

EVA Checklist

STS-131 Flight Supplement

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

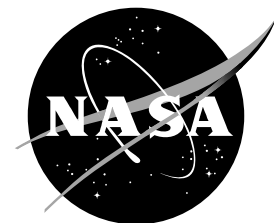
**Final, Rev A
March 17, 2010**

NOTE

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

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas



MISSION OPERATIONS DIRECTORATE

**EVA CHECKLIST
STS-131 FLIGHT SUPPLEMENT**


FINAL, REVISION A
March 17, 2010

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Incorporates the following:			
482#:	EVA FS-00340	EVA FS-00345	EVA FS-00359
	EVA FS-00341	EVA FS-00346	EVA FS-00360
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AREAS OF TECHNICAL RESPONSIBILITY

Book Manager

DX3/J. Mularski

281-483-5316

EVA CHECKLIST
STS-131 FLIGHT SUPPLEMENT

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REV A 03/17/10

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AIRLOCK CONFIG

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AIRLOCK
CONFIG

AIRLOCK PREP (50 min)

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

- AW18A
1. ✓ Inner hatch Equal vlv (two) – OFF
 2. LTG FLOOD (four) – ON
 3. Remove from airlock, as reqd:
 - Airlock Stowage Bag
 - Airlock Floor Pallet using 3/8-in breaker bar, 4-in ext w/3/8-in drive, and 1/2-in socket w/3/8-in drive
 4. Stow Vol H Bags in Vol H
 5. Transfer to airlock:
 - EVA Bag – install on airlock wall
 - DEPRESS/REPRESS Cue Card
 - Helmet Lights
 - Contamination Detection Kit – install on airlock wall
 6. Install IVA foot restraint, as reqd
 7. Unbuckle SCU straps, Velcro SCU to wall
 8. Install EMU lights on helmets (EMU 1, EMU 2) and perform pull test to verify latches fully seated in helmet brackets
 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

EMU CHECKOUT PREP (30 min)

- | | |
|------------------|--|
| Airlock | 1. LTG FLOOD (four) – on |
| A/L Floor Bag | 2. Unpack Mt and Ad LCVGs; temp stow in Airlock for use in EMU C/O |
| | 3. If necessary, remove Airlock Floor Bag from Airlock |
| | 4. Unbuckle SCU straps, Velcro SCU to wall |
| MD23R
(Vol H) | 5. Retrieve SCOFs for use in EMU C/O |
| | 6. Retrieve EMU Servicing Kit s/n 5002 (yellow tag)
for EMU Prep for Transfer to ISS Airlock |
| | 7. Disconnect helmets from EMUs, temp stow |
| | 8. ✓DIDB restraint bags installed |
| | 9. Remove 2 CCAs each from LTA Restraint Bag Kangaroo Pouch;
connect MT1 to EMU 3017 and AD1 to EMU 3008 electrical harnesses
Temp stow CCAs MT2 and AD2 |
| | 10. Remove LTA Restraint Bags |
| | 11. Disconnect waist rings; remove ECOKs |
| | 12. Stow CCAs MT2 and AD2 in ECOKs |
| | 13. Temp stow ECOKs for EMU Prep for Transfer to ISS |
| | 14. Roll and temp stow LTA Restraint Bags on bottom of AAPs |
| | 15. Waist rings – engage position |
| | 16. Connect LTAs to HUTs, lock |
| | 17. Unstow ISS EVA Cuff C/L (2) from SODF locker
Install Mt, Ad C/L on EMUs, left arm |

LTA RESTRAINT STRAP REMOVAL (15 min)

NOTE

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

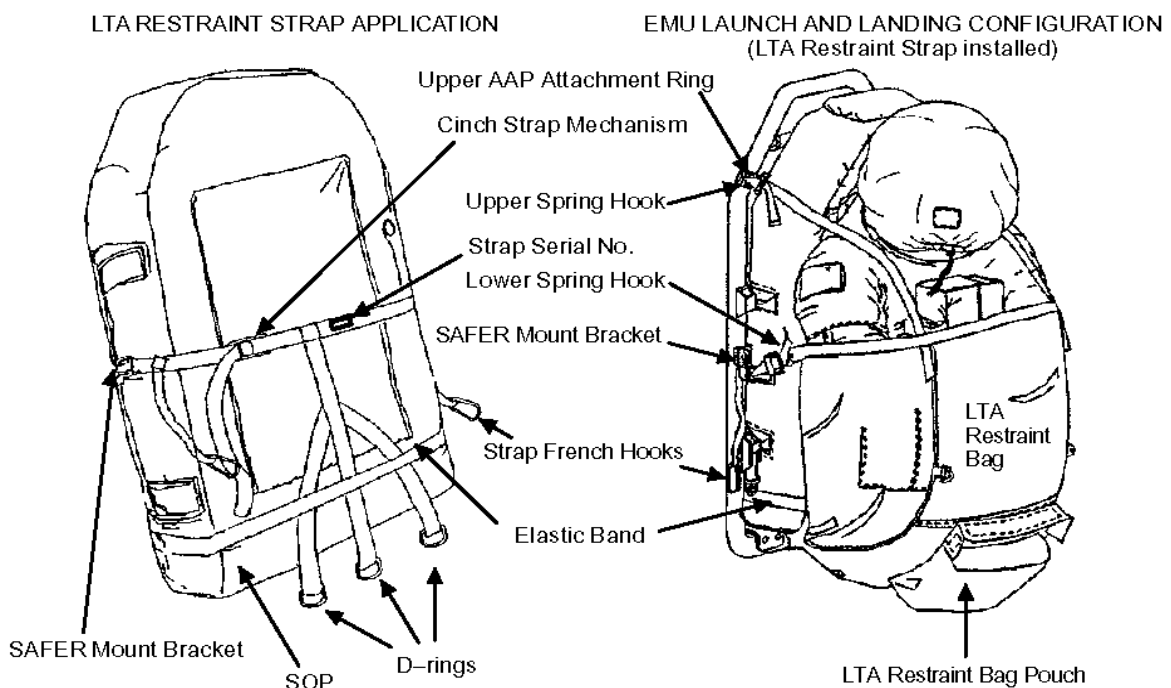
1. As reqd, remove comm cap from LTA Restraint Bag; temp stow
2. Remove EMU from AAP
3. Disconnect all restraint attachments from SAFER mount brackets (two)
4. Loosen cinch strap mechanism, remove SAFER mount brackets
5. Remove strap from PLSS
6. Stow strap in LTA Restraint Bag Pouch with D-rings (three)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

LTA RESTRAINT STRAP INSTALLATION (15 min)

NOTE

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

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



NOTE

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

EMU PREP FOR TRANSFER TO ISS (90 min)

- BOTH EMUs/
DCM
1. ✓ SCOFs stowed in EMU Equipment Bag in main compartment
 2. Stow EMU Equipment Bag in Vol H Inboard Bag and restow in Vol H
 3. ✓ PWR – SCU
 4. ✓ PURGE vlv – op (up)
 5. ✓ WATER – OFF, switch guard installed
 6. ✓ O₂ ACT – OFF
 7. Configure/verify items according to tables below:

<p style="text-align: center;">EMU 3017 (Mt)</p> <input type="checkbox"/> DIDB Restraint Bag (verified during EMU C/O) <input type="checkbox"/> Comm Cap (MT1) (installed during EMU C/O) <input type="checkbox"/> Helmet (✓sun shade down, cover installed) <ul style="list-style-type: none"> <input type="checkbox"/> Valsalva <input type="checkbox"/> Fresnel Lens <input type="checkbox"/> EMU Gloves (MT1) <input type="checkbox"/> Cuff C/L <input type="checkbox"/> Wrist Mirror (2) <input type="checkbox"/> LTA <input type="checkbox"/> Multiple Water Connector Cover	<p style="text-align: center;">EMU 3008 (Ad)</p> <input type="checkbox"/> DIDB Restraint Bag (verified during EMU C/O) <input type="checkbox"/> Comm Cap (AD1) (installed during EMU C/O) <input type="checkbox"/> Helmet (✓sun shade down, cover installed) <ul style="list-style-type: none"> <input type="checkbox"/> Valsalva <input type="checkbox"/> Fresnel Lens <input type="checkbox"/> EMU Gloves (AD1) <input type="checkbox"/> Cuff C/L <input type="checkbox"/> Wrist Mirror (2) <input type="checkbox"/> Adj Wrist Tethers s/ns 1104 & 1105 (2) <input type="checkbox"/> LTA <input type="checkbox"/> Multiple Water Connector Cover
<p style="text-align: center;">EMU Crew Options Kit (Mt)</p> <input type="checkbox"/> ECOK – Mesh Bag <ul style="list-style-type: none"> <input type="checkbox"/> Mt EVA 1, 2 & 3 Ziplock Bags <ul style="list-style-type: none"> <input type="checkbox"/> 2 per EVA, 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"/> Velcro <input type="checkbox"/> Glass Retention Device <ul style="list-style-type: none"> <input type="checkbox"/> EV1 identifier stripes <input type="checkbox"/> Mission patch <input type="checkbox"/> US flag <input type="checkbox"/> Comm Cap (MT2) <input type="checkbox"/> Crew personal items for Campout (as reqd) <input type="checkbox"/> Mesh Bags (3) <ul style="list-style-type: none"> – Remove ‘EVA Systems Transfer’ Bag <input type="checkbox"/> LCVG	<p style="text-align: center;">EMU Crew Options Kit (Ad)</p> <input type="checkbox"/> ECOK – Mesh Bag <ul style="list-style-type: none"> <input type="checkbox"/> Ad EVA 1, 2 & 3 Ziplock Bags <ul style="list-style-type: none"> <input type="checkbox"/> 2 per EVA, 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"/> Velcro <input type="checkbox"/> Glass Retention Device <ul style="list-style-type: none"> <input type="checkbox"/> Croakie <input type="checkbox"/> EV2 identifier stripes <input type="checkbox"/> Mission patch <input type="checkbox"/> US flag <input type="checkbox"/> Comm Cap (AD2) <input type="checkbox"/> Crew personal items for Campout (as reqd) <input type="checkbox"/> LCVG

EVA Systems Transfer Bag	
Current Location	Item
Vol H	<input type="checkbox"/> EMU Servicing Kit s/n 5002 (Yellow Tag)
FDF Locker	<input type="checkbox"/> <u>STS-131 CONSUMABLES TRACKING CUE CARD</u> (1 of 1) (Battery Recharge Cue Card on back) <input type="checkbox"/> <u>EMERGENCY UNDOCKING EVA TRANSFER CUE CARD</u> (1 of 1) (Expedited Suit Doffing on back) <input type="checkbox"/> STS-131 EVA Checklist (yellow) (green stays on shuttle)
SODF Locker	<input type="checkbox"/> ISS EVA Systems Checklists (yellow) (green stays on shuttle) <input type="checkbox"/> Joint Emergency Egress Cue Card (1)
A/L Floor Bag	<input type="checkbox"/> DIDBs (6) to fill FD3 <input type="checkbox"/> EMU LiOH Canisters (4) <input type="checkbox"/> 85-ft Safety Tether s/n 1006, Decal # 26
MD Ceil Bag E	<input type="checkbox"/> BRT s/n 1008

POST-DOCKING EVA TRANSFER (30 min)

NOTE

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

1. Transfer the following EVA equipment from Shuttle to ISS:

Item	Initial Location (On Shuttle)	Final Destination (On ISS)
EMU 3017 (Mt)	Shuttle A/L	E-Lk Aft EDDA
EMU 3008 (Ad)	Shuttle A/L	E-Lk Fwd EDDA
EVA Systems Transfer Bag	Middeck	E-Lk
ECOK (Mt)	Middeck	E-Lk
ECOK (Ad)	Middeck	E-Lk

POST-DOCKING EVA RECONFIG (45 min)

1. Deploy items from EVA Systems Transfer Mesh Bag as follows.
Additional items will be deployed during Tool Config

Item	Final Destination (On ISS)
<input type="checkbox"/> <u>STS-131 CONSUMABLES TRACKING CUE CARD</u> (1 of 1) <input type="checkbox"/> <u>EMERGENCY UNDOCKING EVA TRANSFER CUE CARD</u> (1 of 1) <input type="checkbox"/> STS-131 EVA Checklist (yellow)	E-Lk deployed
<input type="checkbox"/> ISS EVA Systems Checklists (yellow) <input type="checkbox"/> Joint Emergency Egress Cue Card (1)	E-Lk deployed
<input type="checkbox"/> DIDBs (6) <input type="checkbox"/> EMU LiOH Canisters (4) <input type="checkbox"/> 85-ft Safety Tether s/n 1006, Decal # 26 <input type="checkbox"/> EMU Servicing Kit s/n 5002 (Yellow Tag) – do not use	Keep in EVA Systems Transfer Bag
<input type="checkbox"/> BRT s/n 1008	E-Lk deployed on MWS
<input type="checkbox"/> Taped BRT s/n 1017 from ISS	EVA Systems Transfer Bag

EMUs 3017/
3008

2. Check s/ns of installed LiOH and EMU Batteries
Fill in LiOH s/ns for EVA 1 and verify EMU batteries
per STS-131 EVA CONSUMABLES TRACKING CUE CARD

SCU ROUTING

1. Route ISS SCUs as shown. Pouches stay in their current locations

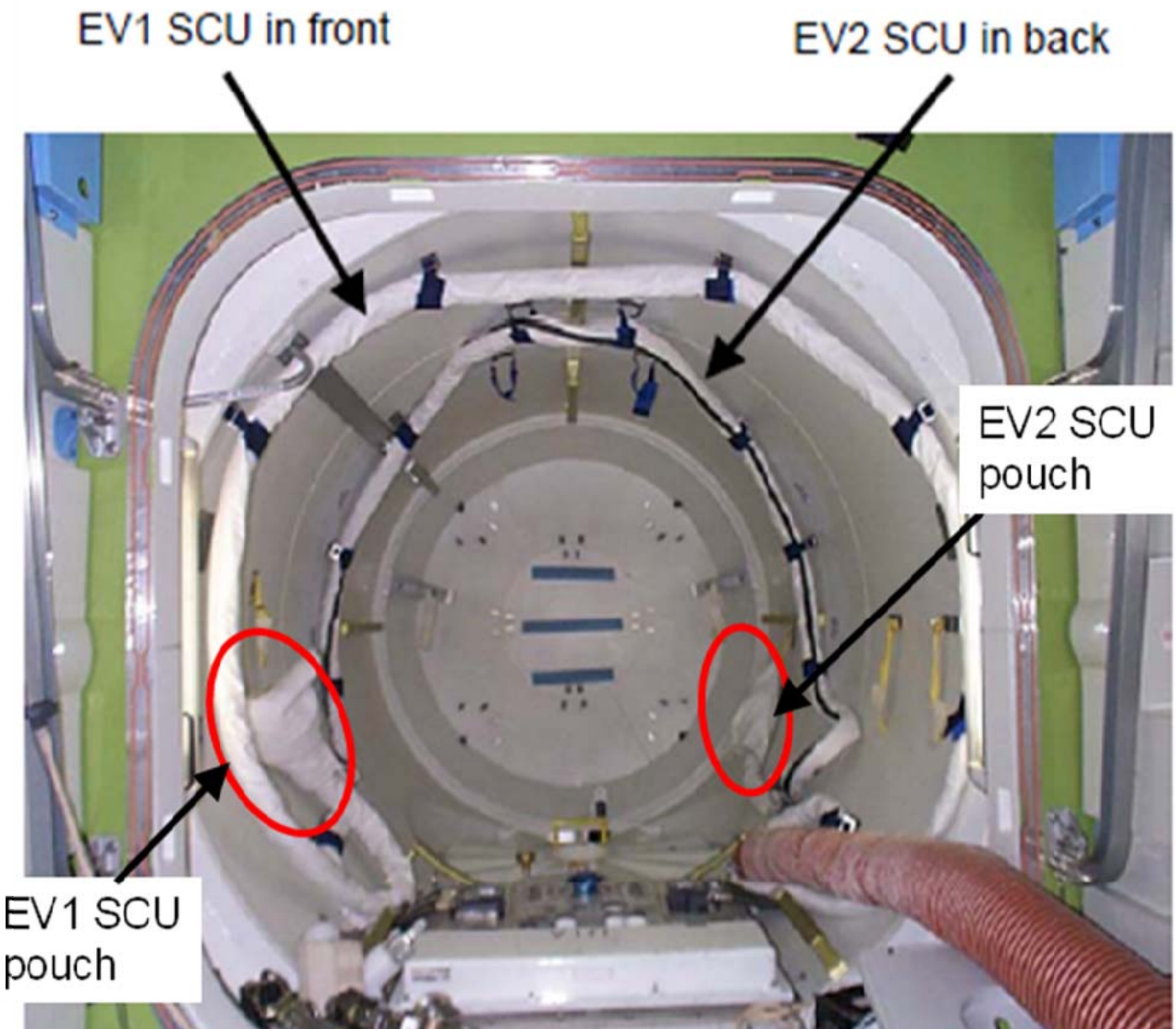


Figure 1.- SCU Routing for EVA 2

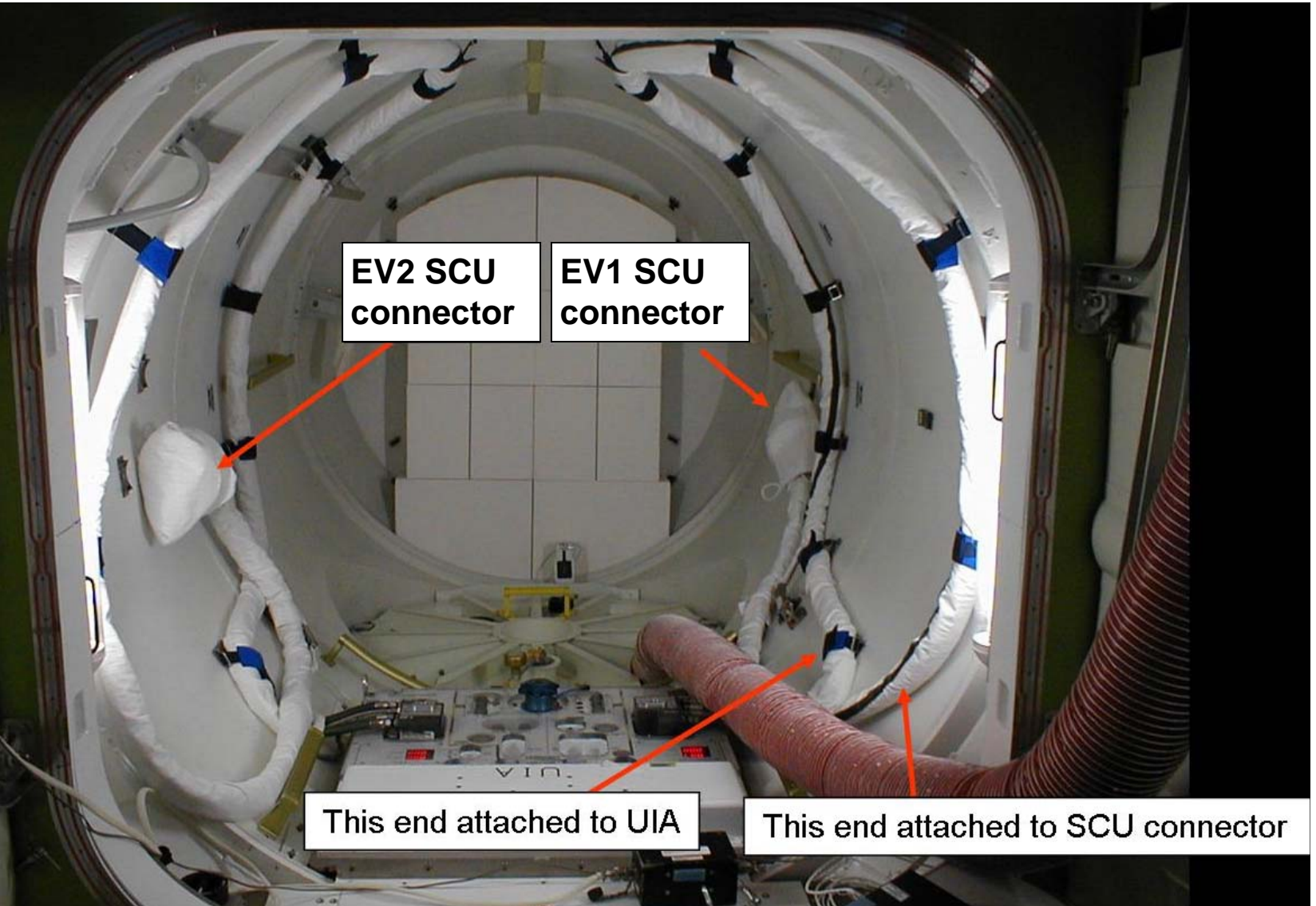


Figure 2.- Nominal SCU Routing

POST EVA EMU RECONFIG (150 min)

I

NOTE

This procedure assumes the following procedure has been completed following EVA 3:

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

Generic sizing procedure may be used for reference: {1.550 EMU Resize} (SODF: ISS EVA SYS: EVA PREP/POST).

Figures in the STS-131 NOMINAL EMU SIZING, FS 12-29 may be used for reference

- | | |
|--------------------|---|
| EMUs 3017/
3008 | <ol style="list-style-type: none"> 1. Remove the following and stow in M-02 s/n 1038: <ul style="list-style-type: none"> <input type="checkbox"/> REBAs <input type="checkbox"/> Helmet Light batteries 2. Remove D-ring Extenders
Stow on Tether Staging Area 3. Remove Helmet Lights/EMU TV assembly
Temp stow in ISS Equipment Lock
EMU TV IDs 18, 19, & 20 stay on ISS; ID 16 return in MPLM 4. Remove valsalva devices and fresnel lenses from helmets; stow fresnel lens in ECOK; temp stow helmets 5. Remove prime Comm Cap and ISS Cuff Checklists
Stow in EVA Systems Transfer Bag |
| ECOKs | <ol style="list-style-type: none"> 6. Remove back-up Comm Caps; stow in EVA Systems Transfer Bag 7. Remove LCVGs; stow in EVA Systems Transfer Bag |
| EMU 3010 | <ol style="list-style-type: none"> 8. Remove assembled LTA s/n 2074 (waist s/n 031) and Helmet s/n 1079; temp stow for installation on EMU 3017 |
| EMU 3017 | <ol style="list-style-type: none"> 9. Remove assembled LTA s/n 2089 (waist s/n 047); temp stow 10. Install assembled LTA s/n 2074 (waist s/n 031) and Helmet s/n 1079; verify cams per figure 1 below |
| EMU 3010 | <ol style="list-style-type: none"> 11. Install assembled LTA s/n 2089 (waist s/n 047) and Helmet s/n 1082 |

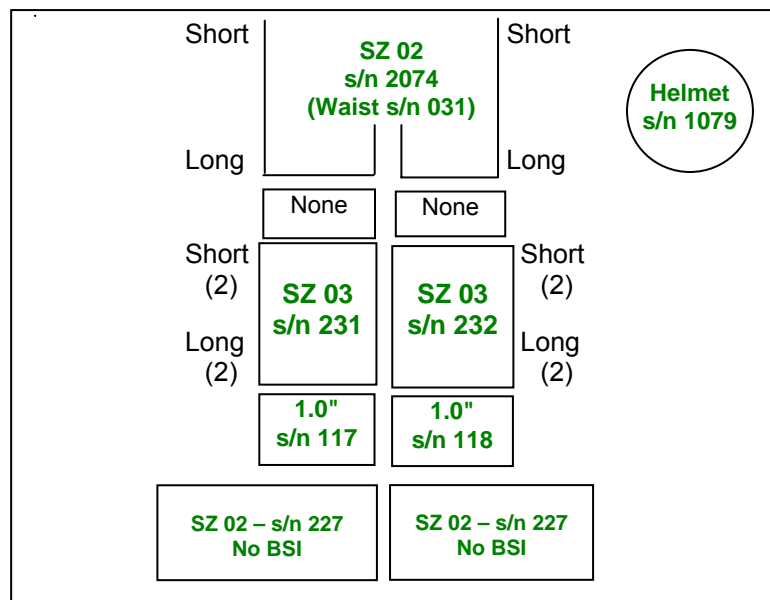


Figure 1.- Mt (EMU 3017) Return LTA Configuration

- EMU 3009 12. Remove Legs, Sizing Rings (if installed), and Boots; temp stow for re-install on EMU 3009
- 13. Remove Waist Brief s/n 2084 (waist s/n 002) and Helmet s/n 1077; temp stow for install on EMU 3008
- 14. Install Helmet s/n 1081
- EMU 3008 15. Remove Legs, 1.0" Leg Sizing Rings, and Boots; temp stow for re-install on EMU 3008
- 16. Remove Waist Brief s/n 2088 (waist s/n 048); temp stow
- 17. Install Waist Brief s/n 2084 (waist s/n 002); verify cams per figure 2
- 18. Install Legs, 1.0" Leg Sizing Rings, and Boots from temp stow in step 15
- 19. Disconnect upper and lower arm power harness; disconnect AD1 Gloves; temp stow
- M-02 Bag 1010 20. Retrieve Lower Arms s/n 321 & 322; temp stow
- EMU 3008 21. Remove Lower Arms s/n 431 & 432 and stow in M-02 Bag s/n 1010 in the Arms and Legs CTB
- 22. Install Lower Arms s/n 321 & 322 (red right) and Helmet s/n 1077
- 23. Reconnect AD1 Gloves; \sqrt locked
Reconnect upper arm power harness
Verify cams per figure 2
- EMU 3009 24. Install Waist Brief s/n 2088 (waist s/n 048); re-install Legs, Leg Sizing Rings (if installed), and Boots from step 12

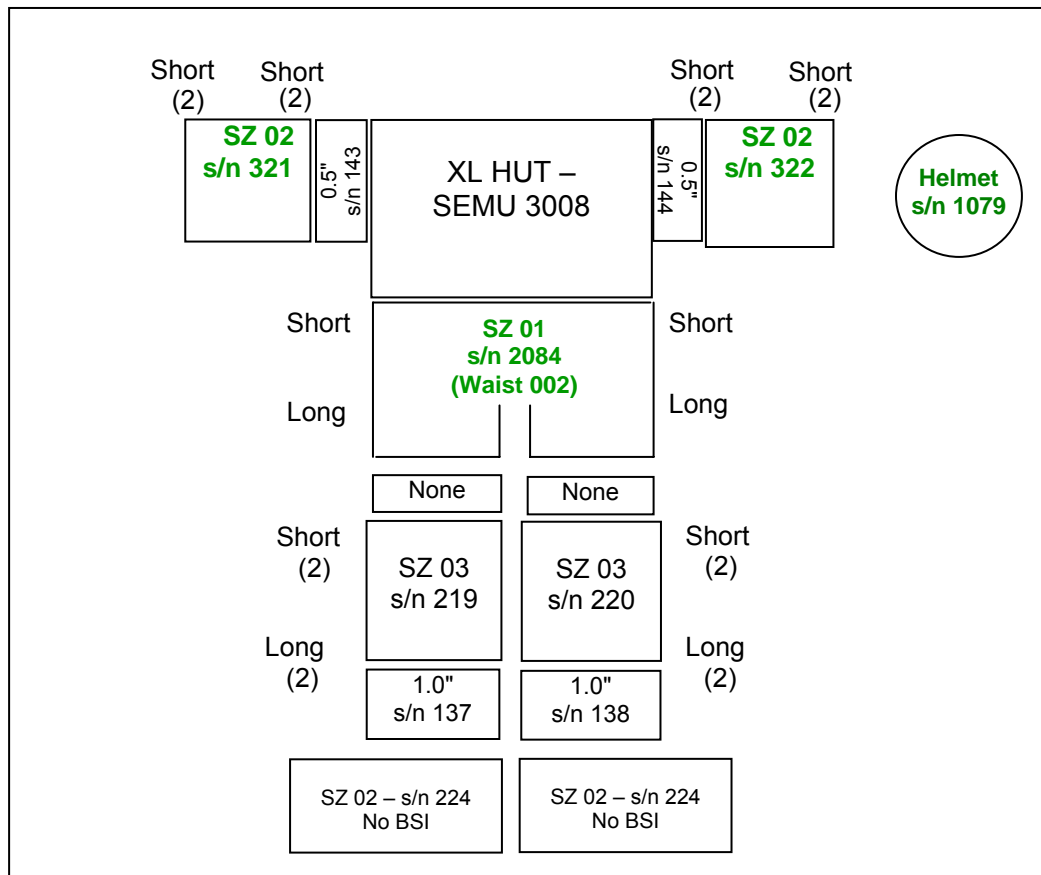


Figure 2.- Ad (EMU 3008) Return Configuration

25. Verify EMU configuration per following table:

EMU 3017 (Mt)	EMU 3008 (Ad)
<input type="checkbox"/> DIDB Restraint Bag <input type="checkbox"/> Multiple Water Connector Cover <input type="checkbox"/> Helmet s/n 1079 (√sun shade down, cover installed) <input type="checkbox"/> Gloves MT1; √locked <input type="checkbox"/> Wrist Mirror (2) (Leave best on ISS) <input type="checkbox"/> EMU Battery per <u>CONSUMABLES TRACKING CUE CARD</u> <input type="checkbox"/> LiOH	<input type="checkbox"/> DIDB Restraint Bag <input type="checkbox"/> Multiple Water Connector Cover <input type="checkbox"/> Helmet s/n 1077(√sun shade down, cover installed) <input type="checkbox"/> Gloves AD1; √locked <input type="checkbox"/> Wrist Mirror (2) (Leave best on ISS) <input type="checkbox"/> Adj Tether (2) s/n 1104 & 1105 <input type="checkbox"/> EMU Battery per <u>CONSUMABLES TRACKING CUE CARD</u> <input type="checkbox"/> LiOH

26. Verify contents per following table; stow ECOK in HUT

EMU Crew Options Kit (Mt)	EMU Crew Options Kit (Ad)
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Mt EVA 1, 2 & 3 Ziplock Bags <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> MAGs (Less items used) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> TCUs (top, bottom) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Socks <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Wristlets <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Comfort Gloves <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Velcro <input type="checkbox"/> Glass Retention Device <input type="checkbox"/> EV1 identifier stripes <input type="checkbox"/> <input type="checkbox"/> Mission patch <input type="checkbox"/> <input type="checkbox"/> US flag <input type="checkbox"/> Fresnel lens	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Ad EVA 1, 2 & 3 Ziplock Bags <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> MAGs (Less items used) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> TCUs (top, bottom) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Socks <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Wristlets <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Comfort Gloves <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Velcro <input type="checkbox"/> Glass Retention Device <input type="checkbox"/> Croakie <input type="checkbox"/> EV2 identifier stripes <input type="checkbox"/> <input type="checkbox"/> Mission patch <input type="checkbox"/> <input type="checkbox"/> US flag <input type="checkbox"/> Fresnel lens

EVA Sys
Xfer Bag

27. Stow EMU Servicing Kit s/n 5002 (Yellow Tag) on E-Lk Wall
Retrieve EMU Servicing Kit s/n 5005 marked for return
and stow in EVA Sys Xfer Bag

28. Add to contents of EVA Systems Transfer Bag, verify per following table

EVA Systems Transfer Bag	
Current Location	Item
E-Lk Deployed	<input type="checkbox"/> <u>CONSUMABLES TRACKING CUE CARD</u> (1 of 1) <input type="checkbox"/> <u>EMERGENCY UNDOCKING EVA TRANSFER CUE CARD</u> (1 of 1) <input type="checkbox"/> STS-131 EVA Checklist (yellow) <input type="checkbox"/> ISS EVA Systems Checklists (yellow) <input type="checkbox"/> Joint Emergency Egress Cue Card (1) <input type="checkbox"/> 85-ft Safety Tether s/n 1006, Decal # 26 <input type="checkbox"/> PGT s/n 1002 (battery removed)
EVA Systems Transfer Bag	<input type="checkbox"/> ISS Cuff Checklists (2) <input type="checkbox"/> Comm Caps (4) (Mt & Ad prime and back-up) <input type="checkbox"/> LCVGs (2) (Mt & Ad) <input type="checkbox"/> EMU Servicing Kit s/n 5005 <input type="checkbox"/> LiOH (1, select any s/n) <input type="checkbox"/> Taped BRT s/n 1017

EMUs 3017/
3008

29. Remove from EDDA and temp stow for transfer to shuttle

EVA TRANSFER TO SHUTTLE (30 min)

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

Item	Destination	Transfer Status
EMU 3017 (L) with ECOK	Temp stow Middeck	
EMU 3008 (XL) with ECOK	Temp stow Middeck	
EVA Systems Transfer Bag	Temp stow Middeck	

EVA UNPACK AND STOW (90 min)

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

Item	Final Location
EMU 3017 (Mt)	Ext A/L (Stbd AAP)
EMU 3008 (Ad)	Ext A/L (Port AAP)
EVA Systems Transfer Bag	A/L Floor Bag
<input type="checkbox"/> LCVG (2)	A/L Floor Bag
<input type="checkbox"/> 85-ft Safety Tether s/n 1006, Decal # 26	
<input type="checkbox"/> Comm Caps (4)	LTA Restraint Bag Kangaroo Pouches
<input type="checkbox"/> STS-131 CONSUMABLES TRACKING CUE CARD (1 of 1)	FDF Locker
<input type="checkbox"/> EMERGENCY UNDOCKING EVA TRANSFER CUE CARD (1 of 1)	
<input type="checkbox"/> STS-131 EVA Checklist (yellow)	
<input type="checkbox"/> ISS EVA Systems Checklists (yellow)	SODF Locker
<input type="checkbox"/> ISS Cuff C/L (2)	
<input type="checkbox"/> Joint Emergency Egress Cue Card	
<input type="checkbox"/> EMU Servicing Kit (s/n 5005 marked for return)	Vol H
<input type="checkbox"/> Taped BRT s/n 1017	MD Ceil Bag E
<input type="checkbox"/> PGT s/n 1002	TBD
<input type="checkbox"/> LiOH (1)	

2. Install back-up gloves on EMUs
3. Stow prime gloves in MD Floor Bag
4. EMU O2 ISOL VLV – CL
5. AIRLK AUD PWR – OFF
6. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
PWR/BATT CHGR EMU 1,2 MODE (two) – OFF
7. EV-1, EV-2 O2 vlv (two) – CL
8. EMU 1,2 H2O WASTE, SPLY tb (FOUR) – CL
9. SCU stowed on AAP, straps buckled
10. PURGE vlvs – op (up)
11. No loose items temp stowed in Vol H (waist tethers, etc). Install as reqd
12. Attach LTA Restraint Bags over LTA, suit arms, tethers; tighten straps
13. Comm Caps stowed in LTA Restraint Bag
14. Install floor Airlock Stowage Bag in airlock; bag, strap installed
15. Equal vlv (two) – NORM, install caps
 - * If outer hatch leaking or integrity suspect: *
 - * Equal vlv (two) – OFF, install caps *
16. Inform MCC, EVA Unpack and Stow complete

TIMELINES

I

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 EVA 1 PLB ATA RELEASE & PLB CLEANUP FS 7-23

 EVA 1 PLB CLEANUP & JEM MPAC/SEED RETRIEVE FS 7-25

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 EVA 2 RELEASE CETA CART ATA & INSTALL AGB FS 7-75

 EVA 2 A/L MMOD SHIELD RETRIEVE FS 7-77

 EVA 2 CLEANUP/INGRESS FS 7-78

EVA 3

 EVA 3 SUMMARY TIMELINE FS 7-84

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GET-AHEADS

 STS-131 GET-AHEAD INHIBIT PAD FS 7-123

 P1 FHRC P-CLAMP RELEASE (00:30) PER BAY FS 7-124

 P1 RBVM MLI REPAIR FS 7-126

 S1 FHRC P-CLAMP RELEASE (00:30) PER BAY FS 7-128

TIMELINES

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STS-131 (19A) OVERVIEW EVA TIMELINES – 3 EVAs

NOTE: All times are approximate. Arm blocks do not represent maneuver times

Pre EVA 1 Empty ATA on S1. Full ATA on LMC

EVA 1	00:00	01:00	02:00	03:00	04:00	05:00	06:00	6:30	
EV1 (FF)	Egress	FGB Retrieve	Prep PLB ATA for Release	Release PLB ATA & H/O to SSRMS	JEM SEED Retrieve	AGB Retrieve/Install	S0 RGA R&R	P6 Battery Prep	Cleanup & Ingress
EV2 (FF)	Egress	Release S1 ATA FQDs	Prep PLB ATA for Release	Release PLB ATA & H/O to SSRMS	PLB Cleanup & Translation to ESP-2	AGB Retrieve/Install	S0 RGA R&R	P6 Battery Prep	Cleanup & Ingress
SSRMS	Node 2 PDGF								
	Full ATA on SSRMS				Full ATA to POA EV not required				Walkoff to MBS PDGF
Restrictions	S1 TRRJ Locked S1 SASA Off		MT not at WS 5			Port SARJ Locked			

Pre EVA 2 Full ATA on POA. Empty ATA on S1

EVA 2	00:00	01:00	02:00	03:00	04:00	05:00	06:00	6:30		
EV1 (FF)	Egress	Release S1 ATA & H/O to SSRMS	Tie down ATA to CETA Cart	P1 Rad GF Stow Beam Install	AGB Release	Install ATA on S1	S1 ATA Connectors	Release CETA ATA & Install AGB	A/L MMOD Shields	Ingress
EV2 (FF)	Egress	Release S1 ATA & H/O to SSRMS	Tie down ATA to CETA Cart	P1 Rad GF Stow Beam Install	AGB Release	Install ATA on S1	APFR Relocate	Release CETA ATA & Install AGB	A/L MMOD Shields	Ingress
SSRMS	MBS PDGF									
	Receive ATA from EVA	S1 ATA to CETA Cart	Retrieve POA ATA	ATA to S1		CETA ATA Grapple	Empty ATA to POA EV not required	Walkoff to Node 2 PDGF		
Restrictions	S1 TRRJ Locked; S1 SASA Off					P1 TRRJ Locked @ 0				

Pre EVA 3 Empty ATA on POA. Full ATA on S1

EVA 3	00:00	01:00	02:00	03:00	04:00	05:00	06:00	6:30		
EV1 (FF)	Egress	AGB Stow	PLB Setup	Install ATA on LMC	FGB Remove/Stow	LWAPA Retrieve	CP13 ETVCG Light	S1 Rad GF Stow Beam Install	WIFEX Reloc	Cleanup & Ingress
EV2 (SSRMS)	Egress	AGB Stow	PLB Setup	Install ATA on LMC	SSRMS Setup	LWAPA Retrieve	SPDM CLPA Install & EP1 Cover Remove	SSRMS Cleanup		Cleanup & Ingress
SSRMS	Node 2 PDGF									
	Pre-EVA Setup	AGB Stow	Mnvr to PLB	Install ATA on LMC	SSRMS Setup	LWAPA Retrieve	SPDM CLPA Install & EP1 Cover Remove	SSRMS Cleanup	Released from EVA Support	
Restrictions	S1 TRRJ Locked; S1 SASA Off				S1 TRRJ Locked @ 0					

Post EVA 3 Empty ATA on LMC. Full ATA on S1

EVA Task Priorities

- Setup & Cleanup
- CAT 1
- CAT 2
- CAT 3

Timelined Get-aheads

- Move WIFEX for ULF4 (EVA 3) (00:30)
- Move APFRs (2) for ULF 4 (EVA 2) (00:15)

Get-aheads

- Connect P4-P5 Jumper (EVA 1 only) (00:15)
- Close P1 RBVM Thermal Bootie (00:15)
- Release S1 FHRC P-Clamps (00:30 per bay)
- Release P1 FHRC P-Clamps (00:30 per bay)

GET-AHEAD TASK MATRIX

Get-aheads	Applicable EVAs:			Constraints/Notes:	Completed On:
	EVA 1	EVA 2	EVA 3		
Tighten FGB bolts on S1 ATA	X			Stbd TRRJ locked	
Relocate WIF Extender for STS-132 (ULF-4)	X			Timelined for EVA 3	
P4-P5 Contingency Fluid Jumper	X			Port SARJ locked	
P1 RBVM MLI Repair		X		Port TRRJ locked at 0 Requires Long Wire Tie	
S1 FHRC P-clamp Release	X	X	X	Stbd TRRJ locked (0 deg preferred) Hosebox P-clamps can be released with TRRJ at any angle	
P1 FHRC P-clamp Release		X		Port TRRJ locked at 0	

EVA 1 SUMMARY TIMELINE

PET HR : MIN	IV/SSRMS	EV1 (Mastracchio)	EV2 (Anderson)	
00:00		<u>EGRESS & SETUP</u> (00:15)	<u>EGRESS & SETUP</u> (00:15)	00:00
		<u>RETRIEVE FGB FROM S1 ATA</u> (00:30)	<u>RELEASE S1 ATA FLUID QDs</u> (00:45)	
		<ul style="list-style-type: none"> Retrieve S1 ATA FGB Temp stow FGB in PLB 	<ul style="list-style-type: none"> Demate 2 NH3 and 2 N2 fluid lines Cap ATA male fluid QDs 	
01:00		<u>PREP PLB ATA FOR RELEASE</u> (00:45)	<u>PREP PLB ATA FOR RELEASE</u> (00:30)	01:00
		<ul style="list-style-type: none"> Release ATA Bolt 1 Install FGB on LMC ATA 	<ul style="list-style-type: none"> Retrieve APFR from Stbd CETA cart Install APFR on LMC 	
		<u>RELEASE PLB ATA & HANDOFF TO SSRMS</u> (00:45)	<u>RELEASE PLB ATA & HANDOFF TO SSRMS</u> (00:45)	
02:00		<ul style="list-style-type: none"> Release ATA Bolt 4 and 2 H/O ATA to SSRMS 	<ul style="list-style-type: none"> Release ATA Bolt 3 H/O ATA to SSRMS 	02:00
		<u>JEM MPAC/SEED RETRIEVE</u> (00:45)	<u>PLB CLEANUP & TRANSLATION TO ESP-2</u> (00:45)	
		<ul style="list-style-type: none"> Install MPAC/SEED cover Retrieve MPAC/SEED experiment 	<ul style="list-style-type: none"> Retrieve LMC APFR Stow APFR on NODE 2 WIF 7 Temp stow C/L bag on S0 	
03:00		<u>AGB TRANSFER</u> (00:45)	<u>AGB TRANSFER</u> (00:45)	03:00
		<ul style="list-style-type: none"> Temp stow MPAC/SEED at A/L Release AGB from ESP-2 FHRC Install AGB on ATA 	<ul style="list-style-type: none"> Release AGB from ESP-2 FHRC Install AGB on ATA Tether swap to tether shuttle 	
04:00		<u>S0 RGA 1 R&R</u> (01:15)	<u>S0 RGA 1 R&R</u> (00:30)	04:00
		<ul style="list-style-type: none"> Stow MPAC/SEED in A/L Retrieve spare RGA from A/L Tether swap to tether shuttle If reqd, relocate TERA Temp stow failed RGA on face 1 	<ul style="list-style-type: none"> Release fwd RGA bolts Retrieve C/L bag 	
		<u>P6 BATTERY PREP</u> (00:45)	<u>P6 BATTERY PREP</u> (01:30)	05:00
05:00		<ul style="list-style-type: none"> Relocate Gap Spanners Relocate APFR Release launch torque on Battery bolts 	<ul style="list-style-type: none"> Relocate Gap Spanners Relocate APFR Release launch torque on Battery bolts 	
06:00		<u>CLEANUP & INGRESS</u> (00:45)	<u>CLEANUP & INGRESS</u> (00:45)	06:00
		<ul style="list-style-type: none"> Retrieve failed RGA Stow tether shuttle 	<ul style="list-style-type: none"> Retrieve failed RGA Stow tether shuttle 	
06:30				06:30

EVA 1

EVA 1 INHIBIT PAD

Orbiter (1)

ALL EVAs	
TCS (Prior to Egress)	
IV L12	1. √TCS POWER – OFF
TriDAR (Prior to Egress)	
IV L12L	1. √TriDAR POWER – OFF (tb-bp) (SSP2)
KU-Band Antenna (Prior to Egress)	
MCC-H	1. √KU-BAND Mask – active 2. √KU-BAND EVA Protect Box – active
RCS (Prior to Egress)	
	EV crew < 27 feet from FRCS
IV O14,15,16	1. √DAP: VERN, FREE, LO Z 2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF LOGIC (four) – OFF
MCC-H	3. √Above RCS config
IV	4. √RCS F – ITEM 1 EXEC (*) √JET DES F1U – ITEM 17 (*) F3U – ITEM 19 (*) F2U – ITEM 21 (*)

Ground

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

USOS (1)

ALL EVAs	
PCU (Prior to Egress)	
	NOTE PCUs may require up to a 1-hour warmup period before they are operational.
MCC-H	1. √PCUs (two) operational in discharge mode and one of the following: a. CCS PCU EVA hazard control FDIR enabled. b. No more than two arrays unshunted and oriented <105° from velocity vector. If one or both PCUs failed 2. No more than two arrays unshunted and oriented <105° from velocity vector.
CUCU (Prior to Egress)	
IV (LAB104)	1. √cb POWER A, B [two] – OPEN 2. √cb LINK 1,2 [two] – OPEN
LOCATION DEPENDENT INHIBITS	
LAB Window (EV1 Translation to PLB) (Prior to Egress)	
IV	EV crew expected < 10 feet from window or in window FOV, close window shutter
Cupola Windows	
IV	If EV crew less than 10 feet from window or in window FOV, coordinate shutter opening/closing with EV crew and minimize time shutter is open
S-Band (SASA) Antennas (S1 ATA Prep) (Prior to Egress)	
MCC-H	EV crew expected < 3.6 feet from S1 SASA 1. P1 SASA – Active 2. S1 SASA – Powered down and unavailable to FDIR
Mobile Transporter (Prior to Egress)	
MCC-H	EV crew expected <1.5 meters from MT 1. √MT latched
TRRJ (FGB Retrieve & S1 ATA Prep) (Prior to Egress)	
MCC-H	EV crew working within 2 feet of S1 TRRJ rotation envelope 1. √DLA (1) – LOCKED between -40 & -115 or 40 & 115

EVA 1 INHIBIT PAD (Cont)

USOS (2)

LOCATION DEPENDENT INHIBITS	
SARJ (Prior to P6 Battery Prep)	
MCC-H	EV crew working within 2 feet or outboard of port SARJ between 245 & 50 deg (0 deg preferred) <ol style="list-style-type: none"> 1. √DLA (1) – LOCKED 2. All motor setpoints set to zero. 3. All motors deselected.
FPMU	
MCC-H	1. FPMU power – Off
TASK SPECIFIC INHIBITS	
RGA (Prior to RGA R&R)	
MCC-H	1. RPCM S01A E RPC 3 – Open, Close Cmd Inhibit
P6 Battery Prep (Prior to P6 Battery Prep)	
MCC-H	<ol style="list-style-type: none"> 1. Lock P4 non-Keel side BGA (4A) between 0 & 180 deg 2. Lock P6 BGAs (2B & 4B) between 240 & 130 deg
ATA (See detailed procedure for timing of inhibits)	
MCC-H	1. 1.100 S1 ATA Removal and Replacement Prep – Part 2

RSOS (1)

ALL EVAs	
SM Antennas (Prior to Egress)	
IV	<ol style="list-style-type: none"> 1. GTS – Deactivate 2. ARISS (Ham Radio) – Deactivate
IMPULSE (Prior to Egress)	
MCC-M	1. IMPULSE (ИПИ-100) – Is not activated

JEM (1)

ALL EVAs	
ICS-EF Antenna (Prior to Egress)	
SSIPC	<ol style="list-style-type: none"> 1. ICS MOD – OFF 2. ICS UPC – OFF 3. ICS HPA – OFF 4. “HPA ON” and “UPC ON” commands are cleared (not present) in the ICS stored command queue
LOCATION DEPENDENT INHIBITS	
JPM Windows (MPAC/SEED Retrieve) (Prior to Egress)	
IV	When EV crew translating on JPM port end cone, close window shutters
JPM PROX Antenna (MPAC/SEED Retrieve) (Prior to Egress)	
SSIPC	EV crew working within 0.3 ft JPM PROX Antenna <ol style="list-style-type: none"> 1. TRX Power – OFF 2. TX Power – OFF or 3. JPM PROX Antennas – OFF
SEDA-AP Mast & PLAM-S (MPAC/SEED Retrieve) (Prior to Egress)	
SSIPC	EV crew working within the SEDA-AP mast extension envelope <ol style="list-style-type: none"> 1. Mast Actuator – OFF 2. PLAM-S – OFF
EFU (MPAC/SEED Retrieve) (Prior to Egress)	
SSIPC	EV crew working within 2 ft of EFU <ol style="list-style-type: none"> 1. JEF PDB a RPC 03 – Open (for EDU a) 2. JEF PDB b RPC 20 – Open (for EDU b) 3. EFU[X] Sel Status – not selected [X=1 to 12] 4. EEU Mode – EFU stop

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. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
6. Avoid contact with OBSS striker bars (Vitrolube coating)
7. 85-ft safety tether retract force may affect body positioning

CAUTION

ISS Generic Constraints

- A. Avoid inadvertent contact with
1. Grapple fixture shafts (drylube)
 2. PIP Pins
 3. Passive UMAs
 4. MBS/SSRMS/SPDM taped radiative surfaces: VDU, ACU, JEU, LEU, MCU, CRPCMs, and Cameras
 5. SPDM SJEU, EP, OTCM, LEU, and LEE VDU radiator surfaces
 6. OTSD
 7. MMOD shields tied to ESP-2
- B. Electrical cables
1. Avoid bend radii < 10 times cable diameter
- C. Fiber optic cables
1. Avoid bend radii < 10 times cable diameter
 2. Avoid pulling on cable during mate/demate
- D. Fluid line flex hoses and QDs
1. Avoid bend radii < 14 in for hoses with a diameter \geq 1 in
 2. Additional care should be taken to not exceed bend radii when applying loads at the flexible hose to rigid tube stub interfaces
 3. Ensure fluid QD booties are fully closed prior to leaving worksite; wire tie if required
 4. Avoid bend radii < 5 in for hoses with diameter < 1 in on LAB, S0, S1, P1, and 10 in for hoses with diameter < 1 in on all other elements

CAUTION

ISS Generic Constraints (Cont)

- 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
- F. Other
1. ITT Cannon connector: On demated connectors, do not rotate collar or manipulate cable/connector using collar or connector tool
 2. MLI handholds are not rated for crewmember translation loads

EVA 1 NOTES, CAUTIONS, AND WARNINGS (Cont)

CAUTION

ISS Truss Constraints

A. Avoid inadvertent contact with

1. CETA lights (Z-93 paint) [LAB,S1, NODE 1]
2. Deployed TUS cable [Zenith and Nadir CETA rail]
3. S0 aft face radiator
4. GPS antennas (S13 paint) [S0,JLP]
5. UHF antennas [LAB,P1]
6. ETCS radiator flexhoses and panels [S1,P1]
7. EETCS/PV radiator flexhoses, bellows and panels [P6,P4,S4,S6]
8. SASA RF group [S1,P1]
9. Heat pipe radiators [Z1]
10. PCU cathode and HCA ports [Z1]
11. Ku-Band antenna (SGANT) dish [Z1]
12. CMG cover/shells [Z1]
13. FPMU [P1]
14. SASA high and low gain antennas and radiator surfaces [Z1]
15. Deployed MISSEs
16. OTP on Hab Tray [S0]

B. For structural reasons

1. Avoid kicking S1/P1 radiator beam. If any of these occur, wait 2 to 5 min to allow structural response to dissipate

CAUTION

ISS Truss Constraints (Cont)

C. Other

1. WIS antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
2. Lubricant from Ku-Band SGANT gimbals [Z1], CMGs [Z1], and RTAS ground strap fasteners [P6,P4,S4,S6] can contaminate EMU
3. Prevent inadvertent contact of the tether shuttle with ETRS when the P3 tether shuttle stop is raised away from the rail

CAUTION

ISS U.S. Pressurized Elements Constraints

A. Avoid inadvertent contact with

1. EVA crane [PMA1]
2. TCS reflectors [PMA2,PMA3]
3. APAS hardware [PMA2,PMA3]
4. CETA lights (Z-93 paint) [LAB,S1, NODE 1]
5. UHF antennas [LAB,P1]
6. Open CBM petal covers, LAB and Cupola window shutters
7. S0/NODE 2 fluid tray hardlines at NODE 2 end, which are limited to 25 lb

B. Other

1. WIS antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
2. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged

EVA 1 NOTES, CAUTIONS, AND WARNINGS (Cont)

CAUTION

ISS I.P. Elements Constraints

COL

- A. Avoid inadvertent contact with
1. COL ARISS and AIS antennas [COL-Nadir]

JEM

- A. Avoid inadvertent contact with
1. GPS antennas (S13 paint) [S0,JLP]
 2. Open JPM window shutter
 3. JTVE, WVE/EVE, JEF VE cameras
 4. JEMRMS taped radiative surfaces [JEU,EE,Cameras]
 5. JEM A/L target and pins
 6. JEF ORUs and EFUs (paint and lubricant)
 7. MAXI front and top panel (paint)
 8. SEDA-AP sensors (HIT, SDOM, and AOM) and MPAC & SEED
 9. Trunnions and UCMs (paint and lubricant) [JEF Payloads]
 10. RAIDS covers on end of HREP
 11. ICS-EF Ka-Band antenna dish
 12. Small Fine Arm (SFA) (paint, coating and lubricant)
- B. For structural reasons
1. Avoid kicking MMOD shields between JLP and JPM
 2. Avoid tool impact on ICS-EF sensor

CAUTION

Shuttle Constraints

- A. Avoid inadvertent contact with
1. OBSS and SRMS composite sections joint torque arms, grapple fixture shafts, and cable harnesses
 2. LCS (silver Teflon) and LDRI (silver Teflon) and ITVC (gold foil) [OBSS]
 3. WVS antenna [ODS truss and PLB sill]
 4. Payload bay and camera wire harnesses, cables, cable guides, 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]

EVA 1 NOTES, CAUTIONS, AND WARNINGS (Cont)

WARNING

ISS Generic Constraints

- A. Avoid inadvertent contact with
1. Grapple fixture targets and target pins
- B. Pinch
1. NZGL connector linkage. Use caution when mating/locking
 2. ITT Cannon connector rotating housing
- C. QDs
1. If QD is in FID when valve is opened (bail fwd), QD will leak and fluid line may whip
 2. Do not rotate if in mated/valve open configuration
- D. Sharp Edges
1. Inner edges of WIF sockets
 2. APFR active WIF probes
 3. Mating surfaces of EVA connectors
Avoid side loads during connector mating
 4. Back side of MMOD shield fasteners
 5. Spring loaded captive EVA fasteners (e.g., 6B-boxes, BMRRM, RTAS, SARJ Covers); the end of the spring may protrude
 6. SPDM OTCM gripper jaws
 7. Keep hands away from SSRMS, LEE/POA/SPDM LEE opening, snares, and PDGF curvic coupling (teeth)
 8. MMOD strikes on ISS exterior

WARNING

ISS Generic Constraints (Cont)

- E. Thermal
1. EVA connectors with booties may become hot if left uncovered. Handling may need to be limited
 2. Turn off glove heaters when comfortable temperature reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
 3. Uncovered trunnion pins may be hot
 4. SSRMS/MBS/SPDM operating cameras and lights may radiate large amounts of heat
 5. Do not touch EMU protective visor if temperature has been < -134 degF for > 15 min
 6. No EMU boot contact with foot restraint when temperature < -120 degF or > 200 degF
 7. PDGF surfaces may not meet touch temperature requirements for unlimited contact when $\beta \leq -70$ or $\beta \geq 70$
- F. Electrical Shock
1. Do not touch SPDM CLPA 1 electrical connector prior to camera installation

WARNING

ISS Truss Constraints

- A. Avoid inadvertent contact
1. SSU, ECU, beta gimbal platform, mast canister, SAW blanket boxes unless the beta gimbal is locked and the motor is turned off
 2. Stay inboard of SARJ when active
 3. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate
 4. Stay 5 ft from moving MT on face 1
- B. RF radiation exposure
1. Stay 3.6 ft from S-Band (SASA) high gain antenna when powered [S1,P1]
 2. Stay 1.3 ft from S-Band (SASA) low gain antenna when powered [S1,P1]
 3. Stay 1 ft from UHF antenna when powered [LAB,P1]
- C. Sharp Edges
1. Solar array blanket box [P6,S6]
 2. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing
 3. Outboard MT rail attachment lug near P6 handrail 5333 and gap spanner
 4. P2 connector on EWIS box TAA-06 [Zenith/Forward Corner 1 of P5 – SARJ at 0 deg]
 5. Nickel coated braided copper ground straps may contain frayed wires [P6,P4,S4,S6]
 6. MMOD strikes on Z1 tool boxes

EVA 1 NOTES, CAUTIONS, AND WARNINGS (Cont)

WARNING

ISS Truss Constraints (Cont)

D. Electrical Shock

1. Stay ≥ 2 ft from ungrounded floating connectors if powered
S0 EVA power cables (inside S0 Bay 00 Face 4, Bay 01 Face 3)
ESP-2 jumper (inside S0 Bay 03 Face 4)

E. Thermal

1. ELC may exceed touch temperatures when $\beta > 75$ deg

WARNING

ISS U.S. Pressurized Elements Constraints

A. Handrails

1. Handrails previously used for MISSE attachment may not be used as a safety tether point [A/L endcone 564 and 566, A/L Tank 2 Nad/Fwd and Port/Fwd, P6 5389]

B. Pinch

1. EV side of IV Hatch during Hatch operation (also snag hazard) [A/L]
2. LAB window shutter and CBM petal cover linkages during operation

C. RF radiation exposure

1. Stay 1 ft from UHF antenna when powered [LAB,P1]

D. Sharp Edges

1. PMA umbilical launch restraints – exposed bolt threads
2. Adjustable fuse tether (Fish Stringer) buckles stowed in Node bag
3. Port/Aft portion of A/L circular HR [HR 0506]
4. A/L HR 0537 (Eq Lock Zenith)

E. Thermal

1. PMA handrails may be hot. Handling may need to be limited
2. Stay ≥ 1 ft away from PMAs and MMOD shields > 270 degF if EMU sun visor up; limit time to 15 min or less if > 300 degF
3. Stay at least 0.5 ft away from PMA and MMOD shields > 325 degF
4. No EMU TMG contact with PMAs and MMOD shields > 320 degF

WARNING

ISS U.S. Pressurized Elements Constraints (Cont)

F. Electrical Shock

1. Stay ≥ 2 ft from ungrounded floating connectors if powered
SSPTS connectors include NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA2 Stbd

G. Fluid QDs

1. When NODE 3 – LAB NH3 jumpers are pressurized do not translate on gap spanners restraining jumpers and do not tether or BRT to handrails used to anchor gap spanners

EVA 1 NOTES, CAUTIONS, AND WARNINGS (Cont)

WARNING

ISS I.P. Elements Constraints

COL

A. Avoid inadvertent contact with

1. SOLAR [COL EPF]

B. Thermal

1. Columbus end cones may violate touch temperature constraints when $-75 \leq \beta \leq -60$ or $60 \leq \beta \leq 75$

JEM

A. Avoid inadvertent contact with

1. ICS-EF sensors

B. Pinch

1. JPM window shutter linkages during operation
2. JEM cameras (JVTEs, EVE, WVE, and JEF VEs)
3. JEM EFU latching arms
4. JEF SSE latch
5. ICS-EF antenna boom
6. SEDA-AP mast
7. SMILES antenna rotating area
8. HREP hinge sides and RAIDS pinch areas
9. JEMRMS EE
10. JEMRMS Small Fine Arm (SFA) joints and booms

WARNING

ISS I.P. Elements Constraints (Cont)

JEM (Cont)

C. Sharp Edges

1. Interior of JEMRMS HRMs
2. JEMRMS EE opening and snares
3. JEM A/L hatch corners
4. ICS-EF AHM gears
5. MAXI visual star camera
6. SMILES baffles (two), baffle base bare bolts, and Cold Sky Terminator (CST)
7. HREP baffles (four) [Star tracker aperture Zenith and three instrument baffles Aft]
8. SFAs Electro-Mechanical GF (EMGF)

D. RF radiation exposure

1. Stay 0.3 ft from Fwd/Aft JPM PROX antenna

E. Thermal

1. JPM Port End Cones and JLP Port Nadir may violate touch temperature constraints when $\beta > 60$ deg
2. JEMRMS/JTVE/JEFVE operating cameras and lights may radiate large amounts of heat

WARNING

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]

EVA 1 NOTES, CAUTIONS, AND WARNINGS (Cont)

WARNING

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
4. TCS connector backshells have exposed threads [ODS]

E. Thermal

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

F. Contamination

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

G. Lasers

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

EVA 1 BRIEFING CARD

Aft EDDA _____
Fwd EDDA _____
Suit IV _____
Task IV _____
M1/M2 _____

General Briefing

1. Robotics – M1/M2

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

2. Communications – Task IV

- Overall setup: Big loop, A/G2, S/G2, ICOM, remind EV crew when mode swapping
- EV/IV comm protocol review – Use EV1/2/3 for DCM sw throws

3. Hygiene Break & EVA Prep – Suit IV

- Remember pure O2 protocol
- Equipment lock activities – IV responsibilities
- Suit donning plan – special requests
- SAFER, MWS, Safety tethers, bag stowage
- Airlock depress review

4. EV Crew Procedure Review – EV CMs

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

5. Other Procedure Review – Task IV

- Get-ahead tasks
 - o P4/P5 Contingency Fluid Jumper
 - o FGB Attachment Bolts
 - o WIF Extender Relocate
 - o S1 FHRC P-Clamps (Hosebox Only)

- Constraints – ground and flight
- Notes, Cautions, and Warnings review
- Contingency procedures – cribsheet
- Hygiene Break Repress (GMT) _____ : _____
- Depress to 10.2 _____ : _____
- Start Purge _____ : _____
- PET 00:00 _____ : _____

6. Emergencies Review – Suit IV/Task IV

- Emergency suit doff and power down
 - √Expedited Suit Doffing cue card pre-positioned for EVA day
- Loss of comm
- EMU malfunctions
 - o If you get a mal, read the caution and warning message so everyone knows what it is
- Lost tools
- Lost crewmember
- DCS
- Abort and Terminate scenarios, protocols
- Hand signal reviews

7. Post EVA – Suit IV

- Suit doffing responsibilities
- Post EVA plan

8. Reminders – Task IV

- Translate slow. Relax grip
 - Be extra careful on non-standard routes or orientations
 - Don't hop
- Monitor safety tether
- Prior to moving and ingress, √BRT & Swingarm stowed
- Be disciplined when tired
- OK for IV and ground to check on us. If you need update, ask
- Let mistakes pass
- Manage frustration (slow down, if needed)

EVA 1 BRIEFING CARD (Cont)

Generic Calls:

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

EVA 1 TOOL CONFIG

EV1

EMU D-rings

- D-ring Extender (2, R&L D-ring)
 - A/L 85-ft Safety Tether (R D-ring Ext)
 - Spare 85-ft Safety Tether (R D-ring Ext)
- Waist Tether (L on D-ring Ext)

MWS

- RET (sm-sm)
- RET w/PIP Pin
- Adj Tether (2)
- Wire Tie (3)
- Small ISS Trash Bag (L inside)

- Swing Arm (R)
 - RET (sm-sm)
 - PGT w/6-in ext s/n 1006
 - PGT Battery s/n _____

- BRT (L)
 - RET (sm-sm)
 - Wire Tie (2)

- SAFER
- WVS

NOTE: Prior to use, inspect the following hardware:

- RET cords for fraying
- Safety Tether/Waist Tether LAS & D-ring Extenders; ref (section 8) CREW TETHER INSPECTIONS:
 1. MMOD/general damage
 2. Discoloration
 3. Tack Stitching
 4. Red Band
- ISS Trash Bag: Empty, Zipped, and Bristle deformation/damage, after having stowed tools inside
- PGT MTL @ 30.5 & battery ~40 V
- Verify MWS EE secured to T-bar
- Verify ORUs brought IVA are capped

Tether Counts: **(Red RETs)**
 RETs (sm-sm) = 9 of 16 RETs (PIP Pin) = 3 of 5
 RETs (Lg-sm) = 3 of 8 Adj Equip Tethers = 10 of 10

EV2

EMU D-rings

- D-ring Extender (2, R&L D-ring)
 - A/L 85-ft Safety Tether (L D-ring Ext)
 - Spare 85-ft Safety Tether (L D-ring Ext)
- Waist Tether (R on D-ring)

MWS

- RET (sm-sm)
- RET w/PIP Pin
- Adj Tether
- Wire Tie (2)
- Small ISS Trash Bag (L inside)

- Swing Arm (R)
 - RET w/PIP Pin
 - PGT w/6-in ext s/n 1001
 - PGT Battery s/n _____

- BRT (L)
 - RET (sm-sm)
 - Wire Tie (2)

- Adj Tether (2) on wrists

- SAFER
- WVS

Camera Checkout

- Camera focuses
- Data in view finder
- Take sample IVA photos to check camera function
- Eyepiece thermal wrap connected to thermal blanket

Verify PGT #2 (s/n 1002) in the Staging Bag

CREWLOCK

- Tether Ext on A/L D-ring

- RET (Lg-sm)
 - C/L bag
 - Adj Tether (outside – tie down) (2)
 - EVA Camera w/Bracket (outside)
 - RET (sm-sm)
 - Wire Tie (outside – MPAC/SEED) (2)
 - Adj Tether (outside – MPAC/SEED) (2)
 - Round Scoop
 - MPAC/SEED Cover
 - 55-ft Safety Tether
 - Ratchet (No Palm Wheel) (Int RET #1)
 - 7/16-2-in rigid ext
 - Round TM (Int RET #2)
 - 7/16-in Flush Socket
 - Prybar (Int RET #3)
 - Ratchet (No Palm Wheel) (Int RET #4)
 - 7/16-2-in rigid ext
 - EVA Camera w/Bracket
 - Fish Stringer
 - 1/4-in Fluid Caps (2)
 - 1/2-in Fluid Caps (2)

- RET (Lg-sm)
 - Large ORU bag
 - Adj Tether (outside – tie down) (Lower Right Loop)
 - RET (sm-sm)
 - Spare RGA
 - RET (sm-sm)
 - Failed RGA
 - 55-ft Safety Tether (Attach inside – ERCM outside)

- RET (Lg-sm)
 - Round Scoop
 - MPAC/SEED Cover w/Sample

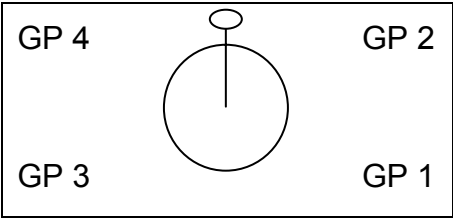
EVA 1 TOOL CONFIG (Cont)

- Staging Bag
 - Fish Stringer
 - Wire Tie Caddy (Hook #1)
 - Velcro/Tape Caddy (Hook #2)
 - PGT (Hook #3) s/n 1002
 - PGT Battery s/n _____
 - 7/16 (wobble) Socket-6 ext
 - Vise Grips (Hook #4)
 - Ratchet Wrench (Hook #5)
 - 7/16 (rigid) Socket-9 ext
 - Needle Nose Pliers (Hook #6)
 - Spare WIF Adapter (Hook #7)
 - Spare 85-ft Safety Tether
 - Fish Stringer
 - Connector Cleaner Tool Kit (Hook #1)
 - Pin Straightener Assy (Hook #2)
 - Probe w/Sheath (Hook #3)
 - Hammer (Hook #4)
 - Cheater Bar (Hook #5)
 - BRS Pin Tool (Hook #7)
 - MWS Key Strap Assy (on Wire tie, to strap)
 - Long Duration Tie-Down Tether
 - RET (sm-sm)
 - Right Angle Drive
- IV Bag
 - Towels (2)
 - Contamination Detection Kit
 - GP Caddy (2)
 - Adjustable Thermal Mittens (2)
 - Socket Caddy (hatch cont) w/RET (sm-sm) (Black)
 - 1/2 Socket-8 ext
 - 7/16 (wobble) Socket-6 ext (spare)
 - DCM Plug (SAFER Hardmount) (2)
 - RET (sm-sm, Black) (2)

EVA 1 EGRESS (00:15)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<p>1. WVS Software: Select page – RF Camera sel 'Advanced controls' S-Band level (two) – max (Required after A/L egress)</p>	<p><u>INITIAL CONFIG</u> Verify: <input type="checkbox"/> EV1 left waist tether connected to EV2 85-ft ST <input checked="" type="checkbox"/> √Gate closed (both hooks) <input checked="" type="checkbox"/> √Hook locked (both hooks)</p> <p><u>EGRESS (00:15)</u> 1. Receive camera from EV2 2. Open A/L thermal cover 3. Egress A/L 4. Attach EV1 85-ft ST to aft A/L anchor point <input checked="" type="checkbox"/> √Gate closed (both hooks) <input checked="" type="checkbox"/> √Hook locked (both hooks) <input checked="" type="checkbox"/> √Reel unlocked 5. Attach EV2 85-ft ST to fwd A/L anchor point <input checked="" type="checkbox"/> √Gate closed <input checked="" type="checkbox"/> √Hook locked 6. Release waist tether from EV2 85-ft ST 7. Give EV2 GO to release waist tether from A/L D-ring extender and stay aft on A/L</p> <p>8. Verify EV1 SAFER and WVS config: <input checked="" type="checkbox"/> √R Handle down (HCM door – Closed) <input checked="" type="checkbox"/> √L Handle down (MAN ISO Valve – Open)</p>	<p><u>INITIAL CONFIG</u> Verify: <input type="checkbox"/> EV2 right waist tether connected to A/L D-ring extender <input type="checkbox"/> EV2 85-ft ST connected to EV1 left waist tether <input checked="" type="checkbox"/> √Gate closed (both hooks) <input checked="" type="checkbox"/> √Hook locked (both hooks)</p> <p><u>EGRESS (00:15)</u> 1. Hand camera to EV1</p> <p>2. Check ST config <input checked="" type="checkbox"/> √Gate closed <input checked="" type="checkbox"/> √Hook locked <input checked="" type="checkbox"/> √Reel unlocked</p> <p>3. On EV1 GO release waist tether from A/L D-ring extender 4. Egress A/L w/C/L bag (Attach RET to A/L D-ring) 5. Place C/L bag on BRT</p> <p>6. Close A/L thermal cover</p> <p>7. Verify EV2 SAFER and WVS config: <input checked="" type="checkbox"/> √R Handle down (HCM door – Closed) <input checked="" type="checkbox"/> √L Handle down (MAN ISO Valve – Open)</p>

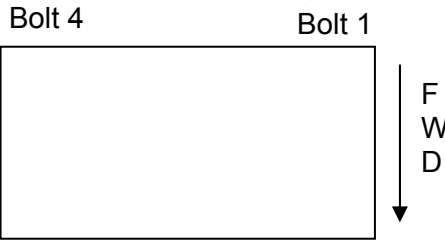
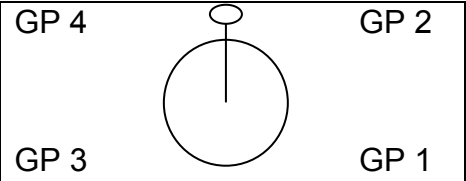
EVA 1 S1 ATA FGB RETRIEVE (00:30) & S1 ATA FLUID QD RELEASE (00:45)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<p>1. <input checked="" type="checkbox"/> MCC-H: <input type="checkbox"/> Stbd TRRJ locked, <input type="checkbox"/> S1 SASA off, <input type="checkbox"/> LAB window closed, and <input type="checkbox"/> ATA vented and ready for EV QD disconnects</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">ATA FGB Attach Points</p>  </div> <p>2. Rotate PLB camera B clear of port FGB worksite</p>	<p><u>RETRIEVE FGB FROM S1 ATA</u> (00:30)</p> <ol style="list-style-type: none"> On IV GO: Translate to Nadir side of S1 ATA <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;">CAUTION Avoid contact with FGB grapple pin and target</p> </div> <ol style="list-style-type: none"> RET to FGB PGT [B7, CCW2, 30.5] (25.5 ft-lb, 30 RPM); 6-in ext Release ATA FGB bolts (4) 10 turns (any order); stop on turns <input type="checkbox"/> GP 4 <input type="checkbox"/> GP 2 <input type="checkbox"/> GP 3 <input type="checkbox"/> GP 1 Remove FGB from ATA and stow on BRT Translate to JPM HR 1100 (fwd/nadir on ending) via the low road Perform tether swap to spare 85-ft ST: <input type="checkbox"/> <input checked="" type="checkbox"/> Gate closed (both hooks) <input type="checkbox"/> <input checked="" type="checkbox"/> Hook locked (both hooks) <input type="checkbox"/> Reel unlocked (Spare 85-ft ST) <input type="checkbox"/> Temp stow A/L 85-ft ST reel on JPM HR 1100 <input type="checkbox"/> Reel unlocked (A/L 85-ft ST) <div style="border: 3px double black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;">WARNING 2-ft KOZ for SSPTS cable floating connectors on PMA2 stbd side</p> </div> <ol style="list-style-type: none"> Fairlead on ODS Truss HR with Adj tether Translate to PLB ATA using port sill Fairlead on PRLA V-guide Temp stow FGB on LMC HRs near port sill Temp stow camera, as reqd Glove check 	<p><u>RELEASE S1 ATA FLUID QDs</u> (00:45)</p> <ol style="list-style-type: none"> On IV GO: Translate to Zenith side of S1 ATA via aft face; fairlead on CETA spur Temp stow C/L bag on S1 HR 3279 Deploy Fish Stringer with FQD caps on S1 HR 3283 and 3284 (stbd of ATA) Open shroud covering ATA connectors <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;">CAUTION QDs exposed to direct sunlight can overtemp in 20 min. Shading by EMU or thermal shroud can lengthen acceptable time with bootie removed</p> </div> <ol style="list-style-type: none"> BRT to ATA Stbd HRs as reqd <p><u>F50/M3</u></p> <ol style="list-style-type: none"> Open thermal bootie, open TA clamps as reqd, RET to 1/2" SPD on FQD F50/M3 and remove; BLOCK A Close valve on FQD F50/M3 (NH3 line); BLOCK B Demate FQD F50 from ATA M3; BLOCK C; close thermal bootie around QD, stow clear of worksite <p><u>F1/M1</u></p> <ol style="list-style-type: none"> Open thermal bootie, open TA clamps as reqd and close valve on FQD F1/M1 (NTA line); BLOCK B Demate FQD F1 from ATA M1; BLOCK C; close thermal bootie around QD, stow clear of worksite

EVA 1 S1 ATA FGB RETRIEVE (00:30) & S1 ATA FLUID QD RELEASE (00:45) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)				
<p>3. <input type="checkbox"/> Record WVS survey</p>		<p><u>F51/M4</u></p> <p>11. Open thermal bootie, open TA clamps as reqd and close valve on FQD F51/M4 (NH3 line); BLOCK B</p> <p>12. Demate FQD F51 from ATA M4; BLOCK C; close thermal bootie around QD, stow clear of worksite</p> <p><u>F2/M2</u></p> <p>13. Open thermal bootie, open TA clamps as reqd and close valve on FQD F2/M2 (NTA line); BLOCK B</p> <p>14. Demate FQD F2 from ATA M2; BLOCK C; close thermal bootie around QD, stow clear of worksite</p> <p>15. Install caps on FQDs (4)</p> <table border="0"> <tr> <td><input type="checkbox"/> M1 (1/4")</td> <td><input type="checkbox"/> M2 (1/4")</td> </tr> <tr> <td><input type="checkbox"/> M3 (1/2")</td> <td><input type="checkbox"/> M4 (1/2")</td> </tr> </table> <p>16. WVS survey of MLI and QDs <input type="checkbox"/></p> <p>17. Close shroud covering ATA connectors</p> <p>18. Retrieve C/L bag; place on BRT</p> <p>19. Glove check</p>	<input type="checkbox"/> M1 (1/4")	<input type="checkbox"/> M2 (1/4")	<input type="checkbox"/> M3 (1/2")	<input type="checkbox"/> M4 (1/2")
<input type="checkbox"/> M1 (1/4")	<input type="checkbox"/> M2 (1/4")					
<input type="checkbox"/> M3 (1/2")	<input type="checkbox"/> M4 (1/2")					

EVA 1 PLB ATA PREP (00:45)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)																				
<p style="text-align: center;">ATA Orientation</p> <p style="text-align: center;">PLB PORT →</p>  <p style="text-align: center;">ATA FGB Attach Points</p>  <table border="1"> <thead> <tr> <th>FGB Bolt</th> <th>Torque</th> <th>Turns</th> <th>Green Light</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	FGB Bolt	Torque	Turns	Green Light	1				2				3				4				<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>CAUTION Avoid contact with PLB cameras</p> </div> <p><u>FGB INSTALL</u> (00:45)</p> <ol style="list-style-type: none"> PGT [B6, CCW2, 30.5] (24.0 ft-lb, 30 RPM); 6-in ext <ul style="list-style-type: none"> <input type="checkbox"/> √2 white lines visible <input type="checkbox"/> Fold floating clevis clear of bolt PGT [B7, CCW2, 30.5] (25.5 ft-lb, 30 RPM); 6-in ext Release ATA port FGB bolts (4); 19 turns; stop on turns <ul style="list-style-type: none"> <input type="checkbox"/> GP 4 <input type="checkbox"/> GP 2 <input type="checkbox"/> GP 3 <input type="checkbox"/> GP 1 PGT [A7, CW2, 30.5] (9.2 ft-lb, 30 RPM); 6-in ext Soft dock FGB onto ATA Engage ATA FGB bolts (4) 10-11 turns to hard stop <ul style="list-style-type: none"> <input type="checkbox"/> GP 4 <input type="checkbox"/> GP 2 <input type="checkbox"/> GP 3 <input type="checkbox"/> GP 1 Retrieve RET <p>If time permits:</p> <ol style="list-style-type: none"> PGT [B7, CCW2, 30.5] (25.5 ft-lb, 30 RPM); 6-in ext Release ATA Stbd FGB bolts (4) 19 turns, stop on turns (any order) <ul style="list-style-type: none"> <input type="checkbox"/> GP 4 <input type="checkbox"/> GP 2 <input type="checkbox"/> GP 3 <input type="checkbox"/> GP 1 	<p><u>PLB SETUP</u> (00:30)</p> <ol style="list-style-type: none"> Translate to stbd CETA Cart WIF 1 √APFR ingress aid stowed and locked Tether C/L bag to APFR Retrieve APFR and place on BRT <div style="border: 3px double black; padding: 5px; text-align: center;"> <p>WARNING 2-ft KOZ for SSPTS cable floating connectors on Lab Stbd/Fwd HR 0273</p> </div> <ol style="list-style-type: none"> Translate to LAB HR 0247 via the high road Fairlead w/Adj tether on LAB HR 0252 Perform tether swap to spare 85-ft ST on NODE 2 HR 0359: <ul style="list-style-type: none"> <input type="checkbox"/> √Gate closed (both hooks) <input type="checkbox"/> √Hook locked (both hooks) <input type="checkbox"/> √Reel unlocked (Spare 85-ft ST) <input type="checkbox"/> Temp stow A/L 85-ft ST reel on NODE 2 HR 0359 <input type="checkbox"/> √Reel unlocked (A/L 85-ft ST) Translate to Orbiter via nadir side of PMA2 between grapple fixtures <div style="border: 3px double black; padding: 5px; text-align: center;"> <p>WARNING 2-ft KOZ for SSPTS cable floating connectors on PMA2 stbd side Stay > 1 ft from powered ROEU connector Stay 1 ft from PLB SSOR antenna</p> </div> <ol style="list-style-type: none"> Translate to LMC using stbd PLB sill; fairlead on ODS with Adj tether Fairlead on PRLA V-guide Install APFR [1,OO,G,1] into stbd LMC WIF <ul style="list-style-type: none"> <input type="checkbox"/> √Blk-Blk <input type="checkbox"/> Pull/Twist test Remove C/L bag from APFR and temp stow on LMC near middle
FGB Bolt	Torque	Turns	Green Light																			
1																						
2																						
3																						
4																						


EVA 1 PLB ATA RELEASE (00:45) & PLB CLEANUP (00:45)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<ol style="list-style-type: none"> 1. EV and SSRMS Comm Check 2. IV: Inform SSRMS Bolt 3 in work 3. SSRMS: On EV1 GO, grapple FGB 4. SSRMS: Give EV2 GO to release RET 5. SSRMS: GCA clear of structure 6. SSRMS: On EV GO, maneuver to ESP-2 	<p><u>ATA RELEASE (00:45)</u></p> <ol style="list-style-type: none"> 1. PGT [B6, CCW2, 30.5] (24.0 ft-lb, 30 RPM); 6-in ext 2. Release ATA Bolt 4; ~16 turns to hard stop <input type="checkbox"/> √2 white lines visible 3. Release ATA Bolt 2; ~16 turns to hard stop <input type="checkbox"/> √2 white lines visible 4. BRT to LMC HR; restrain ATA 5. Perform comm check with SSRMS 6. Give EV2 GO to release Bolt 3 7. Lift ATA from soft dock 1m up and 30 deg fwd yaw 8. Give SSRMS GO to grapple FGB 9. GCA SSRMS clear of structure 10. Give SSRMS GO to maneuver to ESP-2 <p><u>JEM MPAC/SEED PREP</u></p> <ol style="list-style-type: none"> 11. Receive MPAC/SEED cover from EV2 12. Place cover on BRT 13. Retrieve camera from temp stow 14. Perform tool inventory of MWS 15. Glove check 16. Translate to ODS; retrieve fairlead 	<p><u>ATA RELEASE (00:45)</u></p> <ol style="list-style-type: none"> 1. Retrieve EVA ratchet from C/L bag 2. Break torque (less than 1 turn) on Bolt 3 with EVA ratchet 3. Stow EVA ratchet in C/L bag 4. Ingress APFR 5. RET to ATA HR 6. PGT [B4, CCW2, 30.5] (19.4 ft-lb, 30 RPM); 6-in ext 7. On EV1 GO: Release ATA Bolt 3; ~14 turns <input type="checkbox"/> √Bolt popped up 8. Lift ATA from soft dock 1m up and 30 deg fwd yaw 9. Present ATA to SSRMS 10. On SSRMS GO: Release RET from ATA 11. GCA SSRMS clear of structure 12. Give SSRMS GO to maneuver to ESP-2 <p><u>PLB CLEANUP (00:45)</u></p> <ol style="list-style-type: none"> 13. Transfer MPAC/SEED cover to EV1 14. Perform tool inventory of MWS and C/L bag 15. √APFR ingress aid stowed and locked 16. Attach C/L bag to APFR bootplate 17. Retrieve APFR; place on BRT 18. Glove check 19. Translate to ODS Truss; retrieve fairlead

EVA 1 PLB ATA RELEASE (00:45) & PLB CLEANUP (00:45) (Cont)

EV1 MWS	EV2 MWS	C/L Bag
<ul style="list-style-type: none"><input type="checkbox"/> BRT (L)<ul style="list-style-type: none"><input type="checkbox"/> RET (sm-sm)<input type="checkbox"/> MPAC/SEED Cover w/Rd scoop<input type="checkbox"/> Wire Ties<input type="checkbox"/> RET (sm-sm)<input type="checkbox"/> RET w/PIP Pin<input type="checkbox"/> Adj Tether<input type="checkbox"/> Wire Tie (3)<input type="checkbox"/> Small ISS Trash Bag<input type="checkbox"/> RET (sm-sm)<ul style="list-style-type: none"><input type="checkbox"/> EVA Camera w/Bracket<input type="checkbox"/> RET (sm-sm)<ul style="list-style-type: none"><input type="checkbox"/> PGT w/6-in ext	<ul style="list-style-type: none"><input type="checkbox"/> BRT (L)<ul style="list-style-type: none"><input type="checkbox"/> RET (sm-sm)<input type="checkbox"/> Wire Ties<input type="checkbox"/> RET (sm-sm)<input type="checkbox"/> RET w/PIP Pin<input type="checkbox"/> Adj Tether<input type="checkbox"/> Wire Tie (2)<input type="checkbox"/> Small ISS Trash Bag<input type="checkbox"/> RET w/PIP Pin<input type="checkbox"/> PGT w/6-in ext	<ul style="list-style-type: none"><input type="checkbox"/> Adj Tether (outside – tie down) (2)<input type="checkbox"/> Adj Tether (From MPAC/SEED Cover) (2)<input type="checkbox"/> Wire Tie (outside) (2)<input type="checkbox"/> 55-ft Safety Tether<input type="checkbox"/> Ratchet (No Palm Wheel) (Int RET #1)<ul style="list-style-type: none"><input type="checkbox"/> 7/16-2-in rigid ext<input type="checkbox"/> Round TM (Int RET #2)<ul style="list-style-type: none"><input type="checkbox"/> 7/16-in Flush Socket<input type="checkbox"/> Prybar (Int RET #3)<input type="checkbox"/> Ratchet (No Palm Wheel) (Int RET #4)<ul style="list-style-type: none"><input type="checkbox"/> 7/16-2-in rigid ext<input type="checkbox"/> EVA Camera w/Bracket

EVA 1 PLB CLEANUP (00:45) & JEM MPAC/SEED RETRIEVE (00:45)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)												
<p>1. <input checked="" type="checkbox"/> MCC-H: EFUs & SEDA-AP Mast/PLAM-S Inhibits</p> <p>2. <input type="checkbox"/> Record WVS Survey</p> <p>MPAC/SEED Cover Bolts</p> <table border="1"> <thead> <tr> <th></th> <th>Torque</th> <th>Turns</th> <th>Green Light</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>EV1 MWS</p> <ul style="list-style-type: none"> <input type="checkbox"/> BRT (L) <ul style="list-style-type: none"> <input type="checkbox"/> RET (sm-sm) <ul style="list-style-type: none"> <input type="checkbox"/> MPAC/SEED w/Rd scoop <input type="checkbox"/> Wire Ties <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> RET w/PIP Pin <input type="checkbox"/> Adj Tethers (2) <input type="checkbox"/> Wire Tie (3) <input type="checkbox"/> Small ISS Trash Bag <input type="checkbox"/> RET (sm-sm) <ul style="list-style-type: none"> <input type="checkbox"/> EVA Camera w/Bracket <input type="checkbox"/> RET (sm-sm) <ul style="list-style-type: none"> <input type="checkbox"/> PGT w/6-in ext 		Torque	Turns	Green Light	1				2				<p><u>JEM MPAC/SEED RETRIEVE (00:45)</u></p> <ol style="list-style-type: none"> Translate to JPM via the following: NODE 2 safety tether anchor and Aft/nadir JPM HR path On IV GO: Translate to SEDA-AP payload via the following: JEF stbd/nadir path & JEF fwd/nadir path <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">CAUTION</p> <p>Avoid contact with SEDA-AP sensors, solid lubricant (trunnions), and UCM (umbilical)</p> <p>Avoid contact with MPAC/SEED sample face</p> </div> <div style="border: 3px double black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">WARNING</p> <p>Remain clear of SEDA-AP Mast extension envelope</p> </div> <ol style="list-style-type: none"> If able, take photos and WVS of sample surface <input type="checkbox"/>  PGT [B1, CW2, 30.5] (12.0 ft-lb, 30 RPM); 6-in ext Soft dock MPAC/SEED cover Engage MPAC/SEED cover bolts (2); ~9.4 turns <ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> $\sqrt{2}$ white lines not visible <input checked="" type="checkbox"/> RET on round scoop PGT [B7, CCW2, 30.5] (25.5 ft-lb, 30 RPM); 6-in ext Release MPAC/SEED attachment bolts (3); ~11 turns; bolts will pop up <ul style="list-style-type: none"> <input type="checkbox"/> Bolt 3; $\sqrt{2}$ white lines visible <input type="checkbox"/> Bolt 4; $\sqrt{2}$ white lines visible <input type="checkbox"/> Bolt 5; $\sqrt{2}$ white lines visible Slide MPAC/SEED ISS fwd off of support pins Stow MPAC/SEED on BRT Perform tool inventory Translate to JPM HR 1100 	<ol style="list-style-type: none"> Perform tether swap to A/L 85-ft ST at NODE 2 HR 0359: <ul style="list-style-type: none"> <input type="checkbox"/> $\sqrt{}$ Gate closed <input type="checkbox"/> $\sqrt{}$ Hook locked <input type="checkbox"/> $\sqrt{}$ Reel unlocked (A/L 85-ft ST) <input type="checkbox"/> Stow spare 85-ft ST on MWS Stow APFR in NODE 2 WIF 7 <ul style="list-style-type: none"> <input type="checkbox"/> $\sqrt{}$ Blk-Blk <input type="checkbox"/> Pull/Twist test <p>If time permits, perform <u>RGA PREP</u></p> <p style="text-align: center;"><u>NOTE</u></p> <p>If comm lost after entering truss, exit truss to reestablish</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">CAUTION</p> <p>Avoid inadvertent contact with S0 heat pipes</p> </div> <ol style="list-style-type: none"> Ingress S0 Bay 4 (feet first) PGT [B7, CCW2, 30.5] (25.5 ft-lb, 30 RPM); 6-in ext Release RGA fwd bolts (2), 10-13 turns; bolts pop up <ul style="list-style-type: none"> <input type="checkbox"/> Zenith bolt <input type="checkbox"/> Nadir bolt Egress S0 Bay 4 Verify SAFER config: <ul style="list-style-type: none"> <input type="checkbox"/> $\sqrt{}$ R Handle down (HCM door – Closed) <input type="checkbox"/> $\sqrt{}$ L Handle down (MAN ISO Valve – Open) <ol style="list-style-type: none"> Retrieve EVA ratchet from C/L bag Translate to ESP-2 via LAB gap spanner Fairlead on inboard ESP-2 trunnion
	Torque	Turns	Green Light											
1														
2														

EVA 1 AGB TRANSFER (00:45)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<p>1. SSRMS: On EV GO, approach ESP-2</p>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> <p><u>CAUTION</u> Avoid contact with AGB grapple pin and target</p> </div> <p><u>AGB TRANSFER (00:45)</u></p> <ol style="list-style-type: none"> 1. Perform tether swap to A/L 85-ft ST: <ul style="list-style-type: none"> <input type="checkbox"/> √Gate closed <input type="checkbox"/> √Hook locked <input type="checkbox"/> √Reel unlocked (A/L 85-ft ST) <input type="checkbox"/> Stow spare 85-ft ST on MWS 2. Temp stow MPAC/SEED on A/L HR 3. Translate to ESP-2 Fwd Face 4. Fairlead as reqd <p>5. Give SSRMS GO to approach ESP-2</p> <p>6. RET to AGB HR If space allows:</p> <ol style="list-style-type: none"> 7. PGT [A2, CCW2, 30.5] (3.8 ft-lb, 30 RPM); 6-in ext 8. Use PGT to release AGB Bolt; ~2-4 turns to hard stop <p>If PGT does not fit:</p> <div style="border: 1px solid black; padding: 2px; text-align: center;"> <p><u>CAUTION</u> Verify ratchet wrench is set for CCW to prevent damage to AGB</p> </div> <ol style="list-style-type: none"> 9. Use ratchet to release AGB Bolt; ~2-4 turns to hard stop 10. Pull T-handle to unlock <ul style="list-style-type: none"> <input type="checkbox"/> √2 white lines visible 11. Extend AGB and release AGB from soft dock (2 pin side) 12. Rotate AGB 180 deg 	<p><u>AGB TRANSFER (00:45)</u></p> <ol style="list-style-type: none"> 1. Assist EV1 as reqd 2. Give SSRMS GO to approach ESP-2 3. If reqd, transfer ratchet to EV1

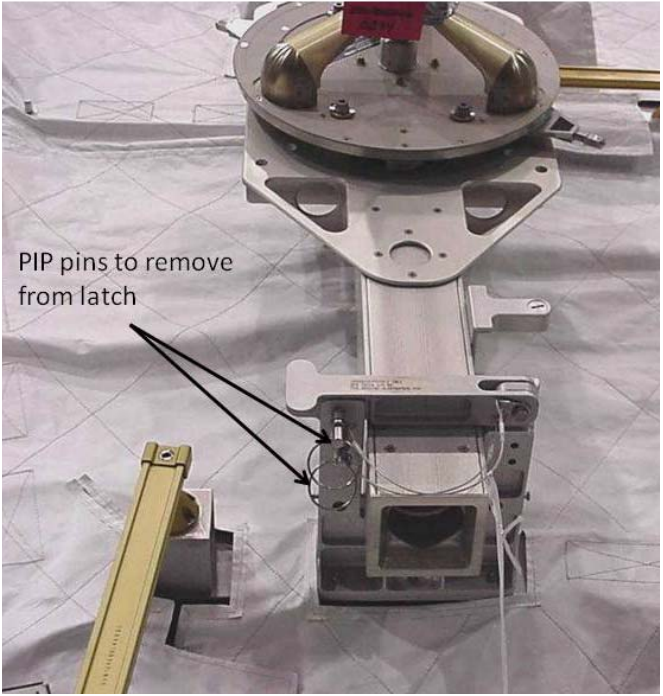
EVA 1 AGB TRANSFER (00:45) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)						
<p>2. SSRMS: GCA for AGB install 3. SSRMS: Give EV GO for AGB install</p> <p>AGB Bolt</p> <table border="1"> <thead> <tr> <th>Torque</th> <th>Turns</th> <th>Green Light</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>4. SSRMS: On EV GO, maneuver to POA</p>	Torque	Turns	Green Light				<p>13. GCA SSRMS for AGB install 14. On SSRMS GO: Soft dock AGB onto ATA (2 pin side stbd) 15. Slide single pin end into ATA receptacle until aligned with ATA position indicator 16. Push T-handle to lock AGB <input type="checkbox"/> √No white lines visible 17. Release RET from AGB</p> <p>18. Close FHRC AGB GP MLI flap (1) 19. Glove check 20. Translate to A/L</p>	<p>4. PGT [A2, CW2, 30.5] (3.8 ft-lb, 30 RPM); 6-in ext 5. Drive AGB bolt, 2-4 turns to hard stop 6. Perform pull test of AGB 7. Give SSRMS GO to maneuver to POA 8. Close FHRC AGB GP MLI flaps (2) 9. Glove check 10. Verify EV2 has EVA ratchet 11. Translate to S0 Face 6 Tether Shuttle Stowage</p>
Torque	Turns	Green Light						

EVA 1 RGA R&R (01:15)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
	<p>RGA 1 INSTALL (01:15)</p> <ol style="list-style-type: none"> 1. Open A/L thermal cover 2. Stow MPAC/SEED in A/L 3. Retrieve Lg ORU bag; place on BRT 4. Close A/L thermal cover 5. Verify EV1 SAFER and WVS config: <ul style="list-style-type: none"> <input type="checkbox"/> √R Handle down (HCM door – Closed) <input type="checkbox"/> √L Handle down (MAN ISO Valve – Open) 6. Translate to S0 Face 6 Tether Shuttle Stowage 7. Unlock and retrieve tether shuttle 8. Translate to face 1 port of MT and CETA cart 9. Install tether shuttle onto nadir CETA rail stbd of EV2 w/TP nadir <ul style="list-style-type: none"> <input type="checkbox"/> Lock shuttle 10. Perform tether swap to spare 85-ft ST on nadir TP: <ul style="list-style-type: none"> <input type="checkbox"/> √Gate closed (both hooks) <input type="checkbox"/> √Hook locked (both hooks) <input type="checkbox"/> √Reel unlocked (Spare 85-ft ST) <input type="checkbox"/> Temp stow A/L 85-ft ST reel on LAB strut HR <input type="checkbox"/> √Reel unlocked (A/L 85-ft ST) 11. Translate to RGA 1 via Face 1; head Zenith at Bay 2 <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">CAUTION</p> <p style="text-align: center;">Avoid inadvertent contact with S0 GPS antennas, S0 aft face radiator, and RGA Z-93 paint</p> </div> 12. Temp stow Lg ORU bag on S0 HR 3519 (face 3 above RGA) outboard stanchion w/lid opening inboard <div style="border: 3px double black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">WARNING</p> <p style="text-align: center;">TERA active WIF probe is no touch</p> </div> 	<ol style="list-style-type: none"> 1. Unlock and retrieve tether shuttle 2. Translate to face 1 port of MT and CETA cart 3. Install tether shuttle onto nadir CETA rail w/TP nadir <ul style="list-style-type: none"> <input type="checkbox"/> Lock shuttle 4. Perform tether swap to spare 85-ft ST on nadir TP: <ul style="list-style-type: none"> <input type="checkbox"/> √Gate closed (both hooks) <input type="checkbox"/> √Hook locked (both hooks) <input type="checkbox"/> √Reel unlocked (Spare 85-ft ST) <input type="checkbox"/> Temp stow A/L 85-ft ST reel near mile marker 8190 <input type="checkbox"/> √Reel unlocked (A/L 85-ft ST) <p>RGA PREP (If not completed earlier) (00:30)</p> <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">If comm lost after entering truss, exit truss to reestablish</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;">Avoid inadvertent contact with S0 heat pipes</p> </div> <ol style="list-style-type: none"> 5. Ingress S0 Bay 4 (feet first) 6. PGT [B7, CCW2, 30.5] (25.5 ft-lb, 30 RPM); 6-in ext 7. Release RGA fwd bolts (2), 10-13 turns <ul style="list-style-type: none"> <input type="checkbox"/> Zenith bolt <input type="checkbox"/> Nadir bolt 8. Egress S0 Bay 4 9. Verify SAFER config: <ul style="list-style-type: none"> <input type="checkbox"/> √R Handle down (HCM door – Closed) <input type="checkbox"/> √L Handle down (MAN ISO Valve – Open) <hr/> <ol style="list-style-type: none"> 10. Glove and gauntlet check 11. Retrieve C/L bag; stow on BRT

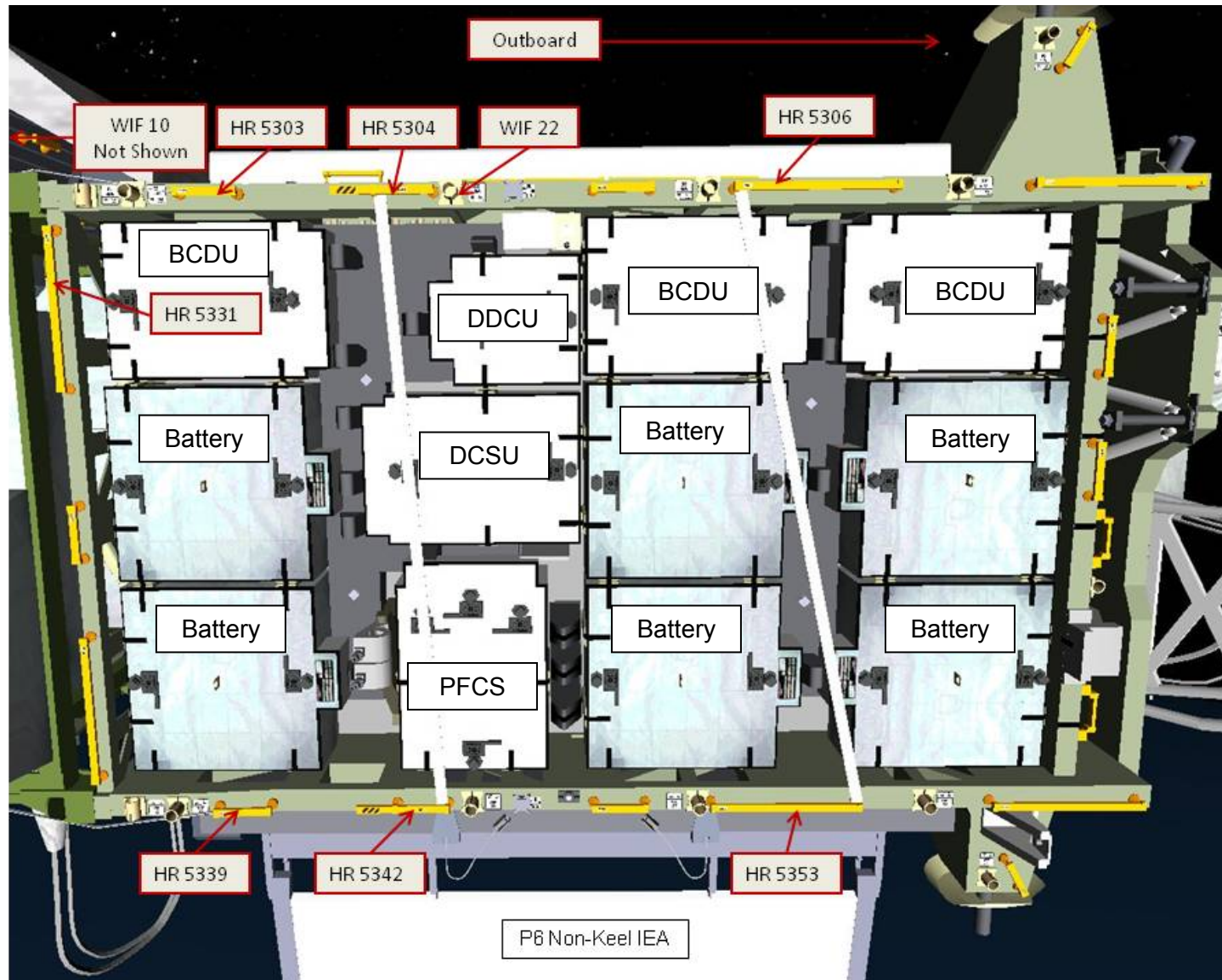
EVA 1 RGA R&R (01:15) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<p>1. <input checked="" type="checkbox"/> MCC-H: RGA inhibits in place</p>	<p>13. Open RGA 1 thermal shroud (port) 14. Attach RET from Lg ORU bag to failed RGA</p> <p>15. If TA clamps must be opened for RGA 1 connector demate, RET to connectors as reqd to avoid loss inside the truss</p> <p>16. On IV GO, demate RGA 1 connectors (2): <input type="checkbox"/> P671 from J671 (Zenith connector) <input type="checkbox"/> P673 from J673 (Aft connector)</p> <p>17. Visually verify if RGA will clear TERA load alleviator</p> <p>If RGA will not clear TERA: 18. Translate to S0 HR 3542 19. RET to TERA 20. Release port PIP pins (2) from over center latch 21. Release PIP pin from TERA passive WIF 22. Install TERA into S0 WIF 43 <input type="checkbox"/> <input checked="" type="checkbox"/> BIK-BIK <input type="checkbox"/> Pull/Twist test</p> <p>23. PGT [B7, CCW2, 30.5] (25.5 ft-lb, 30 RPM); 6-in ext</p> <p>24. Release RGA aft bolts (2), 10-13 turns; bolts pop up <input type="checkbox"/> Zenith bolt <input type="checkbox"/> Nadir bolt</p> <p>25. Remove RGA from slot and tend to Lg ORU bag</p> <p>26. Install spare RGA into guide rails</p>	 <p>PIP pins to remove from latch</p>

EVA 1 RGA R&R (01:15) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)												
<p><u>EV1 MWS</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> BRT (L) <ul style="list-style-type: none"> <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> Wire Ties <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> RET w/PIP Pin <input type="checkbox"/> Adj Tether (2) <input type="checkbox"/> Wire Tie (3) <input type="checkbox"/> Small ISS Trash Bag <input type="checkbox"/> RET (sm-sm) <ul style="list-style-type: none"> <input type="checkbox"/> EVA Camera w/Bracket <input type="checkbox"/> RET (sm-sm) <ul style="list-style-type: none"> <input type="checkbox"/> PGT w/6-in ext <input type="checkbox"/> 55-ft Safety Tether <p><u>Lg ORU Bag</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Adj Tether (Outside) <input type="checkbox"/> RET (sm-sm) <ul style="list-style-type: none"> <input type="checkbox"/> Failed RGA <ul style="list-style-type: none"> <input type="checkbox"/> RGA Caps (2) <input type="checkbox"/> RET (sm-sm) <p><u>RGA Bolts (2 of 4)</u></p> <table border="1"> <thead> <tr> <th></th> <th>Torque</th> <th>Turns</th> <th>Green Light</th> </tr> </thead> <tbody> <tr> <td>Fwd/Zen</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Fwd/Nad</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Torque	Turns	Green Light	Fwd/Zen				Fwd/Nad				<p>45. Perform tool inventory</p> <p>46. Translate to S0 Face 1</p> <p>47. Stow Lg ORU bag on S0 3508 (zenith of Bay 2)</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0; text-align: center;"> <p>CAUTION</p> <p>Avoid inadvertent contact with S0 heat pipes</p> </div> <p>48. Ingress S0 Bay 4</p> <p>49. BRT to S0 HR 3534</p> <p>50. PGT [A2, CW2, 30.5] (3.8 ft-lb, 30 RPM); 6-in ext</p> <p>51. Engage RGA fwd bolts (2), 10-13 turns</p> <ul style="list-style-type: none"> <input type="checkbox"/> Zenith bolt <input type="checkbox"/> Nadir bolt <p>52. Egress S0 Bay 4</p> <p>53. Verify SAFER config:</p> <ul style="list-style-type: none"> <input type="checkbox"/> √R Handle down (HCM door – Closed) <input type="checkbox"/> √L Handle down (MAN ISO Valve – Open) <p>54. Glove and gauntlet check</p>	
	Torque	Turns	Green Light											
Fwd/Zen														
Fwd/Nad														

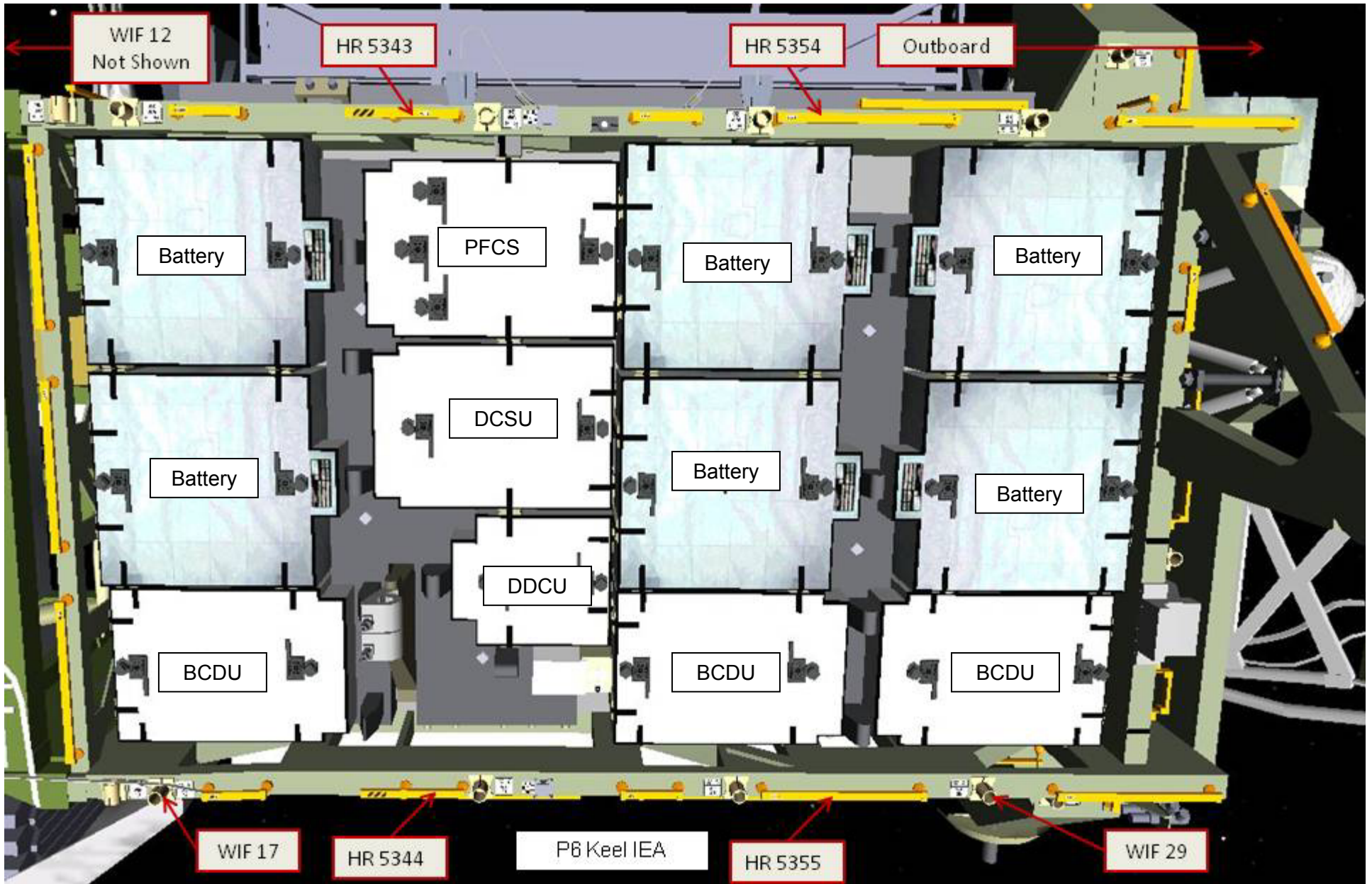
EVA 1 P6 KEEL SIDE BATTERY PREP (01:30) (Cont)



EVA 1 P6 KEEL SIDE BATTERY PREP (01:30) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><u>CAUTION</u></p> <ul style="list-style-type: none"> When breaking torque, release H1 before H2 (jacking bolt) Do not exceed more turns on H2 than H1 When re-torquing bolts, H2 must be tightened before H1 </div> <p style="text-align: center;"><u>RELEASE TORQUE ON BATTERY BOLTS</u></p> <ol style="list-style-type: none"> 1. Break torque on H1 and H2: Ratchet wrench, ccw: <ol style="list-style-type: none"> a. Release torque on H1 bolt (expect ~31.7 ft-lb), 1 turn or less b. Release torque on H2 bolt (expect ~33.5 ft-lb), 1/2 turn or less 2. Re-torque H2 and H1: Ratchet wrench, cw (required bolt torque is between 6 and 70 ft-lb): <ol style="list-style-type: none"> a. Tighten H2 bolt b. Tighten H1 bolt 	<p><u>Outboard/Radiator Side</u> 4B1_1: Release <input type="checkbox"/> H1 <input type="checkbox"/> H2 (APFR) Tighten <input type="checkbox"/> H2 <input type="checkbox"/> H1</p> <p><u>Outboard/Non-Radiator Side</u> 4B1_2: Release <input type="checkbox"/> H1 <input type="checkbox"/> H2 (APFR) Tighten <input type="checkbox"/> H2 <input type="checkbox"/> H1</p> <p><u>Middle/Non-Radiator Side</u> 4B2_2: Release <input type="checkbox"/> H1 <input type="checkbox"/> H2 (APFR) Tighten <input type="checkbox"/> H2 <input type="checkbox"/> H1</p> <p><u>Middle/Radiator Side</u> 4B2_1: Release <input type="checkbox"/> H1 <input type="checkbox"/> H2 (HR 5349) Tighten <input type="checkbox"/> H2 <input type="checkbox"/> H1</p> <ol style="list-style-type: none"> 3. Retrieve APFR [QQ,F,12]; stow on BRT 4. Translate to P6 WIF 17 5. Install APFR into P6 WIF 17 [12,QQ,F,12] <ul style="list-style-type: none"> <input type="checkbox"/> √Blk-Blk <input type="checkbox"/> Pull/Twist test
<p><u>Inboard/Non-Radiator Side</u> 4B3_1: Release <input type="checkbox"/> H1 <input type="checkbox"/> H2 (HR 5337) Tighten <input type="checkbox"/> H2 <input type="checkbox"/> H1</p>		
<p><u>Inboard/Radiator Side</u> 4B3_2: Release <input type="checkbox"/> H1 <input type="checkbox"/> H2 (HR 5336) Tighten <input type="checkbox"/> H2 <input type="checkbox"/> H1</p>		

EVA 1 P6 KEEL SIDE BATTERY PREP (01:30) (Cont)



EVA 1 CLEANUP/INGRESS (00:45)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<p>1. Inform MCC-H when EV crew is clear of P6 BGAs <input type="checkbox"/> EV1 <input type="checkbox"/> EV2</p> <p>2. Inform MCC-H when EV crew is clear of Port SARJ <input type="checkbox"/> EV1 <input type="checkbox"/> EV2</p>	<p><u>CLEANUP (00:30)</u></p> <ol style="list-style-type: none"> 1. Perform tool inventory 2. Translate to C/L bag 3. Stow ratchet in C/L bag 4. Translate to P6 HR 5339 5. Inform IV when clear of P6 BGAs 6. Perform tether swap to TS 85-ft ST: <ul style="list-style-type: none"> <input type="checkbox"/> √Gate closed <input type="checkbox"/> √Hook locked <input type="checkbox"/> √Reel unlocked (TS 85-ft ST) <input type="checkbox"/> Stow spare 55-ft ST reel on MWS <input type="checkbox"/> √Reel unlocked (spare 55-ft ST) 7. If time permits, perform P4/P5 jumper get-ahead 8. Inform IV when clear of Port SARJ 9. Stow 55-ft ST on Lg ORU bag 10. Retrieve Lg ORU bag; place on BRT 11. Translate to LAB strut HR 12. RET to tether shuttle 13. Perform tether swap to A/L 85-ft ST: <ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> √Gate closed (both hooks) <input type="checkbox"/> <input type="checkbox"/> √Hook locked (both hooks) <input type="checkbox"/> √Reel unlocked (A/L 85-ft ST) <input type="checkbox"/> Temp stow spare 85-ft ST anchor on MWS <input type="checkbox"/> √Reel unlocked (Spare 85-ft ST) 14. Unlock and retrieve tether shuttle 15. Translate to face 6 tether shuttle stowage location 16. Install tether shuttle onto stowage rail w/TP nadir <ul style="list-style-type: none"> <input type="checkbox"/> Lock shuttle 	<p><u>CLEANUP (00:30)</u></p> <ol style="list-style-type: none"> 1. Perform tool inventory 2. Translate to C/L bag 3. Stow ratchet in C/L bag 4. Translate to P6 HR 5303 5. Inform IV when clear of P6 BGAs 6. Perform tether swap to TS 85-ft ST: <ul style="list-style-type: none"> <input type="checkbox"/> √Gate closed <input type="checkbox"/> √Hook locked <input type="checkbox"/> √Reel unlocked (TS 85-ft ST) <input type="checkbox"/> Stow spare 55-ft ST reel on MWS <input type="checkbox"/> √Reel unlocked (spare 55-ft ST) 7. If time permits, perform P4/P5 jumper get-ahead 8. Stow 55-ft ST in C/L bag 9. Perform tool inventory of C/L bag 10. Place C/L bag on BRT 11. Inform IV when clear of Port SARJ 12. Translate to S0 HR 3530 13. RET to tether shuttle 14. Perform tether swap to A/L 85-ft ST: <ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> √Gate closed (both hooks) <input type="checkbox"/> <input type="checkbox"/> √Hook locked (both hooks) <input type="checkbox"/> √Reel unlocked (A/L 85-ft ST) <input type="checkbox"/> Temp stow spare 85-ft ST anchor on MWS <input type="checkbox"/> √Reel unlocked (Spare 85-ft ST) 15. Unlock and retrieve tether shuttle 16. Retrieve Lab fairlead 17. Translate to face 6 tether shuttle stowage location 18. Install tether shuttle onto stowage rail w/TP nadir <ul style="list-style-type: none"> <input type="checkbox"/> Lock shuttle

EVA 1 CLEANUP/INGRESS (00:45) (Cont)

EV1 MWS	EV2 MWS	C/L Bag
<ul style="list-style-type: none"><input type="checkbox"/> BRT (L)<ul style="list-style-type: none"><input type="checkbox"/> RET (sm-sm)<input type="checkbox"/> Wire Ties<input type="checkbox"/> RET (sm-sm)<ul style="list-style-type: none"><input type="checkbox"/> Ratchet (No Palm Wheel)<ul style="list-style-type: none"><input type="checkbox"/> 7/16-2-in rigid ext<input type="checkbox"/> RET w/PIP Pin<input type="checkbox"/> Adj Tether (2)<input type="checkbox"/> Wire Tie (3)<input type="checkbox"/> Small ISS Trash Bag<input type="checkbox"/> RET (sm-sm)<ul style="list-style-type: none"><input type="checkbox"/> EVA Camera w/Bracket<input type="checkbox"/> RET (sm-sm)<ul style="list-style-type: none"><input type="checkbox"/> PGT w/6-in ext	<ul style="list-style-type: none"><input type="checkbox"/> BRT (L)<ul style="list-style-type: none"><input type="checkbox"/> RET (sm-sm)<input type="checkbox"/> Wire Ties<input type="checkbox"/> RET (sm-sm)<ul style="list-style-type: none"><input type="checkbox"/> Ratchet (No Palm Wheel)<ul style="list-style-type: none"><input type="checkbox"/> 7/16-2-in rigid ext<input type="checkbox"/> RET w/PIP Pin<input type="checkbox"/> Adj Tether<input type="checkbox"/> Wire Tie (2)<input type="checkbox"/> Small ISS Trash Bag<input type="checkbox"/> RET w/PIP Pin<ul style="list-style-type: none"><input type="checkbox"/> PGT w/6-in ext <input type="checkbox"/> Adj Tether on wrist	<ul style="list-style-type: none"><input type="checkbox"/> Adj Tether (outside – tie down) (2)<input type="checkbox"/> Adj Tether (from MPAC/SEED Cover) (2)<input type="checkbox"/> Ratchet (No Palm Wheel) (Int RET #1)<ul style="list-style-type: none"><input type="checkbox"/> 7/16-2-in rigid ext<input type="checkbox"/> Round TM (Int RET #2)<ul style="list-style-type: none"><input type="checkbox"/> 7/16-in Flush Socket<input type="checkbox"/> Prybar (Int RET #3)<input type="checkbox"/> Ratchet (No Palm Wheel) (Int RET #4)<ul style="list-style-type: none"><input type="checkbox"/> 7/16-2-in rigid ext<input type="checkbox"/> RET (sm-sm)<ul style="list-style-type: none"><input type="checkbox"/> EVA Camera w/Bracket<input type="checkbox"/> 55-ft Safety Tether

EVA 1 CLEANUP/INGRESS (00:45) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<p>Prior to Ingress: 1. Perform WVS PWRDN (PHOTO/TV, <u>WVS CUE CARD</u>)</p> <p style="text-align: center;"><u>A/L Inventory</u></p> <p><u>EV1</u> <input type="checkbox"/> 85-ft Safety Tether (2)</p> <p><u>EV2</u> <input type="checkbox"/> 85-ft Safety Tether (2)</p> <p><u>C/L</u> <input type="checkbox"/> C/L bag <input type="checkbox"/> Lg ORU bag <input type="checkbox"/> Round Scoop <input type="checkbox"/> MPAC/SEED</p>	<p><u>INGRESS</u> (00:15)</p> <p>1. Hand Lg ORU bag to EV2</p> <p>2. Connect waist tether to EV2 85-ft ST</p> <p>3. On EV2 GO: Disconnect EV2 85-ft ST from aft A/L anchor point <input type="checkbox"/><input type="checkbox"/> √Gate closed (both hooks) <input type="checkbox"/><input type="checkbox"/> √Hook locked (both hooks)</p> <p>4. Release EV1 85-ft ST from fwd A/L anchor point; stow on MWS</p> <p>5. Ingress A/L</p> <p>6. Close thermal cover; attach Velcro strap</p> <p>7. Perform A/L Inventory</p> <p>8. Remove SCU from stowage pouch</p> <p>9. Remove DCM cover; Velcro to DCM</p> <p>10. Connect SCU to DCM; √SCU Locked</p> <p style="text-align: center;"><u>NOTE</u> To reduce time for SCU cooling, set TCV 8 – Max C</p> <p>11. WATER – OFF (fwd), expect H2O IS OFF msg</p> <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px auto; width: fit-content;"> <p><u>CAUTION</u> Do not close hatch until EMU Water OFF for 2 min. Verify outer hatch clear of hardware</p> </div> <p>12. √EV hatch clear of FOD and obstructions</p> <p>13. Verify EV hatch handle position per hatch decal; close and lock</p> <p>Go to PRE-REPRESS (<u>DEPRESS/REPRESS</u> Cue Card)</p>	<p><u>INGRESS</u> (00:15)</p> <p>1. Open A/L thermal cover</p> <p>2. Stow C/L bag in A/L</p> <p>3. Ingress A/L</p> <p>4. Receive Lg ORU bag from EV1; stow in A/L</p> <p>5. Connect waist tether to A/L D-ring ext <input type="checkbox"/> √Gate closed <input type="checkbox"/> √Hook locked</p> <p>6. Give EV1 GO to disconnect EV2 85-ft ST</p> <p>7. Perform A/L Inventory</p> <p>8. Remove SCU from stowage pouch</p> <p>9. Remove DCM cover; Velcro to DCM</p> <p>10. Connect SCU to DCM; √SCU Locked</p> <p>11. WATER – OFF (fwd), expect H2O IS OFF msg</p> <p>Go to PRE-REPRESS (<u>DEPRESS/REPRESS</u> Cue Card)</p>

EVA 1 SPECIFIC GET-AHEADS

S1 ATA FGB Bolts (Planned for EVA 2)

IV/SSRMS				EV
1. <input checked="" type="checkbox"/> MCC-H: Stbd TRRJ locked				1. Translate to nadir side of S1 ATA
FGB Bolt	Torque	Turns	Green Light	2. PGT [A1, CW2, 30.5] (2.5 ft-lb, 30 RPM); 6-in ext
1				3. Engage ATA nadir FGB bolts (4) 19 turns
2				<input type="checkbox"/> GP 4 <input type="checkbox"/> GP 2
3				<input type="checkbox"/> GP 3 <input type="checkbox"/> GP 1
4				

WIF Extender Relocate for STS-132 (ULF-4) (Planned for EVA 3)

IV/SSRMS	EV
	<ol style="list-style-type: none"> Translate to stbd edge of ESP-2 to WIF 03 Retrieve WIF Extender, place on BRT Translate to MT/MBS WIF 12 (zenith/stbd) via CETA spur Install WIF EXTENDER [2,A,1] into WIF 12 <ul style="list-style-type: none"> <input type="checkbox"/> <input checked="" type="checkbox"/> BIK-BIK <input type="checkbox"/> Pull/Twist test

EVA 1 SPECIFIC GET-AHEADS (Cont)

P4/P5 Contingency Fluid Jumper (00:15)

IV/SSRMS	EV
<p>QD Size = 1 inch</p> <p><u>Contingency Tools</u></p> <p><input type="checkbox"/> 1-inch QD Release Tool (QRT) Located in A/L QD Bag</p> <p>1. <input type="checkbox"/> Record WVS survey</p>	<div style="border: 3px double black; padding: 5px; text-align: center;"> <p><u>WARNING</u> Maintain 2 ft clearance from rotating BGA including SSU and ECU</p> </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><u>CAUTION</u> QDs exposed to direct sunlight can overtemp in 20 min. Shading by EMU or thermal shroud can lengthen acceptable time with bootie removed</p> </div> <ol style="list-style-type: none"> 1. Translate to P5 HR 5204 (Radiator side) 2. Open TA-clamps (2) 3. Open MLI on QD F16 4. BRT to P5 HR 5204, as reqd 5. Demate QD F16; BLOCK C 6. Close TA-clamps (2) 7. BRT to P4 HR 5146, as reqd 8. Remove cap from QD M16 near P4 HR 5146 9. Verify tools and tethers clear 10. Mate QD F16 to M16 on P4; BLOCK D 11. Open valve on QD F16; BLOCK E 12. Reinstall thermal bootie 13. Perform WVS survey of jumper connection <input type="checkbox"/> 14. Glove and gauntlet check

EVA 1 SPECIFIC GET-AHEADS (Cont)

P4



P5



EVA 1 S1 ATA PREP – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:45

Tools:

EV2
Fish Stringer (Connector Tiedown)
BRT
APFR
Fluid Caps (4) – 1/4 in (2) & 1/2 in (2)

Foot Restraints:

Task	WIF	APFR Setting	Notes
Fluid QD Release	S1 WIF 4	[8,TT,E,10]	Contingency

Fluid QDs:

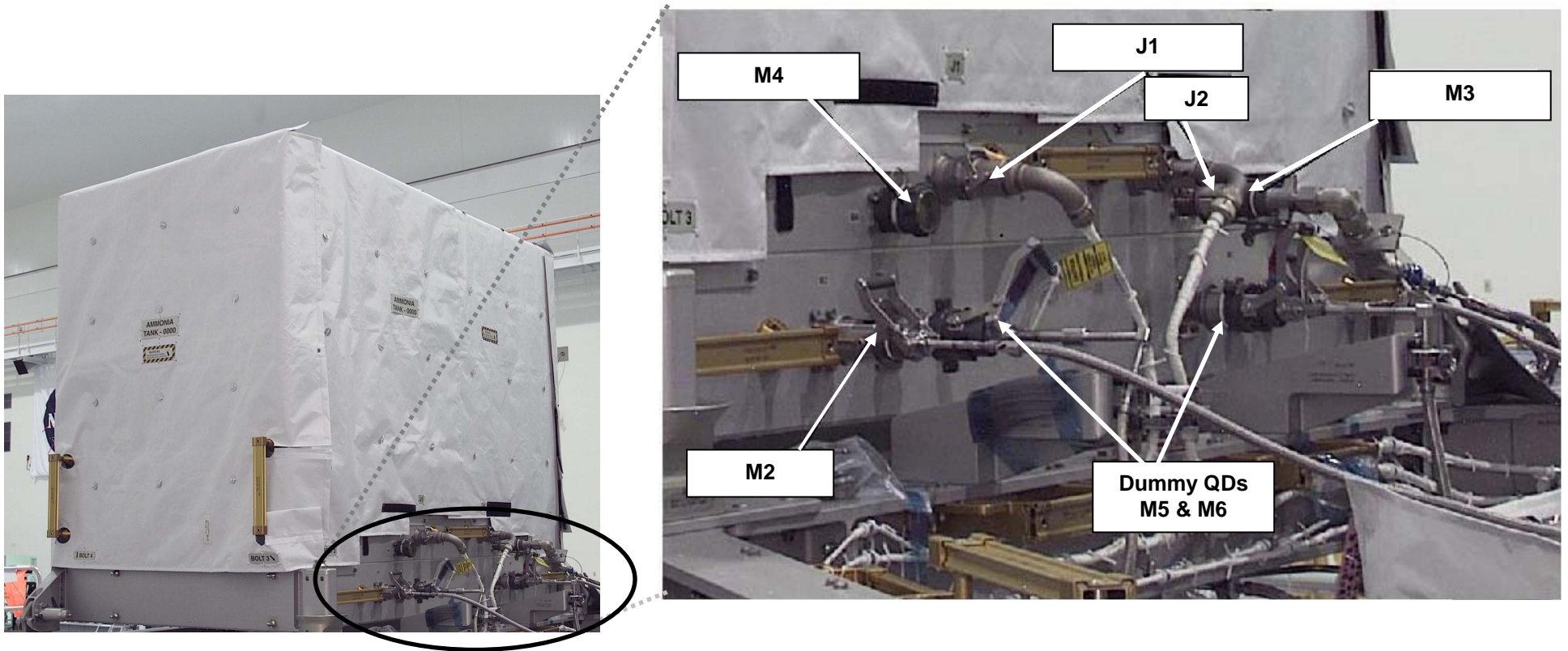
Connector Name	From	To	Clamps (#)	QD Size	Function
F50/M3 * (Zenith)	PM	ATA M3	1	1/2"	NH3 out
F1/M1 (Zenith)	NTA M2	ATA M1	1	1/4"	N2 pressure
F51/M4 (Nadir)	Vent	ATA M4	1	1/2"	NH3 out
F2/M2 (Nadir)	NTA M3	ATA M2	1	1/4"	N2 pressure

* Spool positioning device installed on F50

Cautions:

1. QDs exposed to direct sunlight can overtemp in 20 min. Shading by EMU or thermal shroud can lengthen acceptable time with bootie removed

EVA 1 S1 ATA PREP – TASK DATA (Cont)



EVA 1 FIXED GRAPPLE BAR (FGB) – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:45

EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Old ATA GP release	GP 1-GP 4	7/16	4	---	25.5 (B7)	47.4	8-11	30 (CCW2)
New ATA GP release	GP 1-GP 4	7/16	4	---	25.5 (B7)	47.4	17-20	30 (CCW2)
New ATA GP install	GP 1-GP 4	7/16	4	9.2 (A7)	---	16.1	8-11	30 (CW2)

Tools:

EV1
PGT w/7/16 – 6 in ext BRT

Mass & Dimensions:

ORU	Mass (lb)
FGB	76

Notes:

- All 4 bolts are required for SSRMS grapple
- Soft dock detent on Bolt 3 only

Cautions:

- Avoid contact with FGB grapple pin and target



EVA 1 LMC ATA – TASK DATA

Estimated Task Duration:

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

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
Ammonia Tank Assembly (ATA)	Dry – 1289 Wet – 1760	(L*W*H) 57.3" x 80.1" x 45.4"

Tools:

EV1	EV2
PGT w/7/16 – 6 in ext BRT Fixed Grapple Bar (FGB)	PGT w/7/16 – 6 in ext EVA Ratchet w/7/16 – 2 in ext APFR

EVA Fasteners:

Fastener Name	Head Size	Ground Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	Features
Bolt 1 (Clevis)	7/16	20.0-22.9	24.0 (B6)	165.8	~16	√2 white lines visible
Bolt 2 (Clevis)	7/16	20.0-22.9	24.0 (B6)	165.8	~16	√2 white lines visible
Bolt 3 (Microconical)	7/16	69-81	Ratchet Wrench (99.2 max expected torque) PGT 19.4 (B4)	146.5	~14	Pops up & Free spins
Bolt 4 (Clevis)	7/16	20.0-22.9	24.0 (B6)	165.8	~16	√2 white lines visible
Contingency						
LMC Bolt 3 Release (3 Bolts)	7/16	26.7-28.3	25.5 (B7) (37.3 max expected torque)	63.0	11.5-13	

Foot Restraints:

Task	WIF	APFR Setting
Lift ATA from Soft Dock	Stbd LMC WIF	[1,00,G,1]

Notes:

1. Spring plunger soft docks on Bolts 2 and 4

Cautions:

1. Avoid contact with PLB cameras
2. Avoid contact with FGB grapple pin and target

EVA 1 JEM MPAC/SEED RETRIEVE – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	01:00

Tools:

EV1
Round Scoop
BRT
PGT w/7/16 – 6 in ext

EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	Feature
Sample Cover	1-2	7/16	2	12.0 (B1)	---	88.8	~9.4	√2 white <u>not</u> lines visible
Sample Release	3-5	7/16	3	---	25.5 (B7)	88.8	~11	√2 white lines visible

Foot Restraints:

Task	WIF	APFR Setting	Note
Cover Install & Sample Release	JEF WIF 22	[6,PP,G,12]	Contingency APFR

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
MPAC/SEED Sample	17.6	17.7 x 7.5 x 3.0
Protection Cover	6.2	17.8 x 10.7 x 3.3

Timeline Considerations:

1. Still photos & WVS survey have been requested by hardware owner

Notes:

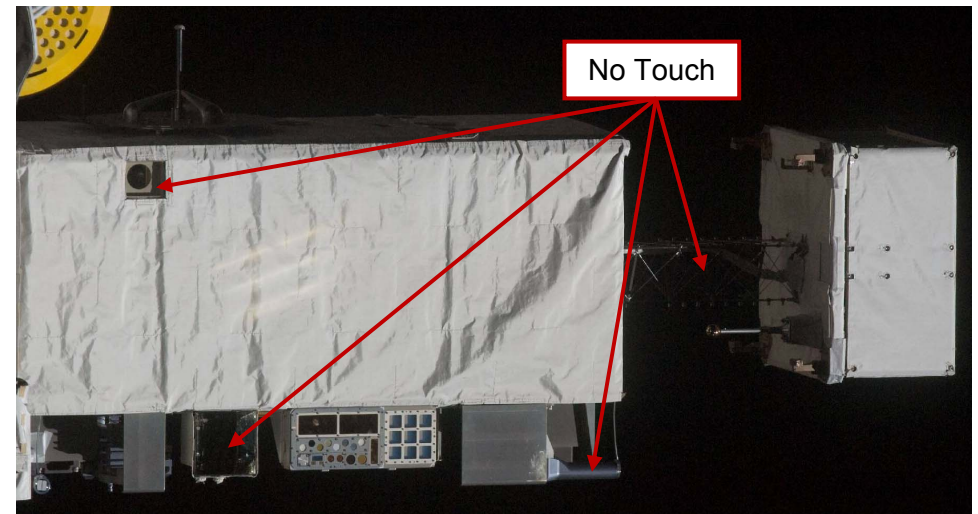
1. MPAC/SEED Cover has soft docks

Cautions:

1. Avoid contact with SEDA-AP sensors, solid lubricant, and UCM (Umbilical)
2. Avoid contact with MPAC/SEED sample face

Warnings:

1. Remain clear of SEDA-AP mast extension envelope



EVA 1 ADJUSTABLE GRAPPLE BAR (AGB) – TASK DATA

Estimated Task Duration:

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

Tools:

EV1	EV2
PGT w/7/16 – 2 in ext or Ratchet	PGT w/7/16 – 6 in ext

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
AGB Bolt	7/16	1	3.8 (A2)	3.8 (A2)	5.7 (Install) 116.8 (Release)	2-4

Mass & Dimensions:

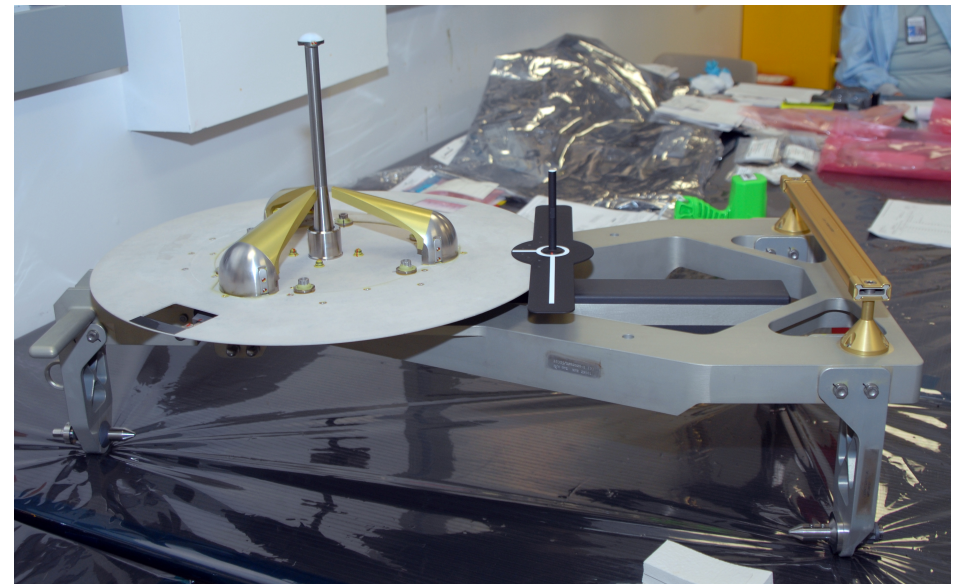
ORU	Mass (lb)
AGB	75

Notes:

1. There are 2 spring plunger soft docks on each passive pin (4 plungers total)
2. There are 2 spring plungers on the AGB T-handle

Cautions:

1. Avoid contact with AGB grapple pin and target



EVA 1 RATE GYRO ASSEMBLY (RGA) R&R – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	01:15	N/A
Two EV Crew	00:45	N/A

Tools:

EV1	EV2
PGT w/7/16 – 6 in ext Lg ORU Bag	PGT w/7/16 – 6 in ext

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
RGA Bolt	7/16	4	3.8 (A2)	25.5 (B7)	30.7 (Release) 29.5 (Install)	10-13

EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
W4210	P671	J671	1	11	Data
W4109	P673	J673	1	15	Power

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
RGA	53.23	23.5 x 22.1 x 14.3

Notes:

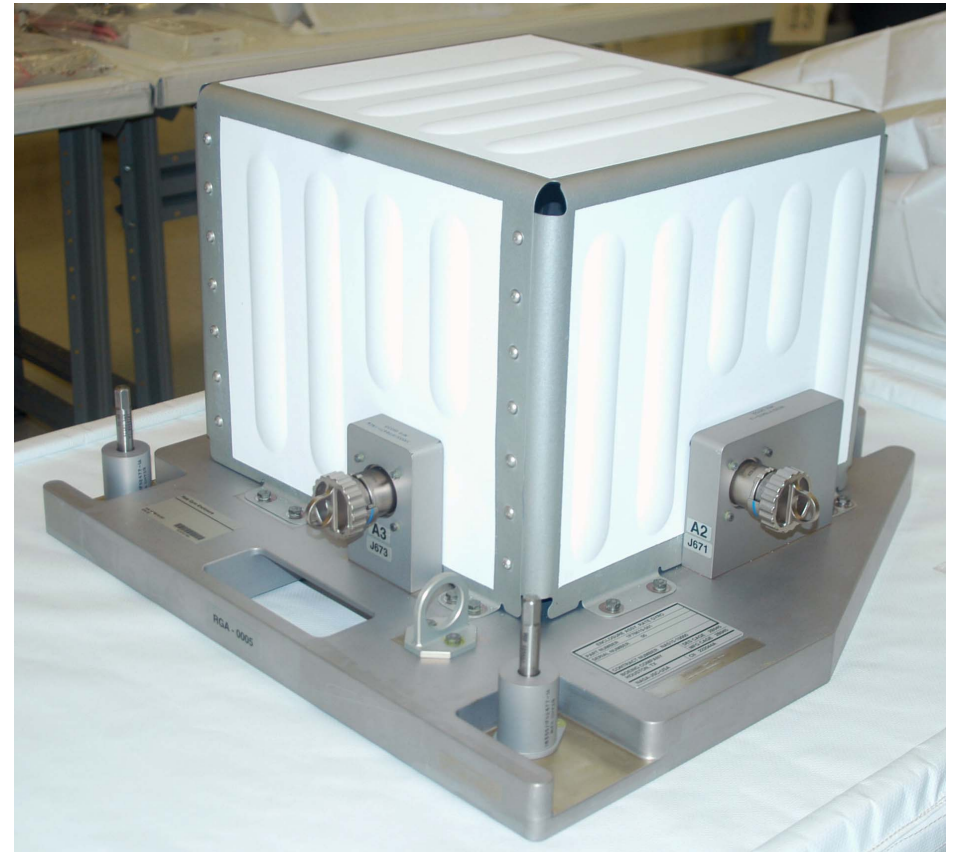
1. RGA soft dock consists of 2 spring plungers on the S0 RGA track

Cautions:

1. Avoid contact with RGA thermal paint
2. Avoid inadvertent contact with S0 aft face radiator

Warnings:

1. TERA active WIF probe is no touch



EVA 2 SUMMARY TIMELINE

PET HR : MIN	IV/SSRMS	EV1 (Mastracchio)	EV2 (Anderson)	
00:00		<u>EGRESS & SETUP</u> (00:15)	<u>EGRESS & SETUP</u> (00:15)	00:00
		<u>RELEASE S1 ATA & HANDOFF TO SSRMS</u> (01:00)	<u>RELEASE S1 ATA & HANDOFF TO SSRMS</u> (01:00)	
		<ul style="list-style-type: none"> Tighten Nadir FGB bolts Release ATA Bolts 3 and 4 H/O ATA to SSRMS 	<ul style="list-style-type: none"> Demate electrical connectors Release ATA Bolt 2 H/O ATA to SSRMS 	
01:00				01:00
		<u>OLD ATA TIEDOWN TO PORT CETA CART</u> (00:45)	<u>OLD ATA TIEDOWN TO PORT CETA CART</u> (00:45)	
		<ul style="list-style-type: none"> Move CETA Cart to P1 Tie down ATA to CETA Cart 	<ul style="list-style-type: none"> Prep CETA Cart Tie down ATA to CETA Cart 	
02:00				02:00
		<u>P1 RAD GF STOWAGE BEAM INSTALL</u> (00:30)	<u>P1 RAD GF STOWAGE BEAM INSTALL</u> (00:30)	
		<u>AGB RELEASE</u> (00:30)	<u>AGB RELEASE</u> (00:30)	
		<ul style="list-style-type: none"> Release AGB from new ATA and temp stow AGB 	<ul style="list-style-type: none"> Release AGB from new ATA and temp stow AGB 	
03:00				03:00
		<u>INSTALL S1 ATA</u> (00:45)	<u>INSTALL S1 ATA</u> (01:00)	
		<ul style="list-style-type: none"> Engage ATA Bolts 2 and 3 	<ul style="list-style-type: none"> Engage ATA Bolts 1 & 4 Release Nadir FGB bolts 	
04:00				04:00
		<u>S1 ATA CONNECTORS</u> (00:45)		
		<ul style="list-style-type: none"> Connect ATA NZGLs Connect ATA Fluid QDs Relocate ULF-4 APFR 	<u>CLEANUP & APFR RELOCATE</u> (00:30)	
		<u>RELEASE CETA CART ATA & INSTALL AGB</u> (01:00)	<u>RELEASE CETA CART ATA & INSTALL AGB</u> (01:00)	
		<ul style="list-style-type: none"> Release ATA from CETA cart Install AGB on old ATA Reconfigure CETA Cart 	<ul style="list-style-type: none"> Release ATA from CETA cart Install AGB on old ATA Reconfigure CETA Cart 	
05:00				05:00
		<u>A/L MMOD SHIELD RETRIEVE</u> (00:45)	<u>A/L MMOD SHIELD RETRIEVE</u> (00:45)	
06:00				06:00
		<u>CLEANUP & INGRESS</u> (00:15)	<u>CLEANUP & INGRESS</u> (00:15)	
06:30				06:30

EVA 2

EVA 2 INHIBIT PAD

Orbiter (1)

ALL EVAs	
TCS (Prior to Egress) L12	1. √TCS POWER – OFF
Ku-Band Antenna (Prior to Egress) MCC-H	
	1. √KU-BAND Mask – active 2. √KU-BAND EVA Protect Box – active
TriDAR (Prior to Egress) IV L12L	
	1. √TriDAR POWER – OFF (tb-bp) (SSP2)

Ground

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

JEM (1)

ALL EVAs	
ICS-EF Antenna SSIPC	
	1. ICS MOD – OFF 2. ICS UPC – OFF 3. ICS HPA – OFF 4. “HPA ON” and “UPC ON” commands are cleared (not present) in the ICS stored command queue

RSOS (1)

ALL EVAs	
SM Antennas IV	
	1. GTS – Deactivate 2. ARISS (Ham Radio) – Deactivate
IMPULSE MCC-M	
	1. IMPULSE (ИПИ-100) – Is not activated

USOS (1)

LOCATION DEPENDENT INHIBIT	
FPMU MCC-H	
	1. FPMU power – Off

USOS (2)

ALL EVAs	
PCU (Prior to Egress)	
NOTE PCUs may require up to a 1-hour warmup period before they are operational.	
MCC-H	1. √PCUs (two) operational in discharge mode and one of the following: a. CCS PCU EVA hazard control FDIR enabled. b. No more than two arrays unshunted and oriented <105° from velocity vector. If one or both PCUs failed 2. No more than two arrays unshunted and oriented <105° from velocity vector.
CUCU (Prior to Egress) IV (LAB104)	
	1. √cb POWER A, B [two] – OPEN 2. √cb LINK 1,2 [two] – OPEN
LOCATION DEPENDENT INHIBITS	
Cupola Windows IV	
	If EV crew less than 10 feet from window or in window FOV, coordinate shutter opening/closing with EV crew and minimize time shutter is open
S-Band (SASA) Antennas (S1 ATA Prep) (Prior to Egress) MCC-H	
	EV crew expected < 3.6 feet from S1 SASA 1. P1 SASA – Active 2. S1 SASA – Powered down and unavailable to FDIR
Mobile Transporter (Prior to Egress) MCC-H	
	EV crew expected <1.5 meters from MT 1. √MT latched
TRRJ (S1: S1 ATA & P1: P1 Rad GF Stowage Beams) MCC-H	
	EV crew working within 2 feet of P1 TRRJ rotation envelope 1. √DLA (1) – LOCKED at 0
MCC-H	EV crew working within 2 feet of S1 TRRJ rotation envelope 2. √DLA (1) – LOCKED between -40 & -115 or 40 & 115
TASK SPECIFIC INHIBITS	
ATA (See detailed procedure for timing of inhibits) MCC-H	
	1. 1.100 S1 ATA Removal and Replacement Prep – Part 4 2. 1.110 S1 ATA Post-Replacement Activation – Part 2

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. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
6. Avoid contact with OBSS striker bars (Vitrolube coating)
7. 85-ft safety tether retract force may affect body positioning

CAUTION

ISS Generic Constraints

- A. Avoid inadvertent contact with
1. Grapple fixture shafts (drylube)
 2. PIP Pins
 3. Passive UMAs
 4. MBS/SSRMS/SPDM taped radiative surfaces: VDU, ACU, JEU, LEU, MCU, CRPCMs, and Cameras
 5. SPDM SJEU, EP, OTCM, LEU, and LEE VDU radiator surfaces
 6. OTSD
 7. MMOD shields tied to ESP-2
- B. Electrical cables
1. Avoid bend radii < 10 times cable diameter
- C. Fiber optic cables
1. Avoid bend radii < 10 times cable diameter
 2. Avoid pulling on cable during mate/demate
- D. Fluid line flex hoses and QDs
1. Avoid bend radii < 14 in for hoses with a diameter ≥ 1 in
 2. Additional care should be taken to not exceed bend radii when applying loads at the flexible hose to rigid tube stub interfaces
 3. Ensure fluid QD booties are fully closed prior to leaving worksite; wire tie if required
 4. Avoid bend radii < 5 in for hoses with diameter < 1 in on LAB, S0, S1, P1, and 10 in for hoses with diameter < 1 in on all other elements

CAUTION

ISS Generic Constraints (Cont)

- 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
- F. Other
1. ITT Cannon connector: On demated connectors, do not rotate collar or manipulate cable/connector using collar or connector tool
 2. MLI handholds are not rated for crewmember translation loads

EVA 2 NOTES, CAUTIONS, AND WARNINGS (Cont)

CAUTION

ISS Truss Constraints

A. Avoid inadvertent contact with

1. CETA lights (Z-93 paint) [LAB,S1, NODE 1]
2. Deployed TUS cable [Zenith and Nadir CETA rails]
3. S0 aft face radiator
4. GPS antennas (S13 paint) [S0,JLP]
5. UHF antennas [LAB,P1]
6. ETCS radiator flexhoses and panels [S1,P1]
7. EETCS/PV radiator flexhoses, bellows and panels [P6,P4,S4,S6]
8. SASA RF group [S1,P1]
9. Heat pipe radiators [Z1]
10. PCU cathode and HCA ports [Z1]
11. Ku-Band antenna (SGANT) dish [Z1]
12. CMG cover/shells [Z1]
13. FPMU [P1]
14. SASA high and low gain antennas and radiator surfaces [Z1]
15. Deployed MISSEs
16. OTP on Hab Tray [S0]

B. For structural reasons

1. Avoid kicking S1/P1 radiator beam. If any of these occur, wait 2 to 5 min to allow structural response to dissipate

CAUTION

ISS Truss Constraints (Cont)

C. Other

1. WIS antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
2. Lubricant from Ku-Band SGANT gimbals [Z1], CMGs [Z1], and RTAS ground strap fasteners [P6,P4,S4,S6] can contaminate EMU
3. Prevent inadvertent contact of the tether shuttle with ETRS when the P3 tether shuttle stop is raised away from the rail

CAUTION

ISS U.S. Pressurized Elements Constraints

A. Avoid inadvertent contact with

1. EVA crane [PMA1]
2. TCS reflectors [PMA2,PMA3]
3. APAS hardware [PMA2,PMA3]
4. CETA lights (Z-93 paint) [LAB,S1, NODE 1]
5. UHF antennas [LAB,P1]
6. Open CBM petal covers, LAB and Cupola window shutters
7. S0/NODE 2 fluid tray hardlines at NODE 2 end, which are limited to 25 lb

B. Other

1. WIS antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
2. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged

EVA 2 NOTES, CAUTIONS, AND WARNINGS (Cont)

CAUTION

ISS I.P. Elements Constraints

COL

- A. Avoid inadvertent contact with
1. COL ARISS and AIS antennas [COL-Nadir]

JEM

- A. Avoid inadvertent contact with
1. GPS antennas (S13 paint) [S0,JLP]
 2. Open JPM window shutter
 3. JTVE, WVE/EVE, JEF VE cameras
 4. JEMRMS taped radiative surfaces [JEU,EE,Cameras]
 5. JEM A/L target and pins
 6. JEF ORUs and EFUs (paint and lubricant)
 7. MAXI front and top panel (paint)
 8. SEDA-AP sensors (HIT, SDOM, and AOM) and MPAC & SEED
 9. Trunnions and UCMs (paint and lubricant) [JEF Payloads]
 10. RAIDS covers on end of HREP
 11. ICS-EF Ka-Band antenna dish
 12. Small Fine Arm (SFA) (paint, coating and lubricant)
- B. For structural reasons
1. Avoid kicking MMOD shields between JLP and JPM
 2. Avoid tool impact on ICS-EF sensor

CAUTION

Shuttle Constraints

- A. Avoid inadvertent contact with
1. OBSS and SRMS composite sections joint torque arms, grapple fixture shafts, and cable harnesses
 2. LCS (silver Teflon) and LDRI (silver Teflon) and ITVC (gold foil) [OBSS]
 3. WVS antenna [ODS truss and PLB sill]
 4. Payload bay and camera wire harnesses, cables, cable guides, 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]

EVA 2 NOTES, CAUTIONS, AND WARNINGS (Cont)

WARNING

ISS Generic Constraints

- A. Avoid inadvertent contact with
1. Grapple fixture targets and target pins
- B. Pinch
1. NZGL connector linkage. Use caution when mating/locking
 2. ITT Cannon connector rotating housing
- C. QDs
1. If QD is in FID when valve is opened (bail fwd), QD will leak and fluid line may whip
 2. Do not rotate if in mated/valve open configuration
- D. Sharp Edges
1. Inner edges of WIF sockets
 2. APFR active WIF probes
 3. Mating surfaces of EVA connectors
Avoid side loads during connector mating
 4. Back side of MMOD shield fasteners
 5. Spring loaded captive EVA fasteners (e.g., 6B-boxes, BMRRM, RTAS, SARJ Covers); the end of the spring may protrude
 6. SPDM OTCM gripper jaws
 7. Keep hands away from SSRMS LEE/POA/SPDM LEE opening, snares, and PDGF curvic coupling (teeth)
 8. MMOD strikes on ISS exterior

WARNING

ISS Generic Constraints (Cont)

- E. Thermal
1. EVA connectors with booties may become hot if left uncovered. Handling may need to be limited
 2. Turn off glove heaters when comfortable temperature reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
 3. Uncovered trunnion pins may be hot
 4. SSRMS/MBS/SPDM operating cameras and lights may radiate large amounts of heat
 5. Do not touch EMU protective visor if temperature has been < -134 degF for > 15 min
 6. No EMU boot contact with foot restraint when temperature < -120 degF or > 200 degF
 7. PDGF surfaces may not meet touch temperature requirements for unlimited contact when $\beta \leq -70$ or $\beta \geq 70$
- F. Electrical Shock
1. Do not touch SPDM CLPA 1 electrical connector prior to camera installation

WARNING

ISS Truss Constraints

- A. Avoid inadvertent contact
1. SSU, ECU, beta gimbal platform, mast canister, SAW blanket boxes unless the beta gimbal is locked and the motor is turned off
 2. Stay inboard of SARJ when active
 3. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate
 4. Stay 5 ft from moving MT on face 1
- B. RF radiation exposure
1. Stay 3.6 ft from S-Band (SASA) high gain antenna when powered [S1,P1]
 2. Stay 1.3 ft from S-Band (SASA) low gain antenna when powered [S1,P1]
 3. Stay 1 ft from UHF antenna when powered [LAB,P1]
- C. Sharp Edges
1. Solar array blanket box [P6,S6]
 2. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing
 3. Outboard MT rail attachment lug near P6 handrail 5333 and gap spanner
 4. P2 connector on EWIS box TAA-06 [Zenith/Forward Corner 1 of P5 – SARJ at 0 deg]
 5. Nickel coated braided copper ground straps may contain frayed wires [P6,P4,S4,S6]
 6. MMOD strikes on Z1 toolboxes

EVA 2 NOTES, CAUTIONS, AND WARNINGS (Cont)

WARNING

ISS Truss Constraints (Cont)

D. Electrical Shock

1. Stay ≥ 2 ft from ungrounded floating connectors if powered
S0 EVA power cables (inside S0 Bay 00 Face 4, Bay 01 Face 3)
ESP-2 jumper (inside S0 Bay 03 Face 4)

E. Thermal

1. ELC may exceed touch temperatures when $\beta > 75$ deg

WARNING

ISS U.S. Pressurized Elements Constraints

A. Handrails

1. Handrails previously used for MISSE attachment may not be used as a safety tether point [A/L endcone 564 and 566, A/L Tank 2 Nad/Fwd and Port/Fwd, P6 5389]

B. Pinch

1. EV side of IV Hatch during Hatch operation (also snag hazard) [A/L]
2. LAB window shutter and CBM petal cover linkages during operation

C. RF radiation exposure

1. Stay 1 ft from UHF antenna when powered [LAB,P1]

D. Sharp Edges

1. PMA umbilical launch restraints – exposed bolt threads
2. Adjustable fuse tether (Fish Stringer) buckles stowed in Node bag
3. Port/Aft portion of A/L circular HR [HR 0506]
4. A/L HR 0537 (Eq Lock Zenith)

E. Thermal

1. PMA handrails may be hot. Handling may need to be limited
2. Stay ≥ 1 ft away from PMAs and MMOD shields > 270 degF if EMU sun visor up; limit time to 15 min or less if > 300 degF
3. Stay at least 0.5 ft away from PMA and MMOD shields > 325 degF
4. No EMU TMG contact with PMAs and MMOD shields > 320 degF

WARNING

ISS U.S. Pressurized Elements Constraints (Cont)

F. Electrical Shock

1. Stay ≥ 2 ft from ungrounded floating connectors if powered
SSPTS connectors include NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA2 Stbd

G. Fluid QDs

1. When NODE 3 – LAB NH3 jumpers are pressurized do not translate on gap spanners restraining jumpers and do not tether or BRT to handrails used to anchor gap spanners

EVA 2 NOTES, CAUTIONS, AND WARNINGS (Cont)

WARNING

ISS I.P. Elements Constraints

COL

A. Avoid inadvertent contact with

1. SOLAR [COL EPF]

B. Thermal

1. Columbus end cones may violate touch temperature constraints when $-75 \leq \beta \leq -60$ or $60 \leq \beta \leq 75$

JEM

A. Avoid inadvertent contact with

1. ICS-EF sensors

B. Pinch

1. JPM window shutter linkages during operation
2. JEM cameras (JVTEs, EVE, WVE, and JEF VEs)
3. JEM EFU latching arms
4. JEF SSE latch
5. ICS-EF antenna boom
6. SEDA-AP mast
7. SMILES antenna rotating area
8. HREP hinge sides and RAIDS pinch areas
9. JEMRMS EE
10. JEMRMS Small Fine Arm (SFA) joints and booms

WARNING

ISS I.P. Elements Constraints (Cont)

JEM (Cont)

C. Sharp Edges

1. Interior of JEMRMS HRMs
2. JEMRMS EE opening and snares
3. JEM A/L hatch corners
4. ICS-EF AHM gears
5. MAXI visual star camera
6. SMILES baffles (two), baffle base bare bolts, and Cold Sky Terminator (CST)
7. HREP baffles (four) [Star tracker aperture Zenith and three instrument baffles Aft]
8. SFA Electro-Mechanical GF (EMGF)

D. RF radiation exposure

1. Stay 0.3 ft from Fwd/Aft JPM PROX antenna

E. Thermal

1. JPM Port End Cones and JLP Port Nadir may violate touch temperature constraints when $\beta > 60$ deg
2. JEMRMS/JTVE/JEFVE operating cameras and lights may radiate large amounts of heat

WARNING

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]

EVA 2 NOTES, CAUTIONS, AND WARNINGS (Cont)

WARNING

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
4. TCS connector backshells have exposed threads [ODS]

E. Thermal

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

F. Contamination

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

G. Lasers

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

EVA 2 BRIEFING CARD

Aft EDDA _____
Fwd EDDA _____
Suit IV _____
Task IV _____
M1/M2 _____

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

General Briefing

1. Robotics – M1/M2

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

2. Communications – Task IV

- Overall setup: Big loop, A/G2, S/G2, ICOM, remind EV crew when mode swapping
- EV/IV comm protocol review – Use EV1/2/3 for DCM sw throws

3. Hygiene Break & EVA Prep – Suit IV

- Remember pure O2 protocol
- Equipment lock activities – IV responsibilities
- Suit donning plan – special requests
- SAFER, MWS, Safety tethers, bag stowage
- Airlock depress review

4. EV Crew Procedure Review – EV CMs

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

5. Other Procedure Review – Task IV

- Get-ahead tasks
 - o P1 RBVM MLI Repair
 - o S1 FHRC P-Clamps (Hosebox Only)
 - o P1 FHRC P-Clamps
- Constraints – ground and flight
- Notes, Cautions, and Warnings review
- Contingency procedures – cribsheet

6. Emergencies Review – Suit IV/Task IV

- Emergency suit doff and power down
 - √Expedited Suit Doffing cue card pre-positioned for EVA day
- Loss of comm
- EMU malfunctions
 - o If you get a mal, read the caution and warning message so everyone knows what it is
- Lost tools
- Lost crewmember
- DCS
- Abort and Terminate scenarios, protocols
- Hand signal reviews

7. Post EVA – Suit IV

- Suit doffing responsibilities
- Post EVA plan

8. Reminders – Task IV

- Translate slow. Relax grip
 - Be extra careful on non-standard routes or orientations
 - Don't hop
- Monitor safety tether
- Prior to moving and ingress, √BRT & Swingarm stowed
- Be disciplined when tired
- OK for IV and ground to check on us. If you need update, ask
- Let mistakes pass
- Manage frustration (slow down, if needed)

EVA 2 BRIEFING CARD (Cont)

Generic Calls:

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

EVA 2 TOOL CONFIG

EV1

EMU D-rings

- D-ring Extender (2, R&L D-ring)
 - A/L 85-ft Safety Tether (R D-ring Ext)
- Waist Tether (L on D-ring Ext)

MWS

- RET (sm-sm)
 - Ratchet (No Palm Wheel)
 - 7/16-2-in rigid ext
- RET w/PIP Pin
- Adj Tether (2)
- Wire Tie (3)
- Small ISS Trash Bag
- Swing Arm (R)
 - RET (sm-sm)
 - PGT w/6-in ext s/n 1006
 - PGT Battery s/n _____
- BRT (L)
 - RET (sm-sm)
 - Wire Tie (2 – short & 2 – long)

- SAFER
- EHIP (Lights)/ERCA (WVS)

NOTE: Prior to use, inspect the following hardware:

- RET cords for fraying
- Safety Tether/Waist Tether LAS & D-ring Extenders; ref (section 8) CREW TETHER INSPECTIONS:
 1. MMOD/general damage
 2. Discoloration
 3. Tack Stitching
 4. Red Band
- ISS Trash Bag: Empty, Zipped, and √Bristle deformation/damage, after having stowed tools inside
- PGT MTL @ 30.5 & battery ~40 V
- Verify MWS EE secured to T-bar
- Verify ORUs brought IVA are capped

Tether Counts: (Red RETs)
 RETs (sm-sm) = 11 of 16 RETs (PIP Pin) = 3 of 5
 RETs (Lg-sm) = 3 of 8 Adj Equip Tethers = 12 of 10

EV2

EMU D-rings

- D-ring Extender (2, R&L D-ring)
 - A/L 85-ft Safety Tether (L D-ring Ext)
 - Spare 85-ft Safety Tether (L D-ring Ext)
- Waist Tether (R on D-ring)

MWS

- RET (sm-sm)
- RET w/PIP Pin
- Adj Tether
- Wire Tie (2)
- Small ISS Trash Bag
 - Wire Ties (2) (CETA Cart)
- LDTD Tethers (2)
- Swing Arm (R)
 - RET w/PIP Pin
 - PGT w/6-in ext s/n 1001
 - PGT Battery s/n _____
- BRT (L)
 - RET (sm-sm)
 - Wire Tie (2 – short & 2 – long)

- Adj Tether (2) on wrists

- SAFER
- EHIP (Lights)/ERCA (WVS)

Camera Checkout

- √Camera focuses
- √Data in view finder
- Take sample IVA photos to check camera function
- √Eyepiece thermal wrap connected to thermal blanket

Prybar must be placed in Staging Bag

CREWLOCK

- Tether Ext on A/L D-ring
 - RET (Lg-sm)
 - C/L bag
 - Adj Tether (outside – tie down)
 - RET (sm-sm) (outside)
 - EVA Camera w/Bracket
 - Ratchet (No Palm Wheel) (Int RET #1) (Pre-Stage hook outside of bag)
 - 7/16-2-in rigid ext
 - Round TM (Int RET #2)
 - 7/16-in Flush Socket
 - MMOD Shield T-Handle Short (Int RET #3)
 - RET (sm-sm)
 - EVA Camera w/Bracket
 - 3 – Adj Tethers (ATA Tiedown)
 - 3 – Adj Tethers (ATA Tiedown)
 - EV2 Spare 85-ft Safety Tether
 - Fish Stringer (ATA QDs)
 - 4 – FQD Caps (ATA)
 - RET (Lg-sm)
 - Med ORU bag (Deploy beams through gap)
 - EV1 Spare 85-ft Safety Tether (Outside)
 - RET (sm-sm)
 - Outbd RAD GF Stow Beam (Bottom of Bag – Label Up)
 - RET (sm-sm)
 - Inbd RAD GF Stow Beam (Top of Bag – Label Up)
 - RET (sm-sm)
 - Socket Caddy (PIP Pin vertical)
 - 5/8 x 7.8 in socket (Center Post)
 - RET (Lg-sm) (On D-ring Extender)
 - A/L MMOD Shields
 - MMOD Shield T-Handle
- (Pre-Configure Bungie for Shields)

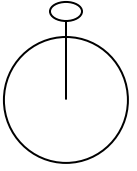
EVA 2 TOOL CONFIG (Cont)

- Staging Bag
 - Fish Stringer
 - Wire Tie Caddy (Hook #1)
 - Velcro/Tape Caddy (Hook #2)
 - PGT (Hook #3) s/n 1002
 - PGT Battery s/n _____
 - 7/16 (wobble) Socket-6 ext
 - Vise Grips (Hook #4)
 - Ratchet Wrench (Hook #5)
 - 7/16 (rigid) Socket-9 ext
 - Needle Nose Pliers (Hook #6)
 - Spare WIF Adapter (Hook #7)
 - Spare 85-ft Safety Tether
 - Fish Stringer
 - Connector Cleaner Tool Kit (Hook #1)
 - Pin Straightener Assy (Hook #2)
 - Probe w/Sheath (Hook #3)
 - Hammer (Hook #4)
 - Cheater Bar (Hook #5)
 - Prybar (Hook #6)
 - BRS Pin Tool (Hook #7)
 - MWS Key Strap Assy (on Wire tie, to strap)
 - Long Duration Tie-Down Tethers (2)
 - RET (sm-sm)
 - Right Angle Drive
- IV Bag
 - Towels (2)
 - Contamination Detection Kit
 - GP Caddy (2)
 - Adjustable Thermal Mittens (2)
 - Socket Caddy (hatch cont) w/RET (sm-sm) (Black)
 - 1/2 Socket-8 ext
 - 7/16 (wobble) Socket-6 ext (spare)
 - DCM Plug (SAFER Hardmount) (2)
 - RET (sm-sm, Black) (2)



EVA 2 EGRESS & SETUP (00:15)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<p>1. WVS Software: Select page – RF Camera sel 'Advanced controls' S-Band level (two) – max (Required after A/L egress)</p>	<p><u>INITIAL CONFIG</u> Verify:</p> <ul style="list-style-type: none"> <input type="checkbox"/> EV1 left waist tether connected to A/L D-ring extender <input type="checkbox"/> EV1 safety tether connected to EV2 right waist tether <input checked="" type="checkbox"/> Gate closed (both hooks) <input checked="" type="checkbox"/> Hook locked (both hooks) <p><u>EGRESS (00:15)</u></p> <ol style="list-style-type: none"> 1. Check ST config <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Gate closed <input checked="" type="checkbox"/> Hook locked <input checked="" type="checkbox"/> Reel unlocked 2. On EV2 GO: Release waist tether from A/L D-ring extender 3. Place camera on MWS 4. Transfer C/L bag to EV2. (Attach RET to A/L D-ring) 5. Egress A/L 6. Retrieve ORU bag w/Lg-sm RET; stow on A/L HR 7. Close A/L thermal cover 8. Verify EV1 SAFER, WVS and MWS config: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> R Handle down (HCM door – Closed) <input checked="" type="checkbox"/> L Handle down (MAN ISO Valve – Open) 	<p><u>INITIAL CONFIG</u> Verify:</p> <ul style="list-style-type: none"> <input type="checkbox"/> EV2 right waist tether connected to EV1 85-ft ST <input checked="" type="checkbox"/> Gate closed (both hooks) <input checked="" type="checkbox"/> Hook locked (both hooks) <p><u>EGRESS (00:15)</u></p> <ol style="list-style-type: none"> 1. Open A/L thermal cover 2. Egress A/L 3. Attach EV2 85-ft ST to aft A/L anchor point <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Gate closed (both hooks) <input checked="" type="checkbox"/> Hook locked (both hooks) <input checked="" type="checkbox"/> Reel unlocked 4. Attach EV1 85-ft ST to fwd A/L anchor point <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Gate closed <input checked="" type="checkbox"/> Hook locked 5. Release waist tether from EV1 85-ft ST 6. Give EV1 GO to release waist tether from A/L D-ring extender 7. Receive C/L bag from EV1 and stow on BRT 8. Verify EV2 SAFER, WVS and MWS config: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> R Handle down (HCM door – Closed) <input checked="" type="checkbox"/> L Handle down (MAN ISO Valve – Open)

EVA 2 S1 ATA RELEASE & HANDOFF TO SSRMS (01:00)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)																				
<p>1. <input checked="" type="checkbox"/> MCC-H: <input type="checkbox"/> Stbd TRRJ locked, <input type="checkbox"/> S1 SASA off, and <input type="checkbox"/> S1 ATA inhibits in place</p> <table border="1"> <thead> <tr> <th>FGB Bolt</th> <th>Torque</th> <th>Turns</th> <th>Green Light</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	FGB Bolt	Torque	Turns	Green Light	1				2				3				4				<p><u>S1 ATA PREP</u></p> <ol style="list-style-type: none"> Retrieve APFR from stbd A/L toolbox On IV GO: Translate to nadir side of S1 ATA Install APFR into S1 WIF 4 [8,TT,E,10] <ul style="list-style-type: none"> <input type="checkbox"/> \sqrtBik-Bik <input type="checkbox"/> Pull/Twist test Fairlead on S1 HR 3291 w/Adj tether Temp stow camera, as reqd PGT [A1, CW2, 30.5] (2.5 ft-lb, 30 RPM); 6-in ext Engage ATA nadir FGB bolts (4) 19 turns <ul style="list-style-type: none"> <input type="checkbox"/> GP 4 <input type="checkbox"/> GP 2 <input type="checkbox"/> GP 3 <input type="checkbox"/> GP 1 	<p><u>S1 ATA PREP</u></p> <ol style="list-style-type: none"> On IV GO: Translate fwd around the C/L to zenith side of S1 ATA; fairlead on CETA spur <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>CAUTION Avoid contact with FGB grapple pin and target</p> </div> <ol style="list-style-type: none"> Temp stow C/L bag on S1 HR 3283 & 3279 (Stbd/Zenith of ATA); deploy tether for EV1 ratchet
FGB Bolt	Torque	Turns	Green Light																			
1																						
2																						
3																						
4																						
<p style="text-align: center;"><u>ATA FGB Attach Points</u></p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  </div>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>CAUTION QDs exposed to direct sunlight can overtemp in 20 min. Shading by EMU or thermal shroud can lengthen acceptable time with bootie removed</p> </div> <p style="text-align: center;"><u>NOTE</u> Be aware of possible metal shaving debris coming out of AGB attach points on ATA</p> <p><u>RELEASE S1 ATA</u></p> <ol style="list-style-type: none"> Break torque on ATA Bolt 3 with EVA ratchet; less than 1 turn Stow ratchet on C/L bag w/deployed RET PGT [B6, CCW2, 30.5] (24.0 ft-lb, 30 RPM); 6-in ext Release ATA Bolt 4; ~16 turns to hardstop <ul style="list-style-type: none"> <input type="checkbox"/> \sqrt2 white lines visible Ingress APFR RET to ATA HR 	<p><u>RELEASE ATA CONNECTORS</u></p> <ol style="list-style-type: none"> Open shroud covering old ATA connectors On IV GO: Open TA clamps as reqd and demate P634 from connector J1 Open TA clamps as reqd and demate P635 from connector J2 Restrain fluid and electrical connectors using Fish Stringer <p><u>RELEASE S1 ATA</u></p> <ol style="list-style-type: none"> PGT [B6, CCW2, 30.5] (24.0 ft-lb, 30 RPM); 6-in ext Release ATA Bolt 2; ~16 turns to hardstop <ul style="list-style-type: none"> <input type="checkbox"/> \sqrt2 white lines visible Verify ATA Bolt 1 released <ul style="list-style-type: none"> <input type="checkbox"/> \sqrt2 white lines visible 																				

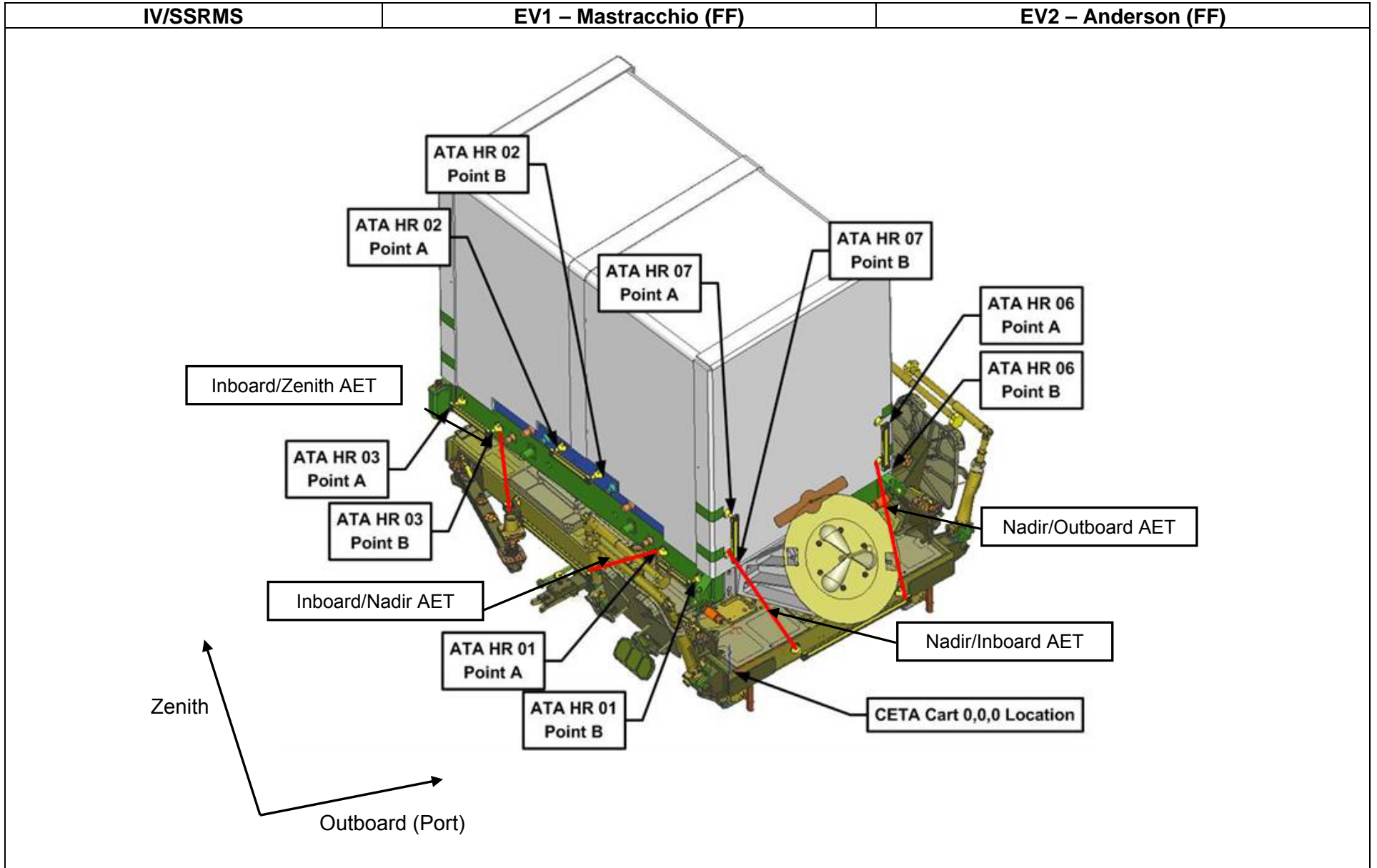
EVA 2 S1 ATA RELEASE & HANDOFF TO SSRMS (01:00) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
2. EV & SSRMS Comm Check	14. Perform comm check with SSRMS	
	15. PGT [B6, CCW2, 30.5] (24.0 ft-lb, 30 RPM); 6-in ext	10. BRT to S0 HR 3418 (vert HR port of ATA) or 3427 (port of 3418); restrain ATA
3. IV: Inform SSRMS Bolt 3 is in work	16. On EV2 GO: Release ATA Bolt 3 ; ~14 turns bolt will free spin <input type="checkbox"/> √Bolt popped up	11. Give EV1 GO to release ATA Bolt 3
	17. Verify tools and tether clear of ATA	12. Verify tools and tethers clear of ATA
	18. Lift old ATA from soft dock 2 ft ISS aft	13. Lift old ATA from soft dock 2 ft ISS aft
4. SSRMS: On EV2 GO, grapple ATA	19. Present old ATA to SSRMS	14. Move port of ATA to S0 HR 3434 (diagonal HR)
5. SSRMS: Give EV1 GO to release RET	20. On SSRMS GO: Release RET from ATA	15. Verify SSRMS LEE in view
6. SSRMS: Mnvr to S1 Backoff	21. Give SSRMS GO to maneuver to S1 backoff and provide ATA to S1 clearance calls	16. Give SSRMS GO to grapple old ATA
	22. After SSRMS is at S1 Clearance position, egress APFR	17. Give SSRMS GO to maneuver to S1 backoff and provide ATA to S1 clearance calls
	23. Verify FQDs are shaded	18. After SSRMS is at S1 Clearance position, retrieve C/L bag; stow on BRT
	24. Retrieve EVA camera; stow on MWS	19. Verify FQDs are shaded
	25. Retrieve fairlead	20. Perform WVS survey for shrouded connectors 
7.  Record WVS survey	26. Glove check	21. Glove check
	27. Translate to A/L	CAUTION Avoid inadvertent contact with OTSD, S0 aft radiator, and S0 GPS antennas
	28. Retrieve ORU bag; stow on BRT	
	29. Translate to inboard side of port CETA cart	22. Once SSRMS is clear, translate to port CETA cart via Hab tray on Face 3; poorman fairlead on S0 trunnion and HRs near GPS antenna, as reqd
	30. Temps stow ORU bag on CETA cart, if reqd	

EVA 2 PORT CETA CART ATA TIEDOWN (00:45)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<p>1. SSRMS: GCA to CETA cart</p> <p>2. SSRMS: Give EV GO to attach tethers to ATA</p>	<p><u>STOW ATA ON CETA CART</u></p> <p>1. Prep CETA cart for old ATA:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Push brake release 2 times <input type="checkbox"/> CETA cart coupler to unlock <input type="checkbox"/> Push cart port to Bay 06. Align inboard TFR with mile marker 8445 <input type="checkbox"/> Verify cart wheel bogies not over truss joint <input type="checkbox"/> Engage parking brake (left handle) <input type="checkbox"/> CETA cart coupler to capture <input type="checkbox"/> √Inboard brake handles parallel to Face 1 <input type="checkbox"/> Rotate inboard TFR to position 5; lock TFR <p>2. Temp stow ORU bag on S0 HR 3530 (short vert HR below Bay 4)</p> <p>3. Fairlead on CETA HR w/Adj tether</p> <p>4. Temp stow camera, as reqd</p> <p>5. Retrieve Adj tethers (3) from C/L bag</p> <p>6. Pre-stage Inboard Adj tethers (3); fully loosen tethers <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>7. Verify tools and tethers are clear of CETA cart</p> <p>8. GCA SSRMS to CETA cart</p> <p>9. On SSRMS GO: Attach tethers between CETA cart and old ATA loosely <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p><u>STOW ATA ON CETA CART</u></p> <p>1. Temp stow C/L bag on P1 HR 3617 (short HR zenith of NTA)</p> <p>2. Prep CETA cart for old ATA:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Retrieve wire ties (2) between outboard brake handles and CETA cart. (Leave brake handles folded and wire tied together); stow in trash bag <input type="checkbox"/> Fold brake handles parallel to Face 1 <input type="checkbox"/> Rotate outboard TFR zenith to position 5; lock TFR <p>3. Retrieve Adj tethers (3) from C/L bag</p> <p>4. Pre-stage Zenith Adj tethers (3); fully loosen tethers <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>5. Verify tools and tethers are clear of CETA cart</p> <p>6. GCA SSRMS to CETA cart</p> <p>7. If reqd, RET to ATA</p> <p>8. On SSRMS GO: Attach tethers between CETA cart and old ATA loosely <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>

EVA 2 PORT CETA CART ATA TIEDOWN (00:45) (Cont)



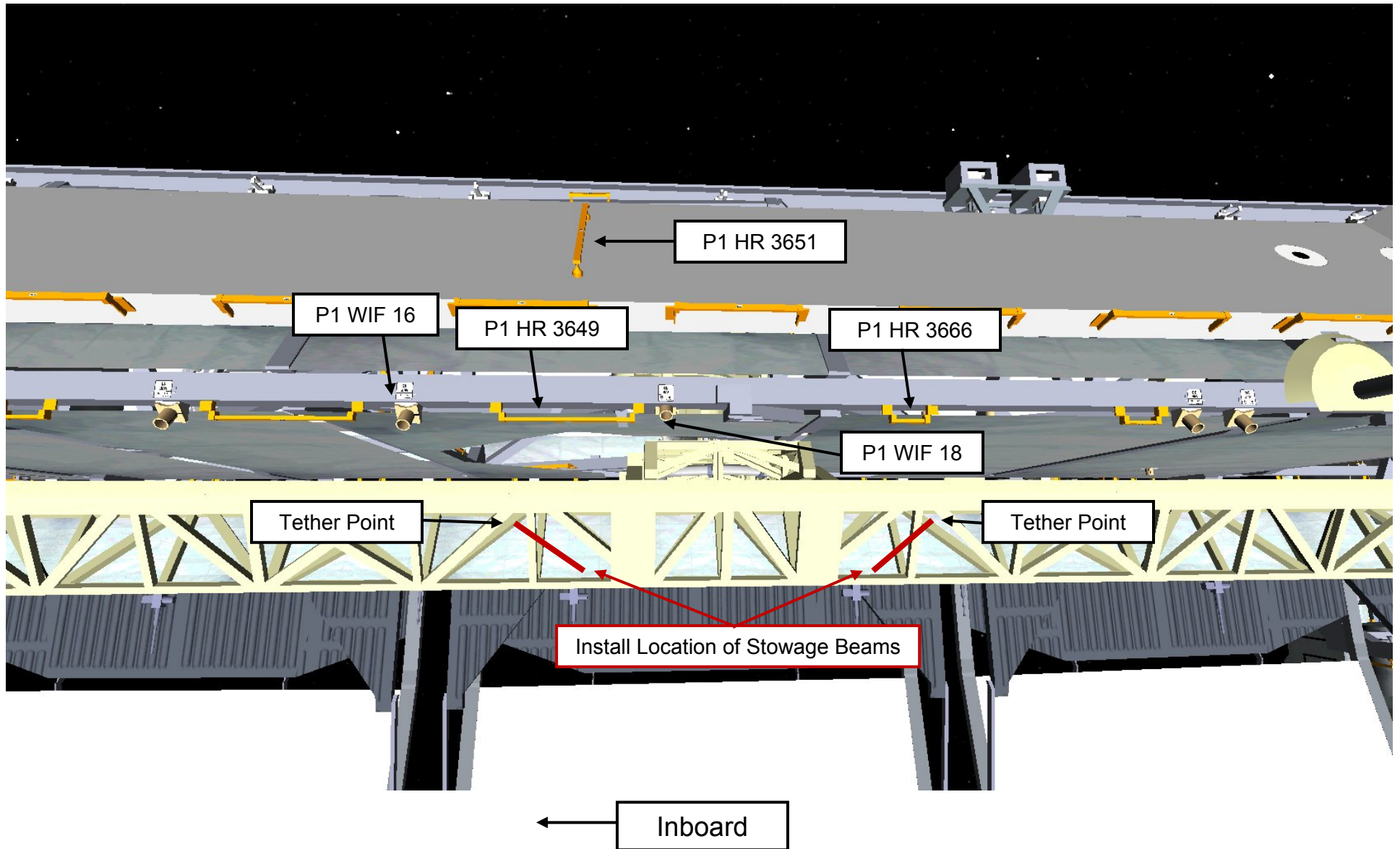
EVA 2 PORT CETA CART ATA TIEDOWN (00:45) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<p>3. SSRMS: On EV GO, ungrapple ATA</p> <p>4. SSRMS: Inform EV crew when clear of ATA</p> <p>5. Record WVS survey</p>	<p>10. Give SSRMS GO to ungrapple old ATA</p> <p>11. Snug tethers: <input type="checkbox"/> Zen/In (Top) <input type="checkbox"/> In/Zen <input type="checkbox"/> In/Nadir <input type="checkbox"/> Nadir/In (Bottom)</p> <p>12. When SSRMS is clear of ATA, perform WVS survey of tiedown </p> <p>13. Glove check</p>	<p>9. Give SSRMS GO to ungrapple old ATA</p> <p>10. Snug tethers: <input type="checkbox"/> Zen/Out (Top) <input type="checkbox"/> Nadir/Out (Bottom)</p> <p>11. When SSRMS is clear of ATA perform, WVS survey of tiedown </p> <p>12. Glove check</p>

EVA 2 P1 RADIATOR GF STOWAGE BEAM INSTALL (00:30) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)									
<p>P1 Inboard Stowage Beam Bolts</p> <table border="1"> <thead> <tr> <th></th> <th>Torque</th> <th>Green Light</th> </tr> </thead> <tbody> <tr> <td>Fwd</td> <td></td> <td></td> </tr> <tr> <td>Aft</td> <td></td> <td></td> </tr> </tbody> </table>		Torque	Green Light	Fwd			Aft			<p>13. Transfer PGT to EV2</p> <p>14. BRT to P1 HR 3666, as reqd</p> <p>15. Receive outboard stowage beam from EV2</p> <p>16. Place stow beam on radiator beam with tether point facing ISS fwd (away from radiator)</p> <p>17. Depress bolts (2) of outboard stowage beam to engage zip nuts</p> <p>18. Receive PGT w/5/8 in socket from EV2</p> <p>19. PGT [B1, CW2, 30.5] (12.0 ft-lb, 30 RPM); 5/8 x 7.8-in ext</p> <p>20. Torque bolts (2) of outboard stowage beam <input type="checkbox"/> <input type="checkbox"/></p> <p>21. Check no white lines visible on bolts <input type="checkbox"/> <input type="checkbox"/></p> <p>22. Transfer PGT to EV2</p> <p>23. Verify TRRJ launch lock is still in stowed config</p> <p>24. Retrieve ORU bag</p> <p>25. Perform tether swap to A/L 85-ft ST <input type="checkbox"/> <input type="checkbox"/> √Gate closed (both hooks) <input type="checkbox"/> <input type="checkbox"/> √Hook locked (both hooks) <input type="checkbox"/> √Reel unlocked (A/L 85-ft ST) <input type="checkbox"/> Stow spare 85-ft ST on ORU bag</p> <p>26. Temp stow ORU bag on S0 HR 3530</p> <p>27. Translate to Port CETA cart</p>	<p>9. Receive PGT from EV1</p> <p>10. Retrieve outboard stowage beam from ORU bag with lid closed</p> <p>11. Transfer stow beam to EV1</p> <p>12. Transfer PGT to EV1</p> <p>13. Receive PGT from EV1</p> <p>14. Socket swap to 7/16 x 6-in ext on PGT and 5/8 x 7.8-in on socket caddy <input type="checkbox"/> <input type="checkbox"/> Pull test</p> <p>15. Translate stbd to S0 Bay 2 Face 1 for AGB removal</p>
	Torque	Green Light									
Fwd											
Aft											

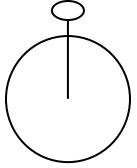
EVA 2 P1 RADIATOR GF STOWAGE BEAM INSTALL (00:30) (Cont)



EVA 2 AGB RELEASE & S1 ATA INSTALL (02:00) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)																								
<p>4. SSRMS: On EV GO, mnvr to S1 Approach position</p> <p>5. SSRMS: GCA to ATA ungrapple</p> <p>6. SSRMS: On EV1 GO, ungrapple ATA</p> <p>7. SSRMS: Inform EV crew when clear of ATA</p>	<p><u>S1 ATA INSTALL</u> (00:45)</p> <p>18. Translate to A/L</p> <p>19. Temp stow ORU bag on A/L toolbox</p> <p>20. Translate to nadir side of S1 ATA worksite</p> <p>21. Verify Bolt 1,2, & 4 spherical bearing will not impede bolt <input type="checkbox"/> Bolt 1 <input type="checkbox"/> Bolt 2 <input type="checkbox"/> Bolt 4</p> <p>22. Verify Bolt 1 clevis rotated out of the way</p> <p>23. Verify APFR S1 WIF 4 [8,TT,E,10]</p> <p>24. Fairlead as reqd</p> <p>25. Ingress APFR</p> <p>26. Inform SSRMS ready to monitor clearances</p> <p>27. GCA SSRMS to ATA ungrapple</p> <p>28. RET to ATA</p> <p>29. Verify tools and tethers are clear</p> <p>30. Hold ATA and give SSRMS GO to ungrapple ATA</p> <p>31. When SSRMS is clear of ATA soft dock new ATA onto truss</p> <p>32. PGT [B7, CW2, 30.5] (25.5 ft-lb, 30 RPM); 6-in ext</p> <p>33. On EV2 GO: Engage ATA Bolt 3, ~14 turns</p> <p>34. Release RET from new ATA</p> <p>35. Egress APFR</p> <p>36. PGT [A7, CW2, 30.5] (9.2 ft-lb, 30 RPM), 6-in ext</p> <p>37. Engage ATA Bolt 2, ~16 turns <input type="checkbox"/> √No white lines visible</p> <p>38. Temp stow 6-in wobble on PIP pin RET in trash bag</p> <p>39. Retrieve torque multiplier from C/L bag</p> <p>40. Install Rd TM on bolt 3 <input type="checkbox"/> Pull test <input type="checkbox"/> TM locked <input type="checkbox"/> Anti-backlash in Neutral</p>	<p><u>S1 ATA INSTALL</u> (01:00)</p> <p>6. Stow spare 85-ft ST in C/L bag</p> <p>7. Retrieve C/L bag; stow on BRT</p> <p>8. Translate to zenith side of S1 ATA worksite</p> <p>9. Temp stow C/L bag on S1 HR 3290 (zenith/outboard of ATA)</p> <p>10. Inform SSRMS ready to monitor clearances</p> <p>11. GCA SSRMS to ATA ungrapple</p> <p>12. Verify tools and tethers are clear</p> <p>13. Assist EV1 as reqd</p> <p>14. Rotate Bolt 1 clevis vertical</p> <p>15. Hand start ATA Bolt 1</p> <p>16. Hold new ATA and give EV1 GO to drive ATA Bolt 3</p> <p>17. PGT [A7, CW2, 30.5] (9.2 ft-lb, 30 RPM), 6-in ext</p> <p>18. Engage ATA Bolt 4, ~16 turns <input type="checkbox"/> √No white lines visible</p> <p>19. PGT [B7, CCW2, 30.5] (25.5 ft-lb, 30 RPM), 6-in ext</p> <p>20. Release Nadir ATA FGB bolts, 19 turns (any order) Stop on Turns <input type="checkbox"/> GP 4 <input type="checkbox"/> GP 2 <input type="checkbox"/> GP 3 <input type="checkbox"/> GP 1</p> <p>21. Retrieve EVA ratchet from C/L bag</p>																								
<p>S1 ATA Bolts</p> <table border="1"> <thead> <tr> <th></th> <th>Torque</th> <th>Turns</th> <th>Green Light</th> </tr> </thead> <tbody> <tr> <td>Bolt 1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Bolt 2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Bolt 3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Bolt 3 w/TM</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Bolt 4</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Torque	Turns	Green Light	Bolt 1				Bolt 2				Bolt 3				Bolt 3 w/TM				Bolt 4					
	Torque	Turns	Green Light																							
Bolt 1																										
Bolt 2																										
Bolt 3																										
Bolt 3 w/TM																										
Bolt 4																										

EVA 2 AGB RELEASE & S1 ATA INSTALL (02:00) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<p>ATA FGB Attach Points</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">  </div> <p>8. <input checked="" type="checkbox"/> MCC-H: S1 ATA inhibits in place</p> <p>9. <input checked="" type="checkbox"/> MCC-H: S1 ATA and NTA valves are in the proper config</p>	<p>41. PGT [B1, CW2, 30.5] (12.0 ft-lb, 30 RPM), Rd TM</p> <p>42. Apply final torque to ATA Bolt 3 with Rd TM</p> <p>43. Stow Rd TM in C/L bag</p> <p>44. Place 6-in wobble on PGT <input type="checkbox"/> Pull test</p> <p style="text-align: center;"><u>NOTE</u> Prior to mating electrical connectors, check no bent pins, no FOD, good EMI band, and good bend radius</p> <p><u>S1 ATA ELECTRICAL CONNECTORS (00:15)</u></p> <p>45. On IV GO: Remove cap from ATA J2 connector; stow on Adj tether (Not in trash bag)</p> <p>46. Mate P635 to J2</p> <p>47. Remove cap from ATA J1 connector; stow on Adj tether (Not in trash bag)</p> <p>48. Mate P634 to J1</p> <p><u>S1 ATA FLUID CONNECTORS (00:30)</u> <u>ATA F1/M1</u></p> <p>49. On IV GO: Remove 1/4-in cap from ATA M1</p> <p>50. Mate F1 to ATA M1 (N2) – BLOCK D</p> <p>51. Open valve on F1/M1 (N2) – BLOCK E</p> <p>52. Replace thermal bootie on F1/M1</p> <p><u>ATA F50/M3</u></p> <p>53. Remove 1/2-in cap from ATA M3</p> <p>54. Mate F50 to ATA M3 (NH3) – BLOCK D</p> <p>55. Open valve on F50/M3 (NH3) – BLOCK E</p> <p>56. Retrieve 1/2-in SPD</p> <p>57. Attach 1/2-in SPD to F50/M3 – BLOCK F</p> <p>58. Replace thermal bootie on F50</p>	<p>22. Engage ATA Bolt 1 w/ratchet, ~16 turns <input type="checkbox"/> <input checked="" type="checkbox"/> No white lines visible</p> <p>23. Stow EVA ratchet in C/L bag</p> <p><u>APFR RELOCATE FOR ULF-4</u></p> <p>24. Translate to A/L WIF 9 (Eq Lock zenith)</p> <p>25. Retrieve APFR from A/L WIF 9; stow on BRT</p> <p>26. Translate to stbd CETA Cart WIF 1</p> <p>27. Install APFR [6,00,E,6] into stbd CETA cart WIF 1 <input type="checkbox"/> <input checked="" type="checkbox"/> Blk-Blk <input type="checkbox"/> Pull/Twist test</p> <p>28. Translate to C/L bag stowed on S1 HR 3290</p>



EVA 2 AGB RELEASE & S1 ATA INSTALL (02:00) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<p>10. <input type="checkbox"/> Record WVS survey</p>	<p><u>ATA F2/M2</u> 59. Remove 1/4-in cap from ATA M2 60. Mate F2 to ATA M2 (N2) – BLOCK D 61. Open valve on F2/M2 (N2) – BLOCK E 62. Replace thermal bootie on F2/M2</p> <p><u>ATA F51/M4</u> 63. Remove 1/2-in cap from ATA M4 64. Mate F51 to ATA M4 (NH3) – BLOCK D 65. Open valve on F51/M4 (NH3) – BLOCK E 66. Replace thermal bootie on F51</p> <p>67. Close TA clamps as reqd 68. Retrieve Fish Stringer; stow on CETA spur 69. Close ATA QD thermal shroud 70. WVS survey of ATA shroud <input type="checkbox"/></p> <p>71. Give MCC-H GO to activate ATA</p> <p>72. Retrieve EVA camera 73. Glove check</p> <p><u>RELOCATE APFR FOR ULF-4</u> 74. Translate to S1 WIF 4 75. Retrieve APFR; stow on BRT 76. Translate to stbd CETA Cart WIF 2 77. Install APFR [8,RR,E,6] into stbd CETA cart WIF 2 <input type="checkbox"/> √Bik-Bik <input type="checkbox"/> Pull/Twist test</p> <p>78. Translate to port CETA Cart</p>	<p>29. Place C/L bag on BRT</p> <p>30. Glove check 31. Translate to port CETA cart via Hab tray on Face 3; poorman fairlead on S0 trunnion</p>

EVA 2 RELEASE CETA CART ATA & INSTALL AGB (01:00)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)						
<p>1. SSRMS: On EV GO, grapple ATA</p> <p>2. SSRMS: Give EV GO to release ATA tethers</p> <p>3. SSRMS: GCA for AGB install</p> <p>4. SSRMS: Give EV GO to install AGB</p> <p>AGB Bolt</p> <table border="1"> <thead> <tr> <th>Torque</th> <th>Turns</th> <th>Green Light</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p>5. SSRMS: On EV2 GO, maneuver to CETA Clearance posn</p>	Torque	Turns	Green Light				<p><u>RELEASE ATA FROM CETA CART</u> (00:30)</p> <ol style="list-style-type: none"> 1. Fold inboard brake handles parallel to Face 1 2. Install electrical caps onto old ATA NZGLs <input type="checkbox"/> J1 <input type="checkbox"/> J2 3. Fairlead on CETA cart and temp stow camera, as reqd 4. RET to ATA 5. Loosen and remove tethers on ATA 6. Hold ATA and give SSRMS GO to grapple ATA 7. On SSRMS GO: Release RET from old ATA 8. Stow tethers in C/L bag 9. Move fairlead to CETA HR <p><u>INSTALL AGB ON ATA</u> (00:30)</p> <ol style="list-style-type: none"> 10. Fold inboard brake handles away from Face 1 11. Assist EV2 as reqd <p>12. Retrieve fairlead and EVA camera</p>	<p><u>RELEASE ATA FROM CETA CART</u> (00:30)</p> <ol style="list-style-type: none"> 1. Temp stow C/L bag at CETA cart 2. Loosen and remove tethers on ATA 3. Hold ATA and give SSRMS GO to grapple ATA 4. Stow tethers in C/L bag 5. Retrieve MMOD shield tool from C/L bag; stow on MWS <p><u>INSTALL AGB ON ATA</u> (00:30)</p> <ol style="list-style-type: none"> 6. Retrieve AGB 7. Pull T-handle to unlock <input type="checkbox"/> √2 white lines visible 8. Extend AGB 9. GCA SSRMS for AGB install 10. On SSRMS GO: Soft dock AGB onto ATA (2 pin side stbd) 11. Slide single pin end into ATA receptacle until aligned with ATA position indicator 12. Push T-handle to lock AGB <input type="checkbox"/> √No white lines visible 13. PGT [A2, CW2, 30.5] (3.8 ft-lb, 30 RPM), 6-in ext 14. Drive AGB bolt, 2-4 turns to hard stop 15. Perform pull test on AGB 16. Release RET from AGB 17. Give SSRMS GO to maneuver to CETA Clearance posn
Torque	Turns	Green Light						

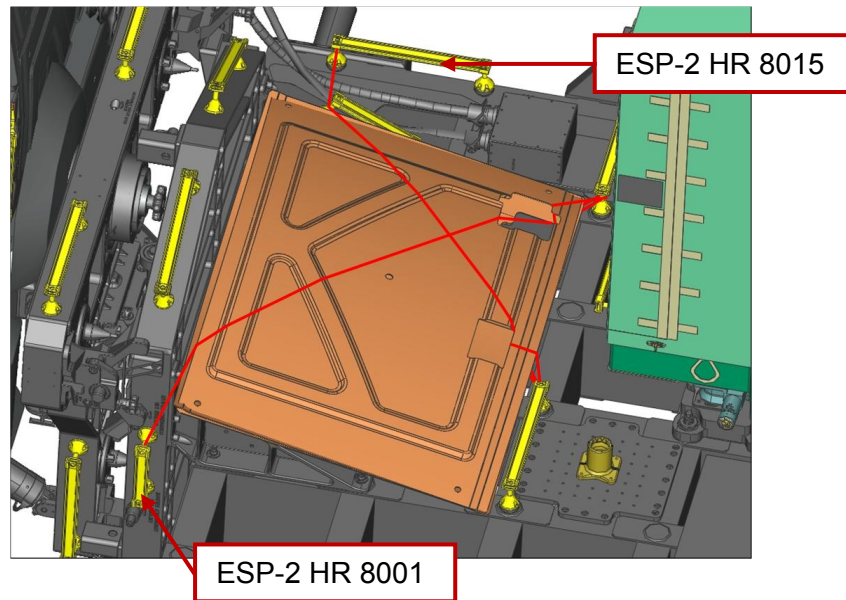
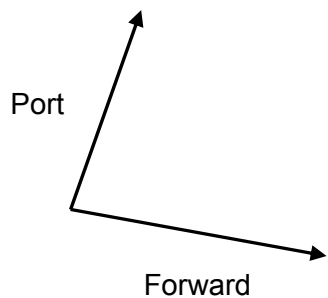
EVA 2 RELEASE CETA CART ATA & INSTALL AGB (01:00) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<p>6.  Record WVS survey</p> <p>7. Verify tool inventories</p>	<p><u>CETA CART RECONFIG & CLEANUP</u></p> <p style="text-align: center;"><u>NOTE</u> When coupling CETA cart be aware of SSRMS POA operations</p> <p>13. Couple CETA cart to MT: <input type="checkbox"/> Rotate inboard TFR to position 0; lock TFR <input type="checkbox"/> √CETA coupler in capture <input type="checkbox"/> Push inboard brake release 2 times <input type="checkbox"/> Couple CETA cart to MT slowly <input type="checkbox"/> CETA cart coupler to lock</p> <p>14. WVS survey of CETA brake handles and WIFs </p> <p>15. Perform tool inventory of MWS and C/L bag 16. Retrieve C/L bag; place on BRT 17. Glove check 18. Retrieve fish stringer from CETA spur; stow in C/L bag 19. Translate to A/L</p>	<p><u>CETA CART RECONFIG & CLEANUP</u></p> <p>18. Translate to outboard side of CETA cart 19. Rotate outboard TFR nadir to position 30 20. Fold outboard brake handles away from Face 1 21. Wire tie zenith brake handle to SGI “H” w/long wire tie <input type="checkbox"/> √3 – 180 deg twists at each end of wire tie 22. Wire tie nadir brake handle to TFR toe clip w/long wire tie <input type="checkbox"/> √3 – 180 deg twists at each end of wire tie 23. √Outboard WIFs (4 & 5) pitched inboard at least 45 deg</p> <p>24. Perform tool inventory of MWS</p> <p>25. Glove check</p> <p>26. Translate to ESP-2</p>

<p><u>EV1 MWS</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> BRT (L) <ul style="list-style-type: none"> <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> Wire Ties <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> RET w/PIP Pin <input type="checkbox"/> Adj Tether (2) <input type="checkbox"/> Wire Tie (3) <input type="checkbox"/> Small ISS Trash Bag <ul style="list-style-type: none"> <input type="checkbox"/> 4 – Fluid QD Caps <input type="checkbox"/> RET (sm-sm) <ul style="list-style-type: none"> <input type="checkbox"/> EVA Camera w/Bracket <input type="checkbox"/> RET (sm-sm) <ul style="list-style-type: none"> <input type="checkbox"/> PGT w/6-in ext 	<p><u>EV2 MWS</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> BRT (L) <ul style="list-style-type: none"> <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> Wire Ties <input type="checkbox"/> RET (sm-sm) <ul style="list-style-type: none"> <input type="checkbox"/> MMOD Shield T-Handle <input type="checkbox"/> RET w/PIP Pin <input type="checkbox"/> Adj Tether <input type="checkbox"/> Wire Tie (2) <input type="checkbox"/> Small ISS Trash Bag <ul style="list-style-type: none"> <input type="checkbox"/> 2 – Wireties <input type="checkbox"/> RET w/PIP Pin <ul style="list-style-type: none"> <input type="checkbox"/> PGT w/6-in ext <input type="checkbox"/> 2 – Adj Tethers on wrist 	<p><u>C/L Bag</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Adj Tether (outside – tie down) <input type="checkbox"/> Ratchet (No Palm Wheel) (Int RET #1) <ul style="list-style-type: none"> <input type="checkbox"/> 7/16-2-in rigid ext <input type="checkbox"/> Round TM (Int RET #2) <ul style="list-style-type: none"> <input type="checkbox"/> 7/16-in Flush Socket <input type="checkbox"/> RET (sm-sm) <ul style="list-style-type: none"> <input type="checkbox"/> EVA Camera w/Bracket <input type="checkbox"/> 6 – Adj Tethers (ATA Tiedown) <input type="checkbox"/> EV2 Spare 85-ft Safety Tether
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EVA 2 A/L MMOD SHIELD RETRIEVE (00:45)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
	<div style="border: 2px solid black; padding: 5px;"> <p>WARNING Back side of MMOD shield fasteners are potential sharp edges</p> </div>	
	<p><u>A/L MMOD SHIELD RETRIEVE</u></p> <ol style="list-style-type: none"> 1. Place C/L bag on A/L HR (aft) 2. Open thermal cover when EV2 ready to pass shields 3. Daisy chain RET (sm-sm) to RET (Lg-sm) 4. RET to MMOD shield T-handle tool 5. Receive A/L MMOD shields from EV2 6. Stow shields in A/L behind bungee w/T-handle away from IV hatch 	<p><u>A/L MMOD SHIELD RETRIEVE</u></p> <ol style="list-style-type: none"> 1. Enter worksite w/head port 2. Install MMOD shield T-handle into A/L MMOD shield <ul style="list-style-type: none"> <input type="checkbox"/> Pull test 3. RET to T-handle tool 4. Release LDTD tether from ESP-2 HR 8015 5. Release LDTD tether from ESP-2 HR 8001 6. Pass MMOD shields to EV1; attach MWS end of T-handle RET to wire tie 7. Retrieve LDTD tethers (2); stow on MWS



EVA 2 CLEANUP & INGRESS (00:15)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<p>Prior to Ingress:</p> <ol style="list-style-type: none"> 1. Perform WVS PWRDN (PHOTO/TV, <u>WVS CUE CARD</u>) 	<p><u>CLEANUP/INGRESS</u> (00:15)</p> <ol style="list-style-type: none"> 1. Connect waist tether to A/L D-ring extender <ul style="list-style-type: none"> <input type="checkbox"/> √Gate closed <input type="checkbox"/> √Hook locked 2. Ingress A/L 3. Stow ORU bag in A/L 4. Receive C/L bag from EV2; stow in A/L on RET 5. Give EV2 GO to release EV1 85-ft ST 6. Remove SCU from stowage pouch 7. Remove DCM cover; Velcro to DCM 8. Connect SCU to DCM; √SCU locked 9. WATER – OFF (fwd), expect H2O IS OFF msg <p style="text-align: center;">NOTE To reduce time for SCU cooling, set TCV 8 – Max C</p> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;">CAUTION Do not close hatch until EMU Water OFF for 2 min. Verify outer hatch clear of hardware</p> </div> <p>Go to PRE-REPRESS (<u>DEPRESS/REPRESS</u> Cue Card)</p>	<p><u>CLEANUP/INGRESS</u> (00:15)</p> <ol style="list-style-type: none"> 1. Retrieve C/L bag from A/L HR 2. Hand ORU bag to EV1 3. Hand C/L bag to EV1 4. Connect waist tether to EV1 85-ft ST 5. On EV 1 GO: Release EV1 85-ft ST from A/L anchor point <ul style="list-style-type: none"> <input type="checkbox"/> √Gate closed (both hooks) <input type="checkbox"/> √Hook locked (both hooks) 6. Release EV2 85-ft ST from A/L anchor point; stow on MWS 7. Ingress A/L 8. Close thermal cover; attach Velcro strap 9. Remove SCU from stowage pouch 10. Remove DCM cover; Velcro to DCM 11. Connect SCU to DCM; √SCU locked 12. WATER – OFF (fwd), expect H2O IS OFF msg 13. √EV hatch clear of FOD and obstructions 14. Verify EV hatch handle position per hatch decal; close and lock <p>Go to PRE-REPRESS (<u>DEPRESS/REPRESS</u> Cue Card)</p>

EVA 2 ATA R&R – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	N/A
Two EV Crew	04:45	N/A

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
Ammonia Tank Assembly (ATA)	Dry – 1289 Wet – 1760	(L*W*H) 57.3" x 80.1" x 45.4"

Tools:

EV1	EV2
PGT w/7/16 – 6 in ext BRT Round TM w/7/16 Flush socket Fixed Grapple Bar (FGB)	PGT w/7/16 – 6 in ext EVA Ratchet w/7/16 – 2 in ext APFR

EVA Fasteners:

Fastener Name	Head Size	Ground Install Torque (ft-lb)	Release/ Install Torque (ft-lb)	Failure Torque (ft-lb)	Turns	Features
Bolt 1 (Clevis)	7/16	20.0-22.9	24.0 (B6) (R) 9.2 (A7) (I)	165.8 (R) 35.1 (I)	~16	√2 white lines visible
Bolt 2 (Clevis)	7/16	20.0-22.9	24.0 (B6) (R) 9.2 (A7) (I)	165.8 (R) 35.1 (I)	~16	√2 white lines visible
Bolt 3 (Microconical)	7/16	69-81	Ratchet (86.9 max expected) (R) PGT + TM 12.0 (B1) (I)	146.5 (R) 81.1 (I)	~14	Pops up & Free spins
Bolt 4 (Clevis)	7/16	20.0-22.9	24.0 (B6) (R) 9.2 (A7) (I)	165.8 (R) 35.1 (I)	~16	√2 white lines visible

Foot Restraints:

Task	WIF	APFR Setting	Notes
ATA Handling	S1 WIF 4	[8,TT,E,10]	Nominal

EVA Connectors:

Harness	From	To	Conn Size
W5124	P634	J1	19
W5307	P635	J2	17

Fluid QDs:

Connector Name	From	To	Clamps (#)	QD Size	Function
F50/M3 * (Zenith)	PM	ATA M3	1	1/2"	NH3 out
F1/M1 (Zenith)	NTA M2	ATA M1	1	1/4"	N2 pressure
F51/M4 (Nadir)	Vent	ATA M4	1	1/2"	NH3 out
F2/M2 (Nadir)	NTA M3	ATA M2	1	1/4"	N2 pressure

* Spool positioning device installed on F50

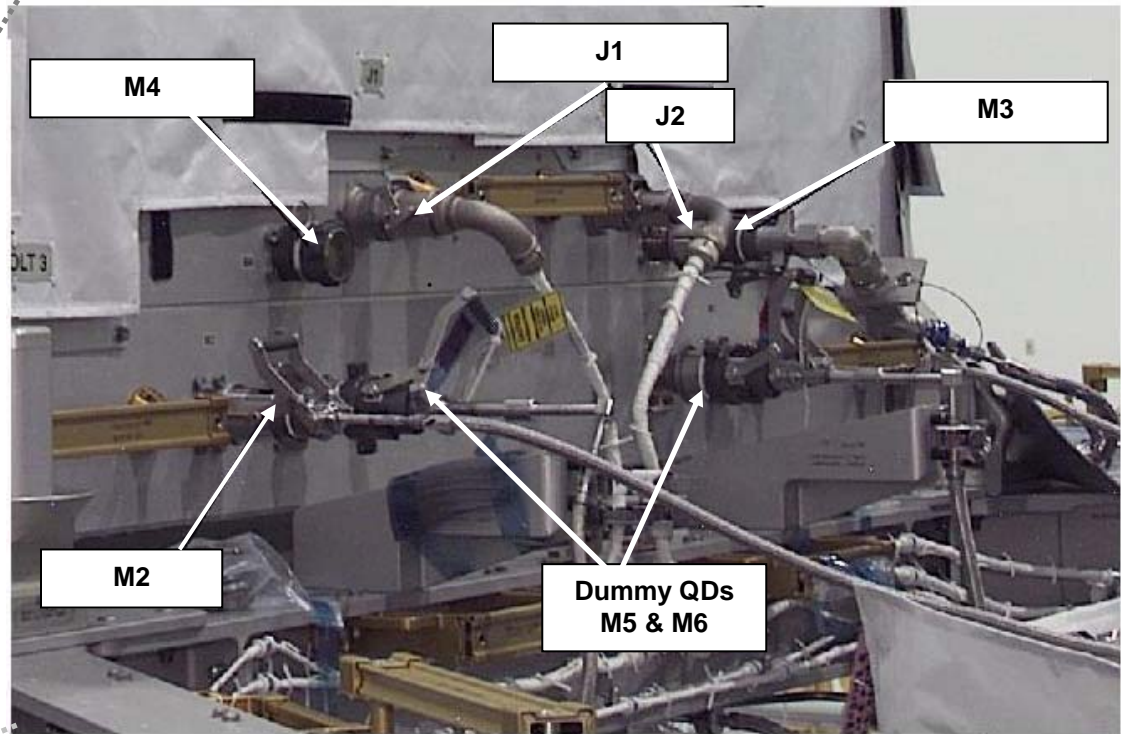
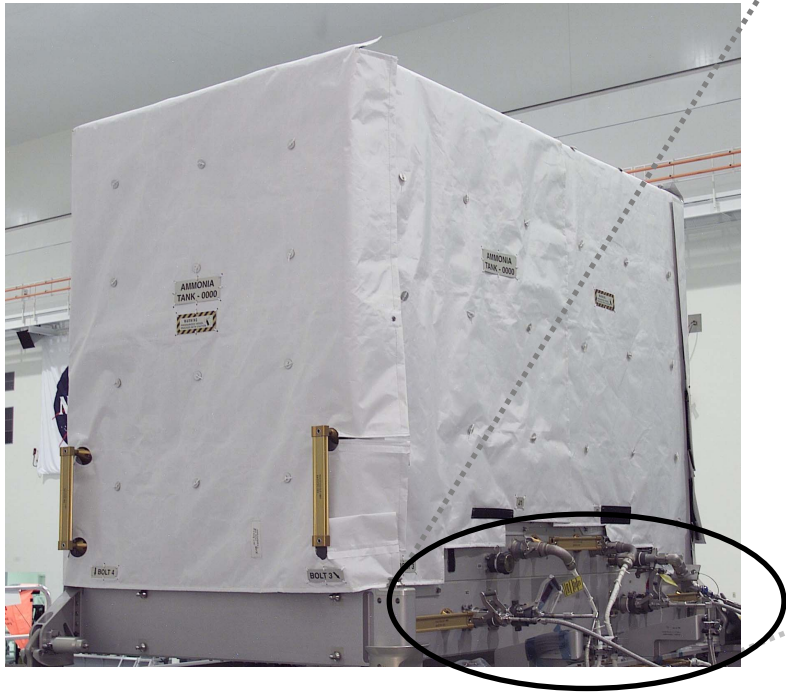
Notes:

1. Be aware of possible metal shaving debris coming out of AGB attach points on ATA
2. When coupling CETA cart be aware of SSRMS POA operations
3. Spring plunger soft docks on Bolts 2, 3 and 4

Cautions:

1. QDs exposed to direct sunlight can overtemp in 20 min. Shading by EMU or thermal shroud can lengthen acceptable time with bootie remove

EVA 2 ATA R&R – TASK DATA (Cont)



EVA 2 ATA R&R – TASK DATA (Cont)

Estimated Task Duration:

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

Tools:

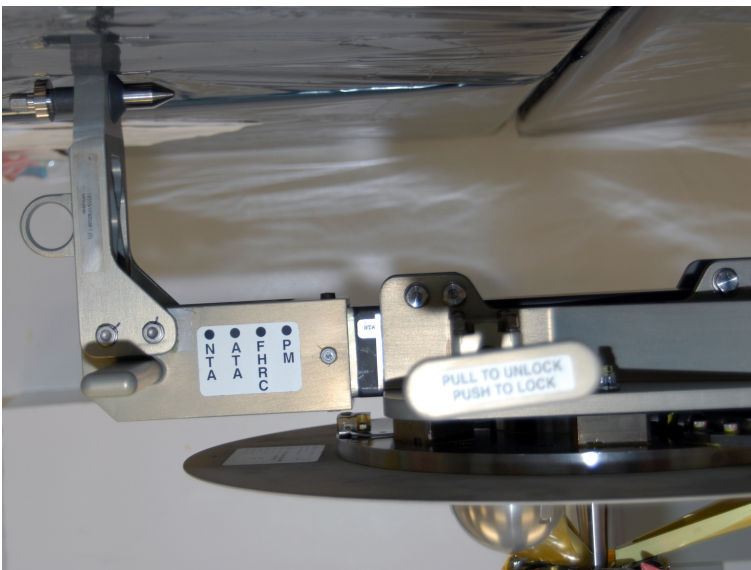
EV1	EV2
None	PGT w/7/16 – 6 in ext

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
AGB Bolt	7/16	1	3.8 (A2)	3.8 (A2)	5.7 (Install) 116.8 (Release)	2-4

Mass & Dimensions:

ORU	Mass (lb)
AGB	75

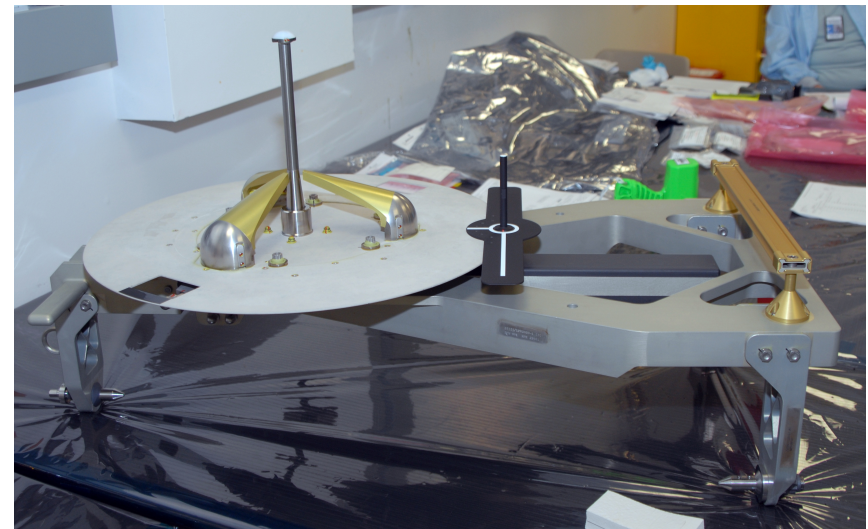


Notes:

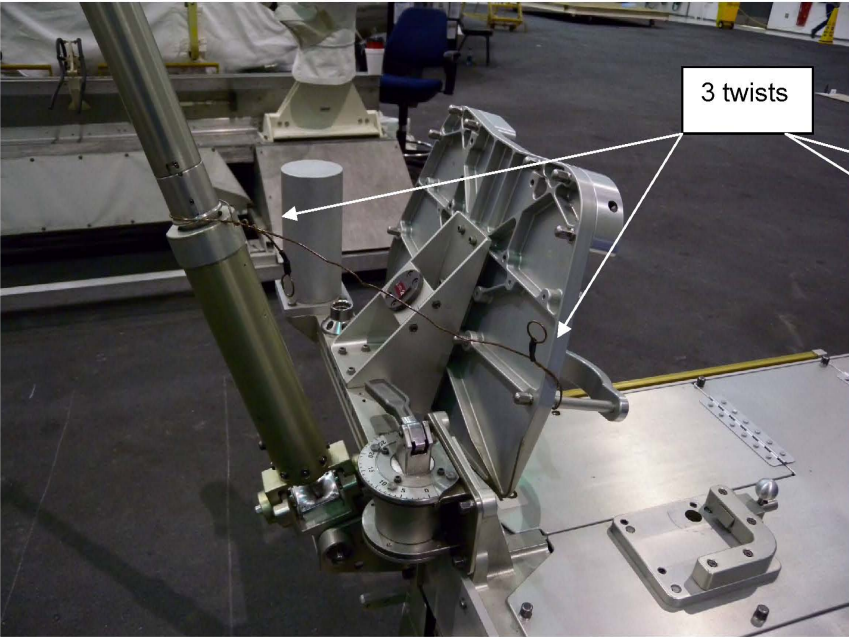
1. There are 2 spring plunger soft docks on each passive pin (4 plungers total)
2. There are 2 spring plungers on the AGB T-handle

Cautions:

1. Avoid contact with AGB grapple pin and target



EVA 2 ATA R&R – TASK DATA (Cont)



Zenith Port brake handle



Nadir Port brake handle

EVA 2 P1 RADIATOR GRAPPLE FIXTURE STOWAGE BEAM INSTALL – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:45
Two EV Crew	N/A	00:30

Tools:

EV1	EV2
ORU Bag	PGT
Stow Beams (2)	Socket Caddy
	5/8 x 7.8-in Socket

EVA Fasteners:

Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
5/8	4	12.0	N/A	77.1	21-23	30

Notes:

1. Stow beams are attached to the truss with zip nuts

Cautions:

1. Avoid kicking P1 radiator beam. If this occurs, wait 2 to 5 min to allow structural response to dissipate

Timeline Considerations:

1. Task is being used to fill time while SSRMS is retrieving ATA from POA



EVA 3

EVA 3 SUMMARY TIMELINE

PET HR : MIN	IV/SSRMS	EV1 (Mastracchio)	EV2 (Anderson)	
00:00		<u>EGRESS & SETUP</u> (00:15)	<u>EGRESS & SETUP</u> (00:15)	00:00
		<u>AGB STOW</u> (00:30) <ul style="list-style-type: none"> AGB removal from ATA AGB install on ESP-2 FHRC 	<u>AGB STOW</u> (00:30) <ul style="list-style-type: none"> AGB removal from ATA AGB install on ESP-2 FHRC 	
01:00		<u>PLB SETUP</u> (00:30) <ul style="list-style-type: none"> Verify spherical bearings aligned Bolt 2 & 4 Verify floating clevis clear Bolt 1 Temp stow CLPA1 	<u>PLB SETUP</u> (00:30) <ul style="list-style-type: none"> APFR retrieve APFR install on LMC 	01:00
		<u>ATA INSTALL ON LMC</u> (00:45) <ul style="list-style-type: none"> Install Bolt 2 Install Bolt 4 Remove FGB and temp stow Install Bolt 1 	<u>ATA INSTALL ON LMC</u> (00:45) <ul style="list-style-type: none"> SSRMS Release ATA Install Bolt 3 Retrieve APFR 	
02:00		<u>S1 ATA FGB INSTALL</u> (01:00) <ul style="list-style-type: none"> PLB Cleanup Install FGB on S1 ATA Nadir Retrieve and temp stow Light Bag 	<u>SSRMS SETUP</u> (00:30) <ul style="list-style-type: none"> Translate to COL Install APFR on SSRMS 	02:00
		<u>LWAPA INSTALL</u> (00:30) <ul style="list-style-type: none"> Assist EV2 with LWAPA install Transfer SPDM Bag to EV2 	<u>LWAPA RETRIEVE</u> (01:00) <ul style="list-style-type: none"> Remove LWAPA Install LWAPA on LMC Receive SPDM Bag from EV1 	03:00
03:00		<u>CP13 (LAB) LIGHT R&R</u> (01:00) <ul style="list-style-type: none"> Remove failed light unit from CP13 ETVCG Install new light unit on CP13 ETVCG 	<u>SPDM CLPA1 INSTALL</u> (00:45) <ul style="list-style-type: none"> Retrieve Med ORU bag from EV1 Install CLPA1 on SPDM 	04:00
		<u>S1 RADIATOR GRAPPLE FIXTURE BEAM INSTALL</u> (01:00) <ul style="list-style-type: none"> Stow failed light in A/L Retrieve Beam Bag S1 Rad GF Stow Beam install 	<u>SPDM EP1 MLI REMOVAL</u> (00:45) <ul style="list-style-type: none"> EP1 Thermal cover remove 	05:00
05:00		<u>WIF EXTENDER RELOCATE</u> (00:30) <ul style="list-style-type: none"> Stow Beam Bag in A/L WIF EX Relocate from ESP-2 to MBS WIF 12 	<u>SSRMS CLEANUP</u> (01:00) <ul style="list-style-type: none"> Stow APFR in NOD2 WIF 7 	06:00
06:00		<u>CLEANUP & INGRESS</u> (00:30)	<u>CLEANUP & INGRESS</u> (00:30)	06:00
06:30				06:30

EVA 3 INHIBIT PAD

Orbiter (1)

ALL EVAs	
TCS (Prior to Egress)	
IV L12	1. √TCS POWER – OFF
TriDAR (Prior to Egress)	
IV L12L	1. √TriDAR POWER – OFF (tb-bp) (SSP2)
Ku-Band Antenna (Prior to Egress)	
MCC-H	1. √KU-BAND Mask – active
	2. √KU-BAND EVA Protect Box – active
RCS (Prior to Egress)	
	EV crew < 27 feet from FRCS
IV O14,15,16	1. √DAP: VERN, FREE, LO Z
	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 (*)
LMC LWAPA PFRAM (Prior to Install on LMC)	
IV R1	1. √PL AFT MNC – OFF

Ground

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

USOS (1)

ALL EVAs	
PCU (Prior to Egress)	
	NOTE
	PCUs may require up to a 1-hour warmup period before they are operational.
MCC-H	1. √PCUs (two) operational in discharge mode and one of the following:
	a. CCS PCU EVA hazard control FDIR enabled.
	b. No more than two arrays unshunted and oriented <105° from velocity vector.
	If one or both PCUs failed
	2. No more than two arrays unshunted and oriented <105° from velocity vector.
CUCU (Prior to Egress)	
IV (LAB104)	1. √cb POWER A, B [two] – OPEN
	2. √cb LINK 1,2 [two] – OPEN
LOCATION DEPENDENT INHIBITS	
LAB Window (EV1 Translation to PLB) (Prior to Egress)	
IV	EV crew expected < 10 feet from window or in window FOV, close window shutter
Cupola Windows	
IV	If EV crew less than 10 feet from window or in window FOV, coordinate shutter opening/closing with EV crew and minimize time shutter is open
S-Band (SASA) Antennas (FGB on S1 ATA) (Prior to Egress)	
MCC-H	EV crew expected 3.6 feet from S1 SASA
	1. P1 SASA – Active
	2. S1 SASA – Powered down & unavailable to FDIR
Mobile Transporter (Prior to Egress)	
MCC-H	EV crew expected <1.5 meters from MT
	1. √MT latched
TRRJ (FGB on S1 ATA & S1 Rad GF Stow Beams) (Prior to Egress)	
MCC-H	EV crew working within 2 feet of S1 TRRJ rotation envelope
	1. √DLA (1) – LOCKED at 0

EVA 3 INHIBIT PAD (Cont)

USOS (2)

LOCATION DEPENDENT INHIBITS

SPDM CLPA1 Install

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

FPMU

- MCC-H**
1. FPMU power – Off

LOCATION DEPENDENT INHIBITS

ETVCG (CP13 Light R&R)

- MCC-H** One (1) hr prior to EV crew working on CP13 Light
1. RPCM S01A C RPC 12 (Light Ops PWR)

At start of crew translation to worksite:

1. Stow Camera
2. RPCM S01A C RPC 13 (Ops PWR)
3. RPCM S02B C RPC 12 (Light HTR PWR)

SSPTS (CP13 Light R&R)

- MCC-H** EV crew working within 2 ft of LAB SSPTS cables
1. RPCM Z14B A RPC 2 – Open, Close Cmd Inhibit
 2. RPCM Z13B A RPC 2 – Open, Close Cmd Inhibit

JEM (1)

ALL EVAs

ICS-EF Antenna (Prior to Egress)

- SSIPC**
1. ICS MOD – OFF
 2. ICS UPC – OFF
 3. ICS HPA – OFF
 4. “HPA ON” and “UPC ON” commands are cleared (not present) in the ICS stored command queue

RSOS (1)

ALL EVAs

SM Antennas (Prior to Egress)

- IV
1. GTS – Deactivate
 2. ARISS (Ham Radio) – Deactivate

IMPULSE (Prior to Egress)

- MCC-M**
1. IMPULSE (ИПИ-100) – Is not activated

COL (1)

TASK SPECIFIC INHIBITS

COLUMBUS EPF (LWAPA Retrieve)

(Prior to Egress)

- IV COL1SC
1. √PPSB PL DN 1, 2 (two) sw – DISCHARGE

(20 min prior to LWAPA Removal)

- COL-CC**
1. √PDU2 Outlet 3 SSPC 1, 2, 3, 4 (four) Pwr – OFF
Verify Current < 0.1A
 2. √SSPC 1, 2, 3, 4 (four) Sys Bus Cntl Stat – DISABLED

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. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
6. Avoid contact with OBSS striker bars (Vitrolube coating)
7. 85-ft safety tether retract force may affect body positioning

CAUTION

ISS Generic Constraints

- A. Avoid inadvertent contact with
1. Grapple fixture shafts (drylube)
 2. PIP Pins
 3. Passive UMAs
 4. MBS/SSRMS/SPDM taped radiative surfaces: VDU, ACU, JEU, LEU, MCU, CRPCMs, and Cameras
 5. SPDM SJEU, EP, OTCM, LEU, and LEE VDU radiator surfaces
 6. OTSD
- B. Electrical cables
1. Avoid bend radii < 10 times cable diameter
- C. Fiber optic cables
1. Avoid bend radii < 10 times cable diameter
 2. Avoid pulling on cable during mate/demate
- D. Fluid line flex hoses and QDs
1. Avoid bend radii < 14 in for hoses with a diameter \geq 1 in
 2. Additional care should be taken to not exceed bend radii when applying loads at the flexible hose to rigid tube stub interfaces
 3. Ensure fluid QD booties are fully closed prior to leaving worksite; wire tie if required
 4. Avoid bend radii < 5 in for hoses with diameter < 1 in on LAB, S0, S1, P1, and 10 in for hoses with diameter < 1 in on all other elements

CAUTION

ISS Generic Constraints (Cont)

- 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
- F. Other
1. ITT Cannon connector: On demated connectors, do not rotate collar or manipulate cable/connector using collar or connector tool
 2. MLI handholds are not rated for crewmember translation loads

EVA 3 NOTES, CAUTIONS AND WARNINGS (Cont)

CAUTION

ISS Truss Constraints

A. Avoid inadvertent contact with

1. CETA lights (Z-93 paint) [LAB,S1, NODE 1]
2. Deployed TUS cable [Zenith & Nadir CETA rail]
3. S0 aft face radiator
4. GPS antennas (S13 paint) [S0,JLP]
5. UHF antennas [LAB,P1]
6. ETCS radiator flexhoses and panels [S1,P1]
7. EETCS/PV radiator flexhoses, bellows and panels [P6,P4,S4,S6]
8. SASA RF group [S1,P1]
9. Heat pipe radiators [Z1]
10. PCU cathode and HCA ports [Z1]
11. Ku-Band antenna (SGANT) dish [Z1]
12. CMG cover/shells [Z1]
13. FPMU [P1]
14. SASA high and low gain antennas and radiator surfaces [Z1]
15. Deployed MISSEs
16. OTP on Hab Tray [S0]

B. For structural reasons

1. Avoid kicking S1/P1 radiator beam. If any of these occur, wait 2 to 5 min to allow structural response to dissipate

CAUTION

ISS Truss Constraints (Cont)

C. Other

1. WIS antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
2. Lubricant from Ku-Band SGANT gimbals [Z1], CMGs [Z1], and RTAS ground strap fasteners [P6,P4,S4,S6] can contaminate EMU
3. Prevent inadvertent contact of the tether shuttle with ETRS when the P3 tether shuttle stop is raised away from the rail

CAUTION

ISS U.S. Pressurized Elements Constraints

A. Avoid inadvertent contact with

1. EVA crane [PMA1]
2. TCS reflectors [PMA2,PMA3]
3. APAS hardware [PMA2,PMA3]
4. CETA lights (Z-93 paint) [LAB,S1, NODE 1]
5. UHF antennas [LAB,P1]
6. Open CBM petal covers and LAB & Cupola window shutter
7. S0/NODE 2 fluid tray hardlines at NODE 2 end, which are limited to 25 lb

B. Other

1. WIS antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
2. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged

EVA 3 NOTES, CAUTIONS AND WARNINGS (Cont)

CAUTION

ISS I.P. Elements Constraints

COL

- A. Avoid inadvertent contact with
1. COL ARISS and AIS antennas [COL-Nadir]

JEM

- A. Avoid inadvertent contact with
1. GPS antennas (S13 paint) [S0,JLP]
 2. Open JPM window shutter
 3. JTVE, WVE/EVE, JEF VE cameras
 4. JEMRMS taped radiative surfaces [JEU,EE,Cameras]
 5. JEM A/L target and pins
 6. JEF ORUs and EFUs (paint and lubricant)
 7. MAXI front and top panel (paint)
 8. SEDA-AP sensors (HIT, SDOM, and AOM) and MPAC & SEED
 9. Trunnions and UCMs (paint and lubricant) [JEF Payloads]
 10. RAIDS covers on end of HREP
 11. ICS-EF Ka-Band antenna dish
 12. Small Fine Arm (SFA) (paint, coating and lubricant)
- B. For structural reasons
1. Avoid kicking MMOD shields between JLP and JPM
 2. Avoid tool impact on ICS-EF sensor

CAUTION

Shuttle Constraints

- A. Avoid inadvertent contact with
1. OBSS and SRMS composite sections joint torque arms, grapple fixture shafts, and cable harnesses
 2. LCS (silver Teflon) and LDRI (silver Teflon) and ITVC (gold foil) [OBSS]
 3. WVS antenna [ODS truss and PLB sill]
 4. Payload bay and camera wire harnesses, cables, cable guides, 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 Generic Constraints

- A. Avoid inadvertent contact with
1. Grapple fixture targets and target pins
- B. Pinch
1. NZGL connector linkage. Use caution when mating/locking
 2. ITT Cannon connector rotating housing
- C. QDs
1. If QD is in FID when valve is opened (bail fwd), QD will leak and fluid line may whip
 2. Do not rotate if in mated/valve open configuration
- D. Sharp Edges
1. Inner edges of WIF sockets
 2. APFR active WIF probes
 3. Mating surfaces of EVA connectors. Avoid side loads during connector mating
 4. Back side of MMOD shield fasteners
 5. Spring loaded captive EVA fasteners (e.g., 6B-boxes, BMRRM, RTAS, SARJ Covers); the end of the spring may protrude
 6. SPDM OTCM gripper jaws
 7. Keep hands away from SSRMS LEE/POA/SPDM LEE opening, snares, and PDGF curvic coupling (teeth)
 8. MMOD strikes on ISS exterior

EVA 3 NOTES, CAUTIONS AND WARNINGS (Cont)

WARNING

ISS Generic Constraints (Cont)

E. Thermal

1. EVA connectors with booties may become hot if left uncovered. Handling may need to be limited
2. Turn off glove heaters when comfortable temperature reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
3. Uncovered trunnion pins may be hot
4. SSRMS/MBS/SPDM operating cameras and lights may radiate large amounts of heat
5. Do not touch EMU protective visor if temperature has been < -134 degF for > 15 min
6. No EMU boot contact with foot restraint when temperature < -120 degF or > 200 degF
7. PDGF surfaces may not meet touch temperature requirements for unlimited contact when $\beta \leq -70$ or $\beta \geq 70$

F. Electrical Shock

1. Do not touch SPDM CLPA 1 electrical connector prior to camera installation

WARNING

ISS Truss Constraints

A. Avoid inadvertent contact

1. SSU, ECU, beta gimbal platform, mast canister, SAW blanket boxes unless the beta gimbal is locked and the motor is turned off
2. Stay inboard of SARJ when active
3. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate
4. Stay 5 ft from moving MT on face 1

B. RF radiation exposure

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

C. Sharp Edges

1. Solar array blanket box [P6,S6]
2. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing
3. Outboard MT rail attachment lug near P6 handrail 5333 and gap spanner
4. P2 connector on EWIS box TAA-06 [Zenith/Forward Corner 1 of P5 – SARJ at 0 deg]
5. Nickel coated braided copper ground straps may contain frayed wires [P6,P4,S4,S6]
6. MMOD strikes on Z1 toolboxes

WARNING

ISS Truss Constraints (Cont)

D. Electrical Shock

1. Stay ≥ 2 ft from ungrounded floating connectors if powered
S0 EVA power cables (inside S0 Bay 00 Face 4, Bay 01 Face 3)
ESP-2 jumper (inside S0 Bay 03 Face 4)

E. Thermal

1. ELC may exceed touch temperatures when $\beta > 75$ deg

EVA 3 NOTES, CAUTIONS AND WARNINGS (Cont)

WARNING

ISS U.S. Pressurized Elements Constraints

A. Handrails

1. Handrails previously used for MISSE attachment may not be used as a safety tether point [A/L endcone 564 and 566, A/L Tank 2 Nad/Fwd and Port/Fwd, P6 5389]

B. Pinch

1. EV side of IV Hatch during Hatch operation (also snag hazard) [A/L]
2. LAB window shutter and CBM petal cover linkages during operation

C. RF radiation exposure

1. Stay 1 ft from UHF antenna when powered [LAB, P1]

D. Sharp Edges

1. PMA umbilical launch restraints – exposed bolt threads
2. Adjustable fuse tether (Fish Stringer) buckles stowed in Node bag
3. Port/Aft portion of A/L circular HR [HR 0506]
4. A/L HR 0537 (Eq Lock Zenith)

E. Thermal

1. PMA handrails may be hot. Handling may need to be limited
2. Stay ≥ 1 ft away from PMAs and MMOD shields > 270 degF if EMU sun visor up; limit time to 15 min or less if > 300 degF
3. Stay at least 0.5 ft away from PMA and MMOD shields > 325 degF
4. No EMU TMG contact with PMAs and MMOD shields > 320 degF

WARNING

ISS U.S. Pressurized Elements Constraints (Cont)

F. Electrical Shock

1. Stay ≥ 2 ft from ungrounded floating connectors if powered
SSPTS connectors include NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA2 Stbd

G. Fluid QDs

1. When NODE 3 – Lab NH3 jumpers are pressurized do not translate on gap spanners restraining jumpers and do not tether or BRT to handrails used to anchor gap spanners

WARNING

ISS I.P. Elements Constraints

COL

A. Avoid inadvertent contact with

1. SOLAR [COL EPF]

B. Thermal

1. Columbus end cones may violate touch temperature constraints when $-75 \leq \beta \leq -60$ or $60 \leq \beta \leq 75$

JEM

A. Avoid inadvertent contact with

1. ICS-EF sensors

B. Pinch

1. JPM window shutter linkages during operation
2. JEM cameras (JVTEs, EVE, WVE, and JEF VEs)
3. JEM EFU latching arms
4. JEF SSE latch
5. ICS-EF antenna boom
6. SEDA-AP mast
7. SMILES antenna rotating area
8. HREP hinge sides and RAIDS pinch areas
9. JEMRMS EE
10. JEMRMS Small Fine Arm (SFA) joints and booms

EVA 3 NOTES, CAUTIONS AND WARNINGS (Cont)

WARNING

ISS I.P. Elements Constraints (Cont)

JEM (Cont)

C. Sharp Edges

1. Interior of JEMRMS HRMs
2. JEMRMS EE opening and snares
3. JEM A/L hatch corners
4. ICS-EF AHM gears
5. MAXI visual star camera
6. SMILES baffles (two), baffle base bare bolts, and Cold Sky Terminator (CST)
7. HREP baffles (four) [Star tracker aperture Zenith and three instrument baffles Aft]
8. SFAs Electro-Mechanical GF (EMGF)

D. RF radiation exposure

1. Stay 0.3 ft from Fwd/Aft JPM PROX antenna

E. Thermal

1. JPM Port End Cones and JLP Port Nadir may violate touch temperature constraints when $\beta > 60$ deg
2. JEMRMS/JTVE/JEFVE operating cameras and lights may radiate large amounts of heat

WARNING

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

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
4. TCS connector backshells have exposed threads [ODS]

E. Thermal

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

F. Contamination

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

G. Lasers

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

EVA 3 BRIEFING CARD

Aft EDDA _____
Fwd EDDA _____
Suit IV _____
Task IV _____
M1/M2 _____

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

General Briefing

1. Robotics – M1/M2

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

2. Communications – Task IV

- Overall setup: Big loop, A/G2, S/G2, ICOM, remind EV crew when mode swapping
- EV/IV comm protocol review – Use EV1/2/3 for DCM sw throws

3. EVA Prep – Suit IV

- Remember O2 protocol
- Equipment lock activities – IV responsibilities
- Suit donning plan – special requests
- SAFER, MWS, Safety tethers, bag stowage
- Airlock depress review

4. EV Crew Procedure Review – EV CMs

- Egress Plan, √Safety tethers
- Review first post-egress steps
- Summary timeline
- Translation plan, fairleads, and tether swaps
- Hazards
- Ingress Plan

5. Other Procedure Review – Task IV

- Get-ahead tasks:
 - Release S1 FHRC P-Clamps
 - Release P1 FHRC P-Clamps
- Constraints – ground and flight
- Notes, Cautions, and Warnings review
- Contingency procedures – cribsheet

6. Emergencies Review – Suit IV/Task IV

- Emergency suit doff and power down
 - √Expedited Suit Doffing cue card pre-positioned for EVA day
- Loss of comm
- EMU malfunctions
- DCS
- Abort and Terminate scenarios, protocols
- Hand signal reviews
- If you get a mal, read the caution and warning message so everyone knows what it is

7. Post EVA – Suit IV

- Suit doffing responsibilities
- Post EVA plan

8. Reminders – Task IV

- Translate slow. Relax grip
 - Be extra careful on non-standard routes or orientations
 - Don't hop
- Monitor safety tether
- Prior to moving and ingress, √BRT & Swingarm stowed
- Be disciplined when tired

EVA 3 BRIEFING CARD (Cont)

Generic Calls:

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

EVA 3 TOOL CONFIG

EV1

EMU D-rings

- D-ring Extender (2, R&L D-ring)
 - A/L 85-ft Safety Tether (R D-ring Ext)
 - Spare 85-ft Safety Tether (R D-ring Ext)
- Waist Tether (L on D-ring Ext)

MWS

- RET (sm-sm)
- RET w/PIP Pin
- Adj Tether (2)
- Wire Tie (3)
- Small ISS Trash Bag (L Inner)

- Swing Arm (R)
 - RET (sm-sm)
 - PGT w/6-in ext s/n 1006
 - PGT Battery s/n _____

- BRT (L)
 - RET (sm-sm)
 - Wire Tie (2)

- SAFER
- WVS

NOTE: Prior to use, inspect the following hardware:

- RET cords for fraying
- Safety Tether/Waist Tether LAS & D-ring Extenders; ref (section 8) CREW TETHER INSPECTIONS:
 1. MMOD/general damage
 2. Discoloration
 3. Tack Stitching
 4. Red Band
- ISS Trash Bag: Empty, Zipped, and ✓Bristle deformation/damage, after having stowed tools inside
- PGT MTL @ 30.5 & battery ~40 V
- Verify MWS EE secured to T-bar
- Verify ORUs brought IVA are capped

Tether Counts: RED RETs

RETs (sm-sm) = 16 of 16

RETs (PIP Pin) = 3 of 5

RETs (Lg-sm) = 4 of 8

Adj Equip Tethers = 7 of 10

EV2

EMU D-rings

- D-ring Extender (2, R&L D-ring)
 - A/L 85-ft Safety Tether (L D-ring Ext)
 - Spare 85-ft Safety Tether (L D-ring Ext)
- Waist Tether (R on D-ring)

MWS

- RET (sm-sm)
- RET w/PIP Pin
- Adj Tether
- Wire Tie (2)
- Small ISS Trash Bag (L Inner)

- Swing Arm (R)
 - RET w/PIP Pin
 - PGT [A2, 30.5] s/n 1001
 - 2-in rigid socket
 - 6-in wobble socket
 - PGT Battery s/n _____

- BRT (L)
 - RET (sm-sm)
 - Wire Tie (2 – short)

- Adj Tether (2) on wrists

- SAFER
- WVS

CREWLOCK

- Tether Ext on A/L D-ring
- RET (Lg-sm)
 - Light Bag** (LG ORU Bag)
 - RET (sm-sm) (to lid)
 - ETVCG Light
 - RET (sm-sm) (to lid)
 - Rd scoop (On Light)
 - EV1 85-ft Safety Tether (Outside)

Place LDTD Tether in Staging Bag

CREWLOCK (Cont)

- RET (Lg-sm)
 - C/L Bag**
 - Adj Tether (outside – tie down)
 - 55-ft Safety Tether (SSRMS)
 - RET (sm-sm)
 - EVA Camera w/Bracket
 - WIF Adapter (Int RET #1)
 - Round TM (Int RET #2)
 - 7/16-in Flush Socket
 - Ratchet w/no PW (Int RET #3)
 - 2-in rigid socket
 - Socket caddy (Int RET #4)
 - 6-in wobble socket
 - 2-in rigid socket
 - RET (Lg-sm)
 - SPDM Bag** (Med ORU Bag)
 - EVA Camera Bracket RET
 - RET (sm-sm) (outside of bag)
 - Adj Tether (outside – tie down)
 - RET (sm-sm)
 - Sq scoop (at 9 o'clock)
 - CLPA1 (Unstow per Sec 8)
 - RET (sm-sm) (EP1 MLI)
 - RET (sm-sm) (inside bag for C/L Bag)

- RET (Lg-sm)
 - Beam Bag** (Med ORU Bag)
 - (Deploy beams through gap)
 - RET (sm-sm)
 - Outbd RAD GF Stow Beam (Bottom of Bag – Label Up)
 - RET (sm-sm)
 - Inbd RAD GF Stow Beam (Top of Bag – Label Up)
 - RET (sm-sm)
 - Socket Caddy (PIP Pin vertical)
 - 5/8 x 7.8 in socket (center post)

Camera Checkout:

- ✓Camera focuses
- ✓Data in view finder
- Take sample IVA photos to check camera function
- ✓Eyepiece thermal wrap connected to thermal blanket

EVA 3 TOOL CONFIG (Cont)

- Staging Bag
 - Fish Stringer
 - Wire Tie Caddy (Hook #1)
 - Velcro/Tape Caddy (Hook #2)
 - PGT (Hook #3) s/n 1002
 - PGT Battery s/n _____
 - 7/16 (wobble) Socket-6 ext
 - Vise Grips (Hook #4)
 - Ratchet Wrench (Hook #5)
 - 7/16 (rigid) Socket-9 ext
 - Needle Nose Pliers (Hook #6)
 - Spare WIF Adapter (Hook #7)
 - Spare 85-ft Safety Tether
 - Fish Stringer
 - Connector Cleaner Tool Kit (Hook #1)
 - Pin Straightener Assy (Hook #2)
 - Probe w/Sheath (Hook #3)
 - Hammer (Hook #4)
 - Cheater Bar (Hook #5)
 - Prybar (Hook #6)
 - BRS Pin Tool (Hook #7)
 - MWS Key Strap Assy (on Wire tie, to strap)
 - Long Duration Tie-Down Tethers (2)
 - RET (sm-sm)
 - Right Angle Drive
- IV Bag
 - Towels (2)
 - Contamination Detection Kit
 - GP Caddy (2)
 - Adjustable Thermal Mittens (2)
 - Socket Caddy (hatch cont) w/RET (sm-sm) (Black)
 - 1/2 Socket-8 ext
 - 7/16 (wobble) Socket-6 ext (spare)
 - DCM Plug (SAFER Hardmount) (2)
 - RET (sm-sm, Black) (2)

EVA 3 EGRESS (00:15)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<p>1. WVS Software: Select page – RF Camera sel 'Advanced controls' S-Band level (two) – max (Required after A/L egress)</p>	<p><u>INITIAL CONFIG</u> Verify: <input type="checkbox"/> EV1 left waist tether connected to EV2 85-ft ST <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> √Gate closed (both hooks) <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> √Hook locked (both hooks)</p> <p><u>EGRESS (00:15)</u> 1. Open A/L Thermal Cover 2. Egress A/L 3. Attach EV1 85-ft ST to aft A/L anchor point <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> √Gate closed (both hooks) <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> √Hook locked (both hooks) <input checked="" type="checkbox"/> √Reel unlocked 4. Attach EV2 85-ft ST to fwd A/L anchor point <input checked="" type="checkbox"/> √Gate closed <input checked="" type="checkbox"/> √Hook locked 5. Release waist tether from EV2 85-ft ST 6. Give EV2 GO to release waist tether from A/L D-ring extender 7. Receive SPDM ORU bag; temp stow on A/L HR, stay aft on A/L 8. Put camera on MWS 9. Verify EV1 SAFER and WVS config: <input checked="" type="checkbox"/> √R Handle down (HCM door – Closed) <input checked="" type="checkbox"/> √L Handle down (MAN ISO Valve – Open)</p>	<p><u>INITIAL CONFIG</u> Verify: <input type="checkbox"/> EV2 right waist tether connected to A/L D-ring extender <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> √Gate closed (both hooks) <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> √Hook locked (both hooks)</p> <p><u>EGRESS (00:15)</u> 1. Check ST config <input checked="" type="checkbox"/> √Gate closed <input checked="" type="checkbox"/> √Hook locked <input checked="" type="checkbox"/> √Reel unlocked 2. On EV1 GO release waist tether from A/L D-ring extender 3. Transfer SPDM ORU bag to EV1 4. Egress A/L w/C/L bag 5. Place C/L Bag on BRT 6. Close A/L thermal cover 7. Verify EV2 SAFER and WVS config: <input checked="" type="checkbox"/> √R Handle down (HCM door – Closed) <input checked="" type="checkbox"/> √L Handle down (MAN ISO Valve – Open)</p>

EVA 3 AGB STOW (00:30)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)						
<p>1. SSRMS: On EV GO, approach ESP-2</p> <p>2. SSRMS: GCA to AGB Removal</p> <p>3. SSRMS: On EV1 GO, maneuver to ESP-2 Clearance position</p> <p>4. AGB Bolt</p> <table border="1"> <thead> <tr> <th>Torque (ft-lb)</th> <th>Turns</th> <th>Green Light</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Torque (ft-lb)	Turns	Green Light				<p><u>AGB STOW</u> (00:30)</p> <p>1. Translate to ESP-2 fwd face</p> <p>2. Fairlead as reqd</p> <p>3. Give SSRMS GO to approach ESP-2</p> <p>4. Open FHRC AGB GP MLI flap (1) <u>If time permits:</u> <input type="checkbox"/> Open FHRC AGB GP MLI flaps (2)</p> <p>5. RET to AGB HR</p> <p>6. Release AGB from soft dock (2 pin side)</p> <p>7. Give SSRMS GO to maneuver to ESP-2 Clearance position</p> <p>8. Slide single pin end into FHRC receptacle until aligned with FHRC position</p> <p>9. Push T-handle to lock AGB <input type="checkbox"/> $\sqrt{2}$No white lines visible</p> <p>10. Receive PGT from EV2</p> <p>11. PGT [A2, CW2,30.5] (3.8 ft-lb, 30 RPM); 2-in ext</p> <p>12. Drive AGB bolt, 2-4 turns to hard stop</p> <p>13. Transfer PGT to EV2</p> <p>14. Pull Test AGB</p> <p>15. Close FHRC AGB GP MLI flap (1)</p> <p>16. Glove check</p>	<p><u>AGB STOW</u> (00:30)</p> <p>1. Translate to ESP-2 fwd face via CETA Spur and LAB</p> <p>2. Fairlead on LAB HR 0252 (0247) w/Adj</p> <p>3. Poorman fairlead on inboard ESP-2 trunion</p> <p>4. Give SSRMS GO to approach ESP-2</p> <p>5. Open FHRC AGB GP MLI flaps (2)</p> <p>6. GCA SSRMS for AGB Removal</p> <p>7. PGT [A2, CCW2,30.5] (3.8 ft-lb, 30 RPM); 2-in ext</p> <p>8. Release AGB Bolt; ~2-4 turns to hardstop</p> <p>9. Pull T-handle to unlock <input type="checkbox"/> $\sqrt{2}$ white lines visible</p> <p>10. Extend AGB</p> <p>11. Release AGB from ATA</p> <p>12. Soft dock AGB onto FHRC (2 pin side port)</p> <p>13. Transfer PGT to EV1 for AGB install</p> <p>14. Receive and stow PGT</p> <p>15. Close FHRC AGB GP MLI flaps (2)</p> <p>16. Glove check</p>
Torque (ft-lb)	Turns	Green Light						

EVA 3 PLB SETUP (00:30)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<p style="text-align: center;"><u>NOTE</u> SPDM ORU bag on NODE 2 HR 0324 is for PLB safing</p>	<p><u>PLB SETUP</u> (00:30)</p> <ol style="list-style-type: none"> 1. Translate to A/L 2. Retrieve SPDM ORU bag; stow on BRT 3. Translate to JPM HR 1100 via the low road 4. Perform tether swap to spare 85-ft ST: <ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> √Gate closed (both hooks) <input type="checkbox"/> <input type="checkbox"/> √Hook locked (both hooks) <input type="checkbox"/> √Reel unlocked (Spare 85-ft ST) <input type="checkbox"/> Temp stow A/L 85-ft ST reel on JPM HR 1100 (fwd/nadir on JPM endcone) <input type="checkbox"/> √Reel unlocked (A/L 85-ft ST) 5. Temp stow SPDM ORU bag on NODE 2 HR 0324 (fwd endcone) <div style="border: 3px double black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>WARNING</u> 2-ft KOZ for SSPTS cable floating connectors on PMA2 stbd side</p> </div> <ol style="list-style-type: none"> 6. Fairlead on ODS HR with Adj tether 7. Translate to PLB ATA using port sill, watch for SSRMS 8. Poorman fairlead on PRLA V-guides <p>9. Glove check</p>	<p><u>PLB SETUP</u> (00:30)</p> <div style="border: 3px double black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>WARNING</u> 2-ft KOZ for SSPTS cable floating connectors on Lab Stbd/Fwd HR 0273</p> </div> <ol style="list-style-type: none"> 1. Translate to APFR in NODE 2 WIF 7 2. Tether C/L bag to APFR boot plate 3. Translate fwd to NODE 2 HR 0359 (stbd/fwd of N2 zenith CBM) 4. Perform tether swap to spare 85-ft ST: <ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> √Gate closed (both hooks) <input type="checkbox"/> <input type="checkbox"/> √Hook locked (both hooks) <input type="checkbox"/> √Reel unlocked (Spare 85-ft ST) <input type="checkbox"/> Temp stow A/L 85-ft ST reel on NODE 2 HR 0352 <input type="checkbox"/> √Reel unlocked (A/L 85-ft ST) 5. √APFR ingress aid stowed and locked 6. Retrieve APFR; stow on BRT <div style="border: 3px double black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>WARNING</u> 2-ft KOZ for SSPTS cable floating connectors on PMA2 stbd side Stay 1 ft from PLB SSOR antenna Stay 1 ft from powered ROEU connector</p> </div> <ol style="list-style-type: none"> 7. Translate to LMC using stbd PLB sill; fairlead on ODS with Adj tether (from wrist) 8. Poorman fairlead on PRLA V-guides 9. Install APFR [1,00,G,1] into stbd LMC WIF <ul style="list-style-type: none"> <input type="checkbox"/> √Bik-Bik <input type="checkbox"/> Pull/Twist test 10. Remove C/L Bag from APFR and temp stow near middle of LMC 11. Perform socket swap from 2-in to 6-in <ul style="list-style-type: none"> <input type="checkbox"/> 2-in on socket caddy, tug test <input type="checkbox"/> 6-in on PGT, tug test 12. Glove check

EVA 3 ATA INSTALL ON LMC/FGB REMOVAL (01:45)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)																								
<ol style="list-style-type: none"> Verify SSRMS at Payload Bay Port Clear position SSRMS GCA to ATA Release position SSRMS receive EV2 GO: Release ATA SSRMS Clear of ATA and maneuvering to ATA Backoff 	<p><u>ATA UNGRAPPLE</u></p> <ol style="list-style-type: none"> Verify following on FSE: <ul style="list-style-type: none"> <input type="checkbox"/> Spherical bearings aligned on Bolt 1,2 <input type="checkbox"/> Bolt 1 floating clevis rotated clear GCA SSRMS to ATA Release position Assist EV2 as reqd Maneuver ATA into soft dock (bolts 2 & 4) on LMC 	<p><u>ATA UNGRAPPLE</u></p> <ol style="list-style-type: none"> Verify following on FSE: <ul style="list-style-type: none"> <input type="checkbox"/> Spherical bearings aligned on Bolt 4 Ingress APFR GCA SSRMS to ATA Release position Attach RET to ATA HR Give SSRMS GO: Release ATA Maneuver ATA into soft dock (bolts 2 & 4) on LMC 																								
<table border="1"> <thead> <tr> <th>ATA Bolt</th> <th>Torque</th> <th>Turns</th> <th>Green Light</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3 w/TM</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	ATA Bolt	Torque	Turns	Green Light	1				2				3				3 w/TM				4				<p><u>ATA INSTALL</u></p> <ol style="list-style-type: none"> Hold ATA and give EV2 GO: Drive bolt 3 PGT [A7, CW2, 30.5] (9.2 ft-lb, 30 RPM); 6-in ext Drive ATA bolt 2, ~16 turns to a hardstop <ul style="list-style-type: none"> <input type="checkbox"/> Verify no white lines visible Stow 6-in socket in trash bag Retrieve TM from C/L Bag Engage TM on ATA bolt 3 <ul style="list-style-type: none"> <input type="checkbox"/> Verify anti-backlash in neutral Drive TM at PGT [A7, CW2, 30.5] to torque (9.2 ft-lb, 30 RPM) Stow TM in C/L Bag Socket swap to 6-in in trash bag <ul style="list-style-type: none"> <input type="checkbox"/> Pull test 	<p><u>ATA INSTALL</u></p> <ol style="list-style-type: none"> PGT [A7, CW2, 30.5] (9.2 ft-lb, 30 RPM); 6-in ext On EV1 GO: Drive ATA bolt 3, 14 turns to a hardstop Remove RET from ATA HR Egress APFR Drive ATA bolt 4, ~16 turns to a hardstop <ul style="list-style-type: none"> <input type="checkbox"/> Verify no white lines visible Perform Tool Inventory (MWS and C/L bag) C/L Bag inventory: <ul style="list-style-type: none"> <input type="checkbox"/> C/L Bag <ul style="list-style-type: none"> <input type="checkbox"/> Adj Tether (outside – tie down) <input type="checkbox"/> 55-ft Safety Tether (SSRMS) <input type="checkbox"/> RET (sm-sm) <ul style="list-style-type: none"> <input type="checkbox"/> EVA Camera w/Bracket <input type="checkbox"/> WIF Adapter (Int RET) <input type="checkbox"/> Round TM (Int RET) <ul style="list-style-type: none"> <input type="checkbox"/> 7/16-in Flush Socket <input type="checkbox"/> Ratchet w/no PW (Int RET) <ul style="list-style-type: none"> <input type="checkbox"/> 2-in socket <input type="checkbox"/> Socket caddy (Int RET) <ul style="list-style-type: none"> <input type="checkbox"/> 2-in socket
ATA Bolt	Torque	Turns	Green Light																							
1																										
2																										
3																										
3 w/TM																										
4																										
<ol style="list-style-type: none"> Verify tool inventory of EV2 MWS(L-R) <ul style="list-style-type: none"> <input type="checkbox"/> BRT (L) <ul style="list-style-type: none"> <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> Wire Tie (2) <input type="checkbox"/> Small ISS Trash Bag <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> RET (sm-sm) w/PIP Pin <input type="checkbox"/> Adj Tether <input type="checkbox"/> Wire Tie (2 – short) <input type="checkbox"/> RET w/PIP Pin <ul style="list-style-type: none"> <input type="checkbox"/> PGT <ul style="list-style-type: none"> <input type="checkbox"/> 6-in ext <input type="checkbox"/> Adj Tether (0) on wrists; fairleads 	<table border="1"> <tr> <td style="text-align: center;">CAUTION</td> </tr> <tr> <td style="text-align: center;">Avoid contact with FGB grapple pin and RMS target</td> </tr> <tr> <td style="text-align: center;">Avoid contact with PLB cameras</td> </tr> </table>	CAUTION	Avoid contact with FGB grapple pin and RMS target	Avoid contact with PLB cameras	<ol style="list-style-type: none"> Perform Tool Inventory (MWS and C/L bag) C/L Bag inventory: <ul style="list-style-type: none"> <input type="checkbox"/> C/L Bag <ul style="list-style-type: none"> <input type="checkbox"/> Adj Tether (outside – tie down) <input type="checkbox"/> 55-ft Safety Tether (SSRMS) <input type="checkbox"/> RET (sm-sm) <ul style="list-style-type: none"> <input type="checkbox"/> EVA Camera w/Bracket <input type="checkbox"/> WIF Adapter (Int RET) <input type="checkbox"/> Round TM (Int RET) <ul style="list-style-type: none"> <input type="checkbox"/> 7/16-in Flush Socket <input type="checkbox"/> Ratchet w/no PW (Int RET) <ul style="list-style-type: none"> <input type="checkbox"/> 2-in socket <input type="checkbox"/> Socket caddy (Int RET) <ul style="list-style-type: none"> <input type="checkbox"/> 2-in socket Tether C/L bag to APFR boot plate √APFR ingress aid stowed and locked Retrieve APFR, stow on BRT Glove check 																					
CAUTION																										
Avoid contact with FGB grapple pin and RMS target																										
Avoid contact with PLB cameras																										
<ol style="list-style-type: none"> Verify PLB Camera B rotated vertical 																										

EVA 3 ATA INSTALL ON LMC/FGB REMOVAL (01:45) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)																				
<table border="1"> <thead> <tr> <th>FGB Bolt</th> <th>Torque</th> <th>Turns</th> <th>Green Light</th> </tr> </thead> <tbody> <tr> <td>GP1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>GP2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>GP3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>GP4</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>7. Verify tool inventory of EV1 MWS (L-R)</p> <ul style="list-style-type: none"> <input type="checkbox"/> BRT (L) <ul style="list-style-type: none"> <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> Wire Tie (2 – short) <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> RET w/PIP Pin <input type="checkbox"/> Adj Tether (1); fairlead <input type="checkbox"/> Wire Tie (3) <input type="checkbox"/> Small ISS Trash Bag <input type="checkbox"/> RET (sm-sm) <ul style="list-style-type: none"> <input type="checkbox"/> PGT w/6-in ext <input type="checkbox"/> EVA Camera <input type="checkbox"/> RET (sm-sm) 	FGB Bolt	Torque	Turns	Green Light	GP1				GP2				GP3				GP4				<p><u>FGB REMOVAL</u></p> <p>14. RET to FGB 15. PGT [B7, CCW2, 30.5] (25.5 ft-lb, 30 RPM); 6-in ext 16. Release FGB bolts (4) 10 turns; stop on turns (aft bolts 1st) <input type="checkbox"/> GP4 <input type="checkbox"/> GP2 <input type="checkbox"/> GP3 <input type="checkbox"/> GP1 17. Temp stow FGB on LMC HR 18. Rotate Bolt 1 clevis vertical 19. PGT [A7, CW2, 30.5] (9.2 ft-lb, 30 RPM); 6-in ext 20. Drive ATA bolt 1, ~16 turns to a hardstop <input type="checkbox"/> Verify no white lines visible</p> <p><u>TIGHTEN FGB BOLTS FOR ENTRY</u></p> <p>21. PGT [A1, CW2, 30.5] (2.5 ft-lb, 30 RPM); 6-in ext 22. Tighten FGB bolts (4) 19 turns (any order) <input type="checkbox"/> GP4 <input type="checkbox"/> GP2 <input type="checkbox"/> GP3 <input type="checkbox"/> GP1 23. Glove check 24. Tool Inventory (L-R)</p> <p><u>FGB INSTALL ON S1 ATA NADIR (00:45)</u></p> <p>25. Retrieve FGB from LMC HR, place on BRT 26. Translate to ODS via port sill 27. Retrieve Fairlead Adj tether from ODS</p>	
FGB Bolt	Torque	Turns	Green Light																			
GP1																						
GP2																						
GP3																						
GP4																						

EVA 3 INSTALL ATA ON LMC/FGB REMOVAL (01:45) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)																				
<p>8. <input checked="" type="checkbox"/> MCC-H: S1 TRRJ Locked & S1 SASA OFF</p> <table border="1"> <thead> <tr> <th>FGB Bolt</th> <th>Torque</th> <th>Turns</th> <th>Green Light</th> </tr> </thead> <tbody> <tr> <td>GP1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>GP2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>GP3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>GP4</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>9. <input checked="" type="checkbox"/> MCC-H: SSPTS inhibits in place</p>	FGB Bolt	Torque	Turns	Green Light	GP1				GP2				GP3				GP4				<p>28. On IV GO: Translate to S1 ATA worksite, fairlead as reqd</p> <p>29. Perform tether swap to A/L 85-ft ST (JPM HR 1100):</p> <ul style="list-style-type: none"> <input type="checkbox"/> <input checked="" type="checkbox"/> Gate closed (both hooks) <input type="checkbox"/> <input checked="" type="checkbox"/> Hook locked (both hooks) <input type="checkbox"/> <input checked="" type="checkbox"/> Reel unlocked (A/L 85-ft ST) <input type="checkbox"/> Temp stow spare 85-ft ST on JPM HR 1100 <input type="checkbox"/> <input checked="" type="checkbox"/> Reel unlocked (spare 85-ft ST) <p>30. Install FGB onto S1 ATA nadir</p> <p>31. PGT [A7, CW2, 30.5] (9.2 ft-lb, 30 RPM); 6-in ext</p> <p>32. Tighten FGB bolts (4) 8-11 turns to hardstop (any order)</p> <ul style="list-style-type: none"> <input type="checkbox"/> GP4 <input type="checkbox"/> GP2 <input type="checkbox"/> GP3 <input type="checkbox"/> GP1 <p><u>RETRIEVE LIGHT BAG</u></p> <p>33. Translate to A/L</p> <p>34. Open thermal cover and retrieve Light ORU bag (take Lg-sm RET)</p> <p>35. Attach RET, place Light ORU bag in BRT</p> <p>36. Close thermal cover</p> <p>37. Verify EV1 SAFER:</p> <ul style="list-style-type: none"> <input type="checkbox"/> <input checked="" type="checkbox"/> R Handle down (HCM door – Closed) <input type="checkbox"/> <input checked="" type="checkbox"/> L Handle down (MAN ISO Valve – Open) <div style="border: 3px double black; padding: 5px; text-align: center; margin: 10px 0;"> <p>WARNING Stay 1 ft from Lab UHF Antenna</p> </div> <p>38. On IV GO: Translate to CP13 ETVCG worksite</p> <p>39. Temp stow Light bag on LAB HR 0274 w/Lg-sm (near trunnion on LAB)</p>	
FGB Bolt	Torque	Turns	Green Light																			
GP1																						
GP2																						
GP3																						
GP4																						

EVA 3 INSTALL ATA ON LMC/FGB REMOVAL (01:45) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
	<p>40. Translate to JPM HR 1100</p> <p>41. Perform tether swap to spare 85-ft ST (JPM HR 1100):</p> <ul style="list-style-type: none"> <input type="checkbox"/> <input checked="" type="checkbox"/> Gate closed (both hooks) <input type="checkbox"/> <input checked="" type="checkbox"/> Hook locked (both hooks) <input type="checkbox"/> <input checked="" type="checkbox"/> Reel unlocked (spare 85-ft ST) <input type="checkbox"/> Temp stow A/L 85-ft ST on JPM HR 1100 <input type="checkbox"/> <input checked="" type="checkbox"/> Reel unlocked (A/L 85-ft ST) <p>42. Translate to NODE 2 HR 0324</p> <p>43. Retrieve SPDM ORU Bag, place in BRT</p> <p>44. Translate to PLB, fairlead as reqd</p>	

EVA 3 SSRMS SETUP (00:30)

IV/SSRMS	EV2 – Anderson (SSRMS)
<p>1. Verify SSRMS at LWAPA Approach position</p> <p>2. SSRMS GCA to APFR install</p> <p>3. SSRMS GCA to APFR Ingress</p>	<p><u>SSRMS SETUP</u> (00:30)</p> <ol style="list-style-type: none"> 1. Translate to ODS via stbd sill; retrieve fairlead 2. Translate to COL, take zenith route to COL stbd, fairlead on COL HR 0933 (zenith side, stbd end) 3. Translate via endcone fwd handrails to nadir worksite 4. Temp stow C/L bag on COL HR 0940 (nadir side, stbd end) 5. GCA SSRMS to APFR install/ingress position 6. Attach MWS EE to SSRMS LEE 7. Install WIF adapter (tether point toward EE) <ul style="list-style-type: none"> <input type="checkbox"/> PIP Pin installed <input type="checkbox"/> Pull test 8. Install APFR [12,NN,F,6] into WIF adapter <ul style="list-style-type: none"> <input type="checkbox"/> √Blk-Blk <input type="checkbox"/> Pull/Twist test 9. Retrieve camera from C/L bag 10. Perform tether swap to 55-ft ST on SSRMS LEE HR tether point <ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> √Gate closed (both hooks) <input type="checkbox"/> <input type="checkbox"/> √Hook locked (both hooks) <input type="checkbox"/> √Reel unlocked (55-ft ST) <input type="checkbox"/> Temp stow Spare 85-ft ST reel on COL HR 0956 (nadir/fwd edge of EPF) <input type="checkbox"/> √Reel unlocked (Spare 85-ft ST) 11. GCA SSRMS for APFR Ingress, extend APFR Ingress Aid <div style="border: 3px double black; padding: 5px; margin: 10px 0; text-align: center;"> <p>WARNING If APFR Ingress Aid handle left extended for more than 1.5 hr, limit contact</p> </div> 12. Ingress APFR <ul style="list-style-type: none"> <input type="checkbox"/> Attach MWS EE to APFR Ingress Aid <input type="checkbox"/> Tuck APFR Ingress Aid between legs


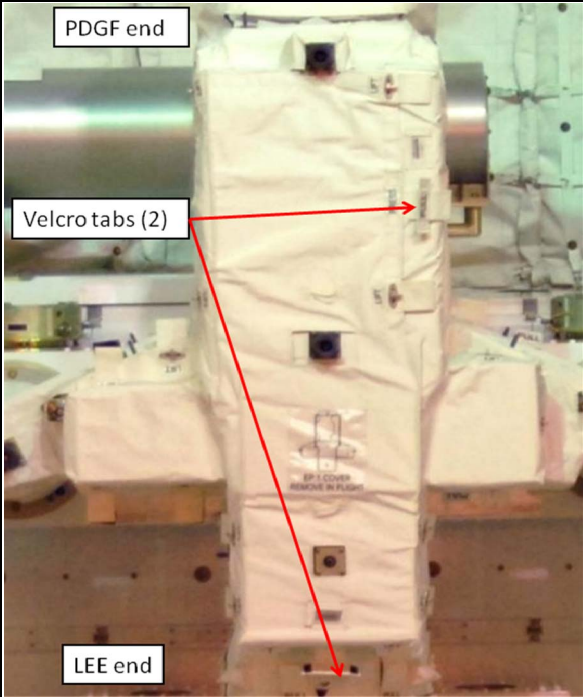
EVA 3 LWAPA RETRIEVE (01:00)

IV/SSRMS	EV2 – Anderson (SSRMS)
<p>4. <input checked="" type="checkbox"/> MCC-H: LWAPA inhibits</p> <p>5. SSRMS: On EV2 GO, GCA for access to FRAM handrails</p> <p>6. Verify EV2 config prior to LWAPA bolt removal</p> <p>7. Give EV2 GO for LWAPA FRAM Bolt release</p> <p>8. SSRMS: On EV2 GO, maneuver to LWAPA Clearance</p> <p>9. Verify inhibit in place prior to installing LWAPA on LMC: R1 <input checked="" type="checkbox"/> PL AFT MNC – OFF</p>	<p><u>LWAPA REMOVAL AND TRANSFER TO PLB (01:00)</u></p> <div style="border: 3px double black; padding: 5px; text-align: center; margin: 10px 0;"> <p>WARNING LWAPA PIP pins may be sharp</p> </div> <p>13. GCA SSRMS for access to FRAM handrails, if reqd</p> <p>14. Attach RET to LWAPA; verify following in good config prior to LWAPA removal</p> <ul style="list-style-type: none"> <input type="checkbox"/> Cooling <input type="checkbox"/> Visors <input type="checkbox"/> Glove htrs <input type="checkbox"/> Helmet lights <input type="checkbox"/> Keep heels out <input type="checkbox"/> Tethers clear <p>15. PGT [A4, CCW2, 30.5] (6.3 ft-lb, 30 RPM); 6-in ext</p> <p>16. On IV GO:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Release primary FRAM bolt ~11 turns to hard stop. (Push ~10 lb to release bolt locking tabs) <input type="checkbox"/> <input checked="" type="checkbox"/> Status Indicator “In” <p>17. Stow PGT</p> <p>18. Lift LWAPA from PFRAM</p> <p>19. Give SSRMS GO: Maneuver to LWAPA Clearance</p>

EVA 3 LWAPA RETRIEVE (01:00) (Cont)

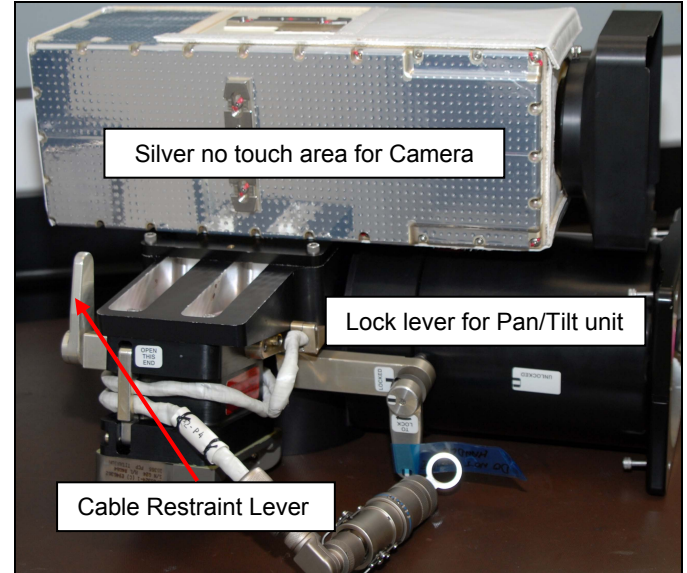
IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (SSRMS)						
<p>1. Record LWAPA bolt data</p> <table border="1"> <thead> <tr> <th>Torque (ft-lb)</th> <th>Turns</th> <th>Green Light</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p>2. Verify tool inventory EV1 MWS (L-R)</p> <ul style="list-style-type: none"> <input type="checkbox"/> BRT (L) <input type="checkbox"/> RET <input type="checkbox"/> Wire Tie (2) <input type="checkbox"/> Small ISS Trash Bag <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> RET (sm-sm) w/PIP Pin <input type="checkbox"/> Adj Tether (1) <input type="checkbox"/> Wire Tie (3 – short) <input type="checkbox"/> EVA Camera <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> PGT <input type="checkbox"/> 6-in ext <input type="checkbox"/> FGB on BRT <p>3. <input checked="" type="checkbox"/> MCC-H CLPA1 inhibits in place</p> <p>4. <input checked="" type="checkbox"/> MCC-H CP13 Light inhibits in place and light has been OFF at least 1 hr prior</p>	Torque (ft-lb)	Turns	Green Light				<p><u>LWAPA INSTALL ON LMC (00:30)</u></p> <div style="border: 2px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p>WARNING LWAPA PIP pins may be sharp</p> </div> <ol style="list-style-type: none"> 1. Translate to nadir side of LMC, temp stow SPDM ORU bag on LMC <ul style="list-style-type: none"> <input type="checkbox"/> Verify SPDM ORU bag does not block Camera B 2. GCA SSRMS to LWAPA install position 3. Assist EV2 as reqd 4. Retrieve SPDM ORU bag from LMC 5. Transfer SPDM ORU bag to EV2 6. Glove check 7. Perform tool inventory 8. If not complete: Stow FGB and retrieve Light ORU bag 9. On IV GO: Translate to CP13 worksite 	<p><u>LWAPA INSTALL ON LMC (00:30)</u></p> <ol style="list-style-type: none"> 1. GCA SSRMS to LWAPA install position 2. On IV GO: Position LWAPA on PFRAM using FRAM alignment stripes 3. PGT [A4, CW2, 30.5] (6.3 ft-lb, 30 RPM); 6-in ext 4. Engage primary FRAM bolt ~11 turns to hard stop <ul style="list-style-type: none"> <input type="checkbox"/> <input checked="" type="checkbox"/> Status indicator 'out' (Push ~10 lb to release bolt locking tabs) 5. Release RET from LWAPA 6. Receive SPDM ORU bag from EV1 7. Stow SPDM ORU bag on BRT 8. Tool inventory prior to leaving PLB (L-R) <ul style="list-style-type: none"> <input type="checkbox"/> BRT (L) <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> Med ORU bag (SPDM bag) <input type="checkbox"/> Wire Tie (2) <input type="checkbox"/> Adj Tether <input type="checkbox"/> Small ISS Trash Bag <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> RET (sm-sm) w/PIP Pin <input type="checkbox"/> Wire Tie (2 – short) <input type="checkbox"/> EVA Camera <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> RET w/PIP Pin <input type="checkbox"/> PGT w/6-in ext <input type="checkbox"/> Adj Tether (0) on wrists; fairleads
Torque (ft-lb)	Turns	Green Light						

EVA 3 SPDM CLPA1 INSTALL/EP1 MLI REMOVAL (01:30)

IV/SSRMS	EV2 – Anderson (SSRMS)							
<ol style="list-style-type: none"> SSRMS: On EV2 GO, maneuver to LMC Clearance position If not already complete: $\sqrt{\text{MCC-H}}$ CLPA1 inhibits in place SSRMS GCA CLPA1 install  Record WVS survey <p>CLPA1 Bolt Data</p> <table border="1"> <thead> <tr> <th>Torque (ft-lb)</th> <th>Turns</th> <th>Green Light</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> <ol style="list-style-type: none"> Give MCC-H GO to power up CLPA1 SSRMS: On EV2 GO, maneuver to EP1 Blanket Removal position 	Torque (ft-lb)	Turns	Green Light					<p><u>SPDM CLPA1 INSTALL</u> (00:45)</p> <ol style="list-style-type: none"> Give SSRMS GO: Maneuver to LMC Clearance position Remove CLPA w/sq scoop from ORU bag (on bag RET) GCA SSRMS to CLPA1 install position On IV GO: Remove connector cover on SPDM; mate Velcro tab and cover exposed Velcro with flap Install CLPA on SPDM; magnetic soft dock PGT [B2, CW2, 30.5] (16.0 ft-lb, 30 RPM); 6-in ext Drive tie-down bolt, 22-23 turns to hardstop Remove sq scoop; stow in ORU bag Inspect tie-down bolt indicator to confirm fully 'IN' (only white tip of indicator visible if scoop not blocking) <p><u>SPDM EP1 THERMAL COVER REMOVAL</u> (00:45)</p> <ol style="list-style-type: none"> Give SSRMS GO: Maneuver to EP1 Blanket Removal position GCA SSRMS as reqd Attach RET from ORU bag to EP1 blanket tether loop Release quarter turn fasteners (14 total) and lift corresponding tabs Remove blanket from EP1; stow inside ORU bag On SPDM, fold over Velcro flaps to cover thermal blanket grounding patches (2) and Velcro patches (3)
Torque (ft-lb)	Turns	Green Light						

EVA 3 CP13 (LAB) LIGHT R&R (01:00)

IV/SSRMS	EV1 – Mastracchio (FF)
<p>1. If not already complete: <input checked="" type="checkbox"/> MCC-H CP13 Light inhibits in place and light has been OFF at least 1 hr prior</p>	<p><u>CP13 (LAB) LIGHT R&R (01:00)</u></p> <ol style="list-style-type: none"> Perform tether swap to A/L 85-ft ST (JPM HR 1100): <ul style="list-style-type: none"> <input type="checkbox"/> <input checked="" type="checkbox"/> \sqrtGate closed (both hooks) <input type="checkbox"/> <input checked="" type="checkbox"/> \sqrtHook locked (both hooks) <input type="checkbox"/> <input checked="" type="checkbox"/> \sqrtReel unlocked (A/L 85-ft ST) <input type="checkbox"/> Temp stow spare 85-ft ST on MWS <input type="checkbox"/> <input checked="" type="checkbox"/> \sqrtReel unlocked (spare 85-ft ST) Temp stow Light ORU bag on LAB HR 0296 & 0273 Stow spare 85-ft Safety Tether on Light ORU bag <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">CAUTION</p> <p>Avoid contact with ETVCG Light cover glass. Reflective coating may be damaged. Contact with other surfaces of ETVCG Light should be minimized to avoid damaging thermal coating</p> <p>Avoid contact with ETVCG silver tape</p> </div> <ol style="list-style-type: none"> Retrieve Rd scoop from ORU bag Install Rd scoop on VSSA base (aft) Move RET from Rd scoop to old ETVCG light Verify that Camera is in stowed position On IV GO: Place the Pan/Tilt mechanism in LOCKED position (Push and turn lever) Open TA-Clamp Disconnect NZGL; restrain cable as reqd PGT [B6, CCW2, 30.5] (24.0 ft-lb, 30 RPM); 6-in ext Release bolt 11-15 turns, remove old ETVCG light and temp stow Retrieve new ETVCG light and check connector <ul style="list-style-type: none"> <input type="checkbox"/> <input checked="" type="checkbox"/> \sqrtPins <input type="checkbox"/> <input checked="" type="checkbox"/> \sqrtGood EMI band <input type="checkbox"/> <input checked="" type="checkbox"/> \sqrtNo FOD Install new ETVCG light in soft dock



EVA 3 CP13 (LAB) LIGHT R&R (01:00) (Cont)

IV/SSRMS	EV1 – Mastracchio (FF)						
<p>CP13 Light Bolt Data</p> <table border="1"> <thead> <tr> <th>Torque (ft-lb)</th> <th>Turns</th> <th>Green Light</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p>2. Verify tool inventory of EV1 MWS</p> <ul style="list-style-type: none"> <input type="checkbox"/> BRT (L) <ul style="list-style-type: none"> <input type="checkbox"/> RET <input type="checkbox"/> Wire Tie (2) <input type="checkbox"/> Small ISS Trash Bag <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> RET (sm-sm) w/PIP Pin <input type="checkbox"/> Adj Tether (2) <input type="checkbox"/> Wire Tie (3 – short) <input type="checkbox"/> EVA Camera <ul style="list-style-type: none"> <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> RET (sm-sm) <ul style="list-style-type: none"> <input type="checkbox"/> PGT w/6-in ext <ul style="list-style-type: none"> <input type="checkbox"/> 6-in ext <input type="checkbox"/> Med ORU bag <ul style="list-style-type: none"> <input type="checkbox"/> RET (Lg-sm) <input type="checkbox"/> RET (sm-sm) <ul style="list-style-type: none"> <input type="checkbox"/> Round scoop <input type="checkbox"/> RET (sm-sm) <ul style="list-style-type: none"> <input type="checkbox"/> ETVCG light (old) <input type="checkbox"/> 85-ft Safety Tether 	Torque (ft-lb)	Turns	Green Light				<ol style="list-style-type: none"> 15. PGT [B1, CW2, 30.5] (12.0 ft-lb, 30 RPM); 6-in ext 16. Drive bolt 11-15 turns to hardstop 17. Connect NZGL on ETCVG light <ul style="list-style-type: none"> <input type="checkbox"/> √Pins <input type="checkbox"/> √Good EMI band <input type="checkbox"/> √No FOD 18. Close TA-Clamp 19. √Cable under cable restraint on ETVCG pan/tilt unit 20. If cable not under restraint, push and rotate cable restraint lever. Lift cable restraint bar. Place cable under restraint and close restraint 21. While holding restraint closed, push and rotate cable restraint lever to LOCKED position 22. Place Pan/Tilt mechanism in UNLOCKED position 23. Move RET from new light to Rd scoop 24. Retrieve Rd scoop from VSSA base 25. Give MCC-H GO to pan/tilt camera/light 26. Place old light in ORU bag 27. Perform tool inventory 28. Place Light ORU bag on BRT 29. Glove check
Torque (ft-lb)	Turns	Green Light					

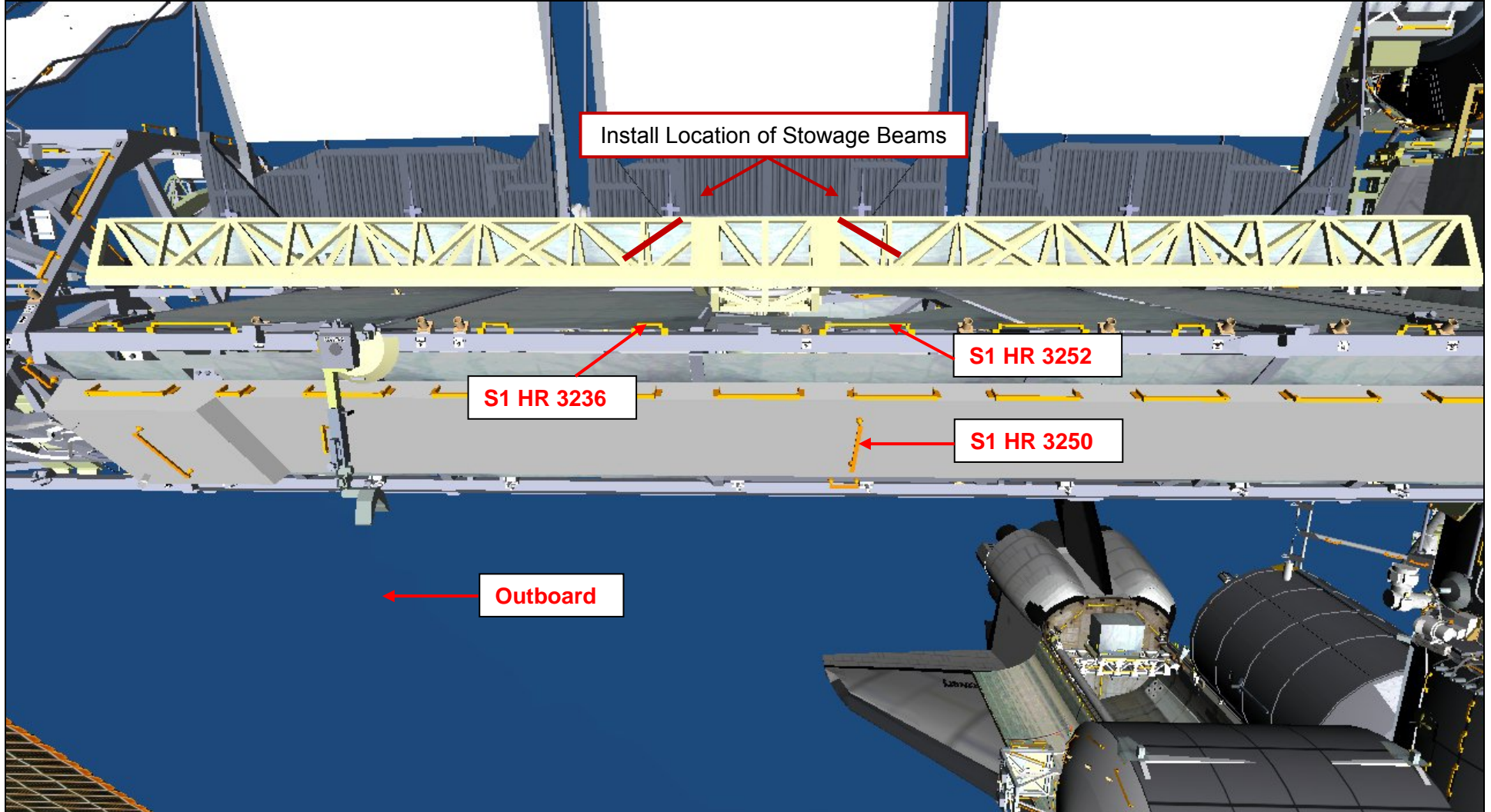
EVA 3 S1 RAD GF STOW BEAM INSTALL (01:00)

IV/SSRMS	EV1 – Mastracchio (FF)									
<p>S1 Inboard Stowage Beam Bolts</p> <table border="1"> <thead> <tr> <th></th> <th>Torque</th> <th>Green Light</th> </tr> </thead> <tbody> <tr> <td>Fwd</td> <td></td> <td></td> </tr> <tr> <td>Aft</td> <td></td> <td></td> </tr> </tbody> </table>		Torque	Green Light	Fwd			Aft			<p><u>S1 RADIATOR GF STOWAGE BEAM INSTALL</u></p> <ol style="list-style-type: none"> 1. Translate to A/L 2. Open Thermal cover, attach A/L RET (Lg-sm) to Light ORU bag 3. Retrieve S1 Rad GF Beam bag (take Lg-sm RET) 4. Place in BRT 5. Close Thermal Cover 6. Verify EV1 SAFER: <ul style="list-style-type: none"> <input type="checkbox"/> √R Handle down (HCM door – Closed) <input type="checkbox"/> √L Handle down (MAN ISO Valve – Open) <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">CAUTION</p> <p style="text-align: center;">Avoid kicking S1 radiator beam. If this occurs, wait 2 to 5 min to allow structural response to dissipate</p> </div> <ol style="list-style-type: none"> 7. Translate zenith at S1 FHRC to S1 HR 3250 8. Temp stow Beam ORU bag on S1 HR 3251 (nadir edge of S1) 9. Perform socket swap to 5/8 x 7.8-in <ul style="list-style-type: none"> <input type="checkbox"/> Pull test 10. PGT [B1, CW2, 30.5] (12.0 ft-lb, 30 RPM); 5/8 x 7.8-in ext 11. Retrieve inboard stowage beam 12. Translate to S1 HR 3252 inboard 13. BRT to S1 HR 3252, as reqd 14. Place inboard stowage beam on radiator beam per picture with tether point facing ISS fwd (away from radiator) 15. Depress bolts (2) of inboard stowage beam to engage zip nuts 16. Torque bolts (2) of inboard stowage beam <ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> 17. Check no white lines visible on bolts <ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> 18. Translate outboard to S1 HR 3236 19. BRT to S1 HR 3236, as reqd 20. Place outboard stowage beam on radiator beam per picture with tether point facing ISS fwd (away from radiator) 21. Depress bolts (2) of outboard stowage beam to engage zip nuts
	Torque	Green Light								
Fwd										
Aft										

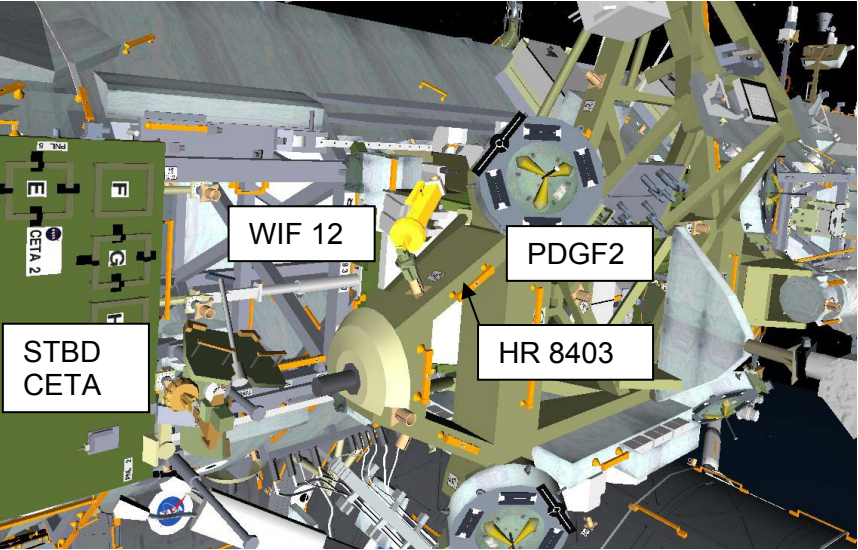
EVA 3 S1 RAD GF STOW BEAM INSTALL (01:00) (Cont)

IV/SSRMS			EV1 – Mastracchio (FF)	
S1 Outboard Stowage Beam Bolts			22. PGT [B1, CW2, 30.5] (12.0 ft-lb, 30 RPM); 5/8 x 7.8-in ext	
	Torque	Green Light	23. Torque bolts (2) of outboard stowage beam <input type="checkbox"/> <input type="checkbox"/>	
Fwd			24. Check no white lines visible on bolts <input type="checkbox"/> <input type="checkbox"/>	
Aft			25. Perform socket swap back to 6-in	
Beam bag inventory:			26. Retrieve Beam ORU bag	
<input type="checkbox"/> Beam Bag (Med ORU Bag)			27. Perform Beam ORU bag inventory	
<input type="checkbox"/> RET (Lg-sm)			28. Verify TRRJ Launch Lock in stowed position	
<input type="checkbox"/> RET (sm-sm)			29. Glove check	
<input type="checkbox"/> RET (sm-sm)				
<input type="checkbox"/> RET (sm-sm)				
<input type="checkbox"/> Socket Caddy				
<input type="checkbox"/> 5/8 x 7.8 in socket (center post)				

EVA 3 S1 RAD GF STOW BEAM INSTALL (01:00) (Cont)



EVA 3 WIF EXTENDER RELOCATE (00:30)

IV/SSRMS	EV1 – Mastracchio (FF)
	<p><u>WIF EXTENDER RELOCATE</u> (00:30)</p> <ol style="list-style-type: none">1. Translate to A/L2. Temp stow Beam ORU bag near A/L3. Translate to stbd edge of ESP-2 to WIF 034. Retrieve WIF Extender, place on BRT5. Translate to MT/MBS via CETA spur6. Translate to MBS WIF 12 (zenith/stbd)7. Install WIF EXTENDER [2,A,1] into MBS WIF 12<ul style="list-style-type: none"><input type="checkbox"/> √Bik-Bik<input type="checkbox"/> Pull/Twist test  <p>The image is a 3D CAD model of a complex mechanical assembly, likely part of a spacecraft's external structure. It features a central cylindrical component labeled 'WIF 12'. To its left is a green rectangular panel labeled 'STBD CETA'. To its right is a larger, more complex structure labeled 'PDGF2'. Below 'PDGF2' is another component labeled 'HR 8403'. The model is rendered in a light grey color with various orange and yellow highlights indicating different parts or assembly points. The background is black, suggesting a space environment.</p>

EVA 3 CLEANUP/INGRESS (01:00)

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<ol style="list-style-type: none"> 1. SSRMS: On EV2 GO, maneuver to EP1 Setup position 2. SSRMS GCA to APFR egress 3. Verify tool inventory of EV2 MWS <ul style="list-style-type: none"> <input type="checkbox"/> BRT (L) <ul style="list-style-type: none"> <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> Wire Tie (2) <input type="checkbox"/> Small ISS Trash Bag <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> RET (sm-sm) w/PIP Pin <input type="checkbox"/> Adj Tether <input type="checkbox"/> Wire Tie (2 – short) <input type="checkbox"/> RET w/PIP Pin <ul style="list-style-type: none"> <input type="checkbox"/> PGT <ul style="list-style-type: none"> <input type="checkbox"/> 6-in ext <input type="checkbox"/> Adj Tether (1) on wrist; fairlead <input type="checkbox"/> C/L Bag <ul style="list-style-type: none"> <input type="checkbox"/> Adj Tether <input type="checkbox"/> 55-ft ST <input type="checkbox"/> WIF Adapter (Int RET) <input type="checkbox"/> EVA Camera w/Bracket <ul style="list-style-type: none"> <input type="checkbox"/> RET (sm-sm) <input type="checkbox"/> Rd TM (Int RET) <ul style="list-style-type: none"> <input type="checkbox"/> 7/16-in flush socket <input type="checkbox"/> Ratchet w/no PW <ul style="list-style-type: none"> <input type="checkbox"/> 2-in socket <input type="checkbox"/> Socket Caddy <ul style="list-style-type: none"> <input type="checkbox"/> 2-in socket <input type="checkbox"/> SPDM bag <ul style="list-style-type: none"> <input type="checkbox"/> RET (sm-sm) w/sq scoop <input type="checkbox"/> RET (sm-sm) w/EP1 MLI <input type="checkbox"/> RET (sm-sm) (attached to C/L) <input type="checkbox"/> Adj Tether (outside) 		<p><u>SSRMS CLEANUP</u> (01:00)</p> <ol style="list-style-type: none"> 1. Give SSRMS GO: Maneuver to EP1 Setup position 2. GCA SSRMS for APFR Egress 3. Egress APFR 4. Temp stow SPDM ORU bag near C/L bag on COL HR0946 5. Perform tether swap to Spare 85-ft ST: <ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> √Gate closed (both hooks) <input type="checkbox"/> <input type="checkbox"/> √Hook locked (both hooks) <input type="checkbox"/> √Reel unlocked (Spare 85-ft ST) <input type="checkbox"/> Retrieve SSRMS LEE 55-ft ST; stow inside C/L bag <ul style="list-style-type: none"> <input type="checkbox"/> √Reel unlocked (55-ft ST) 6. Retract and lock ingress aid; fold to boot plate 7. RET to APFR, remove from WIF adapter 8. Place APFR on BRT 9. RET to WIF adapter, remove PIP pin, stow in C/L Bag 10. Verify tools and tethers clear of SSRMS 11. Give SSRMS GO to mnvr to COL backoff posn 12. Translate to NODE 2 WIF 7 and pickup fairlead 13. Install APFR [12,NN,F,6] into NODE 2 WIF 7 <ul style="list-style-type: none"> <input type="checkbox"/> √Blk-Blk <input type="checkbox"/> Pull/Twist test <input type="checkbox"/> √AIA retracted and locked, folded to boot plate 14. Translate to C/L bag and SPDM ORU bag on COL HR0940 15. Perform tool inventory prior to stowing C/L bag 16. Stow C/L bag inside SPDM ORU bag, use external RET (sm-sm) to tether to SPDM ORU bag 17. Stow SPDM ORU bag on BRT 18. Translate to A/L ST on NODE 2 HR 0359 19. Perform tether swap to A/L 85-ft ST on NODE 2 HR 0359: <ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> √Gate closed (both hooks) <input type="checkbox"/> <input type="checkbox"/> √Hook locked (both hooks) <input type="checkbox"/> √Reel unlocked (A/L 85-ft ST) <input type="checkbox"/> Temp stow Spare 85-ft ST MWS <input type="checkbox"/> √Reel unlocked (Spare 85-ft ST)

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

IV/SSRMS	EV1 – Mastracchio (FF)	EV2 – Anderson (FF)
<p>Prior to Ingress: 4. Perform WVS PWRDN (PHOTO/TV, <u>WVS CUE CARD</u>)</p>	<p><u>CLEANUP/INGRESS</u> (00:30) 1. Translate to A/L 2. Retrieve Beam ORU bag 3. Transfer Beam ORU bag to EV2 4. Connect waist tether to EV2 85-ft ST 5. On EV2 GO: Disconnect EV2 85-ft ST from aft A/L anchor point <input type="checkbox"/> <input type="checkbox"/> √Gate closed (both hooks) <input type="checkbox"/> <input type="checkbox"/> √Hook locked (both hooks) 6. Release EV1 85-ft ST from fwd A/L anchor point; stow on MWS 7. Ingress A/L 8. Close thermal cover; attach Velcro strap 9. Remove SCU from stowage pouch 10. Remove DCM cover; Velcro to DCM 11. Connect SCU to DCM; √SCU Locked <u>NOTE</u> To reduce time for SCU cooling, set TCV 8 – Max C 12. WATER – OFF (fwd), expect H2O IS OFF msg <u>CAUTION</u> Do not close hatch until EMU Water OFF for 2 min 13. √EV hatch clear of FOD and obstructions 14. Verify EV hatch handle position per hatch decal; close and lock Go to PRE-REPRESS (<u>DEPRESS/REPRESS</u> Cue Card)</p>	<p><u>CLEANUP/INGRESS</u> (00:30) 1. Translate to A/L 2. Retrieve fairlead from LAB HR 0252 (0247) 3. Open A/L thermal cover 4. Attach SPDM ORU bag/C/L bag to RET (Lg-sm); stow in A/L 5. Ingress A/L 6. Connect waist tether to A/L D-ring ext <input type="checkbox"/> √Gate closed <input type="checkbox"/> √Hook locked 7. Receive Beam ORU bag from EV1 8. Attach Beam ORU bag to RET (Lg-sm); stow in A/L 9. Give EV1 GO to disconnect EV2 85-ft ST 10. Remove SCU from stowage pouch 11. Remove DCM cover; Velcro to DCM 12. Connect SCU to DCM; √SCU Locked 13. WATER – OFF (fwd), expect H2O IS OFF msg Go to PRE-REPRESS (<u>DEPRESS/REPRESS</u> Cue Card)</p>

EVA 3 FIXED GRAPPLE BAR (FGB) – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:45

EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Old ATA GP release	GP 1-GP 4	7/16	4	---	25.5 (B7)	47.4	8-11	30 (CCW2)
New ATA GP release	GP 1-GP 4	7/16	4	---	25.5 (B7)	47.4	17-20	30 (CCW2)
New ATA GP install	GP 1-GP 4	7/16	4	9.2 (A7)	---	16.1	8-11	30 (CW2)

Tools:

EV1
PGT w/7/16 – 6 in ext BRT

Mass & Dimensions:

ORU	Mass (lb)
FGB	76

Notes:

1. All 4 bolts are required for SSRMS grapple
2. Soft dock detent on Bolt 3 only

Cautions:

1. Avoid contact with FGB grapple shaft
2. Avoid contact with FGB FRGF target and pin



EVA 3 LMC ATA – TASK DATA

Estimated Task Duration:

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

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
Ammonia Tank Assembly (ATA)	Dry – 1289 Wet – 1760	(L*W*H) 57.3" x 80.1" x 45.4"

Tools:

EV1	EV2
PGT w/7/16 – 6 in ext	PGT w/7/16 – 6 in ext
Fixed Grapple Bar (FGB)	Round TM with 7/16 flush socket

EVA Fasteners:

Fastener Name	Head Size	Ground Install Torque (ft-lb)	Install Torque (ft-lb)	Failure Torque (ft-lb)	Turns	Features
Bolt 1 (Clevis)	7/16	N/A	9.2 (A7)	35.1	~16	√2 white lines visible
Bolt 2 (Clevis)	7/16	N/A	9.2 (A7)	35.1	~16	√2 white lines visible Soft dock
Bolt 3 (Microconical)	7/16	N/A	PGT + TM 9.2 (A7)	78.3	~14	
Bolt 4 (Clevis)	7/16	N/A	9.2 (A7)	35.1	~16	√2 white lines visible Soft dock
Contingency			Release Torque (ft-lb)			
LMC Bolt 3 Release (3 Bolts)	7/16	26.7-28.3	25.5 (B7) (37.3 max expected torque)	63.0	11.5-13	

Foot Restraints:

Task	WIF	APFR Setting
ATA Install on LMC	Stbd LMC WIF	[1,00,G,1]

Notes:

1. Bolts 2 and 4 on LMC have 2 spring plunger soft docks each

Cautions:

1. Avoid contact with PLB cameras
2. Avoid contact with FGB grapple pin and target

EVA 3 ADJUSTABLE GRAPPLE BAR (AGB) – TASK DATA

Estimated Task Duration:

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

Tools:

EV1	EV2
None	PGT w/7/16 – 6 in ext

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
AGB Bolt	7/16	1	3.8 (A2)	3.8 (A2)	5.7	2-4

Mass & Dimensions:

ORU	Mass (lb)
AGB	75

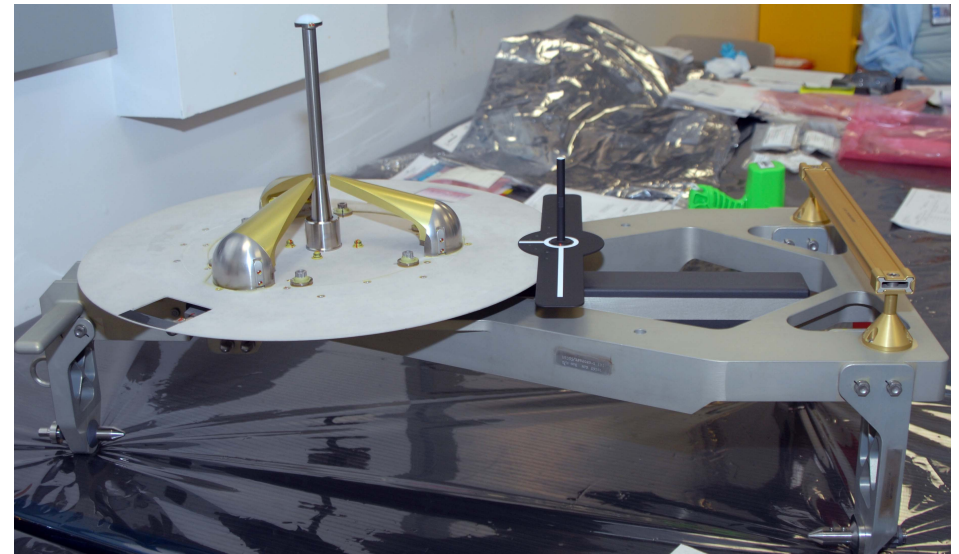


Notes:

1. There are 2 spring plunger soft docks on each passive pin (4 plungers total)
2. There are 2 spring plungers on the AGB T-handle

Cautions:

1. Avoid contact with AGB grapple pin and target



SPDM CLPA1 – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	00:45	N/A

Tools:

EV2
PGT w/7/16 – 6 in ext
ORU Bag
Sq Scoop
CLPA

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
CLPA Bolt	7/16	1	16.0 (B2)	N/A	30.5	22-23

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
CLPA	50.59	22.5 x 17.0 x 16.8

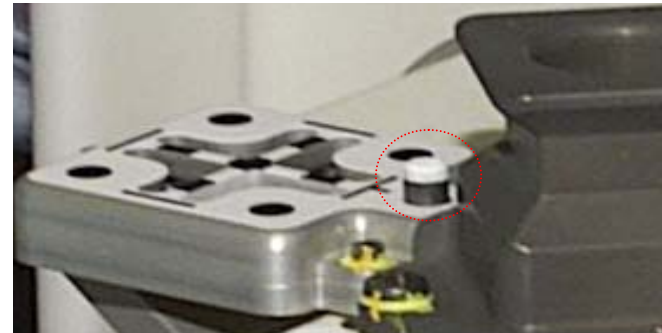


Notes:

1. There is a magnetics soft dock for the CLPA
2. The status indicator may only be visible once the sq scoop is removed

Cautions:

1. Avoid contact with SPDM CLPA connections if powered



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

ETVCG CP13 LIGHT – TASK DATA

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	01:00	N/A

Tools:

EV2
PGT w/7/16 – 6 in ext
ORU Bag
Sq Scoop
ETVCG Lamp

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
ETVCG Light Bolt	7/16	1	12.0 (B1)	24.0 (B6)	73.4	11-15

Mass & Dimensions:

ORU	Part Number	Mass (lb)
ETVCG Light	1F01194-1	32.5

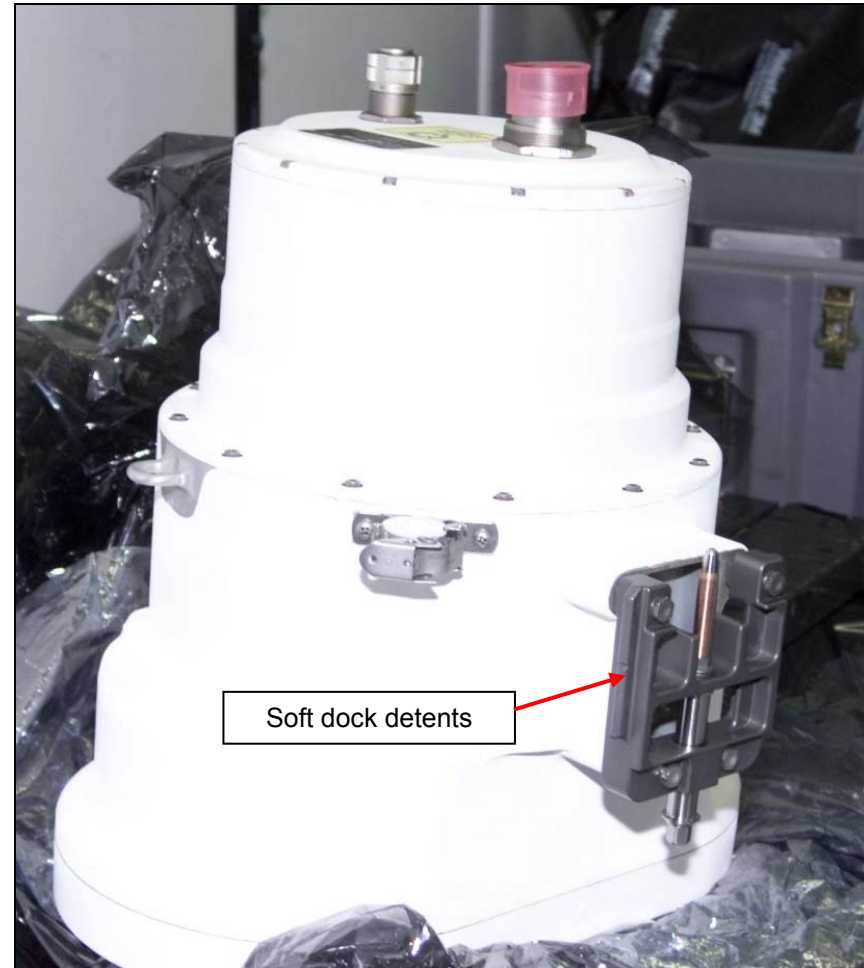


Notes:

1. ETVCG light shoe has 2 detents for ball plunger soft docks

Cautions:

1. Avoid contact with ETVCG Light cover glass. Reflective coating may be damaged. Contact with other surfaces of the ETVCG Light should be minimized to avoid damaging thermal coating
2. Avoid contact with silver teflon covering on ETVCG camera



ATA CUE CARD

BLOCK A – REMOVE 1/2" SPD

1. Pull up on Lock Knob
2. Slide slider aft from bail handle

BLOCK B – CLOSE VALVE

1. ✓ Detent button fully installed
2. ✓ Aft white band visible
3. ✓ Detent button can be depressed
4. Push bail toward open position with significant force (unstick male sleeve seal)
5. Counteract side loads
6. Press detent button, move bail aft (close valve)
7. ✓ Fwd white band visible; ✓ detent button up
8. ✓ For NH3 crystals on valve ext

BLOCK C – DEMATE QD

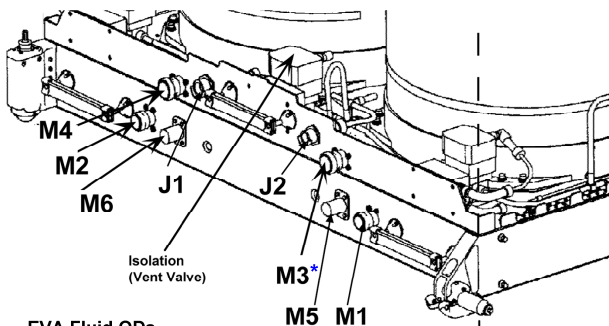
1. ✓ Detent button – up
2. Counteract side loads
3. Pull back on release ring
4. Demate QD
5. ✓ Fwd white band not visible (✓ release ring – retracted)



1/2" SPD

TOP

HOOK
VELCRO



EVA Fluid QDs

Line Name	From	To	Clamps (#)	QD Size	Function
F50/M3* (Zenith)	PM	ATA M3	1	1/2"	NH3 out
F1/M1 (Zenith)	NTA M2	ATA M1	1	1/4"	N2 pressure
F51/M4 (Nadir)	Vent	ATA M4	1	1/2"	NH3 out
F2/M2 (Nadir)	NTA M3	ATA M2	1	1/4"	N2 pressure

* Spool positioning device installation

BLOCK D – MATE QD

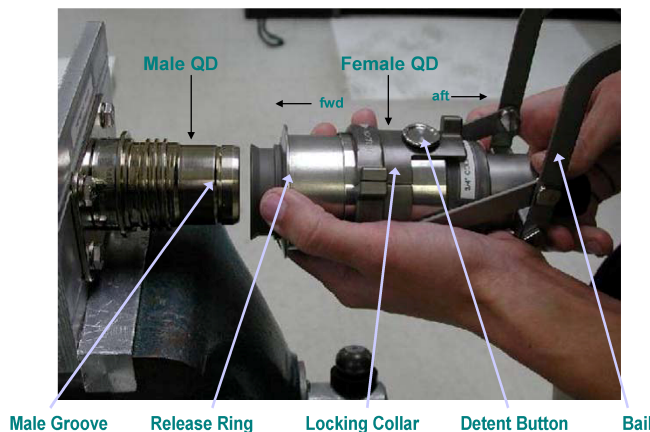
1. Inspect QDs for FOD or damage
2. ✓ Detent button – up
3. ✓ Fwd white band – not visible
4. Counteract side loads
5. Mate QD
6. ✓ Fwd white band – visible
7. Snapback test (✓ Fwd white band still visible)
8. Pull test
9. Visual gap test

BLOCK E – OPEN VALVE

1. Counteract side loads
2. Press detent button – down, move bail fwd
3. ✓ Aft white band visible; ✓ detent button – up
4. Verify detent button can be depressed
5. If M4, rotate locking collar to locked position

BLOCK F – 1/2" SPD INSTALL

- NOTE:** Do not fully close QD
1. Depress button and pull bail aft until aft white line no longer visible
 2. Check SPD slider full aft
 3. Install 1/2" SPD
 - Slide slider fwd to capture bail handle
 - Push lock knob down
 - Perform tug test



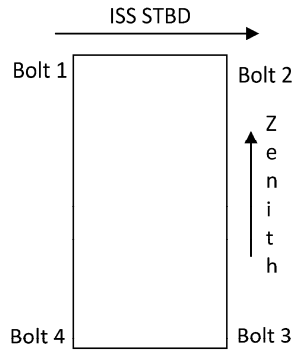
EVA-7a/131/O/B

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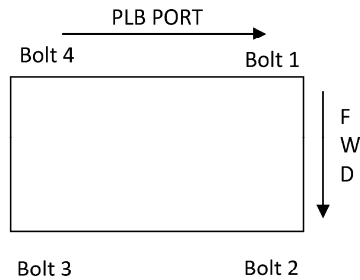
TOP
BACK OF 'ATA CUE CARD'

HOOK
VELCRO

ATA Orientation on S1



ATA Orientation on LMC



Bolt Features

	Bolt 1	Bolts 2 & 4	Bolt 3 (Install w/TM)
Release			
LMC (EVA 1)	[B6, CCW2, 30.5] (24.0 ft-lb, 30 RPM) 6-in ext; 16 turns	[B6, CCW2, 30.5] (24.0 ft-lb, 30 RPM) 6-in ext; 16 turns	[B6, CCW2, 30.5] (24.0 ft-lb, 30 RPM) 6-in ext; 14 turns
S1 (EVA 2)	[B6, CCW2, 30.5] (24.0 ft-lb, 30 RPM) 6-in ext; 16 turns	[B6, CCW2, 30.5] (24.0 ft-lb, 30 RPM) 6-in ext; 16 turns	[B4, CCW2, 30.5] (19.4 ft-lb, 30 RPM) 6-in ext; 14 turns
Install			
LMC (EVA 3)	[A7, CW2, 30.5] (9.2 ft-lb, 30 RPM) 6-in ext; 16 turns	[A7, CW2, 30.5] (9.2 ft-lb, 30 RPM) 6-in ext; 16 turns	[A7, CW2, 30.5] (9.2 ft-lb, 30 RPM) TM; 14 turns
S1 (EVA 2)	[A7, CW2, 30.5] (9.2 ft-lb, 30 RPM) 6-in ext; 16 turns	[A7, CW2, 30.5] (9.2 ft-lb, 30 RPM) 6-in ext; 16 turns	[B1, CW2, 30.5] (12.0 ft-lb, 30 RPM) TM; 14 turns
Visual Indicators			
Release	2 White Stripes	2 White Stripes	Popped Up
Install	0 White Stripes	0 White Stripes	Bolt Flush w/Microconical
Soft Dock	None	2 Spring Plungers on ATA	2 Spring Plungers on Truss FSE
Anti-Rotation	2 Spring Plungers	2 Spring Plungers	None
Threads	Internal	Internal	External

EVA-7b/131/O/B

(reduced copy)

STS-131 GET-AHEAD INHIBIT PAD

P1 RBVM MLI Repair & P1 FHRC P-clamp Release

TRRJ

MCC-H EV crew working within 2 feet of P1 TRRJ rotation envelope
1. √DLA (1) – LOCKED at 0 deg

S1 FHRC P-clamp Release

TRRJ

MCC-H EV crew working within 2 feet of S1 TRRJ rotation envelope
1. √DLA (1) – LOCKED (0 deg preferred)

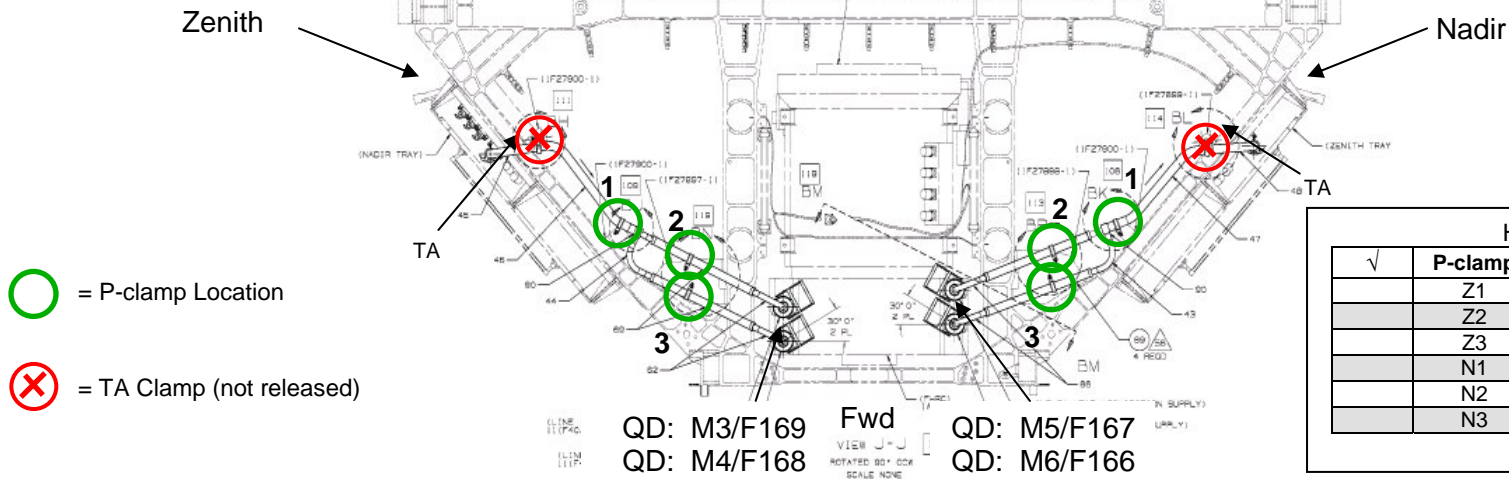
P1 FHRC P-CLAMP RELEASE (00:30) PER BAY

IV/SSRMS	EV
<p>1. √MCC-H: Port TRRJ locked</p>	<p>1. On IV GO: Retrieve ratchet wrench and translate to P1 FHRC Bay 12</p> <p>2. PGT [A7, CCW2, 30.5] (9.2 ft-lb, 30 RPM); 6-in ext</p> <p>3. Release Stinger P-clamps (5) [6th P-clamp requires 18-in ext] ~7-12.5 turns Do not release P-clamp on hardline P-clamps are not numbered Release 3 P-clamps closest to QD</p> <p>4. Egress Bay 12</p> <p>5. Verify SAFER config: <input type="checkbox"/> √R Handle down (HCM door – Closed) <input type="checkbox"/> √L Handle down (MAN ISO Valve – Open)</p> <p>6. Translate to Bay 14</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>Do not impart loads greater than 15 lb into FHRC Hose Box fluid lines</p> </div> <p>7. Release Hose Box P-clamps (6) ~6-12.5 turns</p>

P1 FHRC P-CLAMP RELEASE (00:30) PER BAY (Cont)

FHRC P-clamps – Hose Box (Outboard)

Aft

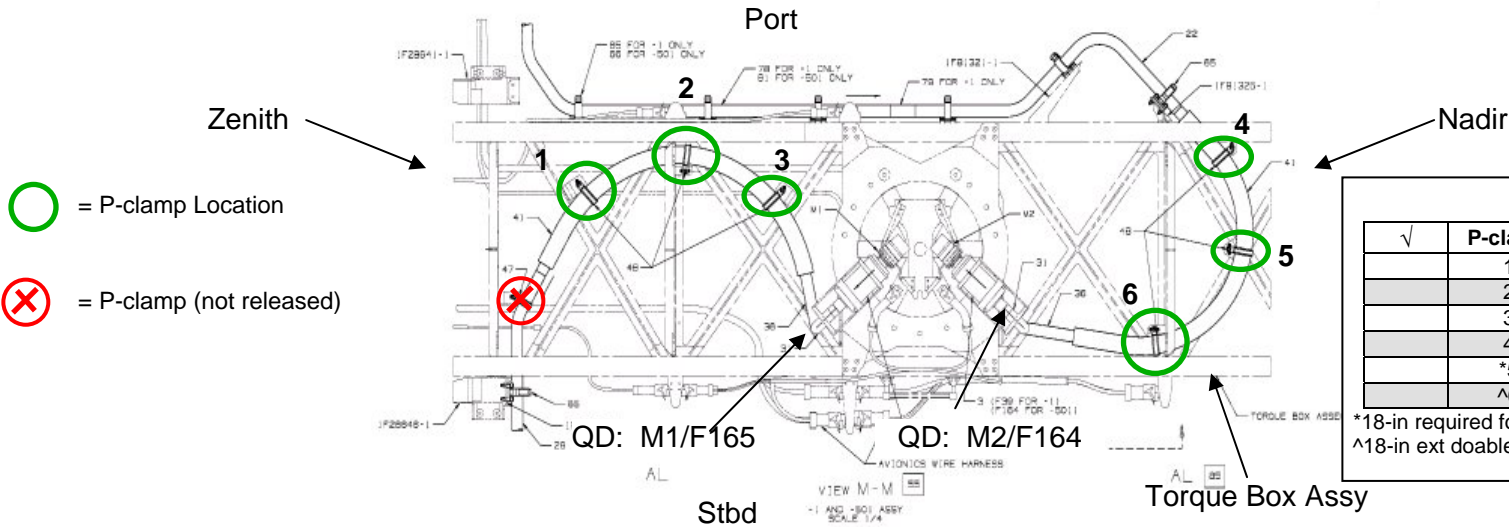


Hose Box			
√	P-clamp	Tool	Socket
	Z1	PGT	6-in ext
	Z2	Ratchet	2-in ext
	Z3	Ratchet	2-in ext
	N1	PGT	6-in ext
	N2	Ratchet	2-in ext
	N3	Ratchet	2-in ext

- = P-clamp Location
- ✗ = TA Clamp (not released)

FHRC P-clamps – Stinger (Inboard)

Port




Stinger			
√	P-clamp	Tool	Socket
	1	PGT	6 or 18-in ext
	2	PGT	12-in ext
	3	PGT	6 or 18-in ext
	4	PGT	6 or 18-in ext
	*5	PGT	18-in ext
	^6	PGT	6 or 18-in ext

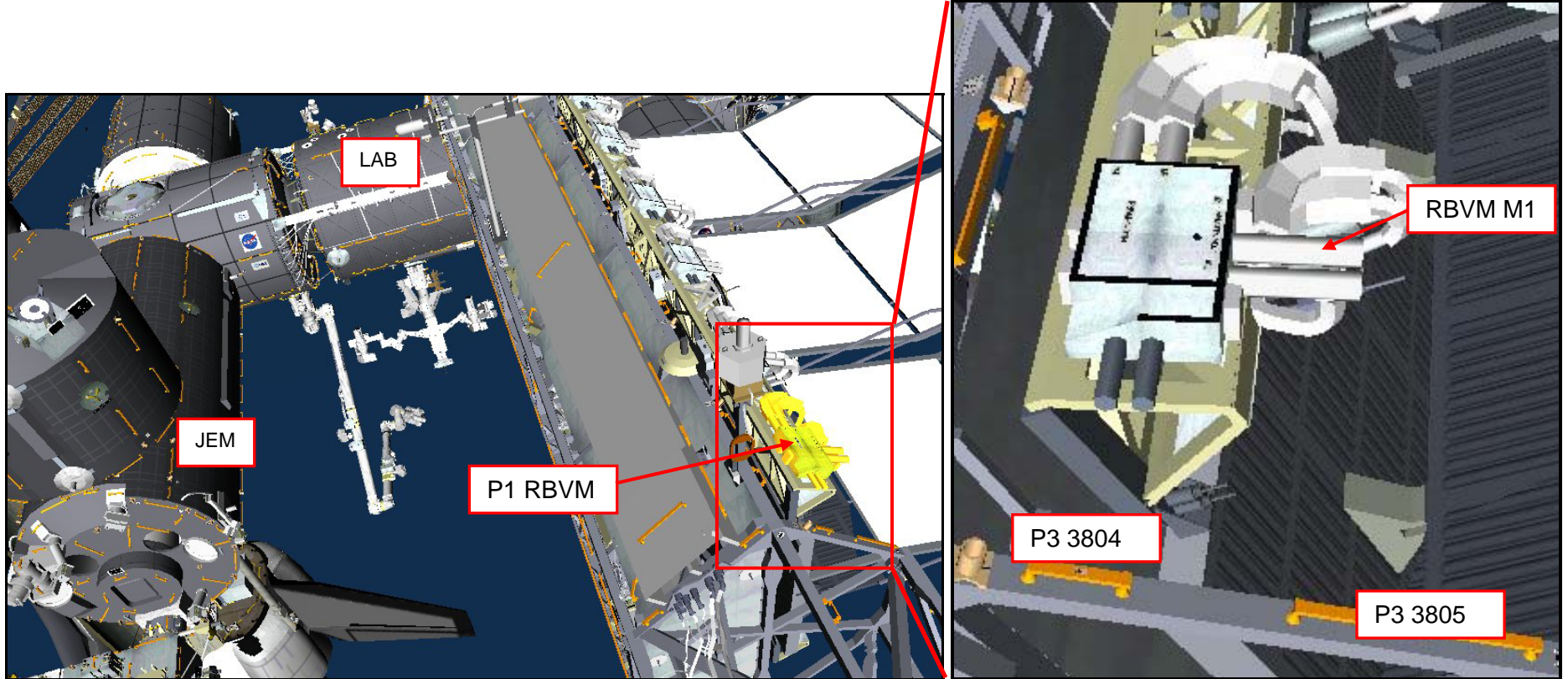
*18-in required for this bolt
^18-in ext doable w/difficulty

- = P-clamp Location
- ✗ = P-clamp (not released)

P1 RBVM MLI REPAIR (00:30)

IV/SSRMS	EV (FF)
<p>Verify MCC-H that P1 TRRJ is parked and locked</p>	<p><u>P1 RBVM MLI</u></p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>CAUTION</u></p> <p>Do not impart loads into radiator. If inadvertent kick load is applied anywhere along the radiator beam, wait 2 min to allow the response to dissipate</p> </div> <ol style="list-style-type: none"> 1. BRT to P3 HR3804 or 3805 2. Reinstall FQD MLI on M1/F151 3. Install wire tie around FQD MLI 4. Perform WVS survey of RBVM  5. Translate to A/L ST HR 3523 6. Perform tether swap to A/L 85-ft ST: <ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> √Gate closed (both hooks) <input type="checkbox"/> <input type="checkbox"/> √Hook locked (both hooks) <input type="checkbox"/> √Reel unlocked (A/L 85-ft ST) <input type="checkbox"/> Retrieve spare 85-ft ST; stow on MWS <input type="checkbox"/> √Reel unlocked (spare 85-ft ST)

P1 RBVM MLI REPAIR (00:30) (Cont)



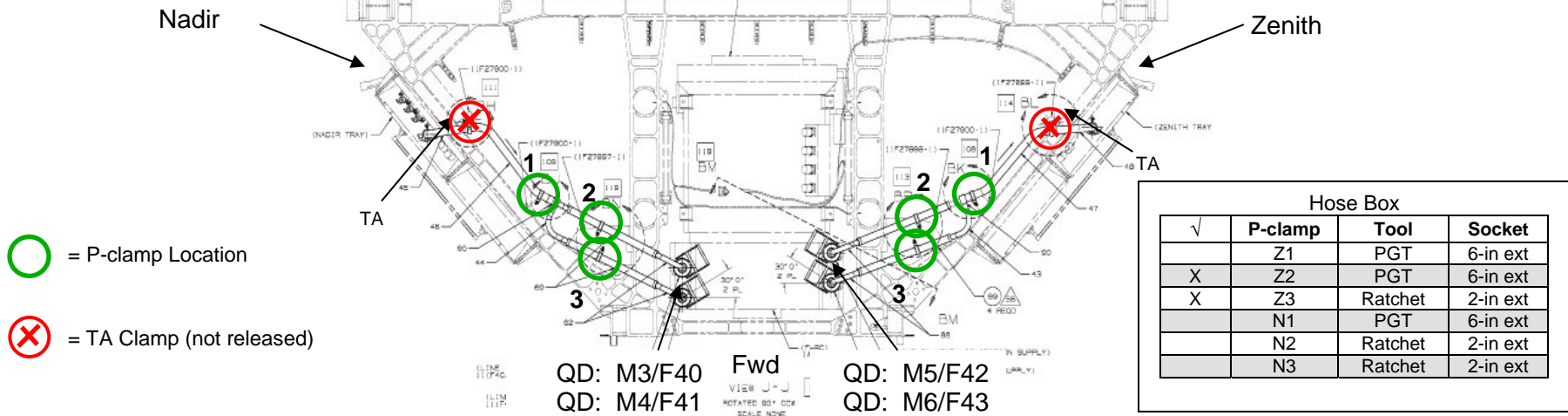
S1 FHRC P-CLAMP RELEASE (00:30) PER BAY

IV/SSRMS	EV
<p>1. <input checked="" type="checkbox"/> MCC-H: Stbd TRRJ locked</p>	<ol style="list-style-type: none"> 1. On IV GO: Retrieve ratchet wrench and translate to S1 FHRC Bay 11 2. PGT [A7, CCW2, 30.5] (9.2 ft-lb, 30 RPM); 6-in ext 3. Release Stinger P-clamps (5) [6th P-clamp requires 18 in ext] ~7-12.5 turns Do not release P-clamp on hardline P-clamps are not numbered Release 3 P-clamps closest to QD 4. Egress Bay 11 5. Verify SAFER config: <ul style="list-style-type: none"> <input type="checkbox"/> <input checked="" type="checkbox"/> R Handle down (HCM door – Closed) <input type="checkbox"/> <input checked="" type="checkbox"/> L Handle down (MAN ISO Valve – Open) 6. Translate to Bay 13 <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">CAUTION</p> <p style="text-align: center;">Do not impart loads greater than 15 lb into FHRC Hose Box fluid lines</p> </div> <ol style="list-style-type: none"> 7. Release Hose Box P-clamps (6) ~6-12.5 turns

S1 FHRC P-CLAMP RELEASE (00:30) PER BAY (Cont)

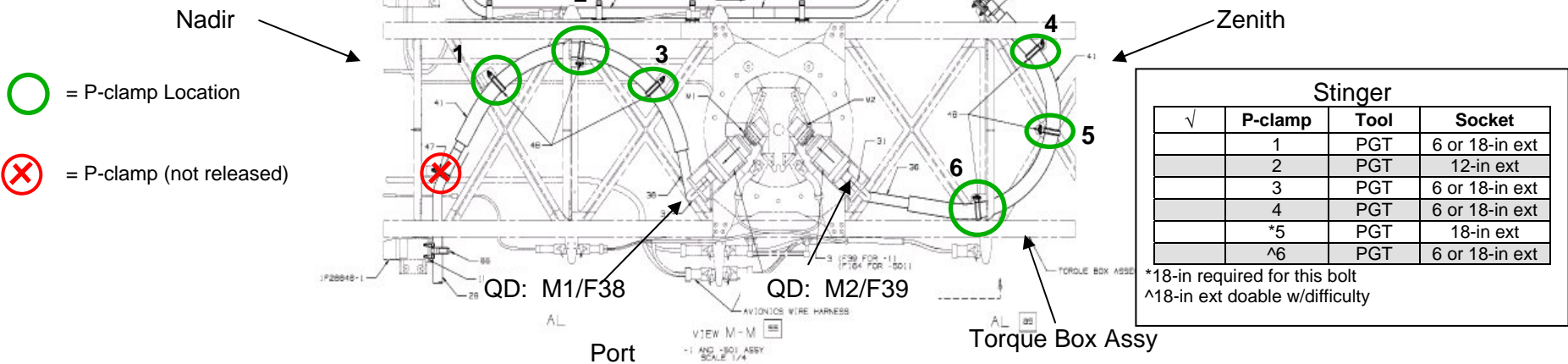
FHRC P-clamps – Hose Box (Outboard)

Aft



FHRC P-clamps – Stinger (Inboard)

Stbd



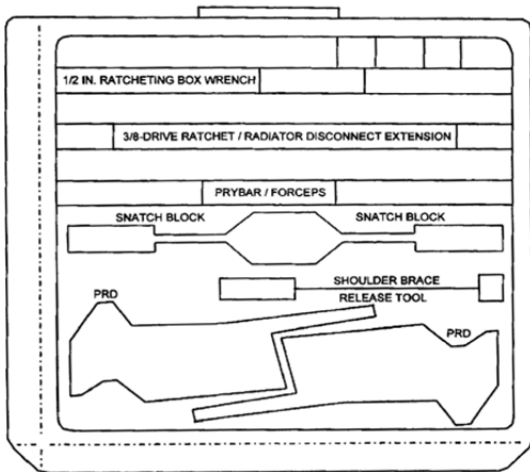
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TOOLS AND STOWAGE

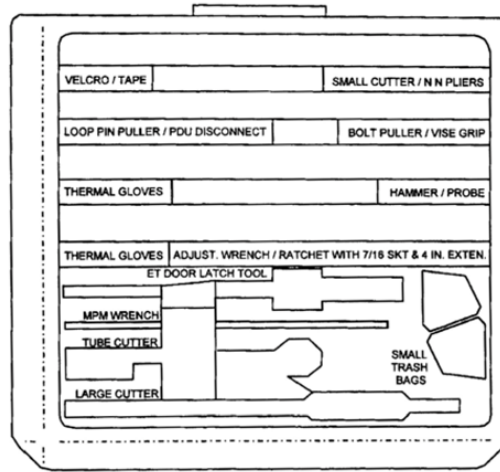
STARBOARD LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA).....	TEMP FS 8-2	
PGT CHECKOUT	8-3	
PGSC-PGT CONNECTION (A31P AND 760XD)	8-4	
PROGRAM PGT SETTINGS	8-5	
DOWNLOAD/ERASE EVENT LOG	8-5	
PGT CONTINGENCIES.....	8-6	
PGT STANDARD SETTINGS.....	8-7	
APFR MANAGEMENT – STS-131 (19A).....	FS 8-9	
TOOLBOX STOWAGE – STS-131 (19A)	FS 8-10	
TOOLBOX PANEL AND SLOT LABELS	FS 8-11	
Z1 TOOLBOX INTERNAL LAYOUT	FS 8-12	
AIRLOCK TOOLBOX INTERNAL LAYOUT.....	FS 8-13	
FLUID QD BAG LAYOUT	FS 8-14	
CREW TETHER INSPECTIONS	FS 8-16	
CLPA IVA UNPACKING	FS 8-23	

TOOLS AND
STOWAGE

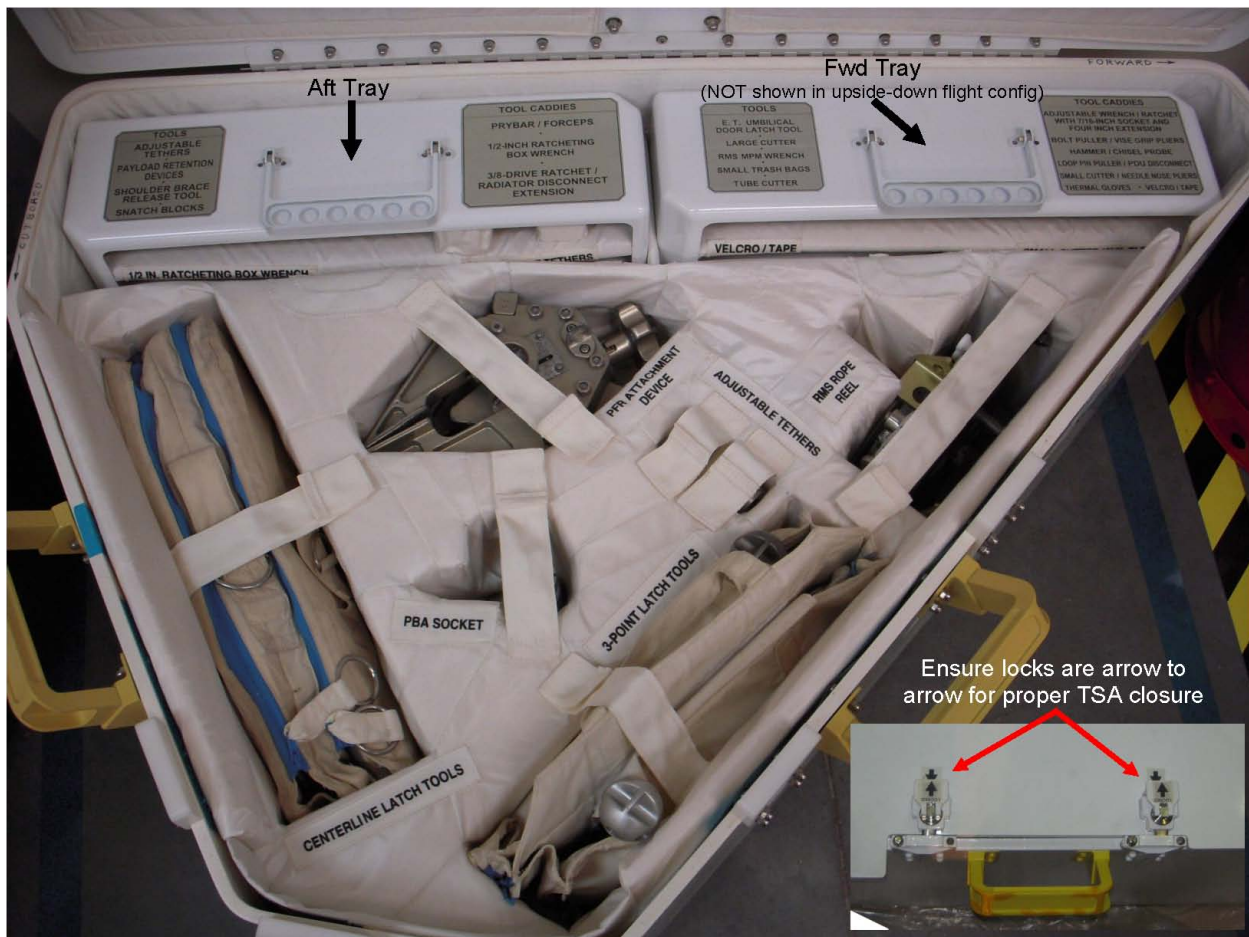
STARBOARD LIGHTWEIGHT TOOL STORAGE ASSEMBLY (TSA)



Aft Tray Layout and Labels

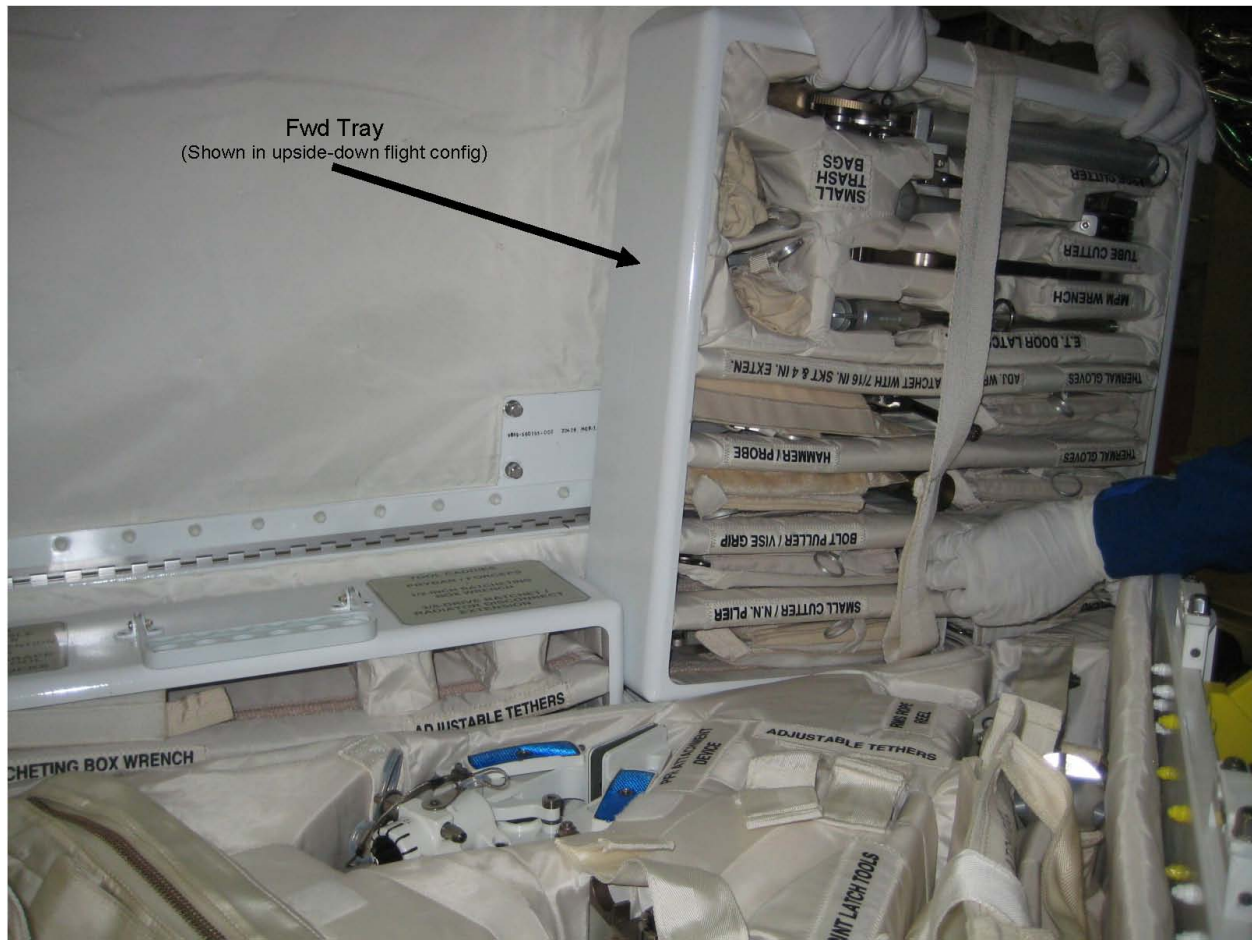


Forward Tray Layout and Labels
(installed upside down)



TOOLS AND STOWAGE

STARBOARD LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA) (Cont)



Forward Tray Flight Configuration (installed upside down, as shown)

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APFR MANAGEMENT – STS-131 (19A)

1

APFR DESIGNATOR	APFR 1 s/n 1004 (8A, 13A.1 Pitch knob problem)	APFR 2 s/n 1006 (US EVA 9 Pitch knob problem, 10A sticky locking collar)	APFR 3 s/n 1005 (no pitch knob prob 9A-inc12 suspected sharp edge on locking collar and possible sticky locking collar)	APFR 4 s/n 1002 (Heat shield)	APFR 5 s/n 1003 (Heat shield removed on ULF-3)	APFR 6 s/n 1007 (Heat shield removed on 12A.1 stage)	APFR 7 s/n 1008	IAPFR 1	IAPFR 2	OTSD	WIF Extender
Post STS-130	P6 WIF 22 [12,QQ,C,1] Yaw & Roll Settings are Approximate	P1 WIF 3 [6,PP,F,11] TS	Stbd A/L Tool Box [9,RR,F,12] Ingress Aid	Z1 WIF 10 [3,LL,B,6] TS	A/L WIF 9 [12,PP,F,12]	Stbd CETA cart WIF 1 [6,OO,E,6] Ingress Aid	P6 WIF 10 [12,GG,E,6] Ingress Aid	Z1 WIF 5 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	S0 WIF 7 CL=7	ESP-2 WIF 3 [3,A,1]
Post EVA 1	P6 WIF 17 [12,QQ,F,12]	P1 WIF 3 [6,PP,F,11] TS	Stbd A/L Tool Box [9,RR,F,12] Ingress Aid	Z1 WIF 10 [3,LL,B,6] TS	A/L WIF 9 [12,PP,F,12]	NODE 2 WIF 7 Crew Choice Ingress Aid	P6 WIF 12 [6,NN,F,6] Ingress Aid	Z1 WIF 5 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	S0 WIF 7 CL=7	ESP-2 WIF 3 [3,A,1]
Post EVA 2	P6 WIF 17 [12,QQ,F,12]	P1 WIF 3 [6,PP,F,11] TS	Stbd CETA Cart WIF 2 [8,RR,E,6] Ingress Aid	Z1 WIF 10 [3,LL,B,6] TS	Stbd CETA Cart WIF 1 [6,OO,E,6]	NODE 2 WIF 7 Crew Choice Ingress Aid	P6 WIF 12 [6,NN,F,6] Ingress Aid	Z1 WIF 5 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	S0 WIF 7 CL=7	ESP-2 WIF 3 [3,A,1]
Post EVA 3	P6 WIF 17 [12,QQ,F,12]	P1 WIF 3 [6,PP,F,11] TS	Stbd CETA Cart WIF 2 [8,RR,E,6] Ingress Aid	Z1 WIF 10 [3,LL,B,6] TS	Stbd CETA Cart WIF 1 [6,OO,E,6]	NODE 2 WIF 7 [12,NN,F,6] Ingress Aid	P6 WIF 12 [6,NN,F,6] Ingress Aid	Z1 WIF 5 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	S0 WIF 7 CL=7	MBS WIF 12 [2,A,1]

CRANE (old ORU tether)	ORU Stanchion/ TERA Headless	APFR 2 Tool Stanchion	APFR 4 Tool Stanchion	Tool Stanchion
PMA1 WIF 5	S0 port wedge face	Hex pointed ISS zenith, tool head pointed ISS stbd, and oriented ISS Zenith/Nadir	Tool stanchion aft pointed zenith	S0 port wedge face

TOOLBOX STOWAGE – STS-131 (19A)

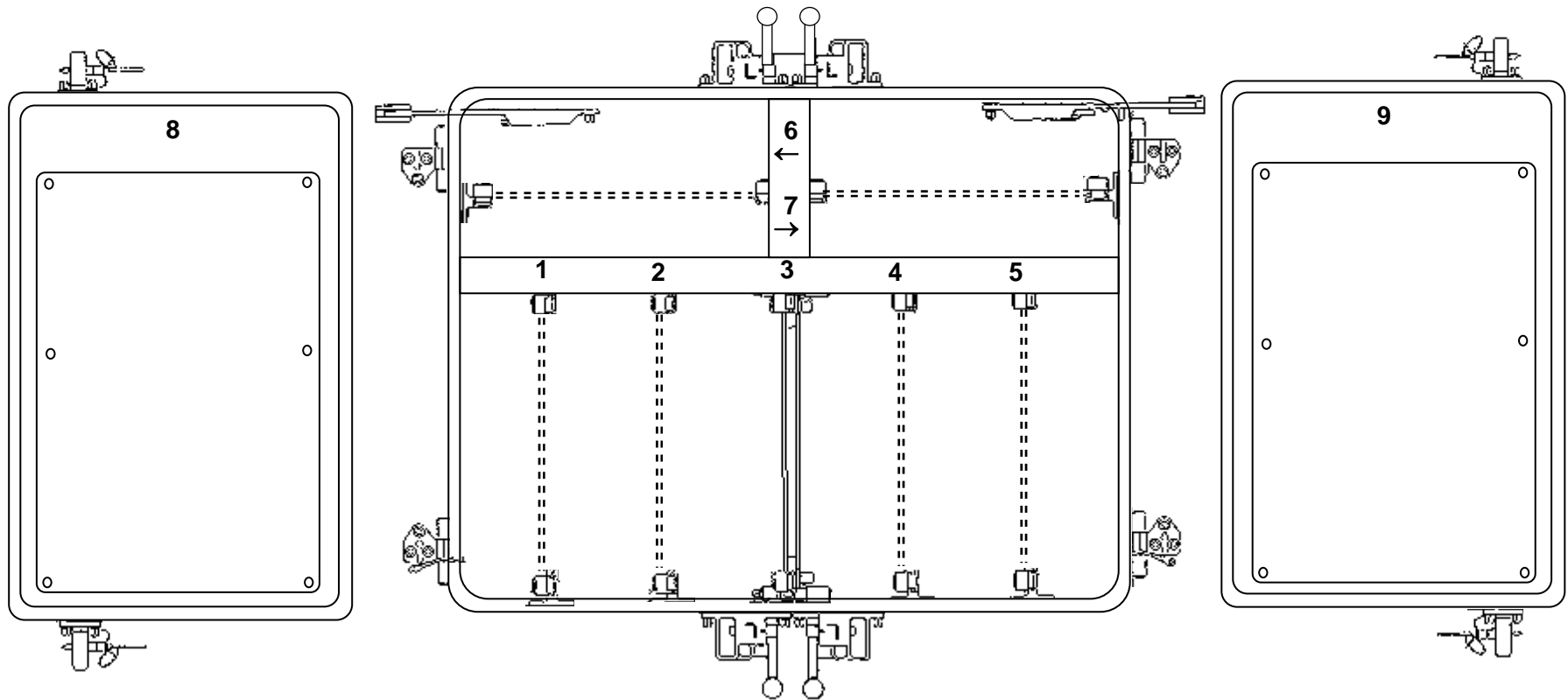
I

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

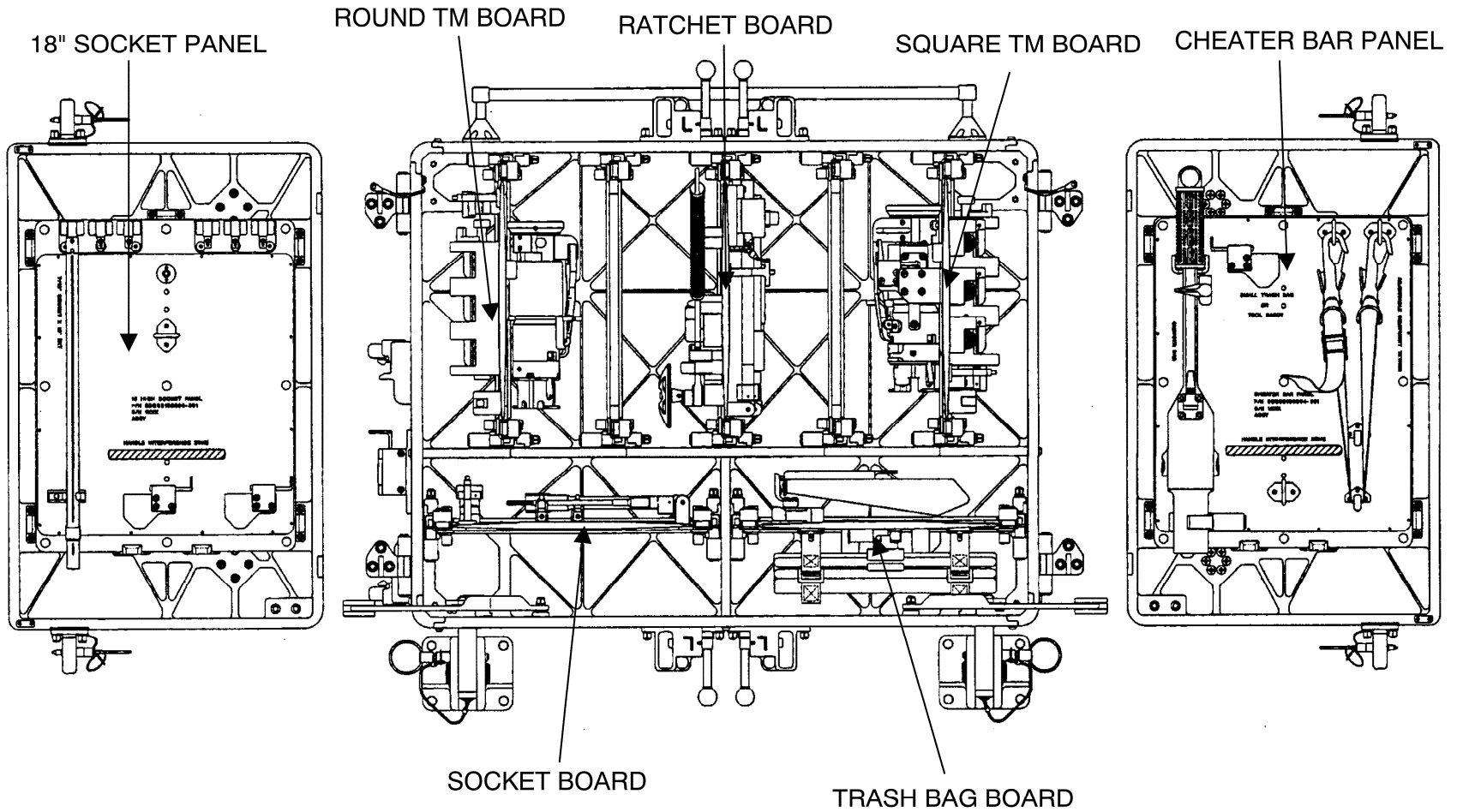
TOOLBOX PANEL AND SLOT LABELS

NOTE

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

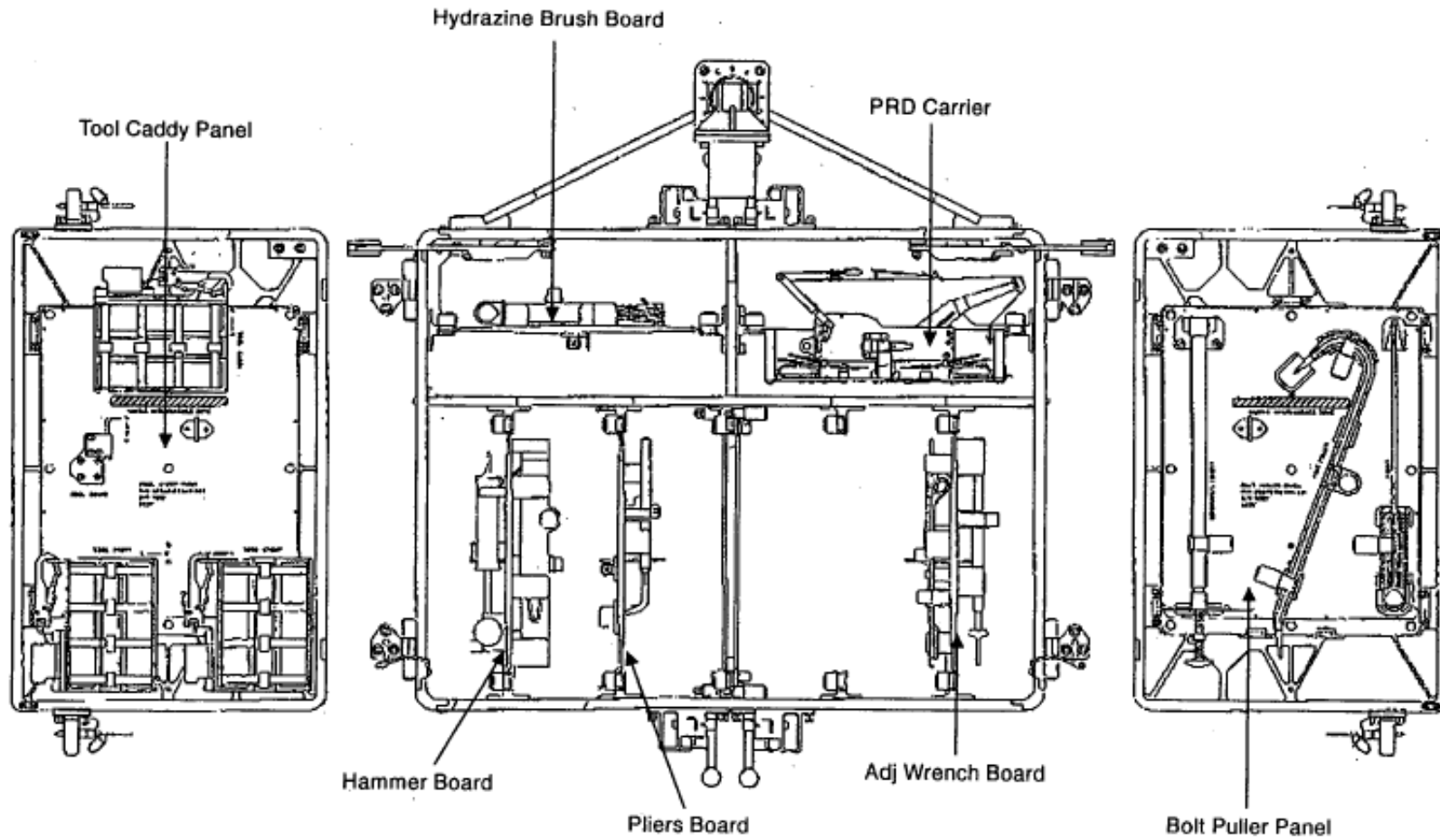


Z1 TOOLBOX INTERNAL LAYOUT



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

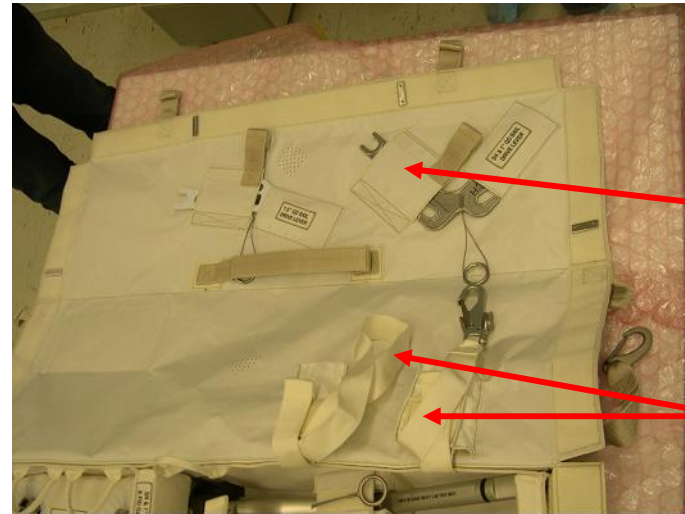
AIRLOCK TOOLBOX INTERNAL LAYOUT



FLUID QD BAG LAYOUT

QD TOOL BAG #1 (SEG33114667-301/1001)			
#	TOOL	PART#/SERIAL #	LOCATION IN BAG
1.	1/4" CAP TOOL	GD2043725/TBD	<input type="checkbox"/> 1/4" CAP TOOL POCKET
2.	1/2" CAP TOOL	GD2043730/TBD	<input type="checkbox"/> 1/2" CAP TOOL POCKET
3.	1" CAP TOOL	GD2043325/TBD	<input type="checkbox"/> 1" CAP TOOL POCKET
4.	3/4" & 1' QD BAIL DRIVE LEVER	SDG33113838-703/TBD	<input type="checkbox"/> 3/4" & 1' QD BAIL DRIVE LEVER POUCH ON LID
5.	1.5" QD BAIL DRIVE LEVER	SDG33113837-701/TBD	<input type="checkbox"/> 1.5" QD BAIL DRIVE LEVER POUCH ON LID
6.	1.5" NH3/N2 VENT TOOL – F	1F9859-1/01	<input type="checkbox"/> 1.5" NH3/N2 VENT TOOL – F POCKET
7.	1" H20/N2 VENT TOOL – F	1F98593-1/01	<input type="checkbox"/> 1" H20/N2 VENT TOOL – F POCKET
8.	3/4" NH3/N2 VENT TOOL – F	1F98597-1/01	<input type="checkbox"/> 3/4" NH3/N2 VENT TOOL – F POCKET
9.	1" NH3/N2 VENT TOOL – F	1F98589-1/TBD	<input type="checkbox"/> 1" NH3/N2 VENT TOOL – F POCKET
10.	1" NH3/N2 VENT TOOL – M	1F98596-1/01	<input type="checkbox"/> 1" NH3/N2 VENT TOOL – M POCKET
11.	1/4" NH3/N2 VENT TOOL – F	1F98592-1/01	<input type="checkbox"/> 1/4" NH3/N2 VENT TOOL – F POCKET
12.	1.5" QRT & FID GAUGE	SEG33114617-701/TBD	<input type="checkbox"/> 1.5" QRT & FID GAUGE POCKET
13.	3/4" & 1" QRT & FID GAUGE	SEG33114616-701/TBD	<input type="checkbox"/> 3/4" & 1" QRT & FID GAUGE POCKET

- Ensure cap tools (3) are friction fitted
- Close all QRT tool flaps (2)
- Close all vent tool flaps (6)



- Close bail drive lever flaps (2)
- Internal bag straps (2) should be stowed in pouches

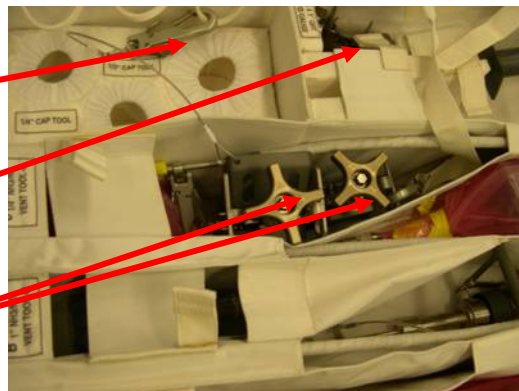
FLUID QD BAG LAYOUT (Cont)

QD TOOL BAG #2 (SEG33114667-301/1002)			
#	TOOL	PART #/SERIAL #	LOCATION IN BAG
1.	1/4" CAP TOOL	GD2043725/TBD	<input type="checkbox"/> 1/4" CAP TOOL POCKET
2.	1/2" CAP TOOL	GD2043730/TBD	<input type="checkbox"/> 1/2" CAP TOOL POCKET
3.	1" CAP TOOL	GD2043325/TBD	<input type="checkbox"/> 1" CAP TOOL POCKET
4.	1.5" NH3/N2 VENT TOOL – F	1F9859-1/02	<input type="checkbox"/> 1.5" NH3/N2 VENT TOOL – F POCKET
5.	1" H2O/N2 VENT TOOL – F	1F98593-1/02	<input type="checkbox"/> STILL IN RAT'S NEST (EXTERNAL FROM 5A)
6.	3/4" NH3/N2 VENT TOOL – F	1F98597-1/02	<input type="checkbox"/> 3/4" NH3/N2 VENT TOOL – F POCKET
7.	1" NH3/N2 VENT TOOL – F	1F98589-1/TBD	<input type="checkbox"/> 1" NH3/N2 VENT TOOL – F POCKET
8.	1" NH3/N2 VENT TOOL – M	1F98596-1/TBD	<input type="checkbox"/> 1" NH3/N2 VENT TOOL – M POCKET
9.	1/4" NH3/N2 VENT TOOL – F	1F98592-1/02	<input type="checkbox"/> 1/4" NH3/N2 VENT TOOL – F POCKET
10.	1/4" BDT	SEG33114984-301/001	<input type="checkbox"/> STOWED ON TOP OF 1/4" VENT TOOL <input type="checkbox"/> MUST BE TETHERED TO INSIDE OF BAG USING 1 ADJ
11.	3/4" BDT	SEG33114986-301/001	<input type="checkbox"/> STOWED ON TOP OF 1/4" VENT TOOL, TETHERS TO BAG INTERNAL LOOPS USING BDT INTEGRAL TETHER
12.	3/4" AKT	SEG33114983-301/1001	<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
13.	VENT TOOL ADAPTERS (2)		<input type="checkbox"/> ONE VTA IN THE 3/4" & 1" QRT & FID GAUGE POUCH; THE OTHER 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

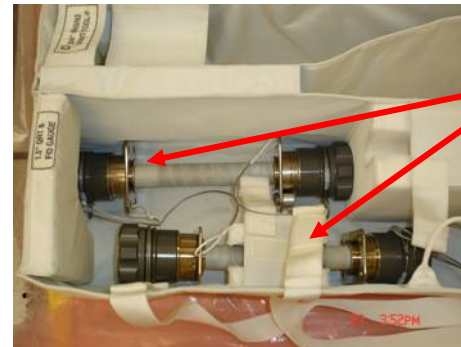
3/4" BDT is tethered to internal bag loop using integral tool tether

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



BDT AND AKT STOWAGE



VENT TOOL ADAPTER STOWAGE

Vent Tool Adapters (2) are stowed in QRT/FID gauge pockets and need adj tethers

CREW TETHER INSPECTIONS

OBJECTIVE:

Inspect Load Alleviating Strap (LAS) on Safety Tethers, Waist Tethers and soft strap on D-Ring extenders. Prior to each set of EVAs (shuttle or ISS), all on-board tethers are to be inspected. Between each EVA, only those tethers used during the previous EVA require inspection.

DURATION:

1 hour 30 minutes (Parts 1 and 2 on six waist tethers, six D-Ring extenders, and eight safety tethers)

Additional 30 minutes required to perform Part 3 on two tethers.

NOTE

Standard tool config prep times only protect for performing Part 1 between EVAs on tethers used during the previous EVA.

ITEMS REQUIRED (PART 2 OR 3):

MATERIALS:

Sharpie

Ziplock Bag

TOOLS:

Camera

IS IVA Toolbox:

Drawer 5:

Tape Measure

Tape Pantry

EVA Tape (1" Permacel Glass Cloth Tape) P/N P-213

PART 1: PRIOR TO EACH EVA

1. Prior to EVA use, soft goods on each safety tether (LAS), waist tether (LAS) and D-Ring extender (strap) for that EVA must be inspected.

1.1 MMOD Inspection

Inspect the soft goods (LAS) of the Waist Tether and ERCM/Safety Tether and soft strap of the D-Ring extender for MMOD damage and discoloration, manipulating the sheath as needed to inspect between folds. The damage may appear as small or large holes in the LAS or as a tear/rip in the sheath. The MMOD damage may also appear in small concentrated areas of excessive fraying (as would be expected to be found in the vicinity of a hole). Soft goods should be white to yellow or tan in appearance. Soft goods showing a burnt brown or black discoloration should not be used. Refer to Figures 1, 2, 3.

CREW TETHER INSPECTIONS (Cont)

1.2 D-Ring Extender

Inspect the soft strap of the D-Ring extender for MMOD damage, excessive wear and fraying.
Refer to Figures 1, 2, 3.

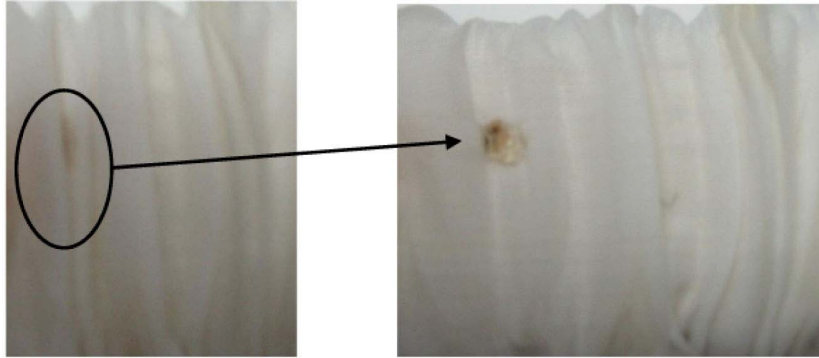


Figure 1. Damage Masked by Folds in LAS Sheath Exposed When Unbunched. (Note: Photo of ground-created damage.)

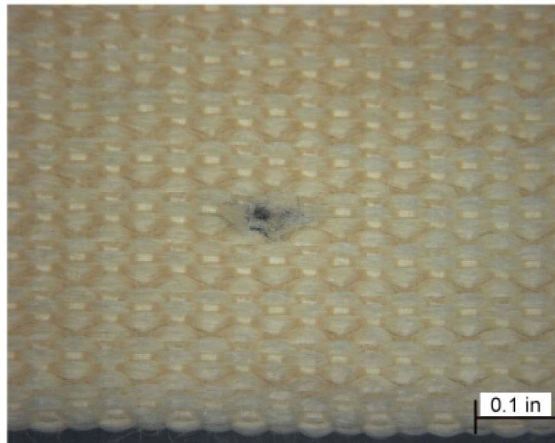


Figure 2. Picture Showing MMOD Damage Found in Flight AET.



Figure 3. Frayed D-Ring Extender; No-GO for Use.

1.3 LAS Base Inspection

Inspect base of LAS where strap attaches to ERCM D-Ring for any damage.
Refer to Figure 4.

1.3.1 Smudging is acceptable.

CREW TETHER INSPECTIONS (Cont)

- 1.3.2 If safety tether anchor hook is taped, inspect tape for wear or damage.



Figure 4. LAS Attachment to ERCM D-Ring.

1.4 Tack Stitching Inspection

Verify two surface and two through tack stitches still present on each LAS (waist tether and safety tether).

- 1.4.1 Verify through stitches still intact by gently moving sheath away from hook to expose threads through Nomex. Refer to Figures 5 and 6. Once verified, gently replace sheath over red indicator.

- 1.4.2 Visually verify surface stitches on nonseam side of tether

1.5 Red Indicator Inspection

If red showing and all tack stitches present

- 1.5.1 Gently pull the sheath back to cover red indicator. Due to tolerances, some red may still show (tether is GO as long as tack stitching still present.)
- 1.5.2 Note width of any remaining red showing.
- 1.5.3 Report S/N of any tethers with red still showing to **MCC-H**.

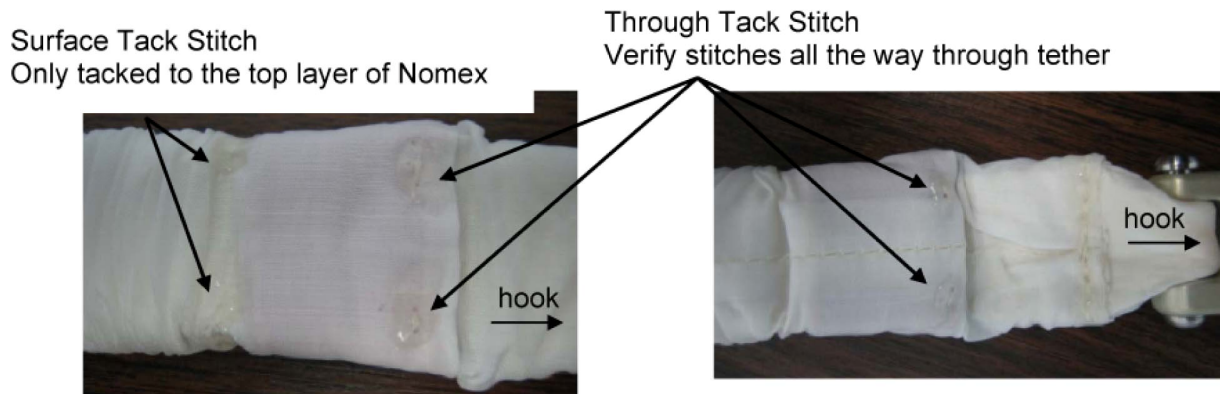


Figure 5. Top View (Non-Seam Side) and Bottom View (Seam Side).

CREW TETHER INSPECTIONS (Cont)

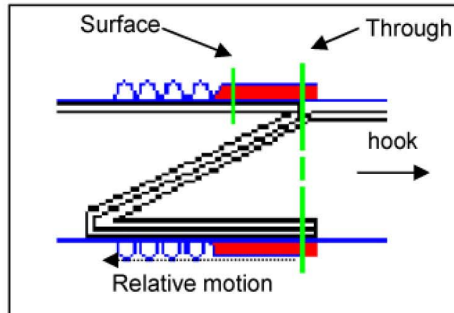


Figure 6. Cross-Section of Tack Stitching.

2. Report serial numbers to **MCC-H** with inspection results.
3. For any tethers with MMOD/other damage, fraying or missing tack stitching, proceed to Part 2.
4. Restow remaining tethers.

PART 2: MMOD DAMAGE/MISSING TACK STITCHING EVALUATION

5. Retrieve Camera and Ziplock Bag(s).
6. If MMOD damage is found on LAS
 - 6.1 Smooth out the sheath at the damage location and take detailed photos of damage (with serial number in photo if possible). Refer to Figures 7 and 8. Note if any damage to the underlying Nomex strap is visible.
 - 6.2 Remove tether from usable inventory. Place tether in Ziplock Bag labeled, "No-GO for use". Report location and S/N to **MCC-H**.
 - 6.3 Report results to **MCC-H**.



Refer to Figure 8 for correct label location.

For Waist Tethers, ensure label says Waist Tether Assy.

Figure 7. Photo of Partial Red Indicator Showing with Serial Number.

CREW TETHER INSPECTIONS (Cont)

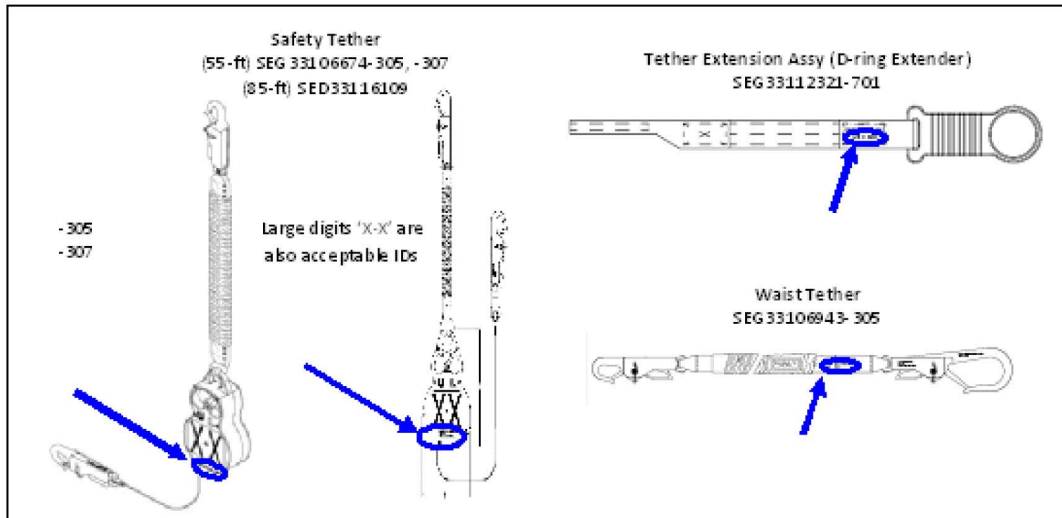


Figure 8. Serial Number References.

7. If tack stitches are broken
 - 7.1 Take detailed photos of tack stitches (with serial number in photo) for further engineering evaluation. Refer to Figure 7.
 - 7.2 Stow tethers per Table 1.

Table 1. Tether GO/No-GO Criteria

Broken Stitch	Action
One or both surface stitches broken	Gently smooth sheath away from hook so only a single layer covers the red indicator area. Return tether to usable inventory.
One through stitch broken, one through stitch intact and zero to two surface tack stitches intact	Return tether to usable inventory.
Two through stitches broken	Remove tether from usable inventory. Place tether in Ziplock Bag labeled "No-GO for use." Report location to MCC-H .

- 7.3 Report results to **MCC-H**.
8. If fraying or MMOD damage is found on D-Ring extender
 - 8.1 Take detailed photos of damage showing S/N of extender (if possible). Refer to Figure 9.
 - 8.2 Remove tether from usable inventory. Place tether in Ziplock Bag labeled "No-GO for use." Report location and S/N to **MCC-H**.

CREW TETHER INSPECTIONS (Cont)

- 8.3 Report results to **MCC-H**.



Figure 9. D-Ring Extender Showing Serial Number.

9. If damage found on LAS base
- 9.1 Take detailed photos of damage with at least one photo showing tether number.
 - 9.2 Swap tether for spare.
 - 9.3 Remove tether from usable inventory. Place tether in Ziplock Bag labeled "No-GO for use." Report location and S/N to **MCC-H**.
 - 9.4 If tape damaged/worn on anchor hook, take detailed photos. Replace tape as necessary using EVA tape.
 - 9.5 Report results to **MCC-H**.

PART 3: MEASURE LAS LENGTH (ON MCC-H GO)

- 10. Retrieve quarantined tethers, tape measure, Sharpie, and Camera.
- 11. Mark the desired length on a stable surface. Refer to Figures 10 and 11 for required lengths.
- 12. Measure quarantined tether against markings. Photograph results.
- 13. Report findings to **MCC-H**.
- 14. Stow tethers per **MCC-H** direction.

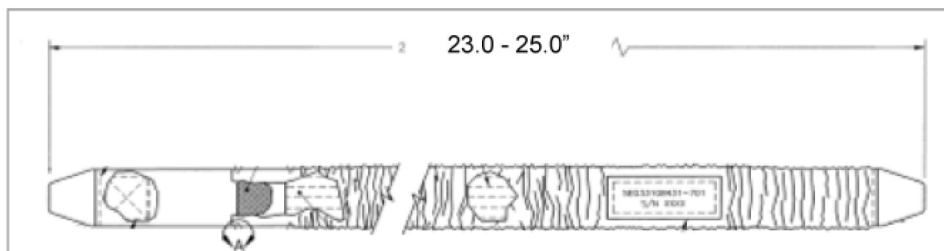


Figure 10. Waist Tether.

CREW TETHER INSPECTIONS (Cont)

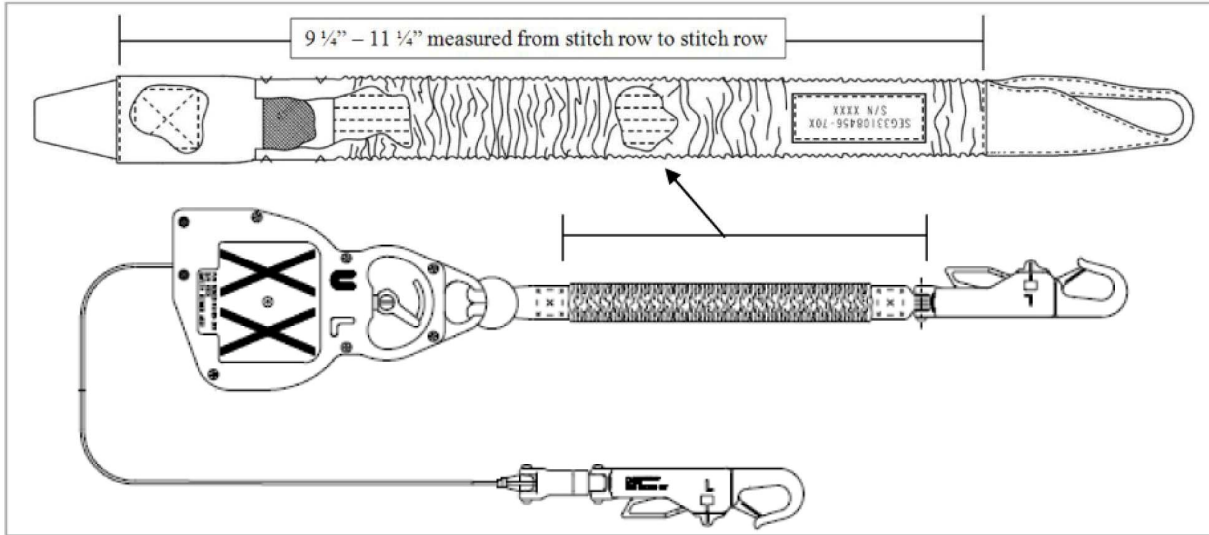


Figure 11. Safety Tether.

Table 2. Inspection Results

Tether Type	Tether S/N	Damage Description	Tether Location
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
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_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

CLPA IVA UNPACKING

I

CAUTION

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

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

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

1. Retrieve CLPA Protective Case from MPLM per transfer list
2. Release belts, pull-tabs, and beta cloth cover (in order); fold beta cloth cover on itself
3. Open two shells to expose mounted CLPA on base plate and ORU interface (figure 1)
4. Using a ratchet wrench w/7/16-in socket, drive EVA bolt ccw, ~22-23 turns
NOTE: Running torque should not exceed 75 in-lb (figure 2)
5. Verify EVA bolt driven out to hard stop
6. CLPA should slide freely from the base plate. It may be necessary to loosen four nuts on top of alignment guides (figure 3)
7. Visually verify blindmate connector cover removed
8. Install Sq scoop and place CLPA in ORU bag per tool config
9. Close shells on base. Secure Velcro straps, belts, and beta cloth cover
10. Stow CLPA Protective Case per transfer list

CLPA IVA UNPACKING (Cont)

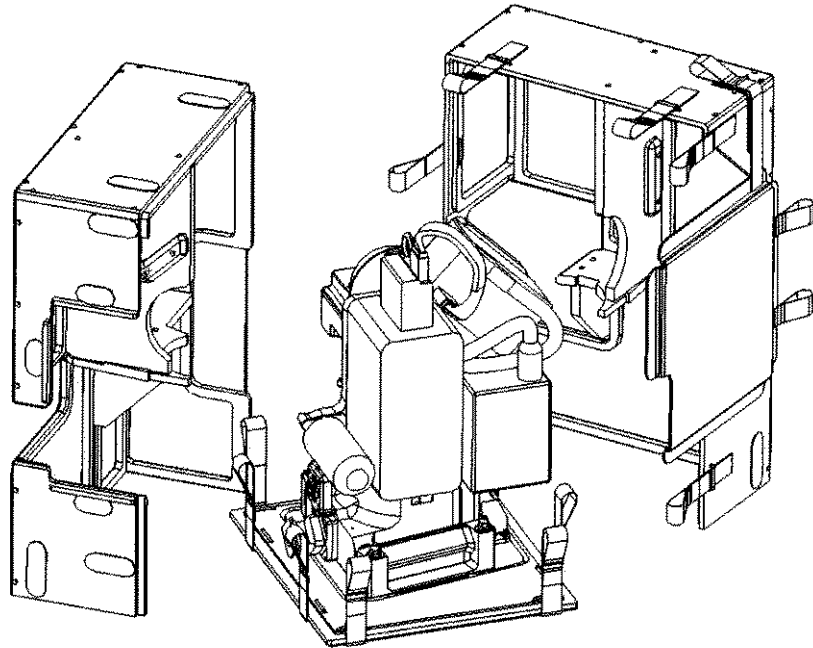


Figure 1

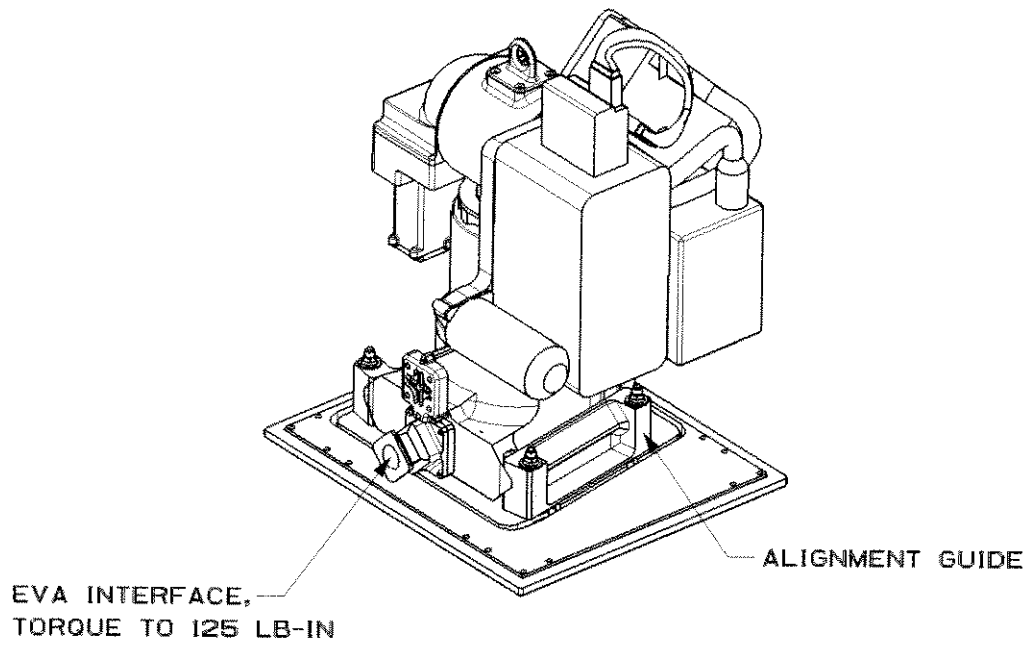


Figure 2

CLPA IVA UNPACKING (Cont)

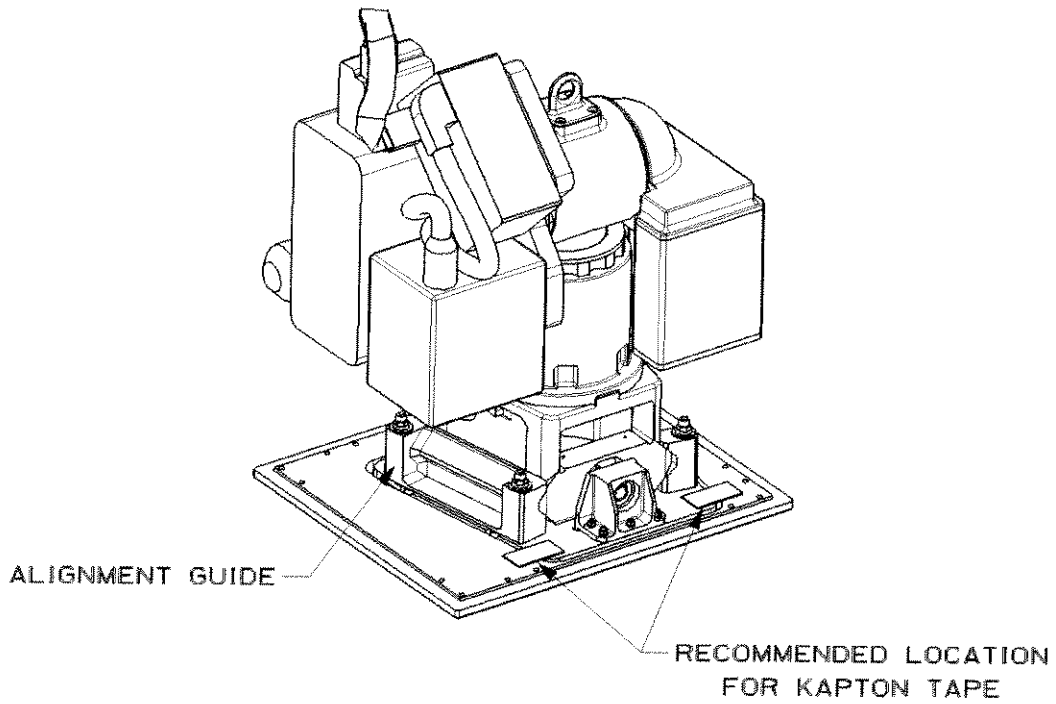


Figure 3

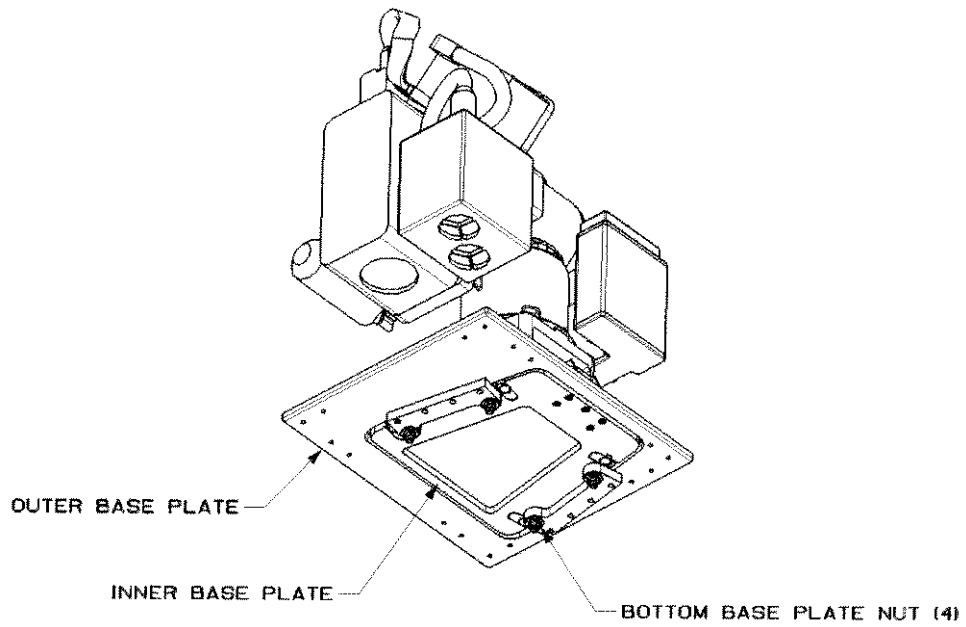


Figure 4

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EMU MAINT/RECHARGE

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

WATER RECHARGE

IF EMU NOT ALREADY POWERED UP:

EMU POWERUP

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

CAUTION

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

- AW18H 4. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR
 BUS SEL (two) – MNA(MNB)
- MD(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	

EMU MAINT/
 RECHARGE

Cont next page

TEMP FS 10-2

131

EVA/ALL/FIN A

TOP

**HOOK
VELCRO**

CONSUMABLES TRACKING CUE CARD

SAFER: s/n 1005 & 1006 (both w/modified latches)				EMU TV: ID old 18/new 19 (Mt) EV1 old 16/new 20 (Ad) EV2			Dump CWC s/n 1059	
PWR usage: 1005, 1025, 1007 in order until empty								
	EMU	LiOH (s/n)	METOX (s/n)	EMU Battery	REBA (s/n)	HL Battery (s/n)	PGT Battery (s/n)	PGT Battery Spare (s/n)
Camp			0005/0007					
EVA 1	EV1 – Mt EMU 3017	20____	N/A	2081	1006	1022/1025	1004	1006
	EV2 – Ad EMU 3008	20____	N/A	2082	1008	1026/1028	1005	
Post					Recharge	Recharge	Recharge	Recharge
Between				Recharge				
Camp			0011/0019					
EVA 2	EV1 – Mt EMU 3017	20____	N/A	2087	1006	1029/1030	1008	1006
	EV2 – Ad EMU 3008	20____	N/A	2088	1008	1031/1035	1009	
Post					Recharge	Recharge	Recharge	Recharge
Between								
Camp			0020/0022					
EVA 3	EV1 – Mt EMU 3017	20____	N/A	2081	1006	1022/1025	1004	1006
	EV2 – Ad EMU 3008	20____	N/A	2082	1008	1026/1028	1005	
Post								
Return	EV1 – Mt EMU 3017	20____		2081				
	EV2 – Ad EMU 3008	20____		2082				

STS Items: All LiOH (6), EMU Batt s/n 2081 & 2082
 Items from MPLM: EMU TV ID 19 & 20
 Items returning in MPLM: LiOH (3), EMU TV ID 16

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EVA-5a/131/O/B

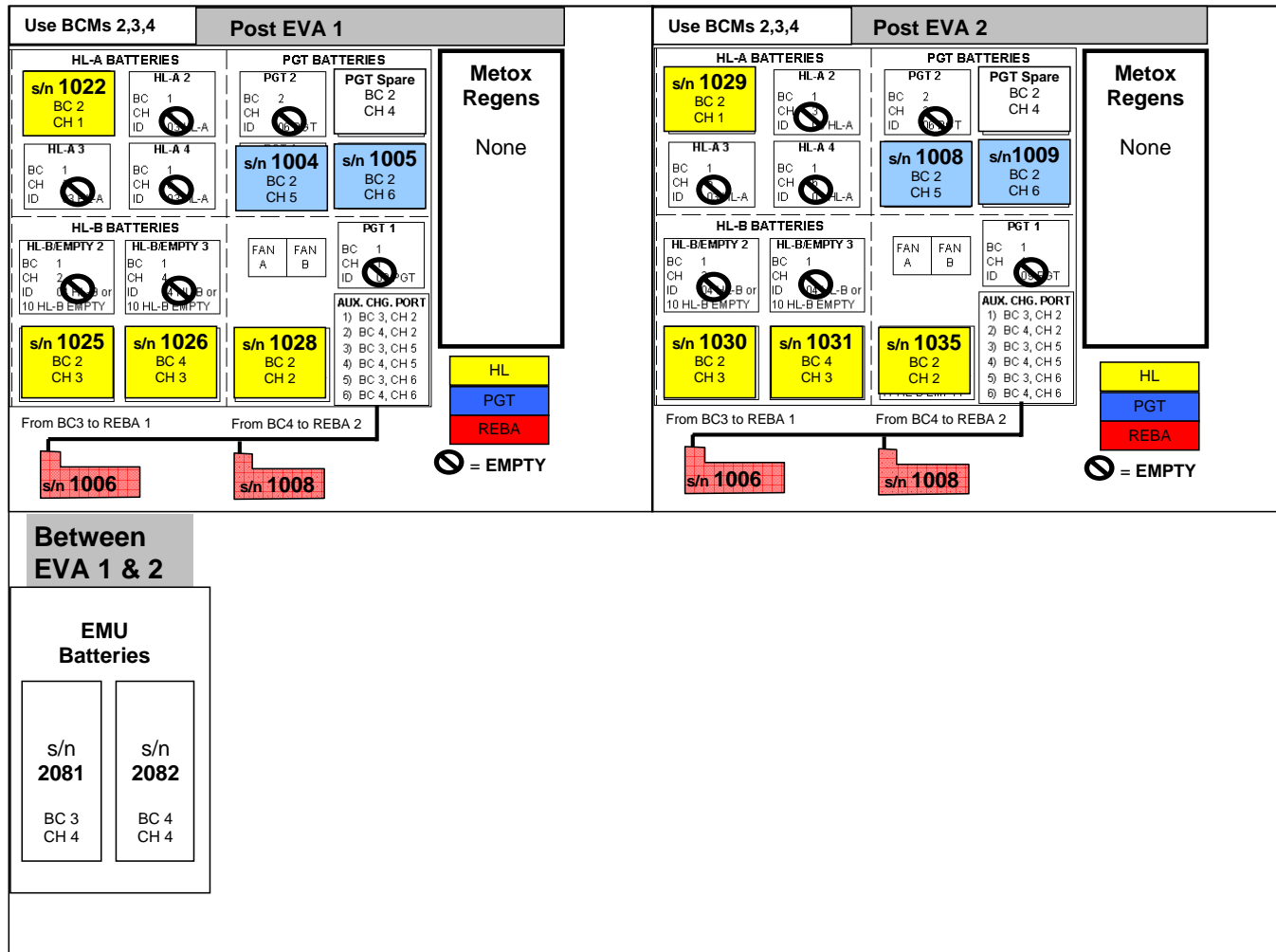
FS CC 10-15

EVA/131/FIN A

TOP
BACK OF 'CONSUMABLES TRACKING CUE CARD'

HOOK
VELCRO

BATTERY RECHARGE CUE CARD



EVA-5b/131/O/B

(reduced copy)

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
EMERGENCY UNDOCKING CUE CARD	FS CC	12-27
EXPEDITED SUIT DOFFING CUE CARD	FS CC	12-28
STS-131 NOMINAL EMU SIZING	FS	12-29
EMU CONTINGENCY RESIZE MATRIX (STS-131/19A).....	FS	12-31

EMU CONT
PROCS

TOP

HOOK
VELCRO

EMERGENCY UNDOCKING CUE CARD

Critical

- Mt EMU 3017
 - Battery installed
 - Mt Comm Cap
 - Time permitting, remove:
 - Helmet Lights/TV
 - REBA
 - MWS
- Ad EMU 3008
 - Battery installed
 - Ad Comm Cap
 - Time permitting, remove:
 - Helmet Lights/TV
 - REBA
 - MWS
- Mt ECOK/LCVG
- Ad ECOK/LCVG
- EVA Systems Transfer Bag (LiOH)
- 85-ft Safety Tether s/n 1006, Decal # 26

Desired

- EMU Servicing Kit (s/n 5005 marked for return preferred)
- Adjustable Wrist Tethers s/ns 1104 & 1105

EVA-6a/131/O/B

(reduced copy)

TOP
BACK OF 'EMERGENCY UNDOCKING CUE CARD'

HOOK
VELCRO

EXPEDITED SUIT DOFFING CUE CARD

CAUTION

Verify EV crew is clear of hatch mechanism.

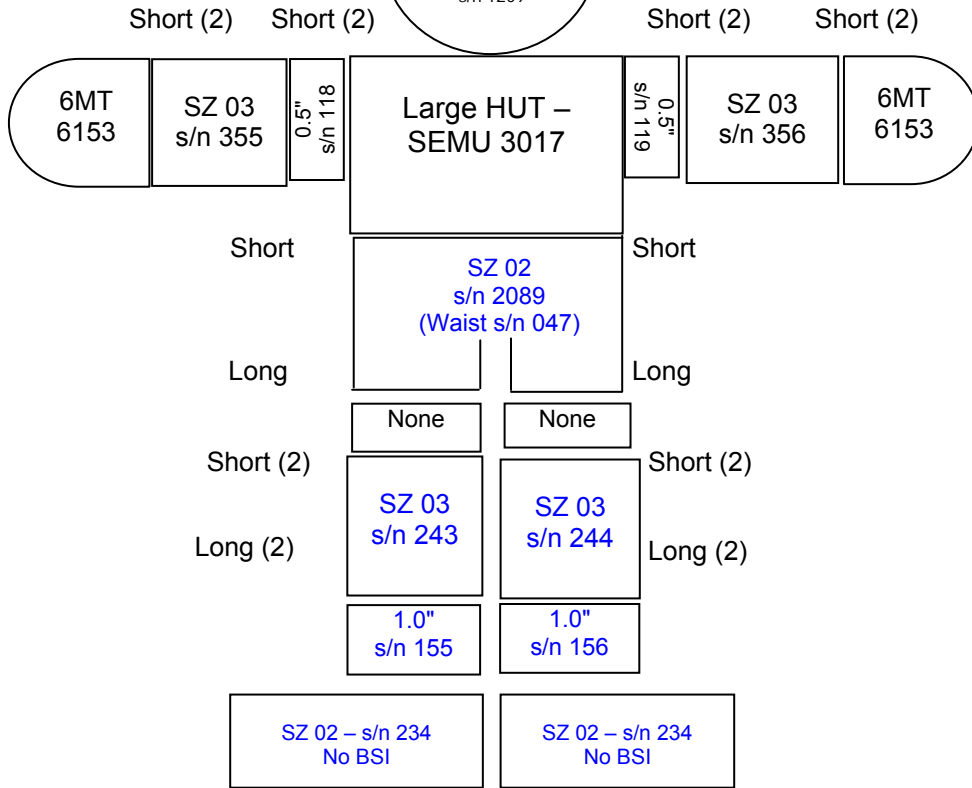
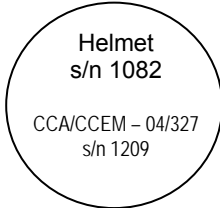
- IV When equalization complete:
1. Open IV Hatch per decal
- SAFER DOFFING (5 min)
SAFER 2. Latch → ENG
3. Latch ↻ until release (~90 deg)
4. PLSS ←|→ Thruster Towers
- SUIT DOFFING (10 min)
DCM 5. O2 ACT → OFF
6. PURGE vlv → op (up)
PLSS 7. sw REBA → OFF (toward left arm of suit)
8. Engage in EDDA
9. EMU TV Power Cable ←|→ EMU TV
DCM 10. √STATUS: **SUIT P** < 0.4 (compare with gauge)
11. Glove ←|→ EMU
12. Helmet ←|→ EMU
13. sw FAN → OFF
14. Doff EMU
- If taking EMUs to shuttle:
UIA 15. sw PWR EV-1,2 (two) → OFF
√PWR EV-1,2 LEDs (four) – Off
DCM 16. SCU ←|→ DCM
17. LTA →|← HUT
18. Gloves →|← EMU
19. Helmet →|← EMU
20. Go to **EMERGENCY UNDOCKING CUE CARD**
on reverse side

EVA-6b/131/O/B

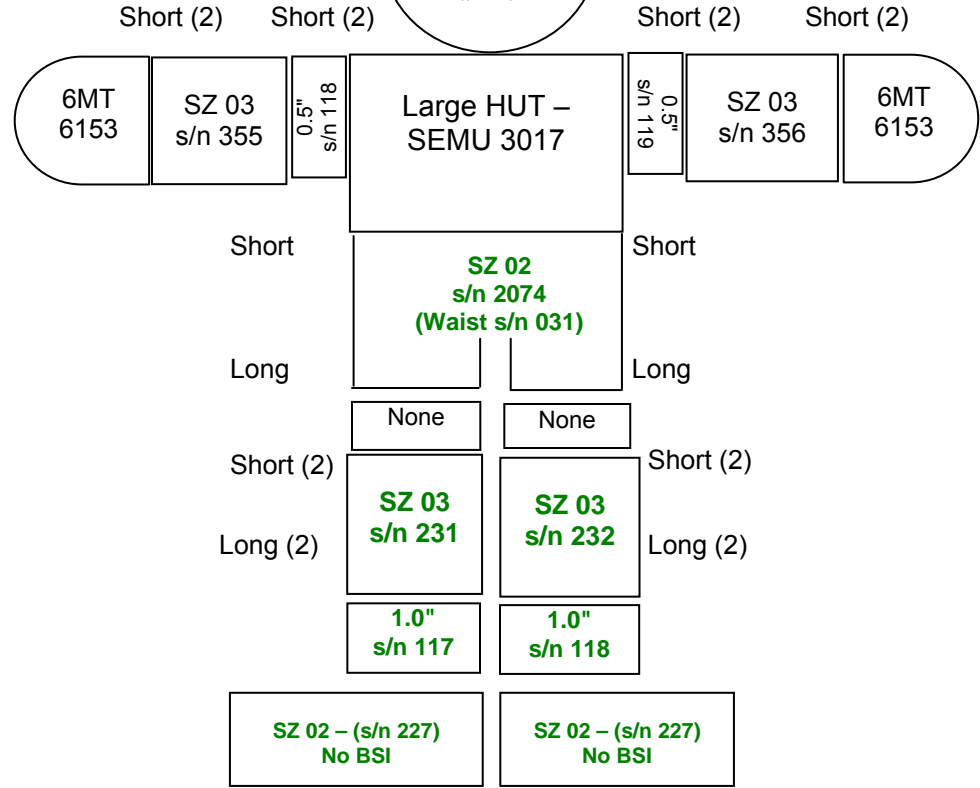
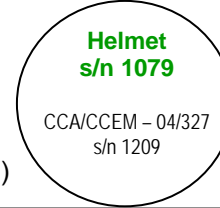
(reduced copy)

STS-131 NOMINAL EMU SIZING

Mastracchio (Mt) up



Mastracchio (Mt) down



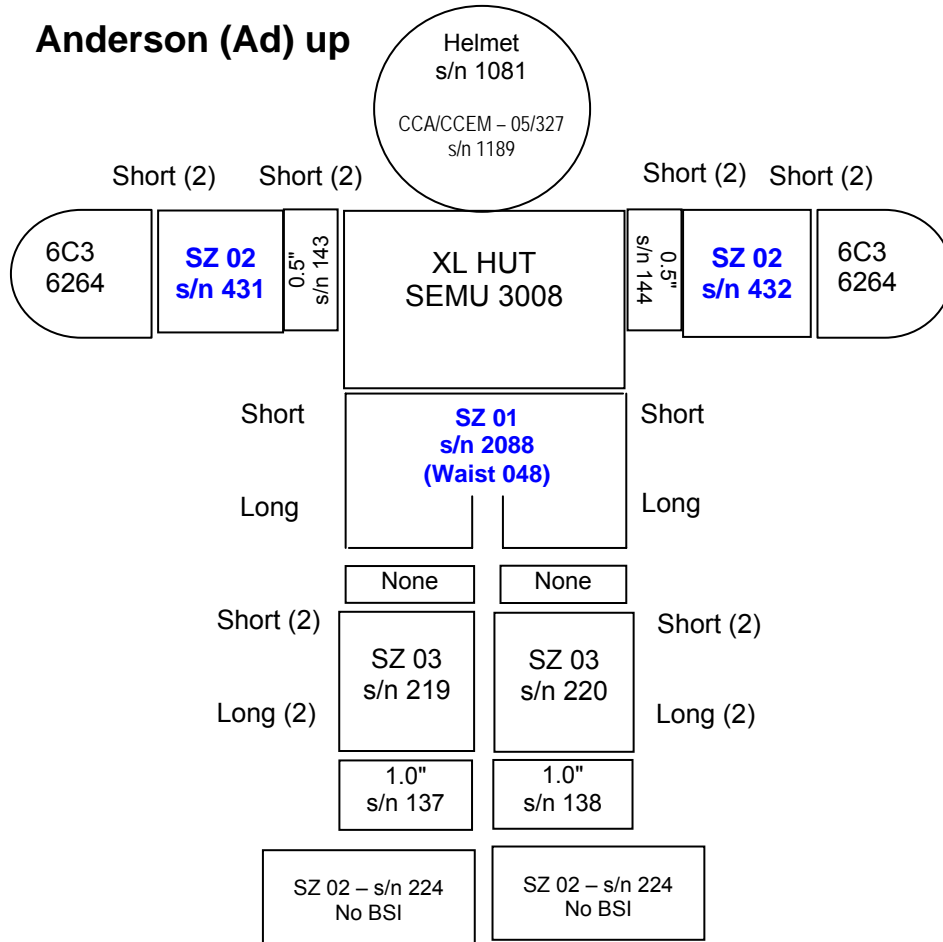
	Croakie	Fresnel Lens	Valsalva	LCVG/BLVD	MAG	TCU Top	TCU Bottom	Comfort Gloves	Socks
Mt	-001 (S) GRD	(2.5 dio) -011	Standard	06/05 Thermal Slippers 07	-711 (Lg)	Large	Medium	Lg, thin (-06)	Crew (10-13)

Blue – Items launched on Shuttle to remain on ISS

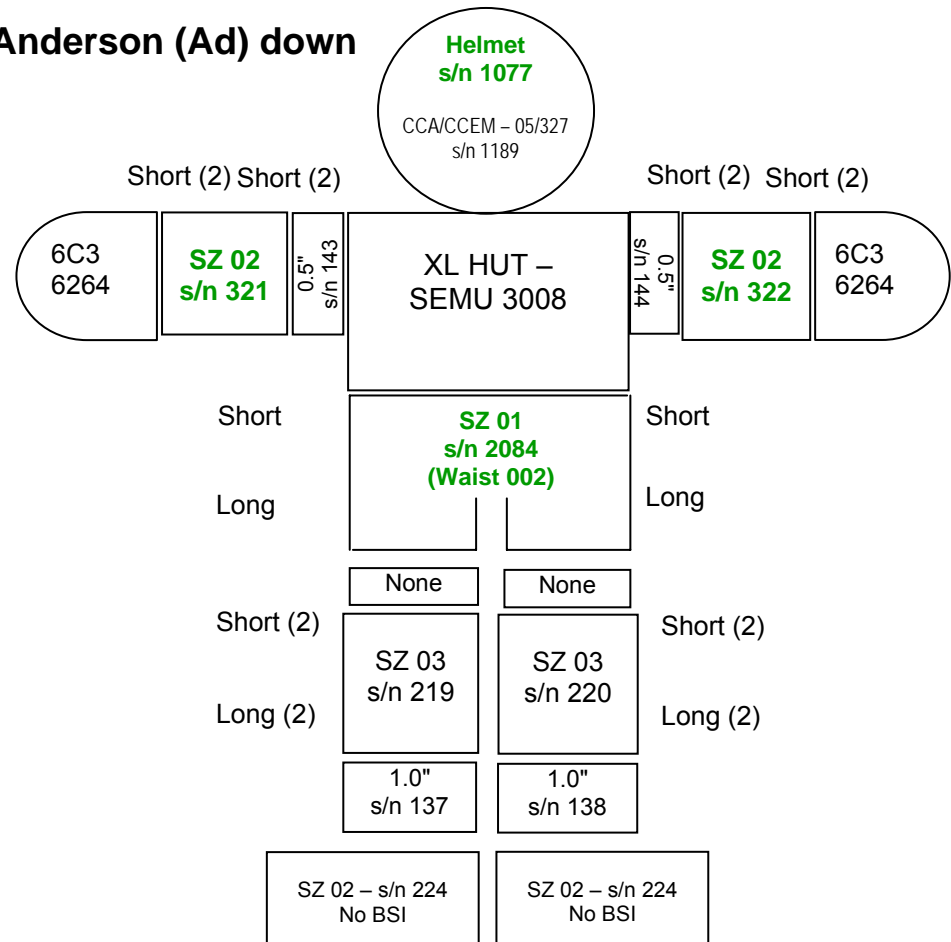
Green – Items returning from ISS

STS-131 NOMINAL EMU SIZING (Cont)

Anderson (Ad) up



Anderson (Ad) down



	Croakie	Fresnel Lens	Valsalva	LCVG/BLVD	MAG	TCU Top	TCU Bottom	Comfort Gloves	Socks
Ad	004[MN] GRD Modified M Croakie	(6.0 dio) x2 -021	Modified	06/05 Thermal Slippers 07	-711 (Large)	Large	Medium	-06 [AD]	Polypropelene (XL)

Blue – Items launched on Shuttle to remain on ISS
Green – Items returning from ISS

EMU CONTINGENCY RESIZE MATRIX (STS-131/19A)

FOR LOSS OF:	EV1 – Mastracchio	EV2 – Anderson
HUT/PLSS	Use EMU 3010, L 1. Remove rings/arm assys/gloves 2. Use primary rings, arms, Mt gloves 3. √Arm red connects to right, √locks, √cams 4. Use primary LTA 5. Swap EMU PLSS identifier stripes, national flag 6. Swap CCA, CCC/Metox, EMU battery, REBA	Use EMU 3005, XL 1. Remove rings/arm assys/gloves 2. Use primary rings, arms, Ad gloves 3. √Arm red connects to right, √locks, √cams 4. Use primary LTA 5. Swap EMU PLSS identifier stripes, national flag 6. Swap helmet, CCA, CCC/Metox, EMU battery, REBA
CCA	Use size 04/327 s/n 1198 Location Mt ECOK	Use size 05/37 CCA s/n 1185x Location Ad ECOK
Lower Arm Segment	Use size 03 arm s/n 377/378 from ISS Cams S/S (red = right, blue = left) 1. √Locks, √cams	Use size 02 arm s/n 331/332 from ISS Cams S/S (red = right, blue = left) 1. √Locks, √cams
Gloves	Back-up (MT2): Use 6MT gloves s/n 6154 Verify wrist mirrors	Back-up (Ad2): Use 6C3 gloves s/n 6317 Verify wrist mirrors
Waist Brief	Use size 02 waist brief s/n 2074 (031) from ISS Cams S/L 1. Use Mt prime 03 legs, 1.0" leg rings, and 02 boots/NO BSI 2. √Locks, √cams 3. Swap EMU brief identifier stripes	Use size 01 waist brief s/n 2076 (045) from ISS Cams S/L 1. Use prime Ad 03 legs, 1.0" leg rings, and 02 boots/NO BSI 2. √Locks, √cams 3. Swap EMU brief identifier stripes
Leg Segment	Use size 03 leg from ISS s/n 251/252 Cams S/L 1. √Locks, √cams	Use size 03 leg from ISS s/n 251/252 Cams S/L 1. √Locks, √cams
Boot	Use size 02 boots s/n 230 from ISS 1. √NO BSI/NO Toe Cap 2. √Locks	Use size 02 boots s/n 230 from ISS 1. √NO BSI/NO Toe Cap 2. √Locks
Sizing Rings	<ul style="list-style-type: none"> • 0.5" arm: Use s/n 145,146 from ISS • 1.0" Leg: Use s/n 125, 126 from ISS 	<ul style="list-style-type: none"> • 0.5" arm: Use s/n 145,146 from ISS • 1.0" Leg: Use s/n 125,126 from ISS
LCVG	Use s/n 3216 from STS 1. Transfer biomed & dosimeter	Use s/n 3223 from STS 1. Transfer biomed & dosimeter
Signal Conditioner	Use s/n 101 from STS OBS IVA Kit	Use s/n 101 from STS OBS IVA Kit

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TPS REPAIR

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

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

Select the "As Flown" Status sheet for STS-131 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

STS-131/19A WORKAROUNDS CRIBSHEET

EVA 1 CONTINGENCIES

TASK	FAILURE	ACTION
I. FGB Retrieve & Install	A. FGB mounting bolt initial torque cannot be released	<ol style="list-style-type: none"> 1. For one turn only, Ratchet Collar – RCCW, reattempt release, then PGT [B7] for remaining turns 2. If no joy, retrieve EVA ratchet from crewlock bag, then PGT: [B7 (25.5), CCW2, 30.5]; release all remaining bolts; reattempt release of last bolt (failure ~60 ft-lb) – discard any FOD in trash bag 3. If no joy, retrieve cheater bar and reattempt to break bolt
	B. FGB mounting bolt jams mid-travel during release	<ol style="list-style-type: none"> 1. Ratchet Collar – RCCW, attempt 1 turn of bolt, then PGT [B7], release remaining turns 2. If no joy, release all remaining bolts and attempt to remove FGB by tilting 3. If no joy, retrieve EVA ratchet from crewlock bag, reattempt release of last bolt (failure ~60 ft-lb) – discard any FOD in trash bag 4. If no joy, retrieve cheater bar and reattempt to break bolt 5. If no joy, retrieve prybar/hammer and attempt to physically slide FGB down to opening of key feature 6. Use prybar to put a bending moment into bolts, providing a gap to slide FGB down to opening in key feature
	C. Cannot remove FGB from soft dock on ATA	<ol style="list-style-type: none"> 1. Apply more force when attempting to slide FGB baseplate past bolts 2. If no joy, attempt to depress/unstick plunger using BRS pin tool with less than 5 lb. Stop if tip of tool starts to bend 3. If no joy, depress plunger with BRS pin tool while simultaneously hitting the support bracing of FGB with hammer to move FGB past plunger 4. If BRS pin tool unable to exercise plunger, retrieve bolt puller to exercise plunger
	D. FGB fails to slide into keyhole on ATA	<ol style="list-style-type: none"> 1. Verify FGB GP3 ball plunger is not stuck 2. As reqd, release bolts an additional 2-3 turns: PGT: [B7 (25.5), CCW2, 30.5]
	E. FGB mounting bolt fails to engage with FGB	<ol style="list-style-type: none"> 1. PGT: [B7 (25.5), CCW2, 30.5] back out bolt 2-3 turns, then reattempt engagement PGT: [A7 (9.2), CW2, 30.5] 2. If no joy, PGT: [B7 (25.5), CCW2, 30.5], back out all bolts 2-3 turns, inspect for FOD; reattempt 2-3 turns at a time in a cross pattern PGT: [A7 (9.2), CW2, 30.5]

UNSC/CONT
EVA TASKS

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
II. ATA Release from LMC	A. Bolt 1, 2, and 4: Initial torque cannot be released	<ol style="list-style-type: none"> 1. Increase torque on bolt for 1 turn PGT: [B7 (25.5), CCW2, 30.5]. Return to nominal release torque PGT: [B6 (24.0), CCW2, 30.5] 2. For one turn only, Ratchet Collar – RCCW, reattempt release, then PGT [B6] for remaining turns 3. If no joy, attempt to release with ratchet wrench in ccw direction 4. If no joy, retrieve cheater bar and reattempt to release
	B. Bolt 3: Initial torque cannot be released using ratchet wrench	<ol style="list-style-type: none"> 1. Use torque multiplier to break torque. Only 1 turn on the bolt. (5 turns with PGT/TM equals one turn on the bolt) √TM anti-backlash in neutral PGT: [B4 (19.4), CCW1, 30.5] 2. If no joy, increase PGT setting: PGT: [B5 (22.0), CCW1, 30.5] 3. Once torque broken, remove TM, socket swap and return to nominal release torque PGT: [B4 (19.4), CCW2, 30.5], 7/16 -6-ext
	C. ATA fails to release from soft dock	<ol style="list-style-type: none"> 1. If bolt 2 or 4, attempt to use BRS pin tool to exercise plungers with less than 5 lb. Stop if tip of tool starts to bend 2. Use prybar to pry the ATA from structure near sticky plungers
	D. APFR stuck in LMC WIF	<ol style="list-style-type: none"> 1. Verify APFR collar fully rotated to black-on-white 2. Wiggle APFR while pulling APFR from WIF 3. On MCC-H GO: Remove 4 bolts attaching WIF to LMC with ratchet or PGT. (Bolts and washers are non-captive) PGT: [B1 (12.0), CCW2, 30.5], 7/16 -6-ext
III. JEM MPAC/SEED	A. MPAC/SEED Cover fails to soft dock	<ol style="list-style-type: none"> 1. Check for FOD on cover and sample soft docks 2. Hold cover in place (use tethers if reqd) and drive cover bolts
	B. Cover bolt fails to fully engage	<ol style="list-style-type: none"> 1. Attempt to cycle the bolt with nominal torque <ol style="list-style-type: none"> a. PGT [B7 (25.5), CCW2, 30.5] rotate 1 turn back b. PGT [B1 (12.0), CW2, 30.5]; rotate < 9.5 turns 2. If 1 of 2 bolts is engaged, no further action required 3. If both bolts failed to install, <ol style="list-style-type: none"> a. Verify the cover does not come off and tether to a handhold nearby b. Retrieve ORU transfer bag c. Proceed releasing sample bolts (#3-5) as nominal d. Remove the sample w/cover carefully and put into the ORU bag for transfer e. If cover is loose from the sample, attach wire tie (long) per need

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	C. Sample bolt fails to release	<ol style="list-style-type: none"> 1. Increase torque PGT [RCCW, 30.5] 2. Use Ratchet Wrench to break torque 3. If sample cannot be released from structure at least 1 bolt must be fully installed
	D. Sample fails to release from support pins	<ol style="list-style-type: none"> 1. Check all sample bolts are fully loosened (2 white lines visible) 2. Grab both bolt casings of MPAC/SEED Cover firmly, and attempt to wiggle and slide it out horizontally (ISS fwd) 3. Retrieve pry bar and attempt to pry out (0.6 inch of travel reqd)
IV. AGB Install onto ATA	A. Bolt fails to release	<ol style="list-style-type: none"> 1. Increase torque PGT: [B1 (12.0), CCW2, 30.5] 2. If no joy, increase torque PGT: [B7 (25.5), CCW2, 30.5]
	B. T-handle fails to unlock (release)	<ol style="list-style-type: none"> 1. Check interface for FOD or damage 2. Increase force and reattempt
	C. AGB fails to release from soft dock	Use prybar to pry the AGB from the FHRC near sticky plungers
	D. AGB fails to soft dock	<ol style="list-style-type: none"> 1. Check for FOD 2. Exercise plungers with bolt puller or prybar
	E. T-handle fails to engage into alignment hole	Slide AGB single pin side in and out a few inches while tapping T-handle into position
	F. Bolt fails to engage fully	<ol style="list-style-type: none"> 1. Check interface for FOD or damage 2. Back out bolt PGT: [A2 (3.8), CCW2, 30.5] and reattempt installation at nominal setting [A2] 3. If green light achieved check with MCC-H if turn count is acceptable
V. RGA R&R	A. NZGLs	See Generic section of cribsheet
	B. Bolt fails to release	<ol style="list-style-type: none"> 1. PGT: [RCCW, 30.5] for one turn only 2. If no joy, release all other engaged bolts and reattempt release on failed bolt 3. If no joy, reinstall all bolts and perform tether tie-down plan using AET; ensure AET completely covered by MLI upon installation. If time available, use LDTD tether instead of AET
	C. RGA ball plungers stuck, RGA fails to remove from guide rails	<ol style="list-style-type: none"> 1. Increase extraction force 2. Retrieve bolt puller or prybar. Insert in interface between baseplate and lower guide rail. Apply a bending moment to help clear the lower detent from the stuck lower plunger 3. Use hammer on RGA baseplate
	D. Fails to slide in track	<ol style="list-style-type: none"> 1. Verify all bolts popped up 2. If attempting install, remove and check for FOD in track, exercise plungers with bolt puller or prybar 3. Check alignment, reattempt installation

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	E. Bolt fails to install	<ol style="list-style-type: none"> 1. Inspect RGA alignment and bolts 2. If bound midtravel, back out at PGT [A2], and then re-engage at PGT [A2] 3. If no joy, increase torque: PGT: [B7 (25.5), CW2, 30.5] and reattempt for one turn, then return to nominal setting PGT [A2 (3.8), CW2, 30.5] 4. If no joy, install remaining bolts and perform tether tie-down plan using AET; ensure AET completely covered by MLI upon complete installation. If time available, use LDTD tether instead of AET. 4 of 4 bolts required, or 2 of 4 bolts with tie down required to leave the RGA installed

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

EVA 2 CONTINGENCIES

TASK	FAILURE	ACTION
I. ATA Release from S1	A. NZGLs	See Generic section of cribsheet
	B. Bolt 1, 2, and 4: Initial torque cannot be released	<ol style="list-style-type: none"> Increase torque on bolt for 1 turn PGT: [B7 (25.5), CCW2, 30.5]. Return to nominal release torque PGT: [B6 (24.0), CCW2, 30.5] For one turn only, Ratchet Collar – RCCW, reattempt release, then PGT [B7] for remaining turns If no joy, attempt to release with ratchet wrench in ccw direction If no joy, retrieve cheater bar and reattempt to release
	C. Bolt 3: Initial torque cannot be released using ratchet wrench	<ol style="list-style-type: none"> Use torque multiplier to break torque. Only 1 turn on the bolt (5 turns with PGT/TM equals one turn on the bolt) √TM anti-backlash in neutral PGT: [B4 (19.4), CCW1, 30.5] If no joy, increase PGT setting: PGT: [B5 (22.0), CCW1, 30.5] Once torque broken, remove TM, socket swap and return to nominal release torque PGT: [B6 (24.0), CCW2, 30.5], 7/16 -6-ext
	D. ATA fails to release from soft dock	<ol style="list-style-type: none"> If bolt 2 or 4, attempt to use BRS pin tool to exercise plungers with less than 5 lb. Stop if tip of tool starts to bend Use prybar to pry the ATA from structure near sticky plungers
II. P1 Radiator GF Stow Beam Install	A. Zip nut fails to engage	<ol style="list-style-type: none"> Check for FOD Engage second zip nut and continue If no joy, hold beam in place while attempting to drive bolts with PGT
III. AGB Release from ATA	A. Bolt fails to release	<ol style="list-style-type: none"> Increase torque PGT: [B1 (12.0), CCW2, 30.5] If no joy, increase torque PGT: [B7 (25.5), CCW2, 30.5]
	B. T-handle fails to unlock (release)	<ol style="list-style-type: none"> Check interface for FOD or damage Increase force and reattempt
	C. AGB fails to release from soft dock	Use prybar to pry the AGB from the ATA near sticky plungers
	D. T-handle fails to engage into alignment hole	Slide AGB single pin side in and out a few inches while tapping T-handle into position
IV. S1 ATA Install	A. ATA fails to engage in soft dock	<ol style="list-style-type: none"> If bolt 2 or 4, use BRS pin tool to exercise plungers with less than 5 lb. Stop if tip of tool starts to bend If plunger problem exists on bolt 3, depress bolt spring, drive bolt 3 to override plungers PGT: [B7 (25.5), CW2, 30.5], 7/16 – 6-ext Hold for thermal equalization of ATA and FSE
	B. Bolt 3 will not install on S1	<ol style="list-style-type: none"> Verify bolts 2 and 4 over soft-dock plungers Verify bolt 3 spring is being depressed PGT/TM: [B1 (12.0), CW1, 30.5] √TM anti-backlash in neutral If alignment in question, install bolts 2 and 4 before reattempting to install bolt 3 If no joy, perform tie-down procedure

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	C. Bolt 1, 2, and 4 will not install on S1	1. Verify bolts 2 and 4 over soft-dock plungers 2. Verify spherical bearings not blocking clevis. If misaligned, use BRS pin tool to center bearing. Install remaining bolts (3 of 4 bolts required if bolt 1 out. 4 of 4 required if any other bolt not installed) 3. If no joy, increase torque PGT: [B7 (25.5), CW2, 30.5] for 1 turn 4. If no joy and issue is on other than bolt 1, perform tie-down procedure
	D. NZGLs	See Generic section of cribsheet
	E. Fluid QDs	See Generic section of cribsheet

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

EVA 3 CONTINGENCIES

TASK	FAILURE	ACTION
I. AGB Release from ATA/ Install on FHRC	A. Bolt fails to release	1. Increase torque PGT: [B1 (12.0), CCW2, 30.5] 2. If no joy, increase torque PGT: [B7 (25.5), CCW2, 30.5]
	B. T-handle fails to unlock (release)	1. Check interface for FOD or damage 2. Increase force and reattempt
	C. AGB fails to release from soft dock	Use prybar to pry the AGB from the ATA near sticky plungers
	D. AGB fails to soft dock	1. Check for FOD 2. Exercise plungers with bolt puller or prybar
	E. T-handle fails to engage into alignment hole	Slide AGB single pin side in and out a few inches while tapping T-handle into position
	F. Bolt fails to engage fully	1. Check interface for FOD or damage 2. Back out bolt PGT: [A2 (3.8), CCW2, 30.5] and reattempt installation at nominal setting [A2] 3. If green light achieved check with MCC-H if turn count is acceptable
	G. PGT will not fit between FHRC and UTA	Retrieve RAD w/2 in socket from A/L staging bag. Install AGB bolt PGT: [A1 (2.5), CW2, 30.5], RAD w/7/16 – 2-ext
II. LMC ATA Install	A. ATA fails to engage in soft dock	1. If bolt 2 or 4, use BRS pin tool to exercise plungers with less than 5 lb. Stop if tip of tool starts to bend 2. Hold for thermal equalization of ATA and FSE
	B. Bolt 3 will not install on LMC	1. Verify bolts 2 and 4 over soft-dock plungers 2. Verify bolt 3 spring is being depressed 3. PGT/TM: [B1 (12.0), CW1, 30.5] √TM anti-backlash in neutral 4. If alignment in question, install bolts 2 and 4 before reattempting to install bolt 3
	C. Bolt 1, 2, and 4 will not install on LMC	1. Verify bolts 2 and 4 over soft-dock plungers 2. Verify spherical bearings not blocking clevis. If misaligned, use BRS pin tool to center bearing 3. Increase torque for 1 turn, PGT: [B7 (25.5), CW2, 30.5] . Return to nominal torque PGT: [A7 (9.2), CW2, 30.5] (4 of 4 bolts required for landing)
	D. 4 of 4 ATA bolts not secured to LMC	1. Release ATA and hand to SSRMS 2. Reattach AGB and place ATA on POA 3. If bolt 3 cannot be released, release FSE contingency release bolts (3) with ratchet
	E. APFR stuck in LMC WIF	1. Verify APFR collar fully rotated to black-on-white 2. Wiggle APFR while pulling APFR from WIF 3. On MCC-H GO : Remove 4 bolts attaching WIF to LMC with ratchet or PGT. (Bolts and washers are non-captive) PGT: [B1 (12.0), CCW2, 30.5], 7/16 -6-ext

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
III. FGB Retrieve & Install	A. FGB mounting bolt initial torque cannot be released	<ol style="list-style-type: none"> 1. For one turn only, Ratchet Collar – RCCW, reattempt release, then PGT [B7] for remaining turns 2. If no joy, retrieve EVA ratchet from crewlock bag, then PGT: [B7 (25.5), CCW2, 30.5]; release all remaining bolts; reattempt release of last bolt (failure ~60 ft-lb) – discard any FOD in trash bag 3. If no joy, retrieve cheater bar and reattempt to break bolt (FGB not certified for return)
	B. FGB mounting bolt jams mid-travel during release	<ol style="list-style-type: none"> 1. Ratchet Collar – RCCW, attempt 1 turn of bolt, then PGT [B7], release remaining turns 2. If no joy, release all remaining bolts and attempt to remove FGB by tilting 3. If no joy, retrieve EVA ratchet from crewlock bag, reattempt release of last bolt (failure ~60 ft-lb) – discard any FOD in trash bag 4. If no joy, retrieve cheater bar and reattempt to break bolt 5. If no joy, retrieve prybar/hammer and attempt to physically slide FGB down to opening of key feature 6. Use prybar to put a bending moment into bolts, providing a gap to slide FGB down to opening in key feature (FGB not certified for return)
	C. Cannot remove FGB from soft dock on ATA	<ol style="list-style-type: none"> 1. Apply more force when attempting to slide FGB baseplate past bolts 2. If no joy, attempt to depress/unstick plunger using BRS pin tool with less than 5 lb. Stop if tip of tool starts to bend 3. If no joy, depress plunger with BRS pin tool while simultaneously hitting the support bracing of FGB with hammer to move FGB past plunger 4. If BRS pin tool unable to exercise plunger, retrieve bolt puller to exercise plunger
	D. FGB fails to slide into keyhole on ATA	<ol style="list-style-type: none"> 1. Verify FGB GP3 ball plunger is not stuck 2. As reqd, release bolts an additional 2-3 turns: PGT: [B7 (25.5), CCW2, 30.5]
	E. FGB mounting bolt fails to engage with ATA	<ol style="list-style-type: none"> 1. PGT: [B7 (25.5), CCW2, 30.5] back out bolt 2-3 turns, then reattempt engagement PGT: [A7 (9.2), CW2, 30.5] 2. If no joy, PGT: [B7 (25.5), CCW2, 30.5], back out all bolts 2-3 turns, inspect for FOD; reattempt 2-3 turns at a time in a cross pattern PGT: [A7 (9.2), CW2, 30.5]

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

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

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
		– Aft pins for reinstallation on EPF <ul style="list-style-type: none"> • Remove bolt from STOW location and engage in INSTALL location • Manually turn bolt as far as possible • PGT: [B1 (12.0), CW2, 30.5], 7/16 - 6-ext 16.858 – (1.25 * Turns on Primary Bolt) turns
V. SPDM CLPA Install	A. Connector cover will not stay clear of CLPA during install	Cut connector cover blanket off of SPDM
	B. CLPA fails to soft dock	1. Inspect for FOD or damage 2. Wiggle CLPA into V-guide
	C. Bolt fails to engage fully	Increase torque PGT: [B7 (25.5), CW2, 30.5] for 1 turn only
VI. SPDM EP1 Cover Remove	A. 1/4 turn fastener fails to rotate	Use equipment hook for additional leverage
VII. CP13 ETVCG Light R&R	A. ETVCG is not oriented correctly (Lens should be pointed to structure)	On MCC-H GO : Manually align camera
	B. PTU lock lever fails to engage	1. Check for FOD 2. Wiggle ETVCG while locking PTU 3. Increase force
	C. NZGLs	See Generic section of cribsheet
	D. Primary bolt fails to release	Increase torque PGT: [B7 (25.5), CCW2, 30.5]
	E. Light fails to engage into soft dock	1. Check for FOD 2. Exercise plungers with bolt puller or prybar
	F. Primary bolt fails to engage	Increase torque PGT: [B7 (25.5), CW2, 30.5] for 1 turn and then return to nominal install PGT: [B1 (12.0), CW2, 30.5]
	G. PTU lock lever fails to release	1. Check for FOD 2. Increase force
VIII. S1 Radiator GF Stow Beam Install	A. Zip nut fails to engage	1. Check for FOD 2. Engage second zip nut and continue 3. If no joy, hold beam in place while attempting to drive bolts with PGT

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

GET-AHEAD CONTINGENCIES

TASK	FAILURE	ACTION
I. FHRC P-Clamp Release	A. Bolt fails to release	Increase torque PGT: [B1 (12.0), CCW2, 30.5] for 1 turn then return to nominal setting PGT: [A7 (9.2), CCW2, 30.5]

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
I. Generic	APFR/IAPFR	
	A. APFR/IAPFR fails to install into WIF	<ol style="list-style-type: none"> 1. Verify APFR collar in install position (black-on-black) 2. Check for FOD in WIF or structural interference 3. Attempt APFR install in alternate clocking 4. If no joy, attempt APFR install in alternate WIF 5. If no joy, APFR failure – Use another APFR
	B. Joint fails to actuate	<ol style="list-style-type: none"> 1. Verify no load is applied to joint and/or jiggle APFR joint while actuating knob – For pitch joint, push knob in during rotation (Class I pitch joints known to be stiff) 2. Increase force applied in order to free joint
	C. Boot becomes stuck in APFR boot plate	<ol style="list-style-type: none"> 1. Have other EV crewmember assist with getting boot out 2. Loosen 7/16-in EVA bolts (3) on heel clip using EVA ratchet or PGT: PGT: [B1 (12.0), CCW2, 30.5], 7/16 - 6-ext 3. Remove 7/16-in EVA bolts (3 – captive) on heel clip (non captive) using EVA ratchet or PGT: PGT: [B1 (12.0), CCW2, 30.5], 7/16 - 6-ext 5 turns
	D. Boot becomes stuck in IAPFR boot plate	<ol style="list-style-type: none"> 1. Have other EV crewmember assist with getting boot out 2. If wearing Small EMU boot, have other EV crewmember adjust boot sizing to Large 3. Loosen 7/16-in EVA bolts (2) on heel clip using EVA ratchet or PGT: PGT: [B2 (16.0), CCW2, 30.5], 7/16 - 6-ext 4. Remove 7/16-in EVA bolts (2) on heel clip using EVA ratchet or PGT: PGT: [B2 (16.0), CCW2, 30.5], 7/16 - 6-ext 4 turns
	Ballstack	
	A. ECOM fails to release from ISS Structure	On MCC-H GO : Tether ballstack to handrail and leave outside
	B. ECOM fails to release from MUT EE	Leave together and return inside
	C. Ballstack fails to rigidize	On MCC-H GO : Use secondary tethers to assist in restraining payload
	BRT	
A. BRT jaws fail to release	<ol style="list-style-type: none"> 1. Loosen rigidizing collar to relieve sideloads 2. Shake BRT while depressing paddles to alleviate sideloads from handrail 3. Detach BRT from suit and tether to structure 	

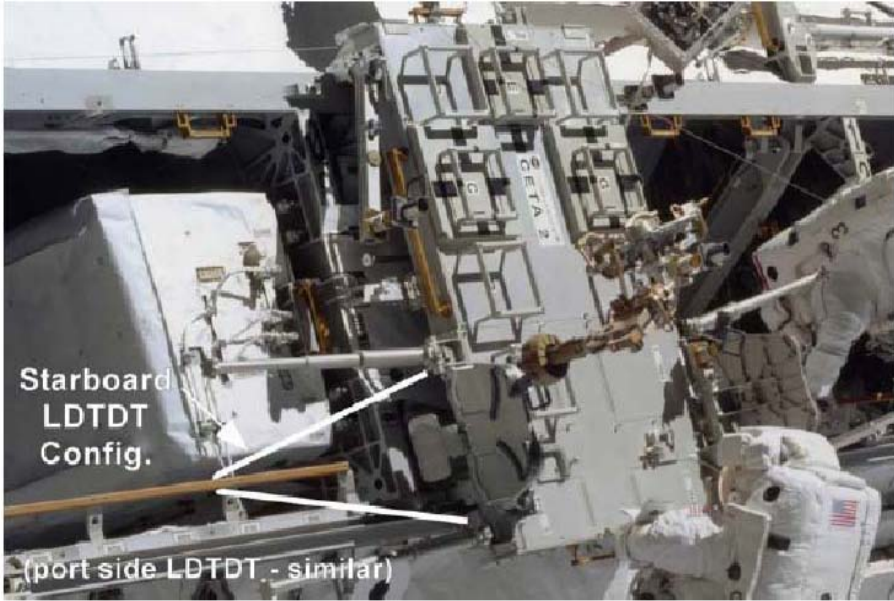

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	Cannon Connector	
	A. Connector fails to release	<ol style="list-style-type: none"> 1. Check for FOD, damage or misalignment 2. Verify cable routing is not impeding connector rotation. (Release TA clamps as required) 3. Use cannon connector tool for more leverage
	B. Connector/Cap fails to softdock	<ol style="list-style-type: none"> 1. Verify collar unlocked. (White on connector shell tip should align with white on receptacle backplate) 2. Check for FOD or damage
	C. Connector/Cap fails to lock	<ol style="list-style-type: none"> 1. Remove connector/cap, check for FOD or damage 2. Check alignment, remate, rock connector back and forth as required. (Once locked, white on connector shell tip should align with black on receptacle backplate) 3. Use cannon connector tool for more leverage
	D. High cable stiffness prevents mating	<ol style="list-style-type: none"> 1. Verify all TA clamps are released 2. Use second crewmember 3. Use APFR
	E. Connector/Jack pin bent	<ol style="list-style-type: none"> 1. Describe pin location and condition – Obtain WVS view of interface if possible 2. On MCC-H GO: For 16, 20, or 22 gauge pins only, retrieve pin straightener and attempt pin repair 3. On MCC-H GO: Retrieve needle nose pliers and attempt pin repair – MCC-H will verify pin size prior to retrieving tools
	F. Connector/Jack FOD	On MCC-H GO : Obtain connector cleaner tool to remove FOD
	G. Connector EMI band bent	On MCC-H GO : Obtain needle nose pliers or forceps to remove band
	CETA Cart	
	A. Wheel bogie fails to release from truss	<ol style="list-style-type: none"> 1. Verify brakes are fully released 2. Ensure trigger is being depressed while attempting to rotate handle 3. On MCC-H GO: Perform {6.100.125 CETA Cart Wheel Bogie R&R} – There is no spare wheel bogie on-orbit, so after the CETA cart is relocated the failed wheel bogie will be reinstalled
	B. Wheel bogie fails to install on truss	There is no spare wheel bogie on-orbit. 4 of 4 bogies are required. Real time call on whether MT couple or CETA cart tiedown required. For tiedown see block G
	C. Parking brake fails to engage	<ol style="list-style-type: none"> 1. Use parking brake handle on other side of CETA cart 2. Couple CETA cart to MT and utilize other WIF if possible
	D. Parking brake fails to disengage	<ol style="list-style-type: none"> 1. Hold pedal down for brake release 2. Use pedal on other side of CETA cart to release parking brake

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	E. Dynamic brake fails to engage	Limit translation rates to allow manual stopping
	F. CETA active coupler fails to capture or lock	<ol style="list-style-type: none"> 1. Cycle active coupler 2. If at least 1 CETA cart is stbd of the MT, swap active couplers 3. On MCC-H GO: Tie down CETA cart. See block G
	G. CETA cart tie down	<p>On MCC-H GO: Perform the following tie-down procedure (see figure 1)</p> <ol style="list-style-type: none"> a. Translate CETA cart to TBD location (not over truss segment joint) b. Engage parking brake c. Retrieve 2 Long Duration Tie Down (LDTD) tethers from P6 AUX Bag (fwd face of Z1) d. Route 1 LDTD tether on stbd side of CETA cart as follows: <ol style="list-style-type: none"> 1. Attach 1 hook to zenith brake handle support tether point 2. Loop tether strap around CETA rail HR standoff 3. Attach second hook to nadir brake handle support tether point 4. Lightly cinch tether and close buckle 5. Close MLI flap over buckle and any excess strap e. Repeat on port side of CETA cart
	H. Coupler knob fails to unlock	<ol style="list-style-type: none"> 1. On MCC-H GO: Release active coupler by removing wire ties (2) (reinstall of wire ties not required) and PIP pins (2) 2. On MCC-H GO: Release passive coupler via EVA bolt: PGT: [B7 (25.5), CCW2, 30.5], 7/16 - 6-ext 9 turns – Bolt is attached by lanyard
	I. Swing arm fails to deploy	Use alternate swing arm or WIF
	J. Swing arm fails to stow	<p>On MCC-H GO: Remove swing arm via EVA bolts (4): PGT: [B7 (25.5), CCW2, 30.5], 7/16 - 6-ext</p>
	K. Swing arm fails to lock	Restrain in stowed position with wire ties

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	 <p>Starboard LDTDT Config. (port side LDTDT - similar)</p>	 <p>STBD TFR</p> <p>Brake Handle Support Tether Point</p>
<div style="border: 1px solid black; padding: 5px; display: inline-block;">Figure 1.- CETA Cart Tiedown.</div>		
	<p>EVA Wrench (Torque & Ratchet)</p> <p>A. Ratchet teeth slip</p> <p>B. Wrench does not ratchet</p>	<p>Ratchet to new set of teeth and reapply torque</p> <p>Hold the ratchet selector and socket in opposite hands and rotate in opposite directions</p>

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	Fluid QD Ops	
	<p><u>NOTE</u> If troubleshooting requires the crew to leave the worksite, verify that female QDs are covered to prevent exposure to direct sunlight. For thermal clocks refer to flight rules</p>	
	Mating Ops	
	A. QD fails to mate	<ol style="list-style-type: none"> 1. Check for debris, damage, or crystals 2. Verify release ring is retracted. (Fwd white band is not visible) 3. Check alignment and verify no side loads
	B. Release ring snap back test fails	<ol style="list-style-type: none"> 1. Push release ring forward. (Release ring will not slide fwd if QD is in FID) 2. QD is in FID; demate QD, verify fwd white band not visible, and remate QD
	C. Gap check fails (visual or FID gauge)	Retract release ring, demate QD, verify fwd white band not visible, and remate QD
	Valve Ops	
	D. Detent button is partially unthreaded	<p>Rethread detent button</p> <ol style="list-style-type: none"> a. Load bail handle (button will free spin if not loaded) <ul style="list-style-type: none"> – If valve is open, pull bail handle aft – If valve is closed, push bail handle fwd b. Rotate button cw (8 turns max)
	E. Detent button is missing	<ol style="list-style-type: none"> 1. Use equipment hook to depress detent button shaft 2. Use tether strap around gloved finger to depress detent button shaft 3. Retrieve and use Beta Gimbal Antirotation Latch Tool to depress detent button shaft 4. On MCC-H GO: Install spare detent button. (Buttons are stowed IVA and must be configured prior to EVA use)
	<u>NOTE</u> Detent button is only required for BDT ops and 1 in SPD ops	
	F. Bail fails to travel fwd	<ol style="list-style-type: none"> 1. Check for debris, damage, or crystals 2. Neutralize sideloads 3. Retrieve and use QD bail drive lever (3/4, 1, and 1-1/2 in only); notify MCC-H
	G. Bail fails to travel to full fwd (valve open) position (button does not pop up)	<ol style="list-style-type: none"> 1. Neutralize sideloads 2. Apply greater opening force to QD bail handle 3. Retrieve and use QD bail drive lever (3/4, 1, and 1-1/2 in only); notify MCC-H 4. If applicable, retrieve and install SPD; notify MCC-H

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	<p>H. Detent button fails to depress during valve closing</p> <div style="border: 2px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">WARNING</p> <p>Bail may kick back and contact crew when button is depressed if a leaking primary seal allowed pressure build-up in spring cavity</p> </div>	<ol style="list-style-type: none"> 1. Verify locking collar fully rotated (1/2, 3/4, and 1 in only) 2. Push and hold bail handle fwd (to open) with significant force to relieve load on button while simultaneously depressing the detent button <ul style="list-style-type: none"> – If button depresses, vent by pulling bail aft until release ring covers aft white band – Push bail fwd to valve open and check button depresses 3. Retrieve QD bail drive lever and repeat step 2 (3/4, 1, and 1-1/2 in only); notify MCC-H 4. Contact MCC-H to reduce NH3 temperature if possible 5. On MCC-H GO: Retrieve and install QD button depress tool (BDT) (1/4, 3/4, and 1 in only)
	<p>I. Bail fails to travel to full aft (valve closed) position (button does not pop up)</p>	<ol style="list-style-type: none"> 1. Inspect QD for retaining wire protrusion 2. Neutralize possible side loading 3. Depress button and increase force on bail 4. Retrieve and use QD bail drive lever (3/4, 1, and 1-1/2 in only); notify MCC-H
Demating Ops		
	<p>J. Female QD fails to demate</p>	<ol style="list-style-type: none"> 1. Verify release ring is fully retracted while attempting to demate 2. Verify TA or P clamps are released 3. Verify detent button is up (locking collar can be rotated under button) 4. Verify trigger linkage is still attached to release ring (1-1/2 in only) 5. Neutralize sideloads or manipulate flexhose to relieve mating forces on female QD 6. Apply greater force to release ring and female QD 7. Retrieve and use QD release tool (QRT) to apply greater force; notify MCC-H
	<p>K. Thermal bootie fails to remain securely closed</p>	<p>Install wire tie around bootie to keep QD fully covered</p>
	<p>L. Cap will not demate</p>	<ol style="list-style-type: none"> 1. Verify pulling out on cap before rotating to ensure locking tab is disengaged 2. Wait for day pass if possible and reattempt cap removal 3. If force is too great for hand actuation or crystals visible around the QD, male may be leaking; notify MCC-H <ul style="list-style-type: none"> – Prepare for quick mate on MCC-H GO 4. Retrieve QD cap tool (1/4, 1/2, and 1 in only) <ul style="list-style-type: none"> – Use PGT: [A4 (6.3), CCW1, 30.5] with QD cap tool to turn stuck cap a maximum of 2 turns (cap vents at ~2 turns). Finish removal of cap by hand (~1 additional turn)


STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	Leaks	
	M. Mated QD leaks in valve open position (bail fwd)	<ol style="list-style-type: none"> 1. Remove SPD and fully open valve (bail fwd) 2. If leak continues close valve (bail aft)
	N. Male QD leaks after cap removal	<ol style="list-style-type: none"> 1. If crystals minimal and dissipating; continue 2. Reinstall cap; notify MCC-H – Prepare for quick QD mate on MCC-H GO
	O. Female QD leaks during or after bail actuation to fwd position (valve open)	<ol style="list-style-type: none"> 1. Return bail to aft position (valve closed) 2. Perform release ring snap back test – If FID is observed, demate and remate QD – If no FID, neutralize sideloads and cycle bail to fwd position (valve open)
	P. Leaking QD after SPD install	<ol style="list-style-type: none"> 1. Remove SPD, open valve fully (bail fwd), verify detent button is up, and aft white line is visible – If leak stops rotate locking collar to lock 2. Close valve (bail aft), verify detent button is up, fwd white line is visible, and rotate locking collar to lock 3. If applicable, close valve of appropriate QD in flowpath, verify detent button is up, and fwd white line is visible
	Q. Female QD leaks after demate	Fully mate to destination male as quickly as possible
	R. Male QD leaks after demate (male sleeve may be visibly stuck open)	<ol style="list-style-type: none"> 1. Remate female QD and open valve (bail fwd) <ol style="list-style-type: none"> a. Depress button and use significant force to push bail forward; release button b. With QD in open position (bail fwd) apply significant force to aft end of the female QD in back and forth, up and down directions c. Attempt to close valve (bail aft) d. Demate QD and inspect 2. If applicable, close valve of appropriate QD in flowpath, verify detent button is up, and fwd white line is visible 3. Install cap (1/4, 1/2, and 1 in only)
	S. Leak detected by MCC-H after valve ops (possible male sleeve stuck open)	<ol style="list-style-type: none"> 1. Cycle QD to open position (bail fwd) <ol style="list-style-type: none"> a. Depress button and use significant force to push bail forward; release button b. With QD in valve open (bail fwd) position apply significant force to aft end of the female QD in back and forth, up and down directions c. Attempt to close valve (bail aft) d. Demate QD and inspect 2. If applicable, close valve of appropriate QD in flowpath, verify detent button is up, and fwd white line is visible
	T. Frozen NH3 present on female or male QD	<ol style="list-style-type: none"> 1. Leave QD exposed to vacuum; wait maximum of 5 min for sublimation (check periodically) 2. On MCC-H GO: Continue QD ops

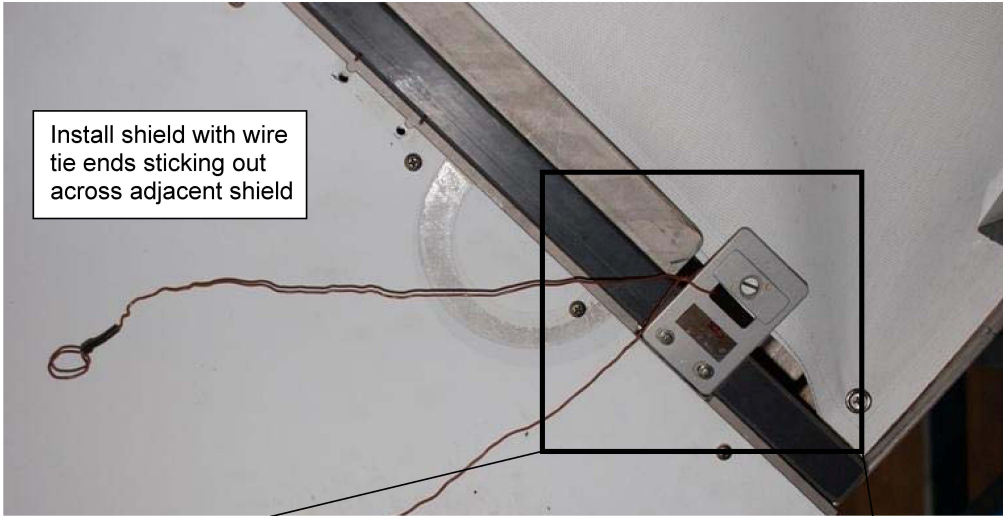
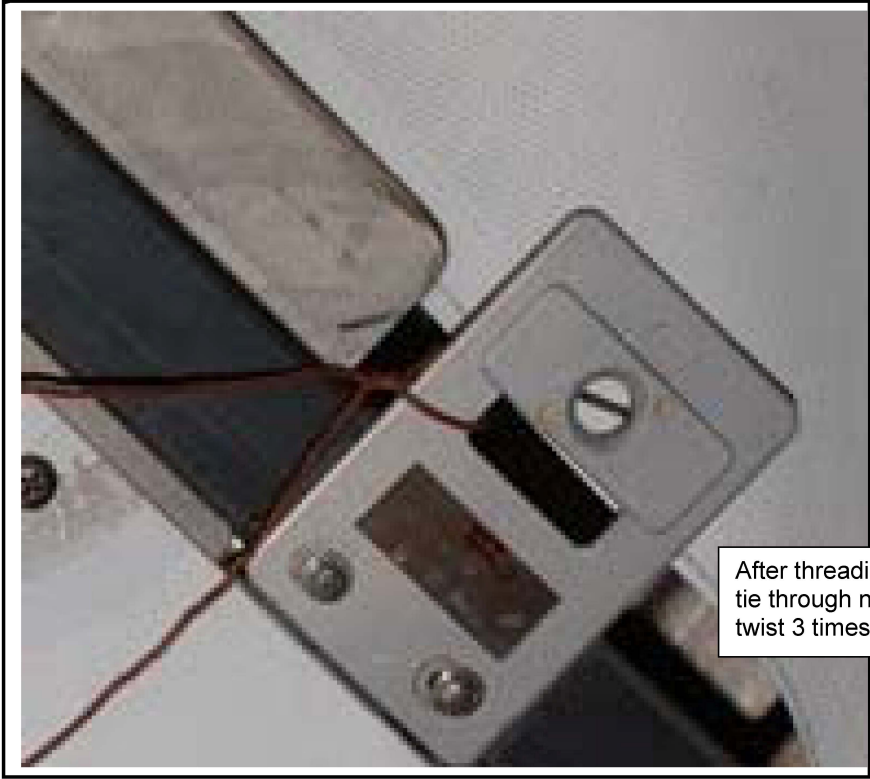
STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	<p>MMOD Shield</p> <p>A. MMOD shield Dzus fastener fails to release</p> <div style="border: 3px double black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">WARNING</p> <p>Do not touch back side of MMOD shield or handle fastener fragments due to sharp edges</p> <p>Fastener and shield/tool interface must be covered to avoid potential projectiles</p> </div>	<ol style="list-style-type: none"> 1. On MCC-H GO: Retrieve pry bar and emptied med ORU bag 2. Release other Dzus fasteners 3. Assess clearance between MMOD shield and tools 4. If possible, rotate fastener to position tangs off of tools 5. Place med ORU bag over failed fastener 6. Insert pry bar under MMOD shield by failed fastener and pry shield away from structure
	<p>B. MMOD shield Dzus fastener fails to engage</p>	<ol style="list-style-type: none"> 1. Verify center fastener is engaged first 2. Check Dzus fastener aligned with bracket (floating receptacles on endcones) 3. Verify fastener clocking correct per alignment mark 4. Push firmly and rotate 5. Engage other fasteners: 2 out of 3 required 6. If 2 of 3 not achieved: <ul style="list-style-type: none"> – Option 1 (Wire Tie) (See figures 2-4): 1 properly secured wire tie = 1 Dzus fastener; using a long wire tie, squish the loop on one end, feed it through the bracket on structure (may need to push floating receptacle inboard to get it out of way), secure wire tie w/3 twists. Feed one end of wire tie around Dzus head (on outside of shield) and secure with 3 twists. If HR nearby can also secure wire tie to HR. (Goal is for the wire tie to push shield in toward body of structure and toward center if endcone shield) – Option 2 (LDTDT): Use 1 adj (attach to tether point on T-tool and to structure HR) and 1 LDTDT across shield to hold shield in position
	<p>C. T-handle tool fails to engage shield</p>	<p>Remove adjacent fasteners and attempt reinstallation</p>
	<p>D. MLI grounding strap Dzus fails to release</p>	<p>On MCC-H GO: Cut ground wire near Dzus fastener</p>

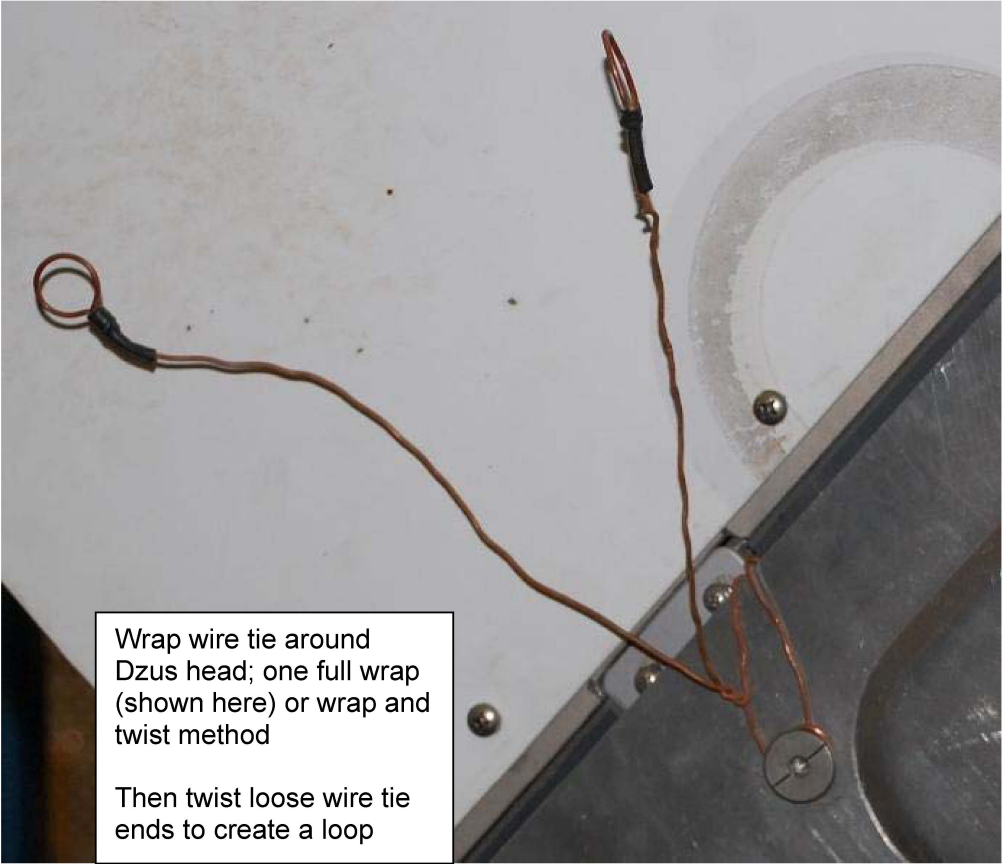
STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
		 <p>Will "squish" loop together a little Pre-EVA for easier access through nutplate</p> <p>Floating receptacle shifted towards center of Shield</p> <p>Wire Tie Inserted Thru "Window" on receptacle bracket</p> <p>Figure 2.- MMOD Shield Wire Tie Option.</p>

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	 <p>Install shield with wire tie ends sticking out across adjacent shield</p>	 <p>After threading wire tie through nutplate, twist 3 times</p> <p>Figure 3.- MMOD Shield Wire Tie Option. (Cont)</p>

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
		 <p>Wrap wire tie around Dzus head; one full wrap (shown here) or wrap and twist method</p> <p>Then twist loose wire tie ends to create a loop</p> <p>Figure 4.- MMOD Shield Wire Tie Option. (Cont)</p>

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	MUT EE	
	A. MUT EE jaws fail to release	<ol style="list-style-type: none"> 1. Verify locking collar fully released 2. Shake MUT EE while depressing paddles to alleviate sideloads from handrail 3. Release MUT EE ECOM socket and tether MUT EE to structure
	MWS	
	A. MWS EE is sticky	Known problem. Report degree of stickiness to MCC-H and any noted correlation with thermal environment. Post EVA, report s/n of affected unit (s/n located on "stem" of T-bar)
	B. MWS EE cord fails to retract	<ol style="list-style-type: none"> 1. Verify MWS EE tether lock in unlock position 2. Cycle MWS EE tether lock 3. Check tether reel opening for FOD 4. Pull out small amount of tether and allow reel to retract while holding light tension on the tether
	C. MWS T-bar fails to pivot	<ol style="list-style-type: none"> 1. Check sideloads on T-bar while depressing button 2. Slip T-bar clutch (40-60 lb force required)
	NZGL Connectors	
	A. Bail bar fails to slide over-center	<ol style="list-style-type: none"> 1. Inspect bail for FOD 2. Inspect bail linkage for damage and report to MCC-H 3. Check alignment and sideloads 4. Verify sufficient TA clamps are open 5. Increase force on bail 6. Attach 2 hooks from adj tether to connector bail and use adj strap to pull bail into demated position 7. On MCC-H GO: Retrieve vise grips to help increase force on bail
	B. Backshell fails to slide (after over-center mechanism has been overcome)	<ol style="list-style-type: none"> 1. Verify sufficient TA clamps are open 2. Check for cable harness and hardware interference 3. Check alignment and sideloads 4. Inspect bail and connector for FOD 5. Inspect bail linkage for damage and report to MCC-H 6. Wiggle/jiggle connector while pushing or pulling on backshell 7. Attach 2 hooks from adj tether to connector bail and use adj strap to pull bail into demated position 8. On MCC-H GO: Retrieve vise grips to help increase force on bail

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	C. Connector fails to release from soft dock	<ol style="list-style-type: none"> 1. Verify bail fully thrown, undamaged, and backshell fully aft 2. If backshell springs forward, pull and hold in fully aft position (will have to overcome spring force, approx 5-10 lb) while attempting to demate connector 3. Verify sufficient TA clamps are open 4. Check for cable harness and hardware interference 5. Check alignment and sideloads 6. Relieve compression on connector interface due to cable loads by pulling backshell away from jack 7. Push the plug towards the jack to compress the soft dock 8. Wiggle/jiggle connector. (Use slight rolling motion)
	D. Connector fails to soft dock	<ol style="list-style-type: none"> 1. Verify correct plug and jack 2. Verify bail fully aft 3. Verify backshell fully aft and remains fully aft. If backshell not fully aft, pull and hold in fully aft position while attempting to soft dock connector 4. Inspect the following: <ul style="list-style-type: none"> – O-ring seal – FOD – Bend radius – Soft dock springs – Connector keying feature 5. Verify alignment (avoid excessive rolling or rocking the plug as this could unseat soft dock springs) <ul style="list-style-type: none"> – Connector should snap into soft dock with little force once half shells are aligned
	E. Connector fails to mate	<ol style="list-style-type: none"> 1. Verify half-shells are fully seated on both sides 2. Verify cable and backshell free to move (no clamps) 3. Push forward on connector backshell while actuating bail 4. Detach from soft dock and inspect: <ul style="list-style-type: none"> – Pins – FOD – EMI band – Bend radius – TA clamps – P clamps – Bail linkages and rivets – Soft dock springs – O-ring seal and main joint gasket – Connector keying feature 5. Cycle bail while disconnected (push forward on connector backshell for additional leverage)

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	F. Connector pin bent	<ol style="list-style-type: none"> 1. Rotate connector to bail up position and describe pin location and condition – Obtain WVS view of interface if possible 2. On MCC-H GO: For 16, 20, or 22 gauge pins only, retrieve pin straightener and attempt pin repair 3. On MCC-H GO: Retrieve needle nose pliers and attempt pin repair – MCC-H will verify pin size prior to retrieving tools 4. Inspect plug and jack prior to re-mating
	G. Connector FOD	<ol style="list-style-type: none"> 1. On MCC-H GO: Retrieve connector cleaner tool <p style="text-align: center;"><u>NOTE</u></p> <p>One N2 cartridge is already captured in the tool (the other is lanyarded inside the caddy). In order to puncture the cartridge, it must be threaded into the tool until the indicator line passes out of sight under the collar of the tool.</p> <p>Puncture connector cleaner cartridge only when ready to perform actual cleaning.</p> <p>Use entire N2 cartridge prior to reentering airlock</p> <ol style="list-style-type: none"> 2. Attempt cleaning
	H. Connector EMI band bent	<p>On MCC-H GO: Retrieve needle nose pliers or forceps to remove band – Bail may need to be pushed forward while demated to expose EMI band for removal</p>
	I. Connector bail linkage failure	<ol style="list-style-type: none"> 1. On MCC-H GO: Reattempt connector mate/demate with broken bail – Impart load through undamaged side of bail linkage – Assist bail motion with hand on backshell once bail linkage has passed over-center – May take multiple pushes on the bail to mate/demate connector 2. Tether hook or vise grips may be used for additional leverage
	J. Connector soft dock spring bent	<p>On MCC-H GO: Retrieve needle nose pliers and remove bent spring</p>
	K. Connector O-ring or main joint gasket seal loose (seal and O-ring required in 1-G only)	<ol style="list-style-type: none"> 1. Remove seal with tether hook 2. On MCC-H GO: Retrieve additional tools to remove seal (Ex: Wire tie, needle nose pliers, probe, loop pin puller)
	L. Connector cap (Twist) will not release	<ol style="list-style-type: none"> 1. Increase force 2. Use tether hook for additional leverage 3. On MCC-H GO: Attach equip hook to cap tether point and use strap of adj tether to release cap

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	On-Orbit Installed HR	
	A. HR will not install in seat track or fails to soft dock	<ol style="list-style-type: none"> 1. Verify HR installed in correct direction per arrow on underside of HR 2. Verify HR shoes are completely released and soft dock armed 3. Check for FOD on HR and seat track 4. Verify HR bolt completely released: PGT [A1 (2.5), CCW2, 30.5], 7/16 - 6-ext 5. If HR in seat track but soft dock will not engage, attempt to drive HR bolts 6. On MCC-H GO: Depending on HR priority, attempt to install 180 out or a different HR at this location
	B. HR bolt fails to fully engage	<ol style="list-style-type: none"> 1. If torqued, remove HR: PGT [A2 (3.8), CCW2, 30.5], 7/16 - 6-ext – To break torque PGT [A1 (2.5), CCW2, 30.5], 7/16 - 6-ext – For removal – Check for FOD on HR and seat track and reinstall using original torque 2. Increase PGT setting: PGT [A3 (4.8), CW2, 30.5], 7/16 - 6-ext 3. On MCC-H GO: Depending on HR priority, attempt to install 180 out or a different HR at this location
	On-Orbit Installed WIF	
	A. WIF fails to soft dock	<ol style="list-style-type: none"> 1. Check for FOD and structural interference, cycle soft dock pins; reattempt installation 2. Verify WIF is co-planar 3. Install a different WIF at this location 4. On MCC-H GO: Attempt installation of WIF in a different location 5. Return WIF inside
	PAD	
	A. Release knob fails to rotate open	<ol style="list-style-type: none"> 1. Verify knob in release position (J-hook not locked) 2. Attempt to rotate knob using ratchet on knob's 7/16 in hex stud 3. Release contingency release bar captive bolts (2) PGT [A6 (8.3), CCW2, 30.5], 7/16 - 6 ext 5 turns (Verify hook released from striker bar)
	PGT	
	A. No LEDs	<ol style="list-style-type: none"> 1. Perform LED test 2. Use display torque
	B. LEDs and torque messages do not agree	Use torque message and notify MCC-H
	C. Mode switch breaks	Retrieve spare PGT

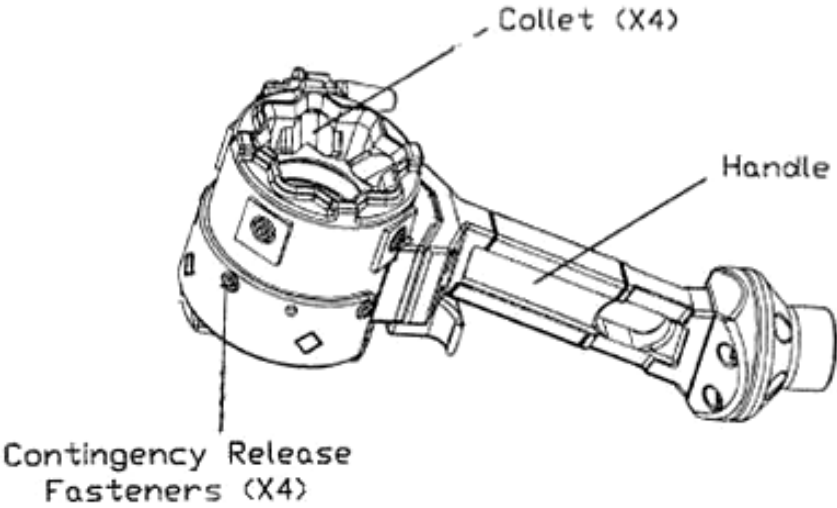
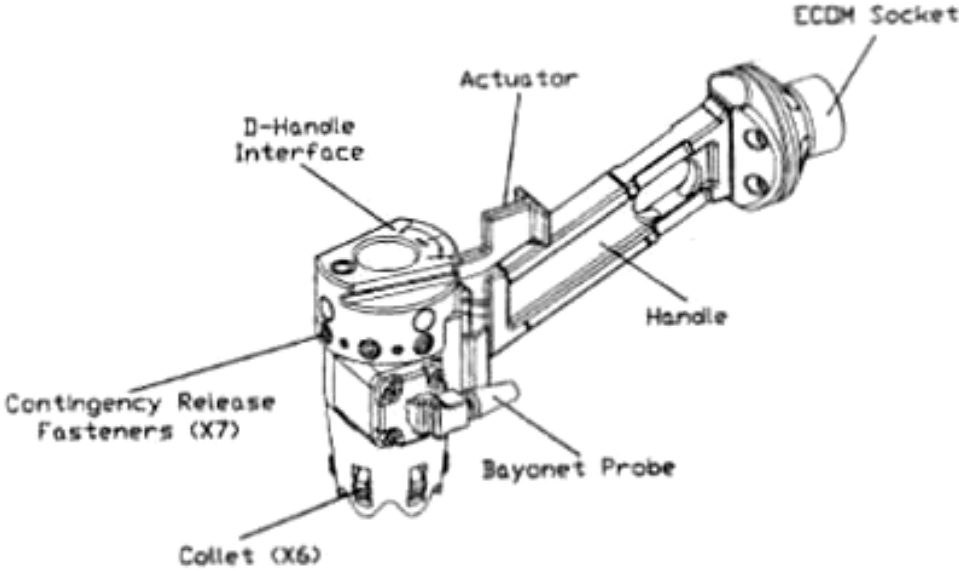
STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	LCD Messages	
	D. BATTERY HITEMP	<ol style="list-style-type: none"> 1. Power off PGT 2. If alternate battery available; change battery 3. Retrieve spare PGT 4. Switch to ratchet mode
	E. BATTERY LOTEMP (blinking)	<ol style="list-style-type: none"> 1. Drive tool with no load to increase battery temperature 2. If alternate battery available; power off and change battery 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	F. BATTERY LOVOLT (blinking)	<ol style="list-style-type: none"> 1. Continue using tool until unable to deliver sufficient torque 2. Retrieve spare PGT 3. Power off and switch to ratchet mode
	G. CAL FAILED	<ol style="list-style-type: none"> 1. Press, release trigger to repeat calibration 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	H. COLLAR ERROR	<ol style="list-style-type: none"> 1. Cycle torque and speed collars to clear error 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	I. COMPAR ERROR	<ol style="list-style-type: none"> 1. Cycle torque collar and A/B mode switch 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	J. EEPROM WR ERR (blinking) HYBRID HITEMP OVER CURR SLFTST FAIL X	<ol style="list-style-type: none"> 1. Power cycle and calibrate 2. Retrieve spare PGT 3. Power off and switch to ratchet mode
	K. HI TORQ	<ol style="list-style-type: none"> 1. Contact MCC-H and report torque. (Real time engineering assessment required) 2. On MCC-H GO: Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	L. HICURR	<ol style="list-style-type: none"> 1. Reattempt operation – Can be caused by excessive rotation of the PGT body while torquing 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	M. LO TORQ (Expected during bolt release)	<ol style="list-style-type: none"> 1. Reattempt operation until desired torque is reached 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	N. LOCURR	<ol style="list-style-type: none"> 1. Reattempt operation 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode

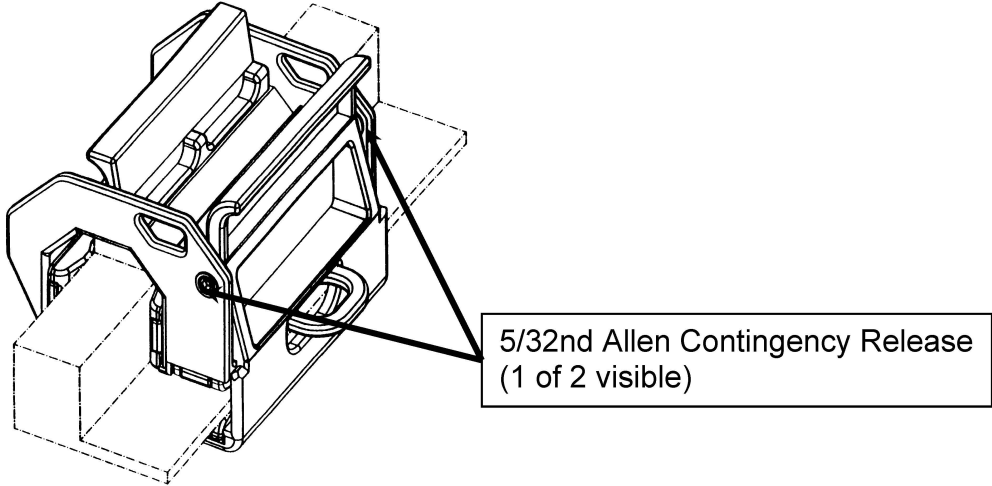
STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	O. LOG IS FULL (blinking)	<ol style="list-style-type: none"> 1. Cycle torque and speed collars to clear message 2. Continue operation
	P. MOTOR HITEMP	<ol style="list-style-type: none"> 1. Power off PGT 2. Retrieve spare PGT 3. Switch to ratchet mode
Safety Tether		
	A. Safety tether fails to retract/tend	<ol style="list-style-type: none"> 1. Verify reel is unlocked 2. Verify tether reel and/or cable guide (for 85-ft tethers) is clear of FOD 3. Pull out small amount of cable and allow reel to retract while holding light tension on the cable 4. Tap side of reel housing during retraction 5. Report ID # of faulty tether to MCC-H and use alternate safety tether 6. Coil safety tether to bring inside 7. For 85-ft tether. On MCC-H GO: If coiling tether is not practical, release level wind mechanism bypass on back of safety tether (red indicator will show around edge of bypass once released) <p style="text-align: center;"><u>NOTE</u></p> <p>Once level wind has been released cable guide will likely be frozen in place. This will limit the amount of tether that can be successfully retracted into the tether housing and may require coiling of excess tether.</p> <p>Level wind release will require safety tether be returned for ground servicing.</p> <p>If tether fails to retract due to thermal issue, normal tether function may return after tether brought IVA</p>
	B. Safety tether red stripe showing (any length)	<p>Safety tether cannot be used</p> <ul style="list-style-type: none"> – Report ID # of faulty tether to MCC-H – Use alternate safety tether
	C. Crew hook fails	<ol style="list-style-type: none"> 1. On load alleviating end: Use waist tether to replace alleviating strap <ul style="list-style-type: none"> – Report ID # of faulty tether to MCC-H – Retrieve replacement safety tether 2. On anchor end: Report ID # of faulty tether to MCC-H and use an alternate safety tether
Scoops		
	A. Scoop will not release from fitting	<ol style="list-style-type: none"> 1. If actuator will not pull back while in locked position, tap actuator with tool to release 2. On MCC-H GO: Leave scoop in place 3. On MCC-H GO: Remove non-captive contingency screws; 5 turns. Stow in trash bag PGT [A1 (2.5), CCW2, 30.5], 5/32 allen drive <ul style="list-style-type: none"> – Square Scoop: 4 screws (figure 5) – Round Scoop: 7 screws (figure 6)

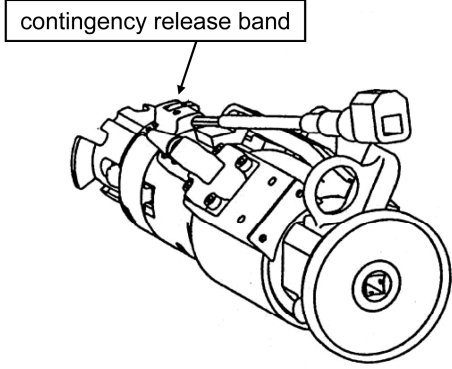
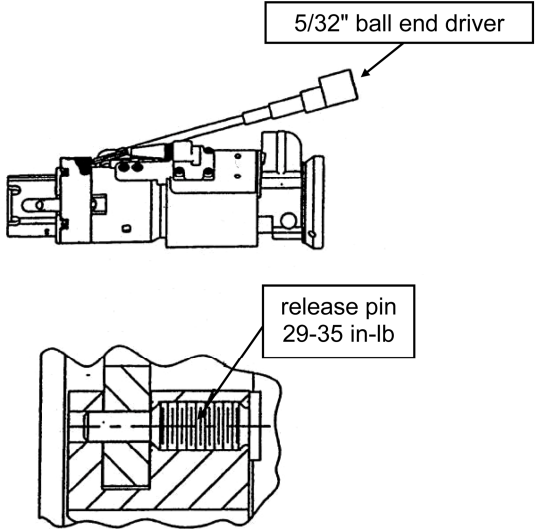
STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
		 <p>Figure 5.- Square Scoop.</p>  <p>Figure 6.- Round Scoop.</p>

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

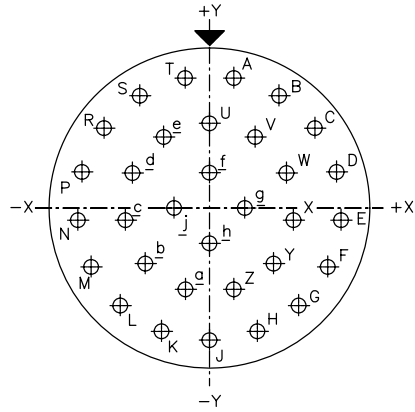
TASK	FAILURE	ACTION
Socket Caddy		
	A. Socket fails to release from socket caddy	<ol style="list-style-type: none"> 1. Verify PIP pin fully inserted into drop proof tether interface on socket 2. Reattempt using a different PIP pin
TA Clamp		
	A. TA clamp fails to release	<ol style="list-style-type: none"> 1. With handle up, press down on top of rounded clamp 2. With handle up, use tether hook to pry drawhook from capture pin
Tether Shuttle		
	A. Tether shuttle will not release from CETA/MT rail	<ol style="list-style-type: none"> 1. Verify slider in unlock and no obstructions to paddle actuation 2. Verify safety tethered to structure and safety tether removed from tether shuttle anchor point 3. On MCC-H GO: Remove non-captive screws (2) at hingeline to release nadir section with slide lock (not captive) (figure 7). TBD turns. Stow screws in trash bag PGT [A1 (2.5), CCW1, 30.5], 5/32 allen drive
 <p>Figure 7.- Tether Shuttle.</p>		
Torque Multiplier		
	A. TM will not release from fitting	<ol style="list-style-type: none"> 1. Place TM anti-backlash in neutral, if unable: PGT [RCW, 30.5] – Apply cw torque while pushing anti-backlash button to neutral. Reattempt removal 2. If able to lift TM off of bolt, attempt to rock off of fitting (Square TM only) 3. On MCC-H GO: Release TM contingency release band pin 20 turns (do not exceed 28 turns) (figure 8): PGT [A1 (2.5), CCW2, 30.5], 5/32 ball end driver – When band springs open remove TM

STS-131/19A WORKAROUNDS CRIBSHEET (Cont)

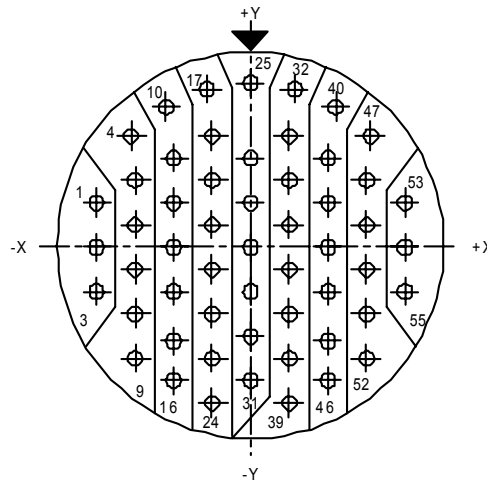
TASK	FAILURE	ACTION
	 <p>contingency release band</p>	 <p>5/32" ball end driver</p> <p>release pin 29-35 in-lb</p> <p>Figure 8.- Torque Multiplier.</p>
TSA		
	A. Latch fails to open	Release 7/16 EVA bolt on latch bracket; rotate bracket clear of latch PGT [A2 (3.8), CCW2, 30.5], 7/16 - 6 ext 1-2 turns
	B. Latch fails to close	Close remaining latches (3 of 4 required for landing)

CONNECTOR PIN MAPS

ATA Connectors



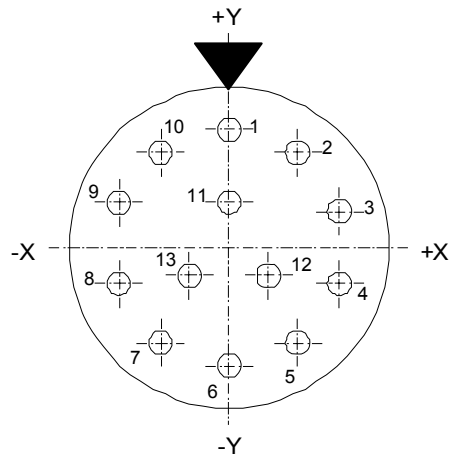
ATA P634 to J1 – Size 19 – 32 Pins Gauge 20



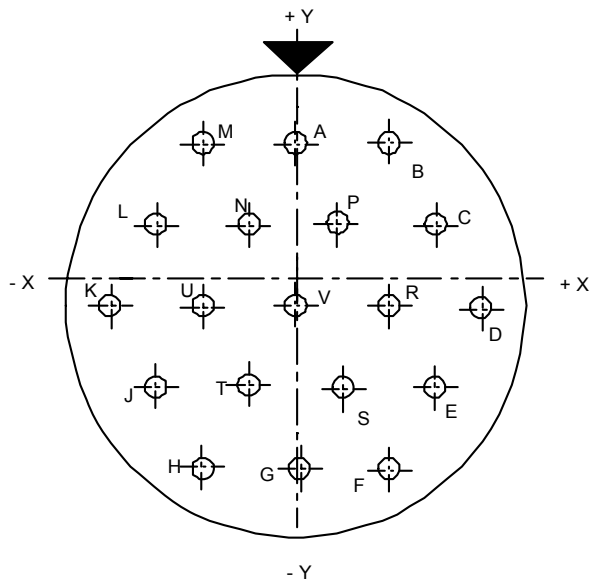
ATA P635 to J2 – Size 17 – 55 Pins Gauge 22

CONNECTOR PIN MAPS (Cont)

RGA Connectors



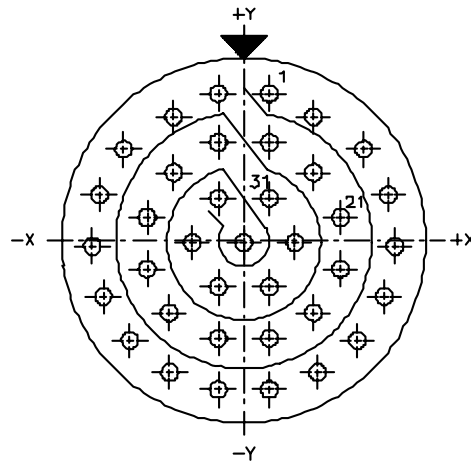
RGA P671 to J671 – Size 11 – 13 Pins Gauge 22



RGA P673 to J673 – Size 15 – 19 Pins Gauge 20

CONNECTOR PIN MAPS (Cont)

ETVCG Luminaire Connector

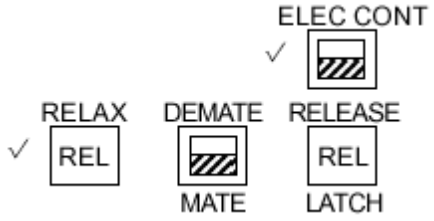
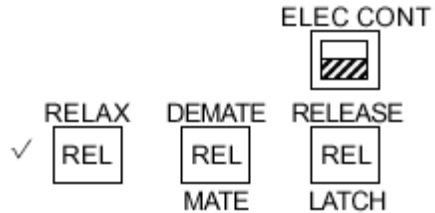


ETVCG Luminaire Connector Map – Size 15 – 37 Pins Gauge 22

RELEASE ROEU LATCHES

IV	EV
<div style="border: 1px solid black; padding: 5px; margin-bottom: 20px;"> <p style="text-align: center;"><u>CAUTION</u> After step 1, 2 hr LCS Thermal Clock starts</p> </div> <div> <p>R1 SSP1 A15</p> <ol style="list-style-type: none"> 1. <u>DEADFACE ROEU</u> <ul style="list-style-type: none"> √PRI PL MNC – OFF (tb-OFF) √MPLM CH 1,2 HTR PWR – OFF (tb-bp) APCU 1,2 CONV (two) – OFF 1 OUTPUT – OFF 2. <u>ROEU SAFING</u> <ul style="list-style-type: none"> √PL BAY MECH PWR SYS 1,2 (two) – OFF √RETEN LOGIC PWR SYS 1,SYS 2 (two) – OFF PL SEL – 1 <p style="margin-top: 40px;">Give EV GO to release ROEU</p> </div>	<p>Tools reqd: Ratchet with 3-in Ext (Airlock)</p> <div style="border: 3px double black; padding: 10px; margin: 20px auto; width: fit-content;"> <p style="text-align: center;"><u>WARNING</u> For release, do not close access cover until ROEU stowed. Latches may not snap back to closed posn</p> </div> <ol style="list-style-type: none"> 1. On IV GO, open latch drive access cover: <ul style="list-style-type: none"> Break safety cord, release access cover (3/4 turn ccw) Open access cover (~120°) <p>Manual drive to RELEASE:</p> <ul style="list-style-type: none"> Rotate control lever to RELEASE Rotate latch drive cw (~9 ft-lb) to hard stop (~3/4 turn) Remove drive ratchet, clear worksite

RELEASE ROEU LATCHES (Cont)





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

RELEASE ROEU LATCHES (Cont)

IV	EV
<p>A15</p> <p>4. <u>ENABLE POWER</u> √APCU 2 OUTPUT – ON APCU 2 CONV – ON</p> <p>5. End Thermal Clock ____:____</p>	<p>2. Reengage latch actuator: Rotate control lever to neutral posn Close, secure access cover (3/4 turn cw) Clear worksite</p>

LATCH ROEU LATCHES

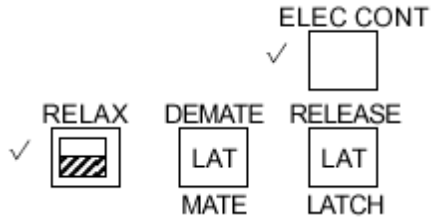
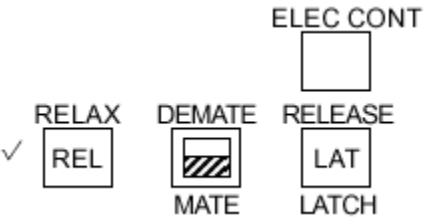
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IV		EV
<p>A6U</p> <p>R13L A6U</p> <p>CRT</p> <p>A6U</p> <p>R1 SSP1 A15</p>	<p>1. <u>CONFIGURE FOR ROEU MATE</u> Install <u>ROEU A6U PANEL OVERLAY</u></p> <p>√PL BAY MECH PWR SYS 1,2 (two) – OFF RETEN LOGIC PWR SYS 1, SYS 2 (two) – OFF PL RETEN PL SEL – 2</p> <p style="border: 1px solid black; padding: 2px; display: inline-block;">SM 97 PL RETENTION</p> <p>√LAT 1,2,3 (six): 0</p> <p>* If LATCH 2,3 LAT msw shows 1, drive latch for * * single motor time *</p> <div style="text-align: center;"> <p>ELEC CONT</p> <p>✓ </p> <p>RELAX DEMATE RELEASE</p> <p>✓   </p> <p> MATE LATCH</p> </div> <p>√PRI PL MNC – OFF (tb-OFF) √MPLM CH 1,2 HTR PWR – OFF (tb-bp) APCU 1,2 CONV (two) – OFF 1 OUTPUT – OFF</p>	<p>Tools reqd: Ratchet with 3-in Ext (Airlock)</p>

LATCH ROEU LATCHES (Cont)

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

LATCH ROEU LATCHES (Cont)

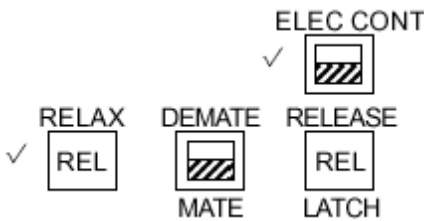
IV	EV
<p>A6U 4. <u>VERIFY TALKBACKS</u> PL RETEN PL SEL – 2</p> <div style="text-align: center;">  <p>ELEC CONT ✓ <input type="checkbox"/></p> <p>RELAX <input checked="" type="checkbox"/> DEMATE <input type="checkbox"/> RELEASE <input type="checkbox"/> LAT MATE LAT LATCH</p> </div> <p>R13L 5. <u>RELAX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

STOW ROEU ARM

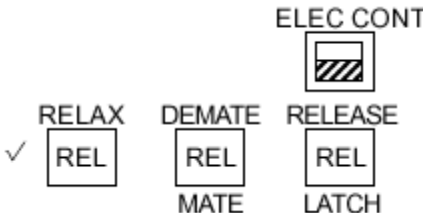
I

IV	EV
<p style="text-align: center;">CAUTION After step 1, 2 hr LCS Thermal Clock starts</p> <p>1. <u>RELEASE ROEU LATCHES</u></p> <p>R1 √PRI PL MNC – OFF (tb-OFF) SSP1 √MPLM CH 1,2 HTR PWR – OFF (tb-bp) A15 APCU 1,2 CONV (two) – OFF 1 OUTPUT – OFF</p> <p>A6U Install <u>ROEU A6U PANEL OVERLAY</u></p> <p>√PL RETEN LAT (five) – OFF PL SEL – 2</p> <p style="text-align: center;">SM 97 PL RETENTION</p> <p>√REL 2,3 (four) – 0</p> <p>* If LATCH 2,3 REL msw shows 1, drive latch for * * single motor time *</p> <div style="text-align: center;"><p>ELEC CONT</p><p>✓ <input type="checkbox"/></p><p>RELAX DEMATE RELEASE</p><p>✓ <input type="checkbox"/> REL <input checked="" type="checkbox"/> MATE <input type="checkbox"/> LAT</p><p> MATE LATCH</p></div>	<p>Tools reqd: Ratchet with 3-in Ext (Airlock)</p>





STOW ROEU ARM (Cont)

	IV	EV
<p>R13L</p> <p>2. <u>RELEASE LATCHES</u> PL RETEN LOGIC PWR SYS 1,2 (two) – ON BAY MECH PWR SYS 1,2 (two) – ON</p> <p>Note single motor time (> 20 sec)</p> <p>RELEASE/LATCH – REL (tb-REL), 40 sec max – OFF</p> <div style="text-align: center;">  <p>The diagram shows a control panel with four columns of buttons. The top row contains 'RELAX REL', 'DEMATE MATE', 'ELEC CONT', and 'RELEASE REL LATCH'. The 'RELAX REL' button has a checkmark to its left. The 'DEMATE MATE' button has a hatched square icon above it. The 'ELEC CONT' button has a checkmark above it and a hatched square icon to its right. The 'RELEASE REL LATCH' button has a hatched square icon above it.</p> </div> <p>R13L A6U</p> <p>3. <u>ROEU SAFING</u> PL BAY MECH PWR SYS 1,2 (two) – OFF PL RETEN LOGIC PWR SYS 1, SYS 2 (two) – OFF PL SEL – 1</p> <p>Give EV GO to stow ROEU</p>	<p>1. On IV GO, open arm drive access cover: Break safety cord, release access cover (3/4 turn ccw) Open access cover (~120°) Manual drive to STOW: Rotate control lever to STOW Rotate arm drive ccw (~23 ft-lb) to hard stop and pull arm inboard to verify Remove drive ratchet</p>	

STOW ROEU ARM (Cont)

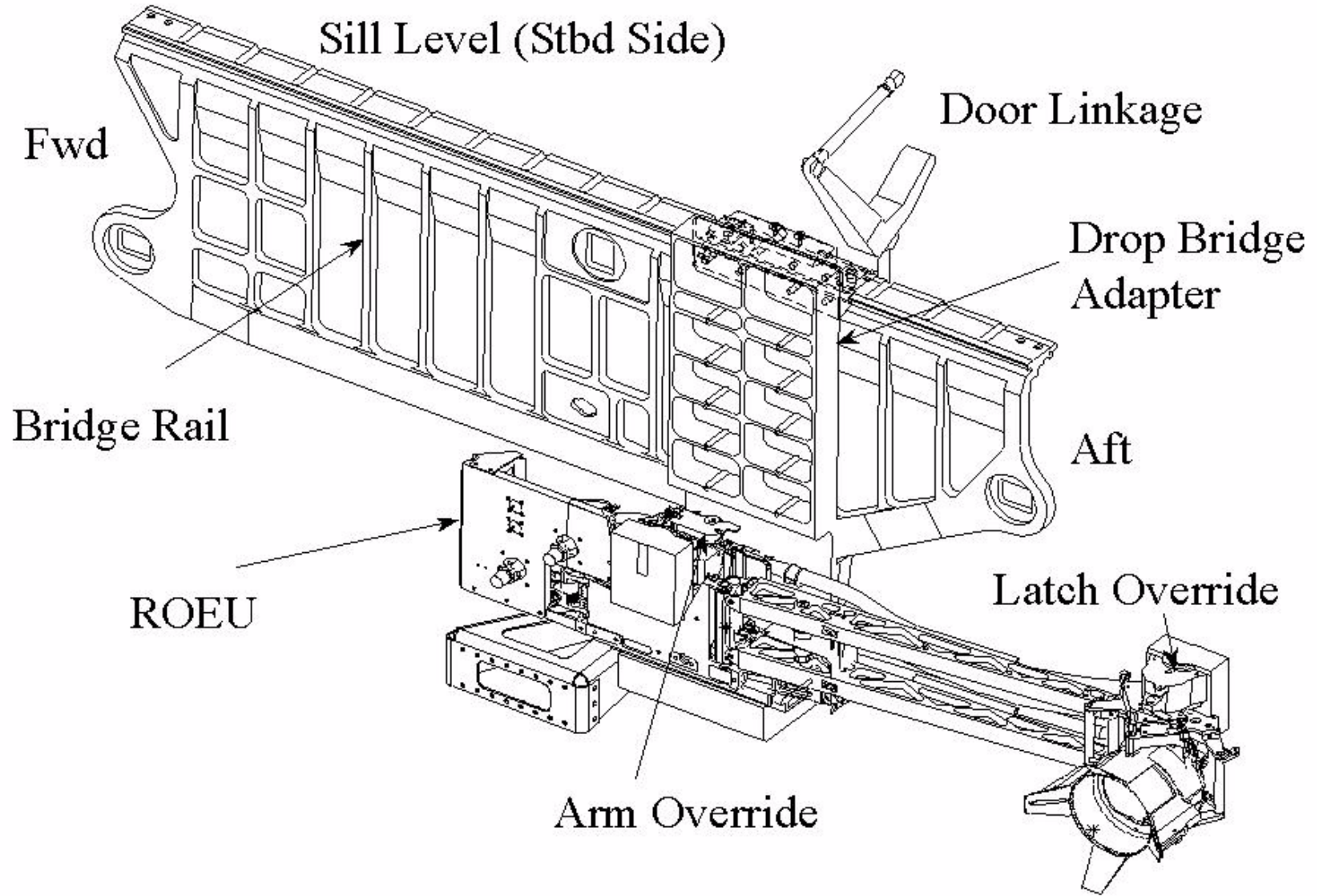
IV	EV
<p>A6U</p> <p>4. <u>VERIFY TALKBACKS</u> PL RETEN PL SEL – 2</p> <div style="text-align: center;"> <p>ELEC CONT</p>  </div> <p>A15</p> <p>5. <u>ENABLE POWER</u> √APCU 2 OUTPUT – ON APCU 2 CONV – ON</p> <p>6. End Thermal Clock ____:____</p>	<p>2. Reengage arm actuator: Rotate control lever to neutral posn Close, secure access cover (3/4 turn cw) Clear worksite</p>

MATE ROEU ARM

IV		EV
<p>A6U</p> <p>1. <u>CONFIGURE ROEU</u> Install <u>ROEU A6U PANEL OVERLAY</u></p> <p>2. <u>ROEU SAFING</u> R13L √PL BAY MECH PWR SYS 1,2 (two) – OFF A6U √RETEN LOGIC PWR SYS 1,SYS 2 (two) – OFF PL SEL – 1 SSP 1 √MPLM CH 1,2 HTR PWR – OFF (tb-bp) A15 APCU 1,2 CONV (two) – OFF 1 OUTPUT – OFF R1 PRI PL MNC – OFF (tb-OFF)</p> <p>Give EV GO to mate ROEU</p> <p>3. <u>VERIFY TALKBACKS</u> PL RETEN PL SEL – 2</p> <div style="text-align: center;"> <p>ELEC CONT</p>  <p>RELAX DEMATE RELEASE</p>    <p>MATE LATCH</p> </div>	<p>Tools reqd: Ratchet with 3-in Ext (Airlock)</p> <p>1. On IV GO, open arm drive access cover: Break safety cord, release access cover (3/4 turn ccw) Open access cover (~120°) Manual drive to MATE: Rotate control lever to MATE Ratchet arm drive cw (~25 ft-lb) until “READY TO LATCH” posn indicated on interface guide Remove drive ratchet Clear worksite (for latching)</p>	

MATE ROEU ARM (Cont)

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



MANUAL GN2 VENT

IV	EV2 – Anderson
<ol style="list-style-type: none"> 1. Verify with MCC-H GO to perform GN2 vent of M2; duration per MCC 2. Verify with MCC-H GO to perform GN2 vent of M1; duration per MCC 	<p><u>EVA SETUP</u></p> <ol style="list-style-type: none"> 1. Perform all ATA QD demates, <u>EVA 1</u> 2. Install caps on FQDs (2) M3 and M4 3. Retrieve 1/4" NH3/N2 vent tool from either Fluid QD bag and route vent tool with nozzle aimed away from structure and crew in direction per MCC-H <div style="border: 3px double black; padding: 5px; text-align: center; margin: 10px 0;"> <p><u>WARNING</u> Do not open vent tool valve until nozzle is routed and EV crew is clear of vent region</p> </div> <ol style="list-style-type: none"> 4. Mate vent tool per BLOCK D to M2 5. When EV clear of vent region, open valve per BLOCK E. Vent duration per MCC expect ~10 min 6. When venting is complete, close valve per BLOCK B 7. Demate per BLOCK C 8. Mate vent tool per BLOCK D to M1 9. Open valve per BLOCK E. Vent duration per MCC expect ~10 min 10. When venting is complete, close valve per BLOCK B 11. Demate vent tool per BLOCK C and return tool to Fluid QD bag 12. Return to EVA 1 procedure

CAUTION	
Avoid contact with the following:	
1.	ACU radiator surface [silver Teflon film (white in color)].
2.	CLA and CLPA radiator surface [silver Teflon film (white in color)].
3.	VDU radiator surface [silver Teflon film (white in color)].
4.	JEU radiator surface (Z93 paint).

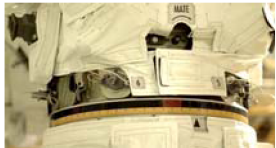

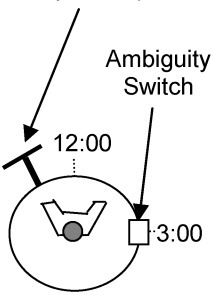
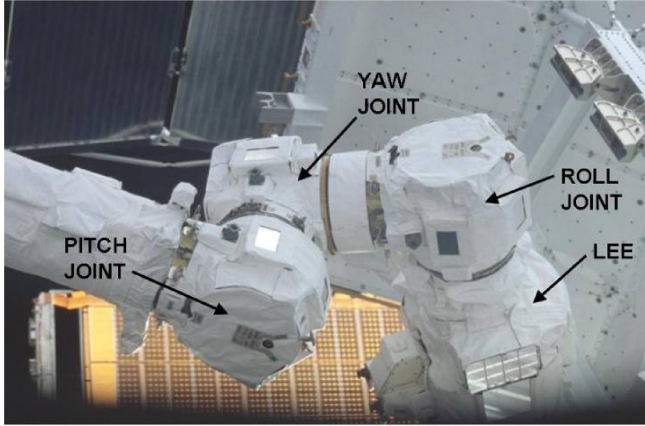
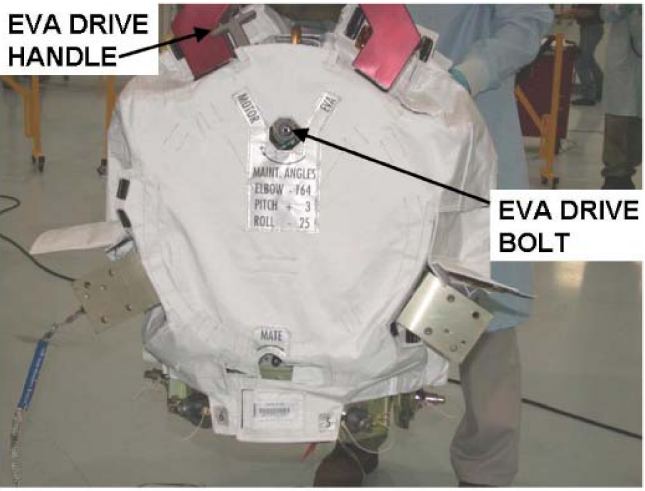
NOTE

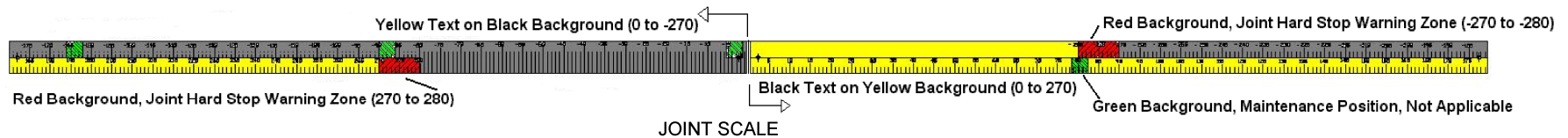
1. Gear ratio: 3.26 EVA Drive turns/1 degree of joint movement.
2. CW input to the EVA drive will produce CCW motion of the joint.
3. Starting from LEE, the order of the joints: roll, yaw, pitch.
4. The signs of the logical (indicated on RWS or PCS) and physical (indicated on EVA scale) angles are reversed for the shoulder roll, shoulder yaw, and wrist roll joint (i.e., +73.2 logical = -73.2 physical) regardless of which end is base.
5. Scale and Ambiguity Switch: Since the SSRMS joints can be rotated more than 360 degrees, there is an ambiguity switch that tells the crewmember whether to use the positive or negative scale.

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 degrees 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 "+", the crew should read off the yellow scale (black text on yellow background). If the switch points to "-", the crew should read off the black scale (yellow text on black background).

EVA Drive handle is on back side of joint (away from LEE), and scale triangle is across from it towards the LEE side.

SSRMS JOINT DRIVE (Cont)

IV/RMS	EV1	REFERENCE
<p>SSRMS EVA JOINT DRIVE POSITION</p> <p>IV</p> <ol style="list-style-type: none"> Record ambiguity sensor reading and joint angle: _____ Monitor SSRMS joint angle. Report position to EV1. Give EV1 STOP when joint angle is at desired position.  <p>Joint Scale and Black Triangle</p>  <p>Ambiguity Switch</p>  <p>EVA Drive Handle (at motor position)</p> <p>Ambiguity Switch</p> <p>12:00</p> <p>3:00</p> <p>Back Side of Joint</p>	<ol style="list-style-type: none"> Translate to failed joint. If required for body stabilization, install square scoop on joint micro fitting and attach BRT. <p>INITIAL POSITION VERIFICATION</p> <ol style="list-style-type: none"> 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 degrees CW from EVA drive, toward front side of joint) <p>JOINT EVA DRIVE</p> <ol style="list-style-type: none"> Press button and move EVA Drive Handle to EVA. <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>NOTE</p> <p>Joint will rotate in opposite direction of PGT.</p> </div> <ol style="list-style-type: none"> PGT[A1 2.5 ft-lb, CW2 or CCW2 30 RPM (as required), MTL 2.5]-6 ext 7/16: Drive EVA bolt in ± direction _____ turns to specified 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. Press button and move EVA Drive Handle to MOTOR. If used, retrieve square scoop. 	<p>REFERENCE</p>  <p>YAW JOINT</p> <p>ROLL JOINT</p> <p>PITCH JOINT</p> <p>LEE</p>  <p>EVA DRIVE HANDLE</p> <p>EVA DRIVE BOLT</p>



SSRMS JOINT DRIVE (Cont)

TASK DATA

Table 1. Tools

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

Table 2. 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	1.25	2.5		30

Foot Restraints: N/A

SSRMS JOINT DRIVE (Cont)

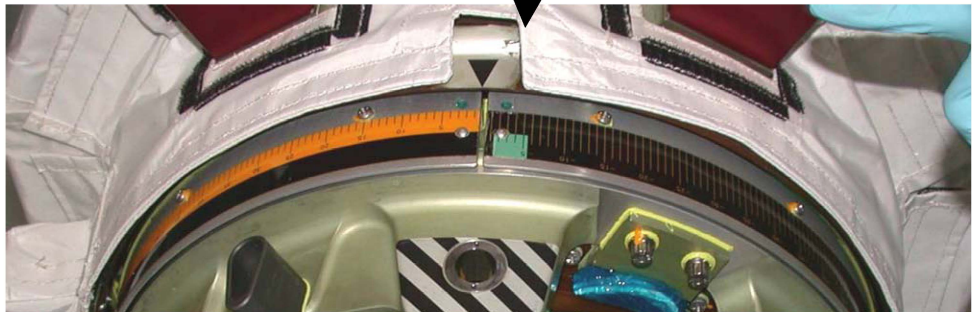
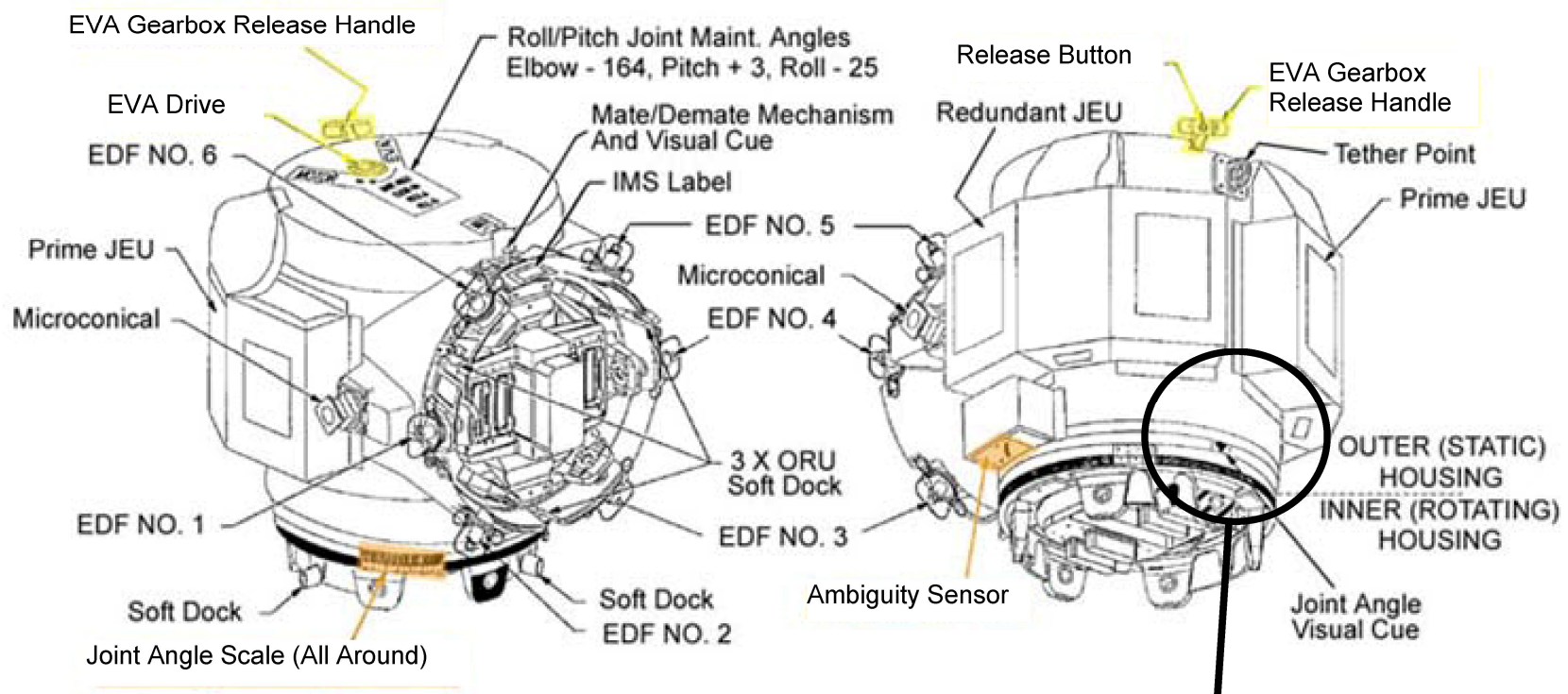


Figure 1.- Roll/Pitch Joint ORU.

SSRMS JOINT DRIVE (Cont)

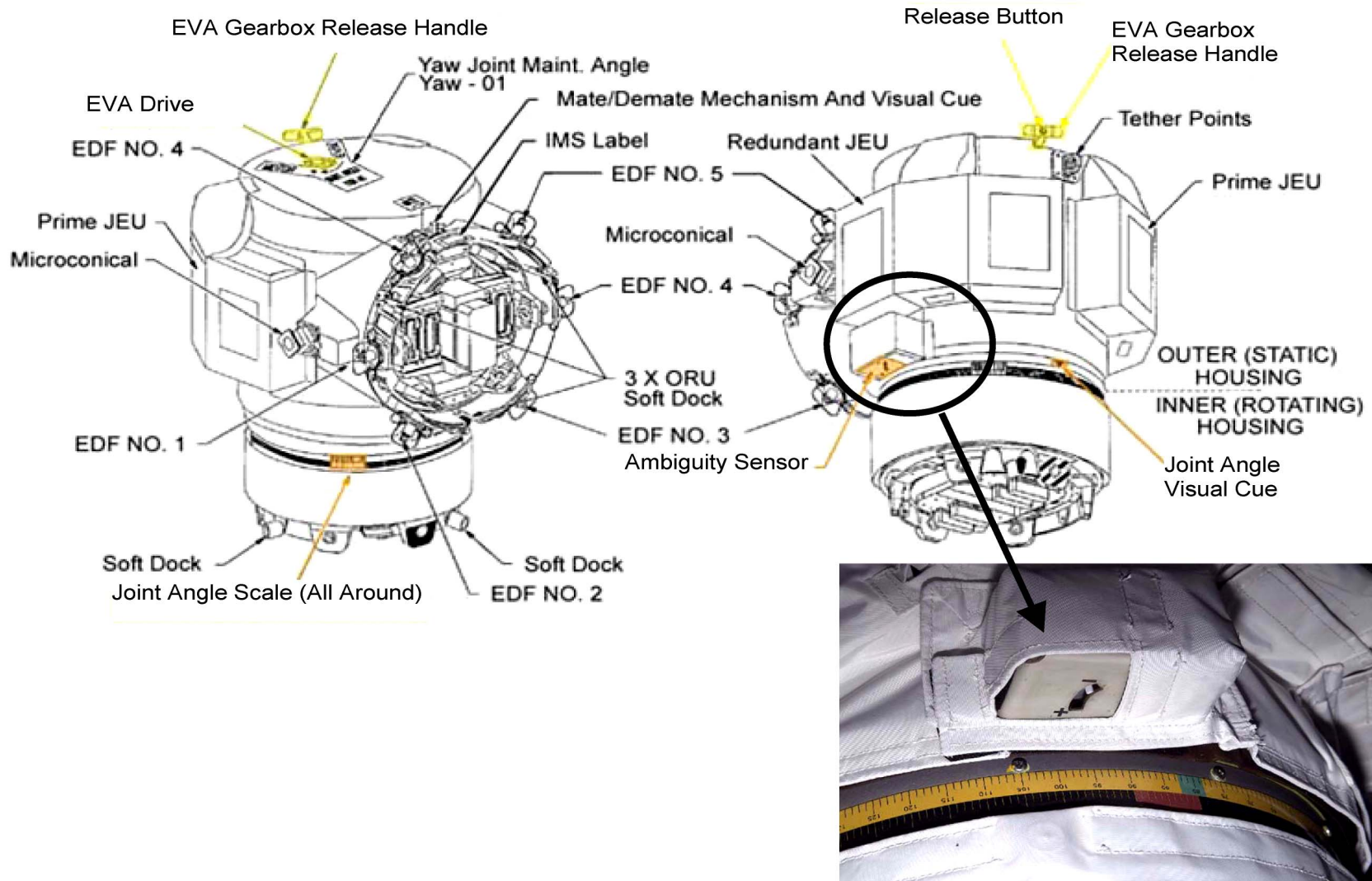


Figure 2.- YAW Joint ORU.

MBSU 1 REMOVE AND REPLACE (NO SSRMS) (Cont)

IV	EV1	EV2
	<p>13. PGT [B1, CCW2, 30.5] (12.0 ft-lb,30 RPM); 6" Ext 7/16"</p> <p>14. Drive H1 ~8 turns</p> <p>15. <input checked="" type="checkbox"/> Status indicator – UNLOCK</p> <p>16. Receive Sq Scoop from EV2; install on H2</p> <p>17. Drive H2 ~18 turns</p> <p>18. <input checked="" type="checkbox"/> Status indicator – UNLOCK</p> <p>19. Stow PGT</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p>WARNING Avoid contact with intermeshing fins of the MBSU and coldplate</p> </div> <p>20. Remove MBSU from coldplate (soft dock on H2 15-20 lb); stow in BRT</p> <p><u>RETRIEVE SPARE MBSU/STOW FAILED MBSU</u></p> <p>21. Egress APFR and translate to ESP-2</p> <p>22. Temp stow failed MBSU on ESP-2 HR 8005 using MUT EE/Ballstack (fins facing away from structure)</p> <p>23. Ingress APFR [10,QQ,G,5] in A/L Toolbox #1 WIF [1,KK]</p> <p>24. Temp stow 6-in wobble on PIP pin RET in trash bag</p> <p>25. PGT [B1, CCW1, 30.5] (12.0 ft-lb, 10 RPM); Sq TM-7/16" Rec</p> <p>26. Drive PGT 5 turns on H1</p> <p>27. Remove Sq TM and install on H2 fitting <input type="checkbox"/> <input checked="" type="checkbox"/> Anti-backlash neutral</p> <p>28. Drive PGT 5 turns on H2</p> <p>29. Transfer Sq TM to EV2</p>	<p>10. Transfer Sq Scoop to EV1</p> <p><u>RETRIEVE SPARE MBSU/STOW FAILED MBSU</u></p> <p>11. Translate to ESP-2; assist with tending MBSU</p> <p>12. Temp stow failed MBSU on ESP-2 HR 8005 using MUT EE/Ballstack (fins facing away from structure)</p> <p>13. Install Sq TM on Spare MBSU H1 fitting <input type="checkbox"/> <input checked="" type="checkbox"/> Anti-backlash neutral</p> <p>14. Receive Sq TM from EV1; stow on MWS</p>

MBSU 1 REMOVE AND REPLACE (NO SSRMS) (Cont)

IV	EV1	EV2									
<p>3. IV: Record failed MBSU installation turns and torque</p> <table border="1"> <thead> <tr> <th>Bolt</th> <th>Turns</th> <th>Torque</th> </tr> </thead> <tbody> <tr> <td>H2</td> <td></td> <td></td> </tr> <tr> <td>H1</td> <td></td> <td></td> </tr> </tbody> </table>	Bolt	Turns	Torque	H2			H1			<p>30. Place 6-in wobble on PGT <input type="checkbox"/> Pull test</p> <p>31. PGT [B1, CCW2, 30.5] (12.0 ft-lb,30 RPM); 6" Ext 7/16"</p> <p>32. Drive H1 ~8 turns</p> <p>33. √Status indicator – UNLOCK</p> <p>34. Retrieve Sq Scoop from MWS; install on H2</p> <p>35. Drive H2 ~18 turns</p> <p>36. √Status indicator – UNLOCK</p> <p>37. Stow PGT</p> <p>38. Remove MBSU (soft dock on H2 15-20 lb); transfer to EV2</p> <p>39. Remove failed MBSU from Ballstack; install on FRAM (soft dock on H2 15-20 lb)</p> <p>40. √Status indicator on H1 and H2 are in UNLOCK</p> <p>41. PGT [B2, CW2, 30.5] (16.0 ft-lb,30 RPM); 6" Ext 7/16"</p> <p>42. Drive H2, expect 17 turns</p> <p>43. √H2 status indicator – LOCK</p> <p>44. PGT [B2, CW2, 30.5] (16.0 ft-lb,30 RPM); 6" Ext 7/16"</p> <p>45. Drive H1, expect 5-7 turns</p> <p>46. √H1 status indicator – LOCK</p> <p>47. Remove Sq Scoop; stow on MWS</p> <p>48. Egress APFR</p> <p>49. Install thermal cover on failed unit</p> <p>50. Translate to S0 worksite; assist with tending MBSU</p>	<p>15. Receive spare MBSU; stow on BRT</p> <p>16. Install thermal cover on failed unit</p> <p>17. Translate to S0 worksite</p>
Bolt	Turns	Torque									
H2											
H1											

MBSU 1 REMOVE AND REPLACE (NO SSRMS) (Cont)

IV	EV1	EV2									
<p>4. IV: Record spare MBSU installation turns and torque</p> <table border="1"> <thead> <tr> <th>Bolt</th> <th>Turns</th> <th>Torque</th> </tr> </thead> <tbody> <tr> <td>H2</td> <td></td> <td></td> </tr> <tr> <td>H1</td> <td></td> <td></td> </tr> </tbody> </table>	Bolt	Turns	Torque	H2			H1			<p><u>INSTALL SPARE MBSU</u></p> <p>51. Ingress APFR 52. Receive MBSU from EV2</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;">There is a TBD thermal dwell time between the MBSU & coldplate. Wait TBD time prior to driving bolt</p> </div> <p>53. Install spare MBSU (soft dock on H2 15-20 lb) 54. √Status indicator on H1 and H2 are in UNLOCK 55. PGT [A6, CW2, 30.5] (8.3 ft-lb, 30 RPM); 6" Ext 7/16" 56. Drive H2, expect 17 turns 57. √H2 status indicator – LOCK</p> <p>58. PGT [A6, CW2, 30.5] (8.3 ft-lb, 30 RPM); 6" Ext 7/16" 59. Drive H1, expect 5-7 turns 60. √H1 status indicator – LOCK 61. Give MCC-H GO to restore power to MBSU</p> <p><u>CLEANUP</u></p> <p>62. Remove APFR; stow per MCC direction</p>	<p><u>INSTALL SPARE MBSU</u></p> <p>18. Transfer MBSU to EV1 19. Inspect guide rails and connectors for debris/damage</p> <p>20. Assist EV1 with MBSU install</p> <p><u>CLEANUP</u></p> <p>21. Remove Sq scoop from MBSU 22. Translate to ESP-2; retrieve MUT EE/Ballstack 23. Translate to A/L Toolbox #1 WIF; remove/reconfigure APFR per MCC instruction</p>
Bolt	Turns	Torque									
H2											
H1											

MBSU REMOVE/REPLACE (NO SSRMS) – TASK DATA

Estimated Task Duration:

	Without SSRMS
One EV Crew	N/A
Two EV Crew	03:30

Tools:

EV1	EV2
Square Scoop	EVA Crewlock Bag (optional)
PGT – 6" Ext 7/16"	Square Scoop
Sq TM 7/16 rec	PGT – 6" Ext 7/16"
	MUT EE
	Ballstack

EVA Fasteners:

Fastener Name	Label	Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
H1 (Secondary Bolt)	H1	7/16	1	8.3 (A6)	9.2 (A7) with TM	93.2 (R) 84.7 (I)	5-6	30
H2 (Primary Bolt)	H2	7/16	1	8.3 (A6)	9.2 (A7) with TM	93.2 (R) 69.3 (I)	16-17	30

Foot Restraints:

Task	WIF	APFR Setting
MBSU 1A1B	S0-22	1,NN,J,11
MBSU 2A2B	S0-19	9,PP,E,11
MBSU 3A3B	S0-19	3,PP,F,1
MBSU 4A4B	S0-18	1,NN,F,12
Spare MBSU (ESP-2, site #4)	AL Toolbox #1 (1, KK)	10,QQ,G,5

ORU Data:

ORU	Part number	Serial Number	Mass	Dimensions
MBSU 1A1B	R072591-41	X700385	236 lb	40" x 28" x 12"
MBSU 2A2B	R072591-41	X700386	236 lb	40" x 28" x 12"
MBSU 3A3B	R072591-41	C250636	236 lb	40" x 28" x 12"
MBSU 4A4B	R072591-41	C250637	236 lb	40" x 28" x 12"
Spare MBSU	R072591-41	X652064	236 lb	40" x 28" x 12"
Spare MBSU	R072591-41	X652065	236 lb	40" x 28" x 12"

Notes:

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

Cautions:

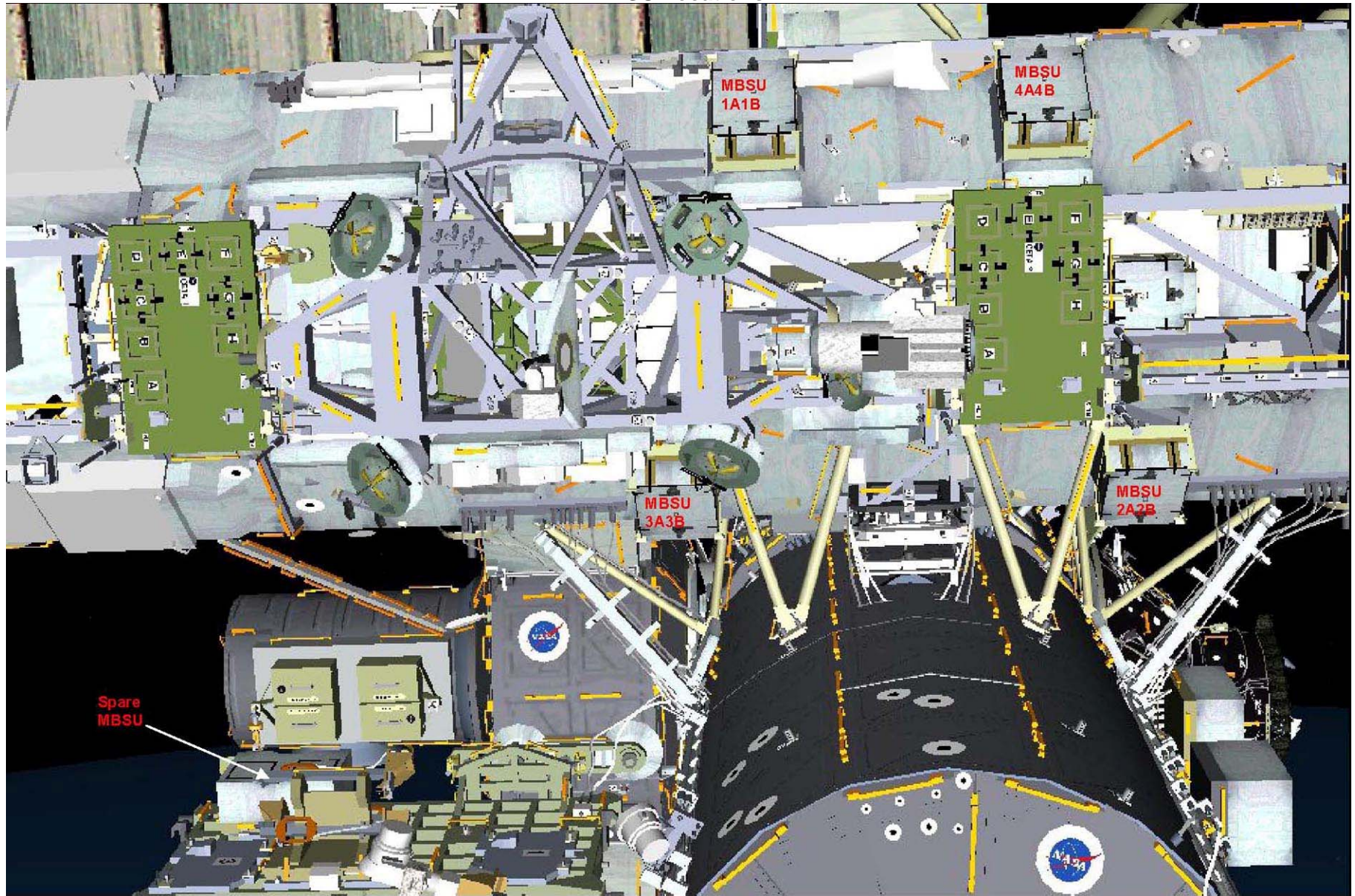
- Acme screws unfastened/fastened out of sequence could lead to jamming of MBSU during removal. When unfastening Acme screws, H1 must be unfastened before H2
- H1 bolt must always be released first and H2 bolt (jack screw) must always be installed first or damage to ORU and underlying structure may occur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

Warnings:

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

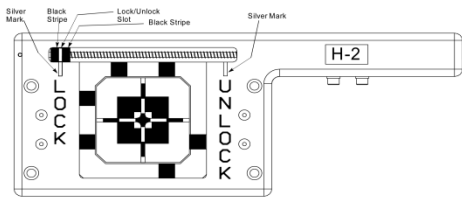
MBSU REMOVE/REPLACE (NO SSRMS) – TASK DATA (Cont)

MBSU Locations

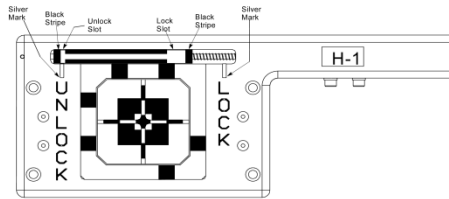


MBSU REMOVE/REPLACE (NO SSRMS) – TASK DATA (Cont)

H2 Status Indicator



H1 Status Indicator

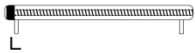
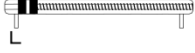


Positional Criteria
 (Adhered to in accordance with torque and turns specified in LSAR procedure.)

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



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



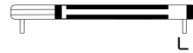
LOG-1010-01

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

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



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



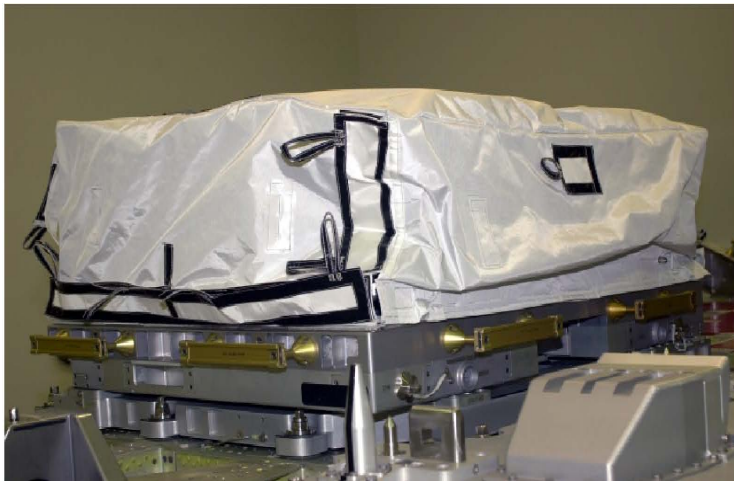
Unlocked, Tolerance: The unlock slot can be left or right of nominal by a distance no greater than the width of the black stripe.



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



LOG-1009-01



Spare MBSU w/MLI attached to FRAM on ESP-2



MBSU at worksite

GENERIC EVA INHIBIT PAD

Orbiter (1)

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

Ground

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

Orbiter (2)

LOCATION DEPENDENT INHIBITS	
OBSS - LDRI TO INHIBIT LASER FIRING BUT LEAVE HEATER POWER ON:	
<u>NOTE</u>	
This procedure works best when performed during orbital night, and OBSS must be positioned such that its diffuser window is visible in the Camera B view.	
R12(VPU) A7U	1. √Green Jumper – LDRI/ITVC 2. VIDEO OUT MON2 pb – push IN B pb – push OUT MON1 pb – push IN PL2(VPU) pb – push 3. Center Cam B (ITVC) in the view of LDRI/ITVC 4. VIDEO OUT MON2 pb – push 5. Center LDRI/ITVC diffuser in the view of Cam B (ITVC) 6. CAMR CMD ZOOM – IN (FULL) 7. VIDEO OUT MUX 1 L pb – push IN MIDDECK pb – push
<u>NOTE</u>	
The following step will power off the LDRI laser. Observe the LDRI diffuser in the Camera B view and verify the laser turns off. Report observation to MCC-H .	
	8. LDRI MODE 1 pb – push 9. VIDEO IN as desired (not MIDDECK)
<u>POINT PTU/LDRI AWAY FROM EV CREW</u>	
A7U	10. VIDEO OUT MON1 pb – push IN PL2(VPU) pb – push 11. CAMR CMD PAN/TILT – HI RATE PAN – L (to hard stop) TILT – UP (to hard stop) PAN/TILT – RESET PAN/TILT – HI RATE (LO within 10°) PAN: TBD TILT: TBD
R12(OBSS)	12. ITVC ENA – OFF

GENERIC EVA INHIBIT PAD (Cont)

Orbiter (3)

LOCATION DEPENDENT INHIBITS (Cont)

OBSS - LCS

TO INHIBIT LASER FIRING BUT LEAVE HEATER POWER ON:

- IV 1. Perform LCC DEACTIVATION step 1 (FDF P/TV CUE CARD, LCS).

To shut down and remove all power to LCS (and ROEU if flown)

NOTE

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

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

EFGF Connector

NOTE

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

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

S-Band Antennas

NOTE

Possible loss of comm when forced LL FWD antenna.

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

USOS (1)

ALL EVAs

PCU

NOTE

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

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

CUCU

- IV (LAB104) 1. √cb POWER A, B [two] – OPEN
 2. √cb LINK 1,2 [two] – OPEN

LOCATION DEPENDENT INHIBITS

Lab Window

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

Cupola Windows

- IV If EV crew less than 10 feet from window or in window FOV, coordinate shutter opening/closing with EV crew and minimize time shutter is open

KU-Band (SGANT Antenna)

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

S-Band (SASA) Antennas

- MCC-H** If EV crew < 3.6 feet from S1 SASA [P1 SASA]
 1. P1 SASA (S1 SASA) – Active
 2. S1 SASA (P1 SASA) – Powered down and unavailable to FDIR

Mobile Transporter

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

GENERIC EVA INHIBIT PAD (Cont)

USOS (2)

LOCATION DEPENDENT INHIBITS	
SARJ MCC-H	If EV crew working within 2 feet or outboard of SARJ 1. √DLA (1) – LOCKED 2. All motor setpoints set to zero. 3. All motors deselected.
TRRJ MCC-H	If EV crew working within 2 feet of P1 TRRJ rotation envelope (Includes Node 3 Port Endcone and PMA 3) 1. √DLA (1) – LOCKED
MCC-H	If EV crew working within 2 feet of S1 TRRJ rotation envelope 1. √DLA (1) – LOCKED
FPMU MCC-H	If EV crew working within 5 feet of Floating Potential Measurement Unit 1. FPMU power – Off
SSPTS MCC-H	If EV crew working within 2 feet of SSPTS cables 1. RPCM LA2A3B D RPC 1 – Open, Close Cmd Inhibit 2. RPCM Z14B A RPC 2 – Open, Close Cmd Inhibit 3. RPCM Z13B A RPC 2 – Open, Close Cmd Inhibit

JEM (1)

ALL EVAs	
ICS-EF Antenna SSIPC	1. ICS MOD – OFF 2. ICS UPC – OFF 3. ICS HPA – OFF 4. “HPA On” and “UPC On” commands are cleared (not present) in ICS stored command queue
LOCATION DEPENDENT INHIBITS	
JPM Windows IV	If EV crew translating on JPM port end cone, close window shutters.
JEMRMS SSIPC	If EV crew working within 5 feet of JEMRMS 1. RIP MA Brake – ON 2. MDP Main Mode – Stby Mode or 1. JEMRMS Rack – OFF
JPM PROX Antenna SSIPC	If EV crew working within 0.3 feet JPM PROX Antenna 1. TRX Power – OFF 2. TX Power – OFF or 1. JPM PROX Antennas – OFF
JPM JTVE SSIPC	If EV crew working within 2 feet of Fwd JPM JTVE 1. PDB WS RPC 8 – Open (for CPB a)
SSIPC	If EV crew working within 2 feet of Aft JPM JTVE 1. PDB b2 RPC 4 – Open (for CPB b)
JEF VE SSIPC	If EV crew working within 2 feet of Fwd JEF VE 1. JEF PDB b RPC 22 – Open (for DCU/TVC/PTU Fwd)
SSIPC	If EV crew working within 2 feet of Aft JEF VE 1. JEF PDB a RPC 5 – Open (for DCU/TVC/PTU Aft)
SEDA-AP Mast and PLAM-S SSIPC	If EV crew working within the SEDA-AP mast extension envelope 1. Mast Actuator – Off 2. PLAM-S – Off

GENERIC EVA INHIBIT PAD (Cont)

JEM (2)

LOCATION DEPENDENT INHIBITS	
EFU SSIPC	If EV crew working within 2 feet of EFU <ol style="list-style-type: none"> 1. JEF PDB a RPC 03 – Open (for EDU a) 2. JEF PDB b RPC 20 – Open (for EDU b) 3. EFU[X] Sel Status – not selected [X=1 to 12] 4. EEU Mode – EFU stop
SSE SLM SSIPC	If EV crew working in the vicinity of the SSE SLM <ol style="list-style-type: none"> 1. SSE SLM Ops Ena/Inh Status 1 – Inhibit 2. SSE SLM Ops Ena/Inh Status 2 – Inhibit
SMILES SSIPC	If EV crew working in the vicinity of open end of SMILES <ol style="list-style-type: none"> 1. Antenna Main Reflector – Stop between 0 deg and -40 deg 2. ADE – Off 3. JEF PDB a RPC 15 – Open (for EFU3)
HREP POIC SSIPC	If EV crew working in the vicinity of open end of HREP <ol style="list-style-type: none"> 1. RAIDS scanhead – Closed (0 deg rot) and unpowered 2. JEF PDB b RPC 31 – Open (for EFU6)
ICS-EF SSIPC	If EV crew working within the ICS-EF antenna dynamic envelope <ol style="list-style-type: none"> 1. ICS DM/DLM Pwr Status – Off 2. ICS DM Ena/Dis – Disable 3. ICS DM Step Sig – Stopped 4. ICS APM Pwr Status – Off 5. ICS APM X Ena Valid – Inhibit 6. ICS APM Y Ena Valid – Inhibit 7. ICS APM X Step Sig – Stopped 8. ICS APM Y Step Sig – Stopped

RSOS (1)

ALL EVAs	
SM Antennas IV	<ol style="list-style-type: none"> 1. GTS – Deactivate 2. ARISS (Ham Radio) – Deactivate
IMPULSE MCC-M	
	<ol style="list-style-type: none"> 1. IMPULSE (ИПИ-100) – Is not activated
EVAS ON PMA 1 OR RSOS (LOCATION DEPENDENT)	
FGB Thrusters MCC-M	<ol style="list-style-type: none"> 1. √FGB MCS unpowered 2. √All FGB Attitude Control Thruster Valves (eighty) – closed 3. √FGB Attitude Control Manifold Valves – closed КШК1, КШК2, КШК4, КШК5, КШК9, ОКО3, ОКГ3, ОКО6, ОКГ6, ОКО7, ОКГ 7, ОКО8, ОКГ8
Soyuz Thrusters MCC-M	<ol style="list-style-type: none"> 1. √Soyuz manifolds (four) – closed ЭКО1, ЭКО2, ЭКГ1, ЭКГ2 2. √Soyuz MCS unpowered 3. √Soyuz Attitude Control Thruster Valves (fifty-six) – closed 4. √Soyuz Main Engine Valves (K1, K2, K3, K4, K5, K6) – closed
FGB Antennas MCC-M	<ol style="list-style-type: none"> 1. √FGB KURS P [КУРС P] – Deactivated
Soyuz Antennas MCC-M	<ol style="list-style-type: none"> 1. √Soyuz KURS A [КУРС A] – Deactivated

GENERIC EVA INHIBIT PAD (Cont)

RSOS (2)

ADDITIONAL ANTENNA INHIBITS FOR EVAS ON RSOS (LOCATION DEPENDENT)

FGB Antennas

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

SM Antennas

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

Soyuz Antennas

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

Progress Antennas

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

ADDITIONAL THRUSTER INHIBITS FOR EVAS ON RSOS (LOCATION DEPENDENT)

SM Thrusters

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

Progress Thrusters

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

GENERIC NOTES, CAUTIONS, & WARNINGS

NOTES

1. Bolt install: Report torque and turns
2. Bolt release: Report torque and turns if different from published range
3. EVA connectors: After disconnection and prior to connection; verify pin and EMI band integrity; verify connector free of FOD
4. Inspect QDs for damage prior to mating
5. Toolbox doors must be closed with one latch per door when EV crew not in immediate vicinity
6. Avoid contact with OBSS striker bars (Vitrolube coating)
7. 85-ft safety tether retract force may affect body positioning

CAUTION

ISS Generic Constraints

- A. Avoid inadvertent contact with
 1. Grapple fixture shafts (drylube)
 2. PIP Pins
 3. Passive UMAs
 4. MBS/SSRMS/SPDM taped radiative surfaces: VDU, ACU, JEU, LEU, MCU, CRPCMs, and Cameras
 5. SPDM SJEU, EP, OTCM, LEU, and LEE VDU radiator surfaces
 6. OTSD
 7. MMOD shields tied to ESP-2
- B. Electrical cables
 1. Avoid bend radii < 10 times cable diameter
- C. Fiber optic cables
 1. Avoid bend radii < 10 times cable diameter
 2. Avoid pulling on cable during mate/demate
- D. Fluid line flex hoses and QDs
 1. Avoid bend radii < 14 in for hoses with a diameter \geq 1 in
 2. Additional care should be taken to not exceed bend radii when applying loads at the flexible hose to rigid tube stub interfaces
 3. Ensure fluid QD booties are fully closed prior to leaving worksite; wire tie if required
 4. Avoid bend radii < 5 in for hoses with diameter < 1 in on LAB, S0, S1, P1, and 10 in for hoses with diameter < 1 in on all other elements

CAUTION

ISS Generic Constraints (Cont)

- 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
- F. Other
 1. ITT Cannon connector: On demated connectors, do not rotate collar or manipulate cable/connector using collar or connector tool
 2. MLI handholds are not rated for crewmember translation loads

GENERIC NOTES, CAUTIONS, & WARNINGS (Cont)

CAUTION

ISS Truss Constraints

- A. Avoid inadvertent contact with
1. CETA lights (Z-93 paint) [LAB,S1,NODE 1]
 2. Deployed TUS cable [Zenith and Nadir CETA rails]
 3. S0 aft face radiator
 4. GPS antennas (S13 paint) [S0,JLP]
 5. UHF antennas [LAB,P1]
 6. ETCS radiator flexhoses and panels [S1,P1]
 7. EETCS/PV radiator flexhoses, bellows and panels [P6,P4,S4,S6]
 8. SASA RF group [S1,P1]
 9. Heat pipe radiators [Z1]
 10. PCU cathode and HCA ports [Z1]
 11. Ku-Band antenna (SGANT) dish [Z1]
 12. CMG cover/shells [Z1]
 13. FPMU [P1]
 14. SASA high and low gain antennas and radiator surfaces [Z1]
 15. Deployed MISSEs
- B. For structural reasons
1. Avoid kicking S1/P1 radiator beam. If any of these occur, wait 2 to 5 min to allow structural response to dissipate

CAUTION

ISS Truss Constraints (Cont)

- C. Other
1. WIS Antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
 2. Lubricant from Ku-Band SGANT gimbals [Z1], CMGs [Z1], and RTAS ground strap fasteners [P6,P4,S4,S6] can contaminate EMU
 3. Prevent inadvertent contact of the tether shuttle with ETRS when the P3 tether shuttle stop is raised away from the rail

CAUTION

ISS U.S. Pressurized Elements Constraints

- A. Avoid inadvertent contact with
1. EVA crane [PMA1]
 2. TCS reflectors [PMA2,PMA3]
 3. APAS hardware [PMA2,PMA3]
 4. CETA lights (Z-93 paint) [LAB,S1,NODE 1]
 5. UHF antennas [LAB,P1]
 6. Open CBM petal covers, LAB and Cupola window shutters
 7. S0/NODE 2 fluid tray hardlines at NODE 2 end, which are limited to 25 lb
- B. Other
1. WIS antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
 2. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged

GENERIC NOTES, CAUTIONS, & WARNINGS (Cont)

CAUTION

ISS I.P. Elements Constraints

COL

- A. Avoid inadvertent contact with
1. COL ARISS and AIS antennas [COL-Nadir]

JEM

- A. Avoid inadvertent contact with
1. GPS antennas (S13 paint) [S0,JLP]
 2. Open JPM window shutter
 3. JTVE, WVE/EVE, JEF VE cameras
 4. JEMRMS taped radiative surfaces [JEU,EE,Cameras]
 5. JEM A/L target and pins
 6. JEF ORUs and EFUs (paint and lubricant)
 7. MAXI front and top panel (paint)
 8. SEDA-AP sensors (HIT, SDOM, and AOM) and MPAC & SEED
 9. Trunnions and UCMs (paint and lubricant) [JEF Payloads]
 10. RAIDS covers on end of HREP
 11. ICS-EF Ka-Band antenna dish
 12. Small Fine Arm (SFA) (paint, coating and lubricant)
- B. For structural reasons
1. Avoid kicking MMOD shields between JLP and JPM
 2. Avoid tool impact on ICS-EF sensor

CAUTION

Shuttle Constraints

- A. Avoid inadvertent contact with
1. OBSS and SRMS composite sections joint torque arms, grapple fixture shafts, and cable harnesses
 2. LCS (silver Teflon) and LDRI (silver Teflon) and ITVC (gold foil) [OBSS]
 3. WVS antenna [ODS truss and PLB sill]
 4. Payload bay and camera wire harnesses, cables, cable guides, 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]

GENERIC NOTES, CAUTIONS, & WARNINGS (Cont)

WARNING

ISS Generic Constraints

- A. Avoid inadvertent contact with
 - 1. Grapple fixture targets and target pins
- B. Pinch
 - 1. NZGL connector linkage. Use caution when mating/locking
 - 2. ITT Cannon connector rotating housing
- C. QDs
 - 1. If QD is in FID when valve is opened (bail fwd), QD will leak and fluid line may whip
 - 2. Do not rotate if in mated/valve open configuration
- D. Sharp Edges
 - 1. Inner edges of WIF sockets
 - 2. APFR active WIF probes
 - 3. Mating surfaces of EVA connectors
Avoid side loads during connector mating
 - 4. Back side of MMOD shield fasteners
 - 5. Spring loaded captive EVA fasteners (e.g., 6B-boxes, BMRRM, RTAS, SARJ Covers); the end of the spring may protrude
 - 6. SPDM OTCM gripper jaws
 - 7. Keep hands away from SSRMS LEE/POA/SPDM LEE opening, snares, and PDGF curvic coupling (teeth)
 - 8. MMOD strikes on ISS exterior

WARNING

ISS Generic Constraints (Cont)

- E. Thermal
 - 1. EVA connectors with booties may become hot if left uncovered. Handling may need to be limited
 - 2. Turn off glove heaters when comfortable temperature reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
 - 3. Uncovered trunnion pins may be hot
 - 4. SSRMS/MBS/SPDM operating cameras and lights may radiate large amounts of heat
 - 5. Do not touch EMU protective visor if temperature has been < -134 degF for > 15 min
 - 6. No EMU boot contact with foot restraint when temperature < -120 degF or > 200 degF
 - 7. PDGF surfaces may not meet touch temperature requirements for unlimited contact when $\beta \leq -70$ or $\beta \geq 70$
- F. Electrical Shock
 - 1. Do not touch SPDM CLPA 1 electrical connector prior to camera installation

WARNING

ISS Truss Constraints

- A. Avoid inadvertent contact
 - 1. SSU, ECU, beta gimbal platform, mast canister, SAW blanket boxes unless the beta gimbal is locked and the motor is turned off
 - 2. Stay inboard of SARJ when active
 - 3. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate
 - 4. Stay 5 ft from moving MT on face 1
- B. RF radiation exposure
 - 1. Stay 3.6 ft from S-Band (SASA) high gain antenna when powered [S1,P1]
 - 2. Stay 1.3 ft from S-Band (SASA) low gain antenna when powered [S1,P1]
 - 3. Stay 1 ft from UHF antenna when powered [LAB,P1]
- C. Sharp Edges
 - 1. Solar array blanket box [P6,S6]
 - 2. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing
 - 3. Outboard MT rail attachment lug near P6 handrail 5333 and gap spanner
 - 4. P2 connector on EWIS box TAA-06 [Zenith/Forward Corner 1 of P5 – SARJ at 0 deg]
 - 5. Nickel coated braided copper ground straps may contain frayed wires [P6,P4,S4,S6]
 - 6. MMOD strikes on Z1 toolboxes

GENERIC NOTES, CAUTIONS, & WARNINGS (Cont)

WARNING

ISS Truss Constraints (Cont)

D. Electrical Shock

1. Stay \geq 2 ft from ungrounded floating connectors if powered
S0 EVA power cables (inside S0 Bay 00 Face 4, Bay 01 Face 3)
ESP-2 jumper (inside S0 Bay 03 Face 4)

E. Thermal

1. ELC may exceed touch temperatures when $\beta > 75$ deg

WARNING

ISS U.S. Pressurized Elements Constraints

A. Handrails

1. Handrails previously used for MISSE attachment may not be used as a safety tether point [A/L endcone 564 and 566, A/L Tank 2 Nad/Fwd and Port/Fwd, P6 5389]

B. Pinch

1. EV side of IV Hatch during Hatch operation (also snag hazard) [A/L]
2. LAB window shutter and CBM petal cover linkages during operation

C. RF radiation exposure

1. Stay 1 ft from UHF antenna when powered [LAB, P1]

D. Sharp Edges

1. PMA umbilical launch restraints – exposed bolt threads
2. Adjustable fuse tether (Fish Stringer) buckles stowed in Node bag
3. Port/Aft portion of A/L circular HR [HR 0506]
4. A/L HR 0537 (Eq Lock Zenith)

E. Thermal

1. PMA handrails may be hot. Handling may need to be limited
2. Stay \geq 1 ft away from PMAs and MMOD shields > 270 degF if EMU sun visor up; limit time to 15 min or less if > 300 degF
3. Stay at least 0.5 ft away from PMA and MMOD shields > 325 degF
4. No EMU TMG contact with PMAs and MMOD shields > 320 degF

WARNING

ISS U.S. Pressurized Elements Constraints (Cont)

F. Electrical Shock

1. Stay \geq 2 ft from ungrounded floating connectors if powered. SSPTS connectors include NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA 2 Stbd

G. Fluid QDs

1. When Node 3 – Lab NH3 jumpers are pressurized do not translate on gap spanners restraining jumpers and do not tether or BRT to handrails used to anchor gap spanners

GENERIC NOTES, CAUTIONS, & WARNINGS (Cont)

WARNING

ISS I.P. Elements Constraints

COL

A. Avoid inadvertent contact with

1. SOLAR [COL EPF]

B. Thermal

1. Columbus end cones may violate touch temperature constraints when $-75 \leq \beta \leq -60$ or $60 \leq \beta \leq 75$

JEM

A. Avoid inadvertent contact with

1. ICS-EF sensors

B. Pinch

1. JPM window shutter linkages during operation
2. JEM cameras (JVTEs, EVE, WVE, and JEF VEs)
3. JEM EFU latching arms
4. JEF SSE latch
5. ICS-EF antenna boom
6. SEDA-AP mast
7. SMILES antenna rotating area
8. HREP hinge sides and RAIDS pinch areas
9. JEMRMS EE
10. JEMRMS Small Fine Arm (SFA) joints & booms

WARNING

ISS I.P. Elements Constraints (Cont)

JEM (Cont)

C. Sharp Edges

1. Interior of JEMRMS HRMs
2. JEMRMS EE opening and snares
3. JEM A/L hatch corners
4. ICS-EF AHM gears
5. MAXI visual star camera
6. SMILES baffles (two), baffle base bare bolts, and Cold Sky Terminator (CST)
7. HREP baffles (four) [Star tracker aperture Zenith and three instrument baffles Aft]
8. SFA's Electro-Mechanical GF (EMGF)

D. RF radiation exposure

1. Stay 0.3 ft from Fwd/Aft JPM PROX antenna

E. Thermal

1. JPM Port End Cones and JLP Port Nadir may violate touch temperature constraints when $\beta > 60$ deg
2. JEMRMS/JTVE/JEFVE operating cameras and lights may radiate large amounts of heat

WARNING

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]

GENERIC NOTES, CAUTIONS, & WARNINGS (Cont)

WARNING

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
4. TCS connector backshells have exposed threads [ODS]

E. Thermal

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

F. Contamination

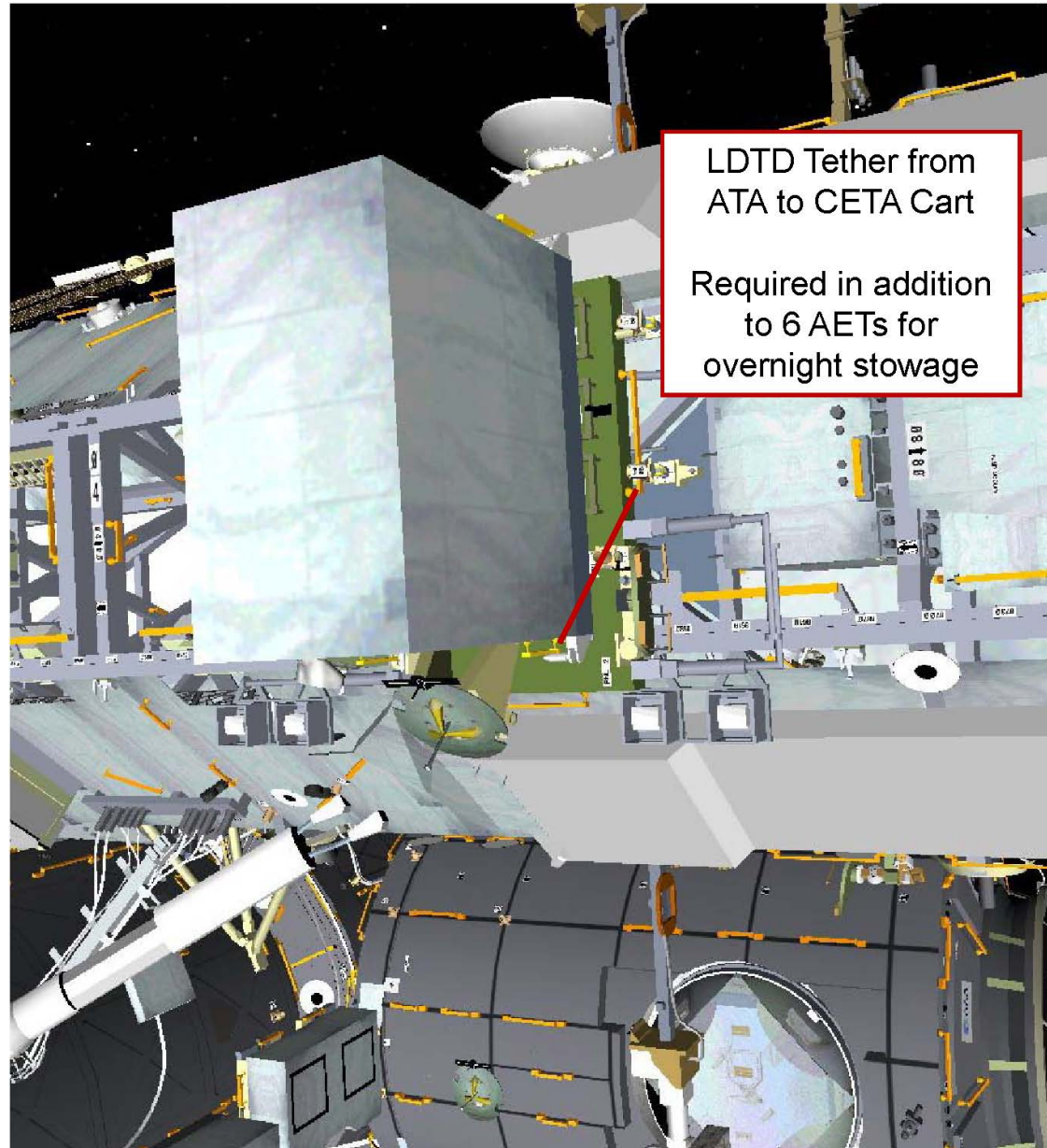
1. Stay out of the immediate vicinity of leaking jet or APU

G. Lasers

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

CETA CART ATA OVERNIGHT TIE-DOWN

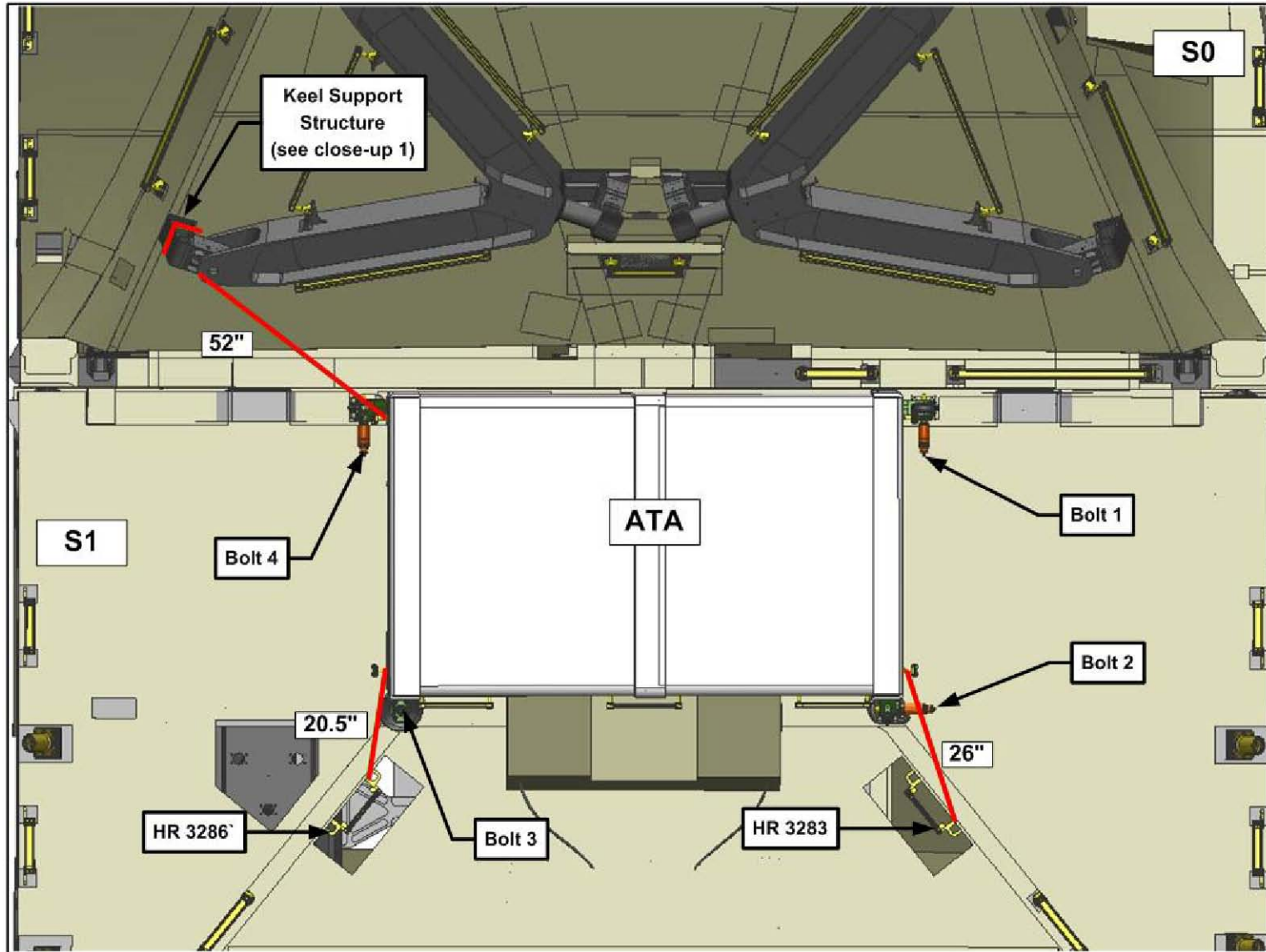
I



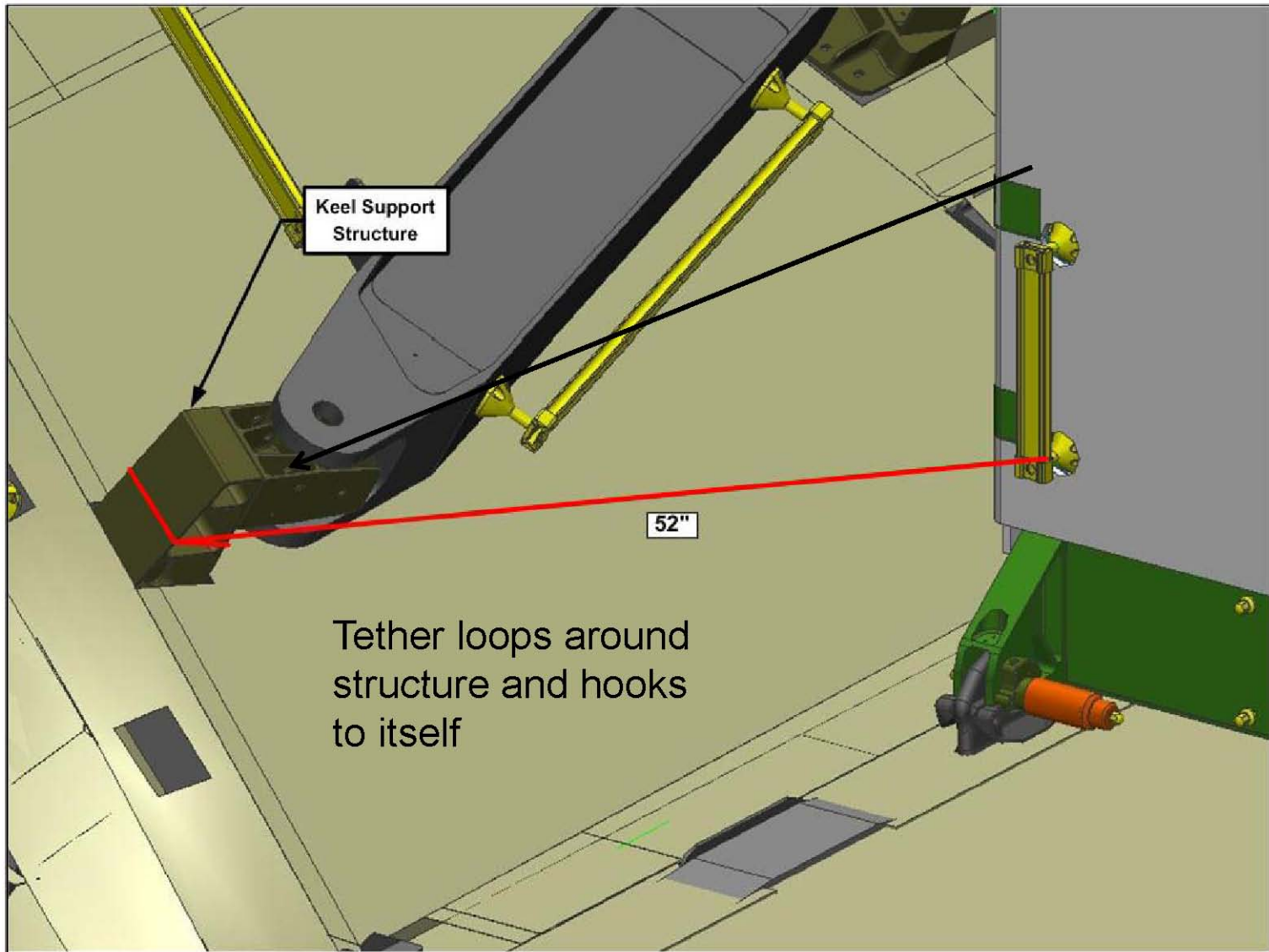
FS 16-73

EVA/131/FIN A

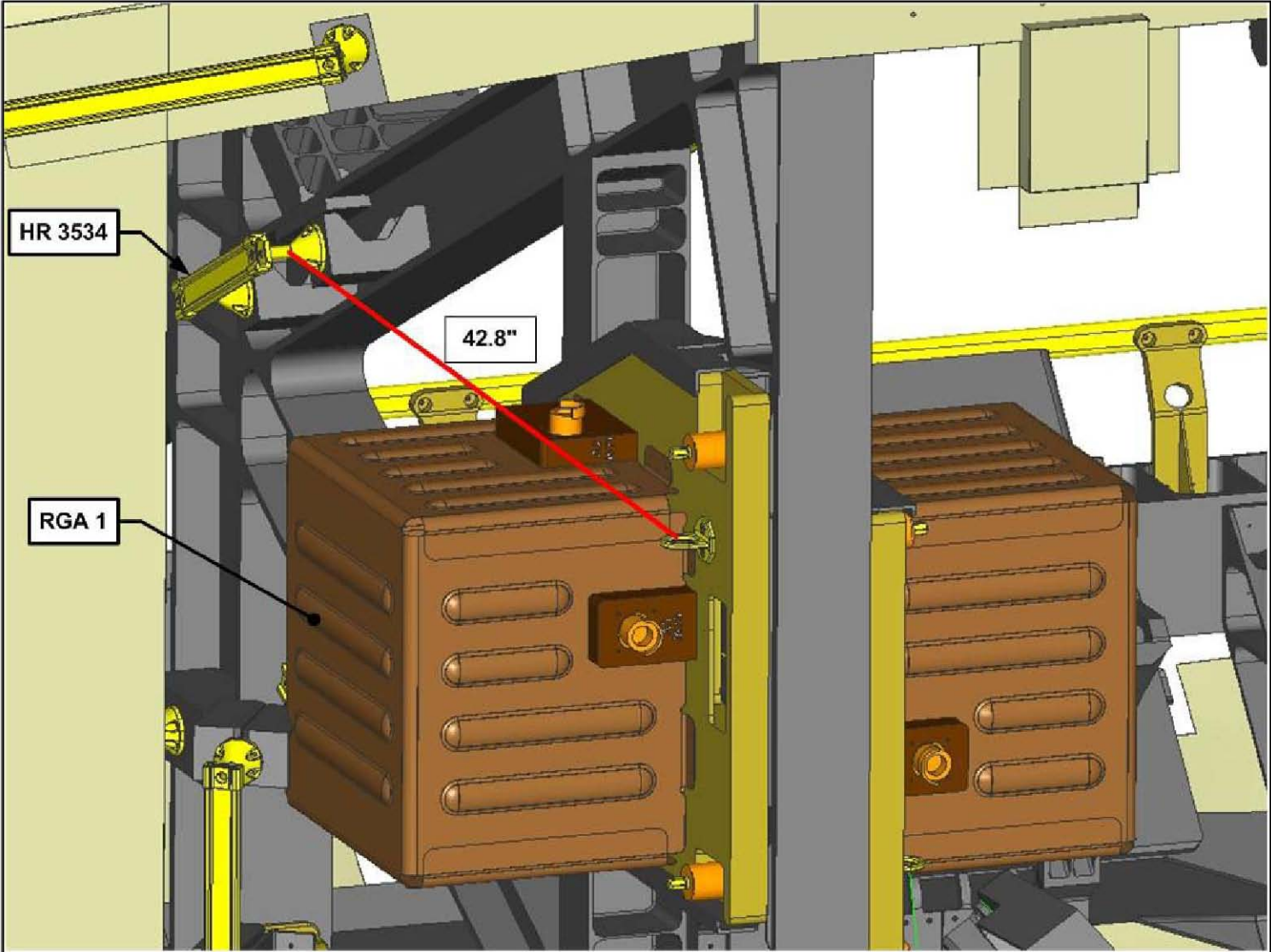
S1 ATA TIE-DOWN



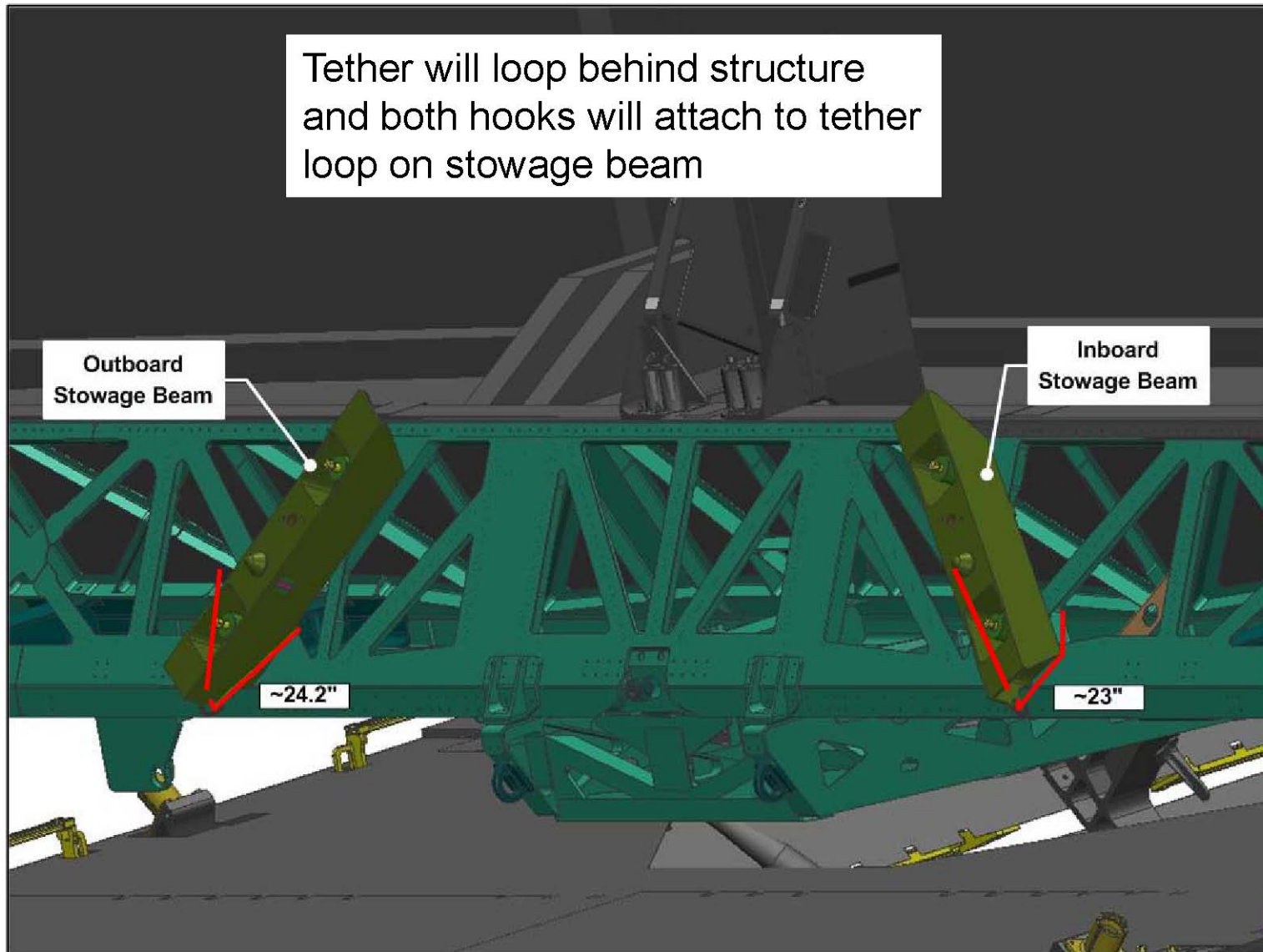
S1 ATA TIE-DOWN BOLT 4 CLOSEUP



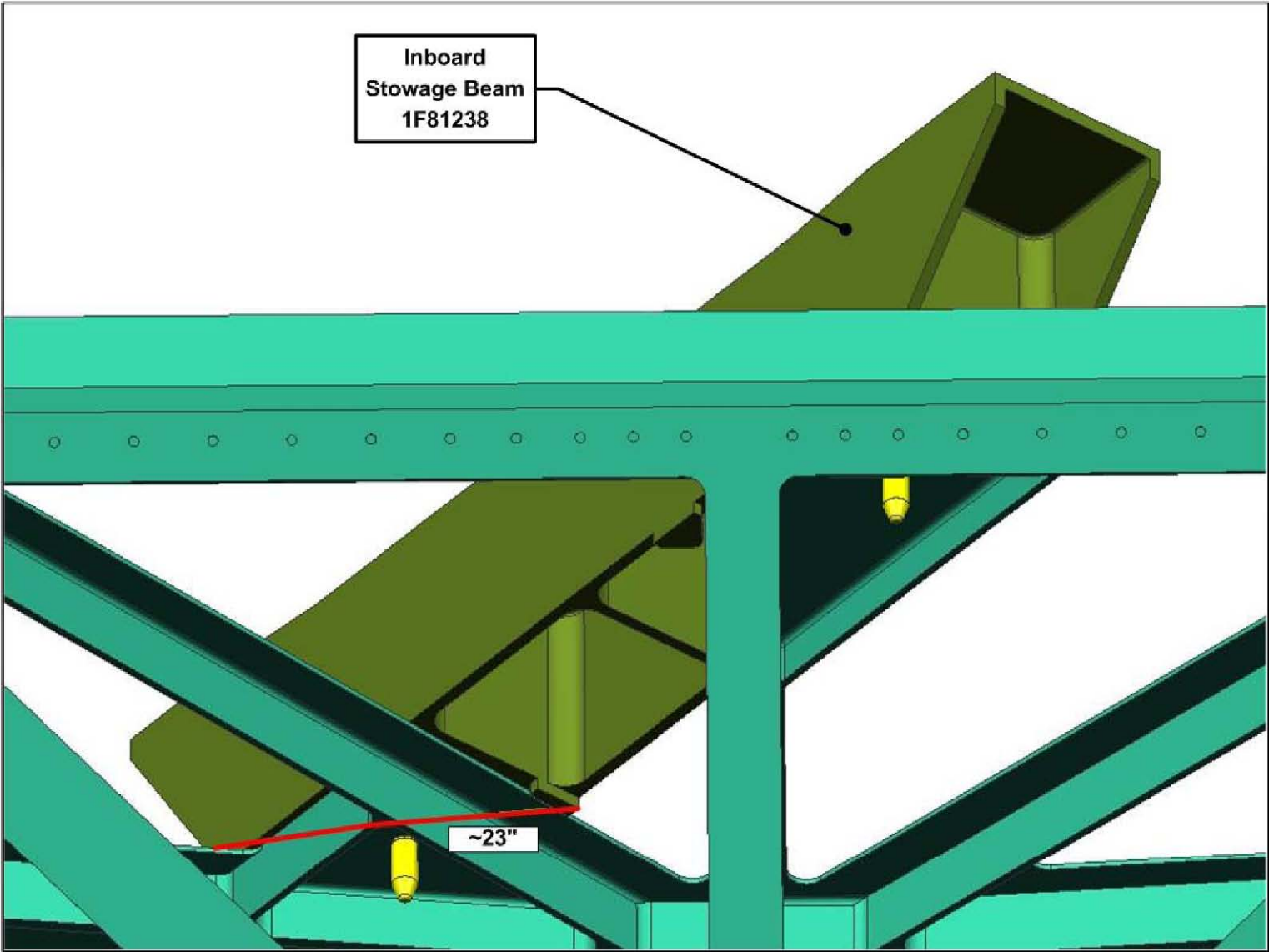
RGA 1 TIE-DOWN



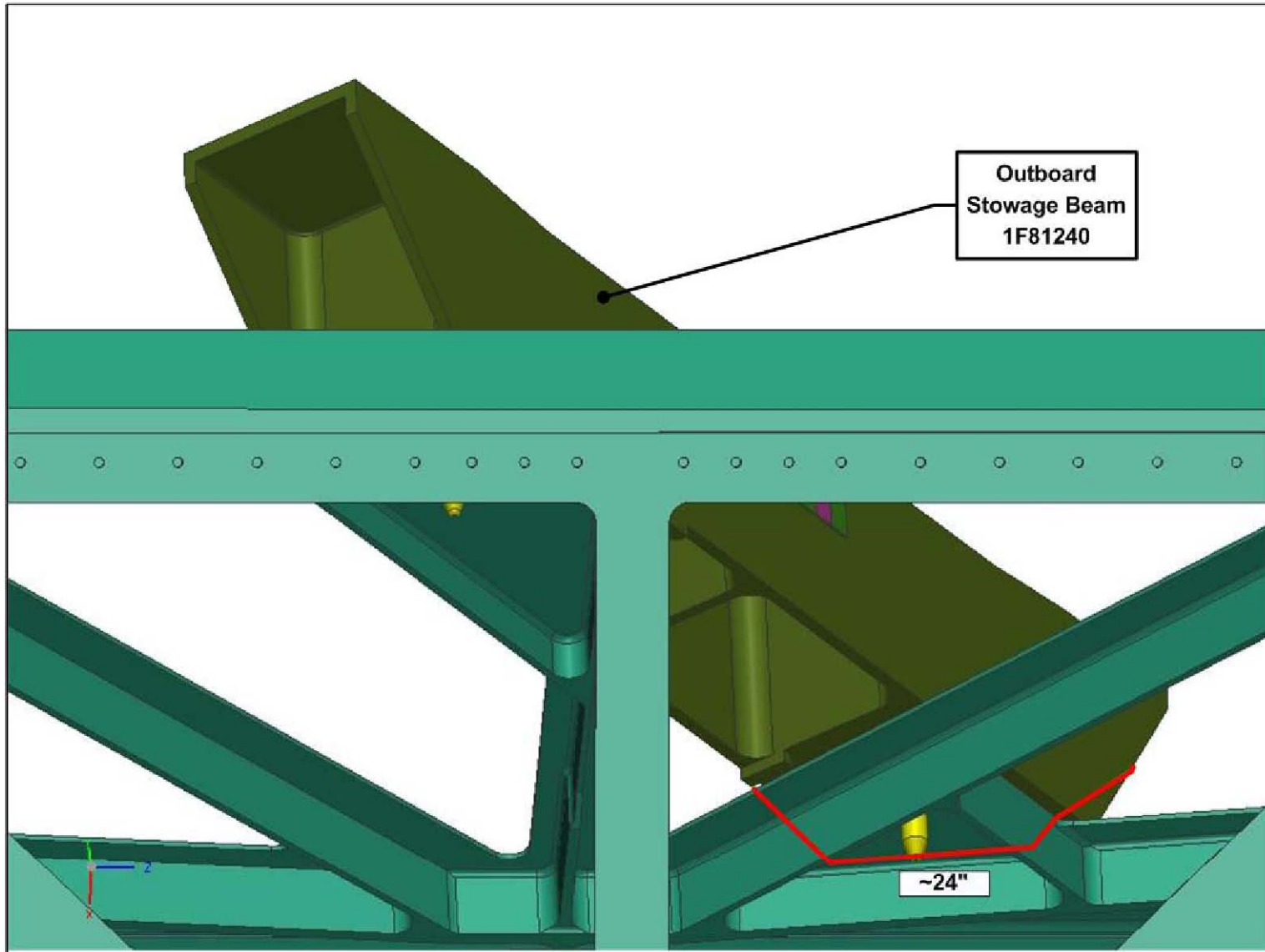
RADIATOR GRAPPLE FIXTURE STOWAGE BEAM TIE-DOWNS



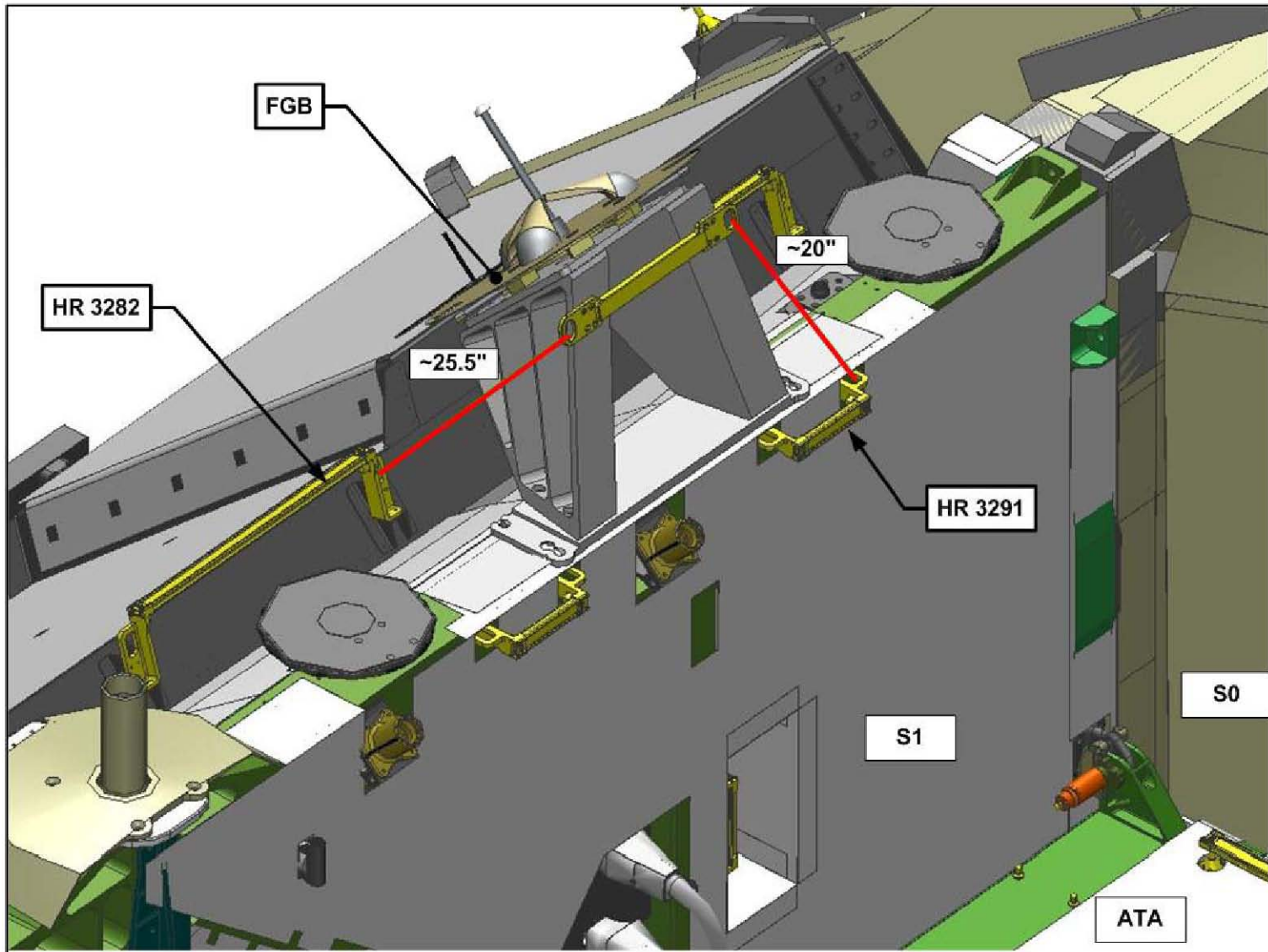
INBOARD RADIATOR GRAPPLE FIXTURE STOWAGE BEAM TIE-DOWN



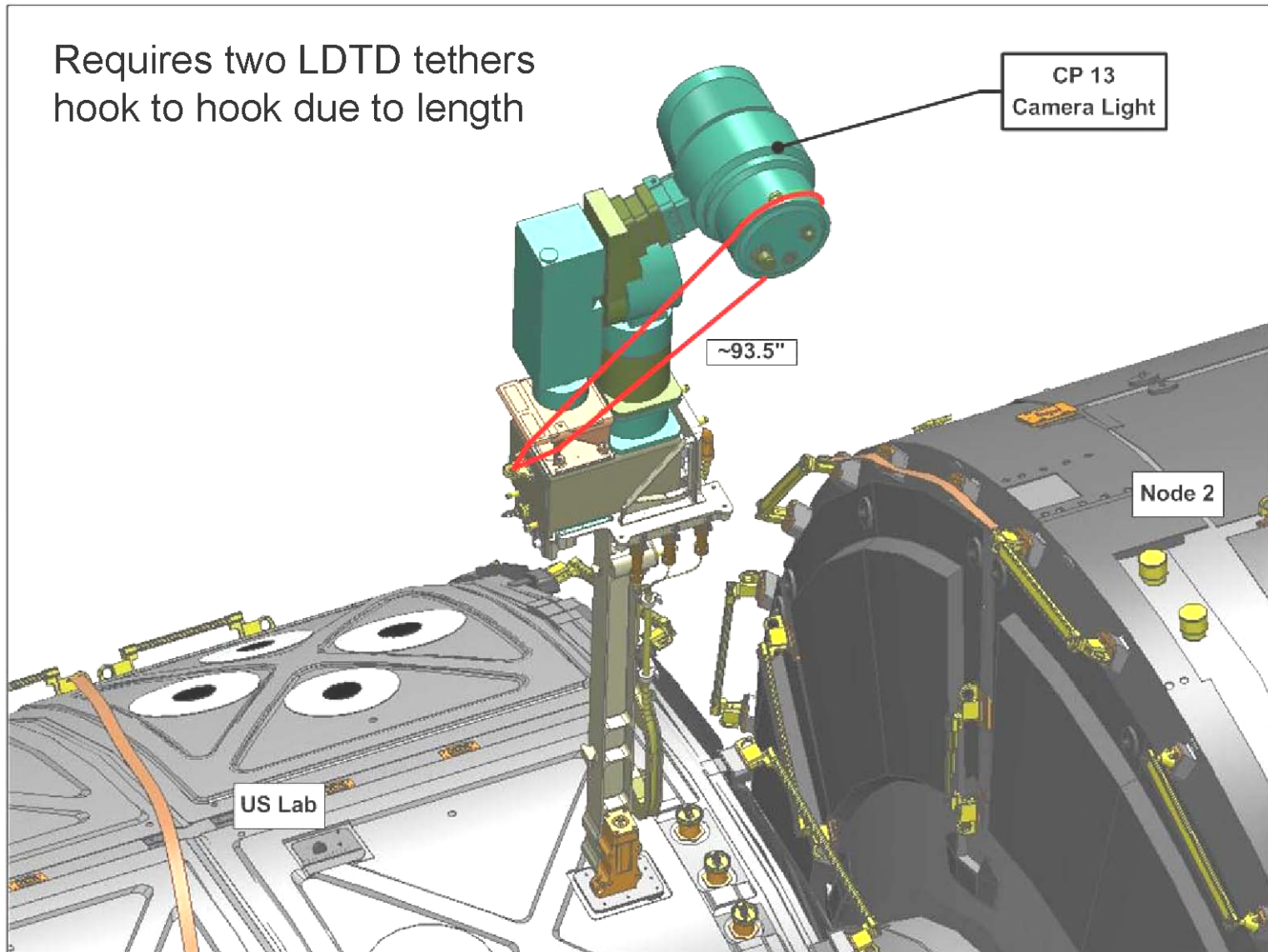
OUTBOARD RADIATOR GRAPPLE FIXTURE STOWAGE BEAM TIE-DOWN



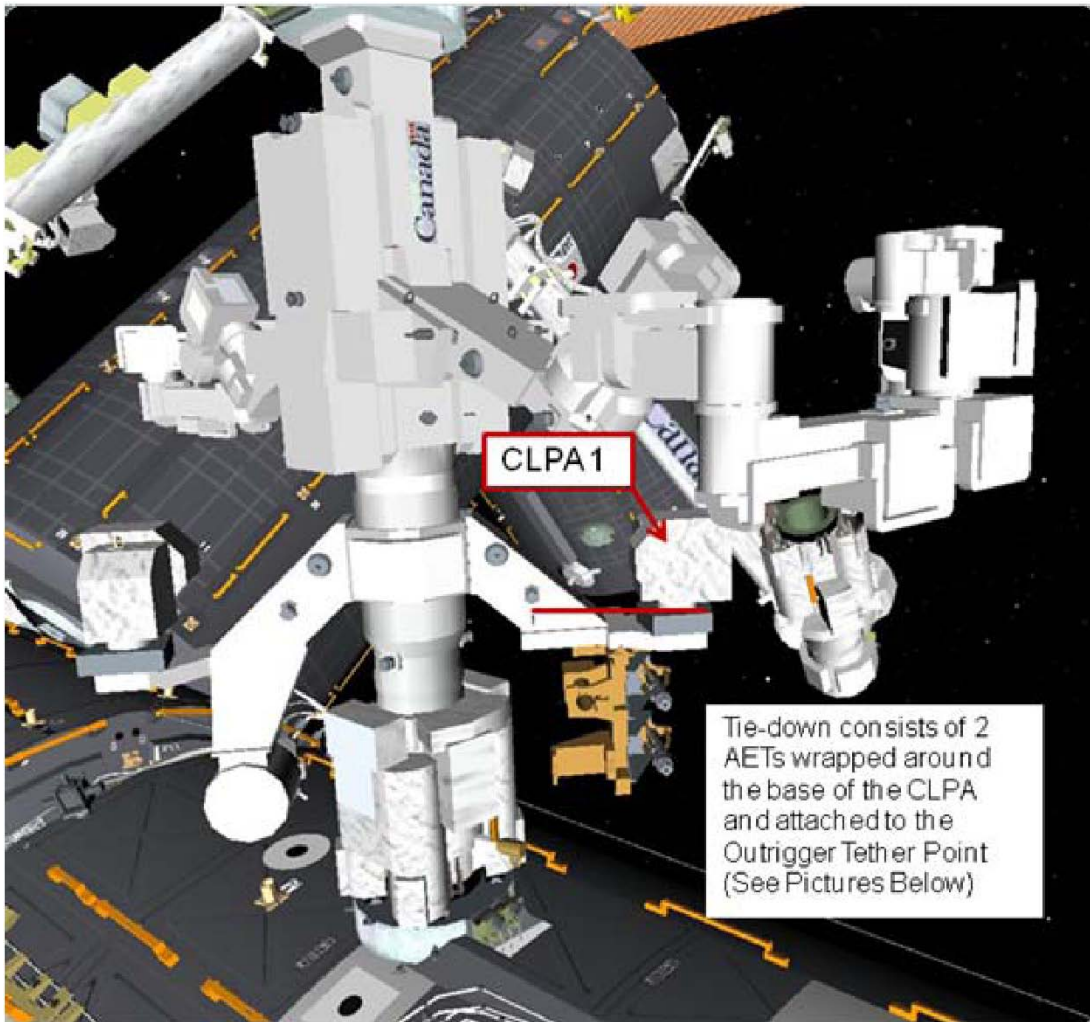
S1 FGB TIE-DOWN



CP13 ETVCG LIGHT TIE-DOWN



SPDM CLPA 1 TIE-DOWN



FLIGHT SPECIFIC EVA REFERENCE

I

PAYLOAD BAY OVERVIEW FS 18-3

ATA

 SPARE ATA OVERVIEW..... FS 18-4

 SPARE ATA BOLT 1 AND FSE FS 18-8

 SPARE ATA BOLT 2 AND FSE FS 18-11

 SPARE ATA BOLT 3 AND FSE FS 18-13

 SPARE ATA BOLT 4 AND FSE FS 18-16

 S1 ATA OVERVIEW..... FS 18-19

 S1 ATA BOLT 1 FS 18-20

 S1 ATA BOLT 2 FS 18-21

 S1 ATA BOLT 3 FS 18-22

 S1 ATA BOLT 4 FS 18-23

 S1 ATA CONNECTORS FS 18-24

 ATA CONTINGENCIES FS 18-28

 ADJUSTABLE GRAPPLE BAR (AGB) FS 18-32

 FGB OVERVIEW..... FS 18-37

 CETA CART OVERVIEW..... FS 18-40

EVA 1

 MPAC SEED OV 1 FS 18-45

 MPAC SEED OV 2..... FS 18-46

 MPAC & SEED PROTECTION COVER FS 18-47

 MPAC & SEED ON BRACKET WITH PROTECTION COVER..... FS 18-49

 MPAC & SEED INSTALLED FS 18-50

 RGA 1 FS 18-52

EVA 2 & 3

 OTP TIE-DOWN..... FS 18-56

 RAD GF STOW BEAM OV..... FS 18-60

 RAD GF STOW BEAM ALIGNMENT GUIDES FS 18-61

 RAD GF STOW BEAM BOLT FS 18-62

 S1 RAD GF STOW BEAM WORKSITE FS 18-63

 RAD GF STOW BEAM WORKSITE..... FS 18-64

 A/L MMOD SHIELD RETRIEVE..... FS 18-65

 LWAPA RETRIEVE..... FS 18-66

 CP 13 OV FS 18-76

 ETVCG OV 1..... FS 18-77

 ETVCG OV 2..... FS 18-78

 ETVCG LIGHT 1 FS 18-79

 ETVCG LIGHT 2 FS 18-80

 SPDM OV 1..... FS 18-81

 SPDM OV 2..... FS 18-82

 SPDM CLPA1 INSTALL..... FS 18-83

 SPDM EP1 MLI RETRIEVE FS 18-92

ORBITER

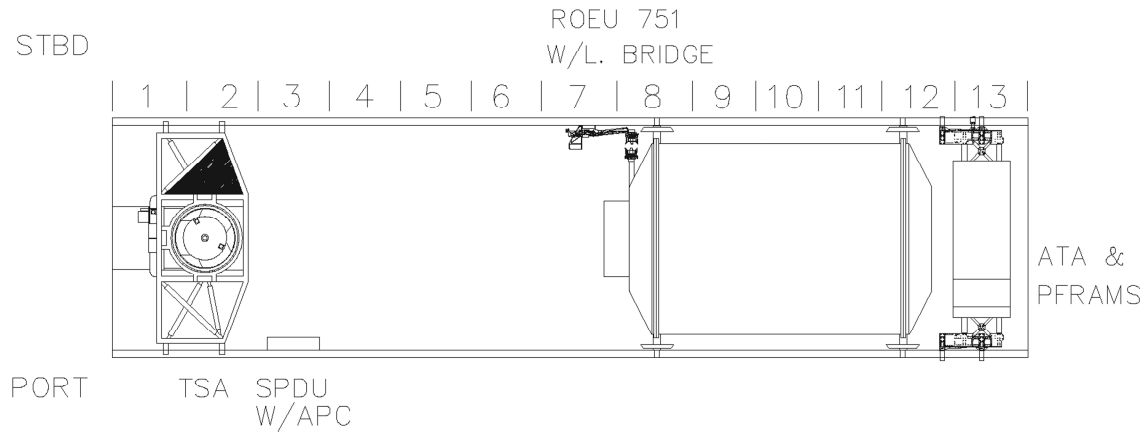
 ROEU..... FS 18-95

 PRLA..... FS 18-100

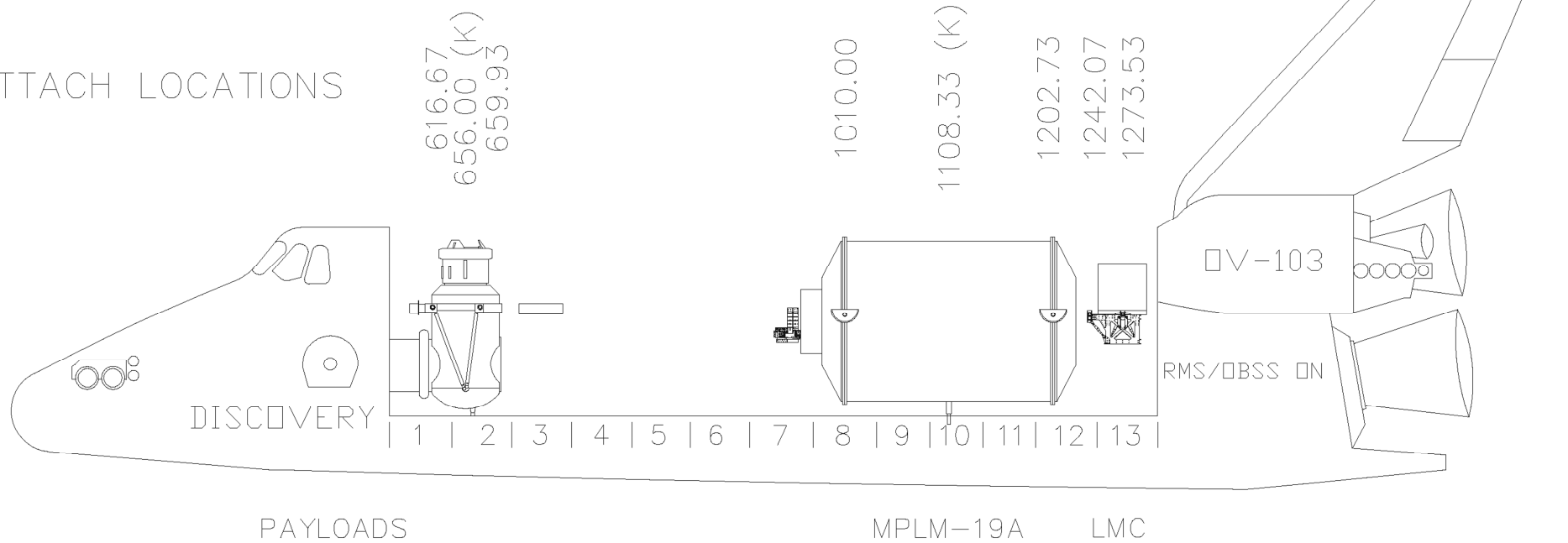
FLIGHT SPECIFIC
EVA REFERENCE

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PAYLOAD BAY OVERVIEW



ATTACH LOCATIONS



ATA

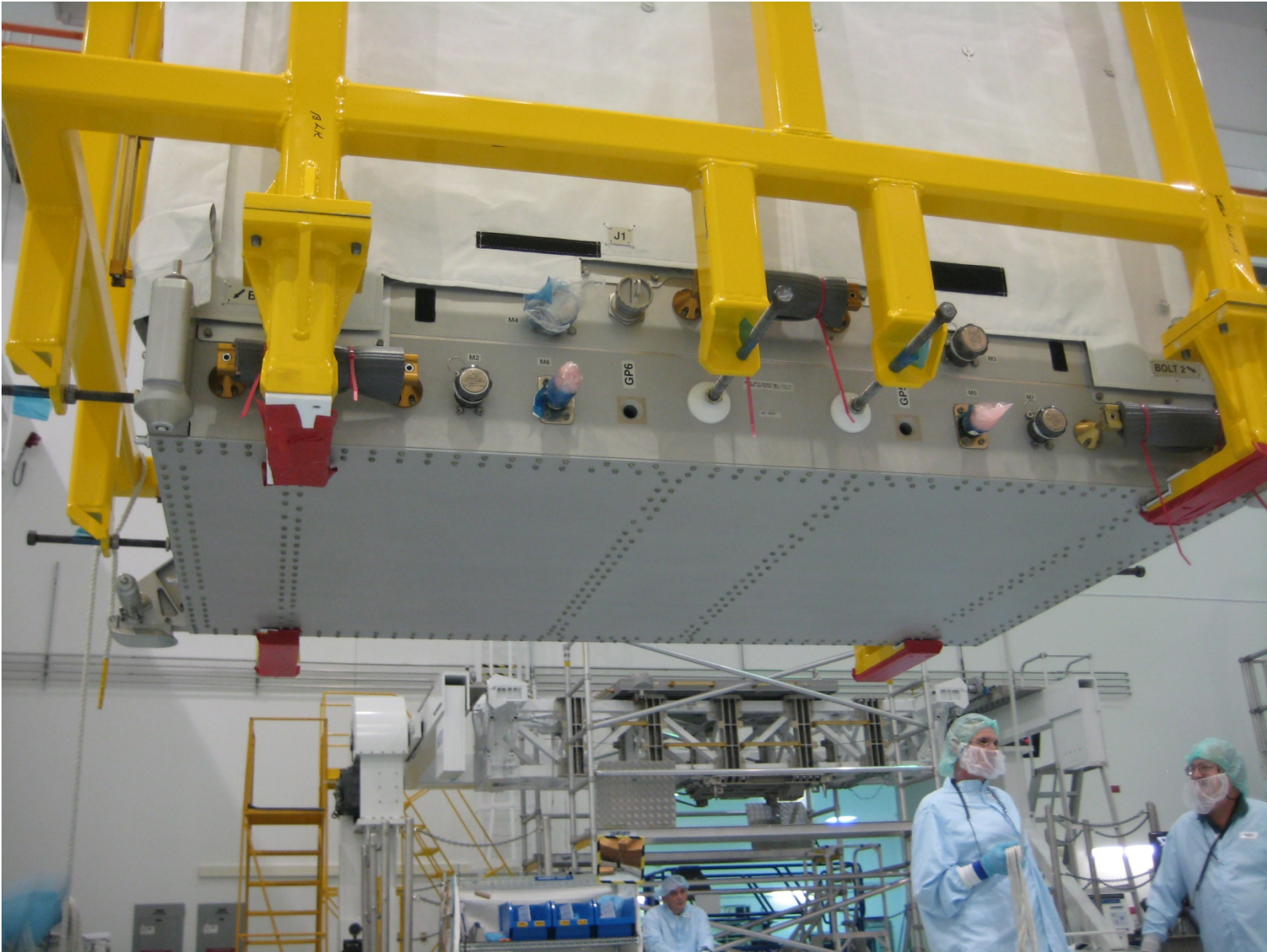
SPARE ATA OVERVIEW



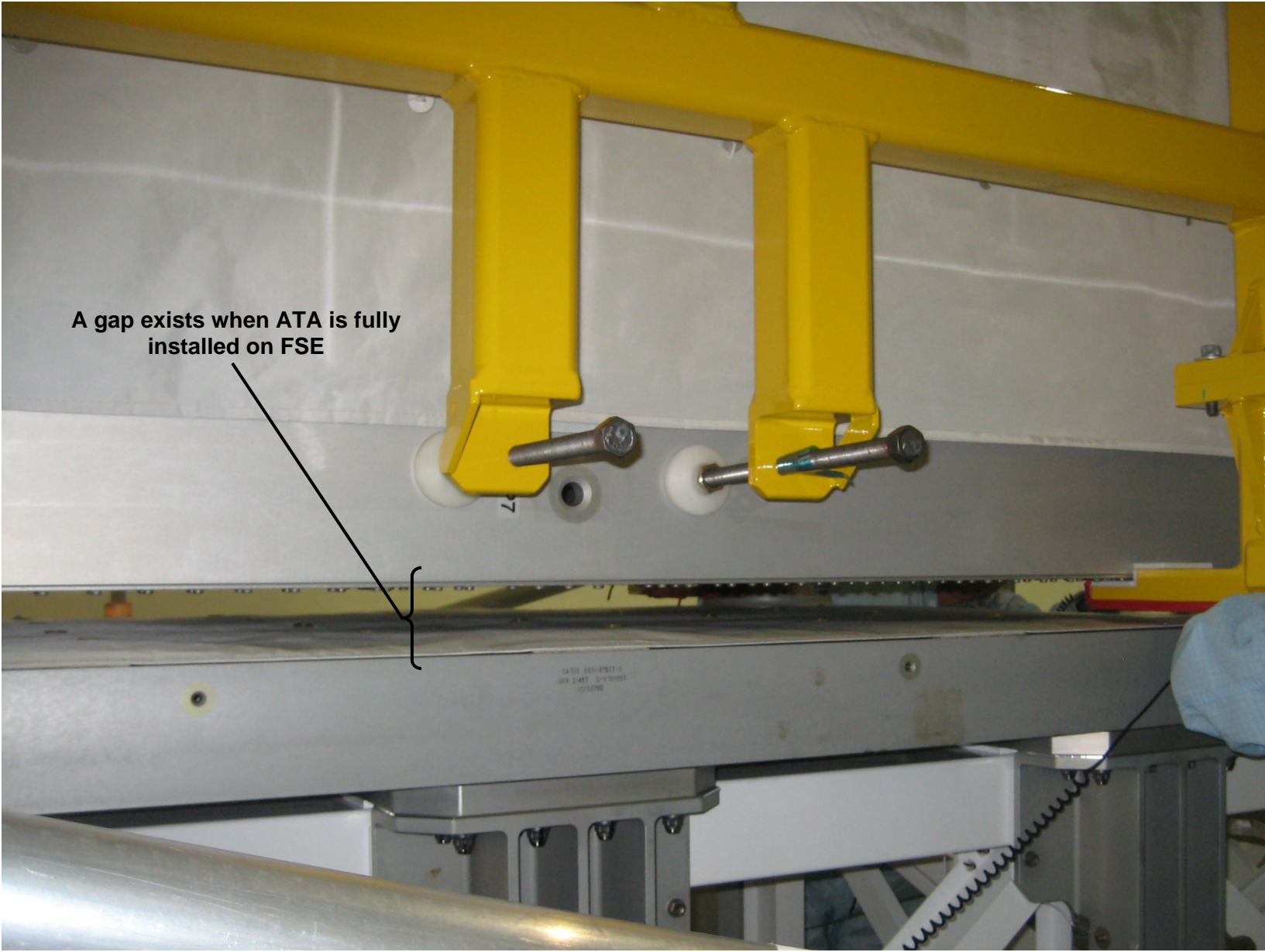
SPARE ATA OVERVIEW (Cont)



SPARE ATA OVERVIEW (Cont)



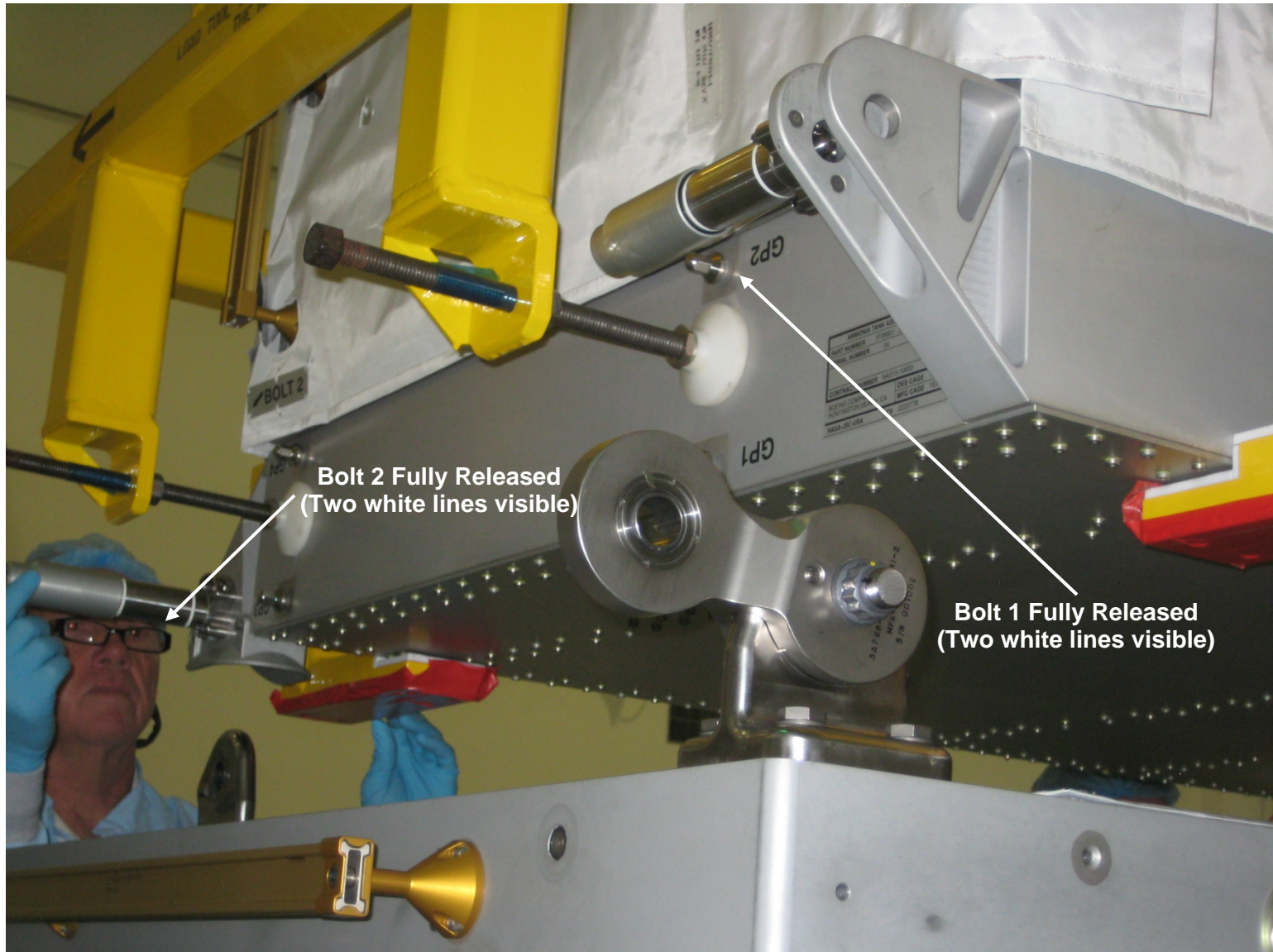
SPARE ATA OVERVIEW (Cont)



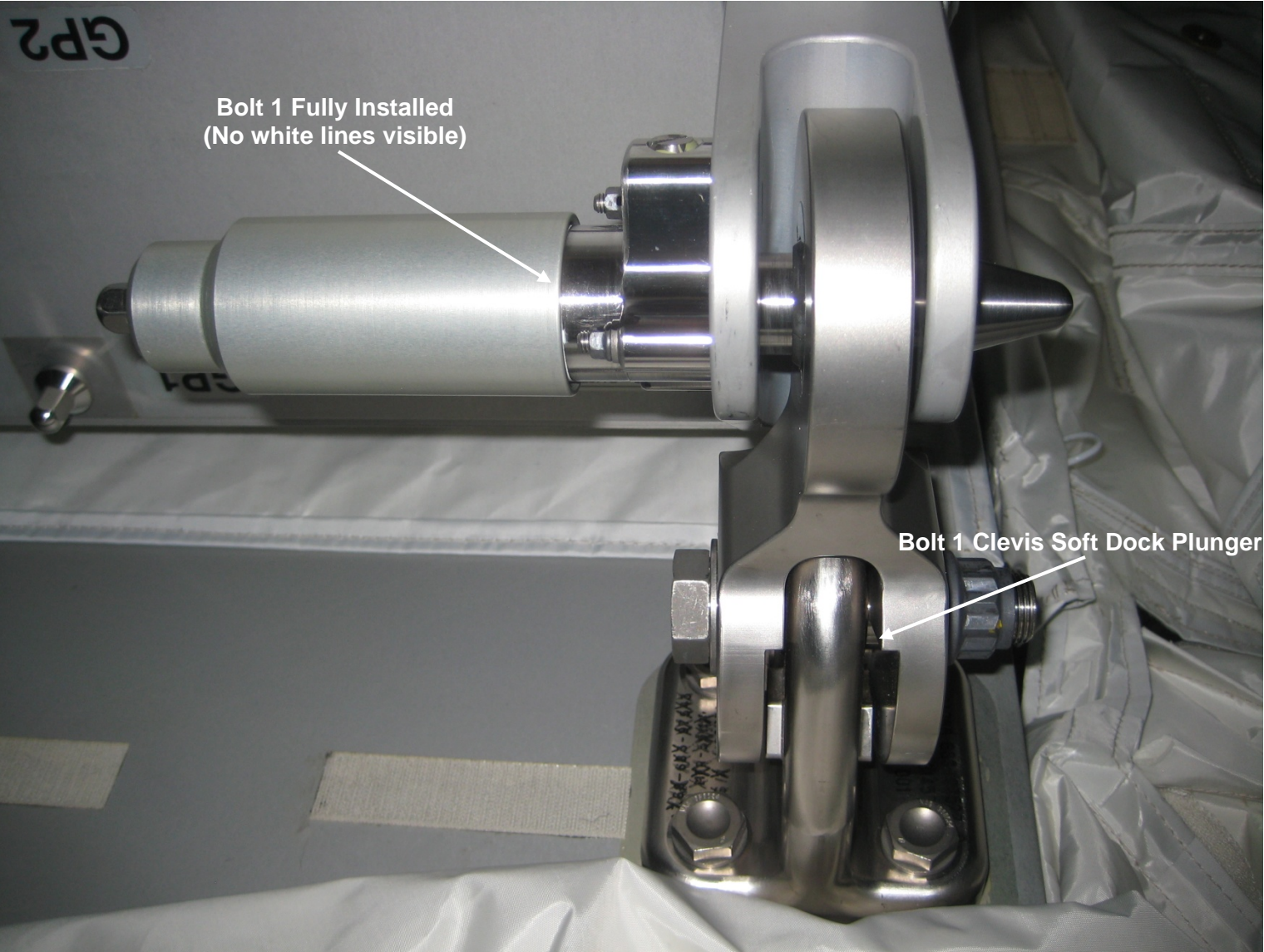
SPARE ATA BOLT 1 AND FSE



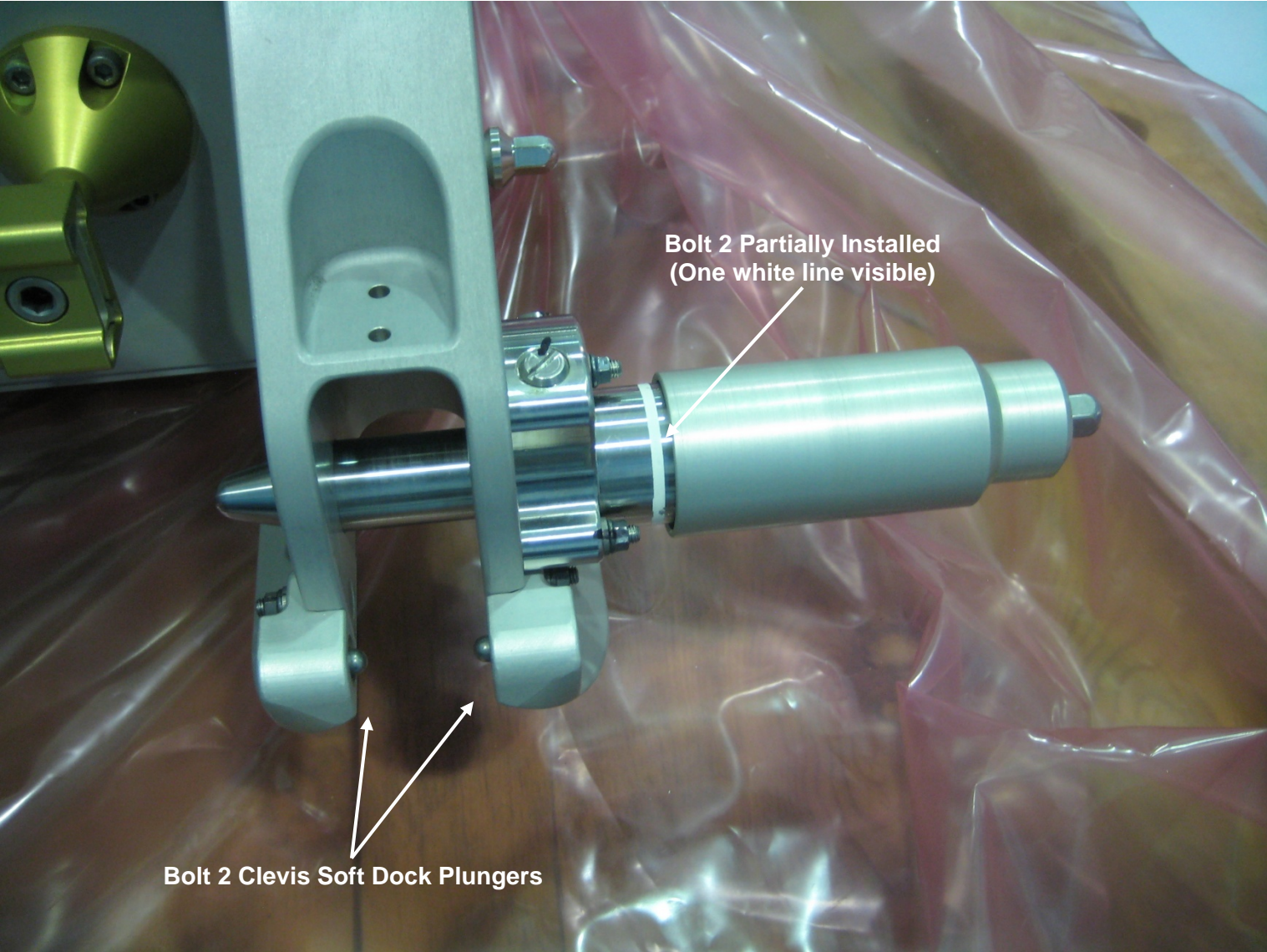
SPARE ATA BOLT 1 AND FSE (Cont)



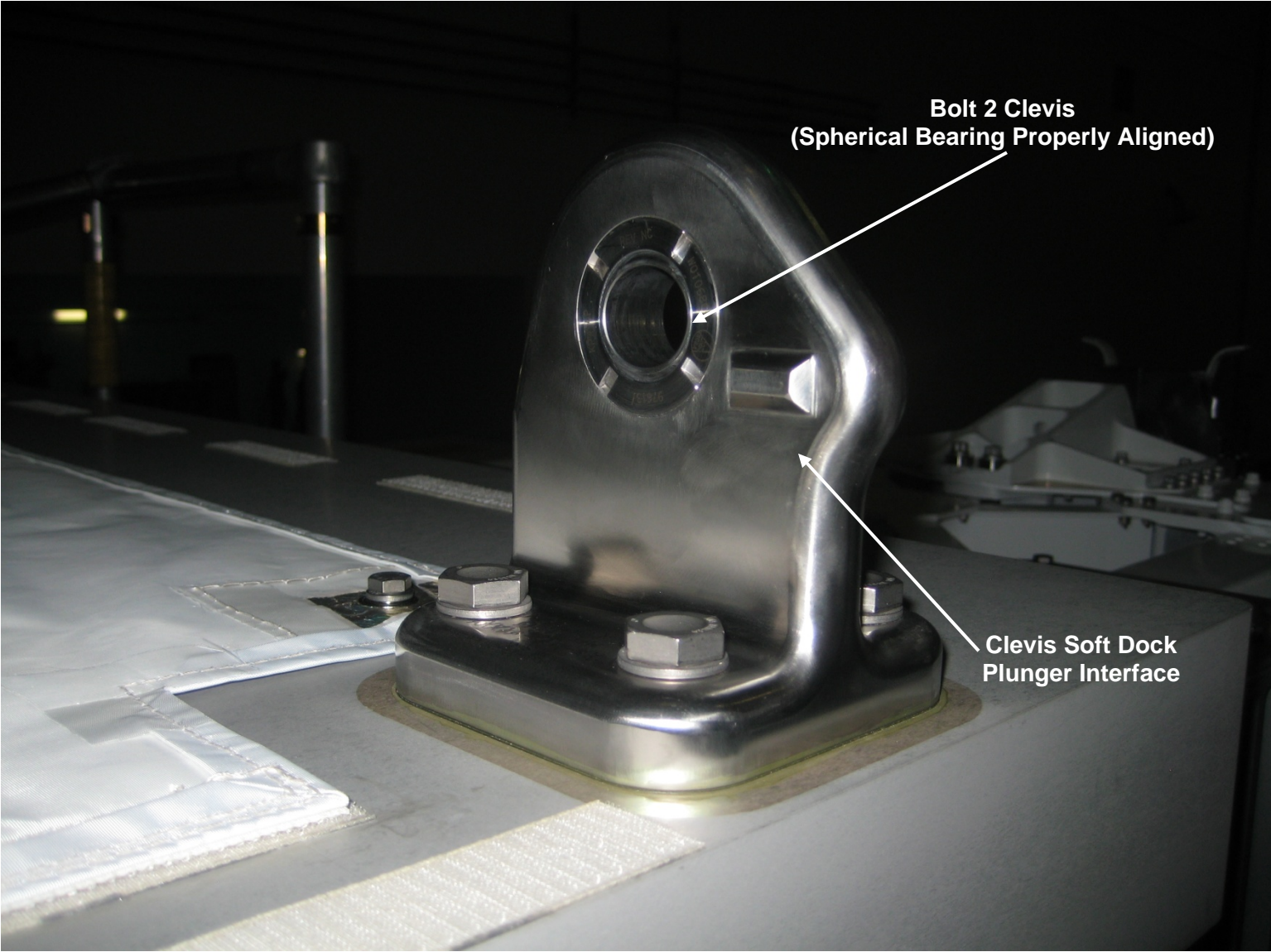
SPARE ATA BOLT 1 AND FSE (Cont)



SPARE ATA BOLT 2 AND FSE



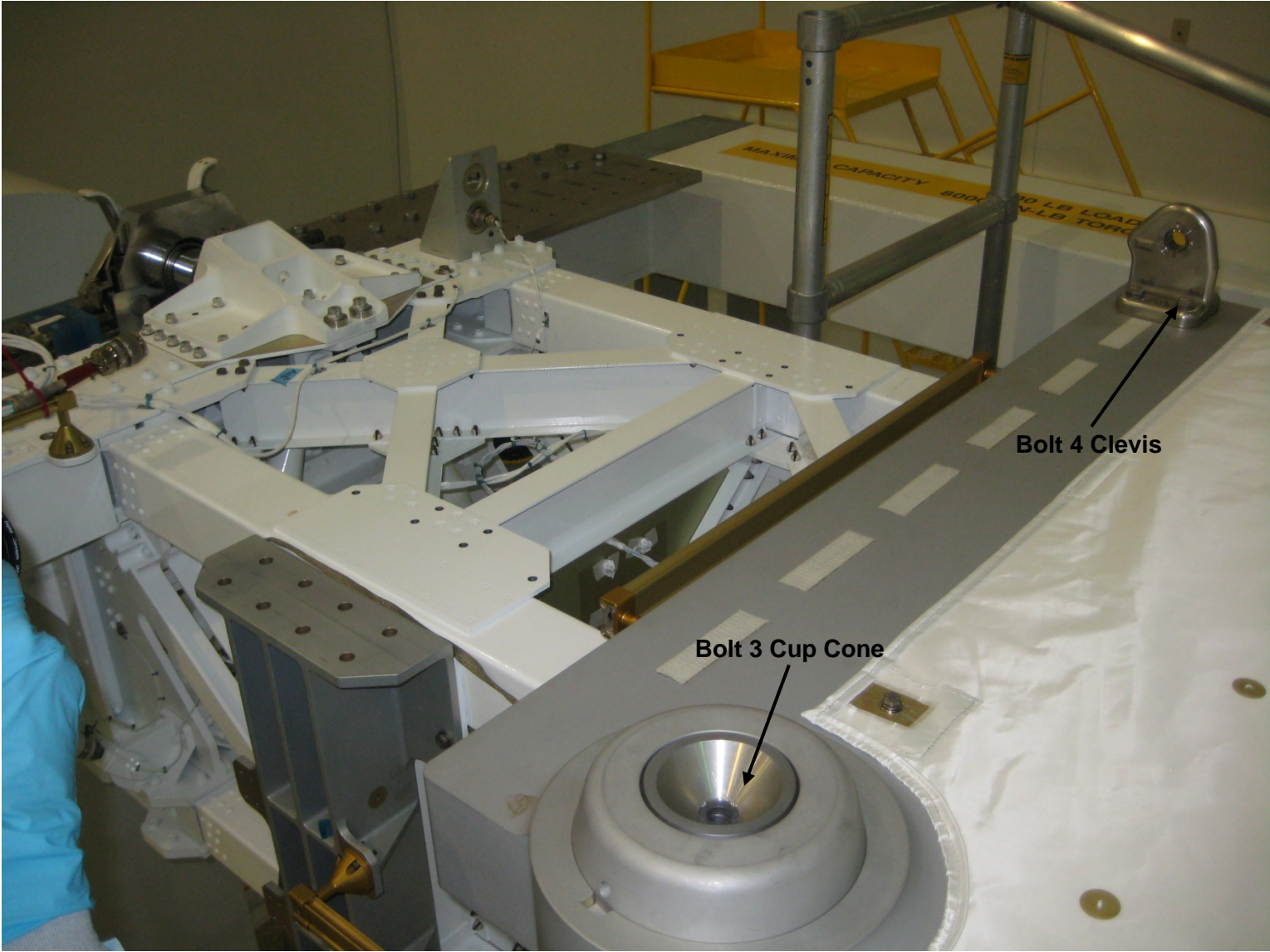
SPARE ATA BOLT 2 AND FSE (Cont)



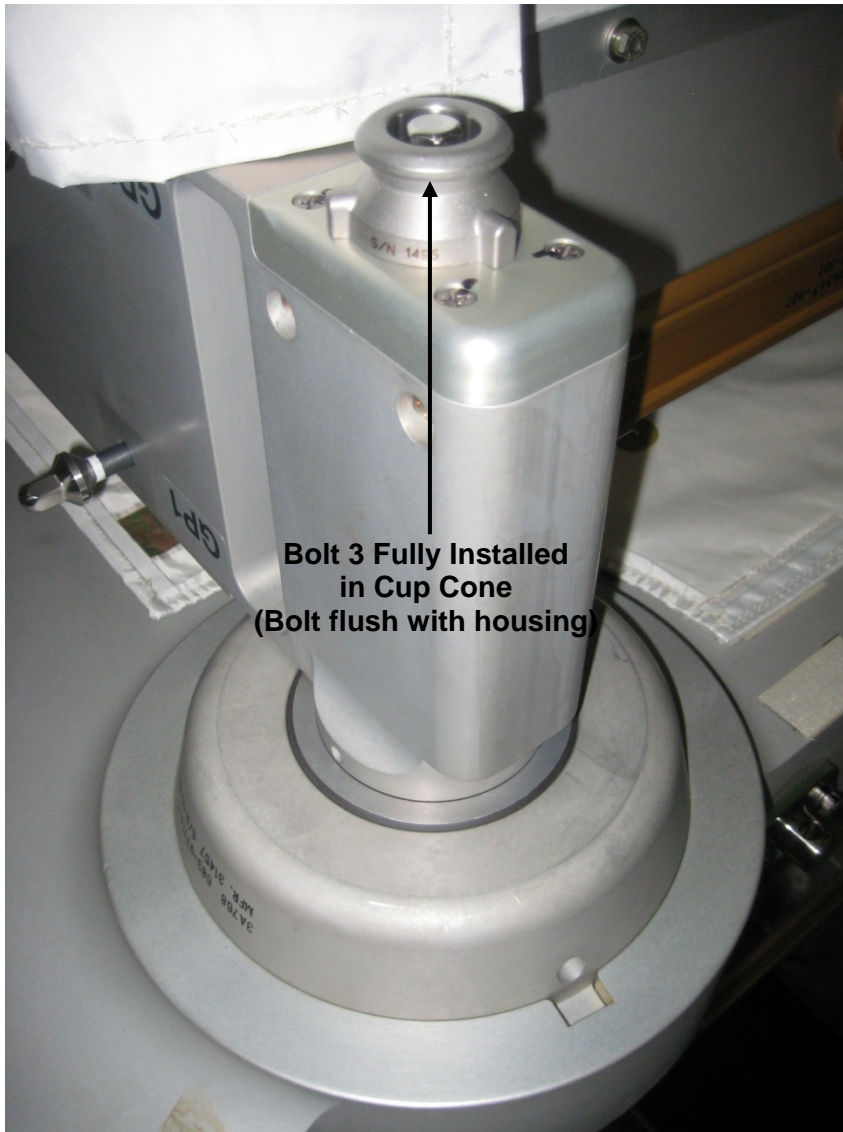
SPARE ATA BOLT 3 AND FSE



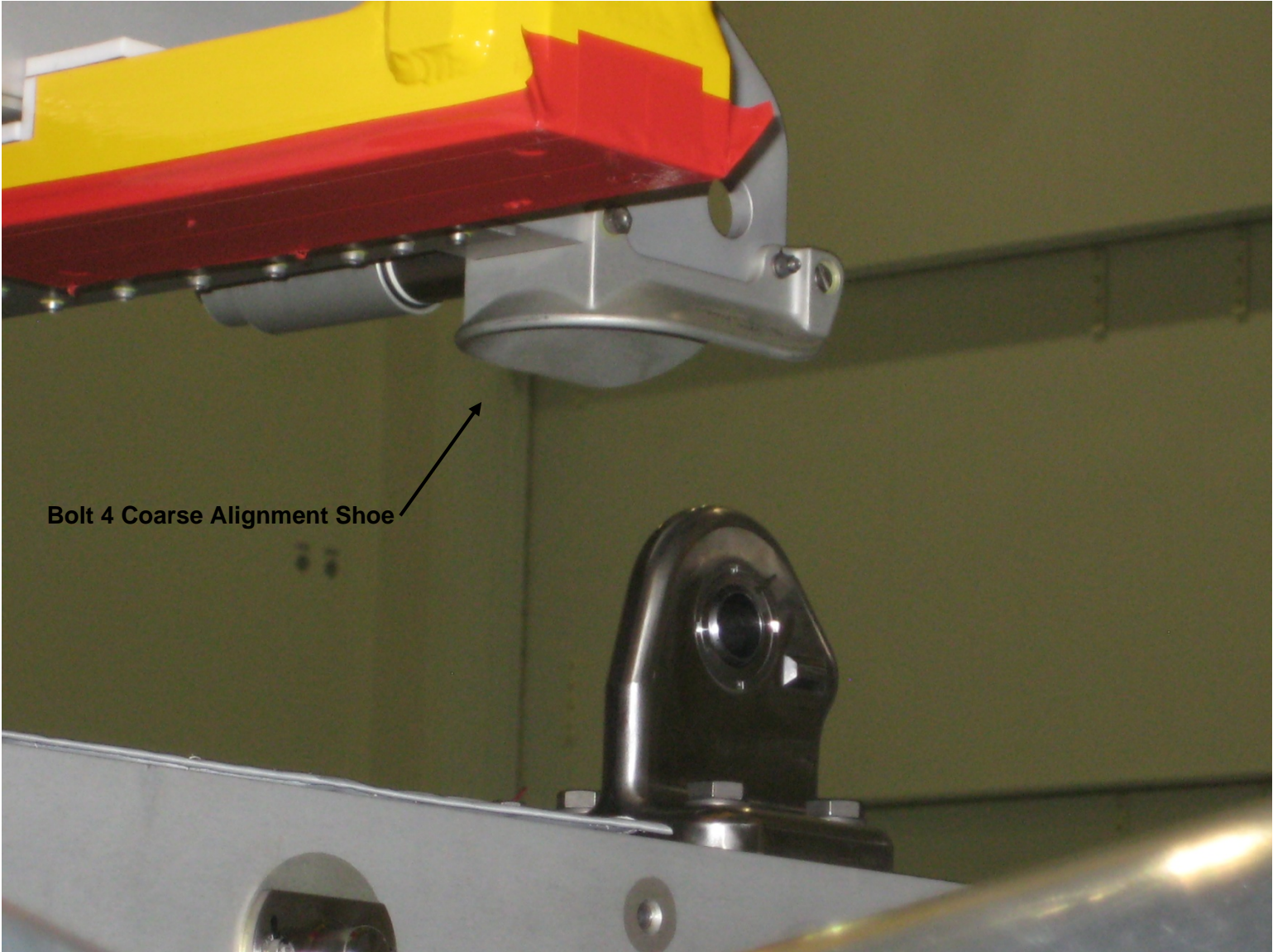
SPARE ATA BOLT 3 AND FSE (Cont)



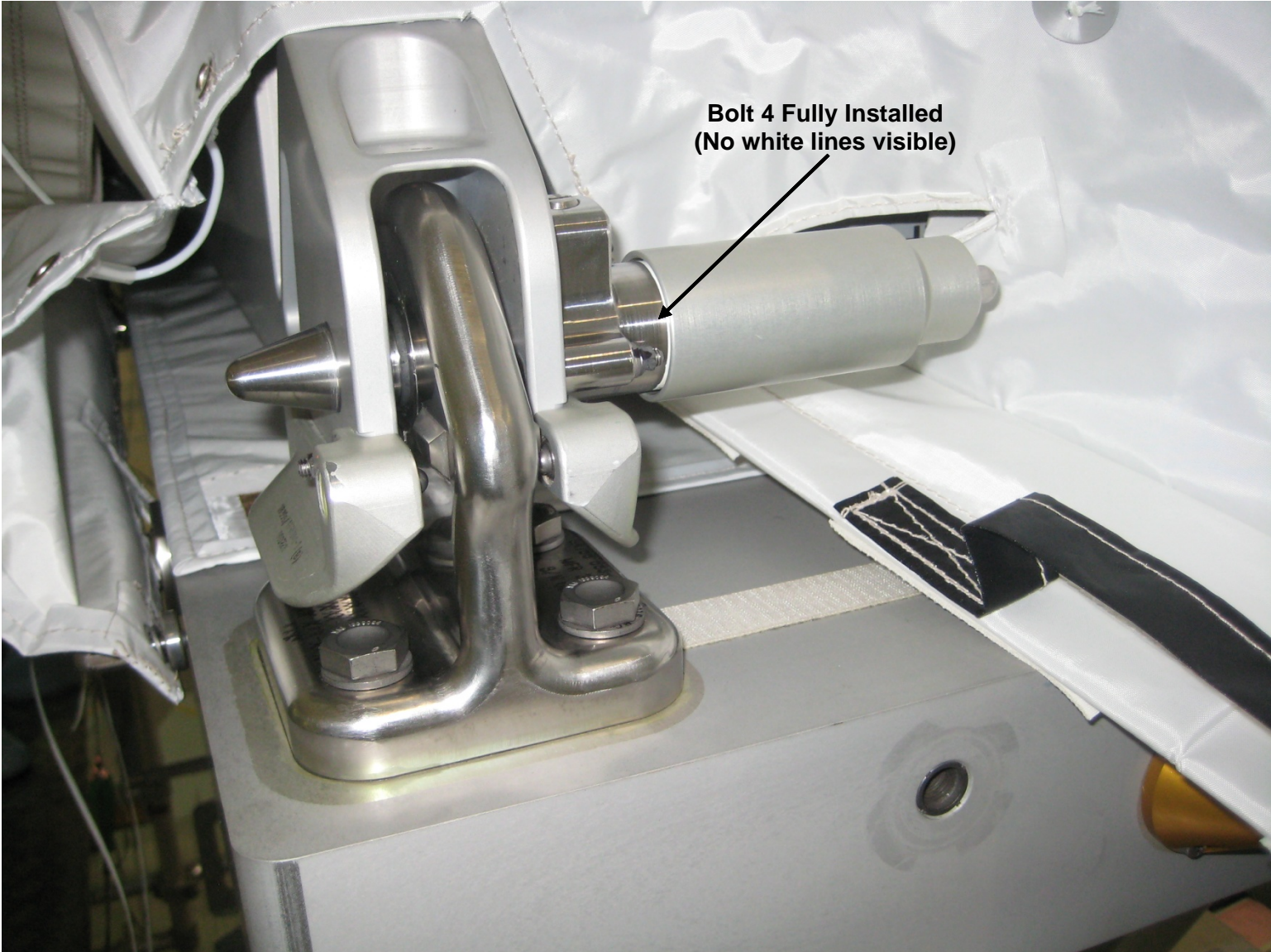
SPARE ATA BOLT 3 AND FSE (Cont)



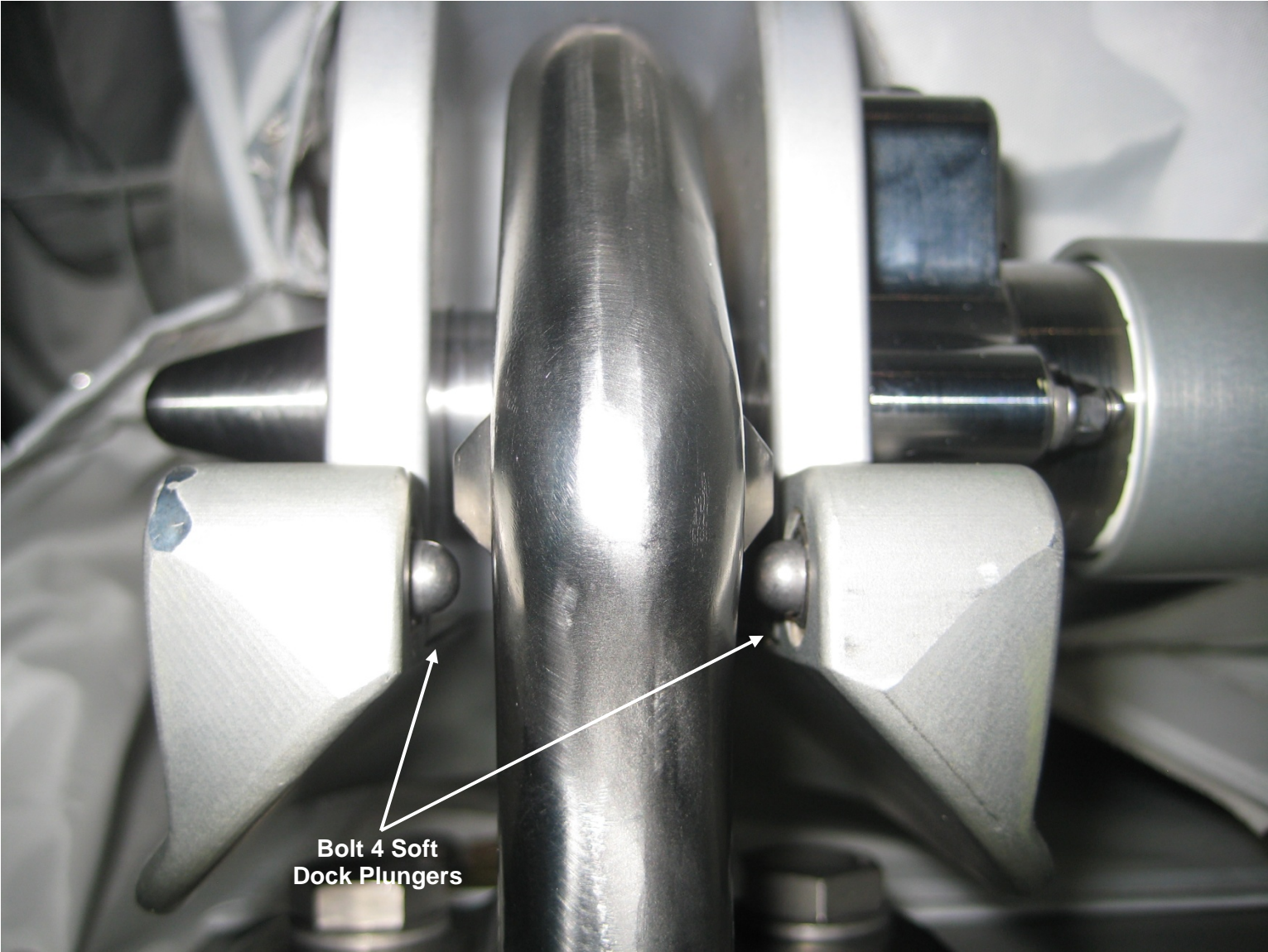
SPARE ATA BOLT 4 AND FSE



SPARE ATA BOLT 4 AND FSE (Cont)

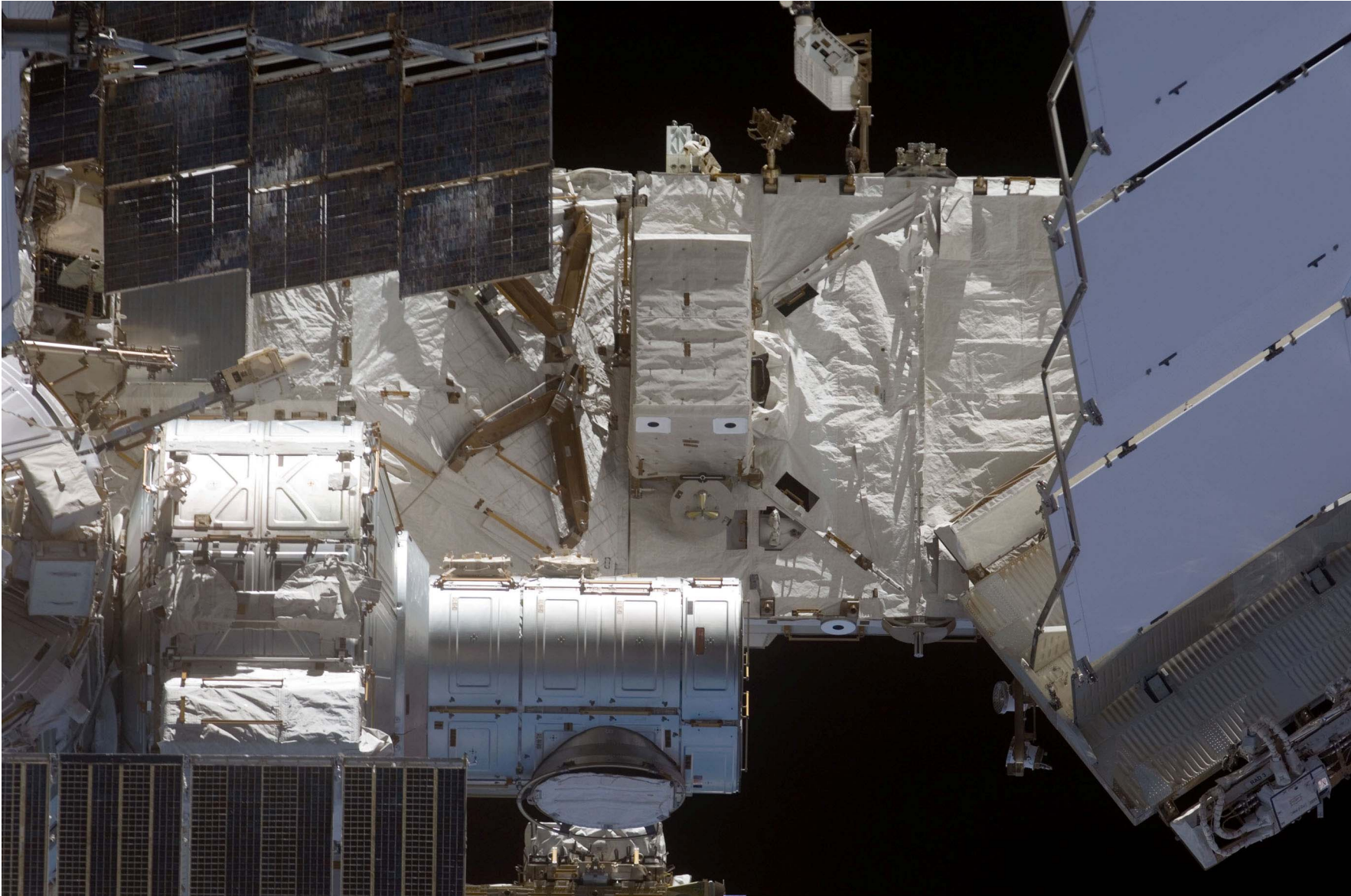


SPARE ATA BOLT 4 AND FSE (Cont)



**Bolt 4 Soft
Dock Plungers**

S1 ATA OVERVIEW



S1 ATA BOLT 1



S1 ATA BOLT 2



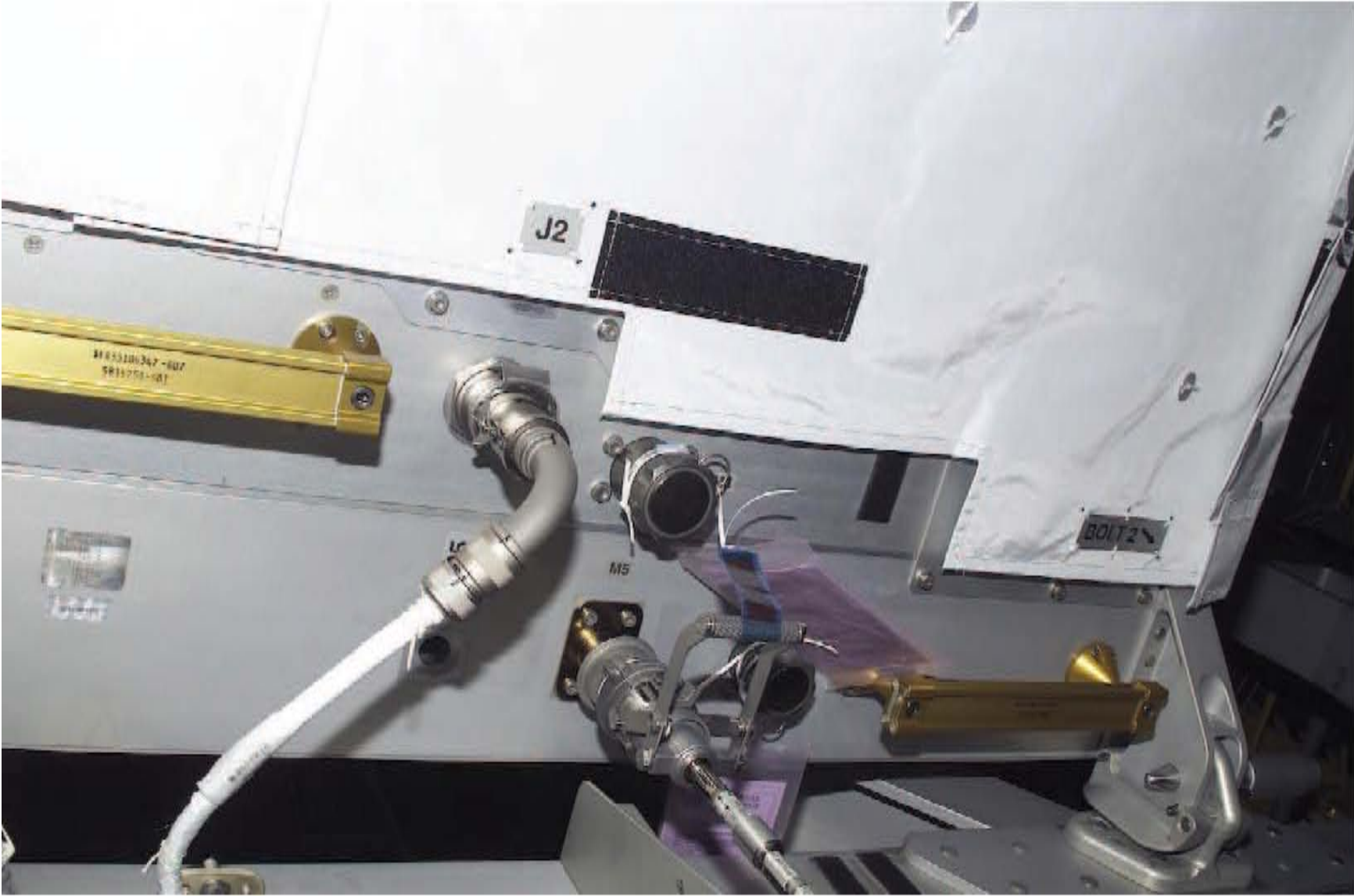
S1 ATA BOLT 3



S1 ATA BOLT 4



S1 ATA CONNECTORS



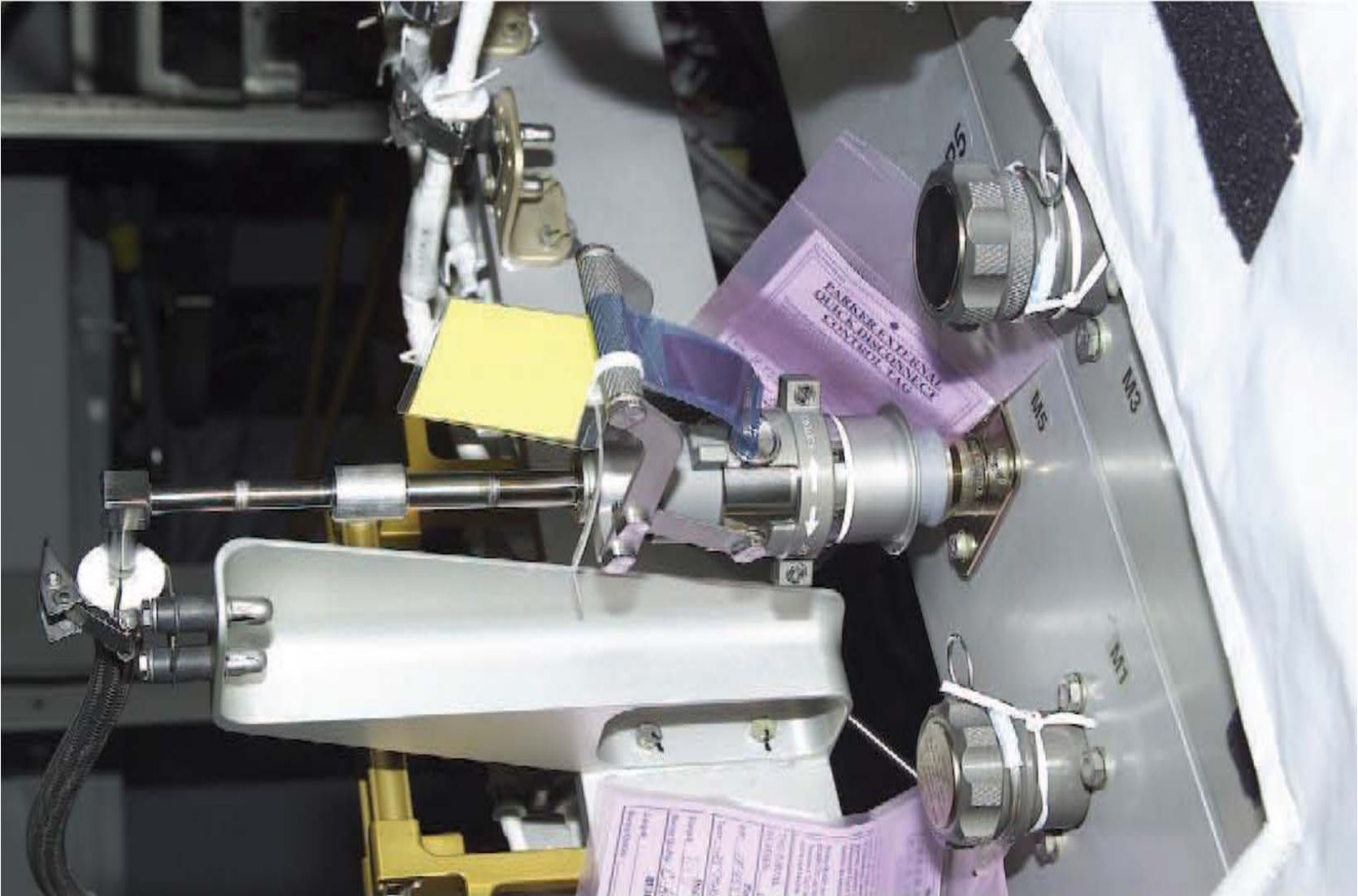
S1 ATA CONNECTORS (Cont)



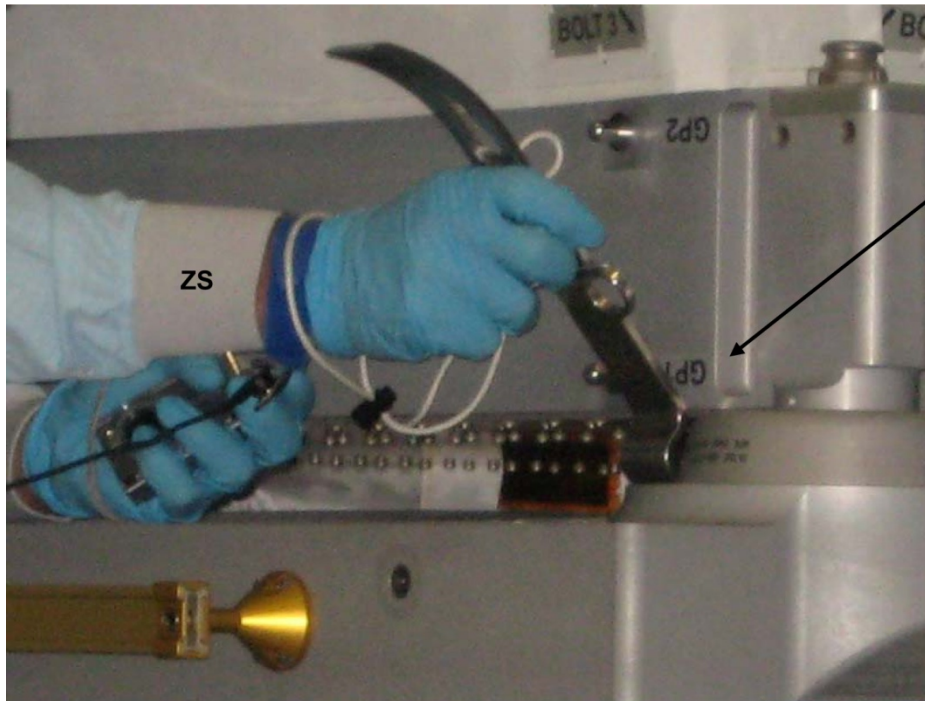
S1 ATA CONNECTORS (Cont)



S1 ATA CONNECTORS (Cont)

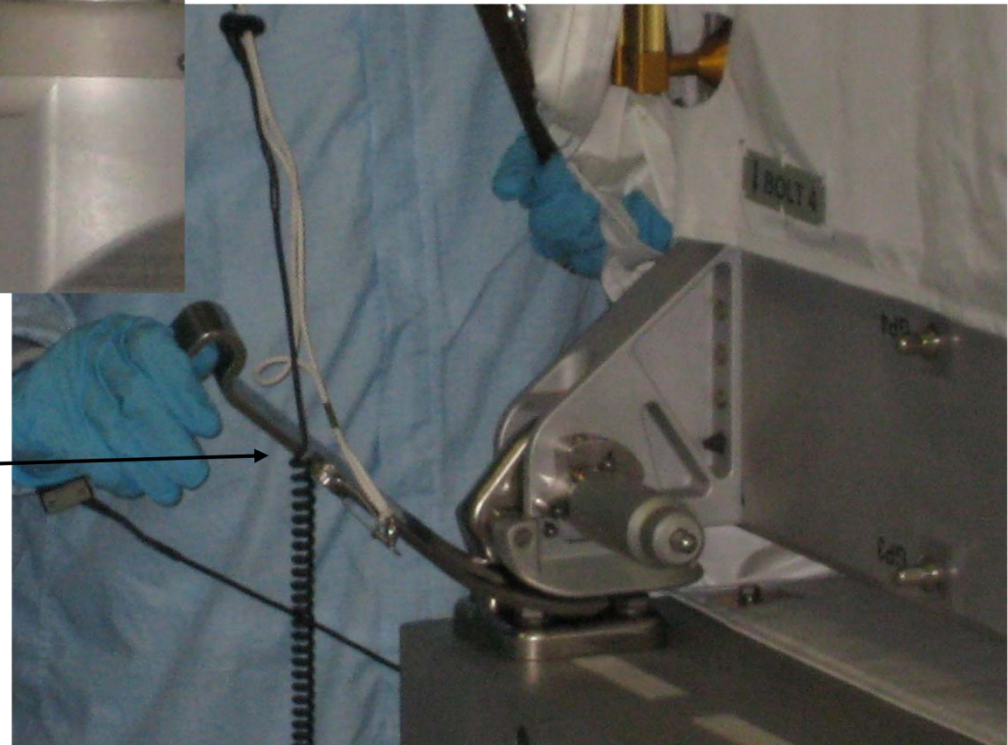


ATA CONTINGENCIES



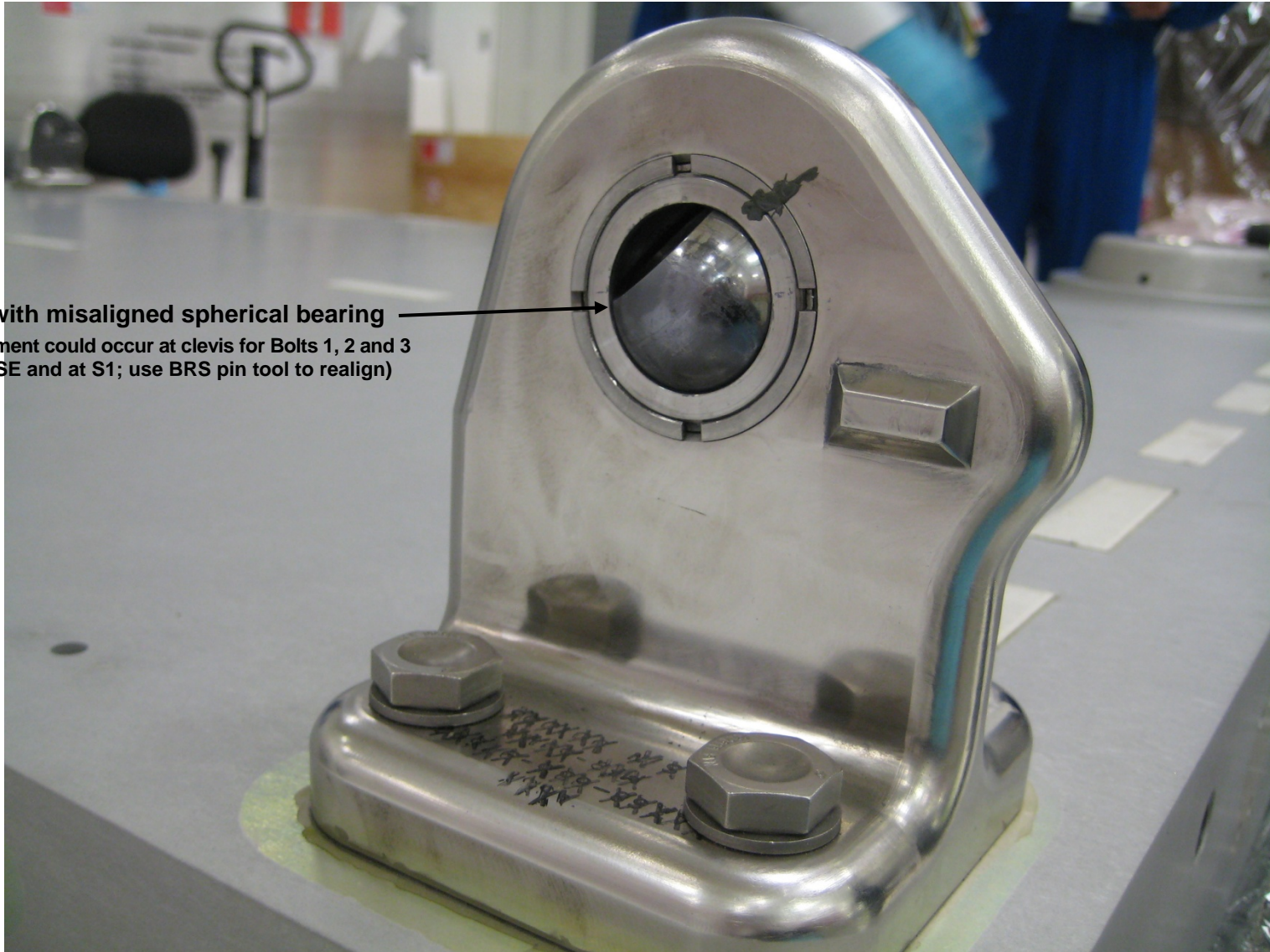
Prybar used to clear ATA from soft dock at Bolt 3
(NOTE: FSE has NO soft dock at Bolt 3; this assessment used to demonstrate technique to be used for ATA on S1)

Prybar used to clear ATA from soft dock at Bolt 4
(NOTE: Soft dock at Bolt 2 and Bolt 4 on both FSE and at S1)



ATA CONTINGENCIES (Cont)

Bolt 4 Clevis with misaligned spherical bearing
(NOTE: Misalignment could occur at clevis for Bolts 1, 2 and 3 on the FSE and at S1; use BRS pin tool to realign)



ATA CONTINGENCIES (Cont)

BRS Pin Tool used to exercise sticky plungers at Bolts 2 and 4

(NOTE: Soft dock plungers interface with clevis brackets at Bolt 2 and Bolt 4 on both the FSE and S1)

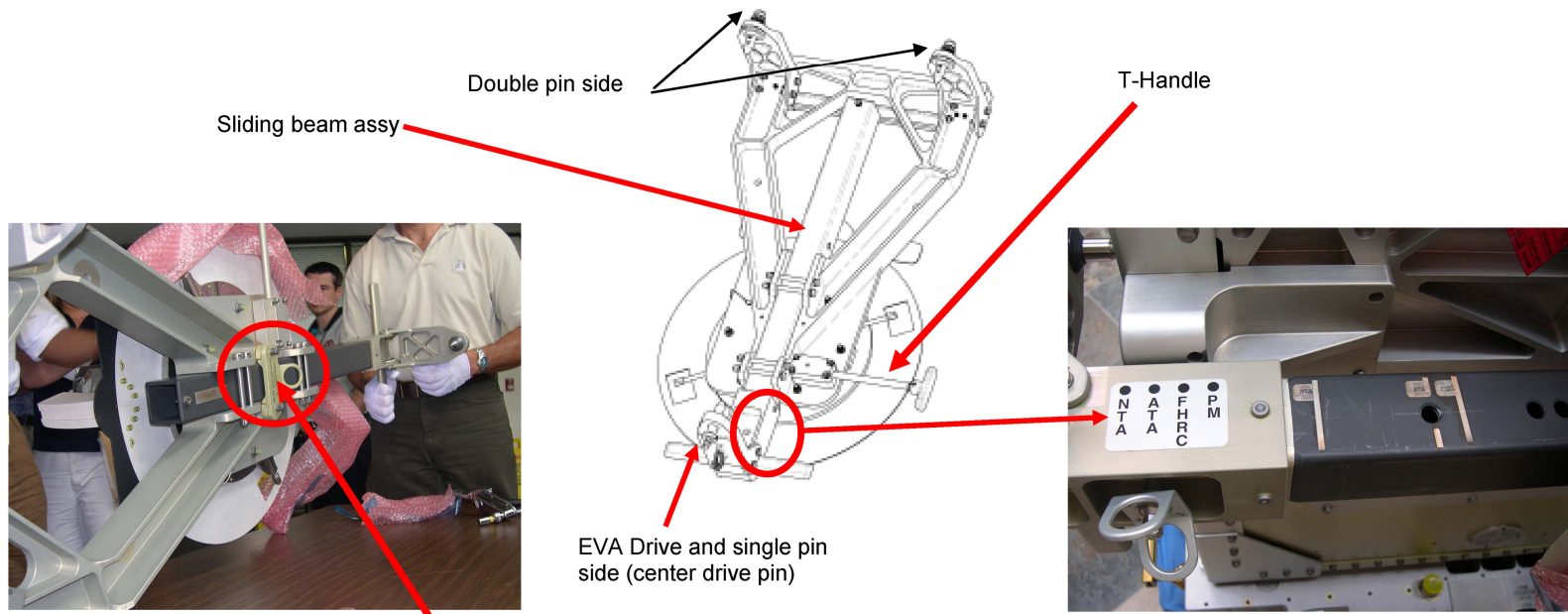


ATA CONTINGENCIES (Cont)

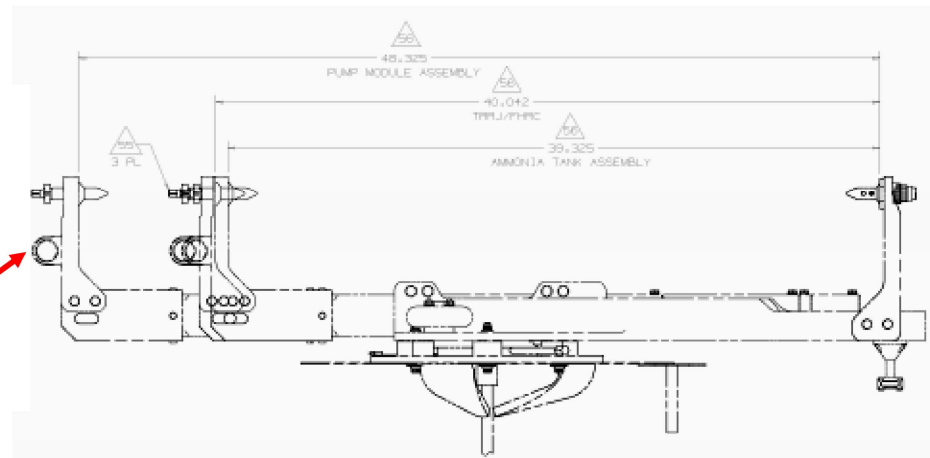
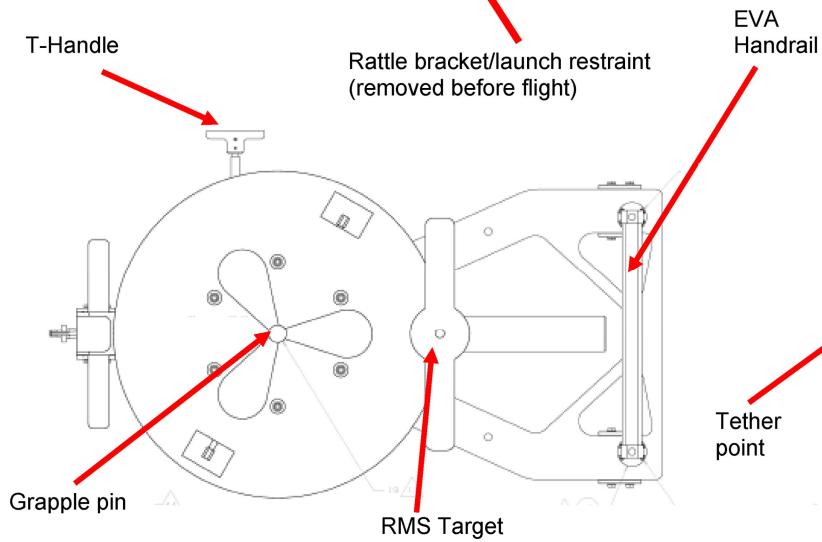


**LMC at Bolt 3 Cup Cone
(bottom view of upper surface)**

ADJUSTABLE GRAPPLE BAR (AGB)



ORU INDICATOR LABEL

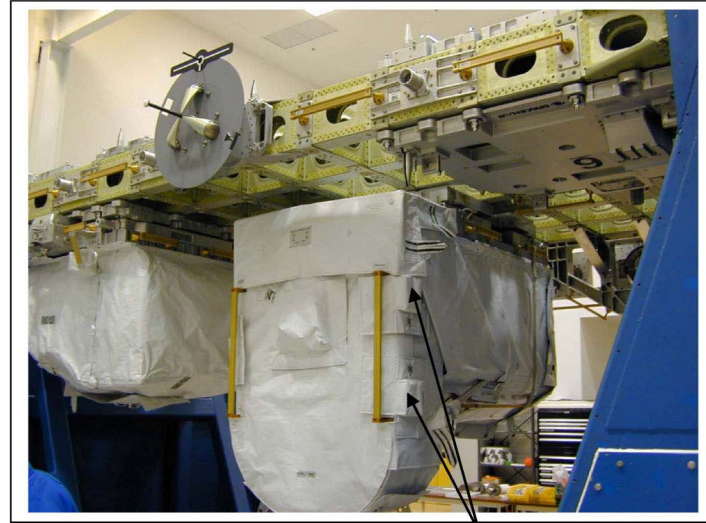


AGB EXTENDED FOR DIFFERENT ORUS

ADJUSTABLE GRAPPLE BAR (AGB) (Cont)



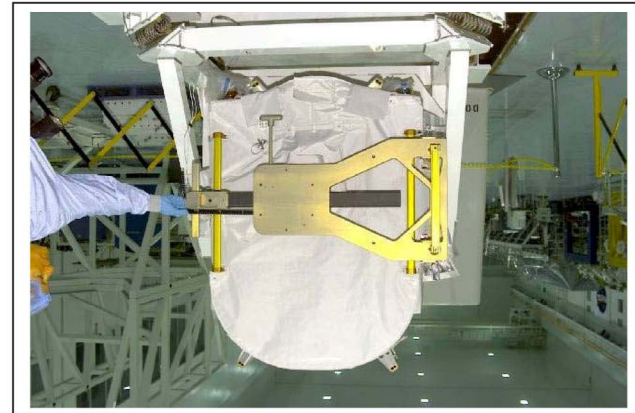
VELCRO FLAPS FOR AGB ATTACH – CLOSED POSN



FHRG ON ESP-2 (DOUBLE PIN SIDE)

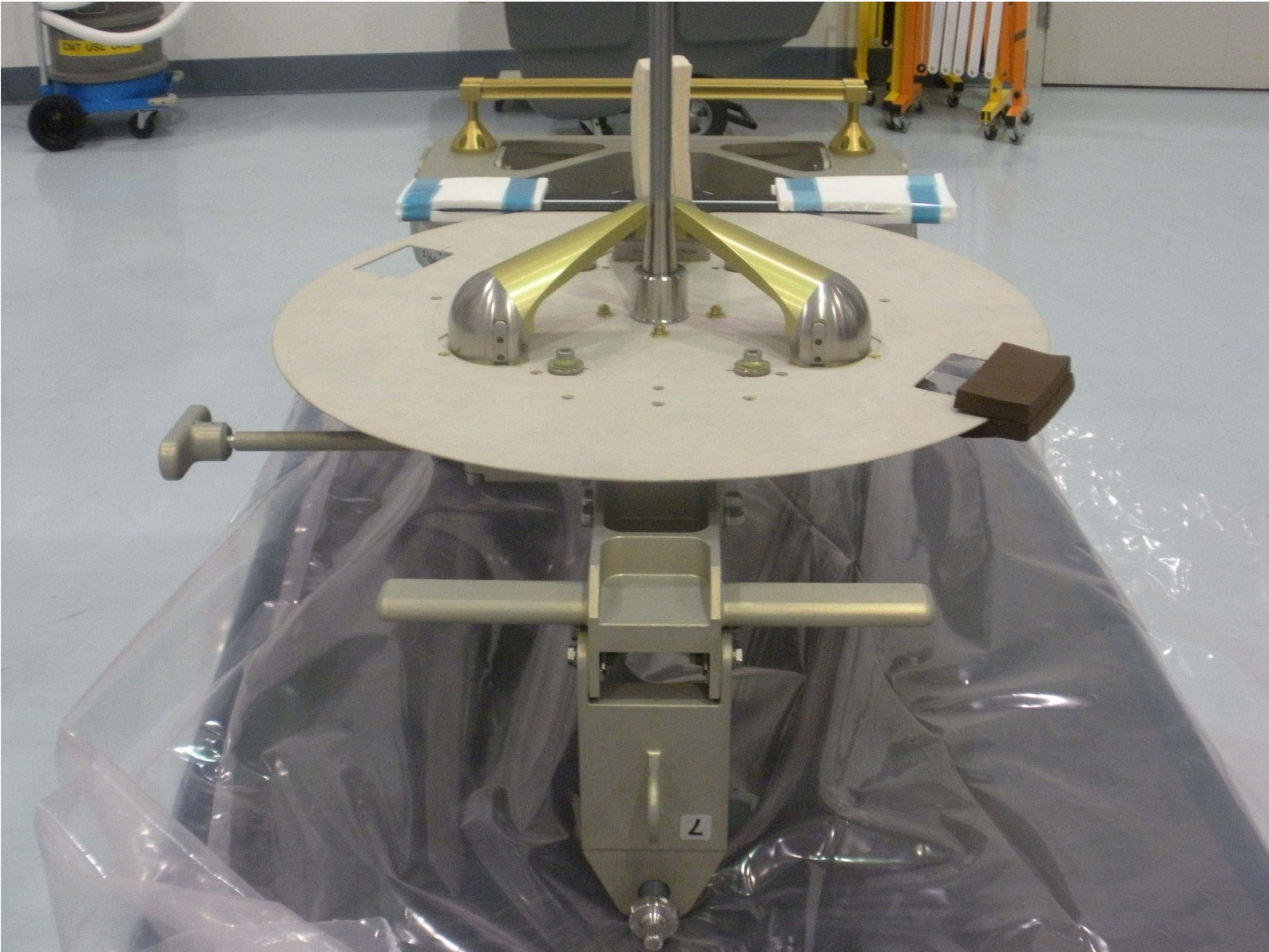


AGB INSTALL ON FHRG – DOUBLE PIN SIDE
(MLI FLAPS ARE VELCROED OPEN)

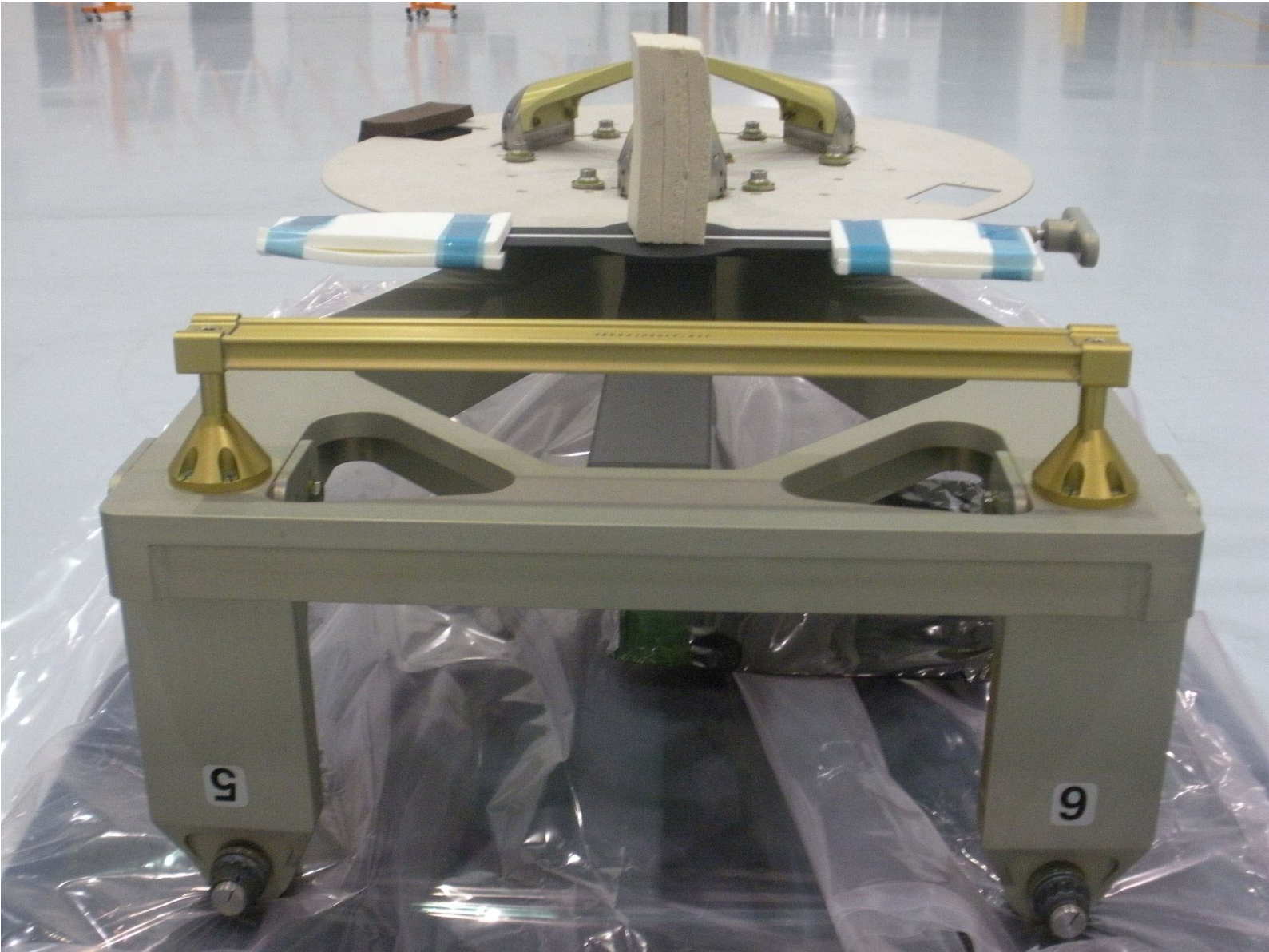


AGB INSTALL ON FHRG – FRONT VIEW

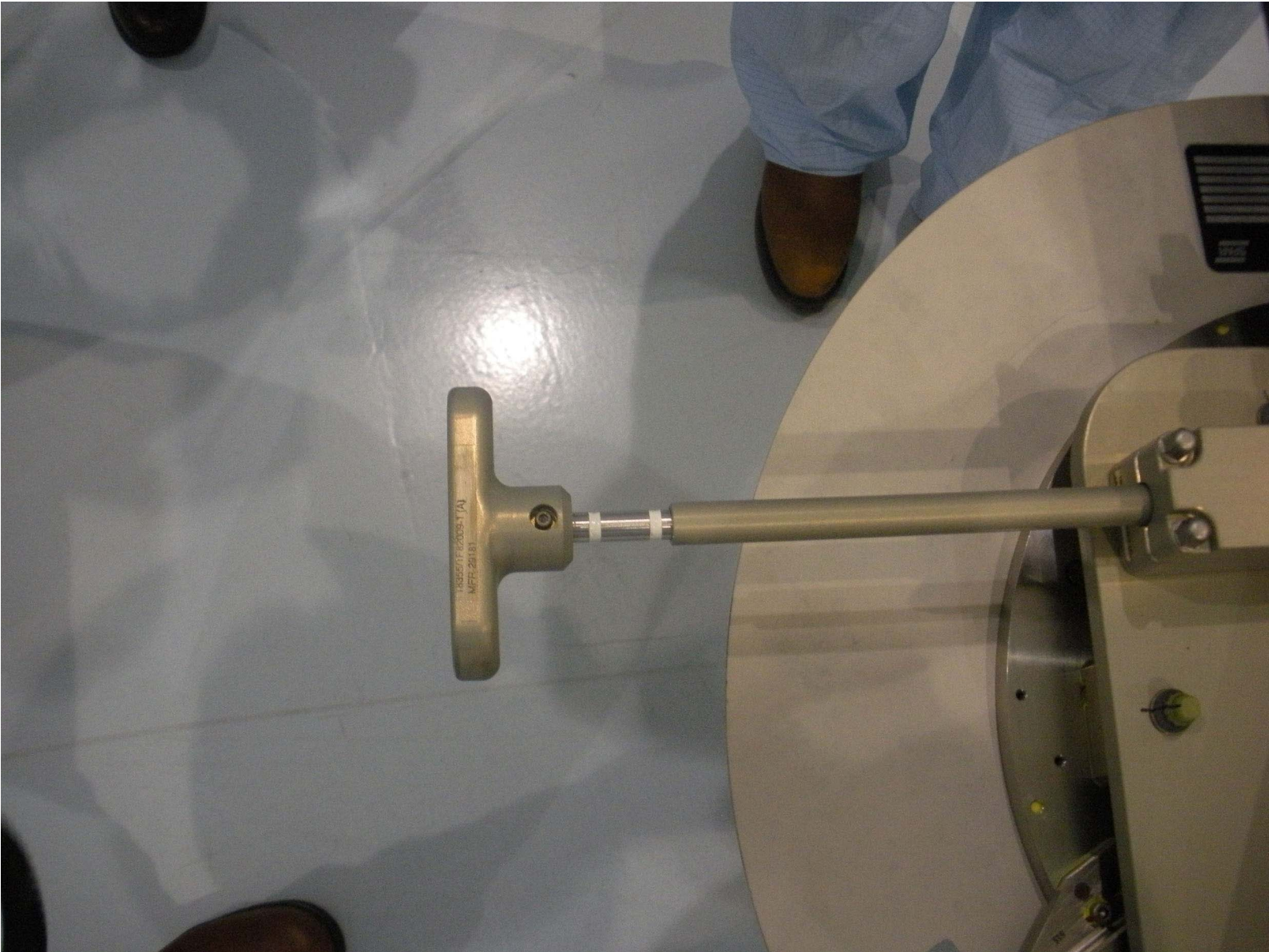
ADJUSTABLE GRAPPLE BAR (AGB) (Cont)



ADJUSTABLE GRAPPLE BAR (AGB) (Cont)



ADJUSTABLE GRAPPLE BAR (AGB) (Cont)



FGB OVERVIEW



DETENT ON BOLT 3 ONLY

FGB OVERVIEW (Cont)

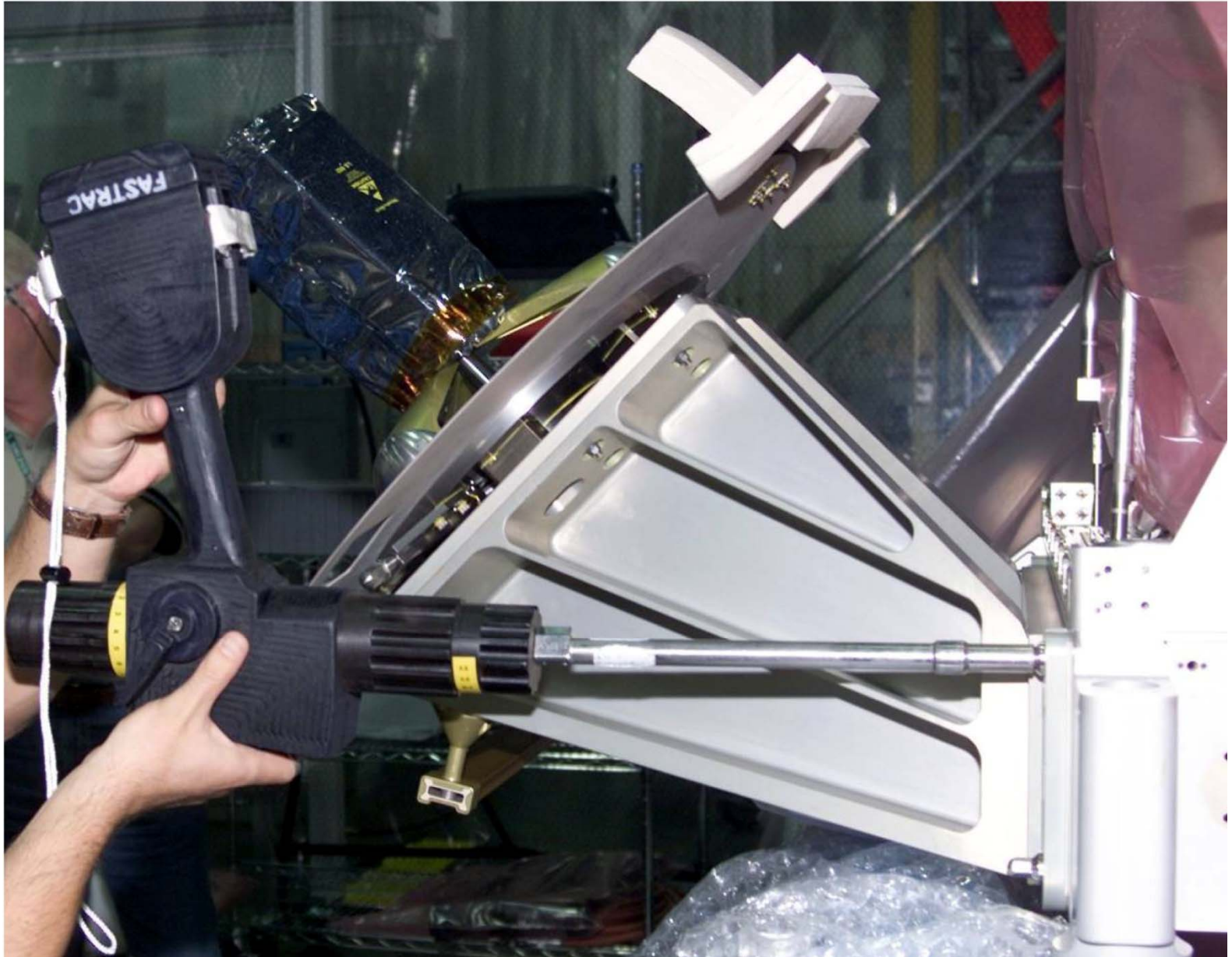


DETENT ON BOLT 3 ONLY

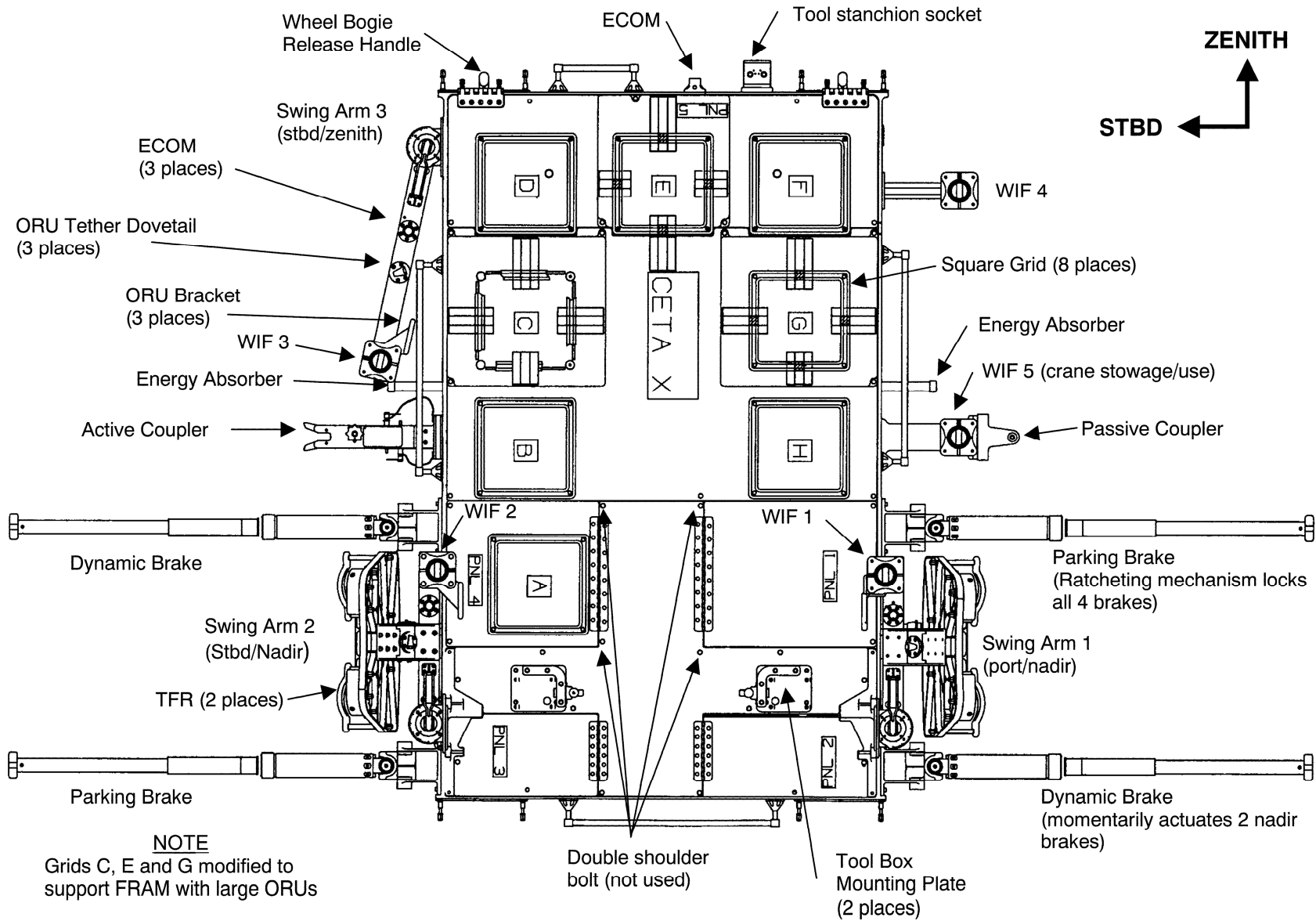


FGB OVERVIEW (Cont)

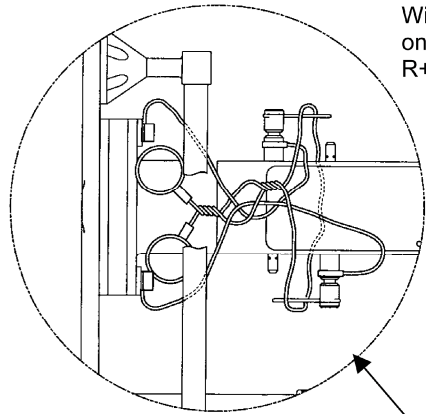
NOTE: 12" SOCKET
PICTURED, BUT 6"
PASSED FIT CHECK



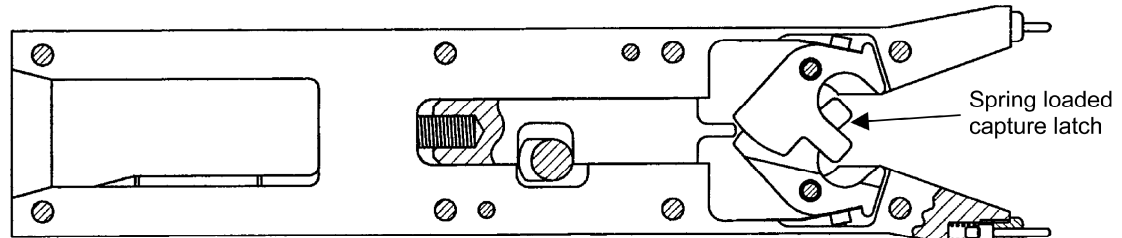
CETA CART OVERVIEW



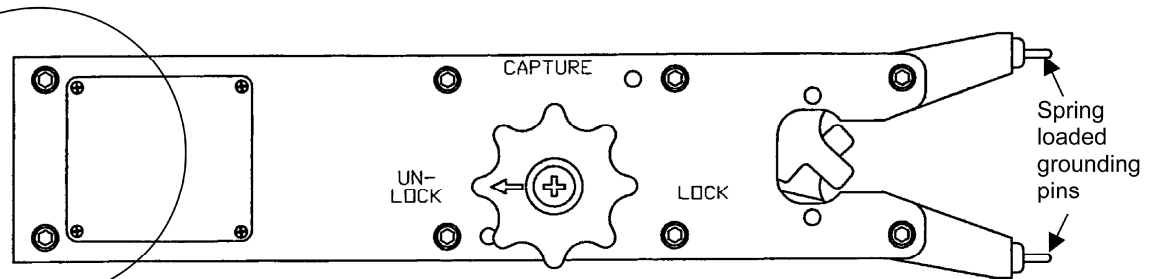
CETA CART OVERVIEW (Cont)



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

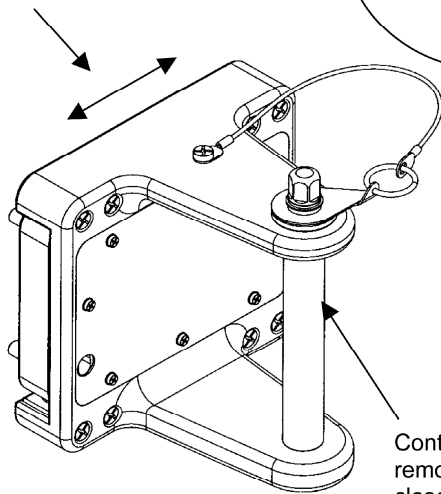


BOTTOM VIEW



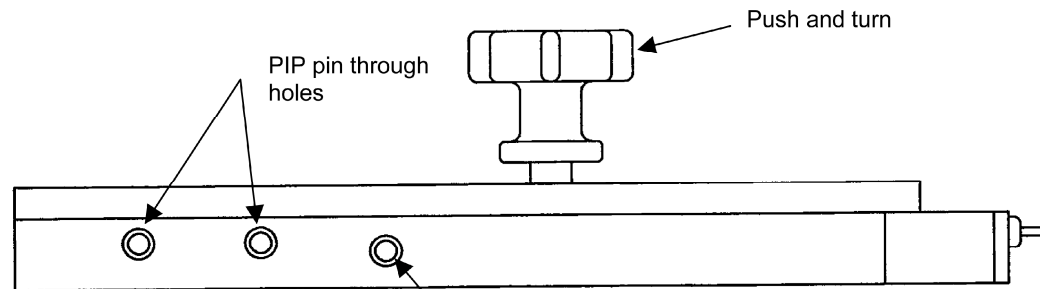
TOP VIEW

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



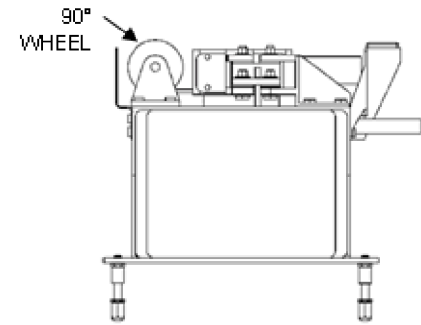
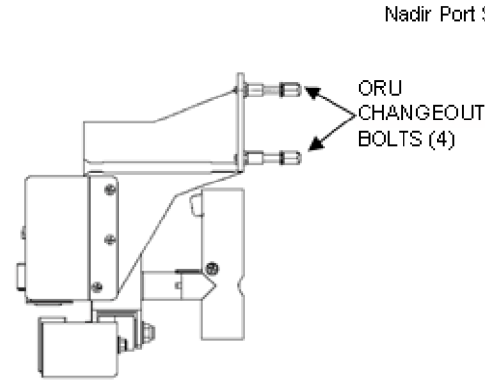
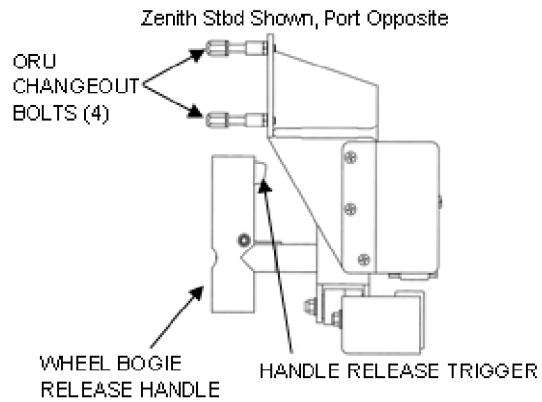
PASSIVE COUPLER

Contingency bolt removed if latch failed closed

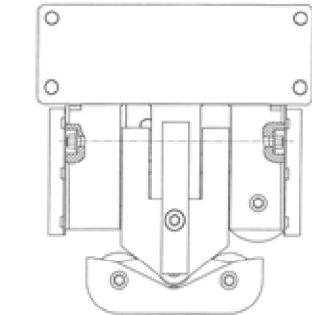


SIDE VIEW

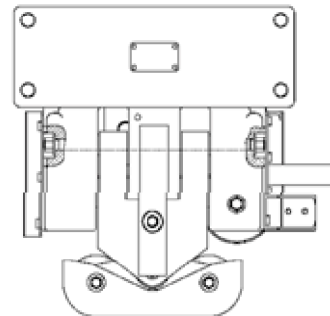
CETA CART OVERVIEW (Cont)



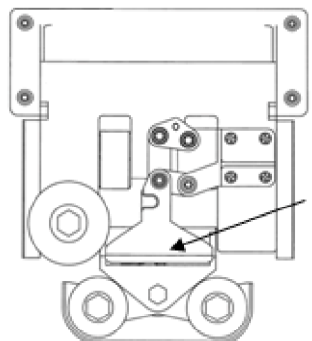
TOP VIEW



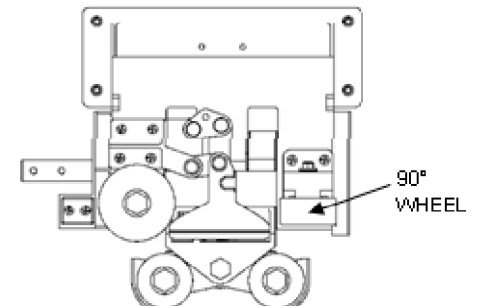
OUTBOARD SIDE



OUTBOARD SIDE

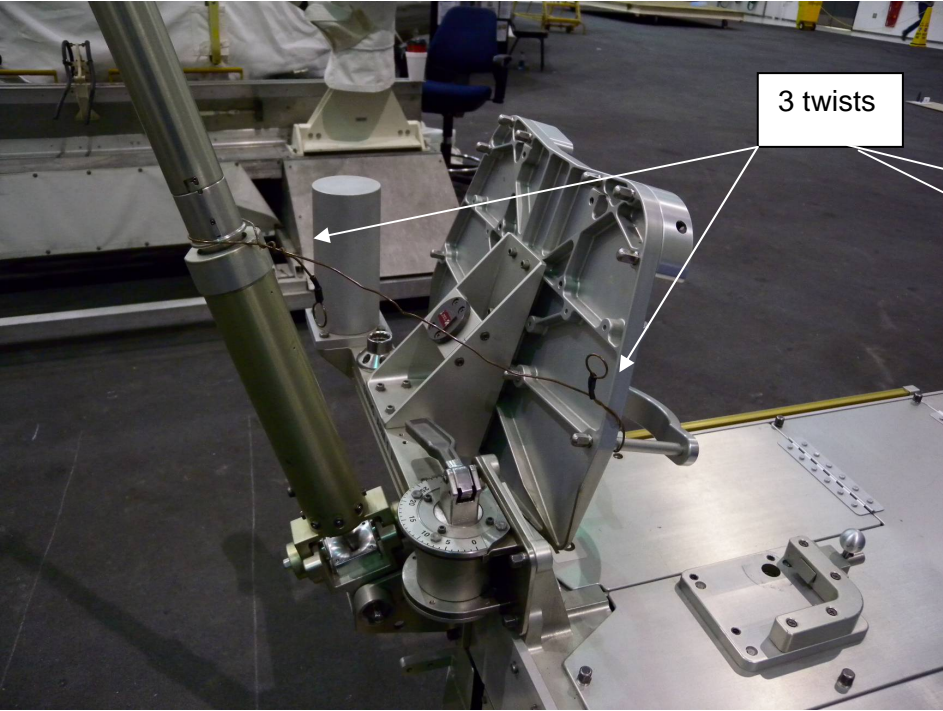


INBOARD SIDE



INBOARD SIDE

CETA CART OVERVIEW (Cont)

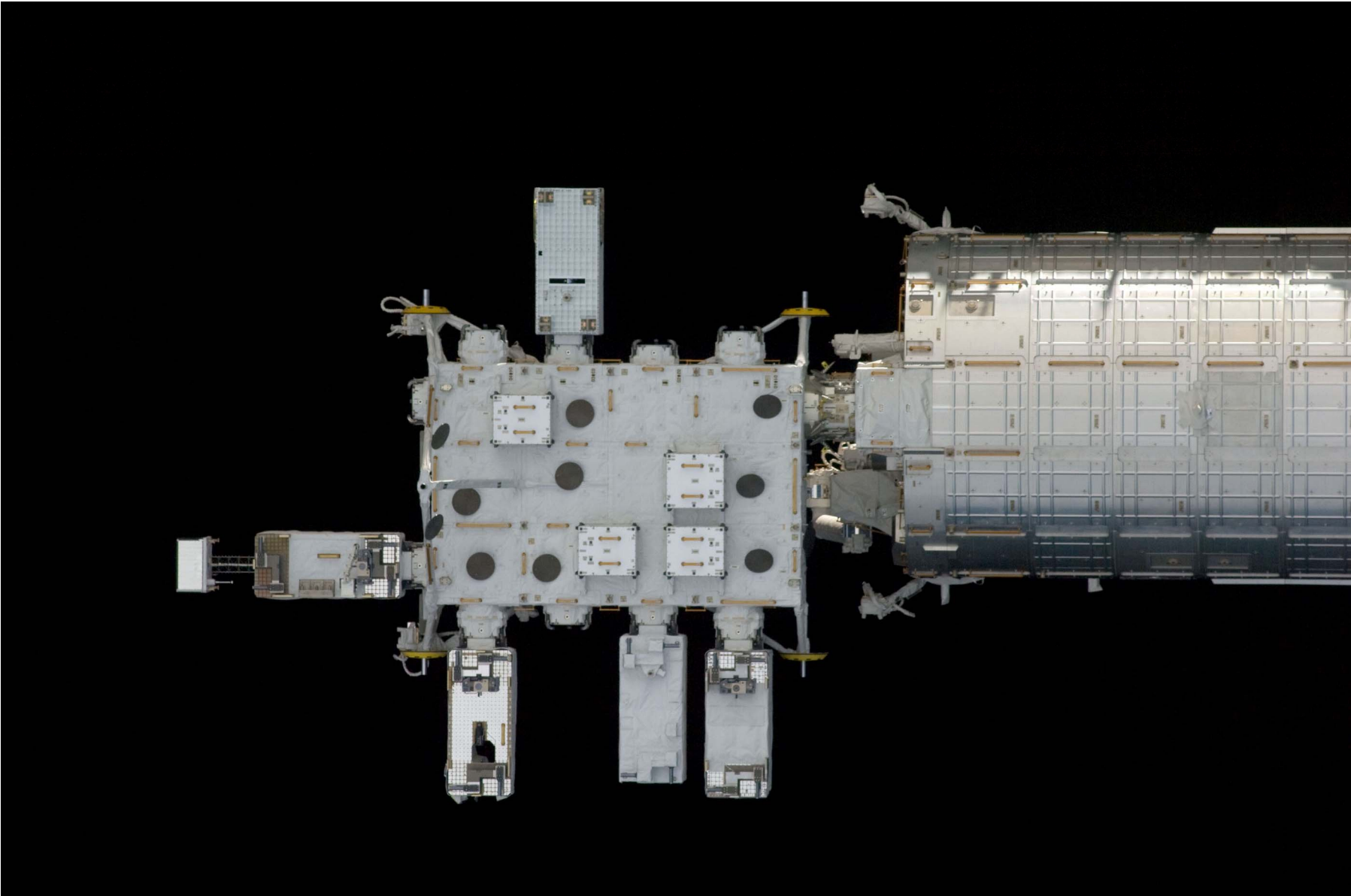


Zenith Port brake handle



Nadir Port brake handle

MPAC SEED OV 1



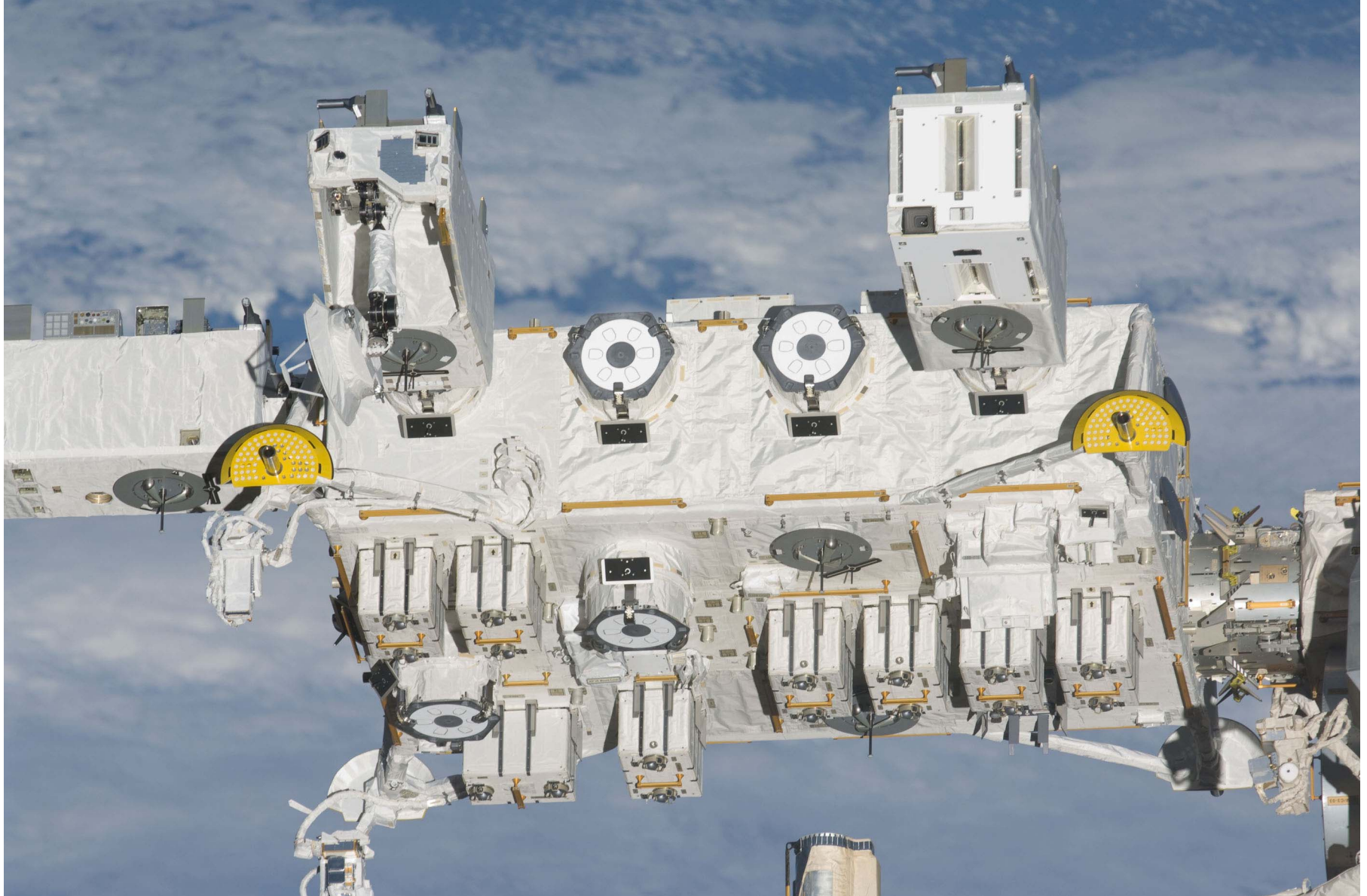
FS 18-45

EVA/131/FIN A

EVA 1

EVA 1

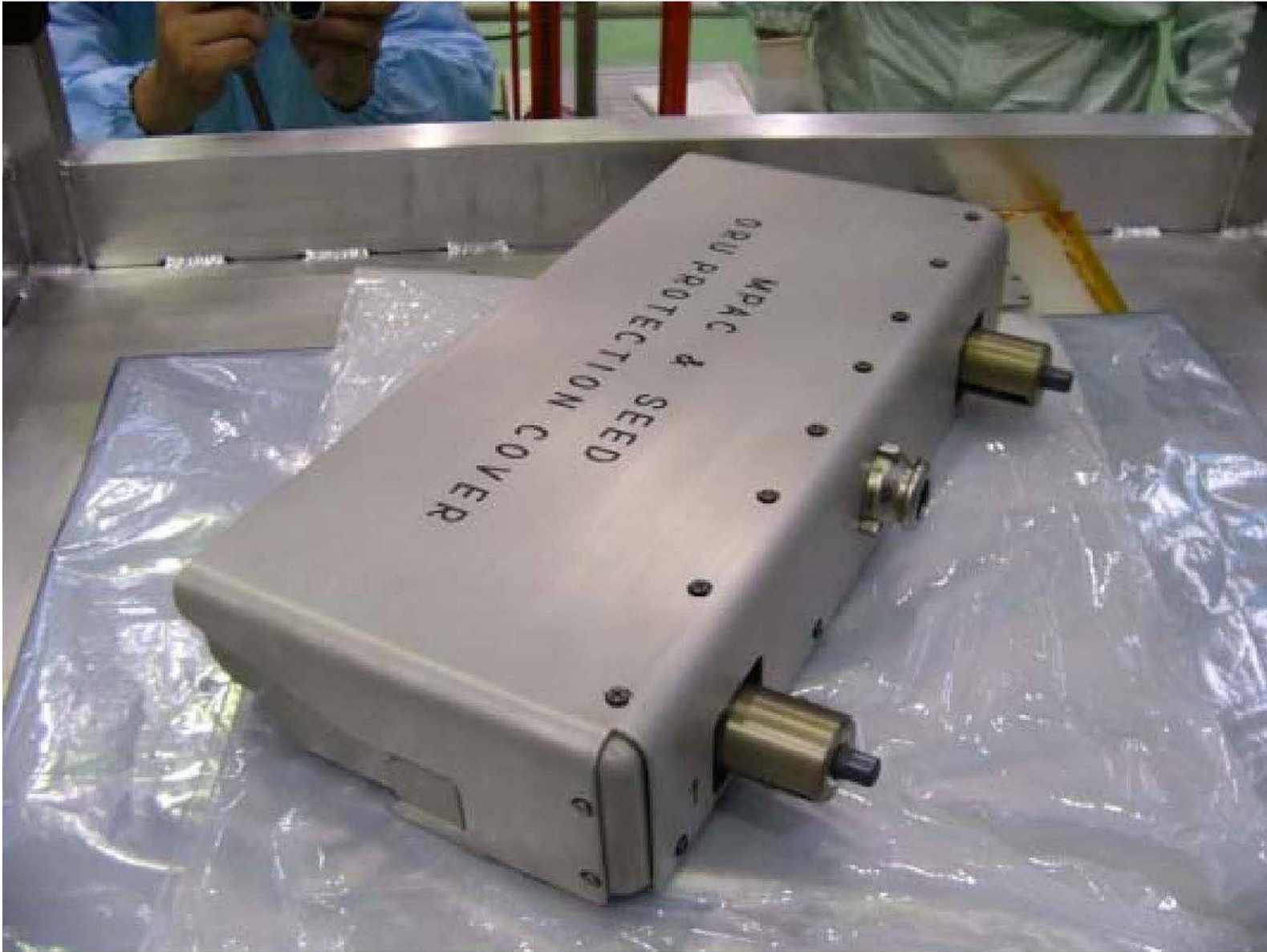
MPAC SEED OV 2



FS 18-46

EVA/131/FIN A

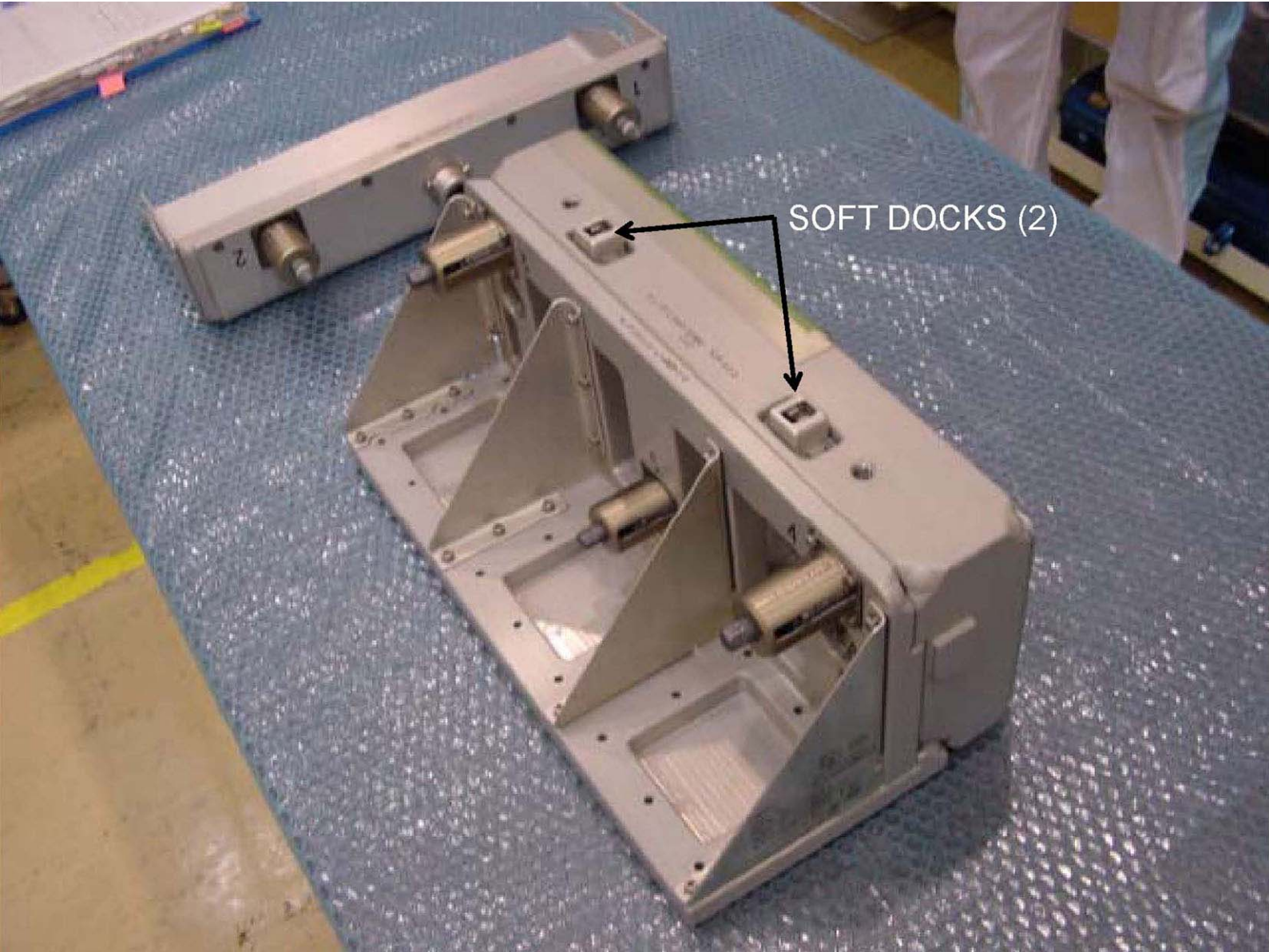
MPAC & SEED PROTECTION COVER



MPAC & SEED PROTECTION COVER (Cont)



MPAC & SEED ON BRACKET WITH PROTECTION COVER



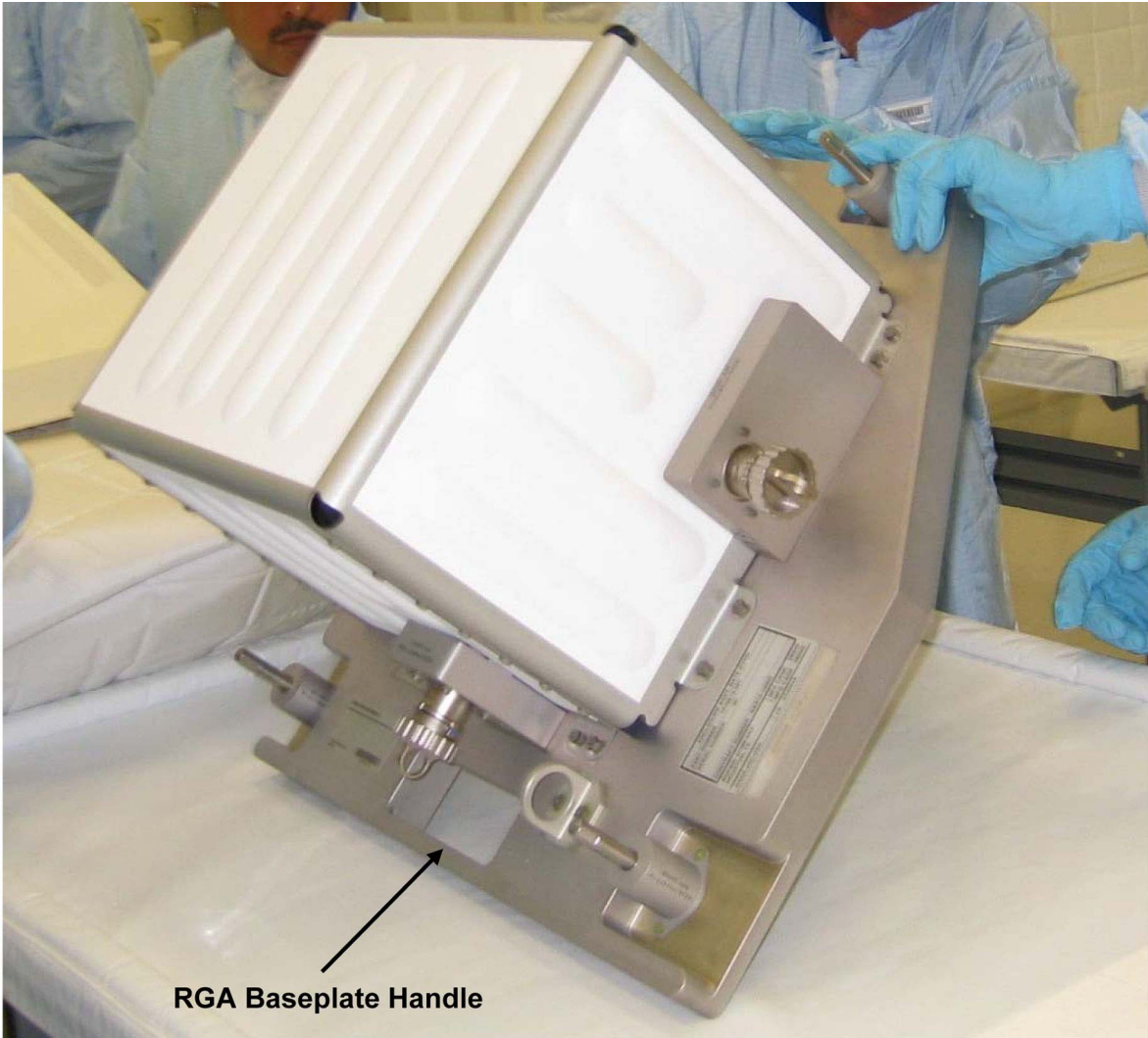
MPAC & SEED INSTALLED



MPAC & SEED INSTALLED (Cont)



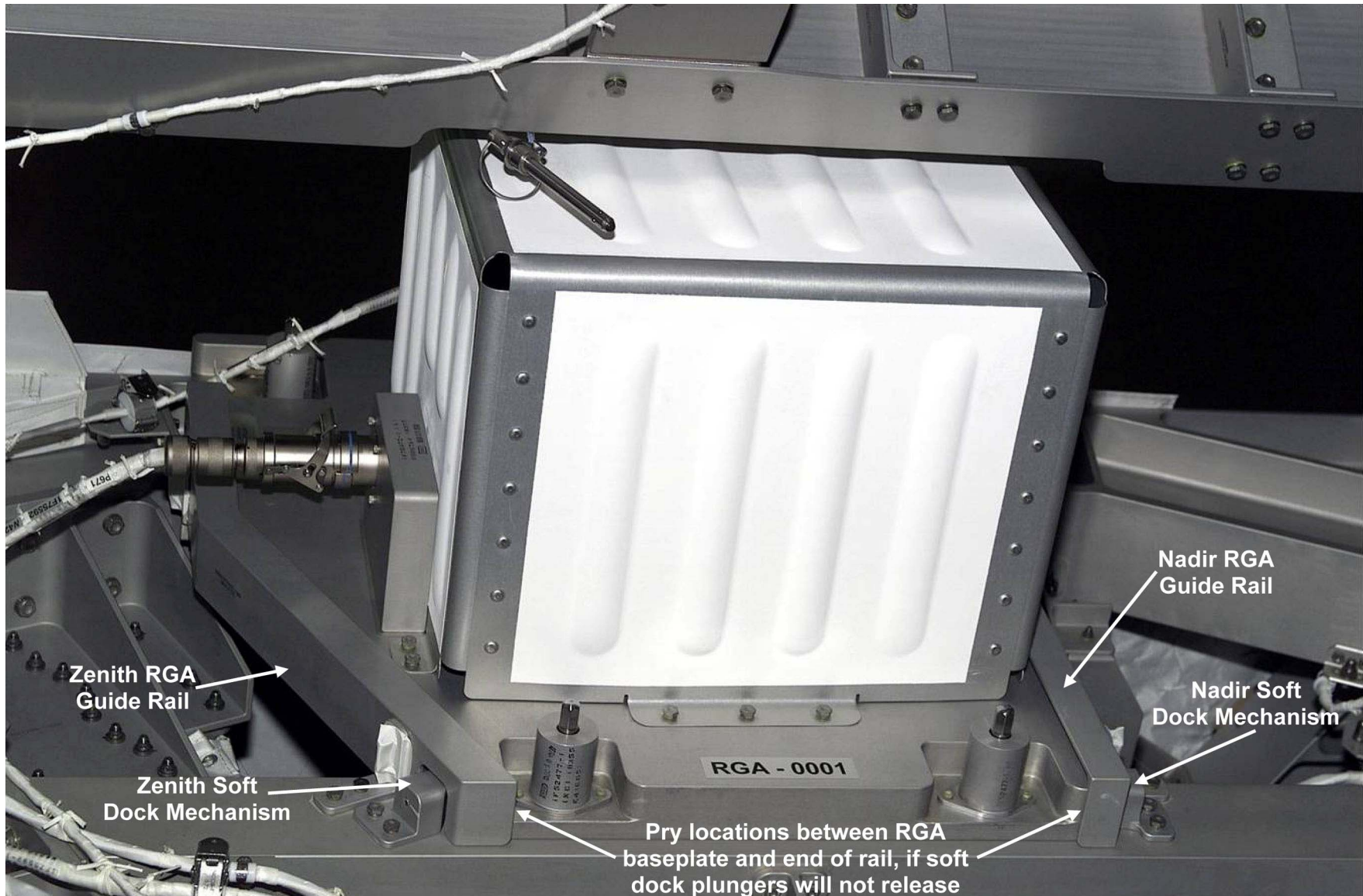
RGA 1



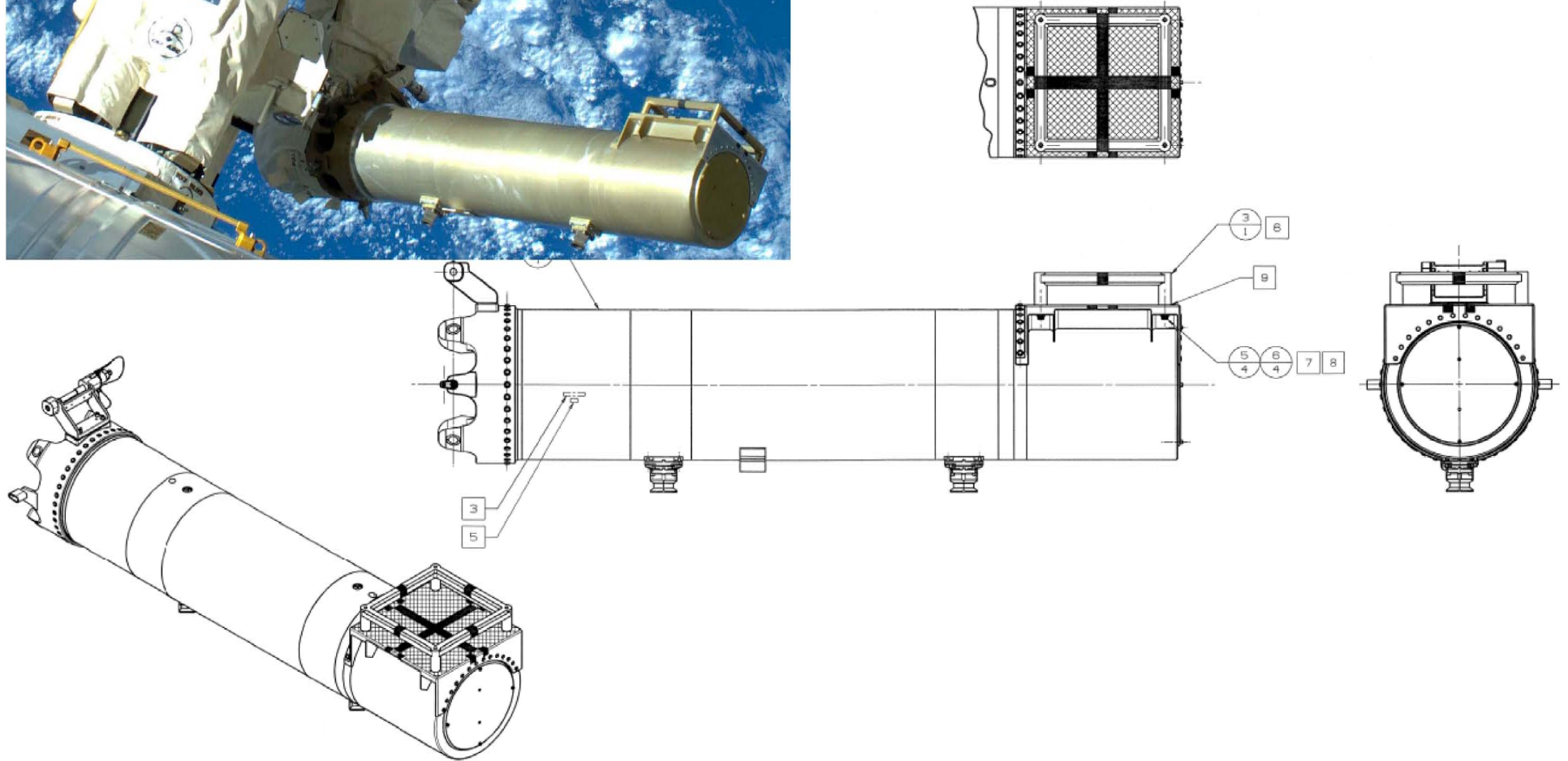
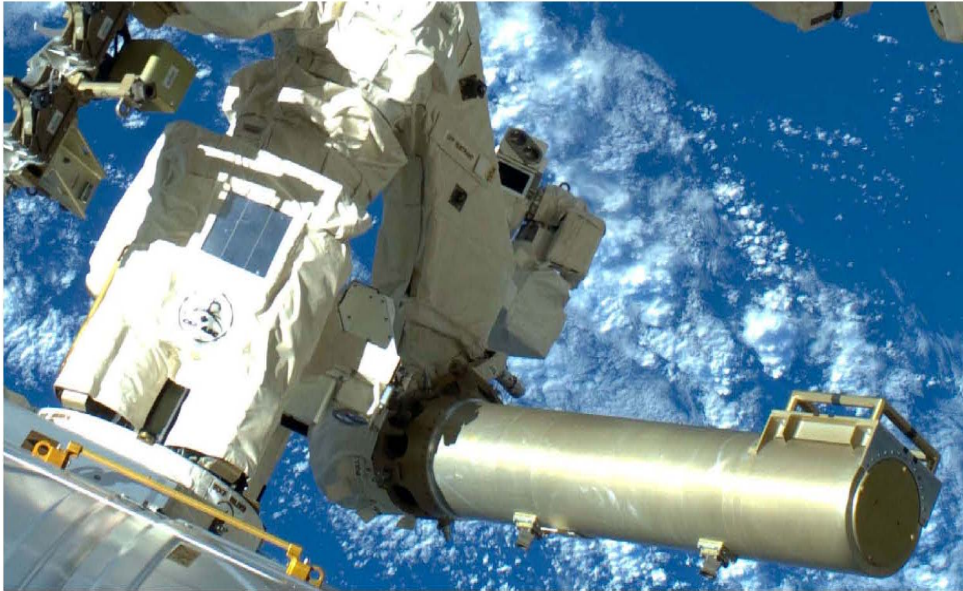
RGA 1 (Cont)



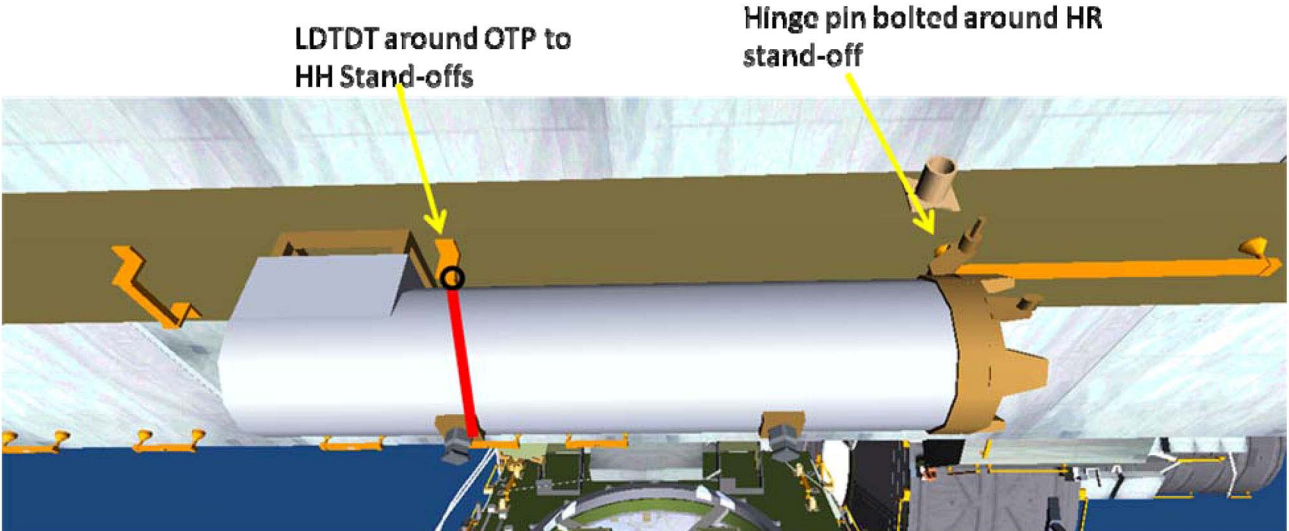
RGA 1 (Cont)



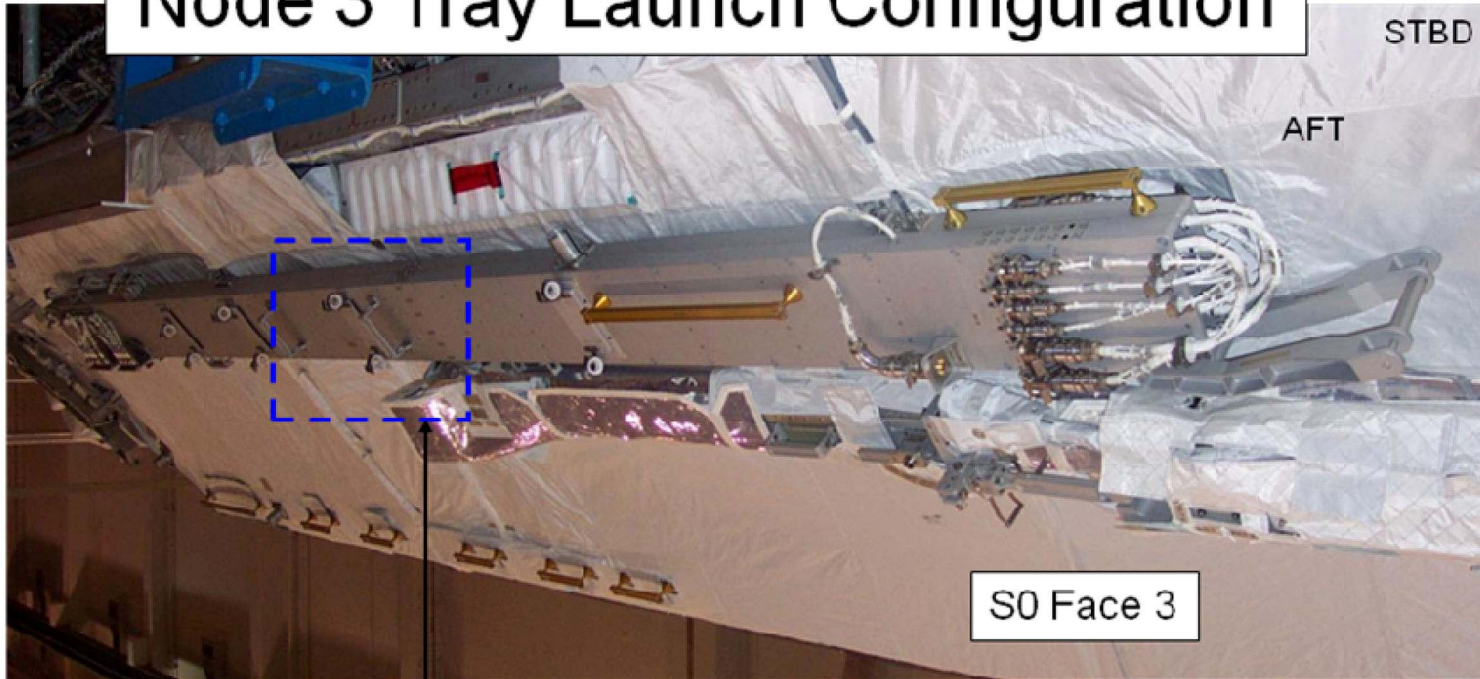
OTP TIE-DOWN



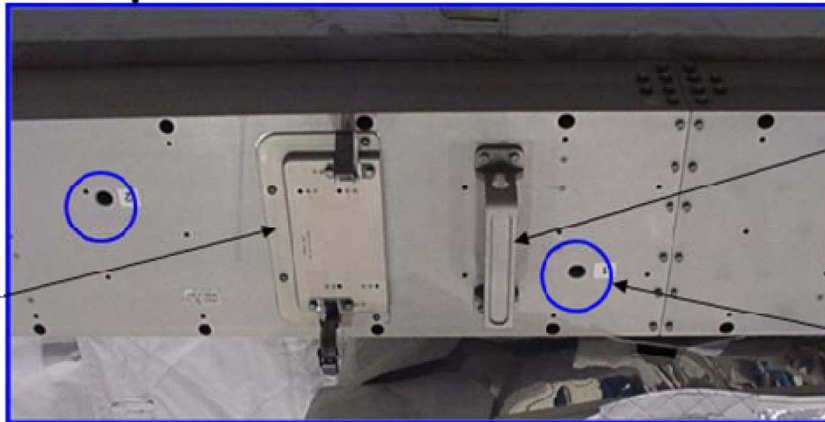
OTP TIE-DOWN (Cont)



Node 3 Tray Launch Configuration



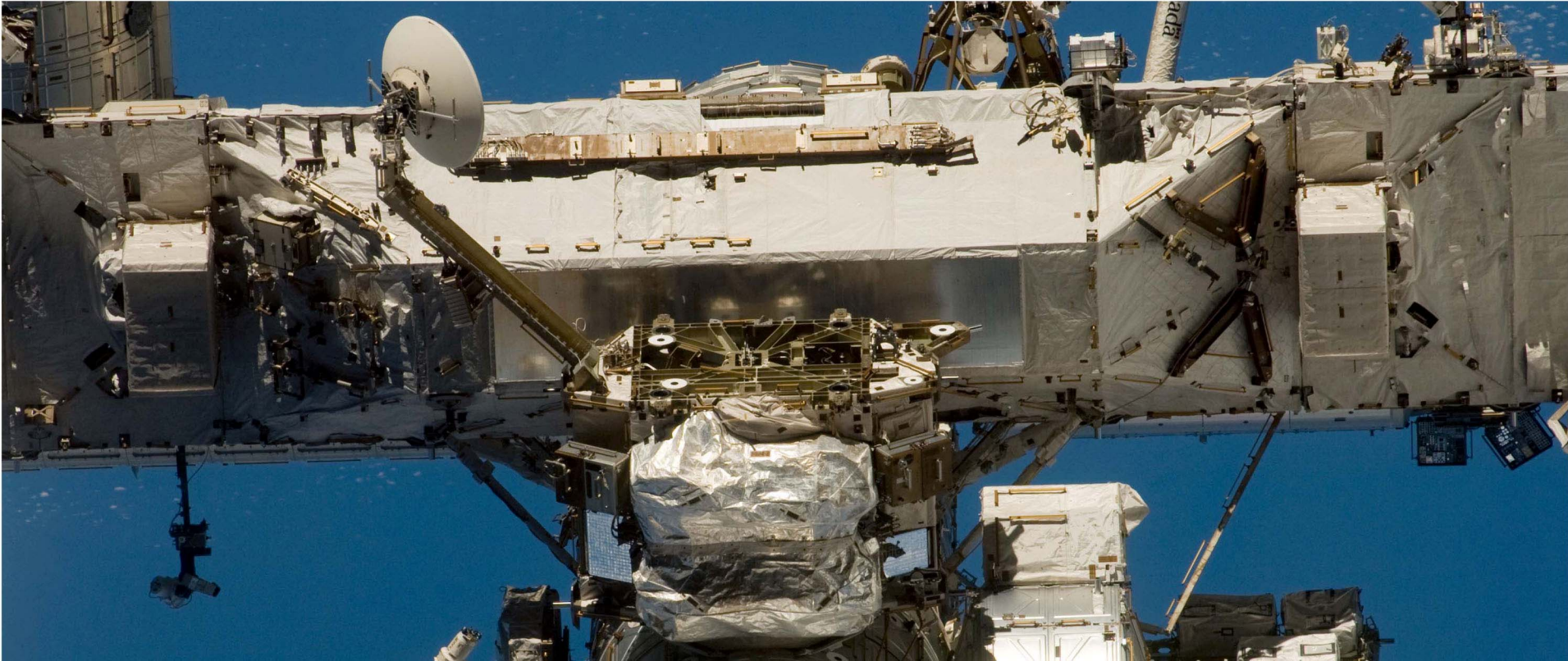
1F77671
Bracket, Cable, Drag On



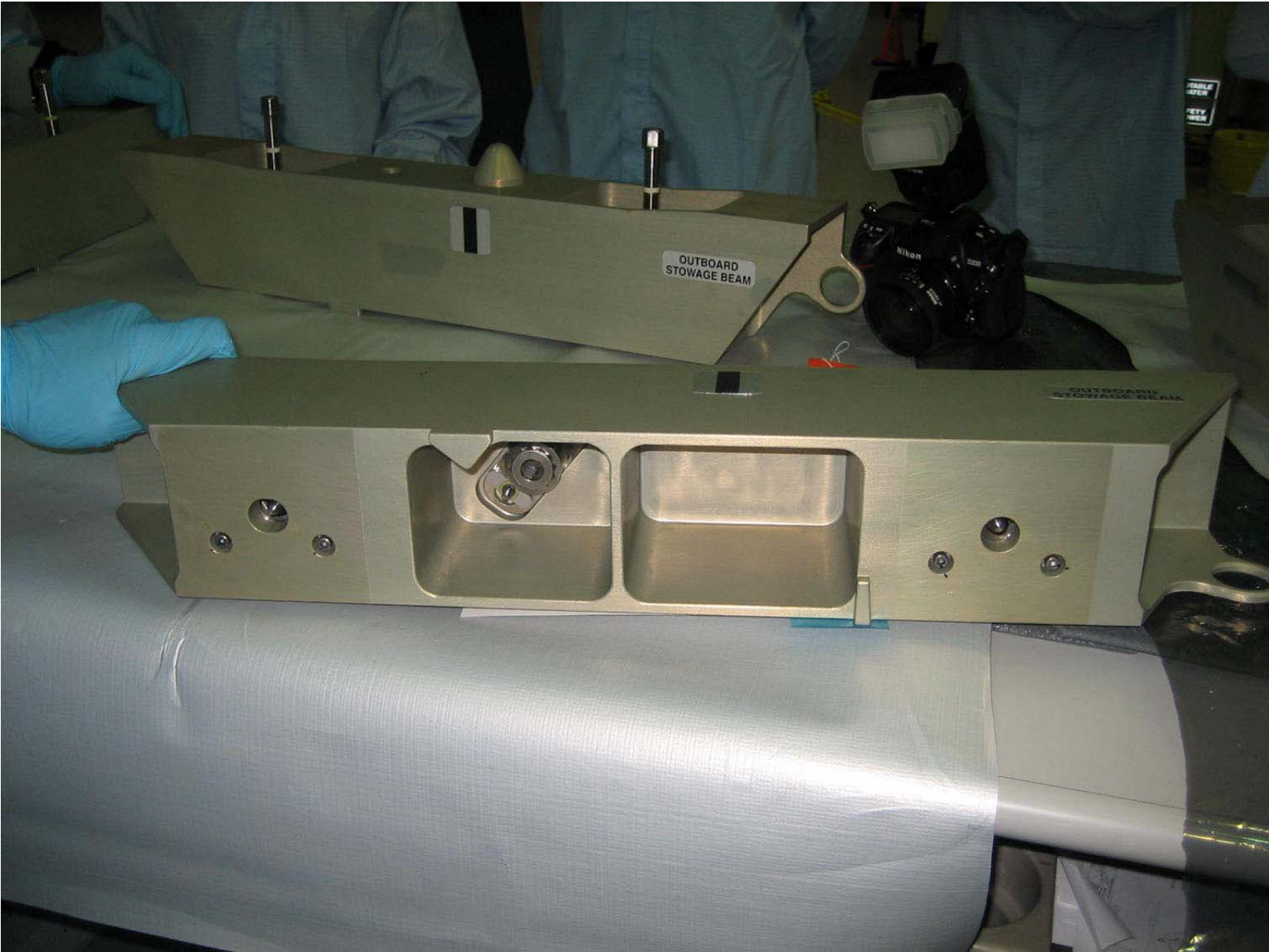
1F76152
EVA Handle

N3 Tray
Launch Restraint Bolts
(2 Places)

OTP TIE-DOWN (Cont)



RAD GF STOW BEAM OV



RAD GF STOW BEAM BOLT



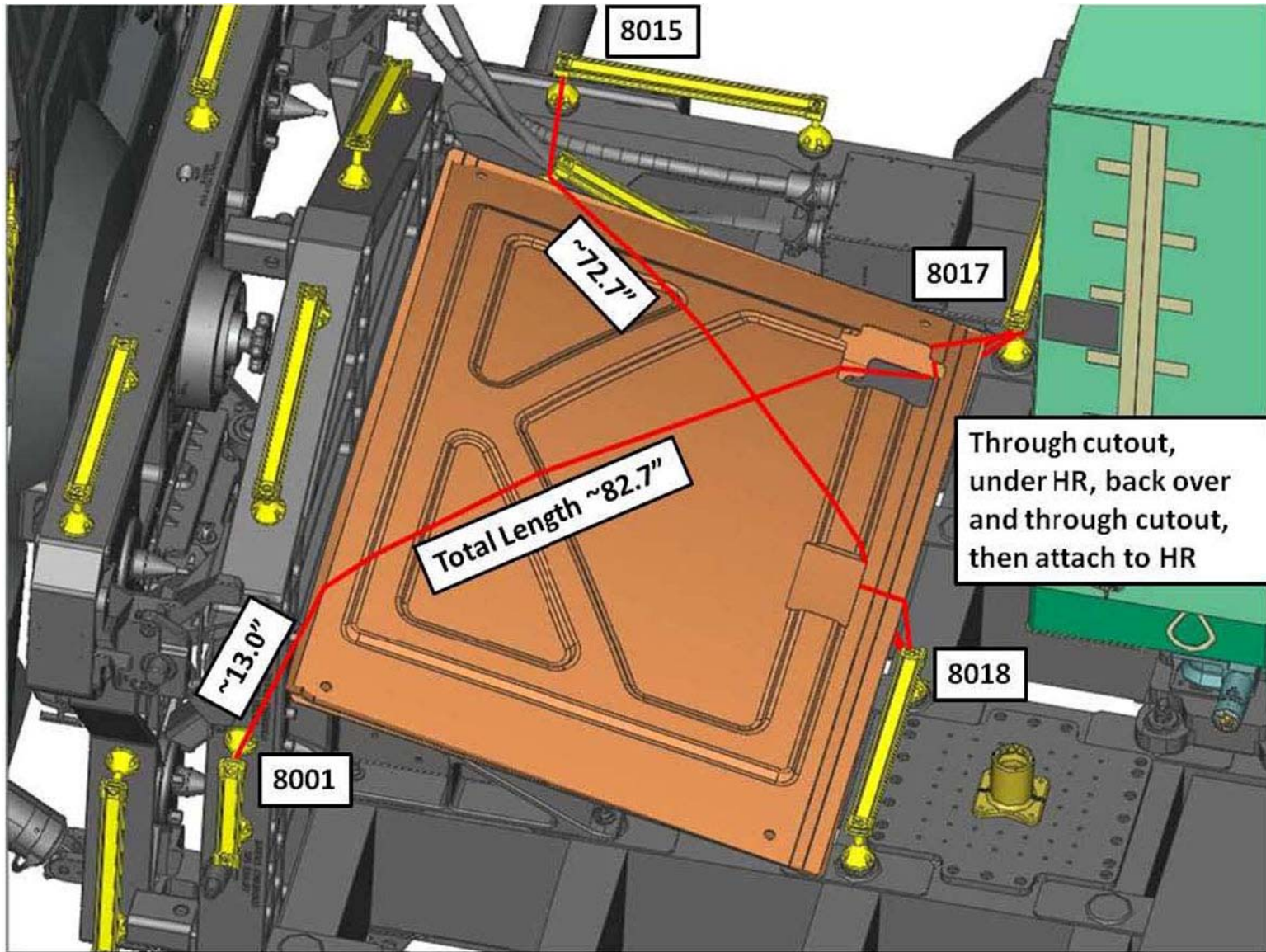
S1 RAD GF STOW BEAM WORKSITE



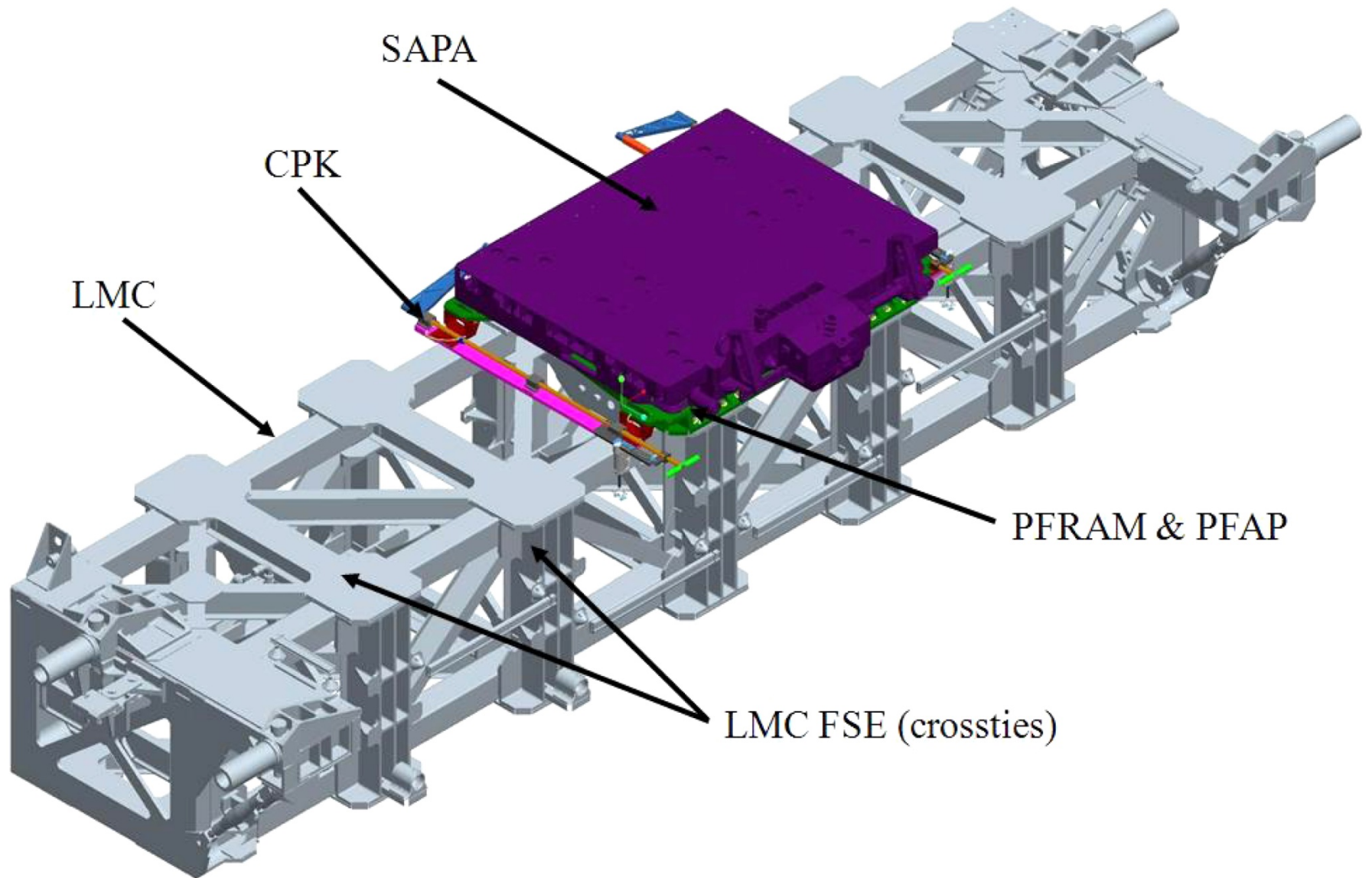
RAD GF STOW BEAM WORKSITE



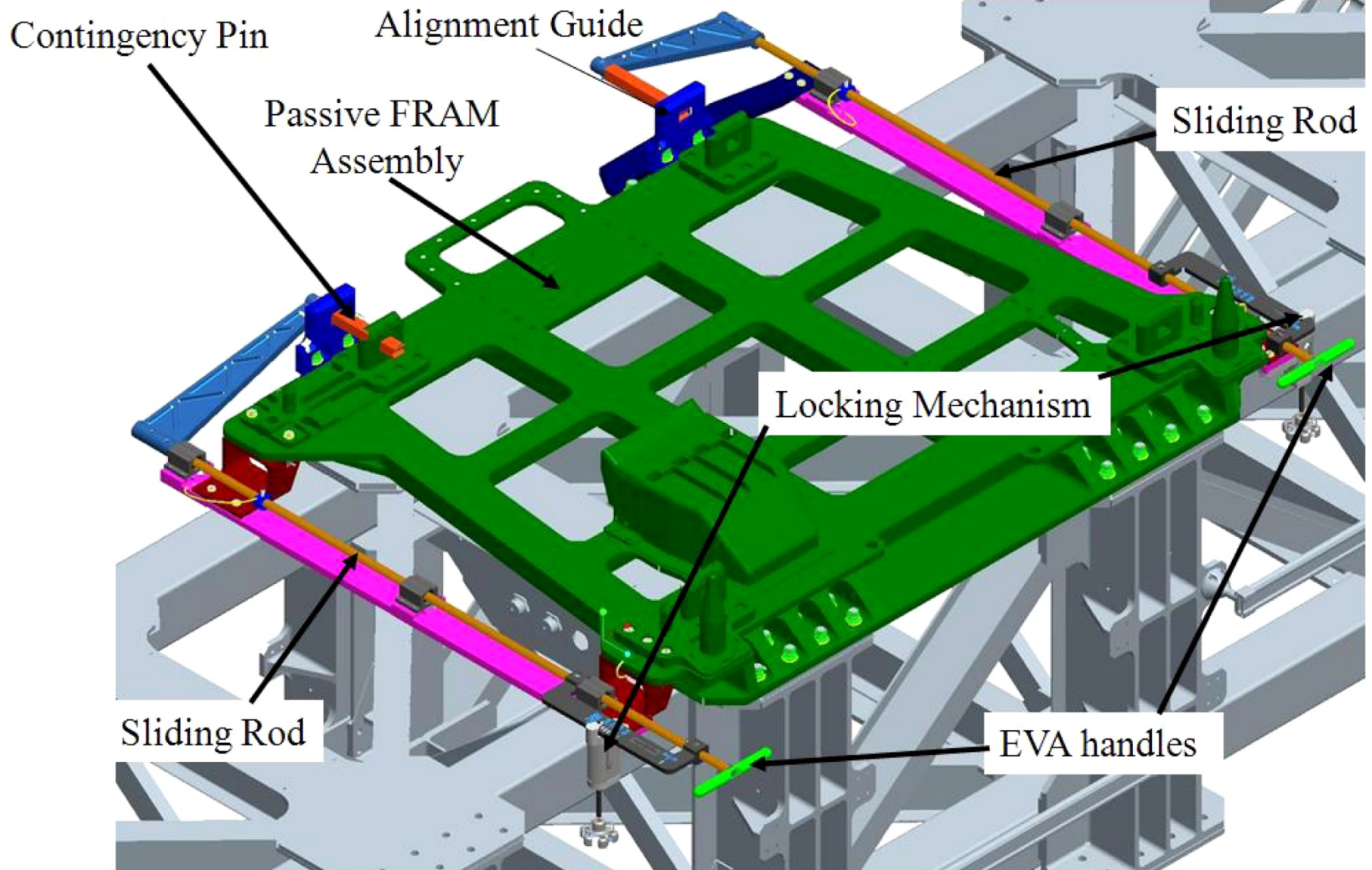
A/L MMOD SHIELD RETRIEVE



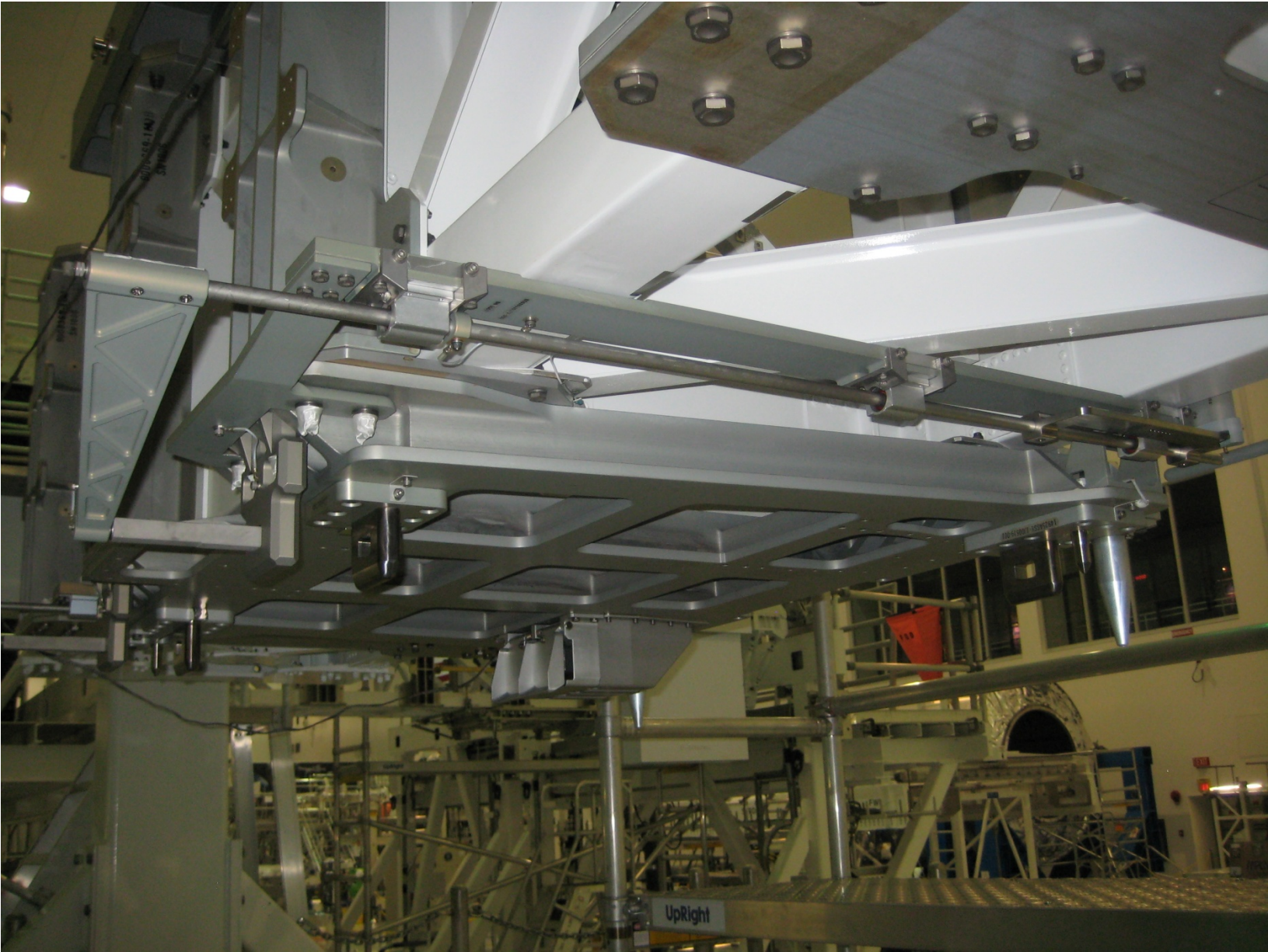
LWAPA RETRIEVE



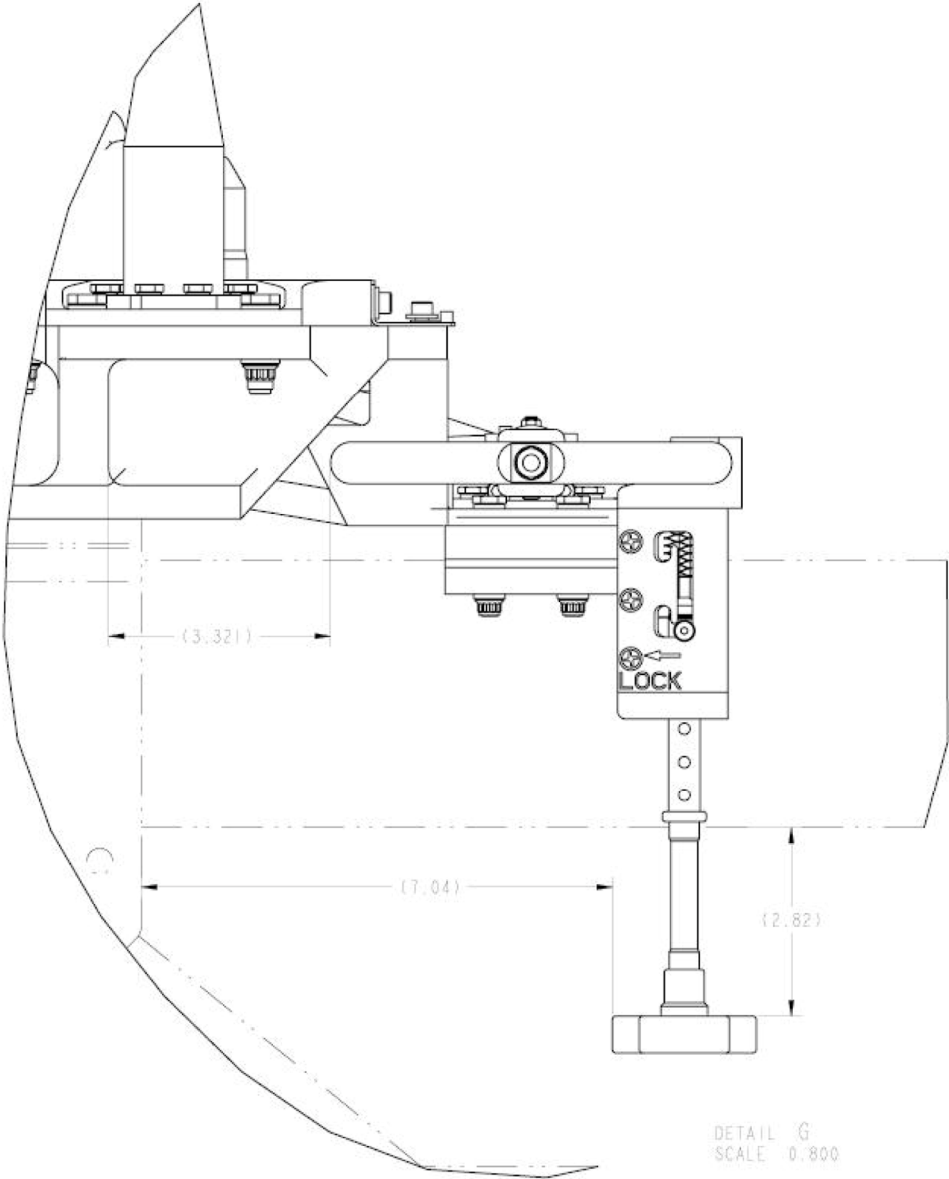
LWAPA RETRIEVE (Cont)



LWAPA RETRIEVE (Cont)



LWAPA RETRIEVE (Cont)



LWAPA RETRIEVE (Cont)



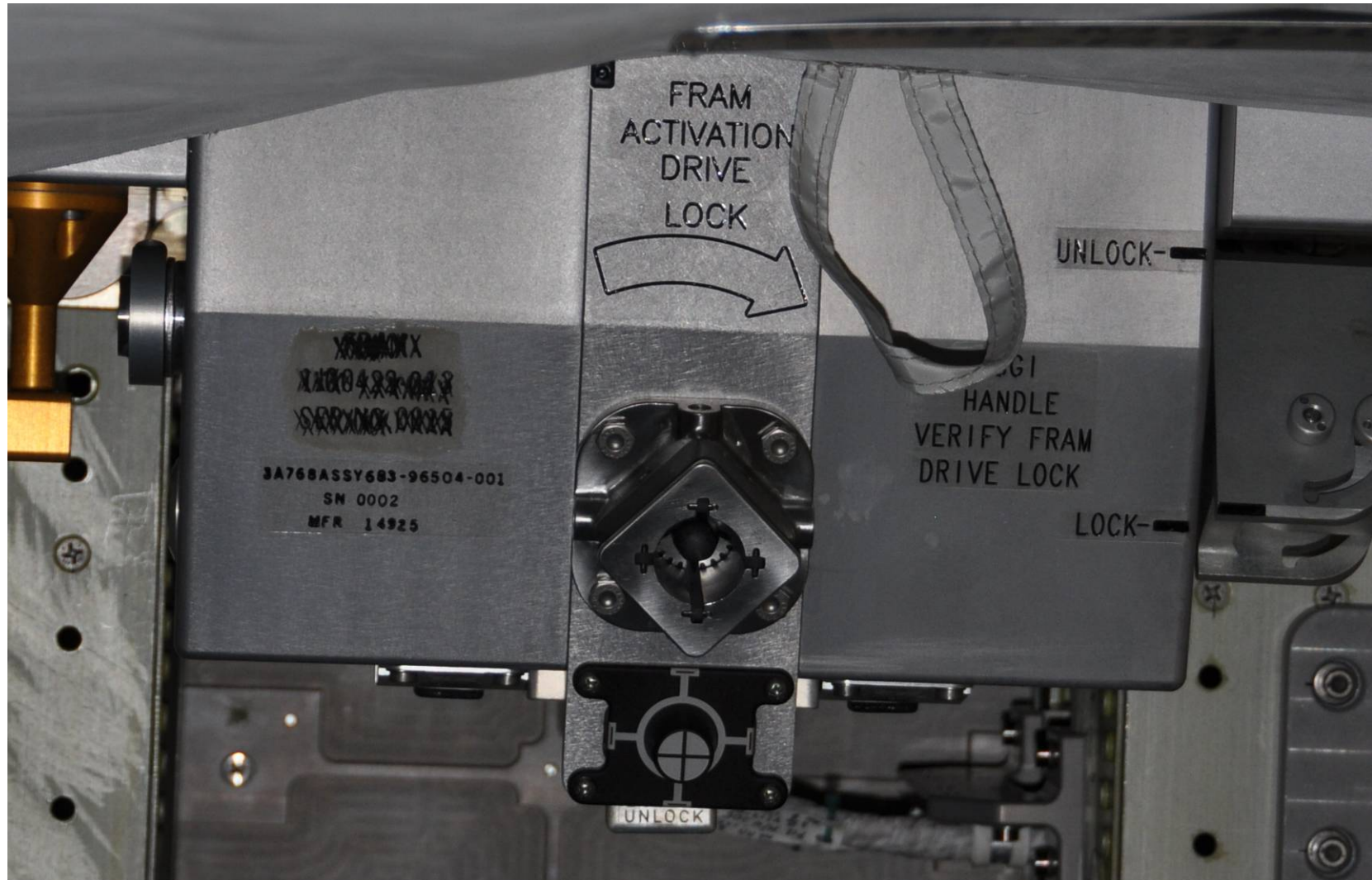
LWAPA RETRIEVE (Cont)



LWAPA RETRIEVE (Cont)



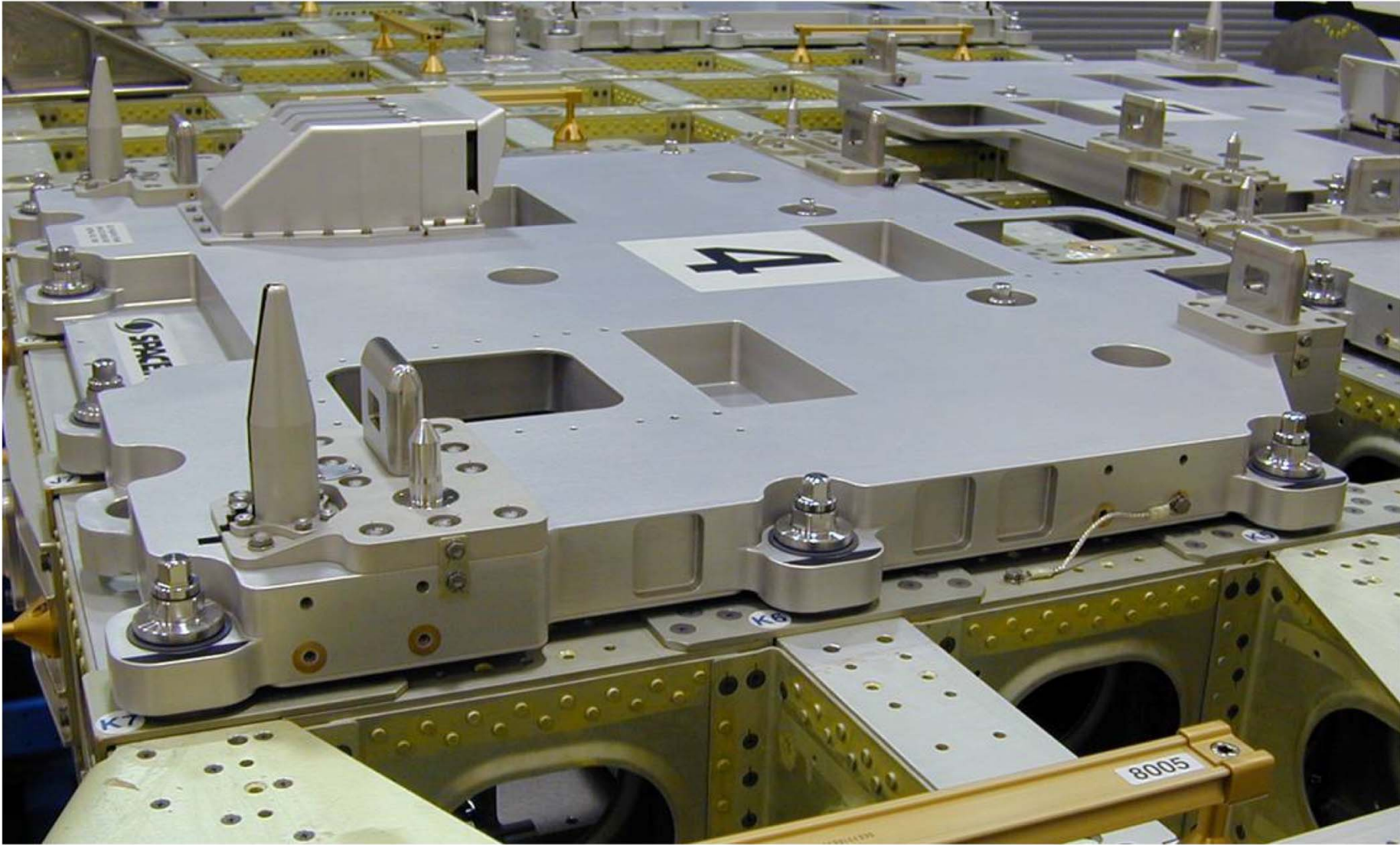
LWAPA RETRIEVE (Cont)



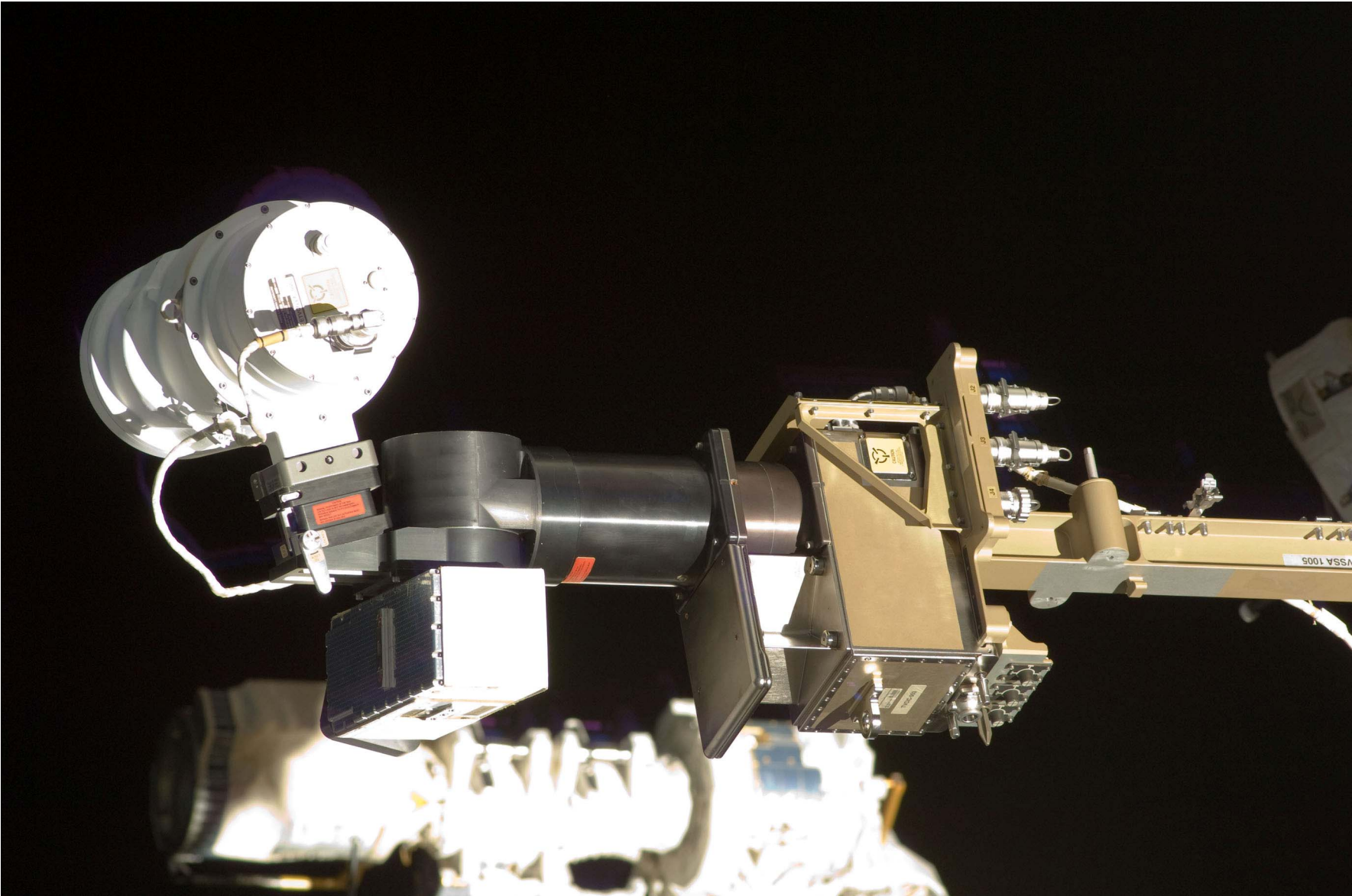
LWAPA RETRIEVE (Cont)



LWAPA RETRIEVE (Cont)







ETVCG OV 2

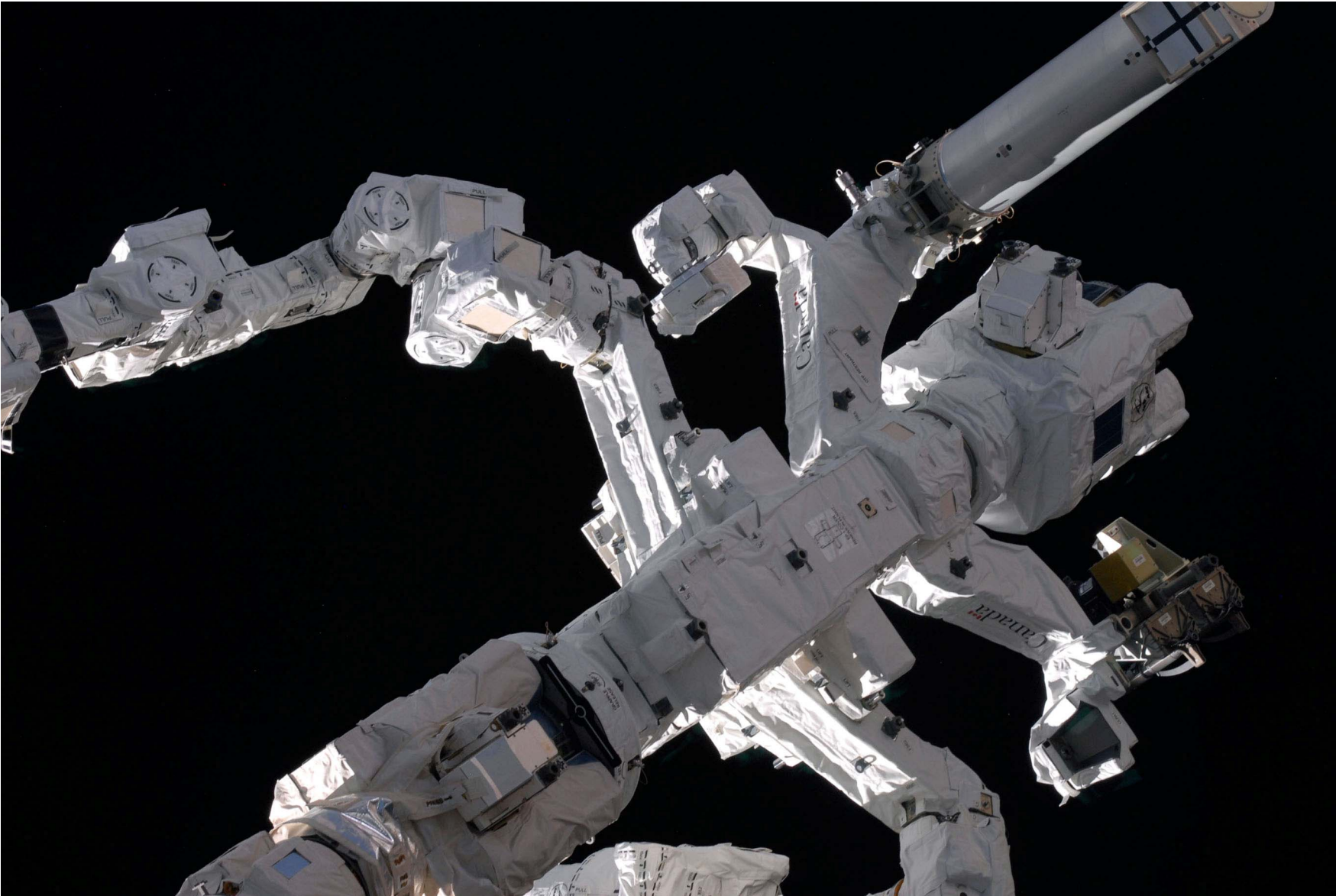


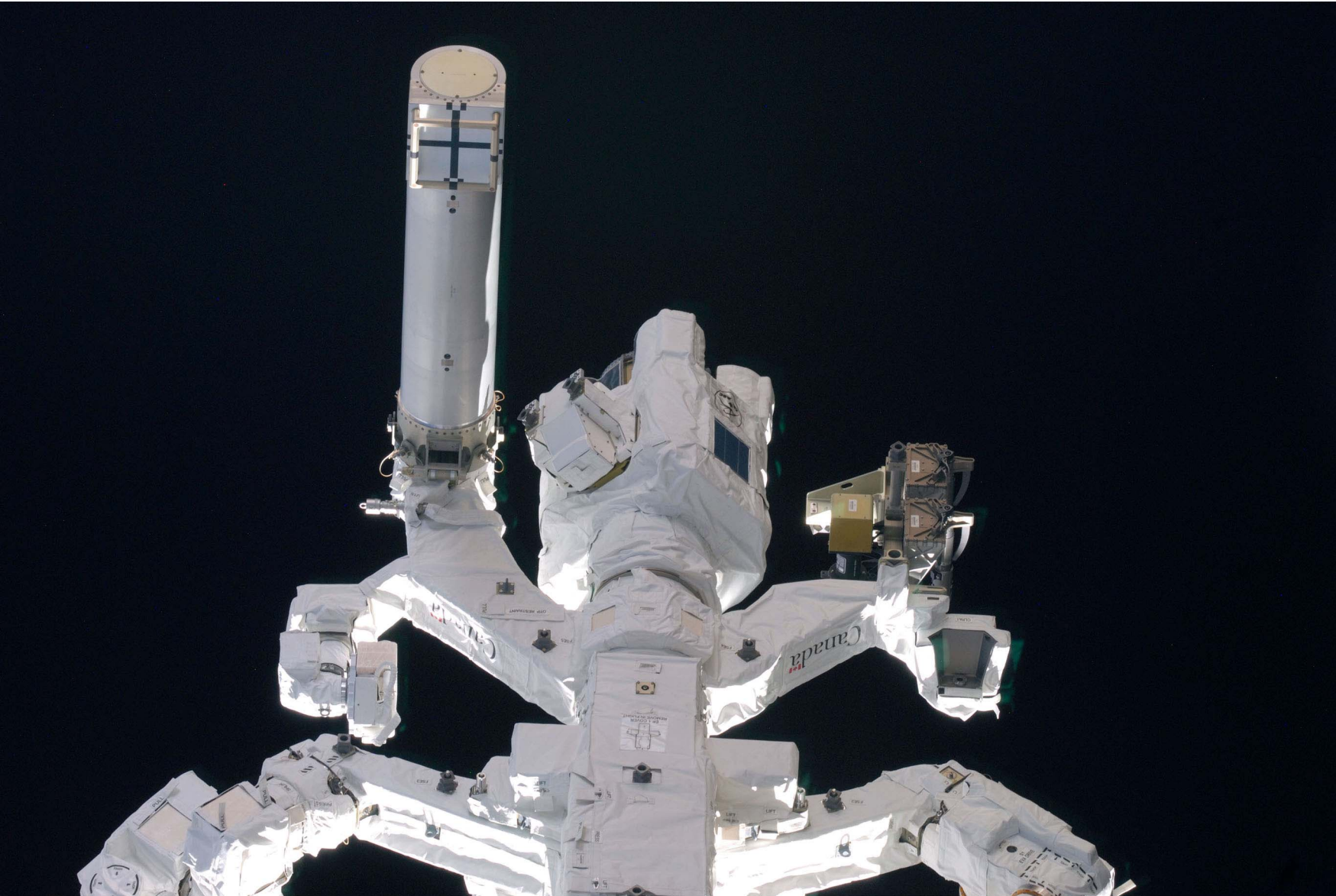
ETVCG LIGHT 1



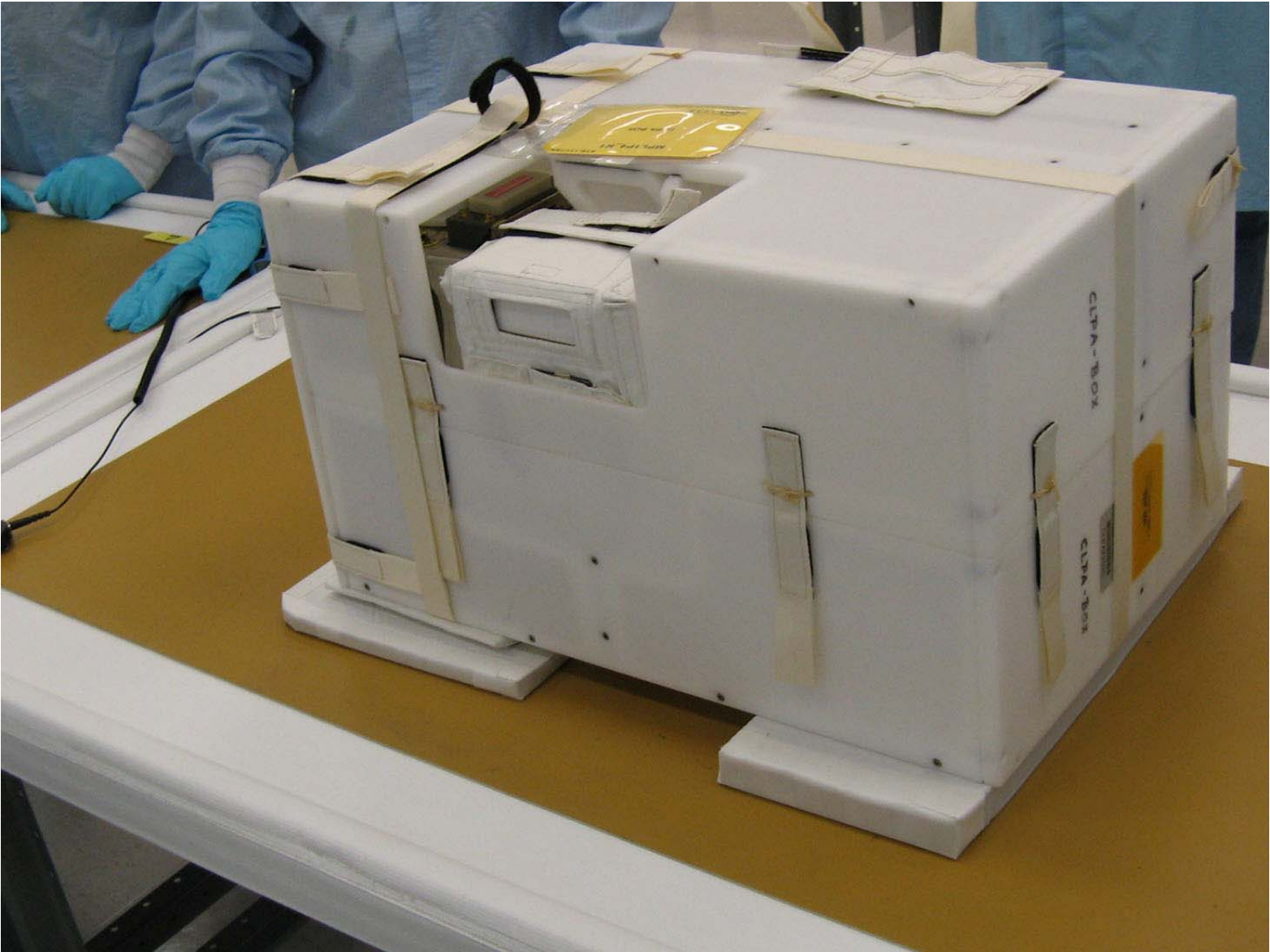
ETVCG LIGHT 2



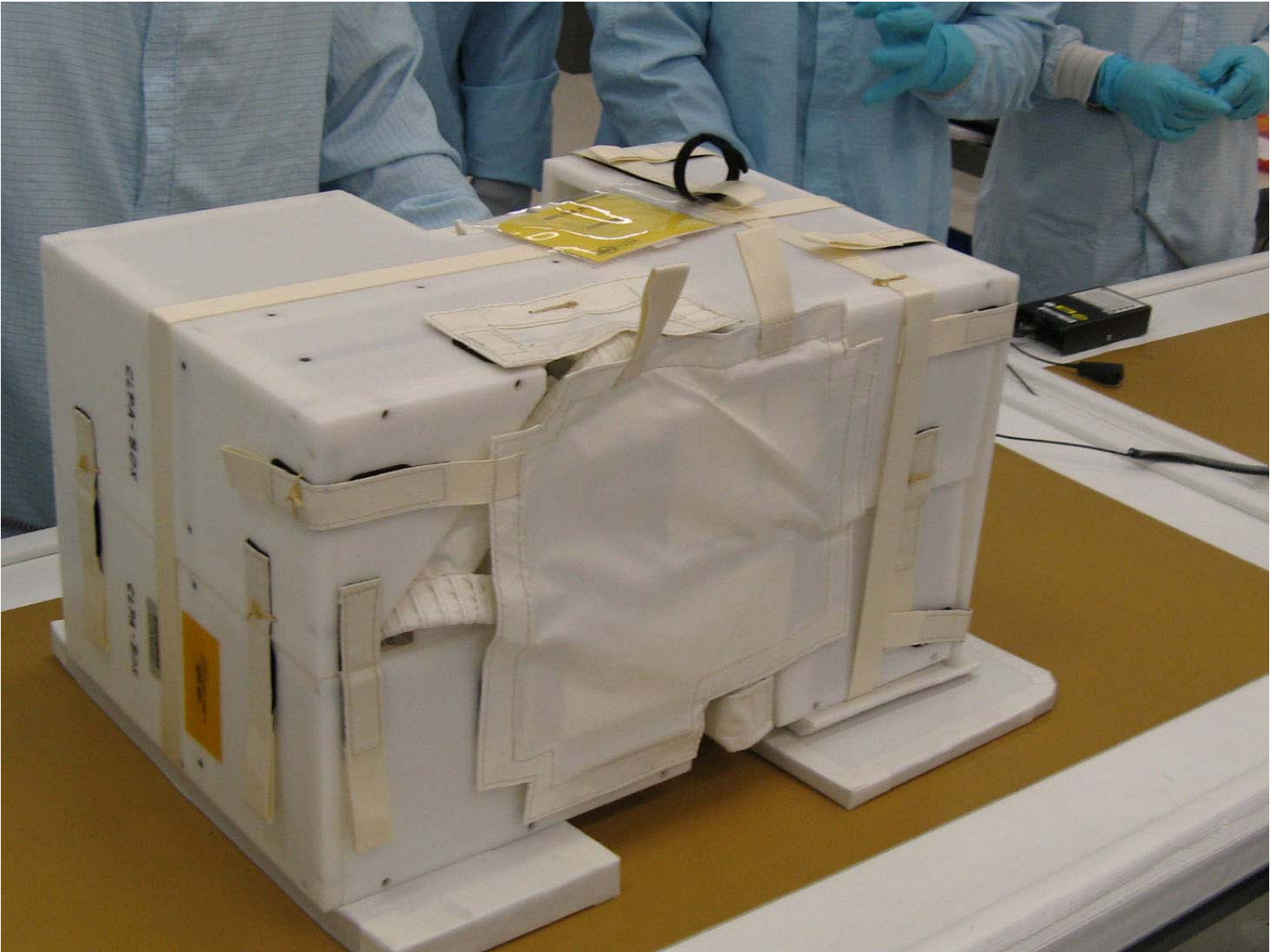




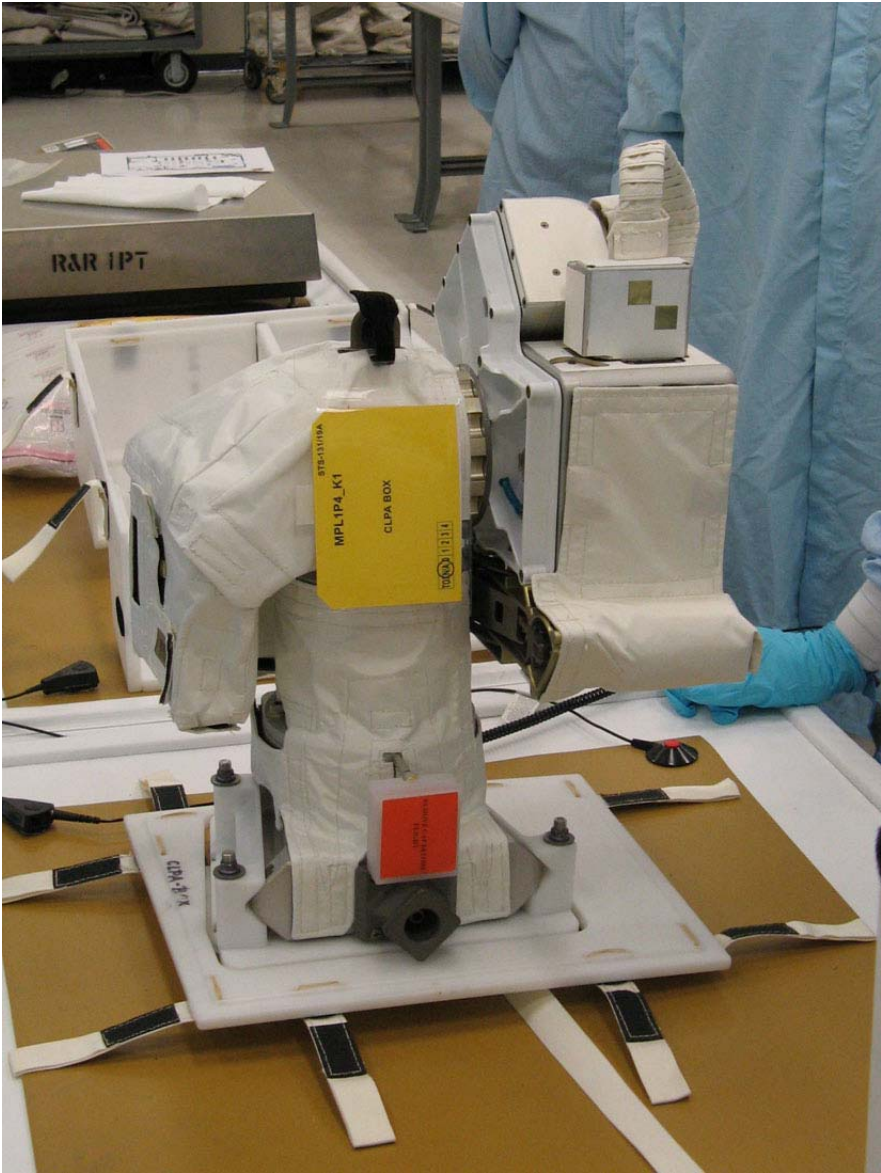
SPDM CLPA1 INSTALL



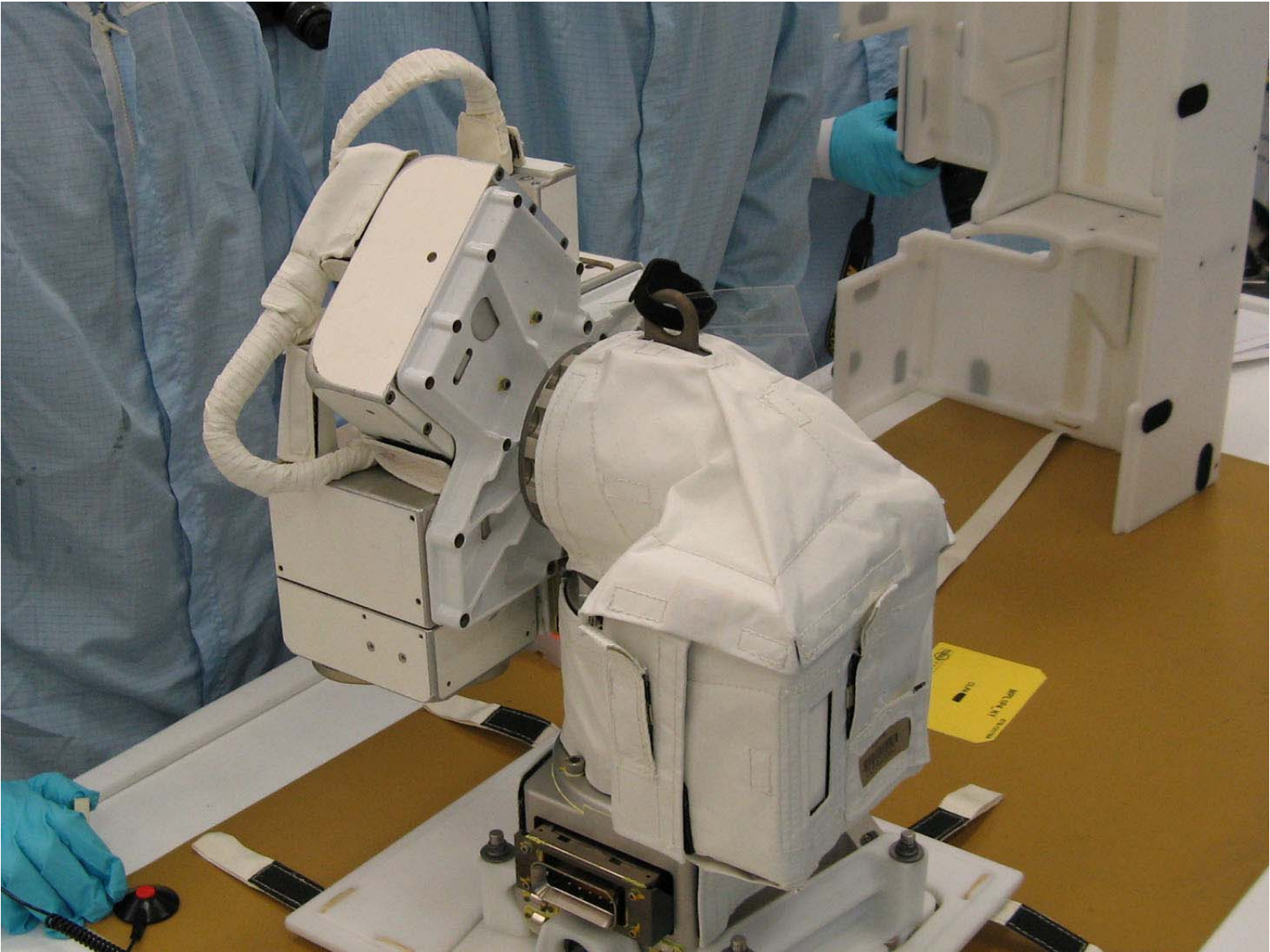
SPDM CLPA1 INSTALL (Cont)



SPDM CLPA1 INSTALL (Cont)



SPDM CLPA1 INSTALL (Cont)



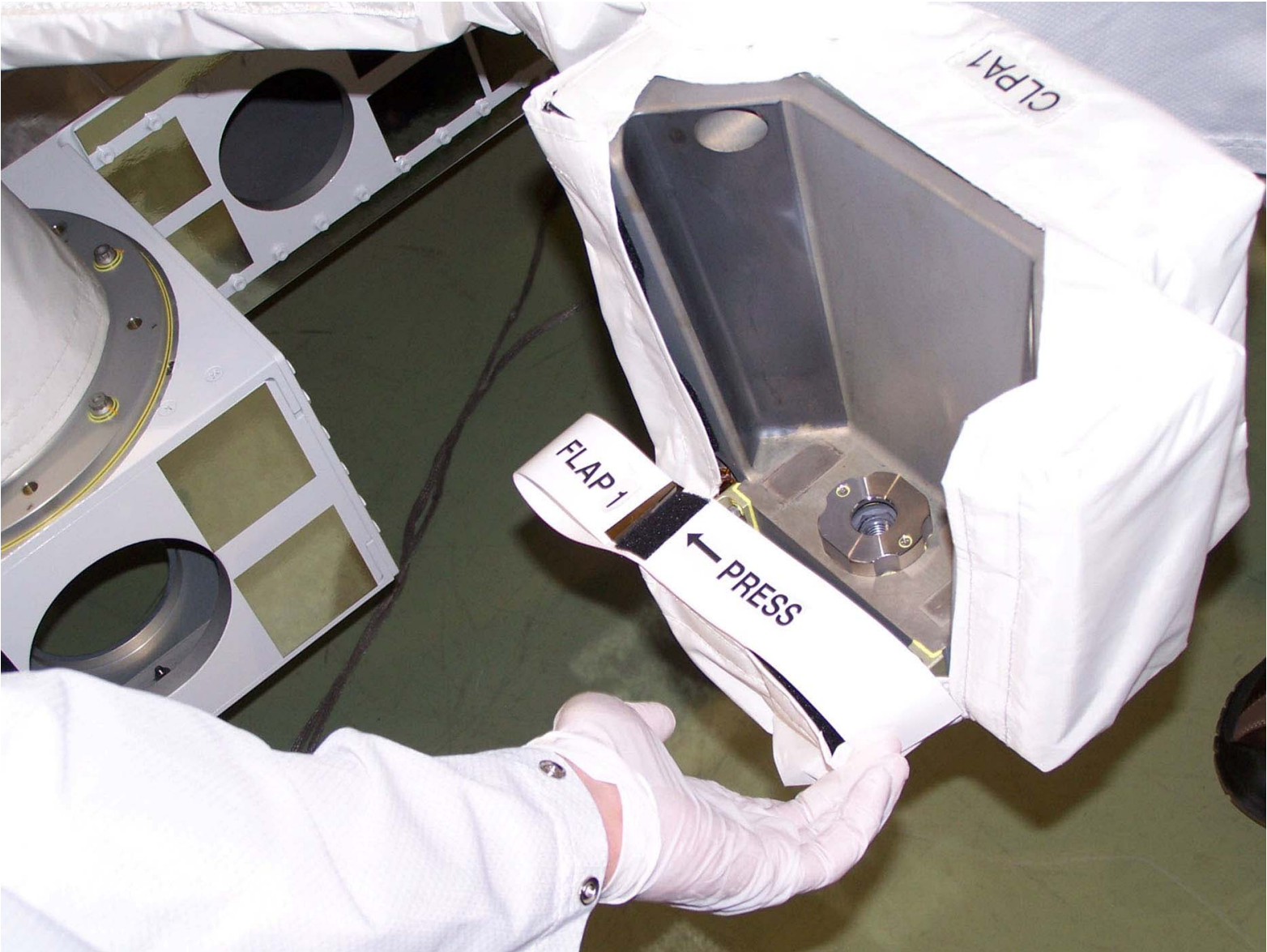
SPDM CLPA1 INSTALL (Cont)



SPDM CLPA1 INSTALL (Cont)



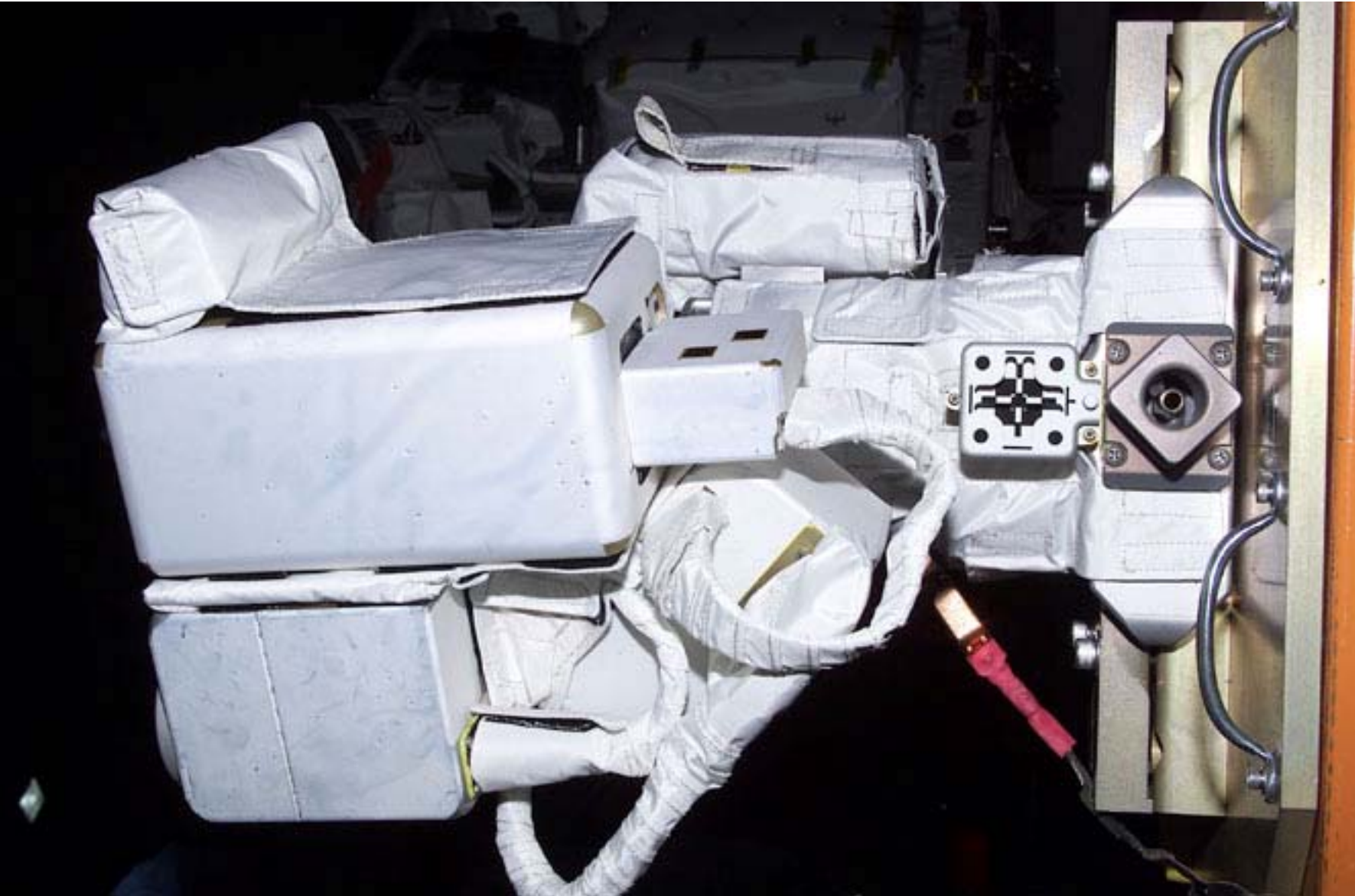
SPDM CLPA1 INSTALL (Cont)



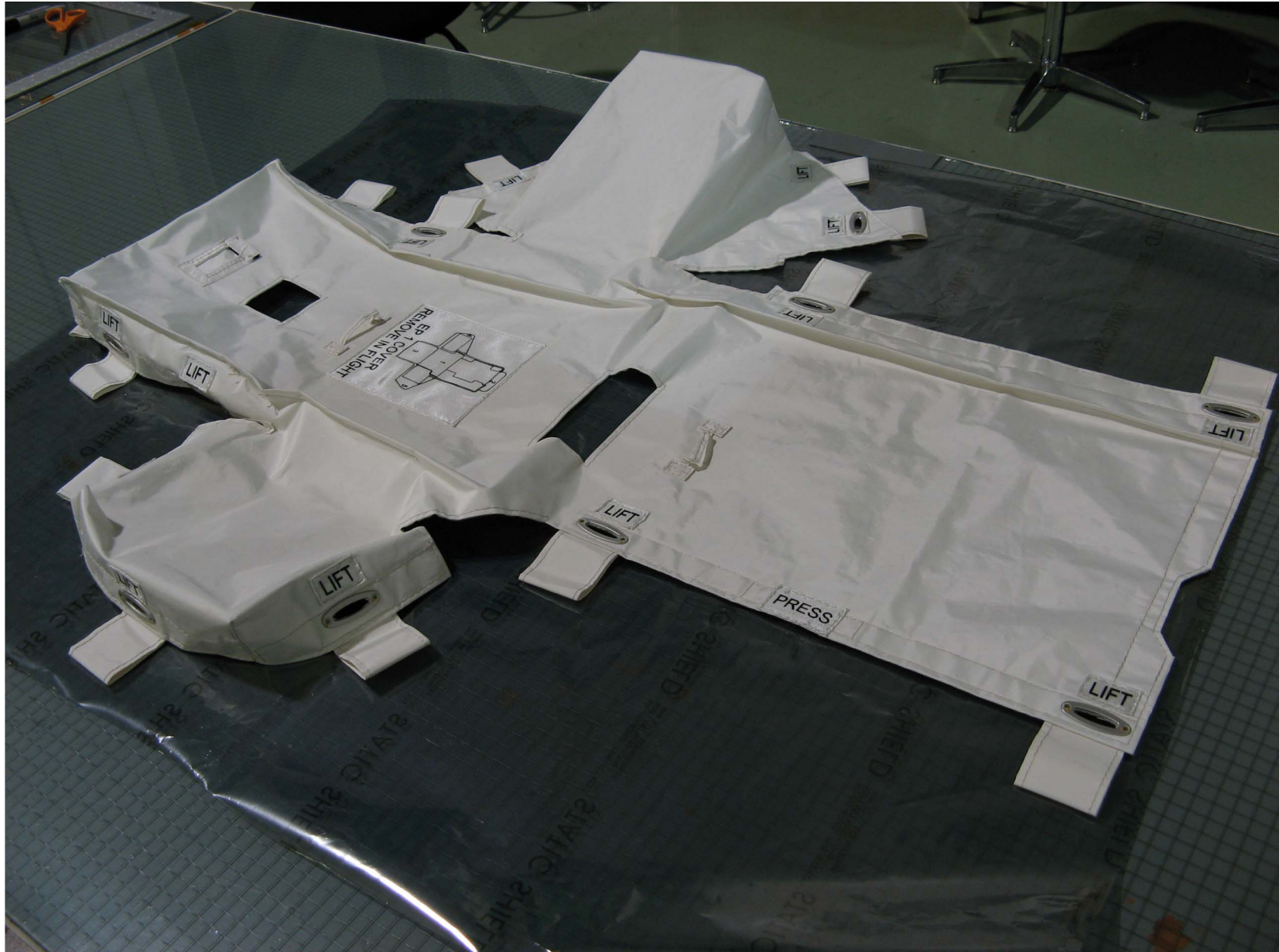
SPDM CLPA1 INSTALL (Cont)



SPDM CLPA1 INSTALL (Cont)



SPDM EP1 MLI RETRIEVE



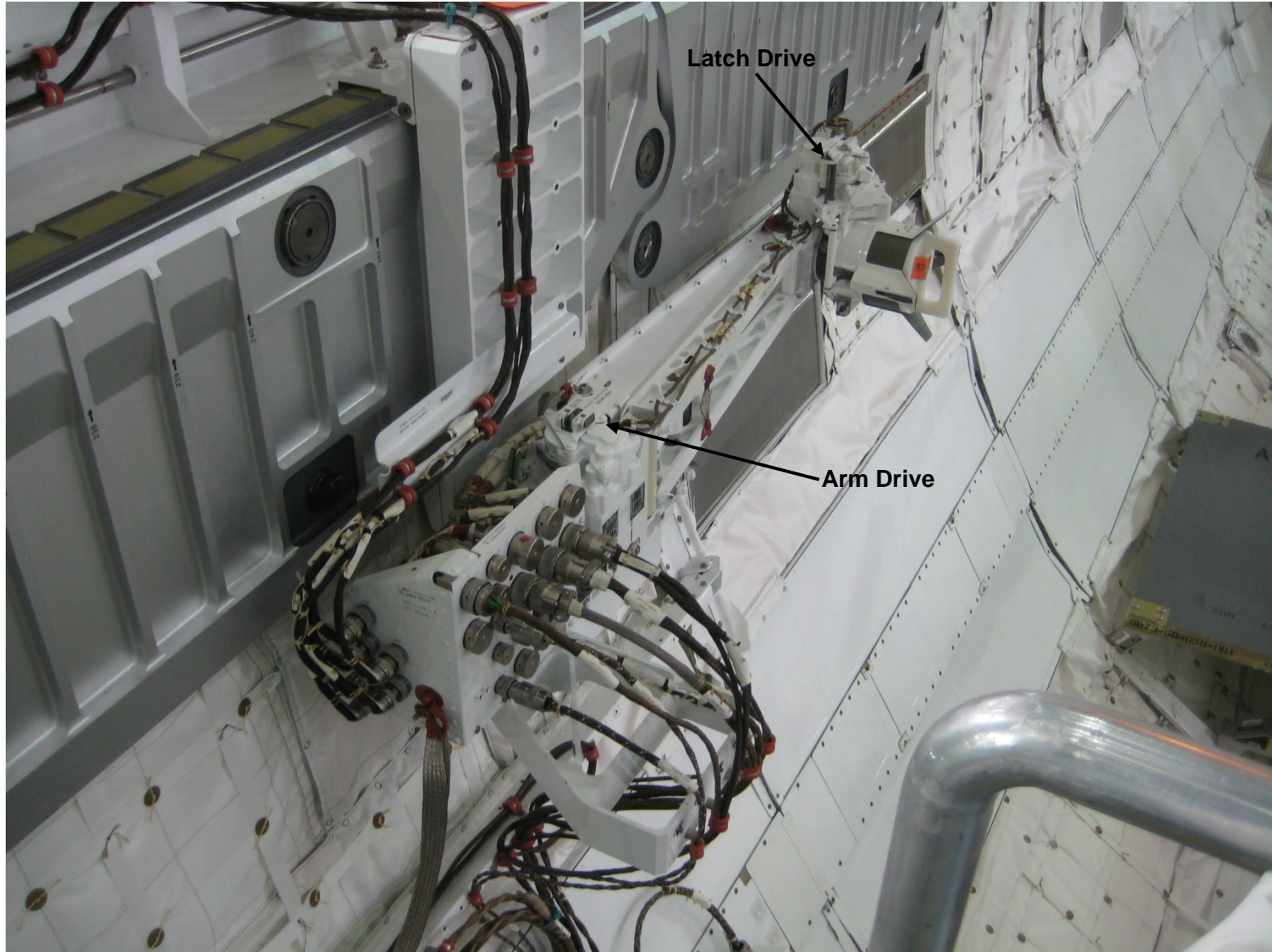
SPDM EP1 MLI RETRIEVE (Cont)



SPDM EP1 MLI RETRIEVE (Cont)



ROEU



FS 18-95

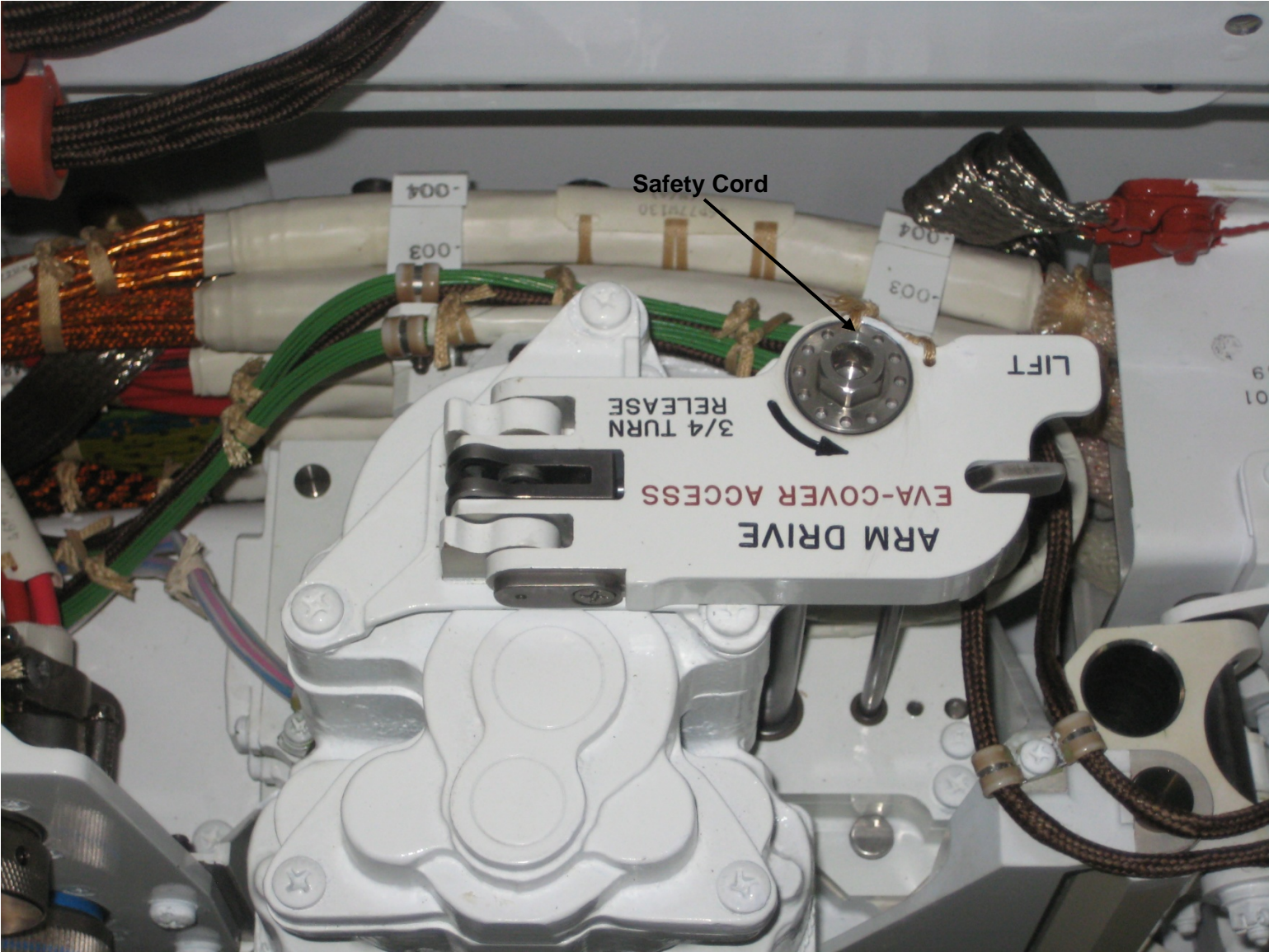
EVA/131/FIN A

ORBITER

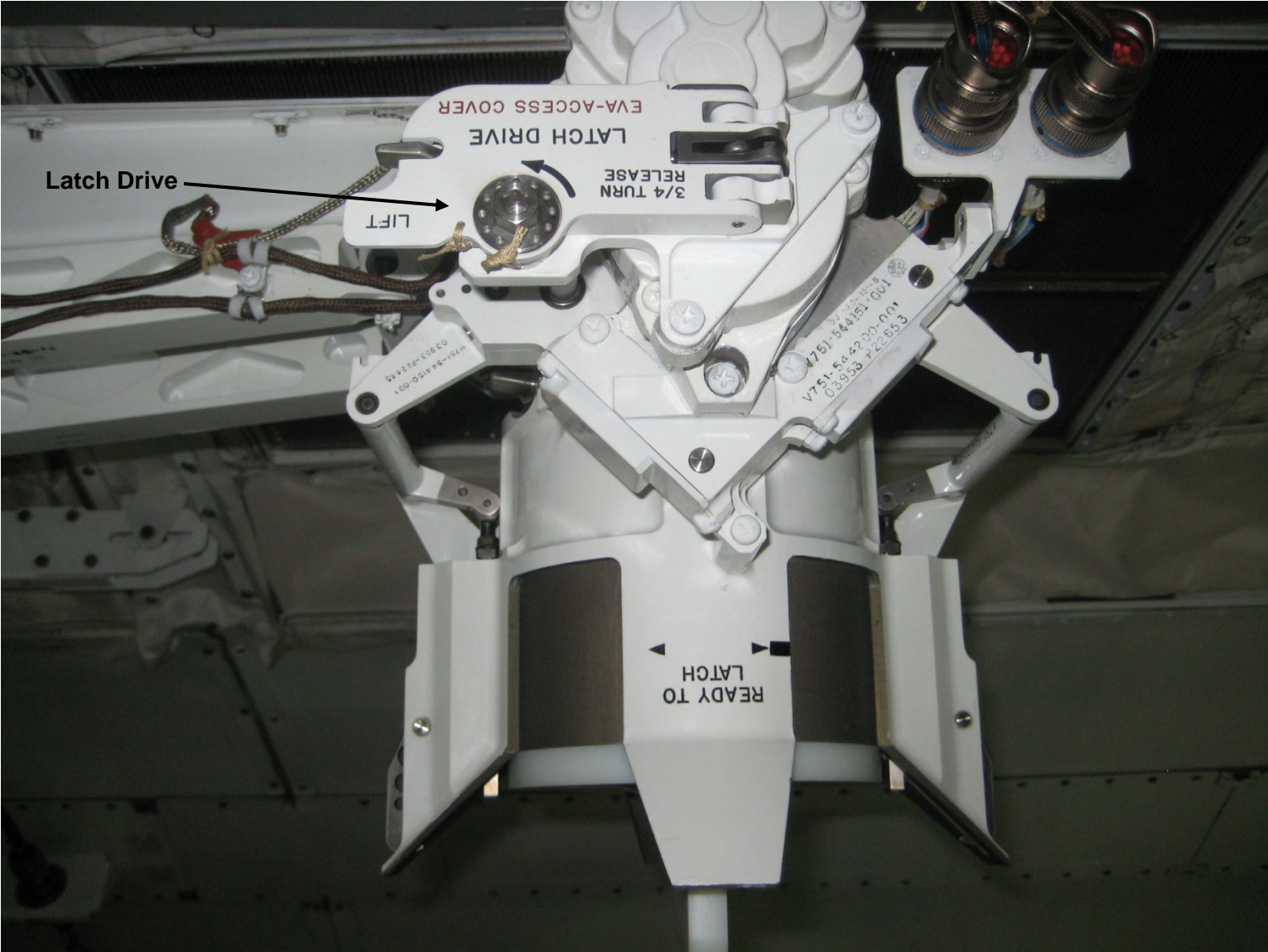
ROEU (Cont)



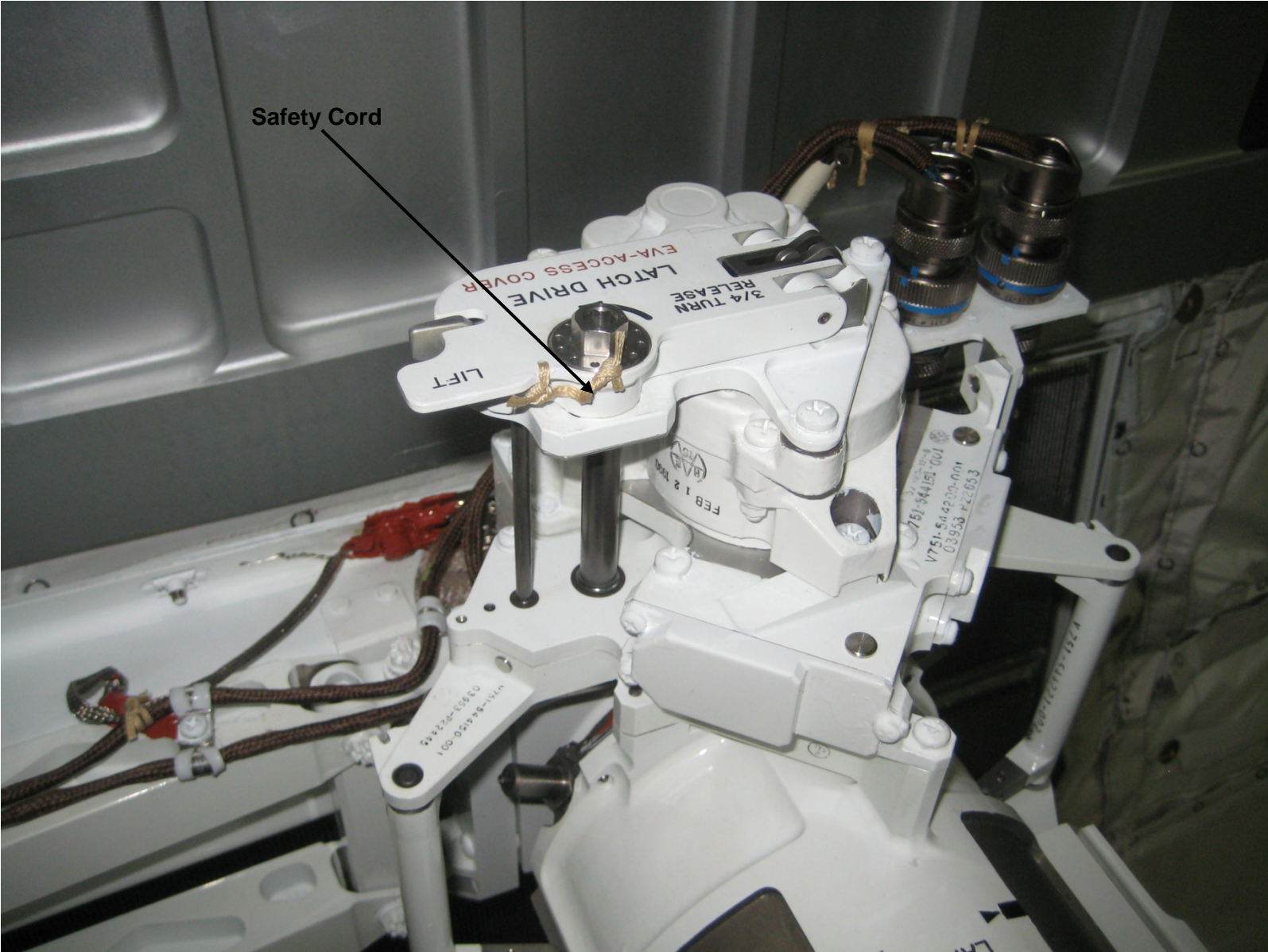
ROEU (Cont)



ROEU (Cont)

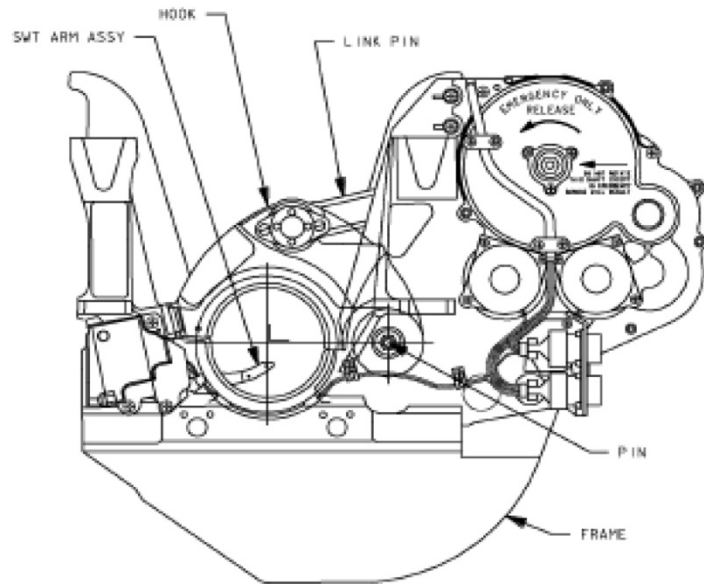


ROEU (Cont)



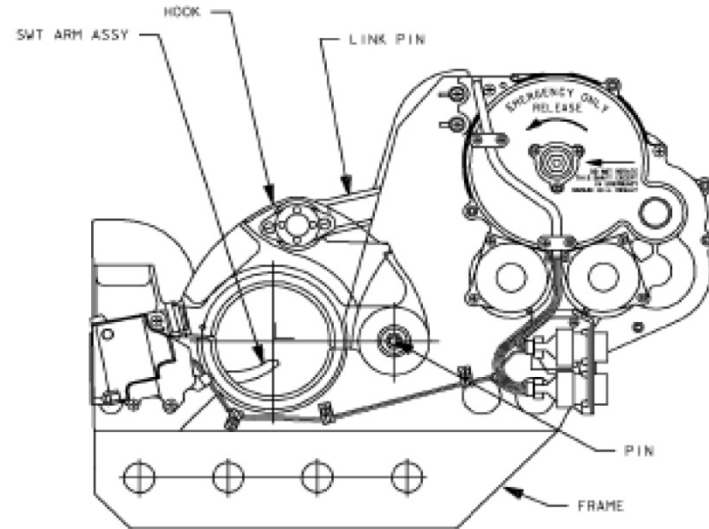
PRLA

In-board end of shaft has yellow marks.
Not aligned indicates motor disengaged



LWLL/MWLL/SMWLL

**LIGHTWEIGHT LONGERON LATCH/
MIDDLEWEIGHT LONGERON LATCH/
SUPER MIDDLEWEIGHT LONGERON LATCH**



MMWL

MODIFIED MIDDLEWEIGHT LATCH

173253111, ART. 1

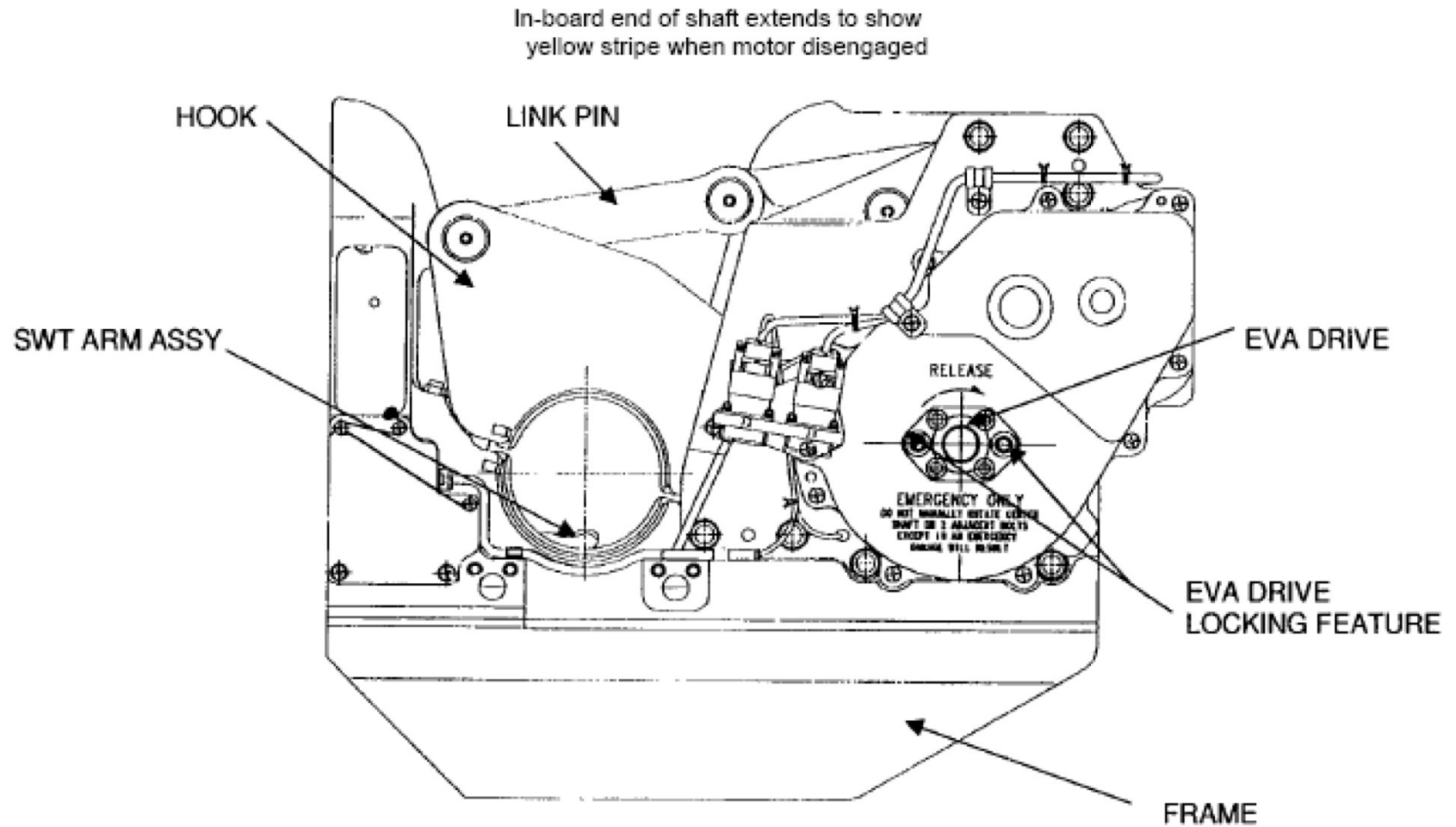
EVA RELEASABLE PAYLOAD RETENTION LATCHES

PRLA (Cont)

EVA Release Bolt
(NOTE: This style PRLA only on FWD trunnion pin of MPLM, stbd and port)



PRLA (Cont)



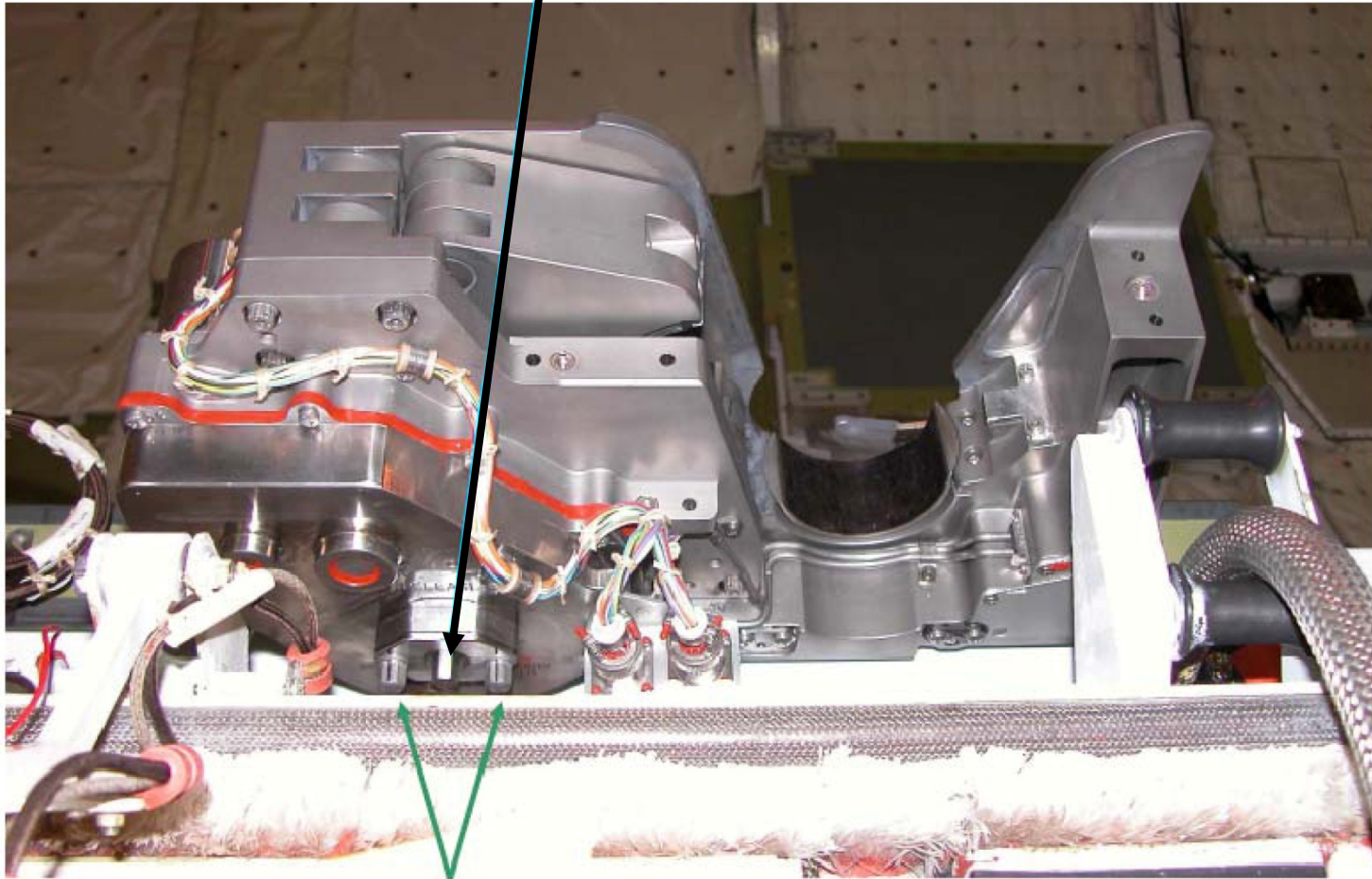
STANDARD WEIGHT LATCH

EVA RELEASABLE PAYLOAD RETENTION LATCHES (Cont)

PRLA (Cont)

EVA Release Bolt

(NOTE: This style PRLA only on AFT trunnion pin of MPLM, stbd and port)



Locking Bolts (2)

Standard Weight PRLA



PRLA Grounding Wiper: Listed as a sharp edge warning in Notes/Cautions/Warnings

They are installed as needed based on testing after payload installation. They have passed switch tests, but EV crew should be aware and take precaution



EVA CHECKLIST

STS
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