

EVA Checklist

STS-118 Flight Supplement

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

**Final
March 9, 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



SMS FDF CHANGE NOTIFICATION

SIM PACK

DATE INITIATED
5/9/07

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5-14-07

BOOK TITLE

BK ISSUE (Ed, Rev, PCN)
FINAL

EVA Checklist Flight Supplement

SIM PACK NUMBER

SIM-141

Change is for flights (Also give SMS load if load dependent):
STS-118

SMS UNIQUE?
 YES NO

DEVELOPMENTAL?
 YES NO

FABRICATED ITEM CHANGE? NONE CUE CARDS TRANSPARENCIES Other _____

INSTRUCTIONS TO USER:

This sim pack to be used for STS-118 FD3-FD5 long simulation on May 22-23.

- 1) Replace pages FS2-9 through FS2-16
- 2) Replace pages FS7-3 through FS7-44 (EVA 1 timeline)
- 3) Replace pages FS12-27 and FS12-28

(52 pages)

AUTHORITY FOR CHANGE* (Approved 482 numbers, approved issue at print shop, supervisors deem mandatory, etc.):
Supervisor deems mandatory

*Refer to Crew Procedures Management Plan

OTHER AFFECTED FDF BOOKS

Are all SIM PACKS submitted? YES NO

IMPLEMENTATION REQUIREMENTS

Limited Distribution
(List in comments)

NO EARLIER THAN _____
(Date and/or Sim ID)

NO LATER THAN _____
(Date and/or Sim ID)

May 22, 2007 ^{long} sim

BOOK MGR (Signature/Date)

5-9-07
[Signature]

SUPERVISOR (if required, Signature/Date)

5/10/07
[Signature]
Kanna Shook/282 5/10/07

FDF COORD or FDF MGR (Signature/Date)

5/14/07
[Signature]

COMMENTS:

MISSION OPERATIONS DIRECTORATE

**EVA CHECKLIST
STS-118 FLIGHT SUPPLEMENT**

FINAL
March 9, 2007

PREPARED BY:

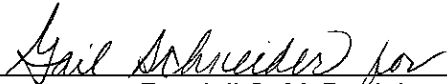


Paul G. Boehm
Book Manager

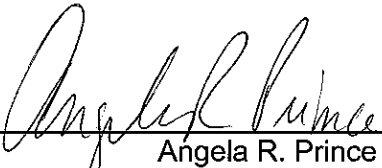
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Incorporates the following:	
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Systems Lead	DX35/D. Brashinger	281-244-8727
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EVA CHECKLIST
STS-118 FLIGHT SUPPLEMENT

LIST OF EFFECTIVE PAGES

FINAL 03/09/07

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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

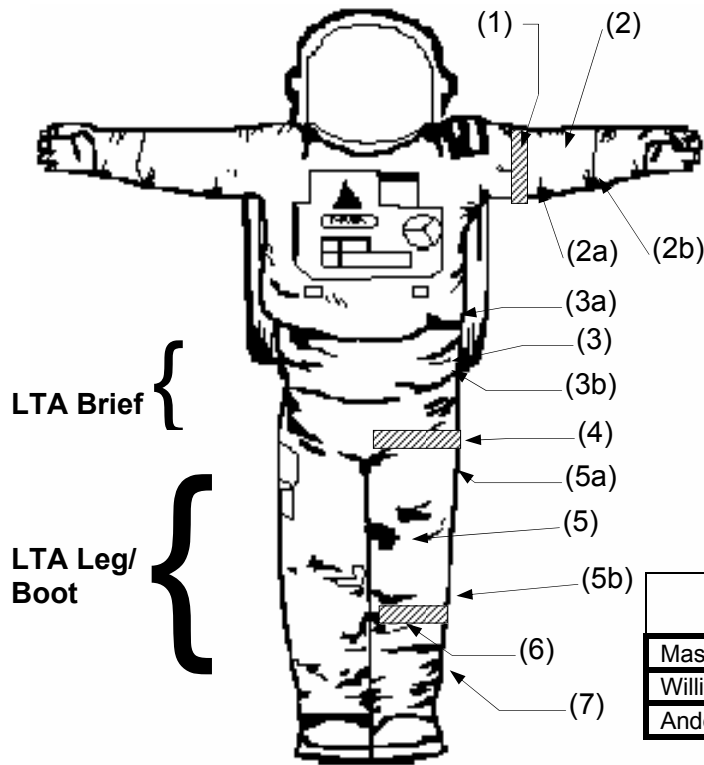
- AW18A
1. ✓ Inner hatch Equal vlv (two) – OFF
 2. LTG FLOOD (four) – ON
 3. Remove from airlock, as reqd:
 - Airlock Stowage Bag
 - Airlock Floor Pallet using 3/8-in breaker bar, 4-in ext w/3/8-in drive, and 1/2-in socket w/3/8-in drive
 4. Stow Vol H Bags in Vol H
 5. Transfer to airlock:
 - EVA Bag – 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 CONTINGENCY RESIZE MATRIX (STS-118/13A.1)

FOR LOSS OF:	EV1 – Mastracchio	EV2 – Williams	EV3 – Anderson
HUT/PLSS	Use Large HUT s/n 3006 from ISS 1. Remove gloves/lower arms/arm rings 2. Use prime MT gloves/arms/arm rings 3. √Arm red disconnect to right, √locks, √cams 4. Use prime MT LTA 5. Swap EMU PLSS identifier stripes, mission patch, and national flag	Use Large HUT s/n 3006 from ISS 1. Remove gloves/lower arms/arm rings 2. Use prime WM gloves/lower arms 3. √Arm red disconnect to right, √locks, √cams 4. Use prime WM LTA 5. Swap EMU PLSS identifier stripes, mission patch, and national flag	Contact MCC
CCA	Use size 04/327 CCA s/n 1183 from ISS	Use backup CCA s/n XXXX transferred from shuttle	Contact MCC
Lower Arm Segment	Use size 03 lower arm s/n 219 or 220 from ISS (red = right, blue = left) 1. Use prime MT gloves/arm rings 2. √Locks, √cams	Use size 03 lower arm s/n 219 or 220 from ISS (red = right, blue = left) 1. Use prime WM gloves 2. √Locks, √cams	Use size 02 lower arm s/n XXXX from ISS (red = right, blue = left) 1. Use prime AD gloves 2. √Locks, √cams
Gloves	Use 6MT gloves s/n 6XXX from middeck	Use 6E5 gloves s/n 6XXX from middeck	Use 6C3 gloves s/n 6XXX transferred from shuttle
Waist Brief	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 01 waist brief s/n 2081 from ISS 1. Use prime WM thigh rings/legs/leg rings/boots 2. √Locks, √cams 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 Swap EMU brief identifier stripes
Leg Segment	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/thigh rings/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
Boot	Use size 02 boots s/n 213 from ISS 1. Use prime waist brief/legs/leg rings 2. √Locks	Use size 01 boots s/n 203 from ISS 1. Remove BSI/Toe Caps Use prime waist brief/thigh rings/legs/leg rings 2. √Locks	Use size 02 boots s/n 213 from ISS 1. Use prime waist brief/legs/leg rings 2. √Locks
Sizing Rings	<ul style="list-style-type: none"> ▪ <u>0.5 Arm</u>: Use s/n 120 or 121 from ISS ▪ <u>1.0 Leg</u>: Use s/n 161 or 162 transferred from shuttle 	<ul style="list-style-type: none"> ▪ <u>0.5 Thigh</u>: Use s/n 119 or 120 from ISS ▪ <u>1.5 Leg</u>: Use s/n 137 or 138 from ISS 	<ul style="list-style-type: none"> ▪ <u>1.0 Leg</u>: Use s/n 161 or 162 transferred from shuttle
LCVG	Use backup LCVG s/n XXXX from middeck 1. Transfer biomed, dosimeter	Use backup LCVG s/n XXXX from middeck 1. Transfer biomed, dosimeter	Contact MCC

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



EMU	(1) Arm Sizing Ring	(2a) Arm Cam	(2) Lower Arm	(2b) Wrist Cam	HUT
Mastracchio (30XX)	0.5	Short	03	Long	L (03)
Williams (30XX)	--	Short	03	Short	L (03)
Anderson (3008)	--	Long	02	Long	XL (04)

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	Long	01	Long	0.5	Short	03	Long	1.5	01 / 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	M / M / 711	6MT / 6XXX	6MT / 6XXX	04 / 327	Original	--
Williams	06 / 05	L / M / 711	6E5 / 6XXX	6E5 / 6XXX	04 / 323	Original	-009 (+2.0)
Anderson	06 / 05	L / M / 711	6C3 / 6XXX	6C3 / 6XXX	05 / 327	Modified	-000 (+5.0)

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
- 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 aft EDDA
Transfer EMU to Node 1
 - 6. Gather EV1 (Mt) EMU crew-specific items (including EMU Equip Bag Crew Compartment) and place in 'Mt' Mesh Bag
Transfer Mesh Bag to Node 1
- EMU 3017
- 7. Transfer EMU 3017 (Wm) and 'Wm' Mesh Bag from Node 1 to E-Lk
Install EMU on aft EDDA
 - 8. Install Helmet Lights and EMU TV
✓Sun visors down, cover installed
 - 9. ✓Metox, REBA, EMU Battery installed for EVA 4 per STS-118 CONSUMABLES TRACKING Cue Card (EMU MAINT/RECHARGE)

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>EMU 3010 (Mt)</p> <ul style="list-style-type: none"> <input type="checkbox"/> DIDB Restraint Bag <input type="checkbox"/> CCA <input type="checkbox"/> Helmet (√sun visors down, cover installed) <ul style="list-style-type: none"> <input type="checkbox"/> Valsalva <input type="checkbox"/> Fresnel Lens <input type="checkbox"/> 6MT Gloves (prime) <input type="checkbox"/> Wrist Mirror (2) <input type="checkbox"/> ISS EVA Cuff C/L (EV1) <input type="checkbox"/> EMU Battery <input type="checkbox"/> CCC (LiOH) <input type="checkbox"/> LTA 	<p>EMU 3017 (Wm)</p> <ul style="list-style-type: none"> <input type="checkbox"/> DIDB Restraint Bag <input type="checkbox"/> CCA (WM1) <input type="checkbox"/> Helmet (√sun visors down, cover installed) <ul style="list-style-type: none"> <input type="checkbox"/> Valsalva <input type="checkbox"/> Fresnel Lens (2) <input type="checkbox"/> 6E5 Gloves (prime) <input type="checkbox"/> Wrist Mirror (2) <input type="checkbox"/> ISS EVA Cuff C/L (EV2) <input type="checkbox"/> EMU Battery <input type="checkbox"/> CCC (LiOH) <input type="checkbox"/> LTA
<p>Mesh Bag (Mt)</p> <ul style="list-style-type: none"> <input type="checkbox"/> EVA 1, 2, & 3 Ziplock Bags <ul style="list-style-type: none"> <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"/> EVA Contingency Ziplock Bag <ul style="list-style-type: none"> <input type="checkbox"/> 3 MAGs (w/Ziplock Bags) <input type="checkbox"/> Fresnel Lens <input type="checkbox"/> Elastic Glasses Retention Device <input type="checkbox"/> LCVG (w/biomed sternal harness & signal conditioner) <input type="checkbox"/> EMU Equip Bag Crew Compartment <input type="checkbox"/> EVA TOOLS mesh bags (2) 	<p>Mesh Bag (Wm)</p> <ul style="list-style-type: none"> <input type="checkbox"/> EVA 1, 2, & 4 Ziplock Bags <ul style="list-style-type: none"> <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"/> Elastic Glasses Retention Device (EVA 1 bag only) <input type="checkbox"/> EVA Contingency Ziplock Bag <ul style="list-style-type: none"> <input type="checkbox"/> 3 MAGs (w/Ziplock Bags) <input type="checkbox"/> Fresnel Lens (2) <input type="checkbox"/> Elastic Glasses Retention Device <input type="checkbox"/> Moleskin <input type="checkbox"/> Mosite <input type="checkbox"/> CCA (WM2) <input type="checkbox"/> LCVG (w/biomed sternal harness & signal conditioner) <input type="checkbox"/> EMU Equip Bag Crew Compartment

EMU PREP FOR TRANSFER TO ISS (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	<u>Mesh Bag (EVA Systems 1)</u> <input type="checkbox"/> 6 DIDBs (empty)
<input type="checkbox"/> 8 MAGs (w/Ziplock Bags)	<u>Mesh Bag (EVA Systems 2)</u> <input type="checkbox"/> 8 DIDBs (full) <input type="checkbox"/> EMU Servicing Kit s/n 5005 <input type="checkbox"/> SCOFs (2) <input type="checkbox"/> Helmet Lights (2) <input type="checkbox"/> C/L 118 EVA (1) <input type="checkbox"/> STS-118 Consumables Tracking Cue Card <input type="checkbox"/> ISS EVA Cuff C/L (EV3) <input type="checkbox"/> C/L ISS EVA SYSTEMS (red stripe w/118 crew notes) <input type="checkbox"/> C/L ISS EVA SYSTEMS (Transfer to ISS) <input type="checkbox"/> ISS Crewlock Depress/Repress Cue Card (Transfer to ISS) <input type="checkbox"/> Joint Emergency Egress Cue Card (Transfer to ISS)

EVA TOOL TRANSFER PREP

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"/> 85ft Safety Tethers (qty 2)	Middeck TBD
<input type="checkbox"/> EVA Torque Wrench Bag <input type="checkbox"/> EVA Torque Wrench	Middeck TBD
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> BRTs (qty 3)	Middeck TBD
<input type="checkbox"/> Long Wire-Ties (qty 5) <input type="checkbox"/> Short Wire-Ties (qty 25)	SpaceHab TBD
<input type="checkbox"/> Red RET (sm-sm) (qty 8) <input type="checkbox"/> Red RET (sm-sm w/pip-pin) (qty 1) <input type="checkbox"/> Red RET (Lg-sm) (qty 2)	SpaceHab TBD

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 the 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 TRANSFER PREP

1. Transfer the following EVA equipment to ISS:

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

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"> <input type="checkbox"/> DIDB Restraint Bag <input type="checkbox"/> CCA <input type="checkbox"/> Helmet s/n 1066 (√sun visors down, cover installed) <input type="checkbox"/> 6MT Gloves (prime) <input type="checkbox"/> Wrist Mirror (2) <input type="checkbox"/> √ISS EVA Cuff Checklist NOT installed <input type="checkbox"/> EMU Battery <input type="checkbox"/> CCC (LiOH) <input type="checkbox"/> LTA 	<p><u>EMU 3017 (Wm)</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> DIDB Restraint Bag <input type="checkbox"/> CCA (WM1) <input type="checkbox"/> Helmet s/n 1071 (√sun visors down, cover installed) <input type="checkbox"/> 6E5 Gloves (prime) <input type="checkbox"/> Wrist Mirror (2) <input type="checkbox"/> √ISS EVA Cuff Checklist NOT installed <input type="checkbox"/> EMU Battery <input type="checkbox"/> CCC (LiOH) <input type="checkbox"/> LTA
<p><u>Mesh Bag (Mt)</u></p> <ul style="list-style-type: none"> <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> EVA 1, 2, & 3 Ziplock Bags <ul style="list-style-type: none"> <input type="checkbox"/> 2 MAGs (less used items) <input type="checkbox"/> TCUs (top, bottom) <input type="checkbox"/> Socks <input type="checkbox"/> Wristlets <input type="checkbox"/> Comfort Gloves <input type="checkbox"/> EVA Contingency Ziplock Bag <ul style="list-style-type: none"> <input type="checkbox"/> 3 MAGs (w/Ziplock Bags) <input type="checkbox"/> Fresnel Lens <input type="checkbox"/> Elastic Glasses Retention Device <input type="checkbox"/> LCVG (w/biomed sternal harness & signal conditioner) <input type="checkbox"/> EMU Equip Bag Crew Compartment 	<p><u>Mesh Bag (Wm)</u></p> <ul style="list-style-type: none"> <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> EVA 1, 2, & 4 Ziplock Bags <ul style="list-style-type: none"> <input type="checkbox"/> 2MAGs (less used items) <input type="checkbox"/> TCUs (top, bottom) <input type="checkbox"/> Socks <input type="checkbox"/> Wristlets <input type="checkbox"/> Comfort Gloves <input type="checkbox"/> Elastic Glasses Retention Device (EVA 1 bag only) <input type="checkbox"/> EVA Contingency Ziplock Bag <ul style="list-style-type: none"> <input type="checkbox"/> 3 MAGs (w/Ziplock Bags) <input type="checkbox"/> Fresnel Lens (2) <input type="checkbox"/> Elastic Glasses Retention Device <input type="checkbox"/> Moleskin <input type="checkbox"/> Mosite <input type="checkbox"/> CCA (WM2) <input type="checkbox"/> LCVG (w/biomed sternal harness & signal conditioner) <input type="checkbox"/> EMU Equip Bag Crew Compartment
<p><u>Mesh Bag (Ad)</u></p> <ul style="list-style-type: none"> <input type="checkbox"/><input type="checkbox"/> STS-118 EVA 3 & 4 Ziplock Bags <ul style="list-style-type: none"> <input type="checkbox"/> 2 MAGs (less used items) <input type="checkbox"/> TCUs (top, bottom) <input type="checkbox"/> Socks <input type="checkbox"/> Wristlets <input type="checkbox"/> Comfort Gloves 	<p><u>Mesh Bag (EVA Systems 2)</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> SCOFs (2) s/n 1009 & 1010 <input type="checkbox"/> EMU Servicing Kit s/n 5004 <input type="checkbox"/> CCA (s/n 1183) <input type="checkbox"/> Helmet Lights (2) s/n 1005 & 1010 <input type="checkbox"/> C/L 118 EVA <input type="checkbox"/> STS-118 Consumables Tracking Cue Card <input type="checkbox"/> C/L ISS EVA SYSTEMS (red stripe w/118 crew notes)

EMU TRANSFER TO SHUTTLE

I

NOTE

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

1. Transfer the following EVA equipment to SHUTTLE:

Item	Destination	Transfer Status
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

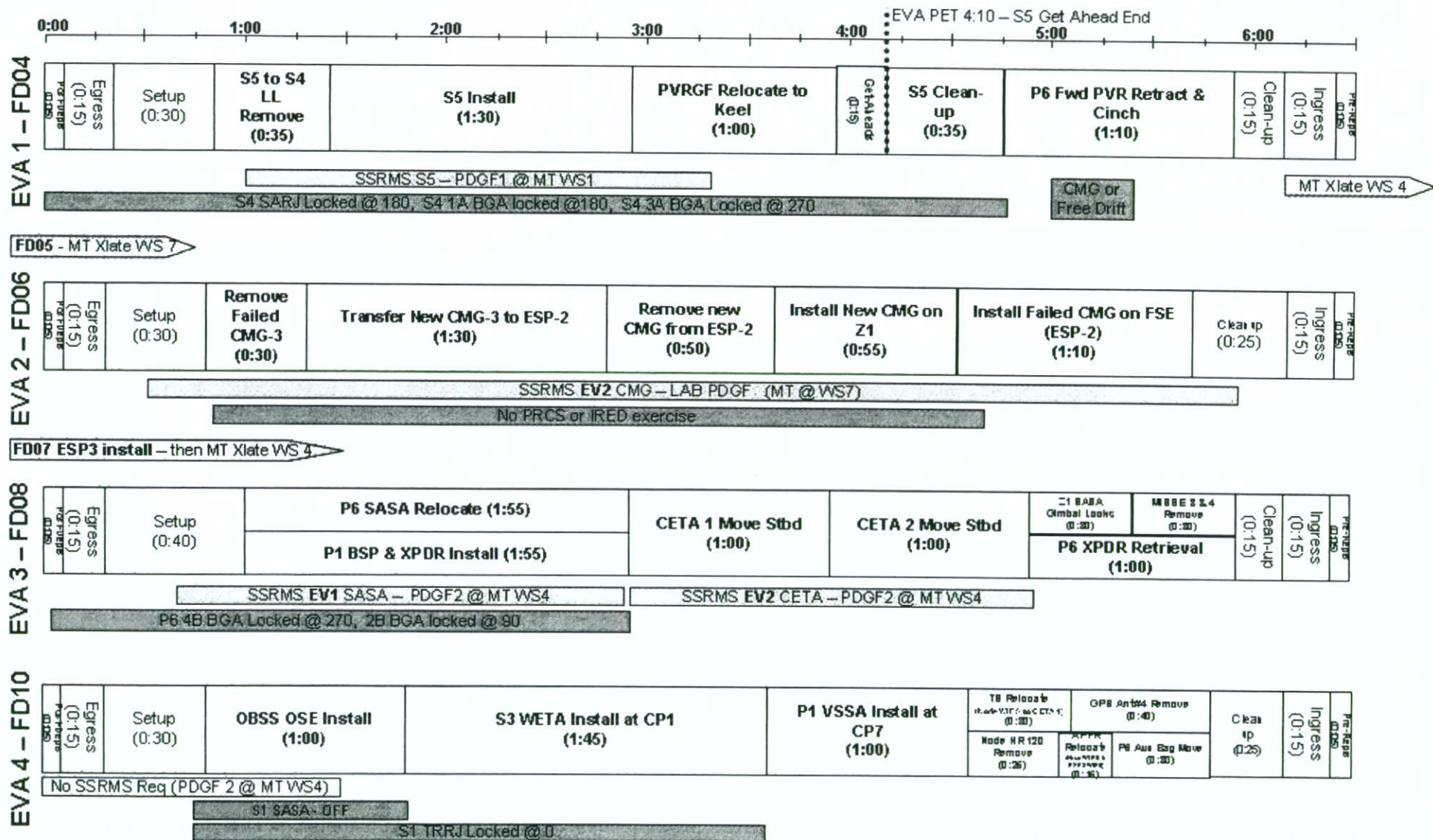
TIMELINES

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TIMELINES

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



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EVA 1 BRIEFING CARD

EVA PREP:

- Remove watches and jewelry
- 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

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 ether 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)
	IV: P6 PVR Retract	04:45	<u>P6 PVR CINCH</u> (01:10)	04:45	<u>P6 PVR CINCH</u> (01:10)
05:00					
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 6:30	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" rigid
- 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
- Adj tether to internal D-ring
- Socket Caddy
- 7/16 X 6" wobble
- 7/16 X 2"
- Manual Ratchet
- Adj tether to internal D-ring
- Spare torque wrench
- D-ring Extender (on AL D-ring)
- Small ORU Bag (AL zenith/fwd/stb; tied to HRs)
- RET (Lg-sm) on outside
- GPS Caps wire-tied together
- RET (sm-sm)
- RET (sm-sm)

Prior to EVA

- Inspect BRTs and ball stacks for loose fittings/screws
- Inspect RET cord for damage
- Inspect safety tethers and waist tethers load alleviating straps

EVA 1 INHIBIT PAD

Orbiter

TCS

- L12 1. √TCS POWER – OFF

Ku-Band Antenna

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

RCS

If EV crew < 27 ft from FRCS:

- IV 1. √DAP: VERN, FREE, LO Z (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

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

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

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

S4 BGAs – (S5 Install and PVRGF Relocate)

- 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, both RJMCs unpowered for EV crew translation on S1 nadir:

- MCC-H
1. √DLA (1) – LOCKED
 2. RPCM S11A_C RPC 1 – Open, Close Cmd Inhibit S1-1 (Zenith RJMC Ops pwr)
 3. RPCM S12B_B RPC 11 – Open, Close Cmd Inhibit S1-2 (Nadir RJMC Ops pwr)

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, both RJMCs unpowered for EV crew translation on S1 nadir:

- MCC-H
1. √DLA (1) – LOCKED RJMC (Ops power)
- S1-1 (Zenith):
2. RPCM S11A_C RPC 1 – Open, Close Cmd Inhibit
- S1-2 (Nadir):
3. RPCM S12B_B RPC 11 – Open, Close Cmd Inhibit

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, P6]
 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 ≥ 2 ft from exposed EFGF connector when OBSS berthed, powered, and EFGF not grappled [PLB]
2. Stay ≥ 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

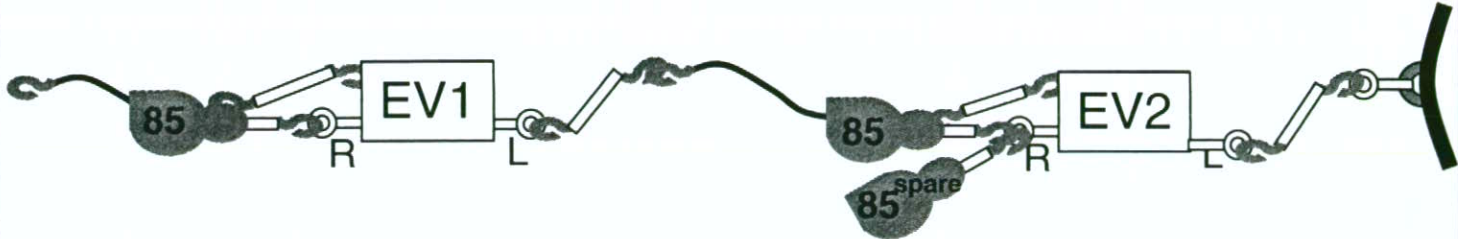
E. Thermal

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

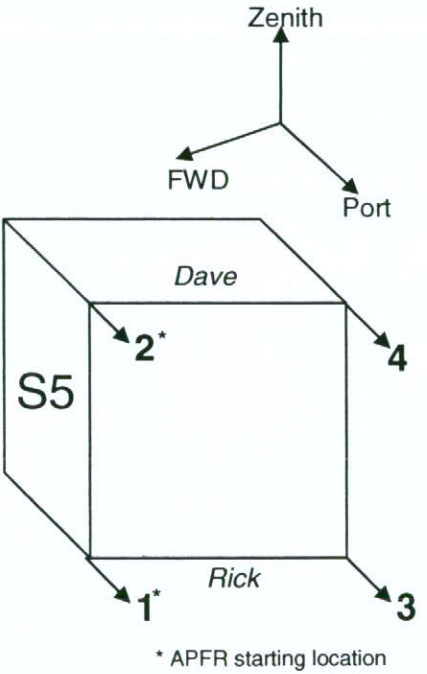
F. Thruster Contamination

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

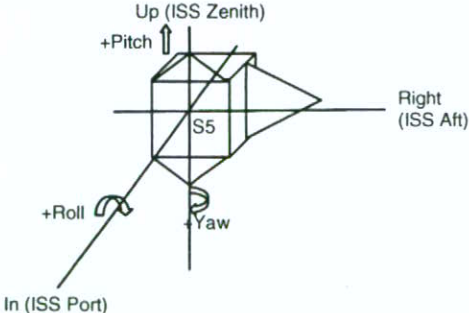
EVA 1 EGRESS/SETUP (00:50)

IV/RMS	EV1 (FF)	EV2 (FF)
<p>POST DEPRESS (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> <ol style="list-style-type: none"> Record MET CL Bag with torque wrench removed from airlock: _____/_____:_____ 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>POST DEPRESS (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"> √Initial tether configuration, hooks locked, reels unlocked Hatch Thermal cover – open Egress airlock Attach Rt 85-ft safety tether retracting end to A/L handrail 0550, LOCK hook Verify 85-ft tether reel housing in Unlocked position Release left waist tether from EV2's 85-ft safety tether Attach EV2's 85-ft safety tether retracting end to A/L handrail 0554 inboard stanchion, LOCK hook Give EV2 GO to release from AL D-ring Receive Crewlock Bag w/Lg-Sm RET, attach to BRT √SAFER MAN ISOL vlv – OP (dn) and HCM (dn) Translate Aft on A/L 	<p>POST DEPRESS (DEPRESS/REPRESS Cue Card)</p> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> √Initial tether configuration, hooks locked, reels unlocked Release left waist tether from A/L D-ring Verify 85-ft tether reel housing in Unlocked position Pass Crewlock Bag #1 w/Torque Wrench to EV1 ← <input type="checkbox"/> Egress Airlock √SAFER MAN ISOL vlv – OP (dn) and HCM (dn) Close Hatch Thermal Cover

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

IV/RMS	EV1 (FF)	EV2 (FF)
 <p>* 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. Translate to 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 0;"> <p style="text-align: center;">CAUTION</p> <p>Tight clearances between S5 and BGA; monitor:</p> <ul style="list-style-type: none"> • RTAS housing and 4-bar linkage </div> <p>1. Position for GCA (HR 2236)</p> <p>2. GCA SSRMS 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 0;"> <p style="text-align: center;">CAUTION</p> <p>Do not impart any loads into structure while removing launch locks</p> <p>Do not exceed 72 turns (PGT), 36 turns (bolt) when removing launch locks or primary bolt can come free of self feeding nut</p> <p>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 0;"> <p style="text-align: center;">CAUTION</p> <p>Tight clearances between S5 and BGA; monitor:</p> <ul style="list-style-type: none"> • RTAS housing and 4-bar linkage • RTAS housing and SSU – do not allow RTAS housing clearance with SSU to fall below 3.0 cm (1.2 inches) • S5 HR and SSU </div> <p>1. Position for GCA (HR 2243)</p> <p>2. GCA SSRMS 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 0;"> <p style="text-align: center;">CAUTION</p> <p>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 5/8X7.8" 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)

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

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-lbs)	Release Torque (ft-lbs)	Failure Torque (ft-lbs)	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

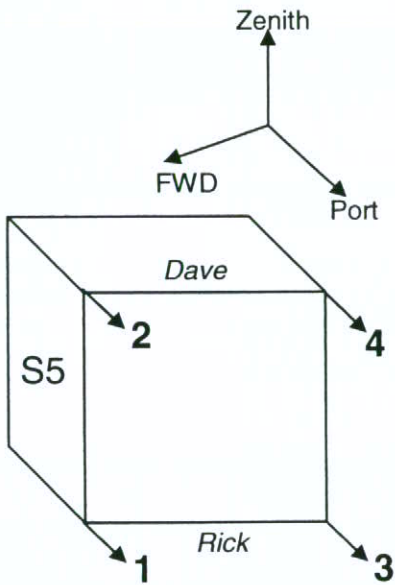
Cautions:

- 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 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)

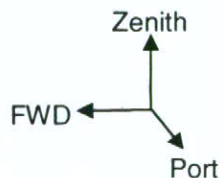
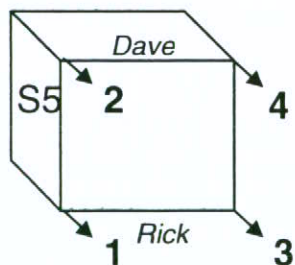
IV/RMS	EV1 (FF)	EV2 (FF)
<p><u>GCA SSRMS INTO SOFT CAPTURE</u></p> <p>1. SSRMS: S5 install</p>  <p>The diagram shows a 3D rectangular prism representing the S5 structure. A coordinate system is defined with three axes: Zenith (pointing up), FWD (pointing left), and Port (pointing right). The corners are numbered 1 through 4: Corner 1 is at the bottom-front-left (labeled 'Rick'), Corner 2 is at the top-front-left (labeled 'Dave'), Corner 3 is at the bottom-front-right, and Corner 4 is at the top-front-right. The side of the prism facing the viewer is labeled 'S5'.</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>CAUTION Do not impart loads into S5 structure until soft capture pins are engaged</p> </div> <ol style="list-style-type: none"> Remain at corner 3 (nadir, aft) for GCA Verify all cables and tethers clear of RTAS interface Hold HR 2236 for GCA <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"> GCA SSRMS into soft capture √S4 soft capture pin has engaged S5 coarse alignment cone @ corner 3 √S4 soft capture pin has engaged S5 coarse alignment cone @ corner 1 Configure RAD for translation <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"> Bolt 1 Bolt 2 Bolt 3 and 4 in any order <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"> Translate to corner 1 Ingress APFR WIF 18 [8, OO, C, 1] 	<p><u>GCA SSRMS INTO SOFT CAPTURE</u></p> <ol style="list-style-type: none"> Translate back to corner 2 (zenith, fwd) for GCA Verify all cables and tethers clear of RTAS interface Hold HR 2243 for GCA <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"> GCA SSRMS into soft capture √S4 soft capture pin has engaged S5 coarse alignment cone @ corner 2 √S4 soft capture pin has engaged S5 coarse alignment cone @ corner 4 <p><u>BOLT #2 INITIAL TORQUE (zenith, fwd)</u></p> <ol style="list-style-type: none"> Ingress APFR WIF 19 [6, TT, J, 11] Wait for EV1 GO (bolt 1 complete)

S5 INSTALL (01:30) (Cont)

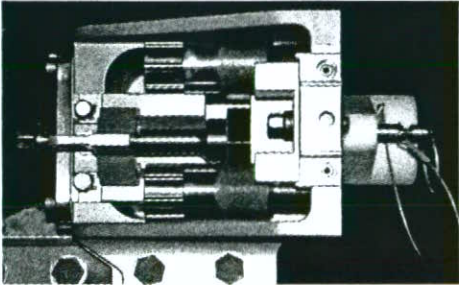
IV/RMS	EV1 (FF)	EV2 (FF)																		
<p>3. Record initial torque and turns on RTAS bolts</p> <table border="1"> <thead> <tr> <th></th> <th>EV1 Bolt 1</th> <th>EV2 Bolt 2</th> </tr> </thead> <tbody> <tr> <td>Turns</td> <td></td> <td></td> </tr> <tr> <td>Torque (ft-lb)</td> <td></td> <td></td> </tr> </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>CAUTION Do not apply a push force on primary bolt. Damage to self-feeding nut may result</p> </div> <p style="text-align: center;">NOTE</p> <p>Gap check criteria:</p> <ul style="list-style-type: none"> Tip of equipment tether hook should NOT pass through or penetrate gap between RTAS housings <p>11. On IV GO (SSRMS limp):</p> <p>12. PGT[B1, CW2, 30.5]-RAD-5/8X7.8" 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. PGT[B1, CW2, 30.5]-RAD-5/8X7.8" 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. PGT[B1, CW2, 30.5]-RAD-5/8X7.8" 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. PGT[B1, CW2, 30.5]-RAD-5/8X7.8" 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 27. Configure torque wrench w/5/8 X 7.8"; pull test √55-60 ft-lb</p> <p><u>BOLT #1 FINAL TORQUE</u></p> <p>28. Ingress APFR 29. Wait for EV2 GO (initial torque all 4 bolts complete) 30. Torque bolt #1 until torque wrench trips (~1/4 turn) ← Report torque and turns</p> <p>31. Perform gap check w/equipment hook 32. Pass torque wrench w/5/8X7.8" to EV2</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>CAUTION Ground straps are sensitive to cross threading. Begin installation manually for thread alignment and complete total turns and torque with PGT</p> </div> <p><u>INSTALL BOLT #1 GROUND STRAP</u></p> <p>33. PGT[B3, CCW2, 30.5]-7/16X6" Release ground strap from S4, 13 turns 34. Start ground strap bolt to S5 by hand ~1 turn 35. PGT[B1, CW2, 30.5]-7/16X6" Complete ground strap install ~9-12 turns (hard stop)</p> <p><u>REMOVE CORNER 1 SOFT CAPTURE PIN</u></p> <p>36. Rotate APFR to [8, OO, F, 1] 37. Tether to soft capture pin 38. PGT[A6, CCW2, 30.5]-7/16X6" Release soft capture pin fasteners (4), 13-17 turns 39. Remove soft capture pin assembly 40. Egress APFR 41. Stow soft capture pin in crewlock bag 42. Retrieve APFR, translate to corner 3</p>	<p>20. Give EV1 GO for final torque</p> <p><u>BOLT #2 FINAL TORQUE</u></p> <p>21. Translate to corner 2 22. Receive torque wrench from EV1 23. Ingress APFR 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; text-align: center;"> <p>CAUTION Ground straps are sensitive to cross threading. Begin installation manually for thread alignment and complete total turns and torque with PGT</p> </div> <p><u>INSTALL BOLT #2 GROUND STRAP</u></p> <p>26. Stow RAD on socket caddy; pull test 27. Install 7/16X2" on PGT; pull test 28. PGT[B3, CCW2, 30.5]-7/16X2" Release ground strap from S4, 13 turns 29. Start ground strap bolt to S5 by hand ~1 turn 30. PGT[B1, CW2, 30.5]-7/16X2" Complete ground strap install ~9-12 turns (hard stop) 31. Egress APFR 32. Retrieve APFR, translate to corner 4</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 Bolt 3</th> <th>EV2 Bolt 4</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> </tbody> </table>  <p>Put labels on pic</p>	EV1 Bolt 3	EV2 Bolt 4			<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. PGT[B3, CCW2, 30.5]-7/16X6" Release ground strap from S4, 13 turns</p> <p>49. Start ground strap bolt to S5 by hand ~1 turn 50. PGT[B1, CW2, 30.5]-7/16X6" 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. PGT[A6, CCW2, 30.5]-7/16X6" Release soft capture pin fasteners (4), 13-17 turns 53. Remove soft capture pin assembly 54. Egress APFR 55. Translate to corner 1 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</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/5/8x7.8" to EV1</p> <p><u>INSTALL BOLT #4 GROUND STRAP</u></p> <p>38. PGT[B3, CCW2, 30.5]-7/16X2" Release ground strap from S4, 13 turns 39. Start ground strap bolt to S5 by hand ~1 turn 40. PGT[B1, CW2, 30.5]-7/16X2" 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</p>
EV1 Bolt 3	EV2 Bolt 4					

S5 INSTALL (01:30) (Cont)

IV/RMS	EV1 (FF)	EV2 (FF)
	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	

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-lbs)	Failure Torque (ft-lbs)	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:

- Bolt torque order in this procedure was done to minimize socket swaps, APFR relocation, and crew translation between corners
- Torque wrench exposure is limited to 3.5 hr to maintain correct calibration
- 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:

- 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
- Ground strap bolts are sensitive to side loading and extra turns which may release washer of captive fastener feature
- Tip of gap check tool should NOT penetrate gap between RTAS housings past the second line if performed

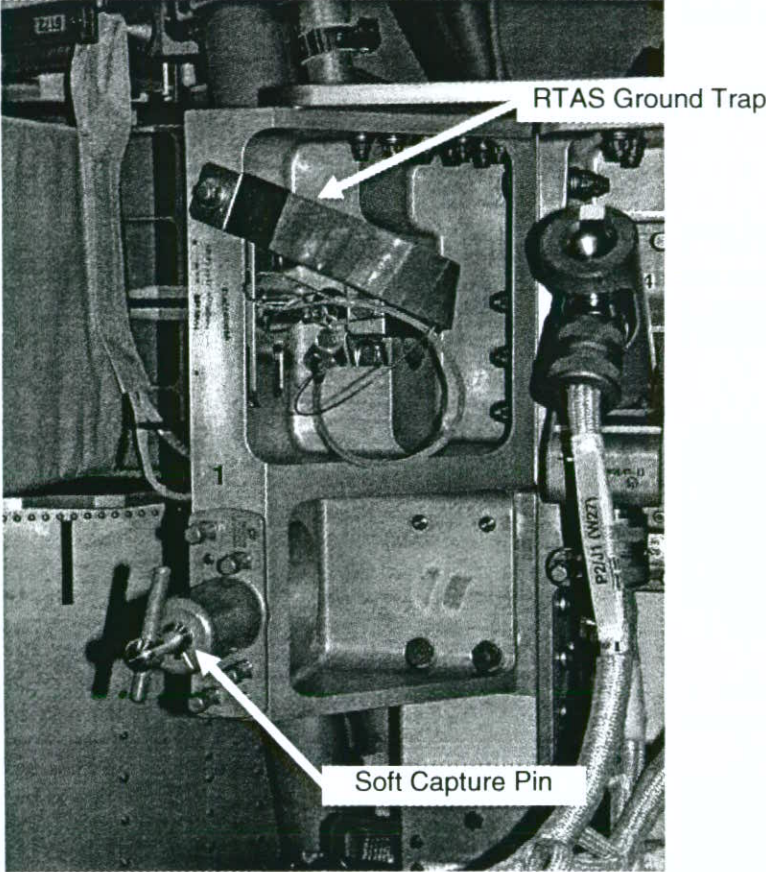
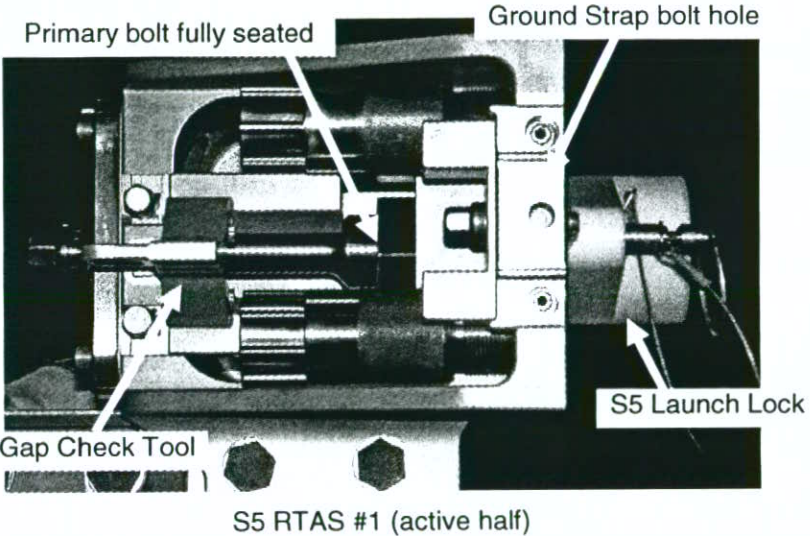
Cautions:

- Verify all cables and tethers are free of S4/S5 interface prior to soft dock
- 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
- 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
- Ground straps are sensitive to cross threading. Begin installation manually for thread alignment and complete turns/torque with PGT
- Hardware is sensitive to crew loads. Do not apply a push force on primary bolt. Damage to self-feeding nut may result
- Approval given to translate w/RAD and socket on PGT from corner to corner for 13A.1 per EVATT
- 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)
- 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)

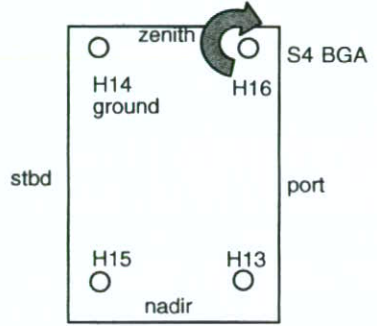
Warnings:

- N/A

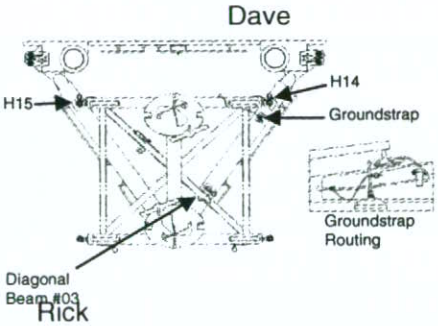
S5 INSTALL TASK DATA SHEET (Cont)



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"> 1. Configure APFR [12, UU, J, 11] 2. Translate to PVRGF fastener H13 3. BRT to HR 2103 if required <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"> • Zenith/Port corner of PVRGF (fastener H16) and Zenith/Port PIP pin on PVRGF with Mast Canister HR and BGA platform cables • Stbd corners of PVRGF (H15 and H14) and outbd RTAS housings • Released PVRGF and SAW blanket box </div> <ol style="list-style-type: none"> 4. PGT[B4 CCW2, 30.5]-7/16X6" Release PVRGF fastener H13, 6-8 turns (do not go to hard stop at this torque) 5. Remove retaining washer, stow in MLI near handrail <p><u>RELEASE PVRGF FASTENER, H15 (FLOAT)</u></p> <ol style="list-style-type: none"> 6. Reconfigure BRT to reach PVRGF fastener H15 if required 7. PGT[B4, CCW2, 30.5]-7/16X6" Release PVRGF fastener H15, 6-8 turns (do not go to hard stop at this torque) 8. Remove retaining washer, temp stow 	<p><u>RELEASE PVRGF GROUND STRAP FASTENER</u></p> <ol style="list-style-type: none"> 1. Verify APFR roll operation 2. Attach waist tether to APFR 3. Ingress APFR <ol style="list-style-type: none"> 4. PGT[B7, CCW2, 30.5]-7/16X2" Release PVRGF ground strap fastener (near H14) from G1, 11-13 turns <p><u>RELEASE PVRGF FASTENER, H14 (FLOAT)</u></p> <ol style="list-style-type: none"> 5. PGT[B4, CCW2, 30.5]-7/16X2" Release PVRGF fastener H14, 6-8 turns (do not go to hard stop at this torque) 6. Remove retaining washer, temp stow on S5 <p><u>RELEASE PVRGF FASTENER, H16, RELEASE PVRGF</u></p> <ol style="list-style-type: none"> 7. Tether to PVRGF HR nadir standoff near H14 (use RET MWS left side), check cooling

PVRGF RELOCATION (01:00) (Cont)

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

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-lbs)	Failure Torque (ft-lbs)	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:

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

Notes:

- PVRGF fasteners H13, H14, and H15 may be released in any order
- For PVRGF spherical bearings: H13 (fixed), H16 (slotted), H14 (float), H15 (float)
- 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

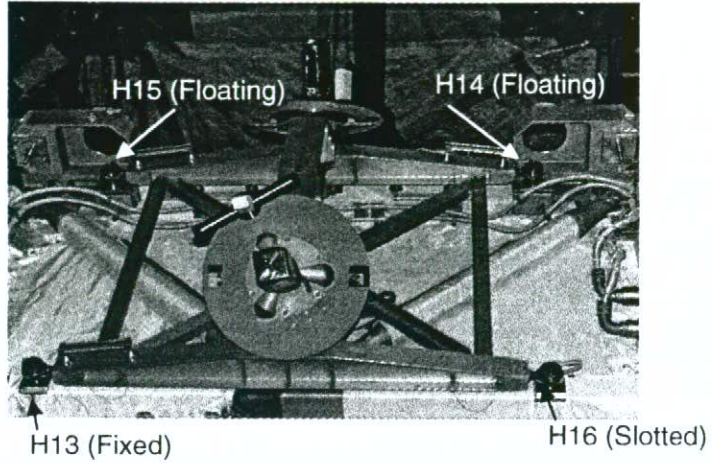
Cautions:

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

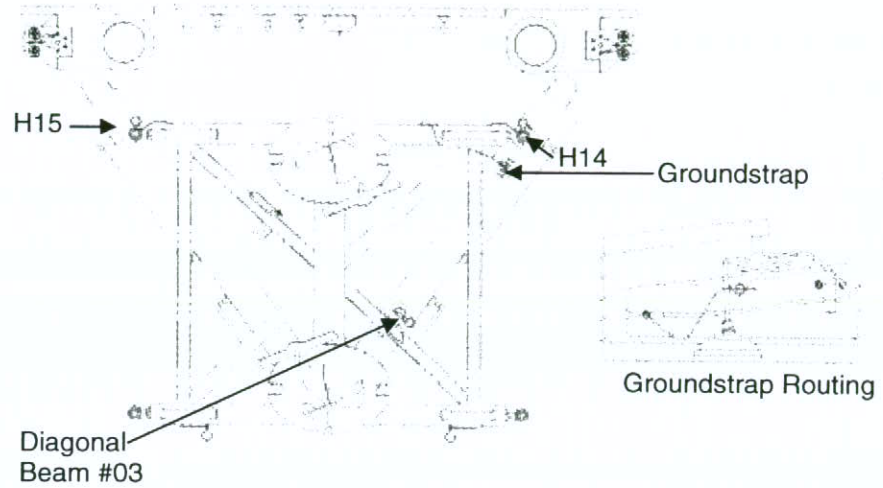
Warnings:

- N/A

PVRGF RELOCATION TASK DATA SHEET (Cont)

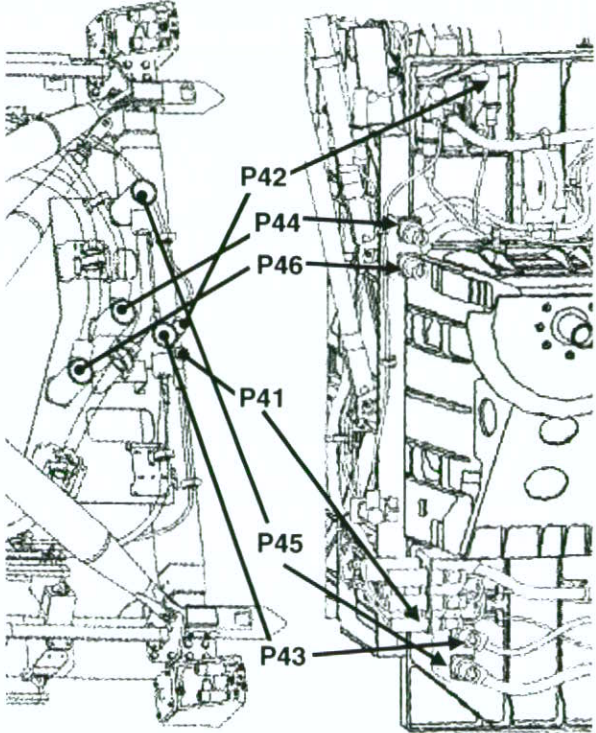


PVRGF in S5 Launch Configuration

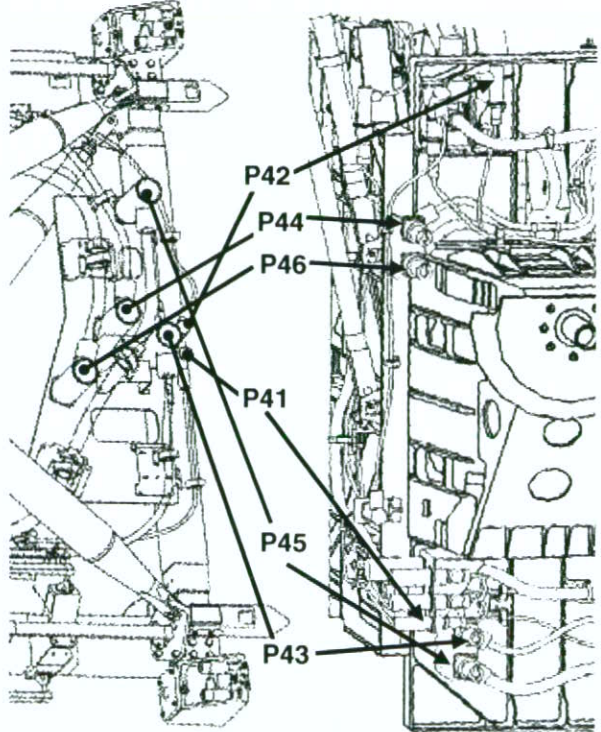


PVRGF on Keel

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"> Remove connector cap from S4 Demate umbilical from S5 Install connector cap on S5 <ul style="list-style-type: none"> Note O-ring on dummy jack Line up white on white Install cap, 90 deg cw <input type="checkbox"/> Pull test Inspect Connector plug <ul style="list-style-type: none"> <input type="checkbox"/> EMI Band <input type="checkbox"/> Pins <input type="checkbox"/> No FOD Use cable to wiggle/twist the plug into alignment, not the tool Line up white on white Install plug, 90 deg cw <ol style="list-style-type: none"> IV: Verify with MCC inhibits for S5 umbilicals (J43, J45) Give EV1 GO for J43, J45, J41 	<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"> Adjust APFR in S5 WIF 13 to [X,SS,B,1] prior to relocation due to boot plate interference Relocate APFR from S5 WIF 13 to S5 WIF 03 (near S5 nadir trunnion); configure to [4,SS,B,1], pull test Retrieve Cannon Connector tool from crewlock bag Release T/A clamps on S5 Nadir/Aft cables <ul style="list-style-type: none"> P41: (3) P43: (5) P45: (5) Ingress APFR <input type="checkbox"/> ← Wait for IV GO (verify power inhibits to J43 and J45) Perform Connector Ops for <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;">RTAS 3</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> <ol style="list-style-type: none"> Remove connector cap from S4 Demate umbilical from S5 Install connector cap on S5 <ul style="list-style-type: none"> Note O-ring on dummy jack Line up white on white Install cap, 90 deg cw <input type="checkbox"/> Pull test Inspect connector plug <ul style="list-style-type: none"> <input type="checkbox"/> EMI Band <input type="checkbox"/> Pins <input type="checkbox"/> No FOD Use cable to wiggle/twist the plug into alignment, not the tool Line up white on white Install plug, 90 deg cw 	<ol style="list-style-type: none"> Egress APFR Close TA clamps as required Reposition APFR to [4,SS,E,1] Release T/A Clamps on S5 Nadir/Fwd cables <ul style="list-style-type: none"> P42: (3) P44: (2) P46: (5) Ingress APFR (may need to Egress APFR for J42 → BRT to S4 HR 2207) <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> Wait for IV GO (verify power inhibits to J44 and J46; data bus reconfig for J42) Perform Connector Ops for: <p style="text-align: center;"><u>NOTE</u> 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> <ol style="list-style-type: none"> Egress APFR Restrain remaining umbilical length in TA clamps as needed to reduce slack Close unused TA Clamps <input checked="" type="checkbox"/> final umbilical config 	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;">RTAS 3</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																						

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

Tools:

EV1 (FF)
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 (OOC)	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:

- Umbilicals must be mated prior to S6 Installation on 15A

Notes:

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

Cautions:

- Inspect connectors for bent pins and FOD
- Verify integrity of EMI band and O-ring
- 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:

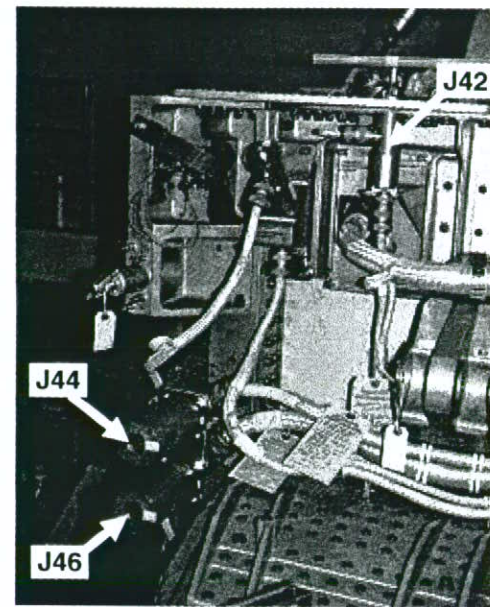
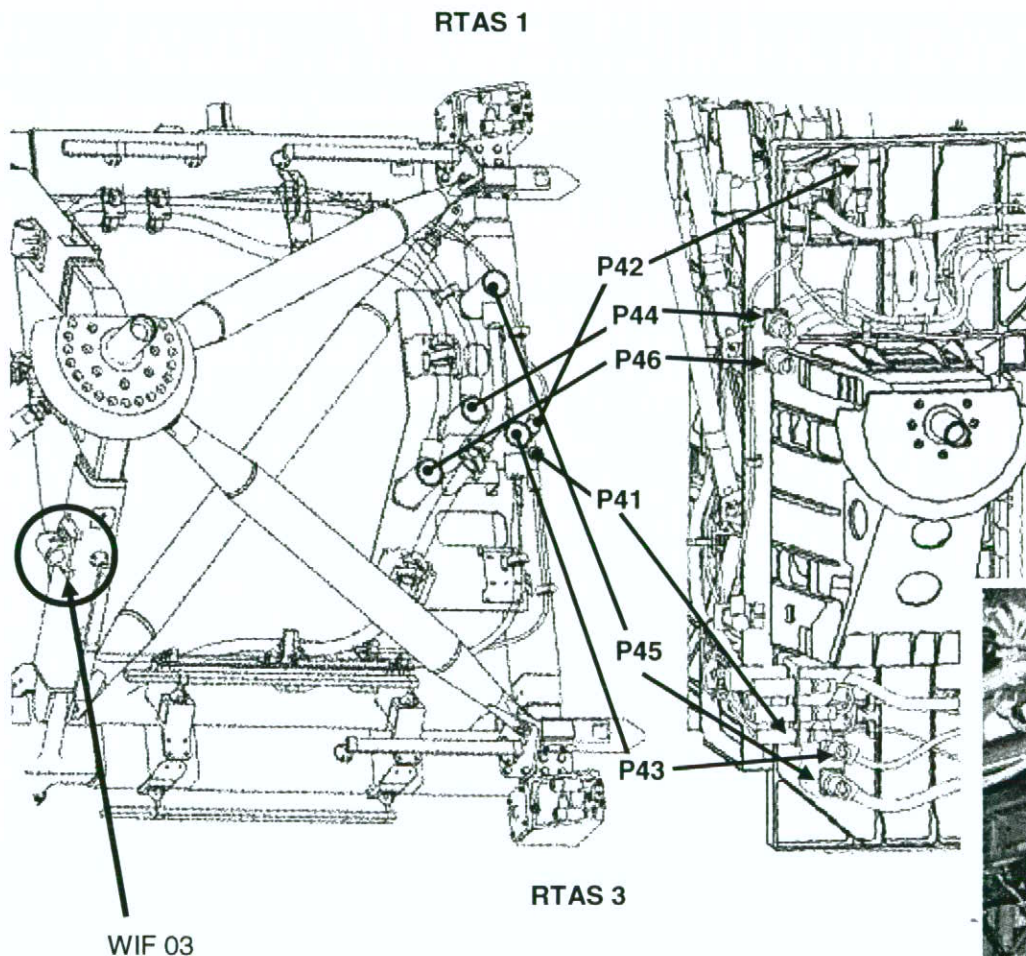
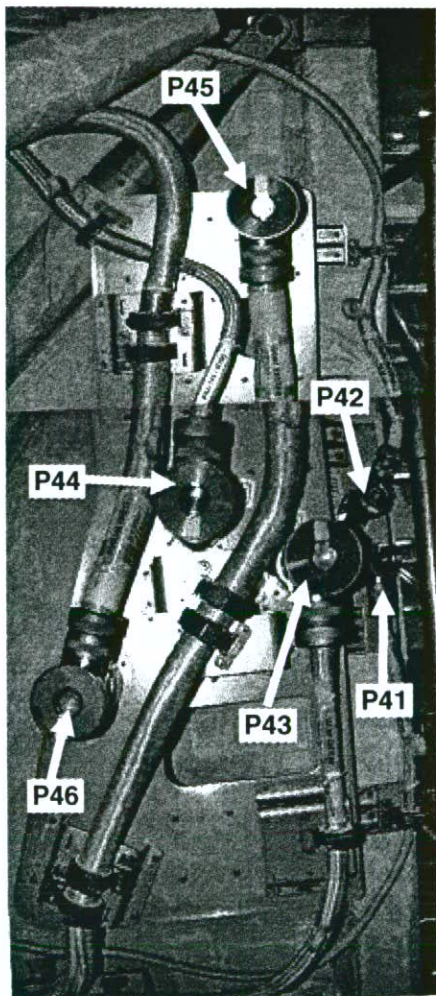
- N/A

MATE S5 TO S4 UMBILICALS TASK DATA SHEET (Cont)

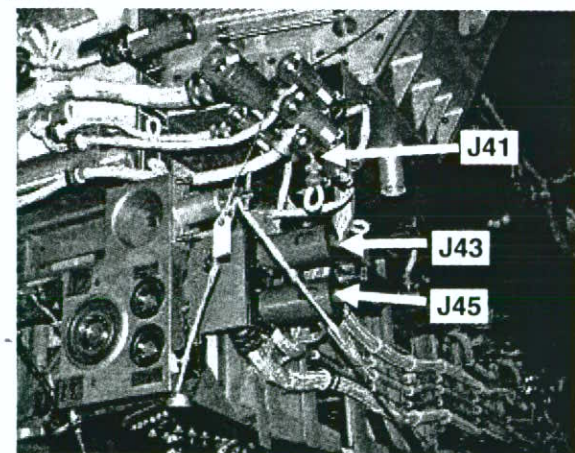
S5 Nadir

STBD ←
↓
AFT

S4 Nadir




J42, J44 and 46 dummy caps installed

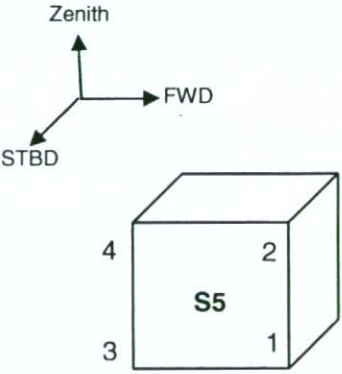


J41, J43 and 45 dummy caps installed

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;">CAUTION</p> <p>Avoid contact with PVRGF grapple pins and RMS target</p> </div> <ol style="list-style-type: none"> 1. Translate to S5 CLA, BRT to S5 handrail 2136 2. Reconfigure PGT with 2 or 6-in socket 3. PGT[A6, CCW3, 30.5]-7/16X2": Open CLA, -127 turns 4. PGT[A6, CW2, 30.5]-7/16X2": Partially close CLA, ~1 turn 5.  final CLA config (SSRMS acceptable if good view and recording)

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		 <p>The diagram shows a 3D perspective of a cube labeled 'S5'. Three axes are shown: 'Zenith' pointing upwards, 'FWD' pointing to the right, and 'STBD' pointing towards the bottom-left. The four corners of the front face of the cube are numbered: corner 1 is at the bottom-right, corner 2 is at the top-right, corner 3 is at the bottom-left, and corner 4 is at the top-left.</p>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p align="center">CAUTION</p> <p>Do not exceed 36 turns when removing launch locks or primary bolt can come free of self-feeding nut</p> </div> <p>REMOVE LAUNCH LOCK</p> <ol style="list-style-type: none"> Translate to S5 corner 3 (nadir/aft) BRT to S5 handrail per IV table Reconfigure PGT – 5/8X7.8" socket; stow 2-in socket on socket caddy Tether to Launch Lock PIP pin PGT[B7, CCW2, 30.5] – 5/8X7.8" Retract S5 primary bolt from launch lock #X 27 turns ← Report turns (36 max) Remove launch lock #X via PIP pin, stow in sm trash bag √Bolt head recessed inside shear cylinder (2-7 threads visible at bolt shoulder) If threads not visible: <ol style="list-style-type: none"> Retract primary bolt until 2 to 7 threads visible Repeat steps 2 to 7 on other 3 corners Remove 5/8 socket and stow on socket caddy; pull test Install 2-in socket on PGT; pull test
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 ()

EV2 (FF)
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-lbs)	Release Torque (ft-lbs)	Failure Torque (ft-lbs)	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:

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

Notes:

- N/A

Cautions:

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

Warnings:

- N/A

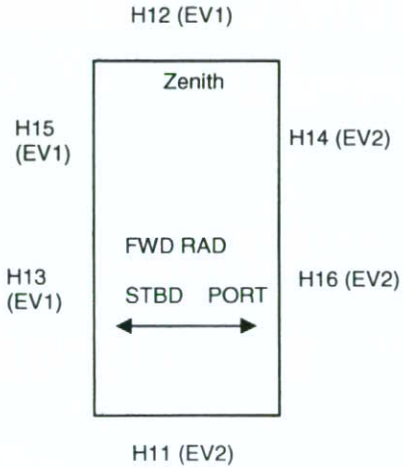
S5 CLEANUP (00:35)

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

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: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;">Zenith</p> <p style="text-align: center;">FWD RAD</p> <p style="text-align: center;">STBD PORT</p> <p style="text-align: center;">↔</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</p> <ul style="list-style-type: none"> - Up Z1 Aft, Stbd corner - FWD on P6 @ IEA - Zenith on P6 <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;">CAUTION</p> <ul style="list-style-type: none"> • Avoid contact with radiator inter-panel flexhoses and thermal outer coating. Tend safety tether reel and line from radiator • Watch helmet clearance with radiator during adjustable tether installation. </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), zenith cinch, PIP pin stowed</p> <ul style="list-style-type: none"> <input type="checkbox"/> H13 <input type="checkbox"/> H15 <input type="checkbox"/> H12 <input type="checkbox"/> Center PVR attach bolt PIP pin <p>4. 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;">WARNING</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>5. Give MCC-H GO for radiator retract when clear</p> <p>6. 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</p> <ul style="list-style-type: none"> - Up Z1 Fwd, Stbd corner (to kelp bed) - Port on P6 above EAS - Zenith on P6 <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), nadir cinch, PIP pin stowed</p> <ul style="list-style-type: none"> <input type="checkbox"/> H16 <input type="checkbox"/> H14 <input type="checkbox"/> H11 <input type="checkbox"/> Center PVR attach bolt PIP pin <p>4. 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>5. Give MCC-H GO for radiator retract when clear</p> <p>6. 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>H12 (EV1)</p> <p>Zenith</p> <p>H15 (EV1)</p> <p>H14 (EV2)</p> <p>FWD RAD</p> <p>STBD PORT</p> <p>H16 (EV2)</p> <p>H11 (EV2)</p>	<p><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></p> <ul style="list-style-type: none"> • Don't touch PVR HR during torquing sequence </div> <p style="text-align: center;"><u>NOTE</u></p> <ul style="list-style-type: none"> • 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. • Check that the fixed end of cinch is properly seated in bracket <ol style="list-style-type: none"> 1. Attach BRT as required 2. Verify zenith cinch bolt (H12) is engaged in threads 3. Verify fixed end pulled all the way out and seated properly in bracket 4. Compress radiator panels and assess zenith cinch installation <ul style="list-style-type: none"> * If not able to install cinch: * * Install adj tethers (2) between PVR panel * * HR and P6 HR * * Simo with EV2, tension tethers * <ol style="list-style-type: none"> 5. Install zenith cinch (H12) 6. Remove zenith winch bar PIP pin (H34); align winch bar clevis to lug on radiator; re-install PIP pin 	<p><u>RADIATOR CINCH INSTALL</u></p> <ol style="list-style-type: none"> 1. Attach BRT as required 2. Verify nadir cinch bolt (H11) is engaged in last thread 3. Verify fixed end pulled all the way out and seated properly in bracket 4. Compress radiator panels and assess nadir cinch installation <ul style="list-style-type: none"> * If not able to install cinch: * * Install adj tethers (2) between PVR panel * * HR and P6 HR * * Simo with EV1, tension tethers * <ol style="list-style-type: none"> 5. Install nadir cinch (H11) 6. Remove nadir winch bar PIP pin (H33); align winch bar clevis to lug on radiator; re-install PIP pin

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

IV	EV1	EV2																																												
<p><u>Cinch (Initial Torque)</u> IV: Record Torque/Turns</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center;">EV1</th> <th style="width: 5%;"></th> <th style="width: 20%; text-align: center;">EV2</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">H12</td> <td></td> <td></td> <td style="text-align: center;">H11</td> </tr> <tr> <td style="text-align: center;">H15</td> <td></td> <td></td> <td style="text-align: center;">H16</td> </tr> <tr> <td style="text-align: center;">H13</td> <td></td> <td></td> <td style="text-align: center;">H14</td> </tr> </tbody> </table> <p><u>Cinch (Final Torque/Manual Turns)</u> IV: Record Torque/Turns and Manual Turn</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center;">EV1</th> <th style="width: 5%;"></th> <th style="width: 20%; text-align: center;">EV2</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">H12</td> <td></td> <td></td> <td style="text-align: center;">H11</td> </tr> <tr> <td style="text-align: center;">Manual</td> <td></td> <td></td> <td style="text-align: center;">Manual</td> </tr> <tr> <td style="text-align: center;">H15</td> <td></td> <td></td> <td style="text-align: center;">H16</td> </tr> <tr> <td style="text-align: center;">Manual</td> <td></td> <td></td> <td style="text-align: center;">Manual</td> </tr> <tr> <td style="text-align: center;">H13</td> <td></td> <td></td> <td style="text-align: center;">H14</td> </tr> <tr> <td style="text-align: center;">Manual</td> <td></td> <td></td> <td style="text-align: center;">Manual</td> </tr> </tbody> </table>		EV1		EV2	H12			H11	H15			H16	H13			H14		EV1		EV2	H12			H11	Manual			Manual	H15			H16	Manual			Manual	H13			H14	Manual			Manual	<p><u>INITIAL CINCH TORQUE</u></p> <p>7. Once both cinches installed: PGT: [A3,CW2,30.5]; 7/16" 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</p> <p>8. Retrieve adj tethers from PVR if used</p> <p><u>FINAL CINCH TORQUE</u></p> <p>9. Set up BRT for bolt final torque (repeat steps 9-12 for all 3 cinches, zenith first)</p> <p>10. PGT: [A3,CW2,30.5]; 7/16" Tighten zenith cinch ~1 turn to torque</p> <p>11. PGT Manual Ratchet (RCW), 30.5; 7/16" Place TBD/TBD turn on cinch</p> <p>12. Verify anti-rotation device is up; if not, put PGT in RCW (manual ratchet), rotate bolt cw – maximum of 60 deg</p> <p style="margin-left: 40px;"> <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 </p> <p>13. Perform tool inventory 14. Remove adj fairlead</p>	<p><u>INITIAL CINCH TORQUE</u></p> <p>7. Once both cinches installed: PGT: [A3,CW2,30.5]; 7/16" 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</p> <p>8. Retrieve adj tethers from PVR if used</p> <p><u>FINAL CINCH TORQUE</u></p> <p>9. Set up BRT for bolt final torque (repeat steps 9-12 for all 3 cinches, nadir first)</p> <p>10. PGT: [A3,CW2,30.5]; 7/16" Tighten zenith cinch ~1 turn to torque</p> <p>11. PGT Manual Ratchet (RCW), 30.5; 7/16" Place TBD/TBD turn on cinch</p> <p>12. Verify anti-rotation device is up; if not, put PGT in RCW (manual ratchet), rotate bolt cw – maximum of 60 deg</p> <p style="margin-left: 40px;"> <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 </p> <p>13. Perform tool inventory</p>
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Manual			Manual																																											

FORWARD RADIATOR 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)

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"> 1. Translate to airlock 2. GET AHEAD: relocate IAPFR from WIF 01 to WIF 05 [11, OO, F, 12]; pull test 3. Perform Tool Inventory 4. If time, take MISSE photos; using EVA Digital Camera take photos of MISSEs 3 & 4 both sides <p><u>INGRESS</u></p> <ol style="list-style-type: none"> 5. On EV2 GO, disconnect EV2 85-ft safety tether from A/L HR 0554 6. Connect left waist tether to EV2 85-ft safety tether, lock hooks 7. Disconnect EV1 85-ft safety tether from EMU, attach to external A/L D-Ring or HR 8. Ingress airlock 9. Remove SCU from stowage pouch 10. Remove DCM cover, Velcro to DCM 11. Connect SCU to DCM; √SCU locked 12. DCM: WATER – OFF 13. Hatch thermal cover – close, attach Velcro strap <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"> 14. Verify all hardware is clear of hatch 15. EV hatch – close and lock 16. Go to PRE REPRESS portion of {CREWLOCK, <u>DEPRESS/REPRESS CUE CARD</u>} (SODF: ISS EVA SYS: EVA PREP/POST) 	<p><u>CLEANUP</u></p> <ol style="list-style-type: none"> 1. Translate to airlock 2. Perform Tool Inventory 3. If time, take MISSE photos; using EVA Digital Camera take photos of MISSEs 3 & 4 both sides <p><u>INGRESS</u></p> <ol style="list-style-type: none"> 4. Ingress airlock 5. Connect left waist tether to UIA D-ring 6. Give EV1 GO to disconnect 85-ft tether 7. Remove SCU from stowage pouch 8. Remove DCM cover, Velcro to DCM 9. Connect SCU to DCM; √SCU locked 10. DCM: WATER – OFF <ol style="list-style-type: none"> 11. Go to PRE REPRESS portion of {CREWLOCK, <u>DEPRESS/REPRESS CUE CARD</u>} (SODF: ISS EVA SYS: EVA PREP/POST)

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" rigid
- BRT (L)
- RET (sm-sm)
- Wire Ties (2)

CREWLOCK

Verify following item is in Staging Bag

- PGT S/N _____ w/battery
- 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) – 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
- Adj tether to internal D-ring
- Socket Caddy
- 7/16 X 6" wobble
- 7/16 X 2"
- Manual Ratchet
- Adj tether to internal D-ring
- Spare torque wrench
- D-ring Extender

External

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

EVA 2 BREIFING CUE CARD**EVA PREP:**

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

Remove watches, jewelry, etc during EMU ops

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 to EV2 Left waist

* Tuck in all tools, BRT, PGT prior to egress

* 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 & INSTALL at Z1:

Avoid inadvertent contact with CMG

CMG shims must be removed within two hours 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 ESP3

SSRMS smooth onset motion: CMG mass handling

CMG INSTALL at ESP2:

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

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, LDRI diffuser, OBSS saddle and MPM contacts, cameras, Ku-Band blank 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

* Tuck in all tools, BRT, PGT prior to ingress

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

EVA 2 SUMMARY TIMELINE

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

CREWLOCK

Verify following item is in Staging Bag

- PGT S/N _____ w/battery
- 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
- MUT EE
- ISS Prybar
- RAD
- Digital Camera
- 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
- EVA Ratchet
- Adj tether to internal D-ring
- Socket Caddy
- 7/16 X 6" wobble
- 7/16 X 2"
- Ballstack
- Spare 85-ft safety tether
- D-ring Extender

Outside

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

Prior to EVA

Inspect BRTs and ball stacks for loose fittings/screws

Inspect RET cord for damage

Inspect safety tethers and waist tethers load alleviating straps

EVA 2 INHIBIT PAD

Orbiter

TCS	
L12	1. √TCS POWER – OFF
Ku-Band Antenna	
MCC-H	1. √KU-BAND Mask – active 2. √KU-BAND EVA Protect Box – active
RCS	
	If EV crew < 27 ft from FRCS:
IV O14,15,16	1. √DAP: VERN, FREE, LO Z (flt specific √with GNC) 2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF LOGIC (four) – OFF
MCC-H	3. √Above RCS config
IV	4. √RCS F – ITEM 1 EXEC (*) √JET DES F1U – ITEM 17 (*) F3U – ITEM 19 (*) F2U – ITEM 21 (*)
S-Band Antennas	
	<u>NOTE</u> Possible loss of comm when forced LL FWD antenna
IV A1R	If EV crew < 1.6 ft from S-Band antenna: 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

ESP-3 (prior to CMG/FRAM remove)		
		<u>SM 179 POWER TRANSFER</u>
IV	A15	1. APCU 1,2 CONV (two) – 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

Ground Radar	
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. TBD Inhibit to safe site #5

Lab Window

- IV
1. Close window shutter

CMG-3

- 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, ОК03, ОКГ3, ОК06, ОКГ6, ОК07, ОКГ7, ОК08, 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

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, P6]
 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. 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 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

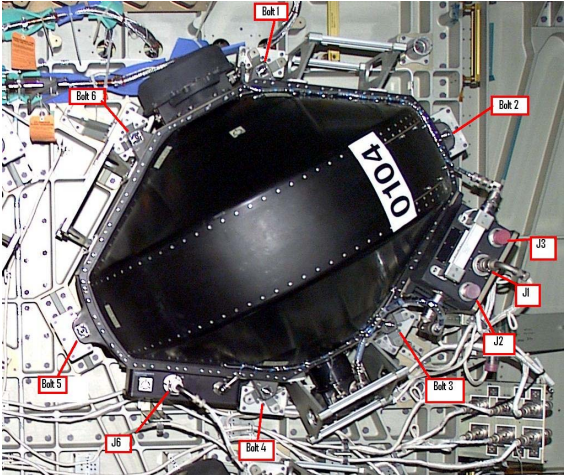
EVA 2 EGRESS/SETUP (00:50)

IV/RMS	EV1 (FF)	EV2 (FF)
<p>POST DEPRESS (DEPRESS/REPRESS Cue Card)</p> <p>SSRMS Initial Config: 1.300 CMG R&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>POST DEPRESS (DEPRESS/REPRESS Cue Card)</p> <div> </div> <p style="text-align: center;">Initial Tether Configuration</p> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> 1. ✓ Initial tether configuration, hooks locked, reels unlocked 2. On EV2 GO, release left waist tether from A/L D-ring 3. Egress Airlock with CL Bag #1 4. ✓ SAFER MAN ISOL vlv – OP (dn) and HCM (dn) 5. Close Hatch Thermal Cover 	<p>POST DEPRESS (DEPRESS/REPRESS Cue Card)</p> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> 1. ✓ Initial tether configuration, hooks locked, reels unlocked 2. Hatch Thermal cover – open 3. Egress airlock 4. Inspect external Safety tether load alleviating straps 5. Attach RT 85-ft safety tether retracting end to A/L HR 0554, LOCK hook, reel unlocked 6. Attach EV1 85-ft safety tether to A/L HR 0550, LOCK hook 7. Give EV1 GO to release from A/L D-ring 8. ✓ SAFER MAN ISOL vlv – OP (dn) and HCM (dn)

EVA 2 EGRESS/SETUP (Cont)

IV/RMS	EV1 (FF)	EV2 (FF)
<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>SSRMS: On EV2 GO, mnvr to PLB</p>	<p><u>SETUP</u></p> <ol style="list-style-type: none"> 6. Translate to Z1 worksite 7. Reconfigure IAPFR in from Z1 WIF 01 to WIF 05 [11, OO, F, 12]; pull test 8. Verify on IAPFR that the Boot Clips are set for large and PIP pin installed on toe bar 9. Temp stow CL Bag on Z1 HR 6051 <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"> 10. Verbalize CMG shroud configuration and removal actions to IV; need to return MLI at end of R&R to starting config 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) 12. Perform WVS survey of failed CMG on Z1 <input type="checkbox"/> WVS complete 	<p><u>SETUP</u></p> <ol style="list-style-type: none"> 9. GCA SSRMS for install 10. Install WIF adapter on SSRMS, tether point toward EE; install hitch pin or RET 11. Retrieve APFR and Ingress Aid from A/L WIF 11 12. Install APFR (w/Ingress Aid); pull test 13. Configure SSRMS APFR [12,PP,F,4] 14. Verify safety tether clear of SSRMS 15. Give SSRMS GO for mnvr to PLB; GCA as required 16. Translate to shroud removal worksite; fairlead to HR 6550 17. Assist EV1 as required to remove Velcro and peel back Z1 CMG thermal shroud to gain access to CMG 3

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><u>REMOVE FAILED CMG</u></p> <p>← <input type="checkbox"/></p> <ol style="list-style-type: none"> On IV GO, demate connector: <ul style="list-style-type: none"> <input type="checkbox"/> J6 – tuck behind CMG #4 HR Demate connectors: <ul style="list-style-type: none"> <input type="checkbox"/> J1 <input type="checkbox"/> J2 <input type="checkbox"/> J3 Temp stow connectors (3) to HR on CMG #4, wire tie as required Ingress IAPFR (WIF 05) Configure PGT with 12-in socket if required PGT[B4, CCW2, 30.5]-12Ext-7/16: Loosen CMG bolts (3), 2 turns each, any order: <ul style="list-style-type: none"> <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 When all 6 bolts loosened, wiggle CMG Tether to shims PGT[A4, CCW2, 30.5]-12Ext-7/16: Remove shims (2), place in trash bag, expect 10-14 turns, any order <ul style="list-style-type: none"> <input type="checkbox"/> 3c <input type="checkbox"/> 3d Tether to CMG HR using Lg/Sm RET prior to removing last bolt PGT[B4, CCW2, 30.5]-12Ext-7/16: Remove CMG bolts (3), expect 9-13 turns, any order: <ul style="list-style-type: none"> <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 Remove CMG from soft dock, expect 16 lb force Position CMG for temp stow 	<p><u>REMOVE FAILED CMG</u></p> <ol style="list-style-type: none"> Set up MUT-Ballstack-MUT on HR 6050 (above Z1 Stbd Toolbox) Set up Lg-Sm RET from CL Bag #1 on HR 6050 Fairlead over top of Z1, using HR 6051 (w/adj) as translating port BRT to CMG #2 HR (or Z1 HR 6036) PGT[B4, CCW2, 30.5]-6Ext-7/16: Loosen CMG bolts (3), 2 turns each, any order: <ul style="list-style-type: none"> <input type="checkbox"/> 1 <input type="checkbox"/> 5 <input type="checkbox"/> 6 When all 6 bolts loosened, wiggle CMG Tether to shims PGT[A4, CCW2, 30.5]-6Ext-7/16: Remove shims (2), place in trash bag, expect 10-14 turns, any order <ul style="list-style-type: none"> <input type="checkbox"/> 6c <input type="checkbox"/> 6d PGT[B4, CCW2, 30.5]-6Ext-7/16: Remove CMG bolts (3), expect 9-13 turns, Bolt 6 last: <ul style="list-style-type: none"> <input type="checkbox"/> 1 <input type="checkbox"/> 6 <input type="checkbox"/> 5 (last) Assist EV1 in CMG until clear of structure Stow CMG on MUT EE Tether CMG to Z1 HR Give EV1 GO to Release

REMOVE FAILED CMG (00:30) (Cont)

IV/RMS	EV1 (FF)	EV2 (FF)
<p>WVS View should include:</p> <ul style="list-style-type: none">• Connector stow• 6 bolt stanchions <p><u>NOTE:</u> Leave CL Bag #1 on Z1</p>	<ol style="list-style-type: none">14. On EV2 GO, release CMG tether15. Remove 12" socket from PGT stow on socket caddy16. Install 6" socket on PGT17. Perform WVS survey of CMG location after removal of failed CMG<ul style="list-style-type: none"><input type="checkbox"/> WVS survey complete	

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</p> <div> <p>SM 179 POWER TRANSFER</p> </div> <table border="0"> <tr> <td>A15</td> <td>1.</td> <td>PTAPCU 1,2 CONV (two) – OFF</td> </tr> <tr> <td>CRT</td> <td>2.</td> <td>√PTU 1,2 APCU OUT VOLTS < 10 V</td> </tr> <tr> <td>A15</td> <td>3.</td> <td>APCU 1 OUTPUT – OFF</td> </tr> <tr> <td>CRT</td> <td>4.</td> <td>√PTU 1 APCU OUTPUT – OFF</td> </tr> </table> <p>Report Inhibits Complete to MCC and EV crewmembers</p> <p>SSRMS: On EV2 GO, ESP-2 mnvr with new CMG</p>	A15	1.	PTAPCU 1,2 CONV (two) – OFF	CRT	2.	√PTU 1,2 APCU OUT VOLTS < 10 V	A15	3.	APCU 1 OUTPUT – OFF	CRT	4.	√PTU 1 APCU OUTPUT – OFF	<p><u>CMG/FSE RELEASE FROM ESP-3</u></p> <ol style="list-style-type: none"> Translate to Airlock Hatch for Tether Config Attach EV2 safety tether (retracting end) to left D-ring ext; verify hook locked Retrieve spare 85-ft tether from airlock Translate to PMA/ODS tether swap location Tether swap to spare 85-ft tether, PMA HR 402 Translate to ESP-3 via port side, fairlead at fwd PLB/ODS truss (w/Adj) <p><u>NOTE:</u> Watch out for PLB KOZ and monkey fur</p> <ol style="list-style-type: none"> Fairlead safety tether at port fwd corner of ESP-3 Remove CMG shroud straps, temp stow Remove MLI to access HRs on torque side for transfer to ESP-2 <div> </div> <ol style="list-style-type: none"> Verify safety tether clear of worksite On IV and EV2 GO, release FRAM bolt PGT [TBD, CCW2, MTL 30.5]-6 Ext 7/16: Release FRAM Primary Bolt, push while turning to release ARD (~10 lb), approx 11 turns to hard stop Assist EV2 as required <p><u>POWER CABLE RECONFIG ON ESP-3</u></p> <ol style="list-style-type: none"> Translate to ESP-3 KYA Connector Box 	<p><u>CMG/FSE RELEASE FROM ESP-3</u></p> <ol style="list-style-type: none"> Translate to Airlock Hatch for Tether Config Attach spare waist tether to HR Tether swap A/L tether to EV1 (Daisy Chain method) Translate to PMA/ODS tether swap location Pause while EV1 does tether swap Translate to Ingress position (port sill) <p><u>NOTE:</u> Watch out for PLB KOZ and monkey fur</p> <ol style="list-style-type: none"> At Ingress position, waist tether to sill GCA SSRMS in to tether swap position Tether swap to SSRMS Attach MWS EE to Ingress Aid Ingress SSRMS APFR GCA SSRMS to CMG/FRAM removal location Attach RET to CMG (HR between EA and THA boxes) <ol style="list-style-type: none"> Verify safety tether clear of worksite Give EV1 and IV GO for FRAM release Remove Integrated Assembly (IA) from passive FRAM; remove restrained by magnetic soft dock (15-20 lb reqd for removal) <p><u>CMG/FSE INSTALL ON ESP-2</u></p> <ol style="list-style-type: none"> Give SSRMS GO to mnvr to ESP-2
A15	1.	PTAPCU 1,2 CONV (two) – OFF												
CRT	2.	√PTU 1,2 APCU OUT VOLTS < 10 V												
A15	3.	APCU 1 OUTPUT – OFF												
CRT	4.	√PTU 1 APCU OUTPUT – OFF												

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

IV/RMS	EV1 (FF)	EV2 (SSRMS)
<p>IV: Verify ESP-2 FRAM Site #5 inhibits in place</p>	<ol style="list-style-type: none"> 15. On IV GO, disconnect shuttle power cable (P1) from connector box (J1) 16. Mate to dummy receptacle on KYA, coil cable away from ESP-3 17. Perform WVS survey 18. Translate to ESP-3 PDU 19. Disconnect UMA power cable (P1) from dummy receptacle 20. Disconnect shuttle power cable (P2) from PDU J1; mate to dummy receptacle 21. Mate UMA power cable (P1) to PDU J1 22. Verify ESP-3 clear to come out of bay 23. Perform Tool Inventory <p><u>CMG/FSE INSTALL ON ESP-2</u></p> <ol style="list-style-type: none"> 24. Retrieve Adj fairlead 25. Translate to PMA/ODS tether swap location 26. Tether swap to A/L tether 27. Translate to ESP-2 Nadir Site #5 28. Stow spare safety tether at A/L 29. Verify safety tether clear of worksite 30. GCA SSRMS to CMG/FSE Install worksite <ol style="list-style-type: none"> 31. Assist EV2 to soft dock CMG/FSE 32. PGT [TBD, CW2, MTL 30.5]-6 Ext 7/16: Drive FRAM Primary Bolt, push while turning to release ARD (~10 lb), approx 11 turns to hard stop 	<ol style="list-style-type: none"> 18. Align CMG/FRAM with FRAM site #5 on ESP-2 19. Soft dock CMG/FSE; magnetic soft dock 15-20 lb

REMOVE NEW CMG (00:50)

IV/RMS	EV1 (FF)	EV2 (SSRMS)
<p>SSRMS: On EV2 GO, mnvr to Z1 ACCESS position</p>	<p><u>REMOVE NEW CMG</u></p> <ol style="list-style-type: none"> 1. Open Thermal cover 2. Remove connector caps (4); temp stow on EPS-2 3. BRT to CMG HR as required 4. PGT[B4, CCW2, 30.5]-6Ext-7/16: Loosen CMG bolts (3), 2 turns each, any order: <input type="checkbox"/>2 <input type="checkbox"/>1 <input type="checkbox"/>6 5. When all 6 bolts loosened, wiggle CMG 6. Tether to shims 7. PGT[A4, CCW2, 30.5]-6Ext-7/16: Remove shims (2), place in trash bag, expect 10-14 turns, any order <input type="checkbox"/>6c <input type="checkbox"/>6d 8. PGT[B4, CCW2, 30.5]-6Ext-7/16: Remove CMG bolts (3), expect 9-13 turns, Bolt 2 last: <input type="checkbox"/>6 <input type="checkbox"/>1 <input type="checkbox"/>2 (last) 9. Verify safety tether clear of CMG worksite 10. Assist EV2 on CMG removal 	<p><u>REMOVE NEW CMG</u></p> <ol style="list-style-type: none"> 1. Assist EV1 with opening thermal cover 2. Assist EV1 with connector cap removal 3. Configure PGT w/12" socket; pull test 4. PGT[B4, CCW2, 30.5]-12Ext-7/16: Loosen CMG bolts (3), 2 turns each, any order: <input type="checkbox"/>3 <input type="checkbox"/>4 <input type="checkbox"/>5 5. When all 6 bolts loosened, wiggle CMG 6. Tether to shims 7. PGT[A4, CCW2, 30.5]-12Ext-7/16: Remove shims (2), place in trash bag, expect 10-14 turns, any order <input type="checkbox"/>3c <input type="checkbox"/>3d 8. Verify tethered to CMG HR using Lg/Sm RET prior to last bolt removal 9. PGT[B4, CCW2, 30.5]-12Ext-7/16: Remove CMG bolts (3), expect 9-13 turns, any order: <input type="checkbox"/>3 <input type="checkbox"/>4 <input type="checkbox"/>5 10. Stow 12" socket on socket caddy; pull test 11. Remove CMG from FSE 12. Give SSRMS GO to mnvr to Z1

INSTALL NEW CMG ON Z1 (00:55)

IV/RMS	EV1 (FF)	EV2 (SSRMS/FF)																
<p>ISS views while moving to Z1: PLB A, B</p> <p>SSRMS: On EV2 GO, mnvr to CMG HANDOFF position</p> <p>IV: Record installation turns/torques for CMGXX:</p> <table border="1"> <thead> <tr> <th colspan="2">EV1</th> <th colspan="2">EV2</th> </tr> </thead> <tbody> <tr> <td>Bolt 2</td> <td></td> <td>Bolt 1</td> <td></td> </tr> <tr> <td>Bolt 3</td> <td></td> <td>Bolt 5</td> <td></td> </tr> <tr> <td>Bolt 4</td> <td></td> <td>Bolt 6</td> <td></td> </tr> </tbody> </table>	EV1		EV2		Bolt 2		Bolt 1		Bolt 3		Bolt 5		Bolt 4		Bolt 6		<p><u>INSTALL NEW CMG</u></p> <ol style="list-style-type: none"> Translate to Z1 worksite Check for FOD in CMG cavity before installation Actuate plungers with RET hook (4); Corners 1, 3, 4, 6 Ingress IAPFR (WIF 05) Configure PGT w/12-in ext; pull test Attach Lg/Sm RET to CMG Give EV2 GO to release RET from CMG Receive CMG from EV2 Give EV2 GO to release CMG Install CMG into soft dock position on Z1. Expect 16 lb force, use 15-25 deg tilt PGT[B6, CW2, 30.5]-12Ext-7/16: Install CMG bolts (3), 2 turns each: <input type="checkbox"/>2 <input type="checkbox"/>3 <input type="checkbox"/>4 PGT[B6, CW2, 30.5]-12Ext-7/16: Install CMG bolts (3), expect 9-13 turns to a torque stall: <input type="checkbox"/>2 <input type="checkbox"/>3 <input type="checkbox"/>4 ← <input type="checkbox"/> Report torque/turns Stow 12-in socket on socket caddy; pull test Install 6-in socket on PGT; pull test Remove tether from CMG 	<p><u>INSTALL NEW CMG</u></p> <ol style="list-style-type: none"> SSRMS mnvr to Z1 Watch all SSRMS clearances at Z1 worksite as reqd GCA SSRMS to Handoff position <p>Position CMG for handoff; give EV1 GO to tether to CMG</p> <ol style="list-style-type: none"> On EV1 GO, release RET from CMG Hand CMG to EV1; release on EV1 GO GCA SSRMS to APFR Egress Egress SSRMS APFR Assist EV1 with CMG tilt BRT to Z1 HR 6036 PGT[B6, CW2, 30.5]-6Ext-7/16: Install CMG bolts (3), 2 turns each: <input type="checkbox"/>1 <input type="checkbox"/>5 <input type="checkbox"/>6 PGT[B6, CW2, 30.5]-6Ext-7/16: Install CMG bolts (3), expect 9-13 turns to a torque stall: <input type="checkbox"/>1 <input type="checkbox"/>5 <input type="checkbox"/>6 ← <input type="checkbox"/> Report torque/turns
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Bolt 2		Bolt 1																
Bolt 3		Bolt 5																
Bolt 4		Bolt 6																

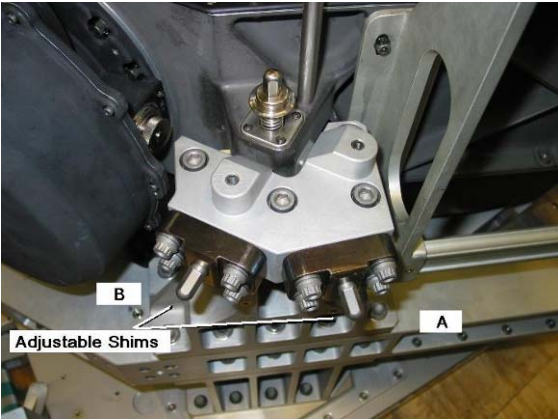
INSTALL NEW CMG ON Z1 (00:55) (Cont)

IV/RMS	EV1 (FF)	EV2 (SSRMS/FF)
<p>IV: Give MCC-H GO for CMG3 power up</p>	<p>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>12. Mate connector: <input type="checkbox"/>J6</p> <p>13. Confirm J6 complete, GO for THA power up</p> <p>14. Perform WVS survey of final CMG configuration <input type="checkbox"/> WVS survey complete</p>

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

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

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

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<p>IV: Record installation turns/torques for CMGXX:</p> <table border="1"> <thead> <tr> <th colspan="2">EV1</th> <th colspan="2">EV2</th> </tr> </thead> <tbody> <tr> <td>Bolt 1</td> <td></td> <td>Bolt 3</td> <td></td> </tr> <tr> <td>Bolt 2</td> <td></td> <td>Bolt 4</td> <td></td> </tr> <tr> <td>Bolt 6</td> <td></td> <td>Bolt 5</td> <td></td> </tr> </tbody> </table>	EV1		EV2		Bolt 1		Bolt 3		Bolt 2		Bolt 4		Bolt 6		Bolt 5		<p>19. PGT[B7, CW2, 30.5]-6Ext-7/16: Torque CMG bolts (3), expect 9-13 turns to a torque stall: <input type="checkbox"/>1 <input type="checkbox"/>2 <input type="checkbox"/>6 ← <input type="checkbox"/> Report torque/turns</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>CAUTION Verify ccw on PGT prior to initial adjustable shim operations</p> </div> <p>20. PGT[A3, CCW1, 30.5]-6Ext-7/16: 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 CW1 1/2 turn</td> <td></td> <td></td> </tr> <tr> <td>iii)</td> <td>Reinstall CCW1 to torque stall. Confirm stall occurred at same location as first stall</td> <td></td> <td></td> </tr> </tbody> </table> <p>21. Install connector caps (4) on failed CMG 22. Install CMG MLI 23. Secure CMG shroud straps (3)</p>			6a	6b	i)	Drive adjustable shim bolts (2), to contact or torque stall, no pattern, min 1 turn			ii)	Rotate CW1 1/2 turn			iii)	Reinstall CCW1 to torque stall. Confirm stall occurred at same location as first stall			<p>15. PGT[B7, CW2, 30.5]-12Ext-7/16: Torque CMG bolts (3), expect 9-13 turns to a torque stall: <input type="checkbox"/>3 <input type="checkbox"/>4 <input type="checkbox"/>5 ← <input type="checkbox"/> Report torque/turns</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>CAUTION Verify ccw on PGT prior to initial adjustable shim operations</p> </div> <p>16. PGT [A3, CCW1, 30.5]-12Ext-7/16: 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 CW1 1/2 turn</td> <td></td> <td></td> </tr> <tr> <td>iii)</td> <td>Reinstall CCW1 to torque stall. Confirm stall occurred at same location as first stall</td> <td></td> <td></td> </tr> </tbody> </table> <p>17. Remove RET tether from CMG 18. Stow 12-in ext on socket caddy; pull test 19. Assist EV1 with connector cap install 20. Assist EV1 with CMG MLI Install 21. Secure CMG shroud straps (3)</p>			3a	3b	i)	Drive adjustable shim bolts (2), to contact or torque stall, no pattern, min 1 turn			ii)	Rotate CW1 1/2 turn			iii)	Reinstall CCW1 to torque stall. Confirm stall occurred at same location as first stall		
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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	22.92	19.4	26.7	10
CMG Shims (fixed, Z1)		7/16	4	5.0	6.3	9.17	10.9
CMG Shims (fixed, FSE)		7/16	4	5.0	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	TBD	TBD	TBD	11

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:

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

Cautions:

1. Avoid inadvertent contact with CMG
2. CMG Shims must be removed within 2 hr of CMG powerdown on Z1
3. 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
4. CMG may have oily residue around the Torque Module Assembly, avoid contact (may cause damage to other ORUs through cross-contamination)
5. 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
6. Adjustable shims can not be turned cw from launch position or damage to soft dock spring plungers can occur

CMG-3 Inhibits:

- MCC-H
1. Verify EA Power Removal and Inhibit
S0:EPS:RPCM Z13B B: RPC 17
RPCM Z13B B RPC 17
√RPC Position – Op
√Close Cmd – Inh
 2. 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)

IV/RMS	EV1	EV2
<p>SSRMS: On EV2 GO, mnvr to APFR EGRESS position</p> <p>IV: Record APFR Setting A/L WIF 11 _____</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"> 1. Perform tool inventory 2. Translate to Airlock <p><u>INGRESS</u></p> <ol style="list-style-type: none"> 3. On IV GO, open thermal cover 4. Stow CL Bag #1 in A/L 5. Ingress A/L 6. Attach left waist tether to A/L D-ring extender 7. Give EV2 GO for tether ops 8. Remove SCU from stowage pouch 9. Remove DCM cover, Velcro to DCM 10. Connect SCU to DCM; √SCU locked 11. DCM: WATER – OFF 12. Close thermal cover, attach Velcro strap 13. Verify all hardware is clear of hatch 14. EV Hatch – close and lock <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"> 1. GCA SSRMS to cleanup position (near A/L WIF 11) 2. Tether swap to A/L; Remove safety tether from SSRMS 3. Remove APFR and Ingress Aid; 4. Stow APFR and Ingress Aid in A/L WIF 11; report settings 5. Remove WIF Adapter, stow in trash bag 6. Release SSRMS from EVA activities 7. Perform tool inventory 8. Translate to A/L hatch <p><u>INGRESS</u></p> <ol style="list-style-type: none"> 9. After EV1 GO, remove EV1 85-ft tether from A/L 10. Hook to EV2 D-ring extender 11. Remove EV2 85-ft tether from A/L 12. Ingress A/L 13. Stow items as reqd 14. Remove SCU from stowage pouch 15. Remove DCM cover, Velcro to DCM 16. Connect SCU to DCM; √SCU locked 17. DCM: WATER – OFF <p>Go to PRE REPRESS portion of {CREWLOCK <u>DEPRESS/REPRESS CUE CARD</u>} (SODF: ISS EVA SYS: EVA PREP/POST)</p>
<p>CAUTION 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 PIP pin)
- RET (sm-sm)
- RET (Lg-sm)
- Sm Trash Bag (R, inside)
- CMG Shims (4)
- 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
- 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 (on wrist)
- 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)
- 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 (2)

CREWLOCK

Verify following item is in Staging Bag

- PGT S/N _____ w/battery
- 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
- MUT EE
- ISS Prybar
- RAD
- Digital Camera
- 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
- EVA Ratchet
- Adj tether to internal D-ring
- Socket Caddy
- 7/16 X 6" wobble
- 7/16 X 2"
- Ballstack
- Spare 85-ft safety tether
- D-ring Extender

External

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

EVA 3

EVA 3 BRIEFING CARD

EVA PREP:

- 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
- * 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

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 ISSACS 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

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:

TBD

DAY/NIGHT TRANSITIONS: (IV will call)

- * Lights, visor, glove heaters, check all tools secure, adjust suit temp if desired

INGRESS PLAN:

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

- * Review during EMU P/B if time

EVA 3 SUMMARY TIMELINE

PET TIME (HR:MIN)	13A.1 EVA 1				
	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>P1 RBVM MLI</u> (00:30)	04:55	<u>P6 TRANSPONDER RETRIEVAL</u> (01:00)
		05:25	<u>Z1 SASA SPARE GIMBAL BOLTS</u> (00:30)		
06:00		05:55	<u>CLEANUP/INGRESS</u> (00:35) CLEANUP (00:15) INGRESS (00:15) PRE REPRESS (DEPRESS/REPRESS CC) (00:05)		<u>CLEANUP/INGRESS</u> (00:35) CLEANUP (00:15) INGRESS (00:15) PRE REPRESS (DEPRESS/REPRESS CC) (00:05)
--	EVA Time 6:30	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

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)
- Socket caddy (R, inside)
- 7/16 X 9" rigid
- 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
- CETA Cart Wheel Boogie PIP pin
- Med ORU Bag
- 6 B box cover w/o thermal cover (long wire-tied to bag)
- RET (to box cover)
- BSP
- 6 B box cover w/thermal cover
- RET (to box cover)
- Transponder
- Round Scoop
- Ballstack (secured on outside)
- RET (sm-sm)
- Lg-sm RET on outside
- sm-sm RETs (free end to outside of bag)
- Adj tether (on outside)
- 85-ft spare 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
- Adj tether to internal D-ring
- EVA Ratchet
- Adj tether to internal D-ring
- Socket Caddy
- 7/16 X 6" wobble
- 7/16 X 2"
- Ballstack
- Spare 85-ft safety tether
- D-ring Extender

Prior to EVA

- Inspect BRTs and ball stacks for loose fittings/screws
- Inspect RET cord for damage
- Inspect safety tethers and waist tethers load alleviating straps

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 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

P1 TRRJ – (P1 RBVM FQD MLI Task)

One TRRJ DLA locked, both RJMCs unpowered for EV crew
in radiator beam proximity:

MCC-H 1. √DLA (1) – LOCKED
2. RPCM P11A_B RPC 11 – Open, Close Cmd Inhibit
P1-1 (Zenith RJMC Ops pwr)
3. RPCM P12B_C RPC 1 – Open, Close Cmd Inhibit
P1-2 (Nadir RJMC Ops pwr)

Z1 SASA – (Z1 SASA Gimbal Locks)

MCC-H Z1 RPCM Z14B_B RPC 2 – Open, Close Cmd Inhibit
Z1 RPCM Z13B_B RPC 2 – 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

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, P6]
 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. 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 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 ≥ 2 ft from exposed EFGF connector when OBSS berthed, powered, and EFGF not grappled [PLB]
2. Stay ≥ 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

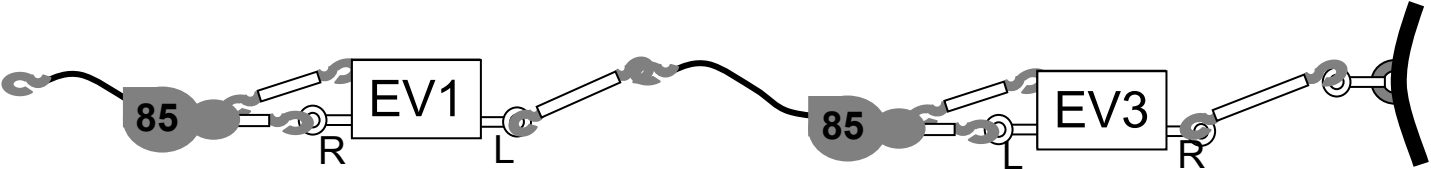
E. Thermal

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)</p> <p>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"> 1. √Initial tether configuration, hooks locked, reels unlocked 2. Hatch Thermal cover – open 3. Egress airlock 4. Inspect external Safety tether load alleviating straps 5. Attach right 85-ft safety tether retracting end to A/L HR 0550, LOCK hook, reel unlocked 6. Release left waist tether from EV3's 85-ft safety tether 7. Attach EV3's 85-ft safety tether retracting end to A/L HR 0554 inboard stanchion, LOCK hook 8. Give EV3 GO to release from A/L D-ring 9. Receive ORU Bag from EV3, temp stow 10. Transfer ORU Bag to EV3 11. √SAFER MAN ISOL vlv – OP (dn) and HCM (dn) 12. Close Hatch Thermal Cover 	<p><u>POST DEPRESS</u> (<u>DEPRESS/REPRESS</u> Cue Card)</p> <p><u>EGRESS</u></p> <ol style="list-style-type: none"> 1. √Initial tether configuration, hooks locked, reels unlocked 2. Release right waist tether from A/L D-ring 3. Verify 85-ft safety tether in Unlocked position 4. Pass ORU Bag to EV1 5. Egress AL 6. Receive ORU Bag, install on BRT 7. √SAFER MAN ISOL vlv – OP (dn) and HCM (dn) 8. Begin 10-min Translation Adaptation enroute to CETA cart worksite: <ul style="list-style-type: none"> Evaluate pitch/yaw/roll control Evaluate start/stop transients Experiment with various translation techniques

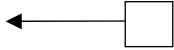
EVA 3 EGRESS/SETUP (01:00) (Cont)

IV/RMS	EV1 (FF)	EV3 (FF)
<p>SSRMS: Mnvr to P6 SASA position</p>	<p><u>SETUP</u></p> <ol style="list-style-type: none"> 13. Retrieve spare safety tether from A/L, attach to MWS 14. Retrieve APFR Ingress aide from A/L WIF 11 APFR 15. Translate aft of C/L to S1 bay 11 via nadir path to crossover handrail 3247 near TRRJ (fairlead w/Adj tether at top of CETA spur) 16. Install ingress aide on APFR S1 WIF 17 – slot facing boot plate, pull test 17. GCA SSRMS to APFR Install position 18. Install WIF adapter on SSRMS, tether point toward EE; install hitch pin, pull test 19. Perform Safety tether swap to SSRMS, check hooks locked 20. Leave 85-ft tether on S1 HR 3247, clear of face 1 CETA translation path 21. Install APFR from S1 WIF 17 on SSRMS [12, PP, F, 6], pull test 22. Extend Ingress Aid 23. Ingress APFR 24. Attach MWS EE to ingress aid; lock MWS EE 25. Give SSRMS GO to maneuver to P6 SASA 	<p><u>SETUP</u></p> <ol style="list-style-type: none"> 9. Translate to CETA cart 2, fairlead w/Adj tether at S0 HR 3444 10. Position swing arm 3 to position 9 11. Temp stow ORU bag on ballstack on swing arm, pull test 12. Decouple CETA cart 2 from MT <ul style="list-style-type: none"> <input type="checkbox"/> CETA 2 coupler to UNLOCK <input type="checkbox"/> Translate CETA 2 ~2 ft port <input type="checkbox"/> Engage parking brake (left handle) <input type="checkbox"/> CETA 2 coupler to CAPTURE 13. Deploy Stbd brake handles (2) (down) 14. Ingress Stbd TFR, release brake (tap pedal twice) 15. Translate CETA carts past P1 bay 6 to Yo 8460 (chest level), engage parking brake (left handle)

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"> GCA SSRMS to SASA Stanchion Removal Position Egress APFR Assess stanchion installation prior to removal for comparison with installation on P1 <ul style="list-style-type: none"> • Check gap between stanchion and plate • Look/feel how many threads visible below plate • Check stanchion stability <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">CAUTION</p> <p>SASA no touch areas:</p> <ul style="list-style-type: none"> • Lo and Hi gain antennas • Z93 thermal paint </div> <ol style="list-style-type: none"> Rotate gimbal locks (2 on left) to locked position (toward High Gain Antenna) 100 deg PGT[A2, CW2, 30.5]-7/16 X 6" Tighten gimbal lock fasteners ~4.5 turns in pattern <ul style="list-style-type: none"> <input type="checkbox"/> Lower-Left bolt 1 <input type="checkbox"/> Upper-Left bolt 4  <ol style="list-style-type: none"> On IV GO, demate SASA connectors (any order) <ul style="list-style-type: none"> <input type="checkbox"/> J2 from SASA <input type="checkbox"/> J3 from SASA <input type="checkbox"/> J4 from SASA Remove P6 dummy caps (3), stow in trash bag Mate connectors to P6 dummy receptacles (rightmost first) <ul style="list-style-type: none"> <input type="checkbox"/> J2 to P6 dummy connector <input type="checkbox"/> J3 to P6 dummy connector <input type="checkbox"/> J4 to P6 dummy connector 	<p><u>P1 BSP AND XPDR DUMMY BOX REMOVAL</u></p> <ol style="list-style-type: none"> Egress Stbd TFR Rotate Stbd TFR swing arm 2 to a setting of 30 Relocate CETA 1 WIF 3 APFR to CETA 2 WIF 2 [10, PP, E, 12], Y/P fitting [12, FF], pull test Ingress APFR Tether XPDR (nadir) dummy box to Y₀ 8490  <ol style="list-style-type: none"> On IV GO, remove XPDR dummy box PGT[A7, CCW2, 30.5]-7/16 X 6" Release XPDR dummy box outer captive fasteners (2) – 16 turns Release center jack bolt – 33 turns Temp stow XPDR dummy box Inspect XPDR mounting location for FOD <ol style="list-style-type: none"> Tether BSP (zenith) dummy box to Y₀ 8490 On IV GO, remove BSP dummy box PGT[A7, CCW2, 30.5]-7/16 X 6" Release XPDR dummy box outer captive fasteners (2) – 16 turns Release center jack bolt – 33 turns Temp stow BSP dummy box Inspect BSP mounting location for FOD

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

IV/RMS	EV1 (FF)	EV3 (FF)																								
<p>SSRMS: Mvnr to P1 SASA Install</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> <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			XPDR	Turns	Torque	Center Bolt			Outer #1			Outer #2			<p>9. Ingress APFR 10. GCA SSRMS to Stanchion Removal Position 11. Tether to SASA w/RET 12. PGT[B7, CCW2, 30.5]-7/16 X 6" Release stanchion attachment bolt ~21 turns 13. Verify SASA in soft dock 14. Stow PGT 15. Remove SASA from soft dock 16. Give SSRMS GO to maneuver to P1 SASA installation site</p> <p><u>SASA INSTALL ON P1</u></p> <p>17. Install SASA onto P1 support bracket soft dock 18. PGT[B3, CW2, 30.5]-7/16 X 6" Engage stanchion attachment bolt ~21 turns (6 lb push force reqd) 19. Release SASA RET 20. Egress APFR</p>  <p>21. On IV GO, mate SASA connectors</p> <p><u>NOTE</u> Route two cables through TA Clamps around aft side of stanchion; third cable around fwd side</p> <p>22. Mate connectors, release TA clamps as required</p> <ul style="list-style-type: none"> <input type="checkbox"/> P3 from P1-J643 to SASA J3 (1 TA clamps) <input type="checkbox"/> P4 from P1-J644 to SASA J4 (2 TA clamps) <input type="checkbox"/> P2 from P1-J632 to SASA J2 (2 TA clamps) <p>23. Give IV GO for SASA heater power</p>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;">CAUTION</p> <p style="text-align: center;">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>17. Remove BSP from ORU bag and 6B cover 18. Install BSP on radiator plate support structure by sliding it along two guide pins into soft dock position 19. Remove scoop and install on XPDR 20. PGT[A7, CW2, 30.5]-7/16 X 6" Push in and engage center jack bolt (~24-30 turns to torque) 21. Visually check for contact between BSP front wedge and radiator plate 22. PGT[A7, CW2, 30.5]-7/16 X 6" Push in and engage outer fasteners (~15 turns to hardstop) 23. PGT[A7, CW2, 30.5]-7/16 X 6" Torque center jack bolt (~TBD turns) 24. Remove scoop from BSP; install on XPDR</p> <p><u>XPDR INSTALL</u></p> <p>25. Remove XPDR from ORU bag and 6B cover 26. Install XPDR on radiator plate support structure by sliding it along two guide pins into soft dock position 27. Remove scoop and install on XPDR Dummy Box 28. PGT[A7, CW2, 30.5]-7/16 X 6" Push in and engage center jack bolt (~24-30 turns to torque) 29. Visually check for contact between XPDR front wedge and radiator plate</p>
BSP	Turns	Torque																								
Center Bolt																										
Outer #1																										
Outer #2																										
XPDR	Turns	Torque																								
Center Bolt																										
Outer #1																										
Outer #2																										

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

IV/RMS	EV1 (FF)	EV3 (FF)
<p>5. On EV2 GO, give MCC GO for BSP and XPDR power up</p>	<p>24. PGT[A2, CCW2, 30.5]-7/16 X 6" Release gimbal lock fasteners ~4.5 turns in pattern <input type="checkbox"/> Upper-Left bolt 4 <input type="checkbox"/> Lower-Left bolt 1</p> <p>25. Rotate gimbal locks away from Hi Gain Antenna 26. Close TA clamps as required 27. GCA SSRMS to APFR egress posn at CETA1 28. Egress SSRMS APFR</p> <p><u>SWAP TO A/L SAFETY TETHER</u> 29. Attach L waist tether to HR, LOCK HOOK 30. Swap to EV3 85-ft safety tether 31. Verify hooks locked, reel unlocked 32. Release L waist tether from HR</p> <p>33. Transfer Camera to EV3</p>	<p>30. PGT[A7, CW2, 30.5]-7/16 X 6" Push in and engage outer fasteners (~15 turns to torque)</p> <p>31. PGT[A7, CW2, 30.5]-7/16 X 6" Torque center jack bolt (~TBD turns)</p> <p>32. Give IV GO for BSP and Transponder power up</p> <p>33. Stow dummy boxes (2) in ORU bag – stow XPDR Dummy Box w/scoop on the loose 6B cover for P6 retrieval 34. Stow stbd TFR swing arm 2 35. Stow stbd swing arm 3</p> <p><u>SWAP TO SSRMS SAFETY TETHER</u> 36. Attach L waist tether to HR, LOCK HOOK 37. Swap to EV1 SSRMS safety tether 38. Verify hooks locked, reel unlocked 39. Release L waist tether from HR</p> <p>40. 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	20 gnd 18.5-33.6 P1	18 launch threads 88.6 P1 (max)	165	10 launch threads 16.5 install	30
Gimbal Lock Bolts	7/16	4	16.7 gnd 3.8 on orbit	18.1	13.9 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 X	21	RF
W31A	SASA J3	P6 X	17	Htr Pwr/1553 Ch B
W21E	SASA J4	P6 X	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. Torque and turn bolt data per STS-115 12A EVA checklist
3. 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
4. P6 dummy caps to be brought inside for 10A use for returning Z1 SASA

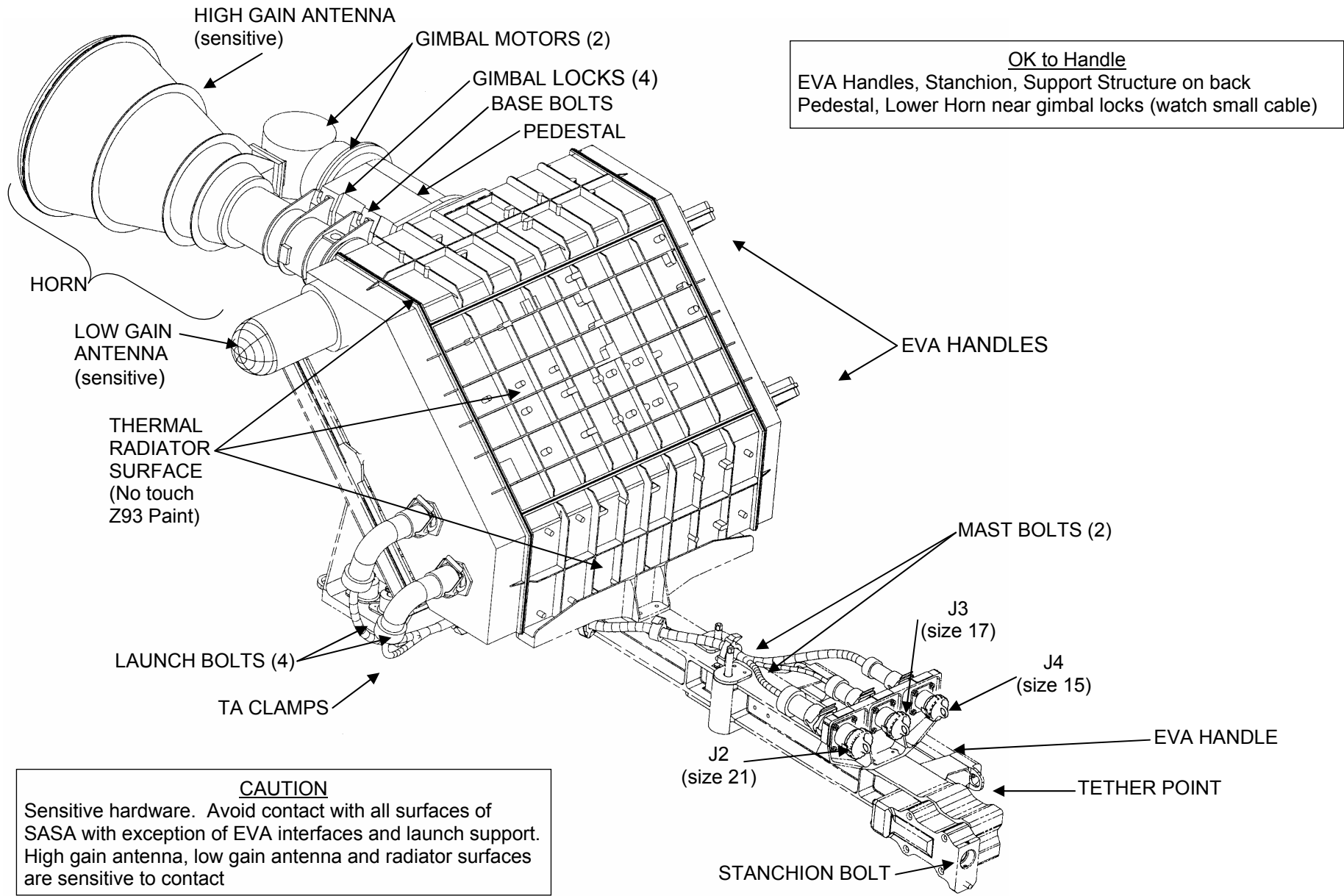
Cautions:

1. Avoid contact with SASA RF group and antennas

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	7/16	1	4.5-4.8 gnd 9.2 on orbit	12.3	14.8 remove 13.2 install	33 release 24.4-30.4 install	30
Stabilizing bolts	7/16	2	4.5-4.8 gnd 9.2 on orbit	12.3	14.8 remove 13.2 install	15	30

EVA Connectors: None

Timeline Considerations:

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

Notes:

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
2. Torque and turn data per STS-115 12A EVA Checklist



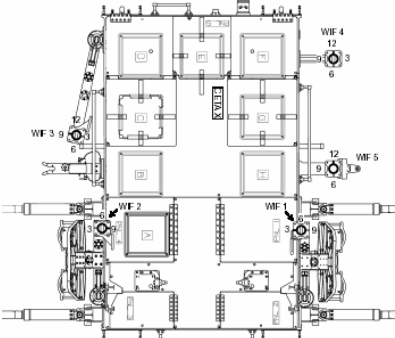
Cautions:

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

Warnings:

1. N/A

CETA CART RELOCATION (02:00)

IV/RMS	EV1 (FF)	EV3 (FF)
<p>  </p> <p>CETA starting configuration</p> <p>1. SSRMS: CETA removal posn</p> <p>  </p> <p>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> <p> 1. Decouple CETA 1 from CETA 2; prep CETA 1 for transfer <ul style="list-style-type: none"> <input type="checkbox"/> CETA 1 coupler to UNLOCK <input type="checkbox"/> Translate CETA 1 port to Bay 10 <input type="checkbox"/> Engage parking brake (left handle) <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"/> √Tool Stanchion position, pull test </p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>CAUTION Do not impart loads into CETA cart with < 4 of 4 wheel bogies latched closed</p> </div> <p> 2. On EV3 GO: Release brake (tap pedal twice) 3. Release wheel bogies (4) 4. Give EV3 GO to remove CETA 1 from rails 5. Assist EV3/M1 with clearances as reqd; verify CETA 1 is clear of structure before translating </p> <p><u>CETA 2 PREP</u></p> <p> 6. Translate to CETA 2 7. Prep CETA 2 for transfer <ul style="list-style-type: none"> <input type="checkbox"/> Translate CETA 2 port to Bay 10 (if clear) <input type="checkbox"/> Engage parking brake (left handle) <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 <input type="checkbox"/> √Ballstack locked, pull test <input type="checkbox"/> √APFR secure, pull test <input type="checkbox"/> √Tool Stanchion position, pull test </p>	<p><u>CETA 1 REMOVAL FROM P1</u></p> <p> 1. Reconfigure APFR to TBD 2. Attach MWS EE to Ingress Aid 3. Ingress SSRMS APFR 4. Tether to CETA 1 with RET 5. Grasp CETA 1 grids B & H </p> <p>6. Give EV1 GO for CETA 1 release</p> <p> 7. On EV1 GO: Remove CETA 1 from rails; lift CETA cart from rails due forward until wheel bogies clear 8. 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, install on BRT 36. Stow APFR on CETA 1 WIF 4 [8,PP,E,12] Y/P fitting [12, FF], pull test 37. Retrieve WIF adapter, stow in sm trash bag 38. Give SSRMS GO to maneuver clear 39. Retrieve APFR Ingress aid from CETA 1 WIF 4 APFR 40. Translate to A/L 41. Stow Ingress aide on A/L WIF 11 APFR 42. Stow spare Safety tether on A/L HR</p>	<p><u>INSTALL CETA 2 ON S1</u></p> <p>18. Install CETA 2 on rail</p> <p>19. On EV1 GO, release CETA 2 tether</p> <p><u>SSRMS CLEANUP</u></p> <p>20. Egress SSRMS, perform safety tether swap to A/L 85-ft tether at S1 HR 3247 21. Translate to CETA 2 22. Retrieve ORU Bag, attach to BRT 23. Translate to A/L 24. Temp stow ORU Bag at A/L</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
3. CETA to CETA max coupling rate is 1 inch/sec
4. 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

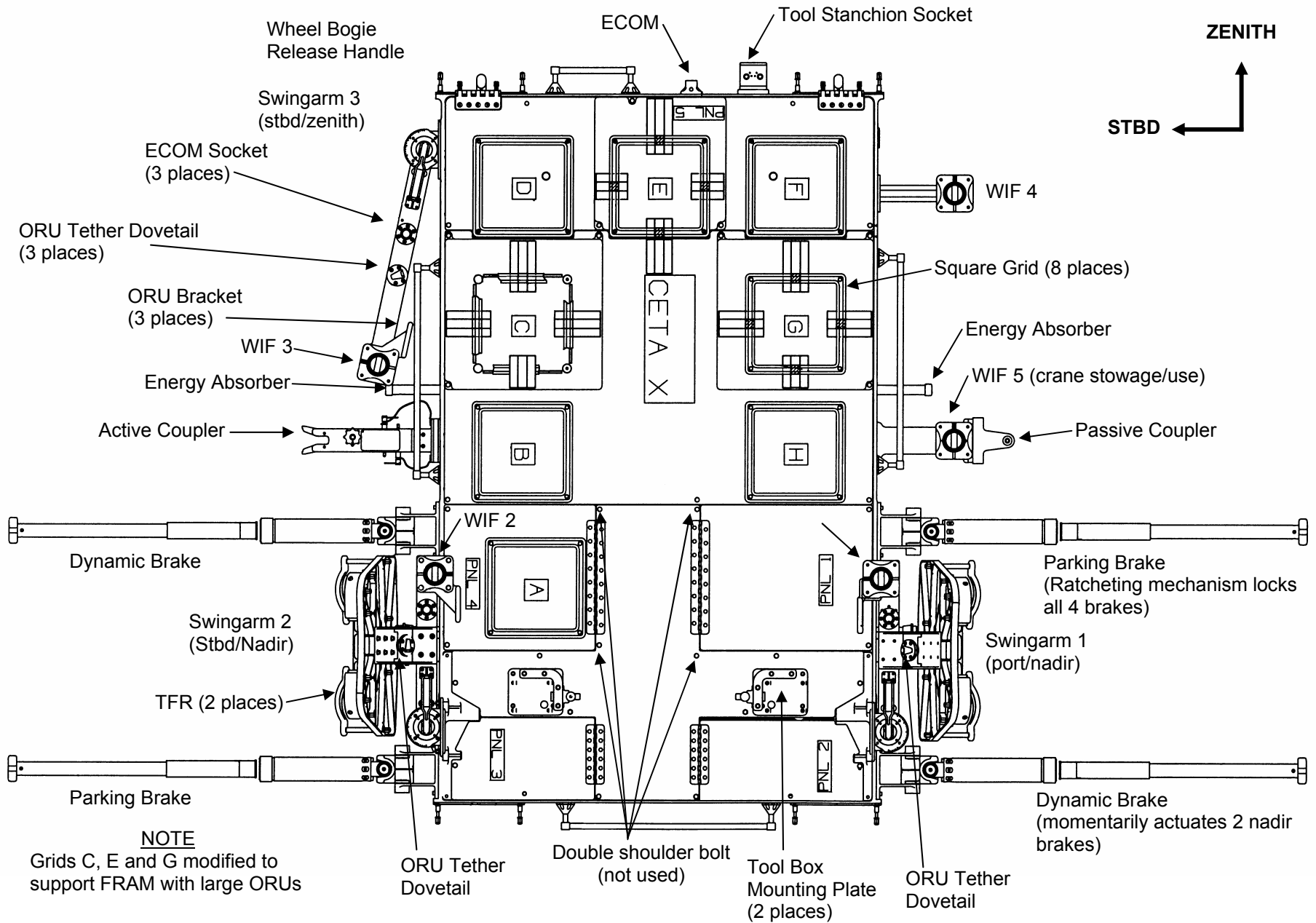
Cautions:

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

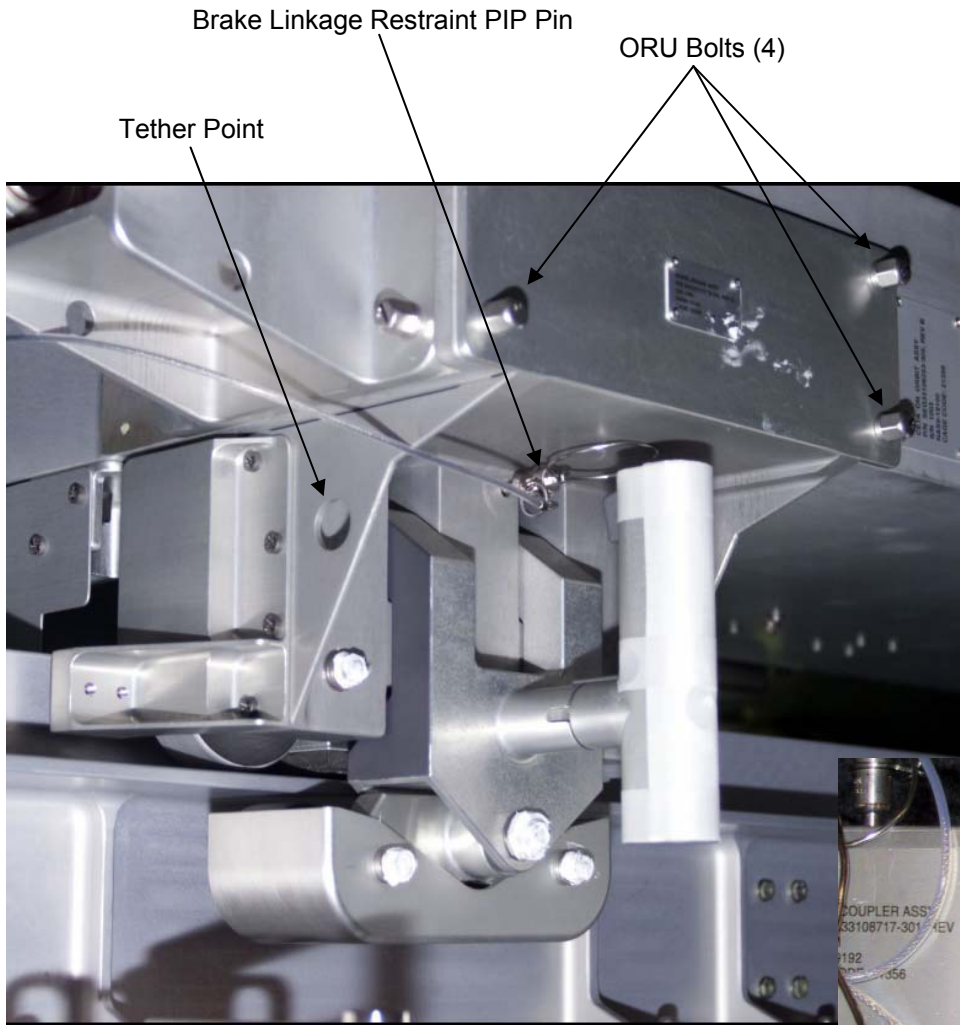
Warnings:

1. None

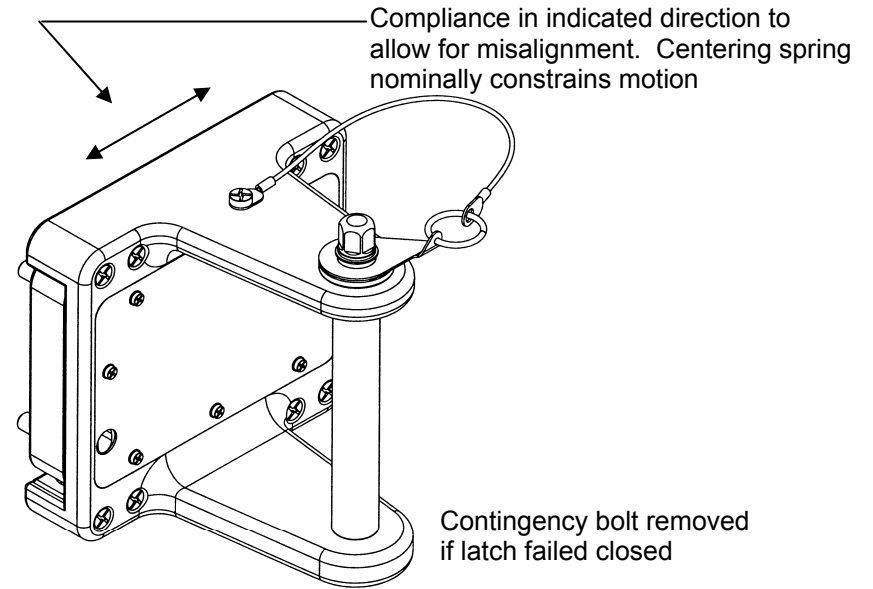
CETA CART RELOCATION TASK DATA SHEET (Cont)



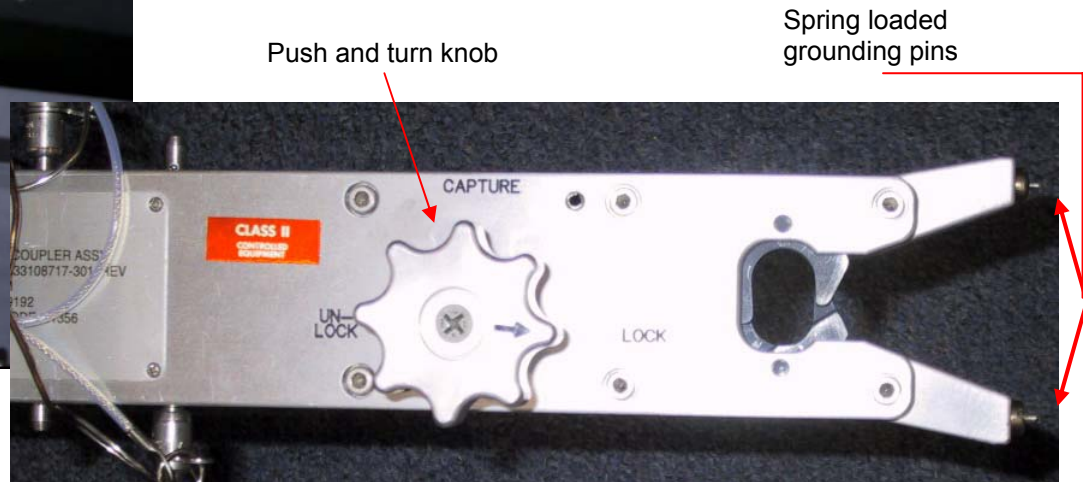
CETA CART RELOCATION TASK DATA SHEET (Cont)



CETA Cart Wheel Bogie

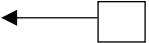


PASSIVE COUPLER




CETA Cart Active Coupler

P1 RBVM MLI REPAIR AND Z1 SASA GIMBAL BOLTS (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-L 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-R 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-L bolt 2	/	NA /	U-R bolt 3	/	NA /	U-R bolt 4	/	NA /	XPDR Dummy	Turns	Torque	Center Bolt			Outer 1			Outer 2			<p><u>Z1 SASA SPARE GIMBAL BOLTS (00:30)</u></p> <ol style="list-style-type: none"> Translate to Z1 HR 6001 (near SASA spare) Remove shroud to access SASA spare gimbal locks PGT[B7, CCW2, 30.5]-7/16 X 6" Loosen gimbal lock fasteners (in order), 2 turns <input type="checkbox"/> Upper-Left bolt 4 (report torque and turns) <input type="checkbox"/> Upper-Right bolt 3 (report torque and turns) Manipulate gimbals with all bolts in place to slightly shift the square spacer block on all bolts to verify no loads exist Verify all four bolts still properly rotated to lock position and seated Rotate gimbal lock fasteners (4) ~1 turn in pattern PGT[A3, CW2, 30.5]-7/16 X 6" <input type="checkbox"/> Lower-Left bolt 1 <input type="checkbox"/> Lower-Right bolt 2 <input type="checkbox"/> Upper-Right bolt 3 <input type="checkbox"/> Upper-Left bolt 4 Re-torque gimbal lock fasteners PGT[A3, CW2, 30.5]-7/16 X 6" Tighten gimbal lock fasteners (4) in same pattern ~1-2 turn to torque <input type="checkbox"/> Lower-Left bolt 1 <input type="checkbox"/> Lower-Right bolt 2 <input type="checkbox"/> Upper-Right bolt 3 <input type="checkbox"/> Upper-Left bolt 4 Stow SASA shroud Translate to A/L 	<p><u>P6 TRANSPONDER RETRIEVAL</u></p> <ol style="list-style-type: none"> Retrieve transponder 6B cover from ORU bag Translate to P6 HR 5326; BRT as required to HR 5322 inverted Remove XPDR MLI, use adj tether to restrain Remove dummy box from 6B cover, temp stow Tether to XPDR  <ol style="list-style-type: none"> On IV GO: Remove P6 XPDR PGT[A7, CCW2, 30.5]-7/16 X 6" Release XPDR left and right captive fasteners ~15 turns PGT[A7, CCW2, 30.5]-7/16 X 6" Release center jack bolt ~33 turns Remove round scoop from dummy box and install on XPDR Remove transponder, stow in 6B cover Install dummy XPDR box in P6 transponder location by sliding it along guide pins into soft dock position PGT[A7, CW2,30.5]-7/16X6" Push in and engage center jack bolt (~33 turns to torque) PGT[A7, CW2, 30.5]-7/16X6" Push in and engage outer fasteners (2) (~15 turns to torque) PGT[A7, CW2,30.5]-7/16X6" Torque center jack bolt (~TBD turns) Close XPDR MLI Stow XPDR on BRT using scoop Translate to A/L
Gimbal Bolts	Turns	Torque																																							
Release																																									
U-L bolt 4																																									
U-R bolt 3																																									
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XPDR Dummy	Turns	Torque																																							
Center Bolt																																									
Outer 1																																									
Outer 2																																									

P1 RBVM MLI REPAIR AND Z1 SASA GIMBAL BOLTS (01:00)/P6 TRANSPONDER RETRIEVAL (01:00) (Cont)

IV/RMS	EV1 (FF)	EV3 (FF)
<p>2. ✓MCC: Verify P1 radiator beam (TRRJ) locked horizontal</p> <p>☐ ✓Good EV1 WVS and recording for RBVM close-out. If no good WVS, then retrieve camera</p>	<p><u>P1 RBVM MLI REPAIR (00:30)</u></p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">CAUTION</p> <p>Do not impart loads into radiator beam when greater than 130 inches from TRRJ center (outboard edge of the outboard trunnion scuff plate). If inadvertent kick load is applied anywhere along the radiator beam, wait 2 min to allow the response to dissipate</p> </div> <div style="text-align: center; margin: 10px 0;">  </div> <ol style="list-style-type: none"> 10. Translate to P1 outboard, tether swap to spare safety tether at P1 HR _____ 11. Translate to P1 outboard RBVM; go zenith at Bay 18 (Y₀ 9795) 12. BRT to P3 HR 3805 or 3804 13. Reinstall FQD MLI on M1/F151 14. Install wire tie around FQD MLI 15. Translate inboard, tether swap to A/L safety tether 	

P1 RBVM MLI REPAIR AND Z1 SASA SPARE GIMBAL BOLTS TASK DATA SHEET

RBVM MLI

Tools:

EV1 (FF)	
Wire Ties	

Foot Restraints:

Task	WIF	APFR Setting
Alternate access to RBVM MLI	P3 WIF XX	

EVA Fasteners: None

EVA Connectors: None

Timeline Considerations:

1. May be performed as a get-ahead during finish of P1 XPDR and BSP install; verify TRRJ locked

Notes:

1. Short wire-tie will reach around Fluid QD for closing MLI

Cautions:

1. Avoid contact with radiator beam

Warnings:

1. None

Z1 SASA Spare Gimbal Bolts

Tools:

EV1 (FF)	
PGT	6" Wobble

Foot Restraints:

Task	WIF	APFR Setting
Z1 Gimbal bolts	Z1 WIF 01	APFR [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 3.8 on-orbit	18.1	13.9 install 46.4 release (first turn) 6.7 release (at hardstop)	4.5	30

EVA Connectors: None

Timeline Considerations:

1. None

Notes:

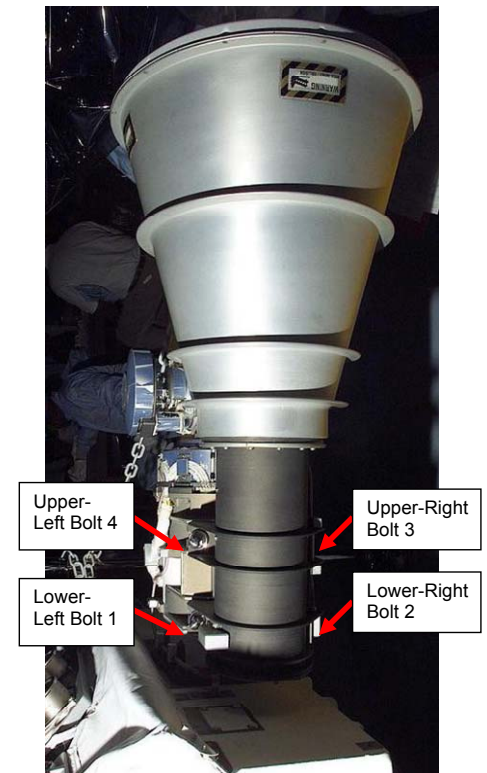
1. Torque and turns per STS-115 12A EVA Checklist
2. Gimbal bolts should be torqued in specified pattern so as to prevent misalignment of the gimbal locks during tightening and resulting in higher torques and possibly not reaching turn counts

Cautions:

1. Avoid contact SASA antennas and coatings

Warnings:

1. None



P6 TRANSPONDER RETRIEVAL TASK DATA SHEET

Tools:

EV3 (FF)
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	7/16	1	4.5-4.8 gnd	12.3	14.8	33	30
			9.2 on orbit		remove 13.2 install	release 24.4-30.4 install	
Stabilizing bolts	7/16	2	4.5-4.8 gnd	12.3	14.8	15	30
			9.2 on orbit		remove 13.2 install		

EVA Connectors: N/A

Timeline Considerations:

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

Notes:

1. Torque and turn data per STS-115 12A EVA Checklist

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)
IV: Perform WVS PWRDN (PHOTO/TV, <u>WVS CUE CARD</u>) IV: Set 2-min timer after both EV1 and EV2 report WATER OFF	<u>CLEANUP</u> 1. Translate to airlock 2. Perform Tool Inventory <u>INGRESS</u> 3. Transfer ORU Bag to EV3 4. Stow spare 85-ft tether on A/L D-ring 5. On EV2 GO, disconnect EV3 85-ft safety tether from A/L HR 0554 6. Connect left waist tether to EV3 85-ft safety tether, LOCK hooks 7. Disconnect 85-ft safety tether from A/L HR 0550 8. Ingress airlock 9. Remove SCU from stowage pouch 10. Remove DCM cover, Velcro to DCM 11. Connect SCU to DCM; √SCU locked 12. DCM: WATER – OFF <div style="border: 1px solid black; text-align: center; padding: 5px;"><u>CAUTION</u> Do not close hatch until EMU WATER – OFF for 2 min</div> 13. Hatch Thermal Cover – close, attach Velcro strap 14. Verify all hardware is clear of hatch 15. EV hatch – close and lock 16. Go to PRE REPRESS portion of {CREWLOCK <u>DEPRESS/REPRESS CUE CARD</u> } (SODF: ISS EVA SYS: EVA PREP/POST)	<u>CLEANUP</u> 1. Translate to airlock 2. Perform Tool Inventory <u>INGRESS</u> 3. Ingress airlock 4. Receive ORU Bag, stow 5. Connect right waist tether to UIA D-ring 6. Give EV1 GO to disconnect 85-ft tether 7. Remove SCU from stowage pouch 8. Remove DCM cover, Velcro to DCM 9. Connect SCU to DCM; √SCU locked 10. DCM: WATER – OFF 11. Go to PRE REPRESS portion of {CREWLOCK <u>DEPRESS/REPRESS CUE CARD</u> } (SODF: ISS EVA SYS: EVA PREP/POST)

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)

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) (3)
- Sm Trash Bag (L, inside)
- Socket caddy (R, inside)
- 7/16 X 9" rigid
- 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

- Staging Bag
 - PGT S/N _____ w/battery
 - CETA Cart Wheel Boogie PIP-Pin
 - Med ORU Bag
 - 6 B box cover
 - Dummy Box
 - 6 B box cover
 - Transponder
 - Round Scoop
 - Ballstack (secured on outside of bag)
 - RET (sm-sm)
 - Lg-sm RET on outside
 - 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
 - EVA Ratchet
 - Adj tether to internal D-ring
 - Socket Caddy
 - 7/16 X 6" wobble
 - 7/16 X 2"
 - Ballstack
 - Spare 85-ft safety tether
-
- Digital Camera
 - D-ring Extender

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EVA 4 BRIEFING CARD

EVA Prep

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 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

* EV1 egresses and attaches both safety tethers to handrails

* 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

* 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

For launch locks don't exceed 27 turns on primary bolts

Torque order (1, 2, 3/4)

PVRGF RELOCATION:

Caution with BGA HR and RTAS clearances

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

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:

TBD

DAY/NIGHT TRANSITIONS: (IV will call)

* Lights, visor, glove heaters, check all tools secure, adjust suit temp if desired

INGRESS PLAN:

Leave 2 spare 85-ft tethers outside A/L

EV2 in first, then ether 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

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EVA 4 SUMMARY TIMELINE

PET TIME (HR : MIN)	13A.1 EVA 4				
	IV	PET	EV2 (FF)	PET	EV3 (FF)
00:00		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		00:50	<u>OBSS BOOM STAND INSTALL</u> (01:00)	00:50	<u>OBSS BOOM STAND INSTALL</u> (01:00)
02:00		01:50	<u>CP1 WETA ANTENNA INSTALL</u> (01:45)	01:50	<u>CP1 WETA ANTENNA INSTALL</u> (01:45)
03:00		03:35	<u>GPS ANTENNA #4 REMOVE</u> (01:00)	03:35	<u>TBD</u> (00:30)
04:00				04:05	<u>P6 AUX BAG RELOCATION</u> (00:30)
05:00		04:35	<u>CP7 STANCHION INSTALL</u> (01:10)	04:35	<u>CP7 STANCHION INSTALL</u> (01:10)
06:00		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)
--	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)
- 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 (2)

EV3

- Waist Tether (R Extender to MWS)
- Waist Tether (L D-ring to Safety Tether)
- 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) (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

- CL Bag #1
- RET (Lg-sm) on outside
- Digital Camera
- Socket Caddy
- RAD + 7/16" X 2" rigid
- Large Gap Spanner (2) (45-72 inch)
- WETA + Round Scoop
- RET (Lg-sm) to Airlock
- OBSS OSE (2)
- RET (Lg-sm) (2)
- bungee?
- Medium ORU Bag
- RET (Lg-sm) on outside
- GPS Caps wire-tied together
- RET (sm-sm)
- RET (sm-sm)
- Adj (2 for restraining cables)
- CL Bag #3 (contingency) -*Aft/Zenith wall*
- Adj (Lg-sm) on outside
- PGT battery
- 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
- EVA Ratchet
- Adj tether to internal D-ring
- D-ring Extender

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 & S3 WETA)

One TRRJ DLA locked, both RJMCs unpowered for EV crew translation on S1 nadir & zenith:

- MCC-H 1. √DLA (1) – LOCKED
2. RPCM S11A_C RPC 1 – Open, Close Cmd Inhibit S1-1 (Zenith RJMC Ops pwr)
3. RPCM S12B_B RPC 11 – Open, Close Cmd Inhibit S1-2 (Nadir RJMC Ops pwr)

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

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

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, P6]
 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 ≥ 2 ft from exposed EFGF connector when OBSS berthed, powered, and EFGF not grappled [PLB]
2. Stay ≥ 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

EVA 4 EGRESS/SETUP

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

OBSS OSE INSTALL (01:00)

IV	EV2 (FF)	EV3 (FF)
<p>Pre-EVA configs:</p> <ul style="list-style-type: none"> <input type="checkbox"/> PAD installed to OSE <input type="checkbox"/> Capture Latch PIP pin installed in stowed position <input type="checkbox"/> Anti-rotation fittings (2) deployed and PIP pins (2) located in capture position <p>1. Record clamp bolt 1 data</p> <p>Bolt 1 (EV2) _____ turns _____ ft-lb</p> <p>Bolt 1 (EV3) _____ turns _____ ft-lb</p> <p>2. Record bolt 2 data</p> <p>Bolt 2 (EV2) _____ turns _____ ft-lb</p> <p>Bolt 2 (EV3) _____ turns _____ ft-lb</p> <p>Record bolt 3 data</p> <p>Bolt 3 (EV2) _____ turns _____ ft-lb</p> <p>Bolt 3 (EV3) _____ turns _____ ft-lb</p>	<p><u>OUTBOARD BOOM STAND INSTALL</u></p> <ol style="list-style-type: none"> 1. Translate to S1 Zenith outboard trunnion, fairlead at HR S1 _____ 2. Install outboard boom stand (OSE 02) to S1 Zenith Outboard trunnion until latch catches shear plate 3. Install capture latch PIP pin in locked position 4. Check gaps between anti-rotation blocks and trunnion shear plate to verify trunnion alignment 5. PGT[AX, CWX, 30.5]-7/16X6" Drive Clamp "Bolt 1", ~13-14 turns cw 6. Verify OSE fully attached, clamped, and aligned to trunnion – view clamping mechanism through OSE cover slot <p><u>EXTEND UPPER EXTENDER TUBE</u></p> <ol style="list-style-type: none"> 7. Pull spring loaded locking pin 8. Extend tube until locking pin engages 9. Verify black alignment stripe on lower tube visible 10. PGT[AX, CWX, 30.5]-7/16X6" TEAR OUT PAGE Drive Bolts 2 and 3, ~12 turns cw 11. Translate to A/L 	<p><u>INBOARD BOOM STAND INSTALL</u></p> <ol style="list-style-type: none"> 1. Close hatch thermal cover 2. Translate to S1 zenith inboard trunnion, via CETA cart translation path 3. Install inboard boom stand (OSE 01) to S1 Zenith inboard trunnion until latch catches shear plate 4. Install capture latch PIP pin in locked position 5. Check gaps between anti-rotation blocks and trunnion shear plate to verify trunnion alignment 6. PGT[AX, CWX, 30.5]-7/16X6" Drive Clamp "Bolt 1", ~13-14 turns cw 7. Verify OSE fully attached, clamped and aligned to trunnion – view clamping mechanism through OSE cover slot <p><u>EXTEND UPPER EXTENDER TUBE</u></p> <ol style="list-style-type: none"> 8. Pull spring loaded locking pin 9. Extend tube until locking pin engages 10. Verify black alignment stripe on lower tube visible 11. PGT[AX, CWX, 30.5]-7/16X6" Drive Bolts 2 and 3, ~12 turns cw 12. Translate to A/L

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	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
OSE Clamp Bolt 1	7/16	1					
OSE Bolt 2	7/16	1					
OSE Bolt 3	7/16	1					

EVA Connectors: None

ORU Identification:

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



Timeline Considerations

- 1.

Notes:

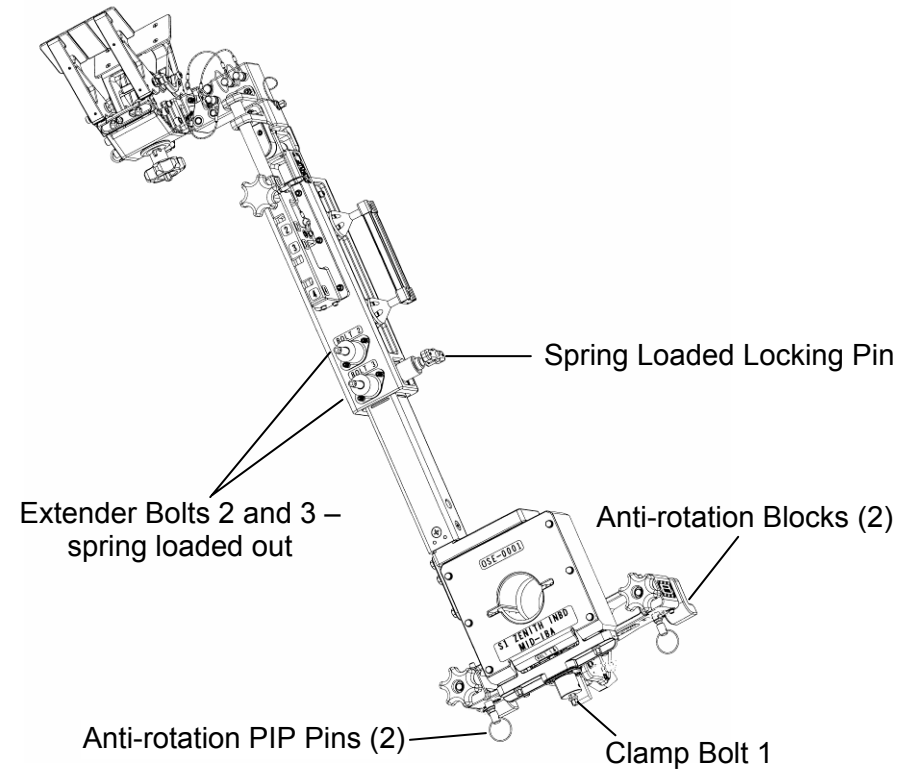
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Cautions:

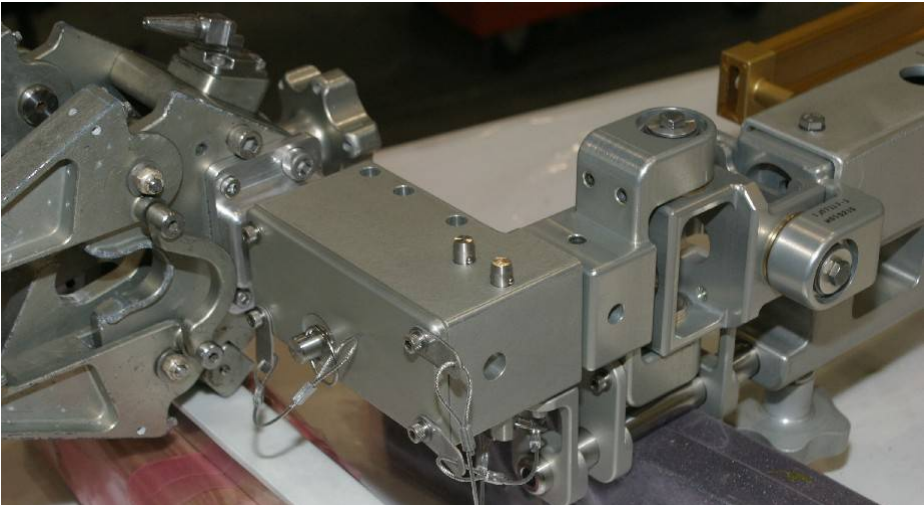
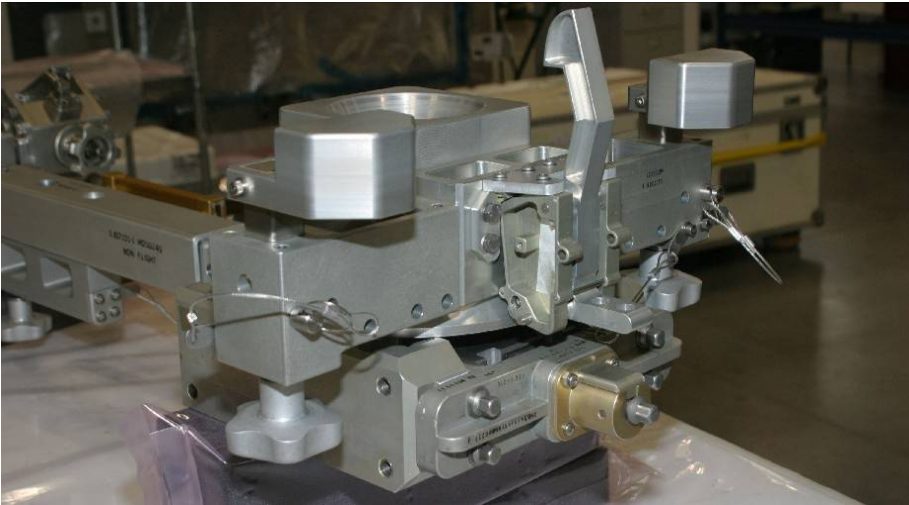
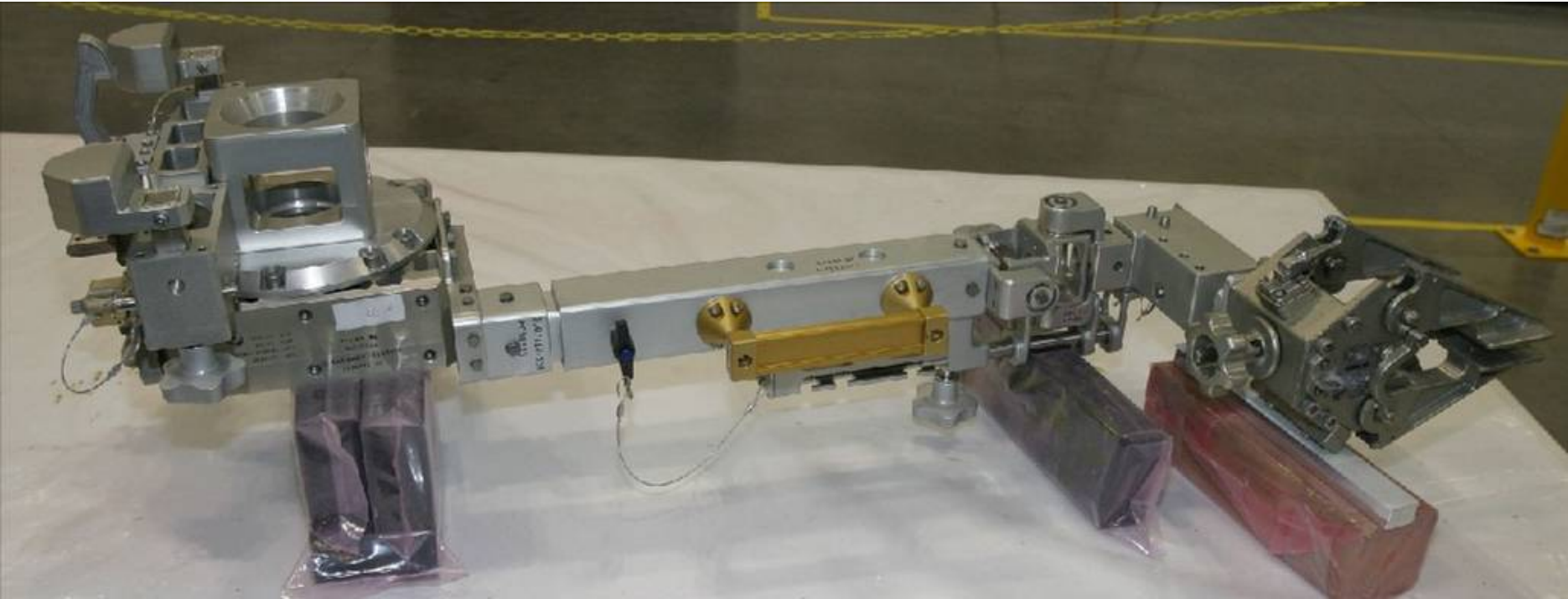
- 1.

Warnings:

- 1.



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"> Retrieve spare safety tether from outside A/L Retrieve WETA w/round scoop from airlock; stow on BRT Close airlock thermal cover Translate aft under A/L and over top to CETA Spur Translate via nadir path toward S1/S3 interface Perform safety tether swap at HR (3233)_____ Stow airlock safety tether on S3 HR _____ Translate to S3 Face 4 WETA Install location (CP-1) <p><u>DUMMY BOX REMOVAL</u></p> <ol style="list-style-type: none"> Open CP-1 shroud to uncover VSSA port Tether to Dummy Box PGT [A6 8.3 ft-lb, CCW2 30 RPM, MTL 10.5] 6" ext 7/16" <input type="checkbox"/> <input type="checkbox"/> Release dummy box left and right captive fasteners 16 turns PGT[A6 8.3 ft-lb, CCW2 30 RPM, MTL 10.5] 6" ext 7/16" <input type="checkbox"/> Release center jack screw 33 turns Remove dummy box; hand off to EV3 Install WVS on the stanchion by sliding it along two guide pins into soft dock position Remove round scoop; hand off to EV3 PGT[A5 7.0 ft-lb, CW2 30 RPM, MTL 10.5] 6" ext 7/16" <input type="checkbox"/> Push in and engage center jack bolt to hardstop ~33 turns 	<p><u>ETVCG STANCHION RELEASE</u></p> <ol style="list-style-type: none"> Retrieve spare safety tether from outside A/L Translate to stanchion carrier on ESP-2 Tether to forward/zenith stanchion (#2) race track tether point PGT [B6 24.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6" ext 7/16" <input type="checkbox"/> <input type="checkbox"/> Release launch restraint bolts (two) ~8.5 turns (bolts will spring out, black line visible) Slide stanchion out of stowage interfaces (toward dummy box) BRT to racetrack Translate to S0; Fairlead near CETA spur Translate via Face 1 S1/S3 interface Perform safety tether swap at HR (3203)_____ Stow airlock safety tether on S3 HR _____ Translate Zenith/Aft to S3 Face 4 WETA Install location (CP-1) <p><u>DUMMY BOX REMOVAL</u></p> <ol style="list-style-type: none"> Temp stow Stanchion BRT to HR _____ Hold VSSA for EV2 Receive dummy box; temp stow Receive round scoop; install on dummy box

WETA ANTENNA INSTALL (01:45) (Cont)

IV/RMS	EV2 (FF)	EV3 (FF)
<p>IV Give EV2 GO for VSSA connector mates</p>	<p>17. Visually check for contact between WETA front wedge and support structure</p> <p>18. PGT[A3 4.8 ft-lb, CW2 30 RPM, MTL 10.5] 6" ext 7/16" <input type="checkbox"/> <input type="checkbox"/> Push in and engage left and right fasteners to hardstop ~16 turns</p> <p>19. PGT[A3 4.8 ft-lb, CW2 30 RPM, MTL 10.5] 6" ext 7/16" <input type="checkbox"/> Torque center jack bolt to hardstop</p> <p>20. Remove thermal shroud from WETA; hand off to EV3</p> <p><u>STANCHION INSTALL</u></p> <p>21. BRT to S3 HR _____</p> <p>22. Softdock stanchion to CP-1 (race track outboard) (~10 lbf required)</p> <p>23. Confirm GO for VSSA connector mates</p> <p>24. Release TA Clamps</p> <p>25. Demate W8200 cable connectors P2, P3 and P4 from dummy panel A296</p> <p>26. Demate deadface connectors and connector cap from panel A78 J2, J3 and J4</p> <p>27. Mate deadface connectors and cap to A296 dummy panel</p> <p>28. Mate W8200 cable connectors to S3 panel A78 receptacles</p>	<p>17. Stow dummy box on BRT</p> <p>18. Stow shroud on MWS w/adj equip tether</p> <p><u>STANCHION INSTALL</u></p> <p><u>NOTE</u> Do not allow socket to come off stanchion bolt head until complete</p> <p>19. PGT [B3 18.4 ft-lb, CW2 30 RPM, MTL 30.5] 6" ext 7/16" <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)</p> <p>20. Report torque and turn data</p> <p><u>NOTE</u> EV3 may need to help EV2 on connector mates and deadface/cap transfers. Dummy panel A296 is on bottom of VSSA mounting plate ~4 ft from S3 face 4; S3 A78 is just inside S3 face 4</p> <p>21. Translate to S1 HR (3203)_____ for tether swap</p>

WETA ANTENNA INSTALL (01:45) (Cont)

IV/RMS	EV2 (FF)	EV3 (FF)
IV Give MCC-H GO to power up WETA	<ul style="list-style-type: none"> <input type="checkbox"/> P2 to J2 <input type="checkbox"/> P3 to J3 <input type="checkbox"/> P4 to J4 29. Wire Tie cables as necessary 30. Give IV/MCC-H GO to power up WETA 31. Translate to S1 HR (3233) _____ for tether swap 32. Perform tether swap; hooks locked, reel unlocked 33. Translate to A/L; stow spare safety tether	22. Perform tether swap, hooks locked, reels unlocked 23. Translate to A/L; temp stow dummy box and spare safety tether

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
???	7/16	2	3.8 TBD	TBD	TBD	8	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:

Task	Inhibits

Timeline Considerations

- 1.

Notes:

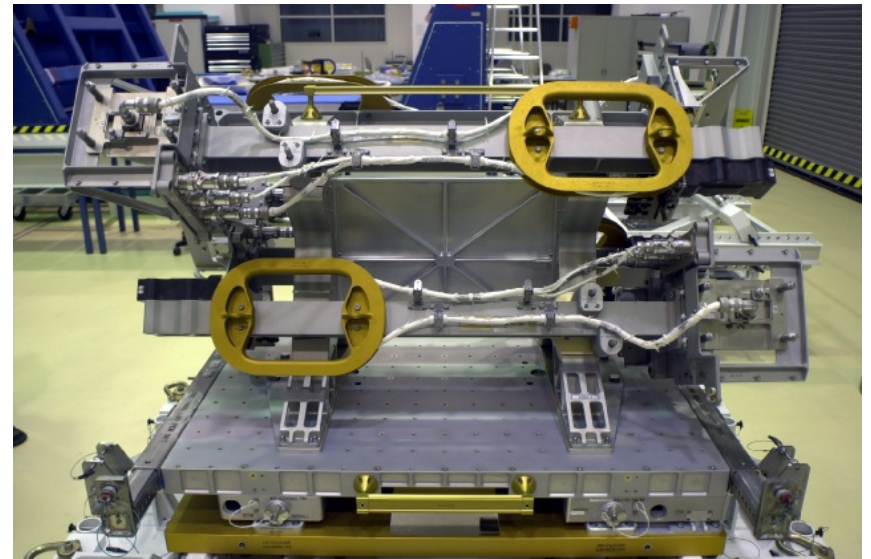
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Cautions:

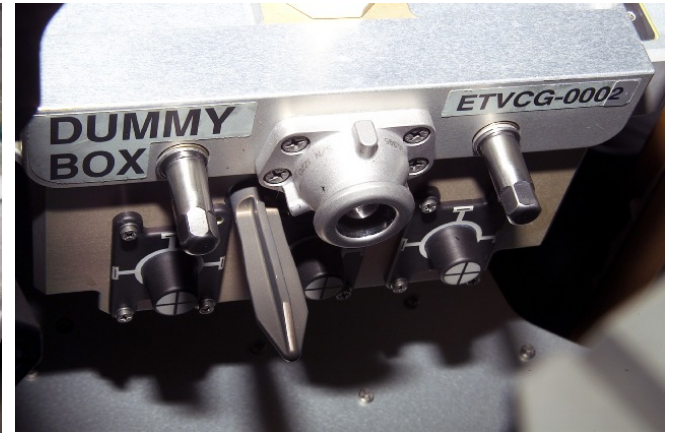
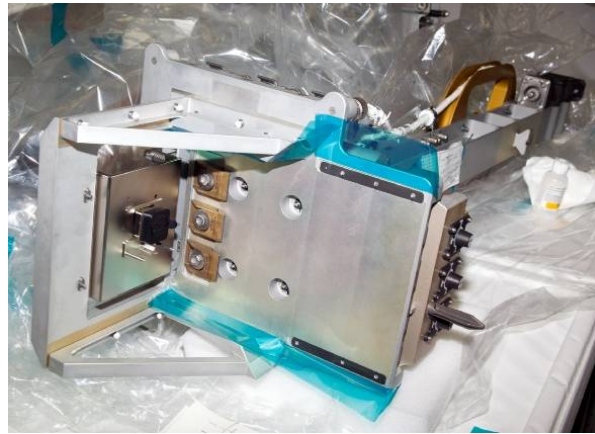
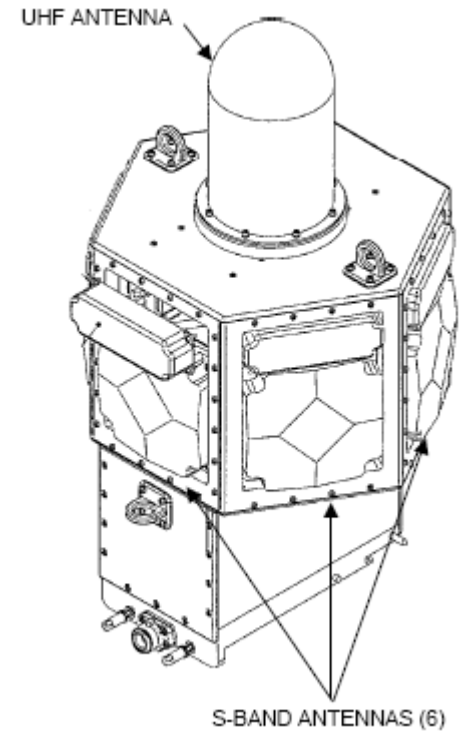
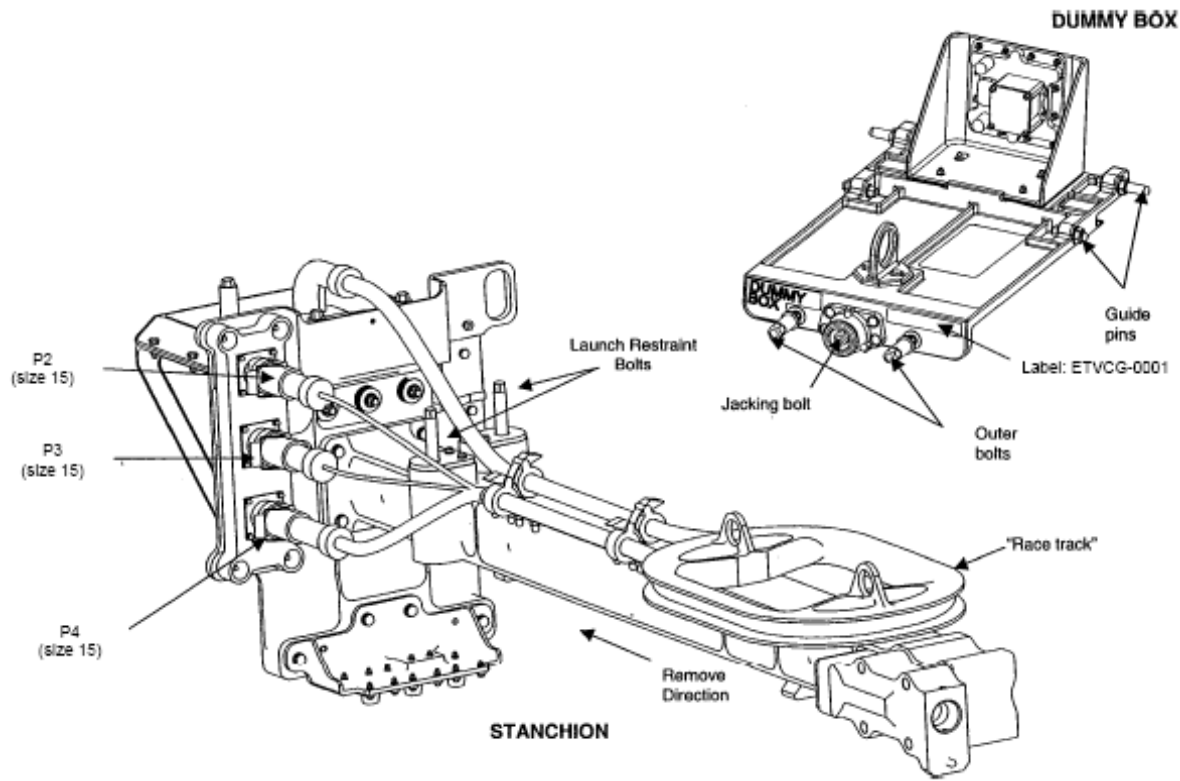
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Warnings:

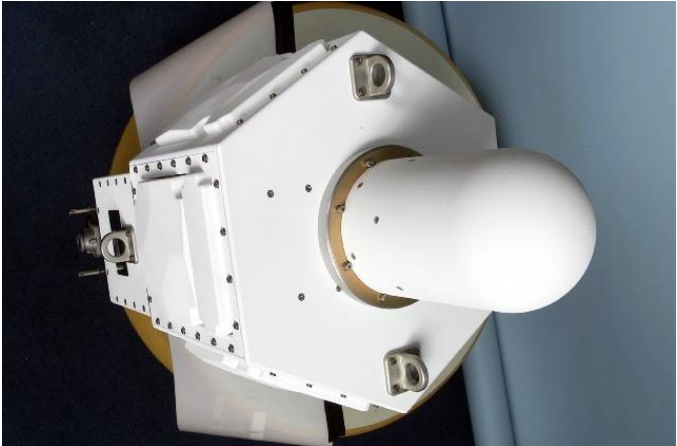
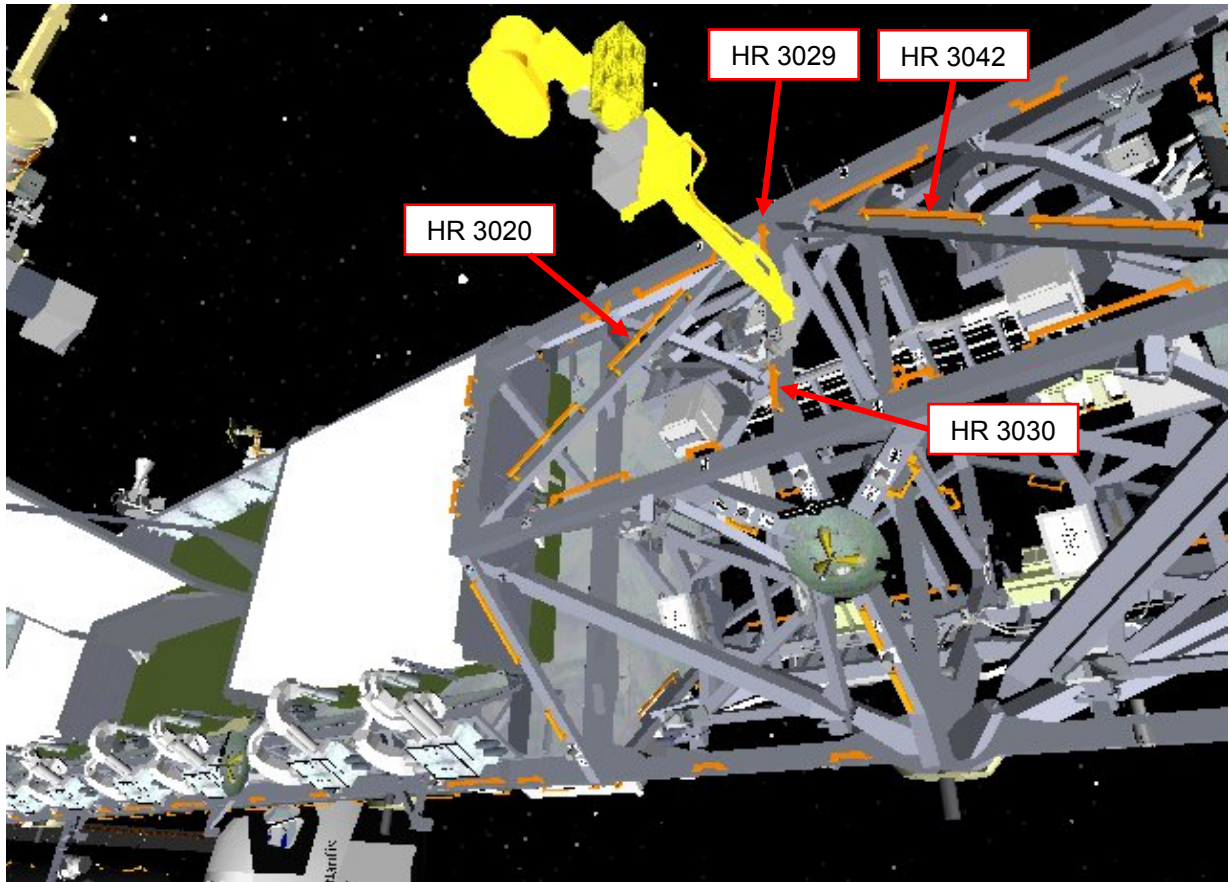
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WETA ANTENNA INSTALL TASK DATA SHEET (Cont)



WETA ANTENNA INSTALL TASK DATA SHEET (Cont)



GPS ANTENNA #4 REMOVE, P6 AUX BAG RELOCATION (01:00)

IV/RMS	EV2 (FF)	EV3 (FF)
<p>1. Verify inhibits for GPS Antenna #4:</p> <ol style="list-style-type: none"> RPCM S02B_E RPC 8 – Open, Close Cmd Inhibit RPCM S01A_E RPC 7 – Open, Close Cmd Inhibit <p style="text-align: center;">NOTE Connector caps are wire-tied together to prevent cables from being lost inside the truss.</p> <p>Ensure MLI is not above original antenna plane after installation</p>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p>CAUTION Avoid inadvertent contact with GPS Antennas (Z-93 paint)</p> </div> <p><u>GPS ANTENNA #4 REMOVAL</u></p> <ol style="list-style-type: none"> Retrieve GPS ORU Bag (with wire-tied caps) Close thermal cover Translate to GPS Antenna #4 (S0 nadir-inboard) Temp stow GPS ORU Bag on HR _____ (3509) BRT to HR _____ (3508) Remove MLI shroud from antenna Tether cables to self or structure before demating (Cables clamps are located internal to the truss; connectors may float out of reach) On IV GO, demate connectors (any order), temp stow as required: <ul style="list-style-type: none"> <input type="checkbox"/> P696 from J1 <input type="checkbox"/> P697 from J2 Tether to failed GPS antenna PGT: [B7 (25.5 ft-lb), CCW2 (30 rpm), MTL 30.5]-7/16", 6-in ext Release bolts (4), (any order), expect ~10 turns (bolts will spring up when released) Remove GPS antenna, expect 4-6 lb soft dock force Stow failed GPS antenna in ORU Bag 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"> <input type="checkbox"/> J1 dummy electrical cover to P696 <input type="checkbox"/> J2 dummy electrical cover to P697 Reconfigure MLI shroud (as required) Stow GPS Ant ORU Bag on BRT Translate to A/L Temp stow ORU Bag 	<p><u>P6 AUX BAG RELOCATION (00:30)</u></p> <ol style="list-style-type: none"> Translate to P6 Aux Bag (stbd/fwd/nadir P6) Retrieve Aux Bag, stow on BRT Translate to Z1 fwd, nadir of MBM Install Aux Bag

GPS ANTENNA REMOVAL TASK DATA SHEET

Tools:

EV2 (FF)
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
Old GPS Antenna #4	7/16"	4	21.6 (TBD)		70.6	10
Spare GPS Antenna	7/16"	3				

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:

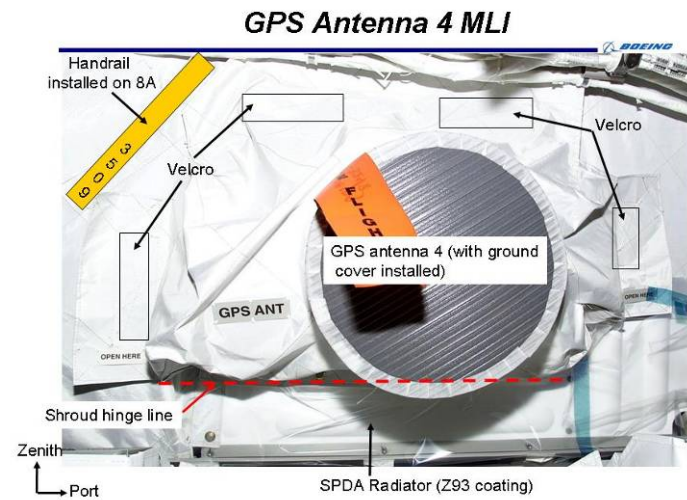
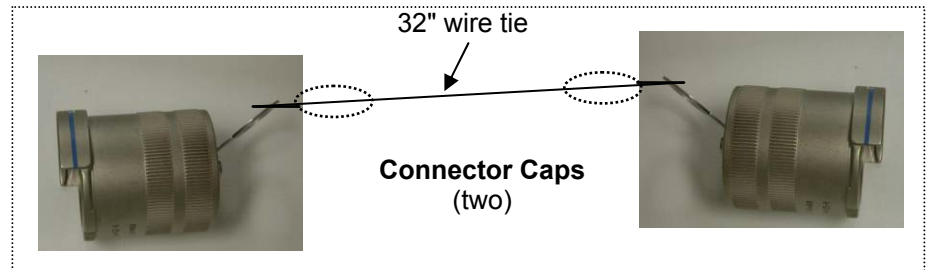
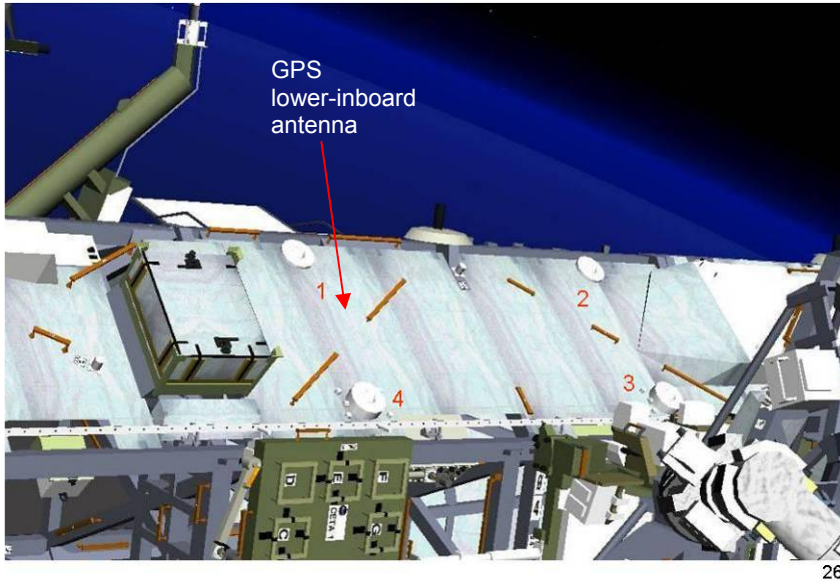
1. GPS Antenna thermal clock is TBD
2. Tether cables to self or structure before demating (Cables may not have clamps to keep them from floating out of reach into the truss)
3. Connector caps are wire-tied together to prevent cables from being lost inside the truss
4. Ensure MLI is not above original antenna plane

Cautions:

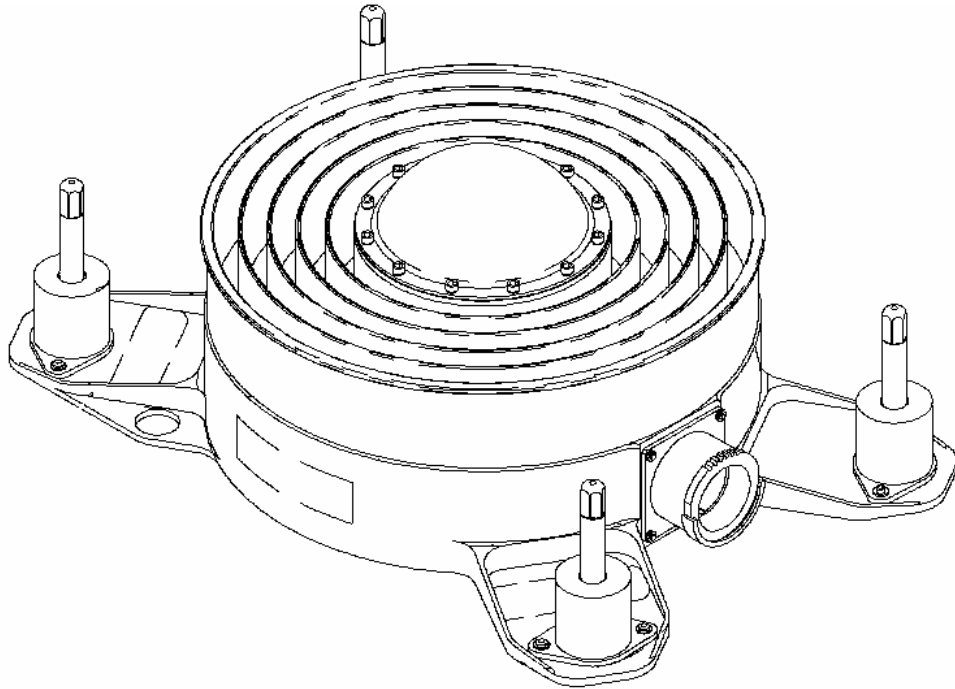
1. Thermal clock data for GPS Antenna 4 (with and without ORU bag):
 - a. 30 min to place failed GPS antenna in the ORU bag + 5 hr transfer clock
 - b. 60 min to place failed GPS antenna in the ORU bag + 2 hr transfer clock
 - c. If ORU bag not used, there is a 60-min clock to transfer the GPS antenna

GPS ANTENNA REMOVAL TASK DATA SHEET (Cont)

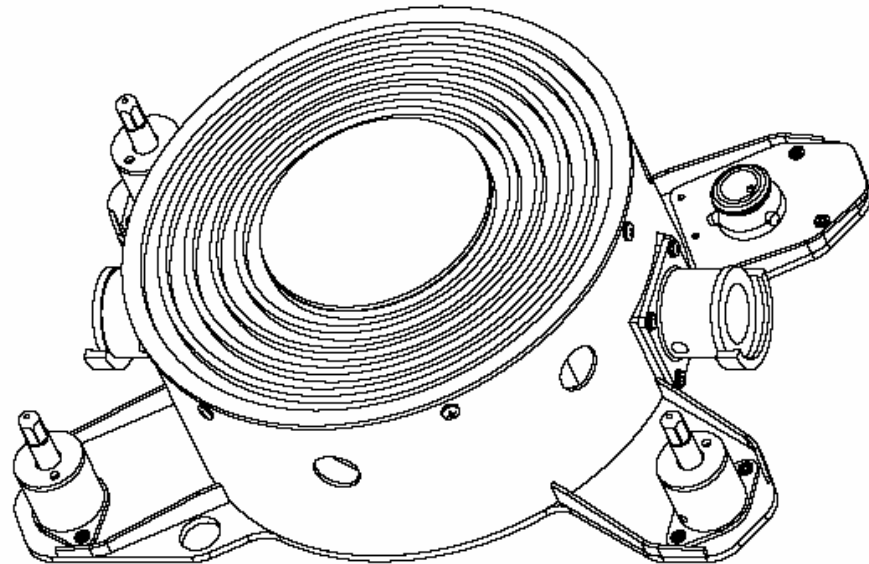
GPS Antenna Worksite



GPS ANTENNA REMOVAL TASK DATA SHEET (Cont)



FAILED GPS UNIT CONFIGURATION



SPARE GPS UNIT CONFIGURATION

P6 AUX BAG RELOCATION TASK DATA SHEET

Tools: None

Foot Restraints: None

EVA Fasteners: None

EVA Connectors: None

Timeline Considerations

1.

Notes:

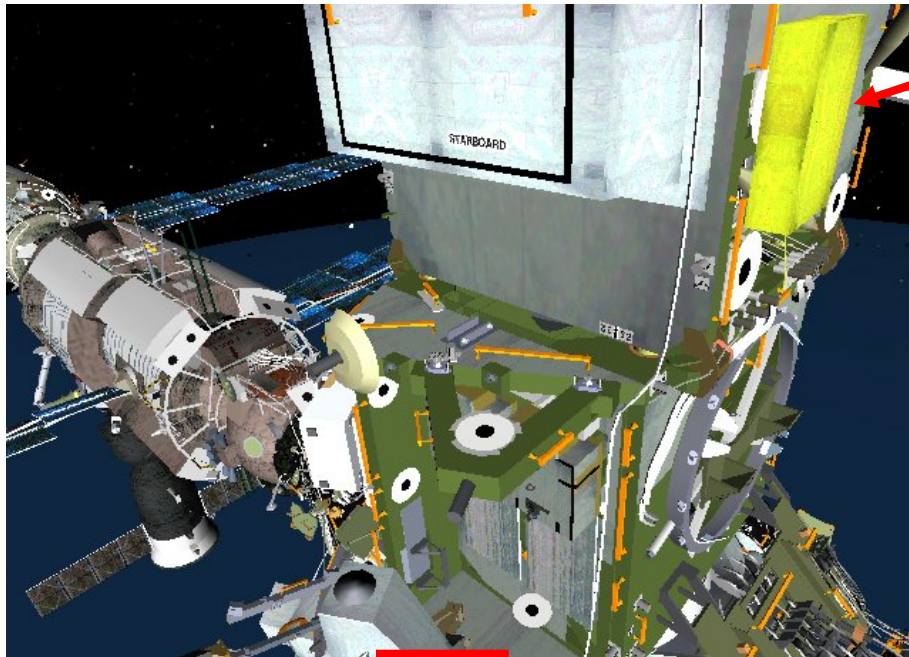
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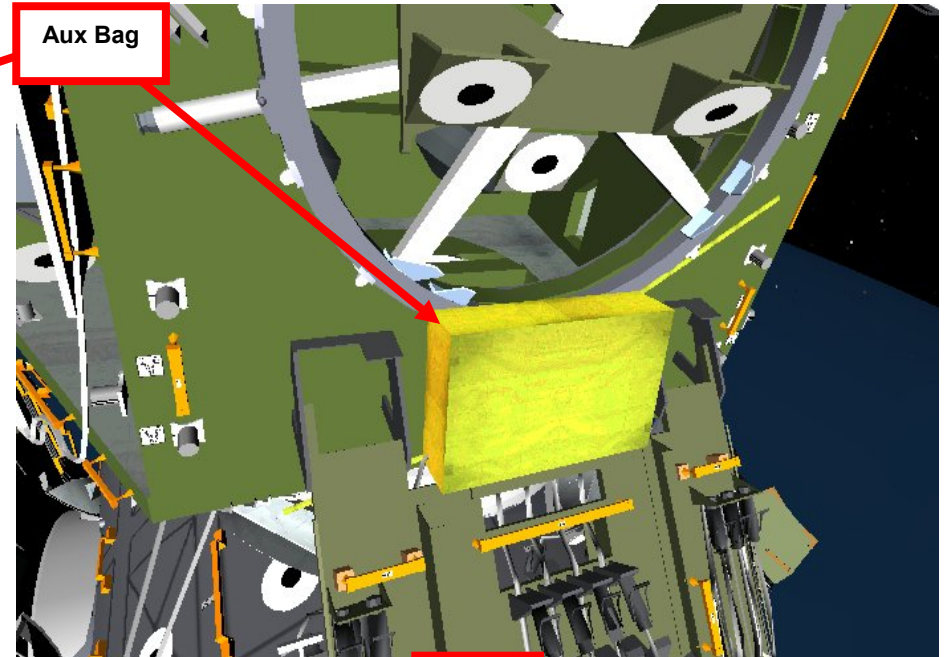
1.

Warnings:

1.



Before



After

CP7 STANCHION INSTALL (01:10)

IV/RMS	EV2 (FF)	EV3 (FF)
	<p><u>STANCHION RETRIEVAL</u></p> <ol style="list-style-type: none"> 1. Translate to stanchion carrier on ESP-2 2. Tether to XXXX stanchion (#) race track tether point 3. PGT [B6 24.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6" ext 7/16" <ul style="list-style-type: none"> <input type="checkbox"/> Release launch restraint bolts (two) ~8.5 turns (bolts will spring out, black line visible) 4. Slide stanchion out of stowage interfaces (towards dummy box) 5. BRT to racetrack 6. Translate to CP-7 (nadir S0/P1 interface) <p><u>STANCHION INSTALL</u></p> <ol style="list-style-type: none"> 7. Transfer stanchion to EV3 8. BRT to HR _____ <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"> 9. PGT [B3 18.4 ft-lb, CW2 30 RPM, MTL 30.5] 6" ext 7/16" <ul style="list-style-type: none"> <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) 10. Report torque and turn data 	<p><u>STANCHION INSTALL</u></p> <ol style="list-style-type: none"> 1. BRT to HR _____ 2. Open CP-7 shroud to uncover VSSA port 3. Receive stanchion 4. Soft dock stanchion to CP-7 (race track outboard) (~10 lbf required) 5. Hold stanchion in soft dock while EV2 engages stanchion bolt

CP7 STANCHION 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
???	7/16	2	3.8 TBD	TBD	TBD	8	30

EVA Connectors: None

Connector Inhibits: None

Timeline Considerations

1.

Notes:

1.

Cautions:

1.

Warnings:

1.

EVA 4 CLEANUP/INGRESS

IV/RMS	EV2 (FF)	EV3 (FF)
	<p><u>CLEANUP</u></p> <ol style="list-style-type: none"> 1. Translate to airlock 2. Perform Tool Inventory <p><u>INGRESS</u></p> <ol style="list-style-type: none"> 3. Ingress airlock 4. Connect left waist tether to airlock internal D-ring 5. Disconnect 85-ft tether short strap, attach to circular airlock handrail standoff 6. Hatch thermal cover – close, attach Velcro strap 7. DCM: water – off 8. Outer hatch – close and lock 9. Go to PRE REPRESS 	<p><u>CLEANUP</u></p> <ol style="list-style-type: none"> 1. Translate to airlock 2. Perform Tool Inventory <p><u>INGRESS</u></p> <ol style="list-style-type: none"> 3. Ingress airlock 4. Connect left waist tether to UIA D-ring 5. Disconnect 85-ft tether short strap, attach to circular airlock handrail standoff <ol style="list-style-type: none"> 6. DCM: water – off 7. Go to PRE REPRESS

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)
- 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 (2)

EV3

- Waist Tether (R Extender to MWS)
- Waist Tether (L D-ring to Safety Tether)
- 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) (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

- CL Bag #1
- RET (Lg-sm) on outside
- Digital Camera
- Socket Caddy
- RAD + 7/16" X 2" rigid
- Large Gap Spanner (2) (45-72 inch)
- WETA + Round Scoop
- RET (Lg-sm) to Airlock
- OBSS OSE (2)
- RET (Lg-sm) (2)
- bungee?
- Medium ORU Bag
- RET (Lg-sm) on outside
- GPS Antenna #4
- RET (sm-sm)
- RET (sm-sm)
- Adj (2 for restraining cables)
- CL Bag #3 (contingency) -*Aft/Zenith wall*
- Adj (Lg-sm) on outside
- PGT battery
- 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
- EVA Ratchet
- Adj tether to internal D-ring
- D-ring Extender

UCCAS DEPLOY (GET-AHEADS)

IV/RMS	EV2 (FF)	EV3 (FF)
MCC-H – Verify P3/P4 SARJ locked	<p><u>P3/S3 ZENITH/NADIR UCCAS DEPLOY</u></p> <ol style="list-style-type: none"> Translate to deploy clevis on the _____ UCCAS PGT [B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16 <ul style="list-style-type: none"> <input type="checkbox"/> Release or swivel deploy clevis bracket, 10 turns on all unless swivel then 8 turns on #1 (if reqd BRT to HR _____) If reqd temp stow deploy clevis bracket <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"> PGT [B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16 <ul style="list-style-type: none"> <input type="checkbox"/> Loosen stow clevis bracket bolts (4), ~4 turns <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"> Release yoke PIP pin ADP, use pre-installed wire tie to secure ADP and PIP pin to yoke PGT [B4 20.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16 <ul style="list-style-type: none"> <input type="checkbox"/> Release diagonal strut cup-cone bolt, 38 turns to hard stop <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"> Translate to A/L; retrieve CL Bag #1 (RAD + 2", Gap Spanners) Translate to zenith hinges on the _____ UCCAS Remove hinge line ADPs (2), insert in stowage hole, √lock bracket engaged Attach large gap spanner to zenith longeron HR _____, loop back on itself PGT [B2 16.6 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16 <ul style="list-style-type: none"> <input type="checkbox"/> Release SARJ brace cup-cone bolt, 23 turns to hard stop <input type="checkbox"/> Release SARJ launch bolt to use for temp stow, 10 turns PGT [B2 16.6 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16 <ul style="list-style-type: none"> <input type="checkbox"/> Attach SARJ brace to diagonal strut, 10 turns <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"> <tr> <th>Bolt #</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> <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> </table> <p>Record Torque and Turns for SARJ Launch Lock and Cup Cone Bolts</p> <table border="1"> <tr> <th>Bolt</th> <th>Launch Lock</th> <th>Cup Cone</th> </tr> <tr> <td>Torque</td> <td></td> <td></td> </tr> <tr> <td>Turns</td> <td></td> <td></td> </tr> </table> <p>Record Torque and Turns for Diagonal Strut Cup-Cone Bolt</p> <table border="1"> <tr> <td>Torque</td> <td></td> </tr> <tr> <td>Turns</td> <td></td> </tr> </table>	Bolt #	1	2	3	4	Torque					Turns					Bolt	Launch Lock	Cup Cone	Torque			Turns			Torque		Turns		<p>7. Help EV3 guide diagonal brace to HR _____</p> <p>8. PGT [B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16</p> <ul style="list-style-type: none"> <input type="checkbox"/> Release or swivel stow clevis bracket clear of UCCAS deploy (3 bolts to swivel, 4 to release), ~6 turns <p>9. PGT [B7 25.5 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</p> <ul style="list-style-type: none"> <input type="checkbox"/> Engage stow clevis bracket bolts (4), 10 turns to hard stop <p>10. Orient deployed clevis bracket with alignment guide</p> <p>11. PGT [B4 20.0 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</p> <ul style="list-style-type: none"> <input type="checkbox"/> Engage deploy clevis bracket bolts (4) part way, 4 turns <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p>CAUTION</p> <p>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. PGT [B4 20.0 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</p> <ul style="list-style-type: none"> <input type="checkbox"/> Engage diagonal strut cup-cone bolt, 38 turns to hard stop <p>14. Install yoke into clevis</p> <ul style="list-style-type: none"> <input type="checkbox"/> Release wire tie securing PIP pin and ADP to yoke <input type="checkbox"/> Install yoke ADP, ✓lock bracket engaged <input type="checkbox"/> Install yoke PIP pin <p>15. PGT [B4 20.0 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</p> <ul style="list-style-type: none"> <input type="checkbox"/> Engage deploy clevis bracket bolt #2, #3, and #1 to hard stop (attempt #4 w/o RAD) <p>16. PGT [XX XX. X ft-lb, CW2 30 RPM, MTL 30.5]-RAD w/2ext 7/16</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>CAUTION</p> <p>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. PGT [B2 16.6 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16</p> <ul style="list-style-type: none"> <input type="checkbox"/> Release SARJ bolt from diagonal, 10 turns <p>14. PGT [B2 16.6 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</p> <p>15. Engage launch bolt, TBD 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"> <input type="checkbox"/> Pull yoke gap spanner to unfold yoke <input type="checkbox"/> Rotate UCCAS out of detent <input type="checkbox"/> Lower yoke into clevis
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)															
<p>Record Torque and Turns of Deployed 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>	Bolt #	1	2	3	4	Torque					Turns					<ul style="list-style-type: none"> <input type="checkbox"/> Engage deploy clevis bracket bolt #4 to hard stop <p>17. Translate under UCCAS UMA</p> <p>18. Tether to hitch PIP pin from EVA OVERRIDE anti-rotation cap and remove hitch PIP pin</p> <p>19. Remove anti-rotation cap and stow in trash bag</p> <p>20. ✓All tools STOWED (PGTs)</p>	<p>18. Translate to each guide vane (3) and perform:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Remove launch restraint PIP pins from guide vanes, stow in trash bag <input type="checkbox"/> Inform MCC-H ready for RTL checkout <input type="checkbox"/> On MCC-H GO, depress and hold RTL lever for 15 sec, then release <input type="checkbox"/> Verify with MCC-H good checkout, move to next guide vane <p>19. Release large gap spanner from yoke</p> <p>20. Stow gap spanner in trash bag</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>CAUTION</u></p> <p style="text-align: center;">EBCS target contains finished surface which could be damaged if contacted by EV crew</p> </div> <p>21. Translate to EBCS target</p> <p>22. Verify EV2 is clear of target</p> <p>23. Remove EBCS target cover, stow on backside of target assembly</p> <p>24. ✓All tools stowed (PGTs)</p> <p>25. ✓Gap spanner in trash bag</p>
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:

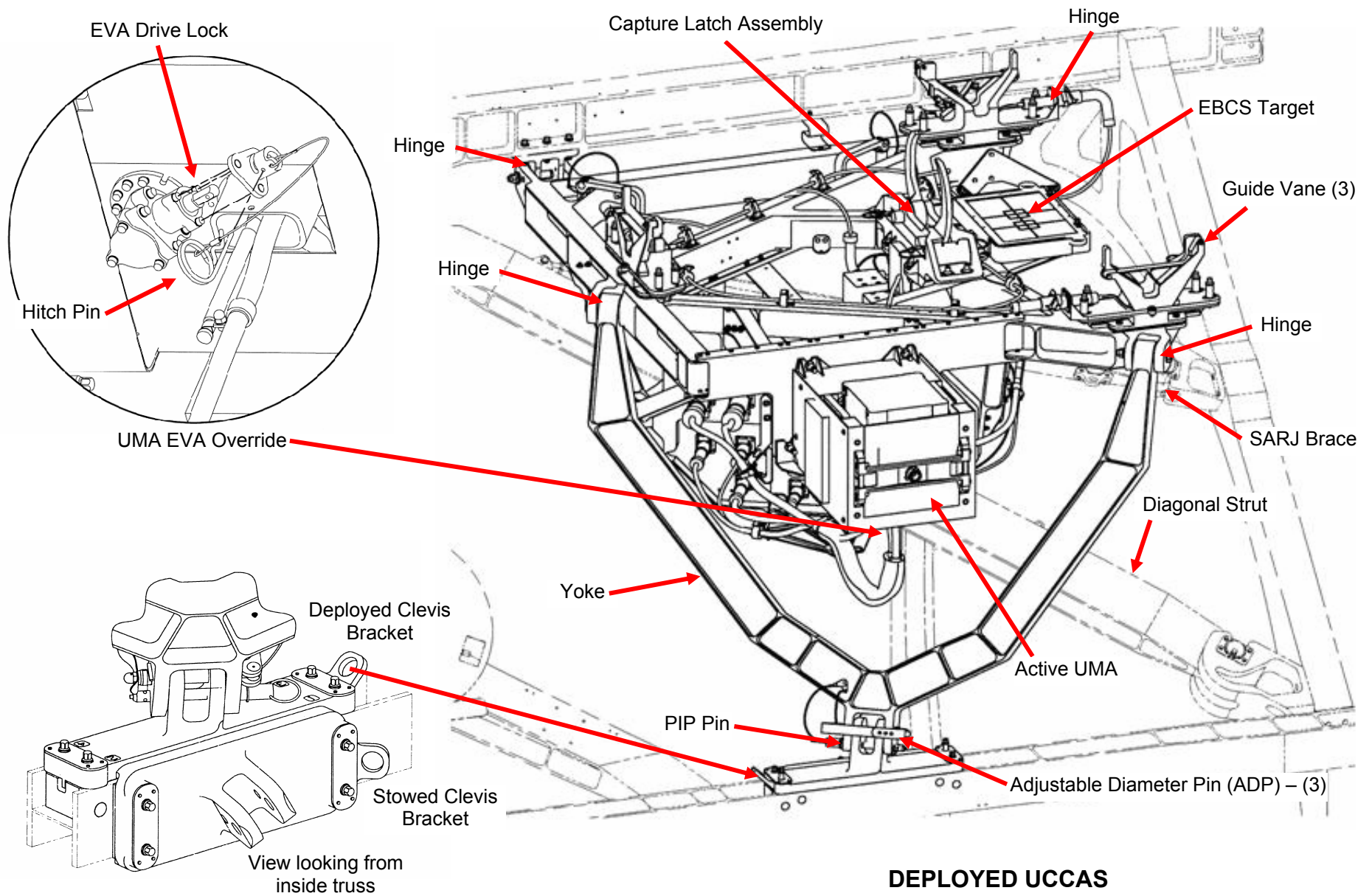
1. Can not release 3 of 4 bolts on either stowed or deployed clevis bracket to rotate out of the way, due to mechanism design
2. UMA EVA Override anti-rotation cap must be removed prior to first use of UMA on UCCAS
3. EBCS target cover must be removed prior to cargo attachment to UCCAS. Protects target from MMOD and inadvertant 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)

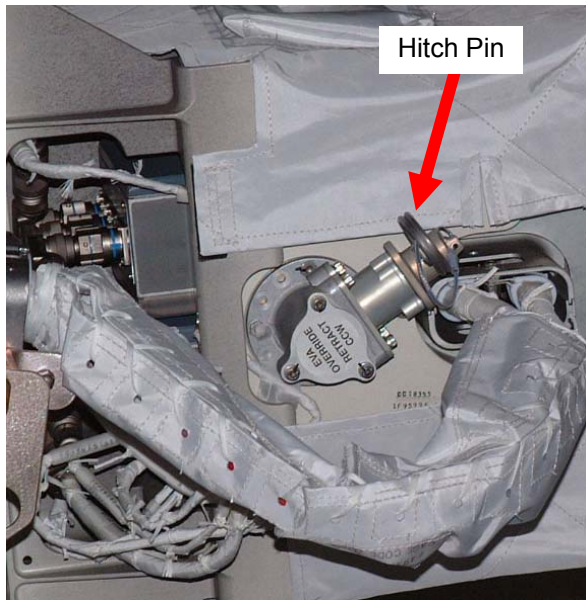


Figure 5. Active UMA EVA Override with Anti-Rotation Cap

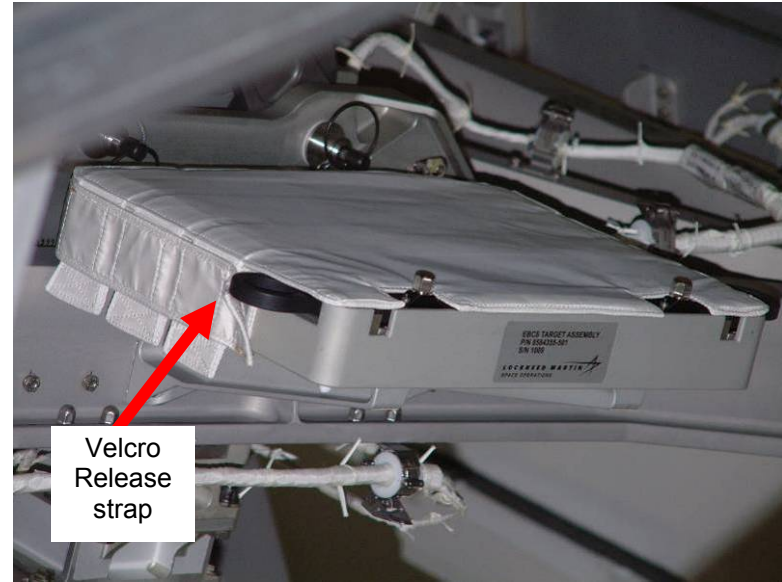


Figure 6. EBCS Target with Cover

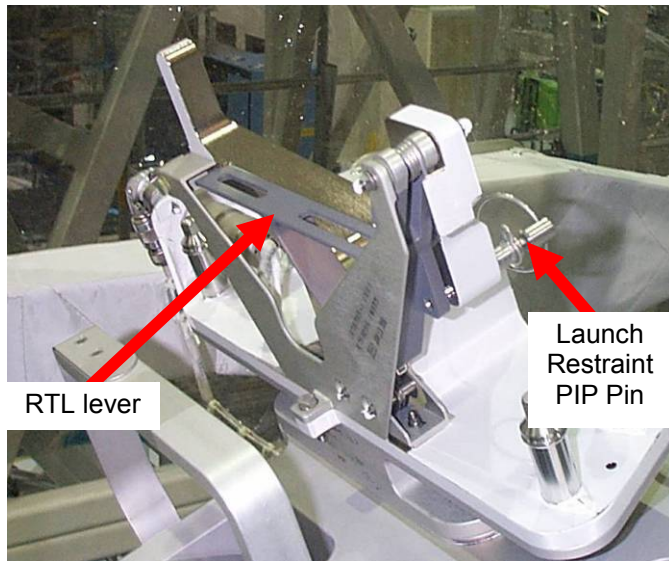


Figure 7. Guide Vane and RTL lever

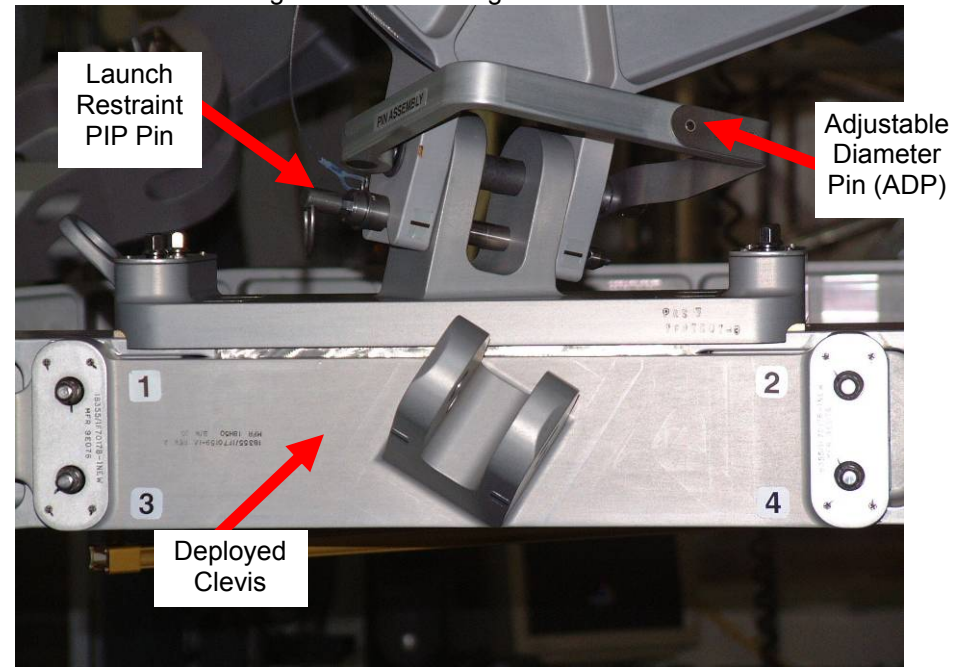


Figure 8. Deployed and Stowed Clevis Brackets (looking from zenith)

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

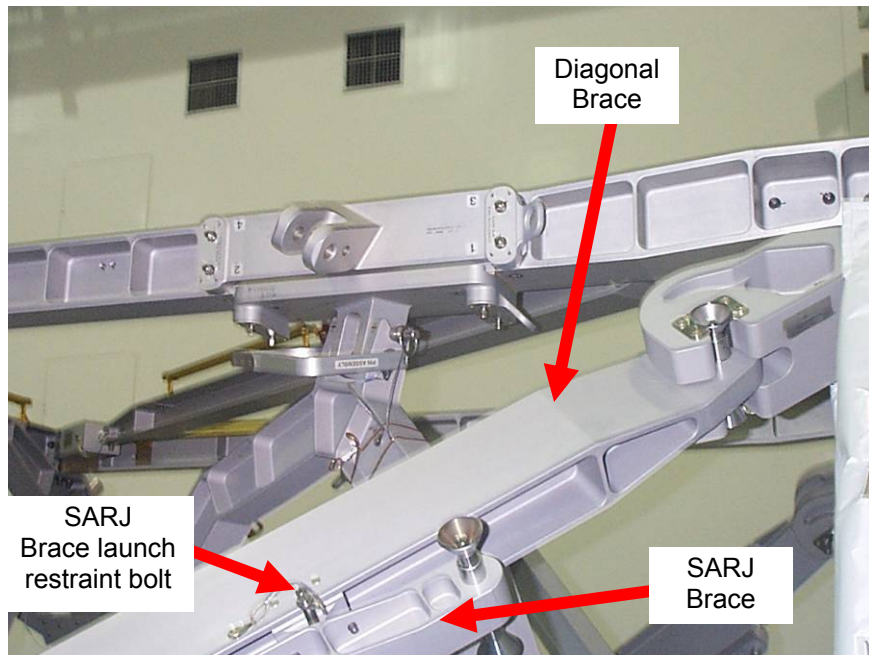


Figure 9. Diagonal and SARJ braces and cup-cones



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

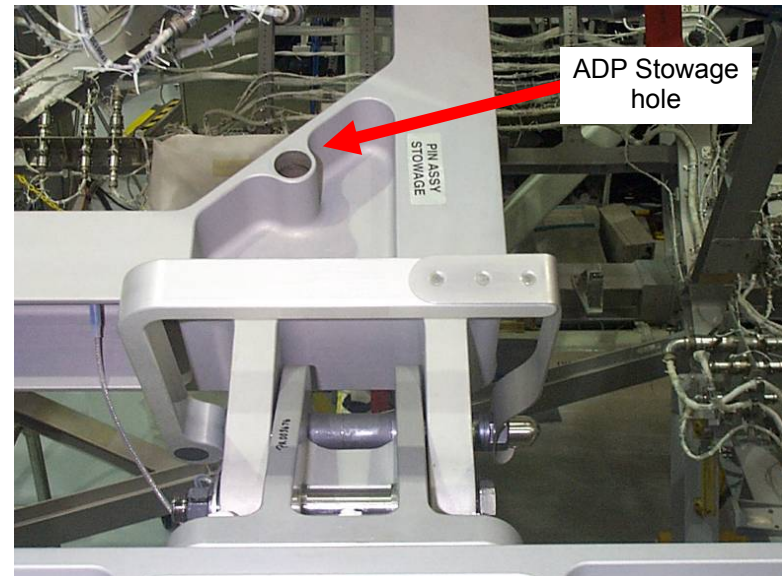


Figure 11. Adjustable Diameter Pin (ADP) and stowage hole (hinge side)

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TOOLS AND
STOWAGE

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APFR MANAGEMENT – STS-118 (13A.1)

APFR DESIGNATOR	APFR 1 (8A Pitch knob problem)	APFR 2	APFR 3 S/N 1005 no pitch knob prob 9A-inc12	APFR 4 (TS, heat shield removed by 12A.1 stage)	APFR 5 Ingress aid (TS, heat shield removed by 12A.1 stage)	APFR 6 (heat shield removed by 12A.1 stage)	APFR 7 S/N 1008	IAPFR 1	IAPFR 2	CRANE (old ORU tether)	TS (from APFR 4)	TS (from APFR 5)	TS	ORU stanchion/ TERA (headless)
EVA 1	S4 WIF 18 [8,OO,C,1]	WIF P6-4B [12,PP,G,2] (near EAS for INC15 stage EVA)	Z1 WIF 11 [2,TT,H,11]	S4 WIF 19 [6,TT,J,11]	A/L WIF 11 [TBD]	CETA 1 WIF 3 [10,PP,E,12] Y/P [TBD]	S0 WIF 07 [5,NN,L,12]	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5	CETA 1	CETA 2	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 13 [12,TT,K,10]			S5 WIF 11 [9,RR,G,12] roll to [9,RR,A,12]										
Get-Aheads: S4/S5 umbilicals (nadir/aft) (nadir/fwd)	S5 WIF 3 [4,RR,B,1] [4,RR,E,1]													
S5 Clean-up	S1 WIF 17 [12,PP,F6]			ESP2 WIF 08 [3, SS, F, 12] (for 10A)										

EVA 2	S1 WIF 17 [12,PP,F,6]	WIF P6-4B [12,PP,G,2]	Z1 WIF 11 [2,TT,H,11]	ESP2 WIF 08 [3, SS, F, 12]	A/L WIF 11 [TBD]	CETA 1 WIF 3 [10,PP,E,12] Y/P [TBD]	S0 WIF 07 [5,NN,L,12]	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5	CETA 1	CETA 2	S0 port wedge face	S0 port wedge face
Setup					SSRMS [12,PP,F,4]			Z1 WIF 05 [11,OO,F,12]						
Replace Z1 Thermal Shroud								Z1 WIF 01 [12,PP,F,12]						
Cleanup					A/L WIF 11 [TBD]									

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

APFR DESIGNATOR	APFR 1 (8A Pitch knob problem)	APFR 2	APFR 3 S/N 1005 no pitch knob prob 9A- inc12	APFR 4 (TS, heat shield removed by 12A.1 stage)	APFR 5 Ingress aid (TS, heat shield removed by 12A.1 stage)	APFR 6 (heat shield)	APFR 7 S/N 1008	IAPFR 1	IAPFR 2	CRANE (old ORU tether)	TS	TS	TS	ORU stanchion/ TERA (headless)
EVA 3	S1 WIF 17 [12,PP,F,6]	WIF P6-4B [12,PP,G,2]	Z1 WIF 11 [2,TT,H,11]	ESP2 WIF 08 [3, SS, F, 12]	A/L WIF 11 [TBD]	<u>CETA 1</u> WIF 3 [10,PP,E,12] Y/P [TBD]	S0 WIF 07 [5,NN,L,12]	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5	CETA 1	CETA 2	S0 port wedge face	S0 port wedge face
SSRMS Setup	SSRMS [12,PP,F,6]				Ingress Aid									
P1 BSP/XPDR Install						CETA 2 WIF 2 [10,PP,E,12] Y/P [12,FF] (for 10A)								
SSRMS Clean-up	CETA 1 WIF 4 [8,PP,E,12] Y/P [12,FF] (for 10A)				(for 10A)									
EVA 4	CETA 1 WIF 4 [8,PP,E,12] Y/P [12,FF]	WIF P6-4B [12,PP,G,2]	Z1 WIF 11 [2,TT,H,11]	ESP2 WIF 08 [3, SS, F, 12]	A/L WIF 11 [TBD]	CETA 2 WIF 2 [10,PP,E,12] Y/P [12,FF]	S0 WIF 07 [5,NN,L,12]	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5	CETA 1	CETA 2	S0 port wedge face	S0 port wedge face
N/A														
Post-EVA 4	CETA 1 WIF 4 [8,PP,E,12] Y/P [12,FF] (for 10A)	WIF P6-4B [12,PP,G,2] (for EAS jettison)	Z1 WIF 11 [2,TT,H,11]	ESP2 WIF 08 [3, SS, F, 12] (for 10A)	A/L WIF 11 [TBD] (for 10A)	CETA 2 WIF 2 [10,PP,E,12] Y/P [12, FF] (for 10A)]	S0 WIF 07 [5,NN,L,12]	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5	CETA 1	CETA 2	S0 port wedge face	S0 port wedge face

SAFETY TETHER CONFIGURATION – 118 (13A.1)

I

	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	#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
Pre EVA1	INSIDE Tether Staging Area	INSIDE Tether Staging Area	INSIDE Tether Staging Area	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
Post EVA 4	INSIDE Tether Stageing Area	INSIDE Tether Staging Area	INSIDE Tether Staging Area	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

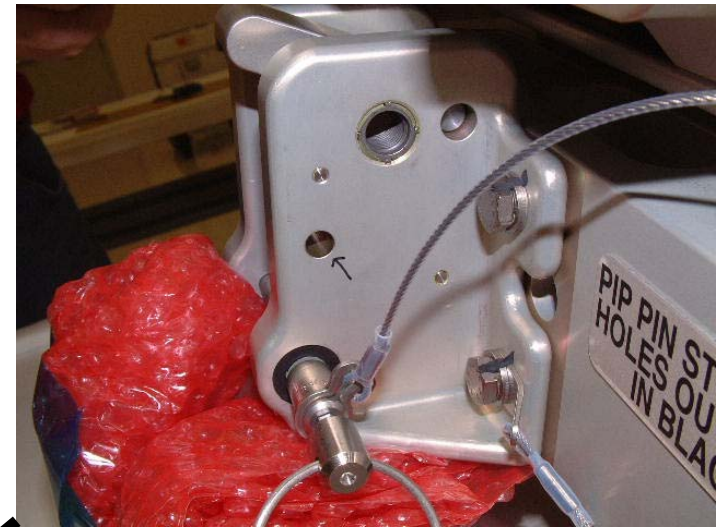
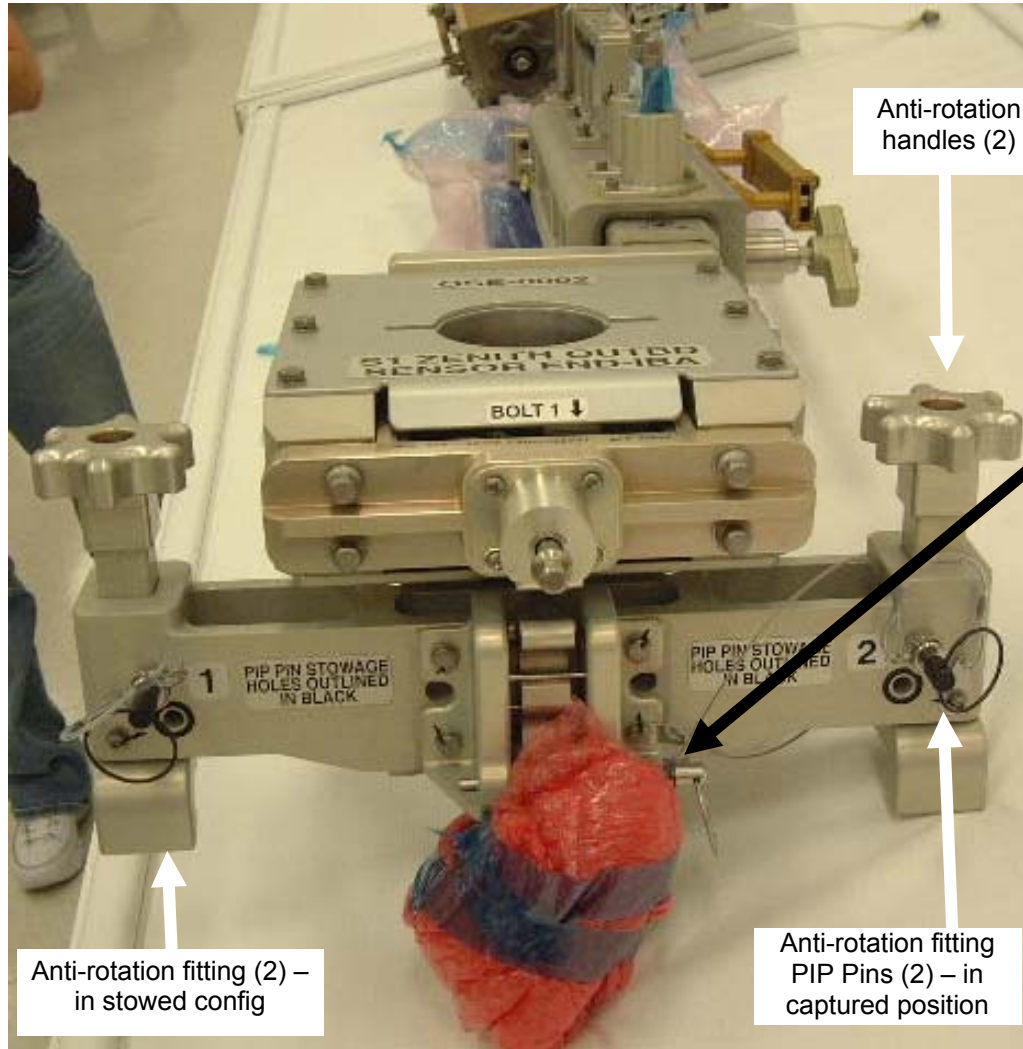
OBSS OSE PRE EVA CONFIG (00:30)

I

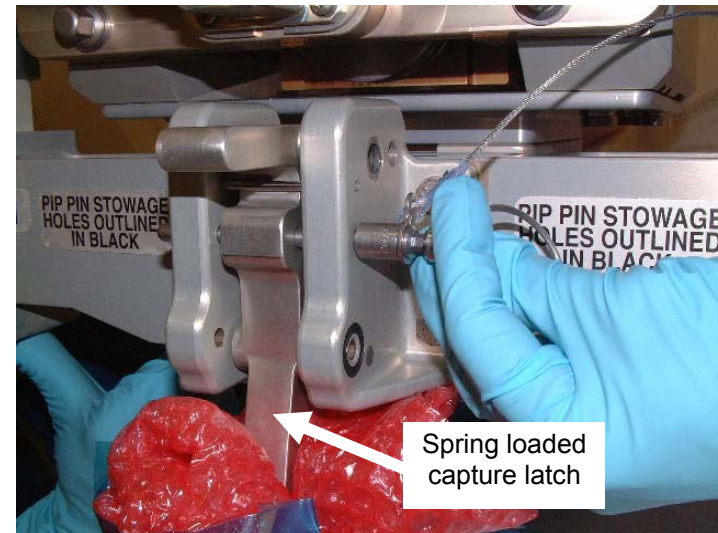
Perform following steps for both boom stand units:

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
TBD IV Tool
or
PGT 7/16 in ext AX, CWX 30.5 (X.X ft-lb, 30 rpm)
4. Drive grounding bolt ~8 turns cw to hard stop
5. Verify capture latch PIP pin installed in the stowed position (black circle hole)
6. Verify anti-rotation fitting (2) are deployed (fittings extended) and PIP pins (2) located in capture position
7. Verify PAD status indicator in SD (soft dock)
8. Remove kapton tape from extender bolts 2 and 3

OBSS OSE PRE EVA CONFIG (Cont)



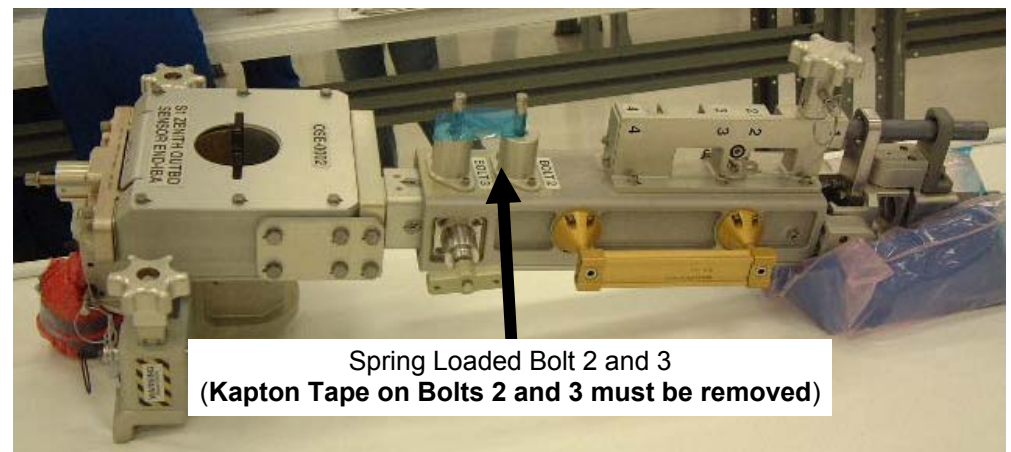
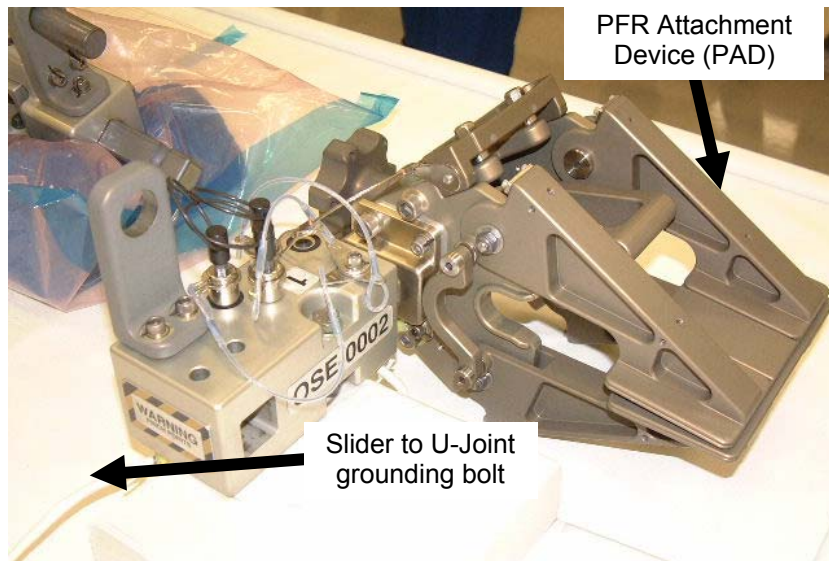
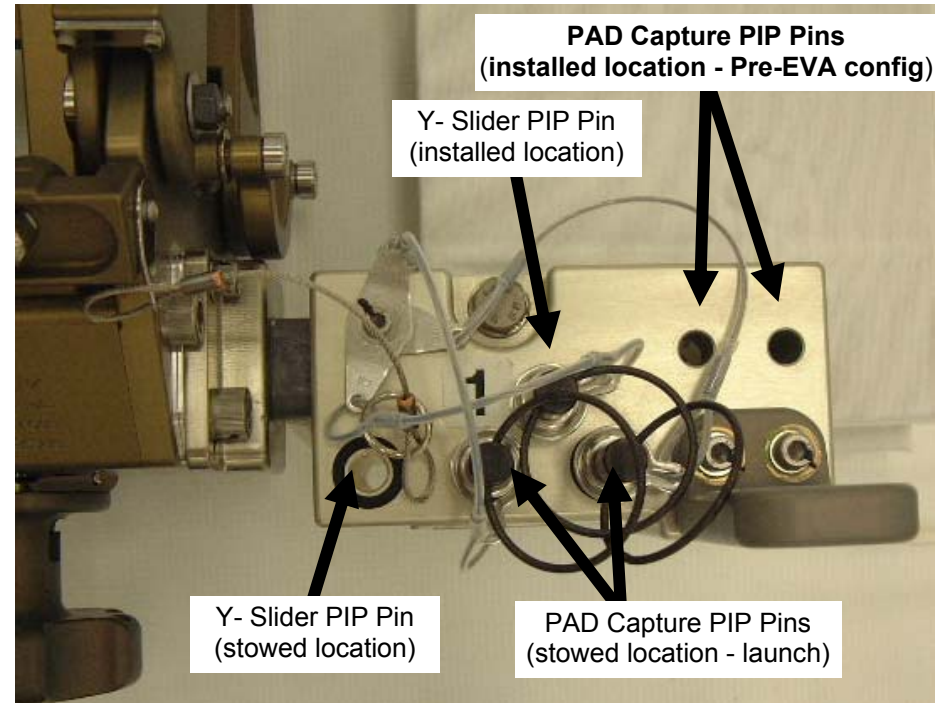
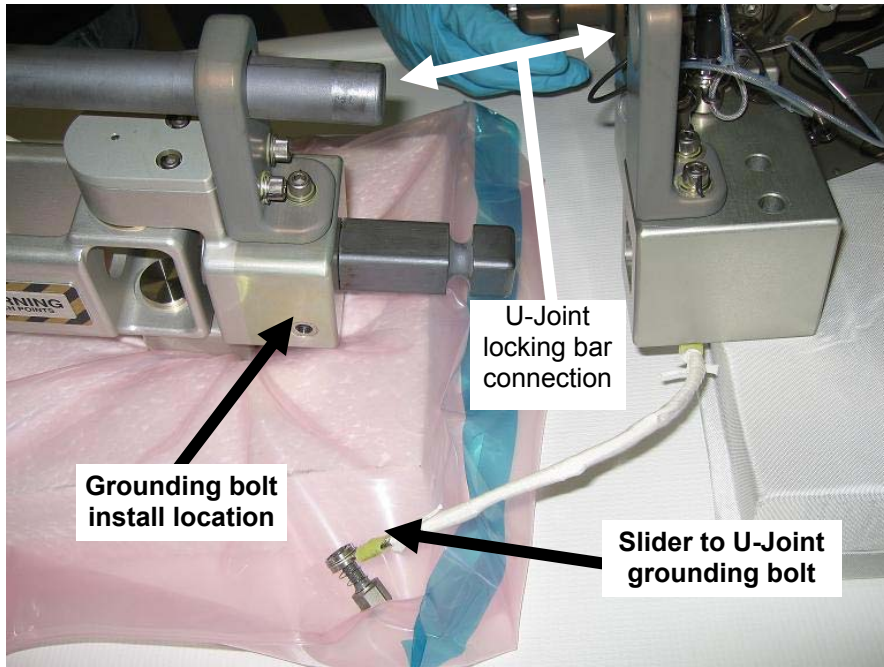
Capture Latch PIP Pin – In STOWED position (Pre-EVA config)



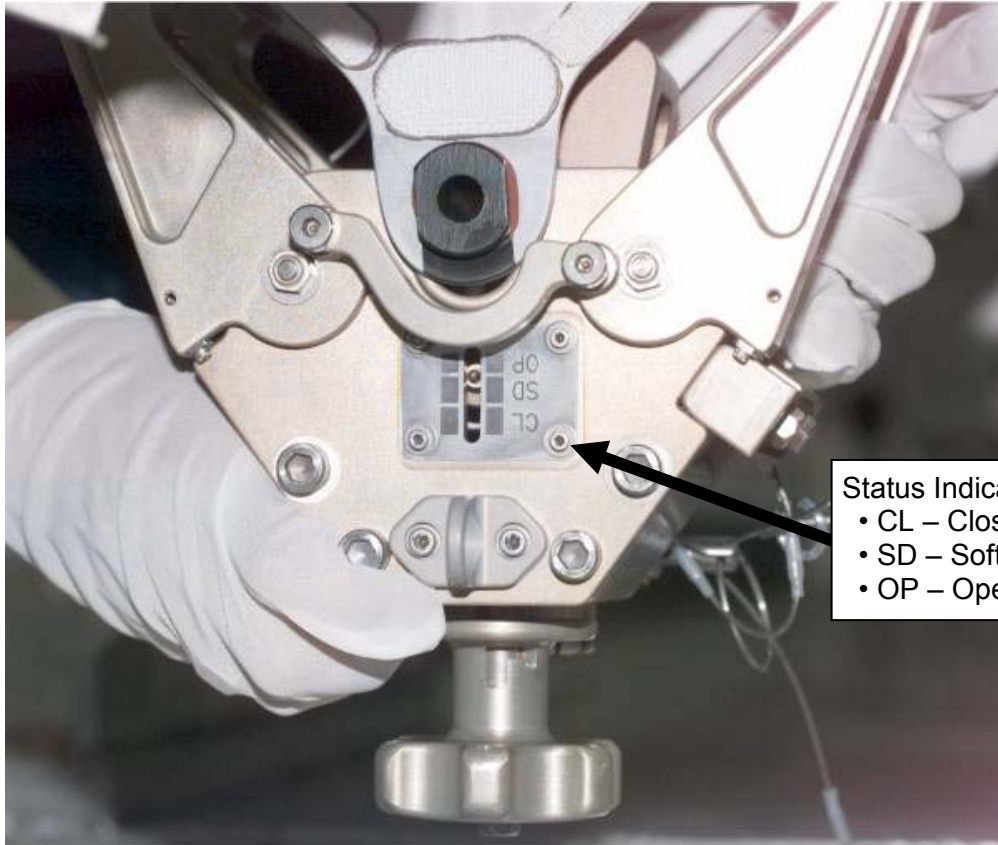
Capture Latch PIP Pin – In LOCKED position (Post Install config – crew drawn arrow on hole as shown above)

NOTE: PIP pin storage holes outlined in black on OSEs

OBSS OSE PRE EVA CONFIG (Cont)

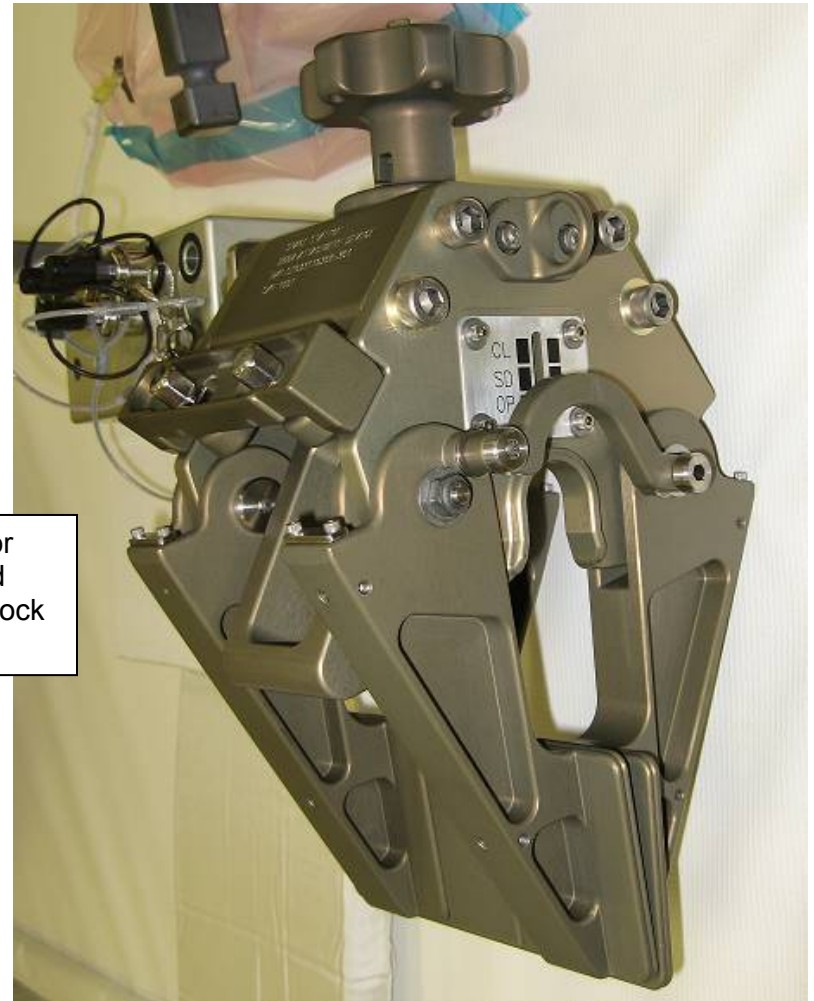


OBSS OSE PRE EVA CONFIG (Cont)

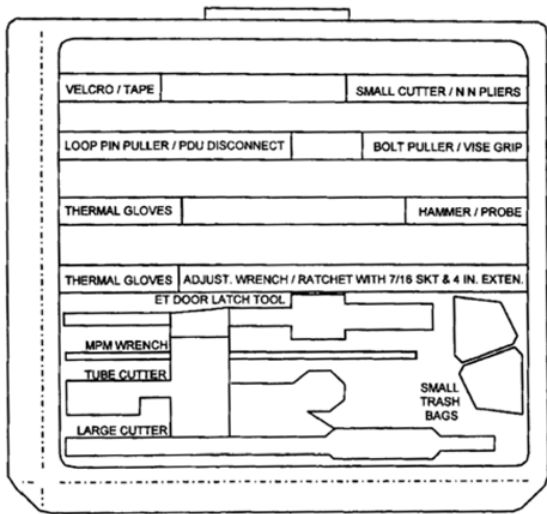
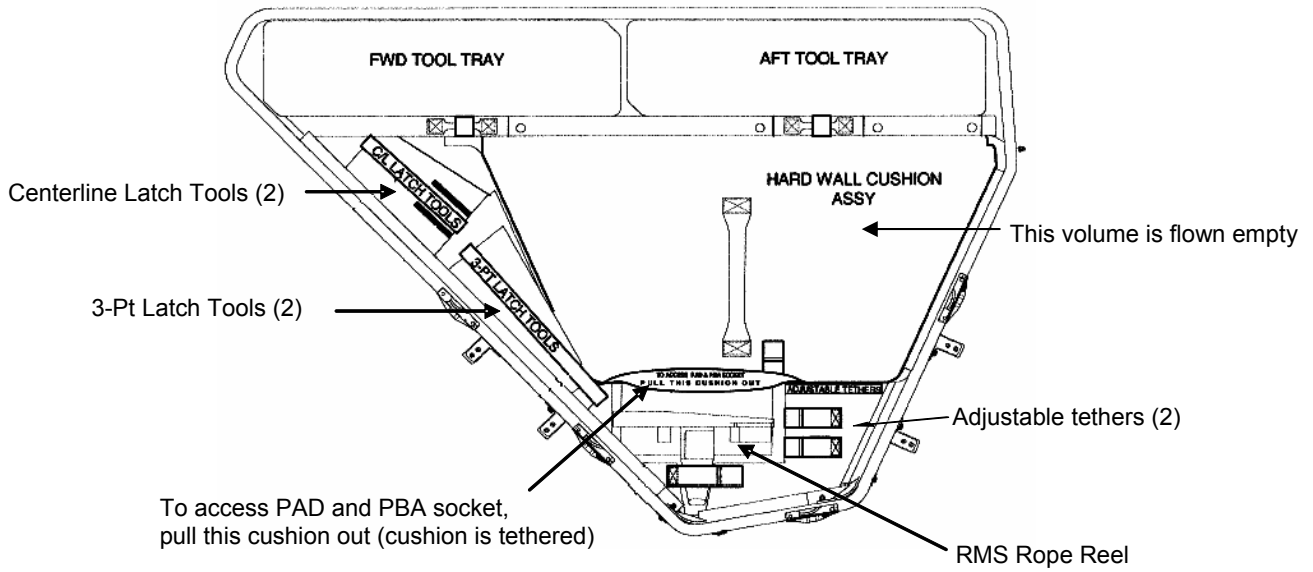


PFR Attachment Device (PAD)

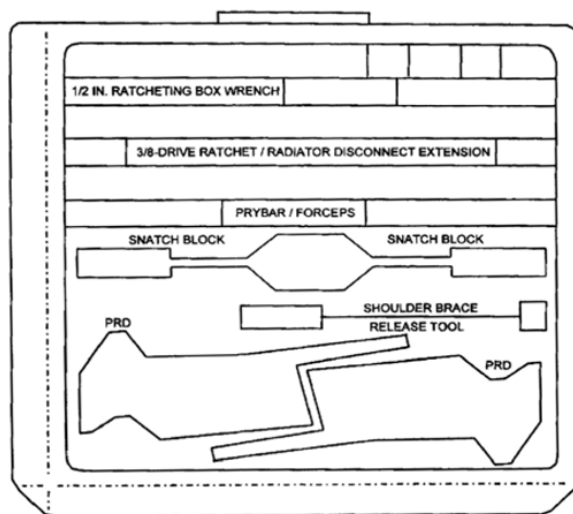
Status Indicator
• CL – Closed
• SD – Soft Dock
• OP – Open



PORT LIGHTWEIGHT TOOL STORAGE ASSEMBLY



Forward Tray layout and Labels



Aft Tray Layout and Labels



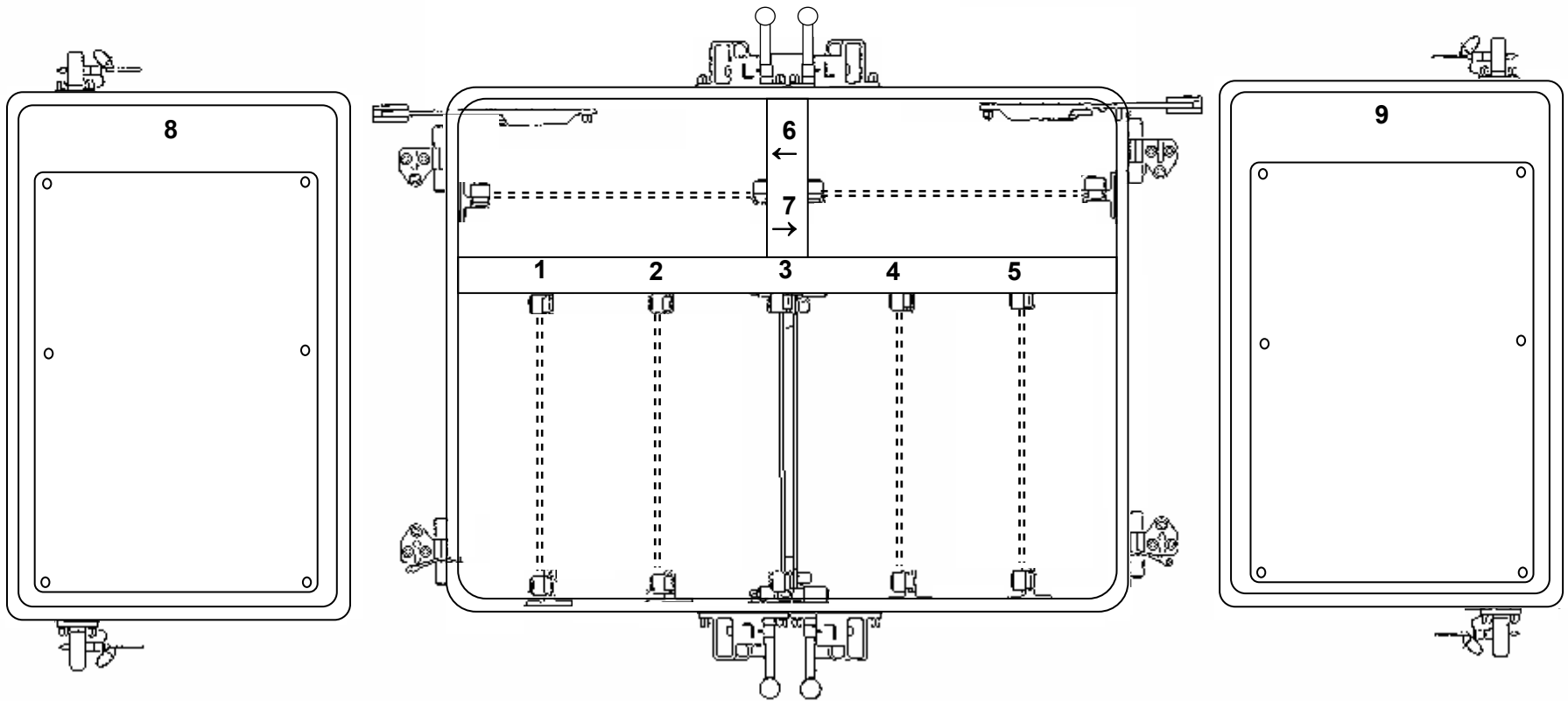
TOOLBOX STOWAGE

	Z1 PORT TOOLBOX	Z1 STBD TOOLBOX	A/L TOOLBOX 1 (STBD)	A/L TOOLBOX 2 (PORT)
SLOT # 1	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
SLOT # 2		QD BAIL TOOL BOARD BMRRM LATCH TOOL QD BAIL DRIVE TOOL (1")	PLIERS BOARD NEEDLE NOSE PLIERS	
SLOT # 3	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		
SLOT # 4				
SLOT # 5	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
SLOT # 6	TRASH BAG BOARD LARGE TRASH BAG SMALL TRASH BAG	TRASH BAG BOARD	HYDRAZINE BRUSH BOARD HYDRAZINE BRUSH	
SLOT # 7	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
PANEL # 8	CHEATER BAR PANEL ADJ EQUIP TETHER	CHEATER BAR PANEL CHEATER BAR ADJ EQUIP TETHER	TOOL CADDY PANEL CADDY, ISS (BUNGEE)	
PANEL # 9	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)
EXTERNAL	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" H2O/N2 Vent Tool – F	1F98593-1	<input type="checkbox"/> 1" H2O/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)



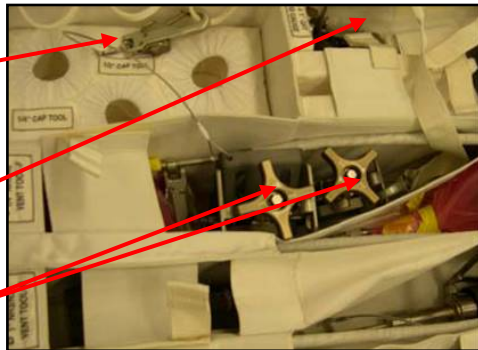
PORT QD BAG (EXTERNAL ON ISS AIRLOCK)

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

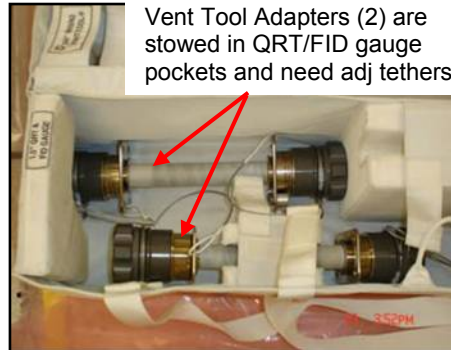
3/4" BDT is tethered to internal bag loop using integral tool tether

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

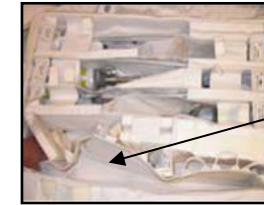
1/4" and 3/4" BDTs are stowed on top of 1/4" vent tool



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

EMU EQUIPMENT SORTED BY ITEM

ITEM	LOCATION	QTY	S/N
TBD	TBD	TBD	TBD

EMU EQUIPMENT SORTED BY LOCATION

LOCATION	ITEM	QTY	S/N
TBD	TBD	TBD	
	TBD	TBD	
	TBD	TBD	
	TBD	TBD	
	TBD	TBD	

SHUTTLE EVA TOOLS SORTED BY TOOL NAME

ITEM	COMMENT	UP	DN	LOCATION
TBD	TBD	TBD	TBD	TBD

SHUTTLE EVA TOOLS SORTED BY LOCATION

ITEM	COMMENT	UP	DN	LOCATION
TBD	TBD	TBD	TBD	TBD

EVA 1 TOOL TRACKER

COMPLETED TASK	RICK	DAVE
S5 CLEANUP	<ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RET <input type="checkbox"/> <input type="checkbox"/> Adj* <input type="checkbox"/> Trash Bag (L, outside) <input type="checkbox"/> Launch Lock #1 <input type="checkbox"/> Launch Lock #3 <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-ft) <input type="checkbox"/> *F.L.: <u>S0/</u> _____ (Adj 1) <input type="checkbox"/> S.T. Swap: _____ <input type="checkbox"/> *F.L.: <u>S4/</u> _____ (Adj 2) <input type="checkbox"/> APFR – stowed @ S1/WIF17 [12, PP, F, 6] <hr style="border-top: 1px dashed black;"/> <ul style="list-style-type: none"> <input type="checkbox"/> CL Bag #1 (Temp stowed on HR _____) <input type="checkbox"/> RET (Lg-sm) on outside <input type="checkbox"/> Fish Stringer <input type="checkbox"/> Digital Camera <input type="checkbox"/> <input type="checkbox"/> Cannon Connector Tools (2) <input type="checkbox"/> Socket Caddy <input type="checkbox"/> 7/16 X 2" <input type="checkbox"/> RAD <input type="checkbox"/> 5/8 X 7.8" rigid <input type="checkbox"/> Torque Wrench Bag (wire-tied on outside) <input type="checkbox"/> Torque Wrench (set 55-60 ft-lb) <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> Spare 85-ft safety tether (on outside) <input type="checkbox"/> Soft Capture pin (S5/Corner 1) <input type="checkbox"/> Soft Capture pin (S5/Corner 3) 	<ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RET <input type="checkbox"/> <input type="checkbox"/> Adj* (wrists) <input type="checkbox"/> Trash Bag (L, outside) <input type="checkbox"/> Launch Lock #2 <input type="checkbox"/> Launch Lock #4 <input type="checkbox"/> Socket Caddy <input type="checkbox"/> 5/8 X 7.8" rigid <input type="checkbox"/> RAD <input type="checkbox"/> BRT (L) – _____ <input type="checkbox"/> RET <input type="checkbox"/> PGT (R) <input type="checkbox"/> 7/16 X 2" rigid <input type="checkbox"/> RET <input type="checkbox"/> Safety Tether (85-ft) <input type="checkbox"/> Spare (85-ft) <input type="checkbox"/> *F.L.: <u>S1/</u> _____ (Adj 1) <input type="checkbox"/> S.T. Swap: _____ <input type="checkbox"/> *F.L.: <u>S4/</u> _____, <u>S5/</u> _____ (Adj 2) <input type="checkbox"/> APFR – stowed @ ESP2/WIF8 [3, SS, F, 12] <p>GET-AHEADS:</p> <ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> S5 Launch Locks
P6 PVR RETRACT AND CINCH	<ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RET <input type="checkbox"/> <input type="checkbox"/> Adj* <input type="checkbox"/> Trash Bag (L, outside) <input type="checkbox"/> Launch Lock #1 <input type="checkbox"/> Launch Lock #3 <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-ft) <p>*F.L.: <u>P6/</u> _____</p>	<ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RET <input type="checkbox"/> <input type="checkbox"/> Adj* (wrists) <input type="checkbox"/> Trash Bag (L, outside)** <input type="checkbox"/> Launch Lock #2 <input type="checkbox"/> Launch Lock #4 <input type="checkbox"/> Socket Caddy <input type="checkbox"/> 5/8 X 7.8" rigid <input type="checkbox"/> RAD <input type="checkbox"/> BRT (L) – _____ <input type="checkbox"/> RET <input type="checkbox"/> PGT (R) <input type="checkbox"/> 7/16 X 2" rigid <input type="checkbox"/> RET <input type="checkbox"/> Safety Tether (85-ft) <p>*F.L.: <u>P6/</u> _____</p>

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EVA 2 TOOL TRACKER

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EVA 3 TOOL TRACKER

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EVA 4 TOOL TRACKER

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EMU MAINT/RECHARGE

WATER RECHARGE.....	TEMP FS 10-2
EMU POWERUP.....	TEMP FS 10-2
WATER FILL.....	TEMP FS 10-2
WATER FILL VERIFICATION.....	TEMP FS 10-2
EMU LiOH CHANGEOUT.....	10-4
MIDDECK EMU BATTERY RECHARGE/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(flr) 5. √EMU O2 ISOL VLV – OP
 AW82B 6. EV1,2 O2 vlv (two) – OP
 DCM 7. PWR – SCU

WATER FILL

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

SM 60 TABLE MAINT

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

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

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

NOTE

Full charge requires ~15 min

WATER FILL VERIFICATION

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

SM 60 TABLE MAINT

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

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

TOP

**HOOK
VELCRO**

STS-118 CONSUMABLES TRACKING CUE CARD

EV1 Mt	EVA	LiOH (s/n) (b/c)	METOX (s/n) (b/c)	EMU Battery (s/n)	REBA (s/n) (b/c)	HL Battery (s/n)	ERCA (s/n) (Address)	SAFER (s/n)	PGT (s/n)	PGT Spare (s/n)
EMU 300A L - HUT	1	200A EMUXX1J	N/A	2041	1003	1015/1017	1010 16	1003	5011	5013
	2	N/A	0012 NO b/c	2038	1003	1015/1017	1010 16	1003	5014	5013
	3	N/A	0017 7811J	2040	1003	1015/1017	1010 16	1003	5011	5013

EV2 Wm	EVA	LiOH (s/n) (b/c)	METOX (s/n) (b/c)	EMU Battery (s/n)	REBA (s/n) (b/c)	HL Battery (s/n)	ERCA (s/n) (Address)	SAFER (s/n)	PGT (s/n)	PGT Spare (s/n)
EMU 300B L - HUT	1	200B EMUXX2J	N/A	2063	1004	1019/1021	1007 18	1006	5012	N/A
	2	N/A	0013 7794J	2039	1004	1019/1021	1007 18	1006	5015	N/A
	4	N/A	0020 7795J	2038	1004	1015/1017	1010 16	1003	5014	5013

EV3 Ad	EVA	LiOH (s/n) (b/c)	METOX (s/n) (b/c)	EMU Battery (s/n)	REBA (s/n) (b/c)	HL Battery (s/n)	ERCA (s/n) (Address)	SAFER (s/n)	PGT (s/n)	PGT Spare (s/n)
EMU 3008 XL - HUT	3	N/A	0019 7807J	2077	1005	1019/1021	1007 18	1006	5012	N/A
	4	N/A	0021 7814J	2039	1005	1019/1021	1007 18	1006	5015	N/A

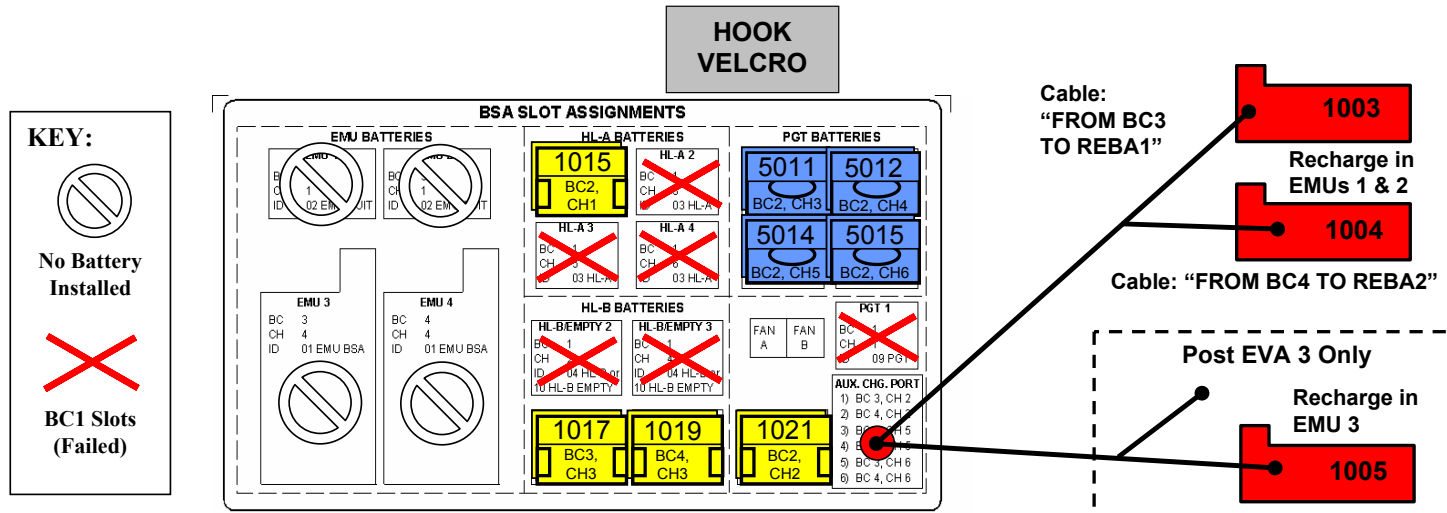
EVA-4a/118/O/A

(reduced copy)

FS CC 10-13

EVA/118/FIN

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	1025		1026	0007 / 0011 7802J / 7792J
2	0015 / 0016 7686J / 7796J	1025 & 1018		1026	0015 / 0016 7686J / 7796J
3	0007 / 0011 7802J / 7792J	1018		1026	0007 / 0011 7802J / 7792J
4	0015 / 0016 7686J / 7796J	1012		1026	--

EVA-4b/118/O/A

(reduced copy)

FS CC 10-14

EVA/118/FIN

EMU CONTINGENCY PROCS

DISPLAY LOSS DURING POWER TRANSFER (WARM RESTART).....	TEMP FS	12-2
VACUUM H2O RECHARGE (MANNED).....	TEMP FS	12-2
LiOH REPLACEMENT (MANNED).....		12-3
BATTERY REPLACEMENT (MANNED)		12-4
WATER DUMP		12-6
SCU SWAP (UNMANNED).....		12-7
SCU SWAP (MANNED).....		12-7
EMU COLD RESTART (MANNED)		12-7
12.1 STS EVA DECONTAMINATION.....		12-8
CONTAMINATION TEST.....		12-15
SAFER BATTERY CHANGEOUT		12-18
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (IN-SUIT)		12-19
BTA PREP		12-19
BTA TREATMENT		12-19
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (POST SUIT DOFFING)		12-21
BTA PREP		12-21
BTA TREATMENT		12-21
EMU RESIZE		12-24
EMU NOMINAL SIZING (STS-118/13A.1).....	FS	12-27
EMU CONTINGENCY RESIZE MATRIX (STS-118/13A.1).....	FS	12-28

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

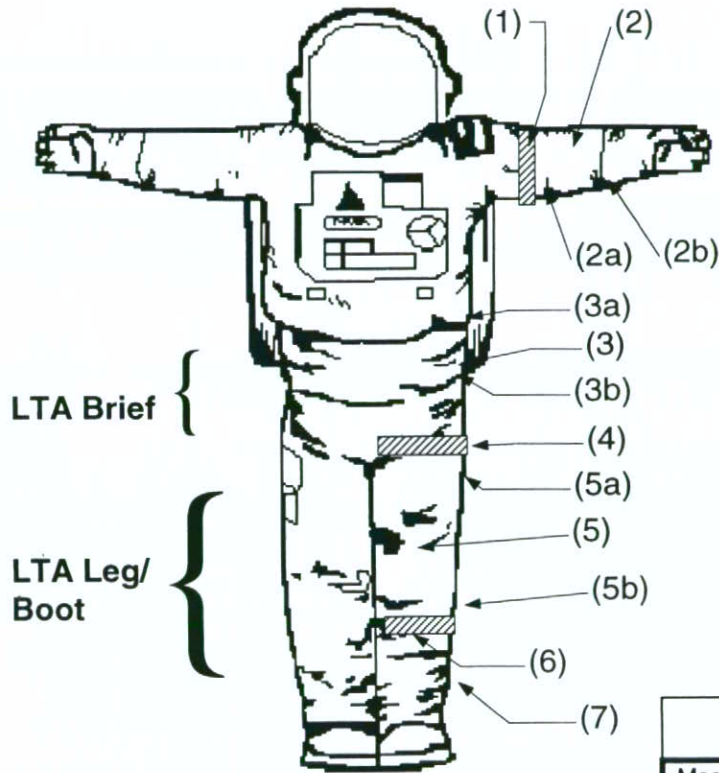
- DCM 4. FAN – OFF (expect **FAN SW OFF** msg, DISP – PRO)
- IV 5. Inform affected EV crewmember of impending comm loss
- DCM 6. PWR – SCU (7 sec)
- 7. PWR – BATT
- When power restart complete:
- 8. √Display – **O2 POS XX**, expect **FAN SW OFF** msg, DISP – PRO
- 9. As reqd, FAN – ON
- If display blank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



<i>SEMU</i>	(1) Arm Sizing Ring	(2a) Arm Cam	(2) Lower Arm	(2b) Wrist Cam	HUT
Mastracchio (3017)	-	Short	04	Long	L (03)
Williams (3010)	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)

<i>LTA</i>	(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

<i>Misc</i>	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
HUT/PLSS	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
CCA	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
Lower Arm Segment	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
Gloves	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
Waist Brief	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
Leg Segment	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
Boot	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
Sizing Rings	<ul style="list-style-type: none"> ▪ <u>1.0 Leg</u>: Use s/n TBD from ISS 	<ul style="list-style-type: none"> ▪ <u>0.5 Arm</u>: Use s/n 120 or 121 from ISS ▪ <u>1.5 Leg</u>: Use s/n 137 or 138 from ISS 	<ul style="list-style-type: none"> ▪ <u>0.5 Arm</u>: Use s/n 167 or 168 from ISS ▪ <u>1.0 Leg</u>: Use s/n TBD from ISS
LCVG	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"> 1. Verify bail fully thrown and undamaged 2. Inspect connector/bail for FOD 3. Check alignment/side loads 4. Wiggle/jiggle connector, pull on connector back shell away from cap/jack for additional leverage 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) 6. Check for harness interference 7. Increase force on bail
B. Connector fails to soft dock	<ol style="list-style-type: none"> 1. Verify bail fully aft 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
C. Connector fails to mate	<ol style="list-style-type: none"> 1. Detach from soft dock and inspect the following: <ol style="list-style-type: none"> a. Pins b. FOD c. EMI band d. bend radius e. bail linkages/rivets f. soft dock springs g. O-ring seal on non-active side or main joint gasket inside receptacle h. connector keying features 2. Cycle bail while disconnected, push on connector back shell toward cap/jack for additional leverage 3. Verify half-shells are fully seated on both sides
D. Connector pin bent (16,20,22 gauge)	<ol style="list-style-type: none"> 1. Rotate connector to bail up position, describe pin condition. If possible, obtain WVS view or interface 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)
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)	1. Remove seal with tether hook 2. If no joy, on MCC GO, obtain needle nose pliers (stbd A/L toolbox, slot 2) to remove seal
J. Twist cap will not release	1. On MCC GO, increase force 2. On MCC GO, attach equipment hook to cap tether point and use strap of adj tether to assist with cap release

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

A. APFR fails to install in WIF	1. Verify APFR collar in install position 2. Check for FOD in WIF or structural interference 3. Attempt APFR install in alternate position. If no joy (APFR failure), use another APFR
B. Joint fails to actuate	1. Verify no load is applied to joint 2. Increase force applied to free joint
C. EMU boot becomes stuck in bootplate	PGT[B1, CCW2, 30.5]-6"-ext-7/16" : Release EVA bolts on heel plate, 5 turns

SAFETY TETHER

A. 55' safety tether fails to retract/tend	1. Verify reel is unlocked 2. Verify tether reel opening is clear of FOD 3. Pull out small amount of cable, allow reel to retract while holding cable slightly tensioned
B. 85' safety tether fails to retract/tend	1. Verify reel is unlocked 2. Verify tether reel opening and cable guide is clear of FOD (ensure nothing is blocking cable from retracting) 3. Pull out small amount of cable, allow reel to retract while holding cable slightly tensioned
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	1. Verify anti-backlash feature in neutral; if not: PGT[RCW, MTL 30.5] : Apply cw torque and push anti-backlash button to neutral posn 2. PGT[A5, 2.5 ft-lb, CCW2, 30.5]-5/32" allen driver: Release torque multiplier contingency release band pin 20 turns (do not exceed 28 turns) 3. When contingency band springs open, remove TM
--	--

SCOOPS

A. Scoop will not release from fitting	PGT[A2, CCW2, 30.5] -5/32" allen driver : 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"> 1. Check worksite for FOD 2. Retrieve EVA Ratchet Wrench from Staging Bag in A/L, install 7.8" x 5/8" socket on ratchet 3. Attempt to break torque (ccw) on launch lock 4. Use PGT with RAD to continue driving bolt through running torque to nominal turn count <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"> 1. Verify PGT turn count. Is primary bolt free of launch lock threads? 2. If no joy, drive primary bolt additional turns, not to exceed 36
<p>C. S5 launch lock PIP pin will not release</p>	<ol style="list-style-type: none"> 1. Check worksite for FOD or damage to PIP pin 2. Increase removal force and try again 3. Retrieve needle nose pliers or vice grips and re-attempt
<p>D. S5-S4 Soft Capture not achieved at any of the 4 corners</p>	<ol style="list-style-type: none"> 1. SSRMS re-attempts per flight rules 2. EVA perform SOFT CAPTURE MANUAL OVERRIDE from section 16
<p>E. For any of the following S5 Primary Bolt contingencies:</p> <ol style="list-style-type: none"> a. Does not achieve full torque b. Bolt shoulder has a gap (is not seated against nut) c. Gap check at corner's 1 and 2 does not pass 	<p>EVA perform MRTAS PRIMARY BOLT CONTINGENCIES from section 16</p>
<p>F. S5 gap check tool (inboard) will not release from corner 1</p>	<ol style="list-style-type: none"> 1. Check worksite for FOD 2. If bolt did not turn, increase PGT setting to B7, drive one turn only, then return to original PGT setting 3. Retrieve gap check tool from outboard corner 1
<p>G. S4 ground strap will not release from S4 launch position</p>	<ol style="list-style-type: none"> 1. Check worksite for FOD 2. Increase PGT setting to B5 3. If bolt did not turn, increase PGT setting to B7, drive one turn only, then return to B5
<p>H. 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>I. 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"> 1. Check ground strap alignment 2. Increase PGT torque setting to B4
<p>J. S4 soft capture pin bolts will not release</p>	<ol style="list-style-type: none"> 1. Check worksite for FOD 2. If bolt did not turn, increase PGT setting to B7, drive 1 turn only, then return to original PGT setting
<p>K. 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>

13A.1 WORKAROUNDS CRIBSHEET (Cont)

PVRGF

A. PVRGF bolts (H13, H14, and H15) won't release	<ol style="list-style-type: none"> 1. Check worksite for FOD 2. Increase PGT torque setting to B7, re-attempt 3. If no joy: <ul style="list-style-type: none"> • PGT – off • Ratchet ccw, (MTL: 30.5) • Attempt to break torque
B. PVRGF bolt H16 won't release (RAD used at this corner)	<ol style="list-style-type: none"> 1. Check worksite for FOD 2. Retrieve the following tools: <ul style="list-style-type: none"> <input type="checkbox"/> EVA Ratchet Wrench from Staging Bag in A/L, install 6-inch socket on Ratchet <input type="checkbox"/> Cheater Bar from Z1 port toolbox, panel 8 3. Using Ratchet Wrench, attempt to break torque (ccw) on launch lock (keep downward pressure on wobble socket while breaking torque). If no joy, install cheater bar on Ratchet Wrench and re-attempt to break torque 4. Use PGT with RAD to continue driving bolt through running torque to nominal turn count
C. PVRGF ground strap bolt won't release (corner H14)	<ol style="list-style-type: none"> 1. Check worksite for FOD 2. Use PGT in ratchet mode: <ul style="list-style-type: none"> • PGT – off • Ratchet ccw, (MTL: 30.5) • Attempt to break torque
D. Corner H16 (nadir/stbd) on PVRGF is interfering with 4A BGA during removal	<ol style="list-style-type: none"> 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 2. Remove PIP pin from PVRGF at H16 corner (lanyarded), re-attempt removal
E. PVRGF ground strap bolt will not install onto S5 Keel lug (cross thread problem)	<ol style="list-style-type: none"> 1. Check worksite for FOD 2. Back-off thread engagement and re-attempt installation manually
F. 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"> 1. Check worksite for FOD 2. Release bolt at B7, re-align and attempt installation at nominal installation PGT setting

13A.1 WORKAROUNDS CRIBSHEET (Cont)

EVA 2

FRAM

A. Primary FRAM bolt fails to release	Contact MCC
B. Primary FRAM bolt fails to engage	<ol style="list-style-type: none"> 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) 2. Engage contingency locking pins (4) <ol style="list-style-type: none"> a. FRAM FWD Cont Pins (SAPA and LAPA): PGT: TBD, TBD turns (see equation) b. FRAM AFT Cont Pins (SAPA/MBSU) (see equation) c. FRAM AFT Cont Pins (LAPA/PM) (see equation) <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><u>FWD CONT PINS:</u></p> <ul style="list-style-type: none"> ➤ Turns = 14.11 – (1.25 x Primary bolt turns) <p><u>AFT CONT PINS (SAPA):</u></p> <ul style="list-style-type: none"> ➤ The rear cont pin can be installed if the primary turn count is 6.5 turns or less ➤ 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 <p><u>AFT CONT PINS (LAPA):</u></p> <ul style="list-style-type: none"> ➤ Turns = 16.858 – (1.25 x Primary bolt turns) </div>

CMG REMOVAL FROM Z1

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

13A.1 WORKAROUNDS CRIBSHEET (Cont)

CMG REMOVAL/INSTALL AT FSE

A. Unable to release fixed shim bolt	1. Increase PGT torque setting to PGT[A7(9.2 ft-lb), CCW1, 30.5]
	2. Increase PGT torque setting to PGT[B7(25.5 ft-lb), CCW1, 30.5]
	3. If not able to release, attempt to remove from FSE. If successful, failed CMG will have to be temp stowed on CETA if shim does not come out after CMG is removed <p style="text-align: center;"><u>NOTE</u> Bolt may shear, causing loose hardware, be aware of sharp edges</p>
B. Unable to remove fixed shim	1. Remove other shims first, reattempt 2. Tether shim, continue with nominal plan, remove shim after CMG is removed
C. Unable to release CMG bolt	1. Re-tighten all bolts and attempt stuck bolt first, continue nominal plan if successful 2. Contact MCC
D. Unable to remove CMG	1. Verify all bolts released, MLI clear 2. Push CMG away from jam, attempt to remove using tipping method 3. Contact MCC. Use bolt puller and pry out CMG
E. Unable to drive CMG bolt	1. Verify alignment, release other torqued down bolts, reattempt bolt first
	2. Remove CMG and verify no obstruction, reinstall
	3. Contact MCC if 5 of 6 bolts complete and continue
F. Unable to drive adjustable shim bolt	1. Increase torque setting to PGT[B7 (25.5 ft-lb), CCW1, 30.5] ½ turn only, return to nominal setting
	2. Contact MCC, stow on CETA cart PGT[B7(25.5), CCW2, 30.5] remove contingency bolts (4) from LMC
G. Unable to release ball stack from LMC	Use an adjustable equipment tether and restrain free end of ball stack to a lid HR. Cinch the tether tight <p style="text-align: center;"><u>NOTE</u> ECOM will release from LMC, bolts not captive</p>
H. Unable to release ball stack from DTO box	

CMG INSTALLATION AT Z1

A. Unable to drive CMG bolt	1. Verify alignment, release other bolts, reattempt bolt first
	2. Remove CMG and verify no obstruction, reinstall
	3. Contact MCC if 4 of 6 bolts complete and continue

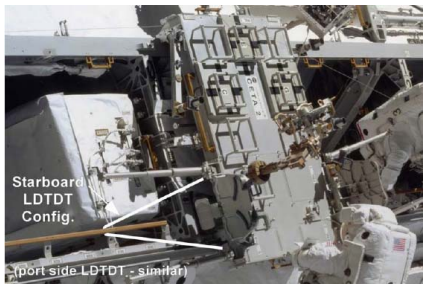
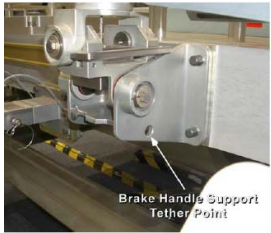

Z1 THERMAL SHROUD INSTALLATION

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

EVA 3

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"> ❑ Manual EVA translation of CETA cart ❑ CETA cart coupling to MT ❑ MT translation with CETA cart coupled to MT
C. Parking brake fails to engage/disengage	<ol style="list-style-type: none"> 1. Retry using other side 2. Contact MCC
D. Dynamic brake fails to engage	<ol style="list-style-type: none"> 1. Limit translation rates for manual stopping or use parking brake as dynamic brake 2. Try other side
<p>E. CETA active coupler fails to capture and lock (CETA cart safing)</p>   	<ol style="list-style-type: none"> 1. Translate CETA cart to TBD location on truss (not over truss segment joint) 2. Pull parking brake (left handle) 3. Retrieve two long duration tie-down tethers (LDTDT) from P6 Aux bag (fwd face of P6) 4. Route one LDTDT on stbd side of CETA cart per the following details: <ul style="list-style-type: none"> ❑ Attach one hook to zenith brake handle support tether point ❑ Loop tether strap around CETA rail HR standoff and back toward nadir brake handle support tether point ❑ Attach second hook to nadir brake handle support tether point ❑ Lightly cinch straps, snap buckle over ❑ Close MLI flap over buckle and any excess strap length 5. Repeat sequence for port side of CETA cart
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

13A.1 WORKAROUNDS CRIBSHEET (Cont)

P1 BSP INSTALL

A. TBD	

P1 XPDR INSTALL

A. TBD	

P6 SASA RELOCATE

A. TBD	

P6 XPDR REMOVE

A. TBD	

EVA 4

OBSS OSE INSTALL

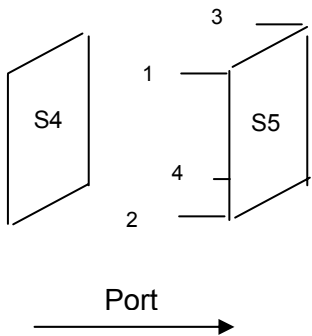
A. TBD	

FLIGHT SPECIFIC – CONTINGENCY TASKS

GENERIC ORUS

A. TBD	
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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></p> <p>For corner 4 (S4 WIF 20): √settings: [6,WW,A,10]</p> <p>For corner 2 (S4 WIF 19), relocate APFR from WIF 20 to WIF19: reconfigure to: [6,PP,K,11]</p> <p>For corner 3 (S4 WIF 17), √settings: [5,RR,J,12]</p> <p>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"> 1. If necessary, temp stow tools 2. Translate to failed corner 3. Install APFR, configure settings per <u>APFR INFO</u> in IV column 4. Ingress APFR 5. Using S5 HRs, manually attempt to pull S5 into soft capture; √S4 soft capture pin has engaged S5 coarse alignment cone <ol style="list-style-type: none"> 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 7. Ratchet PRD to achieve proper preload 8. √S4 soft capture pin has engaged S5 coarse alignment cone 9. Egress APFR 	<ol style="list-style-type: none"> 1. If no joy with soft capture pin set, translate to A/L Toolbox 1 (stbd), retrieve PRD from slot 7 2. Translate to failed corner at S5 3. Route PRD between S5 and S4 <ul style="list-style-type: none"> ❑ Hold PRD housing flush against structure adjacent to S5 HR ❑ Route retractable strap around S5 trunnion strut and back around S4 soft capture assy housing ❑ Hook straps together and remove excess slack ❑ Ensure strap is flush to structure and not twisted ❑ Ensure strap is not routed over HRs 4. Remove PRD

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

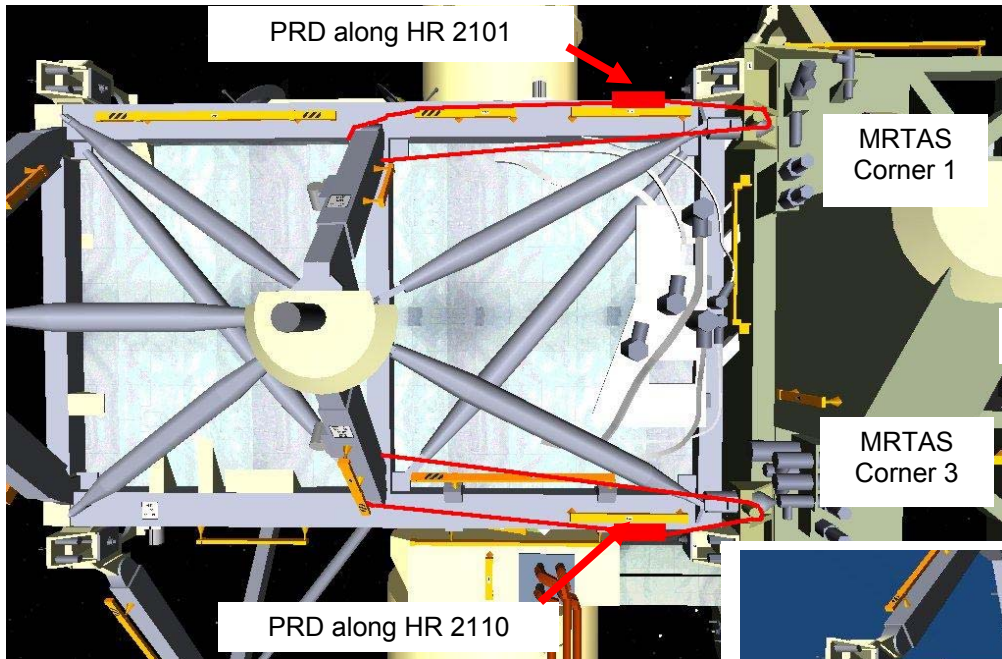
Cautions:

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

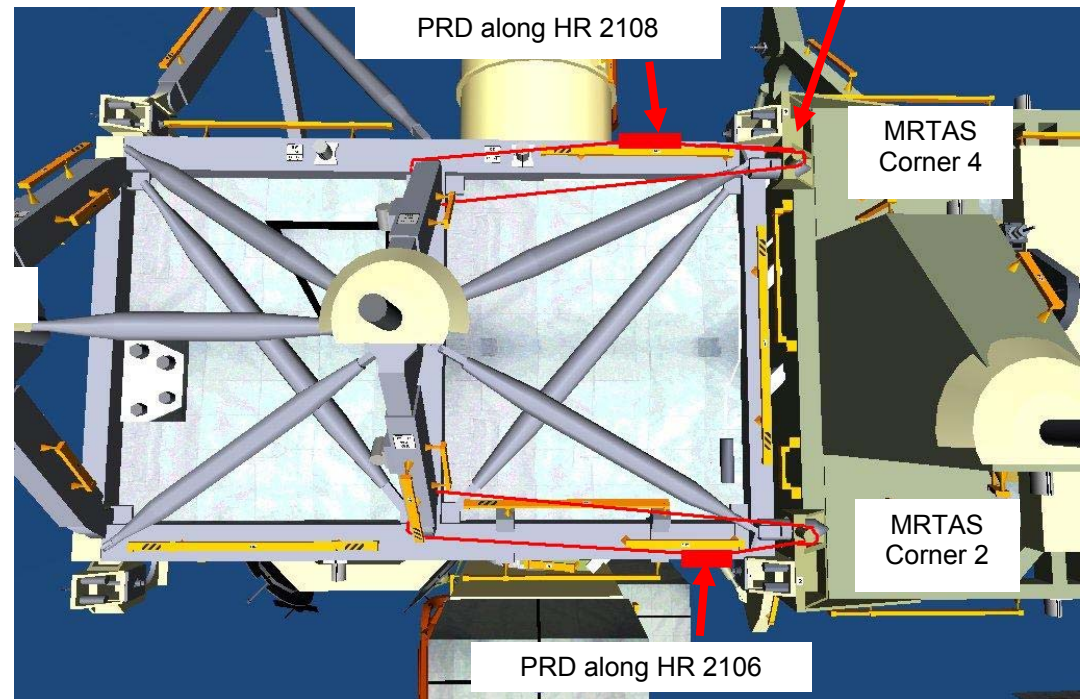
Warnings:

1. NA

S5 SOFT CAPTURE MANUAL OVERRIDE TASK DATA SHEET (Cont)



Nadir S5 – during install



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

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-lbs)	Failure Torque (ft-lbs)	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

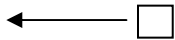
Other:

- 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"> <input type="checkbox"/> Hold PRD housing flush against structure adjacent to S5 HR <input type="checkbox"/> Route retractable strap around S5 trunnion strut and back around S4 soft capture assy housing <input type="checkbox"/> Hook straps together and remove excess slack <input type="checkbox"/> Ensure strap is flush to structure and not twisted <input type="checkbox"/> Ensure strap is not routed over HRs <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"> • For equip tether hook, tip of hook should not pass through or penetrate gap between RTAS housings • For gap check tool, tip of tool should not penetrate gap between RTAS housings past second line <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. PGT [B2, CCW1, 30.5]-6"-Ext-7/16: 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. PGT [A6, CCW2, 30.5]-6"-Ext-7/16: 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"> <input type="checkbox"/> Full torque achieved <input type="checkbox"/> Minimum turn count (after bolt drops out of launch threads) <input type="checkbox"/> Gap check is good <p>10. PGT [B1, CW2, 30.5]-6"-Ext-7/16:</p> <ul style="list-style-type: none"> ➤ Drive contingency bolt 7-9 turns to clear launch threads ➤ Push bolt ~ .5-in to contact nut (no turns reqd) ➤ Drive contingency bolt 9-11 turns to fully engage nut

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"> If all contingency bolt criteria pass, go to step 13 If any contingency bolt criteria fail, go to next contingency bolt, and pick up at step 6 <p>13. PGT [A5, CCW2, 30.5]-6"-Ext-7/16: 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. PGT [B2, CW1, 30.5]-6"-Ext-7/16: 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-lbs)	Failure Torque (ft-lbs)	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

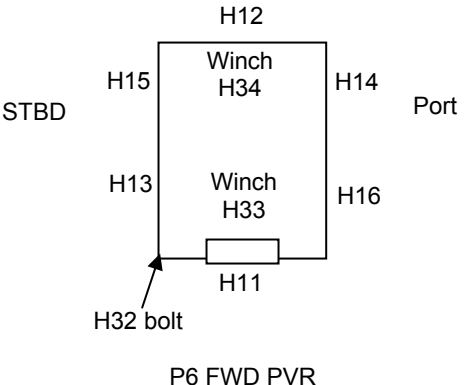
Cautions:

- 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>MCC-H 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"> PGT[B1 (12 ft-lb), CW2 (30RPM), MTL 15.5] -6 ext 7/16: On IV GO, push to engage (5 lb) and turn PVR MDA fastener H32 to PGT stall (if no motion 45-50 turns) 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 Report to IV, radiator retract complete Remove winch bar PIP pin (H34) Together compress radiator panels, align winch bar clevis to lug on radiator, try to re-install winch H34 PIP pin If no joy, continue winch operations <p><u>WINCH OPERATIONS</u></p> <p>REMOVE FQDC SHROUD</p> <ol style="list-style-type: none"> Stage RET for FQDC shroud restraint Release FQDC Shroud bolts (4); PGT[A7 (9.2 ft-lb), CCW2 30 RPM, MTL 30.5] 6-in ext; 7 turns Restrain FQDC shroud w/RET <p>EXTEND WINCH</p> <ol style="list-style-type: none"> PGT[A1 (2.5 ft-lb), CW1 (10 RPM), MTL 30.5] 6-in ext: actuate H10 bolt; push 5 lb; extend winch bars until winch bar clevis aligns with radiator lug (20 turns max) Give EV2 GO for winch install; align winch bar clevis to lug on radiator; re-install H34 PIP pin <p>RETRACT WINCH</p> <ol style="list-style-type: none"> PGT[A1 (2.5 ft-lb), CCW1 (10 RPM), MTL 30.5] 6-in ext; actuate H10 bolt; push 5 lb; fully retract winch bars (approx 25 turns max) 	<ol style="list-style-type: none"> Remove winch bar PIP pin (H33) Together compress radiator panels, align winch bar clevis to lug on radiator, try to re-install winch H33 PIP pin If no joy, continue winch operations <p><u>WINCH OPERATIONS</u></p> <ol style="list-style-type: none"> On EV1 GO for winch install; align winch bar clevis to lug on radiator; re-install H33 PIP pin

MANUAL OVERRIDE TO RETRACT/WINCH RADIATOR (Cont)

IV/RMS	EV1	EV2
	<p><u>INSTALL FQDC SHROUD</u></p> <ol style="list-style-type: none">7. Retrieve FQDC Shroud8. PGT[A7 (9.2 ft-lb), CW2 (30 RPM), MTL 30.5] 6-in ext: attach FQDC shroud bolt (4); ~7 turns to hardstop9. Retrieve RET	

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 (L)	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

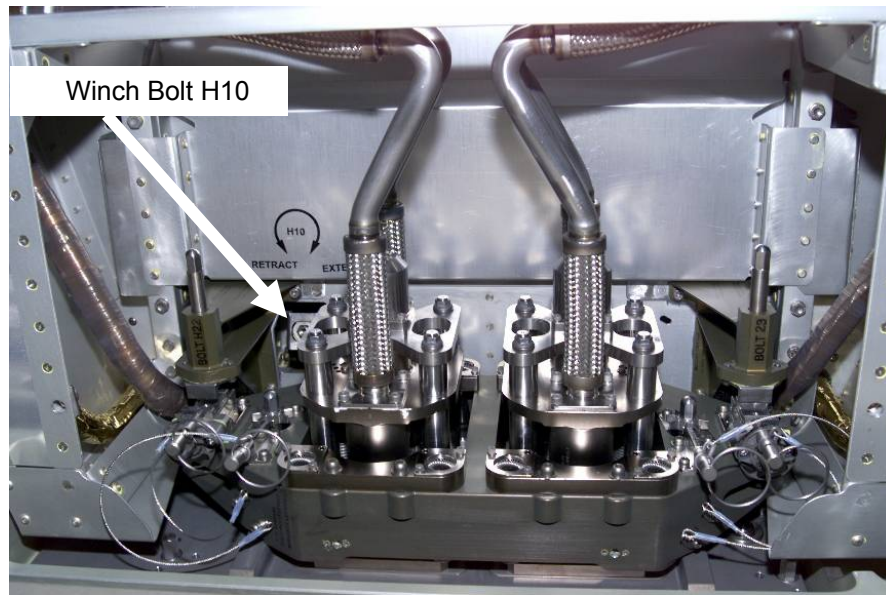


PV Radiator – MDA H32 Fastener Located Near Ground Strap

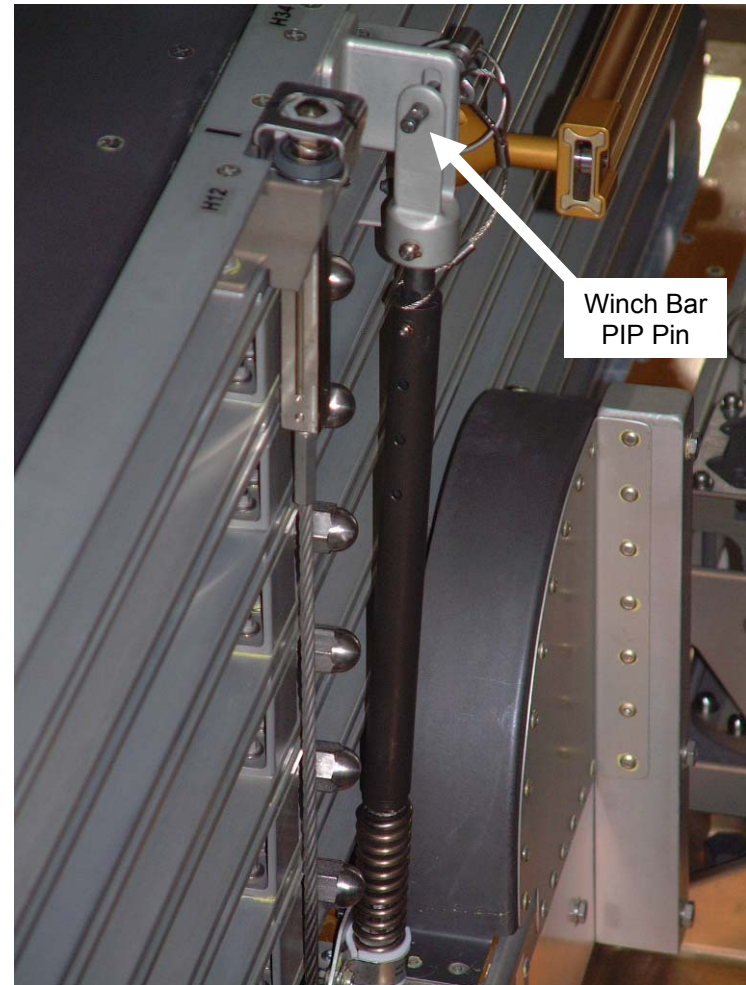


PV Radiator MDA Fastener

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"> 1. Verify PFCS pump shut down complete (Loop A and B valves closed) 2. Verify Utility Power inhibits complete 3. MnvR ISS to PVR Jettison Attitude 	<p><u>FQDC DEMATE</u></p> <ol style="list-style-type: none"> 1. Set up and ingress APFR 2. PGT[A7 9.2 ft-lb, CCW2 30RPM, MTL 30.5]-18 ext 7/16: Release FQDC Shroud bolts (H5, H6, H8, H9), x7 turns 3. Remove shroud and secure with Adj Equip tether 4. PGT[___ 10.83 ft-lb (130in-lb), CCW2 30RPM, MTL ___]-12 ext 7/16: Break torque on FQDC bolts H18, H19 (two) x1 turn <ul style="list-style-type: none"> <input type="checkbox"/> H18 <input type="checkbox"/> H19 5. PGT[___ 6.25 ft-lb (<75 in-lb), CCW2 30RPM, MTL ___]-12 ext 7/16: Attach adj tether to inner loop of FQDC housing for use in correcting alignment. Extend FQDC drive bolts H18, H19 (two) x18¼ turns to hard stop. Verify 4 guide cones squarely engage springs during demate. Verify 90 deg cam rotation during last ¼ turn (indicating latch key rotation to the disengaged position) <ul style="list-style-type: none"> <input type="checkbox"/> H18 <input type="checkbox"/> H19 6. PGT[___ 6.25 ft-lb (<75 in-lb), CW2 30RPM, MTL ___]-12 ext 7/16: 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 3rd turn (cam reset) <ul style="list-style-type: none"> <input type="checkbox"/> H18 <input type="checkbox"/> H19 7. Remove PIP pins from carrier bolts H20, H21, H24, H25 (x4) 8. PGT[___ 2.5 ft-lb, CCW2 30RPM, MTL ___]-12 ext 7/16: Drive slider bolts H20, H21 to hard stop to align brackets with bolts H22, H23 (two) x9 turns <ul style="list-style-type: none"> <input type="checkbox"/> H20 <input type="checkbox"/> H21 	<p><u>ELECTRICAL UMBILICAL DEMATE</u></p> <ol style="list-style-type: none"> 5. Set up APFR near H30 6. On IV GO, using Cannon Connector Tool: <ul style="list-style-type: none"> <input type="checkbox"/> Demate W22-P2 from radiator J1 <input type="checkbox"/> If S4 or S6, mate W22-P2 to IEA dummy J1 <input type="checkbox"/> Demate W122-P2 from radiator J2 <input type="checkbox"/> If S4 or S6, mate W122-P2 to IEA dummy J2 <input type="checkbox"/> Demate W222-P2 from radiator J3 <input type="checkbox"/> If S4 or S6, mate W222-P2 to IEA dummy J3 <input type="checkbox"/> If P4 or P6, wire tie cables to adjacent handhold <p><u>RADIATOR RELEASE/JETTISON</u></p> <ol style="list-style-type: none"> 3. PGT[B7 25.5 ft-lb, CCW2 30RPM, MTL 30.5]-6 ext-7/16: Remove PIP pin and release PVR center attach bolts H26, H27 (two), x35 turns <ul style="list-style-type: none"> <input type="checkbox"/> H26 <input type="checkbox"/> H27 4. PGT[B2 16.0 ft-lb, CCW2 30RPM, MTL 30.5]-Sq TM with 7/16 proud: Remove PIP pins and break torque on PVR corner bolts H28-H31 (four), x1 turn <ul style="list-style-type: none"> <input type="checkbox"/> H30 <input type="checkbox"/> H29 <input type="checkbox"/> H31 <input type="checkbox"/> H28 (when EV1 clears area)

PV RADIATOR JETTISON (Cont)

IV/RMS	EV1	EV2
	<p>9. PGT[___ 4 ft-lb, CW2 30RPM, MTL ____]-12 ext 7/16: Engage bolts H22, H23 (two) into carrier brackets, x2 turns. Push to engage threads</p> <ul style="list-style-type: none"> <input type="checkbox"/> H22 <input type="checkbox"/> H23 <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. PGT[B7 25.5 ft-lb, CCW2 30RPM, MTL 30.5]-12 ext 7/16: Release bolts H24, H25, x 4.5 turns</p> <ul style="list-style-type: none"> <input type="checkbox"/> H24 <input type="checkbox"/> H25 <p>12. Install longer PIP pins for carrier bolts H24, H25 (two)</p> <p>13. PGT[___, CW_ 30RPM, MTL __]-12 ext 7/16: Tighten bolts H22, H23 (two) x4½ turns</p> <ul style="list-style-type: none"> <input type="checkbox"/> H22 <input type="checkbox"/> H23 <p>14. Remove Adj Equip tether from FQDC shroud</p> <p>15. Install shroud over FQDC (Use alignment pin H7)</p> <p>16. PGT[A7 9.2 ft-lb, CW_ 30RPM, MTL ____]-12 ext-7/16: 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. PGT[B7 25.5 ft-lb, CCW2 30RPM, MTL 30.5]-6 ext 7/16: Release PVR Corner bolt H30, x8 turns. Reinstall PIP pin</p> <ul style="list-style-type: none"> <input type="checkbox"/> H30 <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>5. PGT[B7 25.5 ft-lb, CCW2 30RPM, MTL 30.5]-6 ext 7/16: Release PVR grounding strap bolt H17 x11 turns</p> <ul style="list-style-type: none"> <input type="checkbox"/> H17

PV RADIATOR JETTISON (Cont)

IV/RMS	EV1	EV2
	<p>19. PGT[B7 25.5 ft-lb, CCW_ 30RPM, MTL ____]-6 ext 7/16: Release PVR Corner bolt H28, x8 turns. Reinstall PIP pin <input type="checkbox"/> H28</p> <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>6. PGT[B7 25.5 ft-lb, CCW2 30RPM, MTL 30.5]-6 ext 7/16: Release PVR Corner bolt H31,H29 (two) x8 turns. Reinstall PIP pin <input type="checkbox"/> H31 <input type="checkbox"/> H29</p> <p>7. Ingress APFR</p> <p>8. Grasp PVR HR and restrain while EV1 releases final bolt</p> <p>9. Lift PVR out of structure 1 ft to clear accumulator boxes</p> <p>10. Position PVR for jettison</p> <p>11. 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

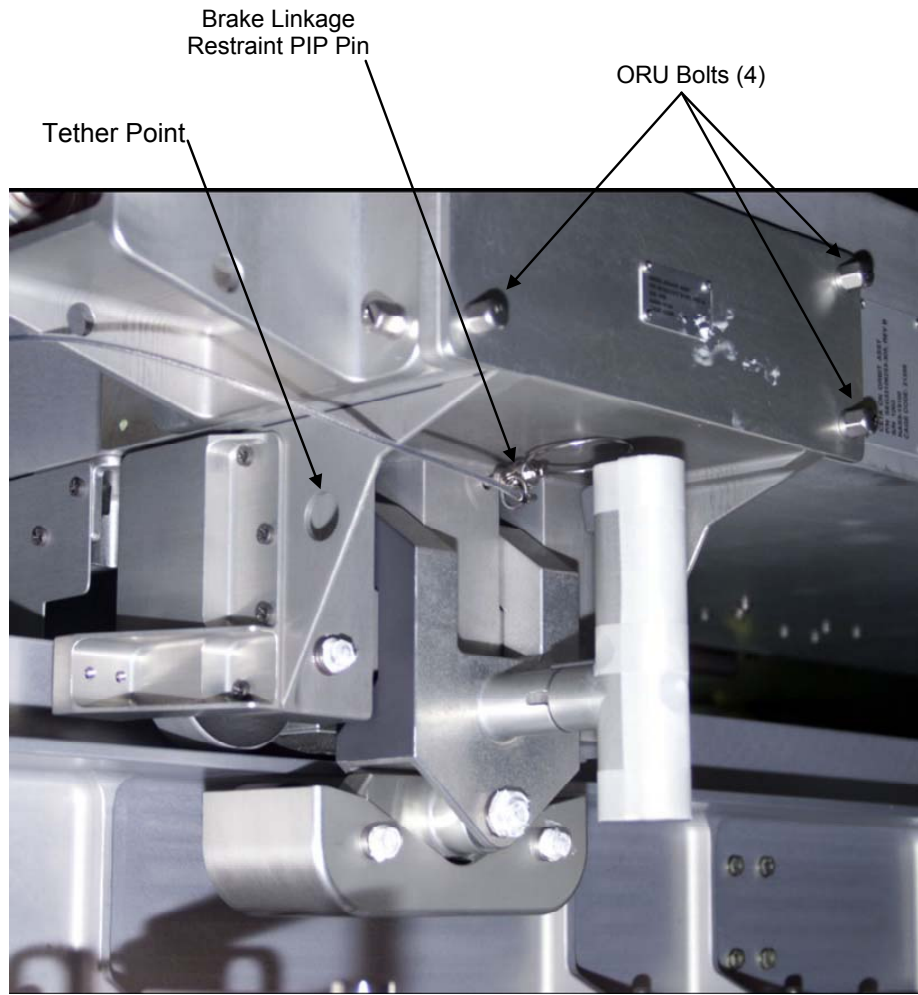
1. Install CETA cart on rails; engage other bogies
2. √CETA/MT Coupler set to capture, couple CETA cart to MT
3. Take coupler to locked
4. √Parking brake released
5. Install wheel bogie into tray guides
 - * If brake cable mechanical coupler interferes (wheel bogie *
* will not install fully): *
 - * 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

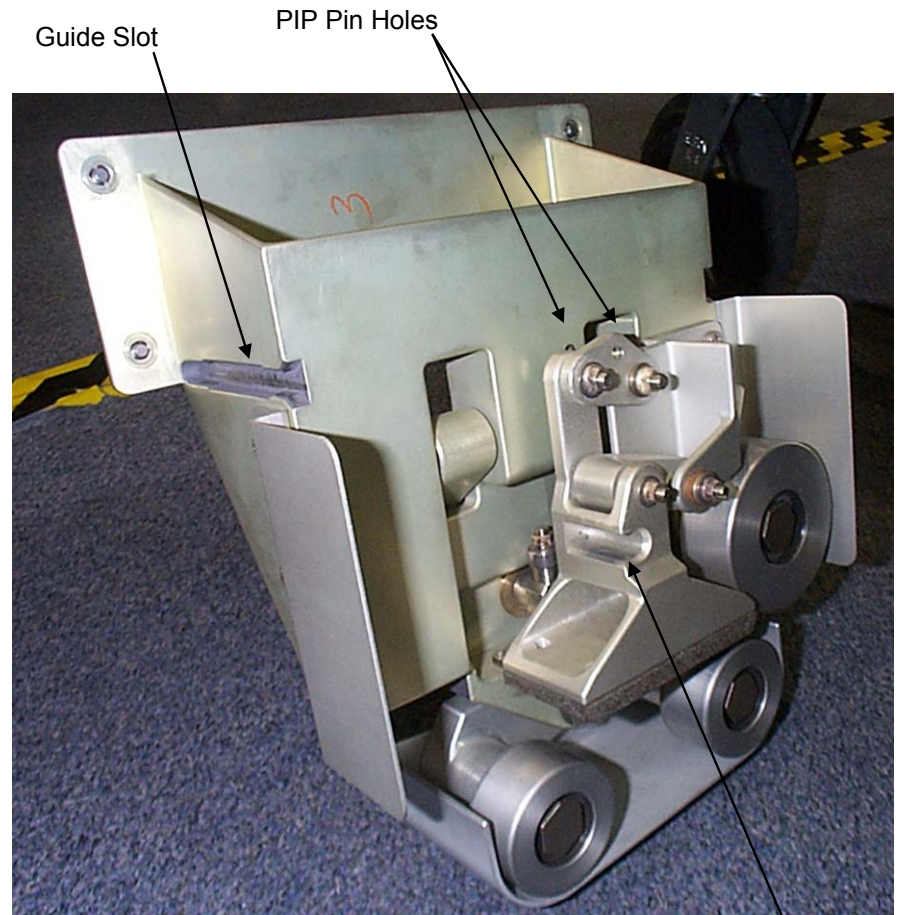
EVA Fasteners:

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

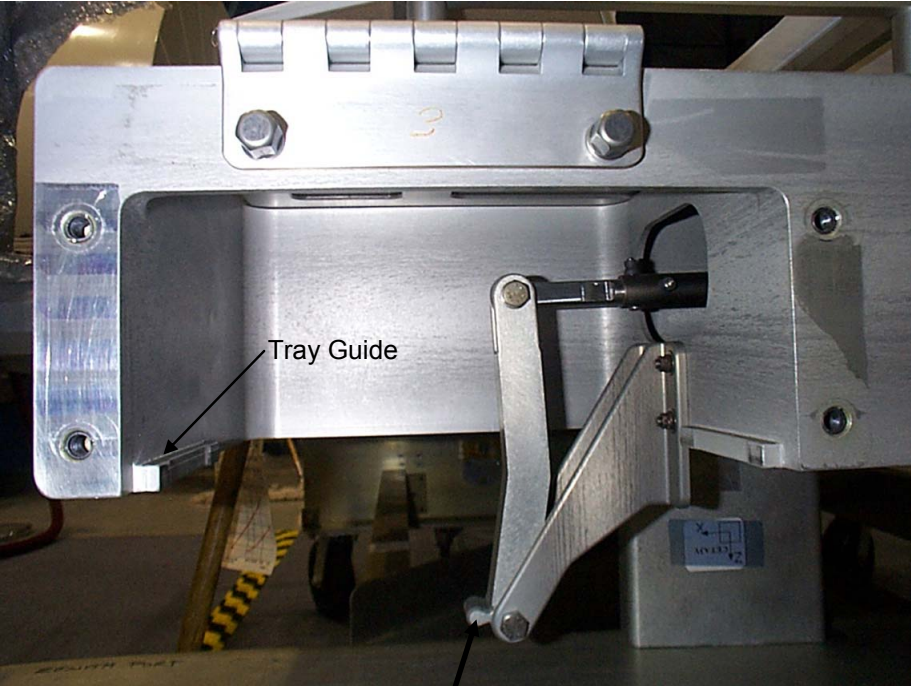


WHEEL BOGIE REMOVED – INBOARD VIEW

Brake Linkage Slot (Slot A)

WHEEL BOGIE R&R – REFERENCE (Cont)

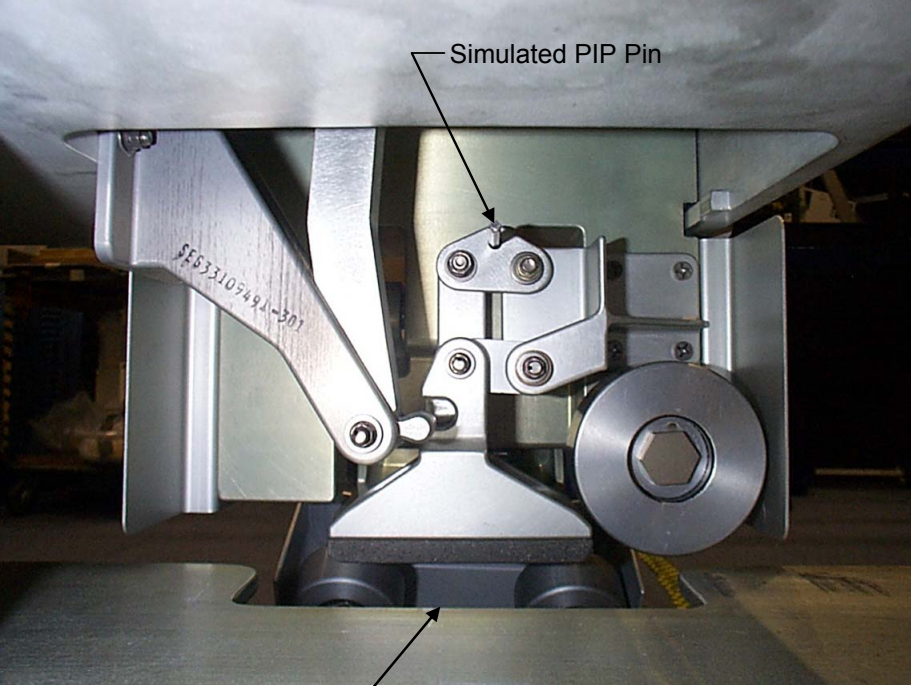
WHEEL BOGIE REMOVED – OUTBOARD VIEW



Tray Guide

Brake Linkage Engagement
Tab (tab A)

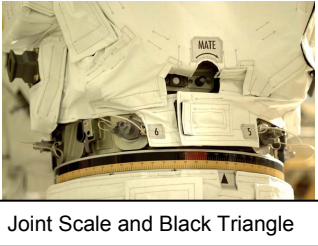
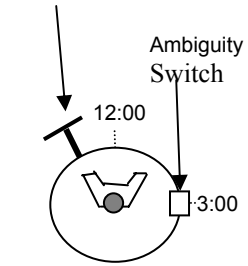

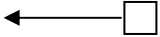
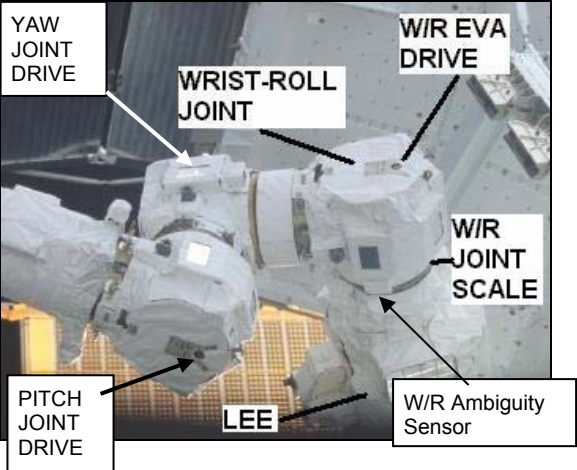
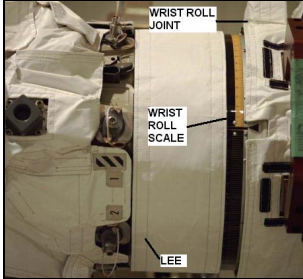
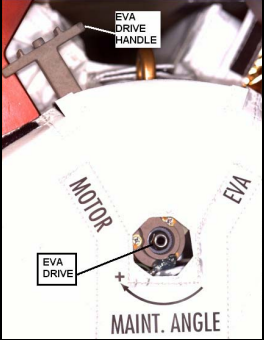
WHEEL BOGIE PARTIALLY INSTALLED – INBOARD VIEW

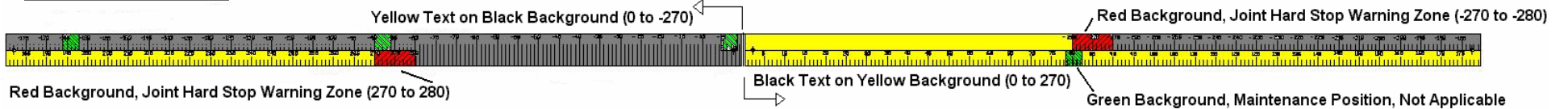


Simulated PIP Pin

Cutout in rail not fight like

SSRMS JOINT DRIVE

IV/RMS	EV1/EV2	REFERENCE
<p style="text-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 style="display: flex; justify-content: space-around; align-items: center;">  <div style="text-align: center;"> <p>EVA Drive Handle (@ motor posn)</p>  <p>Back Side of Joint</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;">  </div>	<p style="text-align: center;"><u>INITIAL POSITION VERIFICATION</u></p> <ol style="list-style-type: none"> Translate to failed joint Verify initial joint position using the following: <ul style="list-style-type: none"> <input type="checkbox"/> Black triangle on fixed side of failed joint <input type="checkbox"/> Ambiguity sensor (90 deg cw from EVA drive, toward front side of joint) <div style="text-align: center; margin: 10px 0;">  </div> <p style="text-align: center;"><u>JOINT EVA DRIVE</u></p> <ol style="list-style-type: none"> Depress button and move EVA Drive handle to EVA PGT[A1 2.5 ft-lb, CW2 or CCW2 (as required), MTL 1.5]-6ext-7/16: Drive EVA bolt in +/- direction _____ turns to desired position Verify joint angle using scale and ambiguity sensor If possible, verify joint angle with IV; if necessary, fine position joint using PGT in manual ratchet mode Depress button and move EVA Drive handle to MOTOR 	<div style="text-align: center;"> <p>REFERENCE</p>  </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;">   </div>



JOINT SCALE

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

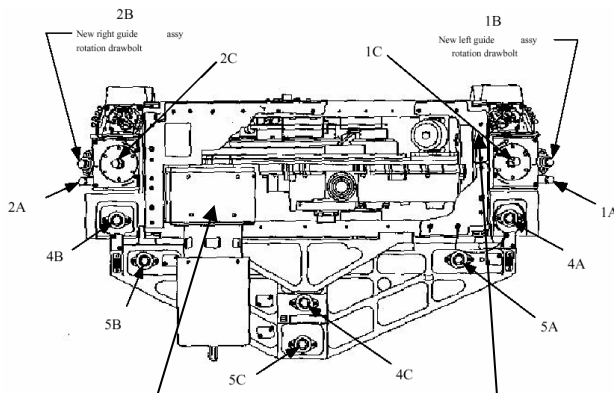
Other:

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

RETURN DLA TO LAUNCH POSITION (Cont)

IV/RMS	EV1	EV2
	<p>10. BOLT 2C: PGT[A3 4.8 ft-lb, CW2 30RPM, MTL 23.5]-6 ext 7/16: Rotate follower arm draw bolt 2C x32 turns to hard stop</p> <p>11. BOLT 2B: PGT, RCCW, MTL 23.5]-6 ext 7/16: Rotate follower arm rotation bolt 2B x5/8 turn to hardstop</p> <p>12. If no joy: BOLT 2C: PGT, RCCW, MTL 23.5]-6 ext 7/16: 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. BOLTS 4A, 4B, 4C: PGT[B4 19.4 ft-lb, CW2 30RPM, MTL 23.5]-6 ext 7/16: 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. BOLTS 1A, 2A: PGT[A5 7.0 ft-lb, CW1 10RPM, MTL 23.5]-6 ext 7/16: 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. PGT[A1 2.5 ft-lb, CW2 30RPM, MTL 23.5]-6 ext 7/16: 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 (L) 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

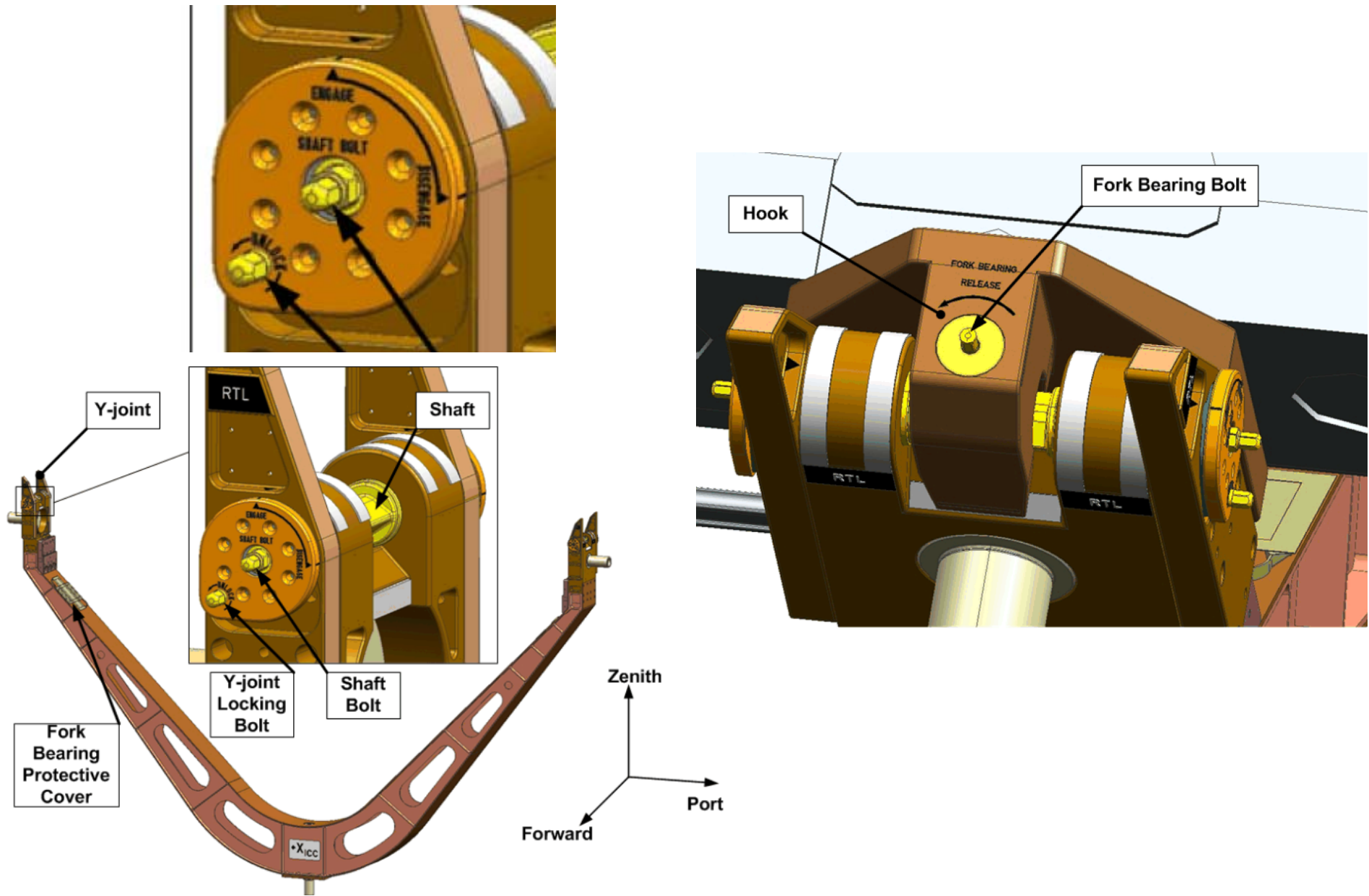
Foot Restraints:

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)



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"> 1. Translate to P3 UCCAS 2. PGT[A4 (6.3ft-lb), CW3 (60 RPM), 30.5]-18Ext-7/16: Rotate CLA drive 42 turns to topological capture 2. On IV GO, rotate drive to hard stop ~85 additional turns (~127 turns total) 3. PGT[A4 (6.3ft-lb), CCW2 (30 RPM), 30.5]-18Ext-7/16: Rotate drive 5 turns to final close position 	

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:

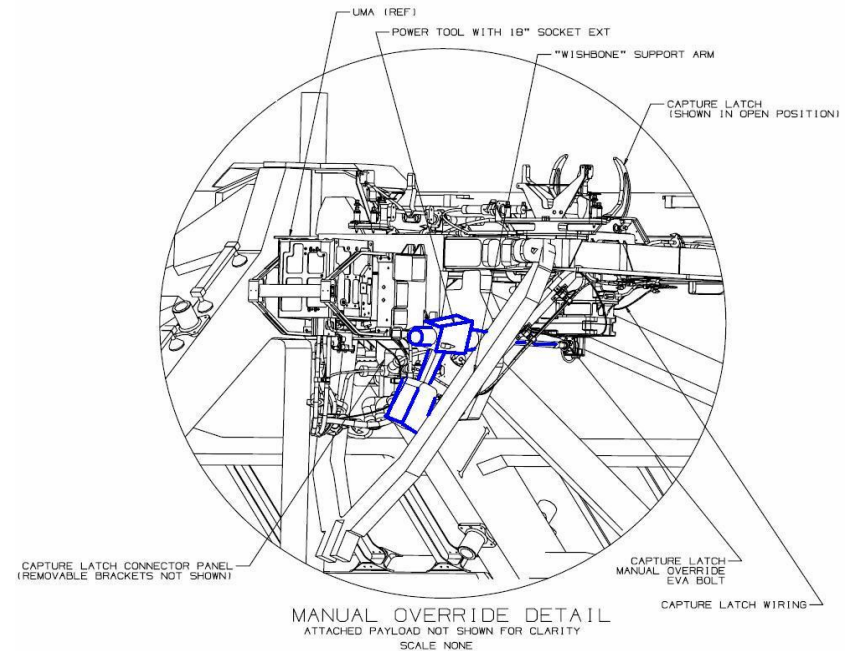
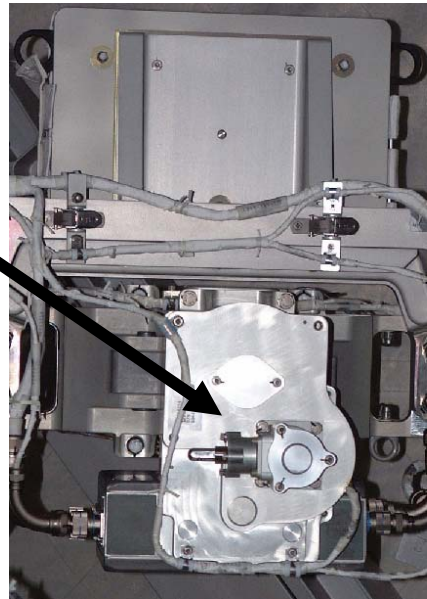
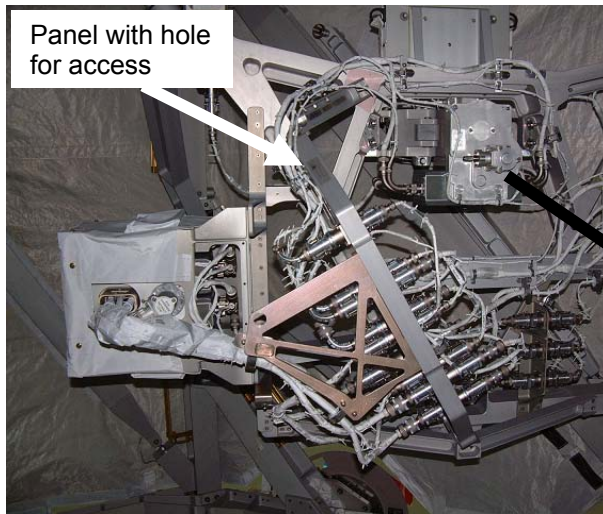
- The connector panels on the attach structures have been modified to add two cut-outs to allow the crewmember to see through the panel to increase visual access to the manual release bolt head
- P3 & S3: Manual operation of the CL requires that the EVA crewmember turn a bolt located underneath the CL. 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
- APFR settings for reference, may not be required

Cautions:

1. TBD

Warnings:

1. TBD



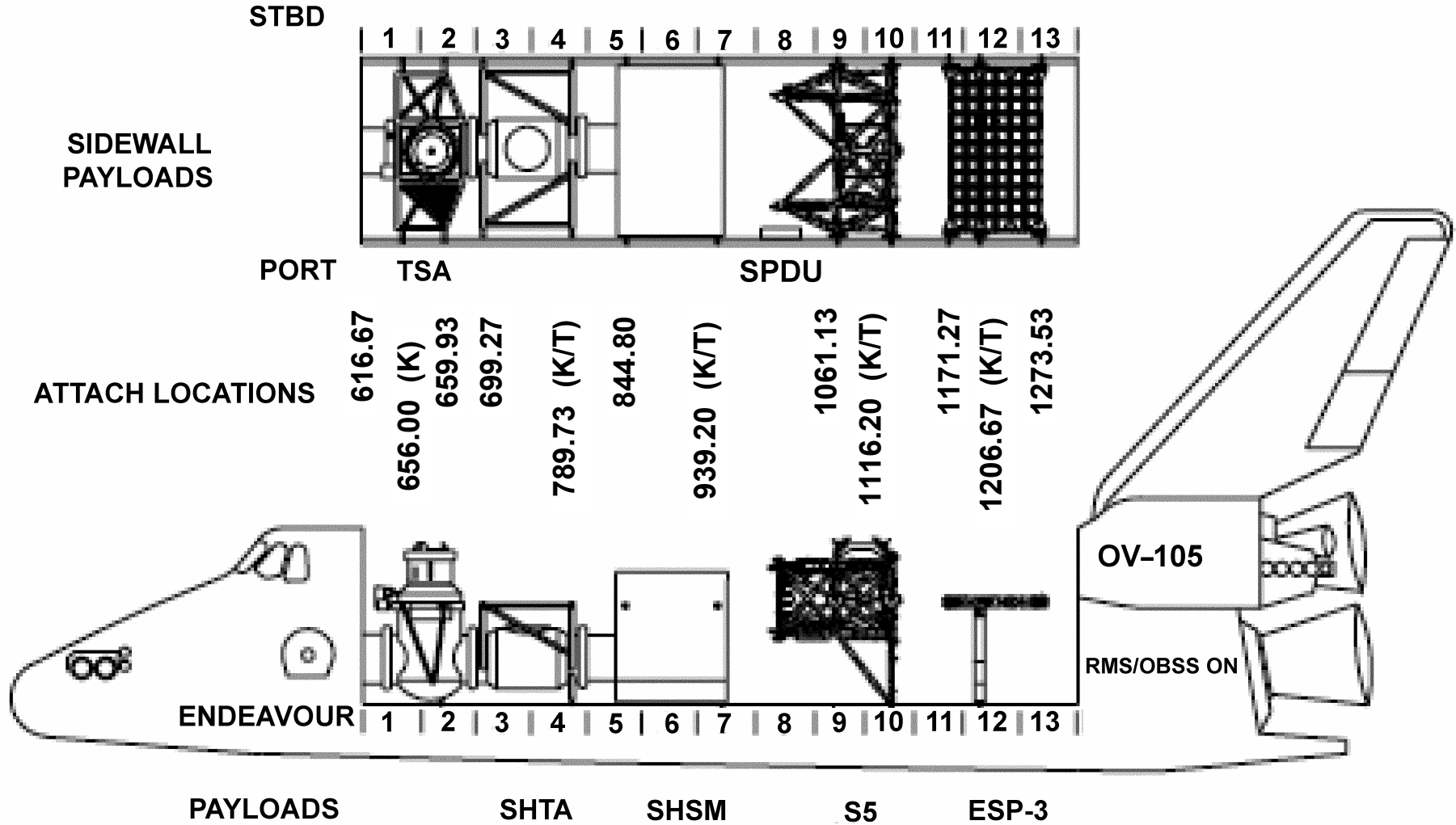
FLIGHT SPECIFIC EVA REFERENCE

STS-118 PAYLOAD BAY LAYOUT	FS 18-3
S5 TRUSS	
S5 MRTAS – ACTIVE	FS 18-4
RTAS HOUSING DIMENSIONS	FS 18-5
S4 MRTAS – PASSIVE	FS 18-6
S5 TO S4 MRTAS PRIMARY BOLT ENGAGED	FS 18-7
GAP CHECK TOOL	FS 18-8
S5 CAPTURE LATCH ASSEMBLY (CLA)	FS 18-9
ESP-3	
ESP-3 PLB TOP VIEW.....	FS 18-10
ESP-3 PLB BOTTOM VIEW.....	FS 18-11
ESP-3 HR AND WIF LOCATIONS (PORT)	FS 18-12
ESP-3 HR AND WIF LOCATIONS (STBD).....	FS 18-13
ESP-3 POWER CABLE CONFIGURATIONS	FS 18-14
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CETA SWINGARM AND WIF MARKINGS	FS 18-16
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FRAM/FSE/ORU ASSEMBLY	FS 18-21
ACTIVE FRAM SOFT CAPTURE MECHANISM	FS 18-22
FRAM CONTINGENCY BOLTS – SAPA	FS 18-23
CMG	
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ESP-3 WITH CMG	FS 18-25
CMG NOMENCLATURE.....	FS 18-26
AFT Z1 PRE-LAUNCH WITH BLANKET	FS 18-27
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CMG FSE WITHOUT MLI OR CMG	FS 18-34
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P1 SASA XPDR AND BSP DUMMY BOXES.....	FS 18-46
P6 SASA XPDR LOCATION	FS 18-47
PVR	
FORWARD RADIATOR CINCH.....	FS 18-48
MANUAL OVERRIDE TO RETRACT/WINCH RADIATOR.....	FS 18-50

FLIGHT SPECIFIC
EVA REFERENCE

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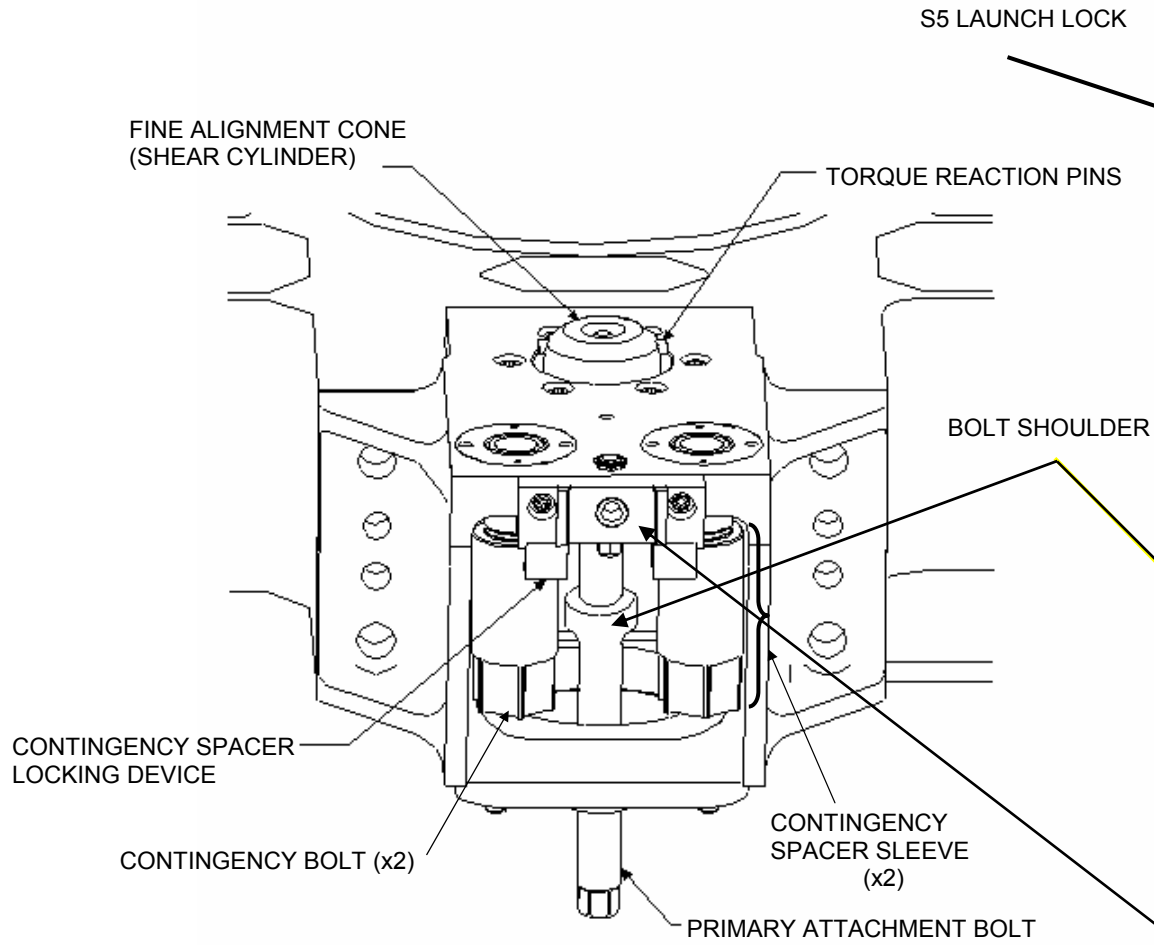
STS-118 PAYLOAD BAY LAYOUT



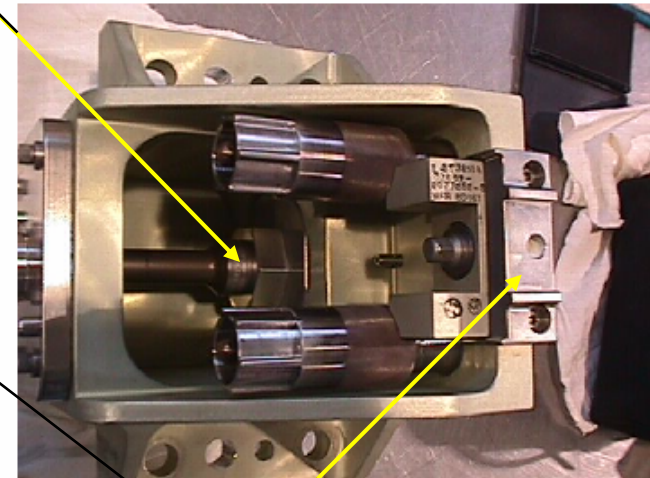
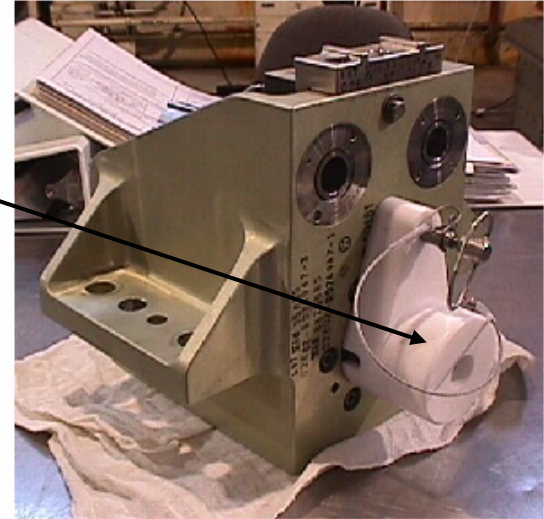
NOTE
ORUs are not shown on ESP-3

S5 TRUSS

S5 MRTAS – ACTIVE

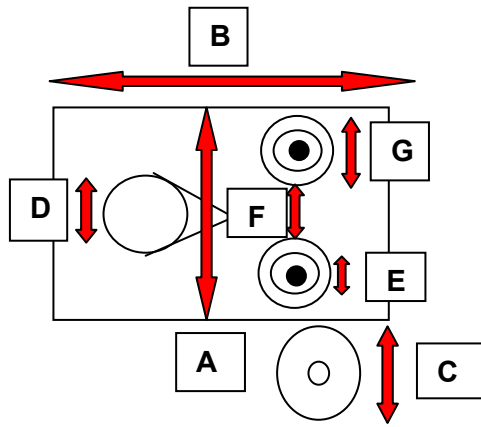


S5 LAUNCH LOCK

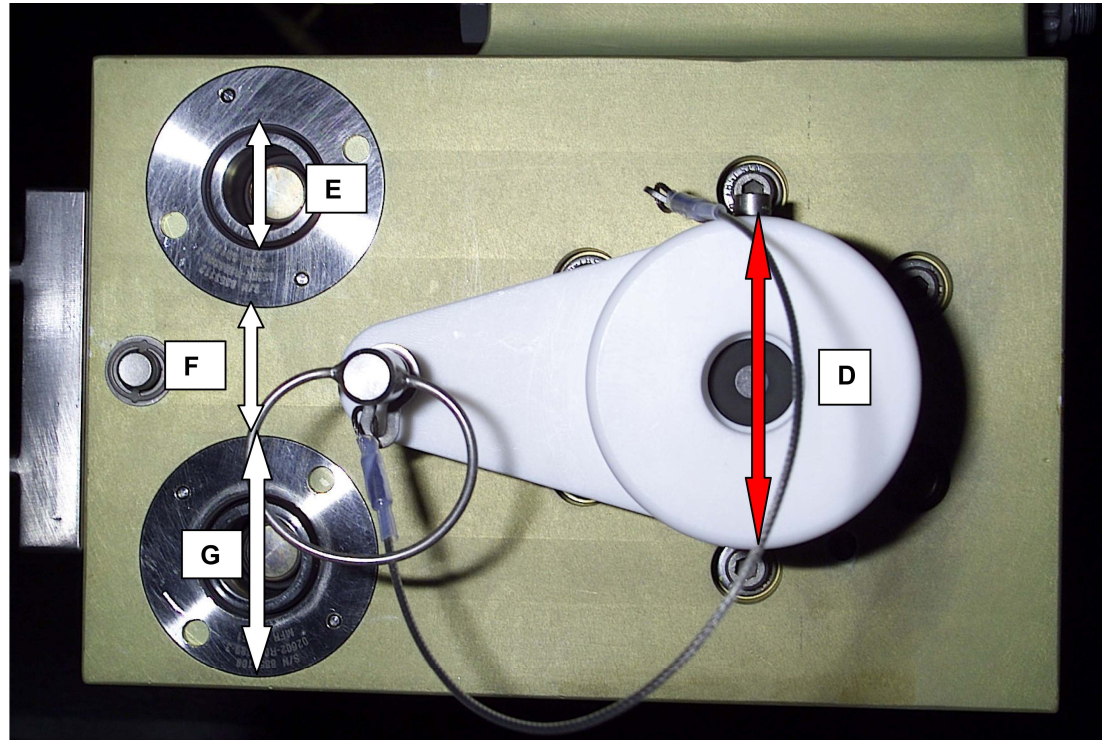


GROUND STRAP RECEPTACLE (GROUNDING LUG)

RTAS HOUSING DIMENSIONS

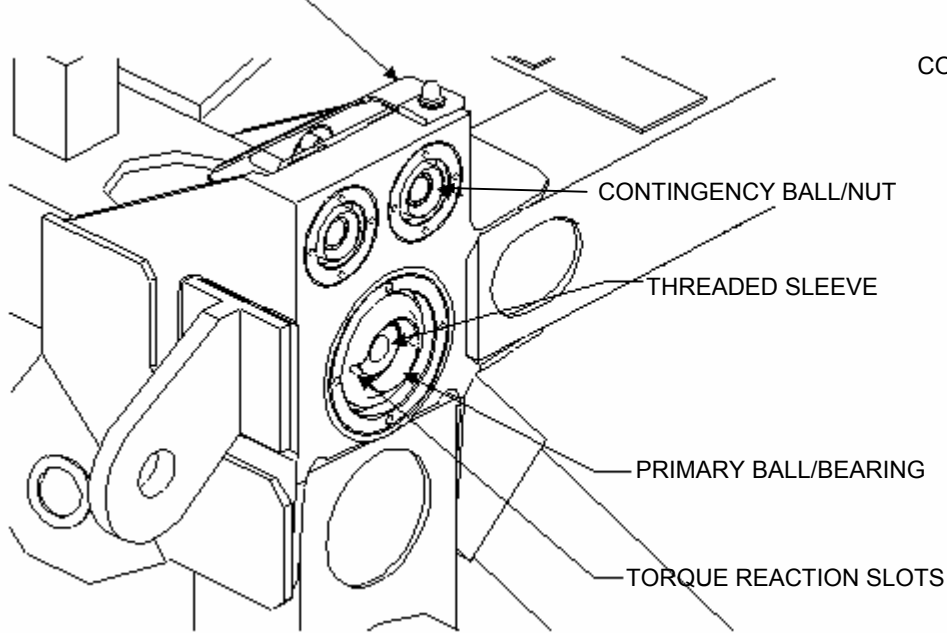


A	Height of RTAS Housing	14.1 cm
B	Width of RTAS Housing	21.5 cm
C	Diameter of Coarse Alignment Cone	9.2 cm
D	Diameter of Launch Lock	6.4 cm
E	Diameter of Cont Bolt Hole	3.0 cm
F	Distance between contingency bolt disks	2.9 cm
G	Diameter of contingency bolt disk	5.5 cm

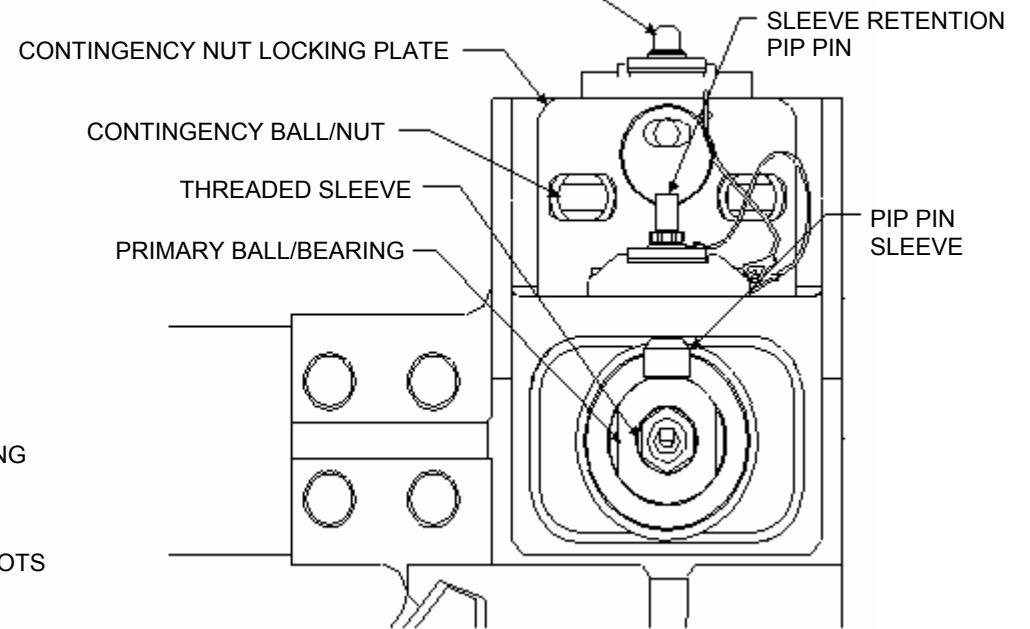


S4 MRTAS – PASSIVE

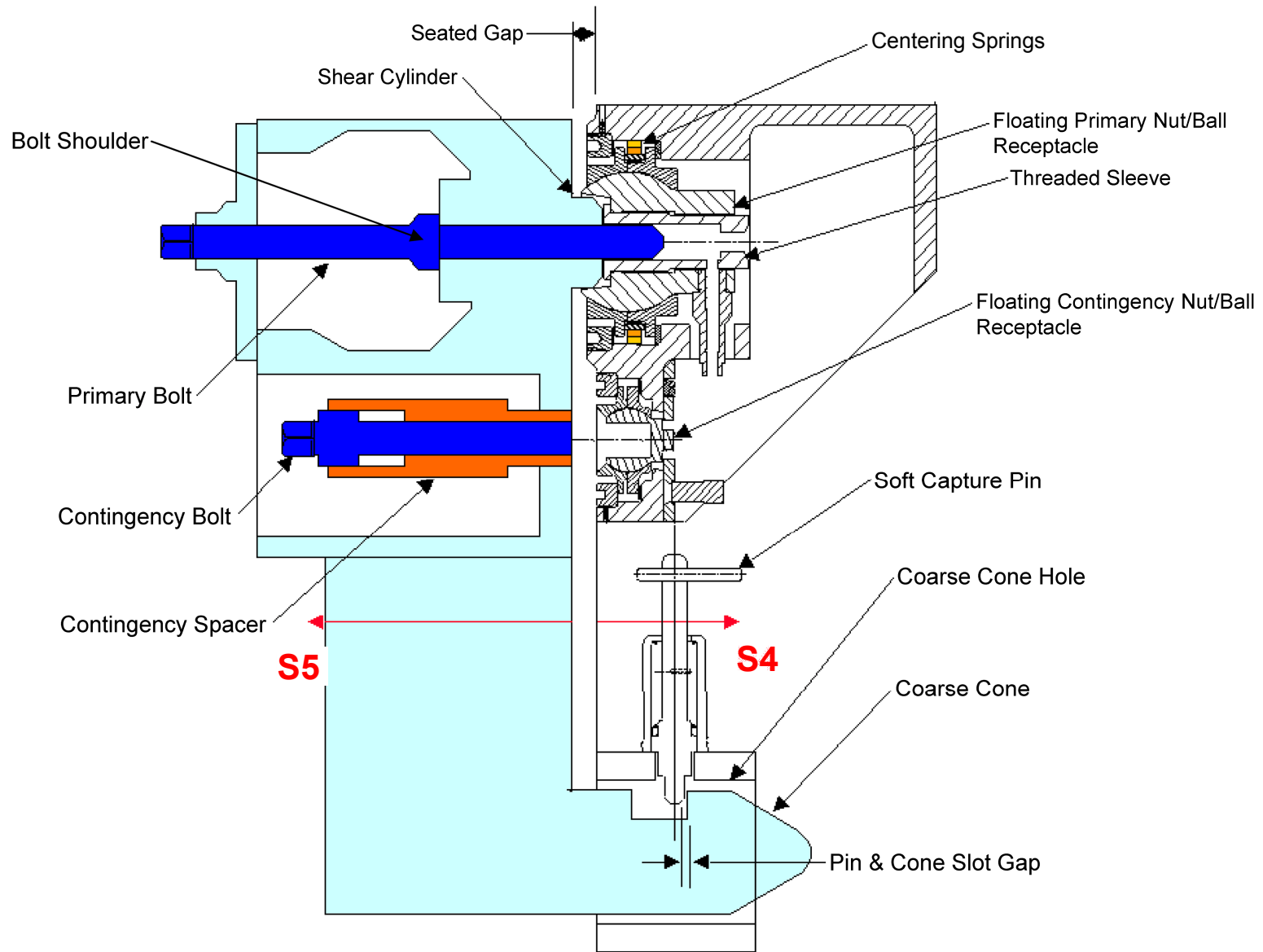
GROUND STRAP, STOWED POSITION



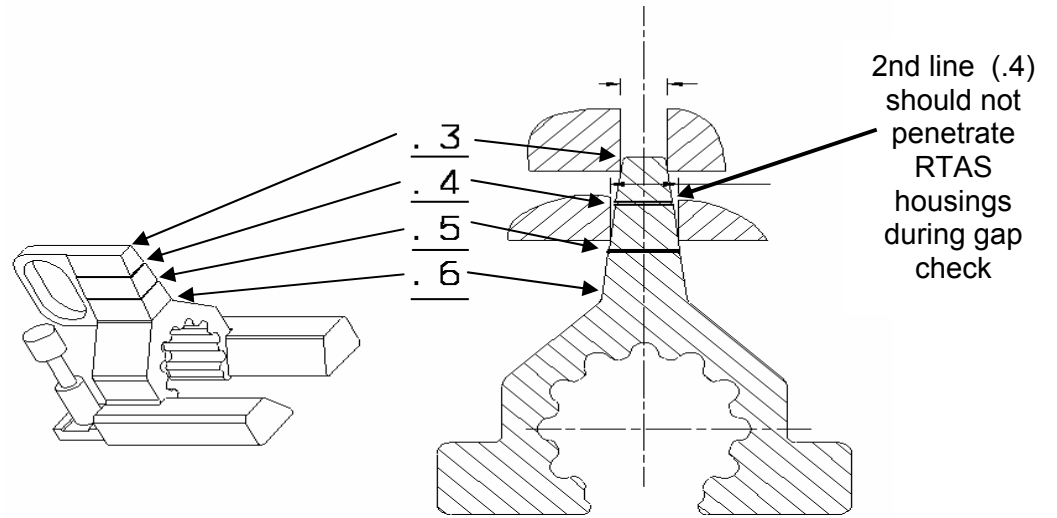
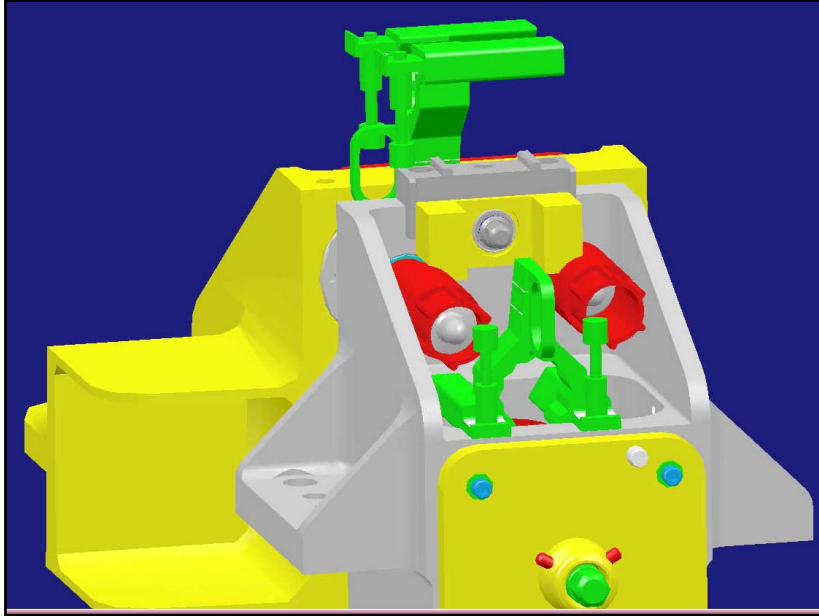
GROUND STRAP STOWAGE BOLT



S5 TO S4 MRTAS PRIMARY BOLT ENGAGED



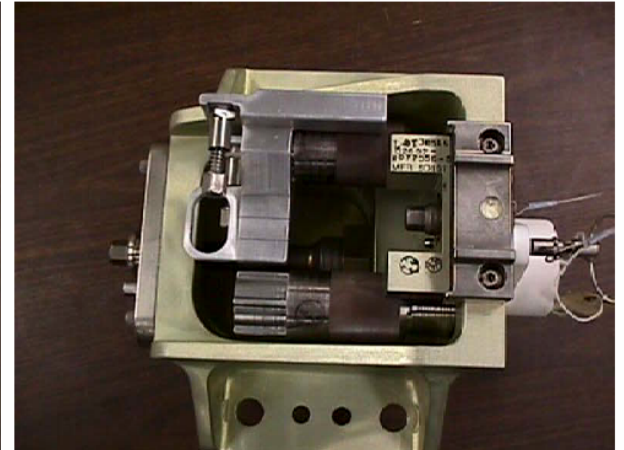
GAP CHECK TOOL



LAUNCH POSITION
(RTAS corner #1)

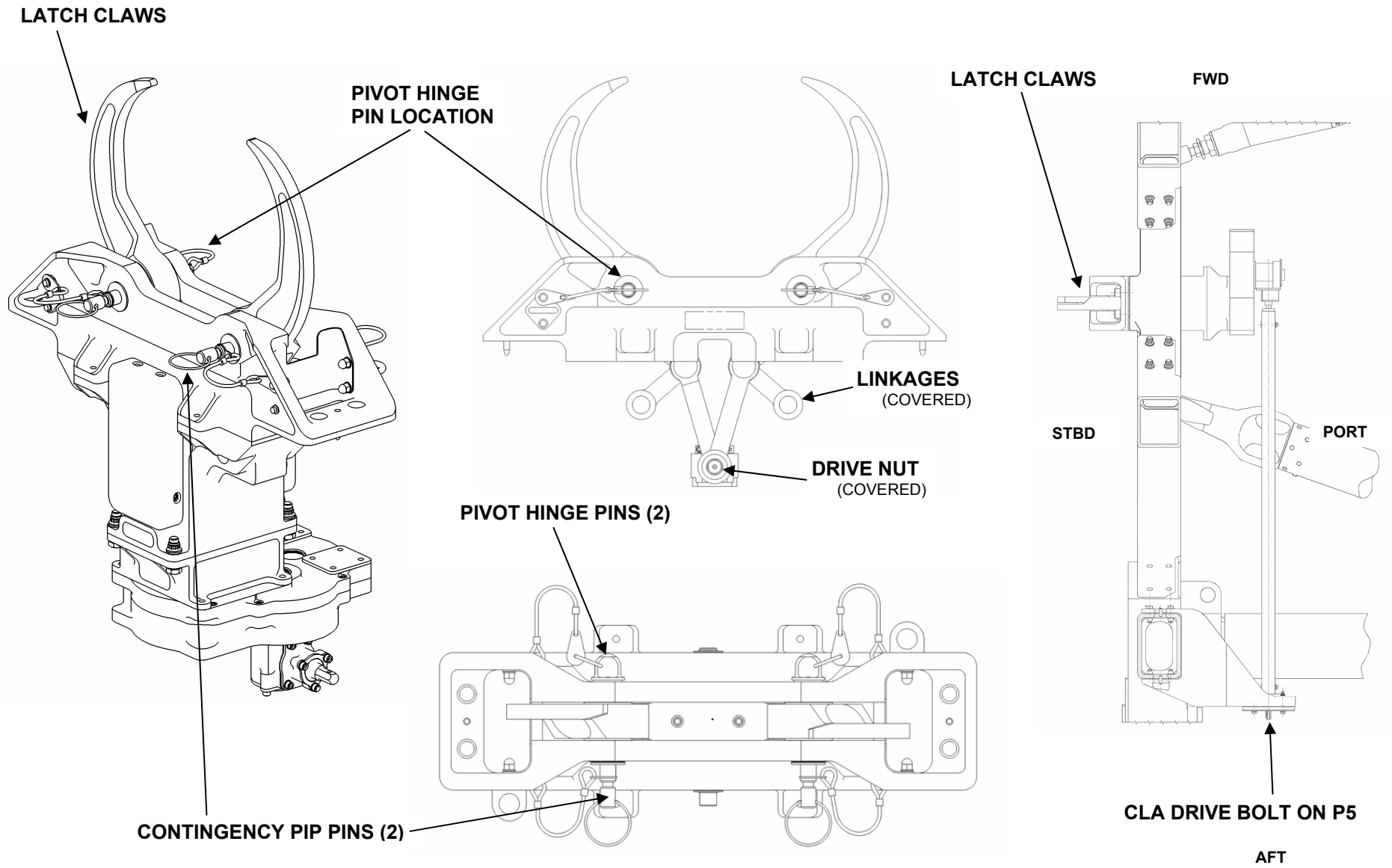


TOOL REMOVED



TOOL INSTALLED ON
RTAS CONTINGENCY SPACER SLEEVE

S5 CAPTURE LATCH ASSEMBLY (CLA)

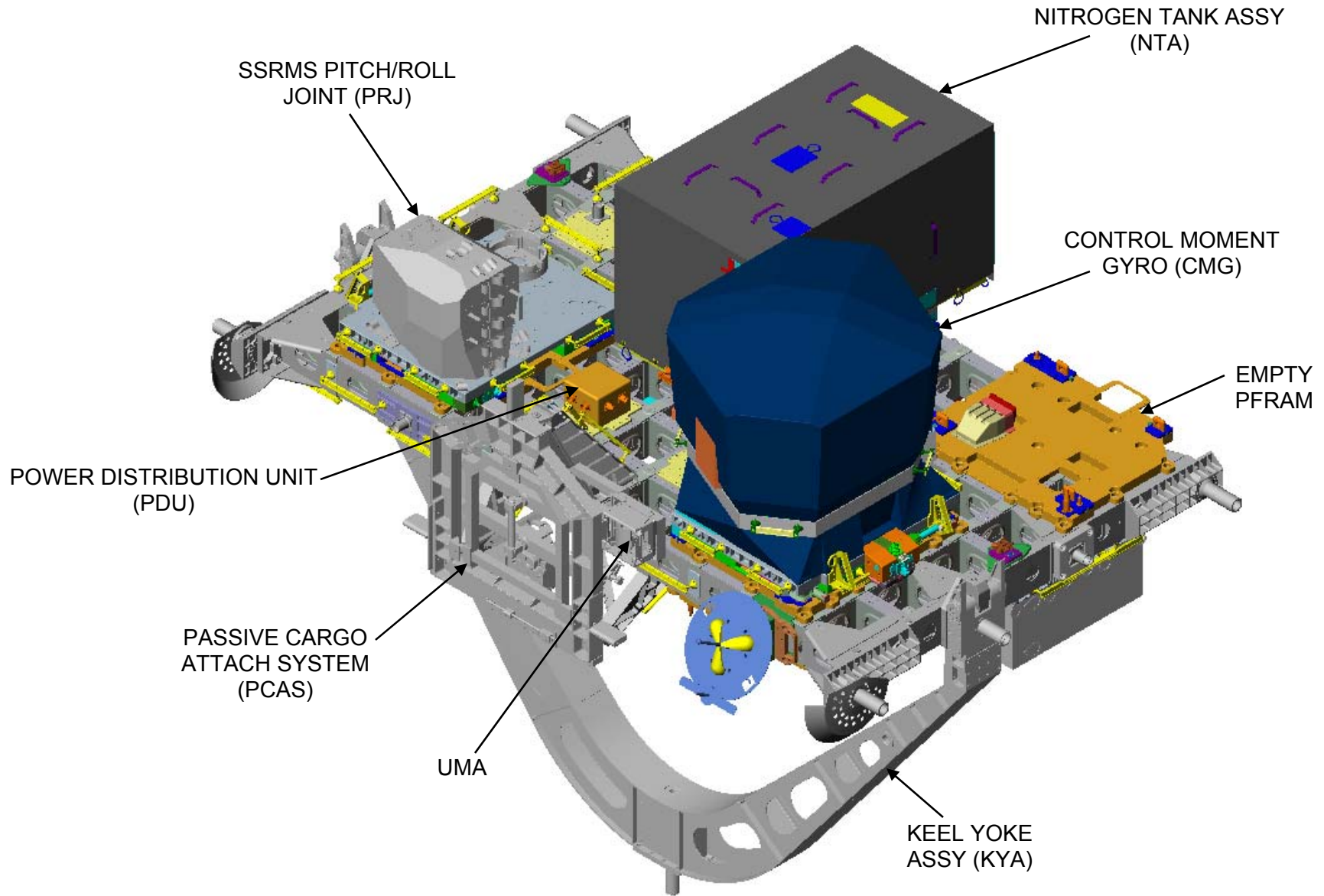


FS 18-9

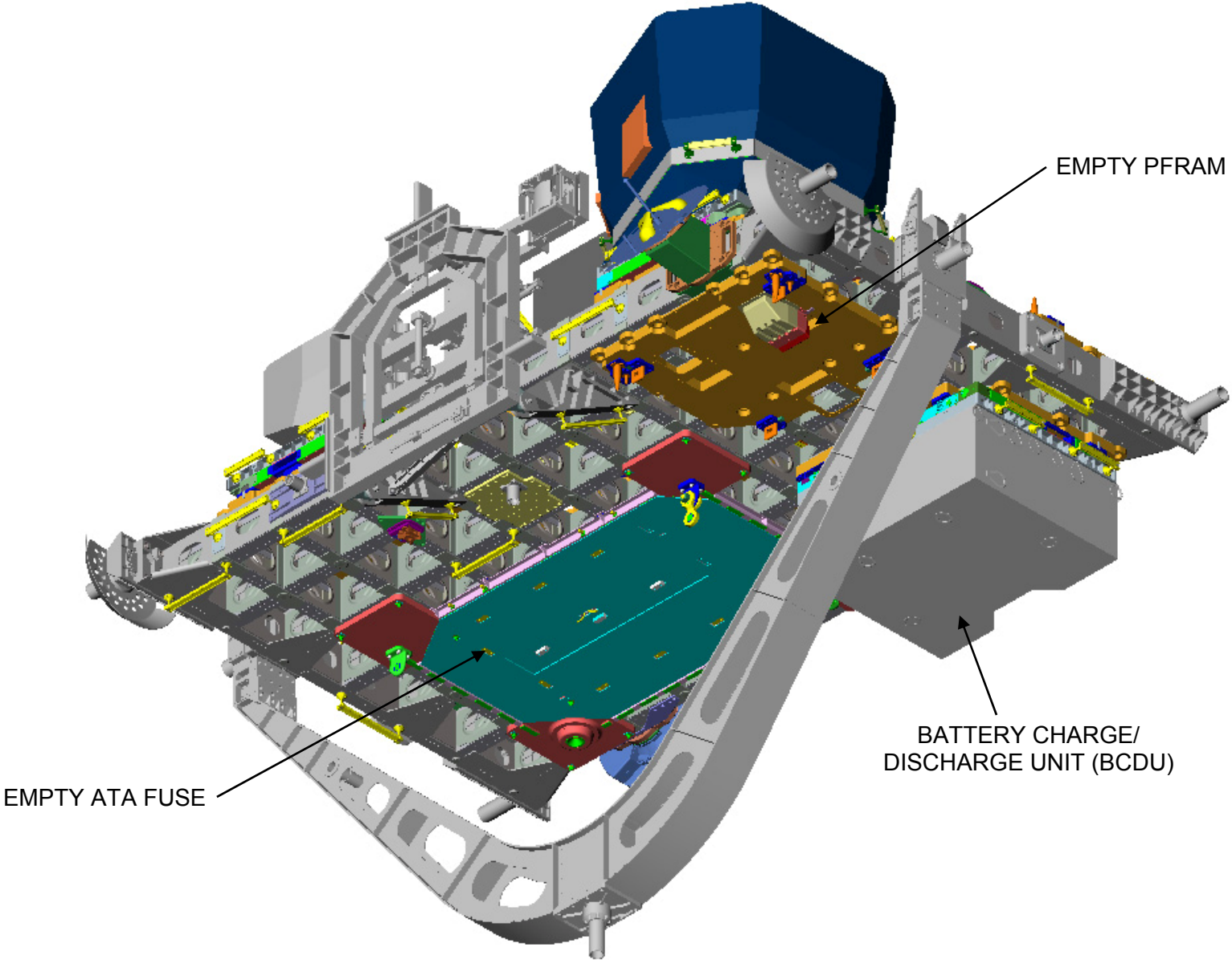
EVA/118/FIN

ESP-3

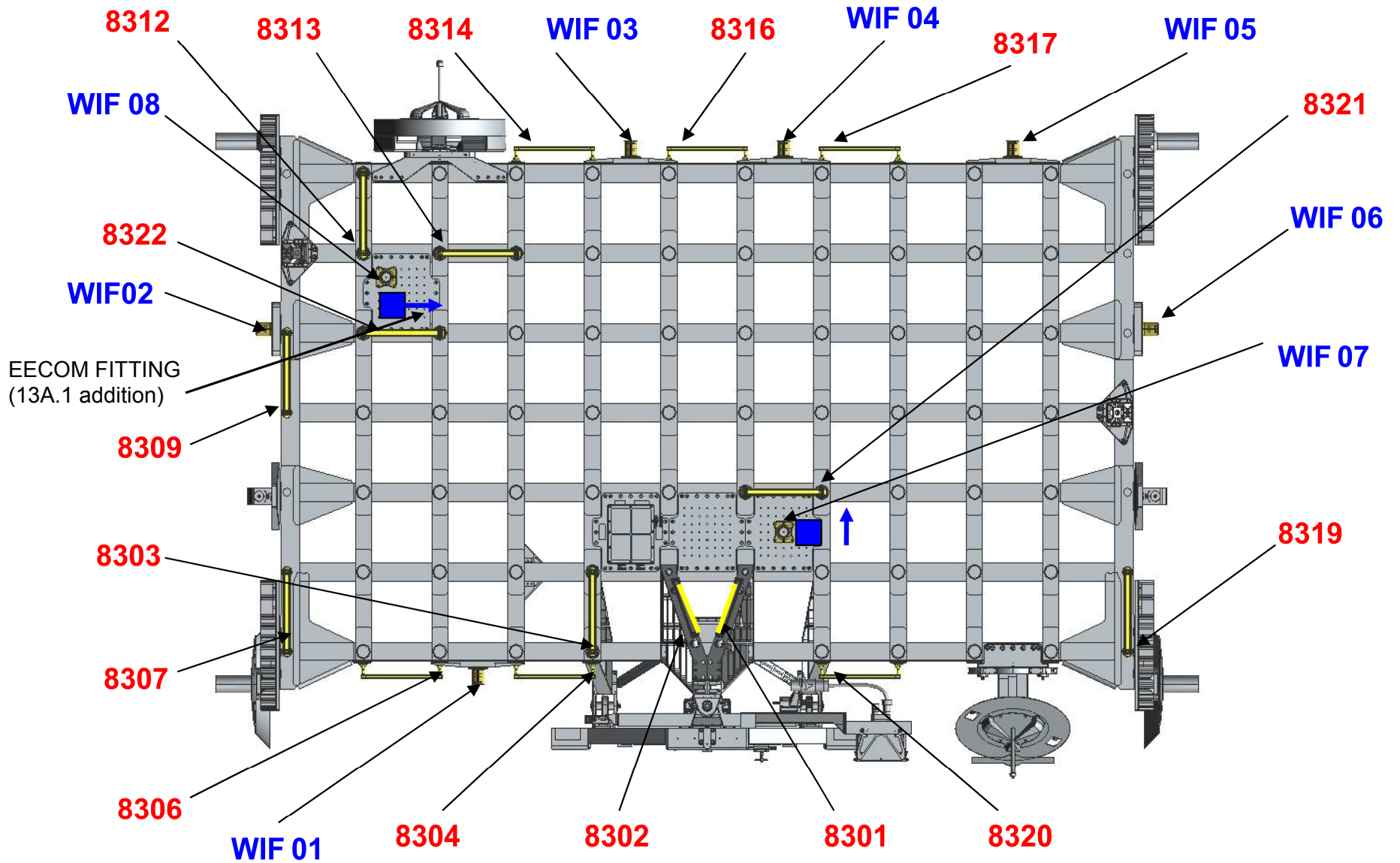
ESP-3 PLB TOP VIEW



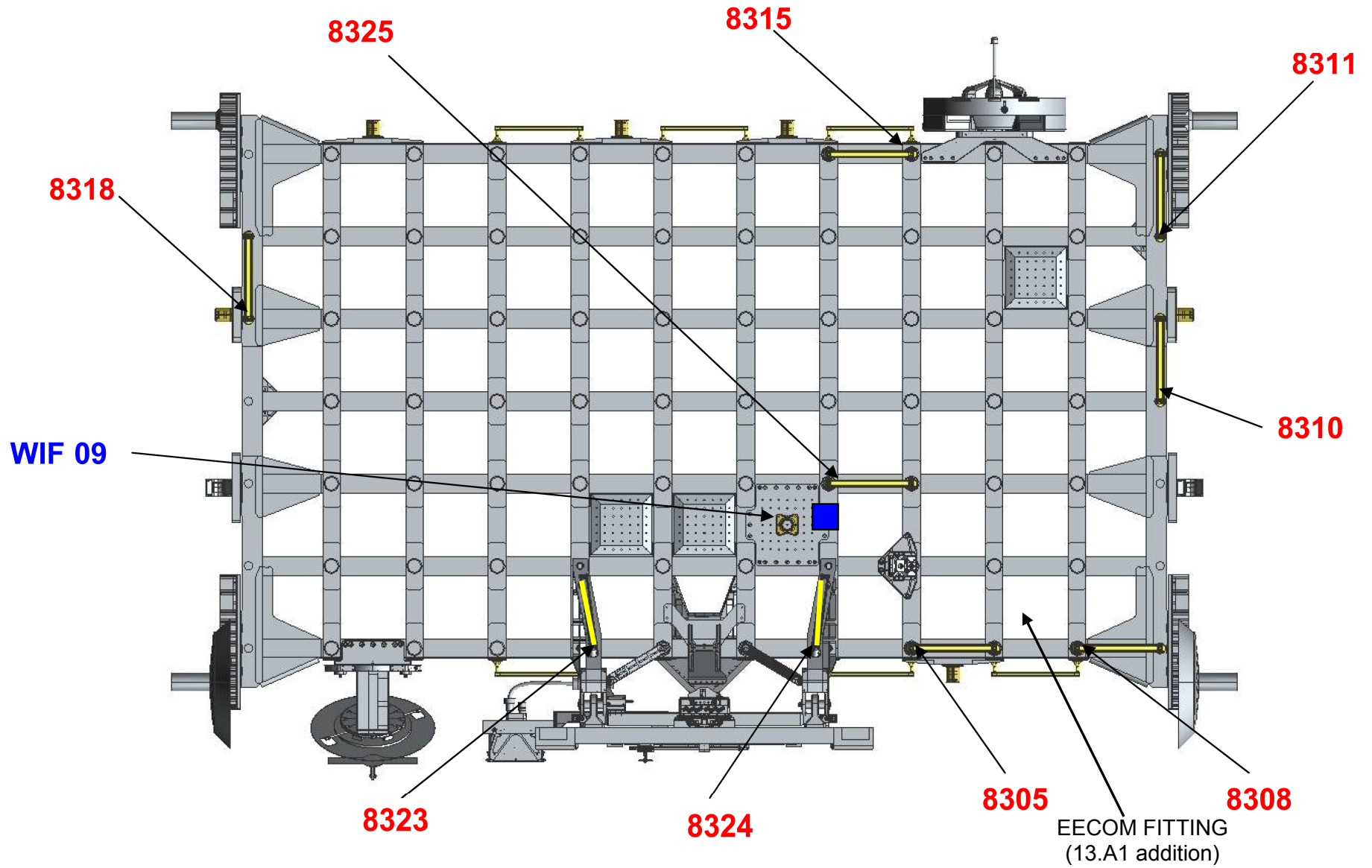
ESP-3 PLB BOTTOM VIEW



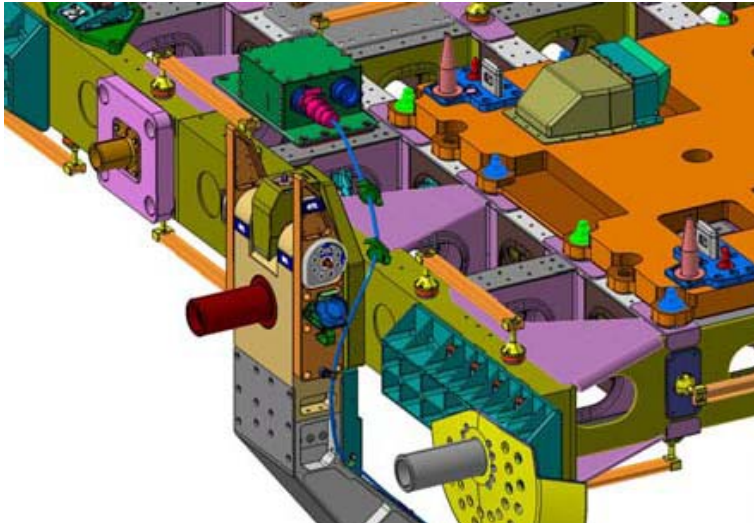
ESP-3 HR AND WIF LOCATIONS (PORT)



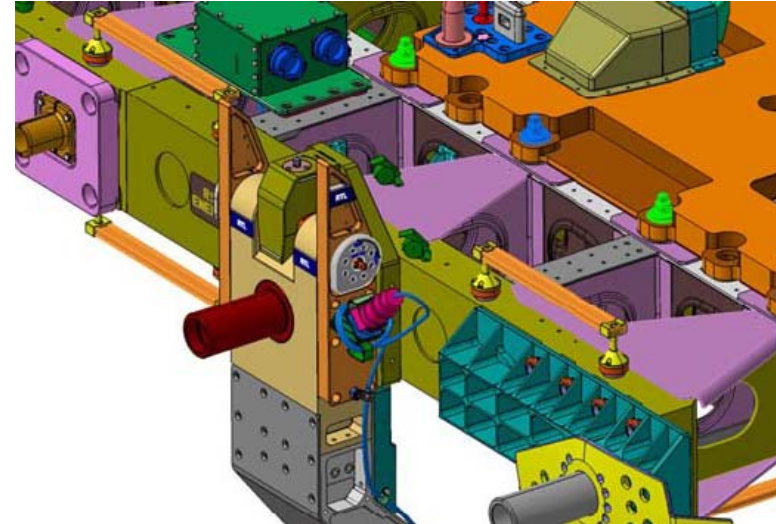
ESP-3 HR AND WIF LOCATIONS (STBD)



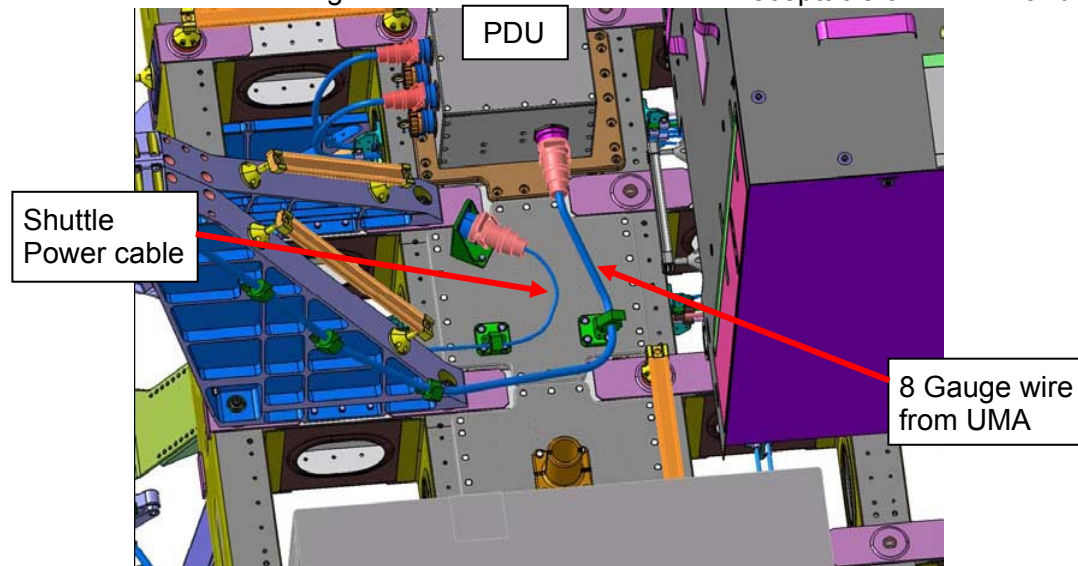
ESP-3 POWER CABLE CONFIGURATIONS



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

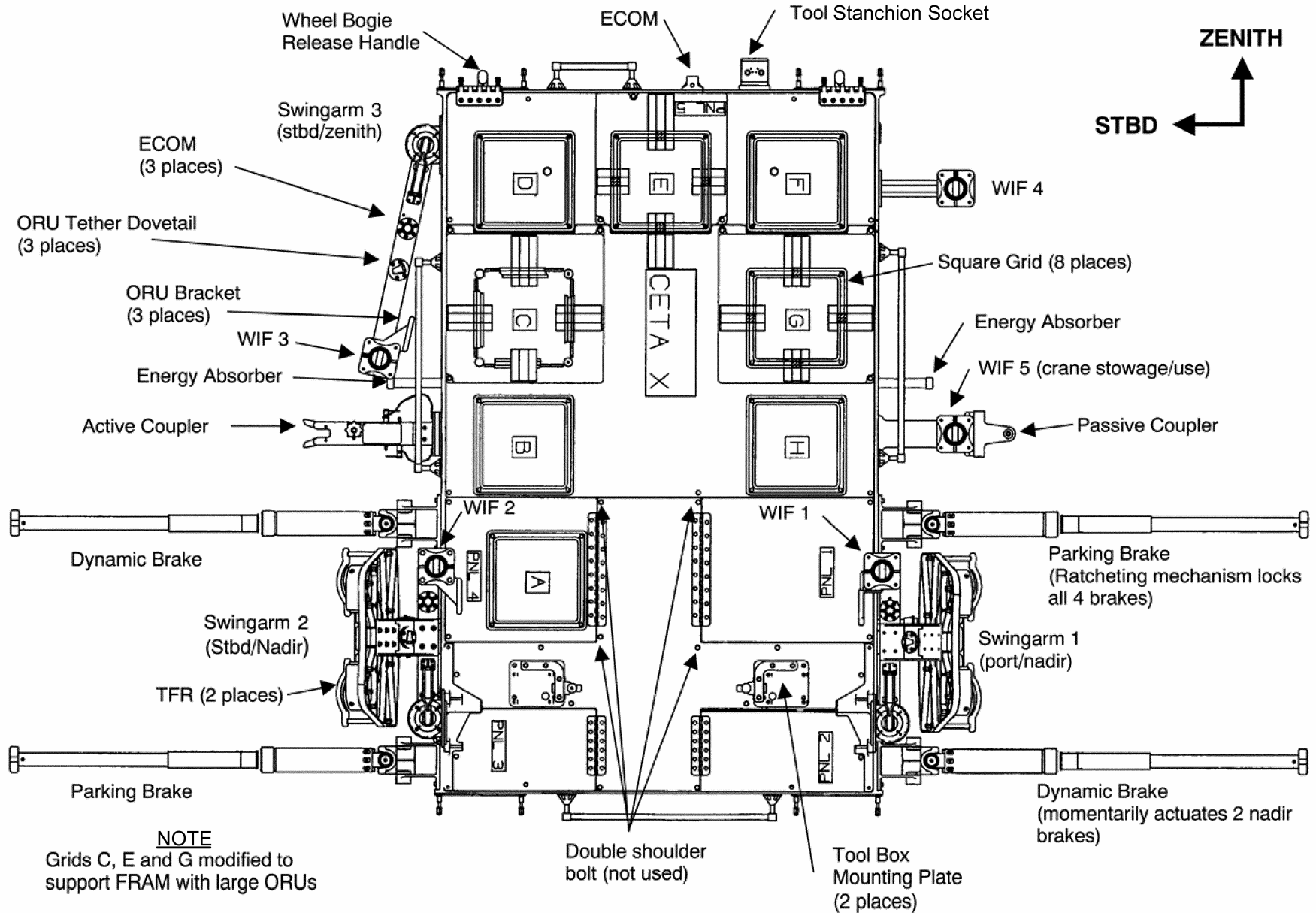


ESP-3 Shuttle Power Cable P1 to dummy receptacle of KYA – Landing Config

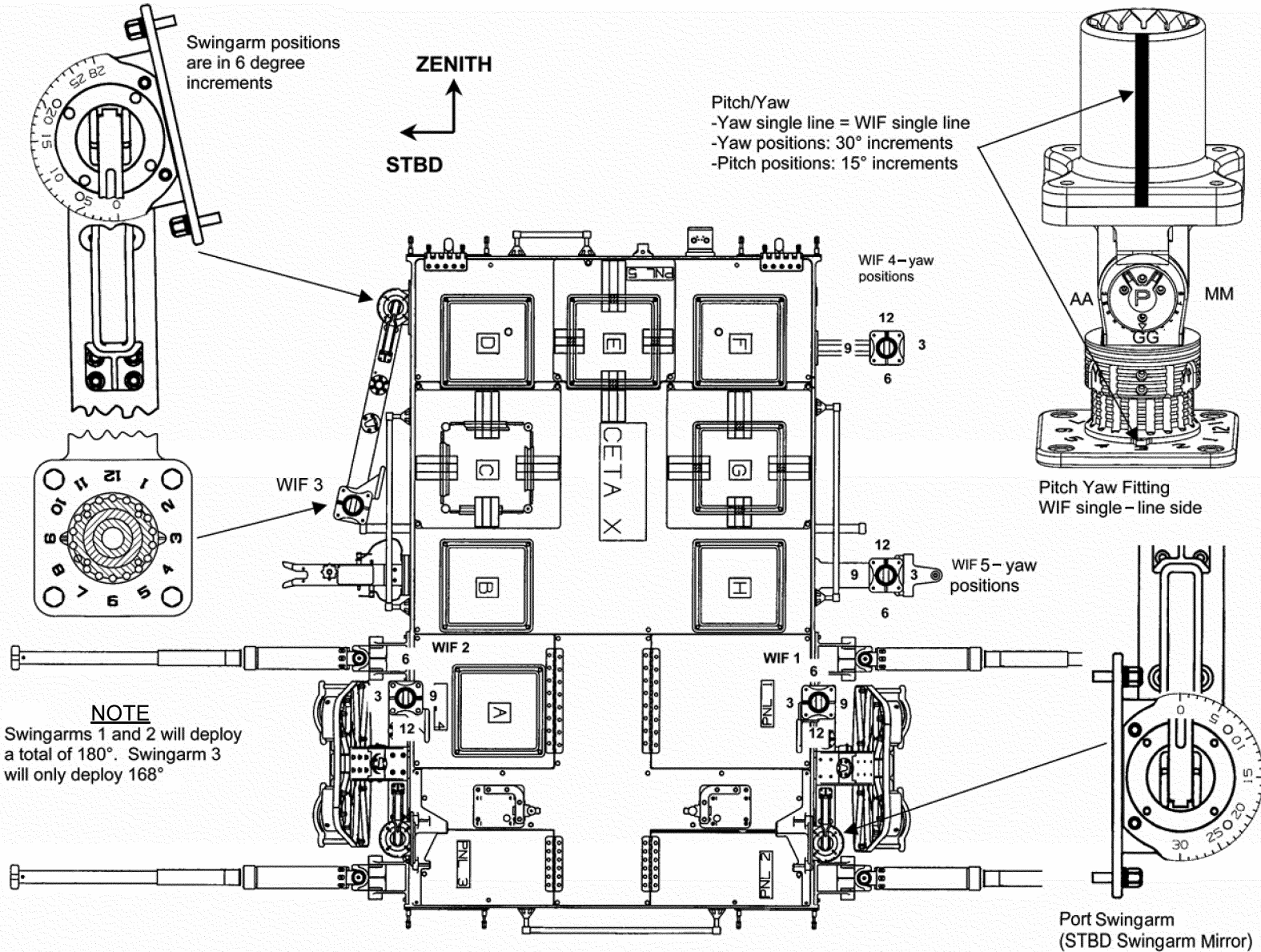


ESP-3 Shuttle Power Cable (P2) to Dummy receptacle near Power Distribution Box (PDU) and UMA Power Cable (P1) connected to J1 of PDU – On-Orbit Config

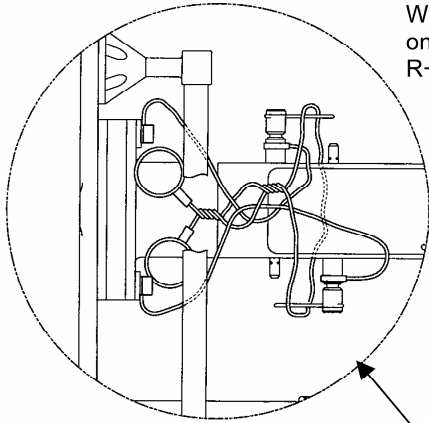
CETA CART – TOP VIEW



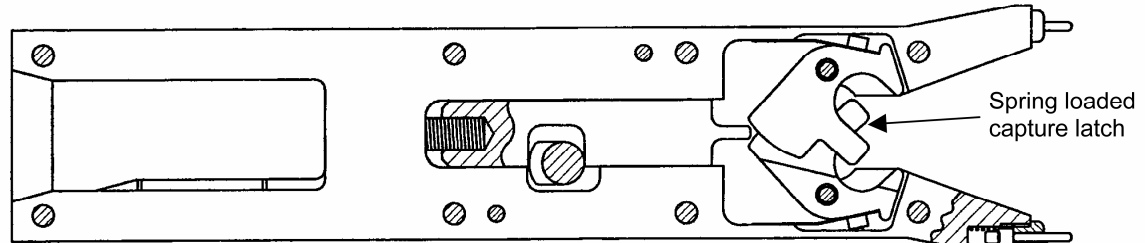
CETA SWINGARM AND WIF MARKINGS



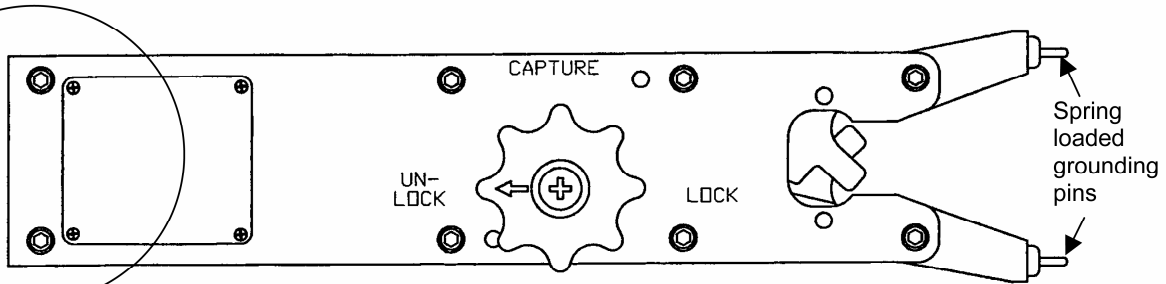
CETA CART COUPLERS



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

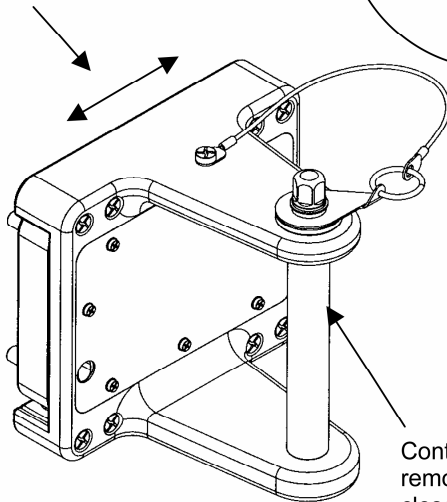


BOTTOM VIEW



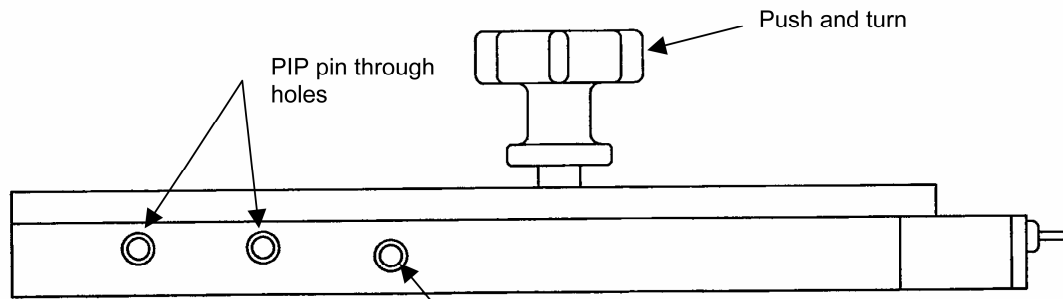
TOP VIEW

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



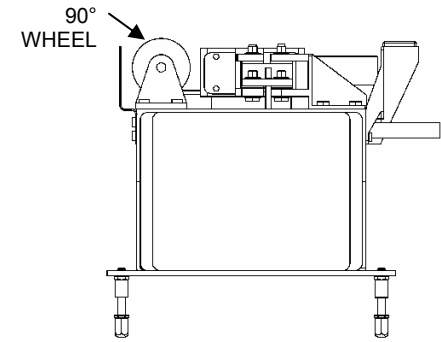
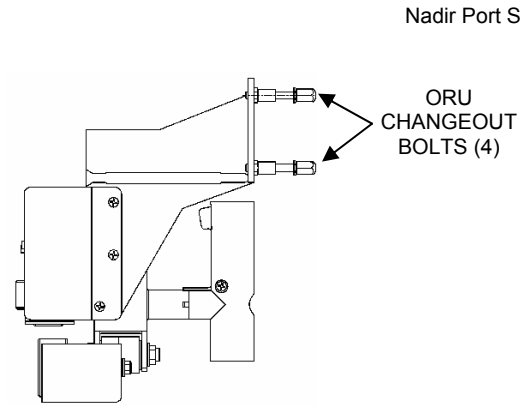
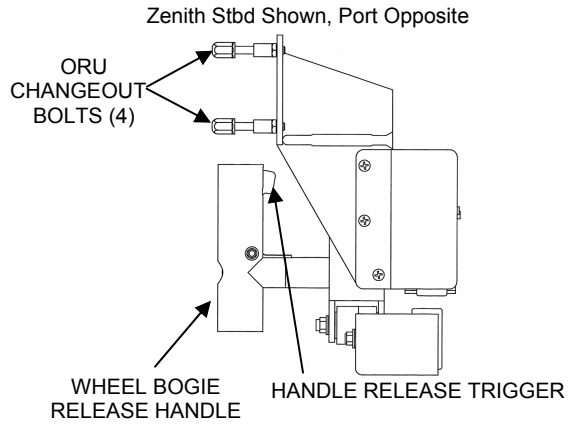
PASSIVE COUPLER

Contingency bolt removed if latch failed closed

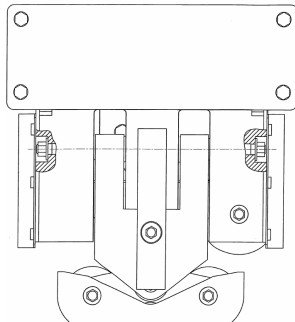


SIDE VIEW

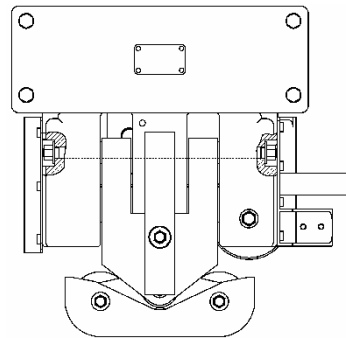
CETA CART WHEEL BOGIES



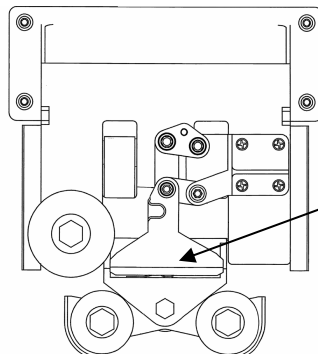
TOP VIEW



OUTBOARD SIDE

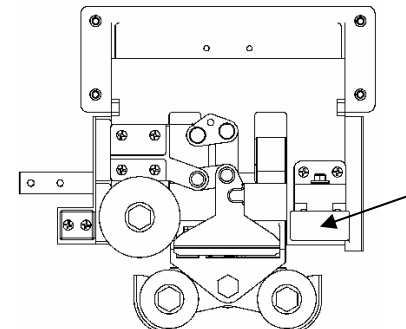


OUTBOARD SIDE



INBOARD SIDE

BRAKE PAD

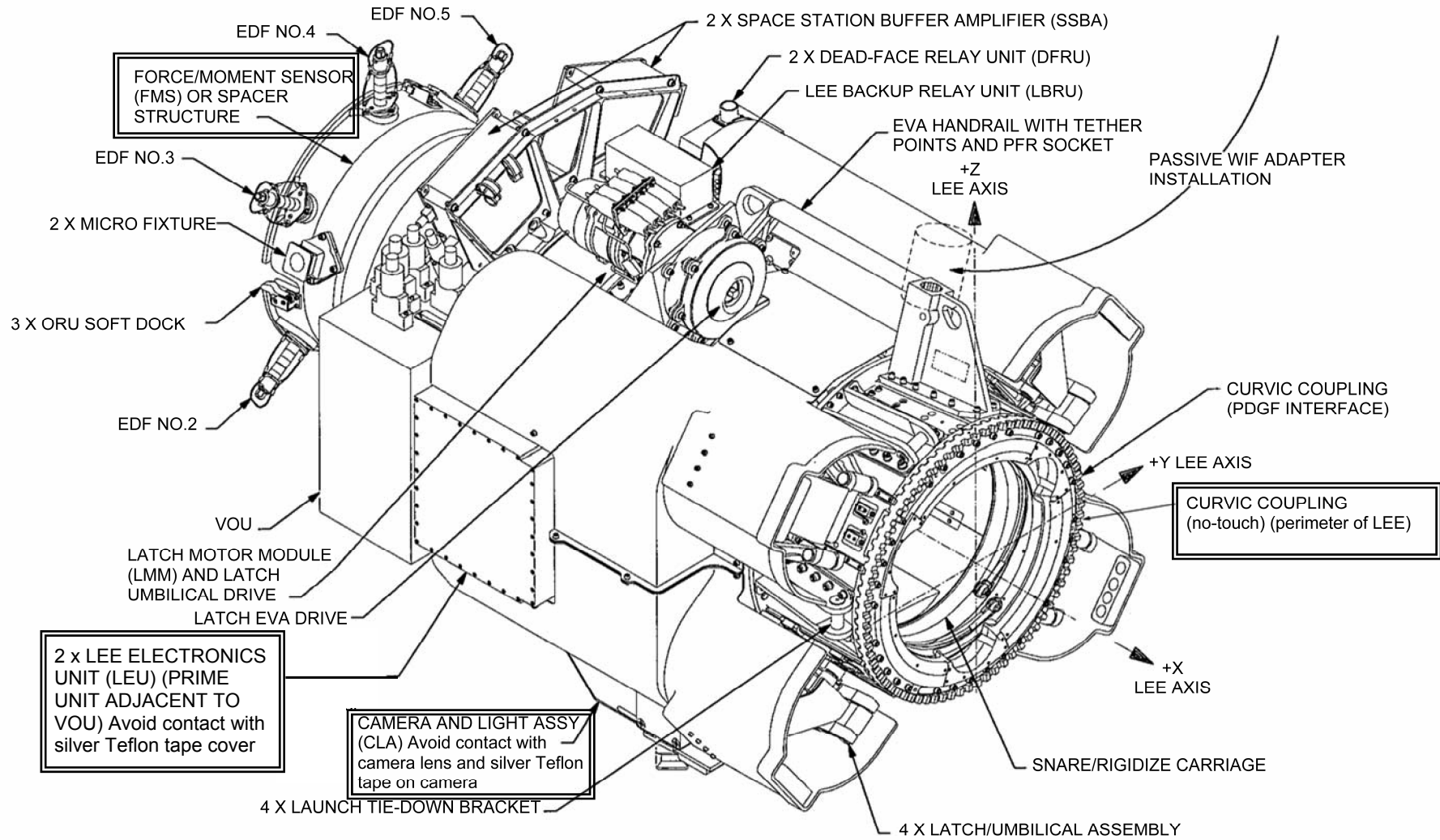


INBOARD SIDE

90° WHEEL

LATCHING END EFFECTOR (LEE)

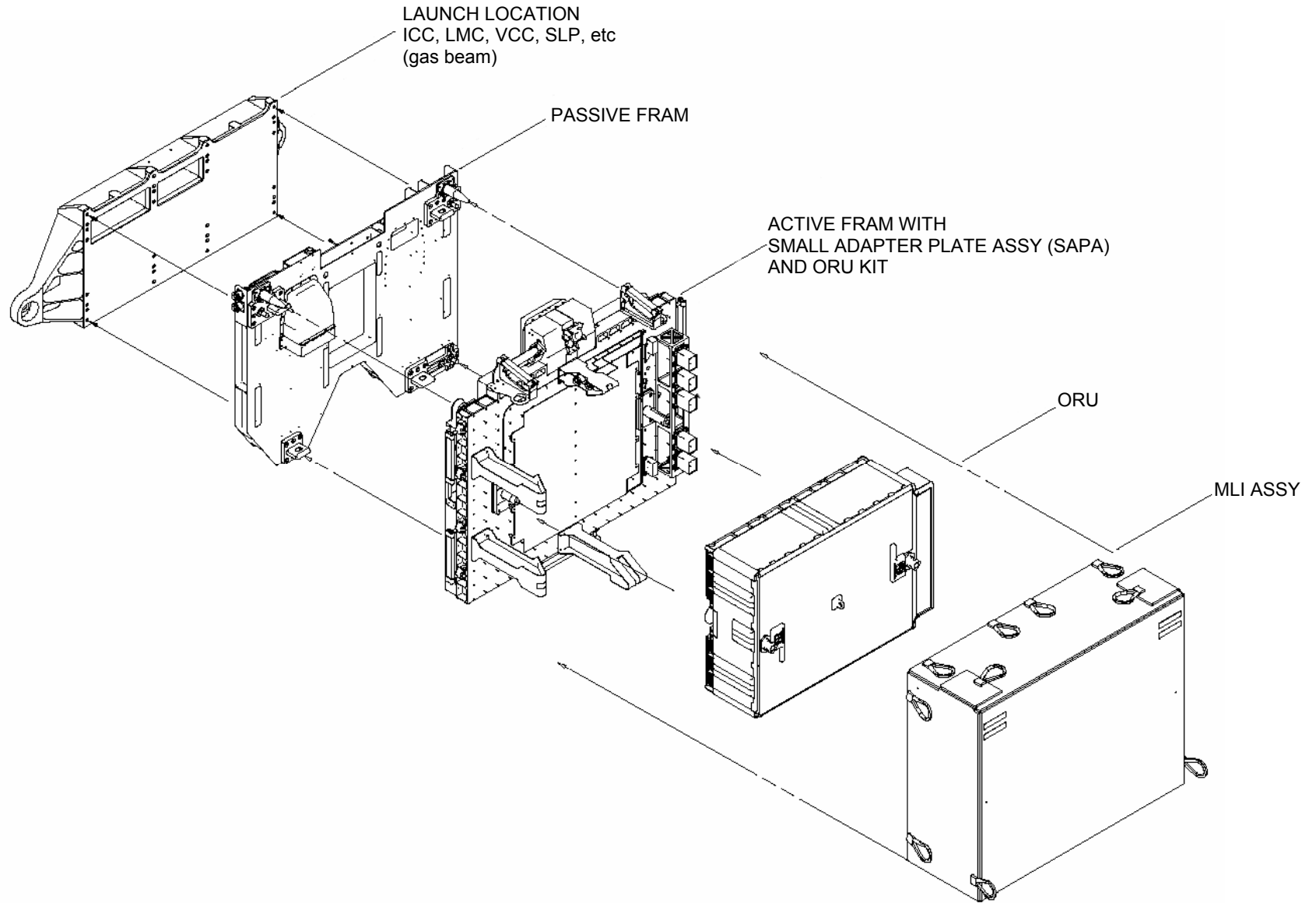
PASSIVE WORKSITE INTERFACE (WIF) ADAPTER ASSY
(Dimensions shown in inches)



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

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FRAM/FSE/ORU ASSEMBLY



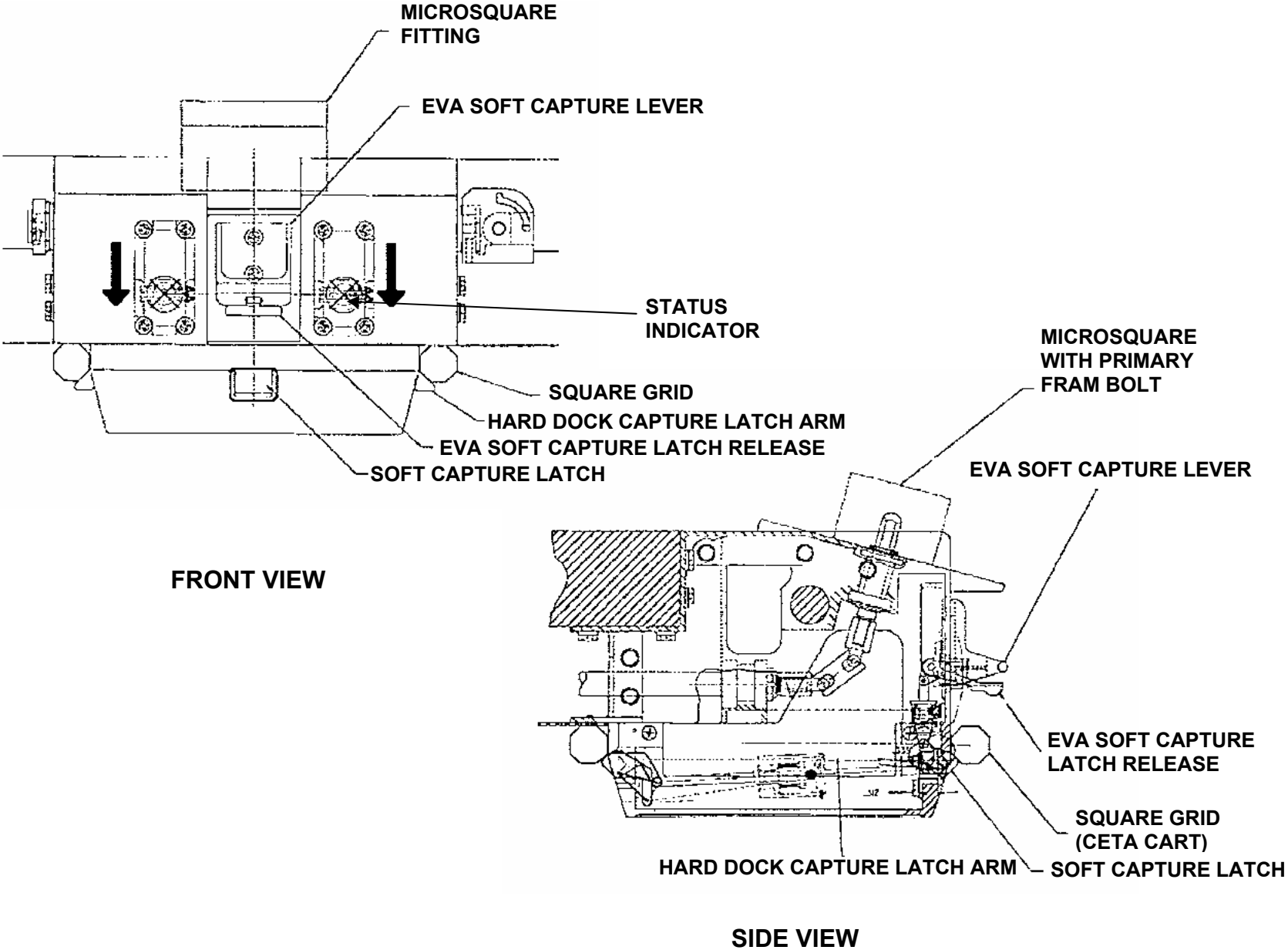
FS 18-21

EVA/118/FIN

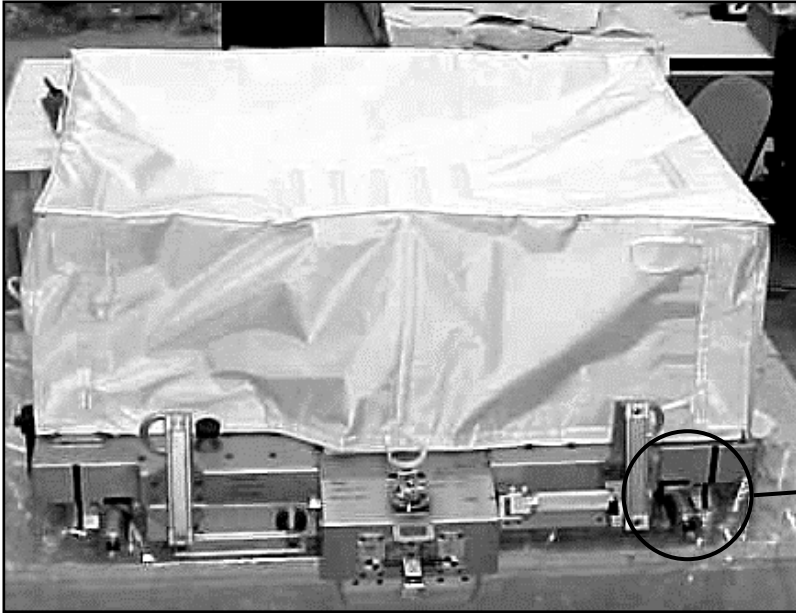
FRAM

FRAM

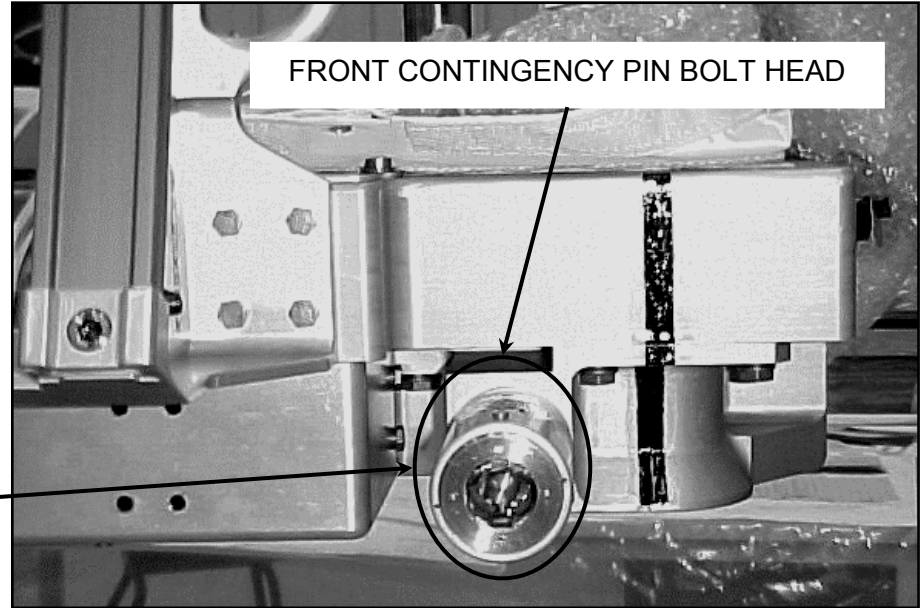
ACTIVE FRAM SOFT CAPTURE MECHANISM



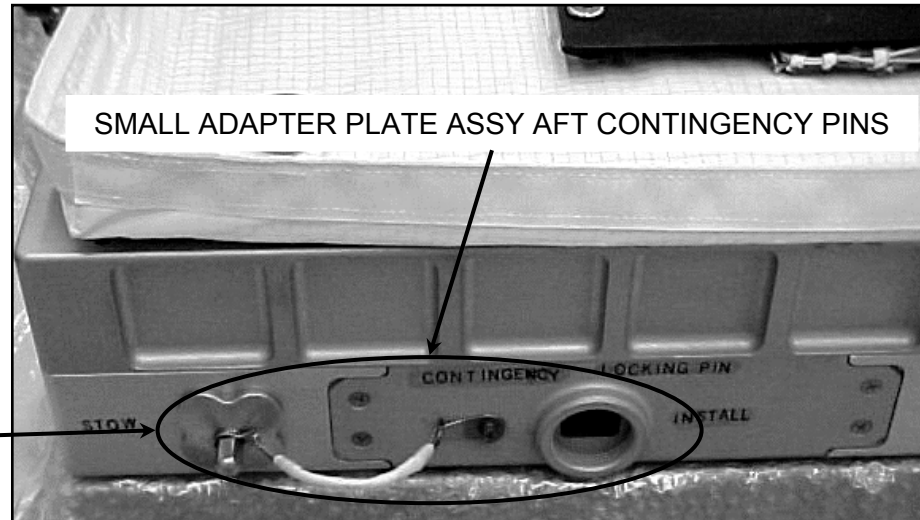
FRAM CONTINGENCY BOLTS – SAPA



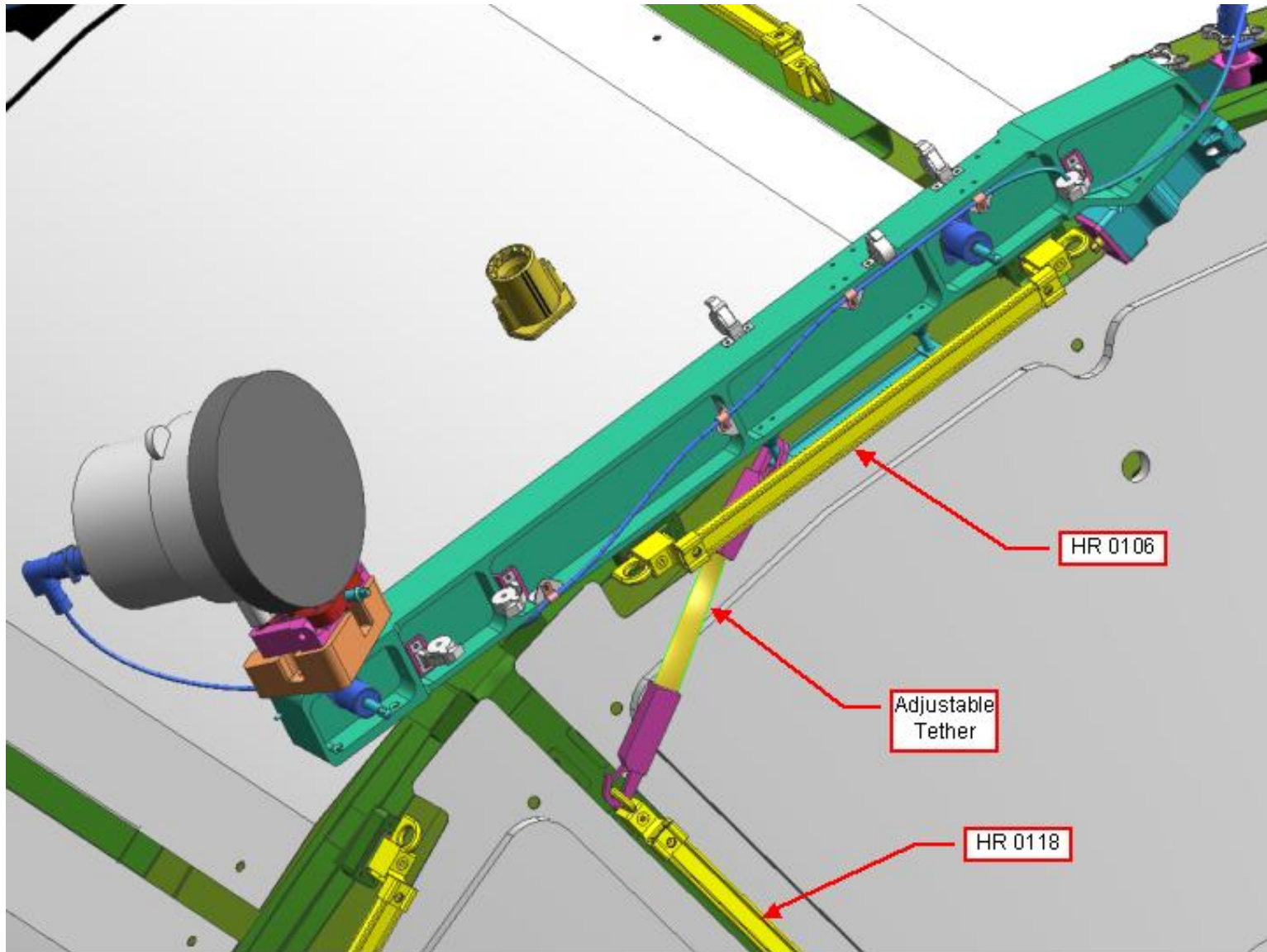
FWD CONTINGENCY BOLT (2)



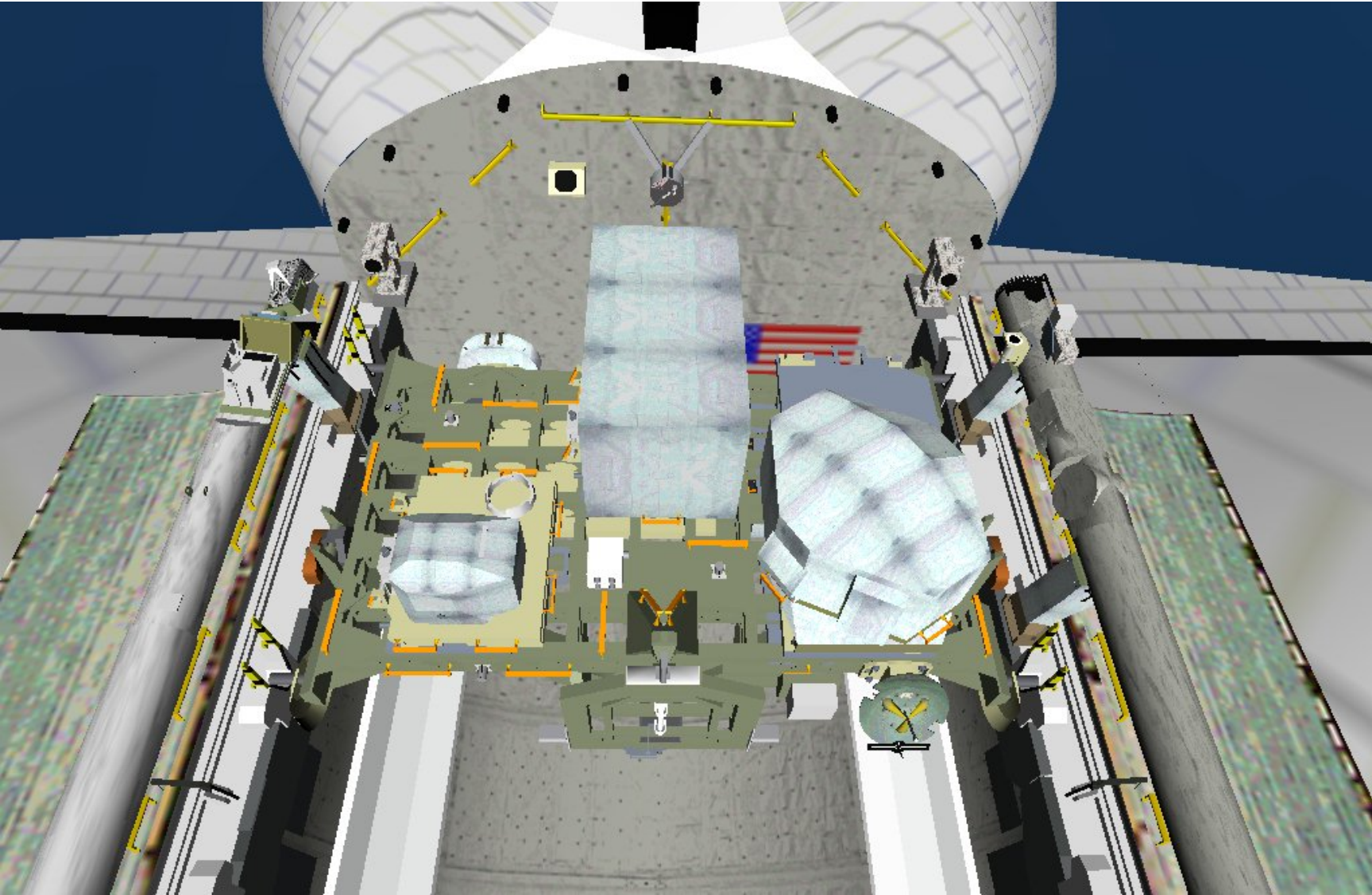
AFT CONTINGENCY BOLT (2)



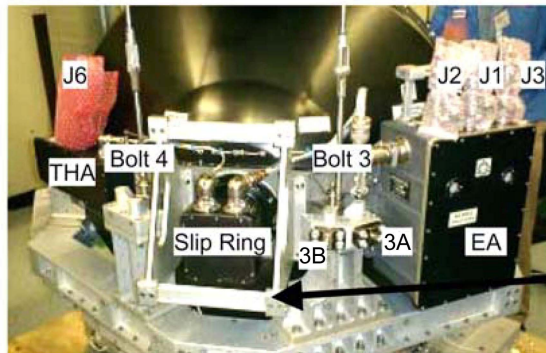
NODE LIGHT STANCHION TIEDOWN



ESP-3 WITH CMG



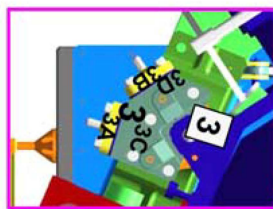
CMG NOMENCLATURE



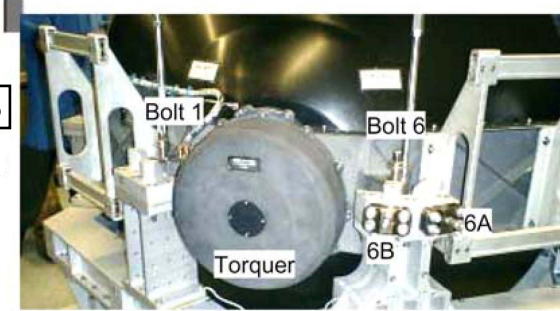
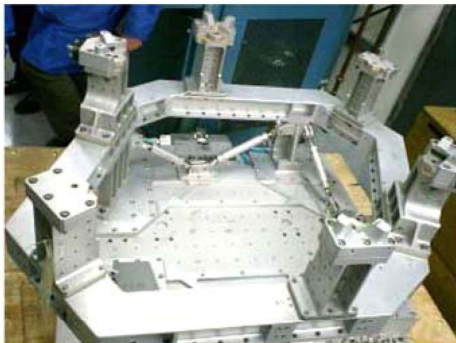
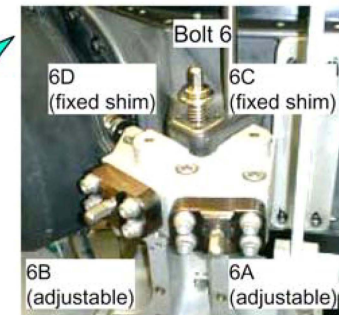
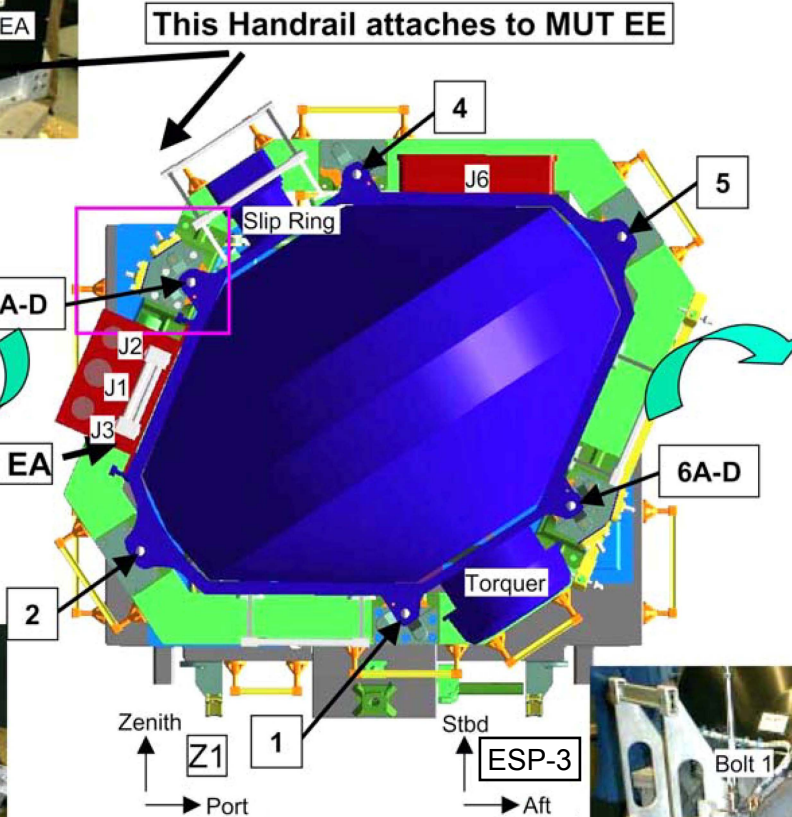
CMG on FSE (Aft-Stbd)



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



EV1 Tether (sm/lg) attaches to EA

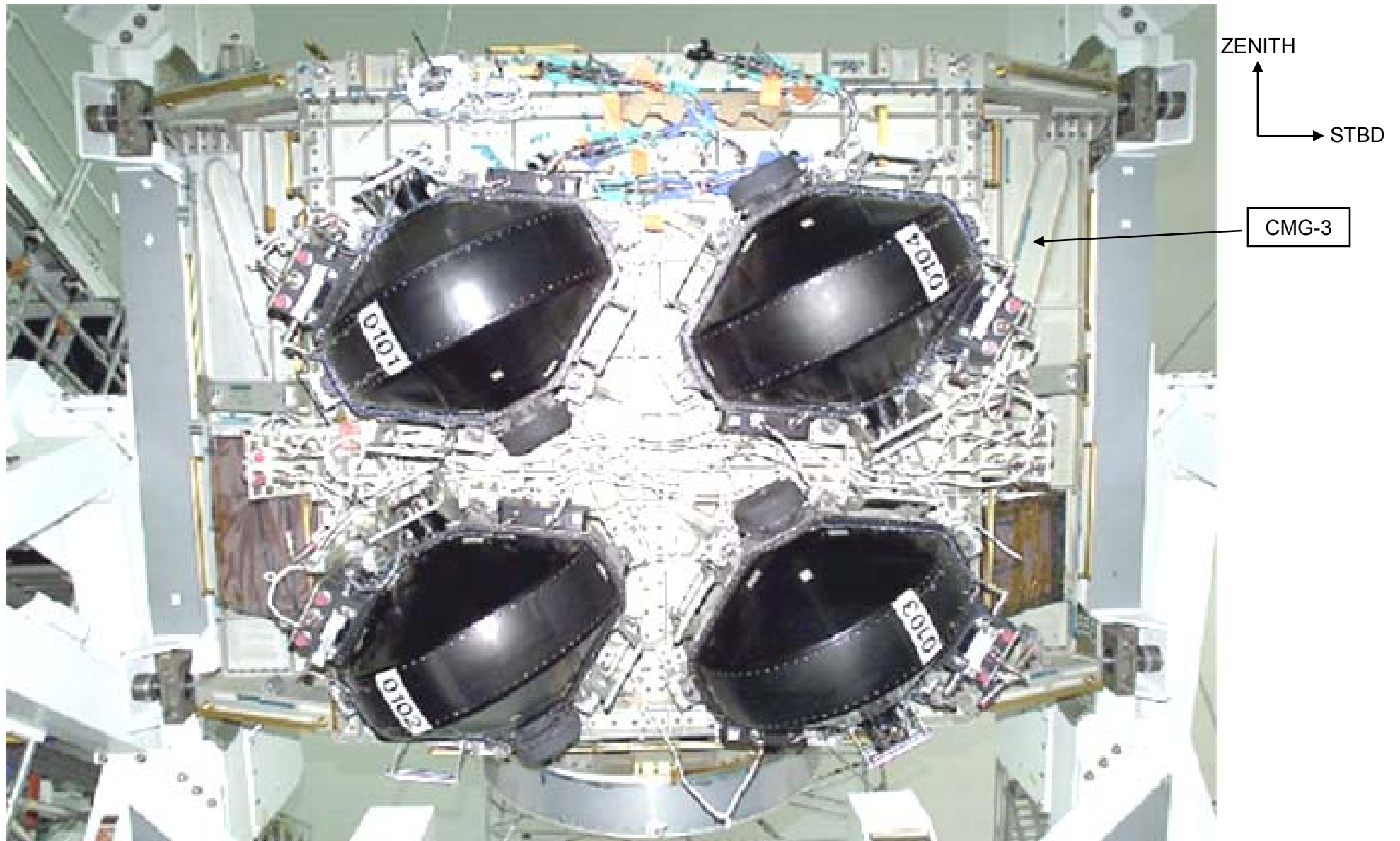


CMG on FSE (Fwd-Port)

AFT Z1 PRE-LAUNCH WITH BLANKET



CMG ON Z1



CMG SHIMS AT Z1



BLANKET CLOSED ON CMG IN FSE



NEW CMG WITH BLANKET



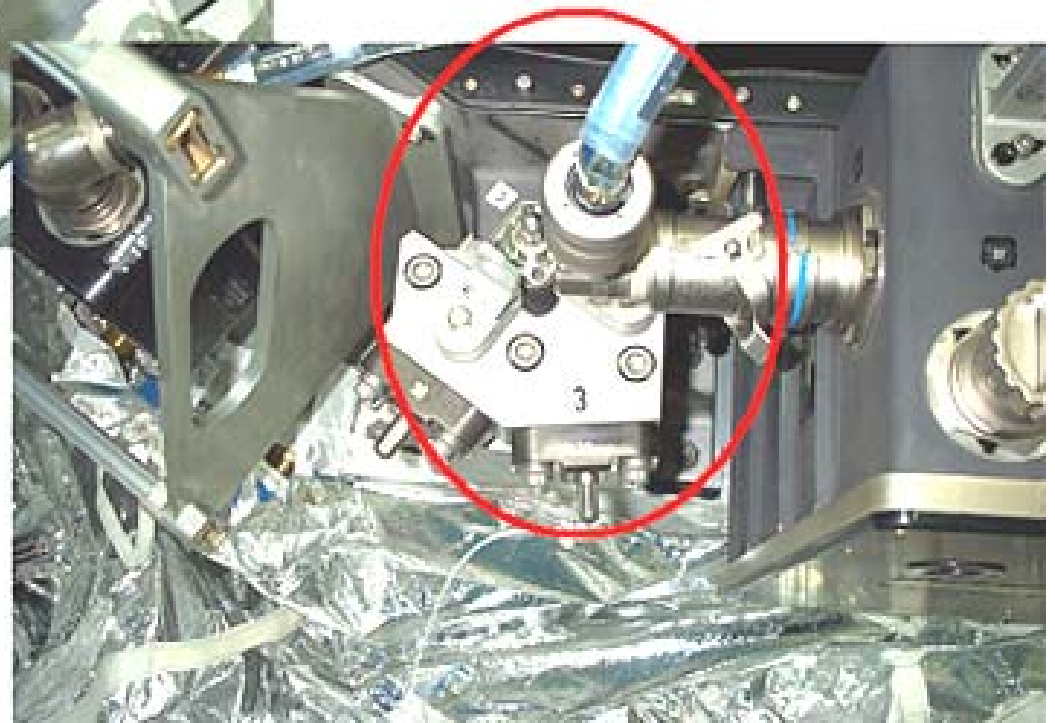
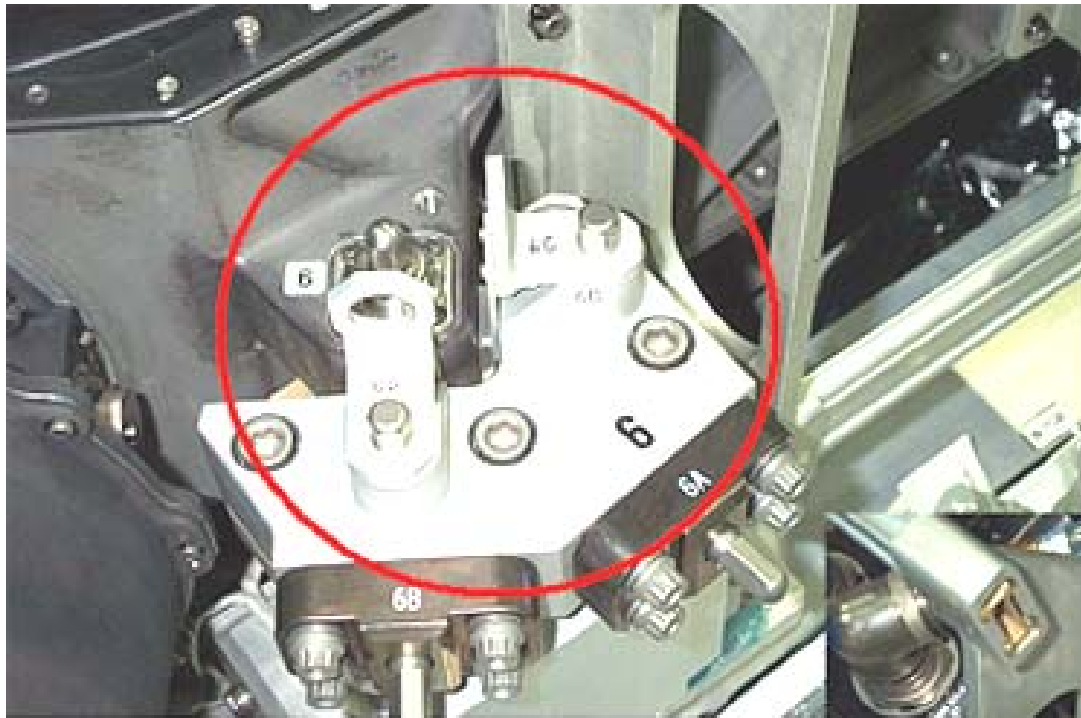
CMG IN FSE WITH MLI



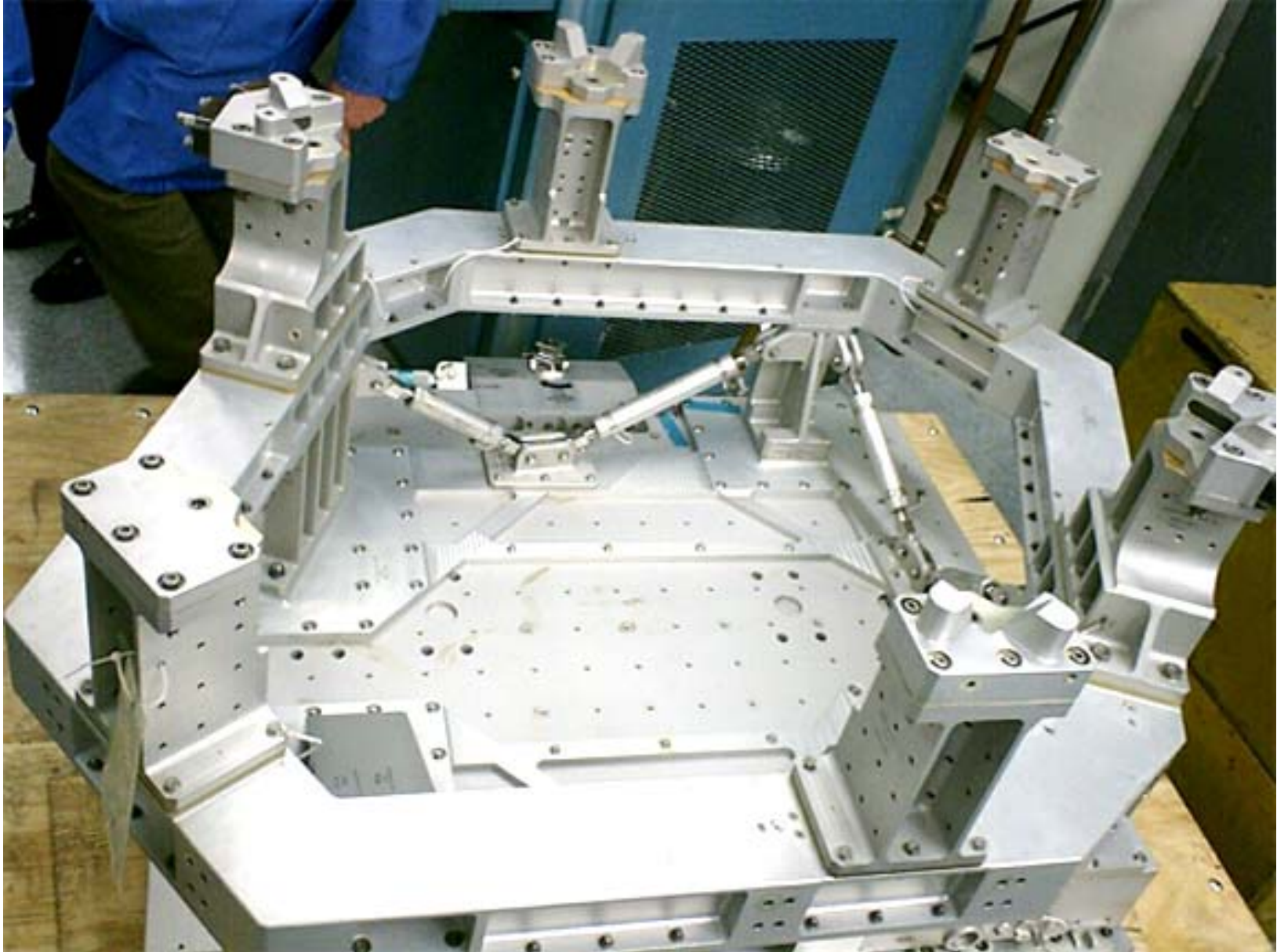
FS 18-32

EVA/118/FIN

CMG SHIMS ON FSE



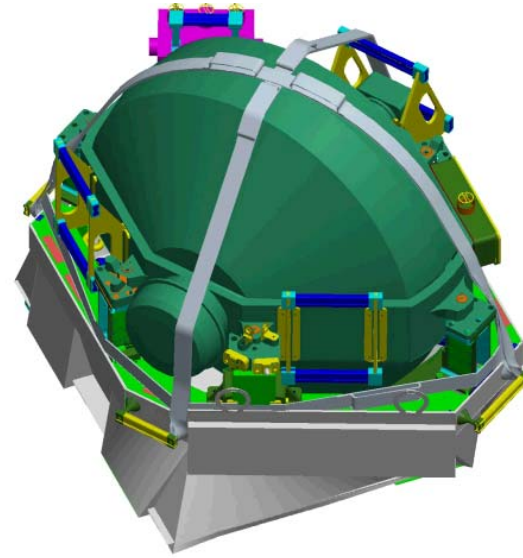
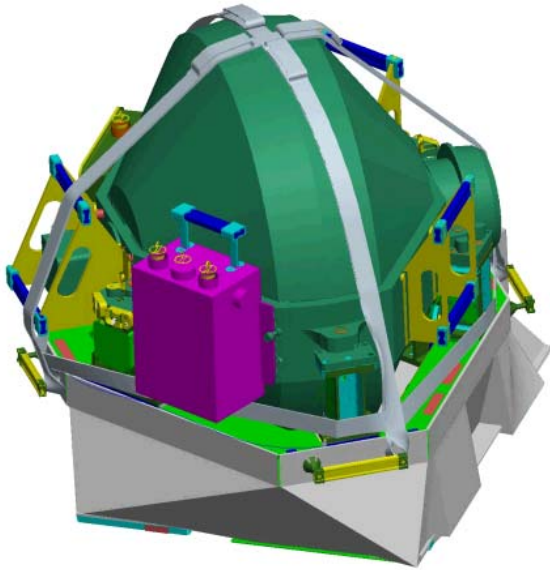
CMG FSE WITHOUT MLI OR CMG



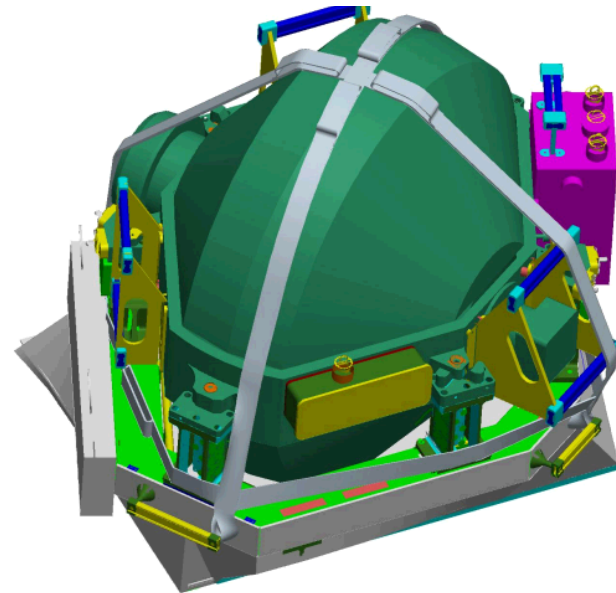
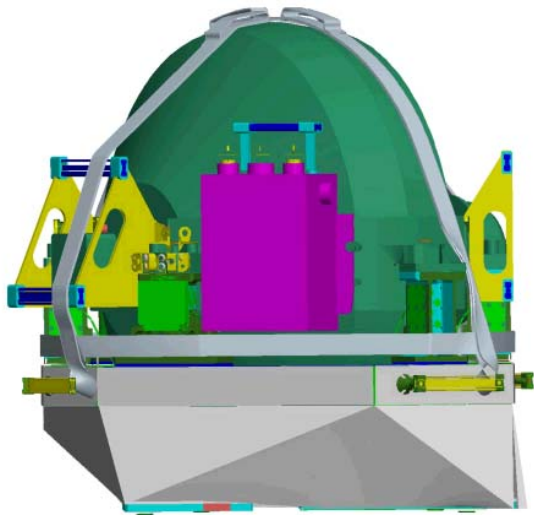
FS 18-34

EVA/118/FIN

CMG MLI STRAPS



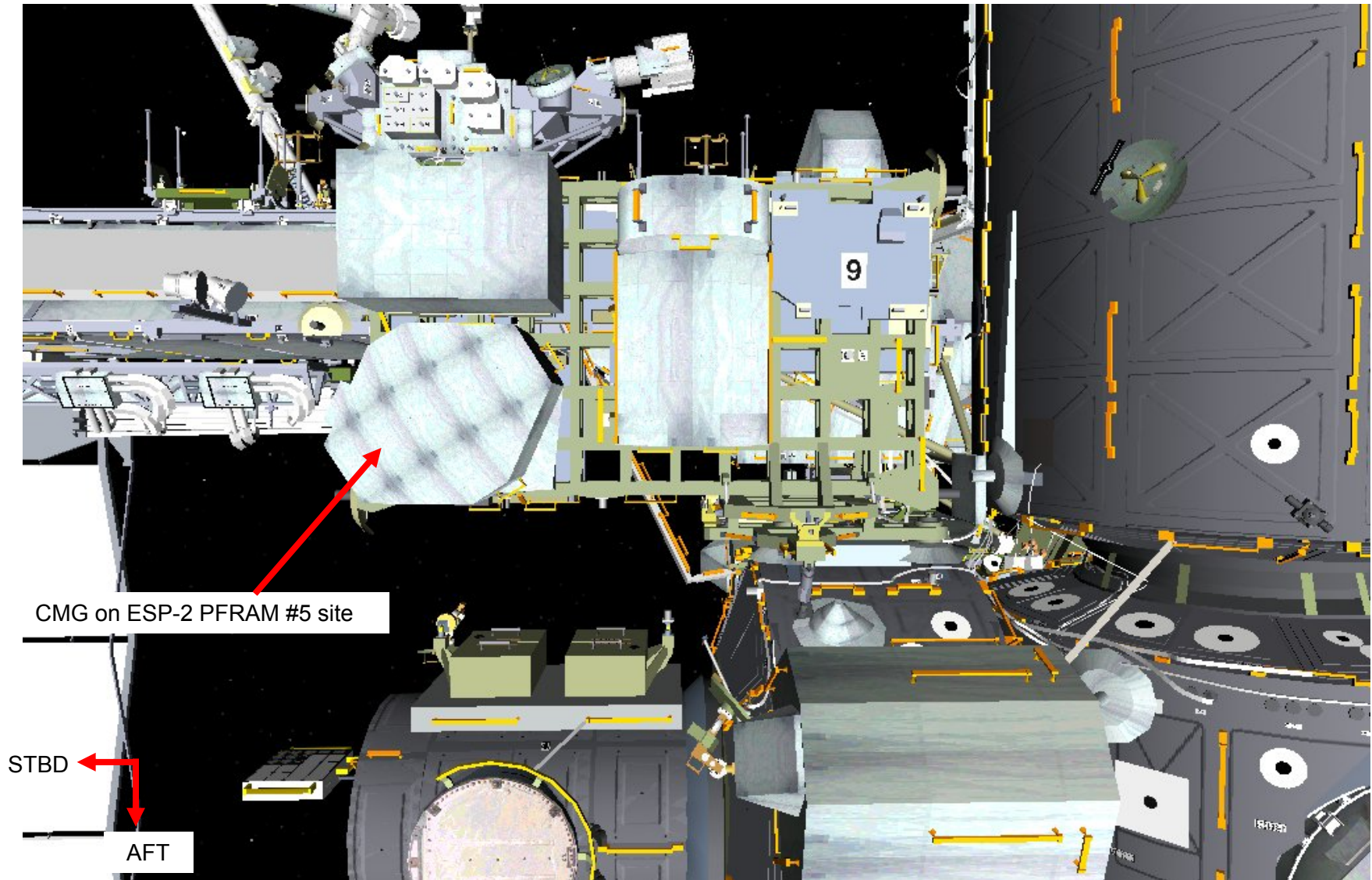
MLI not shown



FS 18-35

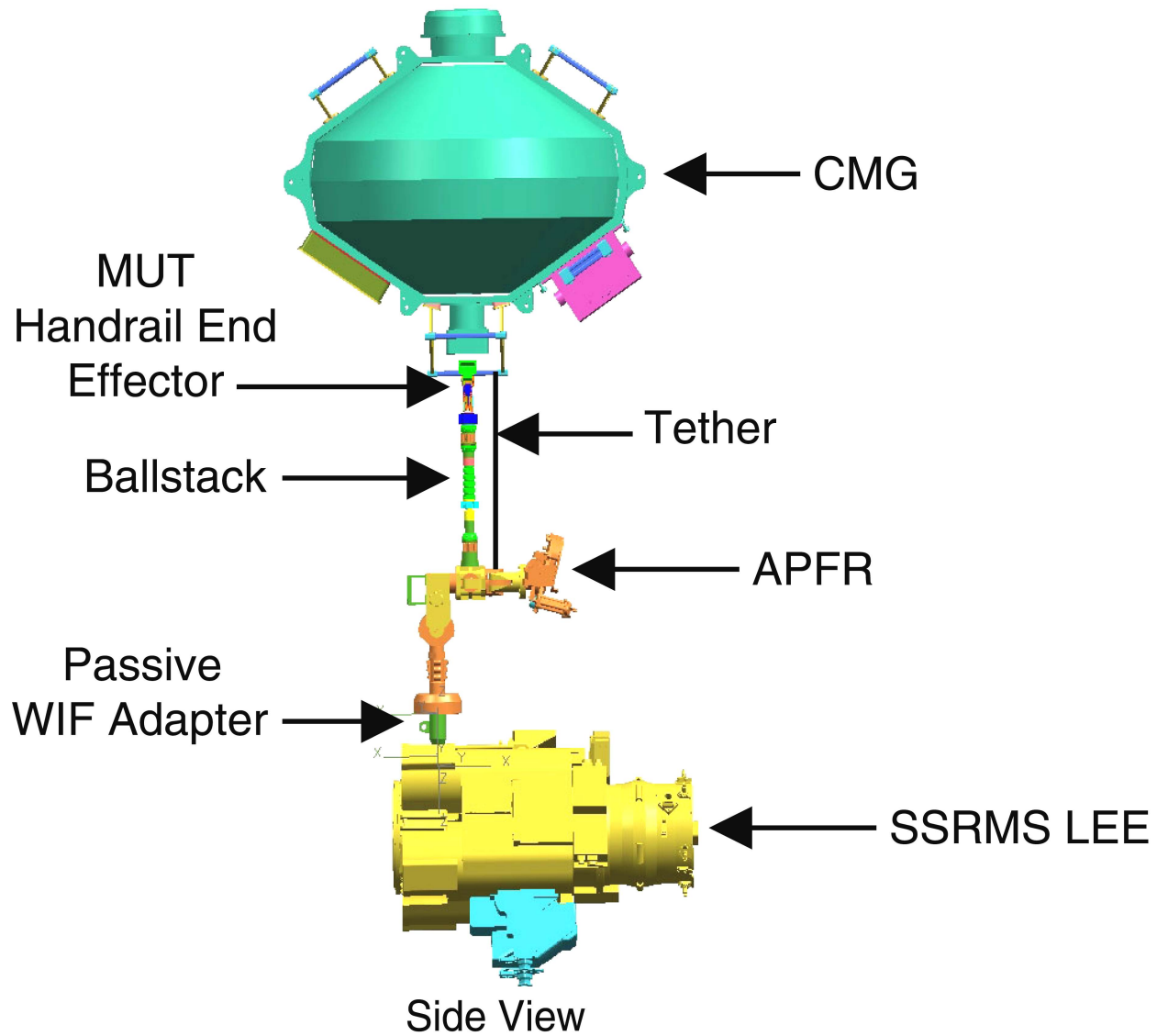
EVA/118/FIN

CMG FRAM ON ESP-2



ESP-2 view looking zenith

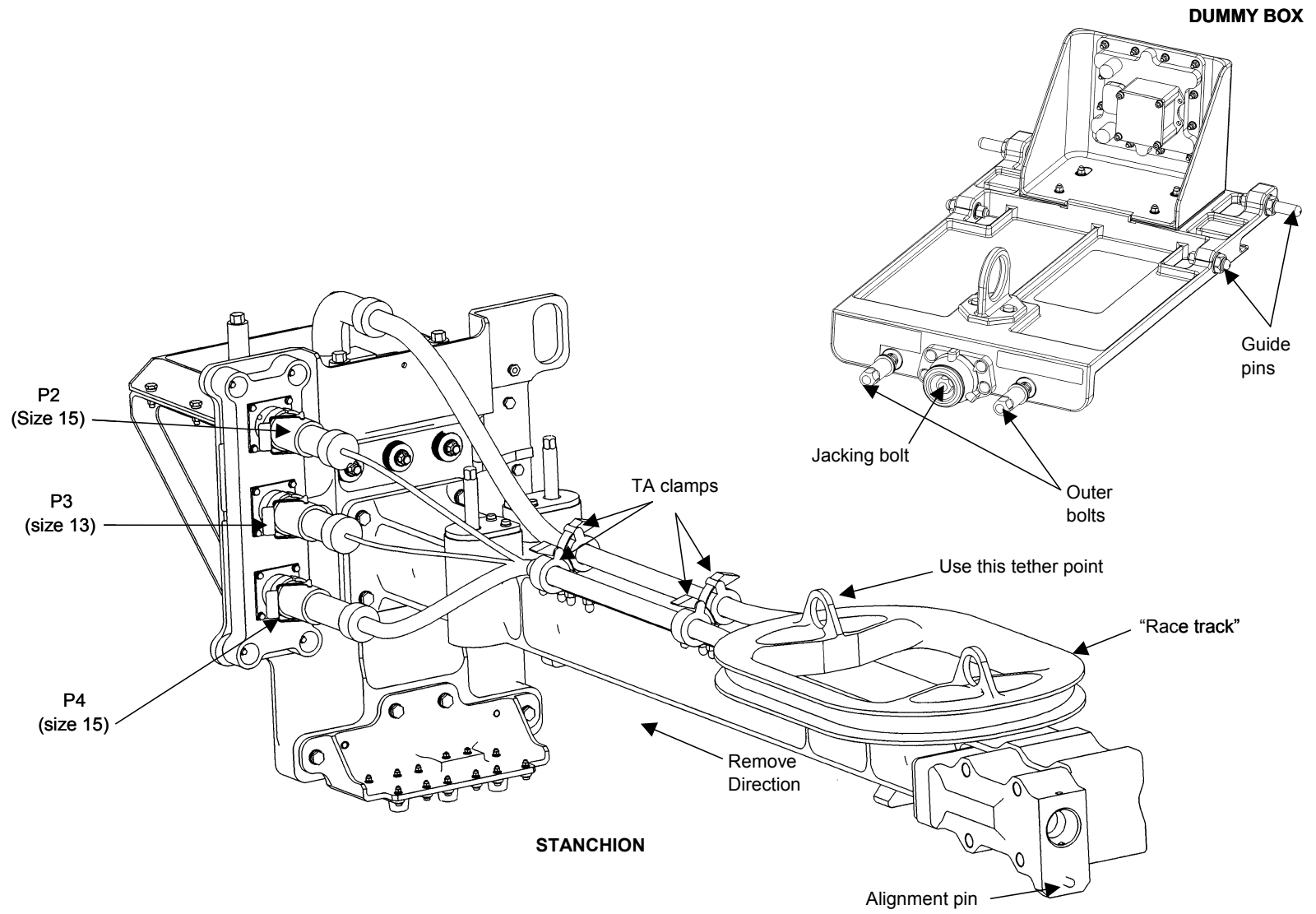
RAPID SAFING CMG STOW



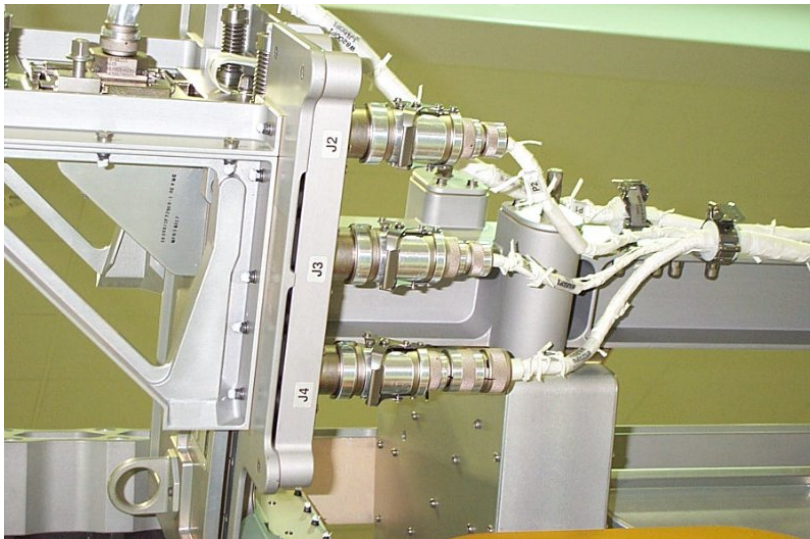
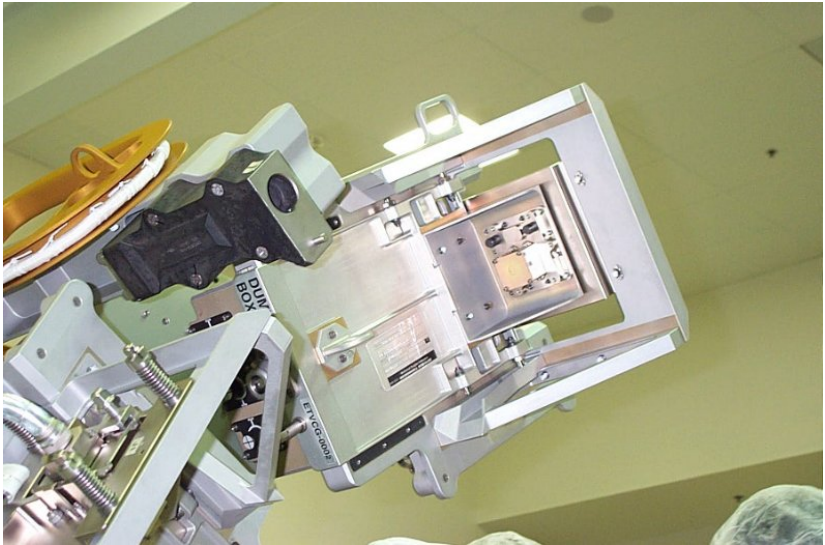
FS 18-37

EVA/118/FIN

VSSA LINE DRAWINGS



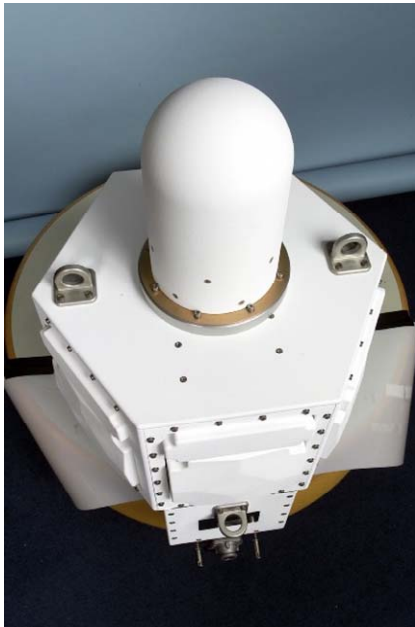
VSSA PICTURES



WETA ASSY AND S3 CP1 INSTALL BRACKET



WETA ASSY AND S3 CP1 INSTALL BRACKET (Cont)

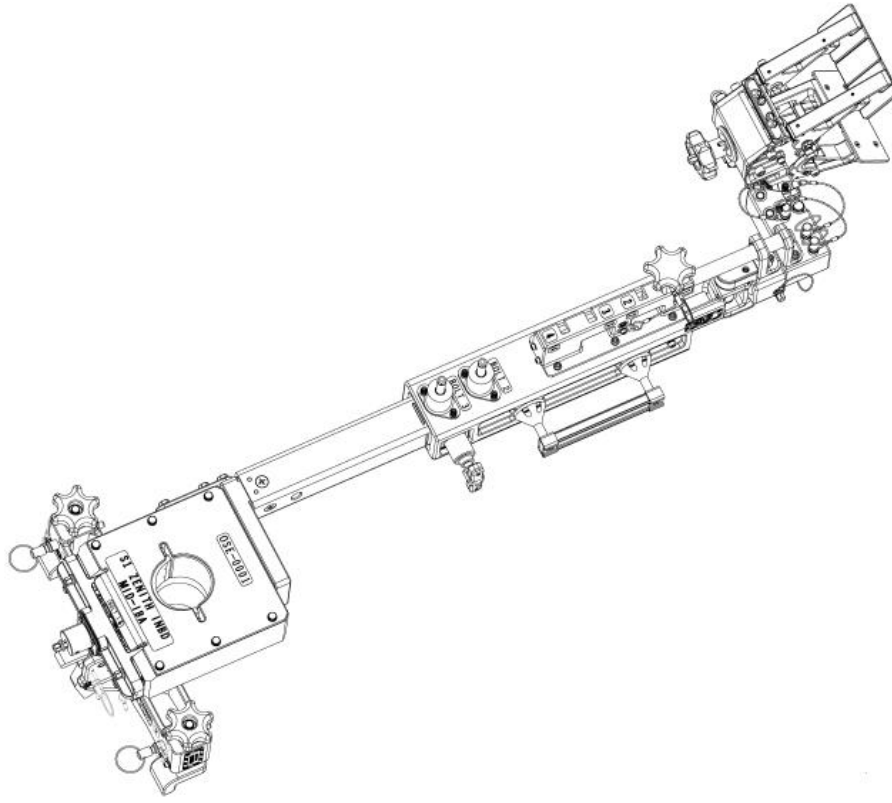


FS 18-41

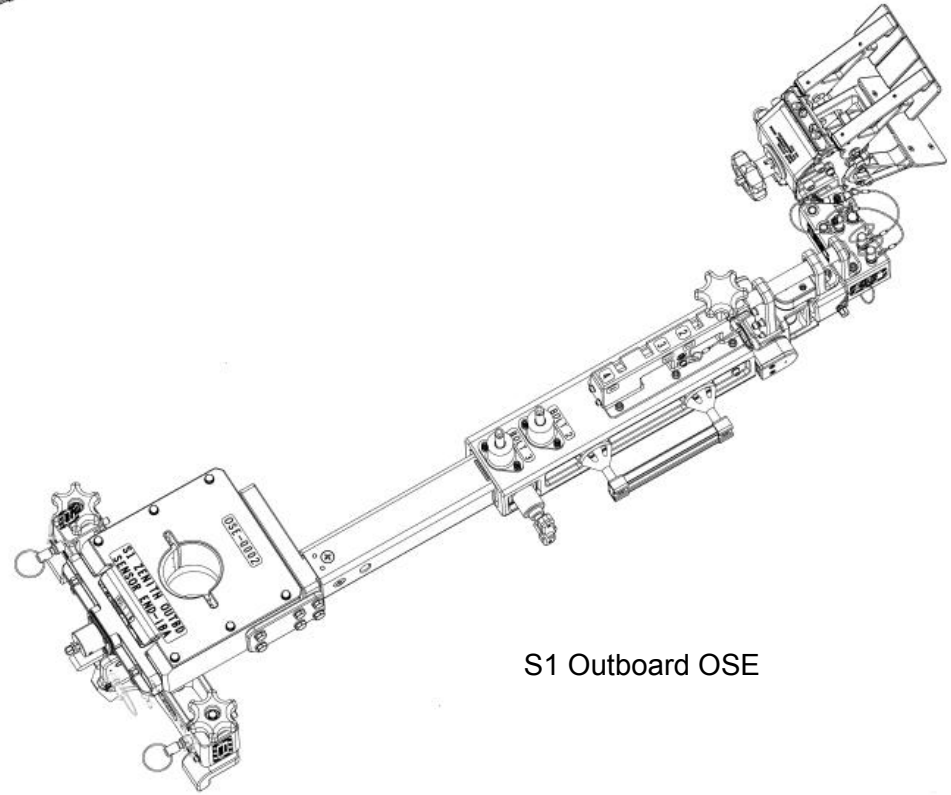
EVA/118/FIN

OBSS OSE

OSE

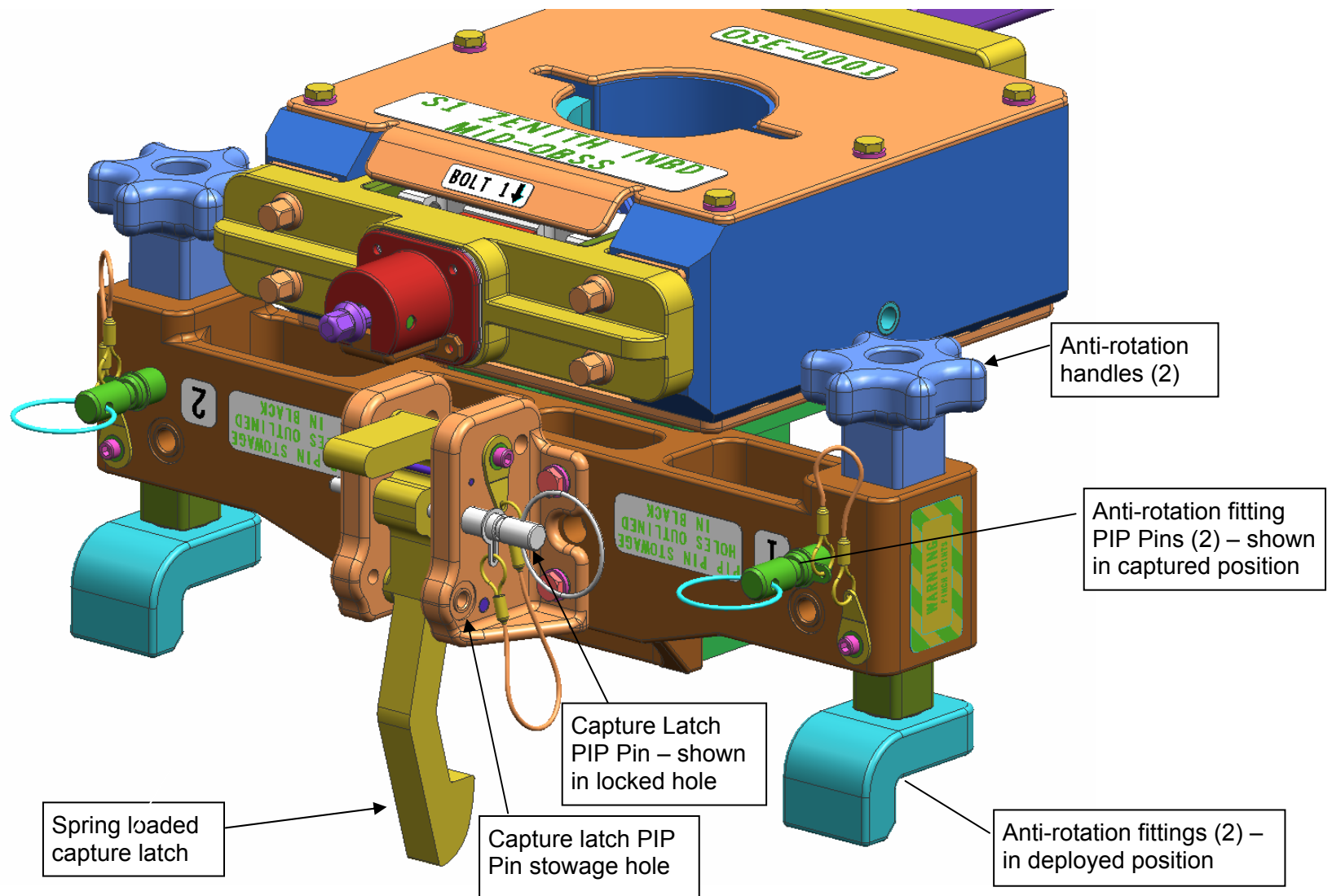


S1 Inboard OSE

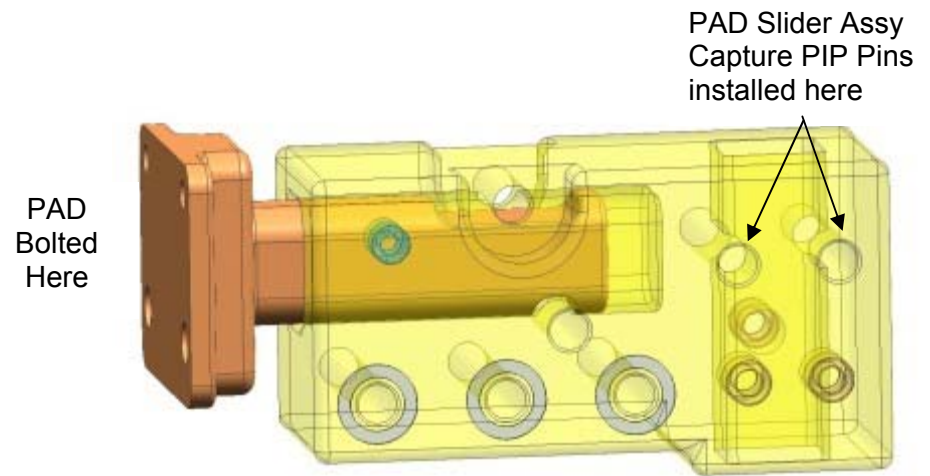
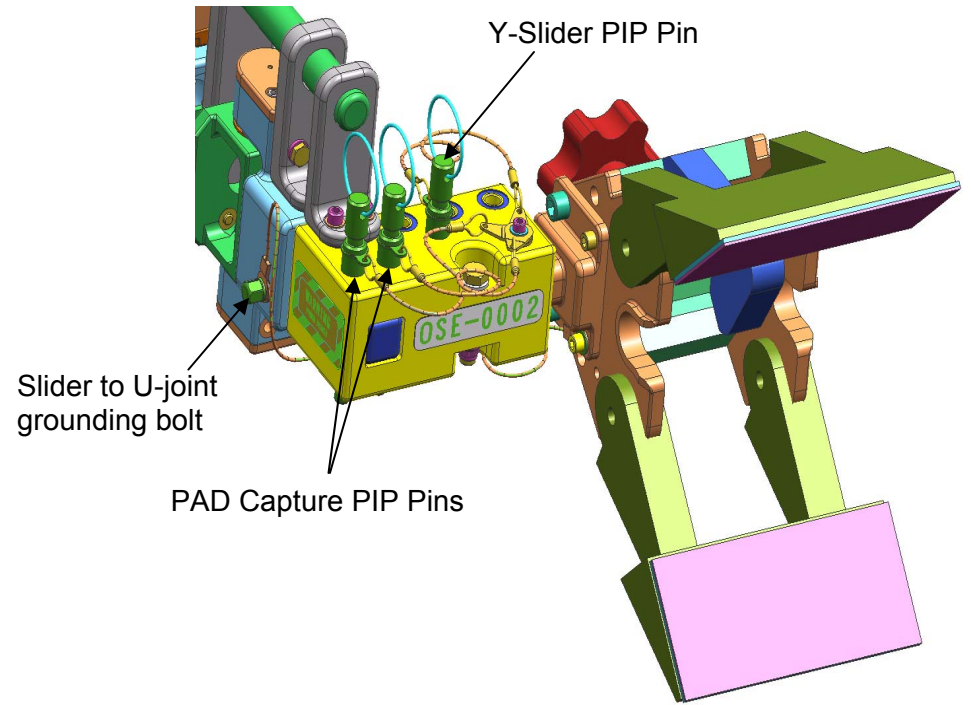
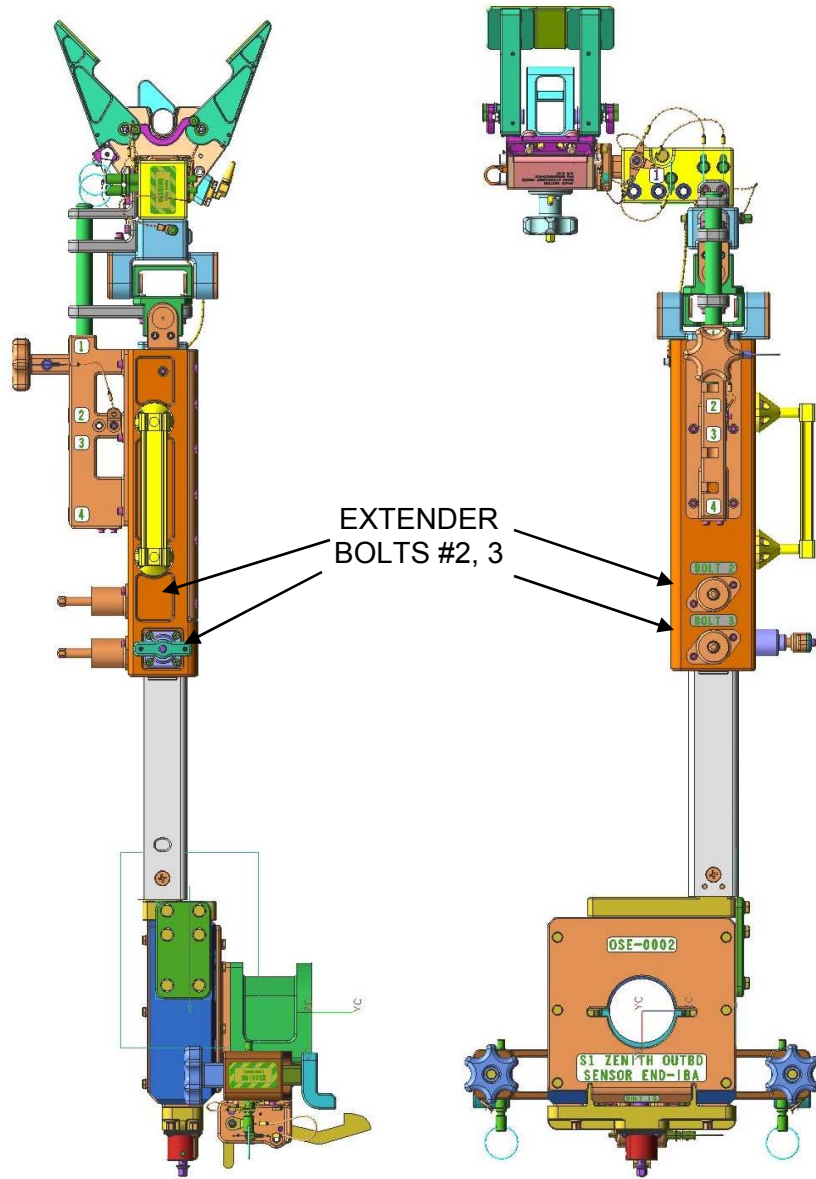


S1 Outboard OSE

OSE (Cont)

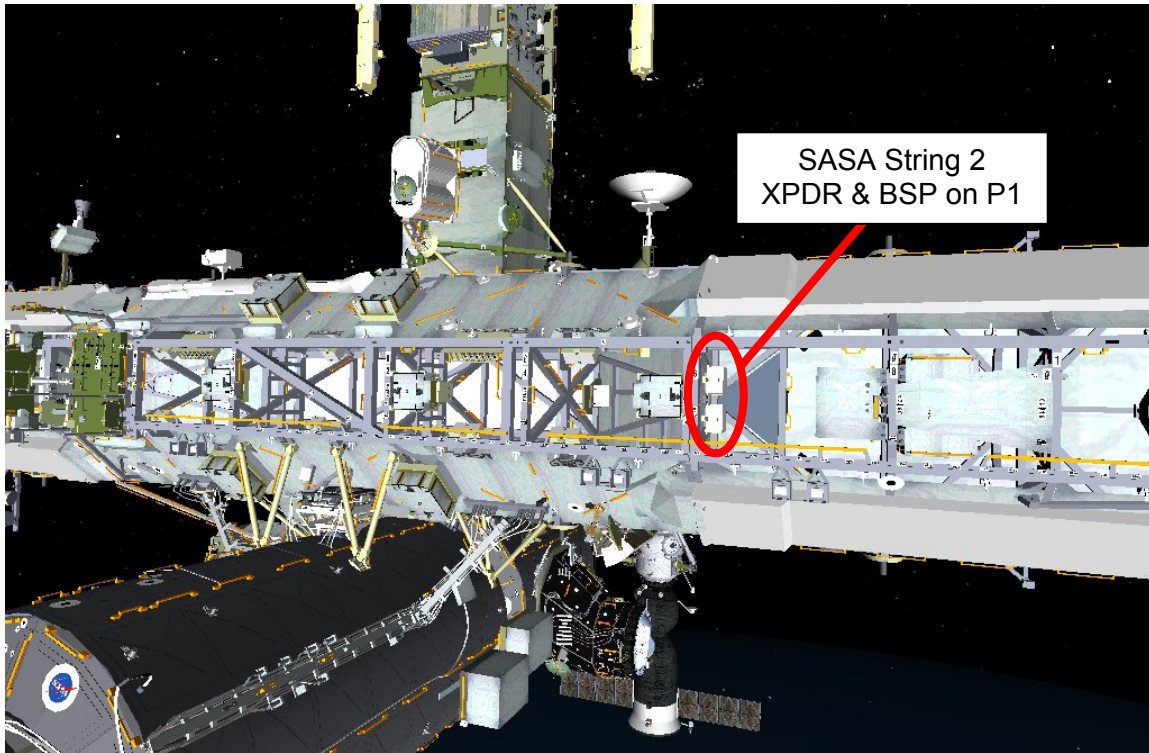


OSE (Cont)



PAD Attachment Slider Assy

P1 SASA XPDR AND BSP LOCATION

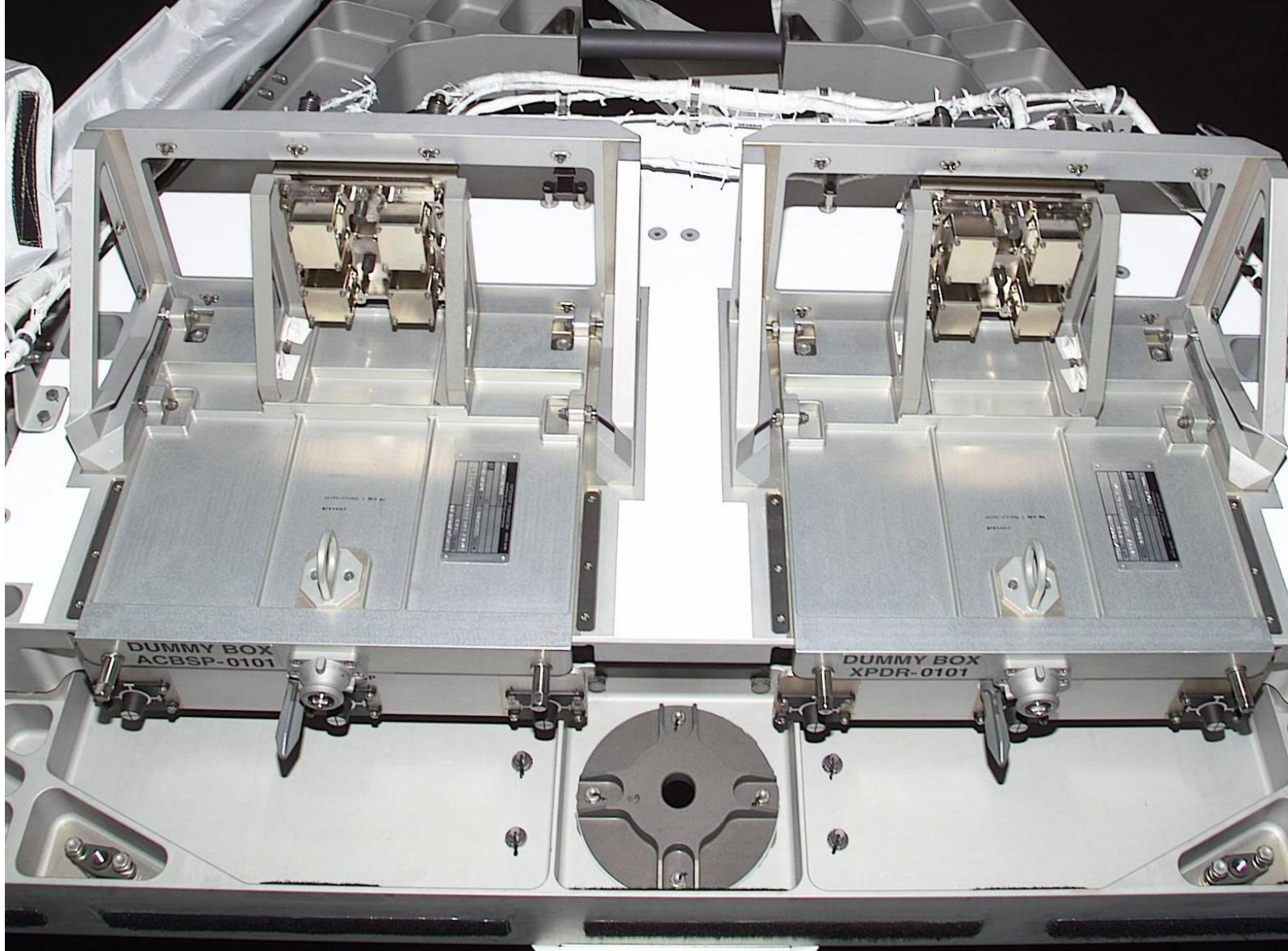


FS 18-45

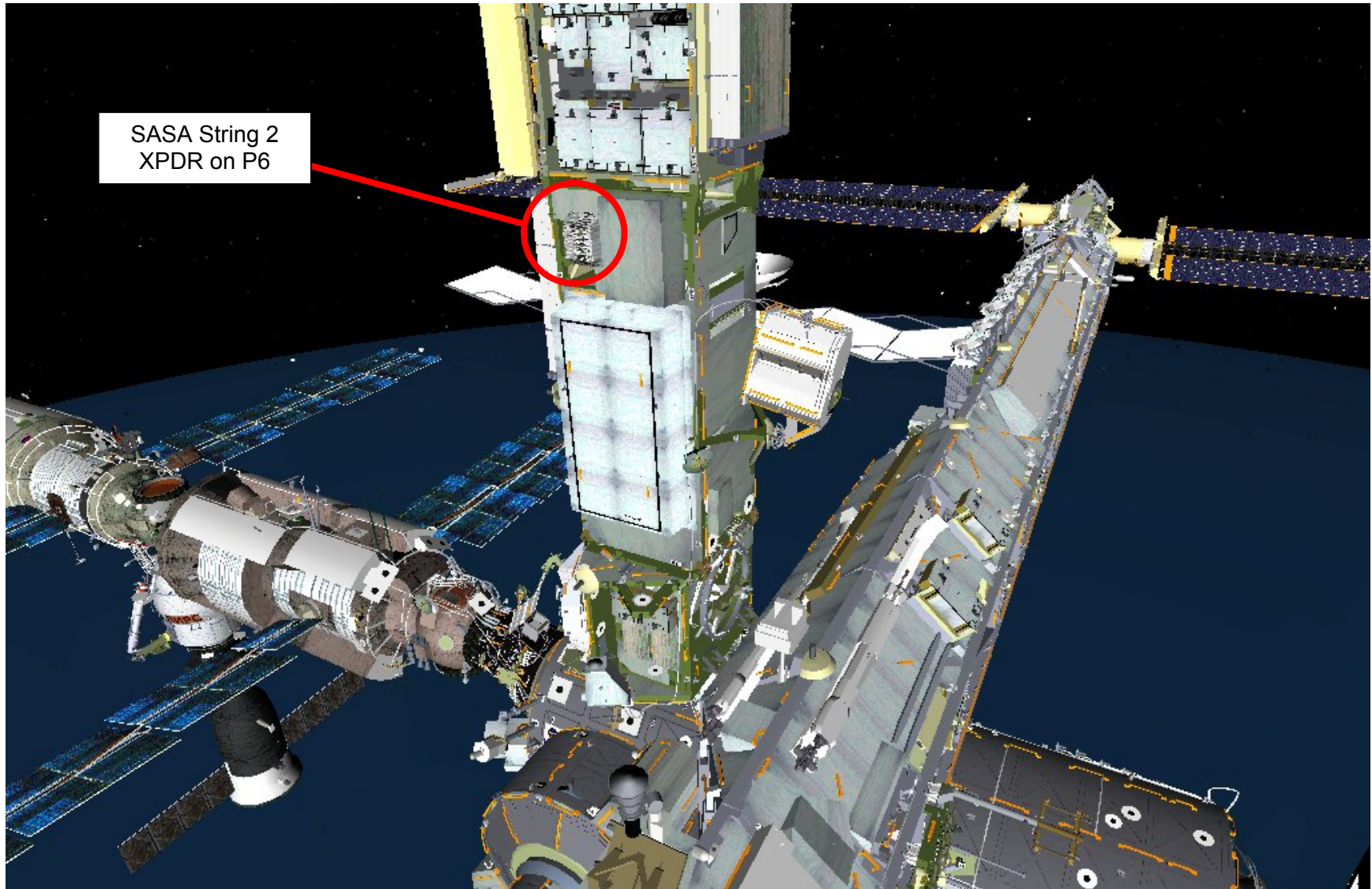
EVA/118/FIN

S-BAND HDW

P1 SASA XPDR AND BSP DUMMY BOXES



P1 SASA XPDR LOCATION



FS 18-47

EVA/118/FIN

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

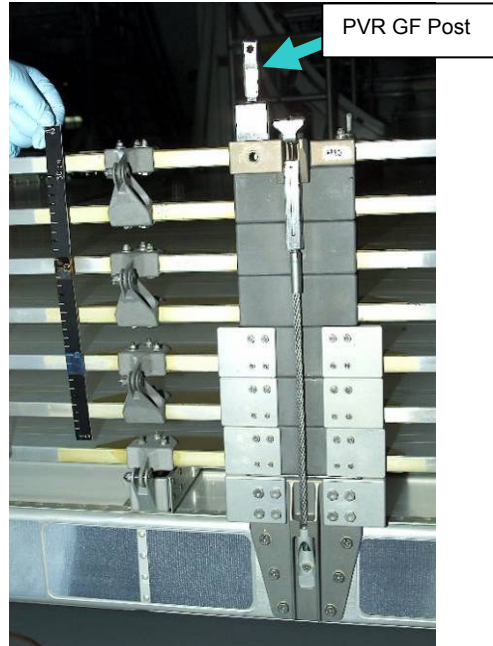


Figure 3. Installed cinch (not tensioned)

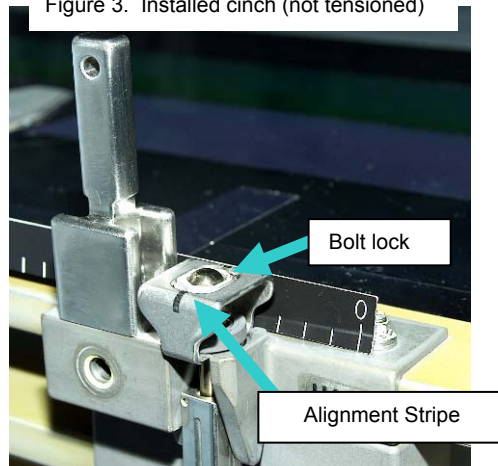
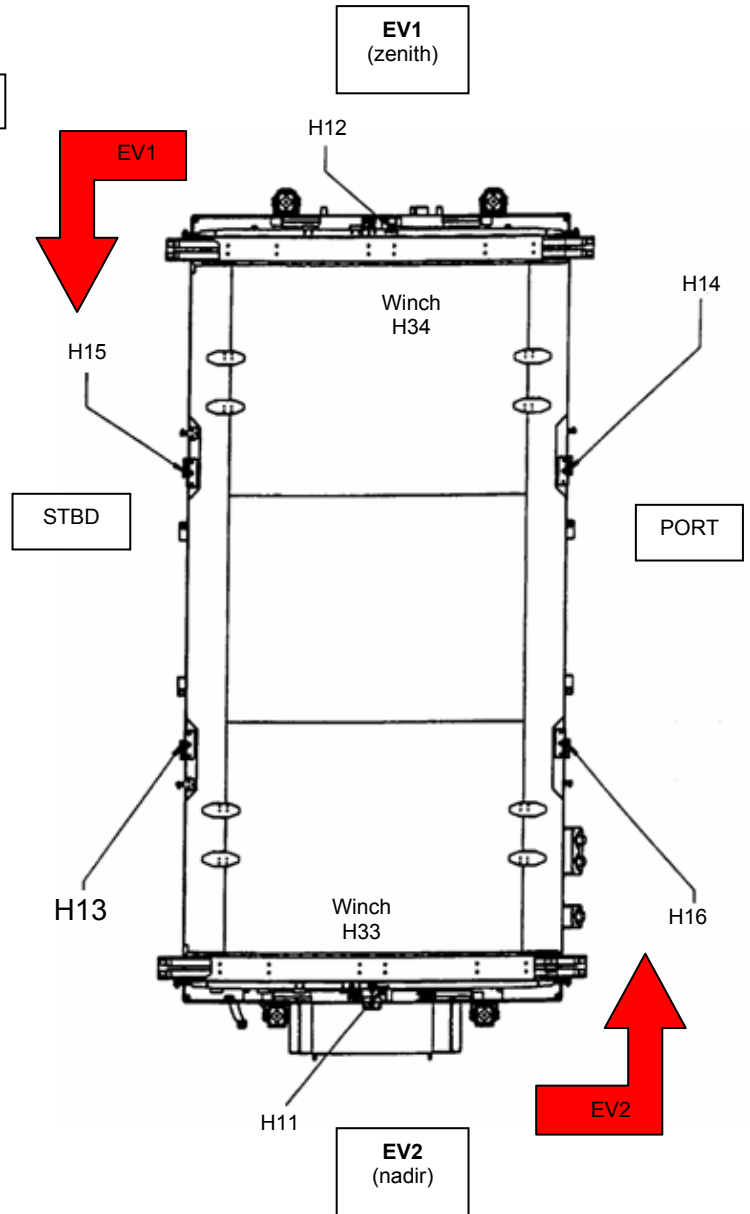
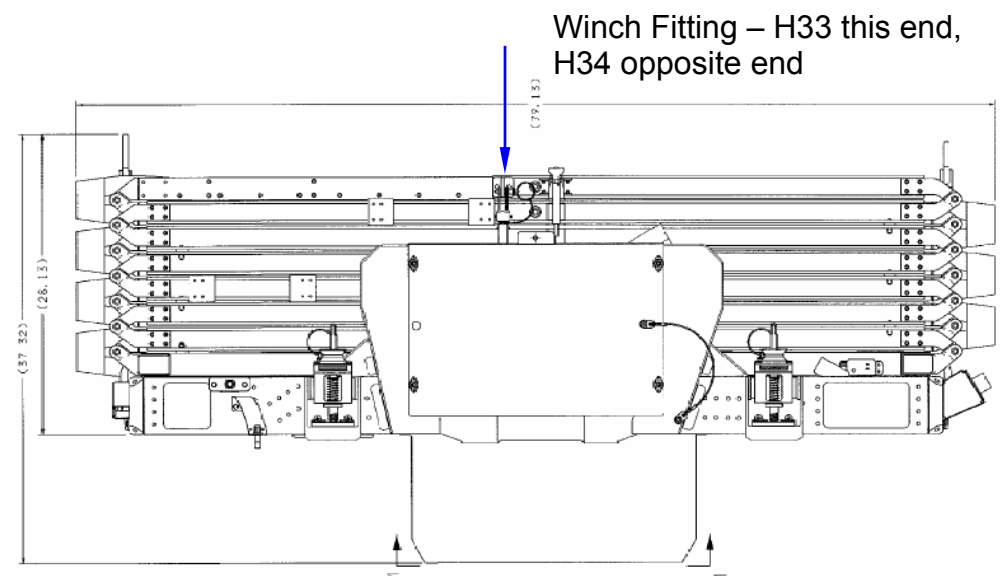
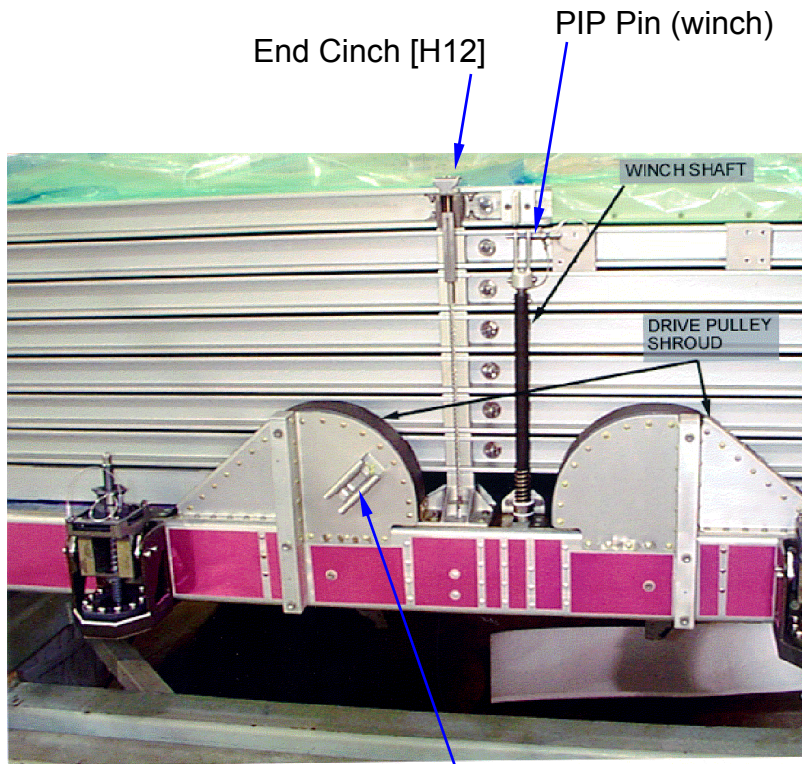


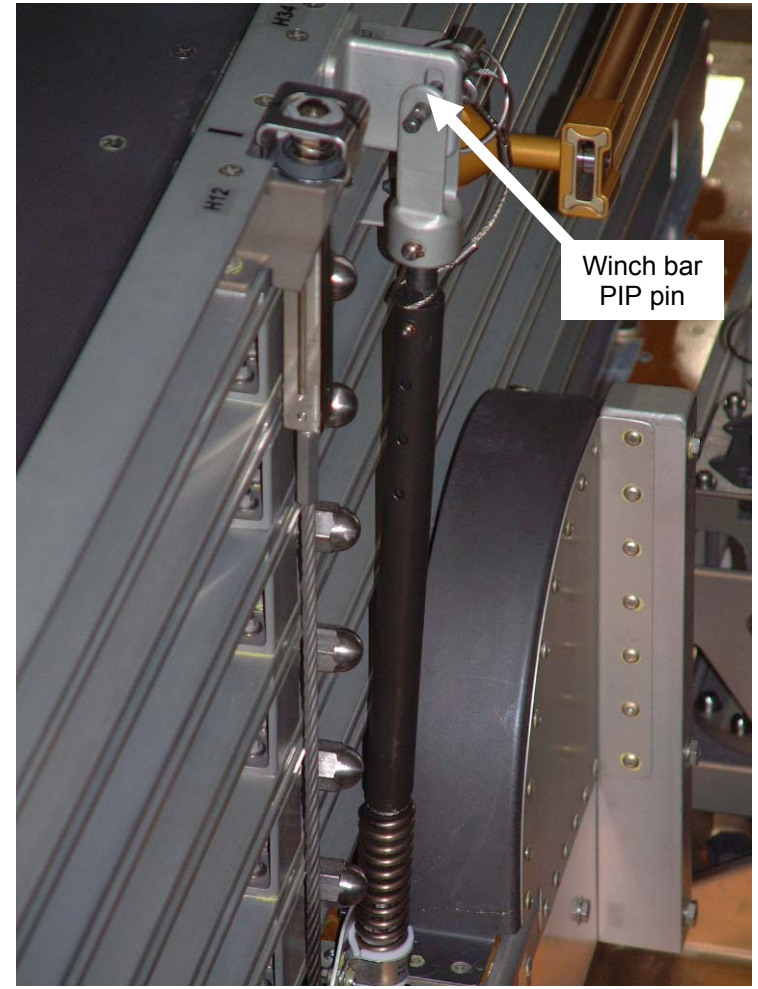
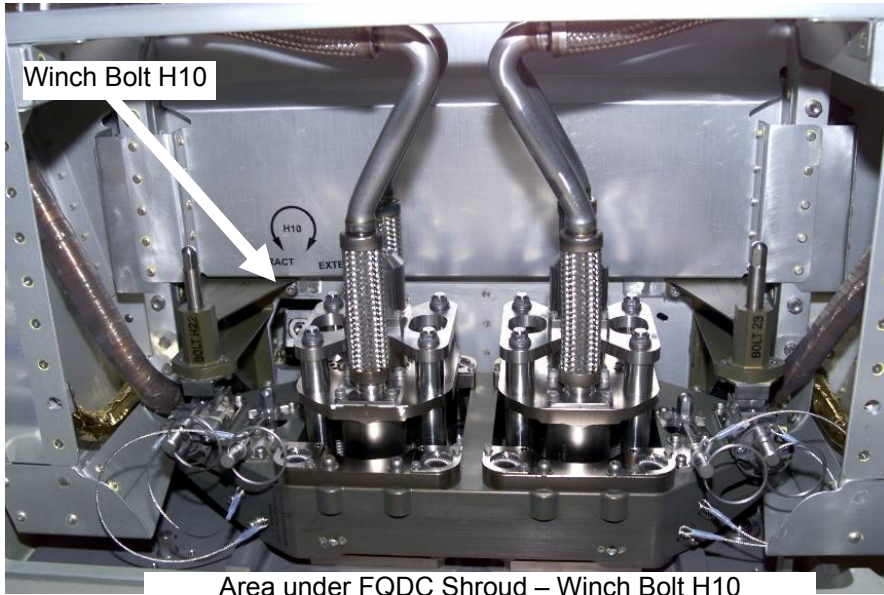
Figure 4. Installed Cinch



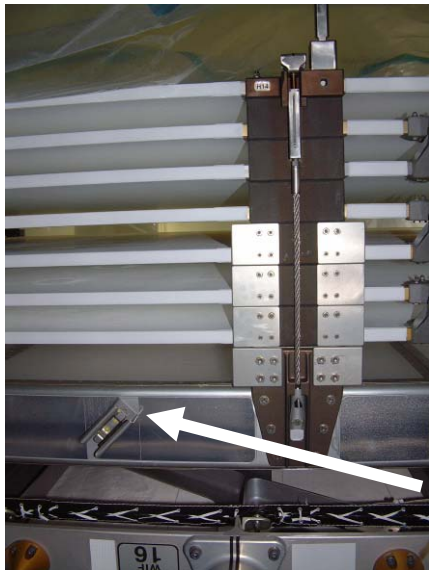
FORWARD RADIATOR CINCH (Cont)



MANUAL OVERRIDE TO RETRACT/WINCH RADIATOR



Winch bar and H12 cinch



Cinch stowage bracket



EVA CHECKLIST

STS
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