

# EVA Checklist

## STS-123 Flight Supplement

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

**Final  
February 13, 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-123 FLIGHT SUPPLEMENT**

FINAL  
February 13, 2008


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Incorporates the following:			
482#:	EVA FS-0145	EVA FS-0154	EVA FS-0163
	EVA FS-0146	EVA FS-0155	EVA FS-0164
	EVA FS-0147	EVA FS-0156	EVA FS-0165
	EVA FS-0148	EVA FS-0157	
	EVA FS-0149	EVA FS-0158	
	EVA FS-0150	EVA FS-0159	
	EVA FS-0151	EVA FS-0160	
	EVA FS-0152	EVA FS-0161	
	EVA FS-0153	EVA FS-0162	

AREAS OF TECHNICAL RESPONSIBILITY

Book Manager	DX35/J. Berger	281-483-9562
Systems Lead	DX35/E. Bell	281-244-8430
Task Lead	DX32/A. Thomason	281-244-1142

EVA CHECKLIST  
STS-123 FLIGHT SUPPLEMENT

**LIST OF EFFECTIVE PAGES**

FINAL      02/13/08

Sign Off .....	*	123/FIN	FS 2-19 .....	†	123/FIN
FS ii .....	*	123/FIN	FS 2-20 .....	†	123/FIN
iii .....	*	generic	FS 2-21 .....		123/FIN
iv .....	*	generic	FS 2-22 .....		123/FIN
FS v .....	*	123/FIN	FS 2-23 .....		123/FIN
FS vi .....	*	123/FIN	FS 2-24 .....		123/FIN
FS vii .....	*	123/FIN	3-1 .....		generic
FS viii .....	*	123/FIN	3-2 .....		generic
FS ix .....	*	123/FIN	3-3 .....		generic
FS x .....	*	123/FIN	3-4 .....		generic
FS xi .....	*	123/FIN	3-5 .....		generic
FS xii .....	*	123/FIN	3-6 .....		generic
FS xiii .....		123/FIN	3-7 .....		generic
FS xiv .....		123/FIN	3-8 .....		generic
FS xv .....		123/FIN	3-9 .....		generic
FS xvi .....		123/FIN	CC 3-10 .....		generic
FS xvii .....		123/FIN	CC 3-11 .....		generic
FS xviii .....		123/FIN	3-12 .....		generic
FS xix .....		123/FIN	4-1 .....		generic
FS xx .....		123/FIN	4-2 .....		generic
1-1 .....		generic	4-3 .....		generic
1-2 .....		generic	4-4 .....		generic
1-3 .....		generic	4-5 .....		generic
1-4 .....		generic	4-6 .....		generic
1-5 .....		generic	4-7 .....		generic
1-6 .....		generic	4-8 .....		generic
1-7 .....		generic	4-9 .....		generic
1-8 .....		generic	4-10 .....		generic
1-9 .....		generic	4-11 .....		generic
1-10 .....		generic	4-12 .....		generic
TEMP FS 2-1 .....		123/FIN	5-1 .....		generic
TEMP FS 2-2 .....		ALL/FIN	5-2 .....		generic
2-3 .....		generic	5-3 .....		generic
2-4 .....		generic	5-4 .....		generic
TEMP FS 2-5 .....		123/FIN	A6-1 .....		generic
TEMP FS 2-6 .....		ALL/FIN	CC A6-2 .....		generic
FS 2-7 .....		123/FIN	6-3 .....		generic
FS 2-8 .....		123/FIN	CC 6-4 .....		generic
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FS 2-10 .....		123/FIN	FS 7-2 .....		123/FIN
FS 2-11 .....		123/FIN	FS CC 7-3 .....		123/FIN
FS 2-12 .....		123/FIN	FS CC 7-4 .....	†	123/FIN
FS 2-13 .....		123/FIN	FS 7-5 .....	Δ	123/FIN
FS 2-14 .....		123/FIN	FS 7-6 .....	Δ	123/FIN
FS 2-15 .....		123/FIN	FS 7-7 .....	†	123/FIN
FS 2-16 .....	†	123/FIN	FS 7-8 .....		123/FIN
FS 2-17 .....	†	123/FIN	FS 7-9 .....	†	123/FIN
FS 2-18 .....		123/FIN	FS 7-10 .....	†	123/FIN

\* – Omit from flight book  
† – Color page in flight book  
Δ – Tear-out page

FS 7-11	†	123/FIN	FS 7-67	Δ	123/FIN
FS 7-12	†	123/FIN	FS 7-68	Δ	123/FIN
FS 7-13	†	123/FIN	FS 7-69	†	123/FIN
FS 7-14	†	123/FIN	FS 7-70		123/FIN
FS 7-15		123/FIN	FS 7-71		123/FIN
FS 7-16		123/FIN	FS 7-72	†	123/FIN
FS 7-17	†	123/FIN	FS 7-73	†	123/FIN
FS 7-18		123/FIN	FS 7-74	†	123/FIN
FS 7-19		123/FIN	FS 7-75	†	123/FIN
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FS 7-22	†	123/FIN	FS 7-78	†	123/FIN
FS 7-23		123/FIN	FS 7-79		123/FIN
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FS 7-25		123/FIN	FS 7-81	†	123/FIN
FS 7-26	†	123/FIN	FS 7-82		123/FIN
FS 7-27	†	123/FIN	FS 7-83	†	123/FIN
FS 7-28	†	123/FIN	FS 7-84		123/FIN
FS 7-29		123/FIN	FS 7-85		123/FIN
FS 7-30	†	123/FIN	FS 7-86	†	123/FIN
FS 7-31	†	123/FIN	FS 7-87		123/FIN
FS 7-32	†	123/FIN	FS 7-88		123/FIN
FS 7-33	†	123/FIN	FS 7-89	†	123/FIN
FS 7-34	†	123/FIN	FS 7-90		123/FIN
FS 7-35	†	123/FIN	FS 7-91		123/FIN
FS 7-36	†	123/FIN	FS 7-92	†	123/FIN
FS 7-37	Δ	123/FIN	FS 7-93		123/FIN
FS 7-38	Δ	123/FIN	FS 7-94	†	123/FIN
FS 7-39	†	123/FIN	FS 7-95	†	123/FIN
FS 7-40		123/FIN	FS 7-96	†	123/FIN
FS 7-41	†	123/FIN	FS 7-97	†	123/FIN
FS 7-42		123/FIN	FS 7-98		123/FIN
FS 7-43	†	123/FIN	FS 7-99	†	123/FIN
FS 7-44	†	123/FIN	FS 7-100	†	123/FIN
FS 7-45		123/FIN	FS 7-101	†	123/FIN
FS 7-46		123/FIN	FS 7-102		123/FIN
FS 7-47		123/FIN	FS 7-103		123/FIN
FS 7-48	†	123/FIN	FS 7-104	†	123/FIN
FS 7-49	†	123/FIN	FS 7-105		123/FIN
FS 7-50		123/FIN	FS 7-106		123/FIN
FS 7-51		123/FIN	FS 7-107	†	123/FIN
FS 7-52	†	123/FIN	FS 7-108	†	123/FIN
FS 7-53	†	123/FIN	FS 7-109		123/FIN
FS 7-54		123/FIN	FS 7-110	†	123/FIN
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FS 7-60	†	123/FIN	FS 7-116		123/FIN
FS 7-61	†	123/FIN	FS 7-117	†	123/FIN
FS 7-62	†	123/FIN	FS 7-118		123/FIN
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FS 7-65	†	123/FIN	FS 7-121		123/FIN
FS 7-66		123/FIN	FS 7-122		123/FIN

† – Color page in flight book  
Δ – Tear-out page

FS 7-123 .....	†	123/FIN	FS 7-179.....		123/FIN
FS 7-124 .....		123/FIN	FS 7-180.....	†	123/FIN
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FS 7-126 .....	†	123/FIN	FS 7-182.....		123/FIN
FS 7-127 .....	†	123/FIN	FS 7-183.....		123/FIN
FS 7-128 .....	†	123/FIN	FS 7-184.....	†	123/FIN
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FS 7-130 .....		123/FIN	FS 7-186.....		123/FIN
FS 7-131 .....		123/FIN	FS 7-187.....		123/FIN
FS 7-132 .....	†	123/FIN	FS 7-188.....	†	123/FIN
FS 7-133 .....	†	123/FIN	FS 7-189.....	†	123/FIN
FS 7-134 .....	†	123/FIN	FS 7-190.....	†	123/FIN
FS 7-135 .....		123/FIN	FS 7-191.....	†	123/FIN
FS 7-136 .....	†	123/FIN	FS 7-192.....		123/FIN
FS 7-137 .....	†	123/FIN	FS 7-193.....	†	123/FIN
FS 7-138 .....	†	123/FIN	FS 7-194.....		123/FIN
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FS 7-140 .....	†	123/FIN	TEMP FS 8-2.....		ALL/FIN
FS 7-141 .....	†	123/FIN	8-3 .....		generic
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FS 7-149 .....	†	123/FIN	FS 8-11.....		123/FIN
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FS 7-152 .....		123/FIN	FS 8-14.....		123/FIN
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FS 7-158 .....	†	123/FIN	FS 8-20.....	†	123/FIN
FS 7-159 .....		123/FIN	FS 8-21.....	†	123/FIN
FS 7-160 .....		123/FIN	FS 8-22.....		123/FIN
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FS 7-167 .....		123/FIN	9-1 .....		generic
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FS 7-177 .....	†	123/FIN	10-4a .....		generic
FS 7-178 .....	†	123/FIN	10-4b .....		generic

† – Color page in flight book

10-5 .....	generic	14-3 .....	generic
10-6 .....	generic	14-4 .....	generic
10-7 .....	generic	14-5 .....	generic
10-8 .....	generic	14-6 .....	generic
10-9 .....	generic	14-7 .....	generic
10-10 .....	generic	14-8 .....	generic
10-11 .....	generic	14-9 .....	generic
10-12 .....	generic	14-10 .....	generic
10-13 .....	generic	14-11 .....	generic
10-14 .....	generic	14-12 .....	generic
FS CC 10-15 .....	123/FIN	14-13 .....	generic
FS CC 10-16 .....	123/FIN	14-14 .....	generic
FS CC 10-17 .....	123/FIN †	14-15 .....	generic
FS CC 10-18 .....	123/FIN †	14-16 .....	generic
11-1 .....	generic	14-17 .....	generic
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11-4 .....	generic	14-20 .....	generic
12-i .....	generic	14-21 .....	generic
12-ii .....	generic	14-22 .....	generic
TEMP FS 12-1 .....	123/FIN	15-1 .....	generic
TEMP FS 12-2 .....	ALL/FIN	15-2 .....	generic
12-3 .....	generic	15-3 .....	generic
12-4 .....	generic	15-4 .....	generic
12-5 .....	generic	15-5 .....	generic
12-6 .....	generic	15-6 .....	generic
12-7 .....	generic	15-7 .....	generic
12-8 .....	generic	15-8 .....	generic
12-9 .....	generic	15-9 .....	generic
12-10 .....	generic	15-10 .....	generic
12-11 .....	generic	15-11 .....	generic
12-12 .....	generic	15-12 .....	generic
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FS 13-1 .....	123/FIN	FS 16-17.....	123/FIN
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14-1 .....	generic	FS 16-19.....	123/FIN
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† – Color page in flight book



FS 16-21 .....	123/FIN	FS 18-9.....	123/FIN
FS 16-22 .....	123/FIN	FS 18-10.....	123/FIN
FS 16-23 .....	123/FIN	FS 18-11.....	123/FIN
FS 16-24 .....	123/FIN	FS 18-12.....	123/FIN
FS 16-25 .....	123/FIN	FS 18-13.....	123/FIN
FS 16-26 .....	123/FIN	FS 18-14.....	123/FIN
FS 16-27 .....	123/FIN	FS 18-15.....	123/FIN
FS 16-28 .....	123/FIN	FS 18-16.....	123/FIN
FS 16-29 .....	123/FIN	FS 18-17.....	123/FIN
FS 16-30 .....	123/FIN	FS 18-18.....	123/FIN
FS 16-31 .....	123/FIN	FS 18-19.....	123/FIN
FS 16-32 .....	123/FIN	FS 18-20.....	123/FIN
FS 16-33 .....	123/FIN	FS 18-21.....	123/FIN
FS 16-34 .....	123/FIN	FS 18-22.....	123/FIN
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FS 16-41 .....	123/FIN	FS 18-29.....	123/FIN
FS 16-42 .....	123/FIN	FS 18-30.....	123/FIN
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FS 16-45 .....	123/FIN	FS 18-33.....	123/FIN
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FS 16-48 .....	123/FIN	FS 18-36.....	123/FIN
FS 16-49 .....	123/FIN	FS 18-37.....	123/FIN
FS 16-50 .....	123/FIN	FS 18-38.....	123/FIN
FS 16-51 .....	123/FIN	FS 18-39.....	123/FIN
FS 16-52 .....	123/FIN	FS 18-40.....	123/FIN
FS 16-53 .....	123/FIN	FS 18-41.....	123/FIN
FS 16-54 .....	123/FIN	FS 18-42.....	123/FIN
FS 16-55 .....	123/FIN	FS 18-43.....	123/FIN
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FS 16-59..... †	123/FIN	FS 18-47.....	123/FIN
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FS 16-61..... †	123/FIN	FS 18-49.....	123/FIN
FS 16-62..... †	123/FIN	FS 18-50.....	123/FIN
FS 16-63..... †	123/FIN	FS 18-51.....	123/FIN
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FS 16-65 .....	123/FIN	FS 18-53.....	123/FIN
FS 16-66 .....	123/FIN	FS 18-54.....	123/FIN
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FS 18-7 .....	123/FIN	19-1 .....	generic
FS 18-8 .....	123/FIN	19-2 .....	generic

† – Color page in flight book

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
20-1.....*	generic
20-2.....*	generic

\* – Omit from flight book

## EVA CUE CARDS

<u>Title</u>	<u>Ref. Page</u>	<u>Card No.</u>
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(Back of DEPRESS/REPRESS) .....	CC 6-4	generic
SPDM DEPLOY TRACKING TABLES (Front).....	FS CC 7-3	EVA-7a/123/O/A
(Back).....	FS CC 7-4	EVA-7b/123/O/A
STS-123 CONSUMABLES TRACKING		
CUE CARD (Front).....	FS CC 10-15	EVA-4a/123/O/B
(Back).....	FS CC 10-16	EVA-4b/123/O/B
STS-123 BATTERY RECHARGE PLAN (Front).....	FS CC 10-17	EVA-5a/123/O/A
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AIRLOCK CONFIG

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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)
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. Unstow from External Airlock Floor Bag:  
    Be ECOK and Rm ECOK  
    Temp stow in Airlock
  4. Unbuckle SCU straps, Velcro SCU to wall
  5. Disconnect helmets from EMUs, temp stow
  6. ✓DIDB restraint bags installed
  7. Remove comm caps (4) from LTA Restraint Bag kangaroo pouches  
    For EMU 3004 (Ln), connect comm cap labeled 'LN1' to electrical harness on suit. Stow comm cap labeled 'BE1' in BE ECOK  
    For EMU 3003 (Fm), connect comm cap labeled 'FM1' to electrical harness on suit. Stow comm cap labeled 'RM1' in RM ECOK
  8. Remove LTA Restraint Bags
  9. Disconnect waist rings; remove ECOKs
  10. Verify Ln LCVG plenum in desired location; temp stow LCVGs for EMU Checkout
  11. Remove crew specific tags from Ln & Fm ECOKs; attach to ECOK drawstring
  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
  16. Transfer ECOKs to Middeck
  17. Retrieve EVA Systems Transfer Bag from Ln ECOK
- Middeck
- Vol H
18. Unstow:  
    Outboard Bag:  
        Helmet Light Batteries (2)  
    Inboard Bag:  
        SCOFs (2), temp stow for EMU Checkout  
        EMU Servicing Kit s/n 5005  
        Helmet Light Batteries (2)
  19. Stow following items in EVA Systems Transfer Bag:  
    EMU Servicing Kit s/n 5005  
    Helmet Light Batteries (4)
  20. Stow Vol H Bags in Vol H  
    (SCOFs (2) will be stowed back in EMU Equipment Bag after EMU Checkout)
  21. Temp stow ECOKs and EVA Systems Transfer Bag for EVA Prep for Transfer to ISS

## LTA RESTRAINT STRAP REMOVAL (15 min)

### NOTE

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

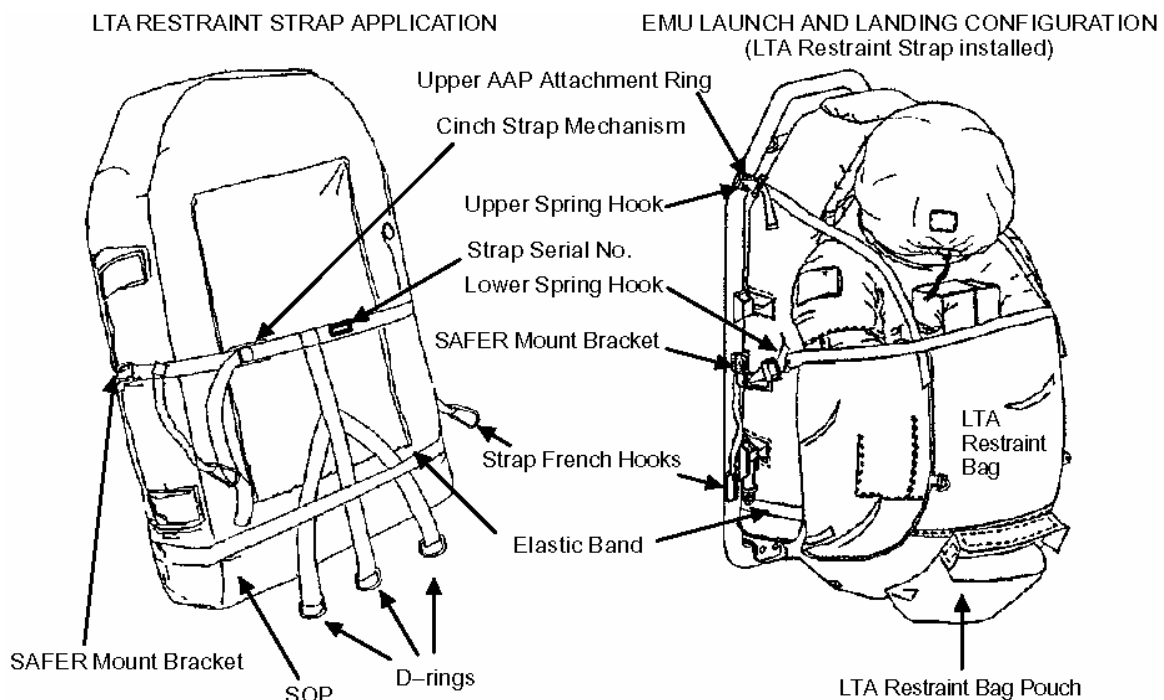
1. As reqd, remove comm cap from LTA Restraint Bag; temp stow
2. Remove EMU from AAP
3. Disconnect all restraint attachments from SAFER mount brackets (two)
4. Loosen cinch strap mechanism, remove SAFER mount brackets
5. Remove strap from PLSS
6. Stow strap in LTA Restraint Bag Pouch with D-rings (three)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



# EVA PREP FOR TRANSFER TO ISS (90 min)

I

BOTH EMUs/  
DCM

1. √PWR – SCU
2. √PURGE vlv – op (up)
3. √WATER – OFF, switch guard installed
4. √O2 ACT – OFF
5. Retrieve empty mesh bags (3) from Ln ECOK labeled:

EVA 1 Task Transfer Bag
EVA 2/3 Task Transfer Bag
EVA 4 Task Transfer Bag

6. Configure/verify items according to table below:

<u>EMU 3004 (Ln)</u>	<u>EMU 3003 (Fm)</u>
<input type="checkbox"/> DIDB Restraint Bag <input type="checkbox"/> CCA (LN1) <input type="checkbox"/> Helmet (√sun visors down, cover installed) <ul style="list-style-type: none"> <li><input type="checkbox"/> Valsalva</li> <li><input type="checkbox"/> Fresnel Lens</li> </ul> <input type="checkbox"/> EMU Gloves (LN1) <input type="checkbox"/> Wrist Mirror (2) <input type="checkbox"/> EMU Battery (verified during EMU c/o) <input type="checkbox"/> CCC (LiOH) (verify in EVA Transfer to ISS) <input type="checkbox"/> LTA	<input type="checkbox"/> DIDB Restraint Bag <input type="checkbox"/> CCA (FM1) <input type="checkbox"/> Helmet (√sun visors down, cover installed) <ul style="list-style-type: none"> <li><input type="checkbox"/> Valsalva</li> </ul> <input type="checkbox"/> EMU Gloves (FM1) <input type="checkbox"/> Wrist Mirror (2) <input type="checkbox"/> EMU Battery (verified during EMU c/o) <input type="checkbox"/> CCC (LiOH) (verify in EVA Transfer to ISS) <input type="checkbox"/> LTA

**EVA PREP FOR TRANSFER TO ISS (90 min) (Cont)**

<b><u>EMU Crew Options Kit (Ln)</u></b>	<b><u>EMU Crew Options Kit (Fm)</u></b>
<ul style="list-style-type: none"> <li><input type="checkbox"/> ECOK Mesh Bag               <ul style="list-style-type: none"> <li><input type="checkbox"/> LCVG (LN1)(w/biomed sternal harness &amp; signal conditioner)</li> </ul> </li> <li><input type="checkbox"/> Ln EVA 1 &amp; 2 Ziplock Bags               <ul style="list-style-type: none"> <li><input type="checkbox"/> 2, MAGs (w/Ziplock Bags)</li> <li><input type="checkbox"/> TCUs (top, bottom)</li> <li><input type="checkbox"/> Socks</li> <li><input type="checkbox"/> Sock liner</li> <li><input type="checkbox"/> Wristlets</li> <li><input type="checkbox"/> Comfort Gloves</li> <li><input type="checkbox"/> 3, coverlet, large</li> <li><input type="checkbox"/> 3, tegaderm</li> <li><input type="checkbox"/> 3, 7/8" dia Velcro loop</li> <li><input type="checkbox"/> 3, 7/8" dia Velcro hook</li> </ul> </li> <li>EVA 1 bag only:               <ul style="list-style-type: none"> <li><input type="checkbox"/> 1 Fresnel lens</li> <li><input type="checkbox"/> Mission patch (STS-123)</li> <li><input type="checkbox"/> American flag</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> ECOK Mesh Bag               <ul style="list-style-type: none"> <li><input type="checkbox"/> LCVG (FM1)(w/biomed sternal harness &amp; signal conditioner)</li> </ul> </li> <li><input type="checkbox"/> Fm EVA 2 &amp; 4 Ziplock Bags               <ul style="list-style-type: none"> <li><input type="checkbox"/> 2, MAGs (w/Ziplock Bags)</li> <li><input type="checkbox"/> TCUs (top, bottom)</li> <li><input type="checkbox"/> Socks</li> <li><input type="checkbox"/> Wristlets</li> <li><input type="checkbox"/> Comfort Gloves</li> <li><input type="checkbox"/> Croakie</li> <li><input type="checkbox"/> 2, coverlet, large</li> <li><input type="checkbox"/> 2, tegaderm</li> <li><input type="checkbox"/> 3, 7/8" dia Velcro loop</li> <li><input type="checkbox"/> 3, 7/8" dia Velcro hook</li> </ul> </li> <li>EVA 2 bag only:               <ul style="list-style-type: none"> <li><input type="checkbox"/> EV identifier stripes (EV3)</li> <li><input type="checkbox"/> Mission patch (STS-123)</li> <li><input type="checkbox"/> American flag</li> </ul> </li> </ul>
<p>From Rm ECOK</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Ln EVA 3 Ziplock Bag               <ul style="list-style-type: none"> <li><input type="checkbox"/> 2, MAGs (w/Ziplock Bags)</li> <li><input type="checkbox"/> TCUs (top, bottom)</li> <li><input type="checkbox"/> Socks</li> <li><input type="checkbox"/> Sock liner</li> <li><input type="checkbox"/> Wristlets</li> <li><input type="checkbox"/> Comfort Gloves</li> <li><input type="checkbox"/> 3, coverlet, large</li> <li><input type="checkbox"/> 3, tegaderm</li> </ul> </li> </ul>	<p>From Be ECOK</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Fm EVA 5 Ziplock Bag               <ul style="list-style-type: none"> <li><input type="checkbox"/> 2, MAGs (w/Ziplock Bags)</li> <li><input type="checkbox"/> TCUs (top, bottom)</li> <li><input type="checkbox"/> Socks</li> <li><input type="checkbox"/> Wristlets</li> <li><input type="checkbox"/> Comfort Gloves</li> <li><input type="checkbox"/> Croakie</li> <li><input type="checkbox"/> 2, coverlet, large</li> <li><input type="checkbox"/> 2, tegaderm</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li><input type="checkbox"/> Ln Contingency EVA Ziplock Bag               <ul style="list-style-type: none"> <li><input type="checkbox"/> 3, MAGs (w/Ziplock Bags)</li> <li><input type="checkbox"/> 2, coverlet, large</li> <li><input type="checkbox"/> 2, tegaderm</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Fm Contingency EVA Ziplock Bag               <ul style="list-style-type: none"> <li><input type="checkbox"/> 3 MAGs (w/Ziplock Bags)</li> </ul> </li> </ul>
<p>From Middeck Floor Starboard 1 Bag</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> 3 DIDBs (empty)</li> </ul>	<p>From Middeck Floor Starboard 1 Bag</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> 3 DIDBs (empty)</li> </ul>
<p>From SODF Locker (MF43K)</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> ISS EVA Cuff C/L (EV1)</li> </ul>	<p>From SODF Locker (MF43K)</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> ISS EVA Cuff C/L (EV2)</li> </ul>
<p>From WCS</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Towels</li> </ul>	<p>From WCS</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Towels</li> </ul>
<ul style="list-style-type: none"> <li><input type="checkbox"/> Crew personal items for Campout</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Crew personal items for Campout</li> </ul>

## EVA PREP FOR TRANSFER TO ISS (90 min) (Cont)

<b><u>EMU Crew Options Kit (Be)</u></b>	<b><u>EMU Crew Options Kit (Rm)</u></b>
<p><input type="checkbox"/> ECOK Mesh Bag</p> <ul style="list-style-type: none"> <li><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> Be EVA 3, 4, &amp; 5 Ziplock Bags               <ul style="list-style-type: none"> <li><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> 2, MAGs (w/Ziplock Bags)</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"/> Sock liner</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> </ul> </li> <li>EVA 3 &amp; 4 bags:               <ul style="list-style-type: none"> <li><input type="checkbox"/><input type="checkbox"/> 3, 7/8" dia Velcro loop</li> <li><input type="checkbox"/><input type="checkbox"/> 3, 7/8" dia Velcro hook</li> </ul> </li> <li>EVA 3 bag only:               <ul style="list-style-type: none"> <li><input type="checkbox"/> EV identifier stripes (EV2)</li> <li><input type="checkbox"/> Mission patch (STS-123)</li> <li><input type="checkbox"/> American flag</li> </ul> </li> </ul> <p><input type="checkbox"/> CCA (BE1)</p> <p>From Middeck Floor Starboard 1 Bag</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> EMU Gloves – 1 pair (BE1)</li> <li><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> 3 DIDBs (empty)</li> </ul> <p>From External A/L Floor Bag</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> LCVG (BE1)(w/biomed sternal harness &amp; signal conditioner)</li> </ul> <p>From SODF Locker (MF43K)</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> ISS EVA Cuff C/L (EV3)</li> </ul> <p>From WCS</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Towels</li> </ul> <p><input type="checkbox"/> Crew personal items for Campout</p>	<p><input type="checkbox"/> ECOK Mesh Bag</p> <ul style="list-style-type: none"> <li><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> Rm EVA 1, Probable EVA 1, &amp; Probable EVA 2 Ziplock Bags               <ul style="list-style-type: none"> <li><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> 2, MAGs (w/Ziplock Bags)</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"/> Comfort Gloves</li> </ul> </li> <li>EVA 1 &amp; Probable EVA 1 bags only:               <ul style="list-style-type: none"> <li><input type="checkbox"/><input type="checkbox"/> 3, 7/8" dia Velcro loop</li> <li><input type="checkbox"/><input type="checkbox"/> 3, 7/8" dia Velcro hook</li> </ul> </li> <li>EVA 1 bag only:               <ul style="list-style-type: none"> <li><input type="checkbox"/> EV identifier stripes (EV4)</li> <li><input type="checkbox"/> Mission patch (STS-123)</li> <li><input type="checkbox"/> American flag</li> </ul> </li> </ul> <p><input type="checkbox"/> Rm Contingency Ziplock Bag</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> 6, MAGs (w/Ziplock Bags)</li> <li><input type="checkbox"/> TCUs (top, bottom)</li> <li><input type="checkbox"/> Socks</li> <li><input type="checkbox"/> Comfort Gloves</li> <li><input type="checkbox"/> 3, 7/8" dia Velcro loop</li> <li><input type="checkbox"/> 3, 7/8" dia Velcro hook</li> <li><input type="checkbox"/> EV identifier stripes (EV1 &amp; EV2)</li> <li><input type="checkbox"/> Mission patch (Exp 16 &amp; Exp 17)</li> <li><input type="checkbox"/> American flag</li> </ul> <p><input type="checkbox"/> CCA (RM1)</p> <p>From Middeck Floor Starboard 1 Bag</p> <ul style="list-style-type: none"> <li><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> 3 DIDBs (empty)</li> </ul> <p>From External A/L Floor Bag</p> <ul style="list-style-type: none"> <li><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> EMU Gloves – 3 pair (RM1/RM2/RM3)</li> <li><input type="checkbox"/> LCVG (RM1)(w/biomed sternal harness &amp; signal conditioner)</li> </ul> <p>From SODF Locker (MF43K)</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> ISS EVA Cuff C/L (EV4)</li> </ul> <p>From WCS</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Towels</li> </ul> <p><input type="checkbox"/> Crew personal items for Campout</p>
<p><b><u>EVA Systems Transfer Bag</u></b></p> <p><input type="checkbox"/> EMU Servicing Kit s/n 5005</p> <p><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> EHIP Batteries (4)</p> <p>From Middeck Floor Starboard 1 Bag</p> <ul style="list-style-type: none"> <li><input type="checkbox"/><input type="checkbox"/> LiOH (2) s/n: _____ s/n: _____</li> </ul> <p>From External A/L Floor Bag</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Overgloves – 1 pair L</li> <li><input type="checkbox"/><input type="checkbox"/> Overgloves – 2 pair M</li> </ul> <p>From FDF Locker (MF57G)</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> STS-123 Consumables Tracking Cue Card</li> <li><input type="checkbox"/> STS-123 Battery Recharge Plan</li> <li><input type="checkbox"/> STS-123 EVA Checklist</li> <li><input type="checkbox"/> Expedited Suit Doffing Cue Card</li> <li><input type="checkbox"/> Emergency Undock EVA Transfer Cue Card</li> </ul> <p>From SODF Locker (MF43K)</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> ISS EVA Systems Checklist (3)</li> </ul> <p>From WCS</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Hygiene items</li> </ul> <p>From Drug Subpack (MF28H)</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Aspirin</li> </ul>	

## EVA PREP FOR TRANSFER TO ISS (90 min) (Cont)

7. Gather EVA Tools from STS Stowage Location and stow in EVA 'X' Task Transfer Bag according to table below

Stowage Location	EVA Tools	EVA 'X' Task Transfer Bag
Ext A/L Floor Bag	<input type="checkbox"/> 85-ft Safety Tether (2) (s/n 1001, 1004)	1
	<input type="checkbox"/> Adj Equipment Tethers ( <del>2</del> <sup>3</sup> )	1
	<input type="checkbox"/> Adj Equipment Tethers ( <del>4</del> <sup>3</sup> )	4
	<input type="checkbox"/> All (red) RETs [eq-eq(16), eq-eq w/PIP(5); Lg-eq(8)]	2/3
	<input type="checkbox"/> Lg Trash Bag (1) (s/n 1011)	2/3
	<input type="checkbox"/> Broom Clip Caddy (1) (s/n 1011)	4
	<input type="checkbox"/> EVA Temperature Sensor (1) (s/n 1005)	4
	<input type="checkbox"/> Brush Handle (tipless) (1) (s/n 1010)	4
	<input type="checkbox"/> Spare EDFs (5)	1
Middeck Floor Stbd 1 (Bag C)	<input type="checkbox"/> OTCM OSE blankets (2)	1
	<input type="checkbox"/> OHT, OTCM Handling Tool (2)	1
	<input type="checkbox"/> EVA Wipes (5)	4

8. Stow EVA 4 Task Transfer Bag in Ext A/L Floor Bag
9. When complete with EVA Prep for Transfer to ISS, report s/ns of LiOH stowed in EVA Systems Transfer Bag and activity status to MCC-H

# POST-DOCKING EVA TRANSFER AND RECONFIG (60 min)

I

## NOTE

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

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

Item	Destination	Transfer list item #	Transfer Status
EMU 3004 (Ln)	E-Lk aft EDDA	Ref Transfer List	
EMU 3003 (Fm)	Node 1	Ref Transfer List	
ECOK (Ln)	E-Lk	Ref Transfer List	
ECOK (Rm)	E-Lk	Ref Transfer List	
ECOK (Be)	Node 1	Ref Transfer List	
ECOK (Fm)	Node 1	Ref Transfer List	
EVA Systems Transfer Bag	E-Lk	Ref Transfer List	
EVA 1 Task Transfer Bag	E-Lk	Ref Transfer List	
EVA 2/3 Task Transfer Bag	Node 1	Ref Transfer List	

- EVA Sys  
Transfer Bag
2. Unstow following items and position in E-Lk:
    - STS-123 Consumables Tracking Cue Card
    - STS-123 Battery Recharge Plan
    - STS-123 ISS EVA Systems Checklist (2)  
(colored stripe for STS-123 mission only)
    - ISS EVA Systems Checklist (1) (to be left on ISS)
    - STS-123 EVA Checklist
    - Emergency Undock EVA Transfer Cue Card
    - Expedited Suit Doffing Cue Card
    - Overgloves – 3 pair (1 pair L / 2 pair M)
    - LiOH (1)  
Record s/n \_\_\_\_\_  
Temp stow for install on EMU 3006
    - EHIP Batteries (4) – stow in M02 Bag w/on-orbit EHIP batteries
    - Crew Hygiene and Preference items
- ECOKs  
(Ln & Rm)
- CCA (RM1) – temp stow for install on EMU 3006
  - EMU gloves (RM1) – temp stow for install on EMU 3006
- EVA Sys  
Transfer Bag
3. Stow ISS EVA Systems Checklist currently on ISS in EVA Systems Transfer Bag for return on STS-123
  4. Stow ISS EVA Cuff C/L (3) currently on ISS in EVA Systems Transfer Bag for return on STS-123  
s/ns: \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_
- EMU 3003
5. Check LiOH s/n and record: \_\_\_\_\_
- EMU 3004
6. Check LiOH s/n and record: \_\_\_\_\_
- For Helmet Light Batteries and ERCA s/n, refer to STS-123 CONSUMABLES TRACKING CUE CARD
7. Install Helmet Lights w/batteries and EMU TV
- EMU 3006
8. Disconnect helmet, temp stow
  9. Connect CCA (Rm1) (temp stowed in step 2) to electrical harness

## POST-DOCKING EVA TRANSFER AND RECONFIG (60 min) (Cont)

I

10. Install helmet
11. Connect EMU gloves (RM1) to EMU (temp stowed in step 2)
12. Install LiOH (temp stowed in step 2)
13. Retrieve following from Rm ECOK and install on EMU:
  - STS-123 Mission patch
  - American flag
  - Crew Identifier stripes
14. Perform EVA 1 Tool Config as time permits
15. Report transfer status and LiOH s/ns from steps 2, 5, and 6 to MCC

## EMU SWAP FOR EVA 2 (30 min)

I

### 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)

- EMU 3006
- 1. Remove Helmet Lights and EMU TV  
Temp stow entire assembly
  - 2. Remove REBA from PLSS, stow
  - 3. Connect waist ring to HUT
  - 4. Connect Rm1 gloves to lower arms
  - 5. √Helmet installed, sun visors down, cover installed
  - 6. If desired:  
Retrieve LTA Restraint straps and bag  
Perform 1.330 LTA RESTRAINT INSTALLATION/REMOVAL  
(Installation steps only)
  - 7. Remove EMU from fwd EDDA  
Transfer EMU to Node 1
  - 8. Gather EV4 (Rm) EMU crew-specific items and place in Rm ECOK  
Transfer Rm ECOK to Node 1
- EMU 3003
- 9. Transfer EMU and Fm ECOK to E-Lk  
Install EMU on fwd EDDA
  - 10. Install Helmet Lights and EMU TV  
√Sun visors down, cover installed
  - 11. Retrieve EV3 cuff checklist from Fm ECOK  
Install on EMU left arm
  - 12. √Wrist Mirrors (two) installed

## EMU SWAP FOR EVA 3 (30 min)

I

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

- EMU 3003
- 1. Remove Helmet Lights and EMU TV  
Temp stow entire assembly
  - 2. Connect waist ring to HUT
  - 3. Connect FM1 gloves to lower arms
  - 4. ✓Helmet installed, sun visors down, cover installed
  - 5. If desired:  
Retireve LTA Restraint straps and bag  
Perform 1.330 LTA Restraint Installation/Removal  
(Installation steps only)
  - 6. Remove EMU from fwd EDDA  
Transfer EMU to Node 1
  - 7. Gather EV3 (Fm) EMU crew-specific items and place in Fm ECOK  
Transfer ECOK to Node 1
- EMU 3004
- 8. Remove from aft EDDA
  - 9. Install on fwd EDDA
- EMU 3008
- 10. If present, remove LTA Restraint Strap/Bag from EMU 3008
  - 11. Transfer EMU and Be ECOK to E-Lk  
Install EMU on aft EDDA
  - 12. Disconnect helmet, temp stow
  - 13. Unstow BE1 CCA from Be ECOK and connect to electrical harness
  - 14. Install helmet on EMU
  - 15. Install Helmet Lights and EMU TV  
✓Sun visors down, cover installed
  - 16. Unstow BE1 EMU gloves from Be ECOK and connect to EMU
  - 17. Retrieve EV2 cuff checklist from Be ECOK  
Install on EMU left arm
  - 18. Retrieve following from Be ECOK and install on EMU:
    - STS-123 Mission patch
    - American flag
    - Crew Identifier stripes
  - 19. ✓Wrist Mirrors (two) installed



## EMU RECONFIG/SWAP FOR EVA 4 (90 min)

I

### NOTE

This procedure assumes the following procedures have been completed following EVA 3:  
{1.240 POST EVA} (SODF: ISS EVA SYS: EVA PREP/POST)  
{1.510 METOX REGENERATION - init} (SODF: ISS EVA SYS: EMU MAINTENANCE)  
{1.605 BSA BATTERY RECHARGE - term} (SODF: ISS EVA SYS: BATTERY OPS)  
{1.605 BSA BATTERY RECHARGE - init} (SODF: ISS EVA SYS: BATTERY OPS)

- EMU 3008
- 1. Connect waist ring to HUT
  - 2. Connect gloves to lower arms
  - 3. ✓Helmet installed, sun visors down, cover installed
  - 4. Remove EMU from EDDA  
Temp stow EMU in Node 1
- EMU 3004
- 5. Remove Helmet Lights and EMU TV  
Temp stow entire assembly
  - 6. Remove REBA from PLSS, stow
  - 7. Remove patches and stripes; temp stow
  - 8. Gather EV1 (Ln) EMU crew-specific items and place in Ln ECOK  
Transfer ECOK to Node 1
- EMU 3006/3004 Resize
- 9. If present, remove LTA Restraint Strap/Bag from EMU 3006 (Rm)
  - 10. Transfer EMU 3006 (Rm) from Node 1 to E-Lk  
Install EMU on aft EDDA
  - 11. Remove patches and stripes; stow in Rm ECOK
  - 12. Disconnect from EMU 3006 and temp stow following:  
Rm LTA  
Rm Helmet (s/n 1069)  
Rm Lower Arms (s/n 265/266) (leave gloves connected)  
Rm CCA
  - 13. Disconnect from EMU 3004 and temp stow following:  
Ln LTA  
Ln Helmet (s/n 1073)  
Ln Lower Arms (s/n 235/236) with 0.5-inch sizing rings  
(leave gloves connected)  
Ln CCA
  - 14. Connect to EMU 3004:  
Rm LTA  
Rm Helmet (s/n 1069)  
Rm Lower Arms (s/n 265/266) (leave gloves connected)  
Rm CCA

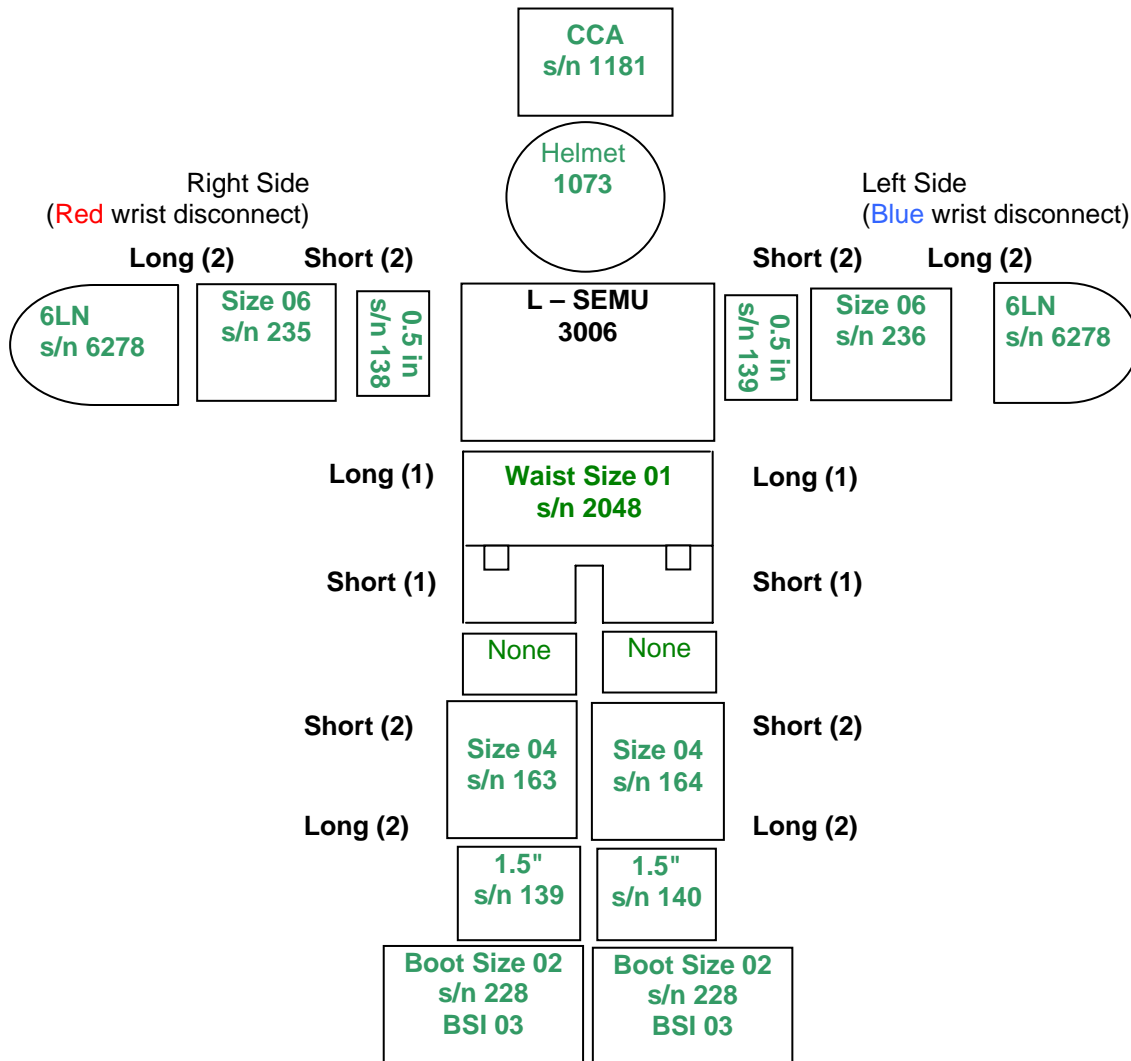
- 15. Connect to EMU 3006:
  - Ln LTA
  - Ln Helmet (s/n 1073)
  - Ln Lower Arms (s/n 235/236) with 0.5-inch sizing rings (leave gloves connected)
  - Ln CCA
- 16. Install patches and stripes on EMU 3006 for Ln (EV1)
- 17. ✓Sun visors down, helmet covers installed (1 per EMU)
- 18. Verify final config of EMUs 3006 and 3004 per following figures

NOTE

All labels show serial numbers on top

**BLACK** font indicates hardware already on EMU 3006

**GREEN** font indicates hardware removed from EMU 3004



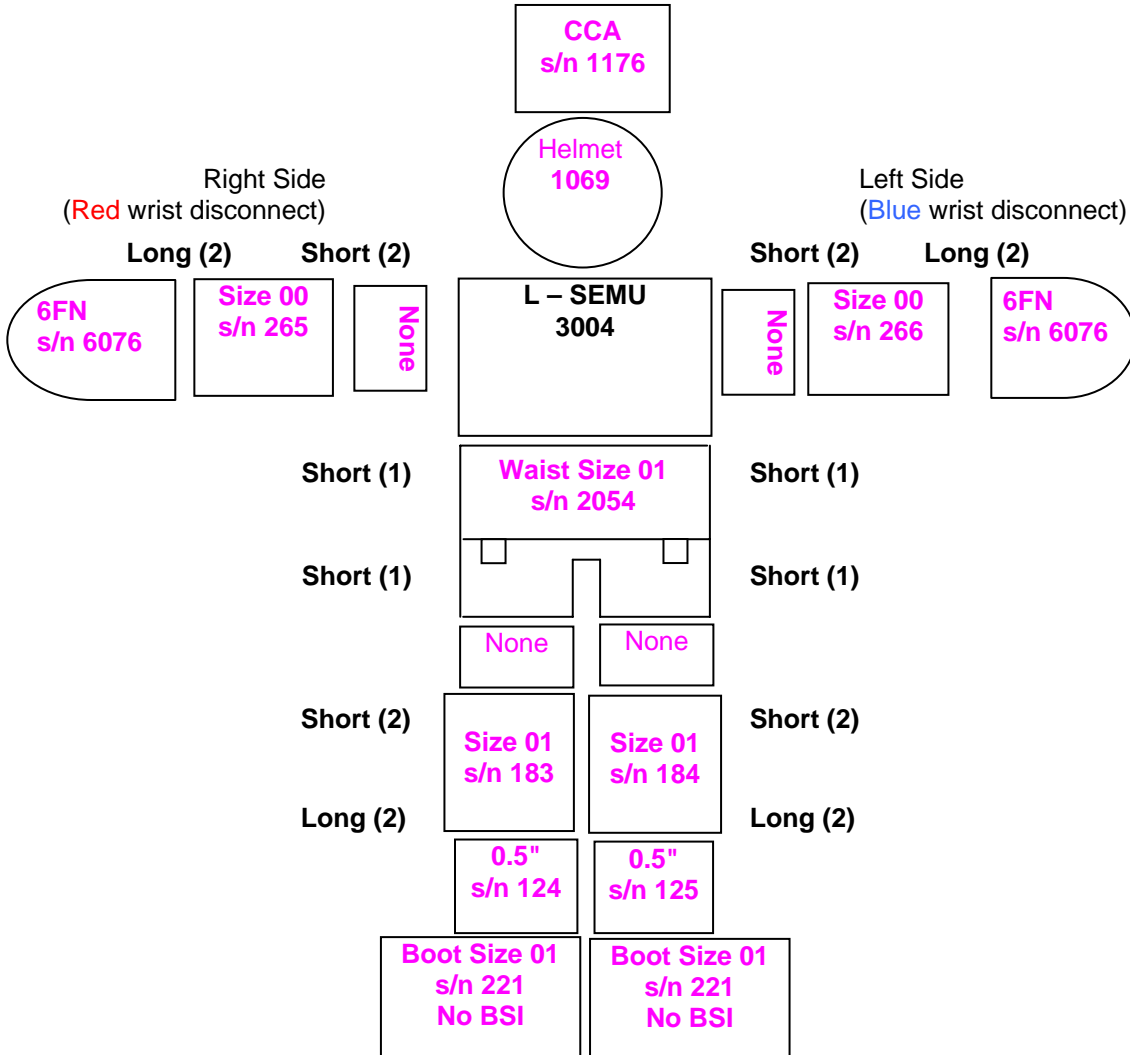
FINAL EMU 3006 CONFIG FOR LINNEHAN

**NOTE**

All labels show serial numbers on top

**BLACK** font indicates hardware already on EMU 3004

**PINK** font indicates hardware removed from EMU 3006



**FINAL EMU 3004 CONFIG FOR REISMAN**

- 19. If desired:
  - Retrieve LTA Restraint straps and bag
  - Perform 1.330 LTA RESTRAINT INSTALLATION/REMOVAL (Installation steps only) for EMU 3004
- 20. Remove EMUs from fwd and aft EDDAs
  - Transfer EMUs to Node 1

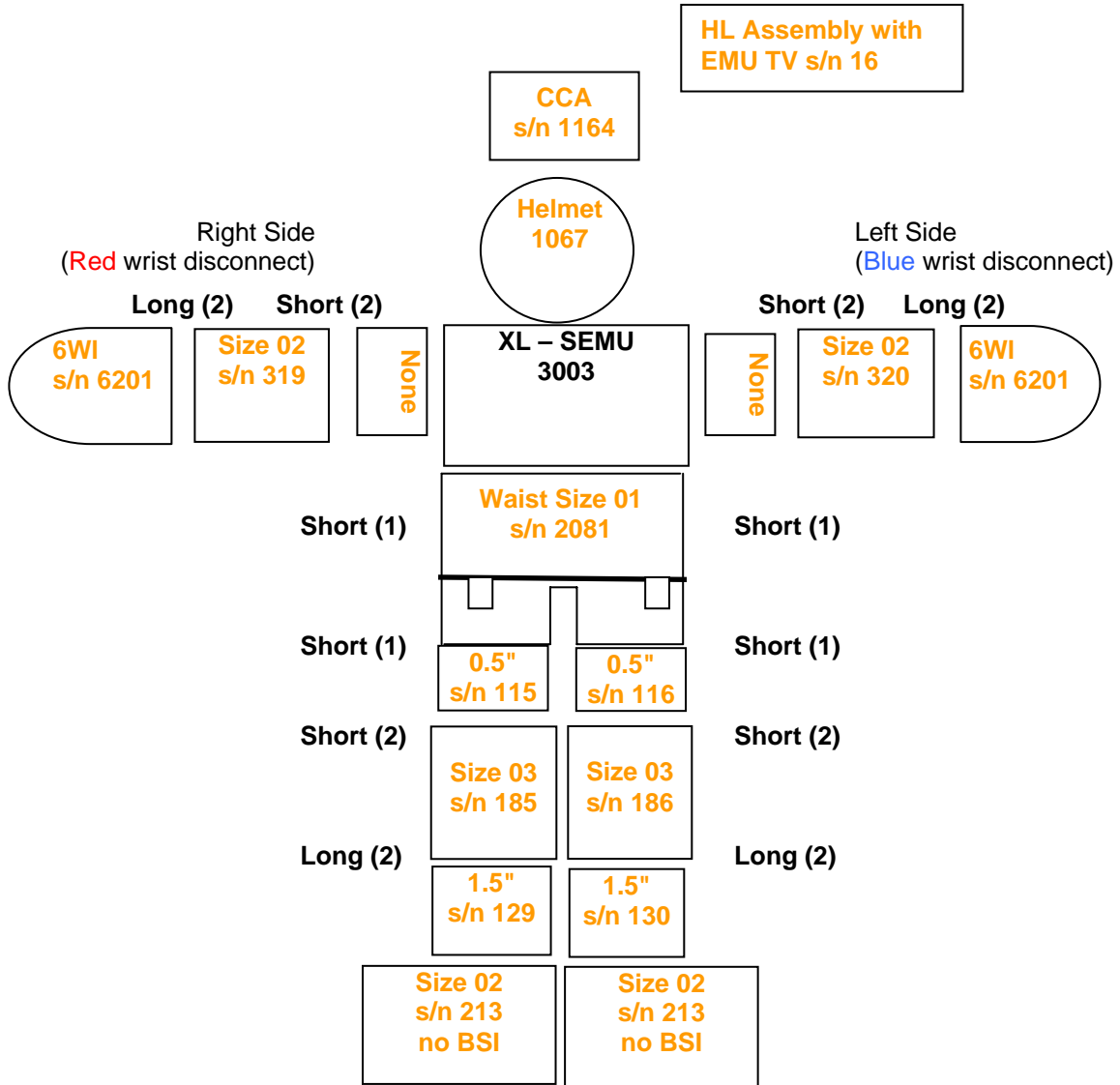
- EMU 3008/3003 Resize
- 21. Transfer EMU 3008 from Node 1 to E-Lk  
Install EMU on fwd EDDA
  - 22. Transfer EMU 3003 and Fm ECOK from Node 1 to E-Lk  
Install EMU on aft EDDA
  - 23. Disconnect from EMU 3008 and temp stow following:  
Be LTA  
Be Helmet (s/n 1067)  
Be Lower Arms (s/n 319/320) (leave gloves connected)  
Be CCA
  - 24. Remove patches and stripes from EMU 3008
  - 25. Disconnect from EMU 3003 and temp stow following:  
Fm LTA  
Fm Helmet (s/n 1077)  
Fm Lower Arms (s/n 343/344) (leave gloves connected)  
Fm CCA
  - 26. Remove patches and stripes from EMU 3003
  - 27. Connect to EMU 3003:  
Be LTA  
Be Helmet (s/n 1067)  
Be Lower Arms (s/n 319/320) (leave gloves connected)  
Be CCA
  - 28. Install patches and stripes on EMU 3003 for Be (EV2)
  - 29. Connect to EMU 3008:  
Fm LTA  
Fm Helmet (s/n 1077)  
Fm Lower Arms (s/n 343/344) (leave gloves connected)  
Fm CCA
  - 30. Install patches and stripes on EMU 3008 for Fm (EV3)
  - 31. Install Helmet Lights and EMU TV on EMU 3008
  - 32. ✓Cuff checklist installed on each EMU
  - 33. ✓Wrist Mirrors (two) installed on each EMU
  - 34. ✓Sun visors down, helmet covers installed (1 per EMU)
  - 35. Verify final config of EMUs 3003 and 3008 per following figures

**NOTE**

All labels show serial numbers on top

**BLACK** font indicates hardware already on EMU 3003

**ORANGE** font indicates hardware removed from EMU 3008



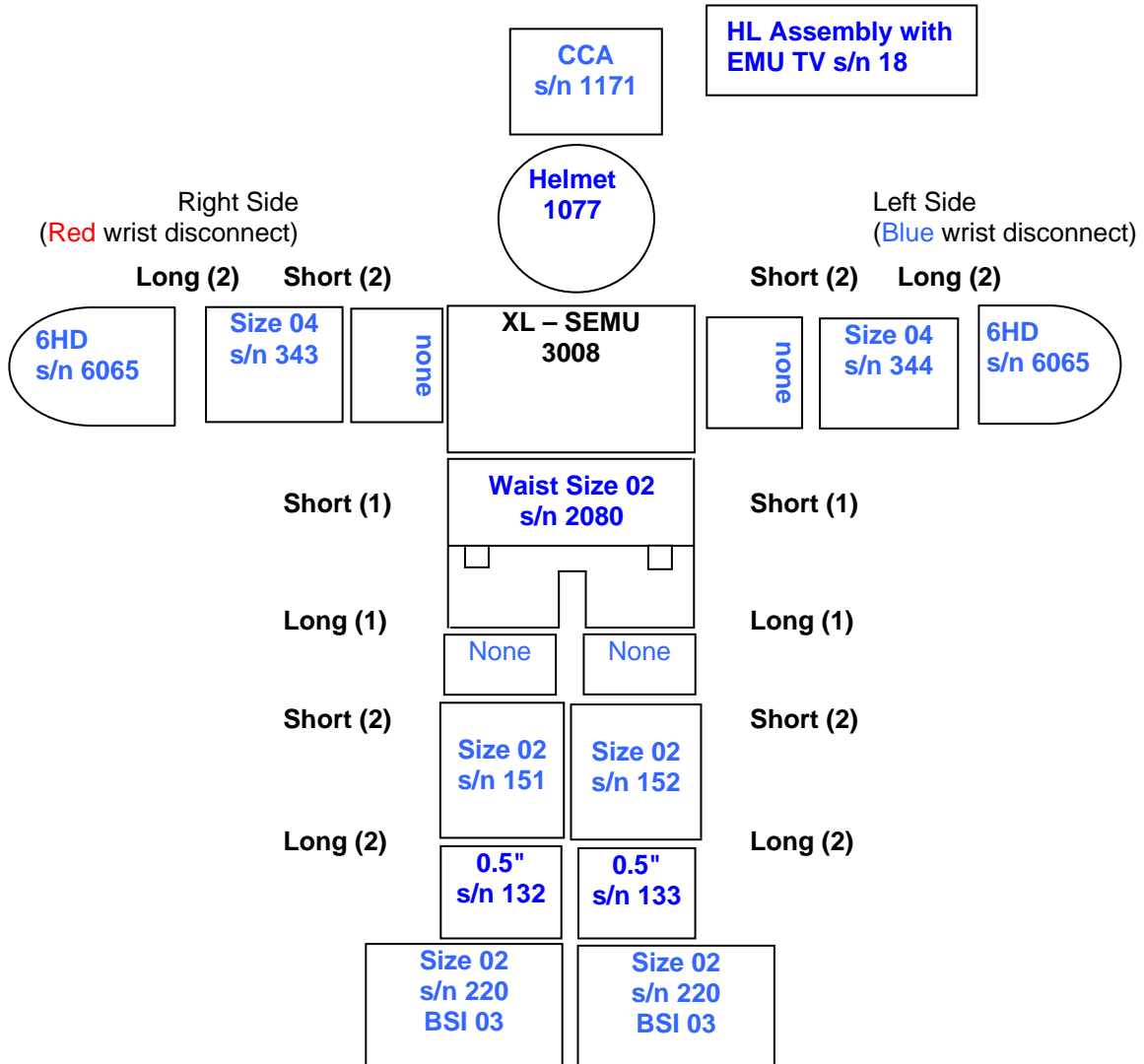
FINAL EMU 3003 CONFIG FOR BEHNKEN

**NOTE**

All labels show serial numbers on top

**BLACK** font indicates hardware already on EMU 3008

**BLUE** font indicates hardware removed from EMU 3003



FINAL EMU 3008 CONFIG FOR FOREMAN

## EVA PREP FOR TRANSFER TO SHUTTLE (90 min)

I

### EMU PRE-PACK

- EMU 3006/ 1. Install expended LiOH canisters and EMU batteries for return (use Return ↓  
3008 Config) per STS-123 CONSUMABLES TRACKING CUE CARD
2. Remove ISS EVA Cuff C/L from EMU 3008
  3. Tear out flight specific pages from EV2, EV3, and EV4 Cuff C/Ls; stow on ISS
  4. Inspect and compare all on-orbit EMU wrist mirrors (8)  
Stow best quality wrist mirrors (4) in ISS A/L MO2 bag  
Install remaining wrist mirrors on EMUs 3006 and 3008 for return  
Report serial numbers and stowage locations to MCC
- DCMs 5. √PWR – SCU  
√PURGE vlv – op (up)  
√O2 ACT – OFF  
√WATER – OFF, switch guard installed
- EMU 3008 6. Remove EMU TV and Helmet lights, stow on ISS
- E-Lk 7. Unstow EMU Servicing Kit s/n 5005 from EVA Systems Transfer Bag  
Locate EMU Servicing Kit s/n 5004 on ISS
8. Stow EMU Servicing Kit s/n 5005 in MO-2 bag  
Stow EMU Servicing Kit s/n 5004 in EVA Systems Transfer Bag for return
  9. Configure/install all items for transfer per table:

**EVA PREP FOR TRANSFER TO SHUTTLE (90 min) (Cont)**

<p style="text-align: center;"><b><u>EMU 3006 (Ln)</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> DIDB Restraint Bag</li> <li><input type="checkbox"/> CCA (LN1)</li> <li><input type="checkbox"/> Helmet s/n 1073 (√sun visors down, cover installed)</li> <li><input type="checkbox"/> EMU Gloves (LN1)</li> <li><input type="checkbox"/> Wrist Mirror (2)</li> <li><input type="checkbox"/> √ISS EVA Cuff Checklist installed</li> <li><input type="checkbox"/> EMU Battery (s/n 2041)</li> <li><input type="checkbox"/> CCC (LiOH) (used)</li> <li><input type="checkbox"/> LTA</li> </ul>	<p style="text-align: center;"><b><u>EMU 3008 (Fm)</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> DIDB Restraint Bag</li> <li><input type="checkbox"/> CCA (FM1)</li> <li><input type="checkbox"/> Helmet s/n 1077 (√sun visors down, cover installed)</li> <li><input type="checkbox"/> EMU Gloves (FM1)</li> <li><input type="checkbox"/> Wrist Mirror (2)</li> <li><input type="checkbox"/> √ISS EVA Cuff Checklist <u>NOT</u> installed</li> <li><input type="checkbox"/> EMU Battery (s/n 2064)</li> <li><input type="checkbox"/> CCC (LiOH) (used)</li> <li><input type="checkbox"/> LTA</li> </ul>
<p style="text-align: center;"><b><u>EMU Crew Options Kit (Ln)</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> EVA 1, 2, &amp; 3 Ziplock Bags <ul style="list-style-type: none"> <li><input type="checkbox"/> 2 MAGs (less used items)</li> <li><input type="checkbox"/> TCUs (top, bottom)</li> <li><input type="checkbox"/> Socks</li> <li><input type="checkbox"/> Wristlets</li> <li><input type="checkbox"/> Comfort Gloves</li> </ul> </li> <li><input type="checkbox"/> EVA Contingency Ziplock Bag <ul style="list-style-type: none"> <li><input type="checkbox"/> 3 MAGs (w/Ziplock Bags)</li> <li><input type="checkbox"/> Fresnel Lens</li> </ul> </li> <li><input type="checkbox"/> LCVG (w/biomed sternal harness &amp; signal conditioner)</li> </ul>	<p style="text-align: center;"><b><u>EMU Crew Options Kit (Fm)</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> EVA 2, 4, &amp; 5 Ziplock Bags <ul style="list-style-type: none"> <li><input type="checkbox"/> 2 MAGs (less used items)</li> <li><input type="checkbox"/> TCUs (top, bottom)</li> <li><input type="checkbox"/> Socks</li> <li><input type="checkbox"/> Wristlets</li> <li><input type="checkbox"/> Comfort Gloves</li> <li><input type="checkbox"/> Croakie</li> </ul> </li> <li><input type="checkbox"/> EVA Contingency Ziplock Bag <ul style="list-style-type: none"> <li><input type="checkbox"/> 3 MAGs (w/Ziplock Bags)</li> </ul> </li> <li><input type="checkbox"/> LCVG (w/biomed sternal harness &amp; signal conditioner)</li> </ul>
<p style="text-align: center;"><b><u>EMU Crew Options Kit (Be)</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> EVA 3, 4, &amp; 5 Ziplock Bags <ul style="list-style-type: none"> <li><input type="checkbox"/> 2 MAGs (less used items)</li> <li><input type="checkbox"/> TCUs (top, bottom)</li> <li><input type="checkbox"/> Socks</li> <li><input type="checkbox"/> Wristlets</li> <li><input type="checkbox"/> Comfort Gloves</li> </ul> </li> <li><input type="checkbox"/> Patches and stripes from EMU 3003</li> <li><input type="checkbox"/> LCVG (BE1)(w/biomed sternal harness &amp; signal conditioner)</li> <li><input type="checkbox"/> CCA (BE1)</li> <li><input type="checkbox"/> EMU Gloves (BE1)</li> </ul>	<p style="text-align: center;"><b><u>EVA Systems Transfer Bag</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> STS-123 Consumables Tracking Cue Card</li> <li><input type="checkbox"/> STS-123 Battery Recharge Plan</li> <li><input type="checkbox"/> Expedited Suit Doffing Cue Card</li> <li><input type="checkbox"/> Emergency Undock EVA Transfer Cue Card</li> <li><input type="checkbox"/> STS-123 EVA Checklist</li> <li><input type="checkbox"/> STS-123 ISS EVA Systems Checklist (2) (colored stripe)</li> <li><input type="checkbox"/> EMU Servicing Kit (s/n 5004)</li> <li><input type="checkbox"/> EHIP Batteries (4) (s/n 1012, 1013, 1014, 1021)</li> <li><input type="checkbox"/> LiOH (2) (used)</li> </ul>
<p style="text-align: center;"><b><u>EVA 1 Task Transfer Bag</u></b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> 85-ft Safety Tether (2) (s/n 1006, 1008)</li> <li><input type="checkbox"/> Adj Equipment Tethers (6) (s/n 1010, 1013, 1014, 1015, 1036, 1037)</li> <li><input type="checkbox"/> RETs (eq-eq) (7) (blue)</li> <li><input type="checkbox"/> RETs (eq-eq w/PIP) (3) (blue)</li> <li><input type="checkbox"/> RETs (Lg-eq) (7) (blue)</li> <li><input type="checkbox"/> Broom Clip Caddy (1) (s/n 1011)</li> <li><input type="checkbox"/> EVA Temperature Sensor (1) (s/n 1005)</li> <li><input type="checkbox"/> EVA 2/3 Task Transfer Bag</li> <li><input type="checkbox"/> EVA 4 Task Transfer Bag</li> <li><input type="checkbox"/> EVA Wipes (5): used/unused</li> <li><input type="checkbox"/> Spare EDFs (5)</li> </ul>	



## EVA TRANSFER TO SHUTTLE (30 min)

I

### NOTE

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

1. Transfer following EVA equipment to shuttle:

<b>Item</b>	<b>Destination</b>	<b>Transfer Status</b>
EMU 3006 (Ln)	Temp stow in Middeck	
EMU 3008 (Fm)	Temp stow in Middeck	
ECOK (Ln)	Temp stow in Middeck	
ECOK (Fm)	Temp stow in Middeck	
ECOK (Be)	Temp stow in Middeck	
EVA Systems Transfer Bag	Temp stow in Middeck	
EVA 1 Task Transfer Bag	Temp stow in Middeck	

2. Report transfer status to MCC

# EVA UNPACK AND STOW (60 min)

I

## NOTE

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

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

Current Location	Item	Final Stowage Location	Status
Middeck	EMU 3006 (Ln)	External A/L (Stbd AAP)	
"	EMU 3008 (FM)	External A/L (Port AAP)	
"	ECOK (Ln)	EMU 3006 (Ln)	
"	ECOK (Fm)	EMU 3008 (Fm)	
"	ECOK (Be)	External A/L Floor Bag	
EVA Systems Transfer Bag	STS-123 Consumable Tracking Cue Card	FDF Locker (MF57G)	
"	STS-123 Battery Recharge Plan	FDF Locker (MF57G)	
"	STS-123 EVA Checklist	FDF Locker (MF57G)	
"	Expedited Suit Doffing Cue Card	FDF Locker (MF57G)	
"	Emergency Undock EVA Transfer Cue Card	FDF Locker (MF57G)	
"	STS-123 SS EVA Systems Checklist (2)	SODF Locker (MF43K)	
"	EMU Servicing Kit (s/n 5004)	Vol H Inboard	
"	EHIP Batteries (4)	2 – Vol H Inboard Bag 2 – Vol H Outboard Bag	
"	LiOH (2)	Middeck Floor Stbd 1 Bag	
"	Empty EVA Systems Transfer Bag	Ext A/L Floor Bag	
EVA 1 Task Transfer Bag	85-ft Safety Tether (2) (1006, 1008)	Ext A/L Floor Bag	
"	Adj Equipment Tethers (6) (1010, 1013, 1014, 1015, 1036, 1037)	Ext A/L Floor Bag	
"	RETs (eq-eq) (7) (blue)	Ext A/L Floor Bag	
"	RETs (eq-eq w/PIP) (3) (blue)	Ext A/L Floor Bag	
"	RETs (Lg-eq) (7) (blue)	Ext A/L Floor Bag	
"	Broom Clip Caddy	Ext A/L Floor Bag	
"	EVA Temperature Sensor	Ext A/L Floor Bag	
"	EVA Wipes (5)	Ext A/L Floor Bag	
"	Spare EDFs (5)	Ext A/L Floor Bag	
"	EVA 2/3 Task Transfer Bag	Ext A/L Floor Bag	
"	EVA 4 Task Transfer Bag	Ext A/L Floor Bag	
"	Empty EVA 1 Task Transfer Bag	Ext A/L Floor Bag	

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TOP

**HOOK  
VELCRO**

**SPDM DEPLOY TRACKING TABLES**

OTCM 2 EDF	Initial torque (9.2 ft-lb)	Initial turns	Final torque (19.4 ft-lb)	Final turns
1				
3				
4				
2				
M/DM E				
M/DM D				
OTCM 1				
3				
1				
2				
4				
M/DM E				
M/DM D				

Body Bolt	Break torque (30.5 ft-lb)	Release (9.2 ft-lb)
FSE 5		
FSE 4		
FSE 3		
FSE 2		
FSE 1		
Release after Arm 1 temp stow		

Arm 1 Install Data				
ARM 1 EDF	Initial torque (9.2 ft-lb)	Initial turns	Final torque (19.4 ft-lb)	Final turns
5				
6				
7				
8				
M/DM A				
M/DM B				
M/DM C				

Arm 2 Install Data				
ARM 2 EDF	Initial torque (9.2 ft-lb)	Initial turns	Final torque (19.4 ft-lb)	Final turns
5				
6				
7				
8				
M/DM A				
M/DM B				
M/DM C				

OTP EDF/Bolt	Initial torque (9.2 ft-lb)	Initial turns	Final torque (25.5 ft-lb)	Final turns
Hinge Pin			(19.4)	
2				
4				
3				
1				

Blanket Management	Arm 1	Arm 2
Remove SJEU OSE #.7 (Wrist)		
Remove SJEU OSE #.6 (Wrist)		
Remove SJEU OSE #.5 (Elbow)		
Remove SJEU OSE #.4 (Elbow)		
Remove SJEU OSE #.3 (Elbow)		
Remove SJEU OSE #.2 (Shoulder)		
Remove SJEU OSE #.1 (Shoulder)		
Remove OTCM OSE (sock)		
Install shoulder clamp interface MLI flaps		
Install wrist clamp interface MLI flaps		
Install Arm FSE EDF flaps (single) (2)		
Install Arm FSE EDF flaps (double) (4)		
Remove EP blanket #1		
Remove EP blanket #2		
Remove CLA blanket		

**SLP**

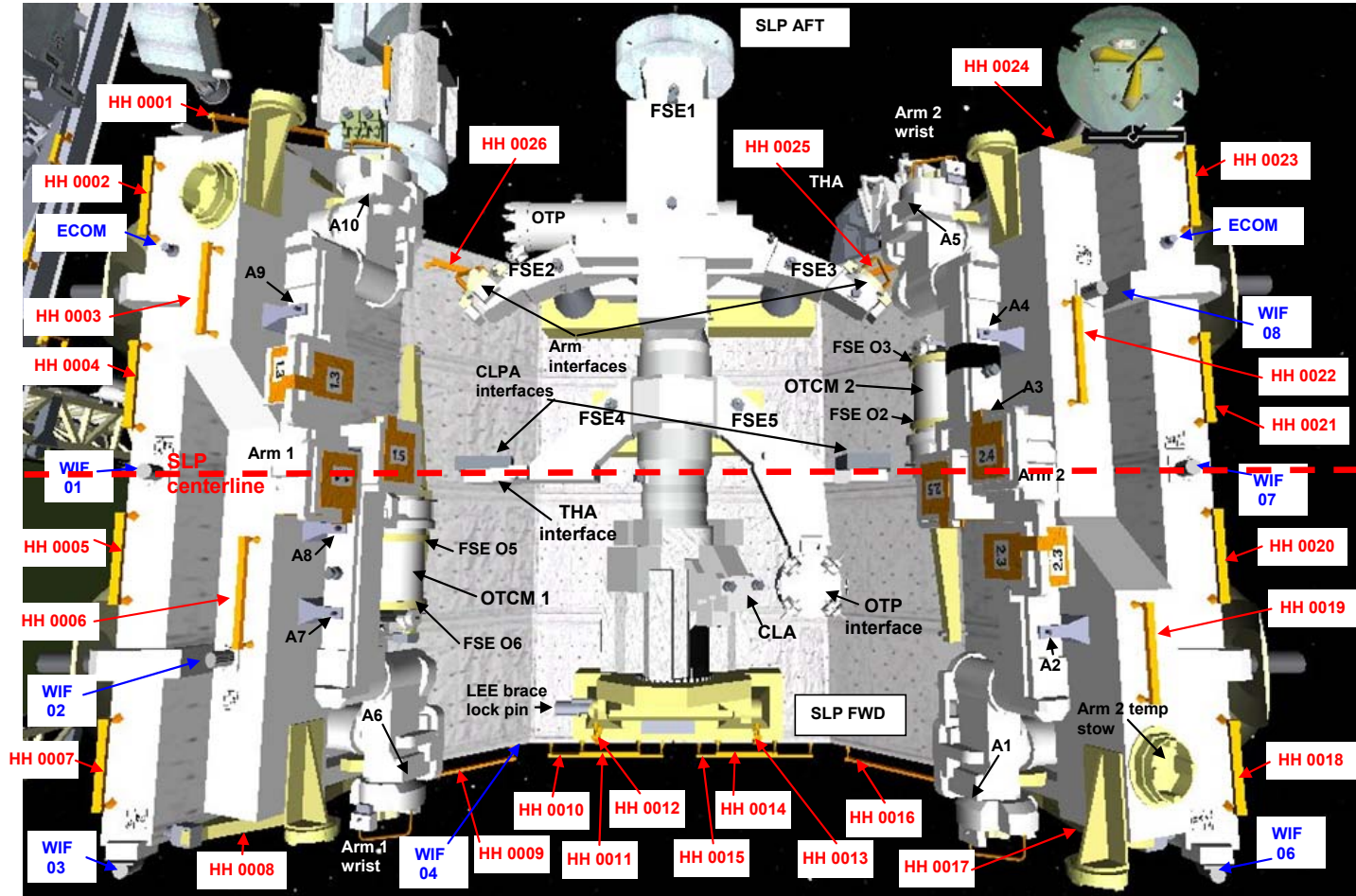
OTCM FSE Item Secured	OTCM 1 (torque/turns)	OTCM 2 (torque/turns)
KA Umbilical (12 ft-lb/7.25)	O4 / /	O1 / /
Clamp 1 (12 ft-lb/8.75,9.25)	O5 / /	O2 / /
Clamp 2 (12 ft-lb/8.75)	O6 / /	O3 / /
Thermal cover replaced		
Arm FSE Secured	Arm 1 (torque/turns)	Arm 2 (torque/turns)
Shldr Clamp (12 ft-lb/9.75)	A10 / /	A1 / /
Wrist Clamp (12 ft-lb/9.75)	A6 / /	A5 / /
Arm EDFs (9.2 ft-lb/5)	A9 / /	A2 / /
Arm EDFs (9.2 ft-lb/5) (double)	A7 / / A8 / /	A3 / / A4 / /
<b>THA</b>	<b>(12.0 ft-lb/23.5 turns)</b>	
THA Bracket Stowed	FSE T1 / /	
<b>THA Bolt</b>	<b>(18.4 ft-lb/25.5 turns)</b>	
FSE T2 (install bolt)	/ /	
THA Task		
Stow RMCT PIP pins (2)		
Remove SET launch restraints (2)	Inner (SET micro)	Housing (horse shoe)

EVA-7a/123/O/A

(reduced copy)

TOP  
BACK OF 'SPDM DEPLOY TRACKING TABLES'

HOOK  
VELCRO



SPDM launch configuration

EVA-7b/123/O/A

(reduced copy)

# STS-123 (1JA) EVA 1 TIMELINE

TIME (HR : MIN)	IV/SRMS/SSRMS	1JA EVA 1	
		EV1 – Ln (FF/SSRMS)	EV2 – Rm (FF)
00:00 ---	<ul style="list-style-type: none"> <li>SRMS in pre-grapple for JLP</li> </ul>	<b>POST DEPRESS</b> (00:05) <b>A/L EGRESS AND SETUP</b> (00:40) <ul style="list-style-type: none"> <li>Anchor safety tethers to S0 and Lab strut HHs</li> <li>Remove Node 2 Zenith CBCS Flap</li> <li>Tether swap to Node 2 endcone</li> </ul>	<b>POST DEPRESS</b> (00:05) <b>A/L EGRESS AND SETUP</b> (00:40) <ul style="list-style-type: none"> <li>Tether swap to Node 2 endcone</li> </ul>
		<b>JLP UNBERTH PREP</b> (01:15) <ul style="list-style-type: none"> <li>Contamination Cover Removal</li> </ul>	<b>JLP UNBERTH PREP</b> (01:15) <ul style="list-style-type: none"> <li>Contamination Cover Removal</li> </ul>
01:00 ---	<ul style="list-style-type: none"> <li>SRMS: JLP grapple</li> </ul>	<ul style="list-style-type: none"> <li>JLP Prep Cleanup</li> </ul>	<ul style="list-style-type: none"> <li>LTA Connector Detachment</li> <li>Stow LTA cable</li> <li>JLP Prep Cleanup</li> </ul>
02:00 ---	<ul style="list-style-type: none"> <li>SSRMS mnvr to APFR INSTALL posn</li> <li>SSRMS mnvr to APFR INGRESS posn</li> </ul>	<b>OTCM 2 INSTALL</b> (02:00) <ul style="list-style-type: none"> <li>SPDM Setup</li> <li>Ingress APFR</li> </ul>	<b>OTCM 2 INSTALL</b> (02:00) <ul style="list-style-type: none"> <li>SPDM Setup</li> </ul>
03:00 ---	<ul style="list-style-type: none"> <li>SSRMS mnvr to OTCM 2 REMOVAL posn</li> <li>SSRMS mnvr to OTCM 2 INSTALL posn</li> </ul>	<ul style="list-style-type: none"> <li>Release OTCM 2</li> </ul>	<ul style="list-style-type: none"> <li>Release Arm 2 wrist KA</li> <li>Release OTCM 2</li> </ul>
		<ul style="list-style-type: none"> <li>Fasten OTCM 2 to Arm 2</li> <li>OTCM 2 Cleanup</li> </ul>	<ul style="list-style-type: none"> <li>Fasten OTCM 2 to Arm 2</li> <li>OTCM 2 Cleanup</li> </ul>
04:00 ---	<ul style="list-style-type: none"> <li>SSRMS mnvr to OTCM 1 REMOVAL AND HANDOFF posn</li> </ul>	<b>OTCM 1 INSTALL</b> (01:20) <ul style="list-style-type: none"> <li>Release OTCM 1</li> </ul>	<b>OTCM 1 INSTALL</b> (01:20) <ul style="list-style-type: none"> <li>Remove/Stow Arm 1 Wrist KA</li> <li>Release OTCM 1</li> </ul>
05:00 ---	<ul style="list-style-type: none"> <li>SSRMS mnvr for APFR EGRESS/REMOVAL posn</li> <li>SSRMS mnvr to JLP CLEARANCE posn</li> </ul>	<ul style="list-style-type: none"> <li>Egress APFR</li> <li>Fasten OTCM 1 to Arm 1</li> <li>OTCM 1 Cleanup</li> </ul>	<ul style="list-style-type: none"> <li>Fasten OTCM 1 to Arm 1</li> <li>OTCM 1 Cleanup</li> </ul>
		<b>SPDM ASSEMBLY PREP TASKS</b> (00:25) <ul style="list-style-type: none"> <li>SJEU blanket removal</li> </ul>	<b>SPDM ASSEMBLY PREP TASKS</b> (00:25) <ul style="list-style-type: none"> <li>SJEU blanket removal</li> </ul>
06:00 ---		<b>EVA 1 CLEANUP AND INGRESS</b> (00:40) <ul style="list-style-type: none"> <li>Relocate APFR</li> <li>Retrieve C/Lk bag #1</li> <li>Retrieve Sq scoop/D-handle from Z1 toolbox</li> </ul>	<b>EVA 1 CLEANUP AND INGRESS</b> (00:40) <ul style="list-style-type: none"> <li>Stow ratchet wrench in C/Lk bag #2</li> <li>Relocate C/Lk bag #2</li> <li>Retrieve spare 85-ft safety tether</li> </ul>
		<b>PRE REPRESS</b> (00:05)	<b>PRE REPRESS</b> (00:05)

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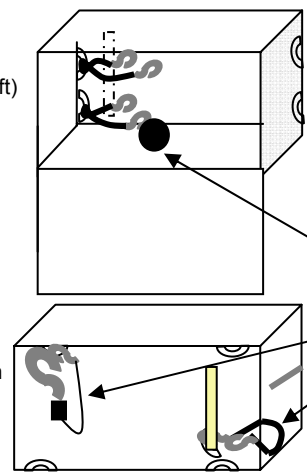
# PRE EVA 1 TOOL CONFIG

- EV1**
- MWS
  - BRT (L)
  - RET (eq-eq)
  - T-Bar
  - RET (eq-eq)
  - RET (eq-eq) w/PIP pin
  - Adj Eq Tether
  - Wire Tie (2)
  - STS Small Trash Bag
  - Adj Eq Tether (clove-hitched on strap, hooks in bag)
  - Swing Arm (R)
  - RET (eq-eq)
  - Waist Tether (R D-ring to ERCM)
  - D-ring Extender (2)
  - Waist Tether (L)
  - Safety Tether (85 ft) (R)
  - Spare Safety Tether (85 ft)
  - SAFER
  - WVS
  - Overgloves (2) donned

- EV2**
- MWS
  - BRT (L)
  - RET (eq-eq)
  - Wire Tie (2)
  - T-Bar
  - RET (eq-eq) w/PIP pin
  - RET (eq-eq)
  - Wire Tie (4)
  - Adj Equip Tether
  - STS Small Trash Bag
  - Adj Eq Tether (clove-hitched on strap, hooks in bag)
  - Swing Arm (R)
  - 760 digital camera and mount (tie wrapped together)
  - D-ring Extender (R)
  - Waist Tether (2) (R - A/L ERCM, L - A/L D-ring)
  - Safety Tether (85 ft) (R)
  - Spare Safety Tether (85 ft)
  - SAFER
  - WVS
  - Overgloves (2) donned

**Tether Count**

RET (eq-eq) – 10	RET (eq-eq) w/PIP Pin – 2
RET (lg-eq) – 5	Adj Eq Tether – 11



- AIRLOCK CONFIG**
- Staging Bag
  - Fuse Tether
  - PGT
  - PGT Battery
  - Wire Tie Caddy
  - RAD
  - Connector Cleaner Tool Kit
  - Probe
  - Connector Pin Straightener
  - Velcro/Tape Caddy
  - IV Bag
  - Towels (2)
  - Contamination Detection Kit
  - GP Caddy (2) w/Adj Thermal Mittens (2)
  - Socket Caddy (hatch cont) w/RET (eq-eq)
  - 1/2 Socket-8 ext
  - 7/16 (wobble) Socket-6 ext (spare)
  - DCM Plug (SAFER Hardmount) (2)
  - D-ring extender on internal D-ring

- RET (Lg-eq) on internal D-ring (for C/Lk bag 1 & 2 staging) (eq hook on D-ring, Lg hook on UIA)

- Large ORU Transfer Bag**
- Adj Eq Tether (eq-eq) (2) (clove hitched to int loops)
  - ORU tether (on clove hitch adj eq tether hook)
  - RET (Lg-eq) (ext loop)
  - Adj Eq Tether (eq-eq) (bag HH)
  - RET (Lg-eq) (outside of bag)
  - PGT [B2 16 ft-lb, CAL, MTL 30.5] s/n \_\_\_\_\_
  - PGT Battery s/n \_\_\_\_\_
  - 7/16 (wobble) socket-6 ext
  - RET (Lg-eq)

- EVA C/Lk Bag #1** (attached to C/Lk bag #2, back to back)
- Ratchet wrench (no palm wheel)
  - 7/16 Socket-2 ext
  - OTCM OSE blanket (2)
  - RET (eq-eq)
  - Adj Eq Tether (eq-eq) (clove hitch to int D-ring)
  - Adj Eq Tether (eq-eq) (outside, opp side of int strap)
  - RET (Lg-eq) (outside of bag)
  - RET (eq-eq) (outside of bag)
  - Strap C/Lk bag #1 and #2 together via integral tethers
  - Snap C/Lk bag #1 and #2 together at corners

- EXTERNAL CONFIG**
- CETA CART 1 (STBD OF MT)**
- APFR (9,SS,F,12) – WIF 4 (12,FF)
- CETA CART 2 (STBD OF MT)**
- APFR (12,PP,F,12) – WIF 5 (12,FF)

- Z1 PORT Toolbox**
- Rd Scoop/D-Handle
  - Sq scoop
- PLB – ECSH**
- LTA connector caps (2)

- AIRLOCK CONFIG (Cont)**
- EVA C/Lk Bag #2** (attached to C/Lk bag #1, back to back)
- WIF Adapter w/PIP pin (w/hitch pin functioning properly)
  - Ratchet wrench (no palm wheel)
  - 7/16 Socket-2 ext
  - RET (eq-eq)
  - Sq scoop
  - OHT
  - 55-ft safety tether (inside bag)
  - Adj Eq Tether (eq-eq) (outside, opp side of int strap)

- EVA C/Lk Bag #3 (Contingency only) – on EV2 BRT**
- ISS bungee caddy
  - Spare EDF #1 (1) (on int hook)
  - Adj Eq Tether (clove hitched to caddy)
  - Spare EDF #2 (1), Spare EDF #3 (1)
  - Hammer
  - Compound Cutters
  - OHT (spare)
  - RET (eq-eq)
  - Prybar
  - RET (eq-eq)
  - Ballstack
  - Adj Eq Tether (eq-eq) (outside, opp side of int strap)

**Prior to EVA, perform the following hardware inspections:**

1. RET cords for fraying
2. No red line visible on safety and waist tether load Alleviation straps
3. Inspect STS trash bags for deformation/damage
4. Inspect EMU gloves for damage
5. Check MWS Baseplate for loose screws on toggle Levers

**Use Blue RETs only**

## EVA 1 INHIBIT PAD

### Orbiter

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 ft from FRCS:
IV	1. √DAP: VERN, FREE, LO Z
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	
	<u>NOTE</u>
	Possible loss of comm when forced LL FWD antenna
IV	If EV crew < 1.6 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 1.6 ft away from all S-Band upper antennas:
C3	4. S-BAND PM ANT – GPC

JLP inhibit steps, to be performed IV during PCBM cover removal	
A15	APCU 1,2 CONV (two) – OFF
	APCU 1,2 OUTPUT (two) – OFF
CRT	√PTU 1,2 APCU OUT VOLTS < 10 V
(spec 179)	√OUTPUT – OFF

### USOS

PCU	
	<u>NOTE</u>
	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° from the velocity vector
	If one or both PCUs failed:
	2. No more than two arrays unshunted and oriented < 105° from velocity vector

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

SSPTS	
IV	If EV crew < 2 ft from ungrounded SSPTS connector (not planned):
	1. RPCM LA2A3B_D RPC 1 – Open, Close Cmd Inhibit
	2. RPCM Z13B_A RPC 2 – Open, Close Cmd Inhibit
	3. RPCM LA1A4A_D RPC 3 – Open, Close Cmd Inhibit
	4. RPCM Z14B_A RPC 2 – Open, Close Cmd Inhibit

SPDM/SLP inhibit steps, to be performed during SPDM setup	
MCC-H	1. MBS CRPCM 2P RPC 2 – OPEN
	2. MBS CRPCM 2R RPC 2 – OPEN

### RSOS

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

### Ground

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

## NOTES, CAUTIONS, AND WARNINGS

### NOTES

1. Bolt install: report torque and turns
2. Perform light pull test after final torque on EDFs
3. Bolt/EDF release: report torque and turns if different from published range
4. EVA connectors: after disconnection and prior to connection; verify pin and EMI band integrity; verify connector free of FOD
5. Inspect QDs for damage prior to mating
6. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
7. 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. 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 (currently none)
  8. Passive UMAs
  9. MBS VDU, MCU, CRPCMs, and Cameras (taped radiative surfaces, silver Teflon)
  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. SSRMS/SPDM Cameras
  22. SPDM SJEU, EP, OTCM Radiator surfaces
  23. Open CBM petal covers and LAB window shutter
  24. FPMU [S1]
  25. OTSD
  26. Columbus HAM radio antennas
  27. Grounding fingers on SPDM and SLP (fragile)

### CAUTION (Cont)

#### 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

## NOTES, CAUTIONS, AND WARNINGS (Cont)

### CAUTION (Cont)

#### 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 (Cont)

#### Shuttle Constraints

##### G. Avoid inadvertent contact with

1. OBSS and SRMS Composite Sections 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 wire harnesses, cables, 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]

## 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
- 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 linkages during operation
- 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 sockets
  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. Z1 handrail 6061 by the Ku-Band boom launch restraint [Z1]
  10. Solar Array Blanket Box [P6,S6]
  11. Keep hands away from SSRMS, SPDM, POA LEE opening, and snares
  12. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing
  13. Lifting lug near P6 handrail 5333 and gap spanner

### WARNING (Cont)

#### ISS Constraints (Cont)

- F. Sharp Edges (Cont)
14. SPDM OTCM Gripper Jaws
  15. SOLAR and EuTEF
  16. Port/Aft portion of A/L circular HH
- 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/SPDM/MBS 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  $< -120$  or  $> 200$  degF

## NOTES, CAUTIONS, AND WARNINGS (Cont)

### WARNING (Cont)

#### ISS Constraints (Cont)

##### H. SLP

1. Keep translation rates below 0.6 ft/sec
2. Do not perform kick offs, quick grabs, shaking motions
3. APFR ops are limited to WIF 1 and 4 and must not have high accelerations, aggressive or quick movements, full or fast laybacks or heavy ingress/egress
4. Do not perform simultaneous FF tasks (except OTCM 1 install and SJEU blanket removal) on the fwd half (LEE pivot end) of SLP. During unplanned activities with two EV crew on the forward SLP half more than two cyclic load inputs must be followed by a 10-sec pause. Additionally, every effort shall be made to limit crew motion to one at a time. During OTP EDF removal, the second CM must stay aft of the SLP midline between WIFs 001 and 007)

##### I. Electrical Shock

1. Stay  $\geq$  2 ft from ungrounded floating connectors if not unpowered:
  - SSPTS connectors [NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA2 Stbd & Port]
  - MBS Cross-Connect jumpers (translate past these using UMA handrails)
  - S0 EVA Power Cables [inside S0 Bay 00 Face 4, Bay 01 Face 3]
  - ESP2 jumper [inside S0 Bay 03 Face 4]

### WARNING (Cont)

#### Shuttle Constraints

##### J. 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]

##### K. Pinch

1. PRLA operation [PLB]

##### L. 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]

### WARNING (Cont)

#### Shuttle Constraints (Cont)

##### M. 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]

##### N. 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

##### O. Contamination

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

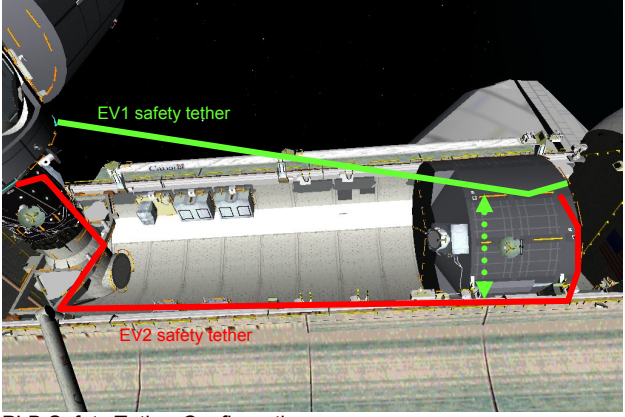
##### P. Lasers

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

# A/L EGRESS/SETUP (00:40)

IV/SRMS	EV1 – Ln (FF)	EV2 – Rm (FF)
	<p><b>Initial Condition:</b> Waist Tether (L) to EV2 85-ft Safety Tether, verify hooks locked. Overgloves donned</p> <p><b>EGRESS</b> (00:15)</p> <ol style="list-style-type: none"> <li>1. Open A/L thermal cover</li> <li>2. Egress airlock</li> <li>3. <u>Receive ORU bag; tether and stow on BRT</u></li> <li>4. Stow C/Lk bag #3 on EV2 BRT, √tether</li> <li>5. √SAFER man isol vlv – open (down)</li> <li>6. √SAFER HCM – closed (down)</li> </ol> <p><b>SETUP</b> (00:10)</p> <ol style="list-style-type: none"> <li>7. Translate up CETA spur along face 1 to stbd Lab strut; attach EV1 85-ft safety tether anchor to strut HH 17 <ul style="list-style-type: none"> <li>☐ Verify hook locked, reel unlocked</li> </ul> </li> <li>8. Attach EV2 safety tether anchor to CETA 1 HH (fairlead on Lab strut HH 17) <ul style="list-style-type: none"> <li>☐ Verify hook locked</li> </ul> </li> <li>9. Give EV2 GO to egress A/L</li> </ol> <p><b>REMOVE NODE 2 ZENITH CBCS FLAP</b> (00:05)</p> <ol style="list-style-type: none"> <li>10. Translate to center of Node 2 zenith ACBM (use Lab HH 272 and Node 2 HH 372 to span gap between modules)</li> <li>11. Release flap fastener snap</li> <li>12. Pull back flap to expose mating Velcro</li> <li>13. Open flap and secure with Velcro (snap optional)</li> </ol> <p><b>SAFETY TETHER SWAP</b> (00:10)</p> <ol style="list-style-type: none"> <li>14. Translate nadir around NODE 2 endcone</li> <li>15. Safety tether swap to Node 2 HH 0310 <ul style="list-style-type: none"> <li>☐ Verify hook locked, reel unlocked</li> </ul> </li> <li>16. Inspect gloves; remove and stow overgloves</li> </ol>	<p><b>Initial Condition:</b> Waist Tether (L) to A/L D-ring extender, verify hooks locked. BRT RET to C/Lk bag #3. Overgloves donned</p> <p><b>EGRESS</b> (00:25)</p> <ol style="list-style-type: none"> <li>1. Transfer ORU bag to EV1 (leave eq-lg RET in A/L)</li> <li>2. Transfer C/Lk bag #3 to EV 1 (on EV2 BRT RET)</li> <li>3. <u>Relocate C/Lk bag #1/#2 to D-ring extender RET</u></li> <li>4. Verify Safety Tether reel is unlocked</li> <li>5. Perform translation adaptation</li> </ol> <ol style="list-style-type: none"> <li>6. On EV1 GO, release waist tether (L) from A/L D-ring</li> <li>7. Egress A/L</li> <li>8. √SAFER man isol vlv – open (down)</li> <li>9. √SAFER HCM – closed (down)</li> <li>10. Close thermal cover</li> </ol>
<p>Safety tether anchor points and C/Lk bag #3 stowage HHs</p> <ol style="list-style-type: none"> <li>1. WVS Software: Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max (required after EV1 and EV2 egress Airlock)</li> <li>2. SRMS in pre-grapple (prior to EVA)</li> </ol>	<p><b>SETUP</b> (00:05)</p> <ol style="list-style-type: none"> <li>11. <u>Translate to Lab struts; stow C/Lk bag #3 on S0 HH 3492 &amp; outboard port Lab strut HH 7</u></li> </ol> <p><b>SAFETY TETHER SWAP</b> (00:10)</p> <ol style="list-style-type: none"> <li>12. Translate to Node 2 (poor man fairlead at top of outboard port strut HH, Lab HH 0259 &amp; HH 0288, Node 2 HH 0364)</li> <li>13. Safety tether swap to Node 2 HH 0307 <ul style="list-style-type: none"> <li>☐ Verify hook locked, reel unlocked</li> </ul> </li> <li>14. Inspect gloves; remove and stow overgloves</li> </ol>	<p><b>SETUP</b> (00:05)</p> <ol style="list-style-type: none"> <li>11. <u>Translate to Lab struts; stow C/Lk bag #3 on S0 HH 3492 &amp; outboard port Lab strut HH 7</u></li> </ol> <p><b>SAFETY TETHER SWAP</b> (00:10)</p> <ol style="list-style-type: none"> <li>12. Translate to Node 2 (poor man fairlead at top of outboard port strut HH, Lab HH 0259 &amp; HH 0288, Node 2 HH 0364)</li> <li>13. Safety tether swap to Node 2 HH 0307 <ul style="list-style-type: none"> <li>☐ Verify hook locked, reel unlocked</li> </ul> </li> <li>14. Inspect gloves; remove and stow overgloves</li> </ol>

# JLP UNBERTH PREP (01:15)

IV/SRMS	EV1 – Ln (FF)	EV2 – Rm (FF)
 <p>EV1 safety tether</p> <p>EV2 safety tether</p> <p>PLB Safety Tether Configuration</p> <ol style="list-style-type: none"> <li><input type="checkbox"/> Use SRMS elbow camera/PLB camera D to monitor EV2 clearance with EV1 safety tether as EV2 translates down PMA</li> <li><input type="checkbox"/> Use PLB Camera B &amp; C to view sealing surface</li> <li>Perform JLP inhibit steps:             <ul style="list-style-type: none"> <li>IV A15      APCU 1, 2 CONV (two) – OFF</li> <li>            APCU 1,2 OUTPUT (two) – OFF</li> <li>CRT        √PTU 1,2 APCU OUT VOLTS &lt; 10 V</li> <li>(spec 179) √OUTPUT – OFF</li> </ul> </li> </ol> <p>Give EV2 GO for LTA cable release</p>	<div style="border: 1px solid black; padding: 5px; text-align: center; margin-bottom: 10px;"> <p><b>WARNING</b></p> <p>Avoid contact with SSPTS cable connectors (2-ft Keep-out Zone)</p> </div> <p><b>PCBM CONTAMINATION COVER REMOVAL</b> (00:50)</p> <ol style="list-style-type: none"> <li>Translate to top of JLP via fwd JLP HH path (clothesline tether from lab to top of JLP)</li> <li><u>Attach Lg ORU bag to stbd standoff of HH 1248 (bag HH PLB aft) using attached adj equipment tether</u></li> <li>Fairlead EV1 safety tether w/RET hook under bag, as reqd</li> <li>Tether aft corner of ORU bag lid to HH 1249 (use aft inner lid strap only, leave fwd lid straps in place)</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center; margin-bottom: 10px;"> <p><b>CAUTION</b></p> <p>Avoid contact with PCBM sealing surface once the contamination covers are removed</p> </div> <ol style="list-style-type: none"> <li>Remove contamination covers (8) in pairs:             <ol style="list-style-type: none"> <li>a. Receive ORU tether hook</li> <li>b. Attach ORU tether to 2 adjacent contamination covers</li> <li>c. Remove both covers; transfer to EV2</li> <li>d. <input type="checkbox"/> Visually inspect PCBM ring as covers are removed                 <ul style="list-style-type: none"> <li><input type="checkbox"/> stbd/nadir</li> <li><input type="checkbox"/> stbd/zenith</li> <li><input type="checkbox"/> port/nadir (translate down port side to worksite)</li> <li><input type="checkbox"/> port/zenith</li> </ul> </li> </ol> </li> <li>Close and cinch Lg ORU bag (route side flap straps under bag corners)</li> <li><u>Tether and stow Lg ORU bag on BRT</u></li> </ol> <p><b>LTA CONNECTOR DETACHMENT</b> (00:05)</p> <ol style="list-style-type: none"> <li>Translate to PLB sill via fwd JLP HH path (EV1 leads)</li> <li>Assist EV2 with LTA cables as reqd</li> </ol>	<p><b>PCBM CONTAMINATION COVER REMOVAL</b> (00:40)</p> <ol style="list-style-type: none"> <li>Translate to JLP via aft JLP HH path (fairlead at ODS and JLP HH 1246)</li> <li>√Connector caps (2) installed on ECSH during translation</li> <li>Attach Lg ORU bag ext loop to fwd standoff of HH 1258 using attached RET (Lg-eq)</li> <li>Fairlead EV1 safety tether w/RET hook under bag, as reqd</li> <li>BRT to HH 1258 (shuttle aft end, w/BRT flat against JLP hull)</li> <li>Verify ORU tether in “free” mode</li> </ol> <ol style="list-style-type: none"> <li>Remove contamination covers (8) in pairs:             <ol style="list-style-type: none"> <li>a. Transfer ORU tether hook to EV1</li> <li>b. Receive PCBM contamination covers (2); stow on clove hitched Adj Eq Tether (single hook)</li> <li>c. Release ORU tether hook                 <ul style="list-style-type: none"> <li><input type="checkbox"/> stbd/nadir</li> <li><input type="checkbox"/> stbd/zenith</li> <li><input type="checkbox"/> port/nadir</li> <li><input type="checkbox"/> port/zenith (leave covers on ORU tether)</li> </ul> </li> </ol> </li> <li>Re-stow ORU tether in Lg ORU bag</li> <li>Close and cinch Lg ORU bag (route side flap straps under bag corners)</li> </ol> <p><b>LTA CONNECTOR DETACHMENT</b> (00:20)</p> <ol style="list-style-type: none"> <li>Translate to LTA connectors via aft JLP HH path</li> <li>Remove connector caps (2) from ECSH dummy panel</li> <li>On IV GO, disconnect JLP LTA connectors (2)             <ul style="list-style-type: none"> <li><input type="checkbox"/> P7151 (sharpie-151) from J7151</li> <li><input type="checkbox"/> P7152 (sharpie-152) from J7152</li> </ul> </li> <li>Install Connector caps (2) on JLP LTA receptacles             <ul style="list-style-type: none"> <li><input type="checkbox"/> J7151</li> <li><input type="checkbox"/> J7152</li> </ul> </li> </ol>




## JLP UNBERTH PREP (01:15) (Cont)

IV/SRMS	EV1 – Ln (FF)	EV2 – Rm (FF)
<p>4. Verify LTA cables released from TA clamps</p> <p>5. On EV GO, give SRMS GO for JLP grapple</p> <p>6. Notify MCC: EV clear of PLB (for KU protect box change)</p>	<p><b><u>JLP PREP CLEANUP</u></b> (00:20)</p> <p>10. Translate to Node 2 HH 310</p> <p>11. Tether swap to S0 safety tether</p> <p style="padding-left: 20px;"><input type="checkbox"/> Verify hook locked, reel unlocked</p> <p>12. Inspect gloves, don overgloves</p> <p>13. Stow 85-ft safety tether on MWS</p> <p>14. Translate to A/L, open thermal cover</p> <p>15. <u>Tether Lg ORU bag and 85-ft safety tether in A/L</u></p>	<p>14. Release LTA cable from TA clamps (2) on JLP; close TA clamps</p> <p>15. Once clear of SRMS trajectory, give GO for JLP grapple</p> <p>16. BRT to HH on ECSH</p> <p>17. Verify Velcro straps are released and wrap LTA cables around cleats</p> <p>18. Secure cable with Velcro straps</p> <p>19. Mate cables to dummy connectors (2)</p> <p style="padding-left: 20px;"><input type="checkbox"/> P7151 (sharpie-151)</p> <p style="padding-left: 20px;"><input type="checkbox"/> P7152 (sharpie-152)</p> <p><b><u>JLP PREP CLEANUP</u></b> (00:15)</p> <p>20. Translate to NODE 2 HH 0307; tether swap to S0 safety tether</p> <p style="padding-left: 20px;"><input type="checkbox"/> Verify hook locked, reel unlocked</p> <p>21. Stow 85-ft safety tether on MWS</p> <p>22. Inspect gloves, don overgloves</p> <p>23. Translate to CETA 2</p>

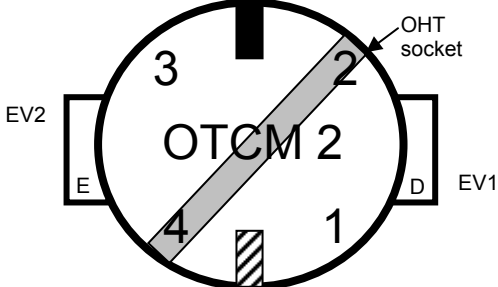
# OTCM 2 INSTALL (02:00)

IV/SSRMS	EV1 – Ln (SSRMS)	EV2 – Rm (FF)
<p>1. Verify with MCC-H SPDM/SLP inhibits in place (15 min prior to first mate/demate) MBS CRPCM 2P RPC 2 – OPEN MBS CRPCM 2R RPC 2 – OPEN</p> <p>Give EVs GO for all mate/demate actuations</p> <p>2. SSRMS mnvr to APFR INSTALL posn</p> <p>3. SSRMS mnvr to APFR INGRESS posn</p>	<p><b>SPDM SETUP</b> (00:47)</p> <ol style="list-style-type: none"> <li>1. Retrieve PGT from A/L; tether and stow on swing arm</li> <li>2. Retrieve C/Lk bag #2 and #1 from A/L; RET/BRT to bag #2</li> <li>3. Inspect gloves</li> <li>4. Close A/L thermal cover</li> <li>5. Translate to CETA 2 (fairlead at zenith/stbd CETA 2 HH); stow C/Lk bag #1 on zenith sq grid, APFR, or pass to EV2</li> <li>6. Translate to CETA 1 WIF 4; tether and stow C/Lk bag #2 on APFR</li> <li>7. RET/BRT to APFR ( PP,F,6)</li> <li>8. Translate to SLP HH 0002 (zenith MT translation path)</li> <li>9. SSRMS mnvr to APFR INSTALL posn</li> </ol> <p>10. Retrieve 55-ft safety tether from C/Lk bag #2; attach to D-ring extender (R)</p> <p>11. Retrieve WIF adapter from C/Lk bag #2 (on bag RET)</p> <p>12. Install WIF adapter in SSRMS, tether point toward EE</p> <p>13. Insert PIP pin</p> <p>14. Insert hitch pin into PIP pin</p> <p>15. Install APFR in SSRMS WIF adapter (Toes away from EE) (12,PP,F,6)</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pull test</li> <li><input type="checkbox"/> Verify lock collar black on black</li> <li><input type="checkbox"/> Release tether</li> </ul> <p>16. Tether swap to SSRMS w/55-ft safety tether (aft of HH)</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Verify hook locked, reel unlocked</li> </ul> <p>17. Attach A/L 85-ft safety tether to SLP HH 0001</p> <p>18. SSRMS mnvr to APFR INGRESS posn</p> <p>19. Attach L waist tether to bootplate; ingress APFR</p>	<p><b>SPDM SETUP</b> (00:37)</p> <ol style="list-style-type: none"> <li>1. Temp stow spare 85-ft safety tether on CETA 2 between sq grid A and nadir HH</li> <li>2. Retrieve C/Lk bag #1 from CETA 2 WIF 5 APFR, sq grid, or EV1; attach Adj Eq Tether on bag to BRT tether loop</li> <li>3. Wrap C/Lk bag #1 integral tether around BRT and back to C/Lk bag D-ring</li> <li>4. RET/BRT to CETA 2 WIF 5 APFR</li> <li>5. Translate to POA (nadir MT translation path); fairlead on POA HH via Adj Eq Tether, route safety tether over trunnions</li> <li>6. Relocate APFR to SLP WIF 04 (7,QQ,G,10) alternate setting: (5,QQ,D,10) <ul style="list-style-type: none"> <li><input type="checkbox"/> Pull test</li> <li><input type="checkbox"/> Verify lock collar black on black</li> <li><input type="checkbox"/> Remove BRT RET</li> </ul> </li> </ol> <p><b>REMOVE/STOW ARM 2 WRIST KA UMBILICAL</b> (00:15)</p> <ol style="list-style-type: none"> <li>7. Remove overgloves</li> <li>8. Translate to SLP HH 0023</li> <li>9. Tether C/Lk bag #1 to HH 0023 and HH 0024</li> <li>10. Retrieve ratchet wrench from C/Lk bag #1 (on bag RET)</li> <li>11. On IV GO, ratchet wrench – 2 ext 7/16, ccw; drive Arm 2 wrist mate/demate mechanism D, E, ~0.75 turns (to hardstop)</li> <li>12. Remove PIP pins (4) from Arm KA Umbilical; insert in temp stow holes as reqd (≤ 22 lbf)</li> <li>13. Relocate Arm KA Umbilical to stow bracket (magnetic soft dock)</li> <li>14. Engage PIP pins (4) for landing (≤ 22 lbf)</li> <li>15. Inspect gloves</li> </ol>
<p><b>CAUTION</b> Avoid contact with radiator surfaces on arm SJEU and EP</p>		
<p><b>WARNING</b> Keep translation rates below 0.6 ft/sec. Do not perform kick offs, quick grabs, shaking motions. No full or fast laybacks in APFR and do light ingress/egress</p> <p>Do not perform simultaneous FF tasks (except OTCM 1 install or SJEU cover removal) on the fwd half (LEE pivot end) of SLP</p>		

**OTCM 2 INSTALL (02:00) (Cont)**

IV/SSRMS	EV1 – Ln (SSRMS)	EV2 – Rm (FF)
<p>4. SSRMS mnvr to OTCM 2 REMOVAL posn</p> <p>5. SSRMS: GCA to OTCM 2 KA interface</p>  <p>OTCM KA temp stow Velcro</p>	<p><b>RELEASE OTCM 2 (00:38)</b></p> <p>20. SSRMS mnvr to OTCM 2 REMOVAL posn</p> <p>21. Inspect gloves (during SSRMS mnvr to OTCM 2)</p> <p>22. Remove overgloves</p> <p>23. GCA to OTCM 2 KA interface</p> <p>24. <u>Transfer C/Lk bag #2 to EV2</u></p> <p>25. Remove OTCM 2 tent blanket; temp stow behind FSE</p> <p>26. Peel back wrap blanket for access to mate/demates, EDFs</p> <p>27. Receive ratchet wrench from EV2 (on bag RET)</p> <p>28. Ratchet wrench – 2 ext 7/16, ccw; drive mate/demate mechanism D, E ~0.75 turns (to hardstop)</p> <p>29. Ratchet wrench – 2 ext 7/16, ccw; untorque OTCM EDF #2, #3 = 2.5 turns</p> <p>30. Transfer ratchet wrench to EV2 (or let it retract to bag)</p> <p>31. Move OTCM EDFs (2) to soft dock</p> <p>32. Temporarily secure wrap blanket</p> <p>33. <b>PGT [B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16,</b> Drive OTCM 2 KA umbilical bolt (FSE O1), <del>-7.25 turns</del> <b>~ 11 turns</b></p> <p>34. Remove OTCM 2 KA umbilical; temp stow on SAPH Velcro</p> <p>35. <b>PGT [B2 16.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16,</b> Drive OTCM 2 clamp bolt (FSE O3), <del>-8.75 turns</del> <b>~ 11 turns</b></p> <p>36. Open clamp to magnetic soft dock, secure with Velcro strap</p> <p>37. Receive OHT (attach EV1 RET and release C/Lk bag RET)</p> <p>38. Install OHT (30 deg angle from OTCM axial line), perform pull test</p> <p>39. Attach EV1 RET to socket restraint plate</p> <p>40. <b>PGT [B2 16.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16,</b> Drive OTCM 2 clamp bolt (FSE O2), <del>-9.25 turns</del> <b>~ 11 turns</b></p> <p>41. Open clamp to magnetic soft dock, secure with Velcro strap</p> <p>42. Mate tent blanket to Velcro patch on SAPH</p> <p>43. Hold OTCM via EDF shroud and OHT</p>	<p><b>RELEASE OTCM 2 (00:33)</b></p> <p>16. Translate to HH 0022</p> <p>17. <u>Receive C/Lk bag #2 from EV1; tether to HH 0021 and 0022</u></p> <p>18. Transfer ratchet wrench from C/Lk bag #2 to EV1 (on bag RET)</p> <p>19. If wrist KA stowed, receive ratchet wrench; stow in C/Lk bag #2</p> <p>20. Retrieve OHT from C/Lk bag #2, transfer to EV1</p> <p>21. Translate to Arm 2 wrist</p>

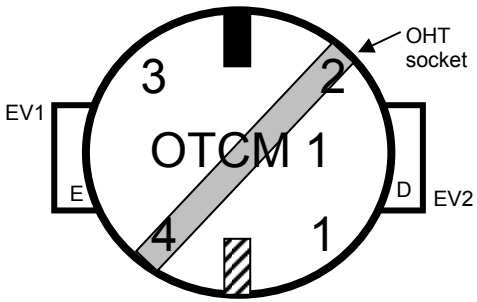
# OTCM 2 INSTALL (02:00) (Cont)

IV/SSRMS	EV1 – Ln (SSRMS)	EV2 – Rm (FF)																									
<p>6. SSRMS mnvr to OTCM 2 INSTALL posn</p> <table border="1" data-bbox="94 316 709 548"> <thead> <tr> <th>OTCM 2 EDF</th> <th>Initial torque (9.2 ft-lb)</th> <th>Initial turns</th> <th>Final torque (19.4 ft-lb)</th> <th>Final turns</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td style="background-color: #cccccc;"></td> <td style="background-color: #cccccc;"></td> <td></td> <td></td> </tr> </tbody> </table>  <p>Looking SLP fwd at Arm 2 wrist, before OTCM installed</p> <p>7. SSRMS: GCA for access to socket restraint plate</p>	OTCM 2 EDF	Initial torque (9.2 ft-lb)	Initial turns	Final torque (19.4 ft-lb)	Final turns	1					3					4					2					<p><b>FASTEN OTCM 2 TO ARM 2</b> (00:27)</p> <p>44. SSRMS mnvr to OTCM 2 INSTALL posn</p> <p>45. Transfer OTCM to EV2</p> <p>46. <b>PGT [A3 4.8 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16</b>, untorque OTCM EDFs #1, 4, = 2.5 turns</p> <p>47. Move OTCM EDFs #1, #4 to soft dock</p> <p>48. Soft dock OTCM 2 to Arm 2 (OHT facing EV1)</p> <p>49. Insert EDFs #1,2 into OTCM 2/Arm 2 interface</p> <p>50. Steady EV2 (hand on helmet) during EDF #4 install</p> <p>51. <b>PGT [A7 9.2 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>, Drive EDF #1 to torque, ~2 turns</p> <p>52. Transfer PGT to EV2</p> <p>53. Steady EV2 (hand on helmet) during EDF #4 install</p> <p>54. Receive PGT</p> <p>55. <b>PGT [B4 19.4 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>, Drive EDF #2 to torque, ~2.5 turns</p> <p>56. Transfer PGT to EV2</p> <p>57. Steady EV2 (hand on helmet) during EDF #4 install</p> <p>58. Receive PGT</p> <p>59. <b>PGT [B4 19.4 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>, Drive EDF #1 to torque, ~0.5 total turns</p> <p>60. Stow PGT</p> <p>61. Perform light tug test on EDF #1, #2</p> <p>62. Receive ratchet wrench (on bag RET)</p> <p>63. Ratchet wrench – 2 ext 7/16, cw; drive mate/demate mechanism D ~0.75 turns (to hardstop)</p> <p>64. Transfer ratchet wrench to EV2</p> <p><b>OTCM 2 CLEANUP</b> (00:08)</p> <p>65. <u>Disengage OHT; transfer to EV2</u></p> <p>66. Install wrap blanket around OTCM (inboard flap first)</p> <p>67. GCA for access to socket restraint plate bolts</p> <p>68. <b>PGT [B2 16.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16</b>, release OTCM 2 socket restraint plate bolts (2), ~9 turns</p> <p>69. Remove socket restraint plate from OTCM 2; transfer to EV2</p> <p>70. Receive OTCM 2 sock (on bag RET); slide over OTCM</p> <p>71. Tuck under wrap blanket ear flaps for access to grounding tabs underneath</p> <p>72. Mate sock grounding tabs (2) and Velcro to wrist; ✓barber pole/black stripe visible through window (Velcro loop to EDF lanyard not required)</p> <p>73. <u>Release OTCM 2 sock tether; let retract to bag</u></p>	<p><b>FASTEN OTCM 2 TO ARM 2</b> (00:27)</p> <p>22. Receive OTCM (on EV1 tether)</p> <p>23. Steady OTCM for EDF untorque</p> <p>24. Soft dock OTCM 2 to Arm 2</p> <p>25. Insert EDFs #3, 4 into OTCM 2/Arm 2 interface</p> <p>26. Receive PGT (on EV1 tether)</p> <p>27. <b>PGT [A7 9.2 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>, Drive EDF #3 and EDF #4 to torque (in order), ~2 turns</p> <p>28. Transfer PGT to EV1</p> <p>29. Receive PGT (on EV1 tether)</p> <p>30. <b>PGT [B4 19.4 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>, Drive EDF #4 and EDF #3 to torque (in order), ~0.5 turns</p> <p>31. Perform light tug test on EDF #3, #4</p> <p>32. Transfer PGT to EV1</p> <p>33. Retrieve ratchet wrench from C/Lk bag #1 (on bag RET)</p> <p>34. Ratchet wrench – 2 ext 7/16, cw; drive mate/demate mechanism E ~0.75 turns (to hardstop)</p> <p>35. Transfer ratchet wrench to EV1 (on bag RET)</p> <p>36. Receive ratchet wrench; stow in C/Lk bag #1</p> <p><b>OTCM 2 CLEANUP</b> (00:08)</p> <p>37. <u>Retrieve OHT; stow in C/Lk bag #1 (on bag RET)</u></p> <p>38. Install wrap blanket around OTCM (inboard flap first)</p> <p>39. <u>Attach RET from C/Lk bag #1 to socket restraint plate</u></p> <p>40. <u>Receive socket restraint plate; stow in C/Lk bag #1 (on bag RET)</u></p> <p>41. Retrieve OTCM sock (on bag RET) from C/Lk bag; transfer to EV1</p> <p>42. Tuck under wrap blanket ear flaps for access to grounding tabs underneath</p> <p>43. Inspect gloves</p> <p>44. <u>RET/BRT to C/Lk bag #1</u></p>
OTCM 2 EDF	Initial torque (9.2 ft-lb)	Initial turns	Final torque (19.4 ft-lb)	Final turns																							
1																											
3																											
4																											
2																											

# OTCM 1 INSTALL (01:20)

IV	EV1 – Ln (SSRMS)	EV2 – Rm (FF)
<p>1. SSRMS mnvr to OTCM 1 REMOVAL AND HANDOFF posn</p>	<p><b>RELEASE OTCM 1 (00:30)</b>  1. Inspect gloves (during translation)  2. SSRMS mnvr to OTCM 1 REMOVAL AND HANDOFF posn  3. Remove OTCM 1 tent blanket; temp stow behind FSE  4. Peel back wrap blanket for access to mate/demates, EDFs</p> <p>5. Receive ratchet wrench from EV2 (on bag RET)  6. Ratchet wrench – 2 ext 7/16, ccw; drive mate/demate mechanism D &amp; E ~0.75 turns (to hard stop)  7. Ratchet wrench – 2 ext 7/16, ccw; untorque EDF #2, #3 on OTCM = 2.5 turns  8. Transfer ratchet wrench to EV2  9. Move OTCM EDFs (2) to soft dock  10. Temporarily secure wrap blanket  11. <b>PGT [B2 16.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16, Drive OTCM 1 clamp bolt (FSE O6), ~8.75 turns <i>will turnS</i></b>  12. Open clamp to magnetic soft dock; Velcro strap not reqd  13. <b>PGT [B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16, Drive OTCM 1 KA umbilical bolt (FSE O4), ~7.25 turns <i>will turnS</i></b>  14. Remove OTCM 1 KA umbilical; temp stow on SAPH Velcro  15. Relocate RET hook from OHT to OTCM 1 socket restraint plate  16. Receive OHT  17. Install OHT (~30 deg from OTCM centerline); perform pull test  18. <b>PGT [B2 16.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16, Drive OTCM 1 clamp bolt (FSE O5), ~8.75 turns <i>will turnS</i></b>  19. Open clamp to magnetic soft dock; Velcro strap not reqd</p> <p><b>FASTEN OTCM 1 TO ARM 1 (00:40)</b>  20. Transfer OTCM 1 to EV2  21. Mate tent blanket to Velcro patch on SAPH (if accessible)  22. SSRMS mnvr to (SLP) APFR EGRESS posn (HH 002); egress APFR</p>	<p><b>REMOVE/STOW ARM 1 WRIST KA UMBILICAL (00:15)</b>  1. <u>Tether C/Lk bag #1 to SLP HH 0012 (int) and HH 0010 (RET to far standoff)</u>  2. Remove PIP pin #3 from wrist KA umbilical; insert in temp stow location as reqd (&lt; 22 lbf)  3. Local tether to SLP HH 0009; Ingress APFR  4. Secure C/Lk bag #1 to swing arm, as reqd  5. Retrieve ratchet wrench from C/Lk bag #1 (on bag RET)  6. Ratchet wrench – 2 ext 7/16, ccw; drive mate/demate mechanism D, E ~0.75 turns to hard stop  7. Stow ratchet wrench in C/Lk bag #1  8. Remove PIP pins (#1, 2, 4) from wrist KA Umbilical; insert in temp stow holes as reqd (&lt; 22 lbf)  9. Relocate Arm KA Umbilical to stowage bracket (magnetic soft dock)  10. Engage PIP pins (1+) in landing location (&lt; 22 lbf) (insert remaining PIP pins during cleanup)</p> <p><b>RELEASE OTCM 1 (00:15)</b>  11. Transfer ratchet wrench to EV1 (on bag #1 RET)</p> <p>12. Receive ratchet wrench; stow in C/Lk bag #1  13. Attach second RET from C/Lk bag #1 to OHT</p> <p>14. Retrieve OHT from C/Lk bag; present to EV1 (both RETs from bag still attached)  15. Transfer OHT to EV1</p> <p><b>FASTEN OTCM 1 TO ARM 1 (00:40)</b>  16. Receive OTCM</p>
<p>2. SSRMS mnvr to APFR EGRESS posn</p>		

# OTCM 1 INSTALL (01:20) (Cont)

IV	EV1 – Ln (SSRMS)	EV2 – Rm (FF)																									
<p>3. SSRMS mnvr to APFR REMOVAL posn</p> <p>4. SSRMS mnvr to JLP CLEARANCE posn</p>  <p>Looking SLP aft at Arm 1 wrist, before OTCM installed</p>	<p>23. SSRMS mnvr to APFR REMOVAL posn; remove L waist tether from APFR</p> <p>24. Tether and relocate APFR (__,PP,F,6) to SLP WIF 01</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pull test</li> <li><input type="checkbox"/> Verify lock collar black on black</li> <li><input type="checkbox"/> Release tether from APFR</li> </ul> <p>25. Safety tether swap to S0 85-ft safety tether at HH 0001</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Verify hook locked, reel unlocked</li> </ul> <p>26. Stow 55-ft safety tether on WIF 01 APFR</p> <p>27. Give SSRMS GO for mnvr to JLP CLEARANCE posn</p> <p>28. Translate to Arm 1 wrist (BRT to SLP HH 0008)</p> <p>29. <b>PGT [A3 4.8 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16</b>, untorque OTCM EDFs #1, #4, = 2.5 turns</p> <p>30. Move OTCM EDFs #1, #4 to soft dock</p> <p>31. Soft dock OTCM 1 to Arm 1 wrist roll joint interface (OHT facing EV2)</p> <p>32. Insert EDFs #3, 4 into OTCM 1/Arm 1 interface</p> <p>33. <b>PGT [A7 9.2 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>, Drive EDF #3 to torque, ~2 turns</p> <p>34. Transfer PGT to EV2 (on EV1 RET)</p>	<p>17. Steady OTCM for EDF untorque</p> <p>18. Soft dock OTCM 1 to Arm 1 wrist roll joint interface (OHT facing EV2)</p> <p>19. Insert EDFs #1, 2 into OTCM 1/Arm 1 interface</p> <p>20. Disengage OHT; stow in C/Lk bag #1 (on bag RET)</p> <p>21. Receive PGT (on EV1 RET)</p> <p>22. <b>PGT [A7 9.2 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>, Drive EDF #1 and EDF #2 to torque (in order), ~2 turns</p> <p>23. Transfer PGT to EV1</p>																									
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## OTCM 1 INSTALL (01:20) (Cont)

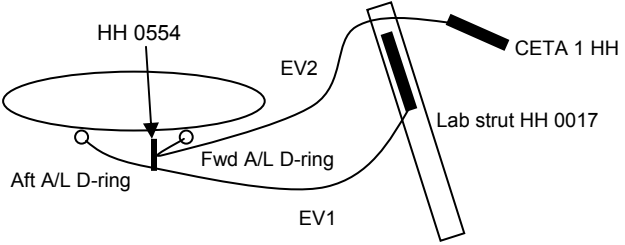
IV	EV1 – Ln (SSRMS)	EV2 – Rm (FF)
<p>5. Give MCC-H GO to restore heater power to SPDM</p> <p>6. √MCC for SCU connect and cleanup times</p>	<p><b><u>OTCM 1 CLEANUP</u></b> (00:10)</p> <p>46. <b>PGT [B2 16.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16,</b> release OTCM 1 socket restraint plate bolts (2), ~9 turns</p> <p>47. Stow PGT on swing arm</p> <p>48. Slide OTCM sock over OTCM 1</p> <p>49. Tuck under wrap blanket ear flaps for access to grounding tabs underneath</p> <p>50. Mate sock grounding tabs (2) and Velcro to wrist; √barber pole/black stripe visible through window (Velcro loop to EDF lanyard not required)</p> <p>51. Engage remaining PIP pins (4 total) in arm KA Umbilical/stowage bracket (≤ 22 lbf)</p> <p>52. Inspect gloves</p>	<p><b><u>OTCM 1 CLEANUP</u></b> (00:10)</p> <p>33. Remove socket restraint plate from OTCM 1 (on bag RET); stow in C/Lk bag</p> <p>34. Retrieve OTCM sock from C/Lk bag #1 (on bag RET)</p> <p>35. Slide OTCM sock over OTCM 1</p> <p>36. Tuck under wrap blanket ear flaps for access to grounding tabs underneath</p> <p>37. Mate sock grounding tabs (2) and Velcro to wrist; √barber pole/black stripe visible through window</p> <p>38. <u>Release OTCM 1 sock tether; let retract to C/Lk bag</u></p> <p>39. Tether and remove SJEU covers 1.6 and 1.7; stow in C/Lk bag #1</p> <p>40. Fold over Velcro straps to cover grounding patches (4 per blanket, can only access 2 of 4 for 1.7)</p> <p>41. Inspect gloves</p> <p>42. Egress APFR</p>

## ASSEMBLY PREP TASKS (00:25)

IV	EV1 or EV2 (FF)
<div data-bbox="220 462 514 755" data-label="Diagram"> <p>A circular diagram representing the layout of OTP EDFs. The circle is divided into four quadrants by a vertical and a horizontal line. The quadrants are numbered 1 (top-left), 2 (bottom-left), 3 (bottom-right), and 4 (top-right). A 'Hinge pin' is indicated at the top center. An arrow labeled 'SLP left' points to the right from the center. An arrow labeled 'SLP fwd' points downwards from the center.</p> </div> <p data-bbox="283 722 388 755">OTP EDFs</p> <p data-bbox="94 803 451 828"><b><u>SJEU BLANKET REMOVAL STEPS</u></b></p> <ul data-bbox="115 828 661 950" style="list-style-type: none"> <li>▪ Press on any "PRESS" label to ground blanket</li> <li>▪ Attach RET to tether loop</li> <li>▪ Remove OSE blanket off ARM and stow in lg trash bag</li> <li>▪ Fold over Velcro flaps to cover joint thermal blanket grounding patches (4 total)</li> </ul> <div data-bbox="94 966 714 1356" data-label="Image"> <p>A photograph showing a close-up of a mechanical assembly. A red box labeled 'FSE T1' points to a pivot bracket. Another red box labeled 'PIP pins' points to two pins on the assembly. A label 'FSE 12' is visible on a component.</p> </div> <p data-bbox="94 1364 210 1388">THA in FSE</p>	<p data-bbox="1270 219 1480 251"><b>EV1 or EV2 (FF)</b></p> <p data-bbox="745 284 1018 308"><b><u>ASSEMBLY PREP TASKS</u></b></p> <p data-bbox="745 308 1165 332">As time permits, perform the following tasks:</p> <ul data-bbox="829 332 1396 462" style="list-style-type: none"> <li><input type="checkbox"/> RELEASE OTP EDFs</li> <li><input type="checkbox"/> REMOVE SJEU BLANKETS</li> <li><input type="checkbox"/> MOVE ARM 2 EDF FSE A4 TO LANDING LOCATION</li> <li><input type="checkbox"/> THA PREP</li> <li><input type="checkbox"/> SPDM photos</li> </ul> <div data-bbox="777 479 1617 576" data-label="Text" style="border: 1px solid black; padding: 5px;"> <p data-bbox="1144 495 1260 519" style="text-align: center;"><b>WARNING</b></p> <p data-bbox="808 519 1606 560">Do not perform simultaneous FF tasks on SLP fwd half. During OTP EDF removal, the second CM must stay SLP aft of the midline between WIFs 001 and 007</p> </div> <p data-bbox="745 625 1039 649"><b><u>RELEASE OTP EDFs</u></b> (00:15)</p> <ol data-bbox="745 649 1669 755" style="list-style-type: none"> <li>1. Release OTP EDFs with Ratchet wrench or PGT <ul data-bbox="787 673 1627 730" style="list-style-type: none"> <li><input type="checkbox"/> Ratchet wrench – 2 ext 7/16, ccw drive OTP EDFs (4) = 5 turns</li> <li><input type="checkbox"/> <b>PGT [B4 19.4 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive EDFs (4) = 5 turns</li> </ul> </li> <li>2. Move EDFs (4) to soft dock (leave EDF #4 in soft dock, do not move to MLI loop until EVA 3)</li> </ol> <p data-bbox="745 803 1207 828"><b><u>REMOVE SJEU BLANKETS</u></b> (00:05 per blanket)</p> <ol data-bbox="745 828 1984 925" style="list-style-type: none"> <li>3. Tether and remove SJEU covers #2.7, 2.6, 2.4 (on MCC GO), 2.3 (on MCC GO), 1.7, 1.6, 1.4, 1.3, 2.2, 2.1, 1.2, 1.1 – listed in order of priority</li> <li>4. Fold over Velcro straps to cover grounding patches (4 per blanket, can only access 2 of 4 for 2.7 and 1.7)</li> <li>5. Stow covers in C/Lk bag #1 (4 available hooks), C/Lk bag #2 (1 available hook), or behind MWS</li> </ol> <p data-bbox="745 974 1354 998"><b><u>MOVE ARM 2 EDF FSE A4 TO LANDING LOCATION</u></b> (00:10)</p> <ol data-bbox="745 998 1764 1120" style="list-style-type: none"> <li>6. Release Arm 2 EDF A4 with PGT only <ul data-bbox="787 1023 1722 1047" style="list-style-type: none"> <li><input type="checkbox"/> <b>PGT [B5 22.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive Arm 2 EDF FSE A4, = 5 turns</li> </ul> </li> <li>7. Move EDF to landing location</li> <li>8. Torque EDF in landing location <ul data-bbox="787 1096 1764 1120" style="list-style-type: none"> <li><input type="checkbox"/> <b>PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>, Drive FSE A4 (landing location), ~5 turns</li> </ul> </li> </ol> <p data-bbox="745 1169 934 1193"><b><u>THA PREP</u></b> (00:10)</p> <ol data-bbox="745 1193 1995 1266" style="list-style-type: none"> <li>9. Move RMCT launch restraint PIP pins (2) to 'stow' posn</li> <li>10. <b>PGT [B5 22.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive captive EVA lockout bolt on pivot bracket 'FSE T1', ~23.5 turns</li> <li>11. Rotate THA FSE pivot bracket 90 deg; engage soft dock</li> </ol>



# EVA 1 CLEANUP/INGRESS (00:40)

IV	EV1 – Ln (FF)	EV2 – Rm (FF)
 <p>Post EVA 1 safety tether configuration</p> <ol style="list-style-type: none"> <li>1. Perform WVS PWRDN (P/TV, <u>WVS Cue Card</u>)</li> </ol>	<p><b>CLEANUP</b> (00:25)</p> <ol style="list-style-type: none"> <li>1. <u>Tether and relocate APFR from SLP WIF 04 to SLP WIF 03 ( ,KK,G,4)</u> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pull test</li> <li><input type="checkbox"/> Verify lock collar black on black</li> <li><input type="checkbox"/> Release tether from APFR</li> </ul> </li> <li>2. Perform C/Lk bag #1 inventory</li> <li>3. <u>Retrieve C/Lk bag #1 (HH 0012); tether and stow on BRT</u></li> <li>4. Perform tool inventory</li> <li>5. Inspect gloves; don overgloves</li> <li>6. Translate to Z1 port toolbox (zenith around wagon wheel to top of crew lock)</li> <li>7. <u>Tether to D-handle on rd scoop; relocate to sq scoop</u></li> <li>8. <u>Tether/stow sq scoop/D-handle on MWS</u></li> <li>9. Translate to Airlock</li> <li>10. Fairlead at A/L HH 0554</li> </ol> <p><b>INGRESS</b> (00:15)</p> <ol style="list-style-type: none"> <li>11. Receive EV2 safety tether; attach LAS hook to fwd A/L D-ring</li> <li>12. <u>Relocate EV2 waist tether (R) to D-handle/sq scoop; pass to EV2</u></li> <li>13. Transfer C/Lk bag #1 to EV2</li> <li>14. Remove EV2 waist tether (R); pass to EV2</li> <li>15. Attach waist tether (L) to A/L D-ring extender <ul style="list-style-type: none"> <li><input type="checkbox"/> Verify hook locked</li> </ul> </li> <li>16. Release EV1 85-ft safety tether LAS hook from D-ring extender (R) (leave waist tether on ERCM); attach to aft D-ring</li> <li>17. Remove waist tether (R) from ERCM and stow</li> <li>18. Ingress A/L</li> <li>19. Close thermal cover, attach Velcro strap</li> <li>20. Remove SCU from stowage pouch</li> <li>21. Remove DCM cover, Velcro to DCM</li> <li>22. Connect SCU to DCM, √SCU locked</li> <li>23. Water – OFF (fwd); expect H2O IS OFF msg</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>24. Verify no hardware blocking hatch</li> <li>25. EV Hatch Handle – Preclose (black pie region)</li> <li>26. EV Hatch – close and lock</li> <li>27. Go to <u>PRE-REPRESS</u> Cue Card</li> </ol>	<p><b>CLEANUP</b> (00:25)</p> <ol style="list-style-type: none"> <li>1. <u>Stow ratchet wrench in C/Lk bag #2 (HH 0021 and HH 0022)</u></li> <li>2. Perform C/Lk bag #2 inventory</li> <li>3. <u>Relocate and tether C/Lk bag #2 (HH 0021) to HH 0005 and HH 0006 (aft standoffs)</u></li> <li>4. Perform tool inventory</li> <li>5. Inspect gloves; don overgloves</li> <li>6. Translate to Airlock; <u>retrieve Adj Eq Tether from POA</u></li> <li>7. <u>Retrieve spare 85-ft safety tether from CETA 2</u></li> <li>8. Fairlead at A/L HH 0554</li> </ol> <p><b>INGRESS</b> (00:15)</p> <ol style="list-style-type: none"> <li>9. Open A/L Thermal Cover</li> <li>10. Ingress A/L</li> <li>11. Attach waist tether (L) to internal A/L D-ring; verify hook locked</li> <li>12. Release 85-ft safety tether LAS from D-ring extender (R) (leave waist tether on ERCM); transfer to EV1</li> <li>13. <u>Receive waist tether (R) and D-handle/sq scoop from EV1</u></li> <li>14. <u>Stow D-handle/sq scoop on A/L RET</u></li> <li>15. Receive C/Lk bag; stow on A/L RET</li> </ol> <ol style="list-style-type: none"> <li>16. Remove SCU from stowage pouch</li> <li>17. Remove DCM cover, Velcro to DCM</li> <li>18. Connect SCU to DCM, √SCU locked</li> <li>19. Water – OFF (fwd); expect H2O IS OFF msg</li> </ol>

# POST EVA 1 TOOL CONFIG

- EV1**
- MWS
  - BRT (L)
  - RET (eq-eq)
  - T-Bar
  - RET (eq-eq)
  - RET (eq-eq) w/PIP pin
  - Sq scoop/D-handle
  - Adj Equip Tether
  - Wire Tie (2)
  - STS Small Trash Bag
  - Adj Eq Tether (clove-hitched on strap, hooks in bag)
  - Swing Arm (R)
  - PGT s/n \_\_\_\_\_
  - PGT Battery s/n \_\_\_\_\_
  - 7/16 (wobble) socket-6 ext
  - RET (eq-eq)
  - Waist Tether (2)
  - D-ring Extender (2)
  - SAFER
  - WVS
  - Overgloves (2) donned

- EV2**
- MWS
  - BRT (L)
  - RET (eq-eq)
  - Wire Tie (2)
  - T-Bar
  - RETs (eq-eq) w/PIP pin
  - RETs (eq-eq)
  - Wire Tie (4)
  - Adj Equip Tether
  - 85-ft Safety Tether
  - STS Small Trash Bag
  - Adj Eq Tether (clove-hitched on strap, hooks in bag)
  - Swing Arm (R)
  - 760 digital camera and mount (tie wrapped together)
  - Waist Tether (2)
  - D-ring Extender (L)
  - SAFER
  - WVS
  - Overgloves (2) donned

- AIRLOCK CONFIG**
- Staging Bag
  - Fuse Tether
  - PGT
  - PGT Battery
  - Wire Tie Caddy
  - RAD
  - Connector Cleaner Tool Kit
  - Probe
  - Prybar
  - Connector Pin Straightener
  - Velcro/Tape Caddy
  - IV Bag
  - Towels (2)
  - Contamination Detection Kit
  - GP Caddy (2)
  - Adj Thermal Mittens (2)
  - Socket Caddy (hatch cont) w/RET (eq-eq)
  - 1/2 Socket-8 ext
  - 7/16 (wobble) Socket-6 ext (spare)
  - DCM Plug (SAFER Hardmount) (2)
  - D-ring extender on internal D-ring

- Large ORU Transfer Bag**
- Adj Eq Tether (eq-eq) (2) (clove hitched to int loops)
  - PCBM contamination covers (6)
  - ORU tether (on clove hitched adj eq tether hook)
  - PCBM contamination covers (2)
  - RET (Lg-eq) (ext loop)
  - Adj Eq Tether (eq-eq) (bag HH)

- EVA Crewlock Bag #1**
- RET (eq-eq)
  - OHT
  - Socket restraint plate (2)
  - Adj Eq Tether (eq-eq) (clove hitch to int D-ring)
  - SJEU covers (\_\_\_\_\_)
  - Adj Eq Tether (eq-eq) (outside of bag)
  - RET (eq-eq) (outside of bag)

**EXTERNAL CONFIG**

- SLP**
- WIF 01**
- APFR (\_\_,PP,F,6)
  - 55-ft safety tether

- HH 0005 and HH 0006**
- EVA Crewlock Bag #2**
- Ratchet wrench (2)
  - 7/16 Socket-2 ext (2)
  - RET (eq-eq)
  - Sq scoop
  - Adj Eq Tether (eq-eq) (outside bag)

- WIF 03**
- APFR (\_\_,KK,G,4)

- S0 HH 3492 & Lab Strut HH 7**
- EVA Crewlock Bag #3 (Contingency only)**
- ISS bungee caddy
  - Spare EDFs (3, on single hook)
  - Hammer
  - Compound Cutters
  - OHT (spare)
  - RET (eq-eq)
  - Prybar
  - RET (eq-eq)
  - Ballstack
  - Adj Eq Tether (eq-eq) (outside bag)

## CBCS FLAP/JLP UNBERTH PREP – TASK DATA

### Estimated Task Duration:

	Without SRMS
One EV Crew	NA
Two EV Crew	01:15

### Tools:

EV1 (SSRMS)	EV2 (FF)
85-ft Safety Tether	85-ft Safety Tether
Large ORU bag w/fuse tether	
ORU tether and adj equipment tethers	

### EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
JLP LTA 1	PLB/P7151	JLP/J7151	2	25	JLP heater power
JLP LTA 2	PLB/P7152	JLP/J7152	2 (same)	25	JLP heater power

### Foot Restraints:

Task	WIF	APFR Setting
N/A		

### ORUs/Loose items:

ORU/Item	Qty	Part Number	Mass (lb)	Volume (in <sup>3</sup> )
PCBM Contamination Cover	4	P/N 683-13603-1	10.1 (8 total)	30.9x3.3x0.8
PCBM Contamination Cover	4	P/N 683-13603-5		30.9x3.3x0.8
LTA Connector cap J7151, J7152	2	P/N NZGL-RPC-N-25-0-MS	0.3 each	2.4(dia)x2.2
LTA Umbilical	2	P/N V845-774887-002	N/A	N/A

### Notes:

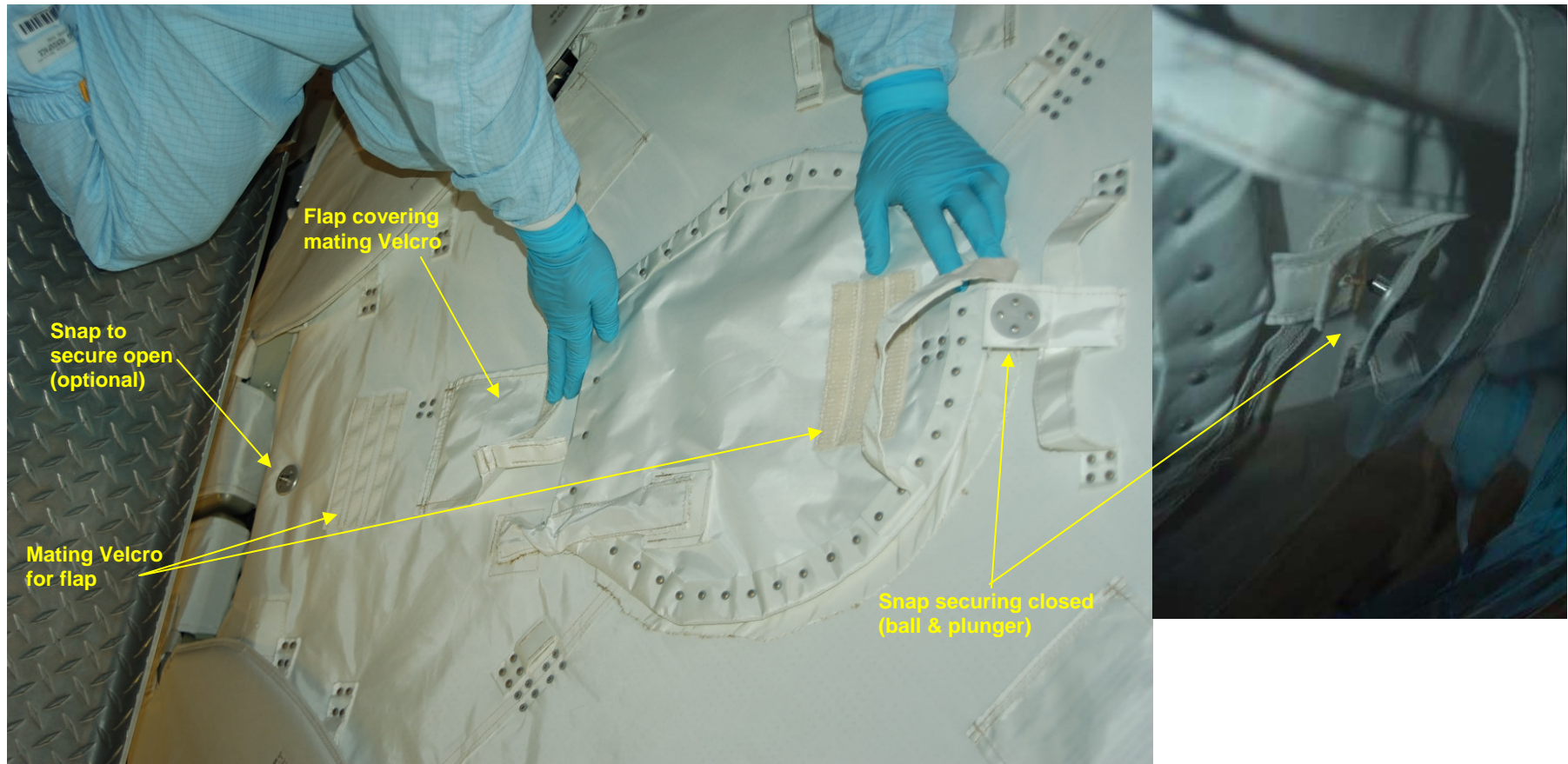
### Cautions:

1. Avoid contact with PCBM sealing surface once the contamination cover is removed

### Warnings:

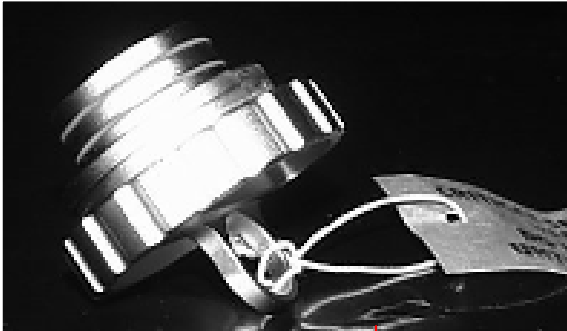
1. Shock hazard. Verify power off before demating JLP LTA cables

## CBCS FLAP/JLP UNBERTH PREP – TASK DATA (Cont)



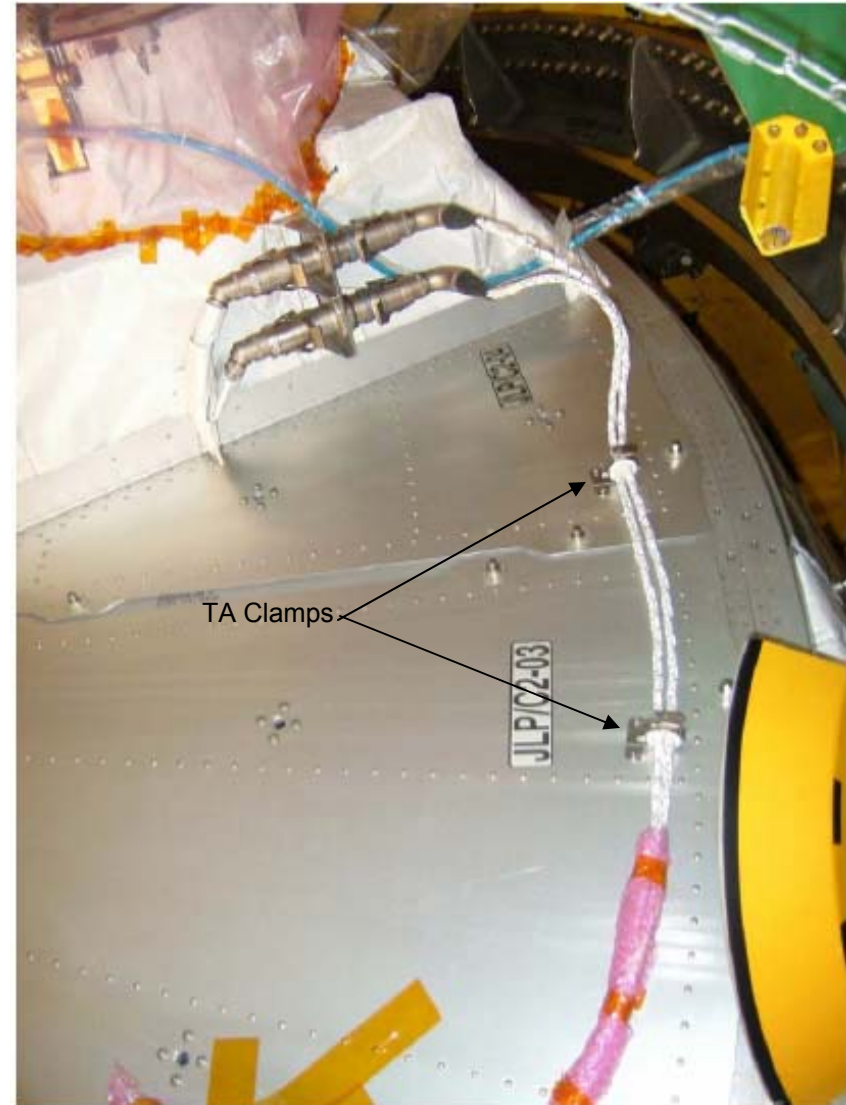
CBCS Flap

## CBCS FLAP/JLP UNBERTH PREP – TASK DATA (Cont)



JLP LTA cable connector cap

JLP LTA cables



JLP LTA cables and TA clamps

**JLP UNBERTH PREP – TASK DATA (Cont)**



JLP PCBM IV MLI Cover



PCBM Contamination Cover

## OTCM INSTALL/SPDM ASSEMBLY PREP TASKS – TASK DATA

### Estimated Task Duration:

	With SSMS	Without SSRMS
One EV Crew	NA	NA
Two EV Crew	03:45	NA

### Tools:

EV1 (SSRMS/FF)	EV2 (FF)
APFR	APFR
EVA C/Lk bag #2	EVA C/Lk bag #1
WIF adapter (PIP pin)	Ratchet wrench 2-in ext – 7/16
OHT	OTCM OSE Blanket (2)
55-ft safety tether	
Ratchet wrench 2-in ext – 7/16	
Sq scoop	
PGT 6-in ext – 7/16	

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Max Torque (ft-lb)	Turns	RPM
Mate/Demate Connector	A-E	7/16	20	4.9	< 5.0	N/A	0.75	N/A
OTCM KA	FSE O1, O4	7/16	2	12.0	25.0	30.5	7.25	30
OTCM EDF	1-4	7/16	8	19.4	3.3	30.5	2.25-2.75	30
OTCM Roll clamp FSE	FSE O2, O3, O5, O6	7/16	4	12.0	12.5	23.8	8.75-9.25	30
OTP EDFs	1-4	7/16	4	25.5	16.7	33.0	5	30
OTCM socket restraint plate bolts	N/A	7/16	4	NA	12.9	N/A	9	30
Arm Boom EDFs	FSE A7, A8, A9, A2, A3, A4	7/16	6	12.0	19.7	19.9	5	30
THA FSE tie-down bolt	FSE T1	7/16	1	12.0	17.9	26.0	23.5	30

### ORUs/Loose items:

ORU/Item	Qty	Part Number	Mass (lbm)	Volume (in <sup>3</sup> )
OTCM	2	51602-4000-1	114	13.9 x 24.3 x 13.9

### Foot Restraints:

Task	WIF	APFR Setting
Install OTCM 1	SLP-04	7, QQ, G, 10

### Notes:

1. If an EDF is released more than 2.5 turns, captive head can back off threads. Re-engage head with threads before driving with PGT
2. The lanyard on EDF #4 was extended to resolve the interference issue between the EDF and the hinge bolt. The lanyard will allow the EDF to pull out of the lug/clevis interface

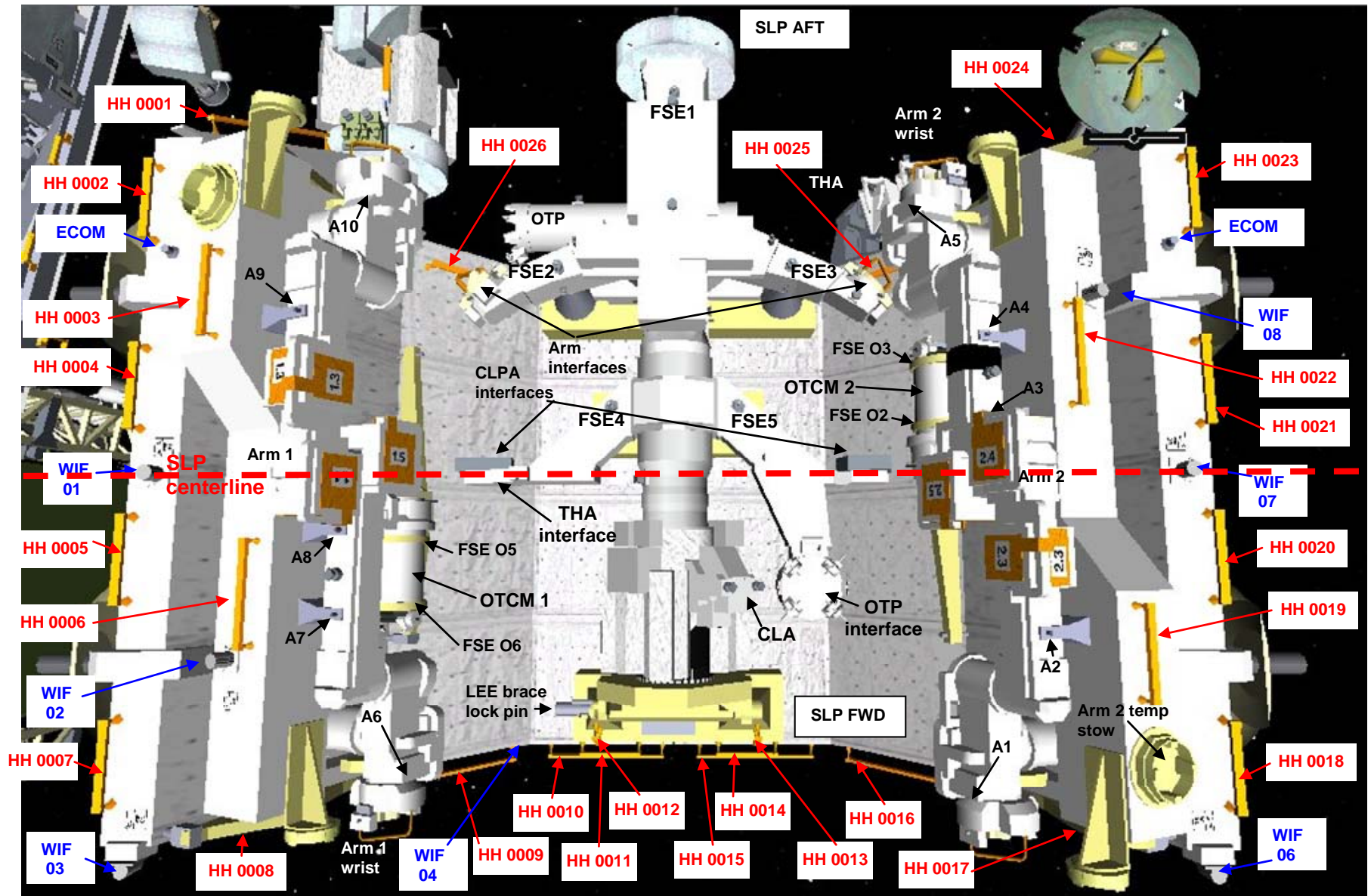
### Cautions:

1. Avoid contact with radiative surfaces on arm SJEU and EP
2. Do not exceed 5 ft-lb when actuating mate/demate mechanism
3. Do not apply loads to KAs until mate/demates are disconnected and 2 of 4 PIP pins are engaged
4. Avoid applying off-axis loads to EDF EVA nut when the EDF is unfastened. Fastener damage may result

### Warnings:

1. Keep translation rates below 0.6 ft/sec
2. Do not perform kick offs, quick grabs, shaking motions
3. APFR ops are limited to WIF 1 and 4 and must not have high accelerations, aggressive or quick movements, full or fast laybacks, or heavy ingress/egress
4. Do not perform simultaneous FF tasks (except OTCM 1 install or SJEU cover removal) on the fwd face (LEE pivot end) of SLP
5. Thermal hazard: maintain a 6-in keep-out zone from operating MSS lights
6. Ensure that power is turned off before ORU interfaces are broken. Failure to comply could result in electric shock to EVA crewmembers

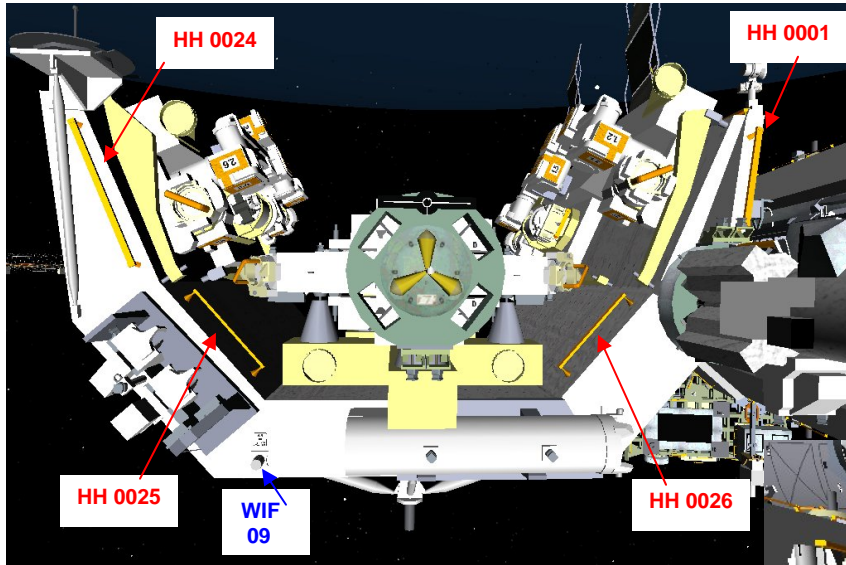
OTCM INSTALL/SPDM ASSEMBLY PREP TASKS – TASK DATA (Cont)



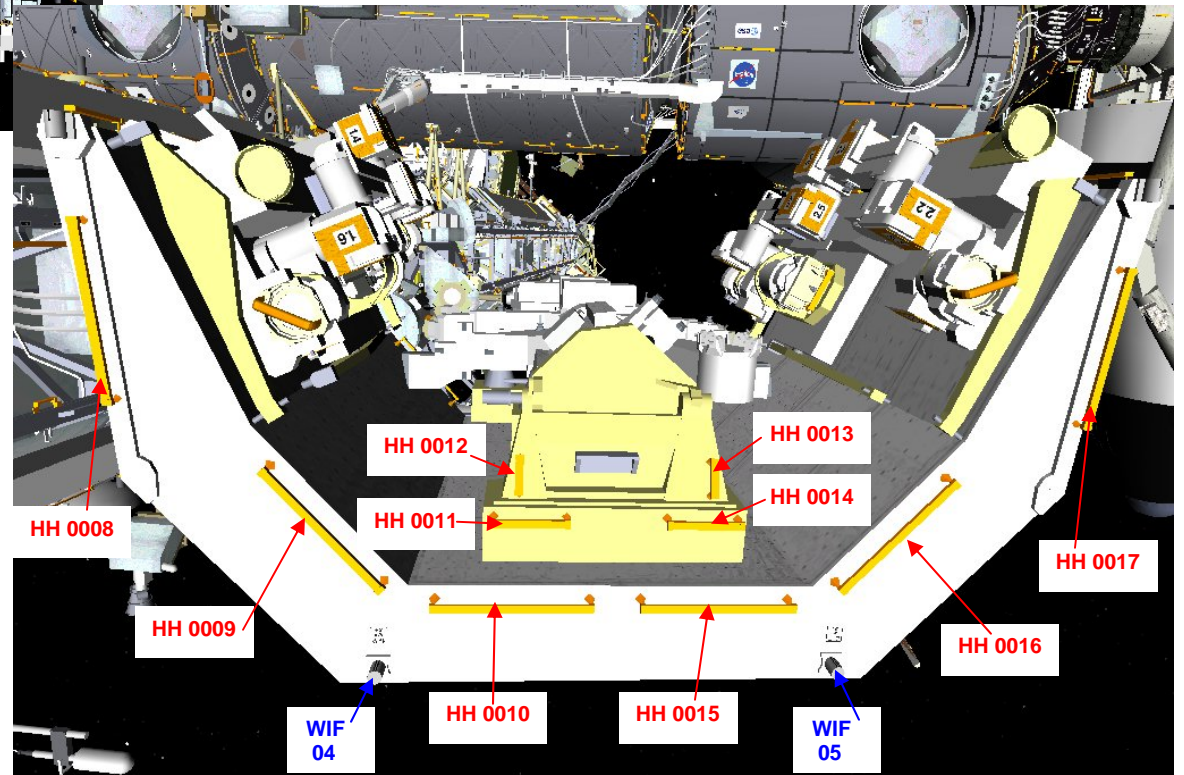
SPDM launch configuration



# OTCM INSTALL/SPDM ASSEMBLY PREP TASKS – TASK DATA (Cont)



SLP Aft



SLP Fwd

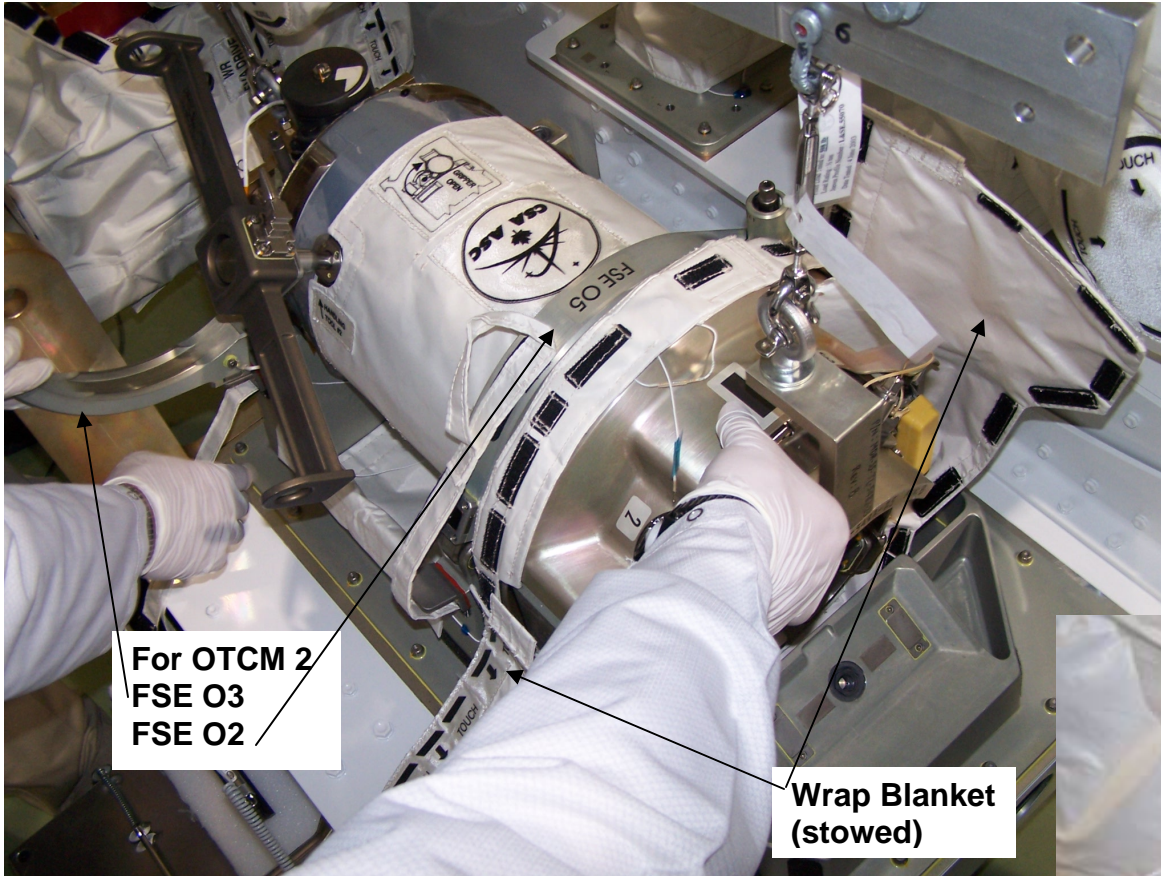
OTCM INSTALL/SPDM ASSEMBLY PREP TASKS – TASK DATA (Cont)



OTCM clamshell blanket temp stow



# OTCM INSTALL/SPDM ASSEMBLY PREP TASKS – TASK DATA (Cont)



For OTCM 2  
FSE O3  
FSE O2

Wrap Blanket  
(stowed)

OTCM 1 in FSE (O5 and O6) w/blankets and KA removed

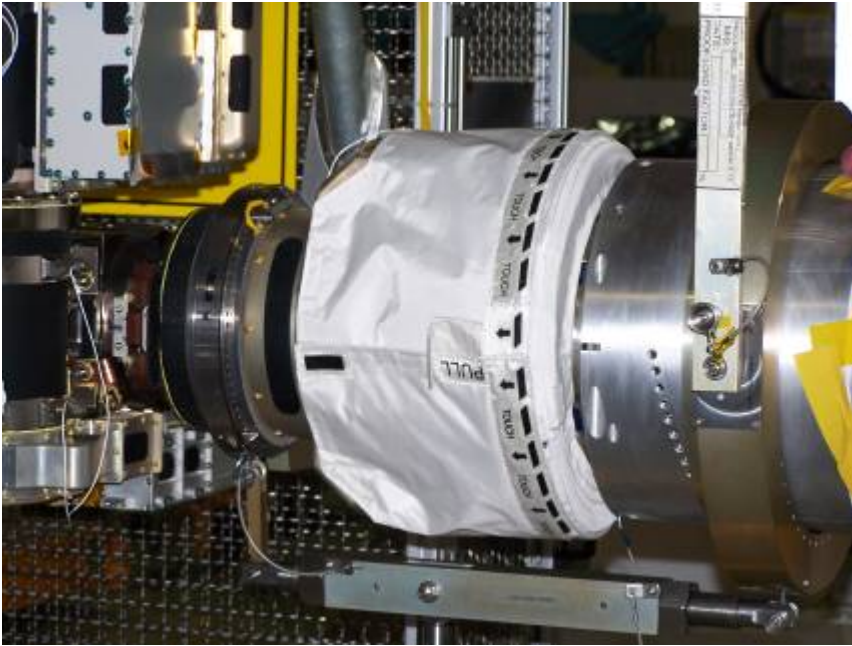


OTCM KA temp stow location



OTCM interface on arm

## OTCM INSTALL/SPDM ASSEMBLY PREP TASKS – TASK DATA (Cont)



OTCM wrap blanket installed



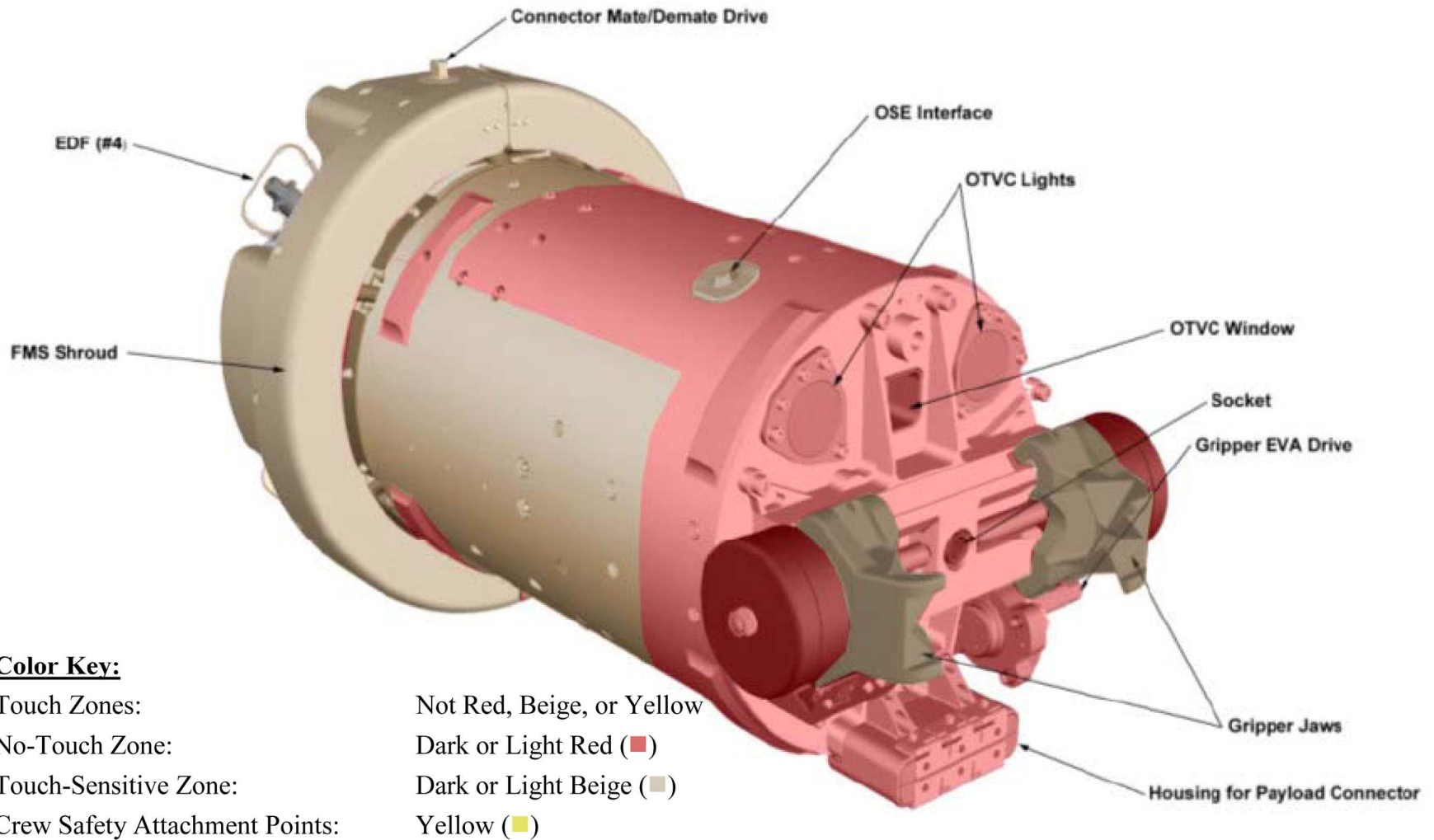
OTCM interface on arm



OHT (OTCM Handling Tool)

## OTCM INSTALL/SPDM ASSEMBLY PREP TASKS – TASK DATA (Cont)

OTCM Touch Zones – Top View



## OTCM INSTALL/SPDM ASSEMBLY PREP TASKS – TASK DATA (Cont)

### OTCM Touch Zones – Bottom View

#### Color Key:

Touch Zones:

Not Red, Beige, or Yellow

No-Touch Zone:

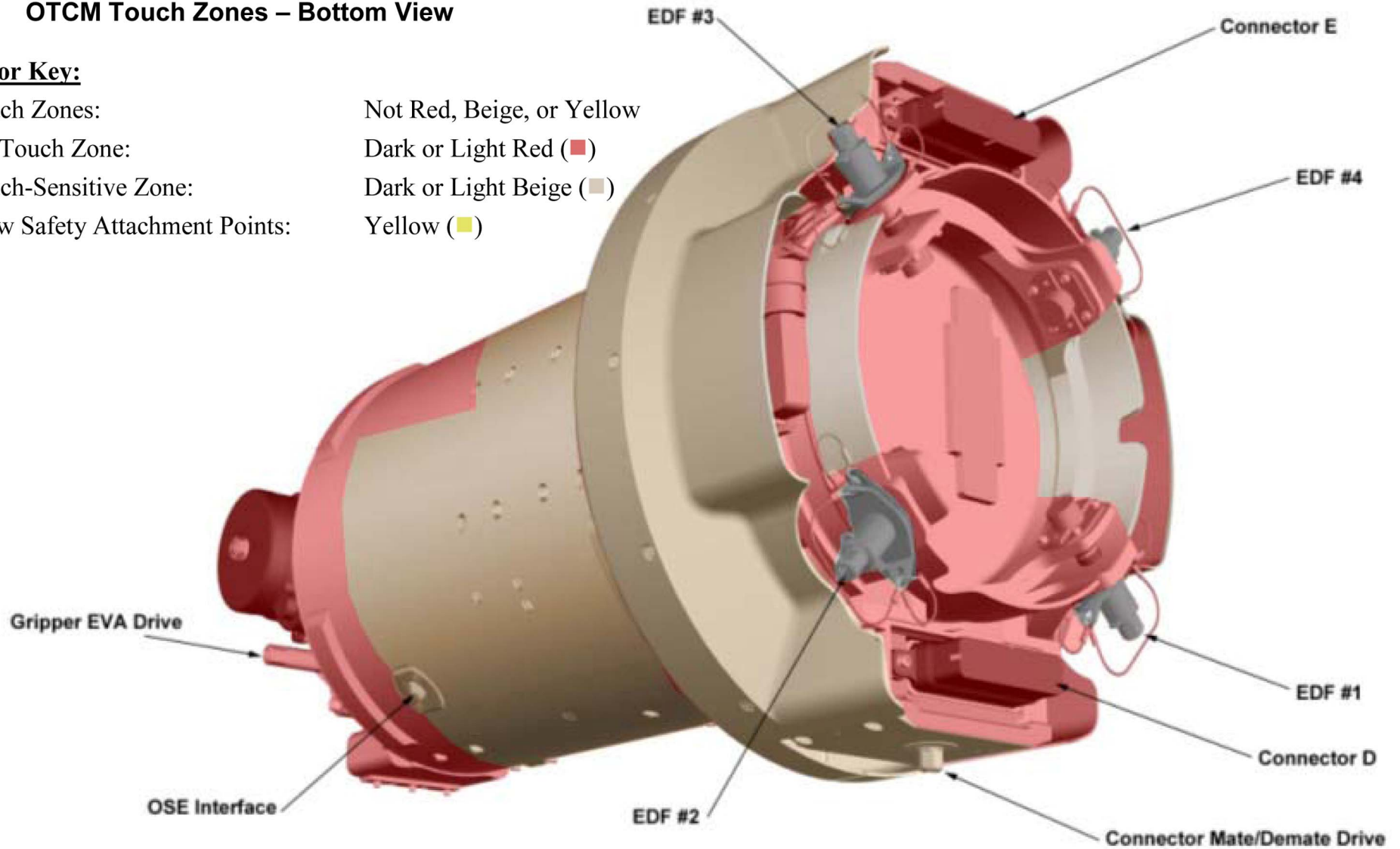
Dark or Light Red (■)

Touch-Sensitive Zone:

Dark or Light Beige (■)

Crew Safety Attachment Points:

Yellow (■)



# STS-123 (1JA) EVA 2 TIMELINE

TIME (HR : MIN)	IV/SSRMS	1JA EVA 2 EV1 – Ln (SSRMS)	EV2 – Fm (FF)
00:00		<b>POST DEPRESS</b> (00:05) <b>A/L EGRESS AND SETUP</b> (00:40)	<b>POST DEPRESS</b> (00:05) <b>A/L EGRESS AND SETUP</b> (00:40)
01:00	<ul style="list-style-type: none"> <li>SSRMS mnvr to APFR INSTALL/INGRESS</li> </ul>	<b>SPDM ARM 2 STOW</b> (01:30) <ul style="list-style-type: none"> <li>Stow body KA umbilical #1</li> <li>Release Arm 1 shoulder roll clamp</li> <li>Stow Arm 1 shoulder KA umbilical</li> <li>Release OTP hinge pin</li> <li>Install APFR/ingress SSRMS</li> </ul>	<b>SPDM ARM 2 STOW</b> (01:30) <ul style="list-style-type: none"> <li>Release Arm 2 wrist roll clamp</li> <li>Remove Arm 2 SJEU covers 2.7, 2.6, 2.4, 2.3</li> <li>Release Arm 2 shoulder roll clamp</li> <li>Stow Arm 2 shoulder KA umbilical</li> <li>Release Arm 1 wrist roll clamp</li> <li>Remove Arm 1 SJEU covers 1.7, 1.6, 1.4, 1.3</li> <li>Release Arm 2 EDFs</li> <li>Temp stow Arm 2</li> </ul>
02:00	<ul style="list-style-type: none"> <li>SSRMS mnvr to ARM 2 EDF REMOVAL posn</li> <li>SSRMS mnvr to ARM 2 TEMP STOW posn</li> </ul>	<ul style="list-style-type: none"> <li>Release Arm 2 EDFs</li> <li>Temp stow Arm 2</li> </ul>	
03:00	<ul style="list-style-type: none"> <li>SSRMS mnvr to SPDM BODY BOLT REMOVAL posn</li> <li>SSRMS mnvr to ARM 1 EDF REMOVAL posn</li> <li>SSRMS mnvr to ARM 1 HANDOFF posn</li> </ul>	<b>SPDM ARM 1 STOW</b> (01:00) <ul style="list-style-type: none"> <li>Release body FSE bolts</li> <li>Release Arm 1 EDFs</li> <li>Transfer Arm 1 to EV2</li> </ul>	<b>SPDM ARM 1 STOW</b> (01:00) <ul style="list-style-type: none"> <li>Stow body KA umbilical #2</li> <li>Release Arm 1 EDFs</li> <li>Hold Arm 1 for SPDM body rotation</li> </ul>
04:00	<ul style="list-style-type: none"> <li>SSRMS mnvr to SPDM BODY ROTATION START posn</li> <li>SSRMS mnvr to SPDM BODY ROTATION END posn</li> <li>SSRMS mnvr to ARM 1 EDF INSTALL posn</li> </ul>	<b>SPDM ARM INSTALL</b> (01:50) <ul style="list-style-type: none"> <li>Release final body FSE bolt</li> <li>Rotate SPDM</li> <li>Fasten Arm 1 to body</li> </ul>	<b>SPDM ARM INSTALL</b> (01:50) <ul style="list-style-type: none"> <li>Fasten Arm 1 to body</li> </ul>
05:00	<ul style="list-style-type: none"> <li>SSRMS mnvr to ARM 2 TEMP STOW posn</li> <li>SSRMS mnvr to ARM 2 INSTALL posn</li> <li>SSRMS mnvr to ARM 2 EDF INSTALL posn</li> </ul>	<ul style="list-style-type: none"> <li>Retrieve Arm 2</li> <li>Fasten Arm 2 to body</li> </ul>	<ul style="list-style-type: none"> <li>Release Arm 2 PIP Pins</li> <li>Fasten Arm 2 to body</li> </ul>
06:00	<ul style="list-style-type: none"> <li>SSRMS mnvr to EP 2 BLANKET REMOVAL posn</li> <li>SSRMS mnvr to ARM 2 SOCK REMOVAL posn</li> <li>SSRMS mnvr to EP 1 BLANKET REMOVAL posn</li> </ul>	<b>SPDM COVER REMOVAL</b> (01:10) <ul style="list-style-type: none"> <li>Remove EP 2 blanket (aft)</li> <li>Remove Arm 2 sock/mate EDF flaps</li> <li>Remove fwd EP 1 blanket (fwd)</li> </ul>	<b>SPDM COVER REMOVAL</b> (01:10) <ul style="list-style-type: none"> <li>Remove SJEU covers 2.1, 2.2, 2.5</li> <li>Remove SJEU covers 1.1, 1.2, 1.5</li> <li>SLP Cleanup</li> </ul>
	<ul style="list-style-type: none"> <li>SSRMS mnvr to APFR EGRESS posn</li> <li>SSRMS mnvr to APFR REMOVAL posn</li> </ul>	<b>CLEANUP AND INGRESS</b> (00:45) <ul style="list-style-type: none"> <li>SLP Cleanup (as time permits)</li> <li>Egress/remove APFR from SSRMS</li> </ul>	<b>CLEANUP AND INGRESS</b> (00:45)
		<b>PRE REPRESS</b> (00:05)	<b>PRE REPRESS</b> (00:05)

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# PRE EVA 2 TOOL CONFIG

- EV1**
- MWS
  - BRT (L)
  - RET (eq-eq)
  - T-Bar
  - RET (eq-eq)
  - RET (eq-eq) w/PIP pin
  - Adj Equip Tether
  - Wire Tie (2)
  - STS Small Trash bag
  - Adj Eq Tether (clove-hitched on strap, hooks in bag)
  - Swing Arm (R)
  - PGT [A7 9.2 ft-lb, CAL, MTL 30.5] s/n \_\_\_\_\_
  - PGT Battery s/n \_\_\_\_\_
  - 7/16 (wobble) socket-6 ext
  - RET (eq-eq)
  - Waist Tether (2) (L – D-ring extender, R – D-ring)
  - D-ring Extender (2)
  - SAFER
  - WVS
  - Overgloves (2) donned

- EV2**
- MWS
  - BRT (L)
  - RET (eq-eq)
  - Wire Tie
  - Sq Scoop/D-Handle
  - T-Bar
  - RET (eq-eq) w/PIP pin
  - RET (eq-eq) (2)
  - Adj Equip Tether (2, use 1 for POA fairlead)
  - Wire Tie (2)
  - ISS Small Trash bag
  - Adj Eq Tether (clove-hitched, hooks in bag)
  - Swing Arm (R)
  - PGT [A3 4.8 ft-lb, CAL, MTL 30.5] s/n \_\_\_\_\_
  - PGT Battery s/n \_\_\_\_\_
  - RET (eq-eq)
  - Waist Tether (2) (L – D-ring, R – D-ring extender)
  - D-ring Extender (2)
  - SAFER
  - WVS
  - Overgloves (2) donned

- AIRLOCK CONFIG**
- Staging Bag
  - Fuse Tether
  - PGT
  - PGT Battery
  - Wire Tie Caddy
  - RAD
  - Connector Cleaner Tool Kit
  - Probe
  - Connector Pin Straightener
  - Velcro/Tape Caddy
  - IV Bag
  - Towels (2)
  - Contamination Detection Kit
  - GP Caddy (2)
  - Adj Thermal Mittens (2)
  - Socket Caddy (hatch cont) w/RET (eq-eq)
  - 1/2 Socket-8 ext
  - 7/16 (wobble) Socket-6 ext (spare)
  - DCM Plug (SAFER Hardmount) (2)

- D-ring extender on internal D-ring
- 760 digital camera and mount (tie wrapped)
- RET (lg-eq)
- Lg trash bag (2)
- RET (eq-eq) (2)
- RET (lg-eq) (2)

**Tether count**  
 RET (eq-eq) – 9, 3 additional blue RETs outside  
 RET (eq-eq) w/PIP pin – 2  
 RET (Lg-eq) – 3  
 Adj Eq Tether – 5, 3 additional Adj tethers outside

- AIRLOCK EXTERIOR**
- CETA 1 HH 85-ft Safety Tethers anchor point
  - HH 17 (S0/Lab strut) 85-ft Safety Tethers anchor point

- LAB**
- APFR w/ingress aid, WIF 11 (11,QQ,A,12)

- SLP**
- APFR, WIF 03 (\_\_,KK,G,4)
  - APFR, WIF 01 (\_\_,PP,F,12)
  - 55-ft Safety Tether
  - EVA Crewlock Bag #2 (SLP HH 0005 and 0006)**
  - Ratchet wrench (2)
  - 7/16 Socket-2 ext (2)
  - Sq scoop
  - RET (eq-eq)
  - Adj Eq Tether (eq-eq) (outside bag)

- SSRMS**
- WIF adapter w/PIP pin

- SPDM**
- OTCM #1 and #2 installed w/socks in place
  - Arm 2 EDF "A4" in landing location

- EVA Crewlock Bag #3 (S0 HH 3492 & Lab Strut HH 7)**
- ISS bungee caddy
  - Adj Eq Tether (clove hitched to caddy)
  - Spare EDFs #1, #2, #3 (1 of each)
  - Hammer
  - Compound Cutters
  - OHT (spare)
  - RET (eq-eq)
  - Prybar
  - RET (eq-eq)
  - Ballstack
  - Adj Eq Tether (eq-eq) (outside bag)

**Prior to EVA, perform the following hardware inspections:**

1. RET cords for fraying
2. No red line visible on safety and waist tether load  
Alleviation straps
3. Inspect STS trash bags for deformation/damage
4. Inspect EMU gloves for damage
5. Check MWS Baseplate for loose screws on toggle levers

**Use Red RETs only**

## EVA 2 INHIBIT PAD

### Orbiter

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 ft from FRCS:  
IV 1. √DAP: VERN, FREE, LO Z  
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 (\*)

### Ground

Ground Radar  
MCC-H 1. √TOPO 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° from the velocity vector  
If one or both PCUs failed:  
2. No more than two arrays unshunted and oriented < 105° from velocity vector

#### SSPTS

MCC If EV crew < 2 ft from ungrounded SSPTS connector (not planned):  
1. RPCM LA2A3B\_D RPC 1 – Open, Close Cmd Inhibit  
2. RPCM Z13B\_A RPC 2 – Open, Close Cmd Inhibit  
3. RPCM LA1A4A\_D RPC 3 – Open, Close Cmd Inhibit  
4. RPCM Z14B\_A RPC 2 – Open, Close Cmd Inhibit

SPDM steps to be performed during EVA, 15 min prior to first mate/demate

MCC MBS CRPCM 2P RPC 2 – OPEN  
MBS CRPCM 2R RPC 2 – OPEN

### RSOS

#### SM Antennas

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

## NOTES, CAUTIONS, AND WARNINGS

### NOTES

1. Bolt install: report torque and turns
2. Perform light pull test after final torque on EDFs
3. Bolt/EDF release: report torque and turns if different from published range
4. EVA connectors: after disconnection and prior to connection; verify pin and EMI band integrity; verify connector free of FOD
5. Inspect QDs for damage prior to mating
6. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
7. 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. 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 (currently none)
  8. Passive UMAs
  9. MBS VDU, MCU, CRPCMs, and Cameras (taped radiative surfaces, silver Teflon)
  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. SSRMS/SPDM Cameras
  22. SPDM SJEU, EP, OTCM Radiator surfaces
  23. Open CBM petal covers and LAB window shutter
  24. FPMU [S1]
  25. OTSD
  26. Columbus HAM radio antennas
  27. Grounding fingers on SPDM and SLP (fragile)

### 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

## NOTES, CAUTIONS, AND WARNINGS (Cont)

### CAUTION (Cont)

#### **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 (Cont)

#### **Shuttle Constraints**

##### G. Avoid inadvertent contact with

1. OBSS and SRMS Composite Sections 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 wire harnesses, cables, 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]

## 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
- 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 linkages during operation
- 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 sockets
  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. Z1 handrail 6061 by the Ku-Band boom launch restraint [Z1]
  10. Solar Array Blanket Box [P6,S6]
  11. Keep hands away from SSRMS, SPDM, POA LEE opening, and snares
  12. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing
  13. Lifting lug near P6 handrail 5333 and gap spanner

### WARNING (Cont)

#### ISS Constraints (Cont)

- F. Sharp Edges (Cont)
14. SPDM OTCM Gripper Jaws
  15. SOLAR and EuTEF
  16. Port/Aft portion of A/L circular HH
- 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/SPDM/MBS 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 deg F 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 or > 200 degF

## NOTES, CAUTIONS, AND WARNINGS (Cont)

### WARNING (Cont)

#### ISS Constraints (Cont)

##### H. SLP

1. Keep translation rates below 0.6 ft/sec
2. Do not perform kick offs, quick grabs, shaking motions
3. APFR ops are limited to WIF 1 and 4 and must not have high accelerations, aggressive or quick movements, full or fast laybacks or heavy ingress/egress
4. Do not perform simultaneous FF tasks (except OTCM 1 install and SJEU blanket removal) on the fwd half (LEE pivot end) of SLP. During unplanned activities with two EV crew on the forward SLP half more than two cyclic load inputs must be followed by a 10-sec pause. Additionally, every effort shall be made to limit crew motion to one at a time. During OTP EDF removal, the second CM must stay aft of the SLP midline between WIFs 001 and 007)

##### I. Electrical Shock

1. Stay  $\geq$  2 ft from ungrounded floating connectors if not unpowered:
  - SSPTS connectors [NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA2 Stbd & Port]
  - MBS Cross-Connect jumpers (translate past these using UMA handrails)
  - S0 EVA Power Cables [inside S0 Bay 00 Face 4, Bay 01 Face 3]
  - ESP2 jumper [inside S0 Bay 03 Face 4]

### WARNING (Cont)

#### Shuttle Constraints

##### J. 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]

##### K. Pinch

1. PRLA operation [PLB]

##### L. 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]

### WARNING (Cont)

#### Shuttle Constraints (Cont)

##### M. 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]

##### N. 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

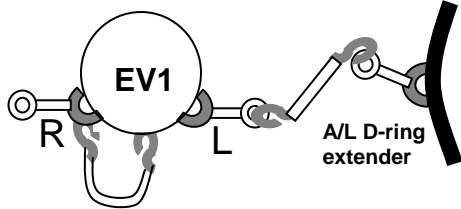
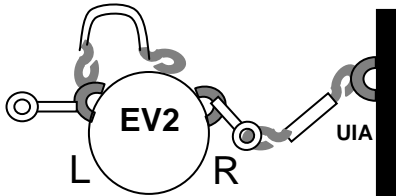
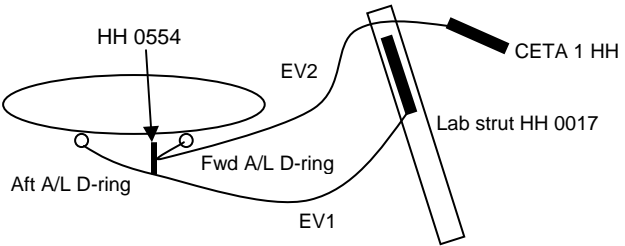
##### O. Contamination

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

##### P. Lasers

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

# A/L EGRESS/SETUP (00:40)

IV	EV1 – Ln (FF)	EV2 – Fm (FF)
		
 <p>Pre-EVA 2 safety tether configuration</p> <ol style="list-style-type: none"> <li>WVS Software: Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max (required after EV1 and EV2 egress Airlock)</li> </ol>	<p><b>Initial Condition:</b> Waist Tether (L) to A/L D-ring extender, verify hooks locked. 85-ft Safety Tether attached to S0/Lab strut HH 17 and A/L fwd D-ring. Overgloves donned</p> <p><b>EGRESS</b> (00:15)</p> <ol style="list-style-type: none"> <li>Open A/L thermal cover</li> <li>Egress A/L</li> <li>Attach waist tether (R) to 85-ft safety tether ERCM on aft D-ring</li> <li>Attach 85-ft safety tether LAS to (R) D-ring extender             <ul style="list-style-type: none"> <li>Verify hook locked, reel unlocked</li> </ul> </li> <li>Release Waist Tether (L) from A/L D-ring extender</li> <li>Receive EV2 waist tether (L); attach to fwd 85-ft safety tether ERCM</li> <li>Release 85-ft safety tether from aft D-ring; pass to EV2</li> <li>Receive <u>Lg trash bag</u>; tether and stow on MWS</li> <li>Receive 2<sup>nd</sup> <u>Lg trash bag</u></li> <li>Stow Lg trash bag on EV2 swing arm (inside)</li> <li>Release fairleads from HH 0554</li> <li>√SAFER man isol vlv – open (down)</li> <li>√SAFER HCM – closed (down)</li> </ol>	<p><b>Initial Condition:</b> Waist Tether (R) to UIA, verify hooks locked. 85-ft Safety Tether attached to CETA 1 HH and A/L aft D-ring. MWS RET connected to L D-ring extender. Overgloves donned</p> <p><b>EGRESS</b> (00:15)</p> <ol style="list-style-type: none"> <li>Pass waist tether (L) to EV1</li> <li>Receive aft 85-ft safety tether; attach load alleviator hook to (L) D-ring extender             <ul style="list-style-type: none"> <li>Verify hook locked, reel unlocked</li> </ul> </li> <li>Release Waist Tether (R) from UIA</li> <li>Transfer <u>Lg trash bag</u> to EV1; stow RET hook on D-ring extender</li> <li>Tether to 2<sup>nd</sup> <u>Lg trash bag</u> w/MWS RET; transfer to EV1</li> <li>Egress A/L</li> <li>√SAFER man isol vlv – open (down)</li> <li>√SAFER HCM – closed (down)</li> <li>Close A/L thermal cover</li> <li>Perform translation adaptation</li> </ol>

**A/L EGRESS/SETUP (00:40) (Cont)**

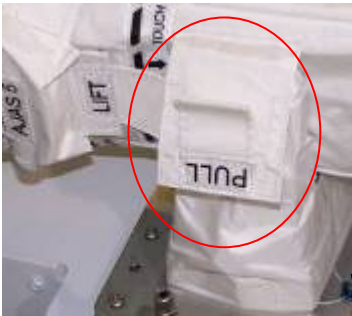
IV	EV1 – Ln (FF)	EV2 – Fm (FF)
<p>2. Verify with MCC-H SPDM/SLP inhibits in place (15 min prior to first mate/demate) MBS CRPCM 2P RPC 2 – OPEN MBS CRPCM 2R RPC 2 – OPEN</p> <p>Give EV1/EV2 GO to demate all KA umbilicals</p>	<p><b>SETUP</b> (00:25)</p> <div data-bbox="1108 332 1682 414" style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><b>CAUTION</b> Avoid contact with radiator surfaces on arm SJEU and EP</p> </div> <div data-bbox="926 446 1858 630" style="border: 3px double black; padding: 10px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><b>WARNING</b> Keep translation rates below 0.6 ft/sec. Do not perform kick offs, quick grabs, shaking motions. No full or fast laybacks in APFR and do light ingress/egress</p> <p style="text-align: center;">Do not perform simultaneous FF tasks (except OTCM 1 install or SJEU cover removal) on the fwd half (LEE pivot end) of SLP</p> </div> <p>14. Translate to SLP HH 0005 (zenith MT translation path); tether and stow <u>Lg trash bag</u> on HH 0005</p> <p>15. Inspect gloves; remove and stow overgloves</p> <p>16. Retrieve <u>ratchet wrench</u> and <u>sq scoop</u> from C/Lk bag on SLP HH 0005/0006; tether and stow both on MWS</p>	<p><b>SETUP</b> (00:25)</p> <p>11. Translate to Lab WIF 11 APFR; tether and stow <u>ingress aid</u></p> <p>12. Translate to POA (nadir MT translation path); fairlead on POA HH with MWS Adj Eq tether</p> <p>13. Inspect gloves; remove and stow overgloves</p> <p>14. Fairlead tether under aft trunnion/over fwd trunnion</p> <p>15. Install ingress aid in SLP WIF 03 APFR, verify ingress aid fully retracted and folded against bootplate</p> <p>16. Retrieve <u>ratchet wrench</u> from C/Lk bag (SLP HH 0005/0006); tether and stow on MWS</p> <p>17. Tether <u>Lg trash bag</u> to SLP HH 0020</p> <p>18. If not performed on EVA 1, move Arm 2 EDF FSE A4 to landing location and verify torque</p> <ol style="list-style-type: none"> <li>a. <b>PGT [B5 22.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive FSE A4, = 5 turns</li> <li>b. Remove EDF and install in landing location</li> <li>c. <b>PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive FSE A4, = 5 turns</li> </ol> <p>19. Install <u>sq scoop/D-handle</u> on Arm 2 microfixture (handle pointing SLP right)</p>



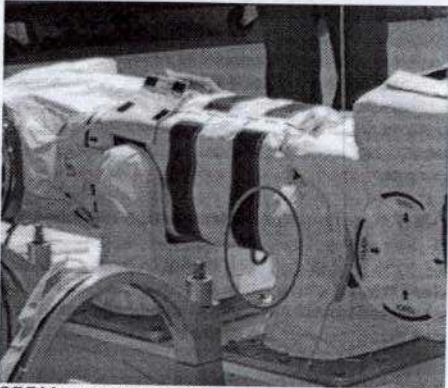
SPDM ARM 2 STOW (01:30)

IV/SSRMS	EV1 – Ln (SSRMS)	EV2 – Fm (FF)
<p><b>SJEU BLANKET REMOVAL STEPS</b></p> <ol style="list-style-type: none"> <li>Press on 'PRESS' label to ground blanket (one tab on each radiator face)</li> <li>Attach RET to tether loop</li> <li>Remove OSE blanket off ARM and stow in lg trash bag</li> <li>Fold over Velcro flaps to cover joint thermal blanket grounding patches (4 total)</li> </ol>	<p><b>REMOVE/STOW BODY KA UMBILICAL #1</b> (00:13)</p> <ol style="list-style-type: none"> <li>Translate to body KA umbilical #1</li> <li>Install <u>sq scoop</u> on FSE 2 (handle SLP aft)</li> <li>On IV GO, Ratchet wrench – 2 ext 7/16, ccw; drive mate/demate mechanism A, B, C ~0.75 turns to hard stop</li> <li>Use scoop on Body FSE bolt #2 to react torque</li> <li>Ratchet wrench – 2 ext 7/16, ccw; drive umbilical EDF #6 = 2.5 turns, move EDF to soft dock</li> <li><b>PGT [A3 4.8 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive umbilical EDF #5, #7, #8 = 2.5 turns</li> <li>Move EDFs to soft dock</li> <li>Relocate Body KA Umbilical to stowage bracket (magnetic soft dock)</li> <li>Move stowage bracket PIP pins (3 of 4) from stowage location to landing location (≤ 22 lbf)</li> </ol> <p><b>RELEASE ARM 1 SHOULDER ROLL CLAMP FSE</b> (00:05)</p> <ol style="list-style-type: none"> <li><b>PGT [B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive shoulder clamp FSE bolt (FSE A10) <i>-9.75 turns w/11 turns</i></li> <li>Open clamp to magnetic soft dock; secure with Velcro strap</li> </ol> <p><b>REMOVE/STOW ARM 1 SHOULDER KA UMBILICAL</b> (00:05)</p> <ol style="list-style-type: none"> <li>Translate to Arm 1 shoulder KA Umbilical</li> <li>Ratchet wrench – 2 ext 7/16, ccw; drive mate/demate mechanism A, B, C ~0.75 turns to hard stop</li> <li>Remove PIP pins (4) from Arm KA Umbilical; use temp stow holes as reqd (≤ 22 lbf)</li> <li>Relocate Arm KA Umbilical to stowage bracket (magnetic soft dock)</li> <li>Engage PIP pins (4) for landing (≤ 22 lbf)</li> </ol> <p><b>RELEASE OTP HINGE PIN</b> (00:02)</p> <ol style="list-style-type: none"> <li><b>PGT [B4 19.4 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive hinge pin nut, ~10.5 turns</li> <li>Extract hinge pin (captive) to soft dock</li> </ol> <p><b>CONFIGURE/INGRESS SSRMS</b> (00:20)</p> <ol style="list-style-type: none"> <li>Translate to SLP WIF 01 APFR; move 55-ft safety tether load alleviator hook to R D-ring extender             <ul style="list-style-type: none"> <li>Verify hook locked, reel unlocked</li> </ul> </li> <li>Stow anchor hook on MWS</li> <li>Tether and retrieve APFR (WIF 01), √(,PP,F,6)</li> <li>Local tether to HH 0002</li> </ol>	<p><b>RELEASE ARM 2 WRIST ROLL CLAMP FSE</b> (00:05)</p> <ol style="list-style-type: none"> <li>Translate to Arm 2 wrist roll clamp; BRT to HH 0025</li> <li><b>PGT [B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive wrist clamp FSE bolt, (FSE A5) <i>-9.75 turns w/11 turns</i></li> <li>Open clamp to magnetic soft dock; secure with Velcro strap</li> </ol> <p><b>REMOVE ARM 2 SJEU BLANKETS</b> (00:15)</p> <ol style="list-style-type: none"> <li>Tether and remove Arm 2 SJEU covers # 2.7, 2.6, 2.4 (on MCC GO), 2.3 (on MCC GO); stow in Lg trash bag on HH 0020 (BRT to HH 0022 for 2.3, 2.4)</li> <li>Fold over Velcro straps to cover grounding patches (4 per blanket, can only access 2 of 4 for 2.7)</li> </ol> <p><b>RELEASE ARM 2 SHOULDER ROLL CLAMP FSE</b> (00:05)</p> <ol style="list-style-type: none"> <li>Translate to Arm 2 shoulder (BRT to HH 0016)</li> <li><b>PGT [B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive shoulder clamp FSE bolt (FSE A1) <i>-9.75 turns w/11 turns</i></li> <li>Open clamp to magnetic soft dock; secure with Velcro strap</li> </ol> <p><b>REMOVE/STOW ARM 2 SHOULDER KA UMBILICAL</b> (00:05)</p> <ol style="list-style-type: none"> <li>Translate to Arm 2 shoulder KA Umbilical</li> <li>Ratchet wrench – 2 ext 7/16, ccw; drive mate/demate mechanism A, B, C ~0.75 turns to hard stop</li> <li>Remove PIP pins (4) from Arm KA Umbilical; use temp stow holes as reqd (≤ 22 lbf)</li> <li>Relocate Arm KA Umbilical to stowage bracket (magnetic soft dock)</li> <li>Engage PIP pins (4) for landing (≤ 22 lbf)</li> </ol> <p><b>RELEASE ARM 1 WRIST ROLL CLAMP FSE</b> (00:05)</p> <ol style="list-style-type: none"> <li>Translate to Arm 1 wrist roll clamp (BRT to HH 0009)</li> <li><b>PGT [B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive wrist clamp FSE bolt, (FSE A6) <i>-9.75 turns w/11 turns</i></li> <li>Open clamp to magnetic soft dock; secure with Velcro strap</li> <li>Verify LEE Brace lock pin not restrained by J-lock</li> </ol> <p><b>REMOVE ARM 1 SJEU BLANKETS</b> (00:15)</p> <ol style="list-style-type: none"> <li>Tether and remove Arm 1 SJEU covers # 1.7, 1.6, 1.4, 1.3; stow in Lg trash bag on HH 0005 (local tether to HH 0005)</li> <li>Fold over Velcro straps to cover grounding patches (4 per blanket, can only access 2 of 4 for 1.7)</li> </ol>

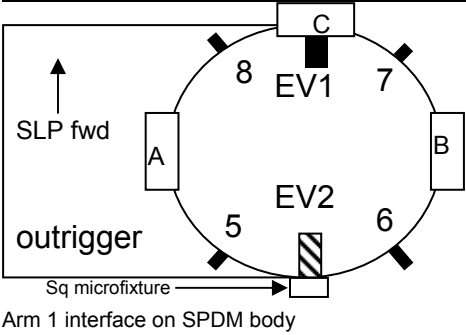
## SPDM ARM 2 STOW (01:30) (Cont)

IV/SSRMS	EV1 – Ln (SSRMS)	EV2 – Fm (FF)
<p>1. SSRMS mnvr to APFR INSTALL posn</p> <p>2. SSRMS mnvr to APFR INGRESS posn</p> <p>3. SSRMS mnvr to ARM 2 EDF REMOVAL posn</p>  <p>Arm EDF blanket flap</p> <p>4. SSRMS mnvr to ARM 2 CLEARANCE posn</p> <p>5. SSRMS mnvr to ARM 2 TEMP STOW posn</p>	<p>23. SSRMS mnvr to APFR INSTALL posn</p> <p>24. Install <u>APFR</u> (12,PP,F,6) in SSRMS WIF adapter</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pull test</li> <li><input type="checkbox"/> Verify lock collar black on black</li> <li><input type="checkbox"/> Release tether</li> </ul> <p>25. Tether swap to SSRMS (anchor hook on aft tether point of SSRMS HH)</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Verify hook locked, reel unlocked</li> </ul> <p>26. Attach S0 safety tether LAS to HH 0001</p> <p>27. SSRMS mnvr to APFR INGRESS posn; attach L waist tether to boot plate</p> <p>28. Ingress APFR</p> <p>29. Inspect gloves (during translation)</p> <p><b><u>RELEASE ARM 2 EDFs</u></b> (00:15)</p> <p>30. SSRMS mnvr to ARM 2 EDF REMOVAL posn (A4 and A3)</p> <p>31. Attach RET to <u>D-handle</u> (installed previously)</p> <p>32. <b>PGT [B5 22.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive FSE A3, = 5 turns</p> <p>33. Remove EDF FSE A3 and install in landing location (If difficult to remove, have EV2 perform step 22 and retry)</p> <p>34. <b>PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive FSE A3, = 5 turns</p> <p>35. Adjust glove heaters, visor, cooling prior to removing Arm</p> <p>36. Once positive control of arm is obtained, give EV2 GO to release A2</p> <p><b><u>TEMP STOW ARM 2</u></b> (00:30)</p> <p>37. On EV2 GO, remove Arm 2 from FSE; use EDF brackets to verify alignment</p> <p>38. SSRMS mnvr to ARM 2 CLEARANCE posn</p> <p>39. Once clear of structure, rotate arm 180 deg (so that OTCM is on EV1 L)</p> <p>40. SSRMS mnvr to ARM 2 TEMP STOW posn</p> <p>41. Mate Arm 2 to temp stow bracket</p> <p>42. Secure Velcro flaps (4) over double EDF holes</p> <p>43. Retrieve <u>sq scoop/D-handle</u>; stow on MWS/BRT</p>	<p><b><u>RELEASE ARM 2 EDFs</u></b> (00:10)</p> <p>20. Translate to ARM 2 FSE EDF FSE A2 (single EDF)</p> <p>21. Inspect gloves</p> <p>22. On EV1 GO, <b>PGT [B5 22.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive FSE A2, = 5 turns</p> <p>23. Remove EDF and install in landing location</p> <p>24. <b>PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive FSE A2, = 5 turns</p> <p><b><u>TEMP STOW ARM 2</u></b> (00:30)</p> <p>25. Give EV1 GO to remove Arm 2</p> <p>26. Verify Arm 2 clear of structure</p> <p>27. Mate Arm 2 to temp stow bracket</p> <p>28. Install PIP pins into lug clevis interface (a minimum of 3 PIP pins must be installed)</p>

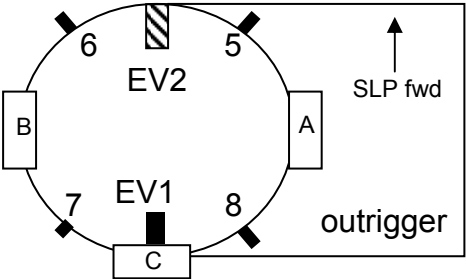
# SPDM ARM 1 STOW (01:00)

IV/SSRMS	EV1 – Ln (SSRMS)	EV2 – Fm (FF)
<p>1. SSRMS mnvr to SPDM BODY BOLT REMOVAL posn</p> <p>2. SSRMS: take GCA for access to body bolts in the following order: FSE 2, FSE 4, FSE 5, FSE 3</p> <p>3. SSRMS mnvr to ARM 1 EDF REMOVAL posn</p>  <p>SPDM arm tether point</p> <p>4. SSRMS mnvr to ARM 1 HANDOFF posn</p>	<p><b>RELEASE SPDM BODY FSE BOLTS (4 of 5) (00:30)</b></p> <ol style="list-style-type: none"> <li>SSRMS mnvr to SPDM BODY BOLT REMOVAL posn</li> <li>GCA for access to body bolts in the following order: FSE 2, FSE 4, FSE 5, FSE 3</li> <li>Release SPDM body bolts             <ol style="list-style-type: none"> <li><b>PGT [RCCW MTL 30.5]-6 ext 7/16</b>; break torque on FSE bolts, ~33.0 ft-lb, ~1 - 2 turn (Use ratchet wrench if reqd)</li> <li><b>PGT [MTR A7 9.2 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; release SPDM FSE bolts, ~17.5 turns                 <ul style="list-style-type: none"> <li><input type="checkbox"/> FSE 2</li> <li><input type="checkbox"/> FSE 4</li> <li><input type="checkbox"/> FSE 5</li> <li><input type="checkbox"/> FSE 3</li> </ul> </li> </ol> </li> </ol> <p><b>RELEASE ARM 1 EDFs (00:25)</b></p> <ol style="list-style-type: none"> <li>SSRMS mnvr to ARM 1 EDF REMOVAL posn (A7 and A8)</li> <li><b>PGT [B5 22.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive FSE A7, = 5 turns</li> <li>Remove EDF and install in landing location</li> <li><b>PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>, Drive FSE A7, ~5 turns</li> <li>Install <u>sq scoop/D-handle</u> on Arm 1 microfixture (handle pointing SLP L, leave RET on sq scoop)</li> <li>Remove RET from ratchet wrench; attach to Arm 1 tether point (use Adj Eq Tether for ratchet, if desired)</li> <li><b>PGT [B5 22.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive FSE A8, = 5 turns</li> <li>Set PGT to <b>[B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]</b></li> <li>Maintain positive control of arm</li> <li>Remove EDF and install in landing location</li> <li><b>PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive FSE A8, ~5 turns</li> <li>Slide Arm 1 inboard in FSE; rotate sq scoop/D-handle 180 deg on microfixture (so that handle points SLP R)</li> </ol> <p><b>TEMP STOW ARM 1 (00:05)</b></p> <ol style="list-style-type: none"> <li>Remove Arm 1 from FSE; use EDF brackets to verify alignment</li> <li>SSRMS mnvr to ARM 1 HANDOFF posn</li> <li>Transfer <u>Arm 1</u> to EV2</li> <li>Re-attach RET to ratchet wrench</li> <li>Inspect gloves (during translation)</li> </ol>	<p><b>REMOVE/STOW BODY KA UMBILICAL #2 (00:30)</b></p> <ol style="list-style-type: none"> <li>Translate to body KA #2; BRT to HH 0025</li> <li>Close OTCM 2 clamp(s) if reqd for M/DM, EDF access             <ul style="list-style-type: none"> <li><input type="checkbox"/> <b>PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive OTCM 2 clamp bolts (FSE O3, FSE O2) ~9.25 turns <i>N 10-11 turns</i></li> </ul> </li> <li>Ratchet wrench – 2 ext 7/16, ccw; drive mate/demate mechanism A, B, C ~0.75 turns to hard stop</li> <li>Ratchet wrench – 2 ext 7/16, ccw, drive umbilical EDF #7 = 2.5 turns</li> <li><b>PGT [A3 4.8 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive umbilical EDF #5, #6, #8 = 2.5 turns</li> <li>Move KA umbilical EDFs (4) to soft dock</li> <li>Relocate Body KA umbilical to stowage bracket (magnetic soft dock)</li> <li>Move stowage bracket PIP pins (3 of 4) from stowage location to landing location (≤ 22 lbf)</li> </ol> <p><b>RELEASE ARM 1 EDFs (00:25)</b></p> <ol style="list-style-type: none"> <li>Translate to ARM 1 EDF FSE A9 (single EDF)</li> <li><b>PGT [B5 22.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive FSE A9, = 5 turns</li> <li>Remove EDF and install in landing location</li> <li><b>PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive FSE A9, ~5 turns</li> <li>Tether and stow <u>ratchet wrench</u> in C/Lk bag</li> <li>Tether and relocate <u>APFR</u> from SLP WIF 03 to WIF 01 (9, KK, G, 4)             <ul style="list-style-type: none"> <li><input type="checkbox"/> Pull test</li> <li><input type="checkbox"/> Verify lock collar black on black</li> <li><input type="checkbox"/> Release tether</li> </ul> </li> <li>Ingress APFR, stow ingress aid</li> <li>Inspect gloves</li> <li>Adjust glove heaters, visor, cooling prior to receiving Arm</li> </ol> <p><b>TEMP STOW ARM 1 (00:20)</b></p> <ol style="list-style-type: none"> <li>Verify Arm 1 clear of structure</li> </ol> <ol style="list-style-type: none"> <li>Receive <u>Arm 1</u>; RET to sq scoop/D-handle</li> </ol>

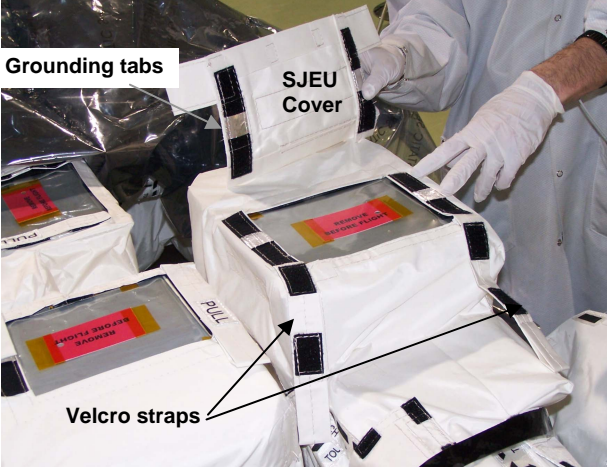
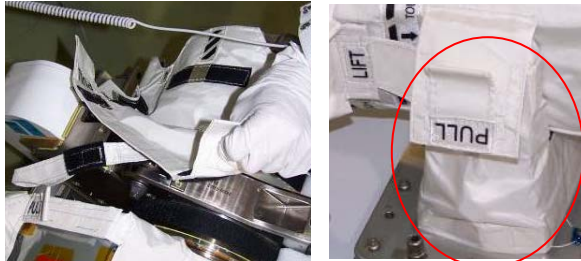
# SPDM ARM INSTALLATION (01:50)

IV/SSRMS	EV1 – Ln (SSRMS)	EV2 – Fm (FF)																									
<p>5. SSRMS mnvr to BODY ROTATION START posn</p> <p>6. SSRMS mnvr to BODY ROTATION END posn</p> <p>7. ✓SPDM locking pin engaged via ISS camera CP09</p> <p>8. SSRMS mnvr to ARM 1 EDF INSTALL posn</p> <table border="1" data-bbox="94 846 709 1024"> <thead> <tr> <th>Arm 1 EDF</th> <th>Initial torque (9.2 ft-lb)</th> <th>Initial turns</th> <th>Final torque (19.4 ft-lb)</th> <th>Final turns</th> </tr> </thead> <tbody> <tr> <td>7</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>8</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> 	Arm 1 EDF	Initial torque (9.2 ft-lb)	Initial turns	Final torque (19.4 ft-lb)	Final turns	7					5					6					8					<p><b>RELEASE SPDM BODY BOLT FSE 1</b> (00:05)</p> <ol style="list-style-type: none"> <li>SSRMS mnvr to BODY ROTATION START posn</li> <li>Tether and relocate <u>Sq scoop</u> from microfixture FSE 2 to FSE 1 (handle pointing SLP left, leave on MWS RET)</li> <li><b>PGT [RCCW, MTL 30.5]-6 ext 7/16</b>, break torque on FSE 1, ~33.0 ft-lb, ~1 - 2 turn (use ratchet if reqd)</li> <li><b>PGT [MTR A7 9.2 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16</b>, release FSE 1, ~17.5 turns</li> </ol> <p><b>ROTATE SPDM</b> (00:10)</p> <p style="text-align: center;"><u>NOTE</u> Once lock-pin engaged, avoid applying loads to SPDM Body</p> <ol style="list-style-type: none"> <li>Grasp sq scoop; SSRMS mnvr to BODY ROTATION END posn</li> <li>After rotation complete, verify self-locking pin in ENGAGED position using visual cue on retention assembly</li> <li>Retrieve <u>sq scoop</u> from FSE 1 microfixture; stow on MWS</li> </ol> <p><b>FASTEN ARM 1 TO SPDM BODY</b> (00:30)</p> <ol style="list-style-type: none"> <li>SSRMS mnvr to ARM 1 EDF INSTALL posn</li> <li>Use visual cues on clevis and lugs to assist EV2 with proper alignment</li> <li>Insert EDFs (2) into Arm 1/shoulder interface</li> </ol> <ol style="list-style-type: none"> <li><b>PGT [A7 9.2 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive EDFs #7, 8 (coordinate with IV/EV2 to drive opposite pairs), ~2 turns</li> <li><b>PGT [B4 19.4 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive EDFs #7, 8 (coordinate with IV/EV2 to drive opposite pairs), ~0.5 turns</li> <li>Perform light tug test on EDF #7, #8</li> </ol>	<p><b>FASTEN ARM 1 TO SPDM BODY</b> (00:30)</p> <ol style="list-style-type: none"> <li>Move Arm 1 into position on SPDM body and engage soft dock</li> <li>When 2 EDFs engaged, remove <u>sq scoop/D-handle</u>; stow on MWS</li> <li>Secure Velcro flaps (4) over double EDF holes</li> <li>Egress APFR; translate to Arm 1 shoulder interface</li> <li>Install <u>sq scoop/D-handle</u> on SPDM body (between EDF 5 and 6)</li> <li>Insert EDFs (2) into Arm 1 shoulder interface</li> <li><b>PGT [A7 9.2 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive EDFs #5, 6 (coordinate with IV/EV1 to drive opposite pairs), ~2 turns</li> <li><b>PGT [B4 19.4 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive EDFs #5, 6 (coordinate with IV/EV1 to drive opposite pairs), ~0.5 turns</li> <li>Perform light tug test on EDF #5, #6</li> </ol>
Arm 1 EDF	Initial torque (9.2 ft-lb)	Initial turns	Final torque (19.4 ft-lb)	Final turns																							
7																											
5																											
6																											
8																											

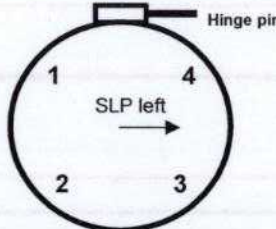
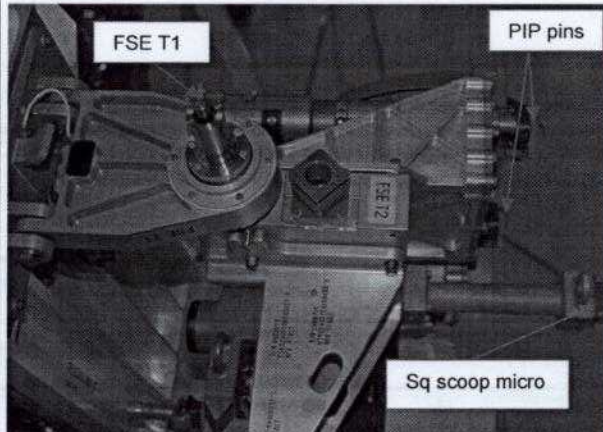
# SPDM ARM INSTALLATION (01:50)

IV/SSRMS	EV1 – Ln (SSRMS)	EV2 – Fm (FF)																									
<p>9. SSRMS mnvr to ARM 2 TEMP STOW posn</p> <table border="1" data-bbox="94 560 709 738"> <thead> <tr> <th>Arm 2 EDF</th> <th>Initial torque (9.2 ft-lb)</th> <th>Initial turns</th> <th>Final torque (19.4 ft-lb)</th> <th>Final turns</th> </tr> </thead> <tbody> <tr> <td>7</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>8</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>10. SSRMS mnvr to ARM 2 INSTALL posn</p> <p>11. SSRMS mnvr to ARM 2 EDF INSTALL posn</p>  <p>Arm 2 interface on SPDM body</p> <p>12. √MCC for SCU connect and cleanup times 13. Give MCC GO to restore SPDM heater power</p>	Arm 2 EDF	Initial torque (9.2 ft-lb)	Initial turns	Final torque (19.4 ft-lb)	Final turns	7					5					6					8					<p><b>MATE ARM 1/BODY CONNECTORS</b> (00:10)</p> <p>14. Ratchet wrench, – 2 ext 7/16, cw, drive mate/demate mechanism A,B,C ~0.75 turns 15. Transfer <u>ratchet wrench</u> to EV2</p> <p><b>ARM 1 CLEANUP</b> (00:05)</p> <p>16. Transfer <u>sq scoop</u> to EV2 17. Tether and receive <u>sq scoop/D-handle</u> from EV2 18. Inspect gloves (during translation)</p> <p><b>REMOVE ARM 2 FROM TEMP STOW BRACKET</b> (00:15)</p> <p>19. SSRMS mnvr to ARM 2 TEMP STOW posn; install <u>sq scoop/D-handle</u> (scoop handle pointing SLP R) 20. Relocate tether to Arm tether point 21. Give EV2 GO to remove PIP pins</p> <p><b>FASTEN ARM 2 TO SPDM BODY</b> (00:35)</p> <p>22. SSRMS mnvr to ARM 2 INSTALL posn</p> <p>23. Move Arm 2 into position on SPDM body and engage soft dock</p> <p>24. Relocate tether to sq scoop/D-handle 25. Remove <u>sq scoop/D-handle</u> from micro-fixture; stow on BRT 26. SSRMS mnvr to ARM 2 EDF INSTALL posn 27. Insert remaining EDFs into Arm 2 shoulder interface 28. <b>PGT [A7 9.2 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive EDFs #7, 8 (coordinate with IV/EV2 to drive opposite pairs), ~2 turns 29. <b>PGT [B4 19.4 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive EDFs #7, 8 (coordinate with IV/EV2 to drive opposite pairs), 4 total, ~0.5 turns 30. Perform light tug test on EDF #7, #8</p> <p><b>MATE ARM 2/BODY CONNECTORS</b> (00:10)</p> <p>31. Receive ratchet wrench from EV2 (on EV2 RET) 32. Ratchet wrench – 2 ext 7/16, cw, drive mate/demate mechanism A,C ~0.75 turns 33. Transfer ratchet wrench to EV2</p>	<p><b>MATE ARM 1/BODY CONNECTORS</b> (00:10)</p> <p>10. Tether and receive <u>ratchet wrench</u>; stow on MWS</p> <p><b>ARM 1 CLEANUP</b> (00:05)</p> <p>11. Tether and receive <u>sq scoop</u> from EV1 12. Remove <u>sq scoop/D-handle</u> from micro; transfer to EV1 13. Inspect gloves</p> <p><b>REMOVE ARM 2 FROM TEMP STOW BRACKET</b> (00:15)</p> <p>14. Translate to Arm 2 stowage bracket</p> <p>15. On EV1 GO remove PIP pins from lug/clevis interface 16. When Arm clear; stow PIP pins in landing location</p> <p><b>FASTEN ARM 2 TO SPDM BODY</b> (00:35)</p> <p>17. Install <u>sq scoop</u> on body microfixture FSE 3 (handle pointing into SLP) 18. Use visual cues on clevis and lugs to assist EV1 with proper alignment 19. Insert at least 2 EDFs into Arm 1 shoulder interface</p> <p>20. <b>PGT [A7 9.2 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive EDFs #5, 6 (coordinate with IV/EV1 to drive opposite pairs), ~2 turns 21. <b>PGT [B4 19.4 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive EDFs #5, 6 (coordinate with IV/EV1 to drive opposite pairs), ~0.5 turns 22. Perform light tug test on EDF #5, #6</p> <p><b>MATE ARM 2/BODY CONNECTORS</b> (00:10)</p> <p>23. Ratchet wrench – 2 ext 7/16, cw, drive mate/demate mechanism B ~0.75 turns 24. Transfer ratchet wrench to EV1 (on EV2 RET) 25. Stow ratchet wrench on MWS</p>
Arm 2 EDF	Initial torque (9.2 ft-lb)	Initial turns	Final torque (19.4 ft-lb)	Final turns																							
7																											
5																											
6																											
8																											

## SPDM COVER REMOVAL (01:10)

IV/SSRMS	EV1 – Ln (SSRMS)	EV2 – Fm (FF)
<ol style="list-style-type: none"> <li>1. SSRMS take GCA for access to Arm 2 single EDF flaps (2)</li> <li>2. SSRMS mnvr to EP 2 THERMAL BLANKET REMOVAL posn</li> <li>3. SSRMS mnvr to ARM 2 SOCK REMOVAL posn</li> <li>4. SSRMS mnvr to EP 1 THERMAL BLANKET REMOVAL posn</li> </ol>	<p><b>REMOVE THERMAL BLANKETS FROM ARM/OTCM</b> (01:10)</p> <ol style="list-style-type: none"> <li>1. Tether and receive <u>Lg trash bag</u> from EV2; stow on MWS</li> <li>2. Transfer <u>sq scoop/D-handle</u> to EV2</li> <li>3. Inspect gloves (during translation)</li> <li>4. As time permits, tether and remove the following blankets and stow in Lg trash bag; swap <u>Lg trash bags</u> w/EV2 as reqd:             <ol style="list-style-type: none"> <li>a. GCA for access to Arm 2 single EDF Velcro flaps (2) Secure Arm 2 EDF Velcro flaps over single EDF holes (2)</li> <li>b. SSRMS mnvr to EP 2 THERMAL BLANKET REMOVAL posn Tether and remove EP 2 blanket (aft)</li> <li>c. SSRMS mnvr to ARM 2 SOCK REMOVAL posn Tether and remove Arm 2 sock (\wrap blanket rolled down)</li> <li>d. Install remaining 2 Velcro straps from SJEU blanket 2.7</li> <li>e. Replace MLI flaps (4) over Arm 2 wrist clamp interface (attach solid line and barber pole sides first)</li> <li>f. If reqd, tether and remove SJEU cover 2.5</li> <li>g. SSRMS mnvr to EP 1 THERMAL BLANKET REMOVAL posn Tether and remove EP 1 blanket (fwd)</li> </ol> </li> </ol> <p><b>SJEU BLANKET REMOVAL STEPS</b></p> <ul style="list-style-type: none"> <li>• Press on any 'PRESS' label to ground blanket</li> <li>• Attach RET to tether loop</li> <li>• Remove OSE blanket off Arm and stow in lg trash bag</li> <li>• Fold over Velcro flaps to cover joint thermal blanket grounding patches (4 total)</li> </ul> <p><b>ELECTRONICS PLATFORM OSE BLANKET REMOVAL STEPS</b></p> <ul style="list-style-type: none"> <li>• Attach RET to OSE thermal blanket tether loop</li> <li>• Release all quarter-turn fasteners and lift corresponding tabs (14 total)</li> <li>• Remove OSE blanket from Electronics Platform and stow in Lg trash bag</li> <li>• Fold over Velcro flaps to cover thermal blanket grounding patches (2 total)</li> </ul>	<p><b>CONFIGURE ARM 2 SHOULDER MLI</b> (00:15)</p> <ol style="list-style-type: none"> <li>1. Transfer HH 0020 <u>Lg trash bag</u> to EV1 (leave RET on bag)</li> <li>2. Tether and receive <u>sq scoop/D-handle</u>; stow on BRT</li> <li>3. Replace MLI over shoulder clamp interface (attach solid line and barber pole sides first)</li> <li>4. Tether and remove Arm 2 <u>SJEU blanket #2.1, 2.2, and 2.5</u> (use ratchet wrench RET); stow behind MWS (remove 2.3 and 2.4, if not previously performed)</li> <li>5. Verify 4 straps installed on each SJEU interface</li> <li>6. Leave sq scoop on FSE 3</li> <li>7. Inspect gloves</li> <li>8. Translate to HH 0005; stow SJEU covers in Lg trash bag</li> <li>9. Attach C/Lk bag RET to ratchet; release ratchet from MWS</li> <li>10. Stow <u>ratchet wrench</u> in C/Lk bag</li> </ol> <p><b>CONFIGURE ARM 1 SHOULDER/ELBOW MLI</b> (00:15)</p> <ol style="list-style-type: none"> <li>11. Secure Arm 1 EDF Velcro flaps over single EDF holes (2), translate on APFR/ingress aid</li> <li>12. Fully retract ingress aid and fold against bootplate</li> <li>13. Tether and remove Arm 1 <u>SJEU blanket #1.1</u>; stow in Lg trash bag</li> <li>14. Translate to Arm 1 shoulder; install D-handle/sq scoop on SPDM body microfixture (between EDF 5 and 6)</li> <li>15. Replace MLI over shoulder clamp interface (attach solid line and barber pole sides first)</li> <li>16. Tether and remove Arm 1 <u>SJEU blanket #1.2, 1.5</u>; stow behind MWS</li> <li>17. Tether and remove <u>D-handle/sq scoop</u> from micro; stow on BRT</li> <li>18. Translate to HH 0005, stow SJEU covers in Lg trash bag</li> <li>19. Swap <u>Lg trash bags</u> with EV1; as reqd</li> </ol> <p><b>SLP CLEANUP</b> (00:40)</p> <ol style="list-style-type: none"> <li>20. Perform <b>SLP CLEANUP</b> tasks as time permits</li> </ol>
 <p>SJEU MLI (blanket and straps)</p>		 <p>Wrist clamp interface MLI      Arm EDF blanket flap</p>

# GET-AHEAD – SLP CLEANUP

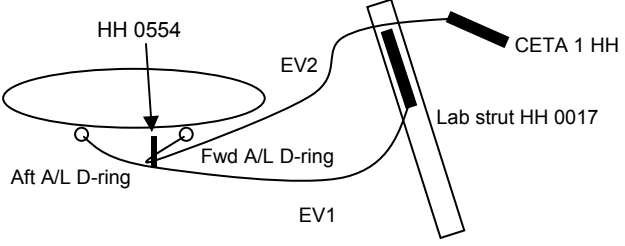
IV	EV1/EV2 (FF)
 <p>OTF EDFs</p>  <p>THA in FSE</p>	<p><b>OTP PREP (after lower Arm 1 SJEU covers removed)</b> (00:10)</p> <ol style="list-style-type: none"> <li>1. PGT [B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16; drive OTP FSE bolts 'FSE OTP2' (closest to POA), ~21 turns</li> <li>2. Install sq scoop/D-handle on OTP micro-fixture (FSE OTP2, hinge side) pointing SLP right (towards SPDM attach interface)</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b></p> <p>Do not perform simultaneous FF tasks on SLP fwd half. During OTP EDF removal, the second CM must stay SLP aft of the midline between WIFs 001 and 007</p> </div> <p><b>RELEASE OTP EDFs</b> (anytime) (00:15)</p> <ol style="list-style-type: none"> <li>3. PGT [B4 19.4 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16; drive EDFs (4) = 5 turns</li> <li>4. Move EDFs (4) to soft dock (leave EDF #4 in soft dock, do not move to MLI loop until EVA 3)</li> </ol> <p><b>THA PREP</b> (after lower Arm 2 SJEU covers removed) (00:10)</p> <ol style="list-style-type: none"> <li>5. Tether and relocate sq scoop from FSE 03 (Arm 2 outrigger) to THA long micro (handle points into SLP)</li> <li>6. Move RMCT launch restraint PIP pins (2) to 'stow' posn</li> <li>7. PGT [B5 22.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16; drive captive EVA lockout bolt on pivot bracket 'FSE T1', ~23.5 turns</li> <li>8. Rotate THA FSE pivot bracket 90 deg; engage soft dock</li> </ol> <p><b>OTCM 1 FSE CLEANUP</b> (prior to THA install) (00:20)</p> <ol style="list-style-type: none"> <li>9. Translate to OTCM 1 FSE; if reqd, install sq scoop on SPDM body and attach BRT</li> <li>10. Place OTCM KA umbilical on stowage bracket</li> <li>11. PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16; drive KA umbilical connector tie-down bolt (FSE O4), ~7.25 turns <i>~10-11 turns</i></li> <li>12. Rotate OTCM clamps (2) to launch/landing position</li> <li>13. PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16; drive OTCM 1 clamp bolts (FSE O5, FSE O6) ~8.75 turns <i>~10-11 turns</i></li> <li>14. Pull OTCM tent blanket through clamps, mate Velcro</li> <li>15. Remove and stow sq scoop</li> </ol> <p><b>OTCM 2 FSE CLEANUP</b> (anytime) (00:20)</p> <ol style="list-style-type: none"> <li>16. Translate to OTCM 2 FSE; if reqd, install sq scoop on SPDM body and attach BRT</li> <li>17. Place OTCM 2 KA umbilical on stowage bracket</li> <li>18. PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16; drive KA umbilical connector tie-down bolt (FSE O1), ~7.25 turns <i>~10-11 turns</i></li> <li>19. Rotate OTCM clamps (2) to launch/landing position</li> <li>20. PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16; drive OTCM 2 clamp bolt (FSE O2) ~9.25 turns <i>~10-11 turns</i></li> <li>21. PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16; drive OTCM 2 clamp bolt ( FSE O3) ~8.75 turns <i>~10-11 turns</i></li> <li>22. Pull OTCM tent blanket through clamps, mate Velcro</li> <li>23. Remove and stow sq scoop</li> </ol>

GET-AHEAD – SLP CLEANUP (Cont)

IV	EV1/EV2 (FF)
	<p><b>SECURE ARM FSE ROLL CLAMPS</b> (after Arms removed) (00:10 per clamp)</p> <ol style="list-style-type: none"><li>24. Complete the following steps for the clamps listed below</li><li>25. Translate to roll clamp</li><li>26. If reqd, release restraining Velcro straps</li><li>27. Rotate clamp to launch/landing position</li><li>28. <b>PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16; drive FSE bolt <del>-9.75 turns</del> ~10-11 turns</b><ul style="list-style-type: none"><li><input type="checkbox"/> ARM 2 SHOULDER (FSE A1)</li><li><input type="checkbox"/> ARM 2 WRIST (FSE A5)</li><li><input type="checkbox"/> ARM 1 WRIST (FSE A6) – prior to THA install</li><li><input type="checkbox"/> ARM 1 SHOULDER (FSE A10)</li></ul></li></ol> <p><b>REMOVE THERMAL BLANKETS FROM CLA</b> (after PET 03:00) (00:05)</p> <ol style="list-style-type: none"><li>29. Tether and remove OSE blanket from CLA, stow in Lg trash bag</li><li>30. Close grounding flaps to cover tabs on CLA</li></ol>



## EVA 2 CLEANUP/INGRESS (00:45)

IV/SSRMS	EV1 – Ln (FF)	EV2 – Fm (FF)
<ol style="list-style-type: none"> <li>1. SSRMS mnvr to APFR EGRESS posn</li> <li>2. SSRMS mnvr to APFR REMOVAL posn</li> </ol>  <p>Post-EVA 2 safety tether configuration</p> <ol style="list-style-type: none"> <li>3. Perform WVS PWRDN (P/TV, <u>WVS Cue Card</u>)</li> </ol>	<p><b>CLEANUP</b> (00:30)</p> <ol style="list-style-type: none"> <li>1. SSRMS mnvr to APFR EGRESS posn (HH 001)</li> <li>2. Egress APFR</li> <li>3. SSRMS mnvr to APFR REMOVAL posn</li> <li>4. Tether swap to 85-ft S0 safety tether <ul style="list-style-type: none"> <li>☐ Verify hook locked, reel unlocked</li> </ul> </li> <li>5. Stow 55-ft safety tether on WIF 1 APFR</li> <li>6. Perform remaining SLP cleanup steps as time permits</li> <li>7. Inspect gloves; don overgloves</li> <li>8. Tether, BRT, and relocate SSRMS <u>APFR</u> to CETA 1 WIF 4 (12,PP,F,6) <ul style="list-style-type: none"> <li>☐ Pull test</li> <li>☐ Verify lock collar black on black</li> <li>☐ Release tether</li> </ul> </li> <li>9. Perform tool inventory</li> <li>10. Translate to A/L (fairlead at A/L HH 0554)</li> </ol> <p><b>INGRESS</b> (00:15)</p> <ol style="list-style-type: none"> <li>11. On EV2 GO, release EV2 85-ft safety tether LAS; stow on fwd A/L D-ring</li> <li>12. Release EV2 waist tether from ERCM; transfer to EV2</li> <li>13. Attach EV1 L waist tether to A/L D-ring extender <ul style="list-style-type: none"> <li>☐ Verify hook locked</li> </ul> </li> <li>14. Release 85-ft safety tether LAS; stow on A/L aft D-ring</li> <li>15. Release R waist tether from 85-ft safety tether ERCM; stow on MWS</li> <li>16. Ingress A/L</li> <li>17. Close thermal cover, attach Velcro strap</li> <li>18. Remove SCU from stowage pouch</li> <li>19. Remove DCM cover, Velcro to DCM</li> <li>20. Connect SCU DCM, √SCU locked</li> <li>21. Water – OFF (fwd); expect H2O IS OFF msg</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>22. Verify no hardware blocking hatch</li> <li>23. EV Hatch Handle – Preclose (black pie region)</li> <li>24. EV Hatch – close and lock</li> <li>25. Go to <u>PRE-REPRESS</u> Cue Card</li> </ol>	<p><b>CLEANUP</b> (00:30)</p> <ol style="list-style-type: none"> <li>1. Translate to SLP HH 0005; tether and stow <u>Lg trash</u> bag on swing arm</li> <li>2. If OTP prep was not performed, stow <u>D-handle/sq scoop</u> in C/Lk bag</li> <li>3. Perform tool and bag inventory</li> <li>4. Inspect gloves; don overgloves</li> <li>5. Release fairlead from POA; stow Adj on MWS</li> <li>6. Translate to A/L (fairlead at A/L HH 0554)</li> </ol> <p><b>INGRESS</b> (00:15)</p> <ol style="list-style-type: none"> <li>7. Open A/L Thermal Cover</li> <li>8. Ingress A/L</li> <li>9. Attach Waist Tether (R) to UIA, verify hook locked</li> <li>10. Give EV1 GO to release 85-ft safety tether LAS</li> <li>11. Receive L waist tether; stow on MWS</li> <li>12. Remove SCU from stowage pouch</li> <li>13. Remove DCM cover, Velcro to DCM</li> <li>14. Connect SCU DCM, √SCU locked</li> <li>15. Water – OFF (fwd); expect H2O IS OFF msg</li> </ol>

## POST EVA 2 TOOL CONFIG

### EV1

- MWS
- BRT (L)
- RET (eq-eq)
- T-Bar
- RET (eq-eq)
- RET (eq-eq) w/PIP pin
- Adj Equip Tether
- Wire Tie (2)
- STS Small Trash bag
- Adj Eq tether (clove-hitched on strap, hooks in bag)
- Lg trash bag
- RET (eq-eq)
- Swing Arm (R)
- PGT
- PGT Battery
- 7/16 (wobble) socket-6 ext
- RET (eq-eq)
- Waist Tether (2) (L – extender, R – D-ring)
- D-ring Extender (2)
- SAFER
- WVS
- Overgloves (2) donned

### EV2

- MWS
- BRT (L)
- RET (eq-eq)
- Wire Ties
- T-Bar
- RETs (eq-eq) w/PIP pin
- RETs (eq-eq) (2)
- Adj Equip Tether (2) (1 from POA)
- Wire Tie (2)
- ISS Small Trash bag
- Adj Eq Tether (clove-hitched, hooks in bag)
- Swing Arm (R)
- PGT
- PGT Battery
- 7/16 (wobble) socket-6 ext
- RET (eq-eq)
- Lg trash bag
- RET (eq-eq)
- Waist Tether (2) (L – D-ring, R – extender)
- D-ring Extender (2)
- SAFER
- WVS
- Overgloves (2) donned

### AIRLOCK CONFIG

- Staging Bag
- Fuse Tether
- PGT
- PGT Battery
- Wire Tie Caddy
- RAD
- Connector Cleaner Tool Kit
- Probe
- Connector Pin Straightener
- Velcro/Tape Caddy
- IV Bag
- Towels (2)
- Contamination Detection Kit
- GP Caddy (2)
- Adj Thermal Mittens (2)
- Socket Caddy (hatch cont) w/RET (eq-eq)
- 1/2 Socket-8 ext
- 7/16 (wobble) Socket-6 ext (spare)
- DCM Plug (SAFER Hardmount) (2)
- D-ring extender on internal D-ring
- 760 digital camera and mount (tie wrapped)
- RET (eq-lg)

### AIRLOCK EXTERIOR

- CETA 1 HH 85-ft Safety Tethers anchor point
- HH 17 (S0/Lab strut) 85-ft Safety Tethers anchor point

### LAB

- APFR (11,QQ,A,12), WIF 11

### SSRMS

- WIF adapter w/PIP pin

### SPDM/SLP

- APFR (9,KK,G,4) w/ingress aid, WIF 01
- 55-ft safety tether
- EVA Crewlock Bag #2 (SLP HH 0005 & 0006)**
- Ratchet wrench (2)
- 7/16 Socket-2 ext (2)
- D-handle/Sq scoop (if get-ahead not performed)
- RET (eq-eq)
- Adj Equip Tether (eq-eq) (outside bag)

### THA

- Sq scoop

### OTP

- D-Handle/Sq Scoop

### CETA CARTS

- APFR, CETA 1 WIF 4 (12,PP,F,6)

### **EVA Crewlock Bag #3 (S0 HH 3492 & Lab Strut HH 7)**

- ISS bungee caddy
- Adj Eq Tether (clove hitched to caddy)
- Spare EDFs #1, #2, #3 (1 of each)
- Hammer
- Compound Cutters
- OHT (spare)
- RET (eq-eq)
- Prybar
- RET (eq-eq)
- Ballstack
- Adj Eq Tether (eq-eq) (outside bag)

## ARM STOW/INSTALL – TASK DATA

### Estimated Task Duration:

	With SSMS	Without SSRMS
One EV Crew	NA	NA
Two EV Crew	05:05	NA

### Tools:

EV1 (SSRMS/FF)	EV2 (FF)
PGT 6-in ext – 7/16	PGT 6-in ext – 7/16
Ratchet wrench 2-in ext – 7/16	EVA C/Lk bag
Sq Scoop	Ratchet wrench 2-in ext – 7/16
D-Handle	Large Trash Bag

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Mate/Demate Connector	A-E	7/16	20	4.9	< 5.0	N/A	0.75	N/A
Arm wrist/shoulder roll clamps	FSE A6, A10, A5, A1	7/16	4	12.0	7.9	24.1	9.75	30
Arm Boom EDFs	FSE A7, A8, A9, A2, A3, A4	7/16	6	12.0	19.7	19.9	5	30
Arm/shoulder EDFs	5, 6, 7, 8	7/16	8	19.4	3.3	30.5	2.25-2.75	30
SPDM Body bolts	FSE 1-5	7/16	5	NA	33.0	N/A	16.5-17.5	30
OTP hinge pin	N/A	7/16	1	19.4	16.7	22.1	10.5	30

### Foot Restraints:

Task	WIF	APFR Setting
Arm 1 temp stow	SLP WIF 1	9, KK, G, 4

### ORUs/Loose items:

ORU/Item	Qty	Part Number	Mass (lb)	Volume (in <sup>3</sup> )
OTCM & Arm	2	51602-4000-1 51602-5001-1	776	45.6 x 139.75 x 25.3

### Notes:

1. If an EDF is released more than 2.5 turns, captive head can back off threads. Re-engage head with threads before driving with PGT

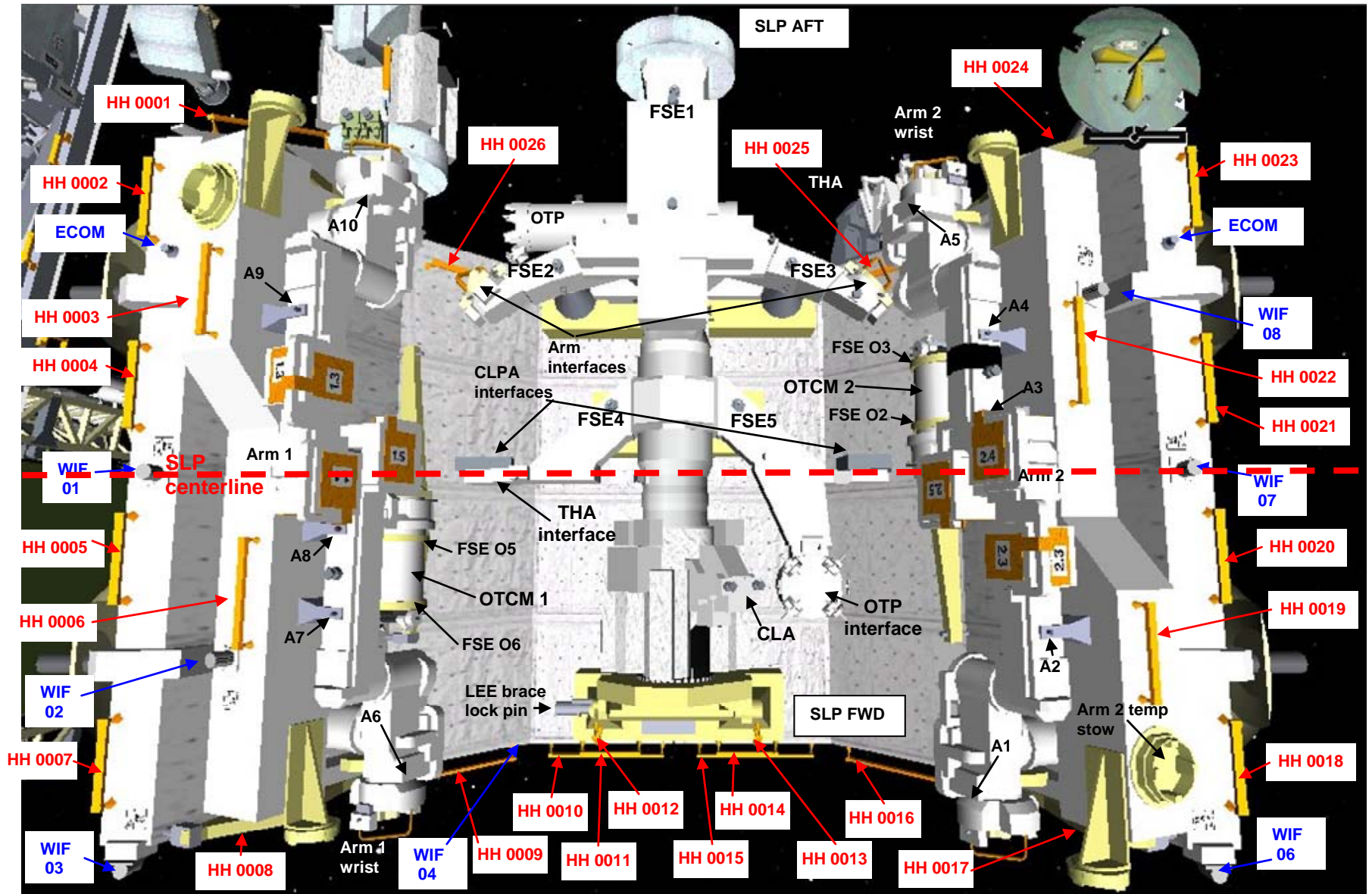
### Cautions:

1. Avoid contact with radiative surfaces on arm SJEU and EP
2. Do not exceed 5 ft-lb when actuating mate/demate mechanism
3. Do not apply loads to KAs until mate/demates are disconnected and 2 of 4 PIP pins are engaged
4. Avoid applying off-axis loads to EDF EVA nut when the EDF is unfastened. Fastener damage may result

### Warnings:

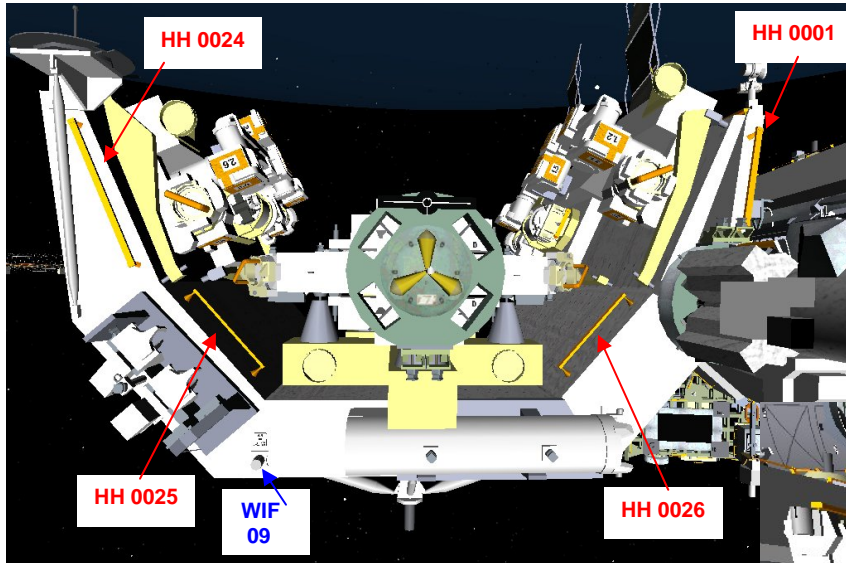
1. Keep translation rates below 0.6 ft/sec
2. Do not perform kick offs, quick grabs, shaking motions
3. APFR ops are limited to WIF 1 and 4 and must not have high accelerations, aggressive or quick movements, full or fast laybacks, or heavy ingress/egress
4. Do not perform simultaneous FF tasks (except OTCM 1 install or SJEU cover removal) on the fwd face (LEE pivot end) of SLP
5. Thermal hazard: maintain a 6-in keep-out zone from operating MSS lights
6. Ensure that power is turned off before ORU interfaces are broken. Failure to comply could result in electric shock to EVA crewmembers

# ARM STOW/INSTALL – TASK DATA (Cont)

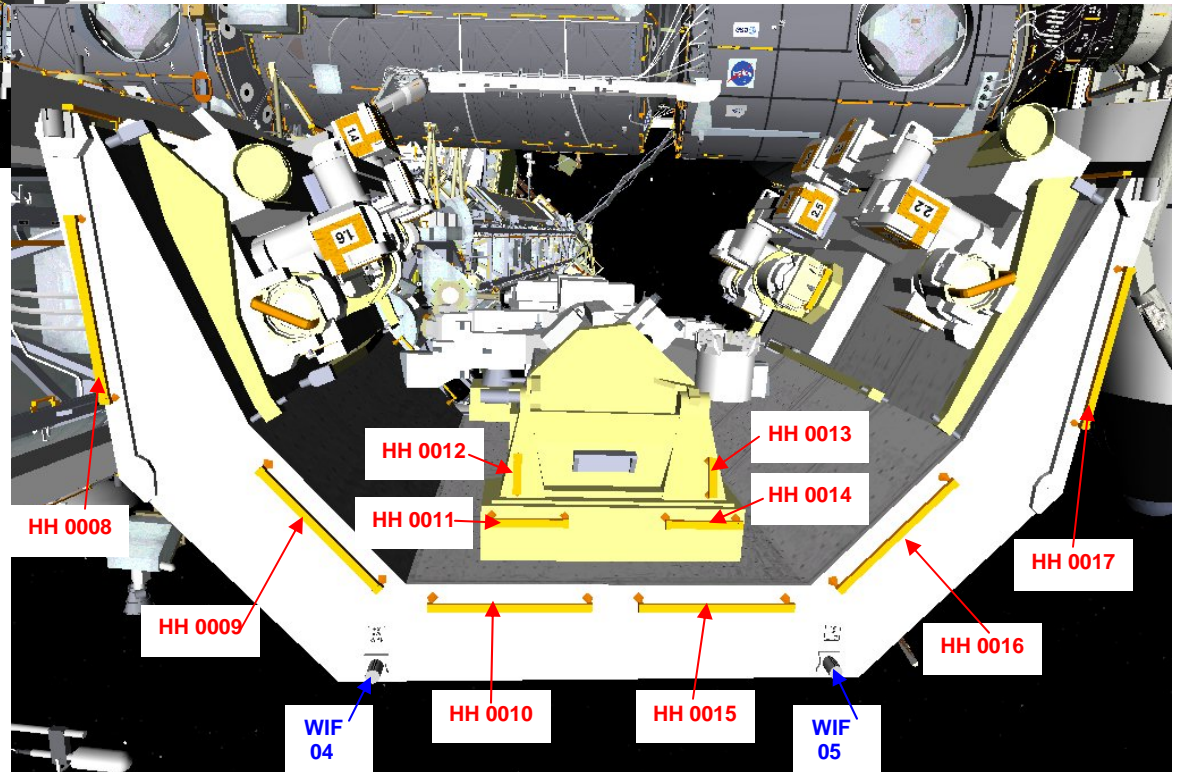


SPDM launch configuration

# ARM STOW/INSTALL – TASK DATA (Cont)

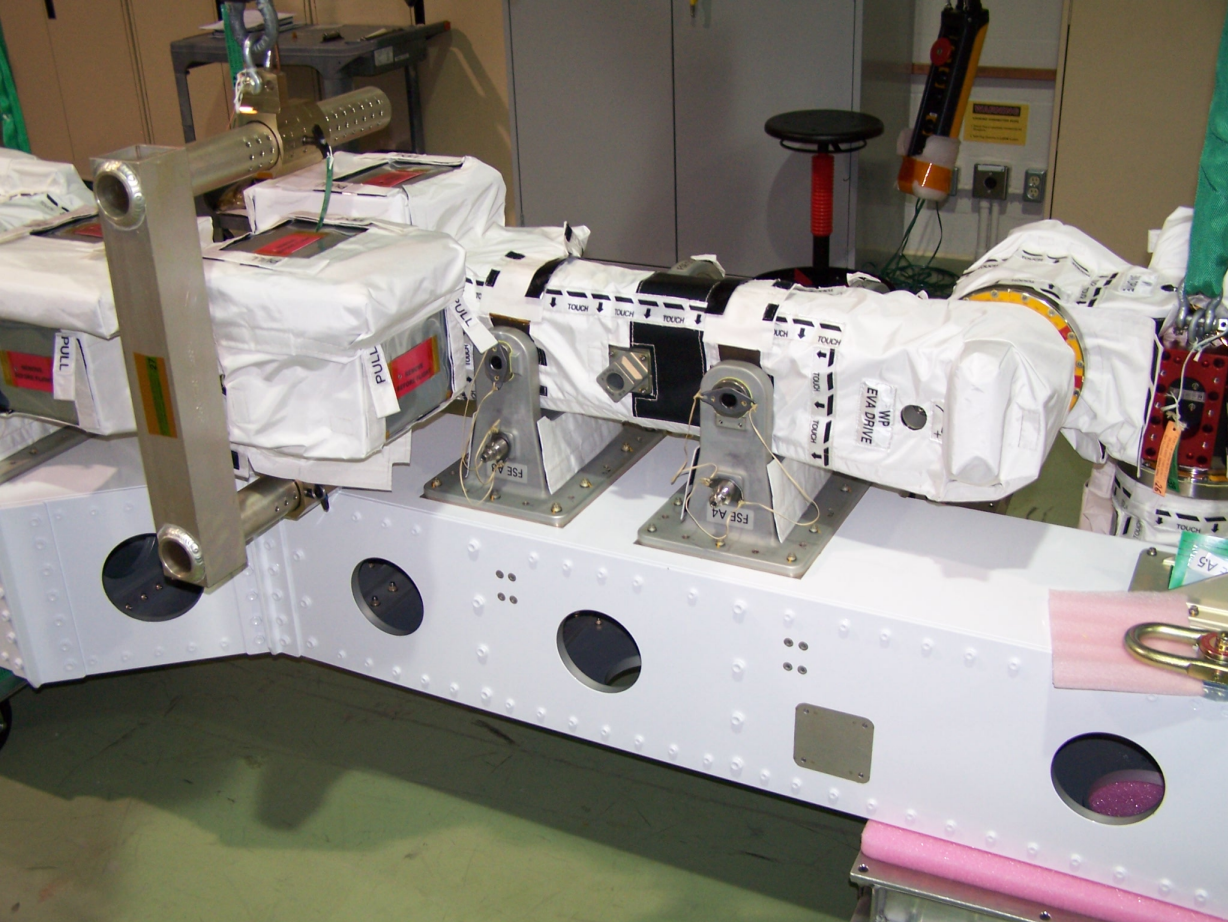


SLP Aft



SLP Fwd

ARM STOW/INSTALL – TASK DATA (Cont)



Arm 2 in SAPH w/EDFs in landing location

ARM STOW/INSTALL – TASK DATA (Cont)

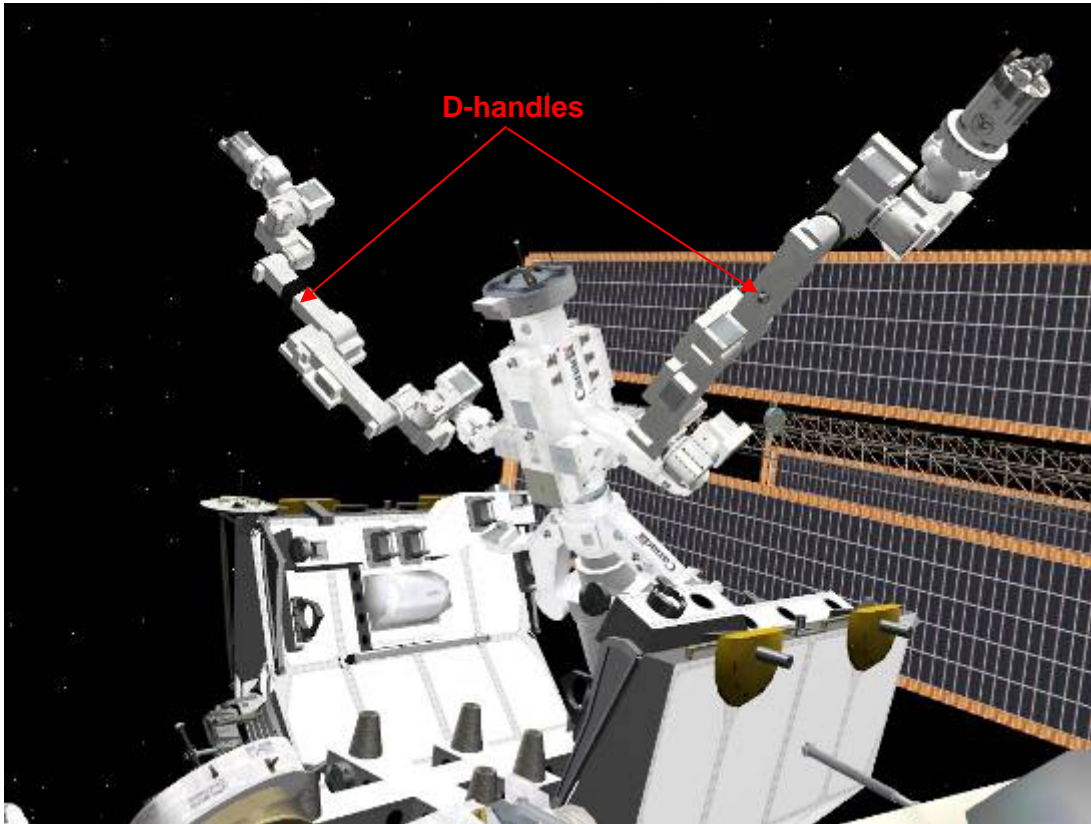


Arm 1 install location



LEE Brace Retention Assembly (disengaged)

## ARM STOW/INSTALL – TASK DATA (Cont)



Final Arm configuration – both D-handles point SLP aft. In temp stow position, Arm 2 D-handle will also be pointing SLP aft



## SPDM MLI REMOVAL/CLEANUP – TASK DATA

### Estimated Task Duration:

	With SSMS	Without SSRMS
One EV Crew	NA	NA
Two EV Crew	02:00	NA

### Tools:

EV1 (SSRMS)	EV2 (FF)
PGT 6-in ext – 7/16	PGT 6-in ext – 7/16
Sq Scoop	Lg trash bag
D-Handle	
Lg trash bag	

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
OTCM KA	FSE O1, O4	7/16	2	12.0	25.0	30.5	7.25	30
Arm wrist/shoulder roll clamps	FSE A6, A10, A5, A1	7/16	4	12.0	7.9	24.1	9.75	30
OTP FSE	FSE OTP 1, 2	7/16	2	N/A	27.92	N/A	21	30
OTCM Roll clamp FSE	FSE O2, O3, O5, O6	7/16	4	12.0	12.5	23.8	8.75-9.25	30
THA FSE tie-down bolt	FSE T1	7/16	1	12.0	17.9	26.0	23.5	30
OTP EDFs	1-4	7/16	4	25.5	16.7	33.0	5	30

### Notes:

1. If an EDF is released more than 2.5 turns, captive head can back off threads. Re-engage head with threads before driving with PGT
2. The lanyard on EDF #4 was extended to resolve the interference issue between the EDF and the hinge bolt. The lanyard will allow the EDF to pull out of the lug/clevis interface

### Cautions:

1. Avoid contact with radiative surfaces on arm SJEU and EP
2. Do not exceed 5 ft-lb when actuating mate/demate mechanism
3. Avoid applying off-axis loads to EDF EVA nut when the EDF is unfastened. Fastener damage may result

### Warnings:

1. Keep translation rates below 0.6 ft/sec
2. Do not perform kick offs, quick grabs, shaking motions
3. APFR ops are limited to WIF 1 and 4 and must not have high accelerations, aggressive or quick movements, full or fast laybacks, or heavy ingress/egress
4. Do not perform simultaneous FF tasks (except OTCM 1 install or SJEU cover removal) on the fwd face (LEE pivot end) of SLP
5. Thermal hazard: maintain a 6-in keep-out zone from operating MSS lights
6. Ensure that power is turned off before ORU interfaces are broken. Failure to comply could result in electric shock to EVA crewmembers

## SPDM MLI REMOVAL/CLEANUP – TASK DATA (Cont)

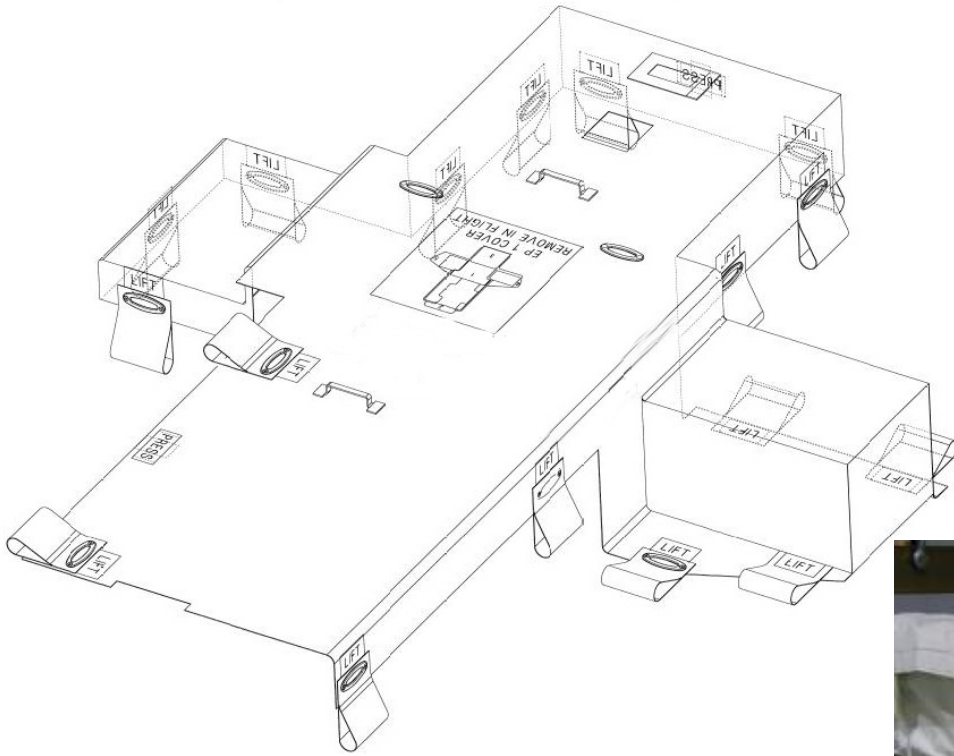


OTCM FSE landing configuration (before KA installed)



Wrist MLI (install barber poll and solid black line sides first)

# OTP/THA INSTALL AND MLI REMOVAL – TASK DATA (Cont)



EP 1 Cover – View 1



EP 1 Cover – View 2

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# STS-123 (1JA) EVA 3 TIMELINE

TIME (HR : MIN)	IV	1JA EVA 3 EV1 – Ln (SSRMS)	EV2 – Be (FF)
00:00 ---		<b>POST DEPRESS</b> (00:05)	<b>POST DEPRESS</b> (00:05)
		<b>A/L EGRESS AND SETUP</b> (00:40)	<b>A/L EGRESS AND SETUP</b> (00:30)
	<ul style="list-style-type: none"> <li>SSRMS mnvr to APFR INSTALL posn</li> <li>SSRMS mnvr to APFR INGRESS posn</li> </ul>	<ul style="list-style-type: none"> <li>Install APFR</li> <li>Ingress APFR</li> </ul>	<ul style="list-style-type: none"> <li>Relocate CLPA 2 to SLP</li> </ul>
	<ul style="list-style-type: none"> <li>SSRMS mnvr to THA HANDOFF posn</li> </ul>	<b>OTP/THA REMOVE/INSTALL</b> (01:15)	<b>OTP/THA REMOVE/INSTALL</b> (01:25)
01:00 ---	<ul style="list-style-type: none"> <li>SSRMS mnvr to OTP REMOVE posn</li> </ul>	<ul style="list-style-type: none"> <li>Receive THA from EV2</li> <li>Release OTP from SLP</li> </ul>	<ul style="list-style-type: none"> <li>Remove THA/Transfer to EV1</li> <li>Soft dock OTP EDFs</li> <li>Clean up Arm 1 wrist clamp</li> <li>Clean up Arm 1 OTCM FSE</li> <li>Perform SLP CLEANUP as time permits</li> <li>OTP install</li> </ul>
	<ul style="list-style-type: none"> <li>SSRMS mnvr to OTP INSTALL posn</li> <li>SSRMS mnvr to OTP EDF INSTALL posn</li> </ul>	<ul style="list-style-type: none"> <li>OTP install</li> </ul>	<ul style="list-style-type: none"> <li>THA SET restraint removal</li> <li>THA install</li> </ul>
	<ul style="list-style-type: none"> <li>SSRMS mnvr to THA INSTALL posn</li> </ul>	<ul style="list-style-type: none"> <li>THA SET restraint removal</li> <li>THA install</li> </ul>	
02:00 ---	<ul style="list-style-type: none"> <li>SSRMS mnvr for EP/Arm 2 blanket removal</li> </ul>	<b>ARM 2/EP BLANKET REMOVAL</b> (00:30)	<b>SLP CLEANUP</b> (01:15)
		<ul style="list-style-type: none"> <li>Remove any remaining EP/Arm 2 blankets</li> </ul>	<ul style="list-style-type: none"> <li>Clean up remaining wrist/shoulder clamps</li> </ul>
		<b>LWAPA TRANSFER</b> (01:00)	<ul style="list-style-type: none"> <li>Clean up remaining OTCM FSE</li> </ul>
	<ul style="list-style-type: none"> <li>SSRMS mnvr to LWAPA REMOVAL posn</li> </ul>	<ul style="list-style-type: none"> <li>LWAPA Retrieve</li> </ul>	<ul style="list-style-type: none"> <li>Remove CLA MLI</li> </ul>
03:00 ---	<ul style="list-style-type: none"> <li>SSRMS mnvr to LWAPA INSTALL posn</li> </ul>	<ul style="list-style-type: none"> <li>LWAPA Install</li> </ul>	<ul style="list-style-type: none"> <li>Remove Arm 1 sock/SJEU covers</li> </ul>
		<b>SSRMS YAW JOINT TRANSFER</b> (00:45)	<b>CLPA INSTALL</b> (00:40)
	<ul style="list-style-type: none"> <li>SSRMS mnvr to YAW JOINT RETRIEVAL</li> </ul>	<ul style="list-style-type: none"> <li>Yaw joint Retrieve</li> </ul>	<ul style="list-style-type: none"> <li>Install CLPA 2</li> </ul>
04:00 ---	<ul style="list-style-type: none"> <li>SSRMS mnvr to YAW JOINT INSTALL</li> </ul>	<ul style="list-style-type: none"> <li>Yaw joint Install</li> </ul>	<ul style="list-style-type: none"> <li>Stow bags</li> </ul>
		<b>DCSU TRANSFER</b> (01:30)	<b>MISSE 6 PEC INSTALL/DEPLOY</b> (02:00)
	<ul style="list-style-type: none"> <li>SSRMS mnvr to DCSU 1 RETRIEVAL</li> </ul>	<ul style="list-style-type: none"> <li>DCSU #1 Retrieve</li> </ul>	<ul style="list-style-type: none"> <li>Relocate EV1 Safety tether to ESP2</li> <li>Stow bags in A/L</li> </ul>
	<ul style="list-style-type: none"> <li>SSRMS mnvr to DCSU 1 INSTALL</li> </ul>	<ul style="list-style-type: none"> <li>DCSU #1 Install</li> </ul>	<ul style="list-style-type: none"> <li>Tether swap to Node 2 endcone</li> <li>Retrieve straight PEC (aft)</li> <li>Install straight PEC on LWAPA</li> <li>Retrieve bent PEC (fwd)</li> <li>Install bent PEC on LWAPA</li> <li>Mate connectors</li> </ul>
05:00 ---	<ul style="list-style-type: none"> <li>SSRMS mnvr to DCSU 2 RETRIEVAL</li> </ul>	<ul style="list-style-type: none"> <li>DCSU #2 Retrieve</li> </ul>	<ul style="list-style-type: none"> <li>Deploy PECs</li> <li>Photograph PECs</li> </ul>
	<ul style="list-style-type: none"> <li>SSRMS mnvr to DCSU 2 INSTALL</li> </ul>	<ul style="list-style-type: none"> <li>DCSU #2 Install</li> </ul>	<ul style="list-style-type: none"> <li>Tether swap to S0 safety tether</li> </ul>
		<b>EVA 3 CLEANUP AND INGRESS</b> (00:40)	<b>EVA 3 CLEANUP AND INGRESS</b> (00:30)
06:00 ---	<ul style="list-style-type: none"> <li>SSRMS mnvr to APFR EGRESS posn</li> </ul>	<ul style="list-style-type: none"> <li>Egress SSRMS and stow APFR on ESP2</li> <li>Attach waist tether to A/L D-ring ext</li> </ul>	<ul style="list-style-type: none"> <li>Get-ahead task – NODE 2 port CBM launch locks</li> <li>Retrieve EV1 and EV2 safety tethers</li> </ul>
		<b>PRE REPRESS</b> (00:05)	<b>PRE REPRESS</b> (00:05)

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# PRE EVA 3 TOOL CONFIG

## EV1

- MWS
- BRT (L)
- RET (eq-eq)
- T-Bar
- RET (eq-eq)
- RET (eq-eq) w/PIP pin
- Adj Eq Tether
- Wire Tie (2)
- STS Small Trash Bag
- Adj Eq tether (clove-hitched on strap, hooks in bag)
- Swing Arm (R)
- RET (eq-eq)
- PGT [B5 22 ft-lb, CAL, MTL 30.5] s/n \_\_\_\_\_
- PGT Battery s/n \_\_\_\_\_
- 7/16 (wobble) socket-6 ext
- Waist Tether (2)
- D-ring Extender (2)
- SAFER
- WVS
- Overgloves (2) donned

## EV2

- MWS
- BRT (L)
- RET (eq-eq)
- T-Bar
- RET (eq-eq) w/PIP pin
- RET (eq-eq)
- Adj Eq Tether (2) (1 to R D-ring ext)
- Wire Tie (2)
- ISS Small Trash Bag
- Swing Arm (R)
- RET (eq-eq)
- PGT [B1 12 ft-lb, CAL, MTL 30.5] s/n \_\_\_\_\_
- PGT Battery s/n \_\_\_\_\_
- 7/16 (wobble) socket-6 ext
- D-ring Extender (2)
- Waist Tether (2)
- SAFER
- WVS
- Overgloves (2) donned

## AIRLOCK CONFIG

- Staging Bag
- Fuse Tether
- PGT
- PGT Battery
- Wire Tie Caddy
- RAD
- Connector Cleaner Tool Kit
- Probe
- Connector Pin Straightener
- Velcro/Tape Caddy
- RET (eq-eq) – to FS strap
- GP Cutters (-303 version)
- RET (eq-eq) (2) – to FS strap
- Ratchet Wrench w/palm wheel (2) (s/n 1011,1012)
- IV Bag (configured w/black RETs)
- Towels (2)
- Contamination Detection Kit
- GP Caddy (2)
- Adjustable Thermal Mittens (2)
- Socket Caddy (hatch cont) w/RET (eq-eq)
- 1/2 Socket-8 ext
- 7/16 (wobble) Socket-6 ext (spare)
- DCM Plug (SAFER Hardmount) (2)

- D-ring extender on internal D-ring
- 760 digital camera and mount (tie wrapped)
- RET (lg-eq)
- Spare 85-ft safety tether

## MED ORU BAG

- CLPA
- Sq scoop
- RET (eq-eq)
- 760 digital camera and mount (tie wrapped)
- Lg trash bag
- RET (eq-eq) (2, only 1 to bag)
- RET (eq-eq)
- Adj Eq Tether (on RET for over gloves)
- Adj Eq Tether (outside of bag)
- RET (Lg-eq) (outside of bag)
- RET (Lg-eq) (outside of bag)

## AIRLOCK EXTERIOR

- CETA 1 HH 85-ft Safety Tethers anchor point
- HH 17 (S0/Lab strut) 85-ft Safety Tethers anchor point

## SSRMS

- WIF adapter w/PIP pin

## SPDM/SLP

- APFR (9,KK,G,4) w/ingress aid, WIF 01
- 55-ft safety tether
- EVA Crewlock Bag** – HH 0005 & HH 0006
- Ratchet wrench (2)
- 7/16 Socket-2 ext (2)
- RET (eq-eq)
- Adj Eq Tether (eq-eq) (outside bag)
- Sq scoop – FSE 03
- Sq Scoop/D-Handle – OTP

## S0 HH 3492 & Lab Strut HH 7

### EVA Crewlock Bag #3 (Contingency only)

- ISS bungee caddy
- Spare EDF #1 (1) (on int hook)
- Adj Eq Tether (clove hitched to caddy)
- Spare EDF #2 (1), Spare EDF #3 (1)
- Hammer
- Compound Cutters
- OHT (spare)
- RET (eq-eq)
- Prybar
- RET (eq-eq)
- Ballstack
- Adj Eq Tether (eq-eq) (outside, opp side of int strap)

### **Tether count**

- RET (eq-eq) – 13, 3 additional **blue** RETs outside
- RET (eq-eq) w/PIP pin – 2
- RET (Lg-eq) – 3
- Adj Eq tether – 6, 3 additional Adj tethers outside

### **Prior to EVA, perform the following hardware inspections:**

1. RET cords for fraying
2. No red line visible on safety and waist tether load  
Alleviation straps
3. Inspect STS trash bags for deformation/damage
4. Inspect EMU gloves for damage
5. Check MWS Baseplate for loose screws on toggle levers

**Use Red RETs only**

## EVA 3 INHIBIT PAD

### Orbiter

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 ft from FRCS:  
IV 1. √DAP: VERN, FREE, LO Z  
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 < 1.6 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 1.6 ft away from all S-Band upper antennas:  
C3 4. S-BAND PM ANT – GPC

Sidewall ORU Heaters  
IV R1 1. PL AFT MNB – OFF  
MCC 2. Verify inhibit

### RSOS

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

### 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° from the velocity vector  
If one or both PCUs failed:  
2. No more than two arrays unshunted and oriented < 105° from velocity vector

#### Lab Window

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

#### ESP2

MCC-H 1. √RPCM N1RS2-B RPC 7 – Open, close cmd inh  
√RPCM S04B-F RPC 11 – Open, close cmd inh  
√RPCM N1RS2 B RPC 11 – Open, close cmd inh  
√RPCM S04B F RPC 13 – Open, close cmd inh

#### SSPTS

MCC If EV crew < 2 ft from ungrounded SSPTS connector (not planned):  
1. RPCM LA2A3B\_D RPC 1 – Open, Close Cmd Inhibit  
2. RPCM Z13B\_A RPC 2 – Open, Close Cmd Inhibit  
3. RPCM LA1A4A\_D RPC 3 – Open, Close Cmd Inhibit  
4. RPCM Z14B\_A RPC 2 – Open, Close Cmd Inhibit

SPDM steps to be performed during EVA, 15 min prior to CLPA 2 install

MCC 1. SPDM PSU Output Bank #1, Port #4, OFF  
2. SPDM PSU Output Bank #2, Port #4, OFF  
3. Verify inhibits for (1) and (2) are OFF



## EVA 3 INHIBIT PAD

### USOS (Cont)

COLUMBUS EPF	2
IV PWS	1. √PDU + Outlet 3 SSPC 1, 2, 3, 4 (four) Pwr – OFF Verify Current < 0.1 A
	2. √SSPC 1, 2, 3, 4 (four) Sys Bus Cntl Stat – DISABLED
COL1SC	3. √PPSB PL DN 1, 2 (two) sw – DISCHARGE

### Ground

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

## NOTES, CAUTIONS, AND WARNINGS

### NOTES

1. Bolt install: report torque and turns
2. Perform light pull test after final torque on EDFs
3. Bolt/EDF release: report torque and turns if different from published range
4. EVA connectors: after disconnection and prior to connection; verify pin and EMI band integrity; verify connector free of FOD
5. Inspect QDs for damage prior to mating
6. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
7. 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. 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 VDU, MCU, CRPCMs, and Cameras (taped radiative surfaces, silver Teflon)
  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. SSRMS/SPDM Cameras
  22. SPDM SJEU, EP, OTCM Radiator surfaces
  23. Open CBM petal covers and LAB window shutter
  24. FPMU [S1]
  25. OTSD
  26. Columbus HAM radio antennas
  27. Grounding fingers on SPDM and SLP (fragile)

### 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

## NOTES, CAUTIONS, AND WARNINGS (Cont)

### CAUTION (Cont)

#### 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 (Cont)

#### Shuttle Constraints

##### G. Avoid inadvertent contact with

1. OBSS and SRMS Composite Sections 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 wire harnesses, cables, 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]

## 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
- 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 linkages during operation
- 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 sockets
  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. Z1 handrail 6061 by the Ku-Band boom launch restraint [Z1]
  10. Solar Array Blanket Box [P6,S6]
  11. Keep hands away from SSRMS, SPDM, POA LEE opening, and snares
  12. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing
  13. Lifting lug near P6 handrail 5333 and gap spanner

### WARNING (Cont)

#### ISS Constraints (Cont)

- F. Sharp Edges (Cont)
14. SPDM OTCM Gripper Jaws
  15. SOLAR and EuTEF
  16. Port/Aft portion of A/L circular HH
- 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/SPDM/MBS 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  $< -120$  or  $> 200$  degF

## NOTES, CAUTIONS, AND WARNINGS (Cont)

### WARNING (Cont)

#### ISS Constraints (Cont)

##### H. SLP

1. Keep translation rates below 0.6 ft/sec
2. Do not perform kick offs, quick grabs, shaking motions
3. APFR ops are not allowed with SPDM rotated up
4. Do not perform simultaneous FF tasks (except OTCM 1 install and SJEU blanket removal) on the fwd half (LEE pivot end) of SLP. During unplanned activities with two EV crew on the forward SLP half more than two cyclic load inputs must be followed by a 10-sec pause. Additionally, every effort shall be made to limit crew motion to one at a time. During OTP EDF removal, the second CM must stay aft of the SLP midline between WIFs 001 and 007)

##### I. Electrical Shock

1. Do not touch SPDM CPLA interfaces if not unpowered
2. Stay  $\geq 2$  ft from ungrounded floating connectors if not unpowered:
  - SSPTS connectors [NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA 2 Stbd & Port]
  - MBS Cross-Connect jumpers (translate past these using UMA handrails)
  - S0 EVA Power Cables [inside S0 Bay 00 Face 4, Bay 01 Face 3]
  - ESP2 jumper [inside S0 Bay 03 Face 4]

### WARNING (Cont)

#### Shuttle Constraints

##### J. 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]

##### K. Pinch

1. PRLA operation [PLB]

##### L. 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]

### WARNING (Cont)

#### Shuttle Constraints (Cont)

##### M. 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]

##### N. 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

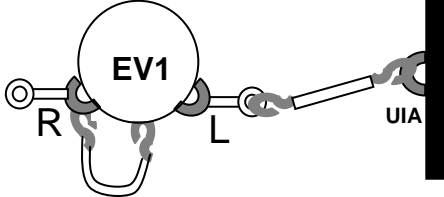
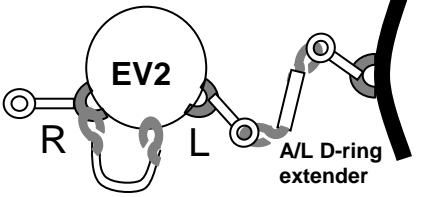
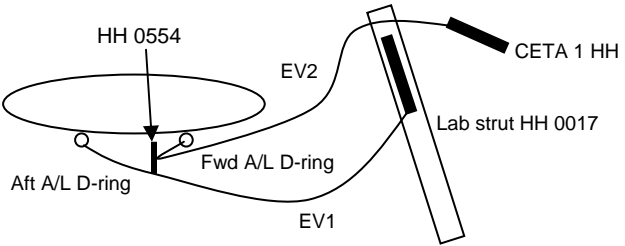
##### O. Contamination

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

##### P. Lasers

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

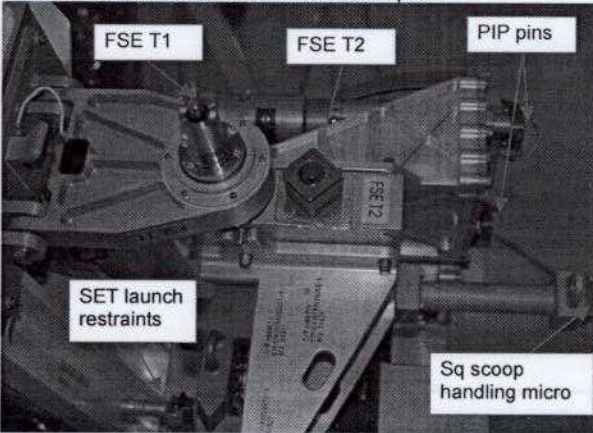
## A/L EGRESS/SETUP (00:40)

IV	EV1 – Ln	EV2 – Be
		
 <p>Pre-EVA 3 safety tether configuration</p> <ol style="list-style-type: none"> <li>WVS Software: Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max (required after EV1 and EV2 egress Airlock)  Verify good video</li> </ol>	<p><b>Initial Condition:</b> Waist Tether (L) to UIA D-ring, verify hooks locked. 85-ft Safety Tether attached to S0/Lab strut HH 17 and aft D-ring. Overgloves donned</p> <p><b>EGRESS</b> (00:15)</p> <ol style="list-style-type: none"> <li>Transfer ORU bag to EV2; stow RET on A/L D-ring</li> <li>Present waist tether (R) to EV2</li> <li>Attach 85-ft safety tether LAS hook to (R) D-ring extender <ul style="list-style-type: none"> <li>Verify hook locked, reel unlocked</li> </ul> </li> <li>Release (L) waist Tether from UIA</li> <li>Egress A/L</li> <li>√SAFER man isol vlv – open (down)</li> <li>√SAFER HCM – closed (down)</li> <li>Close A/L thermal cover</li> </ol>	<p><b>Initial Condition:</b> Waist Tether (L) to A/L D-ring ext, verify hooks locked. 85-ft Safety Tether attached to CETA 1 HH and fwd D-ring. Overgloves donned</p> <p><b>EGRESS</b> (00:15)</p> <ol style="list-style-type: none"> <li>Open A/L thermal cover</li> <li>Egress A/L</li> <li>Attach R waist tether to fwd 85-ft safety tether ERCM</li> <li>Attach 85-ft safety tether LAS hook to (R) D-ring extender <ul style="list-style-type: none"> <li>Verify hook locked, reel unlocked</li> </ul> </li> <li>Release Waist Tether (L) from A/L D-ring extender</li> <li>Tether, receive ORU bag; stow on BRT</li> <li>Attach EV1 waist tether (R) to aft 85-ft safety tether ERCM</li> <li>Release 85-ft safety tether LAS hook from aft D-ring; present to EV1</li> <li>Release safety tether fairleads from HH 0554</li> <li>√SAFER man isol vlv – open (down)</li> <li>√SAFER HCM – closed (down)</li> <li>Release Adj Eq Tether from D-ring ext</li> </ol>

**A/L EGRESS/SETUP (00:40) (Cont)**

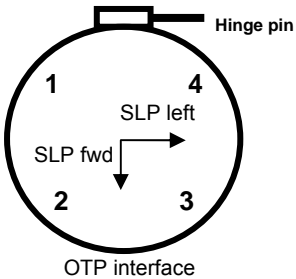
IV	EV1 – Ln	EV2 – Be
<p>2. SSRMS mnvr to APFR INSTALL posn</p> <p>3. SSRMS mnvr to APFR INGRESS posn</p> <p>4. SSRMS: GCA for APFR ingress</p>	<p><b>SETUP</b> (00:25)</p> <div data-bbox="1081 329 1667 407" style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><u>CAUTION</u> Avoid contact with radiator surfaces on arm SJEU and EP</p> </div> <div data-bbox="909 427 1839 578" style="border: 3px double black; padding: 10px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><u>WARNING</u> Keep translation rates below 0.6 ft/sec. Do not perform kick offs, quick grabs, shaking motions. No SLP based APFR ops allowed</p> <hr/> <p style="text-align: center;">Do not perform simultaneous FF tasks on the fwd half (LEE pivot end) of SLP</p> </div> <p>9. Translate to SLP (nadir of MT, fairlead on CETA)</p> <p>10. If sq scoop/D-handle ( for OTP) not installed on EVA 2 – <u>tether, retrieve sq scoop/D-handle from C/Lk bag on HH 0005 and 0006</u></p> <p>11. Translate to WIF 01 APFR; <u>relocate 55-ft safety tether LAS hook to R D-ring extender, anchor hook to MWS</u></p> <p>12. <u>Tether, retrieve APFR/ingress aid from SLP WIF 01</u></p> <p>13. SSRMS mnvr to APFR INSTALL posn</p> <p>14. <u>Install APFR (12,PP,F,6) in SSRMS WIF adapter</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pull test</li> <li><input type="checkbox"/> Verify lock collar black on black</li> <li><input type="checkbox"/> Untether</li> </ul> <p>15. <u>Tether swap to SSRMS</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Verify hook locked, reel unlocked</li> </ul> <p>16. Attach S0 safety tether to HH 0001</p> <p>17. SSRMS mnvr to APFR INGRESS posn</p> <p>18. GCA SSRMS for APFR ingress; ingress APFR</p> <p>19. Inspect gloves; remove overgloves (during translation)</p>	<p><b>SETUP</b> (00:20)</p> <p>13. Translate to SLP (nadir of MT) – includes translation adaptation</p> <p>14. Fairlead on POA w/Adj Eq Tether</p> <p>15. <u>Tether, stow ORU bag between HH 0021 and HH 0022 w/Lg RET and Adj Tether (SLP L sill)</u></p> <p>16. Inspect gloves; <u>stow overgloves on ORU bag (if desired)</u></p> <p>17. <u>Remove Lg trash bag from ORU bag; tether to HH 0021</u></p> <p>18. <u>Remove digital camera from ORU bag; tether, stow on MWS</u></p>

OTP/THA INSTALL (01:25)

IV/SSRMS	EV1 – Ln (SSRMS)	EV2 – Be (FF)
<p>1. SSRMS mnvr to THA HANDOFF posn</p>  <p>THA in FSE</p> <p>2. SSRMS mnvr to OTP REMOVE posn</p> <p>3. SSRMS mnvr to OTP INSTALL posn</p>	<p><b>REMOVE THA FROM SLP (00:20)</b></p> <p>1. SSRMS mnvr to THA HANDOFF posn</p> <p>2. <u>Tether, receive THA; stow on BRT</u></p> <p><b>REMOVE OTP FROM SLP (00:20)</b></p> <p>3. SSRMS mnvr to OTP REMOVE posn</p> <p>4. <u>Attach MWS RET to sq scoop/D-handle</u></p> <p>5. <b>PGT [B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive OTP FSE bolt 'FSE OTP1' (micro near sq grid) ~21 turns</p> <p>6. If OTP prep not performed on EVA 2:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> <b>PGT [B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive OTP FSE bolts 'FSE OTP2,' (micro near SPDM interface) ~10 turns</li> <li><input type="checkbox"/> Install sq scoop/D-handle on OTP micro-fixture 'FSE OTP2' pointing SLP right (leave on RET)</li> <li><input type="checkbox"/> <b>PGT [B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive OTP FSE bolts 'FSE OTP2,' (micro near SPDM interface) ~11 turns</li> </ul> <p>7. Remove OTP from FSE using D-handle and microfixture</p> <p>8. SSRMS mnvr to OTP INSTALL posn</p> <p>9. ✓Hinge pin in soft dock posn</p> <p>10. Hold sq grid as required</p>	<p><b>REMOVE THA FROM SLP (00:20)</b></p> <p>1. <u>Relocate sq scoop from FSE 03 (Arm 2 outrigger) to THA long micro (handle pointing SLP down) – leave RET on scoop</u></p> <p>2. Move RMCT launch restraint PIP pins (2) to 'stow' posn</p> <p>3. <b>PGT [B5 22.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive captive EVA lockout bolt on pivot bracket 'FSE T1', ~23.5 turns</p> <p>4. Rotate THA FSE pivot bracket 90 deg; engage Velcro soft dock</p> <p>5. <b>PGT [B5 22.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive captive EVA lockout bolt 'FSE T2', ~25.5 turns</p> <p>6. <u>Remove THA; transfer to EV1 (on EV1 BRT RET)</u></p> <p style="text-align: center;"><b>NOTE</b> 5 lbf load will be required at bolt head to engage bolt prior to torquing</p> <p>7. Disengage THA FSE pivot bracket from soft dock; rotate until cup engages stowage cone</p> <p>8. <b>PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive lockout bolt 'FSE T1', ~23.5 turns</p> <p><b>RELEASE OTP EDFs (00:10)</b></p> <p>9. Translate to SPDM OTP interface; <u>tether digital camera to HH 0012</u></p> <p>10. BRT to HH 0013</p> <p>11. <b>PGT [B4 19.4 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive EDFs (4) = 5 turns</p> <p>12. Move EDFs (4) to soft dock</p> <p>13. Remove EDF #4 from clevis, stow in MLI loop</p> <p><b>CLOSE ARM 1 WRIST CLAMP (FSE A6) (00:05)</b></p> <p>14. Rotate clamp to launch/landing position</p> <p>15. <b>PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive FSE A6 bolt ~9.75 turns <i>~ 10-11 turns</i></p> <p><b>OTCM 1 FSE CLEANUP (part 1) (00:05)</b></p> <p>16. Rotate OTCM clamp FSE O6 (fwd) to launch/landing position</p> <p>17. <b>PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive OTCM 1 clamp bolt (FSE O6) ~8.75 turns <i>~ 10-11 turns</i></p> <p>18. Free OTCM tent blanket from temp stow, route through fwd OTCM 1 clamp</p>



# OTP/THA INSTALL (01:25) (Cont)

IV/SSRMS	EV1 – Ln (SSRMS)	EV2 – Be (FF)
<p>4. SSRMS mnvr to OTP EDF INSTALL posn</p>  <p>5. SSRMS mnvr to THA INSTALL posn</p>	<p><b><u>INSTALL OTP ON SPDM</u></b> (00:05)</p> <ol style="list-style-type: none"> <li>Present OTP lug interface to EV2</li> <li>Soft dock OTP onto SPDM Lower Body</li> </ol> <p>13. Retrieve RET from EV2</p> <p><b><u>TORQUE OTP EDFs</u></b> (00:15)</p> <ol style="list-style-type: none"> <li>SSRMS mnvr to OTP EDF INSTALL posn; insert hinge pin</li> <li>Install any remaining OTP EDFs</li> <li><b>PGT [B4 19.4 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive hinge pin, ~10.5 turns</li> <li><b>PGT [A7 9.2 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive EDF #1,4 to torque (coordinate with IV/EV2 to drive opposite pairs) ~4.5 turns</li> <li><b>PGT [B7 25.5 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive EDF #1,4 to torque (coordinate with IV/EV2 to drive opposite pairs), ~0.5 turns</li> <li>Perform light tug test on EDF #1, #4</li> </ol> <p><b><u>REMOVE THA SET LAUNCH RESTRAINT BRACKETS</u></b> (00:10)</p> <ol style="list-style-type: none"> <li>SSRMS mnvr to THA INSTALL posn</li> <li>Present SET launch restraint brackets to EV2</li> </ol> <p><b><u>INSTALL THA ON SPDM</u></b> (00:15)</p> <ol style="list-style-type: none"> <li>Soft dock THA to SPDM body</li> <li>Steady THA for EV2</li> </ol> <p>24. Tether, receive digital camera; stow on MWS</p> <p>25. Inspect gloves</p>	<p><b><u>INSTALL OTP ON SPDM</u></b> (00:05)</p> <ol style="list-style-type: none"> <li>Soft dock OTP onto SPDM Lower Body using sq scoop/ D-handle; verify soft dock latches engaged</li> <li>Insert EDFs (2+) into lug-clevis interface</li> <li>Release EV1 RET from D-handle</li> </ol> <p><b><u>TORQUE OTP EDFs</u></b> (00:15)</p> <ol style="list-style-type: none"> <li><b>PGT [A7 9.2 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive EDF #2, 3 to torque (coordinate with IV/EV1 to drive opposite pairs), ~4.5 turns</li> <li><b>PGT [B7 25.5 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive EDF #2, 3 to torque (coordinate with IV/EV1 to drive opposite pairs), ~0.5 turns</li> <li>Perform light tug test on EDF #2, #3</li> </ol> <p><b><u>REMOVE THA SET LAUNCH RESTRAINT BRACKETS</u></b> (00:10)</p> <ol style="list-style-type: none"> <li>Translate to SPDM THA interface; BRT to HH 0009</li> <li><b>PGT [B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive inner retainer (mounted on SET micro-fixture) tie-down bolt, ~12.5 turns</li> <li>Stow inner retainer FSE in small trash bag</li> <li><b>PGT [B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive housing retainer (horse shoe) FSE tie-down bolt, ~12 turns</li> <li>Stow housing retainer FSE in small trash bag</li> </ol> <p><b><u>INSTALL THA ON SPDM</u></b> (00:15)</p> <ol style="list-style-type: none"> <li>Soft dock THA to SPDM body</li> <li><b>PGT [B3 18.4 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16;</b> drive captive EVA lockout bolt 'FSE T2', ~25.5 turns</li> <li>Release EV1 BRT RET from scoop</li> <li>Retrieve digital camera from HH 0012; transfer to EV1</li> <li>Remove sq scoop/D-handle from OTP; stow on MWS</li> <li>Remove sq scoop from THA</li> <li>Translate to HH 0005; stow sq scoop and sq scoop/ D-handle in C/Lk bag</li> <li>Inspect gloves</li> </ol>

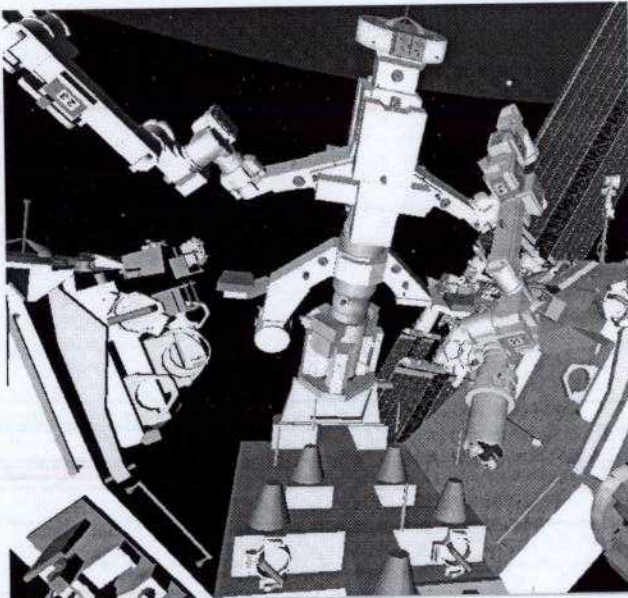
## ARM 2/EP BLANKET REMOVAL (00:30)

IV/SSRMS	EV1 – Ln (SSRMS)	EV2 – Be (FF)
<ol style="list-style-type: none"> <li>1. SSRMS mnvr to EP 2 THERMAL BLANKET REMOVAL posn</li> <li>2. SSRMS mnvr to ARM 2 SOCK REMOVAL posn</li> <li>3. SSRMS mnvr to EP 1 THERMAL BLANKET REMOVAL posn</li> <li>4. GCA SSRMS to SLP sill</li> </ol>	<p><b><u>REMOVE REMAINING SPDM THERMAL BLANKETS</u></b> (00:30)</p> <ol style="list-style-type: none"> <li>1. Tether, receive <u>Lg trash bag</u> from EV2; stow on MWS</li> <li>2. Remove the following blankets; tether and stow in Lg trash bag               <ol style="list-style-type: none"> <li>a. SSRMS mnvr to EP 2 THERMAL BLANKET REMOVAL posn Remove EP 2 blanket (aft)</li> <li>b. SSRMS mnvr to ARM 2 SOCK REMOVAL posn Remove Arm 2 OTCM OSE blankets (√wrap blanket rolled down)</li> <li>c. Install remaining 2 Velcro straps from SJEU blanket 2.7</li> <li>d. Replace MLI flaps (4) over Arm 2 wrist clamp interface (attach solid line and barber pole sides first)</li> <li>e. SSRMS mnvr to EP 1 THERMAL BLANKET REMOVAL posn Remove EP 1 blanket (fwd)</li> </ol> </li> <li>3. GCA SSRMS to SLP sill</li> <li>4. Transfer <u>Lg trash bag</u> to EV2</li> </ol> <p><b><u>SJEU BLANKET REMOVAL STEPS</u></b></p> <ul style="list-style-type: none"> <li>• Press on 'PRESS' label to ground blanket</li> <li>• Attach RET to tether loop</li> <li>• Remove OSE blanket off Arm and stow in lg trash bag</li> <li>• Fold over Velcro flaps to cover joint thermal blanket grounding patches (4 total)</li> </ul> <p><b><u>ELECTRONICS PLATFORM OSE BLANKET REMOVAL STEPS</u></b></p> <ul style="list-style-type: none"> <li>• Attach RET to OSE thermal blanket tether loop</li> <li>• Release all quarter-turn fasteners and lift corresponding tabs (14 total)</li> <li>• Remove OSE blanket from Electronics Platform and stow in lg trash bag</li> <li>• Fold over Velcro flaps to cover thermal blanket grounding patches (2 total)</li> </ul>	<p><b><u>REMOVE REMAINING SPDM THERMAL BLANKETS</u></b> (00:05)</p> <ol style="list-style-type: none"> <li>1. Transfer <u>Lg trash bag</u> from HH 0021 to EV1</li> </ol> <ol style="list-style-type: none"> <li>2. Tether, receive <u>Lg trash bag</u>; <u>stow on HH 0021</u></li> </ol>

SLP CLEANUP (01:15)

IV

EV2 – Be (FF)



EVA 3 SPDM arm blanket access

1. Perform any incomplete **SLP CLEANUP** tasks

**REMOVE THERMAL BLANKETS FROM CLA** (00:10) (if time permits, perform prior to OTP install)

CAUTION  
Avoid contact with radiator surfaces on CLA

2. Translate to CLA

3. Tether, remove OSE blanket from CLA; stow in Lq trash bag

4. Close grounding flaps to cover tabs on CLA

**ARM 2 WRIST (FSE A5)** (00:05)

5. Rotate clamp to launch/landing position

6. **PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16**; drive FSE A5 bolt ~~~9.75 turns~~ *~10-11 turns*

**OTCM 2 FSE CLEANUP** (00:15)

7. Rotate OTCM clamps (2) to launch/landing position

8. **PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16**; drive OTCM 2 clamp bolts (FSE O2) ~~~9.25 turns~~ *~10-11 turns*

9. **PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16**; drive OTCM 2 clamp bolts (FSE O3) ~~~8.75 turns~~ *~10-11 turns*

10. Place OTCM KA umbilical on stowage bracket (magnetic soft dock)

11. **PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16**; drive KA umbilical connector tie-down bolt (FSE O1), ~~~7.25 turns~~ *~10-11 turns*

12. Pull OTCM tent blanket through clamps, mate Velcro

**ARM 2 ELBOW BLANKETS** (00:05)

13. Tether, remove SJEU cover 2.5

14. Fold over Velcro straps to cover SJEU blanket grounding patches (4 total)

**ARM 2 SHOULDER BLANKETS** (00:10)

15. Replace MLI flaps (4) over shoulder clamp interface (attach solid line and barber pole sides first)

16. Tether, remove SJEU cover 2.1, 2.2

17. Fold over Velcro straps to cover SJEU blanket grounding patches (4 total)

**ARM 2 SHOULDER CLAMP (FSE A1)** (00:05)

18. Rotate clamp to launch/landing position

19. **PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16**; drive FSE A1 bolt ~9.75 turns

**ARM 1 SHOULDER BLANKETS** (00:05)

20. Replace MLI flaps (4) over shoulder clamp interface (attach solid line and barber pole sides first)





21. Tether, remove any remaining SJEU covers (1.1, 1.2)

22. Fold over Velcro straps to cover SJEU blanket grounding patches (4 total)



SLP CLEANUP (01:15) (Cont)

IV	EV2 - Be (FF)
	<p><input type="checkbox"/> <b>OTCM 1 FSE CLEANUP</b> (part 2) (00:10)</p> <p>23. Rotate OTCM clamp FSE O5 (aft) to launch/landing position</p> <p>24. PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16; drive OTCM 1 clamp bolt (FSE O5) <del>~8.75 turns</del> <i>~10-11 turns</i></p> <p>25. Place OTCM KA umbilical on stowage bracket (magnetic soft dock)</p> <p>26. PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16; drive KA umbilical connector tie-down bolt (FSE O4), <del>~7.25 turns</del> <i>~10-11 turns</i></p> <p>27. Pull OTCM tent blanket through clamps, mate Velcro</p> <p>28. Inspect gloves</p> <p><input type="checkbox"/> <b>ARM 1 ELBOW BLANKETS</b> (00:05)</p> <p>29. Tether, remove SJEU cover 1.5</p> <p>30. Fold over Velcro straps to cover SJEU blanket grounding patches (4 total)</p> <p><input type="checkbox"/> <b>ARM 1 SHOULDER CLAMP (FSE A10)</b> (00:05)</p> <p>31. Rotate clamp to launch/landing position</p> <p>32. PGT [B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16; drive FSE A10 bolt <del>~9.75 turns</del> <i>~10-11 turns</i></p> <p><input type="checkbox"/> <b>ARM 1 WRIST BLANKETS</b> (00:10)</p> <p>33. Tether, remove Arm 1 OTCM OSE blanket (<i>wrap blanket rolled down</i>)</p> <p>34. Replace MLI flaps (4) over Arm 1 wrist clamp interface (attach solid line and barber pole sides first)</p> <p>35. Tether, remove any remaining SJEU covers (1.6, 1.7)</p> <p>36. Fold over Velcro straps to cover SJEU blanket grounding patches (4 total)</p> <p>37. Secure Arm 1 FSE EDF interface blanket flaps over single EDF holes (2)</p>


## CLPA INSTALL (00:40)

IV	EV2 – Be (FF)
<ol style="list-style-type: none"> <li>1. Verify with MCC-H CLPA 2 inhibits in place (15 min prior to CLPA 2 cover removal)               <ol style="list-style-type: none"> <li>a. SPDM PSU Output Bank #1, Port #4, OFF</li> <li>b. SPDM PSU Output Bank #2, Port #4, OFF</li> </ol> </li> <li>Give EV2 GO for CLPA install</li> <li>2. Position camera 37 for EV2 clearance views during CLPA 2 install</li> </ol> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p style="display: flex; justify-content: space-around; margin-top: 5px;"> <span>CLPA connector cover (launch)</span> <span>CLPA connector cover (stowed)</span> </p>	<p><b>INSTALL CLPA 2 ON SPDM</b> (00:15)</p> <ol style="list-style-type: none"> <li>1. Translate to CLPA #2 install site (SLP L, over OTP)</li> <li>2. BRT to OTCM #2 KA HH</li> <li>3. On IV GO, remove connector cover on SPDM; mate to Velcro tab and cover exposed Velcro with flap</li> <li>4. Remove CLPA/sq scoop from ORU bag (on bag RET)</li> <li>5. Install CLPA on SPDM; magnetic soft dock</li> <li>6. <b>PGT [B2 16.0 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b>; drive tie-down bolt mechanism, 22-23 turns</li> <li>7. Remove sq scoop; stow in ORU bag (let retract to bag on bag RET)</li> <li>8. Inspect tie-down indicator to confirm fully 'IN' (only white tip of indicator visible)</li> </ol> <p><b>CLPA CLEANUP</b> (00:25)</p> <ol style="list-style-type: none"> <li>9. Tether Lg trash bag (HH 0021) in ORU bag #2 (HH 0021 &amp; HH 0022)</li> <li>10. Perform ORU bag inventory</li> <li>11. RET/BRT to ORU bag</li> <li>12. Translate to R SLP sill (HH 0005)</li> <li>13. Perform C/Lk bag #2 inventory (HH 0005 &amp; HH 0006)</li> <li>14. Tether C/Lk bag #2 in ORU bag</li> <li>15. Verify SLP in good config for landing</li> <li>16. If reqd, re-stow ORU bag on BRT</li> <li>17. Release fairlead from POA; stow Adj Eq Tether on MWS</li> <li>18. Inspect gloves; don overgloves</li> </ol>
<ol style="list-style-type: none"> <li>3. Give MCC-H GO to restore power to CLPA</li> </ol> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p>CLPA tie-down status indicator in flush posn (when only the white tip of the indicator is viable, the CLPA is fully installed)</p>	

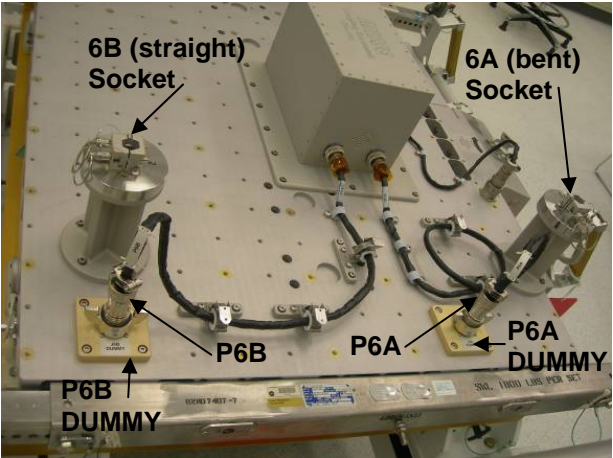
## LWAPA TRANSFER (01:00)/SSRMS YAW JOINT TRANSFER (00:45)

IV/SSRMS	EV1 – Ln (SSRMS)						
<ol style="list-style-type: none"> <li>1. Rotate PLB Camera B to face stbd sill</li> <li>2. SSRMS mnvr to LWAPA REMOVAL posn (bay 13, port)</li> <li>3. GCA for access to primary bolt</li> </ol>	<p><b><u>RETRIEVE LWAPA</u></b> (00:40)</p> <ol style="list-style-type: none"> <li>1. SSRMS mnvr to LWAPA (bay 13 port)</li> <li>2.  SPDM closeout photos w/digital camera</li> <li>3. GCA for access to primary bolt</li> <li>4. Attach RET to FRAM R HH</li> <li>5. <b>PGT [A4 6.3 ft-lb, CCW2 30 RPM, 30.5]-6 ext 7/16</b>; release primary FRAM bolt 11 turns (hard stop); push while turning to disengage anti-rotation device (~10 lb)</li> <li>6. ✓Status indicator 'in'</li> <li>7. Remove LWAPA from sidewall carrier (15-20 lb magnetic soft dock to overcome)</li> </ol>						
<ol style="list-style-type: none"> <li>4. SSRMS mnvr to LWAPA INSTALL posn</li> <li>5. GCA for LWAPA soft dock</li> </ol>	<p><b><u>INSTALL LWAPA ON COLUMBUS</u></b> (00:20)</p> <ol style="list-style-type: none"> <li>8. SSRMS mnvr to Columbus stowage platform (nadir) (Head zenith, PECs sockets pointing nadir)</li> <li>9. GCA for LWAPA soft dock</li> <li>10. Soft dock LWAPA (magnetic soft dock)</li> <li>11. <b>PGT [A4 6.3 ft-lb, CW2 30 RPM, 30.5]-6 ext 7/16</b>; drive primary FRAM bolt 11 turns (hard stop); push while turning to disengage anti-rotation device (~10 lb)</li> <li>12. ✓Status indicator 'out'</li> <li>13. Release FRAM tether</li> </ol>						
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Bolt</th> <th style="width: 33%;">Turns</th> <th style="width: 33%;">Torque</th> </tr> </thead> <tbody> <tr> <td>LWAPA Primary FRAM Bolt (install)</td> <td></td> <td></td> </tr> </tbody> </table>	Bolt	Turns	Torque	LWAPA Primary FRAM Bolt (install)			<p><b><u>SSRMS YAW JOINT RETRIEVE</u></b> (00:25)</p> <ol style="list-style-type: none"> <li>14. SSRMS mnvr to yaw joint (PLB stbd bay 3)</li> <li>15. GCA to FRAM primary bolt</li> <li>16. Attach RET to R FRAM HH</li> <li>17. <b>PGT [A4 6.3 ft-lb, CCW2 30 RPM, 30.5]-6 ext 7/16</b>; release primary FRAM bolt 11 turns (hard stop); push while turning to disengage anti-rotation device (~10 lb)</li> <li>18. ✓Status indicator 'in'</li> <li>19. Remove yaw joint/FRAM from sidewall carrier (15-20 lb magnetic soft dock to overcome)</li> </ol>
Bolt	Turns	Torque					
LWAPA Primary FRAM Bolt (install)							
<ol style="list-style-type: none"> <li>6. SSRMS mnvr to YAW JOINT RETRIEVAL posn</li> </ol>	<p><b><u>SSRMS YAW JOINT INSTALL</u></b> (00:20)</p> <ol style="list-style-type: none"> <li>20. SSRMS mnvr to ESP2, site 5 (nadir/aft)</li> <li>21. Soft dock DCSU/FRAM (magnetic soft dock)</li> <li>22. <b>PGT [A4 6.3 ft-lb, CW2 30 RPM, 30.5]-6 ext 7/16</b>; drive primary FRAM bolt 11 turns (hard stop); push while turning to disengage anti-rotation device (~10 lb)</li> <li>23. ✓Status indicator 'out'</li> <li>24. Inspect gloves</li> <li>25. Release FRAM tether</li> <li>26.  Photograph EUTEF and EV2 during translation back to PLB (w/digital camera)</li> </ol>						
<ol style="list-style-type: none"> <li>7. SSRMS mnvr to YAW JOINT INSTALL</li> <li>8. GCA for yaw joint/FRAM soft dock</li> </ol>							
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Bolt	Turns	Torque					
Yaw Joint Primary FRAM Bolt (install)							

## DCSU TRANSFER (01:30)

IV/SSRMS	EV1 – Ln (SSRMS)					
<ol style="list-style-type: none"> <li>SSRMS mnvr to DCSU 1 RETRIEVAL posn</li> <li>GCA to primary bolt</li> </ol>	<p><b><u>DCSU #1 RETRIEVE</u></b> (00:25)</p> <ol style="list-style-type: none"> <li>SSRMS mnvr to DCSU #1 (PLB stbd bay 4)</li> <li> Photograph EUTEF and EV2 during SSRMS translation (w/digital camera)</li> <li>GCA to primary bolt</li> <li>Attach RET to L FRAM HH</li> <li><b>PGT [A4 6.3 ft-lb, CCW2 30 RPM, 30.5]-6 ext 7/16</b>; release primary FRAM bolt 11 turns (hard stop); push while turning to disengage anti-rotation device (~10 lb)</li> <li>√Status indicator 'in'</li> <li>Remove DCSU/FRAM from sidewall carrier (15-20 lb magnetic soft dock to overcome)</li> </ol> <p><b><u>DCSU #1 INSTALL</u></b> (00:20)</p> <ol style="list-style-type: none"> <li>When FRAM clear of coarse alignment guides; SSRMS mnvr to ESP2, site 2 (fwd/zenith)</li> <li>Once FRAM 5 ft from structure, rotate FRAM 180 deg</li> <li>GCA for DCSU/FRAM soft dock</li> <li>Soft dock DCSU/FRAM (magnetic soft dock)</li> <li><b>PGT [A4 6.3 ft-lb, CW2 30 RPM, 30.5]-6 ext 7/16</b>; drive primary FRAM bolt 11 turns (hard stop); push while turning to disengage anti-rotation device (~10 lb)</li> <li>√Status indicator 'out'</li> <li>Release FRAM tether</li> <li>Inspect gloves</li> </ol> <p><b><u>DCSU #2 RETRIEVE</u></b> (00:25)</p> <ol style="list-style-type: none"> <li>SSRMS mnvr to DCSU (bay 5, stbd)</li> <li>GCA to primary bolt</li> <li>Attach RET to L FRAM HH</li> <li><b>PGT [A4 6.3 ft-lb, CCW2 30 RPM, 30.5]-6 ext 7/16</b>; release primary FRAM bolt 11 turns (hard stop); push while turning to disengage anti-rotation device (~10 lb)</li> <li>√Status indicator 'in'</li> <li>Remove DCSU/FRAM from sidewall carrier (15-20 lb magnetic soft dock to overcome)</li> </ol> <p><b><u>DCSU #2 INSTALL</u></b> (00:20)</p> <ol style="list-style-type: none"> <li>When FRAM clear of coarse alignment guides; SSRMS mnvr to ESP2, site 3 (stbd/zenith)</li> <li>Once FRAM 5 ft from structure, rotate FRAM 180 deg</li> <li>GCA for DCSU/FRAM soft dock</li> <li>Soft dock DCSU/FRAM (magnetic soft dock)</li> <li><b>PGT [A4 6.3 ft-lb, CW2 30 RPM, 30.5]-6 ext 7/16</b>; drive primary FRAM bolt 11 turns (hard stop); push while turning to disengage anti-rotation device (~10 lb)</li> <li>√Status indicator 'out'</li> <li>Release FRAM tether</li> <li>Inspect gloves; don overgloves</li> </ol>					
<ol style="list-style-type: none"> <li>SSRMS mnvr to DCSU 1 INSTALL posn</li> <li>GCA for DCSU/FRAM soft dock</li> </ol> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Bolt</th> <th style="width: 33%;">Turns</th> <th style="width: 33%;">Torque</th> </tr> </thead> <tbody> <tr> <td>DCSU #1 Primary FRAM Bolt (install)</td> <td></td> <td></td> </tr> </tbody> </table> <ol style="list-style-type: none"> <li>SSRMS mnvr to DCSU 2 RETRIEVAL posn</li> <li>GCA to primary bolt</li> </ol>		Bolt	Turns	Torque	DCSU #1 Primary FRAM Bolt (install)	
Bolt	Turns	Torque				
DCSU #1 Primary FRAM Bolt (install)						
<ol style="list-style-type: none"> <li>SSRMS mnvr to DCSU 2 INSTALL posn</li> <li>GCA for DCSU/FRAM soft dock</li> </ol> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Bolt</th> <th style="width: 33%;">Turns</th> <th style="width: 33%;">Torque</th> </tr> </thead> <tbody> <tr> <td>DCSU #2 Primary FRAM Bolt (install)</td> <td></td> <td></td> </tr> </tbody> </table> <ol style="list-style-type: none"> <li>Give MCC-H Go to restore heater power to ESP2</li> </ol>	Bolt	Turns	Torque	DCSU #2 Primary FRAM Bolt (install)		
Bolt	Turns	Torque				
DCSU #2 Primary FRAM Bolt (install)						

## MISSE 6 RETRIEVE/DEPLOY (02:00)

IV	EV2 – Be (FF)
<p>1. √MCC for SCU connect and cleanup times</p>  <p>MISSE 6 LWAPA</p>	<p><b>RELOCATE EV1 SAFETY TETHER</b> (00:15)</p> <ol style="list-style-type: none"> <li>1. Retrieve EV1 85-ft safety tether from SLP HH 0001</li> <li>2. Relocate EV1 85-ft safety tether to ESP2 HH 8004</li> <li>3. Tether ORU bag in A/L</li> <li>4. Move overgloves RET/Adj to MWS</li> <li>5. Tether PGT in A/L</li> <li>6. Retrieve Digital camera; tether, stow on swing arm</li> <li>7. Retrieve spare 85-ft safety tether from A/L; attach LAS hook to R D-ring extender, anchor hook to MWS</li> <li>8. On MCC GO, RET/BRT to C/Lk bag #1 w/JLP trunnion covers</li> <li>9. Close thermal cover</li> <li>10. Inspect gloves</li> </ol> <p><b>MISSE 6 SETUP</b> (00:15)</p> <ol style="list-style-type: none"> <li>11. If retrieved from A/L, temp stow C/Lk bag #1 to JLP HH 1260 (stbd-nadir)</li> <li>12. Translate to Node 2 HH 0310 (zenith translation path on Lab/Node 2)</li> <li>13. Tether swap to 85-ft safety tether on Node 2 HH 0310 <ul style="list-style-type: none"> <li><input type="checkbox"/> Verify hook locked, reel unlocked</li> </ul> </li> </ol> <p><b>REMOVE STRAIGHT PEC FROM SIDEWALL CARRIER</b> (00:20)</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b></p> <p>Sidewall carrier clamp are a pinch point. Use caution during actuation</p> <p>Avoid contact with SSPTS cable connectors (2-ft Keep-out Zone)</p> </div> <p style="text-align: center;"><u>NOTE</u></p> <p>PEC 6a has bent stem, PEC 6b has straight stem</p> <ol style="list-style-type: none"> <li>14. Translate to MISSE 6b straight PEC (aft)</li> <li>15. Inspect gloves</li> <li>16. <u>Tether to PEC with BRT RET</u></li> <li>17. Remove PIP pins (2) from PEC sidewall carrier clamps</li> <li>18. Open sidewall carrier clamps (2)</li> <li>19. Remove PEC from sidewall carrier; stow on BRT</li> <li>20. Close clamp (2) for landing; re-insert PIP pins (2)</li> <li>21. Translate to Columbus Nadir platform (around Node 2 fwd/stbd endcone to zenith HH path on Columbus)</li> </ol> <p><b>INSTALL STRAIGHT PEC ON LWAPA</b> (00:05)</p> <ol style="list-style-type: none"> <li>22. Disengage probe PIP pins (2) on LWAPA <del>stbd socket</del> <span style="background-color: yellow;">port socket</span></li> <li>23. Install straight PEC in socket; align single black lines on probe and socket</li> <li>24. <u>Re-engage PIP pins (2)</u>, √probe secure in clamp</li> </ol>



**MISSE 6 RETRIEVE/DEPLOY (02:00) (Cont)**

IV	EV2 – Be (FF)
<p>2. Give MCC GO to restore power to Columbus nadir platform</p>	<p><b><u>REMOVE BENT PEC FROM SIDEWALL CARRIER</u></b> (00:20)</p> <p>25. Translate to bent PEC (fwd)</p> <p>26. Inspect gloves</p> <p>27. Tether to PEC with BRT RET</p> <p>28. Remove PIP pins (2) from PEC sidewall carrier clamps</p> <p>29. Open sidewall carrier clamps (2)</p> <p>30. Remove PEC from sidewall carrier; stow on BRT</p> <p>31. Close clamp (2) for landing; re-insert PIP pins (2)</p> <p>32. Translate to Columbus Nadir platform (around Node 2 fwd/stbd endcone to zenith HH path on Columbus)</p> <p><b><u>INSTALL BENT PEC ON LWAPA</u></b> (00:05)</p> <p>33. Disengage probe PIP pins (2) on LWAPA <del>port socket</del> <b>stbd socket</b></p> <p>34. Install bent PEC in socket; align single black lines on probe and socket (probe pitched ISS stbd)</p> <p>35. <u>Re-engage PIP pins (2), probe secure in clamp</u></p> <p><b><u>MATE MISSE 6 CONNECTORS</u></b> (00:10)</p> <p>36. Release TA clamps for P6A (2) and P6B (3) connector cables</p> <p>37. <u>Remove red connector cover from bent PEC</u></p> <p>38. <u>Remove green connector cover from straight PEC</u></p> <p>39. Remove P6B from J6B DUMMY</p> <p>40. Mate P6B to straight PEC connector (J6B)</p> <p>41. <u>Mate connector cover to J6B DUMMY</u></p> <p>42. Remove P6A from J6A DUMMY</p> <p>43. Mate P6A to bent PEC connector (J6A)</p> <p>44. <u>Mate connector cover to J6A DUMMY</u></p> <p><b><u>OPEN BENT PEC (6A)</u></b> (00:05)</p> <p>45. Release bent PEC PIP pin securing MISSE closed (2) and PIP pins for securing MISSE open (2)</p> <p>46. Open bent PEC; reinsert PIP pins (2) to restrain open</p> <p><b><u>OPEN STRAIGHT PEC (6B)</u></b> (00:05)</p> <p>47. Release straight PEC PIP pin securing MISSE closed (2) <u>and</u> PIP pins for securing MISSE open (2)</p> <p>48. Open straight PEC; reinsert PIP pins (2) to restrain open</p> <p>49. Give MCC GO to restore power to Columbus nadir stowage platform</p> <p><b><u>PHOTOGRAPH PECs</u></b> (00:10)</p> <p>50. <input type="checkbox"/> Photograph deployed PECs with digital camera (normal, ~2 ft from PEC) (no WVS reqd)</p> <p>51. Inspect gloves</p> <p><b><u>MISSE 6 CLEANUP</u></b> (00:10)</p> <p>52. If time permits, perform JLP TRUNNION/KEEL COVER INSTALL Get-Ahead (FS 7-186)</p> <p>53. <u>Tether swap to S0 85-ft safety tether at Node 2 HH 0310</u></p> <p><input type="checkbox"/> Verify hook locked, reel unlocked</p> <p>54. Stow 85-ft safety tether on MWS</p>

P & I

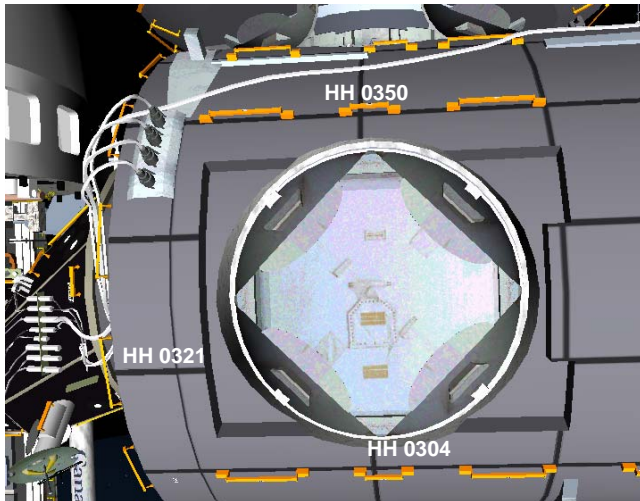


## GET-AHEAD – NODE 2 ACBM LAUNCH LOCKS (00:15)

IV



Launch lock latch



Port Node 2 CBM

EV1/EV2

### PORT CBM PETAL LAUNCH LOCKS (00:15 PER ACBM)

**CAUTION**

Both petal launch locks must be engaged to allow for translation on the petal

1. Translate to Node 2 port CBM
2. Release CBM petal launch locks (use Adj Eq Tether as reqd):
  - Release two aft latches (on petal)
  - Release two zenith latches: use HR 0350
  - Release two fwd latches: use HR 0321
  - Release two nadir latches: use HR 0304
3. Translate to Node 2 nadir CBM
4. Release Node 2 Nadir CBM petal launch locks
  - Release two aft latches (on petal)
  - Release two port latches: use HR 0356
  - Release two fwd latches: use HR 0309
  - Release two stbd latches: use HR 0355

### CLEANUP

5. Inspect gloves

# POST EVA 3 TOOL CONFIG

## EV1

- MWS
- BRT (L)
- RET (eq-eq)
- T-Bar
- RET (eq-eq)
- RET (eq-eq) w/PIP pin
- Adj Equip Tether
- Wire Tie (2)
- Spare Safety Tether (85-ft)
- STS Small Trash Bag
- Adj Eq tether (clove-hitched on strap, hooks in bag)
- WIF adapter w/PIP pin
- 760 digital camera and mount (tie wrapped)
- Swing Arm (R)
- RET (eq-eq)
- PGT
- PGT Battery
- 7/16 (wobble) socket-6 ext
- Waist Tether (2)
- D-ring Extender (2)
- SAFER
- WVS
- Overgloves (2) donned

## EV2

- MWS
- BRT (L)
- RET (eq-eq)
- T-Bar
- RET (eq-eq) w/PIP pin
- RET (eq-eq) (2) (1 for overgloves)
- Adj Eq Tether (on RET for overgloves)
- Adj Equip Tether (2) (1 from POA)
- Wire Tie (3)
- ISS Small Trash Bag
- SET launch restraints (2)
- Swing Arm (R)
- RET (eq-eq)
- 760 digital camera and mount (tie wrapped)
- D-ring Extender (2)
- Waist Tether (2)
- SAFER
- WVS
- Overgloves (2) donned

## AIRLOCK CONFIG

- Staging Bag
- Fuse Tether
- PGT
- PGT Battery
- Wire Tie Caddy
- RAD
- Connector Cleaner Tool Kit
- Probe
- Connector Pin Straightener
- Velcro/Tape Caddy
- IV Bag
- Towels (2)
- Contamination Detection Kit
- GP Caddy (2)
- Adj Thermal Mittens (2)
- Socket Caddy (hatch cont) w/RET (eq-eq)
- 1/2 Socket-8 ext
- 7/16 (wobble) Socket-6 ext (spare)
- DCM Plug (SAFER Hardmount) (2)

## MED ORU BAG

- Sq scoop
- RET (eq-eq)
- Lg trash bag
- RET (eq-eq) (2)
- Adj Eq Tether (outside of bag)
- RET (eq-eq) (outside of bag)
- EVA Crewlock Bag (SLP)
- Ratchet wrench (2)
- 7/16 Socket-2 ext (2)
- Sq Scoop/D-Handle
- Sq scoop
- RET (Lg-eq)
- Adj Eq Tether (eq-eq) (outside bag)

## EXTERNAL CONFIG

### ESP2

- APFR w/ingress aid, WIF 2

### SLP

- Verify all EVA tools/bags removed

## AIRLOCK CONFIG (Cont)

- PGT
- PGT Battery
- 7/16 (wobble) socket-6 ext
- RET (lg-eq)

## EVA Crewlock Bag #3 (Contingency only)

- ISS bungee caddy
- Spare EDF #1 (1) (on int hook)
- Adj Eq Tether (clove hitched to caddy)
- Spare EDF #2 (1), Spare EDF #3 (1)
- Hammer
- Compound Cutters
- OHT (spare)
- RET (eq-eq)
- Prybar
- RET (eq-eq)
- Ballstack
- Adj Eq Tether (eq-eq) (outside, opp side of int strap)

## OTP/THA INSTALL AND MLI REMOVAL – TASK DATA

### Estimated Task Duration:

	With SSMS	Without SSRMS
One EV Crew	NA	NA
Two EV Crew	01:25	NA

### Tools:

EV1 (SSRMS)	EV2 (FF)
PGT 6-in ext – 7/16	PGT 6-in ext – 7/16
Sq Scoop	
D-Handle	
Lg trash bag	

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
OTCM KA	FSE O1, O4	7/16	2	12.0	25.0	30.5	7.25	30
Arm wrist/shoulder roll clamps	FSE A6, A10, A5, A1	7/16	4	12.0	7.9	24.1	9.75	30
OTCM Roll clamp FSE	FSE O2, O3, O5, O6	7/16	4	12.0	12.5	23.8	8.75-9.25	30
OTP EDFs	1-4	7/16	4	25.5	16.7	33.0	5	30
OTP FSE	FSE OTP 1, 2	7/16	2	N/A	27.92	N/A	21	30
OTP hinge pin	N/A	7/16	1	19.4	16.7	22.1	10.5	30
THA FSE tie-down bolt	FSE T1	7/16	1	12.0	17.9	26.0	23.5	30
THA FSE/lower body bolt	FSE T2	7/16	1	18.4	18.75	30.5	25.5	30
SET launch restraint (inner)	N/A	7/16	1	N/A	7.5	N/A	12.5	30
SET launch restraint (housing)	N/A	7/16	1	N/A	9.2	N/A	12	30

### ORUs/Loose items:

ORU/Item	Qty	Part Number	Mass (lb)	Volume (in <sup>3</sup> )
THA	1	51602-7001-1	93	14.0 x 27.7 x 21.0
OTP	1	51602-8200-1	78	18.8 x 59.6 x 14.8

### Notes:

1. If an EDF is released more than 2.5 turns, captive head can back off threads. Re-engage head with threads before driving with PGT
2. The lanyard on EDF #4 was extended to resolve the interference issue between the EDF and the hinge bolt. The lanyard will allow the EDF to pull out of the lug/clevis interface

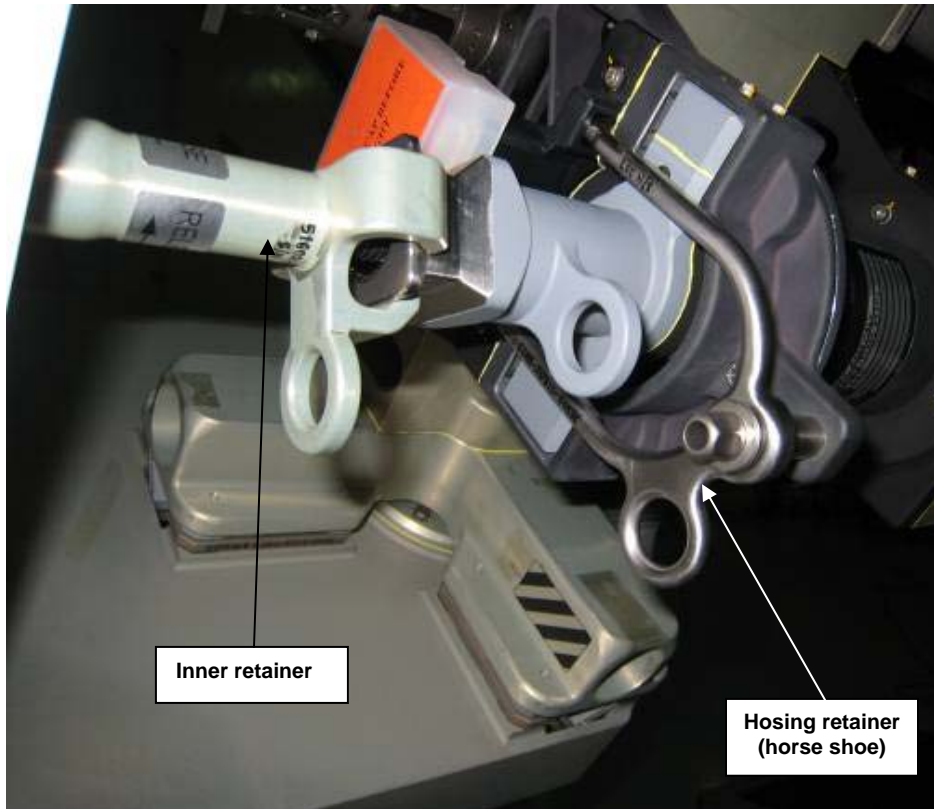
### Cautions:

1. Avoid contact with radiator surfaces on arm SJEU and EP
2. Do not exceed 5 ft-lb when actuating mate/demate mechanism
3. Avoid applying off-axis loads to EDF EVA nut when the EDF is unfastened. Fastener damage may result

### Warnings:

1. Keep translation rates below 0.6 ft/sec
2. Do not perform kick offs, quick grabs, shaking motions
3. SLP APFR ops not allowed when SPDM body is rotated up
4. Do not perform simultaneous FF tasks (except OTCM 1 install or SJEU cover removal) on the fwd face (LEE pivot end) of SLP
5. Do not touch SPDM CPLA interfaces if not unpowered

OTP/THA INSTALL AND MLI REMOVAL – TASK DATA (Cont)



THA Launch Restraints



OTP EDF #4 temp stow position

## SLP CLEANUP/CLPA INSTALL – TASK DATA

### Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	NA	1:55
Two EV Crew	NA	NA

### Tools:

EV2 (FF)
PGT 6-in ext – 7/16
ORU bag
CLPA
Sq Scoop

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
OTCM KA	FSE O1, O4	7/16	2	12.0	25.0	30.5	7.25	30
Arm wrist/shoulder roll clamps	FSE A6, A10, A5, A1	7/16	4	12.0	7.9	24.1	9.75	30
OTCM Roll clamp FSE	FSE O2, O3, O5, O6	7/16	4	12.0	12.5	23.8	8.75-9.25	30
CLPA	N/A	7/16	1	16.0	N/A	30.5	22-23	30

### ORUs/Loose items:

ORU/Item	Qty	Part Number	Mass (lb)	Volume (in <sup>3</sup> )
CLPA	1	51612-3004-1	50.59	22.5 x 17.0 x 16.8

### Notes:

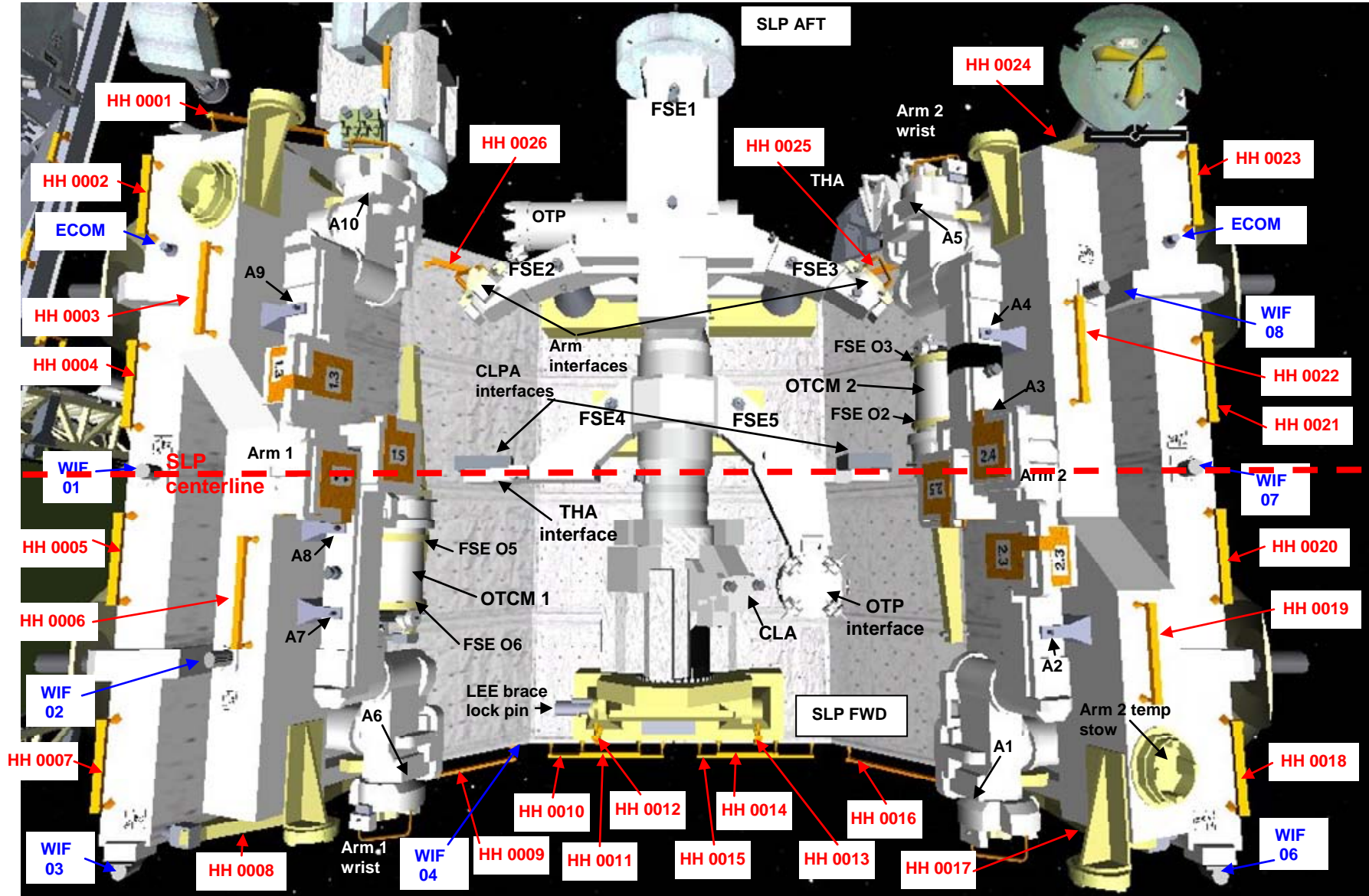
#### Cautions:

1. Avoid contact with radiative surfaces on arm SJEU and EP
2. CLA has a four hour thermal clock with heaters off and cover removed

#### Warnings:

1. Keep translation rates below 0.6 ft/sec
2. Do not perform kick offs, quick grabs, shaking motions
3. SLP APFR ops not allowed when SPDM body is rotated up
4. Do not perform simultaneous FF tasks (except OTCM 1 install or SJEU cover removal) on the fwd face (LEE pivot end) of SLP
5. Thermal hazard: maintain a 6-in keep-out zone from operating MSS lights
6. Ensure that power is turned off before ORU interfaces are broken. Failure to comply could result in electric shock to EVA crewmembers
7. Do not touch SPDM CPLA interfaces if not unpowered

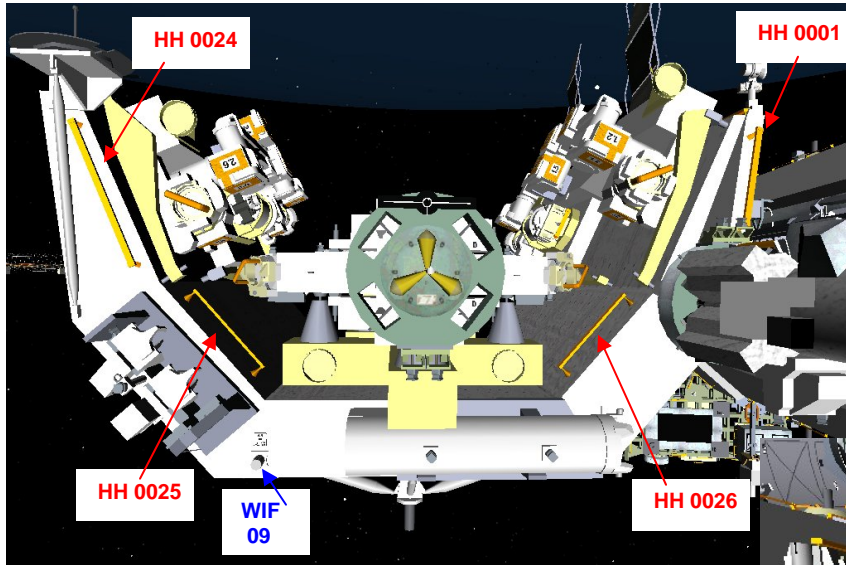
# SLP CLEANUP/CLPA INSTALL – TASK DATA (Cont)



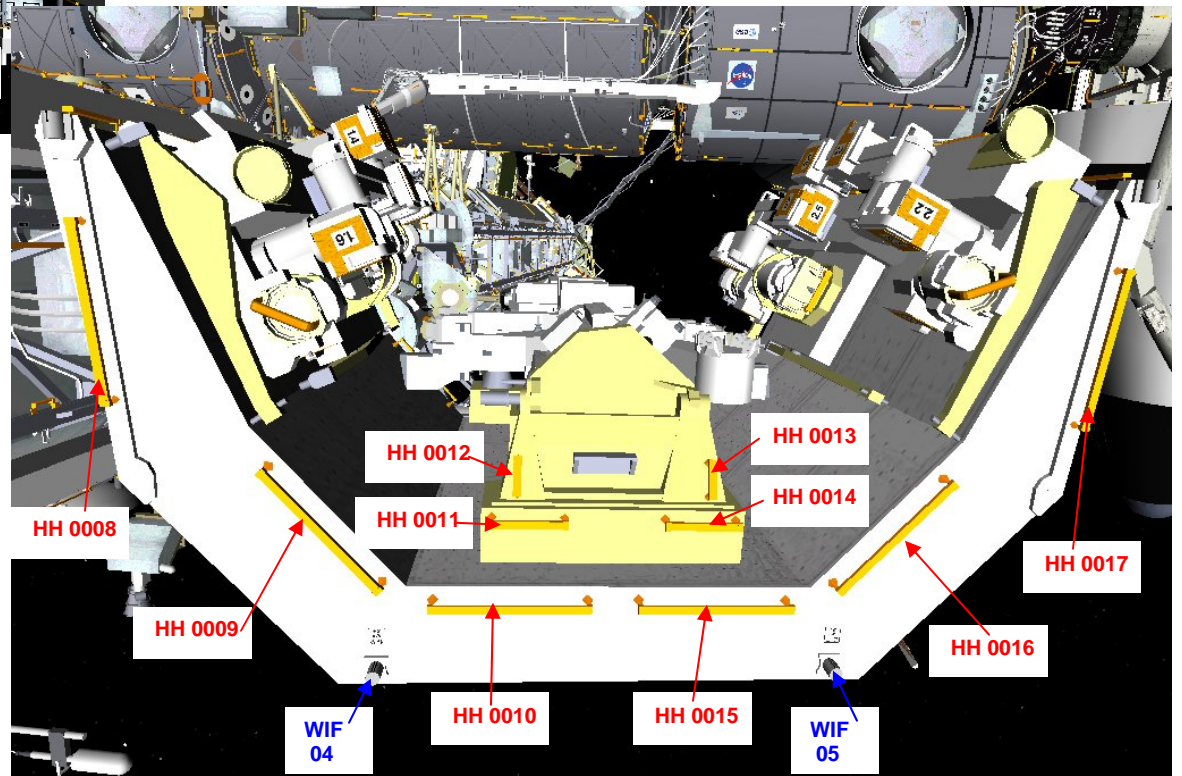
SPDM launch configuration



# SLP CLEANUP/CLPA INSTALL – TASK DATA (Cont)



SLP Aft



SLP Fwd

FS 7-95

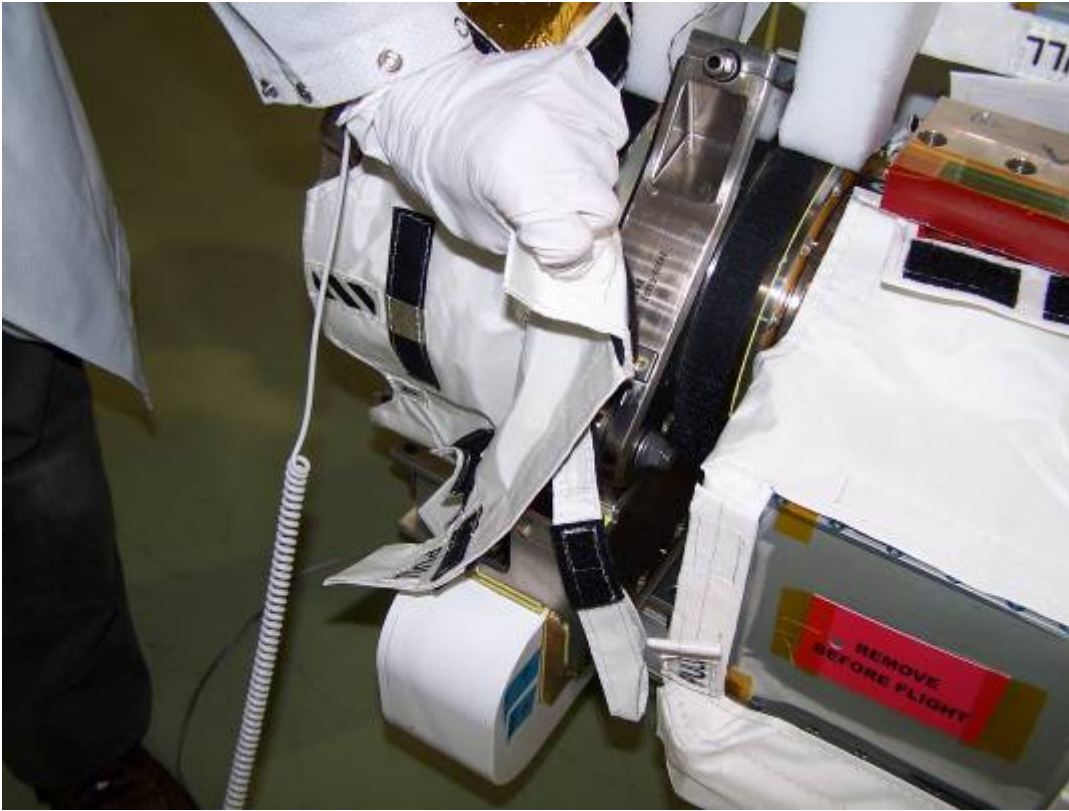
EVA/123/FIN

SLP CLEANUP/CLPA INSTALL – TASK DATA (Cont)

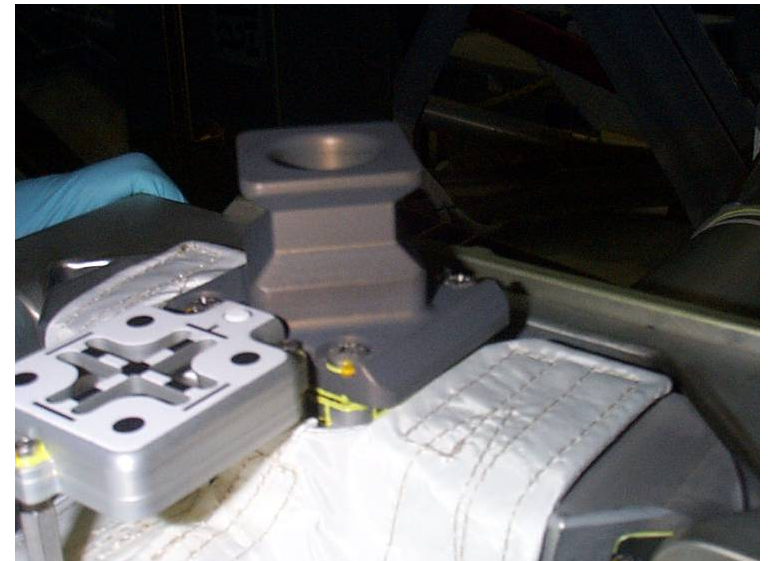
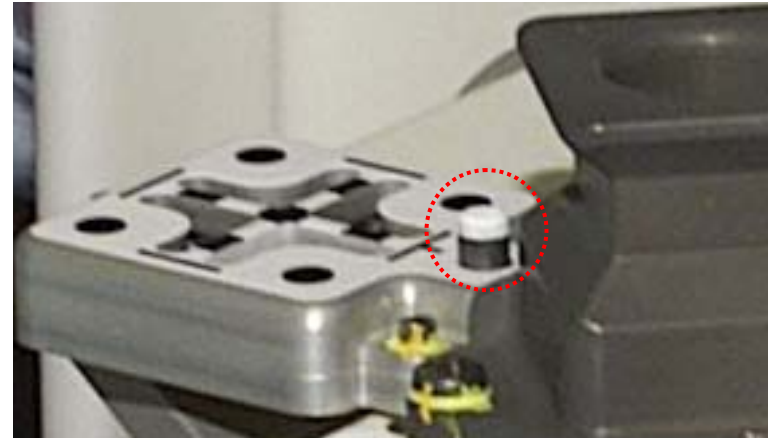


OTCM FSE landing configuration (before KA installed)

SLP CLEANUP/CLPA INSTALL – TASK DATA (Cont)



Wrist MLI (install barber poll and solid black line sides first)



CLPA status indicator (top – indicator shows CLPA not installed, bottom – shows CLPA installed)

## YAW JOINT AND DCSU TRANSFER – TASK DATA

### Estimated Task Duration:

	With SSMS	Without SSRMS
One EV Crew	ORU xfer – 00:45 per ORU	NA
Two EV Crew	NA	NA

### Tools:

EV1 (SSRMS)
55-ft Safety tether
WIF adapter
APFR
PGT 6-in ext – 7/16

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
FRAM PRIMARY BOLT		7/16	1	6.3	6.3		11	30

### Foot Restraints:

Task	WIF	APFR Setting
DCSU TRANSFER	SSRMS	12, PP, F, 6

### ORUs/Loose items:

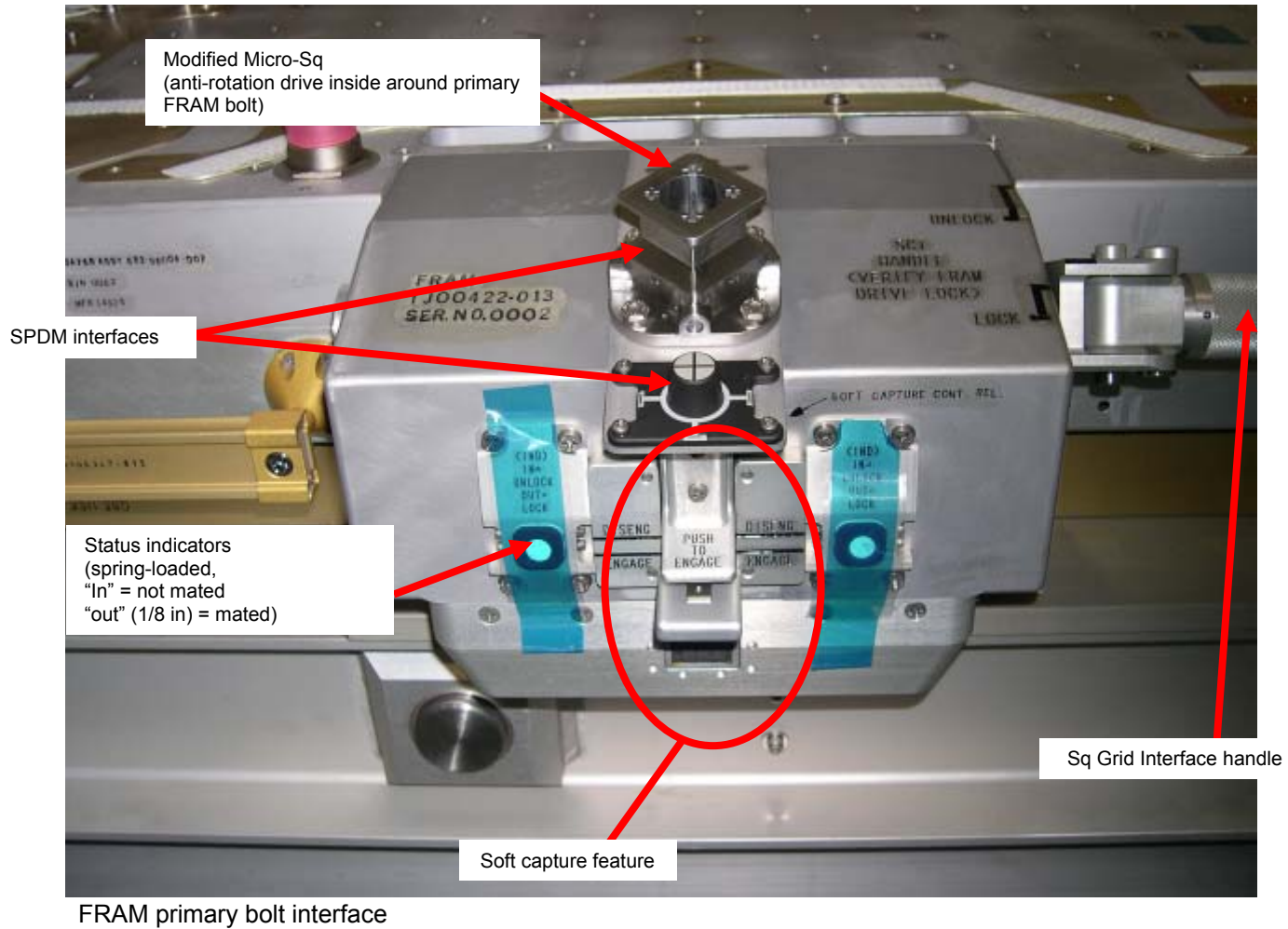
ORU/Item	Qty	Part Number, ID	Mass (lb)	Volume (in <sup>3</sup> )
SSRMS Yaw Joint and FRAM	1	51612-2029-3	507	
DCSU and FRAM	2		371	53x46x25

### Notes:

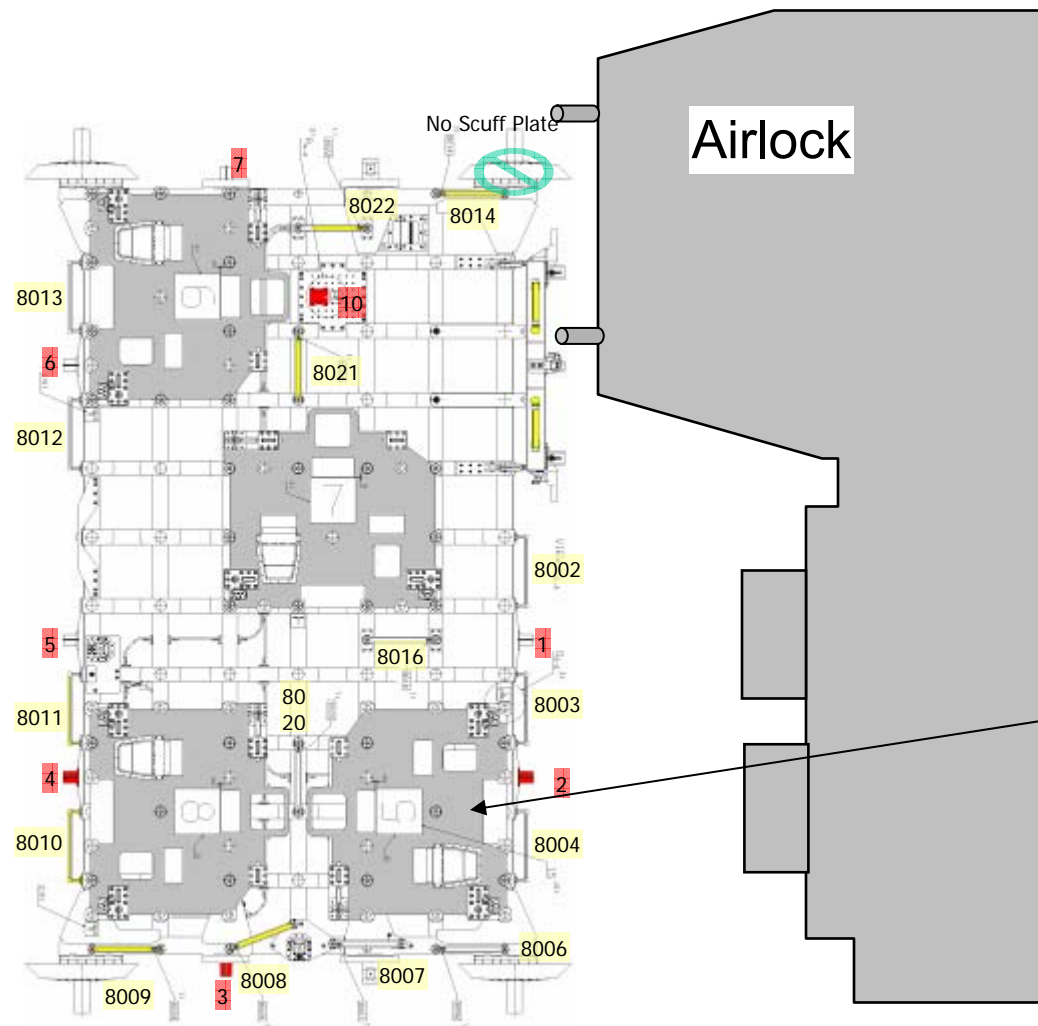
### Cautions:

### Warnings:

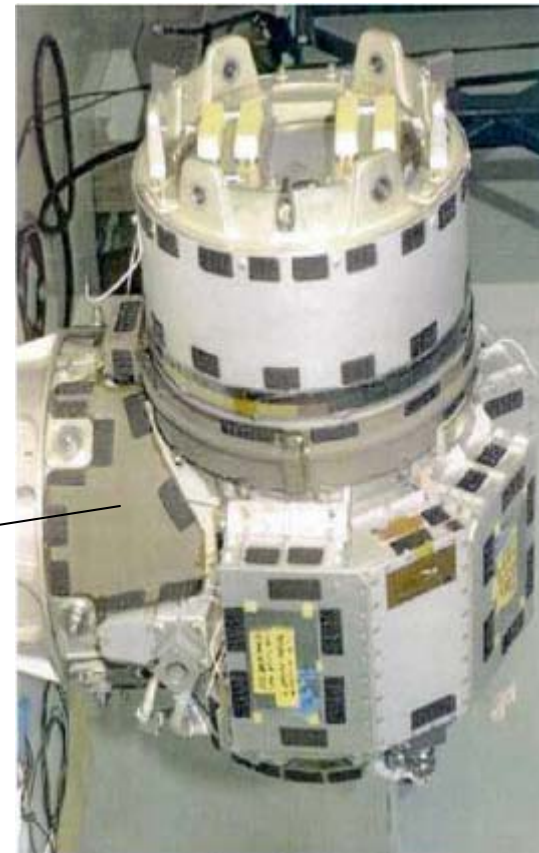
# YAW JOINT AND DCSU TRANSFER – TASK DATA (Cont)



# YAW JOINT AND DCSU TRANSFER – TASK DATA (Cont)

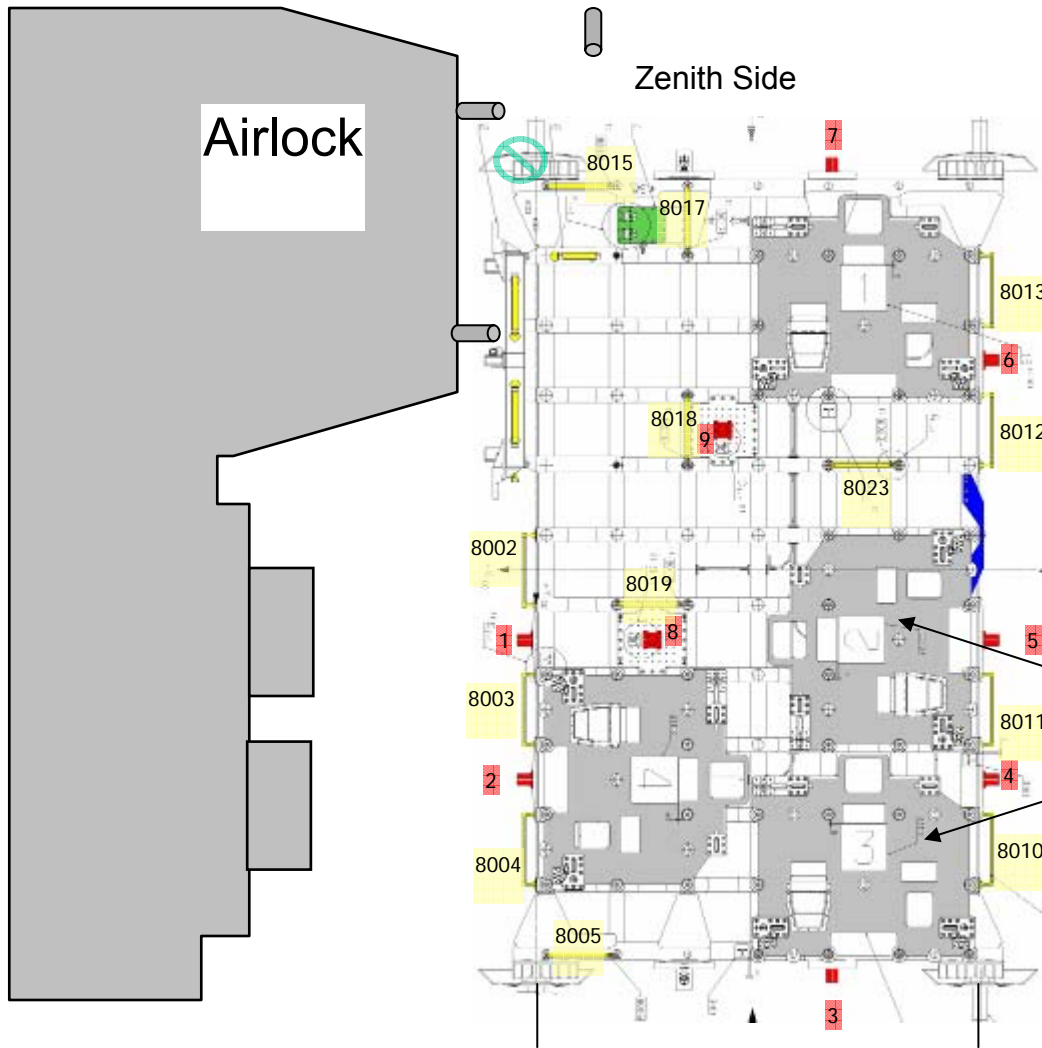


Nadir side of ESP2: SSRMS Yaw Joint Install Location (5)

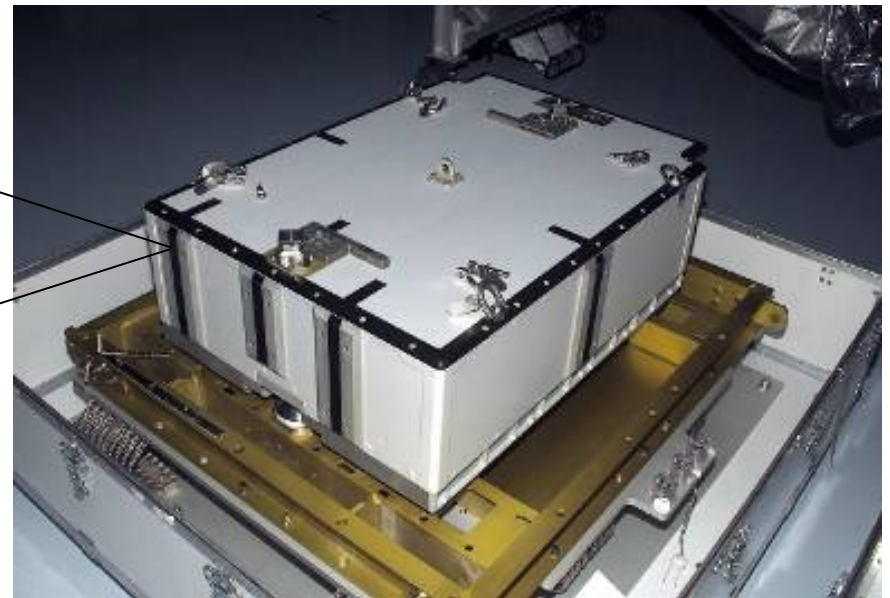


SSRMS Yaw Joint

# YAW JOINT AND DCSU TRANSFER – TASK DATA (Cont)

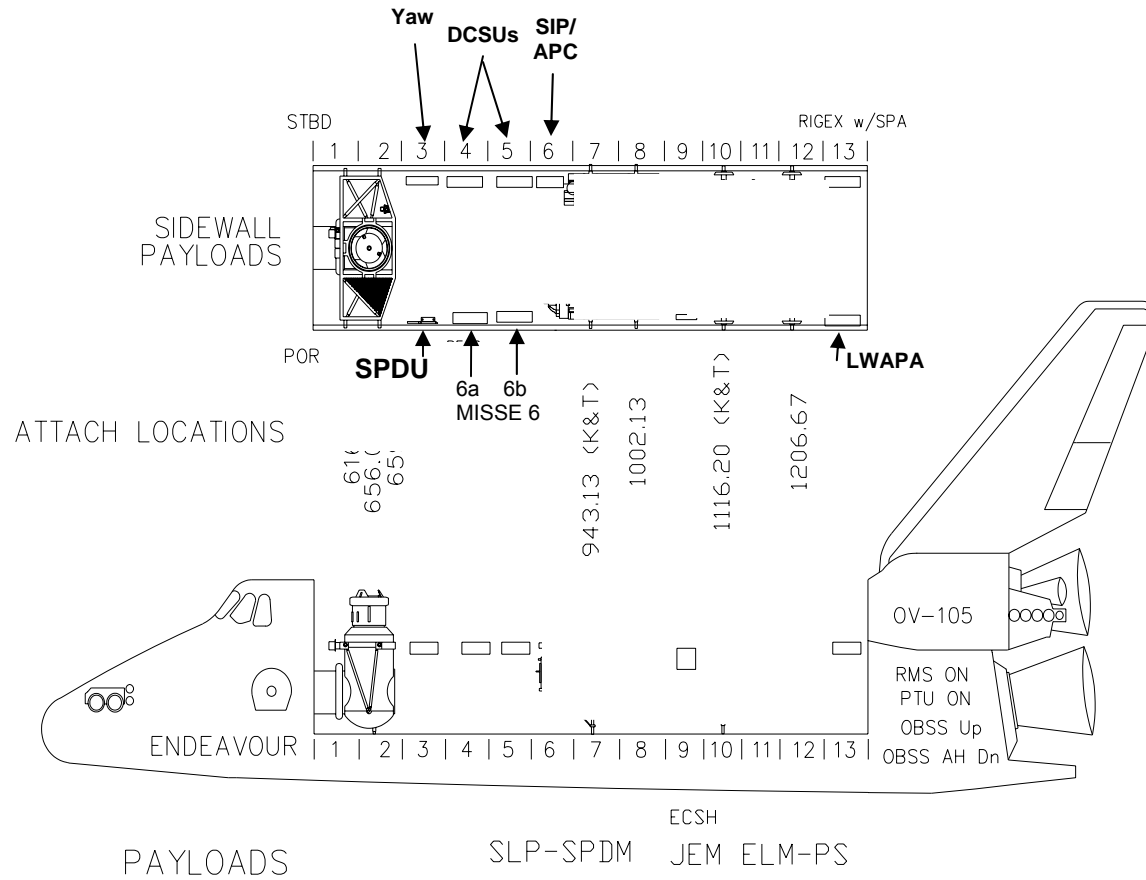


ESP2 DCSU Install Locations (2 and 3)



DCSU

# YAW JOINT AND DCSU TRANSFER – TASK DATA (Cont)





## MISSE 6 INSTALL/DEPLOY – TASK DATA

### Estimated Task Duration:

	With SSMS	Without SSRMS
One EV Crew	01:00	02:00
Two EV Crew	NA	NA

### Tools:

EV1 (SSRMS)	EV2 (FF)
WIF adapter	760 digital camera and mount
APFR	55-ft Safety tether
PGT 6-in ext – 7/16	

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
LWAPA FRAM PRIMARY BOLT		7/16	1	6.3	6.3		11	30

### EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
P6A	LWAPA	J6A (PEC 6A)	2		PEC power
P6B	LWAPA	J6B (PEC 6B)	3		PEC power

### Foot Restraints:

Task	WIF	APFR Setting
MISSE 6 INSATLL	SSRMS	(12,PP,F,6)

### ORUs/Loose items:

ORU/Item	Qty	Part Number, ID	Mass (lb)	Volume (in <sup>3</sup> )
PEC 6A (angled)	1	1247231-1	87.0	30.91 x 33.38 x 6.80
PEC 6B (bent)	1	1247234-1	88.6	30.91 x 32.78 x 6.80
LWAPA and FSE	1	SEG33120158-301	257.8	47.99 x 46.05 x 15.77

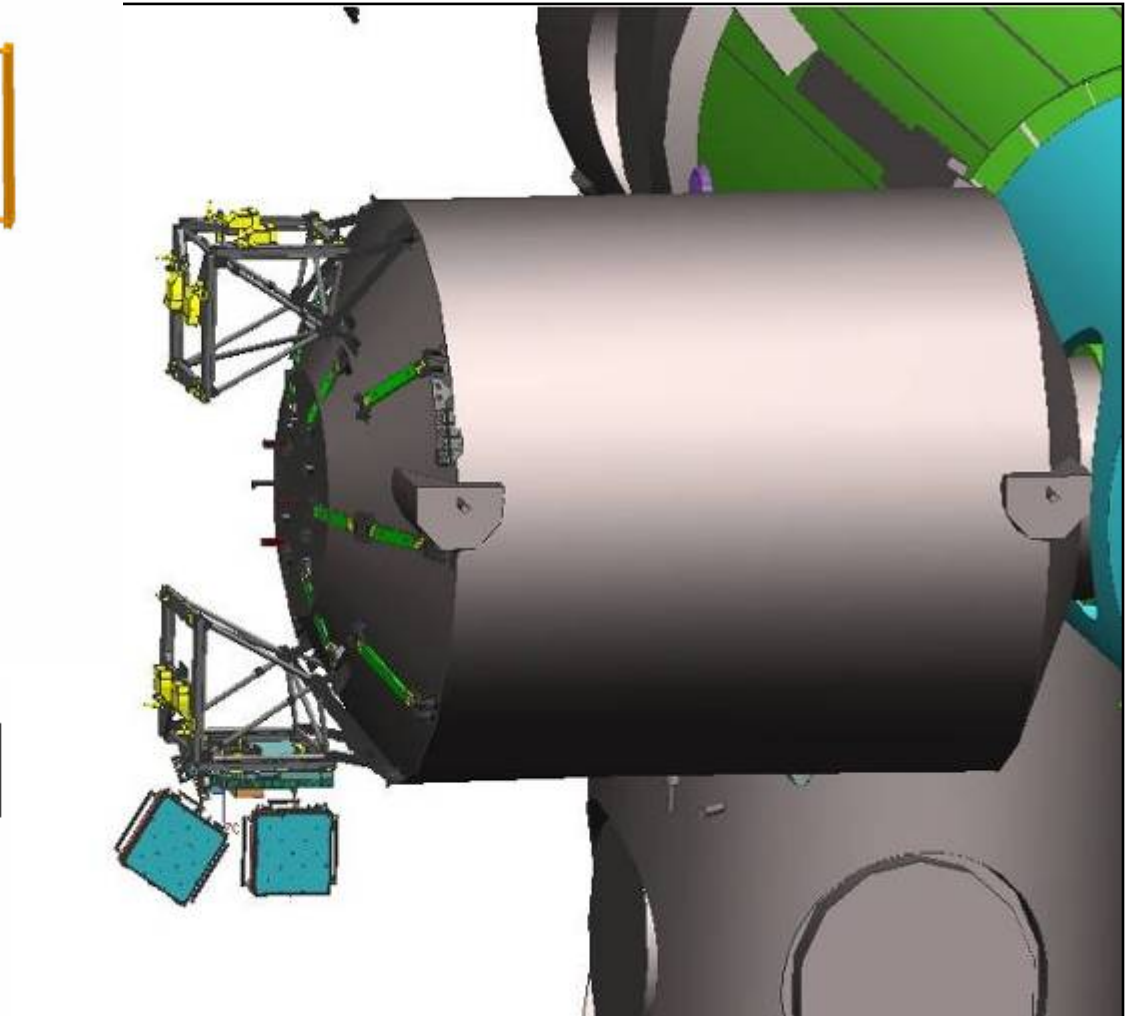
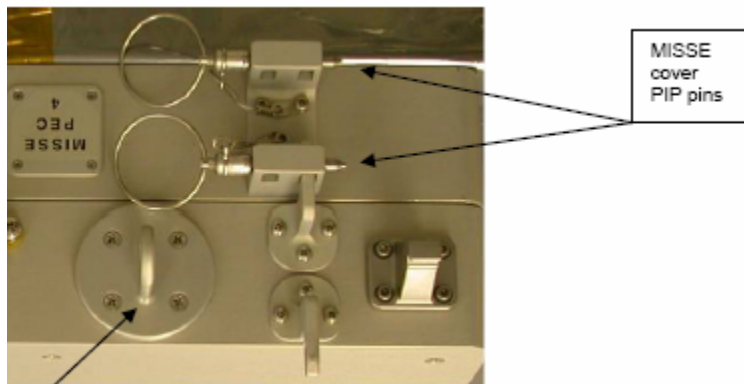
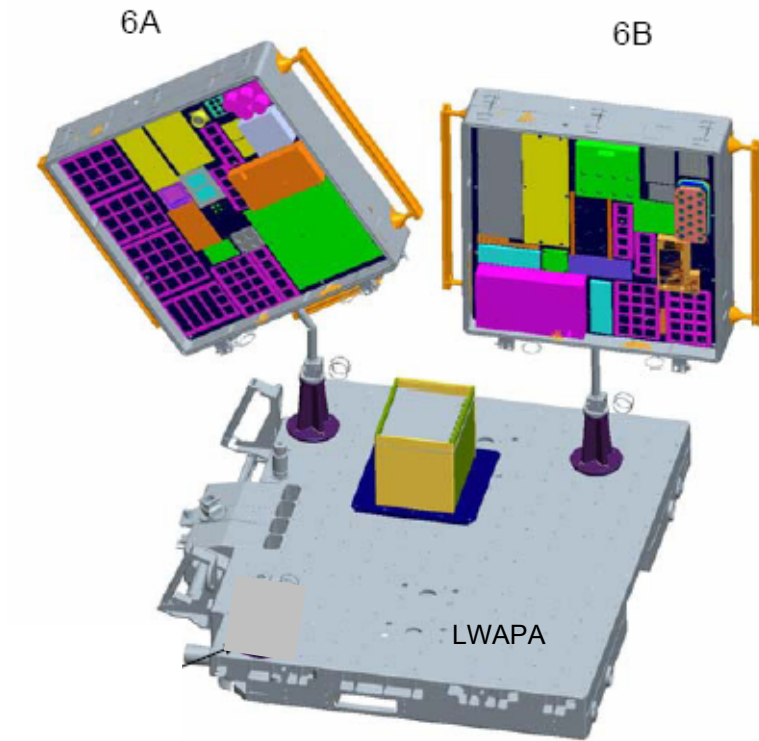
### Notes:

### Cautions:

### Warnings:

1. Sidewall carrier clamp are a pinch point. Use caution during actuation
2. Avoid contact with SSPTS cable connectors (2-ft Keep-out Zone)

# MISSE 6 INSTALL – TASK DATA (Cont)



MISSE 6 install location on Columbus

# STS-123 (1JA) EVA 4 TIMELINE

TIME (HR : MIN)	IV	1JA EVA 4 EV1 – Be (FF)	EV2 – Fm (FF)
00:00 ---		<b>POST DEPRESS</b> (00:05)	<b>POST DEPRESS</b> (00:05)
		<b>A/L EGRESS AND SETUP</b> (00:25) <ul style="list-style-type: none"> <li>Temp stow DTO bags</li> </ul>	<b>A/L EGRESS AND SETUP</b> (00:25) <ul style="list-style-type: none"> <li>Temp stow DTO bags</li> </ul>
		<b>RPCM R&amp;R</b> (00:30) <ul style="list-style-type: none"> <li>Remove failed unit</li> <li>Install spare RPCM</li> </ul>	<b>PATCH PANEL RECONFIGURATION</b> (00:30) <ul style="list-style-type: none"> <li>Stow sq-scoop/D-handle on port Z1 toolbox</li> <li>Swap connector and dust cap</li> </ul>
01:00 ---		<b>T-RAD DTO</b> (03:45) <ul style="list-style-type: none"> <li>Worksite Setup</li> </ul>	<b>T-RAD DTO</b> (03:45) <ul style="list-style-type: none"> <li>Worksite Setup</li> </ul>
02:00 ---		<ul style="list-style-type: none"> <li>T-RAD Pressurization</li> <li>Initial material characterization and purge</li> </ul>	<ul style="list-style-type: none"> <li>T-RAD Pressurization</li> <li>Initial material characterization and purge</li> </ul>
03:00 ---		<ul style="list-style-type: none"> <li>Sample Preparation &amp; Photography</li> </ul>	<ul style="list-style-type: none"> <li>Sample Preparation &amp; Photography</li> </ul>
04:00 ---		<ul style="list-style-type: none"> <li>T-RAD Depressurization</li> <li>Tool Cleanup</li> </ul>	<ul style="list-style-type: none"> <li>T-RAD Depressurization</li> <li>Tool Cleanup</li> </ul>
05:00 ---		<b>PLB OPS</b> (00:45) <ul style="list-style-type: none"> <li>PLB ops</li> </ul>	<b>PLB OPS</b> (00:45) <ul style="list-style-type: none"> <li>PLB ops</li> </ul>
		<b>NODE 2 ACBM LAUNCH LOCK RELEASE</b> (00:15) <ul style="list-style-type: none"> <li>Release Port Launch Locks</li> </ul>	<b>NODE 2 ACBM LAUNCH LOCK RELEASE</b> (00:15) <ul style="list-style-type: none"> <li>Release Nadir Launch Locks</li> </ul>
06:00 ---		<b>EVA 4 CLEANUP AND INGRESS</b> (00:35) <ul style="list-style-type: none"> <li>Lab Cleanup</li> </ul>	<b>EVA 4 CLEANUP AND INGRESS</b> (00:35) <ul style="list-style-type: none"> <li>Lab Cleanup</li> </ul>
		<ul style="list-style-type: none"> <li>Ingress</li> </ul>	<ul style="list-style-type: none"> <li>Ingress</li> </ul>

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**PRE EVA 4 TOOL CONFIG**

*If blue RETs not found, perform RET Pen & Ink changes below:*

- EV1**
- MWS
  - BRT (L)
  - RET (eq-eq)
  - T-Bar
  - RET (eq-eq)
  - RET (eq-eq) w/PIP pin
  - Adj Equip Tether
  - Wire Tie (2)
  - ISS Small Trash Bag
  - RET (eq-eq)
  - EVA Wipe
  - Swing Arm (R)
  - PGT [B3 18.4ft-lb, CAL, MTL 30.5] s/n \_\_\_\_\_
  - PGT Battery s/n \_\_\_\_\_
  - 7/16 (wobble) socket-6 ext
  - RET (eq-eq)
  - Waist Tether (2)
  - D-ring Extender (2)
  - Safety Tether (85 ft)
  - SAFER
  - WWS
  - O2 actuator cover
  - Overgloves (2) donned

- EV2**
- MWS
  - BRT (L)
  - RET (eq-eq)
  - Sq scoop/D-handle
  - Wire Tie
  - T-Bar
  - RET (eq-eq) (R)
  - RET (eq-eq) w/PIP pin (L)
  - Adj Equip Tether
  - Wire Tie (2)
  - ISS Small Trash Bag
  - RET (eq-eq)
  - EVA Wipe
  - Swing Arm (R)
  - T-RAD holster (on outside bayonet)
  - RET (eq-eq)
  - Waist Tether (2) (L – D-ring, R – extender)
  - D-ring Extender (2)
  - Safety Tether (85 ft)
  - SAFER
  - WWS
  - O2 actuator cover
  - Overgloves (2) donned

- AIRLOCK CONFIG**
- Staging Bag
  - Fuse Tether
  - PGT
  - PGT Battery
  - Wire Tie Caddy
  - RAD
  - Connector Cleaner Tool Kit
  - Probe
  - Prybar
  - Connector Pin Straightener
  - Velcro/Tape Caddy
  - RET (eq-eq) (red) – to FS strap
  - GP Cutters (-303 version)
  - RET (eq-eq) (2) (red) – to FS strap
  - Ratchet Wrench w/palm wheel (2) (s/n 1011,1012)
  - IV Bag
  - Towels (2)
  - Contamination Detection Kit
  - GP Caddy (2)
  - Adj Thermal Mittens (2)
  - Socket Caddy (hatch cont) w/RET (eq-eq)
  - 1/2 Socket-8 ext
  - 7/16 (wobble) Socket-6 ext (spare)
  - DCM Plug (SAFER Hardmount) (2)

- EVA C/Lk Bag**
- RPCM
  - RET (Lg-eq) (outside of bag, to secure at worksite) *red*
  - RET (Lg-eq) (outside of bag) *red*

- Sample bag (Tile Sample Bag)**
- Adj Tether on outside of bag (4) (1 on to each hinge-side corner loop, 1 to each opening-side corner strap)
  - Adj Tether (Lg-eq) (to Sample bag internal lid strap)
  - DTO insert (with strong box and pedestals)
  - Sample bag hinge-line corner strap hooks to DTO insert tether points (2)
  - Tile samples strong box, lid secured with hood flap
  - RET (eq-eq) from strong box lid to bag int lid strap
  - EVA wipe
  - RET (eq-eq), securing EVA Wipe to strong box
  - Brush pedestals (3), installed with snaps
  - Angled stamps (2)
  - RET (eq-eq) (2)
  - Brush Handle w/o tip (√s/n 1010)
  - RET (eq-eq)
  - RET (Lg-eq) outside of bag, on side opposite handrail

**AIRLOCK EXTERIOR  
LAB WIF 6**

- APFR (6,PP,L,12)

**AIRLOCK CONFIG (Cont)**

**Large ORU Bag**

- Adj Tether on outside of bag (4) (1 on each loop)
- 85-ft Safety Tethers (2) (under T-RAD)
- T-RAD (day of EVA, end of prebreathe – put knob in STOW position with IV wearing gloves, goggles)
- RET (eq-eq) w/PIP pin (to bag side strap)
- Adj Tether (fully extended on handrail)
- Adj Tether (fully extended on bottom soft strap)
- Fish Stringer *w/1 wipe*
- CIPA Discard Container *w/4 wipes* (on FS hook)
- EVA wipes (3) (on FS hooks)
- Large Trash Bag (FS hook to tether point near opening)
- RET (Lg-eq) (on tether point near opening)
- RET (eq-eq) (on tether point near opening, second hook to restrain bag open when discarding tools)
- Broom Clip Caddy (on FS hook)
- RET (Lg-eq)
- Scraper (not taped)
- Brush Handle w/o tip
- Gel/Foam Brush Caddy w/brush handle w/o tip on int (on FS hook)
- RETs (eq-eq) (2) (1), RET (Lg-eq) (1)
- 1-in foam brush tips (5)
- (remove netting from 4 brushes before EVA)
- Temperature Sensor (on end of FS) → (Lg-eq)
- RET (w/PIP pin) (hooked to FS strap)
- EVA digital camera with bracket (using bracket RET to FS strap, on end opposite temperature sensor)
- RET (w/PIP Pin)
- RET (Lg-eq) (2) (on outside of bag for overgloves)
- Adj Eq Tether (2) (on RET for overgloves)
- RET (Lg-eq) on outside of bag

**Tether Count**

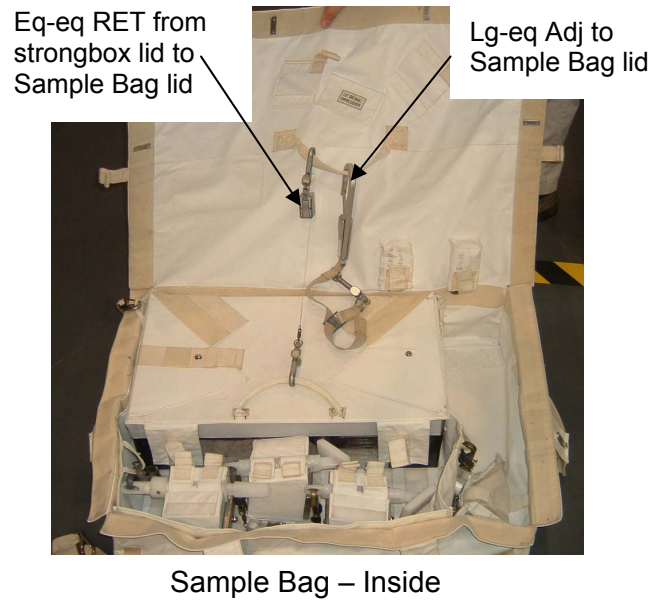
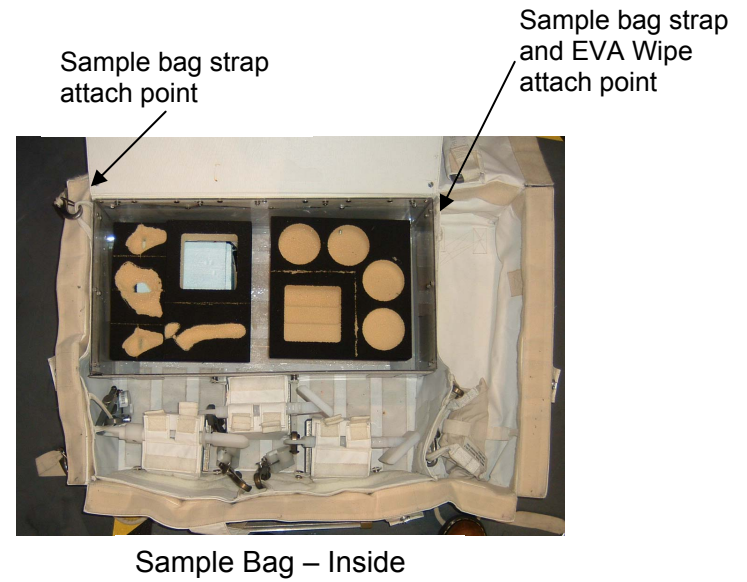
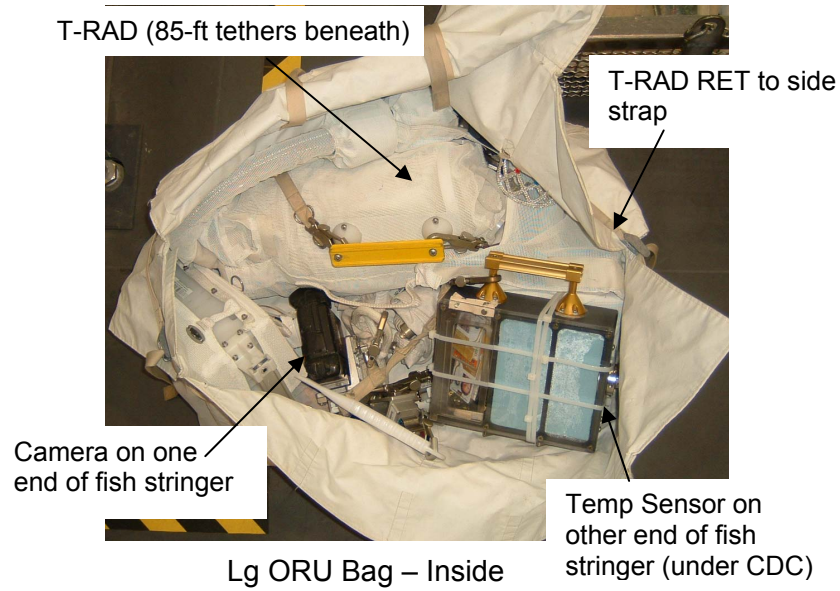
RET (eq-eq) – 16 (blue), 3 (red)  
 RET (Lg-eq) – 8 (blue) RET (w/PIP pin) – 5 (blue)  
 Adj Eq Tether (eq-eq) – 14 Adj Eq Tether (Lg-eq) – 1

**Prior to EVA, perform the following hardware inspections:**

1. RET cords for fraying
2. No red line visible on safety and waist tether load Alleviation straps
3. Inspect STS trash bags for deformation/damage
4. Inspect EMU gloves for damage
5. Check MWS Baseplate for loose screws on toggle levers

**Use Blue RETs only (except for staging bag items)**

PRE EVA 4 TOOL CONFIG (Cont)



## EVA 4 INHIBIT PAD

### Orbiter

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 ft from FRCS:
IV	1. √DAP: VERN, FREE, LO Z
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	
	<u>NOTE</u> Possible loss of comm when forced LL FWD antenna
	If EV crew < 1.6 ft from S-Band antenna:
IV	1. S-BAND FM ANT – XMIT LOWER/RCVR UPPER
A1R	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 1.6 ft away from all S-Band upper antennas:
C3	4. S-BAND PM ANT – GPC

### Ground

Ground Radar	
MCC-H	1. √TOPO 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	1. √PCUs (two) operational in discharge mode and one of the following: <ul style="list-style-type: none"> <li>a. CCS PCU EVA hazard control FDIR enabled</li> <li>b. No more than two arrays unshunted and oriented &lt; 105° from the velocity vector</li> </ul>
	If one or both PCUs failed:
	2. No more than two arrays unshunted and oriented < 105° from velocity vector

Lab Window	
IV	Close window shutter for duration of EVA to prevent contamination from T-RAD

SSPTS	
IV	If EV crew < 2 ft from ungrounded SSPTS connector (not planned): <ul style="list-style-type: none"> <li>1. RPCM LA2A3B_D RPC 1 – Open, Close Cmd Inhibit</li> <li>2. RPCM Z13B_A RPC 2 – Open, Close Cmd Inhibit</li> <li>3. RPCM LA1A4A_D RPC 3 – Open, Close Cmd Inhibit</li> <li>4. RPCM Z14B_A RPC 2 – Open, Close Cmd Inhibit</li> </ul>

RPCM/Patch Panel	
Patch Panel – to be performed during egress	
MCC	√RPCM Z13B RPC 18 – Open, close cmd inh √RPCM S02B D RPC 17 – Open, close cmd inh
RPCM – to be performed 10 min prior to R&R	
MCC	√DDCU S02B Converter Off

### RSOS

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

## 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 (drylube)
  2. PIP pins
  3. EVA Crane [PMA 1]
  4. TCS Reflectors [PMA 2,PMA 3]
  5. APAS hardware [PMA 2,PMA 3]
  6. CETA Lights (Z-93 paint) [LAB,S1,Node 1]
  7. Deployed MISSEs (Columbus EPF)
  8. Passive UMAs
  9. MBS VDU, MCU, CRPCMs, and Cameras (taped radiative surfaces, silver Teflon)
  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. SSRMS/SPDM Cameras
  22. SPDM SJEU, EP, OTCM Radiator surfaces
  23. Open CBM petal covers and LAB window shutter
  24. FPMU [S1]
  25. OTSD
  26. Columbus HAM radio antennas

### 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



## NOTES, CAUTIONS, AND WARNINGS (Cont)

### CAUTION (Cont)

#### 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 (Cont)

#### Shuttle Constraints

##### G. Avoid inadvertent contact with

1. OBSS and SRMS Composite Sections 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 wire harnesses, cables, 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]

## 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
- 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 linkages during operation
- 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 (Cont)

#### 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 sockets
  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. Z1 handrail 6061 by the Ku-Band boom launch restraint [Z1]
  10. Solar Array Blanket Box [P6,S6]
  11. Keep hands away from SSRMS, SPDM, POA LEE opening, and snares
  12. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing
  13. Lifting lug near P6 handrail 5333 and gap spanner

### WARNING (Cont)

#### ISS Constraints (Cont)

- F. Sharp Edges (Cont)
14. SPDM OTCM Gripper Jaws
  15. SOLAR and EuTEF
  16. Port/Aft portion of A/L circular HH
- 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/SPDM/MBS 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  $< -120$  or  $> 200$  degF

## NOTES, CAUTIONS, AND WARNINGS (Cont)

### WARNING (Cont)

#### ISS Constraints (Cont)

##### H. Electrical Shock

1. Stay  $\geq$  2 ft from ungrounded floating connectors if not unpowered:
2. SSPTS connectors [NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA 2 Stbd & Port]
3. MBS Cross-Connect jumpers (translate past these using UMA handrails)
4. S0 EVA Power Cables [inside S0 Bay 00 Face 4, Bay 01 Face 3]
5. ESP2 jumper [inside S0 Bay 03 Face 4]

### WARNING (Cont)

#### 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]

### WARNING (Cont)

#### 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

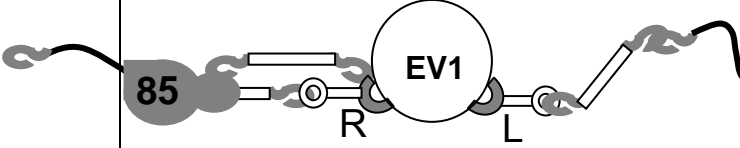
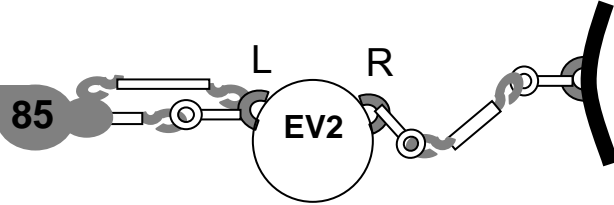
##### N. Contamination

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

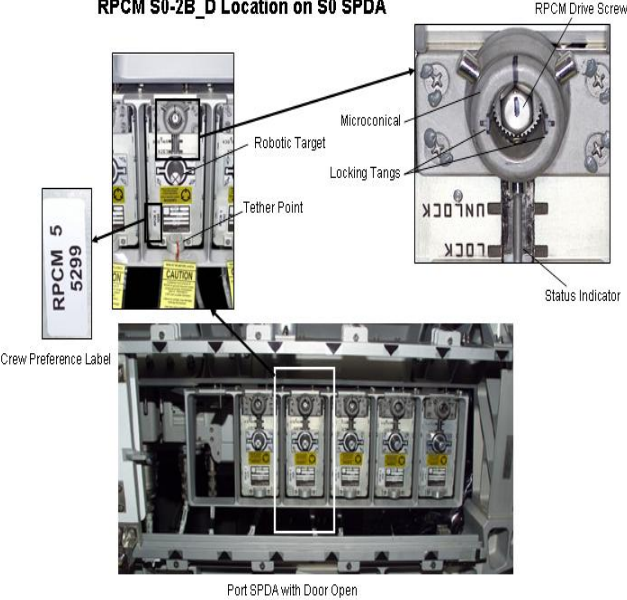
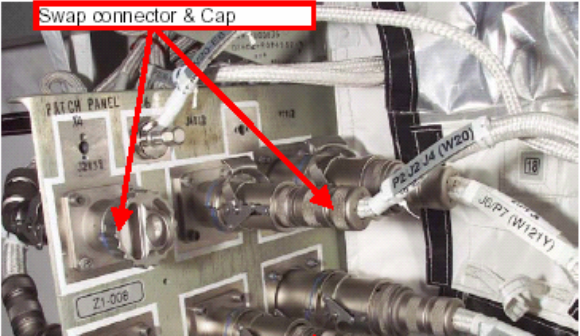
##### O. Lasers

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

# RPCM R&R/PATCH PANEL RECONFIGURATION (00:30)

IV	EV1 – Be (FF)	EV2 – Fm (FF)
<p>1. Post crew egress: WVS Software: Select page – RF Camera sel 'Advanced controls' S-Band level (two) – max</p>	 <p><b>Initial condition:</b> Left waist tether connected to EV2 85-ft safety tether, Hook locked. O2 actuator cover installed. Overgloves donned</p> <p><b>EGRESS/SETUP</b> (00:25)</p> <ol style="list-style-type: none"> <li>Open thermal cover</li> <li>Egress A/L</li> <li>Attach EV1 85-ft safety tether to fwd A/L D-ring <ul style="list-style-type: none"> <li><input type="checkbox"/> √Gate closed</li> <li><input type="checkbox"/> √Hook locked</li> <li><input type="checkbox"/> √Reel unlocked</li> </ul> </li> <li>Attach EV2 85-ft safety tether to aft A/L D-ring tether point <ul style="list-style-type: none"> <li><input type="checkbox"/> √Gate closed</li> <li><input type="checkbox"/> √Hook locked</li> <li><input type="checkbox"/> EV1: √Reel unlocked</li> </ul> </li> <li>Give EV2 GO to release waist tether</li> <li>Receive Lg ORU bag from EV2; stow on A/L toolbox (use corner Adj tether and overglove RET)</li> <li>Receive Sample bag from EV2; stow on A/L HH (use 2 corner Adj tethers)</li> <li>Receive C/Lk bag (RPCM); stow on BRT</li> <li>Verify SAFER config <ul style="list-style-type: none"> <li><input type="checkbox"/> √L Handle down (MAN ISO Vlv – Open)</li> <li><input type="checkbox"/> √R Handle down (HCM – Closed)</li> </ul> </li> <li>√O2 actuator cover installed</li> </ol>	 <p><b>Initial condition:</b> Right waist tether connected to A/L D-ring extender, Hook locked. O2 actuator cover installed. Overgloves donned</p> <p><b>EGRESS/SETUP</b> (00:25)</p> <ol style="list-style-type: none"> <li>On EV1 GO release right waist tether, attach to self</li> <li>Transfer Lg ORU bag to EV1</li> <li>Transfer Sample bag to EV1</li> <li>Transfer C/Lk bag (RPCM) to EV1</li> <li>Egress A/L</li> <li>Close thermal cover</li> <li>Verify SAFER config <ul style="list-style-type: none"> <li><input type="checkbox"/> √L Handle down (MAN ISO Vlv – Open)</li> <li><input type="checkbox"/> √R Handle down (HCM – Closed)</li> </ul> </li> <li>√O2 actuator cover installed</li> </ol>

## RPCM R&R/PATCH PANEL RECONFIGURATION (00:30) (Cont)

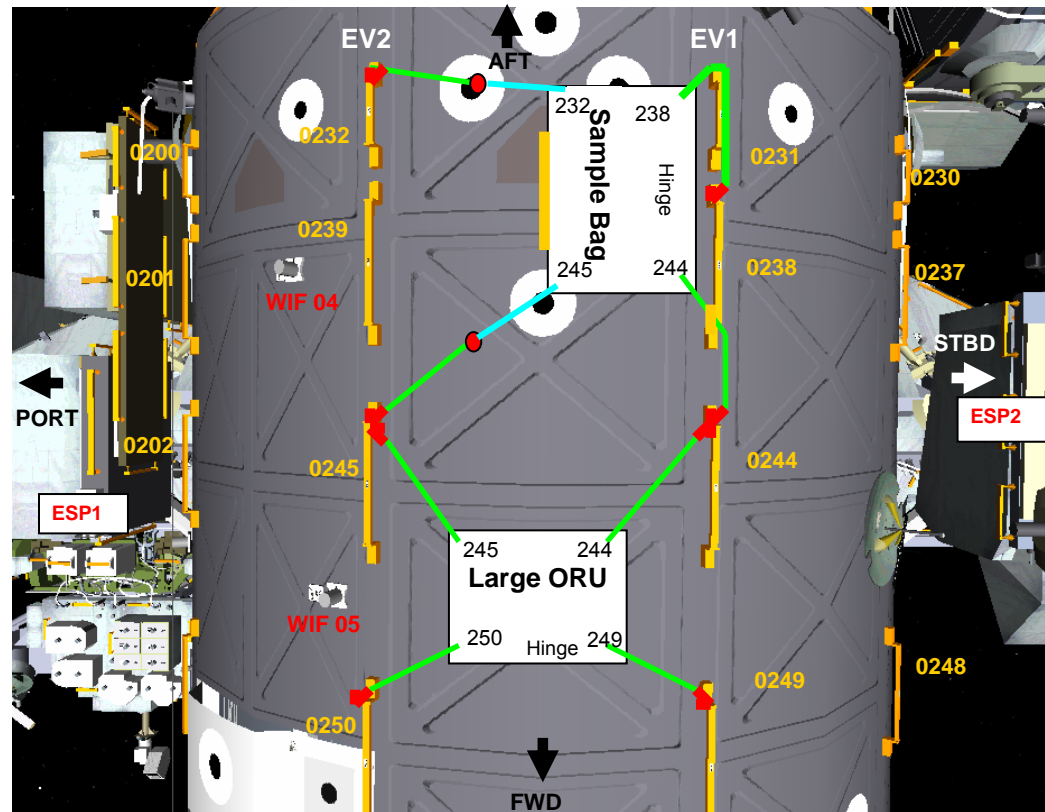
IV	EV1 – Be (FF)	EV2 – Fm (FF)
<p>1. Verify with MCC patch panel inhibits in place:            √RPCM Z13B RPC 18 – Open, close cmd inh            √RPCM S02B D RPC 17 – Open, close cmd inh</p> <p>2. Give EV2 GO for patch panel reconfig</p> <p style="text-align: center;"><b>NOTE</b>            CETA lights will be turned off due to DDCU            powerdown for RPCM</p> <p>3. Verify with MCC RPCM inhibits in place (when EV1 reaches S0):            √DDCU S02B Converter Off</p> <p>4. Give EV1 GO for RPCM Removal</p> <p style="text-align: center;"><b>RPCM S0-2B_D Location on S0 SPDA</b></p>  <p>5. Give MCC-H GO for patch panel power up</p>	<p><b>RPCM R&amp;R</b> (00:30)</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b>            Edges of RPCM housing may be sharp, use caution while handling</p> </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b>            Verify GFE covers removed from RPCM</p> </div> <p style="text-align: center;">Avoid contact with SPDA radiator (face 3)</p> <p>Failure to align and fully seat socket until lock springs have released can result in damage to RPCM Drive Screw Assembly</p> <p>Combined linear and rotational motion on the socket while inserting, can result in damage to RPCM Drive Screw Assembly</p> <ol style="list-style-type: none"> <li>1. Translate to S0 Face 2 between zenith MBSUs; inform MCC when on S0 (translate up aft side of S0)</li> <li>2. Translate to SPDA</li> <li>3. <u>Stow C/Lk bag on HH 3487 and 3484</u></li> <li>4. BRT to HH 3487</li> <li>5. Inspect gloves</li> <li>6. Slide port SPDA door open to soft dock</li> <li>7. Verify failed RPCM 2B_D s/n X800390</li> <li>8. <u>Tether to failed RPCM w/C/Lk bag RET (w/hook pointed toward RPCM)</u></li> <li>9. On IV GO: <b>PGT [A6 8.3 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16</b>: release drive screw, push while turning, ~8 turns</li> <li>10. √Status Indicator – UNLOCK</li> <li>11. Remove failed RPCM, slide off guide rail</li> <li>12. Inspect guide rail for debris/damage</li> <li>13. <u>Retrieve replacement RPCM; stow failed unit in bag</u></li> <li>14. Verify replacement unit s/n</li> <li>15. Inspect RPCM connector interface for debris/damage</li> <li>16. <u>Install RPCM on guide rail and slide into soft dock</u></li> <li>17. √Status Indicator – not below UNLOCK</li> </ol>	<p><b>PATCH PANEL RECONFIG</b> (00:30)</p> <ol style="list-style-type: none"> <li>1. Translate to Z1 port toolbox</li> <li>2. Inspect gloves</li> <li>3. Stow sq scoop/D-handle on port toolbox door</li> <li>4. Translate to Z1 patch panel, Z1-008 (stbd of toolbox)</li> <li>5. On IV GO:           <ul style="list-style-type: none"> <li><input type="checkbox"/> Remove dust cap from J2</li> <li><input type="checkbox"/> Remove connector P2 from J4</li> <li><input type="checkbox"/> Place dust cap on J4</li> <li><input type="checkbox"/> Mate P2 to J2</li> </ul> </li> <li>6. Give GO for patch panel power up</li> <li>7. Translate to A/L</li> </ol>  <p>Z1 Patch Panel – Z1-008</p>

## RPCM R&R/PATCH PANEL RECONFIGURATION (00:30) (Cont)

IV	EV1 – Be (FF)	EV2 – Fm (FF)						
<table border="1" data-bbox="92 337 718 451"> <thead> <tr> <th colspan="2">RPCM Install data</th> </tr> <tr> <th>Torque (3.8 ft-lb)</th> <th>Turns (6.5)</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> </tr> </tbody> </table> <p data-bbox="92 506 466 532">6. Give MCC-H GO for RPCM power up</p>	RPCM Install data		Torque (3.8 ft-lb)	Turns (6.5)			<ol style="list-style-type: none"> <li data-bbox="747 305 1331 376">18. <b>PGT [A2 3.8 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16:</b> fasten drive screw, push while turning, ~6.5 turns to hard stop</li> <li data-bbox="747 380 1031 402">19. √Status Indicator – LOCK</li> <li data-bbox="747 406 1094 428">20. Slide door port to close position</li> <li data-bbox="747 431 1255 454">21. √Alignment mark; verify door does not slide freely</li> <li data-bbox="747 457 968 480">22. <u>Retrieve C/Lk bag</u></li> <li data-bbox="747 483 1073 506">23. Give GO for RPCM power up</li> <li data-bbox="747 509 1142 532">24. Translate to A/L; open thermal cover</li> <li data-bbox="747 535 1087 558">25. <u>Stow PGT and C/Lk bag in A/L</u></li> <li data-bbox="747 561 989 584">26. Close thermal cover</li> </ol>	
RPCM Install data								
Torque (3.8 ft-lb)	Turns (6.5)							

T-RAD DTO (03:45)

IV	EV1 – Be (FF)	EV2 – Fm (FF)
	<p><b>WORKSITE SETUP</b> (01:20)</p> <ol style="list-style-type: none"> <li>Retrieve Lg ORU bag from A/L toolbox; stow on BRT</li> <li>Translate to Lab nadir via stbd path fairlead at HR 0218</li> <li>Translate to aft standoff of HR 0249</li> </ol>	<p><b>WORKSITE SETUP</b> (01:20)</p> <ol style="list-style-type: none"> <li>Retrieve sample bag from A/L HH; stow on BRT</li> <li>Translate to Lab nadir via port path fairlead at Node HH 0132</li> <li>Translate to aft standoff of HR 0232</li> </ol>



**T-RAD DTO (03:45) (Cont)**

IV	EV1 – Be (FF)	EV2 – Fm (FF)
<p><b>Sample bag</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Hook sample bag tether 0244 under HR 0238 to HH 0244 aft standoff</li> <li><input type="checkbox"/> Loop sample bag tether 0238 around HH 0231 aft standoff to HH 0238 aft standoff</li> <li><input type="checkbox"/> Hook sample bag tether 0245 to HH 0245 aft standoff</li> <li><input type="checkbox"/> Hook sample bag tether 232 to HH 0232 aft standoff</li> </ul> <p><b>Lg ORU bag</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Hook ORU bag tether 0249 to HH 0249 aft standoff</li> <li><input type="checkbox"/> Hook ORU bag tether 0244 to HH 0244 aft standoff</li> <li><input type="checkbox"/> Hook ORU bag tether 0250 to HH 0250 aft standoff</li> <li><input type="checkbox"/> Hook ORU bag tether 0245 to HH 0245 aft standoff</li> </ul>	<ol style="list-style-type: none"> <li>5. Temp stow Lg ORU bag</li> <li>6. Translate to Sample bag worksite</li> <li>7. Stow stbd tether of Sample bag w/hinge line stbd, against HR 0238 and 0231 <ul style="list-style-type: none"> <li><input type="checkbox"/> Configure bag per cuff checklist</li> </ul> </li> <li>8. Loosely cinch Sample bag</li> <li>9. Inspect gloves; remove and stow overgloves on Adj tether outside of ORU bag</li> <li>10. Stow stbd tethers of Lg ORU bag w/hinge line fwd <ul style="list-style-type: none"> <li><input type="checkbox"/> Configure bag per cuff checklist</li> </ul> </li> <li>11. Cinch Lg ORU bag</li> <li>12. Open Sample bag lid; secure lid using Lg-sm adj tether</li> <li>13. Open Lg ORU bag lid, secure open w/inner lid hooks</li> <li>14. Translate to EV2; adjust and cinch sample bag as reqd</li> <li>15. Receive EV2 overgloves; stow on Adj tether outside of ORU bag</li> <li>16. Transfer T-RAD gun to EV2 (stow bag RET on T-RAD)</li> <li>17. Secure T-RAD behind EV2 such that gun is fwd of elbow cluster</li> </ol>	<ol style="list-style-type: none"> <li>5. Stow port straps (HH 0232, HH 0245) of Sample bag w/hinge line stbd <ul style="list-style-type: none"> <li><input type="checkbox"/> Configure bag per cuff checklist</li> <li><input type="checkbox"/> If waiting for EV1, proceed w/APFR setup (steps 9-12)</li> </ul> </li> <li>6. Loosely cinch Sample bag</li> <li>7. Stow port tethers of Lg ORU bag w/hinge line fwd <ul style="list-style-type: none"> <li><input type="checkbox"/> Configure bag per cuff checklist</li> </ul> </li> <li>8. Cinch Lg ORU bag</li> <li>9. Translate to Lab WIF 6</li> <li>10. Tether to and retrieve APFR (__, <b>TT,C,11</b>)</li> <li>11. Translate to Lab WIF 4</li> <li>12. Install APFR in Lab WIF 4 (<b>1, TT, C, 11</b>) <ul style="list-style-type: none"> <li><input type="checkbox"/> √Locking collar black-on-black</li> <li><input type="checkbox"/> Good pull test</li> <li><input type="checkbox"/> Inspect gloves</li> </ul> </li> <li>13. Ingress APFR; evaluate reach to samples</li> <li>14. Inspect gloves; remove overgloves and transfer to EV1</li> <li>15. Receive gun from EV1, tether to gun w/MWS RET (top of hose)</li> </ol>

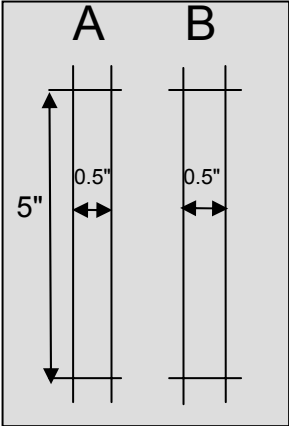




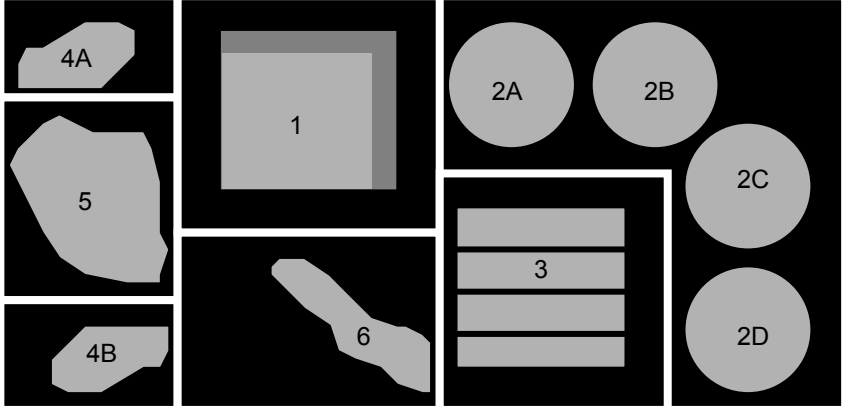
**T-RAD DTO (03:45) (Cont)**

IV/SSRMS	EV1 – Be (FF)	EV2 – Fm (FF)
<p>Record GMT after pressurization _____</p>	<p><b><u>T-RAD PRESSURIZATION</u></b> (00:15)</p> <ol style="list-style-type: none"> <li>1. While EV2 restrains gun, remove EVA knob from STOW port (~5 turns ccw)</li> <li>2. Install EVA knob into PRESSURE port (~5 turns cw to hard stop); back off 1.5 turns ccw</li> <li>3. Verify pressure increasing; report T-RAD pressure _____ psi</li> <li>4. Close MLI flap, Velcro and 1/4 turn fastener as reqd</li> <li>5. Translate back to staged tools on HR 0244</li> <li>6. Attach digital camera RET to HH 0238 (so camera between fish stringer and HH 0238)</li> <li>7. Verify Lg trash bag and EVA wipes accessible</li> </ol>	<p><b><u>T-RAD PRESSURIZATION</u></b> (00:15)</p> <ol style="list-style-type: none"> <li>1. Restrain gun in holster while EV1 is pressurizing T-RAD</li> </ol>

T-RAD DTO (03:45) (Cont)

IV	EV1 – Be (FF)	EV2 – Fm (FF)
<p style="text-align: center;"><u>NOTE</u></p> <p>On gun gauge, green range is 40-120 degF with 5 deg increments</p> <p>Record width _____, thickness _____, and flow duration _____; report to MCC</p> <p>Record purge duration from MCC _____</p> <p>Record temp on gun gage (post purge) _____</p> <p style="padding-left: 20px;">Start 10 min timer after step 4</p> <p style="padding-left: 20px;">Start 10 min timer after step 6</p> <p>Record temp of Aluminum in sample _____ °C</p> <p>Record temp of nozzle _____ °C</p> <p>Record temp on gun gage _____</p>	<p><b><u>INITIAL MATERIAL CHARACTERIZATION AND PURGE</u></b> (00:25)</p> <p>Wipe STA-54 from visor as soon as possible. Use "Trigger...Flow...Release" protocol, indicate when gun end cap back in place. For purges, IV will count down to release. Move flow lever on T-RAD to 'Safe' before holstering and to 'Flow' prior to squeezing trigger. Holster gun when not flowing</p> <div style="text-align: center;">  <p><b>CDC scraper bin</b></p> </div> <ol style="list-style-type: none"> <li>1. Take temperature of Aluminum in 4x4 sample _____ °C</li> <li>2. Wipe nozzle as reqd</li> <li>3. Take temperature of nozzle _____ °C</li> <li>4. Close temp sensor display cover and probe tip cover</li> <li>5. Stow temp sensor in Lg ORU Bag</li> </ol>	<p><b><u>INITIAL MATERIAL CHARACTERIZATION AND PURGE</u></b> (00:25)</p> <p style="text-align: center;"><u>NOTE</u></p> <ol style="list-style-type: none"> <li>1. Dispense 1 line into CDC scraper bin along column A (between tick marks)</li> <li>2. Report approximate thickness and width of line right after dispense</li> <li>3. Watch line for ~1 min, reporting expansion (<u>NOTE</u>: part A only)</li> <li>4. Purge into CDC closed bin for X sec (according to MCC, ref Task Data, FS 7-135), reporting visual dispense information and expansion</li> <li>5. Report temperature on gun gauge, post purge (~where in green/red)</li> <li>6. Dispense 1 line into CDC scraper bin along column B (between tick marks) <ul style="list-style-type: none"> <li>• Discuss for ~1 min (unless unusually interesting)</li> <li>• Report any differences between this and the first line</li> <li>• Report any flow rate changes</li> <li>• Report if homogeneous (color and mixing)</li> </ul> </li> <li>7. Practice small repairs in the corners of the scraper bin (&lt; than 3 min) <ul style="list-style-type: none"> <li>• Vary length of trigger pulls as desired</li> <li>• Move flow lever to 'Safe' and Stow gun in holster</li> <li>• Evaluate tamping effectiveness (does it collapse?)</li> <li>• Close CDC at the end of 3-min clock</li> </ul> </li> <li>8. Report any closed purge bin changes in material expansion</li> <li>9. Push CDC out of work envelope</li> <li>10. Open strongbox lid; secure Velcro flaps under hood flaps as reqd</li> <li>11. Present nozzle to EV1</li> <li>12. Report temperature on gun gauge (~where in green/red) _____ (prior to sample preparation)</li> </ol>

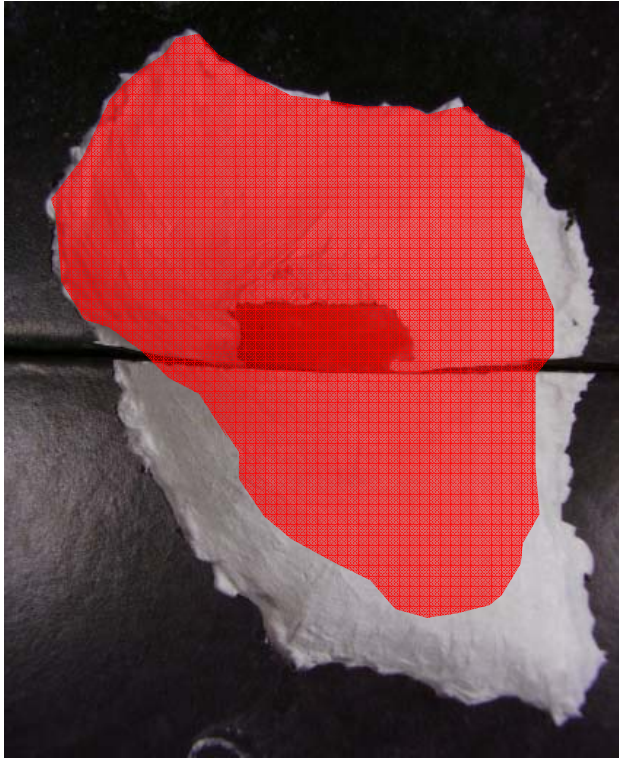
T-RAD DTO (03:45) (Cont)

IV	EV1 & EV2																																				
	<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;">EV1 assist EV2 in verifying gun swivels do not impact tile samples</p> </div> <p style="text-align: center;"><b>NOTE</b></p> <p>Max interval between dispenses should be less than 10 min.</p> <p>Continue to tamp any previous strong box samples as required, per tamping scheme.</p> <p>Attempt flat repairs, tamping out meniscus. If slightly overfilled, try to meet specs at edges (allow center to rise if required)</p>																																				
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:5%;">#</th> <th style="width:65%;">Goal Fill (Requirement)</th> <th style="width:30%;">Tamp</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>OML (&lt;1-in overfill okay)</td> <td>Tamp all layers</td> </tr> <tr> <td>2A</td> <td>OML (&lt;1-in overfill okay)</td> <td>Tamp all layers</td> </tr> <tr> <td>2B</td> <td>OML (&lt;1-in overfill okay)</td> <td>Knock down peaks, no tamping</td> </tr> <tr> <td>2C</td> <td>OML (&lt;1-in overfill okay)</td> <td>1st layer: Light tamp to fill voids, not for adhesion Subs: Knock down peaks, no tamping</td> </tr> <tr> <td>2D</td> <td>OML (&lt;1-in overfill okay)</td> <td>Tamp all layers</td> </tr> <tr> <td>3</td> <td>.25-in under (cover top shelf)</td> <td>Tamp all layers</td> </tr> <tr style="background-color: #cccccc;"> <td colspan="3"></td> </tr> <tr> <td>4A</td> <td>Cover bottom shelf</td> <td>Tamp all layers</td> </tr> <tr> <td>4B</td> <td>Right at top shelf (don't exceed top shelf)</td> <td>Tamp all layers</td> </tr> <tr> <td>5</td> <td>.25-in under, ramp toward 4A to RCG (do not exceed RCG)</td> <td>Tamp all layers</td> </tr> <tr> <td>6</td> <td>.25-in under (do not not exceed 0.1-in under)</td> <td>Tamp all layers</td> </tr> </tbody> </table>	#	Goal Fill (Requirement)	Tamp	1	OML (<1-in overfill okay)	Tamp all layers	2A	OML (<1-in overfill okay)	Tamp all layers	2B	OML (<1-in overfill okay)	Knock down peaks, no tamping	2C	OML (<1-in overfill okay)	1st layer: Light tamp to fill voids, not for adhesion Subs: Knock down peaks, no tamping	2D	OML (<1-in overfill okay)	Tamp all layers	3	.25-in under (cover top shelf)	Tamp all layers				4A	Cover bottom shelf	Tamp all layers	4B	Right at top shelf (don't exceed top shelf)	Tamp all layers	5	.25-in under, ramp toward 4A to RCG (do not exceed RCG)	Tamp all layers	6	.25-in under (do not not exceed 0.1-in under)	Tamp all layers	<p><b>SAMPLE PREPARATION AND PHOTOGRAPHY</b> (01:00)</p> <ol style="list-style-type: none"> <li>1. Apply 1 layer to samples 1,2A,2B,2C,2D,3 in order (2D may only need a dollop)</li> <li>2. Start 10-min timer after sample #3 (do not exceed 10 min of no flow)</li> <li>3. Tamp samples (as indicated on left)</li> <li>4. Periodically inspect brushes/angled stamp for damage; replace as reqd</li> <li>5. Apply additional layers to 1-3 to meet fill requirements (do not exceed 10 min of no flow)             <ol style="list-style-type: none"> <li>a. If flow rate is NOT slow, proceed with step 6 (no purge reqd)</li> <li>b. If flow rate is slow after final layer of sample #3 fill:                 <ul style="list-style-type: none"> <li>• Report temperature on gun gauge (~where in green/red) _____</li> <li>• Perform purge into CDC after leaning away from samples (purge until flow recovered, do not exceed time limit given by MCC)</li> </ul> </li> </ol> </li> </ol> <hr style="border: 2px solid gray;"/> <ol style="list-style-type: none"> <li>6. Apply 1 layer to ALL remaining repairs (4A, 4B, 5, 6)</li> <li>7. Tamp <u>all</u> samples, as reqd</li> <li>8. As reqd, apply additional layer to meet fill requirements; tamp after each layer; MCC may request purges (lean back if purge required into CDC)</li> </ol>
#	Goal Fill (Requirement)	Tamp																																			
1	OML (<1-in overfill okay)	Tamp all layers																																			
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<p>If step 5b is required, use tables below</p> <table style="width:100%; border-collapse: collapse;"> <tr> <td style="width:50%; border-right: 1px solid black; padding: 5px;">                 Record temp on gun gage _____                  Record purge duration from MCC _____                  Record temp on gun gage _____             </td> <td style="width:50%; padding: 5px;">                 Record temp on gun gage _____                  Record purge duration from MCC _____                  Record temp on gun gage _____             </td> </tr> </table>		Record temp on gun gage _____ Record purge duration from MCC _____ Record temp on gun gage _____	Record temp on gun gage _____ Record purge duration from MCC _____ Record temp on gun gage _____																																		
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T-RAD DTO (03:45) (Cont)



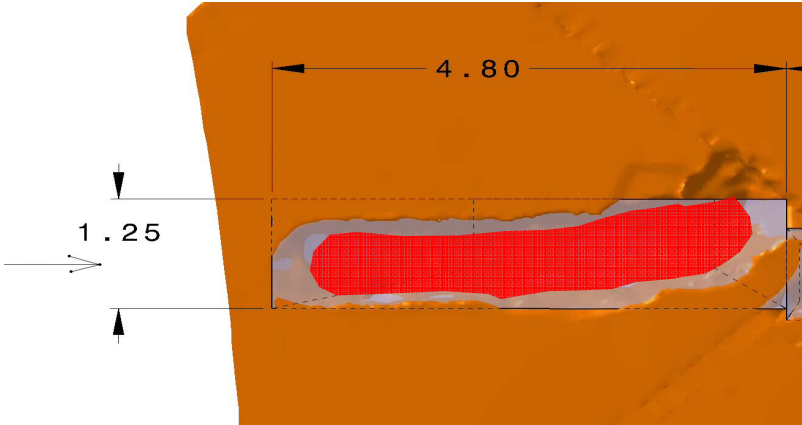
Sample 4A



Sample 5

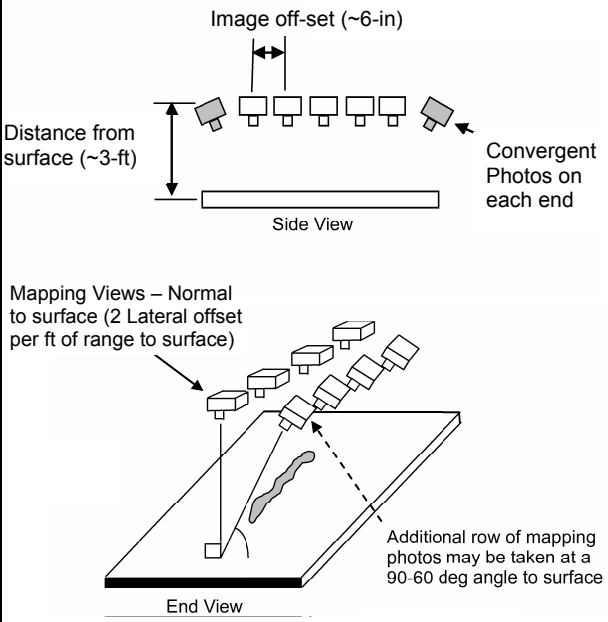


Sample 4B



Sample 6

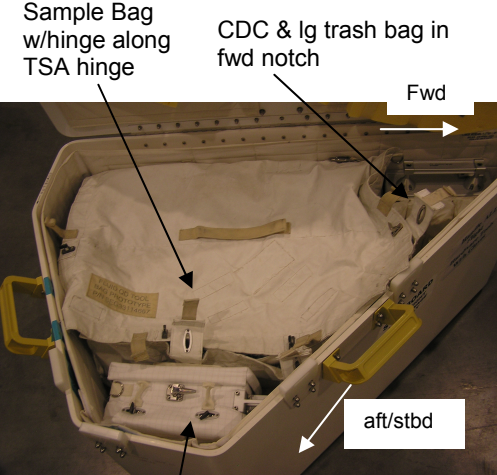
**T-RAD DTO (03:45) (Cont)**

IV	EV1 – Be (FF)	EV2 – Fm (FF)
<p><b>Stereo Photogrammetry</b> (per the P/TV C/L, DCS 760 EVA)            Perform the following step from APFR (~3-ft from sample surface):</p> <ol style="list-style-type: none"> <li>Take mapping images normal to surface, followed by one additional convergent view on each side</li> <li>Shoot photos in pairs. Offset each image laterally 2-in/ft of subject distance (6-in, if 3-ft from surface)</li> <li>An additional row of photos may be taken at a 90-60 deg angle to surface to capture critical details not covered in previous images</li> </ol>  <ol style="list-style-type: none"> <li>Give GO for SPDM relocate when sample bag closed</li> </ol>	<ol style="list-style-type: none"> <li>Take temperature of nozzle _____ °C</li> <li>Close temperature sensor display cover and probe tip cover</li> <li>Stow temperature sensor in Lg ORU Bag</li> <li>Retrieve digital camera</li> <li>Transfer digital camera to EV2</li> <li>Receive digital camera; let retract to FS</li> </ol> <p><b>T-RAD DEPRESSURIZATION</b> (00:05)</p> <ol style="list-style-type: none"> <li>Translate to T-RAD</li> <li>Remove top MLI to expose EVA knob</li> <li>Remove EVA knob from PRESSURE port (~3.5 turns ccw)</li> <li>Install EVA knob into VENT port (~5 turns cw to hard stop)</li> <li>Using pressure gauge on top of T-RAD, report any pressure changes</li> <li>Reinstall top MLI</li> </ol> <p><b>TOOL CLEANUP</b> (00:40)</p> <ol style="list-style-type: none"> <li>Inspect gloves/self for STA-54</li> <li>Inspect EV2 for STA-54</li> <li>Stow used wipes in Lg trash bag, using dirty tools to aid in stowage</li> <li>Stow dirty tools in Lg trash bag</li> <li>Assist EV2 with Sample bag closure; retrieve Lg-sm Adj from lid; stow in Lg ORU bag</li> </ol>	<ol style="list-style-type: none"> <li>Report temperature on gun gauge (~where in green/red) _____</li> <li>Receive digital camera</li> <li>Perform photogrammetry (per IV column) when orbital day during cleanup</li> <li>Transfer digital camera to EV1</li> </ol> <p><b>T-RAD DEPRESSURIZATION</b> (00:05)</p> <ol style="list-style-type: none"> <li>Close sample strongbox lid; secure using hood flap (reopen later if required for photos)</li> </ol> <p><b>TOOL CLEANUP</b> (00:40)</p> <ol style="list-style-type: none"> <li>Inspect gloves/self for STA-54</li> <li>Inspect EV1 for STA-54</li> <li>Perform inventory of Sample bag (tools may be on pedestals or in Lg trash bag):           <ul style="list-style-type: none"> <li><input type="checkbox"/> 2 – Angled Stamps (with 2 RETs)</li> <li><input type="checkbox"/> 1-in Foam brush (with RET)</li> <li><input type="checkbox"/> EVA Wipe (with RET) (may be removed)</li> <li><input type="checkbox"/> RET from strong box lid</li> <li><input type="checkbox"/> Lg-sm Adj (to be removed)</li> </ul> </li> <li>Close Sample bag with EV1 assistance if reqd</li> </ol>

**T-RAD DTO (03:45) (Cont)**


<b>IV</b>	<b>EV1 – Be (FF)</b>	<b>EV2 – Fm (FF)</b>
	<p>6. Remove 85-ft safety tethers from ORU bag; Temp stow both on HH 0249 and HH 250</p> <p>7. Retrieve brush caddy from fish stringer; transfer to EV2 (leave 2 RETs on caddy)</p> <p>8. Receive adj tethers; stow on fish stringer</p> <p>9. Stow broom clip caddy on fish stringer in Lg ORU bag</p> <p>10. Retrieve RET from camera; stow on MWS (to RET CDC to TSA)</p> <p>11. Let digital camera retract to Fish Stringer on int RET</p> <p>12. Perform inventory of Lg ORU bag (some tools may be in Lg trash bag):</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Fish stringer <ul style="list-style-type: none"> <li><input type="checkbox"/> EVA Camera (with camera bracket RET)</li> <li><input type="checkbox"/> Broom Clip Caddy <ul style="list-style-type: none"> <li><input type="checkbox"/> 3" Scraper</li> <li><input type="checkbox"/> Brush Handle</li> </ul> </li> <li><input type="checkbox"/> Temperature Sensor (with PIP pin RET)</li> <li><input type="checkbox"/> 2 EVA wipes</li> <li><input type="checkbox"/> 4 – adj tethers (from Sample bag)</li> <li><input type="checkbox"/> 1 – Lg-sm adj tether (from Sample bag)</li> </ul> </li> </ul> <p>13. Close Lg ORU bag</p> <p>14. Tether swap to Lab HH 0249</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> √Hook locked</li> <li><input type="checkbox"/> √Reel unlocked</li> </ul> <p>15. Retrieve Lg trash bag (w/2 RETs); stow on swing arm (one RET may be in bag)</p> <p>16. Re-inspect gloves for STA-54</p> <p>17. If hand fatigue not excessive, don overgloves (outside ORU bag)</p> <p>18. Stow Sample bag on BRT (use BRT RET)</p>	<p>5. Raise MWS T-Bar</p> <p>6. Transfer holster (with T-RAD gun) from swing arm to MWS T-Bar (secure to T-Bar w/MWS PIP pin RET); RET gun to holster w/MWS RET</p> <p>7. Egress APFR</p> <p>8. Receive brush caddy; stow on swing arm (w/swing arm RET)</p> <p>9. Secure Sample bag to Lab HH w/spare brush caddy RET</p> <p>10. Remove all adj tethers from Sample bag; transfer to EV1</p> <p>11. Tether swap to Lab HH 250</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> √Hook locked</li> <li><input type="checkbox"/> √Reel unlocked</li> </ul> <p>12. Re-inspect gloves for STA-54</p> <p>13. If hand fatigue not excessive, don overgloves (outside ORU bag)</p>

**PLB OPS (00:45)**

IV	EV1 – Be (FF)	EV2 – Fm (FF)
 <p>Sample Bag w/hinge along TSA hinge</p> <p>CDC &amp; lg trash bag in fwd notch</p> <p>Fwd</p> <p>aft/stbd</p> <p>Gel Brush Caddy</p>	<p><b>PLB OPS (00:45)</b></p> <div data-bbox="720 305 1808 444" style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>Avoid contact with SSOR and WVS antennas, PLB cameras and Ku-Band antenna during TSA Ops</p> <p>Only use sides of Sample bag to stow in TSA. Avoid applying force to area where strong box is located to prevent damage to tile samples</p> </div> <div data-bbox="957 457 1612 548" style="border: 2px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><u>WARNING</u></p> <p>Avoid contact with SSPTS cable connectors (2-ft Keep-out Zone)</p> </div> <ol style="list-style-type: none"> <li>1. Translate to stbd TSA, (EV1 leading) (port nadir translation path – use gap spanner between Lab HH 267 and Node 2 HH 364)</li> <li>2. Transfer Sample bag to EV2 (leave on BRT RET)</li> <li>3. Open TSA (4 latches)</li> <li>4. Receive Sample bag from EV2</li> <li>5. RET sample bag to TSA D-ring; stow Sample bag with bag hinge along TSA hinge (keep BRT RET)</li> <li>6. Receive brush caddy; stow in aft/stbd corner of TSA; Attach brush caddy HH RET to sample bag HH</li> <li>7. Receive CDC from EV2; stow in fwd corner of TSA; RET CDC to TSA D-ring using MWS RET (RET came from camera during cleanup)</li> <li>8. Remove Lg trash bag from swing arm; stow beside CDC; RET Lg trash bag to CDC HH (2 RETs go in TSA on Lg trash bag)</li> <li>9. Close stbd TSA (4 latches)</li> <li>10. Translate to port TSA; assist EV2 as reqd</li> </ol>	<p><b>PLB OPS (00:45)</b></p> <ol style="list-style-type: none"> <li>1. Translate to stbd TSA, following EV1 (port nadir translation path – use gap spanner between Lab HH 267 and Node 2 HH 364)</li> <li>2. Receive sample bag</li> <li>3. Transfer Sample bag to EV1</li> <li>4. Transfer Brush caddy to EV1</li> <li>5. Transfer CDC to EV1</li> </ol> <div data-bbox="1377 948 1822 1042" style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>Tools in port TSA are friction fit. Use caution when opening</p> </div> <ol style="list-style-type: none"> <li>6. Translate to port TSA; open lid (4 latches)</li> <li>7. W/swing arm RET, tether to and retrieve 2 – adj tethers from TSA (old-style hooks, only friction-fit in TSA)</li> <li>8. Open flight-specific compartment for T-RAD stowage; attach 1 end of shuttle adj tethers (2) to TSA D-rings</li> <li>9. Remove T-RAD gun from holster; verify RET between holster and tether point on hose (below gun)</li> </ol>



**PLB OPS (00:45) (Cont)**

IV	EV1 – Be (FF)	EV2 – Fm (FF)
<p>Shuttle Adjustable Tethers</p>  <p>T-RAD</p>	<ol style="list-style-type: none"> <li>11. Release T-RAD adj tethers from suit D-rings</li> <li>12. Remove 2 adj tethers from T-RAD; stow on MWS</li> </ol> <ol style="list-style-type: none"> <li>13. Verify PLB free of tethers, tools</li> </ol>	<ol style="list-style-type: none"> <li>10. Remove gun MLI from hose; install MLI on gun</li> </ol> <ol style="list-style-type: none"> <li>11. Stow T-RAD in port TSA; RET from T-RAD to TSA D-ring</li> <li>12. Release holster RET from gun; RET from holster to TSA D-ring</li> <li>13. Remove holster from T-Bar; stow in TSA</li> <li>14. Criss-cross Shuttle adjustable tethers over T-RAD</li> <li>15. Close port TSA (4 latches)</li> <li>16. Verify PLB free of tethers, tools</li> </ol>

## NODE 2 ACBM LAUNCH LOCK RELEASE (00:15)

IV	EV1/EV2(FF)
<div data-bbox="205 269 831 678" data-label="Image"> </div> <p data-bbox="205 695 394 721">Launch lock latch</p> <ol data-bbox="155 834 604 883" style="list-style-type: none"> <li>1. Give MCC GO for petal deploy (to 45 deg)</li> <li>2. Give MCC GO to continue petal deploy</li> </ol> <div data-bbox="205 886 842 1365" data-label="Image"> </div> <p data-bbox="205 1369 394 1395">Port Node 2 CBM</p>	<p data-bbox="1178 289 1745 315"><b>PORT CBM PETAL LAUNCH LOCKS</b> (00:15 PER ACBM)</p> <div data-bbox="1241 321 1864 415" data-label="Text" style="border: 1px solid black; padding: 5px;"> <p data-bbox="1499 334 1604 360" style="text-align: center;"><u>CAUTION</u></p> <p data-bbox="1247 360 1850 407">Both petal launch locks must be engaged to allow for translation on the petals</p> </div> <ol data-bbox="1178 435 1934 776" style="list-style-type: none"> <li>1. Translate to Node 2 fwd endcone (nadir/port path on Lab/Node 2)</li> <li>2. EV1 – Release Node 2 Nadir CBM petal launch locks (use Adj Eq Tether as reqd):             <ul style="list-style-type: none"> <li><input type="checkbox"/> Release two aft latches (on petal)</li> <li><input type="checkbox"/> Release two port latches: use HR 0356</li> <li><input type="checkbox"/> Release two fwd latches: use HR 0309</li> <li><input type="checkbox"/> Release two stbd latches: use HR 0355</li> </ul> </li> <li>3. EV2 – Release Node 2 Port CBM petal launch locks (use Adj Eq Tether as reqd):             <ul style="list-style-type: none"> <li><input type="checkbox"/> Release two aft latches (on petal)</li> <li><input type="checkbox"/> Release two zenith latches: use HR 0350</li> <li><input type="checkbox"/> Release two fwd latches: use HR 0321</li> <li><input type="checkbox"/> Release two nadir latches: use HR 0304</li> </ul> </li> </ol> <p data-bbox="1178 802 1839 828"><b>GET-AHEAD – NADIR NODE 2 ACBM PIP PIN RETRIEVAL</b> (00:25)</p> <ol data-bbox="1178 828 1934 1289" style="list-style-type: none"> <li>4. Give IV GO for petal deploy</li> <li>5. Verify petal deployment motion; give IV GO to continue deploy</li> <li>6. Inspect for pin in access points             <ul style="list-style-type: none"> <li><input type="checkbox"/> 4 quadrants where petals used to be</li> <li><input type="checkbox"/> Open CBCS flap; inspect through opening</li> </ul> <p data-bbox="1220 948 1394 971">If PIP pin is found:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> As reqd, use wire-tie (from BRT) to move PIP pin into reach envelope</li> <li><input type="checkbox"/> Discard PIP pin in small trash bag OR report direction and velocity of departure</li> </ul> <p data-bbox="1220 1068 1499 1091">If PIP pin cannot be removed:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Describe location and security</li> <li><input type="checkbox"/> Verify PIP Pin is not interfering with Latch and Petal motion (depress RTL)</li> <li><input type="checkbox"/> Verify PIP Pin is not interfering with hatch Mechanism</li> <li><input type="checkbox"/> Verify PIP Pin is not interfering with RTL motion</li> </ul> <p data-bbox="1220 1214 1409 1237">If PIP pin not found:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Press down RTL at each quadrant; to verify not jammed by PIP pin</li> </ul> </li> <li>7. Leave CBCS flap open</li> </ol>

## CLEANUP/INGRESS (00:35)

IV	EV1 – Be (FF)	EV2 – Fm (FF)
<p>1. Perform prior to ingress: WVS PWRDN (P/TV, <u>WVS CUE CARD</u>)</p>	<p><b>LAB CLEANUP</b> (00:15)</p> <ol style="list-style-type: none"> <li>Translate to Lab HH 0249</li> <li>Tether swap to A/L safety tether at Lab HH 249               <ul style="list-style-type: none"> <li><input type="checkbox"/> √Hook locked</li> <li><input type="checkbox"/> √Reel unlocked</li> </ul> </li> <li>Assist EV2 with Lg ORU bag removal</li> <li>Inspect gloves</li> <li>Perform tool inventory</li> <li>Translate to Airlock</li> </ol> <p><b>INGRESS</b> (00:20)</p> <ol style="list-style-type: none"> <li>Perform glove inspection for STA-54 and cuts</li> </ol> <div data-bbox="770 699 1745 776" style="border: 1px solid black; text-align: center; padding: 5px;"> <p><b>CAUTION</b> Avoid touching STA-54 contaminated gloves/tools to airlock hatch sealing surface and edges of hatch</p> </div> <ol style="list-style-type: none"> <li>On EV2 GO, disconnect EV2's airlock tether attach to left waist tether               <ul style="list-style-type: none"> <li><input type="checkbox"/> √Hooks locked</li> </ul> </li> <li>Disconnect EV1 A/L safety tether from A/L, attach to self</li> <li>Ingress A/L, close thermal cover, attach Velcro strap</li> <li>Inspect sealing surface for contamination (have EVA wipe available)</li> <li>Open O2 actuator cover</li> <li>Remove SCU from stowage pouch</li> <li>Remove DCM cover, Velcro to DCM</li> <li>Connect SCU DCM, √SCU locked</li> <li>Water – OFF (fwd); expect H2O IS OFF msg</li> </ol> <div data-bbox="707 1230 1188 1281" style="border: 1px solid black; text-align: center; padding: 5px;"> <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 – Preclose (black pie region)</li> <li>EV Hatch – close and lock</li> <li>Go to <u>PRE-REPRESS</u> Cue Card</li> </ol>	<p><b>LAB CLEANUP</b> (00:15)</p> <ol style="list-style-type: none"> <li>Translate to Lab HH 0250</li> <li>Tether swap to A/L safety tether at Lab HH 250               <ul style="list-style-type: none"> <li><input type="checkbox"/> √Hook locked</li> <li><input type="checkbox"/> √Reel unlocked</li> </ul> </li> <li>Clean up and remove Lg ORU bag from worksite</li> <li>Inspect gloves</li> <li>Perform tool inventory</li> <li>Translate to Airlock</li> </ol> <p><b>INGRESS</b> (00:20)</p> <ol style="list-style-type: none"> <li>Perform glove inspection for STA-54 and cuts</li> <li>Stow Lg ORU bag in A/L</li> <li>Ingress Airlock</li> </ol> <ol style="list-style-type: none"> <li>Connect right waist tether to A/L D-ring ext               <ul style="list-style-type: none"> <li><input type="checkbox"/> √Hook locked</li> </ul> </li> <li>Give EV1 GO to disconnect EV2 safety tether</li> </ol> <ol style="list-style-type: none"> <li>Open O2 actuator cover</li> <li>Remove SCU from stowage pouch</li> <li>Remove DCM cover, Velcro to DCM</li> <li>Connect SCU DCM, √SCU locked</li> <li>Water – OFF (fwd); expect H2O IS OFF msg</li> </ol>

## POST EVA 4 TOOL CONFIG

### EV1

- MWS
- BRT (L)
- RET (eq-eq)
- T-Bar
- RET (eq-eq)
- RET (eq-eq) w/PIP pin
- Adj Equip Tether (3, 2 from T-RAD)
- Wire Tie (2)
- ISS Small Trash Bag
- RET (eq-eq)
- EVA Wipe
- Spare 85-ft safety tether
- Swing Arm (R)
- RET (eq-eq)
- Waist Tether (2)
- D-ring Extender (2)
- Safety Tether (85 ft)
- SAFER
- WVS
- O2 actuator cover
- Overgloves (2) donned

### EV2

- MWS
- BRT (L)
- RET (eq-eq)
- Wire Tie
- T-Bar
- RET (eq-eq) w/PIP pin
- Adj Equip Tether
- Wire Tie (2)
- ISS Small Trash Bag
- RET (eq-eq)
- EVA Wipe
- Spare 85-ft safety tether
- Swing Arm (R)
- RET (eq-eq)
- Waist Tether (2) (L – D-ring, R – extender)
- D-ring Extender (2)
- Safety Tether (85 ft)
- SAFER
- WVS
- O2 actuator cover
- Overgloves (2) donned

### AIRLOCK CONFIG

- PGT [B3 18.4 ft-lb, CAL, MTL 30.5] s/n \_\_\_\_\_
- PGT Battery s/n \_\_\_\_\_
- 7/16 (wobble) socket-6 ext
- RET (Lg-eq)
- EVA C/Lk Bag**
- RPCM (failed)
- RET (Lg-eq) (outside of bag, to secure at worksite)

### Large ORU Bag

- Adj Tether on outside of bag (4) (1 on each loop)
- Fish Stringer
- Broom Clip Caddy
- RET (Lg-eq)
- Scraper (not taped)
- Brush Handle (tipless)
- Temperature Sensor (on end of FS)
- RET (with PIP pin) (hooked to FS strap)
- EVA digital camera with bracket
- Adj Tether (4, from sample bag)
- Adj Tether (Lg-eq) (from sample bag)
- RET (Lg-eq) (2) (on outside of bag for overgloves)
- Adj Eq Tether (2) (on RET for overgloves)

### STBD TSA

#### Sample bag (Tile Sample Bag)

- DTO insert (with strong box and pedestals)
- RET (eq-eq) from strong box lid to bag int lid strap
- EVA wipe
- RET (eq-eq), securing EVA Wipe to strong box
- Brush pedestals (3), installed with snaps
- Angled stamps (2)
- RET (eq-eq) (2)
- Brush Handle
- RET (eq-eq)
- RET (eq-eq) (external, attached to TSA D-ring)

#### Gel/Foam Brush Caddy with brush handle on int

- RET (eq-eq) (to sample bag D-ring)

#### CIPA Discard Container

- RET (w/PIP Pin) (to TSA D-ring)

#### Large Trash Bag

- RET (Lg-eq) (to CDC HH)
- RET (eq-eq) (on 1/4 turn fitting, to restrain bag open)

### PORT TSA

- T-RAD
- RET (w/PIP Pin)
- T-RAD Holster
- RET (eq-eq) (from EV2 MWS)

## RPCM R&R – TASK DATA

### Tools:

EV1	EV2
PGT	PGT
7/16 Socket-9 ext	7/16 (wobble) Socket-6 ext
Round scoop	Round scoop
Russian Tie down tether	

### EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
RPCM Drive Screw	7/16	1	5.5 (grnd) 3.8 (orbit)	4.5	18.6 (remove) 8.5 (install)	8 (remove) 6-7 (install)	30

**EVA Connectors:** None

### ORU Identification:

	Serial Number
Spare RPCM	
Failed RPCM	X800390

### Notes:

1. The round scoop is removed for bolt driving operations to allow for visual verification of socket engagement on the drive screw
2. Installation of tether on RPCM tether point must be oriented such that the hook is facing the body of the RPCM. Otherwise interference between the SPDA frame and the RPCM will not allow hook removal

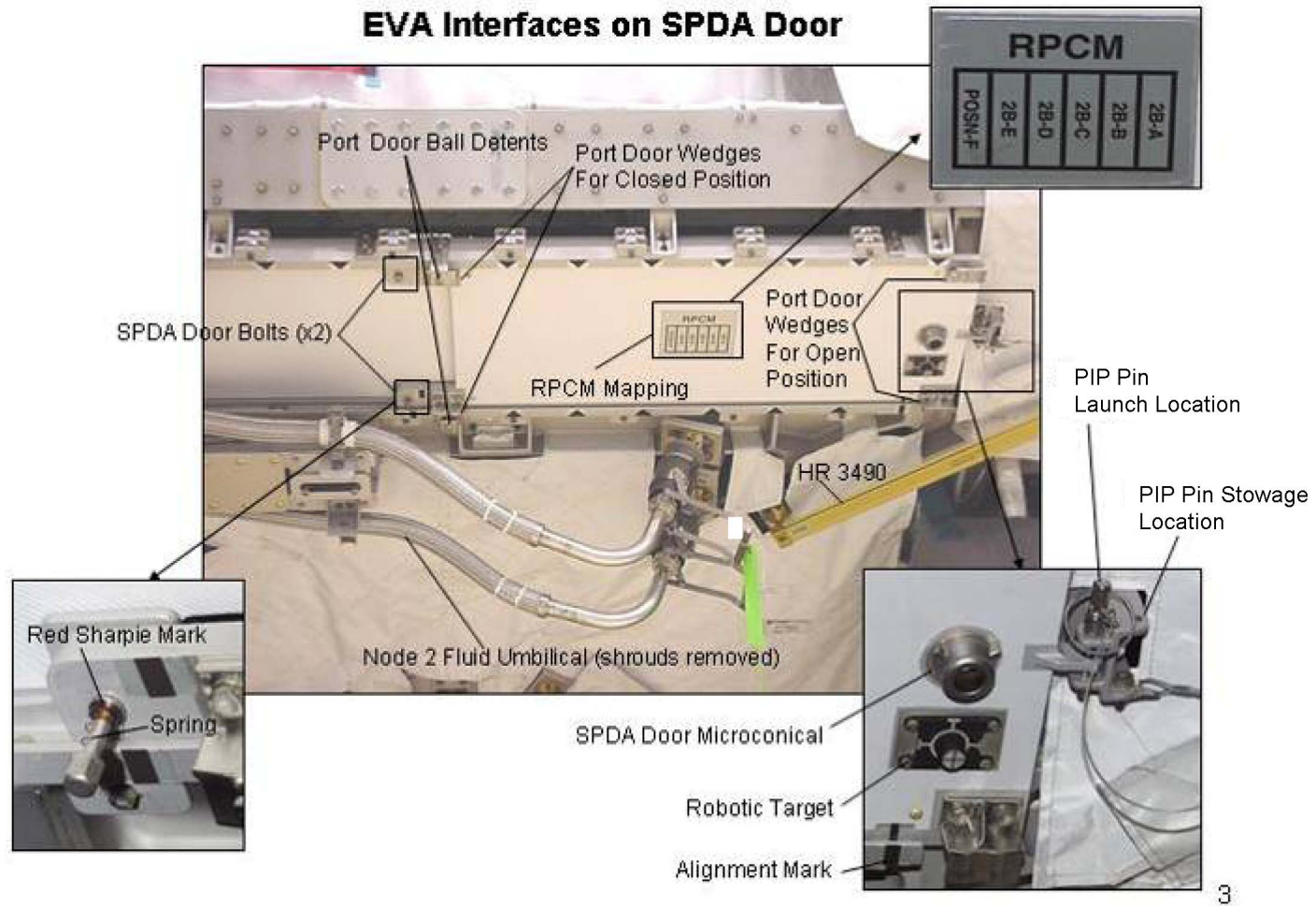
### Cautions:

1. Failure to use wobble socket, or socket with equivalent outer diameter, to release lock springs can result in damage to the RPCM Drive Screw Assembly
2. Do not operate drive screw with scoop attached to microconical. The wobble socket feature will not extend thru the round scoop
3. Failure to align and fully seat socket until lock springs have released can result in damage to RPCM Drive Screw Assembly
4. Combined linear and rotational motion on the socket while inserting, can result in damage to RPCM Drive Screw Assembly
5. If worksite is left unattended at any time with just Bolt 7 and the tether tie down, the tether must be cinched snug

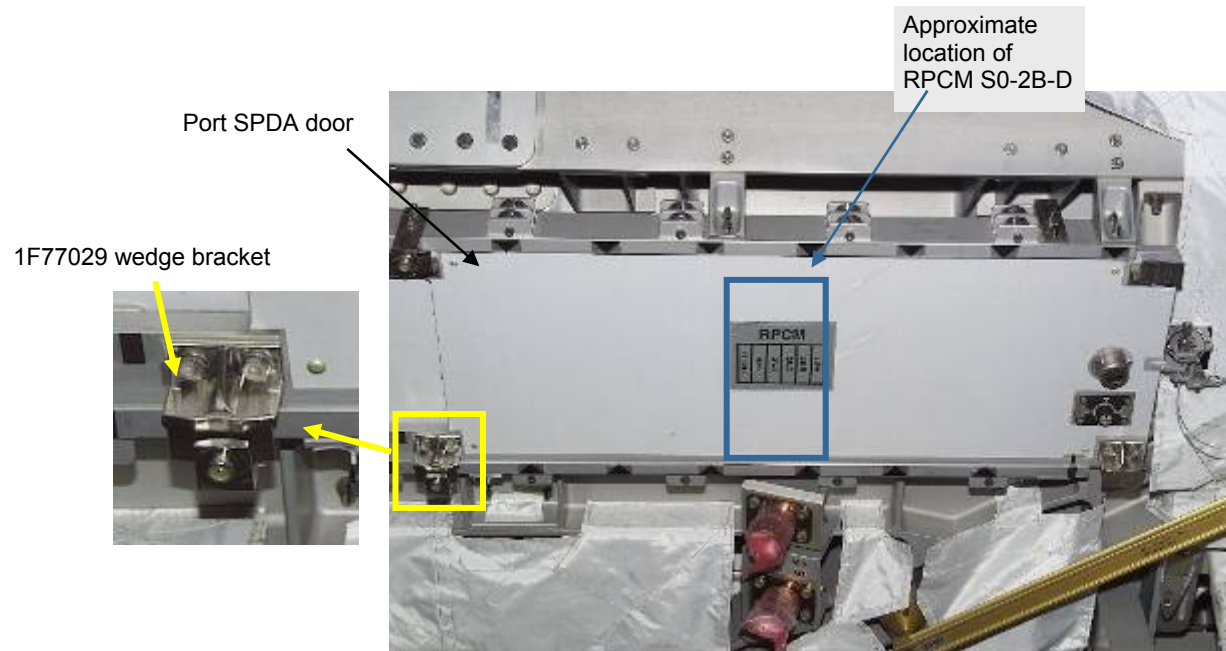
### Warnings:

1. RPCM may have sharp edges, use caution while handling

# RPCM R&R – TASK DATA (Cont)

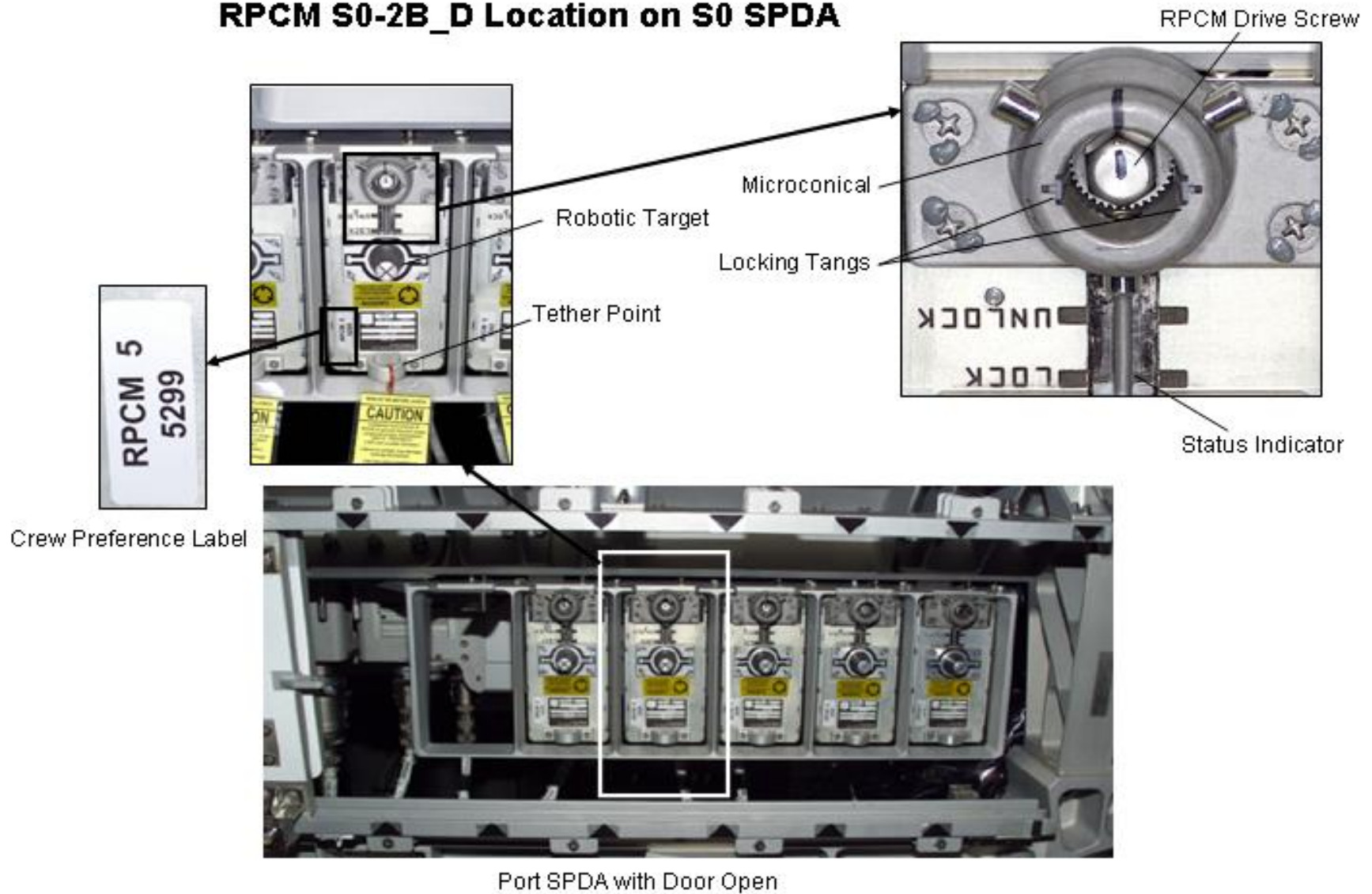


## RPCM R&R – TASK DATA (Cont)



RPCM R&R – TASK DATA (Cont)

**RPCM S0-2B\_D Location on S0 SPDA**





## T-RAD DTO – TASK DATA

### Tools:

EV1 (FF)	EV2 (SSRMS)
See Tool Config	

### EVA Fasteners:

Fastener Name	Head Size	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
N/A						

### EVA Connectors:

Harness	From	To	Conn Size	Function
N/A				

### Foot Restraints:

Task	WIF	APFR Setting
T-RAD DTO	Lab-04	1, TT, C, 11

#### Flow rate, as determined by initial CDC line:

- Length of line = 5 inches
- Width (note that lines are 1/2 in apart) = C inches
- Thickness = B inches (note that nozzle OD is 0.75 inches and ID is 0.5 inches)
- Length of trigger pull = D sec
- Flow rate =  $(5 \text{ in} \times B \times C) / D = \text{_____ in}^3 / \text{sec}$

#### 20 in<sup>3</sup> purge time, based on flow rate:

- @ 0.2 in<sup>3</sup>/sec = 100 sec + 15 sec margin = 115 sec
- @ 0.3 in<sup>3</sup>/sec = 67 sec + 15 sec margin = 82 sec
- @ 0.4 in<sup>3</sup>/sec = 50 sec + 15 sec margin = 65 sec
- @ 0.5 in<sup>3</sup>/sec = 40 sec + 15 sec margin = 55 sec

### Notes:

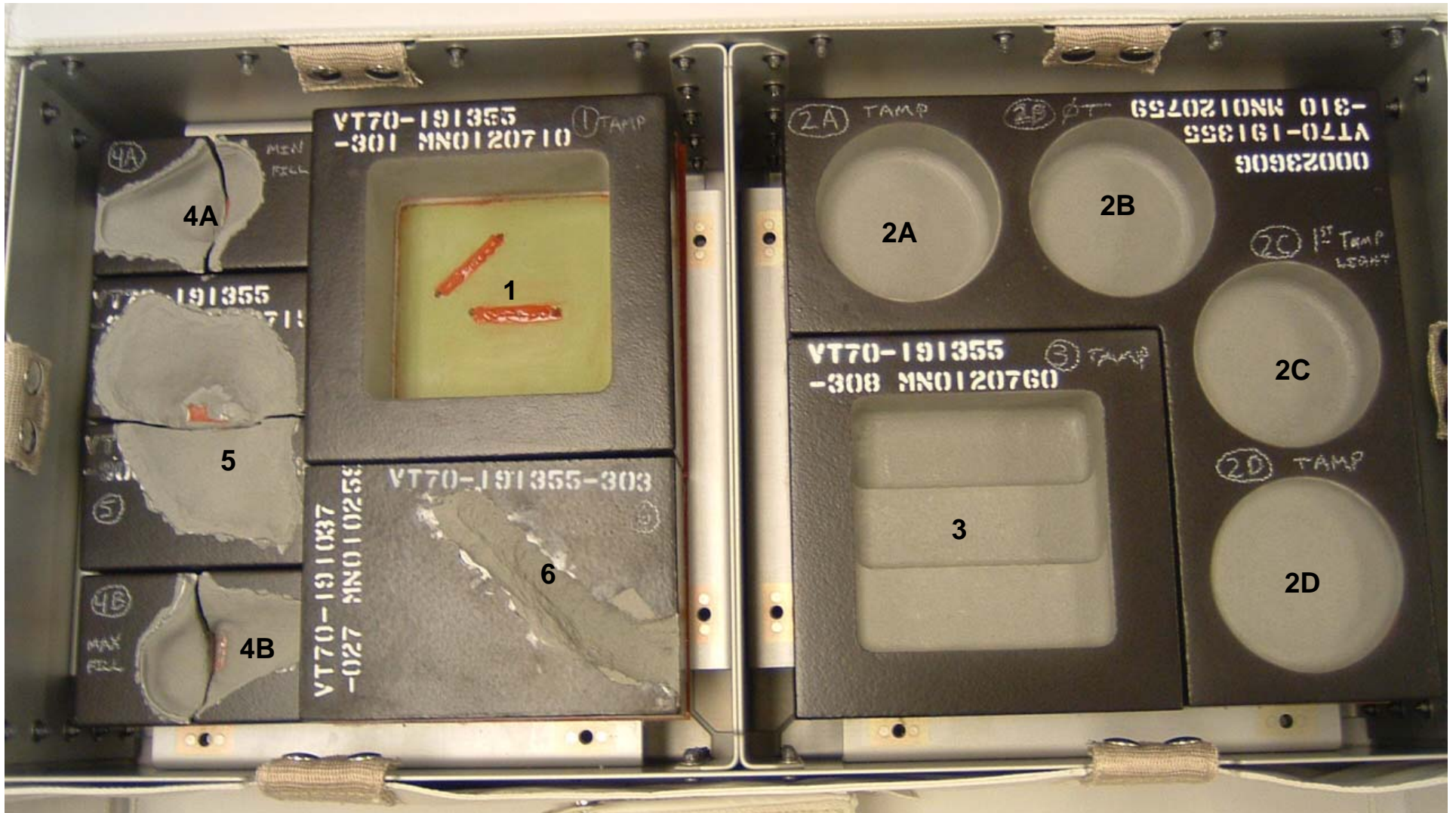
- Temperature gauge on T-RAD gun ranges from 40°-120°. Tick marks are in 5° increments
- When not in use, temperature sensor should be kept in ORU bag and display flap should be closed (to keep within operational thermal range), and tip should be covered (to protect tip)
- Temperature sensor measurement could take up to 10 sec to stabilize
- STA-54 usable mixed quantity = 100-110 in<sup>3</sup> (not including non-mixed 20 in<sup>3</sup>)
- Conservative quantity of mixed material used (assumes no expansion, not including 20 in<sup>3</sup> of known-purged non-mixed material):
  - First bead into scraper bin: diameter of .5-in, assuming 5" long cylindrical bead with a 2x factor for slow hand movements =  $\pi \times (.5"/2)^2 \times 5" \times 2 = 2 \text{ in}^3$
  - Second bead into scraper bin: diameter of .5-in, assuming 5" long cylindrical bead with a 2x factor for slow hand movements =  $\pi \times (.5"/2)^2 \times 5" \times 2 = 2 \text{ in}^3$
  - 4 dollops into scraper bin: ~0.5 in<sup>3</sup> each = 2 in<sup>3</sup>
  - Wastage during initial purge ~10 in<sup>3</sup>
  - Purge after 3<sup>rd</sup> layer = ~10 in<sup>3</sup>
  - Sample quantity = 78.5 in<sup>3</sup>
  - Total quantity: 104.5 in<sup>3</sup>
- If dispense is slow, turn over 6 in 3 per purge for gun volume
- Wipe STA-54 from visor as soon as possible
- Holster gun when not flowing

### Cautions:

- Avoid contact with SSOR and WVS antennas, PLB cameras and Ku-Band antenna during TSA Ops
- Avoid touching STA-54 contaminated gloves/tools to airlock hatch sealing surface and edges of hatch
- Tools in port TSA are friction fit. Use caution when opening
- Only use sides of Sample bag to stow in TSA. Avoid applying force to area where strong box is located to prevent damage to tile samples
- EV2 assist EV1 in verifying swivels do not impact tile samples
- Do not squeeze T-RAD gun trigger prior to pressurization, it may cause the gun to not flow properly

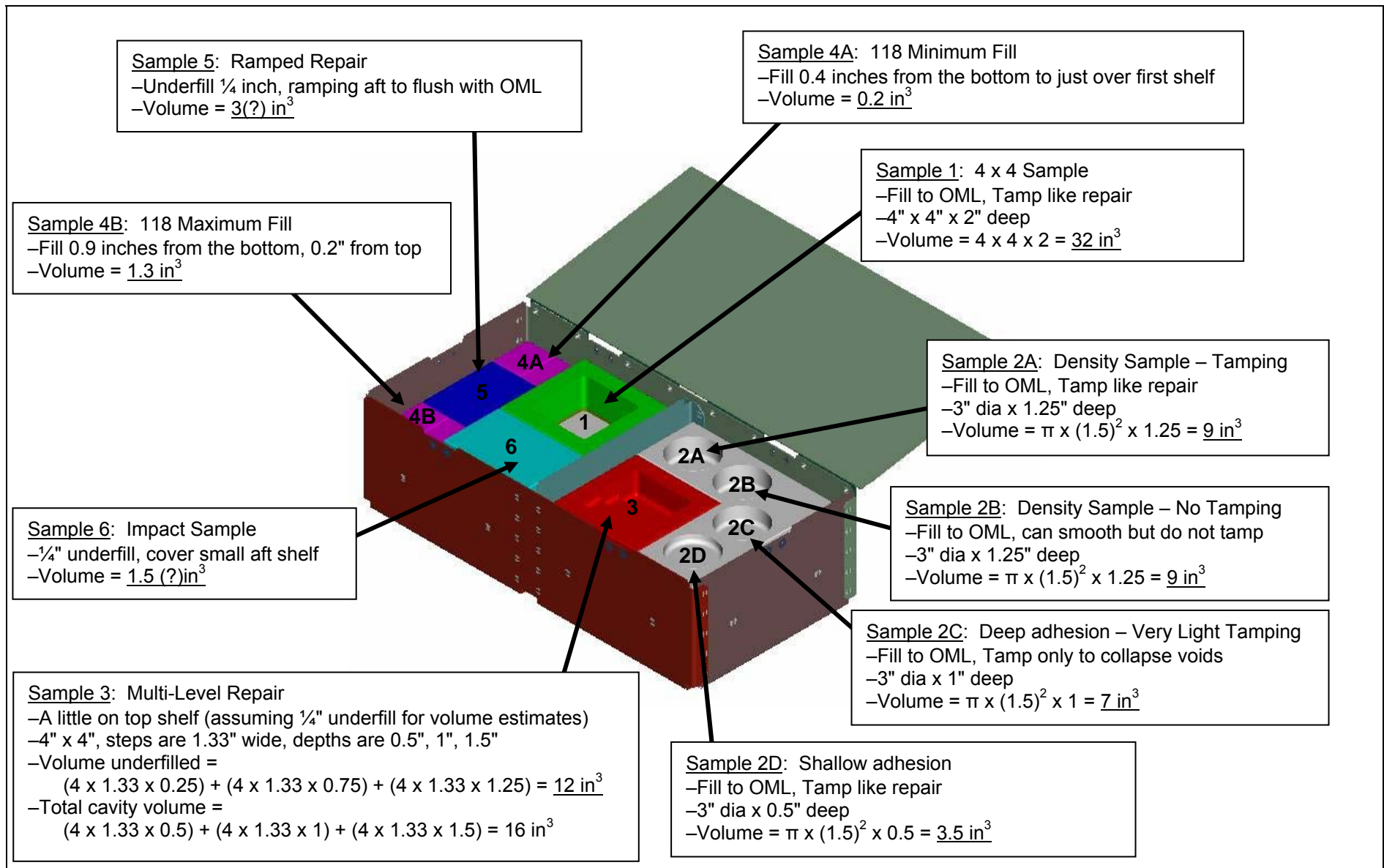
### Warnings:

T-RAD DTO – TASK DATA (Cont)



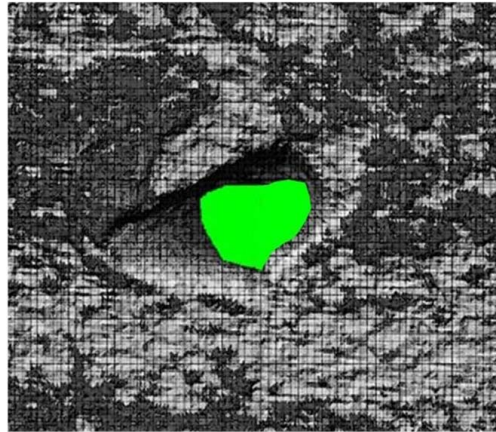
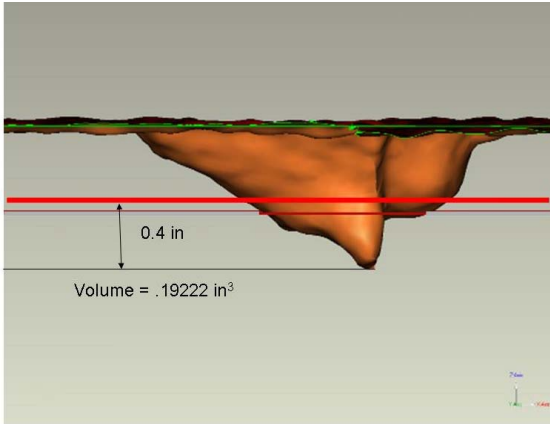
Flight DTO Samples with Emittance Primer. Hinge line at top of photo

## T-RAD DTO – TASK DATA (Cont)

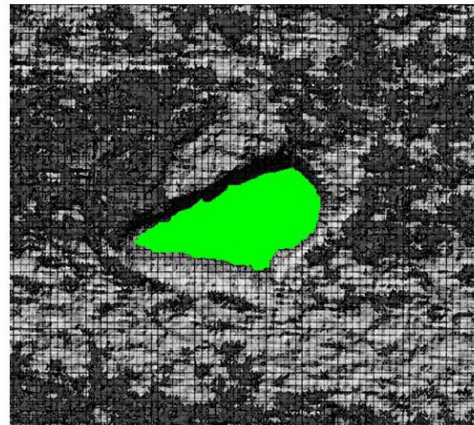
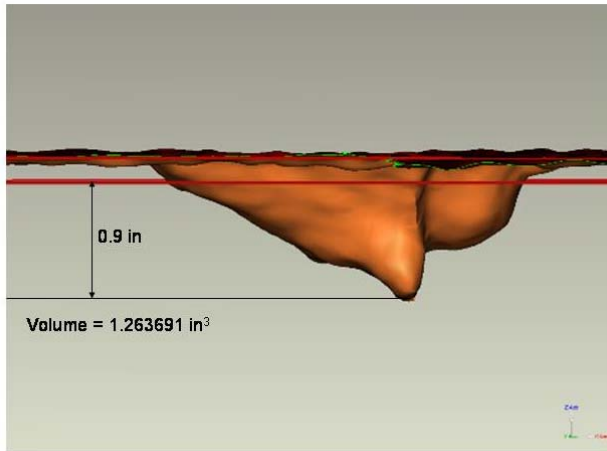


# T-RAD DTO – TASK DATA (Cont)

## Sample 4A – Minimum Fill



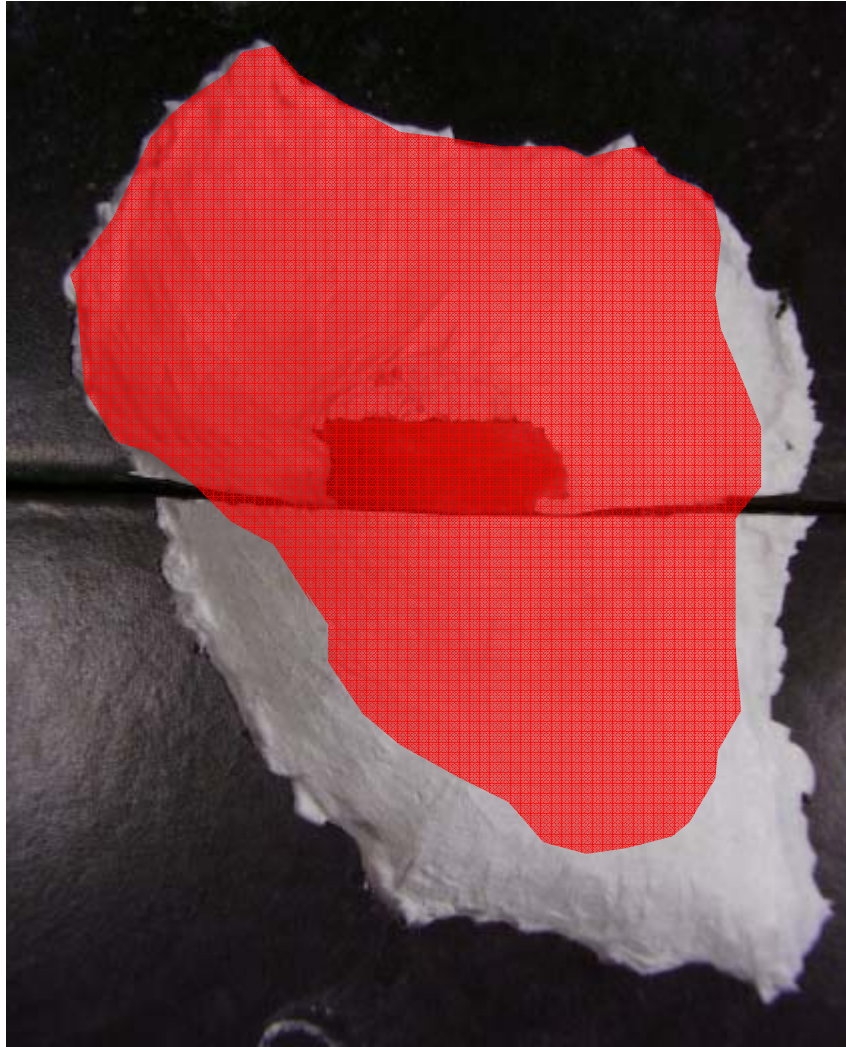
## Sample 4B – Maximum Fill



**NOTE**  
Flight Sample orientation is 180 deg out from  
fill level illustrations

T-RAD DTO – TASK DATA (Cont)

Sample 5 – Ramped Repair



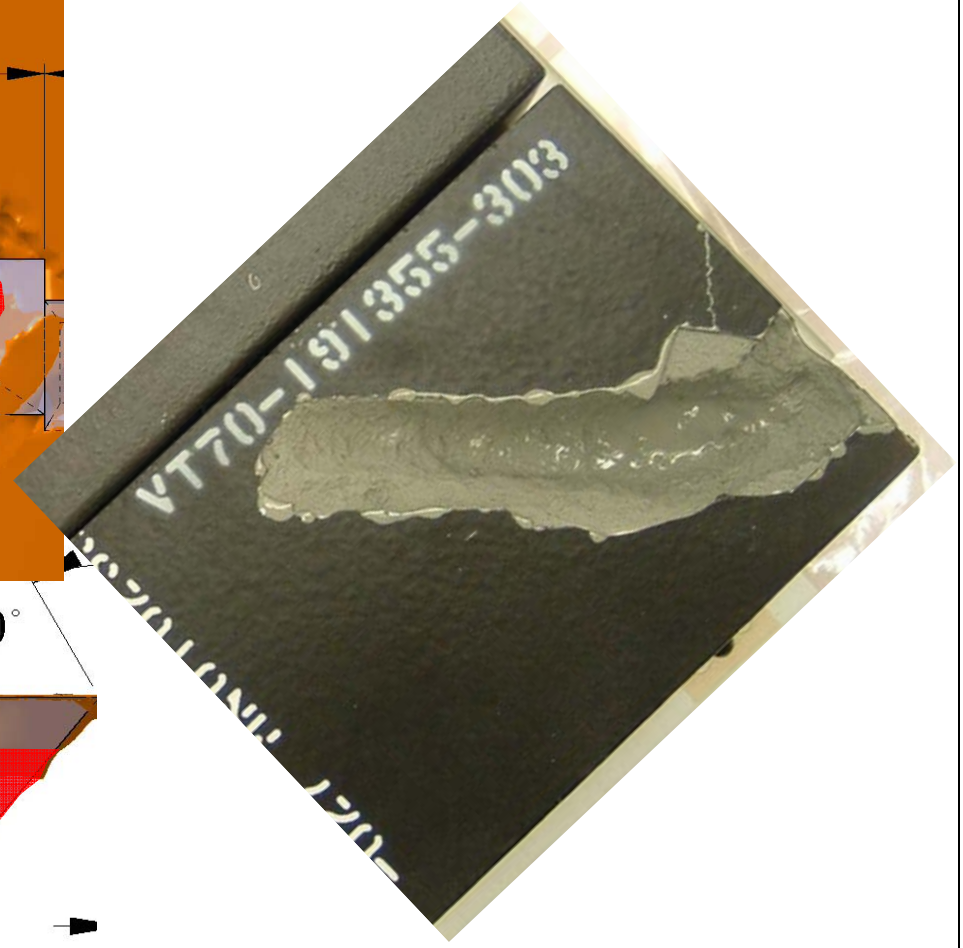
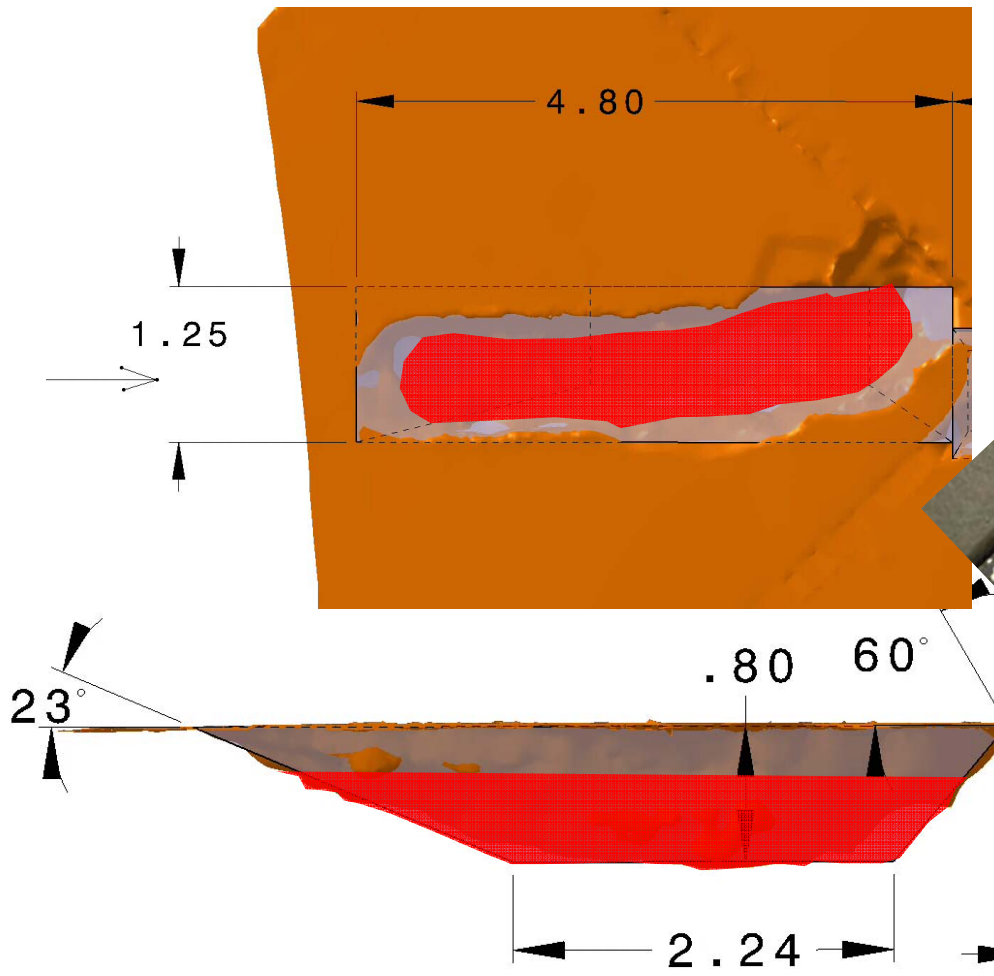
Fill Level Illustration



Flight Sample

T-RAD DTO – TASK DATA (Cont)

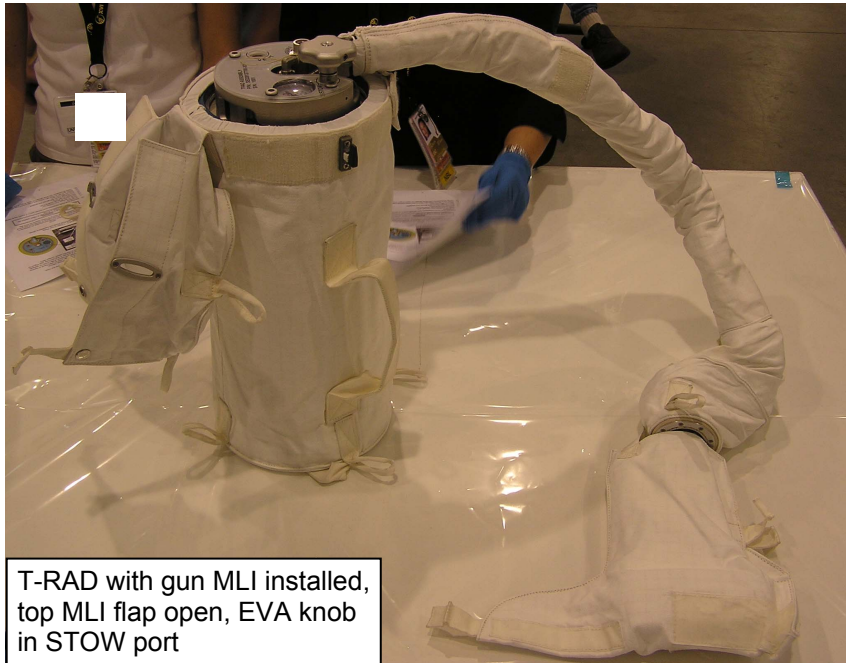
Sample 6 – Impact Sample



Fill Level Illustration

Flight Sample (rotated to match fill level illustrations)

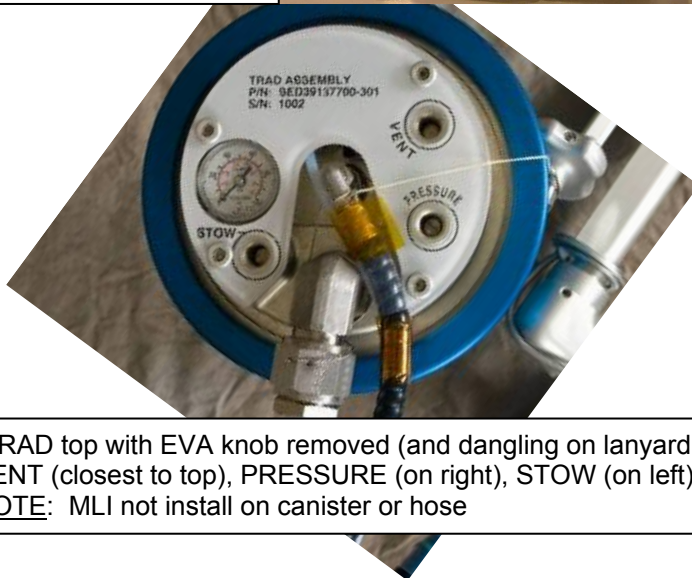
# T-RAD DTO – TASK DATA (Cont)



T-RAD with gun MLI installed, top MLI flap open, EVA knob in STOW port



T-RAD gun with safety in SAFE and flow shut-off knob in OPEN



T-RAD top with EVA knob removed (and dangling on lanyard). VENT (closest to top), PRESSURE (on right), STOW (on left)  
NOTE: MLI not install on canister or hose



T-RAD nozzle fully inserted into closed bin of CDC

STS-123 (1JA) EVA 5 TIMELINE

TIME (HR : MIN)	IV/SSRMS	1JA EVA 5 EV1 - Be (FF)	EV2 - Fm (FF)
00:00 ---		<b>POST DEPRESS</b> (00:05)	<b>POST DEPRESS</b> (00:05)
		<b>A/L EGRESS AND SETUP</b> (00:40)	<b>A/L EGRESS AND SETUP</b> (00:40)
	<ul style="list-style-type: none"> <li>SRMS ungrapple OBSS</li> </ul>		
01:00 ---		<b>OBSS KEEP-ALIVE UMBILICAL INSTALL</b> (01:35)	<b>OBSS KEEP-ALIVE UMBILICAL INSTALL</b> (01:35)
		<ul style="list-style-type: none"> <li>Install Stanchion/avionics box</li> </ul>	<ul style="list-style-type: none"> <li>APFR setup</li> <li>Install Stanchion/avionics box</li> <li>Mate W22/W23 connectors to A114</li> </ul>
	<ul style="list-style-type: none"> <li>SSRMS mnvr to UMBILICAL INSTALL</li> </ul>	<ul style="list-style-type: none"> <li>Install KAD</li> </ul>	<ul style="list-style-type: none"> <li>Monitor OBSS clearance</li> </ul>
02:00 ---		<b>OBSS STOW</b> (01:15)	<b>OBSS STOW</b> (01:15)
	<ul style="list-style-type: none"> <li>SSRMS mnvr to PITCH posn</li> <li>Power up OBSS KA</li> <li>SSRMS: MNVR TO EVA HANDOFF posn</li> <li>SSRMS: SEMI-MANUAL RELEASE</li> </ul>	<ul style="list-style-type: none"> <li>Install P411 connector</li> <li>Verify P411 connector illuminated</li> </ul>	<ul style="list-style-type: none"> <li>Mate W21 connectors to avionics box</li> </ul>
03:00 ---		<b>OBSS STOW</b> (01:15)	<b>OBSS STOW</b> (01:15)
		<ul style="list-style-type: none"> <li>Capture OBSS inboard striker bar</li> <li>Route W21 harness</li> <li>OBSS stow cleanup</li> </ul>	<ul style="list-style-type: none"> <li>Capture OBSS outboard striker bar</li> <li>Install OBSS cover</li> <li>OBSS stow cleanup</li> </ul>
04:00 ---		<b>TBA #5 INSTALL</b> (01:00)	<b>TBA #5 INSTALL</b> (01:00)
		<ul style="list-style-type: none"> <li>Remove cover 20</li> <li>Install TBA</li> <li>Install cover 20</li> </ul>	<ul style="list-style-type: none"> <li>Remove cover 20</li> <li>Install TBA</li> <li>Install cover 20</li> </ul>
05:00 ---		<b>STBD SARJ INSPECTION</b> (01:10)	<b>STBD SARJ INSPECTION</b> (01:10)
		<ul style="list-style-type: none"> <li>Datum-A "divot" inspection (cover 18)</li> <li>Single cover inspection (covers 9, 11)</li> </ul>	<ul style="list-style-type: none"> <li>Single cover 16 inspection</li> <li>Datum-A "divot" inspection (cover 18)</li> <li>Single cover inspection (covers 6, 8)</li> </ul>
06:00 ---		<b>CLEANUP AND INGRESS</b> (00:40)	<b>CLEANUP AND INGRESS</b> (00:40)
		<b>PRE REPRESS</b> (00:05)	<b>PRE REPRESS</b> (00:05)



# PRE EVA 5 TOOL CONFIG

<b>EV1</b>	
<input type="checkbox"/>	MWS
<input type="checkbox"/>	BRT (L)
<input type="checkbox"/>	RET (eq-eq)
<input type="checkbox"/>	Wire Tie
<input type="checkbox"/>	T-Bar
<input type="checkbox"/>	RET (eq-eq)
<input type="checkbox"/>	RET (eq-eq) w/PIP pin
<input type="checkbox"/>	Adj Equip Tether (2)
<input type="checkbox"/>	Wire Tie (2)
<input type="checkbox"/>	STS Small Trash Bag
<input type="checkbox"/>	Swing Arm (R)
<input type="checkbox"/>	PGT [B3 18.4ft-lb, CAL, MTL 30.5] s/n _____
<input type="checkbox"/>	PGT Battery s/n _____
<input type="checkbox"/>	7/16 (wobble) socket-6 ext
<input type="checkbox"/>	RET (eq-eq)
<input type="checkbox"/>	Waist Tether (2)
<input type="checkbox"/>	D-ring Extender (2)
<input type="checkbox"/>	Safety Tether (85 ft)
<input type="checkbox"/>	SAFER
<input type="checkbox"/>	WVS
<input type="checkbox"/>	Overgloves (2) donned
<b>EV2</b>	
<input type="checkbox"/>	MWS
<input type="checkbox"/>	BRT (L)
<input type="checkbox"/>	RET (eq-eq)
<input type="checkbox"/>	Wire Tie
<input type="checkbox"/>	T-Bar
<input type="checkbox"/>	RETs (eq-eq)
<input type="checkbox"/>	RET (eq-eq) w/PIP pin
<input type="checkbox"/>	Adj Equip Tether
<input type="checkbox"/>	Wire Tie (2)
<input type="checkbox"/>	760 digital camera and mount (tie wrapped)
<input type="checkbox"/>	ISS Small Trash Bag
<input type="checkbox"/>	Adj Eq Tether (clove-hitched, hooks in bag)
<input type="checkbox"/>	Swing Arm (R)
<input type="checkbox"/>	RET (eq-eq)
<input type="checkbox"/>	Waist Tether (2) (L – D-ring, R – extender)
<input type="checkbox"/>	D-ring Extender (2)
<input type="checkbox"/>	Safety Tether (85 ft)
<input type="checkbox"/>	SAFER
<input type="checkbox"/>	WVS
<input type="checkbox"/>	Overgloves (2) donned
<b>Tether Count</b>	
RET (eq-eq) – 14	RET (eq-eq) w/PIP Pin – 4
RET (lg-eq) – 6	Adj Eq Tether – 10

<b>AIRLOCK CONFIG</b>	
<input type="checkbox"/>	Staging Bag
<input type="checkbox"/>	Fuse Tether
<input type="checkbox"/>	PGT
<input type="checkbox"/>	PGT Battery
<input type="checkbox"/>	Wire Tie Caddy
<input type="checkbox"/>	RAD
<input type="checkbox"/>	Connector Cleaner Tool Kit
<input type="checkbox"/>	Probe
<input type="checkbox"/>	Prybar
<input type="checkbox"/>	Connector Pin Straightener
<input type="checkbox"/>	Velcro/Tape Caddy
<input type="checkbox"/>	RET (eq-eq) (2) – to fuse tether strap
<input type="checkbox"/>	GP Cutters (-303 version)
<input type="checkbox"/>	RET (Lg-eq) (2) – to fuse tether strap
<input type="checkbox"/>	Ratchet Wrench w/palm wheel (2) (s/n 1011,1012)
<input type="checkbox"/>	LDTD Tether
<b>IV Bag</b>	
<input type="checkbox"/>	Towels (2)
<input type="checkbox"/>	Contamination Detection Kit
<input type="checkbox"/>	GP Caddy (2)
<input type="checkbox"/>	Adj Thermal Mittens (2)
<input type="checkbox"/>	Socket Caddy (hatch cont) w/RET (eq-eq)
<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)
<b>Large ORU Bag</b>	
<input type="checkbox"/>	OBSS stanchion/avionics box
<input type="checkbox"/>	W22/W23 (1 tie-down strap, in clamp)
<input type="checkbox"/>	RET (eq-eq) (2) (for caps)
<input type="checkbox"/>	W21 (in TA clamp, strapped to box HH)
<input type="checkbox"/>	Tie-down straps (6 short, 2 long) (on W21)
<input type="checkbox"/>	Velcro strap from caddy below TA clamp
<input type="checkbox"/>	KAD (J225->P225, J226->P226, in TA clamps)
<input type="checkbox"/>	Adj Equip Tether
<input type="checkbox"/>	P411 connector (tether to T-handle)
<input type="checkbox"/>	RET (eq-eq)
<input type="checkbox"/>	OBSS thermal cover
<input type="checkbox"/>	RET (eq-eq)
<input type="checkbox"/>	RET (eq-eq)
<input type="checkbox"/>	Adj Eq Tether (on RET for overgloves)
<input type="checkbox"/>	RET (eq-eq) (outside of bag)
<input type="checkbox"/>	Adj Eq Tether (outside of bag)
<input type="checkbox"/>	RET (lg-eq) (outside of bag)

<b>AIRLOCK CONFIG (Cont)</b>	
<b>EVA Crewlock Bag #4</b>	
<input type="checkbox"/>	Kapton tape strips on door (8)
<input type="checkbox"/>	Adj Eq Tether (clove hitched to int tether point)
<input type="checkbox"/>	EVA Wipes (2)
<input type="checkbox"/>	Spare TBA mount package (engage tether hook from inside of mount) – inside Adj tether EVA Wipe
<input type="checkbox"/>	Spare TBA bearing package – inside Adj tether EVA Wipe
<input type="checkbox"/>	Inspection mirror
<input type="checkbox"/>	RET (eq-eq) w/PIP pin
<input type="checkbox"/>	EVA Wipes (2)
<input type="checkbox"/>	Digital camera w/flash and mount (35 mm lens)
<input type="checkbox"/>	Adj Eq Tether (securing camera to outside of bag)
<input type="checkbox"/>	Adj Eq Tether (to secure covers)
<input type="checkbox"/>	85-ft safety tether on HH
<input type="checkbox"/>	RET (lg-eq) (outside of bag)
<input type="checkbox"/>	RET (lg-eq)
<input type="checkbox"/>	PGT [A6 18.4 ft-lb, CAL, MTL 30.5] s/n _____
<input type="checkbox"/>	PGT Battery s/n _____
<input type="checkbox"/>	7-16 (wobble) socket-6 ext
<input type="checkbox"/>	85-ft safety tether on AVL HH
<b>AIRLOCK EXTERIOR – ESP2</b>	
<input type="checkbox"/>	APFR w/ingres aid, WIF 2

**Prior to EVA, perform the following hardware inspections:**

- RET cords for fraying
- No red line visible on safety and waist tether load  
Alleviation straps
- Inspect STS trash bags for deformation/damage
- Inspect EMU gloves for damage
- Check MWS Baseplate for loose screws on toggle levers

**Use Red RETs only**

## EVA 5 INHIBIT PAD

### Orbiter

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 ft from FRCS:  
IV 1. √DAP: VERN, FREE, LO Z  
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

Ground Radar  
MCC-H 1. √TOPO 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° from the velocity vector  
If one or both PCUs failed:  
2. No more than two arrays unshunted and oriented < 105° from velocity vector

Lab Window (Not Planned)  
IV If EV crew less than 10 ft from window or in window FOV, close window shutter

S-BAND (SASA) ANTENNAS  
MCC-H 1. P1 SASA – Active  
2. S1 SASA – Powered down

STBD TRRJ  
MCC-H 1. √DLA (1) – LOCKED at 0 or 60 deg

FPMU  
MCC-H 1. FPMU power – Off

CP4 – J2, J3  
MCC-H 1. √RPCM s11a-b RPC 1 – Open, close cmd inh  
√RPCM s11a-b RPC 13 – Open, close cmd inh  
2. √RPCM s12b-b RPC 2 – Open, close cmd inh  
√RPCM s12b-b RPC 12 – Open, close cmd inh

## EVA 5 INHIBIT PAD (Cont)

### USOS (Cont)

#### SSPTS

- MCC If EV crew < 2 ft from ungrounded SSPTS connector (not planned):
1. RPCM LA2A3B\_D RPC 1 – Open, Close Cmd Inhibit
  2. RPCM Z13B\_A RPC 2 – Open, Close Cmd Inhibit
  3. RPCM LA1A4A\_D RPC 3 – Open, Close Cmd Inhibit
  4. RPCM Z14B\_A RPC 2 – Open, Close Cmd Inhibit

#### S3 SARJ (Locked at 300 deg)

- MCC
1. √DLA 1(2) – LOCKED
  2. All motor setpoints set to zero
  3. All motors deselected
- OR
4. Both DLAs – LOCKED

### RSOS

#### SM Antennas

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

## 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 (drylube)
  2. PIP pins
  3. EVA Crane [PMA 1]
  4. TCS Reflectors [PMA 2,PMA 3]
  5. APAS hardware [PMA 2,PMA 3]
  6. CETA Lights (Z-93 paint) [LAB,S1,Node 1]
  7. Deployed MISSEs (Columbus EPF)
  8. Passive UMAs
  9. MBS VDU, MCU, CRPCMs, and Cameras (taped radiative surfaces, silver Teflon)
  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. SSRMS/SPDM Cameras
  22. SPDM SJEU, EP, OTCM Radiator surfaces
  23. Open CBM petal covers and LAB window shutter
  24. FPMU [S1]
  25. OTSD
  26. Columbus HAM radio antennas

### 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
  4. Do not apply more than 33 lbf to OBSS while grappled by SSRMS

## NOTES, CAUTIONS, AND WARNINGS (Cont)

### CAUTION (Cont)

#### 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 (Cont)

#### Shuttle Constraints

##### G. Avoid inadvertent contact with

1. OBSS and SRMS Composite Sections 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 wire harnesses, cables, 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]

## 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
- 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 linkages during operation
- 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 (Cont)

#### 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 sockets
  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. Z1 handrail 6061 by the Ku-Band boom launch restraint [Z1]
  10. Solar Array Blanket Box [P6,S6]
  11. Keep hands away from SSRMS, SPDM, POA LEE opening, and snares
  12. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing
  13. Lifting lug near P6 handrail 5333 and gap spanner

### WARNING (Cont)

#### ISS Constraints (Cont)

- F. Sharp Edges (Cont)
14. SPDM OTCM Gripper Jaws
  15. SOLAR and EuTEF
  16. Port/Aft portion of A/L circular HH
- 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/SPDM/MBS 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  $< -120$  or  $> 200$  degF

## NOTES, CAUTIONS, AND WARNINGS (Cont)

### WARNING (Cont)

#### ISS Constraints (Cont)

##### H. Electrical Shock

1. Stay  $\geq$  2 ft from ungrounded floating connectors if not powered:
  - SSPTS connectors [NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA 2 Stbd & Port]
  - MBS Cross-Connect jumpers (translate past these using UMA handrails)
  - S0 EVA Power Cables [inside S0 Bay 00 Face 4, Bay 01 Face 3]
  - ESP2 jumper [inside S0 Bay 03 Face 4]

### WARNING (Cont)

#### 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]

### WARNING (Cont)

#### 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

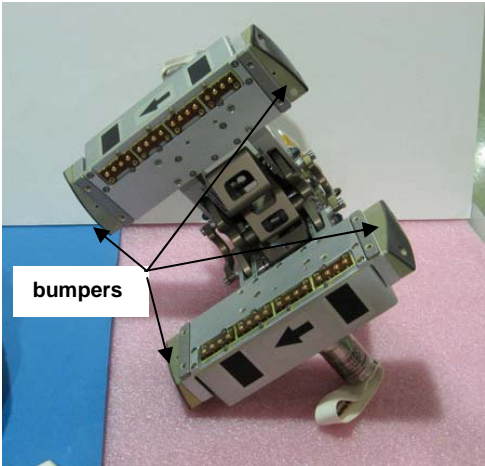
1. Do not look at LDRI diffuser or LCS laser aperture window

## A/L EGRESS/SETUP (00:40)


IV/SSRMS	EV1 – Be (FF)	EV2 – Fm (FF)
<p>The diagram illustrates the A/L Egress/Setup system. On the left, an 'A/L D-ring Ext' is connected to a chain of components. This chain includes a waist tether for EV1 (labeled 'L'), an EV1 safety tether (labeled 'R'), and an 85-foot safety tether (labeled '85'). This 85-foot tether is connected to another chain that includes a waist tether for EV2 (labeled 'R'), an EV2 safety tether (labeled 'L'), and another 85-foot safety tether (labeled '85').</p>		
<ol style="list-style-type: none"> <li>1. SSRMS Grapple OBSS</li>   <li>2. WVS Software: Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max (required after EV1 and EV2 egress Airlock) Verify good video</li>   <li>3. SRMS ungrapple OBSS</li> <li>4. SSRMS mnvr to UMBILICAL INSTALL SETUP</li> </ol>	<p><b>Initial Condition:</b> Waist Tether (L) to A/L D-ring extender, Waist tether (R) to EV1 85-ft safety tether ERCM. EV1 safety tether LAS hook to D-ring extender (R), safety tether large hook to EV2 waist tether (R). Verify hooks locked; overgloves donned</p> <p><b>EGRESS</b> (00:15)</p> <ol style="list-style-type: none"> <li>1. On EV2 GO, release Waist Tether (L) from A/L D-ring extender</li> <li>2. <u>Transfer spare 85-ft safety tether to EV2</u></li> <li>3. <u>Transfer C/Lk bag #1 (JLP trunnion covers) to EV2;</u> leave A/L RET on D-ring ext</li> <li>4. <u>Transfer Lq ORU bag to EV2 (on EV1 BRT RET);</u> leave A/L RET on D-ring ext</li> <li>5. Egress A/L</li> <li>6. √SAFER man isol vlv – open (down)</li> <li>7. √SAFER HCM – closed (down)</li> <li>8. Close A/L thermal cover</li> <li>9. Give SRMS GO for OBSS ungrapple</li> </ol> <p><b>SETUP</b> (00:25)</p> <ol style="list-style-type: none"> <li>10. Translate to CP4 (S1 zenith) via CETA spur and Face 4</li> <li>11. <u>Fairlead with Adj Eq Tether at HH 3290</u></li> </ol>	<p><b>Initial Condition:</b> Waist Tether (R) to EV1 85-ft safety tether large hook; Waist tether (L) to EV2 85-ft safety tether ERCM. EV2 safety tether LAS hook to D-ring extender (L); stow EV2 safety tether large hook on MWS. Verify hooks locked; overgloves donned</p> <p><b>EGRESS</b> (00:15)</p> <ol style="list-style-type: none"> <li>1. Open A/L thermal cover</li> <li>2. Egress Airlock</li> <li>3. Attach EV2 85-ft safety tether large hook to aft A/L D-ring <ul style="list-style-type: none"> <li>□ Verify hook locked, reel unlocked</li> </ul> </li> <li>4. Remove EV1 85-ft safety tether large hook from EV2 waist tether (R), attach to fwd A/L D-ring <ul style="list-style-type: none"> <li>□ Verify hook locked, reel unlocked</li> </ul> </li> <li>5. Give EV1 GO to release Waist Tether (L)</li> <li>6. <u>Stow spare 85-ft safety tether on A/L toolbox</u></li>   <li>7. <u>Stow C/Lk bag #1 (JLP trunnion covers) on A/L toolbox</u></li> <li>8. <u>Stow Lq ORU bag on EV1 BRT</u></li> <li>9. Stay aft of hatch opening; fairlead to provide EV1 path to CETA spur</li> <li>10. √SAFER man isol vlv – open (down)</li> <li>11. √SAFER HCM – closed (down)</li> </ol> <p><b>SETUP</b> (00:25)</p> <ol style="list-style-type: none"> <li>12. Translate to ESP2</li> <li>13. <u>RET/BRT to APFR ( ,TT,H,12)/Ingress Aid from ESP2</u> <u>WIF 2</u></li> <li>14. Translate to inboard OBSS stand via CETA spur and Face 4</li> <li>15. Fairlead using EV1 Adj Eq Tether at HH 3290</li> </ol>



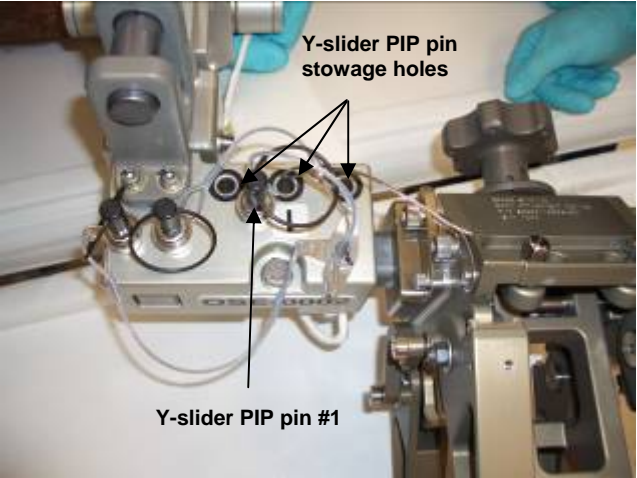
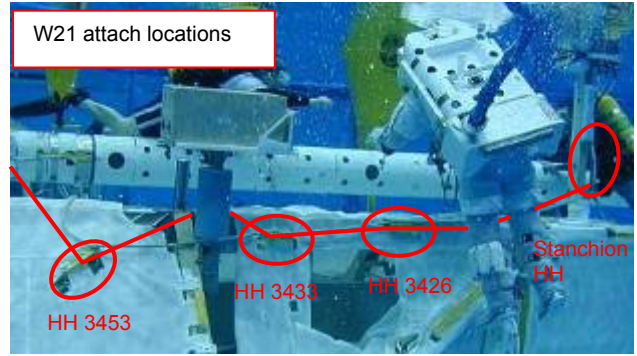
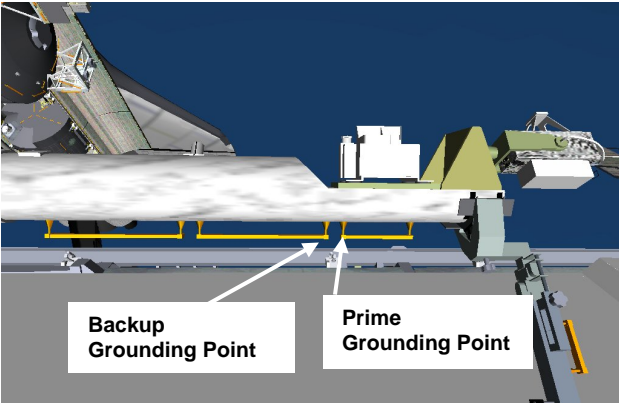
# OBSS KEEP-ALIVE UMBILICAL INSTALL (01:35)

IV/SSRMS	EV1 – Be (FF)	EV2 – Fm (FF)
<p>Stanchion install – torque, turns: _____ (18.4 ft-lb)            _____ (26 turns)</p>  <p>KAD</p>	<p><b>INSTALL STANCHION/AVIONICS BOX</b> (00:15)</p> <ol style="list-style-type: none"> <li>1. Inspect gloves; remove overgloves and stow on ORU bag</li> <li>2. <u>Tether and stow ORU bag on S1 HH 3289 (RET) and S0 HH 3425 (adjustable) – flap opens from ISS aft</u></li> <li>3. Retrieve stanchion/avionics box</li> </ol> <ol style="list-style-type: none"> <li>4. Soft dock stanchion/avionics box to CP-4 (HH outboard)</li> <li>5. Transfer PGT to EV2 (on EV1 RET)</li> </ol> <ol style="list-style-type: none"> <li>6. Receive PGT</li> </ol> <p><b>MATE CONNECTORS</b> (00:05)</p> <ol style="list-style-type: none"> <li>7. Assist EV2 as reqd</li> </ol> <p><b>KAD/P411 INSTALL</b> (01:15)</p> <ol style="list-style-type: none"> <li>8. <u>Tether and retrieve P411 connector from ORU bag; stow on MWS</u></li> <li>9. Retrieve W21 harness/KAD from ORU bag (attached to avionics box)</li> <li>10. Route KAD/W21 FWD of SASA; <u>transfer to EV2</u></li> <li>11. <u>Transfer OBSS cover to EV2</u></li> <li>12. Perform ORU bag inventory; close ORU bag</li> </ol>	<p><b>INSTALL APFR</b> (00:07)</p> <ol style="list-style-type: none"> <li>1. <u>Install APFR/Ingress aid in S1 WIF 05 (10.TT.H.12)</u> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pull test</li> <li><input type="checkbox"/> Verify lock collar black on black</li> <li><input type="checkbox"/> Release RET</li> </ul> </li> <li>2. Inspect gloves; remove overgloves</li> </ol> <p><b>INSTALL STANCHION/AVIONICS BOX</b> (00:08)</p> <ol style="list-style-type: none"> <li>3. Soft dock stanchion/avionics box to CP-4 (HH outboard)</li> <li>4. BRT to HH 3290</li> <li>5. Receive PGT (on EV1 RET)</li> <li>6. <b>PGT [B3 18.4 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tighten stanchion bolt 10 turns, until it drops out of launch position (do not allow socket to come off bolt head)</li> <li><input type="checkbox"/> <u>Tighten stanchion bolt to hard stop, ~16.5 additional turns (26.5 turns total)</u></li> </ul> </li> <li>7. Transfer PGT to EV1</li> </ol> <p><b>MATE CONNECTORS</b> (00:10)</p> <ol style="list-style-type: none"> <li>8. Perform the following demates from S1 PNL A114 and stow caps in ORU bag (use 2 RETs from stanchion to bag, BRT to 3290):           <ul style="list-style-type: none"> <li><input type="checkbox"/> P2 – Deadface connector</li> <li><input type="checkbox"/> P3 – Deadface connector</li> </ul> </li> <li>9. Open captive socks covering W22/P2 and W23/P3</li> <li>10. Mate W22/W23 cable harness connectors to S1 PNL A114:           <ul style="list-style-type: none"> <li><input type="checkbox"/> W22/P2 to J2</li> <li><input type="checkbox"/> W23/P3 to J3</li> </ul> </li> <li>11. Secure W22/W23 to S1 HH 3289 w/integral cable tie, as reqd</li> </ol> <p style="text-align: center;"><u>NOTE</u> Do not handle or open KAD via the connectors</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Avoid contact with the dry lube on the KAD bumpers Do not apply more than 33 lbf to OBSS while grappled by SSRMS</p> </div> <p><b>KAD/P411 INSTALL</b> (01:10)</p> <ol style="list-style-type: none"> <li>12. <u>Receive KAD/W21</u>; temp stow on OBSS stand HH w/Adj</li> <li>13. <u>Receive OBSS cover</u></li> <li>14. Translate to outboard OBSS stand; <u>tether and temp stow OBSS cover on HH 3231 (safety tether routed fwd of APFR)</u></li> </ol>

## OBSS KEEP-ALIVE UMBILICAL INSTALL (01:35) (Cont)

IV/SSRMS	EV1 – Be (FF)	EV2 – Fm (FF)
<p><input type="checkbox"/> <b>Large ORU Transfer Bag</b></p> <p><input type="checkbox"/> Connector caps (2)</p> <p><input type="checkbox"/> RET (eq-eq) (2)</p> <p><input type="checkbox"/> RET (eq-eq) (2) (from OBSS cover and P411)</p> <p><input type="checkbox"/> Adj Eq Tether (outside of bag)</p> <p><input type="checkbox"/> RET (eq-eq) (outside of bag)</p> <p><input type="checkbox"/> RET (eq-eq)</p> <p><input type="checkbox"/> Adj Eq Tether (on RET for overgloves)</p> <ol style="list-style-type: none"> <li>1. SSRMS: MNVR TO UMBILICAL INSTALL</li> <li>2. SSRMS: GCA for KAD install</li> <li>3. SSRMS: √Brakes on, give GO for KAD install</li> </ol> <ol style="list-style-type: none"> <li>4. Upon completion of KAD install, give EV2 GO to mate W21 to avionics box</li> <li>5. SSRMS: MnvR to PITCH posn (hold until LED√)</li> </ol> <ol style="list-style-type: none"> <li>6. SSRMS: GCA for P411 connector install</li> <li>7. SSRMS: √Brakes on, give GO for P411 install</li> </ol> <ol style="list-style-type: none"> <li>8. MCC: On EV GO, power up CP-4 (SSRMS holds in PITCH posn); notify crew just before to power up</li> <li>9. IV: If LOS, perform CP-4 power up steps</li> </ol> <p>PCS S1: EPS: RPCM S11A B</p> <p><b>RPCM S11A B</b> – sel RPC 1</p> <p><b>RPCM S11A B RPC 1</b> – cmd RPC Close Cmd – Ena (√Ena) RPC Position – Close (√Cl)</p> <p><b>RPCM S11A B</b> – sel RPC 13</p> <p><b>RPCM S11A B RPC 13</b> – cmd RPC Close Cmd – Ena (√Ena) RPC Position – Close (√Cl)</p> <p>PCS S1: EPS: RPCM S12B B</p> <p><b>RPCM S12B B</b> – sel RPC 2</p> <p><b>RPCM S12B B RPC 2</b> – cmd RPC Close Cmd – Ena (√Ena) RPC Position – Close (√Cl)</p> <p><b>RPCM S12B B</b> – sel RPC 12</p> <p><b>RPCM S12B B RPC 12</b> – cmd RPC Close Cmd – Ena (√Ena) RPC Position – Close (√Cl)</p>	<ol style="list-style-type: none"> <li>13. Translate to inboard OBSS stand</li> <li>14. Open SSBAD (PAD on stand) feet √Status indicator in SD (soft dock)</li> <li>15. Local tether to stand; ingress APFR</li> <li>16. Inspect gloves</li> <li>17. √Safety tether on top of W21 harness</li> <li>18. √KAD in SD</li> </ol> <ol style="list-style-type: none"> <li>19. Give SSRMS GO for MNVR TO UMBILICAL INSTALL</li> <li>20. GCA SSRMS for KAD install</li> <li>21. On IV GO, capture KAD to striker bar (KAD tether – ISS port)</li> <li>22. Rotate KAD knob cw to CL (closed), lock knob</li> <li>23. √Indicator in CL (anywhere in black CL region)</li> <li>24. <u>Remove Adj Eq Tether from KAD; stow on MWS</u></li> </ol> <ol style="list-style-type: none"> <li>25. SSRMS mnvr to PITCH posn for P411 install</li> <li>26. Tend W21 slack</li> </ol> <ol style="list-style-type: none"> <li>27. GCA for P411 connector install</li> <li>28. On IV GO, <u>install P411 connector; insert PIP pin</u> (hold EFGF lobes and temporarily egress APFR as reqd)</li> <li>29. Give MCC GO for CP4 power up (watch for OFF-&gt;ON transition)</li> <li>30. On IV/MCC GO, verify P411 LEDs (2) are illuminated</li> <li>31. Ingress APFR</li> </ol>	<ol style="list-style-type: none"> <li>15. BRT to HH 3236</li> <li>16.  Photograph EV1 and OBSS mnvr w/digital camera</li> <li>17. Monitor OBSS clearance from HH 3236 or outboard OBSS stand</li> </ol> <ol style="list-style-type: none"> <li>18. <u>Tether and temp stow digital camera on HH 3232</u></li> <li>19. Translate to avionics box (after KAD GCA complete)</li> </ol> <ol style="list-style-type: none"> <li>20. On IV GO, remove dummy caps from J223 and J224 (captive)</li> <li>21. Mate W21 harness connectors to avionics box (align red stripe on connector wing with arrow on avionics box, rotate CW 90 deg) <ul style="list-style-type: none"> <li><input type="checkbox"/> W21/P223 to J223</li> <li><input type="checkbox"/> W21/P224 to J224</li> <li><input type="checkbox"/> √Red ring on both connectors NOT visible</li> </ul> </li> <li>22. Secure dummy connectors via Velcro strap below TA clamp</li> <li>23. Translate to outboard stanchion</li> <li>24. Monitor clearance during GCA</li> </ol>

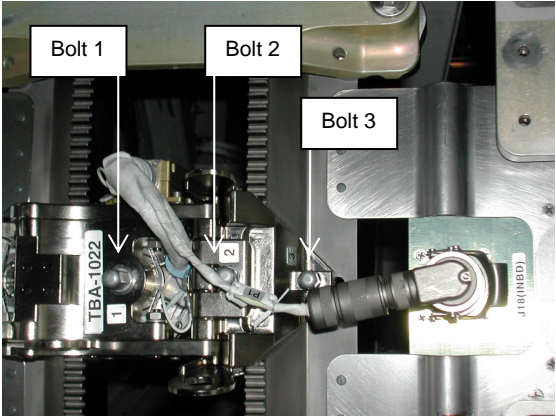
# OBSS STOW (01:15)

IV	EV1 – Be (FF)	EV2 – Fm (FF)
<p>1. SSRMS: Mnvtr to EVA Handoff posn</p> <p>2. Give SSRMS GO for OBSS SEMI-MANUAL RELEASE</p>  	<p><b>OBSS CAPTURE</b> (00:35)</p> <ol style="list-style-type: none"> <li>1. Give GO for SSRMS mnvr to EVA Handoff posn; tend W21 slack</li> <li>2. <u>Attach RET to OBSS HH (after GCA complete)</u></li> <li>3. Give SSRMS GO for OBSS SEMI-MANUAL RELEASE</li> <li>4. Soft capture OBSS striker bar to inboard SSBAD</li> <li>5. <u>Release RET from OBSS HH</u></li> <li>6. Egress APFR</li> </ol> <p><b>RELEASE 1st JOINT CONSTRAINT</b> (inboard) (00:05)</p> <ol style="list-style-type: none"> <li>7. Release Slider Knob PIP pin</li> <li>8. Reposition Slider knob to position 2; re-install PIP pin in knob</li> <li>9. Rotate SSBAD knob cw to CL (closed), lock knob</li> <li>10. ✓Indicator in CL (anywhere in black CL region)</li> </ol> <p><b>RELEASE REMAINING JOINT CONSTRAINTS</b> (inboard) (00:05)</p> <ol style="list-style-type: none"> <li>11. Release Slider knob PIP pin</li> <li>12. Reposition Slider knob to position 4; re-install PIP pin in knob</li> <li>13. Give EV2 GO to dock outboard end of Boom</li> </ol> <p><b>ROUTE W21 HARNESS</b> (00:15)</p> <ol style="list-style-type: none"> <li>14. Route W21 harness fwd of CPDS (Charged Particle Directional Spectrometer); attach integrated cable ties to, HH 3426, HH 3433 (local tether to 3427)</li> <li>15. Secure W21 harness slack to HH 3453 with integral cable ties (Keep cable bend radius &gt; 5-in)</li> </ol> 	<p><b>OBSS CAPTURE</b> (00:40)</p> <ol style="list-style-type: none"> <li>1. Translate onto outboard OBSS stand; attach local tether</li> <li>2. Open SSBAD feet <ul style="list-style-type: none"> <li>□ Status indicator in SD (soft dock)</li> </ul> </li> <li>3. <u>Attach RET to OBSS HH (after GCA complete)</u></li> </ol> <ol style="list-style-type: none"> <li>4. On EV1 GO, soft capture OBSS striker bar to outboard SSBAD</li> <li>5. <u>Release RET from OBSS</u></li> </ol> <p><b>RELEASE JOINT CONSTRAINT (outboard)</b> (00:08)</p> <ol style="list-style-type: none"> <li>6. Release slider knob PIP pin</li> <li>7. Reposition Slider knob to position 4; re-install PIP pin in knob</li> <li>8. Rotate SSBAD knob cw to CL (closed), lock knob</li> <li>9. ✓Indicator in CL (anywhere in black CL region)</li> </ol> <p><b>OUTBOARD Y-SLIDER RELEASE</b> (00:02)</p> <ol style="list-style-type: none"> <li>10. Release Y-slider PIP pin #1 and stow in any black ring stowage hole</li> </ol> <p><b>OBSS COVER INSTALL</b> (00:10)</p> <ol style="list-style-type: none"> <li>11. Retrieve OBSS cover (HH 3231); slide over SP1</li> <li>12. <u>Attach fixed length strap to zenith SP2 T-handle</u></li> <li>13. Cinch drawstring, attach to port/zenith SP2 tether point</li> <li>14. Install Velcro flap over SP2</li> <li>15. Retrieve grounding strap from pouch; route cable through equipment hook gate on T-handle</li> <li>16. Insert grounding PIP pin in outboard-most OBSS HH (port standoff) (backup – stbd standoff on adjacent HH)</li> <li>17. Verify PIP pin clocked to clear HH (grounding strap in line with HH) and fully inserted</li> </ol>

**OBSS STOW (01:15) (Cont)**

IV	EV1 – Be (FF)	EV2 – Fm (FF)
	<p><b><u>CLEANUP</u></b> (00:15)</p> <p>16. Inspect gloves; don overgloves (on ORU bag)</p> <p>17. <u>Retrieve Lg ORU Bag from S1 HH 3289 and S0 HH 3425; transfer to EV2</u></p> <p>18. Translate to A/L toolbox</p> <p>19. <u>Retrieve 85-ft safety tether from A/L toolbox; attach LAS hook to D-ring ext and anchor hook to MWS</u></p>	<p><b><u>CLEANUP</u></b> (00:15)</p> <p>18. <u>Retrieve digital camera (HH 3232); tether and stow on MWS</u></p> <p>19. Tether and relocate APFR to S1 WIF 1 (10,TT,H,12)</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pull test</li> <li><input type="checkbox"/> Verify lock collar black on black</li> <li><input type="checkbox"/> Release RET</li> </ul> <p>20. Inspect gloves; don overgloves</p> <p>21. <u>Tether and receive Lg ORU Bag; stow on BRT</u></p> <p>22. Release both safety tether from fairlead (HH 3290); <u>stow Adj Eq Tether on MWS</u></p> <p>23. Translate to A/L (EV2 leads)</p> <p>24. <u>Stow Lg ORU bag in A/L on D-ring extender RET</u></p> <p>25. <u>Stow digital camera in A/L (w/int RET)</u></p> <p>26. <u>RET to PGT; stow on swing arm</u></p> <p>27. <u>RET/BRT to C/Lk bag #4 (w/85-ft safety tether and digital camera w/flash on it)</u></p> <p>28. Close A/L thermal cover</p>

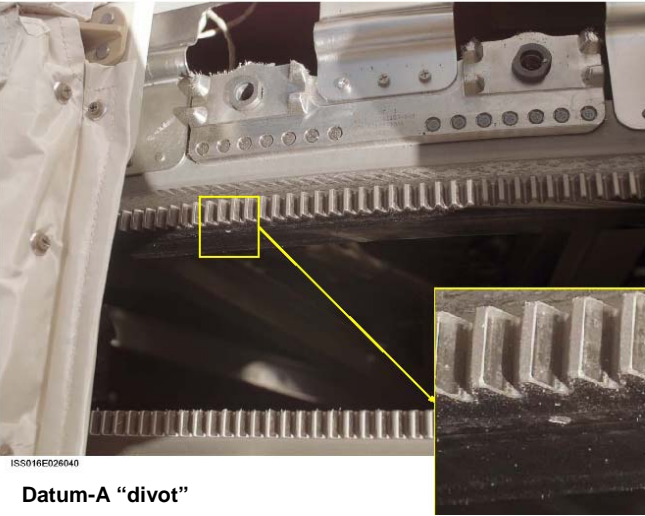
## TBA 5 INSTALL (01:00)

IV/SSRMS	EV1 – Be (FF)	EV2 – Fm (FF)
 <p style="text-align: center;"><b>INBOARD→</b></p>	<p><b>TBA INSTALL SETUP</b></p> <ol style="list-style-type: none"> <li>Translate up CETA spur to S1 HH 3202 (face 1 CETA rail)</li> <li>Tether swap to spare 85-ft safety tether on S1 HH 3202 <ul style="list-style-type: none"> <li>Verify hook locked, reel unlocked</li> </ul> </li> <li>Translate to S3/S4 interface, cover 20 (face 6)</li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><b>WARNING</b></p> <p>Sharp edge – spring loaded captive EVA fasteners (SARJ MLI cover bolts); ends of springs may protrude</p> <p>Avoid contact with any exposed sharp edges during cover removal, TBA install, and SARJ inspection</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><b>CAUTION</b></p> <p>The following precautions should be taken 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 of bolt head</li> <li>Maintain axial force on fastener to compress spring during rotation</li> </ul> </div> <p><b>REMOVE MLI COVER 20</b></p> <ol style="list-style-type: none"> <li>Remove overgloves</li> <li>Attach RET between cover 20 and cover 1 (face 1)</li> <li><b>PGT[A6</b> 8.3 ft-lb, <b>CW2</b> 30RPM, MTL <b>30.5]-6 ext 7/16:</b> Release inboard MLI cover fasteners (4) = 9 turns</li> <li>Remove MLI cover; transfer to EV2</li> </ol> <p><b>INSTALL TBA #5</b></p> <ol style="list-style-type: none"> <li>Receive EVA wipe from EV2</li> <li>Use EVA wipe(s) to clean all inboard and outboard race ring surfaces (where clamp mounts)</li> <li>Pass EVA wipe back to EV2</li> <li>Receive mount package from EV2 (on bag RET)</li> <li>Verify mount clamping leg is open</li> <li>Engage mount onto race ring, aligning mount boss with slot in race ring</li> <li>Close mount clamping leg</li> <li><b>PGT[A3</b> 4.8 ft-lb, <b>CW2</b> 30RPM, MTL <b>30.5]-6 ext 7/16:</b> Engage bolt 3 (mount bolt) exactly 2 turns</li> <li>Release mount tether; pass to EV2</li> <li>Receive bearing package from EV2 (on bag RET)</li> <li>Engage bearing package onto mount, guiding bearing arm through race ring</li> </ol>	<p><b>TBA INSTALL SETUP</b></p> <ol style="list-style-type: none"> <li>Translate up CETA spur to S1 HH 3239 (face 1)</li> <li>Tether swap to spare 85-ft safety tether on S1 HH 3239 <ul style="list-style-type: none"> <li>Verify hook locked, reel unlocked</li> </ul> </li> <li>Fairlead EV1 and EV2 safety tether w/Adj Eq Tether at HH 3061</li> <li>Translate to S3/S4 interface, cover 20 (face 6)</li> <li>Temp stow C/Lk bag #4 on S3 HH 3061</li> </ol> <p><b>REMOVE MLI COVER 20</b></p> <ol style="list-style-type: none"> <li>Remove overgloves</li> <li>Receive MLI cover; let retract to cover 1</li> </ol> <p><b>INSTALL TBA #5</b></p> <ol style="list-style-type: none"> <li>Retrieve EVA Wipe(s) from C/Lk bag #4; transfer to EV1</li> <li>Receive EVA Wipe(s); invert to contain debris and stow in C/Lk bag #4</li> <li>Retrieve mount package from C/Lk bag #4; pass to EV1 on bag RET</li> <li>Assist EV1 with mount package install</li> <li>Let bag RET retract to bag</li> <li>Retrieve bearing package from C/Lk bag #4; pass to EV1 on bag RET</li> <li>Assist EV1 with bearing package install</li> </ol>

**TBA 5 INSTALL (01:00) (Cont)**

IV/SSRMS	EV1 – Be (FF)	EV2 – Fm (FF)
<p>1. Record Bolt 2: Final Torque ____ Turns ____</p> <p>2. Record Bolt 1: Final Torque ____ Turns ____</p> <p>3. Record Bolt 3: Final Torque ____ Turns ____</p>	<p>19. <b>PGT[A4</b> 6.3 ft-lb, <b>CW2</b> 30RPM, MTL <b>30.5]-6 ext 7/16:</b> Engage bolt 2 (draw bolt) ~19 turns to torque until preload arm engages race ring (bearing package will also move toward SARJ and mount package)</p> <p>20. <b>PGT[A4</b> 6.3 ft-lb, <b>CW2</b> 30RPM, MTL <b>30.5]-6 ext 7/16:</b> Engage bolt 1 (bearing preload bolt) ~7 turns to torque</p> <p>21. <u>Release bearing tether; pass to EV2</u></p> <p>22. <b>PGT[A3</b> 4.8 ft-lb, <b>CW2</b> 30RPM, MTL <b>30.5]-6 ext 7/16:</b> Tighten bolt 3 (mount bolt) ~7 turns to torque</p> <p>23. Remove dust cap, transfer to EV2</p> <p>24. Mate <b>P1</b> to inboard receptacle <b>J13</b> on SARJ race ring</p> <p>25. Receive EVA wipe; stow on MWS</p> <p><b><u>INSTALL MLI COVER</u></b></p> <p>26. Receive and install MLI cover 20</p> <p>27. <b>PGT[A1</b> 2.5 ft-lb, <b>CW2</b> 60RPM, MTL <b>30.5]-6 ext 7/16:</b> Engage inboard MLI cover fasteners (4) ~9 turns</p> <p>28. <u>Release RET from cover 1; attach to cover 18 (leave other end attached to cover 20)</u></p>	<p>15. <u>Let bag RET retract to bag</u></p> <p>16. <u>Move EVA wipes from Adj Eq Tether to bag RETs</u></p> <p>17. Stow cap in C/Lk bag</p> <p>18. Transfer EVA wipe to EV1</p> <p>19. Close C/Lk bag #4</p> <p><b><u>INSTALL MLI COVER</u></b></p> <p>20. Pass MLI cover 20 to EV1 (still on cover 1 RET)</p> <p>21. <u>RET/BRT to C/Lk bag #4 (HH 3061)</u></p>

# SARJ INSPECTION (01:10)

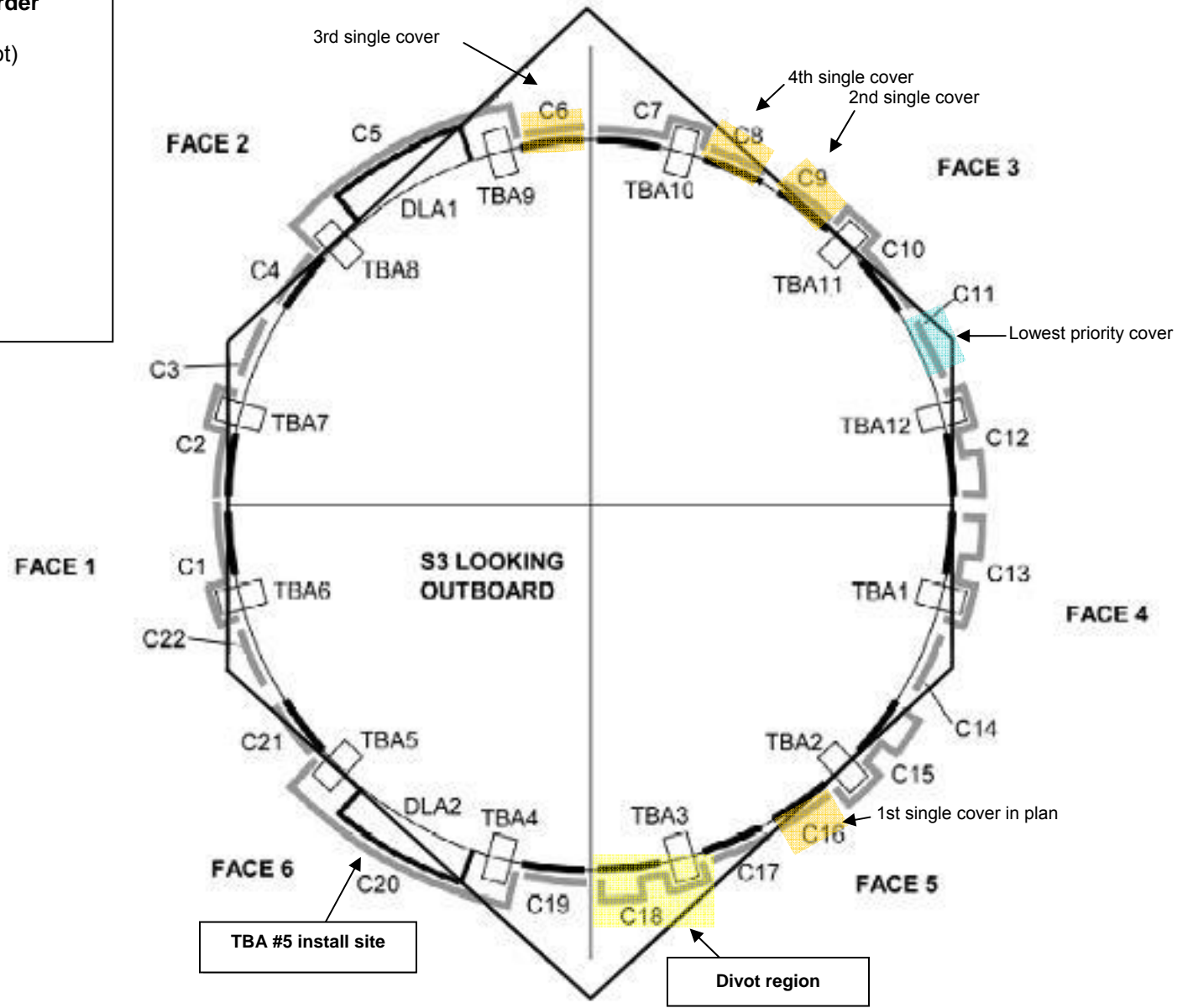
IV	EV1 – BE (FF)	EV2 – FM (FF)
 <p data-bbox="107 1044 184 1052">ISS018ED26040</p> <p data-bbox="121 1068 296 1092">Datum-A "divot"</p> <p data-bbox="92 1149 401 1174"><b><u>CREWLOCK BAG INVENTORY</u></b></p> <ul data-bbox="138 1175 604 1344" style="list-style-type: none"> <li><input type="checkbox"/> Digital camera (35 mm) w/flash and mount</li> <li><input type="checkbox"/> Adj Eq Tether for digital camera</li> <li><input type="checkbox"/> 4 EVA wipes</li> <li><input type="checkbox"/> Adj Equip Tether – clove hitched for 2 wipes</li> <li><input type="checkbox"/> Inspection mirror (on RET)</li> <li><input type="checkbox"/> Adj Eq Tether</li> <li><input type="checkbox"/> Dust cap</li> </ul>	<p data-bbox="1325 318 1394 342" style="text-align: center;"><u>NOTE</u></p> <ul data-bbox="957 344 1738 522" style="list-style-type: none"> <li>• First priority: Datum A divot inspection (divot is expected to be under cover 18)</li> <li>• Second priority: covers 16, 9, 8, 6</li> <li>• Third priority: cover 11</li> <li>• Cover 18 is a double wide cover (6 inboard bolts)</li> <li>• Covers 6, 8, 9, 11, 16 are single wide covers (4 inboard bolts)</li> <li>• Only use digital camera flash during night pass</li> <li>• Any thermal constraints will be uplinked real time</li> </ul> <p data-bbox="762 594 1251 618"><b><u>DATUM-A OUTBOARD RACE RING INSPECTION</u></b></p> <ol data-bbox="762 620 1373 1105" style="list-style-type: none"> <li>1. Translate to SARJ cover 18</li> <li>2. <b>PGT[A6 (8.3), CCW2, 30.5] 6-Ext 7/16</b> release inboard cover fasteners (6), 9 turns only (add single turns incrementally as required for release)</li> <li>3. Remove MLI cover 18; temp stow w/previously installed RET and Adj Eq Tether on adjacent cover</li> <li>4. Inspect backside of cover, both MLI and frame</li> <li>5. Perform search on outboard race ring for Datum A 'divot'</li> <li>6. Perform visual inspection of the 'divot' and report conditions</li> <li>7. Attempt to remove debris from Datum A with EVA wipe</li> <li>8. Report success of debris removal</li> <li>9. <u>If debris can be removed, transfer EVA wipe (inside-out and rolled up) with debris to EV2</u></li> <li>10. Retrieve cover from temp stow location and re-install</li> <li>11. <b>PGT[A1 (2.5), CW2, 30.5] 6-Ext 7/16</b> drive inboard cover fasteners (6), ~8 turns. (Partially engage all MLI cover fasteners prior to final torque)</li> </ol> <p data-bbox="762 1130 1121 1154"><b><u>SARJ SINGLE COVER INSPECTION</u></b></p> <ol data-bbox="762 1156 1339 1203" style="list-style-type: none"> <li>12. Perform single cover inspection steps for cover 9 and 11</li> <li>13. Share camera as reqd</li> </ol> <p data-bbox="762 1227 926 1252"><b><u>SARJ CLEANUP</u></b></p> <ol data-bbox="762 1325 1373 1421" style="list-style-type: none"> <li>14. Translate to A/L safety tether (S1 HH 3202)</li> <li>15. Tether swap to A/L 85-ft safety tether; stow spare on MWS <ul data-bbox="831 1373 1188 1398" style="list-style-type: none"> <li><input type="checkbox"/> Verify hook locked, reel unlocked</li> </ul> </li> <li>16. Don overgloves</li> </ol>	<p data-bbox="1381 594 1772 618"><b><u>SARJ SINGLE COVER 16 INSPECTION</u></b></p> <ol data-bbox="1381 620 1913 667" style="list-style-type: none"> <li>1. Translate to cover 16</li> <li>2. Perform single cover inspection steps for cover 16</li> </ol> <p data-bbox="1381 813 1877 837"><b><u>DATUM-A OUTBOARD RACE RING INSPECTION</u></b></p> <ol data-bbox="1381 839 1990 1105" style="list-style-type: none"> <li>3. Translate to cover 18; assist EV1 with Datum-A inspection</li> <li>4. <u>Receive EVA wipe from EV1; stow in C/Lk bag #4</u></li> <li>5. If debris cannot be removed or damage is observed, retrieve digital camera w/flash</li> <li>6. Take images of the damage area w/digital camera <ol data-bbox="1476 1008 1976 1105" style="list-style-type: none"> <li>a. Focus only on the Datum A surface</li> <li>b. Attempt 6-8 photos</li> <li>c. Take photos at multiple angles (focused only on datum-A target)</li> </ol> </li> </ol> <p data-bbox="1381 1130 1745 1154"><b><u>SARJ SINGLE COVER INSPECTION</u></b></p> <ol data-bbox="1381 1156 1961 1203" style="list-style-type: none"> <li>7. Perform single cover inspection steps for cover 6 and 8</li> <li>8. Share camera as reqd</li> </ol> <p data-bbox="1381 1227 1549 1252"><b><u>SARJ CLEANUP</u></b></p> <ol data-bbox="1381 1253 1948 1421" style="list-style-type: none"> <li>9. Attach digital camera with flash to crewlock bag</li> <li>10. Retrieve C/Lk bag #4; perform tool inventory</li> <li>11. Release SARJ fairleads; stow Adj tether on MWS</li> <li>12. Translate to A/L 85-ft safety tether (S1 HH 3239)</li> <li>13. Tether swap to A/L safety tether; stow spare on MWS <ul data-bbox="1451 1373 1808 1398" style="list-style-type: none"> <li><input type="checkbox"/> Verify hook locked, reel unlocked</li> </ul> </li> <li>14. Don overgloves</li> </ol>

# SARJ INSPECTION (01:10) (Cont)

## Cover remove and inspection order

Double Cover 18 (Datum-A divot)

- Single Cover 16
- Single Cover 9
- Single Cover 8
- Single Cover 6
- Single Cover 11





## SARJ INSPECTION (01:10) (Cont)

IV	EV1 & EV2
<p>1. ✓MCC for SCU connect and cleanup times</p> <p><b>EV1</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Cover 9</li> <li><input type="checkbox"/> Cover 11</li> </ul> <p><b>EV2</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Cover 16</li> <li><input type="checkbox"/> Cover 6</li> <li><input type="checkbox"/> Cover 8</li> </ul>	<p><b>SARJ SINGLE COVER INSPECTION</b></p> <p>Perform following steps for covers 16, 9, 8, 6, 11 as time permits:</p> <ol style="list-style-type: none"> <li>1. RET cover to adjacent cover</li> <li>2. <b>PGT[A6 (8.3), CCW2, 30.5]</b> 6-Ext 7/16 release inboard cover fasteners (4), 9 turns only (add single turns incrementally as required for release)</li> <li>3. Remove MLI cover; temp stow w/previously attached RET and Adj Eq Tether on adjacent cover <ul style="list-style-type: none"> <li><input type="checkbox"/> Inspect backside of cover, both MLI and frame</li> </ul> </li> <li>4. Take images of outboard race ring Datum A surface w/digital camera: <ul style="list-style-type: none"> <li>• Take 4-6 close photos of each surface to capture entire surface once photos are combined</li> </ul> </li> <li>5. If outboard race ring surface has unusual characteristics, perform the following steps: <ul style="list-style-type: none"> <li><input type="checkbox"/> Retrieve tape strips from crewlock bag as reqd</li> <li><input type="checkbox"/> Notify IV which # tape strips are used for SARJ hardware</li> </ul> <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p><b>CAUTION</b></p> <p>Avoid contacting Inboard race ring bearing surfaces with Kapton tape</p> </div> <ul style="list-style-type: none"> <li><input type="checkbox"/> Collect tape samples from a single location on the outer canted surface of the outboard race ring</li> <li><input type="checkbox"/> Fold used tape samples in half (sticky side to sticky side) and stow in trash bag</li> </ul> </li> <li>6. Retrieve SARJ cover from temp stow location and install</li> <li>7. <b>PGT[A1 (2.5), CW2, 30.5]</b> 6-Ext 7/16 drive inboard cover fasteners (4), ~8 turns. (Partially engage all MLI cover fasteners prior to final torque)</li> </ol>

**SARJ INSPECTION (01:10) (Cont)**

		Cover:	18 (divot)	16	9	8	6	11
Back side of MLI cover and frame								
General Condition								
Outboard Race Ring Debris Inspection	Outer Canted		Tape strip #:					
	Datum A	Photos (4-8)	Photos (4-6)	Photos (4-6)	Photos (4-6)	Photos (4-6)	Photos (4-6)	Photos (4-6)
MLI Cover (torque/turns) Rem: A6, CCW2, 30.5 Inst: A1, CW2, 30.5								

**EVA 5 CLEANUP/INGRESS (00:40)**

IV	EV1 – Be (FF)	EV2 – Fm (FF)
<p>1. Perform WWS PWRDN (P/TV, <u>WWS</u> Cue Card)</p> <p><i>Prior to hatch opening, retrieve surgical masks and goggles from LAB1D4-A1 and don for post EVA until SARI samples sealed in Ziplock</i></p>	<p><b>CLEANUP</b> (00:25)</p> <ol style="list-style-type: none"> <li>1. Perform tool inventory</li> <li>2. Translate to Airlock</li> </ol> <p><b>INGRESS</b> (00:15)</p> <ol style="list-style-type: none"> <li>3. Open A/L Thermal Cover</li> <li>4. Ingress A/L</li> <li>5. Attach Waist Tether (R) to UIA D-ring               <ul style="list-style-type: none"> <li><input type="checkbox"/> Verify hook locked, reel unlocked</li> </ul> </li> <li>6. <u>Tether and stow C/Lk bag #4 in A/L; release EV2 BRT RET</u></li> <li>7. Give EV2 GO for EV1 Safety Tether release; stow lg hook on MWS</li> <li>8. Remove SCU from stowage pouch</li> <li>9. Remove DCM cover, Velcro to DCM</li> <li>10. Connect SCU DCM, √SCU locked</li> <li>11. Water – OFF (fwd); expect H2O IS OFF msg</li> </ol>	<p><b>CLEANUP</b> (00:25)</p> <ol style="list-style-type: none"> <li>1. Perform tool inventory</li> <li>2. Translate to Airlock</li> </ol> <p><b>INGRESS</b> (00:15)</p> <ol style="list-style-type: none"> <li>3. <u>Transfer C/Lk bag #4 to EV1 (on BRT RET)</u></li> <li>4. Attach Waist tether to A/L D-ring extender, verify hook locked</li> <li>5. On EV1 GO, release EV1 Safety tether lg hook from fwd tether point; pass hook to EV1</li> <li>6. Release EV2 85-ft Safety Tether lg hook from aft tether point; stow on MWS</li> <li>7. Ingress A/L</li> <li>8. Close thermal cover, attach Velcro strap</li> <li>9. Remove SCU from stowage pouch</li> <li>10. Remove DCM cover, Velcro to DCM</li> <li>11. Connect SCU DCM, √SCU locked</li> <li>12. Water – OFF (fwd); expect H2O IS OFF msg</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 – Preclose (black pie region)</li> <li>15. EV Hatch – close and lock</li> <li>16. Go to <u>PRE-REPRESS</u> Cue Card</li> </ol>

## GET-AHEAD – NODE MMOD SHIELD CLEANUP (01:00)

IV	EV1 – Be (FF)	EV2 – Fm (FF)
<p>See task data (FS 7-185) for Plan B and C photos</p>	<p><b>Setup</b></p> <ol style="list-style-type: none"> <li>1. Translate to Node LAN cable shield (Node FWD port); shield C2-02</li> <li>2. BRT to Lab HR 0209</li> <li>3. Assess alignment; may need to loosen Adj tethers</li> </ol> <p><b>Plan A</b></p> <ol style="list-style-type: none"> <li>4. Attempt installation of center and nadir fasteners (2 of 3 fasteners required)</li> <li>5. If successful, skip to cleanup; if unsuccessful, go to Plan B</li> </ol> <p><b>Plan B</b></p> <ol style="list-style-type: none"> <li>6. Wire tie shield in place (1 wire tie = 1 Dzus)</li> </ol> <p style="text-align: center;"><b>NOTE</b></p> <p style="text-align: center;">Wire tie must positively capture the Dzus fastener (either 2 wraps around or 1 wrap and a double twist) and positively capture structure on the Lab.</p> <p style="text-align: center;">Wire tie must pull shield flat against structure and in toward centerline of module.</p> <p style="text-align: center;">Verify both ends of wire tie attached securely so that if wire tie breaks each end will still be attached</p> <ol style="list-style-type: none"> <li>7. Take closeout photos of shield and tiedown</li> <li>8. If successful, skip to cleanup; if unsuccessful, go to Plan C</li> </ol> <p><b>Plan C</b></p> <ol style="list-style-type: none"> <li>9. Install LDTDT to stretch across the shield (HR 145 stbd/nadir standoff to HR 142 zenith standoff)</li> <li>10. Install Adj from T tool to HR 0141 (13A Adj tethers may not remain EVA)</li> <li>11. After ~5 min revisit LDTD and retighten; strap may loosen due to stretching</li> </ol>	<p><b>Setup</b></p> <ol style="list-style-type: none"> <li>1. Retrieve C/Lk bag #2</li> <li>2. Translate to Node LAN cable shield (Node FWD port); using Lab nadir port path; shield C2-02</li> <li>3. Temp stow C/Lk bag #2 on HR 0208</li> <li>4. Fairlead tether clear of C2-02</li> <li>5. BRT or local tether to HR 140</li> <li>6. Attempt installation of MMOD shield; provide basic alignment and shield manipulation per EV2 directions</li> </ol> <p><b>Plan A</b></p> <ol style="list-style-type: none"> <li>7. Attempt installation of zenith fastener (2 of 3 fasteners required)</li> <li>8. If successful, skip to cleanup; if unsuccessful, go to Plan B</li> </ol> <p><b>Plan B</b></p> <ol style="list-style-type: none"> <li>9. Wire tie shield in place (1 wire tie = 1 Dzus)</li> </ol> <ol style="list-style-type: none"> <li>10. Take closeout photos of shield and tiedown</li> <li>11. If successful, skip to cleanup; if unsuccessful, go to Plan C</li> </ol> <p><b>Plan C</b></p> <ol style="list-style-type: none"> <li>12. Retrieve Long Duration Tie Down Tether (LDTDT) from C/Lk bag #2</li> <li>13. Install LDTDT to stretch across the shield ((HR 145 stbd/nadir standoff to HR 142 zenith standoff)</li> <li>14. Install new Adj from T tool to HR 0141 (13A Adj tethers may not remain EVA)</li> <li>15. After ~5 min revisit LDTD and retighten; strap may loosen due to stretching</li> <li>16. Take closeout photos of shield and tiedown</li> </ol>

**GET-AHEAD – NODE MMOD SHIELD CLEANUP (01:00) (Cont)**

IV	EV1 – Be (FF)	EV2 – Fm (FF)
APFR Settings: Node WIF 5 [4,QQ,G,12] or [4,PP,J,12]	<p><b>Cleanup</b></p> <ol style="list-style-type: none"> <li>12. Retrieve 3 Adj Tethers that were installed on shield; stow in trash bag (13A adj tethers left EVA may not be used and must be returned to Houston)</li> <li>13. Perform Tool Inventory</li> <li>14. Inspect gloves</li> </ol>	<p><b>Cleanup</b></p> <ol style="list-style-type: none"> <li>17. Perform Tool Inventory (including C/Lk Bag)</li> <li>18. Retrieve C/Lk Bag #2; attach to BRT</li> <li>19. Inspect gloves</li> </ol>

# POST EVA 5 TOOL CONFIG

- EV1**
- MWS
  - BRT (L)
  - RET (eq-eq)
  - Wire Tie
  - T-Bar
  - RET (eq-eq)
  - RET (eq-eq) w/PIP pin
  - Adj Equip Tether (2) (1 from KAD)
  - Wire Tie (2)
  - STS Small Trash Bag
  - Spare 85-ft safety tether
  - Swing Arm (R)
  - PGT
  - 7/16 (wobble) socket-6 ext
  - RET (eq-eq)
  - Waist Tether (2)
  - D-ring Extender (2)
  - Safety Tether (85 ft)
  - SAFER
  - WVS
  - Overgloves (2) donned

- EV2**
- MWS
  - BRT (L)
  - RET (eq-eq)
  - Wire Tie
  - T-Bar
  - RETs (eq-eq)
  - RET (eq-eq) w/PIP pin
  - Adj Equip Tether (2) (1 from fairlead)
  - Wire Tie (3)
  - ISS Small Trash Bag
  - Adj Eq Tether (clove-hitched, hooks in bag)
  - Swing Arm (R)
  - PGT
  - 7/16 (wobble) socket-6 ext
  - RET (eq-eq)
  - Waist Tether (2) (L – D-ring, R – extender)
  - D-ring Extender (2)
  - Safety Tether (85 ft)
  - SAFER
  - WVS
  - Overgloves (2) donned

## AIRLOCK CONFIG

- 760 digital camera and mount (tie wrapped)
- RET (lg-eq)

- Large ORU Bag**
- Connector caps (2)
  - RET (eq-eq) (2)
  - RET (eq-eq) (2) (from OBSS cover and P411)
  - Adj Eq Tether (outside of bag)
  - RET (eq-eq) (outside of bag)
  - RET (eq-eq)
  - Adj Eq Tether (on RET for overgloves)

- EVA Crewlock Bag #4**
- Kapton tape strips on door (8, may be in trash bag)
  - Adj Eq Tether (clove hitched to int tether point)
  - EVA Wipes (4)
  - Dust cap
  - Inspection mirror
  - RET (eq-eq)
  - Digital camera w/flash and mount (35 mm lens)
  - Adj Eq Tether (securing camera to outside of bag)
  - Adj Eq tether
  - Spare 85-ft safety tether on HH

## AIRLOCK EXTERIOR

- S1**
- APFR (10,TT,H,12) w/ingress aid, WIF 1

## OBSS KEEP-ALIVE UMBILICAL INSTALL – TASK DATA

### Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	NA	NA
Two EV Crew	NA	01:00

### Tools:

EV1 (FF)	EV2 (FF)
	PGT 6-in ext – 7/16

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Stanchion bolt		7/16	1	18.4	25.5	165	26.5	30

### EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
W21	Avionics box	KAD	TBD	TBD (2)	OBSS heater power
W22/W23	PNL A114	Avionics box	TBD	TBD (2)	OBSS heater power

ORU/Item	Qty	Part Number	Mass (lb)	Volume (in <sup>3</sup> )
Avionics box, Stanchion, Harness W22/W23	1	260213-206829-551	67.3	
Harness W21	1	260213-207103-551	12.7	
KAD	1	260213-206807-551	17.5	

### Notes:

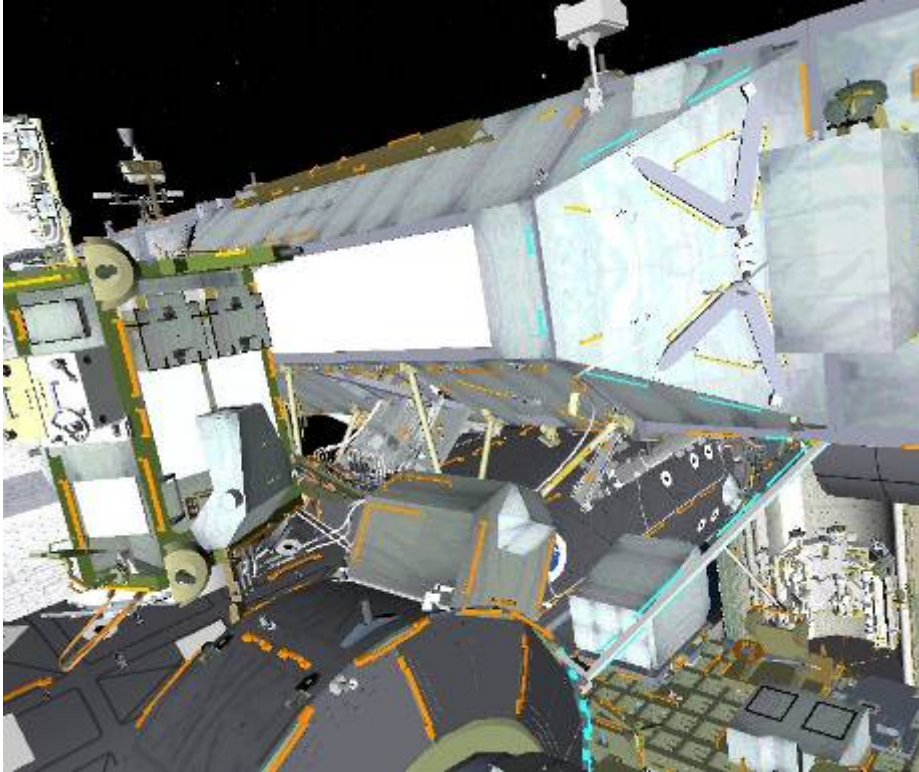
1. Do not handle avionics box via the EVA connectors or caps
2. Gold contact pins on KAD can contact the pins on opposite arm. Use caution when closing KAD
3. Do not handle or open KAD via connectors
4. W21 harness bend radius should be > 5-in
5. W22 harness bend radius should be > 3-in
6. W23 harness bend radius should be > 5-in

### Cautions:

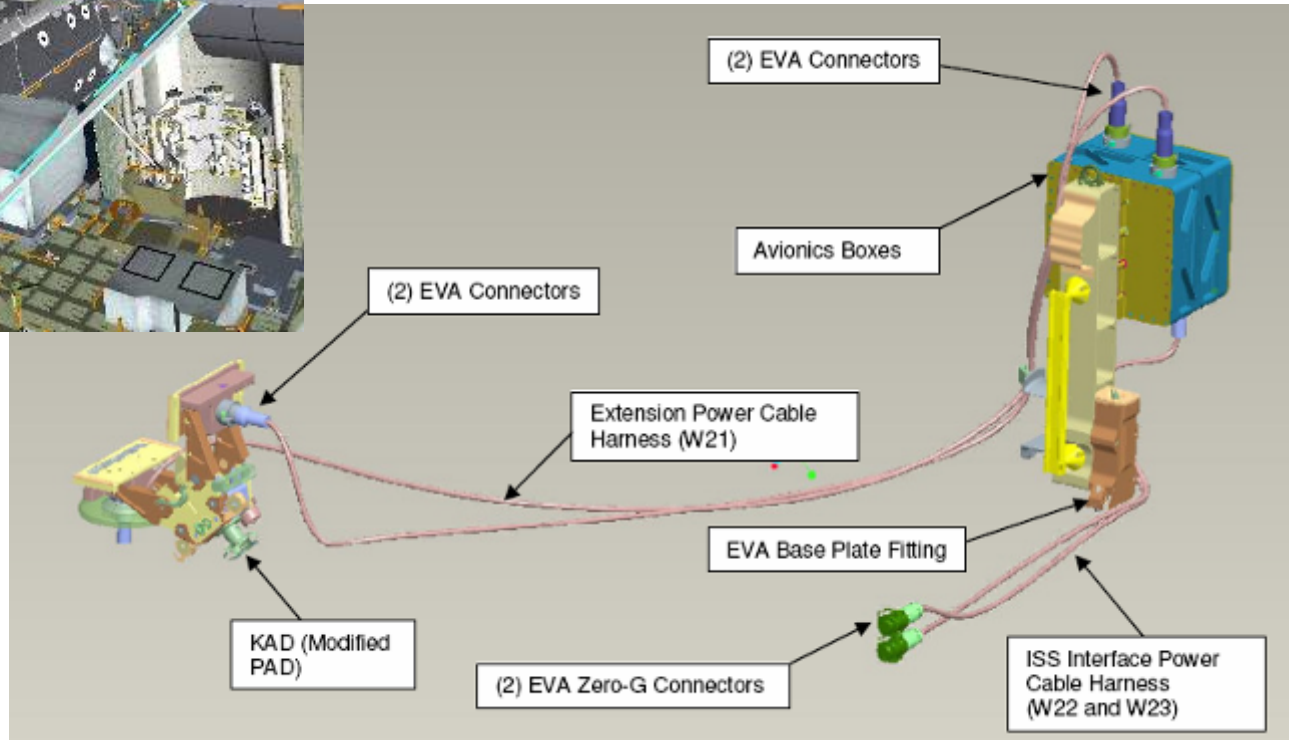
1. Avoid contact with dry lube on KAD bumpers
2. Do not apply more than 33 lbf to OBSS while grappled by SSRMS

### Warnings:

# OBSS KEEP-ALIVE UMBILICAL INSTALL – TASK DATA (Cont)



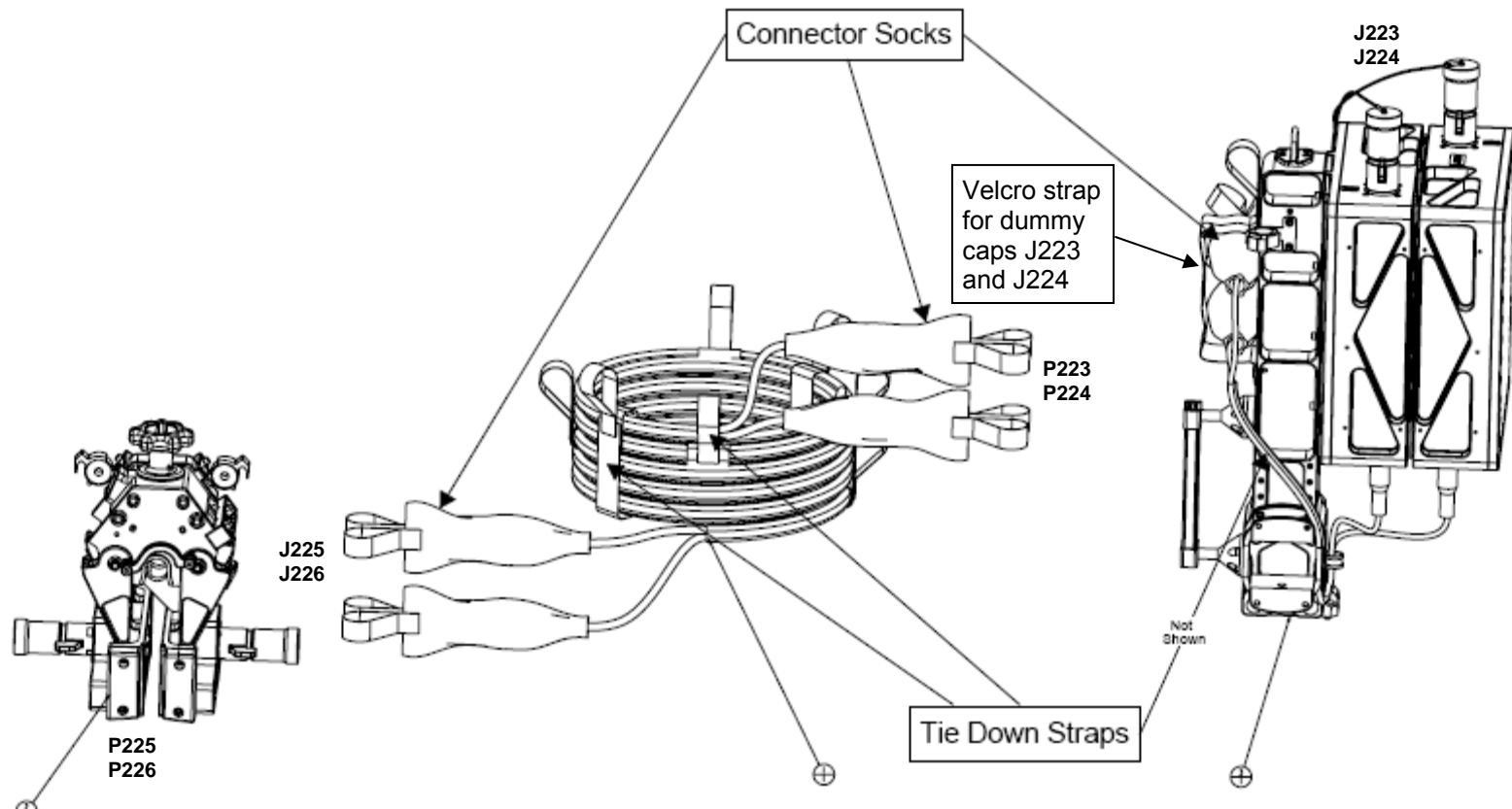
Translation Path to worksite



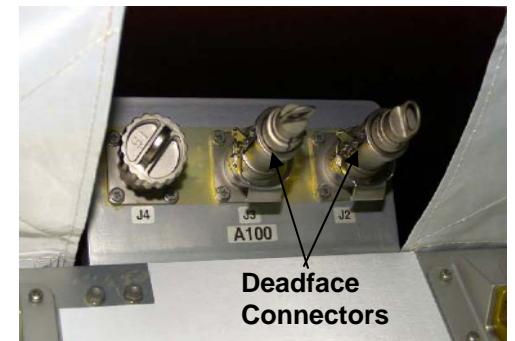
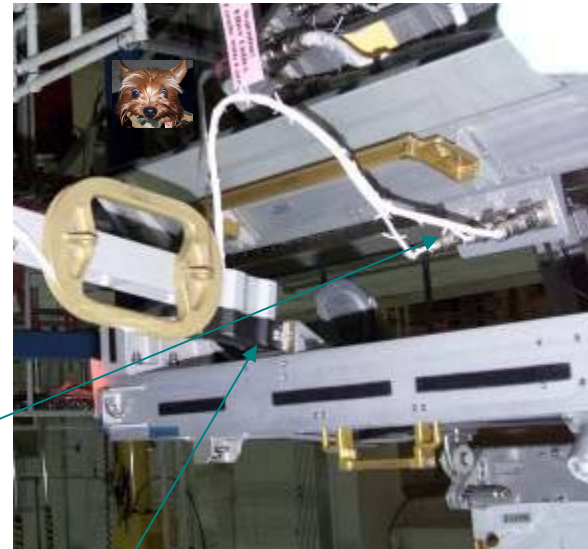
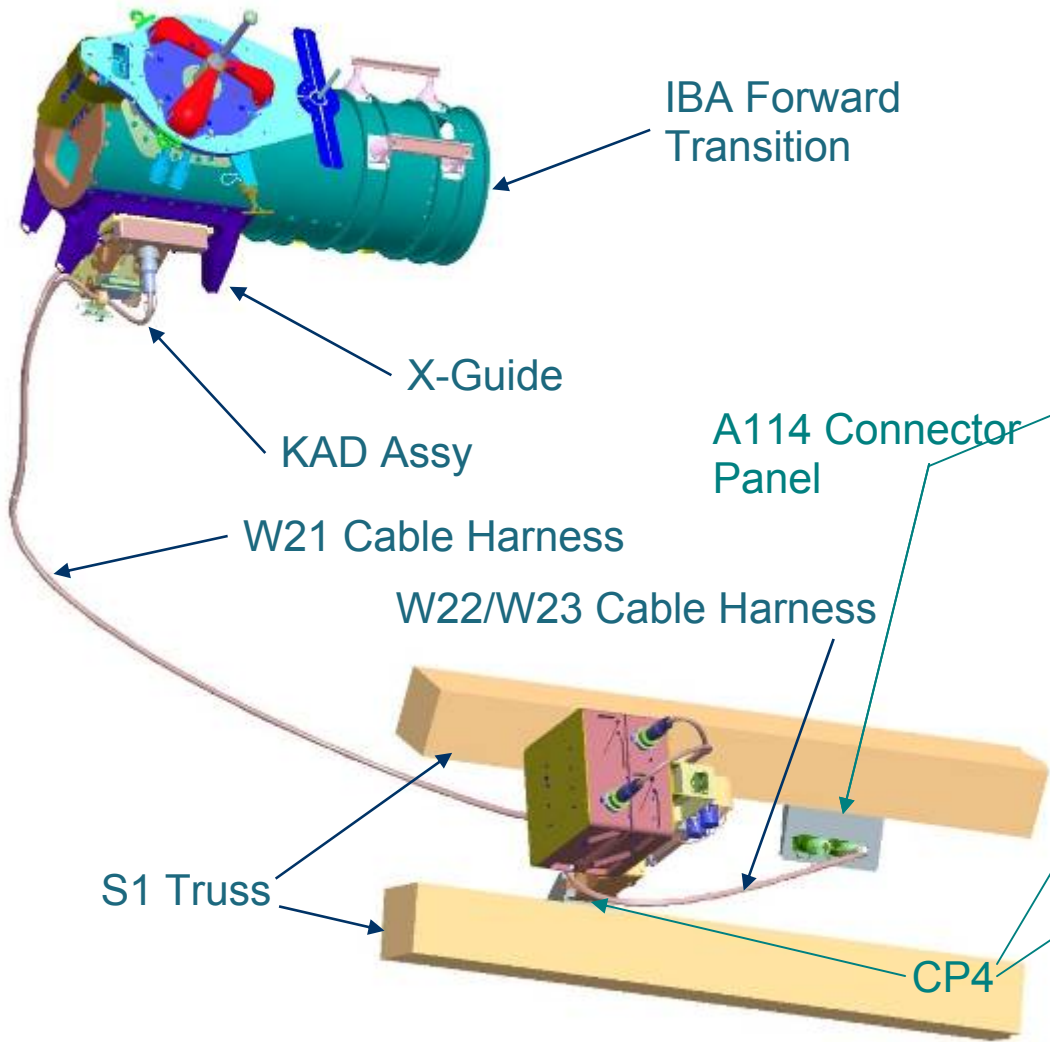
OBSS KA Umbilical components



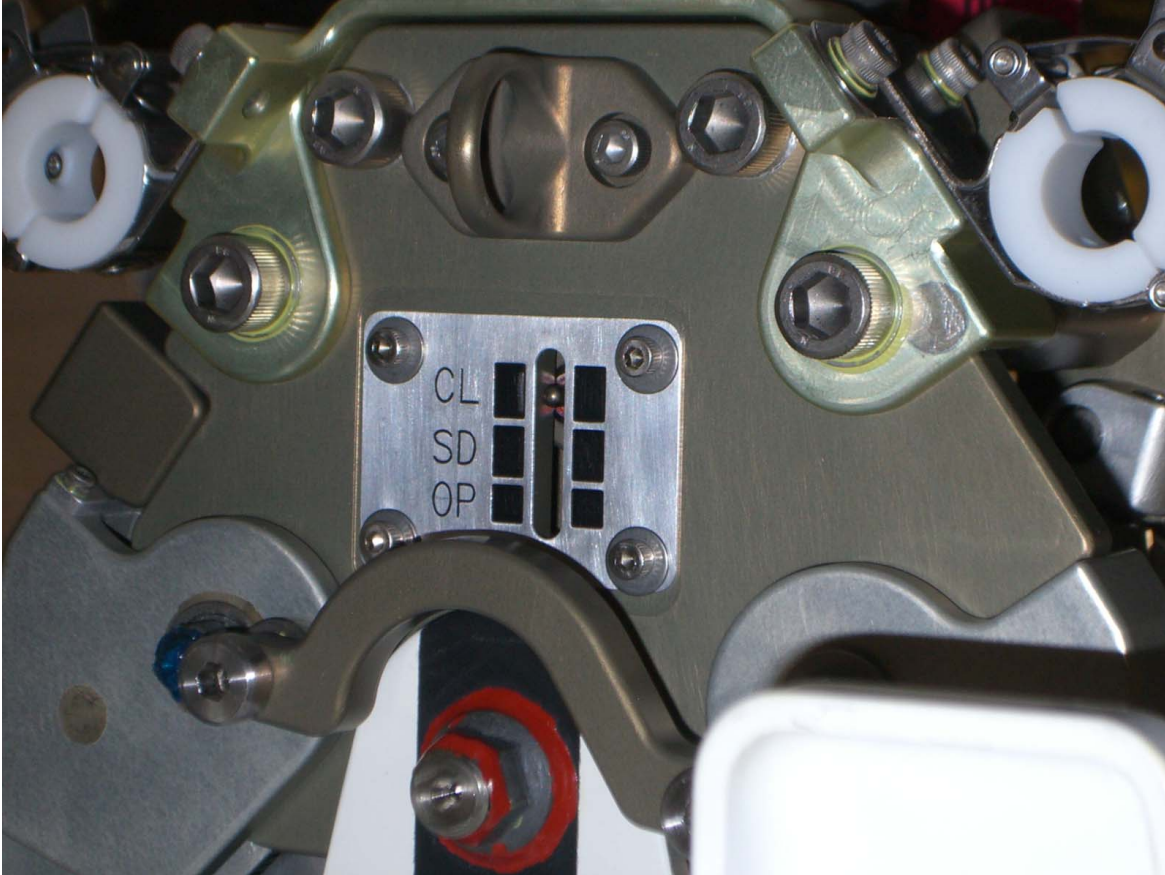
# OBSS KEEP-ALIVE UMBILICAL INSTALL – TASK DATA (Cont)



OBSS KEEP-ALIVE UMBILICAL INSTALL – TASK DATA (Cont)



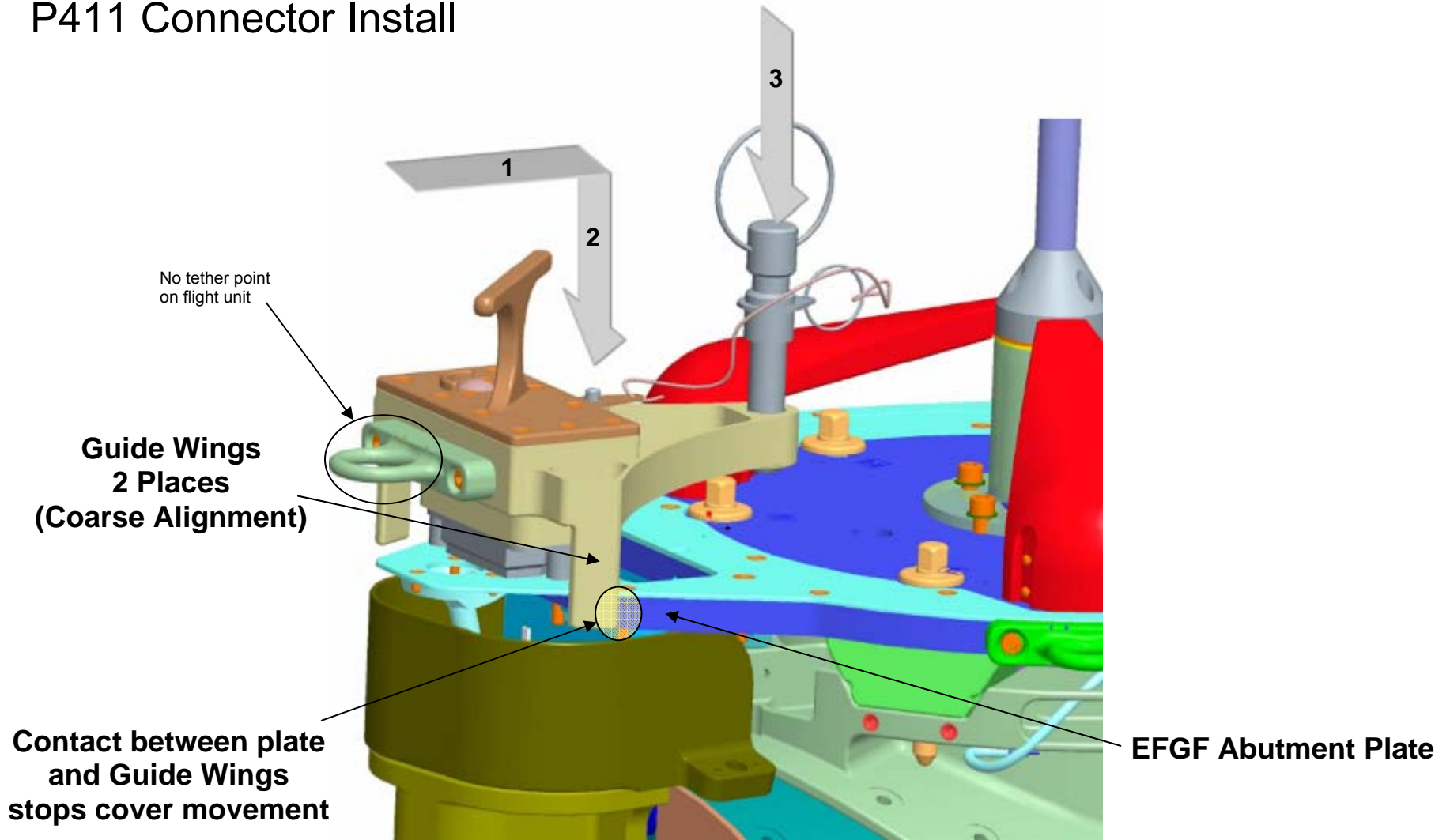
**OBSS KEEP-ALIVE UMBILICAL INSTALL – TASK DATA (Cont)**



KAD in CL position – installed on OBSS

OBSS KEEP-ALIVE UMBILICAL INSTALL – TASK DATA (Cont)

# P411 Connector Install



## OBSS STOW – TASK DATA

### Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	NA	NA
Two EV Crew	NA	01:00

### Tools:

EV1 (FF)	EV2 (FF)
PGT 6-in ext – 7/16	

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Outboard stanchion clamp	bolt #1	7/16	1	18.4	18.4		13.8	30

### Foot Restraints:

Task	WIF	APFR Setting
Inboard striker bar capture	in S1 WIF 05	10,TT,H,12

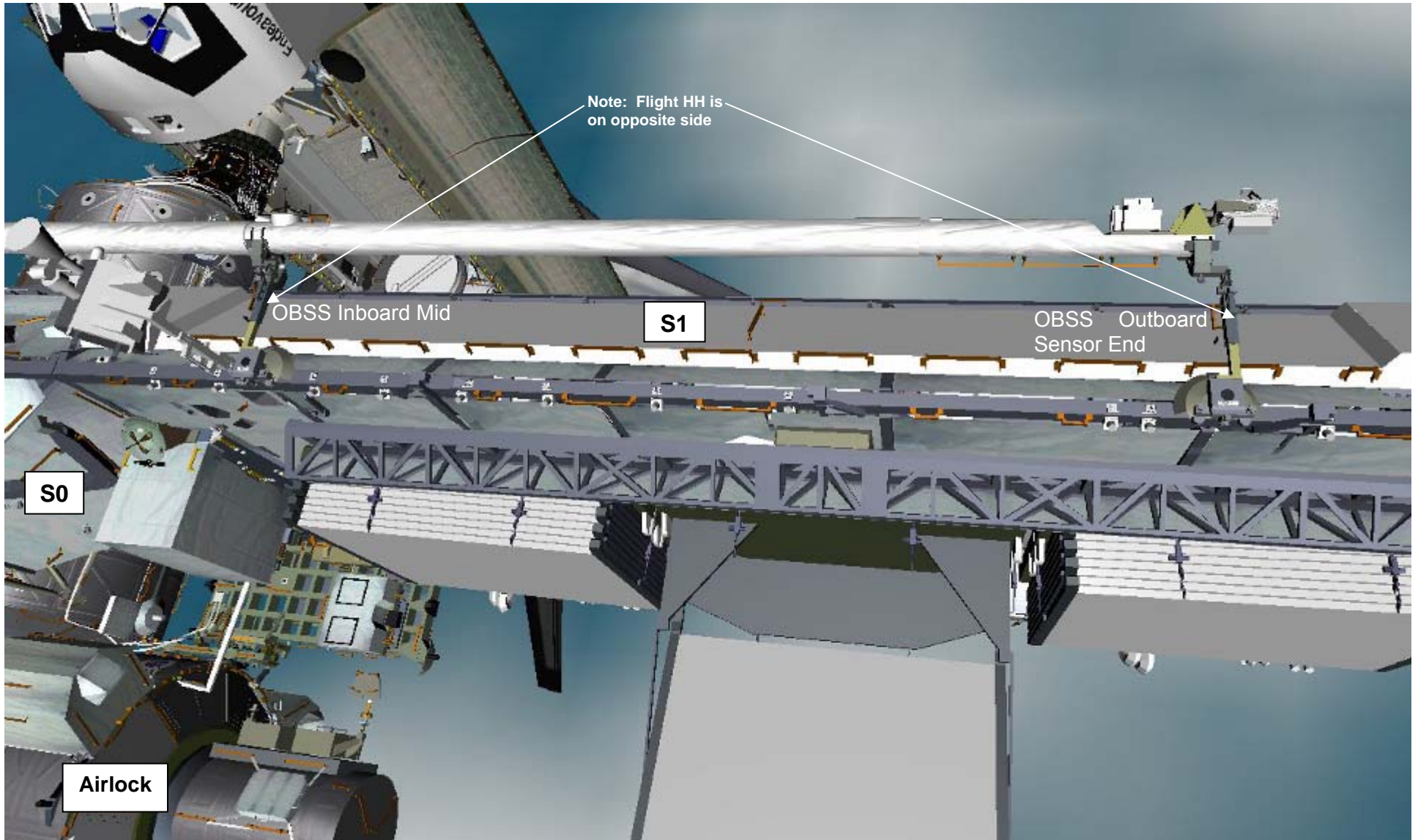
### Notes:

### Cautions:

### Warnings:

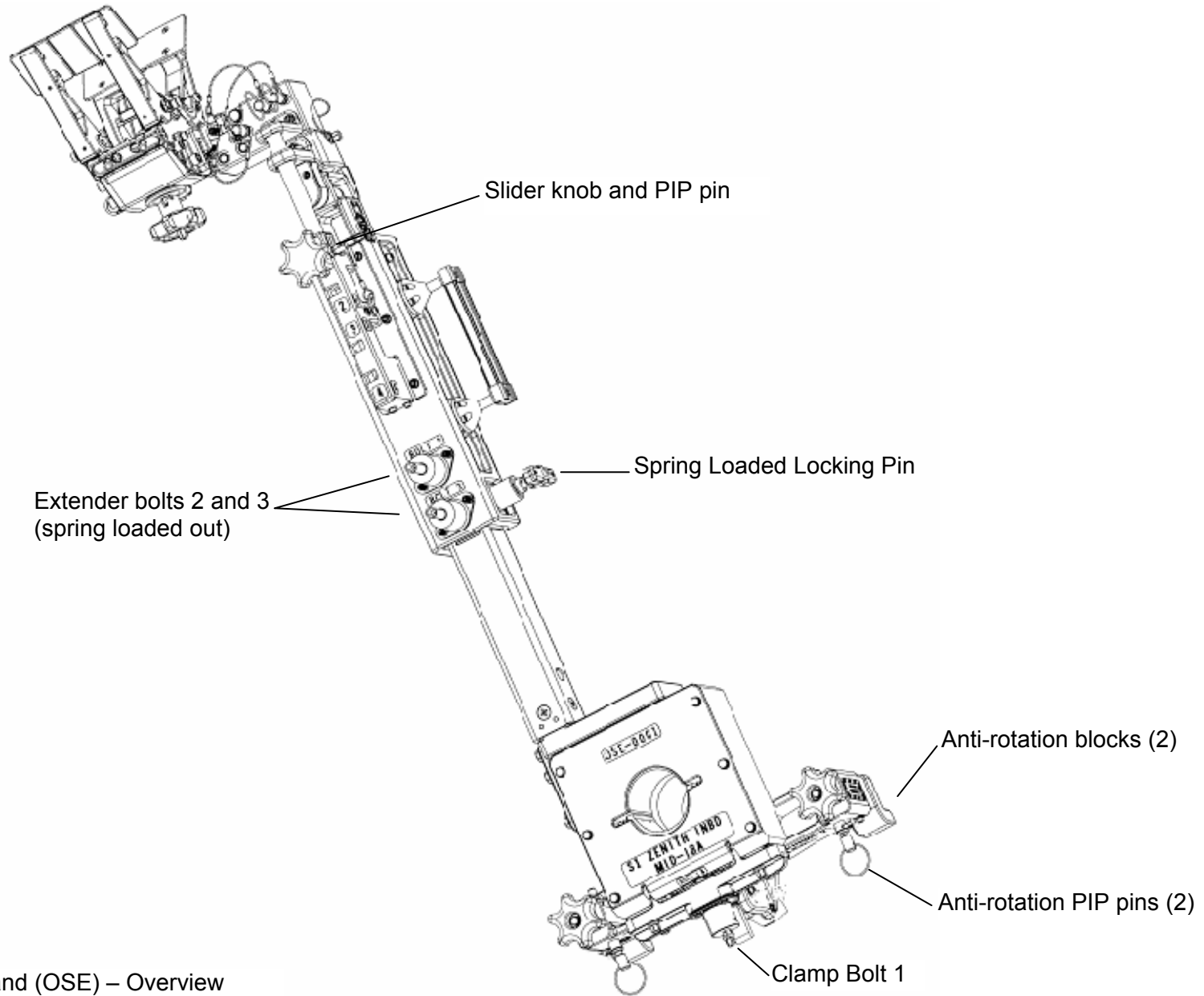
## OBSS STOW – TASK DATA (Cont)

### S1 ZENITH VIEW



Zenith View – looking nadir

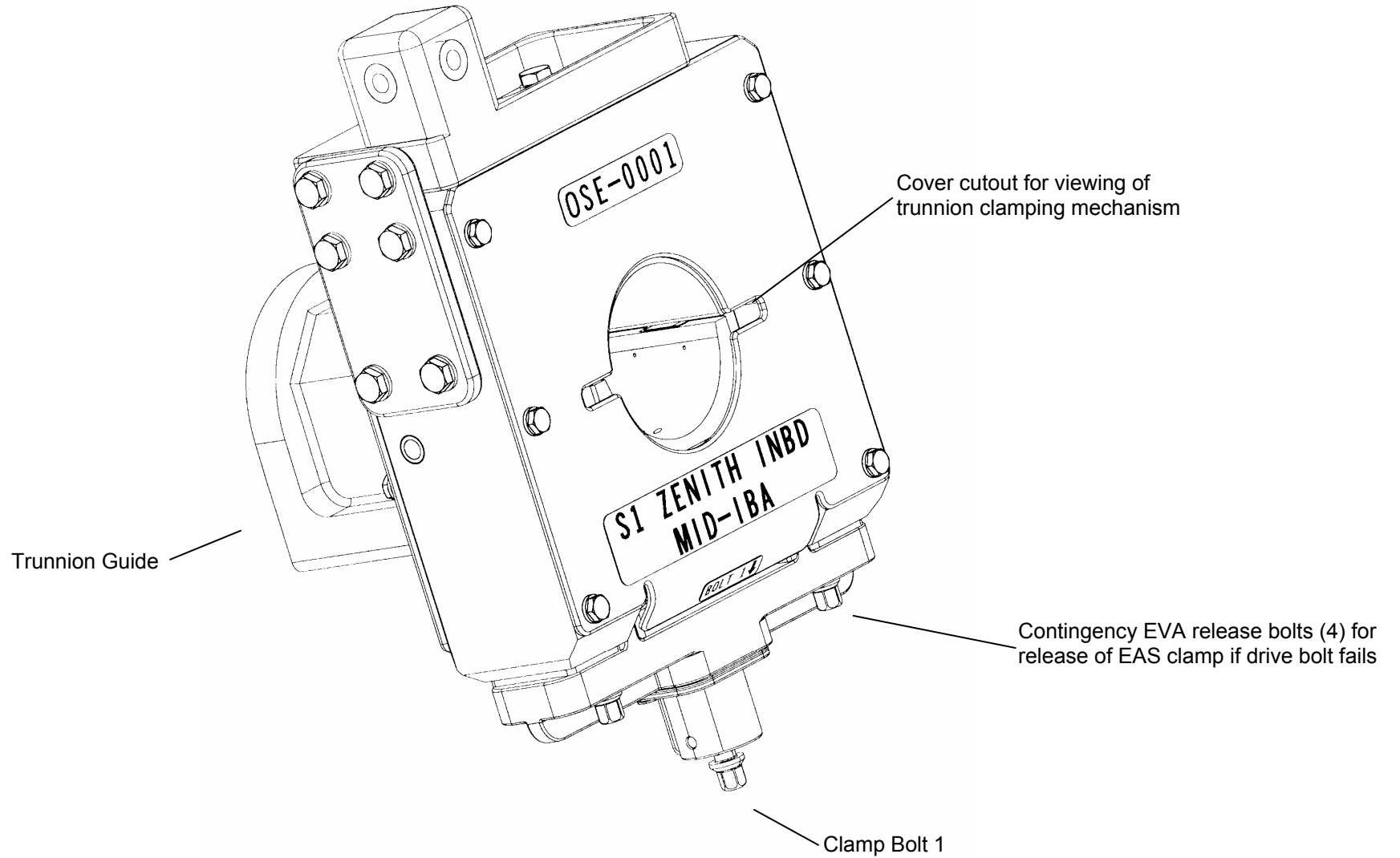
**OBSS STOW – TASK DATA (Cont)**



Boom Stand (OSE) – Overview

## OBSS STOW – TASK DATA (Cont)

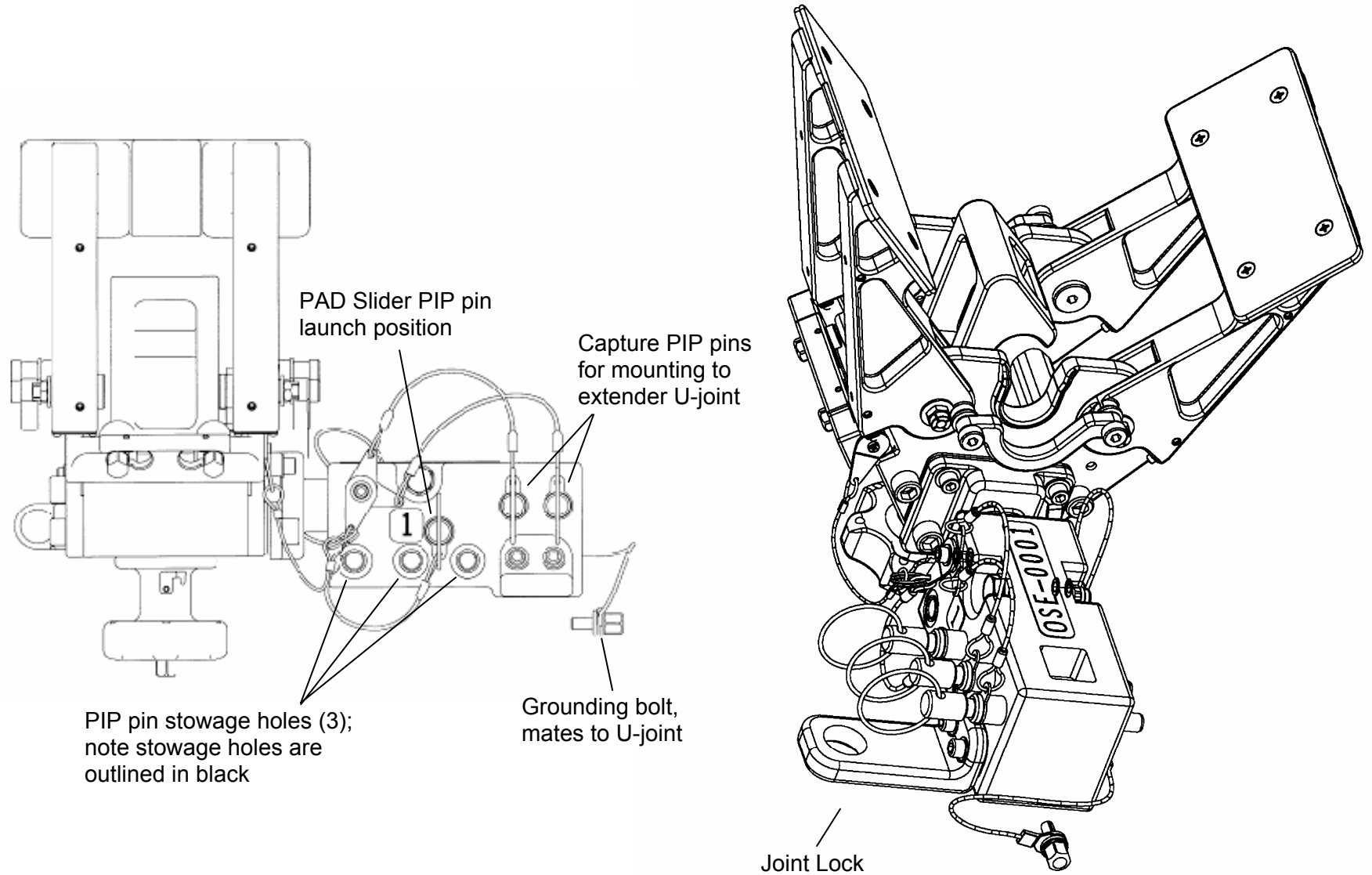
### EAS Attachment Assembly



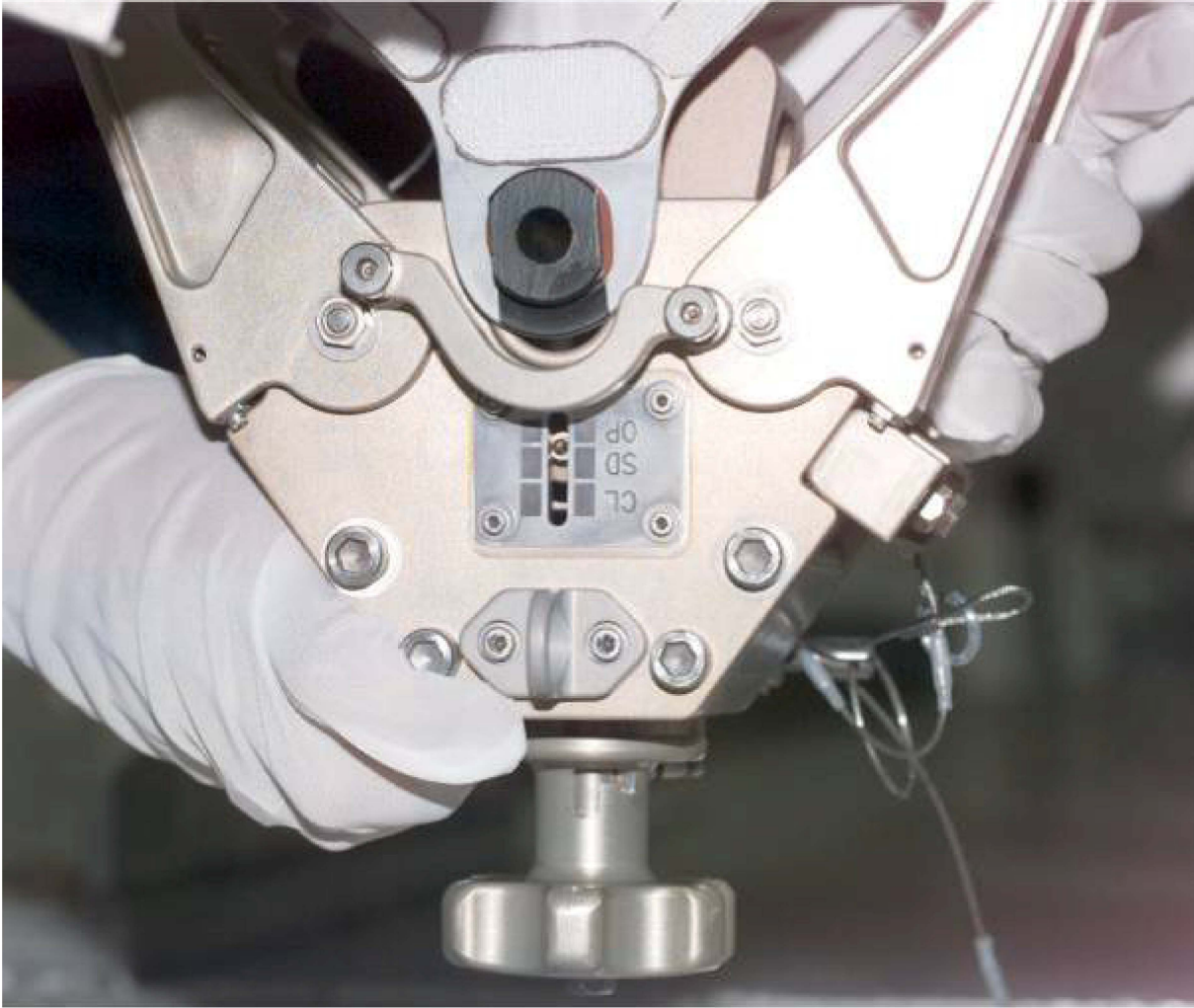


# OBSS STOW – TASK DATA (Cont)

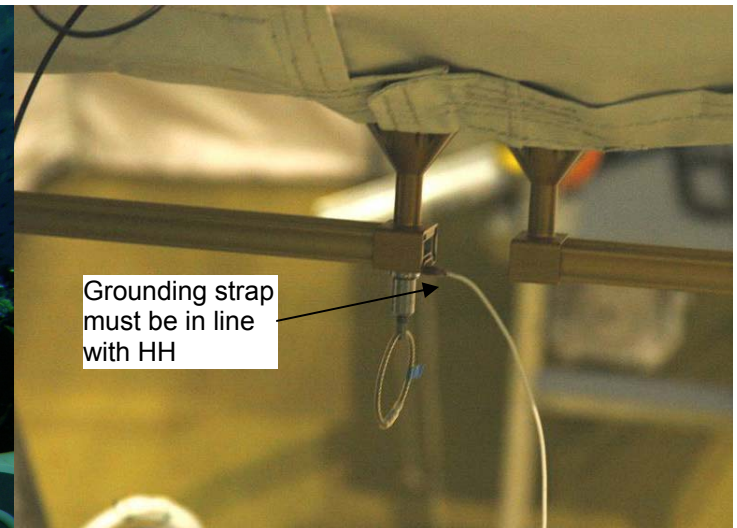
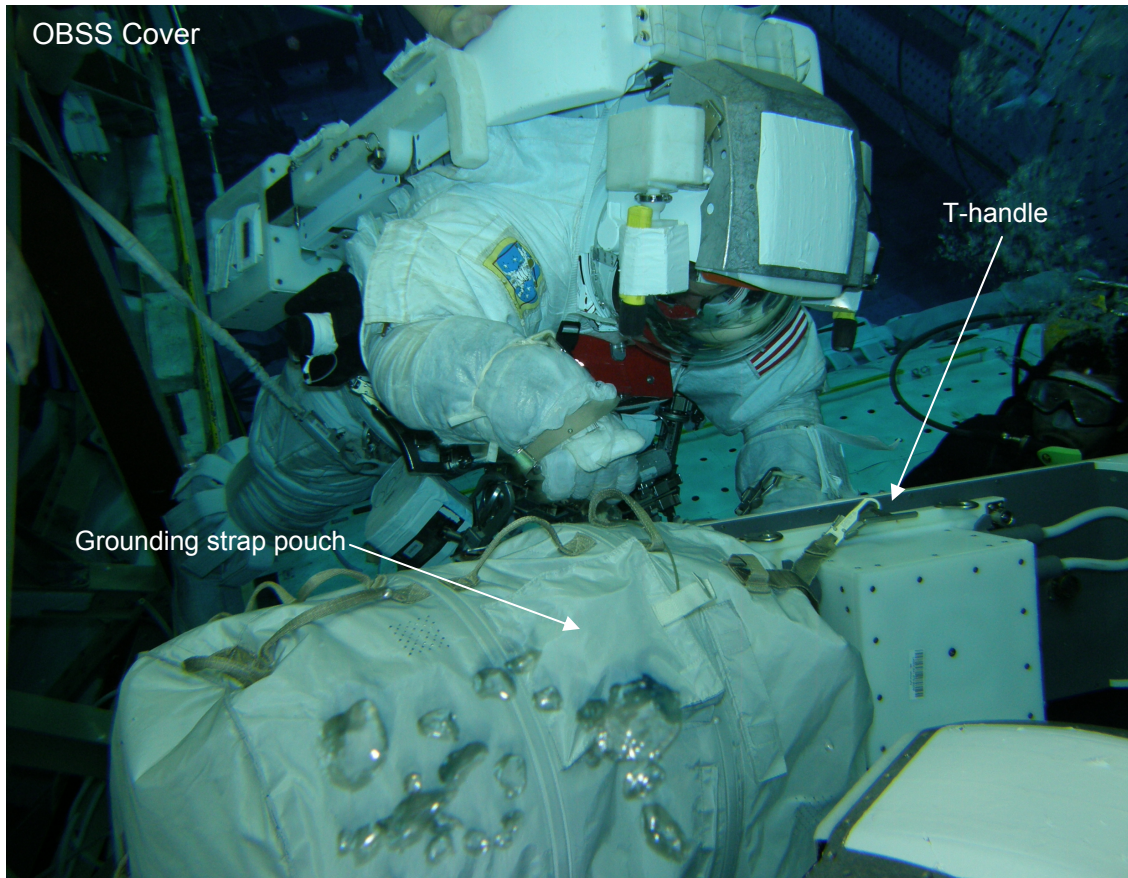
## PAD and Slider Assembly



OBSS STOW – TASK DATA (Cont)



## OBSS STOW – TASK DATA (Cont)



OBSS Cover Grounding Pin

## TBA INSTALL – TASK DATA

### Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	N/A
Two EV Crew	N/A	01:15

### Tools:

EV1	EV2
PGT	
7/16 (wobble) Socket – 6 ext	
Crewlock EVA Bag	
TBA (spare)	

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
SARJ Cover Bolts	N/A	4 or 6	7/16-in	0.8-3.8 on-orbit	Expect: 3.4 PGT: 8.3	Remv: 13.7 Inst: 3.8	7-9	30
TBA Bearing Preload Bolt	1	1	7/16-in	N/A	PGT: 6.3	Remv: 32.5	5-7	30
TBA Draw Bolt	2	1	7/16-in	N/A	PGT: 6.3	Remv: 30.0	10.5-13	30
TBA Mount Bolt	3	1	7/16-in	N/A	PGT: 4.8	Remv: 15.8	4-6	30

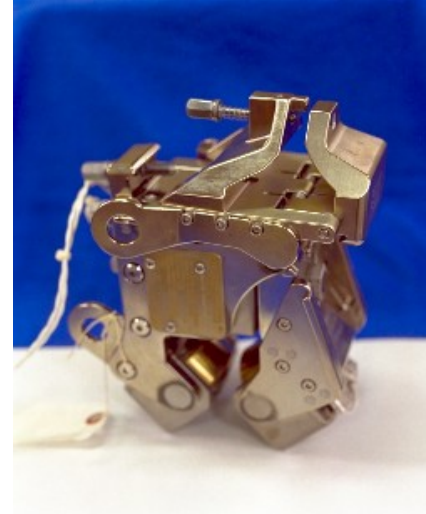
### EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
TBA electrical harness P1	Hardwired to TBA	SARJ Inboard connector J13	0	15	Power and data to TBA

### Foot Restraints:

Task	WIF	APFR Setting
Not Required		

**ORU Mass:** 16 lbs



Trundle bearing and mount assembly



Mount assembly installed on SARJ ring

## TBA INSTALL – TASK DATA (Cont)

### TBA Reference Info:

TBA Location Number	S3 TBA Serial Number	MLI	# MLI Cover Bolts (Type)	S3 Inboard SARJ Conn Label
TBA1	TBA-1032	13	6	J9(INBD)
TBA2	TBA-1029	15	6	J10(INBD)
TBA3	TBA-1033	18	6	J11(INBD)
TBA4	TBA-1035	20	4 (DLA)	J12(INBD)
<b>TBA5</b>	<b>TBA-1026</b>	<b>20</b>	<b>4 (DLA)</b>	<b>J13(INBD)</b>
TBA6	TBA-1017	1	6	J14(INBD)
TBA7	TBA-1036	2	6	J15(INBD)
TBA8	TBA-1031	5	4 (DLA)	J16(INBD)
TBA9	TBA-1030	5	4 (DLA)	J17(INBD)
TBA10	TBA-1037	7	6	J18(INBD)
TBA11	TBA-1023	10	6	J19(INBD)
TBA12	TBA-1034	12	6	J20(INBD)

### 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
- Two spare TBA assemblies were flown on ULF-1 (s/n 1038, s/n 1039) Part number for bearing package: 06887 5846485. Part number for mount package: 55864 400K100
- TBAs adjacent to DLAs have specific tether requirements. During installation of new mount assemblies in these locations, the tether must be engaged outward from the inside on the mount, else the rigid side of the tether hook will become trapped between the DLA and TBA tether point, prohibiting hook removal after the mount has been installed
- The mount bolt (Bolt 3) is springloaded. When depressed with enough force (approximately 2 lbs), 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 treads 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
- DLA covers may require 2 crewmembers to reinstall due to size and tight clearances

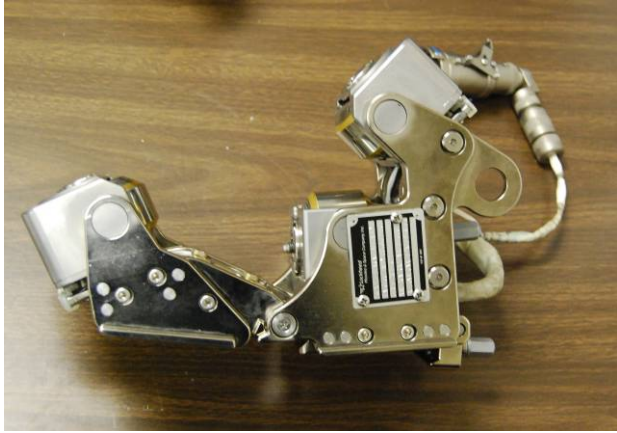
### Cautions:

- Verify electrical power is removed from ORU prior to demating connectors to prevent equipment damage caused by voltage transients and signal degradation
- SARJ Race Ring is not tolerant to nicks and scratches. Exercise care within the vicinity of the Race Ring while handling components
- Do not reengage outboard MLI cover spring clamps during re-installation of cover. Spring clamp engagement will preclude future SARJ rotation

### Warnings:

- Verify SARJ is locked (one DLA locked, one DLA engaged) to prevent rotation while EV crew is in vicinity of rotational plane plus 6 feet
- Verify electrical power is removed from ORU prior to this task to prevent injury to crew or damage to EMU caused by arching

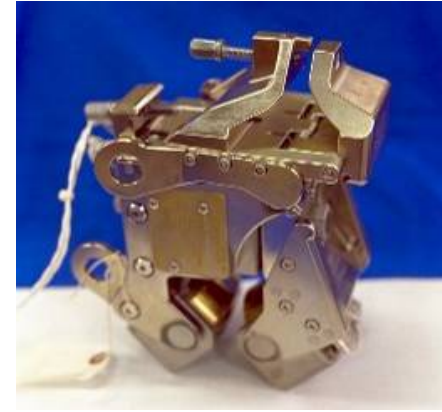
TBA INSTALL – TASK DATA (Cont)



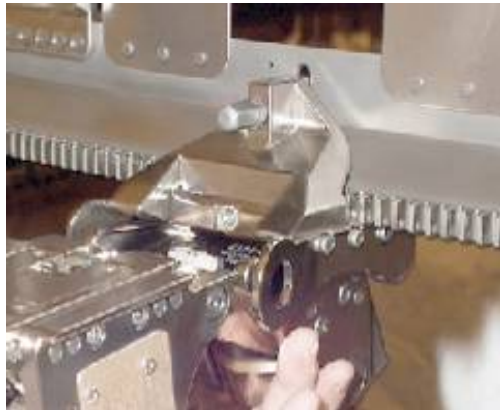
Bearing Package Assembly



Mount Assembly



Trundle Bearing Assembly



Slot in Race Ring to align Mount Boss



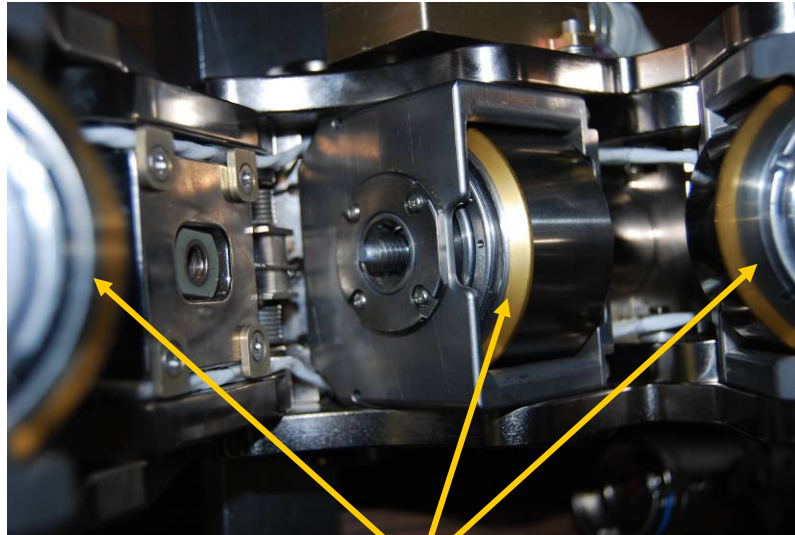
Mount Assy on Race Ring, mount clamp leg open (initial position)



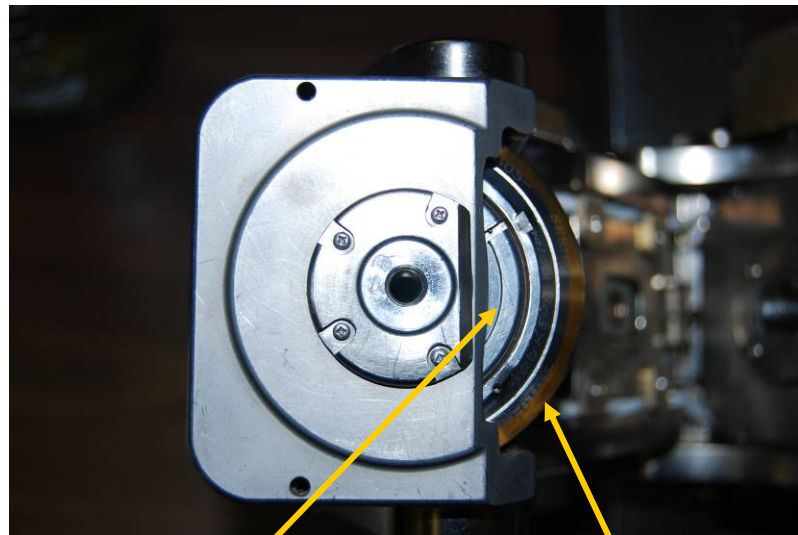
Mount Assy on Race Ring, mount clamp leg closed (final position)

Mount Assembly installed on SARJ ring

TBA INSTALL – TASK DATA (Cont)

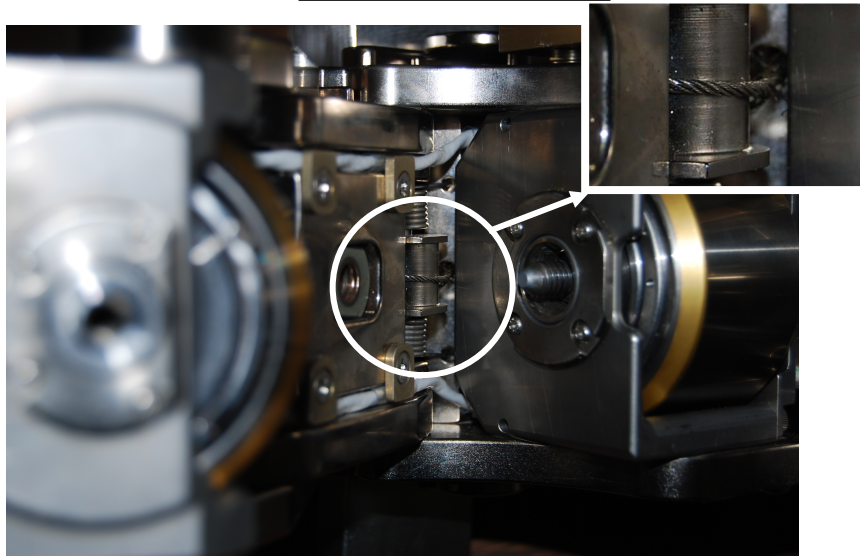


Roller Bearings

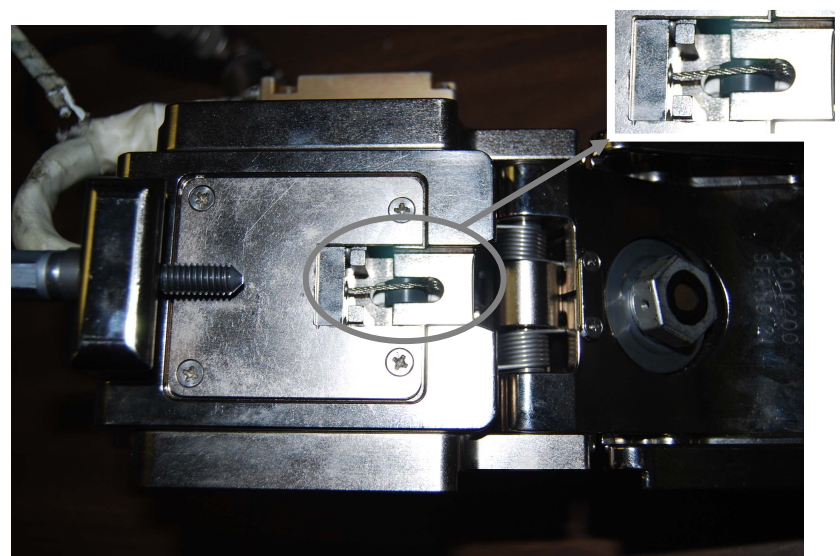


Inner bearing – stationary

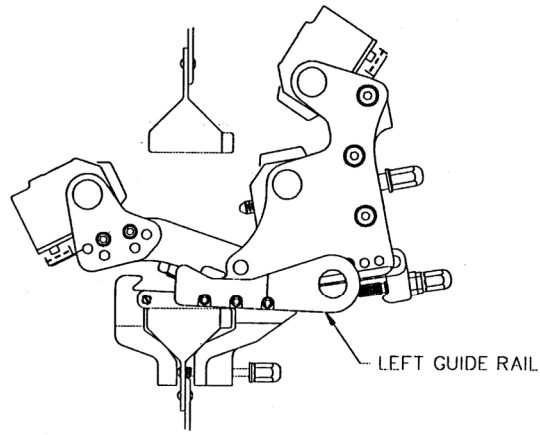
Outer bearing – rotates



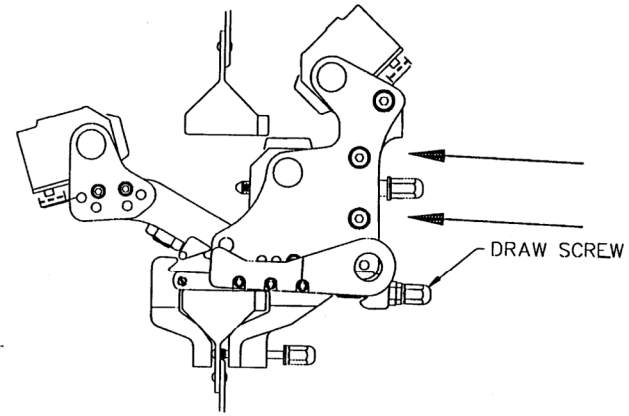
Inspect Cable for Frays Insets show frayed cable on ground unit



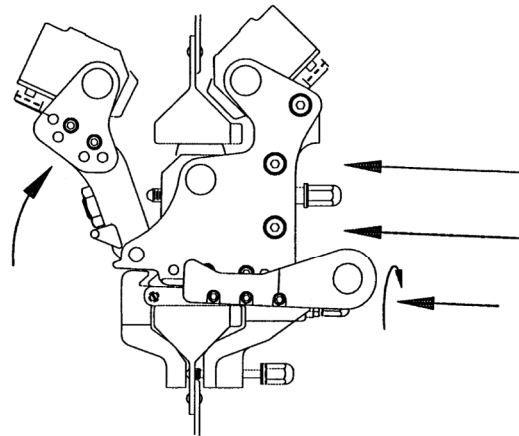
# TBA INSTALL – TASK DATA (Cont)



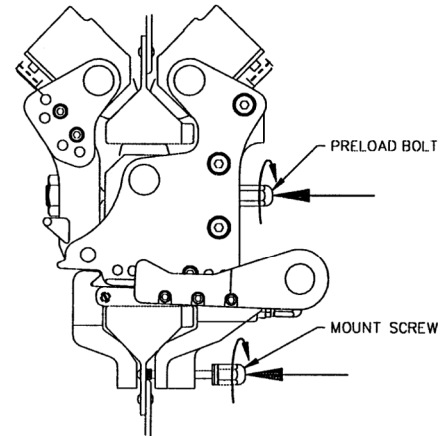
INSERT BEARING PACKAGE ASSEMBLY INTO MOUNT ASSEMBLY



SLIDE BEARING PACKAGE ASSEMBLY INTO MOUNT UNTIL DRAW SCREW ENGAGES ITS INSERT



DRIVING BEARING PACKAGE ASSEMBLY REMAINDER OF ITS TRAVEL WITH DRAW SCREW AUTOMATICALLY CLOSES PRELOAD ARM



ENGAGE AND TORQUE PRELOAD BOLT AND MOUNT SCREW

## Bearing Package Assembly Installation Steps



## SARJ INSPECTION – TASK DATA

### Tools:

EV1 (FF)	EV3 (FF)
See Tool Config	

### EVA Fasteners:

Fastener Name	Label	Qty	Head Size	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
SARJ Cover Bolts	N/A	4 or 6	7/16"	0.8-3.8 on-orbit	Expect: 3.4 PGT: 8.3	Remv: 13.7 Inst: 3.8	7-9	30

EVA Connectors: NA

Foot Restraints: NA

### Notes:

1. First priority: Datum A divot inspection (divot is expected to be under cover 18)
2. Second priority: covers 16, 9, 8, 6
3. Third priority: cover 11
4. Cover 18 is a double wide cover (6 inboard bolts)
5. Covers 6, 8, 9, 11, 16 are single wide covers (4 inboard bolts)
6. For single cover inspections, perform best effort visual assessments of all adjacent structure
7. Because STBD TRRJ will continue to rotate, tether line fairleads are required on face 1
8. Any one additional cover in the Cover to Cover 13 group may be removed for up to 1.5 hr
9. Any two additional covers in the Cover 1 to Cover 13 group may be removed for up to 0.5 hr. Both additional covers must be reinstalled before the expiration of the 0.5 hr clock to prevent TBA over-temperature conditions
10. Cover 7 was previously removed

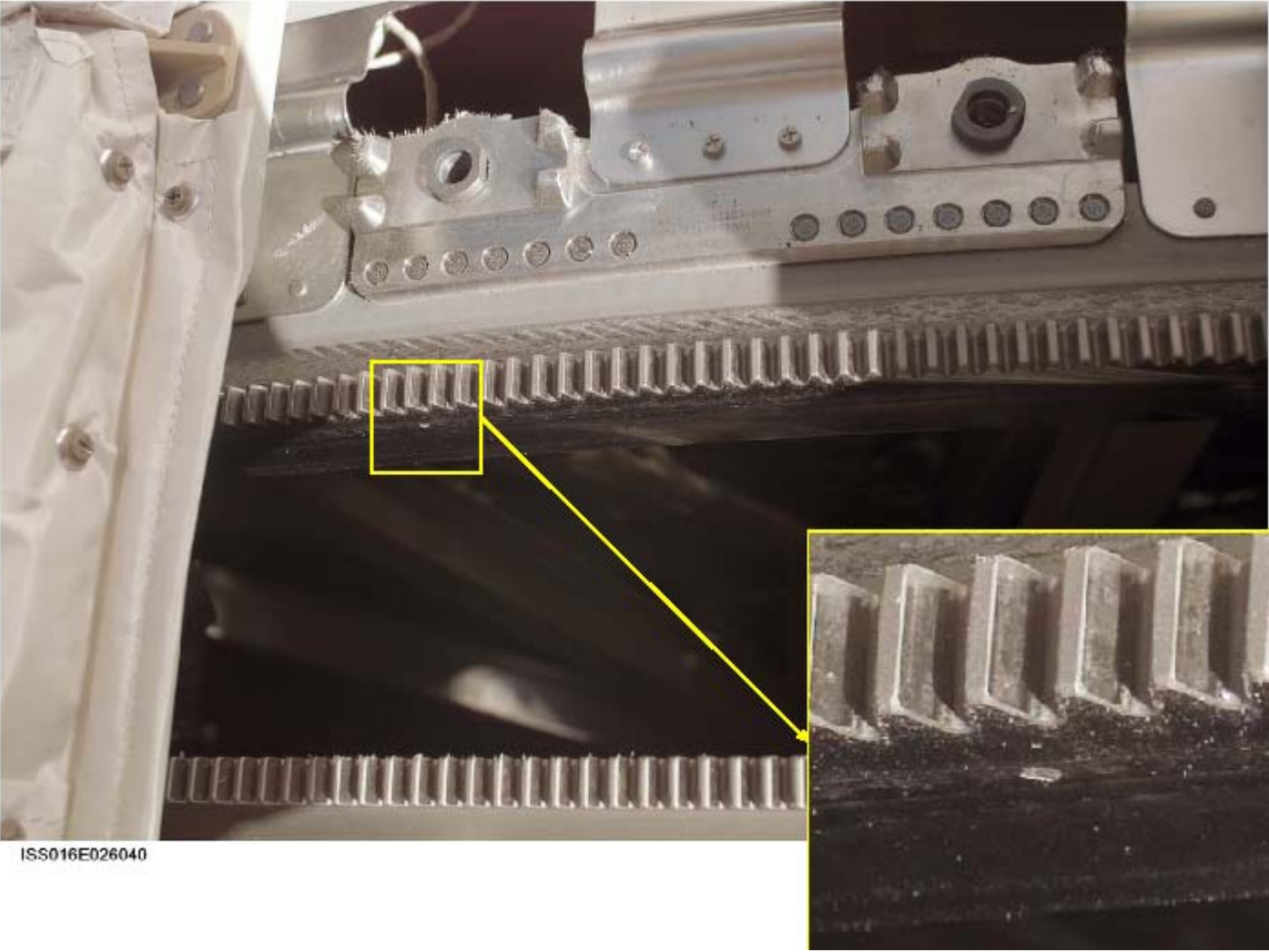
### Cautions:

1. Do not use tape on inboard race ring or gear teeth
2. 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 of bolt head
  - Maintain axial force on fastener to compress spring during rotation
3. SARJ Race Ring is not tolerant to nicks and scratches. Exercise care within the vicinity of the Race Ring while handling components
4. Do not reengage outboard MLI cover spring clamps during re-installation of cover. Spring clamp engagement will preclude future SARJ rotation

### Warnings:

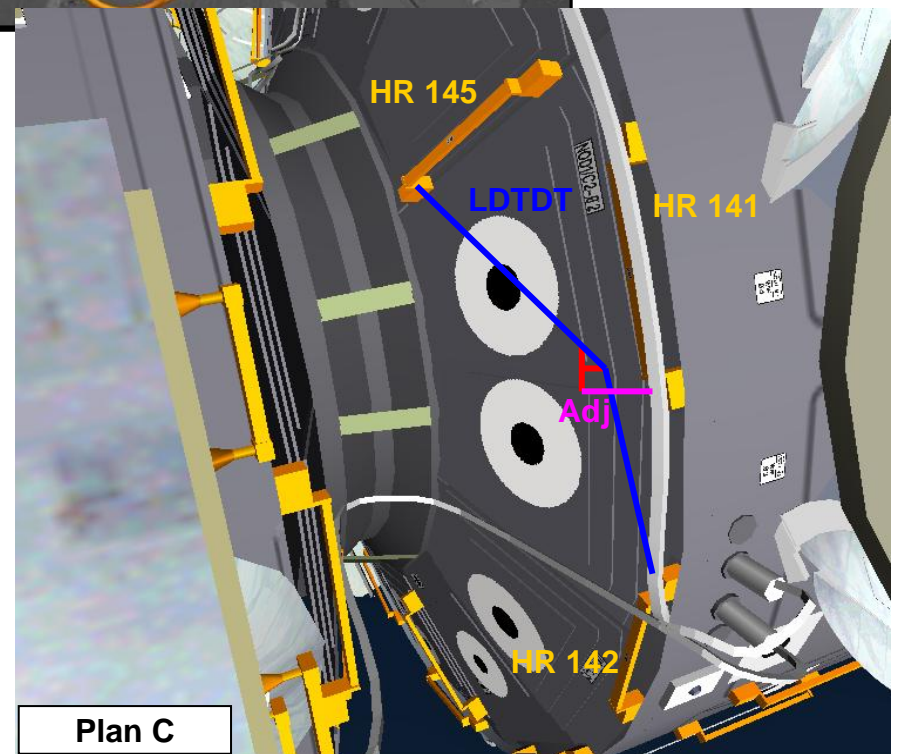
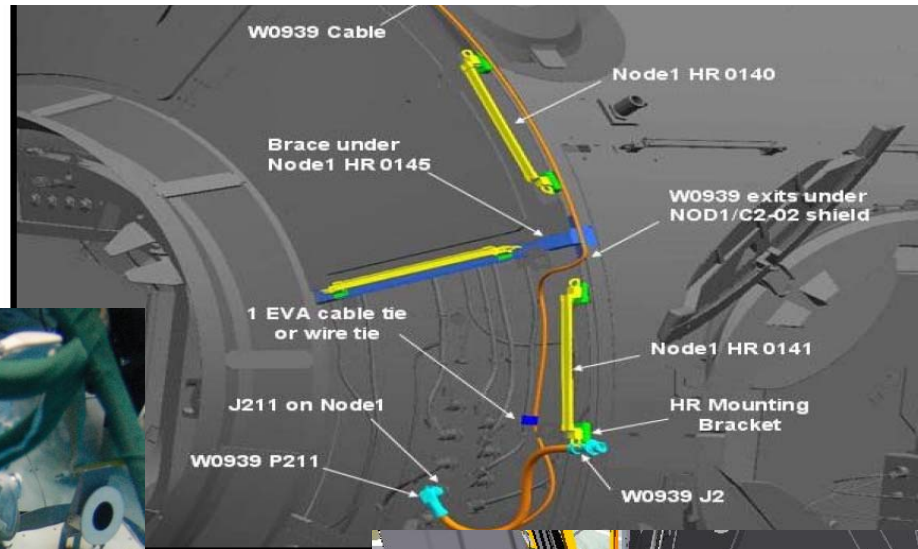
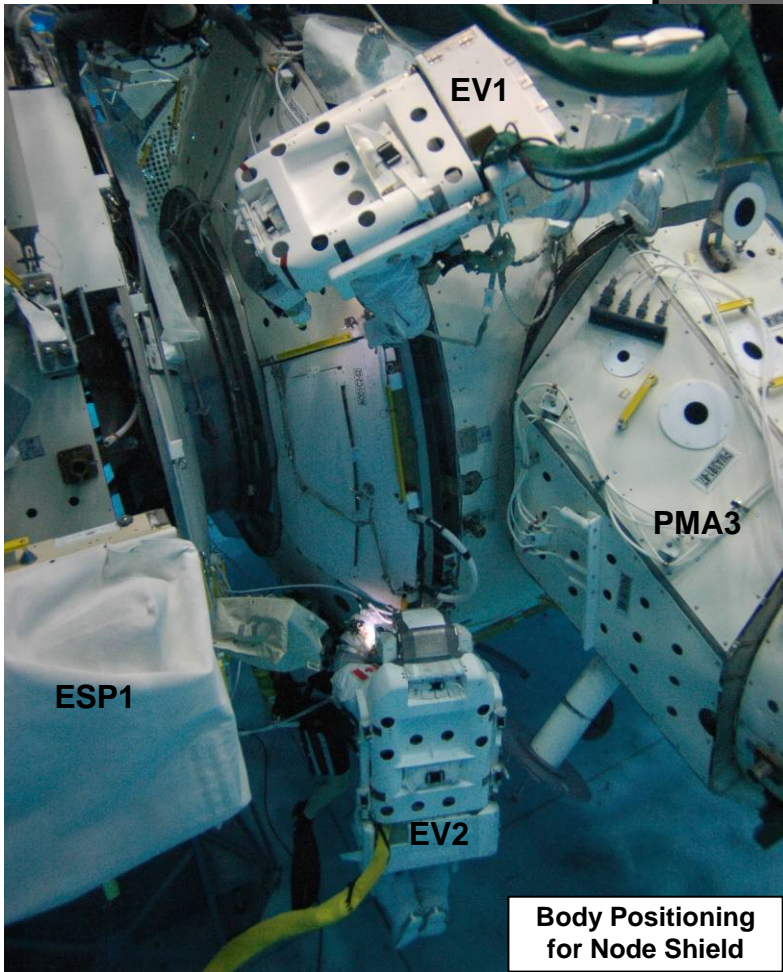
1. Sharp edge – spring loaded captive EVA fasteners (SARJ MLI cover bolts); ends of springs may protrude
2. Potential exists for sharp edge hazards on the TBA bearing package and mount. Attempt to limit contact to tether points only
3. Avoid contact with any exposed sharp edges during cover removal and SARJ inspection
4. Verify SARJ is locked (one DLA locked, one DLA engaged) to prevent rotation while EV crew is in vicinity of rotational plane plus 6 feet

SARJ INSPECTION – TASK DATA (Cont)



ISS016E026040

# NODE MMOD SHIELD CLEANUP – TASK DATA



FS 7-185

EVA/123/FIN

GET-AHEADS

# GET-AHEADS

## STS-123 (1JA) GET-AHEAD – JLP TRUNNION/KEEL COVER INSTALL (00:55)

IV	EV1/EV2
<p><b>TOOL CONFIG:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> <b><u>EVA Crewlock Bag #1</u></b></li> <li><input type="checkbox"/> JLP trunnion/keel covers (5)</li> <li><input type="checkbox"/> RET (eq-eg), to TRC-10</li> <li><input type="checkbox"/> RET (eq-lg) (outside of bag)</li> <li><input type="checkbox"/> Spare 85-ft safety tether</li> </ul> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-left: 20px;"> <p>----TRC 06----</p> <p>----TRC 08----</p> <p>----TRC 07----</p> <p>----TRC 09----</p> <p>----TRC 10----</p> </div>	<p>Perform the following tasks as time permits at the end of EVA 3, 4, or 5:</p> <p><b>SETUP</b> (00:10)</p> <ol style="list-style-type: none"> <li>1. Translate to A/L; open thermal cover</li> <li>2. RET/BRT to C/Lk bag #1 (JLP trunnion covers)</li> <li>3. Close thermal cover</li> <li>4. Translate to Lab/Node 2 interface</li> <li>5. Tether swap to Node 2 HH 0370 using spare 85-ft safety tether (Stow A/L safety tether on Lab HH 0271) (No tether swap required on EVA 3 if anchored to Node 2 HH 0310) <ul style="list-style-type: none"> <li><input type="checkbox"/> Verify hook locked, reel unlocked</li> </ul> </li> <li>6. Translate to JLP HH 1251 (stbd-nadir); tether and stow C/Lk bag on HH 1260</li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">Alignment arrows on trunnion covers point ISS fwd Alignment arrow on keel cover points zenith</p> <p><b>STBD COVER INSTALL</b> (00:10)</p> <ol style="list-style-type: none"> <li>7. Retrieve MLI cover TRC-06 from C/Lk bag #1; install on stbd-nadir trunnion</li> <li>8. √Eleven (11) velcro tabs mated (#8G – grounding tab)</li> <li>9. Retrieve MLI cover TRC-08 from C/Lk bag; translate to stbd-zenith trunnion (use fwd HH)</li> <li>10. Install MLI cover TRC-08 on stbd-zenith trunnion</li> <li>11. √Eleven (11) velcro tabs mated (#5G – grounding tab)</li> </ol> <p><b>PORT COVER INSTALL</b> (00:15)</p> <ol style="list-style-type: none"> <li>12. Tether, retrieve C/Lk bag #1; translate to port-nadir trunnion</li> <li>13. Temp stow C/Lk bag #1 on HH 1225</li> <li>14. Retrieve MLI cover TRC-07 from C/Lk bag; install on port-nadir trunnion</li> <li>15. √Ten (10) velcro tabs mated (#7G – grounding tab)</li> <li>16. Retrieve MLI cover TRC-09 from C/Lk bag; translate to port-zenith trunnion</li> <li>17. Install MLI cover TRC-09 on port-zenith trunnion</li> <li>18. √Six (6) velcro tabs mated (#3G – grounding tab)</li> </ol> <p><b>KEEL COVER INSTALL</b> (00:10)</p> <ol style="list-style-type: none"> <li>19. Retrieve MLI cover TRC-10 from C/Lk bag #1; translate to keel pin (fwd-zenith)</li> <li>20. Install TRC-10 on keel pin</li> <li>21. √Five (5) Velcro tabs mated (#5G – grounding tab)</li> </ol> <p><b>CLEANUP</b> (00:10)</p> <ol style="list-style-type: none"> <li>22. Tether, retrieve C/Lk bag #1 from JLP HH 1225</li> <li>23. Inspect gloves</li> <li>24. Tether swap to A/L safety tether at Node 2 HH 0370/Lab2 HH 0271 (or Node 2 HH 0310) <ul style="list-style-type: none"> <li><input type="checkbox"/> Verify hook locked, reel unlocked</li> </ul> </li> <li>25. Stow 85-ft safety tether on MWS or C/Lk bag #1</li> </ol>

## JLP TRUNNION COVER INSTALL – TASK DATA

### Estimated Task Duration:

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

### Tools:

EV1 (FF)
C/Lk bag
JLP trunnion covers (4)
JLP keel pin cover

### ORUs/Loose items:

ORU/Item	Qty	Part Number, ID	Mass (lb)	Volume (in <sup>3</sup> )
JLP Trunnion MLI Cover (stbd-nadir)	1	TRC-06	1.8	38.2x31.1x5.5
JLP Trunnion MLI Cover (port-nadir)	1	TRC-07	1.8	38.2x31.1x5.5
JLP Trunnion MLI Cover (stbd-zenith)	1	TRC-08	1.8	Approx. 38.2x31.1x5.5
JLP Trunnion MLI Cover (port-zenith)	1	TRC-09	1.8	Approx. 38.2x31.1x5.5
JLP Keel pin MLI Cover	1	TRC-10	0.9	26(dia.)x15

### Notes:

### Cautions:

### Warnings:

JLP TRUNNION COVER INSTALL – TASK DATA (Cont)



TRC-06 (stbd-nadir)



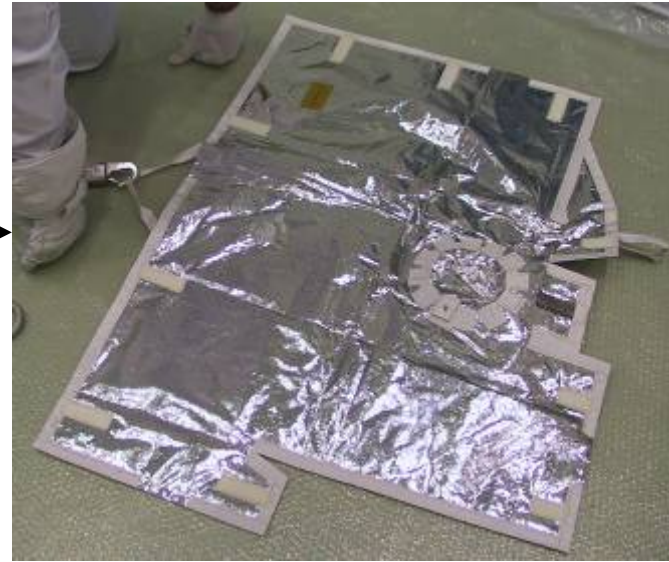
TRC-07 (port-nadir)



## JLP TRUNNION COVER INSTALL – TASK DATA (Cont)



TRC-08 (stbd-zenith)



TRC-09 (port-zenith)



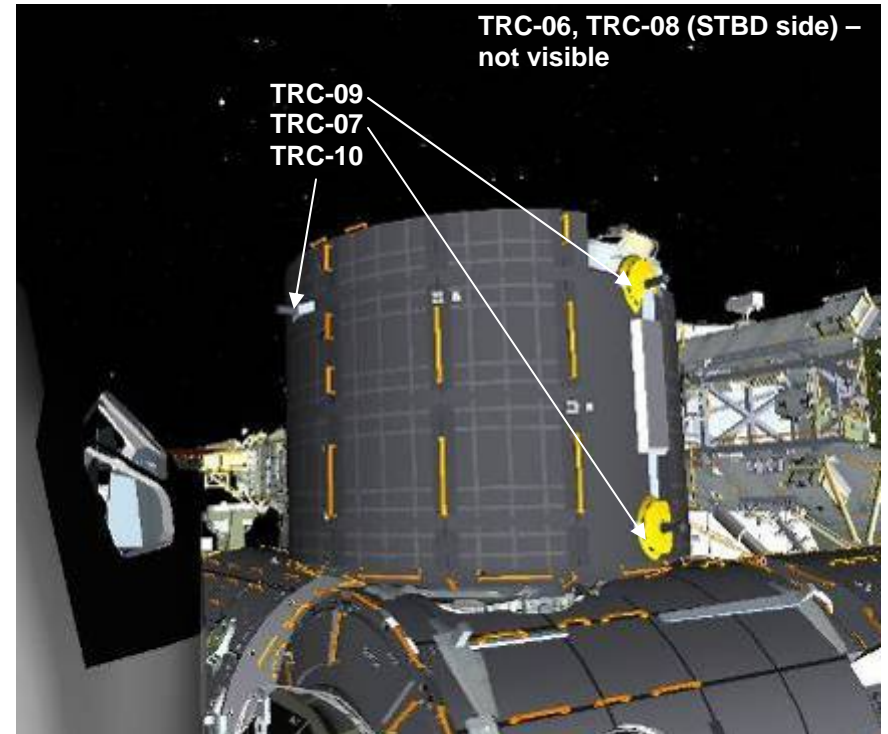
# JLP TRUNNION COVER INSTALL – TASK DATA (Cont)



TRC-10 (fwd-zenith)



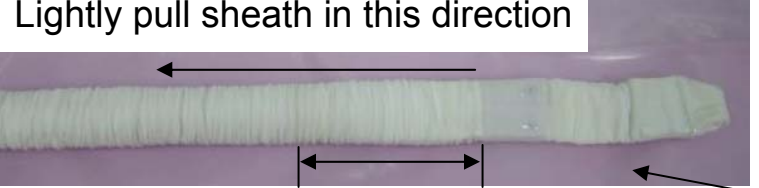


JLP keel (TRC-10) align arrow and Velcro



JLP trunnion/keel cover locations



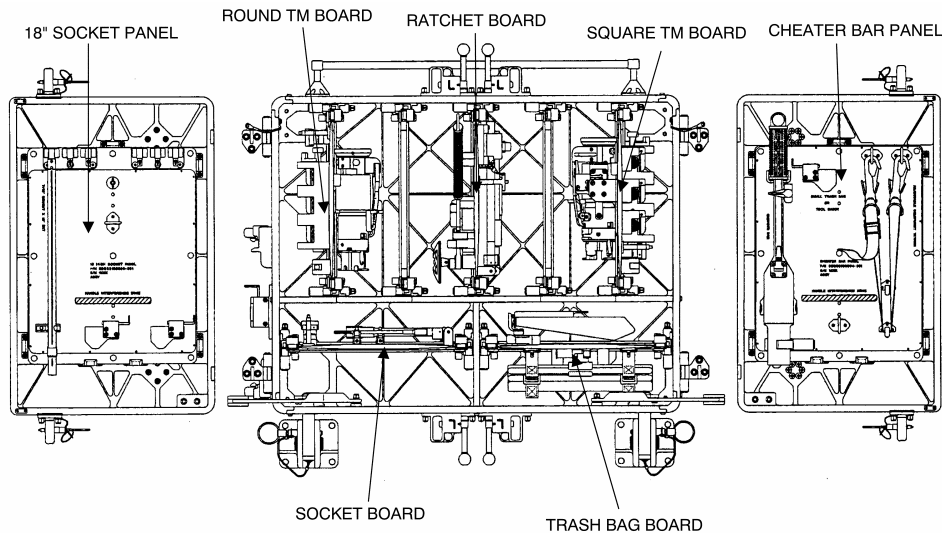
# STS-123 (1JA) GET-AHEAD – S0 SAFETY TETHER LAS INSPECTION

IV	EV1/EV2
<p data-bbox="107 289 667 326">Lightly pull sheath in this direction</p>  <p data-bbox="210 483 651 521"><b>Unacceptable tight bunching</b></p>  <p data-bbox="113 846 743 919"><b>Tack stitches to be verified go all the way through the tether</b></p>  <p data-bbox="149 1349 804 1421"><b>Shows acceptable amount of Red showing. Depending on tolerances, red may show</b></p>	<p data-bbox="877 293 1587 326">Perform the following tasks as time permits during any EVA:</p> <p data-bbox="877 347 1304 373"><b>S0 SAFETY TETHER INSPECTION</b> (00:15)</p> <ol data-bbox="877 373 1486 422" style="list-style-type: none"> <li>1. Translate to S0 HH 3539 and HH 3530 (face 6, port of Lab)</li> <li>2. Inspect both 55-ft safety tethers (#60 and #70):</li> </ol> <ol data-bbox="926 446 1976 592" style="list-style-type: none"> <li>a. Take note of current sheath status and whether sheath appears to be evenly distributed on LAS of tether</li> <li>b. Gently smooth sheath away from red indicator end (opposite label end) slightly less than one hand's width</li> <li>c. To verify integrity of tack stitches, lightly pull on sheath. If tack stitches are not present it will take very little force to expose the entire red indicator</li> </ol> <p data-bbox="1360 618 1430 641" style="text-align: center;"><u>NOTE</u></p> <p data-bbox="995 643 1776 691">It is possible to expose a small amount of red indicator when pulling on the sheath. This is normal and may be pushed back in place</p> <ol data-bbox="926 740 1875 813" style="list-style-type: none"> <li>d. If no red indicator is seen, restow tether</li> <li>e. If red indicator is showing, bring safety tether inside. (Safety tether is NO-GO for crew restraint)</li> </ol>

# STS-123 (1JA) GET-AHEAD – RETURN TOOLS TO EXTERNAL STORAGE LOCATION

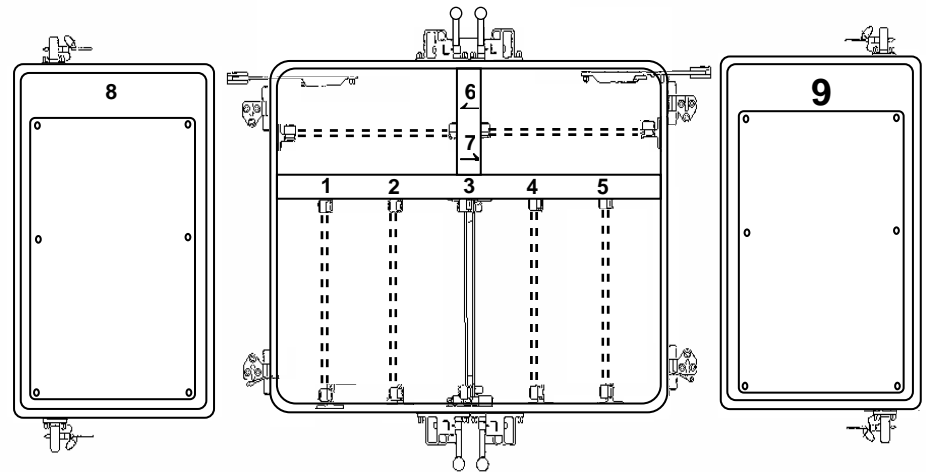
IV	EV1/EV2
<p style="text-align: center;"><u>NOTE</u></p> <ul style="list-style-type: none"> <li>A/L Toolbox: Slider feature located in center slot only (#3)</li> <li>Z1/CETA Toolbox: Slider feature located in all slots</li> </ul>	<p>Perform following tasks as time permits during EVAs 3, 4, or 5:</p> <p><b><u>STOW RATCHET WRENCHES IN Z1 TOOLBOXES</u></b> (00:15)</p> <ol style="list-style-type: none"> <li>Translate to A/L</li> <li>Retrieve Ratchet Wrench w/palm wheel (2, s/n 1011 &amp; 1012) from staging bag; stow on MWS</li> <li>Translate to Z1 stbd toolbox; stow 1 Ratchet Wrench on slot #3 board</li> <li>Close at least 1 latch per door</li> <li>Translate to Z1 port toolbox; stow 1 Ratchet Wrench on slot #3 board</li> <li>Close at least 1 latch per door</li> </ol> <p><b><u>STOW GP CUTTERS IN A/L TOOLBOX</u></b> (00:10)</p> <ol style="list-style-type: none"> <li>Translate to A/L</li> <li>Retrieve GP cutters (-303 version) from staging bag; stow on MWS</li> <li>Translate to port A/L toolbox; stow GP cutters on door panel #9</li> <li>Close at least 1 latch per door</li> </ol>

**Z1 TOOLBOX LAYOUT**



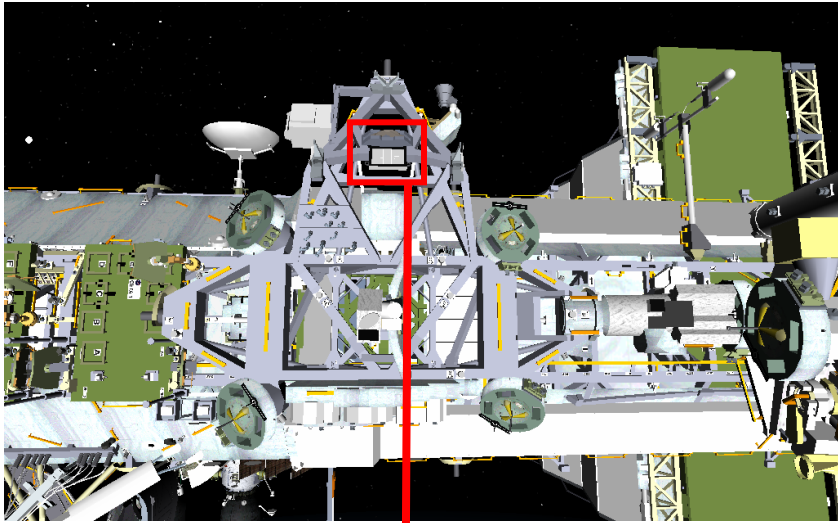
DOORS SHOWN REMOVED AND ROTATED 180° FROM CLOSED POSITION FOR CLARITY.

**A/L TOOLBOX LAYOUT**



## STS-123 (1JA) GET-AHEAD – REMOVE EBSC TARGET COVER

IV



EV1/EV2

Perform following task as time permits during any EVA:

**REMOVE EBSC TARGET COVER** (00:10)

1. Translate to EBSC target (MT zenith)
2. Remove EBSC target cover; stow on backside of target assembly

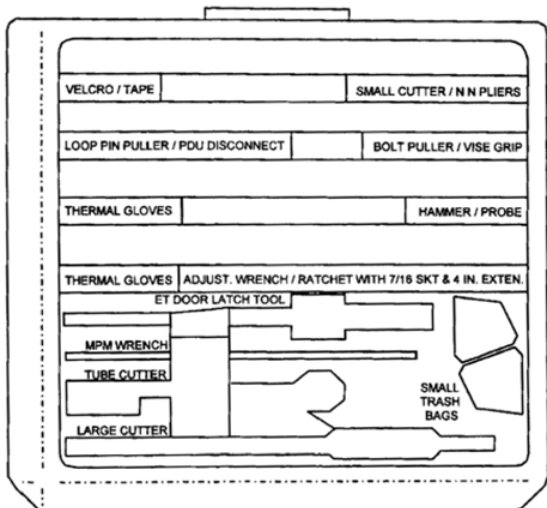
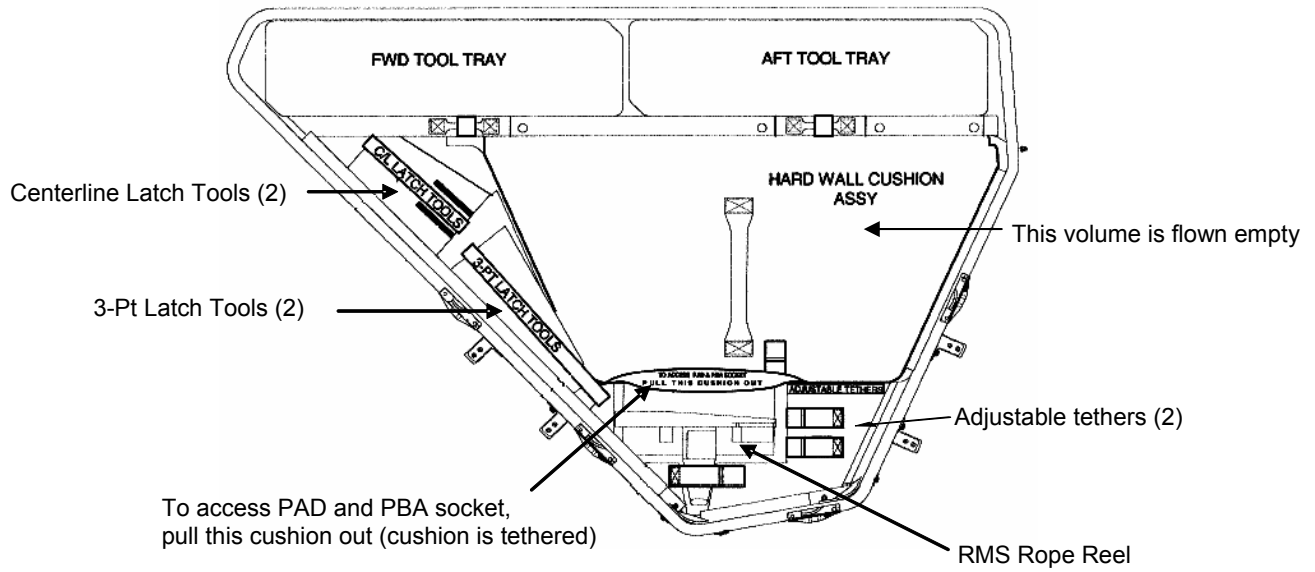
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TOOLS AND STOWAGE

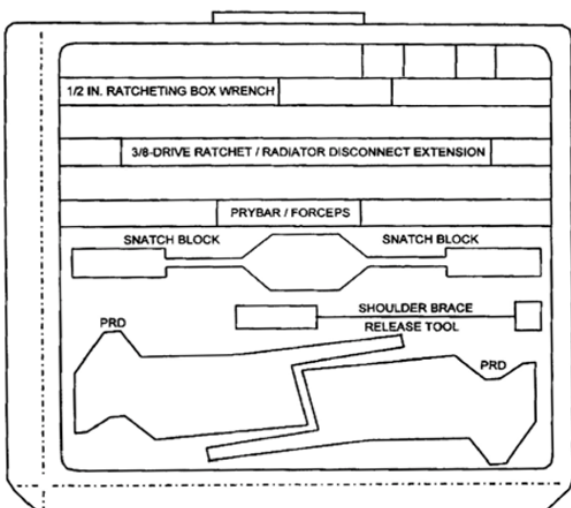
PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA) ..... TEMP FS 8-2  
PGT CHECKOUT ..... 8-3  
PGSC-PGT CONNECTION (A31P AND 760XD) ..... 8-4  
PROGRAM PGT SETTINGS ..... 8-5  
DOWNLOAD/ERASE EVENT LOG ..... 8-5  
PGT CONTINGENCIES..... 8-6  
PGT STANDARD SETTINGS..... 8-7  
CLPA IVA UNPACKING PROCEDURE ..... FS 8-9  
T-RAD IV PREPARATION..... FS 8-13  
TEMPERATURE SENSOR ASSEMBLY ..... FS 8-16  
T-RAD TRANSFER..... FS 8-16  
CIPA DISCARD CONTAINER (CDC) MARKING ..... FS 8-17  
DTO SAMPLE BAG ASSEMBLY ..... FS 8-18  
OBSS KA AVIONICS BOX SETUP AND TRANSFER ..... FS 8-19  
TOOLBOX STOWAGE ..... FS 8-22  
TOOLBOX PANEL AND SLOT LABELS ..... FS 8-23  
Z1 TOOLBOX INTERNAL LAYOUT ..... FS 8-24  
AIRLOCK TOOLBOX INTERNAL LAYOUT..... FS 8-25  
APFR MANAGEMENT – STS-123 (1JA)..... FS 8-26  
SAFETY TETHER CONFIGURATION – STS-123 (1JA)..... FS 8-27  
EMU PREP FOR TPS REPAIR ..... FS 8-28

TOOLS AND  
STOWAGE

# PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA)



Forward Tray layout and Labels



Aft Tray Layout and Labels



TOOLS AND STOWAGE

## CLPA IVA UNPACKING PROCEDURE

1

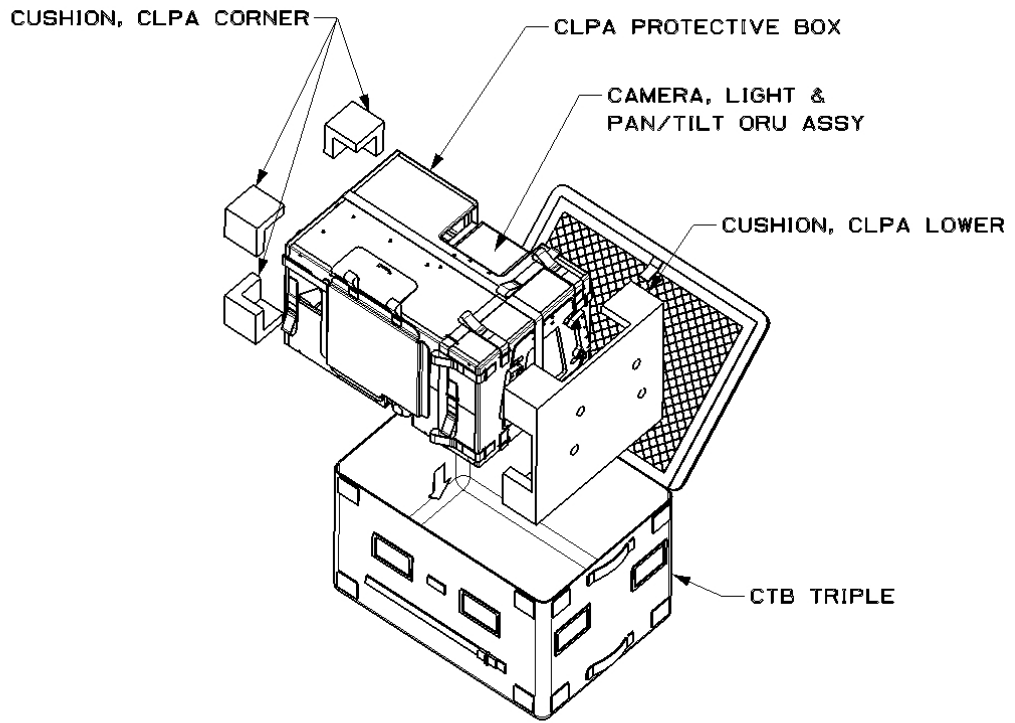
### CAUTION

Extreme care should be exercised to avoid touching the white thermal paint on the camera, as it is easily removed. Scuffing the paint may reduce the CLPA life due to overheating, or it may reduce the allowed operational timelines to prevent overheating

The electrical grounding tabs and the connectors at the base of the unit should not be touched

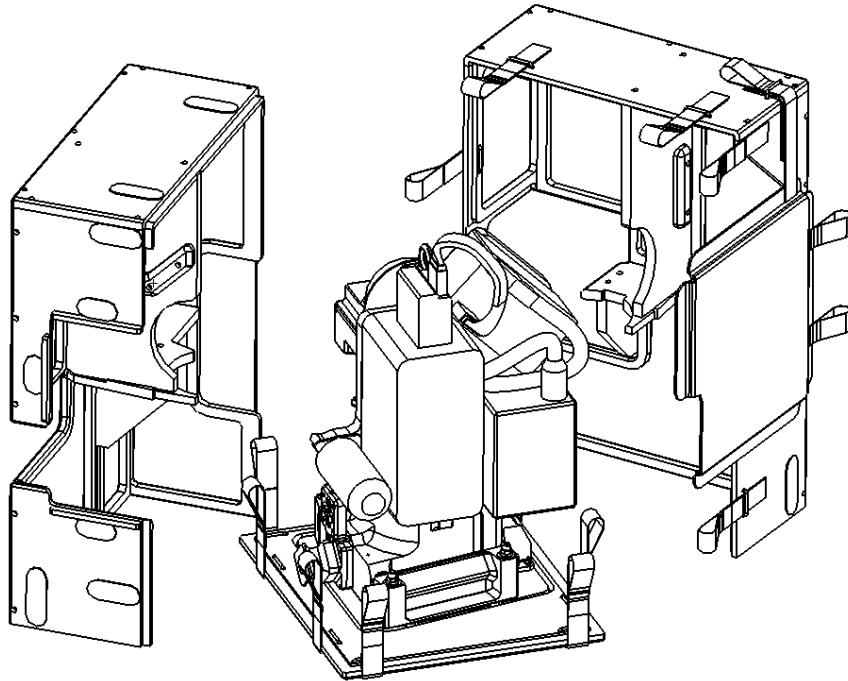
The unit has awkward center of mass, making it uncomfortable to handle. When possible, it is recommended to hold the unit from the tether point and micro fixture

1. Remove package from CTB by pulling bag away from package (figure 1)
2. Remove bottom cushions and stow in CTB bag
3. Release belts, pull-tabs, and beta cloth cover (in order); fold beta cloth cover on itself
4. Open two shells to expose mounted CLPA on base plate and ORU Interface (figure 2)
5. Using a ratchet wrench w/7/16-in socket, drive EVA bolt ccw, ~ 22-23 turns. NOTE: Running torque should not exceed 75 in-lb (figure 3)
6. Verify EVA bolt driven out to hard stop
7. The CLPA should slide freely from the base plate. It maybe necessary to loosen the four nuts on top of the alignment guides (figure 4)
8. Install Sq scoop, place CLPA in Med ORU bag
9. Close shells on base. Secure Velcro straps, belts and beta cloth blanket cover
10. ~~Store Protective Case for packaging and return of a future failed unit~~ - Stow protective box and CTB in Node
11. Transfer CLPA to ISS JOINT A/L



2 (DWG) WORK

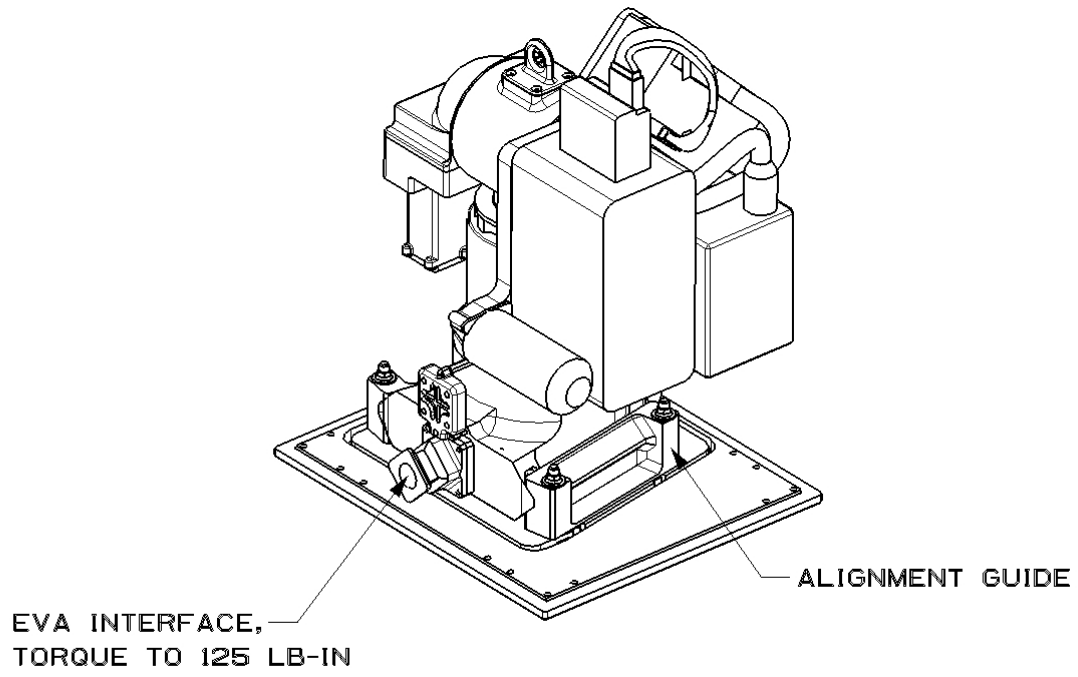
Figure 1



3 (DWG) WORK

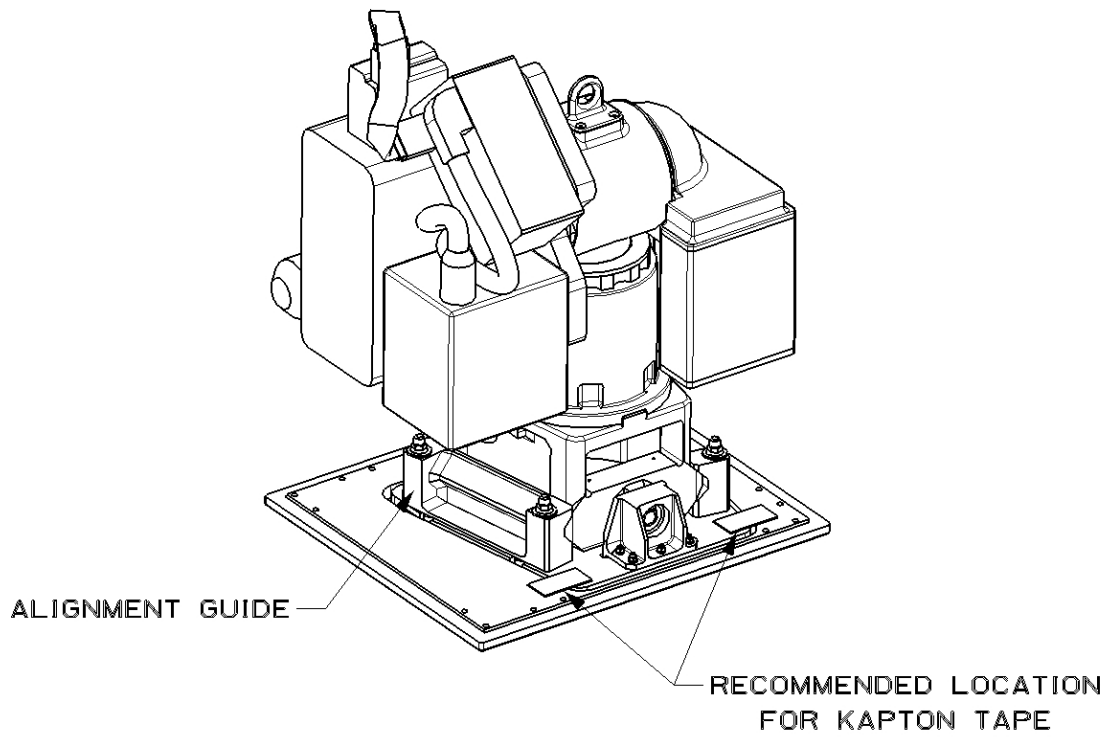
Figure 2





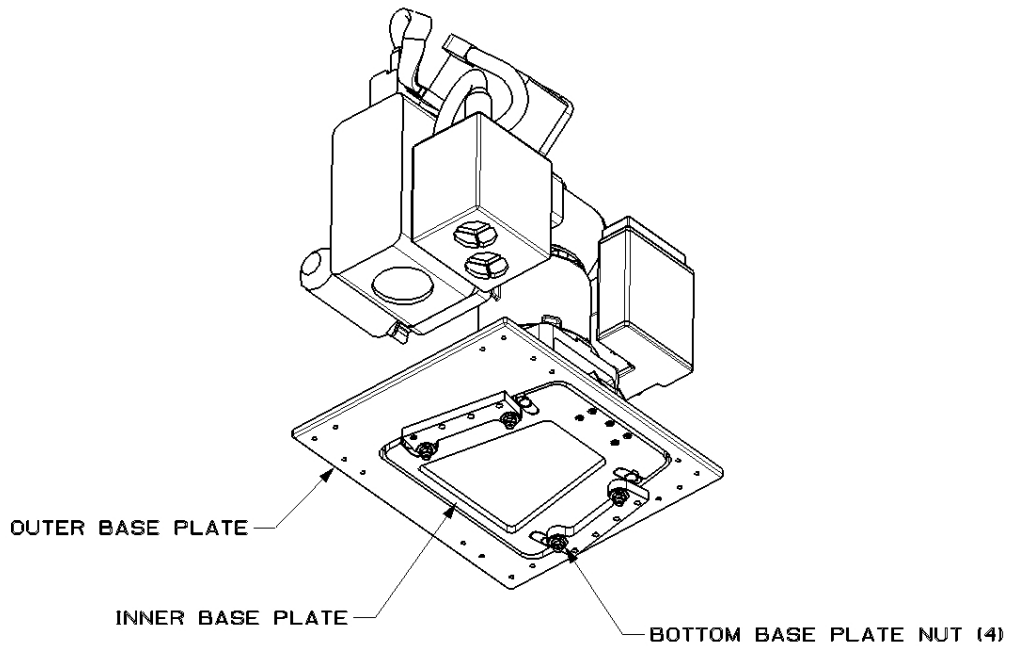
2 (DWG) WORK

Figure 3



2 (DWG) WORK

Figure 4



2 (DWG) WORK

Figure 5

## T-RAD IV PREPARATION

### WARNING

Do not perform this procedure until given a GO from MCC-H

1. On MCC-H GO, obtain latex gloves (WCS glove dispenser) and goggles (CCK in MA9N)
2. Remove T-RAD from stowage location (Double Locker MA9D/F)
3. Remove 5" nozzle from nozzle cushion (small block of foam stowed with T-RAD); remove Kapton tape from ends
4. Visually inspect clear areas of containment bag for milky-white, oily liquid and inspect the pigmat strips of the containment bag for white flaky residue



Figure 1 - T-RAD Stowage (Containment Bag on Left, Nomex Sacks (2) on Right)

### WARNING

White residue is a byproduct of A1100 reaction with pigmat blanket. Milky-white, oily liquid in the containment bag may be liquid A-1100 (which is corrosive to eyes and skin – Tox 2). If present, do not open Containment Bag or Nomex sack; contact MCC

5. Don gloves and goggles
6. If no white residue present, cut Containment Bag between heat seals on short edge, near zipper end of Nomex sack (do not cut through pigmant) and remove Nomex sack
7. Inspect the fabric of the outer sack for white residue or wetted areas
8. Unzip outer Nomex sack, fold lid back, unzip inner Nomex sack, and remove T-RAD
9. Inspect top MLI cover (non-handle end) for evidence of leakage: clear to milky liquid or residue

### NOTE

Do not unfasten the 1/4 turn fastener located below the hose

10. Open top MLI cover (2 – 1/4 turn fasteners, 2 – snaps, Velcro)
11. Inspect entire top surface of T-RAD and interior of MLI cover for leakage, paying special attention to the Part B plunger O-ring vent hole (figure 2)
12. If leakage present, replace T-RAD in Nomex sacks; contact MCC

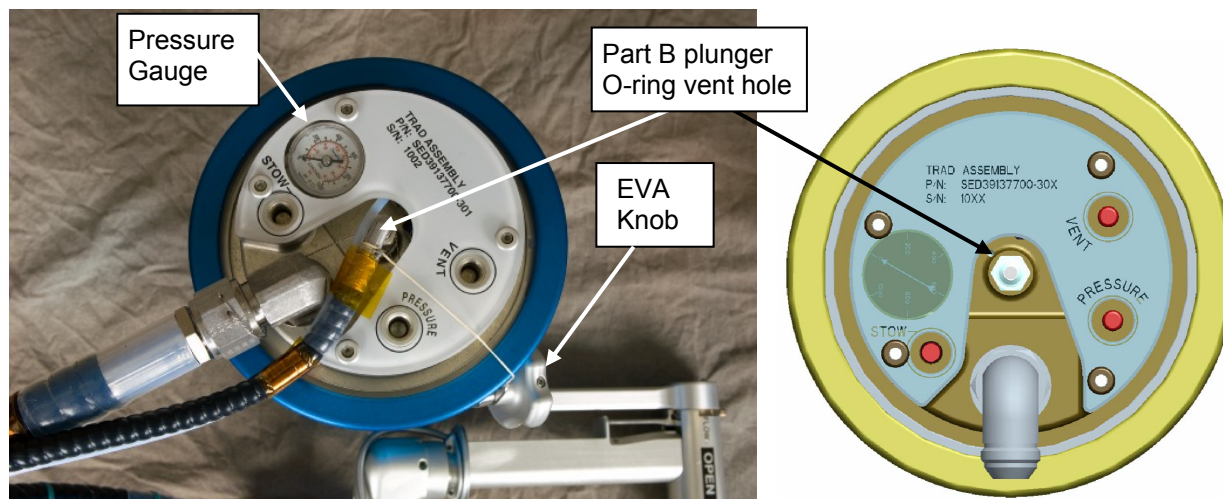


Figure 2 - T-RAD Cover Plate  
(MLI not shown and eva knob not installed in photo)

### NOTE

Do not place EVA knob in STOW port until end of EMU PREBREATHE prior to IV hatch closure on EVA day (provides an additional O-ring barrier to leakage)

### WARNING

Do not put EVA knob in PRESSURE or VENT position as this could create a leak of A1100

13. Remove tape and foam from EVA knob, leave knob dangling on lanyard
14. Verify EVA knob sharpie mark is present
15. Verify no leakage from STOW port
16. Verify pressure gauge reading 0 psi
17. Reinstall top MLI cover
18. If no leakage found, doff gloves and goggles
19. Transfer T-RAD and 5" nozzle to ISS A/L
20. Remove MLI from gun
21. Attach gun MLI to hose MLI Velcro and wrap around hose MLI (figure 3)
22. Verify temperature (via temp gauge) on back of gun in the green zone



Figure 3 - T-RAD and Gun MLI

23. Retrieve CDC s/n 1002 from ISS
24. Perform fit check of 5" nozzle to both ports on CDC
25. Report fit check results to MCC-H
26. Thread nozzle cw into gun body until threads bottom out (~7 turns total)
27. After ~5 turns lock pin will engage; will need to depress lock pin at least once and continue to rotate the nozzle cw to achieve full turn count (figure 4).  
Suggest using RET PIP pin to depress lock pin
28. Rotate nozzle back ccw until lock pin engages

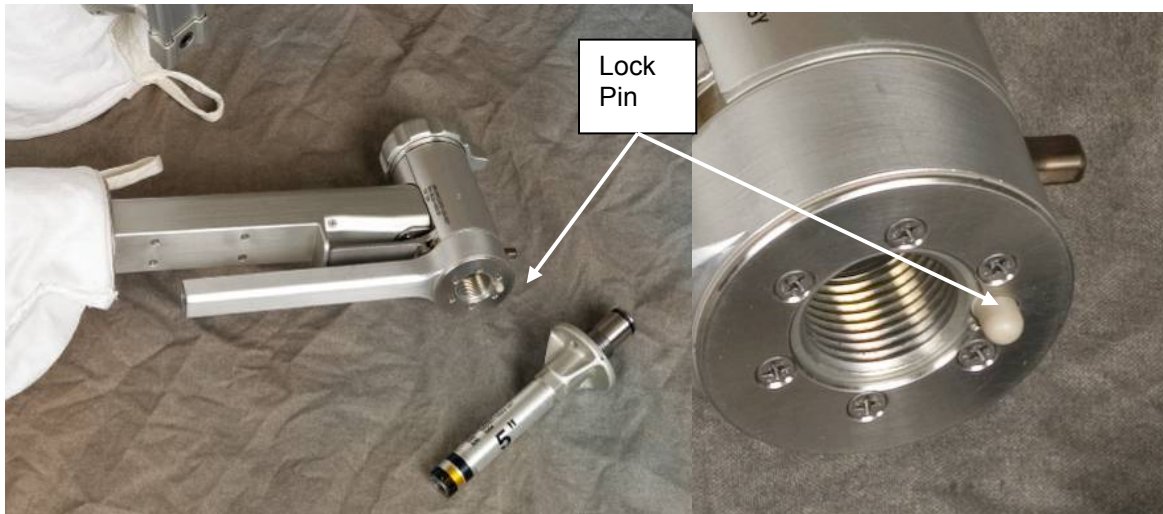


Figure 4 - Nozzle Installation

29. Verify emergency flow control knob on back of gun in OPEN position (figure 5)
30. Verify trigger safety in SAFE position
31. Re-install gun MLI
32. Stage gloves and goggles inside Airlock for day of EVA knob install

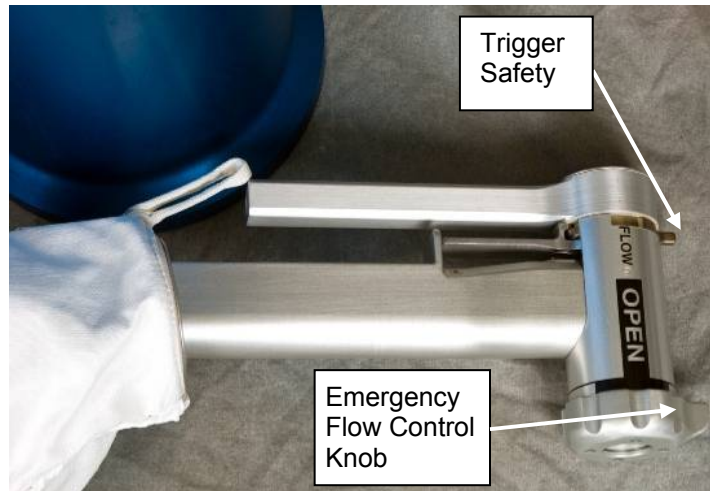


Figure 5 - Gun Nomenclature. Note that valve shown CLOSED in this photo (not correct configuration) and the nozzle not installed

## TEMPERATURE SENSOR ASSEMBLY

### Temp Sensor

1. Retrieve Temperature Sensor (from mesh bag 4 in EXT A/L floor bag) and 3 AA Alkaline batteries (from EXT A/L floor bag foam)
2. Main Power sw – OFF
3. Peel back MLI and remove battery compartment lid by turning captive thumbscrew ccw 3 turns
4. Install 3 AA Alkaline batteries into back of probe
5. Reinstall battery compartment lid by turning thumbscrew cw 3 turns until finger tight
6. Reinstall MLI flap over battery compartment
7. Main Power sw – ON
8. Open display MLI flap and probe tip MLI flap
9. Push Display Wake button
10. Verify display operational
11. Using light contact onto wall or locker, depress ribbon until probe tip is in contact with surface
12. When temp stabilizes, read temp, IV record \_\_\_\_\_ (expect ~21 degC)
13. Verify clear RTV on tip of probe does not appear damaged (still intact)
14. Close MLI flap over probe tip
15. Main Power sw – OFF
16. Close display flap; stow temp sensor in Mesh Bag 4

## T-RAD TRANSFER

1. EVA 4 Transfer Bag to ISS JOINT A/L. Bag contains:
  - Adj Equipment Tethers (4)
  - Broom Clip Caddy (1); (1011)
  - EVA Temperature Sensor (1); (1005)
  - Brush Handle (tipless) (1)
  - CDC
  - EVA Wipes (5)

## CIPA DISCARD CONTAINER (CDC) MARKING

I

1. Retrieve CDC
2. Open scraper bin on CDC
3. Apply 2 pairs of 2 lines spanning the width of the scraper bin (figure 1), placing lines within pairs 0.5" apart (using template below in figure 2)
4. Add tick marks on each line (figure 2), 5" apart (using template below in figure 2)
5. Add label 'A' and 'B' in middle of lines (figure 1)

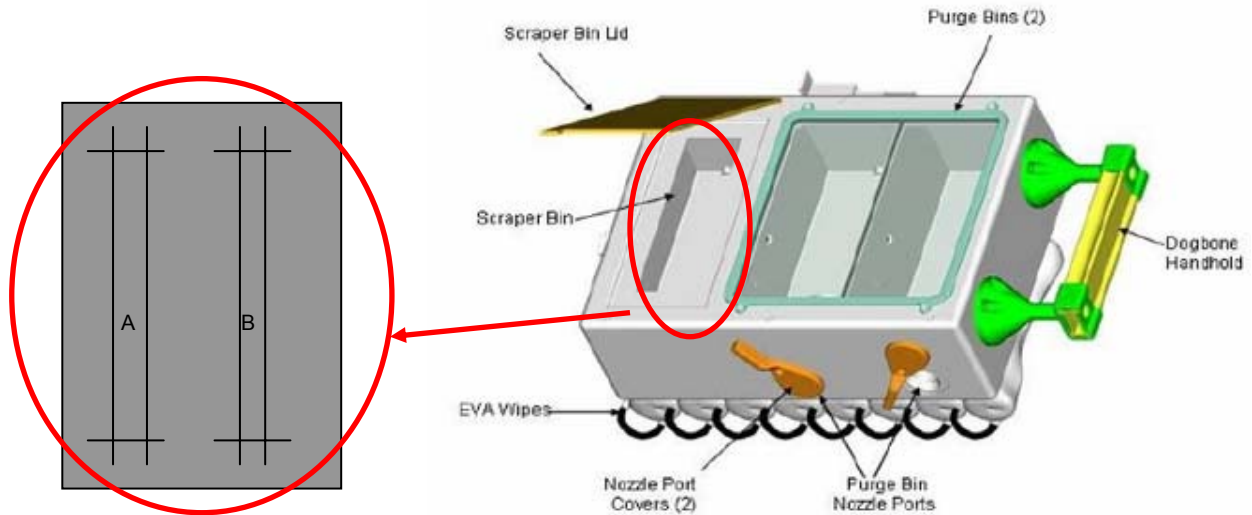


Figure 1 - CIPA Discard Container (CDC)

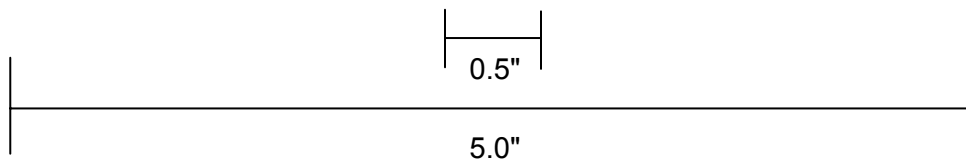


Figure 2 - Line Template

## DTO SAMPLE BAG ASSEMBLY

I

1. Pack Sample bag with tools per the EVA 4 TOOL CONFIG
2. Verify Velcro mate around perimeter of DTO Insert
3. Verify Sample Bag corner equipment hooks (2) closest to tile strongbox hinge line to tether points of DTO Insert
4. Open tile strongbox lid and inspect tile samples. Notify MCC-H of any off-nominal conditions and/or damage to tile samples
5. Secure lid closed with Velcro on hood flap
6. Verify Sample Bag straps marked correctly



## OBSS KA AVIONICS BOX SETUP AND TRANSFER

1. Retrieve Large ORU Bag from ISS
2. Retrieve following items from Middeck Ceiling Stbd 1 (Bag G):
  - Avionics box w/W22/W23 harness and 1 tie-down strap (harness routed through clamp)
  - W21 harness w/6 short and 2 long tie-wraps
  - KAD Assembly

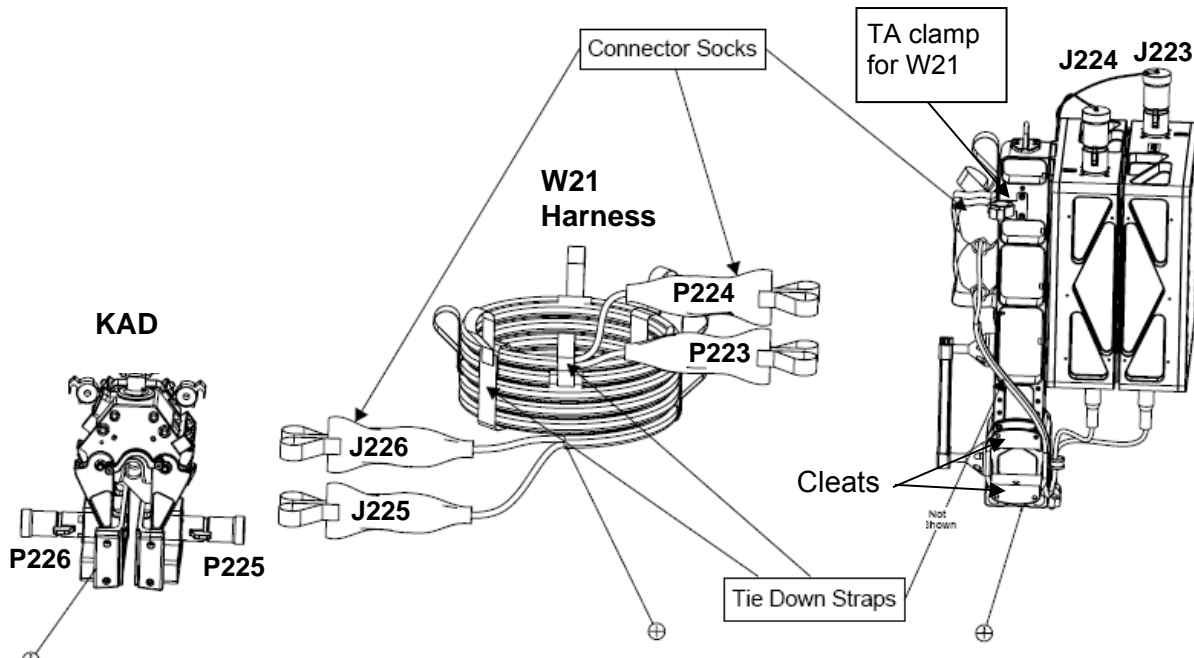


Figure 1 - Avionics Box, W21 Harness, KAD Assembly (added TA Clamp box for KAD)

3. Verify W22/W23 harness secured via cleats and Velcro strap (figure 2); verify bend radius > 3.5 in
  - Open W23/23 connector socks P1 and P2 and remove and discard kapton tape and ESD protective bag from connectors
4. Attach W21 harness to Avionics box (verify bend radius > 5 in)
  - Route P223 and P224 end of harness through TA clamp on avionics box. Close clamp over red RTV tape on harness
  - Optional: Slide short integral tie-down strap near TA clamp (will be used to restrain connector caps during EVA)
  - Use short integral tie-down strap to secure W21 to avionics box HH
  - Verify final Avionics box configuration with figure 2

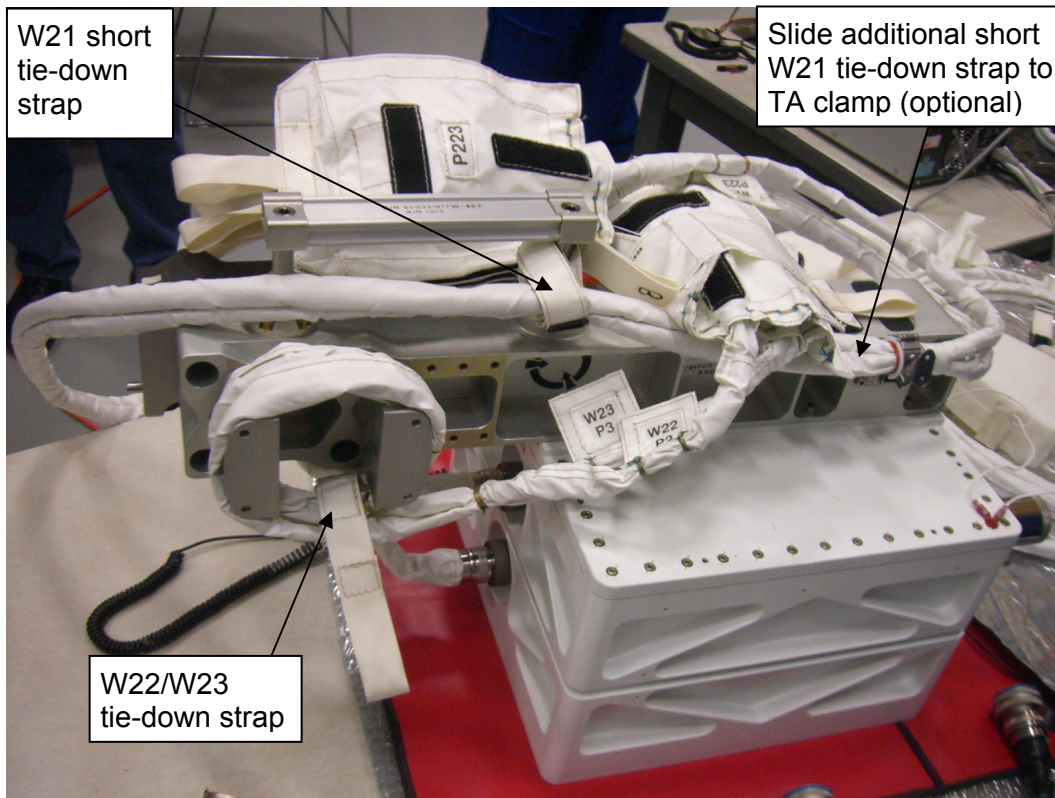


Figure 2 - Avionics Box – Pre-EVA Configuration

5. Verify W21 harness coiled w/integral tie-down straps, as desired

**CAUTION**

Do not handle KAD or open arms via the connector caps  
Use caution when closing KAD arms, gold contact pins  
may be damaged if they contact pins on opposing arm

6. Remove connector caps (2) from KAD connectors P225 and P226; stow in Unique EVA Tools bag (1.0 CTB 1022, A/L1D2)
  - Remove and discard padded bag fitted loosely between the KAD electrical boxes
7. Connect W21 harness to KAD
  - Open W21 connector socks (captive) covering J225 and J226
  - Mate W21 to KAD (align red stripe on connector wing with arrow on KAD, rotate cw 90 deg)
    - Mate W21/J225 to KAD P225
    - Mate W21/J226 to KAD P226
    - Verify red ring on both connectors NOT visible
  - Route J225 and J226 legs of harness through their respective TA clamp. Close clamps over red RTV tape on harness
  - Close KAD arms
  - Verify KAD in SD
  - Verify final KAD configuration with figure 3

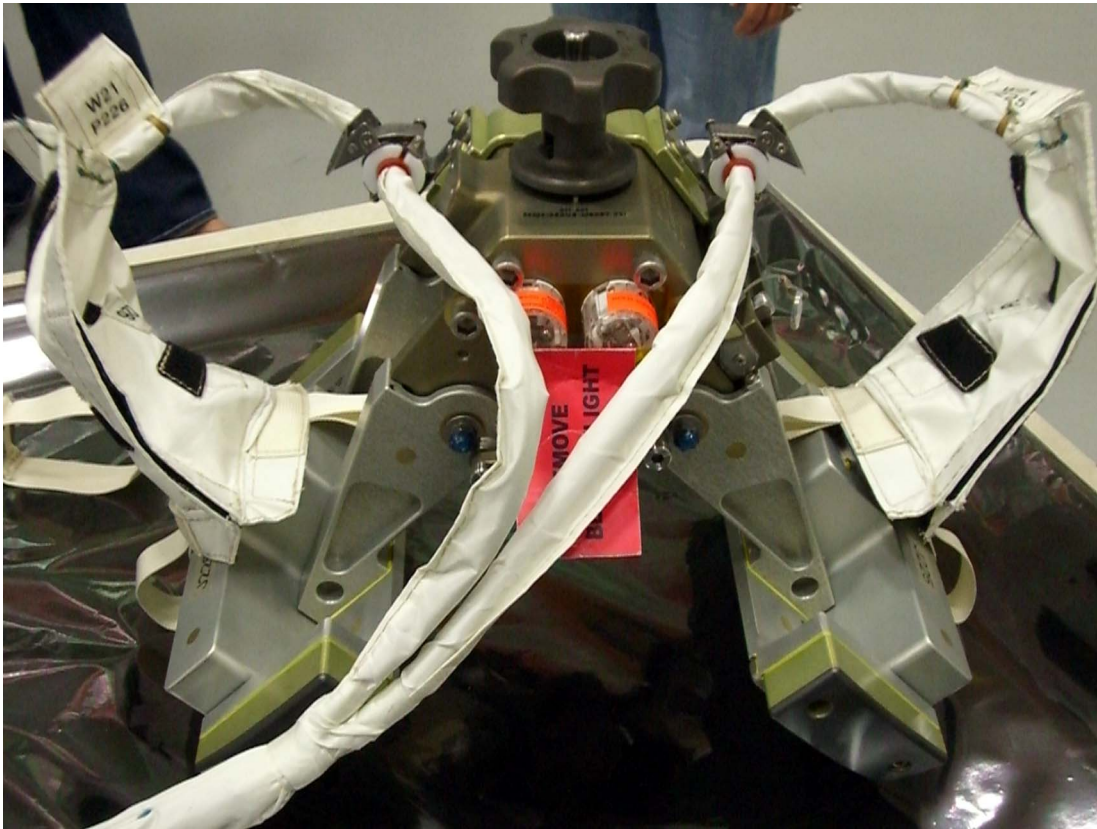


Figure 3 - KAD – Pre-EVA Configuration

8. Stow following items in Large ORU bag
  - OBSS thermal cover
  - P411 connector
  - Configured KAU ASSY
  - Avionics box w/W22/W23 harness and 1 tie-down strap  
(harness routed through clamp)
  - W21 harness w/6 short and 2 long tie-wraps
  - KAD Assembly
9. Transfer Large ORU Bag to ISS JOINT A/L

## TOOLBOX STOWAGE

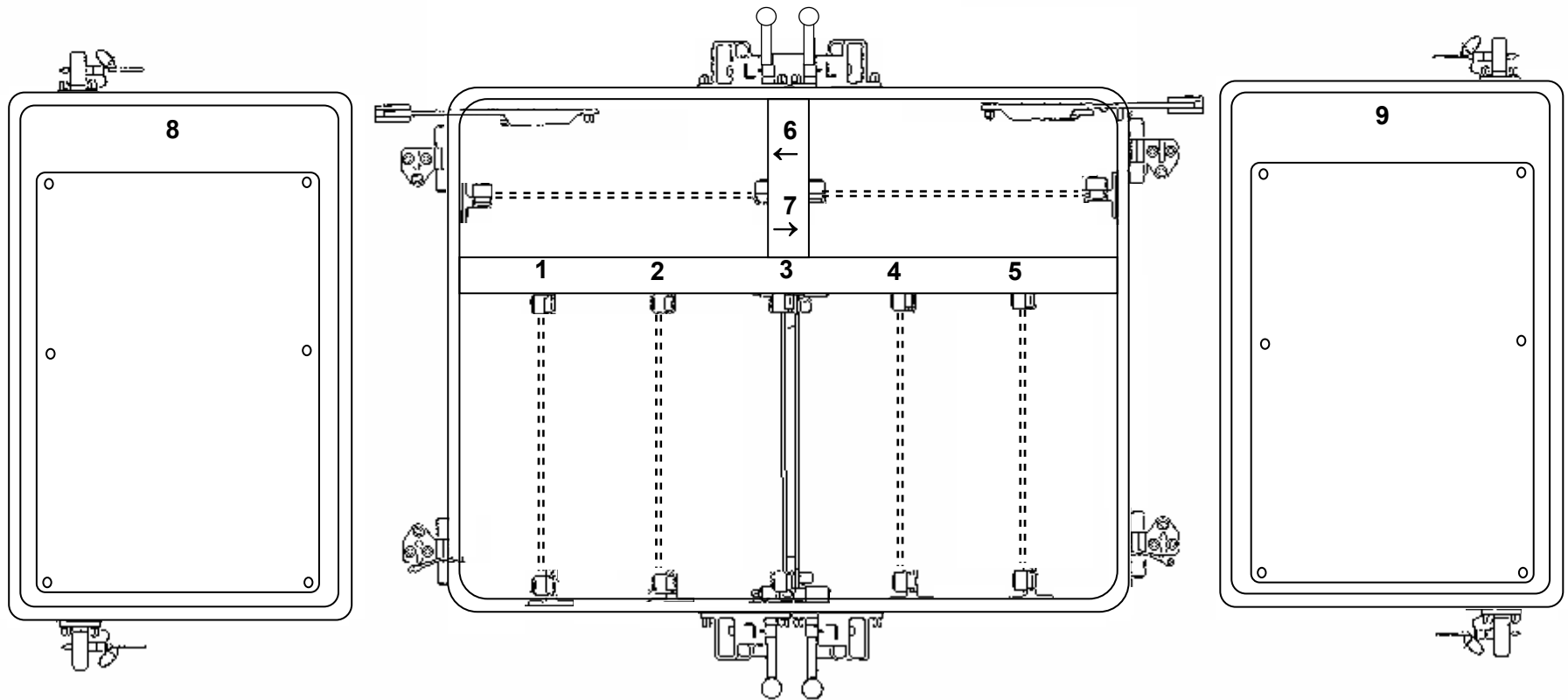
I

	<b>Z1 PORT TOOLBOX</b> {all slots have sliders}	<b>Z1 STBD TOOLBOX</b> {all slots have sliders}	<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}
<b>EXTERNAL</b>	1 SQUARE SCOOP 1 ROUND SCOOP w/D-HANDLE D-HANDLE on port side of toolbox	1 SQUARE SCOOP <u>NOTE</u> D-Handle will not stow on the side of this toolbox due to an interference with the CMG MLI		

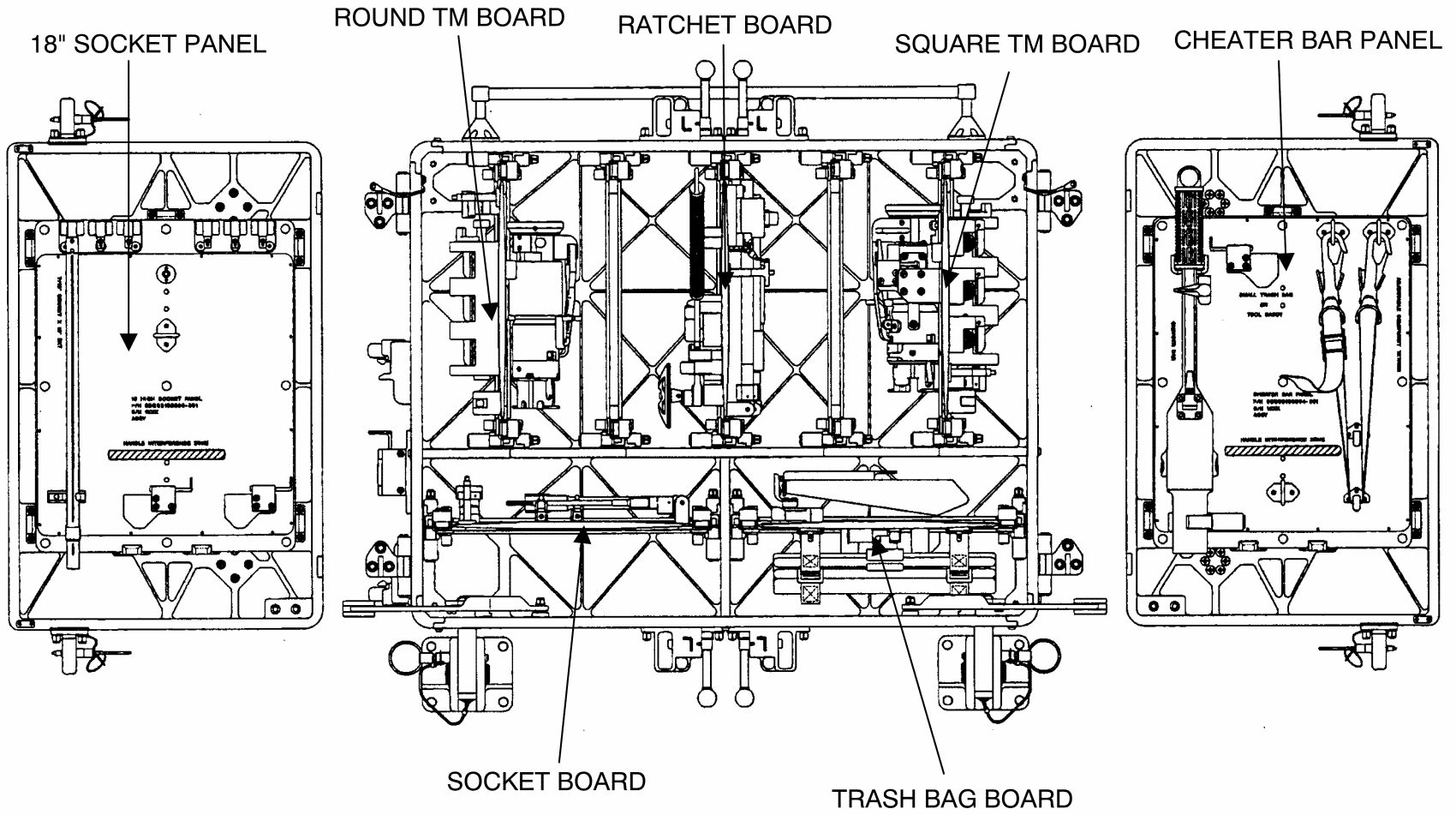
## TOOLBOX PANEL AND SLOT LABELS

### NOTE

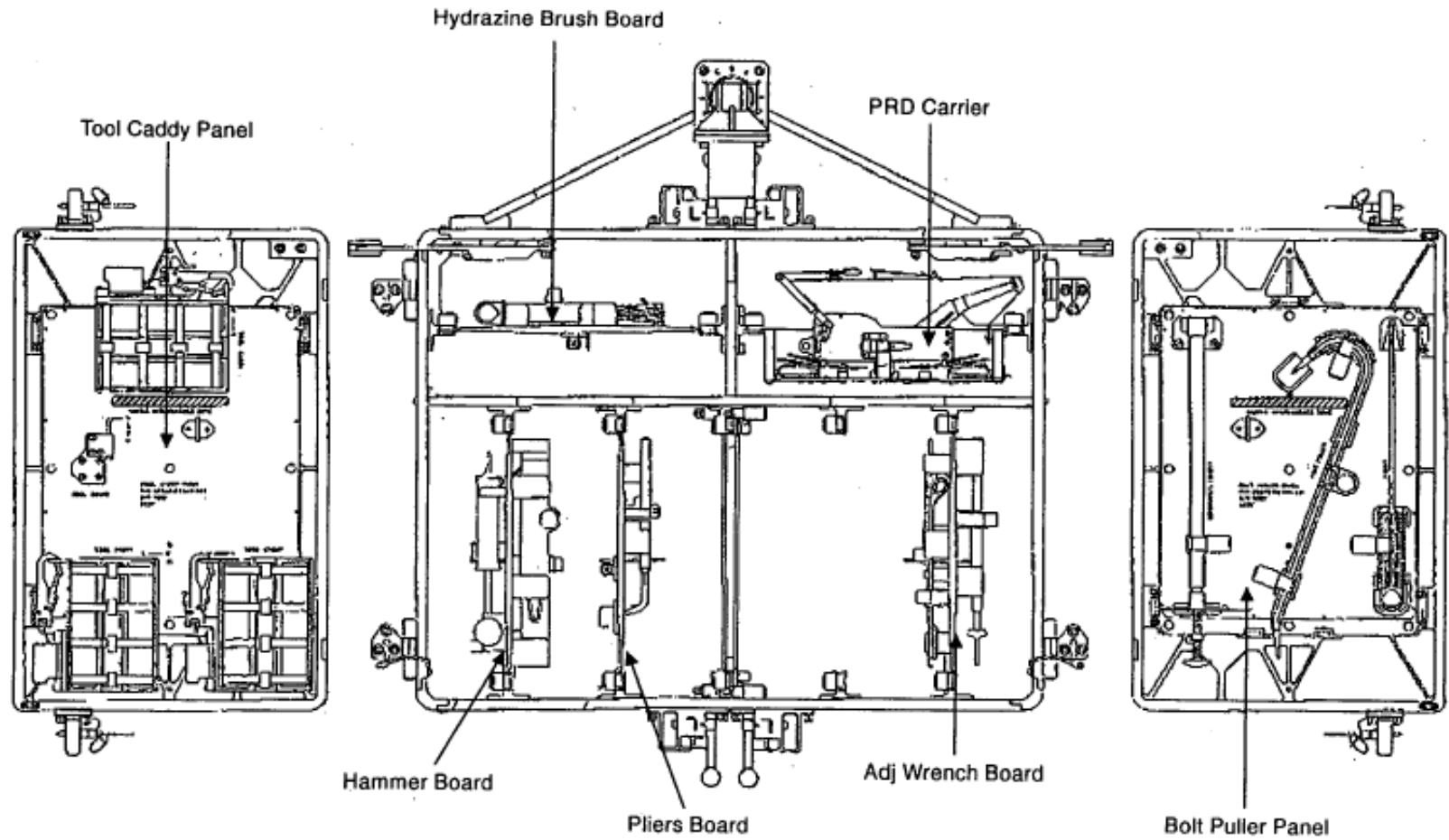
- A/L Toolbox: Slider feature located in center slot only (#3)
- Z1/CETA Toolbox: Slider feature located in all slots



# Z1 TOOLBOX INTERNAL LAYOUT



# AIRLOCK TOOLBOX INTERNAL LAYOUT



APFR MANAGEMENT – STS-123 (1JA)

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)	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
<b>Post STS-122</b>	CETA 1 WIF 4 [9,SS,F,12] Y/P [12,FF]	Lab WIF 6 [6,PP,L,12*] *might not be correct-got bumped	Stbd A/L tool box [6,XX,F,6]	Z1 WIF 08 [7,PP,B,6] TS installed at 4 o'clock points port/nadir	PMA1 WIF 2 [12,KK,F,6]	CETA 2 WIF 5 [12,PP,F,12] Y/P [12, FF]	Lab WIF 11 [11,QQ,A,12] Ingress aid	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
<b>STS-123 EVA 1</b>													
OTCM install	SSRMS (12,PP,F,6)					SLP WIF 4 (5,QQ,D,10)							
Cleanup	SLP WIF 1 (__,PP,F,6)					SLP WIF 3 (__,KK,G,4)							
<b>STS-123 EVA 2</b>													
SPDM arm install	SSRMS (12,PP,F,6)					SLP WIF 1 (9,KK,G,4) w/ingress aid	Move ingress aid to APFR 1						
Cleanup	CETA 1 WIF 4 [12,PP,F,6] Y/P [12,FF]												
<b>STS-123 EVA 3</b>													
OTP/THA/SPDM blankets, ORU transfers						SSRMS (12,PP,F,6) w/ingress aid							
Cleanup						ESP-2 WIF 2 (X,PP,F,6) w/ingress aid							
<b>STS-123 EVA 4</b>													
T-RAD DTO		Lab WIF 4 [1,TT,C,11]											
<b>STS-123 EVA 5</b>													
OBSS stow						S1 WIF 5 (10,TT,H,12) w/ingress aid							
OBSS Stow Cleanup						S1 WIF 1 (10,TT,H,12) w/ingress aid							
<b>Post STS-123</b>	CETA 1 WIF 4 [12,PP,F,6] Y/P [12,FF]	Lab WIF 4 [1,TT,C,11]	Stbd A/L tool box [6,XX,F,6]	Z1 WIF 08 [7,PP,B,6] TS at 4 o'clock	PMA1 WIF 2 [12,KK,F,6]	S1 WIF 1 (10,TT,H,12) ingress aid	Lab WIF 11 [11,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



## SAFETY TETHER CONFIGURATION – STS-123 (1JA)

	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 retraction issues during 10A EVA 4)	#73 s/n 1023 Lg-sm (AR written against this one)	#60 s/n 1008 Lg-sm  (LAS needs inspection prior to use)	#70 s/n 1020 Lg-sm  (LAS needs inspection prior to use)	#66 s/n 1016 Sm-sm	#26 s/n 1006 Lg-sm	#28 s/n 1008 Lg-sm	#21 s/n 1001 (Shuttle safety tethers)	#24 s/n 1004 (Shuttle safety tethers)
Post 122 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	INSIDE tether staging area	INSIDE tether staging area	N/A	N/A
122 stage	-----same-----							-----same-----			
Post 123 EVA 5	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

### 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

## EMU PREP FOR TPS REPAIR

DCM

### O2 ACTUATOR COVER INSTALLATION (5 min)

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

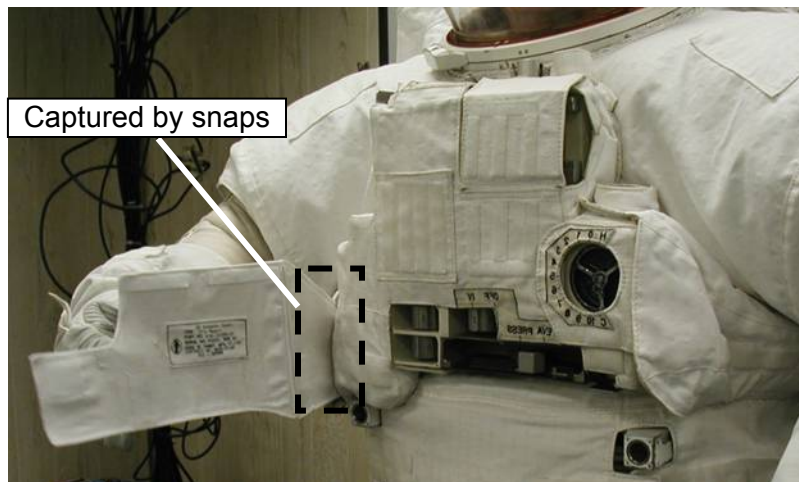


Figure 1 - O2 Actuator Attachment Point

### 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 lense covered with Teflon squares and Kapton tape

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
STS-123 CONSUMABLES TRACKING CUE CARD .....	FS CC 10-15
STS-123 BATTERY RECHARGE PLAN .....	FS CC 10-17

## 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(flr) 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	

TOP

**HOOK  
VELCRO**

**STS-123 CONSUMABLES TRACKING CUE CARD**

Crew Identifiers

EV1: Ln	EV3: Fm
EV2: Be	EV4: Rm

<b>SAFER Usage:</b>	use s/n 1006 and s/n 1007
<b>ERCA Usage:</b>	use s/n 16 and s/n 18
<b>PWR Usage:</b>	use 1012, 1023, 1025, 1026 in that order until drained
<b>Dump CWC:</b>	1059 for all EVAs

		EMU	LiOH/Metox (s/n)	EMU Battery (s/n)	HL Battery (s/n)	REBA (s/n)	PGT Battery (s/n)
<b>Pre-EVA 1</b>	Campout		0017 (Mtx) 0019 (Mtx)				
<b>FD 4: EVA 1</b>	EV1	3004 (Aft – SCU 1)	LiOH ~ launched in suit	2070 ~ launched in suit	1011, 1012	1003	1004
	EV4	3006 (Fwd – SCU 2)	LiOH	2065	1013, 1014	1011	1005
<b>Post EVA 1</b>			Regen Metox 0017, 0019		Recharge EVA 1 Batts in BSA *	Recharge EVA 1 Batts in BSA *	Recharge EVA 1 Batts in BSA *
<b>FD 5</b>				EVA 1 EMU Batts in BSA *			
<b>Pre-EVA 2</b>	Campout		0017 (Mtx) 0019 (Mtx)				
<b>FD 6: EVA 2</b>	EV1	3004 (Aft – SCU 1)	LiOH	2066	1015, 1017	1003	1006
	EV3	3003 (Fwd – SCU 2)	LiOH ~ launched in suit	2071 ~ launched in suit	1019, 1021	1005	1008
<b>Post EVA 2</b>			Regen Metox 0017, 0019		Recharge EVA 2 Batts in BSA *	Recharge EVA 2 Batts in BSA *	Recharge EVA 2 Batts in BSA *
<b>FD 7</b>				EVA 2 EMU Batts in BSA *			
<b>Pre-EVA 3</b>	Campout		0017 (Mtx) 0019 (Mtx)				
<b>FD 8: EVA 3</b>	EV1	3004 (Fwd – SCU 2)	0020 (Mtx)	2070	1011, 1012	1003	1004
	EV2	3008 (Aft – SCU 1)	0021 (Mtx)	2065	1013, 1014	1004	1005
<b>Post EVA 3</b>			Regen Metox 0020, 0021		Recharge EVA 3 Batts in BSA *	Recharge EVA 3 Batts in BSA *	Recharge EVA 3 Batts in BSA *

\* See Battery Recharge Plan for battery slot assignments in Battery Stowage Assembly

EVA-4a/123/O/B

(reduced copy)

FS CC 10-15

EVA/123/FIN

TOP  
BACK OF 'STS-123 CONSUMABLES TRACKING CUE CARD'

**HOOK  
VELCRO**

Crew Identifiers

EV1: Ln	EV3: Fm
EV2: Be	EV4: Rm

<b>SAFER Usage:</b>	use s/n 1006 and s/n 1007
<b>ERCA Usage:</b>	use s/n 16 and s/n 18
<b>PWR Usage:</b>	use 1012, 1023, 1025, 1026 in that order until drained
<b>Dump CWC:</b>	1059 for all EVAs

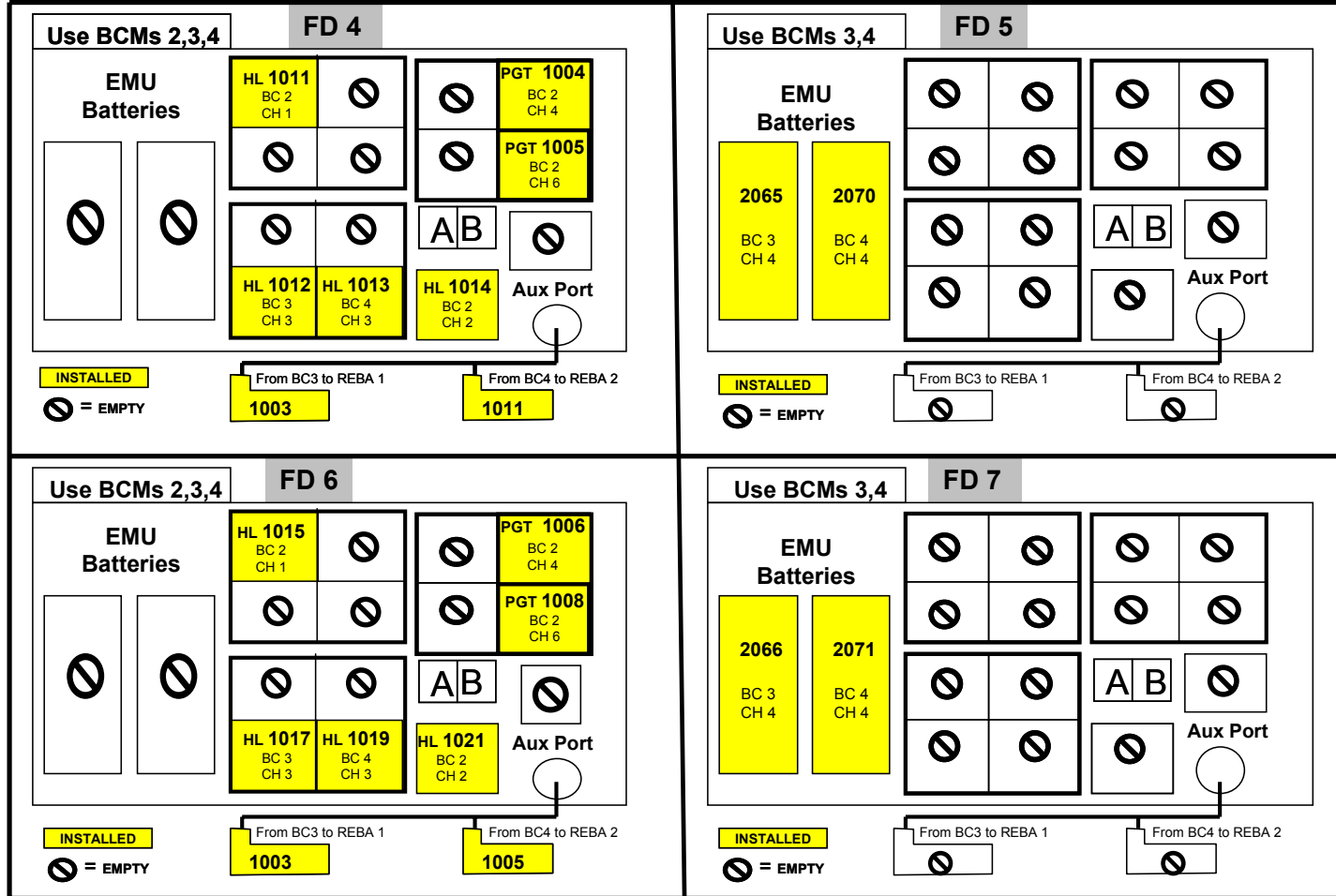
		EMU	LiOH/Metox (s/n)	EMU Battery (s/n)	HL Battery (s/n)	REBA (s/n)	PGT Battery (s/n)
<b>FD 9</b>			Regen Metox 0017, 0019	EVA 3 EMU Batts in BSA *			
<b>Pre-EVA 4</b>	Campout		0020 (Mtx) 0021 (Mtx)				
<b>FD 11: EVA 4</b>	EV2	3003 (Aft - SCU 1)	0015 (Mtx)	2066	1015, 1017	1005	1006
	EV3	3008 (Fwd - SCU 2)	0016 (Mtx)	2071	1019, 1021	1004	1008
<b>Post EVA 4</b>			Regen Metox 0015, 0016		Recharge EVA 4 Batts in BSA *	Recharge EVA 4 Batts in BSA *	Recharge EVA 4 Batts in BSA *
<b>Pre-EVA 5</b>	Campout		0015 (Mtx) 0016 (Mtx)				
<b>FD 13: EVA 5</b>	EV2	3003 (Fwd - SCU 2)	0012 (Mtx)	2070	1011, 1012	1005	1004
	EV3	3008 (Aft - SCU 1)	0013 (Mtx)	2065	1013, 1014	1004	1005
<b>Post EVA 5</b>			Regen Metox 0012, 0013				
<b>FD 14</b>			Regen Metox 0015, 0016				
<b>Return Config</b>	EV1	3006	Expended LiOH	2041			
	EV3	3008	Expended LiOH	2064			
<b>FD 15</b>			Regen Metox 0020, 0021				

\* See Battery Recharge Plan for battery slot assignments in Battery Stowage Assembly

TOP

**HOOK  
VELCRO**

### STS-123 BATTERY RECHARGE PLAN



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FS CC 10-17

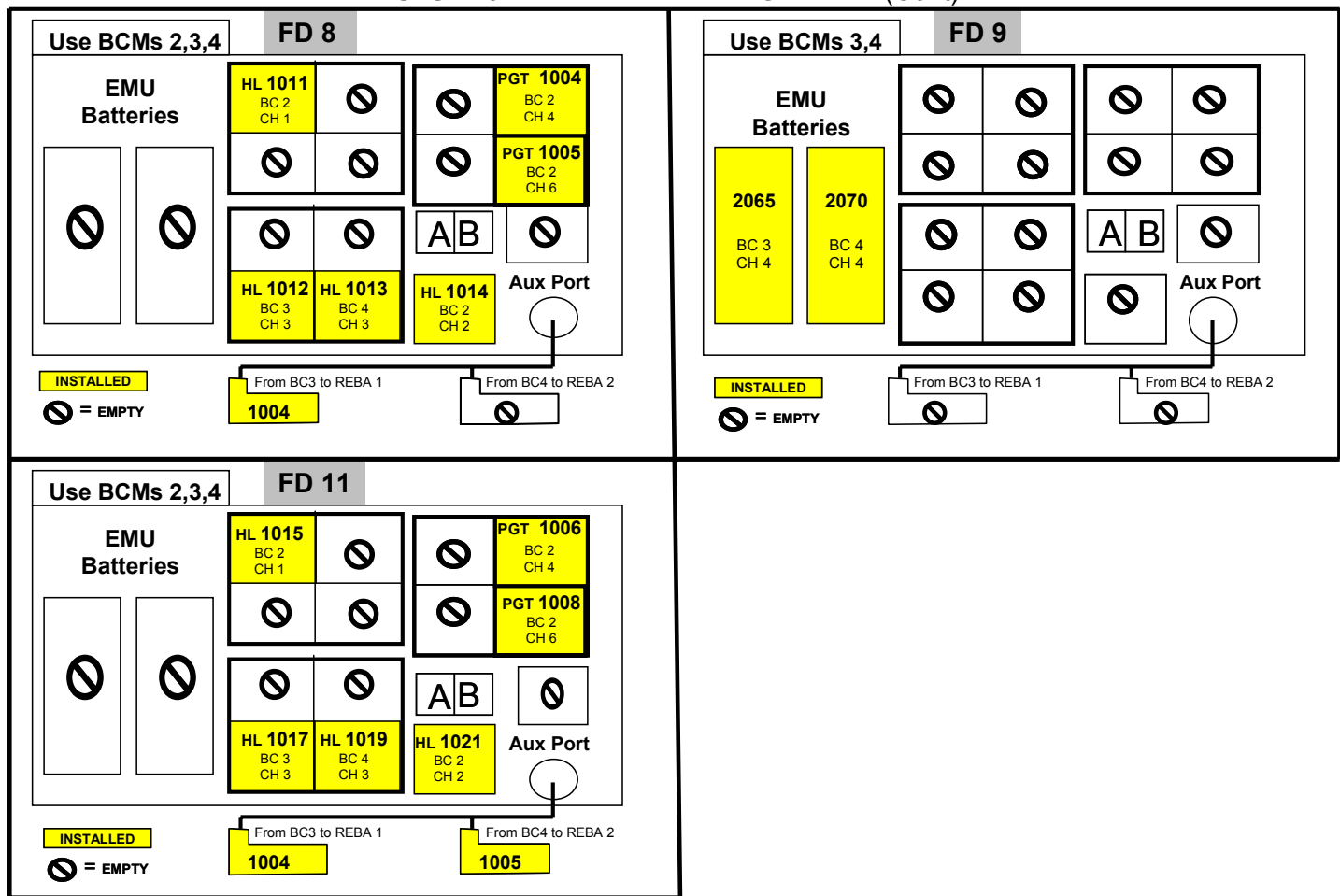
EVA-5a/123/O/A

EVA/123/FIN

TOP  
BACK OF 'STS-123 BATTERY RECHARGE PLAN'

**HOOK  
VELCRO**

**STS-123 BATTERY RECHARGE PLAN (Cont)**



(reduced copy)

FS CC 10-18

EVA-5b/123/O/A

EVA/123/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
SCU SWAP (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
BTA TREATMENT .....		12-19
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (POST SUIT DOFFING) .....		12-21
BTA PREP .....		12-21
BTA TREATMENT .....		12-21
EMU RESIZE .....		12-24
STS-123 NOMINAL EMU SIZING MATRIX.....	FS	12-27
STS-123 EMU CONTINGENCY RESIZE MATRIX.....	FS	12-28
EMERGENCY UNDOCK EVA TRANSFER CUE CARD.....	FS CC	12-30
EXPEDITED SUIT DOFFING CUE CARD .....	FS CC	12-31

**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:
- 2. PWR – BATT
- AW18H 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

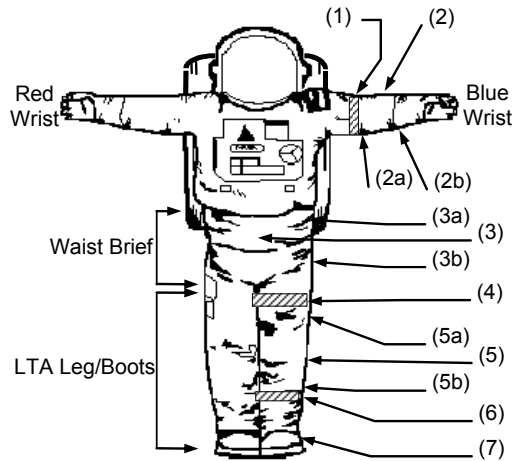
- DCM 4. FAN – OFF (expect FAN SW OFF msg, DISP – PRO)
- IV 5. Inform affected EV crewmember of impending comm loss
- DCM 6. PWR – SCU (7 sec)
- 7. PWR – BATT
- When power restart complete:
- 8. √Display – O2 POS XX, expect FAN SW OFF msg, DISP – PRO
- 9. As reqd, FAN – ON
- If display blank or locked 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-123 NOMINAL EMU SIZING MATRIX



### NOTE

Note any changes made in-flight to EMU size; record in EVA C/L

EMU	Helmet	HUT Size/ SEMU #	(1) Arm Sizing Ring	(2a) Arm Cam	(2) Lower Arm	(2b) Wrist Cam	PhaseVI Glove
Linnehan	1073	L/3004 (dn: 3006)	0.5 inch (s/n 138/139)	Short	06 (s/n 235/236)	Long	6LN (s/n 6278)
Behnken	1067	XL/3008	None	Short	02 (s/n 319/320)	Long	6WL (s/n 6201)
Foreman	1077	XL/3003 (dn: 3008)	None	Short	04 (s/n 343/344)	Long	6HD (s/n 6065)
Reisman	1069	L/3006	None	Short	00 (s/n 265/266)	Long	6FN (s/n 6076)

LTA	(3a) Brief Upper Cam	(3) Waist Brief	(3b) Brief Lower Cam	(4) Thigh Sizing Ring	(5a) Leg Upper Cam	(5) Leg Segment	(5b) Leg Lower Cam	(6) Leg Sizing Ring	(7) Boot/Insert
Linnehan	Long	01 (s/n 2048)	Short	None	Short	04 (s/n 163/164)	Long	1.5 inch (s/n 139/140)	02/03 (s/n 228)
Behnken	Short	01 (s/n 2081)	Short	0.5 inch (s/n 115/116)	Short	03 (s/n 185/186)	Long	1.5 inch (s/n 129/130)	02/None (s/n 213)
Foreman	Short	02 (s/n 2080)	Long	None	Short	02 (s/n 151/152)	Long	0.5 inch (s/n 132/133)	02/03 (s/n 220)
Reisman	Short	01 (s/n 2054)	Short	None	Short	01 (s/n 183/184)	Long	0.5 inch (s/n 124/125)	01/None (s/n 221)

Crew Options: Size (Serial #)	CCA/ CCEM	MAG	TCU top/ bottom	Comfort Gloves/ Wristlets	LCVG/ AVD/LVD/BLVD	OBS/Signal Conditioner	Boot Liner/Sock	Comments
Linnehan	04/327 (s/n 1181/1057)	711	XL/L	Lg, Thick [-12]/Yes	06/15/10/05 (s/n 3205) Leg Cuff Extension	pr:110 b/u:123	Thermax Liners [L], Poly Liners [L]	Fresnel lens: 1.0 diopter (-005) Plenum shifted right on LCVG approx 1 inch Modified Valsalva
Behnken	04/321 (s/n 1164/1056)	709	L/L	Med, Thick [-10]/Yes	04/14/07/05 (s/n 3161)	pr:111 b/u:113	Thermax Liners [L] Thermal Slipper (07) 3/8" heel pads, sides only	Fresnel lens: none Modified Valsalva
Foreman	04/323 (s/n 1171/1007)	711	L/L	Lg, Thin [-06]/Yes	06/16/08/05 (s/n 3182)	pr:101 b/u:118	Poly Liners [L] 1/2" heel pads, sides only	Fresnel lens: none Modified Croakie [L] Valsalva
Reisman	02/321 (s/n 1176/1031)	709	M/S	Flat Pattern [LE]/No	02/11/01/03 (s/n 3179)	pr:117 b/u:118	Poly Liners [L] Thermal Slipper (04) 1/4" heel pads, sides only	Fresnel lens: none Valsalva (2)

**STS-123 EMU CONTINGENCY RESIZE MATRIX**

1

<b>LOSS OF:</b>	<b>EV1 – Linnehan (Ln)</b>	<b>EV2 – Behnken (Be)</b>	<b>EV3 – Foreman (Fm)</b>	<b>EV4 – Reisman (Rm)</b>
Helmet	(1073) 1. Use on-orbit Helmet (1070) 2. May need to replace Valsalva 3. Install fresnel lens	(1067) 1. Use on-orbit Helmet (1070) 2. May need to replace Valsalva	(1077) 1. Use on-orbit Helmet (1070) 2. May need to replace Valsalva	(1069) 1. Use on-orbit Helmet (1070) 2. May need to replace Valsalva
CCA	(04/327-1181/1057) 1. Use on-orbit CCA (04/327-1183/1059)	(04/321-1164/1056) 1. Use on-orbit CCA (04/327-1183/1059)	(04/323-1171/1007) 1. Use on-orbit CCA (04/327-1183/1059)	(02/321-1176/1031) 1. Use on-orbit CCA (01/327-1195/1044)
LCVG	(06-3205) 1. Use Ln b/u LCVG (06-3206) 2. Transfer: biomed and dosimeter	(04-3161) 1. Use Fm/Be b/u LCVG (06-3178) 2. Transfer: biomed and dosimeter	(06-3182) 1. Use Fm/Be b/u LCVG (06-3178) 2. Remove thermal slippers 3. Transfer: biomed and dosimeter	(02-3179) 1. Use Rm b/u LCVG (02-3180) 2. Transfer: biomed and dosimeter 3. If LCVG dry, perform LCVG Fill
HUT/PLSS	(L-EMU 3004) 1. Use Rm HUT 3006 (L) 2. Install Ln arm sizing rings, lower arms, and gloves 3. Use Ln CCA, Helmet, LTA  <u>NOTE:</u> For this case, Fm will support EVA 1 in place of Rm	(XL-EMU 3008/3003) For EVA with Ln: 1. Use Fm HUT 3003 (XL) 2. Install Be lower arms and gloves 3. Use Be CCA, Helmet, LTA  For EVA with Fm: 1. Use Fm HUT (XL) 2. Install Be lower arms 3. Use Be CCA, Helmet, LTA <u>NOTE:</u> For this case, Fm will downsize to Large HUT	(XL-EMU 3003/3008) For EVA with Ln: 1. Use Be HUT 3008 (XL) 2. Install Fm lower arms and gloves 3. Use Fm CCA, Helmet, LTA  For EVA with Be, if Fm or Be HUT/PLSS failure (XL-EMU 3003/3008) 1. Use Ln HUT 3004 (L) 2. Install on-orbit arm sizing rings (0.5"-120/121) 3. Install FM lower arms 4. For gloves 6065 and 6066: Set arm segment cams to S/S For gloves 6224: Set arm segments to S/L 5. Use Fm CCA, Helmet, LTA	(L-EMU 3006) 1. For this case, Fm will support EVA 1 in place of Rm. No alternate HUT available
Arm Sizing Ring (1)	(0.5"-138/139) 1. Use on-orbit arm sizing rings (0.5"-149/150)	N/A	If using EMU 3004 (L): 1. Use arm sizing rings (0.5"-120/121)	N/A
Lower Arm Segment (2) and cams (2a/2b)	(06, S/L-235/236) 1. Use Ln b/u lower arm segments (06-311/312) 2. Verify cams: S/L	(02, S/L-319/320) 1. Use on-orbit lower arm segments (02-213/214) 2. Set cams: S/L	(04, S/L-343/344) 1. Use on-orbit lower arm segments (04-225/226) 2. Verify cams: S/L	(00, S/L-265/266) 1. Use on-orbit lower arm segments (00-261/262) 2. Verify cams: S/L

**STS-123 EMU CONTINGENCY RESIZE MATRIX (Cont)**

<b>LOSS OF:</b>	<b>EV1 – Linnehan (Ln)</b>	<b>EV2 – Behnken (Be)</b>	<b>EV3 – Foreman (Fm)</b>	<b>EV4 – Reisman (Rm)</b>
Gloves	(For loss of 6LN-6278) 1. Use Ln b/u gloves (6LN-6273) 2. Set arm segment cams: L/L (For loss of 6LN-6273) 1. Use Ln cont gloves (6NM-6131) 2. Set arm segment cams: S/L 3. Remove arm sizing rings	(For loss of 6WL-6201) 1. Use Be b/u gloves (6WL-6254) (For loss of 6WL-6254) 1. Use Be cont gloves (6WL-6246)	(For loss of 6HD-6065) 1. Use Fm b/u gloves (6HD-6066) (For loss of 6HD-6066) 1. Use Fm cont gloves (6HD-6224)  If using Ln HUT 3004 (L) 1. For Fm gloves 6HD-6065 and b/u gloves 6HD-6066, set arm segment cams: S/S 2. For Fm cont gloves 6HD-6224, set arm segment cams: S/L	(For loss of 6FN-6076) 1. Use Rm b/u gloves (6FN-6082) (For loss of 6FN-6082) 1. Use Rm cont gloves (6NF-6190(L), 6RH-6253(R)) 2. Set arm segment cams: S/S
Waist Brief (3) and cams (3a/3b)	(01, L/S-2048) 1. Use on-orbit waist brief (01-2053) 2. Verify waist brief cams: L/S 3. Install Ln leg segments, leg sizing rings and boots	(01, S/S – 2081) 1. Use on-orbit waist brief (01-2053) 2. Verify waist brief cams: S/S 3. Install Be thigh sizing rings, leg segments, leg sizing rings and boots	(02, S/L-2080) 1. Use on-orbit waist brief (02-2056) 2. Verify waist brief cams: S/L 3. Install Fm leg segments, leg sizing rings and boots	(01, S/S-2054) 1. Use on-orbit waist brief (01-2053) 2. Set waist brief cams: S/S 3. Install Rm leg segments, leg sizing rings and boots
Thigh Sizing Ring (4)	N/A	(0.5"-115/116) 1. Use on-orbit leg rings (0.5"-119/120)	N/A	N/A
Leg Segment (5) and cams (5a/5b)	(04, S/L-163/164) 1. Use Ln b/u leg segments (04-131) 2. Verify cams: S/L	(03, S/L-185/186) 1. Use on-orbit leg segments (03-205/206) 2. Verify cams: S/L	(02, S/L-151/152) 1. Use on-orbit leg segments (02-153/154) 2. Verify cams: S/L	(01, S/L-183/184) 1. Use on-orbit leg segments (01-149) 2. Verify cams: S/L
Leg Sizing Ring (6)	(1.5"-139/140) 1. Use on-orbit leg rings (1.5"-141/142)	(1.5"-129/130) 1. Use on-orbit leg rings (1.5"-141/142)	(0.5"-132/133) 1. Use on-orbit leg rings (0.5"-134/135)	(0.5"-124/125) 1. Use on-orbit leg rings (0.5"-134/135)
Boot/BSI (7)	(02/03-228) 1. Use on-orbit boots (02/03-214)	(02/none-213) 1. Use on-orbit boot (02/none-214) 2. Remove BSIs and toe caps from boots (214), temp stow	(02/03-220) 1. Use on-orbit boots (02/03-214)	(01/none-221) 1. Use on-orbit boots (01/none-203)

TOP

HOOK  
VELCRO

**EMERGENCY UNDOCK EVA TRANSFER CUE CARD** |

Remove from EMUs if time available:

1. Helmet Lights and EMU TVs
2. Metox Canisters (if installed)
3. REBA Batteries
4. ISS tethers and tools

Gather and transfer to Shuttle (listed in order of priority):

5. EMU (Ln) s/n 3004 until EMU reconfig, then 3006
6. EMU (Fm) s/n 3003 until EMU reconfig, then 3008
7. CCAs (Ln and Fm)
8. Gloves (Ln and Fm)
9. LCVG (Ln and Fm)
10. EMU Batteries (2) (s/n 2041 and 2064 desirable)
11. 85-ft Safety Tethers (2)
12. ECOK (Ln and Fm)
13. Adjustable Equipment Tethers (6)
14. EMU Servicing Kit (s/n 5004)
15. RETs (16) (Blue desirable)

EVA-6a/123/O/A

HOOK  
VELCRO

**EXPEDITED SUIT DOFFING CUE CARD**

I

**CAUTION**

Verify EV crew is clear of hatch mechanism

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

SAFER DOFFING (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. √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 the EMERGENCY UNDOCK EVA TRANSFER CUE CARD (opposite side)

EVA-6b/123/O/A

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## 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-123 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

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UNSCH/CONT  
EVA TASKS

# 1JA WORKAROUNDS CRIBSHEET

UNSCH/CONT  
EVA TASKS

Procedure	Failure	Work-Around Steps
<b>GENERIC</b>	<b>TA Clamps</b>	
	1. TA clamps fail to release	A. With handle up, press down on top of rounded clamp B. With handle up, use tether hook to pry drawhook from capture pin
	<b>NZGL Connectors</b>	
	2. Connector fails to release from softdock	A. Verify bail is in fully demated position (aft) B. Inspect connector/bail for FOD C. Check alignment/side loads/interference D. Wiggle/jiggle connector E. On MCC GO: Use EVA hammer or similar tool to gently tap bottom of connector
	3. Connector fails to softdock	A. Inspect: <ul style="list-style-type: none"> <li>▪ FOD</li> <li>▪ EMI band</li> <li>▪ Bend radius</li> <li>▪ Soft dock springs</li> <li>▪ O-ring seal</li> <li>▪ Connector keying features</li> </ul> B. Verify bail is in fully demated position (aft) C. Check alignment/side loads/torsion D. Wiggle/jiggle connector
	4. Connector pin bent	A. Report bent pin location to MCC B. Verify pin gauge with MCC; retrieve connector pin straightener, straighten
	5. Connector FOD	On MCC GO: obtain Connector Cleaner Tool to remove FOD (A/L staging bag)
	6. Connector EMI band bent	On MCC GO: obtain Needle Nose Pliers or Forceps to remove band
	7. Connector bail linkage failure	A. Pull (to demate) or push (to mate) on connector backshell to assist bail motion B. On MCC GO: Tether hooks or Vise Grips may be used for additional leverage on bail
	8. Connector soft dock spring bent	On MCC GO: obtain Needle Nose Pliers, attempt to remove bent spring
	9. Connector O-ring seal loose	A. Remove seal with tether hook B. On MCC GO: obtain Needle Nose Pliers to remove seal

## 1JA WORKAROUNDS CRIBSHEET (Cont)

Procedure	Failure	Work-Around Steps
	<b>APFR/IAPFR</b>	
	10. APFR/IAPFR fails to install into WIF	A. Verify APFR/IAPFR collar in install position B. Check for FOD in WIF or structural interference C. Attempt APFR install in alternate clocking and/or WIF position D. If APFR does not install (APFR failure), use another APFR
	11. Joint fails to actuate	A. Verify no load is applied to joint B. For pitch joint, push knob in during rotation C. Increase force applied to free joint
	12. Boot becomes stuck in APFR boot plate	Remove 7/16-in EVA bolts (3) on heel plate using EVA ratchet or <b>PGT: [B1 (12.0 ft-lb), CCW2 (30 RPM), MTL 30.5]</b> , 5 turns
	13. Boot becomes stuck in IAPFR boot plate	Remove 7/16-in EVA bolts on heel plate (2 per boot) using EVA ratchet or <b>PGT: [B2 (16.0 ft-lb), CCW2 (30 RPM), MTL 30.5]</b> , 4 turns
	<b>Safety Tether</b>	
	14. 85-ft or 55-ft safety tether fails to tend	A. Verify safety tether reel is unlocked B. Pull out small amount of cable, allow reel to retract while holding cable slightly tensioned C. Tap side of reel housing during retract D. Use alternate safety tether
	15. Crew hook fails on load alleviating side or red mark on load alleviating strap showing	Use Waist Tether to replace load alleviating strap; retrieve replacement safety tether
	<b>Torque Multiplier</b>	
	16. Torque multiplier fails to release from fitting	A. Verify torque multiplier anti-backlash in neutral, if not, <b>PGT: [RCW, MTL 30.5]</b> . Apply cw torque and push anti-backlash button to neutral position B. <b>PGT: [A5 (7.0 ft-lb), CCW2 30 RPM, MTL 30.5] - 5/32 Allen Drive:</b> Release torque multiplier contingency release band pin 20 turns (do not exceed 28 turns) C. When contingency band springs open, remove torque multiplier; return torque multiplier IVA
	<b>Scoop</b>	
	17. Scoop will not release from fitting	<b>PGT: [A2 (3.8 ft-lb), CCW2 (30 RPM), MTL 30.5] - 5/32 Ball-end Drive Assy:</b> Remove screws (non-captive) 5 turns
	<b>MUT EE</b>	
	18. MUT EE Jaws fail to release	TBD
	<b>Ball stack</b>	
	19. EECOM fails to release from ISS structure	Tether Ballstack to local handrail and leave outside
	20. EECOM fails to release from MUT EE	Leave together
	21. Ballstack fails to rigidize	Press on

# 1JA WORKAROUNDS CRIBSHEET (Cont)

Procedure	Failure	Work-Around Steps
	<b>PAD/KAD/SSBAD</b>	
	22. Release knob fails to rotate open	A. Verify knob in release position B. Attempt to rotate knob using 7/16-in Ratchet on knob's 7/16-in hex stud C. Release contingency release bar by rotating captive release bolts (2) PGT 7/16 - 6 in ext: A6, CCW2, 30.5; 5 turns
	23. Release knob fails to rotate closed	Verify knob in release position
	<b>TSA</b>	
	24. Latch fails to open	Release 7/16-in EVA bolt on latch bracket, rotate bracket clear of latch tongue
	25. Latch fails to close	Close remaining latches (3 of 4 required for landing)
	<b>Fluid QD Operations</b>	
	<b>Mating Ops</b>	
	26. QD fails to mate	A. Check for debris, damage, or crystals (if ammonia); verify release ring is retracted B. Check alignment; verify no side loading present
	27. Release ring snap back test fails	A. Push release ring forward B. Demate and remate QD
	28. Gap check fails (visual or FID gauge)	Retract release ring, demate/remate QD
	<b>Valve Ops</b>	
	29. Bail fails to actuate (to valve open)	A. Check for debris, damage, or crystals (if ammonia); depress button, attempt to actuate B. Retrieve and use QD bail drive lever tool
	30. Detent button fails to pop up after bail actuation (to valve open)	A. Neutralize sideloads, apply greater opening force to QD bail handle B. Contact MCC for use of QD bail drive lever tool to apply greater force
	31. Detent button fails to depress	A. Verify locking collar fully rotated B. Push bail handle fwd (to open) to relieve load on button while depressing detent button <ol style="list-style-type: none"> <li>1. If button depresses, vent by pulling bail aft until release ring covers aft white band</li> <li>2. Push bail fwd to valve open; check button depresses</li> </ol> C. On MCC GO: Retrieve QD bail drive lever tool to push bail fwd <ol style="list-style-type: none"> <li>1. Repeat step B with the QD bail drive lever tool</li> </ol> D. Contact MCC to reduce NH3 temperature at affected QD, if possible E. On MCC GO: Install QD button depress tool (BDT)
	32. Bail fails to actuate or detent button fails to pop up after actuation (to valve close)	A. Inspect QD for retaining wire protrusion B. Neutralize possible side loading C. Depress button, increase force on bail D. Obtain and use QD bail drive lever tool

**CAUTION**  
Handle may kick back when button is depressed and pressure is built up in spring cavity from a leaking primary seal

## 1JA WORKAROUNDS CRIBSHEET (Cont)


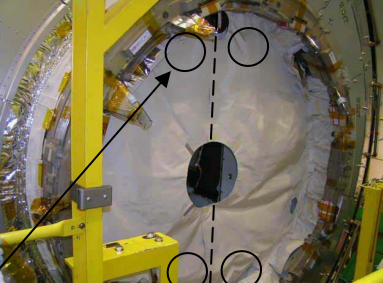
Procedure	Failure	Work-Around Steps
	<b>Demating Ops</b>	
	33. Female QD fails to demate	<ul style="list-style-type: none"> <li>A. Verify release ring is retracting fully while attempting to demate</li> <li>B. Verify line clamps are released</li> <li>C. Verify locking collar has been successfully rotated under detent button (for ½-in, ¾-in, 1-in QDs) – verifies button is all the way up</li> <li>D. For 1.5-in QD, verify trigger linkage is still attached to release ring; if not re-attach</li> <li>E. Neutralize sideloads or manipulate flexhose to relieve mating forces on female QD</li> <li>F. Apply greater retraction force to release ring and/or greater removal force to female QD while neutralizing sideloads</li> <li>G. Contact MCC for use of QD Release Tool (QRT) to apply greater force</li> </ul>
	34. Bootie fails to remain securely closed	Install wire tie around bootie to keep QD fully covered
	35. After demate, male QD leaks	Remate female QD to male and open valve (bail forward) or press with nominal procedure and have IV safe system? <ul style="list-style-type: none"> <li>1. Depress button and use significant force to push bail forward, then release button</li> <li>2. With QD in open position apply significant force to end of the female QD in back and forth, up and down directions</li> <li>3. Attempt to close valve</li> <li>4. Demate QDs, and inspect</li> </ul>
	36. Frozen ammonia present on female/male QD	<ul style="list-style-type: none"> <li>A. Leave QD exposed to vacuum; wait maximum of 5 min for sublimation (check periodically)</li> <li>B. If ammonia still present after 5 min, continue with operation</li> </ul>
	<b>SPDM GENERIC</b>	
ARM/BODY KA	37. Arm/body KA umbilical does not release	<ul style="list-style-type: none"> <li>A. Ensure PIP pins/EDFs are clear of lug/clevis</li> <li>B. "Peel away" KA umbilical from magnetic soft-dock</li> </ul>
	38. Arm/Body KA does not attach to landing bracket	<ul style="list-style-type: none"> <li>A. Insert all possible PIP pins; 3 required for SLP return (loose PIP pins must be cut free and trashed)</li> <li>B. Cut KA umbilical with compound cutters and trash</li> </ul>
MATE/DEMATE CONNECTORS	39. Mate/demate connector does not demate prior to KA removal	<ul style="list-style-type: none"> <li>A. Torque cw, then increase torque (5.0 ft-lbf max)</li> <li>B. Remove fasteners, re-attempt with KA still in place, inspect for FOD or damage</li> <li>C. Remove KA with connector engaged</li> </ul>
	40. Mate/demate connector does not mate	<ul style="list-style-type: none"> <li>A. Torque ccw, then increase torque (5.0 ft-lbf max)</li> <li>B. Untorque EDFs (leave inserted in lug/clevis), wiggle OTCM/Arm, retry</li> <li>C. Remove OTCM/Arm and inspect/cycle connectors, reseal OTCM/Arm, engage EDFs, retry mate</li> </ul>

## 1JA WORKAROUNDS CRIBSHEET (Cont)

Procedure	Failure	Work-Around Steps
EDFs	41. OTCM or shoulder EDF does not release with recommended torque	<ul style="list-style-type: none"> <li>A. Increase torque to B7 (25.5 ft-lb) for one turn only. Continue release at nominal setting</li> <li>B. Increase torque to 30.5 ft-lb (PGT ratchet mode) for one turn only. Continue release at nominal setting</li> <li>C. Remove EDF with prybar (only if head not free spinning)</li> </ul>
	42. OTP EDF does not release with recommended torque	<ul style="list-style-type: none"> <li>A. Increase torque to 30.5 ft-lb (PGT ratchet mode) for one turn only. Continue release at nominal setting</li> <li>B. Remove EDF with prybar (only if head not free spinning)</li> </ul>
	43. EDF cannot be removed from lug/clevis after untorqued	<ul style="list-style-type: none"> <li>A. Twist outer washer (lanyard washer) back and forth while pulling outward</li> <li>B. Verify lanyard not snagged</li> <li>C. Drive EDF ccw 2 turns (start EDF by hand when re-installing)</li> <li>D. Gently tap along EDF major axis with back of equipment hook or hammer (EDF head must not be free spinning), and pull outward with lanyards</li> <li>E. Use equipment hook over EDF bolt head to remove (EDF head must not be free spinning)</li> <li>F. EVA prybar (EDF head must not be free spinning)</li> </ul>
	44. Cannot insert EDF into lug/clevis interface	<ul style="list-style-type: none"> <li>A. Verify lug/clevis fully seated</li> <li>B. Twist EDF bolt head by hand to seat on tip hex head</li> <li>C. Drive EDF 2 add'l turns ccw, retry insertion, verify head not free spinning</li> <li>D. Remove EDF and verify collets not expanded</li> <li>E. Cut EDF lanyards and replace failed EDF with spare EDF, retry</li> </ul>
	45. OTCM/shoulder EDF are not captive after all 4 EDFs at final torque	<ul style="list-style-type: none"> <li>A. Increase torque to B7 (25.5 ft-lb), ensure fully seated</li> <li>B. Increase torque to 30.5 ft-lb (PGT ratchet mode), ensure fully seated</li> <li>C. Pull EDF and re-insert (loosen collets as reqd), ensure fully seated, retry</li> <li>D. Increase torque on all EDFs to 30.5 ft-lb (PGT ratchet mode), ensure fully seated</li> <li>E. Cut EDF lanyards and replace failed EDF with spare EDF, retry</li> </ul>
ROLL CLAMP	46. Roll clamp does not release with recommended torque	<ul style="list-style-type: none"> <li>A. Increase torque to B7 (25.5 ft-lb), one turn only</li> <li>B. Increase torque to 30.5 ft-lb (PGT ratchet mode), one turn only</li> <li>C. Inspect bolt for damage</li> </ul>
PIP PINS	47. KA Umbilical/Temp stow bracket PIP pin will not release/install	<ul style="list-style-type: none"> <li>A. Twist PIP pin ring and retry</li> <li>B. Gently tap PIP pin head w/back of equipment hook or hammer</li> <li>C. Use equipment hook or EVA prybar to release</li> </ul>



# 1JA WORKAROUNDS CRIBSHEET (Cont)

Procedure	Failure	Work-Around Steps
<b>EVA 1</b>	<b>JLP</b>	
 <p>Grounding wires (under cover)</p> <p>Velcro for IVA Cover to attach to Structure side</p>	<p>1. PCBM IVA MLI cover pulled free of Velcro</p> 	<div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><b>WARNING</b></p> <p>Do not touch PCBM sealing surface after Contamination covers are removed</p> </div> <p>A. Attempt to re-seat Velcro on IVA MLI cover</p> <p>B. On MCC GO, obtain Compound Cutter from C/Lk bag #3. Attempt to remove IVA MLI cover (2 halves) from PCBM and cut grounding wires (4 – 2 zenith, 2 nadir)</p>
	<p>2. LTA cable connector cap(s) are missing from cable stowage platform in PLB or cannot be installed</p>	<p>A. If one cap is available, install on J7151</p> <p>B. If cap cannot be installed on J7151: Disconnect connector from back side of connector bracket and wire tie to adjacent connector</p> <p>C. Wire tie cap to bracket structure or adjacent cap</p> <p>D. On MCC GO, obtain connector cap(s) from PROX GPS Ant (ISS zenith surface of JLP) and mate to JLP LTA connector(s)</p>
<b>SPDM – OTCM INSTALL</b>		
	<p>3. OHT does not engage</p>	<p>A. Re-clock OHT, retry</p> <p>B. Handle OTCM via shroud and socket restraint plate or use alternate OHT from C/Lk bag #3</p> <p>C. Once OTCM removed from FSE, attempt to insert OHT into opposite OHT socket</p>
	<p>4. OTCM KA umbilical tie-down bolt does not release with recommended torque</p>	<p>A. Increase torque to B7 (25.5 ft-lb)</p> <p>B. Increase torque to 30.5 ft-lb via PGT in ratchet mode</p> <p>C. Leave in place, and maneuver OTCM out of FSE without removing KA umbilical</p>
	<p>5. OTCM KA umbilical cannot be restrained via Velcro patch on SAPH or interferes with OTCM/Arm removal</p>	<p>A. Verify OTCM aligned with SAPH Velcro</p> <p>B. If OTCM still in place, leave KA restrained via umbilical until OTCM removal complete</p> <p>C. After OTCM removed, pass OTCM to EV2; Reinstall KA on FSE via tie-down bolt <b>PGT: [B1 12.0 ft-lb, CW2, 30.5], 7.25 turns</b></p>
	<p>6. OTCM KA umbilical tie-down bolt does not engage or fully install</p>	<p>A. Increase torque to B7 (25.5 ft-lb)</p> <p>B. Increase torque to 30.5 ft-lb (PGT ratchet mode), ensure fully seated</p> <p>C. Restrain KA with tether (see tie-down plan, FS 16-59)</p> <p>D. After SLP tasks complete on EVA 3, cut cable and bring KA inside</p>
	<p>7. OTCM cannot be installed on wrist</p>	<p>A. Pull all EDFs, inspect for FOD, and retry ("wiggle" OTCM to align all EDFs)</p> <p>B. If EDF interference is noted, attempt to pull interfering EDF from hole</p> <p>C. If no joy, cut EDF lanyards to fully remove interfering EDFs, one EDF at a time, and retry</p>

## 1JA WORKAROUNDS CRIBSHEET (Cont)

Procedure	Failure	Work-Around Steps
	<b>SPDM – OTCM INSTALL (Cont)</b>	
	8. Socket restraint plate does not release with recommended torque	A. Increase torque to B7 (25.5 ft-lb), one turn only B. Increase torque to 30.5 ft-lb (PGT ratchet mode), one turn only
	9. OHT does not release from OTCM	A. Gently tap OHT button with hammer while pulling out from OTCM B. Leave OHT installed in OTCM, tethered to socket restraint place C. At the beginning of EVA 2, wrap ORU bag (not the OTCM sock) over OTCM and secure to arm
<b>EVA 2</b>	<b>SPDM – ARM REMOVE/INSTALL</b>	
	1. Arm boom EDFs not captive in landing location after recommended torque applied	A. Pull EDF and re-insert, ensure fully seated, retry B. Increase torque to B2 (16.0 ft-lb) C. Cut arm boom EDF lanyards and trash EDF
	2. Arm does not release from FSE	Verify all FSE and blankets clear, retry. "Wiggle" arm out of FSE
	3. Cannot secure Arm in temp stow bracket	A. Pull all PIP pins and retry ("wiggle" arm to align all PIP pins); 3 of 4 PIP pins required B. Stow arm in opposite arm's temp stow C. Per MCC instruction, Secure arm to alternate tie-down location
	4. Arm does not release from temp stow bracket	A. "Peel away" arm from magnetic soft-dock B. Gently tap PIP pin head with back of equipment hook or hammer C. EVA prybar on PIP pins
	5. Arm cannot be installed on body	A. Verify EDFs clear of structure B. Pull all EDFs, inspect for FOD, and retry ("wiggle" Arm to align all EDFs) C. If EDF interference is noted, attempt to pull interfering EDF from hole D. If no joy, cut EDF lanyards to fully remove interfering EDFs, one EDF at a time, and retry
	6. Cannot release body tie-down bolt(s)	Increase torque using ratchet wrench
	7. Body will not lock at 60 deg	A. Ensure that body rotation J-lock is not engaged and pin ready to snap into place B. "Wiggle" body while attempting to push in body rotation lock pin C. On MCC GO, secure body in 60 deg position with LDTDT from body tether point above OTP to SLP HH 0014

## 1JA WORKAROUNDS CRIBSHEET (Cont)

Procedure	Failure	Work-Around Steps
<b>EVA 3</b>	<b>OTP/THA INSTALL</b>	
	1. Cannot untorque OTP hinge pin	A. Increase torque to B7 (25.5 ft-lb), one turn only B. Increase torque to 30.5 ft-lb (PGT ratchet mode), one turn only
	2. Cannot untorque OTP FSE bolts	FSE OTP 2: A. Increase torque to 30.5 ft-lb (PGT ratchet mode) B. Attempt to release FSE OTP 1 at first, at nominal setting  FSE OTP 1: A. Increase torque to 30.5 ft-lb (PGT ratchet mode) B. Use ratchet wrench to break torque
	3. Cannot berth OTP to body	A. Verify hinge pin is clear B. Pull all EDFs, inspect for FOD, verify soft dock tab deflection, and retry ("wiggle" OTP to align all EDFs) C. If EDF interference is noted, attempt to pull interfering EDF from hole D. If no joy, cut EDF lanyards to fully remove interfering EDFs, one EDF at a time, and retry E. Engage OTP hinge pin, and soft dock Secure OTP with adjustable tether
	4. Cannot insert hinge pin	A. "Wiggle" hinge pin to work into place and retry B. Verify lanyard not wrapped around shaft C. Cut hinge pin lanyard and bring inside
	5. Cannot release THA FSE bolt T1	A. Increase torque to B7 (25.5 ft-lb), one turn only B. Increase torque to 30.5 ft-lb (PGT ratchet mode), one turn only
	6. Cannot release THA FSE bolt T2	A. Increase torque to B7 (25.5 ft-lb) for one turn only B. Increase torque to 30.5 ft-lb (PGT ratchet mode)
	7. Cannot berth THA on body	Pull THA clear and inspect interfaces, verify interface pin alignment, "wiggle" THA into V-guides
	8. Cannot secure FSE T1 in stowage position	A. Increase torque to B5 (22.0 ft-lb) B. Secure to structure with adjustable tether
	9. Cannot move RMCT PIP pins to "stow" posn	Gently tap RMCT PIP pin button with back of equipment hook or hammer while pulling out from RMCT holster
	10. Cannot release SET launch restraints	A. Increase torque to B7 (25.5 ft-lb), one turn only B. Increase torque to 30.5 ft-lb (PGT ratchet mode), one turn only
	<b>CLPA INSTALL</b>	
	11. Cannot keep connector cover clear of CLPA during install	Cut connector cover blanket free from SPDM
	12. Cannot berth CLPA	Pull CLPA clear, inspect FOD, "wiggle" CLPA into V-guide and retry

# 1JA WORKAROUNDS CRIBSHEET (Cont)

Procedure	Failure	Work-Around Steps
	<b>SLP CLEANUP</b>	
	13. Cannot stow roll clamp	A. Verify Velcro strap not interfering B. Increase torque to B5 (22.0 ft-lb) C. Secure clamp in closed position with wire tie D. Secure clamp in open position with wire tie
	<b>FRAM OPERATIONS</b>	
	14. Primary FRAM bolt fails to release from sidewall carrier	A. Increase PGT settings to: B2, CCW2, 30.5 for 1 turn only to break torque, return PGT settings to: A4, CCW2, 30.5 B. If no joy, engage contingency locking pins (4) to secure ORU for ride home (see procedure below). 4/4 cont pins required for landing loads. (Consider egressing arm for lower contingency pin access)
	15. Primary FRAM bolt fails to engage on ESP2	A. Verify active FRAM fully seated on passive FRAM, check for FOD, back out primary FRAM bolt fully with PGT settings: A7, CCW2, 30.5; re-attempt engagement with PGT settings: A7, CW2, 30.5 B. If no joy, engage contingency locking pins (4) (see procedure below). 3/4 cont pins required for on-orbit loads
	16. Contingency locking pin installation	A. FRAM FWD Cont Pins: PGT settings: A4, CW2, 30.5, TBD turns (see equation below for turns) Can increase PGT to B2 for 1 turn only if A4 no joy B. FRAM AFT Cont Pins: PGT settings: B1, CW2, 30.5, TBD turns (see equation below for turns)
		<div style="border: 1px solid black; padding: 5px;"> <p><u>Fwd Cont Pins:</u>  <math>Turns = 14.11 - (1.25 \times \text{Primary bolt turns achieved})</math></p> <p><u>Aft Cont Pins:</u></p> <ul style="list-style-type: none"> <li>▪ The rear cont pin can be installed if the primary turn count is 6.5 turns or less</li> <li>▪ With greater than 6.5 turn on the primary bolt, the cont pin is not needed, and in some cases where most turns have been engaged by the primary bolt, cannot be installed</li> <li>▪ <math>Turns = 16.858 - (1.25 \times \text{Primary bolt turns})</math></li> </ul> </div> <p><b>NOTE:</b> 4 of 4 contingency pins required for PLB, 3 of 4 required for ESP2 or EPF</p>

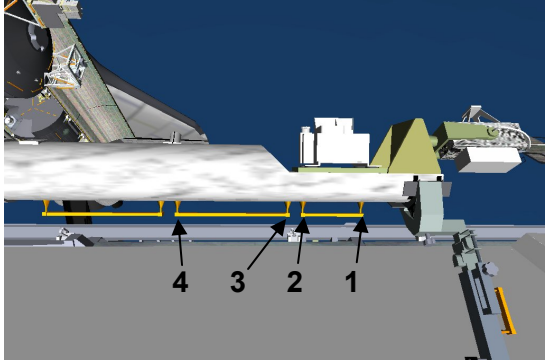
## 1JA WORKAROUNDS CRIBSHEET (Cont)

Procedure	Failure	Work-Around Steps
	<b>MISSE 6</b>	
	17. Sidewall carrier clamp will not release	A. Tether to latch and release clamp hinge bolt (just zenith of carrier HH) <b>PGT 7/16 - 6 in ext: B1, CCW2, 30.5</b> (96 turns) B. Discard latch and bolt in trashbag
	18. Sidewall carrier clamp will not latch in landing position	A. Tether to latch and release clamp hinge bolt (just zenith of carrier HH) <b>PGT 7/16 - 6 in ext: B1, CCW2, 30.5</b> (96 turns) B. Discard latch and bolt in trashbag
	19. PEC Dust cap fails to release	Increase torque. Use tether hook on tether point for leverage
	20. Wing tab connector fails to mate	A. Verify wingtab in disengaged posn prior to installation B. Verify connector fully seated C. Inspect: <ul style="list-style-type: none"> <li>▪ FOD</li> <li>▪ EMI band</li> <li>▪ Bend radius</li> <li>▪ Connector keying features</li> </ul> D. Check alignment/side loads/torsion
	21. PEC Dust cap fails to install on LWAPA dummy connector	Discard cap in small trash bag
	22. PEC PIP pin will not release to open PEC	Strike detent end of PIP pin (end opposite pull ring) with tether hook, retry
	23. PEC PIP pin used to restrain PEC closed will not release	A. Strike detent end of PIP pin (end opposite pull ring) with tether hook, retry B. Close PEC halves as far as possible and restrain with wire tie or adj eq tether
	24. PEC can not be restrained open with PIP pin(s)	A. One PIP pin is sufficient to restrain the PEC open B. If both PIP pins fail, secure PEC open by attaching wire ties or adjustable equipment tethers around the 2 parallel HHs
	25. Clamp PIP Pin will not release for PEC install	Strike detent end of PIP pin (end opposite pull ring) with tether hook, retry
<b>EVA 4</b>	<b>RPCM R&amp;R</b>	
RPCM	1. RPCM jacking bolt will not release	A. Verify socket is fully installed on the bolt (releases the anti-rotation locking tangs) B. Increase PGT setting to: B1, CCW2, 30.5
	2. Spare RPCM did not achieve full turns (6 turns)	A. Verify RET hook installed correctly B. Remove RPCM with PGT settings: A7, CCW2, 30.5, verify no FOD C. Reattempt installation with PGT settings: A2, CW2, 30.5 D. If no joy, contact MCC-H
	3. Status indicator did not travel to LOCK	As long as torque and turns achieved, no action
T-RAD	4. If no flow	Verify gun in FLOW and OPEN, report pressure, verify gun piston motion when trigger depressed
	5. T-RAD knob will not install in VENT port	Install knob in STOW port (~5 turns cw to hard stop)

## 1JA WORKAROUNDS CRIBSHEET (Cont)

Procedure	Failure	Work-Around Steps
<b>EVA 5</b>	<b>OBSS KAU INSTALL</b>	
	1. Stanchion bolt does not release from launch position	A. Increase torque <b>PGT: [B7 (25.5ft-lb), CW2, 30.5]</b> , for 1 turn only B. PGT-OFF, place in manual ratchet mode RCW, 30.5 ft-lb MTL for one turn only
	2. PGT socket comes off avionics stanchion bolt	A. Attempt to reengage bolt B. Remove socket from PGT; engage socket on stanchion bolt then put back on PGT
	3. Avionics box stanchion bolt does not engage truss at least 7 turns	<b>NOTE</b> To meet EVA handling loads (45 lb) a minimum of 4 turns is required. To meet on-orbit acceleration loads (0.4 g) a minimum of 6 turns is required. To meet EVA inadvertent kick loads (125 lb) a minimum of 9 turns is required  A. Release stanchion bolt, verify alignment and reattempt B. Increase torque <b>PGT: [B7 (25.5ft-lb), CW2, 30.5]</b> , re-attempt install C. Tether box to S1 HH 3289 and 3290 with adjustable equipment tethers (see tie-down plan)
	4. KAU Stanchion soft dock spring plungers seizes or fails to depress (unable to soft dock stanchion)	<b>NOTE</b> Tilted install may allow one spring plunger to depress easing soft-dock installation. Process of driving bolt into threaded boss will create force that will cause spring plungers to depress without any risk to hardware  A. Attempt soft-dock installation slightly tilted (~30 deg) and apply downward pressure as stanchion is rotated toward vertical B. Drive bolt until it drops from launch position and reaches truss threads (~10 turns). Ensure proper alignment and start of thread engagement C. Continue driving bolt down until fully installed D. Use EVA probe tool to depress plungers
	<b>KAD INSTALL</b>	
	5. KAD release knob fails to rotate open	A. Verify knob J-lock not engaged B. Attempt to rotate knob hex stud; <b>PGT 7/16 - 6 in ext: AX, CCW2, 30.5</b>
	6. KAD fails to install on OBSS	A. Verify KAD tether point is ISS port B. Verify KAD in SD, knob J-lock not engaged C. If soft dock does not engage, rotate knob ccw until soft dock engages D. Inspect for FOD E. Use finger to slide latch over striker bar F. Attempt to rotate knob hex stud; <b>PGT 7/16 - 6 in ext: AX, CW2, 30.5</b>

# 1JA WORKAROUNDS CRIBSHEET (Cont)

Procedure	Failure	Work-Around Steps
	<p><b>OBSS STOW</b></p> <p>7. OBSS fails to mate to SSBAD</p>	<p>A. Verify SSBAD centered between striker bar stand-offs</p> <p>B. Verify SSBAD in SD, knob J-lock not engaged</p> <p>C. If soft dock does not engage, rotate knob CCW until soft dock engages</p> <p>D. Inspect for FOD</p> <p>E. Use finger to slide latch over striker bar</p> <p>F. Attempt to rotate knob hex stud;  <b>PGT 7/16 - 6 in ext: AX, CW2, 30.5</b></p>
	<p>8. Cannot align OBSS striker bar with outboard stanchion</p>	<p>A. Release Y-slider PIP pin, retry</p> <p>B. Perform OUTBOARD OBSS STAND ALIGNMENT:</p> <ol style="list-style-type: none"> <li>1. <b>PGT [B3 18.4 ft-lb, CW2 30 RPM, MTL 30.5] 6 ext 7/16</b>; drive clamp 'bolt 1' – 13.8 turns</li> <li>2. If OBSS outboard striker bar not captured, give EV3 GO to capture</li> <li>3. Verify OBSS captured to SSBAD</li> <li>4. <b>PGT [B3 18.4 ft-lb, CW2 30 RPM, MTL 30.5] 6 ext 7/16</b>; drive clamp 'bolt 1' ~13.8 turns</li> <li>5. Verify OBSS stand fully clamped to trunnion (view clamping mechanism through OSE cover slot)</li> </ol>
	<p>9. Clamp 'bolt 1' fails to release/engage</p>	<p>Increase torque to B7</p>
	<p>10. OBSS cover grounding PIP pin will not install in HH stanchion</p>	<p>A. Verify grounding cable in line w/HH</p> <p>B. Re-attempt on another HH stanchion (attempt in the following order: 2, 3, 4, 1).  <u>NOTE:</u> additional cable may needed to be pulled from pouch for location 4. ~10 lb force required</p> <p>C. Uncoil cable excess cable from pouch and tear restraint stitching if additional cable length is required</p> 

## 1JA WORKAROUNDS CRIBSHEET (Cont)

Procedure	Failure	Work-Around Steps
	<b>TBA INSTALL</b>	
	11. MLI Cover Inboard Bolt will not break initial torque	A. Increase PGT setting: [B7 (25.5 ft-lb), CCW2, 30.5], reattempt for 1 turn, then return to original torque setting of [A6 (8.3), CCW2, 30.5] B. If free spinning nut plate suspected: <ol style="list-style-type: none"> <li>1. Retrieve vise grips from Staging Bag</li> <li>2. Attach vise grips to bolt head</li> <li>3. Turn bolt ccw while applying gentle pull force (do not fail bolt)</li> </ol>
	12. 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 fastener covers, if one fastener in each pair is engaged then 3 of 6 is the min)



## MANUALLY OPEN/CLOSE CBM PETAL (00:30)

Objective: To manually open/close radial Common Berthing Mechanism (CBM) petal via EVA due to CBM contingency

IV/SSRMS	EV1	EV2
	<div data-bbox="758 321 1264 415" style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> During any CBM operation, avoid contact with sealing surface</p> </div> <p><u>OPEN PETAL</u></p> <ol style="list-style-type: none"> <li>1. Configure/set up APFR and tools as reqd; transfer to worksite</li> </ol> <div data-bbox="758 570 1220 664" style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Do not use petal(s) as hand hold until launch restraints have been engaged</p> </div> <ol style="list-style-type: none"> <li>2. Engage first petal launch restraint for failed petal, push button in</li> <li>3. <b>PGT [A6, CCW2, 30.5]-6 Ext 7/16:</b> Release roller link release bolt (inner-most, one going thru petal) until capture latch disengaged, up to 12-13 turns</li> </ol> <p style="text-align: center;"><u>NOTE</u> Visually verify capture latch tip is no longer engaged on petal roller link</p> <ol style="list-style-type: none"> <li>4. <b>PGT [A6, CW2, 10.5]-6 Ext 7/16:</b> Retighten roller link release bolt up to 12-13 turns</li> <li>5. While restraining petal, release first launch restraint (adj tether strap)</li> <li>6. Slowly, allow petal to open</li> <li>7. Clean up worksite</li> </ol> <p><u>CLOSE PETAL</u></p> <ol style="list-style-type: none"> <li>1. Close petal (1-5 lb force reqd); hold</li> <li>2. Reengage first launch restraint (push in button)</li> </ol>	<div data-bbox="1415 321 1921 415" style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> During any CBM operation, avoid contact with sealing surface</p> </div> <p><u>OPEN PETAL</u></p> <ol style="list-style-type: none"> <li>1. Configure/set up APFR and tools as reqd; transfer to worksite</li> </ol> <div data-bbox="1415 570 1877 664" style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Do not use petal(s) as hand hold until launch restraints have been engaged</p> </div> <ol style="list-style-type: none"> <li>2. Engage second petal launch restraint for failed petal, push button in</li> <li>3. Assist EV1 as reqd</li> </ol> <ol style="list-style-type: none"> <li>4. While restraining petal, release second launch restraint (adj tether strap)</li> <li>5. Slowly, allow petal to open</li> <li>6. Clean up worksite</li> </ol> <p><u>CLOSE PETAL</u></p> <ol style="list-style-type: none"> <li>1. Close petal (1-2 lb force reqd); hold</li> <li>2. Reengage second launch restraint (push in button)</li> </ol>

## MANUALLY OPEN/CLOSE CBM PETAL – TASK DATA

### Tools:

EV1	EV2
PGT	BRT
7/16-6in ext	Adjustable Tether
Adjustable Tether	

### Cautions:

1. During operation, avoid contact with CBM sealing surface
2. Do not use petals as hand hold unless launch restraints have been engaged

### Notes:

1. CBM CPAs do not have to be powered down for this activity

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Roller Link Release Bolt	N/A	7/16"	1	8.3	8.3	12.1	12-13	30

\* Standard PGT settings assumed

### Foot Restraints:

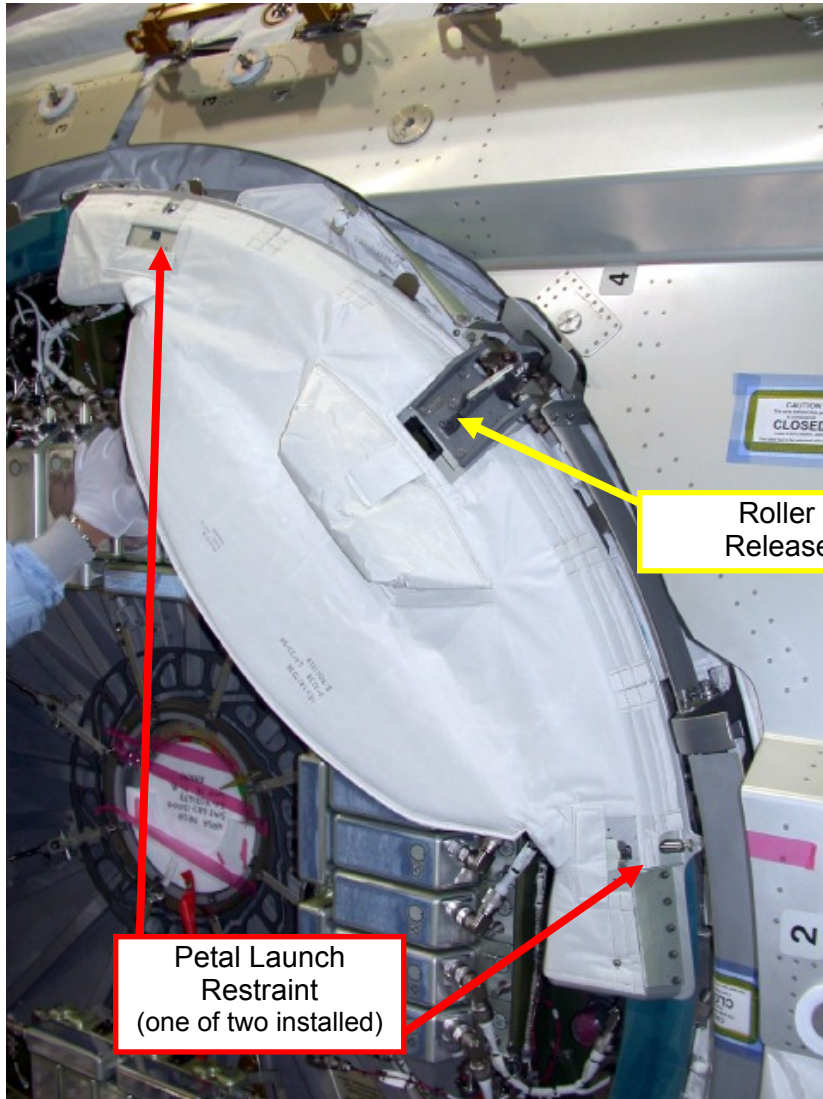
Task	WIF	CETA Position	Swing Arm Settings	APFR Setting
Port CBM – Fwd half	NOD 05	N/A	N/A	11, RR, G, 12
Port CBM – Aft half	NOD 03	N/A	N/A	11, QQ, G, 1
Nadir CBM	SSRMS	N/A	N/A	TBD

\* Not verified in NBL

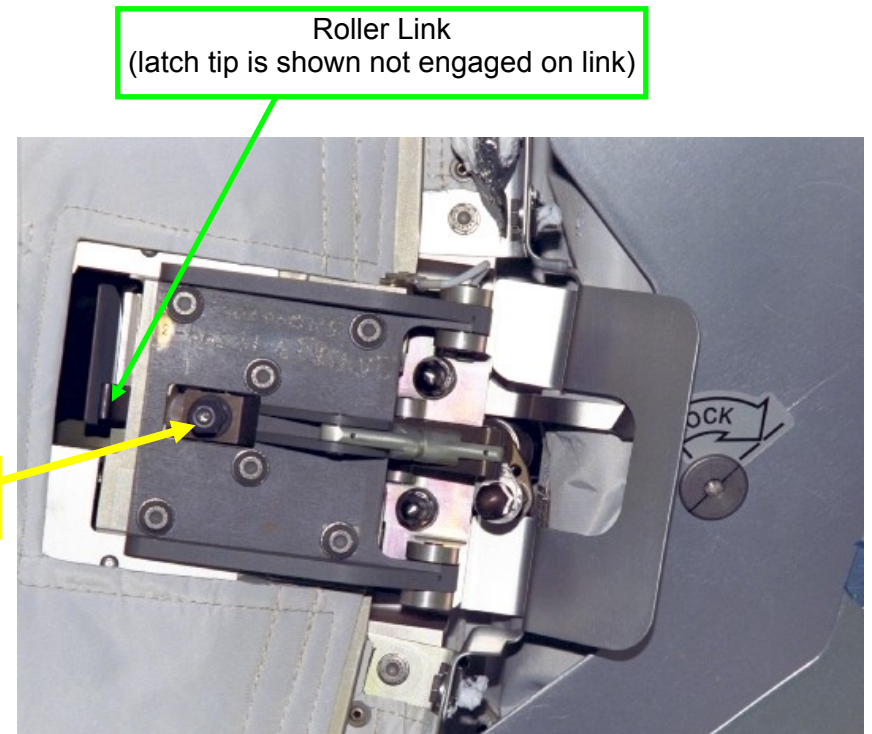
### Petal / Latch Locations:

Element / Location	Petal / Latch 1	Petal / Latch 2	Petal / Latch 3	Petal / Latch 4
Node 1 Nadir	Aft Stbd	Fwd Stbd	Fwd Port	Aft Port
Node 1 Port	Fwd Zenith	Aft Zenith	Aft Nadir	Fwd Nadir
Lab Forward	Zenith Stbd	Zenith Port	Nadir Port	Nadir Stbd
Node 2 Nadir	Aft Stbd	Fwd Stbd	Fwd Port	Aft Port
Node 2 Port	Fwd Zenith	Aft Zenith	Aft Nadir	Fwd Nadir
Node 2 Zenith	Aft Port	Fwd Port	Fwd Stbd	Aft Stbd
Node 2 Starboard	Fwd Nadir	Aft Nadir	Aft Zenith	Fwd Zenith
Node 2 Forward	Zenith Stbd	Zenith Port	Nadir Port	Nadir Stbd
JEM Zenith	Fwd Stbd	Aft Stbd	Aft Port	Fwd Port

# MANUALLY OPEN/CLOSE CBM PETAL – TASK DATA (Cont)

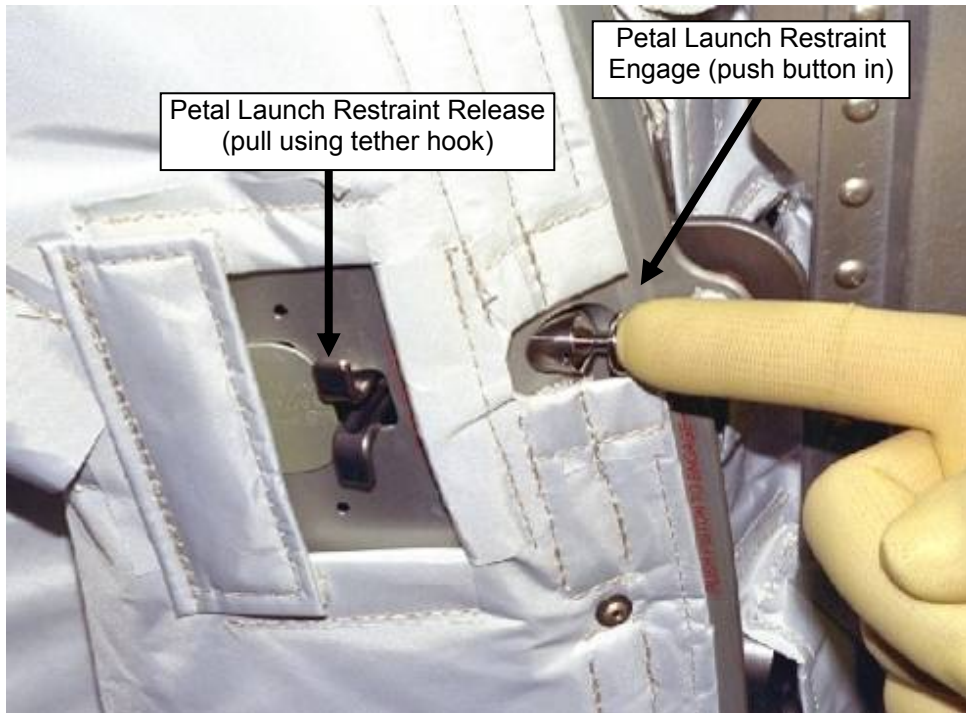


CBM PETAL

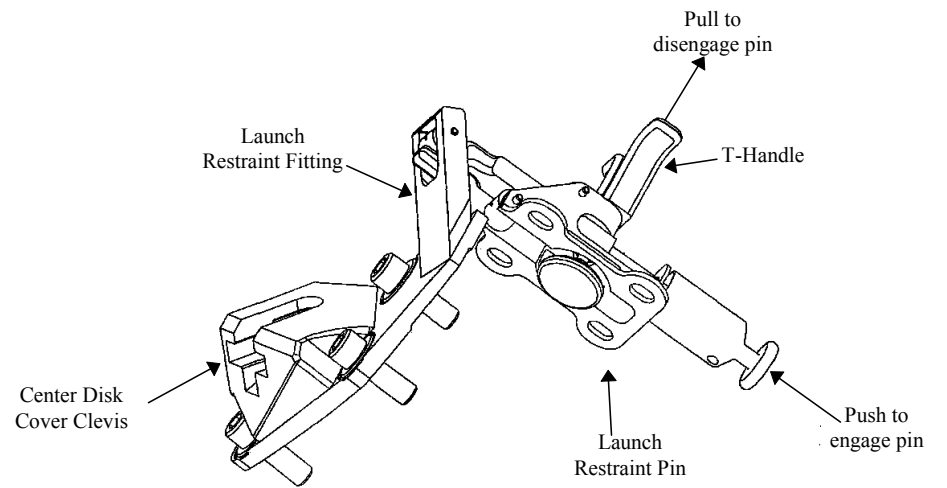


CBM PETAL DEPLOY MECHANISM

## MANUALLY OPEN/CLOSE CBM PETAL – TASK DATA (Cont)



CBM PETAL LAUNCH RESTRAINT OPERATION



CBM PETAL LAUNCH RESTRAINT MECHANISM

**MANUALLY OPEN/CLOSE CBM PETAL – TASK DATA (Cont)**



PETAL LAUNCH RESTRAINT RELEASE USING ADJUSTABLE TETHER STRAP

## REMOVE/REPLACE CENTER DISK COVER (00:30)

IV/SSRMS	EV1/EV2
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p><b>CAUTION</b> During any CBM operation, avoid contact with sealing surface</p> </div> <p><u>COVER REMOVAL</u> (1 quadrant)</p> <ol style="list-style-type: none"> <li>1. Configure/set up APFR and tools as reqd; transfer to worksite</li> <li>2. Access turnbuckle at desired Center Disk Cover quadrant</li> <li>3. Remove PIP pin with socket</li> <li>4. Repeat step 3 for second turnbuckle PIP pin</li> <li>5. Open Center Disk Cover flap below turnbuckle to view Instructions</li> <li>6. Rotate turnbuckle in "LOOSEN" direction to release cable tension (~20-30 turns)</li> <li>7. Configure retractable tethers to cinch back cover</li> <li>8. Pull PIP pins from pulleys (two) to be removed, one per pulley</li> <li>9. Stow pulley PIP pins (two) in Standoff Bar ends</li> <li>10. Remove each pulley from clevis. Use a tether to keep pulley away from CBM mating interface</li> <li>11. Cinch adjustable tether as required</li> <li>12. Remove PIP pins (two) from Standoff Bar. Remove Standoff Bar by rotating inward 45 deg. Use a tether to clear worksite</li> </ol> <p><u>COVER REINSTALL</u></p> <ol style="list-style-type: none"> <li>1. Release/stow tethers used to restrain cover</li> <li>2. Reattach Standoff Bar, rotate outward 45 deg to reinstall cover quadrant</li> <li>3. Insert pulleys (two) back into clevises (two)</li> <li>4. Reinstall pulley PIP pins (1 per pulley)</li> <li>5. Reinstall Standoff Bar PIP pins if time permits (2 per standoff)</li> <li>6. Repeat steps 2-5 as reqd for other CBM quadrants</li> <li>7. If feasible, re-tighten cable by rotating turnbuckles in the "TIGHTEN" direction per instructions</li> <li>8. Return turnbuckle PIP pins to the engaged slot (turn 90 deg)</li> <li>9. Secure cover using tethers or wire ties as reqd</li> </ol> <ol style="list-style-type: none"> <li>10. Clean up worksite</li> </ol>

## REMOVE/REPLACE CENTER DISK COVER – TASK DATA (Cont)

### Tools:

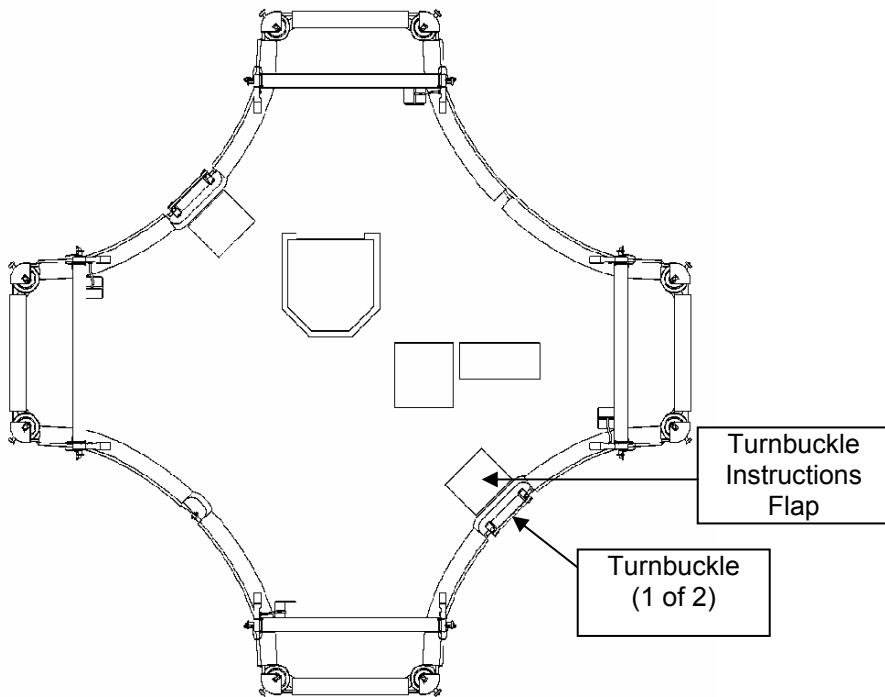
EV1 (FF)	EV2 (FF)
Retractable Tethers (2) w/small equipment hook	
Adjustable Tether	
Wire Ties	

**EVA Fasteners: N/A**

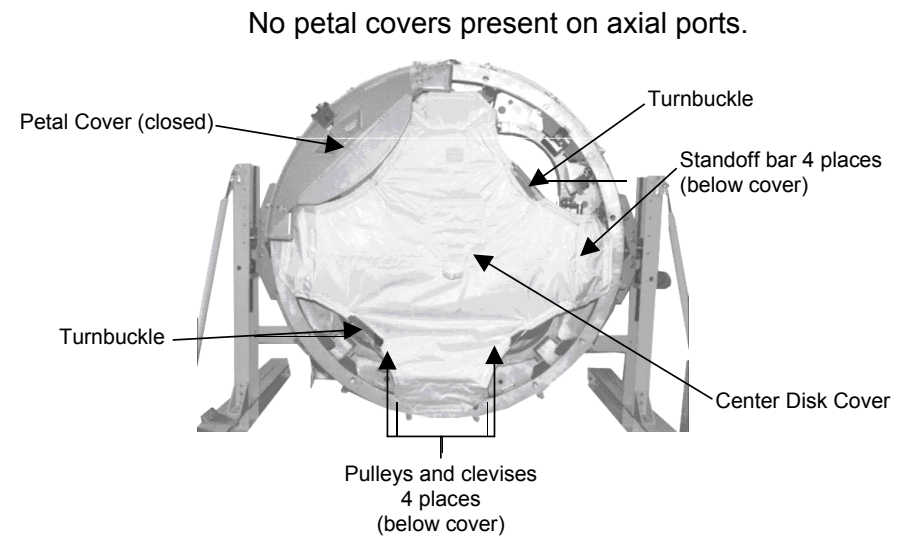
### Notes:

1. If removing Center Disk Cover for CPA R&R, only one quadrant reqd to be removed
2. Securing cover with wire ties or tethers is required if the pulleys are not able to be returned to the clevises and the cable tightened. The requirement for securing the cover is to verify all hardware is out of the capture and mating plane of the CBM

## REMOVE/REPLACE CENTER DISK COVER – TASK DATA (Cont)



CENTER DISK COVER DRAWING



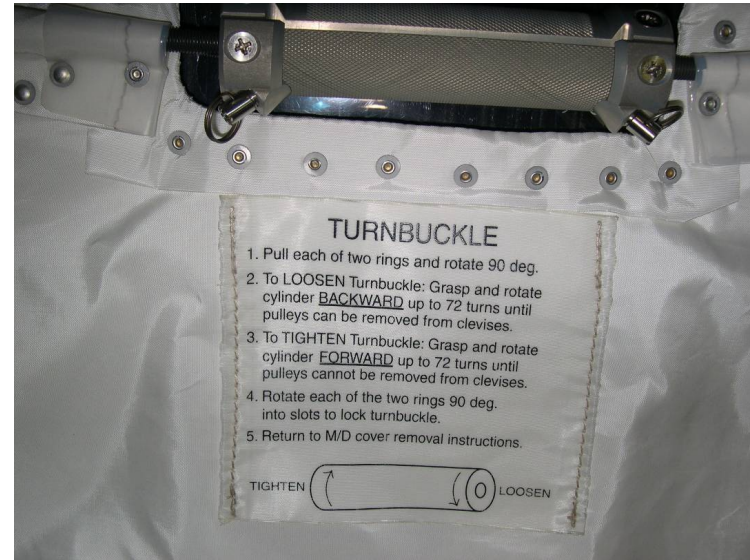
CENTER DISK COVER PHOTO



## REMOVE/REPLACE CENTER DISK COVER – TASK DATA (Cont)

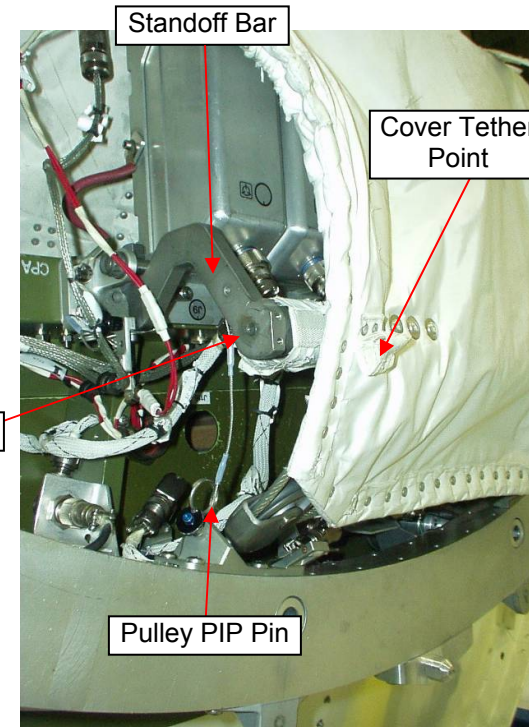
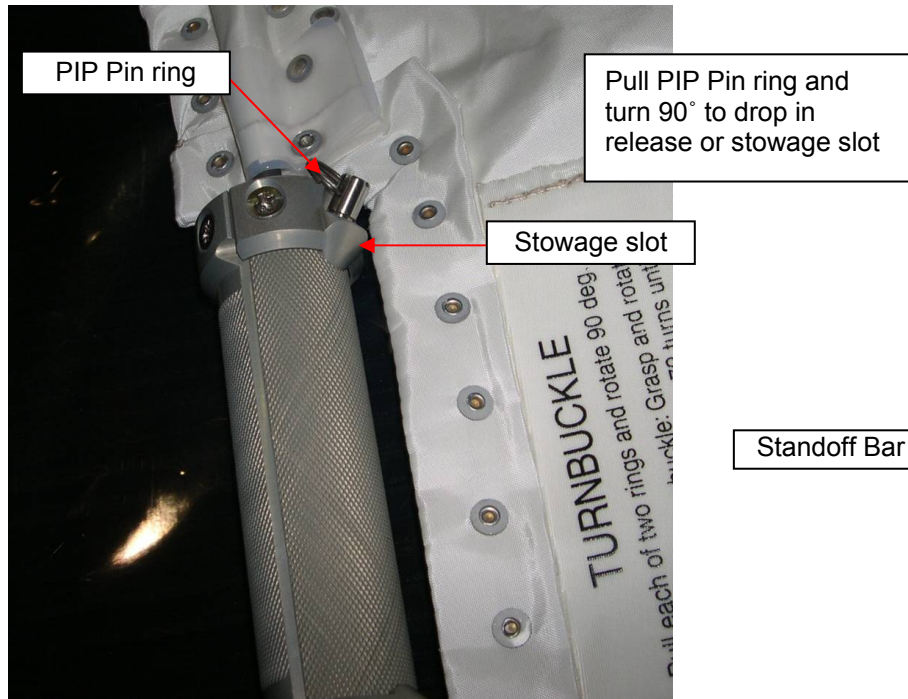


CBM CENTER DISK COVER FLAP INSTRUCTIONS



CBM CENTER DISK COVER TURNBUCKLE INSTRUCTIONS

## REMOVE CBM READY-TO-LATCH (RTL) – TASK DATA (Cont)



## REMOVE/REPLACE CBM CONTROLLER PANEL ASSEMBLY (CPA) (02:00)

Objective: To remove and replace failed CBM Controller Panel Assembly (CPA)

Assumptions: Corresponding CBM Petal Covers (two) for failed CPA have been fully deployed via commanding or EVA

IV Tools reqd for this procedure and must be retrieved prior to EVA. See Task Data Sheet for more info

IV/SSRMS	EV1	EV2
<p>1. √Inhibits in place for affected CPA (see Task Data Sheet)</p> <p>Record s/n of spare CPA _____</p> <p>Record s/n of failed CPA _____</p>	<div style="border: 3px double black; padding: 5px; text-align: center;"> <p><u>WARNING</u></p> <p>Power must be removed from CPA prior to EVA maintenance</p> </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u></p> <p>During any CBM operation, avoid contact with sealing surface</p> </div> <p><u>CPA REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Configure/set up APFR tools as reqd; transfer to worksite</li> <li>2. Remove Center Disk Cover corresponding quadrant: Perform REMOVE/REPLACE CENTER DISK COVER, COVER REMOVAL, removal steps only</li> <li>3. Attach CBM Tether Point to seat track on failed CPA</li> <li>4. Demate cable connectors J1-J9 on CPA (use connector tool as reqd)</li> <li>5. Disconnect grounding straps (two) from CPA with EVA ratchet, 5/32-in Ball End Allen Driver</li> <li>6. Tether to CBM Tether Point on CPA</li> </ol> <div style="text-align: center;"> <p><u>NOTE</u></p> <p>Do not use EVA 7/16" socket on CPA fasteners – will disassemble fastener</p> </div> <ol style="list-style-type: none"> <li>7. <b>PGT [A6, CCW2, 30.5] IV 7/16" w/DPTA:</b> Release fasteners (five) on CPA 13-14 turns</li> <li>8. Detach from bulkhead</li> <li>9. Stow CPA</li> </ol>	<div style="border: 3px double black; padding: 5px; text-align: center;"> <p><u>WARNING</u></p> <p>Power must be removed from CPA prior to EVA maintenance</p> </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u></p> <p>During any CBM operation, avoid contact with sealing surface</p> </div> <p><u>CPA REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Configure/set up APFR tools as reqd; transfer to worksite</li> <li>2. Assist EV1 as reqd</li> </ol>

## REMOVE/REPLACE CBM CONTROLLER PANEL ASSEMBLY (CPA) (02:00) (Cont)

IV/SSRMS	EV1	EV2
	<div style="border: 3px double black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p><u>WARNING</u></p> <p>Power must be removed from CPA prior to EVA maintenance</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p><u>CAUTION</u></p> <p>During any CBM operation, avoid contact with sealing surface</p> </div> <p><u>CPA REPLACE</u></p> <ol style="list-style-type: none"> <li>1. Install new CPA, align CPA: bolt plate edge flush with edge of bulkhead. (May hand start fasteners to “soft-dock” CPA)</li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">Do not use EVA 7/16" socket on CPA fasteners</p> <ol style="list-style-type: none"> <li>2. <b>PGT [A2, CW2, 30.5]-IV 7/16" w/DPTA:</b> Start fasteners (five) on CPA ~3-4 turns</li> <li>3. <b>PGT [A2, CW2, 30.5]-IV 7/16" w/DPTA:</b> Tighten fasteners (five) on CPA ~10 turns</li> <li>4. Remove CBM Tether Point</li> <li>5. Connect grounding straps (two) to CPA with EVA ratchet, 5/32-in Ball End Allen Driver</li> <li>6. Mate cable connectors J1-J9 to CPA (use connector tool as reqd)</li> <li>7. Reinstall Center Disk Cover as reqd: Perform REMOVE/REPLACE CENTER DISK COVER, COVER REINSTALL, install steps only</li> <li>8. Visually inspect CBM mating interface, ensure it is clear of latch, wire ties, MLI and any other equipment or FOD</li> </ol>	<div style="border: 3px double black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p><u>WARNING</u></p> <p>Power must be removed from CPA prior to EVA maintenance</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p><u>CAUTION</u></p> <p>During any CBM operation, avoid contact with sealing surface</p> </div> <p><u>CPA REPLACE</u></p> <ol style="list-style-type: none"> <li>1. Assist EV1 as reqd</li> <li>2. Visually inspect CBM mating interface, ensure it is clear of latch, wire ties, MLI and any other equipment or FOD</li> </ol>

## REMOVE/REPLACE CBM CONTROLLER PANEL ASSEMBLY (CPA) – TASK DATA

### Tools:

EV1	EV2
PGT	BRT
Spare CPA	
CBM Tether Point (1 of 2)	
5/32-in Ball End Allen Driver	
CBM Tether Point (for failed unit)	
Connector Tool, Sm locking electrical	
EVA ratchet	
IV: 7/16" Socket, 3/8" Drive	
Drop Proof Tether Adapter	

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
CPA Removal Fastener	N/A	7/16"	5	3.8	8.3	Rel/12.1 Inst/6.0	13-14.5	30
CPA Ground Strap Fastener	N/A	5/32"	2	hand tight	2.0	Rel/5.4 Inst/2.9	6.5	30

\* Standard PGT settings assumed

### EVA Connectors:

Harness	From	To	Function
W7(2)0	P(2)	J1	Power cable
W7(2)1	P(2)	J2	Data cable
W7(2)2	P(2)	J3	Power cable
W7(2)3	P(2)	J4	Data cable
P1 to J5 LCH CONT	P1	J5	Bolt/latch cable
P1 to J6 LCH CONT	P1	J6	Bolt/latch cable
P1 to J7 LCH CONT	P1	J7	Bolt/latch cable
P1 to J8 LCH CONT	P1	J8	Bolt/latch cable
P1 to J9 LCH CONT	P1	J9	Bolt/latch cable

### Foot Restraints:

Task	WIF	CETA Position	Swing Arm Settings	APFR Setting
Port CBM – Fwd half	NOD 05	N/A	N/A	11, RR, G, 12
Port CBM – Aft half	NOD 03	N/A	N/A	11, QQ, G, 1
Nadir CBM	SSRMS	N/A	N/A	TBD

\* Not verified in NBL

### Warnings:

1. Power must be removed from CPA prior to EVA maintenance

### Cautions:

1. During operation, avoid contact with CBM sealing surface

### Notes:

1. Do not use an EVA 7/16" socket on CPA Removal Fasteners. Although it is possible to remove these fasteners using this socket, the EVA socket is too long and it is possible to simultaneously engage and remove the entire bolt assembly, making it non-captive. To prevent this, the IV 7/16" socket will be used with the DPT
2. There is no real aligning feature for the CPA other than the Removal Fastener bolt holes, therefore reinstalling can be difficult. It may be easiest to start a few bolts by hand (2 bolts furthest out radially have proven easiest with EVA Glove). Note CPA is properly aligned when bolt plate is flush with end of Node bulkhead
3. During installation, to prevent binding of CPA Removal Fasteners, can turn each fastener a few turns, then repeat until torque is met
4. CPA Connectors are fully mated when Red Indicator Ring is no longer visible

## REMOVE/REPLACE CBM CONTROLLER PANEL ASSEMBLY (CPA) – TASK DATA (Cont)

### Petal/Latch Locations:

Element/Location	Petal/Latch 1	Petal/Latch 2	Petal/Latch 3	Petal/Latch 4
Node 1 Nadir	Aft Stbd	Fwd Stbd	Fwd Port	Aft Port
Node 1 Port	Fwd Zenith	Aft Zenith	Aft Nadir	Fwd Nadir
Lab Forward	Zenith Stbd	Zenith Port	Nadir Port	Nadir Stbd
Node 2 Nadir	Aft Stbd	Fwd Stbd	Fwd Port	Aft Port
Node 2 Port	Fwd Zenith	Aft Zenith	Aft Nadir	Fwd Nadir
Node 2 Zenith	Aft Port	Fwd Port	Fwd Stbd	Aft Stbd
Node 2 Starboard	Fwd Nadir	Aft Nadir	Aft Zenith	Fwd Zenith
Node 2 Forward	Zenith Stbd	Zenith Port	Nadir Port	Nadir Stbd
JEM Zenith	Fwd Stbd	Aft Stbd	Aft Port	Fwd Port

### CPA Locations:

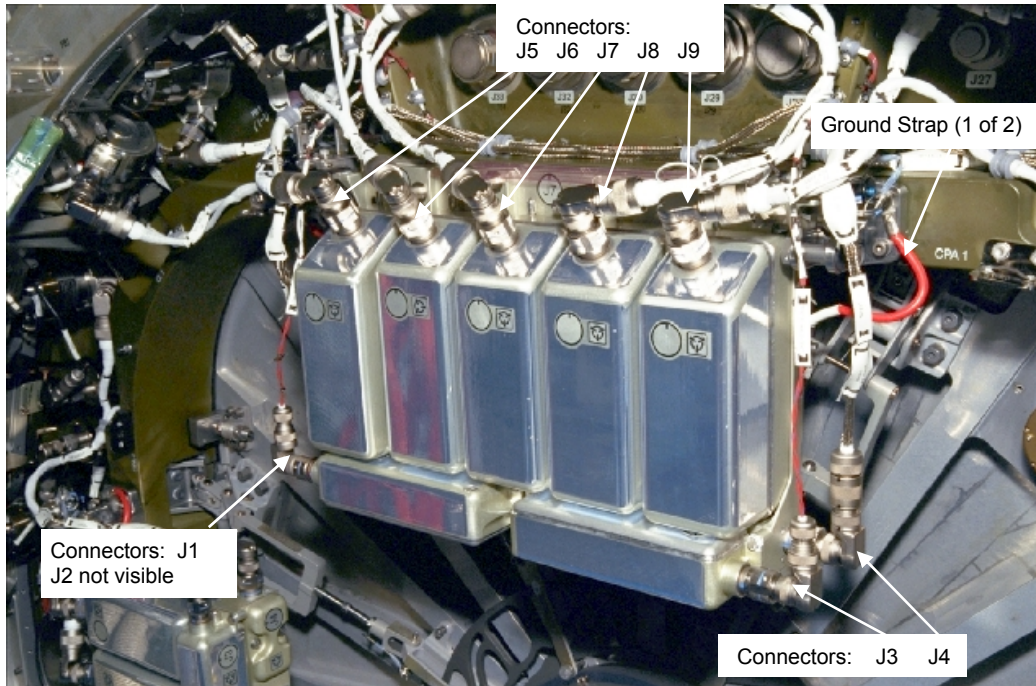
Element/Location	CPA 1	CPA 2	CPA 3	CPA 4
Node 1 Nadir	Stbd	Fwd	Port	Aft
Node 1 Port	Zenith	Aft	Nadir	Fwd
Lab Forward	Zenith	Port	Nadir	Starboard
Node 2 Nadir	Stbd	Fwd	Port	Aft
Node 2 Port	Zenith	Aft	Nadir	Fwd
Node 2 Zenith	Port	Fwd	Stbd	Aft
Node 2 Starboard	Nadir	Aft	Zenith	Fwd
Node 2 Forward	Zenith	Port	Nadir	Stbd
JEM Zenith	Stbd	Aft	Port	Fwd

See S&M 2.514 Generic Procedures  
for complete safing steps

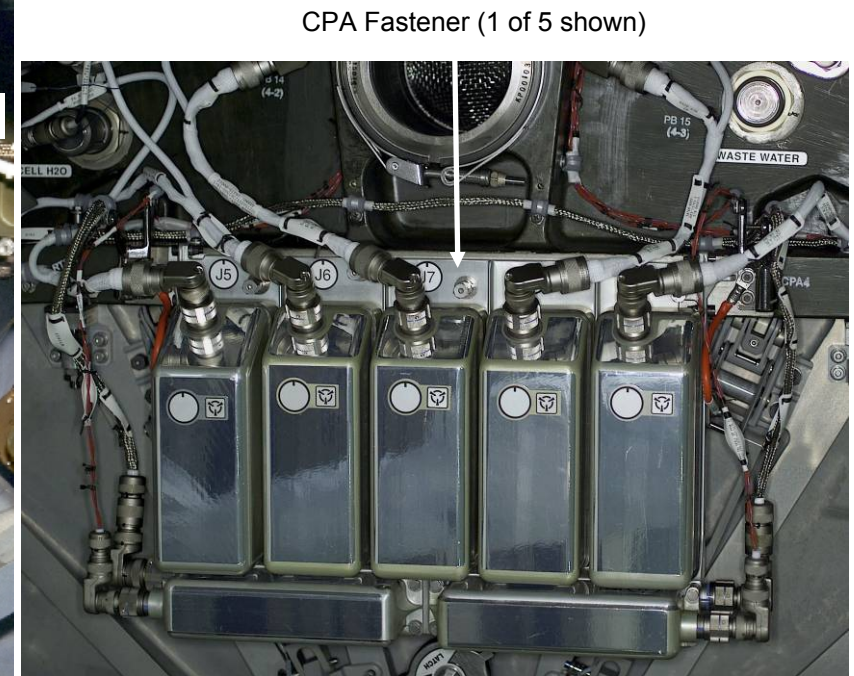
### CPA Power Inhibits:

Element/Location	CPA	Primary RPCM	Secondary RPCM
Node 1 Nadir	CPA 1	RPCM N13B B RPC 03	RPCM N14B B RPC 11
Node 1 Nadir	CPA 2	RPCM N13B B RPC 04	RPCM N14B B RPC 12
Node 1 Nadir	CPA 3	RPCM N13B B RPC 05	RPCM N14B B RPC 13
Node 1 Nadir	CPA 4	RPCM N13B B RPC 06	RPCM N14B B RPC 14
Node 1 Port	CPA 1	RPCM N1RS2 C RPC 07	RPCM N1RS1 B RPC 05
Node 1 Port	CPA 2	RPCM N1RS2 C RPC 08	RPCM N1RS1 B RPC 06
Node 1 Port	CPA 3	RPCM N1RS2 C RPC 10	RPCM N1RS1 B RPC 13
Node 1 Port	CPA 4	RPCM N1RS2 C RPC 11	RPCM N1RS1 B RPC 14
Lab Forward	CPA 1	RPCM LA1B B RPC 4	RPCM LA2B B RPC 4
Lab Forward	CPA 2	RPCM LA1B B RPC 3	RPCM LA2B B RPC 3
Lab Forward	CPA 3	RPCM LA1B B RPC 2	RPCM LA2B B RPC 2
Lab Forward	CPA 4	RPCM LA1B B RPC 1	RPCM LA2B B RPC 1
Node 2 Nadir	CPA 1	RPCM N21B4B A RPC 1	RPCM N22B3A B RPC 1
Node 2 Nadir	CPA 2	RPCM N21B4B A RPC 3	RPCM N22B3A B RPC 3
Node 2 Nadir	CPA 3	RPCM N21B4B A RPC 2	RPCM N22B3A B RPC 2
Node 2 Nadir	CPA 4	RPCM N21B4B A RPC 4	RPCM N22B3A B RPC 4
Node 2 Port	CPA 1	RPCM N21B4B A RPC 5	RPCM N22B3A B RPC 5
Node 2 Port	CPA 2	RPCM N21B4B A RPC 11	RPCM N22B3A B RPC 11
Node 2 Port	CPA 3	RPCM N21B4B A RPC 6	RPCM N22B3A B RPC 6
Node 2 Port	CPA 4	RPCM N21B4B A RPC 12	RPCM N22B3A B RPC 12
Node 2 Zenith	CPA 1	RPCM N21A4A C RPC 1	RPCM N22A3B A RPC 1
Node 2 Zenith	CPA 2	RPCM N21A4A C RPC 3	RPCM N22A3B A RPC 3
Node 2 Zenith	CPA 3	RPCM N21A4A C RPC 2	RPCM N22A3B A RPC 2
Node 2 Zenith	CPA 4	RPCM N21A4A C RPC 4	RPCM N22A3B A RPC 4
Node 2 Starboard	CPA 1	RPCM N21B4B A RPC 13	RPCM N22B3A B RPC 13
Node 2 Starboard	CPA 2	RPCM N21B4B A RPC 15	RPCM N22B3A B RPC 15
Node 2 Starboard	CPA 3	RPCM N21B4B A RPC 14	RPCM N22B3A B RPC 14
Node 2 Starboard	CPA 4	RPCM N21B4B A RPC 16	RPCM N22B3A B RPC 16
Node 2 Forward	CPA 1	RPCM N21A4A C RPC 13	RPCM N22A3B A RPC 13
Node 2 Forward	CPA 2	RPCM N21A4A C RPC 15	RPCM N22A3B A RPC 15
Node 2 Forward	CPA 3	RPCM N21A4A C RPC 14	RPCM N22A3B A RPC 14
Node 2 Forward	CPA 4	RPCM N21A4A C RPC 16	RPCM N22A3B A RPC 16
JEM Zenith	CPAs 1, 2, 3, 4	RPCM PDBa2 RPC 4	RPCMPDBb1 RPC 5

## REMOVE/REPLACE CBM CONTROLLER PANEL ASSEMBLY (CPA) – TASK DATA (Cont)

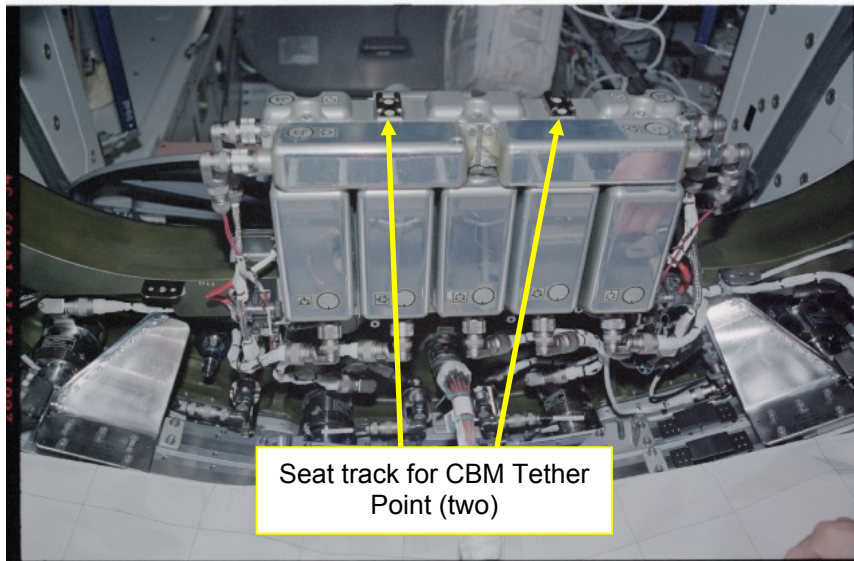


CBM CPA CONNECTORS AND GROUND STRAP  
(CENTER DISK COVER REMOVED)

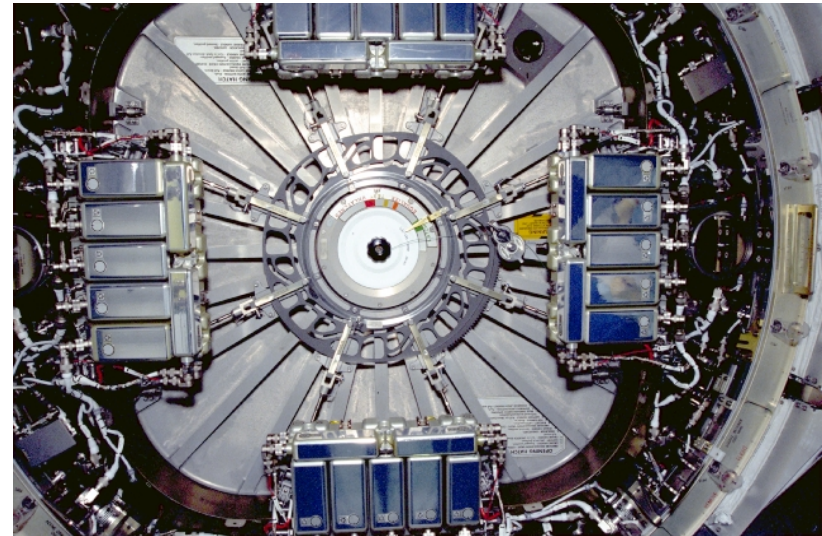


CBM CPA FASTENER LOCATIONS

## REMOVE/REPLACE CBM CONTROLLER PANEL ASSEMBLY (CPA) – TASK DATA (Cont)



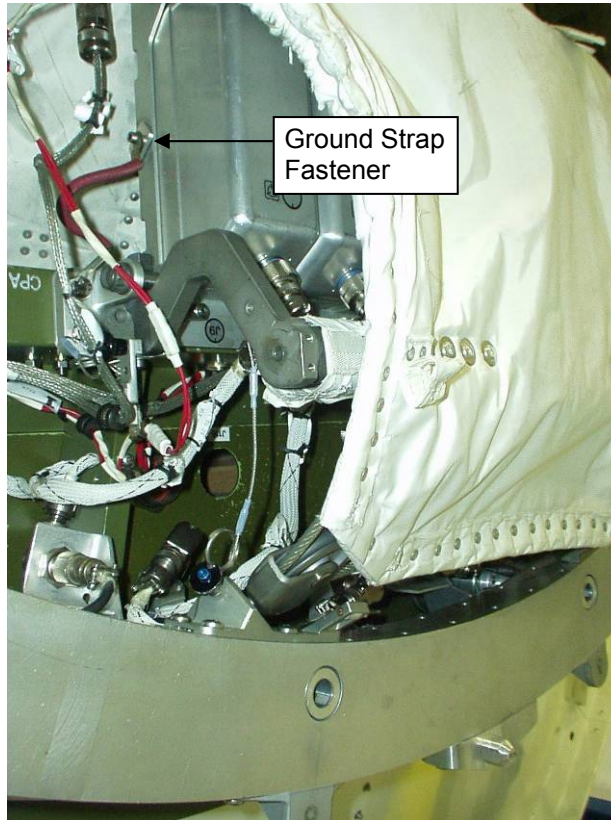
SEAT TRACK FOR CBM TETHER POINT INSTALLATION



EXTERNAL VIEW OF CBM CPAs INSTALLED  
(CENTER DISK COVER REMOVED)



**REMOVE/REPLACE CBM CONTROLLER PANEL ASSEMBLY (CPA) – TASK DATA (Cont)**



**CPA GROUND STRAP FASTENER  
(CENTER DISK COVER INSTALLED)**

## CLEAR/RESTRAIN CBM CAPTURE LATCH (00:30)

Objective: To clear CBM failed Capture Latch from mating interface and restrain via EVA to allow mating operations to continue

Assumptions: Corresponding CBM Petal Cover for failed latch has been fully deployed via commanding or EVA

IV/SSRMS	EV1	EV2
	<div data-bbox="758 354 1272 446" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><b>CAUTION</b></p> <p>During any CBM operation, avoid contact with sealing surface</p> </div> <ol style="list-style-type: none"> <li>1. Configure/set up APFR and tools as reqd; transfer to worksite</li> <li>2. Clear capture latch from CBM mating interface. Restrain capture latch with wire ties, sm-sm RET, or adj equip tethers out of contact zone of CBM ring (latch can be secured to turnbuckle (2 pl), fabric loops, or cable of center disk cover)</li> <li>3. If capture latch cannot be cleared/restrained from mating interface, it must be removed entirely. See REMOVE/REPLACE CBM CAPTURE LATCH procedure</li> <li>4. Clean up worksite</li> <li>5. Visually inspect CBM mating interface, ensure it is clear of latch, wire ties, MLI, and any other equipment or FOD</li> </ol>	<div data-bbox="1415 354 1929 446" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><b>CAUTION</b></p> <p>During any CBM operation, avoid contact with sealing surface</p> </div> <ol style="list-style-type: none"> <li>1. Configure/set up APFR and tools as reqd; transfer to worksite</li> <li>2. Assist EV1 as reqd</li> <li>3. Clean up worksite</li> <li>4. Visually inspect CBM mating interface, ensure it is clear of latch, wire ties, MLI, and any other equipment or FOD</li> </ol>

## CLEAR/RESTRAIN CBM CAPTURE LATCH – TASK DATA

### Tools:

EV1	EV2
Wire Tie Caddy	
Sm-sm RET (2)	
Adj Equip tethers (2)	

### Cautions:

1. During operation, avoid contact with CBM sealing surface
2. Do not use petals as hand hold unless launch restraints have been engaged

### Notes:

1. CBM CPAs do not have to be powered down for this activity

### Foot Restraints:

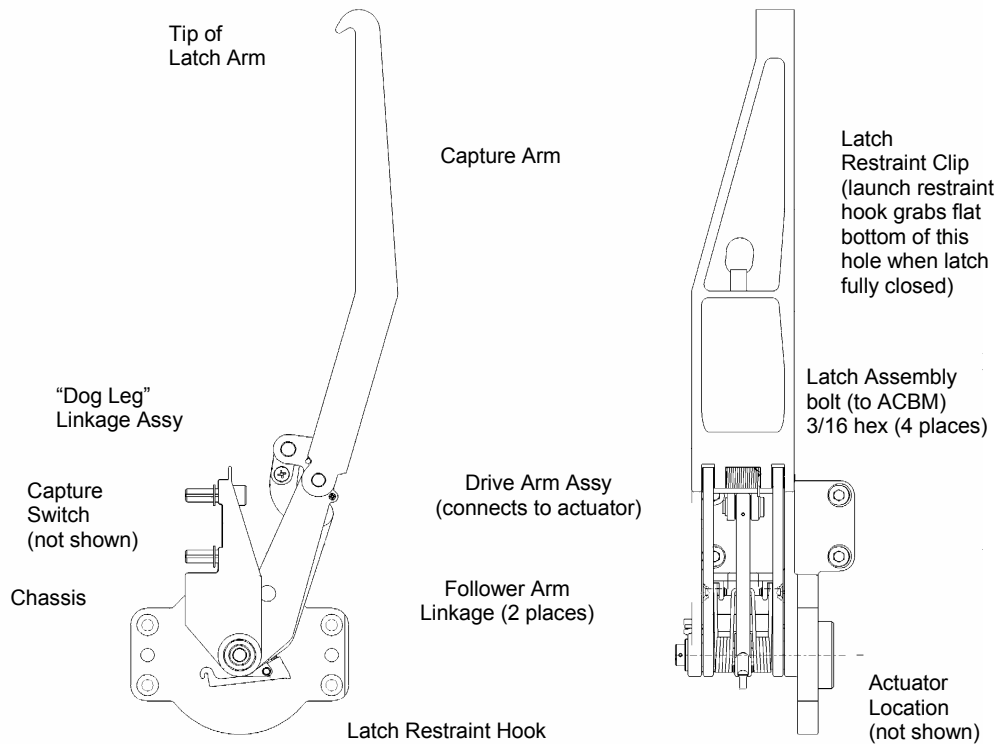
Task	WIF	CETA Position	Swing Arm Settings	APFR Setting
N1 Port CBM – Fwd half	NOD 05	N/A	N/A	11, RR, G, 12
N1 Port CBM – Aft half	NOD 03	N/A	N/A	11, QQ, G, 1
N1 Nadir CBM	SSRMS	N/A	N/A	TBD

\* Not verified in NBL

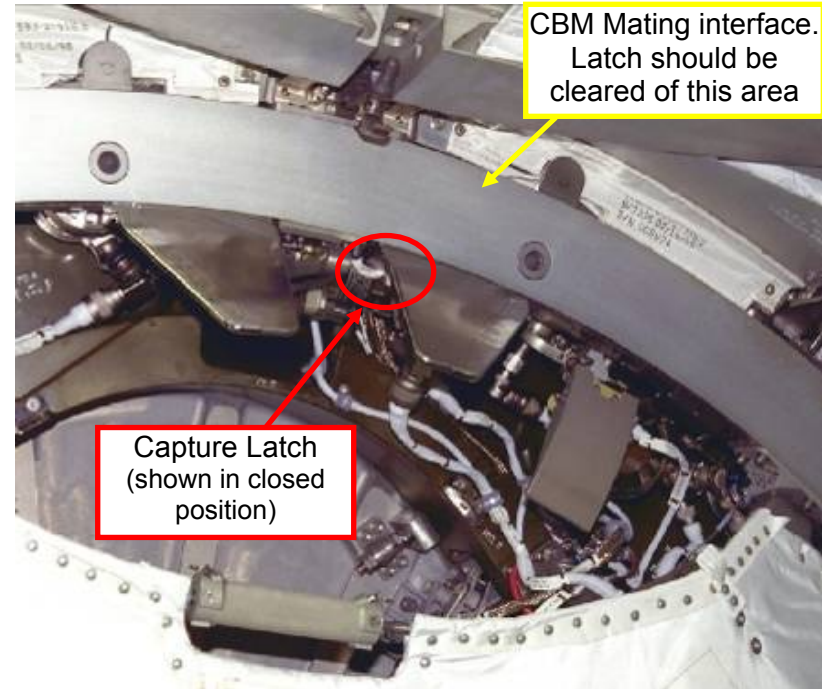
### Petal/Latch Locations:

Element/Location	Petal/Latch 1	Petal/Latch 2	Petal/Latch 3	Petal/Latch 4
Node 1 Nadir	Aft Stbd	Fwd Stbd	Fwd Port	Aft Port
Node 1 Port	Fwd Zenith	Aft Zenith	Aft Nadir	Fwd Nadir
Lab Forward	Zenith Stbd	Zenith Port	Nadir Port	Nadir Stbd
Node 2 Nadir	Aft Stbd	Fwd Stbd	Fwd Port	Aft Port
Node 2 Port	Fwd Zenith	Aft Zenith	Aft Nadir	Fwd Nadir
Node 2 Zenith	Aft Port	Fwd Port	Fwd Stbd	Aft Stbd
Node 2 Starboard	Fwd Nadir	Aft Nadir	Aft Zenith	Fwd Zenith
Node 2 Forward	Zenith Stbd	Zenith Port	Nadir Port	Nadir Stbd
JEM Zenith	Fwd Stbd	Aft Stbd	Aft Port	Fwd Port

# CLEAR/RESTRAIN CBM CAPTURE LATCH – TASK DATA



CBM CAPTURE LATCH NOMENCLATURE



CBM CAPTURE LATCH LOCATION AND CBM MATING INTERFACE

## REMOVE/REPLACE CBM CAPTURE LATCH (01:30)

Objective: To remove and replace CBM failed Capture Latch via EVA to allow mating operations to continue

Assumptions: Corresponding CBM Petal Cover for failed latch has been fully deployed via commanding or EVA

IV/SSRMS	EV1	EV2
<p>1. √Inhibits in place for affected capture latch (see Task Data)</p>	<div data-bbox="751 386 1268 500" style="border: 3px double black; padding: 5px; text-align: center;"> <p><u>WARNING</u> Power must be removed from CPA prior to EVA maintenance</p> </div> <div data-bbox="751 516 1268 613" style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> During any CBM operation, avoid contact with sealing surface</p> </div> <p><u>CAPTURE LATCH REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Configure/set up APFR and tools as reqd; transfer to worksite</li> <li>2. If reqd, open petal cover corresponding to failed capture latch: MANUALLY OPEN/CLOSE CBM PETAL, open steps only</li> <li>3. <b>PGT [A7 (8.2 ft-lb), CCW2, 30.5]-3/16" Allen Driver:</b> Remove captive fasteners (four) and ground strap on capture latch assembly, 14.5 turns</li> <li>4. Tether to capture latch assembly with wire tie</li> <li>5. On IV GO, Disconnect connectors P2 and P3 from capture Latch actuator (2 1/2 turns) (use connector tool as reqd)</li> <li>6. Remove capture latch assembly</li> <li>7. Remove capture latch and stow (use trash bag as reqd for loose pieces)</li> <li>8. If capture latch assembly not being replaced, position ground strap and connector cables such that alignment guides, CBM sealing surface, RTLs are clear</li> </ol>	<div data-bbox="1411 386 1927 500" style="border: 3px double black; padding: 5px; text-align: center;"> <p><u>WARNING</u> Power must be removed from CPA prior to EVA maintenance</p> </div> <div data-bbox="1411 516 1927 613" style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> During any CBM operation, avoid contact with sealing surface</p> </div> <p><u>CAPTURE LATCH REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Configure/set up APFR and tools as reqd; transfer to worksite</li> <li>2. Assist EV1 as reqd</li> </ol>

**REMOVE/REPLACE CBM CAPTURE LATCH (01:30) (Cont)**

IV/SSRMS	EV1	EV2
	<p><u>CAPTURE LATCH REPLACE</u></p> <ol style="list-style-type: none"> <li>1. Mate connectors P3 and P2 on replacement capture latch (use connector tool as required)</li> <li>2. Position capture latch for installation</li> <li>3. Re-position grounding strap on closest CLA captive fastener</li> <li>4. <b>PGT [A3, CW2, 5.5]-3/16" Allen Driver:</b> Tighten captive fasteners (four) on capture latch Assembly, 14.5 turns</li> <li>5. If required, close corresponding petal cover: MANUALLY OPEN/CLOSE CBM PETAL, close steps only</li> <li>6. Clean up worksite</li> <li>7. Visually inspect CBM mating interface, ensure it is clear of latch, wire ties, MLI, and any other equipment or FOD</li> </ol>	<p><u>CAPTURE LATCH REPLACE</u></p> <ol style="list-style-type: none"> <li>1. Assist EV1 as reqd</li> <li>2. Clean up worksite</li> <li>3. Visually inspect CBM mating interface, ensure it is clear of latch, wire ties, MLI, and any other equipment or FOD</li> </ol>

## REMOVE/REPLACE CBM CAPTURE LATCH – TASK DATA (Cont)

### Tools:

EV1 (FF)	EV2 (FF)
Wire Tie Caddy	BRT
3/16" Allen Driver	
Connector Tool, Sm locking electrical	
Small trash bag	
PGT	
BRT	

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Capture Latch Captive Fastener Release	N/A	3/16"	4	N/A	9.2	13.6	14.5	30
Capture Latch Captive Fastener Install	N/A	3/16"	4	4.8	N/A	8.6	14.5	30

\* Standard PGT settings assumed

### Foot Restraints:

Task	WIF	CETA Position	Swing Arm Settings	APFR Setting
N1 Port CBM – Fwd half	NOD 05	N/A	N/A	11, RR, G, 12
N1 Port CBM – Aft half	NOD 03	N/A	N/A	11, QQ, G, 1
N1 Nadir CBM	SSRMS	N/A	N/A	TBD

\* Not verified in NBL

### Warnings:

1. Power must be removed from CPA prior to this task

### Cautions:

1. During operation, avoid contact with CBM sealing surface

### Notes:

1. Connectors are fully mated when Red Indicator Ring is no longer visible
2. Center Disk cover may need to be removed for access with the long 3/16" allen driver tool
3. Only EVA approved 3/16" Allen Driver is in the Node Bag. If necessary IV tools has a 3/16" Allen Driver but must process paperwork to approve for EVA

### Petal/Latch Locations:

Element/Location	Petal/Latch 1	Petal/Latch 2	Petal/Latch 3	Petal/Latch 4
Node 1 Nadir	Aft Stbd	Fwd Stbd	Fwd Port	Aft Port
Node 1 Port	Fwd Zenith	Aft Zenith	Aft Nadir	Fwd Nadir
Lab Forward	Zenith Stbd	Zenith Port	Nadir Port	Nadir Stbd
Node 2 Nadir	Aft Stbd	Fwd Stbd	Fwd Port	Aft Port
Node 2 Port	Fwd Zenith	Aft Zenith	Aft Nadir	Fwd Nadir
Node 2 Zenith	Aft Port	Fwd Port	Fwd Stbd	Aft Stbd
Node 2 Starboard	Fwd Nadir	Aft Nadir	Aft Zenith	Fwd Zenith
Node 2 Forward	Zenith Stbd	Zenith Port	Nadir Port	Nadir Stbd
JEM Zenith	Fwd Stbd	Aft Stbd	Aft Port	Fwd Port

## REMOVE/REPLACE CBM CAPTURE LATCH – TASK DATA (Cont)

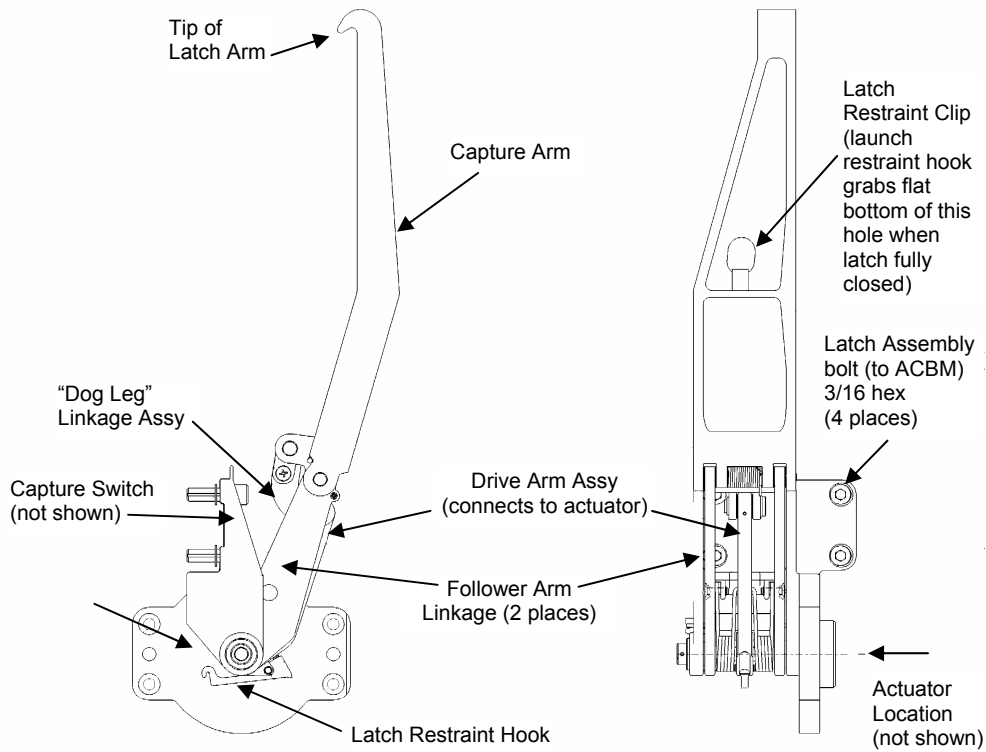
### CPA Power Inhibits:

Element/Location	CPA	Primary RPCM	Secondary RPCM
Node 1 Nadir	CPA 1	RPCM N13B B RPC 03	RPCM N14B B RPC 11
Node 1 Nadir	CPA 2	RPCM N13B B RPC 04	RPCM N14B B RPC 12
Node 1 Nadir	CPA 3	RPCM N13B B RPC 05	RPCM N14B B RPC 13
Node 1 Nadir	CPA 4	RPCM N13B B RPC 06	RPCM N14B B RPC 14
Node 1 Port	CPA 1	RPCM N1RS2 C RPC 07	RPCM N1RS1 B RPC 05
Node 1 Port	CPA 2	RPCM N1RS2 C RPC 08	RPCM N1RS1 B RPC 06
Node 1 Port	CPA 3	RPCM N1RS2 C RPC 10	RPCM N1RS1 B RPC 13
Node 1 Port	CPA 4	RPCM N1RS2 C RPC 11	RPCM N1RS1 B RPC 14
Lab Forward	CPA 1	RPCM LA1B B RPC 4	RPCM LA2B B RPC 4
Lab Forward	CPA 2	RPCM LA1B B RPC 3	RPCM LA2B B RPC 3
Lab Forward	CPA 3	RPCM LA1B B RPC 2	RPCM LA2B B RPC 2
Lab Forward	CPA 4	RPCM LA1B B RPC 1	RPCM LA2B B RPC 1
Node 2 Nadir	CPA 1	RPCM N21B4B A RPC 1	RPCM N22B3A B RPC 1
Node 2 Nadir	CPA 2	RPCM N21B4B A RPC 3	RPCM N22B3A B RPC 3
Node 2 Nadir	CPA 3	RPCM N21B4B A RPC 2	RPCM N22B3A B RPC 2
Node 2 Nadir	CPA 4	RPCM N21B4B A RPC 4	RPCM N22B3A B RPC 4
Node 2 Port	CPA 1	RPCM N21B4B A RPC 5	RPCM N22B3A B RPC 5
Node 2 Port	CPA 2	RPCM N21B4B A RPC 11	RPCM N22B3A B RPC 11
Node 2 Port	CPA 3	RPCM N21B4B A RPC 6	RPCM N22B3A B RPC 6
Node 2 Port	CPA 4	RPCM N21B4B A RPC 12	RPCM N22B3A B RPC 12
Node 2 Zenith	CPA 1	RPCM N21A4A C RPC 1	RPCM N22A3B A RPC 1
Node 2 Zenith	CPA 2	RPCM N21A4A C RPC 3	RPCM N22A3B A RPC 3
Node 2 Zenith	CPA 3	RPCM N21A4A C RPC 2	RPCM N22A3B A RPC 2
Node 2 Zenith	CPA 4	RPCM N21A4A C RPC 4	RPCM N22A3B A RPC 4
Node 2 Starboard	CPA 1	RPCM N21B4B A RPC 13	RPCM N22B3A B RPC 13
Node 2 Starboard	CPA 2	RPCM N21B4B A RPC 15	RPCM N22B3A B RPC 15
Node 2 Starboard	CPA 3	RPCM N21B4B A RPC 14	RPCM N22B3A B RPC 14
Node 2 Starboard	CPA 4	RPCM N21B4B A RPC 16	RPCM N22B3A B RPC 16
Node 2 Forward	CPA 1	RPCM N21A4A C RPC 13	RPCM N22A3B A RPC 13
Node 2 Forward	CPA 2	RPCM N21A4A C RPC 15	RPCM N22A3B A RPC 15
Node 2 Forward	CPA 3	RPCM N21A4A C RPC 14	RPCM N22A3B A RPC 14
Node 2 Forward	CPA 4	RPCM N21A4A C RPC 16	RPCM N22A3B A RPC 16
JEM Zenith	CPAs 1, 2, 3, 4	RPCM PDBa2 RPC 4	RPCMPDBb1 RPC 5

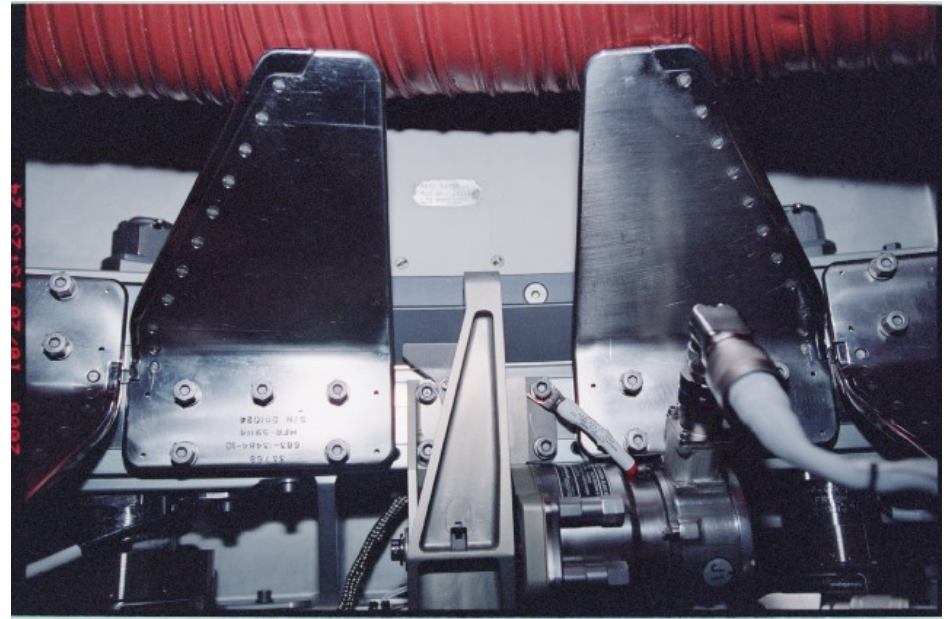
See S&M 2.514 Generic Procedures  
for complete safing steps



# REMOVE/REPLACE CBM CAPTURE LATCH – TASK DATA (Cont)

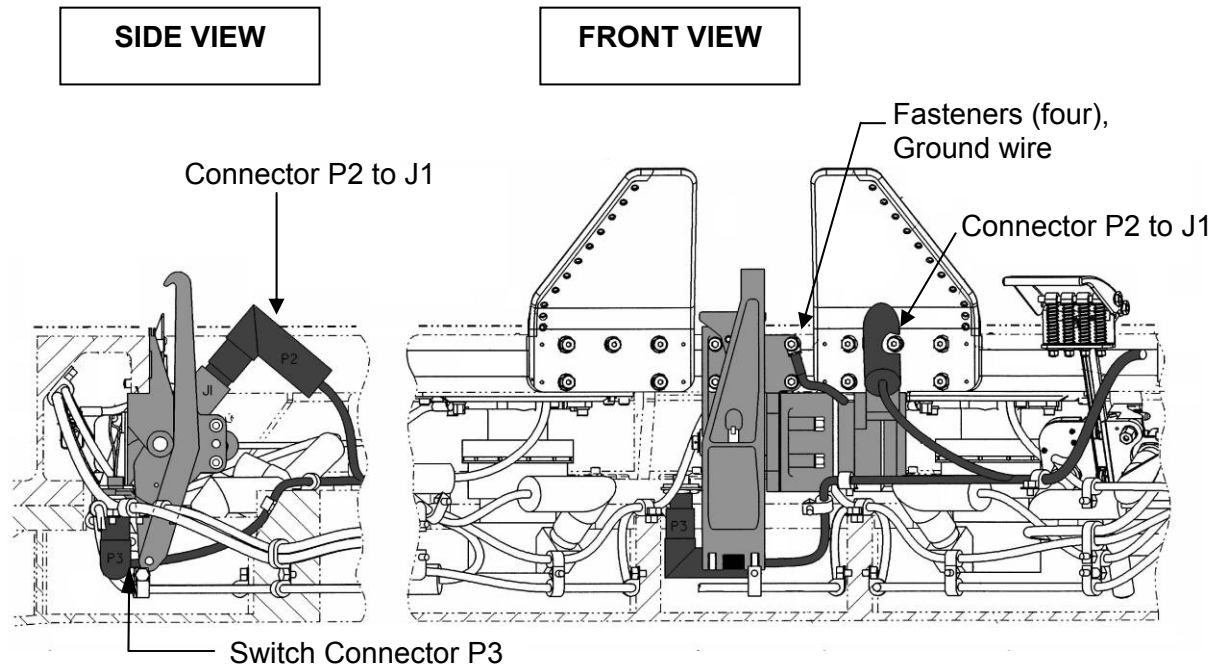


CBM CAPTURE LATCH NOMENCLATURE



CBM CAPTURE LATCH LOCATION

## REMOVE/REPLACE CBM CAPTURE LATCH – TASK DATA (Cont)



CAPTURE LATCH ASSEMBLY (CLA) (SHOWN IN CLOSED POSITION)

## REMOVE CBM READY-TO-LATCH (RTL) (00:45)

Objective: To remove a CBM failed Ready-To-Latch via EVA to allow mating operations to continue

Assumptions: Corresponding CBM Petal Cover for failed RTL has been fully deployed via commanding or EVA

IV/SSRMS	EV1	EV2
<p>1. √Inhibits in place for affected RTL (see Task Data Sheet)</p>	<div data-bbox="785 378 1299 492" style="border: 3px double black; padding: 5px; text-align: center;"> <p><u>WARNING</u> Power must be removed from CPA prior to EVA maintenance</p> </div> <div data-bbox="785 505 1299 597" style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> During any CBM operation, avoid contact with sealing surface</p> </div> <p><u>RTL REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Configure/set up APFR and tools as reqd; transfer to worksite</li> <li>2. Remove center disk cover as reqd: REMOVE/REPLACE CENTER DISK COVER, COVER REMOVAL, steps 1-12</li> <li>3. Verify power removed before continuing</li> <li>4. <b>PGT [A4, CCW2, 30.5]-RAD/DPTA/3/8"</b>: Remove RTL fasteners (2), 13.5 turns</li> <li>5. Tether to RTL assembly</li> <li>6. Disconnect data connector from RTL (use connector tool as required)</li> <li>7. Remove RTL and stow (use trash bag as reqd for loose pieces)</li> <li>8. Reinstall MMOD center cover as required: REMOVE/REPLACE CENTER DISK COVER, COVER REINSTALL, steps 1-10</li> <li>9. Clean up worksite</li> <li>10. Visually inspect CBM mating interface, ensure it is clear of latch, wire ties, MLI, and any other equipment or FOD</li> </ol>	<p><u>RTL REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Configure/set up APFR and tools as reqd; transfer to worksite</li> <li>2. Assist EV1 as required</li> </ol>

## REMOVE CBM READY-TO-LATCH (RTL) – TASK DATA

### Tools:

EV1 (FF)	EV2 (FF)
PGT	BRT
3/8" Socket	
Drop Proof Tether Adapter (DPTA)	
Connector Tool, Sm locking elec	
Small trash bag	
EVA ratchet	
BRT	
Right Angle Drive (RAD)	

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Capture Latch Captive Fastener Release	N/A	3/8"	1	N/A	6.3	10.6	13.5	30

\* Standard PGT settings assumed

### Foot Restraints:

Task	WIF	CETA Position	Swing Arm Settings	APFR Setting
Port CBM – FWD half	NOD 05	N/A	N/A	11, RR, G, 12
Port CBM – Aft half	NOD 03	N/A	N/A	11, QQ, G, 1
Nadir CBM	SSRMS	N/A	N/A	

\* Not verified in NBL

### Warnings:

1. Power must be removed from CPA prior to this task

### Cautions:

1. During operation, avoid contact with CBM sealing surface

### Notes:

1. Connectors are fully mated when red indicator ring is no longer visible
2. Fitcheck of RAD/DPTA/3/8-in socket has not been verified – note DPTA is not shown in photo
3. CPA number in Power Inhibits chart below corresponds to RTL number, e.g., CPA 2 is for RTL 2

### Petal/Latch Locations:

Element/Location	Petal/Latch 1	Petal/Latch 2	Petal/Latch 3	Petal/Latch 4
Node 1 Nadir	Aft Stbd	Fwd Stbd	Fwd Port	Aft Port
Node 1 Port	Fwd Zenith	Aft Zenith	Aft Nadir	Fwd Nadir
Lab Forward	Zenith Stbd	Zenith Port	Nadir Port	Nadir Stbd
Node 2 Nadir	Aft Stbd	Fwd Stbd	Fwd Port	Aft Port
Node 2 Port	Fwd Zenith	Aft Zenith	Aft Nadir	Fwd Nadir
Node 2 Zenith	Aft Port	Fwd Port	Fwd Stbd	Aft Stbd
Node 2 Starboard	Fwd Nadir	Aft Nadir	Aft Zenith	Fwd Zenith
Node 2 Forward	Zenith Stbd	Zenith Port	Nadir Port	Nadir Stbd
JEM Zenith	Fwd Stbd	Aft Stbd	Aft Port	Fwd Port

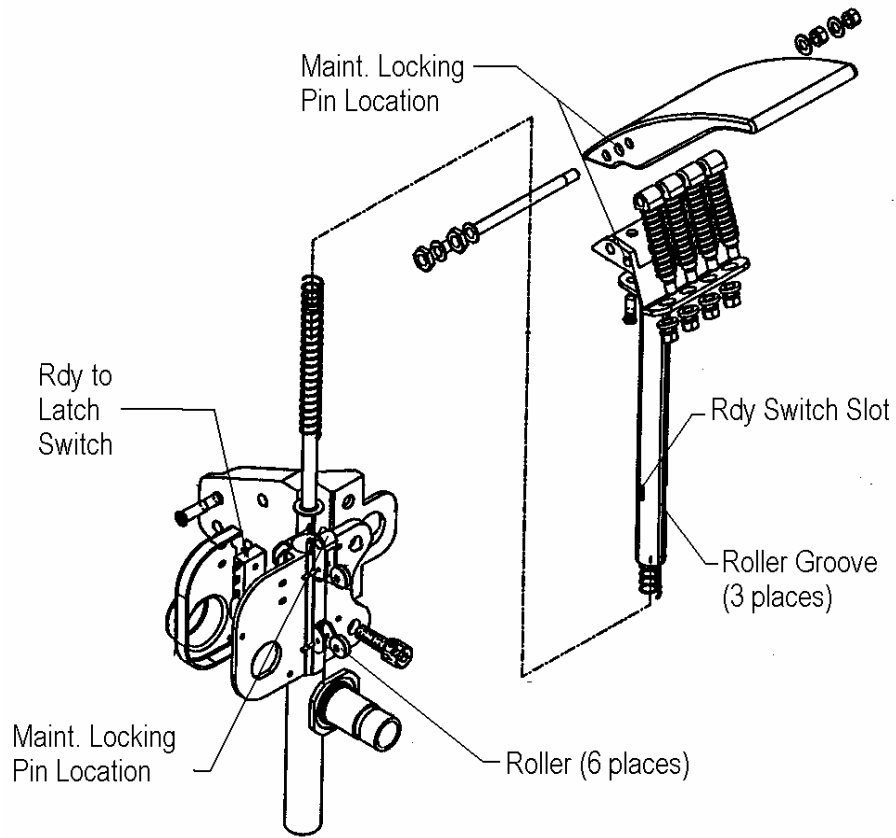
## REMOVE/REPLACE CBM CAPTURE LATCH – TASK DATA (Cont)

### CPA Power Inhibits:

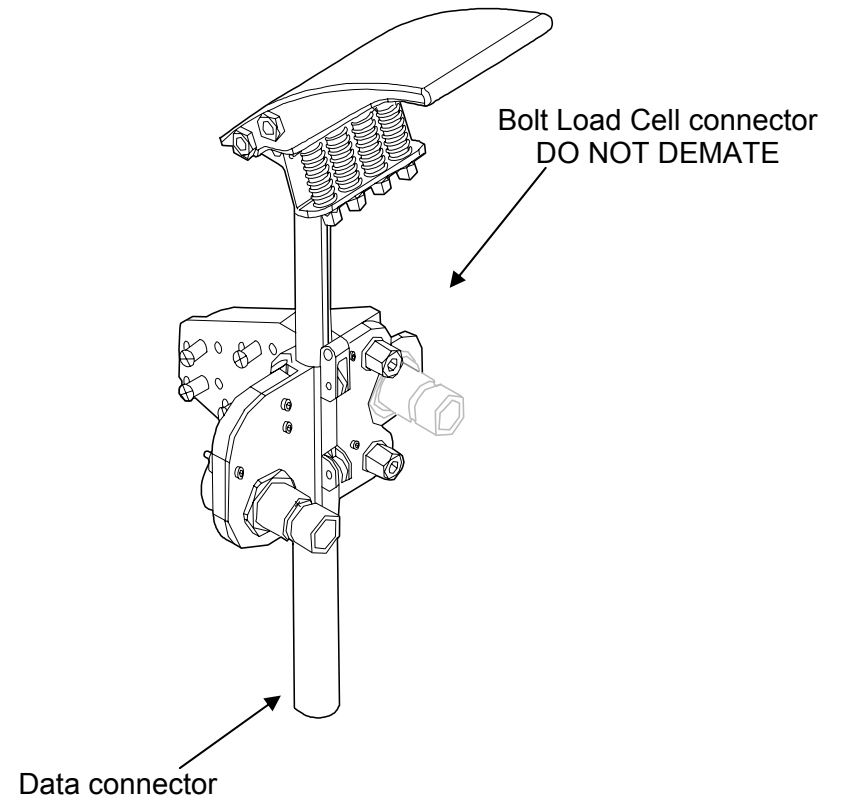
Element/Location	CPA	Primary RPCM	Secondary RPCM
Node 1 Nadir	CPA 1	RPCM N13B B RPC 03	RPCM N14B B RPC 11
Node 1 Nadir	CPA 2	RPCM N13B B RPC 04	RPCM N14B B RPC 12
Node 1 Nadir	CPA 3	RPCM N13B B RPC 05	RPCM N14B B RPC 13
Node 1 Nadir	CPA 4	RPCM N13B B RPC 06	RPCM N14B B RPC 14
Node 1 Port	CPA 1	RPCM N1RS2 C RPC 07	RPCM N1RS1 B RPC 05
Node 1 Port	CPA 2	RPCM N1RS2 C RPC 08	RPCM N1RS1 B RPC 06
Node 1 Port	CPA 3	RPCM N1RS2 C RPC 10	RPCM N1RS1 B RPC 13
Node 1 Port	CPA 4	RPCM N1RS2 C RPC 11	RPCM N1RS1 B RPC 14
Lab Forward	CPA 1	RPCM LA1B B RPC 4	RPCM LA2B B RPC 4
Lab Forward	CPA 2	RPCM LA1B B RPC 3	RPCM LA2B B RPC 3
Lab Forward	CPA 3	RPCM LA1B B RPC 2	RPCM LA2B B RPC 2
Lab Forward	CPA 4	RPCM LA1B B RPC 1	RPCM LA2B B RPC 1
Node 2 Nadir	CPA 1	RPCM N21B4B A RPC 1	RPCM N22B3A B RPC 1
Node 2 Nadir	CPA 2	RPCM N21B4B A RPC 3	RPCM N22B3A B RPC 3
Node 2 Nadir	CPA 3	RPCM N21B4B A RPC 2	RPCM N22B3A B RPC 2
Node 2 Nadir	CPA 4	RPCM N21B4B A RPC 4	RPCM N22B3A B RPC 4
Node 2 Port	CPA 1	RPCM N21B4B A RPC 5	RPCM N22B3A B RPC 5
Node 2 Port	CPA 2	RPCM N21B4B A RPC 11	RPCM N22B3A B RPC 11
Node 2 Port	CPA 3	RPCM N21B4B A RPC 6	RPCM N22B3A B RPC 6
Node 2 Port	CPA 4	RPCM N21B4B A RPC 12	RPCM N22B3A B RPC 12
Node 2 Zenith	CPA 1	RPCM N21A4A C RPC 1	RPCM N22A3B A RPC 1
Node 2 Zenith	CPA 2	RPCM N21A4A C RPC 3	RPCM N22A3B A RPC 3
Node 2 Zenith	CPA 3	RPCM N21A4A C RPC 2	RPCM N22A3B A RPC 2
Node 2 Zenith	CPA 4	RPCM N21A4A C RPC 4	RPCM N22A3B A RPC 4
Node 2 Starboard	CPA 1	RPCM N21B4B A RPC 13	RPCM N22B3A B RPC 13
Node 2 Starboard	CPA 2	RPCM N21B4B A RPC 15	RPCM N22B3A B RPC 15
Node 2 Starboard	CPA 3	RPCM N21B4B A RPC 14	RPCM N22B3A B RPC 14
Node 2 Starboard	CPA 4	RPCM N21B4B A RPC 16	RPCM N22B3A B RPC 16
Node 2 Forward	CPA 1	RPCM N21A4A C RPC 13	RPCM N22A3B A RPC 13
Node 2 Forward	CPA 2	RPCM N21A4A C RPC 15	RPCM N22A3B A RPC 15
Node 2 Forward	CPA 3	RPCM N21A4A C RPC 14	RPCM N22A3B A RPC 14
Node 2 Forward	CPA 4	RPCM N21A4A C RPC 16	RPCM N22A3B A RPC 16
JEM Zenith	CPAs 1, 2, 3, 4	RPCM PDBa2 RPC 4	RPCMPDBb1 RPC 5

See S&M 2.514 Generic Procedures for complete safing steps

# REMOVE CBM READY-TO-LATCH (RTL) – TASK DATA (Cont)

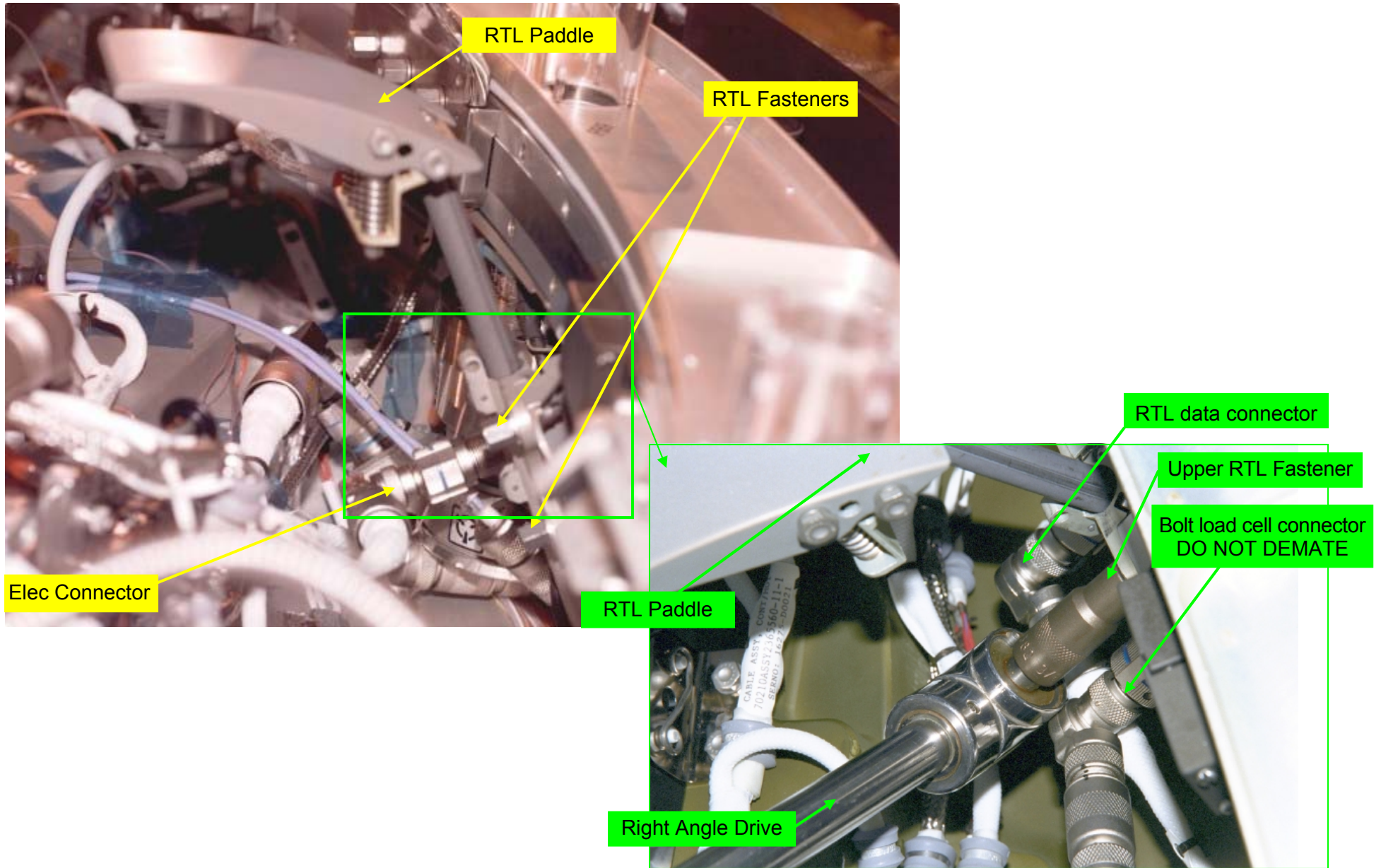


CBM RTL Nomenclature



CBM RTL

# REMOVE CBM READY-TO-LATCH (RTL) – TASK DATA (Cont)



**REMOVE CBM READY-TO-LATCH (RTL) – TASK DATA (Cont)**



PETAL LAUNCH RESTRAINT RELEASE USING ADJUSTABLE TETHER STRAP



## REMOVE/REPLACE CBM PETAL (00:30)

Objective: To manually open/close radial Common Berthing Mechanism (CBM) petal via EVA due to CBM contingency

IV/SSRMS	EV1	EV2
<p style="text-align: center;"><u>NOTE</u></p> <p>It is preferable to remove/replace petal from closed position</p>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u></p> <p>During any CBM operation, avoid contact with sealing surface</p> </div> <p><u>PETAL REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Configure/set up APFR and tools as reqd; transfer to worksite</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u></p> <p>Do not use petal(s) as handhold until launch restraints have been engaged</p> </div> <ol style="list-style-type: none"> <li>2. If petal in fully closed position: Engage first petal launch restraint for failed petal, push button in</li> <li>3. <b>PGT [A7, CW2, 30.5]-6 Ext 7/16:</b> Turn Actuator Lock-out Bolt (outer-most bolt) to disable spring actuator ~23-24 turns</li> <li>4. <b>PGT [A6, CCW2, 30.5]-6 Ext 7/16:</b> Turn Roller Link Release Bolt up to 12-13 turns to disengage Capture Latch</li> <li>5. Visually verify Capture Latch is not engaged on Petal Roller Link</li> <li>6. <b>PGT [A6, CW2, 10.5]-6 Ext 7/16:</b> Retighten Roller Link Release Bolt up to 12-13 turns</li> <li>7. Attach tether to petal hinge linkage</li> <li>8. <b>PGT [B4, CCW2, 30.5]-6 Ext 7/16:</b> Remove Petal Attachment Bolts (two) ~12 turns</li> <li>9. If launch restraints engaged, release first launch restraint</li> <li>10. Remove petal</li> </ol>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u></p> <p>During any CBM operation, avoid contact with sealing surface</p> </div> <p><u>PETAL REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Configure/set up APFR and tools as reqd; transfer to worksite</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u></p> <p>Do not use petal(s) as handhold until launch restraints have been engaged</p> </div> <ol style="list-style-type: none"> <li>2. If petal in fully closed position: Engage second petal launch restraint for failed petal, push button in</li> <li>3. Assist EV1 as reqd</li> <li>4. If launch restraints engaged, release second launch restraint</li> <li>5. Remove petal</li> </ol>

**REMOVE/REPLACE CBM PETAL (00:30) (Cont)**

IV/SSRMS	EV1	EV2
	<p><u>PETAL REPLACE</u></p> <ol style="list-style-type: none"> <li>1. Configure/set up APFR and tools as reqd; transfer to worksite</li> <li>2. Position replacement petal</li> <li>3. If petal in closed position: Engage first launch restraint (push button in)</li> <li>4. <b>PGT [A7, CW2, 30.5]-6 Ext 7/16:</b> Engage Petal Attachment Bolts (two) 12 turns, apply pressure on bolt while turning to ensure engagement</li> <li>5. Remove tether from petal</li> <li>6. <b>PGT [A2, CCW2, 10.5]-6 Ext 7/16:</b> Reengage Actuator Lock-out Bolt (outer-most bolt) ~23-24 turns</li> <li>7. While holding petal, release first launch restraint</li> <li>8. Clean up worksite</li> <li>9. Visually inspect CBM mating interface, ensure it is clear of latch, wire ties, MLI and any other equipment or FOD</li> </ol>	<p><u>PETAL REPLACE</u></p> <ol style="list-style-type: none"> <li>1. Configure/set up APFR and tools as reqd; transfer to worksite</li> <li>2. Assist EV1 as reqd</li> <li>3. If petal in closed position: Engage second launch restraint (push button in)</li> <li>4. While holding petal, release second launch restraint</li> <li>5. Clean up worksite</li> <li>6. Visually inspect CBM mating interface, ensure it is clear of latch, wire ties, MLI and any other equipment or FOD</li> </ol>

## REMOVE CBM READY-TO-LATCH (RTL) – TASK DATA (Cont)

### Tools:

EV1	EV2
PGT	BRT
7/16-6 in ext	Adjustable Tether
Adjustable Tether	
BRT	

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Roller Link Release Bolt	N/A	7/16 in	1	8.3	8.3	12.1	up to 12-13	30
Petal Attachment Bolt	N/A	7/16 in	2	9.2	19.4	26.1/Rel 13.1/Inst	12	30
Actuator Lock-out Bolt	N/A	7/16 in	1	3.8	9.2	15/Rel 6.3/Inst	23-24	30

\* Standard PGT settings assumed

### Foot Restraints:

Task	WIF	CETA Position	Swing Arm Settings	APFR Setting
Port CBM – Fwd half	NOD 05	N/A	N/A	11, RR, G, 12
Port CBM – Aft half	NOD 03	N/A	N/A	11, QQ, G, 1
Nadir CBM	SSRMS	N/A	N/A	TBD

\* Not verified in NBL

### Warnings:

1. Do not use petals as hand hold unless launch restraints have been engaged

### Cautions:

1. During operation, avoid contact with CBM sealing surface

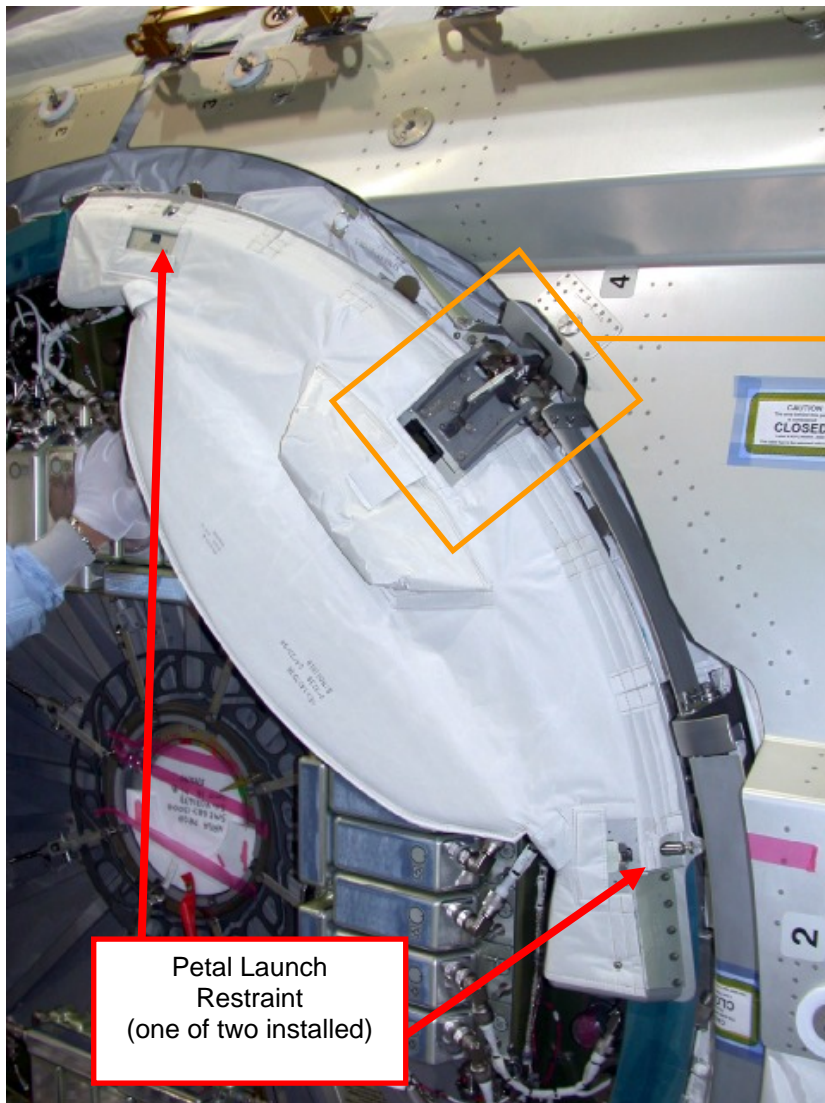
### Notes:

1. CBM CPAs do not have to be powered down for this activity
2. It is preferable to remove/replace petal from closed position, thus allowing crew to disable actuator spring

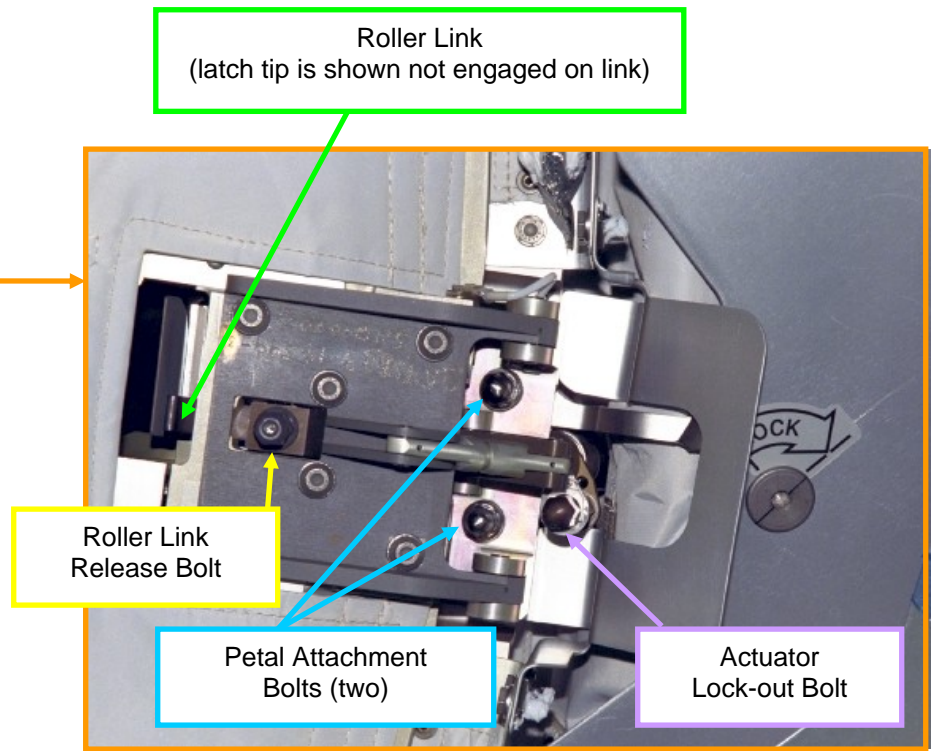
### Petal/Latch Locations:

Element/Location	Petal/Latch 1	Petal/Latch 2	Petal/Latch 3	Petal/Latch 4
Node 1 Nadir	Aft Stbd	Fwd Stbd	Fwd Port	Aft Port
Node 1 Port	Fwd Zenith	Aft Zenith	Aft Nadir	Fwd Nadir
Lab Forward	Zenith Stbd	Zenith Port	Nadir Port	Nadir Stbd
Node 2 Nadir	Aft Stbd	Fwd Stbd	Fwd Port	Aft Port
Node 2 Port	Fwd Zenith	Aft Zenith	Aft Nadir	Fwd Nadir
Node 2 Zenith	Aft Port	Fwd Port	Fwd Stbd	Aft Stbd
Node 2 Starboard	Fwd Nadir	Aft Nadir	Aft Zenith	Fwd Zenith
Node 2 Forward	Zenith Stbd	Zenith Port	Nadir Port	Nadir Stbd
JEM Zenith	Fwd Stbd	Aft Stbd	Aft Port	Fwd Port

# REMOVE CBM READY-TO-LATCH (RTL) – TASK DATA (Cont)

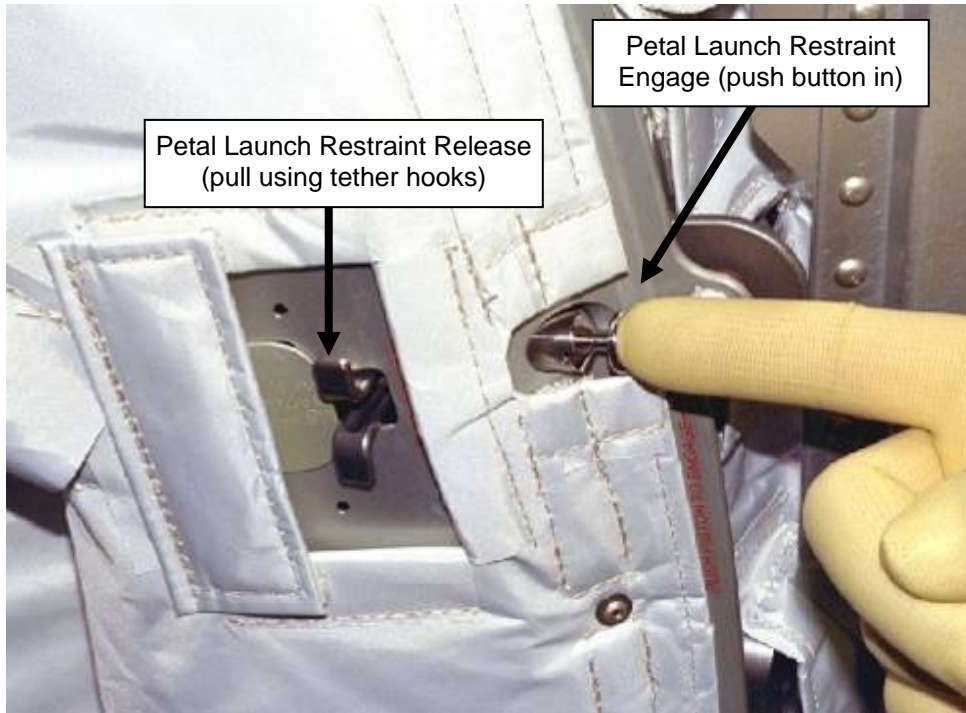


CBM PETAL

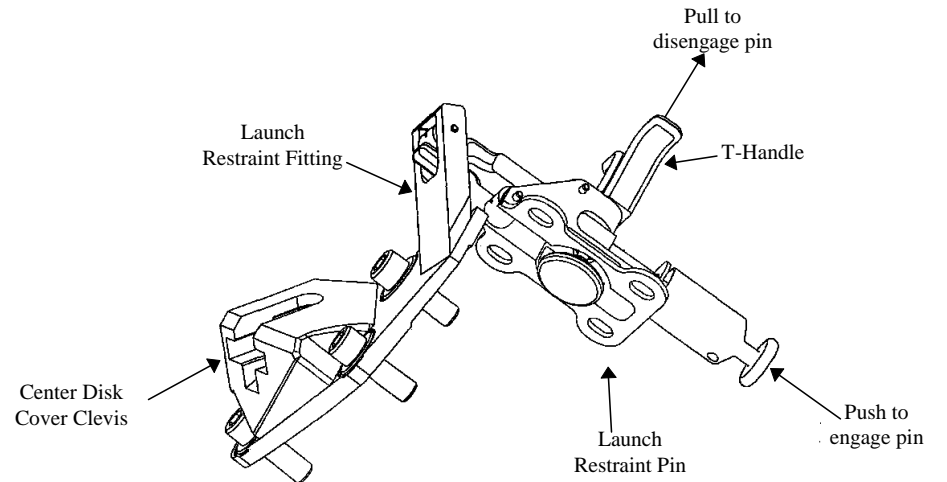


CBM PETAL DEPLOY MECHANISM

## REMOVE CBM READY-TO-LATCH (RTL) – TASK DATA (Cont)



CBM PETAL LAUNCH RESTRAINT OPERATION

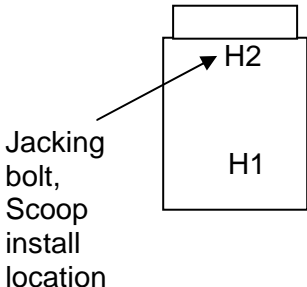


CBM PETAL LAUNCH RESTRAINT MECHANISM

## MBSU REMOVE/REPLACE

IV/SSRMS		EV1 (SSRMS)	EV2 (FF)
IV	<ol style="list-style-type: none"> <li>1. Verify with MCC S0 inhibits in place See Task Data</li> <li>2. Verify w/MCC ESP2 inhibits in place <ul style="list-style-type: none"> <li>• RPCM N1RS2-B RPC10 (open and close inhibited)</li> <li>• RPCM S04B F RPC 12 (open and close inhibited)</li> </ul> </li> </ol>	<div style="border: 2px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p><b>WARNING</b> Hazard voltage exists at the connectors of the MBSU. MBSU must be safed before removal</p> </div>	
SSRMS	<ol style="list-style-type: none"> <li>3. At TBD APFR install posn</li> </ol>	<p><u>S0 MBSU R&amp;R SETUP</u></p> <ol style="list-style-type: none"> <li>1. Retrieve APFR from TBD location</li> <li>2. Translate to SSRMS APFR install location</li> <li>3. Install WIF adapter in SSRMS PFR socket, tether point toward EE</li> <li>4. Install APFR (12,PP,F,6) in SSRMS WIF adapter (Toes away from EE) <ul style="list-style-type: none"> <li>• Pull test</li> <li>• Verify APFR lock collar black on black</li> </ul> </li> <li>5. Safety tether swap to SSRMS, verify hook locked; attach A/L safety tether to nearby HR</li> <li>6. GCA SSRMS for APFR ingress</li> <li>7. Ingress SSRMS APFR</li> <li>8. GCA SSRMS to MBSU worksite</li> </ol>	<p><u>S0 MBSU R&amp;R SETUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to ESP2; attach BRT to ESP2 HR 8003 (aft face, stbd side)</li> <li>2. Remove MLI from spare MBSU (hinge is FWD) <ul style="list-style-type: none"> <li><input type="checkbox"/> Release Velcro tabs on front, side, and back corners of ORU base</li> <li><input type="checkbox"/> Release integral strap from underside of fwd flap</li> <li><input type="checkbox"/> Fold or roll cover toward back of MBSU, attach strap to Velcro mating swatch on back side of MLI</li> <li><input type="checkbox"/> Using side straps from front of MLI, secure rest of MLI as reqd</li> </ul> </li> <li>3. Translate up CETA Spur to S0 Face 1</li> <li>4. Translate to failed MBSU</li> </ol>
IV	<ol style="list-style-type: none"> <li>4. Verify SSRMS in standby prior to APFR install</li> </ol>		
SSRMS	<ol style="list-style-type: none"> <li>5. On EV GO, to APFR Ingress posn, as reqd</li> <li>6. On EV GO, to MBSU worksite</li> </ol>		
IV	<ol style="list-style-type: none"> <li>7. Record S/N of failed MBSU _____</li> </ol>		<ol style="list-style-type: none"> <li>5. Verify failed MBSU P/N and S/N to IV</li> <li>6. Install Sq TM on H1 fitting; √anti-backlash neutral</li> </ol>

## MBSU REMOVE/REPLACE (Cont)

IV/SSRMS	EV1 (SSRMS)	EV2 (FF)
 <p>Jacking bolt, Scoop install location</p> <p>SSRMS 8. On EV GO, to spare MBSU on ESP2</p>	<p><u>MBSU REMOVAL</u></p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b></p> <p>Acme screws unfastened/fastened out of sequence could lead to jamming of MBSU</p> </div> <p>On MCC GO:</p> <ol style="list-style-type: none"> <li>1. <b>PGT [B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-Sq TM-7/16Rec:</b> Drive PGT 5 turns (1 turn at bolt) on H1</li> <li>2. Remove Sq TM and install on H2 fitting; √anti-backlash neutral</li> <li>3. <b>PGT [B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 Ext 7/16:</b> Drive H1 ~8 turns</li> <li>4. √Status indicator – UNLOCK</li> <li>5. <b>PGT [B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-Sq TM-7/16Rec:</b> Drive PGT 5 turns on H2</li> <li>6. Transfer TM to EV2</li> <li>7. Receive Sq Scoop from EV2; install on H2</li> <li>8. <b>PGT [B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 Ext 7/16:</b> Drive H2 ~18 turns</li> <li>9. √Status indicator – UNLOCK</li> <li>10. Stow PGT</li> </ol> <div style="border: 3px double black; padding: 5px; text-align: center;"> <p><b>WARNING</b></p> <p>Avoid contact with intermeshing fins of the MBSU and coldplate</p> </div> <ol style="list-style-type: none"> <li>11. Remove MBSU from coldplate (soft dock on H2 15-20 lb)</li> </ol> <p><u>RETRIEVE SPARE MBSU/STOW FAILED MBSU</u></p> <ol style="list-style-type: none"> <li>1. GCA SSRMS to spare MBSU on ESP2</li> <li>2. Temp stow failed MBSU on ESP2 HR 8005 using MUT EE/Ballstack (fins facing away from structure)</li> </ol>	<p><u>MBSU REMOVAL</u></p> <ol style="list-style-type: none"> <li>1. Receive Sq TM from EV1; stow on MWS</li> <li>2. Transfer Sq Scoop to EV1</li> </ol> <p><u>RETRIEVE SPARE MBSU/STOW FAILED MBSU</u></p> <ol style="list-style-type: none"> <li>1. Translate to ESP2; assist with temp stow</li> <li>2. Install MUT EE/Ballstack on ESP2 HR 8005</li> <li>3. Temp stow failed MBSU on ESP2 HR 8005 using MUT EE/Ballstack (fins facing away from structure)</li> </ol>

**MBSU REMOVE/REPLACE (Cont)**

IV/SSRMS	EV1 (SSRMS)	EV2 (FF)									
<p>IV 9. Record failed MBSU installation turns and torque</p> <table border="1" data-bbox="113 987 485 1118"> <thead> <tr> <th>Bolt</th> <th>Turns</th> <th>Torque</th> </tr> </thead> <tbody> <tr> <td>H2</td> <td></td> <td></td> </tr> <tr> <td>H1</td> <td></td> <td></td> </tr> </tbody> </table> <p>SSRMS 10. On EV GO, to MBSU worksite</p>	Bolt	Turns	Torque	H2			H1			<ol style="list-style-type: none"> <li>3. <b>PGT [B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-Sq TM-7/16Rec:</b> Drive PGT 5 turns on H1</li> <li>4. Remove Sq TM and install on H2 fitting; √anti-backlash neutral</li> <li>5. <b>PGT [B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 Ext 7/16:</b> Drive H1 ~8 turns</li> <li>6. √Status indicator – UNLOCK</li> <li>7. <b>PGT [B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-Sq TM-7/16Rec:</b> Drive PGT 5 turns on H2</li> <li>8. Transfer Sq TM to EV2</li> <li>9. Retrieve Sq Scoop from MWS; install on H2</li> <li>10. <b>PGT [B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6 Ext 7/16:</b> Drive H2 ~18 turns</li> <li>11. √Status indicator – UNLOCK</li> <li>12. Stow PGT</li> <li>13. Remove MBSU (soft dock on H2 15-20 lb); transfer to EV2</li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><b>CAUTION</b></p> <p>Ensure ORU is maintained level and perpendicular to the tiedown stanchions during installation. Failure to comply may damage H-2 status indicator probe</p> </div> <ol style="list-style-type: none"> <li>14. Install failed MBSU (soft dock on H2 15-20 lb) on FRAM</li> <li>15. √Status indicator on H1 and H2 are in UNLOCK</li> <li>16. <b>PGT [B2 16.0 ft-lb, CW2 30 RPM, 30.5]-6Ext-7/16:</b> Drive H2, expect 17 turns</li> <li>17. √H2 status indicator – LOCK</li> <li>18. <b>PGT [B2 16.0 ft-lb, CW2 30 RPM, 30.5]-6Ext-7/16:</b> Drive H1, expect 5.7 turns</li> <li>19. √H1 status indicator – LOCK</li> <li>20. Remove Sq Scoop; stow on MWS</li> <li>21. Install thermal cover on failed unit</li> </ol>	<ol style="list-style-type: none"> <li>4. Install Sq TM on Spare MBSU H1 fitting; √anti-backlash neutral</li> <li>5. Receive Sq TM from EV1; stow on MWS</li> <li>6. Receive spare MBSU</li> </ol>
Bolt	Turns	Torque									
H2											
H1											



**MBSU REMOVE/REPLACE (Cont)**

IV/SSRMS	EV1 (SSRMS)	EV2 (FF)									
<p>IV 11. Record spare MBSU installation turns and torque</p> <table border="1" data-bbox="113 621 485 753"> <thead> <tr> <th>Bolt</th> <th>Turns</th> <th>Torque</th> </tr> </thead> <tbody> <tr> <td>H2</td> <td></td> <td></td> </tr> <tr> <td>H1</td> <td></td> <td></td> </tr> </tbody> </table> <p>SSRMS 12. On EV GO, to spare safety tether location</p>	Bolt	Turns	Torque	H2			H1			<p>22. Receive spare MBSU 23. GCA SSRMS to MBSU worksite</p> <p><u>INSTALL SPARE MBSU</u></p> <p>1. Orient MBSU such that blind-mate connectors and H2 are oriented correctly</p> <div data-bbox="632 532 1205 781" style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>There is a TBD thermal dwell time between the MBSU &amp; coldplate. Wait TBD time prior to driving bolt</p> <p>Ensure ORU is maintained level and perpendicular to the tiedown stanchions during installation. Failure to comply may damage H-2 status indicator probe</p> </div> <p>2. Install spare MBSU (soft dock on H2 15-20 lb) 3. √Status indicator on H1 and H2 are in UNLOCK 4. <b>PGT [A3 4.8 ft-lb, CW2 30 RPM, 30.5]-6Ext-7/16:</b> Drive H2, expect 17 turns 5. √H2 status indicator – LOCK 6. <b>PGT [A3 4.8 ft-lb, CW2 30 RPM, 30.5]-6Ext-7/16:</b> Drive H1, expect 5.7 turns 7. √H1 status indicator – LOCK 8. Give MCC-H GO to restore power to MBSU</p> <p><u>CLEANUP</u></p> <p>1. GCA SSRMS to spare safety tether anchor point 2. Egress APFR; tether swap back to A/L safety tether, verify hook locked 3. Remove APFR; stow in TBD location 4. Remove WIF Adapter; stow in small trash bag</p>	<p>7. Transfer spare MBSU to EV1</p> <p><u>INSTALL SPARE MBSU</u></p> <p>1. Translate to worksite 2. Inspect guide rails and connectors for debris/damage 3. Assist EV1 with MBSU install</p> <p><u>CLEANUP</u></p> <p>1. Remove Sq scoop from MBSU</p>
Bolt	Turns	Torque									
H2											
H1											

## MBSU REMOVE/REPLACE – TASK DATA

### Estimated Task Duration:

	With SSRMS
One EV Crew	NA
Two EV Crew	03:00

### Tools:

EV1	EV2
Square scoop	EVA Crewlock bag (optional)
PGT – 6 Ext 7/16	Square Scoop
WIF Adapter	EVA Ratchet 3/8 drive – 6 Ext 7/16 (backup)
Safety Tether (SSRMS)	Sq TM 7/16 rec
APFR	MUT EE
	Ballstack

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
H1 (Secondary Bolt)	H1	7/16	1	4.8 (S0) 18.4 (esp2)	60	190.3 (R) 83.8 (I)	5-6 (R) 5.7 (I)	30
H2 (Primary Bolt)	H2	7/16	1	4.8 (S0) 18.4 (esp2)	60	188.4 (R) 68.9 (I)	16-17 (R) 16-17 (I)	30

### Foot Restraints:

TASK	WIF	APFR SETTING
MBSU	SSRMS	12, PP, F, 6

### ORU DATA:

ORU	PART NUMBER	SERIAL NUMBER	MASS	DIMENSIONS
MBSU 1A1B	R072591-41	X700385	236 lb	40" x 28" x 12"
MBSU 2A2B	R072591-41	X700386	236 lb	40" x 28" x 12"
MBSU 3A3B	R072591-41	C250636	236 lb	40" x 28" x 12"
MBSU 4A4B	R072591-41	C250637	236 lb	40" x 28" x 12"
Spare MBSU	R072591-41	X652064	236 lb	40" x 28" x 12"
Spare MBSU	R072591-41	TBD	236 lb	40" x 28" x 12"

### Power Inhibits:

MBSU	DCSU Inhibits	MBSU Inhibits
<u>MBSU 1A1B</u>	<u>DCSU 1A RBI 6 open</u> <u>DCSU 1B RBI 6 open</u>	<u>MBSU 4 RBI 6 open</u> <u>MBSU 4 RBI 7 open</u> <u>MBSU 2 RBI 14 open</u>
<u>MBSU 2A2B</u>	<u>DCSU 2A RBI 6 open</u> <u>DCSU 2B RBI 6 open</u>	<u>MBSU 1 RBI 6 open</u> <u>MBSU 3 RBI 7 open</u> <u>MBSU 1 RBI 14 open</u>
<u>MBSU 3A3B</u>	<u>DCSU 3A RBI 6 open</u> <u>DCSU 3B RBI 6 open</u>	<u>MBSU 2 RBI 6 open</u> <u>MBSU 2 RBI 7 open</u> <u>MBSU 4 RBI 14 open</u>
<u>MBSU 4A4B</u>	<u>DCSU 4A RBI 6 open</u> <u>DCSU 4B RBI 6 open</u>	<u>MBSU 3 RBI 6 open</u> <u>MBSU 1 RBI 7 open</u> <u>MBSU 3 RBI 14 open</u>

### Notes:

- H1 is secondary bolt, H2 is primary bolt
- NO ACTION is required when Acme screw torque and appropriate number of turns has been met and the status indicator is not at the LOCKED position. Report anomaly
- Removing MBSU from coldplate causes H1 status indicator to move from UNLOCK to LOCK
- There is no hard stop when releasing H1 and H2 bolts; upon release, they will free spin
- Primary stanchion (H2) has ~15-20 lb soft dock force to overcome during MBSU removal and installation from/to FSE & coldplate
- H1 and H2 status indicators are not identical, see drawing below

### Cautions:

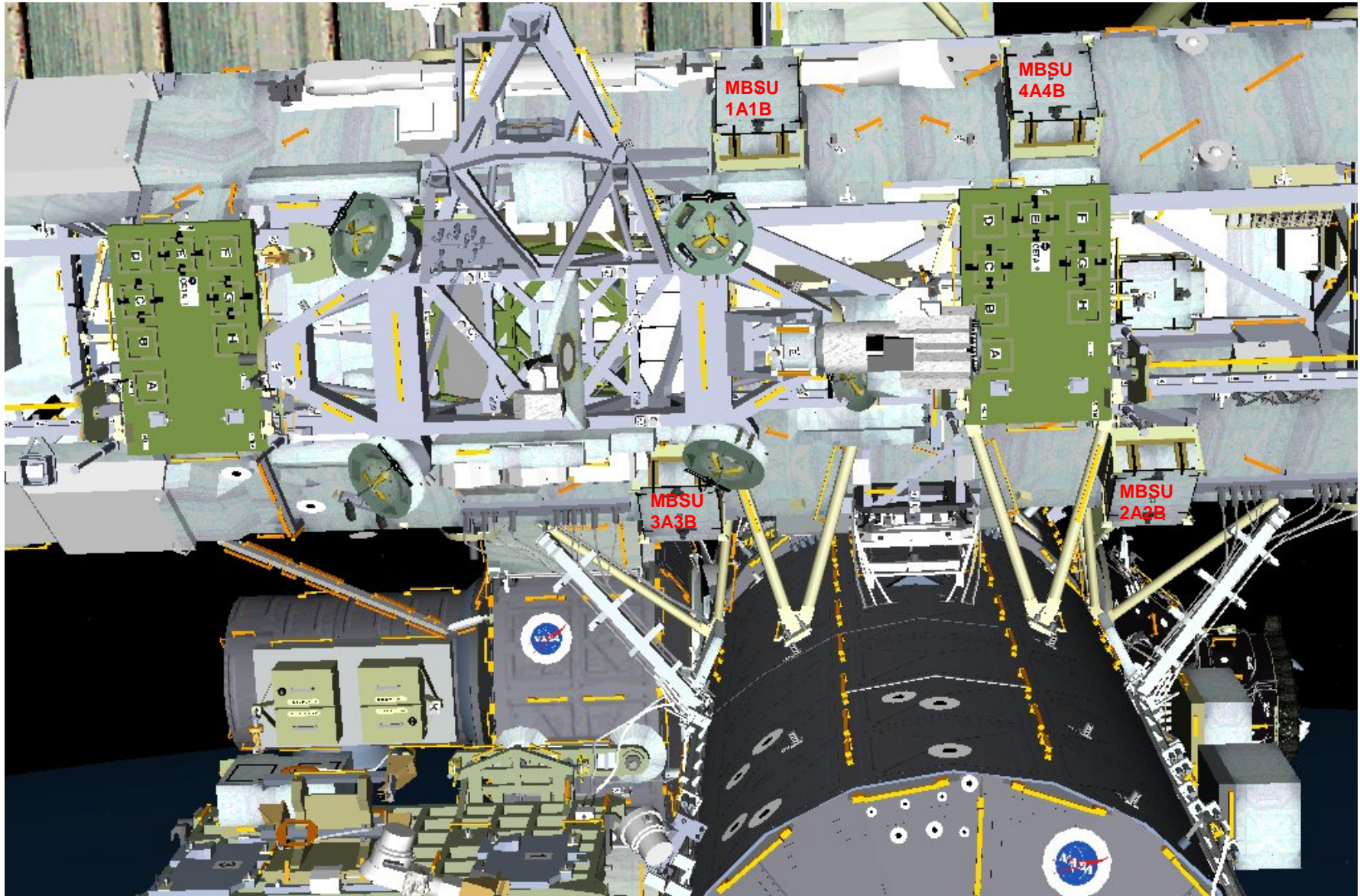
- Acme screws unfastened/fastened out of sequence could lead to jamming of MBSU during removal. When unfastening Acme screws, H1 must be unfastened before H2
- H1 bolt must always be released first and H2 bolt (jack screw) must always be installed first or damage to ORU and underlying structure may occur
- Ensure ORU is maintained level and perpendicular to the tiedown stanchions during installation. Failure to comply may damage H-2 status indicator probe
- Minimize force applied to H1 microfixture. It is not rated to withstand excessive loads
- There is a TBD thermal dwell time between the MBSU and coldplate. Wait TBD time, prior to driving bolts

### Warnings:

- Hazard voltage exists at the connectors of the MBSU. MBSU must be safed before removal
- Avoid contact with intermeshing fins of the MBSU and coldplate due to sharp edge concerns

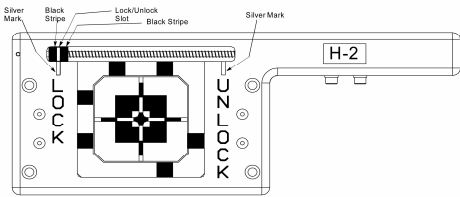
MBSU REMOVE/REPLACE – TASK DATA (Cont)

MBSU Locations

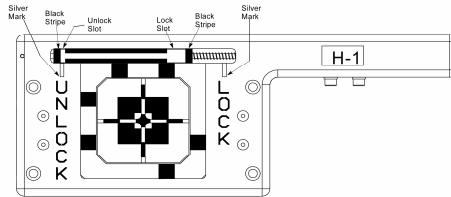


# MBSU REMOVE/REPLACE – TASK DATA (Cont)

H2 Status Indicator

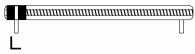


H1 Status Indicator



**Positional Criteria**  
(Adhered to in accordance with torque and turns specified in LSAR procedure.)

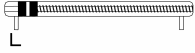
Locked, Nominal: The lock/unlock slot should be centered in relation to the silver mark.



Unlocked, Nominal: The lock/unlock slot should be centered in relation to the silver mark.



Locked, Tolerance: The lock/unlock slot can be left or right of nominal by a distance no greater than the width of the black stripe.



Unlocked, Tolerance: The lock/unlock slot can be left or right of nominal by a distance no greater than the width of the black stripe.



LOG-1010-01

**Positional Criteria**  
(Adhered to in accordance with torque and turns specified in LSAR procedure.)

Unlocked, Nominal: The unlock slot should be centered in relation to the silver mark.



Locked, Nominal: The right edge of the lock slot should be flush with the right edge of the silver mark.



Unlocked, Tolerance: The unlock slot can be left or right of nominal by a distance no greater than the width of the black stripe.



Locked, Tolerance: The lock slot can be left of nominal by a distance no greater than the width of the black stripe.



LOG-1009-01

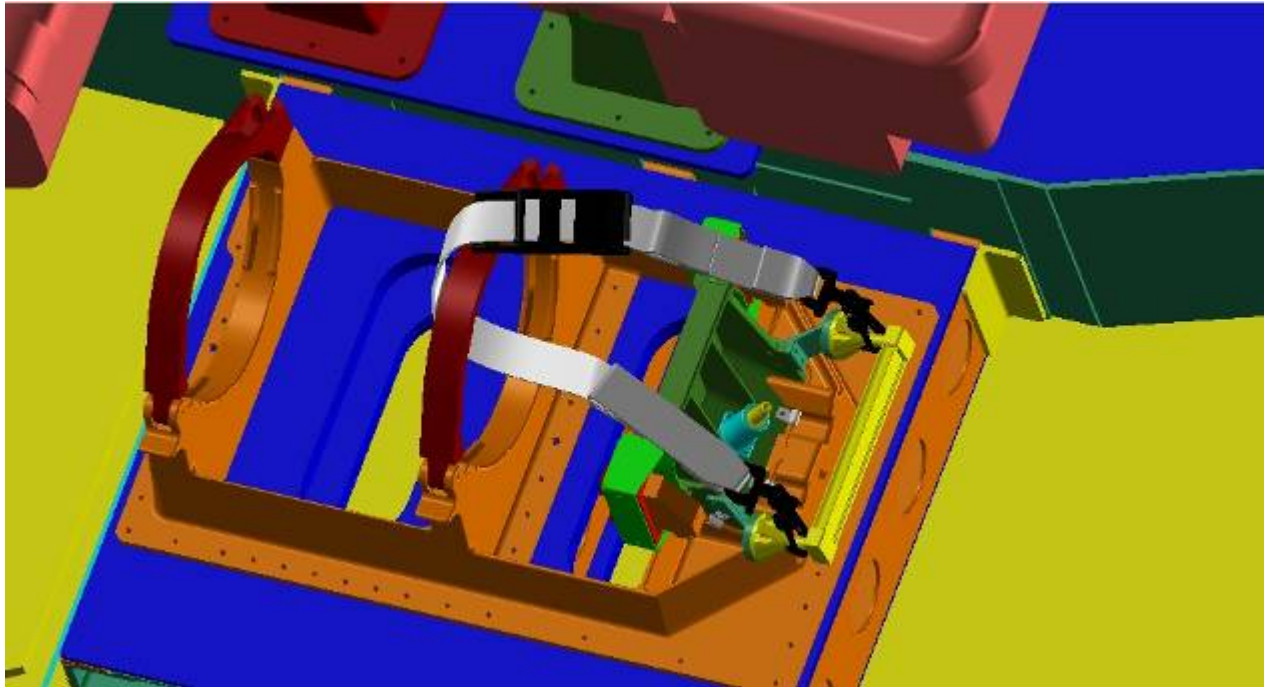


Spare MBSU w/MLI attached to FRAM on ESP2

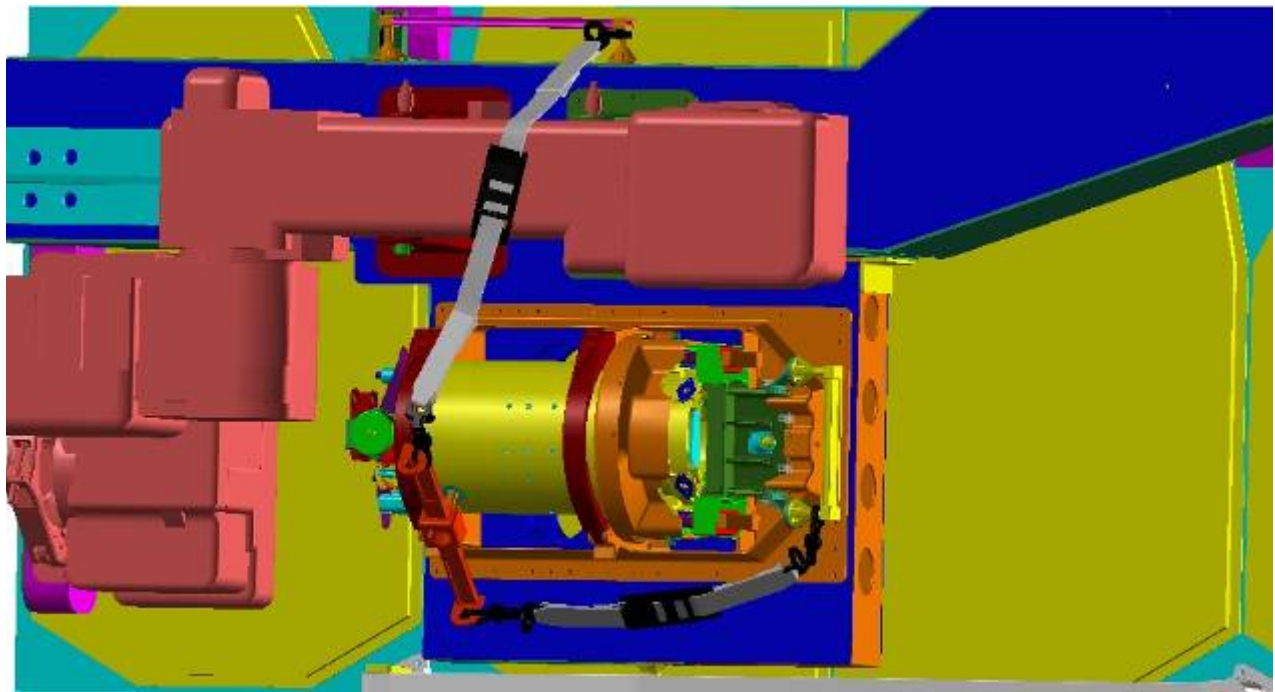


MBSU at worksite

1JA ISS ORU TIE-DOWN PLAN

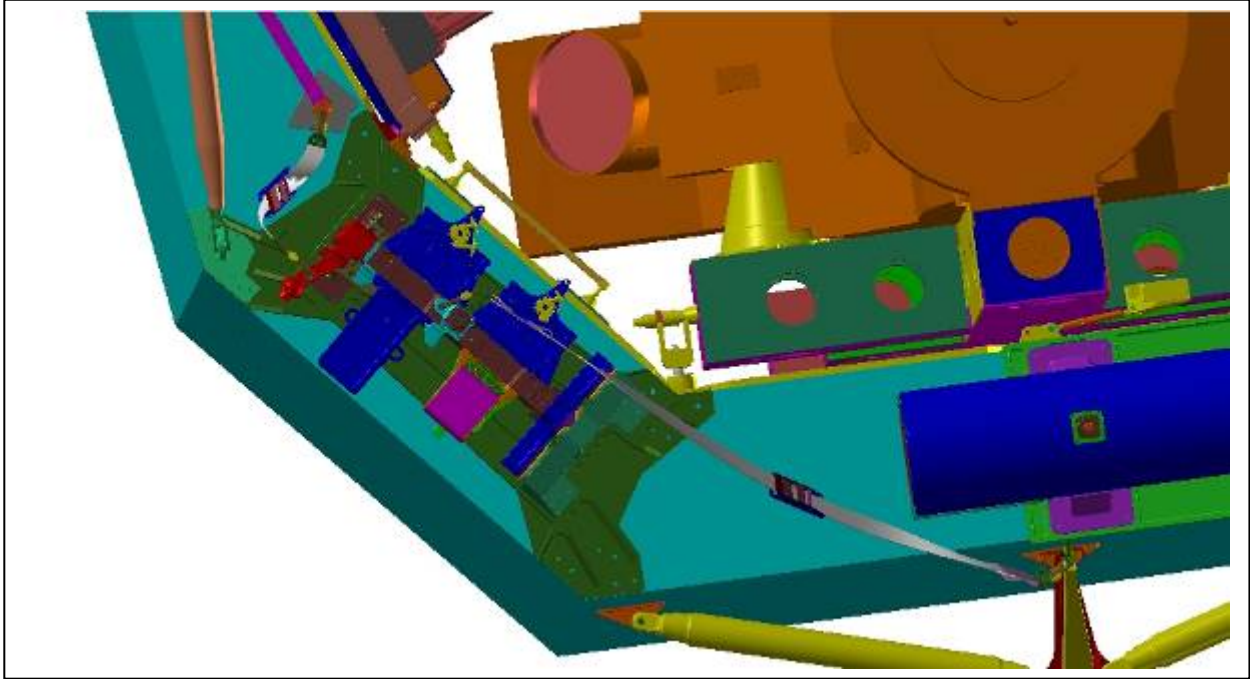


OTCM KA UMBILICAL 1 & 2

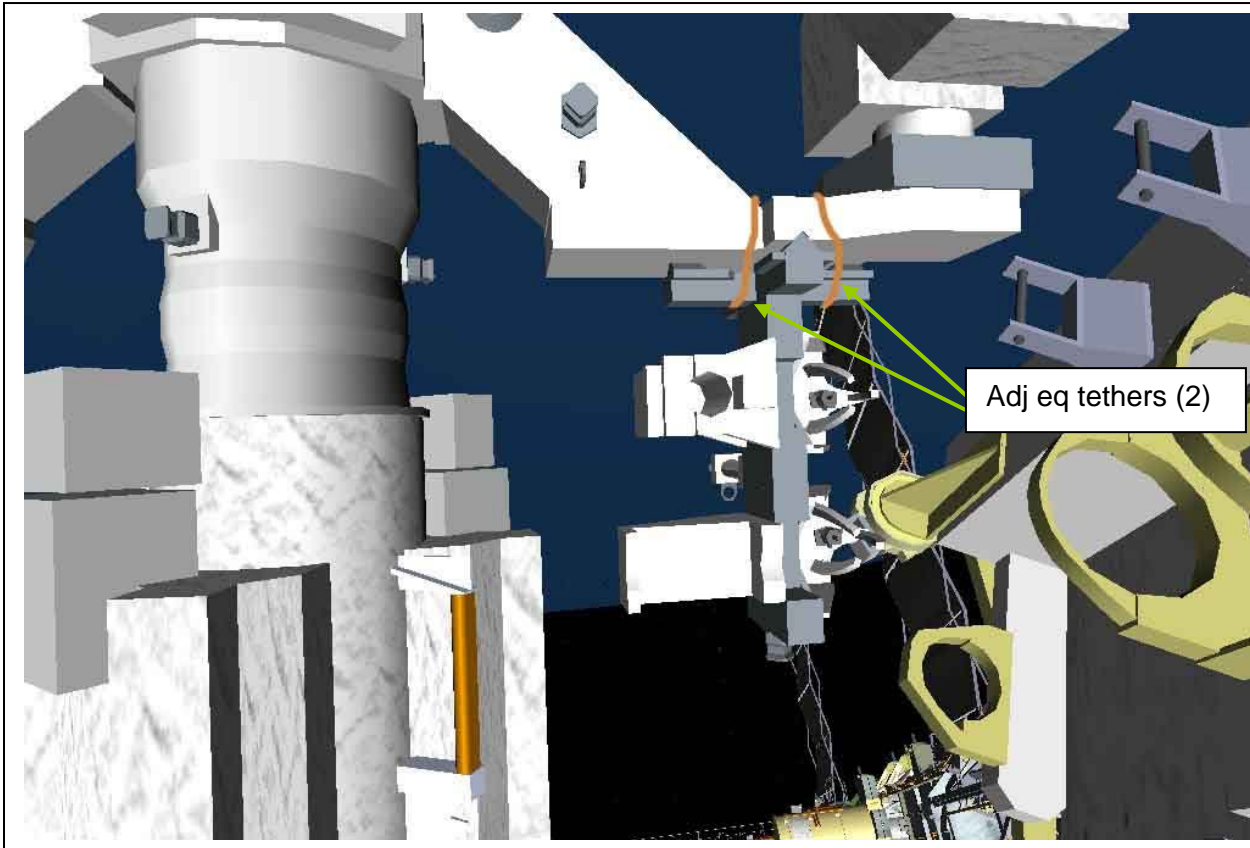


OTCM 1 & 2

1JA ISS ORU TIE-DOWN PLAN (Cont)

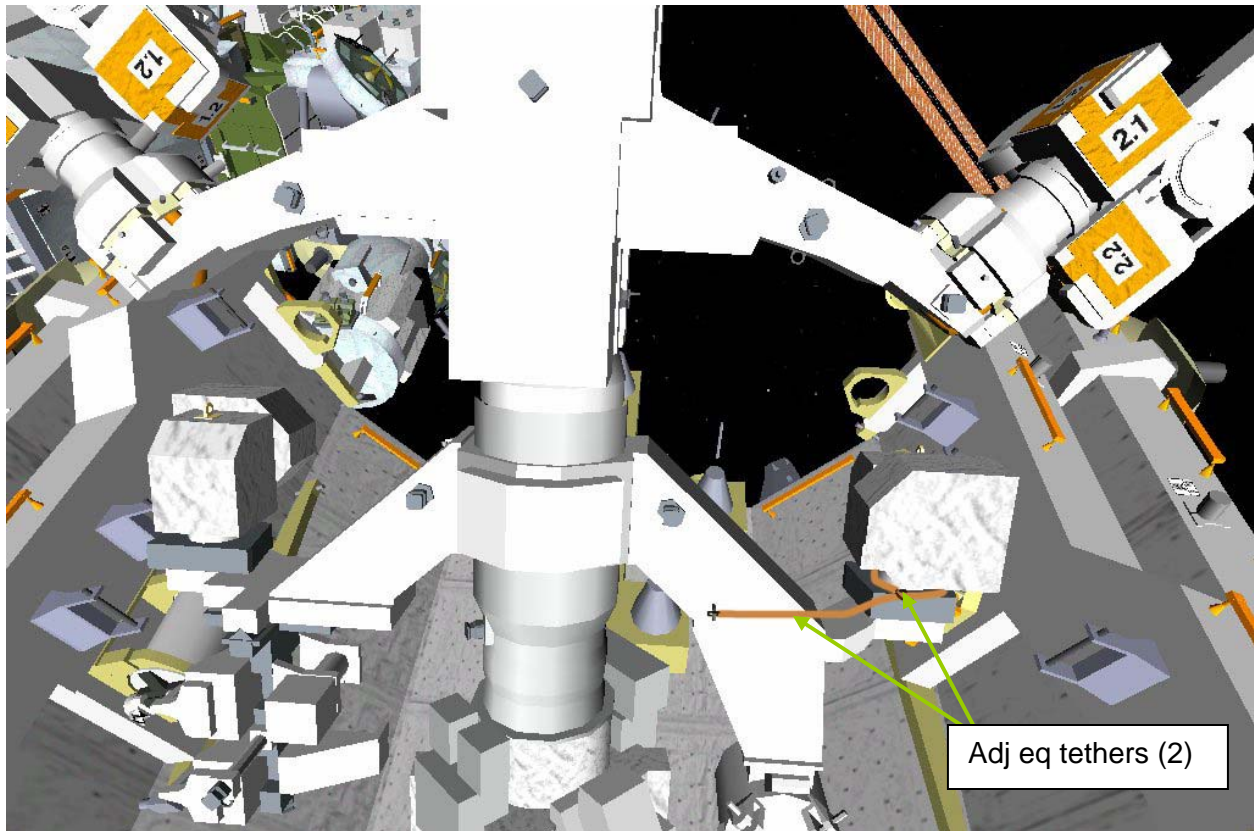


THA (ON FSE)

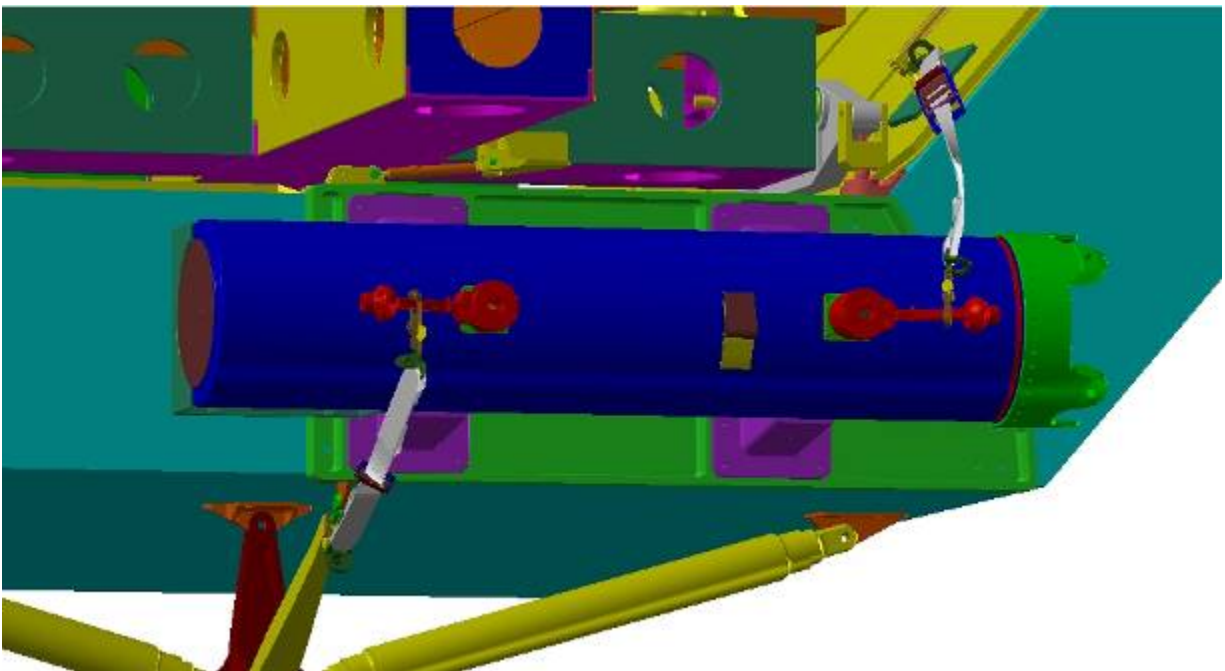


THA (ON SPDM)

1JA ISS ORU TIE-DOWN PLAN (Cont)

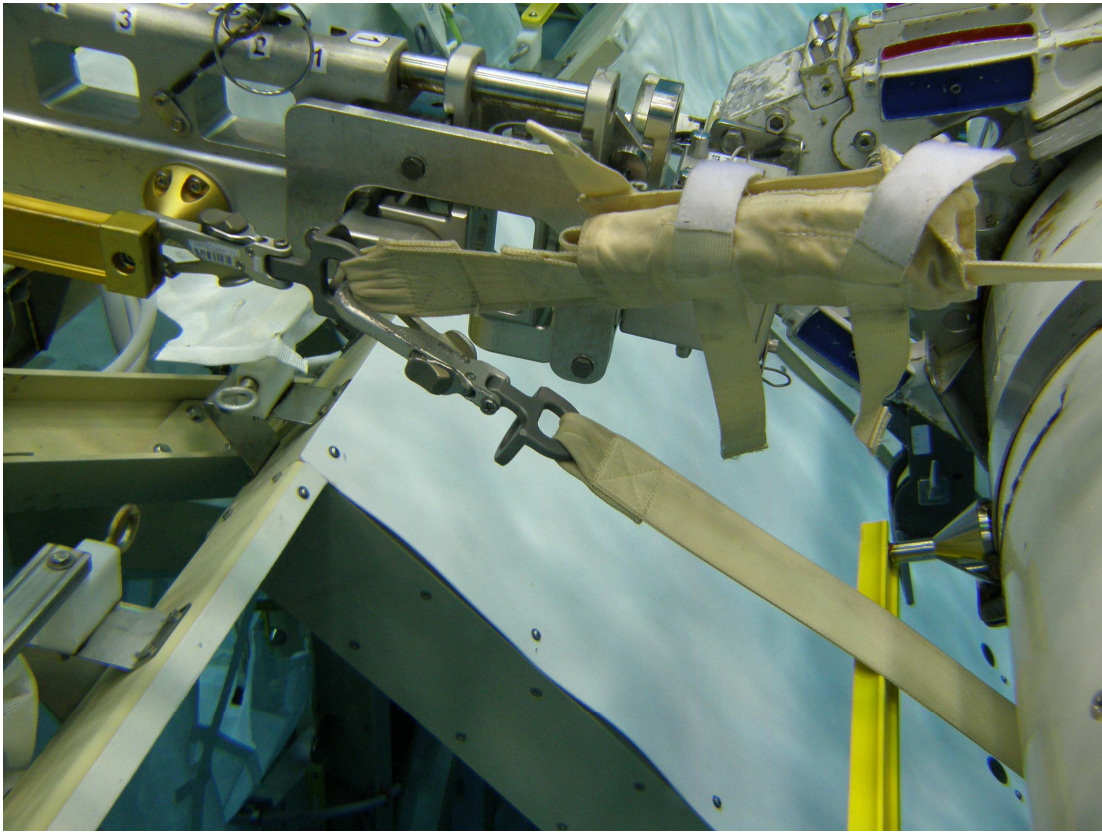


CLPA (on SPDM)

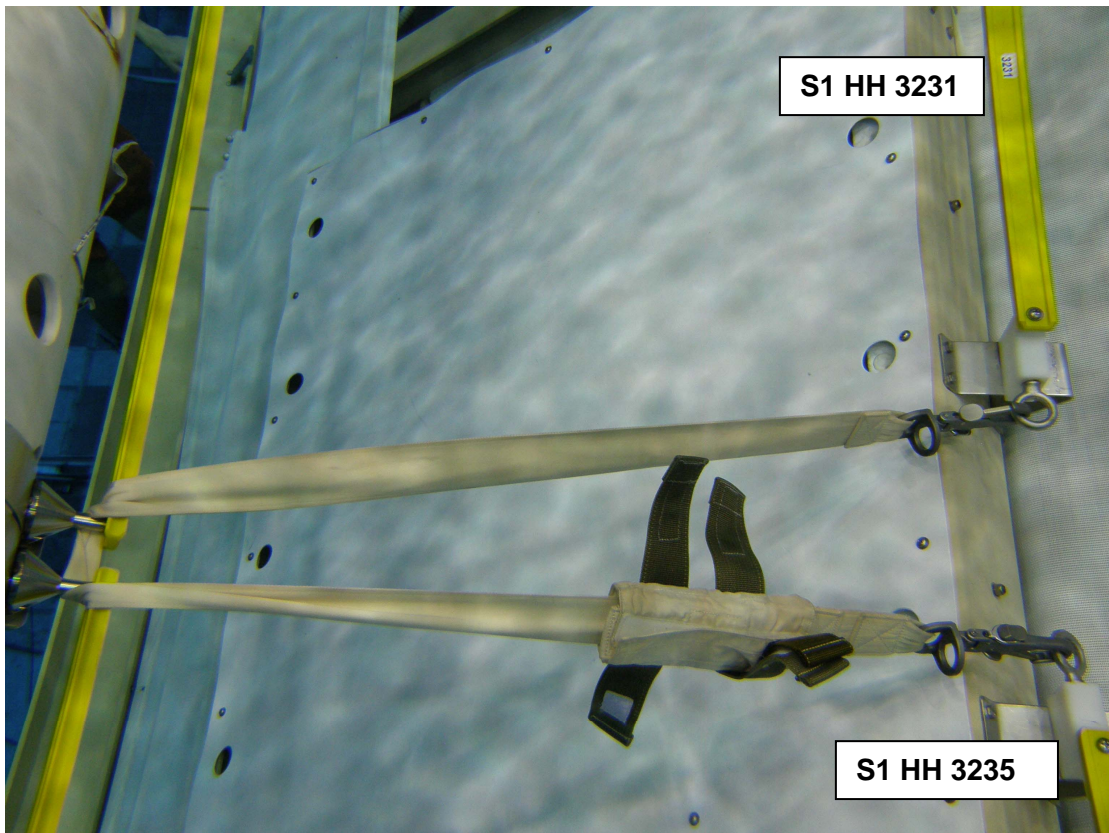


OTP

1JA ISS ORU TIE-DOWN PLAN (Cont)



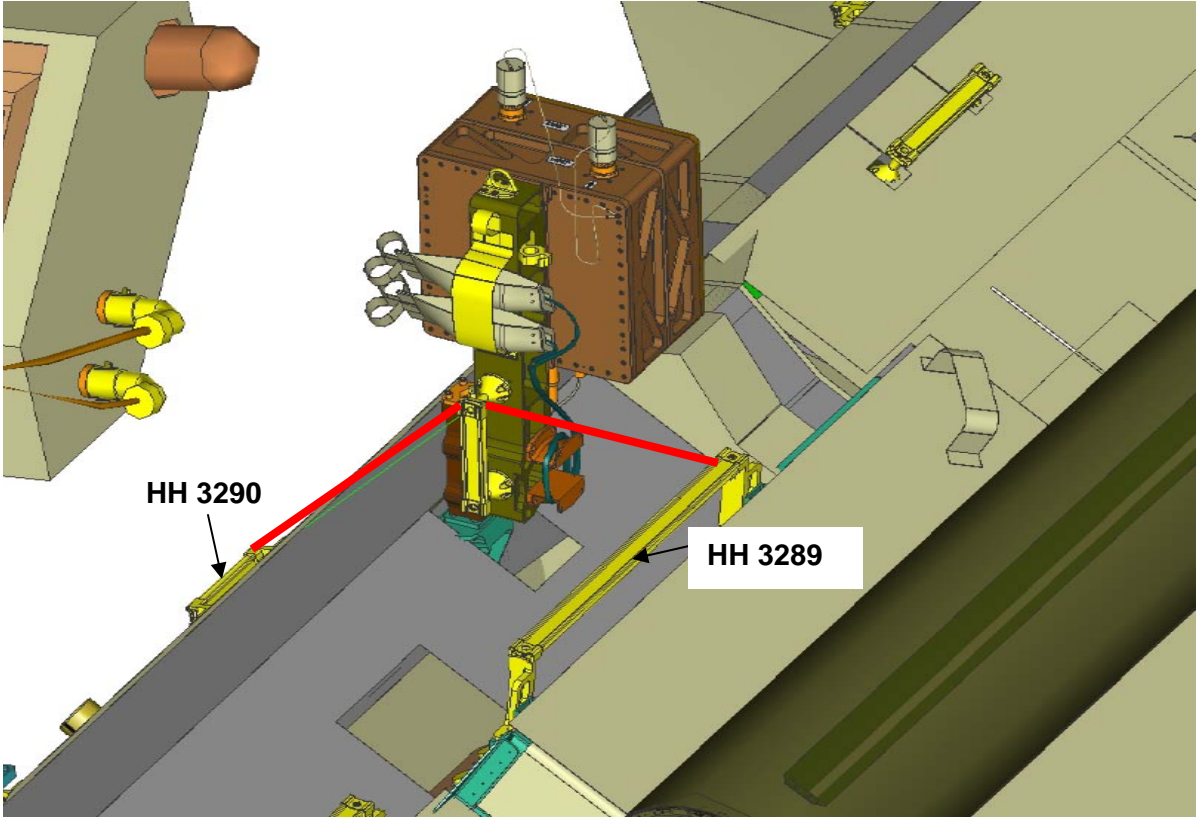
OBSS (inboard)



OBSS (outboard)



1JA ISS ORU TIE-DOWN PLAN (Cont)



HH 3290

HH 3289

OBSS KAU AVIONICS BOX

## CONTINGENCY EVA DRIVE OF A FAILED SPDM ARM JOINT

IV	EV1(FF or SSRMS)
<p>1. Verify with MCC SPDM Arm inhibits in place</p>	<div data-bbox="682 298 1671 448" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><b>WARNING</b></p> <p>EVA crew must avoid volume extending 6-in out from front of OPERATING light on MSS camera/lights (EMU touch temperature hazard)</p> <p>EVA crew should avoid contact with SPDM grippers which could be sharp</p> </div> <div data-bbox="682 482 1663 946" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><b>CAUTION</b></p> <p>EVA drive should not be operated at a rate faster than 20 RPM. This limits the maximum arm tip rate to 0.5-inches per sec</p> <p>EVA joint drive mechanism should only be used to overcome an electrical failure, not a mechanical jam</p> <p>The torque applied to joint EVA drive shaft must not exceed TBD in-lb (to be analyzed real time). Failure to comply could damage joint motor</p> <p>Verify drive rotation direction against scales on joint shroud to prevent collision with structure</p> <p>SPDM ORUs should be covered by OSE Thermal Blankets if SPDM power down will exceed thermal clock: CLPA (2 hr), OTCM (2.7 hr), CLA (4 hr), Electronics Platform (6 hr), Arm (8.3 hr)</p> <p>Radiative surfaces are no touch. Places labeled as touch can take EVA kick loads. Places that aren't radiative surfaces but not labeled as touch can still withstand light inadvertent contact</p> </div> <p><b><u>ROTATE FAILED ARM JOINT VIA JOINT EVA DRIVE</u></b></p> <ol style="list-style-type: none"> <li>1. Determine/verify required joint rotation direction by observing scales on joint shroud</li> <li>2. <b>PGT [A1 2.5 ft-lb, CW1 or CCW1 10 RPM, MTL 30.5]</b> Engage EVA Contingency Joint Bolt</li> <li>3. Drive until desired joint angle is obtained</li> <li>4. Stow PGT</li> </ol>

# CONTINGENCY EVA DRIVE OF A FAILED SPDM ARM JOINT – TASK DATA

## Estimated Task Duration:

One EV Crew	00:15
-------------	-------

## Tools:

EV1
PGT – 6 Ext 7/16



SR EVA Drive



SY EVA Drive



SP EVA Drive



EP EVA Drive



WP EVA Drive



WY EVA Drive



WR EVA Drive

**CONTINGENCY EVA DRIVE OF A FAILED SPDM ARM JOINT – TASK DATA (Cont)**



SPDM Arm Joint Scale Shown in Yellow

FLIGHT SPECIFIC EVA REFERENCE

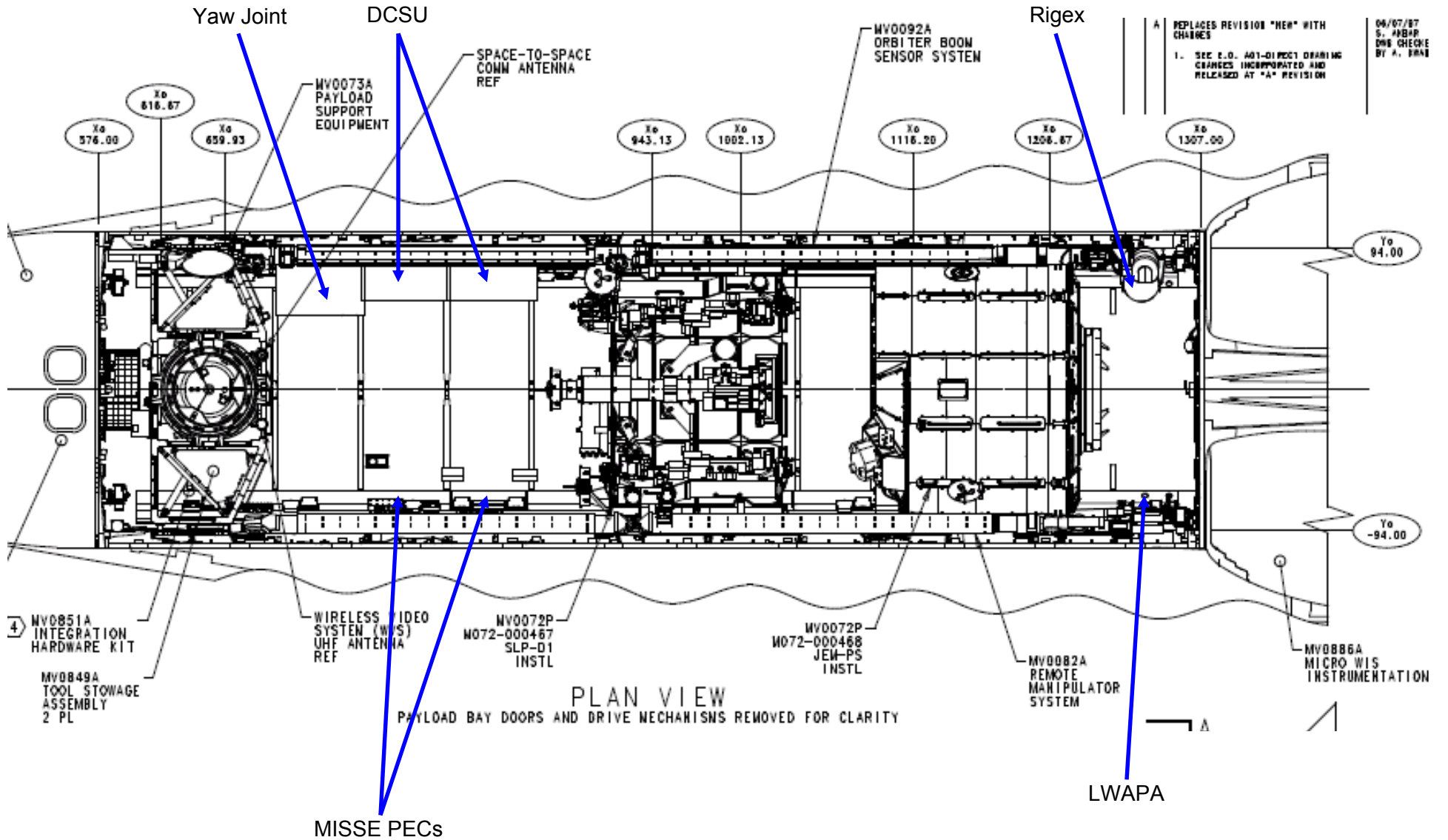
I

PAYLOAD BAY CARGO SCHEMATIC .....	FS 18-3
JLP NADIR ENDCONE VIEW .....	FS 18-4
JLP FWD SIDE VIEW .....	FS 18-5
JLP PORT SIDE VIEW .....	FS 18-6
JLP AFT SIDE VIEW .....	FS 18-7
JLP STBD SIDE VIEW.....	FS 18-8
JLP ZENITH ENDCONE VIEW.....	FS 18-9
SPDM BODY IN FSE – AFT .....	FS 18-10
SPDM BODY IN FSE – FORWARD .....	FS 18-11
SPDM ARM FSE.....	FS 18-12
SPDM ARM FSE – KAU TEMPS STOWS.....	FS 18-13
SPDM OTCM SOCKET RESTRAINING PLATE .....	FS 18-14
SPDM KEEP-ALIVE ASSEMBLY (KAU) .....	FS 18-15
SPDM OTCM TENT BLANKET .....	FS 18-16
SPDM THA AND OTP INTERFACES.....	FS 18-17
SPDM ASSY .....	FS 18-18
SPDM CAMERA LIGHT ASSY (CLA).....	FS 18-19
SPDM CAMERA LIGHT PAN TILT ASSY (CLPA) .....	FS 18-21
SPDM PDGF.....	FS 18-23
SPDM ORU TOOL CHANGEOUT MECHANISM (OTCM).....	FS 18-24
SPDM ARM ASSY .....	FS 18-27
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MISSE 6 PECs INSTALLED ON LWAPA ON COL EPF .....	FS 18-50
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MISSE SWC LATCH ASSY .....	FS 18-53
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DCSU BLANKET, ACTIVE FRAM, AND SAPA.....	FS 18-59
DCSU COURSE ALIGNMENT GUIDES.....	FS 18-60

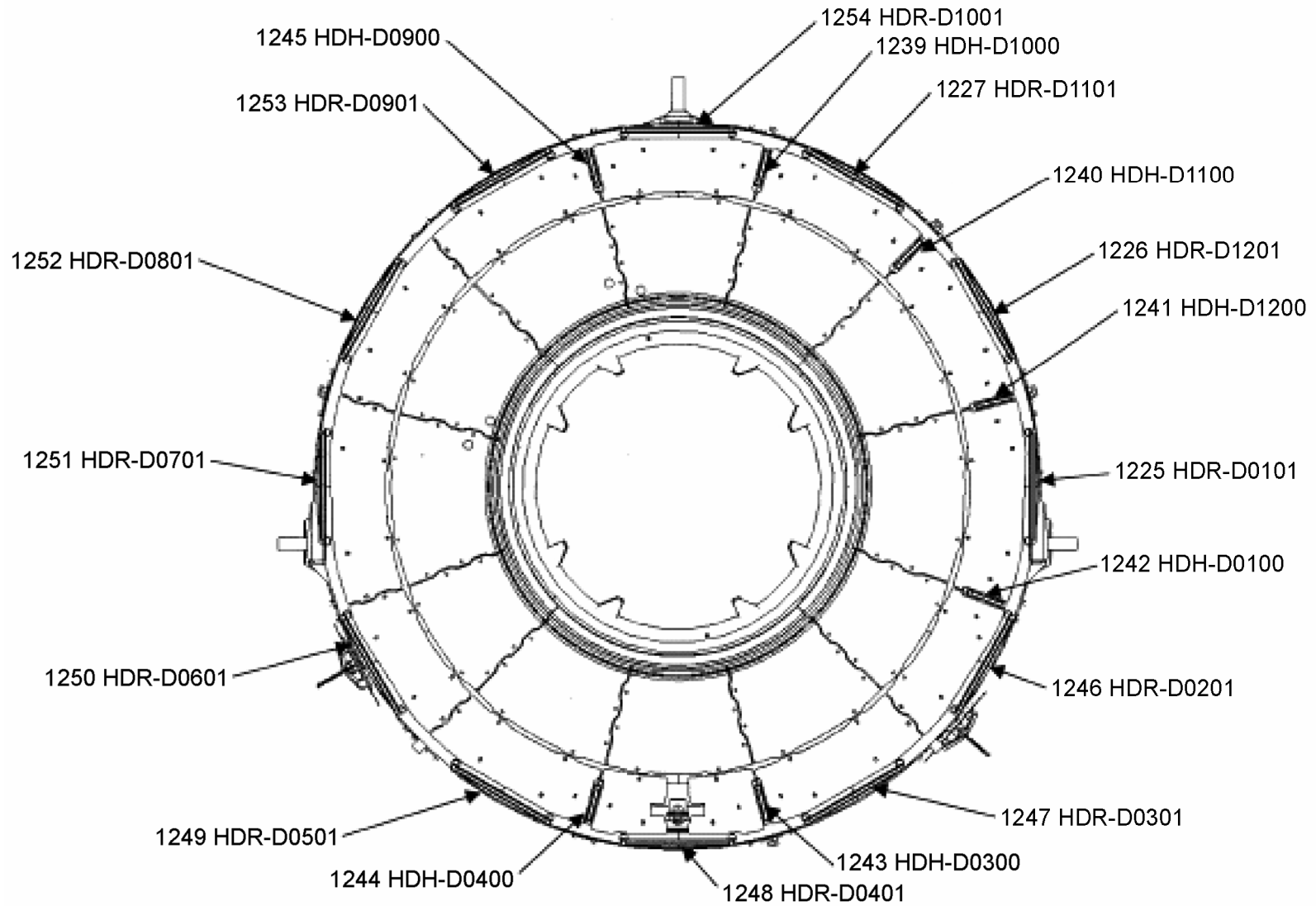
**FLIGHT SPECIFIC  
EVA REFERENCE**

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# PAYLOAD BAY CARGO SCHEMATIC

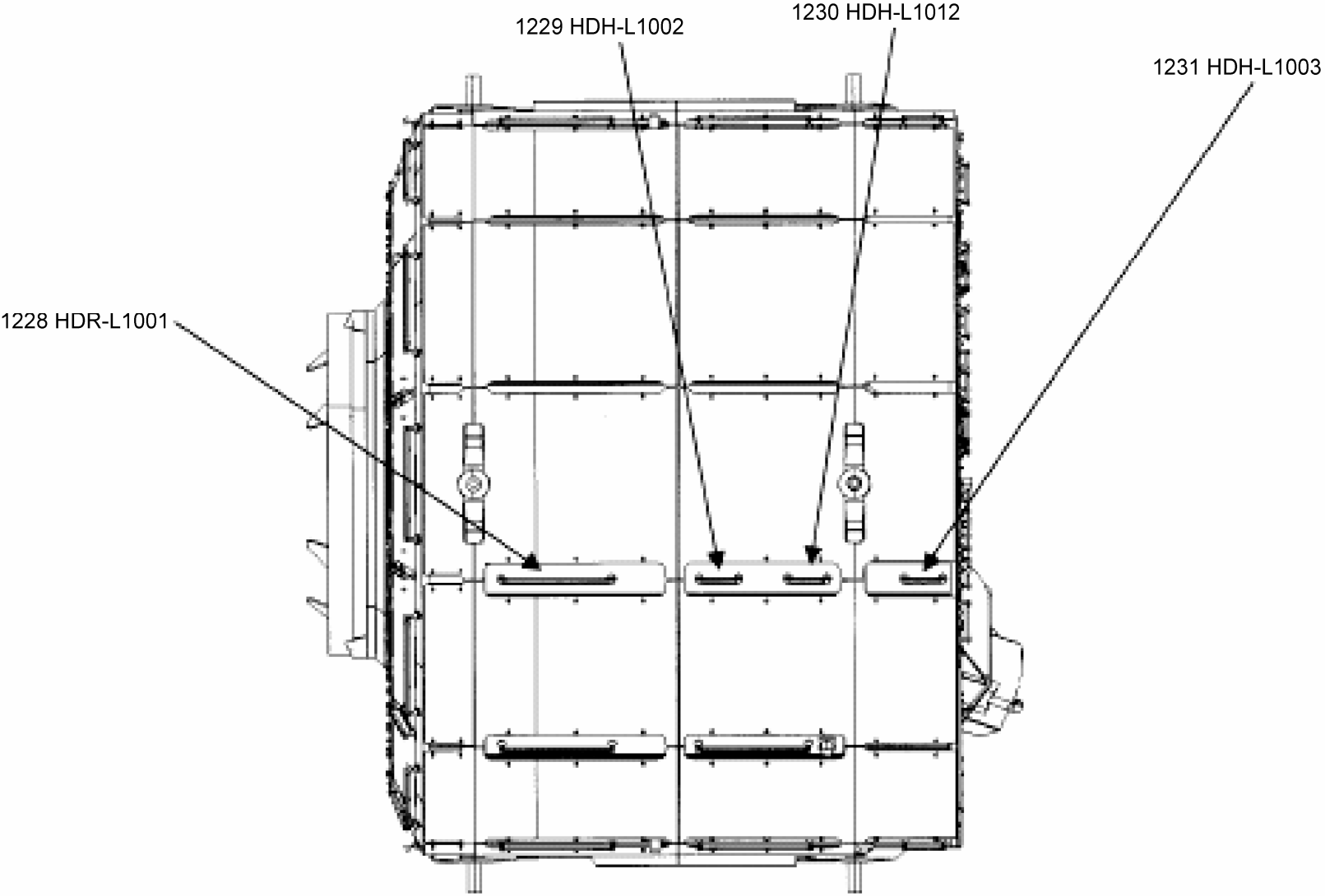


# JLP NADIR ENDCONE VIEW

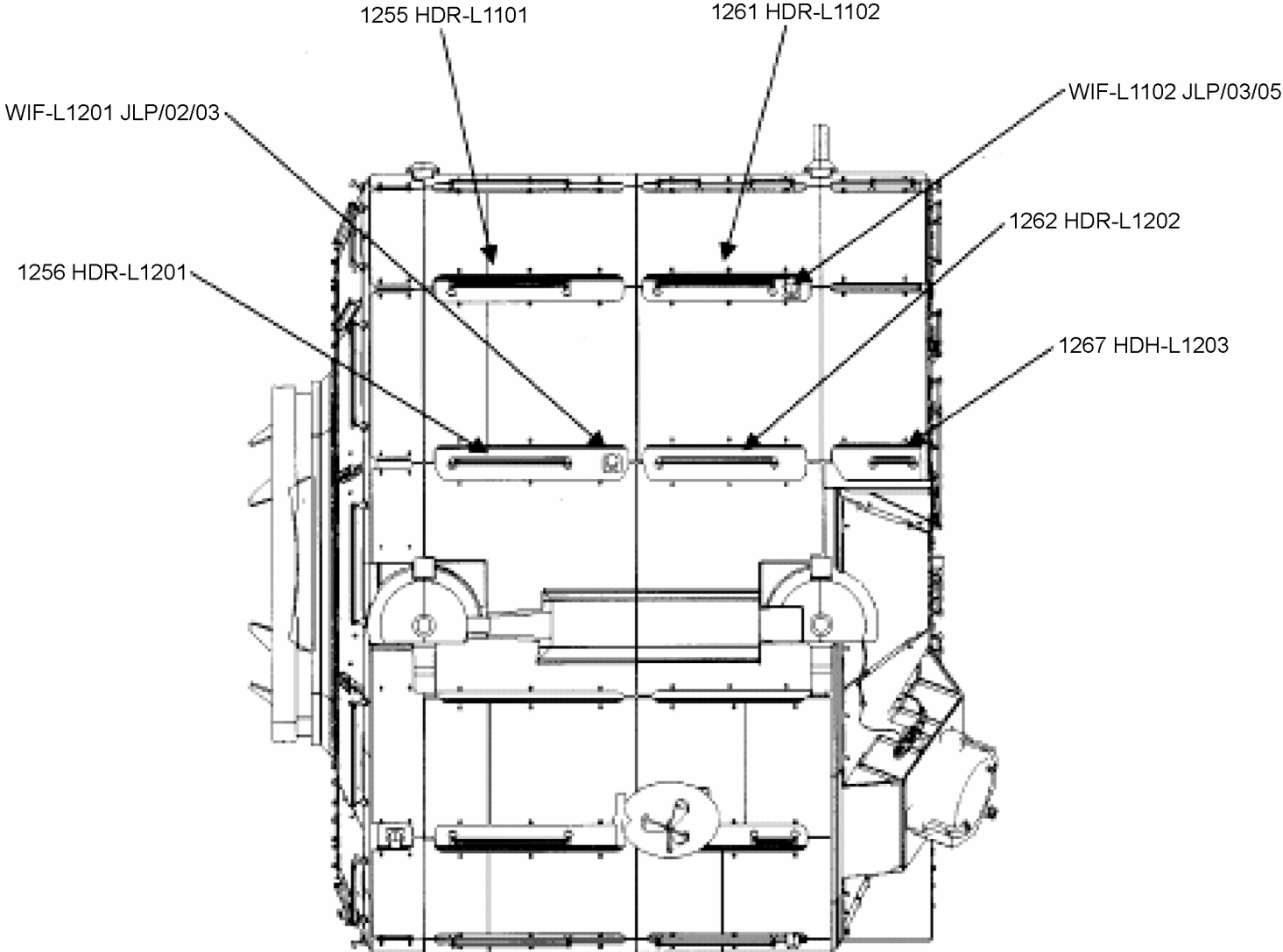




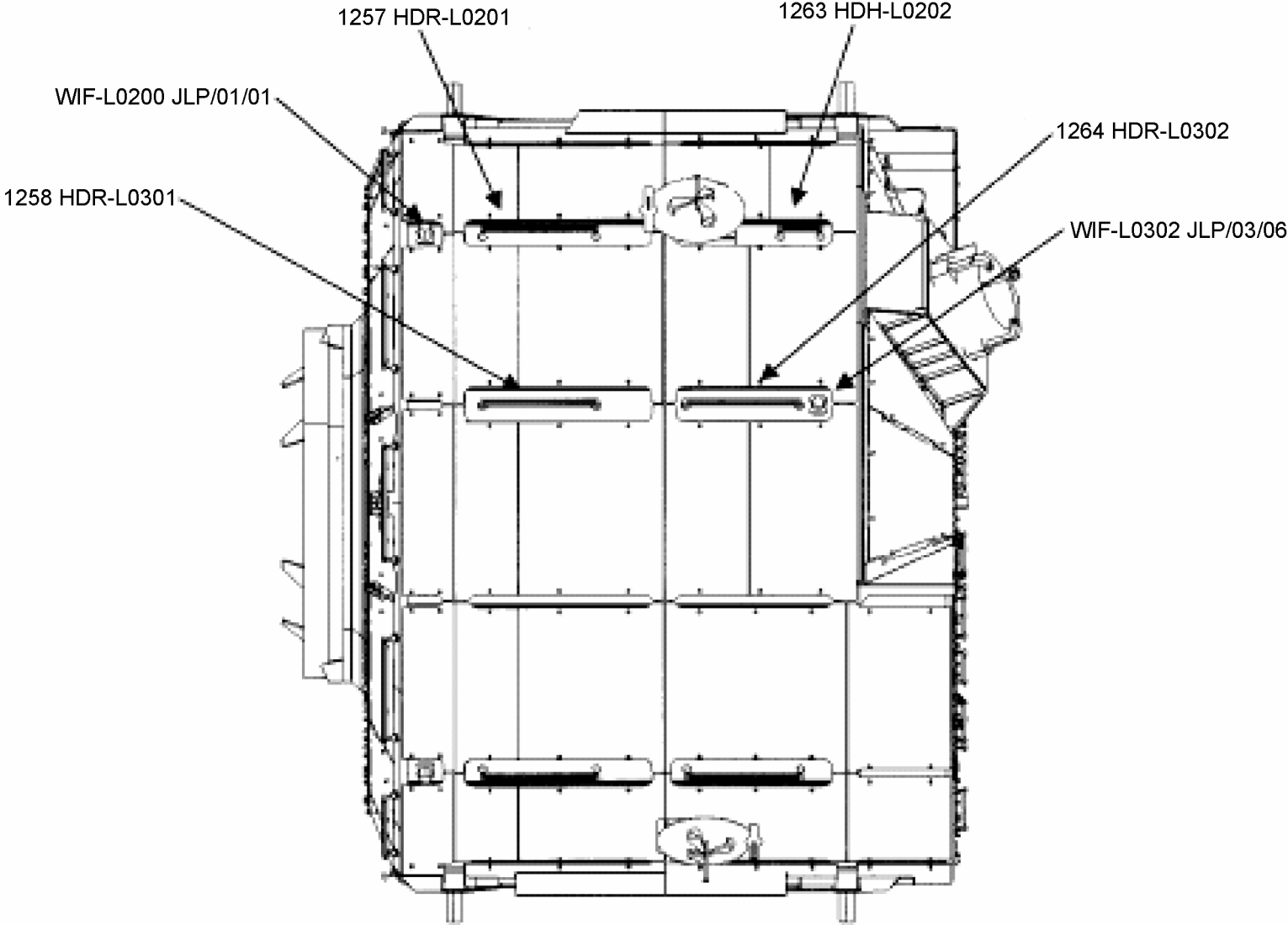
JLP FWD SIDE VIEW



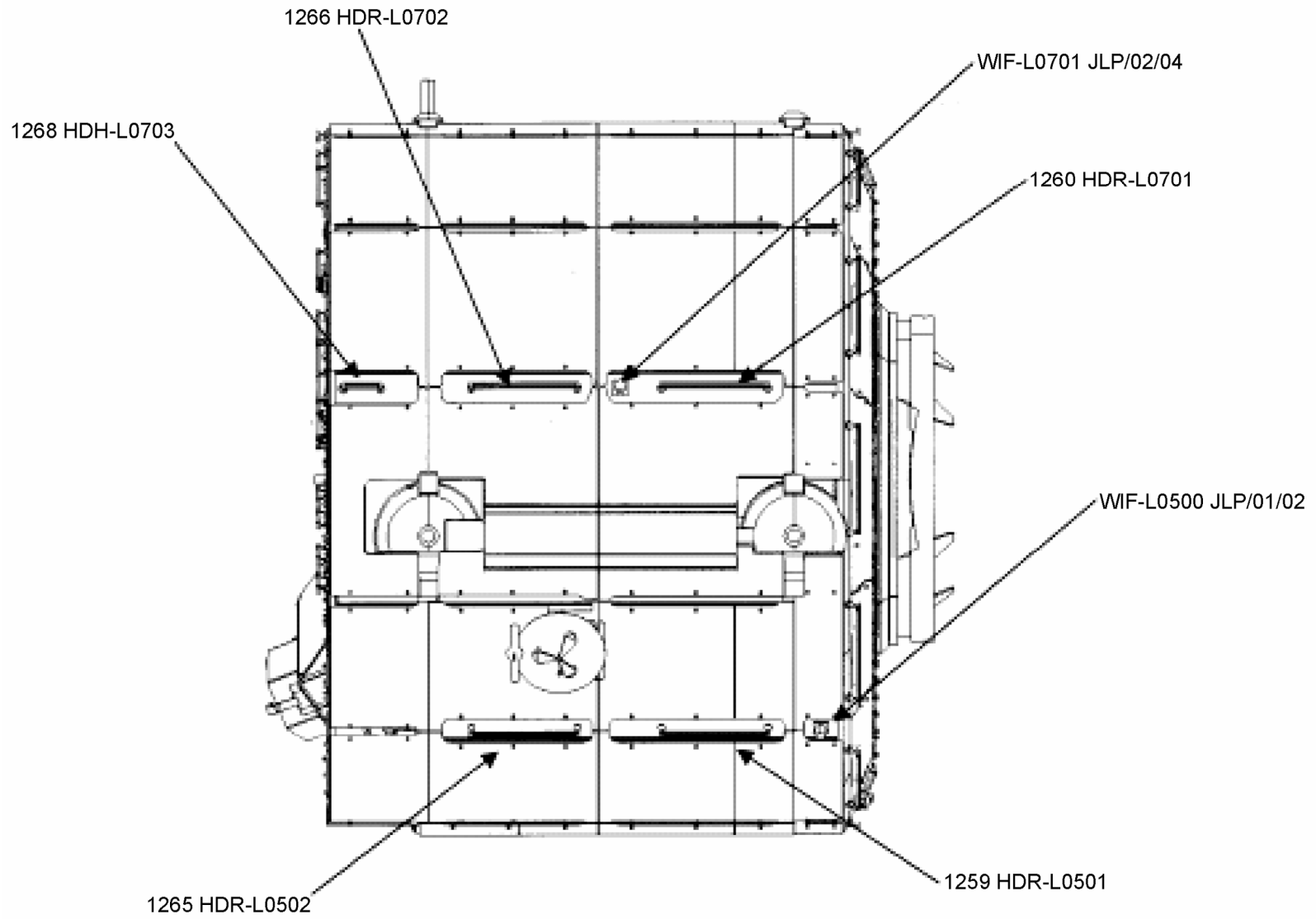
**JLP PORT SIDE VIEW**



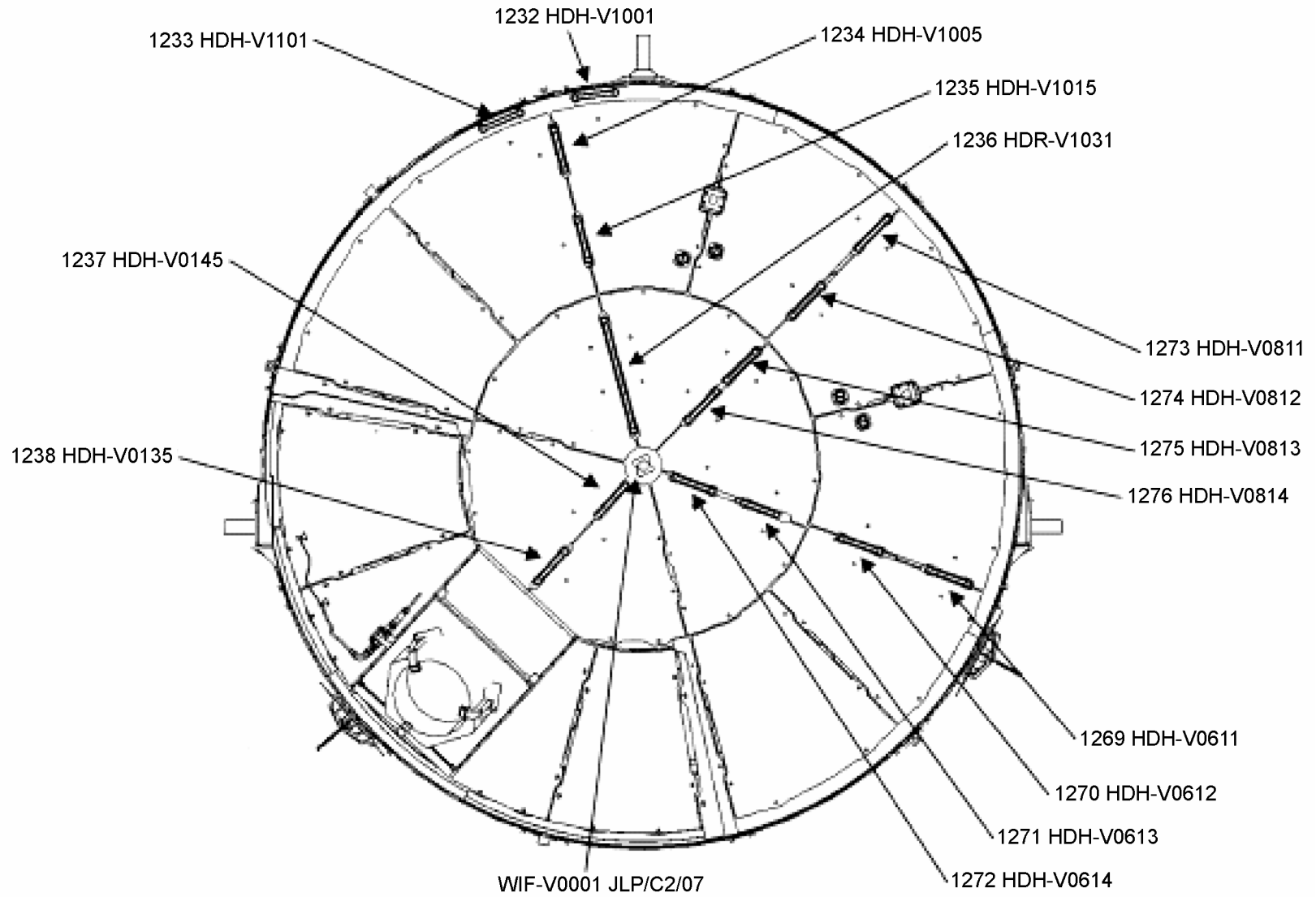
JLP AFT SIDE VIEW



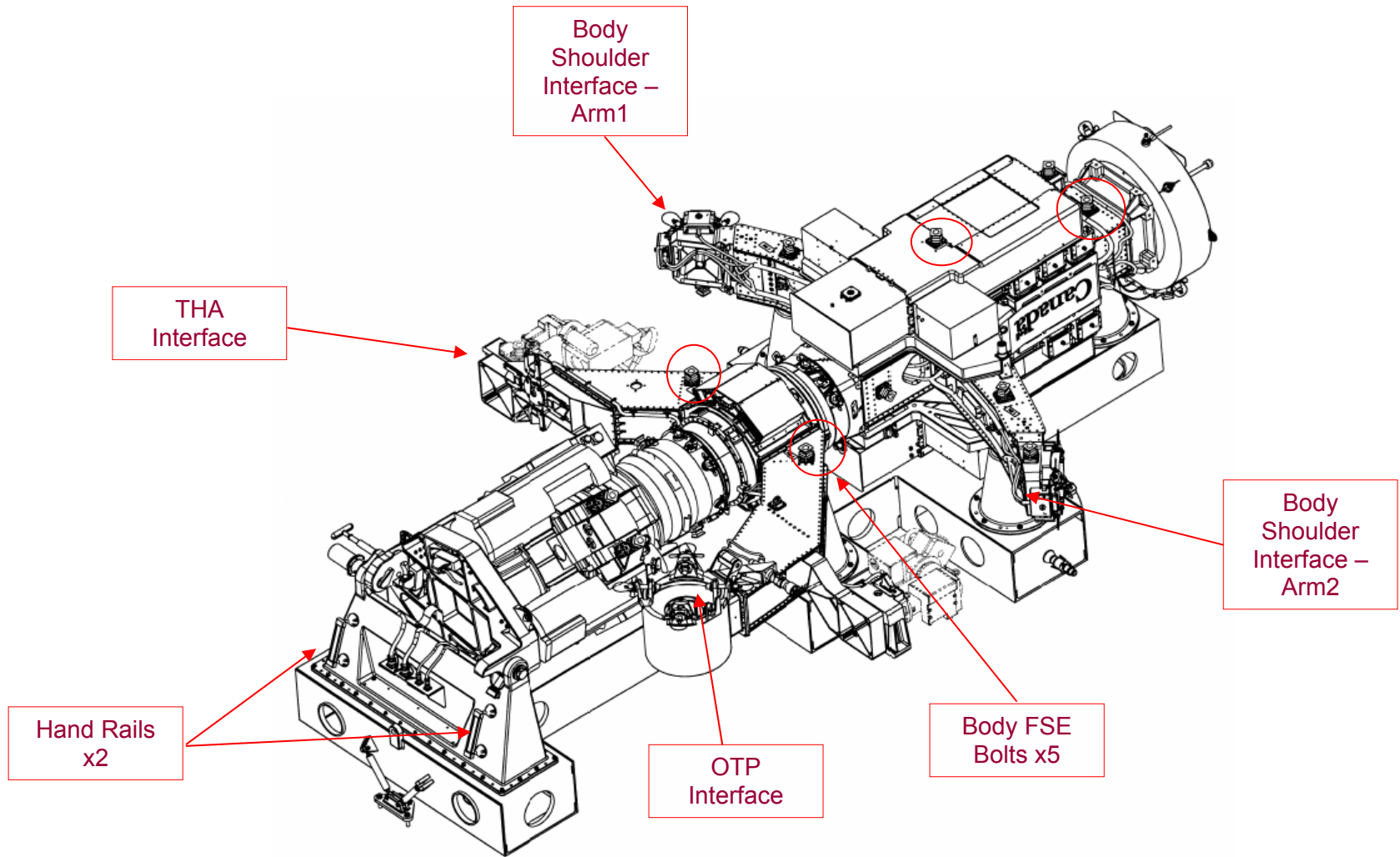
# JLP STBD SIDE VIEW



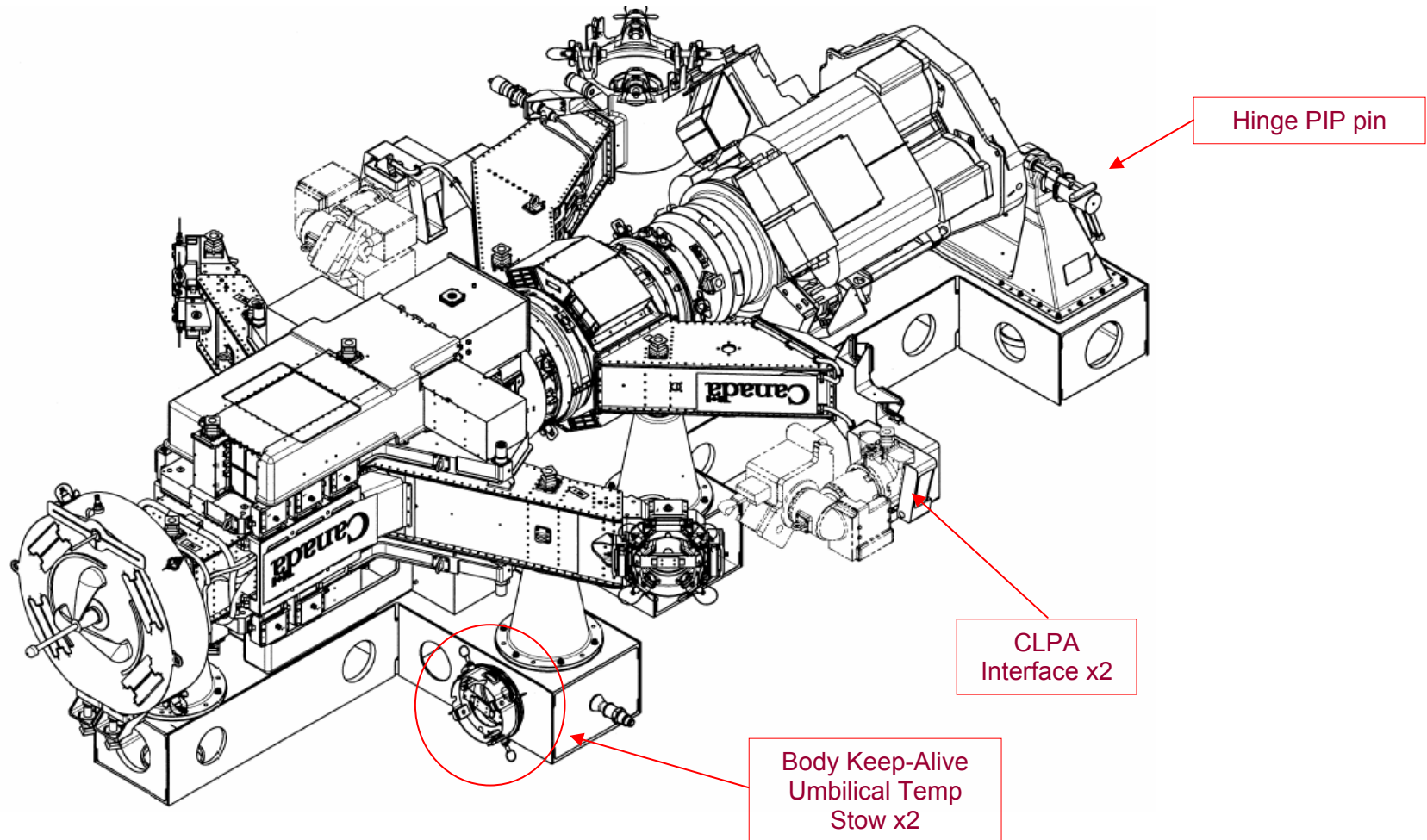
# JLP ZENITH ENDCONE VIEW



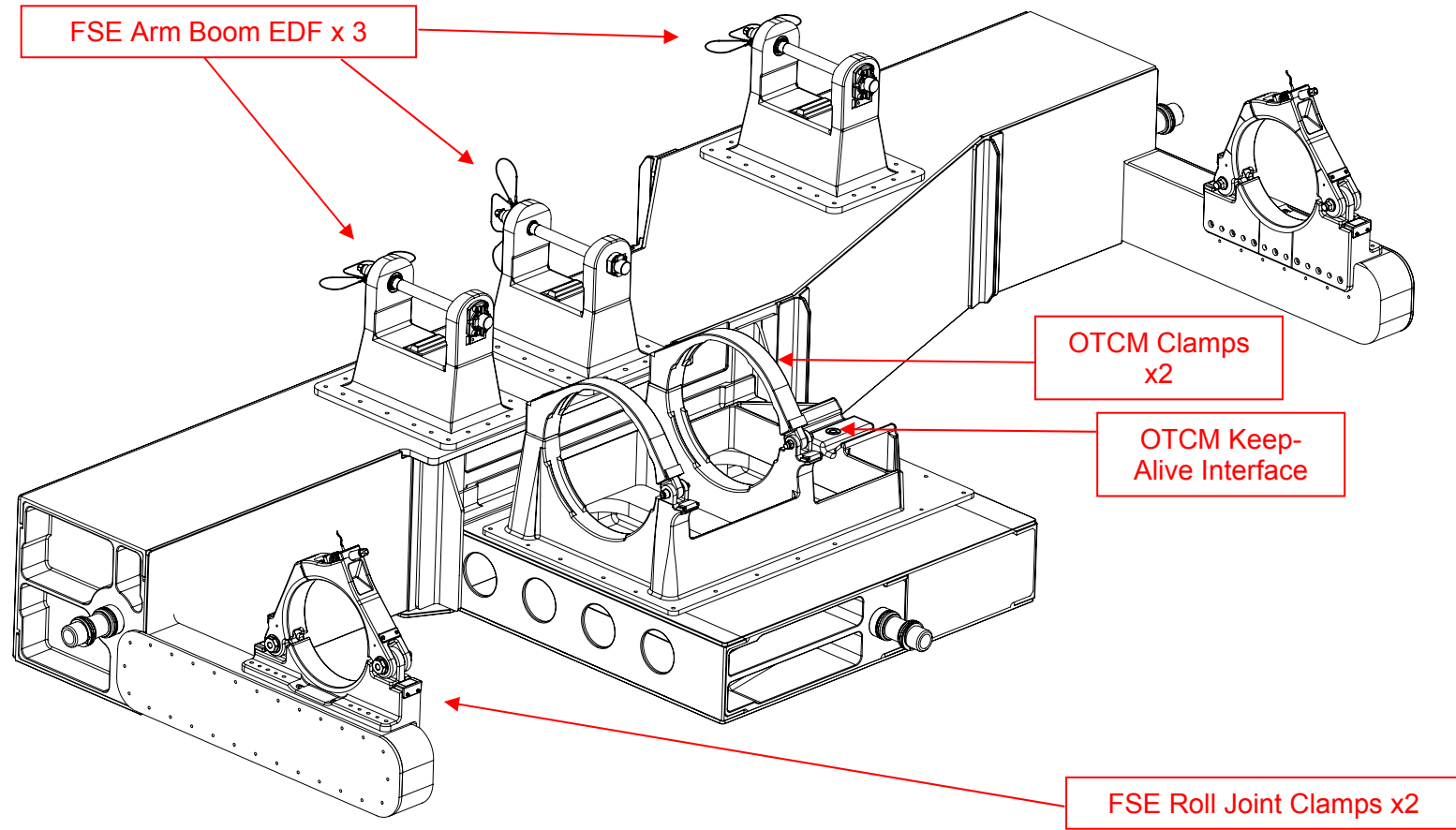
# SPDM BODY IN FSE – AFT



**SPDM BODY IN FSE – FORWARD**

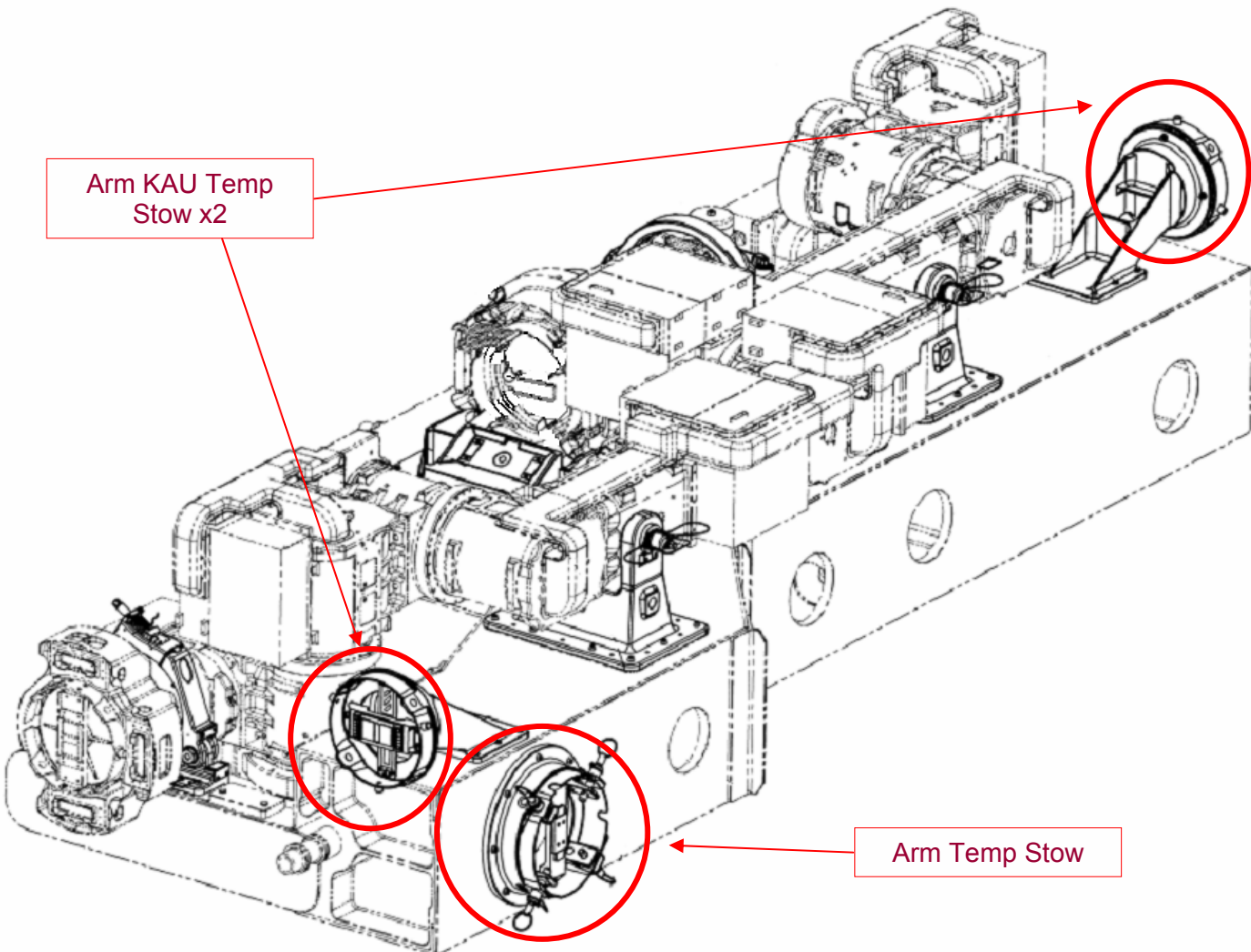


# SPDM ARM FSE

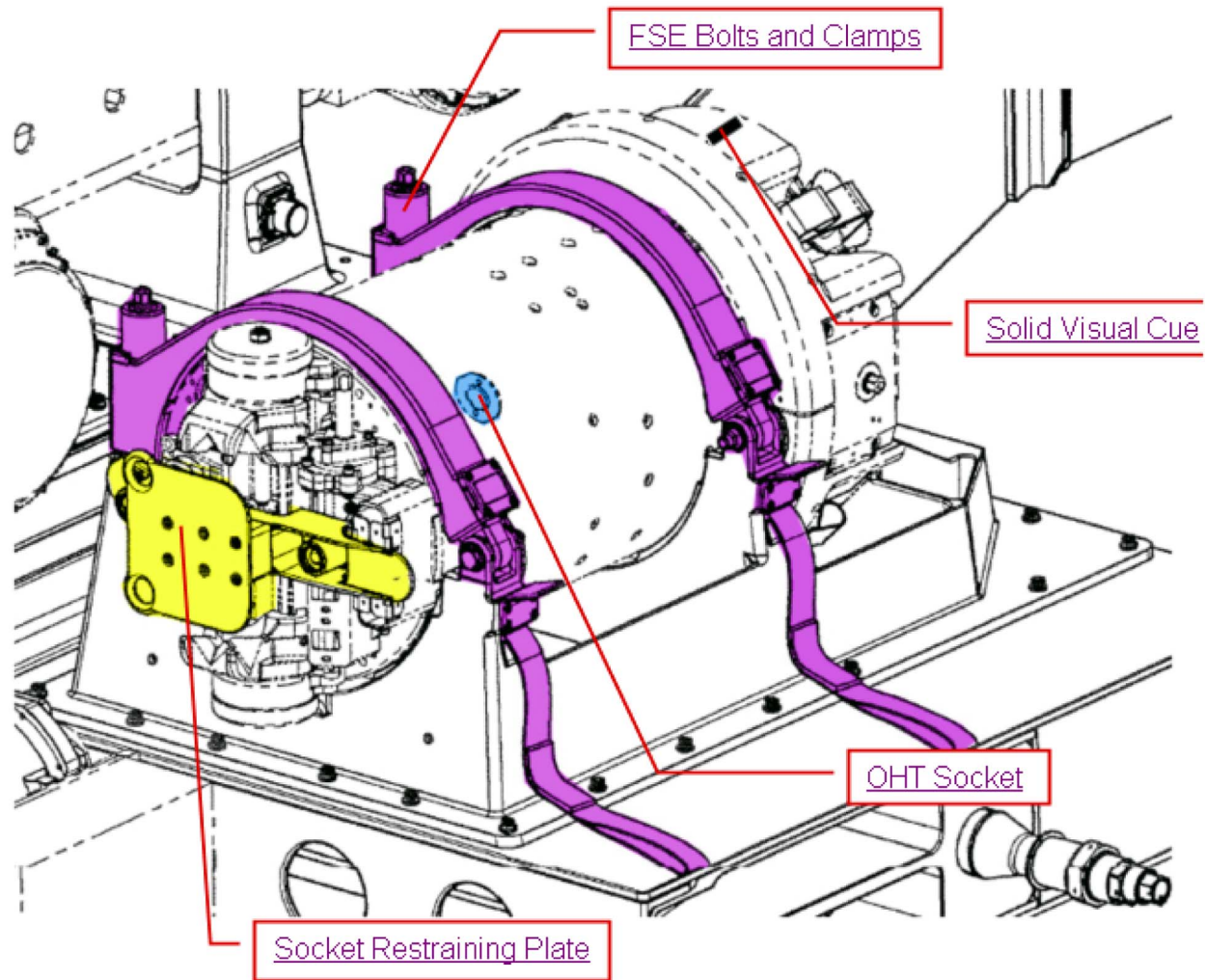




**SPDM ARM FSE – KAU TEMPS STOWS**

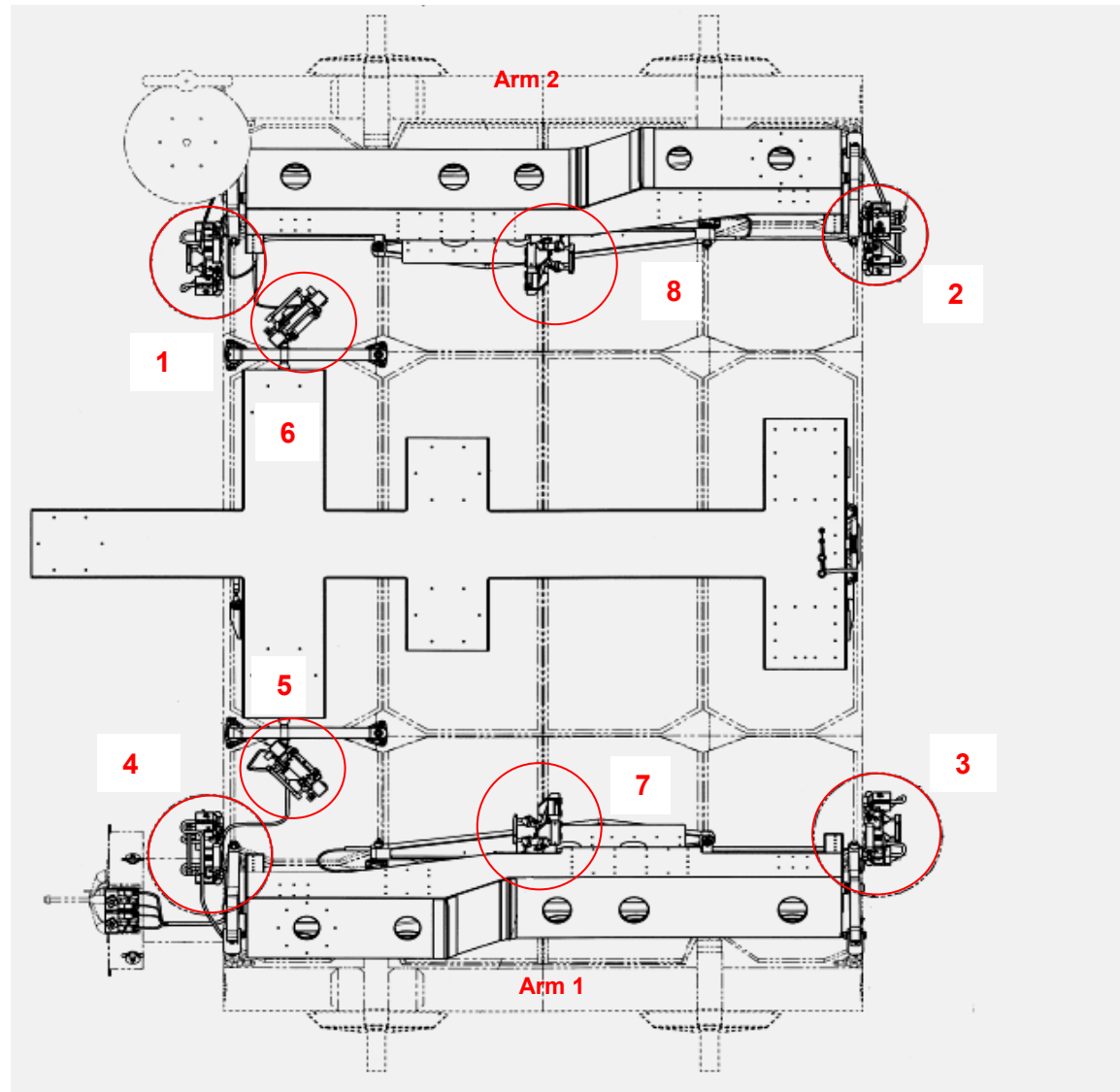


## SPDM OTCM SOCKET RESTRAINING PLATE



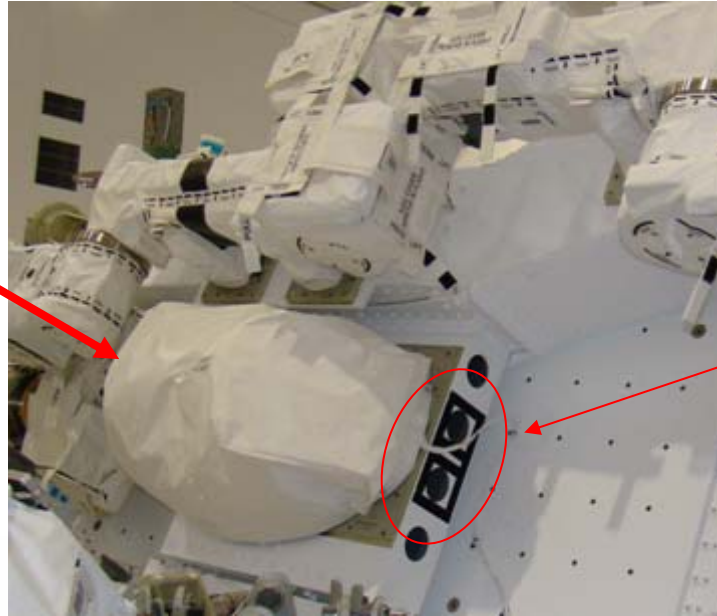
## SPDM KEEP-ALIVE ASSEMBLY (KAU)

- 1 – Arm 2 Wrist KAU
- 2 – Arm 2 Shoulder KAU
- 3 – Arm 1 Wrist KAU
- 4 – Arm 1 Shoulder KAU
- 5 – Body Shoulder 1 KAU
- 6 – Body Shoulder 2 KAU
- 7 – OTCM 1 KAU
- 8 – OTCM 2 KAU

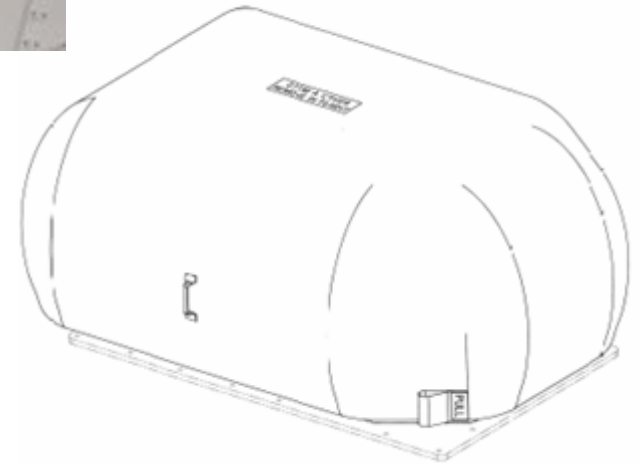
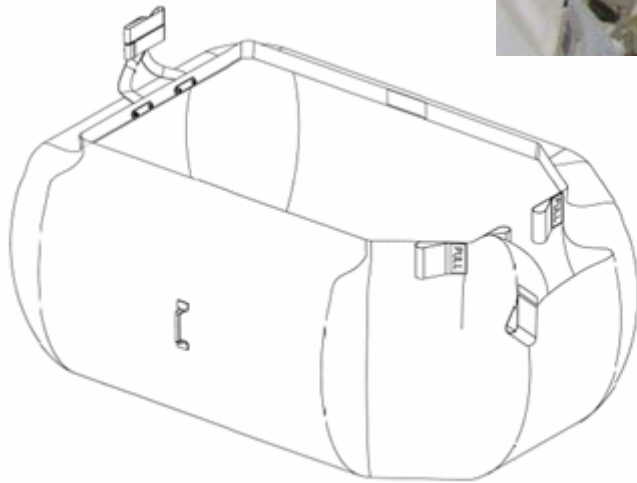


**SPDM OTCM TENT BLANKET**

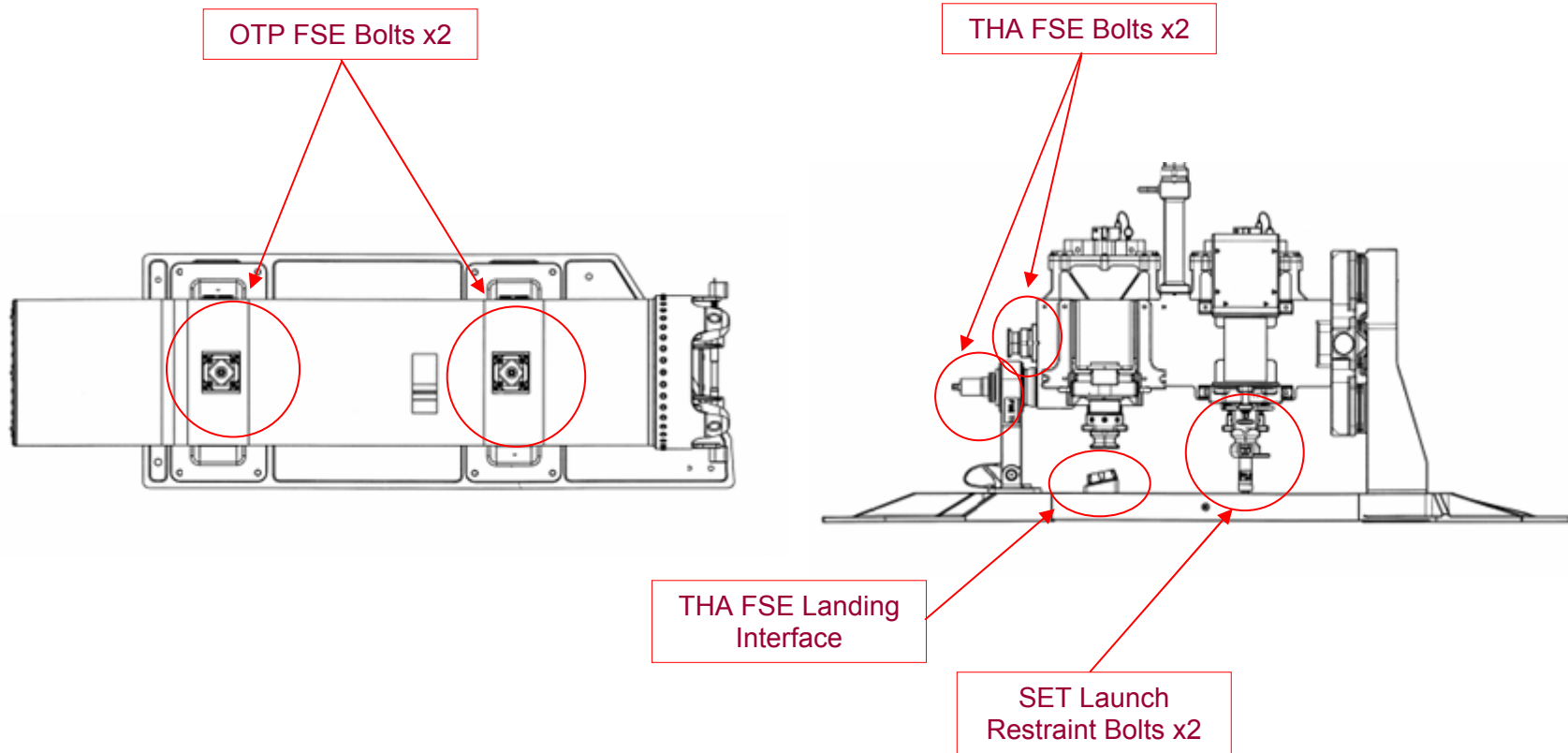
**OTCM Tent  
Blanket x 2**



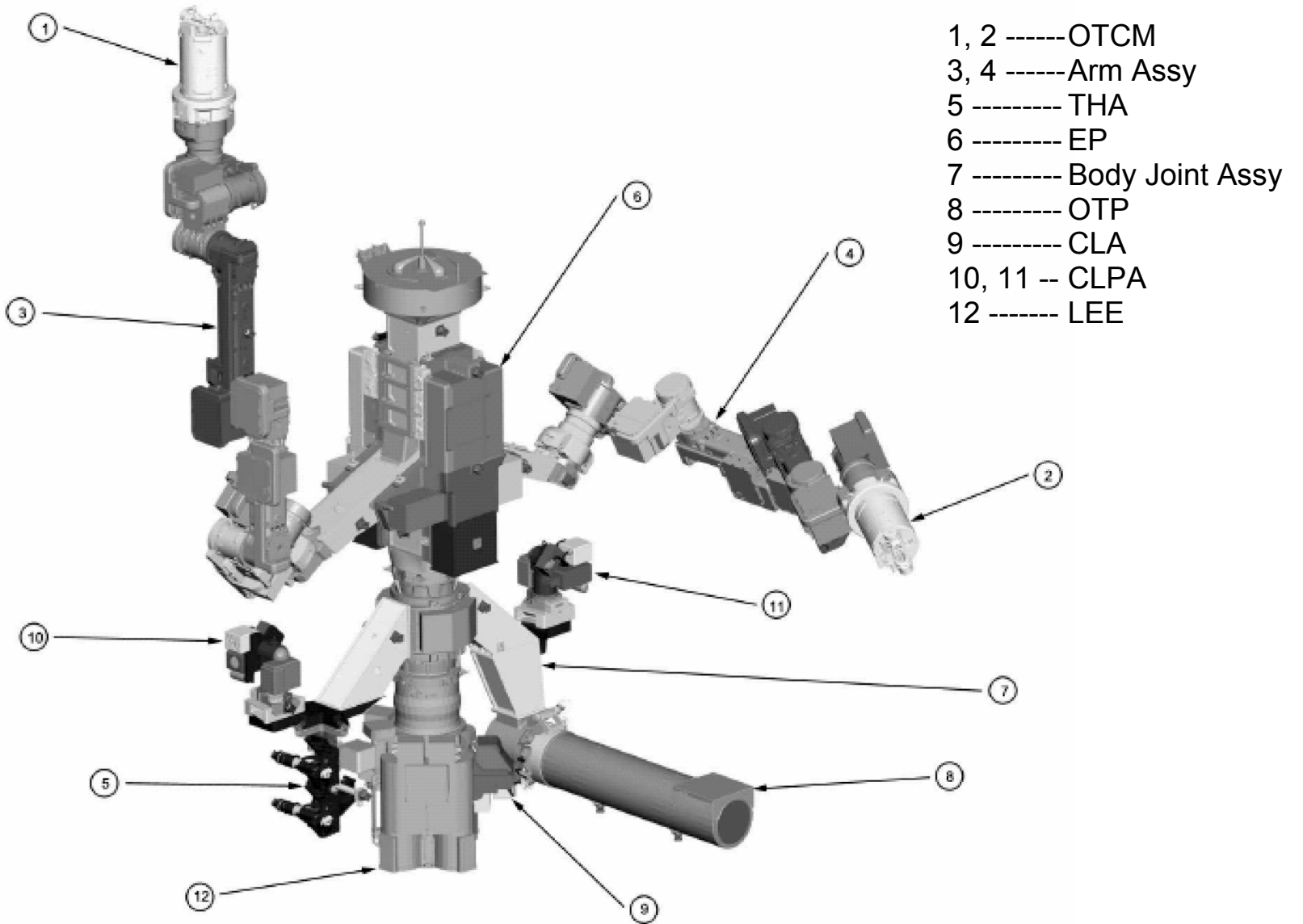
**OTCM Keep-Alive  
Temp Stow**



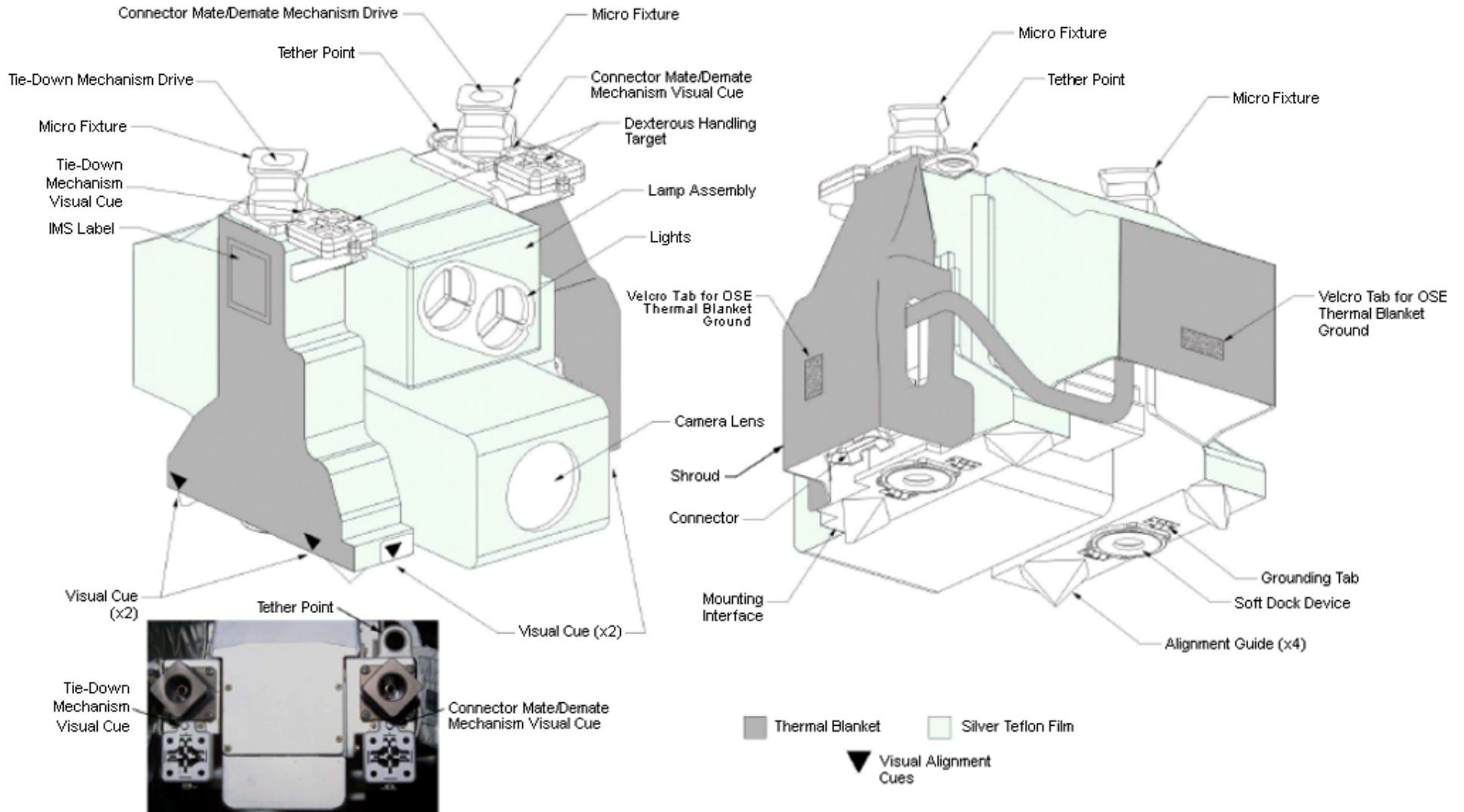
## SPDM THA AND OTP INTERFACES



# SPDM ASSY

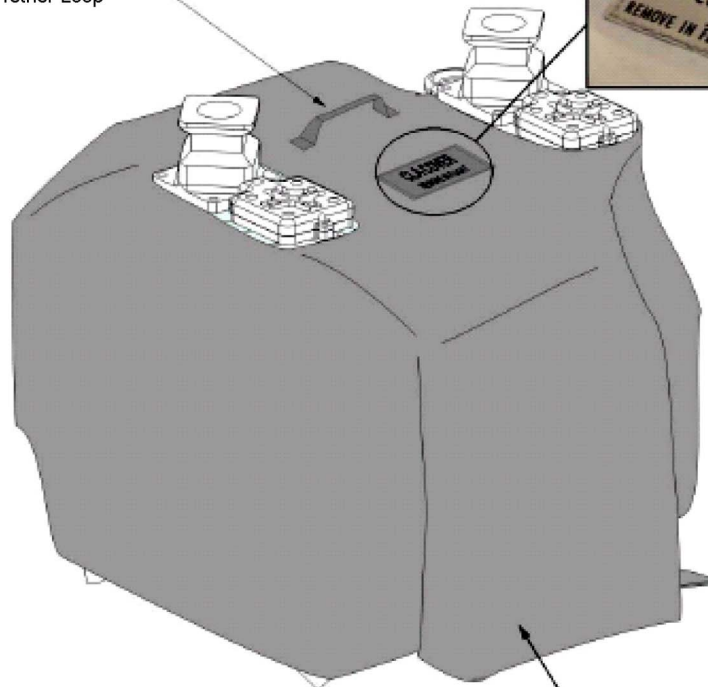


# SPDM CAMERA LIGHT ASSY (CLA)



# SPDM CAMERA LIGHT ASSY (CLA) (Cont)

OSE Thermal Blanket  
Tether Loop



Grounding  
Point Flaps  
& EVA Grasping  
Tab

Shroud Side

Lens Side

EVA Grasping Tab

EVA Grasping Tab

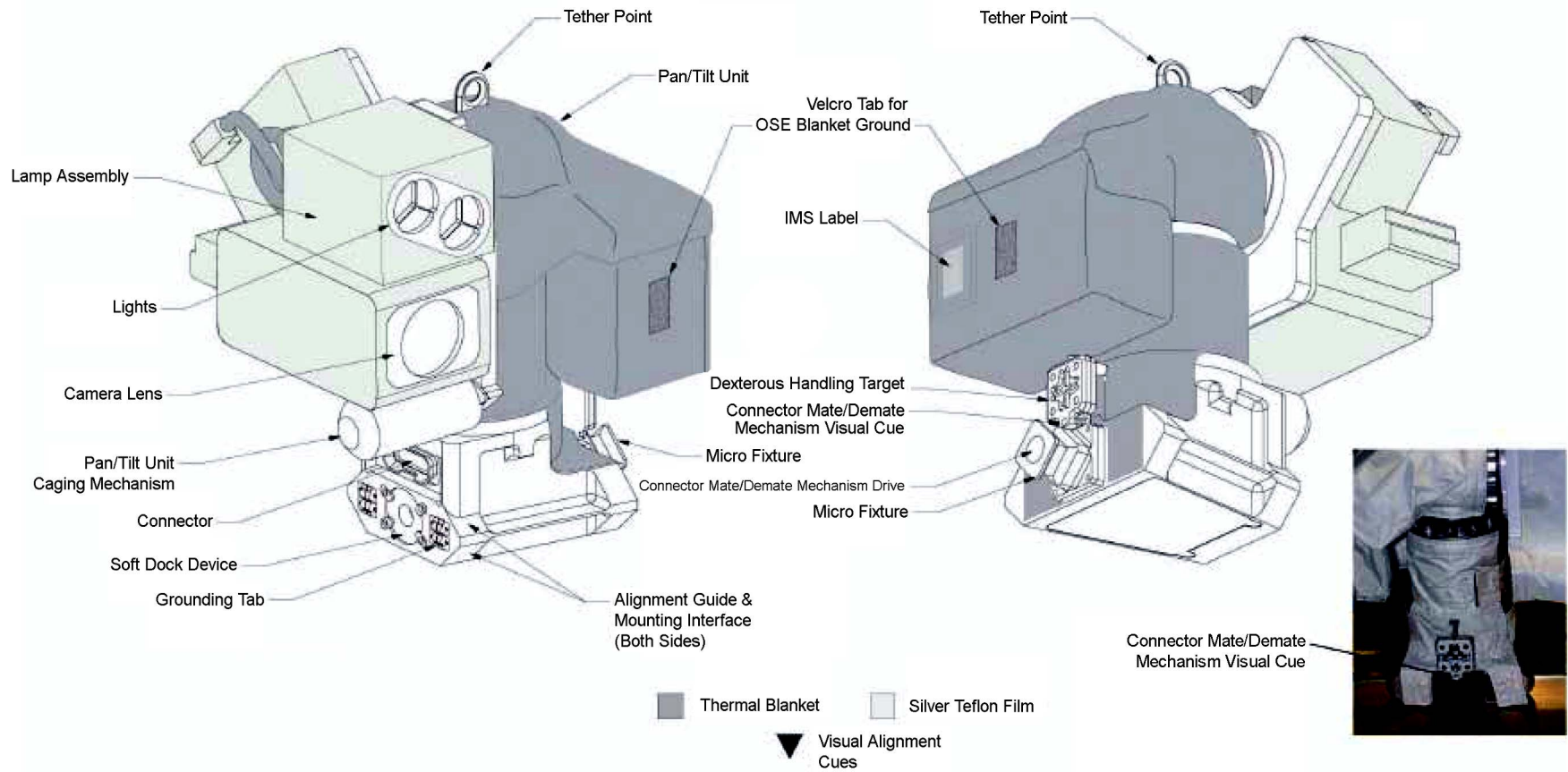
EVA Grasping Tab

Grounding Point Flap  
& EVA Grasping Tab

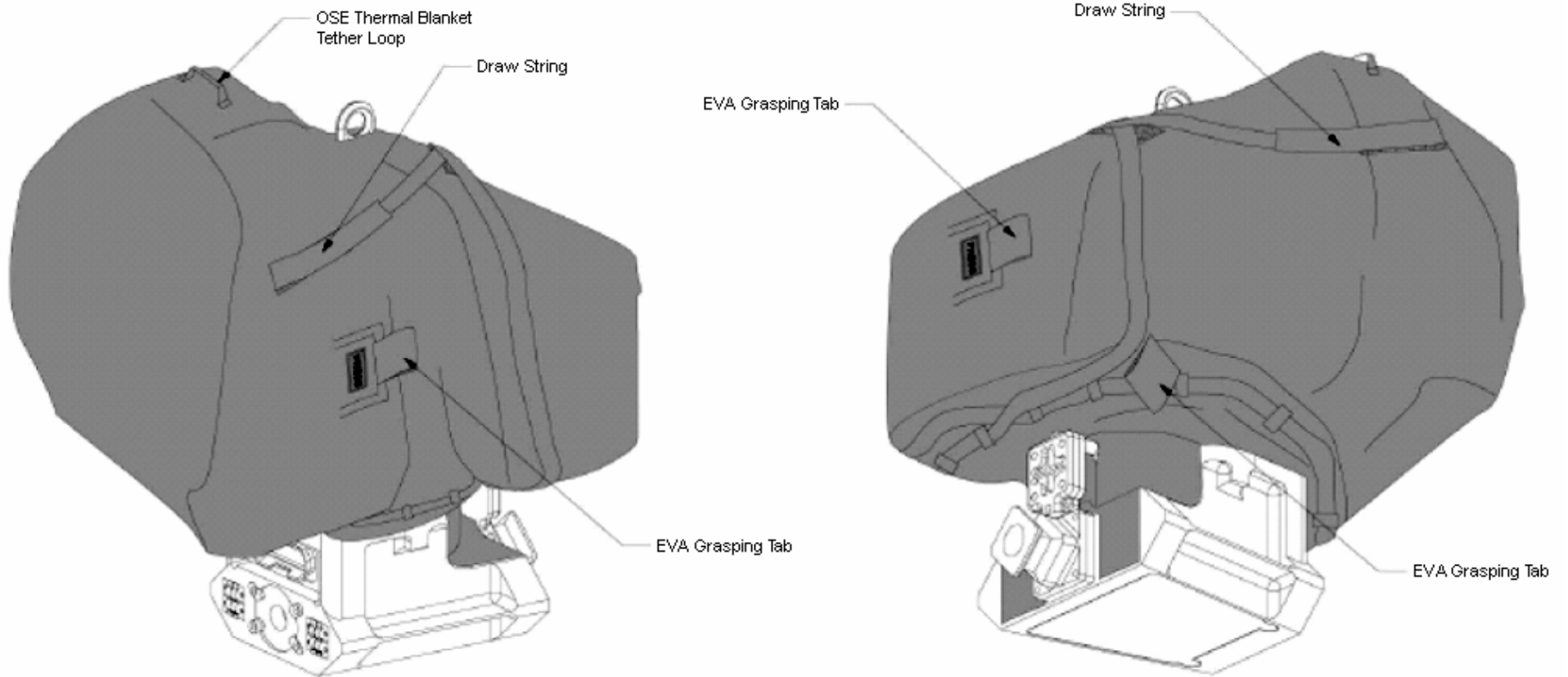
EVA Grasping Tab



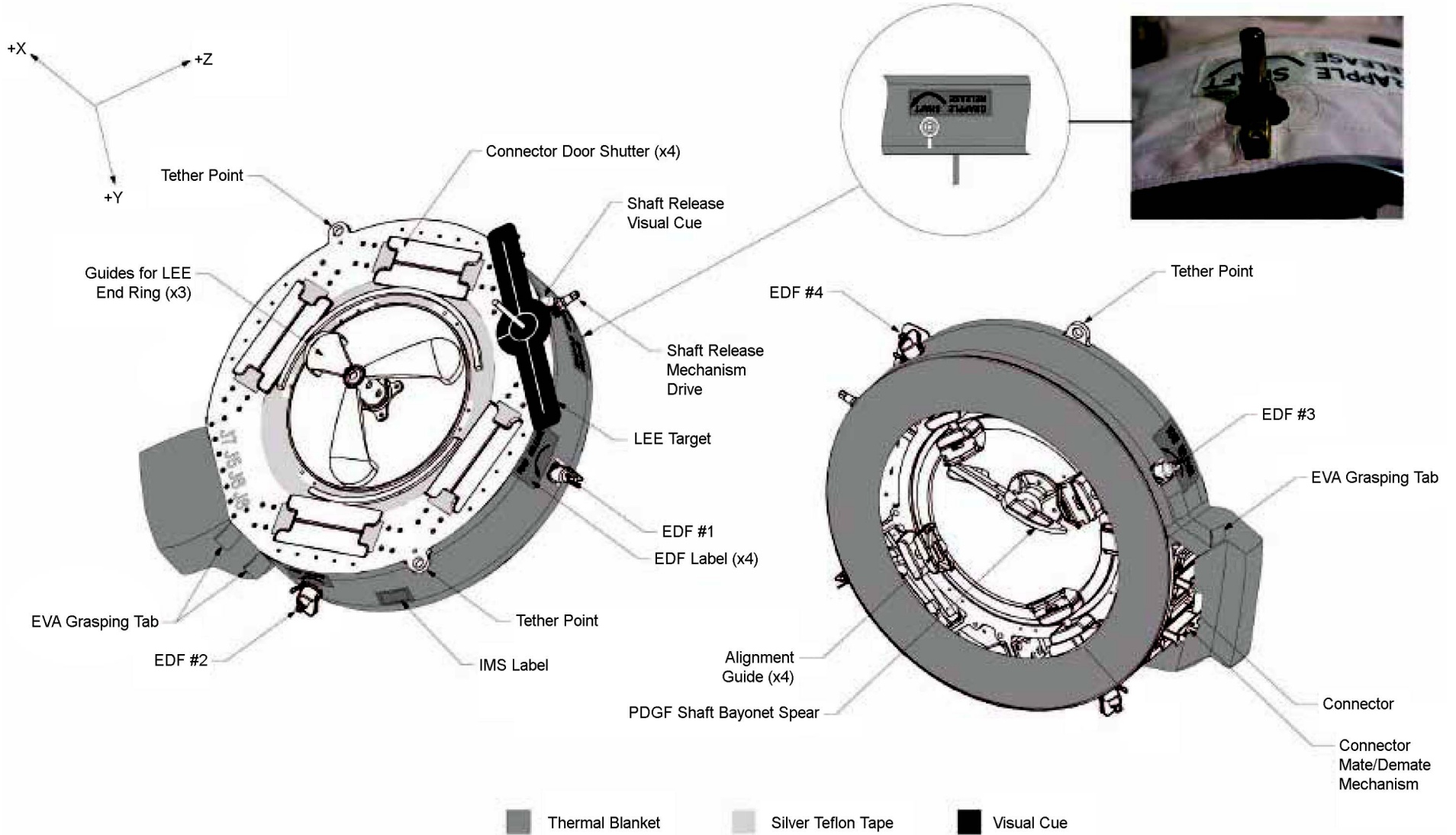
# SPDM CAMERA LIGHT PAN TILT ASSY (CLPA)



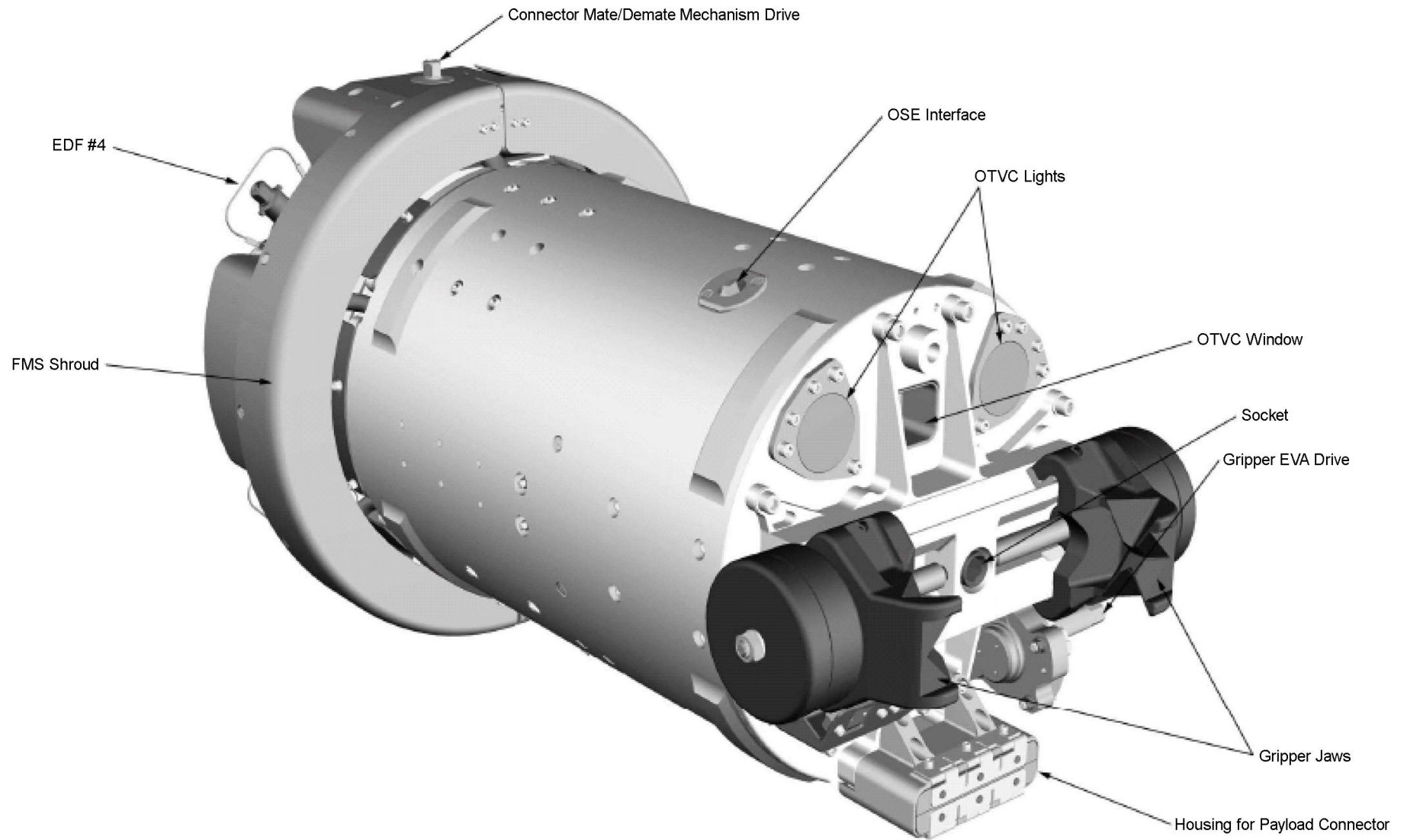
## SPDM CAMERA LIGHT PAN TILT ASSY (CLPA) (Cont)



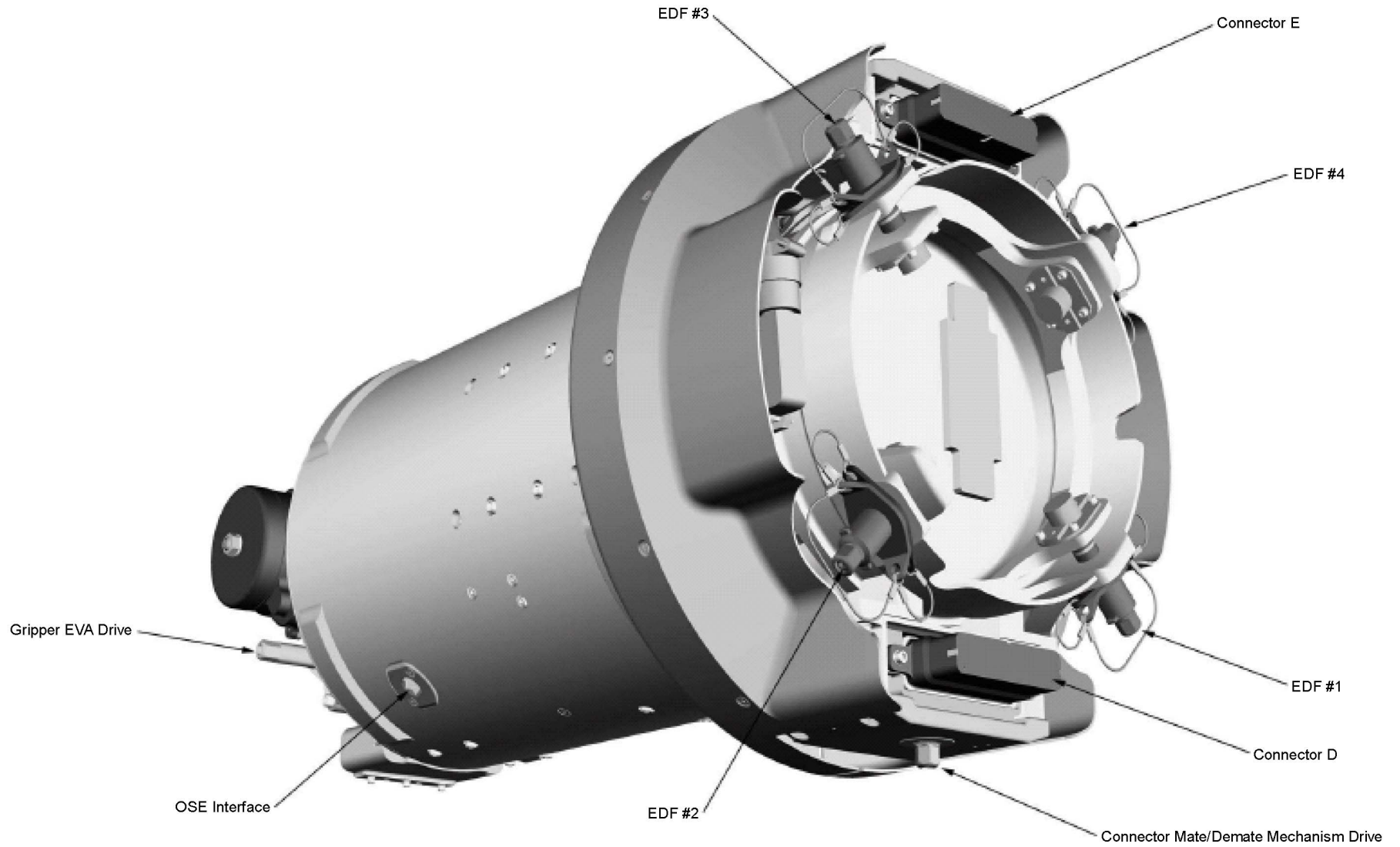
# SPDM PDGF



## SPDM ORU TOOL CHANGEOUT MECHANISM (OTCM)



# ORU TOOL CHANGEOUT MECHANISM (OTCM) (Cont)



## SPDM ORU TOOL CHANGEOUT MECHANISM (OTCM) (Cont)



Temporary radiator surface protection will be removed before launch



OTCM Handling Tool (OHT)



OHT Socket

Silver Teflon film not installed on radiator surface



Silver Teflon film not installed on radiator surface



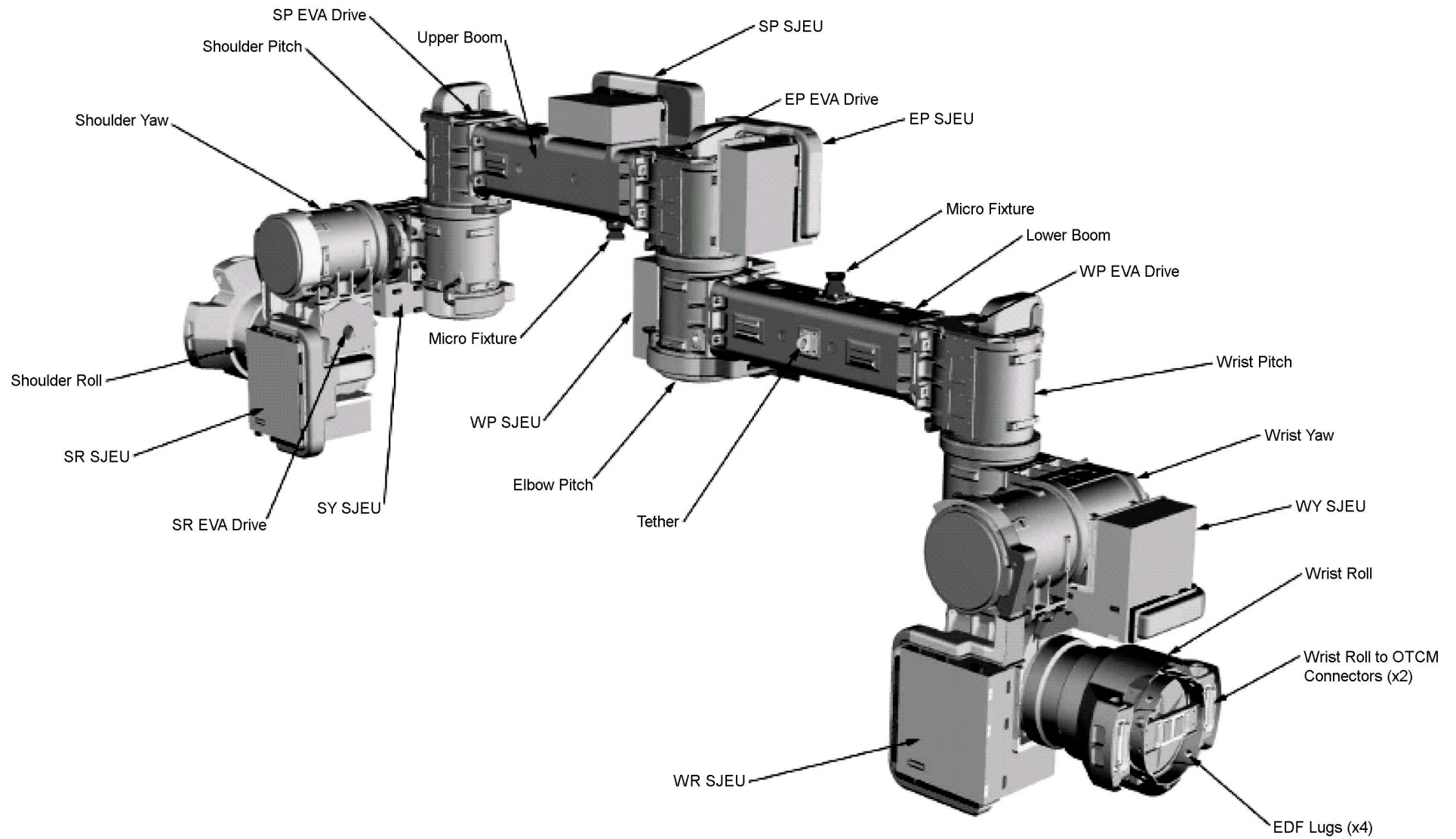
Temporary radiator surface protection will be removed before launch



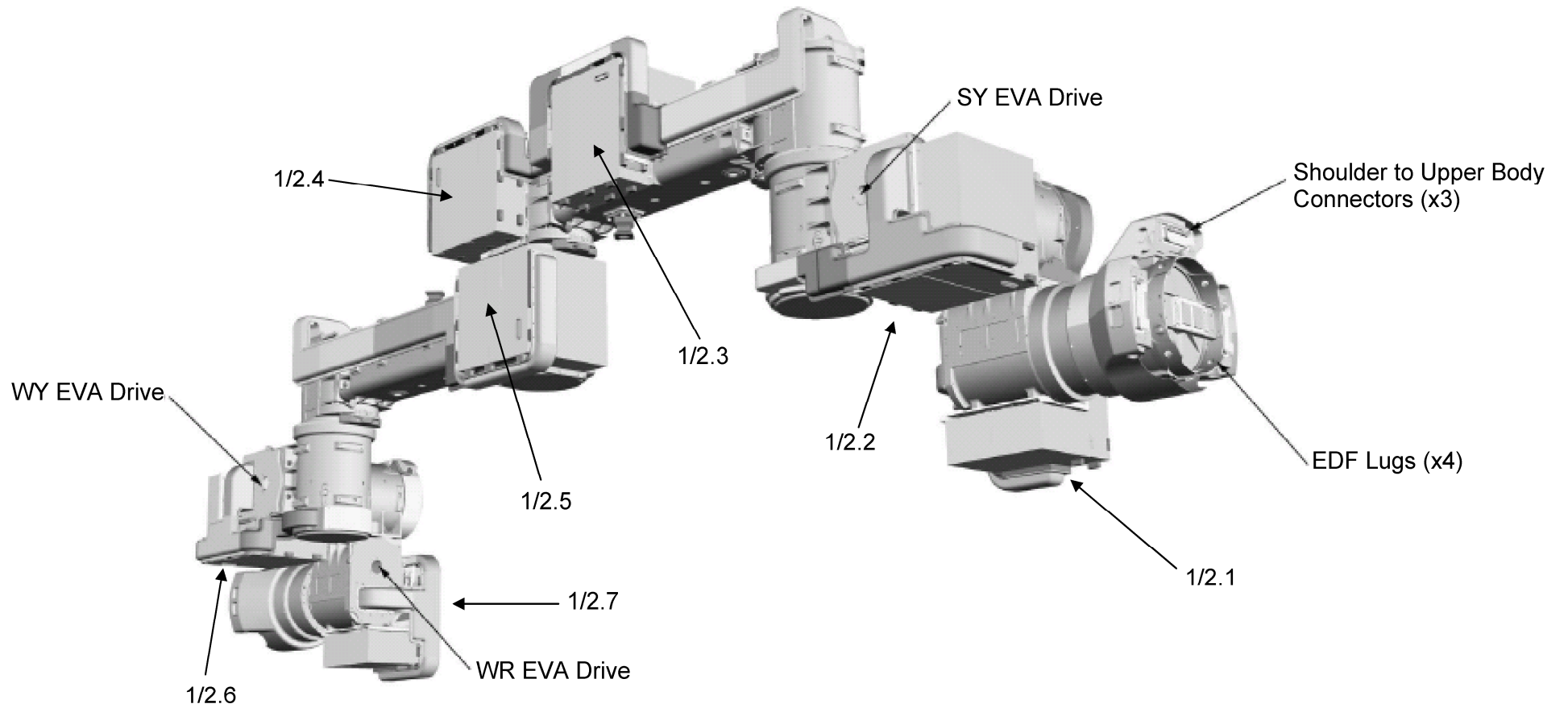
OTCM OSE Blanket

NOTE: OSE to be removed before installation of ORU on SPDM

# SPDM ARM ASSY



**SPDM ARM ASSY (Cont)**



1 – Designates Arm Assy 1  
2 – Designates Arm Assy 2



**SPDM ARM ASSY (Cont)**



SR EVA Drive



SY EVA Drive



SP EVA Drive



EP EVA Drive



WP EVA Drive



WY EVA Drive

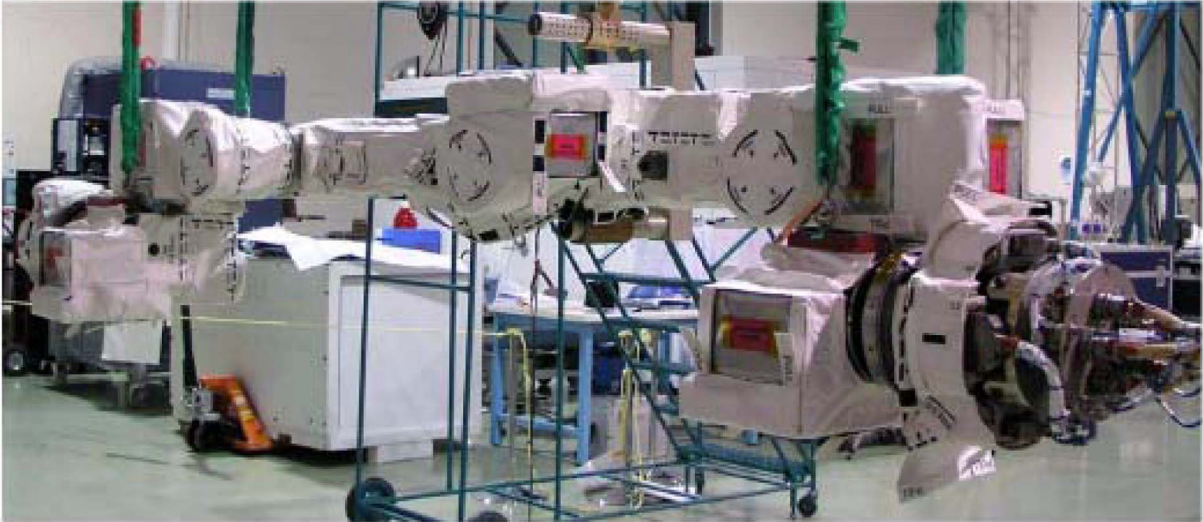


WR EVA Drive

**SPDM ARM ASSY (Cont)**

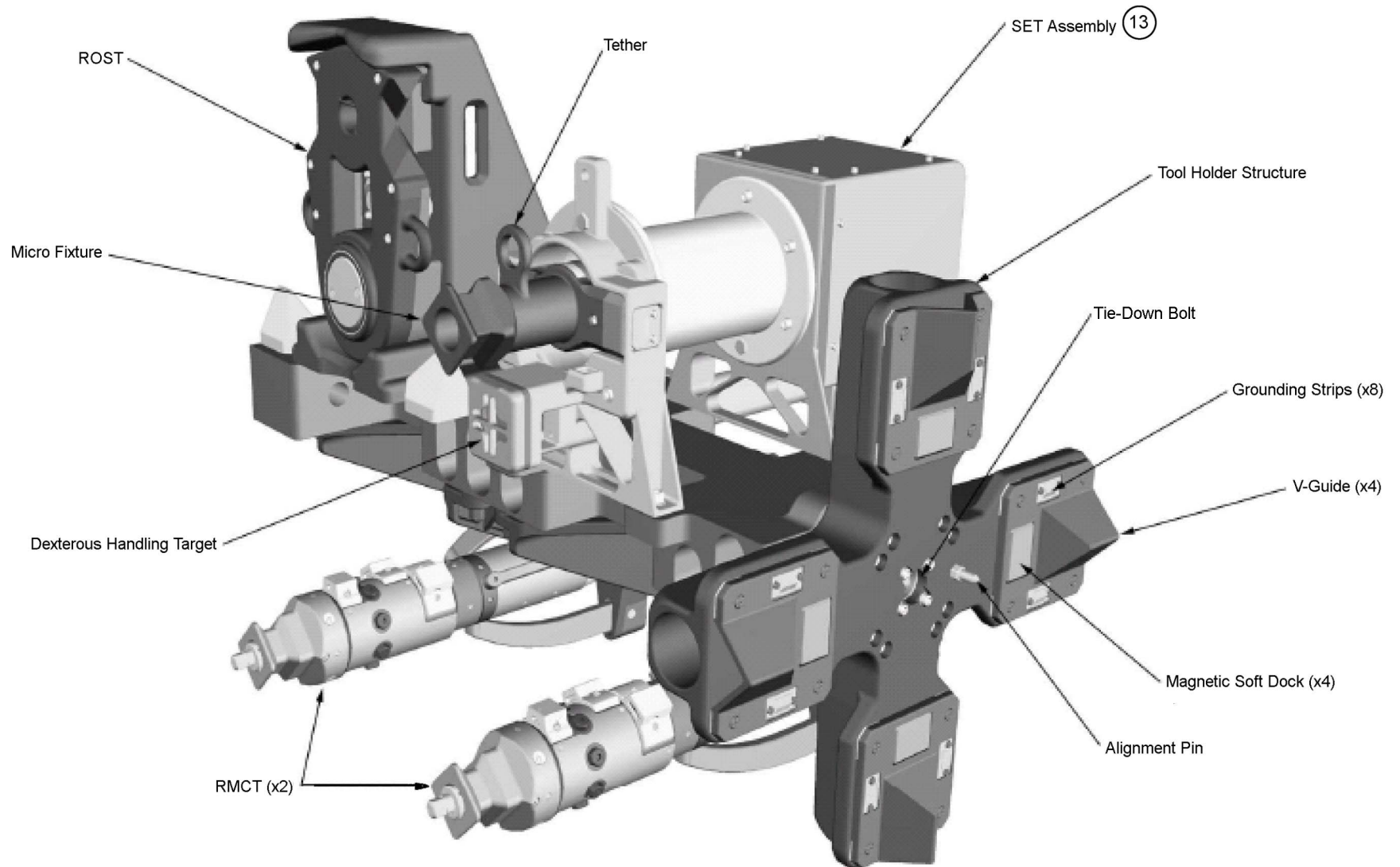


Temporary radiator surface protection will be removed before launch

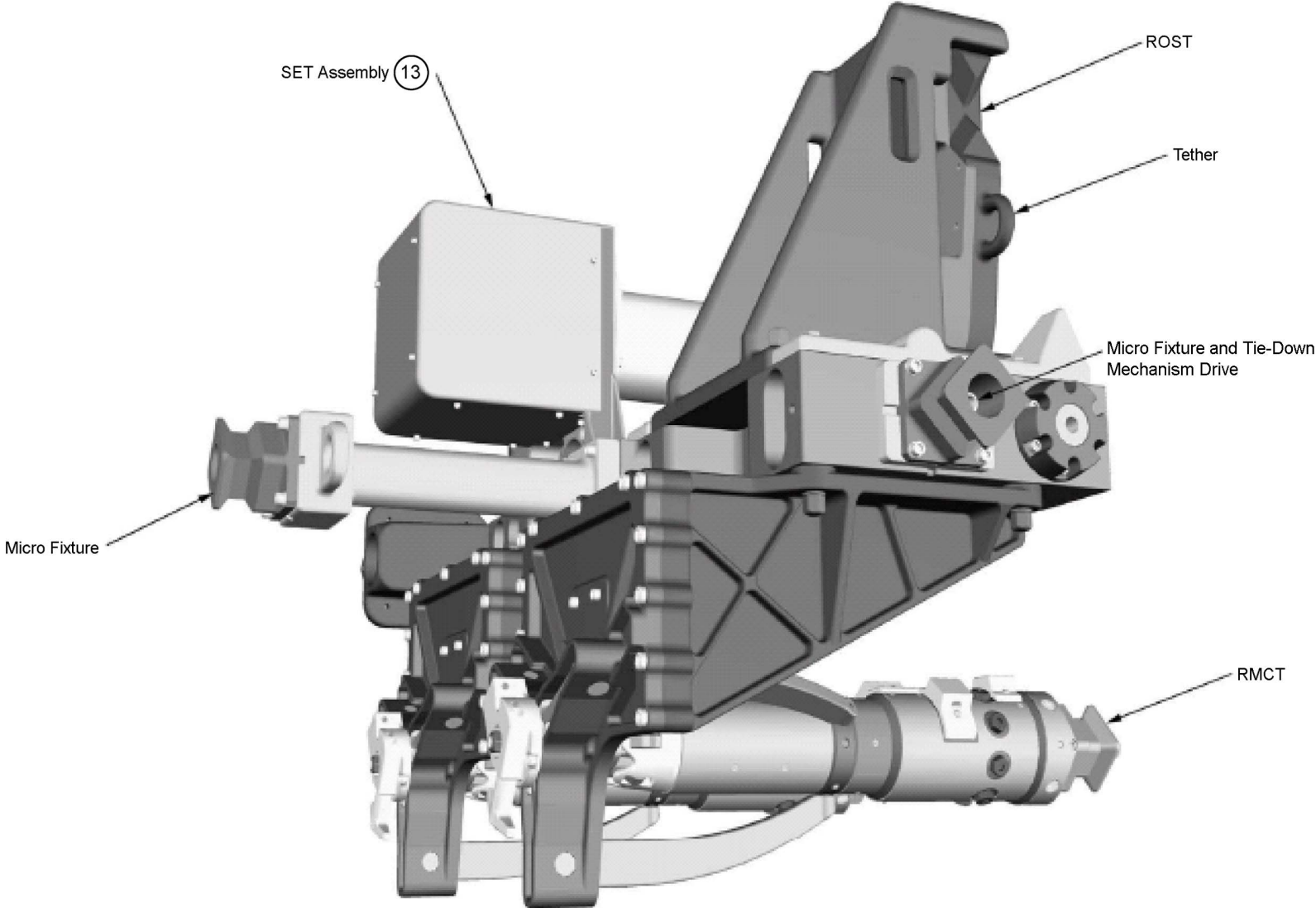


Temporary radiator surface protection will be removed before launch

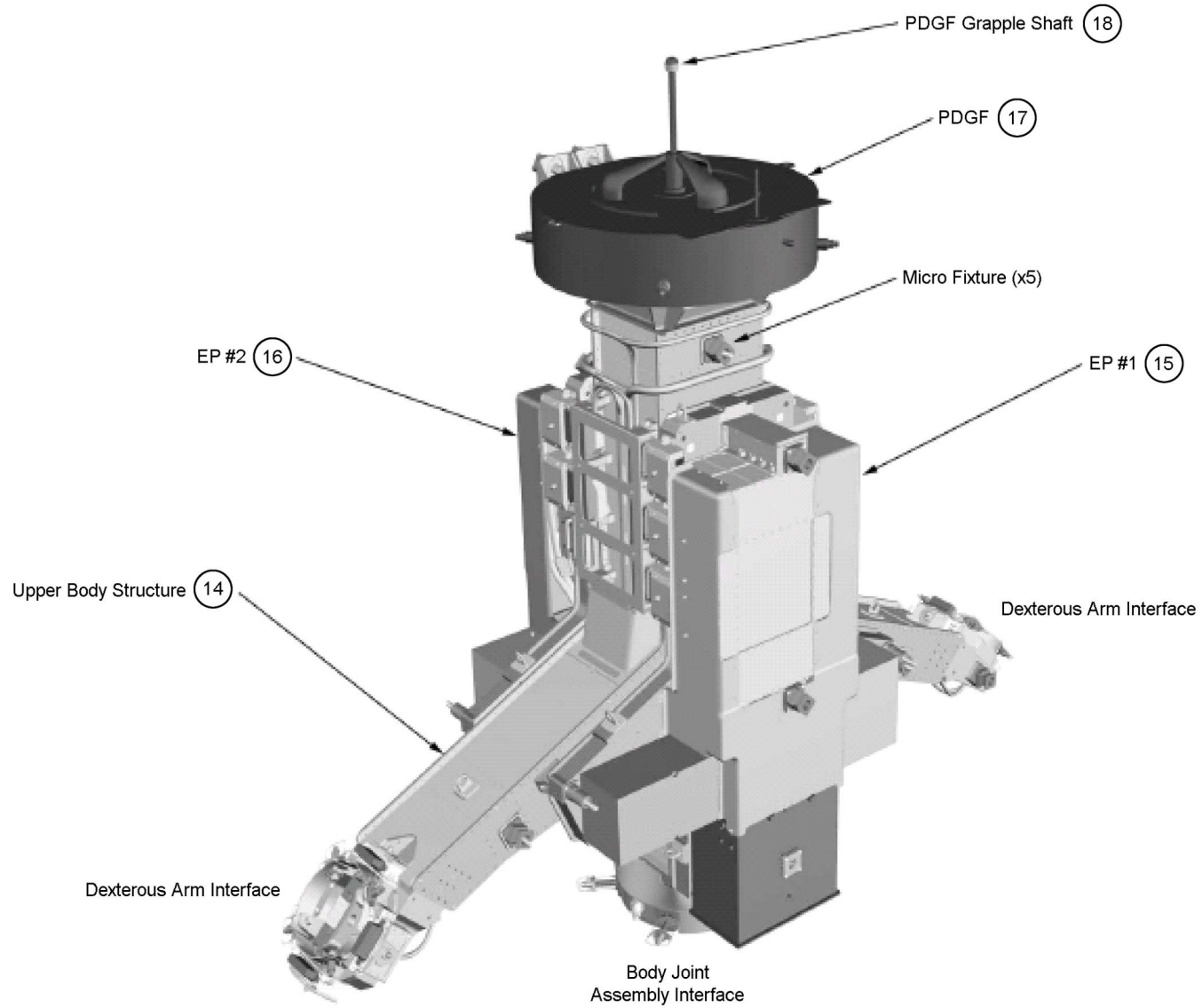
# SPDM TOOL HOLDER ASSY (THA)



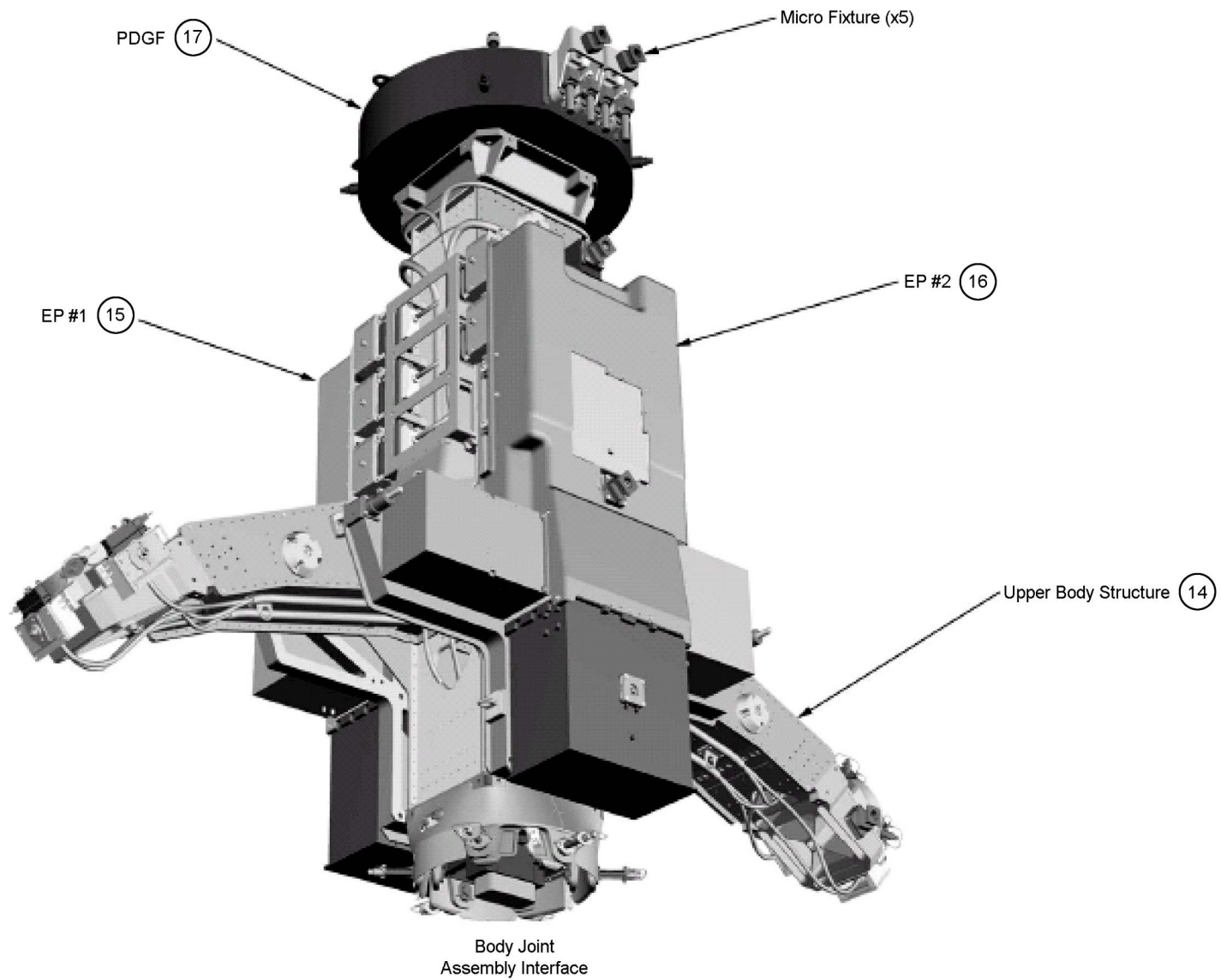
SPDM TOOL HOLDER ASSY (THA) (Cont)



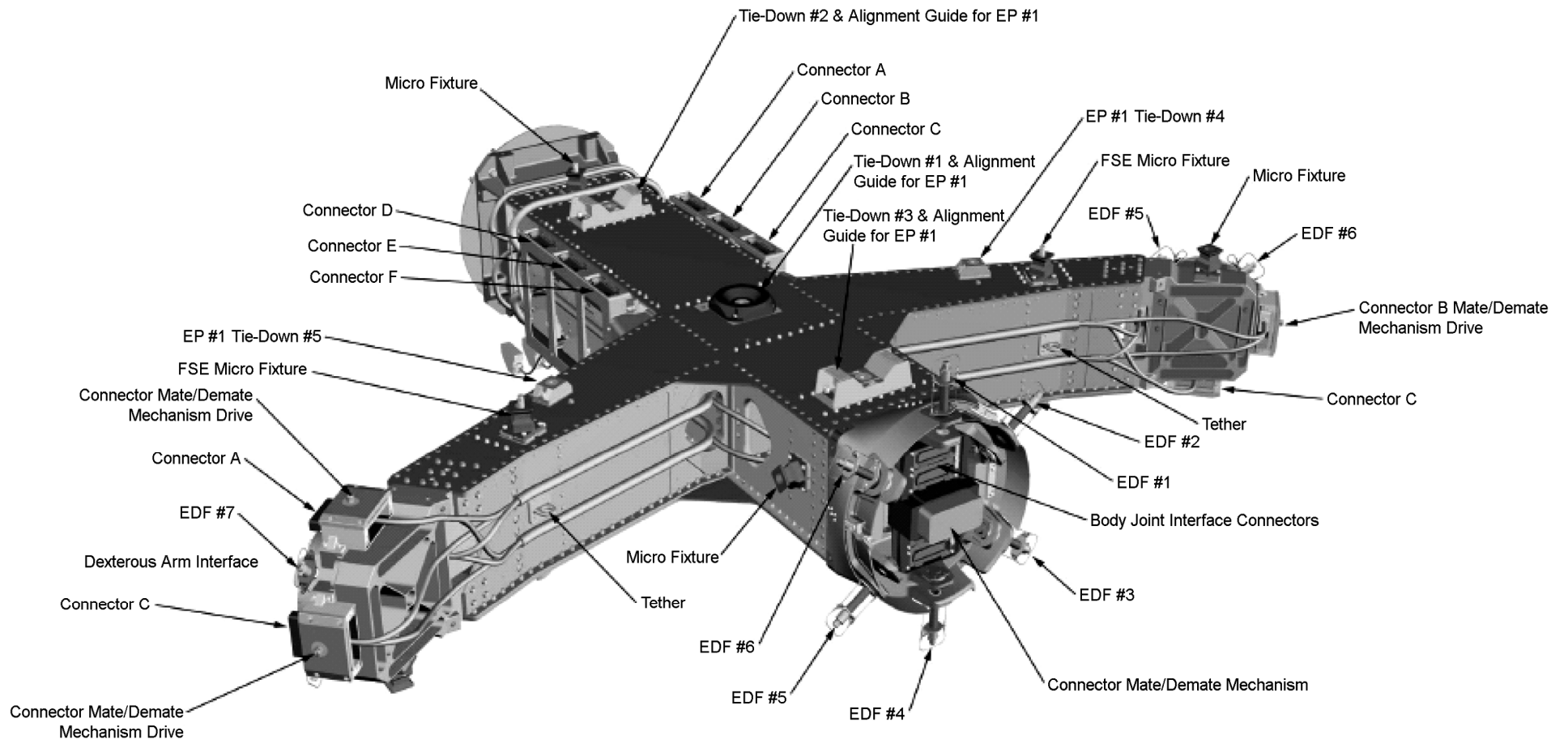
# SPDM UPPER BODY ASSY



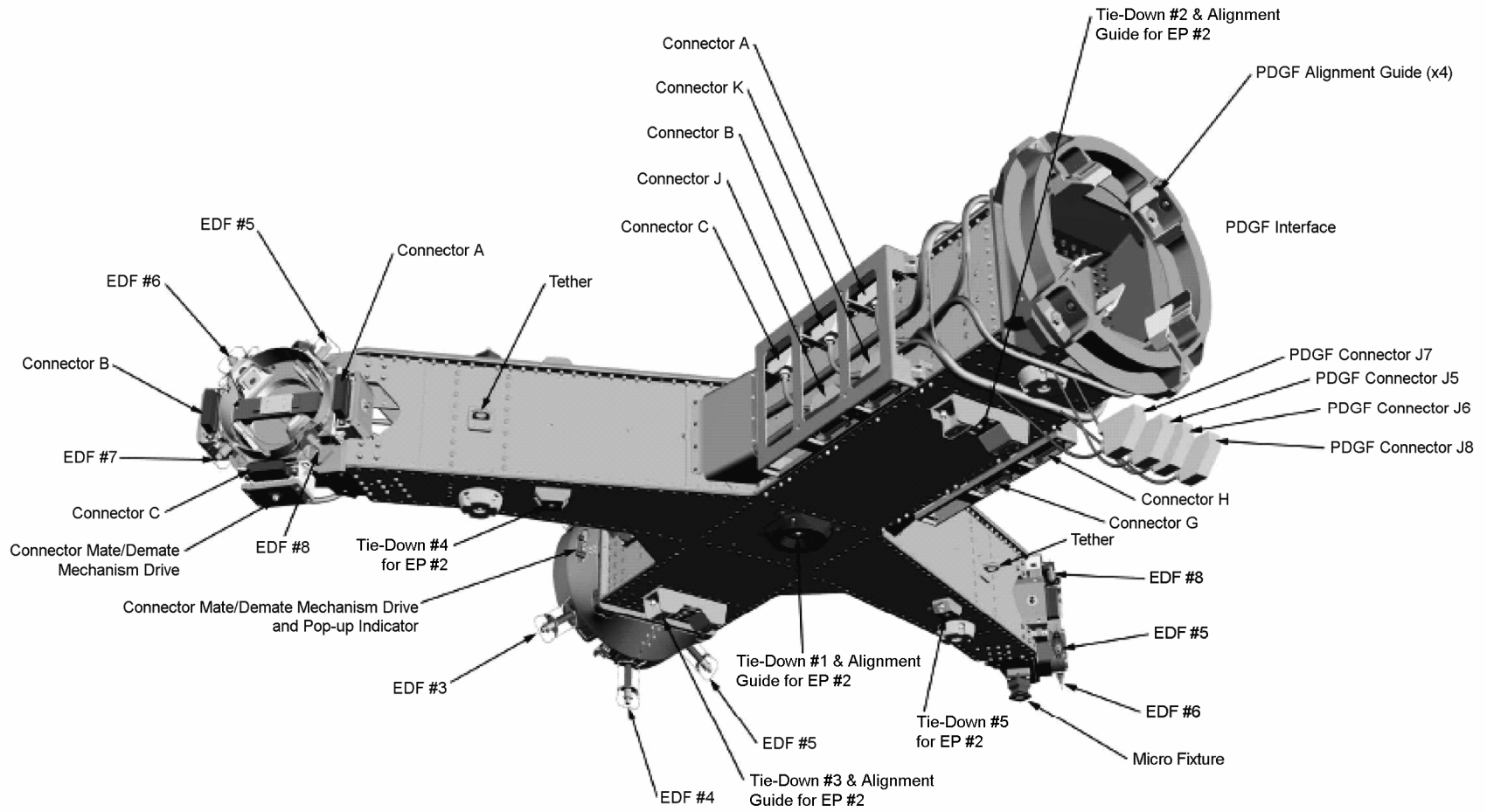
## SPDM UPPER BODY ASSY (Cont)



## SPDM UPPER BODY ASSY (Cont)



# SPDM UPPER BODY ASSY (Cont)





## SPDM UPPER BODY ASSY (Cont)



Connector Mate/Demate Visual Cue at Shoulder



Connector Mate/Demate Visual Cue at Shoulder



Connector Mate/Demate Visual Cue at Shoulder



EP #1 and EP #2 assembled to Upper Body Structure

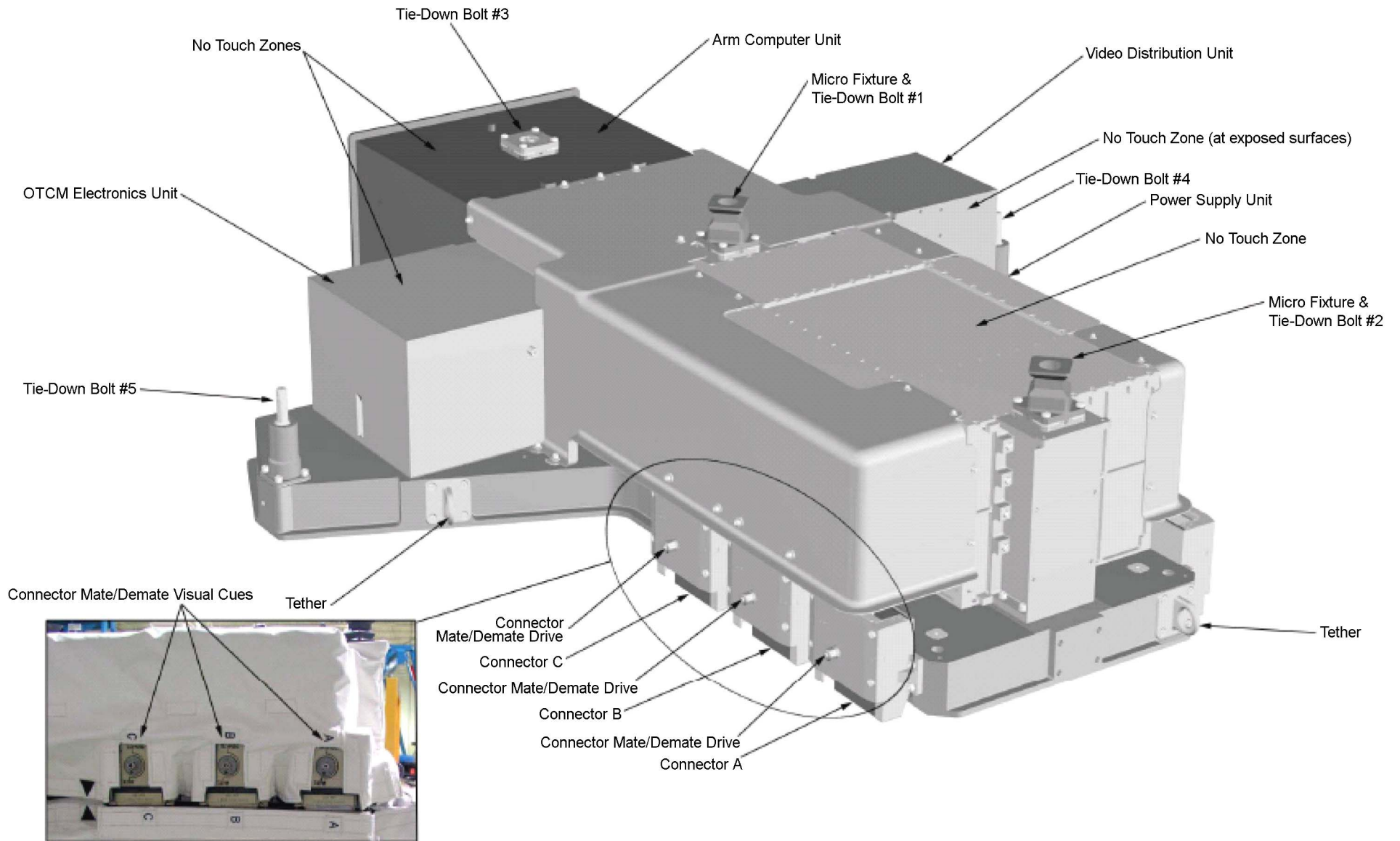


EP #1 and EP #2 assembled to Upper Body Structure

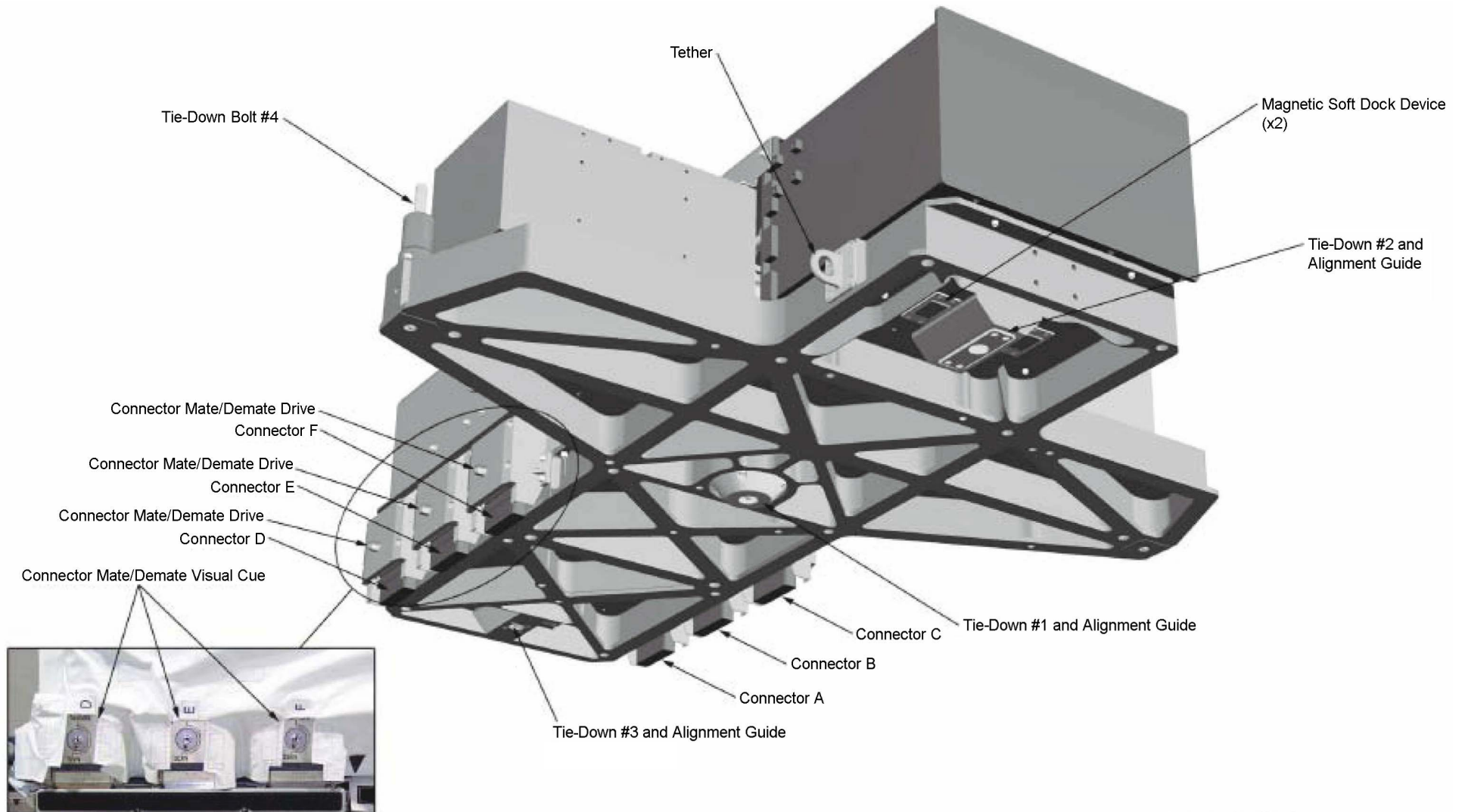
NOTE: Temporary radiator surface protection will be removed before launch

▼ Visual Alignment  
Cues

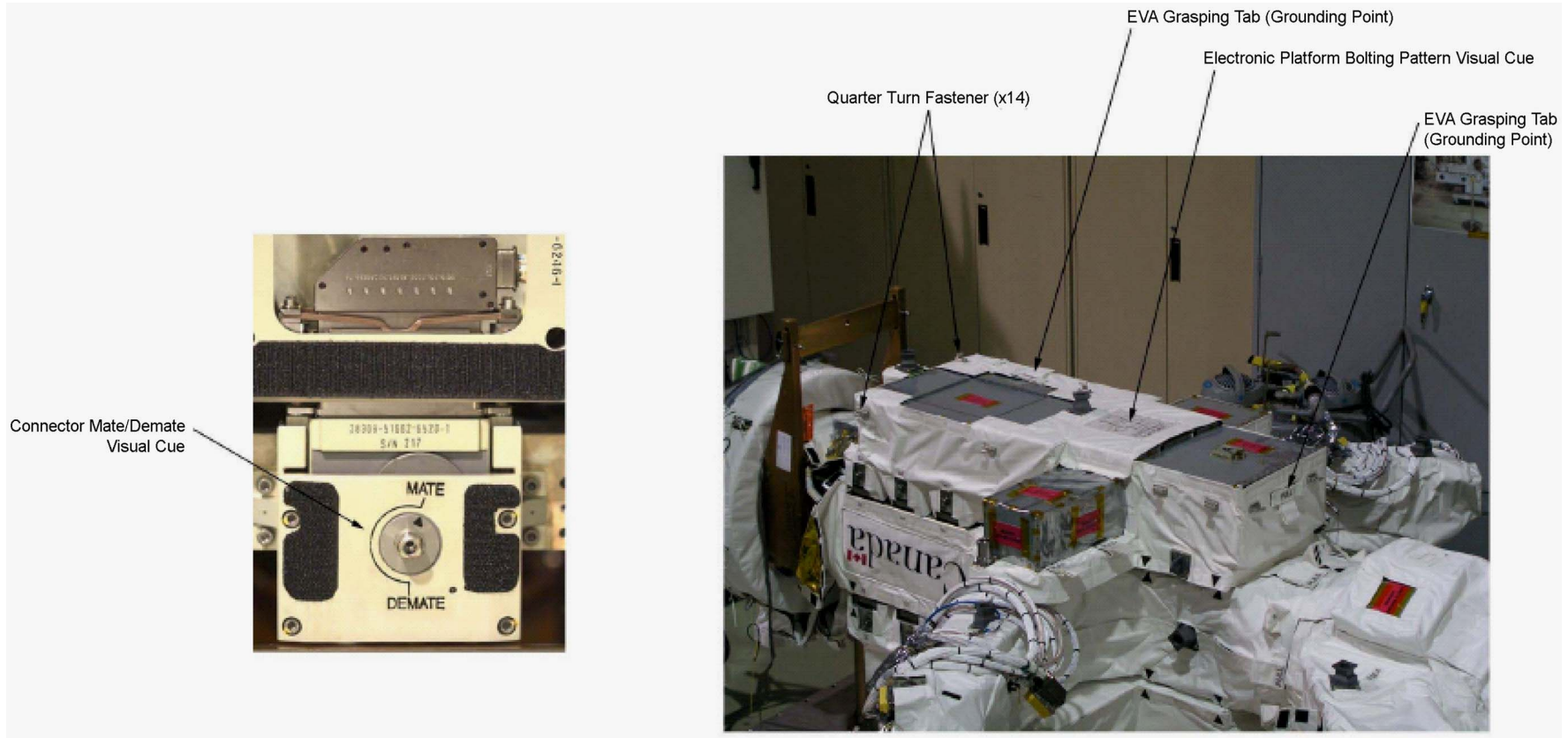
# SPDM ELECTRONIC PLATFORM (EP) #1



# SPDM ELECTRONIC PLATFORM (EP) #1 (Cont)



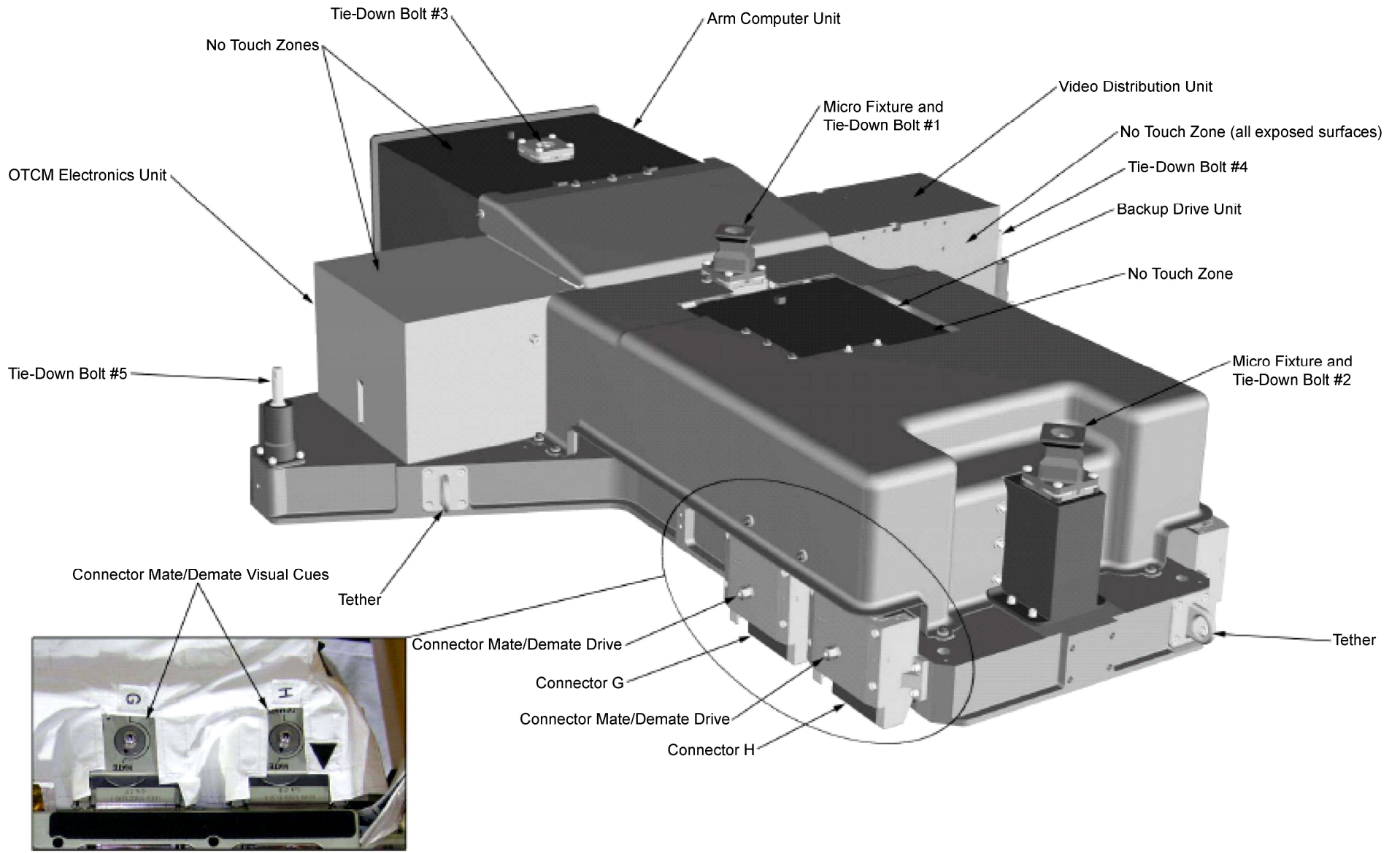
## SPDM ELECTRONIC PLATFORM (EP) #1 (Cont)



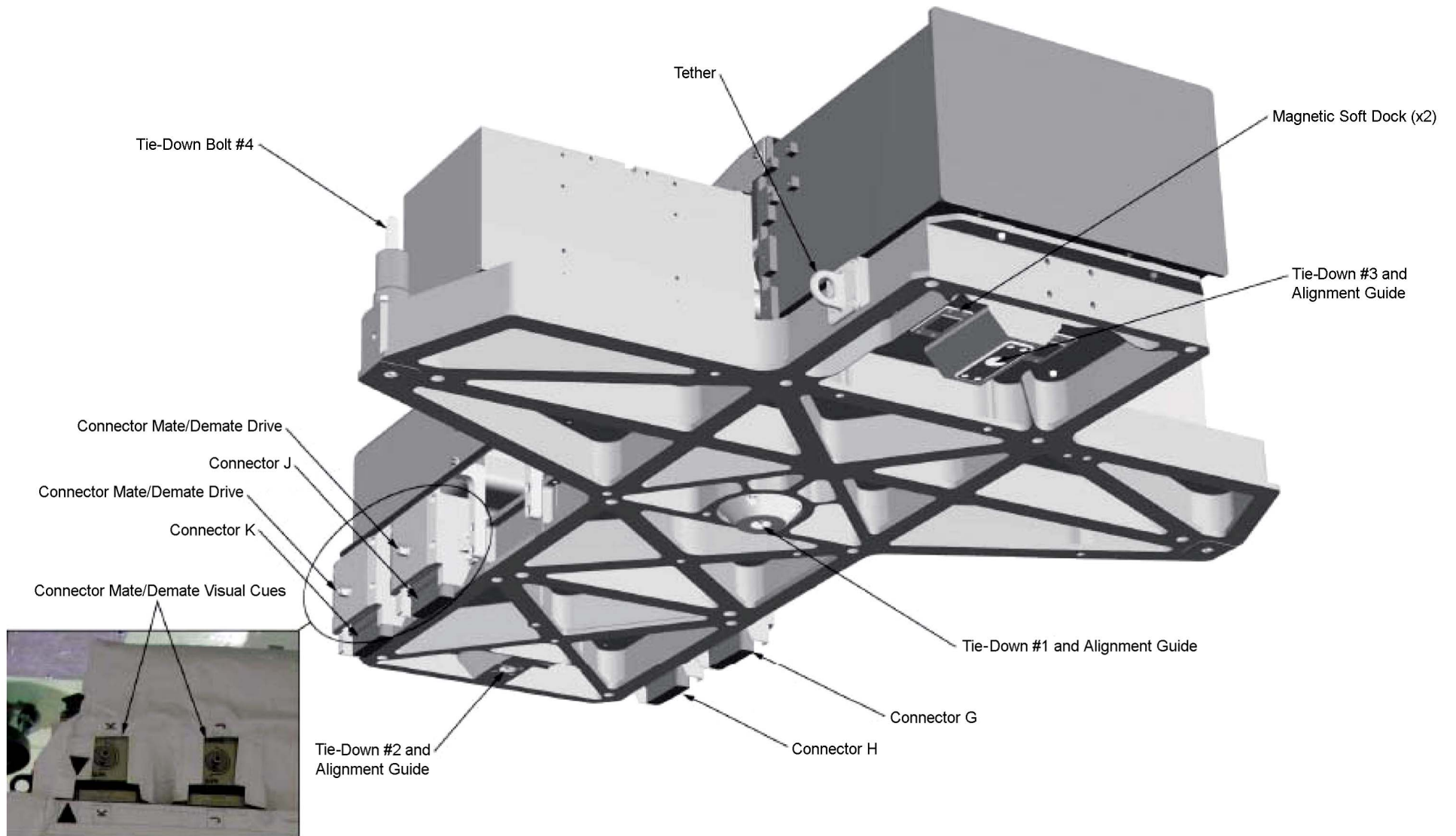
EP #1 installed on Upper Body Structure

NOTE: Temporary radiator surface protection will be removed before launch

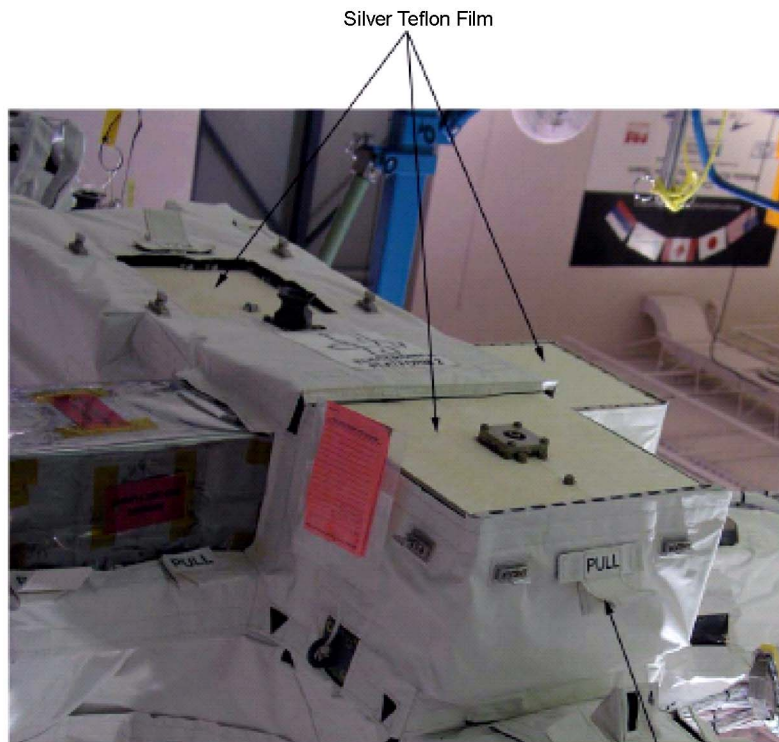
# SPDM ELECTRONIC PLATFORM (EP) #2



## SPDM ELECTRONIC PLATFORM (EP) #2 (Cont)

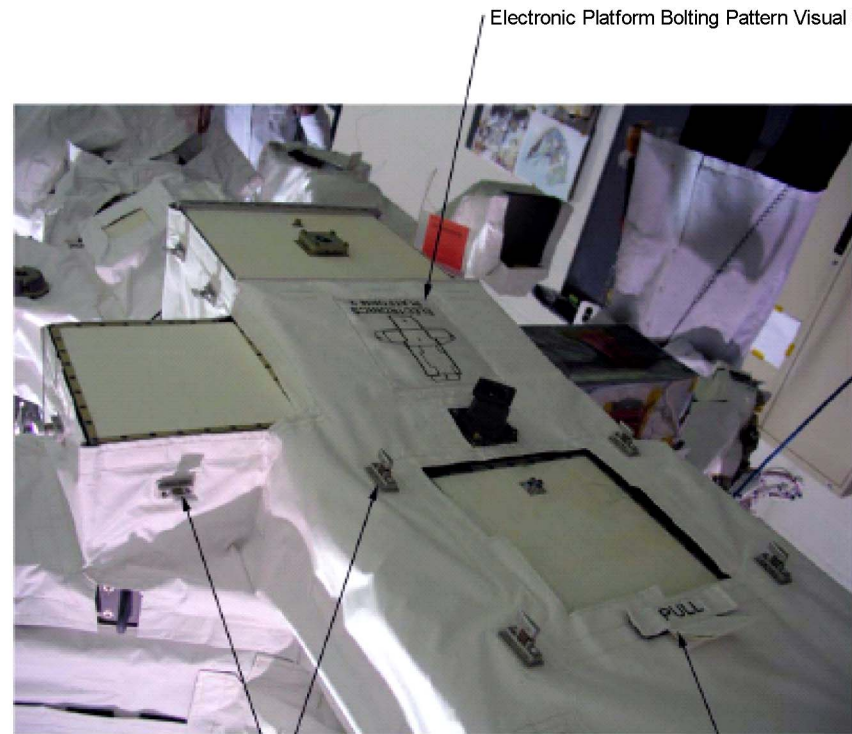


## SPDM ELECTRONIC PLATFORM (EP) #2 (Cont)



EP #2 installed on Upper Body Structure

EVA Grasping Tab  
(Grounding Point)

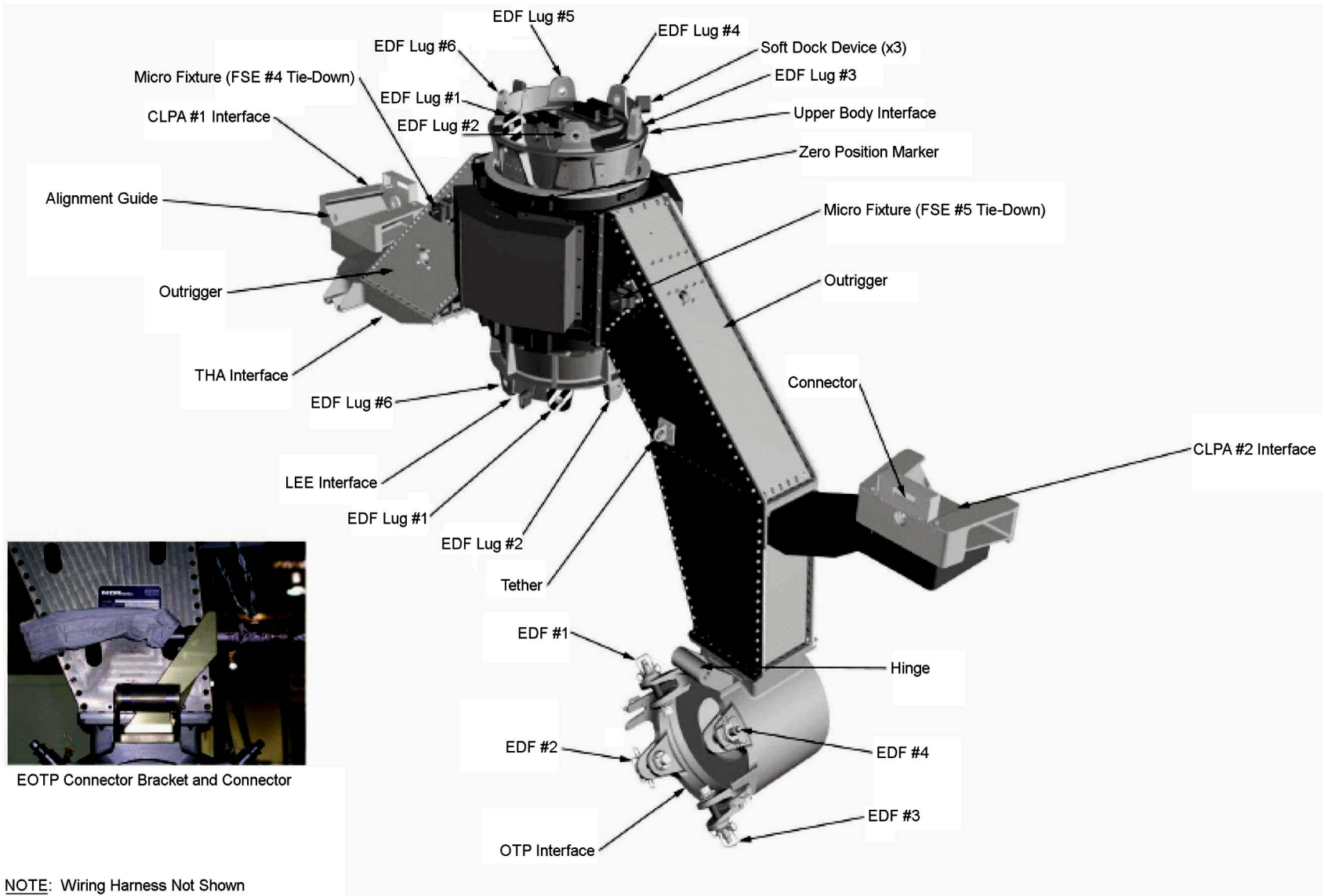


Quarter Turn Fasteners (x14)

EVA Grasping Tab  
(Grounding Point)

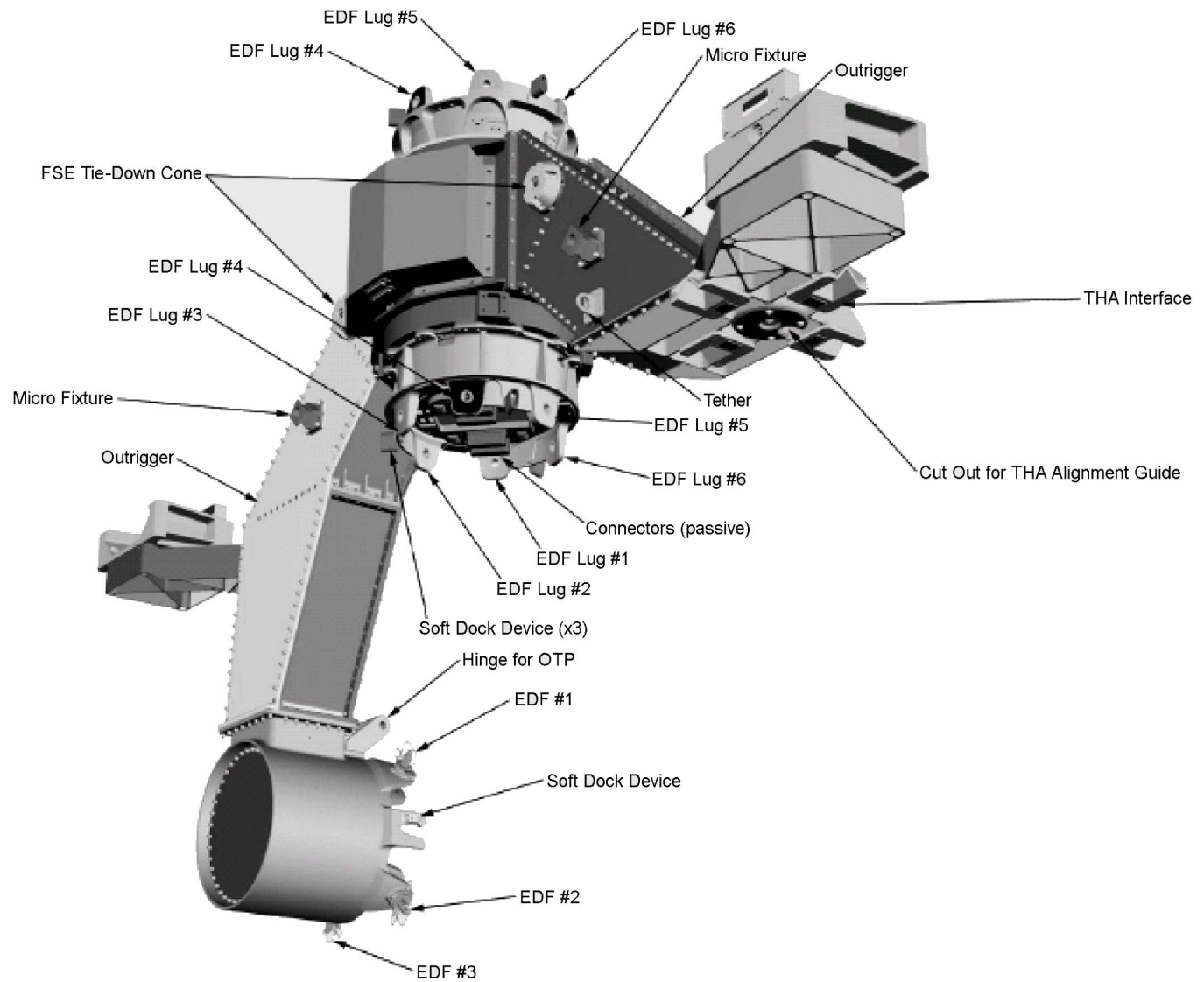
NOTE: Temporary radiator surface protection will be removed before launch

# SPDM BODY JOINT ASSY





## SPDM BODY JOINT ASSY (Cont)

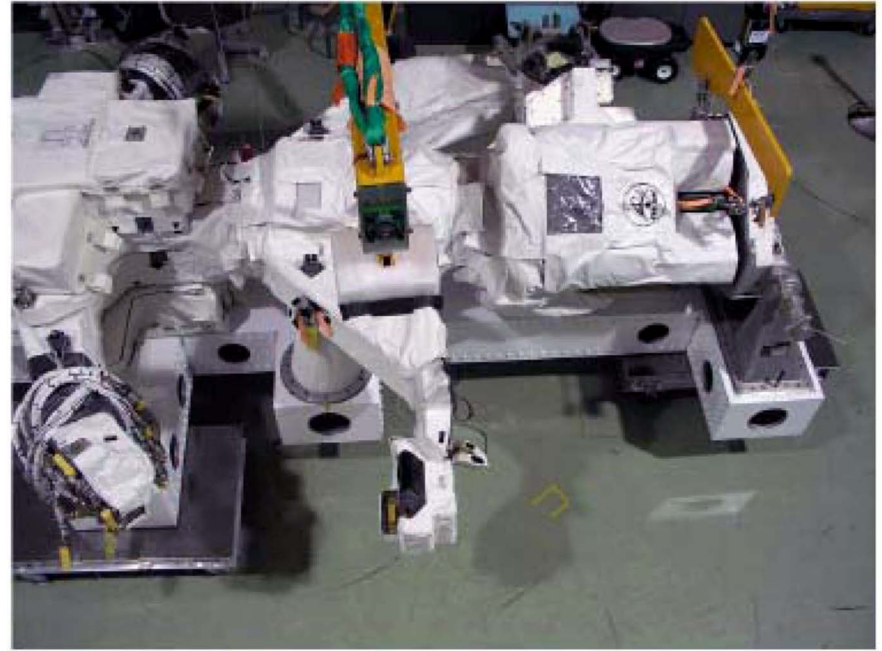


NOTE: Wiring Harness Not Shown

## SPDM BODY JOINT ASSY (Cont)



Tool Holder Content  
Visual Cue

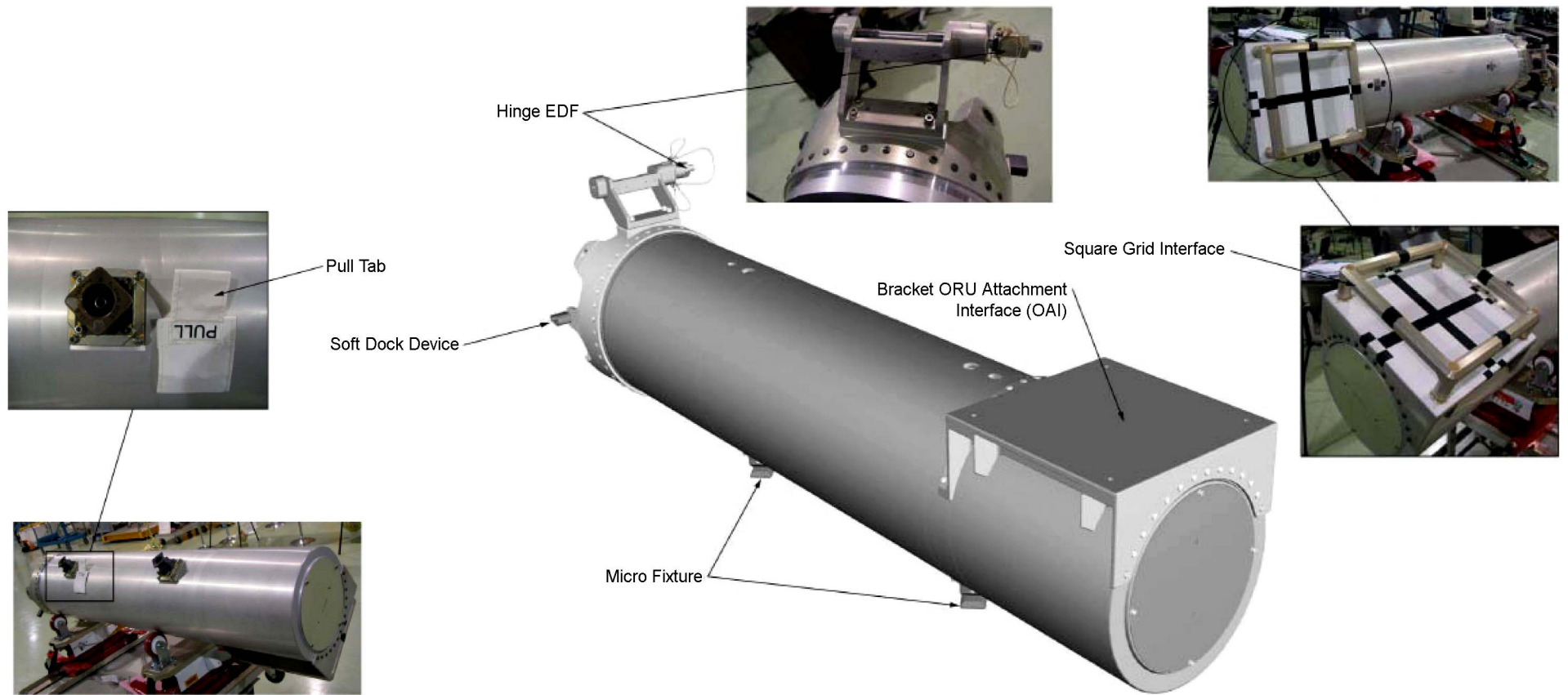


OTP Restraint

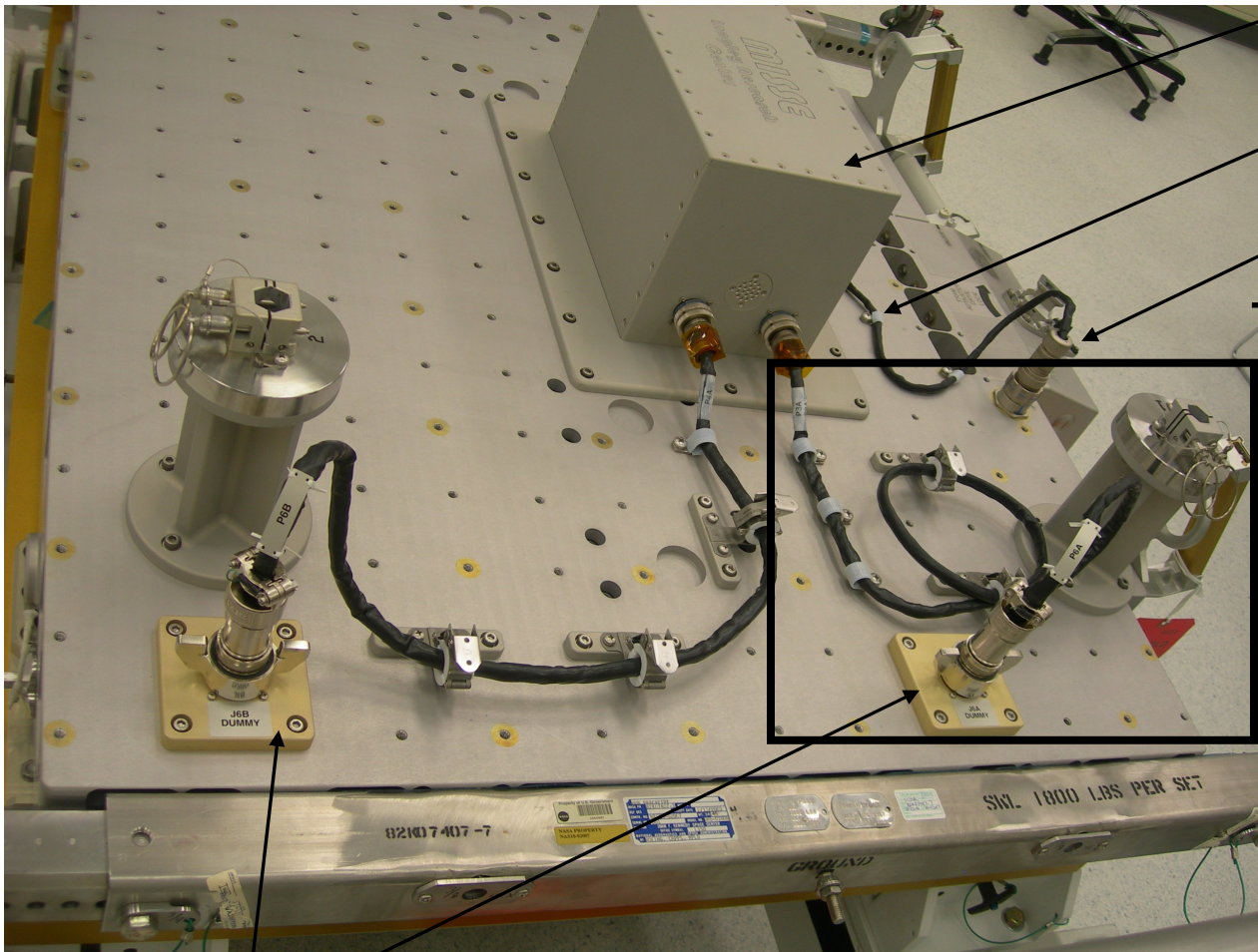


EOTP Connector Bracket and Connector

# ORU TEMPORARY PLATFORM (OTP)



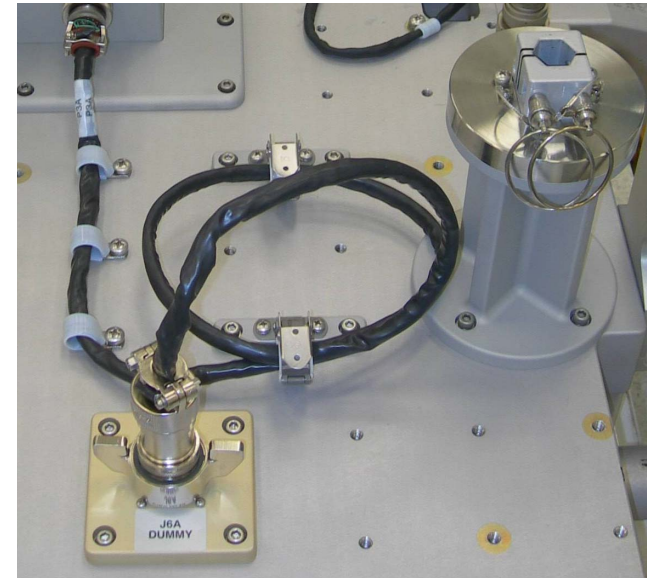
# MISSE 6 FSE ON LWAPA



Power Box

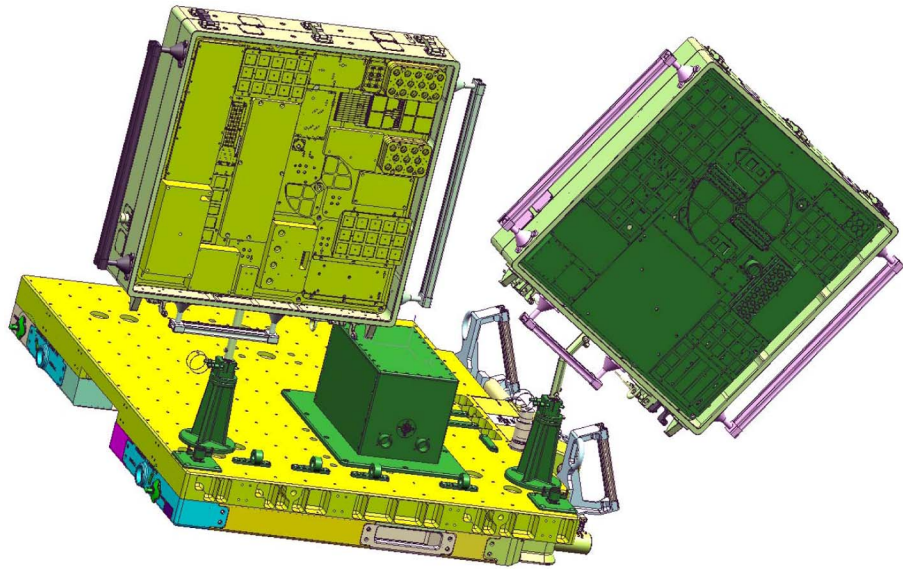
Cushioned Loop Clamps

Electrical Interface



(2) Dummy Connectors

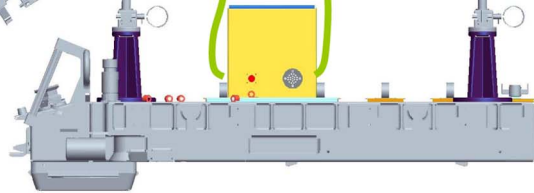
MISSE 6 PECs INSTALLED ON LWAPA



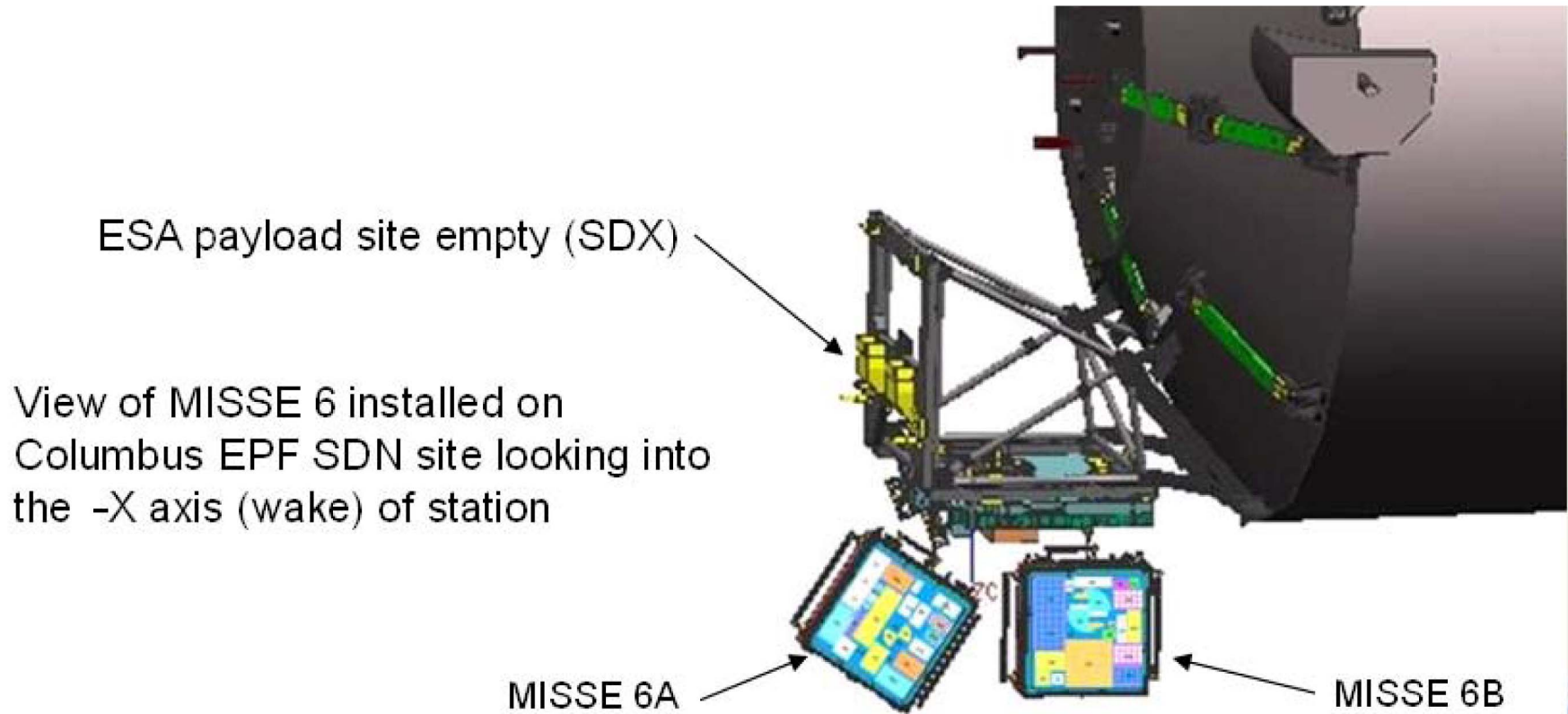
PEC 6A



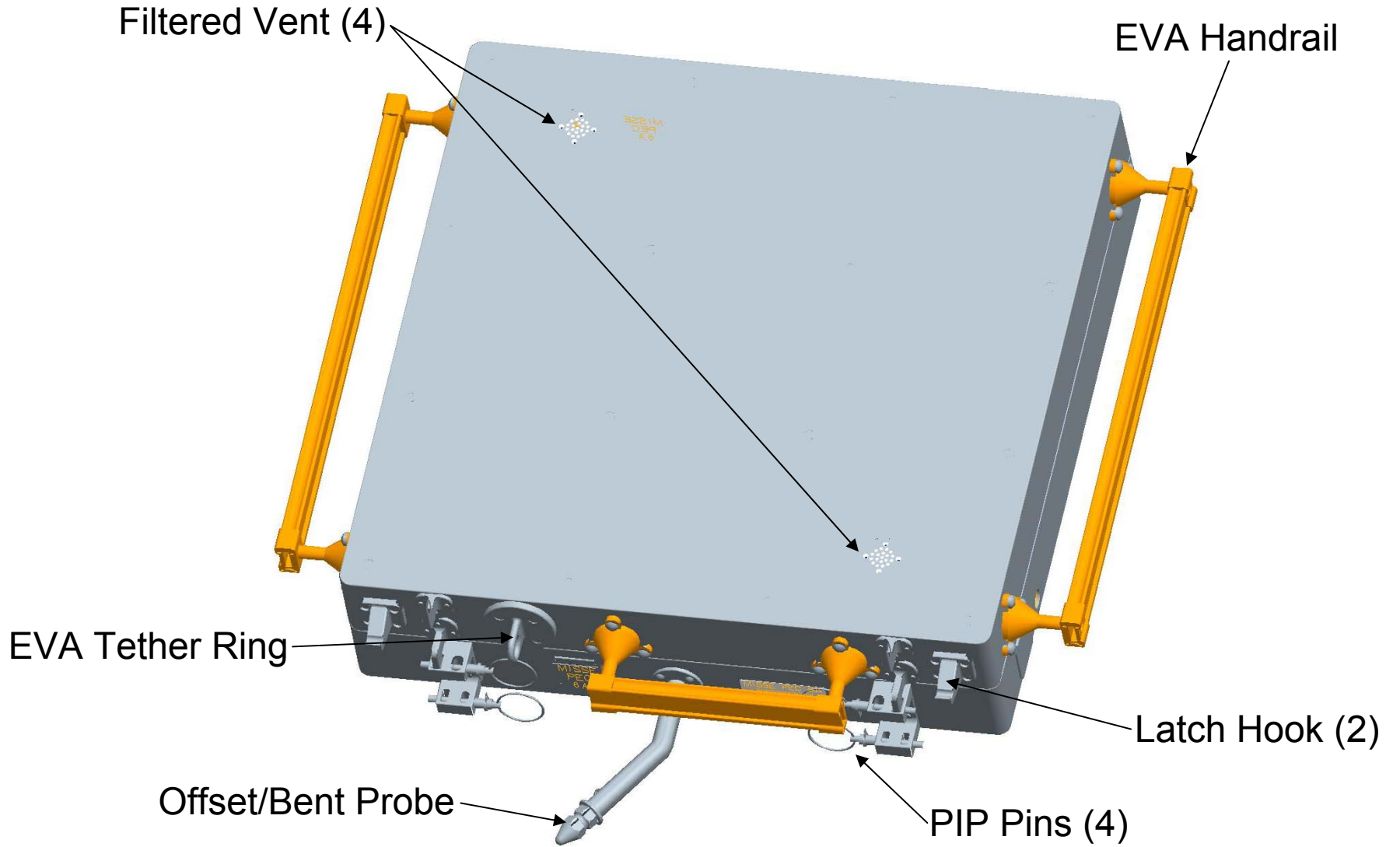
PEC 6B



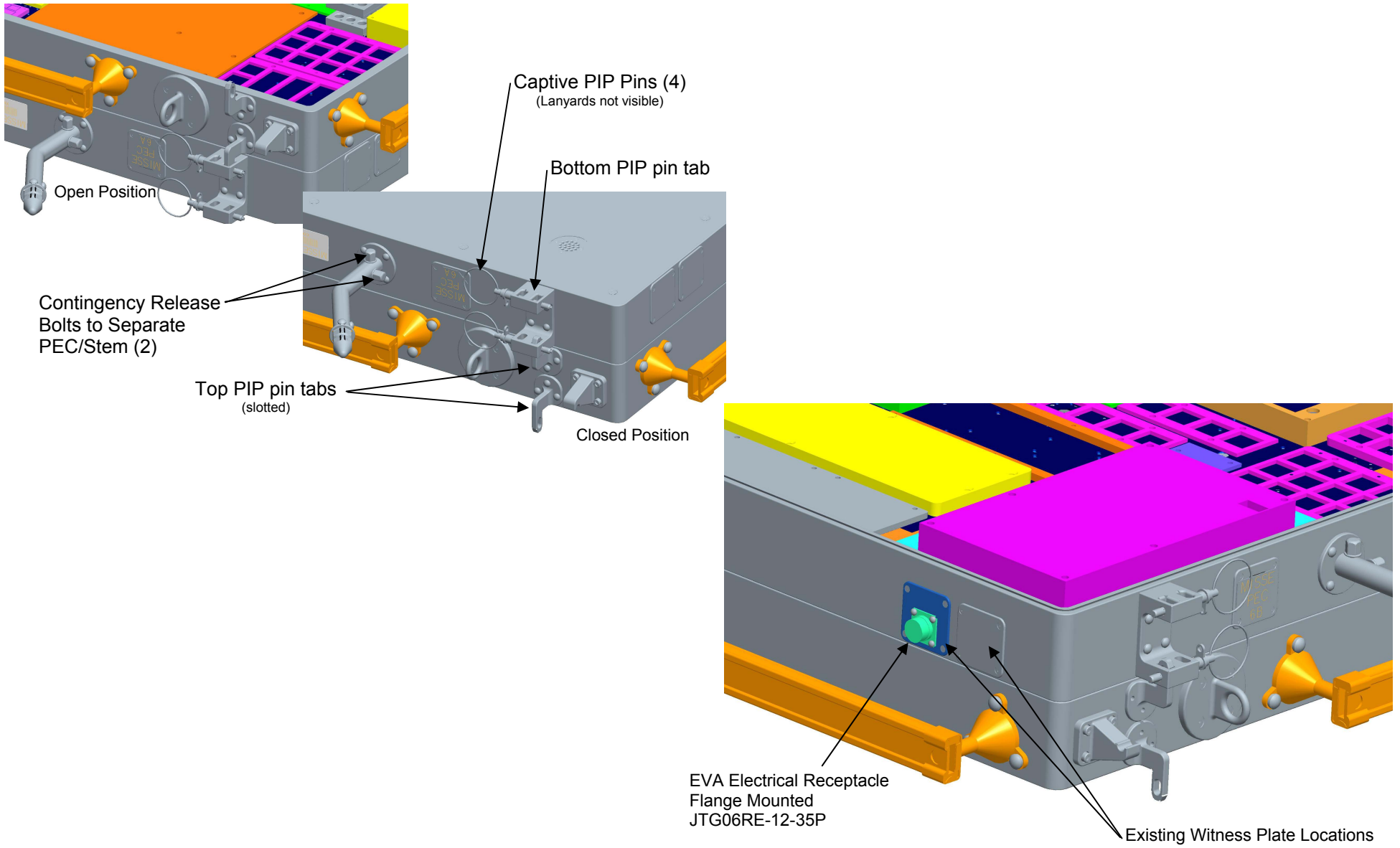
MISSE 6 PECs INSTALLED ON LWAPA ON COL EPF



MISSE BENT PEC

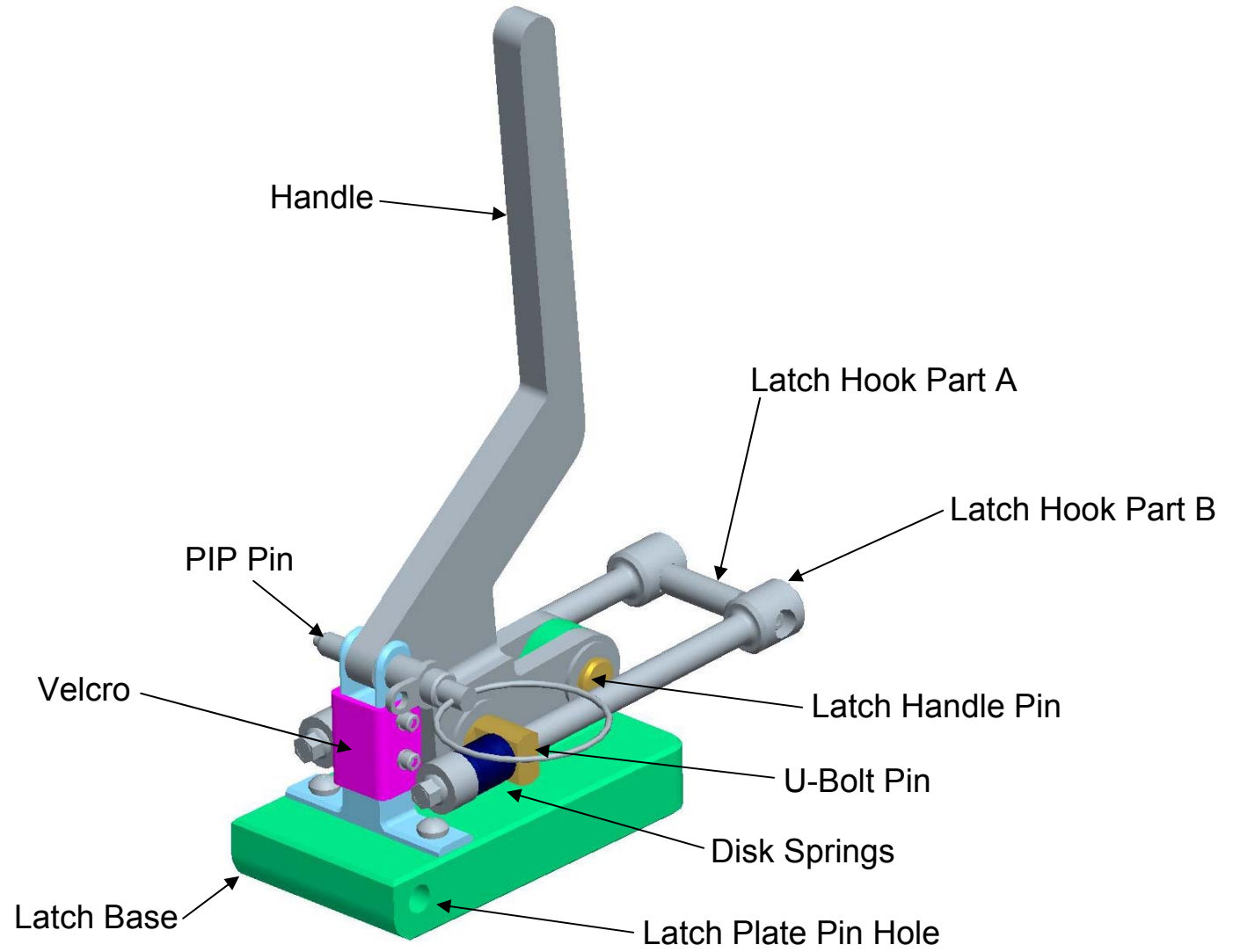


# MISSE PEC PIP PINS AND POWER CONNECTORS

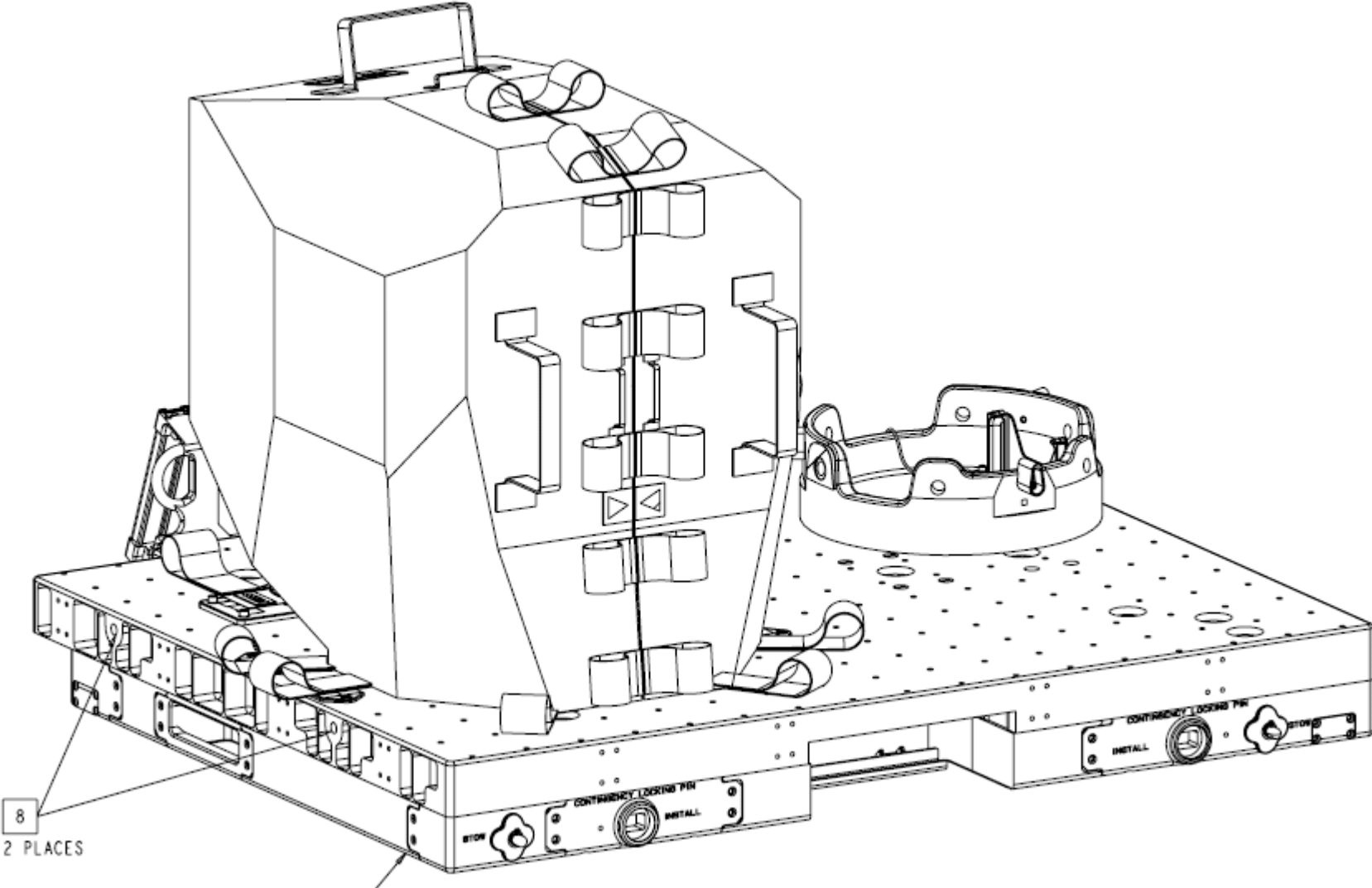




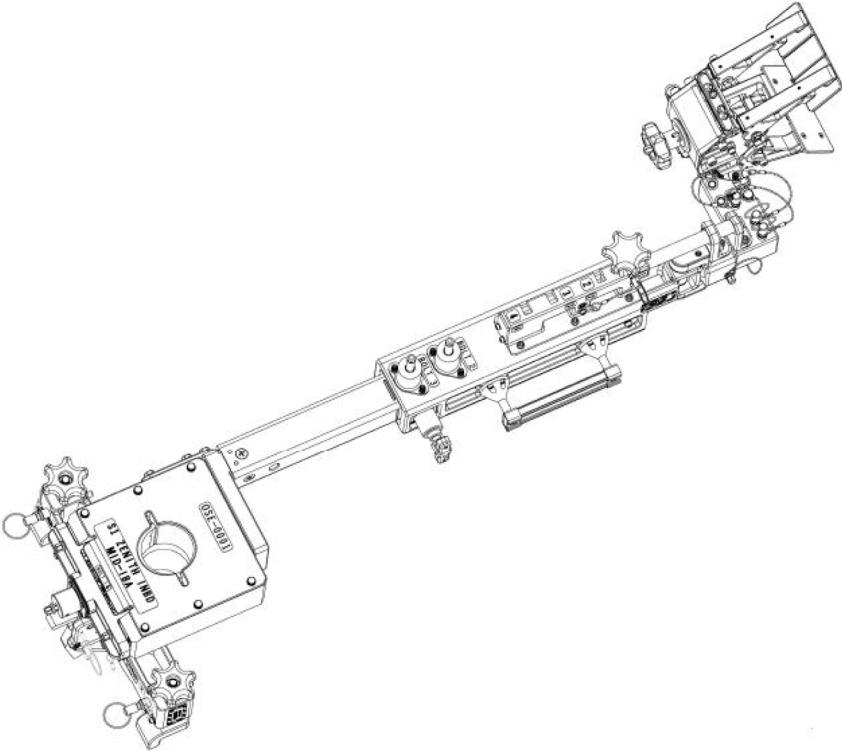
MISSE SWC LATCH ASSY



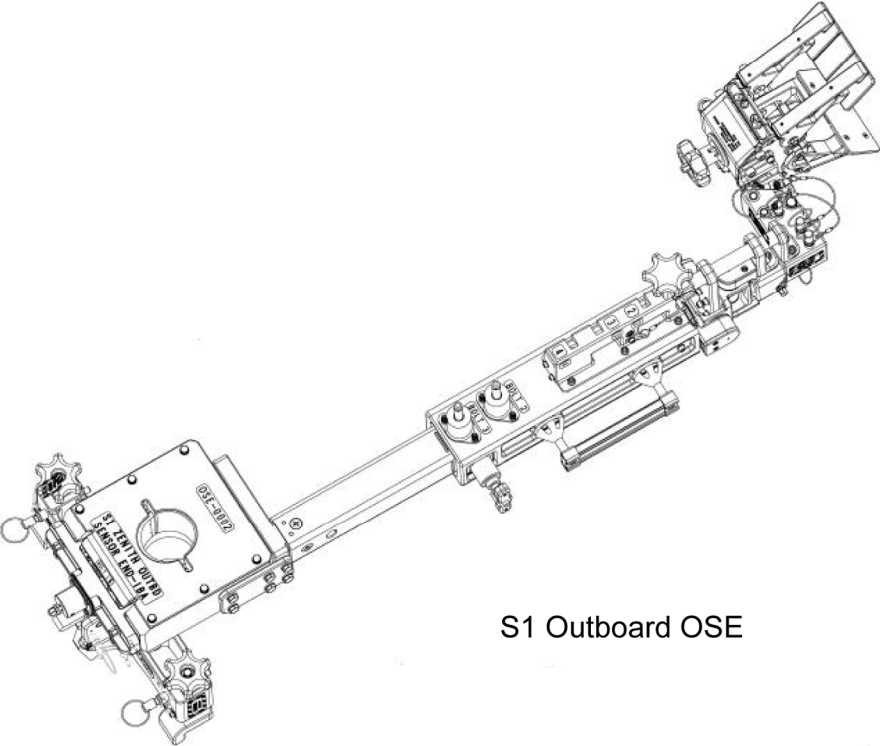
YAW JOINT ON FRAM



**OBSS OSE**

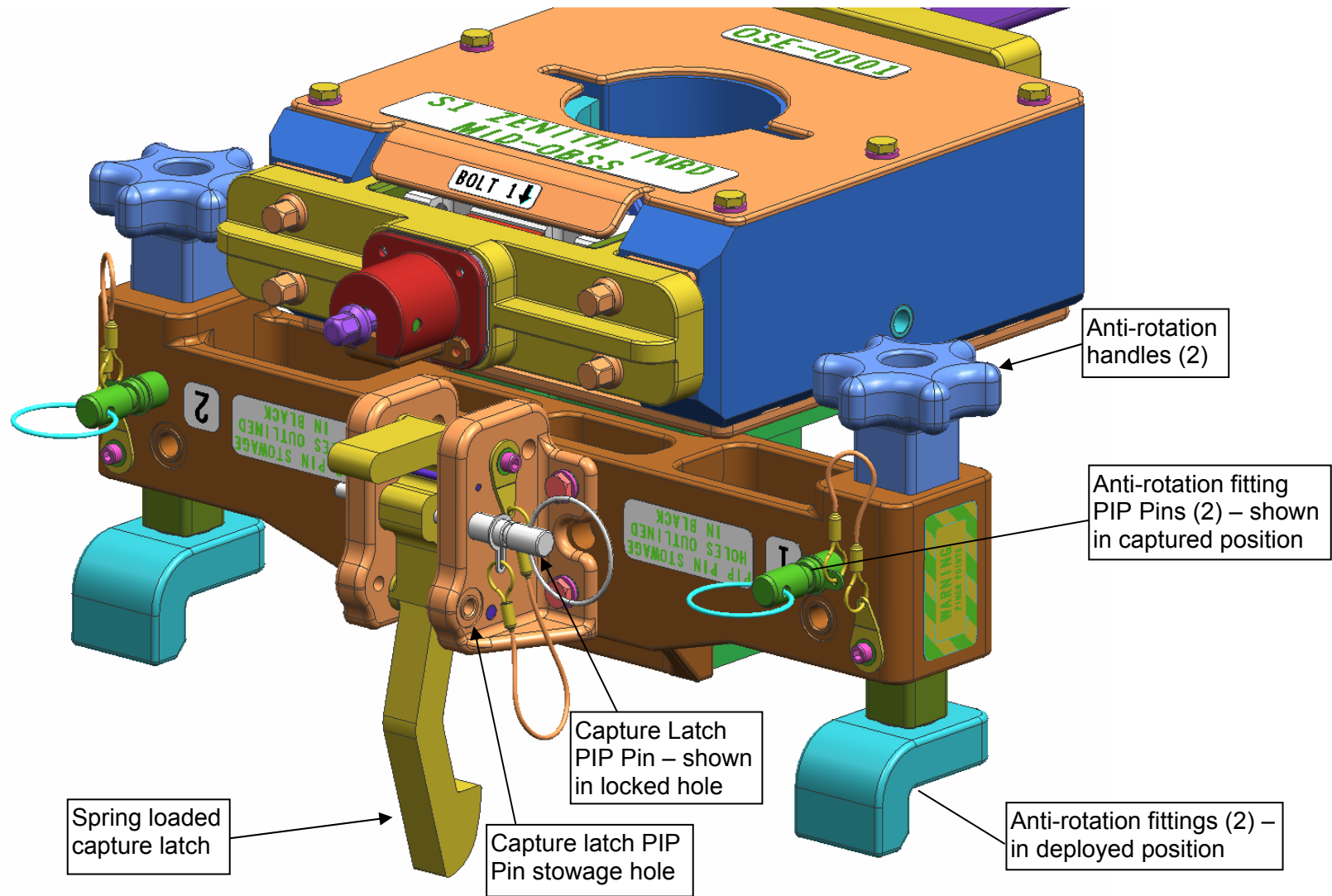


S1 Inboard OSE

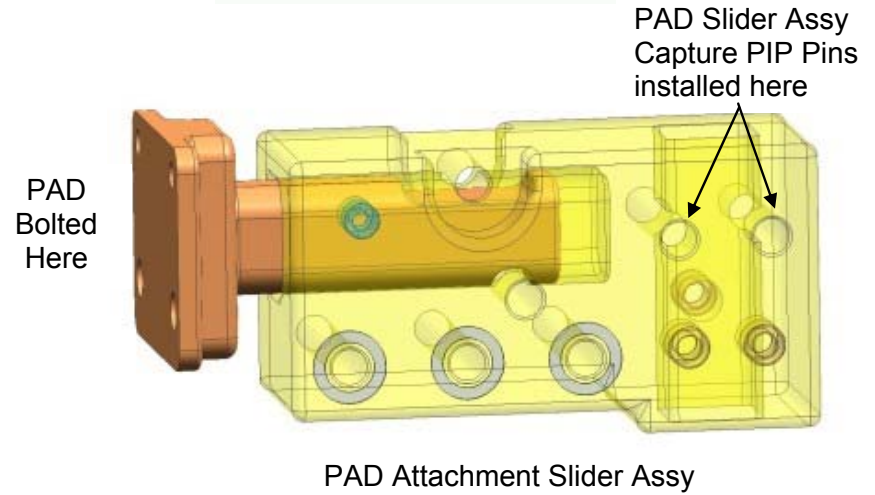
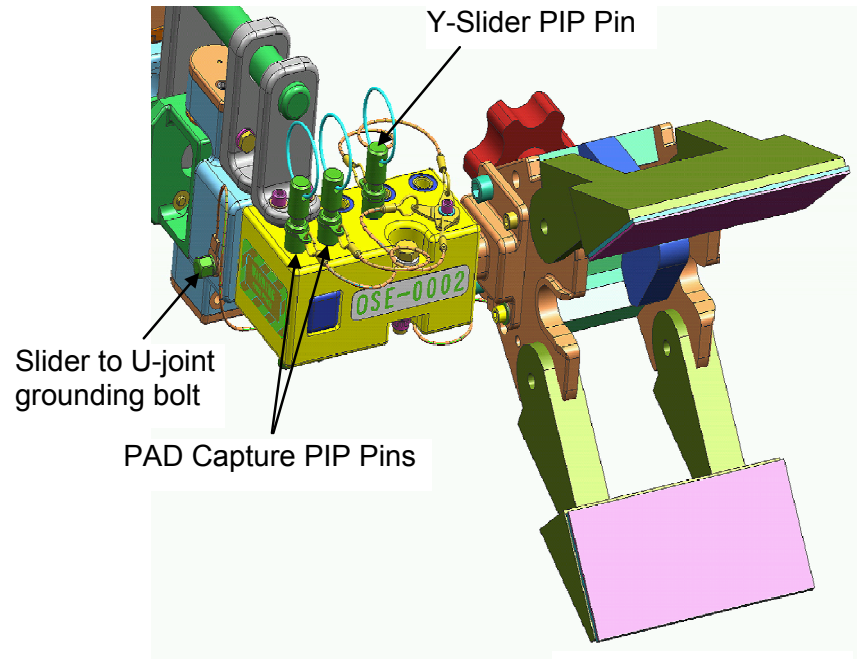
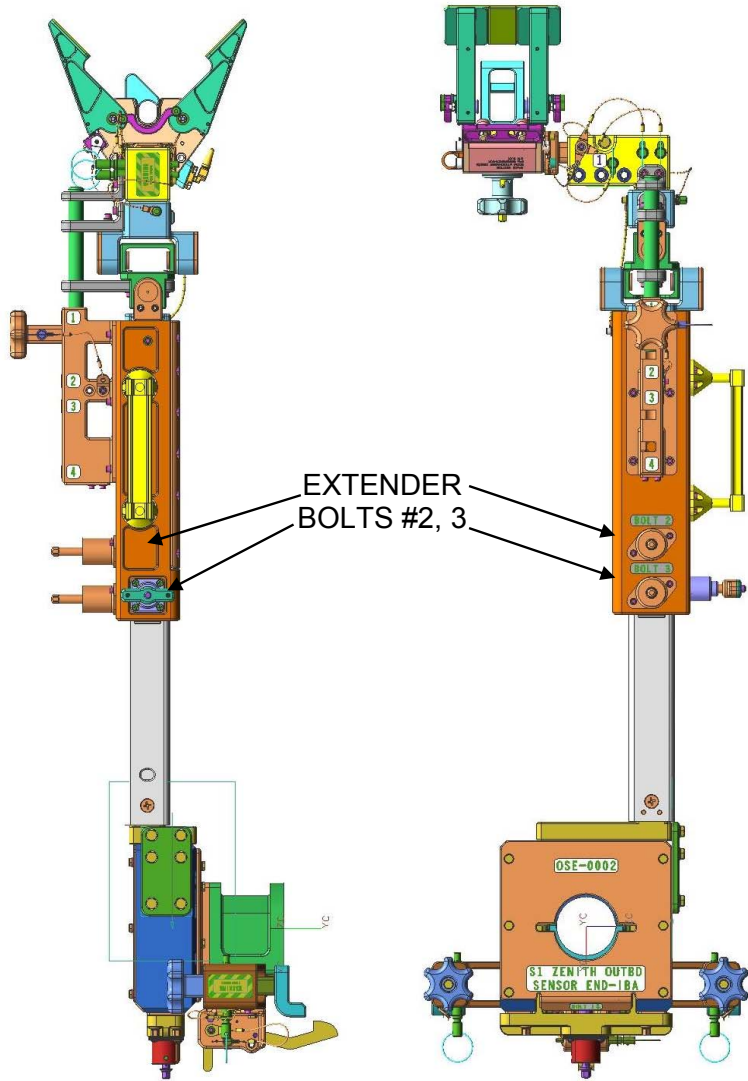


S1 Outboard OSE

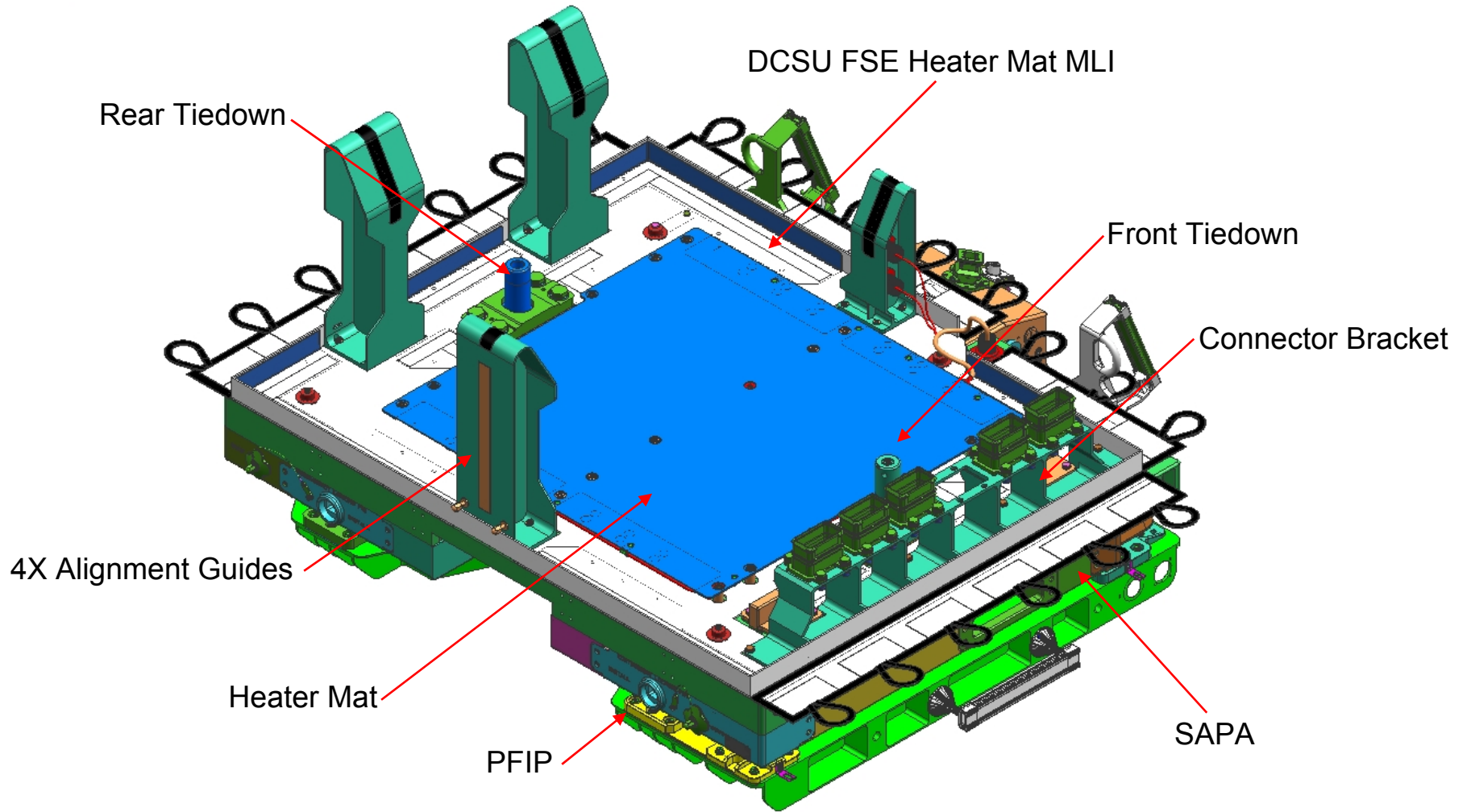
OBSS OSE (Cont)



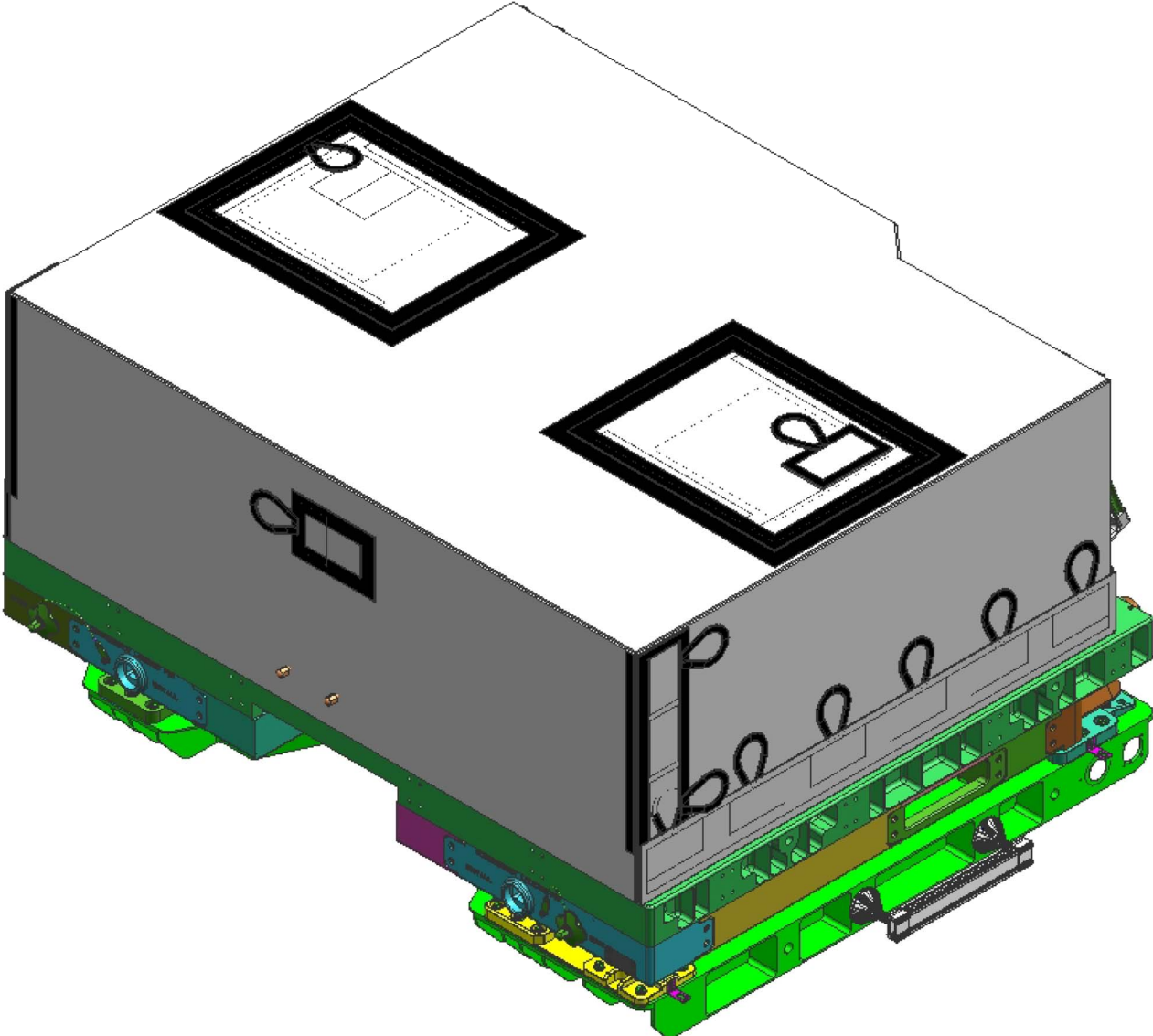
OBSS OSE (Cont)



# DCSU FSE, ACTIVE FRAM, AND SAPA



DCSU BLANKET, ACTIVE FRAM, AND SAPA



**DCSU COURSE ALIGNMENT GUIDES**







# EVA CHECKLIST

STS  
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