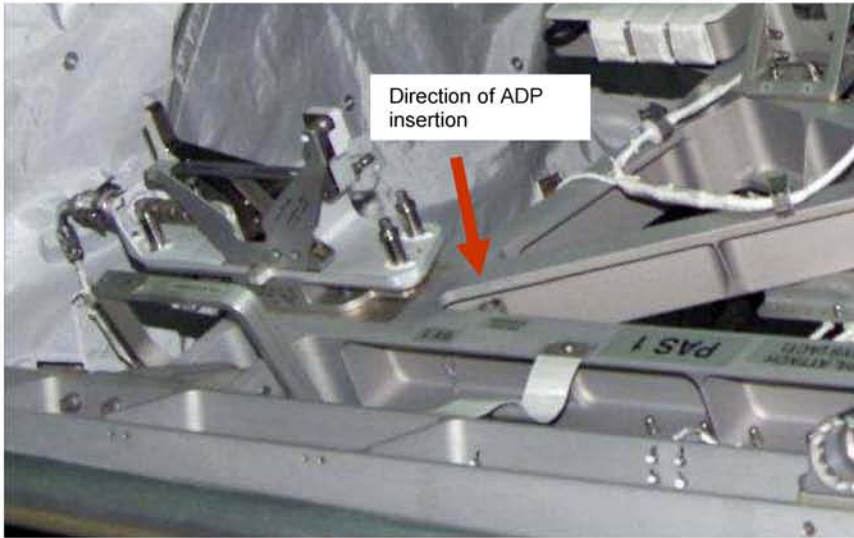
1. UMA EVA Override anti-rotation cap must be removed prior to first use of UMA on PAS
2. EBCS target cover must be removed prior to cargo attachment to PAS. Protects target from MMOD and inadvertant contact. Remove as last activity
3. RAD drive may be needed for re-install of deployed clevis bracket. It will likely exceed RAD limits and need to be returned for refurb

**Cautions:**

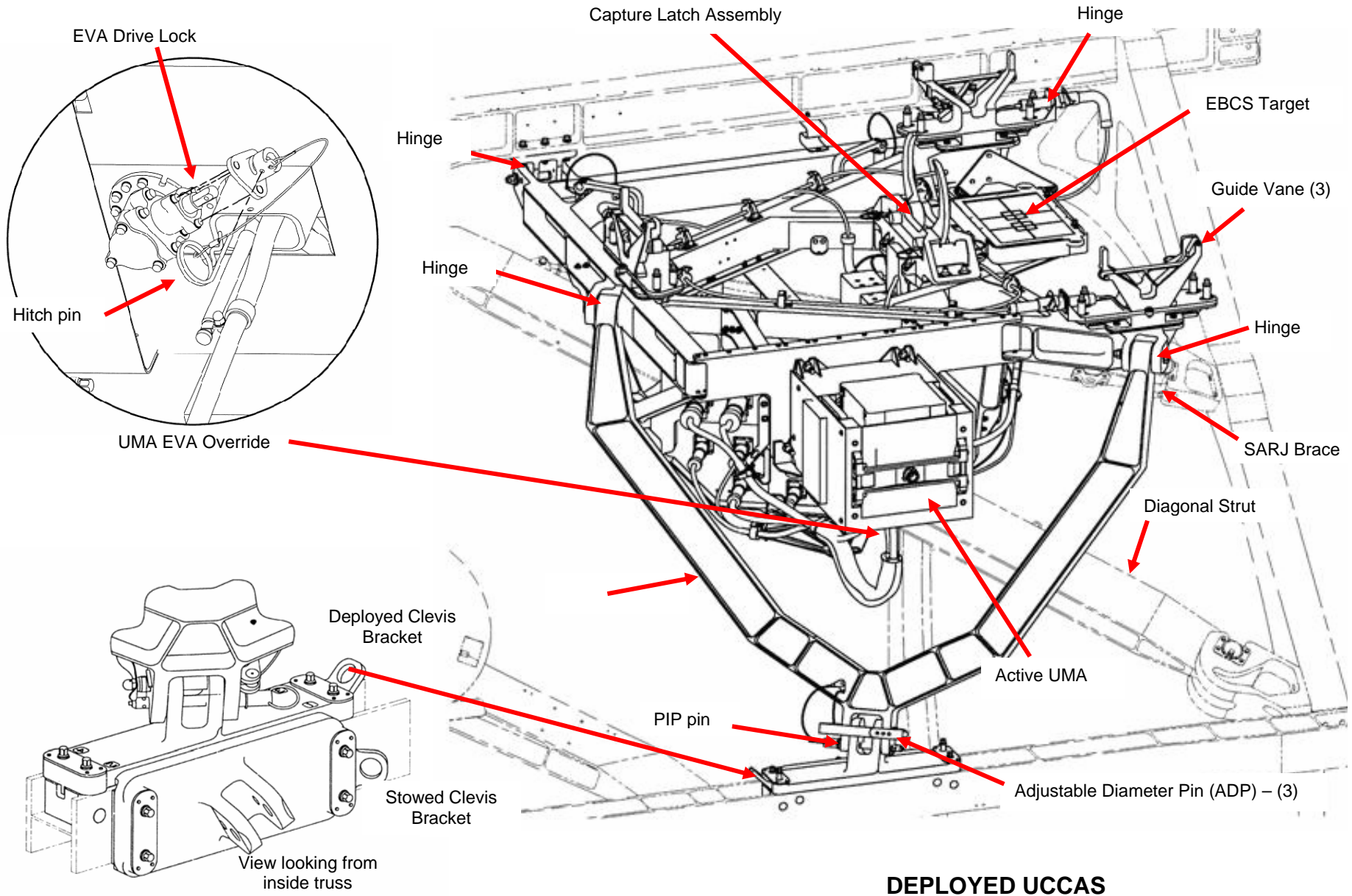
1. Do not lift diagonal brace greater than 7 deg out of rotation plane when rotating to temp stowage location so as to not bend hinge end
2. Do not close ADP lock bracket when ADP is not inserted in a stowage/clevis hole. The pin can fall apart
3. EBCS target has finished surface that is susceptible to damage by contact

**Warnings:**

### S3 ZENITH OUTBOARD CAS DEPLOY – TASK DATA (Cont)

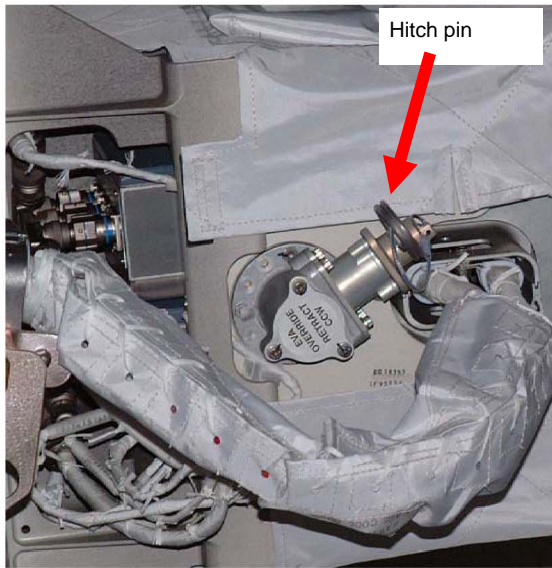


### S3 ZENITH OUTBOARD CAS DEPLOY – TASK DATA (Cont)

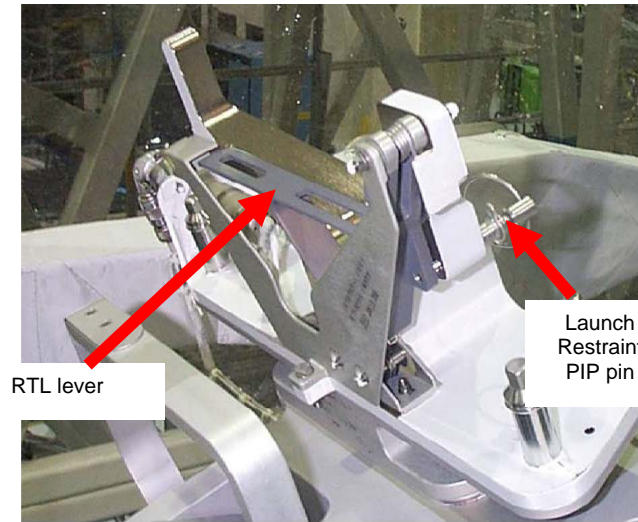


**DEPLOYED UCCAS**

**S3 ZENITH OUTBOARD CAS DEPLOY – TASK DATA (Cont)**



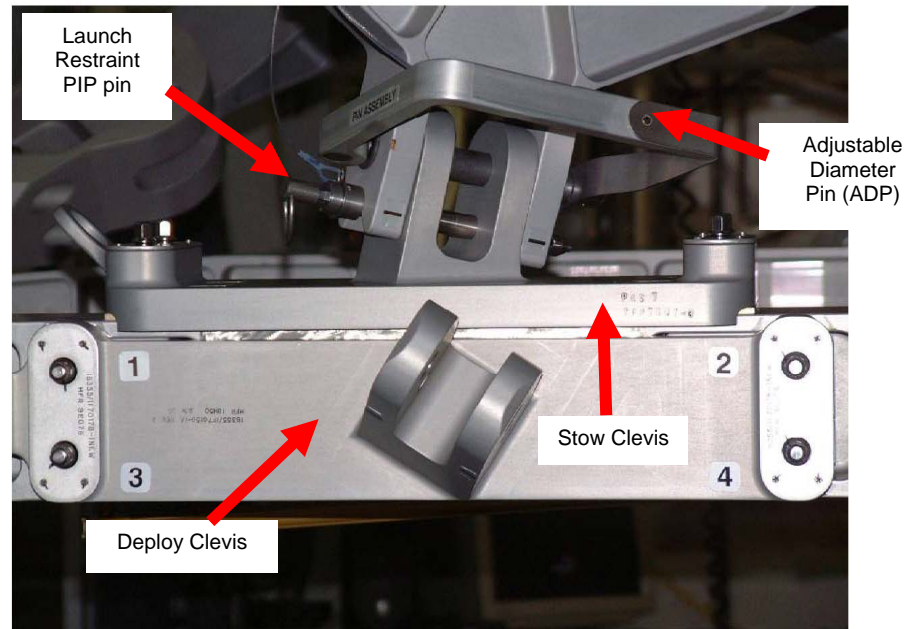
Active UMA EVA Override with Anti-Rotation Cap



Guide Vane and RTL lever

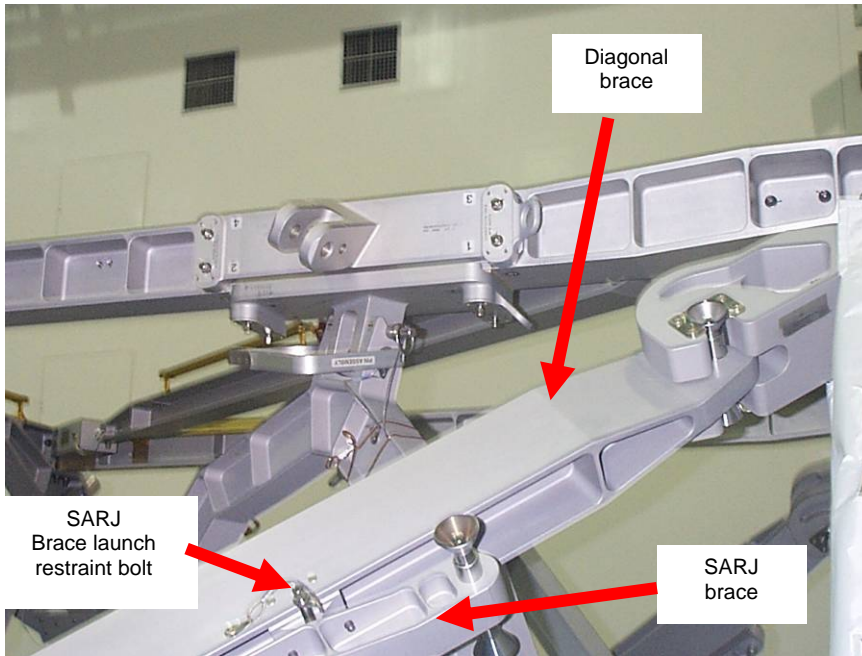


EBCS Target with Cover



Deployed and Stowed Clevis Brackets (looking from zenith)

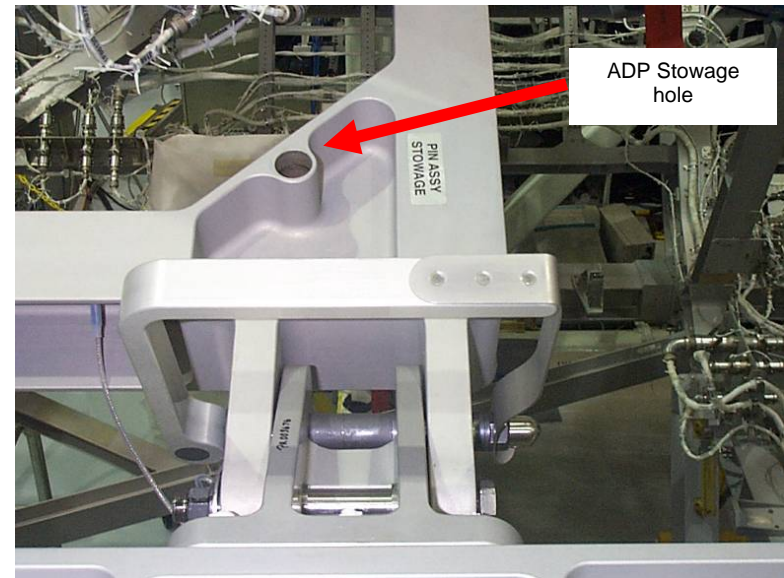
### S3 ZENITH OUTBOARD CAS DEPLOY – TASK DATA (Cont)



Diagonal and SARJ braces and cup-cones



Diagonal and SARJ braces Jack-Joint cup-cones



Adjustable Diameter Pin (ADP) and stowage hole (hinge side)

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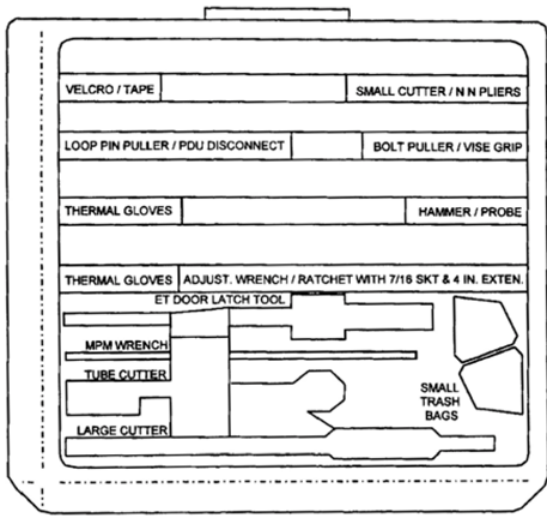
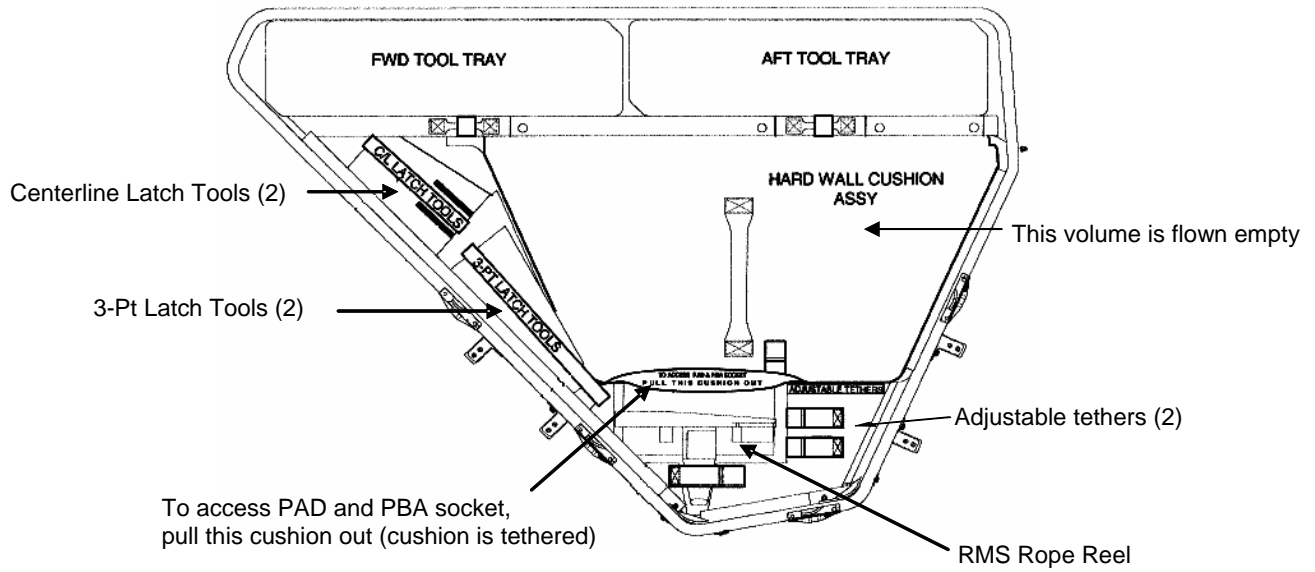


TOOLS AND STOWAGE

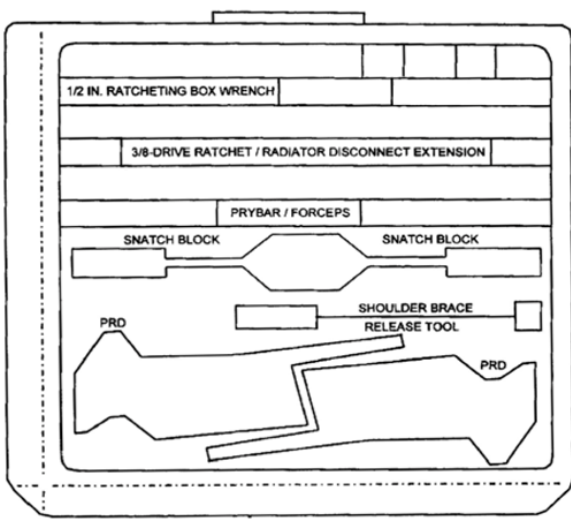
PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA) ..... TEMP FS 8-2  
PGT CHECKOUT ..... 8-3  
PGSC-PGT CONNECTION (A31P AND 760XD) ..... 8-4  
PROGRAM PGT SETTINGS ..... 8-5  
DOWNLOAD/ERASE EVENT LOG ..... 8-5  
PGT CONTINGENCIES..... 8-6  
PGT STANDARD SETTINGS..... 8-7  
ULF2 J NOZZLE GREASE GUN PREP FOR EVA 1..... FS 8-9  
ULF2 GREASE GUN CARTRIDGE SWAP ..... FS 8-10  
ULF2 TOOL STOW FOR MPLM TRANSFER ..... FS 8-13  
APFR MANAGEMENT – STS-126/ULF2..... FS 8-14  
SAFETY TETHERS – STS-126 (ULF2)..... FS 8-15  
TOOLBOX STOWAGE – STS-126 (ULF2)..... FS 8-16  
TOOLBOX PANEL AND SLOT LABELS ..... FS 8-17  
Z1 TOOLBOX INTERNAL LAYOUT ..... FS 8-18  
AIRLOCK TOOLBOX INTERNAL LAYOUT..... FS 8-19

TOOLS AND  
STOWAGE

# PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA)



Forward Tray layout and Labels



Aft Tray Layout and Labels



TOOLS AND STOWAGE

## ULF2 J NOZZLE GREASE GUN PREP FOR EVA 1

I

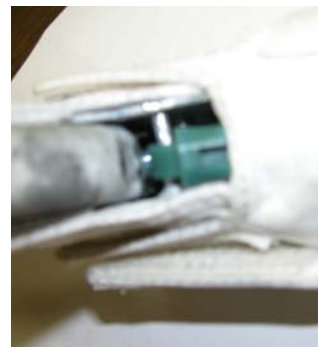
1. Retrieve J Nozzle Grease Guns (2), J Nozzle Valves (2), and full grease cartridges (2) from shuttle transfer items (transferred in Large ORU Bag and 3 CTB)
2. Remove the grease cartridges from the ziplock bags; label one ziplock "1"
3. Remove MLI cover from grease gun
4. Unscrew grease cartridge housing from the trigger assembly (ccw)
5. Fully retract plunger
6. Remove red flange cap from grease cartridge; stow in ziplock "1"
7. Install grease cartridge into grease gun housing, leaving red tip cap on cartridge
8. Screw trigger assembly onto grease gun housing (cw at least 1.5 turns)
9. Verify plunger disengaged (black triangle down)
10. Remove red tip cap (ccw, use Allen wrench if reqd from NOD1D4\_G2 in Drawer 4); stow in ziplock "1"
11. Install nozzle/shutoff valve (cw), attempt to install so nozzle is straight vertical on grease gun
12. Verify valve closed (shutoff knob perpendicular to nozzle)
13. Install MLI cover on grease gun
14. Install MLI tip cover
15. Verify zip tie not visible (MLI should cover zip tie head; see figure 2)
16. Repeat steps 3 thru 15 for second grease gun
17. Prime both grease guns by disengaging plunger and gently pushing fwd on back of triangle until resistance met
18. Stow ziplock "1" in trash for return on ULF2



Figure 1. Grease Cartridge Nomenclature



Good Config



Bad Config (too much zip tie visible)

Figure 2. Zip-tie Configuration

## ULF2 GREASE GUN CARTRIDGE SWAP

During each EVA Tool Config, perform following steps for each grease gun:

1. Measure grease gun plunger from backside of gun to beginning of triangle (see figures 1-3); if grease gun more than 1/2 full, grease gun is ready for next EVA (end procedure)

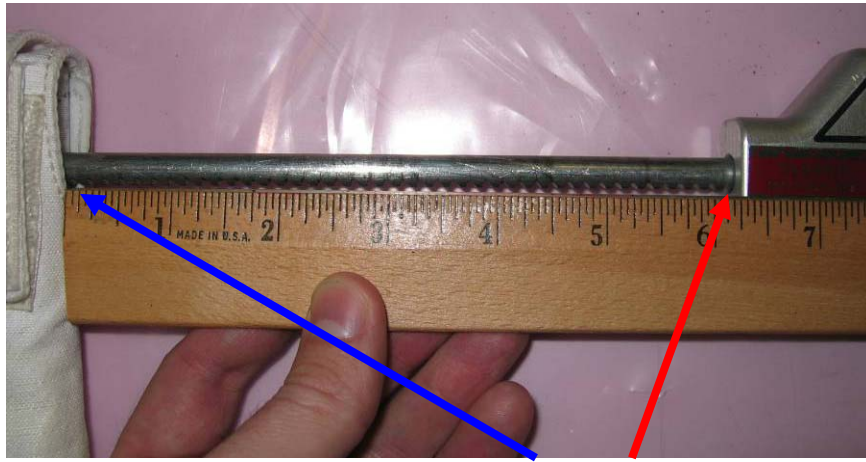


Figure 1. Measurements taken from [here](#) to [here](#)

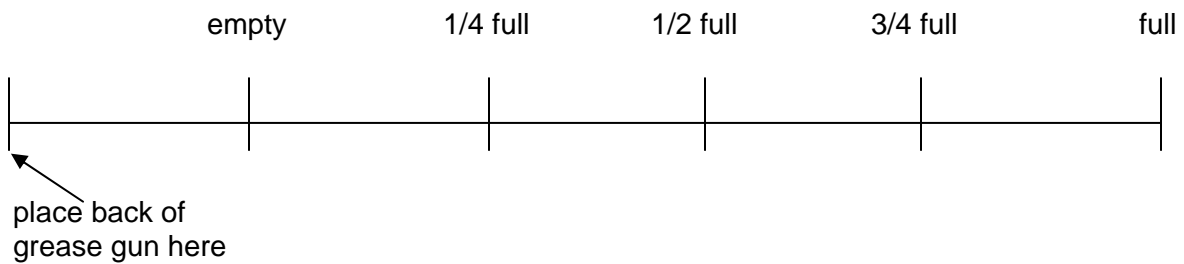


Figure 2. Grease Scale



Figure 3. Empty grease cartridge

### NOTE

Plunger drive shaft is partially visible when cartridge is empty

## ULF2 GREASE GUN CARTRIDGE SWAP (Cont)

### NOTE

Grease cartridges greater than 1/4 full will continue to be stowed on ISS. Therefore, keep the red flange and tip caps from the new grease cartridge to attach on the used grease cartridge if a cartridge swap is required.

Due to the use of towels and gloves to clean grease from hardware, it is best to perform following steps for multiple guns simultaneously, if reqd

If grease gun is less than 1/2 full, perform following steps to swap grease cartridge:

2. Retrieve following hardware from the staged ULF2 tools:
  - a. Full grease cartridge
  - b. Dry towel
  - c. Ziplock bags (2); label ziplock bags "1" and "2"
3. Retrieve Nitrile gloves (NOD1O4\_C1, CTB 1125); don Nitrile gloves
4. Verify plunger disengaged (black triangle down)
5. Verify valve closed (shutoff knob perpendicular to nozzle)
6. Remove MLI cover from grease gun
7. Fully retract plunger
8. Remove nozzle/shutoff valve from used cartridge (ccw); note valve will be full of grease
9. Wipe any excess grease around nozzle using towel; stow towel in ziplock "1"
10. Temp stow nozzle/shutoff valve in ziplock "2"
11. Unscrew grease cartridge housing from trigger assembly (ccw)
12. Remove used cartridge from grease gun housing; stow in ziplock "1" if < 1/4 full, and in ziplock "2" if > 1/4 full
13. Doff Nitrile gloves; stow in ziplock "1"
14. Remove red flange cap from new grease cartridge; stow in ziplock "2" (if used grease cartridge in ziplock "2", stow on the used grease cartridge)
15. Install grease cartridge into grease cartridge housing, leaving red tip cap on cartridge
16. Screw trigger assembly onto grease gun housing (cw at least 1.5 turns)
17. Verify plunger disengaged (black triangle down)
18. Remove red tip cap (ccw, use Allen wrench if reqd from NOD1D4\_G2 in Drawer 4); stow in ziplock "2" (if used grease cartridge in ziplock "2", stow on the used grease cartridge)
19. Retrieve nozzle/shutoff valve from ziplock "2", use towel from ziplock "1" as required
20. Install nozzle/shutoff valve (cw), attempt to install so nozzle is straight vertical on grease gun
21. Verify valve closed (shutoff knob perpendicular to nozzle)
22. Install MLI cover on grease gun
23. Install MLI tip cover
24. Verify zip tie not visible (MLI should cover zip tie head, see figure 5)
25. Prime grease gun by disengaging plunger and gently pushing fwd on back of triangle until resistance met

Cleanup:

26. Stow ziplock "1" in trash for return on ULF2
27. Stow ziplock "2" in mesh bag with tools for EVA
28. Stow grease gun(s) per ULF2 EVA Tool Config

## ULF2 GREASE GUN CARTRIDGE SWAP (Cont)

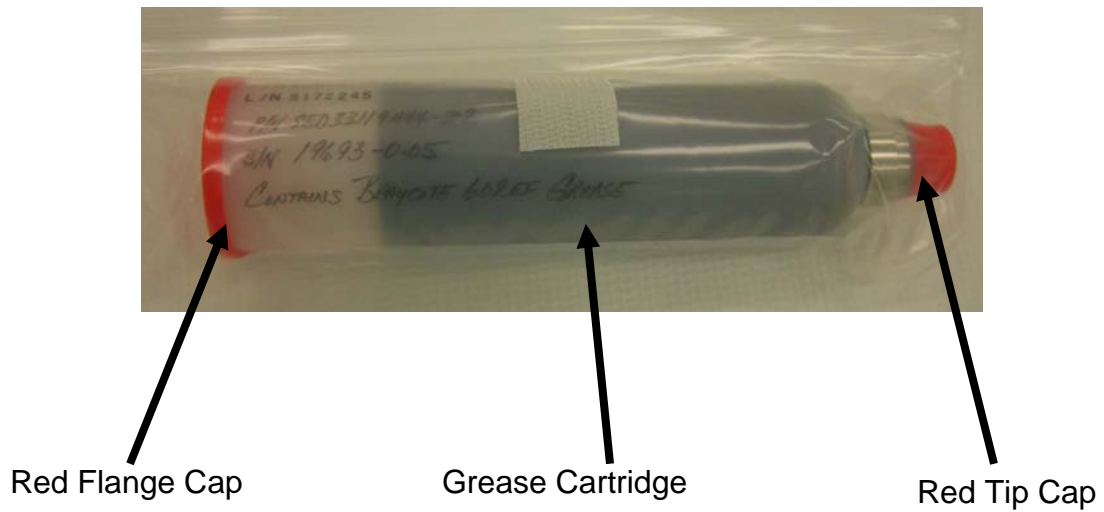


Figure 4. Grease Cartridge Nomenclature



Good Config



Bad Config (too much zip tie visible)

Figure 5. Zip-tie Configuration

## ULF2 TOOL STOW FOR MPLM TRANSFER

I

1. Stow following items in 24" x 24" ziplock bag(s) post EVA:
  - All used EVA Wipes (dry and wet)
  - All used towels
  - All fully used (< 1/4 full) Grease Cartridges
  - Scraper Debris Containers (6)
2. Stow following items in TBA CTBs (from MPLM) and TBA foam (from shuttle)

### NOTE

Remove middle block of foam to fit 2 TBAs in each CTB.  
TBA foam may have to be secured with tape

- TBAs w/connector caps (11)
  - TBA Bags (11)
3. Stow following tools in a mesh bag to be transferred to MPLM for return:
    - All ziplock bags from step 1
    - RETs (RED: 8 Lg-eq)
    - RETs (RED: 5 w/PIP pin)
    - 4A SLR and rail stub
    - EFBM Small Petal Covers (4)
    - GPS Antenna Receptacle MLI (2)
    - GPS Antenna jack caps (4)
    - GPS Antenna connector caps (4)
    - EVA Large Trash Bag (1008) (1)
    - 55-ft Safety Tether (Number 72, Lg-sm, s/n 1022)

**APFR MANAGEMENT – STS-126/ULF2**

1

APFR DESIGNATOR	APFR 1 (8A, 13A.1 Pitch knob problem)	APFR 2 (US EVA 9 Pitch knob problem, 10A sticky locking collar)	APFR 3 s/n 1005 (no pitch knob prob 9A-inc12 suspected sharp edge on locking collar and possible sticky locking collar)	APFR 4 (TS, old ORU tether, heat shield)	APFR 5 (TS, old ORU tether, heat shield)	APFR 6 (heat shield removed on 12A.1 stage)	APFR 7 s/n 1008	IAPFR 1	IAPFR 2	CRANE (old ORU tether)	TS	ORU stanchion/ TERA headless	OTSD
Post STS-124	Lab WIF 7 [6,PP,F,12]	Lab WIF 4 [1,TT,C,11]	Stbd A/L tool box [6,QQ,F,6] ingress aid	Z1 WIF 08 [7,PP,B,6] TS at 4 o'clock	PMA1 WIF 2 [12,KK,F,6]	S1 WIF 1 (10,TT,L,12)	Lab WIF 11 [1,QQ,A,12]	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5	S0 port wedge face	S0 port wedge face	S0 WIF 7 CL=7
STS-126 EVA 1													
			SSRMS [6,QQ,F,6] ingress aid										
STS-126 EVA 2													
			CETA 2 WIF 1 12,GG [6,II,F,6] ingress aid										
STS-126 EVA 3													
STS-126 EVA 4													
					PMA1 WIF 2 [6,KK,F,12]								
Get-Aheads													
	P3 WIF 29												
Post STS-126	Lab WIF 7 [6,PP,F,12]	Lab WIF 4 [1,TT,C,11]	CETA 2 WIF TBD 12, GG [6,II,F,6] ingress aid	Z1 WIF 08 [7,PP,B,6] TS at 4 o'clock	PMA1 WIF 2 [6,KK,F,12]	S1 WIF 1 (10,TT,L,12)	Lab WIF 11 [1,QQ,A,12]	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5	S0 port wedge face	S0 port wedge face	S0 WIF 7 CL=7

CP7 possible: P1 WIF 1 [6, MM, D, 3]

Node 2 WIF 14 (only WIF available for CBM contingencies – with and without WIF Ext)



## SAFETY TETHERS – STS-126 (ULF2)

I

	55-ft tethers							85-ft tethers			
	#59 s/n 1007 Sm-sm	#71 s/n 1021 Lg-sm	#72 s/n 1022 Lg-sm (had 10A – retraction issues)	#73 s/n 1023 Lg-sm (AR written against this one) (1JA – slow retractor)	#60 s/n 1008 Lg-sm (has retracting issues)	#70 s/n 1020 Lg-sm	#66 s/n 1016 Sm-sm	#26 s/n 1002 Lg-sm	#28 s/n 1008 Lg-sm	#21 s/n 1001 (Shuttle safety tethers)	#24 s/n 1004 (Shuttle safety tethers)
Post 124 EVA 3	INSIDE tether staging area	INSIDE tether staging area	INSIDE tether staging area	INSIDE tether staging area	S0 HH 3539 or HH 3530 Tether on 3539 had retracting issues	S0 HH 3539 or HH 3530 Tether on 3539 had retracting issues	INSIDE tether staging area	Returned to shuttle	Returned to shuttle	INSIDE tether staging area	INSIDE tether staging area
124 Stage	-----same-----							-----same-----			
Post 126 EVA 4	Returns on shuttle (MPLM)	INSIDE tether staging area	Returns on shuttle (MPLM)	INSIDE tether staging area	S0 HH 3539 or HH 3530 Tether on 3539 had retracting issues	S0 HH 3539 or HH 3530 Tether on 3539 had retracting issues	INSIDE tether staging area	Remains on shuttle	Remains on shuttle	INSIDE tether staging area	INSIDE tether staging area

### NOTE

During US EVA #8, EV2 reported that her 55-ft safety tether (P/N SEG33106674-307 s/n 1023, #73) was not retracting properly. EV2 attempted to perform the usual technique of pulling out some cable and then letting it reel in, but there came a point when EV2 was neither able to extend or retract the line with 6-8 ft of tether cable still extended. EV2 also cycled the tether from UNLOCK to LOCK and back to UNLOCK, with no joy. The tether was temp stowed as is until later (EV2 was attached to an 85-ft tether at this point.) During EVA cleanup, EV1 attempted to troubleshoot the tether, placing it in LOCK and extending quite a few more feet of cable from the tether. When the tether was placed back in UNLOCK it retracted completely, with a little bit of coaxing for the last couple feet of cable (typical behavior). The tether was brought inside. No further action required

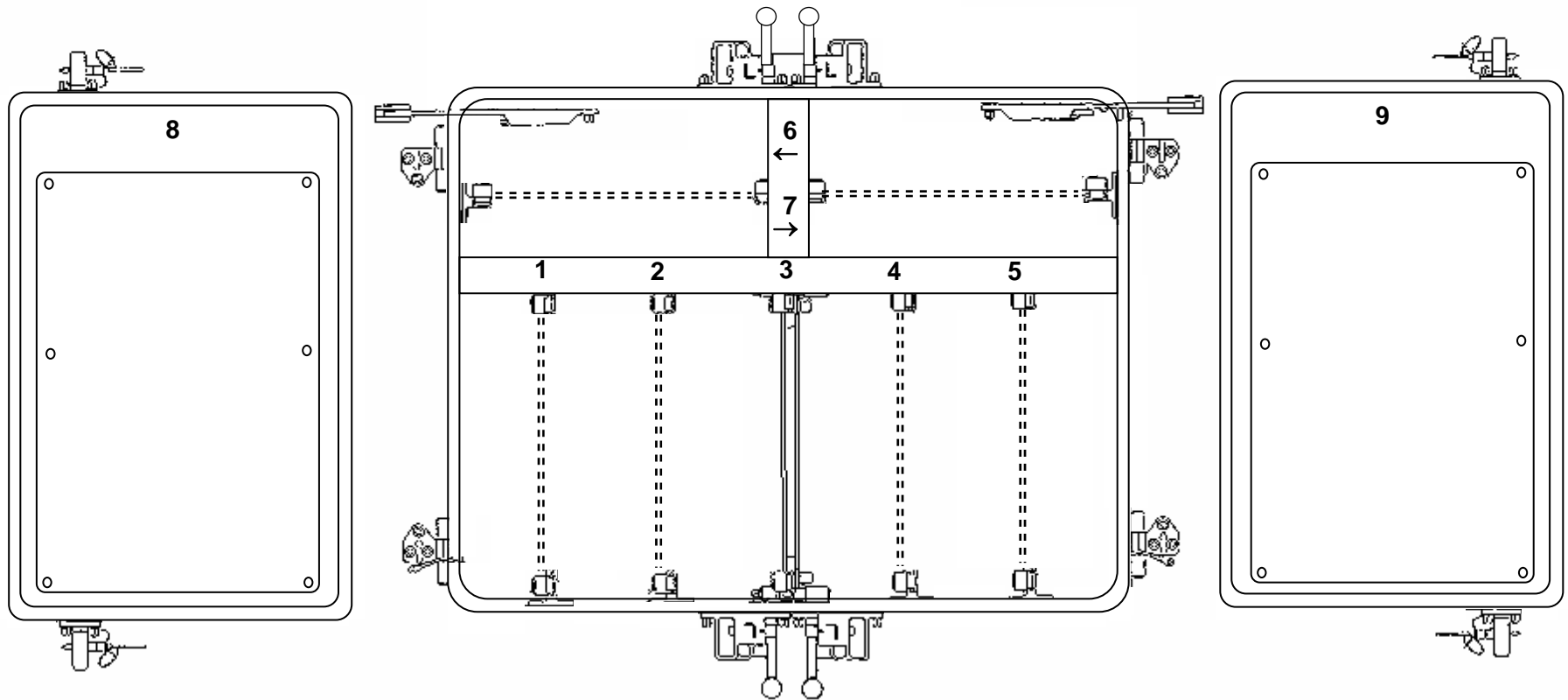
**TOOLBOX STOWAGE – STS-126 (ULF2)**

	<b>Z1 PORT TOOLBOX (MMOD Damage – potential sharp edges) {all slots have sliders}</b>	<b>Z1 STBD TOOLBOX {all slots have sliders}</b>	<b>A/L TOOLBOX 1 (STBD)</b>	<b>A/L TOOLBOX 2 (PORT)</b>
<b>SLOT # 1</b>	SQUARE TM BOARD {stbd door} SQ TORQUE MULTIPLIER 7/16" FLUSH SQ SOCKET 7/16" PROUD SQ SOCKET 7/16" RECESSED SQ SOCKET	SQUARE TM BOARD {stbd door} SQ TORQUE MULTIPLIER 7/16" FLUSH SQ SOCKET 7/16" PROUD SQ SOCKET 7/16" RECESSED SQ SOCKET	HAMMER BOARD {nadir door}	CABLE CUTTER BOARD COMPOUND CUTTERS (SM) SCISSORS {zenith door}
<b>SLOT # 2</b>		QD BAIL TOOL BOARD {stbd door} BMRRM LATCH TOOL QD BAIL DRIVE TOOL (1")	PLIERS BOARD {nadir door} NEEDLE NOSE PLIERS	
<b>SLOT # 3</b>	RATCHET BOARD {middle} 7/16" X 12" WOBBLE SOCKET 7/16" X 2" RIGID SOCKET	RATCHET BOARD {middle} 7/16" X 6" WOBBLE SOCKET	{only slot with slider}	{only slot with slider}
<b>SLOT # 4</b>				
<b>SLOT # 5</b>	ROUND TM BOARD {port door} RND TORQUE MULTIPLIER 5/8" PROUD RND SOCKET 7/16" FLUSH RND SOCKET 7/16" PROUD RND SOCKET	ROUND TM BOARD {port door} 7/16" FLUSH RND SOCKET 7/16" PROUD RND SOCKET	ADJ WRENCH BOARD FORCEPS WRENCH, ADJ {zenith door}	T-HANDLE TOOL BOARD 1-8" T-TOOLS {nadir door}
<b>SLOT # 6</b>	TRASH BAG BOARD {stbd door} LARGE TRASH BAG SMALL TRASH BAG	TRASH BAG BOARD {stbd door}	HYDRAZINE BRUSH BOARD HYDRAZINE BRUSH {nadir door}	
<b>SLOT # 7</b>	SOCKET BOARD {port door} 5/32" BALL END ALLEN DR 1/2" X 8" WOBBLE SOCKET 5/16" X 7" RIGID SOCKET	SOCKET BOARD {port door} 5/32" BALL END ALLEN DR 1/2" X 8" WOBBLE SOCKET 5/16" X 7" RIGID SOCKET	PRD (Toolboard) {zenith door} PRD	PRD (Toolboard) {nadir door} PRD
<b>PANEL # 8</b>	CHEATER BAR PANEL {stbd door} ADJ EQUIP TETHER	CHEATER BAR PANEL {stbd door} CHEATER BAR ADJ EQUIP TETHER	TOOL CADDY PANEL {nadir door} CADDY, ISS (BUNGEE)	
<b>PANEL # 9</b>	18" SOCKET PANEL {port door} 7/16" X 18" WOBBLE SOCKET	18" SOCKET PANEL {port door}	BOLT PULLER PANEL BOLT PULLER MECHANICAL FINGER {zenith door}	LARGE CUTTER PANEL {nadir door} Large Cutters (-303)
<b>EXTERNAL</b>	1 SQUARE SCOOP w/D-HANDLE (on zenith micro) (D-handle taped over repaired MMOD damage) 1 ROUND SCOOP D-HANDLE on port side of toolbox	1 SQUARE SCOOP <b>NOTE</b> D-Handle will not stow on the side of this toolbox due to an interference with the CMG MLI		

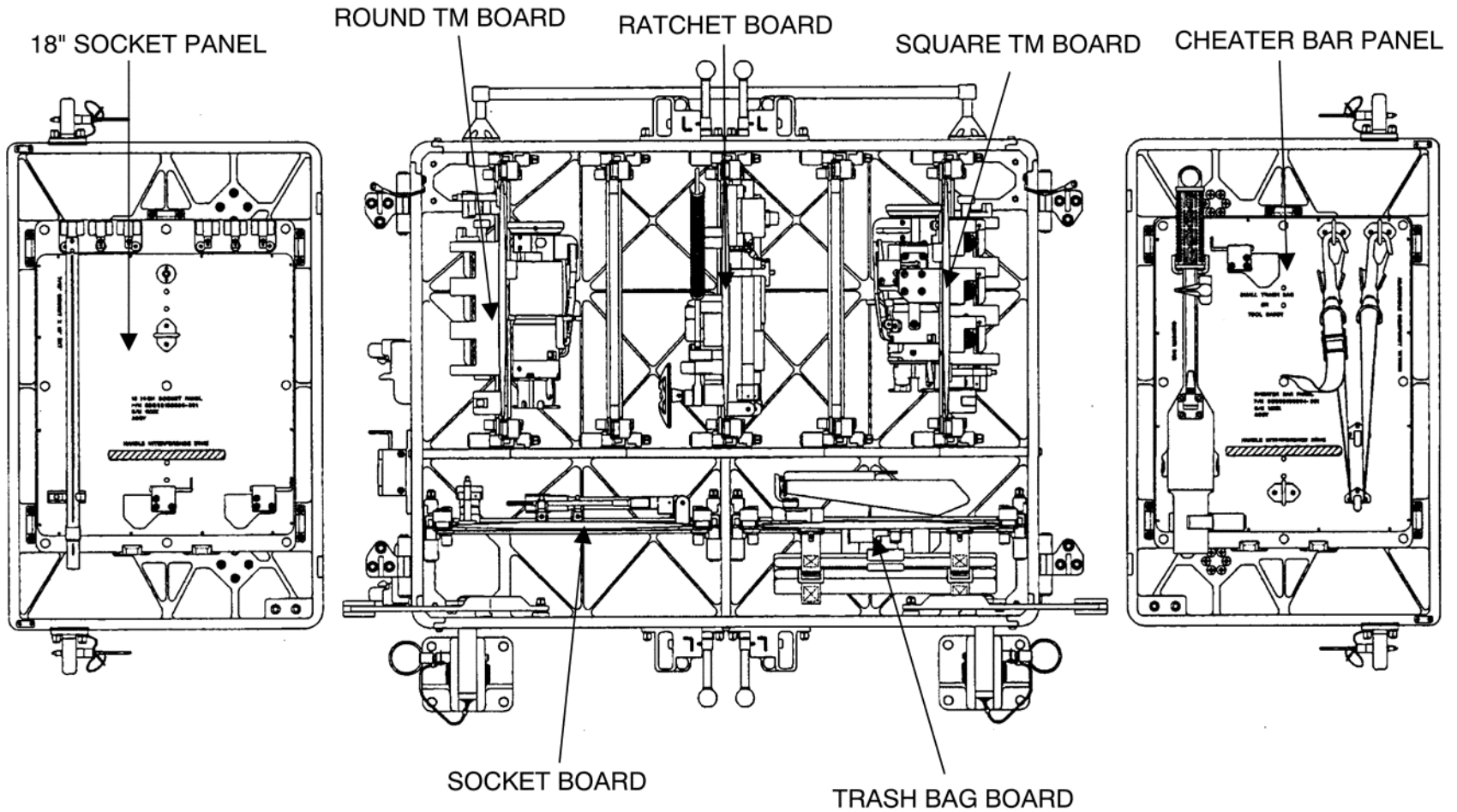
# TOOLBOX PANEL AND SLOT LABELS

### NOTE

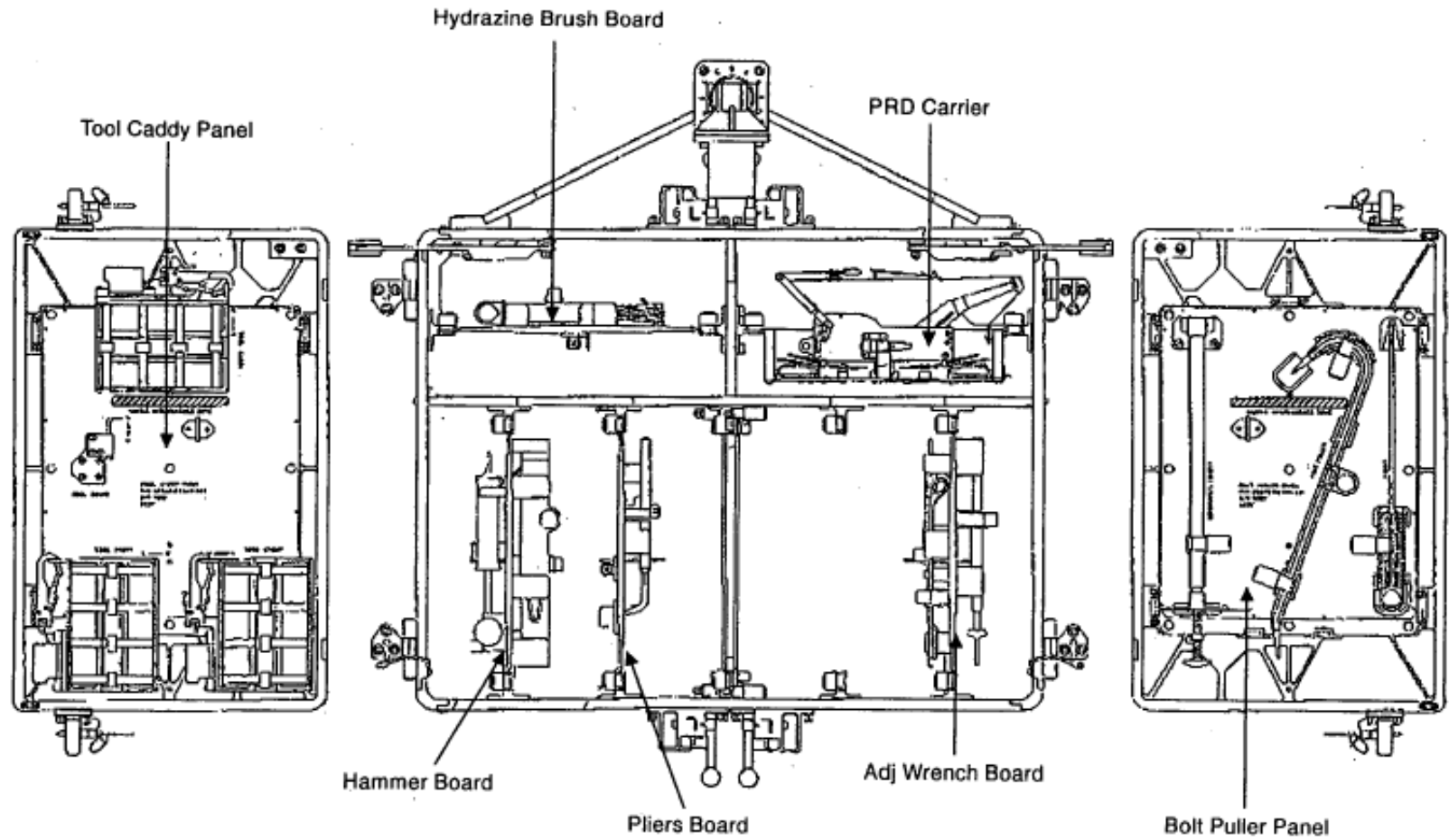
- A/L Toolbox: Slider feature located in center slot only (#3)
- Z1/CETA Toolbox: Slider feature located in all slots



# Z1 TOOLBOX INTERNAL LAYOUT



# AIRLOCK TOOLBOX INTERNAL LAYOUT



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EMU MAINT/RECHARGE

WATER RECHARGE.....	TEMP FS 10-2
EMU POWERUP.....	TEMP FS 10-2
WATER FILL.....	TEMP FS 10-2
WATER FILL VERIFICATION.....	TEMP FS 10-2
EMU LiOH CHANGEOUT.....	10-4
MIDDECK EMU BATTERY RECHARGE (STAND-ALONE).....	10-4a
MIDDECK EMU BATTERY RECHARGE/LiOH REPLACEMENT.....	10-5
INITIATE.....	10-5
TERMINATE.....	10-6
IN-SUIT EMU BATTERY RECHARGE/CHARGE VERIFICATION.....	10-7
INITIATE.....	10-7
TERMINATE.....	10-7
EMU POWERDOWN.....	10-7
HELMET LIGHT/PGT BATTERY RECHARGE.....	10-8
INITIATE.....	10-8
TERMINATE.....	10-9
REBA BATTERY INSTALLATION.....	10-9
EMU BATTERY REMOVAL/INSTALL.....	10-10
HELMET LIGHT BULB CHANGEOUT.....	10-11
REBA BATTERY RECHARGE.....	10-12
INITIATE.....	10-12
TERMINATE.....	10-13
CONSUMABLES TRACKING CUE CARD.....	FS CC 10-15
BATTERY RECHARGE CUE CARD.....	FS CC 10-16

## WATER RECHARGE

### IF EMU NOT ALREADY POWERED UP:

#### EMU POWERUP

- BOTH DCM 1. Retrieve, position SCUs; remove DCM covers  
 2. Connect SCUs to DCM, √locked  
 3. PWR – BATT

#### CAUTION

EMU must be on BATT pwr when  
 airlock pwr supply is turned on

- AW18H 4. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR  
 BUS SEL (two) – MNA(MNB)
- MD(flir) 5. √EMU O2 ISOL VLV – OP
- AW82B 6. EV1,2 O2 vlv (two) – OP
- DCM 7. PWR – SCU

#### WATER FILL

- MO13Q 8. √ARLK H2O S/O VLV – OPEN (tb-OP)
- R11L 9. √SPLY H2O TKA OUTLET – CL (tb-CL)

#### SM 60 TABLE MAINT

- CRT 10. Use TKB quantity:  
 PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC
11. Log value before recharge

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

- AW82D 12. √EMU 1,2 H2O WASTE tb (two) – CL  
 SPLY (two) – OP (tb-OP)
13. √H2O TKB quantity decreasing

#### NOTE

Full charge requires ~15 min

#### WATER FILL VERIFICATION

- DCM 14. √STATUS: **H2O WP** 8-15 psi and stable for ~30 sec (indicates charging complete)

#### SM 60 TABLE MAINT

- CRT 15. Use TKB quantity:  
 PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC
16. Log value after recharge

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

EMU MAINT/  
 RECHARGE

Cont next page

TEMP FS 10-2



TOP

**HOOK  
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**CONSUMABLES TRACKING CUE CARD**

SAFER usage s/n 1004 & 1007				EMU TV: ID 16 & 18			Dump CWC s/n 1059		
	EMU	LiOH (s/n) (B/C)	METOX (s/n) (B/C)	EMU Battery	REBA (s/n)	HL Battery (s/n)	PGT Battery (s/n)	PGT Battery Spare (s/n)	PWR (s/n)
<b>Camp</b>	<b>Resize</b>		<b>0020/0021</b>						
<b>EVA 1</b>	<b>EV1 – Pp</b> EMU 3005	N/A	0015 7686J	2072	1004	1022/1025	1009	1006	
	<b>EV2 – Bw</b> EMU 3003	N/A	0016 7796J	2073	1011	1026/1030	1008		
<b>Post</b>			<b>Regen Camp</b>		<b>Recharge</b>	<b>Recharge</b>	<b>Recharge</b>	<b>Recharge</b>	<b>1024</b>
<b>Between</b>	<b>Swap</b>			<b>Recharge</b>					
<b>Camp</b>			<b>0020/0021</b>						
<b>EVA 2</b>	<b>EV1 – Pp</b> EMU 3005	N/A	0017 7811J	2037	1004	1028/1029	1009	1006	
	<b>EV3 – Kb</b> EMU 3018	N/A	0019 7807J	2067	1003	1031/1035	1008		
<b>Post</b>			<b>Regen Camp</b>		<b>Charge 1006 &amp; 1008</b>	<b>Recharge</b>	<b>Recharge</b>	<b>Recharge</b>	<b>1024/1025</b>
<b>Between</b>	<b>Swap</b>			<b>Recharge</b>					
<b>Camp</b>			<b>0020/0021</b>						
<b>EVA 3</b>	<b>EV1 – Pp (fwd)</b> EMU 3005	2002	N/A	2072	1008	1022/1025	1009	1006	
	<b>EV2 – Bw (aft)</b> EMU 3003	2003		2073	1011	1026/1030	1008		
<b>Post</b>					<b>Recharge</b>	<b>Recharge</b>	<b>Recharge</b>	<b>Recharge</b>	<b>1025/1026</b>
<b>Between</b>	<b>Swap</b>	<b>Cap/Tape</b>		<b>Recharge</b>					
<b>Camp</b>			<b>0011/0012</b>						
<b>EVA 4</b>	<b>EV2 – Bw (fwd)</b> EMU 3003	N/A	0007 7802J	2074	1011	1028/1029	1009	1006	
	<b>EV3 – Kb (aft)</b> EMU 3018	N/A	0013 7794J	2075	1006	1031/1035	1008		
<b>Post</b>									<b>1026</b>
<b>Return</b>	<b>EV1 – Pp</b> EMU 3018	2002		2072					
	<b>EV2 – Bw</b> EMU 3003	2003		2073					

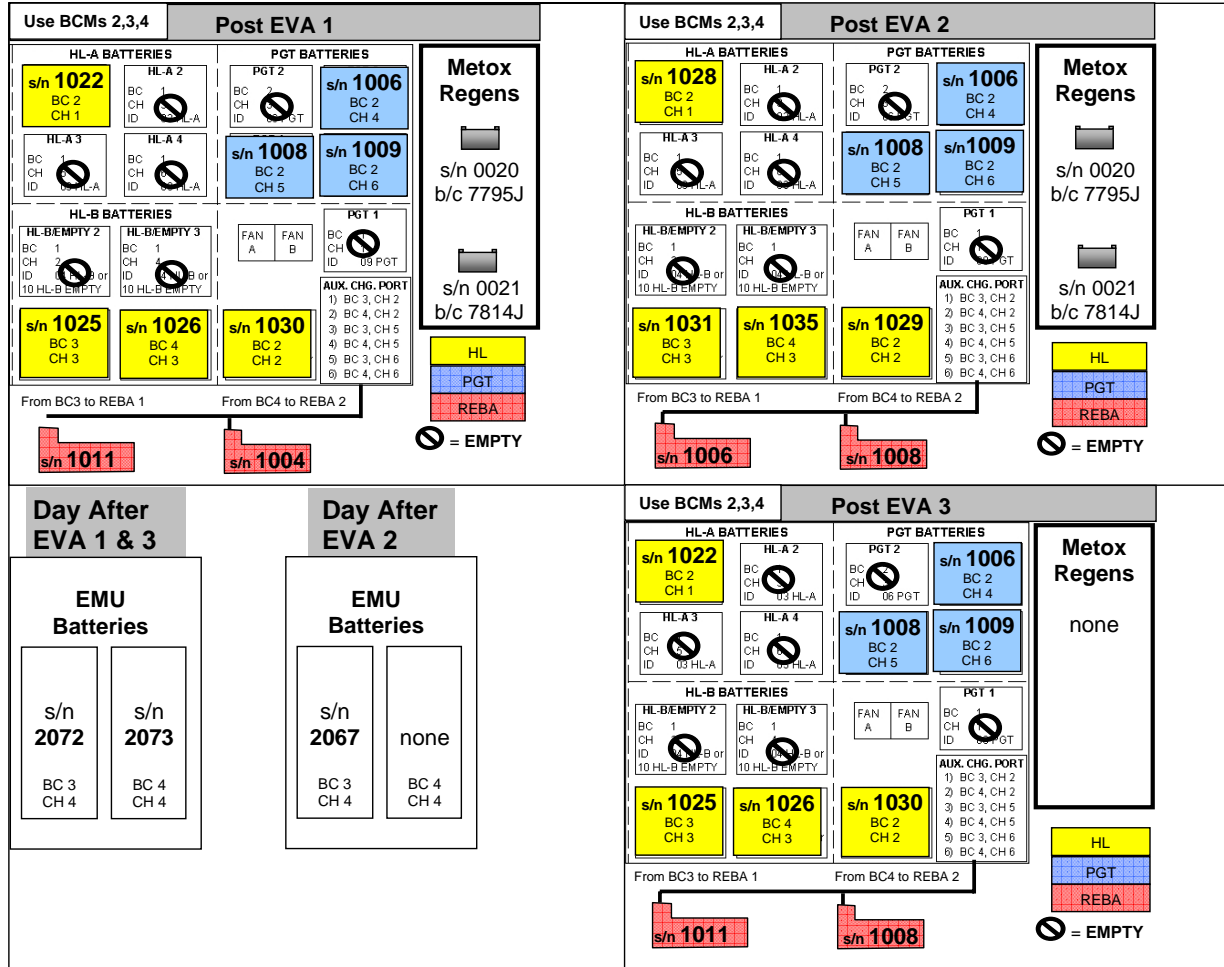
EVA-6a/126/O/A

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TOP  
BACK OF 'CONSUMABLES TRACKING CUE CARD'

HOOK  
VELCRO

BATTERY RECHARGE CUE CARD



EVA-6b/126/O/A

(reduced copy)

FS CC 10-16

EVA/126/FIN

EMU CONTINGENCY PROCS

DISPLAY LOSS DURING POWER TRANSFER (WARM RESTART).....	TEMP FS	12-2
VACUUM H2O RECHARGE (MANNED).....	TEMP FS	12-2
LiOH REPLACEMENT (MANNED).....		12-3
BATTERY REPLACEMENT (MANNED) .....		12-4
WATER DUMP .....		12-6
SCU SWAP (UNMANNED).....		12-7
(MANNED).....		12-7
EMU COLD RESTART (MANNED) .....		12-7
12.1 STS EVA DECONTAMINATION.....		12-8
CONTAMINATION TEST.....		12-15
SAFER BATTERY CHANGEOUT .....		12-18
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (IN-SUIT) .....		12-19
BTA PREP .....		12-19
TREATMENT .....		12-19
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (POST		
SUIT DOFFING).....		12-21
BTA PREP .....		12-21
TREATMENT .....		12-21
EMU RESIZE .....		12-24
STS-126 NOMINAL EMU SIZING .....	FS	12-27
EMU CONTINGENCY RESIZE MATRIX (STS-126/ULF2) .....	FS	12-29
EMERGENCY UNDOCKING EVA TRANSFER CUE CARD.....	FS CC	12-30
EXPEDITED SUIT DOFFING CUE CARD .....	FS CC	12-31
EMU PREP FOR TPS REPAIR .....	FS	12-32

**DISPLAY LOSS DURING POWER TRANSFER (WARM RESTART)**

- DCM If PWR – BATT and SCU connected:  
 AW18H 1. √PWR/BATT CHGR EMU 1(2) BUS SEL – OFF  
 DCM If PWR – SCU:  
 AW18H 2. PWR – BATT  
 3. PWR/BATT CHGR EMU 1(2) BUS SEL – OFF

**WARNING**  
 Fan will be off from steps 4 to 9 during which time CO2 buildup is a concern

**NOTE**

Affected EMU will be without comm after step 6. Steps 6 and 7 should be read together before step 6 is performed

- DCM 4. FAN – OFF (expect **FAN SW OFF** msg, DISP – PRO)  
 IV 5. Inform affected EV crewmember of impending comm loss  
 DCM 6. PWR – SCU (7 sec)  
 7. PWR – BATT  
 When power restart complete:  
 8. √Display – **O2 POS XX**, expect **FAN SW OFF** msg, DISP – PRO  
 9. As reqd, FAN – ON  
 If display blank or locked up:  
 10. Contact MCC  
 If SCU power desired:  
 11. √SCU connected to DCM  
 AW18H 12. PWR/BATT CHGR EMU 1(2) MODE – PWR  
 BUS SEL – MNA(MNB)  
 13. √EMU INPUT 1(2) Volts = 18.0 – 20.0  
 DCM 14. PWR – SCU  
 DCM 15. √Display – **O2 POS XX**

**VACUUM H2O RECHARGE (MANNED)**

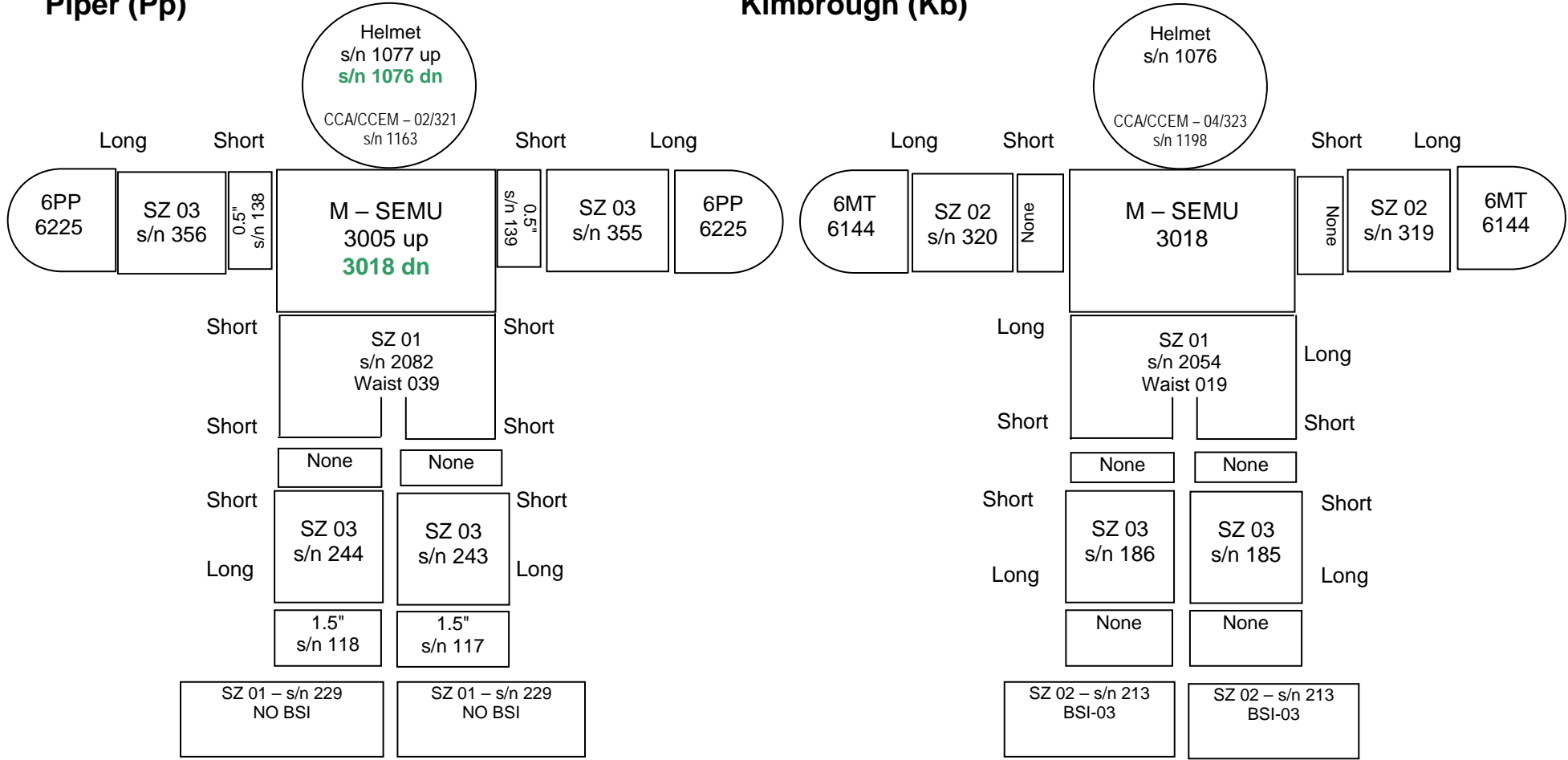
**WARNING**  
 Procedure should be used only if performing a contingency EVA

- EV 1. Perform AIRLOCK INGRESS, Cuff C/L, 30 (Close hatch, partially engage latches)  
 2. √Helmet purge vlv – cl, locked  
 DCM 3. √PURGE vlv – cl (dn)  
 4. √WATER – OFF  
 IV MO13Q 5. √ARLK H2O S/O VLV – OPEN (tb-OP)  
 MD(flr) 6. √EMU O2 ISOL VLV – OP  
 ML86B:C 7. √cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – op  
 AW82B 8. √EV-1(EV-2) O2 vlv – OP  
 EV AW18H 9. PWR/BATT CHGR EMU 1(2) BUS SEL – MNA(MNB)  
 DCM 10. PWR – SCU (fwd), WARN TONE  
 IV R11L If SPLY H2O XOVR VLV closed (tb-CL or bp) (water transfer config):  
 11. SPLY H2O TKA OUTLET – CL (tb-CL)  
 If SPLY H2O XOVR VLV open (tb-OP) (nominal config):  
 L1 12. √RAD CNTLR OUT TEMP – NORM  
 13. √FLASH EVAP CNTLR PRI A,B (two) – OFF  
 ML31C 14. SPLY H2O TKD OUTLET – CL (tb-CL)  
 R11L 15. SPLY H2O TKB OUTLET – CL (tb-CL)  
 √TKA OUTLET – CL (tb-CL)  
 TKC INLET – CL (tb-CL)  
 TKC OUTLET – OP (tb-OP)

# STS-126 NOMINAL EMU SIZING

## Piper (Pp)

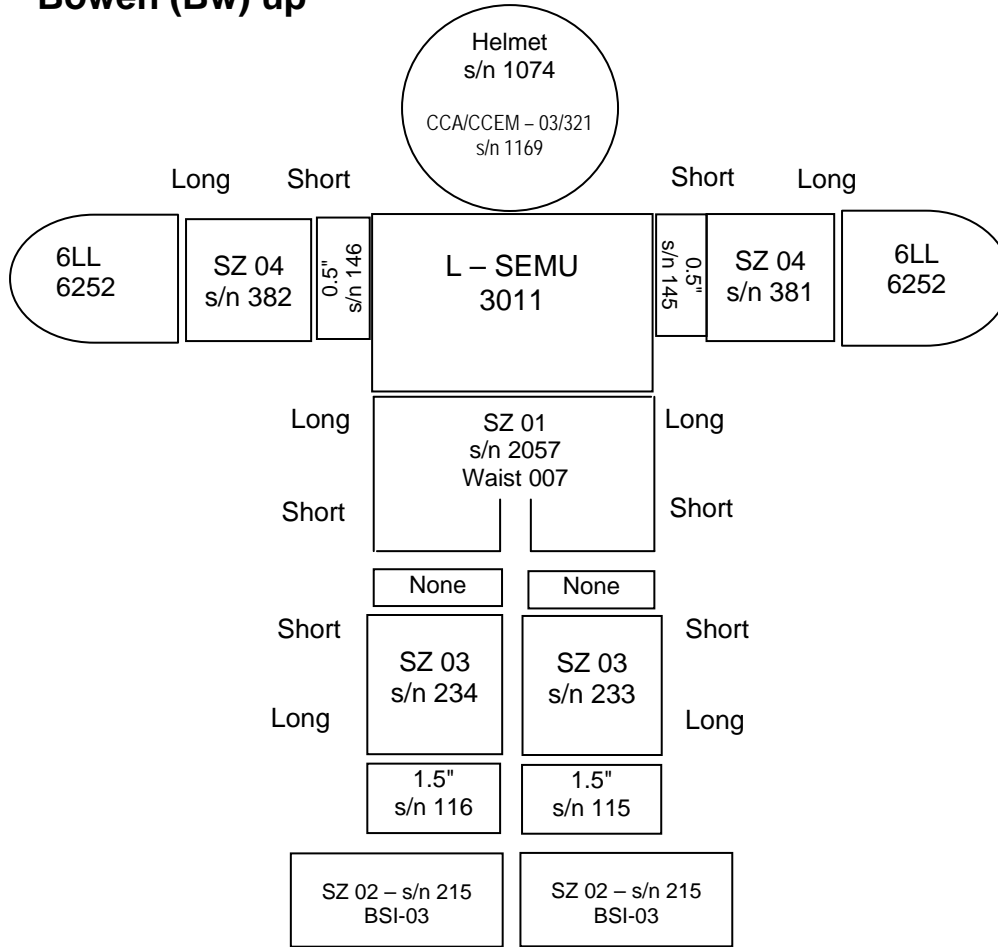
## Kimbrough (Kb)



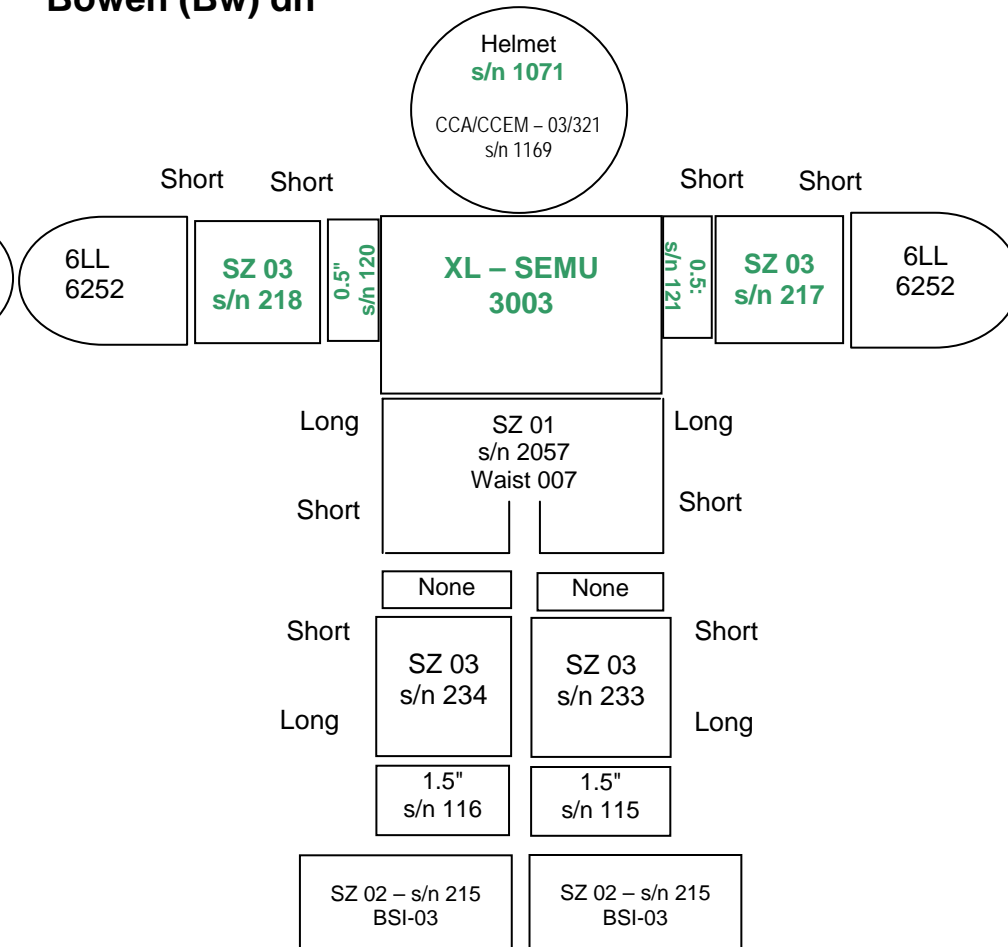
	Croakie	Fresnel Lens	Valsalva	LCVG/BLVD	MAG	TCU Top	TCU Bottom	Comfort Gloves	Socks
<b>Pp</b>	No	None	Val (1) -309	03/04 Thermal Slipper (04)	709	M	M	Silver Bio Flat Pattern	Thermax Sock Liners (2 pair,S)
<b>Kb</b>	No	None	Val (1) -309	05/05	709	M	L	Thick Spectra (M)	Thermax (L)

**STS-126 NOMINAL EMU SIZING (Cont)**

**Bowen (Bw) up**



**Bowen (Bw) dn**



	Croakie	Fresnel Lens	Valsalva	LCVG/BLVD	MAG	TCU Top	TCU Bottom	Comfort Gloves	Socks
<b>Bw</b>	Mod (M)	-009 (2.0 dio)	Val (1) -309	05/05	711	XL	L	Thin Spectra (L)	Tube

## EMU CONTINGENCY RESIZE MATRIX (STS-126/ULF2)

FOR LOSS OF:	EV1 – Piper	EV2 – Bowen	EV3 – Kimbrough
<b>HUT/PLSS</b>	Use EMU 3018, Medium; Resize Kb to EMU 3004, Large 1. Remove rings/ arm assys/ gloves 2. Use primary rings, arms, Pp gloves 3. √Arm red connects to right, √locks, √cams 4. Use primary LTA 5. Swap EMU PLSS identifier stripes, national flag 6. Swap CCA, CCC/Metox, EMU battery, REBA	Use XL HUT ORU (w/ EMU 3011) 1. Remove rings/ arm assys / gloves 2. Use primary rings, arms, Bw gloves 3. √Arm red connects to right, √locks, √cams 4. Use primary LTA 5. Swap EMU PLSS identifier stripes, national flag 6. Swap helmet, CCA, CCC/Metox, EMU battery, REBA	Use EMU3011, Large 1. Remove arm assys / gloves 2. Install 0.5" arm sizing rings 3. Use size 01 arms from ISS s/n 297/298, Kb gloves 4. √Arm red connects to right, √locks 5. Adjust arm cams S/S for prime gloves; S/L for B/U gloves 5. Use primary LTA 6. Swap EMU PLSS identifier stripes, national flag 7. Swap CCA, CCC/Metox, EMU battery, REBA
<b>CCA</b>	Use size 02/321 s/n 1176 Location Pp ECOK	Use size 03/321 CCA s/n 1211 Location Bw ECOK	Use size 04/323 CCA s/n 1209 Location Kb ECOK
<b>Lower Arm Segment</b>	Use size 03 arm s/n 219/220 from ISS. Cams S/L. (red = right, blue = left) 1. √Locks, √cams	Use size 03 arm s/n 219/220 from ISS. Cams S/S. (red = right, blue = left) 1. √Locks, √cams	Use size 02 arm s/n 331/332 from ISS. Cams S/L. (red = right, blue = left) 1. √Locks, √cams
<b>Gloves</b>	Back-up (Pp2): Use 6WS gloves s/n 6236 1. Remove arm sizing rings  Contingency(Pp3): Use 6PP gloves s/n 6177 1. Install arm sizing rings 2. Adjust arm cams to S/S	Back-up (Bw2): Use 6LL gloves s/n 6170 1. Adjust arm cams S/L  Contingency (Bw3): Use 6LL gloves s/n 6171 1. Adjust arm cams S/L	Back-up (Kb2): Use 6MT gloves s/n 6122 1. Install arm sizing ring 2. Adjust arm cams S/S
<b>Waist Brief</b>	Use size 01 waist brief s/n 2084 (002) from ISS. Cams S/S 1. Use Pp prime 03 legs, 1.5" leg rings, and 01 boots 2. √Locks, √cams 3. Swap EMU brief identifier stripes	Use size 01 waist brief s/n 2084 (002) from ISS. Cams L/S 1. Use prime Bw 03 legs/ 1.5" leg rings, and 02 boots/03 BSI 2. √Locks, √cams 3. Swap EMU brief identifier stripes	Use size 01 waist brief s/n 2084 (002) from ISS. Cams L/S 1. Use prime Kb 03 legs and 02 boots/03 BSI 2. √Locks, √cams 3. Swap EMU brief identifier stripes
<b>Leg Segment</b>	Use size 03 leg from ISS s/n 205/206. Cams S/L 1. √Locks, √cams	Use size 03 leg from ISS s/n 205/206. Cams S/L 1. √Locks, √cams	Use size 03 leg from ISS s/n 205/206. Cams S/L 1. √Locks, √cams
<b>Boot</b>	Use size 01 boots s/n 203 from ISS 1. √NO BSI/Toe Cap 2. √Locks	Use size 02 boots s/n 206 from ISS 1. Install BSI -03/Toe Cap 2. √Locks	Use size 02 boots s/n 206 from ISS 1. Install BS-03/Toe Cap 2. √Locks
<b>Sizing Rings</b>	<ul style="list-style-type: none"> <li>• <u>0.5" arm</u>: Use s/n 149, 150, 167, or 168 from ISS</li> <li>• <u>1.5" Leg</u>: Use s/n 129, 130, 141, 142 from ISS</li> </ul>	<ul style="list-style-type: none"> <li>• <u>0.5" arm</u>: Use s/n 149, 150, 167, or 168 from ISS</li> <li>• <u>1.5" Leg</u>: Use s/n 129, 130, 141, 142 from ISS</li> </ul>	<ul style="list-style-type: none"> <li>• <u>0.5" arm</u>: Use s/n 149 or 150 from ISS for b/u gloves only</li> </ul>
<b>LCVG</b>	(03, 04-Therm Slipper) 1. Use s/n 3159 (Pp Backup) 2. Transfer biomed & dosimeter	(05) 1. Use s/n 3187 (Bw Backup) 2. Transfer biomed, dosimeter	(05) 1. Use s/n 3187 (Bw Backup) 2. Transfer biomed, dosimeter

TOP

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## EMERGENCY UNDOCKING EVA TRANSFER

### Critical

- EMUs (3018 & 3003)
  - *Remove: Helmet Lights, TV, REBA, METOX, ISS Tethers and Tools*
- CCAs (Bw & Kb)
- Gloves (Bw & Kb)
- LCVG (Bw & Kb)
- EMU Batteries (2), (s/n 2072 & 2073 desirable)

### Desired

- ECOKS (Pp, Bw, & Kb)
- (1) EMU Servicing Kit
- RETs (RED: 16 eq-eq)
- Adjustable Equipment Tethers (6)
- RETs (RED: 8 Lg-eq, 5 PIP pin)
- PP CCA, Gloves, LCVG
- PP EMU components from M-02
  - R & L Arms, size 03
  - (2) Arm Sizing Rings, ½"
  - (2) Leg Sizing Rings, 1-½"
  - Boots, size 01, no BSI

EVA-5a/126/O/A



HOOK  
VELCRO

**EXPEDITED SUIT DOFFING CUE CARD**

**CAUTION**

Verify EV crew is clear of hatch mechanism

- IV 1. When equalization complete: Open IV Hatch per decal

DOFFING SAFER (5 min)

- SAFER 2. Latch → ENG  
3. Latch ccw until release (~90 deg)  
4. Doff SAFER

SUIT DOFFING (10 min)

- DCM 5. O2 ACT → OFF  
6. PURGE vlv → op (up)  
PLSS 7. sw REBA → OFF (toward left arm of suit)  
8. Engage EMU in EDDA  
PLSS 9. EMU TV Power Cable ←|→ EMU TV  
DCM 10. √STATUS: **SUIT P** < 0.4  
11. Gloves ←|→ EMU  
12. Helmet ←|→ EMU  
DCM 13. sw FAN → OFF  
14. Doff EMU  
15. If taking EMUs to shuttle:  
UIA sw PWR EV-1,2 (two) → OFF  
√PWR EV-1,2 LEDs (four) – Off  
DCM SCU ←|→ DCM  
LTA →|← HUT  
Gloves →|← EMU  
Helmet →|← EMU  
Go to EMERGENCY UNDOCKING EVA TRANSFER Cue Card

EVA-5b/126/O/A

## EMU PREP FOR TPS REPAIR

### O2 ACTUATOR COVER INSTALLATION (5 min)

DCM

1. Unstow O2 Actuator Cover
2. Open two snaps on right side of DCM TMG. (See picture below)
3. Place two holes in O2 Actuator Cover over open snaps
4. Close snaps
5. Velcro cover to self in open position exposing O2 actuator and volume knobs
6. If reqd, repeat steps 1-5 for other EMU

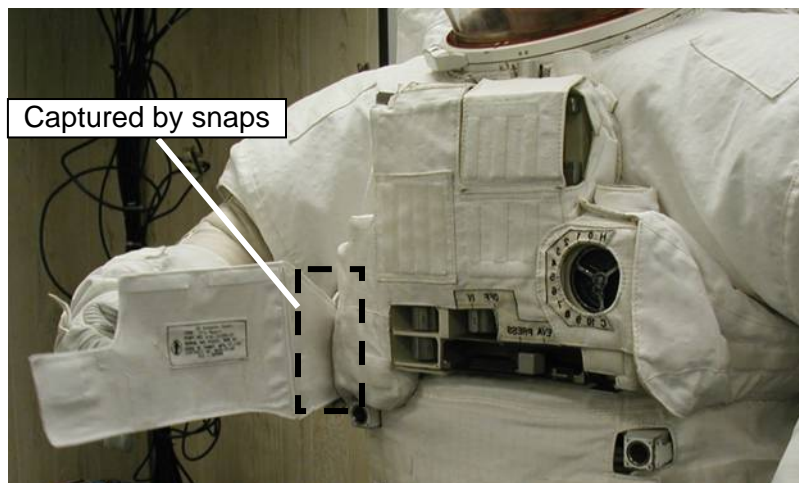


Figure 1 - O2 Actuator Attachment Point

### EMU TV (ERCA) LENSE COVERING INSTALLATION (10 min)

#### NOTE

Repair scenario may require lense covering removal during EVA if IV or MCC determines that visibility for repair verification is degraded

1. Retrieve Teflon squares and Kapton tape from EMU ORU Tool Kit
2. Retrieve scissors from the EMU Servicing Kit
3. Cut Teflon squares to size for covering the ERCA lenses, overlapping by ~1/4"
4. See figure 2. Using Kapton tape, tape down 2 opposite sides of the Teflon squares covering the lenses
5. Fold tape over onto itself to make a handle for removing the coverings while EVA, if necessary



Figure 2 - ERCA lenses covered with Teflon squares and Kapton tape

## TPS REPAIR

The TPS Repair procedures listed below are not published in the hardcopy EVA Flight Supplement. These procedures will be uplinked realtime if they are required.

A PDF and a WORD version of the procedures can be found at:  
<http://mod.jsc.nasa.gov/do3/FDF/FDFBooks/Status%20Sheets/index.html>.

Select the "As Flown" Status sheet for STS-126 and the link to the procedures can be found with the link to the EVA FS. The procedures can also be found on the FDF Books CD provided to the FAO console

<b>BOOM TPS INSPECTION</b>	
BOOM POINT INSPECTION SUMMARY TIMELINE .....	FS 13-3
BOOM POINT INSPECTION TOOL CONFIG.....	FS 13-4
BOOM POINT INSPECTION .....	FS 13-5
BOOM WLE MAPPING SUMMARY TIMELINE .....	FS 13-15
BOOM WLE MAPPING TOOL CONFIG .....	FS 13-17
BOOM WLE MAPPING .....	FS 13-18
EVA WLE MAPPING INSPECTION.....	FS 13-24
<b>BOOM CONTINGENCY</b>	
BOOM FRGF SHAFT RELEASE .....	FS 13-29
BOOM FRGF SHAFT INSTALLATION .....	FS 13-30
BOOM EFGF SHAFT RELEASE .....	FS 13-32
BOOM MPM STOW/DEPLOY.....	FS 13-34
BOOM ASSISTED LATCHING .....	FS 13-35
<b>TILE REPAIR</b>	
EMU PREP FOR TPS REPAIR.....	FS 13-36
POST TPS REPAIR DOFFING .....	FS 13-37
EWA MATERIAL MIXING .....	FS 13-38
EWA REF DATA .....	FS 13-39
EWA TILE REPAIR – DOCKED/ORM SUMMARY TIMELINE .....	FS 13-40
EWA TILE REPAIR – DOCKED/ORM TOOL CONFIG.....	FS 13-41
EWA TILE REPAIR – DOCKED/ORM .....	FS 13-42
SSRMS GAP FILLER REMOVAL SUMMARY TIMELINE .....	FS 13-50
BOOM GAP FILLER REMOVAL SUMMARY TIMELINE .....	FS 13-51
GAP FILLER REMOVAL.....	FS 13-52
<b>RCC REPAIR</b>	
RCC CRACK REPAIR BAG ASSEMBLY.....	FS 13-57
TEMP SENSOR DISASSEMBLY POST-EVA.....	FS 13-60
RCC CRACK REPAIR BAG DISASSEMBLY POST-EVA .....	FS 13-61
TEMPERATURE PROBE ASSEMBLY .....	FS 13-63
CRM APPLICATOR ASSEMBLY .....	FS 13-63
CRM APPLICATOR NOZZLE INSTALLATION (DAY OF EVA).....	FS 13-64
RCC CRACK REPAIR.....	FS 13-65
RCC PLUG TRANSFER BAG ASSEMBLY .....	FS 13-77
<b>NOTES, CAUTIONS, WARNINGS</b>	
EVA TPS INSPECTION/REPAIR INHIBIT PAD.....	FS 13-89
TPS REPAIR CAUTIONS AND WARNINGS .....	FS 13-92
TPS REPAIR NOTES.....	FS 13-93
BOOM OPERATIONAL WARNINGS .....	FS 13-94
BOOM OPERATIONAL NOTES .....	FS 13-95

TPS REF DATA	
PREFERRED EMU POSITIONING FOR TPS REPAIR.....	FS 13-96
EVA TPS REACH AND ACCESS .....	FS 13-97
POINT INSPECTION REACH AND ACCESS WHILE DOCKED.....	FS 13-98
WLE MAPPING INSPECTION WHILE DOCKED .....	FS 13-100
TILE LAYUP .....	FS 13-101
85-FOOT SAFETY TETHER.....	FS 13-102
PFR ATTACHMENT DEVICE (PAD) .....	FS 13-103
WIF EXTENDER .....	FS 13-104
EVA DIGITAL CAMERA.....	FS 13-105
EVA IR CAMERA .....	FS 13-107
OVERLAY TILE REPAIR SYSTEM (OTRS) .....	FS 13-109
OTRS MARKING TEMPLATE AND INSULATION BAGS .....	FS 13-110
AUGER HOUSING.....	FS 13-111
OTRS RELEASED CONFIGURATION .....	FS 13-112
ORU BAG INSERT FOR OTRS .....	FS 13-113
BOOM REF DATA	
RTF BOOM OVERVIEW .....	FS 13-114
BOOM TRANSITIONS WITH MLI .....	FS 13-115
BOOM BASE END AND MODIFIED EFGF .....	FS 13-116
BOOM BASE END EFGF ADAPTER PLATE .....	FS 13-117
EVA-ASSISTED EFGF CONNECTOR DEMATE .....	FS 13-118
BOOM BASE END SADDLE AND MPM.....	FS 13-119
BOOM MID SECTION AND MODIFIED FRGF.....	FS 13-120
BOOM MID SECTION FRGF ADAPTER PLATE.....	FS 13-121
BOOM TIP END AND SENSORS .....	FS 13-122
BOOM SENSOR DETAILS .....	FS 13-124
SENSOR PACKAGE 1 (SP1): LDRI/ITVC .....	FS 13-126
SENSOR PACKAGE 2 (SP2): LCS.....	FS 13-128
POSSIBLE PRD ROUTING FOR EVA ASSISTED LATCHING	
OF BOOM IN MPMS.....	FS 13-130
BOOM CONTINGENCIES .....	FS 13-131
GRAPPLE SHAFTS .....	FS 13-132
PDGF GRAPPLE SHAFT COVER.....	FS 13-133
BOOM FRGF FSE.....	FS 13-134

UNSCHEDULED/CONTINGENCY EVA TASKS

I

ULF2 WORKAROUNDS CRIBSHEET .....	FS 16-3
EFBM CONTINGENCY CHECKOUT INHIBIT PAD .....	FS 16-22
EFBM CONTINGENCY CHECKOUT .....	FS 16-23
RELEASE ROEU LATCHES .....	FS 16-30
LATCH ROEU LATCHES .....	FS 16-33
STOW ROEU ARM.....	FS 16-36
MATE ROEU ARM.....	FS 16-39
ROEU OVERVIEW .....	FS 16-41
DLA REMOVE AND REPLACE .....	FS 16-42
RJMC REMOVE AND REPLACE .....	FS 16-50
GENERIC EVA INHIBIT PAD .....	FS 16-51
GENERIC NOTES, CAUTIONS, AND WARNINGS .....	FS 16-55

UNSCH/CONT  
EVA TASKS

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## ULF2 WORKAROUNDS CRIBSHEET

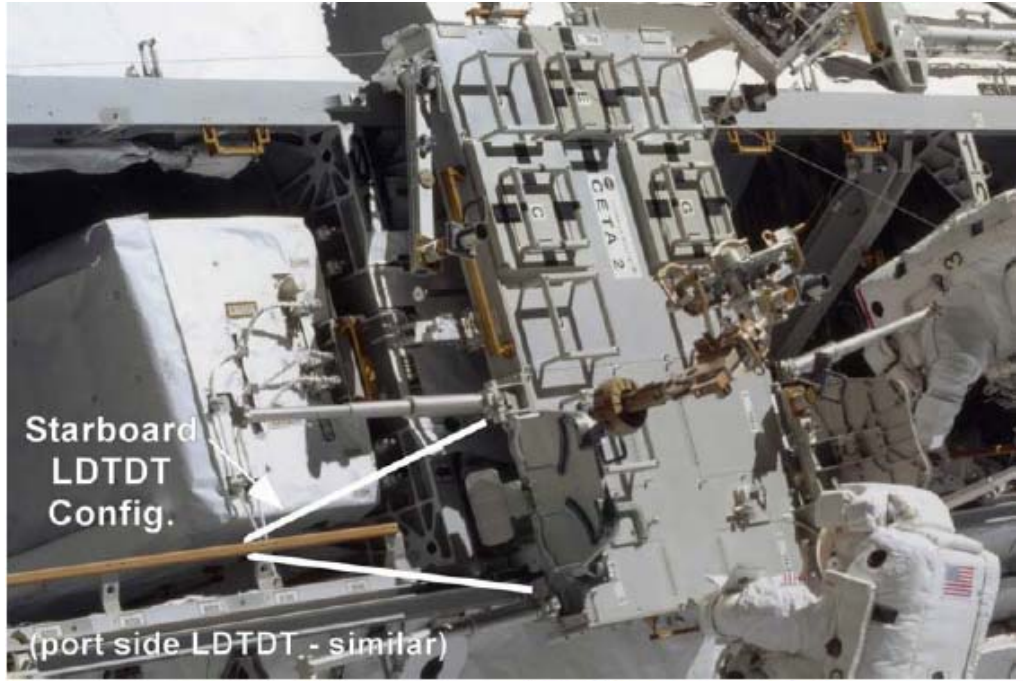


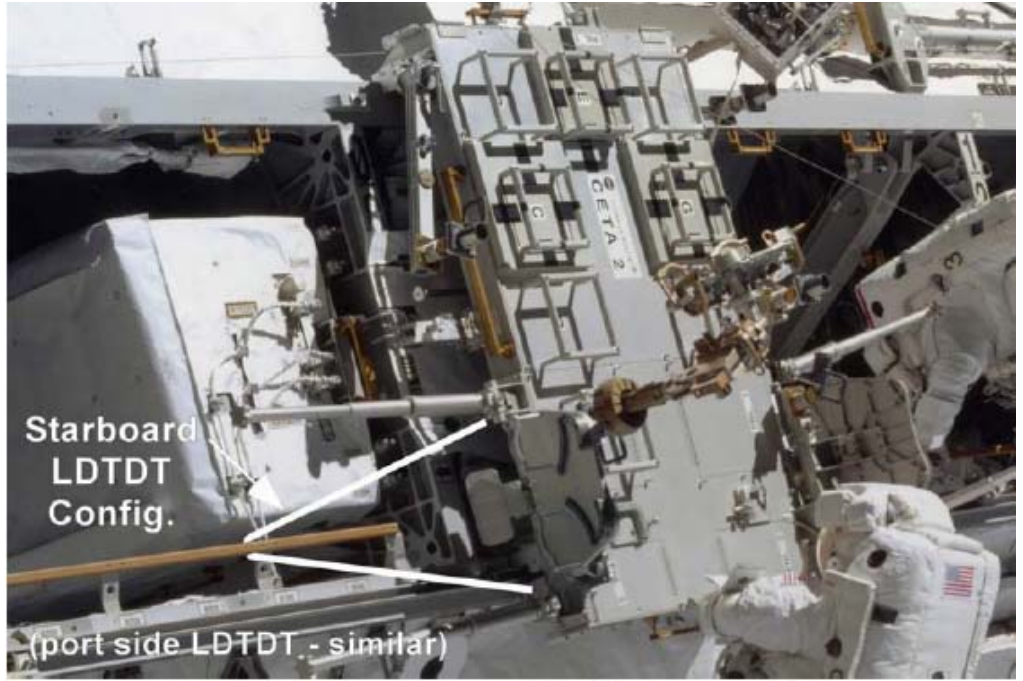


TASK	FAILURE	ACTION
I. ULF2	<b>APFR</b>	
	A. APFR fails to install into WIF	<ol style="list-style-type: none"> <li>1. Verify APFR collar in install position (black-on-black)</li> <li>2. Check for FOD in WIF or structural interference</li> <li>3. Attempt APFR install in alternate clocking</li> <li>4. If no joy, attempt APFR install in alternate WIF</li> <li>5. If no joy, APFR failure                             <ul style="list-style-type: none"> <li>– Use another APFR</li> </ul> </li> </ol>
	B. Joint fails to actuate	<ol style="list-style-type: none"> <li>1. Verify no load is applied to joint and/or jiggle APFR joint while actuating knob                             <ul style="list-style-type: none"> <li>– For pitch joint, push knob in during rotation (Class I pitch joints known to be stiff)</li> </ul> </li> <li>2. Increase force applied in order to free joint</li> </ol>
	C. Boot becomes stuck in APFR boot plate	<ol style="list-style-type: none"> <li>1. Have other EV crewmember assist with getting boot out</li> <li>2. Loosen 7/16-in EVA bolts (3) on heel clip using EVA ratchet or PGT: <b>PGT: [B1 (12.0), CCW2, 30.5], 7/16 - 6-ext</b></li> <li>3. Remove 7/16-in EVA bolts (3 - captive) on heel clip (non captive) using EVA ratchet or PGT: <b>PGT: [B1 (12.0), CCW2, 30.5], 7/16 - 6-ext</b> 5 turns</li> </ol>
	<b>BRT</b>	
	A. BRT jaws fail to release	<ol style="list-style-type: none"> <li>1. Loosen rigidizing collar to relieve sideloads</li> <li>2. Shake BRT while depressing paddles to alleviate sideloads from handrail</li> <li>3. Detach BRT from suit and tether to structure</li> </ol>
	<b>CETA Cart</b>	
	A. Wheel bogie fails to release from truss	<ol style="list-style-type: none"> <li>1. Verify brakes are fully released</li> <li>2. Ensure trigger is being depressed while attempting to rotate handle</li> <li>3. On MCC-H GO: Perform {6.100.125 CETA Cart Wheel Bogie R&amp;R}                             <ul style="list-style-type: none"> <li>– There is no spare wheel bogie on-orbit, so after the CETA cart is relocated the failed wheel bogie will be reinstalled</li> </ul> </li> </ol>
	B. Wheel bogie fails to install on truss	There is no spare wheel bogie on-orbit. 3 of 4 bogies are required. Real time call on whether MT couple or CETA cart tiedown required. For tiedown see block G
	C. Parking brake fails to engage	<ol style="list-style-type: none"> <li>1. Use parking brake handle on other side of CETA cart</li> <li>2. Couple CETA cart to MT and utilize other WIF if possible</li> </ol>
	D. Parking brake fails to disengage	<ol style="list-style-type: none"> <li>1. Hold pedal down for brake release</li> <li>2. Use pedal on other side of CETA cart to release parking brake</li> </ol>
	E. Dynamic brake fails to engage	Limit translation rates to allow manual stopping
	F. CETA active coupler fails to capture or lock	<ol style="list-style-type: none"> <li>1. Cycle active coupler</li> <li>2. Swap active coupler from MT with failed active coupler on CETA Cart</li> <li>3. On MCC-H GO: Tiedown CETA cart. See block G</li> </ol>

## ULF2 WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	G. CETA cart tiedown	<p>On MCC-H GO: Perform the following tiedown procedure (see figure 1)</p> <ol style="list-style-type: none"> <li>a. Translate CETA cart to P3 location (not over truss segment joint)</li> <li>b. Engage parking brake</li> <li>c. Retrieve 2 Long Duration TieDown (LDTD) tethers from Airlock Staging Bag or P6 AUX Bag (fwd face of Z1)</li> <li>d. Route 1 LDTD tether on stbd side of CETA cart as follows:               <ol style="list-style-type: none"> <li>(1) Attach 1 hook to zenith brake handle support tether point</li> <li>(2) Loop tether strap around CETA rail HR standoff</li> <li>(3) Attach second hook to nadir brake handle support tether point</li> <li>(4) Lightly cinch tether and close buckle</li> <li>(5) Close MLI flap over buckle and any excess strap</li> </ol> </li> <li>e. Repeat on port side of CETA cart</li> </ol>
	H. Coupler knob fails to unlock	<ol style="list-style-type: none"> <li>1. On MCC-H GO: Release active coupler by removing wireties (2) (reinstall of wireties not required) and PIP pins (2)</li> <li>2. On MCC-H GO: Release passive coupler via EVA bolt:           <p><b>PGT: [B7 (25.5), CCW2, 30.5], 7/16 - 6-ext</b>  <b>TBD turns</b>            – Bolt is attached by lanyard</p> </li> </ol>



# ULF2 WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	 <p>Starboard LDTDT Config. (port side LDTDT - similar)</p>  	   <p>Figure 1 - CETA Cart Tie-down</p>
<b>EVA Wrench (Torque &amp; Ratchet)</b>		
A. Ratchet teeth slip		Ratchet to new set of teeth and reapply torque
B. Wrench does not ratchet		Hold the ratchet selector and socket in opposite hands and rotate in opposite directions
<b>Fluid QD Ops</b>		
<p style="text-align: center;"><b>NOTE</b></p> <p>The following cribsheet steps apply to 1/4 in QDs only. If troubleshooting requires the crew to leave the worksite, verify that female QDs are covered to prevent exposure to direct sunlight. For thermal clocks refer to flight rules</p>		

## ULF2 WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	<b>Mating Ops</b>	
	A. QD fails to mate	<ol style="list-style-type: none"> <li>1. Check for debris, damage, or crystals</li> <li>2. Verify release ring is retracted (Fwd white band is not visible)</li> <li>3. Check alignment and verify no side loads</li> </ol>
	B. Release ring snap back test fails	<ol style="list-style-type: none"> <li>1. Push release ring forward. (Release ring will not slide fwd if QD is in FID)</li> <li>2. QD is in FID; demate QD, verify fwd white band not visible, and remate QD</li> </ol>
	C. Gap check fails (visual or FID gauge)	Retract release ring, demate QD, verify fwd white band not visible, and remate QD
	<b>Valve Ops</b>	
	D. Detent button is partially unthreaded	Rethread detent button <ol style="list-style-type: none"> <li>a. Load bail handle (button will free spin if not loaded)               <ul style="list-style-type: none"> <li>– If valve is open, pull bail handle aft</li> <li>– If valve is closed, push bail handle fwd</li> </ul> </li> <li>b. Rotate button CW (8 turns max)</li> </ol>
	E. Detent button is missing <u>NOTE</u> Detent button is only required for BDT ops and 1 in SPD ops	<ol style="list-style-type: none"> <li>1. Use equipment hook to depress detent button shaft</li> <li>2. Use tether strap around gloved finger to depress detent button shaft</li> <li>3. Retrieve and use Beta Gimbal Antirotation Latch Tool to depress detent button shaft</li> </ol>
	F. Bail fails to travel fwd	Check for debris, damage, or crystals
	G. Bail fails to travel to full fwd (valve open) position (button does not pop up)	<ol style="list-style-type: none"> <li>1. Neutralize sideloads</li> <li>2. Apply greater opening force to QD bail handle</li> </ol>
	H. Detent button fails to depress during valve closing  <div style="border: 2px solid black; padding: 5px; width: fit-content;"> <p style="text-align: center;"><b>WARNING</b></p> <p>Bail may kick back and contact crew when button is depressed if a leaking primary seal allowed pressure build-up in spring cavity</p> </div>	<ol style="list-style-type: none"> <li>1. Push and hold bail handle fwd (to open) with significant force to relieve load on button while simultaneously depressing the detent button               <ul style="list-style-type: none"> <li>– If button depresses, vent by pulling bail aft until release ring covers aft white band</li> <li>– Push bail fwd to valve open and check button depresses</li> </ul> </li> <li>2. On MCC-H GO: Retrieve and install QD button depress tool (BDT)</li> </ol>
	I. Bail fails to travel to full aft (valve closed) position (button does not pop up)	<ol style="list-style-type: none"> <li>1. Inspect QD for retaining wire protrusion</li> <li>2. Neutralize possible side loading</li> <li>3. Depress button and increase force on bail</li> </ol>
	<b>Demating Ops</b>	
	J. Female QD fails to demate	<ol style="list-style-type: none"> <li>1. Verify release ring is fully retracted while attempting to demate</li> <li>2. Verify TA or P clamps are released</li> <li>3. Verify detent button is up</li> <li>4. Neutralize sideloads or manipulate flexhose to relieve mating forces on female QD</li> <li>5. Apply greater force to release ring and female QD</li> </ol>
	K. Thermal bootie fails to remain securely closed	Install wire tie around bootie to keep QD fully covered

## ULF2 WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	L. Cap will not demate	<ol style="list-style-type: none"> <li>1. Verify pulling out on cap before rotating to ensure locking tab is disengaged</li> <li>2. Wait for day pass if possible and reattempt cap removal</li> <li>3. If force is too great for hand actuation or crystals visible around the QD, male may be leaking; notify MCC-H <ul style="list-style-type: none"> <li>– Prepare for quick mate on MCC-H GO</li> </ul> </li> <li>4. Retrieve QD cap tool (either QD Bag on Airlock) <ul style="list-style-type: none"> <li>– Use QD cap tool to turn stuck cap a maximum of 2 turns (cap vents at ~ 2 turns). Finish removal of cap by hand (~ 1 additional turn)</li> </ul> </li> </ol>
	<b>Leaks</b>	
	M. Mated QD leaks in valve open position (bail fwd)	Close valve (bail aft)
	N. Male QD leaks after cap removal	Reinstall cap; notify MCC-H <ul style="list-style-type: none"> <li>– Prepare for quick QD mate on MCC-H GO</li> </ul>
	O. Female QD leaks during or after bail actuation to fwd position (valve open)	<ol style="list-style-type: none"> <li>1. Return bail to aft position (valve closed)</li> <li>2. Perform release ring snap back test <ul style="list-style-type: none"> <li>– If FID is observed, demate and remate QD</li> <li>– If no FID, neutralize sideloads and push bail to fwd position (valve open)</li> </ul> </li> </ol>
	P. Female QD leaks after demate	Fully mate to destination male as quickly as possible
	Q. Male QD leaks after demate (male sleeve may be visibly stuck open)	<ol style="list-style-type: none"> <li>1. Remate female QD and cycle QD valve <ol style="list-style-type: none"> <li>a. Depress button and use significant force to push bail forward; release button (valve open)</li> <li>b. With QD in open position (bail fwd) apply significant force to aft end of the female QD in back and forth, up and down directions</li> <li>c. Depress button and pull bail aft; release button (valve close)</li> <li>d. Demate QD and inspect</li> </ol> </li> <li>2. If applicable, close valve of appropriate QD in flowpath, verify detent button is up, and fwd white line is visible</li> <li>3. Install cap</li> </ol>
	R. Leak detected by MCC-H after valve ops to close position (possible male sleeve stuck open)	<ol style="list-style-type: none"> <li>1. Cycle QD valve <ol style="list-style-type: none"> <li>a. Depress button and use significant force to push bail forward; release button (valve open)</li> <li>b. With QD in valve open (bail fwd) position apply significant force to aft end of the female QD in back and forth, up and down directions</li> <li>c. Depress button and pull bail aft; release button (valve close)</li> <li>d. Demate QD and inspect</li> </ol> </li> <li>2. If applicable, close valve of appropriate QD in flowpath, verify detent button is up, and fwd white line is visible</li> </ol>
	S. Frozen NH3 present on female or male QD	<ol style="list-style-type: none"> <li>1. Leave QD exposed to vacuum; wait maximum of 5 min for sublimation (check periodically)</li> <li>2. On MCC-H GO: Continue QD ops</li> </ol>

## ULF2 WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	<p><b>QD Blocks</b></p>	<div data-bbox="529 247 1273 705" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p><b><u>MATE QD</u></b></p> <ol style="list-style-type: none"> <li>1. Remove QD caps as required</li> <li>2. Inspect male and female QD for debris or damage</li> <li>3. Verify female QD ready to mate               <ul style="list-style-type: none"> <li>√Detent button – up</li> <li>√Fwd white band – not visible</li> </ul> </li> <li>4. Assess side load potential prior to mate</li> <li>5. Mate QD               <ul style="list-style-type: none"> <li>√Fwd white band – visible</li> </ul> </li> <li>6. Perform snapback test               <ul style="list-style-type: none"> <li>√Fwd white band visible</li> </ul> </li> <li>7. Perform pull test (Stay clear of button and release ring)</li> <li>8. Perform visual gap test               <ul style="list-style-type: none"> <li>√For FID</li> </ul> </li> </ol> </div> <div data-bbox="529 751 1273 974" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p><b><u>Open Valve</u></b></p> <ol style="list-style-type: none"> <li>1. Assess side loads</li> <li>2. Depress detent button</li> <li>3. Push bail to forward position</li> <li>4. √Aft white band visible</li> <li>5. √Detent button – up</li> </ol> </div> <div data-bbox="529 1020 1273 1608" style="border: 1px solid black; padding: 5px;"> <p><b><u>Close Valve, Demate QD</u></b></p> <ol style="list-style-type: none"> <li>1. √Aft white band visible</li> <li>2. √Detent button fully installed</li> <li>3. √Detent button up</li> <li>4. √Detent button can be depressed</li> <li>5. Assess side loads prior to bail movement</li> <li>6. Push bail toward open position with significant force while depressing detent button (unstick male sleeve seals)</li> <li>7. Depress detent button, move bail aft (close valve)</li> <li>8. √Fwd white band visible</li> <li>9. √Detent button up</li> <li>10. Assess side loads prior to demate</li> <li>11. Pull back on release ring and demate QD</li> <li>12. √Release ring – retracted (FWD white band not visible)</li> <li>13. Inspect male and female QD for debris, damage, or anomalous conditions (ammonia crystals)</li> <li>14. Install QD caps as required; verify lock tab engaged</li> </ol> </div>

## ULF2 WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	<b>FRAM</b>	
	A. Active FRAM fails to seat on passive FRAM	<ol style="list-style-type: none"> <li>1. Check for FOD in mechanism</li> <li>2. Check alignment. (Engage 2 forward shear pins first to ensure connector door is not jamming)</li> </ol>
	B. Primary FRAM bolt fails to release	<ol style="list-style-type: none"> <li>1. Confirm socket fully engaged to release anti-rotation mechanism</li> <li>2. Increase PGT setting: <b>PGT: [B2 (16.0), CCW2, 30.5], 7/16 - 6-ext</b> 1 turn only to break torque; reset PGT to <b>A4 (6.3)</b> for full run-out of bolt</li> <li>3. On MCC-H GO: Increase PGT setting: <b>PGT: [B4 (19.4), CCW2, 30.5], 7/16 - 6-ext</b> 1 turn only to break torque; reset PGT to <b>A4 (6.3)</b> for full run-out of bolt</li> <li>4. If no joy, engage contingency locking pins (4) to secure active FRAM to passive FRAM (see block C)</li> </ol>
	C. Primary FRAM bolt fails to engage	<ol style="list-style-type: none"> <li>1. Verify FRAM seated</li> <li>2. Check for FOD</li> <li>3. Back out primary bolt fully: <b>PGT: [A7 (9.2), CCW2, 30.5], 7/16 - 6-ext</b> And reattempt engagement <b>PGT: [A7 (9.2), CW2, 30.5], 7/16 - 6-ext</b></li> <li>4. Increase PGT setting: <b>PGT: [B2 (16.0), CW2, 30.5], 7/16 - 6-ext</b></li> <li>5. On MCC-H GO: Increase PGT setting: <b>PGT: [B4 (19.4), CW2, 30.5], 7/16 - 6-ext</b></li> <li>6. Consider hold for thermal stabilization between active and passive FRAM</li> <li>7. Engage contingency locking pins: <ul style="list-style-type: none"> <li><b>NOTE</b></li> <li>4 of 4 contingency pins required for PLB LMC; 3 of 4 contingency pins required for ESP-3</li> <li>– Front pins (all FRAMs) <b>PGT: [A4 (6.3), CW2, 30.5], 7/16 - 6-ext</b> 14.11 – (1.25 * Turns on Primary Bolt) turns</li> <li><b>NOTE</b></li> <li>Aft contingency pins can only be installed if the primary bolt turn count is 6.5 turns or less. With greater than 6.5 turns on the primary bolt, the contingency pins are not needed and, in some cases where the primary bolt is mostly installed, cannot be installed</li> <li>– Aft pins for ESP3 FRAMs <ul style="list-style-type: none"> <li>– Remove bolt from STOW location and engage in INSTALL location</li> <li>– Manually turn bolt as far as possible</li> <li>– <b>PGT: [B1 (12.0), CW2, 30.5], 7/16 - 6-ext</b> 16.858 – (1.25 * Turns on Primary Bolt) turns</li> </ul> </li> <li>– Aft pins for LMC FRAMs <ul style="list-style-type: none"> <li>– Prep CPK by disengaging J-hook on locking mechanism and fully seating J-hook in unlock position</li> <li>– Slide T-handle until contingency pin contacts primary FRAM pin (# on locking mechanism counter = # of turns on primary FRAM bolt)</li> <li>– Disengage J-hook from unlock position. J-hook is spring loaded and will “pop” into place if not precisely aligned with numbered slot. Fully seat J-hook in lock position</li> </ul> </li> </ul> </li> </ol>

## ULF2 WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	<b>MWS</b>	
	A. MWS EE is sticky	Known problem. Report degree of stickiness to MCC-H and any noted correlation with thermal environment. Post EVA, report s/n of affected unit (s/n located on "stem" of T-bar)
	B. MWS EE cord fails to retract	<ol style="list-style-type: none"> <li>1. Verify MWS EE tether lock in unlock position</li> <li>2. Cycle MWS EE tether lock</li> <li>3. Check tether reel opening for FOD</li> <li>4. Pull out small amount of tether and allow reel to retract while holding light tension on the tether</li> </ol>
	C. MWS T-bar fails to pivot	<ol style="list-style-type: none"> <li>1. Check sideloads on T-bar while depressing button</li> <li>2. Slip T-bar clutch (40-60 lb force required)</li> </ol>
	<b>NZGL Connectors</b>	
	A. Bail bar fails to slide over-center	<ol style="list-style-type: none"> <li>1. Inspect bail for FOD</li> <li>2. Inspect bail linkage for damage and report to MCC-H</li> <li>3. Check alignment and sideloads</li> <li>4. Verify sufficient TA-clamps are open</li> <li>5. Increase force on bail</li> <li>6. Attach 2 hooks from adj tether to connector bail and use adj strap to pull bail into demated position</li> <li>7. On MCC-H GO: Retrieve vise grips to help increase force on bail</li> </ol>
	B. Backshell fails to slide (after over-center mechanism has been overcome)	<ol style="list-style-type: none"> <li>1. Verify sufficient TA-clamps are open</li> <li>2. Check for cable harness and hardware interference</li> <li>3. Check alignment and sideloads</li> <li>4. Inspect bail and connector for FOD</li> <li>5. Inspect bail linkage for damage and report to MCC-H</li> <li>6. Wiggle/jiggle connector while pushing or pulling on backshell</li> <li>7. Attach 2 hooks from adj tether to connector bail and use adj strap to pull bail into demated position</li> <li>8. On MCC-H GO: Retrieve vise grips to help increase force on bail</li> </ol>
	C. Connector fails to release from soft dock	<ol style="list-style-type: none"> <li>1. Verify bail fully thrown, undamaged, and backshell fully aft</li> <li>2. If backshell springs forward, pull and hold in fully aft position (will have to overcome spring force, approx 5-10 lb) while attempting to demate connector</li> <li>3. Verify sufficient TA-clamps are open</li> <li>4. Check for cable harness and hardware interference</li> <li>5. Check alignment and sideloads</li> <li>6. Relieve compression on connector interface due to cable loads by pulling backshell away from jack</li> <li>7. Push the plug towards the jack to compress the soft dock</li> <li>8. Wiggle/jiggle connector (Use slight rolling motion)</li> </ol>

## ULF2 WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	D. Connector fails to soft dock	<ol style="list-style-type: none"> <li>1. Verify correct plug and jack</li> <li>2. Verify bail fully aft</li> <li>3. Verify backshell fully aft and remains fully aft. If backshell not fully aft, pull and hold in fully aft position while attempting to soft dock connector</li> <li>4. Inspect the following:               <ul style="list-style-type: none"> <li>– O-ring seal</li> <li>– FOD</li> <li>– Bend radius</li> <li>– Soft dock springs</li> <li>– Connector keying feature</li> </ul> </li> <li>5. Verify alignment (avoid excessive rolling or rocking the plug as this could unseat soft dock springs)               <ul style="list-style-type: none"> <li>– Connector should snap into soft dock with little force once half shells are aligned</li> </ul> </li> </ol>
	E. Connector fails to mate	<ol style="list-style-type: none"> <li>1. Verify half-shells are fully seated on both sides</li> <li>2. Verify cable and backshell free to move (no clamps)</li> <li>3. Push forward on connector backshell while actuating bail</li> <li>4. Detach from soft dock and inspect:               <ul style="list-style-type: none"> <li>– Pins</li> <li>– FOD</li> <li>– EMI band</li> <li>– Bend radius</li> <li>– TA clamps</li> <li>– P clamps</li> <li>– Bail linkages and rivets</li> <li>– Soft dock springs</li> <li>– O-ring seal and main joint gasket</li> <li>– Connector keying feature</li> </ul> </li> <li>5. Cycle bail while disconnected (push forward on connector backshell for additional leverage)</li> </ol>
	F. Connector pin bent	<ol style="list-style-type: none"> <li>1. Rotate connector to bail up position and describe pin location and condition               <ul style="list-style-type: none"> <li>– Obtain WVS view of interface if possible</li> </ul> </li> <li>2. On MCC-H GO: For 16, 20, or 22 gauge pins only, retrieve pin straightener and attempt pin repair</li> <li>3. On MCC-H GO: Retrieve needle nose pliers and attempt pin repair               <ul style="list-style-type: none"> <li>– MCC-H will verify pin size prior to retrieving tools</li> </ul> </li> <li>4. Inspect plug and jack prior to re-mating</li> </ol>
	G. Connector FOD	<ol style="list-style-type: none"> <li>1. On MCC-H GO: Retrieve connector cleaner tool               <p style="text-align: center;"><b>NOTE</b></p> <p>One N2 cartridge is already captured in the tool (the other is lanyarded inside the caddy). In order to puncture the cartridge, it must be threaded into the tool until the indicator line passes out of sight under the collar of the tool</p> <p>Puncture connector cleaner cartridge only when ready to perform actual cleaning.</p> <p>Use entire N2 cartridge prior to reentering airlock</p> </li> <li>2. Attempt cleaning</li> </ol>

## ULF2 WORKAROUNDS CRIBSHEET (Cont)

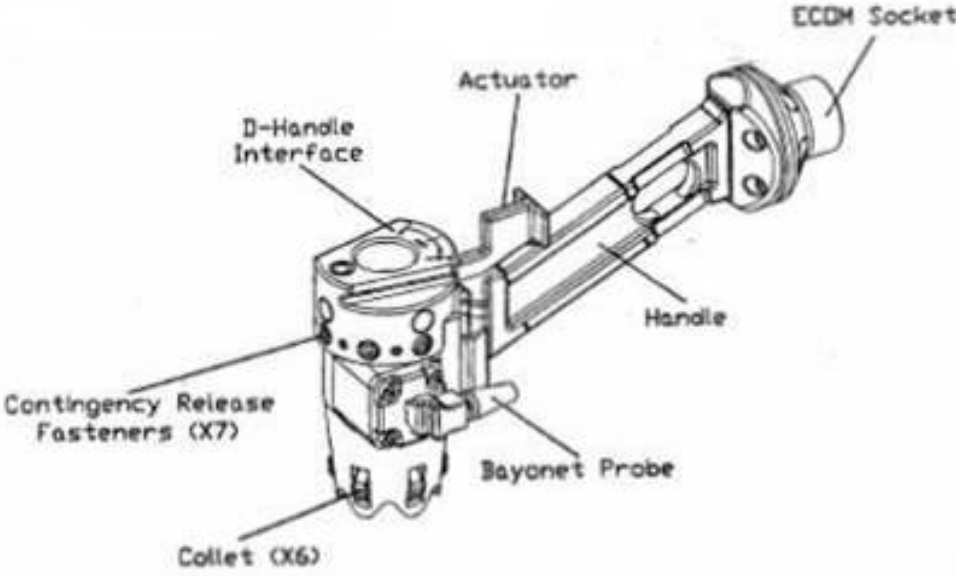
TASK	FAILURE	ACTION
	H. Connector EMI band bent	On MCC-H GO: Retrieve needle nose pliers or forceps to remove band – Bail may need to be pushed forward while demated to expose EMI band for removal
	I. Connector bail linkage failure	1. On MCC-H GO: Re-attempt connector mate/demate with broken bail – Impart load through undamaged side of bail linkage – Assist bail motion with hand on backshell once bail linkage has passed over-center – May take multiple pushes on the bail to mate/demate connector 2. Tether hook or vise grips may be used for additional leverage
	J. Connector soft dock spring bent	On MCC-H GO: Retrieve needle nose pliers and remove bent spring
	K. Connector O-ring or main joint gasket seal loose (seal and O-ring required in 1-G only)	1. Remove seal with tether hook 2. On MCC-H GO: Retrieve additional tools to remove seal (i.e., wire tie, needle nose pliers, probe, loop pin puller)
	L. Connector cap (twist) will not release	1. Increase force 2. Use tether hook for additional leverage
<b>PGT</b>		
	A. No LEDs	1. Perform LED test 2. Use display torque
	B. LEDs and torque messages do not agree	Use torque message and notify MCC-H
	C. Mode switch breaks	Retrieve spare PGT
<b>LCD Messages</b>		
	D. BATTERY HITEMP	1. Power off PGT 2. If alternate battery available; change battery 3. Retrieve spare PGT 4. Switch to ratchet mode
	E. BATTERY LOTEMP (blinking)	1. Drive tool with no load to increase battery temperature 2. If alternate battery available; power off and change battery 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	F. BATTERY LOVOLT (blinking)	1. Continue using tool until unable to deliver sufficient torque 2. Retrieve spare PGT 3. Power off and switch to ratchet mode
	G. CAL FAILED	1. Press, release trigger to repeat calibration 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	H. COLLAR ERROR	1. Cycle torque and speed collars to clear error 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	I. COMPAR ERROR	1. Cycle torque collar and A/B mode switch 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode



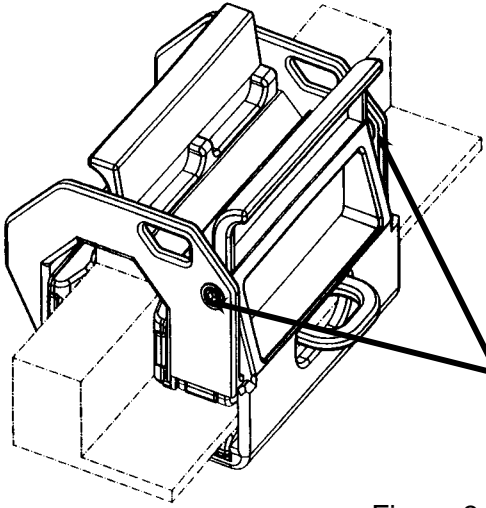
## ULF2 WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	J. EEPROM WR ERR (blinking) HYBRID HITEMP OVER CURR SLFTST FAIL X	<ol style="list-style-type: none"> <li>1. Power cycle and calibrate</li> <li>2. Retrieve spare PGT</li> <li>3. Power off and switch to ratchet mode</li> </ol>
	K. HI TORQ	<ol style="list-style-type: none"> <li>1. Contact MCC-H and report torque (Real time engineering assessment required)</li> <li>2. Power cycle and calibrate</li> <li>3. Retrieve spare PGT</li> <li>4. Power off and switch to ratchet mode</li> </ol>
	L. HICURR	<ol style="list-style-type: none"> <li>1. Reattempt operation – Can be caused by excessive rotation of the PGT body while torquing</li> <li>2. Power cycle and calibrate</li> <li>3. Retrieve spare PGT</li> <li>4. Power off and switch to ratchet mode</li> </ol>
	M. LO TORQ (Expected during bolt release)	<ol style="list-style-type: none"> <li>1. Reattempt operation until desired torque is reached</li> <li>2. Power cycle and calibrate</li> <li>3. Retrieve spare PGT</li> <li>4. Power off and switch to ratchet mode</li> </ol>
	N. LOCURR	<ol style="list-style-type: none"> <li>1. Reattempt operation</li> <li>2. Power cycle and calibrate</li> <li>3. Retrieve spare PGT</li> <li>4. Power off and switch to ratchet mode</li> </ol>
	O. LOG IS FULL (blinking)	<ol style="list-style-type: none"> <li>1. Cycle torque and speed collars to clear message</li> <li>2. Continue operation</li> </ol>
	P. MOTOR HITEMP	<ol style="list-style-type: none"> <li>1. Power off PGT</li> <li>2. Retrieve spare PGT</li> <li>3. Switch to ratchet mode</li> </ol>
<b>Safety Tether</b>		
	A. Safety tether fails to retract/tend	<ol style="list-style-type: none"> <li>1. Verify reel is unlocked</li> <li>2. Verify tether reel and/or cable guide (for 85-ft tethers) is clear of FOD</li> <li>3. Pull out small amount of cable and allow reel to retract while holding light tension on the cable</li> <li>4. Tap side of reel housing during retraction</li> <li>5. Report ID # of faulty tether to MCC-H and use alternate safety tether</li> <li>6. Coil safety tether to bring inside</li> <li>7. For 85-ft tether, on MCC-H GO: If coiling tether is not practical, release level wind mechanism bypass on back of safety tether (Red indicator will show around edge of bypass once released)</li> </ol> <p style="text-align: center;"><b>NOTE</b></p> <p>Once level wind has been released, cable guide will likely be frozen in place. This will limit the amount of tether that can be successfully retracted into the tether housing and may require coiling of excess tether.</p> <p>Level wind release will require safety tether be returned for ground servicing.</p> <p>If tether fails to retract due to thermal issue, normal tether function may return after tether brought IVA</p>
	B. Safety tether red stripe showing (any length)	<p>Safety tether cannot be used</p> <ul style="list-style-type: none"> <li>– Report ID # of faulty tether to MCC-H</li> <li>– Use alternate safety tether</li> </ul>

## ULF2 WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	C. Crew hook fails	<ol style="list-style-type: none"> <li>On load alleviating end: Use waist tether to replace alleviating strap                             <ul style="list-style-type: none"> <li>Report ID # of faulty tether to MCC-H</li> <li>Retrieve replacement safety tether</li> </ul> </li> <li>On anchor end: Report ID # of faulty tether to MCC-H and use an alternate safety tether</li> </ol>
<b>Scoops</b>		
	A. Scoop will not release from fitting	<ol style="list-style-type: none"> <li>If actuator will not pull back while in locked position, tap actuator with tool to release</li> <li>On MCC-H GO: Leave scoop in place</li> <li>On MCC-H GO: Remove non-captive contingency screws; 5 turns:  <b>PGT [A5 (7.0), CCW2, 30.5], 5/32 allen drive</b> <ul style="list-style-type: none"> <li>Round Scoop: 7 screws (figure 2)</li> </ul> </li> </ol>
<div style="text-align: center;">  <p>The diagram shows a mechanical assembly for a round scoop. It features a central handle connected to an actuator, which is linked to an ECCM socket. The handle has a D-handle interface. At the bottom, there are six collets and seven contingency release fasteners. A bayonet probe is also shown attached to the assembly.</p> </div> <p data-bbox="747 1266 1060 1297">Figure 2 - Round Scoop</p>		
<b>Socket Caddy</b>		
	A. Socket fails to release from socket caddy	<ol style="list-style-type: none"> <li>Verify PIP pin fully inserted into drop proof tether interface on socket</li> <li>Reattempt using a different PIP pin</li> </ol>
<b>TA Clamp</b>		
	A. TA clamp fails to release	<ol style="list-style-type: none"> <li>With handle up, press down on top of rounded clamp</li> <li>With handle up, use tether hook to pry drawhook from capture pin</li> </ol>
<b>Tether Shuttle</b>		
	A. Tether shuttle will not release from CETA/MT rail	<p>On MCC-H GO: Remove non-captive screws (2) at hingeline to release nadir section with slide lock (not captive) (figure 3):  <b>PGT [A7 (9.2), CCW1, 30.5], 5/32 allen drive</b></p>

## ULF2 WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	 <p>5/32nd Allen Contingency Release (1 of 2 visible)</p> <p>Figure 3 - Tether Shuttle</p>	
<b>TSA</b>		
	A. Latch fails to open	Release 7/16 EVA bolt on latch bracket; rotate bracket clear of latch <b>PGT [A2 3.8 ft-lb, CCW2, 30.5], 7/16 - 6 ext</b> Loosen bolt 1-2 turns
	B. Latch fails to close	Close remaining latches (3 of 4 required for landing)

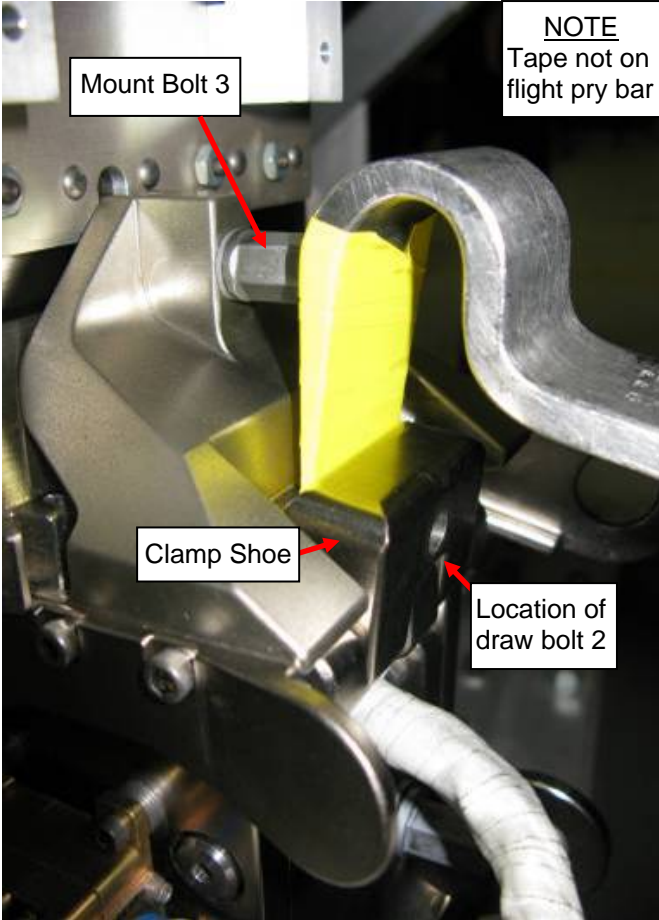
### Flight Specific

TASK	FAILURE	ACTION
I. SARJ MLI COVERS	A. SARJ MLI Cover Inboard Bolt will not release	1. <b>PGT[B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16:</b> Drive bolt 1 turn; report release torque to MCC-H 2. If free spinning nut plate suspected: a. Retrieve vise grips from Staging Bag b. Attach vise grips to bolt head c. Turn bolt ccw while applying gentle pull force (do not fail bolt)
	B. SARJ MLI Cover Inboard Bolt will not engage	Engage other inboard bolts. Minimum number of bolts that must be re-installed is any 2 of 4 or any 4 of 6 per cover panel. For 6 fasteners, 3 of 6 is min if one fastener in each pair
II. SARJ LAUNCH RESTRAINT	A. SARJ Launch Restraint – retaining bolts will not release	1. <b>PGT[RCCW, MTL 30.5]</b> , break torque 2. Retrieve ratchet wrench with 9" socket (Staging Bag) and cheater bar (Z1 Stbd Toolbox); break torque
	B. SARJ Launch Restraint cannot be removed after retaining bolts released 18 turns	<b>PGT[B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16:</b> Drive jacking bolt up to 3 turns. Do not exceed 9 turns

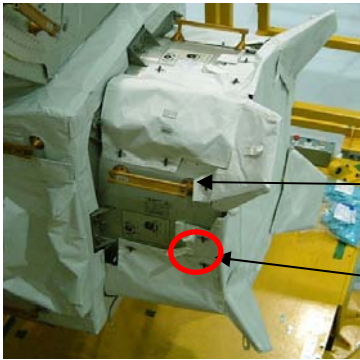
## ULF2 WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
III.SARJ TBA	A. Bolt 3 (mount bolt) will not break initial torque	<ol style="list-style-type: none"> <li>1. Release bolt 1 fully: Break torque at <b>B7 (25.5)</b> for 1 turn, run-out bolt at <b>B3 (18.4)</b> 6 turns</li> <li>2. Release bolt 2 fully: Break torque at <b>B7 (25.5)</b> for 1 turn, run-out bolt at <b>B3 (18.4)</b> 12 turns</li> <li>3. Break torque on bolt 3 at <b>B1 (12.0)</b> for 1 turn</li> <li>4. If no joy, increase PGT setting: <b>[B7 (25.5 ft-lb), CCW2, 30.5]</b>, reattempt for 1 turn, then return to original torque setting of <b>[B1 (12.0), CCW2, 30.5]</b></li> <li>5. On MCC-H GO: If no joy, take PGT to manual ratchet (RCCW), reattempt for 1 turn, then return to original torque setting of <b>[B1 (12.0), CCW2, 30.5]</b></li> <li>6. On MCC-H GO: If still no joy, retrieve ratchet wrench (Staging bag) and cheater bar (Z1 Stbd Toolbox) – (Bolt 3 can be failed in shear); reattempt</li> </ol>
	B. Bolt 3 jams during final release	Verify not pushing on the bolt while driving (will side-load bolt)
	C. Bolt 1 (preload bolt) or Bolt 2 (draw bolt) will not break initial torque	<ol style="list-style-type: none"> <li>1. On MCC-H GO: Take PGT to manual ratchet (RCCW), reattempt for 1 turn, then run-out bolt at torque setting of <b>[B3 (18.4), CCW2, 30.5]</b></li> <li>2. On MCC-H GO, FOR BOLT 2 ONLY: If still no joy, retrieve ratchet wrench and pry bar (Staging Bag) and cheater bar (Z1 Stbd Toolbox) – (Bolt 2 can be failed in shear); reattempt using ratchet wrench and cheater bar</li> </ol>

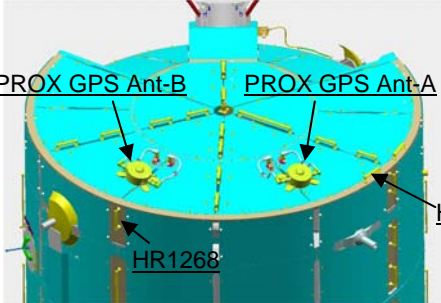
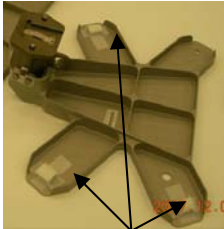

## ULF2 WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	D. Failure to fully remove TBA Bearing Package	<p>1. Retrieve pry bar (Staging Bag), insert between clamp shoe and mount bolt (see figure 4), and pry bearing package away from mount package</p>  <p><b>NOTE</b> Tape not on flight pry bar</p> <p>Mount Bolt 3</p> <p>Clamp Shoe</p> <p>Location of draw bolt 2</p> <p>Figure 4. - Pry Bearing Package Away</p> <p>2. If no joy, reinstall TBA bolts that were partially or fully removed starting with Bolt 2:</p> <ol style="list-style-type: none"> <li><b>PGT [A3 (4.8), CW2, 30.5] 6-Ext 7/16</b> Rotate Bolt 2, ~13 turns</li> <li>For STA TBA: <b>PGT [B1 (12.0), CW2, 30.5] 6-Ext 7/16</b> For Flight TBA: <b>PGT[A5 (7.0), CW2, 30.5] 6-Ext 7/16</b> Rotate Bolt 1, ~7 turns</li> <li>Torque mount package <b>PGT [A2 (3.8), CW2, 30.5] 6-Ext 7/16</b> Rotate Bolt 3, ~ 6 turns</li> </ol>
	E. Failure to fully remove TBA Mount Package	Reinstall TBA mount bolt that was partially removed: Torque mount package <b>PGT [A2 (3.8), CW2, 30.5] 6-Ext 7/16</b> Rotate Bolt 3, ~ 6 turns
	F. Bolt 3 (mount bolt) fails to engage	<ol style="list-style-type: none"> <li>Verify not pushing on bolt 3 while driving (mount clamp leg closed)</li> <li>Remove and inspect mount package for FOD, damaged threads, etc; report conditions to MCC-H</li> <li>On MCC-H GO: Either reattempt installation, or retrieve new TBA</li> </ol>


## ULF2 WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	G. Bolt 2 fails to install	<ol style="list-style-type: none"> <li>1. Remove bearing package and inspect for FOD, damaged threads, etc; report conditions to MCC-H</li> <li>2. On MCC-H GO: Either reinstall bearing package, or remove mount package (release bolt 3 at <b>B1 (12.0)</b> for 2 turns) and retrieve new TBA</li> </ol>
	H. Bolt 1 fails to install	<ol style="list-style-type: none"> <li>1. Verify bearing package fully seated on mount package</li> <li>2. Verify preload arm engages race ring If engaged:               <ol style="list-style-type: none"> <li>a. Remove bolt 2 (<b>B1 (12.0)</b> 10.5-13 turns)</li> <li>b. Remove bearing package, inspect for FOD, damaged threads, etc; report conditions to MCC-H</li> <li>c. On MCC-H GO: Either reattempt bearing package installation, or remove mount package (release bolt 3 at <b>B1 (12.0)</b> for 2 turns) and retrieve new TBA</li> </ol>               If not engaged:               <ol style="list-style-type: none"> <li>a. On MCC-H GO: Use dry wipe to clean area of grease</li> <li>b. Reach between race rings and hold preload arm in position; reattempt bolt 1 at nominal setting (<b>B1 (12.0)</b> for STA TBA, <b>A5 (7.0)</b> for Flight TBA)</li> <li>c. Reapply grease as required</li> </ol> </li> </ol>
	I. Bolt 3 fails to install fully (4-6 turns total)	<ol style="list-style-type: none"> <li>1. On MCC-H GO: Increase torque setting to <b>A3 (4.8)</b> and reattempt</li> <li>2. On MCC-H GO: Remove TBA</li> </ol>
	J. TBA Bag does not remain rolled and folded	<ol style="list-style-type: none"> <li>1. Fold TBA bag, roll 2x, secure close by folding tab ends</li> <li>2. Roll TBA bag 2x, fold, secure close by twisting tab ends together</li> </ol>
IV. EFBM COVER REMOVAL/ INSTL	A. 1/4-turn fastener cannot unlock/rotate (Small/Large cover)	Retrieve Vise Grips and rotate fastener with tool
	B. Bonding Velcro anomaly (Large cover)	<ol style="list-style-type: none"> <li>1. Check for FOD on Velcro</li> <li>2. No action required if 2 of 4 bonding Velcro patches are attached to the Large cover</li> </ol>
	C. Large cover cannot be installed due to 1/4-turn fastener failure	<ol style="list-style-type: none"> <li>1. Retrieve Vise Grips and rotate fastener with tool</li> <li>2. Wire tie the tether strap to nearest handhold</li> </ol>
		<p>Handhold</p> <p>Tether strap</p>

## ULF2 WORKAROUNDS CRIBSHEET (Cont)

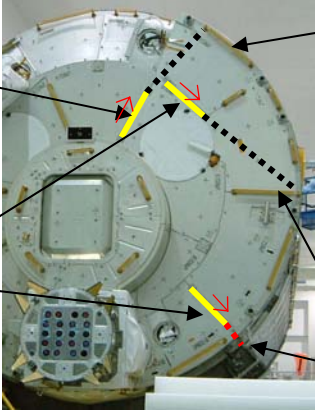
TASK	FAILURE	ACTION
V. PROX GPS ANT INSTL	<p>A. OIWIF cannot be locked on dovetail</p>	<ol style="list-style-type: none"> <li>1. Check for FOD and structural interference, cycle soft dock pins; reattempt installation</li> <li>2. Verify WIF is co-planar</li> <li>3. If cannot engage OIWIF in dovetail, bring GPS antenna back to Airlock</li> <li>4. If can engage OIWIF in dovetail, tie down the antenna: <ul style="list-style-type: none"> <li>- Ant-A: To HR1232 with LDT</li> <li>- Ant-B: To HR1268 with LDT</li> </ul> </li> </ol> 
	<p>B. Taping patch came off from antenna bracket</p>  <p><u>Taping patch (3pl)</u></p>  <p><u>Sharp edge</u></p>	<div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b></p> <p>Do not touch nut retainer on the backside of antenna bracket (sharp edge)</p> </div> <ol style="list-style-type: none"> <li>1. Inspect gloves</li> <li>2. Check the backside of antenna bracket and report the location where taping patch is lost to MCC-H</li> <li>3. Continue the antenna installation without touching the sharp edge</li> <li>4. Stow the taping patch in small trash bag if possible</li> </ol>
	C. Connector cap fails to demate	See NZGL Connecotrs(GENERIC TASKS)
	D. Connector fails to mate	See NZGL Connectors (GENERIC TASKS)
	E. Connector MLI peeled off from JLP due to MLI torn away from fastener	<ol style="list-style-type: none"> <li>1. No action required if MLI can stay on JLP with Velcro only</li> <li>2. After connector cable is installed, tie down the MLI to connector cable with wire tie</li> </ol>
VI. JEM RMS Grounding Tabs	A. Tab is inaccessible due to JEMRMS position	<ol style="list-style-type: none"> <li>1. Attempt different body positions/worksite access</li> </ol> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b></p> <p>Stay away from JEMRMS (Translate clear of JEMRMS). On MCC GO, return to the worksite</p> </div> <ol style="list-style-type: none"> <li>2. On MCC GO, IV mnvr JEMRMS to make crew access possible</li> </ol>

## ULF2 WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	<p>B. Velcro on tabs does not stick together and unable to secure with wire tie</p>	<ol style="list-style-type: none"> <li>1. Check both Velcro's loop/hook orientation is correct to match. Also check FOD on the Velcro</li> <li>2. Attempt to tuck each tab (grounding wire) under permanent MLI near EDF on the arm/EE</li> </ol>  <ol style="list-style-type: none"> <li>3. Retrieve EVA scissors tool from LTA and cut grounding wires</li> </ol>
<p>VII. JPM OIH/OIWIF Installation</p>	<p>A. HR will not install in seat track or fails to soft dock</p>	<ol style="list-style-type: none"> <li>1. Verify HR installed in correct direction</li> <li>2. Verify HR shoes are completely released and soft dock armed</li> <li>3. Check for FOD on HR and seat track</li> <li>4. Verify HR bolt completely released: <b>PGT[A1 2.5 ft-lb, CCW2 30 RPM, MTL 30.5]</b></li> <li>5. If HR in seat track but soft dock will not engage, attempt to drive HR bolts</li> <li>6. Rotate HR 180 deg and reattempt installation; notify MCC-H</li> <li>7. Finish installing other OIHs</li> <li>8. Bring back to airlock or attempt to install a different OIH in this location; report results to MCC-H</li> </ol>
	<p>B. HR bolt fails to fully engage</p>	<ol style="list-style-type: none"> <li>1. If torqued, remove HR: <b>PGT [A2 (3.8), CCW2, 30.5], 7/16 - 6-ext</b> – To break torque <b>PGT [A1 (2.5), CCW2, 30.5], 7/16 - 6-ext</b> – For removal – Check for FOD and reinstall using original torque</li> <li>2. Increase PGT setting: <b>PGT [A3 (4.8), CW2, 30.5], 7/16 - 6-ext</b></li> <li>3. Finish installing other OIHs</li> <li>4. Bring back to airlock or attempt to install a different OIH in this location; report results to MCC-H</li> </ol>
	<p>C. HR bolt jammed and can be neither installed nor removed</p>	<div style="border: 3px double black; padding: 5px; text-align: center;"> <p><b>WARNING</b> Do not use failed OIH for any translation, BRT, etc</p> </div> <ol style="list-style-type: none"> <li>1. If 1 of 2 bolts is installed, no action is required but do not use the OIH</li> <li>2. If both bolts failed, tie down the HR: <ul style="list-style-type: none"> <li>– OIH(1206): Tether to HR1122 with LDT</li> <li>– OIH(1204): Tether to HR1119 with LDT</li> <li>– OIH(1116): Tether to HR1185 with Adj Equip Tether</li> </ul> </li> </ol>



## ULF2 WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
		 <p>HR(1122) → (OIH soft dock direction) ..... (LDT) ..... (Adj Equip Tether) HR(1119) HR(1185) on side</p> <p>OIH(1206) OIH(1204) OIH(1116)</p>
	D. OIWIF cannot be locked on dovetail	<ol style="list-style-type: none"> <li>1. Check for FOD and structural interference, cycle soft dock pins; reattempt installation</li> <li>2. Verify WIF is co-planar</li> <li>3. Install a different WIF at this location</li> <li>4. Bring back to airlock or attempt installation of WIF in a different location; report results to MCC-H</li> </ol>
VIII. ETVCG	A. ETVCG pan/tilt lever won't rotate	<ol style="list-style-type: none"> <li>1. Check worksite for FOD</li> <li>2. Increase force, re-attempt</li> <li>3. Contact MCC</li> </ol>
	B. Dummy box outer bolt does not release	<ol style="list-style-type: none"> <li>1. Check worksite for FOD</li> <li>2. Increase PGT setting to B7 for ONE turn only. Reset PGT to B1 for full run-out of bolt</li> </ol>
	C. Dummy box center jacking bolt does not release	<ol style="list-style-type: none"> <li>1. Check worksite for FOD</li> <li>2. Check outer bolts to make sure they are fully backed out</li> <li>3. Increase PGT torque setting to B7 for ONE turn only. Reset PGT to B1 for full run-out of bolt</li> </ol>
	D. ETVCG center jacking bolt does not engage	Remove camera, inspect rail and bolt interface from damage, attempt re-installation, ensure outer bolts are retracted
	E. ETVCG center jacking bolt does not reach minimum turn count (24 turns)	Increase PGT torque setting to B1; re-attempt
	F. ETVCG outer bolt does not engage	<ol style="list-style-type: none"> <li>1. Check worksite for FOD</li> <li>2. Engage opposite outer bolt, re-attempt driving failed bolt</li> <li>3. Increase PGT torque setting to B1, re-attempt</li> <li>4. Contact MCC</li> </ol>

## EFBM CONTINGENCY CHECKOUT INHIBIT PAD

JEM

JPM Window

IV      Close JPM window shutters (2)

EFBM

IV      √P011B on jumper cable disconnected for BEP

**SSIPC** PDB A2 RPC01 – Op

JEMRMS

**SSIPC** RIP MA Brake – On

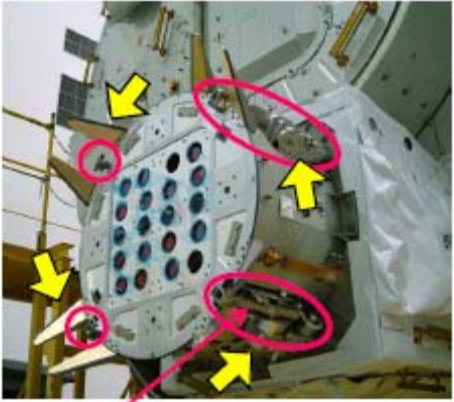





MDP Main Mode – Stdy Mode

HTV PROX Antenna

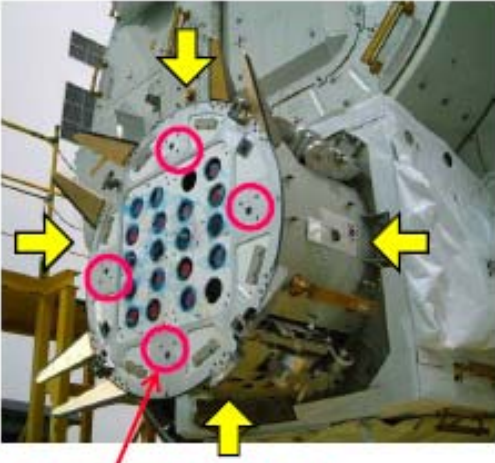



**SSIPC** √TRX Power – OFF

√TX Power – OFF

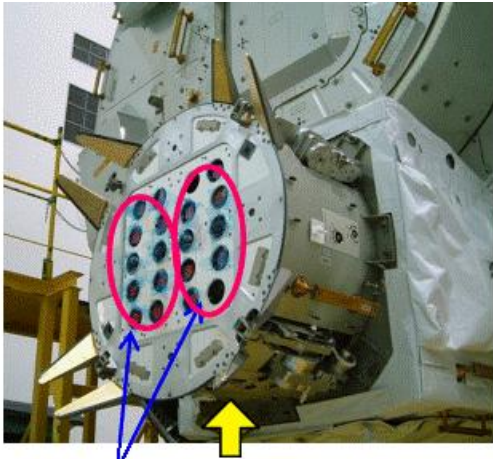



# EFBM CONTINGENCY CHECKOUT

IV	EV1
 <p><b>Capture Latch(x4)</b></p>  <p><b>EVA Access</b></p>  <p><b>EVA Access Port</b></p>  <p><b>Mode Select</b></p> <p><b>Drive Shaft</b></p>	<div style="border: 2px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><b>WARNING</b></p> <p style="text-align: center;">Stay clear of capture latch envelope</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><b>CAUTION</b></p> <p style="text-align: center;">Do not touch EFBM mating surface (silver Teflon), guide vanes (solid lubricant), and MLI on base</p> </div> <p><b>EFBM CONTINGENCY CAPTURE LATCH CHECKOUT</b></p> <ol style="list-style-type: none"> <li>1. Translate to fwd-nadir side of EFBM (capture latch #1)</li> <li>2. ✓MODE SELECT is in 'AUTO'</li> <li>3. Flip the MODE SELECT to 'MANUAL'</li> <li>4. If no joy, <b>PGT [A1 2.5 ft-lb, CW1 10 RPM, MTL 30.5]-6 ext 7/16:</b> drive MODE SELECT to 'MANUAL'; 0.25 turns (90 degrees)</li> <li>5. <b>Ratchet wrench or PGT [A2 3.8 ft-lb, CW1 10 RPM, MTL 30.5]-6 ext 7/16:</b> drive EVA Drive Shaft to 'CAPTURE'; ~2.5 turns (max 2.7)</li> <li>6. ✓Status indicator marking is below line</li> </ol> <p>If latch arm cannot be closed:</p> <ol style="list-style-type: none"> <li>7. <b>Ratchet wrench or PGT [A2 3.8 ft-lb, CCW1 10 RPM, MTL 30.5]-6 ext 7/16:</b> drive EVA Drive Shaft to 'RELEASE;' max 2.7 turns</li> <li>8. ✓Latching arm is outside of guide vane</li> <li>9. 📷 Take picture of capture latch condition</li> <li>10. Repeat steps 2-9 for:             <ul style="list-style-type: none"> <li><input type="checkbox"/> Capture latch #2 (aft-zenith)</li> <li><input type="checkbox"/> Capture latch #3 (aft-nadir)</li> <li><input type="checkbox"/> Capture latch #4 (fwd-zenith)</li> </ul> </li> </ol> <div style="display: flex; justify-content: space-around; margin-top: 20px;">   </div> <div style="display: flex; justify-content: space-around; margin-top: 5px;"> <p><b>Marking for Close Position</b></p> <p><b>Capture Latch (Close)</b></p> </div>

# EFBM CONTINGENCY CHECKOUT (Cont)

IV	EV1
 <p><b>Structural Latch(x4)</b></p> <p><b>EVA Access</b></p>  <p><b>EVA Access Port</b></p>  <p><b>Mode Select</b></p> <p><b>Drive Shaft</b></p>	<div style="border: 2px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><u>WARNING</u></p> <p style="text-align: center;">Stay clear of capture latch envelope</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>Do not touch EFBM mating surface (silver Teflon), guide vanes (solid lubricant), and MLI on base</p> <p>Do not drive the EVA Drive Shaft to hard stop; drive till structural latch is flush with EFBM mating surface</p> </div> <p><u>EFBM CONTINGENCY STRUCTURAL LATCH CHECKOUT</u></p> <ol style="list-style-type: none"> <li>1. Translate to fwd side of EFBM (Structural latch #1)</li> <li>2. ✓MODE SELECT is in 'AUTO'</li> <li>3. <b>PGT [A1 2.5 ft-lb, CW1 10 RPM, MTL 30.5]-6 ext 7/16:</b> drive MODE SELECT to 'MANUAL'; 0.25 turns</li> <li>4. <b>PGT [A1 2.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16:</b> drive EVA Drive Shaft to 'RELEASE'; &lt; 200 turns</li> <li>5. ✓Structural latch is flush with EFBM mating surface</li> <li>6. 📷 Take picture of structural latch condition</li> <li>7. Repeat steps 2-6 for:             <ul style="list-style-type: none"> <li><input type="checkbox"/> Structural latch #2 (aft)</li> <li><input type="checkbox"/> Structural latch #3 (nadir)</li> <li><input type="checkbox"/> Structural latch #4 (zenith)</li> </ul> </li> </ol>  <p style="text-align: center;"><u>Structural Latch (Retracted)</u></p>

# EFBM CONTINGENCY CHECKOUT (Cont)

IV	EV1
 <p>Umbilical Mech. (IN/OUTx2)</p> <p>← EVA Access</p>  <p><b><u>EVA Access Port</u></b></p>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p><b>WARNING</b></p> <p>Stay clear of capture latch envelope</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p><b>CAUTION</b></p> <p>Do not touch EFBM mating surface (silver Teflon), guide vanes (solid lubricant), and MLI on base</p> </div> <p><b><u>EFBM CONTINGENCY UMBILICAL MECHANISM CHECKOUT</u></b></p> <ol style="list-style-type: none"> <li>1. Translate to fwd-nadir side of EFBM (umbilical mechanism #1)</li> <li>2. ✓MODE SELECT #1 is in 'AUTO'</li> <li>3. ✓MODE SELECT #2 is in 'NORMAL'</li> <li>4. <b>PGT [A1 2.5 ft-lb, CW1 10 RPM, MTL 30.5]-6 ext 7/16:</b> drive MODE SELECT #1 to 'MANUAL'; 0.25 turns</li> <li>5. <b>PGT [A2 3.8 ft-lb, CCW1 10 RPM, MTL 30.5]-6 ext 7/16:</b> drive EVA Drive Shaft to 'DISCONNECT'; ~16 turns</li> <li>6. ✓Status indicator is in 'DISCONNECT' position</li> <li>7. <input checked="" type="checkbox"/> Take picture of umbilical mechanism condition</li> <li>8. Repeat steps 2-7 for:             <ul style="list-style-type: none"> <li><input type="checkbox"/> Umbilical mechanism #2 (aft-nadir)</li> </ul> </li> </ol> <div style="display: flex; justify-content: space-around; align-items: flex-start;">   </div> <p style="display: flex; justify-content: space-around;"> <span>Umbilical Mech #1</span> <span>Umbilical Mech #2</span> </p>

## EFBM CONTINGENCY CHECKOUT – TASK DATA

### Estimated Task Duration:

	With SSRMS	Without SSRMS
One EV Crew	00:15 per latch or mechanism	N/A
Two EV Crew	N/A	N/A

### Tools:

EV	
PGT	Ratchet Wrench
7/16 (wobble) Socket-6 ext	

Foot Restraints: N/A

### EVA Fasteners:

Fastener	Head Size (in)	Qty	Install Trq (ft-lbs)	Release Trq (ft-lbs)	Failure Trq (ft-lbs)	Turns	RPM
Mode Select Shaft (capture latch)	7/16	1x4	0.38	0.38	10	0.25	10
Manual Drive Shaft (capture latch)	7/16	1x4	2.1	2.1	34.6	2.7	2.6
Mode Select Shaft (structural latch)	7/16	1x4	0.59	0.59	10	0.25	10
Manual Drive Shaft (structural latch)	7/16	1x4	0.5	0.5	I) 5.85 R) 1.80	200 (Max 220)	54
Mode Select Shaft (structural latch)	7/16	2x2	1.3 (#1) 0.7 (#2)	1.3 (#1) 0.7 (#2)	10	0.25	10
Manual Drive Shaft (structural latch)	7/16	1x2	2.2	2.2	13.5	16	15

EVA Connectors: N/A

**Notes:** N/A

### Cautions:

1. Do not touch EFBM mating surface (silver Teflon), guide vanes (solid lubricant), and MLI on base
2. Do not drive the EVA Drive Shaft to hard stop; drive till structural latch is flush with EFBM mating surface. Additional 20 turns after structural latch is flush until hard stop is reached (4mm gap)

### Warnings:

1. Stay clear of capture latch envelope

### Timeline Considerations:

1. The Capture Latch Mode Select shaft can be actuated by fingers

# EFBM CONTINGENCY CHECKOUT – TASK DATA (Cont)

## VISUALIZED INFORMATION (1/3)

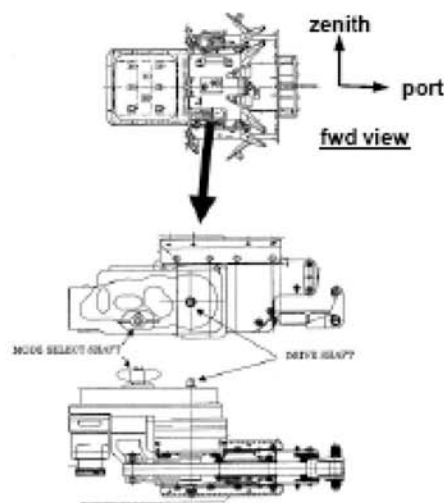


Figure 2 - EVA I/F for Capture Latch

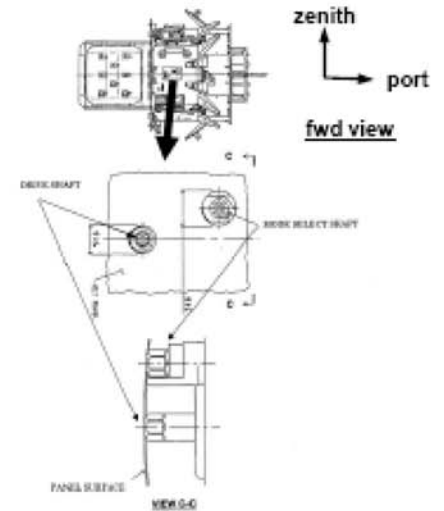


Figure 3 - EVA I/F for Structure Latch

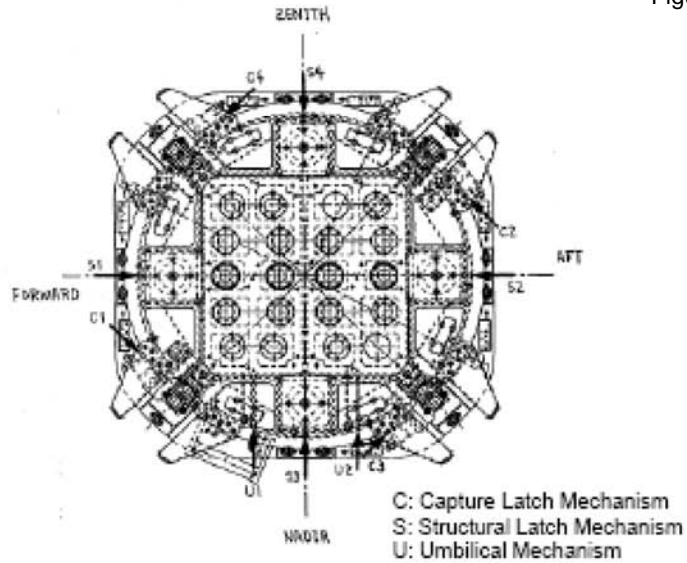


Figure 1 - EFBM Active

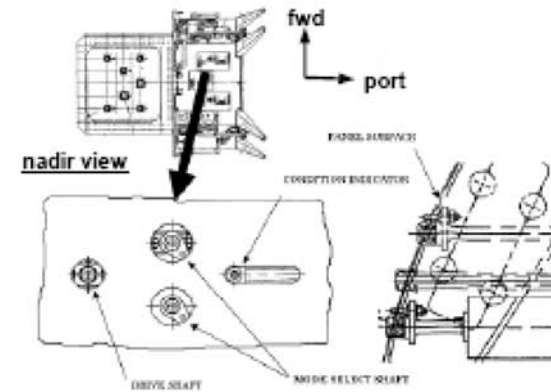


Figure 4 - EVA I/F for Umbilical Mechanism

# EFBM CONTINGENCY CHECKOUT – TASK DATA (Cont)

## VISUALIZED INFORMATION (2/3)



Figure 5 - Structure Latch #2 (lower) and Capture Latch #1 (upper)



Figure 6 - Umbilical Mechanism #1 & #2

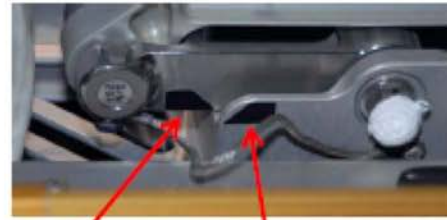


**EFBM CONTINGENCY CHECKOUT – TASK DATA (Cont)**

**VISUALIZED INFORMATION (3/3)**



Figure 7 - Capture Latch (Visual Mark)

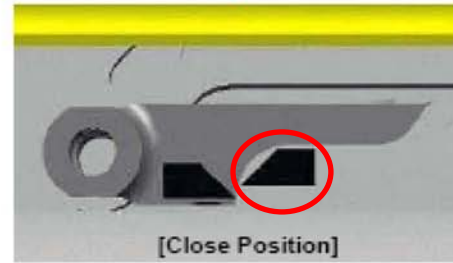


Marking on Arm    Marking on Structure

For close, visual marking ("wedge" shape) on the arm should pass the over-center position.



[Over-Center Position]



[Close Position]

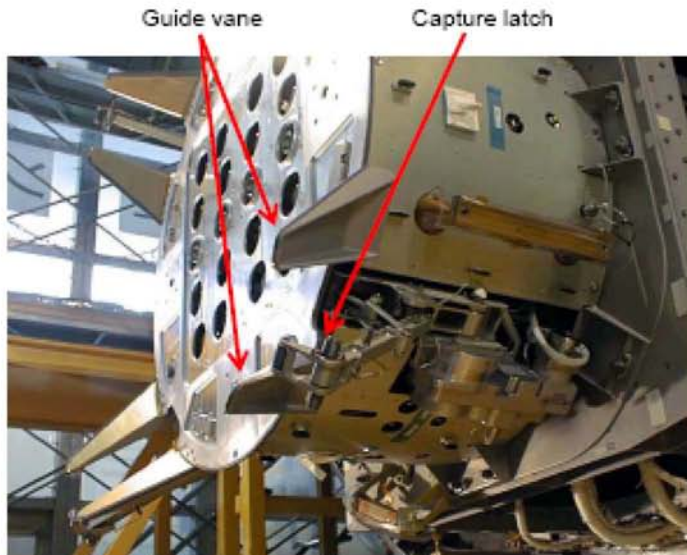
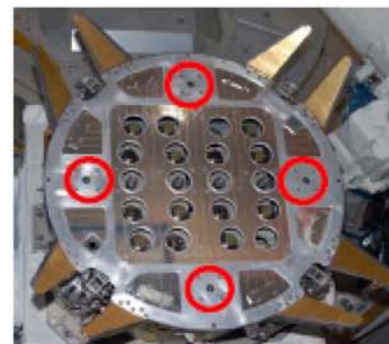


Figure 8 - Capture Latch (Outside of Guide Vane)



○ Structural Latch

Structural Latch











Drive shaft must be stopped when Structural Latch is flush with EFBM mating surface.

Figure 9 - Structural Latch (RELEASE=Retract)

## RELEASE ROEU LATCHES

IV	EV
<div data-bbox="247 305 779 370" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><b>CAUTION</b></p> <p style="text-align: center;">After step 1, 2 hr LCS Thermal Clock starts</p> </div> <p>SSP1 1. <u>Deadface ROEU</u>  √MPLM CH 1,2 HTR PWR – OFF (tb-bp)  APCU 1,2 CONV – OFF (tb-bp)  √1 OUTPUT RLY – OP (tb-bp)</p> <p>R1 PRI PL MNC – OFF (tb-OFF)</p> <p>R13L 2. <u>ROEU SAFING</u>  √PL BAY MECH PWR SYS 1,2 (two) – OFF  A6U √RETEN LOGIC PWR SYS 1,SYS 2 (two) – OFF  PL SEL – 1</p> <p style="text-align: center; margin-top: 20px;">Give EV GO to release ROEU</p>	<p>Tools reqd:  Ratchet with 3-in Ext (Airlock)</p> <div data-bbox="1123 365 1780 479" style="border: 3px double black; padding: 10px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><b>WARNING</b></p> <p style="text-align: center;">For release, do not close access cover until ROEU stowed. Latches may not snap back to closed posn</p> </div> <p>1. On IV GO, open latch drive access cover:  Break safety cord, release access cover (3/4 turn ccw)  Open access cover (~120°)  Manual drive to RELEASE:  Rotate control lever to RELEASE  Rotate latch drive cw (~9 ft-lb) to hard stop (~3/4 turn)  Remove drive ratchet, clear worksite</p>

## RELEASE ROEU LATCHES (Cont)

IV	EV
<p>A6U 3. <u>VERIFY TALKBACKS</u> Install ROEU A6U PANEL OVERLAY</p> <p>PL RETEN PL SEL – 2</p> <div style="text-align: center;"> <p>ELEC CONT</p> <p>✓ </p> <p>RELAX    DEMATE    RELEASE</p> <p>✓   </p> <p>MATE                  LATCH</p> </div> <p>R13L PL BAY MECH PWR SYS 1,2 (two) – ON A6U PL RETEN LOGIC PWR SYS 1,SYS 2 (two) – ON</p> <p>Note single motor time (&gt; 18 sec)</p> <p>DEMATE/MATE – DEMATE (tb–REL), 36 sec max – OFF</p> <div style="text-align: center;"> <p>ELEC CONT</p> <p></p> <p>RELAX    DEMATE    RELEASE</p> <p>✓   </p> <p>MATE                  LATCH</p> </div> <p>PL RETEN LOGIC PWR SYS 1, SYS 2 (two) – OFF PL SEL – 1</p> <p>R13L PL BAY MECH PWR SYS 1,2 (two) – OFF</p>	<div style="border: 3px double black; padding: 10px; text-align: center;"> <p><u>WARNING</u></p> <p>For release, remain clear of latches during access cover closing. Latches may snap back to closed posn</p> </div>

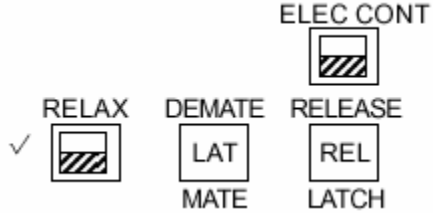
**RELEASE ROEU LATCHES (Cont)**

<b>IV</b>	<b>EV</b>
<p>R1 SSP1</p> <p>4. <u>ENABLE POWER</u>            PRI PL MNC – ON (tb-ON)            APCU 2 OUTPUT RLY – CL                CONV – ON (tb-gray)            √APCU 2 OUTPUT RLY tb – gray</p> <p>5. End Thermal Clock ____:____</p>	<p>2. Reengage latch actuator:            Rotate control lever to neutral posn            Close, secure access cover (3/4 turn cw)            Clear worksite</p>

# LATCH ROEU LATCHES

IV	EV
<p>A6U 1. <u>CONFIGURE FOR ROEU MATE</u> Install ROEU A6U PANEL OVERLAY</p> <p>R13L √PL BAY MECH PWR SYS 1,2 (two) – OFF A6U RETEN LOGIC PWR SYS 1, SYS 2 (two) – OFF PL RETEN PL SEL – 2</p> <p style="text-align: center;"><span style="border: 1px solid black; padding: 2px;">SM 97 PL RETENTION</span></p> <p>CRT √LAT 1,2,3 (six): 0</p> <p style="padding-left: 40px;">* If LATCH 2,3 LAT msw shows 1, drive latch for * * single motor time *</p> <p>A6U</p> <div style="text-align: center;"> <p>The diagram shows a control panel with four columns of buttons. The first column has a checkmark to the left of a 'REL' button under the label 'RELAX'. The second column has a 'REL' button under 'DEMATE' and a 'MATE' button below it. The third column has a 'REL' button under 'RELEASE' and a 'LATCH' button below it. The fourth column has a square button with diagonal hatching under 'ELEC CONT', with a checkmark to its left.</p> </div> <p>SSP1 √MPLM CH 1,2 HTR PWR – OFF (tb-bp) APCU 1,2 CONV – OFF (tb-bp) √1 OUTPUT RLY – OP (tb-bp)</p> <p>R1 PRI PL MNC – OFF (tb-OFF)</p>	<p>Tools reqd: Ratchet with 3-in Ext (Airlock)</p>

## LATCH ROEU LATCHES (Cont)

IV	EV
<p>A6U R13L</p> <p>2. <u>MATE ROEU</u> PL RETEN LOGIC PWR SYS 1,2 (two) – ON PL BAY MECH PWR SYS 1,2 (two) – ON</p> <p>Note single motor time (&gt; 30 sec)</p> <p>A6U</p> <p>DEMATE/MATE – MATE (tb-LAT), 60 sec max – OFF</p> <div style="text-align: center;">  </div> <p>R13L A6U</p> <p>3. <u>ROEU SAFING</u> PL BAY MECH PWR SYS 1,2 (two) – OFF PL RETEN LOGIC PWR SYS 1, SYS 2 (two) – OFF PL SEL – 1</p> <p>Give EV GO to latch ROEU</p>	<p>1. On IV GO, open latch drive access cover: Break safety cord, release access cover (3/4 turn ccw) Open access cover (~120°) Manual drive to LATCH: Rotate control lever to LATCH Rotate latch drive ccw (~9 ft-lb) to hard stop (~3/4 turn) Remove drive ratchet, clear worksite</p>

# LATCH ROEU LATCHES (Cont)

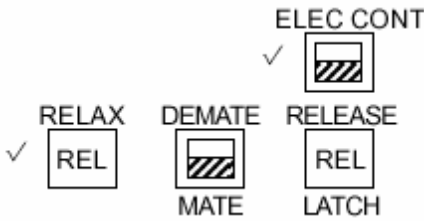
IV	EV
<p>A6U 4. <u>VERIFY TALKBACKS</u> PL RETEN PL SEL – 2</p> <div style="text-align: center;"> </div> <p>R13L 5. <u>RELAX ROEU</u> PL BAY MECH PWR SYS 1,2 (two) – ON A6U PL RETEN LOGIC PWR SYS 1,SYS 2 (two) – ON</p> <p style="text-align: center;"><u>NOTE</u> Monitor PL SEL 2 LATCH 1 REL SYS msws on SPEC 97</p> <p>Note single motor time (&gt; 12 sec)</p> <p>RELAX – RELAX (tb-REL), 24 sec max</p> <p>When LATCH 1 REL A(B) msw changes to 1: RELAX – OFF</p> <div style="text-align: center;"> </div>	<p>2. Reengage latch actuator: Rotate control lever to neutral posn Close, secure access cover (3/4 turn cw) Clear worksite</p>
<p>R13L PL RETEN LOGIC PWR SYS 1,2 (two) – OFF BAY MECH PWR SYS 1,2 (two) – OFF</p>	

# STOW ROEU ARM

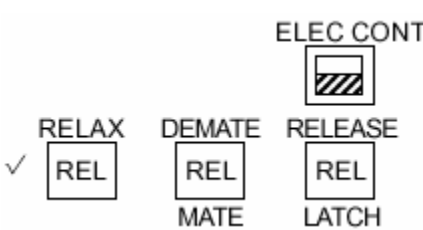
IV	EV
<div data-bbox="344 305 894 370" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><b>CAUTION</b> After step 1, 2 hr LCS Thermal Clock starts</p> </div> <p>1. <b>RELEASE ROEU LATCHES</b></p> <p>SSP 1    √MPLM CHAN 1,2 HTR PWR – OFF (tb-bp)                     APCU 1,2 CONV – OFF (tb-bp)                          √1 OUTPUT RLY – OP (tb-bp)</p> <p>R1        PRI PL MNC – OFF (tb-OFF)</p> <p>A6U        Install ROEU A6U PANEL OVERLAY</p> <p>            √PL RETEN LAT (five) – OFF                              PL SEL – 2</p> <div data-bbox="296 740 596 773" style="border: 1px solid black; padding: 2px; margin: 10px 0;"> <p style="text-align: center;"><b>SM 97 PL RETENTION</b></p> </div> <p>√REL 2,3 (four) – 0</p> <ul style="list-style-type: none"> <li>* If LATCH 2,3 REL msw shows 1, drive latch for *</li> <li>* single motor time                                   *</li> </ul> <div style="text-align: center; margin-top: 20px;"> <p>ELEC CONT</p> <p>✓ <input type="checkbox"/></p> <p>RELAX    DEMATE    RELEASE</p> <p>✓ <input type="checkbox"/>    <input checked="" type="checkbox"/>    <input type="checkbox"/></p> <p>REL        MATE        LAT</p> <p>            MATE        LATCH</p> </div>	<p>Tools reqd: Ratchet with 3-in Ext (Airlock)</p>



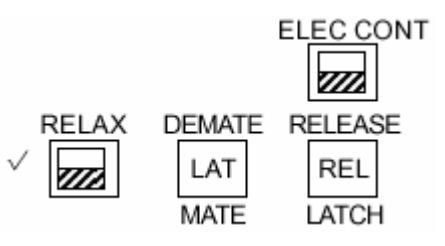
## STOW ROEU ARM (Cont)

	IV	EV
<p>R13L</p> <p>2. <u>RELEASE LATCHES</u>            PL RETEN LOGIC PWR SYS 1,2 (two) – ON            BAY MECH PWR SYS 1,2 (two) – ON</p> <p>Note single motor time (&gt; 20 sec)</p> <p>RELEASE/LATCH – REL (tb-REL), 40 sec max            – OFF</p> <div style="text-align: center;">  </div> <p>R13L A6U</p> <p>3. <u>ROEU SAFING</u>            PL BAY MECH PWR SYS 1,2 (two) – OFF            PL RETEN LOGIC PWR SYS 1, SYS 2 (two) – OFF            PL SEL – 1</p> <p>Give EV GO to stow ROEU</p>	<p>1. On IV GO, open latch drive access cover:            Break safety cord, release access cover (3/4 turn ccw)            Open access cover (~120°)            Manual drive to STOW:            Rotate control lever to STOW            Rotate arm drive ccw (~23 ft-lb) to hard stop and pull arm inboard to verify            Remove drive ratchet</p>	

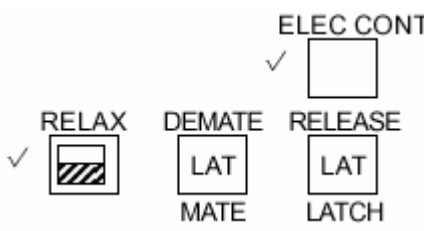
**STOW ROEU ARM (Cont)**

<b>IV</b>	<b>EV</b>
<p>A6U</p> <p>4. <u>VERIFY TALKBACKS</u> PL RETEN PL SEL – 2</p> <div style="text-align: center;">  <p>The diagram shows a control panel with the following elements:              - Top center: ELEC CONT indicator (square with diagonal hatching)              - Middle row: RELAX REL, DEMATE REL MATE, RELEASE REL LATCH              - Bottom row: REL, REL, REL              - A checkmark (✓) is positioned to the left of the first REL button.</p> </div> <p>R1 SSP 1</p> <p>5. <u>ENABLE POWER</u> PRI PL MNC – ON (tb-ON) APCU 2 OUTPUT RLY – CL     CONV – ON (tb-gray)     √OUTPUT RLY tb – gray</p> <p>6. End Thermal Clock ____:____</p>	<p>2. Reengage arm actuator:     Rotate control lever to neutral posn     Close, secure access cover (3/4 turn cw)     Clear worksite</p>

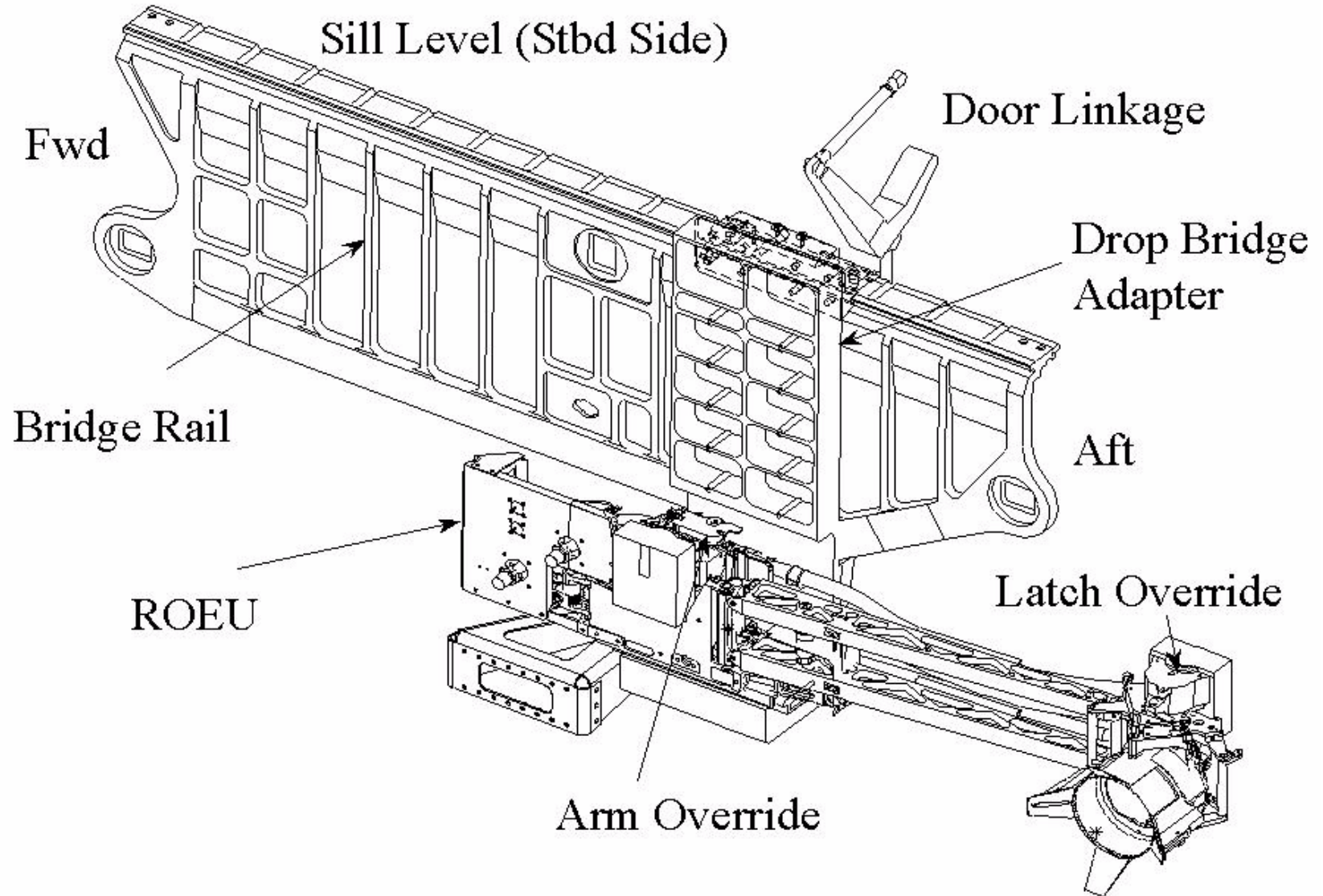
# MATE ROEU ARM

IV	EV
<p>A6U 1. <u>CONFIGURE ROEU</u> Install <u>ROEU A6U PANEL OVERLAY</u></p> <p>R13L 2. <u>ROEU SAFING</u> A6U √PL BAY MECH PWR SYS 1,2 (two) – OFF A6U √RETEN LOGIC PWR SYS 1,SYS 2 (two) – OFF PL SEL – 1</p> <p>SSP 1 √MPLM CH 1,2 HTR PWR – OFF (tb-bp) APCU 1,2 CONV – OFF (tb-bp) R1 √1 OUTPUT RLY – OP (tb-bp) PRI PL MNC – OFF (tb-OFF)</p> <p>Give EV GO to mate ROEU</p> <p>A6U 3. <u>VERIFY TALKBACKS</u> PL RETEN PL SEL – 2</p> <div style="text-align: center;">  <p style="margin-left: 100px;">ELEC CONT</p> <p style="margin-left: 50px;">RELAX    DEMATE    RELEASE</p> <p style="margin-left: 50px;">✓         </p> <p style="margin-left: 50px;">MATE    LATCH</p> </div>	<p>Tools reqd: Ratchet with 3-in Ext (Airlock)</p> <p>1. On IV GO, open arm drive access cover: Break safety cord, release access cover (3/4 turn ccw) Open access cover (~120°) Manual drive to MATE: Rotate control lever to MATE Ratchet arm drive cw (~25 ft-lb) until “READY TO LATCH” posn indicated on interface guide Remove drive ratchet Clear worksite (for latching)</p>

## MATE ROEU ARM (Cont)

	<b>IV</b>	<b>EV</b>
<p>R13L A6U</p> <p>4. <u>LATCH LATCHES</u>            PL BAY MECH PWR SYS 1,2 (two) – ON            RETEN LOGIC PWR SYS 1,SYS 2 (two) – ON</p> <p>Note single motor time (&gt; 20 sec)</p> <p>RELEASE/LATCH – LATCH (tb-LAT), 40 sec max            – OFF</p> <div style="text-align: center;">  <p>The diagram shows a control panel with several buttons. At the top is 'ELEC CONT' with a checkmark to its left. Below it are three buttons: 'RELAX' (with a checkmark to its left and a hatched box inside), 'DEMATE' (with 'LAT' inside), and 'RELEASE' (with 'LAT' inside). Below these are 'MATE' and 'LATCH' buttons, both with 'LAT' inside.</p> </div> <p>R13L</p> <p>PL RETEN LOGIC PWR SYS 1,SYS 2 (two) – OFF            BAY MECH PWR SYS 1,2 (two) – OFF</p> <p>5. <u>RELAX ROEU (EVA)</u>            Monitor PL RETEN LAT 1 tb</p> <p>Give EV GO to STOW arm, halt once RELAX tb – REL</p>	<p>2. <u>RELAX ROEU (EVA)</u>            On IV GO, rotate control lever to STOW:            Ratchet arm drive ccw until IV receives RELAX 1 tb – REL. Remove drive ratchet</p> <p>3. Reengage arm actuator:            Rotate control lever to neutral posn            Close, secure access cover (3/4 turn cw)            Clear worksite</p>	

ROEU OVERVIEW



## DLA REMOVE AND REPLACE

### CAUTION

1. During reinstallation of MLI covers, do not reinstall swing bolts on the outboard SARJ race ring side. This will preclude SARJ rotation.
2. Avoid contact between MLI cover and surrounding hardware.
3. Avoid impacting the race ring with the DLA when the DLA is unconstrained.
4. During follower arm rotation (90 deg turn) when the DLA is unconstrained, interference with structure may occur. The DLA must be held against the outer side of the SARJ race ring for the follower arm to rotate fully, clearing obstruction.
5. The following precautions should be observed to prevent loss of inboard MLI cover fasteners during removal:
  - Limit turn count to minimum required for fastener release.
  - Minimize side loading bolt head.
  - Maintain axial force on fastener to compress spring during rotation.
6. If DLA rotation bolts 1B and 2B do not turn freely when attempting to stow the follower arms, there is still partial interference in the mechanism and additional adjustment to the draw bolts is required to prevent damage to the follower arm mechanism.

### NOTE

1. Steps 1 to 3, ROTATE DLA DRAW BOLTS (1C AND 2C), are required to evenly release tension load on belleville stacks for bolts 1C and 2C.
2. Multiple iterations of DLA draw bolt adjustments may be required to allow follower arms to rotate.
3. The physical labels of the S3 DLAs do not match the logical names the software uses. To ensure that the appropriate DLA commands were sent to prepare for disengaging the DLA, two visual inspections are performed: the window on the DLA indicates "N" for neutral, and the DLA pinion gear teeth are no longer engaged on the SARJ race ring teeth.
4. The ratchet wrench is used to rotate the DLA follower arms to the stow position. This tool is utilized instead of the PGT to protect against damage to the follower arm mechanism.

## DLA REMOVE AND REPLACE (Cont)

IV	EV1	EV2
<p><b>MCC-H</b> 1. Verify failed DLA is in neutral position with no motors selected and motor setpoints set to zero. Verify active DLA is in locked position with no motors selected and motor setpoints set to zero.</p> <p>2. Give GO for EVA to enter SARJ worksite.</p>	<div data-bbox="646 240 1165 511" style="border: 2px solid black; padding: 5px;"> <p style="text-align: center; background-color: yellow;"><b>CAUTION</b></p> <p>The following precautions should be observed to prevent loss of inboard MLI cover fasteners during removal:</p> <ul style="list-style-type: none"> <li>Limit turn count to minimum required for fastener release.</li> <li>Minimize side loading bolt head.</li> <li>Maintain axial force on fastener to compress spring during rotation.</li> </ul> </div> <p><u>REMOVE DLA MLI COVER</u></p> <ol style="list-style-type: none"> <li>1. <b>PGT[A6 8.3 ft-lb, CCW2 30RPM, MTL 30.5]-6ext 7/16:</b> Release inboard MLI cover fasteners (four), nine turns.</li> <li>2. Remove MLI cover and temp stow.</li> <li>3. On IV GO, install and ingress APFR (refer to Task Data for WIF position and APFR settings).</li> </ol> <p><u>VERIFY DLA IN NEUTRAL</u></p> <ol style="list-style-type: none"> <li>1. Inspect window for neutral indicator, N.</li> <li>2. Verify DLA pinion gear teeth are not engaged on the SARJ race ring teeth.</li> </ol> <p><u>ROTATE DLA DRAW BOLTS (1C AND 2C)</u></p> <ol style="list-style-type: none"> <li>1. <b>PGT[B7 25.5 ft-lb, CCW1 10RPM, MTL 30.5]-6ext 7/16:</b> Rotate draw bolt 1C, one turn (release tension).</li> <li>2. <b>PGT[B7 25.5 ft-lb, CW1 10RPM, MTL 30.5]-6ext 7/16:</b> Rotate draw bolt 2C, three turns (release tension).</li> <li>3. <b>PGT[B7 25.5 ft-lb, CCW1 10RPM, MTL 30.5]-6ext 7/16:</b> Rotate draw bolt 1C, two turns (continue releasing tension).</li> <li>4. <b>PGT[A3 4.8 ft-lb, CCW2 30RPM, MTL 30.5]-6ext 7/16:</b> Rotate draw bolt 1C, ~32 turns to hard stop.</li> </ol>	<div data-bbox="1197 316 1816 1015"> </div> <p style="text-align: center;">Figure 1.- DLA Bolts and Labels.</p>

## DLA REMOVE AND REPLACE (Cont)

IV	EV1	EV2
	<p><u>ROTATE FOLLOWER ARMS (1B AND 2B)</u></p> <div data-bbox="646 297 1167 428" style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>CAUTION</b></p> <p>If DLA rotation bolts 1B and 2B do not turn freely, additional adjustment to the draw bolts is required.</p> </div> <div data-bbox="690 472 1167 583" style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="text-align: center;"><u>NOTE</u></p> <p>Multiple iterations of DLA draw bolt adjustments may be required to allow follower arms to rotate.</p> </div> <ol style="list-style-type: none"> <li>1. <b>Ratchet Wrench-6ext 7/16:</b> Rotate draw bolt 1C, CW ~1/8 turn.</li> <li>2. <b>Ratchet Wrench-6ext 7/16:</b> Rotate follower arm rotation bolt 1B, CW ~5/8 turn to hardstop.</li> <li>3. If 1B bolt does not turn freely, repeat steps 1 and 2 until follower arm has rotated 90 deg.</li> <li>4. <b>PGT[A3 4.8 ft-lb, CW2 30RPM, MTL 30.5]-6ext 7/16:</b> Rotate follower arm draw bolt 2C, ~32 turns to hard stop.</li> <li>5. <b>Ratchet Wrench-6ext 7/16:</b> Rotate draw bolt 2C, CCW ~1/8 turn.</li> <li>6. <b>Ratchet Wrench-6ext 7/16:</b> Rotate follower arm rotation bolt 2B, CCW ~5/8 turn to hardstop.</li> <li>7. If 2B bolt does not turn freely, repeat steps 5 and 6 until follower arm has rotated 90 deg.</li> </ol> <p><u>REPOSITION DLA</u></p> <ol style="list-style-type: none"> <li>1. Reposition DLA to launch position [approximately 1 inch away from race ring, then 0.375 inch inboard (toward S0), then 0.5 inch away from race ring].</li> </ol> <p><u>INSTALL THREE DLA LAUNCH RESTRAINT BOLTS (4A, 4B, AND 4C)</u></p> <ol style="list-style-type: none"> <li>1. <b>PGT[B4 19.4 ft-lb, CW2 30RPM, MTL 30.5]-6ext 7/16:</b> Engage launch restraint bolts 4A, 4B, and 4C, ~five to nine turns (attaches DLA frame to launch bracket).</li> </ol> <p><u>PRELOAD FOLLOWER DRAW BOLTS (1C AND 2C) AND ENGAGE DLA LOCK BOLTS (1A AND 2A)</u></p> <ol style="list-style-type: none"> <li>1. <b>PGT[A3 4.8 ft-lb, CCW2 30RPM, MTL 30.5]-6ext 7/16:</b> Preload draw bolt 1C, ~zero to two turns to hardstop.</li> <li>2. <b>PGT[A3 4.8 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Preload draw bolt 2C, ~zero to two turns to hardstop.</li> </ol>	



## DLA REMOVE AND REPLACE (Cont)

IV	EV1	EV2
	<p>3. <b>PGT[A5 7.0 ft-lb, CW1 10RPM, MTL 30.5]-6ext 7/16:</b> Engage lock bolts 1A and 2A fasteners (two), ~six turns (engage lock preload on follower arm with lock tip bolt).</p> <p><u>RELEASE DLA CONNECTORS</u></p> <p>1. Perform the following demates:  DLA 2                                    DLA 1  <input type="checkbox"/> P1 ← → J23                          <input type="checkbox"/> P1 ← → J21  <input type="checkbox"/> P2 ← → J24                          <input type="checkbox"/> P2 ← → J22</p> <p>2. Install dust caps on connectors, if available</p> <p><u>RELEASE BRACKET BOLTS</u></p> <p>1. <b>PGT[B7 25.5 ft-lb, CCW2 30RPM, MTL 30.5]-6ext 7/16:</b> Release 5A, 5B, and 5C in any order, 8-10 turns  2. Remove DLA, lift straight up away from race ring  3. Temp stow DLA on MUT EE/Ballstack on S3 HR 3060/TBD</p> <p><u>PERFORM CLEANING/LUBING OF RACE RING</u>  Refer to pgs FS 7-20</p> <p><u>ENGAGE BRACKET BOLTS</u></p> <p>1. Retrieve DLA  2. Install DLA onto race ring  3. <b>PGT[B7 25.5 ft-lb, CW2 30RPM, MTL 30.5]-6ext 7/16:</b> Engage 5A, 5B, and 5C in any order, 8-10 turns</p> <p><u>ENGAGE DLA CONNECTORS</u></p> <p>4. Perform the following connector mates, stowing any dust caps as reqd:  DLA 2                                    DLA 1  <input type="checkbox"/> P1 → ← J23                          <input type="checkbox"/> P1 → ← TBD  <input type="checkbox"/> P2 → ← J24                          <input type="checkbox"/> P2 → ← TBD</p> <p><u>ROTATE DLA DRAW BOLTS (1C AND 2C)</u>  (This decreases friction between pivot fork and follower bracket)  5. <b>PGT[A3 4.8 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Rotate draw bolt 1C, 2 turns  6. <b>PGT[A3 4.8 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Rotate draw bolt 2C, 2 turns</p>	

## DLA REMOVE AND REPLACE (Cont)

IV	EV1	EV2
	<p><u>BACK OFF DLA LOCK BOLTS (1A AND 2A)</u> (Releases lock preload on follower arm, lock tip bolt retracted from follower bracket)</p> <p>7. <b>PGT[A6 8.3 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Release lock bolts 1A and 2A fasteners (2), 6 turns</p> <p><u>RELEASE 3 DLA LAUNCH RESRAINT BOLTS (4A, 4B, 4C)</u> (This allows the DLA frame to move relative to the launch bracket)</p> <p>8. <b>PGT[B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Release launch restraint bolts 4A, 4B, 4C, ~8-10 turns – bolt pops up</p> <p><u>REPOSITION DLA AND ROTATE FOLLOWER ARMS</u></p> <p>9. Reconfigure <b>PGT[A3 4.8 ft-lb, CCW1 10 RPM, MTL 30.5]-6ext 7/16:</b> Reposition DLA onto race ring (approx 3/8 inch outboard, 1.5 inches radially in) Rotate follower arm rotation bolt 1B, ~5/8 turn to hardstop</p> <p>10. Verify follower arm has rotated 90 deg</p> <p>11. <b>PGT[A3 4.8 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Rotate follower arm draw bolt 1C, ~32 turns to torque</p> <p>12. Verify follower bearings are in contact with race ring</p> <p>13. <b>PGT[A3 4.8 ft-lb, CW1 10 RPM, MTL 30.5]-6ext 7/16:</b> Rotate follower arm rotation bolt 2B, ~5/8 turn to hardstop</p> <p>14. Verify follower arm has rotated 90 deg</p> <p>15. <b>PGT[A3 4.8 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Rotate follower arm draw bolt 2C, ~32 turns to torque</p> <p>16. Verify follower bearings are in contact with race ring</p> <p>17. <b>PGT[B4 19.4 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Final installation torque on follower arm draw bolt 2C, ~4 turns to torque</p> <p>18. <b>PGT[B4 19.4 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Final installation torque on follower arm draw bolt 1C, ~4 turns to torque</p> <p><u>INSPECT DLA</u></p> <p>19. On MCC GO, verify DLA pinion gear teeth fully engaged to SARJ race ring teeth</p> <p><u>REINSTALL DLA MLI COVER</u></p> <p>1. <b>PGT[A1 2.5 ft-lb, CW2 30RPM, MTL 30.5]-6ext 7/16:</b> Engage inboard MLI cover fasteners (four), ~nine turns.</p>	

## DLA REMOVE AND REPLACE – TASK DATA

Table 1. Estimated Task Duration

	With SSRMS	Without SSRMS
One EV Crew	N/A	1:00
Two EV Crew	N/A	0:45

Table 2. Tools

EV1 (FF)	EV2 (FF)
PGT	PGT
6 Ext 7/16	6 Ext 7/16
APFR	
Round Scoop (optional)	

Table 3. EVA Fasteners

Fastener Name	Label	Head Size (in)	Qty	Install Torque (ft-lb)	Max Break Away Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
MLI Cover Inboard Fasteners	N/A	7/16	4 per cover	2.5	3.4	3.8 (Install) 13.7 (Release)	7 to 9	30
DLA 1A and 2A Lock Bolts	Yes	7/16	2	3.3 to 6.3	6.7	42.2	6	30
DLA 1C and 2C Draw Bolts	Yes	7/16	2	19.4 initial 4.8 final	25.7*	29.1 init 38.9 final	3 to 4 init 32 to 33 final	10 init 30 final
DLA 4A, 4B, and 4C Launch Restraint Bolts	Yes	7/16	3	24 to 26	25.0	50 - A and B 75 - C	4 to 6 - A and B 6 to 9 - C	30
DLA 1B and 2B Follower Arm Rotation Bolts	Yes	7/16	N/A	4.8	~1	10.6	5/8	10

\*Max On-Orbit Installable Torque

## DLA REMOVE AND REPLACE – TASK DATA (Cont)

Table 4. Foot Restraints

Task	WIF	APFR Setting	SARJ Angle
P3 Cover 5 DLA 1 Face 6	P3-31	7, PP, F, 12	NA
P3 Cover 20 DLA 2 Face 2	P4-04	6, PP, L, 1	180
S3 Cover 5 DLA 1 Face 2	S3-28	2, PP, F, 12	NA
S3 Cover 20 DLA 2 Face 6	S4-04	6, PP, L, 1	0

Table 5. DLA/RJMC Labeling

Location	Physical Label	Software/Logical Name
S3, Face 6	DLA 2	DLA 1
S3, Face 6	RJMC 2	RJMC 1
S3, Face 2	DLA 1	DLA 2
S3, Face 2	RJMC 1	RJMC 2
P3, Face 6	DLA 1	DLA 1
P3, Face 6	RJMC 1	RJMC 1
P3, Face 2	DLA 2	DLA 2
P3, Face 2	RJMC 2	RJMC 2

## DLA REMOVE AND REPLACE – TASK DATA (Cont)

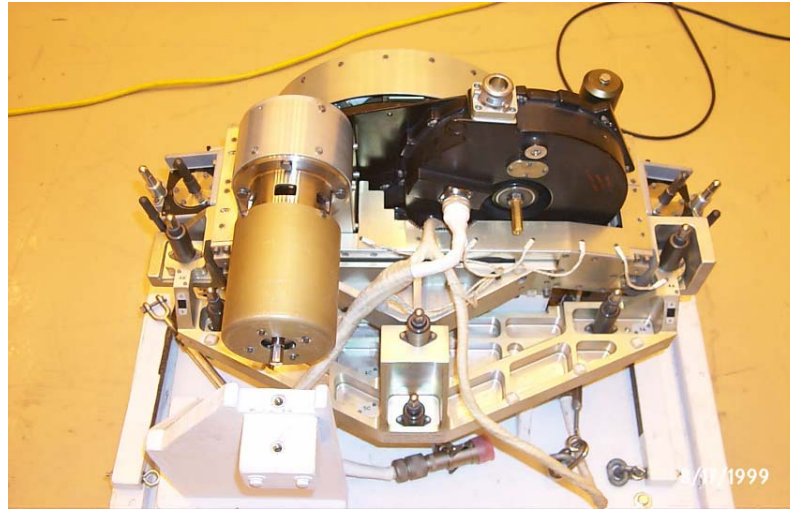


Figure 2.- DLA.

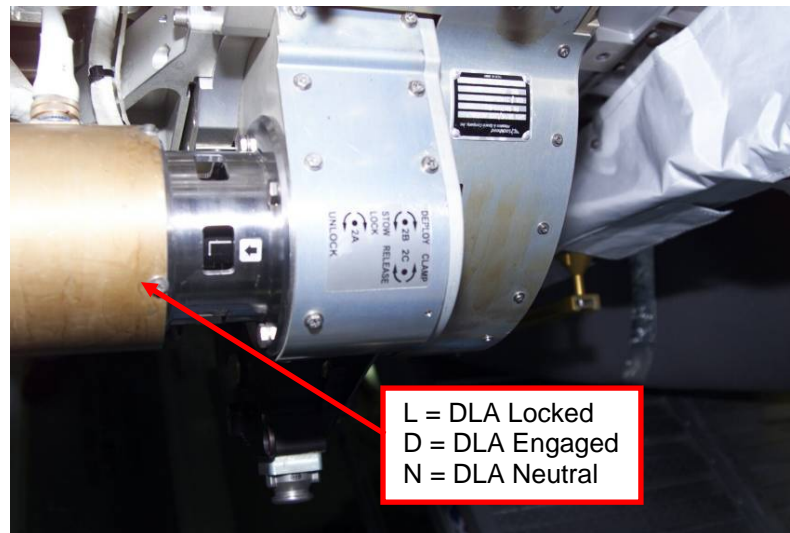


Figure 3.- DLA Window.

## RJMC REMOVE AND REPLACE

IV/SSRMS	EV2												
<p>1. Receive GO from MCC for RJMC R&amp;R (inhibits in place)</p> <table border="1" data-bbox="121 527 556 685"> <thead> <tr> <th>Bolt</th> <th>Torque</th> <th>Turns</th> </tr> </thead> <tbody> <tr> <td>Center</td> <td></td> <td></td> </tr> <tr> <td>Outer (fwd)</td> <td></td> <td></td> </tr> <tr> <td>Outer (aft)</td> <td></td> <td></td> </tr> </tbody> </table>	Bolt	Torque	Turns	Center			Outer (fwd)			Outer (aft)			<p><u>RJMC R&amp;R</u></p> <ol style="list-style-type: none"> <li>1. Translate to S3 RJMC</li> <li>2. <b>PGT[B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Release outer bolts (2) to hardstop, ~13 turns</li> <li>3. <b>PGT[B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Release center jack bolt to hardstop, ~28 turns</li> <li>4. Remove RJMC; temp stow</li> <li>5. Inspect ISS guide rails and connector receptacles</li> <li>6. Retrieve new RJMC from Large ORU Bag</li> <li>7. Install RJMC along guide pins into soft dock position</li> <li>8. <b>PGT[B2 16.0 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Engage center jack bolt to hardstop, 28 turns</li> <li>9. <b>PGT[B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:</b> Engage outer bolts (2) to hard stop, 13 turns</li> <li>10. Stow old RJMC in Large ORU Bag</li> <li>11. Perform Final Bag and Tool Inventory</li> <li>12. Perform Glove Inspection</li> </ol>
Bolt	Torque	Turns											
Center													
Outer (fwd)													
Outer (aft)													

## GENERIC EVA INHIBIT PAD

### Orbiter (1)

ALL EVAs	
TCS L12	1. √TCS POWER – OFF
KU-Band Antenna	
MCC-H	1. √KU-BAND Mask – active 2. √KU-BAND EVA Protect Box – active
RCS	
	If EV crew < 27 feet from FRCS
IV O14,15,16	1. √DAP: VERN, FREE, LO Z (flt specific check with GNC) 2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF LOGIC (four) – OFF
MCC-H	3. √Above RCS config
IV	4. √RCS F – ITEM 1 EXEC (*) √JET DES F1U – ITEM 17 (*) F3U – ITEM 19 (*) F2U – ITEM 21 (*)

### Ground

ALL EVAs	
Ground Radar	
MCC-H	1. √TOPO console, ground radar restrictions in place for EVA

### LOCATION DEPENDENT INHIBITS

#### OBSS – LDRI

TO INHIBIT LASER FIRING BUT LEAVE HEATER POWER ON:

#### NOTE

This procedure works best when performed during orbital night, and OBSS must be positioned such that its diffuser window is visible in the Camera B view

- |          |  |
|----------|--|
| R12(VPU) | 1. √Green Jumper – LDRI/ITVC   |
| A7U      | 2. VIDEO OUT MON2 pb – push<br>IN B pb – push<br>OUT MON1 pb – push<br>IN PL2(VPU) pb – push |
|          | 3. Center Cam B (ITVC) in the view of LDRI/ITVC  |
|          | 4. VIDEO OUT MON2 pb – push  |
|          | 5. Center LDRI/ITVC diffuser in the view of Cam B (ITVC)                                     |
|          | 6. CAMR CMD ZOOM – IN (FULL)   |
|          | 7. VIDEO OUT MUX 1 L pb – push<br>IN MIDDECK pb – push                                       |

#### NOTE

The following step will power off the LDRI laser. Observe the LDRI diffuser in the Camera B view and verify the laser turns off. Report observation to MCC-H

- |           |  |
|-----------|--|
|           | 8. LDRI MODE 1 pb – push   |
|           | 9. VIDEO IN as desired (not MIDDECK)   |
|           | <u>POINT PTU/LDRI AWAY FROM EV CREW</u>  |
| A7U       | 10. VIDEO OUT MON1 pb – push<br>IN PL2(VPU) pb – push  |
|           | 11. CAMR CMD PAN/TILT – HI RATE<br>PAN – L (to hard stop)<br>TILT – UP (to hard stop)<br>PAN/TILT – RESET<br>PAN/TILT – HI RATE (LO within 10°)<br>PAN: TBD<br>TILT: TBD |
| R12(OBSS) | 12. ITVC ENA – OFF   |

## GENERIC EVA INHIBIT PAD (Cont)

Orbiter (2)

### LOCATION DEPENDENT INHIBITS (Cont)

#### OBSS – LCS

TO INHIBIT LASER FIRING BUT LEAVE HEATER POWER ON:

- IV 1. Perform LCC DEACTIVATION step 1 (FDF P/TV CUE CARD, LCS)
- To shut down and remove all power to LCS (and ROEU if flown)

#### NOTE

These steps remove all power from LCS sensor and start a 105-min thermal clock

- IV 2. Perform LCH DEACTIVATION (FDF P/TV CUE CARD, LCS)
- R1 3. √PRI PL MNC – OFF (tb-OFF)
- A6U 4. √PL RETEN PL SEL – 1

#### EFGF Connector

#### NOTE

These steps remove all power from both OBSS sensors and start a 90-min thermal clock

- IV 1. √DEACTIVATION complete (FDF P/TV CUE CARD, LDRI/ITVC)
2. √LCC DEACTIVATION complete (FDF P/TV CUE CARD, LCS)
3. √LCH DEACTIVATION complete (FDF P/TV CUE CARD, LCS)

#### S-Band Antennas

#### NOTE

Possible loss of comm when forced LL FWD antenna

- IV If EV crew < 2 ft from S-Band antenna
- A1R 1. S-BAND FM ANT – XMIT LOWER/RCVR UPPER
2. √MCC, lower antenna selected
- If no comm, or on MCC GO
- C3 3. S-BAND PM ANT – LL FWD
- When EVA crewmember at least 2 ft away from all S-Band upper antennas
- C3 4. S-BAND PM ANT – GPC

USOS (1)

### ALL EVAs

#### PCU

#### NOTE

PCUs may require up to a 1-hr warmup period before they are operational

- MCC-H 1. √PCUs (two) operational in discharge mode and one of the following:
- CCS PCU EVA hazard control FDIR enabled
  - No more than two arrays unshunted and oriented < 105° from velocity vector
- If one or both PCUs failed
2. No more than two arrays unshunted and oriented < 105° from velocity vector

### LOCATION DEPENDENT INHIBITS

#### Lab Window

- IV If EV crew less than 10 ft from window or in window FOV, close window shutter

#### JPM Windows

- IV If EV crew translating on JPM port end cone, close window shutters

#### KU-Band (SGANT) Antenna

- MCC-H If EV crew < 3.3 ft from KU-BAND antenna
- Park KU-BAND:
    - Pointing Mode – Inhibit
    - PLC – Reset
    - Autotrack Continuous Retry – Inhibit

#### Mobile Transporter

- MCC-H If EV crew < 1.5 meters from MT
- √MT latched



## GENERIC EVA INHIBIT PAD (Cont)

### USOS (2)

LOCATION DEPENDENT INHIBITS	
S-Band (SASA) Antennas MCC-H	If EV crew < 3.6 ft from S1 SASA [P1 SASA] <ol style="list-style-type: none"> <li>1. P1 SASA (S1 SASA) – Active</li> <li>2. S1 SASA [P1 SASA] – Powered down</li> </ol>
SARJ MCC-H	If EV crew working within 2 ft or outboard of SARJ <ol style="list-style-type: none"> <li>1. √DLA (1) – LOCKED</li> <li>2. All motor setpoints set to zero</li> <li>3. All motors deselected</li> </ol>
TRRJ MCC-H	If EV crew working within 2 ft of P1 TRRJ rotation envelope <ol style="list-style-type: none"> <li>1. √DLA (1) – LOCKED</li> </ol>
MCC-H	If EV crew working within 2 ft of S1 TRRJ rotation envelope <ol style="list-style-type: none"> <li>1. √DLA (1) – LOCKED</li> </ol>
FPMU MCC-H	If EV crew working within 5 ft of Floating Potential Measurement Unit <ol style="list-style-type: none"> <li>1. FPMU power – Off</li> </ol>
SSPTS MCC-H	If EV crew working within 2 ft of SSPTS cables <ol style="list-style-type: none"> <li>1. RPCM LA1A4A D RPC 3 – Open, Close Cmd Inhibit</li> <li>2. RPCM LA2A3B D RPC 1 – Open, Close Cmd Inhibit</li> <li>3. RPCM Z14B A RPC 2 – Open, Close Cmd Inhibit</li> <li>4. RPCM Z13B A RPC 2 – Open, Close Cmd Inhibit</li> </ol>

### RSOS (1)

ALL EVAs	
SM Antennas IV	<ol style="list-style-type: none"> <li>1. GTS – Deactivate</li> <li>2. ARISS (Ham Radio) – Deactivate or VHF (144-146 MHz) TX only</li> </ol>
EVAS ON PMA 1 OR RSOS (LOCATION DEPENDENT)	
FGB Thrusters MCC-M	<ol style="list-style-type: none"> <li>1. √FGB MCS unpowered</li> <li>2. √All FGB Attitude Control Thruster Valves (eighty) – closed</li> <li>3. √FGB Attitude Control Manifold Valves – closed                      KШK1, KШK2, KШK4, KШK5, KШK9, OKO3, OKГ3, OKO6, OKГ6, OKO7, OKГ 7, OKO8, OKГ8</li> </ol>
Soyuz Thrusters MCC-M	<ol style="list-style-type: none"> <li>1. √Soyuz manifolds (four) – closed                      ЭКО1, ЭКО2, ЭКГ1, ЭКГ2</li> <li>2. √Soyuz MCS unpowered</li> <li>3. √Soyuz Attitude Control Thruster Valves (fifty-two) – closed</li> <li>4. √Soyuz Main Engine Valves (K1, K2, K3, K4, K5, K6) – closed</li> </ol>
FGB Antennas MCC-M	<ol style="list-style-type: none"> <li>1. √FGB KURS P [KYPC P] – Deactivated</li> </ol>
Soyuz Antennas MCC-M	<ol style="list-style-type: none"> <li>1. √Soyuz KURS A [KYPC A] – Deactivated</li> </ol>

## GENERIC EVA INHIBIT PAD (Cont)

### RSOS (2)

#### ADDITIONAL ANTENNA INHIBITS FOR EVAS ON RSOS (LOCATION DEPENDENT)

##### FGB Antennas

MCC-M	1. √TORU [ТОРУ]	– Deactivated
	2. √TV System [ТВС]	– Deactivated
	3. √KURS A [КУРС А]	– Deactivated
	4. Radiotelemetry [БР-9ЦУ-8]	– Deactivate
	5. √TV System [КЛ-108А]	– Deactivated
	6. √CNPMS [СИТНП]	– Deactivated
	7. √KOMPARUS [КИС]	– Deactivated
IV	8. √Sirius (VHF Ham Radio)	– Deactivated

##### SM Antennas

MCC-M	1. VHF-1, VHF-2 [СТТС]	– Deactivate
	2. BITS [БИТС2-12]	– Deactivate
	3. √TV System [ТВС]	– Deactivated
	4. REGUL [РЕГУЛ]	– Deactivate
	5. √LIRA [ОА]	– Deactivated
	6. √Orbit Radio Tracking System [PKO]	– Deactivated
	7. √Kurs P [КУРС P]	– Deactivated
IV	8. ARISS VHF (Ham Radio)	– Deactivate

##### Soyuz Antennas

MCC-M	1. √Teleoperator	– Deactivated
	2. √Telemetry	– Deactivated
	3. √TV	– Deactivated
	4. √Tracking	– Deactivated
	5. √Command (OMNI)	– Deactivated

##### Progress Antennas

MCC-M	1. √Teleoperator	– Deactivated
	2. √Telemetry	– Deactivated
	3. √TV	– Deactivated
	4. √Tracking	– Deactivated
	5. √Command (OMNI)	– Deactivated
	6. √KURS A [КУРС А]	– Deactivated

#### ADDITIONAL THRUSTER INHIBITS FOR EVAS ON RSOS (LOCATION DEPENDENT)

##### SM Thrusters

MCC-M	1. √SM MCS – INDICATOR MODE or CMGTA with Thrusters Disabled
	2. √SM Manifold valves (four) closed ККГ1, ККГ2, ККО1, ККО2
	3. √SM Attitude Control Thruster Valves (sixty-four) – closed
	4. √SM Main Engine Thruster Valves (four) – closed
	5. √SM Reboost manifold valves (four) – closed КМГ1, КМГ2, КМО1, КМО2

##### Progress Thrusters

MCC-M	1. √Progress Manifold Valves (four) – closed ЭКО1, ЭКО2, ЭКГ1, ЭКГ2
	2. √Progress Attitude Control Thruster Valves (fifty-six) – closed
	3. √Progress Main Engine Valves (K1, K2, K3, K4, K5, K6) – closed

## GENERIC NOTES, CAUTIONS, AND WARNINGS

### NOTES

1. Bolt install: Report torque and turns
2. Bolt release: Report torque and turns if different from published range
3. EVA connectors: After disconnection and prior to connection; verify pin and EMI band integrity; verify connector free of FOD
4. Inspect QDs for damage prior to mating
5. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
6. Avoid contact with OBSS striker bars (Vitrolube coating)

### CAUTION

#### ISS Constraints

- A. Avoid inadvertent contact with
  1. Grapple fixture shafts (dry lube)
  2. PIP pins
  3. EVA Crane [PMA1]
  4. TCS Reflectors [PMA2,PMA3]
  5. APAS hardware [PMA2,PMA3]
  6. CETA Lights (Z-93 paint) [LAB,S1,Node 1]
  7. Deployed MISSEs [Columbus EPF]
  8. Passive UMAs
  9. MBS/SSRMS/SPDM/JEMRMS taped radiative surfaces: VDU, ACU, JEU, LEU, MCU, CRPCMs, and Cameras
  10. Deployed TUS cable [Nadir CETA rail]
  11. S0 aft face Radiator
  12. GPS Antennas (S13 paint) [S0]
  13. UHF Antennas [LAB,P1]
  14. ETCS Radiator flexhoses and panels [S1,P1]
  15. EETCS/PV Radiator flexhoses, bellows and panels [P6,P4,S4,S6]
  16. SASA RF Group [S1,P1]
  17. Heat pipe radiators [Z1]
  18. PCU cathode and HCA ports [Z1]
  19. Ku-Band Antenna (SGANT) dish [Z1]
  20. CMG cover/shells [Z1]
  21. SPDM SJEU, EP, OTCM, LEU, and LEE VDU Radiator surfaces
  22. Open CBM petal covers, LAB window shutter, and JPM window shutter
  23. FPMU [S1]
  24. OTSD
  25. COL HAM radio antennas [COL-Nadir]
  26. JTVE Cameras [JEM]

### CAUTION

#### ISS Constraints (Cont)

- B. Electrical cables
  1. Avoid bend radii < 10 times cable diameter
- C. Fiber optic cables
  1. Avoid bend radii < 10 times cable diameter
  2. Avoid pulling on cable during mate/demate
- D. Fluid line flex hoses and QDs
  1. Avoid bend radii < 5 in for hoses with diameter < 1 in on LAB, S0, S1, P1, and 10 in for hoses with diameter < 1 in on all other elements
  2. Avoid bend radii < 14 in for hoses with a diameter  $\geq$  1 in
  3. Additional care should be taken to not exceed bend radii when applying loads at the flexible hose to rigid tube stub interfaces
  4. Ensure fluid QD booties are fully closed prior to leaving worksite; wire tie if reqd
- E. For structural reasons
  1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
  2. Avoid performing shaking motions (sinusoidal functions) more than four cycles
  3. Avoid kicking S1/P1 radiator beam. If any of these occur, wait 2 to 5 min to allow structural response to dissipate

## GENERIC NOTES, CAUTIONS, AND WARNINGS (Cont)

### CAUTION

#### ISS Constraints (Cont)

##### F. Other

1. ITT Cannon connector: On demated connectors, do not rotate collar or manipulate cable/connector using collar or connector tool
2. WIS Antennas: do not use as handholds [Node 1,Lab,P6,Z1]
3. Lubricant from Ku-Band SGANT gimbals [Z1], CMGs [Z1], and RTAS Ground Strap fasteners [P6,P4,S4,S6] can contaminate EMU
4. MLI handholds are not rated for crewmember translation loads
5. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged
6. Prevent inadvertent contact of the tether shuttle with ETRS when the P3/S3 Tether Shuttle Stop is raised away from the rail

### CAUTION

#### Shuttle Constraints

##### G. Avoid inadvertent contact with

1. OBSS and SRMS Composite Sections, Joint Torque Arms, Grapple Fixture Shafts, and Cable Harnesses
2. LCS (silver Teflon) and LDRI (silver Teflon) and ITVC (gold foil) [OBSS]
3. WVS Antenna [ODS Truss & PLB Sill]
4. Payload Bay and Camera wire harnesses, cables, cable guides, and connectors

##### H. No touch

1. LDRI diffuser [OBSS]
2. OBSS saddle contacts (when OBSS unberthed) [OBSS]
3. Monkey fur [PLB]
4. Cameras: metallic surfaces [PLB]
5. Ku-Band Antenna black dish and gold thermal blankets [PLB]

## GENERIC NOTES, CAUTIONS, AND WARNINGS (Cont)

### WARNING

#### ISS Constraints

- A. Avoid inadvertent contact with
  - 1. Grapple fixture targets and target pins
  - 2. SSU, ECU, beta gimbal platform, mast canister, SAW blanket boxes unless the beta gimbal is locked and the motor is turned off
  - 3. Stay inboard of SARJ when active
  - 4. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate
  - 5. Stay 5 ft from moving MT on face 1
  - 6. SOLAR and EuTEF [COL EPF]
- B. Handrails
  - 1. Handrails previously used for MISSE attachment may not be used as a safety tether point [A/L endcone 564 & 566, A/L Tank 2 nad/fwd & port/fwd, P6 5389]
- C. Pinch
  - 1. NZGL connector linkage. Use caution when mating/locking
  - 2. ITT Cannon Connector rotating housing
  - 3. EV side of IV Hatch during Hatch operation (also snag hazard) [A/L]
  - 4. LAB window shutter and CBM petal cover and JPM window shutter linkages during operation
  - 5. JEMRMS HRM capture latches
  - 6. JEM Cameras (JTVEs, EVE, WVE)
- D. QDs
  - 1. If QD is in FID when valve is opened (bail fwd), QD will leak and fluid line may whip
  - 2. Do not rotate if in mated/valve open config

### WARNING

#### ISS Constraints (Cont)

- E. RF radiation exposure
  - 1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1]
  - 2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1]
  - 3. Stay 1 ft from UHF Antenna when powered [LAB,P1]
  - 4. Stay 0.3 ft from fwd/aft JPM PROX antenna
- F. Sharp Edges
  - 1. Inner edges of WIF probes
  - 2. APFR active WIF probes
  - 3. Mating surfaces of EVA connectors  
Avoid side loads during connector mating
  - 4. Back side of MMOD shield fasteners
  - 5. Spring loaded captive EVA fasteners (e.g., 6B-boxes, BMRRM, RTAS, SARJ Covers); the end of the spring may protrude
  - 6. PMA umbilical launch restraints-exposed bolt threads
  - 7. Adjustable Fuse Tether (Fish Stringer) buckles stowed in Node Bag
  - 8. Nickel coated braided copper Ground Straps may contain frayed wires [P6,P4,S4,S6]
  - 9. SPDM OTCM gripper jaws

### WARNING

#### ISS Constraints (Cont)

- F. Sharp Edges (Cont)
  - 10. Solar Array Blanket Box [P6,S6]
  - 11. Keep hands away from SSRMS LEE/POA/SPDM LEE/JEMRMS EE opening, snares, and PDGF curvic coupling (teeth)
  - 12. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing
  - 13. Outboard MT rail attachment lug near P6 handrail 5333 and gap spanner
  - 14. P2 connector on EWIS box TAA-06 [Zenith/Forward Corner 1 of P5 - SARJ at 0 deg]
  - 15. Port/Aft portion of A/L circular HR [HR 0506]
  - 16. Interior of JEMRMS HRMs
  - 17. JEM A/L hatch corners
- G. Thermal
  - 1. EVA connectors with booties may become hot if left uncovered. Handling may need to be limited
  - 2. PMA handrails may be hot. Handling may need to be limited
  - 3. Turn off glove heaters when comfortable temp reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
  - 4. Uncovered trunnion pins may be hot
  - 5. SSRMS/MBS/SPDM/JEMRMS operating cameras and lights may radiate large amounts of heat

## GENERIC NOTES, CAUTIONS, AND WARNINGS (Cont)

### WARNING

#### ISS Constraints (Cont)

##### G. Thermal (Cont)

6. Stay  $\geq 1$  ft away from PMAs and MMOD shields  $> 270$  degF if EMU sun visor up; limit time to 15 min or less if  $> 300$  degF
7. Stay at least 0.5 ft away from PMA and MMOD shields  $> 325$  degF
8. Do not touch EMU protective visor if temp has been  $< -134$  degF for  $> 15$  min
9. No EMU TMG contact with PMAs and MMOD shields  $> 320$  degF
10. No EMU boot contact with foot restraint when temp  $< -120$  degF or  $> 200$  degF
11. Columbus end cones may violate touch temperature constraints when  $-75 \leq \beta \leq -60$  or  $60 \leq \beta \leq 75$
12. PDGF surfaces may not meet touch temperature requirements for unlimited contact when  $\beta \leq -70$  or  $\beta \geq 70$
13. JPM port end cones and JLP port nadir may violate touch temperature constraints when  $\beta > 60$  deg

### WARNING

#### ISS Constraints (Cont)

##### H. Electrical Shock

1. Stay  $\geq 2$  ft from ungrounded floating connectors if not unpowered
  - SSPTS connectors include NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA 2 Stbd and Port
  - MBS Cross-Connect jumpers (translate past these using UMA handrails) Include S0 EVA Power Cables (inside S0 Bay 00 Face 4, Bay 01 Face 3) ESP2 jumper (inside S0 Bay 03 Face 4)
2. Do not touch SPDM CLPA 1 electrical connector prior to camera installation

### WARNING

#### Shuttle Constraints

##### I. Arcing/Molten Debris

1. Stay  $\geq 2$  ft from exposed EFGF connector when OBSS berthed, powered, and EFGF not grappled [PLB]
2. Stay  $\geq 2$  ft from exposed Stbd Fwd MPM contacts [PLB]
3. Stay above PLB sill when within 1 ft of powered ROEU connector [PLB]

##### J. Pinch

1. PRLA operation [PLB]

##### K. RF radiation exposure

1. Stay 3.28 ft from S-Band Antenna when powered
2. Stay 1 ft from top and side of UHF PLB Antenna radome surface when in high powered mode [ODS truss]
3. Stay 0.33 ft from top and side of UHF PLB Antenna radome surface when in low powered mode [ODS truss]
4. Remain below the level of the PLB door mold line for first 20 in Aft of Fwd bulkhead when S-Band Antenna powered [PLB]
5. Remain on the inboard side of the Stbd slidewire (sill handrails if slidewire not installed) for first 20 ft Aft of Fwd bulkhead when Ku-Band Antenna powered [PLB]

## GENERIC NOTES, CAUTIONS, AND WARNINGS (Cont)

### WARNING

#### **Shuttle Constraints (Cont)**

##### L. Sharp Edges

1. PRLA grounding wipers [PLB]
2. LDRI baffles (also an entrapment hazard) [OBSS]
3. Keep hands away from SRMS EE opening and snares
4. TCS connector backshells have exposed threads [ODS]

##### M. Thermal

1. Illuminated PLB lights; do not touch
2. OBSS grapple fixture shafts/cams may be hot. Limit handling if required
3. Stay 27 ft from PRCS when powered
4. Stay 3 ft from VRCS when powered
5. Stay 3 ft from APU when operating

##### N. Contamination

1. Stay out of the immediate vicinity of leaking jet or APU

##### O. Lasers

1. Do not look at LDRI diffuser or LCS laser aperture window

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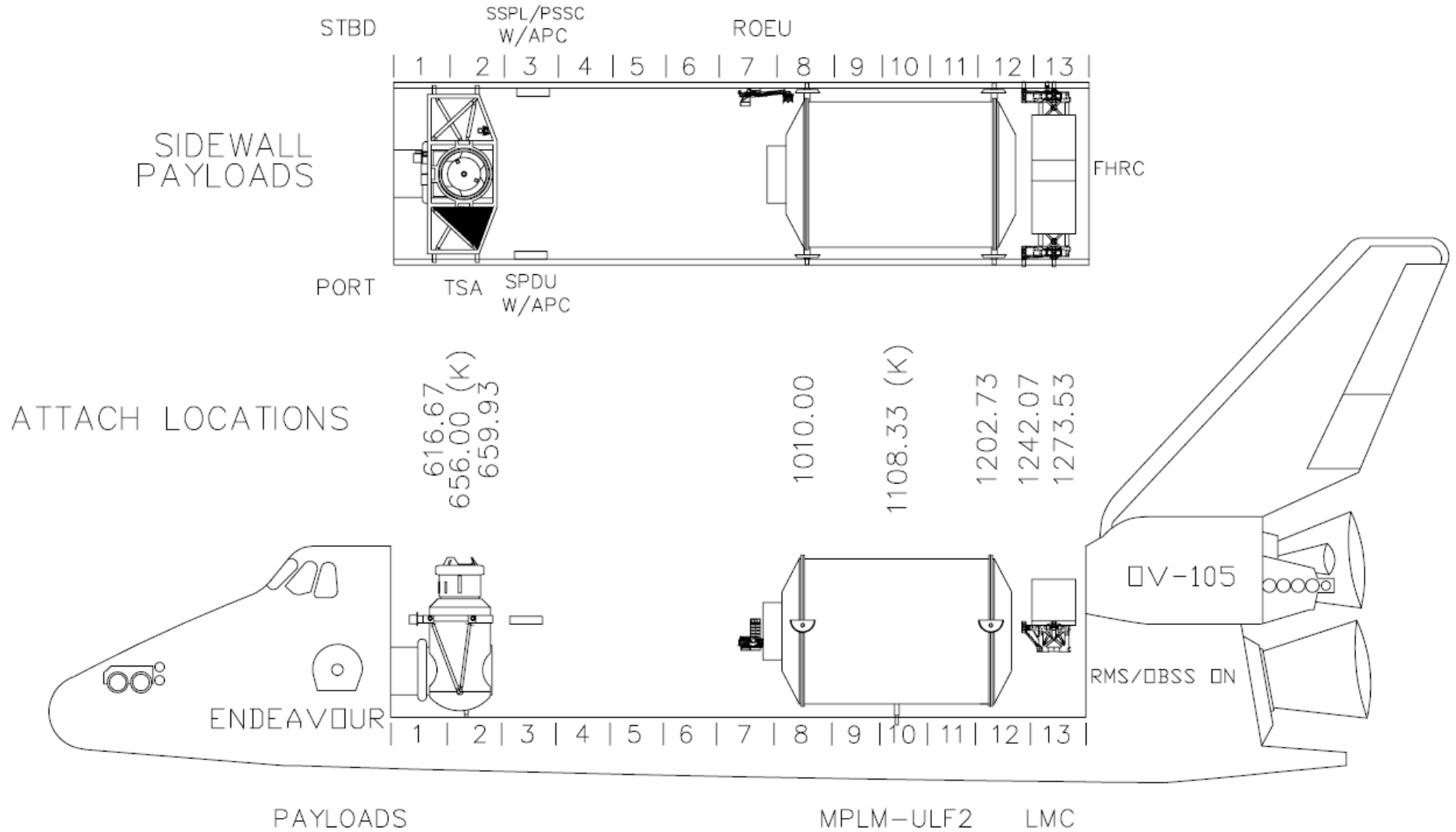
FLIGHT SPECIFIC EVA REFERENCE

PAYLOAD BAY LAYOUT ..... FS 18-3  
FHRC ON LMC ..... FS 18-4  
NTA ON LMC ..... FS 18-5  
CPK ON LMC ..... FS 18-6  
ESP-3 ZENITH VIEW ..... FS 18-7  
ESP-3 NADIR VIEW ..... FS 18-8  
ESP-3 HANDRAILS AND WIFs – ZENITH VIEW ..... FS 18-9  
ESP-3 HANDRAILS AND WIFs – NADIR VIEW ..... FS 18-10  
FRAM/FSE/ORU ASSEMBLY ..... FS 18-11  
ACTIVE FRAM SOFT CAPTURE MECHANISM ..... FS 18-12  
ESP-3 NTA MLI ..... FS 18-14  
NODE 2 ZENITH PORT HANDRAILS ..... FS 18-15  
NODE 2 NADIR STBD HANDRAILS ..... FS 18-16  
NODE 2 PORT NADIR HANDRAILS ..... FS 18-17  
NODE 2 STBD ZENITH HANDRAILS ..... FS 18-18  
NODE 2 FWD END CONE ..... FS 18-19  
JPM – AFT FACE ..... FS 18-20  
JPM – PORT ENDCONE ..... FS 18-21  
JPM OVERALL DIMENSIONS AND MASS INFORMATION ..... FS 18-23  
TRUNDLE BEARING ASSEMBLY ..... FS 18-24  
TIEDOWN: SARJ TBA ..... FS 18-32  
TIEDOWN: S3 AFT-NADIR CLAMSHELL AND STUB ..... FS 18-34  
CETA CART – TOP VIEW ..... FS 18-35  
CETA CART – SWING ARMS AND WIF MARKINGS ..... FS 18-36  
CETA CART – COUPLERS ..... FS 18-37  
CETA CART – WHEEL BOGIES ..... FS 18-38  
P1 MT STOP ..... FS 18-39  
P3 OVERVIEW ..... FS 18-40  
P3/P4 OVERVIEW ..... FS 18-41  
P3 TRUSS SEGMENT (FACE 1, 2, & 6 – TOP VIEW) ..... FS 18-43  
P3 TRUSS SEGMENT (FACE 1, 2, & 3 – PORT END VIEW) ..... FS 18-44  
P3 TRUSS SEGMENT (FACE 3 & 4 – STBD END VIEW) ..... FS 18-45  
P3 TRUSS SEGMENT (FACE 5 & 6 – STBD END VIEW) ..... FS 18-46  
P3 SARJ STRUCTURE (STBD SIDE – UTA SIDE AND  
PORT SIDE – DMA SIDE) ..... FS 18-47  
JLP FWD SIDE VIEW ..... FS 18-48  
JLP PORT SIDE VIEW ..... FS 18-49  
JLP ZENITH ENDCONE VIEW ..... FS 18-50  
ULF2 EVA PROX GPSAA INSTALLATION OPS FLOW –  
CABLE/CONNECTOR LOCATION AND ID ..... FS 18-51  
ETVCG DUMMY BOX ..... FS 18-52  
ETVCG ..... FS 18-53  
TIEDOWN: ETVCG TO VSSA (GENERIC) ..... FS 18-57  
TIEDOWN: DUMMY BOX SECURED TO VSSA ..... FS 18-58  
FHRC STINGER BOX (TRRJ AT -90 DEG) ..... FS 18-59  
FHRC HOSE BOX ..... FS 18-60

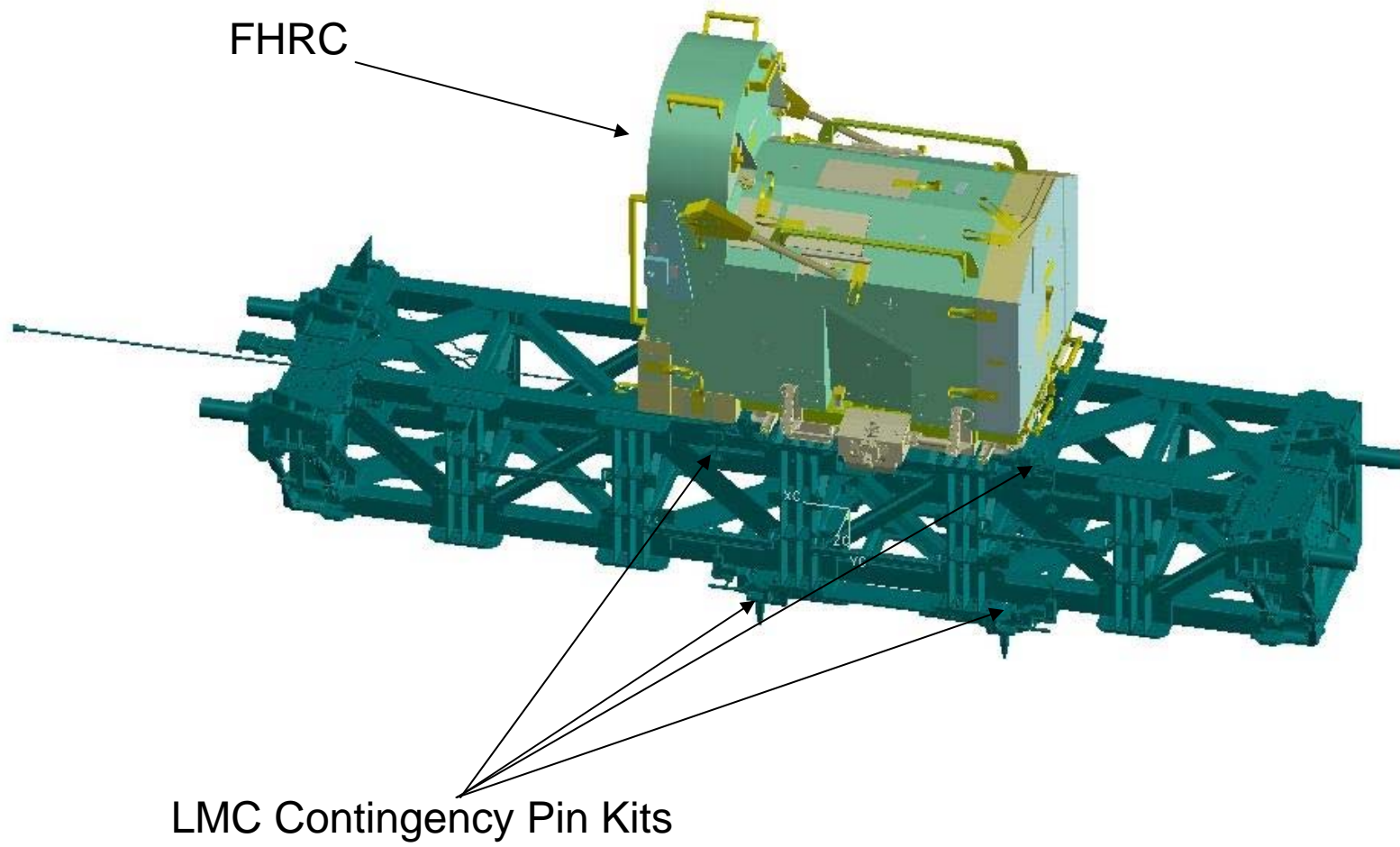
FLIGHT SPECIFIC  
EVA REFERENCE

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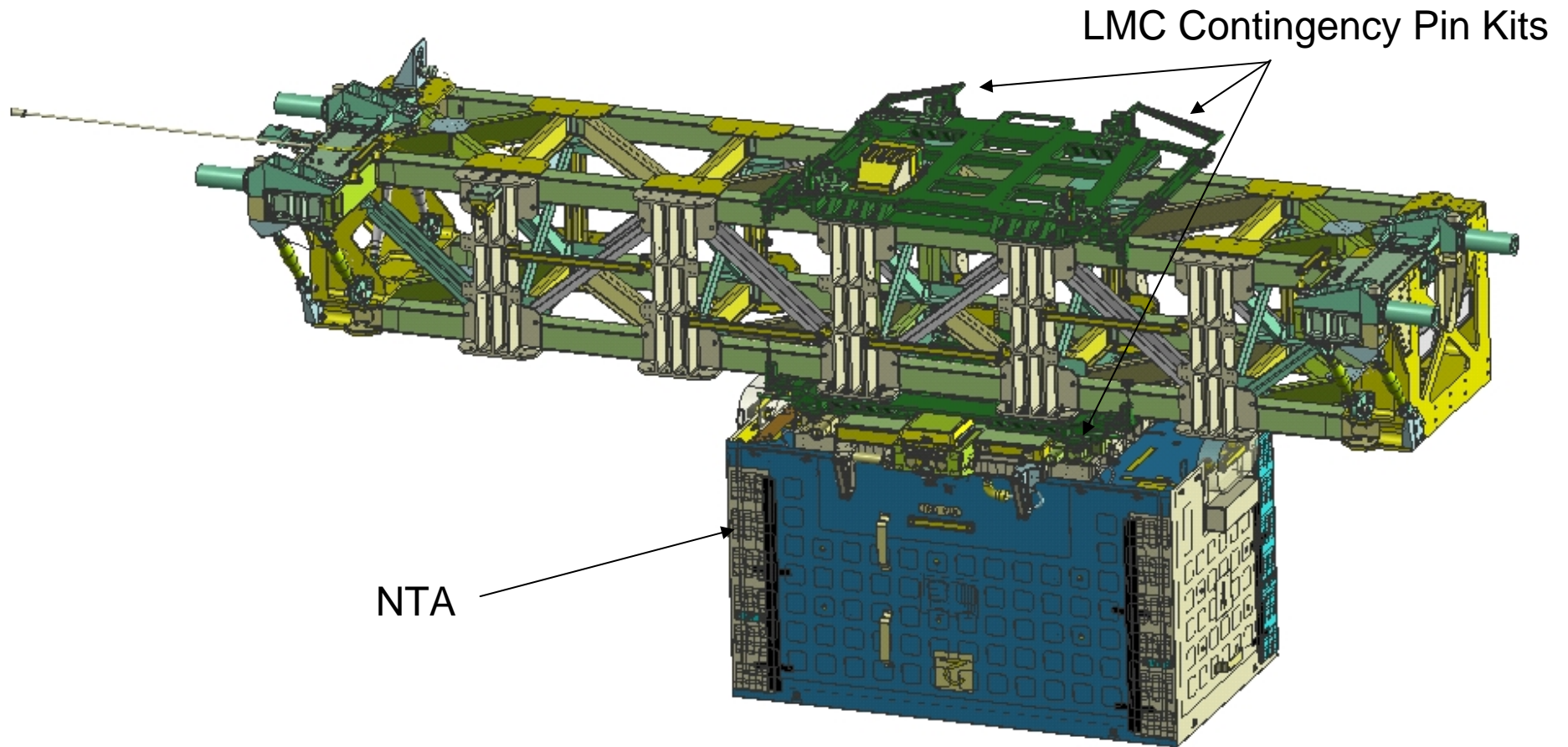
# PAYLOAD BAY LAYOUT



FHRC ON LMC



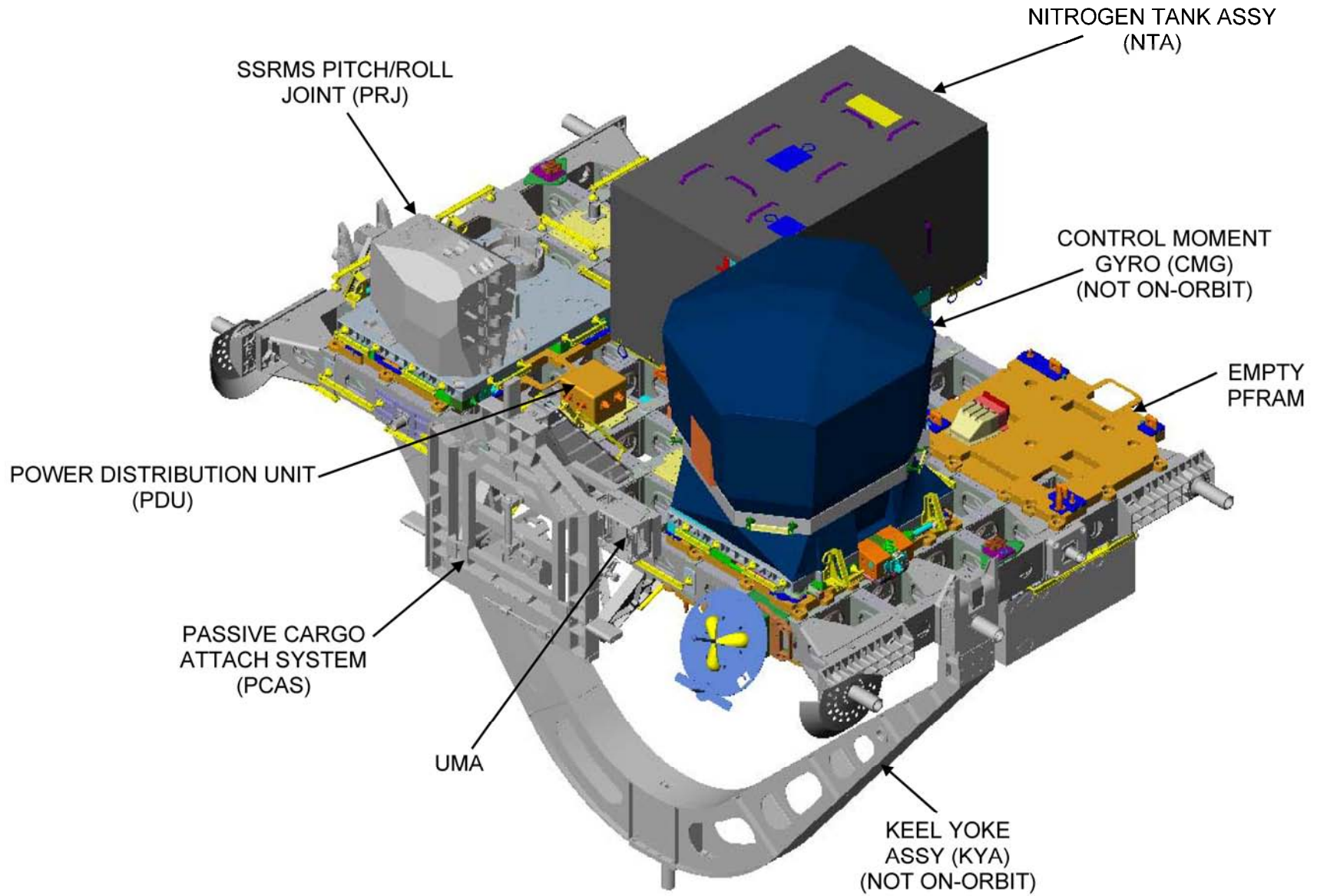
NTA ON LMC



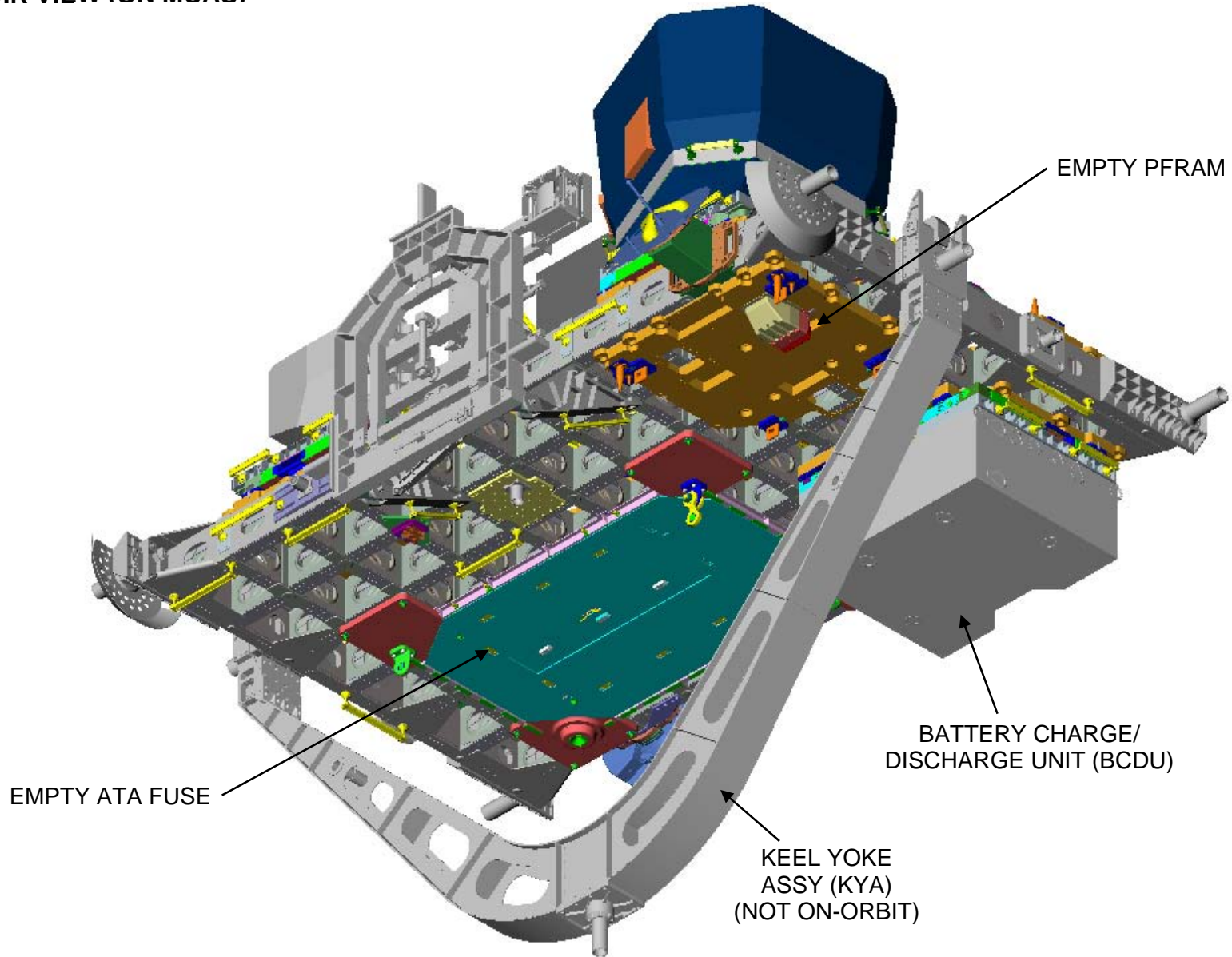
CPK ON LMC



**ESP-3 ZENITH VIEW (ON MCAS)**

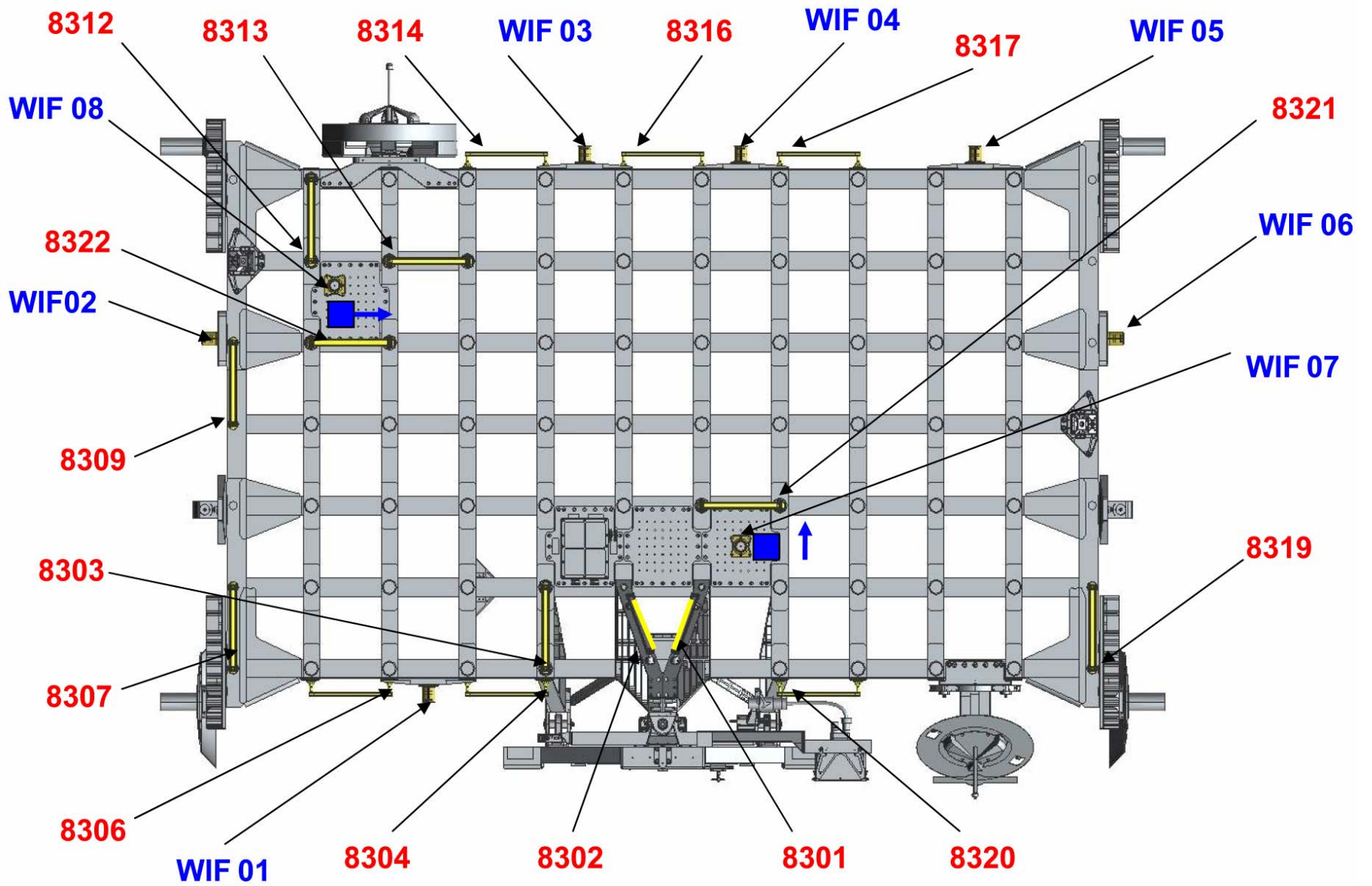


ESP-3 NADIR VIEW (ON MCAS)

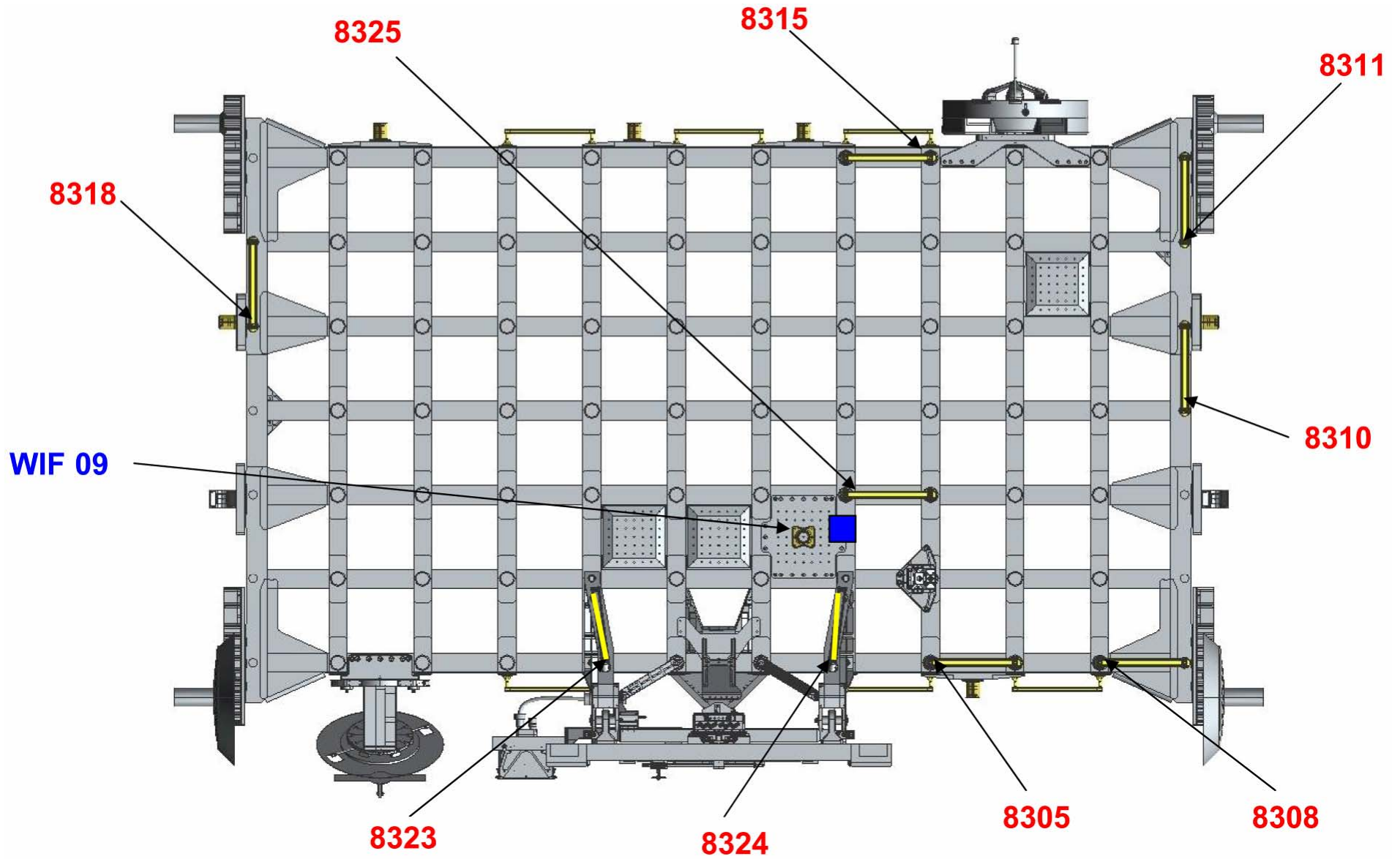




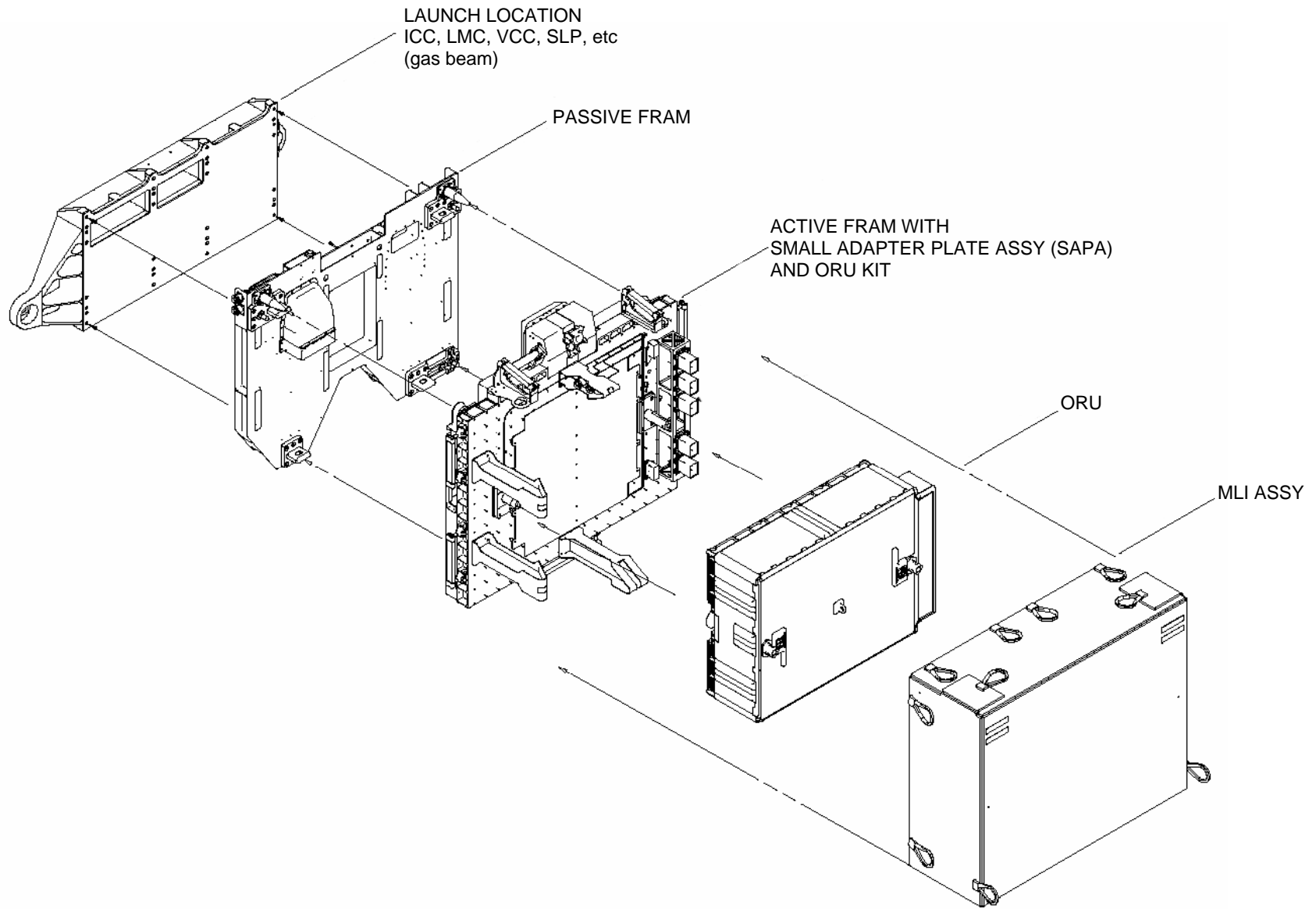
ESP-3 HANDRAILS AND WIFs – ZENITH VIEW



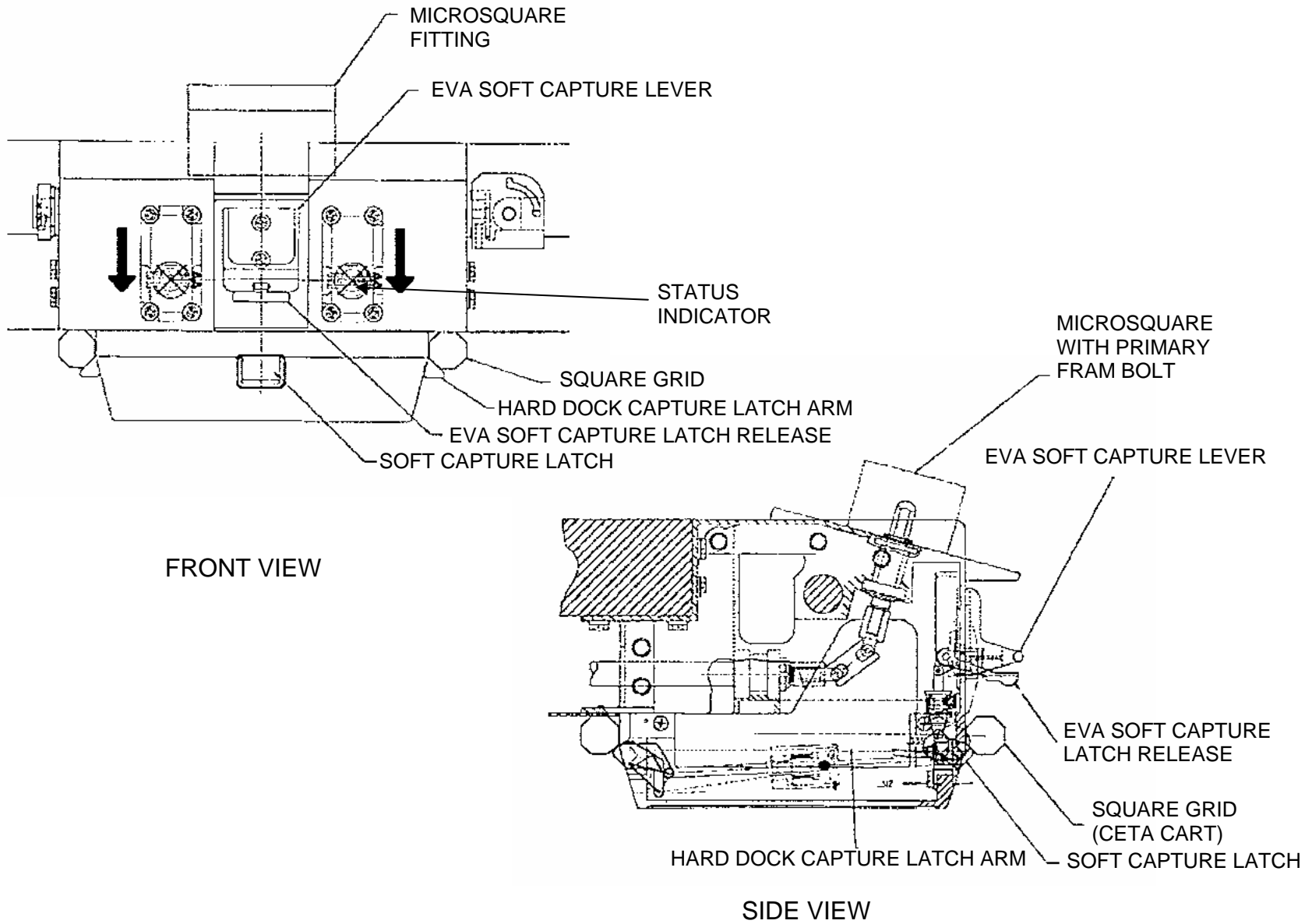
ESP-3 HANDRAILS AND WIFs – NADIR VIEW



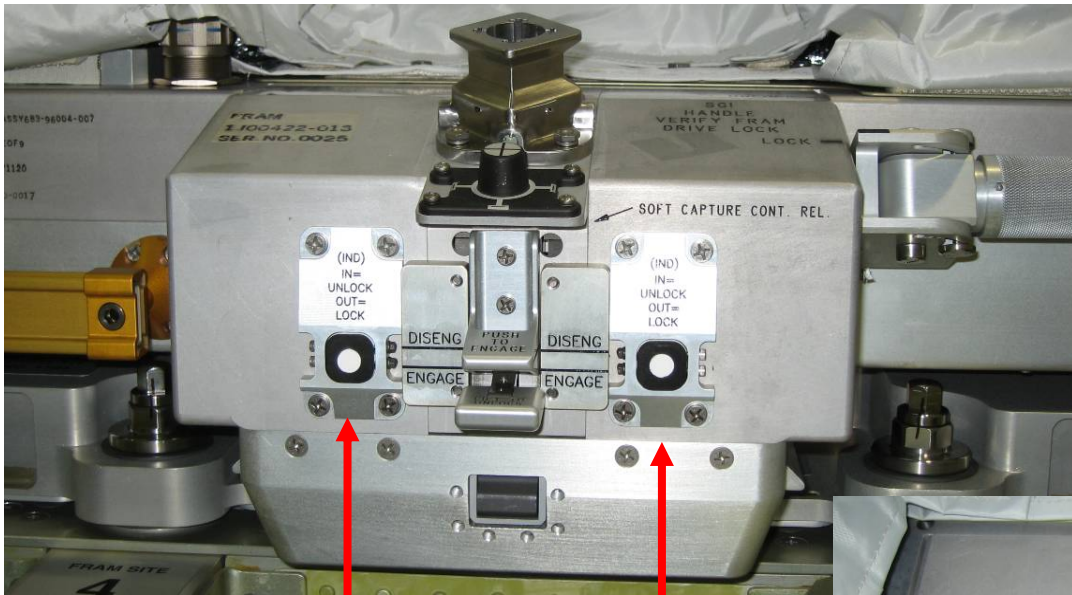
# FRAM/FSE/ORU ASSEMBLY



# ACTIVE FRAM SOFT CAPTURE MECHANISM

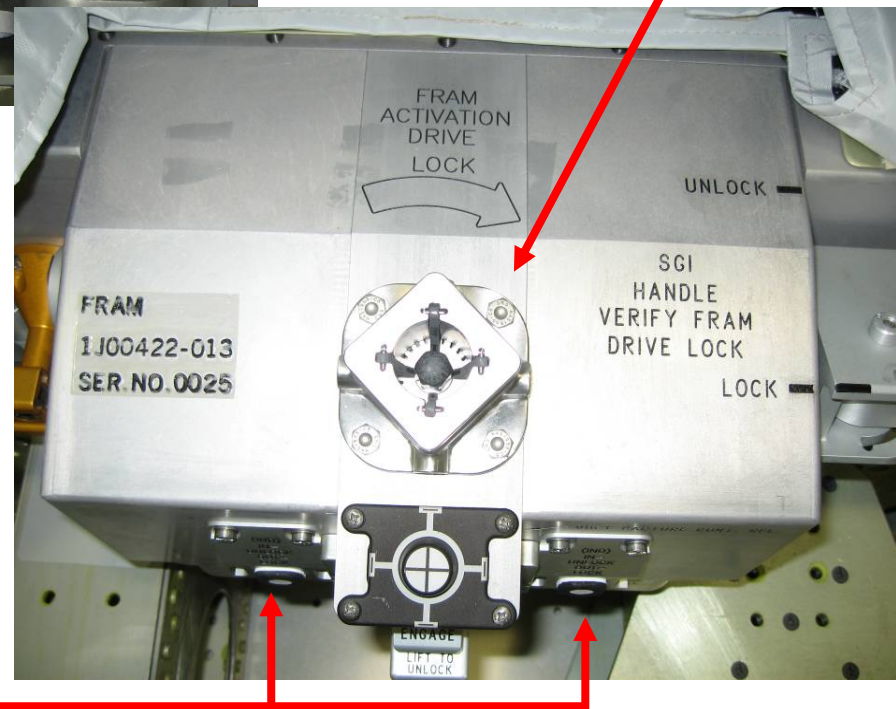


## ACTIVE FRAM SOFT CAPTURE MECHANISM (Cont)

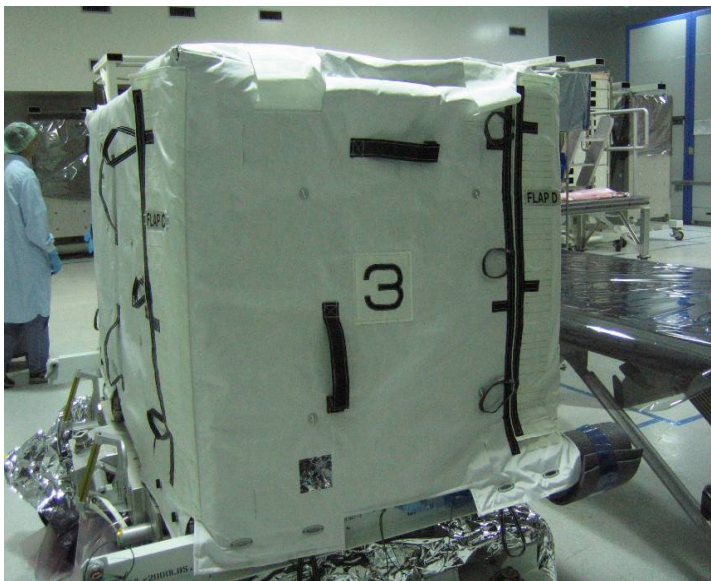
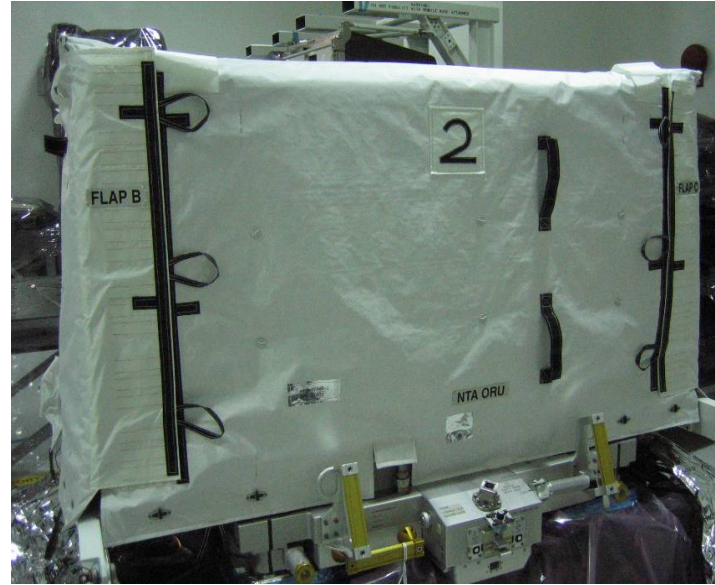


Status Indicators  
(White edge  
indicates locked)

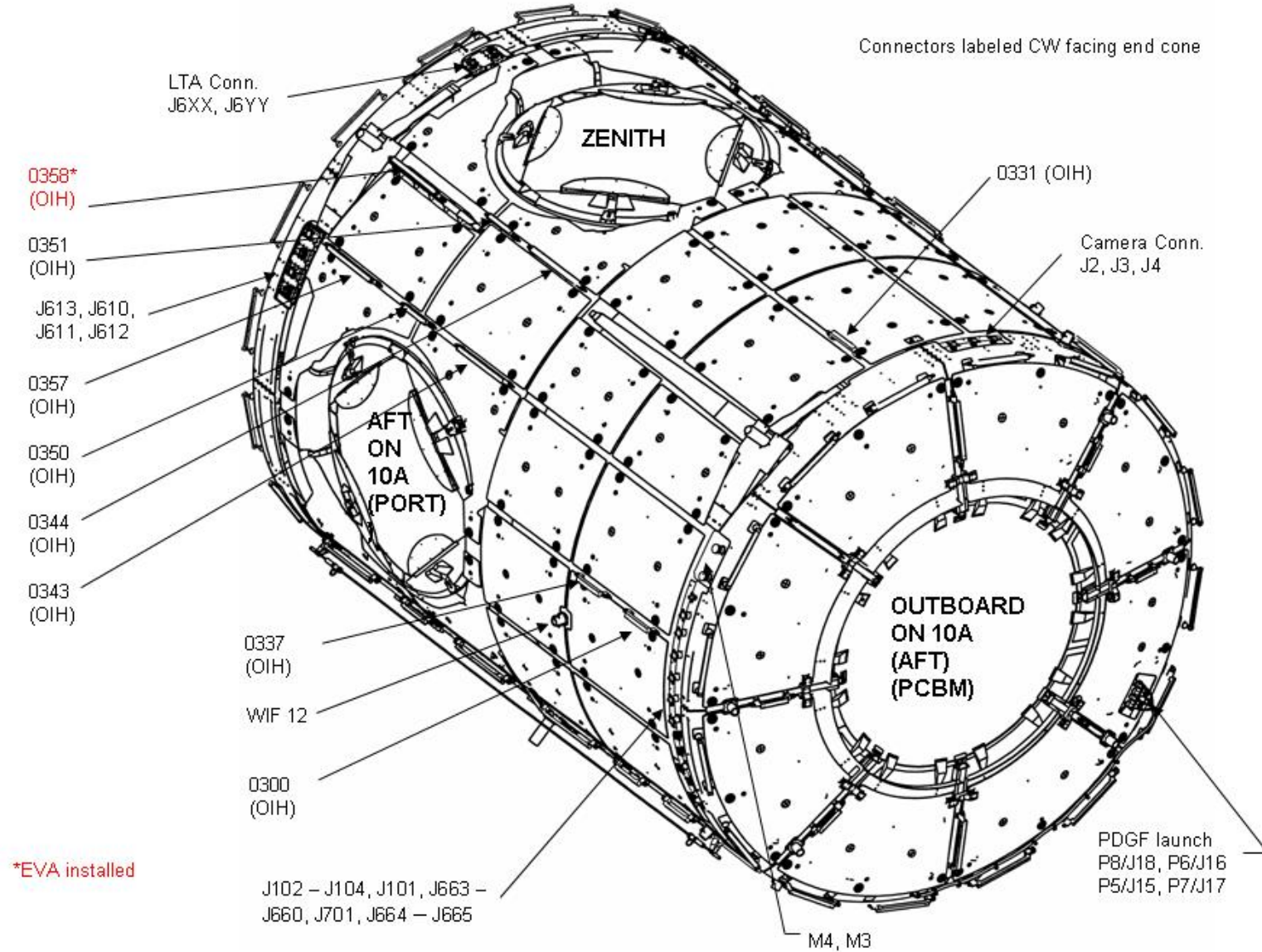
Primary bolt (with  
anti-rotation device)



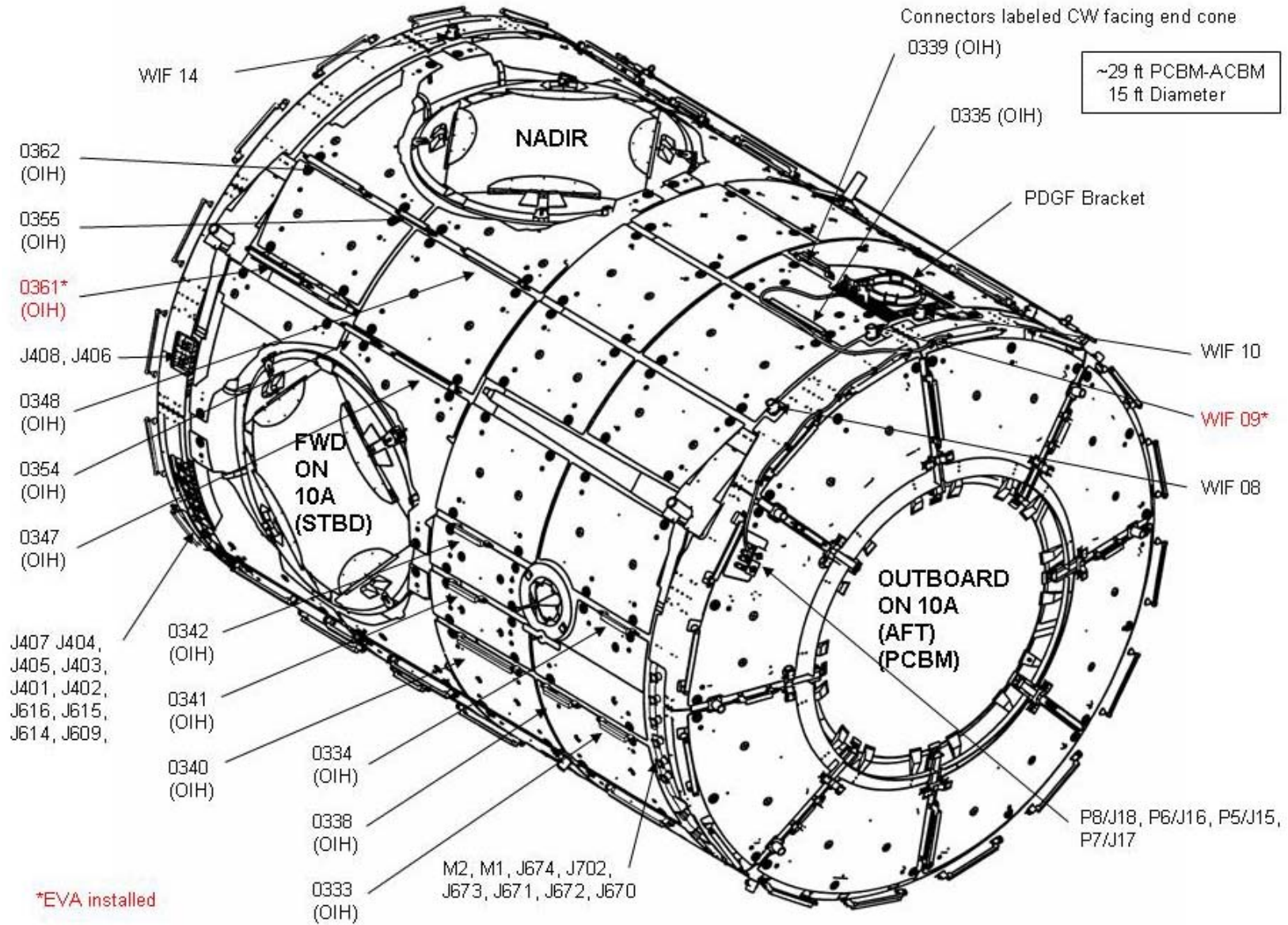
ESP-3 NTA MLI



# NODE 2 ZENITH PORT HANDRAILS

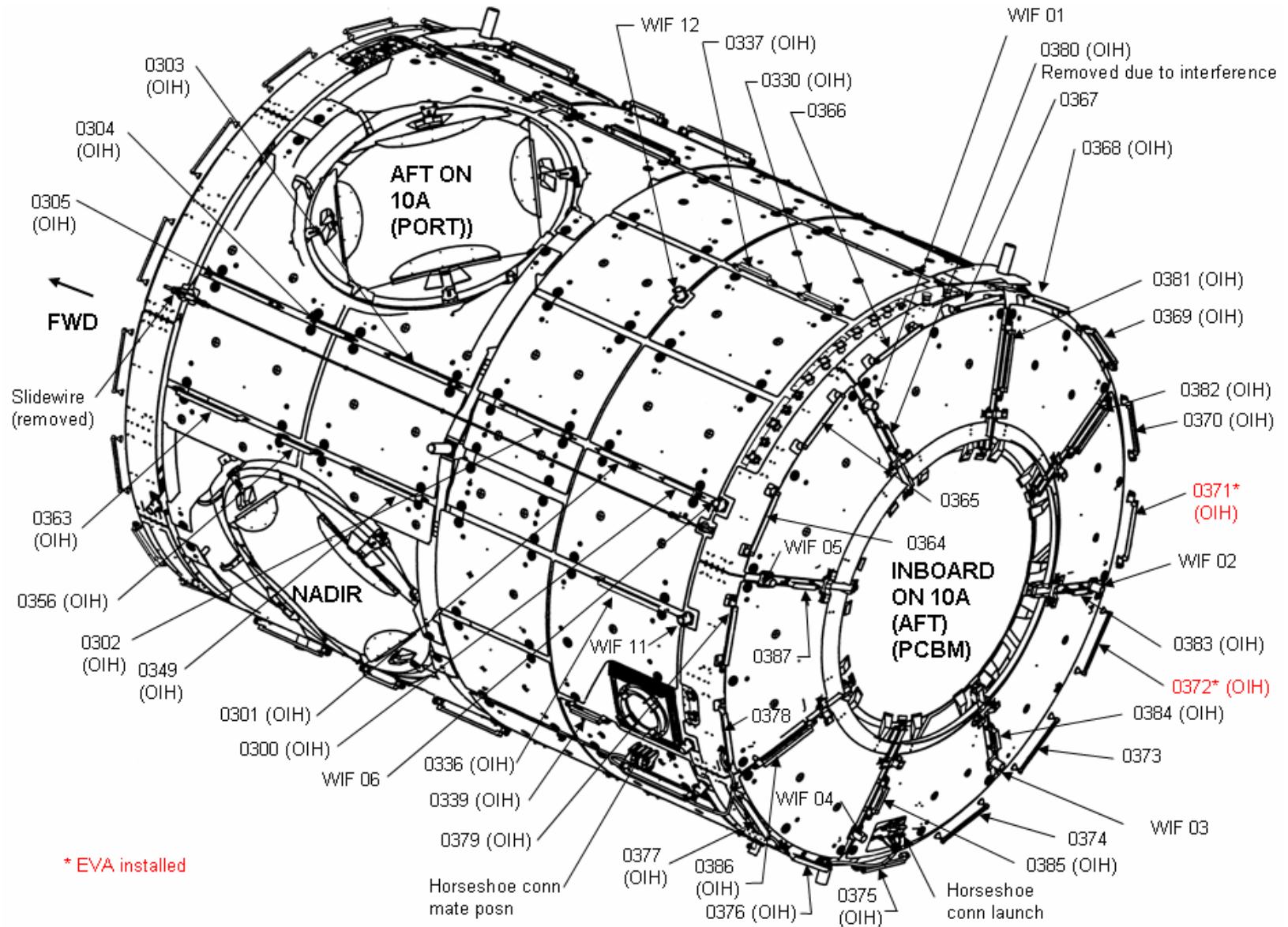


# NODE 2 NADIR STBD HANDRAILS

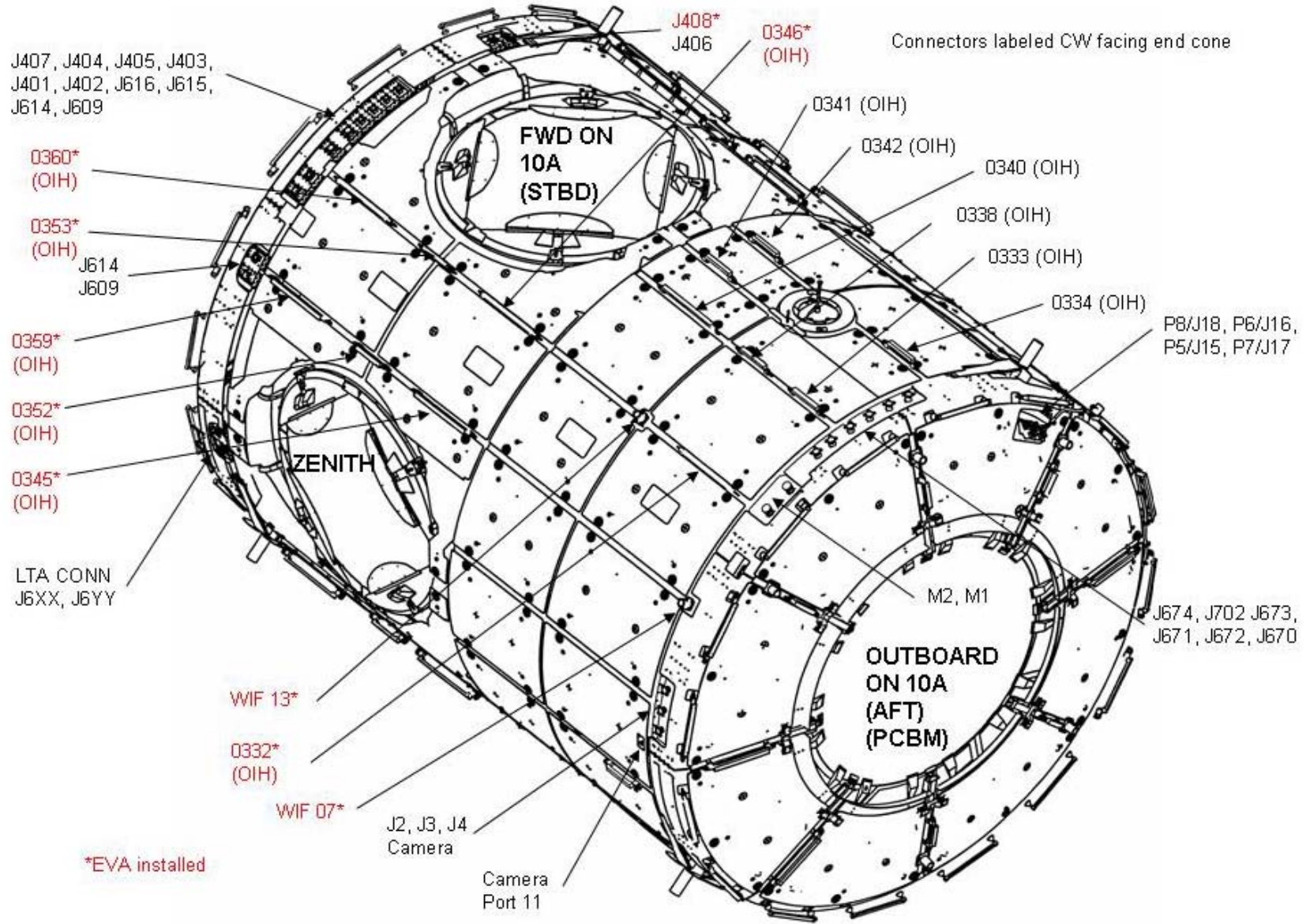




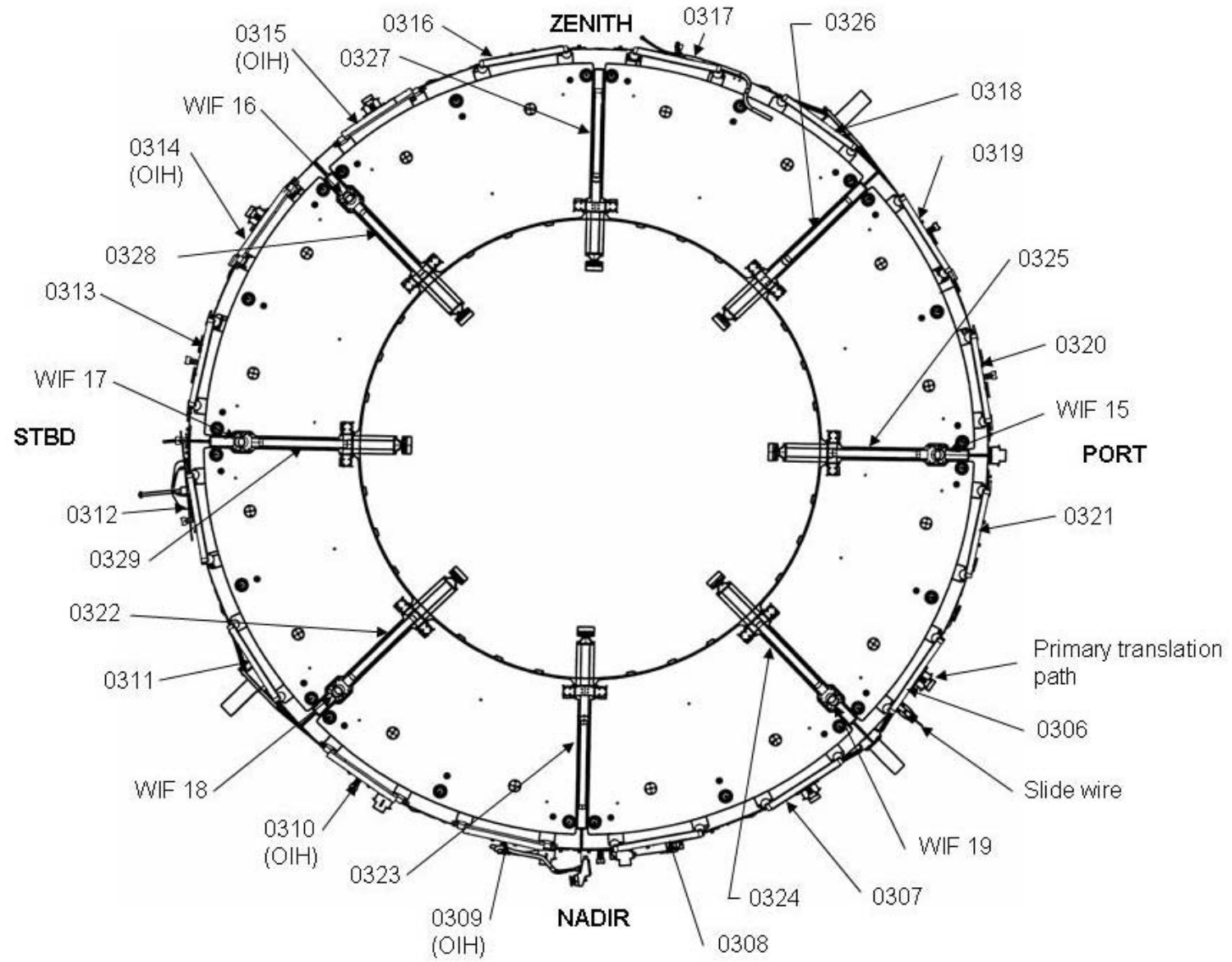
# NODE 2 PORT NADIR HANDRAILS



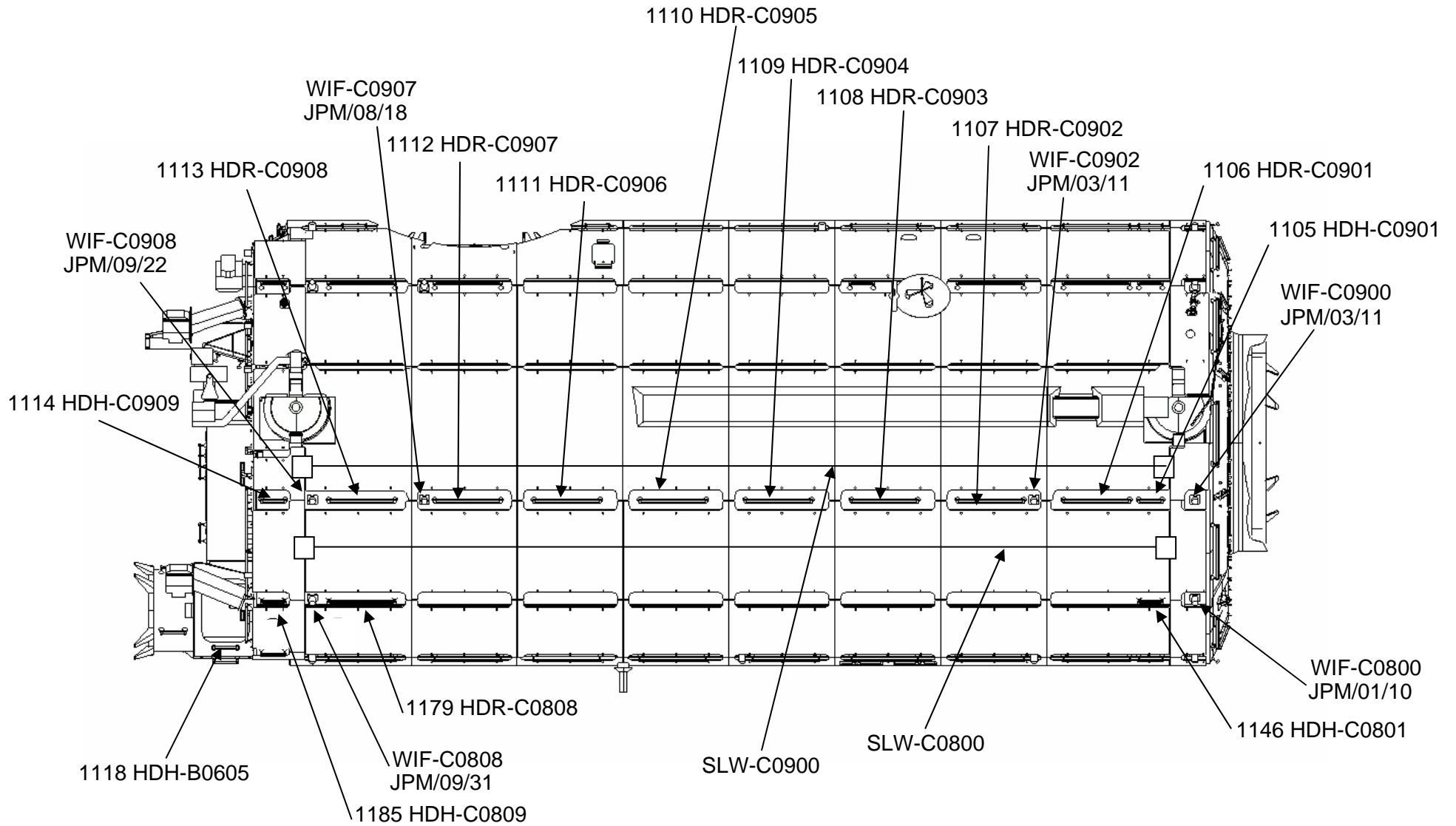
# NODE 2 STBD ZENITH HANDRAILS



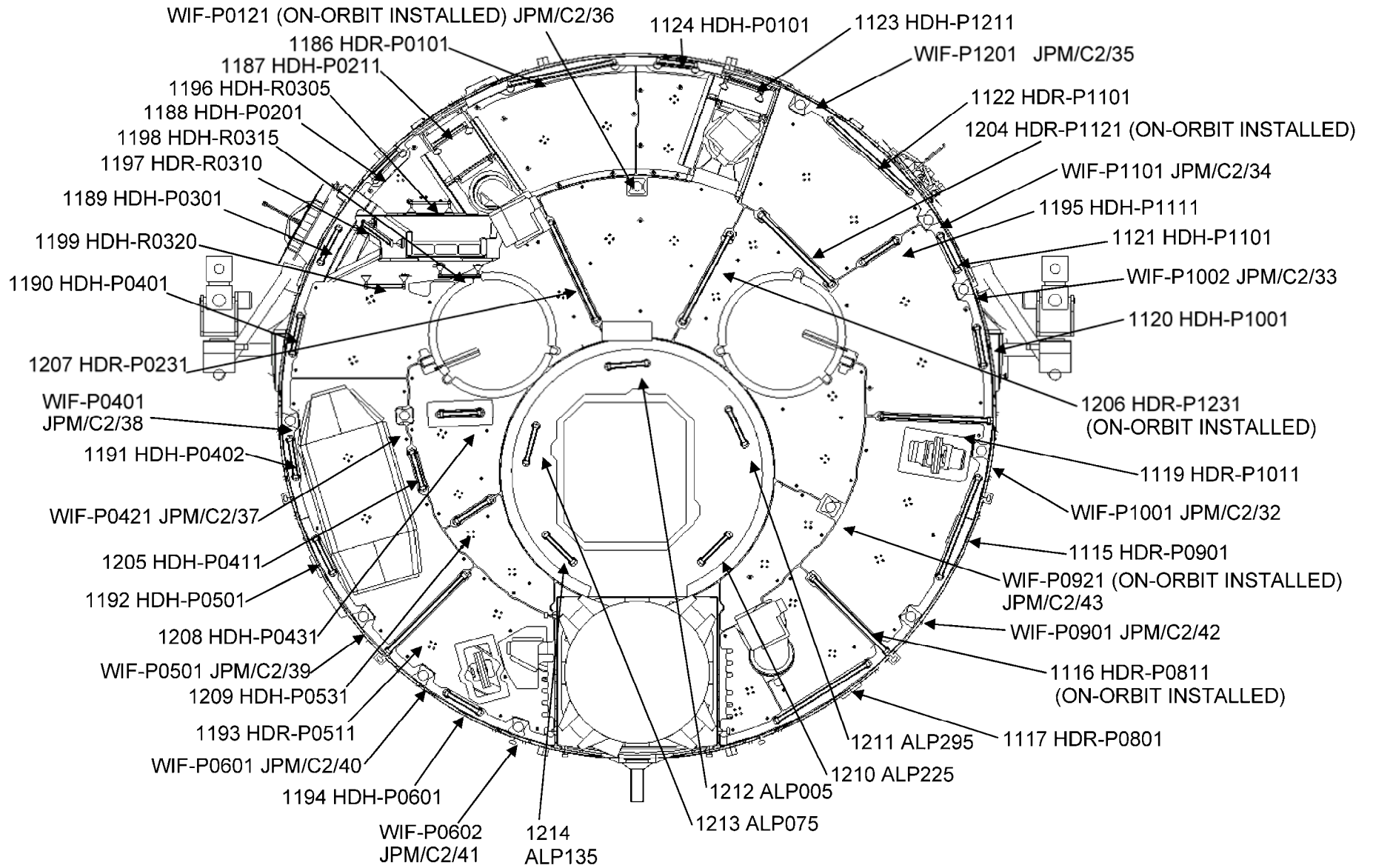
## NODE 2 FWD END CONE



JPM – AFT FACE



# JPM – PORT ENDCONE

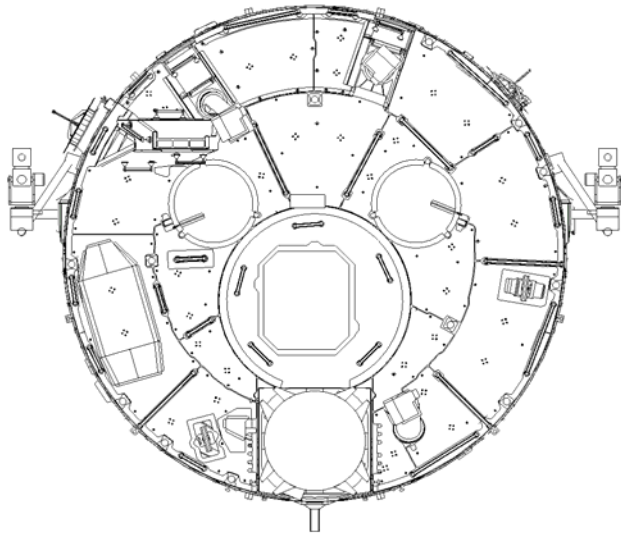


JPM – PORT ENDCONE (Cont)

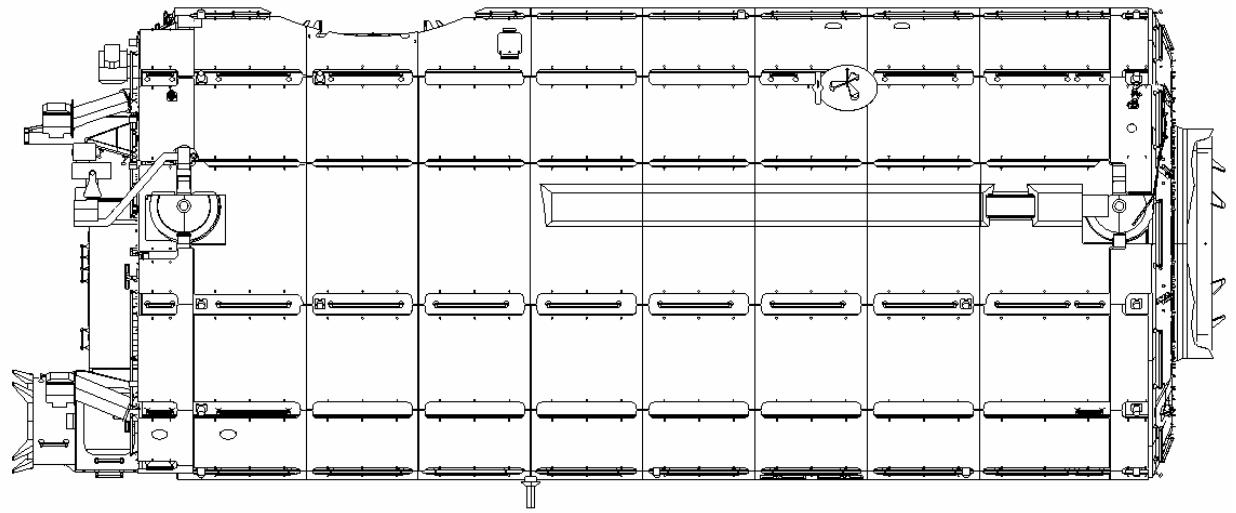


# JPM OVERALL DIMENSIONS AND MASS INFORMATION

Approx 15' Diameter

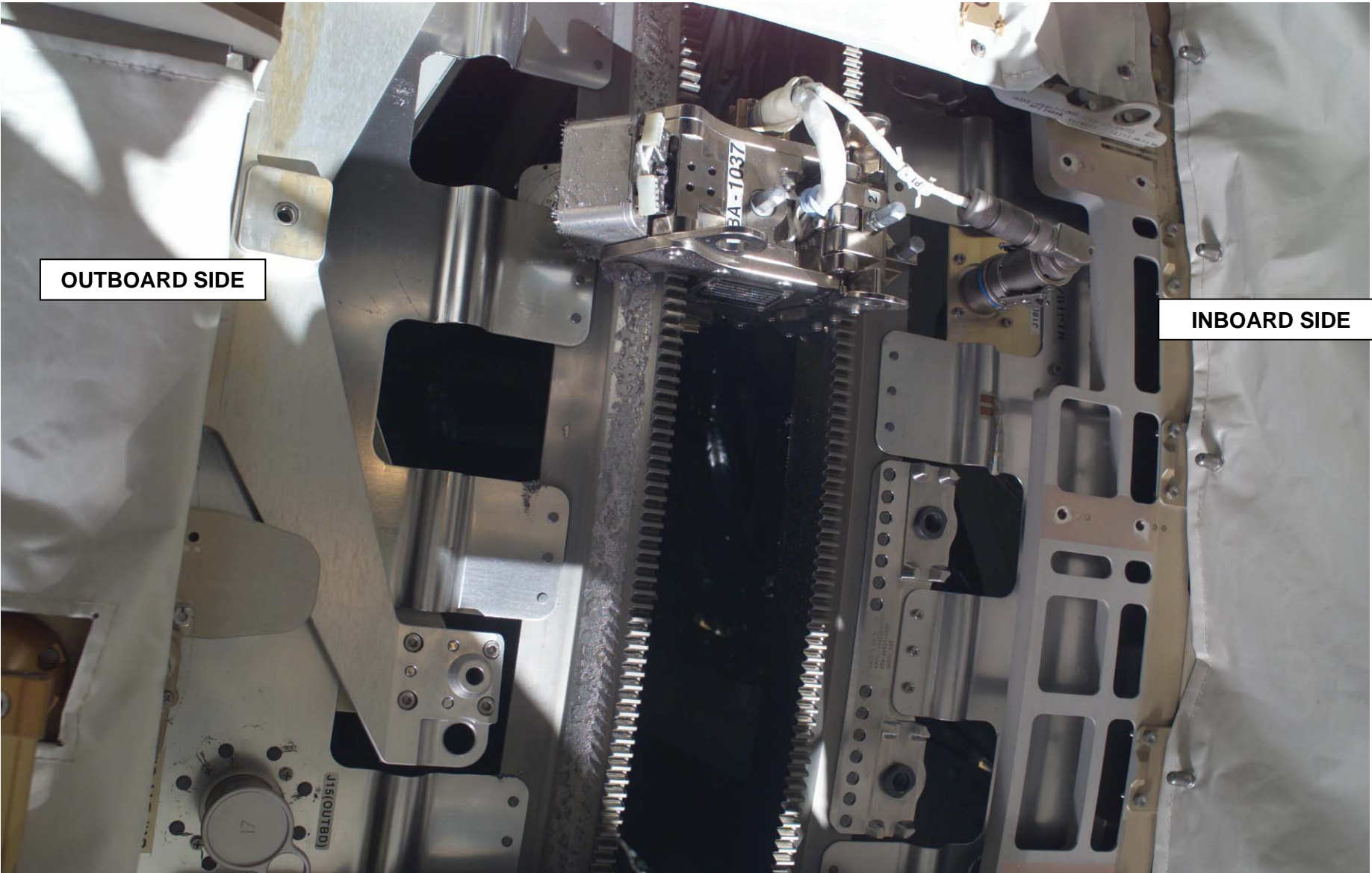


Approx 37' Diameter



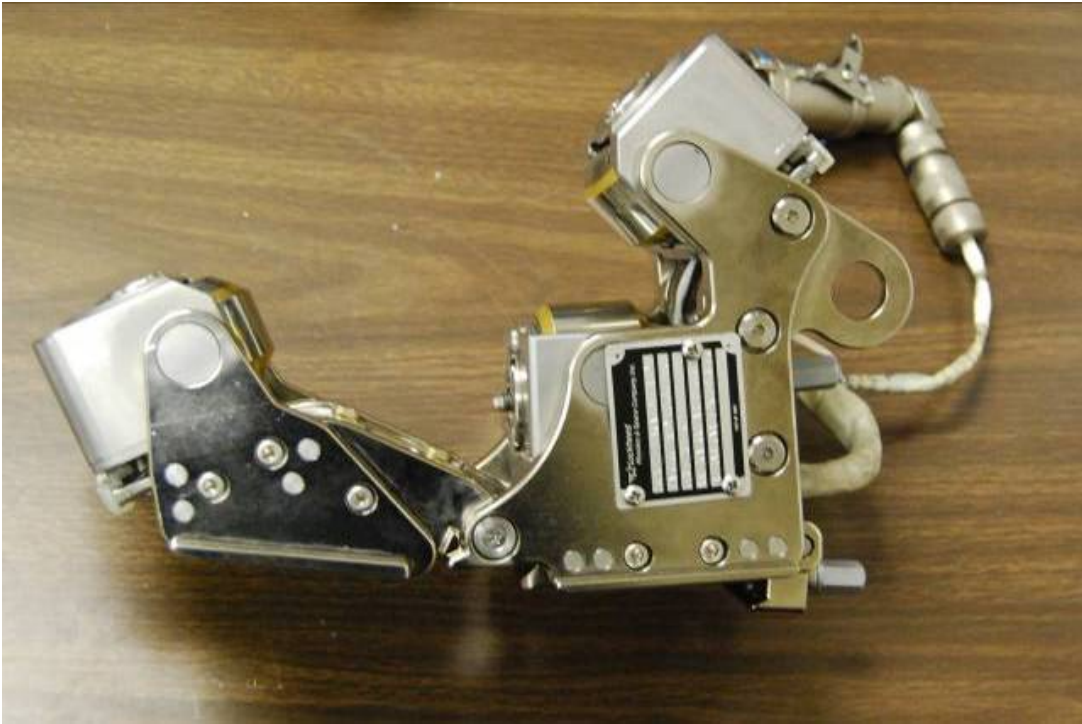
Approximate Launched JEM Weight 32,600 lb

**TRUNDLE BEARING ASSEMBLY**





**TRUNDLE BEARING ASSEMBLY (Cont)**



Bearing Package Assembly



Mount Assembly

## TRUNDLE BEARING ASSEMBLY (Cont)

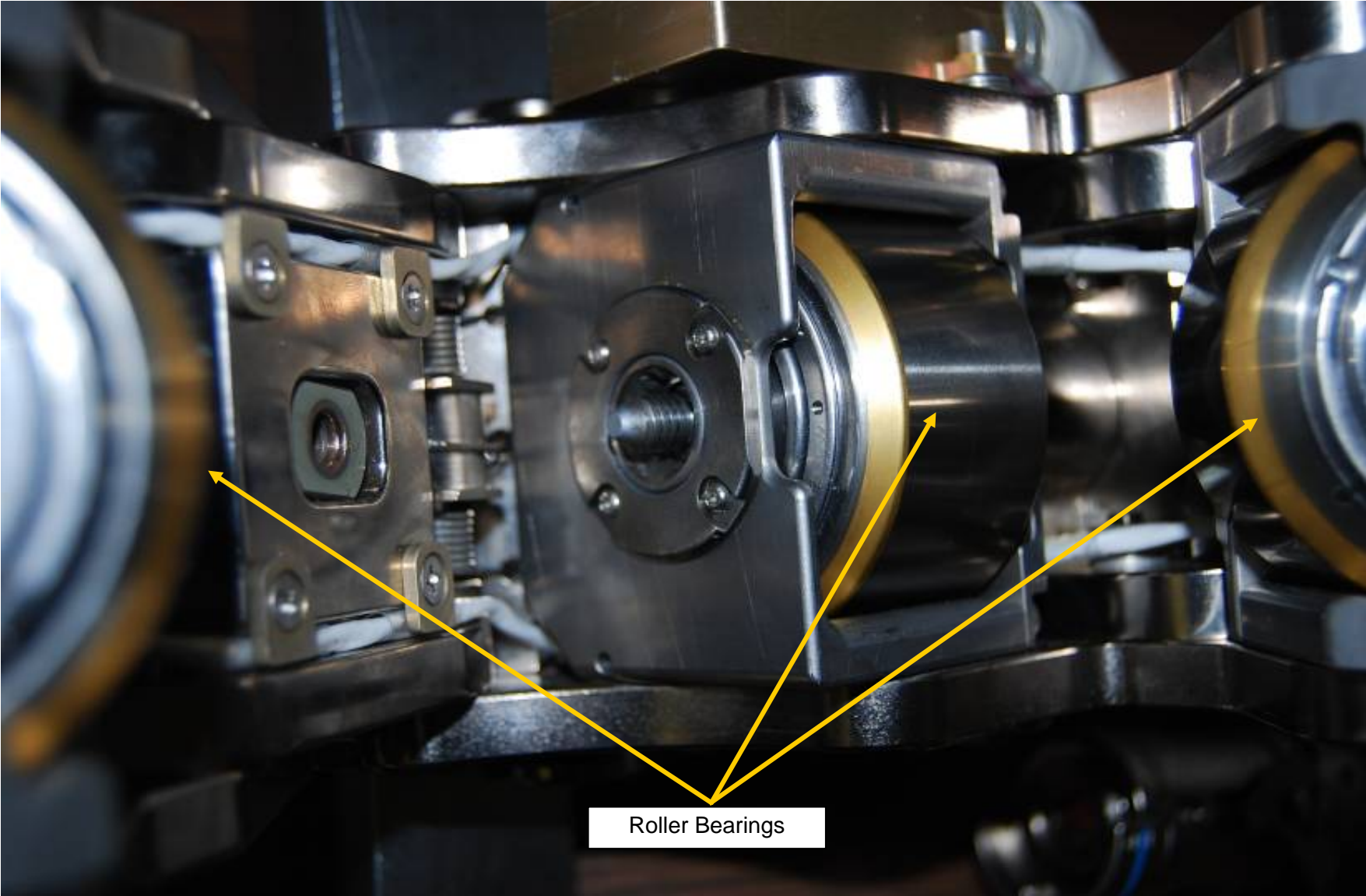


Slot in Race Ring to align Mount Boss



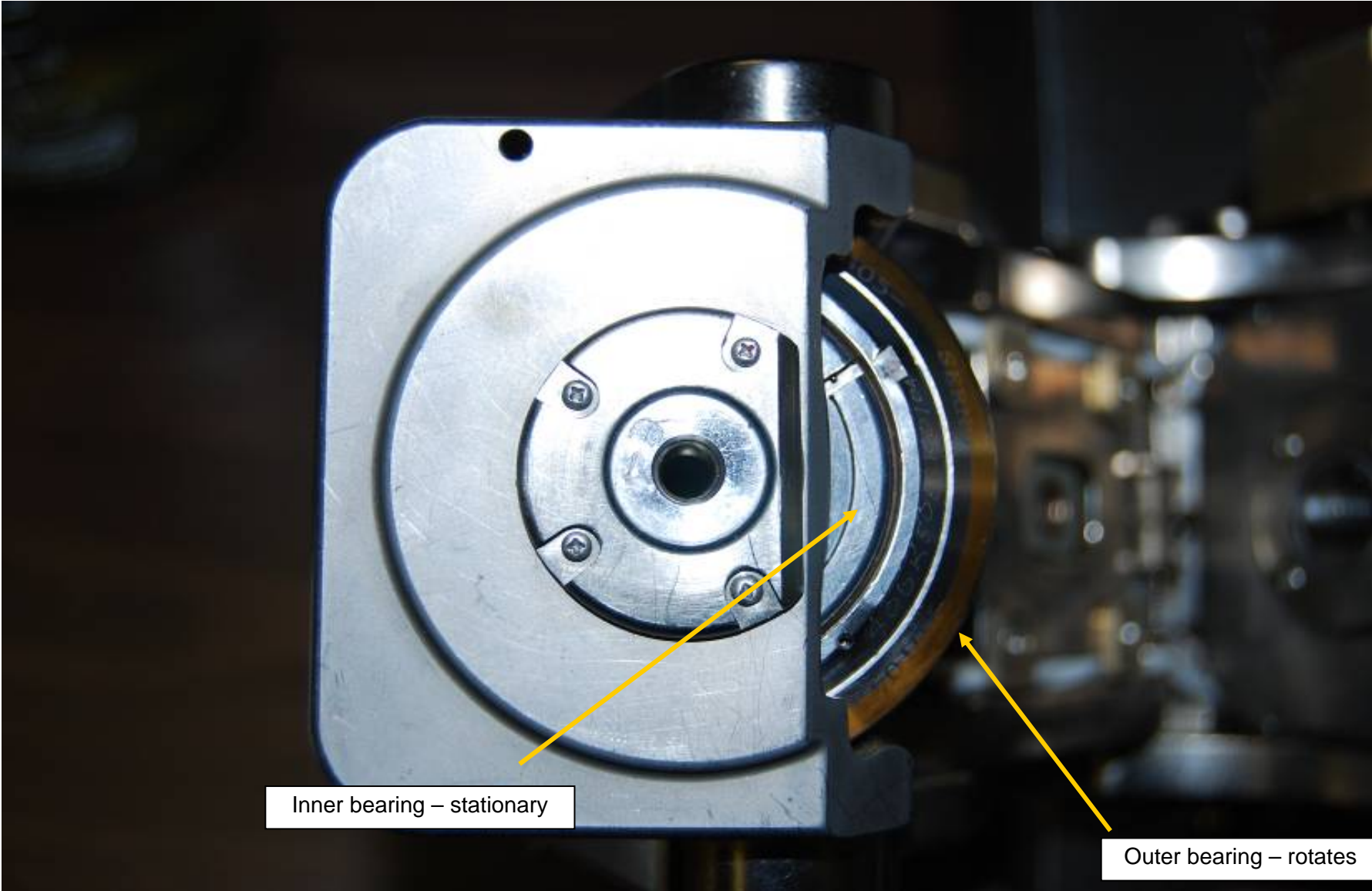
Mount Assy on Race Ring, mount clamp leg open (initial position)

**TRUNDLE BEARING ASSEMBLY (Cont)**



Roller Bearings

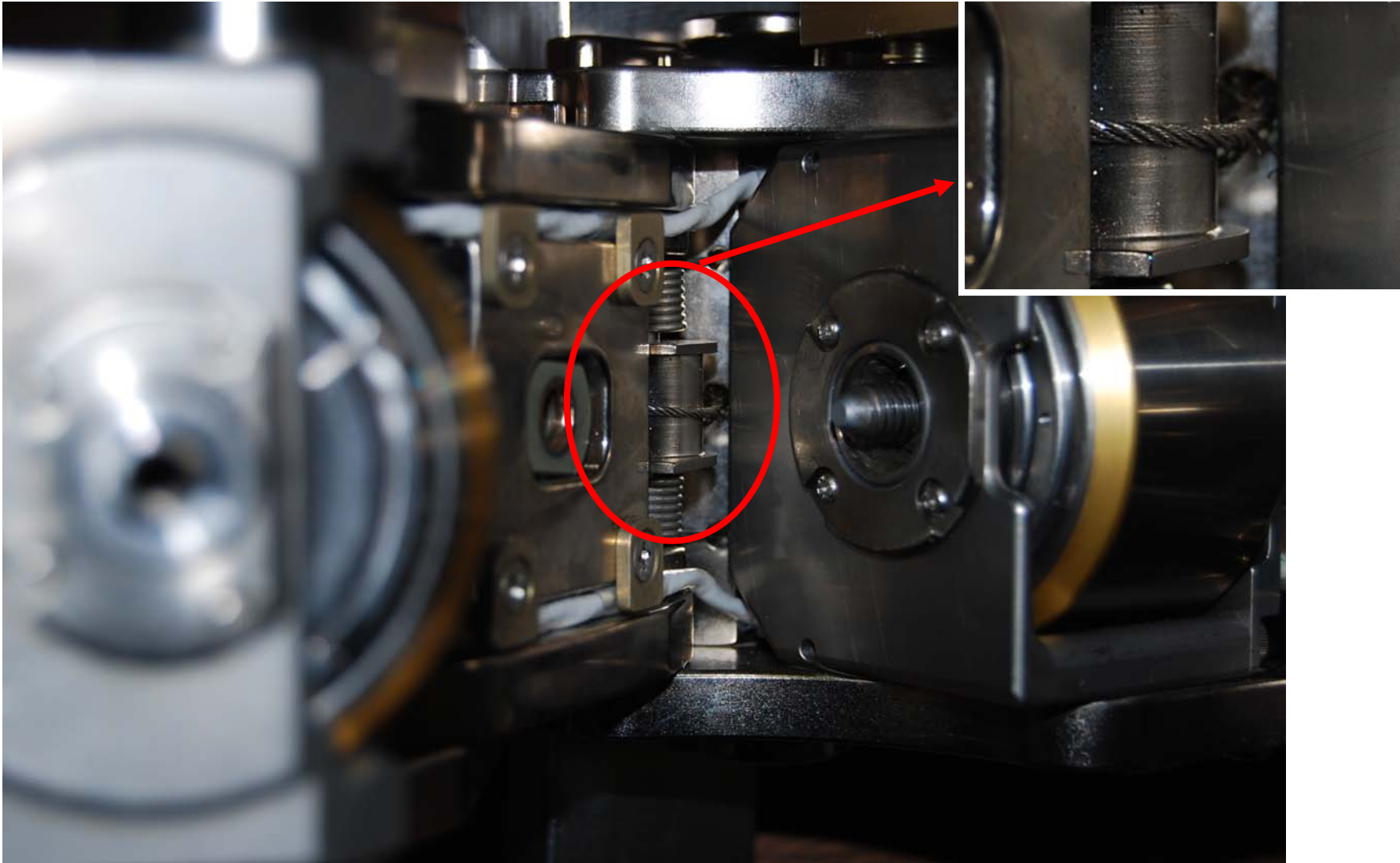
TRUNDLE BEARING ASSEMBLY (Cont)



Inner bearing – stationary

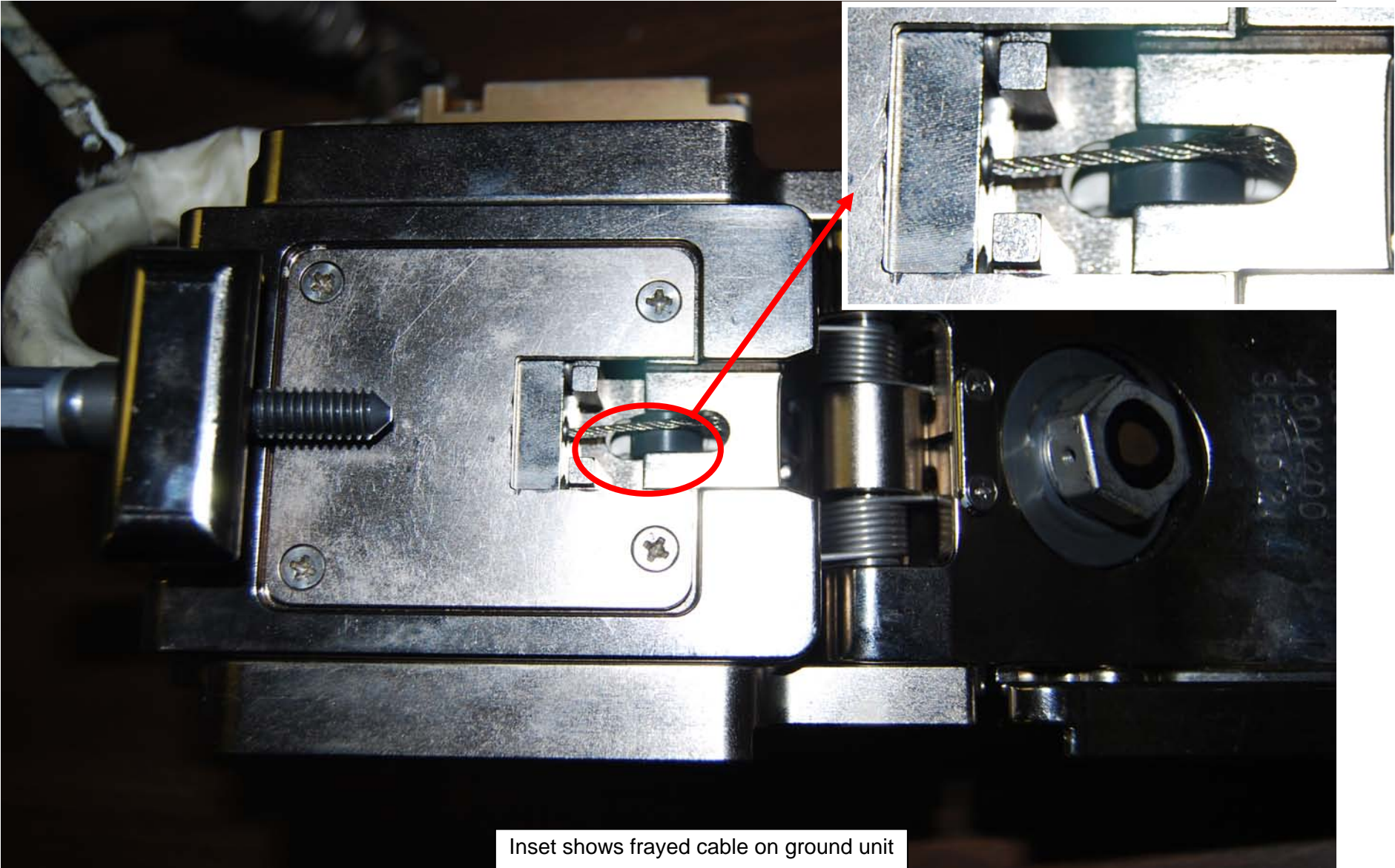
Outer bearing – rotates

**TRUNDLE BEARING ASSEMBLY (Cont)**



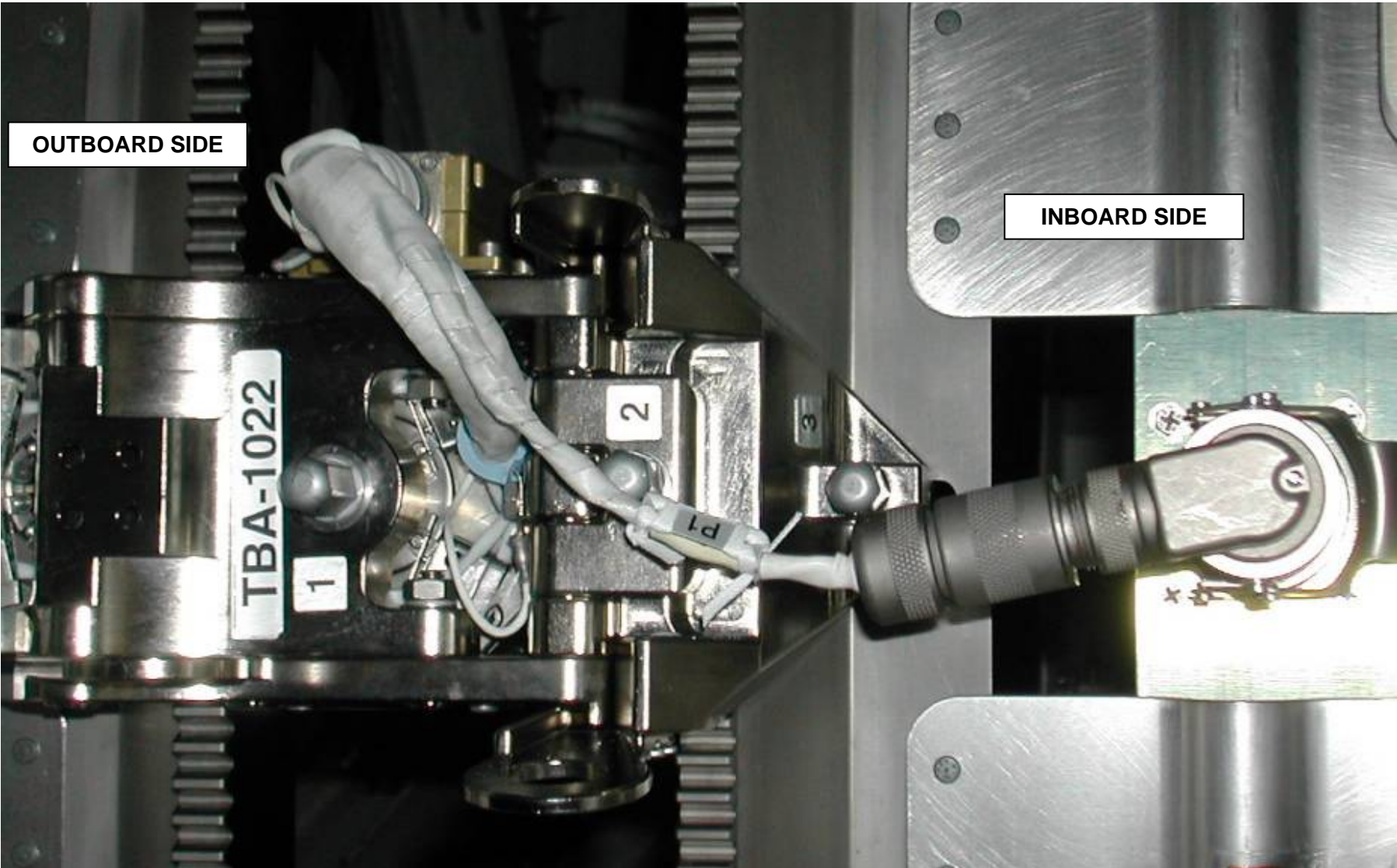
Inspect Cable for Frays Inset shows frayed cable on ground unit

TRUNDLE BEARING ASSEMBLY (Cont)

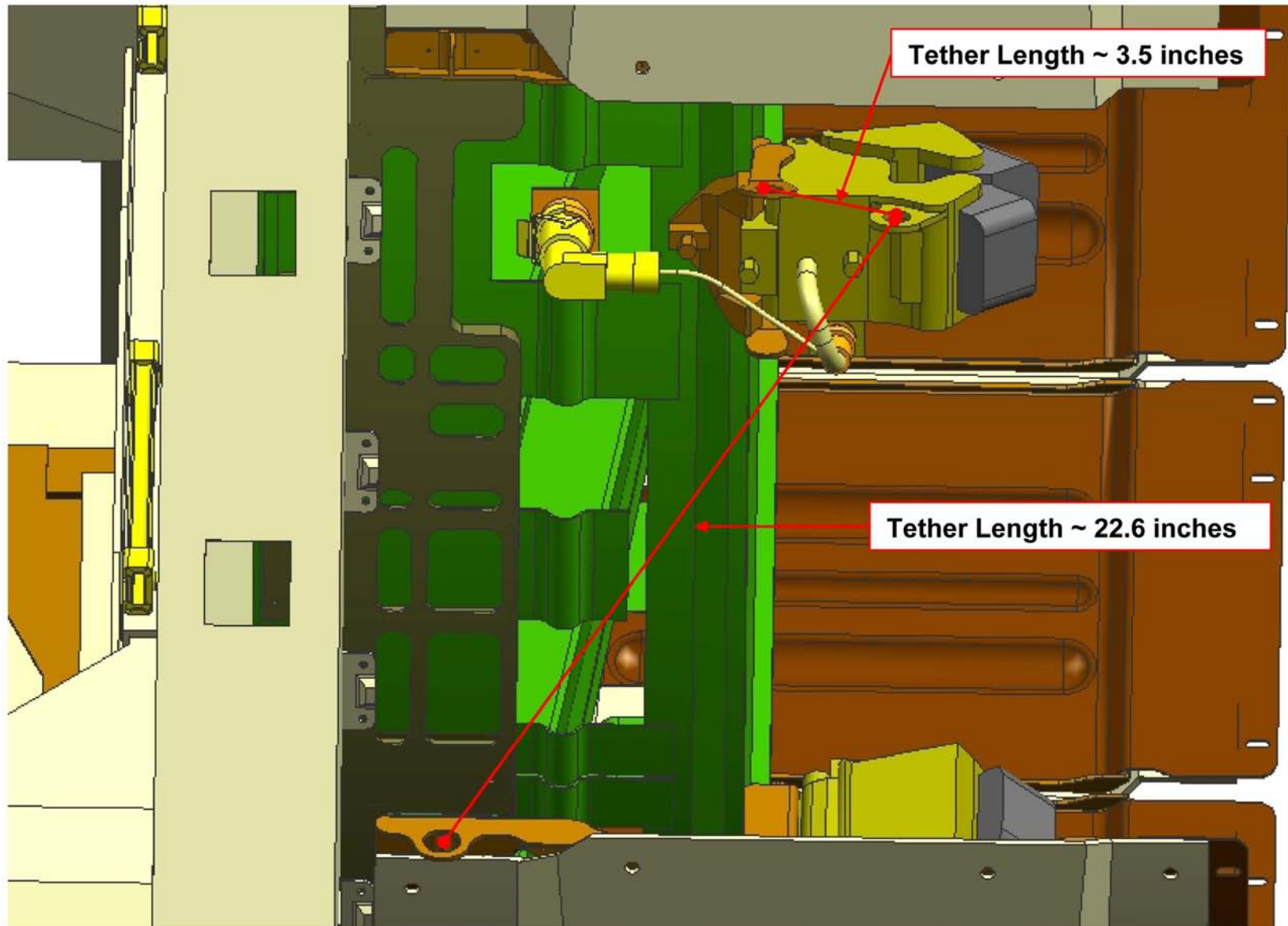


Inset shows frayed cable on ground unit

TRUNDLE BEARING ASSEMBLY (Cont)

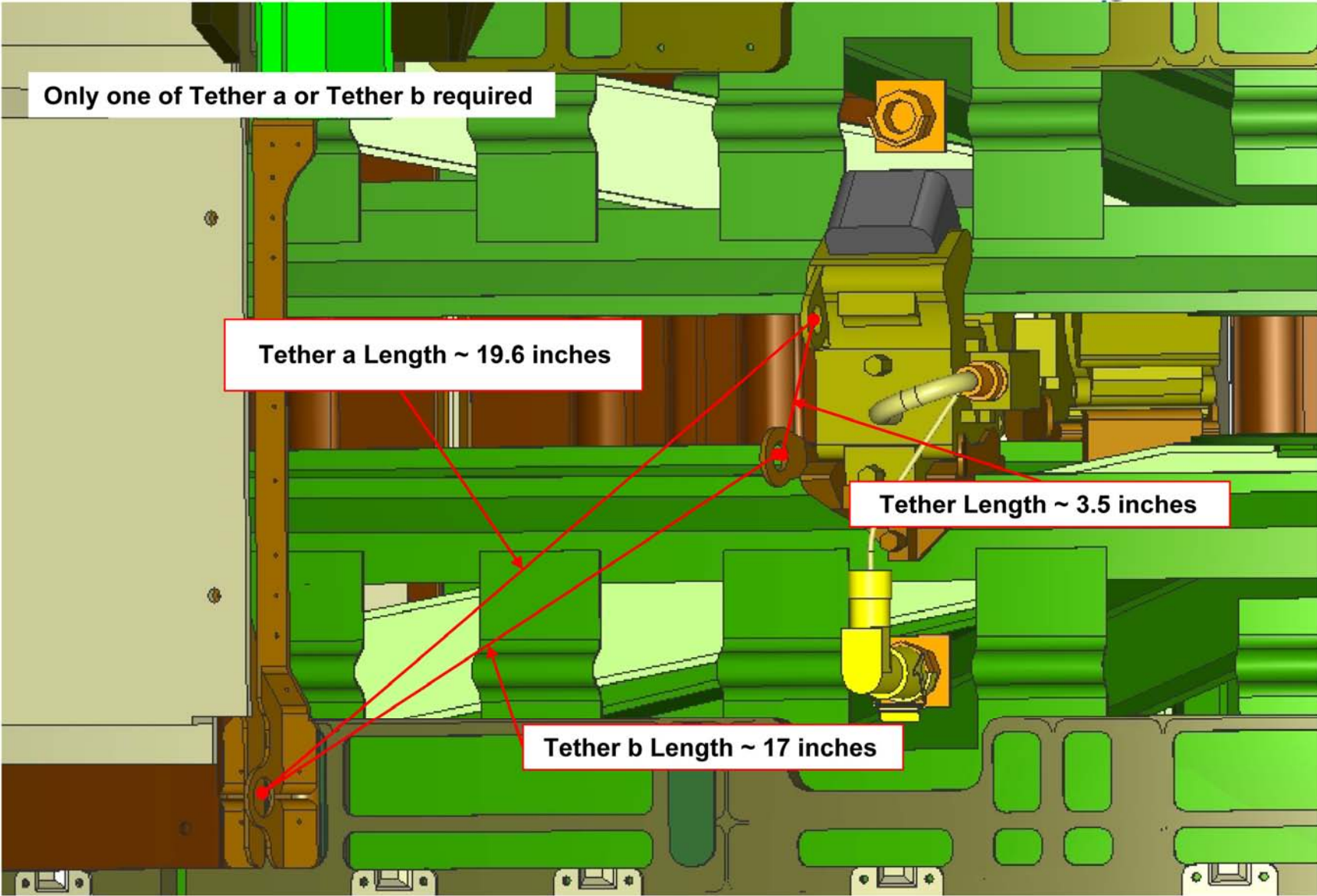


TIEDOWN: SARJ TBA





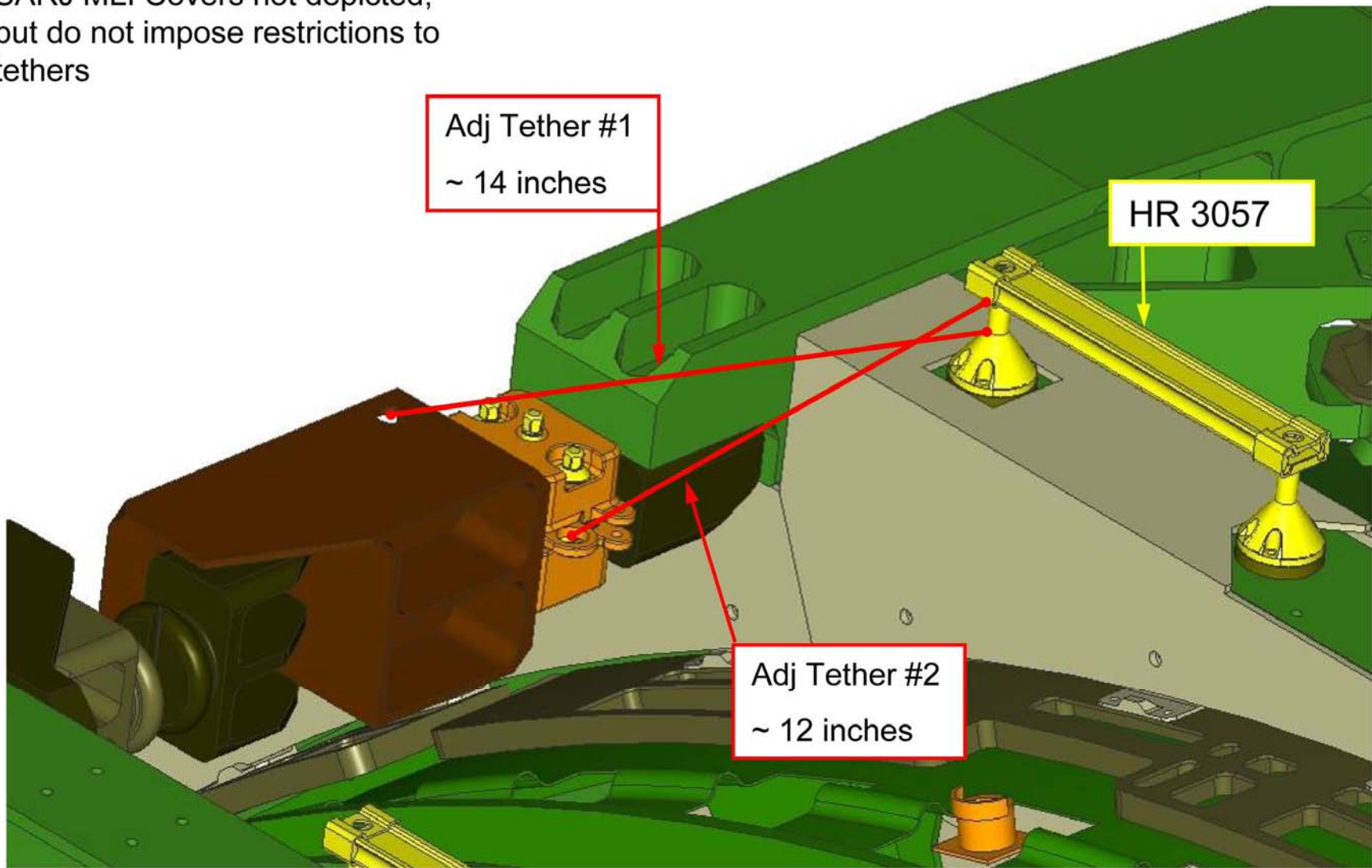
TIEDOWN: SARJ TBA (Cont)



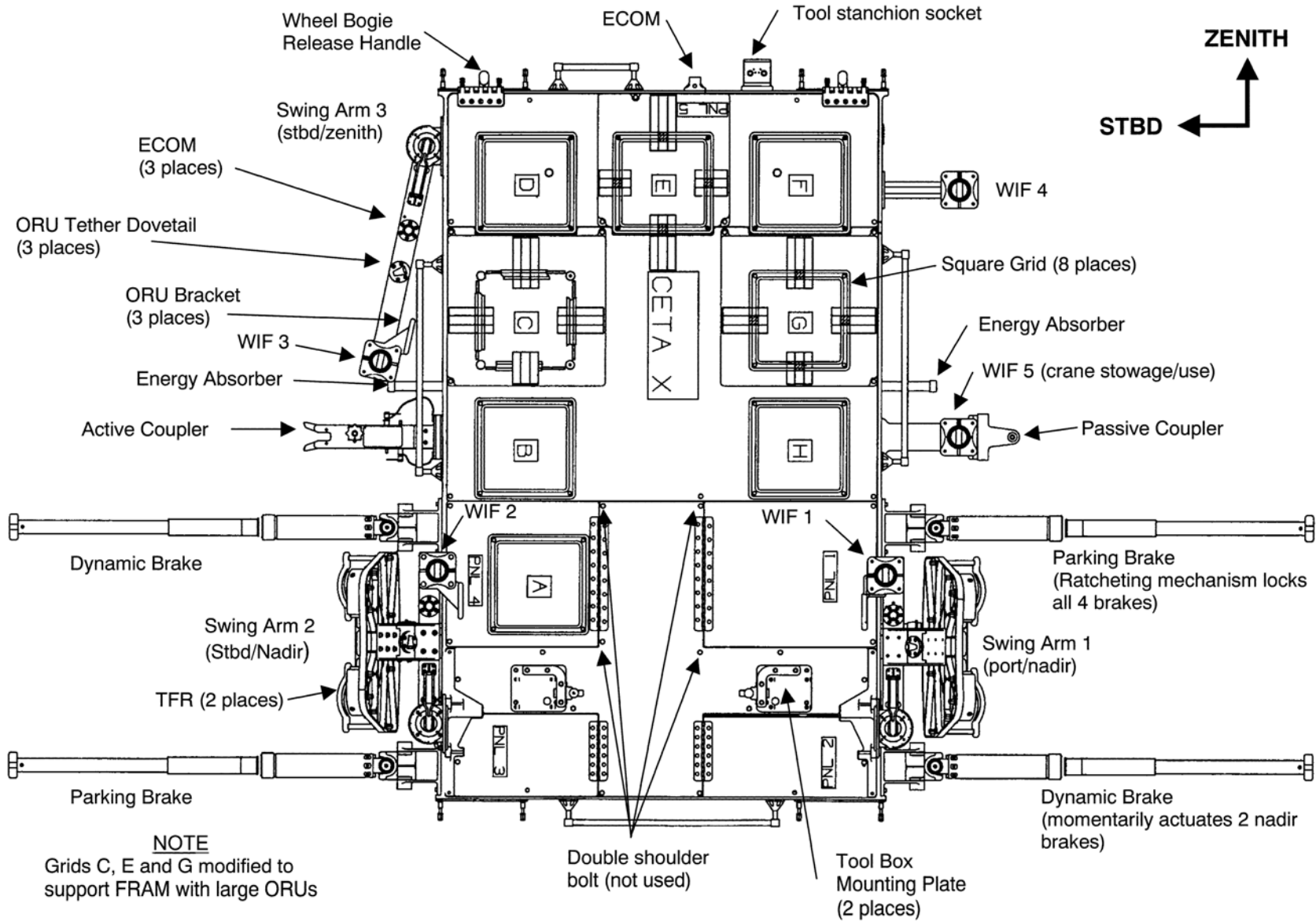
**TIEDOWN: S3 AFT-NADIR CLAMSHELL AND STUB**

NOTE

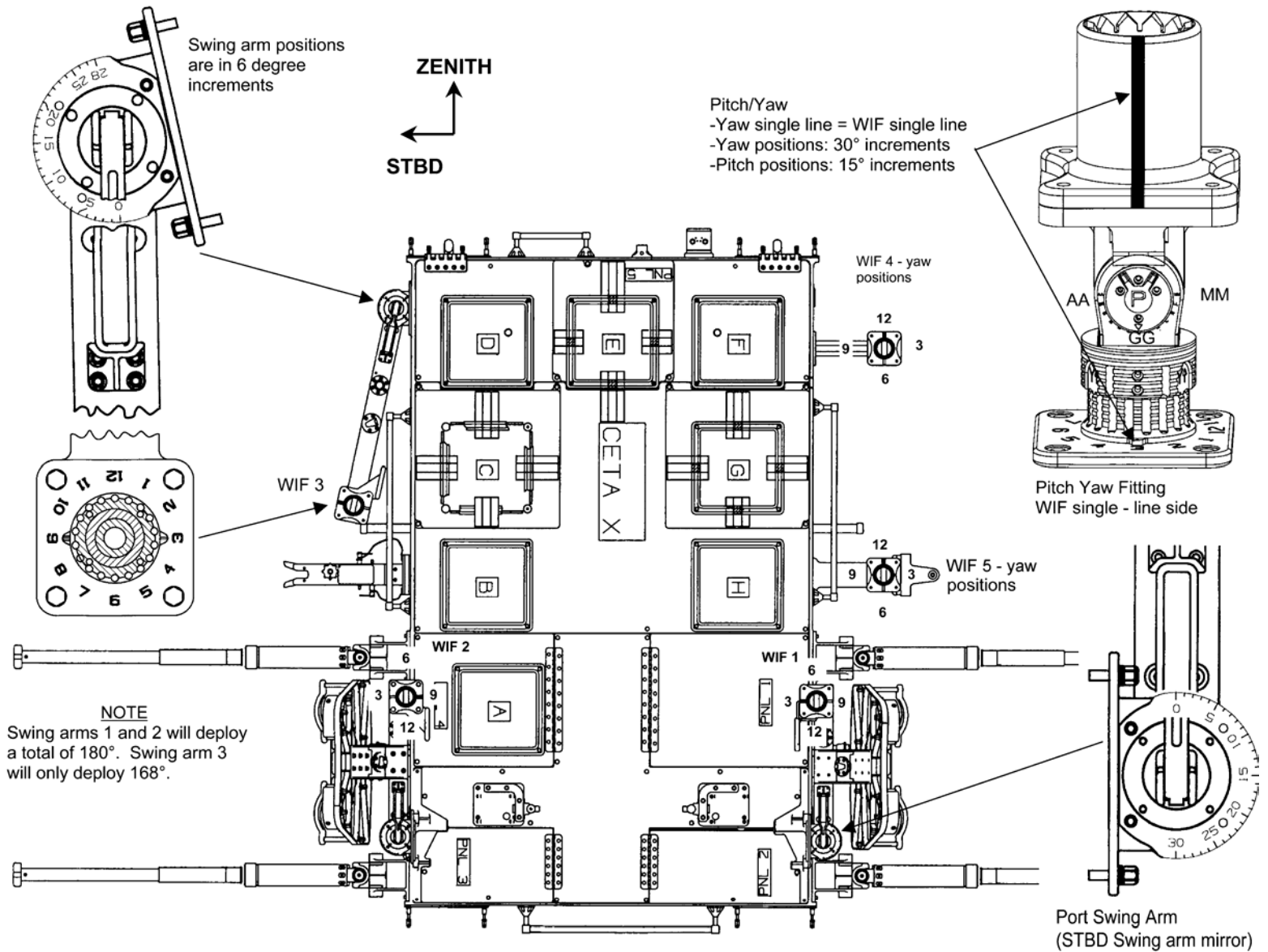
SARJ MLI Covers not depicted,  
but do not impose restrictions to  
tethers



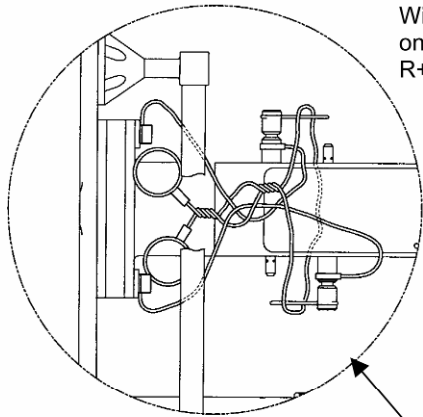
# CETA CART – TOP VIEW



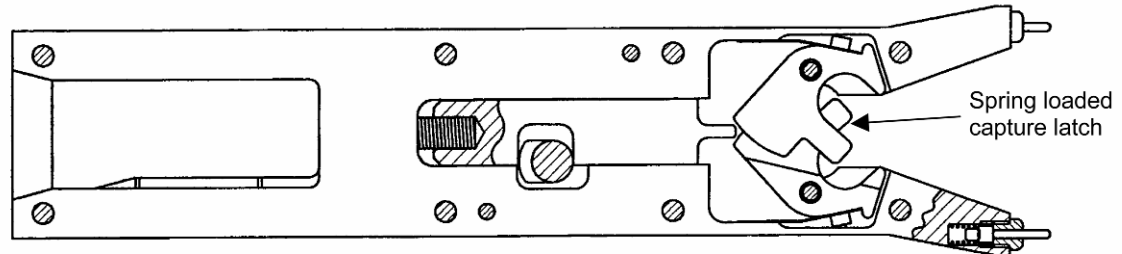
# CETA CART – SWING ARMS AND WIF MARKINGS



# CETA CART – COUPLERS



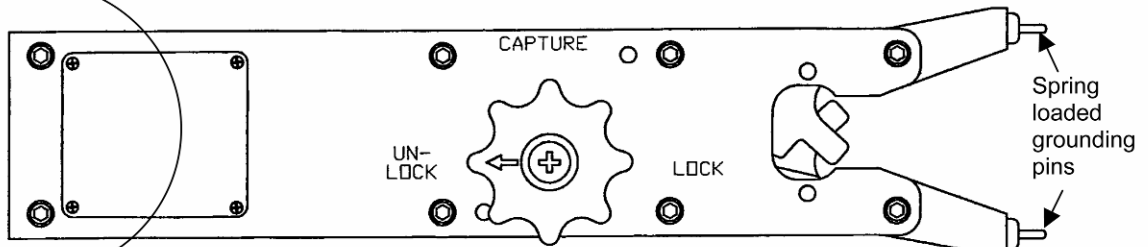
Wire ties required for launch only. Removed for coupler R+R



**BOTTOM VIEW**

Spring loaded capture latch

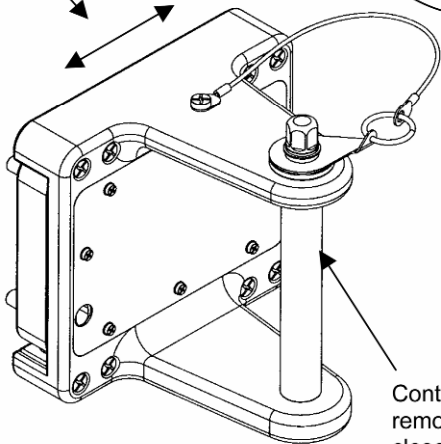
Compliance in indicated direction to allow for misalignment. Centering spring nominally constrains motion



**TOP VIEW**

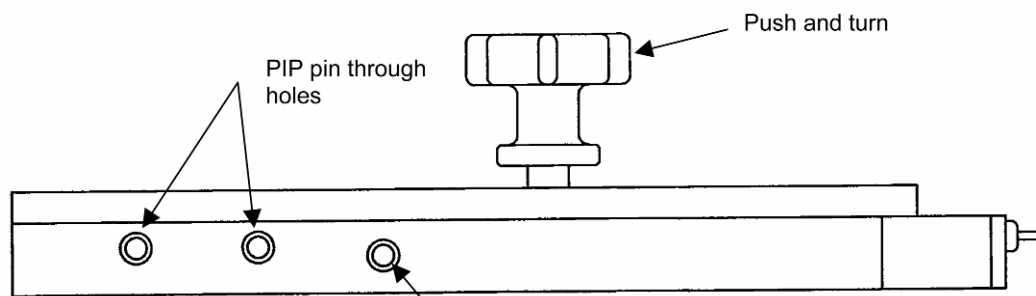
Spring loaded grounding pins

CAPTURE  
UN-LOCK  
LOCK



**PASSIVE COUPLER**

Contingency bolt removed if latch failed closed



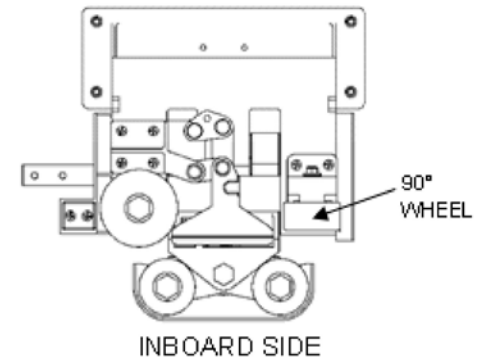
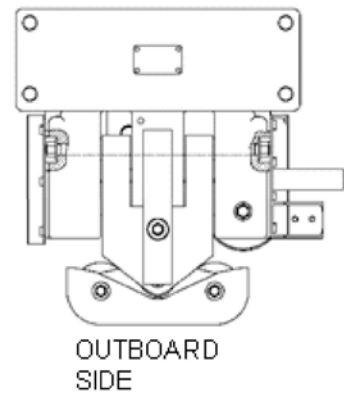
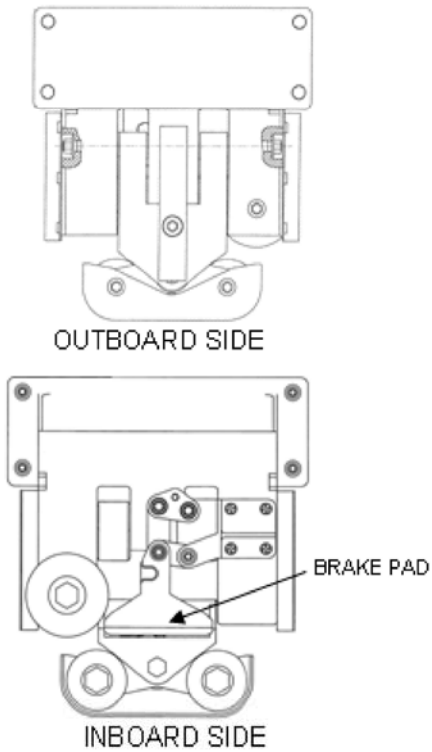
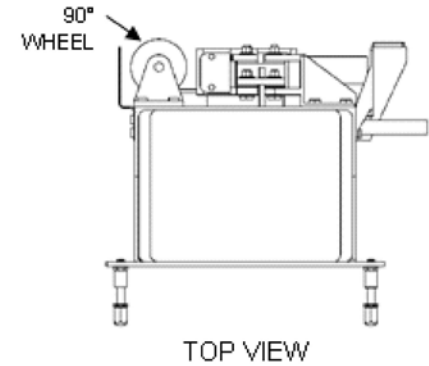
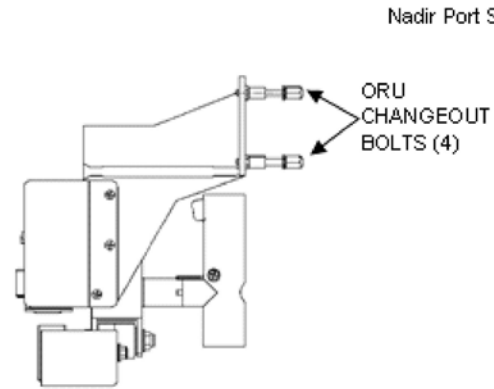
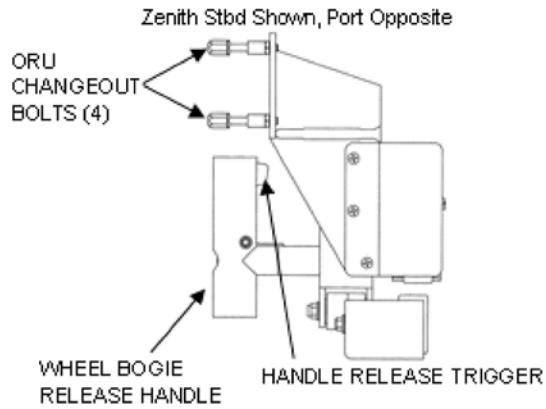
**SIDE VIEW**

Push and turn

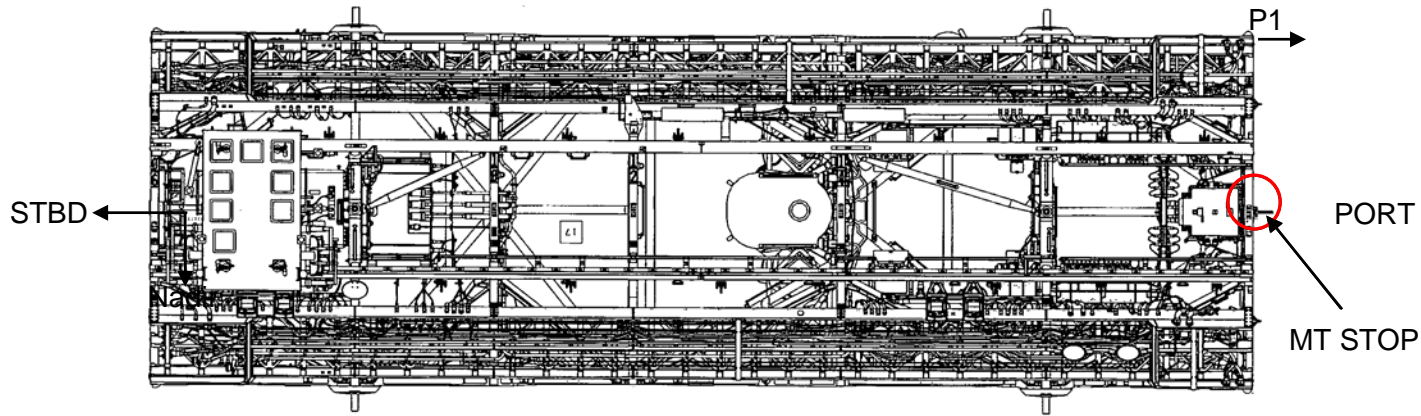
PIP pin through holes

Threaded bolt hole not used

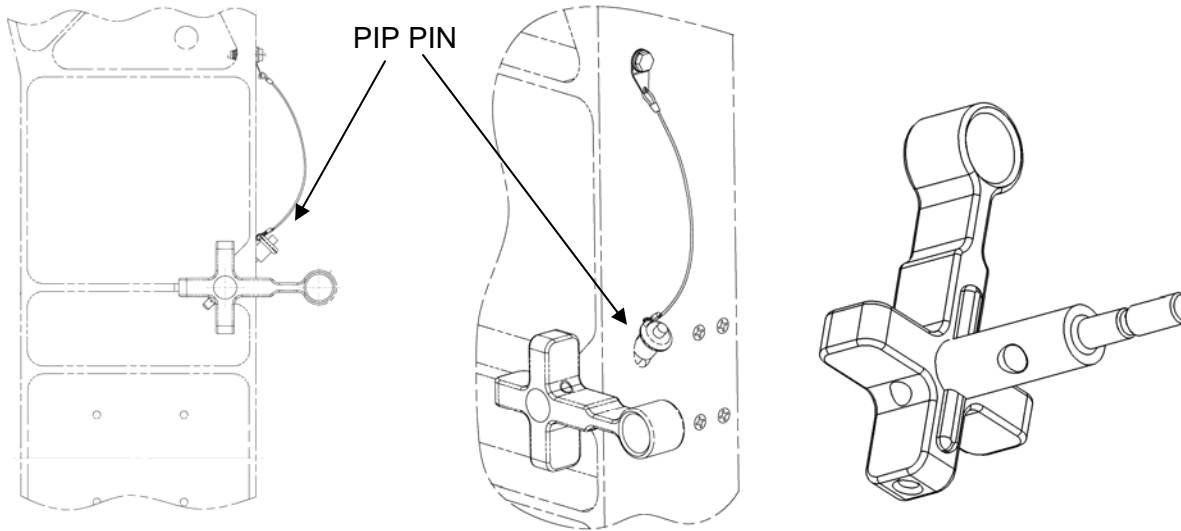
# CETA CART – WHEEL BOGIES



# P1 MT STOP



MT STOP STOWED

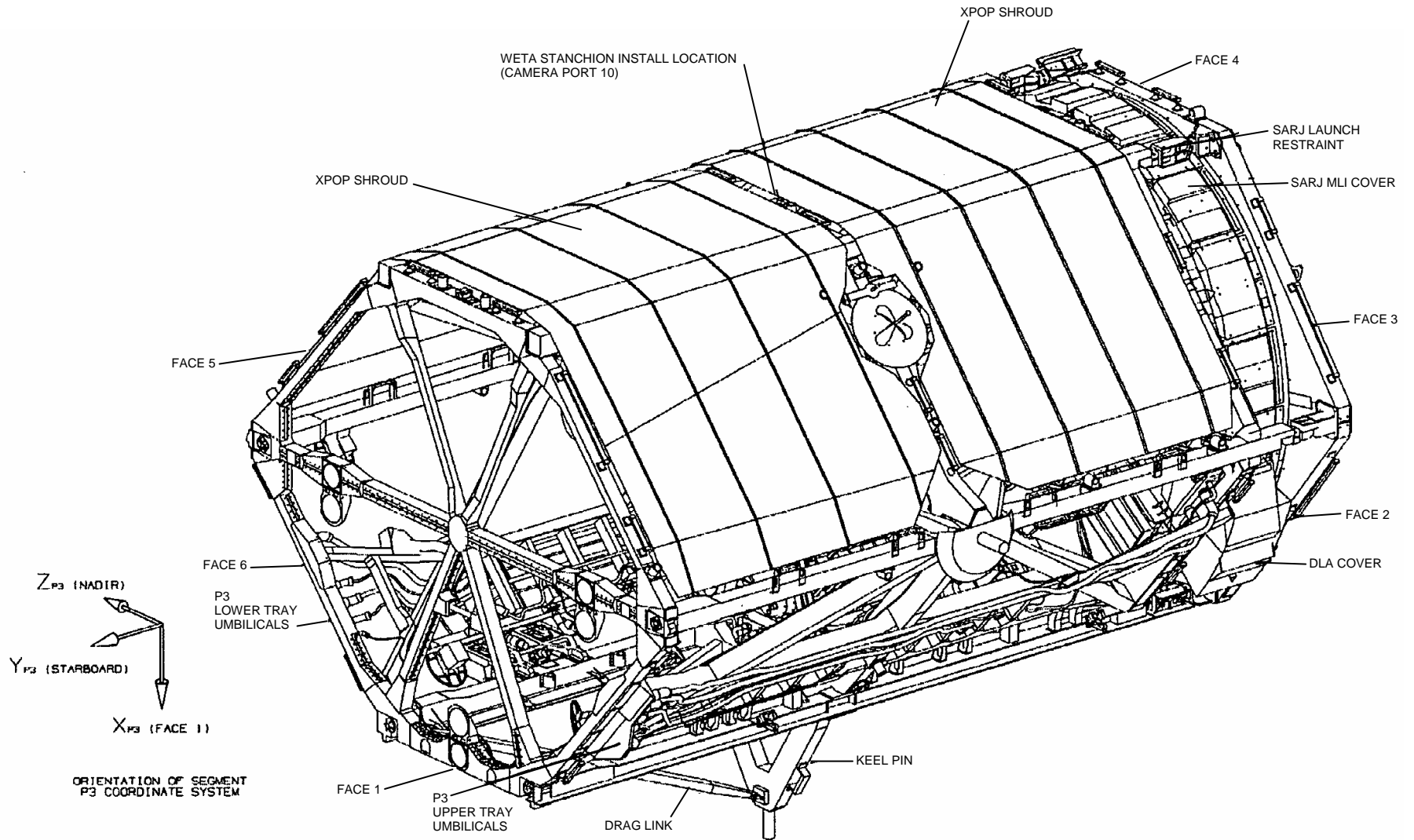


MT STOP DEPLOYED



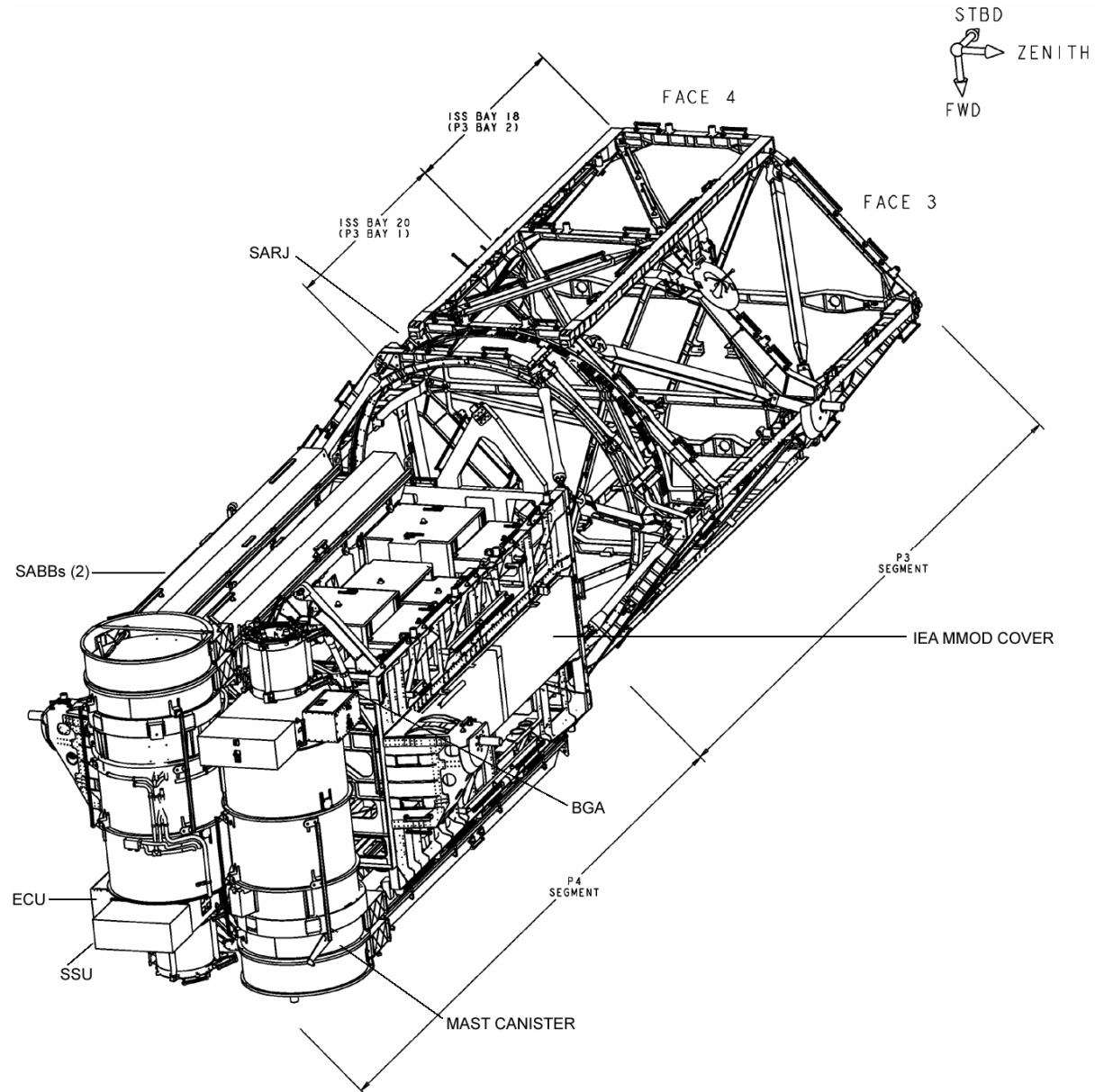
MT STOP DEPLOYED

# P3 OVERVIEW

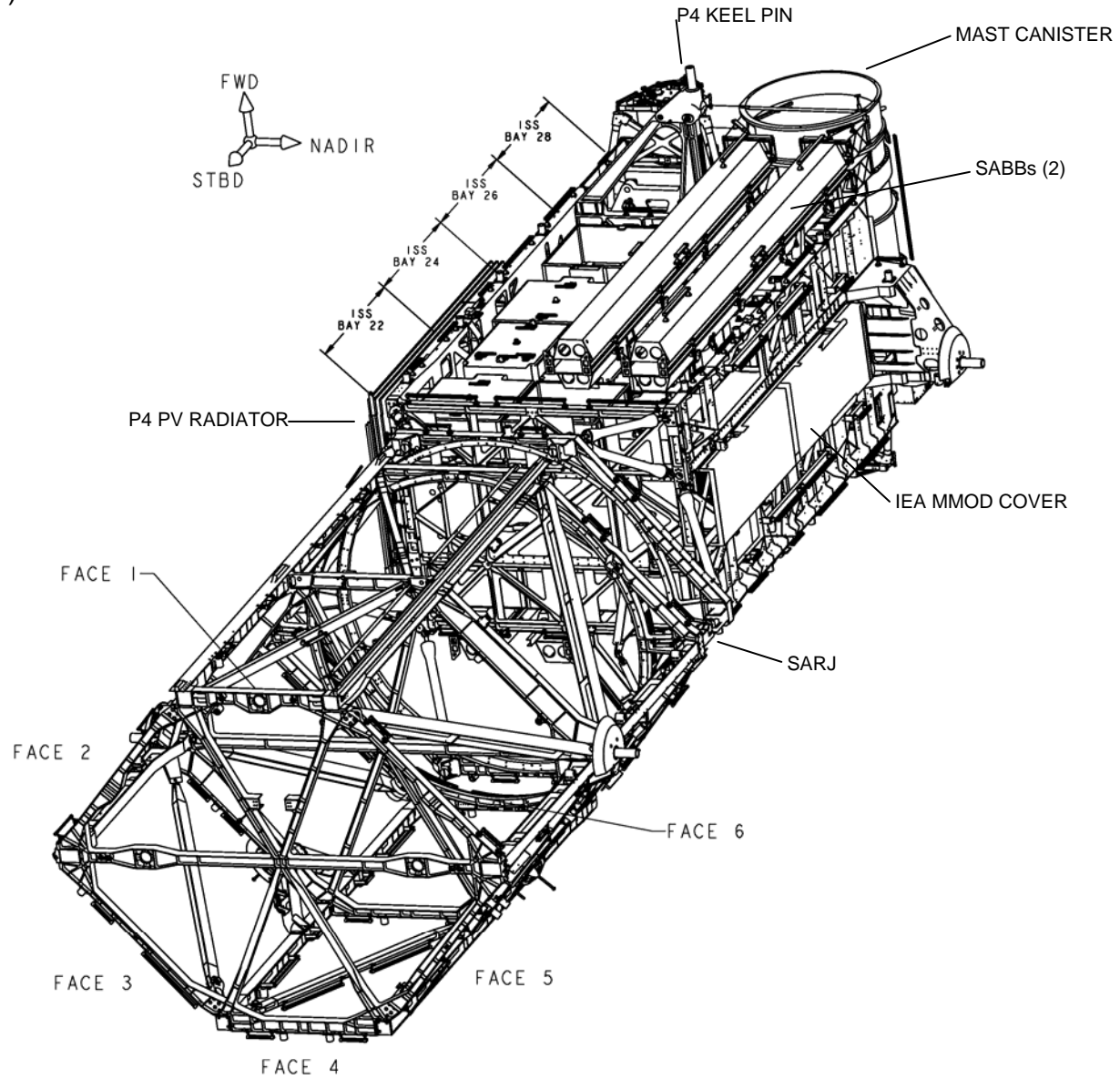




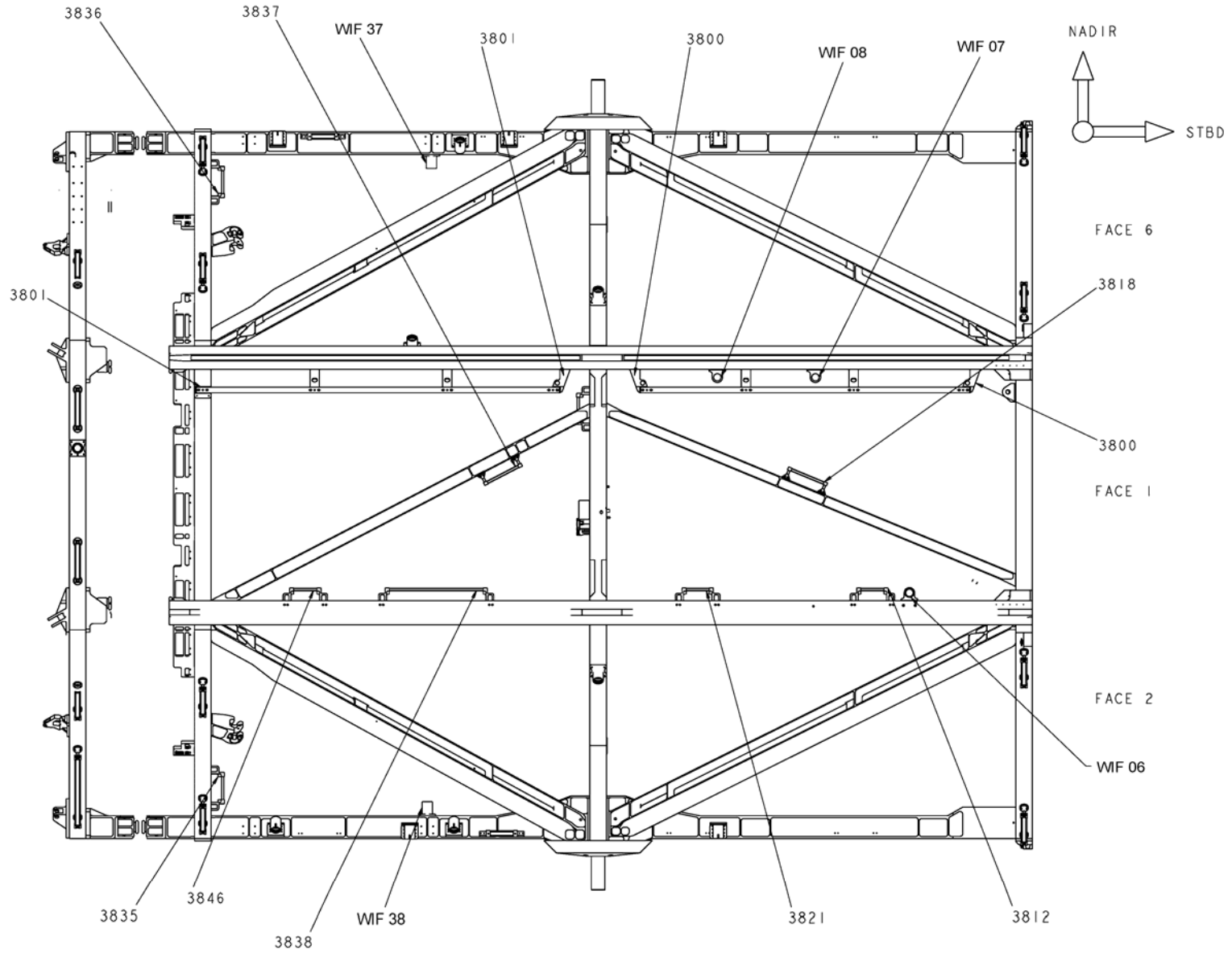
# P3/P4 OVERVIEW



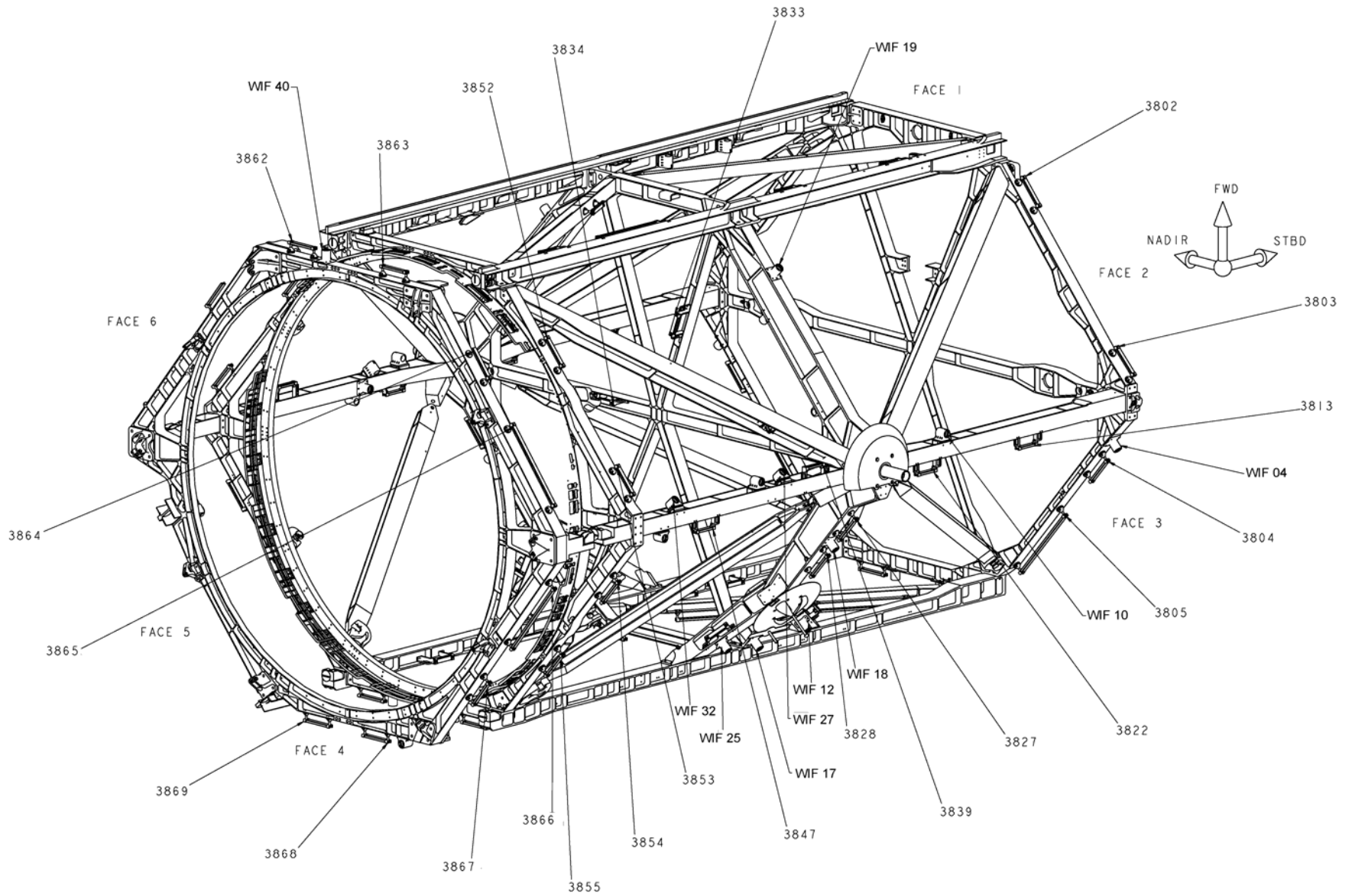
# P3/P4 OVERVIEW (Cont)



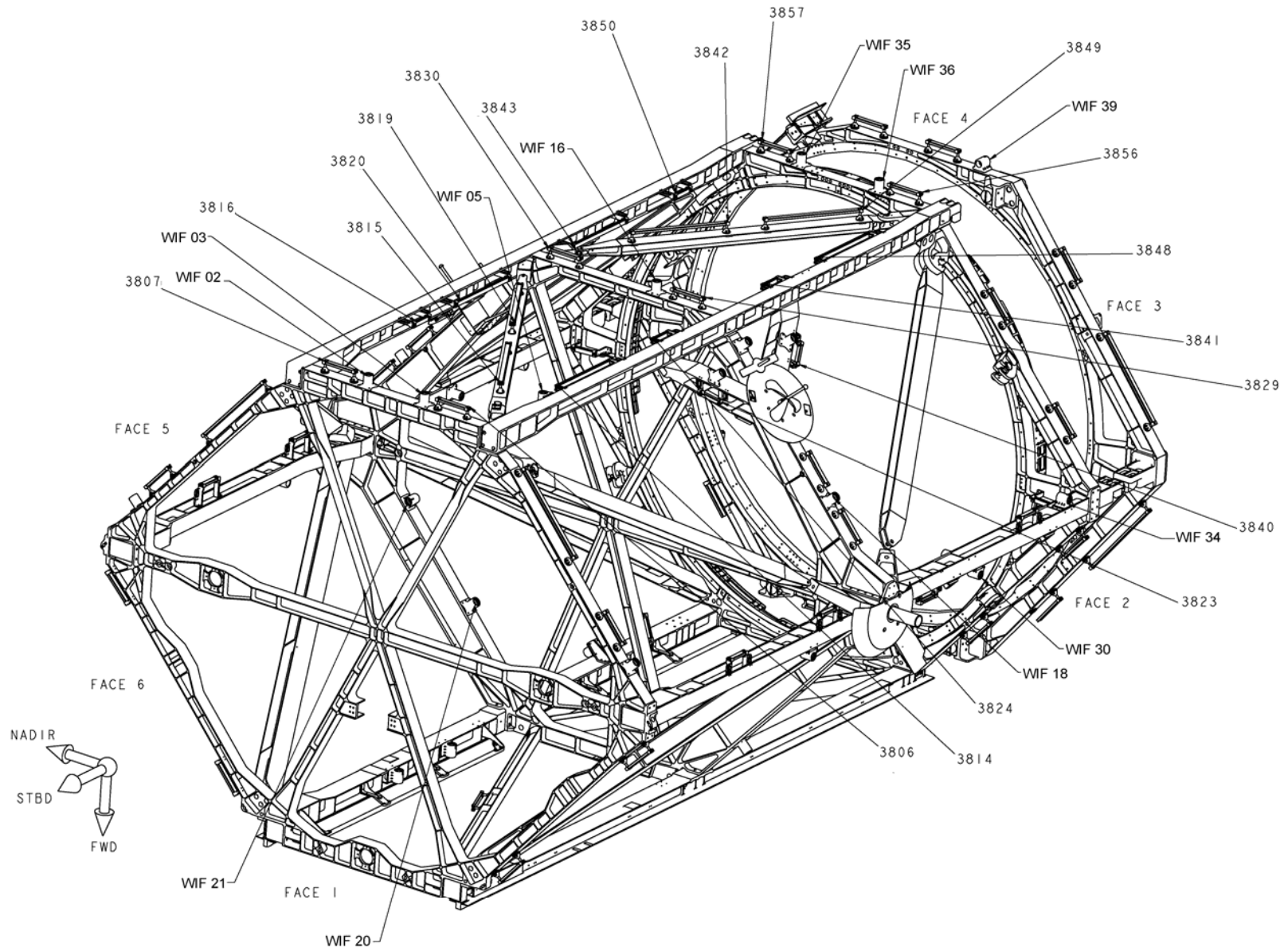
# P3 TRUSS SEGMENT (FACE 1, 2, & 6 – TOP VIEW)



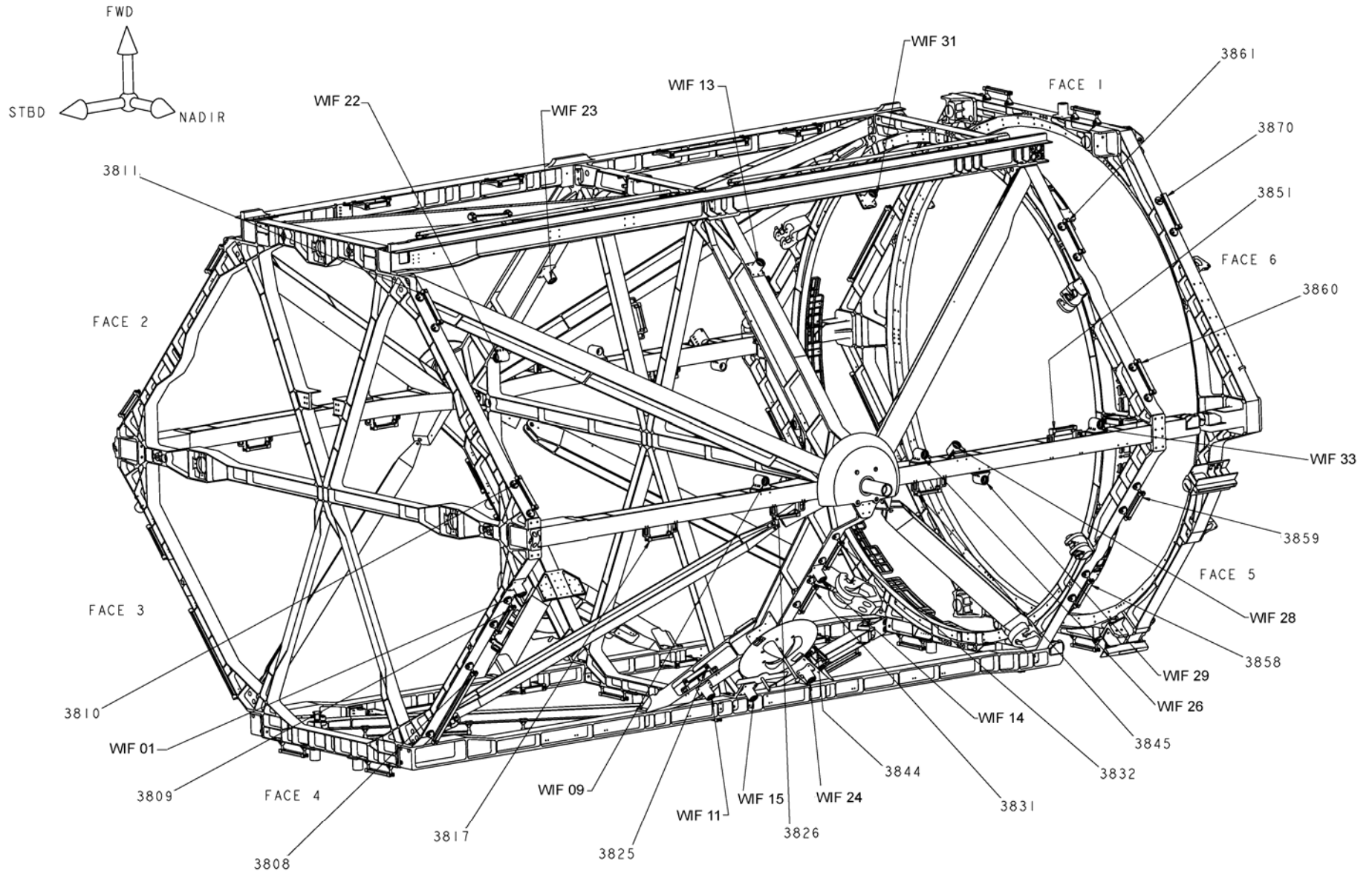
# P3 TRUSS SEGMENT (FACE 1, 2, & 3 – PORT END VIEW)



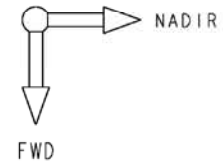
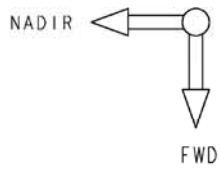
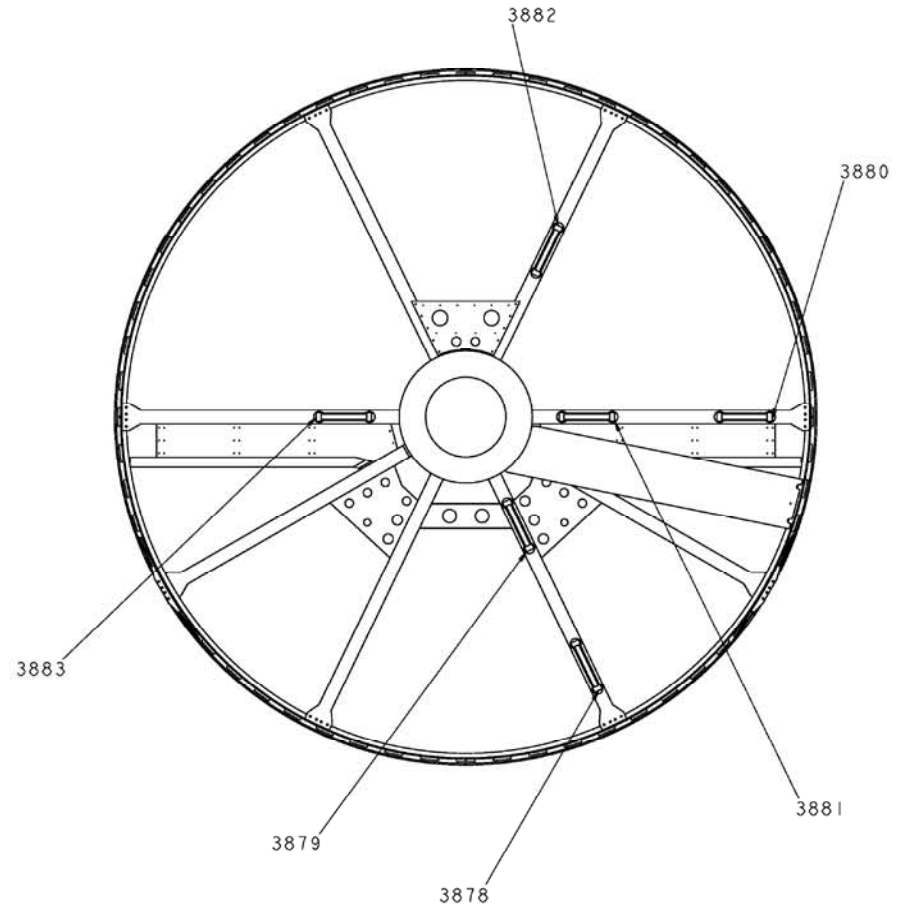
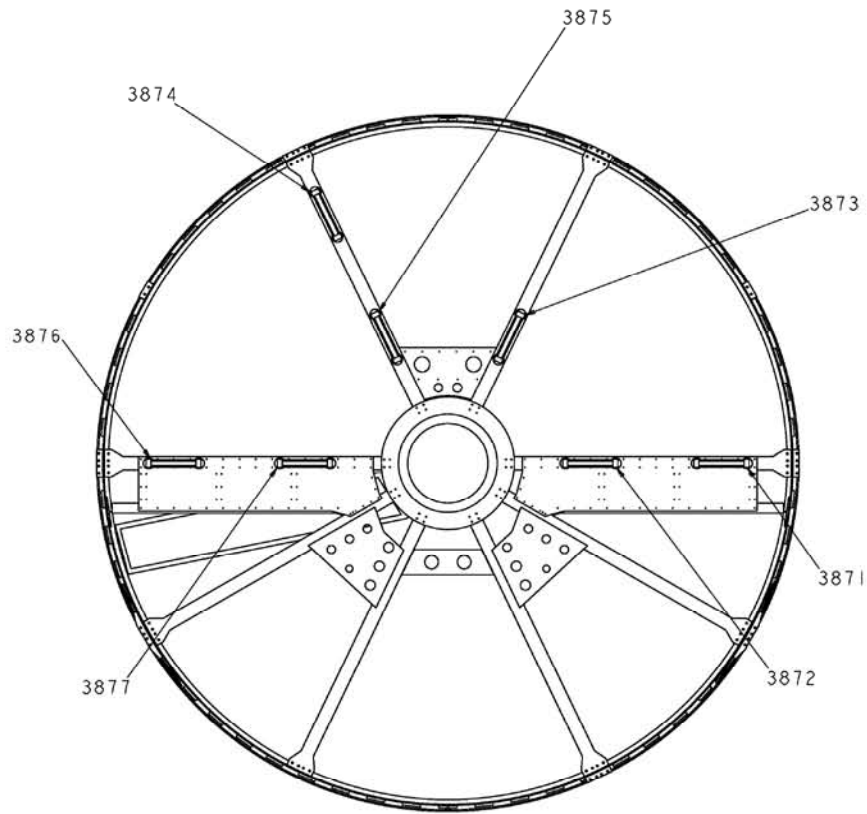
### P3 TRUSS SEGMENT (FACE 3 & 4 – STBD END VIEW)



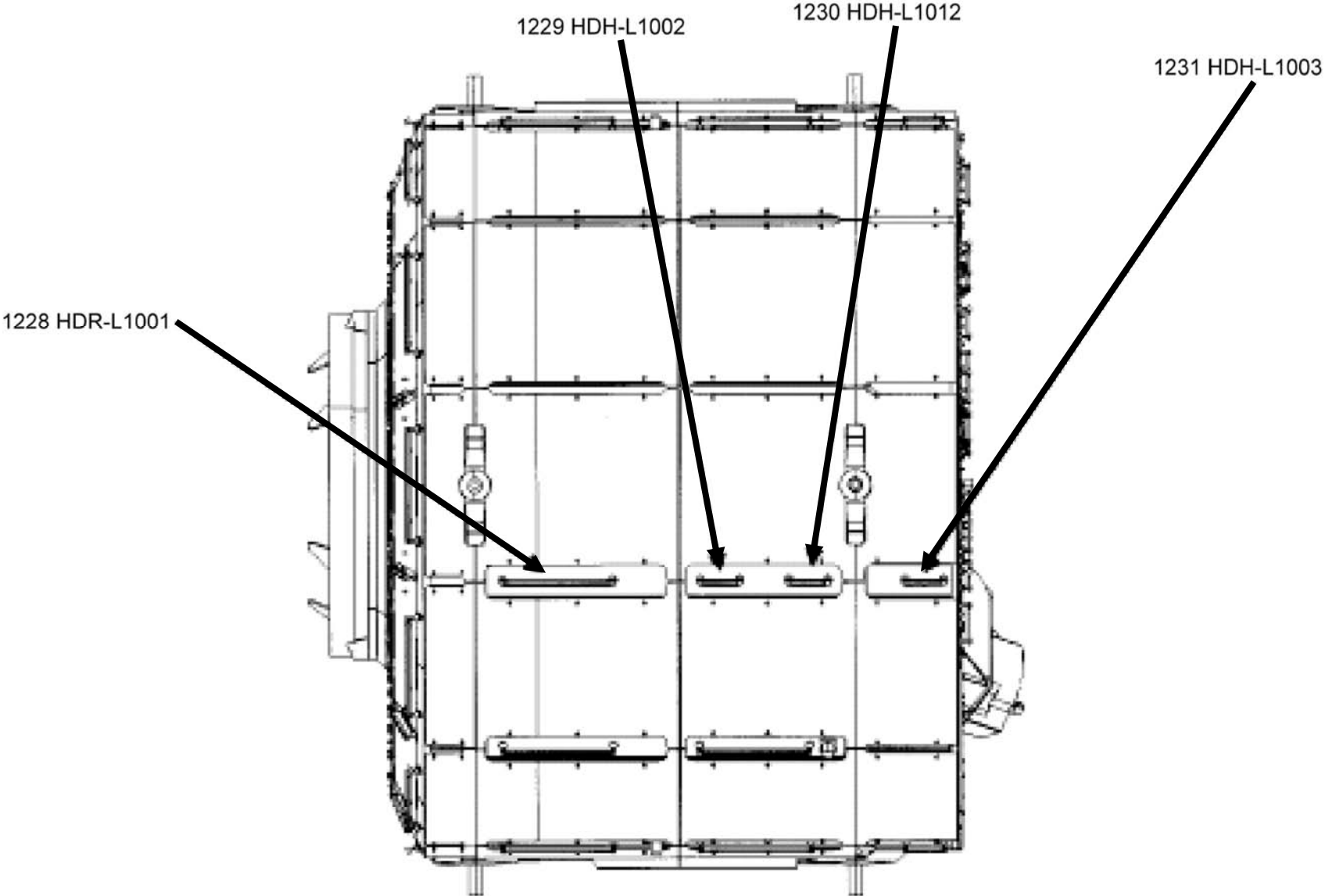
# P3 TRUSS SEGMENT (FACE 5 & 6 – STBD END VIEW)



### P3 SARJ STRUCTURE (STBD SIDE – UTA SIDE AND PORT SIDE – DMA SIDE)

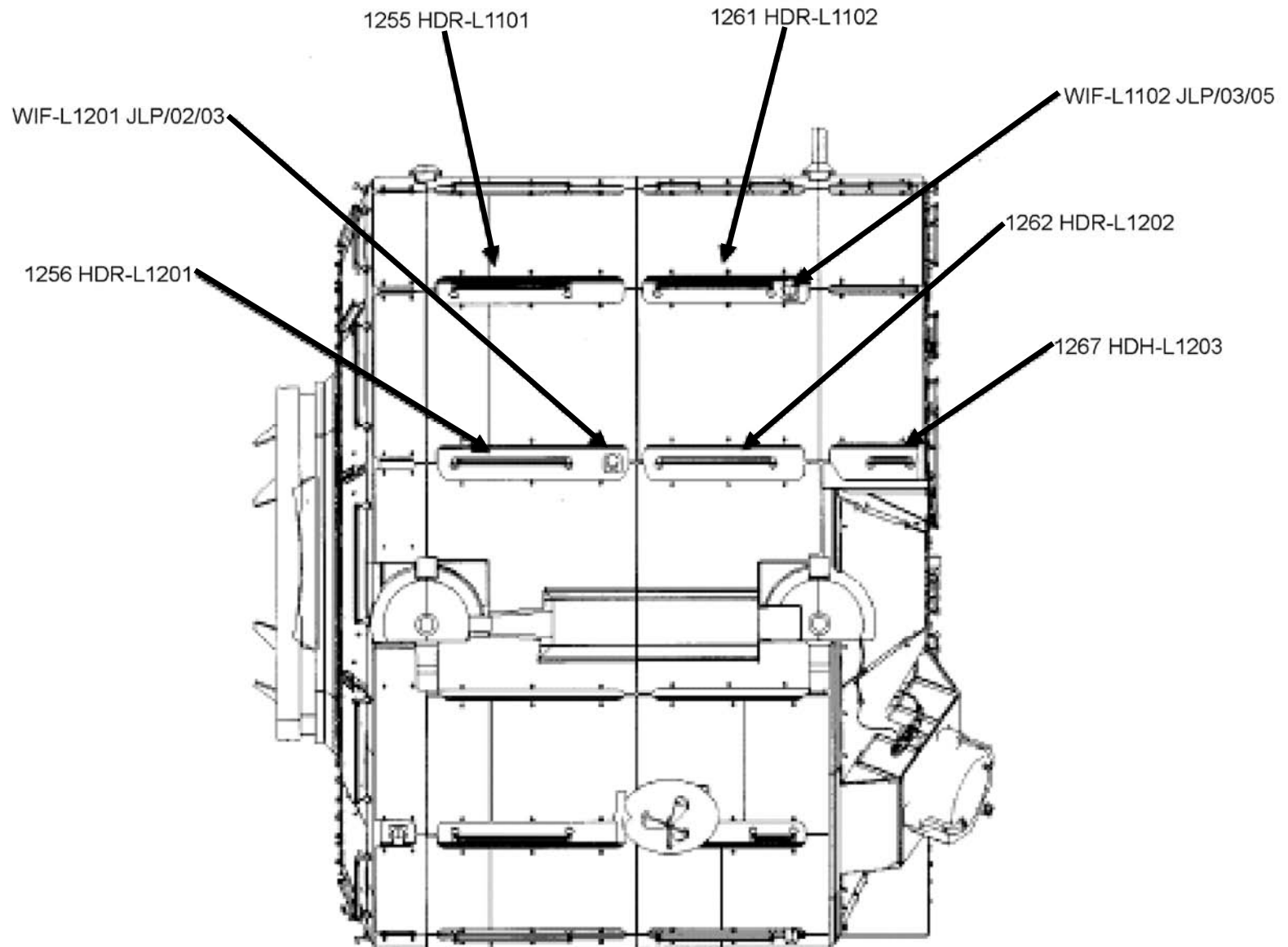


JLP FWD SIDE VIEW

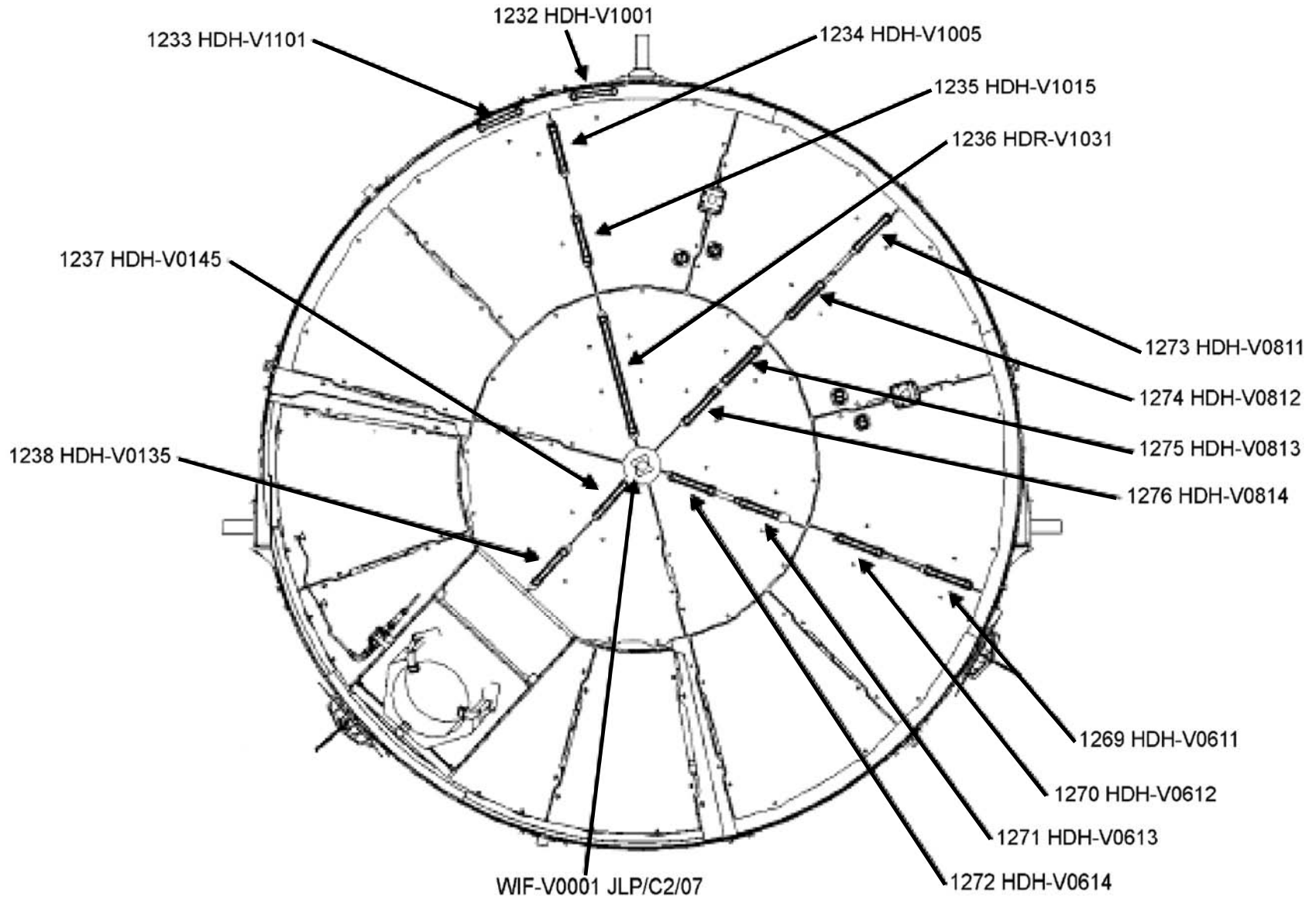




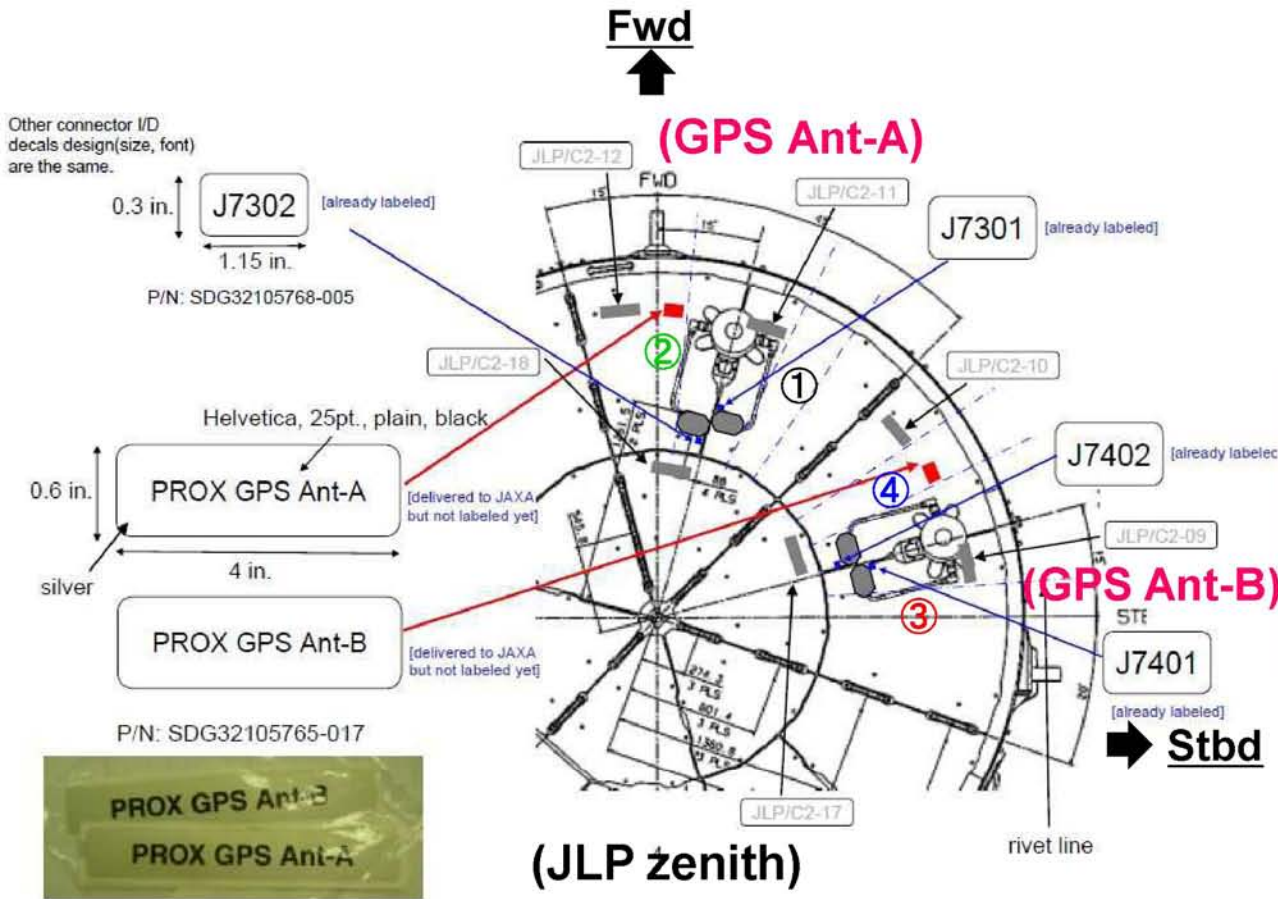
# JLP PORT SIDE VIEW



# JLP ZENITH ENDCONE VIEW



# ULF2 EVA PROX GPSAA INSTALLATION OPS FLOW – CABLE/CONNECTOR LOCATION AND ID



## Cable ID

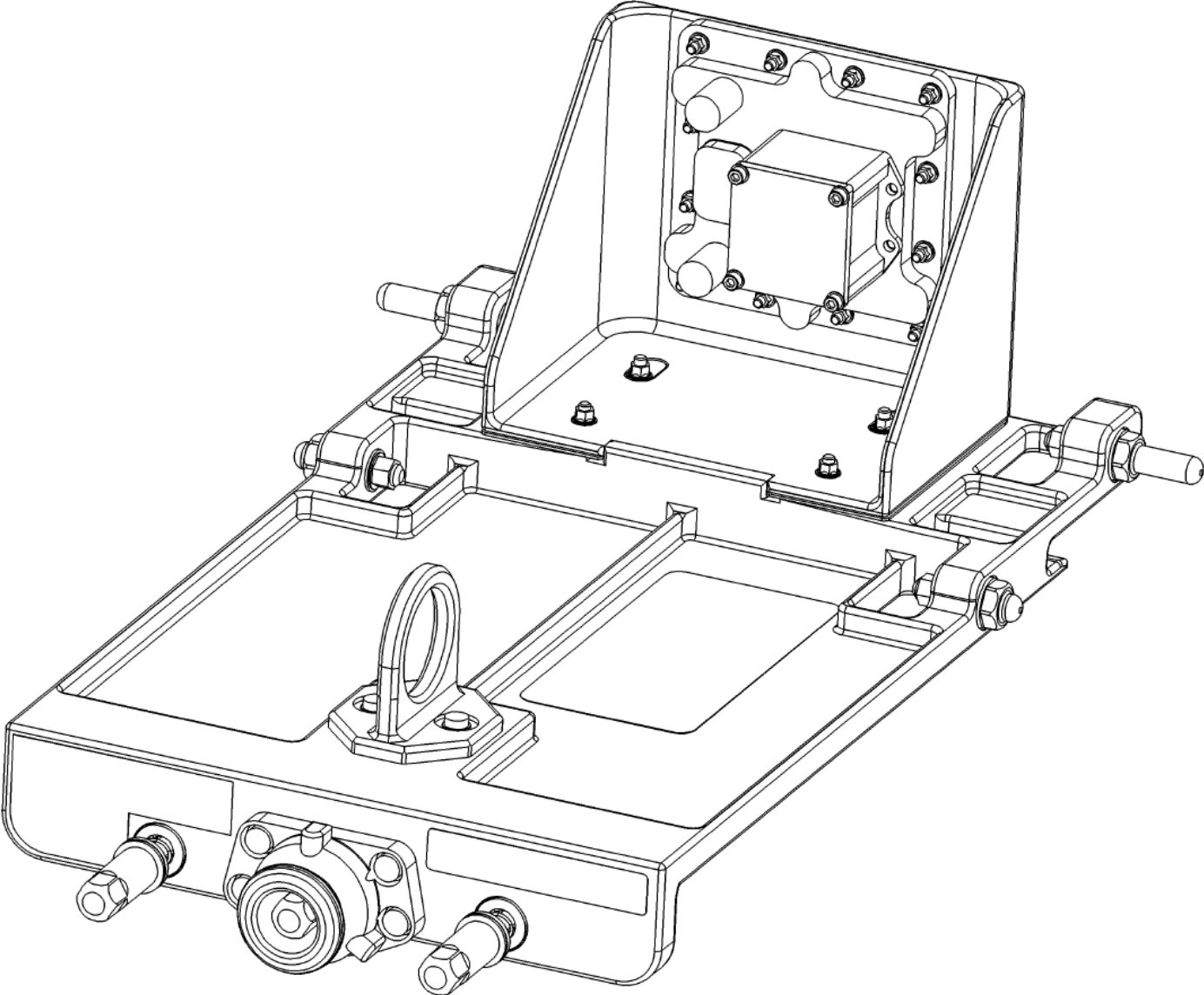
- ① "PROX GPS Ant Cable-A-01"
- ② "PROX GPS Ant Cable-A-02"
- ③ "PROX GPS Ant Cable-B-01"
- ④ "PROX GPS Ant Cable-B-02"

## Connector ID

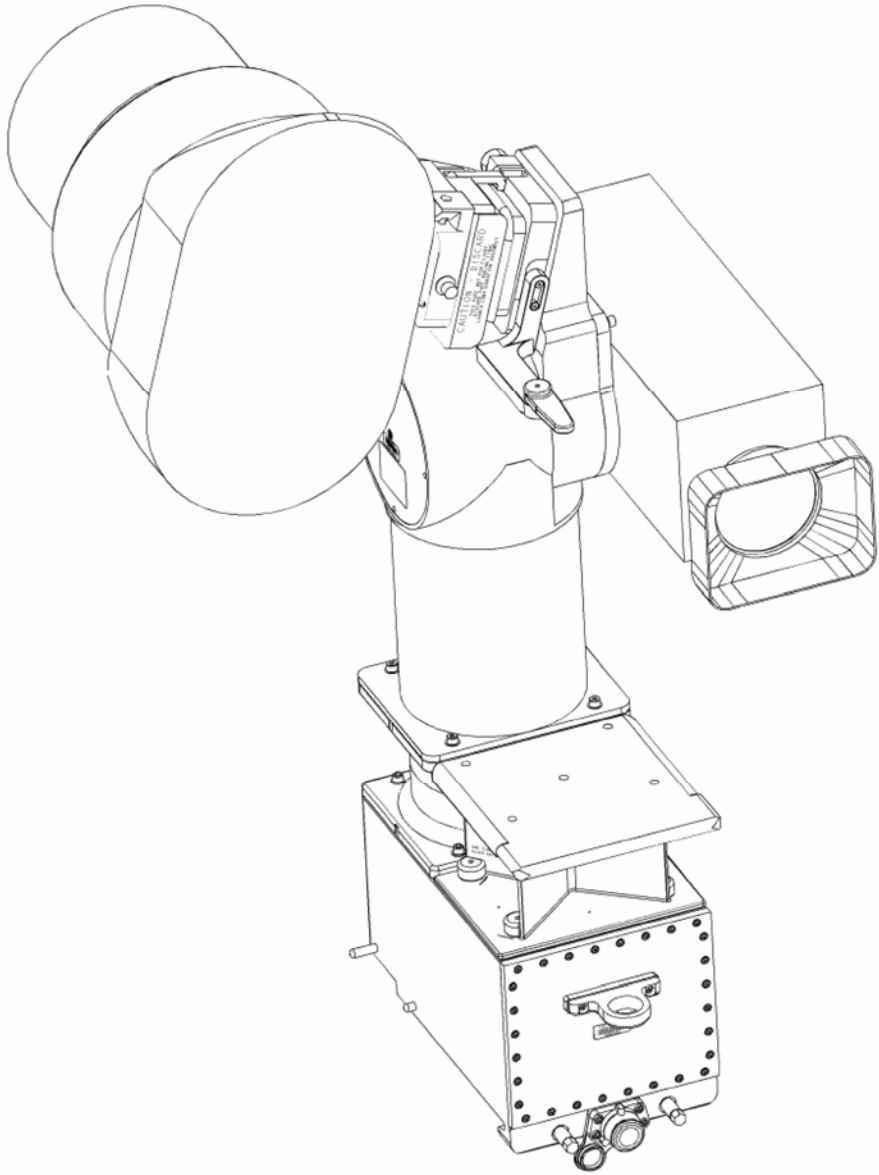
JEM Power Line	GPS Ant-A	GPS Ant-B
A-string	<b>Cable ①</b> (JLP side) P7301⇔J7301 (Ant side) P7351⇔J1	<b>Cable ③</b> (JLP side) P7401⇔J7401 (Ant side) P7451⇔J1
B-string	<b>Cable ②</b> (JLP side) P7302⇔J7302 (Ant side) P7352⇔J2	<b>Cable ④</b> (JLP side) P7402⇔J7402 (Ant side) P7452⇔J2

(P:Plug, J:Jack)

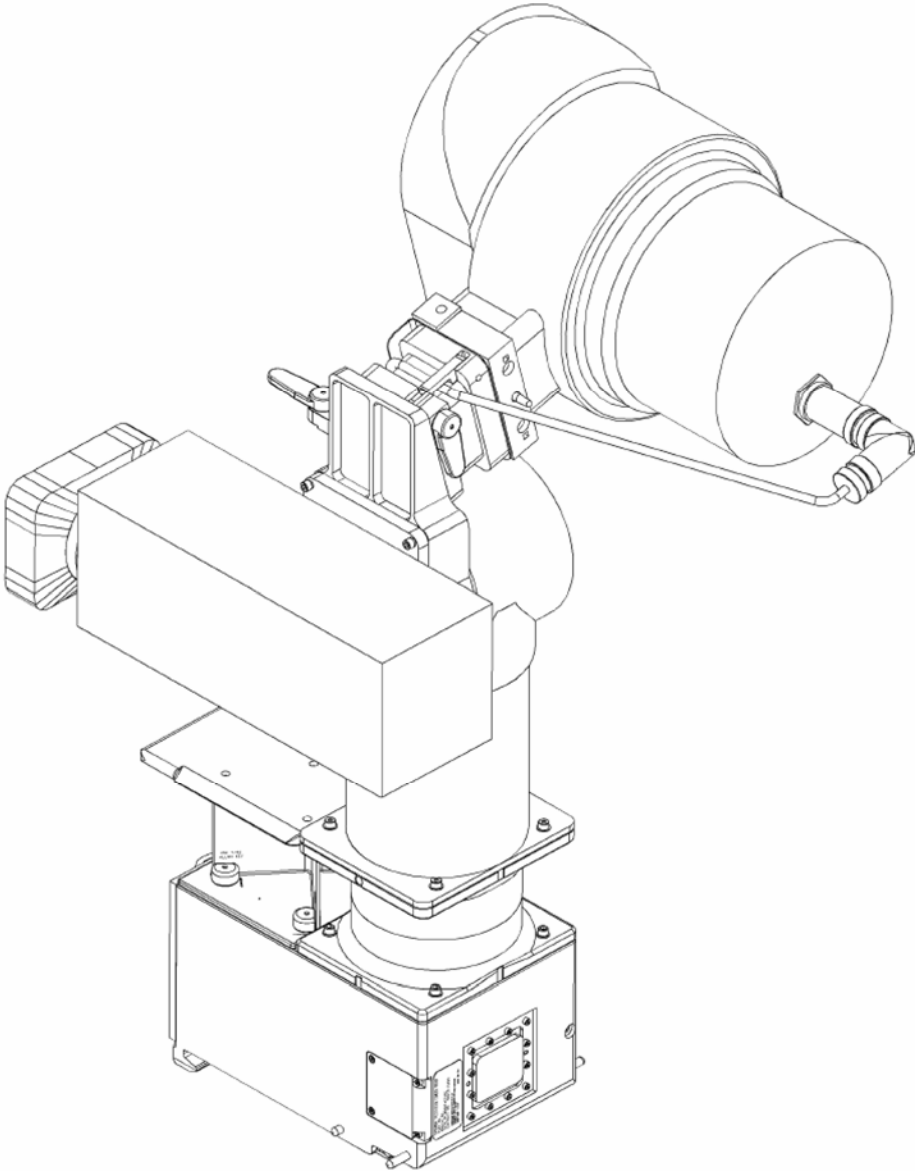
**ETVCG DUMMY BOX**



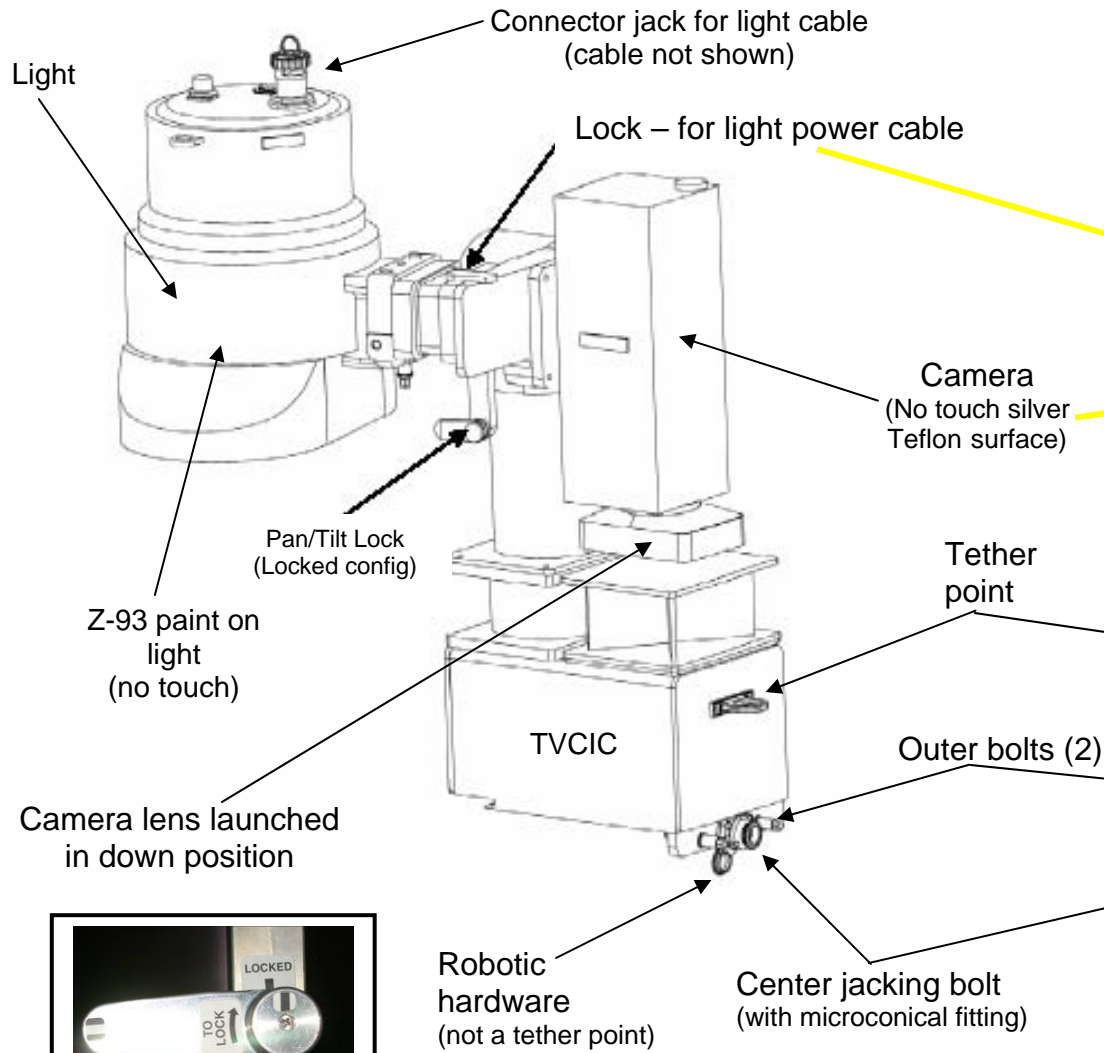
ETVCG



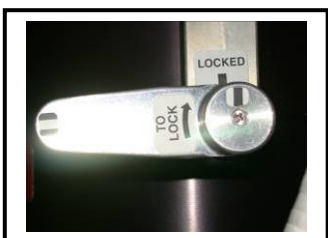
**ETVCG (Cont)**



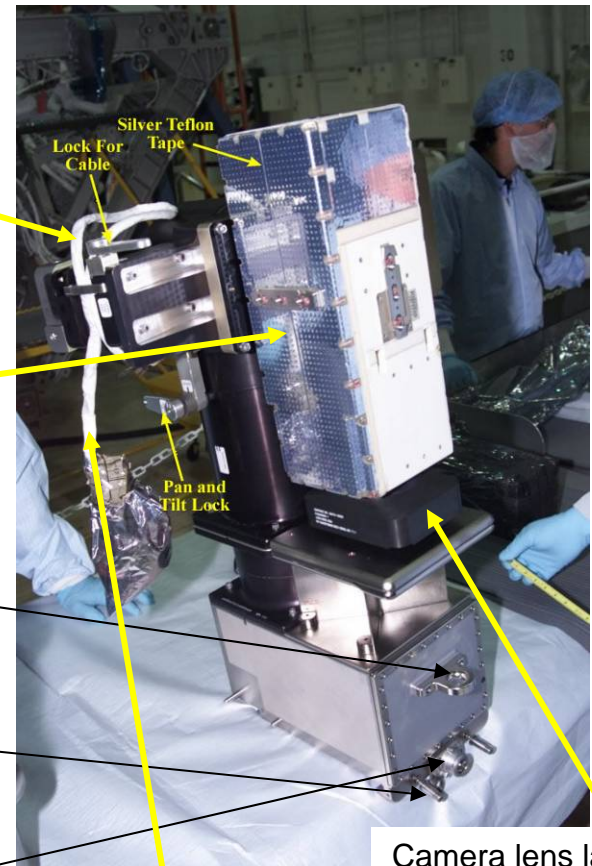
ETVCG (Cont)



Camera lens launched in down position



Pan/Tilt Lock in Locked Posn



Camera lens launched in down position

ETVCG (Cont)

Light  
(with Z93 paint)

Dummy Panel

Stanchion Cable  
(W8200)

EVA Handle  
"race track"

J2

J3

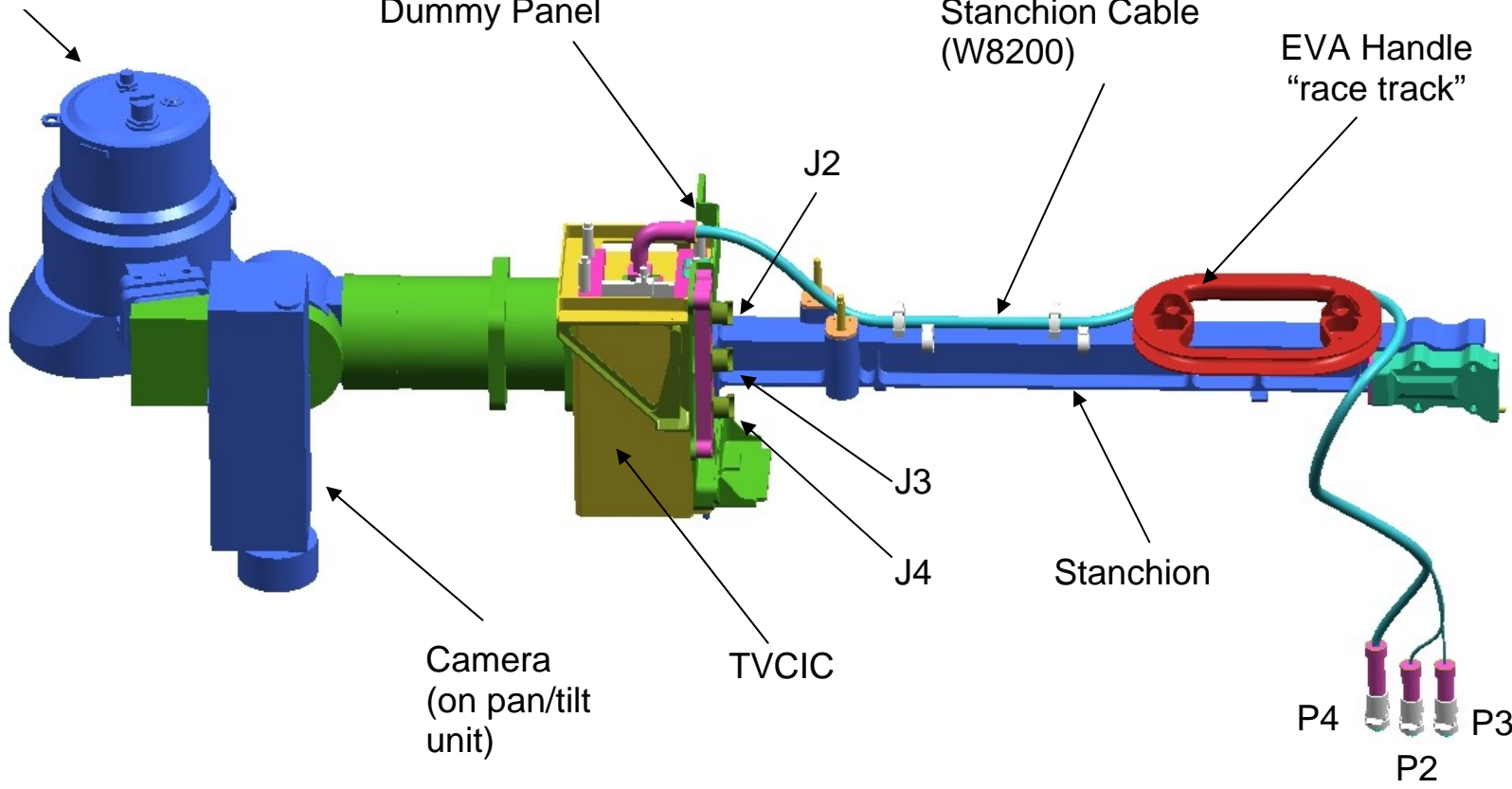
J4

Stanchion

Camera  
(on pan/tilt  
unit)

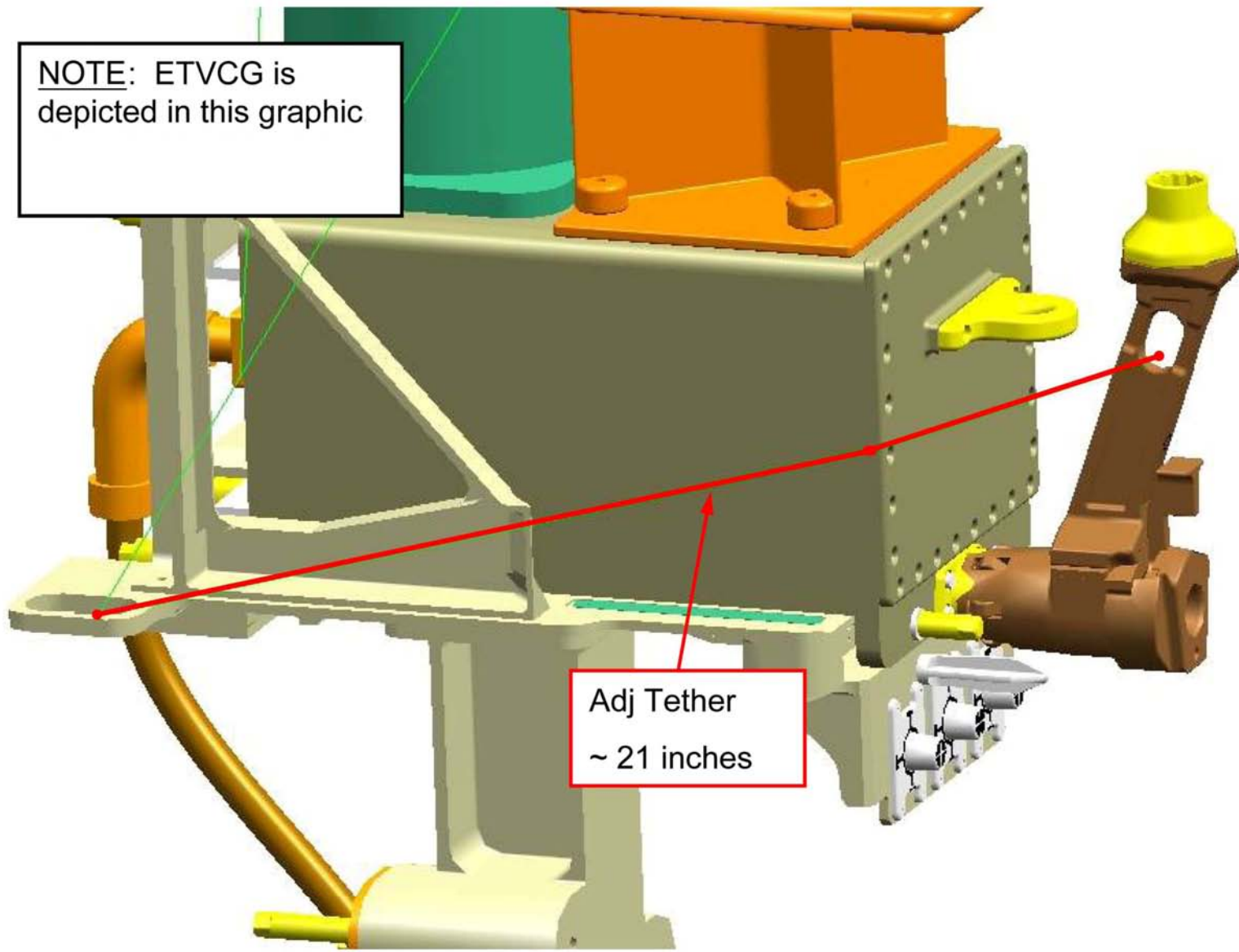
TVCIC

P4 P3 P2



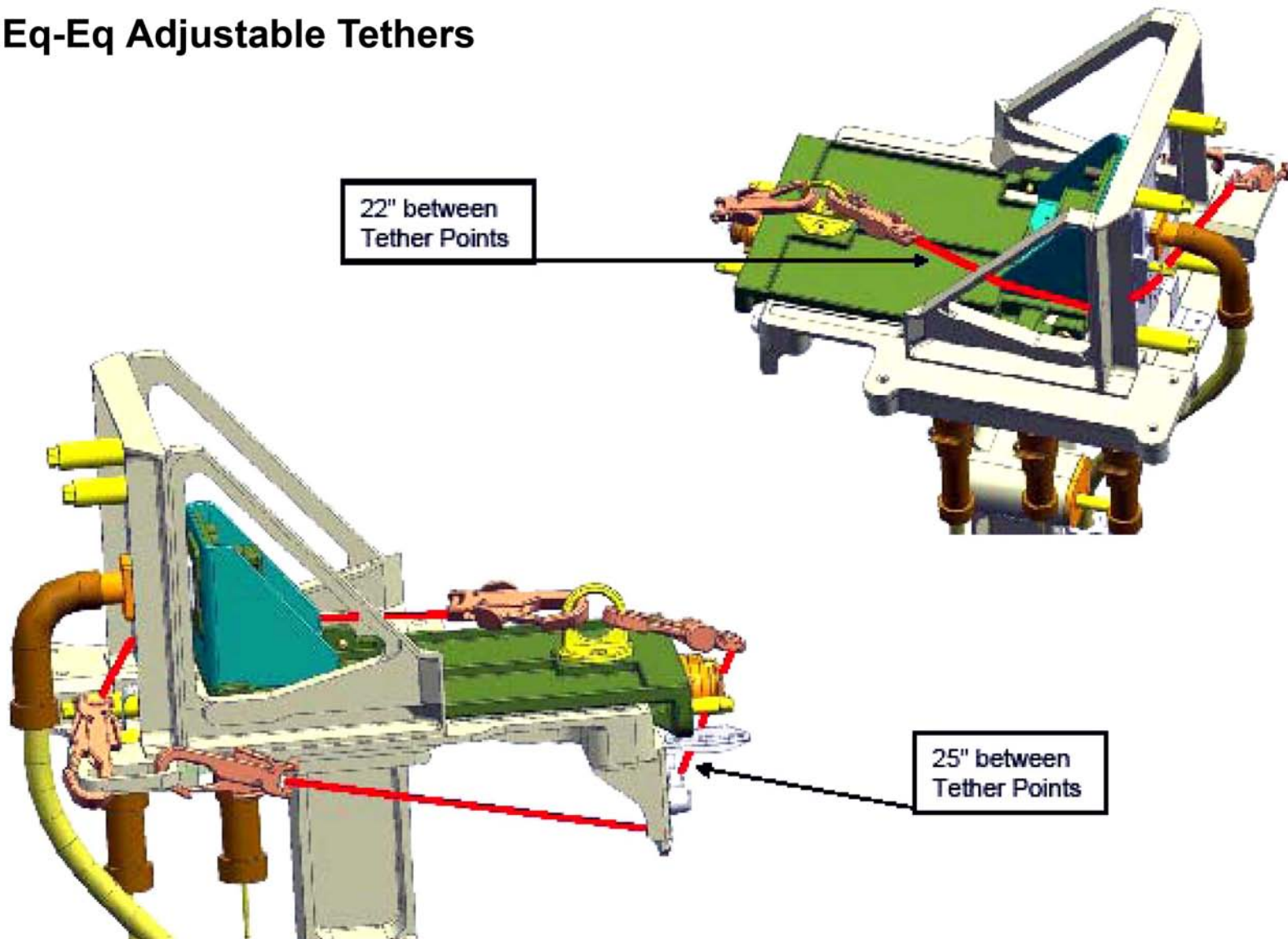


TIEDOWN: ETVCG TO VSSA (GENERIC)

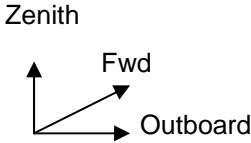
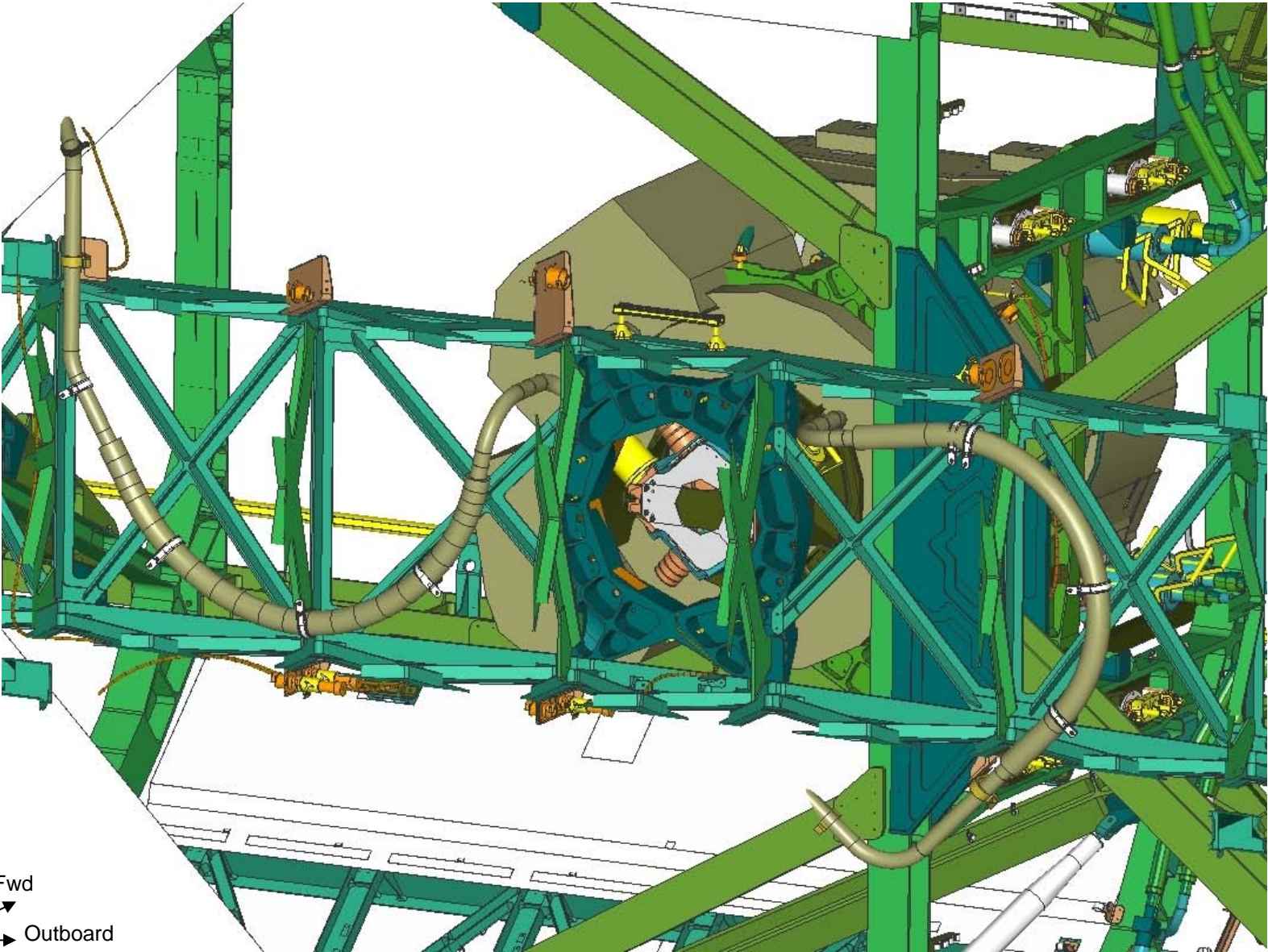


TIEDOWN: DUMMY BOX SECURED TO VSSA

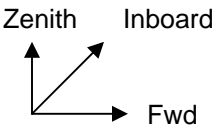
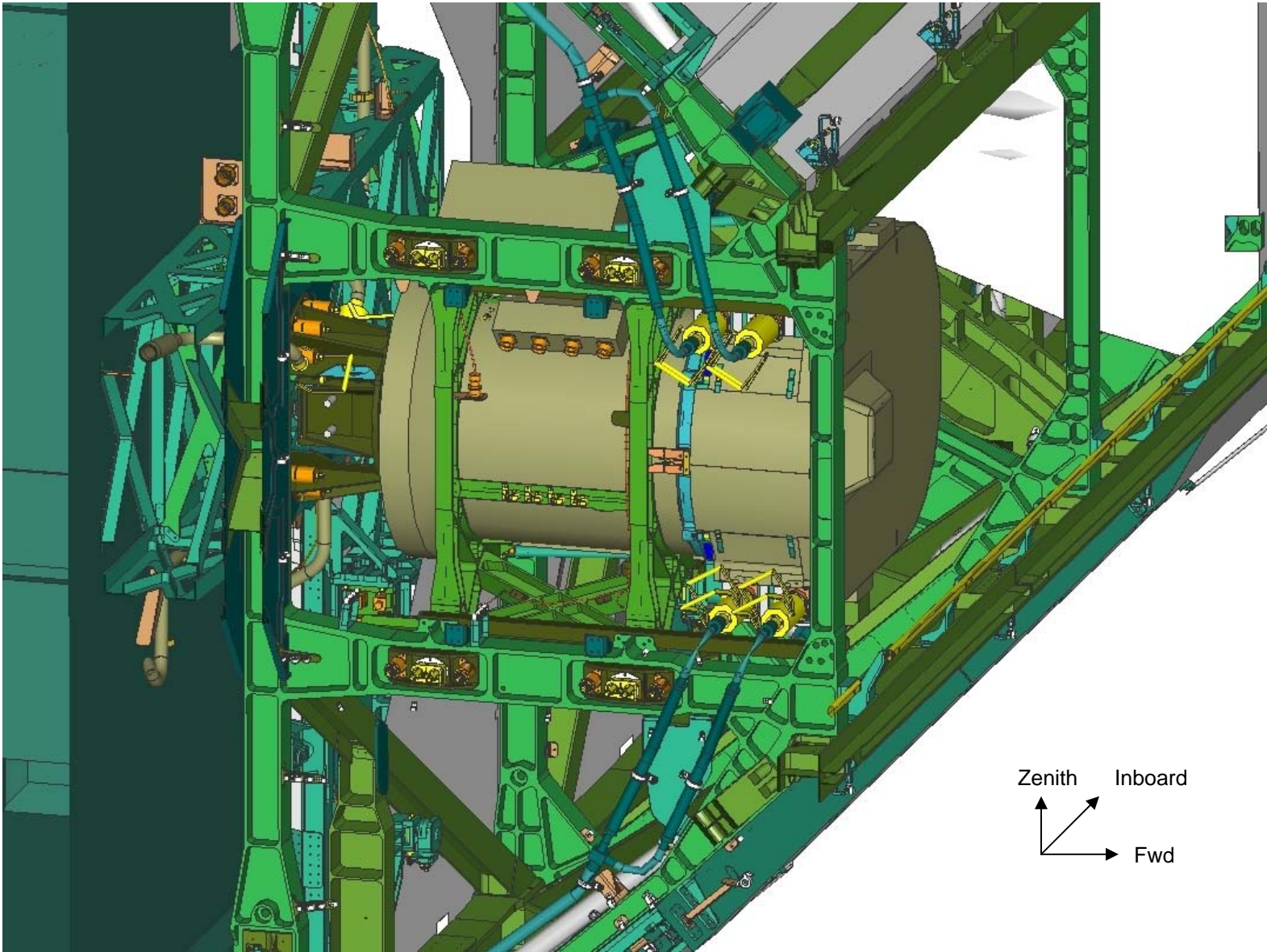
## Two Eq-Eq Adjustable Tethers



FHRC STINGER BOX (TRRJ AT -90 DEG)



FHRC HOSE BOX





# EVA CHECKLIST

STS  
126