EVA Checklist

STS-126 Flight Supplement

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

Final
October 30, 2008

NOTE
This supplement is to be integrated into the generic edition to provide a complete document for the specific flight. Some pages in the generic edition may be replaced with supplemental pages identified as 'TEMP'. These generic pages, if any, must be retained for use on future flights.
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EVA CHECKLIST
STS-126 FLIGHT SUPPLEMENT

FINAL
October 30, 2008

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MASK PREBREATHE INITIATE

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

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

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

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

15. Note time and continue mask prebreathe at least 1 hr
PREP FOR 10.2 PSI CABIN PRESS/CYRO SYS CONFIG

L2 1. \( \checkmark \) O2 SYS 1, 2 SPLY (two) – ctr (tb-OP)
    \( \checkmark \) OVR SYS 1 – OP
2. \( \checkmark \) N2 SYS 1, 2 SPLY (two) – ctr (tb-OP)
    \( \checkmark \) REG INLET (two) – ctr (tb-OP)
3. O2/N2 CNTLR VLV SYS 1 – OP (N2)
    2 – CL (O2)

SM 88 APU/ENVIRON THERM

4. If FLASH EVAP CNTLR PRI A,B – OFF:
   If FREON LOOP 1, 2 EVAP OUT T between
   41-47 degF:
   RAD CNTLR OUT TEMP – HI
   When FREON EVAP OUT TEMP > 50 degF,
   RAD CNTLR OUT TEMP – NORM (then
   immediately)
   FLASH EVAP CNTLR PRI A(B) – ON
   After ~1 min
   If FREON EVAP OUT TEMP ~39 degF
   If FREON LOOP 1, 2 EVAP OUT T not between
   41-47 degF:
   FLASH EVAP CNTLR PRI A(B) – ON

L1 If FLASH EVAP CNTLR PRI A(B) – ON, continue:

AIRLOCK/MIDDECK PREP

MO10W 5. O2 REG INLET SYS 1 vlv – CL
       2 vlv – OP
    XOV SYS 2 – CL
6. \( \checkmark \) N2 XOVER vlv – CL

AW18A 7. LTG FLOOD (four) – ON

DCM 8. \( \checkmark \) PURGE vlv – op (up)

9. Remove LTA Restriction Bag (1 ea EMU)

AW82B 10. AIRLK DEPRESS vlv cap – vent, remove

RESET FDA & C/W LIMITS

X: SM 60 SM TABLE MAINT

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

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CABIN DEPRESS TO 10.2 PSI

WARNING
Do not initiate depress until EV1 and EV2 have completed 45 min of mask prebreathe
Do not terminate prebreathe until cabin pressure at 10.2 psia and 1 hr mask prebreathe completed

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

WARNING
Cabin O2 concentration ([SM SYS SUMM 1]) must be maintained below 28.5% to protect against increased flammability risk
Terminate all WCS activity while flowing N2 thru 14.7 CAB REG INLET SYS 1

NOTE
Expect klaxon each time airlock depress valve opened

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

STOP DEPRESS
AIRLK DEPRESS vlv – CL
Install AIRLK DEPRESS vlv Cap
14.7 CAB REG INLET SYS 1 – CL
SYS 2 – CL

Note:
Trend of plot should closely parallel slope of lines in each zone. If it does not, verify valve config.
10.2 PSI CABIN CONFIG

X: SM 60 SM TABLE MAINT

1. Reset FDA & C/W limits
   Changes enclosed in

2. Contact MCC for uplink of B/U C/W and SM ALERT
   TMBU (if desired)

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3. Perform SM CHECKPOINT INITIATE (ORB OPS, DPS)

4. O2 XOVR SYS 2 – OP

5. If O2 bleed orifice not installed:
   MO69M
   \[\text{\checkmark}\text{LEH O2 vlv 8 – CL}
   Unstow and insert O2 bleed orifice in O2 QD
   LEH O2 vlv 8 – OP

6. Depress Mask O2 control

7. LEH O2 4(5,6,7) outlet – Disconnect
   comm cable
   CCU PWR – ON

8. Stow mask, HIU, and 14 ft comm/O2 umbilical

MASK PREBREATHE TERMINATE

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

When mask prebreathe complete:
EV
1. Momentarily pull mask away from face to verify O2 flow
   * If no positive O2 flow, contact MCC *

2. Set mask O2 control to NORMAL
3. Doff mask

4. LEH O2 4(5,6,7) vlv – CL

MO32M

5. MIDDECK COMM CCU PWR – OFF
   outlet – Disconnect
   comm cable
   CCU PWR – ON

6. Depress Mask O2 control

7. LEH O2 4(5,6,7) outlet – Disconnect hose

C6, MO32M, MO69M

8. Stow mask, HIU, and 14 ft comm/O2 umbilical
AIRLOCK CONFIG

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AIRLOCK PREP (50 min)

Retrieve or unstow following equipment:

- **MF28G**: 3/8-in breaker bar, 4-in ext w/3/8-in drive
- **IFM Tool Kit**: 1/2-in socket w/3/8-in drive
- **Vol H**: EMU Equipment Bag – attach to middeck wall
  - Helmet Lights
  - EVA Bag
- **Contamination Detection Kit** (location flight specific)

**FDF Locker**
- Cuff Checklists (2) – stow in EMU Equipment Bag
- **DEPRESS/REPRESS** Cue Card

1. √ Inner hatch Equal vlv (two) – OFF
2. **AW18A** LTG FLOOD (four) – ON
3. Remove from airlock, as reqd:
   - **Airlock Stowage Bag**
   - Airlock Floor Pallet using 3/8-in breaker bar, 4-in ext w/3/8-in drive, and 1/2-in socket w/3/8-in drive
4. Stow Vol H Bags in Vol H
5. Transfer to airlock:
   - **EVA Bag** – install on airlock wall
   - **DEPRESS/REPRESS** Cue Card
   - Helmet Lights
   - Contamination Detection Kit – install on airlock wall
6. Install IVA foot restraint, as reqd
7. Unbuckle SCU straps, Velcro SCU to wall
8. Install EMU lights on helmets (EMU 1, EMU 2)
9. Disconnect helmets from Airlock EMUs, temp stow
10. Remove comm caps from LTA Restraint Bags and connect to electrical harnesses
11. Install helmets (not reqd if proceeding directly to EMU Checkout)
12. Remove LTA Restraint Bags
13. Disconnect waist rings; remove and stow any equipment stowed in HUT/LTA
14. Stow LTA Restraint Bags on AAPs
15. √ Thermal cover clear of waist ring
16. Waist ring – engage posn
17. Connect LTA to HUT, lock
18. Remove 20-g Crash Bag from middeck EMU, as reqd
EMU CHECKOUT PREP (30 min)

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

Middeck

Vol H
LTA RESTRAINT STRAP REMOVAL (15 min)

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

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

LTA RESTRAINT STRAP INSTALLATION (15 min)

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

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

NOTE:
French hooks should be attached to SAFER mount brackets for launch and landing
EMU PREP FOR ISS TRANSFER (60 min)

1. √PWR – SCU
2. √PURGE vlv – op (up)
3. √O2 ACT – OFF
4. √WATER – OFF, switch guard installed
5. √Helmet sunshades down, cover installed
6. Configure/verify items stowed in tables below

Kb ECOK 7. Retrieve EVA Systems Transfer Bag

---

**EMU 3005 (M) (Pp)**

- □ Helmet (Pp) s/n 1077
- □ Valsalva
- □ LTA (Pp) (attached)
- □ PP1 gloves s/n 6225
- □ Wrist Mirrors (2)
- □ LTA Restraint Strap installed, if desired

**EMU 3011 (L) (Bw)**

- □ Helmet (Bw) s/n 1073
- □ Fresnel Lens (1)
- □ Valsalva
- □ LTA (Bw) (attached)
- □ BW1 gloves s/n 6252
- □ Wrist Mirrors (2)
- □ LTA Restraint Strap installed, if desired

**EMU Crew Options Kit (Pp)**

- □ LCVG (PP1)
- □ CCA PP2
- □ Pp EVA 1 & 2 Ziplock Bags
  - □□□ 2 MAGs
  - □□□ TCU (top, bottom)
  - □□□ Socks
  - □□□ Wristlets
  - □□□ Comfort Gloves
  - □□□ Moleskin
  - □□□ Hair Restraint
  - □□□ Sports Bra
  - □ X X Patch, Stripes, National Flag

**EMU Crew Options Kit (Bw)**

- □ LCVG (BW1)
- □ CCA BW2
- □ Bw EVA 1 & 3 Ziplock Bags
  - □□□ 2 MAGs
  - □□□ TCU (top, bottom)
  - □□□ Socks
  - □□□ Wristlets
  - □□□ Comfort Gloves
  - □ X X Fresnel Lens
  - □ X Croakie
  - □ X X Patch, Stripes, National Flag

From Kb ECOK

- □ Pp EVA 3 Ziplock Bag

---

From Kb ECOK

- □ Bw EVA 4 Ziplock Bag
**EMU PREP FOR ISS TRANSFER** (60 min) (Cont)

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<td>☐ ☐ TCUs (top, bottom)</td>
<td>☐ STS-126 EVA Checklist (1 of 2)</td>
</tr>
<tr>
<td>☐ ☐ Socks</td>
<td>☐ EMU Battery s/n 2037</td>
</tr>
<tr>
<td>☐ ☐ Wristlets</td>
<td>☐ EVA Large ORU Bag (s/n 1016) (1)</td>
</tr>
<tr>
<td>☐ ☐ Comfort Gloves</td>
<td>☐ EVA Grease Gun (J Nozzle) (2)</td>
</tr>
<tr>
<td>☐ ☐ Mole Skin</td>
<td>☐ J Nozzle Valve Assembly (2)</td>
</tr>
<tr>
<td>☐ CCA KB1 &amp; KB2</td>
<td>☐ Tools mesh bags (3)</td>
</tr>
<tr>
<td>☐ EV3 (Kb) Prime Gloves s/n 6144</td>
<td>☐ 3 CTB</td>
</tr>
<tr>
<td></td>
<td>☐ Adjustable Equipment Tethers (6)</td>
</tr>
<tr>
<td></td>
<td>☐ EVA Gap Gauge (s/n 1006) (1)</td>
</tr>
<tr>
<td></td>
<td>☐ EVA Large Trash Bag (s/n 1011) (1)</td>
</tr>
<tr>
<td></td>
<td>☐ Trundle Bearing Assemblies (4)</td>
</tr>
<tr>
<td></td>
<td>☐ Trundle Bearing Assembly Bags (6)</td>
</tr>
<tr>
<td></td>
<td>☐ EVA Wipes (4 dry, 4 wet)</td>
</tr>
<tr>
<td></td>
<td>☐ EVA Wipe Caddies (full)</td>
</tr>
<tr>
<td></td>
<td>☐ SARJ Debris Containers (2)</td>
</tr>
<tr>
<td></td>
<td>☐ SARJ Scrapers (2)</td>
</tr>
<tr>
<td></td>
<td>☐ Braycote Cartridges (2)</td>
</tr>
<tr>
<td></td>
<td>☐ P T/V Equipment</td>
</tr>
</tbody>
</table>

**EVA Systems Transfer Bag**

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

**EVA Large ORU Bag**

<table>
<thead>
<tr>
<th>Current Location</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD Floor Stbd 1 Bag C</td>
<td>☐ Large ORU Bag (s/n 1016) (1)</td>
</tr>
<tr>
<td></td>
<td>☐ EVA Grease Gun (J Nozzle) (2)</td>
</tr>
<tr>
<td>KB ECOK</td>
<td>☐ J Nozzle Valve Assembly (2)</td>
</tr>
<tr>
<td></td>
<td>☐ Tools mesh bags (3)</td>
</tr>
</tbody>
</table>

**3 CTB**

<table>
<thead>
<tr>
<th>Current Location</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Airlock Floor Bag</td>
<td>☐ 3 CTB</td>
</tr>
<tr>
<td></td>
<td>☐ Adjustable Equipment Tethers (6)</td>
</tr>
<tr>
<td></td>
<td>☐ EVA Gap Gauge (s/n 1006) (1)</td>
</tr>
<tr>
<td></td>
<td>☐ EVA Large Trash Bag (s/n 1011) (1)</td>
</tr>
<tr>
<td></td>
<td>☐ Trundle Bearing Assemblies (4)</td>
</tr>
<tr>
<td></td>
<td>☐ Trundle Bearing Assembly Bags (6)</td>
</tr>
<tr>
<td></td>
<td>☐ EVA Wipes (4 dry, 4 wet)</td>
</tr>
<tr>
<td></td>
<td>☐ EVA Wipe Caddies (full)</td>
</tr>
<tr>
<td></td>
<td>☐ SARJ Debris Containers (2)</td>
</tr>
<tr>
<td></td>
<td>☐ SARJ Scrapers (2)</td>
</tr>
<tr>
<td></td>
<td>☐ Braycote Cartridges (2)</td>
</tr>
<tr>
<td></td>
<td>☐ P T/V Equipment</td>
</tr>
</tbody>
</table>
POST-DOCKING EVA TRANSFER AND RECONFIG (90 min)

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

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

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

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

3. Stow following currently on ISS for return on STS-126
- Ammonia Contamination Cue Card (old)
- ISS EVA Systems Checklist (old)
- ISS EVA Cuff C/L (4)

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

CONFIGURE EMU 3018 FOR Kb (15 min)

6. √EMU installed on aft EDDA

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

8. Install following items from Kb ECOK:
- STS-126 Mission Patch, Stripes, National Flag
- Gloves (KB1)

9. Install (2) Wrist Mirrors from EMU Equipment Bag

10. Remove Helmet lights and EMU TV assembly; report ID to MCC-H as comm permits; temp stow for installation on EMU 3005

11. Disconnect/Reconnect Helmet to install:
- CCA KB1 from Kb ECOK
- Valsalva from EMU Servicing Kit

12. √Helmet sunshades down, cover installed

13. Confirm cam configuration per STS-126 NOMINAL EMU SIZING (EMU CONTINGENCY PROCS)
HEATED GLOVE CHECKOUT (10 min)
EMU 3018
14. Upper arm connections mated (located under TMG covering; unzip shoulder TMG as reqd for access, then reconfigure)
15. Glove heater sw – OFF
16. Connect lower arm pwr harness to gloves (remove Kapton tape as reqd)

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

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

23. Remove from aft EDDA; transfer EMU to Node 1

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

CONFIGURE EMU 3005 FOR Pp (20 min)
EMU 3005
36. Install on aft EDDA
37. Install Helmet Lights and EMU TV assembly (temp stowed in step 10)
38. If required, perform 1.330 LTA Restraint Installation/Removal - Removal
   Stow LTA Restraint Bag in Pp ECOK
39. Install EV1 Cuff checklist on EMU left arm. If needed, remove left glove
40. Remove EMU Battery, stow in M-02 s/n 1038, EVA Prep and Ops
41. Remove LiOH, cap; stow in Pp ECOK for EVA 3
   Verify s/n per STS-126 CONSUMABLES TRACKING Cue Card
42. Install EMU Battery and Metox per STS-126 CONSUMABLES TRACKING
   Cue Card
43. Populate ISS EMU Equipment Bag crew specific compartments, as desired
EMU SWAP FOR EVA 2 (Bw → Kb) (15 min)

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

Both EMUs
☐ 1. Connect waist ring to HUT
☐ 2. Reconnect gloves and boots

EMU 3003
☐ 3. Remove Helmet Lights and EMU TV and temp stow
☐ 4. Helmet installed, sun shades down, cover installed
☐ 5. Remove EMU from fwd EDDA
   Transfer EMU to Node 1
☐ 6. Transfer Bw ECOK to Node 1

EMU 3018
☐ 7. Transfer EMU and Kb ECOK to E-Lk
   Install EMU on fwd EDDA
☐ 8. Install Helmet Lights and EMU TV
EMU SWAP FOR EVA 3 (Kb → Bw) (Bw AFT, Pp FWD) (30 min)

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

Both EMUs
- 1. Connect waist ring to HUT
- 2. Reconnect gloves and boots
- 3. Remove REBAs; temp stow in M-02 s/n 1038 for xfer to MPLM

EMU 3018
- 4. Remove EMU Battery for Battery Recharge Init
- 5. Remove Helmet Lights and EMU TV and temp stow
- 6. √Helmet installed, sunshades down, cover installed
- 7. Install REBA s/n 1006
- 8. Remove EMU from fwd EDDA
   Transfer EMU to Node 1
- 9. Transfer Kb ECOK to Node 1

EMU 3005
- 10. Remove EMU from aft EDDA; Install on fwd EDDA
- 11. Install REBA s/n 1008

EMU 3003
- 12. Transfer EMU and Bw ECOK to E-Lk
   Install EMU on aft EDDA
- 13. Install Helmet Lights and EMU TV
EMU SWAP FOR EVA 4 (Pp → Kb) (Kb AFT, Bw FWD) (30 min)

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

Both EMUs
☐ 1. Connect waist ring to HUT
☐ 2. Reconnect gloves and boots

EMU 3005
☐ 3. Remove; stow:
☐ Helmet Lights and EMU TV – temp stow
☐ LiOH – cap and temp stow in Pp ECOK; install Vent Port Plugs
☐ REBA – stow in M-02 s/n 1038
☐ CCA – stow in Pp ECOK
☐ Patch, Stripes, National Flag – stow in Pp ECOK
☐ Cuff C/L – cut out FS pages, stow in EMU Equipment Bag
☐ 4. □ Helmet installed, sunshades down, cover installed
☐ 5. Remove EMU from fwd EDDA
   Transfer EMU to Node 1
☐ 6. Transfer Pp ECOK to Node 1

EMU 3003
☐ 7. Remove EMU from aft EDDA; install on fwd EDDA

EMU 3018
☐ 8. Transfer EMU and Kb ECOK to E-Lk
   Install EMU on aft EDDA
☐ 9. Install Helmet Lights and EMU TV temp stowed in step 3
NOTE
This procedure assumes the following procedures have been completed following EVA 4:

- **{1.240 POST EVA}** (SODF: ISS EVA SYS: EVA PREP/POST)
- **{1.605 BSA BATTERY RECHARGE - term}** (SODF: ISS EVA SYS: BATTERY OPS)
- **{1.515 METOX BATTERY REPLACEMENT}** (SODF: ISS EVA SYS: EMU MAINTENANCE)

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

### EVA Systems Transfer Bag

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

**CONFIGURE EMUs FOR RETURN**

**EMU 3018/3003**

- 5. √DIDB Restraint Bag installed

**DCM**

- 6. √O2 ACT – OFF
  - ∧PWR – SCU
  - ∧DCM Purge vlv – Op (up)
  - ∧WATER – OFF, Switch Guard installed

**EMUs**

- 7. Remove following:
  - ∧Helmet Lights and EMU TV; stow on ISS
  - ∧REBAs; stow in M-02
  - ∧Cuff C/L – cut out FS pages, stow in EMU Equipment Bag
  - ∧CCAs – temp stow Bw until LTA restraint installed
  - ∧Patches, Stripes, National Flag – stow in ECOK
  - ∧Tethers/Tools

- 8. Verify/reconfigure EMUs and ECOK per the following table
  (NOTE: underlined items differ from pre-docking config)
**EMU 3018 (Pp)**
- EMU Battery (s/n 2072)
- LiOH (used)
- Helmet (s/n 1076), cover installed
- Pp ECOK
- LTA (s/n 2082)
- Gloves (Pp)
- Wrist Mirrors (2)
- LTA Restraint installed
- CCA PP1 & PP2 → LTA Restraint pouch

**EMU 3003 (Bw)**
- EMU Battery (s/n 2073)
- LiOH (used)
- Helmet (s/n 1071), cover installed
- Bw ECOK
- LTA (s/n 2057)
- Gloves (Bw)
- Wrist Mirrors (2)
- LTA Restraint installed
- CCA BW1 & BW2 → LTA Restraint pouch

### EMU Crew Options Kit (Pp)
- Pp EVA 1 & 2 Ziplock Bags
  - 2 MAGs (less used items)
  - TCUs (top, bottom)
  - Socks
  - Wristlets
  - Comfort Gloves
  - Moleskin
  - Hair Restraint
  - Sports Bra
  - X X Patch, Stripes, National Flag
- Stow in Kb ECOK
  - Pp EVA 3 Ziplock Bag
- LCWG (PP) (w/biomed sternal harness and signal conditioner)

### EMU Crew Options Kit (Bw)
- Bw EVA 1 & 3 Ziplock Bags
  - 2 MAGs (less used items)
  - TCUs (top, bottom)
  - Socks
  - Wristlets
  - Comfort Gloves
  - X X Fresnel Lens
  - X Croakie
  - X X Patch, Stripes, National Flag
- Stow in Kb ECOK
  - Bw EVA 4 Ziplock Bag
- LCWG (BW) (w/biomed sternal harness and signal conditioner)

### EMU Crew Options Kit (Kb)
- EVA 2 & 4 Ziplock Bags
  - 2 MAGs (less used items)
  - TCUs (top, bottom)
  - Socks
  - Wristlets
  - Comfort Gloves
- Pp EVA 3 Ziplock Bag
- Bw EVA 4 Ziplock Bag
- Remaining Mesh Bags
- CCA KB1 & KB2
- LCWG (KB) (w/biomed sternal harness and signal conditioner)
- EV3 Gloves

---

EMU 3003  
9. Temp stow in Node 2

EMU 3005  
10. Install on EDDA
11. Remove following:
   - Complete LTA (s/n 2082/Waist s/n 039)
   - Arm Rings, Arms, Gloves
   - Cuff C/L – cut out FS pages, stow in EMU Equipment Bag
EMU 3018  12. Remove following:
   □ Complete LTA (s/n 2054/Waist s/n 019)
   □ Arms – stow in M-02
   □ Gloves – stow in Kb ECOK
EMU 3005  13. Install following from EMU 3005:
   □ Complete LTA (s/n 2082/Waist s/n 039)
   □ Arm Rings, Arms, Gloves
EMU 3018  14. Install following:
   □ Helmet Lights and EMU TV
   □ Arm leg covers
   □ Complete LTA (s/n 2054/Waist s/n 019)
EMU 3018  15. Temp stow in Node 2
EVA TRANSFER TO SHUTTLE (30 min)

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

<table>
<thead>
<tr>
<th>EVA Large ORU Bag</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Adjustable Equipment Tethers (s/n 1010, 1013, 1014, 1015, 1036, 1037) (6)</td>
</tr>
<tr>
<td>□ Large ORU Bag (s/n 1016) (1)</td>
</tr>
<tr>
<td>□ Red RETs (16)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Destination</th>
<th>Transfer Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMU 3018 (M) with ECOK</td>
<td>Temp stow Middeck</td>
<td></td>
</tr>
<tr>
<td>EMU 3003 (XL) with ECOK</td>
<td>Temp stow Middeck</td>
<td></td>
</tr>
<tr>
<td>Kb ECOK</td>
<td>Temp stow Middeck</td>
<td></td>
</tr>
<tr>
<td>EVA Systems Transfer Bag</td>
<td>Temp stow Middeck</td>
<td></td>
</tr>
<tr>
<td>EVA Large ORU Bag</td>
<td>Temp stow Middeck</td>
<td></td>
</tr>
</tbody>
</table>
1. Unpack and stow items per table below; report status to MCC when complete

### EMU SYSTEMS TRANSFER BAG UNPACK AND STOW

<table>
<thead>
<tr>
<th>Item</th>
<th>Final Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMU 3018 (Pp)</td>
<td>Ext A/L (Stbd AAP)</td>
</tr>
<tr>
<td>EMU 3003 (Bw)</td>
<td>Ext A/L (Port AAP)</td>
</tr>
<tr>
<td>Kb ECOK; unpack to fit</td>
<td>MD Ceiling Stbd 1 Bag G</td>
</tr>
<tr>
<td>□ ECOK</td>
<td></td>
</tr>
<tr>
<td>□ CCA KB1 &amp; KB2</td>
<td></td>
</tr>
<tr>
<td>□ LCVG (KB)</td>
<td></td>
</tr>
<tr>
<td>□ EV3 Gloves</td>
<td></td>
</tr>
<tr>
<td><strong>EMU Systems Transfer Bag</strong></td>
<td>MD Ceiling Stbd 1 Bag G</td>
</tr>
<tr>
<td>□ STS-126 CONSUMABLES TRACKING Cue Card (1 of 1)</td>
<td>FDF Locker</td>
</tr>
<tr>
<td>□ EMERGENCY UNDOCKING EVA TRANSFER Cue Card</td>
<td></td>
</tr>
<tr>
<td>(1 of 1)</td>
<td></td>
</tr>
<tr>
<td>□ STS-126 EVA Checklist (1 of 2)</td>
<td></td>
</tr>
<tr>
<td>□ STS-126 ISS EVA Systems Checklists (1 of 2),</td>
<td>SODF Locker</td>
</tr>
<tr>
<td>colored</td>
<td></td>
</tr>
<tr>
<td>□ ISS EVA Systems Checklists (old)</td>
<td></td>
</tr>
<tr>
<td>□ ISS Cuff Checklist (4) (old)</td>
<td></td>
</tr>
<tr>
<td>□ Joint Emergency Egress Cue Card</td>
<td></td>
</tr>
<tr>
<td>□ Ammonia Contamination Cue Card (old)</td>
<td></td>
</tr>
<tr>
<td>□ EMU Battery s/n 2067</td>
<td>MD Floor Stbd 1 Bag G</td>
</tr>
<tr>
<td>□ BTA (s/n 1009)</td>
<td>Locker MA16G</td>
</tr>
<tr>
<td>□ EMU Servicing Kit (s/n 5002)</td>
<td>Vol H</td>
</tr>
<tr>
<td>□ EMU Equipment Bag Crew Specific Compartments</td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td><strong>EVA Large ORU Bag</strong>, unpack to fit</td>
<td>MD Floor Stbd 1 Bag C</td>
</tr>
<tr>
<td>Task</td>
<td>Page</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>MIDDECK PREP</td>
<td>4-2</td>
</tr>
<tr>
<td>EVA PREP</td>
<td>4-3</td>
</tr>
<tr>
<td>PREP FOR DONNING</td>
<td>4-3</td>
</tr>
<tr>
<td>EMU DONNING</td>
<td>4-5</td>
</tr>
<tr>
<td>EMU CHECK</td>
<td>4-7</td>
</tr>
<tr>
<td>EMU PURGE</td>
<td>4-7</td>
</tr>
<tr>
<td>EMU PREBREATHE</td>
<td>4-8</td>
</tr>
<tr>
<td>SAFER DONNING</td>
<td>4-8</td>
</tr>
<tr>
<td>EVA COMM CONFIG</td>
<td>4-10</td>
</tr>
<tr>
<td>EVA COMM DECONFIG</td>
<td>4-10</td>
</tr>
<tr>
<td>APPROVED NON-EMU HARDWARE MATRIX</td>
<td>4-11</td>
</tr>
</tbody>
</table>
**WARNING**
Payload bay floods exceed EMU thermal limits during operation. If EVA crew will be operating in vicinity of PLB floods, floods must be turned off now. Cooldown time may be as long as 6 hr.

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

### MIDDECK PREP (30 min)

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

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

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

**CAUTION**
EV crewmembers should minimize application of hygiene and hydrocarbon-based products prior to EVA day to avoid introduction of irritants into EMU. Reference APPROVED NON-EMU HARDWARE MATRIX, 4-11, for acceptable items in EMU.
EVA PREP (90 min)

X: SM 60 SM TABLE MAINT
1. Contact MCC for uplink of SM ALERT TMBU (if desired)
   Changes enclosed in [ ]

<table>
<thead>
<tr>
<th>Param Name</th>
<th>Param ID</th>
<th>Lower Limit</th>
<th>Upper Limit</th>
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<td>EXT A/L H2O LINE T</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>LCG 2 SPLY ZN 1 T</td>
<td>0640182</td>
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<td>85</td>
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<tr>
<td>H2O LINE T 2</td>
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<td>48</td>
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<tr>
<td>SPLY ZN 2 T</td>
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<tr>
<td>LCG 2 SPLY ZN 2 T</td>
<td>0640185</td>
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<td>82</td>
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<tr>
<td>O2 LN T</td>
<td>0640186</td>
<td>OSL</td>
<td>80</td>
</tr>
<tr>
<td>SPLY ZN 2 T</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PREP FOR DONNING (30 min)

BOTH DCM   2. Retrieve, position SCU; remove DCM cover
              3. Connect SCU to DCM, √locked
   AW82B   4. EV-1, EV-2 O2 vlv (two) – op
   MO13Q   5. √ARLK H2O S/O VLV – OPEN (tb-OP)
   MD(flr) 6. √EMU O2 ISOL VLV – OP
   ML86B:C 7. √cb MNC EXT ARLK HTR ZN 1,2 (two) – op
   L2MO10W 8. √O2 XOVR SYS 1,2 (two) – OP
BOTH DCM   9. PWR – BATT

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

AW18H   10. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR
             BUS SEL (two) – MNA(MNB)

DCM   11. PWR – SCU
         12. √STATUS: [BATT VDC] ≥ 20.3
         13. Verify panels as shown next page
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### EVA 1

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0:00</td>
<td>Egress</td>
</tr>
<tr>
<td>0:30</td>
<td>ORU Transfer (NTA &amp; FHRC)</td>
</tr>
<tr>
<td>1:00</td>
<td>S3 SARJ</td>
</tr>
<tr>
<td>1:30</td>
<td>EFBM Cover Rvm</td>
</tr>
<tr>
<td>2:00</td>
<td>Ingress</td>
</tr>
</tbody>
</table>

### EVA 2

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0:00</td>
<td>Egress</td>
</tr>
<tr>
<td>0:30</td>
<td>CETA Cart Relocation</td>
</tr>
<tr>
<td>1:00</td>
<td>S3 SARJ</td>
</tr>
<tr>
<td>1:30</td>
<td>LEE A Lubing</td>
</tr>
<tr>
<td>2:00</td>
<td>Ingress</td>
</tr>
</tbody>
</table>

### EVA 3

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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</thead>
<tbody>
<tr>
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<td>Egress</td>
</tr>
<tr>
<td>0:30</td>
<td>S3 SARJ</td>
</tr>
<tr>
<td>1:00</td>
<td>Ingress</td>
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### EVA 4

<table>
<thead>
<tr>
<th>Time</th>
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</thead>
<tbody>
<tr>
<td>0:00</td>
<td>Egress</td>
</tr>
<tr>
<td>0:30</td>
<td>Rmv P3 MLI Cvr</td>
</tr>
<tr>
<td>1:00</td>
<td>Insl EFBM Cvr</td>
</tr>
<tr>
<td>1:30</td>
<td>JEM RMS Grd Tabs</td>
</tr>
<tr>
<td>2:00</td>
<td>Insl JEM HRs &amp; WIFs</td>
</tr>
<tr>
<td>2:30</td>
<td>Insl JEM GPS Ant</td>
</tr>
<tr>
<td>3:00</td>
<td>JEM Cleanup</td>
</tr>
<tr>
<td>3:30</td>
<td>S1/P1 Radiator Imagery</td>
</tr>
<tr>
<td>4:00</td>
<td>Get-Aheads</td>
</tr>
<tr>
<td>4:30</td>
<td>Cleanup</td>
</tr>
<tr>
<td>5:00</td>
<td>Ingress</td>
</tr>
<tr>
<td>5:30</td>
<td>P3 SARJ 1st Lube</td>
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<tr>
<td>6:00</td>
<td>ETVCG Install CP7</td>
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<tr>
<td>6:30</td>
<td>P3 SARJ 2st Lube</td>
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<tr>
<td>7:00</td>
<td>Insl P3 MLI Cvr</td>
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<tr>
<td></td>
<td>TUS Cable Pictures</td>
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<tr>
<td></td>
<td>Cleanup</td>
</tr>
<tr>
<td></td>
<td>Ingress</td>
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**EVA 1**
## EVA 1 SUMMARY TIMELINE

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

### EV1

<table>
<thead>
<tr>
<th>MWS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRT (L)</td>
</tr>
<tr>
<td>RET (eq-eq)</td>
</tr>
<tr>
<td>Wire Tie (2)</td>
</tr>
<tr>
<td>T-Bar</td>
</tr>
<tr>
<td>RET (eq-eq)</td>
</tr>
<tr>
<td>RET (eq-eq) w/PIP Pin</td>
</tr>
<tr>
<td>Adj Equip Tether (2)</td>
</tr>
<tr>
<td>Wire Tie</td>
</tr>
<tr>
<td>Small Shuttle Trash Bag</td>
</tr>
<tr>
<td>Swing Arm (R)</td>
</tr>
<tr>
<td>RET (eq-eq)</td>
</tr>
<tr>
<td>PGT [A4 6.3ft-lb, CAL, MTL 30.5] s/n _______</td>
</tr>
</tbody>
</table>
| PGT Battery s/n _______

**NOTE:**
- Engage tether hook from inside of mount

### AIRLOCK CONFIG

| RET (Lg-eq) |
| Large ORU Transfer Bag |
| Adj Equip Tether (on outside) |
| Wire Tie (2) |
| T-Bar |
| Small Shuttle Trash Bag |
| Swing Arm (R) |
| RET (eq-eq) |
| Wire Tie (2) |
| T-Bar |
| PGT [A4 6.3ft-lb, CAL, MTL 30.5] s/n _______ |
| Wire Tie (2) |
| T-Bar |
| PGT [A4 6.3ft-lb, CAL, MTL 30.5] s/n _______ |

**NOTE:**
- Match s/n's of Bearing and Mount Packages

### EV2

<table>
<thead>
<tr>
<th>MWS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRT (L)</td>
</tr>
<tr>
<td>RET (eq-eq)</td>
</tr>
<tr>
<td>Wire Tie (2)</td>
</tr>
<tr>
<td>T-Bar</td>
</tr>
<tr>
<td>RET (eq-eq)</td>
</tr>
<tr>
<td>RET (eq-eq) w/PIP Pin</td>
</tr>
<tr>
<td>Adj Equip Tether (2)</td>
</tr>
<tr>
<td>Wire Tie (2)</td>
</tr>
<tr>
<td>Small ISS Trash Bag</td>
</tr>
<tr>
<td>Swing Arm (R)</td>
</tr>
<tr>
<td>RET (eq-eq)</td>
</tr>
<tr>
<td>PGT [A6 8.3ft-lb, CAL, MTL 30.5] s/n _______</td>
</tr>
<tr>
<td>Wire Tie (2)</td>
</tr>
<tr>
<td>T-Bar</td>
</tr>
</tbody>
</table>
| PGT [A6 8.3ft-lb, CAL, MTL 30.5] s/n _______

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

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

| RET (eq-eq) |
| Crewlock Bag (for EFBM Covers) |
| RET (eq-eq) |
| Adj Equip Tether (on outside) |

| SAFER |
| WVS |
| SAFER |
| WVS |

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

| Tether Counts: (Red RETs) |
| RETs (eq-eq) = 15 |
| RETs (PIP Pin) = 2 |
| RETs (Lg-eq) = 3 |
| Adj Equip Tethers = 10 |
EVA 1 PRE TOOL CONFIG (Cont)

**AIRLOCK CONFIG (Cont)**

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

**AIRLOCK CONFIG (Cont)**

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

**EXTERIOR CONFIG**

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

**Additional Items**

- Staging Bag
- Fish Stringer Tether
- S0 HR 3529 – 55-ft Safety Tether
- S0 HR 3539 – 55-ft Safety Tether

**Additional Configurations**

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

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

2. EV Crew Procedure Review – EV CMs
   - Egress Plan, 
   - Safety tethers
   - Review first post-egress steps
   - Order of tasks (summary timeline)
   - Translation plan, fairleads, and tether swaps
   - Hazards
   - Ingress Plan

3. Other Procedure Review – Task IV
   - Get-ahead tasks
   - Constraints – ground and flight
   - Notes, Cautions, and Warnings review
   - Contingency procedures – cribsheet

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

5. Robotics – M1/M2
   - SRMS/SSRMS initial position, maneuvers, clearances
   - Coordinate Frames
   - SRMS/SSRMS comm protocol review – expected calls, use first names
   - GCA – Give direction and approx distance
   - Positive handover who is giving GCA
   - Cameras

6. Emergencies Review – Suit IV/Task IV
   - Emergency suit doff and power down
   - Expedited Suit Doffing cue card pre-positioned for EVA day
   - Loss of comm
   - EMU malfunctions
   - Lost tools
   - Lost crewmember
   - DCS
   - Abort and Terminate scenarios, protocols
   - Hand signal reviews

7. Post EVA – Suit IV
   - Suit doffing responsibilities
   - Post EVA plan

8. Reminders – Task IV
   - Translate slow (then space is like water). Relax grip
     - Be extra careful on non-standard routes or orientations
     - Don’t hop
   - Monitor safety tether
   - Prior to moving and ingress, BRT & Swingarm stowed
   - If you get a mal, read the caution and warning message so everyone knows what it is
   - Be disciplined when tired
   - Openness: When you have boot or glove pain let us know
   - OK for IV and ground to check on us. If you need update, ask
   - Let mistakes pass
   - Manage frustration (slow down, if needed)
   - Cold soak before ingress
   - Verify PGT settings. PGT collars are easy to bump
   - Translation Adaptation plan
EVA 1 BRIEFING CARD (Cont)

Generic Calls:

- **Day/Night Cycles**
  - Lights, visors, gloves, tethers, and tools
  - Glove Checks: Report any damaged/missing RTV, Vetran condition

- **Tether swaps:**
  - Crew Report: "Gate closed, slider locked"
  - Tether Shuttle – Crew Report: "Slider locked"

- **Equipment Tether Discipline**
  - "Make before you break"
  - Check all gates closed

- **√ Both SAFER valves down at egress**
  - Crew Report: "Both handles down"

- **√ APFR locking collar Black-on-black and pull test**
  - Crew Report: "Black-on-black, good pull test"

- **√ PGT Green light on for bolt engage**
  - May get Lo Torque msg at bolt release
  - Crew Report: "XX turns, XX ft-lb, green light"

- **√ Connectors for no bent pins, no FOD, check EMI band and inhibits in place**
  - EV Report: "Pins good, no FOD, Good EMI Band"
  - IV: MüC "Are inhibits in place?"

- **√ Tethers and Tools clear prior to SSRMS ORU movement**
  - Each EV report: "Tethers and tools clear"

- **√ Tool inventory (when leaving worksite)**
  - Bags: EV call out items, IV check off on Tool Matrix
  - MWS: EV call out, BRT – MWS – Swing Arm
  - Confirm all changes from the checklist are accounted for
### EVA 1 INHIBIT PAD

#### Orbiter

| TCS      | L12  | 1. TCS POWER – OFF  
|          |      | 2. Switch guard in place |
| KU-BAND ANTENNA | MCC-H  | 1. KU-BAND Mask – active  
|          |      | 2. KU-BAND EVA Protect Box – active |
| RCS      | MCC-H | NOTE  
|          |      | PCUs may require up to 1 hr warm-up period before they are operational |
| IV       | MCC-H | If EV crew < 27 ft 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   | Above RCS config  
|          |      | 3. Above RCS config  
|          |      | 4. RCS F – ITEM 1 EXEC (*)  
|          |      | JET DES F1U – ITEM 17 (*)  
|          |      | F3U – ITEM 19 (*)  
|          |      | F2U – ITEM 21 (*)  
| S-BAND ANTENNAS | NOTE | Possible loss of comm when forced LL FWD antenna  
| IV       | A1R  | If EV crew < 2 ft from S-Band antenna  
|          |      | 1. S-BAND FM ANT – XMIT LOWER/RCVR UPPER  
|          |      | 2. MCC, lower antenna selected  
|          |      | If no comm, or on MCC GO  
|          | C3   | 3. S-BAND PM ANT – LL FWD  
|          |      | When EVA crewmember at least 2 ft away from all S-Band upper antennas  
|          | C3   | 4. S-BAND PM ANT – GPC  
| LMC      | R1   | 1. PL AFT MNC – OFF  

#### Ground

| All EVAs |  
|          |  
|          |  
| Ground Radar | MCC-H | 1. FIDO console, ground radar restrictions in place for EVA |
| USOS |  
| PCU | NOTE | PCUs may require up to 1 hr warm-up period before they are operational  
|          | MCC-H | 1. PCUs (two) operational in discharge mode and one of the following:  
|          |      | a. CCS PCU EVA hazard control FDIR enabled  
|          |      | b. No more than two arrays unshunted and oriented < 105 deg from the velocity vector  
|          |      | If one or both PCUs failed:  
|          |      | 2. No more than two arrays unshunted and oriented < 105 deg from velocity vector  
| Mobile Transporter | MCC-H | 1. MT latched  
| TUS | MCC-H | 1. Verify RPCM S04B_F RPC 17 – OPEN  
| ESP-3 (required prior to releasing NTA from ESP-3) | MCC-H | 1. CRPCM 2P CRPC 5 – OPEN  
|          |      | 2. CRPCM 2R CRPC 5 – OPEN  

### S-BAND ANTENNAS

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

### TUS

| MCC-H | 1. Verify RPCM S04B_F RPC 17 – OPEN |

### ESP-3 (required prior to releasing NTA from ESP-3)

| MCC-H | 1. CRPCM 2P CRPC 5 – OPEN  
|       | 2. CRPCM 2R CRPC 5 – OPEN  

---

**FS 7-9**

**EVA/126/FIN**
**EVA 1 INHIBIT PAD (Cont)**

### USOS (Cont)

<table>
<thead>
<tr>
<th>S3 SARJ</th>
<th>SARJ at 105 deg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. \DLA (1) – LOCKED</td>
</tr>
<tr>
<td></td>
<td>2. All motor setpoints set to zero</td>
</tr>
<tr>
<td></td>
<td>3. All motors deselected</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SSPTS</th>
<th>MCC-H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. RPCM LA1A4A D RPC 3 – Open, Close Cmd Inhibit</td>
<td></td>
</tr>
<tr>
<td>2. RPCM LA2A3B D RPC 1 – Open, Close Cmd Inhibit</td>
<td></td>
</tr>
<tr>
<td>3. RPCM Z14B A RPC 2 – Open, Close Cmd Inhibit</td>
<td></td>
</tr>
<tr>
<td>4. RPCM Z13B A RPC 2 – Open, Close Cmd Inhibit</td>
<td></td>
</tr>
</tbody>
</table>

### JEM

<table>
<thead>
<tr>
<th>JPM Window IV</th>
<th>Close JPM window shutters (2)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>EFBM SSIPC</th>
<th>PDB A2 RPC01 – Op</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>JEMRMS SSIPC</th>
<th>RIP MA Brake – On</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MDP Main Mode – Stby Mode</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HTV PROX Antenna SSIPC</th>
<th>√TRX Power – OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>√TX Power – OFF</td>
</tr>
</tbody>
</table>

### RSOS

<table>
<thead>
<tr>
<th>SM Antennas IV</th>
<th>GTS – Deactivate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ARISS (Ham Radio) – Deactivate or VHF (144-146 MHz) TX only</td>
</tr>
</tbody>
</table>

### COL

<table>
<thead>
<tr>
<th>EuTEF COL-CC</th>
<th>Verify PLEGPay Power Status (ETF_PLEGPAY_Pwr_Stat) – OFF</th>
</tr>
</thead>
</table>
NOTES

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

CAUTION

ISS Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture shafts (drylube)
   2. PIP pins
   3. TCS Reflectors [PMA2,PMA3]
   4. APAS hardware [PMA2,PMA3]
   5. CETA Lights (Z-93 paint) [LAB,S1, Node 1]
   6. Passive UMAs
   7. MBS/SSRMS/SPDM/JEMRMS taped radiative surfaces: VDU, ACU, JEU, JEMRMS EE, LEU, MCU, CRPCMs, and Cameras
   8. Deployed TUS cable [Nadir CETA rail]
   9. SPDM SJEU, EP, OTCM, LEU, and LEE VDU Radiator surfaces
   10. Open CBM petal covers, LAB window shutter, and JPM window shutter
   11. JTVE Cameras
   12. S0/Node 2 Fluid Tray hardlines at Node 2 end are limited to 25 lb
   13. JEM Airlock target and pin

B. Electrical cables
   1. Avoid bend radii < 10 times cable diameter

C. For structural reasons
   1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
   2. Avoid performing shaking motions (sinusoidal functions) more than four cycles
   3. Avoid kicking S1/P1 radiator beam. If any of these occur, wait 2 to 5 min to allow structural response to dissipate

D. SARJ Hardware
   1. During MLI cover fastener release: Limit turn count to minimum required, minimize side loading bolt head, and maintain axial force on fastener to compress spring during rotation
   2. Avoid scratching or nicking the Race Ring while working on repair
   3. Two TBAs can only be out at the same time at 90, 120, or 180 deg
   4. Port SARJ must be locked for EVA ops outboard of starboard AJIS Struts

E. Other
   1. WIS Antennas: Do not use as handholds [Node 1,LAB]
   2. MLI handholds are not rated for crewmember translation loads
   3. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged

Shuttle Constraints

F. Avoid inadvertent contact with
   1. WVS Antenna [ODS Truss & PLB Sill]
   2. Payload Bay and Camera wire harnesses, cables, cable guides, and connectors

G. No touch
   1. OBSS saddle contacts (when OBSS unberthed) [OBSS]
   2. Monkey fur [PLB]
   3. Cameras: Metallic surfaces [PLB]
   4. Ku-Band Antenna black dish and gold thermal blankets [PLB]
EVA 1 NOTES/CAUTIONS/WARNINGS (Cont)

**WARNING**

**ISS Constraints**

A. Avoid inadvertent contact with
   1. Grapple fixture targets and target pins
   2. Stay inboard of SARJ when active
   3. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate

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

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

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

**ISS Constraints (Cont)**

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

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

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

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

WARNING
Shuttle Constraints

I. Arcing/Molten Debris
1. Stay ≥ 2 ft from exposed Stbd Fwd MPM contacts [PLB]
2. Stay above PLB sill when within 1 ft of powered ROEU connector [PLB]

J. Pinch
1. PRLA operation [PLB]

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

WARNING
Shuttle Constraints (Cont)

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

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

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

O. Lasers
1. Do not look at LDRI diffuser or LCS laser aperture window
## EVA 1 EGRESS/SETUP (00:25)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV1</th>
<th>EV2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Config: EV2 85-ft Safety Tether to R D-ring Ext</td>
<td></td>
<td>Initial Config: Waist Tether from L D-ring Ext to A/L D-ring Ext, 85-ft Safety Tether from R D-ring Ext to EV1’s R D-ring Ext</td>
</tr>
</tbody>
</table>

### EGRESS (00:15)

1. Open A/L thermal cover
2. Egress A/L
3. √ SAFER MAN ISOL vlv – Open (down)
4. √ SAFER HCM – Closed (down)
5. Receive Crewlock Bag from EV2
6. Retrieve APFR from Stbd A/L toolbox [12, NN, F, 6]; stow on BRT
7. Translate to S0 Tether Shuttles
8. Retrieve Tether Shuttles (2)
9. Install EV1 Tether Shuttle onto nadir CETA rail (stbd); verify Locked
10. Install EV2 Tether Shuttle onto nadir CETA rail (port); verify Locked
11. Attach EV1 55-ft Safety Tether to stbd Tether Shuttle
12. Verify locking hooks – Gate Closed, Slider Locked
13. Attach EV2 85-ft Safety Tether to port Tether Shuttle
14. Verify locking hooks – Gate Closed, Slider Locked
15. **Give EV2 GO** to disconnect waist tether

### EGRESS (00:15)

1. Transfer Crewlock Bag to EV1
2. Egress A/L
3. √ SAFER MAN ISOL vlv – Open (down)
4. √ SAFER HCM – Closed (down)
5. Perform translation adaptation as reqd
6. Retrieve Large ORU Bag; stow on BRT
7. **On EV1 GO**, disconnect waist tether
8. Close A/L thermal cover

### WARNING

Do not touch blemishes on zenith TUS cable

### SETUP (00:10)

1. Post crew egress:
   WVS Software:
   Select page – RF camera
   Sel ‘Advanced Controls’
   S-Band Level (two) – Max
16. Translate to stbd CETA Cart
17. Temp stow Crewlock Bag and camera on stbd CETA Cart grid E

### SETUP (00:10)

9. Temp stow Large ORU Bag at S3 Face 1/Face 4
10. Translate to ESP-3
<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV1</th>
<th>EV2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. √ ESP-3 Inhibits in place</td>
<td>NTA REMOVE (00:45)</td>
<td>NTA REMOVE (00:45)</td>
</tr>
<tr>
<td>2. SSRMS: Mnvr as reqd for APFR install</td>
<td>1. Translate to ESP-3 HR 8310</td>
<td>1. When EV1 directed to install WIF adapter, translate to ESP-3</td>
</tr>
<tr>
<td>3. SSRMS: Mnvr as reqd for APFR ingress</td>
<td>2. Perform Glove Inspection</td>
<td>2. Perform Glove Inspection</td>
</tr>
<tr>
<td>4. SSRMS: Mnvr as reqd for NTA removal</td>
<td>3. GCA SSRMS as reqd for APFR install</td>
<td>3. Translate to ESP-3 forward edge</td>
</tr>
<tr>
<td>5. <strong>On EV1 GO</strong>, SSRMS: Mnvr to PLB</td>
<td>4. Install WIF adapter, tether point toward EE</td>
<td>4. Assist EV1 with releasing NTA from soft dock</td>
</tr>
<tr>
<td>6. SSRMS: Once clear of ESP-3, give EV1 GO to reposition arms</td>
<td>5. Install WIF adapter hitch pin</td>
<td>5. Monitor clearances between NTA and ESP-3</td>
</tr>
</tbody>
</table>

**CAUTION**

Avoid inadvertent contact with Fluid Tray hardlines

7. Translate to Node 2 Zenith CBM
8. Close hatch window flap; engage snap
9. Fold Velcro cover over Velcro; WVS Survey
10. Translate to PMA2 HR 0402
11. Perform Safety Tether swap onto spare 85-ft Safety Tether; verify locking hook – Gate Closed, Slider Locked
12. Stow EV2 85-ft Tether Shuttle Safety Tether on PMA2 HR 0402

**WARNING**

Stay > 1 ft from ROEU

13. Translate to LMC
14. Perform Glove Inspection
### EVA 1 ORU TRANSFER (02:15) (Cont)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV1</th>
<th>EV2</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. <strong>On EV2 GO</strong>, SSRMS: Mnvr to NTA install</td>
<td>NTA INSTALL (00:30)</td>
<td>NTA INSTALL (00:30)</td>
</tr>
<tr>
<td>NTA: Turns Torque</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. SSRMS: Mnvr as reqd for FHRC removal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. <strong>On EV1 GO</strong>, SSRMS: Mnvr to PLB hover position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. SSRMS: <strong>Give EV1 GO</strong> to rotate FHRC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. <strong>On EV1 GO</strong>, SSRMS: Mnvr to ESP-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. SSRMS: <strong>Give EV1 GO</strong> to reposition arms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. SSRMS: Mnvr as reqd for FHRC install</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FHRC: Turns Torque</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Give SSRMS GO to mnvr to NTA install; GCA SSRMS as reqd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Assist EV1 with clearances for NTA install</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Install NTA to softdock on LMC PFram</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. <strong>PGT[A4 6.3 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</strong>: Drive primary FRAM bolt, 11 turns to hardstop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Perform pull test on NTA; release tether</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FHRC REMOVAL (00:30)</td>
<td></td>
</tr>
<tr>
<td>20. GCA SSRMS as reqd for FHRC removal (tether to FHRC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. <strong>PGT[A4 6.3 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16</strong>: Release primary FRAM bolt, 11 turns to hardstop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Release FHRC from softdock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. <strong>Give SSRMS GO</strong> to mnvr to PLB hover position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. On <strong>SSRMS GO</strong>, rotate FHRC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. <strong>Give SSRMS GO</strong> to mnvr to ESP-3</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>FHRC INSTALL (00:30)</td>
<td></td>
</tr>
<tr>
<td>26. On <strong>SSRMS GO</strong>, reposition arms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Install FHRC to softdock on ESP-3 PFram</td>
<td></td>
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</tr>
<tr>
<td>28. <strong>PGT[A4 6.3 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</strong>: Drive primary FRAM bolt, 11 turns to hardstop</td>
<td></td>
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</tr>
<tr>
<td>29. Perform pull test on FHRC; release tether</td>
<td></td>
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<tr>
<td>17. Monitor SSRMS clearances</td>
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</tr>
<tr>
<td>18. Assist EV1 with releasing FHRC from softdock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Monitor SSRMS clearances</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. ⬤ WVS Survey of LMC: PFram and NTA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Translate to PMA2 HR 0402</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Perform Safety Tether swap onto EV2 85-ft Tether Shuttle Safety Tether; verify locking hook – Gate Closed, Slider Locked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Retrieve spare 85-ft Safety Tether; stow on MWS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Translate to ESP-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Perform Glove Inspection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. GCA SSRMS as reqd for FHRC install</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Assist EV1 with clearances for FHRC install</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Perform Tool inventory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Retrieve Crewlock Bag from CETA Cart</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Translate to JEM; use fairleads as required to keep tether clear of SSRMS translation path</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### EVA 1 SSRMS CLEANUP (00:15)/EFBM COVER REMOVAL (01:00)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV1</th>
<th>EV2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. SSRMS: Mnvr as reqd for APFR egress</td>
<td>1. SSRMS CLEAN-UP (00:15)</td>
<td>EFBM COVER REMOVAL (01:00)</td>
</tr>
<tr>
<td>2. Verify with MCC-H JEM Inhibit Pad in place</td>
<td>2. GCA SSRMS as reqd for APFR egress</td>
<td>1. Translate to JEM HR 1106</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Stow EV2 85-ft Tether Shuttle Safety Tether on JEM HR 1105</td>
</tr>
<tr>
<td>3. On EV1 GO, SSRMS: Mnvr as reqd to overnight clearance position</td>
<td>4. Perform Safety Tether swap onto EV1 55-ft Tether Shuttle Safety Tether; verify locking hook – Gate Closed, Slider Locked</td>
<td>4. Translate to EFBM on port end of JEM</td>
</tr>
<tr>
<td></td>
<td>5. Retrieve spare 55-ft Safety Tether; stow on MWS</td>
<td>5. Stow Crewlock Bag on JEM HR 1215 and 1218</td>
</tr>
<tr>
<td></td>
<td>6. Verify SSRMS clear of ESP-3</td>
<td>6. Perform Glove Inspection</td>
</tr>
<tr>
<td></td>
<td>7. Give SSRMS GO to mnvr to overnight clearance position</td>
<td>WARNING</td>
</tr>
<tr>
<td></td>
<td>8. WVS Survey of FHRC on ESP-3</td>
<td>Avoid pinch point on EFBM capture latch</td>
</tr>
<tr>
<td></td>
<td>9. Perform Tool inventory</td>
<td>CAUTION</td>
</tr>
<tr>
<td></td>
<td>10. Translate to S3; retrieve Large ORU Bag from S1 Face 1, stow on BRT</td>
<td>Avoid inadvertent contact with the EFBM berthing mechanism (silver Teflon), EFBM guide vane (solid lubricant), and EFBM base</td>
</tr>
<tr>
<td>Cover Removal:</td>
<td>7. Use integral RETs inside Crewlock Bag to remove petal covers (4); make sure to recover Velcro points; stow each cover inside Crewlock Bag</td>
<td></td>
</tr>
<tr>
<td>☐ Fwd/Zenith ☐ Aft/Zenith</td>
<td>8. Tether to center cover</td>
<td></td>
</tr>
<tr>
<td>☐ Fwd/Nadir ☐ Aft/Nadir</td>
<td>9. Remove center cover; secure with wire tie and adj equip tether to JEM HR 1185 and 1179</td>
<td></td>
</tr>
<tr>
<td>☐ Center</td>
<td>10. Verify Velcro config (grounding tabs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11. WVS Survey of EFBM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12. Perform Final Bag and Tool inventory</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13. Retrieve Crewlock Bag; stow on BRT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14. Translate to JEM HR 1105 and 1106</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15. Perform Safety Tether swap onto EV2 85-ft Tether Shuttle Safety Tether; verify locking hook – Gate Closed, Slider Locked</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16. Retrieve spare 85-ft Safety Tether; stow on the outside of Crewlock Bag</td>
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</tr>
<tr>
<td></td>
<td>17. Translate to S0</td>
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</tr>
<tr>
<td></td>
<td>18. Stow Crewlock Bag and spare 85-ft Safety Tether on S0 Face 1</td>
<td></td>
</tr>
</tbody>
</table>
## EVA 1 SARJ (03:00)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV1</th>
<th>EV2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S3 SARJ SETUP</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Translate to S3 Face 4; stow Large ORU Bag</td>
<td></td>
<td>1. Translate to S3 SARJ, Face 2/3 Interface</td>
</tr>
<tr>
<td>2. Perform Glove Inspection</td>
<td></td>
<td>2. Perform Glove Inspection</td>
</tr>
<tr>
<td>3. Retrieve EV2 Fish Stringer Tether; stow at Face 2/3 interface</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Stow 55-ft Safety Tether in Large ORU Bag</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>S3 SARJ WORK</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refer to <strong>STBD SARJ CUE CARD</strong>, FS CC 7-35, for SARJ checklist:</td>
<td></td>
<td>Refer to <strong>STBD SARJ CUE CARD</strong>, FS CC 7-35, for SARJ checklist:</td>
</tr>
<tr>
<td>Covers 7/8 and TBA 10</td>
<td></td>
<td>Covers 22/1 and TBA 6</td>
</tr>
<tr>
<td>Covers 9/10 and TBA 11</td>
<td></td>
<td>Get-Ahead: SLR 4A Removal</td>
</tr>
<tr>
<td>Get-Ahead: Cover 11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refer to SARJ – TBA REMOVE/INSTALL, FS 7-19, for steps to remove and install a TBA</td>
<td></td>
<td>Refer to SARJ – TBA REMOVE/INSTALL, FS 7-19, for steps to remove and install a TBA</td>
</tr>
<tr>
<td>Refer to SARJ – CLEAN/LUBE RACE RING, FS 7-20, for steps to clean and to lubricate the race ring</td>
<td></td>
<td>Refer to SARJ – CLEAN/LUBE RACE RING, FS 7-20, for steps to clean and to lubricate the race ring</td>
</tr>
<tr>
<td><strong>SARJ BAG PACKING</strong></td>
<td></td>
<td><strong>SARJ BAG PACKING</strong></td>
</tr>
<tr>
<td>5. Stow Fish Stringer Tether in Large ORU Bag</td>
<td>3. Retrieve Fish Stringer Tether; stow in Large ORU Bag</td>
<td></td>
</tr>
<tr>
<td>6. Verify TBA Bags are rolled and folded</td>
<td>4. Verify TBA Bags are rolled and folded</td>
<td></td>
</tr>
<tr>
<td>7. Perform Final Bag inventory</td>
<td>5. Perform Final Bag inventory</td>
<td></td>
</tr>
</tbody>
</table>
### Remove

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

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

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

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

11. Verify TBA bag in open position
12. Stow bearing package in TBA bag

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

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

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

### Install

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

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

<table>
<thead>
<tr>
<th>TBA</th>
<th>S/N</th>
<th>Bolt 2</th>
<th>Bolt 1</th>
<th>Bolt 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>*Flight =</td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>1018,1026</td>
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<td></td>
<td></td>
<td>Turns</td>
<td>Torque</td>
<td>Turns</td>
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<td></td>
<td>(~10.5-13)</td>
<td>(~4.8)</td>
<td>(~5-7)</td>
<td>(7.0)</td>
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<td>5</td>
<td>6 (1st)</td>
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<tr>
<td>6 (2nd)</td>
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<td>12</td>
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</tbody>
</table>
### CLEAN STEPS

1. Wet wipe outboard ring inner canted and datum A  
2. Wet wipe any obvious debris on skirts, joggles, etc  
3. Wet wipe DLA surfaces (if applicable)  
4. Wet wipe outer canted surface of outboard ring  
5. Stow wet wipe in large trash bag  
6. Prep straight nozzle gun:  
   a. Engage teeth by rotating plunger 180° (black triangle up)  
   b. Remove MLI tip cover  
   c. Rotate shutoff knob such that FLOW pointing towards nozzle  
7. Lay bead of grease on outer canted surface of outboard ring  
8. Safe and stow straight nozzle gun:  
   a. Disengage teeth by rotating plunger 180° (black triangle down)  
   b. Rotate shutoff knob such that FLOW is perpendicular to nozzle  
   c. Install MLI tip cover  
9. Retrieve dry wipe  
10. Use scraper to remove debris from outer canted surface of outboard ring  
11. Clean scraper in scraper debris container  
12. Close scraper debris container  
13. Use dry wipe to remove residue from cleaning the ring  
14. Use dry wipe to clean mount package area on inboard ring  
15. Stow dry wipe in large trash bag  

#### LUBE STEPS (Outboard ring)

16. Retrieve dry wipe  
17. Use j-hook nozzle gun to grease inner canted surface. Apply approx 1 sharpie mark/click per section between TBAs  
18. Use straight nozzle gun to grease outer canted and Datum A surfaces. Apply approx 1/8” thick bead per section between TBAs  
19. Use dry wipes as required to clean up EMU and tools

*Indicates mount package steps to skip when revisiting a SARJ worksite (TBA 5, 6, and 11)
## EVA 1 SARJ – SLR REMOVAL (00:15)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV1/2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REMOVE SARJ LAUNCH RESTRAINT 4A</strong> (00:15)</td>
<td></td>
</tr>
<tr>
<td>1. <strong>PGT[B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16</strong>: Release retaining bolts (2) 9 turns</td>
<td></td>
</tr>
<tr>
<td>2. Tether to clamshell and rail stub</td>
<td></td>
</tr>
<tr>
<td><strong>CAUTION</strong></td>
<td>Do not exceed 9 turns on clam shell jack bolt</td>
</tr>
<tr>
<td>3. If both clamshells not loosened on “mushroom-shaped” fittings – <strong>PGT[B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16</strong>: Release jack bolt (1) up to 3 turns</td>
<td></td>
</tr>
<tr>
<td>4. <strong>PGT[B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16</strong>: Release retaining bolts (2) (~9 turns)</td>
<td></td>
</tr>
<tr>
<td>5. Remove clamshell from “mushroom-shaped” fitting</td>
<td></td>
</tr>
<tr>
<td>6. <strong>WVS Survey of SLR rail</strong></td>
<td></td>
</tr>
<tr>
<td>7. Stow clamshell in large trash bag</td>
<td></td>
</tr>
<tr>
<td>8. Stow rail stub in Large ORU Bag</td>
<td></td>
</tr>
<tr>
<td>IV/SSRMS</td>
<td>EV1</td>
</tr>
<tr>
<td>----------</td>
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</tr>
<tr>
<td><strong>CLEANUP (00:10)</strong></td>
<td></td>
</tr>
<tr>
<td>1. Perform prior to crew ingress:</td>
<td></td>
</tr>
<tr>
<td>WVS PWRDN (PHOTO/TV, WVS CUE CARD)</td>
<td></td>
</tr>
<tr>
<td><strong>INGRESS (00:15)</strong></td>
<td><strong>INGRESS (00:15)</strong></td>
</tr>
<tr>
<td>3. Open thermal cover</td>
<td>1. Perform Tool inventory</td>
</tr>
<tr>
<td>4. On EV2 GO, perform Safety Tether swap onto EV2’s 85-ft Safety Tether; verify locking hook – Gate Closed, Slider Locked</td>
<td>2. Translate to A/L; fairlead Safety Tether as reqd</td>
</tr>
<tr>
<td>5. Retrieve EV1 55-ft Safety Tether; stow on MWS</td>
<td>3. Retrieve Crewlock Bag and spare 85-ft Safety Tether from S0 Face 1</td>
</tr>
<tr>
<td>6. Retrieve Tether Shuttles (2); stow on S0 bracket; verify Locked</td>
<td>4. Attach Waist Tether to Airlock D-ring extender; verify locking hook – Gate Closed, Slider Locked</td>
</tr>
<tr>
<td>7. Translate to A/L</td>
<td>5. Give EV1 GO to attach to EV2’s 85-ft Safety Tether</td>
</tr>
<tr>
<td>8. Transfer Crewlock Bag to EV2</td>
<td>6. Stow Large ORU Bag in A/L</td>
</tr>
<tr>
<td>10. Remove SCU from stowage pouch</td>
<td>8. Receive Crewlock Bag from EV1</td>
</tr>
<tr>
<td>Remove DCM cover</td>
<td>9. Give EV1 GO to ingress</td>
</tr>
<tr>
<td>Connect SCU to DCM, check locked</td>
<td>10. Remove SCU from stowage pouch</td>
</tr>
<tr>
<td></td>
<td>Remove DCM cover</td>
</tr>
<tr>
<td></td>
<td>Connect SCU to DCM, check locked</td>
</tr>
<tr>
<td>11. Water – OFF (fwd); expect “H2O IS OFF” msg</td>
<td>11. Water – OFF (fwd); expect “H2O IS OFF” msg</td>
</tr>
<tr>
<td>12. Close thermal cover, attach Velcro strap</td>
<td></td>
</tr>
<tr>
<td><strong>CAUTION</strong></td>
<td></td>
</tr>
<tr>
<td>Do not close hatch until EMU water off for 2 min</td>
<td></td>
</tr>
<tr>
<td>13. Verify no hardware blocking hatch</td>
<td></td>
</tr>
<tr>
<td>14. EV Hatch Handle – verify position per hatch decal</td>
<td></td>
</tr>
<tr>
<td>15. EV Hatch – close and lock</td>
<td></td>
</tr>
<tr>
<td>16. Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)</td>
<td></td>
</tr>
</tbody>
</table>
## EVA 1 POST TOOL CONFIG

### EV1 MWS
- **BRT (L)**
- **RET (eq-eq)**
- **Wire Tie (2)**
- **T-Bar**
- **RET (eq-eq) (2)**
- **RET (eq-eq) w/PIP Pin**
- **Adj Equip Tether (2)**
- **Wire Tie**
- **Small Shuttle Trash Bag**
- **Swing Arm (R)**
- **RET (eq-eq)**
- **PGT**
- **7/16 (wobble) Socket-6 ext**
- **55-ft Safety Tether (R D-ring Ext)**
- **Waist Tether (2, R & L on D-ring)**

### EV2 MWS
- **BRT (L)**
- **RET (eq-eq)**
- **Wire Tie (2)**
- **T-Bar**
- **RET (eq-eq)**
- **RET (eq-eq) w/PIP Pin**
- **Adj Equip Tether (1)**
- **Wire Tie (2)**
- **Small ISS Trash Bag**
- **Swing Arm (R)**
- **RET (eq-eq)**
- **PGT**
- **7/16 (wobble) Socket-6 ext**
- **85-ft Safety Tether (R D-ring Ext)**
- **Waist Tether (2, R on D-ring, L on extender)**

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

---

### AIRLOCK CONFIG

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

### EXTERIOR CONFIG

- **JEM**
  - EFBM Center Disk Cover
  - Wire Tie (1) (JEM HR 1179)
  - Adj Equip Tether (1) (JEM HR 1185)
- **S3 SARJ**
  - SARJ Dust Cap on J19 (under Cover 10)
## EVA 1 ORU TRANSFER – TASK DATA

### Estimated Task Duration:

<table>
<thead>
<tr>
<th></th>
<th>With RMS</th>
<th>Without RMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EVA Crew</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Two EVA Crew</td>
<td>02:30</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Tools:

<table>
<thead>
<tr>
<th></th>
<th>EV1</th>
<th>EV2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PGT w/6&quot;-ext 7/16&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WIF Adapter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>APFR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ingress Aid</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RET</td>
<td></td>
</tr>
</tbody>
</table>

### EVA Fasteners:

<table>
<thead>
<tr>
<th>Fastener Name</th>
<th>Label</th>
<th>Qty</th>
<th>Head Size</th>
<th>Install Torque (ft-lb)</th>
<th>Release Torque (ft-lb)</th>
<th>Failure Torque (ft-lb)</th>
<th>Turns</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRAM Primary Drive Bolt</td>
<td>FRAM Activation</td>
<td>1</td>
<td>7/16&quot;</td>
<td>6.3</td>
<td>6.3</td>
<td>21</td>
<td>11</td>
<td>30</td>
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### Foot Restraints:

<table>
<thead>
<tr>
<th>Task</th>
<th>WIF</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORU Transfer</td>
<td>SSRMS</td>
<td>12,NN,F,6</td>
</tr>
<tr>
<td>Contingency Transfer</td>
<td>LMC</td>
<td>10,PP,F,12 (ingress)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10,PP,E,12 (NTA install)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10,PP,H,12 (FHRC remove)</td>
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### ORU Identification:

<table>
<thead>
<tr>
<th>ORU</th>
<th>Mass (ORU + FSE + FRAM)</th>
<th>Part Number</th>
<th>Serial Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTA</td>
<td>1105</td>
<td>1F96000-1</td>
<td>0002 (ESP3↓)</td>
</tr>
<tr>
<td>FHRC</td>
<td>1106</td>
<td>5849811-501</td>
<td>1004 (PLB↑)</td>
</tr>
</tbody>
</table>

### Notes:

- None

### Cautions:

- None

### Warnings:

1. Crew must keep a foot or more away from the ROEU
EVA 1 ORU TRANSFER – TASK DATA (Cont)

Figure 4. FHRC on LMC in PLB

Figure 5. FHRC on FRAM without MLI
EVA 1 EFBM COVER REMOVAL – TASK DATA

Estimated Task Duration:

<table>
<thead>
<tr>
<th></th>
<th>With RMS</th>
<th>Without RMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EVA Crew</td>
<td>N/A</td>
<td>01:00</td>
</tr>
<tr>
<td>Two EVA Crew</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Tools:
- EV2
- Crewlock Bag
- RET
- Adj Equip Tether
- Wire Tie

Notes: None

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

Warnings:
1. Avoid pinch point on EFBM capture latch

Figure 1. EFBM – All Covers On
Figure 2. EFBM – Side View
Figure 3. EFBM – No Covers
**EVA 1 SARJ – TASK DATA**

**Estimated Task Duration:**

<table>
<thead>
<tr>
<th></th>
<th>With RMS</th>
<th>Without RMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EVA Crew</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Two EVA Crew</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Tools:**

<table>
<thead>
<tr>
<th>Tool Description</th>
<th>EV1</th>
<th>EV2</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGT w/6&quot; ext-7/16</td>
<td>PGT w/6&quot; ext-7/16</td>
<td></td>
</tr>
<tr>
<td>Large ORU Bag</td>
<td>Fish Stringer</td>
<td></td>
</tr>
<tr>
<td>Fish Stringer</td>
<td>Crewlock Bag</td>
<td></td>
</tr>
<tr>
<td>Crewlock Bag</td>
<td>Grease Gun – Straight Nozzle</td>
<td></td>
</tr>
<tr>
<td>Grease Gun – J Nozzle</td>
<td>EVA Wipe Caddy</td>
<td></td>
</tr>
<tr>
<td>EVA Wipe Caddy</td>
<td>EVA Wipes (dry)</td>
<td></td>
</tr>
<tr>
<td>EVA Wipes (dry)</td>
<td>EVA Greased Wipes (wet)</td>
<td></td>
</tr>
<tr>
<td>EVA Greased Wipes (wet)</td>
<td>Scrapper Debris Container</td>
<td></td>
</tr>
<tr>
<td>Scrapper Debris Container</td>
<td>Scrapper</td>
<td></td>
</tr>
<tr>
<td>Scrapper</td>
<td>Large Trash Bag</td>
<td></td>
</tr>
<tr>
<td>Large Trash Bag</td>
<td>Camera</td>
<td></td>
</tr>
<tr>
<td>Camera w/Flash</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**EVA Fasteners:**

<table>
<thead>
<tr>
<th>Fastener Name</th>
<th>Label</th>
<th>Qty</th>
<th>Head Size</th>
<th>Install Torque (ft-lb)</th>
<th>Release Torque (ft-lb)</th>
<th>Failure Torque (ft-lb)</th>
<th>Turns</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBA Bearing Preload Bolt</td>
<td>1</td>
<td>1</td>
<td>7/16&quot;</td>
<td>STA: 12.0  Flight: 7.0</td>
<td>18.4</td>
<td>Remv: 21.2</td>
<td>5-7</td>
<td>30</td>
</tr>
<tr>
<td>TBA Draw Bolt</td>
<td>2</td>
<td>1</td>
<td>7/16&quot;</td>
<td>4.8</td>
<td>18.4</td>
<td>Remv: 21.2</td>
<td>10.5-13</td>
<td>30</td>
</tr>
<tr>
<td>TBA Mount Bolt</td>
<td>3</td>
<td>1</td>
<td>7/16&quot;</td>
<td>3.8</td>
<td>12.0</td>
<td>Remv: 14.6</td>
<td>4-6</td>
<td>30</td>
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</table>

**EVA Connectors:**

<table>
<thead>
<tr>
<th>Harness</th>
<th>From</th>
<th>To</th>
<th>Conn Size</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBA electrical harness P1</td>
<td>Hardwired to TBA</td>
<td>SARJ connector J__ (see TBA Reference Info)</td>
<td>15</td>
<td>Power and data to TBA</td>
</tr>
</tbody>
</table>

Figure 1. Scraper Debris Container
Figure 2. EVA Wipe Caddy
Figure 3. Grease Gun w/J Nozzle
Figure 4. TBA Bag
EVA 1 SARJ – TASK DATA (Cont)

TBA Reference Info:

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

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

Cautions:
1. To prevent loss of inboard MLI cover fasteners during removal:
   - Limit turn count to minimum required for fastener release
   - Minimize side loading bolt head
   - Maintain axial force on fastener to compress spring during rotation
2. SARJ Race Ring is not tolerant to nicks and scratches. Exercise care within the vicinity of the Race Ring while handling components.
3. Two TBAs cannot be out at the same time unless the two TBAs are 90, 120, or 180 deg apart from each other.
4. The port SARJ must be locked for EVA ops outboard of the starboard AJIS struts.
EVA 1 SARJ – TASK DATA (Cont)

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

Figure 7. Bearing Package Assembly
Figure 8. Mount Assembly
Figure 9. Trundle Bearing Assembly

Figure 10. Slot in Race Ring to Align Mount
Figure 11. Mount Assy on Race Ring, mount leg clamp open (initial position)
Figure 12. Mount Assy on Race Ring, mount leg clamp closed (final position)
Inset shows frayed cable on ground unit

Roller Bearings

Figure 13. TBA Roller Bearings

Inner bearing – stationary  Outer bearing – rotates

Threaded = Flight TBA  Non Threaded = STA TBA

Figure 14. Roller Bearing Close-Up

Inset shows frayed cable on ground unit

Figure 15. Bearing Package Cable

Inset shows frayed cable on ground unit

Figure 16. Bearing Package Cable – Open View
Figure 17. TBA Install Sequence

INSERT THE BEARING PACKAGE ASSEMBLY INTO THE MOUNT ASSEMBLY.

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

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

ENGAGE AND TORQUE THE PRELOAD BOLT AND MOUNT SCREW.
EVA 1 SLR REMOVAL – TASK DATA

Estimated Task Duration:

<table>
<thead>
<tr>
<th></th>
<th>With RMS</th>
<th>Without RMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EVA Crew</td>
<td>N/A</td>
<td>00:15</td>
</tr>
<tr>
<td>Two EVA Crew</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Tools:

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

EVA Fasteners:

<table>
<thead>
<tr>
<th>Fastener Name</th>
<th>Label</th>
<th>Qty</th>
<th>Head Size</th>
<th>Install Torque (ft-lb)</th>
<th>Release Torque (ft-lb)</th>
<th>Failure Torque (ft-lb)</th>
<th>Turns</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLR Fastener</td>
<td>NA</td>
<td>2</td>
<td>7/16&quot;</td>
<td>52.1-56.3</td>
<td>Expect: 25.5</td>
<td>165.2</td>
<td>17</td>
<td>30</td>
</tr>
<tr>
<td>SLR Jack Bolt</td>
<td>NA</td>
<td>1</td>
<td>7/16&quot;</td>
<td>3.9-12.5</td>
<td>12.0</td>
<td>139.3</td>
<td>3</td>
<td>30</td>
</tr>
</tbody>
</table>

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

Cautions:
1. Do not exceed 9 turns on clamshell jack bolt. Half “moon-shaped” nuts on jack bolt may become detached if turned more than 9 turns.

Warnings:
None

Figure 1. SLR Together
Figure 2. SLR Apart
Figure 3. Mushroom Shaped Fitting
Figure 4. SLR Installed

FS 7-33 EVA/126/FIN
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STBD SARJ CUE CARD

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

MLI COVERS

- REMOVE: Tether to cover: PGTA6 8.3 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16: Release inboard MLI cover fasteners, 9 turns.
- INSTALL: PGTA1 2.5 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16: Engage MLI cover fasteners, 9 turns.

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

TOP
HOOK
VELCRO

EVA-4a/126/O/A

(reduced copy)

FS CC 7-35

EVA/126/FIN
1. Remove MLI covers: Refer to FS 7-94
   - Covers 14 & 15 (EV3)
   - Covers 10 & 11 (EV2)
   - Covers 6 & 7 (EV2)

2. First lubrication of Port SARJ:
   - J-hook nozzle under Covers 14 & 15
   - J-hook nozzle under Covers 10 & 11, and 6 & 7
   - Straight nozzle under Covers 14 & 15
   - Straight nozzle under Covers 10 & 11, and 6 & 7

3. Perform the following until MCC gives GO to continue Port SARJ lubing (port SARJ locked at 210 or 30 deg):
   - ETVCG Install: Refer to FS 7-101
   - Get-Aheads as listed on FS 7-102

4. Second lubrication of Port SARJ:
   - J-hook nozzle under Covers 14 & 15
   - Straight nozzle under Covers 14 & 15, and 6 & 7
   - Straight nozzle under Covers 10 & 11, and 6 & 7

5. Cleanup Tools

6. Install MLI Covers: Refer to FS 7-104
   - Covers 14 & 15
   - Covers 10 & 11

7. Perform the following get-aheads:
   - P1-P3 Fluid Jumper Install: Refer to FS 7-122
   - P1 FHRC P-Clamp Release (Hose Box): Refer to FS 7-124
   - APFR relocate: Lab WIF 7 to P3 WIF 29

---

**CAUTION**

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

**MLI COVERS**

- **REMOVE**: Tether to cover; PGT[A6 8.3 ft-lb, CCW 20 RPM, MTL 30.5]-6ext 7/16: Release inboard MLI cover fasteners, 9 turns
- **INSTALL**: PGT[A1 2.5 ft-lb, CW 20 RPM, MTL 30.5]-6ext 7/16: Engage MLI cover fasteners, 9 turns

**CAUTION** Avoid >45lb loads into covers 2, 8, 21 (missing bolts)

---

1A 6A 3A 4A 12 1B 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

FACE 1 FACE 2 FACE 3 FACE 4 FACE 5 FACE 6

P3 LOOKING OUTBOARD

---

**TOP BACK OF ‘STBD SARJ CUE CARD’**

**HOOK VELCRO**
<table>
<thead>
<tr>
<th>ET HR : MIN</th>
<th>IV/SRMS</th>
<th>EV1 (Pp)</th>
<th>EV3 (Kb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:00</td>
<td>POST DEPRESS (00:05)</td>
<td>POST DEPRESS (00:05)</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>EGRESS/SETUP (00:25)</td>
<td>EGRESS/SETUP (00:29)</td>
<td>--</td>
</tr>
<tr>
<td>01:00</td>
<td>CETA CART RELOCATION (01:50)</td>
<td>CETA Prep</td>
<td>CETA Prep</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CETA 1 Relocate</td>
<td>CETA 1 Relocate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CETA 2 Prep</td>
<td>CETA 1 Install</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TUS Cable Pictures</td>
<td>CETA 2 Prep</td>
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<tr>
<td></td>
<td></td>
<td>CETA 1 Install</td>
<td>CETA 2 Relocate</td>
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<tr>
<td></td>
<td></td>
<td>SSAS BBC Reconfig P1 to P3</td>
<td>CETA 2 Install</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CETA 2 Relocate</td>
<td>SSRMS Cleanup</td>
</tr>
<tr>
<td></td>
<td>Stage SARJ Bags and Tools</td>
<td>CETA 2 Install</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SSRMS Cleanup</td>
<td>--</td>
</tr>
<tr>
<td>02:00</td>
<td>SARJ (03:45)</td>
<td>LEE A LUBRICATION (01:15)</td>
<td>LEE Setup</td>
</tr>
<tr>
<td></td>
<td>SARJ Setup</td>
<td>LEE Setup</td>
<td>LEE A Snare Repair</td>
</tr>
<tr>
<td></td>
<td>Remove Cover 9/10</td>
<td>LEE Setup</td>
<td>LEE Cleanup</td>
</tr>
<tr>
<td></td>
<td>Clean</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Lube</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Install TBA 11</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Install Cover 9/10</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Remove Cover 4/5</td>
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<td>--</td>
</tr>
<tr>
<td></td>
<td>Remove TBA 8</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Clean (DLA 1 as reqd)</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Lube</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Install TBA 8</td>
<td>SARJ Cleanup</td>
<td>SARJ Cleanup</td>
</tr>
<tr>
<td></td>
<td>Install Cover 4</td>
<td>Remove Cover 11/12</td>
<td>SARJ Get-Aheads:</td>
</tr>
<tr>
<td></td>
<td>Remove TBA 9</td>
<td>Lube</td>
<td>Remove Cover 13/14</td>
</tr>
<tr>
<td></td>
<td>Install TBA 9</td>
<td>Clean</td>
<td>Remove TBA 1</td>
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<tr>
<td></td>
<td>Install Cover 5</td>
<td>Lube</td>
<td>Install TBA 1</td>
</tr>
<tr>
<td></td>
<td>SARJ Cleanup</td>
<td>Install Cover 13/14</td>
<td>Install Cover 13/14</td>
</tr>
<tr>
<td></td>
<td>If reqd:</td>
<td>Remove Cover 8</td>
<td>SARJ Cleanup</td>
</tr>
<tr>
<td></td>
<td>Remove Cover 8</td>
<td>Clean</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Clean</td>
<td>Lube</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Lube</td>
<td>Install Cover 8</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>SARJ Get-Aheads:</td>
<td>Remove Cover 1/22</td>
<td>--</td>
</tr>
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<td>Remove Cover 1/22</td>
<td>Remove TBA 6 (bearing package only)</td>
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<td>Remove TBA 6 (bearing package only)</td>
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<td>Install Cover 1/22</td>
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<tr>
<td>03:00</td>
<td>LEE A LUBRICATION (01:15)</td>
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<td>SARJ (02:20)</td>
<td>SARJ Get-Aheads:</td>
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<td>SARJ Setup</td>
<td>SARJ Get-Aheads:</td>
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<td>Remove Cover 11/12</td>
<td>SARJ Clean</td>
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<td>Install Cover 13/14</td>
<td>SARJ Cleanup</td>
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<td>SARJ Clean up</td>
<td>Install Cover 13/14</td>
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<td>Lube</td>
<td>Install Cover 8</td>
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<tr>
<td>06:00</td>
<td>CLEANUP/INGRESS (00:30)</td>
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<td>CLEANUP/INGRESS (00:30)</td>
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<td></td>
<td>PREREPRESS (00:05)</td>
<td>PREREPRESS (00:05)</td>
<td>PREREPRESS (00:05)</td>
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EVA 2
EVA 2 PRE TOOL CONFIG

EVA 2

AIRLOCK CONFIG

EV1

MWS
- BRT (L)
- RET (eq-eq)
- Wire Tie (2)
- T-Bar
- RET (eq-eq)
- RET (eq-eq) w/PIP Pin
- Adj Equip Tether (2)
- Wire Tie
- Small Shuttle Trash Bag
- Swing Arm (R)
- RET (eq-eq)
  - PGT [6.8 ft-lb, CAL, MTL 30.5] s/n _______
  - PGT Battery s/n _______
- 7/16 (wobble) Socket-6 ext
- Camera (on integral RET)
- Camera Bracket
- D-ring Extender (1, R D-ring)
- 85-ft Safety Tether (R D-ring Ext)
- Waist Tether (2, R & L on D-ring)
- SAFER
- WVS

EV3

MWS
- BRT (L)
- RET (eq-eq) w/PIP Pin
- Wire Tie (2)
- T-Bar
- RET (eq-eq) (2)
- Adj Equip Tether (2)
- Wire Tie (2)
- Small ISS Trash Bag
- Swing Arm (R)
- RET (eq-eq)
  - PGT [6.8 ft-lb, CAL, MTL 30.5] s/n _______
  - PGT Battery s/n _______
- 7/16 (wobble) Socket-6 ext
- D-ring Extender (2, R & L D-ring)
- 85-ft Safety Tether (L D-ring Ext)
- 55-ft Safety Tether (R D-ring Ext)
- Waist Tether (1, R on D-ring Ext)
- SAFER
- WVS

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

NOTE: Engage tether hook from inside of mount

NOTE: Match s/n of Bearing and Mount Package

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

FS 7-38
EVA/126/FIN
<table>
<thead>
<tr>
<th>AIRLOCK CONFIG (Cont)</th>
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<tbody>
<tr>
<td>Staging Bag</td>
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<tr>
<td>Fish Stringer Tether</td>
</tr>
<tr>
<td>Wire Tie Caddy</td>
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<tr>
<td>Velcro/Tape Caddy</td>
</tr>
<tr>
<td>PGT</td>
</tr>
<tr>
<td>PGT Battery</td>
</tr>
<tr>
<td>7/16 (wobble) Socket-6 ext</td>
</tr>
<tr>
<td>Vise Grips</td>
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<tr>
<td>Ratchet Wrench</td>
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<tr>
<td>7/16 (rigid) Socket-9 ext</td>
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<tr>
<td>Needle Nose Pliers – removed for EVA 2 LEE Lube</td>
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<tr>
<td>Spare 55-ft Safety Tether</td>
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<tr>
<td>Spare WIF Adapter</td>
</tr>
<tr>
<td>Fish Stringer</td>
</tr>
<tr>
<td>Connector Cleaner Tool Kit</td>
</tr>
<tr>
<td>Pin Straightener Assy</td>
</tr>
<tr>
<td>Probe</td>
</tr>
<tr>
<td>Pry Bar</td>
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<tr>
<td>MWS Key Strap Assy</td>
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<tr>
<td>Long Duration Tie Down Tethers (2)</td>
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<tr>
<td>Wheel Bogie PIP Pin</td>
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<tr>
<td>RET (Lg-eq)</td>
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<tr>
<td>Crewlock Bag</td>
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<tr>
<td>EVA Wipe Caddy</td>
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<tr>
<td>EVA Wipes (6 wet)</td>
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<tr>
<td>Fish Stringer Tether</td>
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<tr>
<td>EVA Wipes (6 dry)</td>
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<tr>
<td>IV Bag</td>
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<tr>
<td>Towels (2)</td>
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<tr>
<td>Contamination Detection Kit</td>
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<tr>
<td>GP Caddy (2)</td>
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<tr>
<td>Adjustable Thermal Mittens (2)</td>
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<tr>
<td>Socket Caddy (hatch cont) w/RET (eq-eq) (Black)</td>
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<tr>
<td>1/2 Socket-8 ext</td>
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<tr>
<td>7/16 (wobble) Socket-6 ext (spare)</td>
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<tr>
<td>DCM Plug (SAFER Hardmount) (2)</td>
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<table>
<thead>
<tr>
<th>EXTERIOR CONFIG</th>
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<tbody>
<tr>
<td>S0 HR 3529 – 55-ft Safety Tether</td>
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<tr>
<td>S0 HR 3539 – 55-ft Safety Tether</td>
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<tr>
<td>JEM</td>
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<tr>
<td>EFBM Center Disk Cover</td>
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<tr>
<td>Wire Tie (1) (JEM HR 1179)</td>
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<tr>
<td>Adj Equip Tether (1) (JEM HR 1185)</td>
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<tr>
<td>S3 SARJ</td>
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<tr>
<td>SARJ Dust Cap on J19 (under Cover 10)</td>
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</tbody>
</table>
EVA 2 BRIEFING CARD

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

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

General Briefing

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

2. EV Crew Procedure Review – EV CMs
   - Egress Plan, Safety tethers
   - Review first post-egress steps
   - Order of tasks (summary timeline)
   - Translation plan, fairleads, and tether swaps
   - Hazards
   - Ingress Plan

3. Other Procedure Review – Task IV
   - Get-ahead tasks
   - Constraints – ground and flight
   - Notes, Cautions, and Warnings review
   - Contingency procedures – crib sheet

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

5. Robotics – M1/M2
   - SRMS/SSRMS initial position, maneuvers, clearances
   - Coordinate Frames
   - SRMS/SSRMS comm protocol review – expected calls, use first names
   - GCA – Give direction and approx distance
   - Positive handover who is giving GCA
   - Cameras

6. Emergencies Review – Suit IV/Task IV
   - Emergency suit doff and power down
     - Expedited Suit Doffing cue card pre-positioned for EVA day
   - Loss of comm
   - EMU malfunctions
   - Lost tools
   - Lost crew member
   - DCS
   - Abort and Terminate scenarios, protocols
   - Hand signal reviews

7. Post EVA – Suit IV
   - Suit doffing responsibilities
   - Post EVA plan

8. Reminders – Task IV
   - Translate slow (then space is like water). Relax grip
     - Be extra careful on non-standard routes or orientations
     - Don’t hop
   - Monitor safety tether
   - Prior to moving and ingress, BRT & Swingarm stowed
   - If you get a mal, read the caution and warning message so everyone knows what it is
   - Be disciplined when tired
   - Openness: When you have boot or glove pain let us know
   - OK for IV and ground to check on us. If you need update, ask
   - Let mistakes pass
   - Manage frustration (slow down, if needed)
   - Cold soak before ingress
   - Verify PGT settings. PGT collars are easy to bump
   - Translation Adaptation plan
EVA 2 BRIEFING CARD (Cont)

Generic Calls:
- Day/Night Cycles
  - Lights, visors, gloves, tethers, and tools
  - Glove Checks: Report any damaged/missing RTV, Vetran condition
- Tether swaps:
  - Crew Report: “Gate closed, slider locked”
  - Tether Shuttle – Crew Report: “Slider locked”
- Equipment Tether Discipline
  - “Make before you break”
  - Check all gates closed
- Both SAFER valves down at egress
  - Crew Report: “Both handles down”
- APFR locking collar Black-on-black and pull test
  - Crew Report: “Black-on-black, good pull test”
- PGT Green light on for bolt engage
  - May get Lo Torque msg at bolt release
  - Crew Report: “XX turns, XX ft-lb, green light”
- Connectors for no bent pins, no FOD, check EMI band and inhibits in place
  - EV Report: “Pins good, no FOD, Good EMI Band”
  - IV: \( \text{MCC} \) “Are inhibits in place?”
- Tethers and Tools clear prior to SSRMS ORU movement
  - Each EV report: “Tethers and tools clear”
- Tool inventory (when leaving worksite)
  - Bags: EV call out items, IV check off on Tool Matrix
  - MWS: EV call out, BRT – MWS – Swing Arm
  - Confirm all changes from the checklist are accounted for
**EVA 2 INHIBIT PAD**

### Orbiter

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

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

#### S-BAND ANTENNAS
- If EV crew < 2 ft from S-Band antenna
  1. S-BAND FM ANT – XMIT LOWER/RCVR UPPER
  2. √MCC, lower antenna selected
- If no comm, or on MCC GO
  3. S-BAND PM ANT – LL FWD
  4. S-BAND PM ANT – GPC

### Ground

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

### USOS

#### PCU
- NOTE
  PCUs may require up to 1 hr warm-up period before they are operational
- MCC-H
  1. √PCUs (two) operational in discharge mode and one of the following:
     a. CCS PCU EVA hazard control FDIR enabled
     b. No more than two arrays unshunted and oriented < 105 deg from the velocity vector
  2. No more than two arrays unshunted and oriented < 105 deg from velocity vector

#### Mobile Transporter
- MCC-H
  1. √MT latched

#### TUS
- MCC-H
  1. Verify RPCM S04B_F RPC 17 – OPEN

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

#### P1 TRRJ
- MCC-H
  1. DLA (1) – LOCKED
### EVA 2 INHIBIT PAD (Cont)

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<tr>
<td><strong>EuTEF</strong></td>
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<td><strong>COL-CC</strong></td>
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<tr>
<td>Verify PLEGPay Power Status (ETF_PLEGPAY_Pwr_Stat) – OFF</td>
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<th>RSOS</th>
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<tbody>
<tr>
<td><strong>SM Antennas</strong></td>
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<tr>
<td><strong>IV</strong></td>
</tr>
<tr>
<td>1. GTS – Deactivate</td>
</tr>
<tr>
<td>2. ARISS (Ham Radio) – Deactivate or VHF (144-146 MHz) TX only</td>
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</tbody>
</table>
NOTES

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

CAUTION

ISS Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture shafts (drylube)
   2. PIP pins
   3. CETA Lights (Z-93 paint) [LAB,S1, Node 1]
   4. Passive UMAs
   5. MBS/SSRMS/SPDM/JEMRMS taped radiative surfaces: VDU, ACU, JEU, JERMRS EE, LEU, MCU, CRPCMs, and Cameras
   6. Deployed TUS cable [Nadir CETA rail]
   7. GPS Antennas (S13 paint) [S0]
   8. UHF Antennas [LAB,P1]
   9. SPDM SJEU, EP, OTCM, LEU, and LEE VDU Radiator surfaces
   10. Avoid inadvertent contact with LEE grounding springs, torsional springs, latch covers, shrouds, and camera

B. Electrical cables
   1. Avoid bend radii < 10 times cable diameter

C. For structural reasons
   1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
   2. Avoid performing shaking motions (sinusoidal functions) more than four cycles
   3. Avoid kicking S1/P1 radiator beam. If any of these occur, wait 2 to 5 min to allow structural response to dissipate

ISS Constraints (Cont)

D. SARJ Hardware
   1. During MLI cover fastener release: Limit turn count to minimum required, minimize side loading bolt head, and maintain axial force on fastener to compress spring during rotation
   2. Avoid scratching or nicking the Race Ring while working on repair
   3. Two TBAs can only be out at the same time at 90, 120, or 180 deg
   4. Port SARJ must be locked for EVA ops outboard of starboard AJIS Struts

E. Other
   1. MLI handholds are not rated for crewmember translation loads
   2. Do not impart loads into CETA cart with less than 3 of 4 wheel bogies engaged
   3. Do not stress torsional spring more than 90 deg (rod-end perpendicular to LEE housing) when exercising bearing
ISS Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture targets and target pins
   2. Stay inboard of SARJ when active
   3. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate

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

C. Pinch
   1. NZGL connector linkage. Use caution when mating/locking
   2. EV side of IV Hatch during Hatch operation (also snag hazard) [A/L]

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

E. Sharp Edges
   1. Inner edges of WIF probes
   2. APFR active WIF probes
   3. Mating surfaces of EVA connectors Avoid side loads during connector mating
   4. Spring loaded captive EVA fasteners (e.g., 6B-boxes, SARJ Covers); the end of the spring may protrude
   5. Keep hands away from SSRMS/POA/SPDM LEE/JEMRMS EE opening, snares, and PDGF curvic coupling (teeth)
   6. Port/Aft portion of A/L circular HR [HR 0506]
   7. LEE grounding springs and internal mechanisms inside LEE with gloved hand

F. Thermal
   1. EVA connectors with booties may become hot if left uncovered. Handling may need to be limited
   2. Turn off glove heaters when comfortable temp reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
   3. Uncovered trunnion pins may be hot
   4. SSRMS/MBS/SPDM/JEMRMS operating cameras and lights may radiate large amounts of heat
   5. Stay ≥ 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

G. Electrical Shock
   1. Stay ≥ 2 ft from ungrounded floating connectors if not powered
      • SSPTS connectors include NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA2 Stbd and Port
      • MBS Cross-Connect jumpers (translate past these using UMA handrails) Include S0 EVA Power Cables (inside S0 Bay 00 Face 4, Bay 01 Face 3) ESP-2 jumper (inside S0 Bay 03 Face 4)
   2. Do not touch blemishes on zenith TUS cable

H. SARJ Hardware
   1. Sharp edge potential on TBA bearing package and mount
   2. SARJ must be locked to prevent rotation when EV crew is within 2 ft of rotational plane
### EVA 2 EGRESS/SETUP (00:25)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV1</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EGRESS</strong> (00:15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Open A/L thermal cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Egress A/L</td>
<td></td>
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</tr>
<tr>
<td>3. √SAFER MAN ISOL vlv – Open (down)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. √SAFER HCM – Closed (down)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Receive Large ORU Bag from EV3; stow on BRT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Translate to S0 Tether Shuttles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Retrieve Tether Shuttles (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Install EV1 Tether Shuttle onto nadir CETA rail (stbd); verify Locked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Install EV3 Tether Shuttle onto nadir CETA rail (port); verify Locked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Attach EV1 85-ft Safety Tether to Tether Shuttle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Verify locking hooks – Gate Closed, Slider Locked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Attach EV3 85-ft Safety Tether to Tether Shuttle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Verify locking hooks – Gate Closed, Slider Locked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. <strong>Give EV3 GO</strong> to disconnect waist tether</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EV1</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SETUP</strong> (00:10)</td>
<td></td>
</tr>
<tr>
<td>15. Translate to S1 HR 3203 (or 3204)</td>
<td>Initial Config: R Waist Tether from R D-Ring Ext to Airlock D-ring Ext. 85-ft Safety Tether from L D-ring Ext to EV1’s R D-ring Ext</td>
</tr>
<tr>
<td>16. Temp stow Large ORU Bag on S1 HR 3203</td>
<td></td>
</tr>
<tr>
<td>17. Translate to CETA 2</td>
<td></td>
</tr>
<tr>
<td>18. Perform Glove Inspection</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EV3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EGRESS</strong> (00:15)</td>
<td></td>
</tr>
<tr>
<td>1. Transfer Large ORU Bag to EV1</td>
<td></td>
</tr>
<tr>
<td>2. Egress A/L</td>
<td></td>
</tr>
<tr>
<td>3. Retrieve Crewlock Bag</td>
<td></td>
</tr>
<tr>
<td>4. Stow Crewlock Bag on BRT</td>
<td></td>
</tr>
<tr>
<td>5. √SAFER MAN ISOL vlv – Open (down)</td>
<td></td>
</tr>
<tr>
<td>6. √SAFER HCM – Closed (down)</td>
<td></td>
</tr>
<tr>
<td>7. Perform translation adaptation as reqd</td>
<td></td>
</tr>
<tr>
<td>8. <strong>On EV1 GO</strong>, disconnect waist tether</td>
<td></td>
</tr>
<tr>
<td>9. Close A/L thermal cover</td>
<td></td>
</tr>
</tbody>
</table>

**WARNING**

Do not touch blemishes on zenith TUS cable

---

1. Post crew egress:
   - WVS Software:
     - Select page – RF camera
     - Sel ‘Advanced Controls’
     - S-Band Level (two) – Max

---

**Initial Config:**
- EV3 85-ft Safety Tether to R D-ring Ext
- R Waist Tether
- Initial Config: L Waist Tether from L D-ring Ext to EV1’s R D-ring Ext
- Initial Config: R Waist
d- Initial Config: L Waist
- Initial Config: R D-ring Ext, 85-ft Safety Tether from L D-ring Ext to EV1’s R D-ring Ext
- Initial Config: L D-ring Ext to Airlock D-ring Ext. 85-ft Safety Tether from L D-ring Ext to EV1’s R D-ring Ext

---

**SETUP** (00:10)

- 10. Translate to CETA 2/CETA 1 interface
- 11. Perform Glove Inspection

---

**SETUP** (00:10)

- 10. Translate to CETA 2/CETA 1 interface
- 11. Perform Glove Inspection
## EVA 2 CETA CART RELOCATE (01:50)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV1</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CETA PREP (00:20)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| **1.** On EV3 GO, translate CETA 2 starboard  
  - Stbd TFR at CETA marker 7650  
  - Port TFR at CETA marker 7800 | **1.** Take CETA 1 coupler to UNLOCK | **CETA PREP (00:20)** |
| **2.** Engage CETA 2 parking brake (left handle)  
  - Reconfigure CETA 2 WIF 1 Y/P [12, GG] (WIF straight fwd & bumper port) | **2.** Give EV1 GO to translate CETA 2 |  |
| **3.** Translate to CETA 1 | **3.** Take CETA 1 coupler to CAPTURE | |
| **4.** [☐] Take photos of SSRMS blemish between N and second A in CANADA (daylight opportunity) | **4.** Translate to CETA 1/MT interface | |
| | **5.** Engage CETA 1 parking brake (left handle) | **5.** Take MT coupler to UNLOCK |
| | **6.** Translate CETA 1 starboard (center on 04 beam)  
  - Stbd TFR at CETA marker 8070  
  - Port TFR at CETA marker 8250 | **6.** Translate CETA 1 starboard (center on 04 beam)  
  - Stbd TFR at CETA marker 8070  
  - Port TFR at CETA marker 8250 | |
| | **7.** Engage CETA 1 parking brake (left handle) | **7.** Engage CETA 1 parking brake (left handle) | |
| **1.** On EV3 GO, SSRMS: Mnvr to APFR reconfig position | **8.** Give SSRMS GO to mnvr to APFR reconfig position | | **8.** Give SSRMS GO to mnvr to APFR reconfig position |
| **2.** SSRMS: Mnvr as reqd to reconfigure APFR | **9.** Take MT coupler to CAPTURE | **9.** Take MT coupler to CAPTURE |
| **3.** SSRMS: Mnvr as reqd for Safety Tether swap and APFR ingress | **10.** Translate to CETA 1 | **10.** Translate to CETA 1 |
| **5.** Prep CETA 1 for relocate  
  - ✓ Brake handles (4) straight/up and collars Locked  
  - ✓ Swingarms (3) stowed  
  - ✓ Fairlead EV3’s safety tether clear of CETA 2  
  - ✓ Verify energy absorbers (2) fully extended  
  - ✓ Release parking brake once EV3 has CETA 1 tethered (tap petal twice) | **11.** GCA SSRMS as reqd to reconfigure APFR | **11.** GCA SSRMS as reqd to reconfigure APFR |
| **Area of Interest on SSRMS** | **12.** Reconfigure APFR on SSRMS: [12, FF, F, 12]  
  ✓ Locking collar black-on-black  
  ✓ Good pull test | **12.** Reconfigure APFR on SSRMS: [12, FF, F, 12]  
  ✓ Locking collar black-on-black  
  ✓ Good pull test |
| | **13.** GCA SSRMS as reqd for Safety Tether swap and APFR ingress | **13.** GCA SSRMS as reqd for Safety Tether swap and APFR ingress |
| | **14.** Perform 55-ft Safety Tether swap onto SSRMS; verify locking hook – Gate Closed, Slider Locked | **14.** Perform 55-ft Safety Tether swap onto SSRMS; verify locking hook – Gate Closed, Slider Locked |
| | **15.** Stow 85-ft Safety Tether on S0 HR 3416 | **15.** Stow 85-ft Safety Tether on S0 HR 3416 |
| | **16.** Ingress APFR | **16.** Ingress APFR |
| | **17.** Attach MWS EE to ingress aid | **17.** Attach MWS EE to ingress aid |
| | **18.** Tether to CETA 1 with RET | **18.** Tether to CETA 1 with RET |
| | | **19.** Hold CETA 1 at grids C and G |
| | | **CAUTION**  
  Do not impart loads into CETA cart with less than 3 of 4 wheel bogies engaged |
| | | **NOTE**  
  Ensure safety tethers are clear of structure during CETA cart install |
EVA 2 CETA CART RELOCATE (01:50) (Cont)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV1</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel Bogies: (ccw)</td>
<td>CETA 1 RELOCATE (00:10)</td>
<td>CETA 1 RELOCATE (00:25)</td>
</tr>
<tr>
<td>☐ Zenith/stbd ☐ Zenith/port</td>
<td>6. On EV3 GO, release CETA 1 wheel bogies (4)</td>
<td>20. Give EV1 GO to release wheel bogies</td>
</tr>
<tr>
<td>☐ Nadir/stbd ☐ Nadir/port</td>
<td>7. Give EV3 GO to remove CETA 1 from rails</td>
<td>21. On EV1 GO, remove CETA 1 from MT rails; remove CETA 1 from rails station forward until wheel bogies clear rail</td>
</tr>
<tr>
<td>4. SSRMS: Mnvr as reqd to move CETA 1 clear of truss</td>
<td>8. Assist EV3 with clearances as reqd</td>
<td>OCAS Time = 00:15</td>
</tr>
<tr>
<td>5. On EV1 GO, SSRMS: Mnvr to relocate CETA 1</td>
<td>9. GCA SSRMS as reqd to move CETA 1 clear of truss</td>
<td></td>
</tr>
<tr>
<td>10. Give SSRMS GO to mnvr to relocate CETA 1</td>
<td>11. Relocate EV3’s safety tether from S0 HR 3416 to S0 HR 3530 (or port strut)</td>
<td></td>
</tr>
<tr>
<td>CETA 2 PREP (00:15)</td>
<td>12. ☐ Take photos of TUS Cable interest areas (daylight opportunity)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13. Translate to CETA 2 (S0 Bay 0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14. Release CETA 2 brakes (tap pedal twice)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15. Translate CETA 2 port (center on 04 beam)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>☐ Stbd TFR at CETA marker 8070</td>
<td></td>
</tr>
<tr>
<td></td>
<td>☐ Port TFR at CETA marker 8250</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16. Engage CETA 2 parking brake</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17. Prep CETA 2 for transfer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>☐ √Brake handles (4) straight/up and collars Locked</td>
<td></td>
</tr>
<tr>
<td></td>
<td>☐ √Swingarms (3) stowed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>☐ Verify energy absorbers (2) fully extended</td>
<td></td>
</tr>
<tr>
<td></td>
<td>☐ Reconfigure CETA 2 WIF 1 Y/P [12, GG] (WIF straight fwd &amp; bumper port)</td>
<td></td>
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<tr>
<td></td>
<td>18. Fairlead Safety Tether zenith and around CETA 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19. As time permits, transfer Large ORU Bag to Stbd SARJ</td>
<td></td>
</tr>
<tr>
<td></td>
<td>04 Beam</td>
<td>GPS Antenna 3</td>
</tr>
</tbody>
</table>

Areas of Interest on the TUS Cable

[Image of areas of interest]
### EVA 2 CETA CART RELOCATE (01:50) (Cont)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV1</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. SSRMS: Mvr as reqd to CETA 1 drop-off position</td>
<td><strong>CETA 1 INSTALL</strong> (00:10)</td>
<td><strong>CETA 1 INSTALL</strong> (00:20)</td>
</tr>
<tr>
<td>Wheel Bogies: (cw)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Zenith/stbd □ Zenith/port</td>
<td>20. Perform Glove Inspection (if reqd)</td>
<td>22. Install CETA 1 on MT rails</td>
</tr>
<tr>
<td>□ Nadir/stbd □ Nadir/port</td>
<td>21. GCA SSRMS as reqd to CETA 1 drop-off position</td>
<td></td>
</tr>
<tr>
<td></td>
<td>22. Guide CETA 1 onto MT rails</td>
<td>23. Receive EVA camera from EV1; stow on swing arm</td>
</tr>
<tr>
<td></td>
<td>23. Install wheel bogies (4)</td>
<td>OCAS Time = 00:15</td>
</tr>
<tr>
<td></td>
<td>24. CETA 1 coupler in CAPTURE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25. Release EV3 RET and attach it to EVA camera with bracket</td>
<td>26. Translate to CETA 2</td>
</tr>
<tr>
<td></td>
<td>26. Transfer EVA camera to EV3</td>
<td>27. Give SSRMS GO to mvr to retrieve CETA 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28. Couple CETA 1 to MT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>29. Take CETA 1 coupler to LOCK</td>
</tr>
<tr>
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<td></td>
<td><strong>SSAS BBC RECONFIG P1 TO P3</strong> (00:15)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24. GCA SSRMS as reqd to CETA 2 pickup position</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25. Tether to CETA 2 with RET</td>
</tr>
<tr>
<td></td>
<td></td>
<td>26. Hold CETA 2 at grids C and G</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>CETA 2 PREP</strong> (00:05)</td>
</tr>
<tr>
<td>7. On EV1 GO, SSRMS: Mvr to retrieve CETA 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. SSRMS: Mvr as reqd to CETA 2 pickup position</td>
<td><strong>NOTE</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ensure safety tethers are clear of structure during CETA cart install</td>
</tr>
</tbody>
</table>

**CAUTION**
Do not impart loads into CETA cart with less than 3 of 4 wheel bogies engaged

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

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
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<tbody>
<tr>
<td><strong>Wheel Bogies</strong>: (ccw)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Zenith/stbd</td>
<td>☐ Zenith/port</td>
<td></td>
</tr>
<tr>
<td>☐ Nadir/stbd</td>
<td>☐ Nadir/port</td>
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</tr>
</tbody>
</table>

**CETA 2 RELOCATE** (00:05)

33. **On EV3 GO**, release CETA 2 wheel bogies (4)
34. **Give EV3 GO** to remove CETA 2 from rails
35. Assist EV3 with clearances as reqd
36. GCA SSRMS as reqd to move CETA 2 clear of truss
37. **Give SSRMS GO** to mnvr to relocate CETA 2

**STAGE STBD SARJ BAGS AND TOOLS** (00:20)

38. As time permits, stage Stbd SARJ Bags and Tools
39. Retrieve EV3’s 85-ft Safety Tether from S0 HR 3530
40. Transfer EV3’s 85-ft Safety Tether to P1 HR 3652 (drag link)

**CETA 2 INSTALL** (00:10)

41. Perform Glove Inspection
42. Translate outboard of CETA 2 drop-off position
43. Tether clear of CETA 2 Install
44. GCA SSRMS as reqd to CETA 2 drop-off position
45. Guide CETA 2 onto MT rails
46. Install wheel bogies (4)
47. CETA 2 coupler in CAPTURE
48. Relocate EV3’s 85-ft safety tether to toe clip on CETA 2 stdt TFR
49. **Give EV3 GO** to release CETA 2
50. GCA SSRMS as reqd to CETA clearance position
51. Retrieve tether fairlead from around CETA 2
52. Couple CETA 2 to CETA 1
53. Take CETA 2 coupler to LOCK

**CETA 2 RELOCATE** (00:25)

27. **Give EV1 GO** to release wheel bogies
28. **On EV1 GO**, remove CETA 2 from MT rails; lift CETA 2 from rails due forward until wheel bogies clear rail

OCAS Time = 00:15

**STAGE STBD SARJ BAGS AND TOOLS** (00:20)

29. Install CETA 2 on MT rails
30. **On EV1 GO**, release CETA 2 tether
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>13. <strong>On EV3 GO</strong>, SSRMS: Mvr to APFR egress position</td>
<td>SSRMS CLEANUP (00:05)</td>
<td>SSRMS CLEANUP (00:05)</td>
</tr>
<tr>
<td>14. SSRMS: Mvr as reqd to APFR egress position</td>
<td>54. WVS Survey of CETA Carts</td>
<td>31. WVS Survey of CETA Carts</td>
</tr>
<tr>
<td></td>
<td>55. Translate to Stbd SARJ</td>
<td>32. <strong>Give SSRMS GO</strong> to mvr to APFR egress position</td>
</tr>
<tr>
<td></td>
<td></td>
<td>33. GCA SSRMS as reqd to APFR egress position</td>
</tr>
<tr>
<td></td>
<td></td>
<td>34. Egress APFR</td>
</tr>
</tbody>
</table>
### EVA 2 LEE A LUBRICATION (01:15)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> SSRMS: Mnvr as reqd for Safety Tether swap and APFR relocate</td>
<td>LEE SETUP (00:20)</td>
</tr>
<tr>
<td>1. GCA SSRMS as reqd for Safety Tether swap and APFR relocate</td>
<td></td>
</tr>
<tr>
<td>2. Perform Safety Tether swap onto EV3 85-ft Safety Tether temp stowed on HR 3652 (drag link)</td>
<td>2. On EV3 GO, SSRMS: Mnvr to LEE setup position</td>
</tr>
<tr>
<td>▪ Fairlead on CETA Cart clear of MCU and VDU surfaces on MBS</td>
<td></td>
</tr>
<tr>
<td>▪ Verify locking hook: Gate Closed; Slider Locked</td>
<td>7. <strong>Give SSRMS GO</strong> to mnvr to LEE setup position</td>
</tr>
<tr>
<td>3. Deploy CETA 2 port parking brake handles down (pointing port)</td>
<td>8. Ingress APFR; attach MWS EE to ingress aid</td>
</tr>
<tr>
<td>4. Relocate APFR to CETA 2 WIF 1; APFR [6, II, F, 6] (WIF 1 Y/P [12, GG]; bumper port)</td>
<td>9. <strong>Give SSRMS GO</strong> to mnvr to the LEE lube position</td>
</tr>
<tr>
<td>▪ Locking collar black-on-black</td>
<td>10. Stow spare 55-ft Safety Tether in Crewlock Bag</td>
</tr>
<tr>
<td>▪ Good pull test</td>
<td>11. Stow WIF adapter in Crewlock Bag</td>
</tr>
<tr>
<td>5. Remove WIF adapter</td>
<td>12. Retrieve Camera from Crewlock Bag</td>
</tr>
<tr>
<td>6. Fairlead Safety Tether along CETA rail</td>
<td>13. GCA SSRMS as reqd to LEE repair position</td>
</tr>
<tr>
<td>7. <strong>Give SSRMS GO</strong> to mnvr to the LEE lube position</td>
<td>14. [mostat] Take pictures of LEE (4)</td>
</tr>
<tr>
<td>8. Ingress APFR; attach MWS EE to ingress aid</td>
<td>▪ Each pair of bearings (3)</td>
</tr>
<tr>
<td>9. <strong>Give SSRMS GO</strong> to mnvr to the LEE lube position</td>
<td>▪ Overall view of LEE</td>
</tr>
<tr>
<td>10. Stow spare 55-ft Safety Tether in Crewlock Bag</td>
<td></td>
</tr>
<tr>
<td>11. Stow WIF adapter in Crewlock Bag</td>
<td></td>
</tr>
<tr>
<td>12. Retrieve Camera from Crewlock Bag</td>
<td></td>
</tr>
</tbody>
</table>

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

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

#### NOTE
Grease should not extend more than ¼ inch from bearing
### EVA 2 LEE A LUBRICATION (01:15) (Cont)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5.</strong> On EV3 GO, SSRMS: Mnvr to close and open the snares</td>
<td><strong>LEE A SNARE REPAIR</strong> (00:40)</td>
</tr>
<tr>
<td><strong>6.</strong> SSRMS: Give EV3 GO for LEE work</td>
<td>15. Give SSRMS GO to close and open the snares</td>
</tr>
<tr>
<td></td>
<td>16. Report to MCC: Snare condition (in or out of groove)</td>
</tr>
<tr>
<td></td>
<td>17. On SSRMS GO, push top right and bottom right snares into groove with needle nose pliers</td>
</tr>
<tr>
<td></td>
<td>18. Exercise bearing the lower left outer bearing in x-axis using needle nose pliers [15 sec]</td>
</tr>
<tr>
<td></td>
<td>19. Push left snare into groove with needle nose pliers</td>
</tr>
<tr>
<td></td>
<td>20. Prep grease gun</td>
</tr>
<tr>
<td></td>
<td>21. Apply grease to lower left bearings (2) (rectangular pattern)</td>
</tr>
<tr>
<td><strong>7.</strong> On EV3 GO, SSRMS: Mnvr +120 deg wrist roll</td>
<td>22. Give SSRMS GO to mnvr a +120 deg wrist roll</td>
</tr>
<tr>
<td><strong>8.</strong> SSRMS: Give EV3 GO for LEE work</td>
<td>23. On SSRMS GO, apply grease to lower left bearings (2) (rectangular pattern)</td>
</tr>
<tr>
<td><strong>9.</strong> On EV3 GO, SSRMS: Mnvr +120 deg wrist roll</td>
<td>24. Give SSRMS GO to mnvr a +120 deg wrist roll</td>
</tr>
<tr>
<td><strong>10.</strong> SSRMS: Give EV3 GO for LEE work</td>
<td>25. On SSRMS GO, apply grease to lower left bearings (2) (rectangular pattern)</td>
</tr>
<tr>
<td><strong>11.</strong> SSRMS: Mnvr as reqd to LEE repair position</td>
<td>26. Stow grease gun</td>
</tr>
<tr>
<td><strong>12.</strong> If GCA in IV/SSRMS step #11 performed, SSRMS: Give EV3 GO for LEE work</td>
<td>27. GCA SSRMS as reqd addition wrist roll; if GCA performed wait for SSRMS GO prior to step 27</td>
</tr>
<tr>
<td></td>
<td>28. Pull lower right snare fully out into C-curve with gap gauge, apply force perpendicular to rod-end</td>
</tr>
<tr>
<td></td>
<td>29. Prep grease gun</td>
</tr>
<tr>
<td></td>
<td>30. Apply grease to rod-end/fork interface to lower left bearing</td>
</tr>
<tr>
<td></td>
<td>31. Apply grease to rod-end/fork interface to right bearing</td>
</tr>
<tr>
<td></td>
<td>32. Stow grease gun</td>
</tr>
<tr>
<td></td>
<td>33. Exercise lower left bearing in x-axis using needle nose pliers, for 1 min (40 cycles)</td>
</tr>
<tr>
<td></td>
<td>34. Report to MCC: Any noticeable change in bearing motion</td>
</tr>
<tr>
<td></td>
<td>35. Exercise right bearing in x-axis using needle nose pliers, for 1 min (40 cycles)</td>
</tr>
<tr>
<td></td>
<td>36. Report to MCC: Any noticeable change in bearing motion</td>
</tr>
<tr>
<td></td>
<td>37. Push lower right snare into groove with needle nose pliers</td>
</tr>
</tbody>
</table>
## EVA 2 LEE A LUBRICATION (01:15) (Cont)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. <strong>On EV3 GO</strong>, SSRMS: Mvr -120 deg wrist roll</td>
<td>38. <strong>Give SSRMS GO</strong> to mvr a -120 deg wrist roll</td>
</tr>
<tr>
<td>14. SSRMS: <strong>Give EV3 GO</strong> for LEE work</td>
<td>39. <strong>On SSRMS GO</strong>, pull lower right snare fully out into C-curve with gap gauge, apply force perpendicular to rod-end</td>
</tr>
<tr>
<td>15. <strong>On EV3 GO</strong>, SSRMS: Mvr -120 deg wrist roll</td>
<td>40. Prep grease gun</td>
</tr>
<tr>
<td>16. SSRMS: <strong>Give EV3 GO</strong> for LEE work</td>
<td>41. Apply grease to rod-end/fork interface to lower left bearing</td>
</tr>
<tr>
<td></td>
<td>42. Apply grease to rod-end/fork interface to right bearing</td>
</tr>
<tr>
<td></td>
<td>43. Stow grease gun</td>
</tr>
<tr>
<td></td>
<td>44. Exercise lower left bearing in x-axis using needle nose pliers, for 1 min (40 cycles)</td>
</tr>
<tr>
<td></td>
<td>45. Report to MCC: Any noticeable change in bearing motion</td>
</tr>
<tr>
<td></td>
<td>46. Exercise right bearing in x-axis using needle nose pliers, for 1 min (40 cycles)</td>
</tr>
<tr>
<td></td>
<td>47. Report to MCC: Any noticeable change in bearing motion</td>
</tr>
<tr>
<td></td>
<td>48. Push lower right snare into groove with needle nose pliers</td>
</tr>
<tr>
<td></td>
<td>49. <strong>Give SSRMS GO</strong> to mvr a -120 deg wrist roll</td>
</tr>
<tr>
<td></td>
<td>50. <strong>On SSRMS GO</strong>, pull lower right snare fully out into C-curve with gap gauge, apply force perpendicular to rod-end</td>
</tr>
<tr>
<td></td>
<td>51. Prep grease gun</td>
</tr>
<tr>
<td></td>
<td>52. Apply grease to rod-end/fork interface to lower left bearing</td>
</tr>
<tr>
<td></td>
<td>53. Apply grease to rod-end/fork interface to right bearing</td>
</tr>
<tr>
<td></td>
<td>54. Stow grease gun</td>
</tr>
<tr>
<td></td>
<td>55. Exercise lower left bearing in x-axis using needle nose pliers, for 1 min (40 cycles)</td>
</tr>
<tr>
<td></td>
<td>56. Report to MCC: Any noticeable change in bearing motion</td>
</tr>
<tr>
<td></td>
<td>57. Exercise right bearing in x-axis using needle nose pliers, for 1 min (40 cycles)</td>
</tr>
<tr>
<td></td>
<td>58. Report to MCC: Any noticeable change in bearing motion</td>
</tr>
<tr>
<td></td>
<td>59. Push lower right snare into groove with needle nose pliers</td>
</tr>
<tr>
<td></td>
<td>60. If reqd, use gap gauge to pack excess grease into bearing</td>
</tr>
<tr>
<td></td>
<td>61. Clean tools and gloves as necessary with EVA wipe</td>
</tr>
</tbody>
</table>
### EVA 2 LEE A LUBRICATION (01:15) (Cont)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. <strong>On EV3 GO,</strong> SSRMS: Mvr to close and open the snares</td>
<td><strong>LEE A CLEANUP</strong> (00:15)</td>
</tr>
<tr>
<td>18. <strong>On EV3 GO,</strong> SSRMS: Mvr to back-off position</td>
<td>62. <strong>Give SSRMS GO</strong> to close and open the snares</td>
</tr>
<tr>
<td></td>
<td>63. Take pictures of LEE</td>
</tr>
<tr>
<td></td>
<td>• Each pair of bearings (3)</td>
</tr>
<tr>
<td></td>
<td>• Overall view of LEE</td>
</tr>
<tr>
<td></td>
<td>64. Report to MCC: Snare condition (in or out of groove)</td>
</tr>
<tr>
<td></td>
<td>65. <strong>Give SSRMS GO</strong> to mvr to back-off position</td>
</tr>
<tr>
<td></td>
<td>66. Egress APFR</td>
</tr>
<tr>
<td></td>
<td>67. Perform Tool inventory</td>
</tr>
<tr>
<td></td>
<td>68. Stow ingress aid</td>
</tr>
<tr>
<td></td>
<td>69. Stow CETA 2 port parking brake handles (straight/up)</td>
</tr>
<tr>
<td></td>
<td>70. Translate to Stbd SARJ</td>
</tr>
</tbody>
</table>
### EVA 2 SARJ (03:45/02:20)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV1</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S3 SARJ SETUP (00:30)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Translate to S3 Face 1; stow Large ORU Bag</td>
<td></td>
<td>1. Translate to S3 SARJ Large ORU Bag</td>
</tr>
<tr>
<td>2. Perform Glove Inspection</td>
<td></td>
<td>2. Perform Glove Inspection</td>
</tr>
<tr>
<td>3. Retrieve EV3 Fish Stringer Tether; stow for EV3 use on Face 3</td>
<td></td>
<td>3. Retrieve straight nozzle grease gun and RET from LEE Crewlock Bag; stow on SARJ Crewlock Bag</td>
</tr>
</tbody>
</table>

| **S3 SARJ WORK (02:45)** | | **S3 SARJ WORK (01:20)** |
|--------------------------|--------------------------|
| Refer to STBD SARJ CUE CARD, FS CC 7-35, for SARJ checklist: | Refer to STBD SARJ CUE CARD, FS CC 7-35, for SARJ checklist: |
| Covers 9/10 and TBA 11 | Covers 11/12 and TBA 12 |
| Covers 4/5 and TBA 8 | Get-Ahead: |
| Cover 5 and TBA 9 | Covers 13/14 and TBA 1 |
| Cover 8 (if reqd) | Refer to SARJ – TBA REMOVE/INSTALL, FS 7-57, for steps to remove and install a TBA |
| Get-Ahead: |
| Covers 1/22 and TBA 6 (bearing package only) | Refer to SARJ – TBA REMOVE/INSTALL, FS 7-57, for steps to remove and install a TBA |
| Refer to SARJ – CLEAN/LUBE RACE RING, FS 7-58, for steps to clean and to lubricate the race ring | Refer to SARJ – CLEAN/LUBE RACE RING, FS 7-58, for steps to clean and to lubricate the race ring |

| **S3 SARJ BAG PACKING (00:30)** | | **S3 SARJ BAG PACKING (00:30)** |
|-------------------------------|-------------------|
| 4. Stow SARJ Crewlock Bag on Fish Stringer Tether in Large ORU Bag | 5. Stow SARJ Crewlock Bag on Fish Stringer Tether |
| 5. Stow Fish Stringer Tether in Large ORU Bag | 6. Retrieve Fish Stringer Tether |
| 6. Verify TBA Bags are rolled and folded | 7. Stow Fish Stringer Tether in Large ORU Bag |
| 7. Perform Large ORU Bag inventory | 8. Verify TBA Bags are rolled and folded |
| 9. Perform Large ORU Bag inventory | 10. Perform Large ORU Bag inventory |
**EVA 2 SARJ – TBA REMOVE/INSTALL**

### Remove

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

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

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

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

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

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

### Install

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

1. Retrieve new mount package from bag; report serial number
2. Verify mount clamping leg is open
3. Engage mount onto race ring, aligning mount boss with slot in race ring
4. Close mount clamping leg
5. **PGT[A2 3.8 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:** Engage bolt 3 (mount bolt), 2 turns
6. Retrieve bearing package; report serial number
7. Engage bearing package onto race ring, guiding bearing arm through race ring
8. **PGT[A3 4.8 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:** Engage bolt 2 (draw bolt), ~10.5-13 turns to torque until preload arm engages race ring (bearing package will also move toward SARJ and mount package)
9. **PGT[B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:** (*Flight = A5 7.0*)
   Engage bolt 1 (bearing preload bolt), ~5-7 turns to torque
10. **PGT[A2 3.8 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:**
    Tighten bolt 3 (mount bolt), ~2-4 turns to torque
11. Remove dust cap on inboard receptacle; stow in TBA bag
12. Remove TBA connector dust cap; stow in TBA bag
13. Verify pin and EMI band integrity; connector free of FOD

**NOTE**
Verify pin and EMI band integrity; connector free of FOD

14. **WVS Survey of work area; clean up work area; reinstall MLI cover**

<table>
<thead>
<tr>
<th>TBA</th>
<th><em>Flight = A5 7.0</em></th>
<th>Bolt 2</th>
<th>Bolt 1</th>
<th>Bolt 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>S/N</td>
<td></td>
<td>Turns</td>
<td>Torque</td>
<td>Turns</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>(~10.5-13)</td>
<td>(4.8)</td>
<td>(~5-7)</td>
</tr>
<tr>
<td>2</td>
<td></td>
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<td>3</td>
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<tr>
<td>5</td>
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</tr>
<tr>
<td>6 (1st)</td>
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<tr>
<td>6 (2nd)</td>
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<td>11</td>
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</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

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

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

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

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

OUTBOARD ← — INBOARD

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

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

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

NOTE
Limit force to engage mount bolt 3; too much force opens mount clamping leg.
**CLEAN STEPS**

1. Wet wipe outboard ring inner canted and datum A
2. Wet wipe any obvious debris on skirts, joggles, etc
3. Wet wipe DLA surfaces (if applicable)
4. Wet wipe outer canted surface of outboard ring
5. Stow wet wipe in large trash bag
6. Prep straight nozzle gun:
   a. Engage teeth by rotating plunger 180 deg (black triangle up)
   b. Remove MLI tip cover
   c. Rotate shutoff knob such that FLOW pointing towards nozzle
7. Lay bead of grease on outer canted surface of outboard ring
8. Safe and stow straight nozzle gun:
   a. Disengage teeth by rotating plunger 180 deg (black triangle down)
   b. Rotate shutoff knob such that FLOW is perpendicular to nozzle
   c. Install MLI tip cover
9. Retrieve dry wipe
10. Use scraper to remove debris from outer canted surface of outboard ring
11. Clean scraper in scraper debris container
12. Close scraper debris container
13. Use dry wipe to remove residue from cleaning the ring
14. Use dry wipe to clean mount package area on inboard ring
15. Stow dry wipe in large trash bag

**LUBE STEPS (Outboard ring)**

16. Retrieve dry wipe
17. Use j-hook nozzle gun to grease inner canted surface. Apply approx 1 sharpie mark/click per section between TBAs
18. Use straight nozzle gun to grease outer canted and Datum A surfaces. Apply approx 1/8” thick bead per section between TBAs

19. Use dry wipes as required to clean up EMU and tools

*Indicates mount package steps to skip when revisiting a SARJ worksite (TBA 5, 6, and 11)
### EVA 2 CLEANUP/INGRESS (00:30)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV1</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CLEANUP</strong> (00:15)</td>
<td><strong>INGRESS</strong> (00:15)</td>
<td><strong>CLEANUP</strong> (00:15)</td>
</tr>
<tr>
<td>1. Retrieve LEE Crewlock Bag; stow on BRT</td>
<td>1. Retrieve Large ORU Bag; stow on BRT</td>
<td>1. Retrieve Large ORU Bag; stow on BRT</td>
</tr>
<tr>
<td>2. Perform Tool inventory</td>
<td>2. Perform Tool inventory</td>
<td>2. Perform Tool inventory</td>
</tr>
<tr>
<td>3. Translate to S0</td>
<td>3. Translate to A/L; fairlead Safety Tether as reqd</td>
<td>3. Translate to A/L; fairlead Safety Tether as reqd</td>
</tr>
</tbody>
</table>

**CAUTION**
Do not close hatch until EMU water off for 2 min


5. Retrieve EV1 85-ft Safety Tether; stow on MWS | 5. Retrieve EV1 85-ft Safety Tether; stow on MWS | 5. Retrieve EV1 85-ft Safety Tether; stow on MWS |

6. Retrieve Tether Shuttles (2); stow on S0 bracket; verify Locked | 6. Retrieve Tether Shuttles (2); stow on S0 bracket; verify Locked | 6. Retrieve Tether Shuttles (2); stow on S0 bracket; verify Locked |

7. Attach Waist Tether to Airlock D-ring extender; verify locking hook – Gate Closed, Slider Locked | 7. Attach Waist Tether to Airlock D-ring extender; verify locking hook – Gate Closed, Slider Locked | 7. Attach Waist Tether to Airlock D-ring extender; verify locking hook – Gate Closed, Slider Locked |

8. Ingress A/L | 8. Give EV1 GO to attach to EV3’s 85-ft Safety Tether | 8. Give EV1 GO to attach to EV3’s 85-ft Safety Tether |


10. On EV3 GO, ingress A/L | 10. Give EV1 GO to ingress | 10. Give EV1 GO to ingress |


12. Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card) | 12. Remove SCU from stowage pouch | 12. Remove SCU from stowage pouch |

13. Verify no hardware blocking hatch | 13. Connect SCU to DCM, check Locked | 13. Connect SCU to DCM, check Locked |

14. EV Hatch Handle – verify position per hatch decal | 14. EV Hatch Handle – verify position per hatch decal | 14. EV Hatch Handle – verify position per hatch decal |

15. EV Hatch – close and lock | 15. EV Hatch – close and lock | 15. EV Hatch – close and lock |

### EVA 2 POST TOOL CONFIG

#### EV1
- **MWS**
  - BRT (L)
  - RET (eq-eq)
  - Wire Tie (2)
  - T-Bar
  - RET (eq-eq) (2)
  - RET (eq-eq) w/PIP Pin
  - Adj Equip Tether (2)
  - Wire Tie
  - Small Shuttle Trash Bag
  - Swing Arm (R)
  - RET (eq-eq)
  - PGT
  - PGT Battery
  - 7/16 (wobble) Socket-6 ext
  - 85-ft Safety Tether (R D-ring Ext)
- Waist Tether (2, R & L on D-ring)

#### EV3
- **MWS**
  - BRT (L)
  - RET (eq-eq) w/PIP Pin
  - Wire Tie (2)
  - T-Bar
  - RET (eq-eq) (2)
  - Adj Equip Tether (2)
  - Wire Tie (2)
  - Small ISS Trash Bag
  - Swing Arm (R)
  - RET (eq-eq)
  - PGT
  - PGT Battery
  - 7/16 (wobble) Socket-6 ext
  - 85-ft Safety Tether (L D-ring Ext)
- Waist Tether (1, R on D-ring Ext)

#### AIRLOCK CONFIG
- **Large ORU Transfer Bag**
  - Adj Equip Tether (on outside)
  - Fish Stringer Tether (Heide)
  - TBA Bag
  - TBA Bearing Package (on bag tether)
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
  - TBA Bag
  - TBA Bearing Package (on bag tether)
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
- **TBA Bag**
  - TBA Dust Cap (on bag tether)
  - SARJ Dust Cap (on bag tether)
  - EVA Wipe Caddy
  - EVA Wipe Caddy
  - Crewlock Bag (SARJ)
  - Adj Equip Tether (2) (on outside)
  - Wire Tie (to secure grease gun)
  - Grease Gun w/Straight Nozzle
  - Wire Tie (to secure grease gun)
  - RET (eq-eq) (on outside)
- **Scraper**
  - Large Trash Bag (int RET)

#### AIRLOCK CONFIG (Cont)
- **Large ORU Transfer Bag (Cont)**
  - Fish Stringer Tether (Shane)
  - TBA Bag
  - TBA Bearing Package (on bag tether)
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
  - TBA Bag
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
  - TBA Bag
  - TBA Bearing Package (on bag tether)
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
- **TBA Bag**
  - TBA Dust Cap (on bag tether)
  - SARJ Dust Cap (on bag tether)
  - Crewlock Bag (SARJ)
  - RET (eq-eq) (spare on outside door handle)
  - Adj Equip Tether (2) (on outside)
  - Wire Tie (to secure grease gun)
  - RET (eq-eq) (on outside)
  - Wire Tie (to secure grease gun)
  - RET (eq-eq) (on outside)
  - Wire Tie (to secure grease gun)
  - RET (eq-eq) (on outside)
  - Wire Tie (to secure grease gun)
  - RET (eq-eq) (on outside)
  - Wire Tie (to secure grease gun)
  - RET (eq-eq)
  - Scraper
  - Large Trash Bag (int RET)

#### Tether Counts:
- (Red RETs)
- RETs (eq-eq) = 14
- RETs (PIP Pin) = 2
- RETs (Lg-eq) = 3
- Adj Equip Tethers = 12 int/1 ext
CETA CART RELOCATION – TASK DATA

Estimated Task Duration:

<table>
<thead>
<tr>
<th></th>
<th>With SSRMS</th>
<th>Without SSRMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EV Crew</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Two EV Crew</td>
<td>01:45</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Tools:
- EV3
- RET

Foot Restraints:

<table>
<thead>
<tr>
<th>Task</th>
<th>WIF</th>
<th>APFR Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>CETA Cart Removal/Install</td>
<td>SSRMS</td>
<td>12,FF,F,12</td>
</tr>
</tbody>
</table>

EVA Fasteners: N/A

EVA Connectors: N/A

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

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

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

Warnings:
None

Timeline Considerations:
1. Some EV1 tasks may be postponed if OCAS times are shorter than estimated
2. Pictures of Zenith TUS cable may be taken by EV1 during OCAS mnvr
Figure 1. CETA CART Relocate Plan
Figure 2. Active Coupler

Figure 3. TFR

Figure 4. Swing Arm

Figure 5. Swing Arm WIF
CETA CART RELOCATION – TASK DATA (Cont)

Figure 6. Port TFR and WIFs

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

Figure 7. Passive Coupler

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

Figure 8. WIF 1

Figure 9. Current ISS

WIF 1
Wheel Bogies

Figure 10. Stowed Position

Figure 11. Handle Rotated in Unlock

Figure 12. Partially Deployed

Figure 13. Backside
LEE SNARE REPAIR – TASK DATA

Estimated Task Duration:

<table>
<thead>
<tr>
<th></th>
<th>With SSRMS</th>
<th>Without SSRMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EV Crew</td>
<td>01:00</td>
<td>N/A</td>
</tr>
<tr>
<td>Two EV Crew</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Tools:

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

Foot Restraints:

<table>
<thead>
<tr>
<th>Task</th>
<th>WIF</th>
<th>Y/P Setting</th>
<th>APFR Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEE A SNARE REPAIR</td>
<td>CETA 2 WIF 1</td>
<td>12, GG, 6</td>
<td>II, F, 6</td>
</tr>
</tbody>
</table>

EVA Fasteners: N/A

EVA Connectors: N/A

LEE Mass = ~ 460 lb/209 kg

Notes:
1. Grease should not extend more than ¼ inch from bearing

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

Warnings:
1. Avoid touching LEE curvic coupling, grounding springs, snares, and internal mechanisms inside LEE with gloved hand

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

Grease Gun Steps:

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

Stow grease gun
1. Rotate shutoff knob such that FLOW points perpendicular to nozzle
2. Disengage teeth by rotating plunger 180 deg (black triangle down)
3. Install MLI tip cover
Figure 1. LEE Face
1. Rod end to torsion spring interface

2. Spherical bearing bottom side

3. Rod end to fork interface

4. Spherical bearing top side

NOTE: Do not apply grease beyond this point
Figure 3. LEE Face
Figure 4. LEE A – March 2008
## EVA 3 SUMMARY TIMELINE

<table>
<thead>
<tr>
<th>PET HR : MIN</th>
<th>IV/SRMS</th>
<th>EV1 (Pp)</th>
<th>EV2 (Bw)</th>
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<tbody>
<tr>
<td>00:00</td>
<td>POST DEPRESS (00:05)</td>
<td>POST DEPRESS (00:05)</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>EGRESS/SETUP (00:30)</td>
<td>EGRESS/SETUP (00:30)</td>
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<tr>
<td><strong>01:00</strong></td>
<td><strong>SARJ (05:50)</strong></td>
<td><strong>SARJ (05:50)</strong></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Remove Covers 13 and 14</td>
<td>Remove Cover 19</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Remove TBA 1</td>
<td>Remove Cover 20</td>
<td></td>
<td></td>
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<tr>
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<tr>
<td></td>
<td>Install TBA 1</td>
<td>Lube</td>
<td></td>
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<tr>
<td></td>
<td>Install Covers 13 and 14</td>
<td>Install TBA 4</td>
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<tr>
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<td>Install Covers 15 and 16</td>
<td>Install TBA 5 Bearing Package</td>
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<td></td>
<td>Remove Covers 17 and 18</td>
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<td>Remove TBA 3</td>
<td>Remove Covers 22 and 1</td>
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<td>Clean</td>
<td>Remove TBA 6 Bearing Package Only</td>
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<td>Lube</td>
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<td>Install TBA 3</td>
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<td>Install Covers 17 and 18</td>
<td>Install TBA 6 Bearing Package</td>
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<td>Install Cover 20</td>
<td>Install Covers 22 and 1</td>
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<td>If Not Completed on EVA 2:</td>
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<td>Remove Covers 2 and 3</td>
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<td></td>
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<td><strong>03:00</strong></td>
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<td><strong>05:00</strong></td>
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<td><strong>06:00</strong></td>
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<tr>
<td><strong>07:00</strong></td>
<td>PREREPRESS (00:05)</td>
<td>PREREPRESS (00:05)</td>
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</tbody>
</table>

**EVA 3**
EVA 3 PRE TOOL CONFIG

EVA 1

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

EVA 2

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

AIRLOCK CONFIG

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

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

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

NOTE: Engage tether hook from inside of mount
NOTE: Match s/n's of Bearing and Mount Packages

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EVA/126/FIN
EVA 3 PRE TOOL CONFIG (Cont)

AIRLOCK CONFIG (Cont)

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

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

AIRLOCK CONFIG (Cont)

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

EXTERIOR CONFIG

- EVA Wipes (6 dry)
- Fish Stringer Tether
- EVA Wipes (6 wet)
General Briefing

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

2. EV Crew Procedure Review – EV CMs
   - Egress Plan, Safety tethers
   - Review first post-egress steps
   - Order of tasks (summary timeline)
   - Translation plan, fairleads, and tether swaps
   - Hazards
   - Ingress Plan

3. Other Procedure Review – Task IV
   - Get-ahead tasks
   - Constraints – ground and flight
   - Notes, Cautions, and Warnings review
   - Contingency procedures – cribsheet

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

5. Robotics – M1/M2
   - SRMS/SSRMS initial position, maneuvers, clearances
   - Coordinate Frames
   - SRMS/SSRMS comm protocol review – expected calls, use first names
   - GCA – Give direction and approx distance
   - Positive handover who is giving GCA
   - Cameras

6. Emergencies Review – Suit IV/Task IV
   - Emergency suit doff and power down
   - Expedited Suit Doffing cue card pre-positioned for EVA day
   - Loss of comm
   - EMU malfunctions
   - Lost tools
   - Lost crewmember
   - DCS
   - Abort and Terminate scenarios, protocols
   - Hand signal reviews

7. Post EVA – Suit IV
   - Suit doffing responsibilities
   - Post EVA plan

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

Hygiene Break Repress (GMT) ______:______
Depress to 10.2 ______:______
Start Purge ______:______
PET 00:00 ______:______
EVA 3 BRIEFING CARD (Cont)

Generic Calls:
- Day/Night Cycles
  - Lights, visors, gloves, tethers, and tools
  - Glove Checks: Report any damaged/missing RTV, Vetran condition
- Tether swaps:
  - Crew Report: “Gate closed, slider locked”
  - Tether Shuttle – Crew Report: “Slider locked”
- Equipment Tether Discipline
  - “Make before you break”
  - Check all gates closed
- Both SAFER valves down at egress
  - Crew Report: “Both handles down”
- APFR locking collar Black-on-black and pull test
  - Crew Report: “Black-on-black, good pull test”
- PGT Green light on for bolt engage
  - May get Lo Torque msg at bolt release
  - Crew Report: “XX turns, XX ft-lb, green light”
- Connectors for no bent pins, no FOD, check EMI band and inhibits in place
  - EV Report: “Pins good, no FOD, Good EMI Band”
  - IV: “MCC Are inhibits in place?”
- Tethers and Tools clear prior to SSRMS ORU movement
  - Each EV report: “Tethers and tools clear”
- Tool inventory (when leaving worksite)
  - Bags: EV call out items, IV check off on Tool Matrix
  - MWS: EV call out, BRT – MWS – Swing Arm
  - Confirm all changes from the checklist are accounted for
## EVA 3 INHIBIT PAD

### Orbiter

#### KU-BAND ANTENNA

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

#### RCS

If EV crew < 27 ft from FRCS

**IV**
1. √DAP: VERN, FREE, LO Z (flt specific check with GNC)
2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF
3. √LOGIC (four) – OFF

**MCC-H**
3. √Above RCS config

**IV**
4. √RCS F – ITEM 1 EXEC (*)
   1. √JET DES F1U – ITEM 17 (*)
   2. √F3U – ITEM 19 (*)
   3. √F2U – ITEM 21 (*)

#### S-BAND ANTENNAS

**NOTE**
Possible loss of comm when forced LL FWD antenna

**IV**
If EV crew < 2 ft from S-Band antenna

**A1R**
1. S-BAND FM ANT – XMIT LOWER/RCVR UPPER
2. √MCC, lower antenna selected

If no comm, or on MCC GO

**C3**
3. S-BAND PM ANT – LL FWD
   When EVA crewmember at least 2 ft away from all S-Band upper antennas

### RSOS

#### All EVAs

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

### Ground

#### All EVAs

**Ground Radar**

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

### USOS

#### PCU

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

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

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

#### S3 SARJ

**MCC-H**
1. S-BAND FM ANT – XMIT LOWER/RCVR UPPER
2. √MCC, lower antenna selected

**C3**
3. S-BAND PM ANT – LL FWD
   When EVA crewmember at least 2 ft away from all S-Band upper antennas

#### SM Antennas

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

### COL

#### EuTEF

**C3-CC**
Verify PLEGPay Power Status (ETF_PLEGPAY_Pwr_Stat) – OFF

---

FS 7-76  EVA/126/FIN
EVA 3 NOTES/CAUTIONS/WARNINGS

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

CAUTION

ISS Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture shafts (drylube)
   2. PIP pins
   3. CETA Lights (Z-93 paint) [S1]
   4. Passive UMAs
   5. Deployed TUS cable [Nadir CETA rail]
   6. ETCS Radiator flexhoses and panels [S1,P1]
   7. EETCS/PV Radiator flexhoses, bellows and panels [P6,P4,S4,S6]
   8. SASA RF Group [S1,P1]

B. Electrical cables
   1. Avoid bend radii < 10 times cable diameter

C. Fluid line flex hoses and QDs
   1. Avoid bend radii < 5 in for hoses with diameter < 1 in on LAB, S0, S1, P1, and 10 in for hoses with diameter < 1 in on all other elements
   2. Avoid bend radii < 14 in for hoses with a diameter ≥ 1 in
   3. Additional care should be taken not to exceed bend radii when applying loads at the flexible hose to rigid tube stub interfaces
   4. Ensure fluid QD booties are fully closed prior to leaving worksite; wire tie if reqd

ISS Constraints (Cont)

D. For structural reasons
   1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
   2. Avoid performing shaking motions (sinusoidal functions) more than four cycles
   3. Avoid kicking S1/P1 radiator beam.
   4. If any of these occur, wait 2 to 5 min to allow structural response to dissipate

E. SARJ Hardware
   1. During MLI cover fastener release: Limit turn count to minimum required, minimize side loading bolt head, and maintain axial force on fastener to compress spring during rotation
   2. Avoid scratching or nicking the Race Ring while working on repair
   3. Two TBAs can only be out at the same time at 90, 120, or 180 deg
   4. Port SARJ must be locked for EVA ops outboard of starboard AJIS Struts

F. Other
   1. MLI handholds are not rated for crewmember translation loads

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

CAUTION

ISS Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture shafts (drylube)
   2. PIP pins
   3. CETA Lights (Z-93 paint) [S1]
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   3. Additional care should be taken not to exceed bend radii when applying loads at the flexible hose to rigid tube stub interfaces
   4. Ensure fluid QD booties are fully closed prior to leaving worksite; wire tie if reqd

ISS Constraints (Cont)

D. For structural reasons
   1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
   2. Avoid performing shaking motions (sinusoidal functions) more than four cycles
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   1. During MLI cover fastener release: Limit turn count to minimum required, minimize side loading bolt head, and maintain axial force on fastener to compress spring during rotation
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   3. Two TBAs can only be out at the same time at 90, 120, or 180 deg
   4. Port SARJ must be locked for EVA ops outboard of starboard AJIS Struts

F. Other
   1. MLI handholds are not rated for crewmember translation loads
ISS Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture targets and target pins
   2. Stay inboard of SARJ when active
   3. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate

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

C. Pinch
   1. NZGL connector linkage. Use caution when mating/locking
   2. EV side of IV Hatch during Hatch operation (also snag hazard) [A/L]

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

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

F. Sharp Edges
   1. Inner edges of WIF probes
   2. APFR active WIF probes
   3. Mating surfaces of EVA connectors
   4. Spring loaded captive EVA fasteners (e.g., 6B-boxes, SARJ Covers); the end of the spring may protrude
   5. Port/Aft portion of A/L circular HR [HR 0506]

G. Thermal
   1. EVA connectors with booties may become hot if left uncovered. Handling may need to be limited
   2. Turn off glove heaters when comfortable temp reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on
   3. Uncovered trunnion pins may be hot
   4. Stay ≥ 1 ft away from PMAs and MMOD shields > 270 degF if EMU sun visor up; limit time to 15 min or less if > 300 degF
   5. Stay at least 0.5 ft away from PMA and MMOD shields > 325 degF

H. Electrical Shock
   1. Stay ≥ 2 ft from ungrounded floating connectors if not unpowered

   • MBS Cross-Connect jumpers (translate past these using UMA handrails) Include S0 EVA Power Cables (inside S0 Bay 00 Face 4, Bay 01 Face 3) ESP2 jumper (inside S0 Bay 03 Face 4)

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


WARNING
### IV/SSRMS

<table>
<thead>
<tr>
<th>EV1</th>
<th>EV2</th>
</tr>
</thead>
</table>

### EGRESS (00:15)

1. Transfer Med ORU Bag to EV2
2. Egress A/L with Large ORU Bag
3. SAFER MAN ISOL vlv – Open (down)
4. SAFER HCM – Closed (down)
5. Receive Med ORU Bag from EV1; stow on BRT
6. Translate to S0 Tether Shuttles
7. Retrieve Tether Shuttles (2)
8. Install EV2 Tether Shuttle onto nadir CETA rail (stbd); verify Locked
9. Install EV1 Tether Shuttle onto nadir CETA rail (port); verify Locked
10. Attach EV2 85-ft Safety Tether to Tether Shuttle
11. Verify locking hooks – Gate Closed, Slider Locked
12. Attach EV1 85-ft Safety Tether to Tether Shuttle
13. Verify locking hooks – Gate Closed, Slider Locked
14. **Give EV1 GO** to disconnect waist tether

### SETUP (00:15)

8. Translate to S3 SARJ; fairlead around S3 trunnion pin
9. Perform Glove Inspection
10. Stow Large ORU Bag on S3 HR 3043; open lid straps to S3 HR 3041 (Face 4)

### EGRESS (00:15)

1. Open A/L thermal cover
2. Egress A/L
3. SAFER MAN ISOL vlv – Open (down)
4. SAFER HCM – Closed (down)
5. Receive Med ORU Bag from EV1; stow on BRT
6. Translate to S0 Tether Shuttles
7. Retrieve Tether Shuttles (2)
8. Install EV2 Tether Shuttle onto nadir CETA rail (stbd); verify Locked
9. Install EV1 Tether Shuttle onto nadir CETA rail (port); verify Locked
10. Attach EV2 85-ft Safety Tether to Tether Shuttle
11. Verify locking hooks – Gate Closed, Slider Locked
12. Attach EV1 85-ft Safety Tether to Tether Shuttle
13. Verify locking hooks – Gate Closed, Slider Locked
14. **Give EV1 GO** to disconnect waist tether

### SETUP (00:15)

15. Translate to S3 SARJ
16. Perform Glove Inspection
17. Secure Tether Shuttle in place via wire tie
18. Stow Med ORU Bag on S3 HR 3046 and 3038 (Face 1)
### S3 SARJ WORK

Refer to **STBD SARJ CUE CARD**, FS CC 7-35, for SARJ checklist:
- Covers 13/14 and TBA 1
- Covers 15/16 and TBA 2
- Covers 17/18 and TBA 3
- Cover 8 (If reqd)
- Install Cover 20 with EV2

Refer to SARJ – TBA REMOVE/INSTALL, FS 7-19, for steps to remove and install a TBA

Refer to SARJ – CLEAN/LUBE RACE RING, FS 7-20, for steps to clean and to lubricate the race ring

### SARJ BAG PACKING

1. Stow Fish Stringer Tether in Large ORU Bag
2. Verify TBA Bags are rolled and folded
3. Perform Final Bag inventory

### S3 SARJ WORK

Refer to **STBD SARJ CUE CARD**, FS CC 7-35, for SARJ checklist:
- Covers 19/20 and TBA 4
- Covers 20/21 and TBA 5 (Bearing Package Only)
- Covers 22/1 and TBA 6 (Bearing Package Only)
- Covers 2/3 and TBA 7
- Install Cover 20 with EV1

Refer to SARJ – TBA REMOVE/INSTALL, FS 7-19, for steps to remove and install a TBA

Refer to SARJ – CLEAN/LUBE RACE RING, FS 7-20, for steps to clean and to lubricate the race ring

### SARJ BAG PACKING

1. Stow Fish Stringer Tether in Med ORU Bag
2. Verify TBA Bags are rolled and folded
3. Perform Final Bag inventory
### EVA 3 CLEANUP/INGRESS (00:30)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>CLEANUP (00:15)</th>
<th>EV1</th>
<th>EV2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Perform prior to crew ingress: WVS PWRDN (PHOTO/TV, WVS CUE CARD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CLEANUP (00:15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Perform Tool inventory</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Retrieve Large ORU Bag; stow on BRT</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Translate to A/L; fairlead Safety Tether as reqd</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>INGRESS (00:15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Open thermal cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Attach Waist Tether to Airlock D-ring extender; verify locking hook – Gate Closed, Slider Locked</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. <strong>Give EV2 GO</strong> to attach to EV1’s 85-ft Safety Tether</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. Stow Large ORU Bag in A/L</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. Receive Med ORU Bag; stow in A/L</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. <strong>Give EV2 GO</strong> to ingress</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10. Remove SCU from stowage pouch Remove DCM cover Connect SCU to DCM, check locked</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11. Water – OFF (fwd); expect “H2O IS OFF” msg</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CAUTION

Do not close hatch until EMU water off for 2 min

| | EV2 |
| | CLEANUP (00:15) | |
| | 1. Perform Tool inventory | |
| | 2. Retrieve Med ORU Bag; stow on BRT | |
| | 3. Translate to S0 | |
| | INGRESS (00:15) | |
| | 4. **On EV1 GO**, perform Safety Tether swap onto EV1’s 55-ft Safety Tether; verify locking hook – Gate Closed, Slider Locked | |
| | 5. Retrieve EV2 85-ft Safety Tether; stow on MWS | |
| | 6. Retrieve Tether Shuttles (2); stow on S0 bracket; verify locked | |
| | 7. Translate to A/L | |
| | 8. Transfer Med ORU Bag to EV2 | |
| | 9. **On EV1 GO**, ingress A/L | |
| | 10. Remove SCU from stowage pouch Remove DCM cover Connect SCU to DCM, check locked | |
| | 11. Water – OFF (fwd); expect “H2O IS OFF” msg | |
| | 12. Close thermal cover, attach Velcro strap | |
| | 13. Verify no hardware blocking hatch | |
| | 14. EV Hatch Handle – verify position per hatch decal | |
| | 15. EV Hatch – close and lock | |
| | 16. Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card) | |
### EVA 3 POST TOOL CONFIG

#### EV1

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

#### EV2

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

#### AIRLOCK CONFIG

- Large ORU Transfer Bag (Heide)
- Adj Equip Tether (on outside)
- Fish Stringer Tether
- TBA Bag
  - TBA Bearing Package (on bag tether)
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
- TBA Bag
  - TBA Bearing Package (on bag tether)
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
- TBA Bag
  - TBA Bearing Package (on bag tether)
  - TBA Dust Cap
  - TBA Mount Package (on bag tether)
- TBA Bag
  - TBA Dust Cap (on bag tether)
  - SARJ Dust Cap (on bag tether)
- Crewlock Bag
  - Adj Equip Tether (2) (on outside)
  - Wire Tie (to secure grease gun)
  - RET (eq-eq) (on outside)
  - Grease Gun w/Straight Nozzle
  - Wire Tie (to secure grease gun)
  - RET (eq-eq) (on outside)
  - Grease Gun w/J Nozzle
  - Wire Tie (to secure grease gun)
  - RET (eq-eq)
  - Scraper
  - Large Trash Bag
  - Camera (on integral RET)
  - Camera Bracket

#### A/L EXTERIOR

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

### Tether Counts: (Red RETs)

- RETs (eq-eq) = 15
- RETs (PIP Pin) = 2
- Adj Equip Tethers = 10 int/1 ext
## EVA 4 SUMMARY TIMELINE

<table>
<thead>
<tr>
<th>TIME HR : MIN</th>
<th>IV/SRMS</th>
<th>EV2 (Bw)</th>
<th>EV3 (Kb)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>00:00</td>
<td>POST DEPRESS (00:05)</td>
<td>POST DEPRESS (00:05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EGRESS/SETUP (00:30)</td>
<td>EGRESS/SETUP (00:30)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>01:00</td>
<td>REMOVE P3 MLI COVERS (00:45)</td>
<td>REMOVED P3 MLI COVERS (00:30)</td>
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<tr>
<td></td>
<td>Cover 11</td>
<td>Cover 14</td>
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<tr>
<td></td>
<td>Cover 10</td>
<td>Cover 15</td>
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<td></td>
<td>Cover 7</td>
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<td></td>
<td>Cover 6</td>
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<tr>
<td></td>
<td>INSTALL EFBM COVER (00:30)</td>
<td></td>
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</tr>
<tr>
<td>02:00</td>
<td>JEMRMS EE GROUNDING TABS (00:30)</td>
<td>ETVCG INSTALL CP 7 (01:15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03:00</td>
<td>INSTALL JEM HANDRAILS AND WIFS (00:30)</td>
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<tr>
<td></td>
<td>GPS ANTENNA INSTALL (00:45)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>PORT SARJ LUBE – 1st (00:45)</td>
<td>PORT SARJ LUBE – 2nd (00:45)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Expect SARJ at 210°</td>
<td>Expect SARJ at 30°</td>
<td></td>
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</tr>
<tr>
<td>04:00</td>
<td>JEM CLEANUP (00:30)</td>
<td>INSTALL P3 MLI COVERS (01:30)</td>
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<tr>
<td>05:00</td>
<td></td>
<td>TUS CABLE PICTURES (00:25)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>GET-AHEADS (00:25)</td>
<td>GET-AHEADS (00:15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BBC Reconfig (00:10); P-Clamps (00:35); Fluid Line (00:45)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>06:00</td>
<td>CLEANUP/INGRESS (00:25)</td>
<td>CLEANUP/INGRESS (00:25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PREREPRESS (00:05)</td>
<td>PREREPRESS (00:05)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### EVA 4 PRE TOOL CONFIG

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

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

### AIRLOCK CONFIG

#### RET (Lg-eq)
- Large ORU Bag (ETVCG) (Shane)
- Adj Equip Tether (on outside)
- RET (Lg-eq)
- ETVCG
- **NOTE:** Verify connector cover removed
- Round Scoop
- RET (Lg-eq) (for dummy box)

#### RET (eq-eq)
- Large ORU Bag (Steve)
- Adj Equip Tether (on outside)
- Fish Stringer (2 hooks to loops inside bag)
- OI WIF 36
- OIH 1206
- OIH 1204
- OIH 43
- OIH 116
- Medium ORU Bag (Steve – GPS)
- Adj Equip Tether (on outside)
- RET (eq-eq)
- GPS Antenna
- Wire Tie (long)
- Connector Caps (2)
- RET (eq-eq)
- GPS Antenna
- Wire Tie (long)
- Connector Caps (2)

### AIRLOCK CONFIG (Cont)

#### RET (Lg-eq)
- Crewlock Bag (SARJ) (Shane)
- RET (eq-eq) (spare on outside door handle)
- Adj Equip Tether (2) (on outside)
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/Straight Nozzle
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/J Nozzle
- EVA Wipe Caddy (int RET)
- EVA Wipes (6) (dry)
- Large Trash Bag (int RET)
- Camera (on integral RET)
- Camera Bracket

#### RET (Lg-eq)
- Crewlock Bag
- Ratchet Wrench
- Socket Caddy
- 7/16 (wobble) Socket-12 ext
- 7/16 (rigid) Socket-9 ext
- 7/16 (rigid) Socket-2 ext
- IR Camera
  - **NOTE:** Prior to egress, turn Master switch ON. Wait until LED on back of camera is solid green (~45 sec). Hold enable switch UP for 5 sec, verify LED – OFF

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

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

---

**P & I**
### AIRLOCK CONFIG (Cont)

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

### AIRLOCK CONFIG (Cont)

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

### EXTERIOR CONFIG

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

- Fish Stringer Tether
- Grease Gun w/Straight Nozzle (spare)
- Grease Gun w/J Nozzle (spare)
- EVA Wipes (5) (dry)
EVA 4 BRIEFING CARD

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

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

General Briefing

1. Hygiene Break & EVA Prep – Suit IV
   - Get-up Plan
   - Prebreath protocol review (Notes and Warnings)
   - Equipment lock activities – IV responsibilities
   - Suit donning plan – special requests
   - SAFER, MWS, Safety tethers, bag stowage
   - Airlock depress review

2. EV Crew Procedure Review – EV CMs
   - Egress Plan, \Safety tethers
   - Review first post-egress steps
   - Order of tasks (summary timeline)
   - Translation plan, fairleads, and tether swaps
   - Hazards
   - Ingress Plan

3. Other Procedure Review – Task IV
   - Get-ahead tasks
   - Constraints – ground and flight
   - Notes, Cautions, and Warnings review
   - Contingency procedures – cribsheet

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

5. Robotics – M1/M2
   - SRMS/SSRMS initial position, maneuvers, clearances
   - Coordinate Frames
   - SRMS/SSRMS comm protocol review – expected calls, use first names
   - GCA – Give direction and approx distance
   - Positive handover who is giving GCA
   - Cameras

6. Emergencies Review – Suit IV/Task IV
   - Emergency suit doff and power down
     - \Expedited Suit Doffing cue card pre-positioned for EVA day
   - Loss of comm
   - EMU malfunctions
   - Lost tools
   - Lost crewmember
   - DCS
   - Abort and Terminate scenarios, protocols
   - Hand signal reviews

7. Post EVA – Suit IV
   - Suit doffing responsibilities
   - Post EVA plan

8. Reminders – Task IV
   - Translate slow (then space is like water). Relax grip
     - Be extra careful on non-standard routes or orientations
     - Don’t hop
   - Monitor safety tether
   - Prior to moving and ingress, \BRT & Swingarm stowed
   - If you get a mal, read the caution and warning message so everyone knows what it is
   - Be disciplined when tired
   - Openness: When you have boot or glove pain let us know
   - OK for IV and ground to check on us. If you need update, ask
   - Let mistakes pass
   - Manage frustration (slow down, if needed)
   - Cold soak before ingress
   - Verify PGT settings. PGT collars are easy to bump
   - Translation Adaptation plan
EVA 4 BRIEFING CARD (Cont)

Generic Calls:
- **Day/Night Cycles**:
  - √ Lights, visors, gloves, tethers, and tools
  - Glove Checks: Report any damaged/missing RTV, Vetran condition
- **Tether swaps:**
  - Crew Report: "Gate closed, slider locked"
  - Tether Shuttle – Crew Report: “Slider locked”
- **Equipment Tether Discipline**
  - “Make before you break”
  - Check all gates closed
- **Both SAFER valves down at egress**
  - Crew Report: “Both handles down”
- **APFR locking collar Black-on-black and pull test**
  - Crew Report: "Black-on-black, good pull test”
- **PGT Green light on for bolt engage**
  - May get Lo Torque msg at bolt release
  - Crew Report: “XX turns, XX ft-lb, green light”
- **Connectors for no bent pins, no FOD, check EMI band and inhibits in place**
  - EV Report: “Pins good, no FOD, Good EMI Band”
  - IV: √MCC "Are inhibits in place?"
- **Tethers and Tools clear prior to SSRMS ORU movement**
  - Each EV report: “Tethers and tools clear”
- **Tool inventory (when leaving worksite)**
  - Bags: EV call out items, IV check off on Tool Matrix
  - MWS: EV call out, BRT – MWS – Swing Arm
  - Confirm all changes from the checklist are accounted for
EVA 4 INHIBIT PAD

Orbiter

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

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

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

Ground

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

USOS

**PCU**
NOTE PCUs may require up to 1 hr warm-up period before they are operational
MCC-H 1. PCUs (two) operational in discharge mode and one of the following:
   a. CCS PCU EVA hazard control FDIR enabled
   b. No more than two arrays unshunted and oriented < 105 deg from the velocity vector
If one or both PCUs failed:
   2. No more than two arrays unshunted and oriented < 105 deg from velocity vector

**Mobile Transporter**
MCC-H 1. MT latched

**TUS**
MCC-H 1. Verify RPCM S04B_F RPC 17 – OPEN

**P3 SARJ**
MCC-H SARJ at 210 deg or 30 deg
1. DLA (1) – LOCKED
2. All motor setpoints set to zero
3. All motors deselected

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

**P1 TRRJ**
1. DLA (1) – LOCKED at 0 deg

**ETVC (prior to ETVCG install)**
MCC-H 1. RPCM P11A_B RPC 2 – Open, Close Cmd Inhibit
2. RPCM P11A_B RPC 12 – Open, Close Cmd Inhibit
3. RPCM P12B_B RPC 1 – Open, Close Cmd Inhibit
4. RPCM P12B_B RPC 13 – Open, Close Cmd Inhibit
### RSOS

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

<table>
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<tr>
<th>IR IMAGERY ON PMA1</th>
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</table>
| FGB Thrusters | MCC-M | 1. FGB MCS unpowered  
|   |   | 2. All FGB Attitude Control Thruster Valves (eighty) – closed  
|   |   | 3. FGB Attitude Control Manifold Valves – closed  
|   |   | КШК1, КШК2, КШК4, КШК5, КШК9, ОКО3, ОКГ3, ОКО6, ОКГ6, ОКО7, ОКГ7, ОКО8, ОКГ8 |

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

| FGB Antennas | MCC-M | 1. FGB KURS P [KUPC P] – Deactivated |


### JEM

| JPM Window | IV | Close JPM window shutters (2) |

| EFBM | IV | √P01B on jumper cable disconnected for BEP |

| SSIPC | PDB A2 RPC01 – Open |

| JEMRMS |  |
| SSIPC | RIP MA Brake – On |

| MDP Main Mode – Stby Mode  
| PDB RMS Ext4 Vout: 0.0V  
| VCU_B TVC WVE Sig Stat – No Signal |

| Signal | VLU EE Pwr – Open  
| JEU Interlock – Inhibit  
| JEU RT – Inhibit  
| MDP Ang/Mtr Cross Ck – Inhibit |

| PROX GPS Antennas (prior to connector mates) |  |
| SSIPC | 1. PDB A2 RPC4 – OPEN  
| 2. PDB B1 RPC5 – OPEN |

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

### COL

| EuTEF |  |
| COL-CC | Verify PLEGPay Power Status (ETF_PLEGPAY_Pwr_Stat) – OFF |
EVA 4 Notes/Cautions/Warnings

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

Caution

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

Caution (Cont)

B. Electrical cables
   1. Avoid bend radii < 10 times cable diameter

C. Fiber optic cables
   1. Avoid bend radii < 10 times cable diameter
   2. Avoid pulling on cable during mate/demate

D. Fluid line flex hoses and QDs
   1. Avoid bend radii < 5 in for hoses with diameter < 1 in on LAB, S0, S1, P1, and 10 in for hoses with diameter < 1 in on all other elements
   2. Avoid bend radii < 14 in for hoses with a diameter ≥ 1 in
   3. Additional care should be taken to not exceed bend radii when applying loads at the flexible hose to rigid tube stub interfaces
   4. Ensure fluid QD booties are fully closed prior to leaving worksite; wire tie if reqd

E. For structural reasons
   1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
   2. Avoid performing shaking motions (sinusoidal functions) more than four cycles
   3. Avoid kicking S1/P1 radiator beam. If any of these occur, wait 2 to 5 min to allow structural response to dissipate
EVA 4 NOTES/CAUTIONS/WARNINGS (Cont)

CAUTION

ISS Constraints (Cont)

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

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

WARNING

ISS Constraints

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

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

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

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

WARNING

ISS Constraints (Cont)

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

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

ISS Constraints (Cont)

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

WARNING

ISS Constraints (Cont)

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

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

Shuttle Constraints

J. Thermal
1. Stay 27 ft from PRCS when powered.
2. Stay 3 ft from VRCS when powered.
3. Stay 3 ft from APU when operating.
### EVA 4 EGRESS/SETUP (00:30)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV2</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Config:</strong></td>
<td>Waist Tether from L D-ring Ext to Airlock D-ring Ext, 85-ft Safety Tether to EV3’s L D-ring Ext</td>
<td></td>
</tr>
</tbody>
</table>

#### EGRESS (00:15)

1. Transfer SARJ Crewlock Bag to EV3
2. Egress A/L
3. Retrieve Large ORU Bag (Handrails and GPS); stow on BRT
4. \(\text{SAFER MAN ISOL} \text{ vlv} \) – Open (down)
5. \(\text{SAFER HCM} \) – Closed (down)

6. **On EV3 GO**, disconnect waist tether
7. Close A/L thermal cover

#### SETUP (00:15)

8. Translate to S0 port strut
9. Stow Large ORU Bag on S0 port strut handrail
10. Translate to P3 SARJ

---

1. Post crew egress:
   - WVS Software:
     - Select page – RF camera
     - Sel ’Advanced Controls’
     - S-Band Level (two) – Max

2. On EV3 GO, disconnect waist tether
3. Close A/L thermal cover
4. Translate to S0 port strut
5. Stow Large ORU Bag on S0 port strut handrail
6. Translate to P3 SARJ

---

1. Open A/L thermal cover
2. Egress A/L
3. \(\text{SAFER MAN ISOL} \text{ vlv} \) – Open (down)
4. \(\text{SAFER HCM} \) – Closed (down)
5. Receive SARJ Crewlock Bag from EV2; stow on BRT
6. Translate to S0 Tether Shuttles
7. Retrieve Tether Shuttles
8. Install EV3 Tether Shuttle onto nadir CETA rail (port); verify Locked
9. Install EV2 Tether Shuttle onto nadir CETA rail (stbd); verify Locked
10. Attach EV3 85-ft Safety Tether to port Tether Shuttle
11. Verify locking hooks – Gate Closed, Slider Locked
12. Attach EV2 85-ft Safety Tether to stbd Tether Shuttle
13. Verify locking hooks – Gate Closed, Slider Locked
14. **Give EV2 GO** to disconnect waist tether

---

15. Translate to P3 SARJ; fairlead Safety Tether as reqd
**EVA 4 REMOVE P3 MLI COVERS (00:45)**

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV2</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. √ Inhibits in place</strong></td>
<td><strong>1. Translate to P3 Port SARJ, Face 6</strong>&lt;br&gt;2. Perform Glove Inspection</td>
<td><strong>1. Translate to P3 Port SARJ, Face 3/4</strong>&lt;br&gt;2. Perform Glove Inspection</td>
</tr>
<tr>
<td><strong>REMOVE P3 MLI Covers (00:45)</strong>&lt;br&gt;3. <strong>REMOVE:</strong> <strong>PGT[A6 8.3 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16</strong>: Release inboard MLI cover fasteners, 9 turns:&lt;br&gt;☐ Cover 7 (P3 HR 3845)&lt;br&gt;☐ Cover 6 (P3 HR 3845 and 3851)&lt;br&gt;☐ Cover 11 (P3 HR 3850)&lt;br&gt;☐ Cover 10 (P3 HR 3843 and diagonal truss)&lt;br&gt;4. Perform Tool Inventory&lt;br&gt;5. Translate to S0 port strut handrail&lt;br&gt;Refer to FS 7-97 for start of JAXA tasks</td>
<td><strong>REMOVE P3 MLI Covers (00:30)</strong>&lt;br&gt;3. <strong>Stow SARJ Crewlock Bag on P3 HR 3855</strong>&lt;br&gt;4. <strong>REMOVE:</strong> <strong>PGT[A6 8.3 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16</strong>: Release inboard MLI cover fasteners, 9 turns:&lt;br&gt;☐ Cover 14 (P3 HR 3849)&lt;br&gt;☐ Cover 15 (P3 HR 3848)&lt;br&gt;5. Retrieve spare RET from SARJ Crewlock Bag as reqd&lt;br&gt;6. Retrieve EVA wipe from wipe caddy&lt;br&gt;7. Stow large trash bag outside of Crewlock Bag&lt;br&gt;Refer to FS 7-95 for steps to lubricate the inner canted surface&lt;br&gt;Refer to FS 7-96 for steps to lubricate the datum A and outer canted surfaces</td>
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</tbody>
</table>

**CAUTION**<br>To prevent loss of inboard MLI cover fasteners during removal:<br>Limit turn count to minimum required for fastener release<br>Minimize side loading bolt head<br>Maintain axial force on fastener to compress spring during rotation
INNER CANTED SURFACES (00:20)

1. Retrieve J-hook nozzle gun
2. Prep J-hook nozzle gun:
   a. Engage teeth by rotating plunger 180 deg (black triangle up)
   b. Remove MLI tip cover
   c. Rotate shut off knob such that FLOW pointing towards nozzle
3. Grease inner canted surface under Covers 14 and 15 (zenith set)
4. Safe J-hook nozzle gun:
   a. Disengage teeth by rotating plunger 180 deg (black triangle down)
   b. Wipe nozzle as required
5. Translate to Covers 11 and 10 (middle set)
6. Prep J-hook nozzle gun: Engage teeth by rotating plunger 180 deg (black triangle up)
7. Grease inner canted surface under Covers 11 and 10
8. Safe J-hook nozzle gun:
   a. Disengage teeth by rotating plunger 180 deg (black triangle down)
   b. Wipe nozzle as required
9. Translate to Covers 7 and 6 (nadir set)
10. Prep J-hook nozzle gun: Engage teeth by rotating plunger 180 deg (black triangle up)
11. Grease inner canted surface under Covers 7 and 6
12. Safe and stow J-hook nozzle gun:
    a. Disengage teeth by rotating plunger 180 deg (black triangle down)
    b. Rotate shut off knob such that FLOW is perpendicular to nozzle
    c. Wipe nozzle as required
    d. Install MLI tip cover
13. Use dry wipe as required to clean up EMU and tools
14. Stow J-hook nozzle gun on SARJ Crewlock Bag
EVA 4 PORT SARJ LUBE (Cont)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV3</th>
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<tbody>
<tr>
<td><strong>DATUM A/OUTER CANTED SURFACES</strong> (00:25)</td>
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<tr>
<td>1. Retrieve straight nozzle grease gun</td>
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<tr>
<td>2. Prep straight nozzle gun:</td>
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<tr>
<td>a. Engage teeth by rotating plunger 180 deg (black triangle up)</td>
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<tr>
<td>b. Remove MLI tip cover</td>
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<tr>
<td>c. Rotate shut off knob such that FLOW pointing towards nozzle</td>
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<tr>
<td>3. Grease datum A and outer canted surface under Covers 14 and 15</td>
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<tr>
<td>4. Safe straight nozzle gun:</td>
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<tr>
<td>a. Disengage teeth by rotating plunger 180 deg (black triangle down)</td>
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<tr>
<td>b. Wipe nozzle as required</td>
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<td>5. Translate to Covers 11 and 10</td>
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<td>12. Safe and stow straight nozzle gun:</td>
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<td>a. Disengage teeth by rotating plunger 180 deg (black triangle down)</td>
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<td>b. Rotate shut off knob such that FLOW is perpendicular to nozzle</td>
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<tr>
<td>c. Wipe nozzle as required</td>
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<tr>
<td>d. Install MLI tip cover</td>
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<tr>
<td>13. Use dry wipe as required to clean up EMU and tools</td>
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<tr>
<td>14. Stow straight nozzle grease gun on SARJ Crewlock Bag</td>
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Prior to leaving worksite after 1st lubrication:
15. Ensure P3 SARJ interface is clear of all tethers, etc
16. Verify 3 tethers on MWS
17. **Give MCC GO** to rotate P3 SARJ

1. **MCC-H:** **On EV3 GO,** rotate P3 SARJ
### IV/SSRMS

1. Verify with MCC-H JEM Inhibit Pad complete

### EV2

**EFBM COVER REINSTALL (00:30)**

1. Retrieve Large ORU Bag from S0 port strut handrail

   **CAUTION**
   Avoid inadvertent contact with Fluid Tray hardlines

2. Translate to EFBM on port end of JEM
3. Perform Glove Inspection
4. Stow Large ORU Bag on JEM HR 1185
5. Retrieve EFBM center cover from JEM HR 1185 and HR 1179
6. Stow wire tie in trash bag

   **WARNING**
   Avoid pinch point on EFBM capture latch

7. Reinstall center cover
   - □ Four 1/4 turn fasteners
   - □ Verify Velcro config (grounding tabs)
8. Stow adj equip tether on MWS
9. ▲ WVS Survey of EFBM

**JEMRMS GROUNDING TABS (00:30)**

10. Translate to JEMRMS EE
11. BRT to JEM HR 1201

   **CAUTION**
   If JEM RMS movement required, EV crew must stay aft of fwd JEM window

12. Wrap protruding EE grounding tabs (2) around WVE I/F cables
13. Attach grounding tabs (2) to each other via Velcro
14. If reqd, use wire tie around grounding tabs to secure in place
15. ▲ WVS Survey of grounding tabs
16. **Give MCC-H GO** to check grounding tabs
EVA 4 INSTALL JEM HANDRAILS AND WIFs (00:30)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV2</th>
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<td>HR</td>
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</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HR</th>
<th>Mount</th>
<th>Bolt #</th>
<th>Turns</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1116</td>
<td>6 (zenith)</td>
<td>6 (zenith)</td>
<td>5 (nadir)</td>
<td>5 (nadir)</td>
</tr>
<tr>
<td>1204</td>
<td>3 (zenith)</td>
<td>3 (zenith)</td>
<td>4 (nadir)</td>
<td>4 (nadir)</td>
</tr>
<tr>
<td>1206</td>
<td>2 (zenith)</td>
<td>2 (zenith)</td>
<td>1 (nadir)</td>
<td>1 (nadir)</td>
</tr>
</tbody>
</table>
### EVA 4 GPS ANTENNA INSTALL (00:45)

**IV/SSRMS**

1. Verify with MCC-H JEM PROX GPS Antennas Inhibit Pad complete

**EV2**

**GPS ANTENNA INSTALL (00:45)**

1. Translate to JLP HR 1275; fairlead Safety Tether out to center of JLP
2. Stow Med ORU Bag on JLP HR 1275; stow Fish Stringer between GPS antennas

#### CAUTION
Avoid inadvertent contact with GPS Antenna (paint)

3. Remove MLI cover for GPS Antenna A (fwd); stow on Fish Stringer
4. Install GPS Antenna A onto dovetail; perform pull test
5. Verify GPS Antenna tabs (2) are secure (down)
6. Open connector MLI covers for GPS Antenna
7. Remove dust caps (2) and stow on Fish Stringer
8. Release wire tie on cables; secure around P7301 dust cap; stow on Fish Stringer

#### NOTE
For all connector ops, verify pin and EMI band integrity; verify connector free of FOD

9. Mate connectors:
   - P7301\(\rightarrow\)\(\leftarrow\)J7301 (stbd)
10. Reattach MLI covers to P7301 grounding Velcro; black on black
11. Remove P7302 dust cap; stow on Fish Stringer
12. Mate connectors:
    - P7302\(\rightarrow\)\(\leftarrow\)J7302 (port)
13. Reattach MLI covers to P7302 grounding Velcro; black on black
14. Remove MLI cover for GPS Antenna B (stbd); stow on Fish Stringer
15. Install GPS Antenna B onto dovetail; perform pull test
16. Open connector MLI covers for GPS Antenna
17. Remove dust caps (2) and stow on Fish Stringer
18. Release wire tie on cables; secure around P7401 dust cap; stow on RET
19. Mate connectors:
    - P7401\(\rightarrow\)\(\leftarrow\)J7401 (aft)
20. Reattach MLI covers to P7401 grounding Velcro; black on black
21. Remove P7402 dust cap; stow on Fish Stringer
22. Mate connectors:
    - P7402\(\rightarrow\)\(\leftarrow\)J7402 (fwd)
23. Reattach MLI covers to P7402 grounding Velcro; black on black
24. WVS Survey of GPS Antennas A and B
25. Give MCC GO to checkout GPS Antennas

---

**FS 7-99**

EVA/126/FIN
## EVA 4 JEM CLEANUP (00:30)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>JEM CLEANUP (00:30)</strong></td>
<td></td>
</tr>
<tr>
<td>1. Retrieve Med ORU Bag; stow on BRT</td>
<td></td>
</tr>
<tr>
<td>2. Translate to JLP HR 1239</td>
<td></td>
</tr>
<tr>
<td>3. Perform tether swap onto 85-ft Safety Tether; verify locking hooks – Gate Closed, Slider Locked</td>
<td></td>
</tr>
<tr>
<td>4. Stow spare 55-ft Safety Tether outside Med ORU Bag</td>
<td></td>
</tr>
<tr>
<td>5. Stow Med ORU Bag inside Large ORU Bag</td>
<td></td>
</tr>
<tr>
<td>6. Retrieve Large ORU Bag; stow on BRT</td>
<td></td>
</tr>
<tr>
<td>7. Perform Final Bag and Tool inventory</td>
<td></td>
</tr>
<tr>
<td>8. Translate to A/L</td>
<td></td>
</tr>
<tr>
<td>9. Perform Glove Inspection</td>
<td></td>
</tr>
<tr>
<td>10. Open thermal cover</td>
<td></td>
</tr>
<tr>
<td>11. Stow Large ORU Bag in Airlock</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

IR Camera requires 5-min warm up after power up and prior to use

| 12. Retrieve IR Camera Crewlock Bag from Airlock | |
| 13. √sw MASTER – ON, √LED – OFF | |
| 14. Press and release ENABLE switch to initiate camera warmup (IV start 5-min timer), √LED – ON | |
| 15. Restow camera in Crewlock Bag | |
| 16. Stow Crewlock Bag on BRT | |
| 17. Close thermal cover | |

Refer to FS 7-103 for S1/P1 Radiator Imagery steps
# EVA 4 ETVCG INSTALL (01:15)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Verify with MCC-H ETVCG Inhibit Pad in place</td>
<td><strong>CAMERA INSTALL</strong> (01:15)</td>
</tr>
<tr>
<td></td>
<td>1. Translate to P1 CP 7</td>
</tr>
<tr>
<td></td>
<td>2. Tether to dummy box</td>
</tr>
<tr>
<td></td>
<td>3. PGT[B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16: Release dummy box outer bolts (2), ~7-12 turns</td>
</tr>
<tr>
<td></td>
<td>4. PGT[B1 12.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16: Release center jacking bolt, ~24-30 turns</td>
</tr>
<tr>
<td></td>
<td>5. Remove dummy box; temp stow on MWS</td>
</tr>
<tr>
<td></td>
<td>6. Verify blind mate connector on stanchion mount is clear of FOD and debris</td>
</tr>
<tr>
<td></td>
<td>7. Translate to Airlock; open thermal cover</td>
</tr>
<tr>
<td></td>
<td>8. Stow dummy box in Airlock</td>
</tr>
<tr>
<td></td>
<td><strong>CAUTION</strong></td>
</tr>
<tr>
<td></td>
<td>Avoid contact with P1 radiator beam</td>
</tr>
<tr>
<td></td>
<td>Avoid contact with light (Z-93 paint) and camera (silver Teflon)</td>
</tr>
<tr>
<td>2. Start ETVCG thermal clock (02:00 without ORU Bag)</td>
<td>9. Retrieve ETVCG from Large ORU Bag; stow on BRT</td>
</tr>
<tr>
<td></td>
<td>10. Close thermal cover</td>
</tr>
<tr>
<td></td>
<td>11. Translate to P1 CP 7</td>
</tr>
<tr>
<td></td>
<td>12. Perform Glove Inspection</td>
</tr>
<tr>
<td></td>
<td>13. Inspect blind mate connector on stanchion and camera; verify clear of FOD and debris</td>
</tr>
<tr>
<td></td>
<td>14. Install ETVCG on stanchion</td>
</tr>
<tr>
<td></td>
<td>15. Release Round Scoop; temp stow on MWS RET</td>
</tr>
<tr>
<td></td>
<td>16. PGT[A7 9.2 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16: Engage center jacking bolt to torque stall, ~24-30 turns</td>
</tr>
<tr>
<td></td>
<td>17. PGT[A7 9.2 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16: Engage outer bolts (2) to torque stall, ~7-12 turns</td>
</tr>
<tr>
<td></td>
<td>18. Release RET from ETVCG</td>
</tr>
<tr>
<td></td>
<td>19. Take camera pan/tilt lever to UNLOCKED</td>
</tr>
<tr>
<td></td>
<td>20. Release TA clamps (2) on stanchion</td>
</tr>
</tbody>
</table>

### ETVCG Installation:

<table>
<thead>
<tr>
<th>Bolt</th>
<th>Turns</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer (fwd)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer (aft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
NOTE
For all connector ops verify pin and EMI band integrity; verify connector free of FOD

CAUTION
Avoid bend radii < 10 times cable diameter.
Avoid pulling on cable during mate/demate

21. Demate the following caps from Panel A114 (HR 3616/3621); temp stow on MWS
   □ Cap ↔ A114 J4
   □ Dead-face Connector ↔ A114 J3
   □ Dead-face Connector ↔ A114 J2

22. Release stanchion connectors P2, P3, and P4

23. BRT to P1 HR 3621

24. Perform the following connector mates:
   □ P4 ↔ A114 J4
   □ P3 ↔ A114 J3
   □ P2 ↔ A114 J2

25. Install the following caps on stanchion receptacles:
   □ Dead-face Connector ↔ Stanchion J2
   □ Dead-face Connector ↔ Stanchion J3
   □ Cap ↔ Stanchion J4

26. WVS Survey of ETVCG, connectors, and surrounding truss area

27. Give IV GO for ETVCG power-up

28. Perform Bag and Tool inventory

29. If P3 SARJ not in position, perform the following get-aheads as time permits:
   □ Transfer Large ORU Bag to Airlock
   □ Relocate APFR: Lab WIF 7 to P3 WIF 29, report settings
   □ P1-P3 Fluid Jumper Install, FS 7-122
## EVA 4 S1/P1 RADIATOR IMAGERY (01:30)

<table>
<thead>
<tr>
<th>IV</th>
<th>EV2 (BW)</th>
</tr>
</thead>
</table>
| IR Camera Warmup start: ___________ | **NOTE**
| | IR Camera is set to auto stop a movie after 150 frames (75 sec). Each row of 8 panels should be roughly 50 frames |
| | 1. Translate to PMA1 HR0002 for S1 radiator imagery (PMA1 HR0011 for P1) |
| | 2. Reconfigure APFR in PMA1 WIF2: [6,KK,F,12] |
| | 3. Ingress APFR; use Tool Stanchion as reqd (yaw handle) |
| | 4. Retrieve IR Camera from Crewlock Bag |
| | 5. Remove camera lens cover |
| | 6. Set camera focus on middle radiator panels 4 and 5 using arrow keys (can be done during warm up)
| | a. Right arrow Course Focus (+)
| | b. Left arrow Course Focus (-)
| | c. Up arrow Fine Focus (+)
| | d. Down arrow Fine Focus (-) |
| | 7. Verify with IV 5-min camera warmup complete |
| | 8. Perform Flat Field correction (Press and release F/A button) |
| | 9. Record 150-frame movie of radiator:
| | a. Press and release the S/T button to start the movie
| | b. Start with zenith radiator panels 1-8, then middle radiator panels 8-1, and finally nadir radiator panels 1-8
| | c. Pause for 2-3 sec centered on each radiator panel
| | d. The movie will auto stop after 150 frames, or if complete with all panels prior to 150 frames press and release the S/T button to stop the movie |
| | 10. Transfer movie to flash card (Press and hold S/T button. Expect 75 sec to complete the transfer) |
| | 11. Close lens cover |
| | 12. ☐ If daylight present, map radiators with EVA camera |
| | 13. **Give IV GO** for TRRJ rotation |
| | 14. Repeat steps 4-13 for both sides of S1 and P1 radiators; yaw APFR and Tool Stanchion as reqd |
| | When complete with all IR imagery of both S1 and P1 radiators, |
| | 15. Press and hold ENABLE switch for 5 sec to put IR Camera in Standby mode (display reads ‘Shutting down…’ and LED-OFF) |
| | 16. Close lens cover and LCD cover |
| | 17. Stow IR Camera in crewlock bag |
| | Give EV2 25 sec time hacks during movie recording |

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

---

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

1 2 3 4 5 6 7 8

Give MCC GO for TRRJ rotation

<table>
<thead>
<tr>
<th>Radiator Side</th>
<th>IR</th>
<th>Digital</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 RBVM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1 Non-RBVM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1 RBVM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1 Non-RBVM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

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

---

FS 7-103
EVA/126/FIN
### EVA 4 P3 MLI COVER INSTALL (01:30)/TUS CABLE PICTURES (00:25)/GET-AHEAD LIST (02:15)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV2</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Install P3 MLI Covers (01:30)

5. **PGT[A1 2.5 ft-lb, CW2 30 RPM, MTL 30.5]-6ext**
   - 7/16: Engage MLI cover fasteners, 9 turns:
     - Cover 15
     - Cover 14
     - Cover 11
     - Cover 10
     - Cover 7
     - Cover 6

#### TUS Cable Pictures (00:25)

**WARNING**

Do not touch blemishes on zenith TUS cable

7. Translate to starboard side of MT
8. Perform Glove Inspection
9. ![Camera] Take photos of blemishes on zenith TUS cable (daylight opportunity)

#### Get-Ahead List (00:15)

Perform the following Get-Aheads as time permits:

- Starboard SSAS BBC Reconfig, FS 7-119
- Starboard Fluid Jumper Install, FS 7-122
- Starboard FRHC P-Clamps, FS 7-124
- Assist EV3 with installing P3 MLI Covers

---

**GET-AHEAD LIST (00:25)**

Perform the following Get-Aheads as time permits:

- Starboard SSAS BCC Reconfig, FS 7-119
- Starboard Fluid Jumper Install, FS 7-122
- Starboard FRHC P-Clamps, FS 7-124
- Assist EV3 with installing P3 MLI Covers

---

**GET-AHEAD LIST (00:15)**

Perform the following Get-Aheads as time permits:

- Port SSAS BBC Reconfig, FS 7-119 (if not already performed on EVA 2)
- Port Fluid Jumper Install, FS 7-122
- Port FHRC P-Clamps, FS 7-124
## EVA 4 CLEANUP/INGRESS (00:25)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV2</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CLEANUP (00:10)</strong></td>
<td><strong>INGRESS (00:15)</strong></td>
<td><strong>CLEANUP (00:10)</strong></td>
</tr>
<tr>
<td>1. Perform Final Bag and Tool inventory 2. Translate to A/L</td>
<td>3. Open thermal cover 4. Attach Waist Tether to Airlock D-ring extender; verify locking hook – Gate Closed, Slider Locked 5. <strong>Give EV3 GO</strong> to attach to EV2’s 85-ft Safety Tether</td>
<td>1. Perform Final Bag and Tool inventory 2. Translate to S0 CETA Spur</td>
</tr>
<tr>
<td></td>
<td>6. <strong>Give EV3 GO</strong> to ingress 7. Remove SCU from stowage pouch Remove DCM cover Connect SCU to DCM, check locked 8. Water – OFF (fwd); expect “H2O IS OFF” msg</td>
<td></td>
</tr>
<tr>
<td><strong>CAUTION</strong></td>
<td></td>
<td><strong>Do not close hatch until EMU water off for 2 min</strong></td>
</tr>
</tbody>
</table>
EVA 4 POST TOOL CONFIG

EV2
MWS
- BRT (L)
- RET (eq-eq)
- Wire Tie (2)
- T-Bar
- RET (eq-eq) (____)
- RET (eq-eq) w/PIP pin
- Adj Equip Tether (____)
- Wire Tie (2)
- Small ISS Trash Bag
- Swing Arm (R)
- RET (eq-eq)
- PGT
- 7/16 (wobble) Socket-6 ext
- Camera (on integral RET)
- Camera Bracket
- 85-ft Safety Tether (R D-ring Ext)
- Waist Tether (1, L on D-ring Ext)

(2, L on D-ring Ext, R on D-ring)

EV3
MWS
- BRT (L)
- RET (eq-eq) w/PIP Pin
- Wire Tie (2)
- T-Bar
- RET (eq-eq) (____)
- Adj Equip Tether (____)
- Wire Tie (2)
- Small ISS Trash Bag
- Swing Arm (R)
- RET (eq-eq)
- PGT
- 7/16 (wobble) Socket-6 ext
- 85-ft Safety Tether (R D-ring Ext)
- Waist Tether (1, R on D-ring Ext)

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

AIRLOCK CONFIG

- Large ORU Transfer Bag (ETVCG) (Shane)
- Adj Equip Tether (on outside)
- RET (Lg-eq)
- Dummy Box

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

AIRLOCK CONFIG (Cont)

- Crewlock Bag
- RET (eq-eq) (spare on outside door handle)
- Adj Equip Tether (2) (on outside)
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/ Straight Nozzle
- Wire Tie (to secure grease gun)
- RET (eq-eq) (on outside)
- Grease Gun w/J Nozzle
- EVA Wipe Caddy (int RET)
- EVA Wipes (____ dry)
- Large Trash Bag (int RET)
- Camera (on integral RET)
- Camera Bracket
- Adj Equip Tether (____) (from covers)
- RET (Lg-eq)
- Round Scoop

- Crewlock Bag
- Ratchet Wrench
- Socket Caddy
- 7/16 (rigid) Socket-9 ext
- 7/16 (wobble) Socket-12 ext
- 7/16 (rigid) Socket-2 ext
- IR Camera

NOTE: Post ingress, turn Master switch OFF (LED-ON)
EVA 4 EFBM COVER INSTALL – TASK DATA

Estimated Task Duration:

<table>
<thead>
<tr>
<th></th>
<th>With RMS</th>
<th>Without RMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EVA Crew</td>
<td>N/A</td>
<td>00:30</td>
</tr>
<tr>
<td>Two EVA Crew</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Tools:
- EV2
- Adj Equip Tether
- Wire Tie

Notes:
None

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

Warnings:
1. Avoid pinch point on EFBM capture latch

Figure 1. EFBM Covers Removed

Figure 2. EFBM Center Disk Cover Installed

Figure 3. EFBM Center Disk Cover Installed View 2
EVA 4 JEM RMS GROUNDING TABS – TASK DATA

Estimated Task Duration:

<table>
<thead>
<tr>
<th></th>
<th>With RMS</th>
<th>Without RMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EVA Crew</td>
<td>N/A</td>
<td>00:30</td>
</tr>
<tr>
<td>Two EVA Crew</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Tools:
- EV2
- Wire Tie

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

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

Warnings:
None

Figure 1. Grounding Tab Obstructing Camera View

Figure 2. Grounding Tabs

Figure 3. JEM RMS KOZ
EVA 4 GPS ANTENNA INSTALL – TASK DATA

Estimated Task Duration:

<table>
<thead>
<tr>
<th></th>
<th>With RMS</th>
<th>Without RMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EVA Crew</td>
<td>N/A</td>
<td>00:45</td>
</tr>
<tr>
<td>Two EVA Crew</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Tools:

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

EVA Connectors:

<table>
<thead>
<tr>
<th>GPS Antenna</th>
<th>Harness</th>
<th>From</th>
<th>To</th>
<th>Conn Size</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>P7301 – P7351</td>
<td>J1</td>
<td>J7301</td>
<td>25</td>
<td>Power, Data</td>
</tr>
<tr>
<td>A</td>
<td>P7302 – P7352</td>
<td>J2</td>
<td>J7302</td>
<td>25</td>
<td>Power, Data</td>
</tr>
<tr>
<td>B</td>
<td>P7401 – P7451</td>
<td>J1</td>
<td>J7401</td>
<td>25</td>
<td>Power, Data</td>
</tr>
<tr>
<td>B</td>
<td>P7402 – P7452</td>
<td>J2</td>
<td>J7402</td>
<td>25</td>
<td>Power, Data</td>
</tr>
</tbody>
</table>

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

Cautions:
1. Avoid inadvertent contact with GPA Antenna (paint)

Warnings:
None
EVA 4 GPS ANTENNA INSTALL – TASK DATA (Cont)

Figure 1. GPS Antenna MLI Covers

Figure 2. GPS Antenna MLI Covers Opened

Figure 3. Close up of Connector MLI Closed

Figure 4. Close up of Connector MLI Open
Figure 5. GPS Antenna Installed (MMOD Shield, connector MLI not installed)
## EVA 4 ETVCG INSTALL – TASK DATA

### Estimated Task Duration:

<table>
<thead>
<tr>
<th></th>
<th>With RMS</th>
<th>Without RMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EVA Crew</td>
<td>N/A</td>
<td>01:00</td>
</tr>
<tr>
<td>Two EVA Crew</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Tools:

*Can be performed by either crewmember

<table>
<thead>
<tr>
<th>Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV1 (FF)</td>
</tr>
<tr>
<td>EV2</td>
</tr>
<tr>
<td>PGT w/6”ext-7/16”</td>
</tr>
<tr>
<td>Round Scoop</td>
</tr>
<tr>
<td>BRT</td>
</tr>
</tbody>
</table>

### EVA Fasteners:

<table>
<thead>
<tr>
<th>Fastener Name</th>
<th>Head Size</th>
<th>Qty</th>
<th>Install Torque (ft-lb)</th>
<th>Failure Torque (ft-lb)</th>
<th>Turns</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer bolts</td>
<td>7/16&quot;</td>
<td>2</td>
<td>9.2 (release and install)</td>
<td>Release: 14.8 Install: 13.2</td>
<td>6-12 (release and install)</td>
<td>30</td>
</tr>
<tr>
<td>Center (Jack) Bolt</td>
<td>7/16&quot;</td>
<td>1</td>
<td>9.2 (release and install)</td>
<td>Release: 14.8 Install: 13.2</td>
<td>24-30 (release and install)</td>
<td>30</td>
</tr>
</tbody>
</table>

### EVA Connectors:

<table>
<thead>
<tr>
<th>Harness</th>
<th>From</th>
<th>To</th>
<th>Conn Size</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSSA P2</td>
<td>VSSA J2</td>
<td>P1 A114 J2</td>
<td>15</td>
<td>Video, ETVCG Power, luminaire power</td>
</tr>
<tr>
<td>VSSA P3</td>
<td>VSSA J3</td>
<td>P1 A114 J3</td>
<td>13</td>
<td>ETVCG heater power, luminaire heater power</td>
</tr>
<tr>
<td>VSSA P4</td>
<td>VSSA J4</td>
<td>P1 A114 J4</td>
<td>15</td>
<td>Data</td>
</tr>
</tbody>
</table>

### Connector Inhibits:

<table>
<thead>
<tr>
<th>Task</th>
<th>Inhibit</th>
</tr>
</thead>
</table>
| P1 – J1 Blind mate | RPCM P11A_B RPC 2 OPEN AND CLOSE INH  
RPCM P11A_B RPC 12 OPEN AND CLOSE INH  
RPCM P12B_B RPC 1 OPEN AND CLOSE INH  
RPCM P12B_B RPC 13 OPEN AND CLOSE INH |
EVA 4 ETVCG INSTALL – TASK DATA (Cont)

Mass and Dimensions:

<table>
<thead>
<tr>
<th>Item</th>
<th>Mass(lb)</th>
<th>Dimensions (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETVCG</td>
<td>37.5</td>
<td>22.6x9.9x7.5</td>
</tr>
<tr>
<td>Dummy Box</td>
<td>6.85</td>
<td>14.8x10.1x6.3</td>
</tr>
</tbody>
</table>

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

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

Warnings:
None
EVA 4 ETVCG INSTALL – TASK DATA (Cont)

Figure 1. ETVCG (Partially Assembled)

Figure 2. Dummy Box
EVA 4 ETVCG INSTALL – TASK DATA (Cont)

Figure 3. Luminaire
Figure 4. VSSA Stanchion
Figure 5. Close Up of Pan/Tilt Lock
### EVA 4 S1/P1 RADIATOR IMAGERY – TASK DATA

#### Estimated Task Duration:

<table>
<thead>
<tr>
<th></th>
<th>With RMS</th>
<th>Without RMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EV Crew</td>
<td>N/A</td>
<td>01:30</td>
</tr>
<tr>
<td>Two EV Crew</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

#### Tools:
- EV1 (FF)
- IR Camera
- EVA Camera
- BRT

#### EVA Fasteners:

<table>
<thead>
<tr>
<th>Fastener Name</th>
<th>Label</th>
<th>Head Size</th>
<th>Qty</th>
<th>Install Torque (ft-lb)</th>
<th>Release Torque (ft-lb)</th>
<th>Failure Torque (ft-lb)</th>
<th>Turns</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

#### EVA Connectors:

<table>
<thead>
<tr>
<th>Harness</th>
<th>From</th>
<th>To</th>
<th>Clamps (#)</th>
<th>Conn Size</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Foot Restraints:

<table>
<thead>
<tr>
<th>Task</th>
<th>WIF</th>
<th>APFR Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

### Warnings:
None
GET-AHEADS

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

USOS

**P1/P3 BBC CONNECTORS**

<table>
<thead>
<tr>
<th>MCC-H</th>
<th>1. P1 TRRJ – _\sqrt{DLA (1)} LOCKED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. RPCM P13A G RPC 1 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>3. RPCM P13A G RPC 5 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>4. RPCM P13A G RPC 13 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>5. RPCM P13A G RPC 14 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>6. RPCM P13A G RPC 15 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>7. RPCM P12B A RPC 3 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>8. RPCM P12B A RPC 4 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>9. RPCM P12B A RPC 13 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>10. RPCM P14B G RPC 1 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>11. RPCM P14B G RPC 2 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>12. RPCM P14B G RPC 13 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>13. RPCM P14B G RPC 14 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>14. RPCM P14B G RPC 15 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>15. RPCM P11A A RPC 5 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>16. RPCM P11A A RPC 11 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>17. RPCM P11A A RPC 13 – Open, Close Cmd Inhibit</td>
</tr>
</tbody>
</table>

**S3 ZENITH OUTBOARD PAS DEPLOY**

<table>
<thead>
<tr>
<th>MCC-H</th>
<th>1. RPCM S34B_E RPC 1 – Open, Close Cmd Inhibit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. RPCM S34B_E RPC 2 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>3. RPCM S34B_E RPC 3 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>4. RPCM S34B_E RPC 4 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>5. RPCM S33A_E RPC 1 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>6. RPCM S33A_E RPC 2 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>7. RPCM S33A_E RPC 3 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>8. RPCM S33A_E RPC 4 – Open, Close Cmd Inhibit</td>
</tr>
</tbody>
</table>

**USOS**

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

| MCC-H | 1. S1/P1 TRRJ – _\sqrt{DLA (1)} LOCKED at 0° |

**FHRC P-CLAMP RELEASE**

| MCC-H | 1. S1/P1 TRRJ – _\sqrt{DLA (1)} LOCKED at 0° |

**USOS**

**S1/S3 BBC CONNECTORS**

<table>
<thead>
<tr>
<th>MCC-H</th>
<th>1. S1 TRRJ – _\sqrt{DLA (1)} LOCKED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. RPCM S13A G RPC 1 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>3. RPCM S13A G RPC 2 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>4. RPCM S13A G RPC 13 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>5. RPCM S13A G RPC 14 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>6. RPCM S13A G RPC 15 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>7. RPCM S12B A RPC 5 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>8. RPCM S12B A RPC 11 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>9. RPCM S12B A RPC 13 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>10. RPCM S14B G RPC 1 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>11. RPCM S14B G RPC 5 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>12. RPCM S14B G RPC 13 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>13. RPCM S14B G RPC 14 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>14. RPCM S14B G RPC 15 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>15. RPCM S11A A RPC 3 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>16. RPCM S11A A RPC 4 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td></td>
<td>17. RPCM S11A A RPC 13 – Open, Close Cmd Inhibit</td>
</tr>
</tbody>
</table>
**SSAS BBC RECONFIG (00:10 PER TRUSS SIDE)**

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV1/2/3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Inhibits in place before swapping connectors</td>
<td>SSAS BBC CONNECTOR SWAPS (00:10 per truss side)</td>
</tr>
</tbody>
</table>

**NOTE**
For all connector ops verify pin and EMI band integrity; verify connector free of FOD

1. Perform the following demate connectors and swap with terminator caps:
   - S1 to S3:
     - Panel A102 (Zenith):
       - Cap $\leftrightarrow J195$
     - Panel A103 (Nadir):
       - Cap $\leftrightarrow J116$
   - P1 to P3:
     - Panel A102 (Zenith):
       - Cap $\leftrightarrow J195$
     - Panel A103 (Nadir):
       - Cap $\leftrightarrow J195$

2. WVS Survey of BBC Panels
SSAS BBC RECONFIG – TASK DATA

Estimated Task Duration:

<table>
<thead>
<tr>
<th></th>
<th>With RMS</th>
<th>Without RMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EVA Crew</td>
<td>N/A</td>
<td>00:15 (per side)</td>
</tr>
<tr>
<td>Two EVA Crew</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Notes: None

Cautions: None

Warnings: None

Tools:

- EV1/2/3
- RET

EVA Connectors:

<table>
<thead>
<tr>
<th>Truss</th>
<th>Harness</th>
<th>From</th>
<th>To</th>
<th>Conn Size</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1/S3</td>
<td>W5111 – P116</td>
<td>A102/J116</td>
<td>A102/J195</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1/S3</td>
<td>W5112 – P121</td>
<td>A103/J121</td>
<td>A103/J196</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1/P3</td>
<td>W5111 – P116</td>
<td>A102/J116</td>
<td>A102/J195</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1/P3</td>
<td>W5112 – P121</td>
<td>A103/J121</td>
<td>A103/J196</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SSAS BBC Reference:

<table>
<thead>
<tr>
<th>Truss</th>
<th>Inhibits: Panel A102</th>
<th>Inhibits: Panel A103</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1/S3</td>
<td>RPCM S14B G RPC 1</td>
<td>RPCM S13A G RPC 1</td>
</tr>
<tr>
<td></td>
<td>RPCM S14B G RPC 5</td>
<td>RPCM S13A G RPC 2</td>
</tr>
<tr>
<td></td>
<td>RPCM S14B G RPC 13</td>
<td>RPCM S13A G RPC 13</td>
</tr>
<tr>
<td></td>
<td>RPCM S14B G RPC 14</td>
<td>RPCM S13A G RPC 14</td>
</tr>
<tr>
<td></td>
<td>RPCM S14B G RPC 15</td>
<td>RPCM S13A G RPC 15</td>
</tr>
<tr>
<td></td>
<td>RPCM S11A A RPC 3</td>
<td>RPCM S12B A RPC 5</td>
</tr>
<tr>
<td></td>
<td>RPCM S11A A RPC 4</td>
<td>RPCM S12B A RPC 11</td>
</tr>
<tr>
<td></td>
<td>RPCM S11A A RPC 13</td>
<td>RPCM S12B A RPC 13</td>
</tr>
<tr>
<td>P1/P3</td>
<td>RPCM P13A G RPC 1</td>
<td>RPCM P14B G RPC 1</td>
</tr>
<tr>
<td></td>
<td>RPCM P13A G RPC 5</td>
<td>RPCM P14B G RPC 2</td>
</tr>
<tr>
<td></td>
<td>RPCM P13A G RPC 13</td>
<td>RPCM P14B G RPC 13</td>
</tr>
<tr>
<td></td>
<td>RPCM P13A G RPC 14</td>
<td>RPCM P14B G RPC 14</td>
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<tr>
<td></td>
<td>RPCM P13A G RPC 15</td>
<td>RPCM P14B G RPC 15</td>
</tr>
<tr>
<td></td>
<td>RPCM P12B A RPC 3</td>
<td>RPCM P11A A RPC 5</td>
</tr>
<tr>
<td></td>
<td>RPCM P12B A RPC 4</td>
<td>RPCM P11A A RPC 11</td>
</tr>
<tr>
<td></td>
<td>RPCM P12B A RPC 13</td>
<td>RPCM P11A A RPC 13</td>
</tr>
</tbody>
</table>
Figure 1. P1 BBC Connectors

Figure 2. P1 BBC Connectors, A103 Panel

Figure 3. P1 BBC Connectors, Panel A102
**S1/S3 AND P1/P3 FLUID JUMPER INSTALL (00:30)**

<table>
<thead>
<tr>
<th>IV</th>
<th>EV1/EV2/EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IV:</strong> √S1 (P1) TRRJ locked</td>
<td><strong>WARNING</strong> The 2 ft KOZ for the S1 Radiator Beam begins just nadir of the umbilical tray. If TRRJ cannot be locked, then body position must be maintained on tray or zenith</td>
</tr>
<tr>
<td><strong>DEMATE QD</strong></td>
<td><strong>CAUTION</strong> QDs exposed to direct sun can overtemp in 6 min. Shading by EMU or thermal shrouds can lengthen acceptable time with bootie removed</td>
</tr>
<tr>
<td>1. √Fwd white band visible, button up</td>
<td>S1/S3 Fluid Jumper Install (00:30)</td>
</tr>
<tr>
<td>2. Demate QD (pull back on release ring)</td>
<td>1. Translate to S1/S3 Face 6 (nadir) interface</td>
</tr>
<tr>
<td></td>
<td>2. Open shroud on S1 nadir umbilical tray</td>
</tr>
<tr>
<td></td>
<td>3. Open TA clamp</td>
</tr>
<tr>
<td></td>
<td>4. BRT to S1 HR 3215</td>
</tr>
<tr>
<td></td>
<td>5. For QDs F56 &amp; F57, open thermal booties and perform DEMATE QD steps in IV column (removes Fluid Jumper from S1)</td>
</tr>
<tr>
<td></td>
<td>6. Open thermal bootie and remove QD cap from M3 on S1 panel A503; stow in trash bag</td>
</tr>
<tr>
<td></td>
<td>7. Perform MATE QD steps (IV column) to mate QD F57 to M3 on S1 panel A503</td>
</tr>
<tr>
<td></td>
<td>8. For QD F57, perform OPEN VALVE steps (IV column)</td>
</tr>
<tr>
<td></td>
<td>9. Reinstall thermal booties</td>
</tr>
<tr>
<td></td>
<td>10. BRT to S1 HR 3010</td>
</tr>
<tr>
<td></td>
<td>11. Open thermal bootie and remove QD cap from M1 on S3 panel A501; stow in trash bag</td>
</tr>
<tr>
<td></td>
<td>12. Perform MATE QD steps (IV column) to mate QD F56 to M1 on S3 panel A501</td>
</tr>
<tr>
<td></td>
<td>13. For QD F56, perform OPEN VALVE steps (IV column)</td>
</tr>
<tr>
<td></td>
<td>14. Reinstall thermal booties</td>
</tr>
<tr>
<td></td>
<td>15. ✔ Perform WVS survey of jumper connections</td>
</tr>
<tr>
<td></td>
<td>16. Close TA clamp</td>
</tr>
<tr>
<td></td>
<td>17. Replace S1 nadir umbilical tray shroud</td>
</tr>
<tr>
<td></td>
<td><strong>OPEN QD VALVE</strong></td>
</tr>
<tr>
<td></td>
<td>1. Press button, move bail fwd (open valve)</td>
</tr>
<tr>
<td></td>
<td>2. √Aft white band visible, button up</td>
</tr>
<tr>
<td></td>
<td>3. Verify detent button can be depressed</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
S1/S3 AND P1/P3 FLUID JUMPER INSTALL (00:30) (Cont)

**NOTE**

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

Fluid Jumper Install Location (M3)

Ammonia Jumper Connection (S3-A501-M1)
**FHRC P-CLAMP RELEASE**

<table>
<thead>
<tr>
<th>S1 FHRC P-Clamps:</th>
<th>EV2/EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay 13 Hose Box (6)</td>
<td>RELEASE FHRC P-CLAMPS [HOSE BOX]</td>
</tr>
<tr>
<td>Bay 11 Stinger (6)</td>
<td>1. Temp stow any items on BRT prior to ingressing the truss</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>P1 FHRC P-Clamps</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay 14 Hose Box (6)</td>
<td>2. Locate hose box P-Clamps in bay 13/14 (S1/P1)</td>
</tr>
<tr>
<td>Bay 12 Stinger (6)</td>
<td>3. Release hose box P-Clamps (6), ~6-12.5 turns:</td>
</tr>
<tr>
<td></td>
<td>If using ratchet wrench, CCW (remove palm wheel as reqd)</td>
</tr>
<tr>
<td></td>
<td>If using PGT: <strong>PGT[A7 9.2 ft-lb, CCW 30 RPM, MTL 30.5]-6ext 7/16</strong></td>
</tr>
<tr>
<td></td>
<td>4.  <strong>WVS Survey of P-Clamps</strong></td>
</tr>
<tr>
<td></td>
<td>5.  Check SAFER Handles</td>
</tr>
</tbody>
</table>

---

**View from outboard looking inboard**

- S1 FHRC P-Clamps: 1, 2, 3, 5, 6
- P1 FHRC P-Clamps: 1, 2, 3, 4, 5, 6

**Recommended Tools**

<table>
<thead>
<tr>
<th>P-Clamp</th>
<th>Recommended Tools</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Ratchet w/2ext 7/16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PGT w/6ext 7/16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ratchet w/2ext 7/16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ratchet w/2ext 7/16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PGT w/6ext 7/16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ratchet w/2ext 7/16</td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>Ratchet w/2ext 7/16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PGT w/6 ext 7/16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ratchet w/2ext 7/16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ratchet w/2ext 7/16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PGT w/6ext 7/16</td>
<td></td>
</tr>
</tbody>
</table>

- □ = TA Clamp, do NOT release
1. Temp stow any items on BRT prior to ingressing truss
2. Locate torque box P-Clamps
3. Release torque box P-clamps (6), ~7-12.5 turns:
   If using ratchet wrench, CCW (remove palm wheel as required)
   If using PGT: \textbf{PGT[A7 9.2 ft-lb, CCW 30 RPM, MTL 30.5]}
   If using PGT with RAD: \textbf{PGT[A5 7.0 ft-lb, CCW 30 RPM, MTL 30.5]}
4. Perform any necessary tool clean-up to stow additional sockets
5. WVS Survey of P-Clamps
6. Check SAFER handles

\textbf{NOTE}

After EVA 2, CETA Cart 2 will have to be moved further port to have access to torque box P-Clamps.
## FHRC P-CLAMP RELEASE – TASK DATA

### Estimated Task Duration:

<table>
<thead>
<tr>
<th>EV Crew</th>
<th>With SSRMS</th>
<th>Without SSRMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EV Crew</td>
<td>N/A</td>
<td>01:00</td>
</tr>
<tr>
<td>Two EV Crew</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### ORU Specs:

<table>
<thead>
<tr>
<th>ORU</th>
<th>Dimensions (inches)</th>
<th>Mass (lbm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FHRC</td>
<td>60.27 X 30.4 X 36.5</td>
<td>Dry – 397, Wet – 457</td>
</tr>
</tbody>
</table>

### Tools:

<table>
<thead>
<tr>
<th>Tool Description</th>
<th>EV1/2/3</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGT w/6&quot; ext-7/16</td>
<td>2&quot; ext 7/16</td>
</tr>
<tr>
<td>Ratchet Wrench</td>
<td>9&quot; ext 7/16</td>
</tr>
<tr>
<td>Socket Caddy</td>
<td></td>
</tr>
</tbody>
</table>

### Fasteners:

<table>
<thead>
<tr>
<th>Fastener Name</th>
<th>Label</th>
<th>Qty</th>
<th>Head Size</th>
<th>Install Torque (ft-lb)</th>
<th>Release Torque (ft-lb)</th>
<th>Failure Torque (ft-lb)</th>
<th>Turns</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hose Box P-Clamps</td>
<td>NA</td>
<td>6</td>
<td>7/16&quot;</td>
<td>5.4 (Ground Install)</td>
<td>9.2 (PGT)</td>
<td>12.6</td>
<td>6-12.5</td>
<td>30</td>
</tr>
<tr>
<td>Torque Box P-Clamps</td>
<td>NA</td>
<td>6</td>
<td>7/16&quot;</td>
<td>5.4 (Ground Install)</td>
<td>9.2 (PGT)</td>
<td>12.6</td>
<td>7-12.5</td>
<td>30</td>
</tr>
</tbody>
</table>

### Notes:

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

### Cautions:

None

### Warnings:

None
Figure 1. Hose Box P-Clamps

Figure 2. Torque Box P-Clamps have Arrow Labels on Torque Box
**S3 ZENITH OUTBOARD CAS DEPLOY**

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV1/EV2</th>
<th>EV2/EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Verify S3/S4 SARJ locked with MCC-H</td>
<td></td>
<td>NOTE</td>
</tr>
<tr>
<td>2. (\text{MCC-H PAS inhibits in place:})</td>
<td></td>
<td>The following steps to prep for CAS deploy may be done by a single crewmember, in any order</td>
</tr>
<tr>
<td>RPCM S34B_E RPC 1 – Open, Close Cmd Inh</td>
<td></td>
<td>CAS PREP</td>
</tr>
<tr>
<td>RPC 2 – Open, Close Cmd Inh</td>
<td></td>
<td>1. Remove/swivel deploy clevis bracket:</td>
</tr>
<tr>
<td>RPC 3 – Open, Close Cmd Inh</td>
<td></td>
<td>□ PGT[B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16: Release deploy clevis fasteners (4), 10 turns on all bolts except bolt 4, 8 turns</td>
</tr>
<tr>
<td>RPC 4 – Open, Close Cmd Inh</td>
<td></td>
<td>□ Swivel deploy clevis bracket clear, use RET to S3 HR 3056 to stow bracket</td>
</tr>
<tr>
<td>RPCM S33A_E RPC 1 – Open, Close Cmd Inh</td>
<td></td>
<td>2. Remove hinge line ADPs (2), insert in stowage hole, (\sqrt{\text{lock bracket engaged}})</td>
</tr>
<tr>
<td>RPC 2 – Open, Close Cmd Inh</td>
<td></td>
<td>□ Inboard</td>
</tr>
<tr>
<td>RPC 3 – Open, Close Cmd Inh</td>
<td></td>
<td>□ Outboard</td>
</tr>
<tr>
<td>RPC 4 – Open, Close Cmd Inh</td>
<td></td>
<td>3. Release SARJ brace:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ PGT[B6 24.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16: Release SARJ brace cup-cone bolt, 35 turns, do not exceed 37 turns</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Release SARJ brace launch restraint bolt, 1-3 turns ccw</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Attach SARJ brace to diagonal strut, hand tighten launch restraint bolt 1 turn cw</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CAUTION</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do not lift diagonal brace more than (\sim 7) deg out of rotation plane to prevent damage to hinge end</td>
</tr>
<tr>
<td>4. PGT[B6 24.0 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16: Release SARJ diagonal strut cup-cone bolt, 35 turns, do not exceed 37 turns</td>
<td></td>
<td>4.</td>
</tr>
<tr>
<td>5. Move diagonal strut; temp stow clear using RET to S3 HR 3040</td>
<td></td>
<td>5.</td>
</tr>
<tr>
<td>6. Attach adj/gap spanner/adj to S3 HR 3047</td>
<td></td>
<td>6.</td>
</tr>
<tr>
<td>7. Route adj/gap spanner/adj to yoke</td>
<td></td>
<td>7.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CAUTION</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When attempting to remove the yoke PIP pin and ADP, do not impart more than 10 lbf</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yoke ADP does not have stowage hole. Do not close ADP lock bracket when ADP is not inserted in a stowage/clevis hole</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8. Release the yoke PIP pin; secure using pre-installed wire tie</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9. Release ADP; secure using pre-installed wire tie</td>
</tr>
</tbody>
</table>
### S3 ZENITH OUTBOARD CAS DEPLOY (Cont)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>CAS DEPLOY</th>
<th>EV1/EV2</th>
<th>EV2/EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NOTE</strong></td>
<td>The following tasks for CAS deploy require two crewmembers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Record torque and turns for stow clevis bracket:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bolt#</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Torque</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turns</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Record torque and turns for deploy clevis bracket:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bolt#</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Torque</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turns</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Record torque and turns for brace and diagonal strut:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagonal Strut</td>
<td>Torque</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SARJ Brace</td>
<td>Turns</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Swing yoke inside truss to provide room for removal of stow clevis bracket
2. **PGT[B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16**: Release stow clevis fasteners (4), 10 turns on all bolts except bolt 7, 8 turns
3. Swivel stow clevis bracket clear, tether to structure as reqd
4. Once yoke clear, finger start all stow clevis bracket bolts (4), 1-2 turns
5. **PGT[B2 16.0 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16**: Engage stow clevis bolts (4), 10 turns, to hardstop
6. Orient deploy clevis bracket with alignment marks
7. Finger start all deploy clevis bracket bolts (4), 1-2 turns
8. **PGT[B2 16.0 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16**: Engage deploy clevis bolts (4), 10 turns, to hardstop
9. **PGT[RCW, MTL 30.5]-6ext 7/16**: Engage deploy clevis bracket bolts (4), two clicks each bolts
10. Release RET on diagonal strut; rotate to install
11. Pull yoke gap spanner to unfold yoke
12. Rotate CAS out of detent
13. Lower yoke into deploy clevis
14. Release wire ties securing PIP pin and yoke ADP
15. Install yoke ADP, vlock bracket engaged
16. Install yoke PIP pin
17. Retrieve adj/gap spanner/adj

1. Deploy CAS to detent, tend with adj/gap spanner/adj, lead with yoke (10 deg past vertical)
2. Assist EV2 with diagonal strut reposition
3. Release adj/gap spanner/adj on S3 HR 3047 (leave on yoke), temp stow free end
4. **PGT[B2 16.0 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16**: Engage diagonal strut cup-cone bolt to hard stop, ~38 turns
5. Release SARJ brace launch restraint bolt, 1 turn
6. Rotate SARJ brace away from diagonal strut
7. Re-insert launch restraint bolt, hand tighten 1 turn
8. **PGT[B2 16.0 ft-lb, CW3 60 RPM, MTL 30.5]-6ext 7/16**: Engage SARJ brace cup-cone bolt to hardstop, ~38 turns
### S3 ZENITH OUTBOARD CAS DEPLOY (Cont)

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV1/EV2</th>
<th>EV2/EV3</th>
</tr>
</thead>
</table>
| 6. Perform RTL verification  
7. Notify EV: RTL verification complete | | |

**NOTE**

The following steps for CAS cleanup may be done by a single crewmember or both crewmembers

---

**CAS CLEANUP**

1. Translate to each guide vane (3) and perform the following:
   - Remove launch restraint PIP pin from guide vane, stow in trash bag
   - Inform MCC-H/IV: Ready for RTL checkout
   - On IV GO: Depress and hold RTL for 15 seconds, then release
   - On IV GO: Move to next guide vane
2. Translate to CAS UMA
3. Tether to EVA OVERRIDE anti-rotation cap hitch pin; remove
4. Remove anti-rotation cap; stow in trash bag
5. Fold MLI target cover back
6. WVS Survey of S3 Zenith Outboard PAS
## S3 ZENITH OUTBOARD CAS DEPLOY – TASK DATA

### Estimated Task Duration:

<table>
<thead>
<tr>
<th></th>
<th>Without SSRMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EV Crew</td>
<td>NA</td>
</tr>
<tr>
<td>Two EV Crew</td>
<td>01:00</td>
</tr>
</tbody>
</table>

### Tools:

<table>
<thead>
<tr>
<th></th>
<th>EV1</th>
<th>EV2</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGT</td>
<td>PGT</td>
<td>PGT</td>
</tr>
<tr>
<td>7/16-6-in socket ext</td>
<td>7/16-6-in socket ext</td>
<td>Adj - 45-72 in Gap Spanner (Large) - Adj</td>
</tr>
</tbody>
</table>

### EVA Fasteners:

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

### Inhibits:

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

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

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

### Warnings:

---

FS 7-131

EVA/126/FIN
S3 ZENITH OUTBOARD CAS DEPLOY – TASK DATA (Cont)

- Direction of ADP insertion
- Red arrows indicate direction of ADP insertion
- Hinge Line ADP Orientation
DEPLOYED UCCAS
Active UMA EVA Override with Anti-Rotation Cap

EBCS Target with Cover

Launch Restraint PIP pin

RTL lever

Guide Vane and RTL lever

Deploy Clevis

Stow Clevis

Adjustable Diameter Pin (ADP)

Velcro Release strap

Deployed and Stowed Clevis Brackets (looking from zenith)
Diagonal and SARJ braces and cup-cones

ADP Stowage hole

Adjustable Diameter Pin (ADP) and stowage hole (hinge side)
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA)</td>
<td>8-2</td>
</tr>
<tr>
<td>PGT CHECKOUT</td>
<td>8-3</td>
</tr>
<tr>
<td>PGSC-PGT CONNECTION (A31P AND 760XD)</td>
<td>8-4</td>
</tr>
<tr>
<td>PROGRAM PGT SETTINGS</td>
<td>8-5</td>
</tr>
<tr>
<td>DOWNLOAD/ERASE EVENT LOG</td>
<td>8-5</td>
</tr>
<tr>
<td>PGT CONTINGENCIES</td>
<td>8-6</td>
</tr>
<tr>
<td>PGT STANDARD SETTINGS</td>
<td>8-7</td>
</tr>
<tr>
<td>ULF2 J NOZZLE GREASE GUN PREP FOR EVA 1</td>
<td>FS 8-9</td>
</tr>
<tr>
<td>ULF2 GREASE GUN CARTRIDGE SWAP</td>
<td>FS 8-10</td>
</tr>
<tr>
<td>ULF2 TOOL STOW FOR MPLM TRANSFER</td>
<td>FS 8-13</td>
</tr>
<tr>
<td>APFR MANAGEMENT – STS-126/ULF2</td>
<td>FS 8-14</td>
</tr>
<tr>
<td>SAFETY TETHERS – STS-126 (ULF2)</td>
<td>FS 8-15</td>
</tr>
<tr>
<td>TOOLBOX STOWAGE – STS-126 (ULF2)</td>
<td>FS 8-16</td>
</tr>
<tr>
<td>TOOLBOX PANEL AND SLOT LABELS</td>
<td>FS 8-17</td>
</tr>
<tr>
<td>Z1 TOOLBOX INTERNAL LAYOUT</td>
<td>FS 8-18</td>
</tr>
<tr>
<td>AIRLOCK TOOLBOX INTERNAL LAYOUT</td>
<td>FS 8-19</td>
</tr>
</tbody>
</table>
PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA)

Centerline Latch Tools (2)
3-Pt Latch Tools (2)
Adjustable tethers (2)
RMS Rope Reel

To access PAD and PBA socket, pull this cushion out (cushion is tethered)

This volume is flown empty

Forward Tray layout and Labels
Aft Tray Layout and Labels
1. Retrieve J Nozzle Grease Guns (2), J Nozzle Valves (2), and full grease cartridges (2) from shuttle transfer items (transferred in Large ORU Bag and 3 CTB)
2. Remove the grease cartridges from the ziplock bags; label one ziplock “1”
3. Remove MLI cover from grease gun
4. Unscrew grease cartridge housing from the trigger assembly (ccw)
5. Fully retract plunger
6. Remove red flange cap from grease cartridge; stow in ziplock “1”
7. Install grease cartridge into grease gun housing, leaving red tip cap on cartridge
8. Screw trigger assembly onto grease gun housing (cw at least 1.5 turns)
9. Verify plunger disengaged (black triangle down)
10. Remove red tip cap (ccw, use Allen wrench if reqd from NOD1D4_G2 in Drawer 4); stow in ziplock “1”
11. Install nozzle/shutoff valve (cw), attempt to install so nozzle is straight vertical on grease gun
12. Verify valve closed (shutoff knob perpendicular to nozzle)
13. Install MLI cover on grease gun
14. Install MLI tip cover
15. Verify zip tie not visible (MLI should cover zip tie head; see figure 2)
16. Repeat steps 3 thru 15 for second grease gun
17. Prime both grease guns by disengaging plunger and gently pushing fwd on back of triangle until resistance met
18. Stow ziplock “1” in trash for return on ULF2

Figure 1. Grease Cartridge Nomenclature

Figure 2. Zip-tie Configuration
During each EVA Tool Config, perform following steps for each grease gun:

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

![Figure 1. Measurements taken from here to here](image1)

![Figure 2. Grease Scale](image2)

![Figure 3. Empty grease cartridge](image3)

**NOTE**
Plunger drive shaft is partially visible when cartridge is empty
ULF2 GREASE GUN CARTRIDGE SWAP (Cont)

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

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

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

2. Retrieve following hardware from the staged ULF2 tools:
   a. Full grease cartridge
   b. Dry towel
   c. Ziplock bags (2); label ziplock bags “1” and “2”
3. Retrieve Nitrile gloves (NOD1O4_C1, CTB 1125); don Nitrile gloves
4. Verify plunger disengaged (black triangle down)
5. Verify valve closed (shutoff knob perpendicular to nozzle)
6. Remove MLI cover from grease gun
7. Fully retract plunger
8. Remove nozzle/shutoff valve from used cartridge (ccw); note valve will be full of grease
9. Wipe any excess grease around nozzle using towel; stow towel in ziplock “1”
10. Temp stow nozzle/shutoff valve in ziplock “2”
11. Unscrew grease cartridge housing from trigger assembly (ccw)
12. Remove used cartridge from grease gun housing; stow in ziplock “1” if < 1/4 full, and in ziplock “2” if > 1/4 full
13. Doff Nitrile gloves; stow in ziplock “1”
14. Remove red flange cap from new grease cartridge; stow in ziplock “2” (if used grease cartridge in ziplock “2”, stow on the used grease cartridge)
15. Install grease cartridge into grease cartridge housing, leaving red tip cap on cartridge
16. Screw trigger assembly onto grease gun housing (cw at least 1.5 turns)
17. Verify plunger disengaged (black triangle down)
18. Remove red tip cap (ccw, use Allen wrench if reqd from NOD1D4_G2 in Drawer 4); stow in ziplock “2” (if used grease cartridge in ziplock “2”, stow on the used grease cartridge)
19. Retrieve nozzle/shutoff valve from ziplock “2”, use towel from ziplock “1” as required
20. Install nozzle/shutoff valve (cw), attempt to install so nozzle is straight vertical on grease gun
21. Verify valve closed (shutoff knob perpendicular to nozzle)
22. Install MLI cover on grease gun
23. Install MLI tip cover
24. Verify zip tie not visible (MLI should cover zip tie head, see figure 5)
25. Prime grease gun by disengaging plunger and gently pushing fwd on back of triangle until resistance met

Cleanup:
26. Stow ziplock “1” in trash for return on ULF2
27. Stow ziplock “2” in mesh bag with tools for EVA
28. Stow grease gun(s) per ULF2 EVA Tool Config
ULF2 GREASE GUN CARTRIDGE SWAP (Cont)

Figure 4. Grease Cartridge Nomenclature

Red Flange Cap

Grease Cartridge

Red Tip Cap

Figure 5. Zip-tie Configuration

Good Config

Bad Config (too much zip tie visible)
ULF2 TOOL STOW FOR MPLM TRANSFER

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

2. Stow following items in TBA CTBs (from MPLM) and TBA foam (from shuttle)

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

   - TBAs w/connector caps (11)
   - TBA Bags (11)

3. Stow following tools in a mesh bag to be transferred to MPLM for return:
   - All ziplock bags from step 1
   - RETs (RED: 8 Lg-eq)
   - RETs (RED: 5 w/PIP pin)
   - 4A SLR and rail stub
   - EFBM Small Petal Covers (4)
   - GPS Antenna Receptacle MLI (2)
   - GPS Antenna jack caps (4)
   - GPS Antenna connector caps (4)
   - EVA Large Trash Bag (1008) (1)
   - 55-ft Safety Tether (Number 72, Lg-sm, s/n 1022)
### APFR MANAGEMENT – STS-126/ULF2

<table>
<thead>
<tr>
<th>APFR DESIGNATOR</th>
<th>APFR 1 (8A, 13A.1 Pitch knob problem)</th>
<th>APFR 2 (US EVA 9 Pitch knob problem, 10A sticky locking collar)</th>
<th>APFR 3 s/n 1005 (no pitch knob prob 9A-inc12 suspected sharp edge on locking collar and possible sticky locking collar)</th>
<th>APFR 4 (TS, old ORU tether, heat shield)</th>
<th>APFR 5 (TS, old ORU tether, heat shield)</th>
<th>APFR 6 (heat shield removed on 12A.1 stage)</th>
<th>APFR 7 s/n 1008</th>
<th>IAPFR 1</th>
<th>IAPFR 2</th>
<th>CRANE (old ORU tether)</th>
<th>TS</th>
<th>ORU stanchion/TERA headless</th>
<th>OTSD</th>
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<tbody>
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<tr>
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CP7 possible: P1 WIF 1 [6, MM, D, 3]
Node 2 WIF 14 (only WIF available for CBM contingencies – with and without WIF Ext)
<table>
<thead>
<tr>
<th>55-ft tethers</th>
<th>85-ft tethers</th>
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<tbody>
<tr>
<td>#59 s/n 1007 Sm-sm</td>
<td>#26 s/n 1002 Lg-sm</td>
</tr>
<tr>
<td>#71 s/n 1021 Lg-sm</td>
<td>#28 s/n 1008 Lg-sm</td>
</tr>
<tr>
<td>#72 s/n 1022 Lg-sm (had 10A – retraction issues)</td>
<td>#21 s/n 1001 (Shuttle safety tethers)</td>
</tr>
<tr>
<td>#73 s/n 1023 Lg-sm (AR written against this one) (1JA – slow retractor)</td>
<td>#24 s/n 1004 (Shuttle safety tethers)</td>
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**Post 124 EVA 3**

<table>
<thead>
<tr>
<th>#59</th>
<th>INSIDE tether staging area</th>
<th>INSIDE tether staging area</th>
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<td>#72</td>
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<tr>
<td>#73</td>
<td>S0 HH 3539 or HH 3530 Tether on 3539 had retracting issues</td>
<td>S0 HH 3539 or HH 3530 Tether on 3539 had retracting issues</td>
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<tr>
<td>#60</td>
<td>S0 HH 3539 or HH 3530 Tether on 3539 had retracting issues</td>
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<tr>
<td>#70</td>
<td>Returns to shuttle</td>
<td>Returned to shuttle</td>
</tr>
<tr>
<td>#66</td>
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**124 Stage**

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<td>Returns on shuttle (MPLM)</td>
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<td>#72</td>
<td>INSIDE tether staging area</td>
<td>INSIDE tether staging area</td>
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<tr>
<td>#73</td>
<td>S0 HH 3539 or HH 3530 Tether on 3539 had retracting issues</td>
<td>S0 HH 3539 or HH 3530 Tether on 3539 had retracting issues</td>
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<tr>
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<td>Remains on shuttle</td>
<td>Remains on shuttle</td>
</tr>
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<td>#66</td>
<td>Remains on shuttle</td>
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<tr>
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**Post 126 EVA 4**

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<td>Returns on shuttle (MPLM)</td>
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<td>INSIDE tether staging area</td>
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<tr>
<td>#73</td>
<td>S0 HH 3539 or HH 3530 Tether on 3539 had retracting issues</td>
<td>S0 HH 3539 or HH 3530 Tether on 3539 had retracting issues</td>
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<td>#66</td>
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<td>INSIDE tether staging area</td>
</tr>
<tr>
<td>#26</td>
<td>Remains on shuttle</td>
<td>INSIDE tether staging area</td>
</tr>
</tbody>
</table>

**NOTE**

During US EVA #8, EV2 reported that her 55-ft safety tether (P/N SEG33106674-307 s/n 1023, #73) was not retracting properly. EV2 attempted to perform the usual technique of pulling out some cable and then letting it reel in, but there came a point when EV2 was neither able to extend or retract the line with 6-8 ft of tether cable still extended. EV2 also cycled the tether from UNLOCK to LOCK and back to UNLOCK, with no joy. The tether was temp stowed as is until later (EV2 was attached to an 85-ft tether at this point.) During EVA cleanup, EV1 attempted to troubleshoot the tether, placing it in LOCK and extending quite a few more feet of cable from the tether. When the tether was placed back in UNLOCK it retracted completely, with a little bit of coaxing for the last couple feet of cable (typical behavior). The tether was brought inside. No further action required.
<table>
<thead>
<tr>
<th>TOOLBOX STOWAGE – STS-126 (ULF2)</th>
</tr>
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<tbody>
<tr>
<td><strong>Z1 PORT TOOLBOX</strong> (MMOD Damage – potential sharp edges) (all slots have sliders)</td>
</tr>
<tr>
<td><strong>SLOT # 1</strong></td>
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<tr>
<td><strong>SLOT # 2</strong></td>
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<tr>
<td><strong>SLOT # 3</strong></td>
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<td><strong>SLOT # 7</strong></td>
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<tr>
<td><strong>SLOT # 8</strong></td>
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<tr>
<td><strong>EXTERNAL</strong></td>
</tr>
</tbody>
</table>

**NOTE**

- 1 SQUARE SCOOP
- D-Handle will not stow on the side of this toolbox due to an interference with the CMG MLI.

FS 8-16 EVA/126/FIN
NOTE

- A/L Toolbox: Slider feature located in center slot only (#3)
- Z1/CETA Toolbox: Slider feature located in all slots
DOORS SHOWN REMOVED AND ROTATED 180° FROM CLOSED POSITION FOR CLARITY.
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
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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(fr)
5. \(\text{EMU O2 ISOL VLV} – \text{OP}\)

AW82B
6. EV1,2 O2 vlv (two) – OP

DCM
7. PWR – SCU

WATER FILL

MO13Q
8. \(\text{ARLK H2O S/O VLV} – \text{OPEN (tb-OP)}\)

R11L
9. \(\text{SPLY H2O TKA OUTLET} – \text{CL (tb-CL)}\)

CRT
10. Use TKB quantity:
PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC

11. Log value before recharge

<table>
<thead>
<tr>
<th>Recharge #</th>
<th>H2O TKB %</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
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<td></td>
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<tr>
<td>4</td>
<td></td>
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<tr>
<td>5</td>
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</tbody>
</table>

AW82D
12. \(\text{EMU 1,2 H2O WASTE} \text{ tb (two) – CL}
SPLY (two) – OP (tb-OP)

13. \(\text{H2O TKB} \text{ quantity decreasing}

**NOTE**
Full charge requires ~15 min

WATER FILL VERIFICATION

DCM
14. \(\text{STATUS: H2O WP} 8-15 \text{ psi and stable for} \sim 30 \text{ sec (indicates charging complete)}\)

CRT
15. Use TKB quantity:
PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC

16. Log value after recharge

<table>
<thead>
<tr>
<th>Recharge #</th>
<th>H2O TKB %</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
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Cont next page
## CONSUMABLES TRACKING CUE CARD

### SAFER usage s/n 1004 & 1007

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<tr>
<th></th>
<th>EMU</th>
<th>LIOH (s/n) (B/C)</th>
<th>METOX (s/n) (B/C)</th>
<th>EMU Battery</th>
<th>REBA (s/n)</th>
<th>HL Battery (s/n)</th>
<th>PGT Battery (s/n)</th>
<th>PGT Battery Spare (s/n)</th>
<th>PWR (s/n)</th>
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<td>Camp</td>
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<td>EMU 3005</td>
<td>N/A</td>
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<td>N/A</td>
<td>0013 7794J</td>
<td>2075</td>
<td>1006</td>
<td>1031/1035</td>
<td>1008</td>
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<tr>
<td>Post</td>
<td></td>
<td>Recharge</td>
<td>Recharge</td>
<td>Recharge</td>
<td>Recharge</td>
<td>1026</td>
<td></td>
<td></td>
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<tr>
<td>Return</td>
<td>EV1 – Pp</td>
<td>EMU 3018</td>
<td>2002</td>
<td></td>
<td>2072</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>EV2 – Bw</td>
<td>EMU 3003</td>
<td>2003</td>
<td></td>
<td>2073</td>
<td></td>
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</tbody>
</table>
# BATTERY RECHARGE CUE CARD

## Use BCMs 2,3,4

<table>
<thead>
<tr>
<th>Day After EVA 1 &amp; 3</th>
<th>Day After EVA 2</th>
<th>Use BCMs 2,3,4</th>
<th>Post EVA 3</th>
</tr>
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<tbody>
<tr>
<td><strong>EMU Batteries</strong></td>
<td><strong>EMU Batteries</strong></td>
<td><strong>Metox Regens</strong></td>
<td><strong>Metox Regens</strong></td>
</tr>
<tr>
<td>s/n 2072, BC 3 CH 4</td>
<td>s/n 2067, BC 3 CH 4</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>s/n 2073, BC 4 CH 4</td>
<td>s/n 2067, BC 4 CH 4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Post EVA 1

- Metox Regens: s/n 0020 b/c 7795J
- Metox Regens: s/n 0021 b/c 7814J

## Post EVA 2

- Metox Regens: s/n 0020 b/c 7795J
- Metox Regens: s/n 0021 b/c 7814J

## Post EVA 3

- Metox Regens: none

---

**From BC3 to REBA 1**: s/n 1011
**From BC4 to REBA 2**: s/n 1004

---

**TOP BACK OF ‘CONSUMABLES TRACKING CUE CARD’**

**EMU Batteries**
- s/n 2072, BC 3 CH 4
- s/n 2073, BC 4 CH 4

**EMU Batteries**
- s/n 2067, BC 3 CH 4
- none

**EMU Batteries**
- s/n 1022, BC 2 CH 1
- s/n 1025, BC 3 CH 3

**EMU Batteries**
- s/n 1028, BC 2 CH 1
- s/n 1031, BC 3 CH 3

**EMU Batteries**
- s/n 1006, BC 2 CH 4
- s/n 1011, BC 3 CH 4

**EMU Batteries**
- s/n 1006, BC 2 CH 4
- s/n 1008, BC 2 CH 5

---

**CHECK BOXES**
- REBA 1
- REBA 2
- BC 1 CH 1
- BC 2 CH 1
- BC 3 CH 1
- BC 4 CH 1
- BC 5 CH 1
- BC 6 CH 1

---

**NOTE**
- Use BCMs 2, 3, 4

---

**EVA-6b/126/O/A**
EMU CONTINGENCY PROCS

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DISPLAY LOSS DURING POWER TRANSFER (WARM RESTART)

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

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

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

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

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

VACUUM H2O RECHARGE (MANNED)

WARNING
Procedure should be used only if performing a contingency EVA

EV 1. Perform AIRLOCK INGRESS, Cuff C/L, 30 (Close hatch, partially engage latches)
2. √Helmet purge vlv – cl, locked
DCM 3. √PURGE vlv – cl (dn)
4. √WATER – OFF
IV MO13Q 5. √ARLK H2O S/O VLV – OPEN (tb-OP)
MD(ftr) 6. √EMU O2 ISOL VLV – OP
ML86B:C 7. √cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – op
AW82B 8. √EV-1(EV-2) O2 vlv – OP
EV AW18H 9. PWR/BATT CHGR EMU 1(2) BUS SEL – MNA(MNB)
DCM 10. PWR – SCU (fwd), WARN TONE
IV R11L If SPLY H2O XOVR VLV closed (tb-CL or bp) (water transfer config):
11. SPLY H2O TKA OUTLET – CL (tb-CL)
If SPLY H2O XOVR VLV open (tb-OP) (nominal config):
L1 12. √RAD CNTLR OUT TEMP – NORM
13. √FLASH EVAP CNTLR PRI A,B (two) – OFF
ML31C 14. SPLY H2O TKD OUTLET – CL (tb-CL)
R11L 15. SPLY H2O TKB OUTLET – CL (tb-CL)
                      √TKA OUTLET – CL (tb-CL)
                      TKC INLET – CL (tb-CL)
                      TKC OUTLET – OP (tb-OP)
<table>
<thead>
<tr>
<th></th>
<th>Croakie</th>
<th>Fresnel Lens</th>
<th>Valsalva</th>
<th>LCVG/BLVD</th>
<th>MAG</th>
<th>TCU Top</th>
<th>TCU Bottom</th>
<th>Comfort Gloves</th>
<th>Socks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pp</strong></td>
<td>No</td>
<td>None</td>
<td>Val (1) -309</td>
<td>03/04</td>
<td>709</td>
<td>M</td>
<td>M</td>
<td>Silver Bio Flat Pattern</td>
<td>Thermax Sock Liners (2 pair, S)</td>
</tr>
<tr>
<td><strong>Kb</strong></td>
<td>No</td>
<td>None</td>
<td>Val (1) -309</td>
<td>05/05</td>
<td>709</td>
<td>M</td>
<td>L</td>
<td>Thick Spectra (M)</td>
<td>Thermax (L)</td>
</tr>
</tbody>
</table>
STS-126 NOMINAL EMU SIZING (Cont)

Bowen (Bw) up

- Helmet: s/n 1074
  - CCA/CCEM – 03/321
  - s/n 1169
- Sizing:
  - SZ 04
    - s/n 382
    - 6LL
    - s/n 6252
- Size:
  - Short
    - None
    - None
  - Long
    - Sz 04
      - s/n 381
      - 6LL
      - s/n 6252
    - Sz 03
      - s/n 234
      - 1.5"
      - s/n 116
      - Sz 02 – s/n 215
        - BSI-03
    - Sz 03
      - s/n 233
      - 1.5"
      - s/n 115
      - Sz 02 – s/n 215
        - BSI-03

Bowen (Bw) dn

- Helmet: s/n 1071
  - CCA/CCEM – 03/321
  - s/n 1169
- Sizing:
  - SZ 03
    - s/n 218
    - 6LL
    - s/n 6252
- Size:
  - Short
    - None
    - None
  - Long
    - Sz 01
      - s/n 2057
      - Waist 007
    - Sz 03
      - s/n 234
      - 1.5"
      - s/n 116
      - Sz 02 – s/n 215
        - BSI-03
    - Sz 03
      - s/n 233
      - 1.5"
      - s/n 115
      - Sz 02 – s/n 215
        - BSI-03

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

FS 12-28

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

### FOR LOSS OF:

**HUT/PLSS**

Use EMU 3018, Medium; Resize Kb to EMU 3004, Large

1. Remove rings/arm assys/gloves
2. Use primary rings, arms, Pp gloves
3. Arm red connects to right, \( \text{\textbackslash locks, \textbackslash cams} \)
4. Use primary LTA
5. Swap EMU PLSS identifier strips, national flag
6. Swap CCA, CCC/Metox, EMU battery, REBA

**EV1 – Piper**

- Use EMU 3018, Medium
- \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**EV2 – Bowen**

- Use XL HUT ORU (w/ EMU 3011)
- \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**EV3 – Kimbrough**

- Use EMU3011, Large
- \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

### CCA

Use size 02/321 s/n 1176 Location Pp ECOK

Use size 03/321 CCA s/n 1211 Location Bw ECOK

Use size 04/323 CCA s/n 1209 Location Kb ECOK

### Lower Arm Segment

Use size 03 arm s/n 219/220 from ISS. Cams S/L. (red = right, blue = left)

1. Remove rings/arm assys/gloves
2. Use primary rings, arms, Bw gloves
3. Arm red connects to right, \( \text{\textbackslash locks, \textbackslash cams} \)
4. Use primary LTA
5. Swap EMU PLSS identifier strips, national flag
6. Swap helmet, CCA, CCC/Metox, EMU battery, REBA

**Back-up (Pp2):**

- Use 6WS gloves s/n 6236
- \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Contingency (Pp3):**

- Use 6PP gloves s/n 6177
- \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Back-up (Bw2):**

- Use 6LL gloves s/n 6170
- \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Contingency (Bw3):**

- Use 6LL gloves s/n 6171
- \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Back-up (Kb2):**

- Use 6MT gloves s/n 6122
- \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

### Waist Brief

Use size 01 waist brief s/n 2084 (002) from ISS. Cams S/S

1. Use Pp prime 03 legs, 1.5" leg rings, and 01 boots
2. \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Back-up (Bw2):**

- Use 6LL gloves s/n 6170
- \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Back-up (Bw3):**

- Use 6LL gloves s/n 6171
- \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Back-up (Kb2):**

- Use 6MT gloves s/n 6122
- \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

### Leg Segment

Use size 03 leg from ISS s/n 205/206. Cams S/L

1. \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Use size 03 leg from ISS s/n 205/206. Cams S/L**

1. \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Use size 03 leg from ISS s/n 205/206. Cams S/L**

1. \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Use size 03 leg from ISS s/n 205/206. Cams S/L**

1. \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Use size 03 leg from ISS s/n 205/206. Cams S/L**

1. \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Use size 03 leg from ISS s/n 205/206. Cams S/L**

1. \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Use size 03 leg from ISS s/n 205/206. Cams S/L**

1. \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Use size 03 leg from ISS s/n 205/206. Cams S/L**

1. \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Use size 03 leg from ISS s/n 205/206. Cams S/L**

1. \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

### Boot

Use size 01 boots s/n 203 from ISS

1. \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Use size 02 boots s/n 206 from ISS**

1. \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Use size 02 boots s/n 206 from ISS**

1. \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

**Use size 02 boots s/n 206 from ISS**

1. \( \text{\textbackslash \textbackslash \textbackslash \textbackslash \textbackslash} \)

### Sizing Rings

- 0.5" arm:
  - Use s/n 149, 150, 167, or 168 from ISS
  - 1.5" Leg:
    - Use s/n 129, 130, 141, 142 from ISS

- 0.5" arm:
  - Use s/n 149, 150, 167, or 168 from ISS
  - 1.5" Leg:
    - Use s/n 129, 130, 141, 142 from ISS

- 0.5" arm:
  - Use s/n 149 or 150 from ISS for b/u gloves only

### LCVG

(03, 04-Therm Slipper)

1. Use s/n 3159 (Pp Backup)
2. Transfer biomed & dosimeter

(05)

1. Use s/n 3187 (Bw Backup)
2. Transfer biomed, dosimeter

(05)

1. Use s/n 3187 (Bw Backup)
2. Transfer biomed, dosimeter
EMERGENCY UNDOCKING
EVA TRANSFER

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

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

CAUTION
Verify EV crew is clear of hatch mechanism

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

DOFFING SAFER (5 min)
SAFER 2. Latch → ENG
3. Latch ccw until release (~90 deg)
4. Doff SAFER

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

EVA-5b/126/O/A
EMU PREP FOR TPS REPAIR

O2 ACTUATOR COVER INSTALLATION (5 min)

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

Figure 1 - O2 Actuator Attachment Point

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

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

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

Figure 2 - ERCA lenses covered with Teflon squares and Kapton tape
The TPS Repair procedures listed below are not published in the hardcopy EVA Flight Supplement. These procedures will be uplinked realtime if they are required.

A PDF and a WORD version of the procedures can be found at: http://mod.jsc.nasa.gov/do3/FDF/FDFBooks/Status%20Sheets/index.html. Select the “As Flown” Status sheet for STS-126 and the link to the procedures can be found with the link to the EVA FS. The procedures can also be found on the FDF Books CD provided to the FAO console.

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<td>FS 16-22</td>
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<td>FS 16-23</td>
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<td>FS 16-30</td>
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<td>LATCH ROEU LATCHES</td>
<td>FS 16-33</td>
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<tr>
<td>STOW ROEU ARM</td>
<td>FS 16-36</td>
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<td>RJMC REMOVE AND REPLACE</td>
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<td>GENERIC EVA INHIBIT PAD</td>
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<tr>
<td>TASK</td>
<td>FAILURE</td>
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<tr>
<td>I. ULF2</td>
<td>APFR</td>
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<tr>
<td></td>
<td>Joint fails to actuate</td>
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<td>Boot becomes stuck in APFR boot plate</td>
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<tr>
<td>BRT</td>
<td>BRT jaws fail to release</td>
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<tr>
<td>CETA Cart</td>
<td>Wheel bogie fails to release from truss</td>
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<td></td>
<td>Wheel bogie fails to install on truss</td>
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<td>Parking brake fails to engage</td>
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<td></td>
<td>Parking brake fails to disengage</td>
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<tr>
<td></td>
<td>Dynamic brake fails to engage</td>
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<tr>
<td></td>
<td>CETA active coupler fails to capture or lock</td>
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<tr>
<td>TASK</td>
<td>FAILURE</td>
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</table>
| G. CETA cart tiedown | On MCC-H GO: Perform the following tiedown procedure (see figure 1)  
|               | a. Translate CETA cart to P3 location (not over truss segment joint)  
|               | b. Engage parking brake  
|               | c. Retrieve 2 Long Duration TieDown (LDTD) tethers from Airlock Staging Bag or P6 AUX Bag (fwd face of Z1)  
|               | d. Route 1 LDTD tether on stbd side of CETA cart as follows:  
|               | (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 | 1. On MCC-H GO: Release active coupler by removing wireties (2) (reinstall of wireties 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 |
### EVA Wrench (Torque & Ratchet)

<table>
<thead>
<tr>
<th>TASK</th>
<th>FAILURE</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Ratchet teeth slip</td>
<td>Ratchet to new set of teeth and reapply torque</td>
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</tr>
<tr>
<td>B. Wrench does not ratchet</td>
<td>Hold the ratchet selector and socket in opposite hands and rotate in opposite directions</td>
<td></td>
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</tbody>
</table>

### Fluid QD Ops

**NOTE**

The following cribsheet steps apply to 1/4 in QDs only. If troubleshooting requires the crew to leave the worksite, verify that female QDs are covered to prevent exposure to direct sunlight. For thermal clocks refer to flight rules.
<table>
<thead>
<tr>
<th>TASK</th>
<th>FAILURE</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mating Ops</strong></td>
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<td></td>
</tr>
</tbody>
</table>
| A. QD fails to mate | 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 | 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 | Rethread detent button  
a. Load bail handle (button will free spin if not loaded)  
– 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  
**NOTE**  
Detent button is only required for BDT ops and 1 in SPD ops | 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 |                                                                        |
| F. Bail fails to travel fwd | Check for debris, damage, or crystals |                                                                        |
| G. Bail fails to travel to full fwd (valve open) position (button does not pop up) | 1. Neutralize sideloads  
2. Apply greater opening force to QD bail handle |                                                                        |
| H. Detent button fails to depress during valve closing  
**WARNING**  
Bail may kick back and contact crew when button is depressed if a leaking primary seal allowed pressure build-up in spring cavity | 1. Push and hold bail handle fwd (to open) with significant force to relieve load on button while simultaneously depressing the detent button  
– 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  
2. On MCC-H GO: Retrieve and install QD button depress tool (BDT) |                                                                        |
| I. Bail fails to travel to full aft (valve closed) position (button does not pop up) | 1. Inspect QD for retaining wire protrusion  
2. Neutralize possible side loading  
3. Depress button and increase force on bail |                                                                        |
| **Demating Ops** |                                                                         |                                                                        |
| J. Female QD fails to demate | 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  
4. Neutralize sideloads or manipulate flexhose to relieve mating forces on female QD  
5. Apply greater force to release ring and female QD |                                                                        |
<p>| K. Thermal bootie fails to remain securely closed | Install wire tie around bootie to keep QD fully covered |                                                                        |</p>
<table>
<thead>
<tr>
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</thead>
</table>
| L.   | Cap will not demate | 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  
   – Prepare for quick mate on MCC-H GO  
4. Retrieve QD cap tool (either QD Bag on Airlock)  
   – Use QD cap tool to turn stuck cap a maximum of 2 turns (cap vents at ~ 2 turns). Finish removal of cap by hand (~ 1 additional turn) |
|      |         |        |
| M.   | Mated QD leaks in valve open position (bail fwd) | Close valve (bail aft) |
| N.   | Male QD leaks after cap removal | Reinstall cap; notify MCC-H  
– Prepare for quick QD mate on MCC-H GO |
| O.   | Female QD leaks during or after bail actuation to fwd position (valve open) | 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 push bail to fwd position (valve open) |
| P.   | Female QD leaks after demate | Fully mate to destination male as quickly as possible |
| Q.   | Male QD leaks after demate (male sleeve may be visibly stuck open) | 1. Remate female QD and cycle QD valve  
   a. Depress button and use significant force to push bail forward; release button (valve open)  
   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. Depress button and pull bail aft; release button (valve close)  
   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 |
| R.   | Leak detected by MCC-H after valve ops to close position (possible male sleeve stuck open) | 1. Cycle QD valve  
   a. Depress button and use significant force to push bail forward; release button (valve open)  
   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. Depress button and pull bail aft; release button (valve close)  
   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 |
| S.   | Frozen NH3 present on female or male QD | 1. Leave QD exposed to vacuum; wait maximum of 5 min for sublimation (check periodically)  
2. On MCC-H GO: Continue QD ops |
### MATE QD
1. Remove QD caps as required
2. Inspect male and female QD for debris or damage
3. Verify female QD ready to mate
   - √ Detent button – up
   - √ Fwd white band – not visible
4. Assess side load potential prior to mate
5. Mate QD
   - √ Fwd white band – visible
6. Perform snapback test
   - √ Fwd white band visible
7. Perform pull test (Stay clear of button and release ring)
8. Perform visual gap test
   - √ For FID

### Open Valve
1. Assess side loads
2. Depress detent button
3. Push bail to forward position
4. √ Aft white band visible
5. √ Detent button – up

### Close Valve, Demate QD
1. √ Aft white band visible
2. √ Detent button fully installed
3. √ Detent button up
4. √ Detent button can be depressed
5. Assess side loads prior to bail movement
6. Push bail toward open position with significant force while depressing detent button (unstick male sleeve seals)
7. Depress detent button, move bail aft (close valve)
8. √ Fwd white band visible
9. √ Detent button up
10. Assess side loads prior to demate
11. Pull back on release ring and demate QD
12. √ Release ring – retracted (FWD white band not visible)
13. Inspect male and female QD for debris, damage, or anomalous conditions (ammonia crystals)
14. Install QD caps as required; verify lock tab engaged
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<tr>
<th>TASK</th>
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</table>
| FRAM | A. Active FRAM fails to seat on passive FRAM | 1. Check for FOD in mechanism  
2. Check alignment. (Engage 2 forward shear pins first to ensure connector door is not jamming) |
|      | B. Primary FRAM bolt fails to release | 1. Confirm socket fully engaged to release anti-rotation mechanism  
2. Increase PGT setting:  
   **PGT:** \[B2 (16.0), CCW2, 30.5\], 7/16 - 6-ext  
   1 turn only to break torque; reset PGT to **A4 (6.3)** for full run-out of bolt  
3. On MCC-H GO: If no joy, engage contingency locking pins to secure active FRAM to passive FRAM (see block C). All 4 pins reqd if > 4.5 turns released on primary bolt; fwd 2 pins only if < 4.5 turns released on primary bolt  
   **NOTE**  
   Aft contingency pins can only be installed if primary bolt turn count for release is 4.5 turns or more. With fewer than 4.5 turns on the primary bolt, contingency pins are not needed and, in some cases where primary bolt is mostly installed, cannot be installed.  
   For CPK installation, the # on locking mechanism counter = 11 − # of turns on primary FRAM bolt |
|      | C. Primary FRAM bolt fails to engage | 1. Verify FRAM seated  
2. Check for FOD  
3. Back out primary bolt fully:  
   **PGT:** \[A7 (9.2), CCW2, 30.5\], 7/16 - 6-ext  
   And reattempt engagement  
   **PGT:** \[A7 (9.2), CW2, 30.5\], 7/16 - 6-ext  
4. On MCC-H GO: Engage contingency locking pins:  
   **NOTE**  
   4 of 4 contingency pins reqd for PLB LMC;  
   3 of 4 contingency pins reqd for ESP-3  
   – Front pins (all FRAMs)  
     **PGT:** \[A4 (6.3), CW2, 30.5\], 7/16 - 6-ext  
     14.11 − (1.25 * Turns on Primary Bolt) turns  
     If no joy, increase to **B2** for 1 turn only  
   **NOTE**  
   Aft contingency pins can only be installed if the primary bolt turn count for engage is 6.5 turns or less. With greater than 6.5 turns on the primary bolt, contingency pins are not needed and, in some cases where primary bolt is mostly installed, cannot be installed  
   – Aft pins for ESP-3 FRAMs  
     – 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  
     Engage aft pin, to hardstop, max 4 turns total  
   – Aft pins for LMC FRAMs  
     – Prep CPK by disengaging J-hook on locking mechanism and fully seating J-hook 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 |
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<th>TASK</th>
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<tbody>
<tr>
<td><strong>MWS</strong></td>
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<tr>
<td>A.</td>
<td>MWS EE is sticky</td>
<td>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)</td>
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</tbody>
</table>
| B. | MWS EE cord fails to retract | 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 | 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 | 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) | 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 |
| C. | Connector fails to release from soft dock | 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) |
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</table>
| D. Connector fails to soft dock | 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:  
   - 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)  
   - Connector should snap into soft dock with little force once half shells are aligned | |
| E. Connector fails to mate | 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:  
   - 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) | |
| F. Connector pin bent | 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 | 1. On MCC-H GO: Retrieve connector cleaner tool  
   **NOTE**  
   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  
   Puncture connector cleaner cartridge only when ready to perform actual cleaning.  
   Use entire N2 cartridge prior to reentering airlock  
2. Attempt cleaning | |
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</table>
| H.  | Connector EMI band bent | On MCC-H GO: Retrieve needle nose pliers or forceps to remove band  
- Bail may need to be pushed forward while demated to expose EMI band for removal |
| I.  | Connector bail linkage failure | 1. On MCC-H GO: Re-attempt connector mate/demate with broken bail  
- Impart load through undamaged side of bail linkage  
- Assist bail motion with hand on backshell once bail linkage has passed over-center  
- May take multiple pushes on the bail to mate/demate connector  
2. Tether hook or vise grips may be used for additional leverage |
| J.  | Connector soft dock spring bent | On MCC-H GO: Retrieve needle nose pliers and remove bent spring |
| K.  | Connector O-ring or main joint gasket seal loose (seal and O-ring required in 1-G only) | 1. Remove seal with tether hook  
2. On MCC-H GO: Retrieve additional tools to remove seal (i.e., wire tie, needle nose pliers, probe, loop pin puller) |
| L.  | Connector cap (twist) will not release | 1. Increase force  
2. Use tether hook for additional leverage |
| PGT | A. No LEDs | 1. Perform LED test  
2. Use display torque |
|     | B. LEDs and torque messages do not agree | Use torque message and notify MCC-H |
| LCD Messages | C. Mode switch breaks | Retrieve spare PGT |
| D.  | BATTRY HITEMP | 1. Power off PGT  
2. If alternate battery available; change battery  
3. Retrieve spare PGT  
4. Switch to ratchet mode |
| E.  | BATTRY LOTEMP (blinking) | 1. Drive tool with no load to increase battery temperature  
2. If alternate battery available; power off and change battery  
3. Retrieve spare PGT  
4. Power off and switch to ratchet mode |
| F.  | BATTRY LOVOLT (blinking) | 1. Continue using tool until unable to deliver sufficient torque  
2. Retrieve spare PGT  
3. Power off and switch to ratchet mode |
| G.  | CAL FAILED | 1. Press, release trigger to repeat calibration  
2. Power cycle and calibrate  
3. Retrieve spare PGT  
4. Power off and switch to ratchet mode |
| H.  | COLLAR ERROR | 1. Cycle torque and speed collars to clear error  
2. Power cycle and calibrate  
3. Retrieve spare PGT  
4. Power off and switch to ratchet mode |
| I.  | COMPAR ERROR | 1. Cycle torque collar and A/B mode switch  
2. Power cycle and calibrate  
3. Retrieve spare PGT  
4. Power off and switch to ratchet mode |
## ULF2 Workarounds CribSheet (Cont)

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</thead>
</table>
| J.   | EEPROM WR ERR (blinking) HYBRID HITEMP OVER CURR SLFTST FAIL X | 1. Power cycle and calibrate  
2. Retrieve spare PGT  
3. Power off and switch to ratchet mode |
| K.   | HI TORQ | 1. Contact MCC-H and report torque (Real time engineering assessment required)  
2. Power cycle and calibrate  
3. Retrieve spare PGT  
4. Power off and switch to ratchet mode |
| L.   | HICURR | 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) | 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 | 1. Reattempt operation  
2. Power cycle and calibrate  
3. Retrieve spare PGT  
4. Power off and switch to ratchet mode |
| O.   | LOG IS FULL (blinking) | 1. Cycle torque and speed collars to clear message  
2. Continue operation |
| P.   | MOTOR HITEMP | 1. Power off PGT  
2. Retrieve spare PGT  
3. Switch to ratchet mode |

### Safety Tether

<table>
<thead>
<tr>
<th>TASK</th>
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<th>ACTION</th>
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</table>
| A.   | Safety tether fails to retract/tend | 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) |
| B.   | Safety tether red stripe showing (any length) | Safety tether cannot be used  
– Report ID # of faulty tether to MCC-H  
– Use alternate safety tether |

---

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.

Level wind release will require safety tether be returned for ground servicing.

If tether fails to retract due to thermal issue, normal tether function may return after tether brought IVA.
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<thead>
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</thead>
</table>
|            | C. Crew hook fails                    | 1. On load alleviating end: Use waist tether to replace alleviating strap  
|            |                                      |   – 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 | 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:  
|            |                                      |   PGT [A5 (7.0), CCW2, 30.5], 5/32 allen drive  
|            |                                      |   – Round Scoop: 7 screws (figure 2) |
| Socket Caddy | A. Socket fails to release from socket caddy | 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           | 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 | On MCC-H GO: Remove non-captive screws (2) at hingeline to release nadir section with slide lock (not captive) (figure 3):  
|            |                                      |   PGT [A7 (9.2), CCW1, 30.5], 5/32 allen drive |

Figure 2 - Round Scoop
### Flight Specific

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

1. Release bolt 1 fully: Break torque at **B7 (25.5)** for 1 turn, run-out bolt at **B3 (18.4)** 6 turns
2. Release bolt 2 fully: Break torque at **B7 (25.5)** for 1 turn, run-out bolt at **B3 (18.4)** 12 turns
3. Demate connector, install dust cap, and remove bearing package; stow in TBA Bag
4. Release bolt 3: 
   - **[B7 (25.5 ft-lb), CCW2, 30.5]**, reattempt for 1 turn, then return to original torque setting of **[B1 (12.0), CCW2, 30.5]**

B. Bolt 3 jams after initial break torque

1. Verify not pushing on the bolt while driving (will side-load bolt)
2. On MCC-H GO: Cycle bolt 3

C. Bolt 1 will not break initial torque

1. On MCC-H GO: Take PGT to manual ratchet (RCCW), reattempt for 1 turn, then run-out bolt at torque setting of **[B3 (18.4), CCW2, 30.5]**. (Bolt 1 should not be failed)
2. If no joy, reinstall TBA bolts per nominal Flight TBA settings

D. Bolt 1 jams after initial break torque

1. On MCC-H GO: Cycle bolt 1
2. If no joy, reinstall TBA per nominal Flight TBA settings

E. Bolt 2 will not break initial torque

1. Release bolt 1 fully: Break torque at **B7 (25.5)** for 1 turn, run-out bolt at **B3 (18.4)** 6 turns
2. Release bolt 2 fully: Reattempt break torque at **B7 (25.5)** for 1 turn, run-out bolt at **B3 (18.4)** 12 turns
3. Take PGT to manual ratchet (RCCW), reattempt for 1 turn, then run-out bolt at torque setting of **[B3 (18.4), CCW2, 30.5]**
4. On MCC-H GO: If still no joy, retrieve ratchet wrench and pry bar (Staging Bag) and cheater bar (Z1 Stbd Toolbox) – (bolt 2 can be failed in shear); reattempt using ratchet wrench and cheater bar
5. If bolt 2 fails, attempt to remove bearing package

F. Bolt 2 jams after initial break torque

1. Verify bolt 1 fully released
2. On MCC-H GO: Cycle bolt 2
3. On MCC-H GO: Take PGT to manual ratchet (RCCW), reattempt for 1 turn, then run-out bolt at torque setting of **[B3 (18.4), CCW2, 30.5]**
4. On MCC-H GO: If still no joy, retrieve ratchet wrench w/9-in ext and pry bar (Staging Bag) and cheater bar (Z1 Stbd Toolbox) – (bolt 2 can be failed in shear); reattempt using ratchet wrench and cheater bar
5. If bolt 2 fails, attempt to remove bearing package
<table>
<thead>
<tr>
<th>TASK</th>
<th>FAILURE</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.</td>
<td>Failure to fully remove TBA Bearing Package</td>
<td>Retrieve pry bar (Staging Bag), insert between clamp shoe and mount bolt (see figure 4), and pry bearing package away from mount package</td>
</tr>
</tbody>
</table>
| H.  | Failure to fully remove TBA Mount Package (clamp fails to open) | On MCC-H GO: Reinstall TBA mount bolt that was partially removed:  
**Torque mount package**  
**PGT [A2 (3.8), CW2, 30.5] 6-Ext 7/16**  
**Rotate Bolt 3, ~ 6 turns** |
| I.  | Bolt 3 (mount bolt) fails to engage | 1. Verify not pushing on bolt 3 while driving (mount clamp leg closed)  
2. Remove and inspect mount package for FOD, damaged threads, etc; report conditions to MCC-H  
3. On MCC-H GO: Either reattempt installation, or retrieve new TBA |
| J.  | Bolt 2 fails to install | 1. Remove bearing package and inspect for FOD, damaged threads, frayed cable, etc; report conditions to MCC-H  
2. On MCC-H GO: Either reinstall bearing package, or remove mount package (release bolt 3 at **B1 (12.0)** for 2 turns) and retrieve new TBA |

![Figure 4. - Pry Bearing Package Away](image-url)
<table>
<thead>
<tr>
<th>TASK</th>
<th>FAILURE</th>
<th>ACTION</th>
</tr>
</thead>
</table>
| K.   | Bolt 1 fails to install | 1. Verify bearing package fully seated on mount package  
2. Remove bolt 2 (B1 (12.0) 10.5-13 turns)  
3. Remove bearing package, inspect for FOD, damaged threads, frayed cable, etc; report conditions to MCC-H  
4. On MCC-H GO: Either reattempt bearing package installation or remove mount package (release bolt 3 at B1 (12.0) for 2 turns) and retrieve new TBA  
5. Additional steps for reattempting installation:  
   a. Use dry wipe to clean area of grease  
   b. Perform nominal TBA install; when engaging bolt 1, reach between race rings and hold preload arm in position if reqd  
   c. Reapply grease as required |
| L.   | Bolt 3 fails to install fully (4-6 turns total) | 1. On MCC-H GO: Cycle bolt 3  
2. On MCC-H GO: Increase torque setting to A3 (4.8) and reattempt  
3. On MCC-H GO: Remove TBA |
| M.   | TBA Bag does not remain rolled and folded | 1. Fold TBA bag, roll 2x, secure close by folding tab ends  
2. Roll TBA bag 2x, fold, secure close by twisting tab ends together |
| IV. EFBM COVER REMOVAL/INSTL A. | 1/4-turn fastener cannot unlock/rotate (Small/Large cover) | Retrieve Vise Grips and rotate fastener with tool |
| B. | Bonding Velcro anomaly (Large cover) | 1. Check for FOD on Velcro  
2. No action required if 2 of 4 bonding Velcro patches are attached to the Large cover |
| C. | Large cover cannot be installed due to 1/4-turn fastener failure | 1. Retrieve Vise Grips and rotate fastener with tool  
2. Wire tie the tether strap to nearest handhold |

![Diagram](image)
<table>
<thead>
<tr>
<th>TASK</th>
<th>FAILURE</th>
<th>ACTION</th>
</tr>
</thead>
</table>
| V. PROX GPS ANT INSTL | A. OIWIF cannot be locked on dovetail               | 1. Check for FOD and structural interference, cycle soft dock pins; reattempt installation  
2. Verify WIF is co-planar  
3. If cannot engage OIWIF in dovetail, bring GPS antenna back to Airlock  
4. If can engage OIWIF in dovetail, tie down the antenna:  
   - Ant-A: To HR1232 with LDT  
   - Ant-B: To HR1268 with LDT |
|                       |                                                      | ![Diagram](image.png)                                                  |
|                       | B. Taping patch came off from antenna bracket       | WARNING  
Do not touch nut retainer on the backside of antenna bracket (sharp edge)  
1. Inspect gloves  
2. Check the backside of antenna bracket and report the location where taping patch is lost to MCC-H  
3. Continue the antenna installation without touching the sharp edge  
4. Stow the taping patch in small trash bag if possible |
|                       |                                                      | ![Diagram](image.png)                                                  |
|                       | C. Connector cap fails to demate                     | See NZGL Connectors(GENERIC TASKS)                                     |
|                       | D. Connector fails to mate                           | See NZGL Connectors (GENERIC TASKS)                                    |
|                       | E. Connector MLI peeled off from JLP due to MLI torn away from fastener | 1. No action required if MLI can stay on JLP with Velcro only  
2. After connector cable is installed, tie down the MLI to connector cable with wire tie |
| VI. JEM RMS Grounding Tabs | A. Tab is inaccessible due to JEMRMS position | 1. Attempt different body positions/worksite access  
WARNING  
 Stay away from JEMRMS (Translate clear of JEMRMS). On MCC GO, return to the worksite  
2. On MCC GO, IV mnvr JEMRMS to make crew access possible |
<table>
<thead>
<tr>
<th>TASK</th>
<th>FAILURE</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.</td>
<td>Velcro on tabs does not stick together and unable to secure with wire tie</td>
<td>1. Check both Velcro’s loop/hook orientation is correct to match. Also check FOD on the Velcro&lt;br&gt;2. Attempt to tuck each tab (grounding wire) under permanent MLI near EDF on the arm/EE&lt;br&gt;3. Retrieve EVA scissors tool from LTA and cut grounding wires</td>
</tr>
</tbody>
</table>

| VII. JPM OIH/OIWIF Installation | | |
| A. | HR will not install in seat track or fails to soft dock | 1. Verify HR installed in correct direction<br>2. Verify HR shoes are completely released and soft dock armed<br>3. Check for FOD on HR and seat track<br>4. Verify HR bolt completely released: PGT[A1 2.5 ft-lb, CCW2 30 RPM, MTL 30.5]<br>5. If HR in seat track but soft dock will not engage, attempt to drive HR bolts<br>6. Rotate HR 180 deg and reattempt installation; notify MCC-H<br>7. Finish installing other OIHs<br>8. Bring back to airlock or attempt to install a different OIH in this location; report results to MCC-H |

| | B. | HR bolt fails to fully engage |
| | | 1. If torqued, remove HR: PGT [A2 (3.8), CCW2, 30.5], 7/16 - 6-ext<br>   - To break torque<br>   PGT [A1 (2.5), CCW2, 30.5], 7/16 - 6-ext<br>   - For removal<br>   - Check for FOD and reinstall using original torque<br>2. Increase PGT setting: PGT [A3 (4.8), CW2, 30.5], 7/16 - 6-ext<br>3. Finish installing other OIHs<br>4. Bring back to airlock or attempt to install a different OIH in this location; report results to MCC-H |

<p>| | C. | HR bolt jammed and can be neither installed nor removed |
| | | WARNING&lt;br&gt;Do not use failed OIH for any translation, BRT, etc&lt;br&gt;1. If 1 of 2 bolts is installed, no action is required but do not use the OIH&lt;br&gt;2. If both bolts failed, tie down the HR: OIH(1206): Tether to HR1122 with LDT&lt;br&gt;   OIH(1204): Tether to HR1119 with LDT&lt;br&gt;   OIH(1116): Tether to HR1185 with Adj Equip Tether |</p>
<table>
<thead>
<tr>
<th>TASK</th>
<th>FAILURE</th>
<th>ACTION</th>
</tr>
</thead>
</table>
| D.  | OIWIF cannot be locked on dovetail | 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. Bring back to airlock or attempt installation of WIF in a different location; report results to MCC-H |
| VIII. ETVCG | A. ETVCG pan/tilt lever won’t rotate | 1. Check worksite for FOD  
2. Increase force, re-attempt  
3. Contact MCC |
| | B. Dummy box outer bolt does not release | 1. Check worksite for FOD  
2. Increase PGT setting to B7 for ONE turn only. Reset PGT to B1 for full run-out of bolt |
| | C. Dummy box center jacking bolt does not release | 1. Check worksite for FOD  
2. Check outer bolts to make sure they are fully backed out  
3. Increase PGT torque setting to B7 for ONE turn only. Reset PGT to B1 for full run-out of bolt |
| | D. ETVCG center jacking bolt does not engage | Remove camera, inspect rail and bolt interface from damage, attempt re-installation, ensure outer bolts are retracted |
| | E. ETVCG center jacking bolt does not reach minimum turn count (24 turns) | Increase PGT torque setting to B1; re-attempt |
| | F. ETVCG outer bolt does not engage | 1. Check worksite for FOD  
2. Engage opposite outer bolt, re-attempt driving failed bolt  
3. Increase PGT torque setting to B1, re-attempt  
4. Contact MCC |
## EFBM Contingency Checkout Inhibit Pad

### JEM

| JPM Window |
| IV | Close JPM window shutters (2) |

| EFBM |
| IV | √P011B on jumper cable disconnected for BEP |
| **SSIPC** | PDB A2 RPC01 – Op |

| JEMRMS |
| **SSIPC** | RIP MA Brake – On |
| **SSIPC** | MDP Main Mode – Stdy Mode |

| HTV PROX Antenna |
| **SSIPC** | √TRX Power – OFF |
| **SSIPC** | √TX Power – OFF |
### EFBM CONTINGENCY CHECKOUT

<table>
<thead>
<tr>
<th>IV</th>
<th>EV1</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
</tbody>
</table>

#### WARNING
Stay clear of capture latch envelope

#### CAUTION
Do not touch EFBM mating surface (silver Teflon), guide vanes (solid lubricant), and MLI on base

---

### EFBM CONTINGENCY CAPTURE LATCH CHECKOUT

1. Translate to fwd-nadir side of EFBM (capture latch #1)
2. MODE SELECT is in ‘AUTO’
3. Flip the MODE SELECT to ‘MANUAL’
4. If no joy, **PGT [A1 2.5 ft-lb, CW1 10 RPM, MTL 30.5]-6 ext 7/16**: drive MODE SELECT to ‘MANUAL’; 0.25 turns (90 degrees)
5. **Ratchet wrench or PGT [A2 3.8 ft-lb, CCW1 10 RPM, MTL 30.5]-6 ext 7/16**: drive EVA Drive Shaft to ‘CAPTURE’; ~2.5 turns (max 2.7)
6. Status indicator marking is below line
   - If latch arm cannot be closed:
     - **Ratchet wrench or PGT [A2 3.8 ft-lb, CCW1 10 RPM, MTL 30.5]-6 ext 7/16**: drive EVA Drive Shaft to ‘RELEASE’; max 2.7 turns
   - Latching arm is outside of guide vane
8. Take picture of capture latch condition
9. **Capture latch #2 (aft-zenith)**
10. **Capture latch #3 (aft-nadir)**
11. **Capture latch #4 (fwd-zenith)**
**EFBM CONTINGENCY CHECKOUT (Cont)**

<table>
<thead>
<tr>
<th>IV</th>
<th>EV1</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
</tbody>
</table>

### WARNING
Stay clear of capture latch envelope

### CAUTION
Do not touch EFBM mating surface (silver Teflon), guide vanes (solid lubricant), and MLI on base

Do not drive the EVA Drive Shaft to hard stop; drive till structural latch is flush with EFBM mating surface

### EFBM CONTINGENCY STRUCTURAL LATCH CHECKOUT

1. Translate to fwd side of EFBM (Structural latch #1)
2. MODE SELECT is in ‘AUTO’
3. PGT [A1 2.5 ft-lb, CW1 10 RPM, MTL 30.5]-6 ext 7/16: drive MODE SELECT to ‘MANUAL’; 0.25 turns
4. PGT [A1 2.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext 7/16: drive EVA Drive Shaft to ‘RELEASE’; < 200 turns
5. Structural latch is flush with EFBM mating surface
6. Take picture of structural latch condition
7. Repeat steps 2-6 for:
   - Structural latch #2 (aft)
   - Structural latch #3 (nadir)
   - Structural latch #4 (zenith)

---

**EVA Access Port**

**Mode Select**

**Drive Shaft**

**Structural Latch (Retracted)**

---

**FS 16-24**
EFBM CONTINGENCY CHECKOUT (Cont)

<table>
<thead>
<tr>
<th>IV</th>
<th>EV1</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Image of EFBM Contingency Umbilical Mechanism" /></td>
<td><img src="image2" alt="Image of Mode Select Indicators" /></td>
</tr>
</tbody>
</table>

**EFBM CONTINGENCY UMBILICAL MECHANISM CHECKOUT**

1. Translate to fwd-nadir side of EFBM (umbilical mechanism #1)
2. ✔ MODE SELECT #1 is in ‘AUTO’
3. ✔ MODE SELECT #2 is in ‘NORMAL’
4. PGT [A1 2.5 ft-lb, CW1 10 RPM, MTL 30.5]-6 ext 7/16: drive MODE SELECT #1 to ‘MANUAL’; 0.25 turns
5. PGT [A2 3.8 ft-lb, CCW1 10 RPM, MTL 30.5]-6 ext 7/16: drive EVA Drive Shaft to ‘DISCONNECT; ~16 turns
6. ✔ Status indicator is in ‘DISCONNECT’ position
7. [ ] Take picture of umbilical mechanism condition
8. Repeat steps 2-7 for:
   - Umbilical mechanism #2 (aft-nadir)

**WARNING**
Stay clear of capture latch envelope

**CAUTION**
Do not touch EFBM mating surface (silver Teflon), guide vanes (solid lubricant), and MLI on base.
**EFBM CONTINGENCY CHECKOUT – TASK DATA**

**Estimated Task Duration:**

<table>
<thead>
<tr>
<th></th>
<th>With SSRMS</th>
<th>Without SSRMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EV Crew</td>
<td>00:15 per latch or mechanism</td>
<td>N/A</td>
</tr>
<tr>
<td>Two EV Crew</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Tools:**

<table>
<thead>
<tr>
<th></th>
<th>EV</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGT</td>
<td>Ratchet Wrench</td>
</tr>
<tr>
<td>7/16 (wobble) Socket-6 ext</td>
<td></td>
</tr>
</tbody>
</table>

**Foot Restraints:** N/A

**EVA Fasteners:**

<table>
<thead>
<tr>
<th>Fastener</th>
<th>Head Size (in)</th>
<th>Qty</th>
<th>Install Trq (ft-lbs)</th>
<th>Release Trq (ft-lbs)</th>
<th>Failure Trq (ft-lbs)</th>
<th>Turns</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode Select Shaft (capture latch)</td>
<td>7/16 1x4</td>
<td>0.38</td>
<td>0.38</td>
<td>10</td>
<td>0.25</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Manual Drive Shaft (capture latch)</td>
<td>7/16 1x4</td>
<td>2.1</td>
<td>2.1</td>
<td>34.6</td>
<td>2.7</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>Mode Select Shaft (structural latch)</td>
<td>7/16 1x4</td>
<td>0.59</td>
<td>0.59</td>
<td>10</td>
<td>0.25</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Manual Drive Shaft (structural latch)</td>
<td>7/16 1x4</td>
<td>5</td>
<td>5</td>
<td>5.85</td>
<td>2.7</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>Mode Select Shaft (structural latch)</td>
<td>7/16 2x2</td>
<td>1.3 (#1)</td>
<td>1.3 (#1)</td>
<td>10</td>
<td>0.25</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Manual Drive Shaft (structural latch)</td>
<td>7/16 1x2</td>
<td>2.2</td>
<td>2.2</td>
<td>13.5</td>
<td>16</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:** N/A

**Cautions:**

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

**Warnings:**

1. Stay clear of capture latch envelope

**Timeline Considerations:**

1. The Capture Latch Mode Select shaft can be actuated by fingers
EFBM CONTINGENCY CHECKOUT – TASK DATA (Cont)

VISUALIZED INFORMATION (1/3)

Figure 1 - EFBM Active

Figure 2 - EVA I/F for Capture Latch

Figure 3 - EVA I/F for Structure Latch

Figure 4 - EVA I/F for Umbilical Mechanism
EFBM CONTINGENCY CHECKOUT – TASK DATA (Cont)

VISUALIZED INFORMATION (2/3)

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

Figure 6 - Umbilical Mechanism #1 & #2
VISUALIZED INFORMATION (3/3)

Figure 7 - Capture Latch (Visual Mark)

Figure 8 - Capture Latch (Outside of Guide Vane)

Figure 9 - Structural Latch (RELEASE=Retract)
## RELEASE ROEU LATCHES

<table>
<thead>
<tr>
<th>IV</th>
<th>EV</th>
</tr>
</thead>
</table>
| **CAUTION**  
After step 1, 2 hr LCS Thermal Clock starts | **Tools reqd:**  
Ratchet with 3-in Ext (Airlock) |
| 1. **Deadface ROEU**  
SSP1  
√MPLM CH 1,2 HTR PWR – OFF (tb-bp)  
APCU 1,2 CONV – OFF (tb-bp)  
√1 OUTPUT RLY – OP (tb-bp)  
R1  
PRI PL MNC – OFF (tb-OFF) |  
**WARNING**  
For release, do not close access cover until ROEU stowed. Latches may not snap back to closed posn |
| 2. **ROEU SAFING**  
R13L  
√PL BAY MECH PWR SYS 1,2 (two) – OFF  
A6U  
√RETEN LOGIC PWR SYS 1,SYS 2 (two) – OFF  
PL SEL – 1 |  |

Give EV GO to release ROEU

1. **On IV GO, open latch drive access cover:**  
   Break safety cord, release access cover (3/4 turn ccw)  
   Open access cover (~120°)  
   Manual drive to RELEASE:  
   Rotate control lever to RELEASE  
   Rotate latch drive cw (~9 ft-lb) to hard stop (~3/4 turn)  
   Remove drive ratchet, clear worksite
**RELEASE ROEU LATCHES (Cont)**

<table>
<thead>
<tr>
<th>IV</th>
<th>EV</th>
</tr>
</thead>
</table>
| **3. VERIFY TALKBACKS**  
A6U Install ROEU A6U PANEL OVERLAY  
PL RETEN PL SEL – 2  
ELEC CONT  
REL  
DEMATE  
RELEASE |
| **WARNING**  
For release, remain clear of latches during access cover closing. Latches may snap back to closed posn |
| R13L  
A6U  
PL BAY MECH PWR SYS 1,2 (two) – ON  
PL RETEN LOGIC PWR SYS 1, SYS 2 (two) – ON  
Note single motor time (> 18 sec)  
DEMATE/MATE – DEMATE (tb–REL), 36 sec max  
– OFF |
|  
ELEC CONT  
REL  
DEMATE  
RELEASE  
REL  
MATE  
LATCH |
|  
PL RETEN LOGIC PWR SYS 1, SYS 2 (two) – OFF  
PL SEL – 1 |
| R13L  
PL BAY MECH PWR SYS 1,2 (two) – OFF |
### RELEASE ROEU LATCHES (Cont)

<table>
<thead>
<tr>
<th></th>
<th>IV</th>
<th>EV</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td><strong>ENABLE POWER</strong>&lt;br&gt;R1&lt;br&gt;SSP1</td>
<td>2. Reengage latch actuator:&lt;br&gt; Rotate control lever to neutral posn&lt;br&gt; Close, secure access cover (3/4 turn cw)&lt;br&gt; Clear worksite</td>
</tr>
<tr>
<td></td>
<td>PRI PL MNC – ON (tb-ON)&lt;br&gt;APCU 2 OUTPUT RLY – CL&lt;br&gt;CONV – ON (tb-gray)&lt;br&gt;√APCU 2 OUTPUT RLY tb – gray</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>End Thermal Clock ____ : ____</td>
<td></td>
</tr>
</tbody>
</table>
## LATCH ROEU LATCHES

<table>
<thead>
<tr>
<th>IV</th>
<th>EV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. CONFIGURE FOR ROEU MATE</strong></td>
<td>Tools reqd: Ratchet with 3-in Ext (Airlock)</td>
</tr>
<tr>
<td>A6U Install ROEU A6U PANEL OVERLAY</td>
<td></td>
</tr>
<tr>
<td>R13L √ PL BAY MECH PWR SYS 1,2 (two) – OFF</td>
<td></td>
</tr>
<tr>
<td>A6U RETEN LOGIC PWR SYS 1, SYS 2 (two) – OFF</td>
<td></td>
</tr>
<tr>
<td>PL RETEN PL SEL – 2</td>
<td></td>
</tr>
<tr>
<td>SM 97 PL RETENTION</td>
<td></td>
</tr>
<tr>
<td>CRT √ LAT 1,2,3 (six): 0</td>
<td></td>
</tr>
<tr>
<td>* If LATCH 2,3 LAT msw shows 1, drive latch for single motor time</td>
<td></td>
</tr>
<tr>
<td>A6U</td>
<td></td>
</tr>
<tr>
<td>ELEC CONT</td>
<td></td>
</tr>
<tr>
<td>RELAX DEMATE RELEASE</td>
<td></td>
</tr>
<tr>
<td>√ REL REL REL</td>
<td></td>
</tr>
<tr>
<td>MATE LATCH</td>
<td></td>
</tr>
<tr>
<td>SSP1 √ MPLM CH 1,2 HTR PWR – OFF (tb-bp)</td>
<td></td>
</tr>
<tr>
<td>APCU 1,2 CONV – OFF (tb-bp)</td>
<td></td>
</tr>
<tr>
<td>√1 OUTPUT RLY – OP (tb-bp)</td>
<td></td>
</tr>
<tr>
<td>R1 PRI PL MNC – OFF (tb-OFF)</td>
<td></td>
</tr>
</tbody>
</table>
### LATCH ROEU LATCHES (Cont)

<table>
<thead>
<tr>
<th>IV</th>
<th>EV</th>
</tr>
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<tbody>
<tr>
<td><strong>2. MATE ROEU</strong></td>
<td></td>
</tr>
<tr>
<td>A6U</td>
<td>PL RETEN LOGIC PWR SYS 1,2 (two) – ON</td>
</tr>
<tr>
<td>R13L</td>
<td>PL BAY MECH PWR SYS 1,2 (two) – ON</td>
</tr>
<tr>
<td>Note single motor time (&gt; 30 sec)</td>
<td></td>
</tr>
<tr>
<td>A6U</td>
<td>DEMATE/MATE – MATE (tb-LAT), 60 sec max – OFF</td>
</tr>
</tbody>
</table>

![ELEC CONT]

- RELAX
- DEMATE
- RELEASE
- MATE
- LATCH

| **3. ROEU SAFING**  |
| R13L | PL BAY MECH PWR SYS 1,2 (two) – OFF  |
| A6U | PL RETEN LOGIC PWR SYS 1, SYS 2 (two) – OFF  |
| PL SEL – 1  |
| Give EV GO to latch ROEU  |

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
<table>
<thead>
<tr>
<th>LATCH ROEU LATCHES (Cont)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IV</strong></td>
</tr>
<tr>
<td>4. VERIFY TALKBACKS</td>
</tr>
<tr>
<td>A6U</td>
</tr>
<tr>
<td>ELEC CONT</td>
</tr>
<tr>
<td>RELAX</td>
</tr>
<tr>
<td>DENATE</td>
</tr>
<tr>
<td>RELEASE</td>
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<td>MATE</td>
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<tr>
<td>LAT</td>
</tr>
<tr>
<td>LAT</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>5. RELAX ROEU</td>
</tr>
<tr>
<td>R13L</td>
</tr>
<tr>
<td>PL BAY MECH PWR SYS 1,2 (two) – ON</td>
</tr>
<tr>
<td>A6U</td>
</tr>
<tr>
<td></td>
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<tr>
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</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

FS 16-35
EVA/126/FIN
CAUTION
After step 1, 2 hr LCS Thermal Clock starts

1. RELEASE ROEU LATCHES
   - MPLM CHAN 1,2 HTR PWR – OFF (tb-bp)
   - APCU 1,2 CONV – OFF (tb-bp)
   - 1 OUTPUT RLY – OP (tb-bp)
   - PRI PL MNC – OFF (tb-OFF)

A6U
   - Install ROEU A6U PANEL OVERLAY
   - PL RETEN LAT (five) – OFF
     PL SEL – 2
   - SM 97 PL RETENTION
   - REL 2,3 (four) – 0

   * If LATCH 2,3 REL msw shows 1, drive latch for
   * single motor time

Tools reqd:
Ratchet with 3-in Ext (Airlock)
### STOW ROEU ARM (Cont)

<table>
<thead>
<tr>
<th>IV</th>
<th>EV</th>
</tr>
</thead>
</table>
| **2. RELEASE LATCHES**  
PL RETEN LOGIC PWR SYS 1,2 (two) – ON  
R13L BAY MECH PWR SYS 1,2 (two) – ON  
   Note single motor time (> 20 sec)  
   RELEASE/LATCH – REL (tb-REL), 40 sec max  
   – OFF  
   ![ELEC CONT](image)  
   ![RELAX](image)  
   ![DEMATE](image)  
   ![RELEASE](image)  
   ![MATE](image)  
   ![REL](image)  
   ![LATCH](image) |  |
| **3. ROEU SAFING**  
R13L PL BAY MECH PWR SYS 1,2 (two) – OFF  
A6U PL RETEN LOGIC PWR SYS 1, SYS 2 (two) – OFF  
   PL SEL – 1  
   Give EV GO to stow ROEU |  |

1. On IV GO, open latch drive access cover:  
   Break safety cord, release access cover (3/4 turn ccw)  
   Open access cover (~120°)  
   Manual drive to STOW:  
   Rotate control lever to STOW  
   Rotate arm drive ccw (~23 ft-lb) to hard stop and pull arm inboard to verify  
   Remove drive ratchet
### STOW ROEU ARM (Cont)

<table>
<thead>
<tr>
<th>IV</th>
<th>EV</th>
</tr>
</thead>
</table>
| 4. VERIFY TALKBACKS  
A6U  
PL RETEN PL SEL – 2 | 2. Reengage arm actuator:  
Rotate control lever to neutral posn  
Close, secure access cover (3/4 turn cw)  
Clear worksite |
| ELEC CONT  
RELAX  
DEMATE  
RELEASE  
√ REL  
REL  
LATCH  
MATE | |
| 5. ENABLE POWER  
R1  
PRI PL MNC – ON (tb-ON)  
SSP 1  
APCU 2 OUTPUT RLY – CL  
CONV – ON (tb-gray)  
√OUTPUT RLY tb – gray | |
| 6. End Thermal Clock  
____:____ | |
## MATE ROEU ARM

<table>
<thead>
<tr>
<th>IV</th>
<th>EV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>CONFIGURE ROEU</strong>&lt;br&gt;A6U&lt;br&gt;Install ROEU A6U PANEL OVERLAY</td>
<td>Tools reqd:&lt;br&gt;Ratchet with 3-in Ext (Airlock)</td>
</tr>
<tr>
<td>2. <strong>ROEU SAFING</strong>&lt;br&gt;R13L&lt;br&gt;√ PL BAY MECH PWR SYS 1,2 (two) – OFF&lt;br&gt;A6U&lt;br&gt;√ RETEN LOGIC PWR SYS 1, SYS 2 (two) – OFF&lt;br&gt;PL SEL – 1&lt;br&gt;SSP 1&lt;br&gt;√ MPLM CH 1,2 HTR PWR – OFF (tb-bp)&lt;br&gt;APCU 1,2 CONV – OFF (tb-bp)&lt;br&gt;√1 OUTPUT RLY – OP (tb-bp)&lt;br&gt;R1&lt;br&gt;PRI PL MNC – OFF (tb-OFF)</td>
<td>1. On IV GO, open arm drive access cover:&lt;br&gt;Break safety cord, release access cover (3/4 turn ccw)&lt;br&gt;Open access cover (~120°)&lt;br&gt;Manual drive to MATE:&lt;br&gt;Rotate control lever to MATE&lt;br&gt;Ratchet arm drive cw (~25 ft-lb) until &quot;READY TO LATCH&quot; posn indicated on interface guide&lt;br&gt;Remove drive ratchet&lt;br&gt;Clear worksite (for latching)</td>
</tr>
<tr>
<td>Give EV GO to mate ROEU</td>
<td></td>
</tr>
</tbody>
</table>

3. **VERIFY TALKBACKS**<br>A6U<br>PL RETEN PL SEL – 2

---

### Tools reqd:
- Ratchet with 3-in Ext (Airlock)

**NOTE:**
- RELAX<br>- DEMATE<br>- RELEASE
- MATE<br>- LATCH
### MATE ROEU ARM (Cont)

<table>
<thead>
<tr>
<th>IV</th>
<th>EV</th>
</tr>
</thead>
</table>
| **4. LATCH LATCHES**  
R13L  
A6U  
PL BAY MECH PWR SYS 1,2 (two) – ON  
RETEN LOGIC PWR SYS 1, SYS 2 (two) – ON  
Note single motor time (> 20 sec)  
RELEASE/LATCH – LATCH (tb-LAT), 40 sec max  
– OFF  
ELEC CONT  
RELAX  
DEMATE  
RELEASE  
MATE  
LAT  
LAT  
LATCH  
PL RETEN LOGIC PWR SYS 1, SYS 2 (two) – OFF  
BAY MECH PWR SYS 1,2 (two) – OFF | **2. RELAX ROEU (EVA)**  
On IV GO, rotate control lever to STOW:  
Ratchet arm drive ccw until IV receives RELAX 1 tb – REL. Remove drive ratchet  
3. Reengage arm actuator:  
Rotate control lever to neutral posn  
Close, secure access cover (3/4 turn cw)  
Clear worksite |

| **5. RELAX ROEU (EVA)**  
Monitor PL RETEN LAT 1 tb  
Give EV GO to STOW arm, halt once RELAX tb – REL  |
CAUTION

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

NOTE

1. Steps 1 to 3, ROTATE DLA DRAW BOLTS (1C AND 2C), are required to evenly release tension load on belleville stacks for bolts 1C and 2C.
2. Multiple iterations of DLA draw bolt adjustments may be required to allow follower arms to rotate.
3. The physical labels of the S3 DLAs do not match the logical names the software uses. To ensure that the appropriate DLA commands were sent to prepare for disengaging the DLA, two visual inspections are performed: the window on the DLA indicates "N" for neutral, and the DLA pinion gear teeth are no longer engaged on the SARJ race ring teeth.
4. The ratchet wrench is used to rotate the DLA follower arms to the stow position. This tool is utilized instead of the PGT to protect against damage to the follower arm mechanism.
IV | EV1 | EV2
---|---|---
**MCC-H** 1. Verify failed DLA is in neutral position with no motors selected and motor setpoints set to zero. Verify active DLA is in locked position with no motors selected and motor setpoints set to zero. 2. Give GO for EVA to enter SARJ worksite.

**CAUTION**

The following precautions should be observed to prevent loss of inboard MLI cover fasteners during removal:
- Limit turn count to minimum required for fastener release.
- Minimize side loading bolt head.
- Maintain axial force on fastener to compress spring during rotation.

**REMOVE DLA MLI COVER**

1. PGT[A6 8.3 ft-lb, CCW 30RPM, MTL 30.5]-6ext 7/16: Release inboard MLI cover fasteners (four), nine turns.
2. Remove MLI cover and temp stow.
3. On IV GO, install and ingress APFR (refer to Task Data for WIF position and APFR settings).

**VERIFY DLA IN NEUTRAL**

1. Inspect window for neutral indicator, N.
2. Verify DLA pinion gear teeth are not engaged on the SARJ race ring teeth.

**ROTATE DLA DRAW BOLTS (1C AND 2C)**

1. PGT[B7 25.5 ft-lb, CCW 10RPM, MTL 30.5]-6ext 7/16: Rotate draw bolt 1C, one turn (release tension).
2. PGT[B7 25.5 ft-lb, CW 10RPM, MTL 30.5]-6ext 7/16: Rotate draw bolt 2C, three turns (release tension).
3. PGT[B7 25.5 ft-lb, CCW 10RPM, MTL 30.5]-6ext 7/16: Rotate draw bolt 1C, two turns (continue releasing tension).

4. PGT[A3 4.8 ft-lb, CCW 30RPM, MTL 30.5]-6ext 7/16: Rotate draw bolt 1C, ~32 turns to hard stop.
IV  

<table>
<thead>
<tr>
<th>EV1</th>
<th>EV2</th>
</tr>
</thead>
</table>

**ROTATE FOLLOWER ARMS (1B AND 2B)**

**CAUTION**
If DLA rotation bolts 1B and 2B do not turn freely, additional adjustment to the draw bolts is required.

**NOTE**
Multiple iterations of DLA draw bolt adjustments may be required to allow follower arms to rotate.

1. **Ratchet Wrench-6ext 7/16**: Rotate draw bolt 1C, CW ~1/8 turn.
2. **Ratchet Wrench-6ext 7/16**: Rotate follower arm rotation bolt 1B, CW ~5/8 turn to hardstop.
3. If 1B bolt does not turn freely, repeat steps 1 and 2 until follower arm has rotated 90 deg.
4. **PGT[A 4.8 ft-lb, CW2 30RPM, MTL 30.5]-6ext 7/16**: Rotate follower arm draw bolt 2C, ~32 turns to hard stop.
5. **Ratchet Wrench-6ext 7/16**: Rotate draw bolt 2C, CCW ~1/8 turn.
6. **Ratchet Wrench-6ext 7/16**: Rotate follower arm rotation bolt 2B, CCW ~5/8 turn to hardstop.
7. If 2B bolt does not turn freely, repeat steps 5 and 6 until follower arm has rotated 90 deg.

**REPOSITION DLA**
1. Reposition DLA to launch position [approximately 1 inch away from race ring, then 0.375 inch inboard (toward S0), then 0.5 inch away from race ring].

**INSTALL THREE DLA LAUNCH RESTRAINT BOLTS (4A, 4B, AND 4C)**
1. **PGT[B 19.4 ft-lb, CW2 30RPM, MTL 30.5]-6ext 7/16**: Engage launch restraint bolts 4A, 4B, and 4C, ~five to nine turns (attaches DLA frame to launch bracket).

**PRELOAD FOLLOWER DRAW BOLTS (1C AND 2C) AND ENGAGE DLA LOCK BOLTS (1A AND 2A)**
1. **PGT[A 4.8 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16**: Preload draw bolt 1C, ~zero to two turns to hardstop.
2. **PGT[A 4.8 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16**: Preload draw bolt 2C, ~zero to two turns to hardstop.
3. **PGT[A5 7.0 ft-lb, CW1 10RPM, MTL 30.5]-6ext 7/16:** Engage lock bolts 1A and 2A fasteners (two), ~six turns (engage lock preload on follower arm with lock tip bolt).

**RELEASE DLA CONNECTORS**

1. Perform the following demates:
   - DLA 2
   - DLA 1
   - P1 → J23
   - P1 → J21
   - P2 → J24
   - P2 → J22
2. Install dust caps on connectors, if available

**RELEASE BRACKET BOLTS**

1. **PGT[B7 25.5 ft-lb, CCW2 30RPM, MTL 30.5]-6ext 7/16:** Release 5A, 5B, and 5C in any order, 8-10 turns
2. Remove DLA, lift straight up away from race ring
3. Temp stow DLA on MUT EE/Ballstack on S3 HR 3060/TBD

**PERFORM CLEANING/LUBING OF RACE RING**

Refer to pgs FS 7-20

**ENGAGE BRACKET BOLTS**

1. Retrieve DLA
2. Install DLA onto race ring
3. **PGT[B7 25.5 ft-lb, CW2 30RPM, MTL 30.5]-6ext 7/16:** Engage 5A, 5B, and 5C in any order, 8-10 turns

**ENGAGE DLA CONNECTORS**

4. Perform the following connector mates, stowing any dust caps as reqd:
   - DLA 2
   - DLA 1
   - P1 → J23
   - P1 → TBD
   - P2 → J24
   - P2 → TBD

**ROTATE DLA DRAW BOLTS (1C AND 2C)**

(This decreases friction between pivot fork and follower bracket)

5. **PGT[A3 4.8 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16:** Rotate draw bolt 1C, 2 turns
6. **PGT[A3 4.8 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16:** Rotate draw bolt 2C, 2 turns
### DLA REMOVE AND REPLACE (Cont)

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

### Table 1. Estimated Task Duration

<table>
<thead>
<tr>
<th></th>
<th>With SSRMS</th>
<th>Without SSRMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EV Crew</td>
<td>N/A</td>
<td>1:00</td>
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<tr>
<td>Two EV Crew</td>
<td>N/A</td>
<td>0:45</td>
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</table>

### Table 2. Tools

<table>
<thead>
<tr>
<th></th>
<th>EV1 (FF)</th>
<th>EV2 (FF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGT</td>
<td>PGT</td>
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<tr>
<td>6 Ext 7/16</td>
<td>6 Ext 7/16</td>
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<tr>
<td>APFR</td>
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<tr>
<td>Round Scoop (optional)</td>
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</tbody>
</table>

### Table 3. EVA Fasteners

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

*Max On-Orbit Installable Torque
## DLA REMOVE AND REPLACE – TASK DATA (Cont)

**Table 4. Foot Restraints**

<table>
<thead>
<tr>
<th>Task</th>
<th>WIF</th>
<th>APFR Setting</th>
<th>SARJ Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>P3 Cover 5 DLA 1 Face 6</td>
<td>P3-31</td>
<td>7, PP, F, 12</td>
<td>NA</td>
</tr>
<tr>
<td>P3 Cover 20 DLA 2 Face 2</td>
<td>P4-04</td>
<td>6, PP, L, 1</td>
<td>180</td>
</tr>
<tr>
<td>S3 Cover 5 DLA 1 Face 2</td>
<td>S3-28</td>
<td>2, PP, F, 12</td>
<td>NA</td>
</tr>
<tr>
<td>S3 Cover 20 DLA 2 Face 6</td>
<td>S4-04</td>
<td>6, PP, L, 1</td>
<td>0</td>
</tr>
</tbody>
</table>

**Table 5. DLA/RJMC Labeling**

<table>
<thead>
<tr>
<th>Location</th>
<th>Physical Label</th>
<th>Software/Logical Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>S3, Face 6</td>
<td>DLA 2</td>
<td>DLA 1</td>
</tr>
<tr>
<td>S3, Face 6</td>
<td>RJMC 2</td>
<td>RJMC 1</td>
</tr>
<tr>
<td>S3, Face 2</td>
<td>DLA 1</td>
<td>DLA 2</td>
</tr>
<tr>
<td>S3, Face 2</td>
<td>RJMC 1</td>
<td>RJMC 2</td>
</tr>
<tr>
<td>P3, Face 6</td>
<td>DLA 1</td>
<td>DLA 1</td>
</tr>
<tr>
<td>P3, Face 6</td>
<td>RJMC 1</td>
<td>RJMC 1</td>
</tr>
<tr>
<td>P3, Face 2</td>
<td>DLA 2</td>
<td>DLA 2</td>
</tr>
<tr>
<td>P3, Face 2</td>
<td>RJMC 2</td>
<td>RJMC 2</td>
</tr>
</tbody>
</table>
Figure 2.- DLA.

Figure 3.- DLA Window.

L = DLA Locked
D = DLA Engaged
N = DLA Neutral
# RJMC REMOVE AND REPLACE

<table>
<thead>
<tr>
<th>IV/SSRMS</th>
<th>EV2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RJMC R&amp;R</strong></td>
<td><strong>RJMC R&amp;R</strong></td>
</tr>
<tr>
<td>1. Receive GO from MCC for RJMC R&amp;R (inhibits in place)</td>
<td>1. Translate to S3 RJMC</td>
</tr>
<tr>
<td></td>
<td>2. <strong>PGT[B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16</strong>: Release outer bolts (2) to hardstop, ~13 turns</td>
</tr>
<tr>
<td></td>
<td>3. <strong>PGT[B7 25.5 ft-lb, CCW2 30 RPM, MTL 30.5]-6ext 7/16</strong>: Release center jack bolt to hardstop, ~28 turns</td>
</tr>
<tr>
<td></td>
<td>4. Remove RJMC; temp stow</td>
</tr>
<tr>
<td></td>
<td>5. Inspect ISS guide rails and connector receptacles</td>
</tr>
<tr>
<td></td>
<td>6. Retrieve new RJMC from Large ORU Bag</td>
</tr>
<tr>
<td></td>
<td>7. Install RJMC along guide pins into soft dock position</td>
</tr>
<tr>
<td></td>
<td>8. <strong>PGT[B2 16.0 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</strong>: Engage center jack bolt to hardstop, 28 turns</td>
</tr>
<tr>
<td></td>
<td>9. <strong>PGT[B1 12.0 ft-lb, CW2 30 RPM, MTL 30.5]-6ext 7/16</strong>: Engage outer bolts (2) to hard stop, 13 turns</td>
</tr>
<tr>
<td></td>
<td>10. Stow old RJMC in Large ORU Bag</td>
</tr>
<tr>
<td></td>
<td>11. Perform Final Bag and Tool Inventory</td>
</tr>
<tr>
<td></td>
<td>12. Perform Glove Inspection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bolt</th>
<th>Torque</th>
<th>Turns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer (fwd)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer (aft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GENERIC EVA INHIBIT PAD

Orbiter (1)

ALL EVAs

<table>
<thead>
<tr>
<th>TCS</th>
<th>1. √TCS POWER – OFF</th>
</tr>
</thead>
</table>

KU-Band Antenna

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

RCS  If EV crew < 27 feet from FRCS

IV  1. √DAP: VERN, FREE, LO Z (flt specific check with GNC)
O14,15,16 2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF
LOGIC (four) – OFF

MCC-H 3. √Above RCS config
IV  4. √RCS F – ITEM 1 EXEC (*)
     √JET DES F1U – ITEM 17 (*)
     F3U – ITEM 19 (*)
     F2U – ITEM 21 (*)

Ground

ALL EVAs

Ground Radar

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

LOCATION DEPENDENT INHIBITS

OBSS – LDRI

TO INHIBIT LASER FIRING BUT LEAVE HEATER POWER ON:

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

R12(VPU) 1. √Green Jumper – LDRI/ITVC
A7U 2. VIDEO OUT MON2 pb – push
     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

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

8. LDRI MODE 1 pb – push
9. VIDEO IN as desired (not MIDDECK)

POINT PTU/LDRI AWAY FROM EV CREW

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
Orbiter (2)

LOCATION DEPENDENT INHIBITS (Cont)

OBSS – LCS
TO INHIBIT LASER FIRING BUT LEAVE HEATER POWER ON:

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

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

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

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

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

S-Band Antennas
NOTE
Possible loss of comm when forced LL FWD antenna

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

USOS (1)

ALL EVAs

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

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

LOCATION DEPENDENT INHIBITS

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

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

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

Mobile Transporter
MCC-H If EV crew < 1.5 meters from MT
   1. MT latched
## GENERIC EVA INHIBIT PAD (Cont)

### USOS (2)

<table>
<thead>
<tr>
<th>LOCATION DEPENDENT INHIBITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S-Band (SASA) Antennas</strong></td>
</tr>
<tr>
<td>MCC-H If EV crew &lt; 3.6 ft from S1 SASA [P1 SASA]</td>
</tr>
<tr>
<td>1. P1 SASA (S1 SASA) – Active</td>
</tr>
<tr>
<td>2. S1 SASA [P1 SASA] – Powered down</td>
</tr>
<tr>
<td><strong>SARJ</strong></td>
</tr>
<tr>
<td>MCC-H If EV crew working within 2 ft or outboard of SARJ</td>
</tr>
<tr>
<td>1. √ DLA (1) – LOCKED</td>
</tr>
<tr>
<td>2. All motor setpoints set to zero</td>
</tr>
<tr>
<td>3. All motors deselected</td>
</tr>
<tr>
<td><strong>TRRJ</strong></td>
</tr>
<tr>
<td>MCC-H If EV crew working within 2 ft of P1 TRRJ rotation envelope</td>
</tr>
<tr>
<td>1. √ DLA (1) – LOCKED</td>
</tr>
<tr>
<td><strong>FPMU</strong></td>
</tr>
<tr>
<td>MCC-H If EV crew working within 5 ft of Floating Potential Measurement Unit</td>
</tr>
<tr>
<td>1. FPMU power – Off</td>
</tr>
<tr>
<td><strong>SSPTS</strong></td>
</tr>
<tr>
<td>MCC-H If EV crew working within 2 ft of SSPTS cables</td>
</tr>
<tr>
<td>1. RPCM LA1A4A D RPC 3 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td>2. RPCM LA2A3B D RPC 1 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td>3. RPCM Z14B A RPC 2 – Open, Close Cmd Inhibit</td>
</tr>
<tr>
<td>4. RPCM Z13B A RPC 2 – Open, Close Cmd Inhibit</td>
</tr>
</tbody>
</table>

### RSOS (1)

#### ALL EVAs

<table>
<thead>
<tr>
<th>SM Antennas</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV 1. GTS – Deactivate</td>
</tr>
<tr>
<td>2. ARISS (Ham Radio) – Deactivate or VHF (144-146 MHz) TX only</td>
</tr>
</tbody>
</table>

#### EVAS ON PMA 1 OR RSOS (LOCATION DEPENDENT)

<table>
<thead>
<tr>
<th><strong>FGB Thrusters</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>MCC-M 1. √ FGB MCS unpowered</td>
</tr>
<tr>
<td>2. √ All FGB Attitude Control Thruster Valves (eighty) – closed</td>
</tr>
<tr>
<td>3. √ FGB Attitude Control Manifold Valves – closed</td>
</tr>
<tr>
<td>4. √ FGB Main Engine Valves (K1, K2, K3) – closed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Soyuz Thrusters</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>MCC-M 1. √ Soyuz manifolds (four) – closed</td>
</tr>
<tr>
<td>2. √ Soyuz MCS unpowered</td>
</tr>
<tr>
<td>3. √ Soyuz Attitude Control Thruster Valves (fifty-two) – closed</td>
</tr>
<tr>
<td>4. √ Soyuz Main Engine Valves (K1, K2, K3, K4, K5, K6) – closed</td>
</tr>
</tbody>
</table>

#### FGB Antennas

| MCC-M 1. √ FGB KURS P [KYP C P] – Deactivated |

#### Soyuz Antennas

# GENERIC EVA INHIBIT PAD (Cont)

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

<table>
<thead>
<tr>
<th>FGB Antennas</th>
<th>1. TORU [ТОРУ] – Deactivated</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCC-M</td>
<td>2. TV System [TBC] – Deactivated</td>
</tr>
<tr>
<td></td>
<td>5. TV System [КП-108A] – Deactivated</td>
</tr>
<tr>
<td></td>
<td>6. CNPMS [СИТП] – Deactivated</td>
</tr>
<tr>
<td></td>
<td>7. KOMPARUS [КИС] – Deactivated</td>
</tr>
<tr>
<td>IV</td>
<td>8. Sirius (VHF Ham Radio) – Deactivated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SM Antennas</th>
<th>1. VHF-1, VHF-2 [CTTC] – Deactivate</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCC-M</td>
<td>2. Bits [БИТС2-12] – Deactivate</td>
</tr>
<tr>
<td></td>
<td>3. TV System [TBC] – Deactivated</td>
</tr>
<tr>
<td></td>
<td>4. REGUL [РЕГУЛ] – Deactivate</td>
</tr>
<tr>
<td></td>
<td>5. LIRA [ОHA] – Deactivated</td>
</tr>
<tr>
<td>IV</td>
<td>8. ARISS VHF (Ham Radio) – Deactivate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Soyuz Antennas</th>
<th>1. Teleoperator – Deactivated</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCC-M</td>
<td>2. Telemetry – Deactivated</td>
</tr>
<tr>
<td></td>
<td>3. TV – Deactivated</td>
</tr>
<tr>
<td></td>
<td>4. Tracking – Deactivated</td>
</tr>
<tr>
<td></td>
<td>5. Command (OMNI) – Deactivated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Progress Antennas</th>
<th>1. Teleoperator – Deactivated</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCC-M</td>
<td>2. Telemetry – Deactivated</td>
</tr>
<tr>
<td></td>
<td>3. TV – Deactivated</td>
</tr>
<tr>
<td></td>
<td>4. Tracking – Deactivated</td>
</tr>
<tr>
<td></td>
<td>5. Command (OMNI) – Deactivated</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>SM Thrusters</th>
<th>MCC-M 1. SM MCS – INDICATOR MODE or CMGTA with Thrusters Disabled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. SM Manifold valves (four) closed</td>
</tr>
<tr>
<td></td>
<td>3. SM Attitude Control Thruster Valves (sixty-four) – closed</td>
</tr>
<tr>
<td></td>
<td>4. SM Main Engine Thruster Valves (four) – closed</td>
</tr>
<tr>
<td></td>
<td>5. SM Reboost manifold valves (four) – closed</td>
</tr>
<tr>
<td></td>
<td>6. SM Reboost manifold valves (four) – closed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Progress Thrusters</th>
<th>MCC-M 1. Progress Manifold Valves (four) – closed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Progress Attitude Control Thruster Valves (fifty-six) – closed</td>
</tr>
<tr>
<td></td>
<td>3. Progress Main Engine Valves (K1, K2, K3, K4, K5, K6) – closed</td>
</tr>
</tbody>
</table>

---

FS 16-54

EVA/126/FIN
NOTES

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

CAUTION

ISS Constraints

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

CAUTION

ISS Constraints (Cont)

B. Electrical cables
   1. Avoid bend radii < 10 times cable diameter

C. Fiber optic cables
   1. Avoid bend radii < 10 times cable diameter
   2. Avoid pulling on cable during mate/demate

D. Fluid line flex hoses and QDs
   1. Avoid bend radii < 5 in for hoses with diameter < 1 in on LAB, S0, S1, P1, and 10 in for hoses with diameter < 1 in on all other elements
   2. Avoid bend radii < 14 in for hoses with a diameter ≥ 1 in
   3. Additional care should be taken to not exceed bend radii when applying loads at the flexible hose to rigid tube stub interfaces
   4. Ensure fluid QD booties are fully closed prior to leaving worksite; wire tie if reqd

E. For structural reasons
   1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
   2. Avoid performing shaking motions (sinusoidal functions) more than four cycles
   3. Avoid kicking S1/P1 radiator beam. If any of these occur, wait 2 to 5 min to allow structural response to dissipate
GENERIC NOTES, CAUTIONS, AND WARNINGS (Cont)

CAUTION

ISS Constraints (Cont)

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

CAUTION

Shuttle Constraints

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

H. No touch
1. LDRI diffuser [OBSS]
2. OBSS saddle contacts (when OBSS unberthed) [OBSS]
3. Monkey fur [PLB]
4. Cameras: metallic surfaces [PLB]
5. Ku-Band Antenna black dish and gold thermal blankets [PLB]
### WARNING

#### ISS Constraints

<table>
<thead>
<tr>
<th>A. Avoid inadvertent contact with</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Grapple fixture targets and target pins</td>
</tr>
<tr>
<td>2. SSU, ECU, beta gimbal platform, mast canister, SAW blanket boxes unless the beta gimbal is locked and the motor is turned off</td>
</tr>
<tr>
<td>3. Stay inboard of SARJ when active</td>
</tr>
<tr>
<td>4. Stay 2 ft from S1/P1 radiator beam rotational envelope when beam is free to rotate</td>
</tr>
<tr>
<td>5. Stay 5 ft from moving MT on face 1</td>
</tr>
<tr>
<td>6. SOLAR and EuTEF [COL EPF]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Handrails</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Handrails previously used for MISSE attachment may not be used as a safety tether point [A/L endcone 564 &amp; 566, A/L Tank 2 nad/fwd &amp; port/fwd, P6 5389]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. Pinch</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. NZGL connector linkage. Use caution when mating/locking</td>
</tr>
<tr>
<td>2. ITT Cannon Connector rotating housing</td>
</tr>
<tr>
<td>3. EV side of IV Hatch during Hatch operation (also snag hazard) [A/L]</td>
</tr>
<tr>
<td>4. LAB window shutter and CBM petal cover and JPM window shutter linkages during operation</td>
</tr>
<tr>
<td>5. JEMRMS HRM capture latches</td>
</tr>
<tr>
<td>6. JEM Cameras (JTVEs, EVE, WVE)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D. QDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. If QD is in FID when valve is opened (bail fwd), QD will leak and fluid line may whip</td>
</tr>
<tr>
<td>2. Do not rotate if in mated/valve open config</td>
</tr>
</tbody>
</table>

### WARNING

#### ISS Constraints (Cont)

<table>
<thead>
<tr>
<th>E. RF radiation exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1]</td>
</tr>
<tr>
<td>2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1]</td>
</tr>
<tr>
<td>3. Stay 1 ft from UHF Antenna when powered [LAB,P1]</td>
</tr>
<tr>
<td>4. Stay 0.3 ft from fwd/aft JPM PROX antenna</td>
</tr>
</tbody>
</table>

### WARNING

#### ISS Constraints (Cont)

<table>
<thead>
<tr>
<th>F. Sharp Edges</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inner edges of WIF probes</td>
</tr>
<tr>
<td>2. APFR active WIF probes</td>
</tr>
<tr>
<td>3. Mating surfaces of EVA connectors Avoid side loads during connector mating</td>
</tr>
<tr>
<td>4. Back side of MMOD shield fasteners</td>
</tr>
<tr>
<td>5. Spring loaded captive EVA fasteners (e.g., 6B-boxes, BMRRM, RTAS, SARJ Covers); the end of the spring may protrude</td>
</tr>
<tr>
<td>6. PMA umbilical launch restraints-exposed bolt threads</td>
</tr>
<tr>
<td>7. Adjustable Fuse Tether (Fish Stringer) buckles stowed in Node Bag</td>
</tr>
<tr>
<td>8. Nickel coated braided copper Ground Straps may contain frayed wires [P6,P4,S4,S6]</td>
</tr>
<tr>
<td>9. SPDM OTCM gripper jaws</td>
</tr>
</tbody>
</table>

### WARNING

#### ISS Constraints (Cont)

<table>
<thead>
<tr>
<th>F. Sharp Edges (Cont)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Solar Array Blanket Box [P6,S6]</td>
</tr>
<tr>
<td>11. Keep hands away from SSRMS LEE/POA/SPDM LEE/JEMRMS EE opening, snares, and PDGF curvic coupling (teeth)</td>
</tr>
<tr>
<td>12. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing</td>
</tr>
<tr>
<td>13. Outboard MT rail attachment lug near P6 handrail 5333 and gap spanner</td>
</tr>
<tr>
<td>14. P2 connector on EWIS box TAA-06 [Zenith/Forward Corner 1 of P5 - SARJ at 0 deg]</td>
</tr>
<tr>
<td>15. Port/Aft portion of A/L circular HR [HR 0506]</td>
</tr>
<tr>
<td>16. Interior of JEMRMS HRMs</td>
</tr>
<tr>
<td>17. JEM A/L hatch corners</td>
</tr>
</tbody>
</table>

### WARNING

#### ISS Constraints

<table>
<thead>
<tr>
<th>G. Thermal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. EVA connectors with booties may become hot if left uncovered. Handling may need to be limited</td>
</tr>
<tr>
<td>2. PMA handrails may be hot. Handling may need to be limited</td>
</tr>
<tr>
<td>3. Turn off glove heaters when comfortable temp reached to prevent bladder damage. Do not pull fingers out of gloves when heaters are on</td>
</tr>
<tr>
<td>4. Uncovered trunnion pins may be hot</td>
</tr>
<tr>
<td>5. SSRMS/MBS/SPDM/JEMRMS operating cameras and lights may radiate large amounts of heat</td>
</tr>
</tbody>
</table>
**WARNING**  
**ISS Constraints** (Cont)  

**G.** Thermal (Cont)  
6. 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  
7. Stay at least 0.5 ft away from PMA and MMOD shields > 325 degF  
8. Do not touch EMU protective visor if temp has been < -134 degF for > 15 min  
9. No EMU TMG contact with PMAs and MMOD shields > 320 degF  
10. No EMU boot contact with foot restraint when temp < -120 degF or > 200 degF  
11. Columbus end cones may violate touch temperature constraints when -75 ≤ β ≤ -60 or 60 ≤ β ≤ 75  
12. PDGF surfaces may not meet touch temperature requirements for unlimited contact when β ≤ -70 or β ≥ 70  
13. JPM port end cones and JLP port nadir may violate touch temperature constraints when β > 60 deg

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

**ISS Constraints** (Cont)  

**J.** Pinch  
1. PRLA operation [PLB]

**Shuttle Constraints**  

**I.** 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]

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

Shuttle Constraints (Cont)

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

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

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

O. Lasers
   1. Do not look at LDRI diffuser or LCS laser aperture window
PAYLOAD BAY LAYOUT ................................................................. FS 18-3
FHRC ON LMC ......................................................................... FS 18-4
NTA ON LMC ........................................................................ FS 18-5
CPK ON LMC .......................................................................... FS 18-6
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ESP-3 HANDRAILS AND WIFs – ZENITH VIEW ..................... FS 18-9
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FHRC STINGER BOX (TRRJ AT -90 DEG) ............................... FS 18-59
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PAYLOAD BAY LAYOUT

SIDEWALL PAYLOADS

PORT
TSA
SPDU W/APC

ATTACH LOCATIONS

ENDEAVOUR

PAYLOADS

MPLM-ULF2
LMC

FS 18-3
FHRC ON LMC

FHRC

LMC Contingency Pin Kits
null
ESP-3 HANDRAILS AND WIFs – ZENITH VIEW
FRAM/FSE/ORU ASSEMBLY

LAUNCH LOCATION
ICC, LMC, VCC, SLP, etc
(gas beam)

PASSIVE FRAM

ACTIVE FRAM WITH
SMALL ADAPTER PLATE ASSY (SAPA)
AND ORU KIT

ORU

MLI ASSY
ACTIVE FRAM SOFT CAPTURE MECHANISM

- MICRO SQUARE FITTING
- EVA SOFT CAPTURE LEVER
- STATUS INDICATOR
- SQUARE GRID
- HARD DOCK CAPTURE LATCH ARM
- EVA SOFT CAPTURE LATCH RELEASE
- SOFT CAPTURE LATCH
- MICRO SQUARE WITH PRIMARY FRAM BOLT

FRONT VIEW

SIDE VIEW

- EVA SOFT CAPTURE LEVER
- EVA SOFT CAPTURE LATCH RELEASE
- SQUARE GRID (CETA CART)
- HARD DOCK CAPTURE LATCH ARM
- SOFT CAPTURE LATCH
ACTIVE FRAM SOFT CAPTURE MECHANISM (Cont)

Primary bolt (with anti-rotation device)

Status Indicators (White edge indicates locked)
NODE 2 ZENITH PORT HANDRAILS

Connector labeled CW facing end cone

Camera Conn. J2, J3, J4

*EVA installed

Outboard on 10A (AFT) (PCBM)

J102 - J104, J101, J663 - J660, J01, J664 - J665

M4, MG

FS 18-15

EVA/126/FIN
JPM – PORT ENDCONE (Cont)
JPM OVERALL DIMENSIONS AND MASS INFORMATION

Approx 15' Diameter

Approx 37' Diameter

Approximate Launched JEM Weight 32,600 lb
TRUNDLER BEARING ASSEMBLY (Cont)

Bearing Package Assembly

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

Slot in Race Ring to align Mount Boss
TRUNDLE BEARING ASSEMBLY (Cont)
TRUNDLE BEARING ASSEMBLY (Cont)

- Inner bearing – stationary
- Outer bearing – rotates
Inspect Cable for Frays    Inset shows frayed cable on ground unit
Inset shows frayed cable on ground unit
TRUNDLE BEARING ASSEMBLY (Cont)
TIEDOWN: SARJ TBA

Tether Length ~ 3.5 inches

Tether Length ~ 22.6 inches
TIEDOWN: SARJ TBA (Cont)

Only one of Tether a or Tether b required

Tether a Length ~ 19.6 inches

Tether b Length ~ 17 inches

Tether Length ~ 3.5 inches
TIEDOWN: S3 AFT-NADIR CLAMSHELL AND STUB

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

Adj Tether #1
~ 14 inches

Adj Tether #2
~ 12 inches

HR 3057
CETA CART – TOP VIEW

Wheel Bogie Release Handle
ECOM (3 places)
ORU Tether Dovetail (3 places)
ORU Bracket (3 places)
Energy Absorber
Active Coupler

Dynamic Brake
Swing Arm 2 (Stbd/Nadir)
TFR (2 places)
Parking Brake

NOTE
Grids C, E and G modified to support FRAM with large ORUs

Double shoulder bolt (not used)
Tool Box Mounting Plate (2 places)

WIF 4
Square Grid (8 places)
Energy Absorber
WIF 5 (crane stowage/use)
Passive Coupler

Parking Brake (Ratcheting mechanism locks all 4 brakes)
Swing Arm 1 (port/nadir)
Dynamic Brake (momentarily actuates 2 nadir brakes)

FS 18-35
EVA/126/FIN
CETA CART – SWING ARMS AND WIF MARKINGS

**NOTE**
Swing arms 1 and 2 will deploy a total of 180°. Swing arm 3 will only deploy 168°.
CETA CART – COUPLERS

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

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

PASSIVE COUPLER
- Contingency bolt removed if latch failed closed

BOTTOM VIEW
- Spring loaded capture latch

TOP VIEW
- Spring loaded grounding pins
- PIP pin through holes
- Push and turn
- Contingency bolt hole not used
CETA CART – WHEEL BOGIES

Zenith Stbd Shown, Port Opposite
ORU CHANGEOUT BOLTS (4)

HANDLE RELEASE TRIGGER
WHEEL BOGIE RELEASE HANDLE

Nadir Port Shown, Stbd Opposite
ORU CHANGEOUT BOLTS (4)

90° WHEEL

TOP VIEW

OUTBOARD SIDE

BRAKE PAD
INBOARD SIDE

OUTBOARD SIDE

INBOARD SIDE

90° WHEEL
P1 MT STOP

MT STOP STOWED

MT STOP DEPLOYED

MT STOP DEPLOYED
P3 TRUSS SEGMENT (FACE 3 & 4 – STBD END VIEW)
P3 TRUSS SEGMENT (FACE 5 & 6 – STBD END VIEW)
P3 SARJ STRUCTURE (STBD SIDE – UTA SIDE AND PORT SIDE – DMA SIDE)
JLP PORT SIDE VIEW

1255 HDR-L1101

1261 HDR-L1102

WIF-L1102 JLP/03/05

WIF-L1201 JLP/02/03

1256 HDR-L1201

1262 HDR-L1202

1267 HDH-L1203

FS 18-49
ULF2 EVA PROX GPSAA INSTALLATION OPS FLOW – CABLE/CONNECTOR LOCATION AND ID

Cable ID

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

Connector ID

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

(P:Plug, J:Jack)
ETVCG DUMMY BOX
ETVCG (Cont)
ETVCG (Cont)

Light

Connector jack for light cable (cable not shown)

Lock – for light power cable

Pan/Tilt Lock (Locked config)

Z-93 paint on light (no touch)

Camera (No touch silver Teflon surface)

Pan/Tilt Lock in Locked Posn

TVCIC

Tether point

Outer bolts (2)

Camera lens launched in down position

Robotic hardware (not a tether point)

Center jacking bolt (with microconical fitting)

Cable for light

Camera lens launched in down position

Lock – for light power cable

Pan/Tilt Lock in Locked Posn

Connector jack for light cable (cable not shown)
ETVCG (Cont)

- Light (with Z93 paint)
- Dummy Panel
- Stanchion Cable (W8200)
- EVA Handle “race track”
- Camera (on pan/tilt unit)
- TVCIC
- Stanchion
- P4
- P3
- P2
- J2
- J3
- J4
TIEDOWN: ETVCG TO VSSA (GENERIC)

NOTE: ETVCG is depicted in this graphic

Adj Tether ~ 21 inches
TIEDOWN: DUMMY BOX SECURED TO VSSA

Two Eq-Eq Adjustable Tethers

22” between Tether Points

25” between Tether Points
FHRC STINGER BOX (TRRJ AT -90 DEG)