

# EVA Checklist

## STS-118 Flight Supplement

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

**Final, Rev A  
June 20, 2007**

### **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



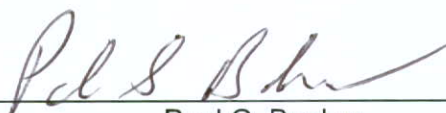


MISSION OPERATIONS DIRECTORATE

**EVA CHECKLIST  
STS-118 FLIGHT SUPPLEMENT**

FINAL, REV A  
June 20, 2007

PREPARED BY:

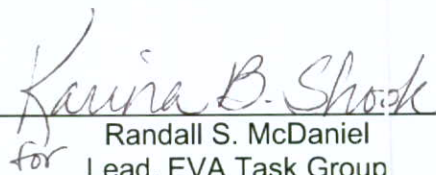


Paul G. Boehm  
Book Manager

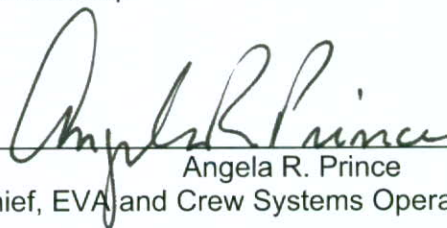
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Incorporates the following:			
482#:	EVA FS-0051	EVA FS-0059	EVA FS-0066
	EVA FS-0053	EVA FS-0060	EVA FS-0067
	EVA FS-0054	EVA FS-0061	EVA FS-0068
	EVA FS-0055	EVA FS-0062	EVA FS-0069
	EVA FS-0056	EVA FS-0063	EVA FS-0070
	EVA FS-0057	EVA FS-0064	EVA FS-0071
	EVA FS-0058	EVA FS-0065	

AREAS OF TECHNICAL RESPONSIBILITY

Book Manager	DX35/P. Boehm	281-483-5447
Systems Lead	DX35/D. Brashinger	281-244-8727
Task Lead	DX32/J. Kagey	281-483-2667

EVA CHECKLIST  
STS-118 FLIGHT SUPPLEMENT

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REV A 06/20/07

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\* – Omit from flight book

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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)

- AW18A
1. LTG FLOOD (four) – ON
  2. Remove Airlock Stowage Bag from airlock
  3. Unbuckle SCU straps, Velcro SCU to wall
  4. Disconnect helmets from EMUs, temp stow
  5. Remove comm caps from LTA Restraint Bags and connect to electrical harnesses in EMU (For WM EMU, connect comm cap labeled “WM1”, temp stow comm cap labeled “WM2”)
  6. Remove LTA Restraint Bags
  7. Disconnect waist rings; remove ECOKs, LCVGs
  8. Retrieve mesh bag labeled “EVA SYSTEMS 1” from MT ECOK and mesh bag labeled “EVA SYSTEMS 2” from WM ECOK
- Vol H
9. Stow comm cap WM2 in WM ECOK
  10. Unstow:
    - OBD Bag
    - EMU Equipment Bag – Crew Specific Compartment (2)
    - Helmet Lights (1)
    - INBD Bag
    - SCOF (2), temp stow for EMU Checkout
    - EMU Servicing Kit (s/n 5005) – mark with Gray Tape; label “118 to ISS”
    - Helmet Lights (1)
  11. Stow one EMU Equipment Bag – Crew Specific Compartment in each MT and WM ECOK
  12. Stow following items in EVA SYSTEMS 2 mesh bag:
    - EMU Servicing Kit
    - Helmet Lights (2)
  13. Stow Vol H Bags in Vol H
  14. Stow LTA Restraint Bags on AAP
  15. √Thermal cover clear of waist rings
  16. Waist ring – engage position
  17. Connect LTA to HUT, lock

## LTA RESTRAINT STRAP REMOVAL (15 min)

### NOTE

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

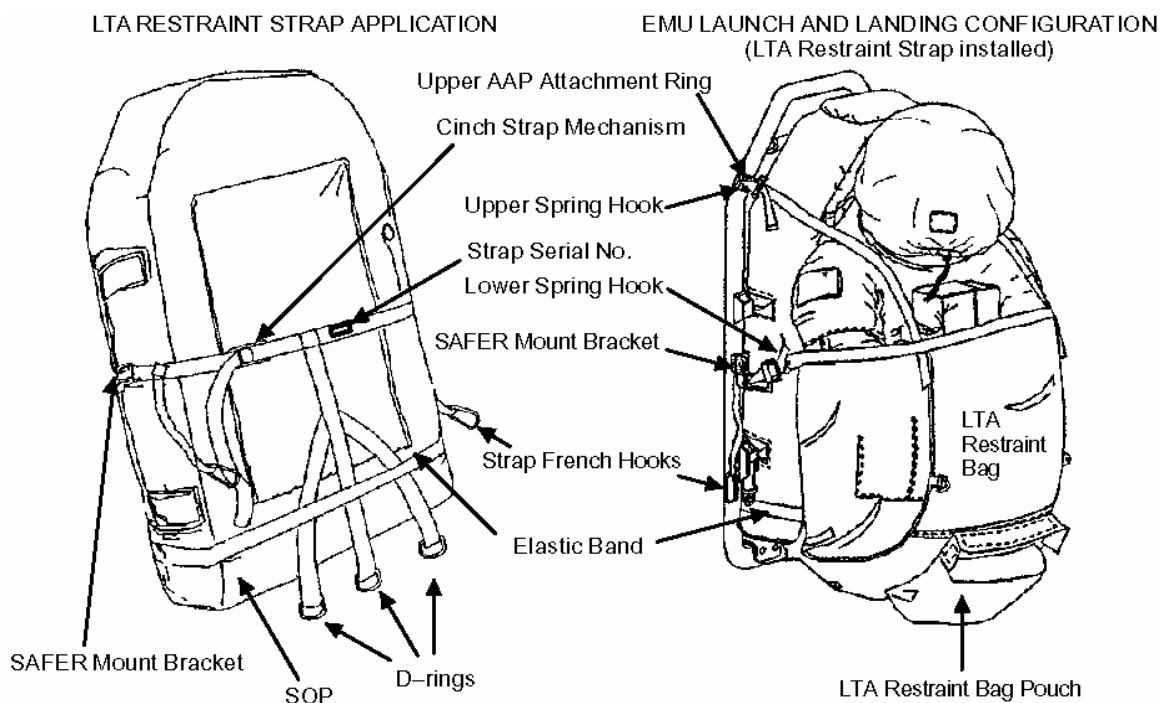
1. As reqd, remove comm cap from LTA Restraint Bag; temp stow
2. Remove EMU from AAP
3. Disconnect all restraint attachments from SAFER mount brackets (two)
4. Loosen cinch strap mechanism, remove SAFER mount brackets
5. Remove strap from PLSS
6. Stow strap in LTA Restraint Bag Pouch with D-rings (three)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

## LTA RESTRAINT STRAP INSTALLATION (15 min)

### NOTE

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

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



### NOTE

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

## EMU PREP FOR TRANSFER TO ISS (90 min)

- BOTH EMUs/  
DCM
1. √PWR – SCU
  2. √PURGE vlv – op (up)
  3. √WATER – OFF, switch guard installed
  4. √O2 ACT – OFF
  5. Configure/verify items according to table below:  
(NOTE: **bolded** items differ from launch config)

ISS FE-2 (Ad) EMU transfer items are located in Middeck Floor Port 1 bag  
Drink Bags (DIDB) are located in External A/L Floor bag

For EMU Battery and CCC s/n, refer to STS-118 CONSUMABLES TRACKING CUE CARD (EMU MAINT/RECHARGE)

<p><u>EMU 3010 (Mt)</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> DIDB Restraint Bag</li> <li><input type="checkbox"/> CCA</li> <li><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> </li> <li><input type="checkbox"/> 6MT Gloves (prime)</li> <li><input type="checkbox"/> Wrist Mirror (2)</li> <li><input type="checkbox"/> <b>ISS EVA Cuff C/L</b> (EV1)</li> <li><input type="checkbox"/> EMU Battery</li> <li><input type="checkbox"/> CCC (LiOH)</li> <li><input type="checkbox"/> LTA</li> </ul>	<p><u>EMU 3017 (Wm)</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> DIDB Restraint Bag</li> <li><input type="checkbox"/> CCA (WM1)</li> <li><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 (2)</li> </ul> </li> <li><input type="checkbox"/> 6E5 Gloves (prime)</li> <li><input type="checkbox"/> Wrist Mirror (2)</li> <li><input type="checkbox"/> <b>ISS EVA Cuff C/L</b> (EV2)</li> <li><input type="checkbox"/> EMU Battery</li> <li><input type="checkbox"/> CCC (LiOH)</li> <li><input type="checkbox"/> LTA</li> </ul>
<p><u>Mesh Bag (Mt)</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> EVA 1, 2, &amp; 3 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> </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> <li><input type="checkbox"/> Elastic Glasses Retention Device</li> </ul> </li> <li><input type="checkbox"/> LCVG (w/biomed sternal harness &amp; signal conditioner)</li> <li><input type="checkbox"/> <b>EMU Equip Bag Crew Compartment</b></li> <li><input type="checkbox"/> EVA TOOLS mesh bags (2)</li> </ul>	<p><u>Mesh Bag (Wm)</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> EVA 1, 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"/> Elastic Glasses Retention Device (EVA 1 bag only)</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 (2)</li> <li><input type="checkbox"/> Elastic Glasses Retention Device</li> <li><input type="checkbox"/> Moleskin</li> <li><input type="checkbox"/> Mosite</li> </ul> </li> <li><input type="checkbox"/> CCA (WM2)</li> <li><input type="checkbox"/> LCVG (w/biomed sternal harness &amp; signal conditioner)</li> <li><input type="checkbox"/> <b>EMU Equip Bag Crew Compartment</b></li> </ul>

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

<u>Mesh Bag (Ad)</u> <input type="checkbox"/> STS-118 EVA 3 & 4 Ziplock Bags <input type="checkbox"/> 2 MAGs (w/Ziplock Bags) <input type="checkbox"/> TCUs (top, bottom) <input type="checkbox"/> Socks <input type="checkbox"/> Wristlets <input type="checkbox"/> Comfort Gloves  <input type="checkbox"/> 8 MAGs (w/Ziplock Bags)	<u>Mesh Bag (EVA Systems 1)</u> <input type="checkbox"/> <b>6 DIDBs</b> (empty)
	<u>Mesh Bag (EVA Systems 2)</u> <input type="checkbox"/> <b>8 DIDBs</b> (full) <input type="checkbox"/> <b>EMU Servicing Kit</b> s/n 5005 <input type="checkbox"/> <b>SCOFs</b> (2) <input type="checkbox"/> <b>Helmet Lights</b> (2) <input type="checkbox"/> <b>C/L 118 EVA</b> (1) <input type="checkbox"/> <b><u>STS-118 CONSUMABLES TRACKING CUE CARD</u></b> <input type="checkbox"/> <b>ISS EVA Cuff C/L</b> (EV3) <input type="checkbox"/> <b>C/L ISS EVA SYSTEMS</b> (red stripe w/118 crew notes) <input type="checkbox"/> <b>C/L ISS EVA SYSTEMS</b> (Transfer to ISS) <input type="checkbox"/> <b>ISS Crewlock Depress/Repress Cue Card</b> (Transfer to ISS) <input type="checkbox"/> <b>Joint Emergency Egress Cue Card</b> (Transfer to ISS)

## EVA TOOL PREP FOR TRANSFER TO ISS

1. Gather EVA TOOLS mesh bags 1 and 2 from Mt mesh bag
2. Configure/verify items according to table below:

<u>Mesh Bag (EVA Tools 1)</u>	<u>Location</u>
<input type="checkbox"/> EVA Tools 2 mesh bag	Mt mesh bag
<input type="checkbox"/> <input type="checkbox"/> 85-ft Safety Tethers (qty 2)	Ext A/L Floor Bag
<input type="checkbox"/> EVA Torque Wrench Bag <input type="checkbox"/> EVA Torque Wrench	Ext A/L Floor Bag
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> BRTs (qty 3)	Ext A/L Floor Bag
<input type="checkbox"/> Long Wire-Ties (qty 5)	Ext A/L Floor Bag
<input type="checkbox"/> Short Wire-Ties (qty 25)	
<input type="checkbox"/> Red RET (sm-sm) (qty 8)	SPACEHAB FC05
<input type="checkbox"/> Red RET (sm-sm w/PIP pin) (qty 1)	
<input type="checkbox"/> Red RET (Lg-sm) (qty 2)	



## EMU TRANSFER TO ISS

### NOTE

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

1. Transfer the following EVA equipment to ISS:

Item	Destination	Transfer Status
EMU 3010 (Mt)	E-Lk aft EDDA	
EMU 3017 (Wm)	E-Lk fwd EDDA	
Mesh Bag (Mt)	E-Lk	
Mesh Bag (Wm)	E-Lk	
Mesh Bag (Ad)	Node 1	
Mesh Bag (EVA Systems 1)	Node 1	
Mesh Bag (EVA Systems 2)	Node 1	

2. Remove following ODF/FDF products from the 'EVA Systems 2' Mesh Bag and deploy in the E-Lk:
  - C/L 118 EVA (1)
  - STS-118 CONSUMABLES TRACKING CUE CARD
  - C/L ISS EVA SYSTEMS (red stripe w/118 crew notes)
  - C/L ISS EVA SYSTEMS (Transfer to ISS)
  - ISS Crewlock Depress/Repress Cue Card (Transfer to ISS)
  - Joint Emergency Egress Cue Card (Transfer to ISS)
3. Report transfer status to MCC

## EVA TOOL TRANSFER TO ISS

### NOTE

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

1. Transfer the following EVA equipment to ISS:

Item	Destination	Transfer Status
Mesh Bag (EVA Tools 1)	E-Lk	

## EMU SWAP FOR EVA 3 (30 min)

### NOTE

This procedure assumes {1.240 POST EVA} (SODF: ISS EVA SYS: EVA PREP/POST) has been completed for EMU 3017

- EMU 3017
- 1. Remove Helmet Lights and EMU TV  
Temporarily stow entire assy
  - 2. Connect waist ring to HUT
  - 3. Connect gloves to lower arms
  - 4.  Helmet installed, sun visors down, cover installed
  - 5. Remove EMU from fwd EDDA  
Transfer EMU to Node 1
  - 6. Gather EV2 (Wm) EMU crew-specific items (including EMU Equip Bag Crew Compartment) and place in 'Wm' Mesh Bag  
Transfer Mesh Bag to Node 1
- EMU 3008
- 7. If present, remove LTA Restraint Strap/Bag from EMU 3008 (Ad)
  - 8. Transfer EMU and 'Ad' Mesh Bag to E-Lk  
Install EMU on fwd EDDA
  - 9. Install Helmet Lights and EMU TV  
 Sun visors down, cover installed
  - 10. Install EV-3 crew identifier stripes (barber-pole), STS-118 mission patch, and U.S. flag from 'Ad' Mesh Bag
  - 11. Install EV3 Cuff checklist from 'EVA Systems 2' Mesh Bag
  - 12.  Wrist Mirrors (two) installed
  - 13. Stow materials removed from EMU 3008 in 'EVA Systems 1' Mesh Bag
  - 14. Locate one EMU Equip Bag Crew Compartment on ISS and deploy for Ad
  - 15.  Metox, REBA, EMU Battery installed for EVA 3 per STS-118 CONSUMABLES TRACKING CUE CARD (EMU MAINT/RECHARGE)

## EMU SWAP FOR EVA 4 (30 min)

### NOTE

This procedure assumes {1.240 POST EVA} (SODF: ISS EVA SYS: EVA PREP/POST) has been completed for EMU 3010

- |          |  |  |
|----------|--|--|
| EMU 3010 | <ul style="list-style-type: none"><li><input type="checkbox"/> 1. Remove Helmet Lights and EMU TV<br/>Temporarily stow entire assy</li><li><input type="checkbox"/> 2. Connect waist ring to HUT</li><li><input type="checkbox"/> 3. Connect gloves to lower arms</li><li><input type="checkbox"/> 4. <input checked="" type="checkbox"/> Helmet installed, sun visors down, cover installed</li><li><input type="checkbox"/> 5. Remove EMU from aft EDDA<br/>Transfer EMU to Node 1</li><li><input type="checkbox"/> 6. Gather EV1 (Mt) EMU crew-specific items (including EMU Equip Bag Crew Compartment) and place in 'Mt' Mesh Bag<br/>Transfer Mesh Bag to Node 1</li></ul> |  |
| EMU 3017 | <ul style="list-style-type: none"><li><input type="checkbox"/> 7. Transfer EMU 3017 (Wm) and 'Wm' Mesh Bag from Node 1 to E-Lk<br/>Install EMU on aft EDDA</li><li><input type="checkbox"/> 8. Install Helmet Lights and EMU TV<br/><input checked="" type="checkbox"/> Sun visors down, cover installed</li><li><input type="checkbox"/> 9. <input checked="" type="checkbox"/> Metox, REBA, EMU Battery installed for EVA 4 per <u>STS-118 CONSUMABLES TRACKING CUE CARD (EMU MAINT/RECHARGE)</u></li></ul>  |  |

## EMU PREP FOR TRANSFER TO SHUTTLE

### EMU RE-PACK

- EMU 3017/ 1. Perform 1.307 REBA INSTALLATION/REMOVAL (ISS EVA SYS,  
3010 AIRLOCK CONFIG), removal steps
2. Install expended LiOH canisters and EMU batteries for return (use EVA 1 config) per STS-118 CONSUMABLES TRACKING CUE CARD (EMU MAINT/RECHARGE)
3. Remove ISS EVA Cuff C/L (2) from EMUs and stow in 'EVA Systems 1' mesh bag
- DCMs 4. √SCUs disconnected  
√PWR – SCU  
√PURGE vlv – op (up)  
√O2 ACT – OFF  
√WATER – OFF, switch guard installed
- EMU 3017 5. Locate Helmet s/n 1066 on ISS  
Swap Helmets so that s/n 1066 is installed on EMU 3017 for return
- EMU 3010 6. Locate Helmet s/n 1071 on ISS  
Swap Helmets so that s/n 1071 is installed on EMU 3010 for return
- EMU 3017/ 7. If required, remove EMU TV and Helmet lights, stow on ISS  
3010
- E-Lk 8. Unstow SCOFs s/n 1003 and 1006 from 'EVA Systems 2' mesh bag  
Swap SCOFs with s/n 1009 and 1010 from EMU Equipment Bag  
Stow SCOFs s/n 1009 and 1010 in 'EVA Systems 2' mesh bag for return
9. Unstow EMU Servicing Kit s/n 5005 labeled "118 to ISS" from 'EVA Systems 2' mesh bag  
Locate EMU Servicing Kit s/n 5004 on ISS
10. Stow EMU Servicing Kit s/n 5005 in MO-2 bag labeled "EVA Prep & Ops"  
Stow EMU Servicing Kit s/n 5004 in 'EVA Systems 2' mesh bag for return
11. Locate comm cap s/n 1183 on ISS  
Stow in 'EVA Systems 2' mesh bag for return
12. Locate EMU Helmet Lights s/n 1005 and 1010 on ISS  
Swap Helmet Lights with s/n TBD and TBD from 'EVA Systems 2' mesh bag  
Stow Helmet Lights s/n 1005 and 1010 in 'EVA Systems 2' mesh bag for return  
Stow Helmet Lights s/n TBD and TBD on ISS
13. Transfer MAGs (8) from 'Ad' mesh bag to 'EVA Systems 1' mesh bag
14. Configure/install all items for transfer per table:  
(NOTE: **bolded** items differ from the pre-docking config)

## EMU PREP FOR TRANSFER TO SHUTTLE (Cont)

<p><u>EMU 3010 (Mt)</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> DIDB Restraint Bag</li> <li><input type="checkbox"/> CCA</li> <li><input type="checkbox"/> <b>Helmet s/n 1071</b> (√sun visors down, cover installed)</li> <li><input type="checkbox"/> 6MT Gloves (prime)</li> <li><input type="checkbox"/> Wrist Mirror (2)</li> <li><input type="checkbox"/> √ISS EVA Cuff Checklist <b>NOT</b> installed</li> <li><input type="checkbox"/> EMU Battery</li> <li><input type="checkbox"/> CCC (LiOH)</li> <li><input type="checkbox"/> LTA</li> </ul>	<p><u>EMU 3017 (Wm)</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> DIDB Restraint Bag</li> <li><input type="checkbox"/> CCA (WM1)</li> <li><input type="checkbox"/> <b>Helmet s/n 1066</b> (√sun visors down, cover installed)</li> <li><input type="checkbox"/> 6E5 Gloves (prime)</li> <li><input type="checkbox"/> Wrist Mirror (2)</li> <li><input type="checkbox"/> √ISS EVA Cuff Checklist <b>NOT</b> installed</li> <li><input type="checkbox"/> EMU Battery</li> <li><input type="checkbox"/> CCC (LiOH)</li> <li><input type="checkbox"/> LTA</li> </ul>
<p><u>Mesh Bag (Mt)</u></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> <li><input type="checkbox"/> Elastic Glasses Retention Device</li> </ul> </li> <li><input type="checkbox"/> LCVG (w/biomed sternal harness &amp; signal conditioner)</li> <li><input type="checkbox"/> EMU Equip Bag Crew Compartment</li> </ul>	<p><u>Mesh Bag (Wm)</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> EVA 1, 2, &amp; 4 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"/> Elastic Glasses Retention Device (EVA 1 bag only)</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 (2)</li> <li><input type="checkbox"/> Elastic Glasses Retention Device</li> <li><input type="checkbox"/> Moleskin</li> <li><input type="checkbox"/> Mosite</li> </ul> </li> <li><input type="checkbox"/> CCA (WM2)</li> <li><input type="checkbox"/> LCVG (w/biomed sternal harness &amp; signal conditioner)</li> <li><input type="checkbox"/> EMU Equip Bag Crew Compartment</li> </ul>
<p><u>Mesh Bag (Ad)</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/><input type="checkbox"/> STS-118 EVA 3 &amp; 4 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> </ul>	<p><u>Mesh Bag (EVA Systems 2)</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> SCOFs (2) <b>s/n 1009 &amp; 1010</b></li> <li><input type="checkbox"/> EMU Servicing Kit <b>s/n 5004</b></li> <li><input type="checkbox"/> <b>CCA (s/n 1183)</b></li> <li><input type="checkbox"/> Helmet Lights (2) <b>s/n 1005 &amp; 1010</b></li> <li><input type="checkbox"/> C/L 118 EVA</li> <li><input type="checkbox"/> <u>STS-118 CONSUMABLES TRACKING CUE CARD</u></li> <li><input type="checkbox"/> C/L ISS EVA SYSTEMS (red stripe w/118 crew notes)</li> </ul>

## EMU TRANSFER TO SHUTTLE

### NOTE

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

1. Transfer the following EVA equipment to SHUTTLE:

<b>Item</b>	<b>Destination</b>	<b>Transfer Status</b>
EMU 3010 (Mt)	Temp stow in Middeck	
EMU 3017 (Wm)	Temp stow in Middeck	
Mesh Bag (Mt)	Temp stow in Middeck	
Mesh Bag (Wm)	Temp stow in Middeck	
Mesh Bag (Ad)	Temp stow in Middeck	
Mesh Bag (EVA Systems 2)	Temp stow in Middeck	

NOTE: 'EVA Systems 1' mesh bag remains on ISS

2. Report transfer status to MCC

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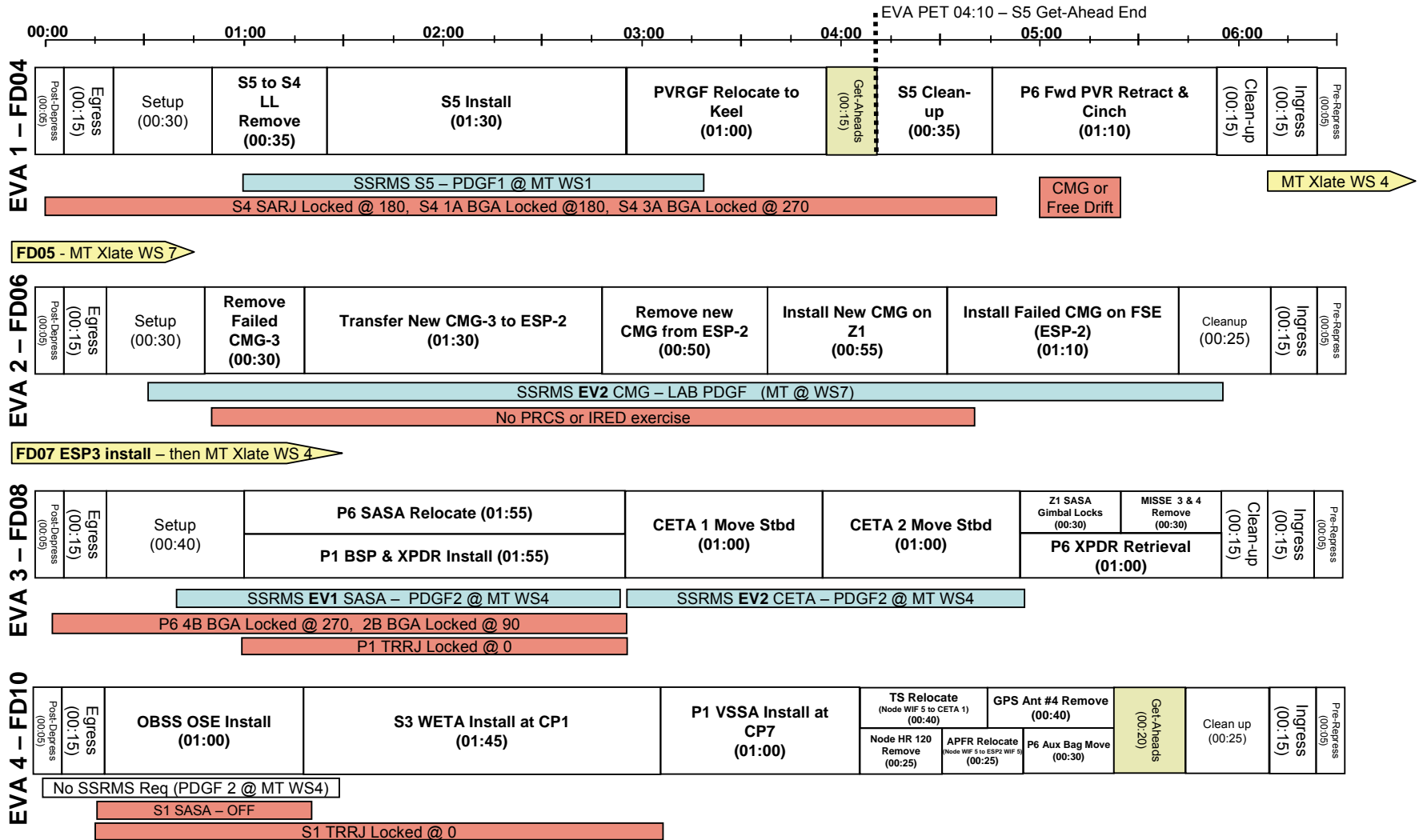
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**TIMELINES**



# STS-118 (13A.1) EVA TIMELINE OVERVIEW



**Notes:**

Required hardware delivered on 13A.1:

- P1 S-Band BSP
- P1 S-Band XPDR
- OBSS OSEs
- WETA

**S5 Get-Aheads (in priority):**

- S5 to S4 Umbilicals (01:00)
- S5 Launch Locks (00:45)
- S5 Capture Launch (00:15)

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## EVA 1 BRIEFING CARD

### **EVA PREP:**

Remove watches, jewelry etc, during EMU ops  
Follow procedures carefully  
PBA and SCU are pure O2  
Do not touch connections. Inspect for dirt, oil, burrs, particles  
Do not force connections  
Do not crush or kink hoses  
EMU is pure O2 environment. Do not wear oil based products

### **A/L CONFIG AND TOOLS:**

- \* Crew lock bag with Torque wrench for nominal tasks
- \* Crew lock bag for contingencies stays in the A/L

### **EGRESS PLAN:**

- \* EV2 to A/L D-ring; EV1 L waist to EV2 safety tether
- \* Check PGT, tools, BRT tucked in
- \* EV1 egresses and attaches both safety tethers to handrail
- \* EV2 hands out Crew lock bag
- \* EV2 egresses and closes thermal cover
- \* Both check SAFER handles down and down

### **TRANSLATION:**

- \* Hand on structure at all times. Do not hop
- \* Avoid feet first translation
- \* Slow and deliberate
- \* Check tethers often
- \* Check each other's tethers, when possible
- \* Keep loaded BRT in scan as well
- \* Stay aware of sensitive hardware in your work area

### **TETHER SWAPS:**

- \* Secure spare waist tether first, check locked
- \* Perform tether swap
- \* Visually check and verbalize all tethers locked, reel unlocked

### **TETHERS AND TOOLS:**

- \* Follow good tethering protocol on all tools – “Good RET”
- \* Pull test everything (PGT sockets, APFRs, etc)

### **S5 INSTALL:**

- \* S5 GCA review and clearance issues
- \* Beware of pinch points and stored arm energy when S5 close to S4

Torque order (1, 2, 3/4)

### **PVRGF RELOCATION:**

Caution with BGA HR and RTAS clearances  
PVRGF = 250#; go slow with large mass

### **COMM PROTOCOL:**

Succinct and professional; SSRMS calls are top priority  
\* Call 'GCA Complete' when SSRMS GCA is done  
\* Call 'All Stop' for immediate SSRMS stop  
IVA is prime relay to MCC

### **SUIT MAL PROTOCOL:**

Challenge-response led by IV or nominal suit

### **CANON CABLES/CONNECTORS:**

Check pin straightness, no FOD in receptacle, good EMI band  
Proper bend radius  
\* Inspect gloves for RTV and Vectran damage; report to MCC

### **PGT OPS:**

Check settings with IV  
Pull test on all socket installs  
\* Report Turn count (count all turns at bolt vice RAD)  
\* Report lights and actual torque from PGT display  
Red light – Low torque, green light – in torque window, Both – Hi torque  
Cal Procedure – Ratchet Collar – Not motor, Speed Collar – Cal, Pull trigger

### **KEEP OUT ZONES:**

S4 SSU, S1 Radiator Beam, TUS cable, S1 nadir (light and camera stanchion)

### **DAY/NIGHT TRANSITIONS: (IV will call)**

- \* Lights, visor, check all tools secure

### **INGRESS PLAN:**

Leave 1 spare 85-ft tethers outside A/L  
\* Check PGT, tools, BRT tucked in  
EV2 in first, then tether to D-ring extender  
EV1 disconnect EV2 safety tether, connect it to left waist tether  
EV1 disconnect own safety tether  
EV1 in feet first with an EV2 assist  
Check hatch seal clear before closing

- \* Review during EMU P/B if time

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# EVA 1 SUMMARY TIMELINE

PET TIME (HR : MIN)	13A.1 EVA 1				
	IV/SSRMS	PET	EV1 (FF)	PET	EV2 (FF/SSRMS)
00:00	SSRMS: S5 Preinstall Position	00:00	<u>EGRESS/SETUP</u> (00:50) POST DEPRESS and EGRESS (00:20) SETUP (00:30)	00:00	<u>EGRESS/SETUP</u> (00:50) POST DEPRESS and EGRESS (00:20) SETUP (00:30)
01:00	SSRMS: S5 Launch Lock Removal Position	00:50	<u>S5 TO S4 LAUNCH LOCK REMOVAL</u> (00:35)	00:50	<u>S5 TO S4 LAUNCH LOCK REMOVAL</u> (00:35)
02:00	SSRMS: S5 Soft Dock/Install	01:25	<u>S5 INSTALL</u> (01:30)	01:25	<u>S5 INSTALL</u> (01:30)
03:00		02:55	<u>RELOCATE PVRGF TO KEEL</u> (01:00)	02:55	<u>RELOCATE PVRGF TO KEEL</u> (01:00)
04:00		03:55	<u>GET-AHEADS</u> (00:15)	03:55	<u>GET-AHEADS</u> (00:15)
		04:10	<u>S5 CLEANUP</u> (00:35)	04:10	<u>S5 CLEANUP</u> (00:35)
05:00	IV: P6 PVR Retract	04:45	<u>P6 PVR CINCH</u> (01:10)	04:45	<u>P6 PVR CINCH</u> (01:10)
06:00		05:55	<u>CLEANUP/INGRESS</u> (00:35) CLEANUP (00:15) INGRESS (00:15) PRE REPRESS ( <u>DEPRESS/REPRESS</u> ) (00:05)	05:55	<u>CLEANUP/INGRESS</u> (00:35) CLEANUP (00:15) INGRESS (00:15) PRE REPRESS ( <u>DEPRESS/REPRESS</u> ) (00:05)
	EVA Time 06:30	06:30		06:30	



NOTE: S5 CLA, S4/S5 Electrical Connections, and S5/S6 Launch Locks are get-aheads prior to leaving S5; must start S5 Cleanup at 04:10 PET

## PRE EVA 1 TOOL CONFIG

### EV1

- Waist Tether (R D-ring to Safety tether)
- Waist Tether (L D-ring Ext to MWS)
- D-ring Extender (2)
- 85-ft Safety Tether (R on extender)
- MWS
- T-bar
- Rabbit Ear Wire Ties (2)
- RET (sm-sm PIP pin)
- RET (sm-sm)
- Sm Trash Bag (L, outside) 
- RET (sm-sm)
- Adj (2)
- Swing Arm (R)
- RET (sm-sm)
- PGT S/N \_\_\_\_\_ w/battery
- BRT (L)
- RET (sm-sm)
- Wire Ties (2)

### EV2

- Waist Tether (R D-ring to Safety tether)
- Waist Tether (L D-ring ext to MWS)
- D-ring Extender (2)
- 85-ft Safety Tether (R on extender)
- Adj (2 – on wrist)
- MWS
- T-bar
- Rabbit Ear Wire Ties (2)
- RET (sm-sm PIP pin)
- RET (sm-sm) (3) 
- Sm Trash Bag (L, inside) 
- Socket Caddy (R, inside)
- 7/16 x 2"
- 5/8 x 7.8" rigid
- RAD S/N \_\_\_\_\_
- Spare 85-ft safety tether
- Swing Arm (R)
- RET (sm-sm)
- PGT S/N \_\_\_\_\_ w/battery
- BRT (L)
- RET (sm-sm)
- Wire Ties (2)

### CREWLOCK

- Verify following item is in Staging Bag
- PGT S/N \_\_\_\_\_ w/battery

### CREWLOCK

- CL Bag #1
  - RET (Lg-sm) on outside
  - Fish Stringer
  - Digital Camera
  - Cannon Connector Tools (2)
  - Socket Caddy
  - 7/16 x 6" wobble
  - 7/16 x 2"
  - RAD S/N \_\_\_\_\_
  - 5/8 x 7.8" rigid
  - Torque Wrench Bag (on outside)
  - Wire Ties (2) – Verify torque wrench can come out of bag after wire tie install
  - Torque Wrench (set 55-60 ft-lb)
  - RET (sm-sm)
  - Spare 85-ft safety tether (on outside)
- 
- CL Bag #3 (contingency) -*Aft/Zenith wall*
  - Adj (Lg-sm) on outside
  - Wire Tie Caddy
  - Connector Cleaner Tool Caddy
  - Connector Pin Straightener
  - EVA Ratchet
  - Socket Caddy
  - 7/16 x 6" wobble
  - 7/16 x 2"
  - 7/16 x 9" rigid
  - RAD
  - Adj tether to internal D-ring (2)
  - Spare torque wrench
- 
- D-ring Extender (on A/L D-ring)
- 
- Small ORU Bag (A/L zenith/fwd/stbd; tied to HRs)
  - RET (Lg-sm) on outside
  - GPS Caps wire-tied together
  - RET (sm-sm) (2)

Prior to EVA  
 Inspect RET cord for damage  
 Inspect safety tethers and waist tethers load alleviating straps

# EVA 1 INHIBIT PAD

## Orbiter

<b>TCS</b>	
L12	1. √TCS POWER – OFF
<b>Ku-Band Antenna</b>	
MCC-H	1. √KU-BAND Mask – active 2. √KU-BAND EVA Protect Box – active
<b>RCS</b>	
If EV crew < 27 ft from FRCS:	
IV	1. √DAP: VERN, FREE, LO Z (flt specific √ with GNC)
O14,15,16	2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF LOGIC (four) – OFF
MCC-H	3. √Above RCS config
IV	4. √RCS F – ITEM 1 EXEC (*) √JET DES F1U – ITEM 17 (*) F3U – ITEM 19 (*) F2U – ITEM 21 (*)
<b>S-Band Antennas</b>	
<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
C3	If no comm, or on MCC call: 3. S-BAND PM ANT – LL FWD
C3	When EVA crewmember at least 1.6 ft away from all S-Band upper antennas: 4. S-BAND PM ANT – GPC

## USOS

<b>PCU</b>	
<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 enabled B. No more than two arrays unshunted C. No more than two arrays pointed < 90 deg from velocity vector
OR	
	2. One or no PCUs operational in discharge mode and one of the following: A. No more than two arrays unshunted B. No more than two arrays pointed < 90 deg from velocity vector
<b>S3/S4 SARJ – (S5 Install and PVRGF Relocate)</b>	
Locked at 180 deg:	
MCC-H	1. √DLA 1(2) – LOCKED 2. All motor setpoints set to zero 3. All motors deselected
OR	
	4. Both DLAs – LOCKED
<b>S4 BGAs – (S5 Install and PVRGF Relocate)</b>	
MCC-H	S4 1A BGA locked at 180 deg S4 3A BGA locked at 270 deg
Cont on next page	

## EVA 1 INHIBIT PAD (Cont)

### USOS

#### S1 TRRJ – (S5 Install and PVRGF Relocate)

One TRRJ DLA locked for EV crew translation on S1 nadir:  
MCC-H 1. √DLA (1) – LOCKED

#### KU-BAND (SGANT) ANTENNA – (P6 Fwd PVR Retract Task)

MCC-H If EV crew < 3.3 ft from KU-BAND antenna  
1. Park KU-BAND  
1.1 Pointing Mode – Inhibit  
1.2 PLC – Reset  
1.3 Autotrack Continuous Retry – Inhibit

### RSOS

#### SM Antennas

MCC-M 1. Global Timing Sys 1(400.1 MHz) [GTS] – Deactivate  
2. ARISS – Deactivate

#### FGB Antennas

MCC-M 1. ARISS – Deactivate

### GROUND

#### Ground Radar

MCC-H 1. √TOPO and FDO consoles, ground radar restrictions in place for EVA

## EVA 1 GET-AHEADS (S5/S4 Umbilicals, S5/S6 Launch Locks, and S5 Capture Latch Open)

#### S1 TRRJ – (S5/S4 Umbilicals, LL and CLA)

One TRRJ DLA locked for EV crew translation on S1 nadir:  
MCC-H 1. √DLA (1) – LOCKED

#### S5/S4 Umbilicals

MCC-H 1. RPCM 3A\_B RPC 1 – Open, Close Cmd Inhibit  
2. RPCM 1A\_B RPC 1 – Open, Close Cmd Inhibit  
3. MBSU 3 RBI 8 – Open  
4. MBSU 1 RBI 8 – Open

#### S3/S4 SARJ – (S5 Install and PVRGF Relocate)

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

OR

4. Both DLAs – LOCKED

#### S4 BGAs – (S5/S4 Umbilicals, LL and CLA)

MCC-H S4 1A BGA locked at 180 deg  
S4 3A BGA locked at 270 deg



## EVA 1 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. MLI handholds are not rated for crewmember translation loads
6. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged
7. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
8. Avoid contact with Vitrolube-coated OBSS striker bars
9. Velcro exposed to AO deteriorates rapidly; verify full and smooth velcro seams

### CAUTION

#### **ISS Constraints**

- A. Avoid inadvertent contact with
  1. Grapple fixture shafts (drylube)
  2. PIP pins
  3. MDM sunshade [PMA1]
  4. EVA Crane [PMA1]
  5. TCS Reflectors [PMA2, PMA3]
  6. APAS hardware [PMA2, PMA3]
  7. CETA Lights (Z-93 paint) [LAB, S1, Node 1]
  8. Deployed MISSEs [A/L]
  9. Passive UMAs
  10. MBS VDU, MCU, CRPCMs, and Cameras (taped radiative surfaces, silver Teflon)
  11. Deployed TUS cable
  12. S0 aft face Radiator
  13. GPS Antennas (S13 paint) [S0]
  14. UHF Antennas [LAB, P1]
  15. ETCS Radiators [S1, P1]
  16. EETCS/PV Radiator bellows and panels [P6, P4, S4, S6]
  17. SASA RF Group [Z1, S1, P6]
  18. Heat pipe radiators [Z1]
  19. PCU cathode and HCA ports [Z1]
  20. Ku-Band Antenna (SGANT) dish [Z1]
  21. CMG cover/shells [Z1]
  22. SSRMS Cameras
  23. Open CBM petal covers and LAB window shutter

### 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. 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
- E. Other
  1. ITT Cannon connector: do not turn collar from WHITE to BLACK without a mating half attached
  2. WIS Antennas: do not use as handholds [Node 1, P6, Z1]
  3. Lubricant from Ku-Band SGANT gimbals [Z1], CMGs [Z1], and RTAS Ground Strap fasteners [P6,P4,S4,S6] can contaminate EMU

## EVA 1 NOTES, CAUTIONS, AND WARNINGS (Cont)

### **CAUTION** (Cont)

#### **Shuttle Constraints**

- A. 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]
  - 4. Payload Bay wire harnesses, cables, and connectors
- B. 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]

### **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 566, A/L Tank 2 nad/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

### **WARNING** (Cont)

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

- D. RF Radiation Exposure
  - 1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1,P6]
  - 2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1,P6]
  - 3. Stay 1 ft from UHF Antenna when powered [LAB, P1]
- E. Sharp Edges
  - 1. Inner edges of WIF sockets
  - 2. Mating surfaces of EVA connectors. Avoid side loads during connector mating
  - 3. Back side of MMOD shield fasteners
  - 4. Spring loaded captive EVA fasteners (e.g., 6B-boxes, BMRRM); the end of the spring may protrude
  - 5. PMA umbilical launch restraints-exposed bolt threads
  - 6. Nickel coated braided copper Ground Straps may contain frayed wires [P6, P4, S4, S6]
  - 7. Solar Array Blanket Box [P6, S6]
  - 8. Keep hands away from SSRMS LEE opening, and snares

## EVA 1 NOTES, CAUTIONS, AND WARNINGS (Cont)

### **WARNING** (Cont)

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

##### **F. Thermal**

1. PMA handrails may be hot. Handling may need to be limited
2. Turn off glove heaters when comfortable temp reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
3. Uncovered trunnion pins may be hot
4. SSRMS/MBS operating Cameras and lights may radiate large amounts of heat
5. Stay 1 ft away from PMAs and MMOD shields > 270 degF if EMU sun visor up
6. Stay at least 1 ft away for no more than 15 min from PMAs and MMOD shields > 300 degF if EMU sun visor up
7. Stay 0.5 ft away from PMA and MMOD shields > 325 degF
8. Do not touch EMU protective visor if temp has been < -134 for > 15 min
9. No EMU TMG contact of PMAs and MMOD shields when temp > 320 degF
10. No EMU boot contact with foot restraint when temp < -120 degF or > 200 degF

### **WARNING** (Cont)

#### **Shuttle Constraints**

##### **A. 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]

##### **B. Pinch**

1. PRLA operation [PLB]

##### **C. 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)**

##### **D. 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

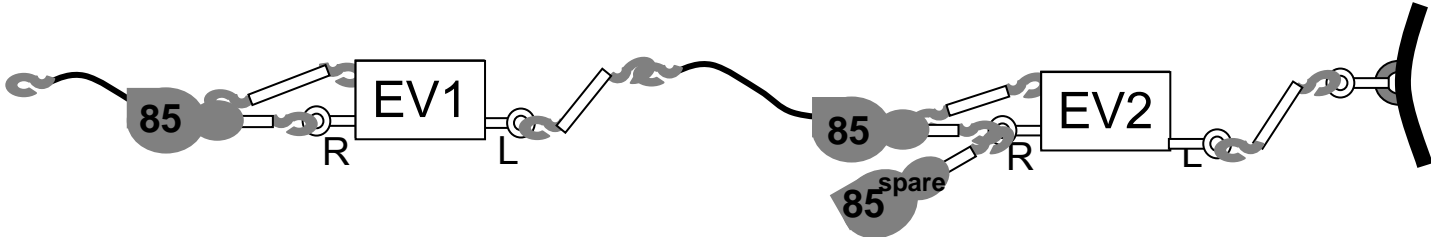

##### **E. Thermal**

1. Illuminated PLB lights; do not touch
2. OBSS grapple fixture shafts/cams may be hot. Limit handling if required

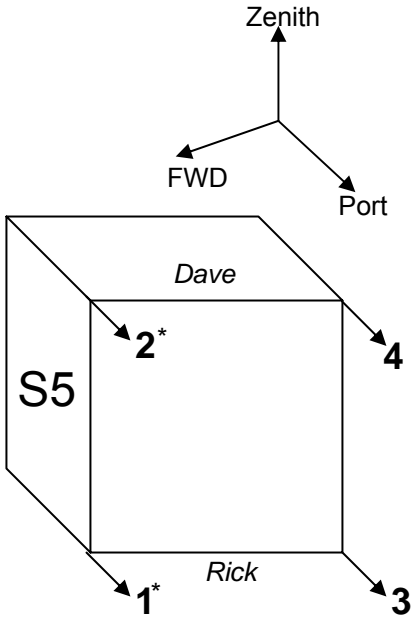
##### **F. Thruster Contamination**

1. Stay out of the immediate vicinity of leaking jet or APU
2. Stay 27 ft from PRCS when powered
3. Stay 3 ft from VRCS when powered
4. Stay 3 ft from APU when operating

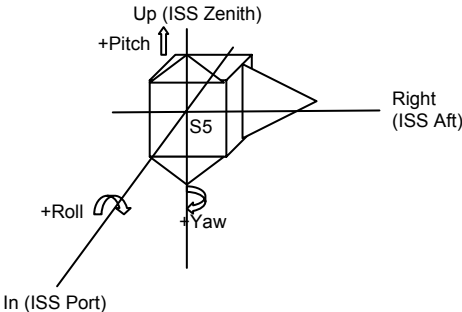
# EVA 1 EGRESS/SETUP (00:50)

IV/RMS	EV1 (FF)	EV2 (FF)
<p><u>POST DEPRESS</u> (DEPRESS/REPRESS Cue Card) SSRMS Initial Config: 1.120 SSRMS S5 INSTALL – Preinstall Posn</p> <p style="text-align: center;"><u>NOTE</u> Torque wrench thermal clock is 3.5 hr. Torque wrench must be kept in stowage bag prior to use</p> <p>1. Record MET CL Bag with torque wrench removed from airlock:  _____/_____:_____</p> <p>2. WVS Software: Select page – RF camera Sel ‘Advanced Controls’ S-Band Level (two) – Max (reqd after EV egress airlock) Verify good WVS video from both EVs</p>	<p><u>POST DEPRESS</u> (DEPRESS/REPRESS Cue Card)</p>  <p style="text-align: center;">Initial Tether Configuration</p> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. √Initial tether configuration, hooks locked, reels unlocked</li> <li>2. Hatch Thermal cover – open</li> <li>3. Egress airlock</li> <li>4. Attach Rt 85-ft safety tether retracting end to A/L handrail 0550, LOCK hook</li> <li>5. Verify 85-ft tether reel housing in Unlocked position</li> <li>6. Release left waist tether from EV2’s 85-ft safety tether</li> <li>7. Attach EV2’s 85-ft safety tether retracting end to A/L handrail 0554 inboard stanchion, LOCK hook</li> <li>8. Give EV2 GO to release from A/L D-ring</li> <li>9. Receive Crewlock Bag w/Lg-Sm RET, attach to BRT</li> <li>10. √SAFER MAN ISOL vlv – OP (dn) and HCM (dn)</li> <li>11. Translate Aft on A/L</li> </ol>	<p><u>POST DEPRESS</u> (DEPRESS/REPRESS Cue Card)</p> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. √Initial tether configuration, hooks locked, reels unlocked</li> <li>2. Release left waist tether from A/L D-ring</li> <li>3. √Verify 85-ft tether reel housing in Unlocked position</li> <li>4. Pass Crewlock Bag #1 w/Torque Wrench to EV1 ← </li> <li>5. Egress Airlock</li> <li>6. √SAFER MAN ISOL vlv – OP (dn) and HCM (dn)</li> <li>7. Close Hatch Thermal Cover</li> </ol>

**EVA 1 EGRESS/SETUP (00:50) (Cont)**

IV/RMS	EV1 (FF)	EV2 (FF)
 <p style="text-align: center;">Zenith</p> <p style="text-align: center;">FWD                      Port</p> <p style="text-align: center;">Dave</p> <p style="text-align: center;">S5                      2*</p> <p style="text-align: center;">Rick                      4</p> <p style="text-align: center;">1*</p> <p style="text-align: center;">* APFR starting location</p>	<p>12. Begin 10-min Translation Adaptation enroute to S4 worksites:          Evaluate pitch/yaw/roll control          Evaluate start/stop transients          Experiment with various translation techniques</p> <p><u>SETUP</u></p> <p>13. Translate to S0 Face 1, fairlead (w/Adj) on Face 1 (above CETA spur) HR (3413)_____</p> <p>14. Translate to S3 Face 1 Outboard CETA Cart 2. Perform safety tether swap to spare 85-ft tether, hooks locked, reels unlocked (tether to CETA HR)</p> <p>15. Translate to S4 corner 1 (nadir, fwd), fairlead at HR 2206 inbd w/Adj</p> <p>16. Temp stow CL Bag on S4 handrail 2207</p> <p>17. Temp stow RAD w/Socket in trash bag</p> <p>18. Get-Ahead: Verify corner 1 APFR position:  <input type="checkbox"/> S4 WIF 18 [8, OO, C, 1]</p> <p>19. ✓S4 corner 1 and 3 soft capture pins are set  <input type="checkbox"/> Corner 1            <input type="checkbox"/> Corner 3</p> <p>20. Translate to corner 3 (nadir, aft) for GCA</p>	<p>8. Begin 10-min Translation Adaptation enroute to S4 worksites:          Evaluate pitch/yaw/roll control          Evaluate start/stop transients          Experiment with various translation techniques</p> <p><u>SETUP</u></p> <p>9. Translate to S0</p> <p>10. Translate to S1 HR (3266 or 3254) _____ via nadir handrail path, fairlead (w/Adj)</p> <p>11. Translate to S3 HR (3026) _____. Perform safety tether swap to spare 85-ft tether, hooks locked, reels unlocked</p> <p>12. Translate via corner 4 to S4 corner 2 (zenith, fwd), fairlead at HR (2230 or 2226)____ inbd (w/Adj)</p> <p>13. ✓S4 corner 2 and 4 soft capture pins are set  <input type="checkbox"/> Corner 4            <input type="checkbox"/> Corner 2</p> <p>14. Get-Ahead: Verify corner 2 APFR position  <input type="checkbox"/> S4 WIF 19 [6, TT, J, 11]</p> <p>15. Remain at corner 2 (zenith, fwd) for GCA</p>

## S5 TO S4 LAUNCH LOCK REMOVAL (00:35)

IV/RMS	EV1 (FF)	EV2 (FF)
<p>1. SSRMS: Verify Thruster Inhibit Verify 'Desat Request.' – Inh</p> <p>2. SSRMS: S5 Launch Lock Removal Position</p> <p>3. SSRMS: When SSRMS brakes on, give EV GO to begin Launch Lock Removal</p> <p>GCA Coordinates from the EV's perspective</p> 	<p><u>GCA SSRMS TO LAUNCH LOCK REMOVAL POSN</u></p> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><u>CAUTION</u></p> <p style="text-align: center;">Tight clearances between S5 and BGA; monitor:</p> <ul style="list-style-type: none"> <li>RTAS housing and 4-bar linkage</li> </ul> </div> <p>1. Position for GCA (HR 2236)</p> <p>2. <b>GCA SSRMS</b> from corner 3 into launch lock removal position (~8 inches between RTAS housings)</p> <p><u>REMOVE LAUNCH LOCK FROM CORNER 1</u></p> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><u>CAUTION</u></p> <p style="text-align: center;">Do not impart any loads into structure while removing launch locks</p> <hr/> <p style="text-align: center;">Do not exceed 72 turns (PGT), 36 turns (bolt) when removing launch locks or primary bolt can come free of self feeding nut</p> <hr/> <p style="text-align: center;">Do not apply a push or pull force or side loads while driving primary bolt. Damage to self feeding nut may result. Primary bolt is sensitive to crew loads</p> </div> <p>3. Wait for IV GO (SSRMS BRAKES ON)</p> <p>4. Retrieve RAD w/5/8 socket</p> <p>5. Ingress APFR</p> <p>6. Install RAD w/5/8 socket on PGT; pull test</p> <p>7. Tether to Launch Lock PIP pin, do not remove PIP pin</p>	<p><u>GCA SSRMS TO LAUNCH LOCK REMOVAL POSN</u></p> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><u>CAUTION</u></p> <p style="text-align: center;">Tight clearances between S5 and BGA; monitor:</p> <ul style="list-style-type: none"> <li>RTAS housing and 4-bar linkage</li> <li>RTAS housing and SSU – do not allow RTAS housing clearance with SSU to fall below 3.0 cm (1.2 inches)</li> <li>S5 HR and SSU</li> </ul> </div> <p>1. Position for GCA (HR 2243)</p> <p>2. <b>GCA SSRMS</b> from corner 2 into launch lock removal position (~8 inches between RTAS housings)</p> <p><u>REMOVE LAUNCH LOCK FROM CORNER 2</u></p> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><u>CAUTION</u></p> <p style="text-align: center;">Watch clearances between helmet and SSU during translation and APFR ingress</p> </div> <p>3. Wait for IV GO (SSRMS BRAKES ON)</p> <p>4. Ingress APFR</p> <p>5. Install 5/8 x 7.8" socket on RAD, RAD on PGT; pull test</p> <p>6. Tether to Launch Lock PIP pin, do not remove PIP pin</p>

**S5 TO S4 LAUNCH LOCK REMOVAL (00:35) (Cont)**

<b>IV/RMS</b>				<b>EV1 (FF)</b>		<b>EV2 (FF)</b>	
4. IV record total <b>turns</b> required to retract primary bolt from launch lock				8. <b>PGT[B1, CCW2, 30.5]-RAD-5/8X7.8"</b> Retract S5 primary bolt from Launch Lock #1 27 turns (54 turns @PGT) ← Report turns (36 max)		7. <b>PGT[B1, CCW2, 30.5]-RAD-5/8X7.8"</b> Retract S5 primary bolt from Launch Lock #2 27 turns (54 turns @PGT) ← Report turns (36 max)	
<b>EV1</b>	<b>LL#1</b>	<b>EV2</b>	<b>LL#2</b>	9. Remove Launch Lock #1 via PIP pin, stow in sm trash bag		8. Remove Launch Lock #2 via PIP pin, stow in sm trash bag	
				10. ✓ Bolt head recessed inside shear cylinder (2-7 threads visible at bolt shoulder)		9. ✓ Bolt head recessed inside shear cylinder (2-7 threads visible at bolt shoulder)	
				11. Configure RAD for translation		10. Configure RAD for translation	
				12. Translate to corner 3 (nadir, fwd)		11. Translate to corner 4 (zenith, aft)	
				<u>REMOVE LAUNCH LOCK FROM CORNER 3</u>		<u>REMOVE LAUNCH LOCK FROM CORNER 4</u>	
5. IV record total <b>turns</b> required to retract primary bolt from launch lock				13. BRT to HR 2236		12. BRT to HR 2235	
				14. Tether to Launch Lock PIP pin		13. Tether to Launch Lock PIP pin	
				15. <b>PGT[B1, CCW2, 30.5 ]-RAD-5/8X7.8"</b> Retract S5 primary bolt from Launch Lock #3 27 turns (54 turns @PGT) ← Report turns (36 max)		14. <b>PGT[B1, CCW2, 30.5]-RAD-5/8X7.8"</b> Retract S5 primary bolt from Launch Lock #4 27 turns (54 turns @PGT) ← Report turns (36 max)	
<b>EV1</b>	<b>LL#3</b>	<b>EV2</b>	<b>LL#4</b>	16. Remove Launch Lock #3 via PIP pin, stow in sm trash bag		15. Remove Launch Lock #4 via PIP pin, stow in sm trash bag	
				17. ✓ Bolt head recessed inside shear cylinder (2-7 threads visible at bolt shoulder)		16. ✓ Bolt head recessed inside shear cylinder (2-7 threads visible at bolt shoulder)	
				18. Inspect gloves; status MCC on RTV and Vectran state		17. Inspect gloves; status MCC on RTV and Vectran state	

## S5 TO S4 LAUNCH LOCK REMOVAL TASK DATA SHEET

### Tools: Backup tool shown in ( )

EV1 (FF)	EV2 (FF)
PGT	PGT
RAD	RAD
7.8ext x 5/8	7.8ext x 5/8
(Ingress Aid)	(Ingress Aid)

### Foot Restraints:

Task	WIF	APFR Setting
S5 LL 3 Removal	S4 WIF 17	[5,RR,J,11]
S5 LL 4 Removal	S4 WIF 20	[6,VV,A,11]
S5 LL 1 Removal	S4 WIF 18	[8,OO,D,1]
S5 LL 2 Removal	S4 WIF 19	[6,PP,K,12]

### BRT Handrails (optional use):

Task	Handrail
S5 LL 3 Removal	S4 HR 2236
S5 LL 4 Removal	S4 HR 2235
S5 LL 1 Removal	S4 HR 2207
S5 LL 2 Removal	S4 HR 2234

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Recommended Torque (ft-lb)	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Primary Bolt	1, 2, 3, 4	5/8"	1			12.0 (thru RAD) 25.5 (no RAD)	610	24-36 (bolt)	30

EVA Connectors: N/A

### Timeline Considerations:

- Torque wrench exposure is limited to 3.5 hr to maintain correct calibration. Starts when removed from airlock
- S5 launch locks must be removed before S5 can be soft captured to S4

### Notes:

- Primary bolt will come free of launch lock at ~38 turns (PGT), 19 turns (bolt) – (KSC data)
- Bolt data (torque/turn) from STS-116 12A.1 EVA Checklist

### Cautions:

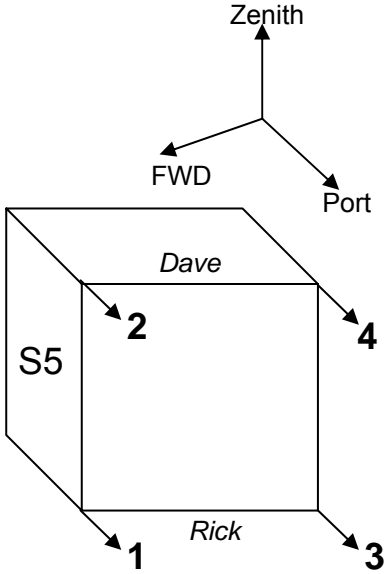
- Tight clearances between BGA and S5. Monitor: SSU and RTAS housing; SSU and S5 handrail, RTAS housing and 4-bar linkage; PVRGF and Mast canister handrail. EV2 maintain minimum 3.0 cm (1.2 in) between RTAS and SSU
- Verify all cables and tethers are free of S4/S5 interface prior to soft dock
- Do not impart any loads into structure while removing launch locks – Clearances between S4 and S5 are tight
- Do not exceed 36 turns when removing launch locks or primary bolt can come free of self feeding nut
- Do not apply a push or pull force or side loads while driving the primary bolt – Primary bolt is a sensitive to crew loads and damage to self-feeding nut may result
- Approval given to translate w/RAD and 5/8 socket on PGT from corner to corner for 13A.1 per waiver EVA-00504R1

### Warnings:

- N/A



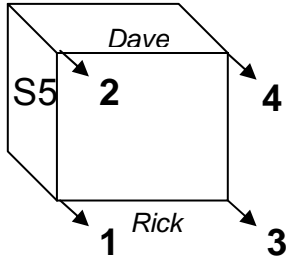
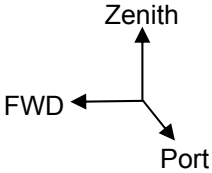
**S5 INSTALL (01:30)**

IV/RMS	EV1 (FF)	EV2 (FF)
<p><u>GCA SSRMS INTO SOFT CAPTURE</u></p> <p>1. SSRMS: S5 install</p>  <p>The diagram shows a 3D rectangular prism representing the S5 structure. A coordinate system is defined with three axes: Zenith (pointing up), FWD (pointing left), and Port (pointing right). The corners of the prism are numbered 1 through 4. Corner 1 is at the bottom-left-front, corner 2 is at the top-left-back, corner 3 is at the bottom-right-back, and corner 4 is at the top-right-back. The name 'Dave' is written on the top surface, and 'Rick' is written on the bottom surface.</p> <p>2. When SSRMS is limp, give EV1 GO to drive bolt #1</p>	<p><u>GCA SSRMS INTO SOFT CAPTURE</u></p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b> Do not impart loads into S5 structure until soft capture pins are engaged</p> </div> <ol style="list-style-type: none"> <li>Remain at corner 3 (nadir, aft) for GCA</li> <li>Verify all cables and tethers clear of RTAS interface</li> <li>Hold HR 2236 for GCA</li> </ol> <p style="text-align: center;"><u>NOTE</u> Soft capture black indicator lines will NOT be visible when S4 soft capture pins have engaged S5 coarse alignment cones successfully. Corners 2 and 3 will soft dock first</p> <ol style="list-style-type: none"> <li><b>GCA SSRMS</b> into soft capture</li> <li>√S4 soft capture pin has engaged S5 coarse alignment cone @ corner 3</li> <li>√S4 soft capture pin has engaged S5 coarse alignment cone @ corner 1</li> <li>Configure RAD for translation</li> </ol> <p><u>BOLT #1 INITIAL TORQUE (nadir, fwd)</u></p> <p style="text-align: center;"><u>NOTE</u> Primary bolts must be fastened in the following order:</p> <ul style="list-style-type: none"> <li>Bolt 1</li> <li>Bolt 2</li> <li>Bolt 3 and 4 in any order</li> </ul> <p>Final torque can be done in any order after initial torque for all 4 bolts is complete</p> <ol style="list-style-type: none"> <li>Translate to corner 1</li> <li>Ingress APFR WIF 18 [8, OO, C, 1]</li> </ol>	<p><u>GCA SSRMS INTO SOFT CAPTURE</u></p> <ol style="list-style-type: none"> <li>Translate back to corner 2 (zenith, fwd) for GCA</li> <li>Verify all cables and tethers clear of RTAS interface</li> <li>Hold HR 2243 for GCA</li> </ol> <p style="text-align: center;"><u>NOTE</u> Soft capture black indicator lines will NOT be visible when S4 soft capture pins have engaged S5 coarse alignment cones successfully. Corners 2 and 3 will soft dock first</p> <ol style="list-style-type: none"> <li><b>GCA SSRMS</b> into soft capture</li> <li>√S4 soft capture pin has engaged S5 coarse alignment cone @ corner 2</li> <li>√S4 soft capture pin has engaged S5 coarse alignment cone @ corner 4</li> </ol> <p><u>BOLT #2 INITIAL TORQUE (zenith, fwd)</u></p> <ol style="list-style-type: none"> <li>Ingress APFR WIF 19 [6, TT, J, 11]</li> <li>Wait for EV1 GO (bolt 1 complete)</li> </ol>

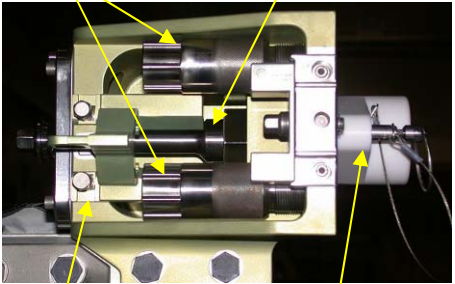
**S5 INSTALL (01:30) (Cont)**

IV/RMS	EV1 (FF)	EV2 (FF)																		
<p>3. Record initial torque and turns on RTAS bolts</p> <table border="1"> <thead> <tr> <th></th> <th>EV1 Bolt 1</th> <th>EV2 Bolt 2</th> </tr> </thead> <tbody> <tr> <td>Turns</td> <td></td> <td></td> </tr> <tr> <td>Torque (ft-lb)</td> <td></td> <td></td> </tr> </tbody> </table> <p>4. Record initial torque and turns on RTAS bolts</p> <table border="1"> <thead> <tr> <th></th> <th>EV1 Bolt 3</th> <th>EV2 Bolt 4</th> </tr> </thead> <tbody> <tr> <td>Turns</td> <td></td> <td></td> </tr> <tr> <td>Torque (ft-lb)</td> <td></td> <td></td> </tr> </tbody> </table>		EV1 Bolt 1	EV2 Bolt 2	Turns			Torque (ft-lb)				EV1 Bolt 3	EV2 Bolt 4	Turns			Torque (ft-lb)			<p>10. Wait for IV GO (SSRMS limp)</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Do not apply a push force on primary bolt. Damage to self-feeding nut may result</p> </div> <p style="text-align: center;"><u>NOTE</u></p> <p>Gap check criteria:</p> <ul style="list-style-type: none"> <li>• Tip of equipment tether hook should NOT pass through or penetrate gap between RTAS housings</li> </ul> <p>11. On IV GO (SSRMS limp):</p> <p>12. <b>PGT[B1, CW2, 30.5]-RAD-5/8X7.8"</b> Drive bolt #1, 27 turns (54 turns @PGT) ← Report torque and turns</p> <p>13. ✓Primary bolt shoulder seated (flush to large nut)</p> <p>14. Perform gap check w/equipment hook</p> <p>15. Give EV2 GO for corner #2</p> <p>16. Egress APFR</p> <p>17. Configure RAD for translation</p> <p><u>BOLT #3 INITIAL TORQUE</u></p> <p>18. Translate to corner 3, BRT to S4 HR 2236</p> <p>19. Wait for EV2 GO (bolt 2 complete)</p> <p>20. <b>PGT[B1, CW2, 30.5]-RAD-5/8X7.8"</b> Drive bolt #3, 27 turns (54 turns @PGT) ← Report torque and turns</p> <p>21. ✓Primary bolt shoulder seated (flush to large nut)</p> <p>22. Configure RAD for translation</p> <p>23. Translate to corner 1</p> <p>24. Stow RAD in crewlock bag; pull test</p> <p>25. Install 7/16 x 6" wobble on PGT; pull test</p>	<p>9. On EV1 GO (bolt 1 complete):</p> <p>10. <b>PGT[B1, CW2, 30.5]-RAD-5/8X7.8"</b> Drive bolt #2, 27 turns (54 turns @PGT) ← Report torque and turns</p> <p>11. ✓Primary bolt shoulder seated (flush to large nut)</p> <p>12. Perform gap check w/equipment hook</p> <p>13. Give EV1 GO for corner #3</p> <p>14. Egress APFR</p> <p>15. Configure RAD for translation</p> <p>16. Translate to corner 4</p> <p><u>BOLT #4 INITIAL TORQUE</u></p> <p>17. BRT to S4 HR 2235 or 2247</p> <p>18. <b>PGT[B1, CW2, 30.5]-RAD-5/8X7.8"</b> Drive bolt #4, 27 turns (54 turns @PGT) ← Report torque and turns</p> <p>19. ✓Primary bolt shoulder seated (flush to large nut)</p>
	EV1 Bolt 1	EV2 Bolt 2																		
Turns																				
Torque (ft-lb)																				
	EV1 Bolt 3	EV2 Bolt 4																		
Turns																				
Torque (ft-lb)																				

## S5 INSTALL (01:30) (Cont)

IV/RMS	EV1 (FF)	EV2 (FF)								
<p>SSRMS: GO for Ungrapple</p> <p>5. Record turn count for final torquing on RTAS bolts</p> <table border="1"> <thead> <tr> <th>EV1 Bolt 1</th> <th>EV2 Bolt 2</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> </tr> </tbody> </table> <p>6. Record turn count and torque on ground bolts</p> <table border="1"> <thead> <tr> <th>EV1 Bolt 1</th> <th>EV2 Bolt 2</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> </tr> </tbody> </table>  	EV1 Bolt 1	EV2 Bolt 2			EV1 Bolt 1	EV2 Bolt 2			<p>26. Retrieve torque wrench</p> <p>27. Configure torque wrench w/5/8 x 7.8"; pull test √55-60 ft-lb</p> <p><b><u>BOLT #1 FINAL TORQUE</u></b></p> <p>28. Ingress APFR</p> <p>29. Wait for EV2 GO (initial torque all 4 bolts complete)</p> <p>30. Torque bolt #1 until torque wrench trips (~1/4 turn) ← Report torque and turns</p> <p>31. Perform gap check w/equipment hook</p> <p>32. Pass torque wrench w/5/8 x 7.8" to EV2</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b><u>CAUTION</u></b></p> <p>Ground straps are sensitive to cross threading. Begin installation manually for thread alignment and complete total turns and torque with PGT</p> <p>Ground strap bolt may become non-captive – Additional turns on bolt past spring release may cause failure of nut locking feature</p> </div> <p><b><u>INSTALL BOLT #1 GROUND STRAP</u></b></p> <p>33. <b>PGT[B3, CCW2, 30.5]-7/16X6"</b> Release ground strap from S4, ~13 turns</p> <p>34. Start ground strap bolt to S5 by hand ~1 turn</p> <p>35. <b>PGT[B1, CW2, 30.5]-7/16X6"</b> Complete ground strap install ~9-12 turns (hard stop)</p> <p><b><u>REMOVE CORNER 1 SOFT CAPTURE PIN</u></b></p> <p>36. Rotate APFR to [8, OO, F, 1]</p> <p>37. Tether to soft capture pin</p> <p>38. <b>PGT[A6, CCW2, 30.5]-7/16X6"</b> Release soft capture pin fasteners (4), 13-17 turns</p> <p>39. Remove soft capture pin assembly</p>	<p>20. Give EV1 GO for final torque</p> <p><b><u>BOLT #2 FINAL TORQUE</u></b></p> <p>21. Translate to corner 2</p> <p>22. Receive torque wrench from EV1</p> <p>23. Ingress APFR</p> <p>24. Torque bolt #2 until torque wrench trips (~1/4 turn) √55-60 ft-lb ← Report torque and turns</p> <p>25. Perform gap check w/equipment hook</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b><u>CAUTION</u></b></p> <p>Ground straps are sensitive to cross threading. Begin installation manually for thread alignment and complete total turns and torque with PGT</p> <p>Ground strap bolt may become non-captive – Additional turns on bolt past spring release may cause failure of nut locking feature</p> </div> <p><b><u>INSTALL BOLT #2 GROUND STRAP</u></b></p> <p>26. Stow RAD on socket caddy; pull test</p> <p>27. Install 7/16 x 2" on PGT; pull test</p> <p>28. <b>PGT[B3, CCW2, 30.5]-7/16X2"</b> Release ground strap from S4, ~13 turns</p> <p>29. Start ground strap bolt to S5 by hand ~1 turn</p> <p>30. <b>PGT[B1, CW2, 30.5]-7/16X2"</b> Complete ground strap install ~9-12 turns (hard stop)</p>
EV1 Bolt 1	EV2 Bolt 2									
EV1 Bolt 1	EV2 Bolt 2									

**S5 INSTALL (01:30) (Cont)**

IV/RMS	EV1 (FF)	EV2 (FF)								
<p>7. Record turn count for final torquing on RTAS bolts</p> <table border="1"> <thead> <tr> <th>EV1</th> <th>Bolt 3</th> <th>EV2</th> <th>Bolt 4</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>  <p>Contingency Bolt</p> <p>Primary Bolt</p> <p>Gap Check Tool</p> <p>Launch Lock</p>	EV1	Bolt 3	EV2	Bolt 4					<p>40. Egress APFR 41. Stow soft capture pin in crewlock bag 42. Retrieve APFR, translate to corner 3</p> <p><u>BOLT #3 FINAL TORQUE</u></p> <p>43. Install APFR WIF 17 [5, RR, J, 11], pull test 44. Receive torque wrench from EV2 45. Ingress APFR 46. Torque bolt #3 until torque wrench trips (~1/4 turn) √55-60 ft-lb ← Report torque and turns</p> <p>47. Perform gap check w/equipment hook</p> <p><u>INSTALL BOLT #3 GROUND STRAP</u></p> <p>48. <b>PGT[B3, CCW2, 30.5]-7/16X6"</b> Release ground strap from S4, 13 turns</p> <p>49. Start ground strap bolt to S5 by hand ~1 turn 50. <b>PGT[B1, CW2, 30.5]-7/16X6"</b> Complete ground strap install ~9-12 turns (hard stop)</p> <p><u>REMOVE CORNER 3 SOFT CAPTURE PIN</u></p> <p>51. Tether to soft capture pin 52. <b>PGT[A6, CCW2, 30.5]-7/16X6"</b> Release soft capture pin fasteners (4), 13-17 turns 53. Remove soft capture pin assembly 54. Egress APFR 55. Translate to corner 1</p>	<p>31. Egress APFR 32. Retrieve APFR, translate to corner 4</p> <p><u>BOLT #4 FINAL TORQUE</u></p> <p>33. Install APFR in WIF 20 [6, VV, A, 11], black on black, pull test 34. Ingress APFR 35. Torque bolt #4 until torque wrench trips (~1/4 turn) √55-60 ft-lb ← Report torque and turns</p> <p>36. Perform gap check w/equipment hook 37. Pass torque wrench w/5/8 x 7.8" to EV1</p> <p><u>INSTALL BOLT #4 GROUND STRAP</u></p> <p>38. <b>PGT[B3, CCW2, 30.5]-7/16X2"</b> Release ground strap from S4, 13 turns 39. Start ground strap bolt to S5 by hand ~1 turn 40. <b>PGT[B1, CW2, 30.5]-7/16X2"</b> Complete ground strap install ~9-12 turns (hard stop) 41. Retrieve fairlead (adj tether) from S4 HR (2230) _____ 42. Retrieve APFR</p> <p>43. Fairlead on S5 HR 2123 for PVRGF relocate 44. Relocate APFR to S5 WIF 11 [9, RR, G, 12] (near H14); pull test 45. Inspect gloves; status MCC on RTV and Vectran state</p>
EV1	Bolt 3	EV2	Bolt 4							

**S5 INSTALL (01:30) (Cont)**

<b>IV/RMS</b>	<b>EV1 (FF)</b>	<b>EV2 (FF)</b>
	56. Stow soft capture pin in crewlock bag 57. Remove 5/8 socket from torque wrench; stow on socket caddy from CL bag; pull test 58. Install socket caddy on MWS 59. Stow torque wrench in bag 60. Retrieve APFR 61. Relocate APFR to S5 WIF 13 [12, UU, J, 11] (near keel) for PVRGF relocate; pull test 62. Inspect gloves; status MCC on RTV and Vectran state	

## S5 INSTALL TASK DATA SHEET

### Tools: Backup tool shown in ( )

EV1 (FF)	EV2 (FF)
PGT	PGT
RAD	RAD
7.8ext x 5/8	7.8ext x 5/8
6-in ext	2-in ext
Torque Wrench	Torque Wrench
(Ingress Aid)	Ingress Aid

### Foot Restraints:

Task	WIF	APFR Setting
Engage Bolt 1	S4 WIF 18	[8,OO,D,1]
Engage Bolt 2	S4 WIF 19	[6,PP,K,12]
Engage Bolt 3; Install Bolt 3 Groundstrap; Remove Soft Capture Pin 3	S4 WIF 17	[5,RR,J,11]
Engage Bolt 4; Install Bolt 4 Groundstrap	S4 WIF 20	[6,VV,A,11]

### BRT Handrail:

Task	Handrail
Torque Bolt 1; Install Bolt 1 Groundstrap; Remove Soft Capture Pin 1	S4 HR 2207
Torque Bolt 2; Install Bolt 2 Groundstrap	S4 HR 2234
Torque Bolt 3	S4 HR 2236

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Release/ Install Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
RTAS Primary Fastener	1,2,3,4	5/8"	4	Install: 25.5 (initial) 57.0 (final)	105.3 (insert shear out)	27 (bolt)	30
Ground Straps	none	7/16"	4	Release: 18.4 Install: 12.0	Release: 31.1 Install: 26.4	Release: 11-13 Install: 8-12	30
Soft Capture Pin Assembly	none	7/16"	4	Release: 8.3	12.0	13-17	30
Gap check tool bolts	none	7/16"	2	Release: 8.3	Release: 12.2	12-14	30

EVA Connectors: N/A

### Timeline Considerations:

1. Bolt torque order in this procedure was done to minimize socket swaps, APFR relocation, and crew translation between corners
2. Torque wrench exposure is limited to 3.5 hr to maintain correct calibration
3. The soft capture pin assemblies are removed at corners 1 and 3 due to interference with routing the W08 (primary power) cable at corner 3 and hard interference with the S5 MT/CETA rail that will eventually be installed at corner 1

### Notes:

1. Primary bolts must be fastened in the following order: Bolt 1 (nadir/fwd), Bolt 2 (zenith/fwd), Bolts 3 (nadir/aft) and 4 (zenith/aft) can be fastened in any order AFTER Bolts 1 and 2
2. Ground strap bolts are sensitive to side loading and extra turns which may release washer of captive fastener feature
3. Tip of gap check tool should NOT penetrate gap between RTAS housings past the second line if performed

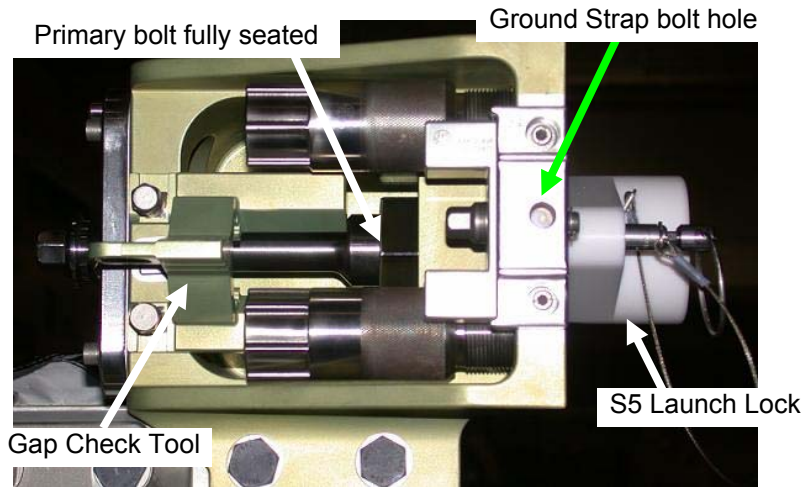
### Cautions:

1. Verify all cables and tethers are free of S4/S5 interface prior to soft dock
2. Tight clearances between BGA and S5. Monitor: SSU and RTAS housing; SSU and S5 handrail, RTAS housing and 4-bar linkage; PVRGF and Mast canister handrail
3. Clearances between S4 and S5 are tight. Avoid inadvertent contact with S5 and do not impart any loads into structure until primary bolts are engaged
4. Ground straps are sensitive to cross threading. Begin installation manually for thread alignment and complete turns/torque with PGT
5. Hardware is sensitive to crew loads. Do not apply a push force on primary bolt. Damage to self-feeding nut may result
6. Approval given to translate w/RAD and socket on PGT from corner to corner for 13A.1 per EVATT
7. S5 can be translated on by one crewmember after 2 diagonal corners are in soft capture (TBR for 2 crewmembers). Thus, S5 is in a safe config to be used as an ingress aid for final torquing of RTAS bolts (already have achieved initial torque)
8. Initial torque must be achieved at all 4 corners prior to giving SSRMS operator GO to ungrapple (conservative approach and pending new data, ungrapple may occur after 4 corners have achieved soft capture)

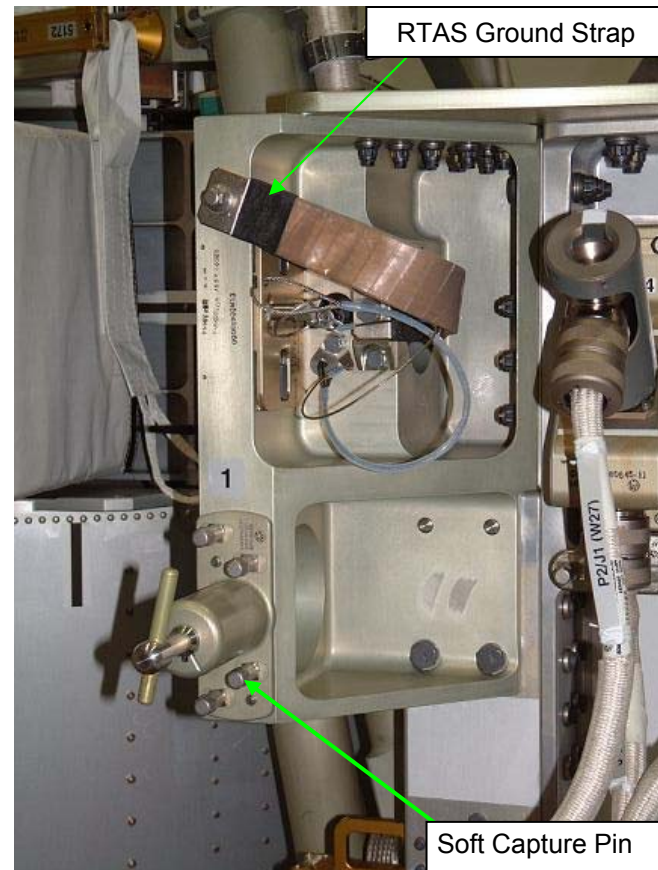
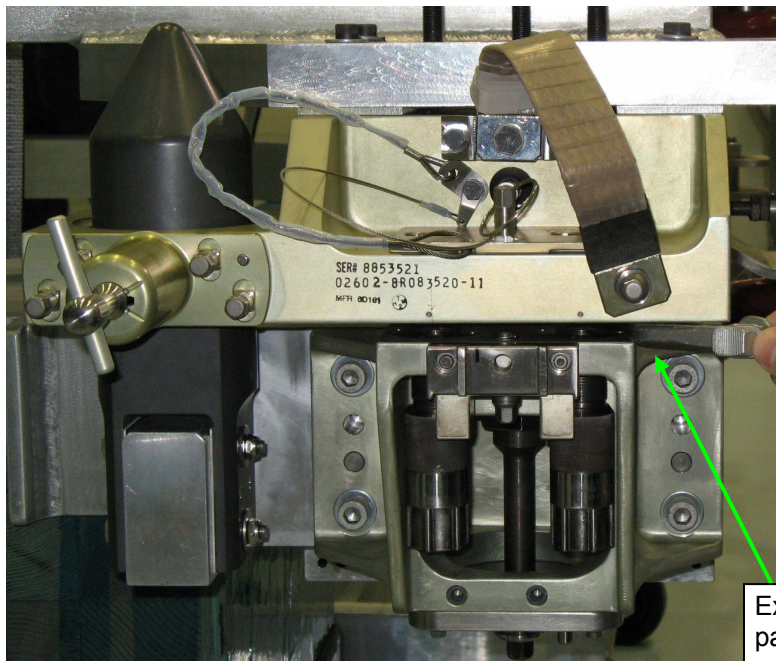
### Warnings:

1. N/A

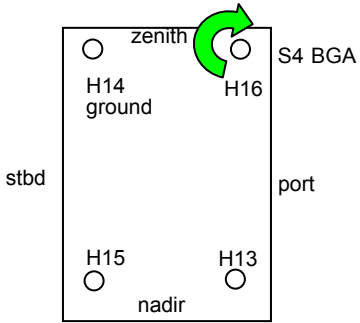
# S5 INSTALL TASK DATA SHEET (Cont)



S5 RTAS #1 (active half)

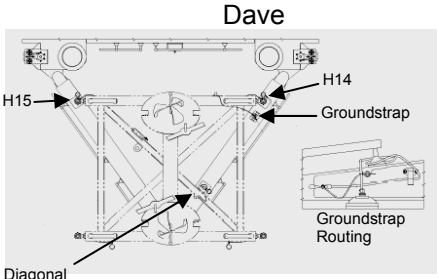


# PVRGF RELOCATION (01:00)

IV/RMS	EV1 (FF)	EV2 (FF)
	<p style="text-align: center;"><u>NOTE</u> PVRGF Fasteners H13, H14, and H15 may be released in any order</p> <p><u>RELEASE PVRGF FASTENER, H13 (FIXED)</u></p> <ol style="list-style-type: none"> <li>1. Configure APFR [12, UU, J, 11]</li> <li>2. Translate to PVRGF fastener H13</li> <li>3. BRT to HR 2103 if required</li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: 80%;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>Be aware of tight clearances between:</p> <ul style="list-style-type: none"> <li>• Zenith/Port corner of PVRGF (fastener H16) and Zenith/Port PIP pin on PVRGF with Mast Canister HR and BGA platform cables</li> <li>• Stbd corners of PVRGF (H15 and H14) and outbd RTAS housings</li> <li>• Released PVRGF and SAW blanket box</li> </ul> </div> <ol style="list-style-type: none"> <li>4. <b>PGT[B4 CCW2, 30.5]-7/16X6"</b> Release PVRGF fastener H13, 6-8 turns (do not go to hard stop at this torque)</li> <li>5. Remove retaining washer, stow in MLI near handrail</li> </ol> <p><u>RELEASE PVRGF FASTENER, H15 (FLOAT)</u></p> <ol style="list-style-type: none"> <li>6. Reconfigure BRT to reach PVRGF fastener H15 if required</li> <li>7. <b>PGT[B4, CCW2, 30.5]-7/16X6"</b> Release PVRGF fastener H15, 6-8 turns (do not go to hard stop at this torque)</li> <li>8. Remove retaining washer, temp stow</li> </ol>	<p><u>RELEASE PVRGF GROUND STRAP FASTENER</u></p> <ol style="list-style-type: none"> <li>1. Verify APFR roll operation</li> <li>2. Attach waist tether to APFR</li> <li>3. Ingress APFR</li> </ol> <ol style="list-style-type: none"> <li>4. <b>PGT[B7, CCW2, 30.5]-7/16X2"</b> Release PVRGF ground strap fastener (near H14) from G1, 11-13 turns</li> </ol> <p><u>RELEASE PVRGF FASTENER, H14 (FLOAT)</u></p> <ol style="list-style-type: none"> <li>5. <b>PGT[B4, CCW2, 30.5]-7/16X2"</b> Release PVRGF fastener H14, 6-8 turns (do not go to hard stop at this torque)</li> <li>6. Remove retaining washer, temp stow on S5</li> </ol> <p><u>RELEASE PVRGF FASTENER, H16, RELEASE PVRGF</u></p> <ol style="list-style-type: none"> <li>7. Tether to PVRGF HR nadir standoff near H14 (use RET MWS left side), check cooling</li> </ol>



PVRGF RELOCATION (01:00) (Cont)

IV/RMS	EV1 (FF)	EV2 (FF)
 <p><b>NOTE</b> Continue with S5 get-aheads until EVA PET 4:10</p>	<p><u>STABILIZE AND RELEASE PVRGF</u></p> <ol style="list-style-type: none"> <li>9. Hold PVRGF handrails</li> <li>10. Give EV2 GO to begin releasing bolt H16</li> <li>11. Assist EV2 in PVRGF release clearances</li> <li>12. Release PVRGF on EV2 GO</li> <li>13. Translate to S5 WIF 11 (fairlead S5 aft)</li> <li>14. Ensure tool stanchion fitting on APFR is out of the way</li> <li>15. Roll EV2's APFR to A [9, RR, A, 12]; react against handrail 2123</li> <li>16. Translate to S5 WIF 13, ingress APFR</li> </ol> <p><u>INSTALL PVRGF AT KEEL</u></p> <ol style="list-style-type: none"> <li>17. Verify safety tether clear of PVRGF install location</li> <li>18. Tether to PVRGF handrail H14</li> <li>19. Grasp PVRGF, release EV2's RET</li> <li>20. Align PVRGF H14 with keel post H14</li> <li>21. Slide spherical bearing H14 onto keel post H14 and diagonal beam onto keel post until fully seated</li> <li>22. Install PIP pin at H14</li> <li>23. Install PIP pin at diagonal beam #03</li> <li>24. Release RET from PVRGF</li> <li>25. Release TA clamp from PVRGF ground strap</li> <li>26. Unwrap ground strap from H14</li> <li>27. Route ground strap 2 times around length of handrail</li> <li>28. <b>PGT[A5, CW2, 30.5]-7/16X6"</b> Manually install ground strap fastener to keel fitting ~1 turn; Attach PVRGF ground strap fastener, ~11-13 turns total (hard stop)</li> <li>29. Egress APFR</li> <li>30. Inspect gloves; status MCC on RTV and Vectran state</li> </ol>	<ol style="list-style-type: none"> <li>8. Reconfigure PGT with RAD, 7/16 x 2" socket; pull test</li> <li>9. <b>PGT[B4, CCW2, 30.5]-RAD w/7/16X2"</b> Release PVRGF fastener H16, 6-8 turns (do not go to hard stop at this torque)</li> <li>10. Remove retaining washer, stow in MLI near handrail</li> <li>11. Grasp PVRGF</li> <li>12. Rotate PVRGF outboard about H16 (swivel socket) to clear mast canister handrail and BGA platform cables</li> <li>13. Give EV1 GO to release PVRGF</li> <li>14. Perform partial layback to raise PVRGF, maintain clearance with SAW blanket box</li> <li>15. Rotate PVRGF ~180 deg cw</li> </ol> <p><u>INSTALL PVRGF AT KEEL</u></p> <ol style="list-style-type: none"> <li>16. Transfer PVRGF to EV1</li> <li>17. On EV1 GO, release PVRGF</li> <li>18. Egress APFR</li> <li>19. Align PVRGF H15 with keel post H15</li> <li>20. Slide spherical bearing H15 onto keel post H15 until fully seated</li> <li>21. Install PIP pin at H15</li> <li>22. Stow RAD on socket caddy; pull test</li> <li>23. Install 2-in socket on PGT; pull test</li> <li>24. WVS Overview of final PVRGF config</li> <li>25. Inspect gloves; status MCC on RTV and Vectran state</li> </ol>

## PVRGF RELOCATION TASK DATA SHEET

### Tools:

EV1 (FF)	EV2 (FF)
PGT	PGT
6-in ext	6-in ext
	RAD
	2-in ext
	Ingress Aid

### Foot Restraints:

Task	WIF	APFR Setting
Install PVRGF at Keel	S5 WIF 13	[12,TT,K,10]
Release Groundstrap Fastener; Release PVRGF Fasteners H14 and H16	S5 WIF 11	[9,RR,H,12]
Install PVRGF at Keel	S5 WIF 11	[9,RR,A,12]

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
PVRGF Fastener	H13 H14 H15 H16	7/16"	4	Release: 19.4 (do not go to hard stop at this torque, 10 turns) (12.0 w/RAD)	167.5  8.3 (failure torque at hard stop)	6-8	30
Ground Strap	GS 1	7/16"	1	Release: 25.5  Install: 7.0	53.7 release 11.1 install	11-13	30

PVRGF Mass = ~228 lb/103 kg

EVA Connectors: N/A

### Timeline Considerations:

1. PVRGF must be removed in order to rotate the 3A BGA

### Notes:

1. PVRGF fasteners H13, H14, and H15 may be released in any order
2. For PVRGF spherical bearings: H13 (fixed), H16 (slotted), H14 (float), H15 (float)
3. PVRGF bolts are captive and will reach a hard stop when released all the way. Bolts can be re-driven (cw) up to 17 turns after washer removal; this can provide an additional 0.85" of clearance for PVRGF removal

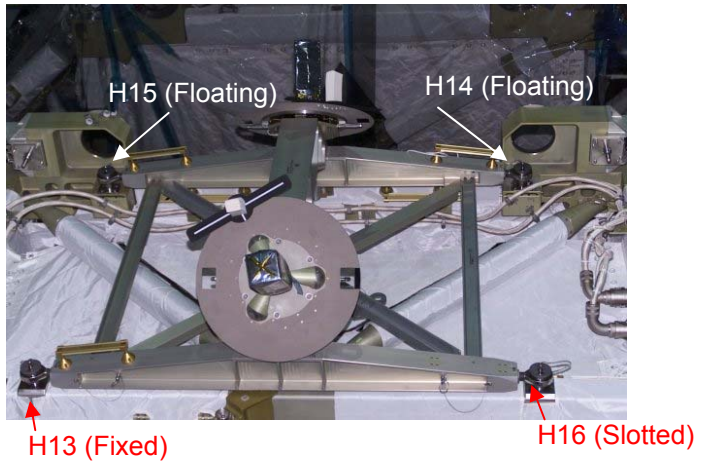
### Cautions:

1. Be aware of tight clearances between fastener H16 on PVRGF and Mast Canister handrail and BGA platform cables
2. Prior to driving bolt H16, EV1 must be holding PVRGF

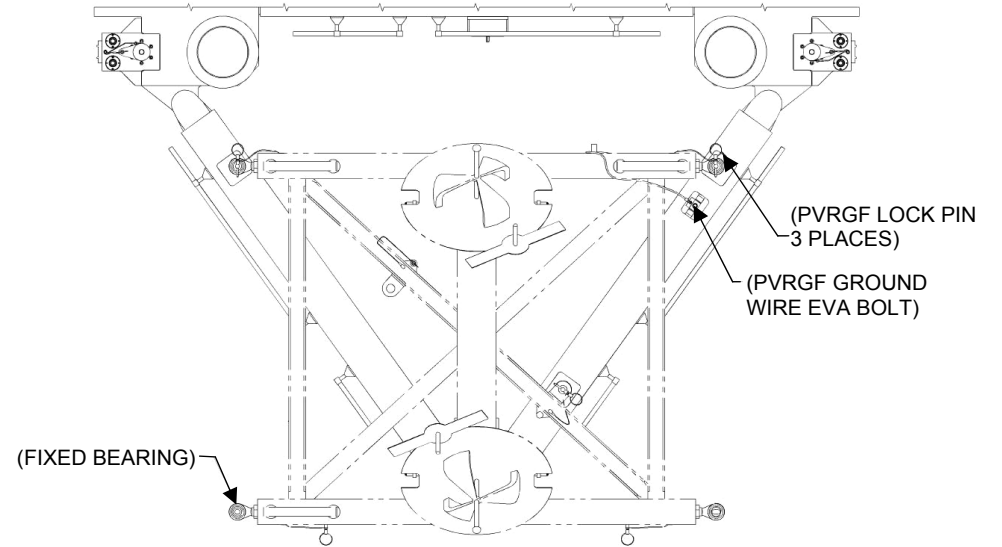
### Warnings:

1. N/A

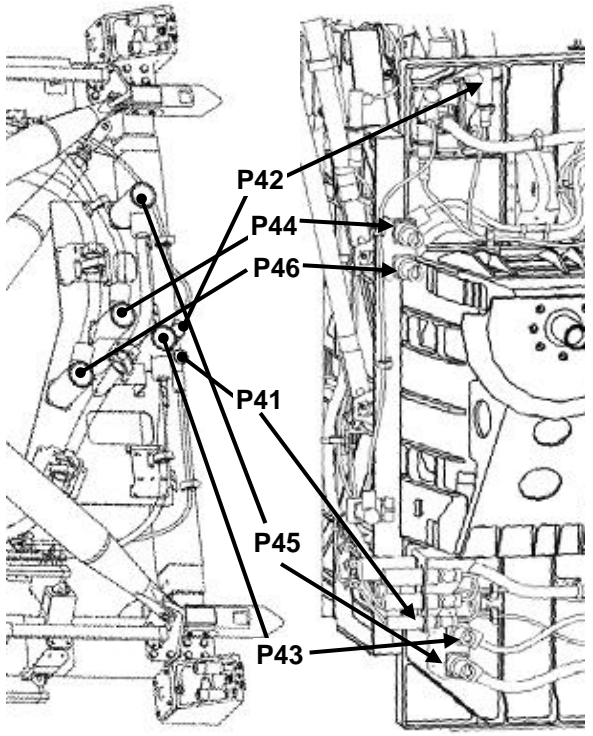
# PVRGF RELOCATION TASK DATA SHEET (Cont)



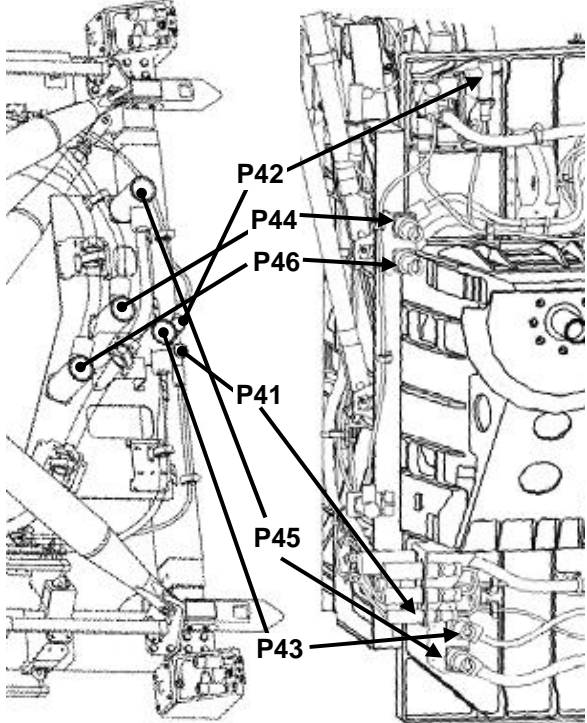
PVRGF in S5 Launch Configuration



**GET-AHEADS – MATE S5 TO S4 UMBILICALS (01:00)**

IV/RMS	EV1 (FF)	EV2 (FF)																				
<p><u>Connector mating steps:</u></p> <ol style="list-style-type: none"> <li>Remove connector cap from S4</li> <li>Demate umbilical from S5</li> <li>Install connector cap on S5                             <ul style="list-style-type: none"> <li>Note O-ring on dummy jack</li> <li>Line up white on white</li> <li>Install cap, 90 deg cw</li> <li><input type="checkbox"/> Pull test</li> </ul> </li> <li>Inspect Connector plug                             <ul style="list-style-type: none"> <li><input type="checkbox"/> EMI Band</li> <li><input type="checkbox"/> Pins</li> <li><input type="checkbox"/> No FOD</li> <li>Use cable to wiggle/twist the plug into alignment, not the tool</li> <li>Line up white on white</li> <li>Install plug, 90 deg cw</li> </ul> </li> </ol> <ol style="list-style-type: none"> <li>IV: Verify with MCC inhibits for S5 umbilicals (J43, J45)</li> <li>Give EV1 GO for J43, J45, J41</li> </ol>	<p><u>CONNECT S5 TO S4 UTILITIES</u></p> <p style="text-align: center;"><u>NOTE</u></p> <p>Connection/disconnection of 1553 jumpers (P41 and P42) must be done serially. Do not disconnect both jumpers at the same time</p> <ol style="list-style-type: none"> <li>Adjust APFR in S5 WIF 13 to [X, <b>SS, B, 1</b>] prior to relocation due to boot plate interference</li> <li>Relocate APFR from S5 WIF 13 to S5 WIF 03 (near S5 nadir trunnion); configure to [4, SS, B, 1], pull test</li> <li>Retrieve Cannon Connector tool from crewlock bag</li> <li>Release T/A clamps on S5 Nadir/Aft cables                             <ul style="list-style-type: none"> <li>P41: (3)</li> <li>P43: (5)</li> <li>P45: (5)</li> </ul> </li> <li>Ingress APFR  <input type="checkbox"/> ←</li> <li>Wait for IV GO (verify power inhibits to J43 and J45)</li> <li>Perform Connector Ops for:</li> </ol> <table border="1"> <thead> <tr> <th>Conn</th> <th>Remove Cap from S4</th> <th>Demate Umbilical from S5</th> <th>Install Cap on S5 (pull test)</th> <th>Inspect and Mate Umbilical to S4</th> </tr> </thead> <tbody> <tr> <td>P43/J43</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>P45/J45</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>P41/J41</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p style="text-align: center;"><u>NOTE</u></p> <p>Connection/disconnection of 1553 jumpers (P41 and P42) must be done serially. Do not disconnect both jumpers at the same time</p>	Conn	Remove Cap from S4	Demate Umbilical from S5	Install Cap on S5 (pull test)	Inspect and Mate Umbilical to S4	P43/J43					P45/J45					P41/J41					 <p style="text-align: center;"><b>RTAS 3</b></p>
Conn	Remove Cap from S4	Demate Umbilical from S5	Install Cap on S5 (pull test)	Inspect and Mate Umbilical to S4																		
P43/J43																						
P45/J45																						
P41/J41																						

# GET-AHEADS – MATE S5 TO S4 UMBILICALS (01:00) (Cont)

IV/RMS	EV1 (FF)	EV2 (FF)																				
<p>3. IV: Verify with MCC inhibits for S5 umbilicals (J46, J44)</p> <p>4. Verify data bus reconfig complete. Give EV1 GO to remove connector cap from S4 J42</p> <p><u>Connector mating steps:</u></p> <p>1. Remove connector cap from S4</p> <p>2. Demate umbilical from S5</p> <p>3. Install connector cap on S5</p> <ul style="list-style-type: none"> <li>- Note O-ring on dummy jack</li> <li>- Line up white on white</li> <li>- Install cap, 90 deg cw</li> <li><input type="checkbox"/> Pull test</li> </ul> <p>4. Inspect connector plug</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> EMI Band</li> <li><input type="checkbox"/> Pins</li> <li><input type="checkbox"/> No FOD</li> <li>- Use cable to wiggle/twist the plug into alignment, not the tool</li> <li>- Line up white on white</li> <li>- Install plug, 90 deg cw</li> </ul>	<p>8. Egress APFR</p> <p>9. Close TA clamps as required</p> <p>10. Reposition APFR to [4, SS, E, 1]</p> <p>11. Release T/A Clamps on S5 Nadir/Fwd cables</p> <p style="margin-left: 20px;">P42: (3)</p> <p style="margin-left: 20px;">P44: (2)</p> <p style="margin-left: 20px;">P46: (5)</p> <p>12. Ingress APFR (may need to Egress APFR for J42 → BRT to S4 HR 2207)</p> <p style="margin-left: 20px;">← <input type="checkbox"/></p> <p>13. Wait for IV GO (verify power inhibits to J44 and J46; data bus reconfig for J42)</p> <p>14. Perform Connector Ops for:</p> <p style="text-align: center;"><u>NOTE</u></p> <p style="margin-left: 20px;">Route umbilical P42 outside of diagonal beam. May need to disconnect J44 and J46 to mate J44</p> <table border="1"> <thead> <tr> <th>Conn</th> <th>Remove Cap from S4</th> <th>Demate Umbilical from S5</th> <th>Install Cap on S5 (pull test)</th> <th>Inspect and Mate Umbilical to S4</th> </tr> </thead> <tbody> <tr> <td>P42/J42</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>P44/J44</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>P46/J46</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>15. Egress APFR</p> <p>16. Restrain remaining umbilical length in TA clamps as needed to reduce slack</p> <p>17. Close unused TA Clamps</p> <p>18. <input type="checkbox"/> <b>final umbilical config</b></p> <p>19. Inspect gloves; status MCC on RTV and Vectran state</p>	Conn	Remove Cap from S4	Demate Umbilical from S5	Install Cap on S5 (pull test)	Inspect and Mate Umbilical to S4	P42/J42					P44/J44					P46/J46					 <p style="text-align: center;"><b>RTAS 3</b></p>
Conn	Remove Cap from S4	Demate Umbilical from S5	Install Cap on S5 (pull test)	Inspect and Mate Umbilical to S4																		
P42/J42																						
P44/J44																						
P46/J46																						

## MATE S5 TO S4 UMBILICALS TASK DATA SHEET

### Tools:

<b>EV1 (FF)</b>
Cannon Connector Tools (2)

### Foot Restraints:

Task	WIF	APFR Setting	Alt APFR and Setting
S5 Umbilical Mate (Nadir/Aft )	S5 WIF 3	[4,SS,B,1]	S4 WIF 17 [4,RR,F,11]
S5 Umbilical Mate (Nadir/Fwd)	S5 WIF 3	[4,SS,E,1]	
W01-P46 Umbilical Mate (backups)	S4 WIF 14	[7,RR,C,2]	S5 WIF 4 [3,FF,A,1] S5 WIF 1 [2,RR,B,10]

### EVA Connectors:

Harness	From	To	Clamps (qty)	Clamps to Be Released (OOCT)	Conn Size	Function
W10-P43	S5 J43	S4 J43		5	37	LPR MSC to UMA 2 (power)
W08-P45	S5 J45	S4 J45		5	37	LPR Primary Power
W07-P41	S5 J41	S4 J41		3	19	1553 Bus B (data)
W09-P44	S5 J44	S4 J44		2	37	UPR MSC to UMA 1 (power)
W01-P46	S5 J46	S4 J46		5	37	UPR Primary Power
W02-P42	S5 J42	S4 J42		5	19	1553 Bus A (data)

### Connector Inhibits:

Task	Inhibits
	UPR Primary Power
	LPR Primary Power
	UPR MSC to UMA 1 (power)
	LPR MSC to UMA 2 (power)

### Timeline Considerations:

1. Umbilicals must be mated prior to S6 Installation on 15A

### Notes:

1. Adjust APFR pitch prior to installing APFR in S5 WIF 03, otherwise boot plate will interfere with installation

### Cautions:

1. Inspect connectors for bent pins and FOD
2. Verify integrity of EMI band and O-ring
3. Connection/disconnection of 1553 jumpers (P41 and P42) must be done serially because they are loop-back connectors. Do not disconnect both jumpers at the same time

### Warnings:

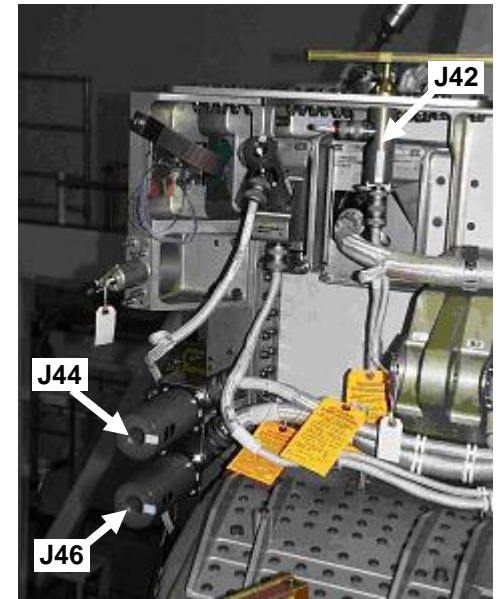
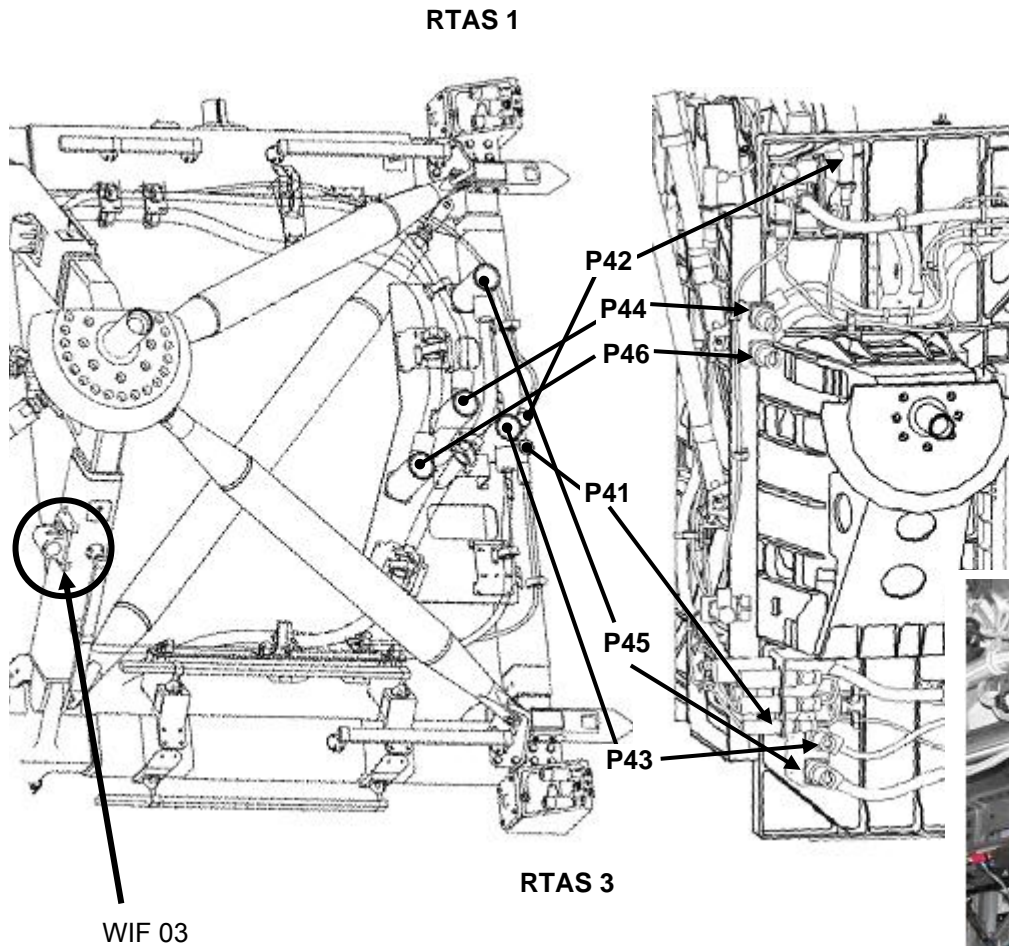
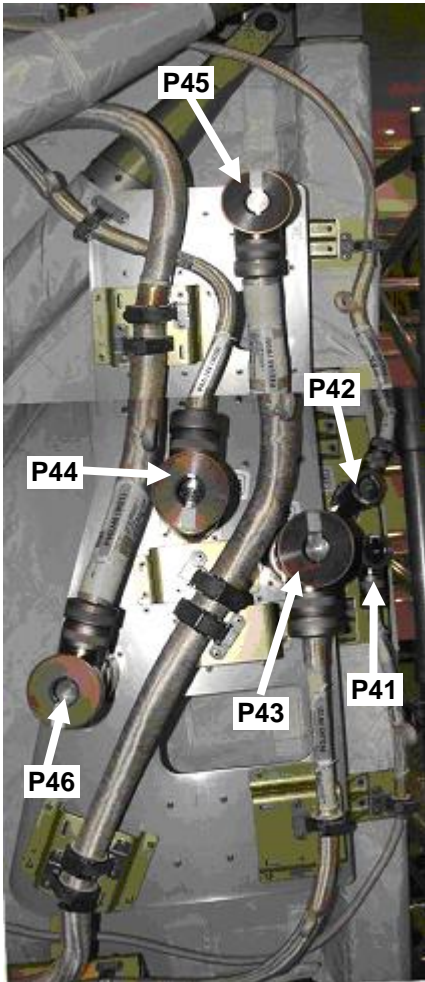
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MATE S5 TO S4 UMBILICALS TASK DATA SHEET (Cont)

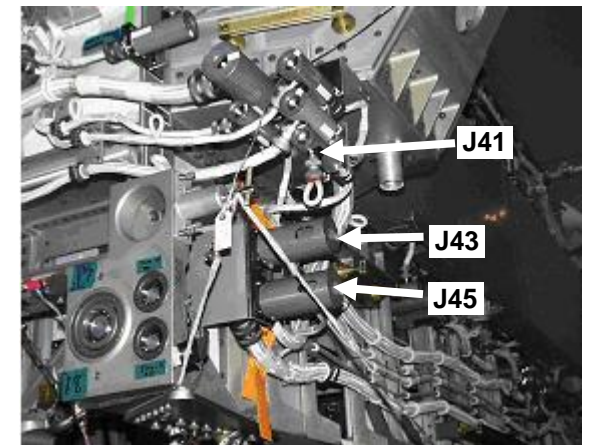
S5 Nadir

STBD ←  
AFT ↓

S4 Nadir




J42, J44 and 46 dummy caps installed



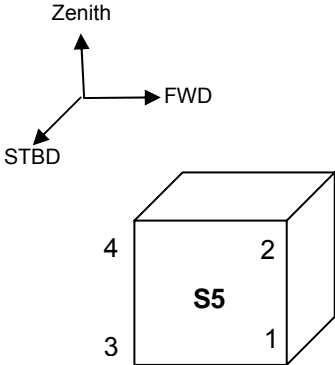
J41, J43 and 45 dummy caps installed

GET-AHEADS – CYCLE S5 CLA (00:15)

IV/RMS	EV1 (FF)	EV2 (FF)
Posn SSRMS for CLA claw view		<p><u>CYCLE S5 CAPTURE LATCH ASSY</u></p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>Avoid contact with PVRGF grapple pins and RMS target</p> </div> <ol style="list-style-type: none"> <li>1. Translate to S5 CLA, BRT to S5 handrail 2136</li> <li>2. Reconfigure PGT with 2 or 6-in socket</li> <li>3. <b>PGT[A6, CCW3, 30.5]-7/16X2"</b>: Open CLA, -127 turns</li> <li>4. <b>PGT[A6, CW2, 30.5]-7/16X2"</b>: Partially close CLA, ~1 turn</li> <li>5.  final CLA config (SSRMS acceptable if good view and recording)</li> <li>6. Inspect gloves; status MCC on RTV and Vectran state</li> </ol>



# GET-AHEADS – S5 TO S6 LAUNCH LOCK REMOVAL (00:40)

IV/RMS	EV1 (FF)	EV2 (FF)															
<table border="1"> <thead> <tr> <th>LL #</th> <th>BRT HR #</th> <th>Turns</th> </tr> </thead> <tbody> <tr> <td>1 (nadir, fwd)</td> <td>2103 or 2126</td> <td></td> </tr> <tr> <td>2 (zenith, fwd)</td> <td>2123</td> <td></td> </tr> <tr> <td>3 (nadir, aft)</td> <td>2135</td> <td></td> </tr> <tr> <td>4 (zenith, aft)</td> <td>2132</td> <td></td> </tr> </tbody> </table>	LL #	BRT HR #	Turns	1 (nadir, fwd)	2103 or 2126		2 (zenith, fwd)	2123		3 (nadir, aft)	2135		4 (zenith, aft)	2132			<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p align="center"><b>CAUTION</b></p> <p>Do not exceed 36 turns when removing launch locks or primary bolt can come free of self-feeding nut</p> </div> <p><b>REMOVE LAUNCH LOCK</b></p> <ol style="list-style-type: none"> <li>Translate to S5 corner 3 (nadir/aft)</li> <li>BRT to S5 handrail per IV table</li> <li>Reconfigure PGT – 5/8 x 7.8" socket; stow 2-in socket on socket caddy</li> <li>Tether to Launch Lock PIP pin</li> <li><b>PGT[B7, CCW2, 30.5] – 5/8X7.8"</b> Retract S5 primary bolt from launch lock #X 27 turns ← Report turns (36 max)</li> <li>Remove launch lock #X via PIP pin, stow in sm trash bag</li> <li>✓ Bolt head recessed inside shear cylinder (2-7 threads visible at bolt shoulder) If threads not visible:             <ol style="list-style-type: none"> <li>Retract primary bolt until 2 to 7 threads visible</li> </ol> </li> <li>Repeat steps 2 to 7 on other 3 corners</li> <li>Remove 5/8 socket and stow on socket caddy; pull test</li> <li>Install 2-in socket on PGT; pull test</li> <li>Inspect gloves; status MCC on RTV and Vectran state</li> </ol>
LL #	BRT HR #	Turns															
1 (nadir, fwd)	2103 or 2126																
2 (zenith, fwd)	2123																
3 (nadir, aft)	2135																
4 (zenith, aft)	2132																

## GET-AHEADS – S5 TO S6 LAUNCH LOCK REMOVAL TASK DATA SHEET

**Tools: Backup tool shown in ( )**

<b>EV2 (FF)</b>
PGT
7.8 ext x 5/8

**BRT Handrails:**

Task	Handrail
S5 LL 3 Removal	S5 HR 2135
S5 LL 4 Removal	S5 HR 2132
S5 LL 2 Removal	S5 HR 2123
S5 LL 1 Removal	S5 HR 2103

**Foot Restraints (optional use):**

Task	WIF	APFR Setting
S5 LL 3 Removal	S4 WIF 17	[5,RR,J,11]
S5 LL 4 Removal	S4 WIF 20	[6,VV,A,11]
S5 LL 1 Removal	S4 WIF 18	[8,OO,D,1]
S5 LL 2 Removal	S4 WIF 19	[6,PP,K,12]

**EVA Fasteners:**

Fastener Name	Label	Head Size	Qty	Recommended Torque (ft-lb)	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Primary Bolt	1, 2, 3, 4	5/8"	1			12.0 (thru RAD) 25.5 (no RAD)	610	27 (bolt)	30

**EVA Connectors:** N/A

**Timeline Considerations:**

1. Launch locks must be removed prior to S6 installation on 15A

**Notes:**

1. N/A

**Cautions:**

1. Do not exceed 36 turns when removing launch locks or primary bolt can come free of self feeding nut

**Warnings:**

1. N/A

**S5 CLEANUP (00:35)**

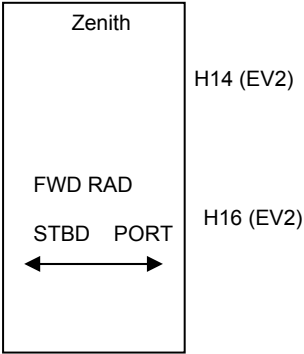
|

IV/RMS	EV1 (FF)	EV2 (FF)
	<p><u>S5 WORKSITE CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to corner 1</li> <li>2. Photo ops if required</li>   <li>3. Stow socket caddy in C/L Bag</li> <li>4. Stow sm trash bag in CL bag (<i>optional</i>)</li> <li>5. Retrieve CL bag</li> <li>6. Perform tool inventory</li> </ol> <p><u>RETURN TO AIRLOCK</u></p> <ol style="list-style-type: none"> <li>7. Retrieve APFR from WIF 13 (or WIF 03 if S4/S5 conn) for relocate</li> <li>8. Retrieve Adj fairlead at S4 HR 2206</li> <li>9. Translate to outboard CETA Cart 2, releasing fairleads</li> <li>10. Stow APFR in CETA Cart 2 WIF 2 [12, FF] [10, PP, E, 12]; pull test</li> <li>11. Swap to A/L 85-ft tether, hooks locked, reel unlocked</li> <li>12. Retrieve Adj Tether from fairlead near CETA spur</li> <li>13. Translate to airlock</li> <li>14. Open thermal cover, ingress airlock</li> <li>15. Stow in A/L:               <ul style="list-style-type: none"> <li>Crewlock bag w/torque wrench</li> <li>Other tools/tethers and report to IV</li> <li>Get camera and stow outside A/L</li> </ul> </li> <li>16. Egress A/L, Close hatch thermal cover</li> <li>17. SAFER MAN ISOL vlv – OP (dn) and HCM (dn)</li> <li>18. Retrieve camera</li> </ol>	<p><u>S5 WORKSITE CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to corner 1 if required</li> <li>2. Photo ops if required</li>   <li>3. Stow sm trash bag and launch locks in CL bag at corner 1 (<i>optional</i>)</li> <li>4. Perform tool inventory</li> </ol> <p><u>RETURN TO AIRLOCK</u></p> <ol style="list-style-type: none"> <li>5. Retrieve APFR from WIF 11 for relocate</li> <li>6. Retrieve S5 fairlead (HR 2123) as required</li>   <li>7. Translate to S3 HR 3026, releasing fairleads</li> <li>8. Stow APFR in CETA Cart 1 WIF 4 [12, FF] [3, SS, F, 12]; pull test</li> <li>9. Swap to A/L 85-ft tether, hooks locked, reel unlocked</li> <li>10. Translate to airlock</li> <li>11. Stow spare 85-ft tether on A/L HR 0546</li> </ol>

# FORWARD RADIATOR RETRACT AND CINCH (01:10)

IV	EV1 (FF)	EV2 (FF)
<p>1. MCC-H: Verify PVR motor OFF</p> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;">H12 (EV1)</p> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;"> <p>H15 (EV1)</p> <p>Zenith</p> </div> <div style="text-align: center;"> <p>H14 (EV2)</p> </div> </div> <div style="display: flex; justify-content: center; align-items: center; margin: 10px 0;"> <div style="text-align: center;"> <p>FWD RAD</p> <p>STBD    PORT</p> <p>←————→</p> </div> </div> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;"> <p>H13 (EV1)</p> </div> <div style="text-align: center;"> <p>H16 (EV2)</p> </div> </div> <p style="text-align: center;">H11 (EV2)</p> </div> <p>2. MCC-H: Verify ISS in CMG control or free drift</p> <p>3. Verify cinches (6), winches (2), safety tethers, and EV crew clear; give MCC-H GO for Radiator Retract</p>	<p><u>FWD RADIATOR PREP</u></p> <p>1. Translate to P6 FWD Radiator Starboard Nadir Corner          – Up Z1 Aft, Stbd corner          – FWD on P6 @ IEA          – Zenith on P6</p> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><b>CAUTION</b></p> <p style="text-align: center;">Avoid contact with radiator inter-panel flexhoses and thermal outer coating. Tend safety tether reel and line from radiator</p> <hr/> <p style="text-align: center;">Watch helmet clearance with radiator during adjustable tether installation</p> </div> <p><u>RADIATOR SURVEY</u></p> <p>2. Translate zenith around starboard side of radiator; fairlead w/adj (HR 5358) _____ safety tether clear of radiator</p> <p>3. Verify stbd cinches (2) and zenith cinch stowed  <input type="checkbox"/> H13    <input type="checkbox"/> H15    <input type="checkbox"/></p> <p>4. Inspect PVR PIP pins  <input type="checkbox"/> FWD PVR stbd side  <input type="checkbox"/> STBD PVR fwd side</p> <p>5. Verify zenith winch bar is clear of retract envelope; if necessary attach tether to keep winch bar clear (√PIP pin installed)</p> <div style="border: 3px double black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><b>WARNING</b></p> <p style="text-align: center;">Moving hardware hazard. PV radiator panels are free to move until cinches secured</p> </div> <p><u>RADIATOR RETRACT</u></p> <p>6. Give MCC-H GO for radiator retract when clear</p> <p>7. Minimize EVA loads during radiator retract. Notify MCC of any obstructions seen during retract</p>	<p><u>FWD RADIATOR PREP</u></p> <p>1. Translate to P6 FWD Radiator Nadir Position          – Up Z1 Fwd, Stbd corner (to kelp bed)          – Port on P6 above EAS          – Zenith on P6</p> <p><u>RADIATOR SURVEY</u></p> <p>2. Translate port then zenith around radiator; fairlead safety tether clear of radiator (HR 2008)</p> <p>3. Verify port cinches (2) and nadir cinch stowed  <input type="checkbox"/> H16    <input type="checkbox"/> H14    <input type="checkbox"/></p> <p>4. Inspect PVR PIP pin  <input type="checkbox"/> FWD PVR port side</p> <p>5. Verify nadir winch bar is clear of retract envelope; if necessary attach tether to keep winch bar clear (√PIP pin installed)</p> <p><u>RADIATOR RETRACT</u></p> <p>6. Give MCC-H GO for radiator retract when clear</p> <p>7. Minimize EVA loads during radiator retract. Notify MCC of any obstructions seen during retract</p>

# FORWARD RADIATOR RETRACT AND CINCH (01:10) (Cont)

IV	EV1	EV2
 <p style="text-align: center;">H12 (EV1)</p> <p style="text-align: center;">Zenith</p> <p>H15 (EV1)                      H14 (EV2)</p> <p style="text-align: center;">FWD RAD</p> <p>H13 (EV1)                      H16 (EV2)</p> <p style="text-align: center;">STBD    PORT</p> <p style="text-align: center;">←————→</p> <p style="text-align: center;">H11 (EV2)</p>	<p style="text-align: center;"><u>RADIATOR CINCH INSTALL</u></p> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><u>CAUTION</u> Don't touch PVR HR during torquing sequence</p> </div> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">Cinch bolt must be engaged in the threads of square case. If detect movement between bolthead and square case, then turn bolt head cw 1 or 2 turns to engage bolt.</p> <p style="text-align: center;">Check that the fixed end of cinch is properly seated in bracket</p> <ol style="list-style-type: none"> <li>1. Attach BRT as required</li> <li>2. Verify zenith cinch bolt (H12) is engaged in threads</li> <li>3. Verify fixed end pulled all the way out and seated properly in bracket</li> <li>4. Compress radiator panels and assess zenith cinch installation</li> </ol> <p style="margin-left: 40px;">* If not able to install cinch:                      *</p> <p style="margin-left: 40px;">* Install adj tethers (2) between PVR panel                      *</p> <p style="margin-left: 40px;">* HR and P6 HR                      *</p> <p style="margin-left: 40px;">* Simo with EV2, tension tethers                      *</p> <ol style="list-style-type: none"> <li>5. Install zenith cinch (H12)</li> <li>6. Remove zenith winch bar PIP pin (H34); align winch bar clevis to lug on radiator; re-install PIP pin</li> </ol>	<p style="text-align: center;"><u>RADIATOR CINCH INSTALL</u></p> <ol style="list-style-type: none"> <li>1. Attach BRT as required</li> <li>2. Verify nadir cinch bolt (H11) is engaged in last thread</li> <li>3. Verify fixed end pulled all the way out and seated properly in bracket</li> <li>4. Compress radiator panels and assess nadir cinch installation</li> </ol> <p style="margin-left: 40px;">* If not able to install cinch:                      *</p> <p style="margin-left: 40px;">* Install adj tethers (2) between PVR panel                      *</p> <p style="margin-left: 40px;">* HR and P6 HR                      *</p> <p style="margin-left: 40px;">* Simo with EV1, tension tethers                      *</p> <ol style="list-style-type: none"> <li>5. Install nadir cinch (H11)</li> <li>6. Remove nadir winch bar PIP pin (H33); align winch bar clevis to lug on radiator; re-install PIP pin</li> </ol>

## FORWARD RADIATOR RETRACT AND CINCH (01:10) (Cont)

IV				EV1				EV2							
Cinch ( <b>Initial Torque</b> ) IV: Record Torque/Turns				<b>INITIAL CINCH TORQUE</b> 7. Once both cinches installed: <b>PGT: [A3, CW2, 30.5]; 7/16"</b> Tension cinches ~6 turns to torque <input type="checkbox"/> H12 – BRT to P6 HR 5362 <input type="checkbox"/> H15 – BRT to P6 HR 5353 <input type="checkbox"/> H13 – BRT to P6 HR 5342 8. Retrieve adj tethers from PVR if used				<b>INITIAL CINCH TORQUE</b> 7. Once both cinches installed: <b>PGT: [A3, CW2, 30.5]; 7/16"</b> Tension cinches ~6 turns to torque <input type="checkbox"/> H11 – BRT to P6 HR 5335 <input type="checkbox"/> H16 – BRT to P6 HR 5343 <input type="checkbox"/> H14 – BRT to P6 HR 5349 8. Retrieve adj tethers from PVR if used							
<b>EV1</b>		<b>EV2</b>		<b>EV1</b>		<b>EV2</b>		<b>EV1</b>		<b>EV2</b>		<b>EV1</b>		<b>EV2</b>	
H12		H11		H12		H11		H12		H11		H12		H11	
H15		H16		H15		H16		H15		H16		H15		H16	
H13		H14		H13		H14		H13		H14		H13		H14	
Cinch ( <b>Final Torque/Manual Turns</b> ) IV: Record Torque/Turns and Manual Turn				<b>FINAL CINCH TORQUE</b> 9. Set up BRT for bolt final torque (repeat steps 9-12 for all 3 cinches, zenith first) 10. <b>PGT: [A3, CW2, 30.5]; 7/16"</b> Tighten cinch ~1 turn to torque 11. <b>PGT Manual Ratchet (RCW), 30.5; 7/16"</b> Place <b>TBD/TBD</b> turn on cinch 12. Verify anti-rotation device is up; if not, put PGT in RCW (manual ratchet), rotate bolt cw – maximum of 60 deg <input type="checkbox"/> H12 – BRT to P6 HR 5362 <input type="checkbox"/> H15 – BRT to P6 HR 5353 <input type="checkbox"/> H13 – BRT to P6 HR 5342 13. Perform tool inventory 14. Inspect gloves; status MCC on RTV and Vectran state 15. Remove adj fairlead				<b>FINAL CINCH TORQUE</b> 9. Set up BRT for bolt final torque (repeat steps 9-12 for all 3 cinches, nadir first) 10. <b>PGT: [A3, CW2, 30.5]; 7/16"</b> Tighten cinch ~1 turn to torque 11. <b>PGT Manual Ratchet (RCW), 30.5; 7/16"</b> Place <b>TBD/TBD</b> turn on cinch 12. Verify anti-rotation device is up; if not, put PGT in RCW (manual ratchet), rotate bolt cw – maximum of 60 deg <input type="checkbox"/> H11 – BRT to P6 HR 5335 <input type="checkbox"/> H16 – BRT to P6 HR 5343 <input type="checkbox"/> H14 – BRT to P6 HR 5349 13. Perform tool inventory 14. Inspect gloves; status MCC on RTV and Vectran state							
<b>EV1</b>		<b>EV2</b>		<b>EV1</b>		<b>EV2</b>		<b>EV1</b>		<b>EV2</b>		<b>EV1</b>		<b>EV2</b>	
H12		H11		H12		H11		H12		H11		H12		H11	
Manual		Manual		Manual		Manual		Manual		Manual		Manual		Manual	
H15		H16		H15		H16		H15		H16		H15		H16	
Manual		Manual		Manual		Manual		Manual		Manual		Manual		Manual	
H13		H14		H13		H14		H13		H14		H13		H14	
Manual		Manual		Manual		Manual		Manual		Manual		Manual		Manual	

## FORWARD RADIATOR RETRACT AND CINCH TASK DATA SHEET

### Tools:

EV1 (FF)	EV2 (FF)
PGT	PGT
7/16 Socket	7/16 Socket
BRT	BRT
(RAD w/6in ext for FQDC Shroud Cover)	

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
FQDC Shroud	H5,H6, H8,H9	7/16	4	7.5	8.33	15.7 install 21.0 remove	7	30
Winch bolt	H10	7/16	1	2.25	NA	3.8	25 max from full retract	30
Cinch	H11-H16	7/16	6	2 ft-lb (initial) 10 ft-lb (final)	20	35	14 max  ~8 post 4A 6 to 8	30

### APFR Positions:

Task	WIF	APFR Setting

### Timeline Considerations:

1. P6 Forward radiator must be retracted to provide SSRMS clearance for EVA 3 P6 SASA and CETA cart relocate

### Notes:

1. Prior to cinch installation, verify fixed end of cinch is seated in retention bracket to allow full extension of cinch cable. If not done, could cause slack later if the cable slips
2. Cinch must be installed with alignment stripe perpendicular to radiator panel and rectangular bolt housing properly seated
3. During Cinch bolt drive, apply 5 lb push force to disengage the spring-loaded washer
4. First pair of cinches are installed/tightened simo to ensure even loads, especially considering grapple post alignment for PVR relocate in the future
5. Radiator is 48" tall after retraction. The approximate distance from the top of the PVR base plate to the top of the panel stack is 17 inches. The base plate is approximately 5 inches
6. Radiator bellows have MLI over them and crew may think it is ok to use it for translation; the crew should avoid contact or risk damage to the hardware
7. Use of Radiator Handholds  
 Prior to installing the cinches: NOT OK  
 During initial pre-loading/torquing: NOT OK  
 After initial pre-loading/torquing on all cinches: OK  
 While pre-loading/torquing the second time (during bolt actuation): NOT OK  
 After pre-loading/torquing the second time: OK  
 During final pre-loading/torquing (setting the final fraction of turns): OK

### Cautions:

1. Avoid contact with radiator inter-panel flexhoses and thermal outer coating
2. Avoid putting high loads on winch bolt; retaining mechanism for locking device may fail. Still usable if failure occurs, no locking capability may fail due to excess slack if extended beyond 25 turns from a fully retracted state

### Warnings:

1. Moving hardware hazard. PV radiator panels are free to move until secured to winch bar. Winch bar will move when H10 bolt is driven

EVA 1 CLEANUP/INGRESS (00:35)

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IV/RMS	EV1 (FF)	EV2 (FF)
<p>IV: Perform WVS PWRDN (PHOTO/TV, <u>WVS CUE CARD</u>)</p> <p>IV: Set 2-min timer after both EV1 and EV2 report WATER OFF</p>	<p><u>CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to airlock</li> <li>2. GET AHEAD: relocate IAPFR from WIF 01 to WIF 05 [11, OO, F, 12]; pull test</li> <li>3. Perform Tool Inventory</li> <li>4. If time, take photos of MISSEs 3 and 4, both sides, using EVA Digital Camera</li> </ol> <p><u>INGRESS</u></p> <ol style="list-style-type: none"> <li>5. On EV2 GO, disconnect EV2 85-ft safety tether from A/L HR 0554</li> <li>6. Connect left waist tether to EV2 85-ft safety tether, lock hooks</li> <li>7. Disconnect EV1 85-ft safety tether from EMU, attach to external A/L D-Ring or HR</li> <li>8. Ingress airlock</li> <li>9. Remove SCU from stowage pouch</li> <li>10. Remove DCM cover, Velcro to DCM</li> <li>11. Connect SCU to DCM; √SCU locked</li> <li>12. DCM: WATER – OFF</li> <li>13. Hatch thermal cover – close, attach Velcro strap</li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><u>CAUTION</u> Do not close hatch until EMU WATER – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>14. Verify all hardware is clear of hatch</li> <li>15. EV hatch – close and lock</li> <li>16. Go to PRE REPRESS portion of {CREWLOCK <u>DEPRESS/REPRESS CUE CARD</u>} (SODF: ISS EVA SYS: EVA PREP/POST)</li> </ol>	<p><u>CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to airlock</li> <li>2. Perform Tool Inventory</li> <li>3. If time, take photos of MISSEs 3 and 4, both sides, using EVA Digital Camera</li> </ol> <p><u>INGRESS</u></p> <ol style="list-style-type: none"> <li>4. Ingress airlock</li> <li>5. Connect left waist tether to UIA D-ring</li> <li>6. Give EV1 GO to disconnect 85-ft tether</li> </ol> <ol style="list-style-type: none"> <li>7. Remove SCU from stowage pouch</li> <li>8. Remove DCM cover, Velcro to DCM</li> <li>9. Connect SCU to DCM; √SCU locked</li> <li>10. DCM: WATER – OFF</li> </ol> <ol style="list-style-type: none"> <li>11. Go to PRE REPRESS portion of {CREWLOCK <u>DEPRESS/REPRESS CUE CARD</u>} (SODF: ISS EVA SYS: EVA PREP/POST)</li> </ol>



## POST EVA 1 TOOL CONFIG

### EV1

- Waist Tether (R D-ring to Safety tether)
- Waist Tether (L D-ring Ext to MWS)
- D-ring Extender (2)
- 85-ft Safety Tether (R on extender)
- MWS
- T-bar
- Rabbit Ear Wire Ties (2)
- RET (sm-sm PIP pin)
- RET (sm-sm) (2)
- Sm Trash Bag (L, outside)
- Launch Locks (2)
- Adj (2)
- Swing Arm (R)
- RET (sm-sm)
- PGT S/N \_\_\_\_\_ w/battery
- 7/16 x 6" wobble
- BRT (L)
- RET (sm-sm)
- Wire Ties (2)

### EV2

- Waist Tether (R D-ring to Safety tether)
- Waist Tether (L D-ring ext to MWS)
- D-ring Extender (2)
- 85-ft Safety Tether (R on extender)
- Adj (2 – on wrist)
- MWS
- T-bar
- Rabbit Ear Wire Ties (2)
- RET (sm-sm PIP pin)
- RET (sm-sm) (3)
- Sm Trash Bag (L, inside)
- Launch Locks (4)
- Socket Caddy (R, inside)
- 5/8 x 7.8" rigid
- RAD S/N \_\_\_\_\_
- Swing Arm (R)
- RET (sm-sm)
- PGT S/N \_\_\_\_\_ w/battery
- 7/16 x 2"
- BRT (L)
- RET (sm-sm)
- Wire Ties (2)

### CREWLOCK

\*If GPS Antenna retrieval not performed

- Small ORU Bag (A/L zenith/fwd/stb; tied to HRs)
- RET (Lg-sm) on outside
- GPS Caps wire-tied together
- RET (sm-sm)

### CREWLOCK

Verify following item is in Staging Bag

- PGT S/N \_\_\_\_\_ w/battery

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- CL Bag #1
- RET (Lg-sm) on outside
- Launch Locks (2)
- Soft Capture Pins (2)
- Fish Stringer
- Digital Camera
- Cannon Connector Tools (2)
- Socket Caddy
- 7/16 x 2"
- RAD S/N \_\_\_\_\_
- 5/8 x 7.8" rigid
- Torque Wrench Bag (on outside)
- Wire Ties (2)
- Torque Wrench
- RET (sm-sm)
- Spare 85-ft safety tether (on outside)

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- CL Bag #3 (contingency) -Aft/Zenith wall
- Adj (Lg-sm) on outside
- Wire Tie Caddy
- Connector Cleaner Tool Caddy
- Connector Pin Straightener
- EVA Ratchet
- Socket Caddy
- 7/16 x 6" wobble
- 7/16 x 2"
- 7/16 x 9" rigid
- RAD
- Adj tether to internal D-ring (2)
- Spare torque wrench

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- D-ring Extender (on A/L D-ring)

### External

- Spare 85-ft safety tether (A/L HR 0546)
- 55-ft safety tether hatch D-ring (2)

## EVA 2

### EVA 2 BRIEFING CARD

#### **EVA PREP:**

Remove watches, jewelry, etc, during EMU ops

Follow procedures carefully

PBA and SCU are pure O2

Do not touch connections. Inspect for dirt, oil, burrs, particles

Do not force connections. Do not crush or kink hoses

EMU is pure O2 environment. Do not wear oil based products

#### **A/L CONFIG AND TOOLS:**

\* Crew lock bag with MUT-Ballstack-MUT for nominal tasks

\* Crew lock bag for contingencies stays in the A/L

#### **EGRESS PLAN:**

\* EV1 to A/L D-ring; EV1 Safety tether to EV2 Left waist

\* Check PGT, tools, BRT tucked in

\* EV2 egresses and checks safety tether load straps

\* EV2 attaches both safety tethers to handrails

\* EV1 egresses with crewlock bag and closes thermal cover

\* Both check SAFER handles down and down

#### **TRANSLATION:**

\* Hand on structure at all times. Do not hop

\* Avoid feet first translation

\* Slow and deliberate

\* Check tethers often

\* Check each other's tethers, when possible

\* Keep loaded BRT in scan as well

\* Stay aware of sensitive hardware in your work area

#### **TETHER SWAPS:**

\* Secure spare waist tether first, check locked

\* Perform tether swap

\* Visually check and verbalize all tethers locked, reel unlocked

#### **TETHERS AND TOOLS:**

\* Follow good tethering protocol on all tools – “Good RET”

\* Pull test everything (PGT sockets, APFRs, etc)

#### **CMG REMOVAL AND INSTALL at Z1:**

Avoid inadvertent contact with CMG

CMG shims must be removed within 2 hr of powerdown on Z1

Equal force should be exerted by crew in order to prevent binding when installing/removing the CMG from its mounting on Z1

CMG may have oily residue on TMA; avoid contact (cross-contamination)

Avoid contact w/ORU radiators on Z1 (mirror surfaces)

#### **CMG FSE TRANSFER:**

Watch NTA clearances removing CMG FSE from ESP-3

SSRMS smooth onset motion: CMG mass handling

#### **CMG INSTALL at ESP-2:**

SSRMS – smooth stop motion

#### **COMM PROTOCOL:**

Succinct and professional; SSRMS calls are top priority

\* Call ‘GCA Complete’ when SSRMS GCA is done

\* Call ‘All Stop’ for immediate SSRMS stop

Use Internal Coordinate system for GCAs

IVA is prime relay to MCC

#### **SUIT MAL PROTOCOL:**

Challenge-response led by IV or nominal suit

#### **CANON CABLES/CONNECTORS:**

Check pin straightness, No FOD in receptacle, EMI band, Proper bend radius

\* Inspect gloves for RTV and Vectran damage, report to MCC

#### **PGT OPS:**

Check settings with IV

Pull test on all socket installs

Turn count (count all turns at bolt vice RAD)

Red light – Low torque, green light – in torque window, Both – Hi torque

Cal Procedure – Ratchet Collar – Not motor, Speed Collar – Cal, Pull trigger

#### **KEEP OUT ZONES:**

\* Shuttle Payload Bay KOZ: antennas, silver Teflon, gold foil, wire harnesses, cables, connectors, and OBSS/SRMS composite sections

\* PLB No touch: monkey fur, LDR1 diffuser, OBSS saddle and MPM contacts, cameras, Ku-Band black and gold

Verify inhibits prior to removing/installing any hardware or connectors

#### **DAY/NIGHT TRANSITIONS: (IV will call)**

\* Lights, visor, check tools secure

#### **INGRESS PLAN:**

Leave 1 spare 85-ft tether outside A/L

\* Check PGT, tools, BRT tucked in

EV1 in first, then ether to D-ring extender

EV2 disconnect EV1 safety tether, connect it to left waist tether

EV2 disconnect own safety tether

EV2 in feet first with an EV1 assist

\* Check hatch seal clear before closing


\* Review during EMU P/B if time

## EVA 2 SUMMARY TIMELINE

PET TIME (HR : MIN)	13A.1 EVA 2				
	IV/SSRMS	PET	EV1 (FF/SSRMS)	PET	EV2 (SSRMS/FF)
00:00	SSRMS: APFR INSTALL	00:00	<b>EVA 2 EGRESS/SETUP</b> (00:50) POST DEPRESS and EGRESS (00:20) SETUP (00:30)	00:00	<b>EVA 2 EGRESS/SETUP</b> (00:50) POST DEPRESS and EGRESS (00:20) SETUP (00:30)
01:00	SSRMS: MANEUVER TO PAYLOAD BAY	00:50	<b>REMOVE FAILED CMG</b> (00:30)	00:50	<b>REMOVE FAILED CMG</b> (00:30)
02:00	IV: GO for ESP-3 heater power deact SSRMS: MANEUVER TO ESP-2	01:20	<b>TRANSFER NEW CMG to ESP-2</b> (01:30)	01:20	<b>TRANSFER NEW CMG to ESP-2</b> (01:30)
03:00		02:50	<b>REMOVE NEW CMG from ESP-2</b> (00:50)	02:50	<b>REMOVE NEW CMG from ESP-2</b> (00:50)
04:00	SSRMS: MANEUVER TO Z1	03:40	<b>INSTALL NEW CMG on Z1</b> (00:55)	03:40	<b>INSTALL NEW CMG on Z1</b> (00:55)
05:00	SSRMS: MANEUVER TO ESP-2	04:35	<b>INSTALL FAILED CMG on FSE (ESP-2)</b> (01:10)	04:35	<b>INSTALL FAILED CMG on FSE (ESP-2)</b> (01:10)
06:00	SSRMS: APFR EGRESS	05:45	<b>CLEANUP/INGRESS</b> (00:45) CLEANUP (00:25)  INGRESS and PRE REPRESS (00:20)	05:45	<b>CLEANUP/INGRESS</b> (00:45) CLEANUP (00:25)  INGRESS and PRE REPRESS (00:20)
	EVA Time 06:30	06:30		06:30	

## PRE EVA 2 TOOL CONFIG

### EV1


- Waist Tether (R D-ring to Safety tether)
- Waist Tether (L D-ring ext to MWS)
- D-ring Extender (2)
- 85-ft Safety Tether (R on extender)
- Adj (on wrist)
- MWS
- T-bar
- Rabbit Ear Wire Ties (2)
- RET (sm-sm) (2)
- RET (Lg-sm)
- Sm Trash Bag (R, inside) 
- Adj (2)
- Socket Caddy (L, inside)
- 7/16 x 12" wobble
- 7/16 x 6" wobble
- Swing Arm (R)
- RET (sm-sm)
- PGT S/N \_\_\_\_\_ w/battery
- Lg trash bag
- RET (sm-sm)
- BRT (L)
- RET (sm-sm)
- Wire Ties (3)

### External

- Spare 85-ft safety tether (on HR 0546)
- 55-ft safety tether hatch D-ring

Prior to EVA  
 Inspect ball stacks for loose fittings/screws  
 Inspect RET cord for damage  
 Inspect safety tethers and waist tethers load alleviating straps

### EV2

- Waist Tether (R D-ring to Safety tether)
- Waist Tether (L D-ring ext to MWS)
- D-ring Extender (2)
- 85-ft Safety Tether (R on extender)
- Adj (on wrist) (2)
- MWS
- T-bar
- Rabbit Ear Wire Ties (2)
- RET (sm-sm PIP pin)
- RET (sm-sm) (2)
- RET (Lg-sm)
- Sm Trash Bag (L, inside) 
- WIF Adapter
- Socket Caddy
- 7/16 x 12" wobble
- 7/16 x 2"
- Swing Arm (R)
- RET (sm-sm)
- PGT S/N \_\_\_\_\_ w/battery
- 7/16 x 6" wobble
- BRT (L)
- RET (sm-sm)
- Wire Ties (3)

### CREWLOCK

- Verify following item is in Staging Bag
- PGT S/N \_\_\_\_\_ w/battery
- In empty CL bag on endcone
- Spare RPCM (Ext Type V)  
 √IV caps and tape removed

### CREWLOCK

- CL Bag #1
  - RET (Lg-sm) on outside – take with bag
  - MUT EE – Ballstack on outside of bag
  - Wire Ties (2) thru grommets, twist then tie  
 MUT – Ballstack to bag
  - RET (sm-sm)
  - MUT EE
  - ISS Prybar
  - RAD
  - Digital Camera
  - Vice Grips
  - Adj tether to internal D-ring
- 
- CL Bag #3 (contingency) -*Aft/Zenith wall*
  - Adj (Lg-sm) on outside
  - Wire Tie Caddy
  - Connector Cleaner Tool Caddy
  - Connector Pin Straightener
  - EVA Ratchet
  - Socket Caddy
  - 7/16 x 6" wobble
  - 7/16 x 2"
  - 7/16 x 9" rigid
  - RAD
  - Ballstack
  - Adj tether to internal D-ring (2)
  - Spare 85-ft safety tether
- 
- D-ring Extender (on A/L D-ring)
- 
- Small ORU Bag (A/L zenith/fwd/stb; tied to HRs)
  - RET (Lg-sm) on outside
  - GPS Caps wire-tied together
  - RET (sm-sm) (2)

# EVA 2 INHIBIT PAD

## ORBITER

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

<b>ESP-3 (prior to CMG/FRAM remove – as late as possible)</b>		
		<u>SM 179 POWER TRANSFER</u>
IV	A15	1. APCU 1,2 CONV – OFF
	CRT	2. √PTU 1,2 APCU OUT VOLTS < 10 V
	A15	3. APCU 1 OUTPUT – OFF
	CRT	4. √PTU 1 APCU OUTPUT – OFF

## GROUND

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

## EVA 2 INHIBIT PAD (Cont)

### 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 enabled
    - B. No more than two arrays unshunted
    - C. No more than two arrays pointed < 90 deg from velocity vector
- OR
2. One or no PCUs operational in discharge mode and one of the following:
    - A. No more than two arrays unshunted
    - B. No more than two arrays pointed < 90 deg from velocity vector

#### ESP-2 FRAM Site #5 (prior to CMG/FRAM Install)

- IV
1. RPCM N1RS2\_B RPC 7 – Open, Close Cmd Inhibit
  2. RPCM S04B\_F RPC 11 – Open, Close Cmd Inhibit

#### Lab Window

- IV
1. Close window shutter

#### CMG-3 (at Egress)

- MCC-H
1. RPCM Z13B\_B RPC 17 – Open, Close Cmd Inhibit
  2. RPCM Z14B\_B RPC 12 – Open, Close Cmd Inhibit

#### KU-BAND (SGANT) ANTENNA

- MCC-H
- If EV crew < 3.3 ft from KU-BAND antenna
1. Park KU-BAND
    - 1.1 Pointing Mode – Inhibit
    - 1.2 PLC – Reset
    - 1.3 Autotrack Continuous Retry – Inhibit

### RSOS

#### SM Antennas

- MCC-M
1. Global Timing Sys 1(400.1 MHz) [GTS] – Deactivate
  2. ARISS – Deactivate

#### FGB Antennas

- MCC-M
1. ARISS – Deactivate
  2. ✓FGB KURS P [KYPC P] – Deactivated

#### FGB Thrusters

- MCC-M
1. ✓FGB MCS unpowered
  2. ✓All FGB Attitude Control Thruster Valves (eighty) – closed
  3. ✓FGB Attitude Control Manifold Valves – closed  
КШК1, КШК2, КШК4, КШК5, КШК9, ОКО3, ОКГ3, ОКО6, ОКГ6, ОКО7, ОКГ 7, ОКО8, ОКГ8

#### Soyuz Antennas

- MCC-M
1. ✓Soyuz KURS A [KYPC A] – Deactivated

#### Soyuz Thrusters

- MCC-M
1. ✓Soyuz manifolds (four) – closed  
ЭКО1, ЭКО2, ЭКГ1, ЭКГ2
  2. ✓Soyuz MCS unpowered
  3. ✓Soyuz Attitude Control Thruster Valves (fifty-two) – closed
  4. ✓Soyuz Main Engine Valves (K1,K2,K3,K4,K5,K6) – closed

## EVA 2 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. MLI handholds are not rated for crewmember translation loads
6. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged
7. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
8. Avoid contact with Vitrolube-coated OBSS striker bars
9. Velcro exposed to AO deteriorates rapidly; verify full and smooth velcro seams

### CAUTION

#### ISS Constraints

- A. Avoid inadvertent contact with
  1. Grapple fixture shafts (drylube)
  2. PIP pins
  3. MDM sunshade [PMA1]
  4. EVA Crane [PMA1]
  5. TCS Reflectors [PMA2, PMA3]
  6. APAS hardware [PMA2, PMA3]
  7. CETA Lights (Z-93 paint) [LAB, S1, Node 1]
  8. Deployed MISSEs [A/L]
  9. Passive UMAs
  10. MBS VDU, MCU, CRPCMs, and Cameras (taped radiative surfaces, silver Teflon)
  11. Deployed TUS cable
  12. S0 aft face Radiator
  13. GPS Antennas (S13 paint) [S0]
  14. UHF Antennas [LAB, P1]
  15. ETCS Radiators [S1, P1]
  16. EETCS/PV Radiator bellows and panels [P6, P4, S4, S6]
  17. SASA RF Group [Z1, S1, P6]
  18. Heat pipe radiators [Z1]
  19. PCU cathode and HCA ports [Z1]
  20. Ku-Band Antenna (SGANT) dish [Z1]
  21. CMG cover/shells [Z1]
  22. SSRMS Cameras
  23. Open CBM petal covers and LAB window shutter

### 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. 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
- E. Other
  1. ITT Cannon connector: do not turn collar from WHITE to BLACK without a mating half attached
  2. WIS Antennas: do not use as handholds [Node 1, P6, Z1]
  3. Lubricant from Ku-Band SGANT gimbals [Z1], CMGs [Z1], and RTAS Ground Strap fasteners [P6,P4,S4,S6] can contaminate EMU

## EVA 2 NOTES, CAUTIONS, AND WARNINGS (Cont)

### **CAUTION** (Cont)

#### **Shuttle Constraints**

- A. 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]
  - 4. Payload Bay wire harnesses, cables, and connectors
- B. 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]

### **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 566, A/L Tank 2 nad/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

### **WARNING** (Cont)

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

- D. RF Radiation Exposure
  - 1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1,P6]
  - 2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1,P6]
  - 3. Stay 1 ft from UHF Antenna when powered [LAB, P1]
- E. Sharp Edges
  - 1. Inner edges of WIF sockets
  - 2. Mating surfaces of EVA connectors. Avoid side loads during connector mating
  - 3. Back side of MMOD shield fasteners
  - 4. Spring loaded captive EVA fasteners (e.g., 6B-boxes, BMRRM); the end of the spring may protrude
  - 5. PMA umbilical launch restraints-exposed bolt threads
  - 6. Nickel coated braided copper Ground Straps may contain frayed wires [P6, P4, S4, S6]
  - 7. Solar Array Blanket Box [P6, S6]
  - 8. Keep hands away from SSRMS LEE opening, and snares



## EVA 2 NOTES, CAUTIONS, AND WARNINGS (Cont)

### **WARNING** (Cont)

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

##### F. Thermal

1. PMA handrails may be hot. Handling may need to be limited
2. Turn off glove heaters when comfortable temp reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
3. Uncovered trunnion pins may be hot
4. SSRMS/MBS operating Cameras and lights may radiate large amounts of heat
5. Stay 1 ft away from PMAs and MMOD shields > 270 degF if EMU sun visor up
6. Stay at least 1 ft away for no more than 15 min from PMAs and MMOD shields > 300 degF if EMU sun visor up
7. Stay 0.5 ft away from PMA and MMOD shields > 325 degF
8. Do not touch EMU protective visor if temp has been < -134 for > 15 min
9. No EMU TMG contact of PMAs and MMOD shields when temp > 320 degF
10. No EMU boot contact with foot restraint when temp < -120 degF or > 200 degF

### **WARNING** (Cont)

#### **Shuttle Constraints**

##### A. 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]

##### B. Pinch

1. PRLA operation [PLB]

##### C. 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)**

##### D. 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

##### E. Thermal

1. Illuminated PLB lights; do not touch
2. OBSS grapple fixture shafts/cams may be hot. Limit handling if required

##### F. Thruster Contamination

1. Stay out of the immediate vicinity of leaking jet or APU
2. Stay 27 ft from PRCS when powered
3. Stay 3 ft from VRCS when powered
4. Stay 3 ft from APU when operating

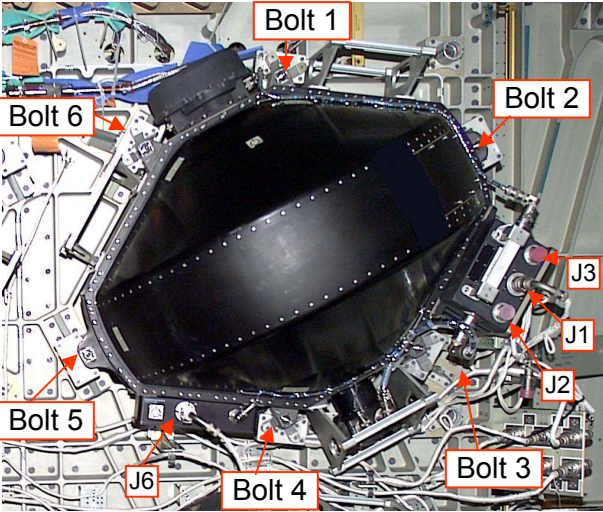
# EVA 2 EGRESS/SETUP (00:50)

IV/RMS	EV1 (FF)	EV2 (FF)
<p><u>POST DEPRESS</u> (<u>DEPRESS/REPRESS</u> Cue Card)</p> <p>SSRMS Initial Config: 1.300 CMG R&amp;R EVA SUPPORT: EVA 2 Start position</p> <p>IV: WVS Software: Select page – RF camera Sel ‘Advanced Controls’ S-Band Level (two) – Max (reqd after EV egress airlock)</p> <p>Verify good WVS video from both EVs</p>	<p><u>POST DEPRESS</u> (<u>DEPRESS/REPRESS</u> Cue Card)</p> <div> <p>The diagram illustrates the initial tether configuration for two Extravehicular Activities (EVs). On the left, EV2 is shown with a rectangular box labeled 'EV2'. To its left is a circular component labeled '85', representing an 85-foot tether. Below the tether are labels 'R' and 'L'. A similar setup is shown for EV1 on the right, with a rectangular box labeled 'EV1', a circular component labeled '85', and labels 'R' and 'L'. The tethers are connected to a central point on the right side of the diagram, which is partially obscured by a curved line representing the airlock structure.</p> </div> <p style="text-align: center;">Initial Tether Configuration</p> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. ✓ Initial tether configuration, hooks locked, reels unlocked</li> <li>2. On EV2 GO, release left waist tether from A/L D-ring</li> <li>3. Egress Airlock with CL Bag #1</li> <li>4. ✓ SAFER MAN ISOL vlv – OP (dn) and HCM (dn)</li> <li>5. Close Hatch Thermal Cover</li> </ol>	<p><u>POST DEPRESS</u> (<u>DEPRESS/REPRESS</u> Cue Card)</p> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. ✓ Initial tether configuration, hooks locked, reels unlocked</li> <li>2. Hatch Thermal cover – open</li> <li>3. Egress airlock</li> <li>4. Attach RT 85-ft safety tether retracting end to A/L HR 0550, LOCK hook, reel unlocked</li> <li>5. Attach EV1 85-ft safety tether to A/L HR 0554, LOCK hook</li> <li>6. Give EV1 GO to release from A/L D-ring</li> <li>7. ✓ SAFER MAN ISOL vlv – OP (dn) and HCM (dn)</li> </ol>

**EVA 2 EGRESS/SETUP (Cont)**

<b>IV/RMS</b>	<b>EV1 (FF)</b>	<b>EV2 (FF)</b>
<p>SSRMS: On EV2 GO, GCA to APFR INSTALL position</p> <p>MCC-H: Perform CMG-3 Power Inhibits per EVA INHIBIT PAD</p>	<p><u>SETUP</u></p> <ol style="list-style-type: none"> <li>6. Translate to Z1 worksite</li> <li>7. Reconfigure IAPFR in from Z1 WIF 01 to WIF 05 [11, OO, F, 12]; pull test</li> <li>8. Verify on IAPFR that the Boot Clips are set for large and PIP pin installed on toe bar</li> <li>9. Temp stow CL Bag on Z1 HR 6051</li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <p>Ground strap is located on zenith center of Z1 thermal blanket</p> <ol style="list-style-type: none"> <li>10. Verbalize CMG shroud configuration and removal actions to IV; need to return MLI at end of R&amp;R to starting config</li> <li>11. Restrain CMG thermal shroud by attaching Adj equip tether to Z1 HR 6035 or CMG #2. Attach 2nd adj equip tether to HR on CMG #4 (nadir, stbd CMG)</li> <li>12. Perform WVS survey of failed CMG on Z1  <input type="checkbox"/> WVS complete</li> </ol>	<p><u>SETUP</u></p> <ol style="list-style-type: none"> <li>8. <b>GCA SSRMS</b> for install as required</li> <li>9. Install WIF adapter on SSRMS, tether point toward EE</li> <li>10. Retrieve APFR and Ingress Aid from A/L WIF 11</li> <li>11. Install APFR [12, PP, F, 4] (w/Ingress Aid); pull test</li> <li>12. Fold Ingress Aid flat</li> </ol> <ol style="list-style-type: none"> <li>13. Translate to Z1 shroud removal worksite</li> <li>14. Fairlead to HR 6051 (w/adj) over top of Z1 prior to translating port</li> <li>15. Assist EV1 as required to remove Velcro and peel back Z1 CMG thermal shroud to gain access to CMG #3</li> </ol>

## REMOVE FAILED CMG (00:30)

IV/RMS	EV1 (FF)	EV2 (FF)
<p>1. IV: Verify with MCC inhibits for CMG 3 prior to EV1 action</p>  <p>Loosen CMG Bolts 2 turns:  <input type="checkbox"/>1   <input type="checkbox"/>2   <input type="checkbox"/>3   <input type="checkbox"/>4   <input type="checkbox"/>5   <input type="checkbox"/>6</p> <p>Remove CMG Bolts (Dave does last bolt):  <input type="checkbox"/>1   <input type="checkbox"/>2   <input type="checkbox"/>3   <input type="checkbox"/>4   <input type="checkbox"/>5   <input type="checkbox"/>6</p> <p>WVS View should include:</p> <ul style="list-style-type: none"> <li>• Connector stow</li> <li>• 6 bolt stanchions</li> </ul> <p><u>NOTE:</u> Leave CL Bag on Z1</p>	<p><u>REMOVE FAILED CMG</u></p> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> <li>On IV GO, demate connector:  <input type="checkbox"/>J6 – tuck behind CMG #4 HR</li> <li>Demate connectors:  <input type="checkbox"/>J1   <input type="checkbox"/>J2   <input type="checkbox"/>J3</li> <li>Temp stow connectors (3) to HR on CMG #4, wire tie as required</li> <li>Ingress IAPFR (WIF 05)</li> <li>Configure PGT with 12-in socket; pull test</li> <li><b>PGT[B4, CCW2, 30.5]-12Ext-7/16:</b> Loosen CMG bolts (3), 2 turns each, any order</li> <li>When all 6 bolts loosened, wiggle CMG</li> <li>Tether to shims</li> <li><b>PGT[A4, CCW2, 30.5]-12Ext-7/16:</b> Remove shims (2), place in trash bag, expect 10-14 turns, any order  <input type="checkbox"/>3c   <input type="checkbox"/>3d</li> <li>Tether to CMG HR using Lg-sm RET prior to removing last bolt</li> <li><b>PGT[B4, CCW2, 30.5]-12Ext-7/16:</b> Remove CMG bolts (3), expect 9-13 turns, any order</li> <li>Remove CMG from soft dock, expect 16 lb force</li> <li>Position CMG for temp stow</li> <li>On EV2 GO, release CMG tether</li> <li>Remove 12" socket from PGT, stow on socket caddy; install 6" socket on PGT; pull test</li> <li>Perform WVS survey of CMG location after removal of failed CMG  <input type="checkbox"/> WVS survey complete</li> <li>Inspect gloves; status MCC on RTV and Vectran state</li> </ol>	<p><u>REMOVE FAILED CMG</u></p> <ol style="list-style-type: none"> <li>Set up MUT-Ballstack-MUT on HR 6050 (above Z1 Stbd Toolbox)</li> <li>Set up Lg-sm RET from CL Bag #1 on HR 6050</li> <li>Fairlead (poor man's) to keep safety tether clear of worksite</li> <li>BRT to CMG #2 HR (or Z1 HR 6036)</li> <li><b>PGT[B4, CCW2, 30.5]-6Ext-7/16:</b> Loosen CMG bolts (3), 2 turns each, any order</li> <li>When all 6 bolts loosened, wiggle CMG</li> <li>Tether to shims</li> <li><b>PGT[A4, CCW2, 30.5]-6Ext-7/16:</b> Remove shims (2), place in trash bag, expect 10-14 turns, any order  <input type="checkbox"/>6c   <input type="checkbox"/>6d</li> <li><b>PGT[B4, CCW2, 30.5]-6Ext-7/16:</b> Remove CMG bolts (3), expect 9-13 turns, Bolt 6 last</li> <li>Assist EV1 in CMG until clear of structure</li> <li>Stow CMG on MUT EE</li> <li>Tether CMG to Z1 HR</li> <li>Give EV1 GO to release</li> <li>Inspect gloves; status MCC on RTV and Vectran state</li> </ol>

**TRANSFER NEW CMG TO ESP-2 (01:30)**

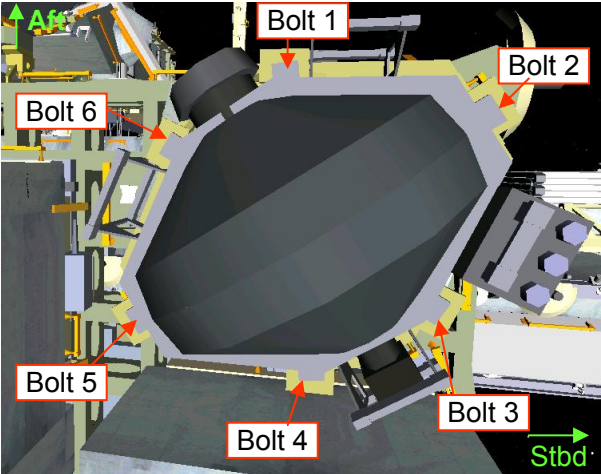
IV/RMS	EV1 (FF)	EV2 (SSRMS)
<div> </div> <p>IV: Perform ESP-3 Inhibits per EVA INHIBIT PAD <b>SM 179 POWER TRANSFER</b></p> <p>A15 1. APCU 1,2 CONV – OFF CRT 2. √PTU 1,2 APCU OUT VOLTS &lt; 10 V A15 3. APCU 1 OUTPUT – OFF CRT 4. √PTU 1 APCU OUTPUT – OFF</p> <p>Report Inhibits Complete to MCC and EV crewmembers</p>	<p><u>CMG/FSE RELEASE FROM ESP-3</u></p> <ol style="list-style-type: none"> <li>1. Translate to Airlock Hatch for Tether Config</li> <li>2. Retrieve spare 85-ft tether from airlock HR 0546; inspect load alleviating strap</li> <li>3. Translate to PMA/ODS tether swap location, PMA HR 402</li> <li>4. Tether swap to spare 85-ft tether; LOCK hook, reel unlocked</li> <li>5. Translate to ESP-3 via port side, fairlead at fwd PLB/ODS truss (w/Adj)</li> </ol> <p><u>NOTE:</u> Watch out for PLB KOZ and monkey fur</p> <ol style="list-style-type: none"> <li>6. Fairlead safety tether at port fwd corner of ESP-3</li> <li>7. Remove CMG shroud straps (3), stow in Lg trash bag</li> <li>8. Remove MLI</li> </ol> <div> </div> <p><u>POWER CABLE RECONFIG ON ESP-3</u></p> <ol style="list-style-type: none"> <li>9. Translate to ESP-3 KYA Connector Box</li> <li>10. On IV GO, disconnect shuttle power cable (P1) from connector box (J1)</li> <li>11. Mate to dummy receptacle on KYA, coil cable away from ESP-3</li> <li>12. Perform WVS survey</li> <li>13. Translate to ESP-3 PDU</li> </ol>	<p><u>CMG/FSE RELEASE FROM ESP-3</u></p> <ol style="list-style-type: none"> <li>1. Translate to Airlock Hatch for Tether Config; pick up adj fairlead from Z1</li> <li>2. Attach left waist tether to HR</li> <li>3. Tether swap from A/L tether to SSRMS</li> <li>4. Ingress SSRMS APFR</li> <li>5. Attach MWS EE to Ingress Aid</li> <li>6. Give SSRMS GO to mnvr to payload bay; check cooling during SSRMS mnvr</li> </ol> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><u>CAUTION</u></p> <p style="text-align: center;">Do not touch APFR Ingress Aid shaft for more than 2.5 min after first 1.5 hr exposed</p> </div> <ol style="list-style-type: none"> <li>7. <b>GCA SSRMS</b> to CMG/FRAM removal location</li> <li>8. Egress SSRMS</li> <li>9. Help EV1 w/MLI removal; use FRAM HR for shroud straps (not CMG)</li> <li>10. Ingress SSRMS</li> <li>11. Attach RET to CMG (HR between EA and THA boxes)</li> <li>12. Verify safety tether clear of worksite</li> <li>13. Configure temp control, gloves, visor for SSRMS mnvr</li> </ol>

## TRANSFER NEW CMG TO ESP-2 (01:30) (Cont)

IV/RMS	EV1 (FF)	EV2 (SSRMS)						
<div> </div> <p>SSRMS: On EV2 GO, ESP-2 mnvr with new CMG</p> <p>IV: Verify ESP-2 FRAM Site #5 inhibits in place</p> <ol style="list-style-type: none"> <li>1. RPCM N1RS2_B RPC 7 – Open, Close Cmd Inhibit</li> <li>2. RPCM S04B_F RPC 11 – Open, Close Cmd Inhibit</li> </ol> <p>IV: Record Torque/Turn data for FRAM install:</p> <table border="1"> <thead> <tr> <th></th> <th>Torque</th> <th>Turns</th> </tr> </thead> <tbody> <tr> <td>FRAM Bolt</td> <td></td> <td></td> </tr> </tbody> </table>		Torque	Turns	FRAM Bolt			<ol style="list-style-type: none"> <li>14. Disconnect UMA power cable (P1) from dummy receptacle</li> <li>15. Disconnect shuttle power cable (P2) from PDU J1; mate to dummy receptacle</li> <li>16. Mate UMA power cable (P1) to PDU J1</li> <li>17. Verify ESP-3 clear to come out of bay</li> <li>18. Verify safety tether clear of worksite</li> <li>19. On IV and EV2 GO, release FRAM bolt</li> <li>20. <b>PGT [A4, CCW2, MTL 30.5]-6 Ext 7/16:</b> Release FRAM Primary Bolt, push while turning to release ARD (~10 lb), approx 11 turns to hard stop</li> <li>21. Assist EV2 as required</li> <li>22. Perform Tool Inventory</li> </ol> <p><u>CMG/FSE INSTALL ON ESP-2</u></p> <ol style="list-style-type: none"> <li>23. Retrieve Adj fairlead</li> <li>24. Translate to PMA/ODS tether swap location</li> <li>25. Tether swap to A/L tether</li> <li>26. Translate to ESP-2 Nadir Site #5</li> <li>27. Stow spare safety tether and Lg trash bag at A/L</li> <li>28. Verify safety tether clear of worksite</li> <li>29. <b>GCA SSRMS</b> to CMG/FSE Install worksite</li> <li>30. Assist EV2 to soft dock CMG/FSE</li> <li>31. <b>PGT [A4, CW2, MTL 30.5]-6 Ext 7/16:</b> Drive FRAM Primary Bolt, push while turning to release ARD (~10 lb), approx 11 turns to hard stop √FRAM Indicator in locked position; white edge exposed</li> <li>32. Inspect gloves; status MCC on RTV and Vectran state</li> </ol>	<ol style="list-style-type: none"> <li>14. Give EV1 and IV GO for FRAM release</li> <li>15. Remove Integrated Assembly (IA) from passive FRAM; remove restrained by magnetic soft dock (15-20 lb reqd for removal)</li> </ol> <p><u>CMG/FSE INSTALL ON ESP-2</u></p> <ol style="list-style-type: none"> <li>16. Give SSRMS GO to mnvr to ESP-2</li> <li>17. Align CMG/FRAM with FRAM site #5 on ESP-2</li> <li>18. Soft dock CMG/FSE; magnetic soft dock 15-20 lb</li> <li>19. Pull test of CMG and FRAM</li> <li>20. Inspect gloves; status MCC on RTV and Vectran state</li> </ol>
	Torque	Turns						
FRAM Bolt								

## REMOVE NEW CMG (00:50)

I

IV/RMS	EV1 (FF)	EV2 (SSRMS)
<p>Loosen CMG Bolts 2 turns:  <input type="checkbox"/>1   <input type="checkbox"/>2   <input type="checkbox"/>3   <input type="checkbox"/>4   <input type="checkbox"/>5   <input type="checkbox"/>6</p>  <p>Remove CMG Bolts (Rick does last bolt):  <input type="checkbox"/>1   <input type="checkbox"/>2   <input type="checkbox"/>3   <input type="checkbox"/>4   <input type="checkbox"/>5   <input type="checkbox"/>6</p> <p>SSRMS: On EV2 GO, mnvr to Z1 ACCESS position</p>	<p><u>REMOVE NEW CMG</u></p> <ol style="list-style-type: none"> <li>1. BRT to CMG HR as required</li> <li>2. <b>PGT[B4, CCW2, 30.5]-6Ext-7/16:</b> Loosen CMG bolts (3), 2 turns each, any order</li> <li>3. When all 6 bolts loosened, wiggle CMG</li> <li>4. Tether to shims</li> <li>5. <b>PGT[A4, CCW2, 30.5]-6Ext-7/16:</b> Remove shims (2), place in trash bag, expect 10-14 turns, any order:  <input type="checkbox"/>6c   <input type="checkbox"/>6d</li> <li>6. <b>PGT[B4, CCW2, 30.5]-6Ext-7/16:</b> Remove CMG bolts (3), expect 9-13 turns, Bolt 2 last</li> <li>7. Verify safety tether clear of CMG worksite</li> <li>8. Verify CMG clear of all straps and shroud</li> <li>9. Assist EV2 on CMG removal</li> <li>10. Inspect gloves; status MCC on RTV and Vectran state</li> <li>11. Drop off Lg trash bag at A/L and safety tether at A/L HR 0546</li> </ol>	<p><u>REMOVE NEW CMG</u></p> <ol style="list-style-type: none"> <li>1. Configure PGT w/12" socket and stow 6" on socket caddy; pull test</li> <li>2. <b>PGT[B4, CCW2, 30.5]-12Ext-7/16:</b> Loosen CMG bolts (3), 2 turns each, any order</li> <li>3. When all 6 bolts loosened, wiggle CMG</li> <li>4. Tether to shims</li> <li>5. <b>PGT[A4, CCW2, 30.5]-12Ext-7/16:</b> Remove shims (2), place in trash bag, expect 10-14 turns, any order:  <input type="checkbox"/>3c   <input type="checkbox"/>3d</li> <li>6. Verify tethered to CMG HR using Lg/Sm RET prior to last bolt removal</li> <li>7. <b>PGT[B4, CCW2, 30.5]-12Ext-7/16:</b> Remove CMG bolts (3), expect 9-13 turns, any order</li> <li>8. Stow 12" socket on socket caddy; pull test</li> <li>9. Install 6" socket on PGT, pull test</li> <li>10. Remove CMG from FSE</li> <li>11. Give SSRMS GO to mnvr to Z1</li> </ol>

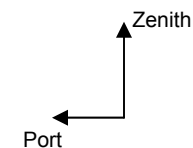
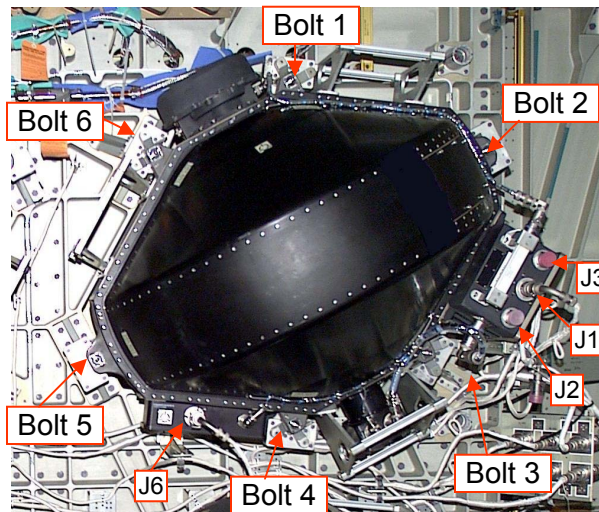
**INSTALL NEW CMG ON Z1 (00:55)**

IV/RMS	EV1 (FF)	EV2 (SSRMS/FF)												
<p>SSRMS: On EV2 GO, mnvr to CMG HANDOFF position</p> <p>Tighten CMG Bolts 2 turns (Dave does first bolt):  <input type="checkbox"/>1    <input type="checkbox"/>2    <input type="checkbox"/>3    <input type="checkbox"/>4    <input type="checkbox"/>5    <input type="checkbox"/>6</p> <p>IV: Record installation torques/turns for CMG:</p> <table border="1"> <tr><td><input type="checkbox"/> Bolt 1</td><td></td></tr> <tr><td><input type="checkbox"/> Bolt 2</td><td></td></tr> <tr><td><input type="checkbox"/> Bolt 3</td><td></td></tr> <tr><td><input type="checkbox"/> Bolt 4</td><td></td></tr> <tr><td><input type="checkbox"/> Bolt 5</td><td></td></tr> <tr><td><input type="checkbox"/> Bolt 6</td><td></td></tr> </table>	<input type="checkbox"/> Bolt 1		<input type="checkbox"/> Bolt 2		<input type="checkbox"/> Bolt 3		<input type="checkbox"/> Bolt 4		<input type="checkbox"/> Bolt 5		<input type="checkbox"/> Bolt 6		<p><u>INSTALL NEW CMG</u></p> <ol style="list-style-type: none"> <li>Translate to Z1 worksite</li> <li>Check for FOD in CMG cavity before installation</li> <li>Actuate plungers with RET hook (4); Corners 1, 3, 4, 6</li> <li>Translate to Node 1 HR 107 (aft/port); to help SSRMS w/views; GCA as needed</li> </ol> <p><u>NOTE:</u> Watch clearance of SSRMS wrist cluster, EV2, CMG with Z1 aft face</p> <ol style="list-style-type: none"> <li>Ingress IAPFR (WIF 05)</li> <li>Attach Lg/Sm RET to CMG</li> <li>Give EV2 GO to release RET from CMG</li> <li>Receive CMG from EV2</li> <li>Give EV2 GO to release CMG</li> </ol> <ol style="list-style-type: none"> <li>Install CMG into soft dock position on Z1. Expect 16 lb force; use 15-25 deg tilt</li> <li><b>PGT[B6, CW2, 30.5]-6Ext-7/16:</b> Install CMG bolts (3), 2 turns each</li> <li><b>PGT[B6, CW2, 30.5]-6Ext-7/16:</b> Install CMG bolts (3), expect 9-13 turns to a torque stall</li> </ol> <p>← <input type="checkbox"/> Report torque/turns</p> <ol style="list-style-type: none"> <li>Remove tether from CMG</li> </ol>	<p><u>INSTALL NEW CMG</u></p> <ol style="list-style-type: none"> <li>SSRMS mnvr to Z1</li> <li>Watch all SSRMS clearances at Z1 worksite as reqd</li> <li><b>GCA SSRMS</b> to Handoff position</li> <li>Position CMG for handoff (rotate 180); give EV1 GO to tether to CMG</li> <li>On EV1 GO, release RET from CMG</li> <li>Hand CMG to EV1; release on EV1 GO</li> <li><b>GCA SSRMS</b> to APFR Egress</li> <li>Egress SSRMS APFR</li> <li>Assist EV1 with CMG tilt</li> <li>BRT to Z1 HR 6036</li> <li><b>PGT[B6, CW2, 30.5]-6Ext-7/16:</b> Install CMG bolts (3), 2 turns each</li> <li><b>PGT[B6, CW2, 30.5]-6Ext-7/16:</b> Install CMG bolts (3), expect 9-13 turns to a torque stall</li> </ol> <p>← <input type="checkbox"/> Report torque/turns</p>
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<input type="checkbox"/> Bolt 4														
<input type="checkbox"/> Bolt 5														
<input type="checkbox"/> Bolt 6														



## INSTALL NEW CMG ON Z1 (00:55) (Cont)

IV/RMS	EV1 (FF)	EV2 (SSRMS/FF)
<p>IV: Give MCC-H GO for CMG3 power up</p>	<p>14. Remove Connector caps (3); stow in trash bag or on MWS  <input type="checkbox"/> J1            <input type="checkbox"/> J2            <input type="checkbox"/> J3</p> <p>16. Mate connectors:  <input type="checkbox"/> J1            <input type="checkbox"/> J2            <input type="checkbox"/> J3</p> <p>17. Confirm J1, J2, J3 complete, GO for EA power up</p> <p>18. Inspect gloves; status MCC on RTV and Vectran state</p>	<p>13. Remove connector cap (1); stow in trash bag or on MWS  <input type="checkbox"/> J6</p> <p>14. Mate connector:  <input type="checkbox"/> J6</p> <p>15. Confirm J6 complete, GO for THA power up</p> <p>16. Inspect gloves; status MCC on RTV and Vectran state</p> <p>17. Perform WVS survey of final CMG configuration  <input type="checkbox"/> WVS survey complete</p>

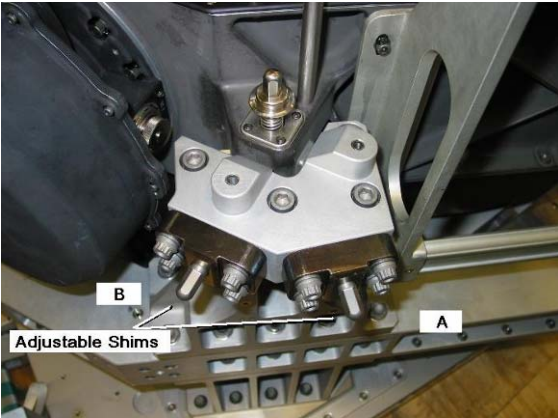


**INSTALL FAILED CMG ON FSE – ESP-2 (01:10)**

I

IV/RMS	EV1 (FF)	EV2 (SSRMS)
<p>SSRMS: On EV2 GO, mnvr to CMG HANDOFF position</p> <p>SSRMS: On EV2 GO, ESP-2 mnvr with FAILED CMG</p> <p>IV: Verify with MCC good CMG power up</p> <p style="text-align: center;"><u>NOTE</u> Bolt 1 should align over FRAM Bolt; torquer aft, slightly port</p> <p>Tighten CMG Bolts 2 turns (Rick does first bolt):  <input type="checkbox"/>1    <input type="checkbox"/>2    <input type="checkbox"/>3    <input type="checkbox"/>4    <input type="checkbox"/>5    <input type="checkbox"/>6</p>	<ol style="list-style-type: none"> <li>1. Ingress IAPFR (WIF 05)</li> <li>2. Receive CMG from EV2; tether to CMG</li> <li>3. Hold until EV2 ready for handoff</li> <li>4. Hand CMG to EV2</li> <li>5. Release tether from CMG on EV2 GO</li> </ol> <p>← <input type="checkbox"/></p> <p><u>REPLACE Z1 THERMAL SHROUD</u></p> <ol style="list-style-type: none"> <li>6. Verify safety tether clear prior to shroud closure</li> <li>7. Retrieve Adj tethers used to hold shroud</li> <li>8. Replace Z1 thermal shroud and attach Velcro</li> <li>9. Give IV CMG INSTALL COMPLETE</li> <li>10. Re-position IAPFR back to Z1 WIF01 [12, PP, F, 12]</li> <li>11. Retrieve CL Bag, MUT-Ballstack-MUT</li> <li>12. Complete Tool Inventory</li> <li>13. Translate to A/L; temp stow CL Bag</li> <li>14. Translate to ESP-2</li> </ol> <p><u>INSTALL FAILED CMG</u></p> <ol style="list-style-type: none"> <li>15. Verify safety tether clear of worksite</li> <li>16. <b>GCA SSRMS</b> to CMG Install position</li> <li>17. Assist EV1 on installing CMG into FSE</li> <li>18. <b>PGT[B7, CW2, 30.5]-6Ext-7/16:</b> Install CMG bolts (3), 2 turns each</li> </ol>	<ol style="list-style-type: none"> <li>1. Retrieve failed CMG from temp stow</li> <li>2. Hand CMG to EV1</li> <li>3. Attach MWS EE to Ingress Aid</li> <li>4. Ingress SSRMS APFR</li> <li>5. <b>GCA SSRMS</b> to CMG Handoff</li> <li>6. Give EV1 GO for hand off of CMG</li> <li>7. Tether to CMG using Lg-sm RET</li> <li>8. Receive CMG from EV1</li> <li>9. Give EV1 GO to release tether</li> <li>10. Give SSRMS GO to mnvr to ESP-2</li> </ol> <p><u>INSTALL FAILED CMG</u></p> <ol style="list-style-type: none"> <li>11. Verify safety tether clear of worksite</li> <li>12. Rotate CMG as required, insert CMG into FSE</li> <li>13. <b>PGT[B7, CW2, 30.5]-6Ext-7/16:</b> Install CMG bolts (3), 2 turns each</li> </ol>

# INSTALL FAILED CMG ON FSE – ESP-2 (01:10) (Cont)

IV/RMS	EV1 (FF)	EV2 (SSRMS)																																				
<p>IV: Record installation <b>turns/torques</b> for CMG:</p> <table border="1"> <tr> <td><input type="checkbox"/> Bolt 1</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Bolt 2</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Bolt 3</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Bolt 4</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Bolt 5</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Bolt 6</td> <td></td> </tr> </table>	<input type="checkbox"/> Bolt 1		<input type="checkbox"/> Bolt 2		<input type="checkbox"/> Bolt 3		<input type="checkbox"/> Bolt 4		<input type="checkbox"/> Bolt 5		<input type="checkbox"/> Bolt 6		<p>19. <b>PGT[B7, CW2, 30.5]-6Ext-7/16:</b> Torque CMG bolts (3), expect 9-13 turns to a torque stall</p> <p>← <input type="checkbox"/> Report torque/turns</p> <p>20. <b>PGT[A3, CCW1, 30.5]-6Ext-7/16:</b> Report torque/turns</p> <table border="1"> <thead> <tr> <th></th> <th></th> <th>6a</th> <th>6b</th> </tr> </thead> <tbody> <tr> <td>i)</td> <td>Drive adjustable shim bolts (2), to contact or torque stall, no pattern, min 1 turn</td> <td></td> <td></td> </tr> <tr> <td>ii)</td> <td>Rotate <b>CW1</b> 1/2 turn</td> <td></td> <td></td> </tr> </tbody> </table>			6a	6b	i)	Drive adjustable shim bolts (2), to contact or torque stall, no pattern, min 1 turn			ii)	Rotate <b>CW1</b> 1/2 turn			<p>14. <b>PGT[B7, CW2, 30.5]-6Ext-7/16:</b> Torque CMG bolts (3), expect 9-13 turns to a torque stall</p> <p>← <input type="checkbox"/> Report torque/turns</p> <p>15. <b>PGT [A3, CCW1, 30.5]-6Ext-7/16:</b> Report torque/turns</p> <table border="1"> <thead> <tr> <th></th> <th></th> <th>3a</th> <th>3b</th> </tr> </thead> <tbody> <tr> <td>i)</td> <td>Drive adjustable shim bolts (2), to contact or torque stall, no pattern, min 1 turn</td> <td></td> <td></td> </tr> <tr> <td>ii)</td> <td>Rotate <b>CW1</b> 1/2 turn</td> <td></td> <td></td> </tr> </tbody> </table>			3a	3b	i)	Drive adjustable shim bolts (2), to contact or torque stall, no pattern, min 1 turn			ii)	Rotate <b>CW1</b> 1/2 turn		
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	<p>21. Install CMG MLI                  22. Give IV GO for ESP-2 powerup                  23. Inspect gloves; status MCC on RTV and Vectran state</p>	<p>16. Remove RET tether from CMG                  17. Assist EV1 with CMG MLI Install                  18. Inspect gloves; status MCC on RTV and Vectran state</p>																																				

## CMG R&R TASK DATA SHEET

### Tools:

EV1 (FF)	EV2 (SSRMS)
PGT	PGT
7/16 (wobble) socket – 12 ext	7/16 (wobble) socket – 6 ext
RAD – 2-in ext	

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
CMG at Z1 Bolts		7/16	6	24.0	19.4	26.7 <sup>release</sup> 37.08 <sup>install</sup>	10
CMG Shims (fixed, Z1)		7/16	4	5.0 grd	6.3	9.17	10.9
CMG Shims (fixed, FSE)		7/16	4	5.0 grd	6.3	9.17	10.9
CMG at FSE Bolts		7/16	6	25.5	19.4	38.25	10
CMG Shims (adjustable)		7/16	4	4.8 (CCW)	N/A	6.8	2-5
FRAM Primary Drive Bolt	FRAM Activation Drive Lock	7/16"	1	6.3	6.3	21	11.2

### EVA Connectors:

Harness	From	To	Conn Size	Function
CMG J6	Failed CMG, P6	New CMG, P6	15	PWR to THA
CMG J1	Failed CMG, P1	New CMG, P1	15	PWR to EA
CMG J2	Failed CMG, P2	New CMG, P2	15	Primary Data Bus, LB GNC-1, Channel A
CMG J3	Failed CMG, P3	New CMG, P3	15	Secondary Data Bus, LB GNC-1, Channel B

### Foot Restraints:

Task	WIF	APFR Setting
ALL	SSRMS	12, PP, F, 4
Z1 Ops	Z1 WIF 05	11, OO, F, 12

### Warnings:

- The pop-up spring on the CMG captive EVA fasteners (CMG Bolts 1-6) presents a puncture hazard

### Cautions:

- Avoid inadvertent contact with CMG
- CMG Shims must be removed within 2 hr of CMG powerdown on Z1
- Equal force should be exerted by crew in order to prevent binding when removing/installing the CMG from its mounting on Z1 and the FSE
- CMG may have oily residue around the Torque Module Assembly, avoid contact (may cause damage to other ORUs through cross-contamination)
- Avoid contact with Optical Solar Reflector Tiles on Z1 heat pipe radiators at the DDCU-HP and RPDA's. These items can be damaged by kick loads
- Fixed shim on Bolt 3 (3c) needs 12" socket

### Notes:

- 4 of 6 CMG bolts required for on-orbit structural loads (non-operational)
- ESP2 FRAM site 5 inhibits also take out power for site 2 (currently VSSA FSE)
- Failed CMG s/n: 0104; New CMG s/n: 0105
- FRAM Contingency pin access on ESP2 is 3 of 4 (aft, port pin not accessible) – 3 of 4 is required

### CMG-3 Inhibits:

- MCC-H
- Verify EA Power Removal and Inhibit  
S0:EPS:RPCM Z13B B: RPC 17  
RPCM Z13B B RPC 17  
√RPC Position – Op  
√Close Cmd – Inh
  - Verify THA Power Removal and Inhibit  
Z1:EPS:RPCM Z14B B: RPC 12  
RPCM Z14B B RPC 12  
√RPC Position – Op  
√Close Cmd – Inh


**CLEANUP/INGRESS (00:45)**

I


IV/RMS	EV1	EV2
<p>SSRMS: On EV2 GO, mnvr to APFR EGRESS position</p> <p>IV: Perform WVS PWRDN (PHOTO/TV, <u>WVS CUE CARD</u>)</p> <p>SSRMS: On EV2 GO, mnvr to EVA 2 end position</p> <p>IV: Set 2-min timer after both EV1 and EV2 report WATER OFF</p>	<p><u>CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Perform tool inventory</li> <li>2. Translate to Airlock</li> <li>3. If time, take photos of MISSEs 3 &amp; 4, both sides, using EVA Digital Camera</li> </ol> <p><u>INGRESS</u></p> <ol style="list-style-type: none"> <li>4. On IV GO, open thermal cover</li> <li>5. Stow CL Bag #1 in A/L</li> <li>6. Ingress A/L</li> <li>7. Attach left waist tether to A/L D-ring extender</li> <li>8. Give EV2 GO for tether ops</li> <li>9. Remove SCU from stowage pouch</li> <li>10. Remove DCM cover, Velcro to DCM</li> <li>11. Connect SCU to DCM; √SCU locked</li> <li>12. DCM: WATER – OFF</li> <li>13. Close thermal cover, attach Velcro strap</li> <li>14. Verify all hardware is clear of hatch</li> <li>15. EV Hatch – close and lock</li> </ol> <p>Go to PRE REPRESS portion of {CREWLOCK <u>DEPRESS/REPRESS CUE CARD</u>} (SODF: ISS EVA SYS: EVA PREP/POST)</p>	<p><u>CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. <b>GCA SSRMS</b> to cleanup position (near A/L WIF 11)</li> <li>2. Tether swap to A/L; remove safety tether from SSRMS</li> <li>3. Remove APFR and ingress aid</li> <li>4. Stow APFR and ingress aid in A/L WIF 11; [3, PP, F, 6]</li> <li>5. Remove WIF Adapter, stow in trash bag or on RET</li> <li>6. Release SSRMS from EVA activities</li> <li>7. Perform tool inventory</li> <li>8. If time, take MISSE photos</li> <li>9. Translate to A/L hatch</li> </ol> <p><u>INGRESS</u></p> <ol style="list-style-type: none"> <li>9. After EV1 GO, remove EV1 85-ft tether from A/L</li> <li>10. Hook to EV2 D-ring extender</li> <li>11. Remove EV2 85-ft tether from A/L</li> <li>12. Ingress A/L</li> <li>13. Stow items as reqd</li> <li>14. Remove SCU from stowage pouch</li> <li>15. Remove DCM cover, Velcro to DCM</li> <li>16. Connect SCU to DCM; √SCU locked</li> <li>17. DCM: WATER – OFF</li> </ol> <p>Go to PRE REPRESS portion of {CREWLOCK <u>DEPRESS/REPRESS CUE CARD</u>} (SODF: ISS EVA SYS: EVA PREP/POST)</p>
<p><b>CAUTION</b> Do not close hatch until EMU WATER – OFF for 2 min</p>		

## POST EVA 2 TOOL CONFIG

### EV1

- Waist Tether (R D-ring to Safety tether)
- Waist Tether (L D-ring ext to MWS)
- D-ring Extender (2)
- 85-ft Safety Tether (R on extender)
- Adj (on wrist)
- MWS
- T-bar
- Rabbit Ear Wire Ties (2)
- RET (sm-sm) (2)
- RET (Lg-sm)
- Sm Trash Bag (R, inside) 
- CMG Shims (4)
- Connector caps (3)
- Adj (2)
- Socket Caddy (L, inside)
- 7/16 x 12" wobble
- Swing Arm (R)
- RET (sm-sm)
- PGT S/N \_\_\_\_\_ w/battery
- 7/16 x 6" wobble
- Lg trash bag
- Shroud Straps (3)
- RET (sm-sm)
- BRT (L)
- RET (sm-sm)
- Wire Ties (3)

### EV2

- Waist Tether (R D-ring to Safety tether)
- Waist Tether (L D-ring ext to MWS)
- D-ring Extender (2)
- 85-ft Safety Tether (R on extender)
- Adj (on wrist) (2)
- MWS
- T-bar
- Rabbit Ear Wire Ties (2)
- RET (sm-sm PIP pin)
- RET (sm-sm) (2)
- RET (Lg-sm)
- Sm Trash Bag (L, inside) 
- CMG Shims (4)
- Connector cap (1)
- WIF Adapter
- Socket Caddy
- 7/16 x 12" wobble
- 7/16 x 2"
- Swing Arm (R)
- RET (sm-sm)
- PGT S/N \_\_\_\_\_ w/battery
- 7/16 x 6" wobble
- BRT (L)
- RET (sm-sm)
- Wire Ties (3)

### CREWLOCK

Verify following item is in Staging Bag

- PGT S/N \_\_\_\_\_ w/battery
  - Spare RPCM (Ext Type V)
  - CL Bag #1
  - RET (Lg-sm) on outside – take with bag
  - MUT EE – Ballstack on outside of bag
  - Wire Ties (2) thru grommets twist then tie MUT-Ballstack to bag
  - RET (sm-sm)
  - MUT EE
  - ISS Prybar
  - RAD
  - Digital Camera
  - Vice Grips
  - Adj tether to internal D-ring
- 
- CL Bag #3 (contingency) -Aft/Zenith wall
  - Adj (Lg-sm) on outside
  - Wire Tie Caddy
  - Connector Cleaner Tool Caddy
  - Connector Pin Straightener
  - EVA Ratchet
  - Socket Caddy
  - 7/16 x 6" wobble
  - 7/16 x 2"
  - 7/16 x 9" rigid
  - RAD
  - Ballstack
  - Adj tether to internal D-ring (2)
  - Spare 85-ft safety tether
- 
- D-ring Extender (on A/L D-ring)
- 
- Small ORU Bag (A/L zenith/fwd/stb)
  - RET (Lg-sm) on outside
  - GPS Caps wire-tied together
  - RET (sm-sm) (2)
  - Adj (2 for restraining cables)

### External

- Spare 85-ft safety tether (on HR 0546)
- 55-ft safety tether hatch D-ring (2)

## EVA 3 BRIEFING CARD

### **EVA PREP:**

Remove watches, jewelry, etc, during EMU ops

Follow procedures carefully

PBA and SCU are pure O2

Do not touch connections. Inspect for dirt, oil, burrs, particles

Do not force connections; Do not crush or kink hoses

EMU is pure O2 environment. Do not wear oil based products

### **A/L CONFIG AND TOOLS:**

\* Medium ORU bag with BSP, Transponder

\* Crew lock bag for contingencies stays in the A/L

### **EGRESS PLAN:**

\* EV3 to A/L D-ring; EV1 L waist to EV3 safety tether

EV3 hold his ERCM while EV1 egresses

\* Check PGT, tools, BRT tucked in

\* EV1 egresses and attaches both safety tethers to handrails

\* EV3 hands out ORU bag

\* EV3 egresses and closes thermal cover

\* Both check SAFER handles down and down

### **TRANSLATION:**

\* Hand on structure at all times. Do not hop

\* Avoid feet first translation

\* Slow and deliberate

\* Check tethers often

\* Check each other's tethers, when possible

\* Keep loaded BRT in scan as well

\* Stay aware of sensitive hardware in your work area

\* Beware of the light stanchion at top of CETA spur

### **TETHER SWAPS:**

\* Secure spare waist tether first, check locked

\* Perform tether swap

\* Visually check and verbalize all tethers locked, reel unlocked

### **TETHERS AND TOOLS:**

\* Follow good tethering protocol on all tools – “Good RET”

\* Pull test everything (PGT sockets, APFRs, etc)

### **SSRMS WITH EV:**

\* Do not touch inside of LEE

\* Be aware of the ingress aid when close to structure

\* Check EMU cooling before grabbing ORU (lower TCV)

### **SASA R&R:**

\* Note SASA Stanchion gap, threads, stability before remove

\* Move large mass slowly, especially near P6 ECU, SSU

### **CETA MOVE:**

Move large mass slowly

\* Use Internal Coordinates

### **COMM PROTOCOL:**

Succinct and professional

SSRMS calls are top priority

\* Call ‘GCA Complete’ when SSRMS GCA is done

\* Call ‘All Stop’ for immediate SSRMS stop

IVA is prime relay to MCC

### **SUIT MAL PROTOCOL:**

Challenge-response led by IV or nominal suit

### **CONNECTORS:**

\* Will probably need to shake/wiggle connectors

Check pin straightness

No FOD in receptacle

Proper bend radius

\* Inspect gloves for RTV and Vectran damage, report to MCC

### **PGT OPS:**

Check settings with IV

Pull test on all socket installs

Turn count (count all turns at bolt)

Red light – Low torque, green light – in torque window, Both – Hi torque

Cal Procedure – Ratchet Collar – Not motor, Speed Collar – Cal, Pull trigger

### **KEEP OUT ZONES:**

P1 radiator beam

### **DAY/NIGHT TRANSITIONS: (IV will call)**

\* Lights, visor, check all tools secure

### **INGRESS PLAN:**

EV3 in first, then R waist tether to UIA D-Ring

\* Check PGT, tools, BRT tucked in

EV1 disconnect EV3 safety tether, connect it to left waist tether

EV1 disconnect own safety tether

EV1 in feet first with an EV3 assist

Check hatch seal clear before closing

\* Have IV bags to pack MISSEs ready; see MISSE PREP FOR RETURN  
(TOOLS AND STOWAGE)

\* Review during EMU P/B if time

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# EVA 3 SUMMARY TIMELINE

PET TIME (HR:MIN)	13A.1 EVA 3				
	IV/SSRMS	PET	EV1 (FF/SSRMS)	PET	EV3 (FF/SSRMS)
00:00	SSRMS: MNVR to EVA 3 Start Position  SSRMS: MNVR to APFR Install position	00:00	<u>EGRESS/SETUP</u> (01:00) POST DEPRESS and EGRESS (00:20) SETUP (00:40)	00:00	<u>EGRESS/SETUP</u> (01:00) POST DEPRESS and EGRESS (00:20) SETUP (00:40)
01:00	SSRMS: MNVR to P6 SASA Removal  SSRMS: MNVR to P1 SASA Install	01:00	<u>SASA RELOCATION</u> (01:55)	01:00	<u>P1 BSP AND XPDR INSTALL</u> (01:55)
02:00					
03:00	SSRMS: MNVR CETA 1 to STBD	02:55	<u>CETA CART RELOCATION</u> (02:00)	02:55	<u>CETA CART RELOCATION</u> (02:00)
04:00	SSRMS: MNVR CETA 2 to STBD				
05:00		04:55	<u>Z1 SASA SPARE GIMBAL BOLTS</u> (00:30)	04:55	<u>P6 TRANSPONDER RETRIEVAL</u> (01:00)
		05:25	<u>MISSE 3/4 RETRIEVAL</u> (00:30)		
06:00		05:55	<u>CLEANUP/INGRESS</u> (00:35) CLEANUP (00:15) INGRESS (00:15) PRE REPRESS ( <u>DEPRESS/REPRESS CC</u> ) (00:05)		<u>CLEANUP/INGRESS</u> (00:35) CLEANUP (00:15) INGRESS (00:15) PRE REPRESS ( <u>DEPRESS/REPRESS CC</u> ) (00:05)
	EVA Time 06:30	06:30		06:30	

## PRE EVA 3 TOOL CONFIG

### EV1


- Waist Tether (R D-ring to Safety tether)
- Waist Tether (L D-ext ring to MWS)
- D-ring Extender (2)
- 85-ft Safety Tether (R on extender)
- MWS
- T-bar
- Rabbit Ear Wire Ties (2)
- Adj
- RET (sm-sm PIP pin)
- RET (sm-sm) (2)
- Sm Trash Bag (L, inside) 
- WIF adapter
- Swing Arm (R)
- RET (sm-sm)
- PGT S/N \_\_\_\_\_ w/battery
- 7/16 x 6" wobble
- BRT (L)
- RET (sm-sm)
- Wire Ties (2)
- Digital Camera

### External

- Spare 85-ft safety tether
- 55-ft safety tether hatch D-ring

Prior to EVA  
Inspect RET cord for damage  
Inspect safety tethers and waist tethers load alleviating straps

### EV3

- Waist Tether (L D-ring to Safety tether)
- Waist Tether (R D-ring to MWS)
- D-ring Extender (2)
- 85-ft Safety Tether (L on extender)
- Adj (2 on wrists)
- MWS
- T-bar
- Rabbit Ear Wire Ties (2)
- Adj
- RET (sm-sm PIP pin)
- RET (sm-sm) (2)
- Sm Trash Bag (L, inside) 
- Swing Arm (R)
- RET (sm-sm)
- PGT S/N \_\_\_\_\_ w/battery
- 7/16 x 6" wobble
- BRT (L)
- RET (sm-sm)
- Wire Ties (3)

### CREWLOCK

- Small ORU Bag (A/L zenith/fwd/stb; tied to HRs)
- RET (Lg-sm) on outside
- GPS Caps wire-tied together
- RET (sm-sm) (2)

### CREWLOCK

- Verify following item is in Staging Bag
- PGT S/N \_\_\_\_\_ w/battery
  - CETA Cart Wheel Boogie PIP pin

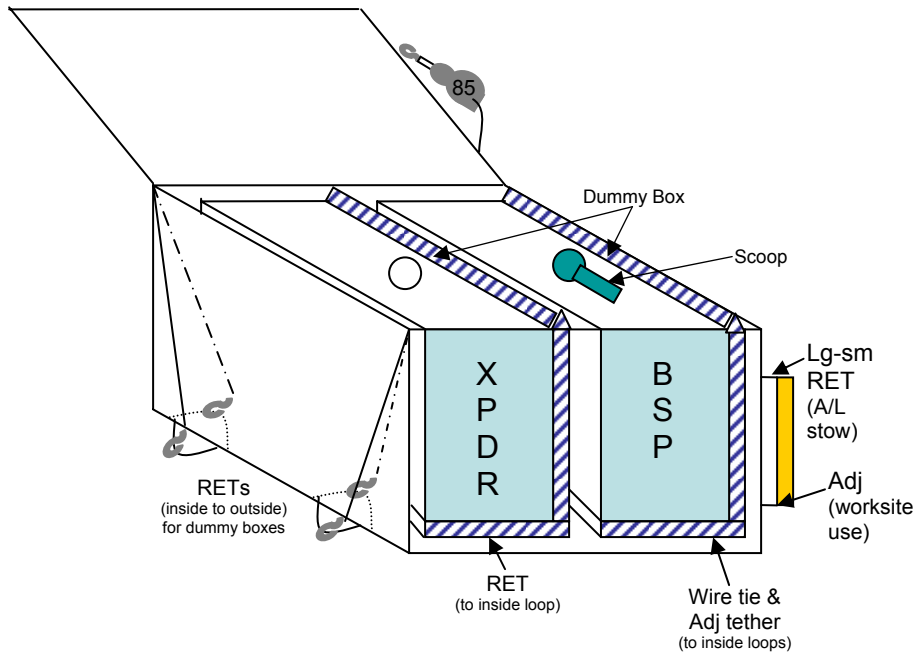
- Med ORU Bag
- 6 B box cover w/o thermal cover (long wire-tied to bag)
- Adj (to box cover)
- BSP
- Round Scoop
- 6 B box cover w/thermal cover
- RET (to box cover)
- Transponder
- Sm-sm RETs (free end to outside of bag)
- Lg-sm RET on outside
- Adj tether (on outside)
- Spare 85-ft safety tether

- CL Bag #3 (contingency) -Aft/Zenith wall
- Adj (Lg-sm) on outside
- Wire Tie Caddy
- Connector Cleaner Tool Caddy
- Connector Pin Straightener
- EVA Ratchet
- Socket Caddy
- 7/16 x 9" rigid
- 7/16 x 6" wobble
- 7/16 x 2"
- RAD
- Vise Grips
- Adj tethers to internal D-ring (3)

- D-ring Extender (on A/L D-ring)

- Lg-sm RET (2) for MISSE Retrieval

# PRE EVA 3 TOOL CONFIG (Cont)



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# 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 (flt specific √ with GNC)  
O14,15,16 2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF  
LOGIC (four) – OFF
- MCC-H 3. √Above RCS config  
IV 4. √RCS F – ITEM 1 EXEC (\*)  
√JET DES F1U – ITEM 17 (\*)  
F3U – ITEM 19 (\*)  
F2U – ITEM 21 (\*)

### S-Band Antennas

#### NOTE

Possible loss of comm when forced LL FWD antenna

- IV If EV crew < 1.6 ft from S-Band antenna:  
A1R 1. S-BAND FM ANT – XMIT LOWER/RCV R UPPER  
2. √MCC, lower antenna selected
- If no comm, or on MCC call:  
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

## 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 enabled  
B. No more than two arrays unshunted  
C. No more than two arrays pointed < 90 deg from velocity vector

OR

2. One or no PCUs operational in discharge mode and one of the following:  
A. No more than two arrays unshunted  
B. No more than two arrays pointed < 90 deg from velocity vector

### P6 SASA – (P6 SASA Relocate)

- MCC-H Park SASA at launch position for gimbal lock install  
Z1 RPCM Z13B\_B RPC 2 – Open, Close Cmd Inhibit  
Z1 RPCM Z14B\_B RPC 2 – Open, Close Cmd Inhibit

### P1 SASA – (P6 SASA Relocate)

- MCC-H P1 RPCM P12B\_B RPC 12 – Open, Close Cmd Inhibit  
RPC 16 – Open, Close Cmd Inhibit

### P6 BGAs – (P6 SASA Relocate)

- MCC-H P6 4B BGA locked at 270 deg  
P6 2B BGA locked at 90 deg

Cont on next page

## EVA 3 INHIBIT PAD (Cont)

### USOS

#### **P1 S-Band BSP – (P1 BSP Install)**

MCC-H P1 RPCM P12B\_B RPC 2 – Open, Close Cmd Inhibit  
RPC 11 – Open, Close Cmd Inhibit

#### **P1 S-Band XPDR – (P1 XPDR Install)**

MCC-H P1 RPCM P12B\_B RPC 10 – Open, Close Cmd Inhibit  
RPC 15 – Open, Close Cmd Inhibit

#### **P6 S-Band XPDR – (P6 XPDR Remove)**

MCC-H Z1 RPCM Z13B\_B RPC 3 – Open, Close Cmd Inhibit  
Z1 RPCM Z14B\_B RPC 3 – Open, Close Cmd Inhibit

### RSOS

#### **SM Antennas**

MCC-M 1. Global Timing Sys 1(400.1 MHz) [GTS] –  
Deactivate  
2. ARISS – Deactivate

#### **FGB Antennas**

MCC-M 1. ARISS – Deactivate

### GROUND

#### **Ground Radar**

MCC-H 1. √TOPO and FDO consoles, ground radar  
restrictions in place for EVA

## EVA 3 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. MLI handholds are not rated for crewmember translation loads
6. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged
7. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
8. Avoid contact with Vitrolube-coated OBSS striker bars
9. Velcro exposed to AO deteriorates rapidly; verify full and smooth velcro seams

### CAUTION

#### **ISS Constraints**

- A. Avoid inadvertent contact with
  1. Grapple fixture shafts (drylube)
  2. PIP pins
  3. MDM sunshade [PMA1]
  4. EVA Crane [PMA1]
  5. TCS Reflectors [PMA2, PMA3]
  6. APAS hardware [PMA2, PMA3]
  7. CETA Lights (Z-93 paint) [LAB, S1, Node 1]
  8. Deployed MISSEs [A/L]
  9. Passive UMAs
  10. MBS VDU, MCU, CRPCMs, and Cameras (taped radiative surfaces, silver Teflon)
  11. Deployed TUS cable
  12. S0 aft face Radiator
  13. GPS Antennas (S13 paint) [S0]
  14. UHF Antennas [LAB, P1]
  15. ETCS Radiators [S1, P1]
  16. EETCS/PV Radiator bellows and panels [P6, P4, S4, S6]
  17. SASA RF Group [Z1, S1, P6]
  18. Heat pipe radiators [Z1]
  19. PCU cathode and HCA ports [Z1]
  20. Ku-Band Antenna (SGANT) dish [Z1]
  21. CMG cover/shells [Z1]
  22. SSRMS Cameras
  23. Open CBM petal covers and LAB window shutter

### 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. 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
- E. Other
  1. ITT Cannon connector: do not turn collar from WHITE to BLACK without a mating half attached
  2. WIS Antennas: do not use as handholds [Node 1, P6, Z1]
  3. Lubricant from Ku-Band SGANT gimbals [Z1], CMGs [Z1], and RTAS Ground Strap fasteners [P6,P4,S4,S6] can contaminate EMU

## EVA 3 NOTES, CAUTIONS, AND WARNINGS (Cont)

### **CAUTION** (Cont)

#### **Shuttle Constraints**

- A. 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]
  - 4. Payload Bay wire harnesses, cables, and connectors
- B. 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]

### **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 566, A/L Tank 2 nad/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

### **WARNING** (Cont)

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

- D. RF Radiation Exposure
  - 1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1,P6]
  - 2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1,P6]
  - 3. Stay 1 ft from UHF Antenna when powered [LAB, P1]
- E. Sharp Edges
  - 1. Inner edges of WIF sockets
  - 2. Mating surfaces of EVA connectors. Avoid side loads during connector mating
  - 3. Back side of MMOD shield fasteners
  - 4. Spring loaded captive EVA fasteners (e.g., 6B-boxes, BMRRM); the end of the spring may protrude
  - 5. PMA umbilical launch restraints-exposed bolt threads
  - 6. Nickel coated braided copper Ground Straps may contain frayed wires [P6, P4, S4, S6]
  - 7. Solar Array Blanket Box [P6, S6]
  - 8. Keep hands away from SSRMS LEE opening, and snares



## EVA 3 NOTES, CAUTIONS, AND WARNINGS (Cont)

### **WARNING** (Cont)

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

##### **F. Thermal**

1. PMA handrails may be hot. Handling may need to be limited
2. Turn off glove heaters when comfortable temp reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
3. Uncovered trunnion pins may be hot
4. SSRMS/MBS operating Cameras and lights may radiate large amounts of heat
5. Stay 1 ft away from PMAs and MMOD shields > 270 degF if EMU sun visor up
6. Stay at least 1 ft away for no more than 15 min from PMAs and MMOD shields > 300 degF if EMU sun visor up
7. Stay 0.5 ft away from PMA and MMOD shields > 325 degF
8. Do not touch EMU protective visor if temp has been < -134 for > 15 min
9. No EMU TMG contact of PMAs and MMOD shields when temp > 320 degF
10. No EMU boot contact with foot restraint when temp < -120 degF or > 200 degF

### **WARNING** (Cont)

#### **Shuttle Constraints**

##### **A. 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]

##### **B. Pinch**

1. PRLA operation [PLB]

##### **C. 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)**

##### **D. 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

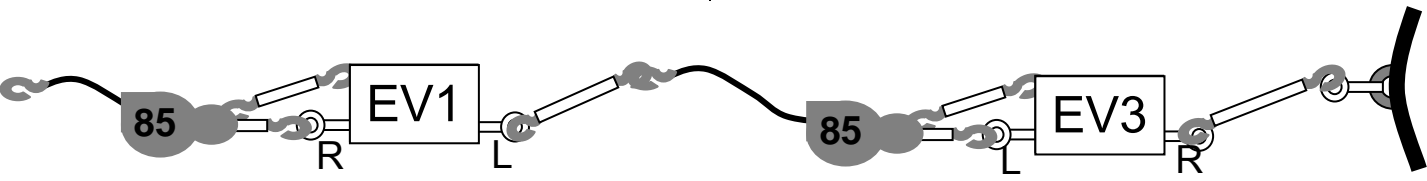
##### **E. Thermal**

1. Illuminated PLB lights; do not touch
2. OBSS grapple fixture shafts/cams may be hot. Limit handling if required

##### **F. Thruster Contamination**

1. Stay out of the immediate vicinity of leaking jet or APU
2. Stay 27 ft from PRCS when powered
3. Stay 3 ft from VRCS when powered
4. Stay 3 ft from APU when operating

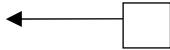
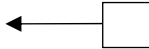
**EVA 3 EGRESS/SETUP (01:00)**

IV/RMS	EV1 (FF)	EV3 (FF)
<p><u>POST DEPRESS</u> (<u>DEPRESS/REPRESS</u> Cue Card) SSRMS Initial Config: 1.610 SSRMS SASA RELOCATE; APFR Install position</p> <p>IV: WVS Software: Select page – RF camera Sel ‘Advanced Controls’ S-Band Level (two) – Max (reqd after EV egress airlock)</p> <p>Verify good WVS on both helmets</p>	<p><u>POST DEPRESS</u> (<u>DEPRESS/REPRESS</u> Cue Card)</p>  <p style="text-align: center;">Initial Tether Configuration</p> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. √Initial tether configuration, hooks locked, reels unlocked; tug test</li> <li>2. Hatch Thermal cover – open</li> <li>3. Egress airlock</li> <li>4. Attach right 85-ft safety tether retracting end to A/L HR 0550, LOCK hook, reel unlocked</li> <li>5. Release left waist tether from EV3’s 85-ft safety tether</li> <li>6. Attach EV3’s 85-ft safety tether retracting end to A/L HR 0554 inboard stanchion, LOCK hook</li> <li>7. Give EV3 GO to release from A/L D-ring</li> <li>8. Receive ORU Bag from EV3, temp stow</li> <li>9. Transfer ORU Bag to EV3</li> <li>10. √SAFER MAN ISOL vlv – OP (dn) and HCM (dn)</li> <li>11. Close Hatch Thermal Cover</li> </ol>	<p><u>POST DEPRESS</u> (<u>DEPRESS/REPRESS</u> Cue Card)</p> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. √Initial tether configuration, hooks locked, reels unlocked; tug test</li> <li>2. Release right waist tether from A/L D-ring</li> <li>3. Verify 85-ft safety tether in Unlocked position</li> <li>4. Pass ORU Bag to EV1</li> <li>5. Egress A/L</li> <li>6. Receive ORU Bag, install on BRT</li> <li>7. √SAFER MAN ISOL vlv – OP (dn) and HCM (dn)</li> </ol>


**EVA 3 EGRESS/SETUP (01:00) (Cont)**

<b>IV/RMS</b>	<b>EV1 (FF)</b>	<b>EV3 (FF)</b>
<p>SSRMS: Mnvrr to P6 SASA position</p>	<p><u>SETUP</u></p> <ol style="list-style-type: none"> <li>12. Retrieve spare safety tether from A/L, attach to MWS</li> <li>13. Inspect external safety tether load alleviating straps</li> <li>14. Stow camera on APFR</li> <li>15. Retrieve APFR and Ingress aide from A/L WIF 11</li> <li>16. Install WIF adapter, clocking of 12</li> <li>17. Translate aft of C/L to S1 bay 11 (fairlead w/Adj tether at top of CETA spur) HR (3413 nadir) _____</li> <li>18. <b>GCA SSRMS</b> to APFR Install position</li> <li>19. Install WIF adapter/APFR on SSRMS, tether point toward EE; install PIP pin, pull test</li> <li>20. Configure APFR on SSRMS [12, PP, F, 6], pull test</li> <li>21. Perform Safety tether swap to SSRMS, check hooks locked</li> <li>22. Leave A/L tether on S1 HR 3247, clear of face 1 CETA translation path</li> <li>23. Stow camera on MWS</li> <li>24. Extend Ingress Aid</li> <li>25. Ingress APFR</li> <li>26. Attach MWS EE to ingress aid; lock MWS EE</li> <li>27. Give SSRMS GO to maneuver to P6 SASA</li> </ol>	<p><u>SETUP</u></p> <ol style="list-style-type: none"> <li>8. Translate to CETA cart 2, fairlead w/Adj tether at S0 HR (3413 zenith) _____</li> <li>9. Decouple CETA cart 2 from MT               <ul style="list-style-type: none"> <li><input type="checkbox"/> CETA 2 coupler to UNLOCK</li> <li><input type="checkbox"/> Translate CETA 2 ~2 ft port</li> <li><input type="checkbox"/> Engage parking brake (left handle)</li> <li><input type="checkbox"/> CETA 2 coupler to CAPTURE</li> </ul> </li> <li>10. Deploy Stbd brake handles (2) (down)</li> <li>11. Position swing arm 3 to position 9</li> <li>12. Temp stow ORU bag on swing arm</li> <li>13. Ingress Stbd TFR, release brake (tap pedal twice)</li> <li>14. Translate CETA carts past P1 bay 6 to Yo 8445 (head level), engage parking brake (left handle)</li> </ol>

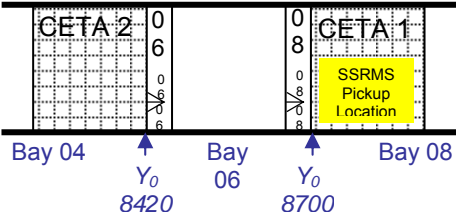
**SASA RELOCATION (01:55)/P1 BSP AND XPDR INSTALL (01:55)**

IV/RMS	EV1 (FF)	EV3 (FF)
<p>1. √MCC: Verify inhibits for P1 BSP and XPDR dummy box remove and ORU install</p> <p>2. √MCC: Verify inhibits for P6 SASA removal (thermal clock starts when inhibit is in place)</p> <p>Thermal Clock Start    ____:____</p>	<p><u>SASA REMOVE FROM P6</u></p> <ol style="list-style-type: none"> <li><b>GCA SSRMS</b> to SASA Stanchion Removal Position</li> <li>Egress APFR</li> <li>Assess stanchion installation prior to removal for comparison with installation on P1 <ul style="list-style-type: none"> <li>• Check gap between stanchion and plate</li> <li>• Look/feel how many threads visible below plate</li> <li>• Check stanchion stability</li> </ul> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><b>CAUTION</b></p> <p>SASA no touch areas:</p> <ul style="list-style-type: none"> <li>• Lo and Hi gain antennas</li> <li>• Z93 thermal paint</li> </ul> </div> </li> <li>Rotate gimbal locks (2 on left) to locked position (toward High Gain Antenna) 100 deg</li> <li><b>PGT[A6, CW2, 30.5 ]-7/16 X 6"</b> Tighten gimbal lock fasteners ~4.5 turns in pattern <ul style="list-style-type: none"> <li><input type="checkbox"/> Lower-Left bolt 1</li> <li><input type="checkbox"/> Upper-Left bolt 4</li> </ul>  </li> <li>Remove P6 dummy caps (3), stow in trash bag</li> <li>On IV GO, demate SASA connectors (any order) <ul style="list-style-type: none"> <li><input type="checkbox"/> J2 from SASA</li> <li><input type="checkbox"/> J3 from SASA</li> <li><input type="checkbox"/> J4 from SASA</li> </ul> </li> <li>Mate connectors to P6 dummy receptacles (rightmost first) <ul style="list-style-type: none"> <li><input type="checkbox"/> J2 to P6 dummy connector</li> <li><input type="checkbox"/> J3 to P6 dummy connector</li> <li><input type="checkbox"/> J4 to P6 dummy connector</li> </ul> </li> </ol>	<p><u>P1 BSP AND XPDR DUMMY BOX REMOVAL</u></p> <ol style="list-style-type: none"> <li>Egress Stbd TFR</li> <li>Rotate Stbd TFR swing arm 2 to a setting of 30</li> <li>Check APFR settings at CETA 2 WIF 2 [10, PP, E, 12], Y/P fitting [12, FF], pull test</li> <li>Ingress APFR</li> <li>Tether XPDR (nadir) dummy box using ORU Bag outside RET</li> </ol>  <ol style="list-style-type: none"> <li>On IV GO, remove XPDR dummy box</li> <li><b>PGT[A5, CCW2, 30.5 ]-7/16 X 6"</b> Release XPDR dummy box outer captive fasteners (2) – 16 turns</li> <li>Release center jack bolt – 33 turns (<i>same PGT</i>)</li> <li>Temp stow XPDR dummy box</li> </ol> <ol style="list-style-type: none"> <li>Tether BSP (zenith) dummy box using ORU Bag outside RET</li> <li>On IV GO, remove BSP dummy box</li> <li><b>PGT[A5, CCW2, 30.5 ]-7/16 X 6"</b> Release XPDR dummy box outer captive fasteners (2) – 16 turns</li> <li>Release center jack bolt – 33 turns (<i>same PGT</i>)</li> <li>Temp stow BSP dummy box</li> </ol>

**SASA RELOCATION (01:55)/P1 BSP AND XPDR INSTALL (01:55) (Cont)**

IV/RMS	EV1 (FF)	EV3 (FF)																														
<p>SSRMS: Mnvr to P1 SASA Install</p> <p><u>NOTE:</u> May need to remove socket from PGT to engage socket on bolt head</p> <p>IV Record</p> <table border="1"> <thead> <tr> <th>BSP</th> <th>Turns</th> <th>Torque</th> </tr> </thead> <tbody> <tr> <td>Center Bolt</td> <td></td> <td></td> </tr> <tr> <td>Outer #1</td> <td></td> <td></td> </tr> <tr> <td>Outer #2</td> <td></td> <td></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>SASA</th> <th>Turns</th> <th>Torque</th> </tr> </thead> <tbody> <tr> <td>Stanchion Bolt</td> <td></td> <td></td> </tr> </tbody> </table> <p>3. √MCC: Verify inhibits for P1 SASA install</p> <p>IV Record</p> <table border="1"> <thead> <tr> <th>XPDR</th> <th>Turns</th> <th>Torque</th> </tr> </thead> <tbody> <tr> <td>Center Bolt</td> <td></td> <td></td> </tr> <tr> <td>Outer #1</td> <td></td> <td></td> </tr> <tr> <td>Outer #2</td> <td></td> <td></td> </tr> </tbody> </table> <p>4. IV: Inform MCC GO for P1 SASA heater power only</p>	BSP	Turns	Torque	Center Bolt			Outer #1			Outer #2			SASA	Turns	Torque	Stanchion Bolt			XPDR	Turns	Torque	Center Bolt			Outer #1			Outer #2			<p>9. Ingress APFR</p> <p>10. <b>GCA SSRMS</b> to Stanchion Removal Position as required</p> <p>11. Verify all local tethers and tools clear of P6</p> <p>12. Tether to SASA w/RET</p> <p>13. <b>PGT[B7, CCW2, 30.5]-7/16 X 6"</b> Release stanchion attachment bolt ~21 turns</p> <p>14. Verify SASA in soft dock</p> <p>15. Stow PGT</p> <p>16. Remove SASA from soft dock</p> <p>17. Give SSRMS GO to maneuver to P1 SASA installation site</p> <p><u>SASA INSTALL ON P1</u></p> <p><u>NOTE:</u> Stay inboard of P1 trunnion pin to avoid radiator beam rotational envelope</p> <p>18. Install SASA onto P1 support bracket soft dock</p> <p>19. <b>PGT[B3, CW2, 30.5]-7/16 X 6"</b> Engage stanchion attachment bolt ~21 turns (6 lb push force reqd); record torque and turns</p> <p>20. Release SASA RET</p> <p>21. Egress APFR</p>  <p>22. On IV GO, mate SASA connectors</p> <p style="text-align: center;"><u>NOTE</u></p> <p>Route two cables through TA Clamps around aft side of stanchion; third cable around fwd side</p> <p>23. Mate connectors, release TA clamps as required</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> P3 from P1-J643 to SASA J3 (1 TA clamps)</li> <li><input type="checkbox"/> P4 from P1-J644 to SASA J4 (2 TA clamps)</li> <li><input type="checkbox"/> P2 from P1-J632 to SASA J2 (2 TA clamps)</li> </ul>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b></p> <p>Avoid contact with all sides other than front face of BSP and Transponder to protect cotherm layer and Z93 paint</p> </div> <p><u>BSP INSTALL</u></p> <p>15. Remove BSP from ORU bag and 6B cover</p> <p>16. Inspect BSP mounting location (zenith) for FOD</p> <p>17. Install BSP on radiator plate support structure by sliding it along two guide pins into soft dock position</p> <p>18. Remove scoop and install on XPDR</p> <p>19. <b>PGT[A7, CW2, 30.5]-7/16 X 6"</b> Push in and engage center jack bolt (~24-30 turns to torque); record torque and turns</p> <p>20. Visually check for contact between BSP front wedge and radiator plate</p> <p>21. <b>PGT[A7, CW2, 30.5]-7/16 X 6"</b> Push in and engage outer fasteners (~7-13 turns to hardstop); record torque and turns</p> <p><u>XPDR INSTALL</u></p> <p>22. Remove XPDR from ORU bag and 6B cover</p> <p>23. Inspect XPDR mounting location (nadir) for FOD</p> <p>24. Install XPDR on radiator plate support structure by sliding it along two guide pins into soft dock position</p> <p>25. Remove scoop and install on XPDR Dummy Box</p> <p>26. <b>PGT[A7, CW2, 30.5]-7/16 X 6"</b> Push in and engage center jack bolt (~24-30 turns to torque); record torque and turns</p> <p>27. Visually check for contact between XPDR front wedge and radiator plate</p> <p>28. <b>PGT[A7, CW2, 30.5]-7/16 X 6"</b> Push in and engage outer fasteners (~7-13 turns to torque); record torque and turns</p>
BSP	Turns	Torque																														
Center Bolt																																
Outer #1																																
Outer #2																																
SASA	Turns	Torque																														
Stanchion Bolt																																
XPDR	Turns	Torque																														
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Outer #2																																

**SASA RELOCATION (01:55)/P1 BSP AND XPDR INSTALL (01:55) (Cont)**

IV/RMS	EV1 (FF)	EV3 (FF)
<p>5. On EV3 GO, give MCC GO for BSP and XPDR power up</p>  <p>The diagram shows a horizontal layout of three bays: Bay 04, Bay 06, and Bay 08. CETA 2 is located in Bay 04, and CETA 1 is located in Bay 08. A yellow box labeled 'SSRMS Pickup Location' is shown in Bay 08. Two Y0 markers are indicated: one at 8420 in Bay 04 and one at 8700 in Bay 08.</p>	<p>24. Give IV GO for SASA heater power</p> <p>25. <b>PGT[B3, CCW2, 30.5]-7/16 X 6"</b> Release gimbal lock fasteners ~1 turn in pattern  <input type="checkbox"/> Upper-Left bolt 4  <input type="checkbox"/> Lower-Left bolt 1</p> <p>26. <b>PGT[A2, CCW2, 30.5]-7/16 X 6"</b> Release gimbal lock fasteners ~3.5 turns in pattern (do not drive to a hardstop)  <input type="checkbox"/> Upper-Left bolt 4  <input type="checkbox"/> Lower-Left bolt 1</p> <p>27. Rotate gimbal locks away from Hi Gain Antenna</p> <p>28. Close TA clamps as required</p> <p>29. Perform Tool Inventory</p> <p>30. Hold onto APFR for SSRMS mnvr</p> <p>31. Give SSRMS GO to APFR egress posn at CETA1</p> <p>32. Reconfig APFR [12, PP, A, 6]</p> <p>33. Inspect gloves; status MCC on RTV and Vectran state</p> <p><u>SWAP TO A/L SAFETY TETHER</u></p> <p>34. Attach L waist tether to HR, LOCK HOOK</p> <p>35. Swap to EV3 85-ft safety tether</p> <p>36. Verify hooks locked, reel unlocked</p> <p>37. Release L waist tether from HR</p> <p>38. Transfer Camera to EV3</p>	<p>29. Give IV GO for BSP and Transponder power up</p> <p>30. Stow dummy boxes (2) in ORU bag; stow XPDR Dummy Box w/scoop on the loose 6B cover for P6 retrieval; bag tool check</p> <p>31. Stow stbd TFR swing arm 2</p> <p>32. Stow stbd swing arm 3</p> <p>33. Perform Tool Inventory</p> <p><u>CETA PREP FOR RELOCATE</u></p> <p>34. Release brakes on CETA 2; mnvr both CETAs so that CETA 2 is in Bay 04</p> <p>35. Engage parking brake on CETA 2 (left handle)</p> <p>36. Decouple CETA 1 from CETA 2  <input type="checkbox"/> CETA 1 coupler to UNLOCK</p> <p>37. Move Stbd side of CETA 1 @ Y<sub>0</sub> 8700 (CETA1 to the stbd side of Bay 08 marker)</p> <p>38. Engage parking brake on CETA 1 (left handle)</p> <p>39. CETA 1 prep  <input type="checkbox"/> CETA 1 coupler to CAPTURE  <input type="checkbox"/> Deploy brake handles (4) (down)  <input type="checkbox"/> √Swing arms stowed (3)  <input type="checkbox"/> √APFR secure, pull test</p> <p>40. CETA 2 prep  <input type="checkbox"/> √CETA 2 coupler to CAPTURE  <input type="checkbox"/> Deploy brake handles (4) (down)  <input type="checkbox"/> √Swing arms stowed (3)  <input type="checkbox"/> √ORU bag position secure (or return to A/L)  <input type="checkbox"/> √APFR secure, pull test</p> <p>40. Inspect gloves; status MCC on RTV and Vectran state</p> <p><u>SWAP TO SSRMS SAFETY TETHER</u></p> <p>41. Attach R waist tether to HR, LOCK HOOK</p> <p>42. Swap to EV1 SSRMS safety tether</p> <p>43. Verify hooks locked, reel unlocked</p> <p>44. Release R waist tether from HR</p> <p>45. Receive Camera from EV1</p>

## SASA RELOCATION TASK DATA SHEET

### Tools:

EV1 (FF)	EV2 (FF)
PGT	
7/16 x 6" wobble	

### Foot Restraints:

Task	WIF	APFR Setting
Nominal Access to SASA at P6 and P1 locations	SSRMS	[12,PP,F,6]
Alternate access to SASA connectors at P6	P6 WIF 38	[6,LL,L,10]
Alternate access to SASA gimbal locks (stbd)	P6 WIF 35	[3,OO,G,12]
Alternate access to SASA gimbal locks (port)	P6 WIF 23	[11,II,F,6]

### EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Stanchion Bolt	7/16	1	18.5-33.6 gnd 18.4 on orbit	25.5	165	10 launch threads 16.5 install	30
Gimbal Lock Bolts	7/16	4	16.7 gnd 3.8 on orbit	18.4 1 turn only 3.8	30.7 install 46.4 release (first turn) 6.7 release (at hardstop)	4.5	30

### EVA Connectors:

Harness	From	To	Conn Size	Function
W19C	SASA J2	P6 P2	21	RF
W31A	SASA J3	P6 P3	17	Htr Pwr/1553 Ch B
W21E	SASA J4	P6 P4	15	Ops Pwr/1153 Ch A
W5256	P1 A51 J632	SASA J2	21	RF
W5181	P1 A51 J643	SASA J3	17	Htr Pwr/1553 Ch B
W5180	P1 A51 J644	SASA J4	15	Ops Pwr/1153 Ch A

### Timeline Considerations:

1. SASA must be removed from P6 prior to 10A P6 relocation

### Notes:

1. SASA has a 1 hr thermal clock
2. Gimbal bolts have torque pattern beginning with bolts closest to base to tighten and opposite for release. Only 2 gimbal bolts tightened due to access issues on P6
3. P6 dummy caps to be brought inside for 10A use for returning Z1 SASA
4. Stay inboard of P1 inboard trunnion pin to avoid radiator beam rotational envelope; if need to go outboard need to lock P1 TRRJ
5. BSP is zenith location/box on P1 and XPDR is nadir

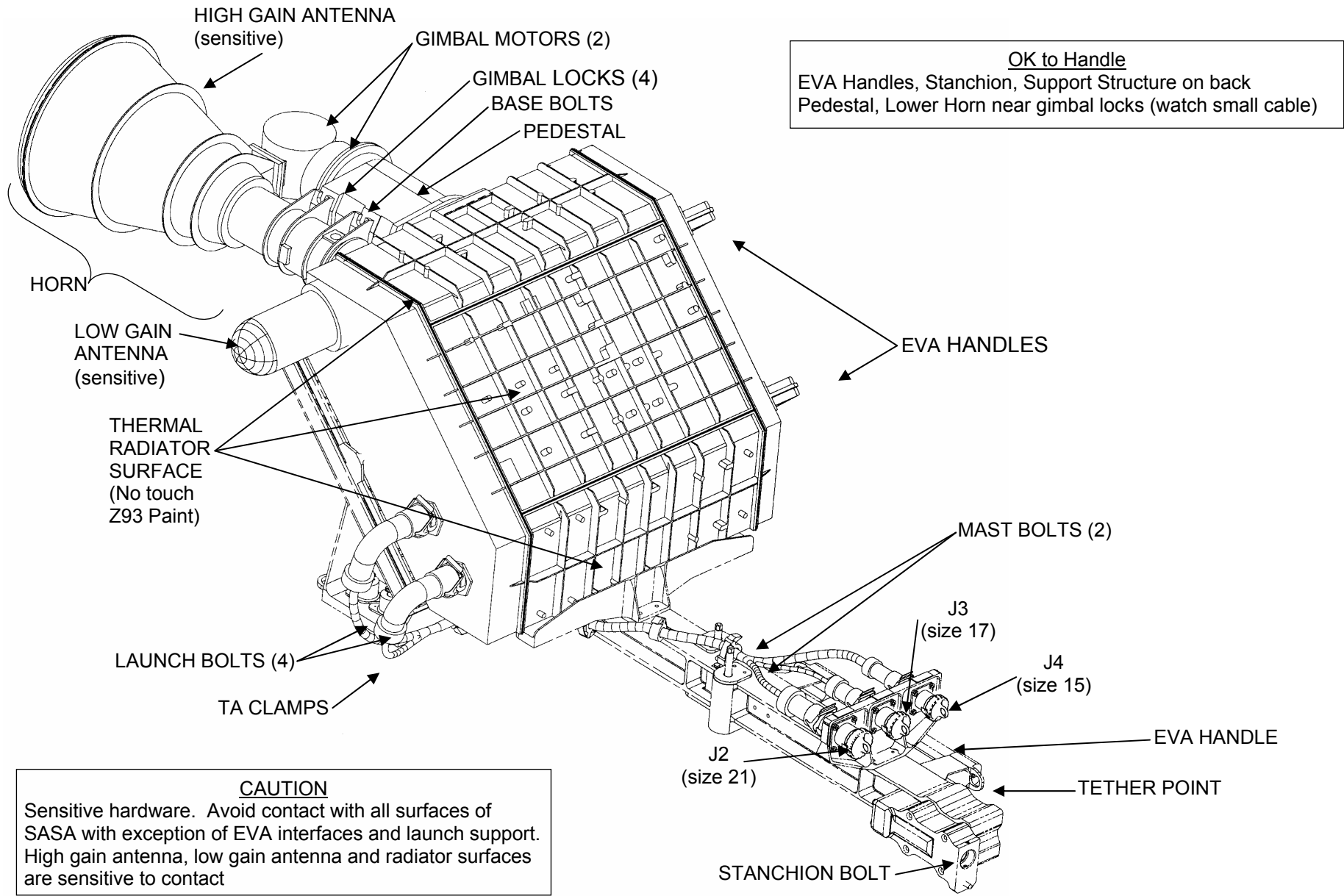
### Cautions:

1. Avoid contact with SASA RF group and antennas
2. Do not try to rotate gimbal locks CCW past hard stop

### Warnings:

1. None

# SASA RELOCATION TASK DATA SHEET (Cont)





## P1 BSP AND XPDR INSTALL TASK DATA SHEET

### Tools:

EV1 (FF)	EV2 (FF)
	PGT
	7/16 x 9" wobble
	Round scoop
	6B cover

### Foot Restraints:

Task	CETA	WIF	APFR Setting
Access to BSP			
Access to Transponder			

### EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Center jack bolt (BSP & XPDR)	7/16	1	4.5-4.8 gnd 9.2 on orbit	9.2 12.3 max	14.8 release 13.2 install	33 release 24.4-30.4 install	30
Outer bolts (BSP & XPDR)	7/16	2	4.5-4.8 gnd 9.2 on orbit	9.2 12.3 max	14.8 release 13.2 install	15 release 6.8-12.8 install	30
Center jack bolt (Dummy Box)	7/16	1	1.6 gnd	7.0	17.1	24.4-30.4	30
Outer bolts (Dummy Box)	7/16	2	1.6 gnd	7.0	17.1	6.8 -12.8	30

**EVA Connectors:** None

### Timeline Considerations:

Get-Ahead would be P1 RBVM MLI if task finished before P1 SASA relocate

### Notes:

- ACBSP (P/N 1F7847-1) and XPDR (1F78475-1) dummy boxes must be installed in their corresponding positions due to keying of the ARINC connector interface on the dummy box
- EV3 85-ft safety tether (from A/L) can reach to P1 **XX**

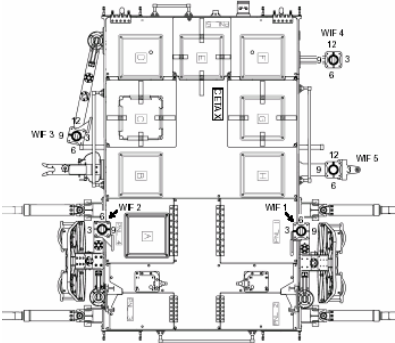
### Cautions:

- Avoid contact with lower surface of 6B boxes (Cho-Therm coating)

### Warnings:

- N/A

# CETA CART RELOCATION (02:00)

IV/RMS	EV1 (FF)	EV3 (FF)
<p> <input type="checkbox"/> MT <input type="checkbox"/> CETA 2 <input type="checkbox"/> CETA 1 <input type="checkbox"/> MT            CETA starting configuration         </p> <p>1. SSRMS: CETA removal posn</p> <p> <input type="checkbox"/> CETA 2 <input type="checkbox"/> CETA 1 <input type="checkbox"/> MT <input type="checkbox"/> MT            CETA ending configuration         </p> <p>2. SSRMS: Mnvr to CETA 1 install posn</p>  <p>FS 18-34</p>	<p><u>CETA 1 REMOVAL FROM P1</u></p> <ol style="list-style-type: none"> <li>Decouple CETA 1 from CETA 2; prep CETA 1 for transfer <i>(if not already completed)</i> <ul style="list-style-type: none"> <li><input type="checkbox"/> CETA 1 coupler to UNLOCK</li> <li><input type="checkbox"/> Translate CETA 1 port to Bay 08</li> <li><input type="checkbox"/> Engage parking brake (left handle)</li> <li><input type="checkbox"/> CETA 1 coupler to CAPTURE</li> <li><input type="checkbox"/> Deploy brake handles (4) (down)</li> <li><input type="checkbox"/> √Swing arms stowed (3)</li> <li><input type="checkbox"/> √APFR secure, pull test</li> </ul> </li> </ol> <p style="text-align: center;"><b>CAUTION</b> Do not impart loads into CETA cart with &lt; 4 of 4 wheel bogies latched closed</p> <ol style="list-style-type: none"> <li>On EV3 GO: Release brake (tap pedal twice)</li> <li>Release wheel bogies (4)</li> <li>Give EV3 GO to remove CETA 1 from rails</li> <li>Assist EV3/M1 with clearances as reqd; verify CETA 1 is clear of structure before translating</li> </ol> <p><u>CETA 2 PREP</u></p> <ol style="list-style-type: none"> <li>Translate to CETA 2 port to Bay 08 (Stbd side of CETA 2 @ Y<sub>0</sub> 8700)</li> <li>Prep CETA 2 for transfer <i>(if not already completed)</i> <ul style="list-style-type: none"> <li><input type="checkbox"/> Engage parking brake (left handle)</li> <li><input type="checkbox"/> √CETA 2 coupler to CAPTURE</li> <li><input type="checkbox"/> Deploy brake handles (4) (down)</li> <li><input type="checkbox"/> √Swing arms stowed (3)</li> <li><input type="checkbox"/> √ORU bag position secure (or return to A/L)</li> <li><input type="checkbox"/> √APFR secure, pull test</li> </ul> </li> </ol>	<p><u>CETA 1 REMOVAL FROM P1</u></p> <ol style="list-style-type: none"> <li>Ingress SSRMS APFR</li> <li>Attach MWS EE to Ingress Aid</li> </ol> <p style="text-align: center;"><b>CAUTION</b> Do not touch APFR Ingress Aid shaft for more than 2.5 min after first 1.5 hr exposed</p> <ol style="list-style-type: none"> <li>Tether to CETA 1 with RET</li> <li>Grasp CETA 1 grids B &amp; H (recommended)</li> </ol> <p>5. Give EV1 GO for CETA 1 release</p> <p>6. On EV1 GO: Remove CETA 1 from rails; lift CETA cart from rails ISS forward until wheel bogies clear</p> <p>7. Give SSRMS GO to maneuver</p>

**CETA CART RELOCATION (02:00) (Cont)**

IV/RMS	EV1 (FF)	EV3 (FF)
<p>3. SSRMS: Mnvr to CETA 2 removal posn</p> <p>4. SSRMS: Mnvr to CETA 2 install posn</p>	<p><u>INSTALL CETA 1 ON S1</u></p> <p>8. Translate to S1 Bay ~11 via nadir path            9. Verify safety tethers clear of CETA install area            10. GCA SSRMS to CETA install position            11. Rotate and lock wheel bogies (4) onto MT rail            12. Engage parking brake            13. Give EV3 GO to release CETA 1</p> <p><u>COUPLE CETA 1 TO MT</u></p> <p>14. Verify CETA cart  <input type="checkbox"/> √MT coupler in CAPTURE  <input type="checkbox"/> Stow brake handles (4) (up)            15. Release brake (tap pedal twice)            16. Translate to MT            17. Couple CETA to MT  <input type="checkbox"/> Couple CETA to MT, max rate 0.5 ft/sec  <input type="checkbox"/> MT coupler to LOCK  <input type="checkbox"/> √CETA1 coupler in CAPTURE</p> <p><u>CETA 2 REMOVAL FROM P1</u></p> <p>18. Translate to P1 CETA 2            19. Translate CETA 2 port to Bay 10 (position CETA for SSRMS pickup)</p> <p>20. On EV3 GO: Release brake (tap pedal twice)            21. Release wheel bogies (4)            22. Give EV3 GO to remove CETA 2 from rails            23. Assist EV3/M1 with clearances as reqd; verify CETA 2 is clear of structure before translating</p>	<p><u>INSTALL CETA 1 ON S1</u></p> <p>8. Install CETA 1 on rail</p> <p>9. On EV1 GO, release CETA 1 tether            10. Give SSRMS GO to maneuver to CETA 2</p> <p><u>CETA 2 REMOVAL FROM P1</u></p> <p>11. <b>GCA SSRMS</b> to CETA 2 Pickup location            12. Tether to CETA 2 with RET            13. Grasp CETA 2 grids B &amp; H (recommended)            14. Give EV1 GO for CETA 2 release</p> <p>15. On EV1 GO: Remove CETA 2 from rails; lift CETA cart from rails due forward until wheel bogies clear            16. Give SSRMS GO to maneuver</p>

**CETA CART RELOCATION (02:00) (Cont)**

IV/RMS	EV1 (FF)	EV3 (FF)
	<p><u>INSTALL CETA 2 ON S1</u></p> <p>24. Translate to S1 Bay ~11 via nadir path 25. Verify Safety tethers clear of CETA 2 install area</p> <p>26. GCA SSRMS to CETA 2 install position 27. Rotate and lock wheel bogies (4) onto MT rail 28. Engage parking brake 29. Give EV3 GO to release</p> <p><u>COUPLE CETA 2 TO CETA 1</u></p> <p>30. Verify CETA 2  <input type="checkbox"/> √CETA 1 coupler in CAPTURE  <input type="checkbox"/> Stow brake handles (4) (up)</p> <p>31. When EV3 clear of CETA 2, release brake (tap pedal twice)</p> <p>32. Translate to CETA 1</p> <p>33. Couple CETA 2 to CETA 1  <input type="checkbox"/> Couple CETA 2 to CETA 1, max rate 1 inch/sec  <input type="checkbox"/> CETA 1 coupler to LOCK  <input type="checkbox"/> √Both CETA brakes released (tap pedal twice)</p> <p><u>SSRMS CLEANUP</u></p> <p>34. Retrieve safety tether from SSRMS, stow on MWS 35. Retrieve APFR and WIF adapter, install on BRT 36. Give SSRMS GO to maneuver clear 37. Translate to A/L; release adj fairlead (S0 HR 3444) 38. Remove WIF adapter and temp stow at A/L 39. Stow APFR and Ingress aide on A/L WIF 11 [3, PP, F, 6] 40. Stow spare (SSRMS) Safety tether on A/L HR 0546 41. Inspect gloves; status MCC on RTV and Vectran state</p>	<p><u>INSTALL CETA 2 ON S1</u></p> <p>17. Install CETA 2 on rail</p> <p>18. On EV1 GO, release CETA 2 tether</p> <p><u>SSRMS CLEANUP</u></p> <p>19. Egress SSRMS, perform safety tether swap to A/L 85-ft tether at S1 HR 3247 20. Translate to CETA 2 21. Retrieve ORU Bag, attach to BRT (<i>if required</i>) 22. Translate to A/L; retrieve adj fairlead (top of CETA spur) 23. Temp stow ORU Bag at A/L; retrieve XPDR dummy box, 6B cover plate and scoop from bag 24. Inspect gloves; status MCC on RTV and Vectran state</p>

# CETA CART RELOCATION TASK DATA SHEET

Tools: None

## Foot Restraints:

Task	WIF	APFR Setting
CETA CART Install/remove	SSRMS	[12,PP,F,6]

EVA Fasteners: None

EVA Connectors: None

CETA Cart Mass = ~560 lb

## Timeline Considerations:

1. CETA carts must be moved to the stbd side of MT for 10A P6 relocation (MT WS 8)

## Notes:

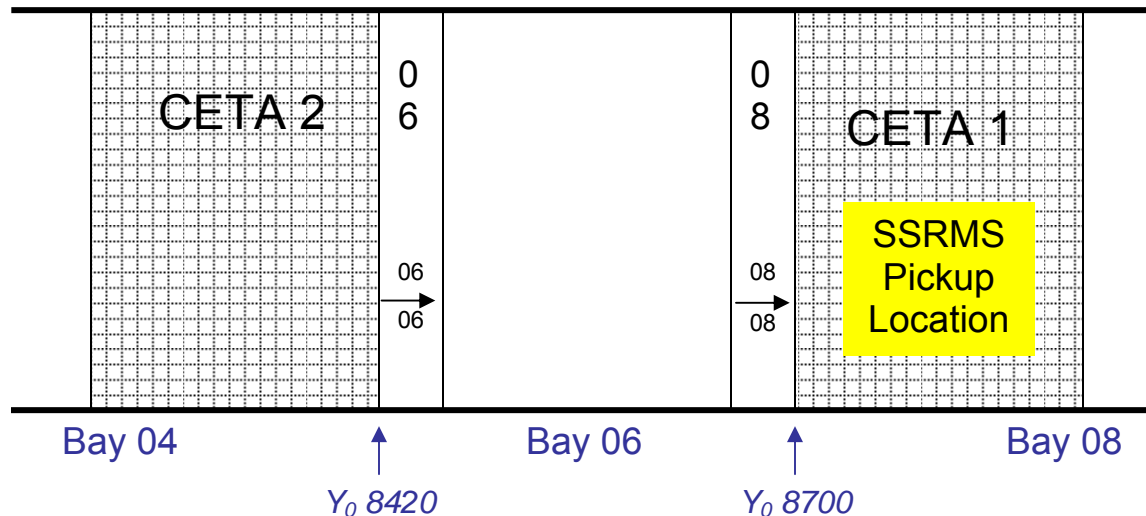
1. Ensure safety tethers are clear of CETA cart during safety tether swap, CETA cart relocation, and CETA cart install
2. CETA to MT max coupling rate is 0.5 ft/sec; CETA to CETA max coupling rate is 1 inch/sec
3. 3 of 4 wheel bogies are required to be installed prior to untethering (from a safety, fault tolerance standpoint); can leave CETA Carts in this config, MT okay to translate (*Approval in work*)
4. 85-ft safety tether stretches from A/L to P1 Bay 12 (middle of bay)

## Cautions:

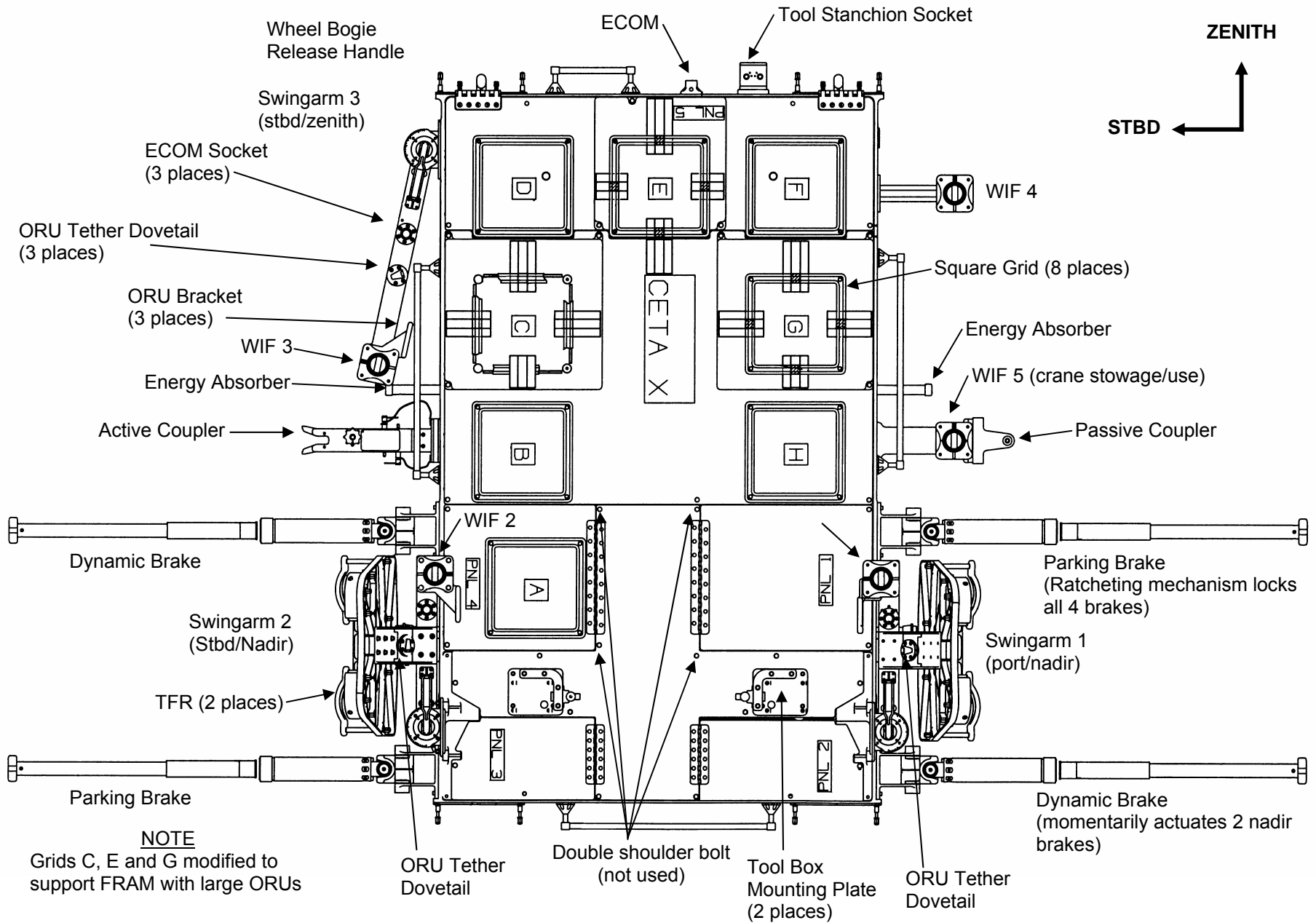
1. Do not impart loads into CETA cart without all 4 wheel bogies engaged

## Warnings:

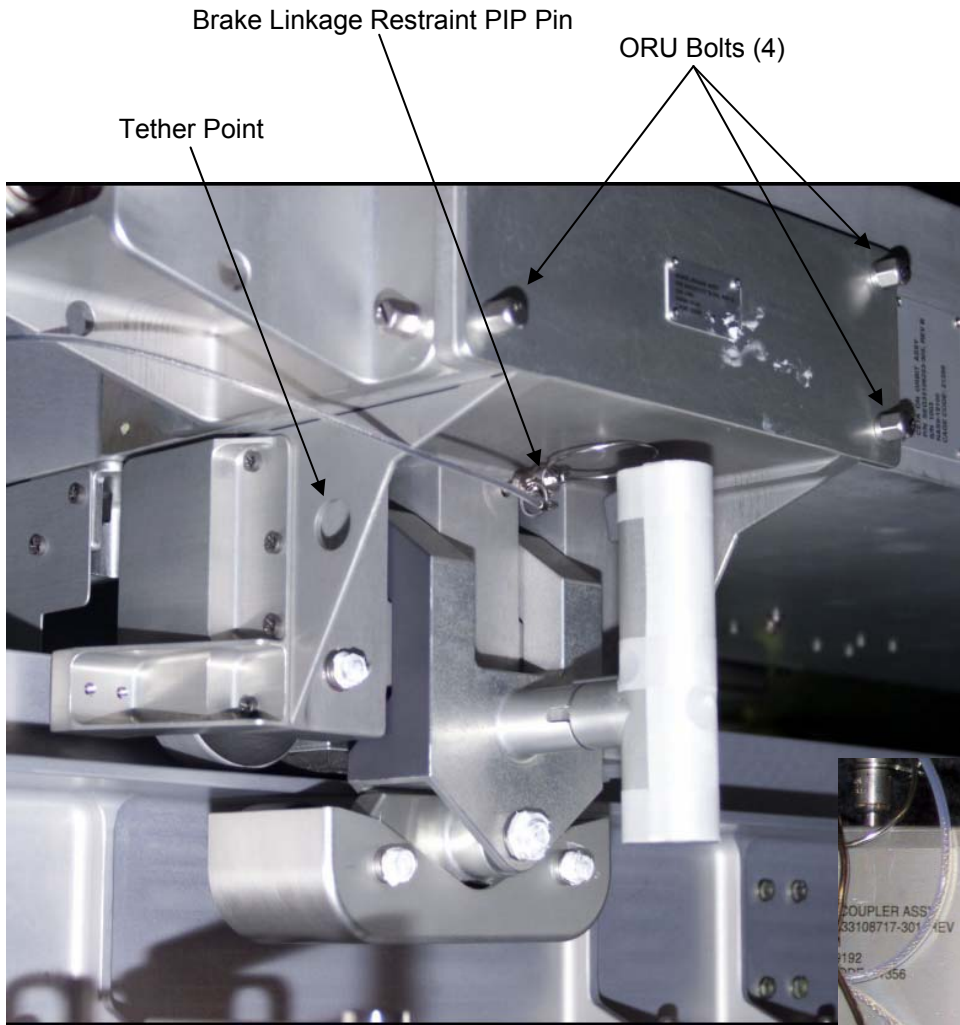
1. None



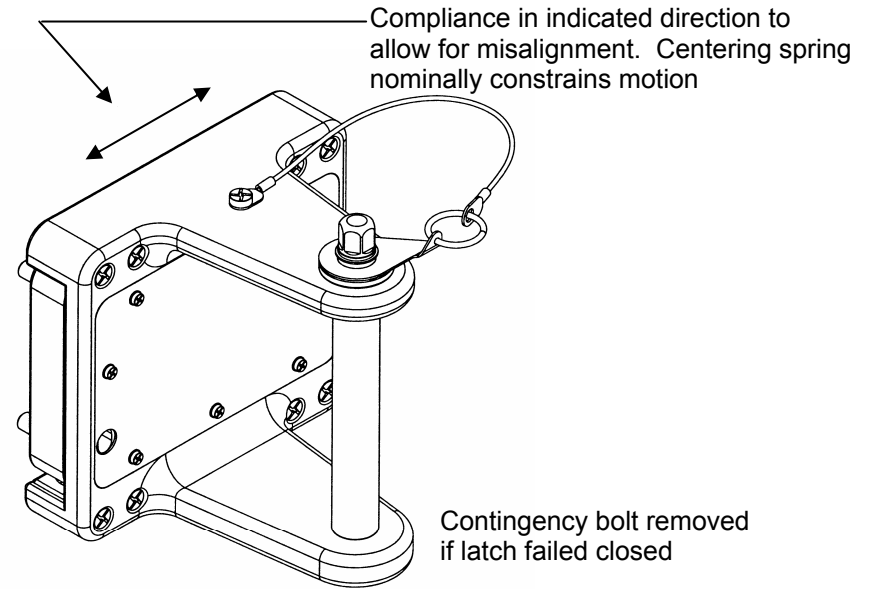
# CETA CART RELOCATION TASK DATA SHEET (Cont)



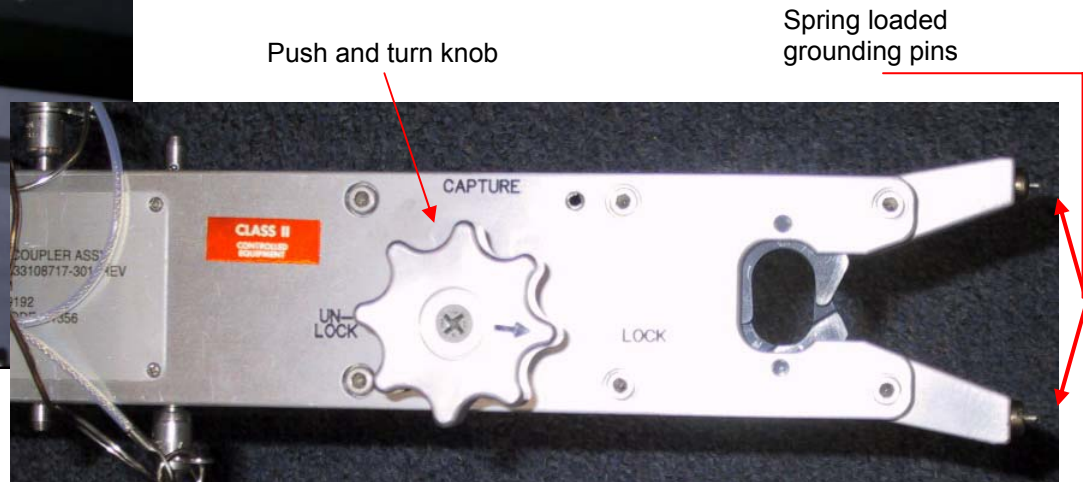
**CETA CART RELOCATION TASK DATA SHEET (Cont)**



**CETA Cart Wheel Bogie**




**PASSIVE COUPLER**



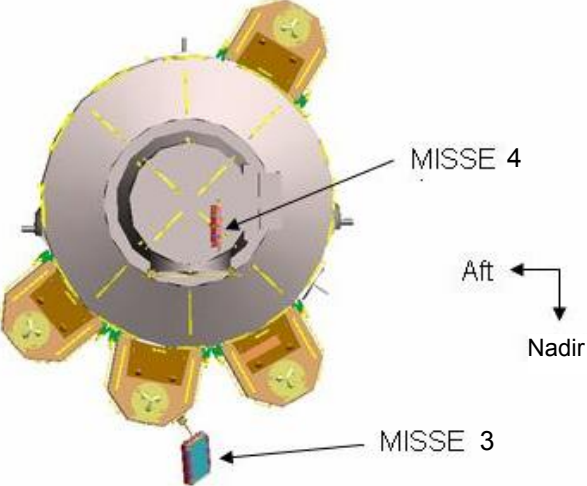
**CETA Cart Active Coupler**

Z1 SASA GIMBAL BOLTS AND MISSE RETRIEVAL (01:00)/P6 TRANSPONDER RETRIEVAL (01:00)

IV/RMS	EV1 (FF)	EV3 (FF)																																							
<p>1. √MCC: Verify inhibits for P6 XPDR remove</p> <p>IV Record</p> <table border="1"> <thead> <tr> <th>Gimbal Bolts</th> <th>Turns</th> <th>Torque</th> </tr> </thead> <tbody> <tr> <td colspan="3" style="text-align: center;">Release</td> </tr> <tr> <td>U-L bolt 4</td> <td></td> <td></td> </tr> <tr> <td>U-R bolt 3</td> <td></td> <td></td> </tr> <tr> <td colspan="3" style="text-align: center;">Re-Torque Initial / Final</td> </tr> <tr> <td>L-L bolt 1</td> <td>/</td> <td>NA /</td> </tr> <tr> <td>L-R bolt 2</td> <td>/</td> <td>NA /</td> </tr> <tr> <td>U-R bolt 3</td> <td>/</td> <td>NA /</td> </tr> <tr> <td>U-L bolt 4</td> <td>/</td> <td>NA /</td> </tr> </tbody> </table> <p>IV Record</p> <table border="1"> <thead> <tr> <th>XPDR Dummy</th> <th>Turns</th> <th>Torque</th> </tr> </thead> <tbody> <tr> <td>Center Bolt</td> <td></td> <td></td> </tr> <tr> <td>Outer 1</td> <td></td> <td></td> </tr> <tr> <td>Outer 2</td> <td></td> <td></td> </tr> </tbody> </table>	Gimbal Bolts	Turns	Torque	Release			U-L bolt 4			U-R bolt 3			Re-Torque Initial / Final			L-L bolt 1	/	NA /	L-R bolt 2	/	NA /	U-R bolt 3	/	NA /	U-L bolt 4	/	NA /	XPDR Dummy	Turns	Torque	Center Bolt			Outer 1			Outer 2			<p>Z1 SASA SPARE GIMBAL BOLTS (00:30)</p> <ol style="list-style-type: none"> <li>Translate to Z1 HR 6001 (near SASA spare)</li> <li>Tether to SASA shroud</li> <li>Remove shroud to access SASA spare gimbal locks</li> <li><b>PGT[B3, CCW2, 30.5 ]-7/16 X 6"</b> Loosen gimbal lock fasteners (in order), 2 turns <ul style="list-style-type: none"> <li><input type="checkbox"/> Upper-Left bolt 4 (report torque and turns)</li> <li><input type="checkbox"/> Upper-Right bolt 3 (report torque and turns)</li> </ul> </li> <li>Manipulate gimbals with all bolts in place to slightly shift the square spacer block on all bolts to verify no loads exist</li> <li>Push inward on the base of the antenna (near bolts 1 &amp; 2) to ensure pedestal is fully seated against the spacer blocks</li> <li>Verify all four bolts still properly rotated to lock position and seated</li> <li>Rotate gimbal lock fasteners (4) in pattern <b>PGT[A3, CW2, 30.5 ]-7/16 X 6"</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lower-Left bolt 1 ~ 3 turns</li> <li><input type="checkbox"/> Lower-Right bolt 2 ~ 3 turns</li> <li><input type="checkbox"/> Upper-Right bolt 3 ~ 2 turns</li> <li><input type="checkbox"/> Upper-Left bolt 4 ~ 2 turns</li> </ul> <p>← Report torque and turns</p> </li> <li>Visually verify that all bolts are properly aligned and seated</li> <li>Re-torque gimbal lock fasteners <b>PGT[A3, CW2, 30.5 ]-7/16 X 6"</b> Tighten gimbal lock fasteners (4) in same pattern ~1-2 turn to torque <ul style="list-style-type: none"> <li><input type="checkbox"/> Lower-Left bolt 1</li> <li><input type="checkbox"/> Lower-Right bolt 2</li> <li><input type="checkbox"/> Upper-Right bolt 3</li> <li><input type="checkbox"/> Upper-Left bolt 4</li> </ul> <p>← Report torque and turns</p> </li> <li>Stow SASA shroud</li> <li>Inspect gloves; status MCC on RTV and Vectran state</li> <li>Translate to A/L</li> </ol>	<p>P6 TRANSPONDER RETRIEVAL</p> <ol style="list-style-type: none"> <li>Retrieve transponder 6B cover from ORU bag (with scoop)</li> <li>Translate to P6 HR 5326; BRT as required to HR 5322 inverted (up Z1 fwd/stbd corner, aft @ Z1/P6, zenith on aft stbd corner of P6)</li> <li>Remove XPDR MLI, use adj tether to restrain</li> <li>Tether to XPDR</li> </ol> <p>← </p> <ol style="list-style-type: none"> <li>On IV GO: Remove P6 XPDR</li> <li><b>PGT[A7, CCW2, 30.5 ]-7/16 X 6"</b> Release XPDR left and right captive fasteners ~15 turns</li> <li><b>PGT[A7, CCW2, 30.5 ]-7/16 X 6"</b> Release center jack bolt ~33 turns</li> <li>Remove transponder, temp stow</li> <li>Remove dummy box from 6B cover</li> <li>Install dummy box (XPDR) in P6 transponder location by sliding it along guide pins into soft dock position</li> <li><b>PGT[A7, CW2, 30.5]-7/16X6"</b> Push in and engage center jack bolt (~33 turns to torque) ← Report torque and turns</li> <li><b>PGT[A7, CW2, 30.5]-7/16X6"</b> Push in and engage outer fasteners (2) (~15 turns to torque) ← Report torque and turns</li> <li>Close XPDR MLI</li> <li>Install XPDR on 6B cover and scoop on XPDR</li> <li>Stow XPDR on BRT using scoop</li> <li>Time permitting: Inspect PVR PIP pins during translation nadir <ul style="list-style-type: none"> <li><input type="checkbox"/> Aft PVR Stbd side</li> <li><input type="checkbox"/> Stbd PVR Aft side</li> </ul> </li> <li>Inspect gloves; status MCC on RTV and Vectran state</li> <li>Translate to A/L</li> </ol>
Gimbal Bolts	Turns	Torque																																							
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Outer 2																																									



Z1 SASA GIMBAL BOLTS AND MISSE RETRIEVAL (01:00)/P6 TRANSPONDER RETRIEVAL (01:00) (Cont)

IV/RMS	EV1 (FF)	EV3 (FF)
	<p>MISSE RETRIEVAL (00:30)</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><b>WARNING</b></p> <p>MISSEs 3 &amp; 4 contain lithium thionyl chloride batteries that can be toxic; inspection required prior to closure</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><b>CAUTION</b></p> <p>MISSE interior contains shatterable materials. Do not allow tools or suit to impact samples When closing/removing MISSE, apply force at lowest part of HR and do not exceed 45 lb</p> </div> <ol style="list-style-type: none"> <li>1. Translate to airlock gas tank 2 (middle/nadir tank) MISSE 3</li> <li>2. Take photos or WVS survey of both sides of MISSE sample; not required if performed on prior EVA</li> <li>3. Release PIP pins (4) which secure MISSE open/close</li> <li>4. Close MISSE, insert PIP pins (2) which secure MISSE close</li> <li>5. Tether to MISSE</li> <li>6. Push lever lock and move clamp lever to UNLOCK position</li> <li>7. Release capture plate PIP pin, open plate</li> <li>8. Remove MISSE/Clamp from handrail, close capture plate, reinsert PIP pin</li> <li>9. Stow MISSE inside A/L</li>   <li>10. Retrieve MISSE 4; translate to airlock endcone</li> <li>11. Repeat steps for MISSE 4 retrieval</li> <li>12. Inspect gloves; status MCC on RTV and Vectran state</li> </ol>	 <p>The diagram illustrates the MISSE retrieval mechanism. It shows a circular structure with several orange components around the perimeter. In the center, there is a red rectangular object labeled 'MISSE 4'. Below it, there is a blue rectangular object labeled 'MISSE 3'. To the right of the diagram, there are two directional arrows: one pointing left labeled 'Aft' and one pointing down labeled 'Nadir'.</p>

# Z1 SASA SPARE GIMBAL BOLTS AND MISSE RETRIEVAL TASK DATA SHEET

## MISSE

ORU Identification:

ORU	Part number	Serial Number
MISSE PEC 3 Handrail Clamp	419878-1 419900-1	N/A N/A
MISSE PEC 4 Handrail Clamp	419879-1 419900-3	N/A N/A

**Tools:** N/A

**Foot Restraints:** N/A

### Timeline Considerations:

- Both MISSEs to be returned on 13A.1, MISSE 3 is a higher priority for return than MISSE 4

### Notes:

- MISSE PEC with clamp = 76.4 lbs

### Cautions:

- Can not attach safety tethers to same handrail MISSE is attached
- MISSE 3 and 4 contain shatterable materials. Avoid impact with material
- When MISSE is attached to HR, do not exceed 45 lb load at a distance greater than 17 inches from the probe end

### Warnings:

- None

## Z1 SASA Spare Gimbal Bolts

### Tools:

EV1 (FF)	
PGT	6" Wobble

### Foot Restraints:

Task	WIF	APFR Setting
Z1 Gimbal bolts	Z1 WIF 01	IAPFR [3,RR,F12]

### EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Gimbal Fasteners	7/16	4	16.7 gnd 8.3-25.5 on-orbit	18.4 for 1 turn 3.8	30.7 install 46.4 release (first turn) 6.7 release (at hardstop)	4.5	30

**EVA Connectors:** None

### Timeline Considerations:

- None

### Notes:

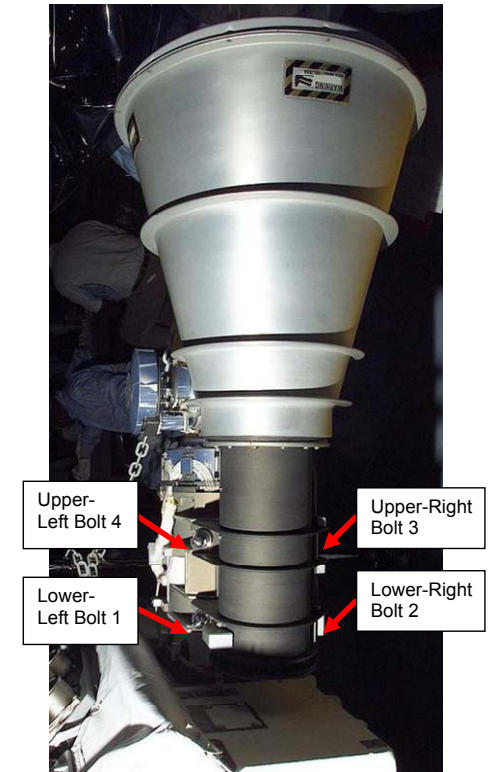
- Gimbal bolts should be torqued in specified pattern so as to prevent misalignment of the gimbal locks during tightening and resulting in higher torques and possibly not reaching turn counts

### Cautions:

- Avoid contact SASA antennas and coatings

### Warnings:

- None



## P6 TRANSPONDER RETRIEVAL TASK DATA SHEET

### Tools:

<b>EV3 (FF)</b>
PGT
6-in wobble
Round Scoop
6B Box ORU Cover

### Foot Restraints:

Task	WIF	APFR Setting

### EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Center jack bolt (XPDR)	7/16	1	4.5-4.8 gnd 9.2 on orbit	9.2 12.3 max	14.8 release 13.2 install	33 release 24.4-30.4 install	30
Outer bolts (XPDR)	7/16	2	4.5-4.8 gnd 9.2 on orbit	9.2 12.3 max	14.8 release 13.2 install	15 release 6.8-12.8 install	30
Center jack bolt (Dummy Box)	7/16	1	1.6 gnd	7.0	17.1	24.4-30.4	30
Outer bolts (Dummy Box)	7/16	2	1.6 gnd	7.0	17.1	6.8-12.8	30

**EVA Connectors:** N/A

### Timeline Considerations:

1. P6 XPDR must be removed before P6 relocated on 10A

### Notes:

1. N/A

### Cautions:

1. ACBSP (P/N 1F7847-1) and XPDR (1F78475-1) dummy boxes must be installed in their corresponding positions due to keying of the ARINC connector interface on the dummy box

### Warnings:

1. N/A


## EVA 3 CLEANUP/INGRESS (00:35)

|

IV/RMS	EV1 (FF)	EV3 (FF)
<p>IV: Perform WVS PWRDN (PHOTO/TV, <u>WVS CUE CARD</u>)</p> <p>IV: Set 2-min timer after both EV1 and EV2 report WATER OFF</p>	<p><u>CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to airlock</li> <li>2. Perform Tool Inventory</li> </ol> <p><u>INGRESS</u></p> <ol style="list-style-type: none"> <li>3. Transfer ORU Bag to EV3</li> <li>4. Stow spare 85-ft tether on A/L D-ring</li> </ol> <p><u>NOTE:</u> EV1 &amp; EV3 safety tethers are swapped (ST anchor is not based where started at beginning of EVA)</p> <ol style="list-style-type: none"> <li>5. On EV2 GO, disconnect EV3 85-ft safety tether from A/L HR 0554</li> <li>6. Connect left waist tether to EV3 85-ft safety tether, LOCK hooks</li> <li>7. Disconnect 85-ft safety tether from A/L HR 0550</li> <li>8. Ingress airlock</li> <li>9. Hatch Thermal Cover – close, attach Velcro strap</li> <li>10. Remove SCU from stowage pouch</li> <li>11. Remove DCM cover, Velcro to DCM</li> <li>12. Connect SCU to DCM; √SCU locked</li> <li>13. DCM: WATER – OFF</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Do not close hatch until EMU WATER – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>14. Verify all hardware is clear of hatch</li> <li>15. EV hatch – close and lock</li> <li>16. Go to PRE REPRESS portion of {CREWLOCK <u>DEPRESS/REPRESS CUE CARD</u>} (SODF: ISS EVA SYS: EVA PREP/POST)</li> </ol>	<p><u>CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to airlock</li> <li>2. Perform Tool Inventory</li> </ol> <p><u>INGRESS</u></p> <ol style="list-style-type: none"> <li>3. Ingress airlock</li> <li>4. Receive ORU Bag, stow</li> <li>5. Connect right waist tether to UIA D-ring</li> <li>6. Give EV1 GO to disconnect 85-ft tether</li> </ol> <ol style="list-style-type: none"> <li>7. Remove SCU from stowage pouch</li> <li>8. Remove DCM cover, Velcro to DCM</li> <li>9. Connect SCU to DCM; √SCU locked</li> <li>10. DCM: WATER – OFF</li> </ol> <ol style="list-style-type: none"> <li>11. Go to PRE REPRESS portion of {CREWLOCK <u>DEPRESS/REPRESS CUE CARD</u>} (SODF: ISS EVA SYS: EVA PREP/POST)</li> </ol>

## POST EVA 3 TOOL CONFIG

### EV1


- Waist Tether (R D-ring to Safety tether)
- Waist Tether (L D-ring to MWS)
- D-ring Extender (2)
- 85-ft Safety Tether (R on extender)
- MWS
- T-bar
- Rabbit Ear Wire Ties (2)
- Adj
- RET (sm-sm PIP pin)
- RET (sm-sm) (2)
- Sm Trash Bag (L, inside) 
- WIF adapter
- Swing Arm (R)
- RET (sm-sm)
- PGT S/N \_\_\_\_\_ w/battery
- 7/16 x 6" wobble
- BRT (L)
- RET (sm-sm)
- Wire Ties (2)

### External

- Spare 85-ft safety tether (on HR 0546)
- 55-ft safety tether hatch D-ring

Have MISSE return bags pre staged in A/L; see MISSE PREP FOR RETURN (TOOLS AND STOWAGE)

### EV3

- Waist Tether (L D-ring to Safety tether)
- Waist Tether (R D-ring to MWS)
- D-ring Extender (2)
- 85-ft Safety Tether (L on extender)
- Adj (2 on wrists)
- MWS
- T-bar
- Rabbit Ear Wire Ties (2)
- Adj
- RET (sm-sm PIP pin)
- RET (sm-sm) (2)
- Sm Trash Bag (L, inside) 
- Swing Arm (R)
- RET (sm-sm)
- PGT S/N \_\_\_\_\_ w/battery
- 7/16 x 6" wobble
- BRT (L)
- RET (sm-sm)
- Wire Ties (3)

### CREWLOCK

- 6 B box cover
- Transponder
- Round Scoop
- Small ORU Bag (A/L zenith/fwd/stb)
- RET (Lg-sm) on outside
- GPS Caps wire-tied together
- RET (sm-sm) (2)

### CREWLOCK

- Staging Bag
  - PGT S/N \_\_\_\_\_ w/battery
  - CETA Cart Wheel Boogie PIP pin
- Med ORU Bag
- 6 B box cover w/o thermal cover (long wire-tied to bag)
- Adj (to box cover)
- Dummy Box
- Sm-sm RETs
- Lg-sm RET on outside
- Adj tether (on outside)
- Spare 85-ft safety tether
- CL Bag #3 (contingency) -Aft/Zenith wall
- Adj (Lg-sm) on outside
- Wire Tie Caddy
- Connector Cleaner Tool Caddy
- Connector Pin Straightener
- EVA Ratchet
- Socket Caddy
- 7/16 x 9" rigid
- 7/16 x 6" wobble
- 7/16 x 2"
- RAD
- Vise Grips
- Adj tether to internal D-ring (3)
- Digital Camera
- D-ring Extender
- MISSE 3 & MISSE 4
- Lg-sm RET (2)

**EVA 4 BRIEFING CARD****EVA Prep**

Remove watches, jewelry, etc during EMU ops

Follow procedures carefully

PBA and SCU are pure O2

Do not touch connections. Inspect for dirt, oil, burrs, particles

Do not force connections

Do not crush or kink hoses

EMU is pure O2 environment. Do not wear products such as chapstick

**A/L CONFIG AND TOOLS:**

\* Crew lock bag for nominal tasks; 2 OSEs, WETA

\* Crew lock bag for contingencies stays in the A/L

**EGRESS PLAN:**

\* EV3 to A/L D-ring; EV2 L waist to EV3 safety tether

\* Check PGT, tools, BRT tucked in

\* EV2 egresses and attaches both safety tethers to handrails

\* EV3 hands out Crew lock bag and OSEs

\* EV3 egresses and closes thermal cover

\* Both check SAFER handles down and down

**TRANSLATION:**

\* Hand on structure at all times. Do not hop

\* Avoid feet first translation

\* Slow and deliberate

\* Check tethers often

\* Check each other's tethers, when possible

\* Keep loaded BRT in scan as well

\* Stay aware of sensitive hardware in your work area

**TETHER SWAPS:**

\* Secure spare waist tether first, check locked

\* Perform tether swap

\* Visually check and verbalize all tethers locked, reel unlocked

**TETHERS AND TOOLS:**

\* Follow good tethering protocol on all tools – “Good RET”

\* Pull test everything (PGT sockets, APFRs, etc)

**Task Specific Items (TBD):**

\* TBD

\* TBD

TBD

**TASK SPECIFIC Items (TBD):**

TBD

**COMM PROTOCOL:**

Succinct and professional

SSRMS calls are top priority

IVA is prime relay to MCC

**SUIT MAL PROTOCOL:**

Challenge-response led by IV or nominal suit

**CANON CABLES/CONNECTORS:**

Check pin straightness

No FOD in receptacle

EMI band

Proper bend radius

\* Inspect gloves for RTV and Vectran damage, report to MCC

**PGT OPS:**

Check settings with IV

Pull test on all socket installs

Turn count (count all turns at bolt vice RAD)

Red light – Low torque, green light – in torque window, Both – Hi torque

Cal Procedure – Ratchet Collar – Not motor, Speed Collar – Cal, Pull trigger

**KEEP OUT ZONES:**

S1 SASA, S1 Radiator Beam

**DAY/NIGHT TRANSITIONS: (IV will call)**

\* Lights, visor, check all tools secure

**INGRESS PLAN:**

Bring all 85-ft tethers inside A/L

\* Check PGT, tools, BRT tucked in

EV3 in first, then tether to D-ring extender

EV2 disconnect EV3 safety tether, connect it to left waist tether

EV2 disconnect own safety tether

EV2 in feet first with an EV3 assist

Check hatch seal clear before closing

\* Review during EMU P/B if time


# EVA 4 SUMMARY TIMELINE

1


PET TIME (HR : MIN)	13A.1 EVA 4				
	IV	PET	EV2 (FF)	PET	EV3 (FF)
00:00		00:00	<u>EGRESS/SETUP</u> (00:20) POST DEPRESS and EGRESS (00:20)	00:00	<u>EGRESS/SETUP</u> (00:20) POST DEPRESS and EGRESS (00:20)
		00:20	<u>OBSS BOOM STAND INSTALL</u> (01:00)		<u>OBSS BOOM STAND INSTALL</u> (01:00)
01:00		01:20	<u>CP1 WETA ANTENNA INSTALL</u> (01:45)	01:20	<u>CP1 WETA ANTENNA INSTALL</u> (01:45)
02:00					
03:00		03:05	<u>P1 VSSA INSTALL at CP7</u> (01:00)	03:05	<u>P1 VSSA INSTALL at CP7</u> (01:00)
04:00		04:05	<u>TS RELOCATE (NODE 1 WIF5 to CETA 1)</u> (00:40)	04:05	<u>NODE HR 120 REMOVE</u> (00:25)
				04:30	<u>APFR MOVE (NODE1 WIF5 – ESP2 WIF8)</u> (00:25)
		04:45	<u>GPS ANTENNA #4 REMOVE</u> (00:40)	04:55	<u>P6 AUX BAG MOVE</u> (00:30)
05:00		05:25	<u>GET AHEADS</u> (00:20)	05:25	<u>GET AHEADS</u> (00:20)
		05:45	<u>CLEANUP/INGRESS</u> (00:45) CLEANUP (00:25)  INGRESS (00:15) PRE REPRESS ( <u>DEPRESS/REPRESS</u> ) (00:05)	05:45	<u>CLEANUP/INGRESS</u> (00:45) CLEANUP (00:25)  INGRESS (00:15) PRE REPRESS ( <u>DEPRESS/REPRESS</u> ) (00:05)
06:00					
	EVA Time 6:30	06:30		06:30	

## PRE EVA 4 TOOL CONFIG

### EV2

- Waist Tether (R D-ring to Safety Tether)
- Waist Tether (L Extender to MWS)
- D-ring Extender (2)
- 85-ft Safety Tether (R on extender)
- Adj (2 on wrist)
- MWS
- T-bar
- Rabbit Ear Wire Ties (2)
- RET (sm-sm PIP pin)
- RET (sm-sm) (3)
- Sm Trash Bag (L, inside) 
- Swing Arm (R)
- RET (sm-sm)
- PGT S/N \_\_\_\_\_ w/battery
- 7/16 x 6" wobble
- BRT (L)
- RET (sm-sm)
- Wire Ties (2)

### EV3

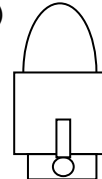
- Waist Tether (R D-ring)
- D-ring Extender (2)
- 85-ft Safety Tether (R on extender)
- Adj (2 on wrists)
- MWS
- T-bar
- Rabbit Ear Wire Ties (2)
- Adj
- RET (sm-sm PIP pin)
- RET (sm-sm) (3)
- Sm Trash Bag (L, inside) 
- Swing Arm (R)
- RET (sm-sm)
- PGT S/N \_\_\_\_\_ w/battery
- 7/16 x 6" wobble
- BRT (L)
- RET (sm-sm)
- Wire Ties (3)

### CREWLOCK

Verify following item is in Staging Bag

- PGT S/N \_\_\_\_\_ w/battery

- WETA
  - √EVA MLI installed (IV MLI and connector cap removed)
- Round Scoop (handle up)
- RET (Lg-sm) to Airlock



Prior to EVA  
 Inspect RET cord for damage  
 Inspect safety tethers and waist tethers load alleviating straps

### CREWLOCK (continued)

- CL Bag #1
- RET (Lg-sm) on outside
- Digital Camera
- RET
- Adj (2)
- Spare 85-ft safety tether (on outside)

- OBSS OSE (2)
- RET (Lg-sm) (2)
- Bungee
  - √PAD installed to OSE (closed)
  - √Capture Latch PIP pin installed in stowed position
  - √Anti-rotation fittings (2) deployed and PIP pins (2) located in capture position

- Small ORU Bag
- RET (Lg-sm) on outside (*keep w/bag*)
- GPS Caps wire-tied together
- RET (sm-sm) (2)

- CL Bag #3 (contingency) -*Aft/Zenith wall*
- Adj (Lg-sm) on outside
- Wire Tie Caddy
- Connector Cleaner Tool Caddy
- Connector Pin Straightener
- EVA Ratchet
- Socket Caddy
- 7/16 x 6" wobble
- 7/16 x 2"
- 7/16 x 9" rigid
- RAD
- Vice Grips
- Adj tether to internal D-ring (3)

- D-ring Extender (on A/L D-ring)



# 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 (flt specific √ with GNC)  
O14,15,16 2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF  
LOGIC (four) – OFF
- MCC-H 3. √Above RCS config  
IV 4. √RCS F – ITEM 1 EXEC (\*)  
√JET DES F1U – ITEM 17 (\*)  
F3U – ITEM 19 (\*)  
F2U – ITEM 21 (\*)

### S-Band Antennas

#### NOTE

Possible loss of comm when forced LL FWD antenna

- IV If EV crew < 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 call:  
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

## USOS

### PCU

- MCC-H 1. √PCUs (two) operational in discharge mode and one of the following:  
A. CCS PCU EVA Hazard Control enabled  
B. No more than two arrays unshunted  
C. No more than two arrays pointed < 90 deg from velocity vector
- OR
2. One or no PCUs operational in discharge mode and one of the following:  
A. No more than two arrays unshunted  
B. No more than two arrays pointed < 90 deg from velocity vector

### Ground Radar

- MCC-H 1. √TOPO and FDO consoles, ground radar restrictions in place for EVA

### S1 TRRJ – (OBSS OSE AND S3 WETA)

One TRRJ DLA locked for EV crew translation on S1 nadir and zenith:

- MCC-H 1. √DLA (1) – LOCKED

Cont on next page

## EVA 4 INHIBIT PAD (Cont)

### USOS

#### S3 CP1 – (WETA Install at CP1)

- MCC-H
1. RPCM S31A\_A RPC 15 – Open, Close Cmd Inhibit
  2. RPC 16 – Open, Close Cmd Inhibit
  3. RPCM S32B\_A RPC 15 – Open, Close Cmd Inhibit
  4. RPC 16 – Open, Close Cmd Inhibit

#### S1 SASA (OBSS OSE Install)

- MCC-H
1. Check String 1 Transponder powered off
  2. String 1 RFG Parked at EL = 0 and Az = 0
  3. String 1 RFG Transmitter turned off
  4. String 1 RFG SSPA Muted

#### GPS Antenna #4 Remove

- MCC-H
1. RPCM S02B\_E RPC 8 – Open, Close Cmd Inhibit
  2. RPCM S01A\_E RPC 7 – Open, Close Cmd Inhibit

### RSOS

#### SM Antennas

- MCC-M
1. Global Timing Sys 1(400.1 MHz) [GTS] – Deactivate
  2. ARISS – Deactivate

#### FGB Antennas

- MCC-M
1. ARISS – Deactivate
  2. √FGB KURS P [KYPC P] – Deactivated

#### FGB Thrusters

- MCC-M
1. √FGB MCS unpowered
  2. √All FGB Attitude Control Thruster Valves (eighty) – closed
  3. √FGB Attitude Control Manifold Valves – closed  
КШК1, КШК2, КШК4, КШК5, КШК9, ОКО3, ОКГ3, ОКО6, ОКГ6, ОКО7, ОКГ7, ОКО8, ОКГ8

#### Soyuz Antennas

- MCC-M
1. √Soyuz KURS A [KYPC A] – Deactivated

#### Soyuz Thrusters

- MCC-M
1. √Soyuz manifolds (four) – closed  
ЭКО1, ЭКО2, ЭКГ1, ЭКГ2
  2. √Soyuz MCS unpowered
  3. √Soyuz Attitude Control Thruster Valves (fifty-two) – closed
  4. √Soyuz Main Engine Valves (K1,K2,K3,K4,K5,K6) – closed

## EVA 4 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. MLI handholds are not rated for crewmember translation loads
6. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged
7. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
8. Avoid contact with Vitrolube-coated OBSS striker bars
9. Velcro exposed to AO deteriorates rapidly; verify full and smooth velcro seams

### CAUTION

#### ISS Constraints

- A. Avoid inadvertent contact with
  1. Grapple fixture shafts (drylube)
  2. PIP pins
  3. MDM sunshade [PMA1]
  4. EVA Crane [PMA1]
  5. TCS Reflectors [PMA2, PMA3]
  6. APAS hardware [PMA2, PMA3]
  7. CETA Lights (Z-93 paint) [LAB, S1, Node 1]
  8. Deployed MISSEs [A/L]
  9. Passive UMAs
  10. MBS VDU, MCU, CRPCMs, and Cameras (taped radiative surfaces, silver Teflon)
  11. Deployed TUS cable
  12. S0 aft face Radiator
  13. GPS Antennas (S13 paint) [S0]
  14. UHF Antennas [LAB, P1]
  15. ETCS Radiators [S1, P1]
  16. EETCS/PV Radiator bellows and panels [P6, P4, S4, S6]
  17. SASA RF Group [Z1, S1, P6]
  18. Heat pipe radiators [Z1]
  19. PCU cathode and HCA ports [Z1]
  20. Ku-Band Antenna (SGANT) dish [Z1]
  21. CMG cover/shells [Z1]
  22. SSRMS Cameras
  23. Open CBM petal covers and LAB window shutter

### 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
- 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
- F. Other
  1. ITT Cannon connector: do not turn collar from WHITE to BLACK without a mating half attached
  2. WIS Antennas: do not use as handholds [Node 1, P6, Z1]
  3. Lubricant from Ku-Band SGANT gimbals [Z1], CMGs [Z1], and RTAS Ground Strap fasteners [P6,P4,S4,S6] can contaminate EMU

## EVA 4 NOTES, CAUTIONS, AND WARNINGS (Cont)

### **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]
  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]

### **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 566, A/L Tank 2 nad/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

### **WARNING** (Cont)

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

- D. RF Radiation Exposure
1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1,P6]
  2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1,P6]
  3. Stay 1 ft from UHF Antenna when powered [LAB, P1]
- E. Sharp Edges
1. Inner edges of WIF sockets
  2. Mating surfaces of EVA connectors. Avoid side loads during connector mating
  3. Back side of MMOD shield fasteners
  4. Spring loaded captive EVA fasteners (eg 6B-boxes, BMRRM); the end of the spring may protrude
  5. PMA umbilical launch restraints-exposed bolt threads
  6. Nickel coated braided copper Ground Straps may contain frayed wires [P6, P4, S4, S6]
  7. Z1 handrail 6061 by the Ku-Band boom launch restraint [Z1]
  8. Solar Array Blanket Box [P6, S6]
  9. Keep hands away from SSRMS LEE opening, and snares

## EVA 4 NOTES, CAUTIONS, AND WARNINGS (Cont)

### **WARNING** (Cont)

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

##### F. Thermal

1. PMA handrails may be hot. Handling may need to be limited
2. Turn off glove heaters when comfortable temp reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
3. Uncovered trunnion pins may be hot
4. SSRMS/MBS operating Cameras and lights may radiate large amounts of heat
5. Stay 1 ft away from PMAs and MMOD shields > 270 degF if EMU sun visor up
6. Stay at least 1 ft away for no more than 15 min from PMAs and MMOD shields > 300 degF if EMU sun visor up
7. Stay 0.5 ft away from PMA and MMOD shields > 325 degF
8. Do not touch EMU protective visor if temp has been < -134 for >15 min
9. No EMU TMG contact of PMAs and MMOD shields when temp > 320 degF
10. No EMU boot contact with foot restraint when temp < -120 degF or > 200 degF

### **WARNING** (Cont)

#### **Shuttle Constraints**

##### G. 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]

##### H. Pinch

1. PRLA operation [PLB]

##### I. 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)**

##### J. 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

##### K. Thermal

1. Illuminated PLB lights; do not touch
2. OBSS grapple fixture shafts/cams may be hot. Limit handling if required

##### L. Thruster Contamination

1. Stay out of the immediate vicinity of leaking jet or APU
2. Stay 27 ft from PRCS when powered
3. Stay 3 ft from VRCS when powered
4. Stay 3 ft from APU when operating

IV	EV2 (FF)	EV3 (FF)
<p><u>POST DEPRESS</u> (DEPRESS/REPRESS Cue Card)</p>	<p><u>POST DEPRESS (DEPRESS/REPRESS Cue Card)</u></p> <div> </div> <p style="text-align: center;">Initial Tether Configuration</p> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. √Initial tether configuration, hooks locked, reels unlocked</li> <li>2. Hatch Thermal cover – open</li> <li>3. Egress airlock</li> <li>4. Attach Rt 85-ft safety tether retracting end to A/L HR 0550, LOCK hook</li> <li>5. Verify 85-ft tether reel housing in Unlocked position</li> <li>6. Release left waist tether from EV3's 85-ft safety tether</li> <li>7. Attach EV3's 85-ft safety tether retracting end to A/L handrail 0554 inboard stanchion, LOCK hook</li> <li>8. Give EV3 GO to release from A/L D-ring</li> <li>9. Receive crewlock bag and sm ORU bag from EV3, stow on A/L outboard toolbox</li> <li>10. Receive outboard OSE from EV3, attach to BRT</li> <li>11. Receive inboard OSE, hold for EV3</li> <li>12. Assist EV3, if required</li> <li>13. √SAFER MAN ISOL vlv – OP (dn) and HCM (dn)</li> <li>14. √Safety tethers and OSE configs</li> </ol>	<p><u>POST DEPRESS (DEPRESS/REPRESS Cue Card)</u></p> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> <li>1. √Initial tether configuration, hooks locked, reels unlocked</li> <li>2. On GO, release left waist tether from A/L D-ring</li> <li>3. Verify 85-ft tether reel housing in Unlocked position</li> <li>4. Hand crewlock bag and sm ORU bag (w/Lg-sm RET) to EV2</li> <li>5. Retrieve outboard OSE, pass to EV2</li> <li>6. Retrieve inboard OSE, pass to EV2</li> <li>7. Egress A/L</li> <li>8. Retrieve OSE from EV2 and attach to BRT</li> <li>9. √SAFER MAN ISOL vlv – OP (dn) and HCM (dn)</li> <li>10. √Safety tethers and OSE configs</li> <li>11. Close hatch thermal cover</li> </ol>

OBSS OSE INSTALL (01:00)

IV	EV2 (FF)	EV3 (FF)												
<p>IV: Verify w/MCC that inhibits for S1 SASA are in place</p> <p>1. IV: Record torque/turns data</p> <table border="1"> <thead> <tr> <th></th> <th>EV2</th> <th>EV3</th> </tr> </thead> <tbody> <tr> <td><b>Bolt 1</b> (Clamp)</td> <td></td> <td></td> </tr> <tr> <td><b>Bolt 2</b></td> <td></td> <td></td> </tr> <tr> <td><b>Bolt 3</b></td> <td></td> <td></td> </tr> </tbody> </table> <p>IV: Give MCC GO for S1 SASA power up</p>		EV2	EV3	<b>Bolt 1</b> (Clamp)			<b>Bolt 2</b>			<b>Bolt 3</b>			<p><u>OUTBOARD BOOM STAND INSTALL</u></p> <ol style="list-style-type: none"> <li>Translate to S1 Zenith outboard trunnion, fairlead (w/adj) at HR (S1 3247 <i>face 6</i>) _____</li> <li>Install outboard boom stand (OSE 02) to S1 Zenith Outboard trunnion until latch catches shear plate</li> <li>Install capture latch PIP pin in locked position (hole w/arrow)</li> <li>Check gaps between anti-rotation blocks and trunnion shear plate to verify trunnion alignment</li> <li>BRT to HR (3231) _____</li> <li><b>PGT[B3, CW2, 30.5]-7/16X6"</b> Drive Clamp "Bolt 1", ~11-13 turns ← Report torque and turns</li> <li>Verify OSE fully attached, clamped, and aligned to trunnion – view clamping mechanism through OSE cover slot</li> </ol> <p><u>EXTEND UPPER EXTENDER TUBE</u></p> <ol style="list-style-type: none"> <li>Pull spring loaded locking pin</li> <li>Extend tube until locking pin engages</li> <li>Verify black alignment stripe on lower tube visible</li> <li><b>PGT[A3, CW2, 30.5]-7/16X6"</b> Drive Bolts 2 and 3, ~12 turns ← Report torque and turns</li> <li>Configure PAD to Soft Dock position</li> <li>Inspect gloves; status MCC on RTV and Vectran state</li> <li>Translate to A/L; retrieve adj fairlead</li> </ol>	<p><u>INBOARD BOOM STAND INSTALL</u></p> <ol style="list-style-type: none"> <li>Translate to S1 zenith inboard trunnion, via CETA cart translation path, fairlead (w/adj) at top of CETA spur HR (S0 3413) _____ <i>monitor EV2 safety tether</i></li> <li>Install inboard boom stand (OSE 01) to S1 Zenith inboard trunnion until latch catches shear plate</li> <li>Install capture latch PIP pin in locked position (hole w/ arrow)</li> <li>Check gaps between anti-rotation blocks and trunnion shear plate to verify trunnion alignment</li> <li>BRT to HR (3271) _____ (local tether HR 3274)</li> <li><b>PGT[B3, CW2, 30.5]-7/16X6"</b> Drive Clamp "Bolt 1", ~11-13 turns ← Report torque and turns</li> <li>Verify OSE fully attached, clamped and aligned to trunnion – view clamping mechanism through OSE cover slot</li> </ol> <p><u>EXTEND UPPER EXTENDER TUBE</u></p> <ol style="list-style-type: none"> <li>Pull spring loaded locking pin</li> <li>Extend tube until locking pin engages</li> <li>Verify black alignment stripe on lower tube visible</li> <li><b>PGT[A3, CW2, 30.5]-7/16X6"</b> Drive Bolts 2 and 3, ~12 turns ← Report torque and turns</li> <li>Configure PAD to Soft Dock position</li> <li>Inspect gloves; status MCC on RTV and Vectran state</li> <li>Translate to A/L; release adj fairlead</li> </ol>
	EV2	EV3												
<b>Bolt 1</b> (Clamp)														
<b>Bolt 2</b>														
<b>Bolt 3</b>														

## OBSS OSE INSTALL TASK DATA SHEET

### Tools:

EV2 (FF)	EV3 (FF)
PGT	PGT
7/16 x 6" wobble	7/16 x 6" wobble

Foot Restraints: None

### EVA Fasteners:

Fastener Name	Head Size	Qty (per OSE)	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
OSE Clamp Bolt 1	7/16	1	18.4	N/A	385	11-13	
OSE Bolt 2	7/16	1	4.8	N/A	9.4	12-14	
OSE Bolt 3	7/16	1	4.8	N/A	9.4	12-14	

### ORU Identification:

	Serial Number
S1 Zenith INBD Mid – IBA	OSE 0001
S1 Zenith OUTBD Sensor End – IBA	OSE 0002



### Timeline Considerations

1. N/A

### Notes:

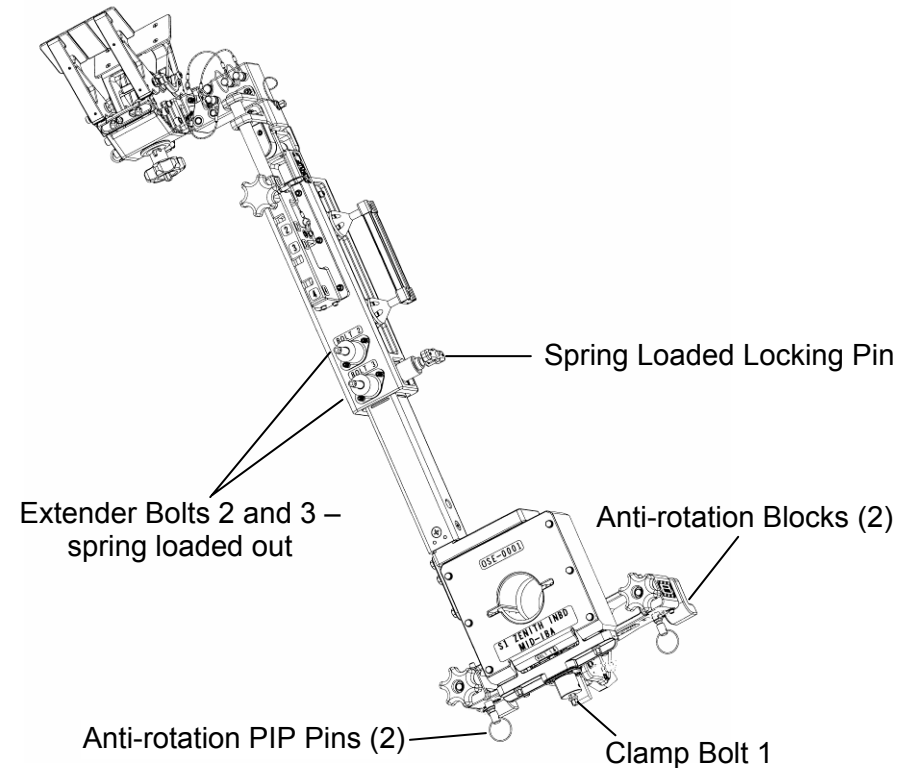
1. Configure PAD to soft dock for future OBSS stow

### Cautions:

1. N/A

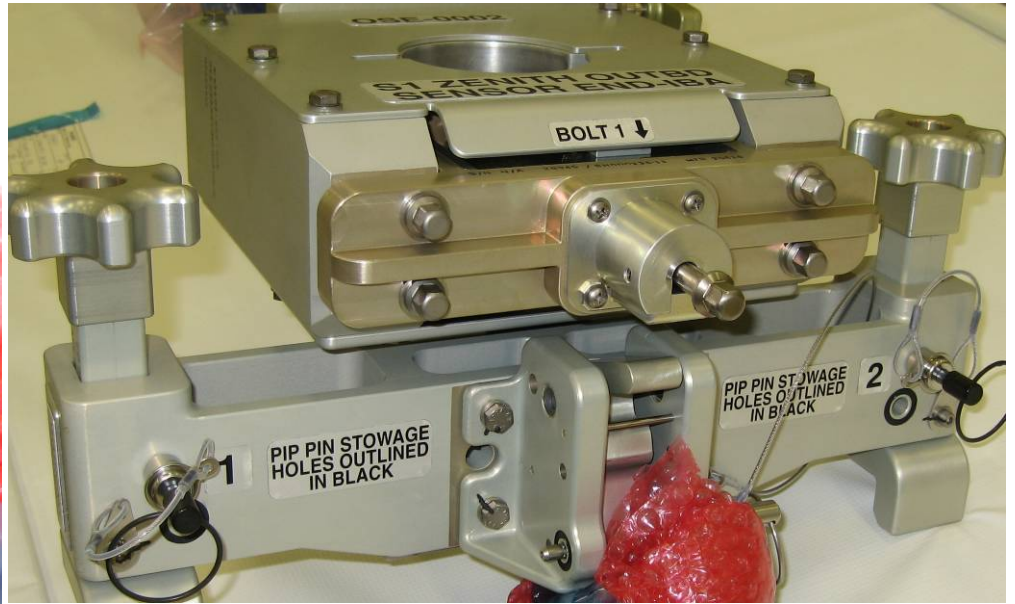
### Warnings:

1. N/A





OBSS OSE INSTALL TASK DATA SHEET (Cont)



## WETA ANTENNA INSTALL (01:45)

IV/RMS	EV2 (FF)	EV3 (FF)
<p>IV Confirm MCC GO for VSSA connector mates</p>	<p><u>WETA RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>1. Retrieve spare safety tether from outside A/L</li> <li>2. Retrieve WETA w/round scoop from airlock (leave Lg-sm RET in A/L); stow on BRT (<i>tether to WETA tether point not scoop</i>)</li> <li>3. Close airlock thermal cover</li> <li>4. Translate aft under A/L and over top to CETA Spur</li>   <li>5. Translate via nadir path toward S1/S3 interface</li> <li>6. Perform safety tether swap at HR (3233)_____</li> <li>7. Stow airlock safety tether on S3 HR _____</li>   <li>8. Translate to S3 Face 4 WETA Install location (CP-1)</li>   <p><u>DUMMY BOX REMOVAL</u></p> <li>9. Open CP-1 shroud to uncover VSSA port</li> <li>10. BRT to HR 3020</li> <li>11. Tether to dummy box</li> <li>12. <b>PGT [A5, CCW2, MTL 30.5] 6" ext 7/16"</b>  <input type="checkbox"/> <input type="checkbox"/> Release dummy box left and right captive fasteners <b>16 turns</b></li> <li>13. <b>PGT[A5, CCW2, MTL 30.5] 6" ext 7/16"</b>  <input type="checkbox"/> Release center jack screw <b>33 turns</b></li> <li>14. Remove dummy box; hand off to EV3</li> <li>15. Install WETA on the stanchion by sliding it along two guide pins into soft dock position</li> <li>16. Remove round scoop; stow on MWS</li> </ol>	<p><u>VSSA STANCHION RELEASE</u></p> <ol style="list-style-type: none"> <li>1. Retrieve spare 85-ft safety tether from outside A/L; configure for later tether swap</li> <li>2. Translate to stanchion carrier on ESP-2</li> <li>3. Tether to a stanchion race track tether point</li> <li>4. <b>PGT [B7, CCW2, MTL 30.5]-6" ext 7/16"</b>  <input type="checkbox"/> <input type="checkbox"/> Release launch restraint bolts (two) <b>~8.5 turns</b> (bolts will spring out, black line visible)</li> <li>5. Slide stanchion out of stowage interfaces (toward dummy box)</li> <li>6. BRT to racetrack</li> <li>7. Translate to S0; fairlead near CETA spur (adj left on HR 3413)</li> <li>8. Translate via Face 1 S1/S3 interface</li> <li>9. Perform safety tether swap at HR (3246)_____</li> <li>10. Stow airlock safety tether on S3 HR _____</li> <li>11. Translate Zenith/Aft at Bay 17 to S3 Face 4 WETA Install location (CP-1)</li>   <p><u>DUMMY BOX REMOVAL</u></p> <li>12. Temp stow stanchion</li> <li>13. BRT to HR _____</li> <li>14. Hold stanchion for EV2</li>   <li>15. Receive dummy box; stow in CL bag</li> </ol>

**WETA ANTENNA INSTALL (01:45) (Cont)**

IV/RMS			EV2 (FF)	EV3 (FF)
	<b>Torque</b>	<b>Turns</b>	<p>17. <b>PGT[A7, CW2, MTL 30.5] 6" ext 7/16"</b>                      Push in and engage center jack bolt to hardstop                      ~33 turns                      ← Report torque and turns</p> <p>18. Visually check for contact between WETA front wedge and support structure</p> <p>19. <b>PGT[A7, CW2, MTL 30.5] 6" ext 7/16"</b>                      Push in and engage left and right fasteners to hardstop ~16 turns                      ← Report torque and turns</p> <p>20. Remove thermal shroud from WETA; hand off to EV3</p> <p><u>STANCHION INSTALL</u></p> <p style="text-align: center;"><u>NOTE</u>                      Do not allow socket to come off stanchion bolt head until install complete</p> <p>21. <b>PGT [B4, CW2, MTL 30.5] 6" ext 7/16"</b>                      Engage stanchion bolt 10 turns until it drops out of launch position. Continue to engage stanchion bolt to torque stall ~16 turns (6 lb push force reqd)                      ← Report torque and turns</p>	<p>16. Receive shroud; stow in CL bag</p> <p><u>STANCHION INSTALL</u></p> <p>17. BRT to S3 HR (3043) _____</p> <p>18. Soft dock stanchion to CP-1 (~10 lbf required)</p> <p>19. Release RET from stanchion</p>
<b>WETA</b> (Center)				
<b>WETA</b> (Outer-Left)				
<b>WETA</b> (Outer-Right)				
<b>VSSA Stanchion Bolt</b>				



## WETA ANTENNA INSTALL TASK DATA SHEET

### Tools:

EV2 (FF)	EV3 (FF)
PGT	PGT
7/16 x 6" wobble	7/16 x 6" wobble
Round Scoop (on WETA in A/L)	
Wire ties	

Foot Restraints: None

### EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Dummy Box (Outer)	7/16	2	N/A	7.0	17.1	6.8-11.8	30
Dummy Box (Center)	7/16	1	N/A	7.0	17.1	24.4-30.4	30
WETA (Outer)	7/16	2	9.2	N/A	13.2	6.8-12.8	30
WETA (Center)	7/16	1	9.2	N/A	13.2	24.4-30.4	30
VSSA Launch Restraint Bolts	7/16	2	N/A	25.5	50.1	7-11.5	30
VSSA Stanchion Bolt	7/16	1	18.4	25.5	62.0	10 launch 16.5 install/ release	30

### EVA Connectors:

Harness	From	To	Conn Size
Dead Face Connector	S3 J2	VSSA Dummy Panel	
Dead Face Connector	S3 J3	VSSA Dummy Panel	
Connector Cap	S3 J4	VSSA Dummy Panel	
W8200-P2	VSSA Dummy Panel	S3 J2	15
W8200-P3	VSSA Dummy Panel	S3 J3	13
W8200-P4	VSSA Dummy Panel	S3 J4	15

### Connector Inhibits:

1. RPCM S31A\_A RPC 15 – Open, Close Cmd Inhibit
2. RPC 16 – Open, Close Cmd Inhibit
3. RPCM S32B\_A RPC 15 – Open, Close Cmd Inhibit
4. RPC 16 – Open, Close Cmd Inhibit

### Timeline Considerations

1. N/A

### Notes:

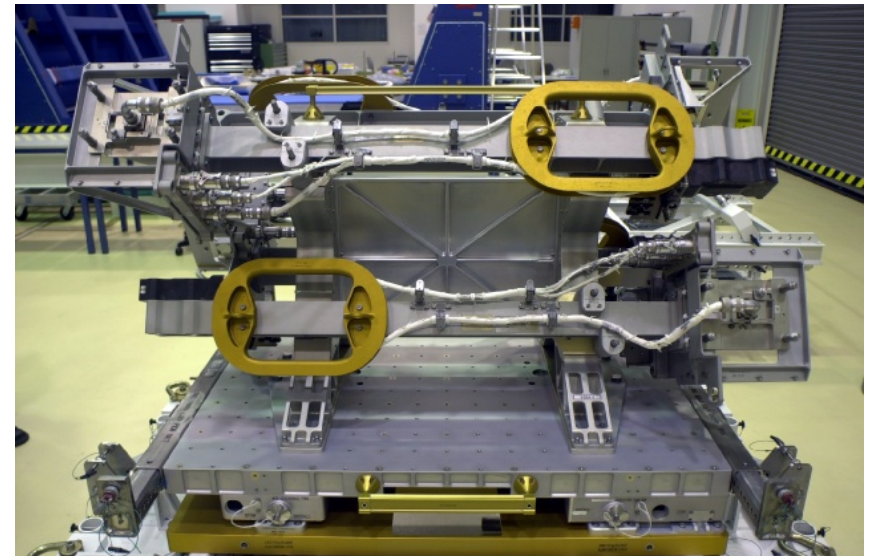
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### Cautions:

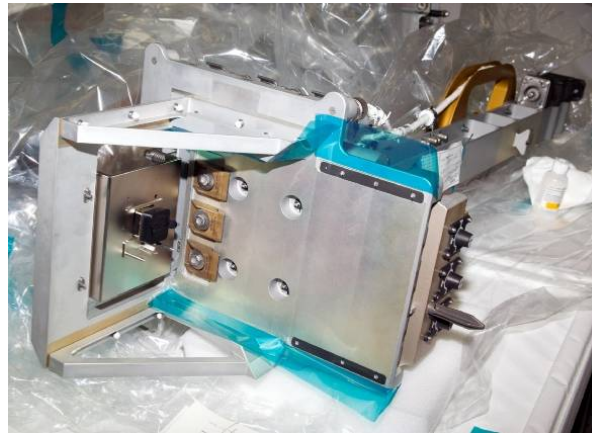
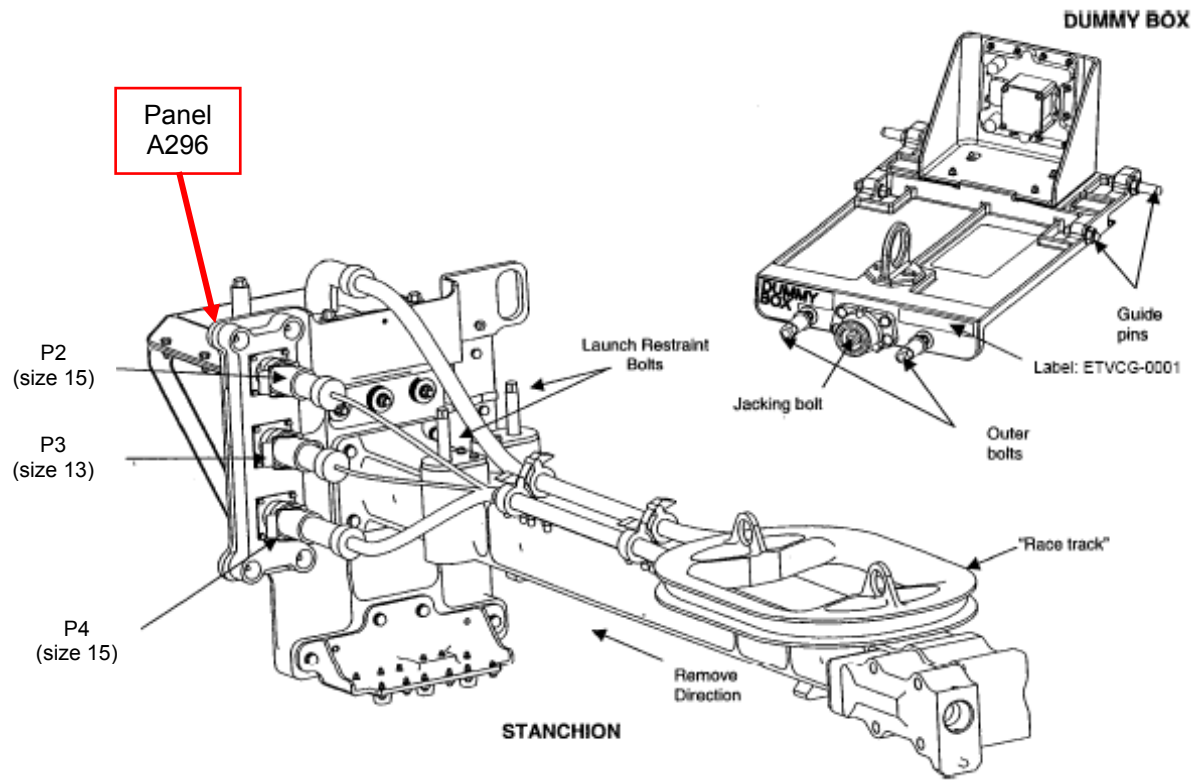
1. N/A

### Warnings:

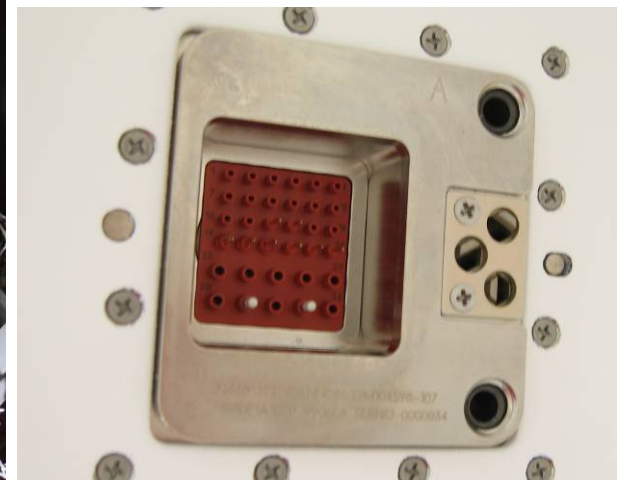
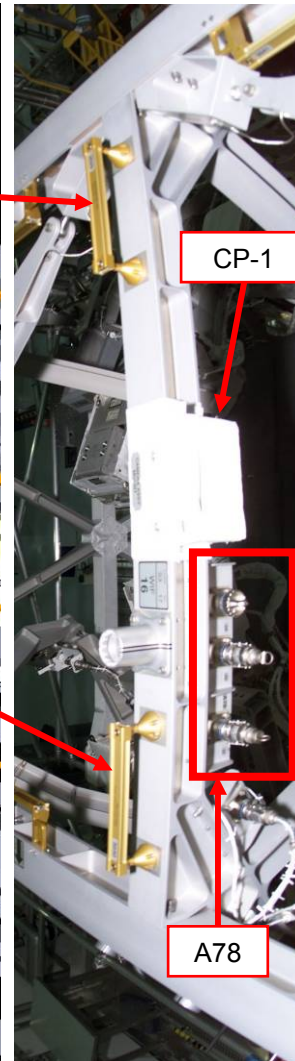
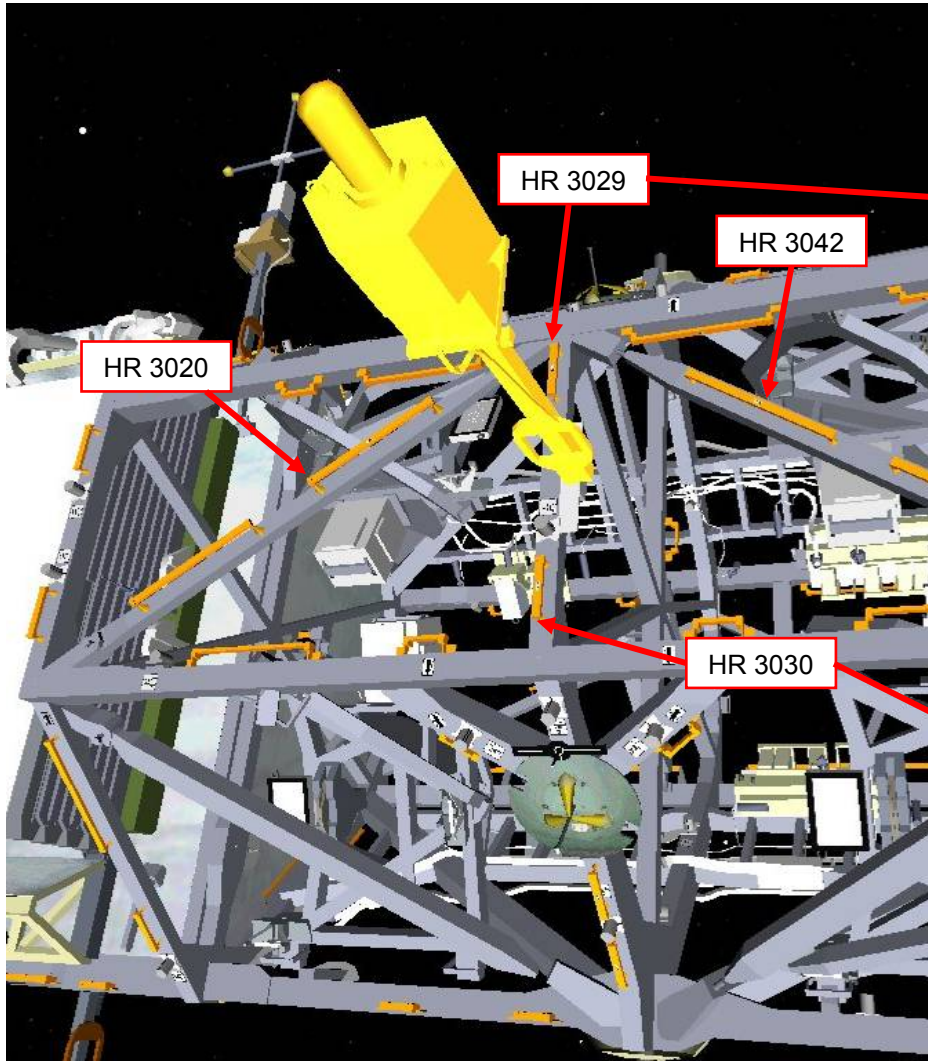
1. N/A



# WETA ANTENNA INSTALL TASK DATA SHEET (Cont)



# WETA ANTENNA INSTALL TASK DATA SHEET (Cont)



**P1 VSSA INSTALL AT CP7 (01:00)**

IV/RMS	EV2 (FF)	EV3 (FF)						
<table border="1"> <thead> <tr> <th></th> <th>Torque</th> <th>Turns</th> </tr> </thead> <tbody> <tr> <td>VSSA Stanchion Bolt</td> <td></td> <td></td> </tr> </tbody> </table>		Torque	Turns	VSSA Stanchion Bolt			<p><u>STANCHION RETRIEVAL</u></p> <ol style="list-style-type: none"> <li>Translate to stanchion carrier on ESP-2</li> <li>Tether to stanchion race track tether point</li> <li>Attach scoop to dummy box</li> <li><b>PGT [B7, CCW2, MTL 30.5]-6" ext 7/16"</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Release launch restraint bolts (two) ~8.5 turns (bolts will spring out, black line visible)</li> </ul> </li> <li>Slide stanchion out of stowage interfaces (towards dummy box)</li> <li>BRT to racetrack</li> <li>Translate to CP-7 (nadir S0/P1 interface) via Node nadir path; port is near P1 WIF 01 and HR 3615</li> </ol> <p><u>STANCHION INSTALL</u></p> <ol style="list-style-type: none"> <li>Transfer stanchion to EV3</li> <li>BRT to HR (3615) _____</li> </ol> <p style="text-align: center;"><u>NOTE</u> Do not allow socket to come off stanchion bolt head until complete</p> <ol style="list-style-type: none"> <li><b>PGT [B4, CW2, MTL 30.5] 6" ext 7/16"</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Engage stanchion bolt 10 turns until it drops out of launch position. Continue to engage stanchion bolt to torque stall ~16 turns (6 lb push force reqd)</li> </ul> </li> <li>← Report torque and turn data</li> <li>Inspect gloves; status MCC on RTV and Vectran state</li> </ol>	<ol style="list-style-type: none"> <li>Translate to ESP-2</li> <li>Assist EV2 as needed</li> <li>Temp stow GPS Ant Bag on CETA 1 <i>time permitting</i></li> <li>Translate to CP7 (nadir S0/P1 interface) via Z1 zenith of wagon wheel; fairlead (w/adj) on Z1 port</li> </ol> <p><u>STANCHION INSTALL</u></p> <ol style="list-style-type: none"> <li>BRT to HR (3548) _____</li> <li>Receive stanchion</li> <li>Soft dock stanchion to CP-7 (race track outboard) (~10 lbf required)</li> <li>Hold stanchion in soft dock while EV2 engages stanchion bolt</li> <li>Inspect gloves; status MCC on RTV and Vectran state</li> </ol>
	Torque	Turns						
VSSA Stanchion Bolt								



# P1 VSSA INSTALL TASK DATA SHEET

**Tools:**

EV2 (FF)	EV3 (FF)
PGT	
7/16 x 6" wobble	

**Foot Restraints:** None

**EVA Fasteners:**

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
VSSA Launch Restraint Bolts	7/16	2	N/A	25.5	50.1	7-11.5	30
VSSA Stanchion Bolt	7/16	1	18.4	25.5	62.0	10 launch 16.5 install/ release	30

**EVA Connectors:** None

**Connector Inhibits:** None

**Timeline Considerations**

1. N/A

**Notes:**

1. N/A

**Cautions:**

1. N/A

**Warnings:**

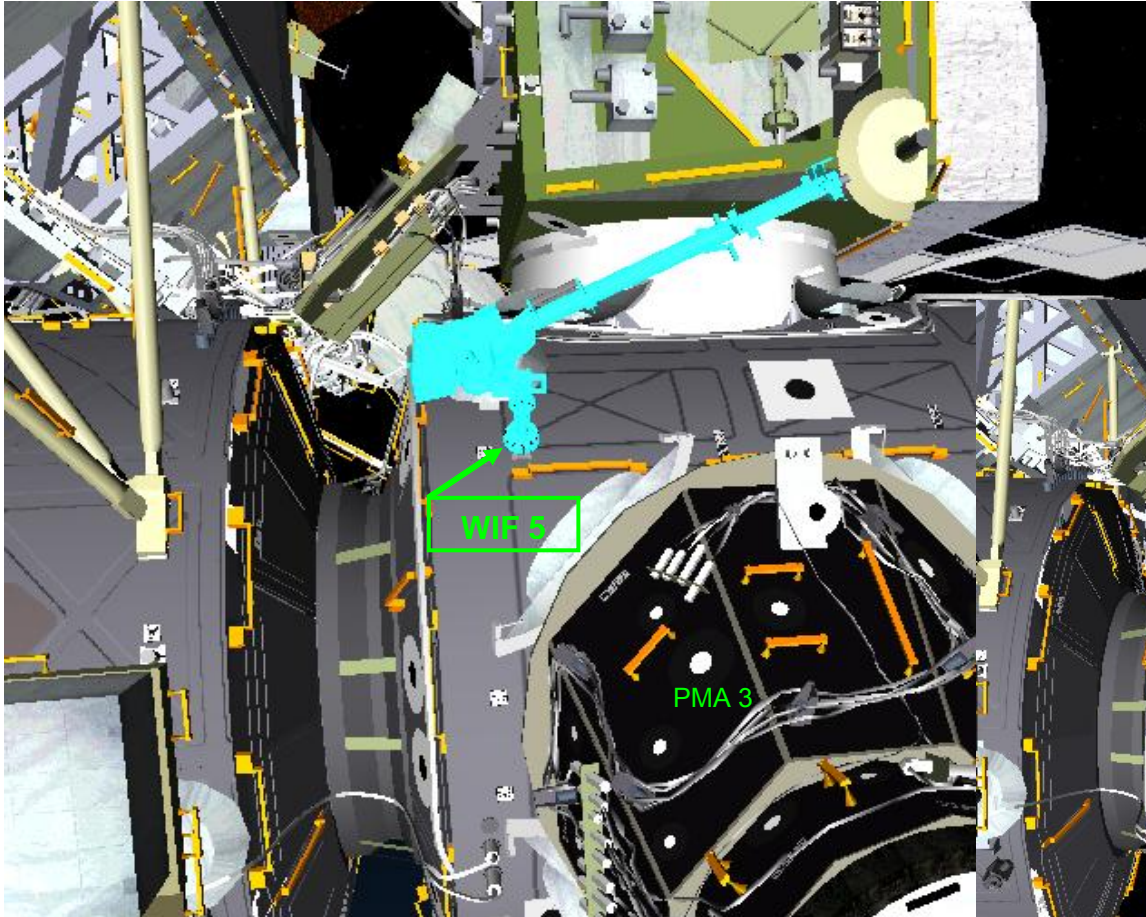
1. N/A

## NODE HR REMOVAL/APFR AND TS RELOCATE

IV/RMS	EV2 (FF)	EV3 (FF)
	<p><u>TS RELOCATE</u> (00:30)</p> <ol style="list-style-type: none"> <li>1. Translate to Node 1 WIF 5 (zenith/fwd of PMA3)</li> <li>2. Tether to tool stanchion</li> <li>3. Remove TS from APFR; install on BRT</li> <li>4. Translate to CETA Cart #1 (carts are stbd of MT – CETA 1 is inboard cart)</li> <li>5. Install TS on CETA 1; pull test</li> <li>6. Inspect gloves; status MCC on RTV and Vectran state</li> </ol>	<p><u>NODE HR 120 REMOVE</u> (00:25)</p> <ol style="list-style-type: none"> <li>1. Translate to Node HR 120 (aft of PMA3/port CBM)</li> <li>2. Tether to HR 120</li> <li>3. <b>PGT [A4, CCW2, MTL 30.5] 6" ext 7/16"</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> <input type="checkbox"/> Disengage outer bolts (2), 1 turn to break torque</li> </ul> </li> <li>3. <b>PGT [A1, CCW2, MTL 30.5] 6" ext 7/16"</b> <ul style="list-style-type: none"> <li>~ 8 turns each</li> </ul> </li> <li>4. Depress buttons (2) on inside of HR (HR should pop up releasing soft dock)               <ol style="list-style-type: none"> <li>a. If HR doesn't pop up, push in both buttons simo and pull up</li> </ol> </li> <li>5. Slide HR to remove it from dove tail fittings</li> <li>6. Attach HR to BRT</li> </ol> <p><u>APFR RELOCATE</u> (00:15)</p> <ol style="list-style-type: none"> <li>7. Translate to Node 1 WIF 5 (zenith/fwd of PMA3)</li> <li>8. Remove HR from BRT; strap HR to APFR</li> <li>9. Tether to APFR</li> <li>10. Remove APFR from WIF 5; install on BRT</li> <li>11. Translate to ESP2 WIF 8 (zenith, center)</li> <li>12. Install APFR ESP2 WIF 8 [3, SS, F, 12]</li> <li>13. Retrieve HR120 from APFR</li> <li>14. Translate to A/L; temp stow HR 120 at Airlock</li> <li>15. Inspect gloves; status MCC on RTV and Vectran state</li> </ol>

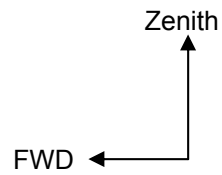
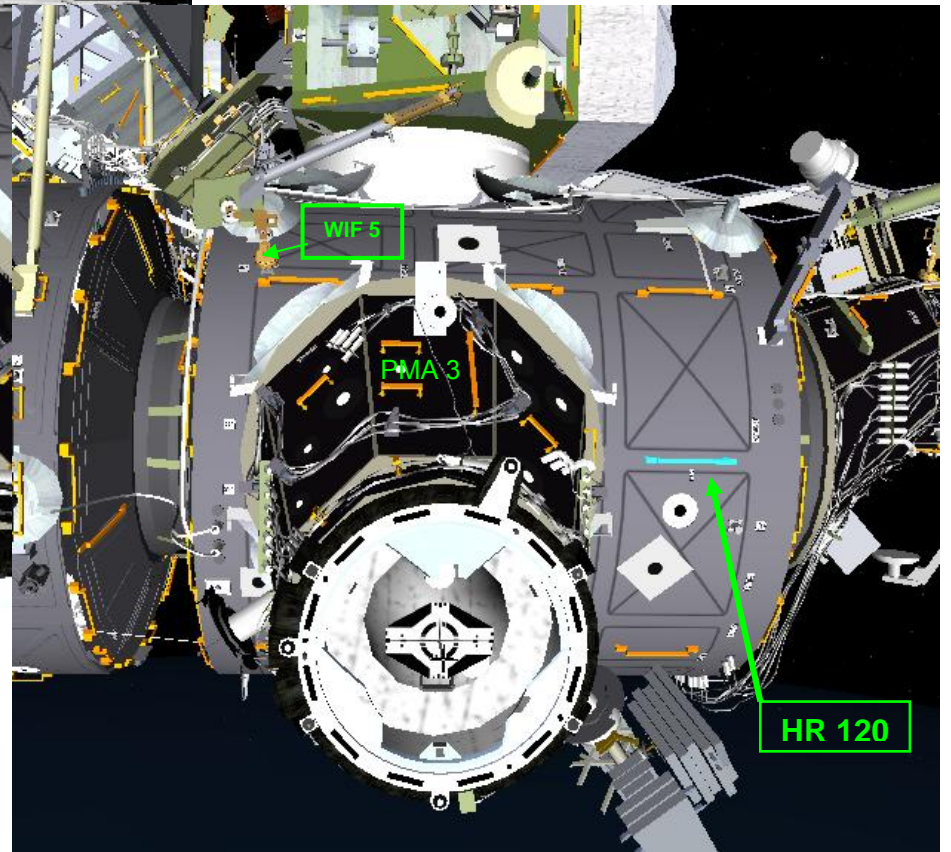
# NODE HR REMOVAL/APFR AND TS RELOCATE TASK DATA SHEET

## Node 1 Port Side

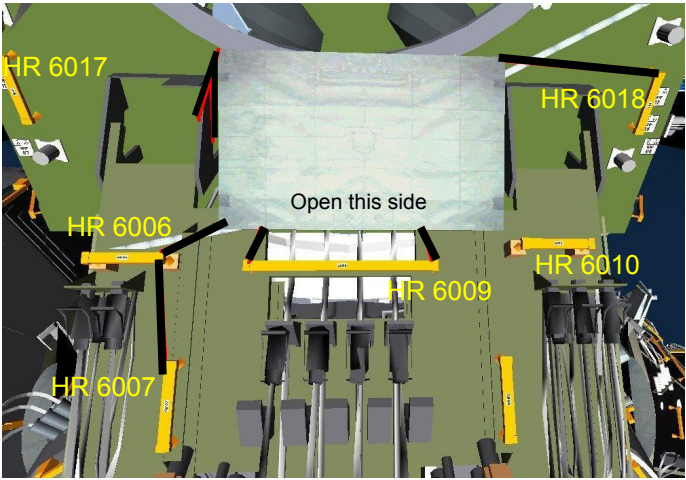


### Fastener Data:

Bolt Name	# of Bolts	Install (ft-lb)	Remove (ft-lb)	Failure (ft-lb)
OIH Bolt	2	3.8	3.8	21.3



# GPS ANTENNA #4 REMOVE, P6 AUX BAG RELOCATION

IV/RMS	EV2 (FF)	EV3 (FF)
<p>7. Verify inhibits for GPS Antenna #4:</p> <ol style="list-style-type: none"> <li>RPCM S02B_E RPC 8 – Open, Close Cmd Inhibit</li> <li>RPCM S01A_E RPC 7 – Open, Close Cmd Inhibit</li> </ol> <p style="text-align: center;"><u>NOTE</u> Connector caps are wire-tied together to prevent cables from being lost inside the truss</p>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p><b>CAUTION</b> Avoid inadvertent contact with GPS Antennas (Z-93 paint)</p> </div> <p><u>GPS ANTENNA #4 REMOVAL</u> (00:40)</p> <ol style="list-style-type: none"> <li>Retrieve GPS ORU Bag (with wire-tied caps) – temp stowed outside AL</li> <li>Translate to GPS Antenna #4 (S0 nadir-inboard)</li> <li>Temp stow GPS ORU Bag on HR _____ (3509)</li> <li>BRT to HR _____ (3508)</li> <li>Remove MLI shroud from antenna</li> <li>Tether cables to self or structure before demating (Cable clamps are located internal to the truss; connectors may float out of reach)</li> <li>On IV GO, demate connectors (any order), temp stow as required:               <ul style="list-style-type: none"> <li><input type="checkbox"/> P696 from J1</li> <li><input type="checkbox"/> P697 from J2</li> </ul> </li> <li>Tether to failed GPS antenna</li> <li><b>PGT: [B7, CCW2, MTL 30.5]-7/16", 6-in ext</b> Release bolts (4), (any order), expect ~10 turns (bolts will spring up when released)</li> <li>Remove GPS antenna, expect 4-6 lb soft dock force</li> <li>Stow failed GPS antenna in ORU Bag</li> <li>Retrieve electrical connector covers from GPS ORU Bag adjustable equipment tether, install electrical connector covers on electrical connectors (any order):               <ul style="list-style-type: none"> <li><input type="checkbox"/> J1 dummy electrical cover to P696</li> <li><input type="checkbox"/> J2 dummy electrical cover to P697</li> </ul> </li> <li>Reconfigure MLI shroud (as required)</li> <li>Stow GPS Ant ORU Bag on BRT</li> <li>Inspect gloves; status MCC on RTV and Vectran state</li> <li>Translate to A/L</li> <li>Temp stow ORU Bag</li> </ol>	<p><u>P6 AUX BAG RELOCATION</u> (00:30)</p> <ol style="list-style-type: none"> <li>Translate to P6 Aux Bag (stbd/fwd/nadir P6)</li> <li>Retrieve Aux Bag</li> <li>Translate to Z1 fwd, nadir of wagon wheel</li> <li>Install Aux Bag; report strap connections</li> <li>Get WVS or still photos of Final config</li> <li>Inspect gloves; status MCC on RTV and Vectran state</li> </ol>  <p style="text-align: center;">Zenith ↑ Port →</p>

## GPS ANTENNA REMOVAL TASK DATA SHEET

### Tools:

<b>EV2 (FF)</b>
PGT w/7/16" wobble 6-in ext
Adjustable Tethers (2)
Medium ORU bag
Round Scoops (2)

### EVA Fasteners:

Fastener Name	Head Size	Qty	Removal Torque (ft-lb)	Install Torque (ft-lb)	Failure Torque (ft-lb)	Turns
GPS Antenna #4	7/16"	4	25.5	9.2	70.6	10

### EVA Connectors:

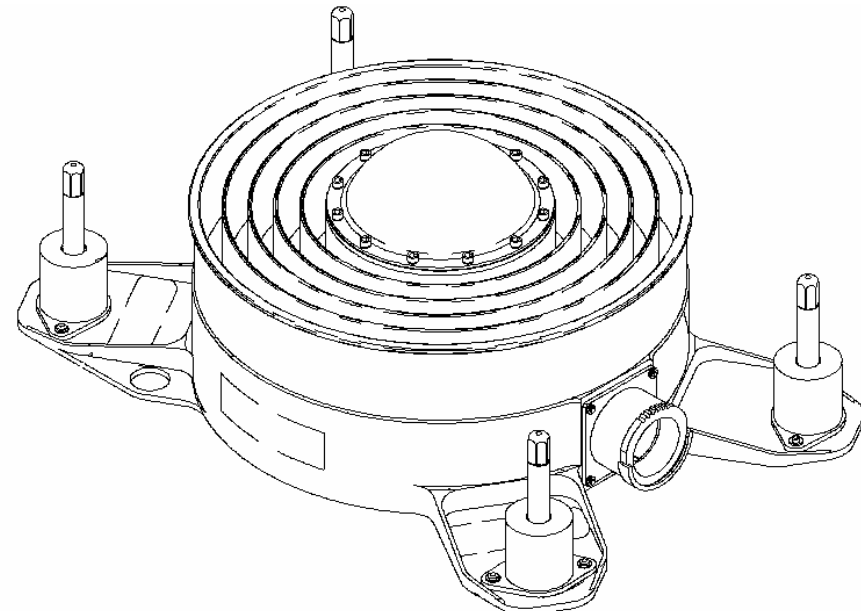
Harness	From	To	Function
W4503	S0 P696	J1	GPS Ant #4: Ops-1 & Htr-1 power
W4502	S0 P697	J2	GPS Ant #4: Ops-2 & Htr-2 power

### Notes:

1. Tether cables to self or structure before demating (Cable clamps are located internal to the truss; connectors may float out of reach)
2. Connector caps are wire-tied together to prevent cables from being lost inside the truss

### Cautions:

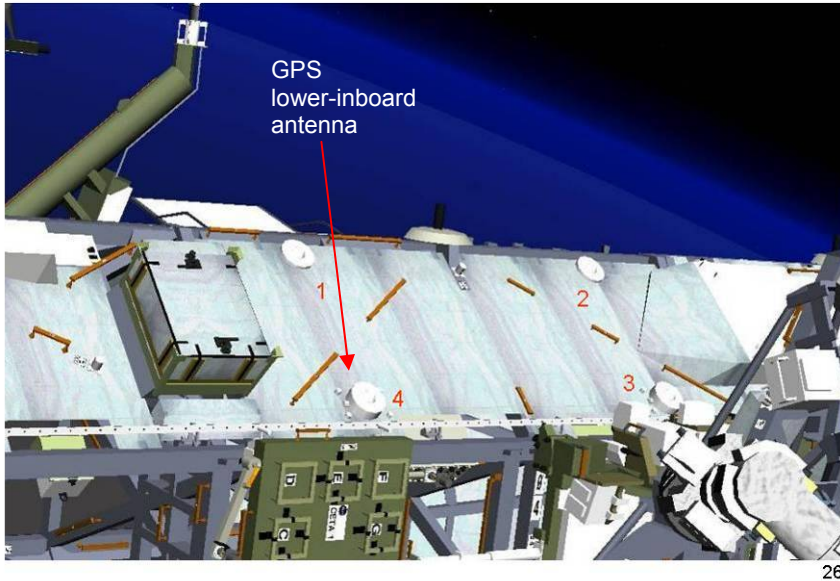
1. Thermal clock data for GPS Antenna 4 (with and without ORU bag):
  - a. 30 min to place failed GPS antenna in the ORU bag + 5 hr transfer clock
  - b. 60 min to place failed GPS antenna in the ORU bag + 2 hr transfer clock
  - c. If ORU bag not used, there is a 60-min clock to transfer the GPS antenna



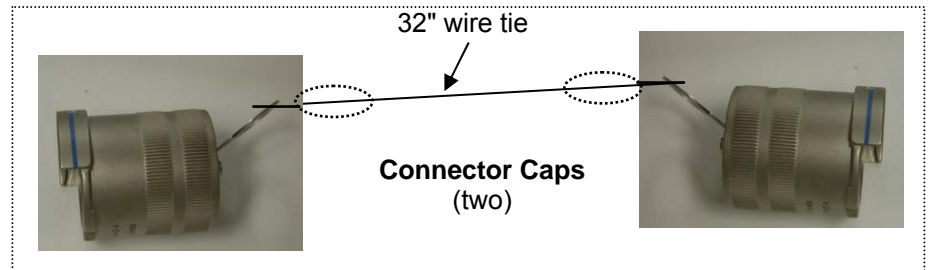
FAILED GPS UNIT CONFIGURATION

# GPS ANTENNA REMOVAL TASK DATA SHEET (Cont)

GPS Antenna Worksite



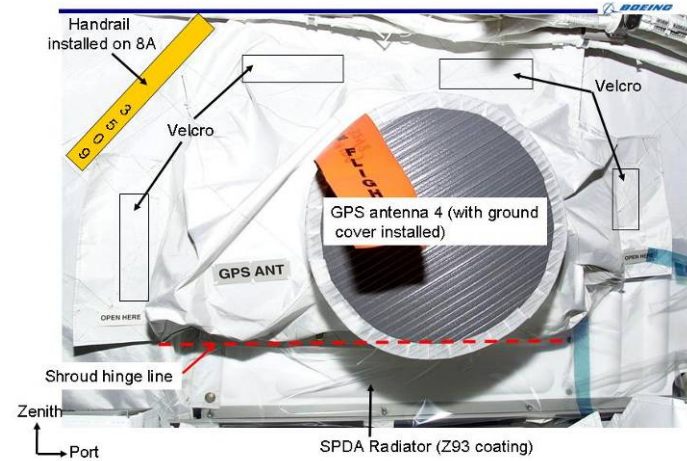
26



GPS Antenna #4 (lower-inboard)



GPS Antenna 4 MLI



## P6 AUX BAG TASK DATA SHEET

Tools: None

Foot Restraints: None

EVA Fasteners: None

EVA Connectors: None

### Timeline Considerations

1.

### Notes:

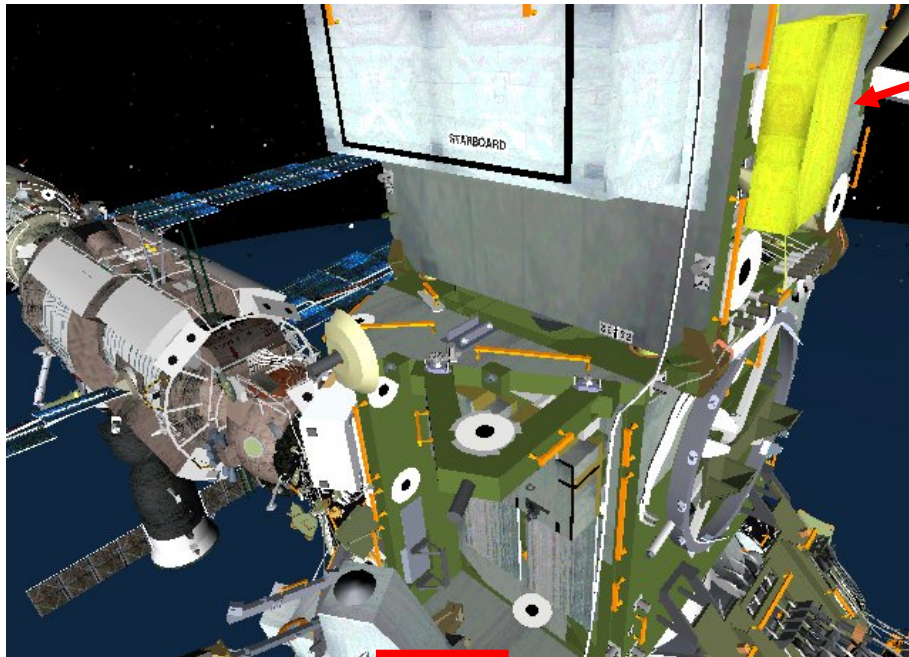
1.

### Cautions:

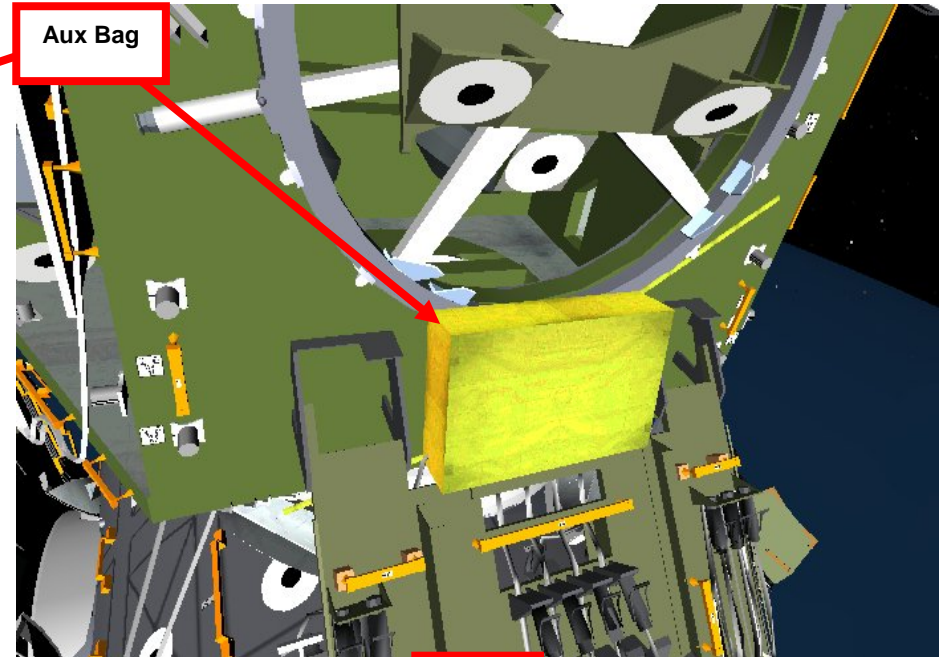
1.

### Warnings:

1.



Before



After


## EVA 4 CLEANUP/INGRESS

IV/RMS	EV2 (FF)	EV3 (FF)
<p>IV: Perform WVS PWRDN (PHOTO/TV, <u>WVS CUE CARD</u>)</p> <p>IV: Set 2-min timer after both EV1 and EV2 report WATER OFF</p>	<p><u>CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to airlock</li> <li>2. Retrieve and stow the following inside A/L: HR 120, GPS ORU Bag and CL bag</li> <li>3. Retrieve spare 85-ft tether from A/L exterior</li> </ol> <p><u>NOTE:</u> All 85-ft safety tethers must return inside during this EVA prior to hatch closure</p> <ol style="list-style-type: none"> <li>4. Perform Tool Inventory</li> </ol> <p><u>INGRESS</u></p> <ol style="list-style-type: none"> <li>4. On EV3 GO, disconnect EV3 85-ft safety tether from A/L HR 0554</li> <li>5. Connect left waist tether to EV3 85-ft safety tether, lock hooks</li> <li>6. Disconnect EV2 85-ft safety tether from HR, attach to EMU D-ring or MWS</li> <li>7. Ingress airlock</li> <li>8. Remove SCU from stowage pouch</li> <li>9. Remove DCM cover, Velcro to DCM</li> <li>10. Connect SCU to DCM; √SCU locked</li> <li>11. DCM: WATER – OFF</li> <li>12. Hatch thermal cover – close, attach Velcro strap</li> </ol> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> Do not close hatch until EMU WATER – OFF for 2 min</p> </div> <ol style="list-style-type: none"> <li>13. Verify all hardware is clear of hatch</li> <li>14. EV hatch – close and lock</li> <li>15. Go to PRE REPRESS portion of {CREWLOCK <u>DEPRESS/REPRESS CUE CARD</u>} (SODF: ISS EVA SYS: EVA PREP/POST)</li> </ol>	<p><u>CLEANUP</u></p> <ol style="list-style-type: none"> <li>1. Translate to airlock</li> <li>2. Perform Tool Inventory</li> </ol> <p><u>INGRESS</u></p> <ol style="list-style-type: none"> <li>3. Ingress airlock</li> <li>4. Connect left waist tether to hatch D-ring</li> <li>5. Give EV2 GO to disconnect 85-ft tether</li> </ol> <ol style="list-style-type: none"> <li>6. Remove SCU from stowage pouch</li> <li>7. Remove DCM cover, Velcro to DCM</li> <li>8. Connect SCU to DCM; √SCU locked</li> <li>9. DCM: WATER – OFF</li> </ol> <ol style="list-style-type: none"> <li>10. Go to PRE REPRESS portion of {CREWLOCK <u>DEPRESS/REPRESS CUE CARD</u>} (SODF: ISS EVA SYS: EVA PREP/POST)</li> </ol>



## POST EVA 4 TOOL CONFIG


### EV2

- Waist Tether (R D-ring to Safety Tether)
- Waist Tether (L Extender to MWS)
- D-ring Extender (2)
- 85-ft Safety Tether (R on extender)
- Adj (2 on wrist)
- MWS
- T-bar
- Rabbit Ear Wire Ties (2)
- RET (sm-sm PIP pin)
- RET (sm-sm) (3)
- Sm Trash Bag (L, inside) 
- Swing Arm (R)
- RET (sm-sm)
- PGT S/N \_\_\_\_\_ w/battery
- 7/16 x 6" wobble
- BRT (L)
- RET (sm-sm)
- Wire Ties (2)

### Outside

- 55-ft safety tethers on hatch D-ring

### EV3

- Waist Tether (R D-ring)
- D-ring Extender (2)
- 85-ft Safety Tether (R on extender)
- Adj (2 on wrists)
- MWS
- T-bar
- Rabbit Ear Wire Ties (2)
- Adj
- RET (sm-sm PIP pin)
- RET (sm-sm) (3)
- Sm Trash Bag (L, inside) 
- Swing Arm (R)
- RET (sm-sm)
- PGT S/N \_\_\_\_\_ w/battery
- 7/16 x 6" wobble
- BRT (L)
- RET (sm-sm)
- Wire Ties (3)

### CREWLOCK

Verify following item is in Staging Bag

- PGT S/N \_\_\_\_\_ w/battery

- 
- Round Scoop
  - RET (Lg-sm) to Airlock

- 
- HR 120
  - Spare 85-ft tether

### CREWLOCK

- CL Bag #1
- RET (Lg-sm) on outside
- Digital Camera
- Dummy Box
- EVA MLI
- RET
- Adj (2)
- Spare 85-ft safety tether (on outside)

- 
- RET (Lg-sm) (2)
  - Bungee

- 
- Small ORU Bag
  - RET (Lg-sm) on outside
  - GPS Antenna #4
  - RET (sm-sm) (2)

- 
- CL Bag #3 (contingency) -*Aft/Zenith wall*
  - Adj (Lg-sm) on outside
  - Wire Tie Caddy
  - Connector Cleaner Tool Caddy
  - Connector Pin Straightener
  - Adj tether to internal D-ring
  - Socket Caddy
  - 7/16 x 6" wobble
  - 7/16 x 2" rigid
  - RAD
  - EVA Ratchet
  - Adj tether to internal D-ring
  - Vice Grips
  - Adj tether to internal D-ring

- 
- D-ring Extender (on A/L D-ring)

**GET-AHEADS**

**UCCAS DEPLOY (GET-AHEADS)**

IV/RMS	EV2 (FF)	EV3 (FF)
<p>MCC-H – Verify P3/P4 SARJ locked</p>	<p><u>P3/S3 ZENITH/NADIR UCCAS DEPLOY</u></p> <ol style="list-style-type: none"> <li>Translate to deploy clevis on the _____ UCCAS</li> <li><b>PGT [B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Release or swivel <b>deploy clevis</b> bracket, 10 turns on all unless swivel then 8 turns on #1 (if reqd BRT to HR _____)</li> </ul> </li> <li>If reqd temp stow deploy clevis bracket</li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>The stowed clevis bracket must be loosened before the yoke ADP is removed to prevent damage to the mechanism</p> </div> <ol style="list-style-type: none"> <li><b>PGT [B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Loosen stow clevis bracket bolts (4), ~4 turns</li> </ul> </li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>Yoke ADP does not have stowage hole. Do not close ADP lock bracket when ADP is not inserted in a stowage/clevis hole</p> </div> <ol style="list-style-type: none"> <li>Release yoke PIP pin ADP, use pre-installed wire tie to secure ADP and PIP pin to yoke</li> <li><b>PGT [B4 20.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Release diagonal strut cup-cone bolt, 38 turns to hard stop</li> </ul> </li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>Do not lift diagonal brace more than ~7 deg out of rotation plane to prevent damage to hinge end</p> </div>	<p><u>P3/S3 ZENITH/NADIR UCCAS DEPLOY</u></p> <ol style="list-style-type: none"> <li>Translate to A/L; retrieve CL Bag #1 (RAD + 2", Gap Spanners)</li> <li>Translate to zenith hinges on the _____ UCCAS</li> <li>Remove hinge line ADPs (2), insert in stowage hole, <math>\sqrt</math>lock bracket engaged</li> <li>Attach large gap spanner to zenith longeron HR _____, loop back on itself</li> <li><b>PGT [B2 16.6 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Release SARJ brace cup-cone bolt, 23 turns to hard stop</li> <li><input type="checkbox"/> Release SARJ launch bolt to use for temp stow, 10 turns</li> </ul> </li> <li><b>PGT [B2 16.6 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Attach SARJ brace to diagonal strut, 10 turns</li> </ul> </li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>Do not lift diagonal brace more than ~7 deg out of rotation plane to prevent damage to hinge end</p> </div>

# UCCAS DEPLOY (GET-AHEADS) (Cont)

IV/RMS	EV2 (FF)	EV3 (FF)																												
<p>Record Torque and Turns for Stowed Bracket</p> <table border="1"> <thead> <tr> <th>Bolt #</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>Torque</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Turns</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Record Torque and Turns for SARJ Launch Lock and Cup Cone Bolts</p> <table border="1"> <thead> <tr> <th>Bolt</th> <th>Launch Lock</th> <th>Cup Cone</th> </tr> </thead> <tbody> <tr> <td>Torque</td> <td></td> <td></td> </tr> <tr> <td>Turns</td> <td></td> <td></td> </tr> </tbody> </table> <p>Record Torque and Turns for Diagonal Strut Cup-Cone Bolt</p> <table border="1"> <tbody> <tr> <td>Torque</td> <td></td> </tr> <tr> <td>Turns</td> <td></td> </tr> </tbody> </table>	Bolt #	1	2	3	4	Torque					Turns					Bolt	Launch Lock	Cup Cone	Torque			Turns			Torque		Turns		<p>7. Help EV3 guide <b>diagonal brace</b> to HR _____</p> <p>8. <b>PGT [B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Release or swivel stow clevis bracket clear of UCCAS deploy (3 bolts to swivel, 4 to release), ~6 turns</li> </ul> <p>9. <b>PGT [B7 25.5 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Engage stow clevis bracket bolts (4), 10 turns to hard stop</li> </ul> <p>10. Orient deployed clevis bracket with alignment guide</p> <p>11. <b>PGT [B4 20.0 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Engage deploy clevis bracket bolts (4) part way, 4 turns</li> </ul> <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p><b>CAUTION</b> Do not lift diagonal brace more than ~7 deg out of rotation plane to prevent damage to hinge end</p> </div> <p>12. Release adjustable tether (stow on MWS) holding diagonal/SARJ braces, move diagonal brace to install</p> <p>13. <b>PGT [B4 20.0 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Engage diagonal strut cup-cone bolt, 38 turns to hard stop</li> </ul> <p>14. Install yoke into clevis</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Release wire tie securing PIP pin and ADP to yoke</li> <li><input type="checkbox"/> Install yoke ADP, ✓lock bracket engaged</li> <li><input type="checkbox"/> Install yoke PIP pin</li> </ul> <p>15. <b>PGT [B4 20.0 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Engage deploy clevis bracket bolt #2, #3, and #1 to hard stop (attempt #4 w/o RAD)</li> </ul> <p>16. <b>PGT [XX XX. X ft-lb, CW2 30 RPM, MTL 30.5]-RAD w/2ext 7/16</b></p>	<p>7. Temp stow diagonal brace to HR _____ using RET</p> <p>8. Route gap spanner to yoke now that brace is out of the way</p> <p>9. Pull up on the yoke to provide clearance to remove the bracket</p> <p>10. Continue to deploy UCCAS to detent (10 deg past vertical), lead with yoke</p> <p>11. Release spanner at zenith longeron, temp stow on HR _____</p> <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p><b>CAUTION</b> Do not lift diagonal brace more than ~7 deg out of rotation plane to prevent damage to hinge end</p> </div> <p>12. Assist EV2 with diagonal brace move</p> <p>13. <b>PGT [B2 16.6 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Release SARJ bolt from diagonal, 10 turns</li> </ul> <p>14. <b>PGT [B2 16.6 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</b></p> <p>15. Engage launch bolt, <b>TBD</b> turns</p> <p>16. Engage SARJ strut cup-cone bolt, 23 turns to hard stop</p> <p>17. Install yoke into clevis</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pull yoke gap spanner to unfold yoke</li> <li><input type="checkbox"/> Rotate UCCAS out of detent</li> <li><input type="checkbox"/> Lower yoke into clevis</li> </ul>
Bolt #	1	2	3	4																										
Torque																														
Turns																														
Bolt	Launch Lock	Cup Cone																												
Torque																														
Turns																														
Torque																														
Turns																														

**UCCAS DEPLOY (GET-AHEADS) (Cont)**

IV/RMS					EV2 (FF)	EV3 (FF)															
<b>Record Torque and Turns of Deployed Bracket</b> <table border="1"> <thead> <tr> <th>Bolt #</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>Torque</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Turns</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>					Bolt #	1	2	3	4	Torque					Turns					<input type="checkbox"/> Engage deploy clevis bracket bolt #4 to hard stop 17. Translate under UCCAS UMA 18. Tether to hitch PIP pin from EVA OVERRIDE anti-rotation cap and remove hitch PIP pin 19. Remove anti-rotation cap and stow in trash bag 20. ✓All tools stowed (PGTs)	18. Translate to each guide vane (3) and perform: <ul style="list-style-type: none"> <li><input type="checkbox"/> Remove launch restraint PIP pins from guide vanes, stow in trash bag</li> <li><input type="checkbox"/> Inform MCC-H ready for RTL checkout</li> <li><input type="checkbox"/> On MCC-H GO, depress and hold RTL lever for 15 sec, then release</li> <li><input type="checkbox"/> Verify with MCC-H good checkout, move to next guide vane</li> </ul> 19. Release large gap spanner from yoke 20. Stow gap spanner in trash bag <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><b>CAUTION</b></p> <p style="text-align: center;">EBCS target contains finished surface which could be damaged if contacted by EV crew</p> </div> 21. Translate to EBCS target 22. Verify EV2 is clear of target 23. Remove EBCS target cover, stow on backside of target assembly 24. ✓All tools stowed (PGTs) 25. ✓Gap spanner in trash bag
Bolt #	1	2	3	4																	
Torque																					
Turns																					

## UCCAS DEPLOY (GET-AHEADS) TASK DATA SHEET

### Estimated Task Duration:

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

### Tools:

EV2	EV3
PGT	PGT
7/16 socket 6-in ext	7/16 socket 6-in ext
	RAD + 7/16 socket 2-in ext
	45-72 in Gap Spanner (Large)

### EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns

### Inhibits:

Inhibit
P3/P4 SARJ Locked

Foot Restraint	WIF	Settings
Remove/Install Deployed/Stowed Clevis Brackets	P3 - 17	2,PP,D,11

### Notes:

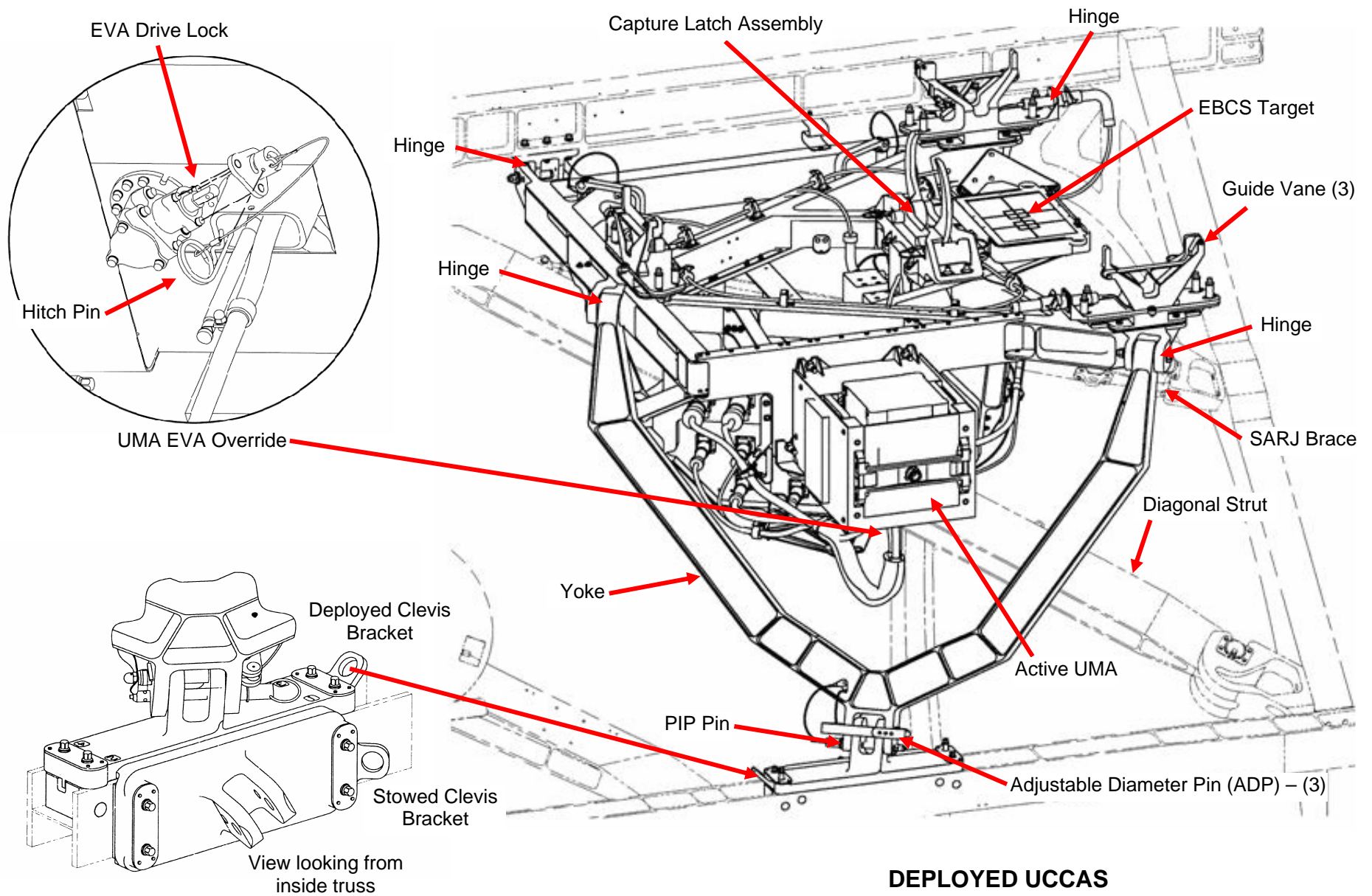
1. Can not release 3 of 4 bolts on either stowed or deployed clevis bracket to rotate out of the way, due to mechanism design
2. UMA EVA Override anti-rotation cap must be removed prior to first use of UMA on UCCAS
3. EBCS target cover must be removed prior to cargo attachment to UCCAS. Protects target from MMOD and inadvertent contact. Remove as last activity
4. RAD drive may be needed for re-install of deployed clevis bracket. It will likely exceed RAD limits and need to be returned for refurb

### Cautions:

1. Stowed clevis bracket must be loosened 4 turns on each bolt prior to releasing yoke ADP
2. Do not lift diagonal brace greater than 7 deg out of rotation plane when rotating to temp stowage location so as to not bend hinge end
3. Do not close ADP lock bracket when ADP is not inserted in a stowage/clevis hole. The pin can fall apart
4. EBCS target has finished surface that is susceptible to damage by contact

### Warnings:

# UCCAS DEPLOY (GET-AHEADS) TASK DATA SHEET (Cont)



UCCAS DEPLOY (GET-AHEADS) TASK DATA SHEET (Cont)

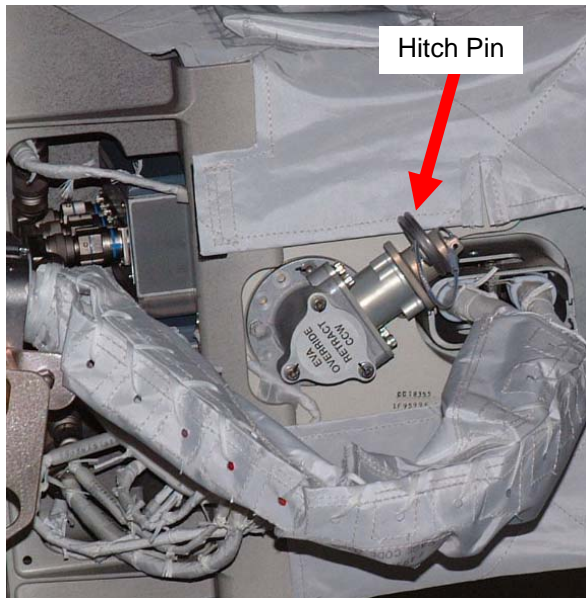


Figure 5. Active UMA EVA Override with Anti-Rotation Cap

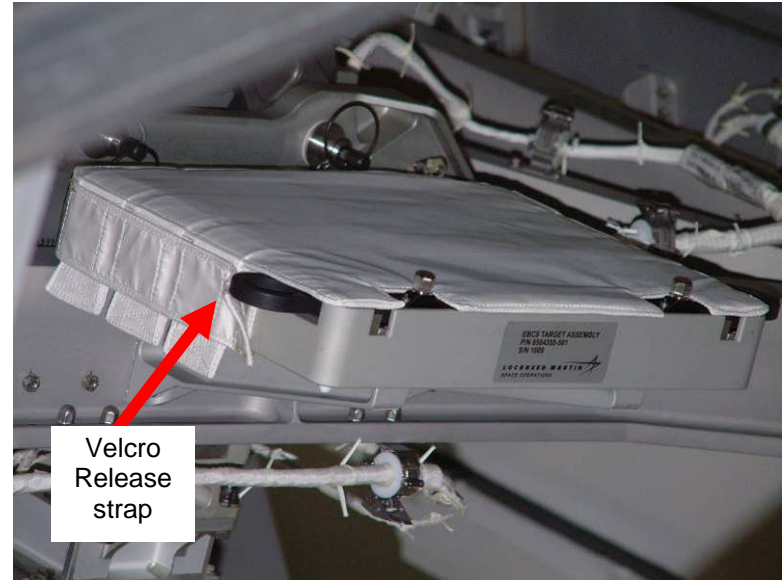


Figure 6. EBCS Target with Cover

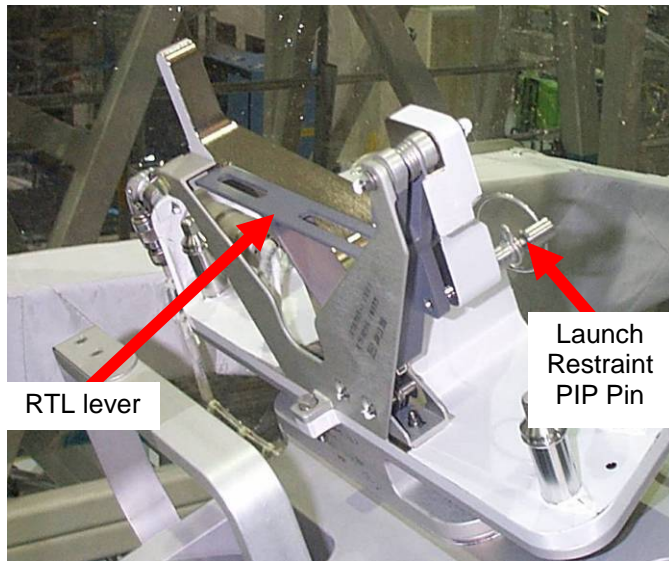


Figure 7. Guide Vane and RTL lever

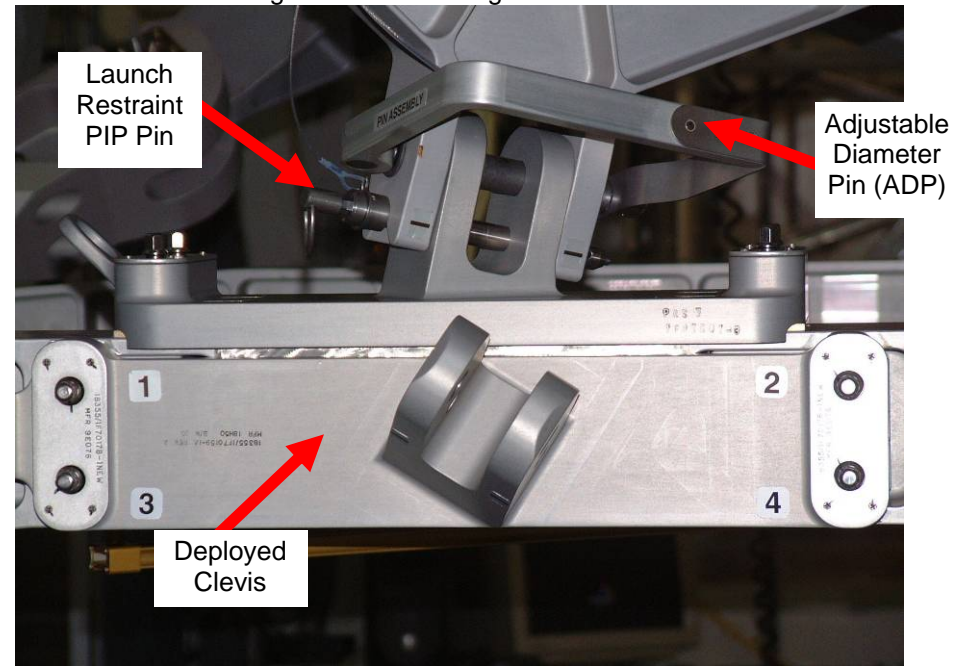


Figure 8. Deployed and Stowed Clevis Brackets (looking from zenith)

# UCCAS DEPLOY (GET-AHEADS) TASK DATA SHEET (Cont)

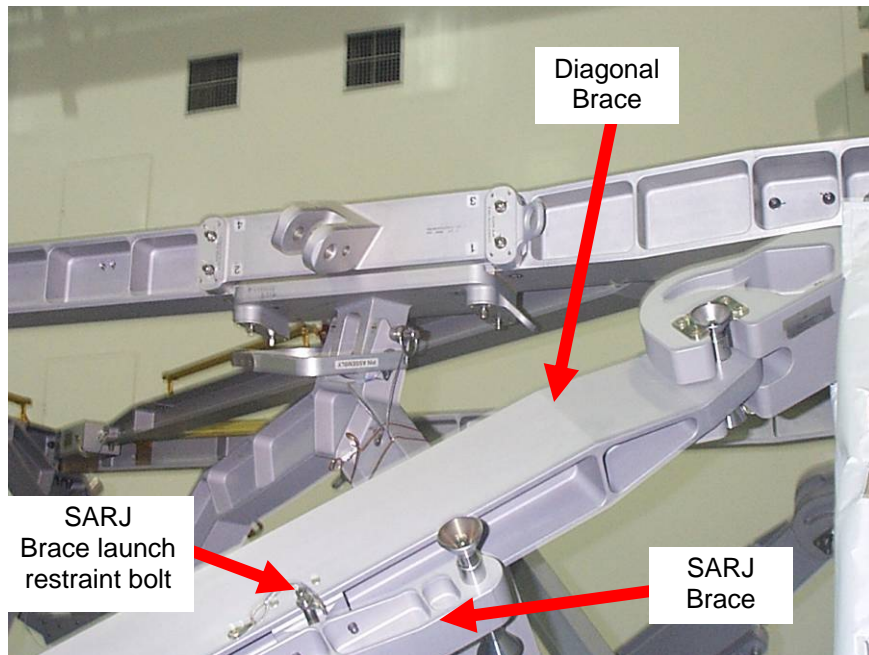


Figure 9. Diagonal and SARJ braces and cup-cones



Figure 10. Diagonal and SARJ braces Jack-Joint cup-cones

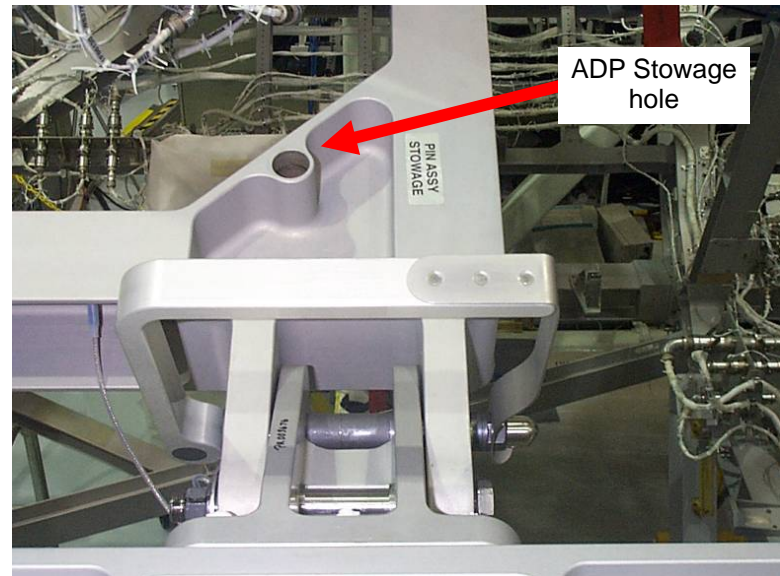


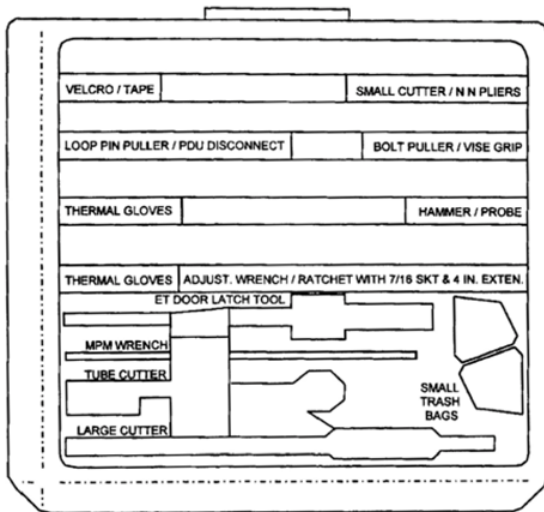
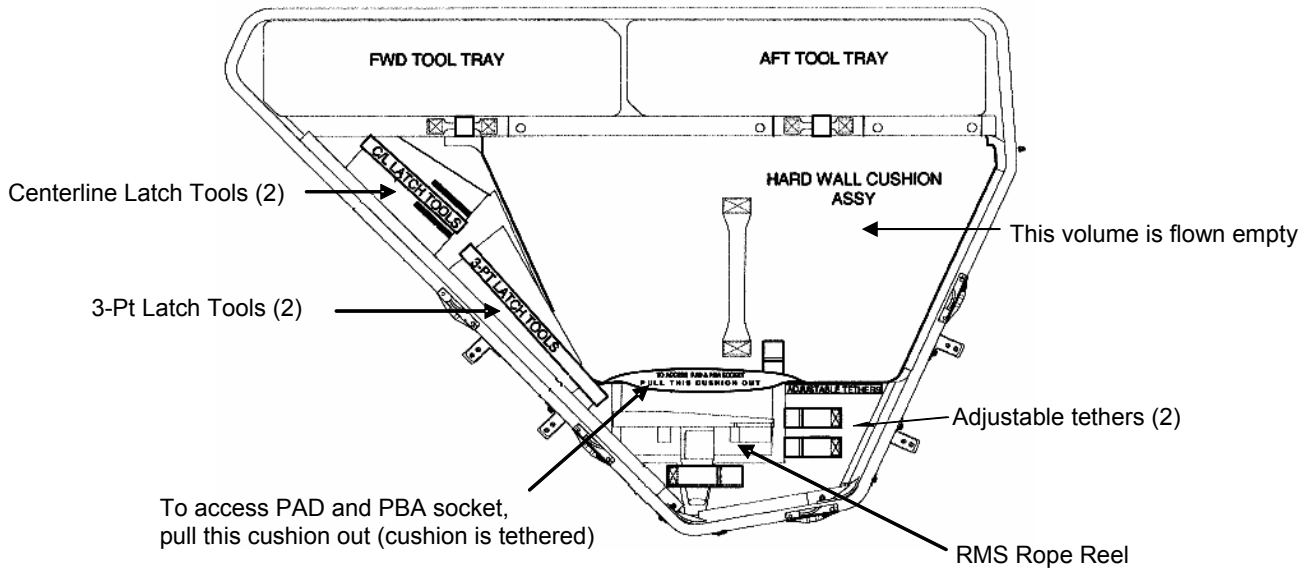
Figure 11. Adjustable Diameter Pin (ADP) and stowage hole (hinge side)



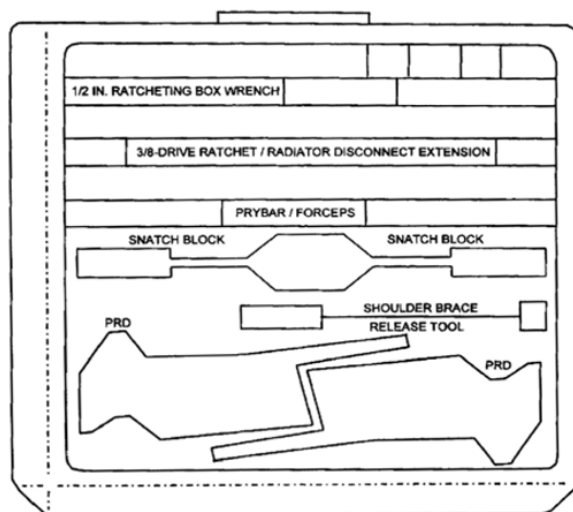
## TOOLS AND STOWAGE

PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA) .....	TEMP FS 8-2
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EVA 3 TOOL TRACKER.....	FS 8-25
EVA 4 TOOL TRACKER.....	FS 8-27
MISSE PREP FOR RETURN .....	FS 8-29

# PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA)



Forward Tray layout and Labels



Aft Tray Layout and Labels



TOOLS AND STOWAGE

**APFR MANAGEMENT – STS-118 (13A.1)**

I

<b>APFR DESIGNATOR</b>	<b>APFR 1</b> (8A Pitch knob problem)	<b>APFR 2</b>	<b>APFR 3</b> S/N 1005 no pitch knob prob 9A-inc12	<b>APFR 4</b> (TS, old ORU tether, heat shield)	<b>APFR 5</b> (TS, old ORU tether, heat shield)	<b>APFR 6</b>	<b>APFR 7</b> S/N 1008 Ingress Aid	<b>IAPFR 1</b>	<b>IAPFR 2</b>	<b>CRANE</b> (old ORU tether)	<b>TS</b>	<b>TS</b>	<b>TS</b>	<b>ORU</b> stanchion/ TERA (headless)
<b>EVA 1</b>	S4 WIF 19 [6,TT,J,11]  [1]	Z1 WIF 11 [2,TT,H,11]  [2]	ESP2 WIF 8 [3,SS,F,12]  [2]	Z1 WIF 8 [9,PP,F,6]  [1]	PMA1 WIF2 [12,KK,F,6]	S4 WIF 18 [8,OO,C,1]  [1]	A/L WIF 11 [6,PP,F,6]  [1]	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5	APFR 4	APFR 5	S0 port wedge face	S0 port wedge face
S5 Outbd LL Remove (RTAS Corner 1)						S4 WIF 18 [8,OO,C,1]								
S5 Outbd LL Remove (RTAS Corner 2)	S4 WIF 19 [6,TT,J,11]													
Init/Final Torquing (RTAS Corner 1)						S4 WIF 18 [8,OO,C,1]								
Init/Final Torquing (RTAS Corner 2)	S4 WIF 19 [6,TT,J,11]													
Soft Capture Pin Remove (Corner 1)						S4 WIF 18 [8,OO,F,1]								
Final Torquing (RTAS Corner 3)						S4 WIF 17 [5,RR,J,11]								
Final Torquing (RTAS Corner 4)	S4 WIF 20 [6,VV,A,11]													
Soft Capture Pin Remove (Corner 3)						S4 WIF 17 [5,RR,J,11]								
PVRGF Relocate	S5 WIF 11 [9,RR,G,12] roll to [9,RR,A,12]					S5 WIF 13 [12,UU,J,11]								
Get-Aheads: S4/S5 umbilicals (nadir/aft) (nadir/fwd)						S5 WIF 3 [4,SS,B,1] [4,SS,E,1]								
S5 Clean-up	CETA 1 WIF 4 [3,SS,F,12] Y/P [12,FF] (for 10A)					CETA2 WIF 2 [10,PP,E,12] Y/P [12,FF]								

Notes: [1] - moved by 13A EVA [2] - moved by 13A Stage EVA

<b>EVA 2</b>	CETA 1 WIF 4 [8,PP,E,12] Y/P [12,FF]	Z1 WIF 11 [2,TT,H,11]	ESP2 WIF 8 [3,SS,F,12]	Z1 WIF 8 [9,PP,F,6]	PMA1 WIF2 [12,KK,F,6]	CETA2 WIF 2 [10,PP,E,12] Y/P [12,FF]	A/L WIF 11 [6,PP,F,6]	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5	APFR 4	APFR 5	S0 port wedge face	S0 port wedge face
Setup							SSRMS [12,PP,F,4]	Z1 WIF 05 [11,OO,F 12]						
Install Failed CMG on FSE ESP-2 - Replace Z1 Thermal Shroud Cleanup								Z1 WIF 01 [12,PP,F 12]						
							A/L WIF 11 [3, PP,F,6]							

**APFR MANAGEMENT – STS-118 (13A.1) (Cont)**

<b>APFR DESIGNATOR</b>	<b>APFR 1</b> (8A Pitch knob problem)	<b>APFR 2</b>	<b>APFR 3</b> S/N 1005 no pitch knob prob 9A- inc12	<b>APFR 4</b> (TS, old ORU tether, heat shield)	<b>APFR 5</b> (TS, old ORU tether, heat shield)	<b>APFR 6</b>	<b>APFR 7</b> S/N 1008  Ingress Aid	<b>IAPFR 1</b>	<b>IAPFR 2</b>	<b>CRANE</b> (old ORU tether)	<b>TS</b>	<b>TS</b>	<b>TS</b>	<b>ORU</b> stanchion/ TERA (headless)
<b>EVA 3</b>	CETA 1 WIF 4 [8,PP,E,12] Y/P [12,FF]	Z1 WIF 11 [2,TT,H,11]	ESP2 WIF 8 [3,SS,F,12]	Z1 WIF 8 [9,PP,F,6]	PMA1 WIF2 [12,KK,F,6]	CETA2 WIF 2 [10,PP,E,12] Y/P [12,FF]	A/L WIF 11 [3, PP,F,6]	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5	APFR 4	APFR 5	S0 port wedge face	S0 port wedge face
Setup							SSRMS [12,PP,F,6]							
P1 BSP/XPDR Install						CETA 2 WIF 2 [10,PP,E,12] Y/P [12,FF]								
CETA Cart Relocate							SSRMS [12,PP,A,6]							
SSRMS Clean-up							A/L WIF 11 [3, PP,F,6]							
<b>EVA 4</b>	CETA 1 WIF 4 [8,PP,E,12] Y/P [12,FF]	Z1 WIF 11 [2,TT,H,11]	ESP2 WIF 8 [3,SS,F,12]	Z1 WIF 8 [9,PP,F,6]	PMA1 WIF2 [12,KK,F,6]	CETA 2 WIF 2 [10,PP,E,12] Y/P [12,FF]	A/L WIF 11 [3, PP,F,6]	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5	APFR 4	APFR 5	S0 port wedge face	S0 port wedge face
N/A														
<b>Post-EVA 4</b>	CETA 1 WIF 4 [8,PP,E,12] Y/P [12,FF] (for 10A)	Z1 WIF 11 [2,TT,H,11]	ESP2 WIF 8 [3,SS,F,12] (for 10A)	Z1 WIF 8 [9,PP,F,6]	PMA1 WIF2 [12,KK,F,6]	CETA 2 WIF 2 [10,PP,E,12] Y/P [12, FF] (for 10A) ]	A/L WIF 11 [3, PP,F,6] (for 10A)	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5	APFR 4	APFR 5	S0 port wedge face	S0 port wedge face

## SAFETY TETHER CONFIGURATION – 118 (13A.1)

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	55-ft Safety Tethers							85-ft Safety Tethers			
	#59 SN 1007 Sm-sm	#71 SN 1021 Lg-sm	#72 SN 1022 Lg-sm	#73 SN 1023 Lg-sm  (Issue during 12A.1 stage)	#60 or #70 SN 1008 or 1020 Lg-sm	#60 or #70 SN 1008 or 1020 Lg-sm	#66 SN 1016 Sm-sm	#26 SN 1006 85-ft Tether Lg-sm	#28 SN 1008 85-ft Lg-sm	#23 SN 1003 85-ft (Shuttle Safety Tethers)	#25 SN 1005 85-ft (Shuttle Safety Tethers)
Pre EVA 1	INSIDE Tether Staging Area	OUTSIDE A/L	OUTSIDE A/L	INSIDE Tether Staging Area	S0 HH 3539 or 3530  Tether on 3539 had some retracting issues	S0 HH 3530 or 3539  Tether on 3539 had some retracting issues	INSIDE Tether Staging Area	INSIDE Tether Staging Area	INSIDE Tether Staging Area	Transferred to ISS	Transferred to ISS
Post EVA 4	INSIDE Tether Stageing Area	OUTSIDE A/L	OUTSIDE A/L	INSIDE Tether Staging Area	S0 HH 3539 or 3530  Tether on 3539 had some retracting issues	S0 HH 3530 or 3539  Tether on 3539 had some retracting issues	INSIDE Tether Staging Area	INSIDE Tether Staging Area	INSIDE Tether Staging Area	Transferred to Shuttle	Transferred to Shuttle

## OBSS OSE PRE EVA CONFIG (00:30)

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Perform following steps for both boom stand units:

Tools required;

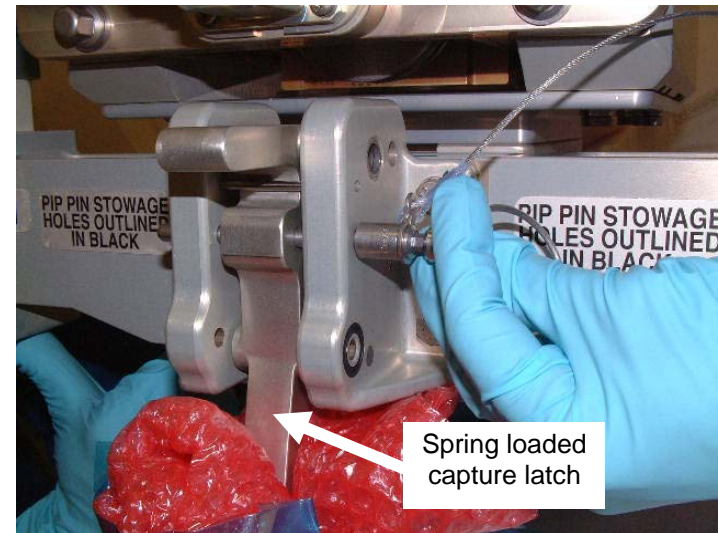
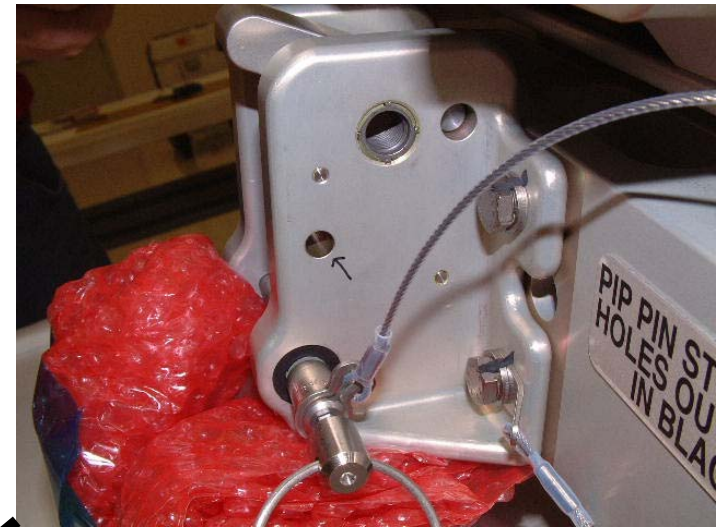
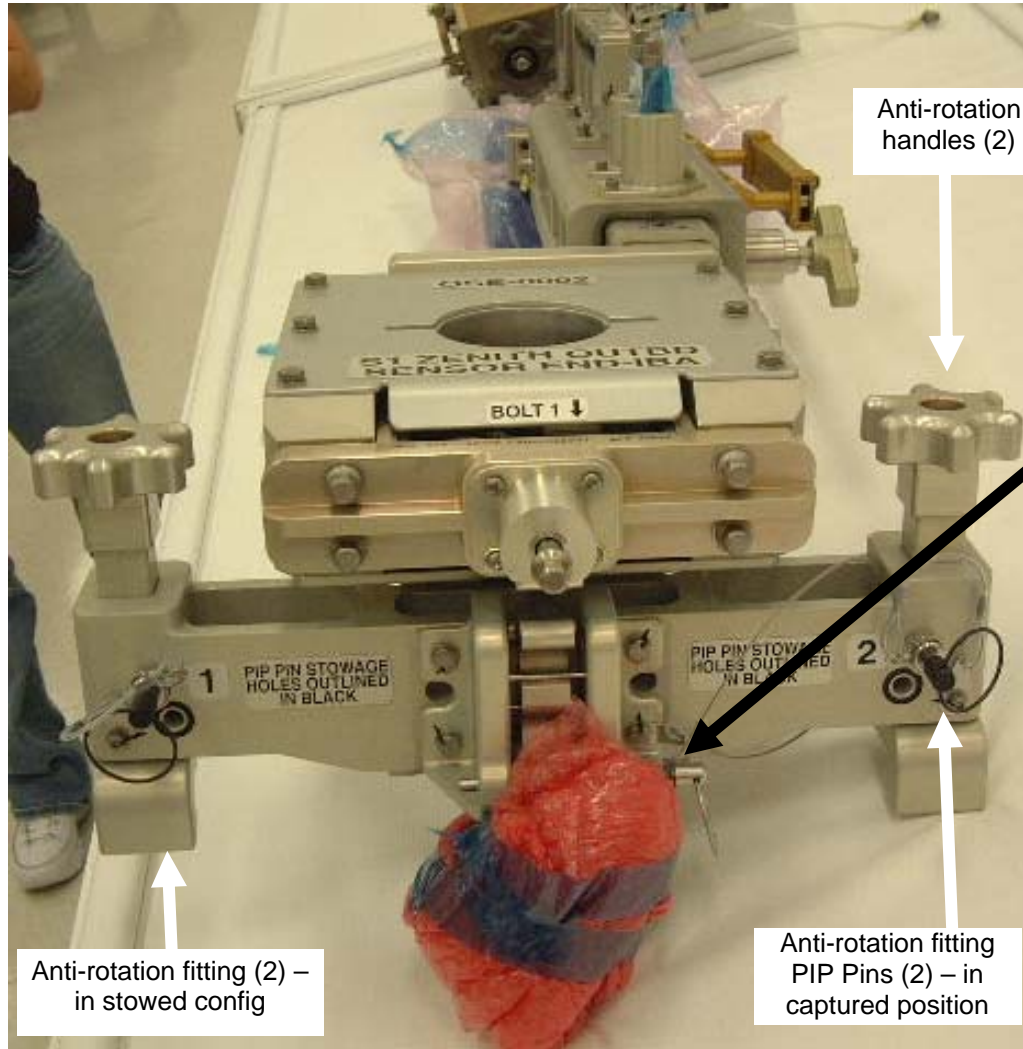
- ISS IVA Tool Kit ; NOD1P4\_G2; Drawer 2
  - 40-200 in-lbs Torque Wrench, 3/8-in Drive;  
Set torque wrench to 58 in-lbs
  - 7/16 socket, 3/8-in Drive

Or

PGT [A3, CW2, 30.5] -7/16 in ext (4.83 ft-lb, 30 rpm)

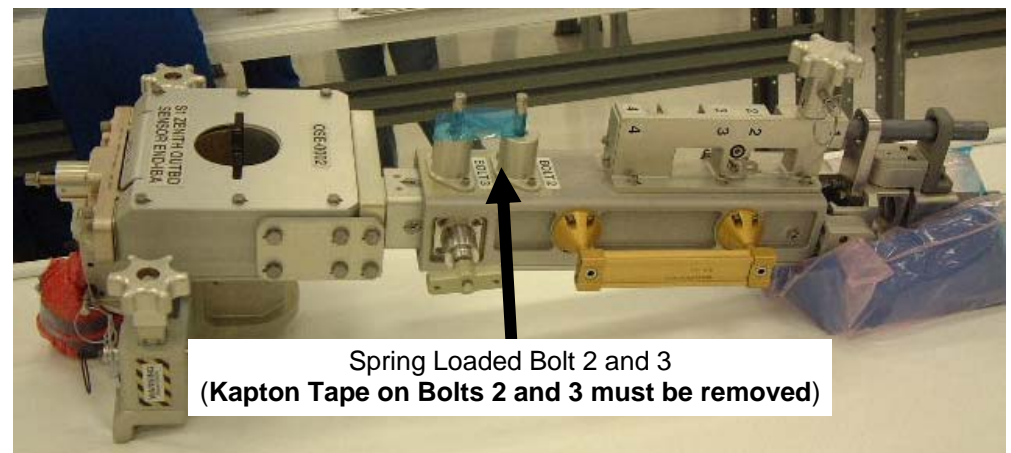
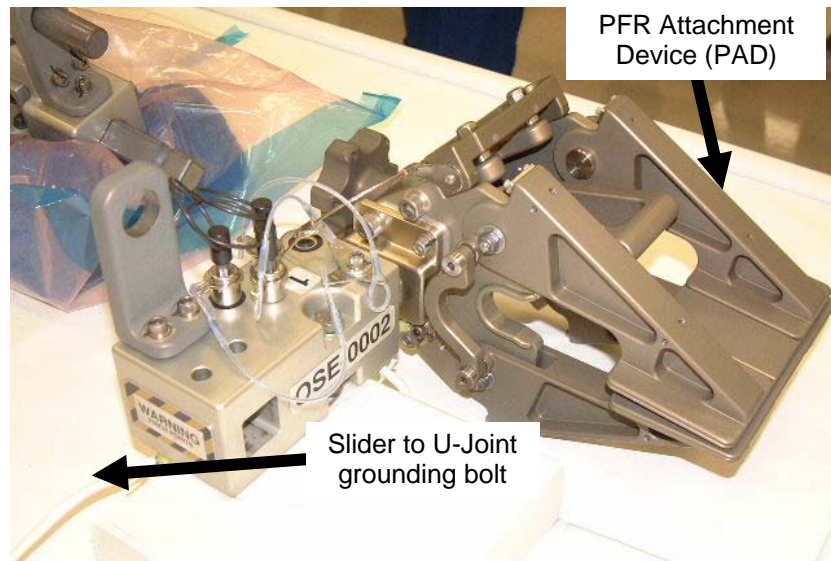
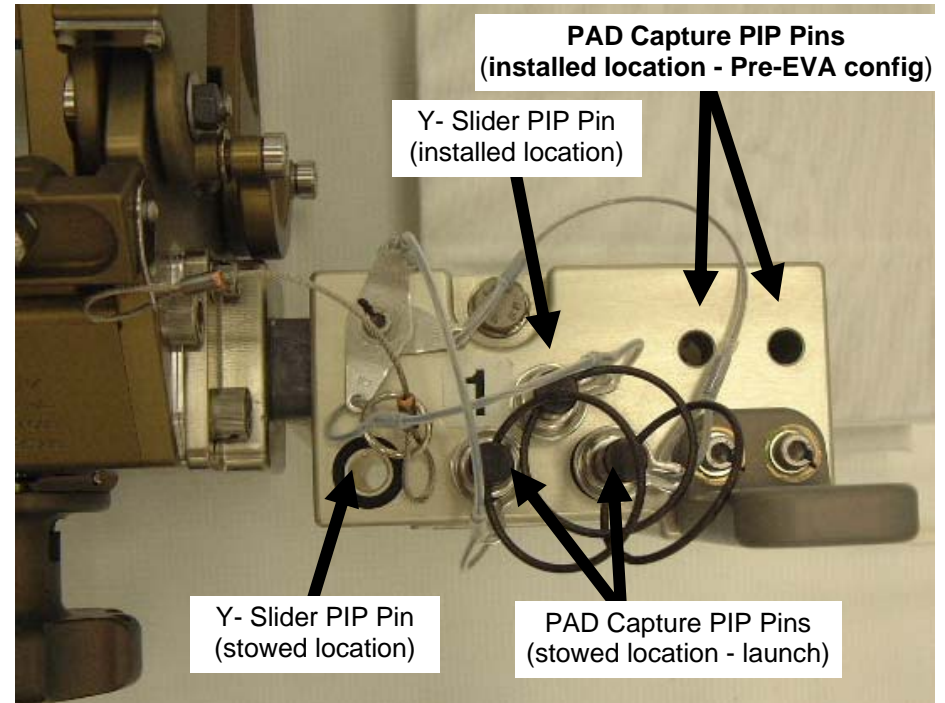
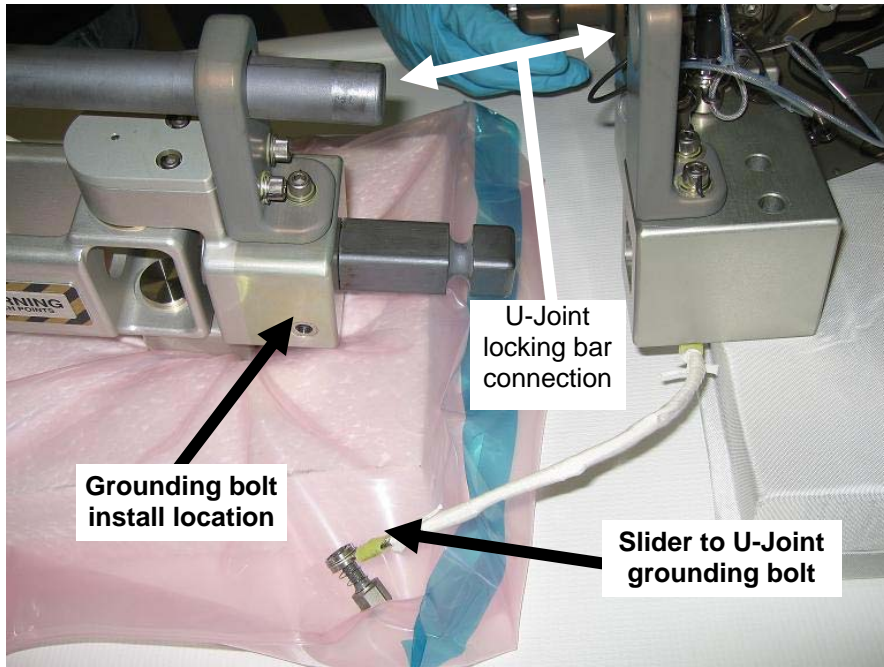
1. Install PAD and Slider assembly to U-joint assembly (OSE-0001 PAD to OSE-0001 and OSE-0002 PAD to OSE-0002)
2. Install PAD Capture PIP pins (2) in non-black circle holes to capture PAD slider assembly
3. Engage slider grounding bolt to U-joint
4. Drive grounding bolt ~8 turns cw to torque using torque wrench or PGT
5. Verify capture latch PIP pin installed in the stowed position (black circle hole)
6. Position anti-rotation fitting (2) to deployed position (fittings extended) and PIP pins (2) located in capture position
7. Verify PAD status indicator in SD (soft dock), close PAD paddles
8. Remove kapton tape from extender bolts 2 and 3
9. Stow tools

OBSS OSE PRE EVA CONFIG (Cont)



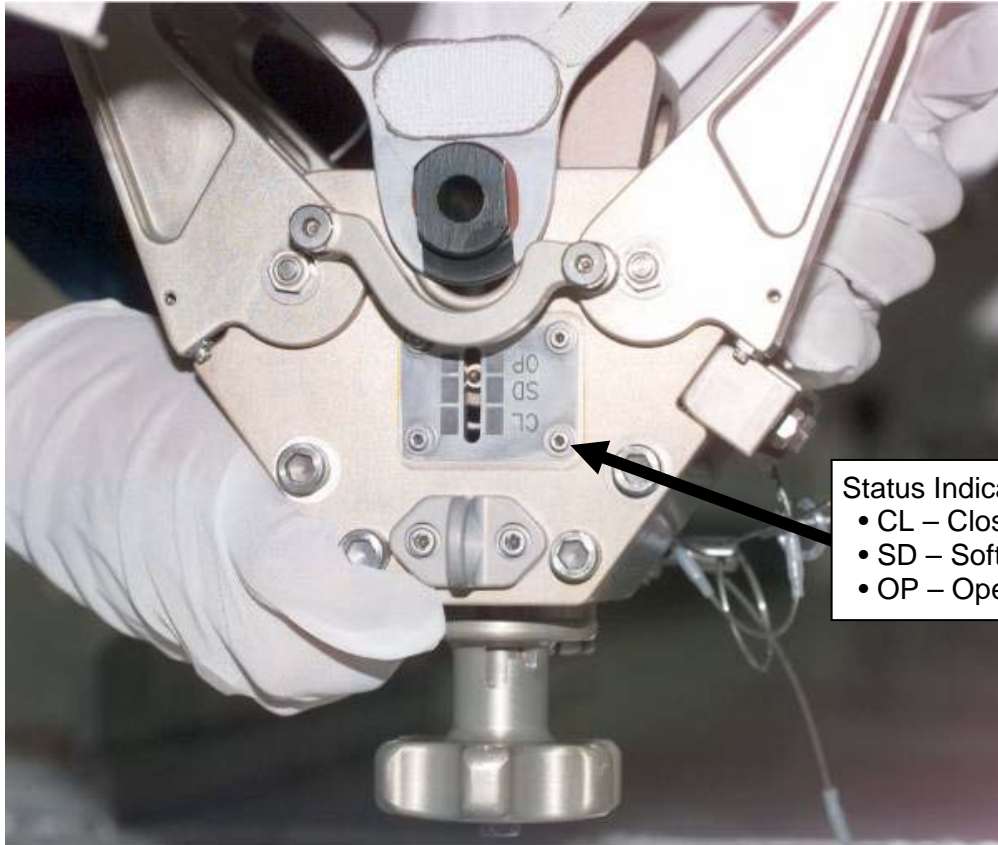
**NOTE:** PIP pin storage holes outlined in black on OSEs

**OBSS OSE PRE EVA CONFIG (Cont)**



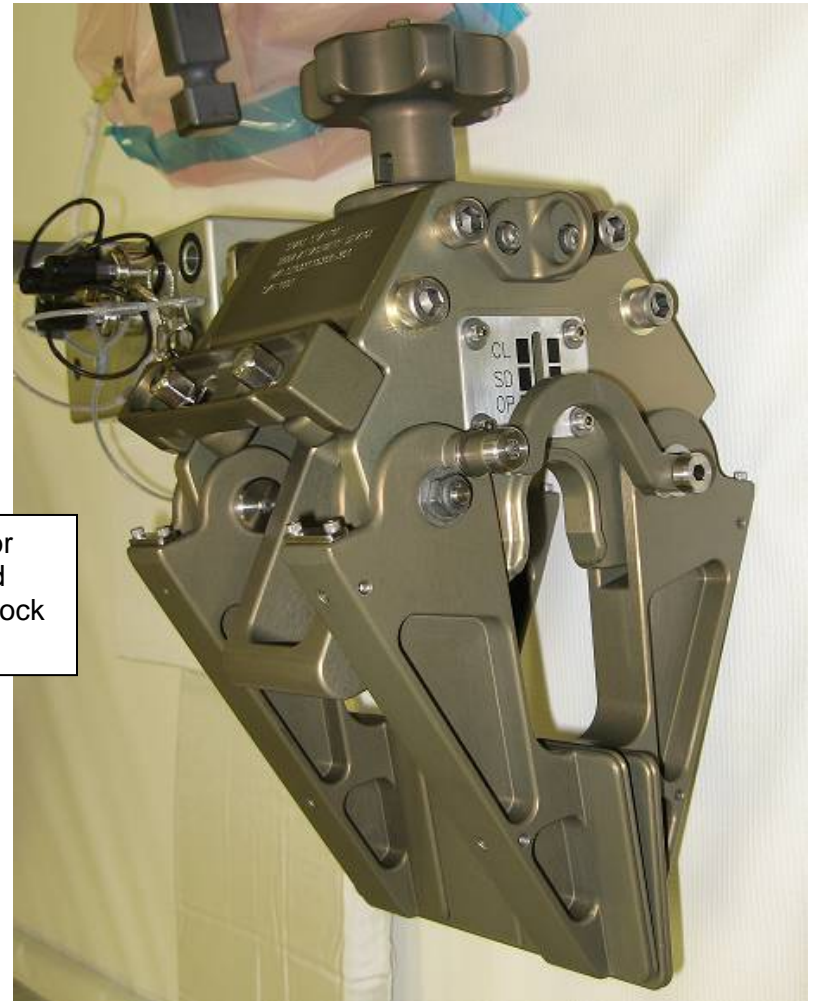


OBSS OSE PRE EVA CONFIG (Cont)



PFR Attachment Device (PAD)

Status Indicator  
• CL – Closed  
• SD – Soft Dock  
• OP – Open



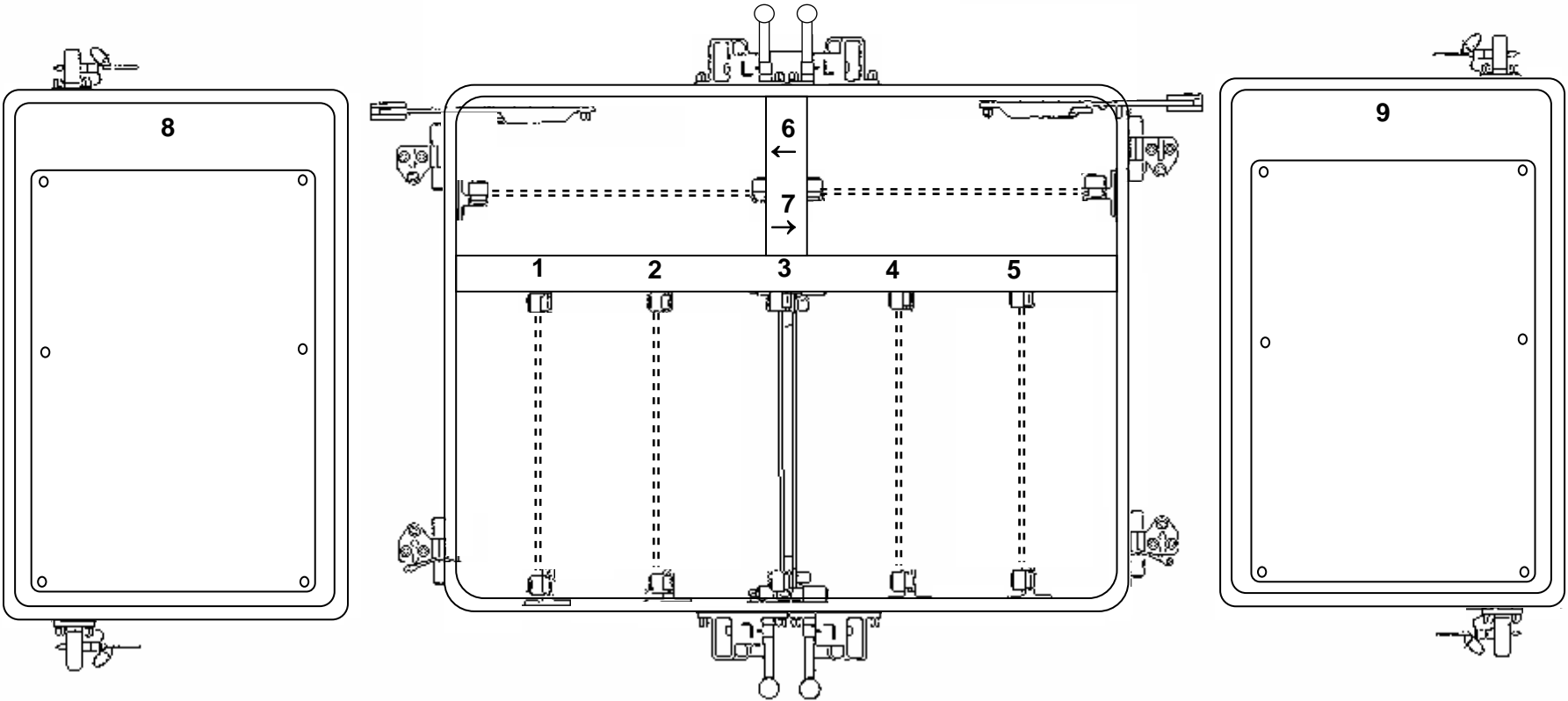
## TOOLBOX STOWAGE

	Z1 PORT TOOLBOX	Z1 STBD TOOLBOX	A/L TOOLBOX 1 (STBD)	A/L TOOLBOX 2 (PORT)
<b>SLOT # 1</b>	SQUARE TM BOARD SQ TORQUE MULTIPLIER 7/16" FLUSH SQ SOCKET 7/16" PROUD SQ SOCKET 7/16" RECESSED SQ SOCKET	SQUARE TM BOARD SQ TORQUE MULTIPLIER 7/16" FLUSH SQ SOCKET 7/16" PROUD SQ SOCKET 7/16" RECESSED SQ SOCKET	HAMMER BOARD HAMMER	CABLE CUTTER BOARD COMPOUND CUTTERS (SM) SCISSORS
<b>SLOT # 2</b>		QD BAIL TOOL BOARD BMRRM LATCH TOOL QD BAIL DRIVE TOOL (1")	PLIERS BOARD NEEDLE NOSE PLIERS	
<b>SLOT # 3</b>	RATCHET BOARD 3/8" DRIVE RATCHET 7/16" X 12" WOBBLE SOCKET 7/16" X 2" RIGID SOCKET	RATCHET BOARD 3/8" DRIVE RATCHET 7/16" X 6" WOBBLE SOCKET		
<b>SLOT # 4</b>				
<b>SLOT # 5</b>	ROUND TM BOARD RND TORQUE MULTIPLIER 5/8" PROUD RND SOCKET 7/16" FLUSH RND SOCKET 7/16" PROUD RND SOCKET	ROUND TM BOARD 7/16" FLUSH RND SOCKET 7/16" PROUD RND SOCKET	ADJ WRENCH BOARD FORCEPS WRENCH, ADJ	T-HANDLE TOOL BOARD 1-3" T-TOOLS 2-8" T-TOOLS
<b>SLOT # 6</b>	TRASH BAG BOARD LARGE TRASH BAG SMALL TRASH BAG	TRASH BAG BOARD	HYDRAZINE BRUSH BOARD HYDRAZINE BRUSH	
<b>SLOT # 7</b>	SOCKET BOARD 5/32" BALL END ALLEN DR 1/2" X 8" WOBBLE SOCKET 5/16" X 7" RIGID SOCKET	SOCKET BOARD 5/32" BALL END ALLEN DR 1/2" X 8" WOBBLE SOCKET 5/16" X 7" RIGID SOCKET	PRD (Toolboard) PRD	PRD (Toolboard) PRD
<b>PANEL # 8</b>	CHEATER BAR PANEL ADJ EQUIP TETHER	CHEATER BAR PANEL CHEATER BAR ADJ EQUIP TETHER	TOOL CADDY PANEL CADDY, ISS (BUNGEE)	
<b>PANEL # 9</b>	18" SOCKET PANEL 7/16" X 18" WOBBLE SOCKET	18" SOCKET PANEL	BOLT PULLER PANEL BOLT PULLER MECHANICAL FINGER	LARGE CUTTER PANEL GP CUTTER (LARGE)
<b>EXTERNAL</b>	1 SQUARE SCOOP w/D-HANDLE 1 ROUND SCOOP	1 SQUARE SCOOP w/D-HANDLE		

# TOOLBOX PANEL AND SLOT LABELS

### NOTE

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



**STBD QD BAG (EXTERNAL ON ISS AIRLOCK)**

STBD QD BAG (SEG33114667-301)			
#	TOOL	PART#	LOCATION IN BAG
1.	1/4" cap tool	GD2043725	<input type="checkbox"/> 1/4" cap tool (pocket)
2.	1/2" cap tool	GD2043730	<input type="checkbox"/> 1/2" cap tool (pocket)
3.	1" cap tool	GD2043325	<input type="checkbox"/> 1" cap tool (pocket)
4.	3/4" & 1" QD Bail Drive lever	SDG33113838-703	<input type="checkbox"/> 3/4" & 1" QD Bail Drive Lever pouch on lid
5.	1.5" QD Bail Drive Lever	SDG33113837-701	<input type="checkbox"/> 1.5" QD bail Drive Lever pouch on lid
6.	1.5" QRT & FID Gauge	SEG33114617-701	<input type="checkbox"/> 1.5" QRT & FID Gauge (pocket)
7.	3/4" & 1" QRT & FID Gauge	SEG33114616-701	<input type="checkbox"/> 3/4" & 1" QRT & FID Gauge (pocket)
8.	1" H20/N2 Vent Tool – F	1F98593-1	<input type="checkbox"/> 1" H20/N2 Vent Tool – F (pocket)
9.	1" NH3/N2 Vent Tool – F	1F98589-1	<input type="checkbox"/> 1" NH3/N2 Vent Tool – F (pocket)
10.	1" NH3/N2 Vent Tool – M	1F98596-1	<input type="checkbox"/> 1" NH3/N2 Vent Tool – M (pocket)
11.	1.5" NH3/N2 Vent Tool – F	1F9859-1	<input type="checkbox"/> 1.5" NH3/N2 Vent Tool – F (pocket)
12.	3/4" NH3/N2 Vent Tool – F	1F98597-1	<input type="checkbox"/> 3/4" NH3/N2 Vent Tool – F (pocket)
13.	1/4" NH3/N2 Vent Tool – F	1F98592-1	<input type="checkbox"/> 1/4" NH3/N2 Vent Tool – F (pocket)



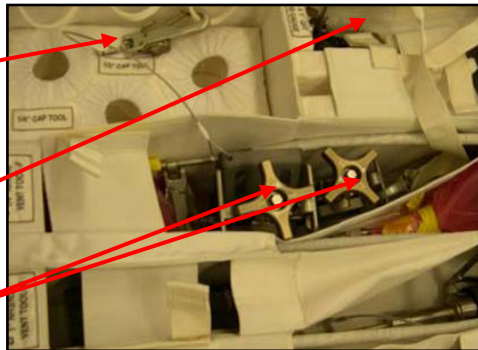
## PORT QD BAG (EXTERNAL ON ISS AIRLOCK)

PORT QD BAG (SEG33114667-301/1001)			
#	TOOL	PART #	LOCATION IN BAG
1.	1/4" cap tool	GD2043725	<input type="checkbox"/> 1/4" cap tool (pocket)
2.	1/2" cap tool	GD2043730	<input type="checkbox"/> 1/2" cap tool (pocket)
3.	1.5" NH3/N2 Vent Tool – F	1F9859-1	<input type="checkbox"/> 1.5" NH3/N2 Vent Tool – F (pocket)
4.	1" H2O/N2 Vent Tool – F	1F98593-1	<input type="checkbox"/> 1" H2O/N2 Vent Tool – F (pocket)
5.	3/4" NH3/N2 Vent Tool – F	1F98597-1	<input type="checkbox"/> 3/4" NH3/N2 Vent Tool – F (pocket)
6.	1" NH3/N2 Vent Tool – M	1F98596-1	<input type="checkbox"/> 1" NH3/N2 Vent Tool – M (pocket)
7.	1/4" NH3/N2 Vent Tool – F	1F98592-1	<input type="checkbox"/> 1/4" NH3/N2 Vent Tool – F (pocket)
8.	Vent Tool Adapters (2)	SEG33119079-301	<input type="checkbox"/> One VTA goes in the 3/4" & 1" QRT & FID Gauge pouch; the other goes in the 1.5" QRT & FID Gauge pouch <input type="checkbox"/> Each VTA must be tethered inside the bag using 1 adj tether for each <input type="checkbox"/> See picture B
9.	1/4" BDT	SEG33114984-301	<input type="checkbox"/> Stowed on top of 1/4" Vent Tool <input type="checkbox"/> Must be tethered to inside of bag using 1 adj <input type="checkbox"/> See picture A
10.	3/4" BDT	SEG33114986-301	<input type="checkbox"/> Stowed on top of 1/4" Vent Tool, tethers to bag internal loops using BDT integral tether <input type="checkbox"/> See picture A
11.	3/4" AKT	SEG33114983-301	<input type="checkbox"/> Stowed with vent tool adapters in QRT & FID pouches <input type="checkbox"/> Must be tethered to inside of bag using 1 adj <input type="checkbox"/> See picture A

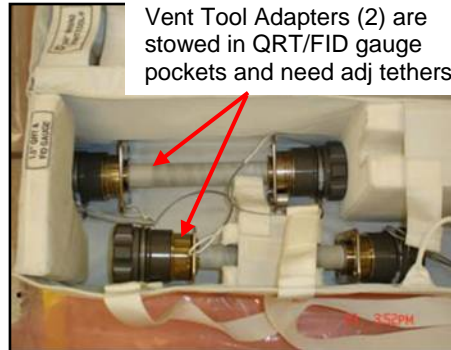
3/4" BDT is tethered to internal bag loop using integral tool tether

3/4" AKT stowed with VTAs in QRT & FID pouch

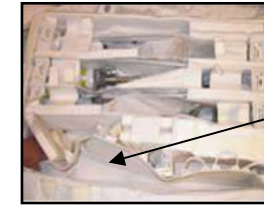
1/4" and 3/4" BDTs are stowed on top of 1/4" vent tool



PICTURE A: BDT AND AKT STOWAGE



PICTURE B: VENT TOOL ADAPTER STOWAGE



Port QD Bag launch config with insert peeled back



Port QD Bag with insert re-attached to bag wall

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# EVA 1 TOOL TRACKER

COMPLETED TASK	RICK	DAVE
<p><b>S5 CLEANUP</b></p> <p>Torque Wrench (out) _____ : _____ : _____ (in) _____ : _____ : _____</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> CL Bag #1 (Temp stowed on HR _____)</li> <li><input type="checkbox"/> RET (Lg-sm) on outside</li> <li><input type="checkbox"/> Fish Stringer</li> <li><input type="checkbox"/> Digital Camera</li> <li><input type="checkbox"/> Cannon Connector Tools (2)</li> <li><input type="checkbox"/> Socket Caddy</li> <li><input type="checkbox"/> 7/16 X 2"</li> <li><input type="checkbox"/> RAD</li> <li><input type="checkbox"/> 5/8 X 7.8" rigid</li> <li><input type="checkbox"/> Torque Wrench Bag (wire-tied on outside)</li> <li><input type="checkbox"/> Torque Wrench (set 55-60 ft-lb)</li> <li><input type="checkbox"/> RET (sm-sm)</li> <li><input type="checkbox"/> Soft Capture pin (S5/Corner 1)</li> <li><input type="checkbox"/> Soft Capture pin (S5/Corner 3)</li> </ul> <hr/> <ul style="list-style-type: none"> <li><input type="checkbox"/> RET</li> <li><input type="checkbox"/> Trash Bag (L, outside)</li> <li><input type="checkbox"/> Launch Lock #1</li> <li><input type="checkbox"/> Launch Lock #3</li> <li><input type="checkbox"/> BRT (L) – _____</li> <li><input type="checkbox"/> RET</li> <li><input type="checkbox"/> PGT (R)</li> <li><input type="checkbox"/> 7/16 X 6" wobble</li> <li><input type="checkbox"/> RET</li> <li><input type="checkbox"/> APFR</li> <li><input type="checkbox"/> Adj</li> </ul> <hr/> <ul style="list-style-type: none"> <li><input type="checkbox"/> FL S4/_____ (Adj)</li> <li><input type="checkbox"/> ST Swap: _____</li> <li><input type="checkbox"/> Safety Tether (85-ft)</li> <li><input type="checkbox"/> Spare 85-ft safety tether (on MWS)</li> <li><input type="checkbox"/> FL S0/_____ (Adj)</li> <li><input type="checkbox"/> APFR – stowed @ CETA2 WIF 2 [10 PP E 12], Y/P [12 FF]</li> <li><input type="checkbox"/> Spare 85-ft safety tether back on bag at A/L</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> RET</li> <li><input type="checkbox"/> Adj (wrists)</li> <li><input type="checkbox"/> Trash Bag (L, outside)</li> <li><input type="checkbox"/> Launch Lock #2</li> <li><input type="checkbox"/> Launch Lock #4</li> <li><input type="checkbox"/> Socket Caddy</li> <li><input type="checkbox"/> 5/8 X 7.8" rigid</li> <li><input type="checkbox"/> RAD</li> <li><input type="checkbox"/> BRT (L) – _____</li> <li><input type="checkbox"/> RET</li> <li><input type="checkbox"/> PGT (R)</li> <li><input type="checkbox"/> 7/16 X 2" rigid</li> <li><input type="checkbox"/> RET</li> </ul> <hr/> <ul style="list-style-type: none"> <li><input type="checkbox"/> FL (S4/_____ (Adj)</li> <li><input type="checkbox"/> FL (S5/_____ (Adj)</li> <li><input type="checkbox"/> ST Swap: _____</li> <li><input type="checkbox"/> Safety Tether (85-ft)</li> <li><input type="checkbox"/> Spare (85-ft)</li> <li><input type="checkbox"/> FL (S1/_____ (Adj)</li> </ul> <ul style="list-style-type: none"> <li><input type="checkbox"/> APFR – stowed @ CETA 1 WIF 4 (no change to settings from S5)</li> </ul> <ul style="list-style-type: none"> <li><input type="checkbox"/> Spare (85-ft) – stow outside A/L post S5</li> </ul>
	<p>GET AHEADS:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> S5 Launch Locks</li> </ul>	
<p><b>P6 PVR RETRACT AND CINCH</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> RET</li> <li><input type="checkbox"/> Adj</li> <li><input type="checkbox"/> Trash Bag (L, outside)</li> <li><input type="checkbox"/> Launch Lock #1</li> <li><input type="checkbox"/> Launch Lock #3</li> <li><input type="checkbox"/> BRT (L) – _____</li> <li><input type="checkbox"/> RET</li> <li><input type="checkbox"/> PGT (R)</li> <li><input type="checkbox"/> 7/16 X 6" wobble</li> <li><input type="checkbox"/> RET</li> <li><input type="checkbox"/> Safety Tether (85-ft)</li> </ul> <ul style="list-style-type: none"> <li><input type="checkbox"/> FL P6/_____</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> RET</li> <li><input type="checkbox"/> Adj (wrists)</li> <li><input type="checkbox"/> Trash Bag (L, outside)**</li> <li><input type="checkbox"/> Launch Lock #2</li> <li><input type="checkbox"/> Launch Lock #4</li> <li><input type="checkbox"/> Socket Caddy</li> <li><input type="checkbox"/> 5/8 X 7.8" rigid</li> <li><input type="checkbox"/> RAD</li> <li><input type="checkbox"/> BRT (L) – _____</li> <li><input type="checkbox"/> RET</li> <li><input type="checkbox"/> PGT (R)</li> <li><input type="checkbox"/> 7/16 X 2" rigid</li> <li><input type="checkbox"/> RET</li> <li><input type="checkbox"/> Safety Tether (85-ft)</li> <li><input type="checkbox"/> FL P6/_____</li> </ul>

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# EVA 2 TOOL TRACKER

COMPLETED TASK	RICK	DAVE
<p align="center"><b>RMV OLD CMG (Z1)</b></p>	<p><input type="checkbox"/> RET (Lg-Sm) – on failed CMG</p>	<p><input type="checkbox"/> FL_____ (Adj) Z1/6551)</p>
<p align="center"><b>TRANSFER NEW CMG TO ESP (Before leaving PLB)</b></p>	<p> <input type="checkbox"/> <input type="checkbox"/> RET  <input type="checkbox"/> RET (Lg-Sm)  <input type="checkbox"/> Socket Caddy (L, inbd)  <input type="checkbox"/> 7/16 x 12" wobble  <input type="checkbox"/> Sm Trash bag (R, inbd)  <input type="checkbox"/> BRT (L)  <input type="checkbox"/> RET  <input type="checkbox"/> PGT (R, swing arm)  <input type="checkbox"/> 7/16 x 6" wobble  <input type="checkbox"/> RET  <input type="checkbox"/> Lg Trash Bag (R, swing arm)  <input type="checkbox"/> <input type="checkbox"/> Shims (2)  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Shroud Straps (3)         </p> <hr/> <p> <input type="checkbox"/> Adj (from wrist)  <input type="checkbox"/> FL (<u>fwd port corner ODS</u>)  <input type="checkbox"/> Spare 85' (from A/L)  <input type="checkbox"/> Swap _____  <input type="checkbox"/> Safety Tether (85')         </p>	<p align="center">(On SSRMS w/CMG)</p>
<p align="center"><b>INSTALL NEW CMG (Z1)</b></p>	<p> <input type="checkbox"/> RET (Lg-Sm)  <input type="checkbox"/> <input type="checkbox"/> Adj (from shroud)  <input type="checkbox"/> Adj (on wrist)  <input type="checkbox"/> <input type="checkbox"/> RET (2)  <input type="checkbox"/> Sm Trash bag (R, inbd)  <input type="checkbox"/> <input type="checkbox"/> Shims (2)  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Connector Caps (3)  <input type="checkbox"/> Socket Caddy (L, inbd)  <input type="checkbox"/> 7/16 x 12" wobble  <input type="checkbox"/> BRT (L)  <input type="checkbox"/> RET  <input type="checkbox"/> PGT (R, swing arm)  <input type="checkbox"/> 7/16 x 6" wobble  <input type="checkbox"/> RET  <input type="checkbox"/> Safety Tether         </p> <hr/> <p> <input type="checkbox"/> CL Bag _____ (Z1/6051)  <input type="checkbox"/> RET (Lg-sm on outside)  <input type="checkbox"/> Ballstack – MUT (on outside)  <input type="checkbox"/> RET  <input type="checkbox"/> MUT EE  <input type="checkbox"/> ISS Prybar  <input type="checkbox"/> RAD  <input type="checkbox"/> Digital Camera  <input type="checkbox"/> Vice Grips  <input type="checkbox"/> Adj (attached inside CL bag)         </p>	<p align="center">(Use Post EVA TOOL CONFIG)</p>

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# EVA 3 TOOL TRACKER

COMPLETED TASK	RICK	CLAY
<p><b>SASA RELOCATE (P1)</b></p>	<p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RET  <input type="checkbox"/> Trash bag (L, inbd)  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> P6 SASA dummy caps (3)  <input type="checkbox"/> PGT (R)  <input type="checkbox"/> 7/16 x 6" wobble  <input type="checkbox"/> RET  <input type="checkbox"/> BRT (L)  <input type="checkbox"/> RET  <input type="checkbox"/> Digital Camera  <hr/> <input type="checkbox"/> ST swap _____ (to Clay's A/L ST-0554)         </p>	<p>N/A</p>
<p><b>BSP/XPDR INSTALL (P1)</b></p>	<p>N/A</p>	<p> <input type="checkbox"/> <input type="checkbox"/> Adj (wrists?)  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RET  <input type="checkbox"/> Trash bag (L, inbd)  <input type="checkbox"/> PGT (R)  <input type="checkbox"/> 7/16 x 6" wobble  <input type="checkbox"/> RET  <input type="checkbox"/> BRT (L)  <input type="checkbox"/> RET  <hr/> <input type="checkbox"/> <b>ORU Bag</b>  <input type="checkbox"/> <input type="checkbox"/> RET (sm-sm free end attached to outside)  <input type="checkbox"/> Lg-sm RET (on outside)  <input type="checkbox"/> Adj (on outside)  <input type="checkbox"/> Spare ST (on outside)  <input type="checkbox"/> XPDR Dummy Box w/Round Scoop  <input type="checkbox"/> BSP Dummy Box  <hr/> <input type="checkbox"/> ST swap _____ (spare on SSRMS)         </p>
<p><b>CETA CART RELOCATE (S1)</b></p>	<p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RET  <input type="checkbox"/> Trash bag (L, inbd)  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> P6 SASA dummy caps (3)  <input type="checkbox"/> PGT (R)  <input type="checkbox"/> 7/16 x 6" wobble  <input type="checkbox"/> RET  <input type="checkbox"/> BRT (L)  <input type="checkbox"/> RET  <input type="checkbox"/> WIF Adapter  <input type="checkbox"/> APFR &amp; Ingress Aid (relocate to ALWIF11)  <input type="checkbox"/> SSRMS ST (stow outside A/L)  <hr/> <input type="checkbox"/> FL _____            Clay's Adj – S0/3413 zenith stanchion)         </p>	<p> <input type="checkbox"/> <input type="checkbox"/> Adj (wrists?)  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RET  <input type="checkbox"/> Trash bag (L, inbd)  <input type="checkbox"/> PGT (R)  <input type="checkbox"/> 7/16 x 6" wobble  <input type="checkbox"/> RET  <input type="checkbox"/> BRT (L)  <input type="checkbox"/> RET  <input type="checkbox"/> Digital Camera  <hr/> <input type="checkbox"/> ST swap_ (to Rick's A/L @ S1/HR 3246)  <input type="checkbox"/> FL _____            (Rick's Adj @ S0/3413 nadir stanchion)         </p>
<p><b>CLEANUP (Rick @ A/L) (Clay @ P6)</b></p>	<p> <input type="checkbox"/> Adj  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RET  <input type="checkbox"/> Trash bag (L, inbd)  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> P6 SASA dummy caps (3)  <input type="checkbox"/> PGT (R)  <input type="checkbox"/> 7/16 x 6" wobble  <input type="checkbox"/> RET  <input type="checkbox"/> BRT (L)  <input type="checkbox"/> RET  <input type="checkbox"/> WIF Adapter?  <input type="checkbox"/> Digital Camera?  <hr/> <input type="checkbox"/> Safety Tether (85'): A/L HR 0554  <input type="checkbox"/> Spare (ext A/L) ST: A/L D-ring         </p>	<p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Adj  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RET  <input type="checkbox"/> Trash bag (L, inbd)  <input type="checkbox"/> PGT (R)  <input type="checkbox"/> 7/16 x 6" wobble  <input type="checkbox"/> RET  <input type="checkbox"/> BRT (L)  <input type="checkbox"/> RET  <input type="checkbox"/> XPDR + 6B Cover + Round Scoop  <hr/> <input type="checkbox"/> Safety Tether (85'): A/L HR 0550         </p>

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# EVA 4 TOOL TRACKER

COMPLETED TASK	DAVE	CLAY
<b>OBSS OSE INSTALL (S1)</b>	<input type="checkbox"/> PGT (R) <input type="checkbox"/> 7/16 x 6" wobble <input type="checkbox"/> RET <input type="checkbox"/> FL_____ (Adj)	<input type="checkbox"/> PGT (R) <input type="checkbox"/> 7/16 x 6" wobble <input type="checkbox"/> RET <input type="checkbox"/> Release FL_____ (leave Adj for WETA task)
<b>WETA ANTENNA INSTALL (S3)</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RET <input type="checkbox"/> Trash bag (L, inbd) <input type="checkbox"/> BRT (L) <input type="checkbox"/> RET <input type="checkbox"/> PGT (R) <input type="checkbox"/> 7/16 x 6" wobble <input type="checkbox"/> RET <input type="checkbox"/> Round Scoop <input type="checkbox"/> ST Swap_____ <input type="checkbox"/> A/L ST (85'): A/L HR 0550 <input type="checkbox"/> Spare ST (55') <input type="checkbox"/> FL_____ (Adj)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RET <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Adj (2 on wrists) <input type="checkbox"/> Trash bag (L, inbd) <input type="checkbox"/> BRT (L) <input type="checkbox"/> RET <input type="checkbox"/> PGT (R) <input type="checkbox"/> 7/16 x 6" wobble <input type="checkbox"/> RET <input type="checkbox"/> ST Swap_____ (near FHRC?) <input type="checkbox"/> A/L ST (85'): A/L HR 0554 <input type="checkbox"/> FL_____ (Adj) <hr/> <input type="checkbox"/> C/L bag Dummy Box <input type="checkbox"/> WETA MLI Shroud <input type="checkbox"/> Spare ST (85') – stow @ A/L
<b>P1 VSSA INSTALL (P1)</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RET <input type="checkbox"/> Adj <input type="checkbox"/> Trash bag (L, inbd) <input type="checkbox"/> BRT (L) <input type="checkbox"/> RET <input type="checkbox"/> PGT (R) <input type="checkbox"/> 7/16 x 6" wobble <input type="checkbox"/> RET <input type="checkbox"/> Safety Tether (85'): A/L HR 0550 <hr/> <input type="checkbox"/> Round Scoop	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RET <input type="checkbox"/> <input type="checkbox"/> Adj (2 on wrists) <input type="checkbox"/> Trash bag (L, inbd) <input type="checkbox"/> BRT (L) <input type="checkbox"/> RET <input type="checkbox"/> PGT (R) <input type="checkbox"/> 7/16 x 6" wobble <input type="checkbox"/> RET <input type="checkbox"/> A/L ST (85'): A/L HR 0554 <input type="checkbox"/> FL_____ (Adj) <hr/> <input type="checkbox"/> Node HR 120
<b>END, BEFORE INGRESS (A/L)</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RET (one w/PIP pin) <input type="checkbox"/> <input type="checkbox"/> Adj (2 on wrists) <input type="checkbox"/> Trash bag (L, inbd) <input type="checkbox"/> BRT (L) <input type="checkbox"/> RET <input type="checkbox"/> PGT (R) <input type="checkbox"/> 7/16 x 6" wobble <input type="checkbox"/> RET <input type="checkbox"/> A/L ST (85'): A/L HR 0550 <hr/> <input type="checkbox"/> Spare ST 85' (comes inside A/L) <hr/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Spare ST 55' (remains outside) <hr/> <input type="checkbox"/> Sm ORU bag <input type="checkbox"/> RET (Lg-sm on outside) <input type="checkbox"/> RET (sm-sm on inside) <input type="checkbox"/> GPS Antenna #4 <input type="checkbox"/> RET (sm-sm)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RET (one w/PIP pin) <input type="checkbox"/> <input type="checkbox"/> Adj <input type="checkbox"/> Trash bag (L, inbd) <input type="checkbox"/> BRT (L) <input type="checkbox"/> RET <input type="checkbox"/> PGT (R, on swing arm) <input type="checkbox"/> 7/16 x 6" wobble <input type="checkbox"/> RET <input type="checkbox"/> A/L ST (85'): A/L HR 0554 <input type="checkbox"/> FL_____ (Adj) <hr/> <input type="checkbox"/> WETA Dummy Box <input type="checkbox"/> Round Scoop <input type="checkbox"/> RET (Lg-sm) <input type="checkbox"/> WETA MLI Shroud <input type="checkbox"/> RET/Adj? <hr/> <input type="checkbox"/> Node HR 120 <input type="checkbox"/> Tether? <hr/> <input type="checkbox"/> Digital Camera <input type="checkbox"/> RET (Lg-sm)

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# MISSE PREP FOR RETURN

## OBJECTIVE

Remove MISSE Clamps and Probes from MISSEs 3 and 4. Pack MISSEs for return in SPACEHAB.

## TOOLS REQUIRED

Drawer 2 of ISS IVA Toolbox (NOD1D4\_G2):  
Ratchet, 3/8" Drive, P/N F830  
7/16" Socket, 3/8" Drive, P/N F141  
4" Ext, 3/8" Drive, P/N FXK4

## MATERIALS

Set of bags (from SH) (two):  
PEC Flight Bag (Ilumaloy)  
24x24 Ziplock bag (two)  
0.5 CTB, divider and tape from ISS (pregathered)

### **WARNING**

MISSEs 3 and 4 contain lithium thionyl chloride batteries that can be toxic; inspection required prior to ingress.

### NOTE

Preferred handling of the MISSE PECs is by their EVA handrails as much as possible.

## MISSE 4 Clamp and Probe Removal:

- 1.0 Remove MISSE Clamp 2 from Probe on MISSE 4 by releasing PIP pins (two). After removing MISSE Clamp 2, reinstall PIP pins (two).
- 2.0 Place MISSE Clamp 2 in a Ziplock bag and place in empty 0.5 CTB.
- 3.0 Pre-stage tape for noncaptive washers. Remove bolts/noncaptive washers (two sets) from Probe base (Ratchet, 3/8" Drive; 4" Ext; 7/16" Socket). Remove Probe from base. Reinstall bolts/noncaptive washers (two sets) in base.
- 4.0 Place Probe in Ziplock bag. Wrap up and tuck under a handrail on MISSE 4.
- 5.0 Place MISSE 4 and Probe in PEC Flight bag. Fold over top of bag and tape shut.

## MISSE 3 Clamp and Probe Removal:

- 6.0 Remove MISSE Clamp 1 from Probe on MISSE 3 by releasing PIP pins (two). After removing MISSE Clamp 1, reinstall PIP pins (two).

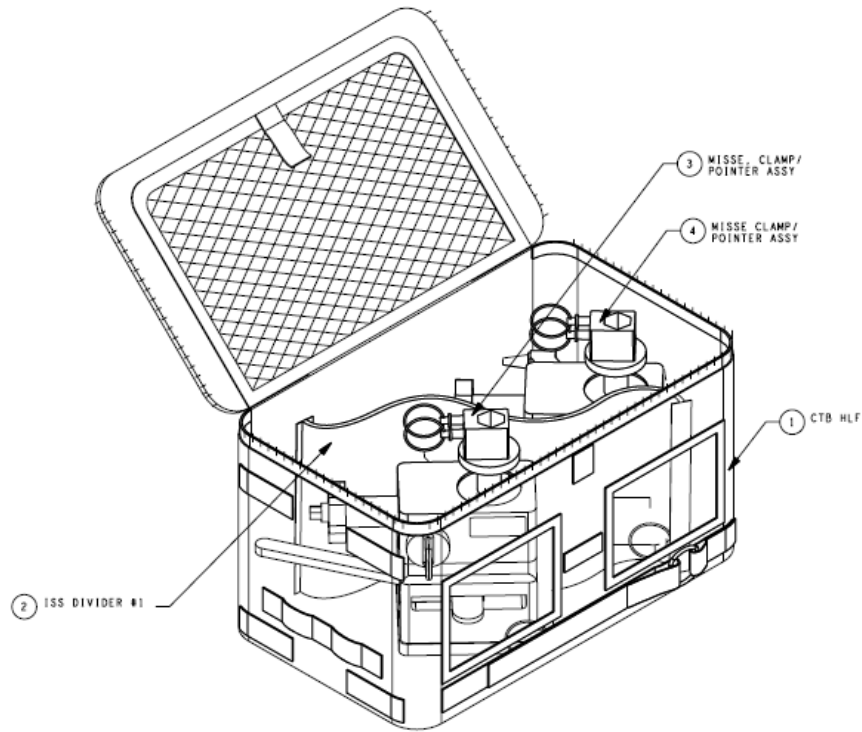


Figure 1: MISSE CLAMPS IN 0.5 CTB.

- 7.0 Place MISSE Clamp 1 in a Ziplock bag and place in 0.5 CTB with MISSE Clamp 2. Verify CTB divider is placed between the clamps (Figure 1).
- 8.0 Pre-stage tape for noncaptive washers. Remove bolts/noncaptive washers (two sets) from probe base (Ratchet, 3/8" Drive; 4" Ext; 7/16" Socket). Remove Probe from base. Reinstall bolts/noncaptive washers (two sets) in base.
- 9.0 Place Probe in Ziplock bag. Wrap up and tuck under a handrail on MISSE 3.
- 10.0 Place MISSE 3 and Probe in PEC Flight bag. Fold over top of bag and tape shut.

Clean Up:

- 11.0 Return all ISS tools to Drawer 2 of ISS IVA Tool Box (NOD1D4\_G2).
- 12.0 Transfer both MISSEs and 0.5 CTB to SH for return. Reference Spacehab Transfer List.



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.....	10-12
STS-118 CONSUMABLES TRACKING CARD.....	FS CC 10-13

## WATER RECHARGE

### IF EMU NOT ALREADY POWERED UP:

#### EMU POWERUP

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

#### CAUTION

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

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

#### WATER FILL

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

#### SM 60 TABLE MAINT

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

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

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

#### NOTE

Full charge requires ~15 min

#### WATER FILL VERIFICATION

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

#### SM 60 TABLE MAINT

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

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

TOP

**HOOK  
VELCRO**

**STS-118 CONSUMABLES TRACKING CUE CARD**

<b>EV1 Mt</b>	<b>EVA</b>	<b>LiOH (s/n) (b/c)</b>	<b>METOX (s/n) (b/c)</b>	<b>EMU Battery (s/n)</b>	<b>REBA (s/n) (b/c)</b>	<b>HL Battery (s/n)</b>	<b>ERCA (s/n) (Address)</b>	<b>SAFER (s/n)</b>	<b>PGT (s/n)</b>	<b>PGT Spare (s/n)</b>
EMU 3010  L – HUT	<b>1</b>	Record s/n	N/A	2039 <sup>1</sup>	1003	1015/1017	1010 16	1005	1004	1006
	<b>2</b>	N/A	0012 NO b/c	2038 <sup>2</sup>	1003	1015/1017	1010 16	1005	1004	1006
	<b>3</b>	N/A	0017 7811J	2039 <sup>4</sup>	1003	1015/1017	1010 16	1005	1004	1006
	↓	EVA 1 LiOH	N/A	2039	N/A	N/A	N/A	N/A	N/A	N/A

<b>EV2 Wm</b>	<b>EVA</b>	<b>LiOH (s/n) (b/c)</b>	<b>METOX (s/n) (b/c)</b>	<b>EMU Battery (s/n)</b>	<b>REBA (s/n) (b/c)</b>	<b>HL Battery (s/n)</b>	<b>ERCA (s/n) (Address)</b>	<b>SAFER (s/n)</b>	<b>PGT (s/n)</b>	<b>PGT Spare (s/n)</b>
EMU 3017  L – HUT	<b>1</b>	Record s/n	N/A	2040 <sup>1</sup>	1004	1019/1021	1007 18	1006	1005	N/A
	<b>2</b>	N/A	0013 7794J	2041 <sup>3</sup>	1004	1019/1021	1007 18	1006	1005	N/A
	<b>4</b>	N/A	0020 7795J	2063 <sup>3</sup>	1004	1015/1017	1010 16	1005	1004	1006
	↓	EVA 1 LiOH	N/A	2040	N/A	N/A	N/A	N/A	N/A	N/A

<b>EV3 Ad</b>	<b>EVA</b>	<b>LiOH (s/n) (b/c)</b>	<b>METOX (s/n) (b/c)</b>	<b>EMU Battery (s/n)</b>	<b>REBA (s/n) (b/c)</b>	<b>HL Battery (s/n)</b>	<b>ERCA (s/n) (Address)</b>	<b>SAFER (s/n)</b>	<b>PGT (s/n)</b>	<b>PGT Spare (s/n)</b>
EMU 3008  XL – HUT	<b>3</b>	N/A	0019 7807J	2077 <sup>3</sup>	1005	1019/1021	1007 18	1006	1005	N/A
	<b>4</b>	N/A	0021 7814J	2038 <sup>3</sup>	1005	1019/1021	1007 18	1006	1005	N/A

Notes: <sup>1</sup> Charge FD05 for EVA 3 & Spare <sup>2</sup> Charge FD07 for EVA 4 <sup>3</sup> Leave discharged post-EVA <sup>4</sup> Charge FD09 for Return

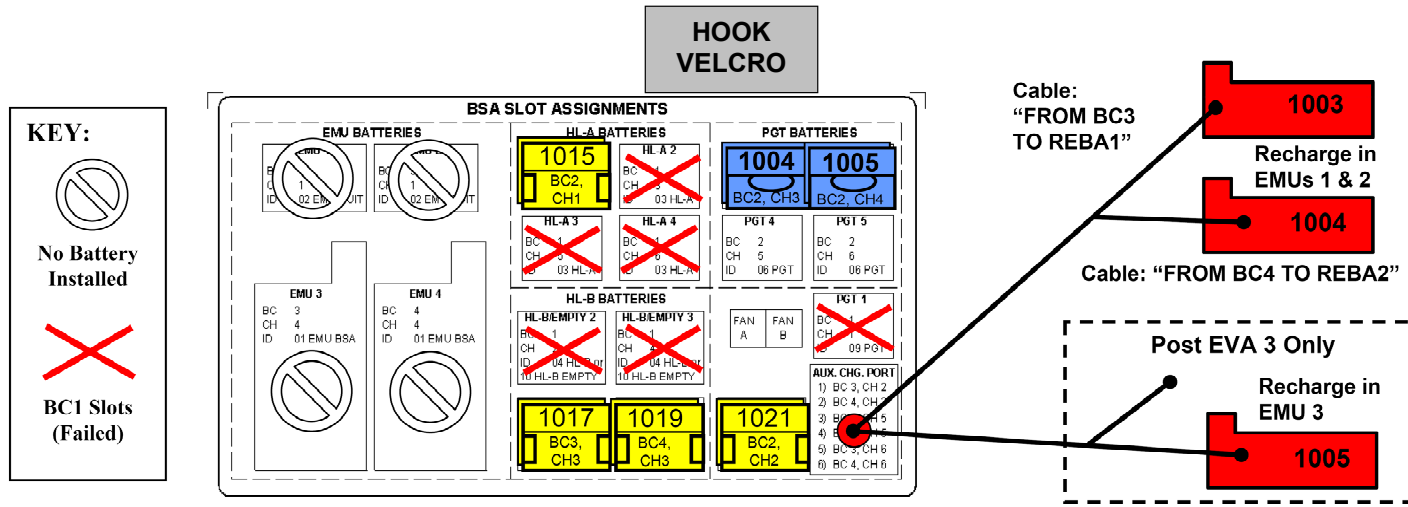
EVA-4a/118/O/B

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FS CC 10-13

EVA/118/FIN A

TOP  
BACK OF 'STS-118 CONSUMABLES TRACKING CUE CARD'



POST EVA Battery Recharge

AIRLOCK OPERATIONS

EVA	METOX (S/N) (B/C)	PWR (EMU Water Bag) (S/N)	IRU EMU Fill Quantity Post EVA (lbs)	CWC (Ullage Dump) (S/N)	Post-EVA METOX Regen (S/N) (B/C)
1	0007 / 0011 7802J / 7792J	1018		1059	0007 / 0011 7802J / 7792J
2	0015 / 0016 7686J / 7796J	1018 & 1025		1059	0015 / 0016 7686J / 7796J
3	0007 / 0011 7802J / 7792J	1025		1059	0007 / 0011 7802J / 7792J
4	0015 / 0016 7686J / 7796J	1025 & 1024		1059	--

**Post-EVA Metox/Battery Install**

FD05: Configure Mt and Wm EMUs for EVA 2 per cue card

FD07: Configure Mt EMU for EVA 3 and Wm EMU for EVA 4 per cue card

FD09: Prep Mt EMU for Return (↓) and Ad EMU for EVA 4 per cue card

EVA-4b/118/O/B

(reduced copy)

FS CC 10-14

EVA/118/FIN A

## POST ISS EVA ENTRY PREP (45 min)

1. Unstow 'Mt', 'Wm', 'Ad', and 'EVA Systems 2' mesh bags
  2. Stow 'Ad' mesh bag Middeck Floor Port 1 bag for entry
  3. Stow in FDF/ODF locker:  
STS-118 CONSUMABLES TRACKING CUE CARD  
ISS EVA Systems Checklist (red stripe w/118 crew notes)
  - Vol H 4. Unstow Vol H bags (2)  
Stow EMU Equipment Bag – Crew Specific Compartments (2) in Vol H OBD bag  
Stow SCOF (2) and EMU Servicing Kit in Vol H INBD bag  
Stow Helmet Lights (1 each) in Vol H INBD and OBD bags  
Stow Vol H bags  
√No loose items temp stowed in Vol H (waist tethers, etc). Install as reqd
  5. Remove comm cap s/n 1183 from 'EVA Systems 2' mesh bag; temp stow  
Verify 'EVA Systems 2' mesh bag is empty, stow bag in 'Mt' mesh bag
  6. Remove comm cap 'WM2' from 'Wm' mesh bag; temp stow
  - MD(flr) 7. EMU O2 ISOL VLV – CL
  - AW18D 8. AIRLK AUD PWR – OFF
  - AW18H 9. √PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF  
MODE (two) – OFF
  - AW82B 10. √EV-1, EV-2 O2 vlv (two) – CL
  - AW82D 11. √EMU 1,2 H2O WASTE, SPLY tb (four) – CL
  12. √No helmet lights or EMU TV installed on helmets
  13. Remove helmets, temp stow
  14. Disconnect comm caps from EMU electrical harness, temp stow
  15. Remove LTA, √Multiple Water Connector cover installed
  16. Stow LCVG and EV Crew Options Kit (ECOK) in HUT
  17. Connect LTA to HUT
  18. √Gloves installed, locked
  19. √Any wrist tethers attached to glove tether loop with only one hook (other hook on D-ring or first hook) and cinched down around wrist
  20. Install helmets, lock
  21. Install helmet covers if not already installed
  22. √SCU stowed on AAP, straps buckled
  - DCM 23. √PURGE vlvs – op (up)
  24. Attach LTA Restraint Bags over LTA, suit arms, tethers; tighten straps
  25. Stow comm caps (2) in each LTA Restraint Bag pocket
  26. Install floor Airlock Stowage Bag in airlock; √bag, strap installed
  - Inner Hatch 27. Equal vlv (two) – NORM, install caps
- \* If outer hatch leaking or integrity suspect: \*
- \* Equal vlv (two) – OFF, install caps \*
28. Inform MCC, Post ISS EVA Entry Prep complete
  29. Stow remaining FDF EVA Checklist in FDF/ODF locker

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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
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EMU NOMINAL SIZING (STS-118/13A.1).....	FS	12-27
EMU CONTINGENCY RESIZE MATRIX (STS-118/13A.1).....	FS	12-28

**EMU CONT  
PROCS**

**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

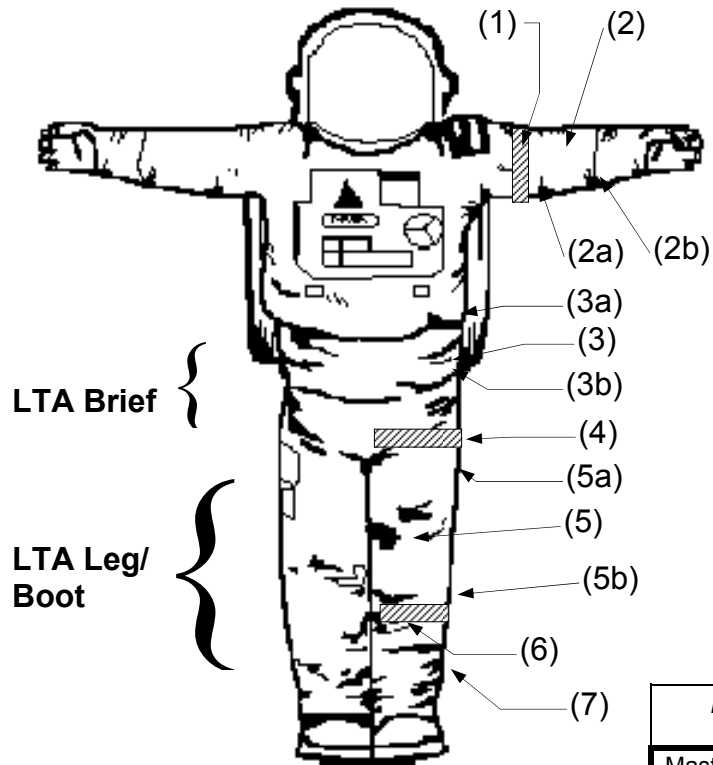
**VACUUM H2O RECHARGE (MANNED)**

**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)



# EMU NOMINAL SIZING (STS-118/13A.1)



EMU	(1) Arm Sizing Ring	(2a) Arm Cam	(2) Lower Arm	(2b) Wrist Cam	HUT
Mastracchio (3010)	-	Short	04	Long	L (03)
Williams (3017)	0.5	Short	03	Long	L (03)
Anderson (3008)	0.5	Short	02	Short	XL (04)
Anderson (3006)	0.5	Long	02	Long	L (03)

LTA	(3a) Brief Upper Cam	(3) Adjust. Waist Brief	(3b) Brief Lower Cam	(4) Thigh Sizing Ring	(5a) Thigh Cam	(5) Leg Segment	(5b) Leg Cam	(6) Leg Sizing Ring	(7) Boot/Insert-Type
Mastracchio	Short	02	Long	-	Short	03	Long	1.0	02/NO BSI
Williams	Short	02	Short	-	Short	03	Long	1.5	02/NO BSI
Anderson	Short	01	Long	-	Short	03	Long	1.0	02/NO BSI

Misc	LCVG/BLVD	TCU top/Bottom/MAG	Prime Gloves/s/n	b/u Gloves/s/n	CCA/CCEM	Valsalva	Fresnel Lens (diopters)
Mastracchio	06/05	L/M/711	6MT/6120	6MT / 6122	04/327	Original	-011 (+2.5)
Williams	06/05	L/M/711	6E5/6262	6E5 / 6261	04/323	Original	-009 (+2.0) -013 (+3.0)
Anderson	06/05	L/M/711	6C3/6264	6C3 / 6263	05/327	Modified	-019 (+5.0) -021 (+6.0)

## EMU CONTINGENCY RESIZE MATRIX (STS-118/13A.1)

FOR LOSS OF:	EV1 – Mastracchio	EV2 – Williams	EV3 – Anderson
<b>HUT/PLSS</b>	Use Large HUT s/n 3006 from ISS 1. Remove gloves/lower arms 2. Use prime MT gloves/arms/arm rings 3. √Arm red disconnect to right, √locks, √cams, √REBA upper arm power cables connected 4. Use prime MT LTA 5. Swap EMU PLSS identifier stripes, mission patch, and national flag 6. Swap helmet, CCA, CCC/Metox, EMU battery, and REBA battery	Use Large HUT s/n 3006 from ISS 1. Remove gloves/lower arms/arm rings 2. Use prime WM gloves/lower arms/arm rings 3. √Arm red disconnect to right, √locks, √cams, √REBA upper arm power cables connected 4. Use prime WM LTA 5. Swap EMU PLSS identifier stripes, mission patch, and national flag 6. Swap helmet, CCA, CCC/Metox, EMU battery, and REBA battery	Use Large HUT s/n 3006 from ISS 1. Remove gloves/lower arms/arm rings 2. Use prime AD gloves/lower arms/arm rings 3. Change lower arm cams to Long/Long 4. √Arm red disconnect to right, √locks, √cams, √REBA upper arm power cables connected 5. Use prime AD LTA 6. Swap EMU PLSS identifier stripes, mission patch, and national flag 7. Swap helmet, CCA, CCC/Metox, EMU battery, and REBA battery
<b>CCA</b>	Use size 04/327 CCA s/n 1183 from ISS	Use backup CCA 'WM2' from 'Wm' Mesh Bag	Use size 05/327 CCA s/n 1185 from ISS 1. Swap chin strap
<b>Lower Arm Segment</b>	Use size 04 lower arm s/n 225 or 226 from ISS (red = right, blue = left) 1. Use prime MT gloves 2. √Locks, √cams, √REBA upper arm power cables connected	Use size 03 lower arm s/n 219 or 220 from ISS (red = right, blue = left) 1. Use prime WM gloves/arm rings 2. √Locks, √cams, √REBA upper arm power cables connected	Use size 02 lower arm s/n 319 or 320 from ISS (red = right, blue = left) 1. Use prime AD gloves/arm rings 2. √Locks, √cams, √REBA upper arm power cables connected
<b>Gloves</b>	Use 6MT gloves s/n 6122 from middeck 1. Change lower arm cams to Short/Short	Use 6E5 gloves s/n 6261 from middeck	Use 6C3 gloves s/n 6263 from ISS
<b>Waist Brief</b>	Use size 02 waist brief s/n 2056 from ISS 1. Use prime MT legs/leg rings/boots 2. √Locks, √cams 3. Swap EMU brief identifier stripes	Use size 02 waist brief s/n 2056 from ISS 1. Use prime WM legs/leg rings/boots 2. √Locks, √cams 3. Swap EMU brief identifier stripes	Use size 01 waist brief s/n 2081 from ISS 1. Use prime AD legs/leg rings/boots 2. √Locks, √cams 3. Swap EMU brief identifier stripes
<b>Leg Segment</b>	Use size 03 leg s/n 161 or 162 from ISS 1. Use prime waist brief/leg rings/boots 2. √Locks, √cams	Use size 03 leg s/n 161 or 162 from ISS 1. Use prime waist brief/leg rings/boots 2. √Locks, √cams	Use size 03 leg s/n 161 or 162 from ISS 1. Use prime waist brief/leg rings/boots 2. √Locks, √cams
<b>Boot</b>	Use size 02 boots s/n 213 from ISS 1. Use prime waist brief/legs/leg rings 2. √Locks	Use size 02 boots s/n 213 from ISS 1. Use prime waist brief/legs/leg rings 2. √Locks	Use size 02 boots s/n 213 from ISS 1. Use prime waist brief/legs/leg rings 2. √Locks
<b>Sizing Rings</b>	<ul style="list-style-type: none"> <li>▪ <u>1.0 Leg</u>: Use s/n TBD from ISS</li> </ul>	<ul style="list-style-type: none"> <li>▪ <u>0.5 Arm</u>: Use s/n 120 or 121 from ISS</li> <li>▪ <u>1.5 Leg</u>: Use s/n 137 or 138 from ISS</li> </ul>	<ul style="list-style-type: none"> <li>▪ <u>0.5 Arm</u>: Use s/n 167 or 168 from ISS</li> <li>▪ <u>1.0 Leg</u>: Use s/n TBD from ISS</li> </ul>
<b>LCVG</b>	Use backup LCVG s/n 3178 from ISS 1. Transfer biomed sternal harness, signal conditioner, and dosimeter	Use backup LCVG s/n 3178 from ISS 1. Transfer biomed sternal harness, signal conditioner, and dosimeter	Use backup LCVG s/n 3178 from ISS 1. Transfer biomed sternal harness, signal conditioner, and dosimeter

## 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-118 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

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## 13A.1 WORKAROUNDS CRIBSHEET

### GENERIC

#### NZGL CONNECTOR

A. Connector fails to demate	<ol style="list-style-type: none"> <li>1. Verify bail fully thrown and undamaged</li> <li>2. Inspect connector/bail for FOD</li> <li>3. Check alignment/side loads</li> <li>4. Wiggle/jiggle connector, pull on connector back shell away from cap/jack for additional leverage</li> <li>5. Attach 2 hooks from adjustable tether to connector bail, use adjustable strap to pull bail into demated position (this works better after bail/linkage has passed over-center feature)</li> <li>6. Check for harness interference</li> <li>7. Increase force on bail</li> </ol>
B. Connector fails to soft dock	<ol style="list-style-type: none"> <li>1. Verify bail fully aft</li> <li>2. Verify plug half shell is aligned with jack half shell, avoid rolling/rocking plug onto jack (this could possibly unseat soft dock springs; it is also possible for keying feature to prevent soft dock). Once half shells are aligned, connector should snap into soft dock position with little force</li> </ol>
C. Connector fails to mate	<ol style="list-style-type: none"> <li>1. Detach from soft dock and inspect the following:             <ol style="list-style-type: none"> <li>a. Pins</li> <li>b. FOD</li> <li>c. EMI band</li> <li>d. bend radius</li> <li>e. bail linkages/rivets</li> <li>f. soft dock springs</li> <li>g. O-ring seal on non-active side or main joint gasket inside receptacle</li> <li>h. connector keying features</li> </ol> </li> <li>2. Cycle bail while disconnected, push on connector back shell toward cap/jack for additional leverage</li> <li>3. Verify half-shells are fully seated on both sides</li> </ol>
D. Connector pin bent (16,20,22 gauge)	<ol style="list-style-type: none"> <li>1. Rotate connector to bail up position, describe pin condition. If possible, obtain WVS view or interface</li> <li>2. On MCC GO, retrieve pin straightener (A/L staging bag) or needle nose pliers (stbd A/L toolbox, slot 2); attempt pin repair (this is based on pin size and MCC will verify actual pin size prior to retrieving tool)</li> </ol>
E. Connector FOD	<p>On MCC GO, obtain connector cleaner tool from A/L staging bag; use entire cartridge prior to re-entry to the airlock</p> <p style="text-align: center;"><u>NOTE</u></p> <p>One N2 cartridge is already captured onto the CCT (the other is lanyarded inside caddy). In order to puncture cartridge, it must be threaded into CCT until indicator line passes out of sight under the collar of the CCT</p>
F. Connector EMI band bent	<p>On MCC GO, obtain needle nose pliers (stbd A/L toolbox, slot 2) or forceps to remove band</p>
G. Connector bail linkage failure	<p>On MCC GO, re-attempt connector mate with broken bail. Vice grips may be used for additional leverage or hand on backshell (hand on back shell is easiest once linkage/bail has passed over-center feature)</p>
H. Connector soft dock spring bent	<p>On MCC GO, obtain needle nose pliers (stbd A/L toolbox, slot 2); attempt to remove bent spring</p>

## 13A.1 WORKAROUNDS CRIBSHEET (Cont)

### GENERIC (Cont)

#### NZGL CONNECTOR (Cont)

I. Connector O-ring or Main Joint Gasket seal loose (used as a moisture seal in 1G only, not needed on orbit)	<ol style="list-style-type: none"> <li>1. Remove seal with tether hook</li> <li>2. If no joy, on MCC GO, obtain needle nose pliers (stbd A/L toolbox, slot 2) to remove seal</li> </ol>
J. Twist cap will not release	<ol style="list-style-type: none"> <li>1. On MCC GO, increase force</li> <li>2. On MCC GO, attach equipment hook to cap tether point and use strap of adj tether to assist with cap release</li> </ol>

#### TA Clamp

TA clamp fails to release	Use tether hook to open clamp (do not use as a prying mechanism)
---------------------------	--

#### TSA

A. Latch fails to open	Release 7/16" EVA bolt on latch bracket, rotate bracket clear of latch tongue
B. Latch fails to close	Close remaining latches (3 of 4 required for landing)

#### APFR/IAPFR

A. APFR/IAPFR fails to install in WIF	<ol style="list-style-type: none"> <li>1. Verify APFR/IAPFR collar in install position</li> <li>2. Check for FOD in WIF or structural interference</li> <li>3. Attempt APFR install in alternate position. If no joy (APFR failure), use another APFR</li> </ol>
B. Joint fails to actuate	<ol style="list-style-type: none"> <li>1. Verify no load is applied to joint</li> <li>2. For pitch joint, push knob in during rotation</li> <li>3. Increase force applied to free joint</li> </ol>
C. EMU boot becomes stuck in APFR bootplate	<b>PGT[B1, CCW2, 30.5]-6"-ext-7/16"</b> : Release EVA bolts (3) on heel plate, 5 turns
D. EMU boot becomes stuck in IAPFR bootplate	<b>PGT[B2, CCW2, 30.5]-6"-ext-7/16"</b> : Release EVA bolts (4) on heel plates, 4 turns

#### SAFETY TETHER

A. 55' safety tether fails to retract/tend	<ol style="list-style-type: none"> <li>1. Verify reel is unlocked</li> <li>2. Verify tether reel opening is clear of FOD</li> <li>3. Pull out small amount of cable, allow reel to retract while holding cable slightly tensioned</li> <li>4. Tap on side of reel housing during retract</li> </ol>
B. 85' safety tether fails to retract/tend	<ol style="list-style-type: none"> <li>1. Verify reel is unlocked</li> <li>2. Verify tether reel opening and cable guide is clear of FOD (ensure nothing is blocking cable from retracting)</li> <li>3. Pull out small amount of cable, allow reel to retract while holding cable slightly tensioned</li> </ol>
C. Safety tether red stripe showing (any length)	Safety tether cannot be used. Replace with spare safety tether from Crewlock Bag #1

#### TORQUE MULTIPLIER

A. Torque Multiplier fails to release from fitting	<ol style="list-style-type: none"> <li>1. Verify anti-backlash feature in neutral; if not: <b>PGT[RCW, MTL 30.5]</b>: Apply cw torque and push anti-backlash button to neutral posn</li> <li>2. <b>PGT[A5, 7.0 ft-lb, CCW2, 30.5]-5/32"</b> Allen driver: Release torque multiplier contingency release band pin 20 turns (do not exceed 28 turns)</li> <li>3. When contingency band springs open, remove TM</li> </ol>
--	---

#### SCOOPS

A. Scoop will not release from fitting	<b>PGT[A2, CCW2, 30.5] -5/32" Allen driver</b> : Remove screws (not captive), 5 turns each
--	--



## 13A.1 WORKAROUNDS CRIBSHEET (Cont)

### FLIGHT SPECIFIC – NOMINAL TASKS

#### EVA 1

##### **S5/S4**

<p>A. S5 launch lock will not release because primary bolt torques out</p>	<ol style="list-style-type: none"> <li>1. Check worksite for FOD</li> <li>2. Retrieve EVA Torque Wrench, install 7.8" x 5/8" socket on wrench</li> <li>3. Attempt to break torque (ccw) on launch lock</li> <li>4. Use PGT with RAD to continue driving bolt through running torque to nominal turn count</li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <p>Boeing has given the GO to use B7 from a truss hardware standpoint, but we are limited to a setting of B1 with the RAD</p>
<p>B. S5 launch lock will not release from S5 when PIP pin is pulled</p>	<ol style="list-style-type: none"> <li>1. Verify PGT turn count. Is primary bolt free of launch lock threads?</li> <li>2. If no joy, drive primary bolt additional turns, not to exceed 36</li> </ol>
<p>C. S5 launch lock PIP pin will not release</p>	<ol style="list-style-type: none"> <li>1. Check worksite for FOD or damage to PIP pin</li> <li>2. Increase removal force and try again</li> <li>3. Retrieve needle nose pliers or vice grips and re-attempt</li> </ol>
<p>D. S5-S4 Soft Capture not achieved at any of the 4 corners</p>	<ol style="list-style-type: none"> <li>1. SSRMS re-attempts per flight rules</li> <li>2. EVA perform SOFT CAPTURE MANUAL OVERRIDE from section 16</li> </ol>
<p>E. Primary bolt free spins and does not advance into S4 nut (PGT does not "see" torque) (possible broken self-feeding nut)</p>	<p>If bolt free spins, push S5 bolt axially toward S4 while driving PGT until bolt threads begin to engage S4 nut (under load)</p>
<p>F. For any of the following S5 Primary Bolt contingencies:</p> <ol style="list-style-type: none"> <li>a. Does not achieve full torque</li> <li>b. Bolt shoulder has a gap (is not seated against nut)</li> <li>c. Gap check at corner's 1 and 2 does not pass</li> </ol>	<p>EVA perform MRTAS PRIMARY BOLT CONTINGENCIES from section 16</p>
<p>G. S5 gap check tool (inboard) will not release from corner 1</p>	<ol style="list-style-type: none"> <li>1. Check worksite for FOD</li> <li>2. If bolt did not turn, increase PGT setting to B7, drive one turn only, then return to original PGT setting</li> <li>3. Retrieve gap check tool from outboard corner 1</li> </ol>
<p>H. S4 ground strap will not release from S4 launch position</p>	<ol style="list-style-type: none"> <li>1. Check worksite for FOD</li> <li>2. Increase PGT setting to B5</li> <li>3. If bolt did not turn, increase PGT setting to B7, drive one turn only, then return to B5</li> </ol>
<p>I. S4 ground strap cross threads during install onto S5 lug</p>	<p>Ensure EV crew begins installation manually, back-off thread engagement and re-attempt</p>
<p>J. S4 ground strap will not seat properly onto S5 lug (ground strap is not flush to surface or PGT stalls)</p>	<ol style="list-style-type: none"> <li>1. Check ground strap alignment</li> <li>2. Increase PGT torque setting to B4</li> </ol>
<p>K. S4 soft capture pin bolts will not release</p>	<ol style="list-style-type: none"> <li>1. Check worksite for FOD</li> <li>2. If bolt did not turn, increase PGT setting to B7, drive 1 turn only, then return to original PGT setting</li> </ol>

## 13A.1 WORKAROUNDS CRIBSHEET (Cont)

### PVRGF

A. PVRGF bolts (H13, H14, and H15) won't release	<ol style="list-style-type: none"> <li>1. Check worksite for FOD</li> <li>2. Increase PGT torque setting to B7, re-attempt</li> <li>3. If no joy: <ul style="list-style-type: none"> <li>• PGT – off</li> <li>• Ratchet ccw (MTL: 30.5)</li> <li>• Attempt to break torque</li> </ul> </li> </ol>
B. PVRGF bolt H16 won't release (RAD used at this corner)	<ol style="list-style-type: none"> <li>1. Check worksite for FOD</li> <li>2. Retrieve the following tools: <ul style="list-style-type: none"> <li>☐ EVA Torque Wrench, install 2-inch 7/16 socket on Wrench</li> </ul> </li> <li>3. Using Wrench, attempt to break torque (ccw) on launch lock</li> <li>4. Use PGT with RAD to continue driving bolt through running torque to nominal turn count</li> </ol>
C. PVRGF ground strap bolt won't release (corner H14)	<ol style="list-style-type: none"> <li>1. Check worksite for FOD</li> <li>2. Use PGT in ratchet mode: <ul style="list-style-type: none"> <li>• PGT – off</li> <li>• Ratchet ccw (MTL: 30.5)</li> <li>• Attempt to break torque</li> </ul> </li> </ol>
D. Corner H16 (zenith/port) on PVRGF is interfering with 3A BGA during removal	<p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">After bolt is released and washer removed</p> <ol style="list-style-type: none"> <li>1. Drive H16 bolt cw up to 17 turns with PGT setting of A5 toward structure to provide an additional 0.85" of clearance at that corner for removal; re-attempt PVRGF removal</li> <li>2. Remove PIP pin from PVRGF at H16 corner (lanyarded); re-attempt removal</li> </ol>
E. Can't rotate EV2 APFR (using two APFRs)	<ol style="list-style-type: none"> <li>1. EV1 BRT to HR 2144 (stbd face, nadir) for handoff</li> <li>2. EV2 hand off PVRGF, then ingress APFR at S5 WIF 13</li> <li>3. EV2 receive PVRGF, rotate 180 deg</li> <li>4. EV1 move zenith to install PIP pin</li> </ol>
F. Only one APFR for PVRGF relocate	<ol style="list-style-type: none"> <li>1. EV1 rotate EV2 with PVRGF in APFR</li> <li>2. EV1 BRT to HR 2136 for handoff</li> <li>3. EV2 stay zenith for PVRGF install</li> </ol>
G. PVRGF ground strap bolt will not install onto S5 Keel lug (cross thread problem)	<ol style="list-style-type: none"> <li>1. Check worksite for FOD</li> <li>2. Back off thread engagement and re-attempt installation manually</li> </ol>
H. PVRGF ground strap will not seat properly onto S5 keel lug (ground strap is not flush to surface or PGT stalls)	<ol style="list-style-type: none"> <li>1. Check worksite for FOD</li> <li>2. Release bolt at B7, re-align and attempt installation at nominal installation PGT setting</li> </ol>

### P6 PVR RETRACT

A. PVR manual retract bolt H32 won't turn	<ol style="list-style-type: none"> <li>1. For first 43 turns, increase PGT setting to B2 (16.0)</li> <li>2. Stop deploy/retract at 43 turns, and decrease PGT setting to B1 (12.0) for remaining turns. Stop on torque</li> <li>3. If bolt H32 won't turn at B1 setting above 43 turns, contact MCC</li> </ol>
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## 13A.1 WORKAROUNDS CRIBSHEET (Cont)

### EVA 2

#### FRAM

A. Primary FRAM bolt fails to release	<ol style="list-style-type: none"> <li>1. Increase PGT torque setting to <b>PGT[B2, CCW2, 30.5]</b> for one turn to break torque</li> <li>2. Contact MCC</li> </ol>
B. Primary FRAM bolt fails to engage	<ol style="list-style-type: none"> <li>1. Verify active FRAM fully seated on passive FRAM, check for FOD, back out primary FRAM bolt (A7, CCW2, 30.5) fully; re-attempt engagement (A7, CW2, 30.5)</li> <li>2. Engage contingency locking pins (4)               <ol style="list-style-type: none"> <li>a. FRAM FWD Cont Pins (SAPA): <b>PGT[A4, CW2, 30.5]</b> TBD turns (see equation) – can go to B2 for one turn if A4 no joy</li> <li>b. FRAM AFT Cont Pins (SAPA/CMG): <b>PGT[B1 CW2, 30.5]</b> (see equation)</li> </ol> </li> </ol> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><u>FWD CONT PINS:</u></p> <ul style="list-style-type: none"> <li>➤ Turns = 14.11 – (1.25 x Primary bolt turns)</li> </ul> <p><u>AFT CONT PINS (SAPA):</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> </ul> </div>

#### CMG REMOVAL FROM Z1

A. Unable to release fixed shim bolt	<ol style="list-style-type: none"> <li>1. Increase PGT torque setting to <b>PGT[A7(9.2 ft-lb), CCW1, 30.5]</b></li> </ol> <p style="text-align: center;"><u>NOTE</u> Bolt may shear, causing loose hardware, be aware of sharp edges</p> <ol style="list-style-type: none"> <li>2. Increase PGT torque setting to <b>PGT[B7(25.5 ft-lb), CCW1, 30.5]</b></li> </ol>
B. Unable to remove fixed shim	<ol style="list-style-type: none"> <li>1. Remove other shims first, reattempt</li> <li>2. Tether shim, continue with nominal plan, remove shim after CMG is removed</li> <li>3. Use bolt puller to pry shim out</li> </ol>
C. Unable to release CMG bolt	<ol style="list-style-type: none"> <li>1. Re-tighten all bolts and attempt stuck bolt first, continue nominal plan if successful</li> <li>2. Set PGT to manual ratchet, reattempt</li> <li>3. Check MCC, use ratchet wrench with cheater bar</li> </ol>
D. Unable to remove CMG from soft dock	<ol style="list-style-type: none"> <li>1. Verify all bolts, connectors released</li> <li>2. Push CMG away from jam, attempt to remove using tipping method</li> <li>3. Contact MCC. Use bolt puller and pry CMG out</li> </ol>

## 13A.1 WORKAROUNDS CRIBSHEET (Cont)

### CMG REMOVAL/INSTALL AT FSE

A. Unable to release fixed shim bolt	<ol style="list-style-type: none"> <li>Increase PGT torque setting to <b>PGT[A7(9.2 ft-lb), CCW1, 30.5]</b></li> </ol> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">Bolt may shear, causing loose hardware, be aware of sharp edges</p> <ol style="list-style-type: none"> <li>Increase PGT torque setting to <b>PGT[B7(25.5 ft-lb), CCW1, 30.5]</b></li> </ol>
B. Unable to remove fixed shim	<ol style="list-style-type: none"> <li>Remove other shims first, reattempt</li> <li>Tether shim, continue with nominal plan, remove shim after CMG is removed</li> </ol>
C. Unable to release CMG bolt	<ol style="list-style-type: none"> <li>Re-tighten all bolts and attempt stuck bolt first, continue nominal plan if successful</li> <li>Contact MCC</li> </ol>
D. Unable to remove CMG	<ol style="list-style-type: none"> <li>Verify all bolts released, MLI clear</li> <li>Push CMG away from jam, attempt to remove using tipping method</li> <li>Contact MCC. Use bolt puller and pry out CMG</li> </ol>
E. Unable to drive CMG bolt	<ol style="list-style-type: none"> <li>Verify alignment, release other torqued down bolts, reattempt bolt first</li> <li>Remove CMG and verify no obstruction, reinstall</li> <li>Contact MCC if 5 of 6 bolts complete and continue</li> </ol>
F. Unable to drive adjustable shim bolt	<ol style="list-style-type: none"> <li>Increase torque setting to <b>PGT[B7 (25.5 ft-lb), CCW1, 30.5]</b> ½ turn only, return to nominal setting</li> <li>Contact MCC</li> </ol>

### CMG INSTALLATION AT Z1

A. Unable to drive CMG bolt	<ol style="list-style-type: none"> <li>Verify alignment, release other bolts, reattempt bolt first</li> <li>Remove CMG and verify no obstruction, reinstall</li> <li>Contact MCC if 4 of 6 bolts complete and continue</li> </ol>
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### Z1 THERMAL SHROUD INSTALLATION

A. Unable to reattach shroud	Notify MCC of condition and continue
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## 13A.1 WORKAROUNDS CRIBSHEET (Cont)

### EVA 3

#### **P1 BSP/XPDR INSTALL**

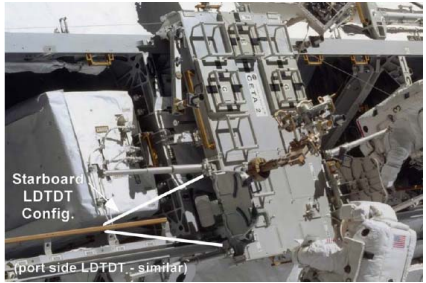
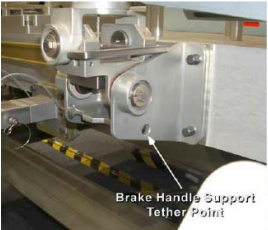

A. Dummy box side or center bolts will not release	<ol style="list-style-type: none"> <li>1. Increase torque on <b>PGT[B7 25.5 ft-lb, CCW2 30 RPM, 30.5]</b> for one turn to break torque</li> <li>2. Continue with nominal PGT for removal</li> </ol>
B. Center jack bolt or outer bolt fails to engage/install	<ol style="list-style-type: none"> <li>1. Remove box, inspect rail and bolt interface for debris. Check box co-therm layer for damage</li> <li>2. Attempt to reinstall</li> <li>3. <b>PGT[A7 9.2 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16:</b> Re-attempt fasteners</li> <li>4. Incrementally (one PGT setting at a time) increase torque up to B2 (16.0 ft-lb)</li> </ol>
C. High running torque on Center jack bolt or outer bolts	Incrementally (one PGT setting at a time) increase torque up to B2 (16.0 ft-lb)

#### **P6 SASA RELOCATE**

A. Stanchion bolt does not release	<ol style="list-style-type: none"> <li>1. Use manual <b>PGT[RCCW, MTL 30.5]</b>, drive bolt 1 turn, return to nominal settings</li> <li>2. If no joy, retrieve manual ratchet, re-attempt ccw rotation</li> </ol>
B. PGT socket comes off stanchion bolt	<ol style="list-style-type: none"> <li>1. Attempt to reengage bolt</li> <li>2. Remove socket from PGT; engage socket on stanchion bolt then put back on PGT</li> </ol>
C. SASA stanchion bolt does not engage truss at least 7 turns	<p style="text-align: center;"><u>NOTE</u></p> <p>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</p> <ol style="list-style-type: none"> <li>1. Release stanchion bolt, verify alignment and reattempt</li> <li>2. Increase torque <b>PGT[B7 (25.5ft-lb), CW2, 30.5]</b>, re-attempt install</li> </ol>
D. Stanchion soft dock spring plungers seize or fail to depress (unable to soft dock stanchion)	<p style="text-align: center;"><u>NOTE</u></p> <p>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</p> <ol style="list-style-type: none"> <li>1. Attempt soft-dock installation slightly tilted (~30 deg) and apply downward pressure as stanchion is rotated toward vertical</li> <li>2. Drive bolt until it drops from launch position and reaches truss threads (~10 turns). Ensure proper alignment and start of thread engagement</li> <li>3. Continue driving bolt down until fully installed</li> <li>4. Use EVA probe tool to depress plungers</li> </ol>

## 13A.1 WORKAROUNDS CRIBSHEET (Cont)

### CETA CART

A. Wheel bogie fails to release from truss	Perform CETA Cart Wheel Bogie R&R procedure from section 16; there is no spare bogie on orbit, so remove the failed one from the cart, relocate the cart onto the truss, and then re-install the same wheel bogie
B. Wheel bogie fails to install onto truss	There are no spares on-orbit; it is acceptable to perform the following actions with an unsecured or missing wheel bogie: <ul style="list-style-type: none"> <li><input type="checkbox"/> Manual EVA translation of CETA cart</li> <li><input type="checkbox"/> CETA cart coupling to MT</li> <li><input type="checkbox"/> MT translation with CETA cart coupled to MT</li> </ul>
C. Parking brake fails to engage/disengage	<ol style="list-style-type: none"> <li>1. Retry using other side</li> <li>2. Contact MCC</li> </ol>
D. Dynamic brake fails to engage	<ol style="list-style-type: none"> <li>1. Limit translation rates for manual stopping or use parking brake as dynamic brake</li> <li>2. Try other side</li> </ol>
<p>E. CETA active coupler fails to capture and lock (CETA cart safing)</p>   	<ol style="list-style-type: none"> <li>1. Translate CETA cart to TBD location on truss (not over truss segment joint)</li> <li>2. Pull parking brake (left handle)</li> <li>3. Retrieve two long duration tie-down tethers (LDTDT) from P6 Aux bag (fwd face of P6)</li> <li>4. Route one LDTDT on stbd side of CETA cart per the following details: <ul style="list-style-type: none"> <li><input type="checkbox"/> Attach one hook to zenith brake handle support tether point</li> <li><input type="checkbox"/> Loop tether strap around CETA rail HR standoff and back toward nadir brake handle support tether point</li> <li><input type="checkbox"/> Attach second hook to nadir brake handle support tether point</li> <li><input type="checkbox"/> Lightly cinch straps, snap buckle over</li> <li><input type="checkbox"/> Close MLI flap over buckle and any excess strap length</li> </ul> </li> <li>5. Repeat sequence for port side of CETA cart</li> </ol>
F. Coupler knob fails to lock	The CETA cart coupler cannot be left in the CAPTURE position and allowed to translate with the MT. In the event the coupler fails to LOCK: Perform steps 1 through 5 in section E above
G. Coupler knob fails to unlock	Remove coupler: remove wire ties (2) and PIP pins to release active coupler or single EVA bolt to release passive coupler
H. Swing arm fails to rotate	Do not force swing arm into position; use alternate swing arm/WIF
I. Swing arm fails to lock	Wire tie in stowed position

### P6 XPDR REMOVE

A. Center jack bolt or outer bolt fails to release	<ol style="list-style-type: none"> <li>1. Increase torque on <b>PGT[B7 25.5 ft-lb, CCW2 30 RPM, 30.5]</b> for one turn to break torque</li> <li>2. Continue with nominal PGT for removal</li> </ol>
B. High running torque on Center jack bolt or outer bolts	Incrementally (one PGT setting at a time) increase torque up to B2 (16.0 ft-lb)
C. Dummy box side or center bolts will not engage/install	<ol style="list-style-type: none"> <li>1. Increase torque on <b>PGT[B1 (12.0 ft-lb), CW2 30 RPM, 30.5]</b></li> <li>2. Increase torque up to B2 (16.0 ft-lb), must be incremental increase</li> </ol>

## 13A.1 WORKAROUNDS CRIBSHEET (Cont)

### MISSE 3 AND 4 RETRIEVAL

A. Unable to release PEC from MISSE clamp	Remove clamp from HR, report to MCC, continue as planned
B. Damage (MMOD) noted to MISSE internal battery locations	Leave MISSE in place, contact MCC

### Z1 SASA GIMBAL BOLTS

A. Initial torque higher than nominal	<p>Perform final torquing per table based on required initial torque:</p> <table border="1"> <thead> <tr> <th>PGT Initial Torque</th> <th>PGT Final Torque</th> </tr> </thead> <tbody> <tr> <td>8.3 (A6)</td> <td>22.0 (B5)</td> </tr> <tr> <td>9.2 (A7)</td> <td>24.0 (B6)</td> </tr> <tr> <td>12 (B1)</td> <td>25.5 (B7)</td> </tr> <tr> <td>16 (B2)</td> <td>25.5 (B7)</td> </tr> </tbody> </table>	PGT Initial Torque	PGT Final Torque	8.3 (A6)	22.0 (B5)	9.2 (A7)	24.0 (B6)	12 (B1)	25.5 (B7)	16 (B2)	25.5 (B7)
PGT Initial Torque	PGT Final Torque										
8.3 (A6)	22.0 (B5)										
9.2 (A7)	24.0 (B6)										
12 (B1)	25.5 (B7)										
16 (B2)	25.5 (B7)										

## EVA 4

### OBSS OSE INSTALL

A. Clamp Bolt fails to engage	Increase torque <b>PGT[B7 (25.5 ft-lb), CW2 (30 RPM), 30.5]</b>
B. Drive Bolts (#2 or 3) fails to engage	Increase torque <b>PGT[A6 (8.3 ft -lb), CW2 (30 RPM), 30.5]</b>

### WETA INSTALL

A. Stanchion launch restraint bolt does not release from FSE	<ol style="list-style-type: none"> <li>1. Apply higher torque: Manual PGT [RCCW ,30.5]</li> <li>2. On MCC GO: go to next stanchion (if available)</li> </ol>
B. Stanchion Dummy Box center or outer bolt does not release	<ol style="list-style-type: none"> <li>1. Increase torque on <b>PGT[B7 25.5 ft-lb, CCW2 30 RPM, 30.5]</b> for one turn to break torque</li> <li>2. Continue with nominal PGT for removal</li> </ol>
C. WETA center jacking bolt does not engage	<ol style="list-style-type: none"> <li>1. Remove WETA, inspect rail and bolt interface for damage, attempt reinstallation, ensure outer bolts are retracted</li> <li>2. If no joy, increase torque <b>PGT[B1 (12.0), CW2, 30.5]</b></li> <li>3. Contact MCC</li> </ol> <p><u>NOTE:</u> minimum of 24.4 turns for adequate electrical connection</p>
D. WETA outer bolt does not engage	<ol style="list-style-type: none"> <li>1a. Engage alternate bolt, then attempt driving failed bolt</li> <li>1b. If no joy, increase torque <b>PGT[B1 (12.0), CW2, 30.5]</b></li> <li>1c. Contact MCC</li> </ol>

### 13A.1 WORKAROUNDS CRIBSHEET (Cont)

<p>E. Stanchion bolt does not fully engage truss at least 7 turns</p>	<p style="text-align: center;"><b>NOTE</b></p> <p>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</p> <ol style="list-style-type: none"> <li>1. Release stanchion bolt, verify alignment and reattempt</li> <li>2. Increase torque: <b>PGT[B7 (25.5), CW2, 30.5]</b></li> </ol>
<p>F. PGT socket comes off stanchion bolt</p>	<ol style="list-style-type: none"> <li>1. Attempt to reengage bolt</li> <li>2. Remove socket from PGT; engage socket on stanchion bolt then put back on PGT</li> </ol>
<p>G. Stanchion soft dock spring plungers seize or fail to depress (unable to soft dock stanchion)</p>	<p style="text-align: center;"><b>NOTE</b></p> <p>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</p> <ol style="list-style-type: none"> <li>1. Attempt soft-dock installation slightly tilted (~30 deg) and apply downward pressure as stanchion is rotated toward vertical</li> <li>2. Drive bolt until it drops from launch position and reaches truss threads (~10 turns). Ensure proper alignment and start of thread engagement</li> <li>3. Continue driving bolt down until fully installed</li> <li>4. Use EVA probe tool to depress plungers</li> </ol>

#### GPS ANTENNA #4 REMOVE

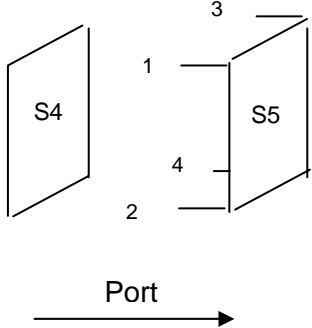
<p>A. Unable to remove bolt</p>	<ol style="list-style-type: none"> <li>1. Increase torque: <b>PGT[RCW, 30.5]</b>. Break torque and return to PGT ops</li> <li>2. Retrieve ratchet and cheater bar from Z1 toolbox. Break torque and return to PGT ops</li> </ol>
<p>B. Unable to release from soft dock</p>	<ol style="list-style-type: none"> <li>1. Rotate antenna cw (approximately 25 deg) pull on antenna bolt flanges</li> <li>2. Retrieve bolt puller from A/L toolbox. With antenna rotated cw (approximately 25 deg), position bolt puller close to soft dock pin to pry antenna out</li> </ol>

#### NODE HR #120 REMOVE

<p>A. Unable to remove bolt</p>	<ol style="list-style-type: none"> <li>1. Increase torque: <b>PGT [B2 (16.0 ft-lb), CCW2, 30.5]</b> for one turn to break torque. Then return to nominal PGT ops</li> </ol>
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## S5 SOFT CAPTURE MANUAL OVERRIDE

IV/SSRMS	EV1 (FF)	EV2 (FF)
<p>1. ROBO: √SSRMS in limp mode</p> <p><u>ISS Fwd View</u></p>  <p><u>APFR INFO</u>            For corner 4 (S4 WIF 20):            √Settings: [6,WW,A,10]            For corner 2 (S4 WIF 19), relocate APFR from WIF 20 to WIF19:            reconfigure to: [6,PP,K,11]            For corner 3 (S4 WIF 17),            √Settings: [5,RR,J,12]            For corner 1 (S4 WIF 18), relocate APFR from WIF 17 to WIF 18;            reconfigure to: [8,OO,D,12]</p>	<p style="text-align: center;">← <input type="checkbox"/></p> <p style="text-align: center;"><u>NOTE</u>            Depending on which corner fails soft capture, one crewmember will be prime for APFR ops, and the other will assist with PRD routing as necessary</p> <ol style="list-style-type: none"> <li>1. If necessary, temp stow tools</li> <li>2. Translate to failed corner</li> <li>3. Install APFR, configure settings per <u>APFR INFO</u> in IV column</li> <li>4. Ingress APFR</li> <li>5. Using S5 HRs, manually attempt to pull S5 into soft capture; √S4 soft capture pin has engaged S5 coarse alignment cone</li> </ol> <ol style="list-style-type: none"> <li>6. Pull out ~ 6 inches of excess strap (~ length of PRD) and ratchet strap a minimum of 14 strokes to ensure strap won't slip under tension</li> <li>7. Ratchet PRD to achieve proper preload</li> <li>8. √S4 soft capture pin has engaged S5 coarse alignment cone</li> <li>9. Egress APFR</li> </ol>	<ol style="list-style-type: none"> <li>1. If no joy with soft capture pin set, translate to A/L Toolbox 1 (stbd), retrieve PRD from slot 7</li> <li>2. Translate to failed corner at S5</li> <li>3. Route PRD between S5 and S4               <ul style="list-style-type: none"> <li>❑ Hold PRD housing flush against structure adjacent to S5 HR</li> <li>❑ Route retractable strap around S5 trunnion strut and back around S4 soft capture assy housing</li> <li>❑ Hook straps together and remove excess slack</li> <li>❑ Ensure strap is flush to structure and not twisted</li> <li>❑ Ensure strap is not routed over HRs</li> </ul> </li> <li>4. Remove PRD</li> </ol>

## S5 SOFT CAPTURE MANUAL OVERRIDE TASK DATA SHEET

Tools: Backup tool shown in ( )

EV1	EV2
PRD	
APFR	

### Foot Restraints

Task	WIF	APFR Setting
Corner 1 PRD routing	S4 WIF 18	[8,OO,D,12]
Corner 2 PRD routing	S4 WIF 19	[6,PP,K,11]
Corner 3 PRD routing	S4 WIF 17	[5,RR,J,12]
Corner 4 PRD routing	S4 WIF 20	[6,WW,A,10]

EVA Fasteners: NA

### Notes:

1. Depending on which corner fails soft capture, one crewmember will be prime for APFR ops, and the other will assist with PRD routing as necessary

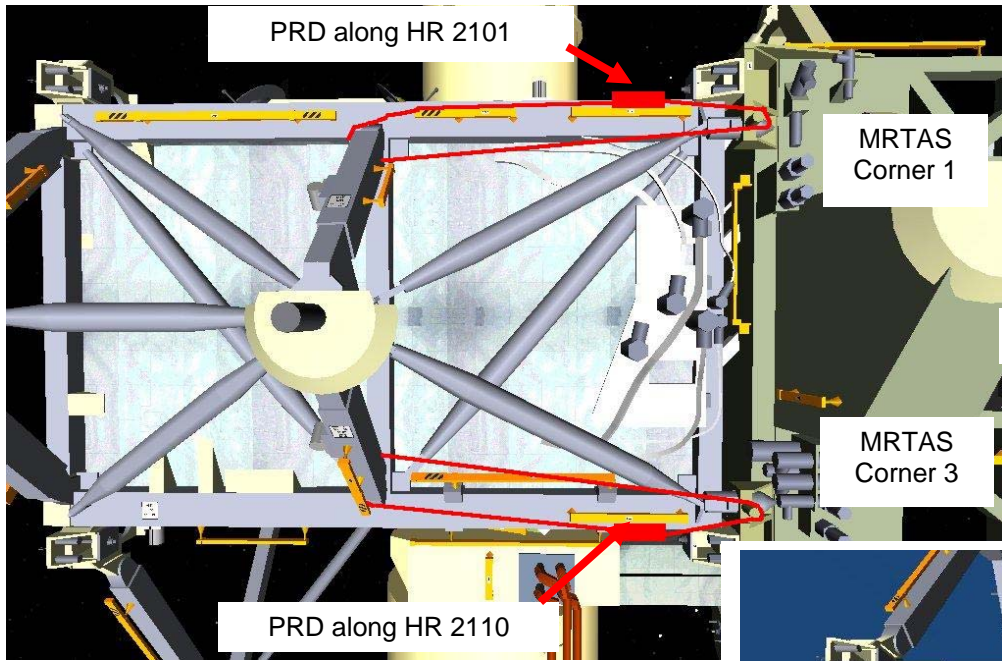
### Cautions:

1. S5 can be translated on with any 2 diagonal corners in soft capture

### Warnings:

1. NA

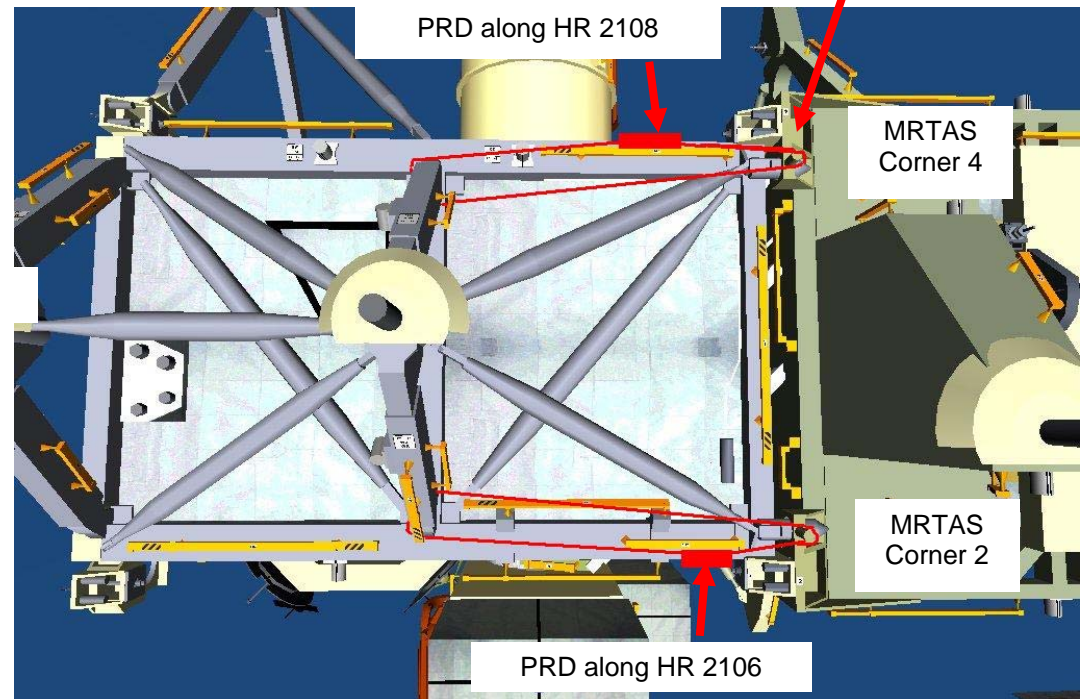
# S5 SOFT CAPTURE MANUAL OVERRIDE TASK DATA SHEET (Cont)



Nadir S5 – during install

FWD

PRD strap routed around soft capture pin fixture on S4 on all corners



Zenith S5 – during install

## MRTAS PRIMARY BOLT CONTINGENCIES

IV	EV1/EV2 (FF)
<p>A. Record Torque: _____</p> <p><u>PRD ROUTING</u></p> <ol style="list-style-type: none"> <li>1. Route PRD between S5 and S4           <ul style="list-style-type: none"> <li><input type="checkbox"/> Hold PRD housing flush against structure adjacent to S5 HR</li> <li><input type="checkbox"/> Route retractable strap around S5 trunnion strut and back around S4 soft capture assy housing</li> <li><input type="checkbox"/> Hook straps together and remove excess slack</li> <li><input type="checkbox"/> Ensure strap is flush to structure and not twisted</li> <li><input type="checkbox"/> Ensure strap is not routed over HRs</li> </ul> </li> <li>2. Ingress APFR if reqd</li> <li>3. Pull out ~ 6 inches of excess strap (~ length of PRD) and ratchet strap a minimum of 14 strokes to ensure strap won't slip under tension</li> <li>4. Ratchet PRD to achieve proper preload</li> </ol> <p>B. Record torque: _____</p>	<p>Failure of a primary bolt is defined as not meeting any 1 of the following 3 criteria:            Full torque achieved            Bolt shoulder has no gap            Equipment hook gap check is good (applies to corners 1 and 2 only)</p> <ol style="list-style-type: none"> <li>1. <b>PGT [B1, CCW2, 30.5]-RAD-7.8"-Ext-5/8:</b> Loosen primary bolt same # of turns that bolt was driven (allowable torque for RAD)           <ul style="list-style-type: none"> <li>➤ If bolt galling has occurred, and primary bolt will not loosen, go to step 3b</li> </ul> </li> <li>2. <b>PGT [B1, CW2, 30.5]- RAD-7.8"-Ext-5/8:</b> Drive primary bolt 54 turns (PGT), 27 turns (bolt)           <ul style="list-style-type: none"> <li>← <input type="checkbox"/></li> </ul> </li> <li>3. Check cases a-d to determine next steps:           <ol style="list-style-type: none"> <li>a. If all primary bolt criteria passes, proceed to next MRTAS corner</li> <li>b. If bolt galling has occurred and the primary bolt cannot be used, go to MRTAS CONTINGENCY BOLT INSTALL procedure</li> <li>c. If gap check fails, retrieve gap check tool from corner 1:  <b>PGT [A6, CCW2, 30.5]-6"-Ext-7/16:</b> Release gap check tool bolts (2), 12-14 turns               <ul style="list-style-type: none"> <li>➤ Perform gap check. Report to MCC gap check tool depth</li> <li>➤ If gap check passes and remaining criteria passes, proceed to next MRTAS corner</li> <li>➤ If gap check fails, go to step 4</li> </ul> </li> <li>d. If any other primary bolt criteria fails, go to step 4</li> </ol> </li> <li>4. Retrieve PRD from A/L Toolbox 1 (stbd) slot 7; install PRD and apply preload – reference IV column, <u>PRD ROUTING</u></li> <li>5. Verify gap:           <ol style="list-style-type: none"> <li>a. If gap check passes, go to step 6</li> <li>b. If gap check fails, report to MCC gap check tool depth               <ul style="list-style-type: none"> <li>➤ If MCC is satisfied with gap check, go to step 6</li> <li>➤ If gap check fails again, verify PRD routing and re-apply preload                   <ul style="list-style-type: none"> <li>❖ If gap check passes, go to step 6</li> <li>❖ If gap check fails again, contact MCC</li> </ul> </li> </ul> </li> </ol> </li> <li>6. <b>PGT [B1, CCW2, 30.5]-RAD-7.8"-Ext-5/8:</b> Loosen primary bolt same # of turns that bolt was driven</li> <li>7. <b>PGT [B1, CW2, 30.5]- RAD-7.8"-Ext-5/8:</b> Drive primary bolt 54 turns (PGT), 27 turns (bolt)           <ul style="list-style-type: none"> <li>← <input type="checkbox"/></li> <li>➤ If all criteria are met, proceed to next RTAS corner</li> <li>➤ If any criteria fail, go to MRTAS CONTINGENCY BOLT INSTALL procedure</li> </ul> </li> </ol>

## MRTAS PRIMARY BOLT CONTINGENCIES TASK DATA SHEET

### Tools:

EV1	EV2
PGT	PGT
RAD	RAD
7.8-in ext x 5/8	7.8-in ext x 5/8
Torque Wrench	Torque Wrench

### Foot Restraints:

Task	WIF	APFR Setting
Bolt 1 PRD routing	P4 WIF 18	[8,OO,D,12]
Bolt 2 PRD routing	P4 WIF 19	[6,PP,K,11]
Bolt 3 PRD routing	P4 WIF 17	[5,RR,J,12]
Bolt 4 PRD routing	P4 WIF 20	[6,WW,A,10]

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
RTAS Primary Fastener	1,2,3,4	5/8"	4	12.0 (w/RAD)	105.3	27 (bolt)	30
Gap check tool bolts	none	7/16"	2	8.3	12.2	12-14	30

### Notes:

- Primary bolt engagement criteria is the following:
  - Full torque achieved
  - Bolt shoulder has no gap
  - Equipment hook gap check is good. If gap check using equip hook fails, retrieve gap check tool from corner 1 to perform more accurate gap check

### Cautions:

- Primary bolts must be fastened in the following order; Bolt 1 (fwd/zenith), Bolt 2 (fwd/nadir), Bolts 3 (aft/zenith) and 4 (aft/nadir) can be fastened in any order AFTER bolts 1 and 2. This also applies in the event of any primary bolt contingencies. Each corner must be secured in the required order regardless of whether a primary bolt or contingency bolt is used
- Hardware sensitive to crew loads. Do not apply a push force on primary bolt. Damage to self-feeding nut may result

### Warnings:

- N/A

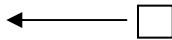
### Other:

- If primary bolt fails at corner 3 or 4 (whichever is driven first), attempt primary bolt at next corner (3 or 4) prior to installing contingency bolt at failed corner. If the second bolt drives successfully, the contingency bolt may be installed at the failed corner without installing a PRD

# MRTAS CONTINGENCY BOLT INSTALL

IV	EV1/EV2 (FF)
<p><u>APFR INFO</u>            For corner 4 (S4 WIF 20):            √Settings: [6,WW,A,10]            For corner 2 (S4 WIF 19), relocate APFR from WIF 20 to WIF19:            reconfigure to: [6,PP,K,11]            For corner 3 (S4 WIF 17),            √Settings: [5,RR,J,12]            For corner 1 (S4 WIF 18), relocate APFR from WIF 17 to WIF 18;            reconfigure to: [8,OO,D,12]</p> <p>1. Record which contingency sleeve used: _____</p> <p><u>PRD ROUTING</u></p> <p>1. Route PRD between S5 and S4</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Hold PRD housing flush against structure adjacent to S5 HR</li> <li><input type="checkbox"/> Route retractable strap around S5 trunnion strut and back around S4 soft capture assy housing</li> <li><input type="checkbox"/> Hook straps together and remove excess slack</li> <li><input type="checkbox"/> Ensure strap is flush to structure and not twisted</li> <li><input type="checkbox"/> Ensure strap is not routed over HRs</li> </ul> <p>2. Ingress APFR if reqd</p>	<p style="text-align: center;"><u>NOTE</u>            If a primary bolt contingency required the use of a PRD at the failed corner, steps 1 through 3 are not required for the contingency bolt procedure</p> <p>1. If reqd, install APFR for PRD ops at failed corner, configure settings per <u>APFR INFO</u> in IV column</p> <p>2. Retrieve PRD from A/L Toolbox 1 (stbd) slot 7; install PRD and apply preload – reference IV column, <u>PRD ROUTING</u></p> <p style="text-align: center;"><u>NOTE</u>            Gap Check Criteria:</p> <ul style="list-style-type: none"> <li>• For equip tether hook, tip of hook should not pass through or penetrate gap between RTAS housings</li> <li>• For gap check tool, tip of tool should not penetrate gap between RTAS housings past second line</li> </ul> <p>3. Perform gap check using equip tether hook</p> <p>4. Verify contingency nuts centered and aligned within anti-rotation slots            ➤ If not centered, adjust by jiggling w/gloved hand</p> <p>5. <b>PGT [B2, CCW1, 30.5]-6"-Ext-7/16:</b> Loosen spacer locking device bolt, ~ 1 turn</p> <p>6. Tighten spacer sleeve by hand until snug, ~ 10 turns (cw)</p> <p style="text-align: center;">← <input type="checkbox"/></p> <p>7. Verify sleeve aligned w/in nut by attempting to jiggle back side of nut            ➤ If spacer does not seat in nut, back out and re-attempt</p> <p>8. <b>PGT [A6, CCW2, 30.5]-6"-Ext-7/16:</b> Release gap check tool bolts (2) from corner 1, 12-14 turns (possibly done)</p> <p>9. Install gap check tool around contingency spacer sleeve (friction fit)</p> <p style="text-align: center;"><u>NOTE</u>            Contingency Bolt Engagement Criteria:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Full torque achieved</li> <li><input type="checkbox"/> Minimum turn count (after bolt drops out of launch threads)</li> <li><input type="checkbox"/> Gap check is good</li> </ul> <p>10. <b>PGT [B1, CW2, 30.5]-6"-Ext-7/16:</b></p> <ul style="list-style-type: none"> <li>➤ Drive contingency bolt 7-9 turns to clear launch threads</li> <li>➤ Push bolt ~ .5-in to contact nut (no turns reqd)</li> <li>➤ Drive contingency bolt 9-11 turns to fully engage nut</li> </ul>

## MRTAS CONTINGENCY BOLT INSTALL (Cont)

IV	EV1/EV2 (FF)
<p>3. Pull out ~ 6 inches of excess strap (~ length of PRD) and ratchet strap a minimum of 14 strokes to ensure strap won't slip under Tension</p> <p>4. Ratchet PRD to achieve proper preload</p> <p>5. Record torque and turns: Torque: _____ Turns: _____</p>	<div style="text-align: center;">  </div> <p>11. Perform gap check using equip tether hook</p> <p>12. Check cases A and B to determine next steps:</p> <ol style="list-style-type: none"> <li>If all contingency bolt criteria pass, go to step 13</li> <li>If any contingency bolt criteria fail, go to next contingency bolt, and pick up at step 6</li> </ol> <p>13. <b>PGT [A5, CCW2, 30.5]-6"-Ext-7/16:</b> Release nut locking plate bolt, 12-14 turns</p> <p>14. Remove nut locking plate (lanyarded), wire tie to adjacent structure</p> <p>15. Remove gap check tool from spacer sleeve, attach to MWS</p> <p>16. <b>PGT [B2, CW1, 30.5]-6"-Ext-7/16:</b> Tighten contingency spacer locking device bolt, ~ 1 turn (do not exceed 1 turn)</p> <p>17. Remove PRD, temp stow</p> <p style="text-align: center;"><u>NOTE</u> After all 4 RTAS corners have initial torque, perform final torquing on contingency bolt</p> <p>18. Configure torque wrench w/7.8-Ext-5/8: set to 52 ft-lb; tighten contingency bolt until torque wrench trips (~1/4 turn)</p>

## MRTAS CONTINGENCY BOLT INSTALL TASK DATA SHEET

### Tools: Backup tool shown in ( )

EV1	EV2
PGT	PGT
RAD	RAD
7.8-in ext x 5/8	7.8-in ext x 5/8
Torque Wrench	Torque Wrench

### Foot Restraints:

Task	WIF	APFR Setting
Bolt 1 PRD routing	P4 WIF 18	[8,OO,D,12]
Bolt 2 PRD routing	P4 WIF 19	[6,PP,K,11]
Bolt 3 PRD routing	P4 WIF 17	[5,RR,J,12]
Bolt 4 PRD routing	P4 WIF 20	[6,WW,A,10]

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
RTAS Cont Bolts	1,2,3,4	5/8"	4	Install: 52.0		7-9 (launch threads) 9-11 (P4 nut)	30
Cont Spacer Sleeve Locking Device Bolt	none	7/16"	1	Release: 16.0  Install: 16.0	31.1	.5-1	30
Gap check tool bolts	none	7/16"	2	Release: 8.3	12.2	12-14	30
Cont Nut Locking Plate Bolts	none	7/16"	2	Release: 7.0	12.2	12-14	30

### Notes:

- Contingency bolt engagement criteria is the following:
  - Full torque achieved
  - Minimum turn count (after bolt drops out of launch threads)
  - Equipment hook gap check is good (this applies to corner's 1 and 2 only). If gap check using equip hook fails, retrieve gap check tool from corner 1 to perform more accurate gap check

### Cautions:

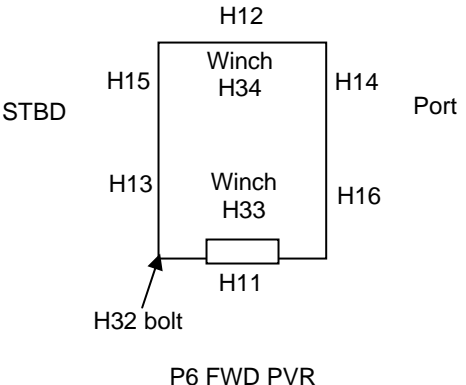
- Primary bolts must be fastened in the following order; Bolt 1 (fwd/zenith), Bolt 2 (fwd/nadir), Bolts 3 (aft/zenith) and 4 (aft/nadir) can be fastened in any order AFTER bolts 1 and 2. This also applies in the event of any primary bolt contingencies. Each corner must be secured in the required order regardless of whether a primary bolt or contingency bolt is used
- Hardware sensitive to crew loads. Do not apply a push force on primary bolt. Damage to self-feeding nut may result

### Warnings:

- N/A



## MANUAL OVERRIDE TO RETRACT/WINCH RADIATOR

IV/RMS	EV1	EV2
<p>MCC-H 1. Verify PVR motor OFF</p> <p>2. Configure ISS attitude control to CMG Control with thrusters disabled</p>  <p>P6 FWD PVR</p>	<p><u>MANUAL OVERRIDE TO RETRACT RADIATOR</u></p> <ol style="list-style-type: none"> <li><b>PGT[B1 (12 ft-lb), CW2 (30RPM), MTL 15.5] -6 ext 7/16:</b> On IV GO, push to engage (5 lb) and turn PVR MDA fastener H32 to PGT stall (if no motion 45-50 turns)</li> <li>If required to re-engage H32 locking collar, PGT manual ratchet cw up to 1/6 of a turn until collar pops up completely and re-engages</li> <li>Report to IV, radiator retract complete</li> <li>Remove winch bar PIP pin (H34)</li> <li>Together compress radiator panels, align winch bar clevis to lug on radiator, try to re-install winch H34 PIP pin</li> <li>If no joy, continue winch operations</li> </ol> <p><u>WINCH OPERATIONS</u></p> <p>REMOVE FQDC SHROUD</p> <ol style="list-style-type: none"> <li>Stage RET for FQDC shroud restraint</li> <li>Release FQDC Shroud bolts (4); <b>PGT[A7 (9.2 ft-lb), CCW2 30 RPM, MTL 30.5] 6-in ext, 7 turns</b></li> <li>Restrain FQDC shroud w/RET</li> </ol> <p>EXTEND WINCH</p> <ol style="list-style-type: none"> <li><b>PGT[A1 (2.5 ft-lb), CW1 (10 RPM), MTL 30.5] 6-in ext:</b> actuate H10 bolt; push 5 lb; extend winch bars until winch bar clevis aligns with radiator lug (20 turns max)</li> <li>Give EV2 GO for winch install; align winch bar clevis to lug on radiator; re-install H34 PIP pin</li> </ol> <p>RETRACT WINCH</p> <ol style="list-style-type: none"> <li><b>PGT[A1 (2.5 ft-lb), CCW1 (10 RPM), MTL 30.5] 6-in ext;</b> actuate H10 bolt; push 5 lb; fully retract winch bars (approx 25 turns max)</li> </ol>	<ol style="list-style-type: none"> <li>Remove winch bar PIP pin (H33)</li> <li>Together compress radiator panels, align winch bar clevis to lug on radiator, try to re-install winch H33 PIP pin</li> <li>If no joy, continue winch operations</li> </ol> <p><u>WINCH OPERATIONS</u></p> <ol style="list-style-type: none"> <li>On EV1 GO for winch install, align winch bar clevis to lug on radiator; re-install H33 PIP pin</li> </ol>

## MANUAL OVERRIDE TO RETRACT/WINCH RADIATOR (Cont)

IV/RMS	EV1	EV2
	<p><u>INSTALL FQDC SHROUD</u></p> <ol style="list-style-type: none"><li>7. Retrieve FQDC Shroud</li><li>8. <b>PGT[A7 (9.2 ft-lb), CW2 (30 RPM), MTL 30.5]</b> <b>6-in ext:</b> attach FQDC shroud bolt (4); ~7 turns to hardstop</li><li>9. Retrieve RET</li></ol>	

# MANUAL OVERRIDE TO RETRACT/WINCH RADIATOR TASK DATA SHEET

## Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	NA	0:30
Two EV Crew	NA	NA

## Tools:

EV1	EV2
PGT	PGT
6 Ext 7/16	6 Ext 7/16
APFR	
Adj equip tether	

## EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
PVR MDA	H32	7/16	1	12.0	12.0	25.5	45-50	30
FQDC Shroud bolts	H5, H6, H8, H9	7/16	4	9.2	9.0	21.2 (R) 18.1 (I)	7	30
Winch bolt	H10	7/16	1	2.5	2.5	6.4	3	30

## EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
NA					

Mass: NA

## Notes:

1. Radiator is 48" tall after retraction

## Cautions:

1. Equipment damage. Avoid contact with radiator inter-panel flexhoses
2. Winch mechanism extension may fail due to excess slack if extended beyond 25 turns from a fully retracted state
3. Avoid putting high loads on winch bolt; retaining mechanism for locking device may fail. Still usable if failure occurs, no locking capability

## Warnings:

1. Moving equipment. Avoid contact with panels and mechanisms during extension of radiator

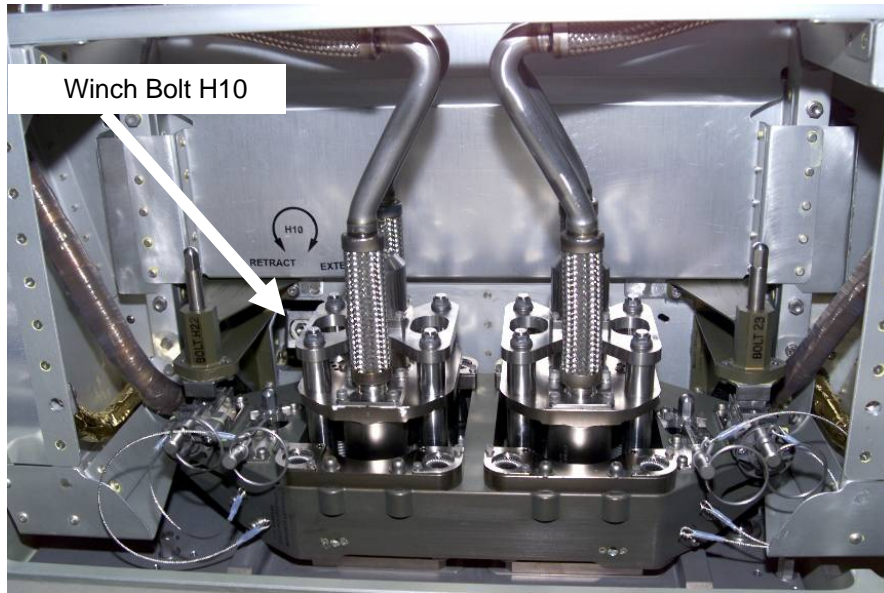


PV Radiator – MDA H32 Fastener Located Near Ground Strap

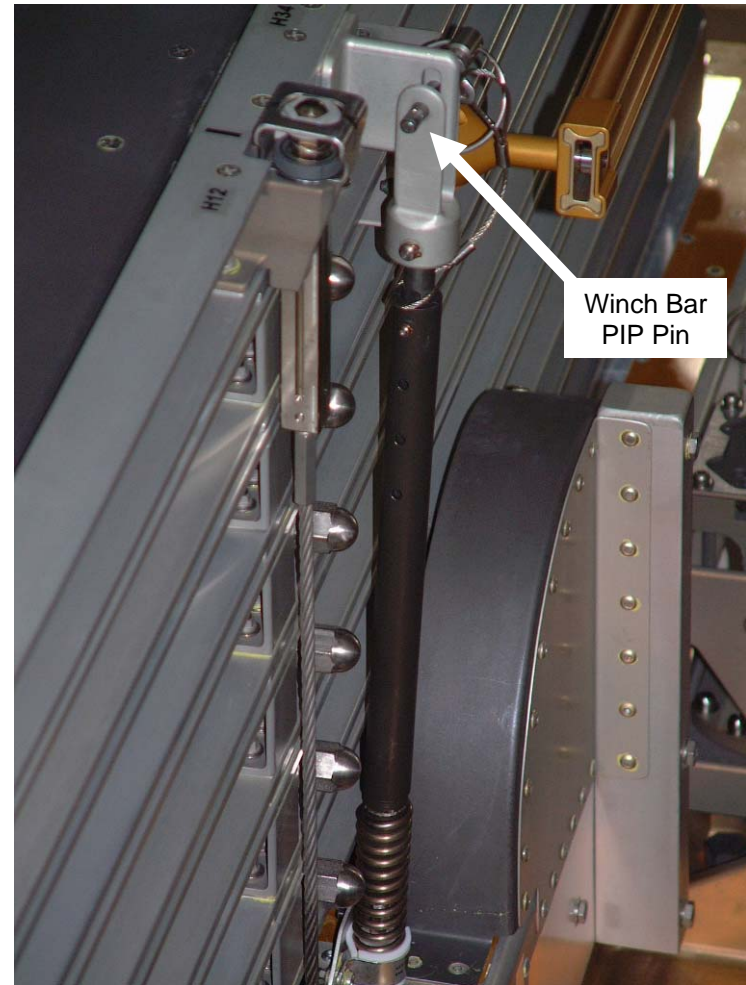


PV Radiator MDA Fastener

## MANUAL OVERRIDE TO RETRACT/WINCH RADIATOR TASK DATA SHEET (Cont)



Area under FQDC Shroud – Winch Bolt H10



Winch Bar and H12 Cinch

## PV RADIATOR JETTISON

IV/RMS	EV1	EV2
<ol style="list-style-type: none"> <li>1. Verify PFCS pump shut down complete (Loop A and B valves closed)</li> <li>2. Verify Utility Power inhibits complete</li> <li>3. MnvR ISS to PVR Jettison Attitude</li> </ol>	<p><u>FQDC DEMATE</u></p> <ol style="list-style-type: none"> <li>1. Set up and ingress APFR</li> <li>2. <b>PGT[A7 9.2 ft-lb, CCW2 30RPM, MTL 30.5]-18 ext 7/16:</b> Release FQDC Shroud bolts (H5, H6, H8, H9), x7 turns</li> <li>3. Remove shroud and secure with Adj Equip tether</li> <li>4. <b>PGT[___ 10.83 ft-lb (130in-lb), CCW2 30RPM, MTL ___]-12 ext 7/16:</b> Break torque on FQDC bolts H18, H19 (two) x1 turn               <ul style="list-style-type: none"> <li>□ H18</li> <li>□ H19</li> </ul> </li> <li>5. <b>PGT[___ 6.25 ft-lb (&lt;75 in-lb), CCW2 30RPM, MTL ___]-12 ext 7/16:</b> Attach adj tether to inner loop of FQDC housing for use in correcting alignment. Extend FQDC drive bolts H18, H19 (two) x1 7/8 turns to hard stop. Verify 4 guide cones squarely engage springs during demate. Verify 90 deg cam rotation during last 1/4 turn (indicating latch key rotation to the disengaged position)               <ul style="list-style-type: none"> <li>□ H18</li> <li>□ H19</li> </ul> </li> <li>6. <b>PGT[___ 6.25 ft-lb (&lt;75 in-lb), CW2 30RPM, MTL ___]-12 ext 7/16:</b> Retract FQDC drive bolt H18, H19 (two) x19 turns to hard stop. Verify guide cones remain engaged in springs. Verify 90 deg cam rotation on 3<sup>rd</sup> turn (cam reset)               <ul style="list-style-type: none"> <li>□ H18</li> <li>□ H19</li> </ul> </li> <li>7. Remove PIP pins from carrier bolts H20, H21, H24, H25 (x4)</li> <li>8. <b>PGT[___ 2.5 ft-lb, CCW2 30RPM, MTL ___]-12 ext 7/16:</b> Drive slider bolts H20, H21 to hard stop to align brackets with bolts H22, H23 (two) x9 turns               <ul style="list-style-type: none"> <li>□ H20</li> <li>□ H21</li> </ul> </li> </ol>	<p><u>ELECTRICAL UMBILICAL DEMATE</u></p> <ol style="list-style-type: none"> <li>5. Set up APFR near H30</li> <li>6. On IV GO, using Cannon Connector Tool:           <ul style="list-style-type: none"> <li>□ Demate W22-P2 from radiator J1</li> <li>□ If S4 or S6, mate W22-P2 to IEA dummy J1</li> <li>□ Demate W122-P2 from radiator J2</li> <li>□ If S4 or S6, mate W122-P2 to IEA dummy J2</li> <li>□ Demate W222-P2 from radiator J3</li> <li>□ If S4 or S6, mate W222-P2 to IEA dummy J3</li> <li>□ If P4 or P6, wire tie cables to adjacent handhold</li> </ul> </li> </ol> <p><u>RADIATOR RELEASE/JETTISON</u></p> <ol style="list-style-type: none"> <li>7. <b>PGT[B7 25.5 ft-lb, CCW2 30RPM, MTL 30.5]-6 ext-7/16:</b> Remove PIP pin and release PVR center attach bolts H26, H27 (two), x35 turns           <ul style="list-style-type: none"> <li>□ H26</li> <li>□ H27</li> </ul> </li> <li>8. <b>PGT[B2 16.0 ft-lb, CCW2 30RPM, MTL 30.5]-Sq TM with 7/16 proud:</b> Remove PIP pins and break torque on PVR corner bolts H28-H31 (four), x1 turn           <ul style="list-style-type: none"> <li>□ H30</li> <li>□ H29</li> <li>□ H31</li> <li>□ H28 (when EV1 clears area)</li> </ul> </li> </ol>

**PV RADIATOR JETTISON (Cont)**

IV/RMS	EV1	EV2
	<p>9. <b>PGT[___ 4 ft-lb, CW2 30RPM, MTL ____]-12 ext 7/16:</b> Engage bolts H22, H23 (two) into carrier brackets, x2 turns. Push to engage threads</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> H22</li> <li><input type="checkbox"/> H23</li> </ul> <p style="text-align: center;"><u>NOTE</u></p> <p>If H22 (H23) do not engage, adjust H20 (H21) cw by ½ turn increments and retry</p> <p>10. Install short PIP pins for carrier bolts H20, H21 (two)</p> <p>11. <b>PGT[B7 25.5 ft-lb, CCW2 30RPM, MTL 30.5]-12 ext 7/16:</b> Release bolts H24, H25, x 4.5 turns</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> H24</li> <li><input type="checkbox"/> H25</li> </ul> <p>12. Install longer PIP pins for carrier bolts H24, H25 (two)</p> <p>13. <b>PGT[___, CW_ 30RPM, MTL __]-12 ext 7/16:</b> Tighten bolts H22, H23 (two) x4½ turns</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> H22</li> <li><input type="checkbox"/> H23</li> </ul> <p>14. Remove Adj Equip tether from FQDC shroud</p> <p>15. Install shroud over FQDC (Use alignment pin H7)</p> <p>16. <b>PGT[A7 9.2 ft-lb, CW_ 30RPM, MTL ____]-12 ext-7/16:</b> Engage upper FQDC Shroud bolts (two), H6, H8 x7 turns. Push to engage bolt threads</p> <p><u>RADIATOR RELEASE / JETTISON</u></p> <p>17. <b>PGT[B7 25.5 ft-lb, CCW2 30RPM, MTL 30.5]-6 ext 7/16:</b> Release PVR Corner bolt H30, x8 turns. Reinstall PIP pin</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> H30</li> </ul> <p>18. Ingress APFR</p>	<div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px auto; width: fit-content;"> <p><u>CAUTION</u></p> <p>Potential for side loading during bolt removal due to strap design</p> </div> <p>9. <b>PGT[B7 25.5 ft-lb, CCW2 30RPM, MTL 30.5]-6 ext 7/16:</b> Release PVR grounding strap bolt H17 x11 turns</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> H17</li> </ul>

**PV RADIATOR JETTISON (Cont)**

IV/RMS	EV1	EV2
	<p>19. <b>PGT[B7 25.5 ft-lb, CCW_ 30RPM, MTL ____]-6 ext 7/16:</b> Release PVR Corner bolt H28, x8 turns. Reinstall PIP pin</p> <ul style="list-style-type: none"> <li>□ H28</li> </ul> <p>20. Grasp PVR HR</p> <p>21. Lift PVR out of structure 1 ft to clear accumulator boxes</p> <p>22. Position PVR for jettison</p> <p>23. On IV GO, release PVR HH</p>	<p>10. <b>PGT[B7 25.5 ft-lb, CCW2 30RPM, MTL 30.5]-6 ext 7/16:</b> Release PVR Corner bolt H31,H29 (two) x8 turns. Reinstall PIP pin</p> <ul style="list-style-type: none"> <li>□ H31</li> <li>□ H29</li> </ul> <p>11. Ingress APFR</p> <p>12. Grasp PVR HR and restrain while EV1 releases final bolt</p> <p>13. Lift PVR out of structure 1 ft to clear accumulator boxes</p> <p>14. Position PVR for jettison</p> <p>15. On IV GO, release PVR HH</p>

# PV RADIATOR JETTISON TASK DATA SHEET

## Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	N/A
Two EV Crew	N/A	1:00

## Tools:

EV1 (RMS)	EV2 (FF)
APFR	APFR
BRT	BRT
PGT	PGT
7/16 wobble socket-18 ext	7/16 wobble socket-6 ext
7/16 wobble socket-6 ext	Cannon Connector Tool
Adj Equip Tether	Sq TM with 7/16 Proud

## EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
FQDC Shroud Bolts	H5, H6, H8, H9	7/16	4	9.2	9.2	21.2	7	10
FQDC Shroud Alignment Pin	H7	N/A	1	N/A	N/A	N/A	N/A	N/A
PVR Grounding Strap Release bolt	H17	7/16	1	N/A	18.7	47.5	15	30
FDQC Drive Bolts	H18, H19	7/16	2	N/A	7.5	33.3	18	30
FQDC Carrier Slider Bolts	H20, H21	7/16	2	2.5	N/A	TBD	9	30
FQDC Carrier-Radiator Attach Bolts	H22, H23	7/16	2	4.0	N/A	TBD	6.5	30
FQDC Carrier-IEA Attach Bolts	H24, H25	7/16	2	N/A	19.8	42.4	4.5	30
PVR Tiedown Center Bolts	H26, H27	7/16	2	N/A	19.8	285	38	30
PVR Tiedown Corner bolts	H28-H31	7/16 microsq	4	N/A	51.7	362.6	8	30

## EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
W22-P2	PVR J1	If S4 or S6, dummy J1 on truss	0	TBD	Signals and MDA power
W122-P2	PVR J2	If S4 or S6, dummy J2 on truss	0	TBD	Primary heater power
W222-P2	PVR J3	If S4 or S6, dummy J3 on truss	0	TBD	Secondary heater power

## Foot Restraints:

Task	WIF	APFR Setting
Access to P4 FQDC	P4-07	7,VV,F,12
Access to S4 FQDC	S4-07	7,VV,F,12
Access to P6 FQDC	P6-07	7,VV,F,12
Access to S6 FQDC	S6-07	7,VV,F,12
Access to P6 Aft FQDC	P6-18	6,VV,G,11
Access to P6 Stbd FQDC	TBD	TBD
EV1 Jettison position for P4 (near H28)	P4-07	7,VV,F,12
EV1 Jettison position for S4 (near H28)	S4-07	7,VV,F,12
EV1 Jettison position for P6 (near H28)	P6-07	7,VV,F,12
EV1 Jettison position for S6 (near H28)	S6-07	7,VV,F,12
EV1 Jettison position for P6 Aft (near H28)	P6-18	6,VV,G,11
EV1 Jettison position for P6 Stbd (near H28)	TBD	TBD
EV2 Jettison position for P4 (near H31)	P4-18	5,SS,D,12
EV2 Jettison position for S4 (near H31)	S4-18	5,SS,D,12
EV2 Jettison position for P6 (near H31)	P6-18	5,SS,D,12
EV2 Jettison position for S6 (near H31)	S6-18	5,SS,D,12
EV2 Jettison position for P6 Aft (near H31)	P6-07	5,SS,F,12
EV2 Jettison position for P6 Stbd (near H31)	TBD	TBD

ORU Mass: 1600 lbm



## PV RADIATOR JETTISON TASK DATA SHEET (Cont)

### Notes:

1. The 18-inch extension is required to access bolts H24 and H25 on the FQDC carrier. Restricted access near some PVR FQDC shrouds and H20, H21 bolts may require a shorter (6-inch) extension
2. The S4 and S6 IEA structures have dummy receptacles for stowing the radiator cannon connectors

### Cautions:

1. Break torque for the FQDCs during demate is greater than the maximum torque allowed for the mechanical stops at the end of bolt travel. Be sure to reset PGT to lower torque setting once initial torque is broke

### Warnings:

None

### Constraints:

1. Shroud fasteners (H5, H6, H8, H9) can be released in any order
2. During PRV Removal, tie down bolts H26 and H27 must be released first and H28 and H29 must be released last. H30 and H31 can be released in any order

## CETA CART WHEEL BOGIE R&R

Objective: Removal of a wheel bogie to allow relocation of the CETA cart in a failure case where a wheel bogie failed to pivot clear of the MT/CETA rail. Once the cart is relocated the wheel bogie is reinstalled

### Wheel Bogie Removal

1. Retrieve CETA cart PIP pin (SEG 33108659-705) from crewlock bag #2
2. √Parking brake off
3. √CETA cart coupled to MT or restrained prior to bogie release
4. Insert PIP pin to restrain brake linkages
5. **PGT [A7, CCW2, 30.5]-6"-Ext-7/16:**  
Disengage ORU bolts (4) ~8 turns (bolts pop out)
6. Remove wheel bogie

### Wheel Bogie Installation

#### NOTE

Pip-pin installation ensures proper brake pad alignment. If brake pad misaligned, wheel bogie cannot be installed due to interference with MT rails.

If CETA cart is not on rails during bogie installation, wheel bogie can be installed such that brake mechanism is not connected

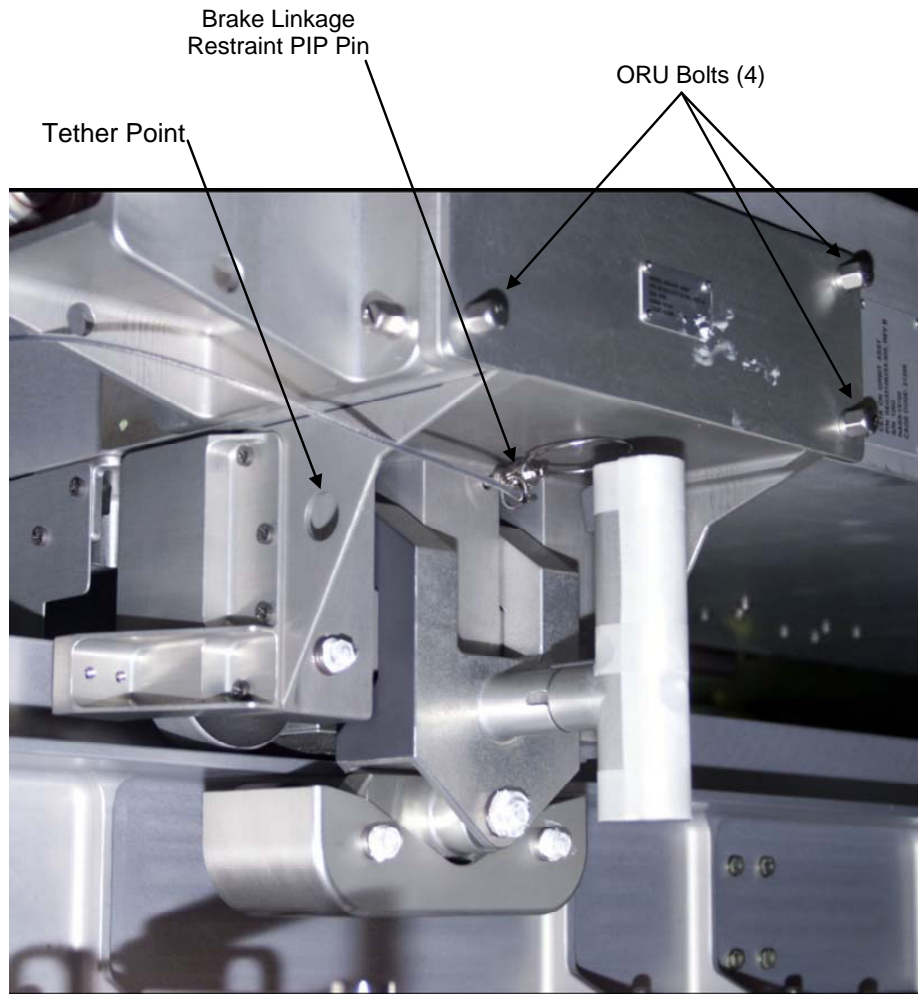
1. Install CETA cart on rails; engage other bogies
2. √CETA/MT Coupler set to capture, couple CETA cart to MT
3. Take coupler to locked
4. √Parking brake released
5. Install wheel bogie into tray guides
  - \* If brake cable mechanical coupler interferes (wheel bogie \*  
\* will not install fully): \*
  - \* Pull dynamic brake handle while reattempting install \*
  - \* \*
  - \* If no PIP pin used and bogie will not fully install: \*
  - \* Remove bogie, realign brake pad linkage and reattempt \*
6. **PGT: [A7, CW2 30.5]-6"-Ext-7/16:**  
Engage ORU bolts (4) ~8 turns
7. Remove PIP pin

## CETA CART WHEEL BOGIE TASK DATA SHEET

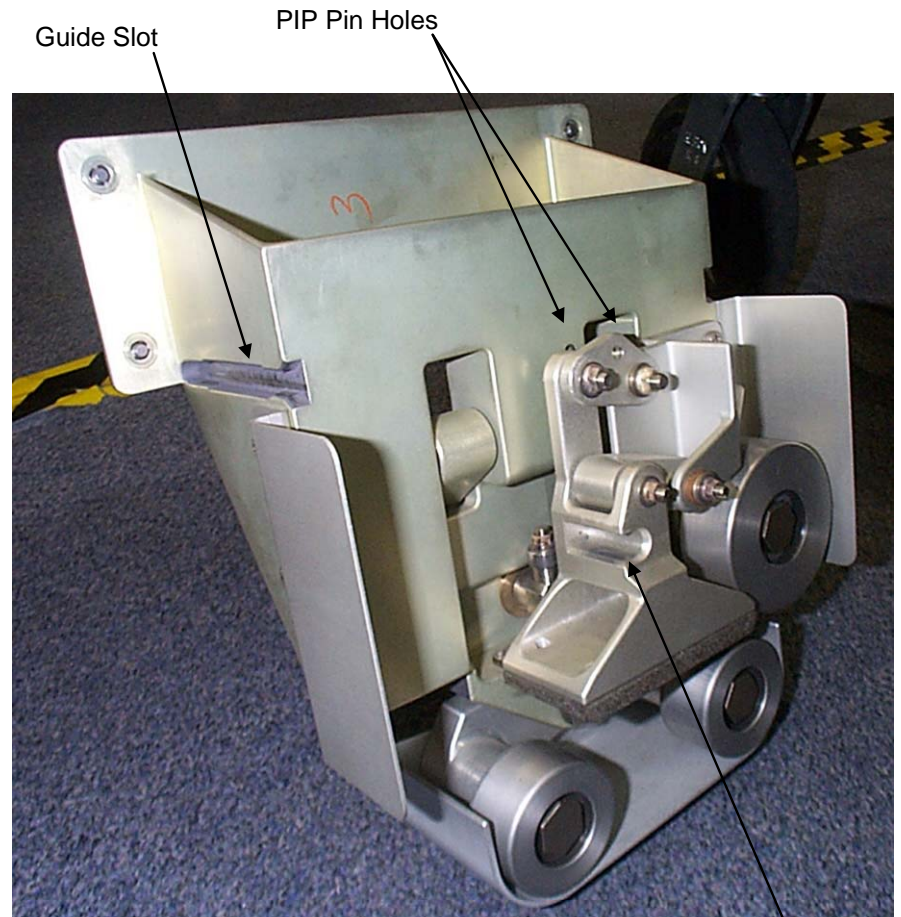
EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Wheel bogie ORU bolt	none	7/16	4	7-10	10		8	30 Max

# WHEEL BOGIE R&R – REFERENCE



WHEEL BOGIE INSTALLED – OUTBOARD VIEW

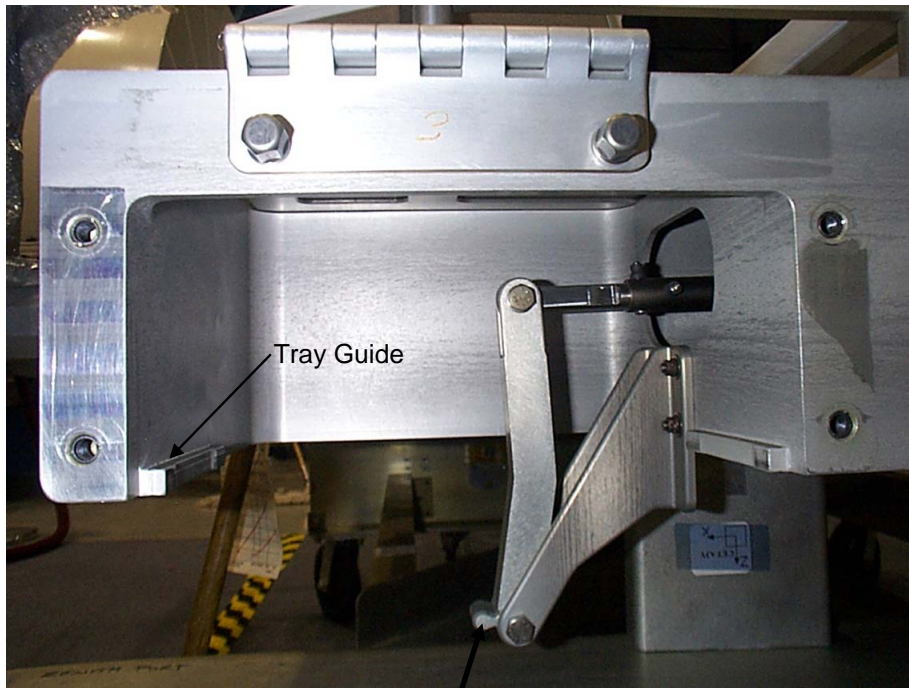


WHEEL BOGIE REMOVED – INBOARD VIEW

Brake Linkage Slot (Slot A)

## WHEEL BOGIE R&R – REFERENCE (Cont)

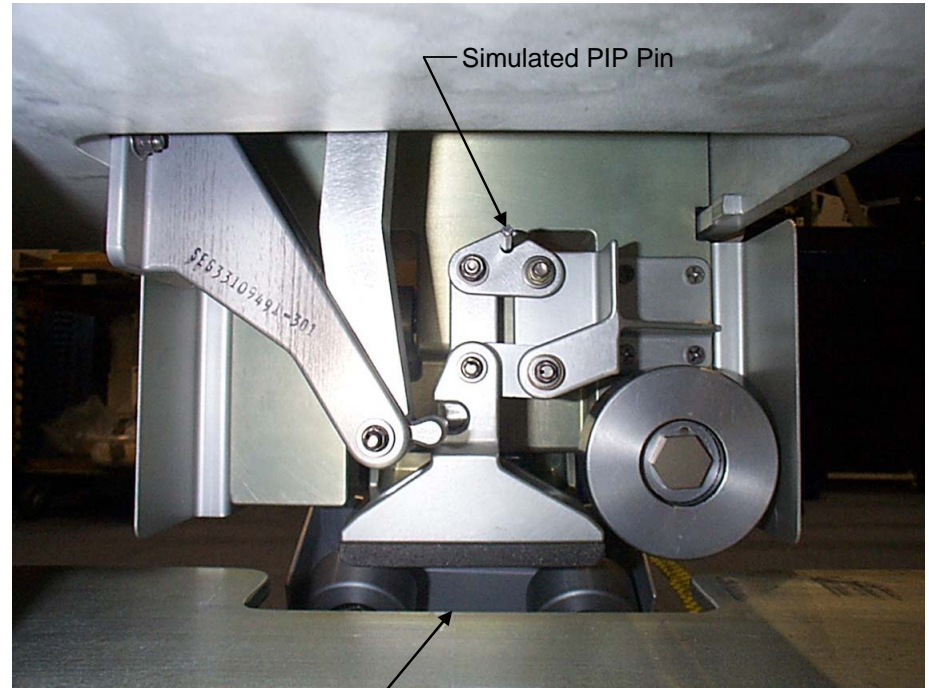
### WHEEL BOGIE REMOVED – OUTBOARD VIEW



Tray Guide

Brake Linkage Engagement  
Tab (tab A)

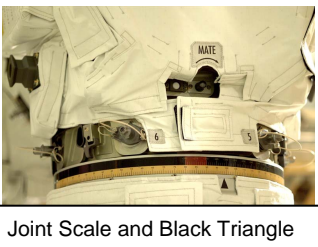

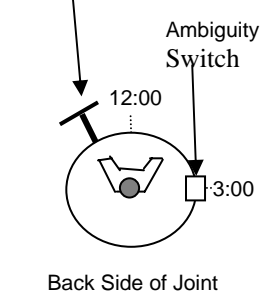
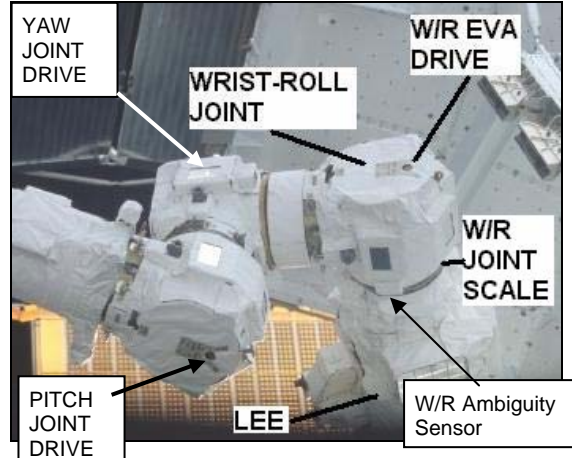
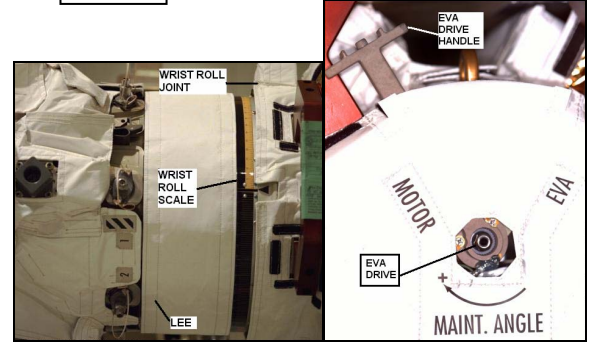
### WHEEL BOGIE PARTIALLY INSTALLED – INBOARD VIEW

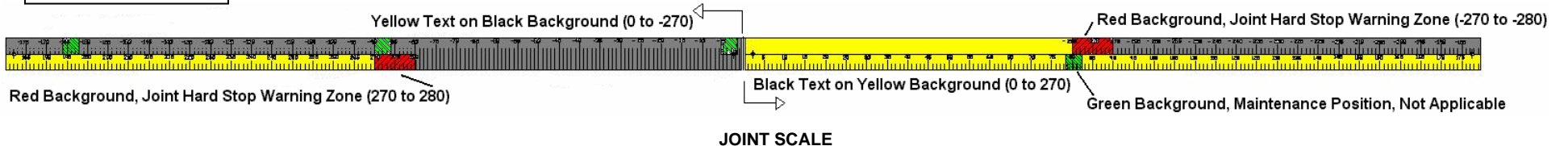


Simulated PIP Pin

Cutout in rail not fight like

# SSRMS JOINT DRIVE

IV/RMS	EV1/EV2	REFERENCE
<p align="center"><u>IV NOTE</u></p> <p>Square scoop may be needed for body positioning at the worksite. If required, retrieve square scoop from crewlock bag #1 in airlock. Install square scoop on failed joint micro fitting; attach BRT for body stabilization</p> <p>1. IV: Record ambiguity sensor reading and joint angle: _____</p> <div>  <p>Joint Scale and Black Triangle</p>  <p>Ambiguity Switch</p>  <p>EVA Drive Handle (@ motor posn)</p> <p>Ambiguity Switch</p> <p>12:00</p> <p>3:00</p> <p>Back Side of Joint</p> </div>	<p align="center"><u>INITIAL POSITION VERIFICATION</u></p> <ol style="list-style-type: none"> <li>Translate to failed joint</li> <li>Verify initial joint position using the following: <ul style="list-style-type: none"> <li>Black triangle on fixed side of failed joint</li> <li>Ambiguity sensor (90 deg cw from EVA drive, toward front side of joint)</li> </ul> </li> </ol> <p align="center">← □</p> <p align="center"><u>JOINT EVA DRIVE</u></p> <ol style="list-style-type: none"> <li>Depress button and move EVA Drive handle to EVA</li> <li><b>PGT[A1 2.5 ft-lb, CW2 or CCW2 (as required), MTL 1.5]-6ext-7/16:</b> Drive EVA bolt in +/- direction _____ turns to desired position</li> <li>Verify joint angle using scale and ambiguity sensor</li> <li>If possible, verify joint angle with IV; if necessary, fine position joint using PGT in manual ratchet mode</li> <li>Depress button and move EVA Drive handle to MOTOR</li> </ol>	<p align="center"><u>REFERENCE</u></p>  



## SSRMS JOINT DRIVE TASK DATA SHEET

### Tools:

EV1
PGT
7/16 (wobble) Socket-6 ext
BRT
Square Scoop

### EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Min Drive Torque (ft-lb)	Max Drive Torque (ft-lb)	Failure Torque (ft-lb)	RPM
EVA Drive	--	7/16	1				30

Foot Restraints: N/A

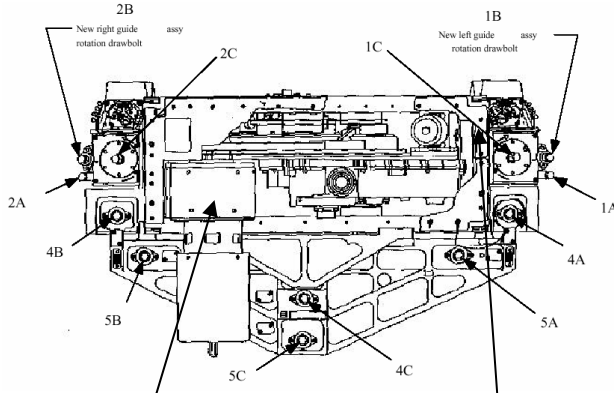


### Other:

1. Gear ratio: 3.26 EVA Drive turns/1 degree of joint movement
2. cw input to the EVA drive will produce ccw motion of the joint
3. Starting from LEE, the order of joints is: roll, yaw, pitch
4. The signs of the logical (indicated on RWS) and physical (indicated on EVA scale) angles are reversed for the wrist roll joint (i.e., +73.2 logical = -73.2 physical)
5. Scale and Ambiguity Switch
6. Since the SSRMS joints can rotate more than 360 deg, there is an ambiguity switch that tells the crewmember whether to use the positive or negative scale
7. The crew reads the scale using the black triangle on the fixed side of the joint. Located to the side of the black triangle (~ 90 deg around the circumference of the joint) is the ambiguity switch. The switch has a pointer that indicates "+" or "-" to tell the crew which side of the scale to read. If the ambiguity switch points to "+" then the crew should read off the yellow scale (black text on yellow background). If the switch points to "-" then the crew should read off the black scale (yellow text on black background)
8. EVA Drive handle is on back side of joint (away from LEE), and scale triangle is across from it toward the LEE side

### Cautions:

9. Avoid contact with ACU radiator surface – silver Teflon film (white in color)
10. CLA and CLPA radiator surface – silver Teflon film (white in color)
11. VDU radiator surface – silver Teflon film (white in color)
12. JEU radiator surface – Z93 paint

## RETURN DLA TO LAUNCH POSITION

IV/RMS	EV1	EV2
<p>MCC-H</p> <ol style="list-style-type: none"> <li>1. Verify failed DLA is in neutral position and active DLA is in locked position</li> <li>2. Give GO for EVA to enter SARJ worksite</li> </ol>	<p><u>REMOVE DLA MLI COVER</u></p> <ol style="list-style-type: none"> <li>1. On IV GO: install and ingress APFR</li> <li>2. <b>PGT[A6 8.3 ft-lb, CCW2 30RPM, MTL 30.5]-6 ext 7/16</b>: Release inboard MLI cover fasteners (4) x9 turns</li> <li>3. Remove MLI cover and temp stow</li> </ol> <p><u>DISENGAGE DLA</u></p> <p><u>ROTATE DLA DRAW BOLTS (1C AND 2C)</u></p> <ol style="list-style-type: none"> <li>4. <b>BOLT 1C: PGT[B7 25.5 ft-lb, CCW1 10RPM, MTL 23.5]-6 ext 7/16</b>: Rotate draw bolt 1C x1 turn (break torque)</li> <li>5. <b>BOLT 2C: PGT[B7 25.5 ft-lb, CW1 10RPM, MTL 23.5]-6 ext 7/16</b>: Rotate draw bolt 2C x3 turns (break torque)</li> <li>6. <b>BOLT 1C: PGT[B7 25.5 ft-lb, CCW1 10RPM, MTL 23.5]-6 ext 7/16</b>: Rotate draw bolt 1C x2 turns</li> <li>7. <b>BOLT 1C: PGT[A3 4.8 ft-lb, CCW2 30RPM, MTL 23.5]-6 ext 7/16</b>: Rotate draw bolt 1C x32 turns to hard stop</li> </ol> <p><u>ROTATE FOLLOWER ARMS (1B AND 2B)</u></p> <p><u>NOTE</u> Adjustment in DLA draw bolt method may be required to align follower arm for rotation</p> <ol style="list-style-type: none"> <li>8. <b>BOLT 1B: PGT, RCW, MTL 23.5]-6 ext 7/16</b>: Rotate follower arm rotation bolt 1B x5/8 turn to hardstop</li> <li>9. If no joy: <b>BOLT 1C: PGT[OFF 1 ft-lb, RCW, MTL 23.5]-6 ext 7/16</b>: Rotate draw bolt 1C x1/8 turn Repeat steps 8 and 9 until follower arm has rotated 90 deg</li> </ol>	 <p><b>DLA Bolts &amp; Labels</b></p>  

**RETURN DLA TO LAUNCH POSITION (Cont)**

IV/RMS	EV1	EV2
	<p>10. <b>BOLT 2C: PGT[A3 4.8 ft-lb, CW2 30RPM, MTL 23.5]-6 ext 7/16:</b> Rotate follower arm draw bolt 2C x32 turns to hard stop</p> <p>11. <b>BOLT 2B: PGT, RCCW, MTL 23.5]-6 ext 7/16:</b> Rotate follower arm rotation bolt 2B x5/8 turn to hardstop</p> <p>12. If no joy: <b>BOLT 2C: PGT, RCCW, MTL 23.5]-6 ext 7/16:</b> Rotate draw bolt 2C x1/8 turn. Repeat steps 11 and 12 until follower arm has rotated 90 deg</p> <p><u>REPOSITION DLA</u></p> <p>13. Reposition DLA to launch position (approx 1.5 inch away from race ring then 0.35 inch inboard (toward S0))</p> <p><u>INSTALL 3 DLA LAUNCH RESTRAINT BOLTS (4A, 4B, AND 4C)</u></p> <p>14. <b>BOLTS 4A, 4B, 4C: PGT[B4 19.4 ft-lb, CW2 30RPM, MTL 23.5]-6 ext 7/16:</b> Engage launch restraint bolts 4A, 4B, and 4C x7 turns (attaches DLA frame to launch bracket)</p> <p><u>IF REQD: ENGAGE DLA LOCK BOLTS (1A AND 2A)</u></p> <p>15. <b>BOLTS 1A, 2A: PGT[A5 7.0 ft-lb, CW1 10RPM, MTL 23.5]-6 ext 7/16:</b> Engage lock bolts 1A and 2A fasteners (two) x6 turns (engage lock preload on follower arm with lock tip bolt – if reqd for return of DLA)</p> <p><u>REINSTALL DLA MLI COVER</u></p> <p>16. <b>PGT[A1 2.5 ft-lb, CW2 30RPM, MTL 23.5]-6 ext 7/16:</b> Engage inboard MLI cover fasteners (four) x8.25 turns</p>	<p><u>REINSTALL DLA MLI COVER</u></p> <p>1. Assist EV1 with DLA cover install</p>



# RETURN DLA TO LAUNCH POSITION TASK DATA SHEET

## Estimated Task Duration:

	With SSRMS	Without SSRMS
One EV Crew	NA	1:00
Two EV Crew	NA	0:45

## Tools:

EV1 (FF)	EV2 (FF)
PGT	PGT
6 Ext 7/16	6 Ext 7/16
APFR	APFR
Round scoop (optional)	Medium ORU transfer bag

## EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
MLI Cover Inboard Fasteners	NA	7/16	4-6 per cover	2.5	3.4	3.8 (I) 13.7 (R)	7- 9	30
DLA 1A and 2A Lock Bolts	Yes	7/16	2	3.3 - 6.3	6.7	42.2	6	10
DLA 1C and 2C Draw Bolts	Yes	7/16	2	4.8	0.8	38.9	32 - 33	30
DLA 4A, 4B, and 4C Launch Restraint Bolts	Yes	7/16	3	20 - 21.7	25.0	50	9.5	30
DLA 1B and 2B Follower Arm Rotation Bolts	Yes	7/16	NA	4.8	1	10.6	0.625	NA
DLA 1C and 2C Draw Bolts	Yes	7/16	NA	4.8	0.8	38.9	32 - 33	30

## EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
DLA Electrical Harness					

## Foot Restraints:

Task	WIF	APFR Setting
P3 Cover 5 DLA 1 Face 6	P3-31	10, PP, F, 12
P3 Cover 20 DLA 2 Face 2	P3-27	10, PP, F, 12
S3 Cover 20 DLA 1 Face 2	S3-28	2, NN, E, 12
S3 Cover 5 DLA 2 Face 6	S3-31	5, OO, F, 12

## Cautions:

1. During re-installation of MLI covers, do not re-install spring clamp bolts on the outboard SARJ race ring side. This will preclude SARJ rotation
2. Avoid contact between MLI cover with surrounding hardware
3. Avoid impacting the race the ring with the DLA when the DLA is unconstrained
4. During follower arm rotation (90 deg turn) when the DLA is unconstrained, interference with structure may occur. The DLA must be held against the outer side of the SARJ race ring for the follower arm to rotate fully – clearing obstruction

## Warnings:

None



DLA



# MANUAL RELEASE OF ESP-3 KYA LATCHES TASK DATA SHEET

**Tools:**

EV1 (FF)
PGT
7/16 (wobble) socket – 6 ext
5/8 socket – 7.8 ext

**Cautions:**

**Warnings:**

**EVA Fasteners:**

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
Y-Joint Locking Bolt	Unlock	7/16	1 fwd & aft				
KYA Shaft Bolt	Shaft Bolt Engage – Disengage	5/8	1 fwd & aft				
Fork Bearing Bolt	Fork Bearing Release	7/16	1 stbd & port				

**EVA Connectors:** N/A

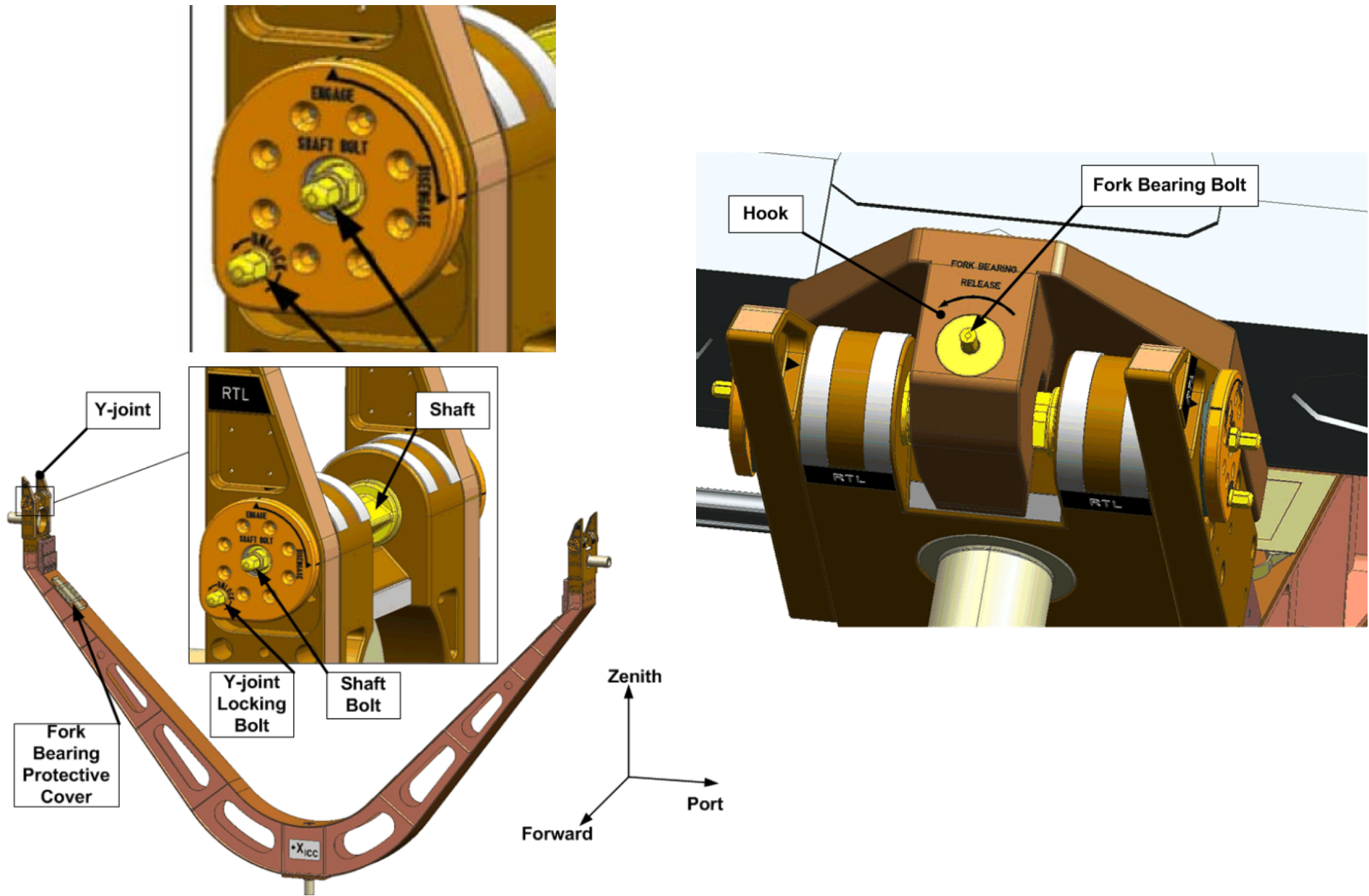
**Foot Restraints:**

Task	WIF	APFR Setting

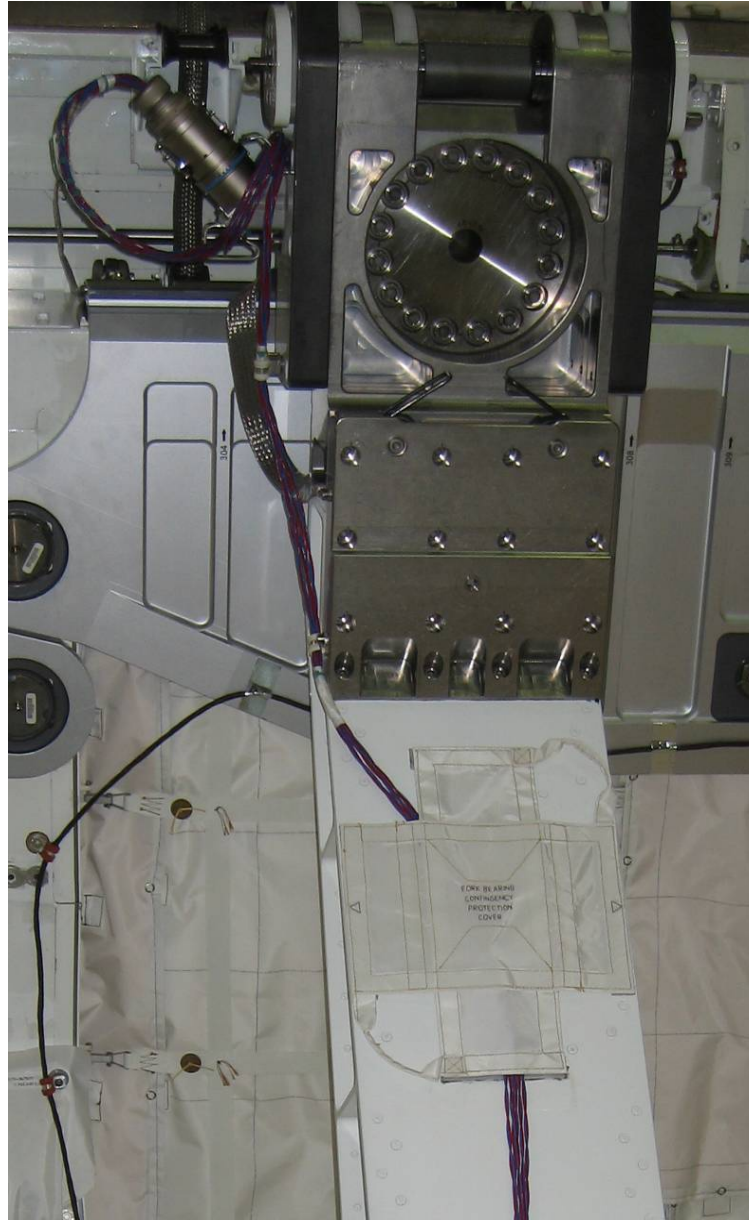
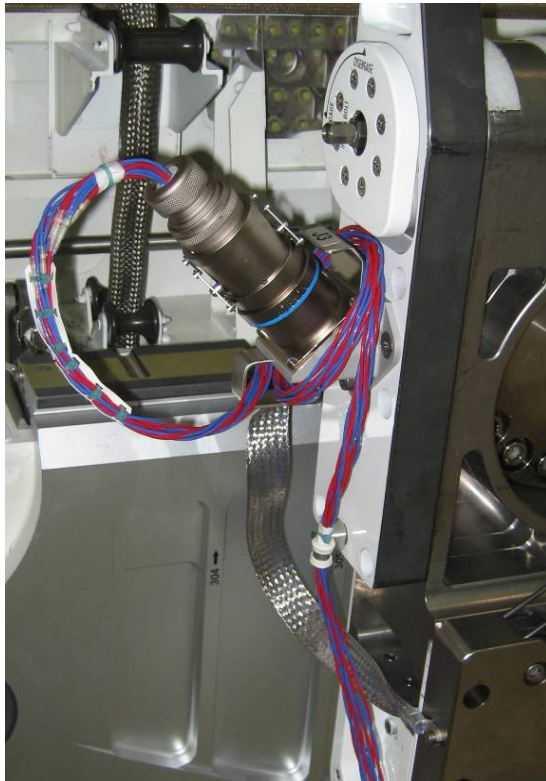
**Notes:**

1. Shaft bolt must be returned to ENGAGE position for ESP-3 re-installation into PLB
2. The Fork Bearing bolts are released as a contingency if the Shaft bolt fails
3. Fork Bearing Velcro cover to be installed from KYA stanchion if fork bearing bolts released
4. ESP-3 unable to be re-installed in PLB if fork bearing bolts performed (OCAD)

# MANUAL RELEASE OF ESP-3 KYA LATCHES TASK DATA SHEET (Cont)



# MANUAL RELEASE OF ESP-3 KYA LATCHES TASK DATA SHEET (Cont)



Fork Bearing Release on ESP-3 (above)

Fork Bearing Contingency Protection Cover on KYA (center)

KYA Shaft Bolt AND Locking Bolt (upper left)

KYA power cable (left)

## UCCAS CAPTURE LATCH ASSY (CLA) MANUAL DRIVE

IV/RMS	EV1 (FF)	EV2 (FF)
<p>1. IV: First stage capture complete, GO to limp SSRMS</p> <p><u>NOTE</u> If less than 63 additional turns (105 total) before hard stop, capture latch closure not complete</p>	<p><u>UCCAS CAPTURE LATCH ASSY MANUAL DRIVE</u></p> <ol style="list-style-type: none"> <li>1. Translate to P3 UCCAS</li> <li>2. <b>PGT[A4 (6.3ft-lb), CW3 (60 RPM), 30.5]-18Ext-7/16:</b> Rotate CLA drive 42 turns to topological capture</li> <li>3. On IV GO, rotate drive to hard stop ~85 additional turns (~127 turns total)</li> <li>4. <b>PGT[A4 (6.3ft-lb), CCW2 (30 RPM), 30.5]-18Ext-7/16:</b> Rotate drive 5 turns to final close position</li> </ol>	

# UCCAS (CLA) MANUAL DRIVE – TASK DATA SHEET

## Tools:

EV1 (FF)	EV2 (FF)
PGT	
7/16 Socket – 18 inch	
BRT	

## EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
CLA Manual Drive		7/16	1				127 total	60

## APFR Positions:

Task	WIF	APFR Setting
CLA Manual Drive	P3 WIF36	[12,QQ,H,11]

## Notes:

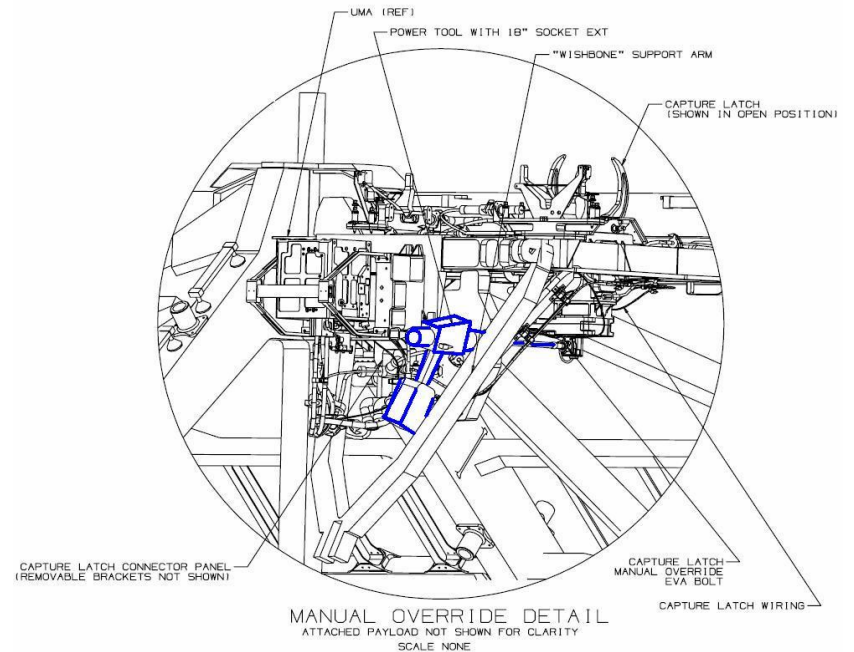
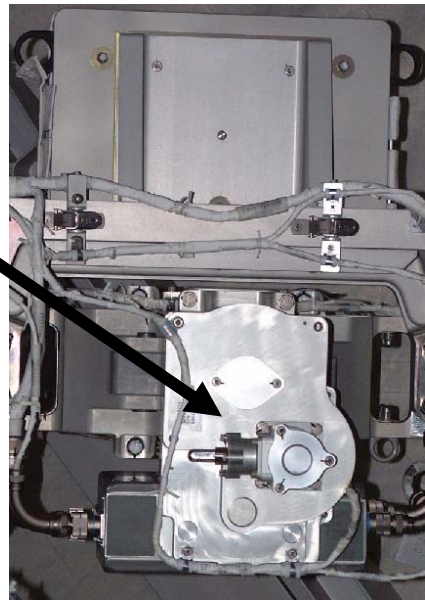
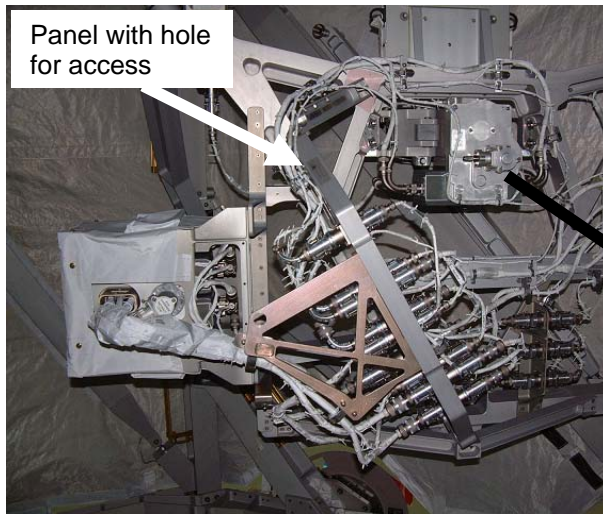
1. The connector panels on the attach structures have been modified to add two cut-outs to allow the crewmember to see through the panel to increase visual access to the manual release bolt head
2. P3 & S3: Manual operation of the CL requires that the EVA crewmember turn a bolt located underneath the CL. The bolt is accessed via a hole in the connector panel beneath the UMA. The EVA bolt requires the power tools with 7/16" x 18" extension
3. APFR settings for reference, may not be required

## Cautions:

1. TBD

## Warnings:

1. TBD



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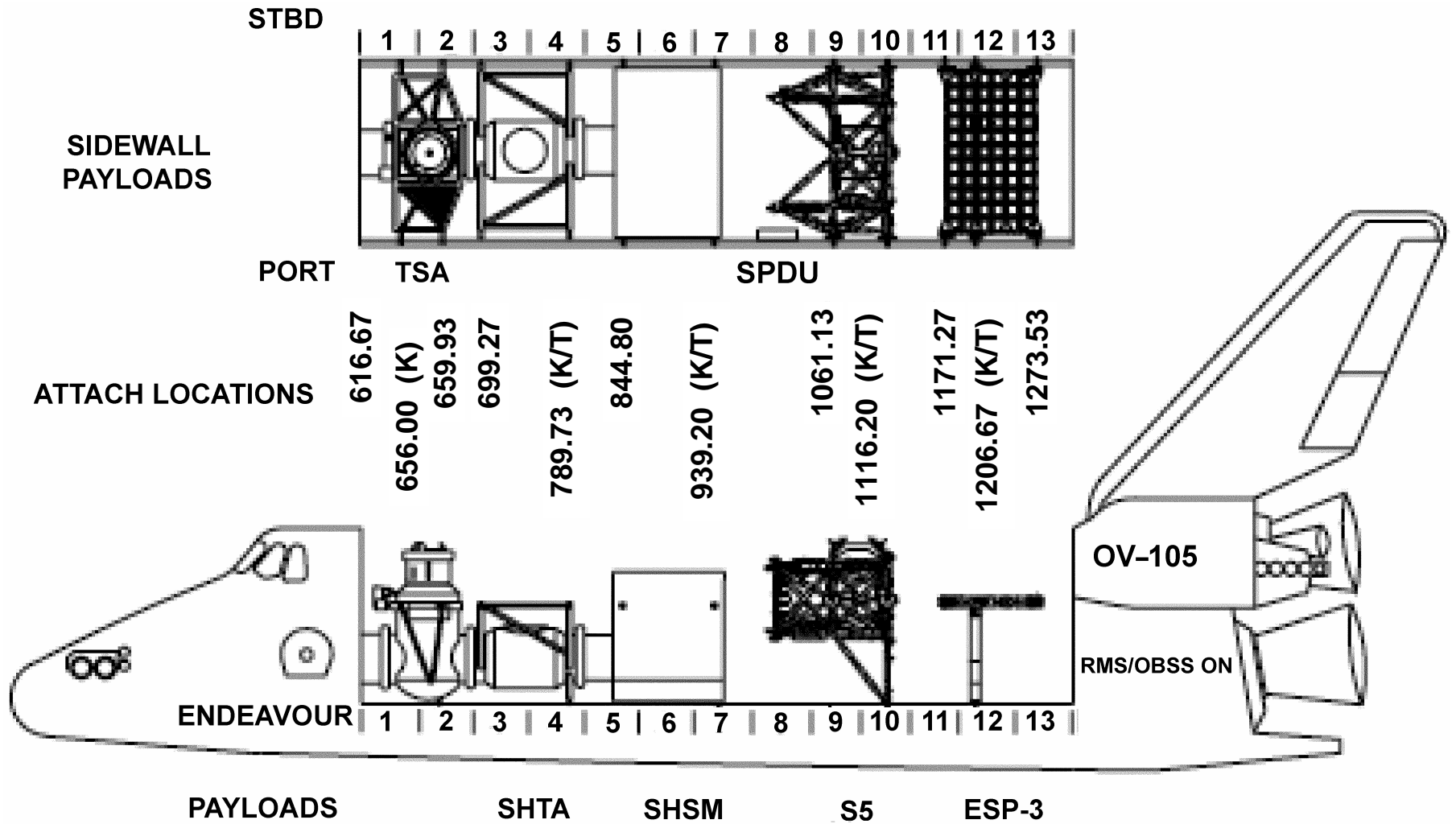
FLIGHT SPECIFIC EVA REFERENCE

STS-118 PAYLOAD BAY LAYOUT .....	FS 18-3
S5 TRUSS	
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FLIGHT SPECIFIC  
EVA REFERENCE

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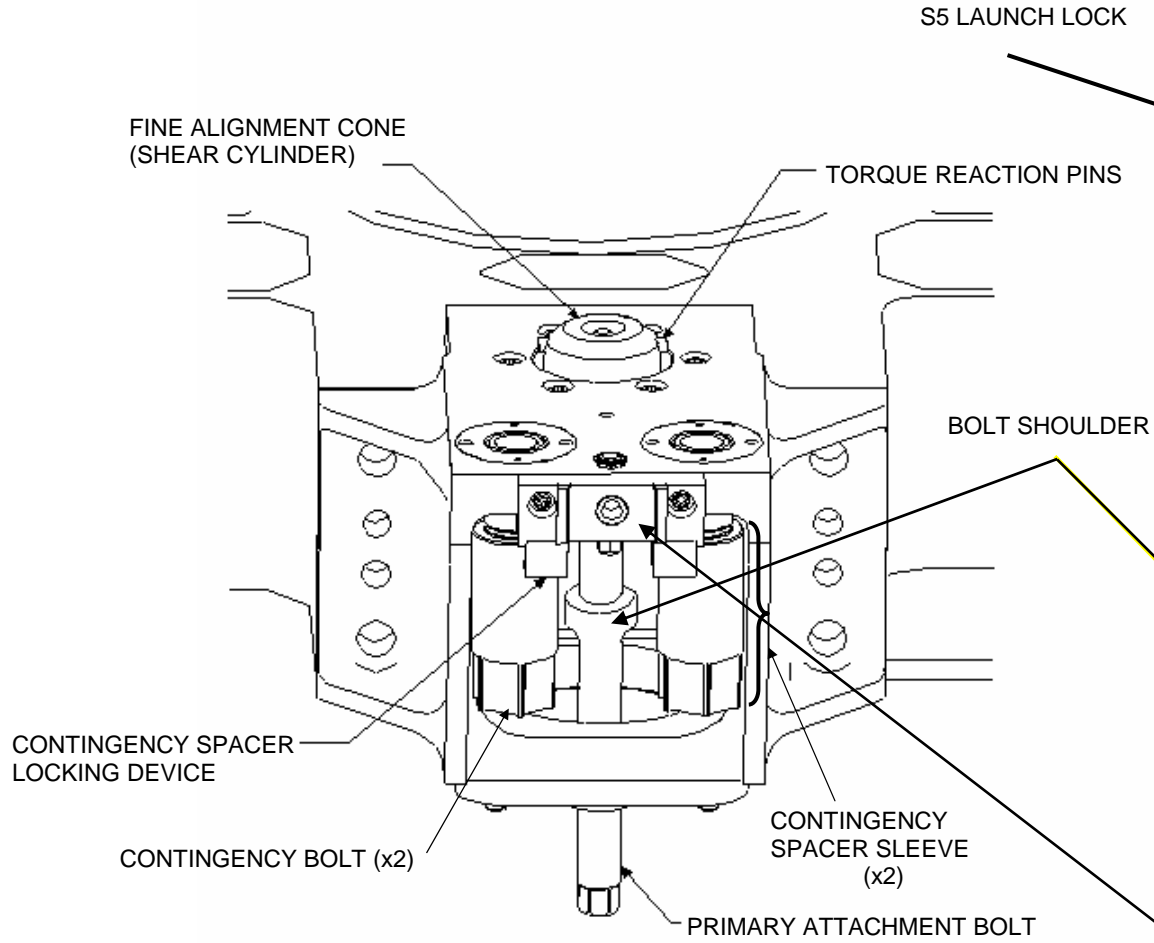
# STS-118 PAYLOAD BAY LAYOUT



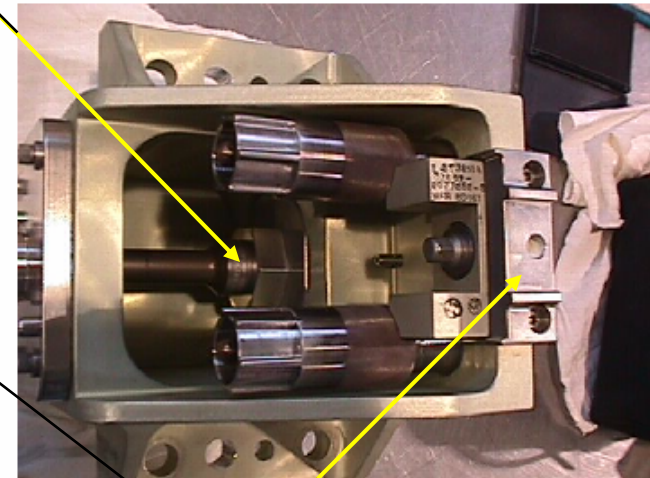
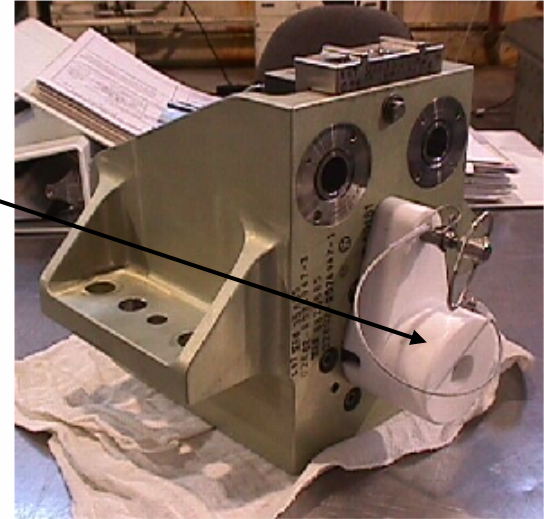
NOTE  
ORUs are not shown on ESP-3

# S5 TRUSS

## S5 MRTAS – ACTIVE

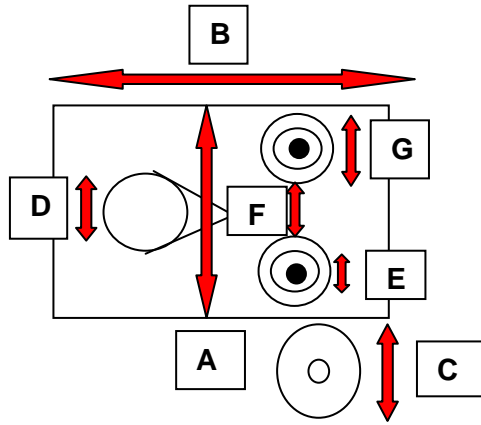


S5 LAUNCH LOCK

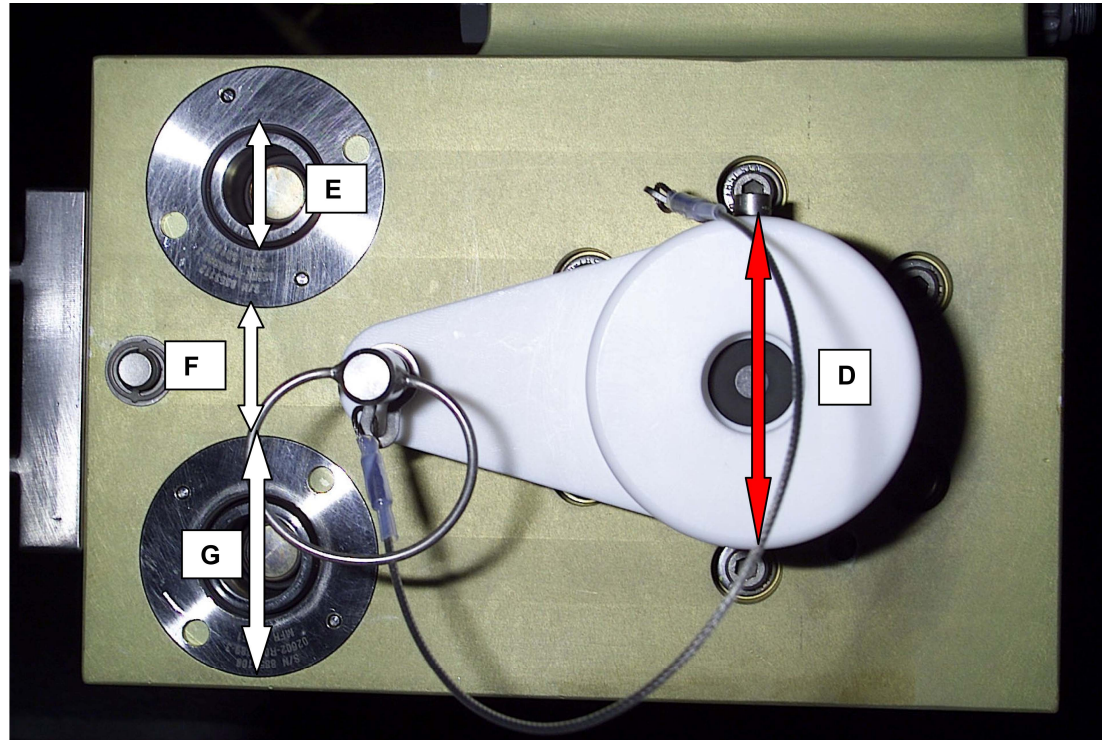


GROUND STRAP RECEPTACLE (GROUNDING LUG)

## RTAS HOUSING DIMENSIONS

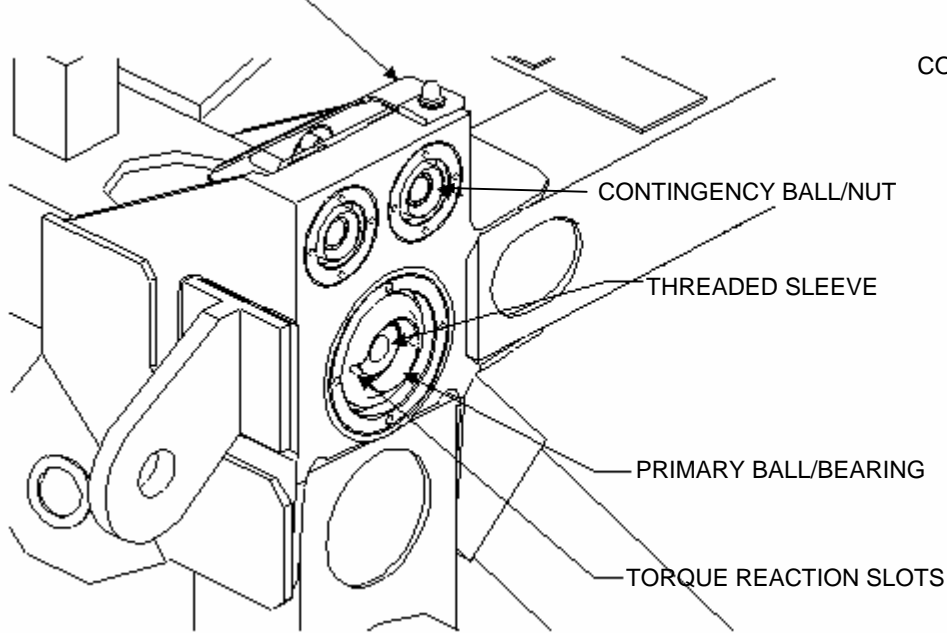


A	Height of RTAS Housing	14.1 cm
B	Width of RTAS Housing	21.5 cm
C	Diameter of Coarse Alignment Cone	9.2 cm
D	Diameter of Launch Lock	6.4 cm
E	Diameter of Cont Bolt Hole	3.0 cm
F	Distance between contingency bolt disks	2.9 cm
G	Diameter of contingency bolt disk	5.5 cm

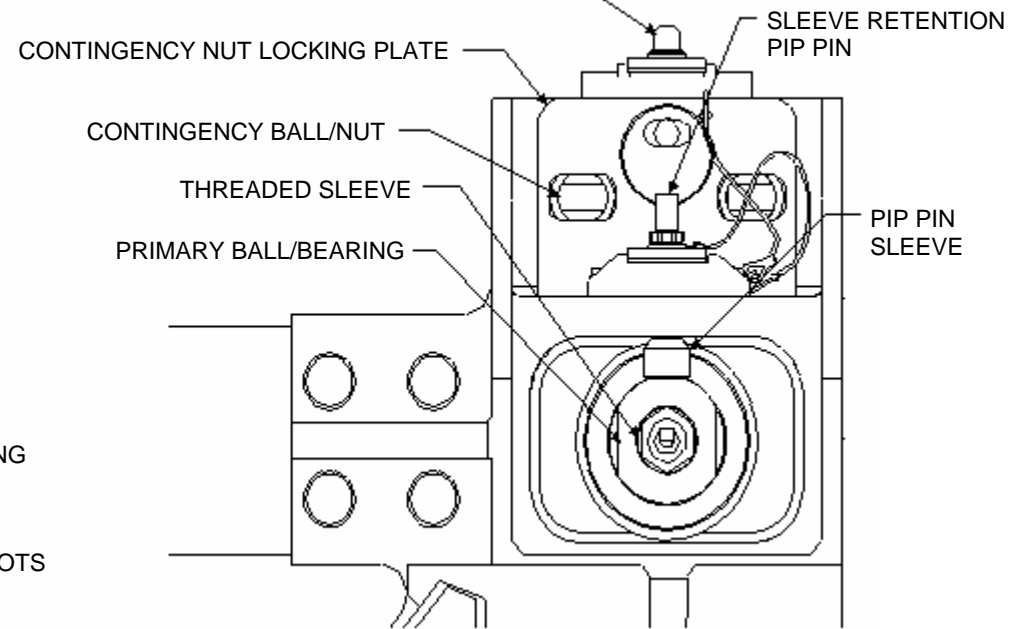


# S4 MRTAS – PASSIVE

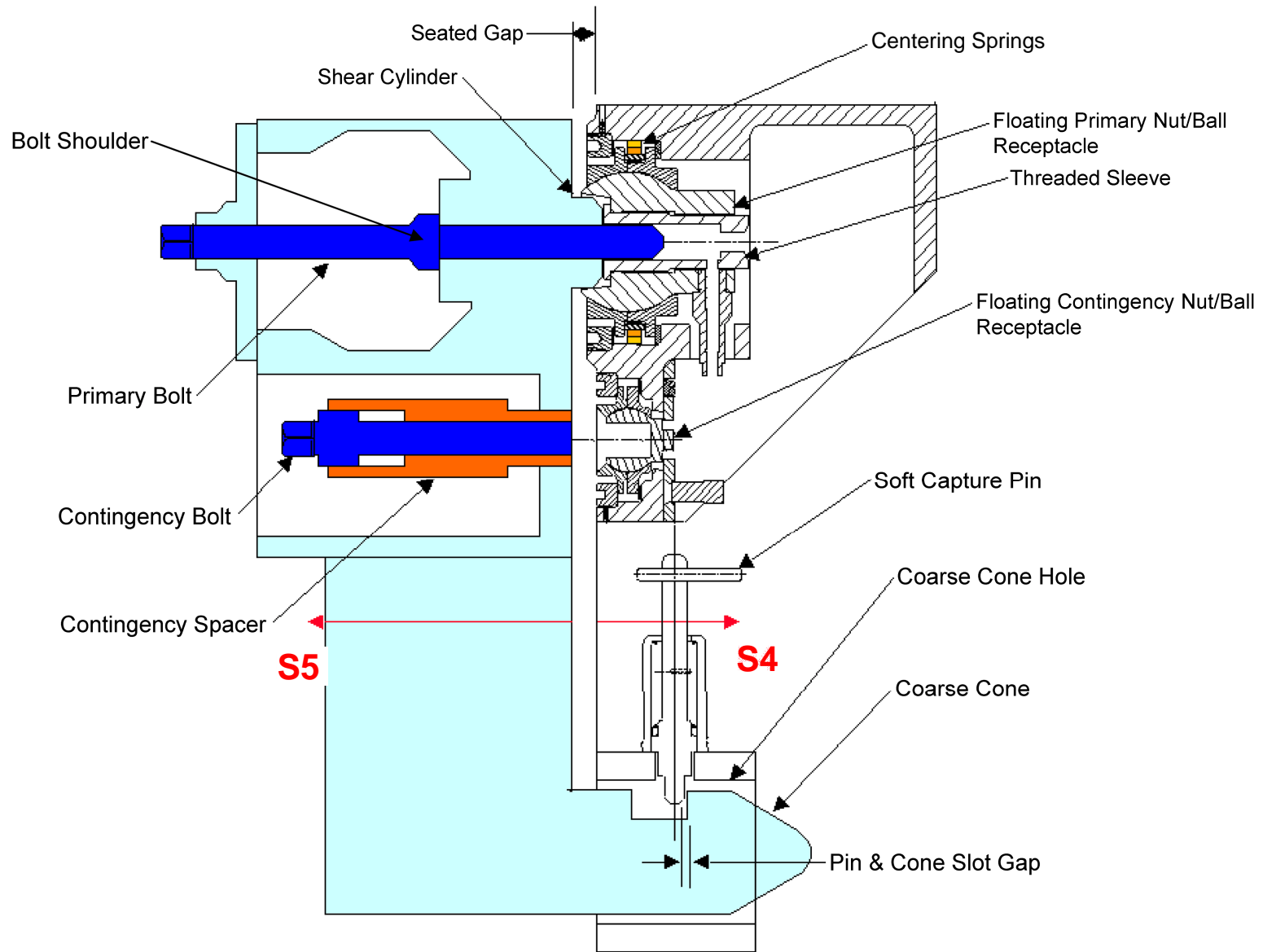
GROUND STRAP, STOWED POSITION



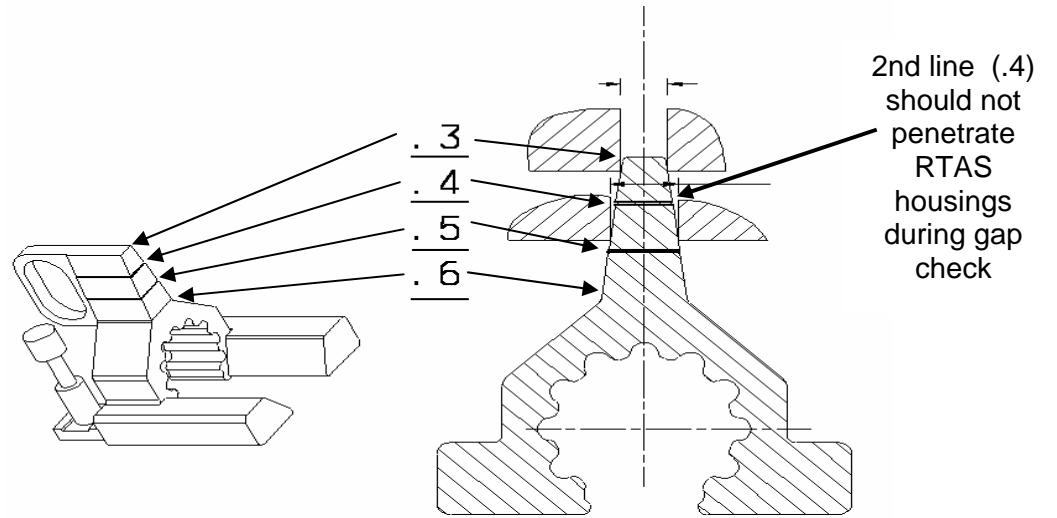
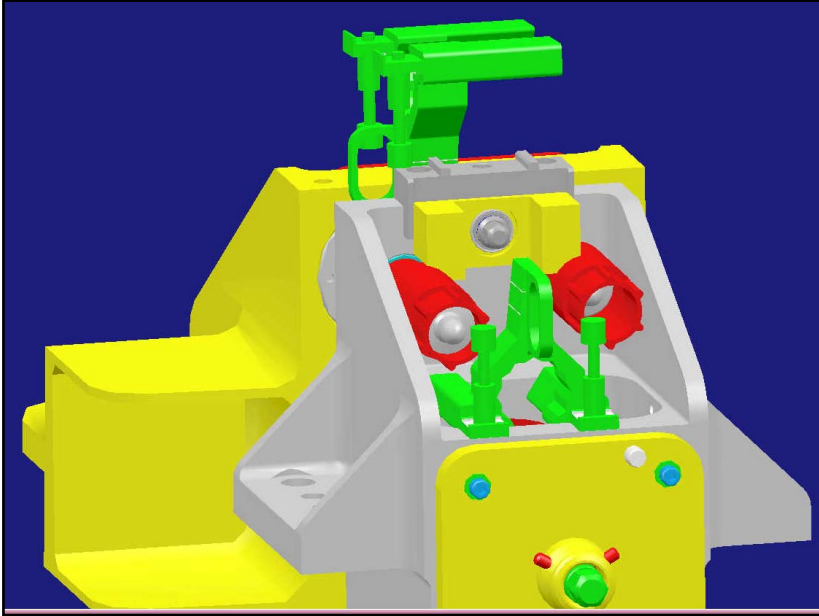
GROUND STRAP STORAGE BOLT



# S5 TO S4 MRTAS PRIMARY BOLT ENGAGED



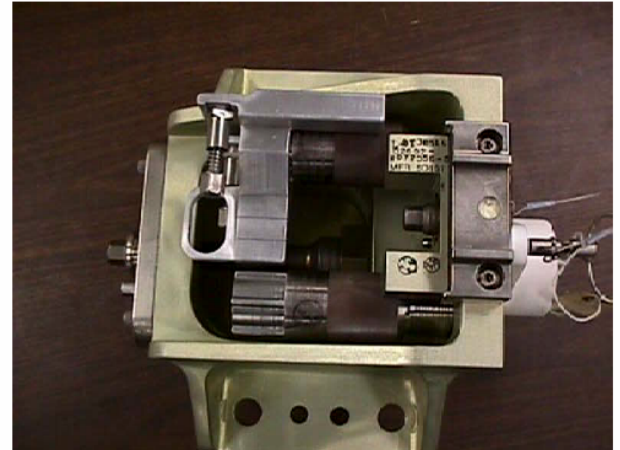
# GAP CHECK TOOL



LAUNCH POSITION  
(RTAS corner #1)



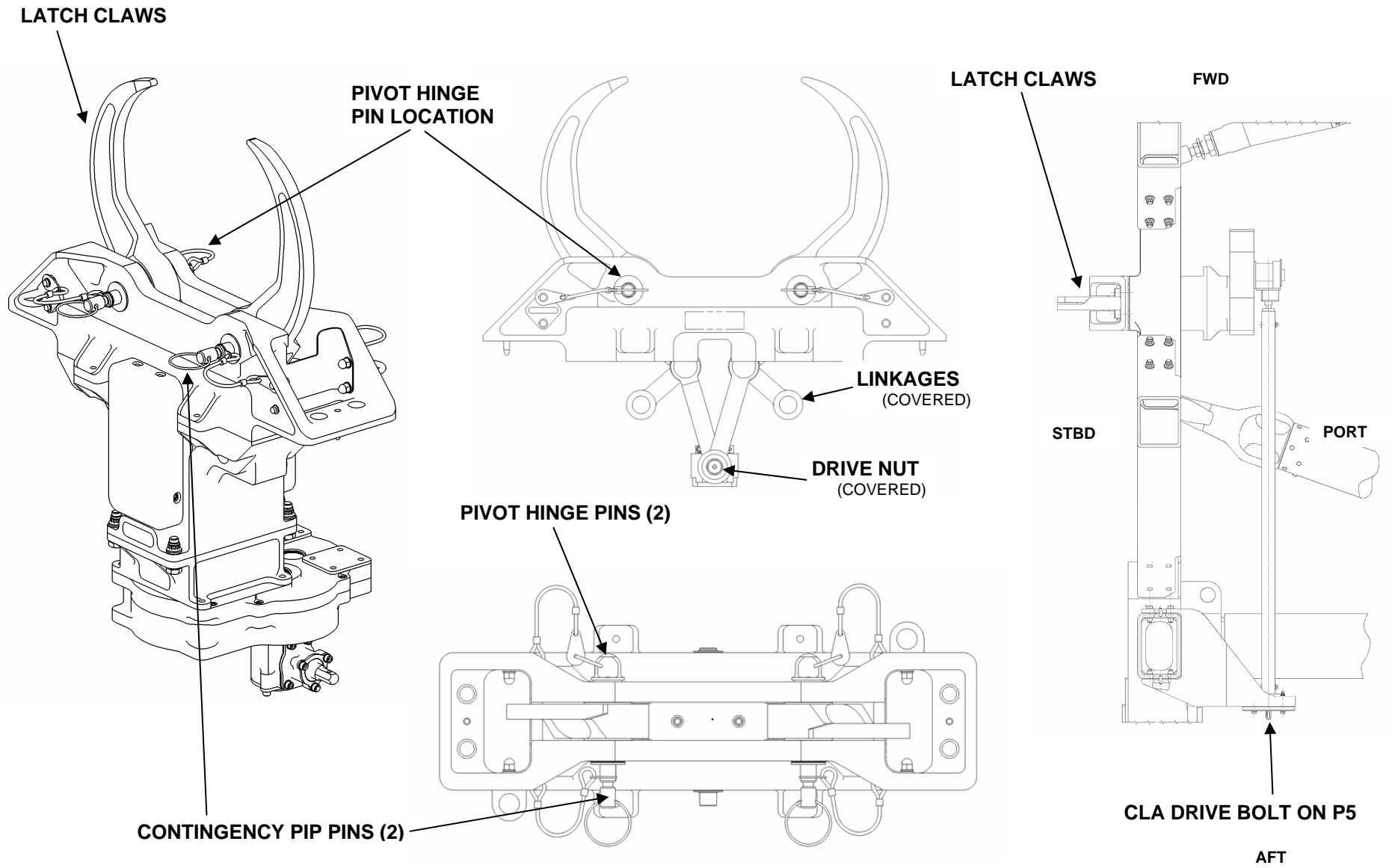
TOOL REMOVED



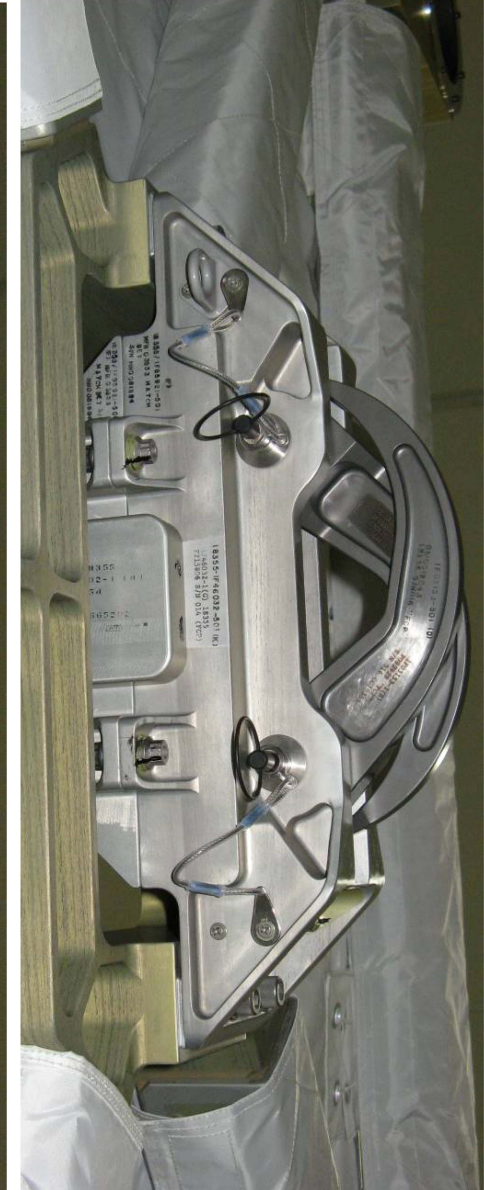
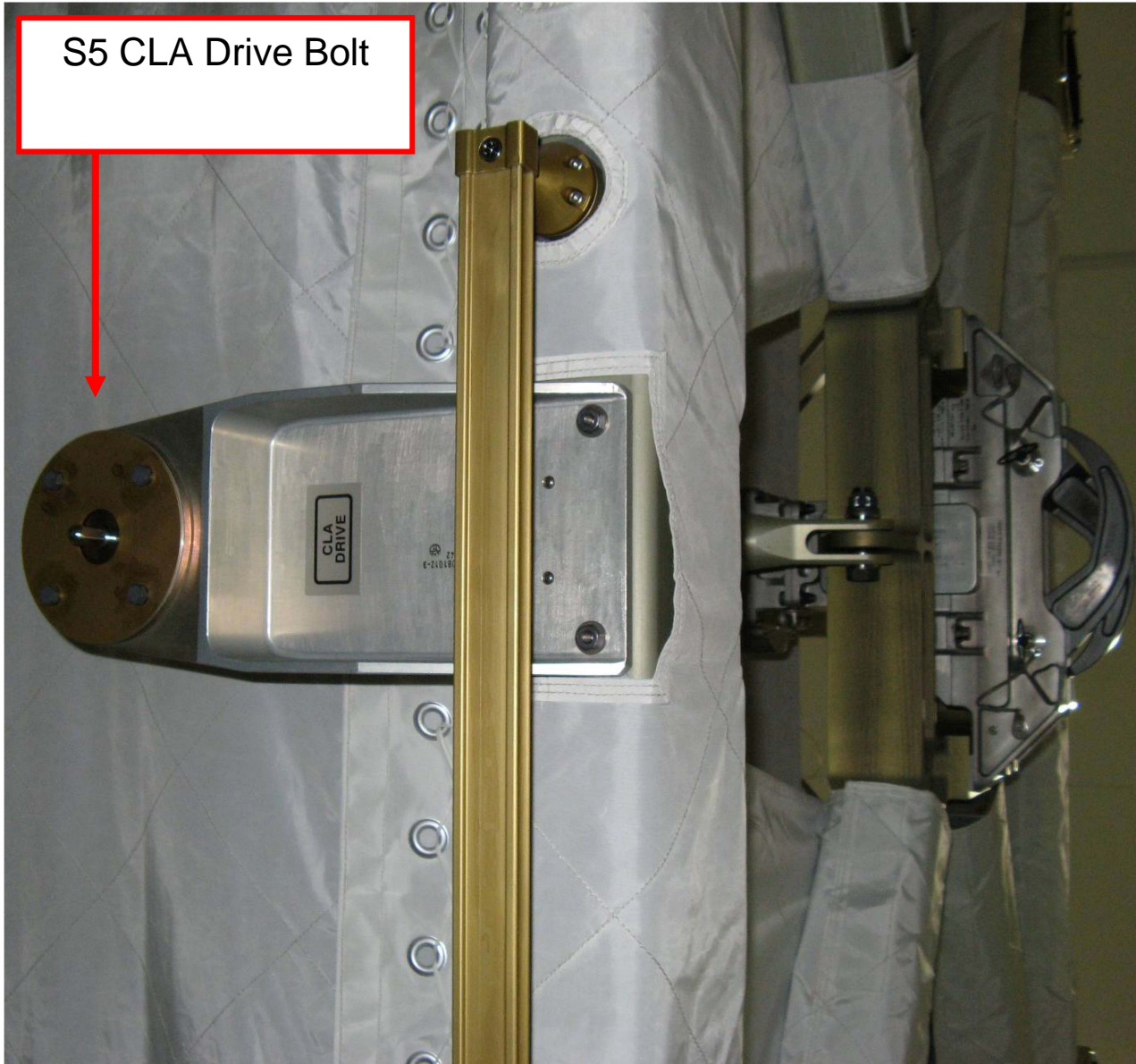
TOOL INSTALLED ON  
RTAS CONTINGENCY SPACER SLEEVE



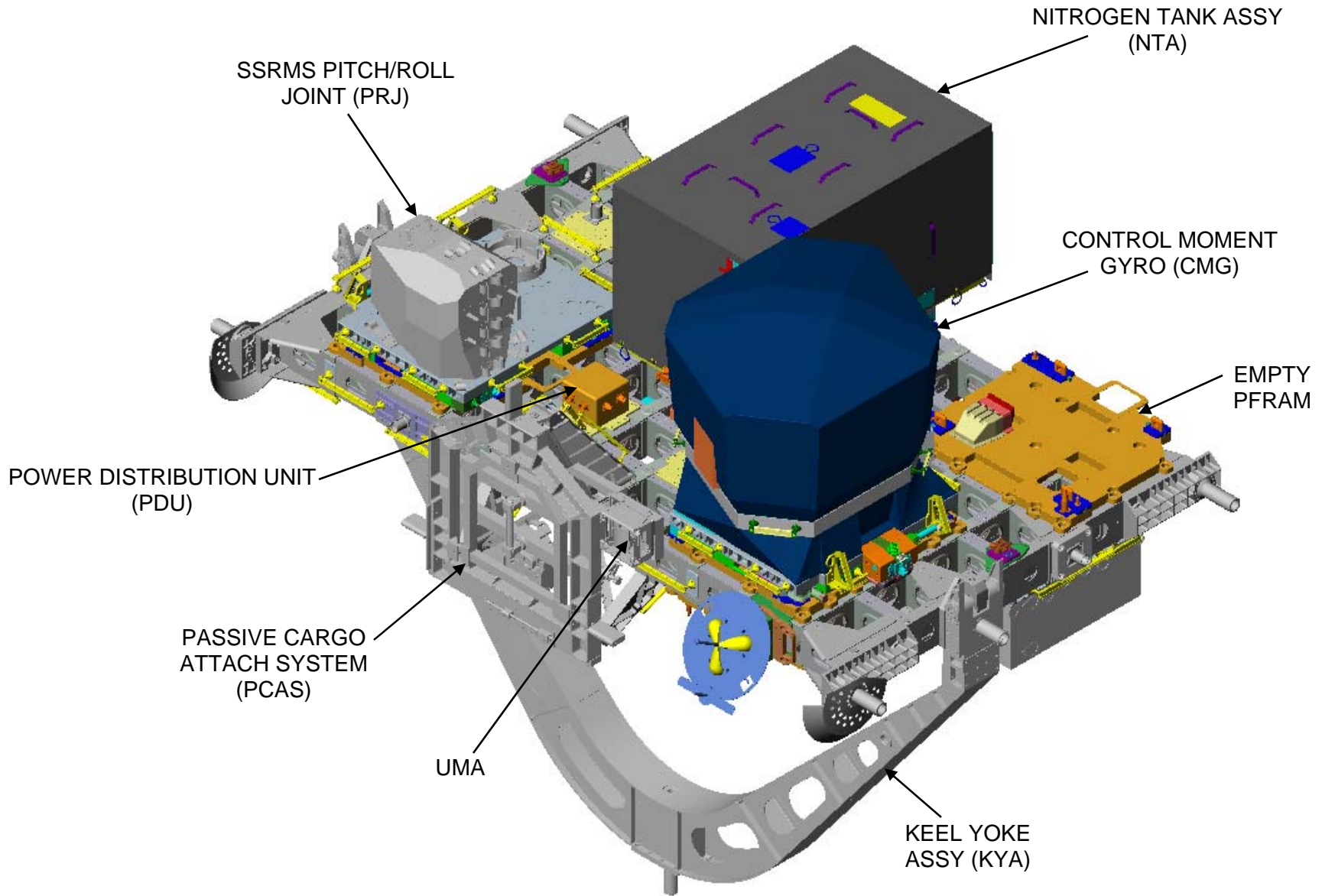
# S5 CAPTURE LATCH ASSEMBLY (CLA)



S5 CLA DRIVE BOLT



# ESP-3 PLB TOP VIEW

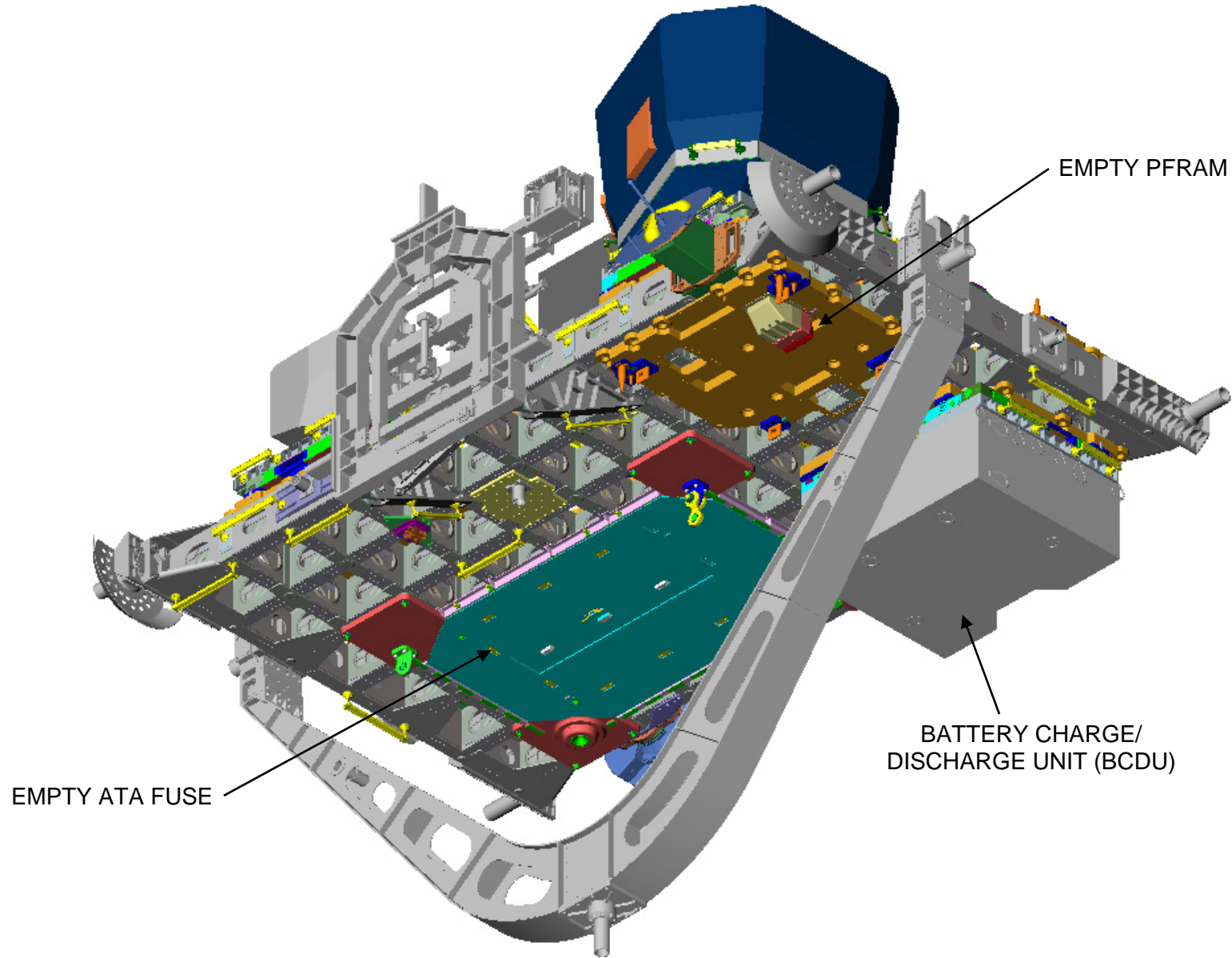


FS 18-11

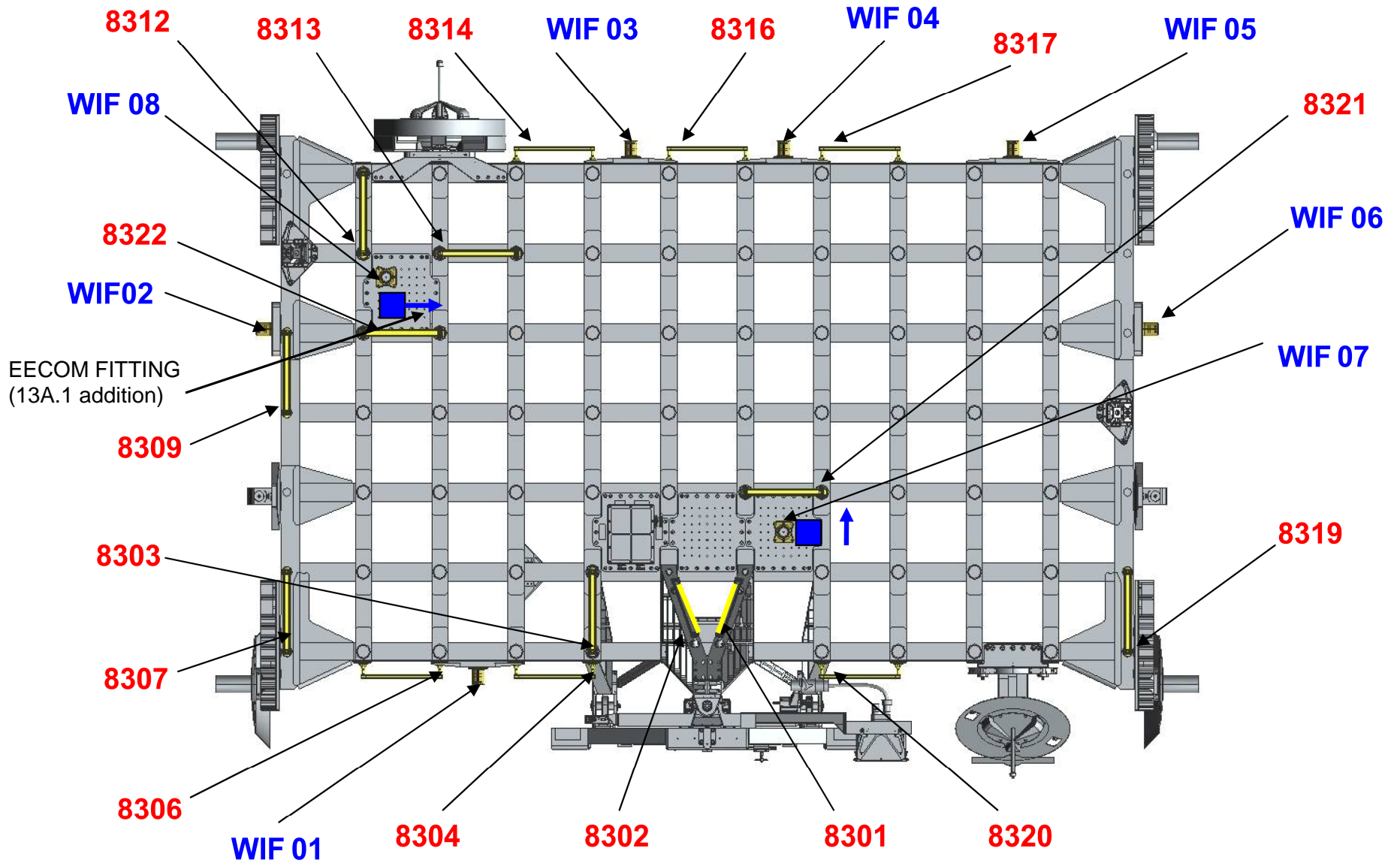
EVA/118/FIN A

ESP-3

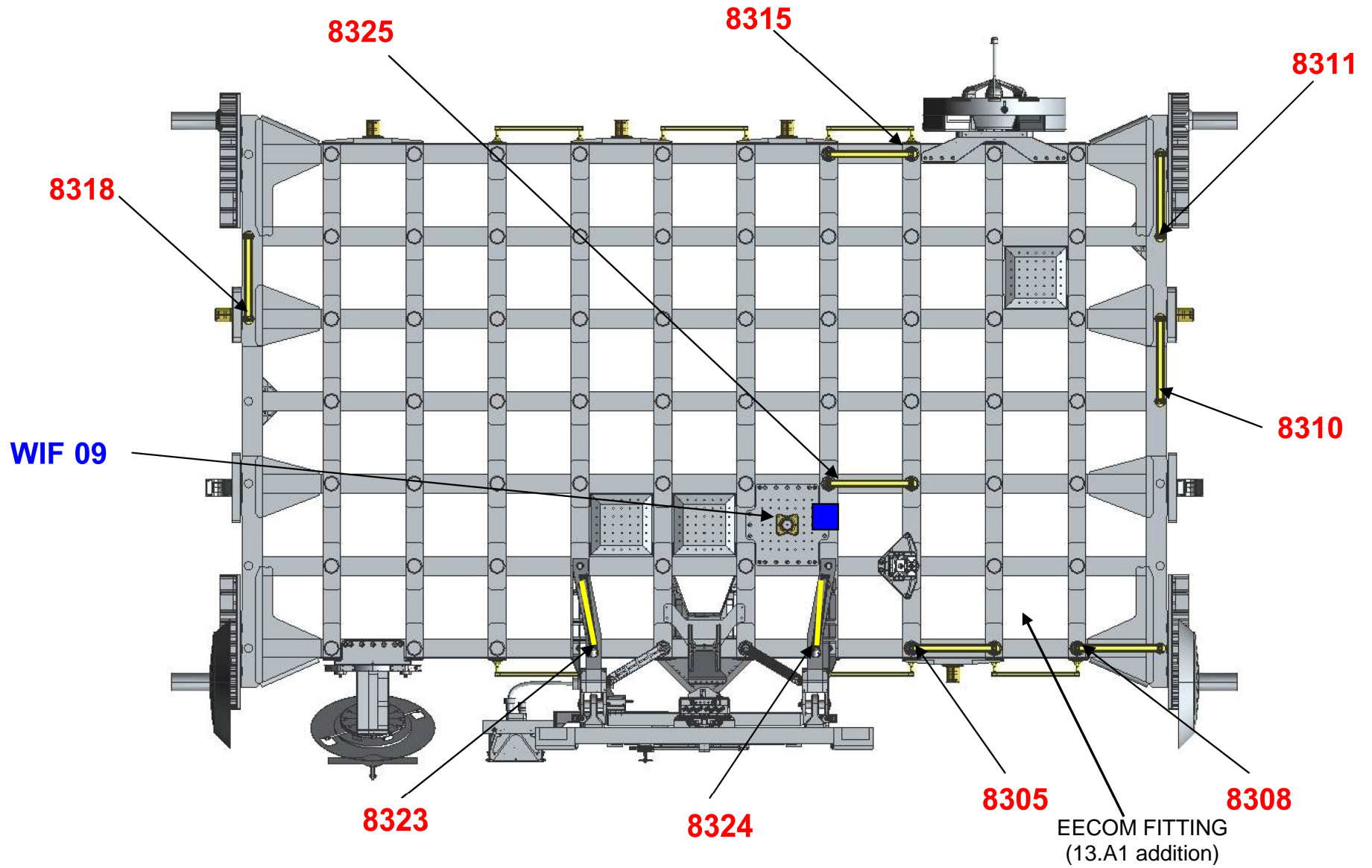
ESP-3 PLB BOTTOM VIEW



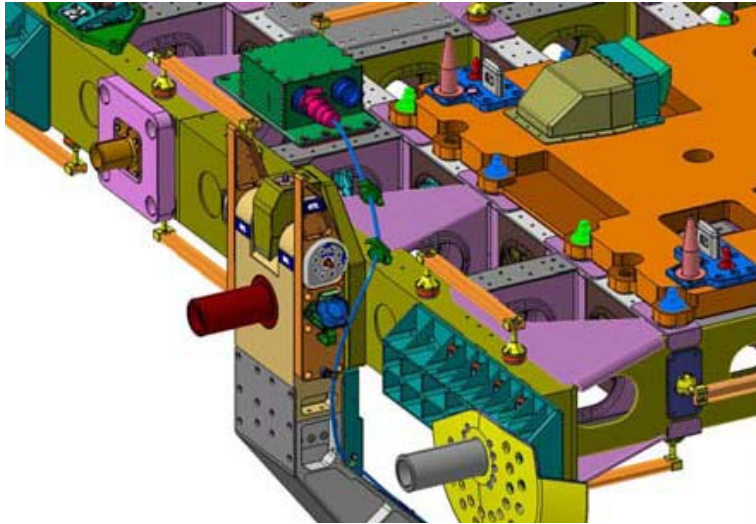
# ESP-3 HR AND WIF LOCATIONS (PORT)



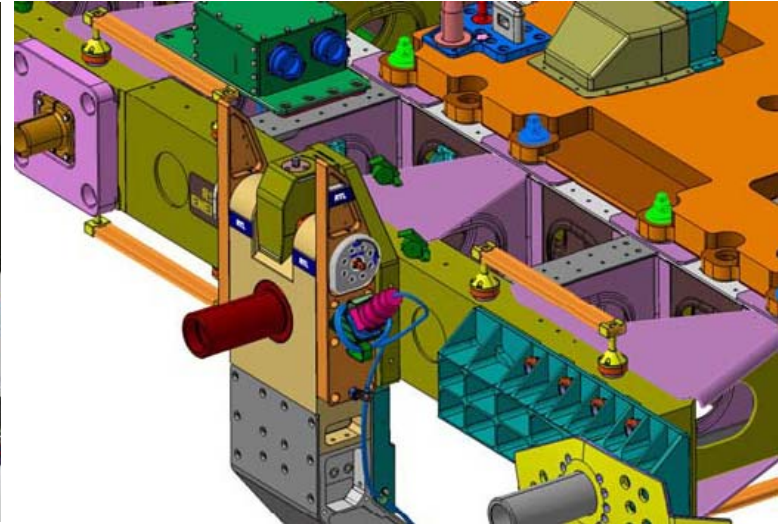
ESP-3 HR AND WIF LOCATIONS (STBD)



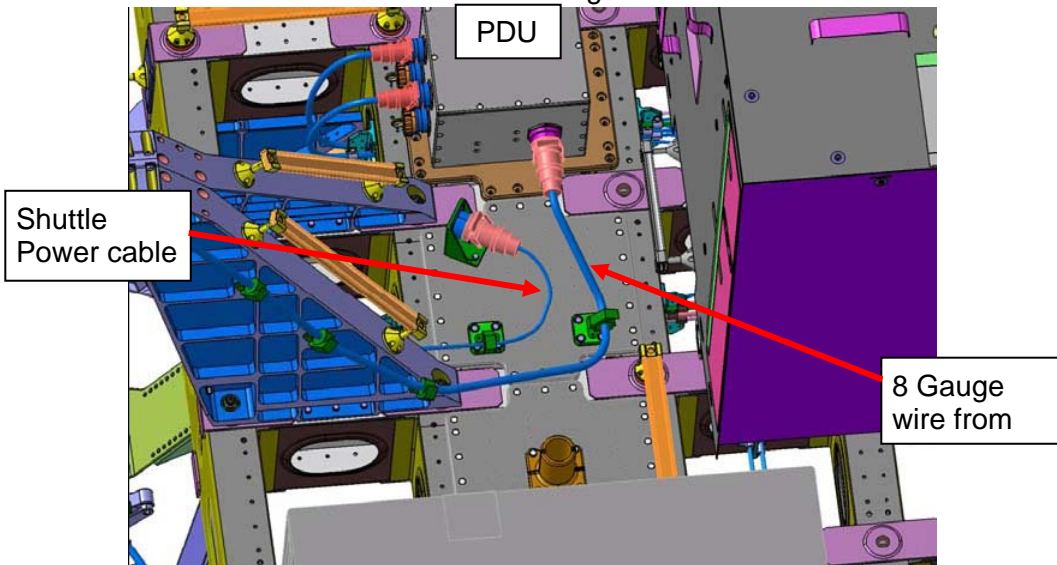
# ESP-3 POWER CABLE CONFIGURATIONS



ESP-3 Shuttle Power Cable P1 to J1 of Connector Box – Launch Config



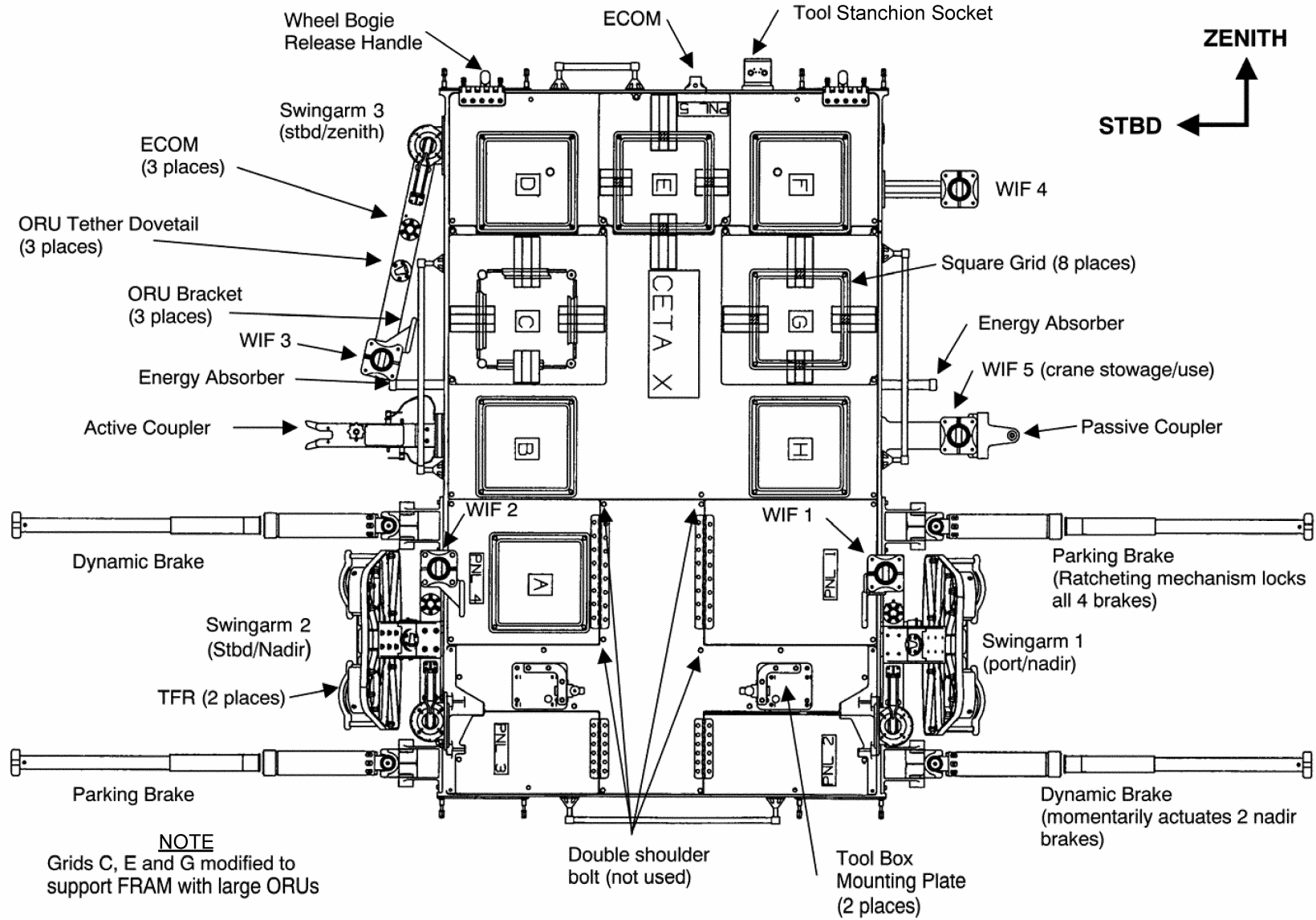
ESP-3 Shuttle Power Cable P1 to dummy receptacle of KYA – Landing Config



ESP-3 Shuttle Power Cable (P2) to Dummy receptacle near Power Distribution Box (PDU) and UMA Power Cable (P1) connected to J1 of PDU – On-Orbit Config

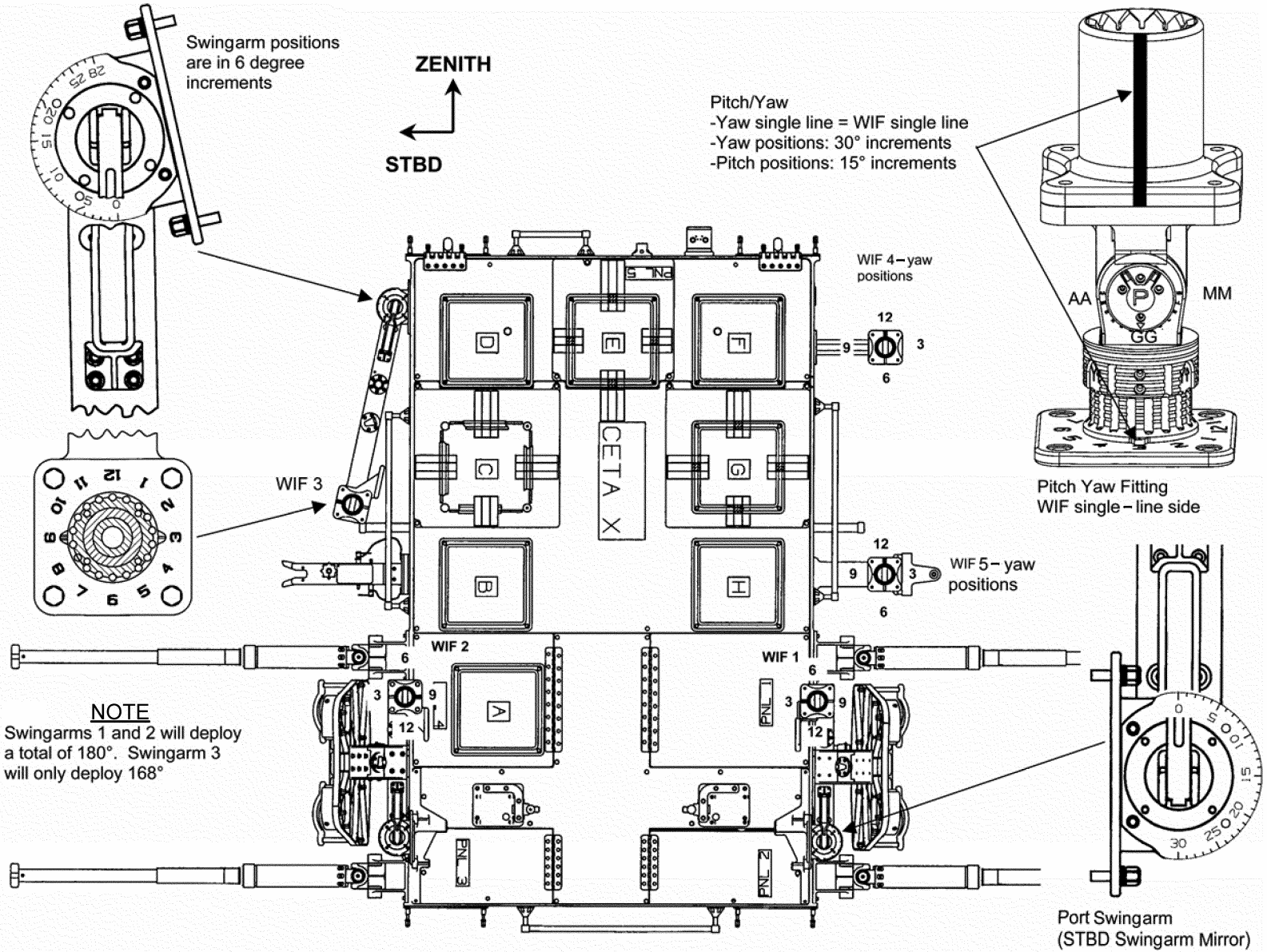


CETA CART – TOP VIEW

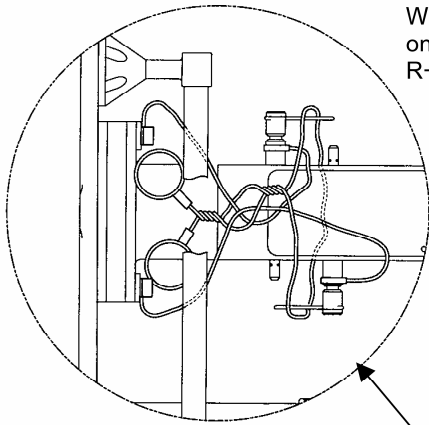




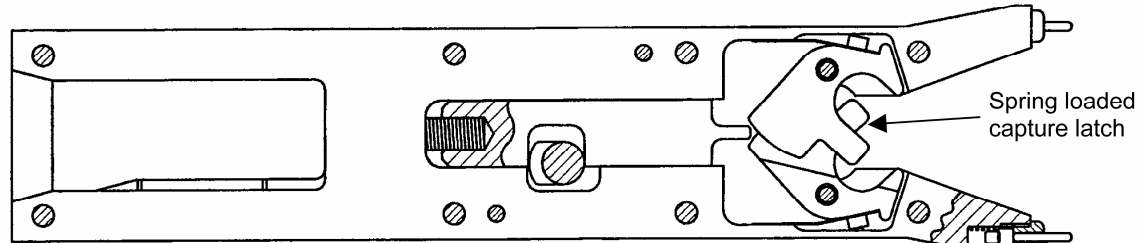
# CETA SWINGARM AND WIF MARKINGS



# CETA CART COUPLERS



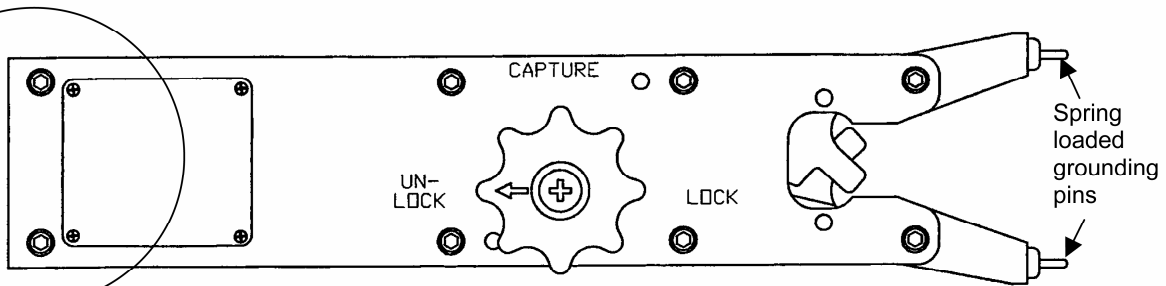
Wire ties required for launch only. Removed for coupler R+R



**BOTTOM VIEW**

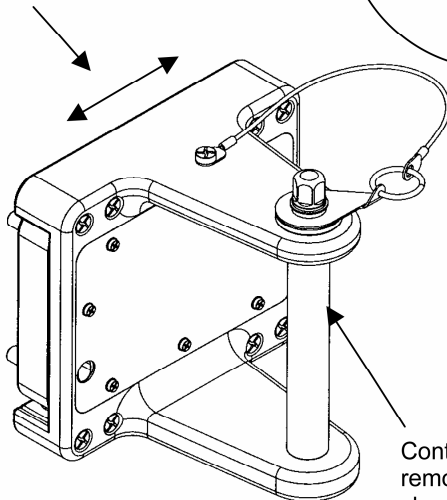
Spring loaded capture latch

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



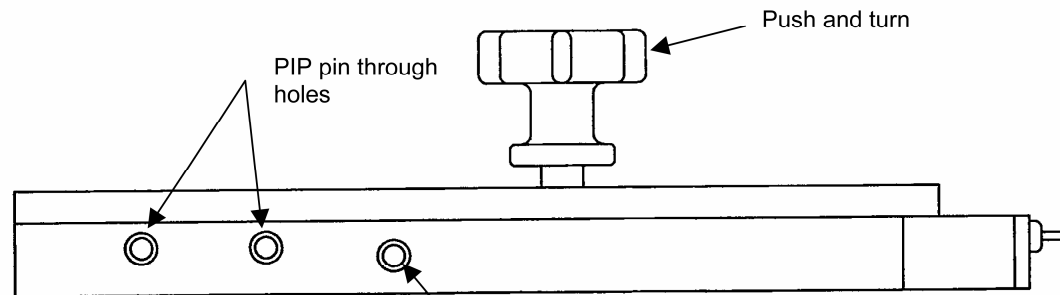
**TOP VIEW**

Spring loaded grounding pins



**PASSIVE COUPLER**

Contingency bolt removed if latch failed closed



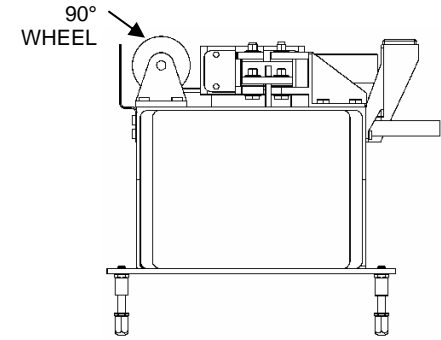
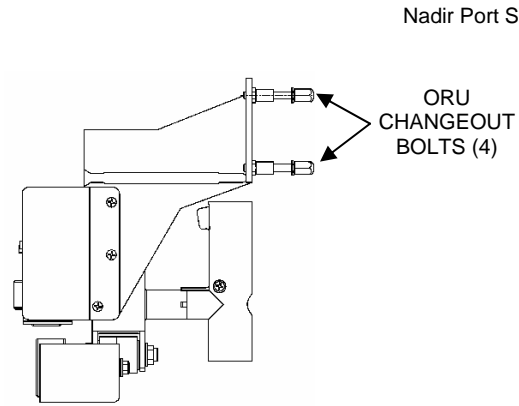
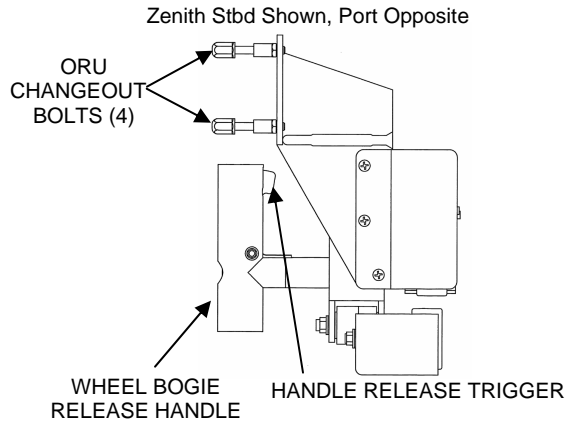
**SIDE VIEW**

PIP pin through holes

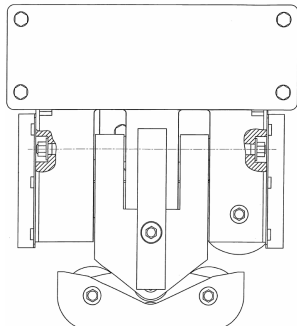
Push and turn

Threaded bolt hole not used

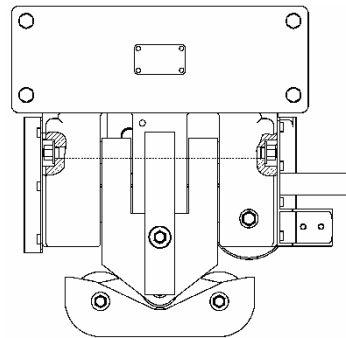
# CETA CART WHEEL BOGIES



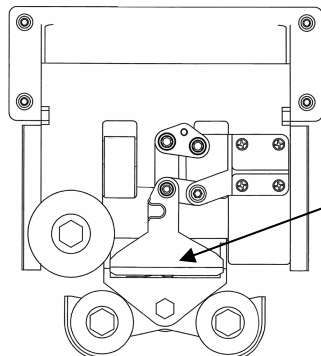
**TOP VIEW**



**OUTBOARD SIDE**

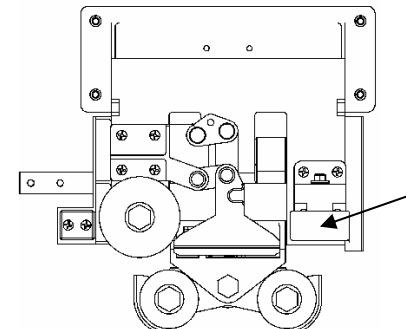


**OUTBOARD SIDE**



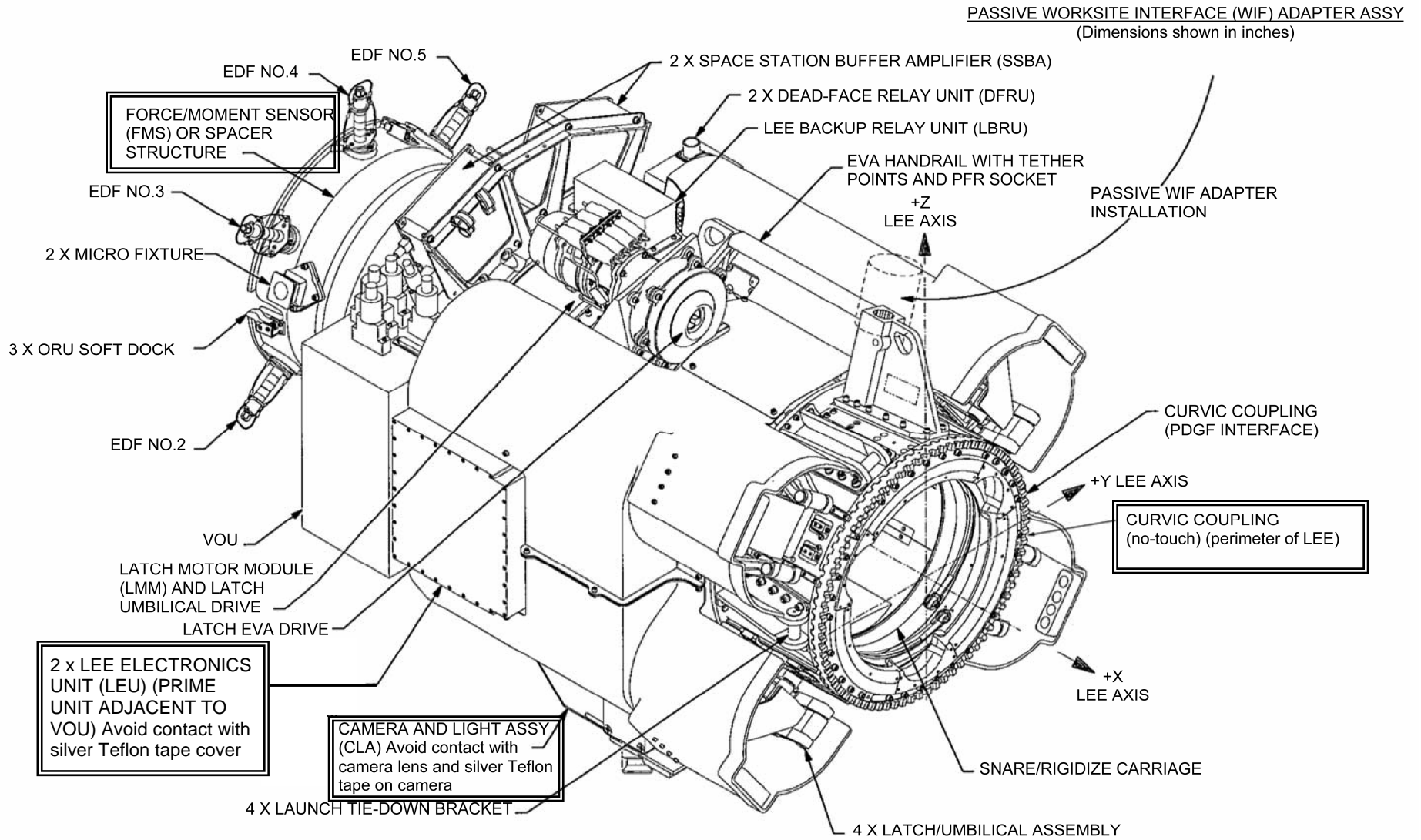
**INBOARD SIDE**

BRAKE PAD



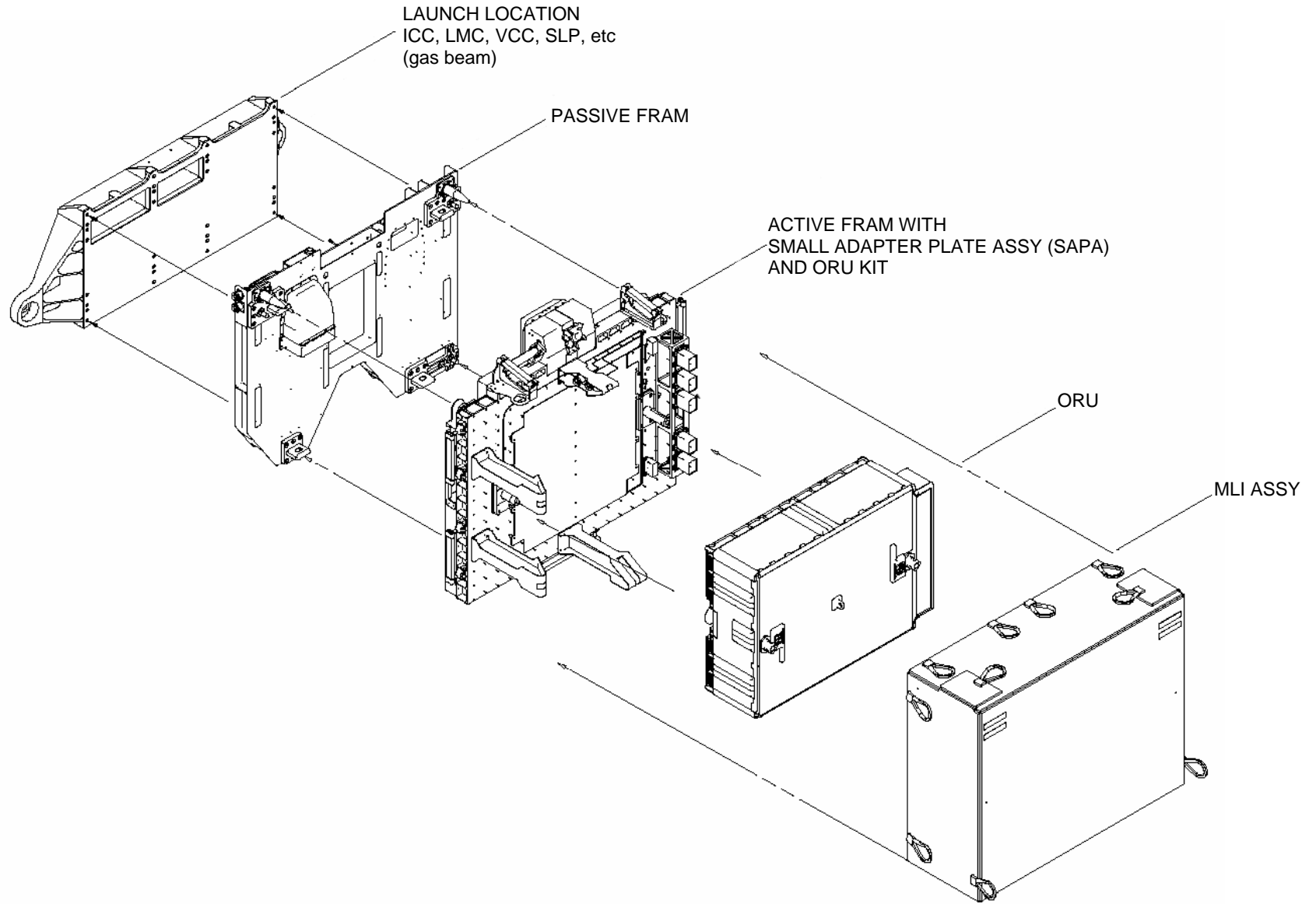
**INBOARD SIDE**

**LATCHING END EFFECTOR (LEE)**



LATCHING END EFFECTOR (LEE) (2 places)  
(Cables and thermal blankets not shown for clarity)

# FRAM/FSE/ORU ASSEMBLY



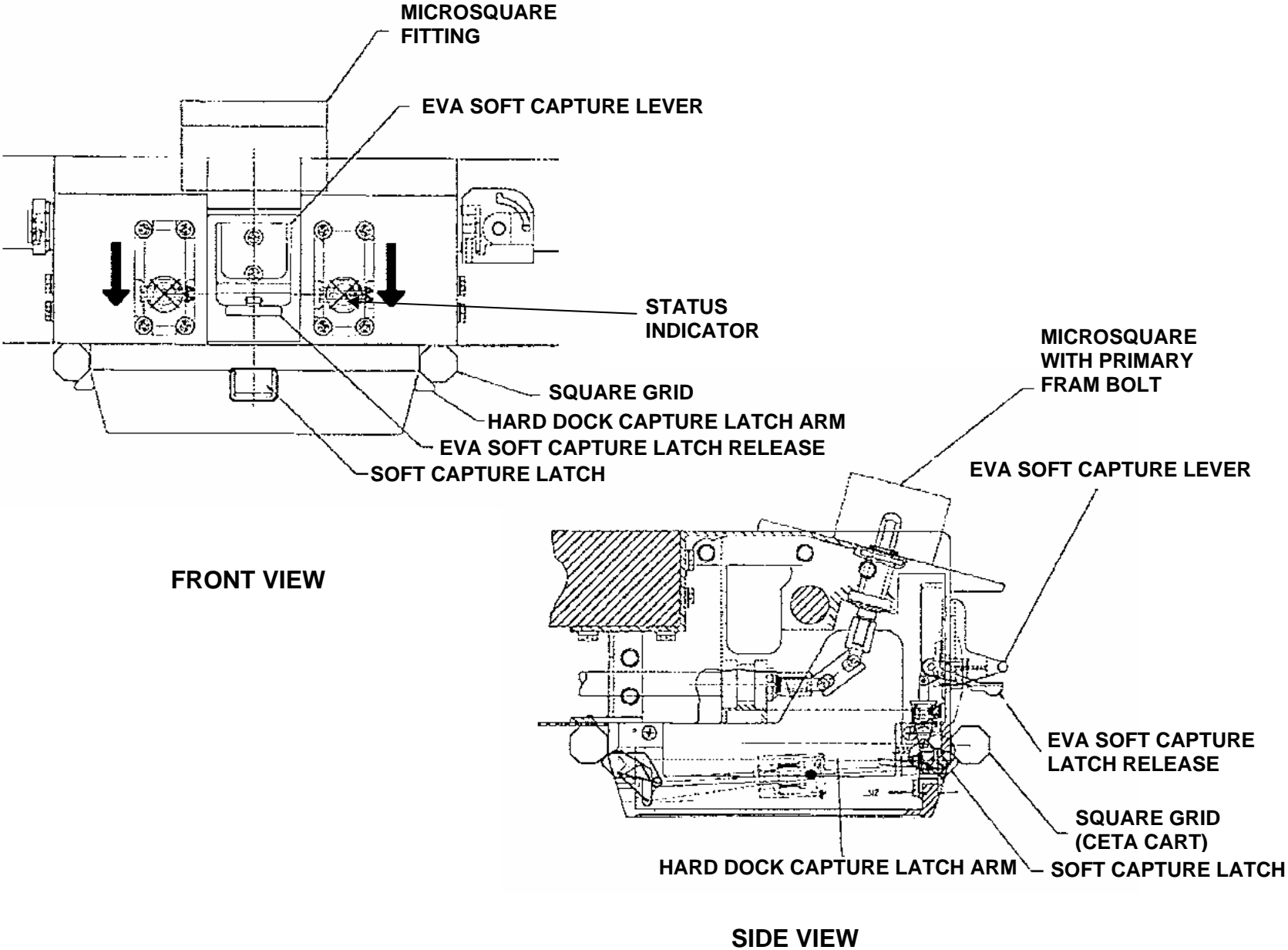
FS 18-21

EVA/118/FIN A

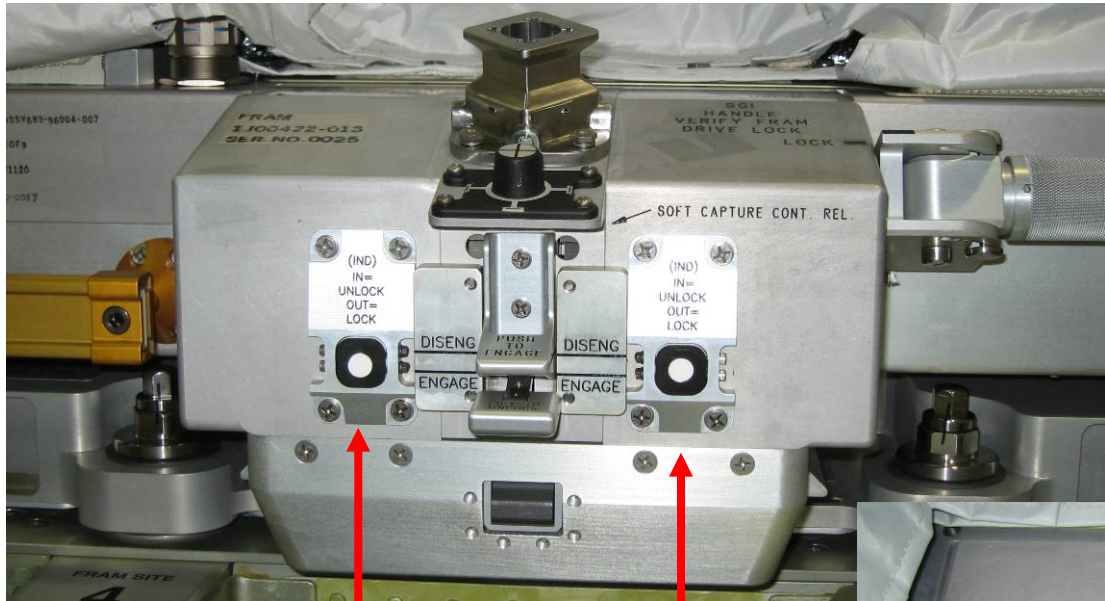
**FRAM**

FRAM

ACTIVE FRAM SOFT CAPTURE MECHANISM

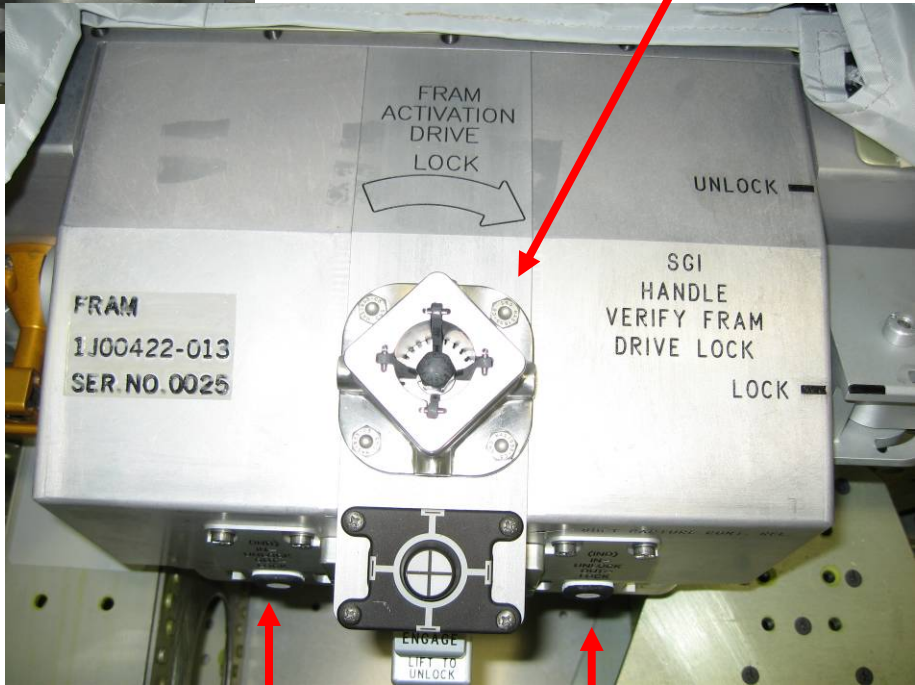


# ACTIVE FRAM SOFT CAPTURE MECHANISM (Cont)

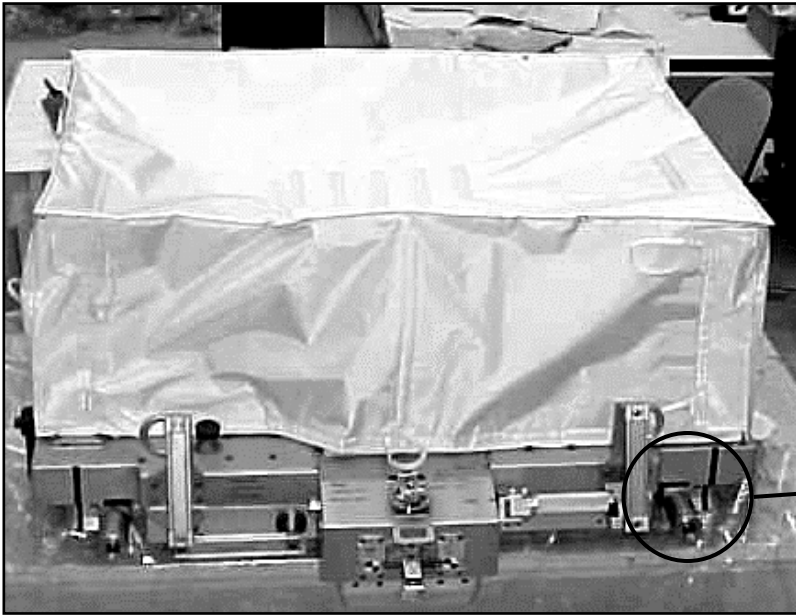


Status Indicators  
(White edge  
indicates locked)

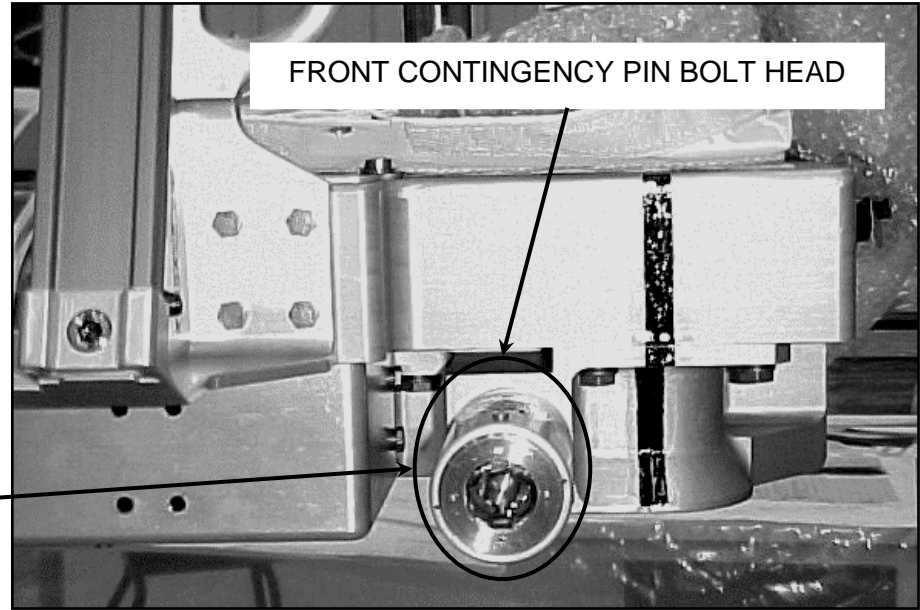
Primary bolt (with  
anti-rotation device)



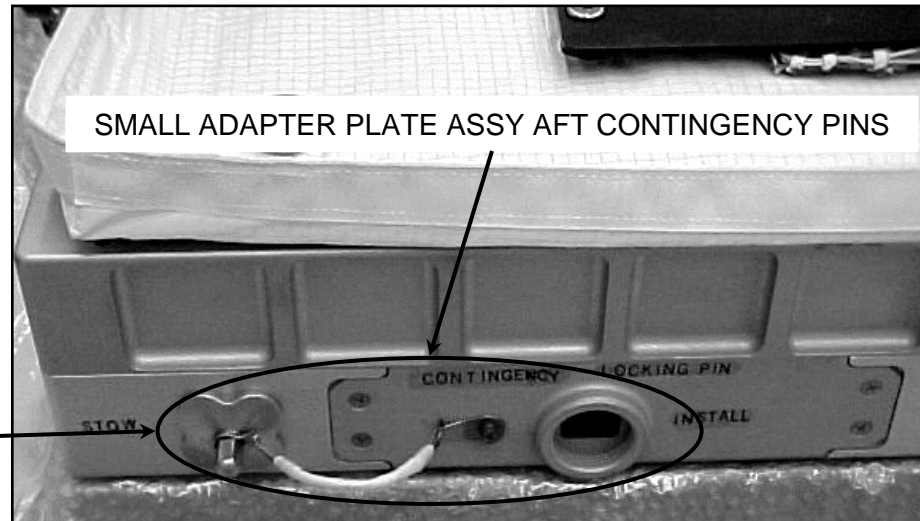
# FRAM CONTINGENCY BOLTS – SAPA



FWD CONTINGENCY BOLT (2)

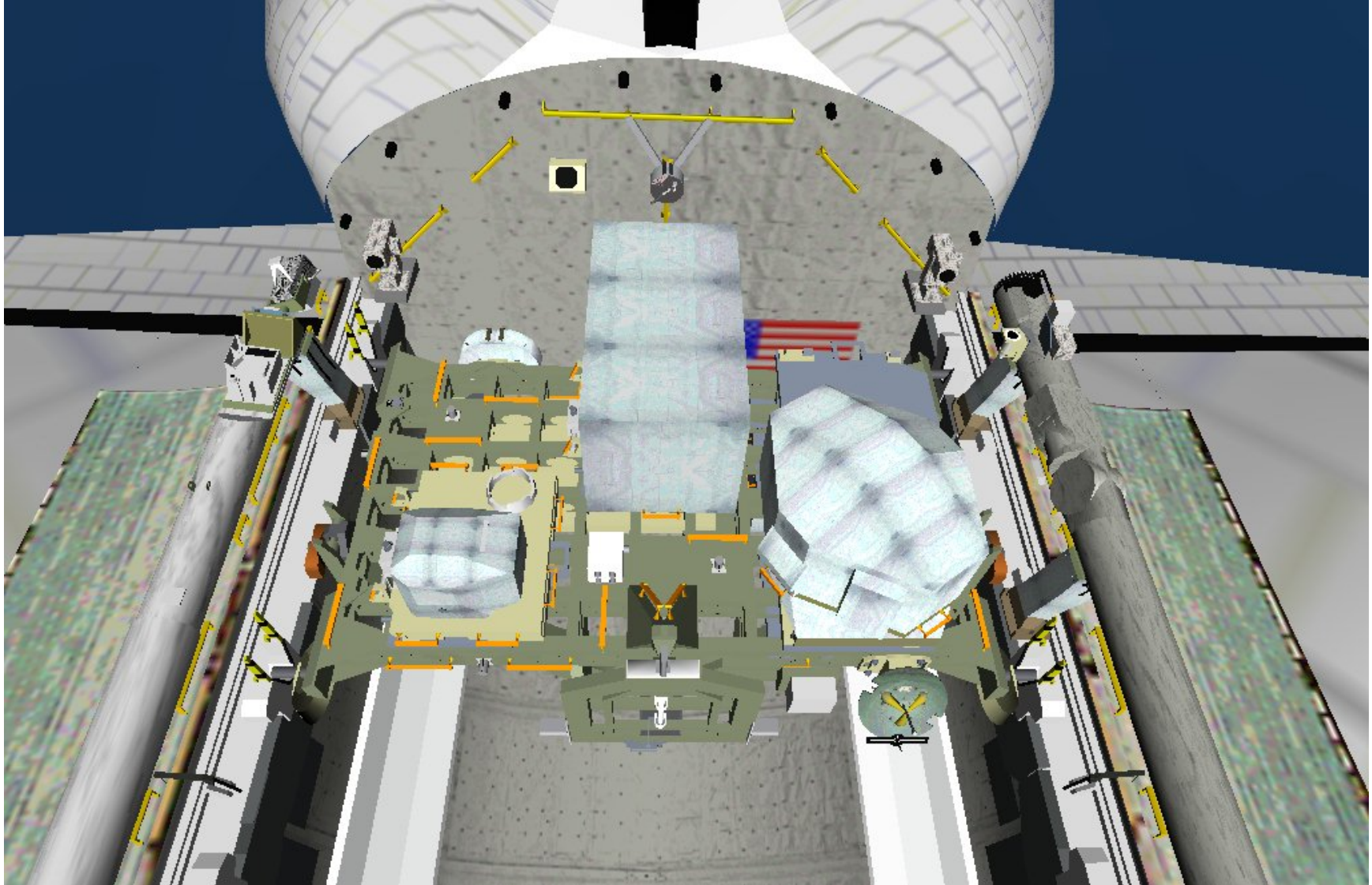


AFT CONTINGENCY BOLT (2)





**ESP-3 WITH CMG**



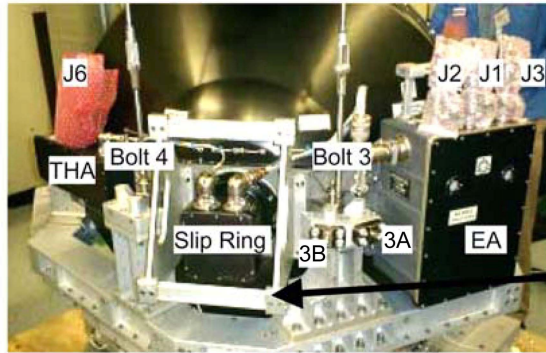
FS 18-25

EVA/118/FIN A

**CMG**

# CMG

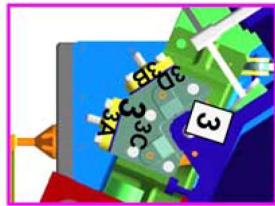
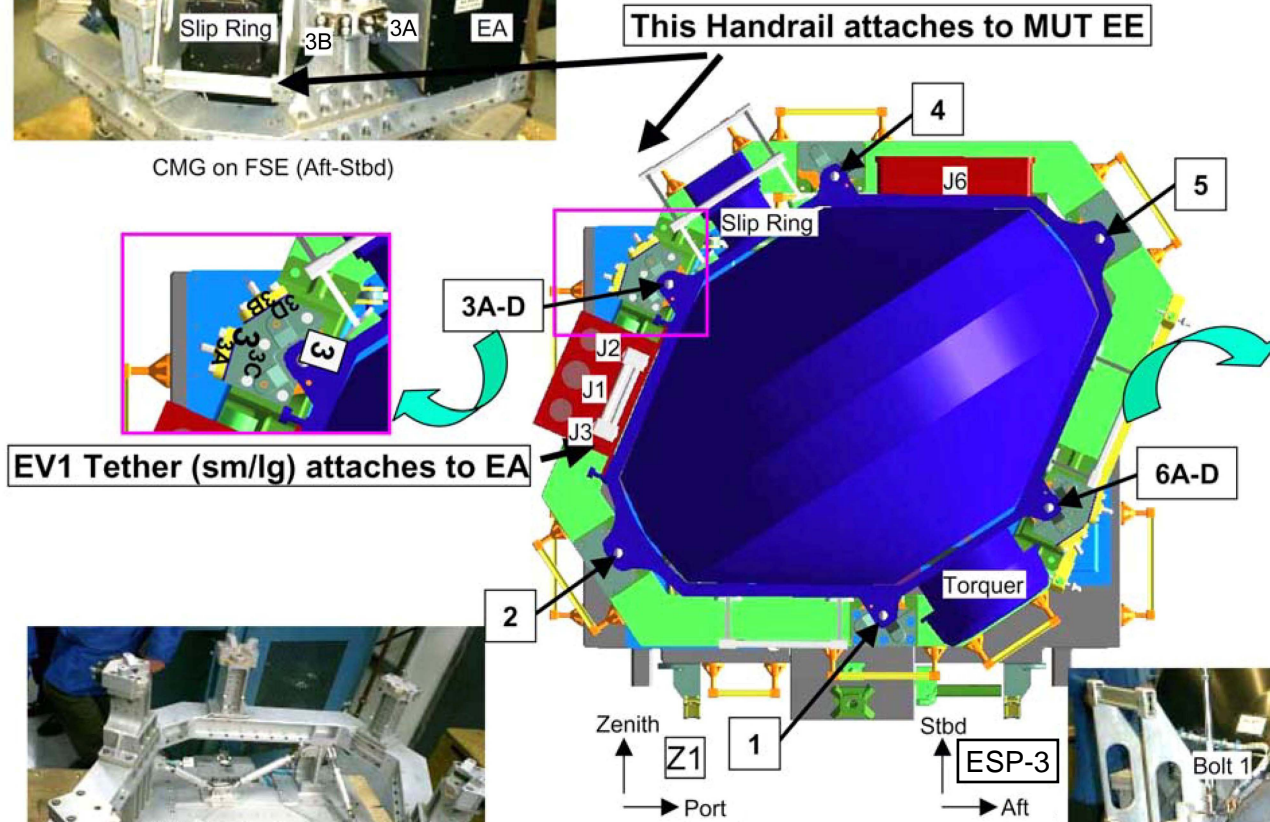
## CMG NOMENCLATURE



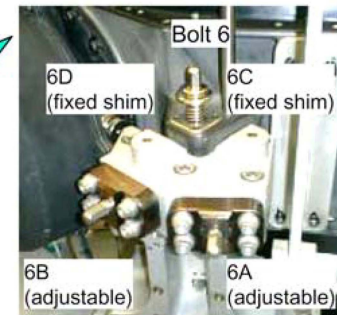
CMG on FSE (Aft-Stbd)



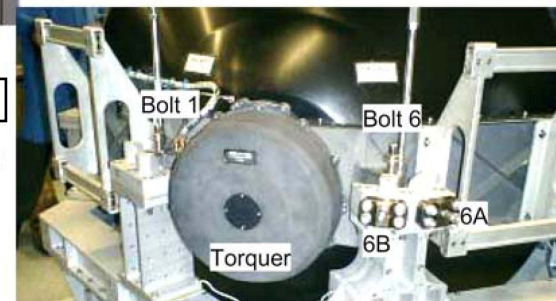
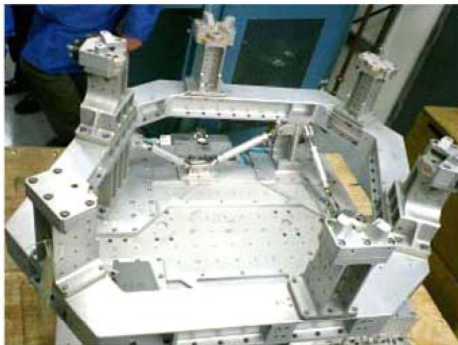
Simulated CCTV B view  
(From orbiter Aft-Port looking Stbd)



EV1 Tether (sm/lg) attaches to EA



Bolt 6  
6D (fixed shim) 6C (fixed shim)  
6B (adjustable) 6A (adjustable)

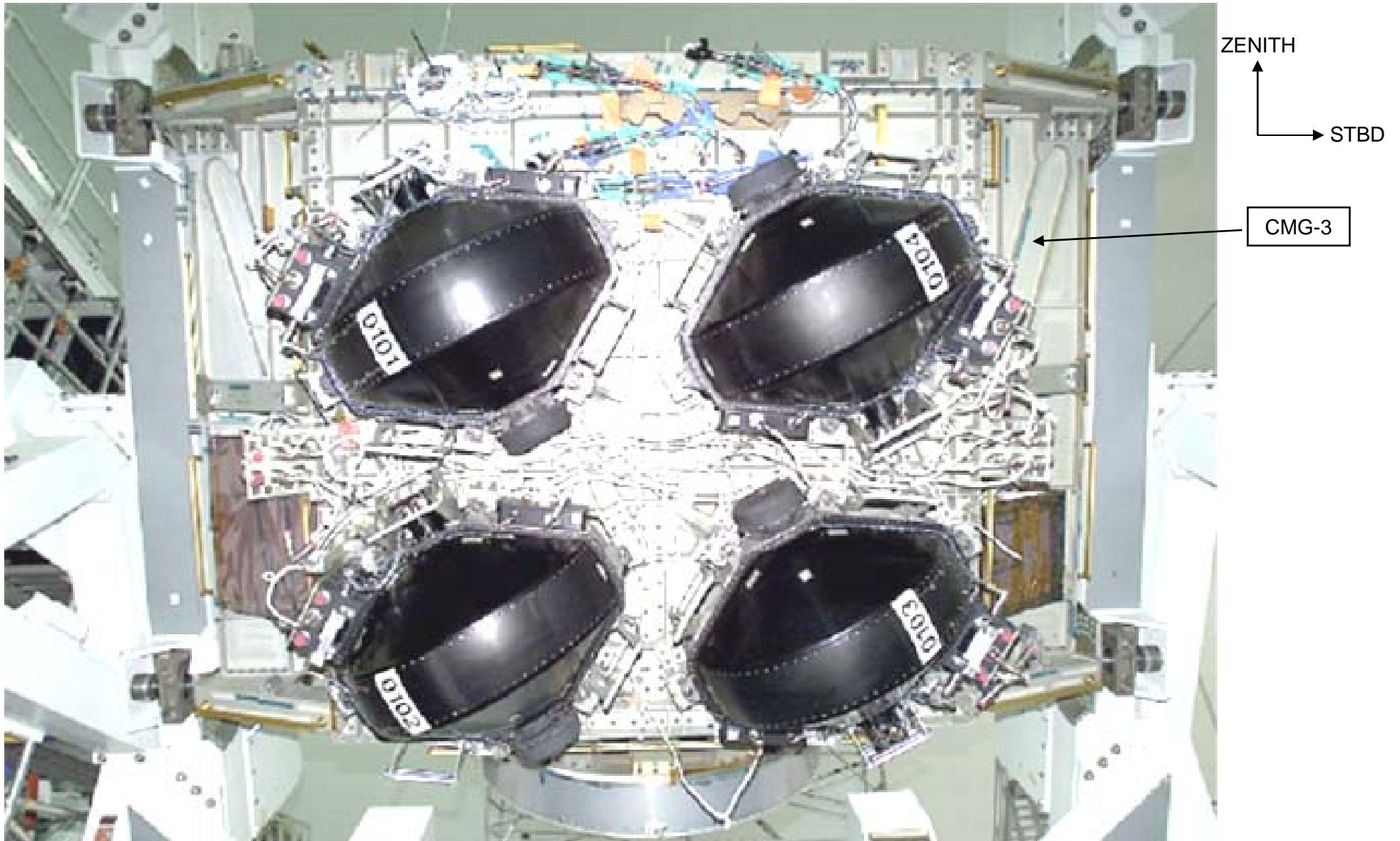


CMG on FSE (Fwd-Port)

AFT Z1 PRE-LAUNCH WITH BLANKET



CMG ON Z1



CMG SHIMS AT Z1



**BLANKET CLOSED ON CMG IN FSE**

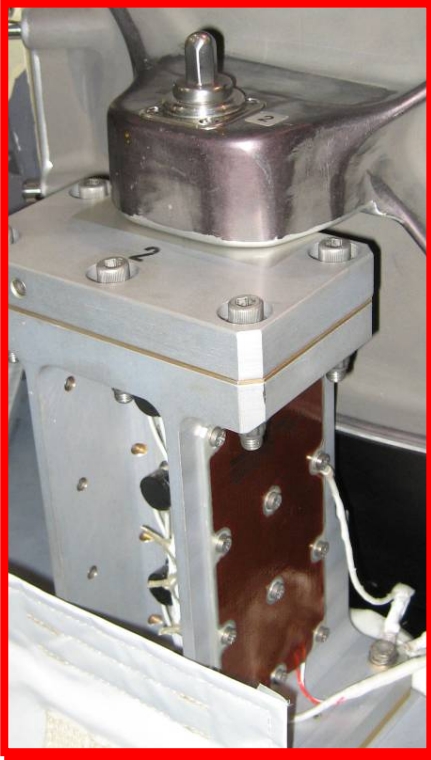


**NEW CMG WITH BLANKET**



**NEW CMG FSE HEATERS**

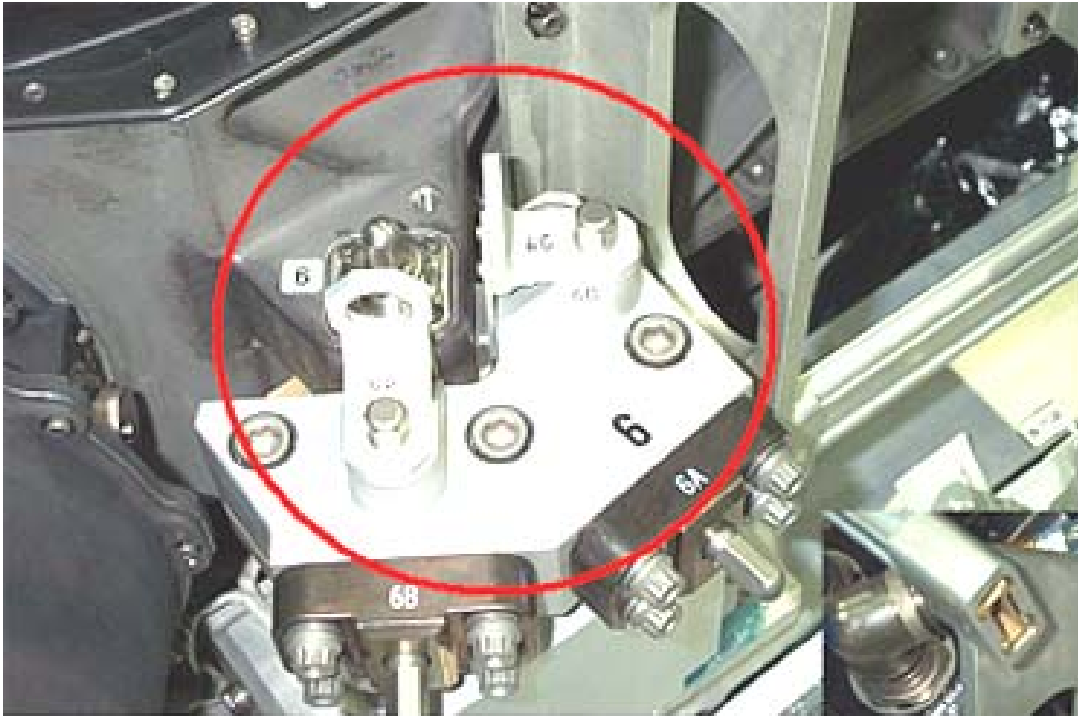
CMG FSE Heater  
(bolt 2)



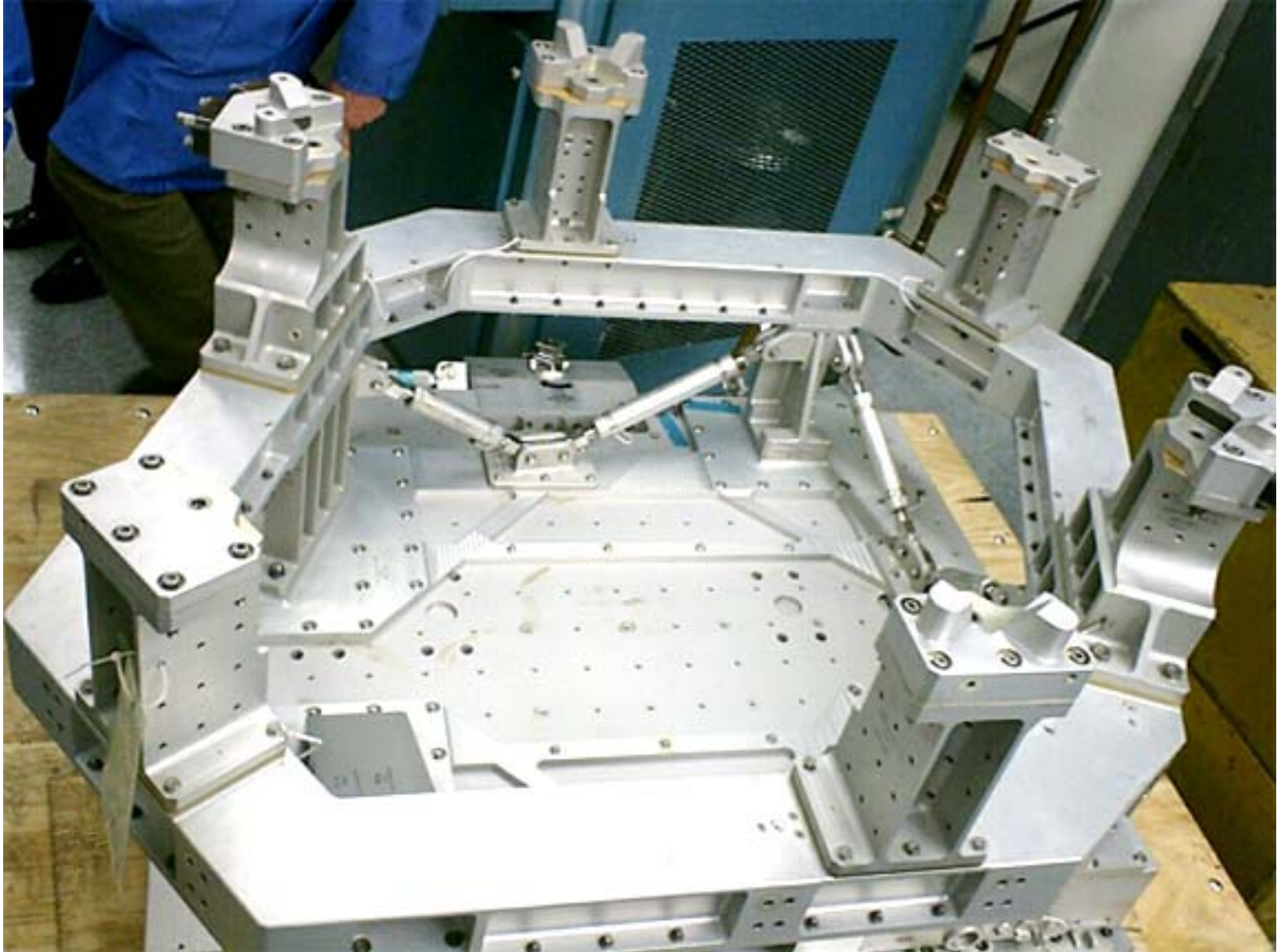
**NOTE**  
There are two heater pads  
on each FSE stanchion



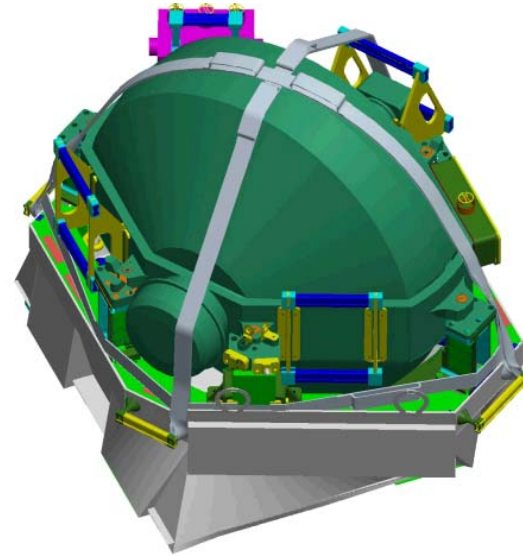
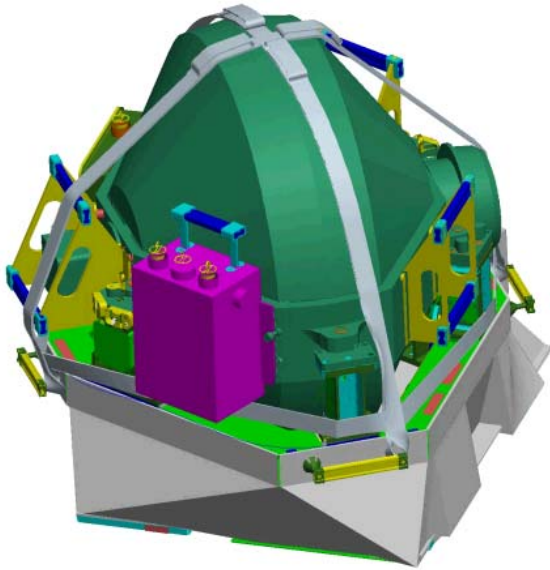
CMG SHIMS ON FSE



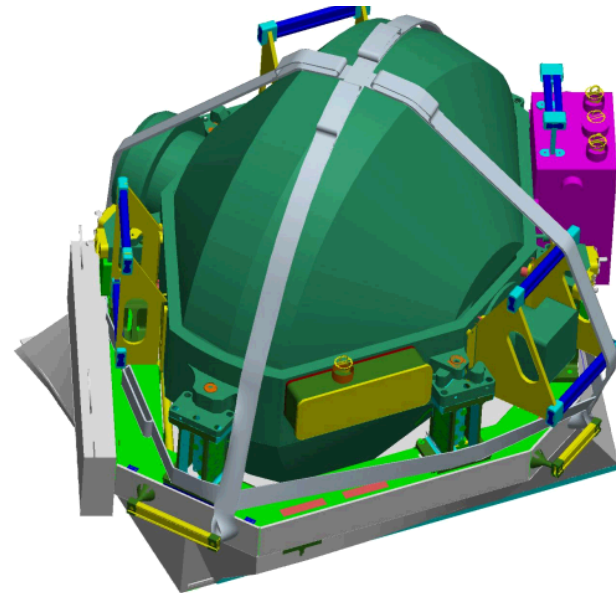
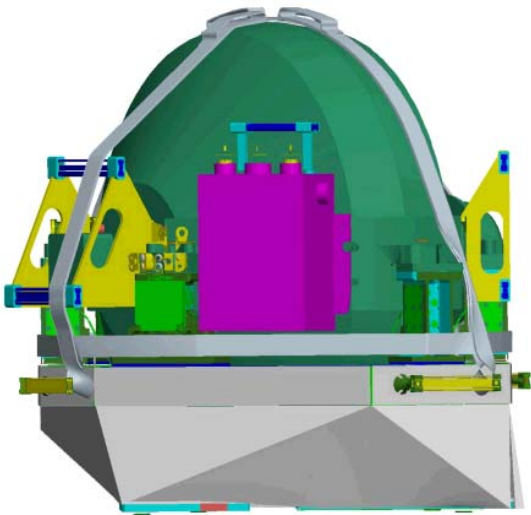
CMG FSE WITHOUT MLI OR CMG



# CMG MLI STRAPS



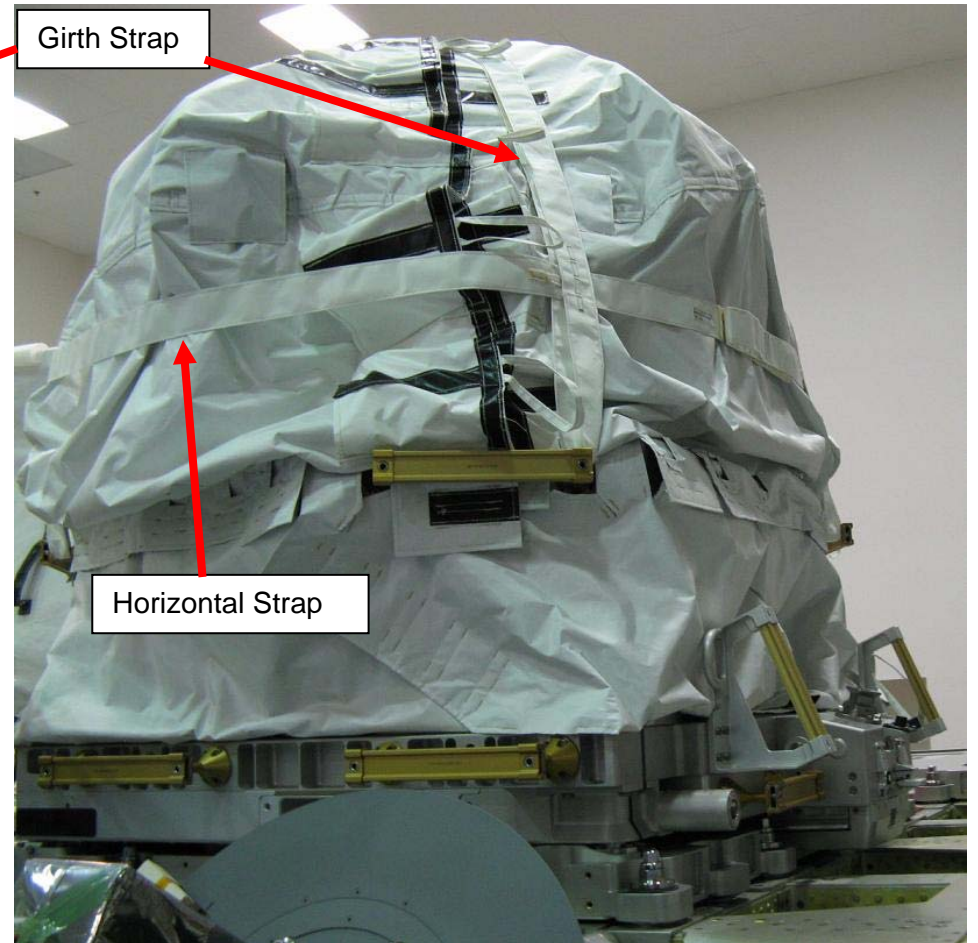
MLI not shown



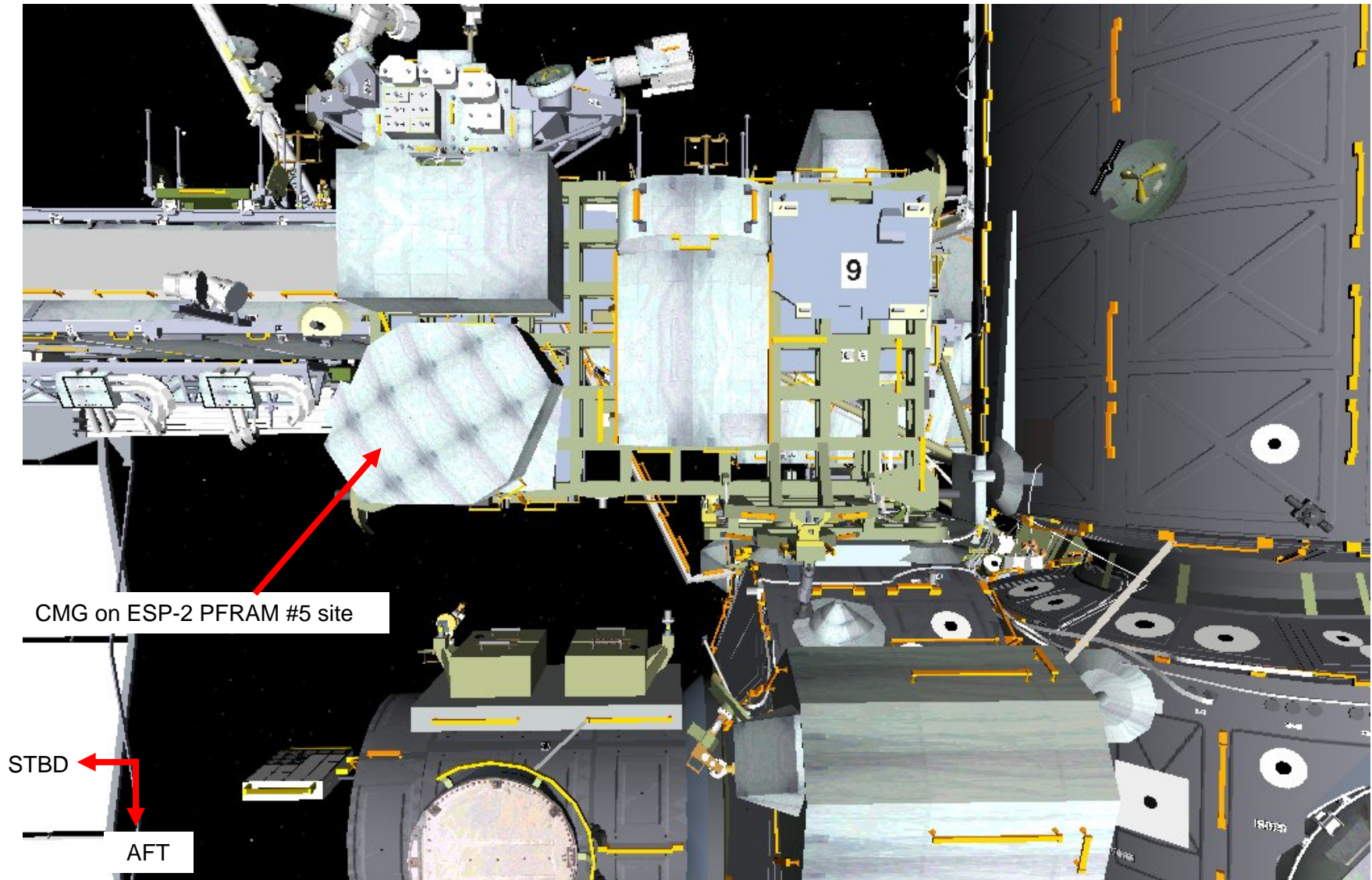
FS 18-35

EVA/118/FIN A

## CMG MLI STRAPS (Cont)

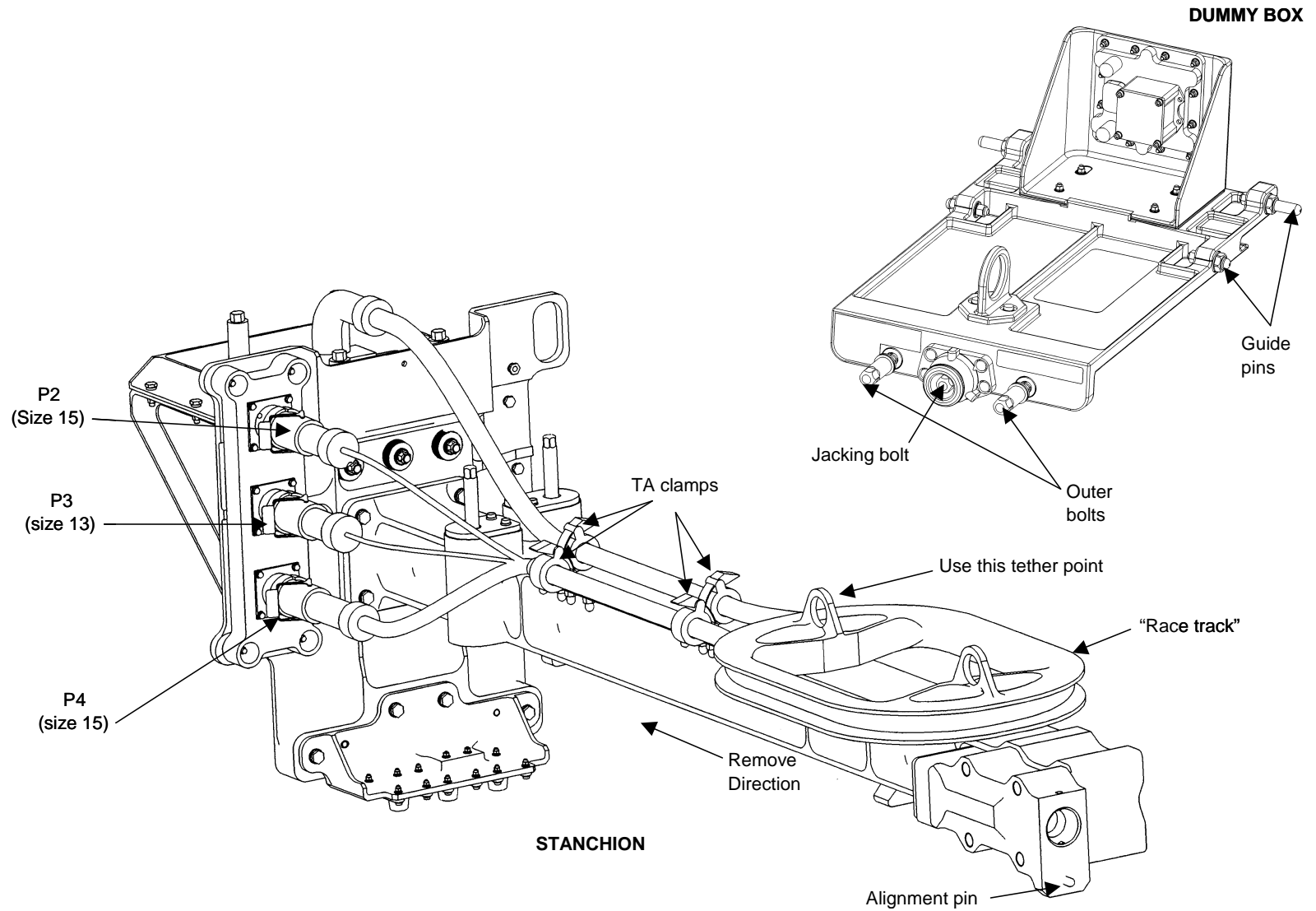


# CMG FRAM ON ESP-2

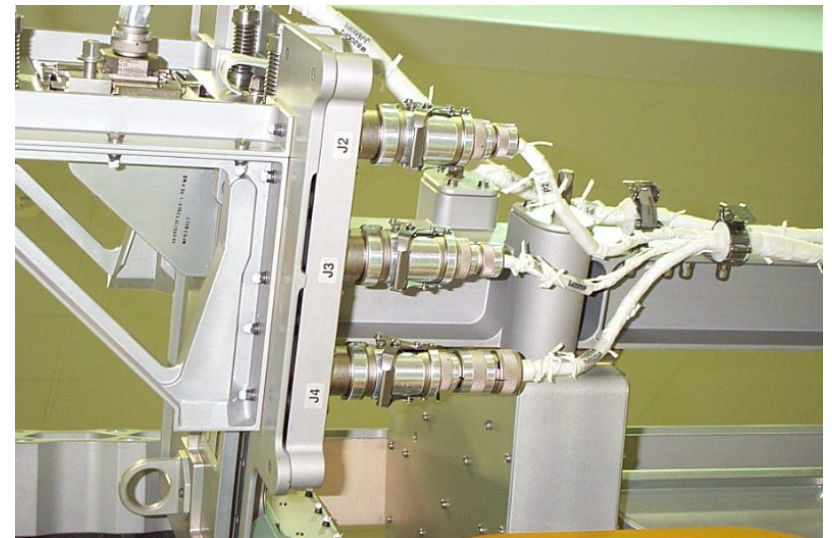
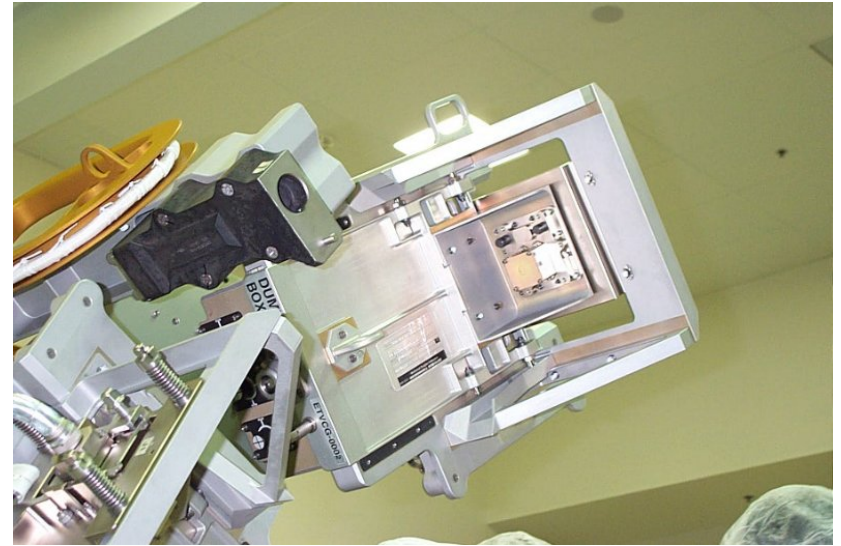


ESP-2 view looking zenith

VSSA LINE DRAWINGS



# VSSA PICTURES

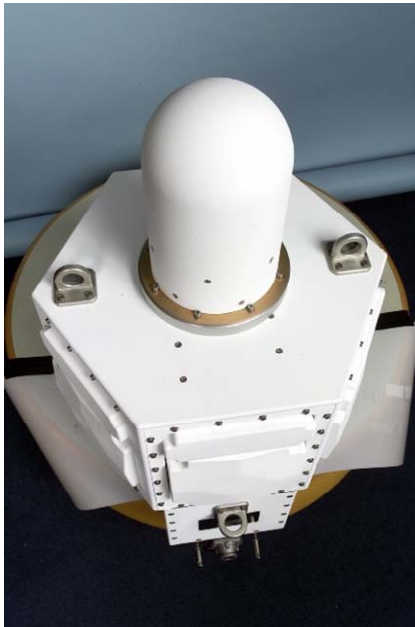


# WETA ASSY AND S3 CP1 INSTALL BRACKET





# WETA ASSY AND S3 CP1 INSTALL BRACKET (Cont)

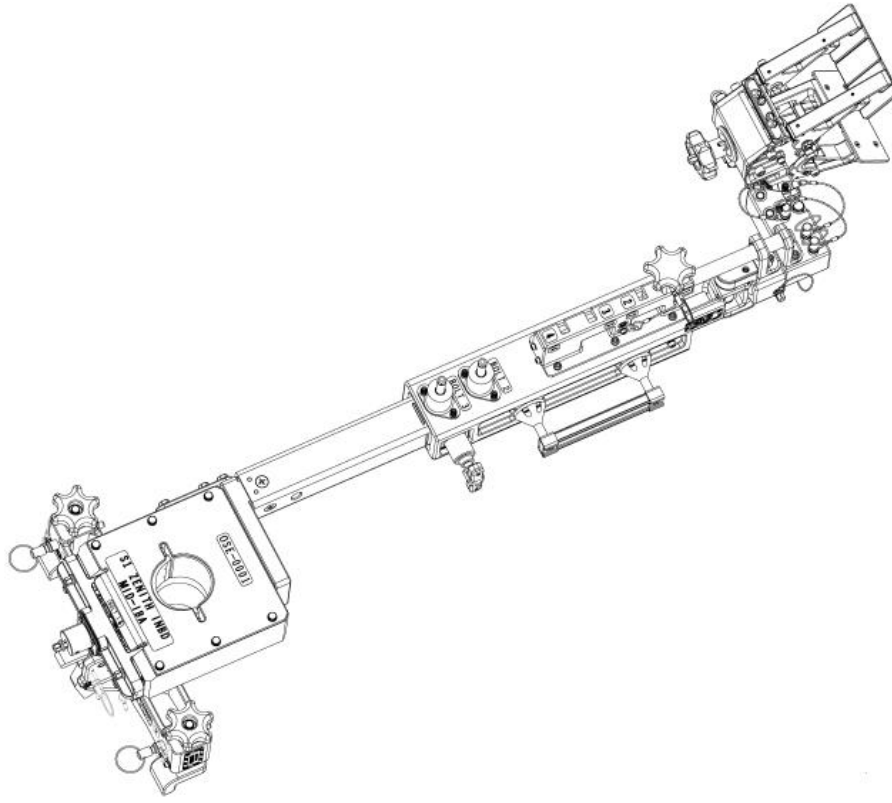


FS 18-41

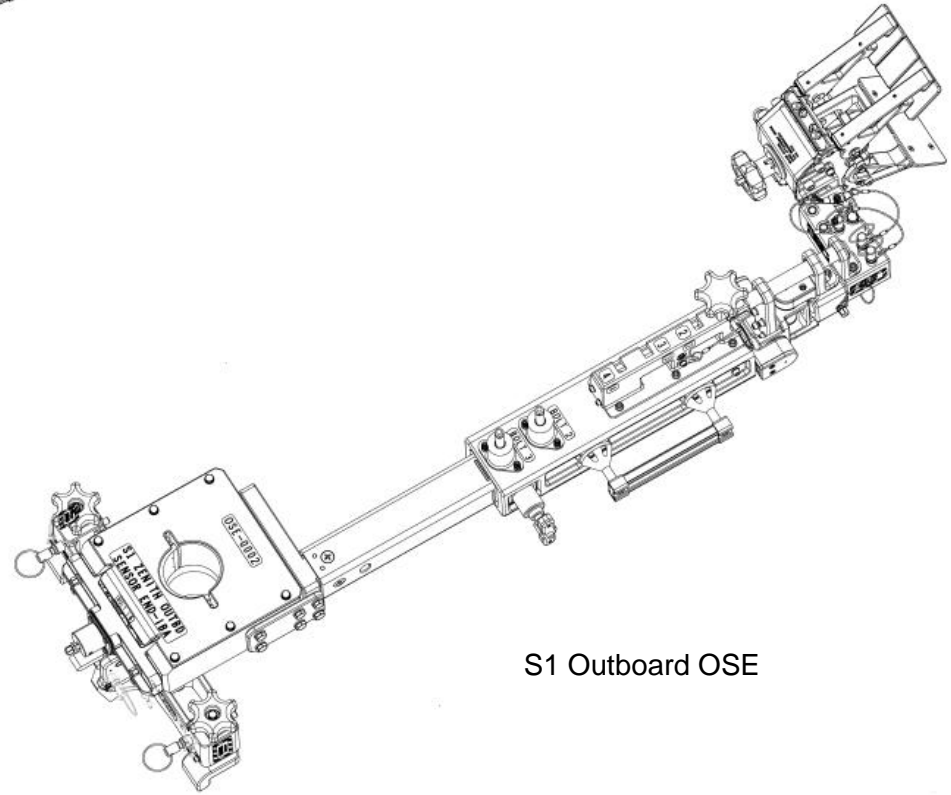
EVA/118/FIN A

OBSS OSE

OSE

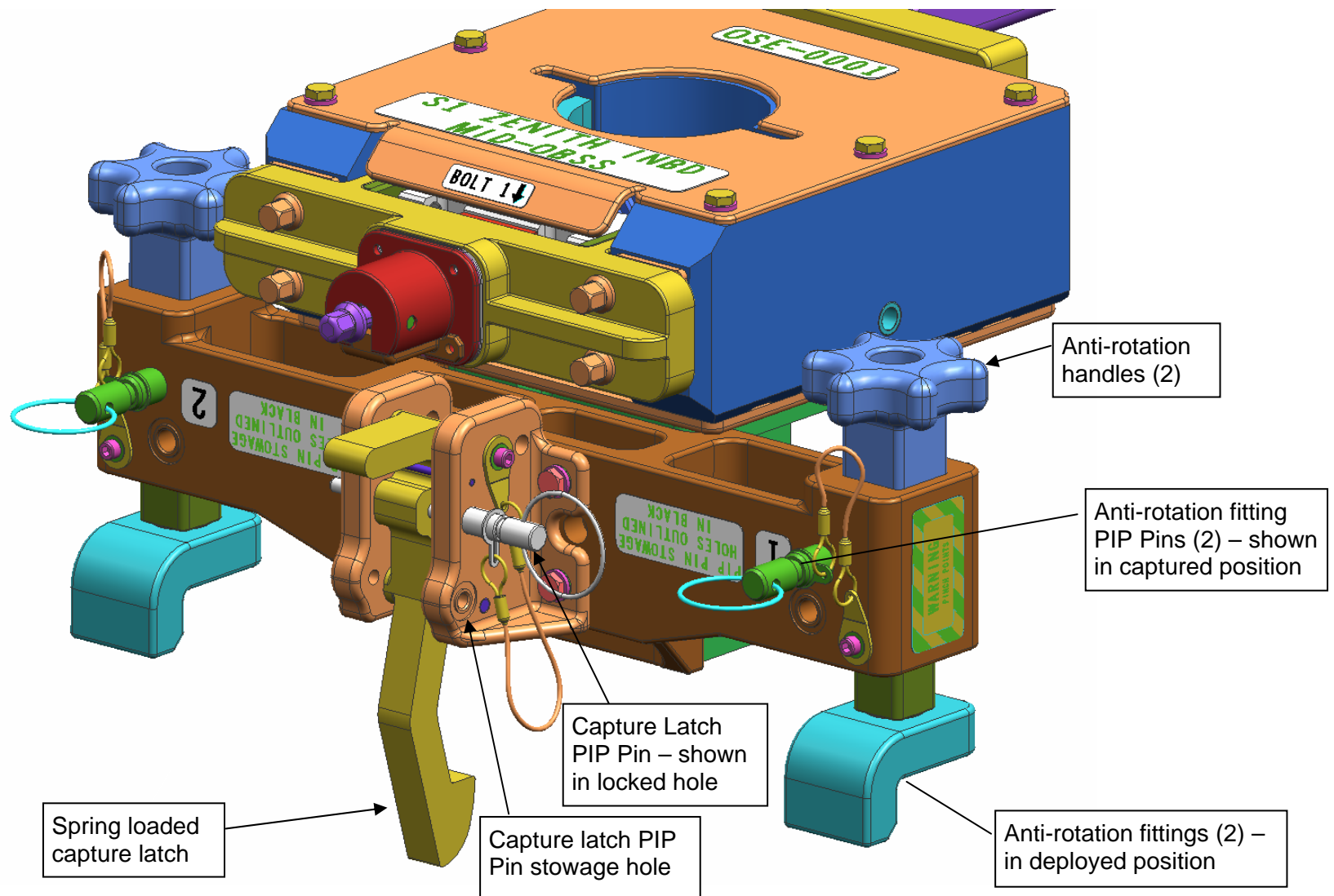


S1 Inboard OSE

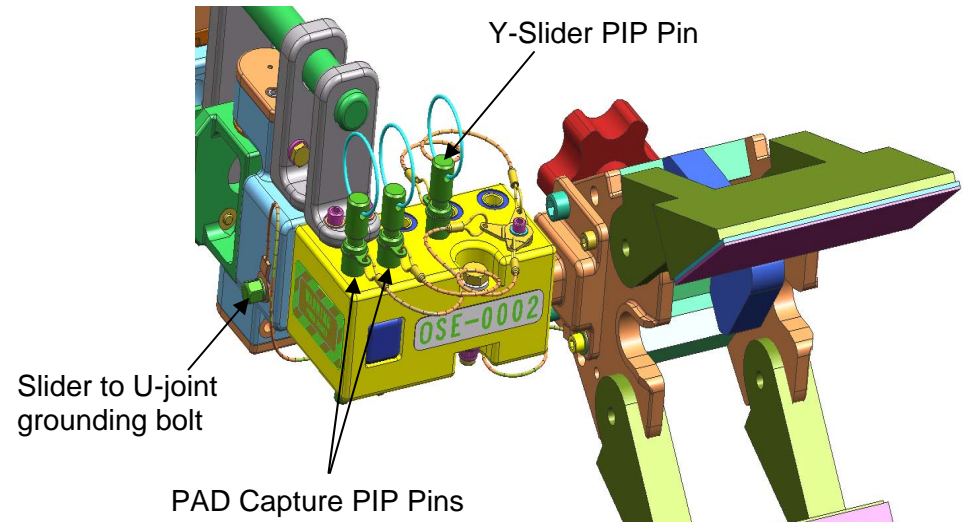
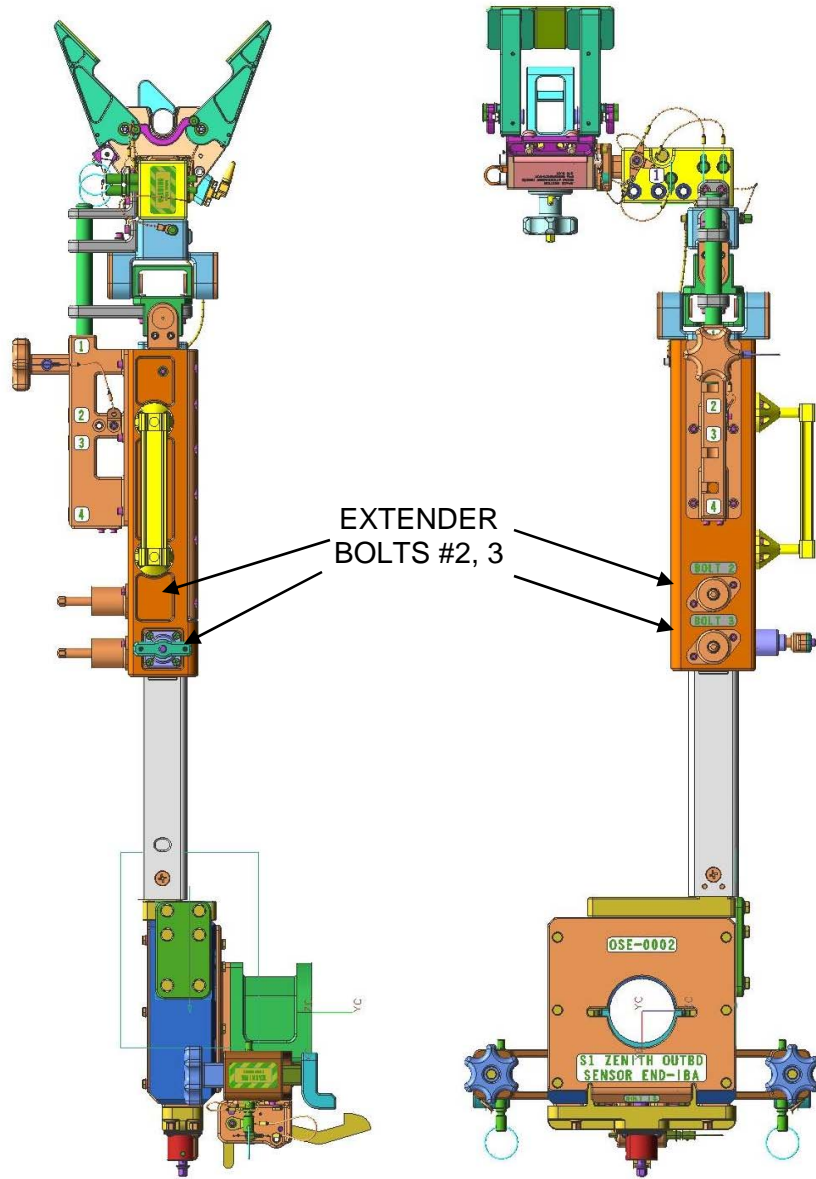


S1 Outboard OSE

OSE (Cont)

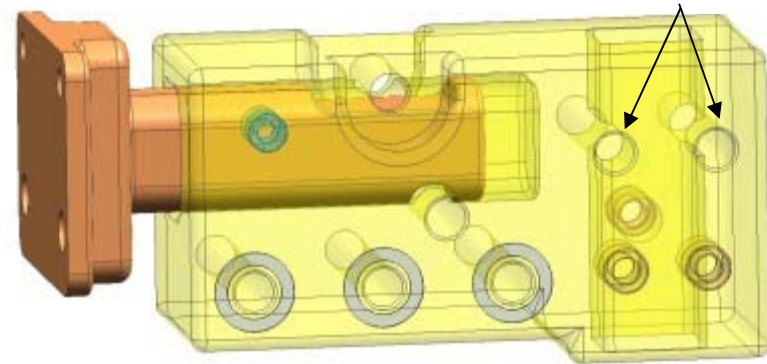


OSE (Cont)



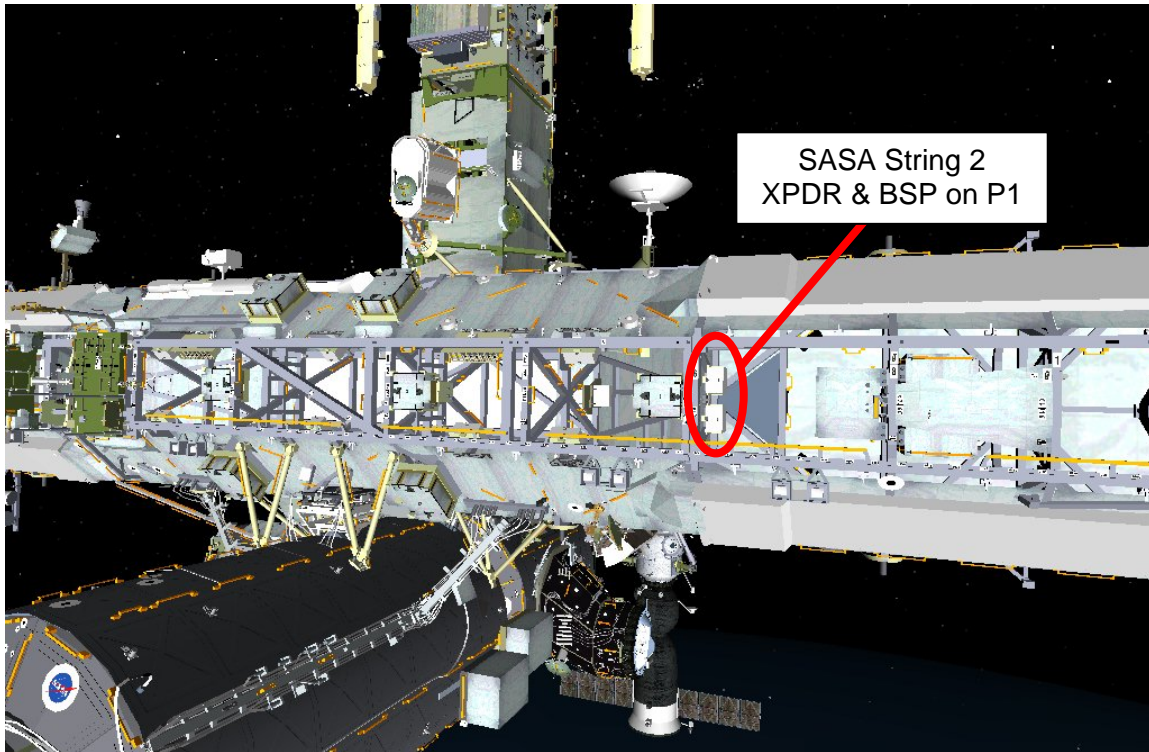
PAD Slider Assy  
Capture PIP Pins  
installed here

PAD  
Bolted  
Here



PAD Attachment Slider Assy

## P1 SASA XPDR AND BSP LOCATION

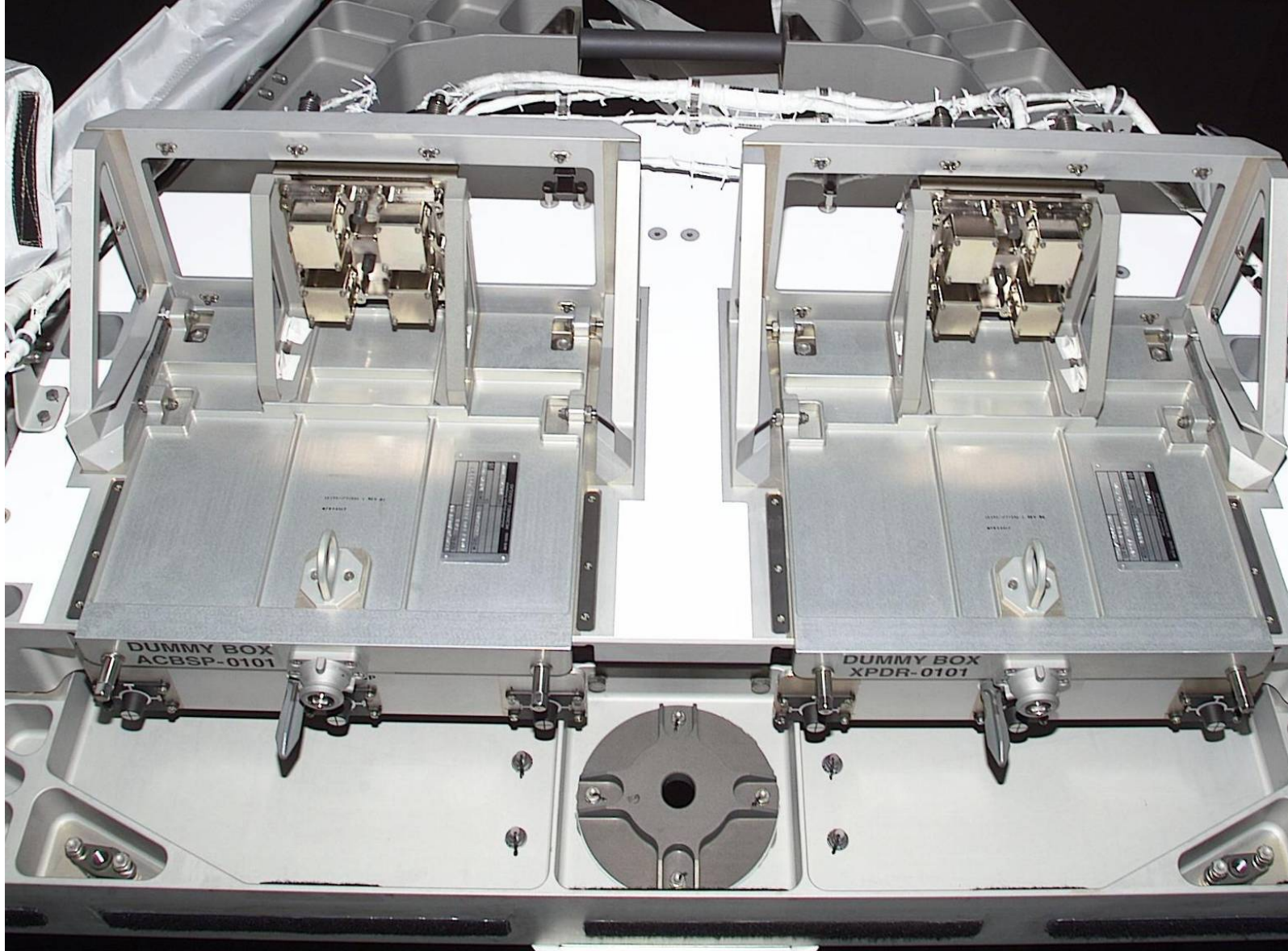


FS 18-45

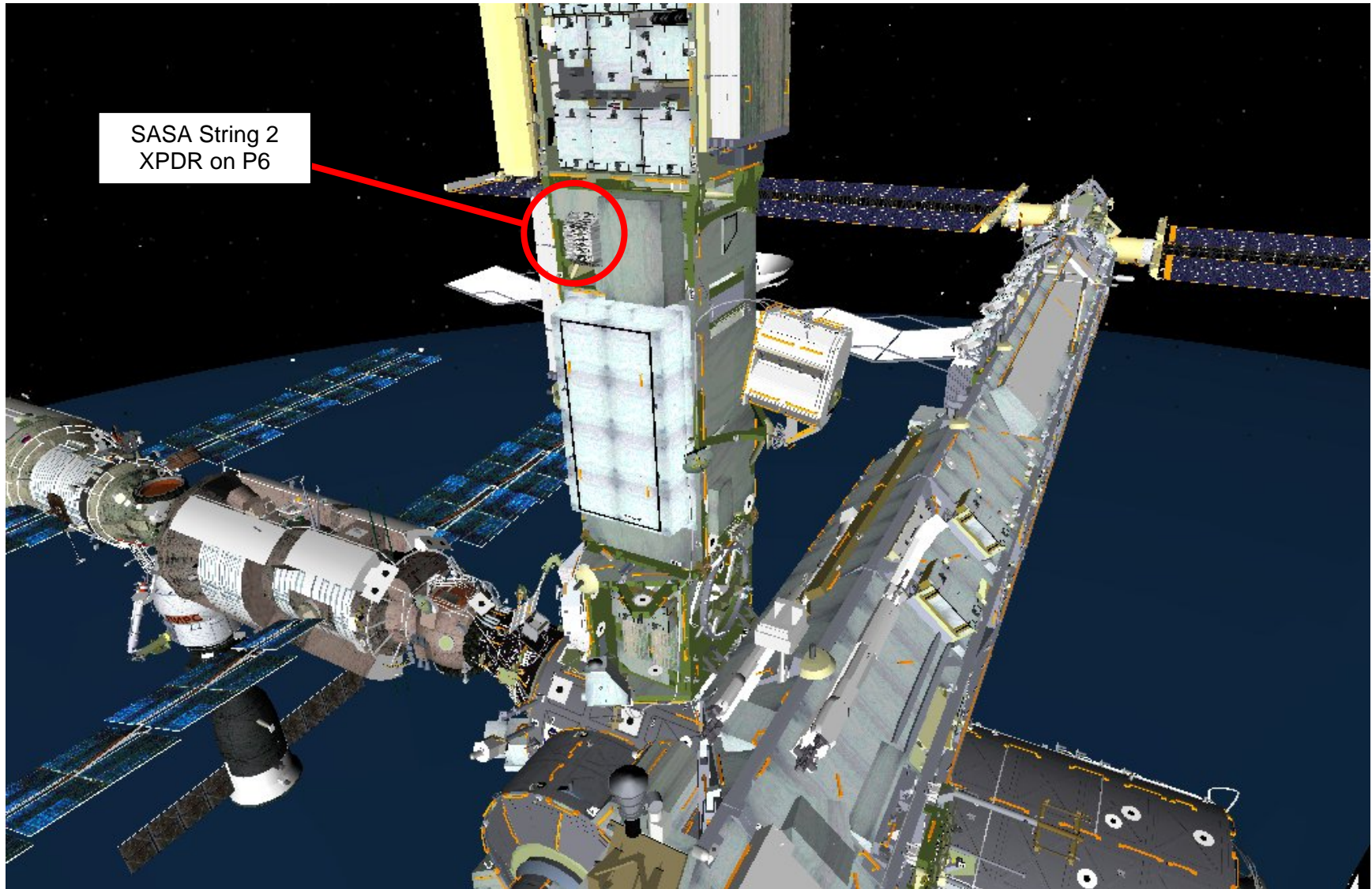
EVA/118/FIN A

**S-BAND HDW**

P1 SASA XPDR AND BSP DUMMY BOXES



## P1 SASA XPDR LOCATION



FS 18-47

EVA/118/FIN A

PVR

# PVR

## FORWARD RADIATOR CINCH



Figure 1. Fixed end of cinch cable fully seated in retention bracket



Figure 2. Uninstalled Cinch – bolt needs to catch last thread in square boss in order for cinch to retract properly. Pulling on bolt should show no movement

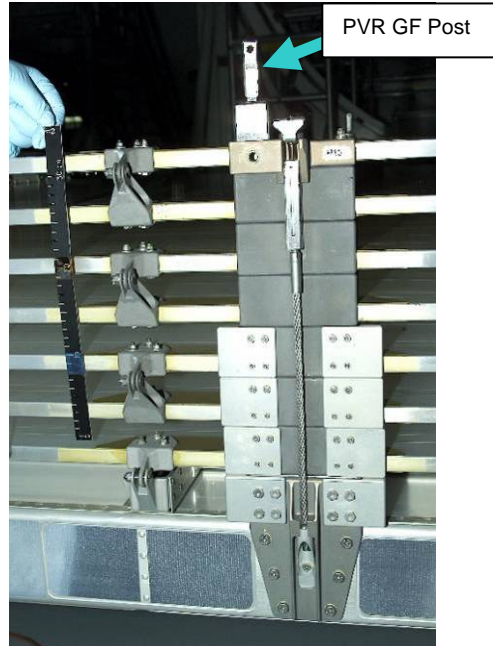


Figure 3. Installed cinch (not tensioned)

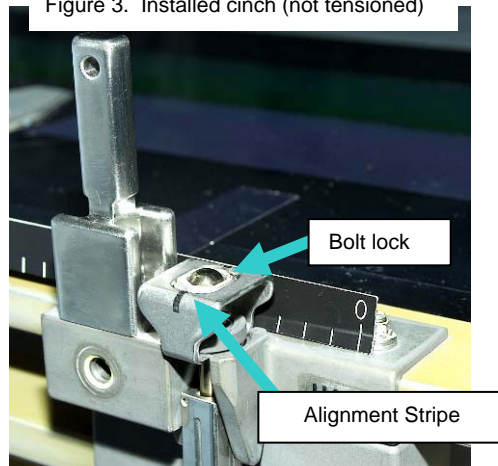
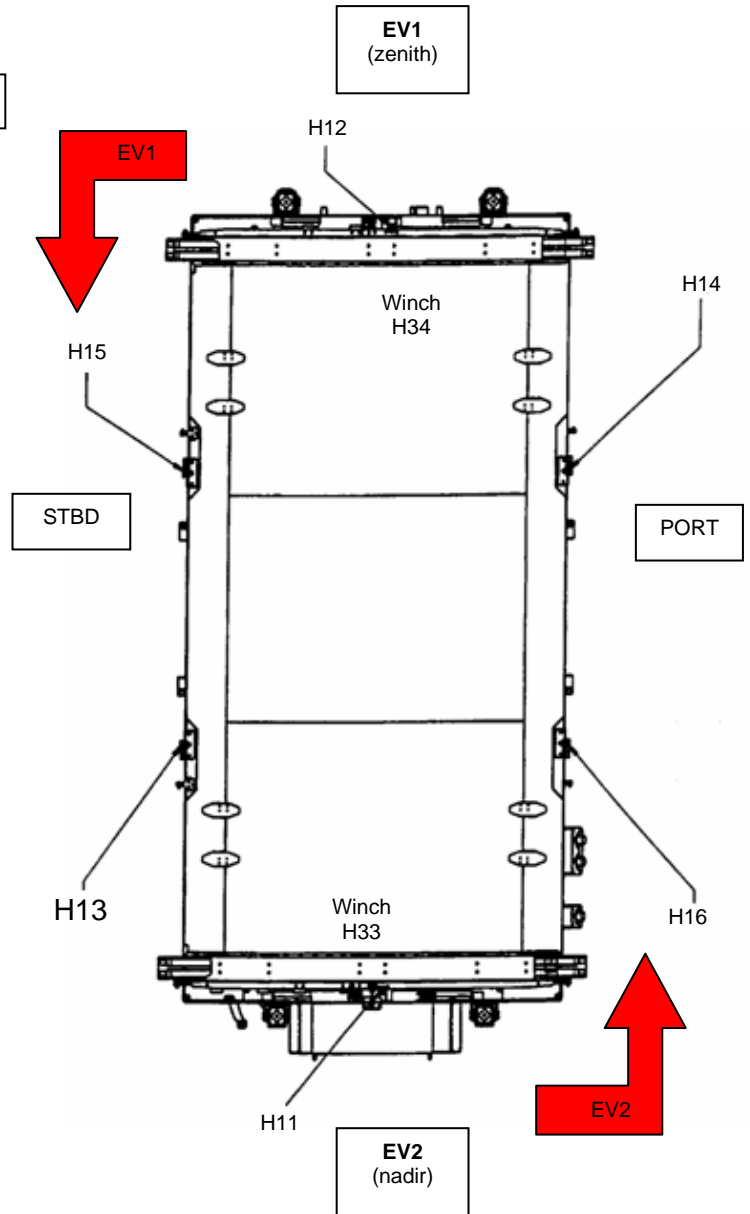
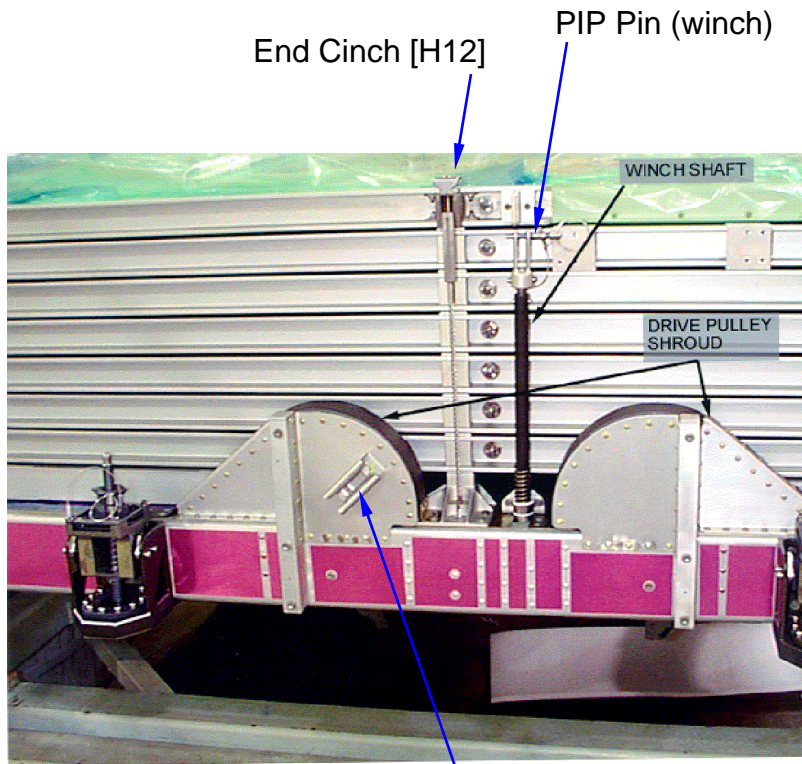


Figure 4. Installed Cinch

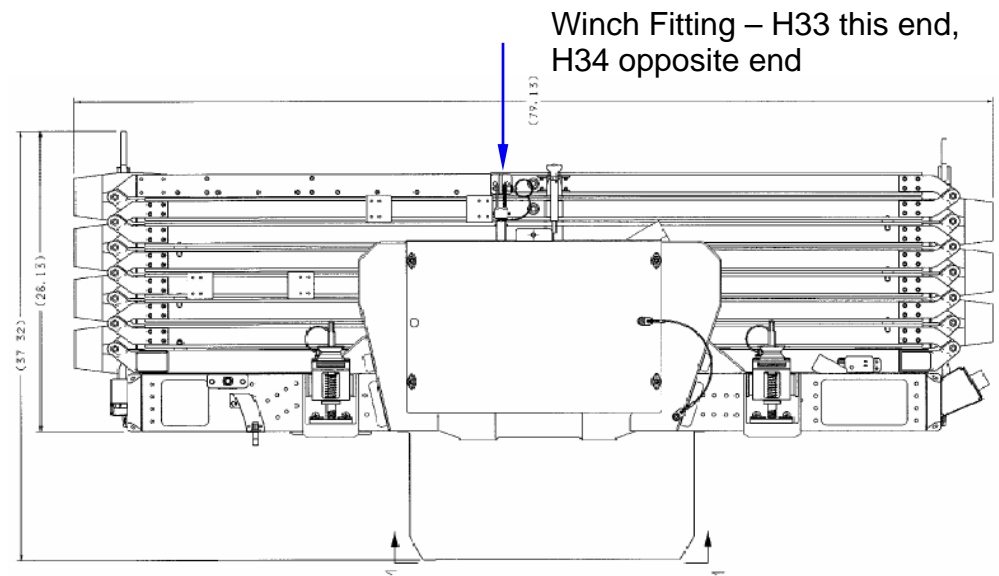




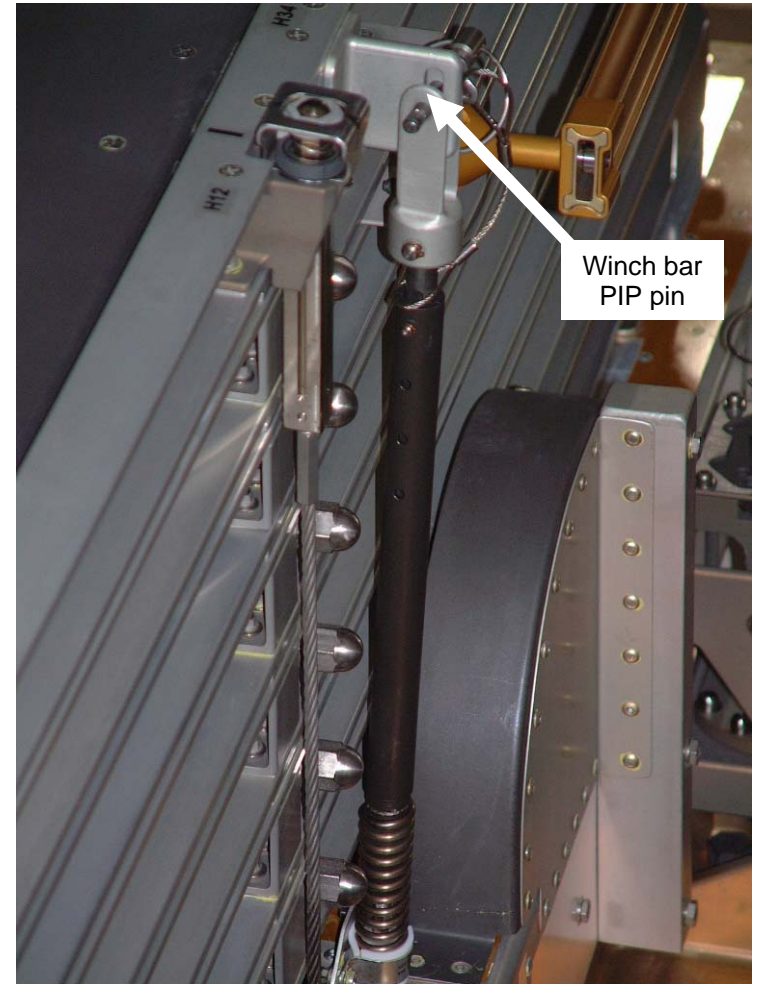
# FORWARD RADIATOR CINCH (Cont)



End Cinch Storage Location



# MANUAL OVERRIDE TO RETRACT/WINCH RADIATOR

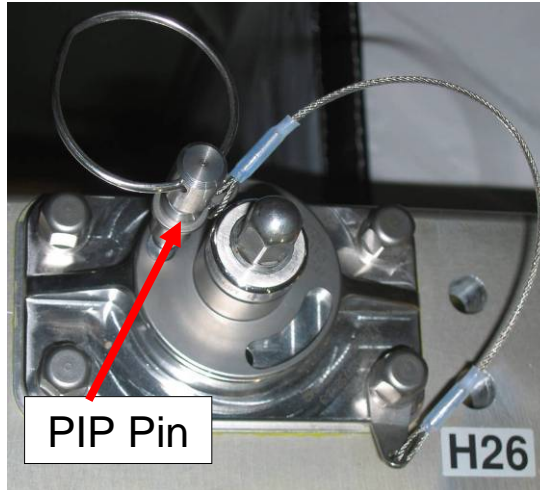
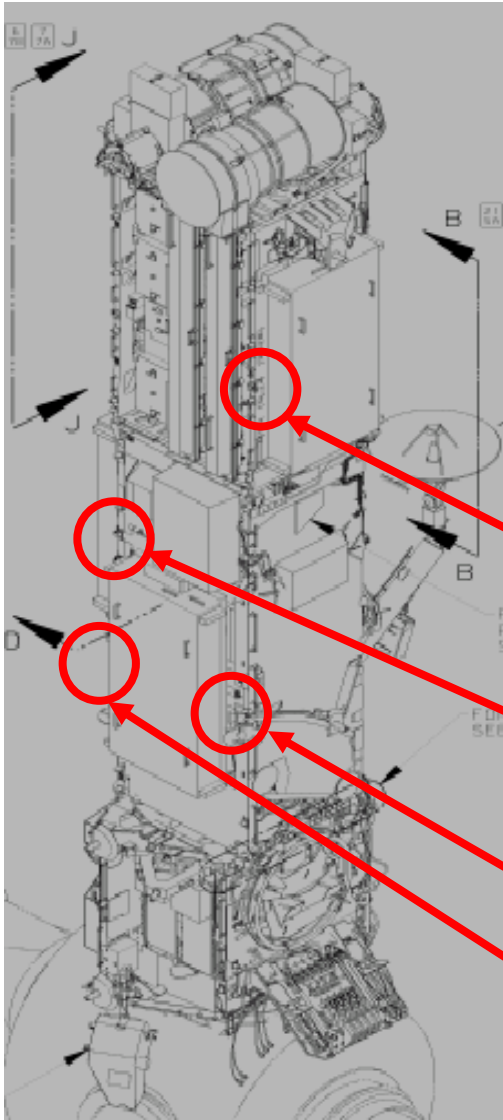


Winch bar and H12 cinch



Cinch stowage bracket

# P6 PVR PIP PIN INSPECTION

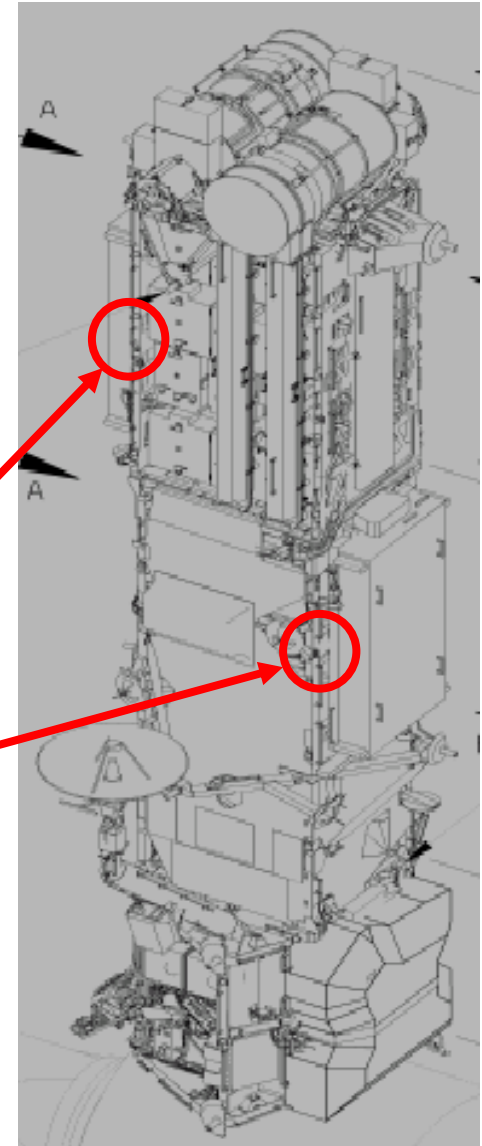


PIP Pin

Fwd PVR Center Fastener Pins  
(2)

EEATCS Aft Radiator  
Center Fastener Pins  
(2)

EEATCS Stbd Radiator  
Center Fastener Pins  
(2)



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# EVA CHECKLIST

STS  
118