EVA Checklist

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

Generic, Rev H
March 4, 2005

NOTE
For STS-114 and subsequent (chronological) flights per current schedule.

Verify this is the correct version for the pending operation (training, simulation or flight).
Electronic copies of FDF books are available. URL: http://mod.jsc.nasa.gov/do3/FDF/index.html
PCN-15 (Aug 28, 2008) Sheet 1 of 1

List of Implemented Change Requests (482s):
EVA-1759   MULTI-1823 A

Incorporate the following:
1. Replace iii and iv
2. Replace 1-3 thru 1-10

NOTE
For STS-125 and subsequent flights

Prepared by: [Signature]  
Book Manager

Approved by: [Signature]  
Lead, EVA Systems Group

Accepted by: [Signature]  
Chief, EVA Operations Branch

Encl: 10 pages

File this PCN immediately behind the front cover as a permanent record
PCN-14 (Apr 15, 2008) Sheet 1 of 1

List of Implemented Change Requests (482s):
EVA-1758

Incorporate the following:
1. Replace iii and iv
2. Replace 4-11 and 4-12

NOTE
For STS-124 and subsequent flights

Prepared by: [Signature]
Book Manager

Approved by: [Signature]
Lead, EVA Systems Group

Accepted by: [Signature]
Chief, EVA and Crew Systems
Operations Branch

Encl: 4 pages

File this PCN immediately behind the front cover as a permanent record
List of Implemented Change Requests (482s):

EVA-1756
EVA-1757

Incorporate the following:
1. Replace iii and iv, vii and viii
2. Replace 14-7 and 14-8
3. Replace 15-11 and 15-12
4. Replace 19-1 and 19-2
   After 9-12, add 19-13 and 19-14

**NOTE**
For STS-123 and subsequent flights

Prepared by: [Signature]
Book Manager

Approved by: [Signature]
Lead, EVA Systems Group

Accepted by: [Signature]
Chief, EVA and Crew Systems
Operations Branch

Encl: 12 pages

*File this PCN immediately behind the front cover as a permanent record*
List of Implemented Change Requests (482s):

EVA-1755

Incorporate the following:

1. Replace iii and iv
2. Replace 4-1 and 4-2

NOTE
For STS-123 and subsequent flights

Prepared by:  

Approved by:  

Accepted by:  

Encl: 4 pages

File this PCN immediately behind the front cover as a permanent record
PCN-11 (Sept 28, 2007) Sheet 1 of 1

List of Implemented Change Requests (482s):
EVA-1754       MULTI-1806

Incorporate the following:
1. Replace iii thru vi
2. Replace 3-3 and 3-4, 3-7 and 3-8
3. Replace 4-5 and 4-6, 4-9 and 4-10
4. Replace 10-1 and 10-2, 10-11 and 10-12
   After 10-12, add 10-13 and 10-14
5. Replace 12-7 and 12-8, 12-19 thru 12-22

NOTE
For STS-120 and subsequent flights

Prepared by:    [Signature]
Book Manager

Approved by:    [Signature]
Lead, EVA Systems Group

Accepted by:    [Signature]
for Angela Prince,
Chief, EVA and Crew Systems
Operations Branch

Encl: 24 pages

File this PCN immediately behind the front cover as a permanent record
List of Implemented Change Requests (482s):
EVA-1753

Incorporate the following:
1. Replace iii and iv
2. Replace 4-5 and 4-6, 4-9 and 4-10
3. Replace 12-7 and 12-8, 12-19 thru 12-22

NOTE
For STS-118 and subsequent flights

Prepared by: [Signature]  
Book Manager

Approved by: [Signature]  
Lead, EVA Systems Group

Accepted by: [Signature]  
Chief, EVA and Crew Systems Operations Branch

Encl: 12 pages

File this PCN immediately behind the front cover as a permanent record
List of Implemented Change Requests (482s):
EVA-1749  MULTI-1787
EVA-1750
EVA-1751
EVA-1752

Incorporate the following:
1. Replace iii thru vi
2. Replace 1-3 thru 1-10
3. Replace 4-5 and 4-6
4. Replace 8-1 and 8-2
   After 8-6, add 8-7 and 8-8
5. Replace 10-7 and 10-8

NOTE
For STS-118 and subsequent flights

Prepared by: [Signature]
Book Manager

Approved by: [Signature]
Lead, EVA Systems Group

Accepted by: [Signature]
Chief, EVA and Crew Systems
Operations Branch

Encl: 20 pages

File this PCN immediately behind the front cover as a permanent record
List of Implemented Change Requests (482s):

EVA-1747  
EVA-1748

Incorporate the following:

1. Replace iii and iv
2. Replace 9-3 thru 9-6
3. Replace 10-7 thru 10-10

NOTE
For STS-117 and subsequent flights

Prepared by:  
Book Manager

Approved by:  
Lead, EVA Systems Group

Accepted by:  
Chief, EVA and Crew Systems Operations Branch

Encl: 10 pages

File this PCN immediately behind the front cover as a permanent record
List of Implemented Change Requests (482s):
EVA-1742  EVA-1745
EVA-1743  EVA-1746
EVA-1744

Incorporate the following:
1. Replace iii thru vi
2. Replace 3-1 and 3-2, 3-7 thru CC 3-10
3. Replace 4-7 thru 4-10
4. Replace section 8 (6 pages)
5. Replace section 9 (6 pages)
6. Replace 10-1 and 10-2
   After 10-4, add 10-4a and 10-4b
   Replace 10-11 and 10-12

Prepared by:  

Approved by:  

Accepted by:  

NOTE
For STS-117 and subsequent flights

File this PCN immediately behind the front cover as a permanent record
PCN-6 (Nov 10, 2006) Sheet 1 of 1

List of Implemented Change Requests (482s):
EVA-1722
EVA-1723
EVA-1724
EVA-1735
EVA-1736

Incorporate the following:
1. Replace iii and iv
2. Replace 3-3 thru 3-8
3. Replace 4-5 and 4-6
4. Replace 10-9 and 10-10
5. Replace 11-1 thru 11-4
6. Replace 15-9 and 15-10, 15-13 and 15-14

NOTE
For STS-116 and subsequent flights

Prepared by:  

Book Manager

Approved by:  

Lead, EVA Systems Group

Accepted by:  

Chief, EVA and Crew Systems
Operations Branch

Encl: 20 pages

File this PCN immediately behind the front cover as a permanent record
List of Implemented Change Requests (482s):

EVA-1686
EVA-1688
EVA-1689
EVA-1690
EVA-1716

Incorporate the following:
1. Replace iii and iv
2. Replace 1-3 thru 1-8
3. Replace 3-3 thru 3-8
4. Replace 4-5 thru 4-8
5. Replace 12-3 and 12-4
6. Replace 19-9 and 19-10

NOTE
For STS-115 and subsequent flights

Prepared by: [Signature] 8-7-06
Book Manager

Approved by: [Signature] 8/1/06
Lead, EVA Systems Group

Accepted by: [Signature] 8/1/06
Chief, EVA and Crew Systems
Operations Branch

Encl: 22 pages

*File this PCN immediately behind the front cover as a permanent record*
PCN-4 (June 12, 2006) Sheet 1 of 1

List of Implemented Change Requests (482s):

EVA-1654
EVA-1655
EVA-1656
EVA-1667
EVA-1680

Incorporate the following:

1. Replace iii thru viii
2. Replace 1-3 thru 1-8
3. Replace section 3 (12 pages)
4. Replace 4-1 thru 4-10
   After 4-10, add 4-11 and 4-12
5. Replace 5-1 and 5-2
6. Replace A6-1 and CC A6-2, B6-1 and CC B6-2
7. Replace 12-1 thru 12-4, 12-19 thru 12-22
8. Replace 14-3 thru 14-10, 14-13 and 14-14, 14-17 thru 14-22
9. Replace section 15 (14 pages)
10. Replace 19-9 and 19-10
11. Replace 20-1 and 20-2

Prepared by: ____________________________
               Book Manager

Approved by: ____________________________
               Lead, EVA Systems Group

Accepted by: ____________________________
               Chief, EVA and Crew Systems
               Operations Branch

Encl: 84 pages

File this PCN immediately behind the front cover as a permanent record
List of Implemented Change Requests (482s):
EVA-1633
EVA-1652

Incorporate the following:
1. Replace iii thru viii
2. Replace 15-1 thru 15-4

NOTE
For STS-121 and subsequent flights

Prepared by:  
Book Manager

Approved by:  
Acting Lead, EVA Systems Group

Accepted by:  
Chief, EVA and Crew Systems Operations Branch

Encl: 10 pages

File this PCN immediately behind the front cover as a permanent record
List of Implemented Change Requests (482s):
EVA-1608

Incorporate the following:
1. Replace iii and iv
2. Replace 12-15 and 12-16

NOTE
For STS-114 and subsequent flights

Prepared by: [Signature]  
Book Manager

Approved by: [Signature]  
Acting Lead, EVA Systems Group

Accepted by: [Signature]  
Chief, EVA and Crew Systems
Operations Branch

Encl: 4 pages

File this PCN immediately behind the front cover as a permanent record
PCN-1 (Apr 8, 2005) Sheet 1 of 1

List of Implemented Change Requests (482s):

| EVA-1563 | EVA-1574 | MULTI-1694 |
| EVA-1566 | EVA-1575 |
| EVA-1570 (R) | EVA-1576 |
| EVA-1573 |

(R) Remainder of a previous partial implementation is in this publication

Incorporate the following:

1. Replace iii and iv
2. Replace 1-3 thru 1-10
3. Replace 2-1 and 2-2
4. Replace 4-5 thru 4-8
5. Replace 9-3 and 9-4
6. Replace 12-9 thru 12-14
7. Replace 15-3 and 15-4
8. Replace 19-5 and 19-8

Prepared by: [Signature]
Bock Manager

Approved by: [Signature]
Lead, EVA Systems Group

Accepted by: [Signature]
Chief, EVA and Crew Systems
Operations Branch

Encl: 28 pages

File this PCN immediately behind the front cover as a permanent record
MISSION OPERATIONS DIRECTORATE

EVA CHECKLIST

GENERAL, REV H
March 4, 2005

PREPARED BY:

[Signature]
Paul G. Boehm
Book Manager

APPROVED BY:

[Signature]
Randall S. McDaniel
Lead, EVA Task Group

[Signature]
Randall S. McDaniel
Acting Lead, EVA Systems Group

[Signature]
Angela R. Prince
Chief, EVA and Crew Systems Operations Branch

This document is under the configuration control of the Crew Procedures Control Board (CPCB). All proposed changes must be submitted on FDF Workflow Crew Procedure Change Request (CR) to DO3/FDF Manager.

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(P) – Partially implemented in this publication

**AREAS OF TECHNICAL RESPONSIBILITY**

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<tr>
<td>Task Procedures</td>
<td>DX32/K. Shook</td>
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**EVA CHECKLIST**

**LIST OF EFFECTIVE PAGES**

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Sign Off ................. * ALL/GEN H 4-11 ............... ALL/GEN H,14
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* – Omit from flight book

Δ – Replace with page from Flight Supplement, if applicable. Otherwise, not flown
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\(\Delta\) – Replace with pages from Flight Supplement, if applicable. Otherwise, not flown

\(*\) – Omit from flight book
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<td>CUE CARD CONFIGURATION</td>
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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)
3. √LEH O2 SPLY 1,2 vlv (two) – OP
4. O2 XOVR SYS 2 – CL
5. LEH O2 4(5,6,7) outlet – connect O2 hose
6. MIDDECK COMM CCU PWR – OFF
   outlet – connect comm cable
   CCU PWR – ON
7. Decrease HIU volume control
8. LEH O2 4(5,6,7) vlv – OP
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. √Comm
14. Configure ATU for PTT/PTT as reqd to alleviate comm noise
15. Note time and continue mask prebreathe at least 1 hr

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

WARNING
Do not terminate prebreathe until cabin pressure at 10.2 psia and 1 hr prebreathe completed
PREP FOR 10.2 PSI CABIN

PRESS/CYRO SYS CONFIG

L2 1. √O2 SYS 1,2 SPLY (two) – ctr (tb-OP)
   √XOVR SYS 1 – OP
   2 – CL
2. √N2 SYS 1,2 SPLY (two) – ctr (tb-OP)
   √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
   √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

AIRLOCK/MIDDECK PREP

MO10W 5. O2 REG INLET SYS 1 vlv – CL
   2 vlv – OP

AW18A 7. LTG FLOOD (four) – ON

DCM 8. PURGE vlv – op (up)

9. Remove LTA Restraint 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 [ ]
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 vlv s per DEPRESS CHART

4. Continue plotting CABIN P vs PPO2 every 60 sec using [SM SYS SUMM 1]. Reconfig vlv s 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)

#### H/W & B/U C/W ENA/INH PARA ID

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<td>2.50</td>
<td>3.90</td>
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</tbody>
</table>

#### IMU FAN ΔP

| ENA 0612869 | 2.7 | 3.8 |

3. Perform SM CHECKPOINT INITIATE (ORB OPS, DPS)
4. O2 XOVR SYS 2 – OP
5. If O2 bleed orifice not installed:
   MO69M
   \( \backslash \text{LEH O2 vlv 8} - \text{CL} \)
   Unstow and insert O2 bleed orifice in O2 QD
   LEH O2 vlv 8 – OP

### MASK PREBREATHE TERMINATE

**WARNING**

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

- **EV**
  1. Momentarily pull mask away from face to verify O2 flow
  2. Set mask O2 control to NORMAL
  3. Doff mask

- **C6, MO32M, MO69M**
  4. LEH O2 4(5,6,7) vlv – CL

- **MO39M**
  5. MIDDECK COMM CCU PWR – OFF
     outlet – Disconnect comm cable
     CCU PWR – ON

- **C6, MO32M, MO69M**
  6. Depress Mask O2 control

- **C6, MO32M, MO69M**
  7. LEH O2 4(5,6,7) outlet – Disconnect hose

- **C6, MO32M, MO69M**
  8. Stow mask, HIU, and 14 ft comm/O2 umbilical
10.2 PSI MAINTENANCE

WARNING
Cabin O2 concentration (SM SYS SUMM 1) must be maintained below 28.5%. See chart this page
Terminate all WCS activity while flowing N2 thru 14.7 CAB REG INLET SYS 1

CAUTION
Do not perform 10.2 PSI MAINTENANCE in parallel with EMU purge

X: SM SYS SUMM 1

NOTE
Perform 10.2 PSI MAINTENANCE procedure post airlock repress and post sleep while 10.2 psi operations desired. Perform pre-sleep maintenance, if reqd, using target area in control zone

1. If PPO2 < 2.70 psia:
   If pre-sleep:
   OCAC
   Perform OCAC filter cleaning as reqd
   OCAC PWR – OFF
   C5
   DIRECT O2 – OP

2. When PPO2 ~2.70 psia or when CABIN PRESS ~10.4 psia:
   DIRECT O2 – CL
   If pre-sleep:
   OCAC
   OCAC PWR – ON

3. If CABIN PRESS < 10.40 psia:
   MO10W
   14.7 CAB REG INLET SYS 1 vlv – OP (N2)
   When CABIN PRESS ~10.40 psia:
   14.7 CAB REG INLET SYS 1 vlv – CL

CABIN LEAK MONITORING
4. Log 10.2 PSI MAINTENANCE times (MET)
   1. ________ 5. ________
   2. ________ 6. ________
   3. ________ 7. ________
   4. ________ 8. ________

NOTE
If MCC requests maintenance, then log time and use that time to compare to next maintenance

5. If successive maintenance reqd because CABIN PRESS decreased from 10.40 to 10.00 psia:
   For ∆t < 40 min, go to O2(N2) FLOW HIGH/CAB P LOW/dP/dT (ORB PKT, ECLS)
   For 40 min < ∆t < 10 hr, go to MAL, ECLS SSR-8, SMALL CABIN-LEAK ISOL
CABIN REPRESS TO 14.7 PSI

WARNING
Terminate all WCS activity during repress to 14.7 psia

SETUP

X: SM 60 SM TABLE MAINT

R13
1. Reset C/W and FDA limits
2. Contact MCC for uplink of B/U C/W and SM ALERT TMBU (if desired)

Changes enclosed in

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REPRESS

X: SM 66 ENVIRONMENT

MO10W
3. 14.7 CAB REG INLET SYS 1,2 vlv (two) – OP
4. \O2/N2 CNTLR VLV SYS 1 – OP
   2 – AUTO
5. Contact MCC to determine if FES should remain ON
6. If FES operation not reqd:
L1 FLASH EVAP CNTLR PRI A(B) – OFF
14.7 PSI CABIN CONFIG

ORBITER PCS 1(2) CONFIG

MO10W
1. O2 REG INLET SYS 1(2) vlv – OP 2(1) vlv – CL
2. H2O TK N2 REG INLET SYS 1(2) vlv – OP 2(1) vlv – CL
3. √H2O TK N2 ISOL SYS 1,2 vlv (two) – OP
4. If prior to shuttle airlock repress:
   14.7 CAB REG INLET SYS 1,2 vlv (two) – CL
   If after shuttle airlock repress:
   14.7 CAB REG INLET SYS 1(2) vlv – OP 2(1) vlv – CL
L2
5. O2/N2 CNTLR VLV SYS 1(2) – AUTO 2(1) – CL(O2)

RESET C/W AND FDA LIMITS

R13U
6. Contact MCC for uplink of B/U C/W and SM ALERT
   TMBU (if desired)
   Changes enclosed in

7. Go to SM CHECKPOINT INITIATE (ORB OPS, DPS)

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AIRLOCK CONFIG

AIRLOCK PREP ............................................................................................................. 2-2
EMU SWAP .................................................................................................................... 2-3
BOOSTER FAN DEACTIVATION/REMOVAL .............................................................. 2-4
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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. \(\sqrt{\text{Inner hatch Equal vlv (two)} \text{ – OFF}}\)

AW18A

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

NOTE
EMU X is to be removed and EMU Y is to be installed

EMU X
1. Install gloves
2. √PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
   √MODE (two) – OFF
3. Disconnect SCU, install DCM cover
4. Stow SCU on AAP, Velcro to wall
5. Connect LTA to HUT, lock (if reqd)
6. Disconnect helmet with sunshades down and helmet cover installed; stow
7. Release EMU from AAP, transfer EMU to middeck
8. Install helmet
9. Remove 20-g Crash Bag on middeck EMUs (if flown)

EMU Y
10. Disconnect helmet, temp stow
11. Remove comm cap from LTA Restraint Bag and connect to electrical harness (if reqd)
12. Remove LTA Restraint Bag
13. Release EMU from middeck AAP, transfer to airlock
14. Mount EMU on AAP
15. Install helmets (not reqd if proceeding directly to EMU Checkout)
16. Disconnect waist ring; remove and stow any equipment stowed in HUT/LTA
17. Waist ring – engage posn
18. Connect LTA to HUT, lock

NOTE
O2 vlv for SCU connected to EMU Y must be closed prior to checkout of EMU Y

AW82B
19. If performing EMU CHECKOUT of EMU Y:
   EV-1(EV-2) O2 vlv – CL

EMU X
20. Attach EMU to middeck AAP
21. Attach LTA Restraint Bag
BOOSTER FAN DEACTIVATION/REMOVAL (15 min)

MO13Q  1. ARLK FAN A,B (two) – OFF
MA73C:G  2. cb AC1,2 ARLK TNL FAN A,B (six) – op
EXT A/L  3. Disconnect flex duct from booster fan muffler inlet, direct airflow into airlock, temp secure
4. Disconnect vent duct from booster fan outlet and external airlock duct inlet; temp stow in middeck
If booster fan to be removed:
5. Disconnect flex duct from booster fan inlet; rotate and stow in launch bracket
6. Demate booster fan electrical connectors from J1,J2 (two) on tunnel extension wall; loosen cable harnesses (two) from Velcro strips (four)
7. Stow electrical connectors (two) on booster fan dummy fittings, secure cable harnesses with Velcro strips
8. Loosen booster fan fasteners (four)
9. Remove booster fan assy, temp stow in middeck

BOOSTER FAN INSTALLATION/ACTIVATION (15 min)

If booster fan to be installed:
MA73C:G  1. √ cb AC1,2 ARLK TNL FAN A,B (six) – op
MO13Q  2. √ ARLK FAN A,B (two) – OFF
EXT A/L  3. Install booster fan assy, secure fasteners (four)
4. Demate electrical connectors (two) from booster fan dummy fittings and Velcro strips
5. Mate booster fan electrical connectors J1,J2 (two) on tunnel extension wall; secure cable harnesses (two) with Velcro strips (four)
6. Unstow/connect flex duct from launch bracket to booster fan inlet
7. Unstow/connect vent duct to external airlock duct inlet and booster fan outlet
8. Unstow/connect flex duct from middeck to fan muffler inlet
MA73C:G  9. cb AC1,2 ARLK TNL FAN A,B (six) – cl
MO13Q  10. ARLK FAN A(B) – ON
11. Check for airflow at top of external airlock halo

EMU REMOVAL (15 min)

1. As reqd, install gloves
2. As reqd, perform LTA RESTRAINT STRAP INSTALLATION (AIRLOCK CONFIG)
3. As reqd, relocate LTA spring hooks (four) from AAP rings to SAFER mount brackets
4. Disconnect EMUs from AAPs, stow in middeck

EMU INSTALLATION (15 min)

1. Transfer EMUs to A/L, connect to AAPs
2. As reqd for EVA, perform LTA RESTRAINT STRAP REMOVAL (AIRLOCK CONFIG)
3. As reqd, relocate LTA spring hooks (four) from SAFER mount brackets to AAP rings
EMU CHECKOUT PREP (30 min)

AW18A 1. LTG FLOOD (four) – ON

Vol H 2. Remove Airlock Stowage Bag from airlock (if flown)

Vol H 3. Unstow:
   EMU Equipment Bag – attach to middeck wall
   EMU Servicing Kit – mark with Gray Tape; label “Shuttle”; temp stow
   Drink Bags for later use (stow on top of Vol H Bags)

Vol H 4. Stow Vol H Bags in Vol H

Vol H 5. Unbuckle SCU straps, Velcro SCU to wall

5. Remove 20-g Crash Bag from middeck EMU (if flown)

Vol H 7. Disconnect helmets from airlock EMUs, temp stow

Vol H 8. Remove comm caps from LTA Restraint Bags and connect to electrical harnesses in EMU

Vol H 9. Remove LTA Restraint Bags

Vol H 10. Disconnect waist rings; remove and temp stow any equipment stowed in HUT/LTA

Vol H 11. Stow LTA Restraint Bags on AAP

Vol H 12. Thermal cover clear of waist rings

Vol H 13. Waist ring – engage position

Vol H 14. Connect LTA to HUT, lock

Vol H 15. Install helmet with sunshades down and helmet cover installed; lock (not reqd if proceeding directly to EMU Checkout)
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
<table>
<thead>
<tr>
<th>CHECKOUTS</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMU CHECKOUT</td>
<td>3-2</td>
</tr>
<tr>
<td>EMU POWERUP AND COMM CHECK</td>
<td>3-2</td>
</tr>
<tr>
<td>PRIMARY REGULATOR/FAN/PUMP CHECK</td>
<td>3-4</td>
</tr>
<tr>
<td>SOP CHECK</td>
<td>3-5</td>
</tr>
<tr>
<td>BATTERY CHARGE CHECK INIT</td>
<td>3-6</td>
</tr>
<tr>
<td>BATTERY CHARGE CHECK TERM</td>
<td>3-6</td>
</tr>
<tr>
<td>EMU SWAP DURING CHECKOUT</td>
<td>3-7</td>
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<tr>
<td>POST EMU C/O RECONFIG</td>
<td>3-7</td>
</tr>
<tr>
<td>SAFER CHECKOUT</td>
<td>3-8</td>
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<tr>
<td>SELF TEST SEQUENCE</td>
<td>3-9</td>
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<tr>
<td>SAFER CHECKOUT RESULTS</td>
<td>CC 3-10</td>
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<td>SAFER STATUS TROUBLESHOOTING</td>
<td>CC 3-11</td>
</tr>
<tr>
<td>REBA POWERED HARDWARE CHECKOUT</td>
<td>3-12</td>
</tr>
</tbody>
</table>
EMU CHECKOUT

NOTE
Procedures are written for simultaneous
C/O of EMUs #____ (stbd) and #_____ (port) in airlock. An additional C/O of
EMU(s) #_____ uses same procedure
after performing EMU SWAP during C/O.

X: SM 60 SM TABLE MAINT

☐ 1. Contact MCC for uplink of SM ALERT TMBU (if desired)

Changes enclosed in [ ]

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<td>VOLTS EMU 2</td>
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<td>OSH</td>
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</table>

EMU POWERUP AND COMM CHECK (15 min)

NOTE
If procedure is being repeated for 3rd EMU #____ only, other previously checked EMU #____ is reqd
in airlock to perform EMU POWERUP and COMM
CHECK procedures to verify EMU-to-EMU comm.

[PWR RESTART] msg and BITE light should be
illuminated whenever EMU power is cycled. Display
and tone tests only occur during cold restarts

BOTH DCM ☐ ☐ 2. Retrieve, position SCUs; remove DCM covers
☑ ☐ 3. Connect SCUs to DCM, \locked
☐ ☐ 4. PWR – BATT

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

AW18H ☐ ☐ 5. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR
           BUS SEL (two) – MNA(MNB)
☐ ☐ 6. √EMU INPUT 1,2 volts = 18.0-20.0
EV AW18D ☐ ☐ 7. √AIRLK AUD PWR – OFF
BOTH DCM ☐ ☐ 8. COMM mode – ALT
☐ ☐ 9. √Comm FREQ – LOW
IV A1R ☐ ☐ 10. √AUD CTR UHF A/G 1,2 (two) – OFF
              A/A – T/R
R14:C ☐ ☐ 11. √cb MNA UHF EVA – cl
         √MNC UHF EVA – cl
12. BIOMED CH 1 – EVA 1
   CH 2 – EVA 2

13. √AUD PWR – AUD/TONE
    A/G 1,2 (two) – OFF
    A/A – T/R
    ICOM A,B (two) – OFF (as reqd)

14. UHF SPLX/EVA PWR AMP – OFF
    MODE – EVA

15. √Aud PWR – AUD/TONE
    A/G 1,2 (two) – OFF
    A/A – T/R
    ICOM A,B (two) – OFF (as reqd)

16. Don comm caps

NOTE
After the next step, be prepared to verify no missing
segments on display and that all tones are audible

17. PWR – SCU
18. Verify no missing segments during display test
    Verify BITE light extinguishes
    Verify status (continuous) tone and warble tone are audible

    Report any anomalies to MCC

19. Perform onboard A/A comm check per table

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<thead>
<tr>
<th>EMUs</th>
<th>MODE</th>
<th>FREQ</th>
<th>EVA STRING</th>
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<tr>
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<td>HIGH</td>
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<td>296.8/417.1</td>
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<td>HIGH</td>
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<td>296.8/417.1</td>
<td></td>
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<tr>
<td>PRI</td>
<td>LOW</td>
<td>1</td>
<td>259.7/414.2</td>
<td></td>
</tr>
</tbody>
</table>

20. Aud A/G 1(2) – T/R
    √Aud A/G 2(1) – OFF
    A/A – T/R

21. Aud CTR UHF A/G 1(2) – T/R
    √Aud C/TR UHF A/G 2(1) – T/R
    A/A – OFF

22. Verify RF comm with MCC

23. Aud CTR UHF A/G 1(2) – OFF

24. Doff comm caps

If procedure is being repeated for 3rd EMU #_____ only, then on other
previously checked EMU #_____:

25. Install helmet, lock

26. COMM mode – OFF

27. PWR/BATT CHGR EMU 1(2) BUS SEL – OFF

28. DISP – STATUS, until [DATA?COMBO] displayed
    – YES (hold for 2 sec)
    – STATUS, until [DATA EMU?] displayed
    – YES (hold for 2 sec)

Verify [DATA?EMU] displayed
PRIMARY REGULATOR/FAN/PUMP CHECK (40 min)

MD(flr)  29. EMU O2 ISOL VLV – OP

DCM  30. √STATUS: O2 P = 850-950

<table>
<thead>
<tr>
<th>EMU</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tr>
<td>30. O2 P</td>
<td></td>
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<td></td>
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</tbody>
</table>

AW82B  31. EV-1, EV-2 O2 vlv (two) – OP

32. Install helmet, lock
33. Suit arms aligned
34. Gloves locked
35. Helmet purge vlv – cl, locked

DCM  36. PURGE vlv – cl (dn)
37. O2 ACT – IV
38. √STATUS: SUIT P = 0.4-1.4 and stable (compare w/gauge)

<table>
<thead>
<tr>
<th>EMU</th>
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<th>3</th>
<th>4</th>
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</thead>
<tbody>
<tr>
<td>38. SUIT P (IV)</td>
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</tbody>
</table>

39. O2 ACT – PRESS

40. √STATUS: SUIT P = 4.2-4.4 and stable (compare w/gauge)
  H2O TEMP = ambient
  H2O GP = 14.0-16.0
  H2O WP = 14.0-16.0

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<td>40. SUIT P (PRESS)</td>
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<tr>
<td>H2O TEMP</td>
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<tr>
<td>H2O GP</td>
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<tr>
<td>H2O WP</td>
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</table>

41. DISP – STATUS, until LEAK CHECK? displayed
  DISP – YES (hold for 2 sec)
  Follow displayed instructions

<table>
<thead>
<tr>
<th>EMU</th>
<th>1</th>
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<tbody>
<tr>
<td>41. ΔP</td>
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</tbody>
</table>

* If LEAKAGE HI SUIT P msg occurs (ΔP > 0.3 psi), *
* go to FAILED LEAK CHECK (14.7/10.2 PSI) Cue *
* Card, CC 6-4 *

42. O2 ACT – OFF

DCM  43. PURGE vlv – op (up)
44. √STATUS: SUIT P < 0.4 (compare w/gauge)
45. Disconnect glove
46. Reconnect glove
47. Disconnect helmet, temp stow
48. Disconnect waist ring – secure LTA to outer hatch handrail
49. Remove Multiple Water Connector cover, temp stow
50. Connect LCVG, \locked

DCM  51. √Temp control vlv – Max C
Minimize fan operation with O2 ACT – OFF (~2 min)

52. FAN – ON (PWR RESTART may occur)
Verify flow at neck ring vent port

AW18H

53. EMU INPUT amps = 1.5-4.7 (1.5-5.0 at 14.7)

<table>
<thead>
<tr>
<th>EMU</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<tbody>
<tr>
<td>53. INPUT AMPS</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

54. Install SCOF, lock

DCM

55. O2 ACT – IV, NO VENT FLOW msg, DISP – PRO
Cooling flow in LCVG

56. STATUS: H2O TEMP decrease from step 40

<table>
<thead>
<tr>
<th>EMU</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>56. H2O TEMP</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

* If no temp decrease, depress and hold pump priming *
* valve on back of EMU, while slowly cycling TCV *
* between 7 and Max C (30 sec minimum) *

AW18H

57. EMU INPUT amps = 1.5-3.6 (1.5-4.0 at 14.7)
EMU INPUT amps decrease from step 53

<table>
<thead>
<tr>
<th>EMU</th>
<th>1</th>
<th>2</th>
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<tbody>
<tr>
<td>57. INPUT AMPS</td>
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</tbody>
</table>

DCM

58. PWR – BATT, NO VENT FLOW message, DISP – PRO

59. STATUS: BAT VDC ≥ 16.5
BAT AMPS = 2.3-3.7 (2.4-4.0 at 14.7)
RPM = 18.0-20.0 K

<table>
<thead>
<tr>
<th>EMU</th>
<th>1</th>
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<th>3</th>
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<tr>
<td>59. BAT VDC</td>
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<tr>
<td>BAT AMPS</td>
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<tr>
<td>RPM</td>
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</tr>
</tbody>
</table>

60. Fan noise steady

61. O2 ACT – OFF

62. FAN – OFF

63. PWR – SCU

SOP CHECK (5 min)

64. Perform step 28 to reset data to EMU mode

DCM

65. STATUS: SOP P = 5410-6800

<table>
<thead>
<tr>
<th>EMU</th>
<th>1</th>
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<tbody>
<tr>
<td>65. SOP P</td>
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</tr>
</tbody>
</table>
SOP  □ □  66. √SOP gauge 5400-6800, note SOP interstage gauge

<table>
<thead>
<tr>
<th>EMU</th>
<th>1</th>
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<tr>
<td>INT GAUGE</td>
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</table>

DCM □ □  67. DISP – STATUS until [SUIT P] displayed
- YES (hold for 2 sec) to lock parameter

□ □  68. Depress SOP manual override (50 sec max):
- SOP interstage gauge < 600

DCM
- STATUS: [SUIT P] = 3.4-3.9

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□ □  69. √STATUS: [SOP P] = 5410-6800

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<td>69. SOP P</td>
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</table>

□ □  70. Remove SCOF, stow
□ □  71. Disconnect LCVG, stow (as reqd if transferring to ISS)
□ □  72. Install Multiple Water Connector cover
□ □  73. Install helmet, LTA

DCM □ □  74. COMM mode – OFF

BATTERY CHARGE CHECK INIT (15 min)

AW18H □ □  75. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
 MODE (two) – CHARGE
 BUS SEL (two) – MNA(MNB)

□ □  76. Continue charge 15 min, minimum

BATTERY CHARGE CHECK TERM
When PWR/BATT CHGR EMU INPUT AMPS < 1 and 15 min minimum charge complete:
□ □  77. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
 MODE (two) – OFF
EMU SWAP DURING CHECKOUT (30 min) (If reqd)

NOTE
EMU(s) #_____ to be removed from airlock.
EMU(s) #_____ to be installed in airlock.
Procedure written for swap of one or two EMUs

EMU ___  78. √Gloves installed
DCM     79. Disconnect SCU, install DCM cover
         80. Stow SCU on AAP, Velcro to wall
         81. Release EMU from AAP, transfer EMU to middeck
EMU ___  82. Disconnect helmet, stow
         83. Remove comm cap from LTA Restraint Bag and connect to
electrical harness
         84. Remove LTA Restraint Bag
         85. Release EMU from middeck AAP, transfer to airlock
         86. Install EMU on AAP
         87. Disconnect waist ring; remove and stow any equipment
              stowed in HUT/LTA
         88. Waist ring – engage posn
         89. Connect LTA to HUT, lock

NOTE
O2 vlv for SCU connected to EMU(s) #_____
must be closed prior to checkout of EMU

AW82B    90. EV-_____ O2 vlv – CL
EMU ___  91. Install EMU on middeck AAP
         92. Attach LTA Restraint Bag, as reqd
         93. Go to EMU POWERUP AND COMM CHECK, 3-2

POST EMU C/O RECONFIG (5 min)
   When EMU C/O for all EMUs complete:
   IV  O6  94. UHF MODE – OFF
         √SPLX/EVA XMIT FREQ – 259.7/414.2
         √PWR AMP – OFF
         √SPLX SQUELCH – ON
   R10     95. √BIOMED CH 1 – EVA 1
         √CH 2 – EVA 2
   AW82B    96. EV-1,EV-2 O2 vlv (two) – CL
   BOTH    97. Remove SCUs, install DCM covers
         98. Stow SCU on AAP, Velcro to wall
   IV      99. cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – cl
            (heaters will be deactivated on MCC call)
            [X:] SM 60 SM TABLE MAINT
         100. Contact MCC for uplink of SM ALERT TMBU (if desired)
             Changes enclosed in [ ]

<table>
<thead>
<tr>
<th>Param Name</th>
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<th>Upper Limit</th>
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<td>EXT A/L O2 SPLY ZN 2 T</td>
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<td>OSH</td>
</tr>
</tbody>
</table>
SAFER CHECKOUT (30 min if first checkout of SAFER unit, 20 min for subsequent checks)

NOTE
Procedures written for simultaneous C/O of two SAFERs

BOTH
1. Remove SAFER and SAFER CHECKOUT RESULTS Cue Card from Stowage Bag/FDF Locker

PM
2. √Inhibitor installed, properly engaged
   If first SAFER CHECKOUT:

HCM
3. Remove power switch guard
4. Stow HCM
5. Remove stowage straps from thruster towers, unfold towers
6. Remove SAFER latch guards from latches (leave lanyard straps attached to towers)

7. Inspect:
   Thruster tower hinges
   Tower latches
   √TMG not blocking thrusters
   √SAFER latch guard lanyard strap attached to SAFER towers above tower hinges

8. Peel back SAFER tower TMG on both towers and install SAFER latch guards over SAFER latches
   √Latch guard lanyards routed under tower TMG
   Re-attach tower TMG to secure latch guards in place

9. Fold thruster towers

10. Install stowage straps

PM
11. MAN ISOL vlv – OP (dn)
12. Deploy HCM; √proper deployment

CAUTION
Minimize time with SAFER powered (~1 min)

NOTE
Have SAFER CHECKOUT RESULTS Cue Card w/proper serial number ready to record status.

   From power on to entry into Test Mode, the SAFER will be in Automatic Attitude Hold (AAH) (Green LED on). Try to hold SAFER steady against a wall. Changes in SAFER attitude may result in AAH-induced thruster firings

13. As reqd, review SELF TEST SEQUENCE (refer to box next page)
14. Perform Self Test:
   Start timer
   HCM
   PWR – TST/ON
   Wait until [GN2 XX% PWR XX%] displayed
   √AAH LED (green) on
   PWR – ON

Cont next page
NOTE
Be prepared to count thruster clicks (24) after PWR – TST/ON

PWR – TST/ON
Follow displayed instructions on HCM:
\[\sqrt{\text{SELF TEST – WAIT}}\] displayed; if able, count thruster clicks (twenty four)

* If [NSI CIRCUIT OPEN] or [FAIL: ...] msg
* displayed or non-responsive display:
* Note failure msg
* Press DISP sw to resume test
* If [HC TO DETENT] msg displayed:
* Note msg
* HC grip springs to center position

When [RATE CHECK] displayed, rotate SAFER at least + and - 3 deg/sec sequentially in each rotational axis

15. \[\sqrt{\text{GO FOR EVA}}\] or [FAILED TEST] displayed
16. PWR – ON
17. DISP: Record GN2%, PWR%, BATT V (SAFER CHECKOUT RESULTS Cue Card)
18. PWR – OFF
19. Stop timer, record ‘ON Time’ (~1 min desired)
20. \(\sqrt{\text{GN2\%} \geq 87}\)
\(\sqrt{\text{PWR\%} \geq 45}\)
\(\sqrt{\text{BATT V} \geq 35}\)
21. Report GN2%, PWR%, BATT V, and SAFER serial number to MCC
22. MODE – ROT

CAUTION
Do not stow HCM to be used for EVA with power switch guard installed

NOTE
When stowing HCM, verify that umbilical will not snag during deployment

23. Stow HCM
24. Stow SAFER and Cue Card in Stowage Bag
25. Inhibitor installed
26. MAN ISOL vlv – CL (up)

SELF TEST SEQUENCE (for reference only; do not perform)

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<tr>
<th>HCM</th>
<th>1. NSI circuit test</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>2. [\sqrt{\text{SELF TEST – WAIT}}] Twenty-four thruster clicks and THR LED (red) flashing</td>
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<tr>
<td></td>
<td>3. DEPRESS AAH</td>
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<tr>
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<td>4. [MODE – ROT] (if in TRAN) [MODE – TRAN]</td>
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<tr>
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<td>5. HC grip detent test</td>
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<tr>
<td></td>
<td>6. [HC +X] (fwd), (-X, +Y (rt), -Y, +Z (dn), -Z, +P (twist up), -P)</td>
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<tr>
<td></td>
<td>7. [RATE CHECK]; rotate SAFER at least + and - 3 deg/sec sequentially in each rotational axis</td>
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# SAFER CHECKOUT RESULTS

## SAFER SERIAL #

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<tr>
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<th>ON Time</th>
<th>GN2%</th>
<th>PWR%</th>
<th>BATT V</th>
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<th>PWR%</th>
<th>BATT V</th>
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## NOTE

SAFER battery expected to last for 52 1-min checkouts and have at least 45% PWR remaining

## BATTERY CHANGEOUT

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(reduced copy)
### SAFER STATUS TROUBLESHOOTING

<table>
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<tr>
<th>GMT</th>
<th>Failure Message</th>
<th>NOMINAL STATUS</th>
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<tr>
<td>GN2%</td>
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<td>87-99%</td>
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<tr>
<td>PWR%</td>
<td></td>
<td>45-99%</td>
</tr>
<tr>
<td>TANK P</td>
<td></td>
<td>&gt; 6575 psia</td>
</tr>
<tr>
<td>TANK T</td>
<td></td>
<td>-40 to 140 degF</td>
</tr>
<tr>
<td>RATE R</td>
<td></td>
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<td>RATE P</td>
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<td>± 99.9 deg</td>
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<tr>
<td>DISPL Y</td>
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<td>± 99.9 deg</td>
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<td>BATT T</td>
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<tr>
<td>Leak</td>
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### SAFER JET NOMENCLATURE

![Diagram of SAFER Jet Nomencalture](image-url)
REBA POWERED HARDWARE CHECKOUT (15 min)

NOTE
Procedure written for simultaneous C/O of 12 volt HDW on all EMUs

1. Perform REBA BATTERY INSTALL (EMU MAINT/RECHARGE), as reqd
All EMUs

2. \(\sqrt{1}\) REBA sw (1 per EMU) – OFF (toward left arm of suit)

If EMU TV:

3. Install EMU TV on helmets 1,2; note camera addresses
   EV1 ___, EV2 ___ (see figure below)

4. Unstow EMU TV power cable, disconnect from ground plug

5. Mate EMU TV power cable to EMU TV

If no EMU TV:

6. \(\sqrt{1}\) EMU TV power cable mated to ground plug

7. \(\sqrt{1}\) Upper arm connections mated

8. \(\sqrt{1}\) Glove heater sw (one per glove) – OFF

9. Connect lower arm pwr harness to gloves

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

10. \(\sqrt{1}\) REBA sw (1 per EMU) – ON, pull tab toward right arm of suit

11. \(\sqrt{1}\) Glove heater sw (one per glove) – ON

When heat detected on all outside fingertips:

12. \(\sqrt{1}\) Glove heater sw (one per glove) – OFF

If EMU TV:

13. EMU TV power pb – press, \(\sqrt{1}\) Green LED illuminated

14. EMU TV power pb – press, \(\sqrt{1}\) Green LED not illuminated

15. \(\sqrt{1}\) REBA sw (1 per EMU) – OFF, pull tab toward left arm of suit

16. Disconnect lower arm pwr harness from gloves

17. Stow lower arm and glove pwr harness connectors under TMG

18. Disconnect EMU TV power cable from EMU TV

19. Connect EMU TV power cable to ground plug

20. Attach LTA Restraint Bag, as reqd

---

Image of a helmet and its components:
- **Helmet Light Gimbal**
- **Camera address located at bottom of receiver**
- **Cable Path:** Cover cable in TMG
- **View from back of helmet looking forward. Helmet light structure omitted for clarity**
### EVA PREP

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<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)

A7
1. WIRELESS VID HTR – ON

Vol H
2. Unstow EMU Servicing Kit

AW18A
3. LTG FLOOD (four) – ON
4. □ EVA Bag installed in airlock
5. □ Contamination Detection Kit installed in airlock
6. □ REBA sw – OFF (toward left arm of suit)
7. □ Helmet lights, helmet light batteries, and EMU TVs installed on helmets
   If EMU TV:

PLSS
8. □ EMU TV power cable demated, connected to ground plug
9. Disconnect helmets, temp stow

HUT
10. Remove Drink Bag Restraint Bag

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)

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<th>Param ID</th>
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<th>Upper Limit</th>
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<tr>
<td>SPLY ZN 2 T</td>
<td>0640186</td>
<td>OSL</td>
<td>80</td>
</tr>
</tbody>
</table>

PREP FOR DONNING (30 min)

1. Contact MCC for uplink of SM ALERT TMBU (if desired)
   Changes enclosed in [ ]

2. Retrieve, position SCU; remove DCM cover
3. Connect SCU to DCM, \ülocked
4. EV-1, EV-2 O2 vlv (two) – op
5. \üARLK H2O S/O VLV – OPEN (tb-OP)
6. \üEMU O2 ISOL VLV – OP
7. \ücb MNC EXT ARLK HTR ZN 1,2 (two) – op
8. \üO2 XOVR SYS 1,2 (two) – OP
9. PWR – BATT
10. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR
11. PWR – SCU
12. STATUS: [BATT VDC] \geq 20.3
13. Verify panels as shown next page
14. Perform EVA COMM CONFIG, steps 1-4
15. Comm FREQ – LOW
16. COMM mode – PRI (EMU data only, no audio)
17. Disconnect, transfer, temp stow LTAs, helmets, additional EMU(s) to middeck
18. Remove Dosimeter from inflight garments; insert in LCVG
19. Unstow biomed OBS/EVA cable (EMU Servicing Kit), connect to elec harness
20. Don MAG, TCU, LCVG
21. Don biomed per figure; shave 3-in patch using shave gel and razor (as reqd) (EMU Servicing Kit), clean skin using shave gel and damp towel, dry skin, install stoma seals and apply paste to electrodes, adhere to chest and secure with overtapes
22. Don comm caps
23. Connect biomed to elec harness
24. Perform EVA COMM CONFIG, steps 5 and 6 (EMU hot mic)
25. Verify biomed signal, EMU data, and RF comm with MCC
26. COMM mode – HL

**NOTE**
Be prepared to verify a nominal powerup sequence after the next step and verify no missing segments on display and that all tones are audible

27. PWR – BATT
Verify no missing segments during display test
Verify status (continuous) tone and warble tone audible
Verify BITE light extinguishes. Report anomalies to MCC

28. PWR – SCU

29. Doff comm caps
30. Disconnect biomed

**EMU DONNING** (55 min)

**NOTE**
May be performed by EV1 and EV2 simultaneously

32. Take one aspirin tablet (325 mg)
33. √STATUS: [SOP P] = 5410-6800 (compare w/gauge)
34. √Waist ring – op
35. Don LTA, attach donning handles as reqd
   If boot bladder manipulation reqd:
   36. Disconnect boot from leg (sizing ring)
   37. Pull up excess boot bladder around full circumference of boot disconnect
   38. Connect boot to leg (sizing ring)
   39. Engage Lock 1
   40. √All locks (three per boot) engaged
41. Ingress airlock
42. Suit arms aligned
43. Disconnect gloves; wrist disconnects – op
44. Stow IV glasses
45. Don thumb loops
46. Drink valve posn before HUT donning
47. Biomed elec harness outside of HUT
PLSS 48. REBA sw – OFF
49. Don HUT
50. Release thumb loops
51. Suit arms aligned
52. Don EV glasses as reqd
53. Don comm cap
DCM 54. COMM mode – HL, vol as reqd
55. Comm with IV
56. Connect biomed to elec harness
57. Connect LCVG to multiple water connector, locked
58. Thermal cover clear of waist ring
59. Waist ring – engage posn
60. Connect waist ring to HUT, locked
61. Remove donning handles, stow in EMU Equipment Bag; cover waist ring

CAUTION
Pulling on drink bag blue bite vlv to adjust posn can cause vlv to release from stem

62. Drink vlv posn after HUT donning
63. Mike boom posn
64. Don comfort gloves, wristlets
65. Wrist rings – engage posn
66. Don EV gloves, locked
67. Tighten palm restraint straps

If REBA battery:

IV 68. Glove heater sw (two) – OFF
69. Connect lower arm pwr harness to gloves
70. Stow slack under arm TMG
71. Cuff C/L posn

CAUTION
Minimize fan operation with O2 ACT – OFF (~2 min)

EV1 DCM 72. FAN – ON (PWR RESTART may occur)
73. Elec harness clear of neck ring
74. Don helmet, locked
DCM 75. O2 ACT – IV
76. Helmet purge vlv – cl, locked
DCM 77. PURGE vlv – cl (dn)

If EMU TV:

PLSS 78. Unstow EMU TV power cable; disconnect from ground plug
79. Mate EMU TV power cable to EMU TV

EV2 80. Repeat steps 33-79 if done serially
EMU CHECK (5 min)

BOTH  

81. √ Cooling

* If cooling insufficient slowly cycle temp control vlv  
* between 7 and Max C while IV depresses and holds  
* pump priming vlv on back of EMU (30 sec min)  

82. Temp control vlv – as reqd  
83. √ Wrist rings – covered  
84. √ Waist rings – covered  

DCM  

85. √ COMM mode – HL  
86. √ WATER – OFF  
87. √ PWR – SCU  
88. √ FAN – ON  
89. √ Comm FREQ – LOW  
90. √ Helmet Light ops  
91. √ Helmet purge vlv – cl, locked  

DCM  

92. √ PURGE vlv – cl (dn)  
93. DISP – STATUS: until [LEAK CHECK?] msg displayed  
   DISP – YES (hold for 2 sec), follow displayed instructions  

* If [PRESS FAIL/SUIT P X.X] or [LEAKAGE HI SUIT P X.X], * 
* go to FAILED LEAK CHECK (14.7/10.2 PSI), CC 6-4  
* (Cue Card)  

EMU PURGE

| MET /__/:______ | MET /__/:______ | MET /__/:______ |

NOTE

Flex arms and legs periodically  
and avoid overcooling during  
purge/prebreathe

<table>
<thead>
<tr>
<th>CABIN P</th>
<th>PURGE DURATION (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.2</td>
<td>8</td>
</tr>
<tr>
<td>14.7</td>
<td>12</td>
</tr>
</tbody>
</table>

BOTH DCM  

1. O2 ACT – PRESS  
2. Verify no EMU fit issues  
3. PURGE vlv – op (up), begin purge clock  
4. When N2 purge complete (per table):  
   PURGE vlv – cl (dn)  
   O2 ACT – IV
**EMU PREBREATHE**

<table>
<thead>
<tr>
<th>IV</th>
<th>R1</th>
<th>1. Begin prebreathe clock</th>
<th>2. O2 TK3 HTR A(B) – as reqd</th>
<th>3. Egress AAP, stow handles</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>AW82B</td>
<td>4. AIRLK DEPRESS vlv cap – vent, remove, stow</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Remove loose equipment</td>
<td>6. If reqd, stow REBA jumper cable</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>7. Remove SAFER from Stowage Bag</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8. Remove stowage straps from thruster towers, stow in EMU Equipment Bag; unfold thruster towers</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>9. Remove SAFER latch guard from SAFER latch (leave lanyard strap attached to thruster tower)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10. Inspect: Thruster tower hinges Tower latches \Text{TMG} not blocking thrusters \Text{SAFER} latch guard lanyard strap attached to \Text{SAFER} towers above tower hinges</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>11. \Text{TMG} clear from \Text{SAFER} striker plate on EMU PLSS</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>12. Remove Inhibitor; close, fasten port cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>13. MAN ISOL vlv – OP (dn)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>14. Latch – PRELOAD</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>15. Rotate latch ccw to recess butterfly in housing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>16. Rotate latch ccw to soft stop</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>If reqd: 17. Rotate latch cw to align latch collar with square bolt head</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>18. Latch – ENG</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>19. Mate PLSS to thruster towers</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>20. Push latch in and rotate cw until stop (~90°)</td>
<td>* If latch will not engage: * Latch – PRELOAD * Rotate latch ccw until soft stop * Return to step 17</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>21. Latch – PRELOAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>22. Rotate latch cw until ratcheting</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>23. Continue ratcheting until lock marking on latch, tower aligned</td>
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<tr>
<td></td>
<td></td>
<td>24. Latch – LCK</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>25. Peel back \Text{SAFER} tower \Text{TMG} on both towers and install \Text{SAFER} latch guards over \Text{SAFER} latches \Text{SAFER} latch guard lanyards routed under tower \Text{TMG} Re-attach tower \Text{TMG} to secure latch guards in place</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>26. \Text{TMG} not blocking thruster</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>27. Access to HCM deploy lever</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>28. \Text{TMG} not blocking thruster</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>29. Repeat for \Text{SAFER} 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SAFER DONNING** (If reqd)

| PM  |     | 11. \Text{TMG} clear from \Text{SAFER} striker plate on EMU PLSS | | |
|     |     | 12. Remove Inhibitor; close, fasten port cover | | |
|     |     | 13. MAN ISOL vlv – OP (dn) | | |
|     |     | 14. Latch – PRELOAD | | |
|     |     | 15. Rotate latch ccw to recess butterfly in housing | | |
|     |     | 16. Rotate latch ccw to soft stop | | |
|     |     | If reqd: 17. Rotate latch cw to align latch collar with square bolt head | | |
|     |     | 18. Latch – ENG | | |
|     |     | 19. Mate PLSS to thruster towers | | |
|     |     | 20. Push latch in and rotate cw until stop (~90°) | * If latch will not engage: * Latch – PRELOAD * Rotate latch ccw until soft stop * Return to step 17 | |
|     |     | 21. Latch – PRELOAD | | |
|     |     | 22. Rotate latch cw until ratcheting | | |
|     |     | 23. Continue ratcheting until lock marking on latch, tower aligned | | |
|     |     | 24. Latch – LCK | | |
|     |     | 25. Peel back \Text{SAFER} tower \Text{TMG} on both towers and install \Text{SAFER} latch guards over \Text{SAFER} latches \Text{SAFER} latch guard lanyards routed under tower \Text{TMG} Re-attach tower \Text{TMG} to secure latch guards in place | | |
|     |     | 26. \Text{TMG} not blocking thruster | | |
|     |     | 27. Access to HCM deploy lever | | |
|     |     | 28. \Text{TMG} not blocking thruster | | |
|     |     | 29. Repeat for \Text{SAFER} 2 | | |

**PREBREATHE DURATION**

<table>
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<tr>
<th>CABIN P</th>
<th>R1</th>
<th>10.2</th>
<th>12 hr</th>
<th>01:15</th>
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<td>AW82B</td>
<td>14.7</td>
<td>24 hr</td>
<td>00:40</td>
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</table>

| MET | / | / | / | / | / | / | / | / |

**CAUTION**

- Rotating ccw past soft stop can bind latch
- Rotating ccw may disengage SAFER
As reqd per MCC,

**EV1, EV2**

Set battery amp-hours:

**DCM**

30. DISP – STATUS until [BATT? 32.0AH] displayed

31. DISP – YES (hold for 2 sec)

32. Use DISP to status to desired value

33. When desired value selected, DISP – YES (hold for 2 sec)

**IV**

34. Install MWS and BRTs (as reqd)

If DCS 760 EVA camera used:

Charger 35. SW2 CAMERA PWR – OFF (LED off)

DCS 760 36. Disconnect DCS 760 pwr cable from DC PWR ADAPTER port

37. Close thermal cover on DC PWR ADAPTER port or connect Ext Camera pwr cable to DC PWR ADAPTER port (as reqd)

**EVA Flash** 38. Install flash batteries (two) (as reqd)

39. √EVA tools installed in airlock

40. As reqd, perform BOOSTER FAN DEACTIVATION/REMOVAL (AIRLOCK CONFIG)

**A/L** 41. Remove, stow appropriate vent ducts to allow hatch closure

**MD(flr)** 42. As reqd, disconnect vent duct from middeck floor fitting; stow

43. As reqd, unstow, install diffuser cap on middeck floor fitting

44. √Loose middeck-stowed items clear of inner hatch and middeck diffuser cap air flow

**DCM** 45. Remove WATER switch guard (two), stow in EMU Equipment Bag

46. REBA sw – ON (toward right arm of suit)

If EMU TV:

47. EMU TV power pb – press, √Green LED illuminated

If airlock with aft hatch:

**A/L(flr)** 48. Deploy floor EVA hatch supports

49. Egress airlock

50. √Inner hatch – close, lock

51. √Inner hatch Equal vlv caps (two) – removed

52. Inner hatch Equal vlv (two) – OFF

53. When prebreathe time complete, √MCC for GO to DEPRESS/REPRESS (Cue Card)
## EVA COMM CONFIG

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| R14:C | 1. √cb MNA UHF EVA – cl  
|      | √MNC UHF EVA – cl  |
| O6 | 2. √UHF SPLX/EVA XMIT FREQ – 259.7/414.2  
|      | √PWR AMP – OFF  
|      | √EVA STRING – 1  
|      | UHF MODE – EVA  |
| IVA ATU | 3. √AUD A/G 1(2) – T/R  |
| R10 | 4. BIOMED CH 1 – EVA 1  
|      | 2 – EVA 2  |

If docked with ISS and EVA comm on A/G 1:

**NOTE**
In step 5, A/G 1 docked hardline disabled.
UHF will become A/G 1 Shuttle-to-ISS link

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| O6 | 5. √MCC and ISS that UHF configured and in Public Call  
| A1R | AUD CTR SPACELAB A/G 1 – OFF  |
| A1R | 6. AUD CTR UHF A/G 1(2) – T/R  
|      | √2(1) – OFF  
|      | √A/A – OFF  |

## EVA COMM DECONFIG

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
</table>
| O6 | 1. UHF MODE – OFF  
|      | √SPLX/EVA XMIT FREQ – 259.7/414.2  
|      | √PWR AMP – OFF  
|      | √SPLX SQUELCH – ON  |

If docked with ISS and EVA comm on A/G 1:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A1R</td>
<td>2. AUD CTR SPACELAB A/G 1 – ON</td>
</tr>
</tbody>
</table>
| A1R | 3. AUD CTR UHF A/G 1(2) – OFF  
|      | √2(1) – OFF  
|      | √A/A – OFF  |
## APPROVED NON-EMU HARDWARE MATRIX

<table>
<thead>
<tr>
<th>Item</th>
<th>Part Number</th>
<th>Item</th>
<th>Part Number</th>
<th>Item</th>
<th>Part Number</th>
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<tbody>
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<td>Passive Dosimeter</td>
<td>SED11100212</td>
<td>Band-Aids</td>
<td>8137004444</td>
<td>Genoptic Ophthalmic Ointment</td>
<td>17478-284-35</td>
</tr>
<tr>
<td>Panty Shield</td>
<td>S019BY2033</td>
<td>Band-Aids</td>
<td>8137004431</td>
<td>JAXA Crew Personal Dosimeter (JaCPD)</td>
<td>CPADLESXXX</td>
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<tr>
<td>Sock</td>
<td>528-40802</td>
<td>Band-Aids</td>
<td>8137004430</td>
<td>Kerlix Dressing</td>
<td>5715</td>
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<td>Band-Aids</td>
<td>09681</td>
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<td>K6715</td>
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<td>ST17C3309</td>
<td>Band-Aids</td>
<td>555-3036</td>
<td>Kling Dressing</td>
<td>6923</td>
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<tr>
<td>Hair Restraint</td>
<td>528-41572-XX</td>
<td>Band-Aid Sheer Dot</td>
<td>4930</td>
<td>Lidocaine Jelly</td>
<td>186033036</td>
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<tr>
<td>Croakie – Modified</td>
<td>528-21224</td>
<td>Band-Aid Strips</td>
<td>NON256602</td>
<td>Lotrimin Cream</td>
<td>0085-0963-17</td>
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<td>GRD Croakie</td>
<td>CP-3-XX-XX1-XX</td>
<td>Band-Aid Sheer Spot</td>
<td>555-8243</td>
<td>Moleskin</td>
<td>528-4304-1</td>
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<td>Croakie</td>
<td>528-41822</td>
<td>Benzoin Swabs</td>
<td>26-06-09</td>
<td>Moiste</td>
<td>1028</td>
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<td>European Crew Personal Dosimeter</td>
<td>EuCPD-FM-XXX-XXX</td>
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<td>26-06-19</td>
<td>Neosporin Plus Cream</td>
<td>0501-3712-05</td>
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<td>Eye Glasses</td>
<td>CP-3-XX-XX-XX</td>
<td>Bioclusive</td>
<td>2461</td>
<td>Polysporin Ointment</td>
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<tr>
<td>OBS Cable</td>
<td>SED42100961</td>
<td>Blistex</td>
<td>1015798221</td>
<td>Polytrim</td>
<td>23782410</td>
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<td>10157-9920-2</td>
<td>Povidone Iodine Swabs</td>
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<tr>
<td>OBS Sternal Harness</td>
<td>SH42100149</td>
<td>Ciloxan 0.3%</td>
<td>0065-0654-35</td>
<td>Pred Forte</td>
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<tr>
<td>3” Ace Bandage</td>
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<td>Coverlet</td>
<td>01307</td>
<td>Steri-Strip</td>
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<td>4” x 4” Gauze</td>
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<td>Tobrex Solution</td>
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<td>16100010</td>
<td>Elastoplast Tape</td>
<td>23631-040X</td>
<td>Triamcinolone Acetonide Dental Paste</td>
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<td>Bacitracin</td>
<td>2438506003</td>
<td>Eye Pads</td>
<td>J8773</td>
<td>Triamcinolone Cream</td>
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<tr>
<td>Bactroban Ointment</td>
<td>0029-1527-22</td>
<td>Famiciclovir</td>
<td>0007-4117-13</td>
<td>VIROPTIC</td>
<td>61570-037-75</td>
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<tr>
<td>Bactroban Ointment</td>
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<td></td>
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<td>Gauze Pads</td>
<td>555-6284</td>
<td></td>
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</tr>
</tbody>
</table>
EMU STATUS
## EMU STATUS

### PARAMETER | NORMAL STATUS | EV1 | EV2 | EV1 | EV2 | EV1 | EV2
---|---|---|---|---|---|---|---
O2 POS | EVA | | | | | | |
SUBLM P | 2.0 to 4.2 psia | | | | | | |
TIME EV | HR:MIN since PWR-BATT | | | | | | |
TIME LF | HR:MIN remaining at present use rate | | | | | | |
%PWR (O2) LF | Limiting consumable displayed | | | | | | |
%O2 (PWR) LF | Nonlimiting consumable displayed | | | | | | |
SUIT P | 4.2 to 4.4 psid | | | | | | |
| (4.2 to 5.5 psid post depress) | | | | | | |
O2 P | 150 to 950 psia | | | | | | |
O2 RATE | 0 to 4.0 psi/min | | | | | | |
SOP P | 5410 to 6800 psia | | | | | | |
BAT VDC | ≥ 16.7 | | | | | | |
BAT AMP | 3.0 to 4.0 | | | | | | |
RPM | 18.0 to 20.0 K | | | | | | |
CO2 | 0.2 to 4.0 mmHg | | | | | | |
H2O TEMP | 32 to 75 degF | | | | | | |
H2O GP | 14.0 to 16.0 psid | | | | | | |
H2O WP | 14.0 to 16.0 psid | | | | | | |
D A T A? | COMBO | | | | | | |
BATT | 32.0 AH (or as directed) | | | | | | |
GAUGE | 4.2 to 4.4 psid | | | | | | |
| (4.2 to 5.5 psid post depress) | | | | | | |

### EMU Status Short Stack:
Used to periodically (every hour for the first 6.5 hr, then every 10 min) report to MCC-H if the EMU data downlink is not available

### PARAMETER | EV | EV | EV | EV | EV | EV | EV
---|---|---|---|---|---|---|---
TIME EV | | | | | | | |
TIME LF | | | | | | | |
%PWR (O2) LF | | | | | | | |
%O2 (PWR) LF | | | | | | | |
DEPRESS (10 min)
When prebreathe complete
DCM 1. \(\sqrt{\text{Comm FREQ}} \quad \text{LOW}\)
2. \(\text{COMM mode} \quad \text{PRI}\)
AW82B 3. \(\text{AIRLK DEPRESS vv} \quad \text{CL}, \text{EV ALERT TONE}\)
  * If gauge > 5.5, stop depress, \(\text{\& MCC}\)
4. Airlock at 6.0, \(\text{EV ALERT TONE}\)
5. When airlock at 5.0, \(\text{AIRLK DEPRESS vv} \quad \text{CL}, \text{EV ALERT TONE}\)
BOTH DCM 6. \(\text{DISP} \quad \text{STATUS}; \text{until LEAK CHECK} \quad \text{displayed, DISP} \quad \text{YES} \quad \text{hold for 2 sec}, \text{follow displayed instructions}\)
  * If LEAKAGE HI | SUIT P X.X, go to FAILED *
  * LEAK CHECK \quad \text{(5 PSI)}, reverse side *
AW82B 7. \(\sqrt{\text{O2 ACT}} \quad \text{EVA}\)
8. \(\text{AIRLK DEPRESS vv} \quad \text{CL}, \text{EV ALERT TONE}\)
  * If gauge > 5.5, stop depress, \(\text{\& MCC}\)
BOTH 9. \(\text{Attach waist tether(s) to A/L D-ring for egress}\)
AW82B 10. \(\text{Airlock dP/dT} \quad \text{CL}, \text{EV ALERT TONE}\)
11. When outer hatch \(\Delta P \leq 0.5\), outer hatch – open, stow
AW82B 12. \(\text{AIRLK DEPRESS vv} \quad \text{CL}\)

POST DEPRESS (5 min)
BOTH DCM 1. \(\text{PWR} \quad \text{BATT}, \text{EV WARN TONE}\)
  (IV record MET \_ \_ \_ \_ \_ \_ \_ \_ \_)
AW18H 2. \(\text{IV} \quad \text{PET} = 00:00\)
DCM 3. \(\text{Disc SCU; install DCM cover}\)
4. \(\text{Stow SCU on AAP, Velcro to wall}\)
5. \(\text{Temp control vv} \quad \text{Max H}\)
6. \(\text{WATER} \quad \text{ON}\)
7. \(\text{\& DCM blank, BITE off}\)
8. \(\text{Temp control vv} \quad 3 \quad \text{MAX C}\)
9. \(\text{STATUS}, \text{compare to Cuff C/L, 1 (IV record)}\)
10. \(\text{Visors as reqd}\)
11. \(\text{Perform AIRLOCK EGRESS, Cuff C/L, 47, or Flight Specific Timeline}\)
IV 12. \(\text{cb MNC EXT ARLK HTR LINE ZN 1,2 (two)} \quad \text{cl}\)

PRE REPRESS (5 min)
IV ML86B:C 1. \(\text{cb MNC EXT ARLK HTR LINE ZN 1,2 (two)} \quad \text{op}\)
MD(fr) 2. \(\text{EMU O2 ISOL vv} \quad \text{OP}\)
DCM 3. \(\text{\& SCUs connected to DCM}\)
4. \(\text{WATER} \quad \text{OFF for 2 min}\)
5. \(\text{Outer hatch closed and locked}\)
6. \(\text{Disc waist tethers, attach to EMU}\)
AW82B 7. \(\text{EV-1, EV-2 O2 vv (two)} \quad \text{OP}\)
AW18H 8. \(\text{PWR/BATT CHGR EMU 1,2 BUS SEL (two)} \quad \text{MNA(MNB)}\)
DCM 9. \(\text{PWR} \quad \text{SCU}, \text{EV WARN TONE}\)
  (IV record MET \_ \_ \_ \_ \_ \_ \_ \_ \_)

REPRESS (10 min)
BOTH DCM 1. \(\text{O2 ACT} \quad \text{PRESS}\)
2. \(\text{COMM mode} \quad \text{HL}\)

NOTE
IV expect dP/dT alarm during repress
AW82B 3. \(\text{AIRLK DEPRESS vv} \quad \text{CL}\)
4. \(\text{Inner hatch Equal vv (one)} \quad \text{throttle OFF to NORM} \quad \text{as reqd}, \text{EV ALERT TONE}\)
5. \(\text{Airlock at 4.0, EV ALERT TONE}\)
6. \(\text{When airlock at 5.0, Equal vv} \quad \text{OFF, EV ALERT TONE}\)
DCM 7. \(\text{Airlock pressure integrity (2 min,} \Delta P \leq 0.1 \text{ psi)}\)
8. \(\text{EV Glove heaters} \quad \text{OFF, gloves clean}\)

WARNING
If Cuff 1 symp resolve upon repress, report as Cuff 2
If any DCS, leave O2 ACT – PRESS

WARNING
If on SOP, leave O2 ACT – EVA thru airlock repress
**DEPRESS (25 min)**

- **When prebreathe complete**
  1. Comm FREQ – LOW
  2. COMM mode – PRI
  3. AIRLK DEPRESS vlv – 5, EV ALERT TONE, monitor suit P gauge < 5.5
     * If gauge > 5.5, stop depress, MCC *
  4. Airlock at 6.0, EV ALERT TONE
  5. When airlock at 5.0, AIRLK DEPRESS vlv – CL, EV ALERT TONE

**BOTH DCM**

- Disp – STATUS: until [LEAK CHECK ?] displayed, Disp – YES (hold for 2 sec), follow displayed instructions
  * If [LEAKAGE HI | SUIT P X.X] go to FAILED *
  * LEAK CHECK (5 PSI), reverse side *

- **O2 ACT – EVA**
- **MCC**

**DEPRESS/REPRESS**

**PRE REPRESS (5 min)**

- IV ML86B:C 1. \(\text{cb MNC EXT ARlk HTR LINE ZN 1, 2 (two)} – \text{op}\)
- MD(flr) 2. \(\text{EMU O2 ISOL vlv – OP}\)
- BOTH DCM
  3. WATER – OFF
  4. \(\text{EVAT} \text{utch closed, locked}\)
  5. Unstow SCU, remove DCM cover, connect SCU, \(\checkmark\) locked
  6. Disc waist tethers, attach to EMU

**AW82B**

- Disc waist tethers, attach to EMU

**AW82B**

- **PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OP**

**AW18H**

- **PWR – SCU, EV WARN TONE**

**DCM**

- **O2 ACT – IV**
- **DCM blank, BITE off**

**POST DEPRESS (15 min)**

**BOTH DCM**

- PWR – BATT, EV WARN TONE
  *(IV record MET __ __ __)*

- WATER – ON

**AW82B**

- AIRLK DEPRESS vlv – CL
- When EVAT hutch \(\Delta P < 0.5\), EVAT hutch – part op

**AW82B**

- **Temp control vlv – Max H**
- **WATER – ON**
- **TEMP STATUS, compare to Cuff C/L, 1 (IV record)**
- **Visors as reqd**
- Perform AIRLOCK EGRESS, Cuff C/L, 47, or Flight Specific Timeline

**IV**

- **ML86B:C 16. cb MNC EXT ARlk HTR LINE ZN 1, 2 (two) – CL**

**DEPRESS/ REPRESS**

**WARNING**

If on SOP, leave O2 ACT – EVA thru airlock repress

**REPRESS (20 min)**

**AW82B**

- **AIRLK DEPRESS vlv – CL**
- **EVAT hutch Equal vlv (one) – throttle OFF to NORM (as reqd), EVAT TONE**
- **Airlock at 4.0, EVAT TONE**
- **When airlock at 5.0, Equal vlv (two) – OFF, EVAT TONE**

**DCM**

- **Airlock pressure integrity (4 min, \(\Delta P \leq 0.1\) psi)**
- **EV Glove heaters – OFF, gloves clean**

**WARNING**

If Cuff 1 symp resolve upon repress, report as Cuff 2

If any DCS, leave O2 ACT – PRESS

**IV**

- **O2 ACT – PRESS**
- **COMM mode – HL**

**NOTE**

IV1 expect dP/dT alarm during repress

**AW82B**

- **O2 ACT –PRESS**
- **INNER HATCH Equal vlv (one) – throttle OFF to NORM (as reqd), EVAT TONE**
- **Airlock at 4.0, EVAT TONE**
- **When airlock at 5.0, Equal vlv (two) – OFF, EVAT TONE**

**DCM**

- **Airlock pressure integrity (4 min, \(\Delta P \leq 0.1\) psi)**
- **EV Glove heaters – OFF, gloves clean**

**WARNING**

If Cuff 1 sym resolve upon repress, report as Cuff 2

If any DCS, leave O2 ACT – PRESS

**DCM**

- **O2 ACT – IV**
- **INNER HATCH Equal vlv (one) – NORM, EVAT TONE**
- **Airlock dP/dT ~0, EVAT TONE**
- **Go to POST EVA**

**EVA-2a/TNL/O/V**
FAILED LEAK CHECK
### Failed Leak Check (5 PSI)

1. **Leaking EMU:** Repeat leak check on watch and gauge as follows:
   - O2 ACT – PRESS until SUIT P = 4.2 to 4.4 and stable, compare with gauge then
   - O2 ACT – IV, start timing (1 min, Max ΔP = 0.3 psi)
2. If leak check passed:
   - Return to DEPRESS/REPRESS Cue Card, DEPRESS, step 7 (suit pressure sensor unreliable) >>
3. **O2 ACT – IV**
4. Equal vlv (one) – NORM
5. Repeat leak check as follows:
   - \( \sqrt{\text{PURGE vlv – cl (dn)}} \)
   - O2 ACT – PRESS, until SUIT P = 4.2 to 4.4 and stable, compare with gauge then
   - O2 ACT – IV, start timing (1 min, Max ΔP = 0.3 psi)
6. Contact MCC

### Failed Leak Check (14.7/10.2 PSI)

**Note:**
The following steps are performed on the leaking EMU only.

1. **Leaking EMU:** O2 ACT – PRESS
2. Rotate lower arm assemblies 180 degrees cw and 360 degrees ccw
3. Align suit arms
4. Sizing rings locked
5. Swivel hips from side to side
6. Repeat leak check as follows:
   - Helmet purge vlv – cl, locked
   - PURGE vlv – cl (dn)
   - O2 ACT – PRESS until SUIT P = 4.2–4.4 and stable (compare w/gauge)
   - O2 ACT – IV, start timing, 1 min (during EMU CHECKOUT, 2 min)
   - (Max ΔP = 0.3 psi)
7. If leak check passed, go to step 11
   If leak check failed:
   - DCM
   - PURGE vlv – op (up), O2 ACT – OFF
   - FAN – OFF (if EVA PREP)
   - Cycle/inspect suit disconnects as follows:
     - Gloves, helmet (leave off), LTA, boots (if removed in EVA PREP)
     - FAN – ON (if EVA PREP)
8. Install helmet, repeat leak check step 6, then:
9. If leak check passed, go to step 11
   If leak check failed:
   - DCM
   - PURGE vlv – op (up), O2 ACT – OFF
   - FAN – OFF (if EVA PREP)
   - Cycle/inspect suit disconnects as follows:
     - Gloves, helmet (leave off)
     - Helmet purge vlv, Sizing rings
     - LIOH cartridge (O-rings)
   - FAN – ON (if EVA PREP)
10. Install helmet, repeat leak check step 6, then:
11. If leak check passed:
    - Waist ring, wrist rings covered
    - Continue EMU CHECKOUT or EVA PREP >>
12. If leak check failed (EMU lost):
    - Contact MCC
FLIGHT SPECIFIC TIMELINES
TOOLS AND STOWAGE

PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA) ..................................................... 8-2
PGT CHECKOUT ..................................................................................................................... 8-3
PGSC-PGT CONNECTION (A31P AND 760XD) .................................................................. 8-4
PROGRAM PGT SETTINGS .................................................................................................... 8-5
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PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA)

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

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

Forward Tray layout and Labels
Aft Tray Layout and Labels
PGT CHECKOUT

1. Unstow PGT
2. √PWR – OFF
3. √Battery connector covering removed
4. Install battery
5. Ratchet collar – not MTR
6. Cycle MTL settings
7. Cycle bayonette fittings
8. Speed collar – CAL
9. PWR – ON
10. √‘TRIG TO CAL’ on display
11. Press, release trigger to calibrate
12. √‘CAL PASSED’ on display
13. Ratchet collar – MTR
14. √Illumination of all LEDs and ‘LED TEST’ displayed
15. Press trigger and hold
   √BATT VDC ≥ 36.0
16. Speed collar – cw
17. Press trigger and √drive rotates cw
18. Speed collar – ccw
19. Press trigger and √drive rotates ccw
20. To verify programmed settings, cycle MODE/torque collar/speed collar and compare with PGT SETTINGS TABLE
21. PWR – OFF
PGSC-PGT CONNECTION (A31P AND 760XD)

PGSC
1. √PGSC equipped with RS422 PCMCIA Card and adapters (two)

PGT
2. √PWR – OFF
   √PGT Battery installed
3. Ratchet collar – not MTR

CAUTION
Do not over-torque serial port cover screw

4. Open PGT serial port cover using 3/32" Allen Wrench attached to the PGT-RS422 Cable
5. Connect PGSC-RS422 Cable to PGT Remote Programming Port

PGSC
6. Connect PGSC-RS422 Cable to COM 2 or COM 4 adapter box, as desired

PGT
7. PWR – ON

PGSC If PGSC not powered:
8. PGSC PWR – ON
9. Select SHUTTLE APPS icon on PGSC Windows desktop, then select either ‘PGT (COM 2)’ or ‘PGT (COM 4)’ icon
   (Use PGT icon corresponding to COM port selected in step 6)
10. √Tool Communication Check dialog box appears
    √Serial Connection verified
    √Intool software version 2.2

* If dialog box in previous step indicates failure to read software version or
  * reports a communication error, verify electrical connections are fully
  * mated at identified locations below (1-5), then clear dialog box, close
  * application, and repeat steps 9 and 10

1 = RS422 PCMCIA Card to PGSC (check PC card is fully engaged)
2 = RS422 PCMCIA Card to dongle
3 = dongle to adapter box
4 = adapter box to PGT RS422 Cable
5 = PGT RS422 cable to PGT Remote Programming Port

11. Select CONTINUE
PROGRAM PGT SETTINGS

1. Perform PGSC-PGT CONNECTION (A31P AND 760XD) If loading settings from a set file in C:\SPOCAPPS\PGT32\SETTINGS:
   2. Select FILE, OPEN ...
   3. Select desired settings file, OPEN
   4. Select TORQUE/REVOLUTIONS SETTINGS tab in Pistol Grip Tool Remote Software window
   5. Enter changes to table as necessary
   6. Select SPEED & POWER MANAGEMENT SETTINGS tab
   7. Enter changes to table as necessary
   8. √Ratchet collar – not MTR
   9. Select TOOL, SEND DATA TO TOOL
  10. Select desired tables for upload
  11. √All sent settings – black on gray (programmed successfully)

If saving new settings to a file:
  12. Select FILE, SAVE AS ...
  13. Type in new file name, SAVE
  14. Verify programmed settings on PGT by cycling MODE/torque collar/speed collar; compare displayed values to expected values

DOWNLOAD/ERASE EVENT LOG

1. Perform PGSC-PGT CONNECTION (A31P AND 760XD)
  2. √Ratchet collar – not MTR
  3. Select EVENT LOG tab
  4. Select TOOL, GET DATA FROM TOOL...
  5. Select TOOL EVENT LOG DATA (READ-ONLY)
  6. √DOWNLOAD PGT EVENT LOG dialog box appears
  7. Select YES to download data
  8. √SAVE EVENT LOG DATA TO FILE dialog box appears
  9. Enter name for file
 10. Select SAVE
 11. √Event Log data displayed in viewer
 12. If erasing Event Log data from PGT, select OK in ERASE EVENT LOG dialog box
## PGT CONTINGENCIES

<table>
<thead>
<tr>
<th>MESSAGE</th>
<th>CORRECTIVE ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BATTRY HITEMP</td>
<td>If alternate battery avail: power off, change battery. Otherwise, power off, switch to Ratchet mode.</td>
</tr>
<tr>
<td>BATTRY LOTEMP (blinking)</td>
<td>Drive tool with no load to increase battery temperature. If no joy and alternate battery avail: power off, change battery. Otherwise, power off, switch to Ratchet mode.</td>
</tr>
<tr>
<td>BATTRY LOVOLT (blinking)</td>
<td>Continue using until tool is unable to deliver sufficient torque. If no joy and alternate battery avail: Power off, change battery. Otherwise, power off, switch to Ratchet mode.</td>
</tr>
<tr>
<td>CAL FAILED</td>
<td>Press, release trigger to repeat calibration. If no joy, power cycle, calibrate. If no joy, power off, switch to Ratchet mode.</td>
</tr>
<tr>
<td>COLLAR ERROR</td>
<td>Cycle Torque and Speed collars to clear error. If no joy, power cycle, calibrate. If no joy, power off, switch to Ratchet mode.</td>
</tr>
<tr>
<td>COMPAR ERROR</td>
<td>Cycle Torque collar and A/B mode switch. If no joy, power cycle, calibrate. If no joy, power off, switch to Ratchet mode.</td>
</tr>
<tr>
<td>EEPROM WR ERR (blinking)</td>
<td>Power cycle, calibrate. If no joy, power off, switch to Ratchet mode.</td>
</tr>
<tr>
<td>HI TORQ</td>
<td>If fault occurs during engagement and MTL did not slip, ignore message. Otherwise: power cycle, calibrate. If no joy, power off, switch to Ratchet mode.</td>
</tr>
<tr>
<td>HICURR</td>
<td>Reattempt operation. If no joy, power cycle, calibrate. If no joy, power off, switch to Ratchet mode.</td>
</tr>
<tr>
<td>HYBRID HITEMP</td>
<td>Power cycle, calibrate. If no joy, power off, switch to Ratchet mode.</td>
</tr>
<tr>
<td>LO TORQ</td>
<td>Reattempt operation until desired torque is reached. If no joy, power cycle, calibrate. If no joy, power off, switch to Ratchet mode.</td>
</tr>
<tr>
<td>LOCURR</td>
<td>Reattempt operation. If no joy, power cycle, calibrate. If no joy, power off, switch to Ratchet mode.</td>
</tr>
<tr>
<td>LOG IS FULL (blinking)</td>
<td>Continue operation.</td>
</tr>
<tr>
<td>MOTOR HITEMP</td>
<td>Power off, switch to Ratchet mode.</td>
</tr>
<tr>
<td>OVER CURR</td>
<td>Power cycle, calibrate. If no joy, power off, switch to Ratchet mode.</td>
</tr>
<tr>
<td>SLFTST FAIL X</td>
<td>Power cycle, calibrate. If no joy, power off, switch to Ratchet mode.</td>
</tr>
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</table>
### PGT STANDARD SETTINGS

<table>
<thead>
<tr>
<th>SETTINGS</th>
<th>TORQUE SETPOINT (FT-LB)</th>
<th>TORQUE WINDOW (FT-LB)</th>
<th>TORQUE THRESHOLD (FT-LB)</th>
<th>TURNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>2.5</td>
<td>± 1.0</td>
<td>1.0</td>
<td>--</td>
</tr>
<tr>
<td>A2</td>
<td>3.8</td>
<td>± 1.0</td>
<td>1.0</td>
<td>--</td>
</tr>
<tr>
<td>A3</td>
<td>4.8</td>
<td>± 1.0</td>
<td>1.0</td>
<td>--</td>
</tr>
<tr>
<td>A4</td>
<td>6.3</td>
<td>± 1.0</td>
<td>1.0</td>
<td>--</td>
</tr>
<tr>
<td>A5</td>
<td>7.0</td>
<td>± 1.0</td>
<td>1.0</td>
<td>--</td>
</tr>
<tr>
<td>A6</td>
<td>8.3</td>
<td>± 1.0</td>
<td>1.0</td>
<td>--</td>
</tr>
<tr>
<td>A7</td>
<td>9.2</td>
<td>± 1.0</td>
<td>1.0</td>
<td>--</td>
</tr>
<tr>
<td>B1</td>
<td>12.0</td>
<td>± 1.0</td>
<td>1.0</td>
<td>--</td>
</tr>
<tr>
<td>B2</td>
<td>16.0</td>
<td>± 1.2</td>
<td>1.0</td>
<td>--</td>
</tr>
<tr>
<td>B3</td>
<td>18.4</td>
<td>± 1.7</td>
<td>1.0</td>
<td>--</td>
</tr>
<tr>
<td>B4</td>
<td>19.4</td>
<td>± 1.9</td>
<td>1.0</td>
<td>--</td>
</tr>
<tr>
<td>B5</td>
<td>22.0</td>
<td>± 2.0</td>
<td>1.0</td>
<td>--</td>
</tr>
<tr>
<td>B6</td>
<td>24.0</td>
<td>± 2.0</td>
<td>1.0</td>
<td>--</td>
</tr>
<tr>
<td>B7</td>
<td>25.5</td>
<td>± 2.0</td>
<td>1.0</td>
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<table>
<thead>
<tr>
<th>SETTINGS</th>
<th>CCW1</th>
<th>CCW2</th>
<th>CCW3</th>
<th>CW3</th>
<th>CW2</th>
<th>CW1</th>
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<tbody>
<tr>
<td>SPEED (RPM)</td>
<td>10</td>
<td>30</td>
<td>60</td>
<td>60</td>
<td>30</td>
<td>10</td>
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<thead>
<tr>
<th>SLEEP TIME</th>
<th>15 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTO – OFF TIME</td>
<td>30 min</td>
</tr>
</tbody>
</table>

### MULTI-SETTING TORQUE LIMITER (MTL) SETTINGS

- 2.5
- 5.5
- 10.5
- 15.5
- 23.5
- 30.5
# POST EVA

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POST EVA (00:45 if NOT performing 'If reqd' proc blocks)  
(01:25 if performing all 'If reqd' proc blocks)

SUIT DOFFING

WARNING
Do not doff EMU if DCS symptoms resolved during REPRESS. √MCC via PMC

IV
1. When ΔP < 0.5, open hatch
2. As reqd, remove diffuser cap at middeck floor, stow
3. As reqd, unstow airlock vent duct, connect end to middeck floor fitting
4. Configure appropriate vent ducts for airflow into airlock
5. As reqd, perform BOOSTER FAN INSTALLATION/ACTIVATION (AIRLOCK CONFIG)
6. √Gloves clean
   * If reqd, IV use damp towel to clean gloves *

MD(flr)
7. O2 ACT – OFF
8. PURGE vlv – op (up)

A/L
9. Install WATER sw guards (two)

EV
10. EMU TV power pb – press; √Green LED not illuminated

If EMU TV:
11. √Glove heaters sw (one per glove) – OFF

If REBA battery:
12. REBA sw – OFF (toward left arm of suit)
13. Disconnect lower arm pwr harness from gloves
14. Stow lower arm and glove pwr harness connectors under TMG

If EMU TV:
15. Demate EMU TV power cable, mate to ground plug

PLSS
16. STATUS: [SUIT P] < 0.4 (compare w/gauge); disconnect gloves, stow in EMU Equipment Bag
17. Disconnect helmet, stow

DCM
18. ARLK DEPRESS vlv – install cap

SAFER DOFFING (10 min) (If reqd)

IV
19. Remove SAFER latch guard from SAFER latch (leave lanyard strap attached to thruster tower)
20. Latch – ENG
21. Rotate latch ccw until release (~90 deg)
22. Demate PLSS from thruster towers
23. Fold thruster towers
24. Transfer to middeck

PM
25. Install inhibitor (not reqd if SAFER has been used)
26. Temp stow SAFER
27. Repeat for SAFER 2
PLSS 28. If reqd, unstow REBA jumper cable
      29. AAP release handles to 90°
      BOTH 30. Engage HUT in AAP (IV assist as reqd)
      31. AAP release handles to lock
DCM 32. FAN – OFF (fwd)
      33. COMM mode – OFF
      34. Doff comm cap
      35. Disconnect waist ring, LCVG, biomed
      36. Wrist disconnects – op
      37. Doff EV glasses
      38. Doff HUT
      39. Doff LTA, secure to handrail
      40. Remove dosimeter from LCVG; insert in inflight garment
      41. Doff: Biomed (disc OBS/EVA cable, stow in EMU Servicing Kit)
           LCVG (secure to HUT)
           TCU (allow to dry, as reqd)
           MAG, stow in wet trash
HUT 42. Install Multiple Water Connector cover
IV 43. Perform EVA COMM DECONFIG (EVA PREP)
R1 44. O2 TK3 HTR A(B) – as reqd
ML86B:C 45. cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – cl

---

EMU WATER RECHARGE (5 min) (If reqd)
R11L 46. SPLY H2O TKA OUTLET – CL (tb-CL)
       [SM 60 TABLE MAINT]
       CRT 47. Use TKB quantity:
           PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC
           [Log value before recharge]
           Recharge # | H2O TKB %
           1          |
           2          |
           3          |
           4          |
           5          |
AW82D 49. [EMU 1,2 H2O WASTE tb (two) – CL]
           SPLY (two) – OP (tb-OP)
CRT 50. [H2O TKB quantity decreasing]

---

SAFER STOW (10 min) (If reqd)
PM 51. [Inhibitor installed]
      52. Latch – PRELOAD
      53. Rotate latch cw until lock markings on latch and tower
           recess aligned
      54. Push in latch, latch – LCK
      55. Install latch guards over latches under TMG, and reattach TMG
      56. Fold thruster towers
      57. Unstow stowage straps from EMU Equipment Bag; install
PM 58. MAN ISOL vlv – CL (up)
      59. Stow SAFER in Stowage Bag
      60. Repeat for SAFER 2

Cont next page
SUIT DRYING/SEAL WIPE

61. Wipe with drying towel:
   - LTA, legs, boots
   - HUT, suit arms
   - Gloves

62. Inspect Gloves for damage
   - Report damage to MCC

**WARNING**
Avoid stericide contact with eyes. Wash hands thoroughly after application.

63. Wipe LTA crotch and HUT armpit areas with stericide (in EMU Servicing Kit)

64. Lightly wipe seals on LTA waist ring, arm wrist rings, HUT neck ring with lint-free wipe (in EMU Servicing Kit)

65. Clean, refurbish biomed

66. Remove drink bag from HUT and dispose in wet trash

67. **✓** Drink Bag Restraint Bag installed in HUT

OXYGEN RECHARGE VERIFICATION

DCM **✓** 68. **✓** STATUS: O2 P ~850 (recharge complete)

WATER FILL VERIFICATION (10 min) (If reqd)

DCM **✓** 69. **✓** STATUS: H2O WP 8-15 psi and stable for ~30 sec
   (indicates charging complete)

CRT **✓** 70. Use TKB quantity:
   - PARAM ID – ITEM 1 + 0 6 2 0 4 2 0 EXEC

R11L **✓** 71. Log value after recharge
   - Recharge # | H2O TKB %
     - 1
     - 2
     - 3
     - 4
     - 5

**NOTE**
Full charge = ~6%/EMU

R11L **✓** 72. SPLY H2O TKA OUTLET – OP (tb-OP)

WCS **✓** 73. **✓** FAN SEP same as HOSE BLOCK

R11L **✓** 74. **✓** MODE – COMMODE/MANUAL/EMU, posn guard over sw
   (airflow, WCS ON lt on)

AW82D **✓** 75. EMU 1,2 H2O SPLY (two) – CL (tb-CL)

R11L **✓** 76. Install SCOFs, lock

DCM **✓** 77. O2 ACT – IV

AW82H **✓** 78. EMU 1,2 H2O WASTE reg (two) – MAN OP

**NOTE**
Step 79 will be performed serially for EMU 1 and EMU 2

AW82D **✓** 79. EMU 1(2) H2O WASTE (one) – OP (tb-OP) (1 min), then
   - CL (tb-CL)
   - Repeat for other EMU

AW82H **✓** 80. EMU 1,2 H2O WASTE reg (two) – REGULATING

DCM **✓** 81. O2 ACT – OFF

WCS **✓** 82. Remove SCOFs, stow

R11L **✓** 83. MODE – AUTO (√WCS ON lt off)

---

9-4 EVA/ALL/GEN H,8
EMU POWERDOWN/OVERNIGHT STOW

84. Stow comm cap in right arm of EMU
85. Install helmets and covers
86. AIRLK AUD PWR – OFF
87. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
88. PWR/BATT CHGR EMU 1,2 MODE (two) – OFF
89. EMU 1,2 H2O WASTE, SPLY tb (four) – CL
90. ARLK AUD PWR – OFF
91. EV-1, EV-2 O2 vlv (two) – CL
92. AIRLK AUD PWR – OFF
93. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
94. PWR/BATT CHGR EMU 1,2 MODE (two) – OFF

If not performing in-suit EMU battery recharge:

90. Remove SCU; install DCM cover
91. Stow SCU on AAP, Velcro to wall
92. Tether LTA to airlock handrail
93. Hang LCVGs, TCUs, and other EMU accessories for drying

If last EVA completed:

X: SM 60 SM TABLE MAINT

94. 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>
</tr>
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<tr>
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<td>49</td>
<td>145</td>
</tr>
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<td>145</td>
</tr>
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<td>EXT A/L H2O LINE T 2</td>
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<td>OSH</td>
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</table>
EMU MAINT/RECHARGE

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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(fl)
5. √EMU O2 ISOL VLV – OP

AW82B
6. EV1,2 O2 vlv (two) – OP

DCM
7. PWR – SCU

WATER FILL

MO13Q
8. √ARLK H2O S/O VLV – OPEN (tb-OP)

R11L
9. √SPLY H2O TKA OUTLET – CL (tb-CL)

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>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

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

13. √H2O TKB quantity decreasing

NOTE
Full charge requires ~15 min

WATER FILL VERIFICATION

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

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>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Cont next page
NOTE
Full charge = ~6%/EMU

R11L 17. SPLY H2O TKA OUTLET – OP (tb-OP)
WCS 18. FAN SEP same as HOSE BLOCK
19. MODE – COMM MODE/MANUAL/EMU, posn guard over sw
   (√airflow, WCS ON lt on)
AW82D 20. EMU 1,2 H2O SPLY (two) – CL (tb-CL)
21. Install SCOFs, lock
AW82H 23. EMU 1,2 H2O WASTE reg (two) – MAN OP

NOTE
Step 24 will be performed serially for EMU 1 and EMU 2

AW82D 24. EMU 1(2) H2O WASTE (one) – OP (tb-OP) (1 min), then
   – CL (tb-CL)
   – Repeat for other EMU
AW82H 25. EMU 1,2 H2O WASTE reg (two) – REGULATING
DCM 26. O2 ACT – OFF
27. Remove SCOFs, stow
WCS 28. MODE – AUTO (√WCS ON lt off)
29. If EMU powerup performed, go to EMU POWERDOWN
EMU LiOH CHANGEOUT (20 min)

1. Transfer new cartridges to airlock
2. Transfer new batteries, as reqd, to airlock
3. Release EMU from AAP, posn as reqd
4. Unzip thermal cover, Velcro to top of EMU
5. Record used LiOH serial numbers

6. Remove, mark used LiOH cartridge

IF EMU BATTERY TO BE REPLACED:

AW18H 7. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
DCM 8. √PWR – SCU

CAUTION
Do not allow battery to impact airlock wall and use care when handling/stowing battery to avoid damaging aluminum cover

9. Remove used battery
10. Install new battery (√connector alignment), latch

CAUTION
If 10.2 cabin used, possible ΔP across LiOH cartridge caps. Direct ports away from face
Limit exposure time of uncapped canister ports and avoid contact with seals

11. Holding new LiOH cartridge with aluminum plate serial number facing self, remove caps (left first), √O-ring seals for damage, install LiOH (attach Velcro retainer strap)
12. Close thermal cover zipper
13. Reinstall EMU in AAP
14. Place caps on used LiOH cartridge
15. Stow used batteries, LiOH in middeck lockers
MIDDECK EMU BATTERY RECHARGE (STAND-ALONE)

**INITIATE** (20 min)

1. Unstow middeck battery charger
2. √ DC UTIL PWR – OFF on specified utility outlet (MUP)
3. Affix batteries to charger using Velcro straps on charger
4. Connect charger cables to batteries
5. Stow batteries/charger for charge
6. Connect charger power cable to specified MUP utility outlet
7. √ CB closed for specified utility outlet
8. DC UTIL PWR – ON
9. √ ON LEDs (red) – ON
   √ READY LEDs (green) – ON (for 10 sec at startup)
   √ READY LEDs (green) – blinking

**NOTE**
EMU batteries may experience a false charge completion due to passivation within the battery. The passivation is removed with repeated attempts (two to three times) at charging the battery.

After 15 min charging, verify charging is continuing:

10. √ ON LEDs (red) – ON
    √ READY LEDs (green) – blinking

* If ON LED (red) is OFF and READY LED (green) is ON (non-blinking):
  * 1. DC UTIL PWR – OFF (3 sec)
  * 2. DC UTIL PWR – ON
  * 3. √ ON LEDs (red) – ON
  * √ READY LEDs (green) – ON 10 sec at startup
  * READY LEDs (green) – blinking
  * 4. Report anomaly to MCC

**NOTE**
The absence of any active LEDs represents an overcurrent or overvoltage condition that has caused the charger to shut down, or the charger has not been properly powered from the DC Utility Outlet. All protective conditions are resettable by taking the DC UTILITY POWER to OFF.

During the charge, the red ON LED will be illuminated and the green READY LED will continue to blink, giving positive indication that the charger is still charging.
MIDDECK EMU BATTERY RECHARGE (STAND-ALONE) (Cont)

NOTE
When a nominal charge is complete, the red ON LED will extinguish and the green READY LED will illuminate without blinking. The red ON LED will be illuminated only when the positive current flow into the battery is greater than 0.6A.

11. When charge complete:
   Charger: √ON LEDs (red) – OFF
            √READY LEDs (green) – ON
   ML85E (MUP): DC UTIL PWR – OFF
   Disconnect cables from batteries
12. Disconnect charger power cable from utility outlet
13. Stow charger and batteries
MIDDECK EMU BATTERY RECHARGE/LiOH REPLACEMENT

INITIATE (30 min)

NOTE
Refer to REF DATA for specific plug-in location

1. Unstow new LiOH cartridges
2. Unzip thermal cover, Velcro to top of EMU
3. Record used LiOH serial numbers

![LiOH cartridge diagram]

4. Remove, mark, stow used LiOH cartridge

DCM  5. \( \sqrt{PWR} – SCU \)

CAUTION
Do not allow battery to impact airlock wall and use care when handling/stowing battery to avoid damaging aluminum cover

6. Remove, stow used battery

CAUTION
If 10.2 cabin used, possible \( \Delta P \) across LiOH cartridge caps. Direct ports away from face
Limit exposure time of uncapped canister ports and avoid contact with seals

7. Holding new LiOH cartridge with aluminum plate serial number facing self, remove caps (left first), \( \sqrt{O} \)-ring seals for damage, install LiOH (attach Velcro retainer strap)
8. Close thermal cover zipper, stow EMU in middeck
9. Unstow middeck battery charger

10. \( \sqrt{DC\ UTIL\ PWR} – OFF \)
11. Configure battery(s), charger, and straps for charge
12. Connect charger cable(s) to battery(s)
13. Stow battery(s)/charger for charge
14. Connect power cable to utility outlet
15. \( DC\ UTIL\ PWR – ON \)

Charger  16. \( \sqrt{ON\ LEDs\ (red)} – ON \)
\( \sqrt{READY\ LEDs\ (green)} – ON \) (for 10 sec at startup)
\( \sqrt{READY\ LEDs\ (green)} – blinking \)

NOTE
EMU batteries may experience a false charge completion due to passivation within the battery. The passivation is removed with repeated attempts (two to three times) at charging the battery

After 15 min charging, verify charging is continuing:

Charger  17. \( \sqrt{ON\ LEDs\ (red)} – ON \)
\( \sqrt{READY\ LEDs\ (green)} – blinking \)
If ON LED (red) is OFF and READY LED (green) is ON (non-blinking):
* 18. DC UTIL PWR – OFF (3 sec)
* 19. DC UTIL PWR – ON
* 20. \^ON LEDs (red) – ON
  \^READY LEDs (green) – ON 10 sec
  \^READY LEDs (green) – blinking
* 21. Report anomaly to MCC

NOTE
The absence of any active LEDs represents an over-current or overvoltage condition that has caused the charger to shut down, or the charger has not been properly powered from the DC Utility Outlet. All protective conditions are resettable by taking the DC UTILITY POWER to OFF.

During the charge, the red ON LED will be illuminated and the green READY LED will continue to blink, giving positive indication that the charger is still charging.

TERMINATE (15 min)

NOTE
When a nominal charge is complete, the red ON LED will extinguish and the green READY LED will illuminate without blinking. The red ON LED will be illuminated only when the positive current flow into the battery is greater than 0.6A

22. When charge complete:
   Charger
   \^ON LEDs (red) – OFF
   \^READY LEDs (green) – ON
   DC UTIL PWR – OFF
   Disconnect cable(s) from battery(s)
23. Unzip thermal cover, Velcro to top of EMU
24. Remove LiOH cartridge
25. Open battery latch
26. Install charged battery (\^connector alignment); latch
27. Reinstall LiOH (attach Velcro retainer strap)
28. Close thermal cover zipper
**IN-SUIT EMU BATTERY RECHARGE/CHARGE VERIFICATION**

**INITIATE**

1. Retrieve, position SCUs; remove DCM covers

2. Connect SCUs to DCM, √locked

AW18H 3. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
       MODE (two) – CHARGE
       BUS SEL (two) – MNA(MNB)

4. Continue charge as reqd:
   Verification: 15 min, minimum
   Full Charge: Up to 20 hr

**TERMINATE**

AW18H 5. √PWR/BATT CHGR EMU INPUT AMPS < 1 for both EMUs

6. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
       MODE (two) – OFF

7. Remove SCU, install DCM cover

8. Stow SCU on AAP, Velcro to wall

**EMU POWERDOWN**

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

AW82D 2. √EMU 1,2 H2O WASTE,SPLY tb (four) – CL

3. Remove SCU, install DCM cover

4. Stow SCU on AAP, Velcro to wall
HELMET LIGHT/PGT BATTERY RECHARGE

INITIATE (10 min)

NOTE
Refer to REF DATA for specific plug-in location

1. Unstow, as reqd: EHIP Light Battery Charger
   EHIP DC PWR/REBA DC EXT Y-Cable
   EHIP-PGT Adapter cable (charger to battery) (2)
   PGT Batteries (2)
   Helmet Light Batteries (4)

2. DC UTIL PWR – OFF

3. Plug EHIP DC PWR/REBA DC EXT Y-Cable into charger, then into orbiter pwr supply

4. DC UTIL PWR – ON
   \Blue LEDs illuminated
   * If blue LEDs not illuminated: *
   * DC UTIL PWR – ON *
   * If blue LEDs still not illuminated: *
   * DC UTIL PWR – OFF *
   * Unplug EHIP DC PWR/REBA DC EXT Y-Cable *
   * from charger *
   IFM Pin Kit
   * Change fuse (7.5A) *
   * Plug EHIP DC PWR/REBA DC EXT Y-Cable *
   * into charger *
   * DC UTIL PWR – ON *

If charging helmet light batteries:
5. Install batteries (four) into charger

If charging PGT batteries, for EACH battery:
6. Release captive screw on PGT battery door using screwdriver
7. Pry open PGT battery door, rotate away from cavity
8. Remove cap from EHIP PGT Adapter cable into charger
9. Remove battery jumper, temp stow on EHIP-PGT Adapter cable cap
   Plug EHIP-PGT Adapter cable into battery
10. Install EHIP-PGT Adapter cable into charger
11. \Yellow LED illuminated; start timer (MET _____/_____:_____:____); temp stow charger
    * If yellow LED not illuminated, see chart below *

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green and red LED illuminated</td>
<td>Cold batt (≤ 50 degF)</td>
<td>Leave batt installed in charger (batt will warm up and automatically change LED to yellow)</td>
</tr>
<tr>
<td>Red LED illuminated</td>
<td>Hot batt (≥ 113 degF)</td>
<td>DC UTIL PWR – OFF Remove batt or EHIP-PGT adapter if PGT batt DC UTIL PWR – ON</td>
</tr>
</tbody>
</table>

12. Wait 15 min and check LEDs
If yellow LEDs illuminated:
13. Continue charging
If green LED(s) illuminated:
14. DC UTIL PWR – OFF
15. Remove battery or EHIP-PGT Adapter cable from affected station(s)
16. DC UTIL PWR – ON
17. Wait for blue LED(s) to illuminate
18. Re-install battery or EHIP-PGT Adapter cable
19. \Yellow LED(s) illuminated
20. Continue charging

Cont next page
TERMATE (10 min)

NOTE
Refer to REF DATA for specific plug-in location

1. \checkmark Green LED illuminated

WARNING
Ensure charger is unpowered before disconnecting batteries

CAUTION
Do not leave batteries installed after unpowering charger to prevent possible charger damage and battery discharge

2. DC UTIL PWR – OFF

If helmet light batteries charged:
3. Remove batteries from charger
4. Install batteries in lights
5. \checkmark EMU light ops

CAUTION
Do not stow EMU lights in locker with batteries installed

If PGT batteries charged, for each battery:
6. Remove EHIP-PGT Adapter cable from charger
7. Unplug battery from EHIP-PGT Adapter cable; reinstall cap on cable

NOTE
PGT battery will not function if jumper is not installed

8. Re-install battery jumper
9. Rotate battery door into place, tighten screw using screwdriver
10. Mark batteries “charged”, stow in locker
11. Stow as reqd:
- EHIP Light Battery Charger(s)
- EHIP DC PWR/REBA DC EXT Y-Cable
- EHIP-PGT Adapter cables (2)
- PGT Batteries (2)

REBA BATTERY INSTALLATION

1. Unstow REBA from locker or charger
2. Remove EMU from AAP, unzip TMG to access REBA pouch and EMU power harness
3. \checkmark Glove heater sw (two) – OFF
4. Remove REBA J1 fabric cover
5. Install REBA on EMU
6. Route REBA sw pull tabs thru TMG loops
7. \checkmark REBA sw (one per EMU) – OFF (toward left arm of suit)
8. Connect EMU power harness (P1) to REBA (J1); verify locked by gently pulling on EMU power harness cable
9. Zip TMG closed, install EMU on AAP
EMU BATTERY REMOVAL/INSTALL (5 min)

CAUTION
Do not allow battery to impact airlock wall and use care when handling/stowing battery to avoid damaging aluminum cover

WARNING
EMU pwr switch must be in SCU position with airlock pwr OFF during battery changeout

DCM
1. √PWR – SCU
   If SCU connected to DCM:
AW18H
2. √PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
PLSS
3. Release EMU from AAP as reqd
4. Unzip thermal cover, Velcro to top of EMU
5. Open LiOH(Metox) latches
6. Rotate LiOH(Metox) canister outward until softstop or remove canister
7. Open battery latches
8. Remove/install EMU battery as reqd (√connector alignment)
9. Close battery latches
10. Reinstall LiOH(Metox), latch
11. Close thermal cover
12. Reinstall EMU in AAP as reqd
13. Stow or charge batteries as reqd
HELMET LIGHT BULB CHANGEOUT (15 min)

NOTE
Light assembly has several loose pieces which may be spring loaded. Be prepared to capture them during changeout

CAUTION
Handle bulbs with care. Do not touch bulbs with bare hands (could degrade bulb life span)

1. Remove battery from affected side of lights
2. If EMU TV installed, remove camera from affected side of lights
3. Obtain, don comfort glove
4. Depress faceplate; open faceplate sliders (two) on affected side of lights
5. Remove faceplate
6. Remove reflector housing by pulling straight out
7. Remove affected bulbs as reqd, replace
8. Mark, stow used bulbs

NOTE
Contacts on spot bulb may be difficult to reseat fully into socket

9. Install reflector housing and flood bulb reflector, seat spot bulb
10. Install faceplate, lock sliders (two)
11. Install battery; \^EMU light ops
12. If EMU TV installed, attach camera back to affected side of lights
13. Remove, stow comfort glove
**REBA BATTERY RECHARGE**

**INITIATE** (10 min)

**NOTE**
Refer to REF DATA for specific plug-in plan location

1. Unstow: REBA Charger
   EHIP DC PWR/REBA DC EXT Y-Cable
   25' REBA/EHIP Ext Pwr cable (if reqd)

2. √DC UTIL PWR – OFF
   If in-suit recharge:
   3. Plug EHIP DC PWR/REBA DC EXT Y-Cable into charger, 25'
      REBA/EHIP Ext Pwr cable into EHIP DC PWR/REBA DC EXT
      Y-Cable, 25' REBA/EHIP Ext Pwr cable into orbiter power supply
   Else:
   4. Plug EHIP DC PWR/REBA DC EXT Y-Cable into charger and orbiter
      power supply

5. DC UTIL PWR – ON
   √Blue LEDs (two) illuminated
   * If blue LED not illuminated: *
   * √DC UTIL PWR – ON *
   * √cb – cl *
   * √Cable connections mated *
   * If blue LED still not illuminated: *
   * DC UTIL PWR – OFF *
   * Unplug EHIP DC PWR/REBA DC EXT Y-Cable from charger *
   REBA Charger
   * Change fuse (4.0 Amps) *
   * Plug EHIP DC PWR/REBA DC EXT Y-Cable into charger *
   * DC UTIL PWR – ON *

6. √REBA sw (two) – OFF
7. Demate REBA jumper cables (two)
8. Mate charger cables (two) to REBA jumper cables

9. √Yellow LEDs (two) illuminated; temp stow charger on wall
   REBA Charger

* If yellow LED not illuminated, see chart below *

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green and red LED illuminated</td>
<td>Cold batt (≤ 50 degF)</td>
<td>Leave REBA connected to charger (REBA will warm up and automatically change LED to yellow)</td>
</tr>
<tr>
<td>Red LED illuminated</td>
<td>Hot batt (≥ 113 degF)</td>
<td>DC UTIL PWR – OFF Disconnect REBA from charger. Allow REBA to cool DC UTIL PWR – ON Mate charger cable to REBA jumper cable</td>
</tr>
</tbody>
</table>

When 15 min of charge complete:

10. √READY LEDs (green) – Off

   * If READY LED (green) – On: *
   * DC UTIL PWR – OFF *
   * Disconnect REBA from charger *
   * DC UTIL PWR – ON *
   * When NO BATTERY LED (blue) – On: *
   * Mate charger cable to REBA jumper cable *
   * √CHARGING LED (yellow) – On *
TERMINATE (10 min)

NOTE
Refer to REF DATA for specific plug-in plan location

1. Green LED illuminated

WARNING
Ensure charger is unpowered before disconnecting batteries

CAUTION
Do not leave batteries installed after unpowering charger to prevent possible charger damage and battery discharge

2. DC UTIL PWR – OFF
3. Disconnect REBA from charger
4. Mate REBA jumper cables
5. Stow: REBA Charger
   EHIP DC PWR/REBA DC EXT Y-Cable
   25' REBA/EHIP Ext Pwr cable (if reqd)
POST EVA ENTRY PREP (45 min if SAFER not flown)  
(55 min if SAFER flown)

AW18D  1. AIRLK AUD PWR – OFF
AW18H  2. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
       MODE (two) – OFF
MD(flr)  3. EMU O2 ISOL VLV – CL
AW82B  4. EV-1, EV-2 O2 vlv (two) – CL
AW82D  5. √EMU 1,2 H2O WASTE, SPLY tb (four) – CL
       Stow in FDF locker: DEPRESS/REPRESS (Cue Card) 
       Cuff C/L (two)
    6. Disconnect comm caps (two) from elec harness, temp stow
    7. Remove LTA, √Multiple Water Connector cover installed
    8. Stow LCVG and EV Crew Options Kit (ECOK) in HUT
    9. Connect LTA to HUT
    10. Install gloves
    11. √Any wrist tethers attached to glove tether loop with only one hook (other hook
on D-ring or first hook) and cinched down around wrist

If REBA:
    12. Remove REBA batteries from all EMUs, stow

CAUTION
EMU TV and helmet lights must be removed prior to landing

If EMU TV:
    13. Remove EMU TVs from helmet lights, stow
    14. Transfer EMU lights to middeck
    15. Install helmets and covers, lock
    16. Remove SCU, install DCM cover
DCM    17. √PURGE vlvs – op (up)
    18. Perform LTA RERAINT STRAP INSTALLATION (AIRLOCK CONFIG)
         as reqd for landing configuration
    19. Attach LTA Restraint Bags over LTA, suit arms; tighten straps
    20. Stow SCU on AAP, rebuckle straps
    21. Install and loosely secure airlock floor pallet using 1/4-in drive ratchet,
        4-in ext w/1/4-in drive, and 1/2-in socket w/1/4-in drive. Torque to
        200 in-lb using torque wrench

SAFER ENTRY STOW (10 min) (if reqd)
    22. Deploy HCM
    23. Install pwr sw guard
    24. Stow HCM in foam outside of SAFER
    25. Stow SAFER in stowage bag

Vol H  26. Install additional EMU(s)/Airlock Stowage Bag(s) in airlock; √bag, 
       strap installed
    27. Install 20-g Crash Bag on middeck EMUs (if flown)
    28. Remove batteries from lights, stow in lockers

CAUTION
To prevent possible equipment damage, do not stow
EMU lights in locker with batts installed

Inner  29. Stow EMU lights, EMU Equipment Bag, EVA Bag in middeck
Hatch  30. Equal vlv (two) – NORM, install caps

* If outer hatch leaking or integrity suspect:
*  Equal vlv (two) – OFF, install caps

31. Inform MCC, Post EVA Entry Prep complete
POST ISS EVA ENTRY PREP (45 min if SAFER not flown)  
(55 min if SAFER flown)

MD(flr) 1. EMU O2 ISOL VLV – CL  
AW18D 2. Airlk AUD PWR – OFF  
AW18H 3. √PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF  
    MODE (two) – OFF  
AW82B 4. √EV-1, EV-2 O2 vlv (two) – CL  
AW82D 5. √EMU 1,2 H2O WASTE, SPLY tb (four) – CL  
6. √No helmet lights or EMU TV installed on helmets  
7. Remove helmets, temp stow  
8. Disconnect comm caps from EMU electrical harness, temp stow  
9. Remove LTA, √Multiple Water Connector cover installed  
10. √Only LCVG and EV Crew Options Kit (ECOK) in HUT  
11. Connect LTA to HUT  
12. √Gloves installed, locked  
13. √Any wrist tethers attached to glove tether loop with only one hook (other hook  
    on D-ring or first hook) and cinched down around wrist  
14. Install helmets, lock  
15. Install helmet covers if not already installed  
16. √SCU stowed on AAP, straps buckled  

DCM 17. √PURGE vlv – op (up)  
Vol H 18. √No loose items temp stowed in Vol H (waist tethers, etc). Install as reqd  
19. Attach LTA Restraint Bags over LTA, suit arms, tethers; tighten straps  
20. Stow comm caps in LTA Restraint Bag pocket  
If airlock floor pallet removed:  
21. Install and loosely secure airlock floor pallet using 1/4–in drive ratchet, 4–in  
    ext w/1/4–in drive, and 1/2–in socket w/1/4–in drive. Torque to 200 in–lb  
    using torque wrench  
22. Install floor Airlock Stowage Bag in airlock; √bag, strap installed  
23. Install 20–g Crash Bag on middeck EMUs (if flown)  

SAFER ENTRY STOW (10 min) (If SAFER returning)
24. Deploy HCM  
25. Install power switch guard (‘PWR’ over PWR switch)  
26. Stow HCM in foam outside of SAFER  
27. Stow SAFER in stowage bag  

Inner 28. Equal vlv (two) – NORM, install caps  
Hatch

* If outer hatch leaking or integrity suspect: *  
* Equal vlv (two) – OFF, install caps  
*

29. Inform MCC, Post ISS EVA Entry Prep complete  
30. Stow in FDF/ODF locker (if reqd):  
    FDF EVA Checklist  
    Used EVA Prebreathe Cue Card  
    ISS EVA Systems Checklist
OFF-NOMINAL PROCEDURES
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):
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)
EV AW82D 16. \(\sqrt{\text{EMU 1(2)} \ H2O \ \text{WASTE} – \ CL \ (tb-CL)}\) 
\(\sqrt{\text{SPLY} – \ OP \ (tb-OP)}\)

**WARNING**
O2 will be off. IV stand by inner hatch
Equal vlvs for emergency repress

EV DCM 17. O2 ACT – OFF, monitor SUIT P (\(\sqrt{\text{SUIT P > 3.6}}\))

* When SUIT P \leq 3.6: 
  * O2 ACT – PRESS until SUIT P = 4.2-4.4 
  * – OFF

18. \(\sqrt{\text{STATUS: H2O WP \ ~8-15 psi and stable for ~30 sec (indicates charging complete), then:}}\)
  O2 ACT – PRESS until SUIT P = 4.2-4.4 – EVA

IV R11L If SPLY H2O XOVR VLV closed (tb-CL or bp) (water transfer config):
19. SPLY H2O TKA OUTLET – OP (tb-OP)
If SPLY H2O XOVR VLV open (tb-OP) (nominal config):
20. SPLY H2O TKC INLET – OP (tb-OP)
   TKB OUTLET – OP (tb-OP)

22. If FES reqd, perform TOPPING FES STARTUP (ORB OPS, ECLS)

EV AW82D 23. EMU 1(2) H2O SPLY – CL (tb-CL)

**NOTE**
Disregard fault msgs until CWS updated with: O2 ACT – EVA, WATER – ON, and H2O TEMP < 60

24. Go to DEPRESS/REPRESS Cue Card, DEPRESS, step 11
   (POST DEPRESS, step 1, if tunnel adapter)

**LiOH REPLACEMENT (MANNED)**

**CAUTION**
If 10.2 cabin used, possible \(\Delta P\) across LiOH cartridge caps. Direct ports away from face
Limit exposure time of uncapped canister ports and avoid contact with seals

IV 1. Unstow new LiOH cartridge with aluminum plate serial number facing self, remove caps (left first)

IV 2. Unzip EMU thermal cover, fold back, Velcro to top of EMU

**WARNING**
Fan will be off during changeout. Perform changeout as quickly as possible

**CAUTION**
Vent loop is pressurized. Restrain LiOH cartridge

DCM 3. \(\sqrt{\text{O2 ACT – IV}}\)
4. Helmet purge vlv – op
5. FAN – OFF

IV EMU 6. Remove used cartridge
7. Holding new LiOH cartridge with aluminum plate serial number facing self, \(\sqrt{\text{O-ring seals for damage, install LiOH (attach Velcro retainer strap)}}\)
NOTE
EMU may issue CO2 HIGH or MONITOR CO2 message

DCM 8. FAN – ON (PWR RESTART may occur)
9. Helmet purge vlv – cl, locked
DCM 10. O2 ACT – PRESS
11. PURGE vlv – op (up)
12. Begin timing 2-min purge

IV EMU 13. Close EMU thermal cover zipper
14. Place caps on used LiOH cartridge
IV 15. Mark used cartridge, stow in middeck
When purge time = 2 min:

DCM 16. √ STATUS: [CO2 < 8.0 mmHg, then PURGE vlv – cl (dn)
17. O2 ACT – IV

NOTE
A minimum of 40 min of prebreathe
reqd to condition LiOH cartridge
18. Continue EVA PREP or EMU PREBREATHE with minimum of 40 min
prebreathe

BATTERY REPLACEMENT (MANNED)

IV 1. Unstow new battery

CAUTION
Do not allow battery to impact airlock wall and
use care when handling/stowing battery to
avoid damaging aluminum cover

PLSS 2. Unzip EMU thermal cover, fold back, Velcro to top of EMU

WARNING
Power switch must be in SCU during battery
cchangeout
Fan will be off during changeout. Perform
cchangeout as quickly as possible

If no SCU power available:

DCM 3. √ O2 ACT – IV
4. Helmet purge vlv – op
5. FAN – OFF

NOTE
EMU will be without comm after step 6
until battery power is restored at step 18

DCM 6. PWR – SCU
If degraded/dead battery:

DCM 7. √ PWR – SCU
8. √ O2 ACT – IV
9. Helmet purge vlv – op

DCM 10. FAN – OFF (fwd)
PLSS 11. Open battery latch
12. Open LiOH cartridge latches
VENT LOOP IS PRESSURIZED. RESTRAIN LIOH CANISTER DURING BATTERY CHANGEOUT TO AVOID INJURY AND BREAKING SEAL.

13. Rotate LiOH cartridge outward until limited by Velcro retainer strap
14. Remove used battery
15. Install new battery (connector alignment); engage latch
16. LiOH cartridge seated in vent ports, rotate downward until latch pins engage
17. Close LiOH cartridge latches
   If no SCU power available:
   18. PWR – BATT
   19. FAN – ON (aft) (PWR RESTART may occur)
   20. Helmet purge vlv – cl, locked

   * If LiOH cartridge seal broken: *
   *DCM 21. O2 ACT – PRESS *
   * 22. PURGE vlv – op (up) *
   * 23. Begin 2 min purge *
   * When 2 min complete: *
   *DCM 24. PURGE vlv – cl (dn) *
   * 25. O2 ACT – IV *

DCM 26. STATUS: [BATT VDC]
   27. Report following to MCC as comm permits:
      Old battery barcode/serial number and stowage location
      New battery barcode/serial number and BATT VDC reading
   28. Close EMU thermal cover zipper

NOTE
   EMU-calculated TIME EV and TIME LF do not reset despite battery changeout. A cold restart is reqd to reset those parameters

29. If reqd per MCC, perform EMU COLD RESTART (EMU CONT PROCS)
30. Continue EVA PREP
WATER DUMP

**BOTH**
1. Connect SCUs to DCM, √locked
2. PWR – BATT

**DCM**

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

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

**WCS**
4. PWR – SCU
5. √FAN SEP same as HOSE BLOCK
6. MODE – COMMODE/MANUAL/EMU; posn guard over sw
   (√airflow, WCS ON lt on)

**AW82D**
7. √EMU 1,2 H2O SPLY (two) – CL (tb-CL)
8. Remove helmets with sunshades down and helmet covers installed; stow
9. Install SCOFs, lock

**DCM**
10. O2 ACT – IV

**AW82D**
11. EMU 1,2 H2O WASTE reg (two) – MAN OP

**NOTE**
EMU will be dumped serially in step 12

12. EMU 1(2) H2O WASTE (one) – OP (tb-OP) (until H2O WP < 7
   and stable for ~1 min)
   – CL (tb-CL)
   – Repeat for other EMU

**AW82H**
13. EMU 1,2 H2O WASTE reg (two) – REGULATING

**DCM**
14. O2 ACT – OFF
15. Remove SCOFs, stow
16. Install helmets with covers, lock

**WCS**
17. MODE – AUTO (√WCS ON lt off)
SCU SWAP (UNMANNED)

**BOTH DCM**
1. √FAN – OFF
2. √O2 ACT – OFF
3. √COMM mode – OFF

**AW18H**
4. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF

**DCM**
5. Swap SCUs
6. PWR – BATT

**AW18H**
7. √PWR/BATT CHGR EMU 1,2 MODE (two) – PWR
8. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – MNA(MNB)
9. √EMU INPUT 1,2 volts = 18.0-20.0

**DCM**
10. PWR – SCU

SCU SWAP (MANNEED)

**BOTH DCM**
1. Temp control vlv – Max C
2. Perform EVA COMM CONFIG (EVA PREP), steps 2, 3, and 6

**O6:A1R**
3. COMM mode – PRI
4. Comm FREQ – LOW
5. PWR – BATT

**AW18H**
6. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF

**DCM**
7. Swap SCUs

**AW18H**
8. √PWR/BATT CHGR EMU 1,2 MODE (two) – PWR
9. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – MNA(MNB)
10. √EMU INPUT 1,2 volts = 18.0-20.0

**DCM**
11. PWR – SCU
12. COMM mode – HL
13. Temp control vlv – as reqd

EMU COLD RESTART (MANNEED)

**WARNING**
This procedure should only be used at airlock pressures of 8.0 psi and higher. Fan and O2 will be off during restart. Perform restart as quickly as possible.

**DCM**
1. FAN – OFF
2. O2 ACT – OFF
If PWR – SCU:
3. PWR – BATT (2 sec)
4. PWR – SCU
If PWR – BATT:
5. PWR – SCU (2 sec)
6. PWR – BATT
7. O2 ACT – IV
8. FAN – ON
12.1 STS EVA DECONTAMINATION

1. Ammonia visual inspection should be performed in night or shaded ambient light with helmet spot lights used to illuminate TMG. Use of sunvisor during inspection should be avoided. View TMG from an oblique angle. Following are indications of ice on EMU:
   a. Loss of TMG thread pattern
   b. Waxy gloss or hard pack snow appearance
   c. Unusual contours

2. For confirmed contamination 1:55 (2:10 if from ISS thruster) of EMU consumables must be available to support activities from ingress through EMU doffing. For suspected contamination 0:55 (1:10 if from ISS thruster) of consumables reqd. EVA tasks must be deferred to protect these consumables. Bakeout on SCU does not consume Metox/LiOH if helmet purge valve is open.

Crew Visually Detects Plume, Leaking QD, White Crystals, or “Snow” Coming from Orbiter/Station During EVA

Orbiter/Station Chemical System Leak Suspected Due to Steady (not Step Function) Decrease in Pressure or Temperature

1. Perform detailed visual inspection of EMU
   Contamination detected on EMU or seen contacting EMU?
   Yes
   No

2. EMU in vicinity of leak when detected visually or by orbiter/station instrumentation. Suspected contamination
   Yes
   No

3. Confirmed contamination
   Yes
   No

4. Brush off crystals using hydrazine brush
   Sublime ice using prybar or other large warm metal

5. Perform detailed visual inspection of EMU
   Contamination seen?
   Yes
   No

6. Start Bakeout PET clock
   PET = 0:00 at (___/___/___)

7. Provide periodic EVA position reports to MCC for thermal tracking
   Continue EVA tasks not in vicinity of leak
   Docked with ISS?
   Yes
   No

8. (MCC-H/ISS-IV)
   • If State – Off, perform {1.301 ATMOSPHERE REVITALIZATION RACK ACTIVATION}, step 8 (SODF: ECLSS: A&C: ARS), then:
     (ISS-IV)
   • For hydrazine contamination only:
     • To set up Portable Fan with ATCO Canister in PMA2, perform {4.302 ECLSS FRP-3: CARBON DIOXIDE REMOVAL KIT ACTIVATION/DEACTIVATION}, steps 2 to 4.3 (SODF: ECLSS: CORRECTIVE: ARS), then:
   • For ammonia contamination only:
     • Perform {6.1 AIR SAMPLE COLLECTION USING DRAEGER AIR SAMPLER (пнд)} steps 1.2 (RODF: SM: СКДС), then:

9. Provide periodic EVA position reports to MCC for thermal tracking
   Continue EVA tasks not in vicinity of leak
   Docked with ISS?
   Yes
   No
For confirmed contamination 1:55 (2:10 if from ISS thruster) of EMU consumables must be available to support activities from ingress through EMU doffing. For suspected contamination 0:55 (1:10 if from ISS thruster) of consumables reqd. EVA tasks must be deferred to protect these consumables. Bakeout on SCU does not consume Metox/LiOH if helmet purge valve is open.
For ammonia or oxidizer only, if the contamination test passed at 5 psia, no further mixing is required. If the test failed and EMU consumables would not support an additional depress/repress cycle, atmospheric mixing with Booster Fan should be performed for 10 min to completely mix the airlock and crew module. Maximum dilution is approximately 12:1 (airlock only) or 7:1 (tunnel adapter). Dilution with ISS will further reduce concentration by 6:1 over 2 hr.

The WCS filter will reduce ammonia concentration by 63% every 60 min for a shuttle equivalent volume.
12.1 (Cont)

23
(MCC-H)
• Inhibit ISS Rapid Depress Response and Alarm
• Verify Russian Segment Rapid Depress Response inhibited (EV)
• ODS Upper Hatch Equal vlv – NORM
• When ODS Upper Hatch ∆P < 0.5, open hatch
• ODS Upper Hatch Equal vlv – OFF (ISS IV)
• Don PBA (all crew)
• Perform (2.104 HATCH OPEN AND SHUTTLE/ISS DUCT INSTALLATION) step 13 to end of procedure (SODF: JNT OPS: INGRESS STATION), then:

24
(ISS IV)
• In airlock, perform {6.1 AIR SAMPLE COLLECTION USING DRAEGER AIR SAMPLER (ипд)} step 3 (RODF: SM: CKQC), then:

25
(ISS IV)
• Draeger reading > 10 ppm?

26
Yes
• Doff PBA and QDMs
• Discard used Draeger tube and tips
• Stow unused Draeger tubes and pump

No

27
On MCC call:
• Perform POST EVA

(L1)
• H2O PUMP LOOP 1 – GPC
• H2O LOOP 2 BYP MODE – AUTO
• CAB TEMP sel – adj rotary as desired

(WCS)
• COMMODE CNTL – OFF (BACK/DOWN)
• MODE – AUTO

7.1
For ammonia or oxidizer only, if the contamination test passed at 5 psia, no further mixing is required. If the test failed and EMU consumables would not support an additional depress/repress cycle, atmospheric mixing with Booster Fan should be performed for 10 min to completely mix the airlock and crew module. Maximum dilution is approximately 12:1 (airlock only) or 7:1 (tunnel adapter). Dilution with ISS will further reduce concentration by 6:1 over 2 hr.

On ISS, it is impossible to determine if a propulsion leak was fuel or oxidizer. Therefore, tests must be performed for both oxidizer and UDMH.
12.1 (Cont)

38
Was contamination confirmed as determined by block 1?

Yes

39
• Airlock Pressure $\geq 4.7$ psia
• For hydrazine, perform CONTAMINATION TEST

Hydrazine test failed?

Yes

31

No

41

Greater than 1:05 EMU consumables remaining?

Yes

15

No

38

41 Parallel Activities for IV, ISS-IV, EV

NOTE Complete parallel activities, then proceed to block 45

42 (IV)
• Don long sleeves, long pants, and gloves as practical
• Prepare wet towels and Ziplock bags

(L1)
• H2O LOOP 2 BYP MODE – MAN
• H2O PUMP LOOP 1 – ON

(WCS)
• MODE – COMMODE/MANUAL/EMU
• COMMODE CNTL – PULL UP
• COMMODE CNTL – PUSH FWD

(Middeck)
• Install ATCO can in place of one LiOH can

43 (ISS-IV)
• Hatches to all other modules are open
• Don long sleeves, long pants, and gloves as practical
• PFA Power Switch $\rightarrow$ ON
• PFA Speed Control Knob $\rightarrow$ Full Flow
• Fan is running

44 (EV)
• Remove contamination sampler from Depress Valve
• Perform REPRESS, steps 9 to 11

45 (IV)
• When Inner Hatch $\Delta P < 0.5$, crack hatch
• Transfer wet towels and Ziplock bags to EV crew
• Close hatch

(EV)
• Wipe EMUs and airlock with towels (avoid electrical panels)
• Seal towels in bags

46
For ammonia or oxidizer only, if the contamination test passed at 5 psia, no further mixing is required. If the test failed and EMU consumables would not support an additional depress/repress cycle, atmospheric mixing with Booster Fan should be performed for 10 min to completely mix the airlock and crew module. Maximum dilution is approximately 12:1 (airlock only) or 7:1 (tunnel adapter). Dilution with ISS will further reduce concentration by 6:1 over 2 hr.

Each ATCO canister will reduce the hydrazine concentration by 63% every 90 min for a shuttle equivalent volume.
CONTAMINATION TEST

To be performed in conjunction with 12.1 STS EVA DECONTAMINATION. It is performed with the external airlock at 5 psia following suspected hydrazine or oxidizer contamination

EV
1. √ Inner hatch Equal vlv (two) – OFF

IV
2. Wait 30 sec for pressure stabilization
   Record AIRLK P from EV DCM
   
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

EV
AW82B
3. Attach STS Contamination Sampler to depress valve

AW18A
4. √ LTG FLOOD (four) – ON
5. Go to appropriate chemical test steps below

AMMONIA CONTAMINATION TEST
6. Using RET, retrieve ammonia detector from Contamination Detection Kit
7. Verify Draeger tube color – yellow
   * Use new tube if not proper color *
   
   CAUTION
   Minimize contact with fracture regions of Draeger tube. Minor glove RTV damage is possible, but protective pressure bladders and restraints unaffected

8. Using equipment hook of RET as a lever, break off both tether points on ammonia detector

AW82B
9. Insert ammonia detector into STS Contamination Sampler with orientation that allows number scale to be read

   WARNING
   Precise sampling times are critical for accurate testing. IV should coordinate start of timer with opening of AIRLK DEPRESS valve

10. AIRLK DEPRESS vlv – 5
11. Start timer (3:30 sampling time)
    When timer expired:
    12. AIRLK DEPRESS vlv – CL

    NOTE
    If ammonia is present, Draeger tube will turn deep blue

DCM
13. Compare ARLK P to pressure in step 2
    If $\Delta P \geq 0.1$ psi (indicates leak in sampling hardware):
    14. To repress airlock to 5.0 psi, Inner hatch Equal vlv (one) – throttle NORM to OFF
    15. Go to step 1 to repeat test with new Draeger tube
16. Determine test results based on table 1 and report to MCC
TABLE 1.- AMMONIA TEST PASS/FAIL CRITERIA

<table>
<thead>
<tr>
<th>Reaction Line</th>
<th>Report Status</th>
<th>Assumed Concentration with 2x Factor of Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>None seen</td>
<td>Passed</td>
<td>10 ppm</td>
</tr>
<tr>
<td>0 &lt; X &lt; 2</td>
<td>Passed</td>
<td>30 ppm</td>
</tr>
<tr>
<td>2 &lt; X &lt; 5</td>
<td>Failed</td>
<td>60 ppm</td>
</tr>
<tr>
<td>5 &lt; X &lt; 25</td>
<td>Failed</td>
<td>180 ppm</td>
</tr>
</tbody>
</table>

17. Continue 12.1 STS EVA DECONTAMINATION

OXIDIZER CONTAMINATION TEST

18. Using RET, retrieve nitrous fumes detector from Contamination Detection Kit
19. Verify Draeger tube color pale gray

* Use new tube if not proper color *

CAUTION
Minimize contact with fracture regions of Draeger tube. Minor glove RTV damage is possible, but protective pressure bladders and restraints unaffected

AW82B
20. Using equipment hook of RET as a lever, break off both tether points on nitrous fumes detector

WARNING
Precise sampling times are critical for accurate testing. IV should coordinate start of timer with opening of AIRLK DEPRESS valve

21. AIRLK DEPRESS vlv – 5
22. Start timer (15:00 sampling time)

When timer expired:
23. AIRLK DEPRESS vlv – CL

NOTE
If oxidizer present, Draeger tube will turn blue gray

DCM
24. Compare AIRLK P to pressure in step 2
If $\Delta P \geq 0.1$ psi (indicates leak in sampling hardware)
25. To repress airlock to 5.0 psi, Inner hatch Equal vlv (one) – throttle NORM to OFF
26. Go to step 1 to repeat test with new Draeger tube
27. Determine test results based on table 2 and report to MCC

TABLE 2.- OXIDIZER TEST PASS/FAIL CRITERIA

<table>
<thead>
<tr>
<th>Reaction Line</th>
<th>Report Status</th>
<th>Assumed Concentration with 2x Factor of Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>X &lt; 0.5</td>
<td>Passed</td>
<td>1.5 ppm</td>
</tr>
<tr>
<td>0.5 &lt; X &lt; 1</td>
<td>Failed</td>
<td>3 ppm</td>
</tr>
<tr>
<td>1 &lt; X &lt; 2</td>
<td>Failed</td>
<td>6 ppm</td>
</tr>
</tbody>
</table>

28. Continue 12.1 STS EVA DECONTAMINATION
HYDRAZINE CONTAMINATION TEST

29. Retrieve hydrazine detector from Contamination Detection Kit

**NOTE**
Hydrazine detector is double bagged. Inner bag is not captive and should be constrained to prevent FOD

30. Tear open hydrazine detector packaging
   Stow packaging in small trash bag

31. Initial coupon color – white

AW82B 32. Insert hydrazine detector into STS Contamination Sampler

33. Helmet Lights – OFF

**WARNING**
Precise sampling times are critical for accurate testing. IV should coordinate start of timer with opening of AIRLK DEPRESS valve

34. AIRLK DEPRESS vlv – 5
35. Start timer (10:00 sampling time)
   When timer expired:
   36. AIRLK DEPRESS vlv – CL

DCM 37. Compare AIRLCK P to pressure in step 2
   If $\Delta P \geq 0.2$ psi (indicates leak in sampling hardware)
   38. To repress airlock to 5.0 psi, Inner hatch Equal vlv (one) – throttle NORM to OFF
   39. Go to step 1 to repeat test with new hydrazine detector

**NOTE**
Hue and intensity of test coupon color change is proportional to hydrazine concentration. For shuttle thruster leaks, compare coupon to US Propellant (MMH) color scale. For ISS thruster leaks, compare coupon to Russian Propellant (UDMH) color scale

40. Determine test results based on table 3 and report to MCC

**TABLE 3.- HYDRAZINE TEST PASS/FAIL CRITERIA**

<table>
<thead>
<tr>
<th>MMH</th>
<th>Report Status</th>
<th>Assumed Concentration with 2x Factor of Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>No color change seen</td>
<td>Passed</td>
<td>28 ppb</td>
</tr>
<tr>
<td>Unexposed $&lt; X &lt; 25$ ppb</td>
<td>Passed</td>
<td>50 ppb</td>
</tr>
<tr>
<td>25 ppb $&lt; X &lt; 50$ ppb</td>
<td>Failed</td>
<td>100 ppb</td>
</tr>
<tr>
<td>50 ppb $&lt; X &lt; 100$ ppb</td>
<td>Failed</td>
<td>200 ppb</td>
</tr>
<tr>
<td>UDMH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No color change seen</td>
<td>Passed</td>
<td>54 ppb</td>
</tr>
<tr>
<td>Unexposed $&lt; X &lt; 50$ ppb</td>
<td>Passed</td>
<td>100 ppb</td>
</tr>
<tr>
<td>50 ppb $&lt; X &lt; 100$ ppb</td>
<td>Failed</td>
<td>200 ppb</td>
</tr>
<tr>
<td>100 ppb $&lt; X &lt; 300$ ppb</td>
<td>Failed</td>
<td>600 ppb</td>
</tr>
</tbody>
</table>

41. Continue 12.1 STS EVA DECONTAMINATION
SAFER BATTERY CHANGEOUT (15 min)

1. Unstow new battery
2. Install Inhibitor
3. \MAN ISOL vlv – CL (up)
4. \PWR – OFF
5. Remove T-Handle tool from lanyard while keeping Inhibitor installed on SAFER
6. Separate TMG Velcro on bottom of prop module to access battery
7. Loosen captive screws (eight) using 9/64-in Hex Wrench on T-Handle tool
8. Remove battery; disconnect battery umbilical connector
9. Stow used battery
10. Record new battery serial number (SAFER CHECKOUT RESULTS Cue Card)
    Report old battery serial number and new stowage location to MCC as comm permits
11. Connect new battery umbilical connector; install battery
12. Tighten captive screws (eight)
13. Reattach TMG Velcro
14. Attach T-Handle tool to lanyard
15. Go to SAFER CHECKOUT
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (IN-SUIT)

BTA PREP
1. Unstow BTA with 3/8-in Wrench
2. Cut/break TMG tacks (see 12-23)
3. Unzip PLSS TMG (avoid pulling on antenna cable)
4. Remove impact shield
5. Disconnect hatch marked cable P3 (see 12-23); cut cable if reqd

NOTE
It may be necessary to extend the legs forward to access the test port in a pressurized EMU

6. Remove test port F plug on SOP using 3/8-in end of BTA Wrench (4-6 turns ccw) (see SECONDARY OXYGEN PACKAGE below)

SECONDARY OXYGEN PACKAGE

BTA
7. Stow test port F plug (see 12-23) on BTA
8. Unstow poppet keeper screw from BTA, temp stow in EMU Servicing Kit

BTA TREATMENT
9. SCU connected to DCM
10. Align BTA engage mark with PPRV mark
    Connect BTA to PPRV (rotate BTA cw to hard stop to lock), locked

AW82B 11. \textbf{EV-1(EV-2) O2 vlv – OP}
MD(flr) 12. \textbf{EMU O2 ISOL vlv – OP}

DCM 13. \textbf{PWR – SCU}
14. \textbf{FAN – ON}
15. \textbf{COMM mode – HL}, vol as reqd
16. DISP – PRO until \textbf{BTA?OFF} displayed
    – YES (hold for 2 sec), verify \textbf{ENABLE BTA?} displayed
    – YES (hold for 2 sec), verify \textbf{BTA ENABLED} displayed

If biomed reqd:
17. Perform EVA COMM CONFIG (EVA PREP), steps 1-6
18. Comm FREQ – LOW
    COMM mode – PRI
19. FAN SEP same as HOSE BLOCK
20. MODE – COMMODE/MANUAL/EMU, posn guard over sw (\textbf{airflow, WCS ON It on})

AW82H 22. \textbf{EMU 1(2) H2O SPLY WASTE reg – MAN OP}
AW82D 23. \textbf{EMU 1(2) H2O WASTE – OP (tb-OP)} (until H2O WP < 7 and stable for ~1 min)
24. \textbf{EMU 1(2) H2O WASTE – CL (tb-CL)}
AW82H 25. \textbf{EMU 1(2) H2O SPLY WASTE reg – REGULATING}
WCS 26. MODE – AUTO (\textbf{WCS ON It off})

DCM 27. \textbf{STATUS: [SUIT P] = 4.2-4.4}
28. O2 ACT – OFF (until SUIT P stabilizes)
NOTE
Suit pressure will nominally increase when O2 actuator taken to OFF. Suit P = [H2O GP] when O2 ACT – OFF. For actual suit P > 5.9 psi, suit P can only be directly read as [H2O GP]; actual suit P = 4.7 to 5.5 psi above BTA gauge pressure

CAUTION
If BTA gauge pressure increases while O2 ACT – PRESS, immediately set O2 ACT – OFF to prevent a hazardous condition; contact MCC.

29. O2 ACT – PRESS (for 15 sec), √BTA gauge not increasing when O2 ACT – PRESS
30. O2 ACT – OFF (until [H2O GP] stable)
31. √STATUS: [H2O GP]
   DISP – YES (hold for 2 sec) to lock parameter; re-lock every 5 min
32. Repeat steps 29,30 until [H2O GP] = 6.0 psid and stable on DCM display with O2 ACT – OFF

As reqd to maintain H2O GP = 6.0 psid:
33. Repeat steps 29,30

NOTE
Initial treatment will be at 6 psid for Cuffs 2 and 3 and will be increased to 8 psid if symptoms do not resolve. Initial treatment for Cuff 4 will be 8 psid

34. Contact Surgeon for treatment length and changes in treatment pressure
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (POST SUIT DOFFING)

BTA PREP
1. Unstow BTA with 3/8-in Wrench
2. Cut/break TMG tacks (see 12-23)
3. Unzip PLSS TMG (avoid pulling on antenna cable)
4. Remove impact shield
5. Disconnect hatch marked cable P3, cut cable if reqd (see 12-23)
6. Remove test port F plug on SOP using 3/8-in end of BTA Wrench (4-6 turns ccw) (see SECONDARY OXYGEN PACKAGE below)

SECONDARY OXYGEN PACKAGE

BTA 7. Stow test port F plug (see 12-23) on BTA

If LiOH replacement reqd by MCC:
8. Unstow new LiOH cartridge
9. Remove used LiOH cartridge
10. Holding new LiOH cartridge w/aluminum plate serial number facing self, remove caps (left first), O-ring seals for damage, install LiOH (attach Velcro retainer strap)
11. Install caps on used LiOH cartridge
   Tape an X on used LiOH cartridge and stow

BTA TREATMENT

BTA 12. SCU connected to DCM
13. Unstow Poppet Keeper Screw from BTA

EMU 14. Open Positive Pressure Relief Valve (PPRV) using BTA poppet keeper (thread cw to hard stop, pull, tighten nut) (see 12-23)
15. Align BTA engage mark with PPRV mark
   Connect BTA to PPRV (rotate BTA cw to hard stop to lock); locked
16. Don MAG, LCVG, biomed
17. Fill drink bag from galley, remove gas and insert drink bag in restraint bag
18. Install Drink Bag Restraint Bag in HUT and dispose of fill tool in wet trash

AW82B 19. EV-1(EV-2) O2 vlv – OP
MD(ftr) 20. EMU O2 ISOL vlv – OP

DCM 21. PWR – BATT

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

AW18H 22. PWR/BATT CHGR EMU 1(2) MODE – PWR
       BUS SEL – MNA(MNB)

DCM 23. PWR – SCU
24. Waist ring – op
25. Don LTA (attach donning handles as reqd)
26. Suit arms aligned
27. Wrist disconnects – op
28. Don thumb loops
29. Biomed connector outside of HUT
30. Don HUT
31. Release thumb loops
32. √Suit arms aligned
33. Don comm cap

DCM
34. √COMM mode – HL, vol as reqd
   If biomed reqd:
   35. Perform EVA COMM CONFIG (EVA PREP), steps 1-6
   36. Comm FREQ – LOW
      COMM mode – PRI

DCM 37. Connect biomed to elec harness
38. Connect LCVG to multiple water connector, √locked
39. √Thermal cover clear of waist ring
40. Waist ring – engage posn
41. Connect waist ring to HUT, √locked
42. Wrist rings – engage posn
43. Don EV gloves, √locked
44. √Mike boom posn

DCM 45. FAN – ON
46. √Elec harness clear of neck ring
47. Don helmet, √locked
48. √Helmet purge vlv – cl, locked
49. √PURGE vlv – op
50. O2 ACT – PRESS, begin purge clock (12 min)

WCS 51. √FAN SEP same as HOSE BLOCK
52. MODE – COMMODE/MANUAL/EMU, posn guard over sw (√airflow, WCS ON lt on)

AW82D 53. √EMU 1(2) H2O SPLY – CL (tb-CL)
AW82H 54. EMU 1(2) H2O SPLY WASTE reg – MAN OP
AW82D 55. EMU 1(2) H2O WASTE – OP (tb-OP)

When N2 purge time = 12 min:
56. EMU 1(2) H2O WASTE – CL (tb-CL)

AW82H 57. EMU 1(2) H2O WASTE – OP – REGULATING

WCS 58. MODE – AUTO (√WCS ON lt off)

DCM 59. PURGE vlv – cl (dn)
60. √STATUS: [SUIT P] = 4.2-4.4
61. DISP – PRO until [BTA?OFF] displayed
   – YES (hold for 2 sec), verify [ENABLE BTA?] displayed
   – YES (hold for 2 sec), verify [BTA ENABLED] displayed

NOTE
Suit P will increase about ~.5 psi each time O2 ACT – OFF

62. O2 ACT – OFF (until Suit P incr stabilizes)
63. O2 ACT – PRESS (for 15 sec)
64. Repeat steps 62,63 until Suit P = 6.0 psig on BTA gauge

NOTE
BTA relief valve relieves at 7.95-8.45 psig

As reqd to maintain Suit P = 6.0 psig:
65. Repeat steps 62,63

NOTE
Initial treatment will be at 6 psid for Cuffs 2 and 3 and will be increased to 8 psid if symptoms do not resolve. Initial treatment for Cuff 4 will be 8 psid

66. Contact Surgeon for treatment length and changes in treatment pressure
BTA LOCATION ON EMU

- P3 connector
- Nut
- Positive pressure relief valve
- Poppet keeper screw w/o BTA (install in PPRV for POST SUIT DOFFING proc only)
- Black alignment stripe
- Gauge
- Relief valve
- Test port F plug stow port

12-23 EVA/ALL/GEN H
NOTE
Procedures written for arm, thigh, and boot disconnects. Arm, thigh, and boot sizing rings are not interchangeable and cannot be stacked. See figures below and next page as reference during procedure.

1. Identify component(s) to be installed per appropriate resize matrix.

Old component(s)/EMU
2. Peel back TMG from disconnect.

If replacing arm components:
3. √REBA sw – OFF (toward left arm of suit)
4. Disconnect lower arm power harness from gloves and upper arm.

WARNING
Threads on sizing rings and arm/leg/boot segments have sharp edges. Avoid contact with skin and suit bladder.

5. Lock 1 – OPEN (on arm, lock may reengage due to bladder)
6. Lock 2 – hold OPEN while turning ring to engage lock 2 OPEN against disconnect.
7. Lock 3 – hold OPEN while turning ring in OPEN direction.
8. Demate segment/ring.
9. Install protective caps on ends of components; place rings in protective pouches.
10. Repeat steps 2-9 as reqd.

New component(s)/EMU
11. √Proper size located on bladder by disconnect.
12. √All seals, threads and wipe with lint-free wipe (EMU Servicing Kit).
13. Lock 1 – OPEN (lock may reengage due to bladder on arm).
14. Align new component yellow hash marks with yellow bar on disconnect.
15. Turn rings in LOCK direction.
16. √Lock 2,3 – locked.
17. Lock 1 – LOCK.
18. √Cam adjustments (4 per segment) per appropriate resize matrix.
19. If lower arm replaced, connect lower arm power harness to upper arm.
20. Remate TMG covering disconnect.
21. Repeat steps 11-20 as reqd.

Old component(s)/EMU
22. Stow replaced component(s).

---

**DISCONNECT IN LOCKED POSITION**
EMU RESIZE (Cont)

ARM CAM ADJUSTMENT
(0.25-in per cam)

NOTES
Cam Adjuster only rotates in one direction.

Cam Adjuster should click and lock in the full SHORT and full LONG positions.

Cam positions/arms must be symmetric; likely minimum of four (4) cams to be adjusted

WAIST CAM ADJUSTMENT
(1.0-in per cam)

NOTES
After adjusting, verify that restraint is routed around proper pin; that material is not damaged, twisted or pinched; and that movable pin is fully inserted.

With restraint in LONG position, the darkened area on Resizing Pull Tab should NOT be easily visible.

With restraint in SHORT position, the darkened area on Resizing Pull Tab should be easily visible.

Cam positions must be symmetric; minimum of two (2) cams to be adjusted

LEG CAM ADJUSTMENT
(0.5-in per cam)

NOTE
After adjusting, verify that restraint is routed around the oval cam; that material is not damaged, twisted or pinched; and that Movable Pin is fully inserted.

Cam positions/legs must be symmetric; likely minimum of four (4) cams to be adjusted

CAUTION
In SHORT position, the Movable Pin must be inserted thru oval cam, not just thru the restraint loop

In LONG position, the restraint must NOT be around the Movable Pin; verify that oval cam and restraint are down
Replace this page with page(s) from Flight Supplement
Replace this page with page(s) from Flight Supplement
ORBITER CONTINGENCY EVA

PAYLOAD BAY EVA NOMENCLATURE ................................................................. 14-2
RMS/PRLA CONTINGENCY EVA ........................................................................ 14-3
96 BOLT PRE-EVA TOOL CONFIG ................................................................. 14-13
  EVA TIMELINE .......................................................................................... 14-14
CAPTURE LATCH MANUAL RELEASE (ODS/PMA) ........................................ 14-19
96 BOLT EVA LAYOUT ................................................................................. 14-21
PLBD LATCH TOOL PLACEMENT WITH DUAL LATCH GANG FAILURES ...... 14-22
PAYLOAD BAY EVA NOMENCLATURE

FREON LOOP CONNECTION
- $X_0 = 839.36$
- $X_0 = 1198.00$

PLBD DRIVE
- $X_0 = 602.30$
- $X_0 = 737.30$
- $X_0 = 903.80$
- $X_0 = 966.35$
- $X_0 = 1144.20$
- $X_0 = 1264.20$

ELECTRICAL CROSSOVER
- $X_0 = 725.60$
- $X_0 = 794.95$
- $X_0 = 863.31$
- $X_0 = 1019.75$
- $X_0 = 1084.75$
- $X_0 = 1214.25$

RADIATOR HINGE ACTUATORS
- $X_0 = 614.50$
- $X_0 = 680.50$
- $X_0 = 725.60$
- $X_0 = 745.50$
- $X_0 = 774.50$
- $X_0 = 857.30$
- $X_0 = 906.80$
- $X_0 = 927.00$
# RMS/PRLA Contingency EVA

## For RMS/PRLA Failures:

### Pre EVA RMS Config [1]

<table>
<thead>
<tr>
<th>IV</th>
<th>If MRL fails to latch:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A8L</td>
<td>RMS R-F-L tb (three) – gray</td>
</tr>
<tr>
<td></td>
<td>RMS tb – STO</td>
</tr>
<tr>
<td></td>
<td>Go to RMS Tiedown [4]</td>
</tr>
</tbody>
</table>

If MPM fails to stow(deploy):

| A8L | RMS RETEN LAT – LAT (tb-LAT) |
|     | MPMs stowed(deployed) as far as possible |
|     | Go to MPM Stow/Deploy [5] |

If Joint fails:

- Position RMS for easy striker bar access
- Go to RMS Joint Align [6]

### Pre EVA EE/GF Config [2]

<table>
<thead>
<tr>
<th>IV</th>
<th>A8U</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BRAKES – ON (tb-ON)</td>
</tr>
<tr>
<td></td>
<td>EE MODE – OFF</td>
</tr>
</tbody>
</table>

| A8L | RMS SEL – OFF |
|     | Go to RMS Flight Releasable Grapple Fixture Release [8] |

### Pre EVA PRLA Config [3]

<table>
<thead>
<tr>
<th>IV</th>
<th>MA73C:C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>cb MCA PWR AC1 3Φ MID 1 – op</td>
</tr>
<tr>
<td></td>
<td>AC2 3Φ MID 3 – op</td>
</tr>
</tbody>
</table>

| R13L | PL BAY MECH PWR 1,2 (two) – OFF |
| A6U  | PL RETEN LOGIC PWR SYS 1,2 (two) – OFF |
|      | LAT (five) – OFF |
|     | Go to PRLA Open/Close [9] |
RMS/PRLA CONTINGENCY EVA (Cont)

FOR RMS/PRLA FAILURES (Cont):

**RMS TIEDOWN [4]**

IV If MRL fail to latch – monitor EV1 and EV2

Refer to RMS TIEDOWN figure, following page, as reqd

**RMS TIEDOWN**

TOOL BOX – PRDs (2), EVA TRASH BAG
IFM – 9/64-in ALLEN WRENCH (AW)
ELBOW – PRD aft of MPM, peel blanket (fwd of MPM) toward EE;
feed hook under cable harness (if reqd, remove cable harness
clamp bolt with AW, bend clamp out of way), adjust strap as far
fwd as possible
WRIST – PRD aft of MPM, strap rests just fwd of pitch joint
opening
END EFFECTOR – PRD fwd of MPM, peel blankets aft and fwd,
strap rests aft-most on yaw joint (at roll/yaw I/F), adjust strap
under bolt studs
1. Figure eight the strap
2. Pull minimum 6-in slack in strap
3. Ratchet PRD snug, (14 full strokes reqd)
4. $\sqrt{\text{Strap in correct arm location, ratchet tight}}$
5. Reattach blankets

NOT IN EV CUFF 41 03/20/06

**MPM STOW/DEPLOY [5]**

IV1 If MPM fail to stow/deploy, monitor EV1 and EV2, then:

**MPM STOW/DEPLOY**

TOOL BOX – MPM WRENCH

1. Rotate torque shaft (8 revs) until MPMs are stowed/deployed,
$X_0=693$

3 inch

IV When MPMs in stow(deploy) position:

A8L

$\sqrt{\text{RMS tb – STO(DPY)}}$

or

4: SM 94 PDRS CONTROL

$\sqrt{\text{RMS STO/DYP}}$

11 00 (00 11)
RMS/PRLA CONTINGENCY EVA (Cont)

FOR RMS/PRLA FAILURES (Cont):

<table>
<thead>
<tr>
<th>IV</th>
<th>RMS JOINT ALIGN [6]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>If Joint Fail – reposition RMS as reqd for</td>
</tr>
<tr>
<td></td>
<td>RMS rope attachment</td>
</tr>
<tr>
<td></td>
<td>– monitor EV1 and EV2</td>
</tr>
</tbody>
</table>

RMS JOINT ALIGN

TOOL BOX – ADJ TETHERS, SNATCH BLOCKS (2), RMS ROPE REEL

1. Attach RMS rope around end effector under handrail. Translate to avoid wrapping rope around RMS
2. Attach snatch block(s) to handrail(s) and route rope as reqd
3. Reposition RMS as required for cradling
4. Pull RMS down into MPMs
5. Perform final positioning by hand to allow MRLs to latch

NOT IN EV CUFF 39 03/20/06

IV When RMS ready to latch:

| R13L | PL BAY MECH PWR SYS (two) – ON |
| A8L  | RMS RETEN LAT – LAT (tb-LAT 18 sec max) |
|      | – OFF |
|      | If MPMs deployed: |
| A8L  | RMS – STO (tb-STO, 68 sec max) |
|      | – OFF |
| A8U  | BRAKES – ON (tb-ON) |
| R13L | PL BAY MECH PWR SYS (two) – OFF |

RMS SHOULDER BRACE RELEASE [7]

IV A8 √RMS SELECT – OFF

RMS SHOULDER BRACE RELEASE TOOL BOX – RMS SHOULDER BRACE RELEASE TOOL

1. Fold aside rub strip and thermal blankets
2. Insert tool and move handle down
3. Remove tool and reconfigure blankets

NOT IN EV CUFF 39 03/20/06
RMS/PRLA CONTINGENCY EVA (Cont)

FOR RMS/PRLA FAILURES (Cont):

RMS FLIGHT RELEASABLE GRAPPLE FIXTURE RELEASE

RMS FLIGHT RELEASABLE
GRAPPLE FIXTURE RELEASE

AIRLOCK – JETTISON STOWAGE BAG
TOOL BOX – 1/2-in BOX RATCHET, VELCRO/TAPE

EV 1. Rotate 10 o’clock posn release rod ccw to hard stop
   (~36 strokes of 90 deg)
2. Rotate 4 o’clock posn release rod cw to hard stop
   (~36 strokes of 90 deg – shaft will release from
   grapple fixture)
3. Clear worksite for RMS powerdown
4. Tape end of shaft to restrain slug within shaft
5. Cover end effector with jettison stowage bag to
   restrain grapple shaft

NOT IN EV CUFF 42 12/19/07
EFGF GRAPPLE SHAFT RELEASE

**Tools Req'd:**
- 1/2-in Box Ratchet, EVA Probe (PSA),
- Jettison Stowage Bag (Airlock),
- Spare Grapple Shaft w/Transfer Bag
  (if reqd, Airlock)

**EV**
1. Perform visual inspection of EE/GF interface to determine possible cause of failure
2. Remove tee pull (~10 lb)
3. Rotate release rod cw (break out < 20 ft-lb, running < 11 ft-lb) to hard stop (~90 strokes of 70 deg)

**WARNING**
If payload not restrained, rotation of release rod after grapple shaft release may impart movements to payload

**IV**
4. √Electrical connector disconnected
5. If electrical connector not disconnected, insert probe into connector release port ~5.25 in for full release
6. Clear worksite for RMS cradle
7. Perform RMS POWERDOWN (PDRS OPS)

**EV**
8. Cover end effector with jettison stowage bag to restrain grapple shaft
9. Rotate release rod cw to hardstop then rotate ccw five strokes of ~70 deg (at least one full rev reqd). This will insure that grapple shaft can be released for future failures
10. Insert spare shaft (~5 lb to overcome ball detent) using alignment pin and guide
11. Rotate release rod ccw to hardstop (~90 strokes of ~70 deg), apply slight axial pressure to grapple shaft for initial rotations. This is required to aid in engagement of Acme threads
   If grapple shaft not engaged after four revs of release rod, repeat steps 9-11
12. Verify no gap between grapple shaft shoulder and grapple fixture cone. If gap is visible, release shaft and repeat insertion procedures
13. Replace tee pull
ELECTRICAL FLIGHT GRAPPLE FIXTURE
RMS/PRLA CONTINGENCY EVA (Cont)

FOR RMS/PRLA FAILURES (Cont):

PRLA OPEN/CLOSE

Refer to EVA RELEASABLE PAYLOAD RETENTION LATCHES figures, 14-11, 14-12, as reqd

PRLA OPEN/CLOSE

AIRLOCK – RATCHET WITH 7/16 SOCKET

IV √PRLA PWR OFF

EV

1. Rotate ratchet in release direction (as marked above EVA drive) to shear pin
2. View yellow indicator as applicable
3. Continue to rotate drive 4-1/2 revs to disc gear train from drive shaft

To open latch:
4. Continue rotation in release direction (as marked above EVA drive) until latch open against stop

To close latch:
5. Rotate EVA drive in opposite direction of release (as marked above EVA drive) until latch closed against hardstop and over center

IV √PRLA tb LAT

Cont next page

NOT IN EV CUFF 43 03/20/06

PRLA OPEN/CLOSE (CONT)

EV

6. Apply PRLA locking feature if applicable

To lock:
7. Rotate each bolt (two) cw 1/2 turn

For subsequent PRLA ops, release locking feature before operating EVA drive (two bolts ccw 1/2 turn); relock after operation

NOT IN EV CUFF 44 03/20/06

IV MA73C:C cb MCA PWR AC1 3φ MID 1 – cl
:D AC2 3φ MID 3 – cl

To verify PL Latches op/cl:
A6U √PL RETEN LAT 1(2,3,4,5) tb – LAT(REL)

NOT IN EV CUFF 44 03/20/06

POST EVA RMS CONFIG 10

IV A8U √BRAKES – ON (tb-ON)

Complete RMS POWERDOWN (PDRS OPS)
RMS/PRLA CONTINGENCY EVA (Cont)

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

LWLL/MWLL/MMWL
LIGHTWEIGHT LONGERON LATCH/
MIDDLEWEIGHT LONGERON LATCH/
SUPER MIDDLEWEIGHT LONGERON LATCH

MODIFIED MIDDLEWEIGHT LATCH

EVA RELEASABLE PAYLOAD RETENTION LATCHES
In-board end of shaft extends to show yellow stripe when motor disengaged.
96 BOLT PRE-EVA TOOL CONFIG

STOWAGE LOCATIONS AT LAUNCH
Flight specific Middeck stowage and PFR configuration will be uplinked

**EMUs:**
- MWS Baseplates (2)
- Retractable Tethers (2)
- Adj Equip Tethers (2)
- Waist Tethers (4)

**Middeck:**
- MWS T-bars (2)
- MWS Swing Arms (3)
- BRT (2)
- Waist Tethers Ext (2) (If flown)
- General Purpose (GP) Caddies (2)
- Adj Equip Tethers (2)
- Retractable Tethers (2)
- Crewlock Bag
- Right Angle Drive (RAD)
- Socket Caddy
- 6-in Exts (2)
- PGTs (2)
- PGT Batteries (3)
- Adj Fuse Tether
- Jettison Stowage Bag

**Node Bag:**
- 96 Bolt Bag:
  - 7/16-in Box End Wrenches (2)
  - ODS Clamps (2)
  - ODS Clamp Handles (2)
  - PB Articulating Socket
  - Bridge Rail Clamp
  - RAD w/7/16-in Sockets (2)

**TSA (Port):**
- Large Cutter
- PRDs (2)
- Sm EVA Trash Bags (2)

**Fwd Bulkhead:**
- PFR

**Port PLB (Bay 2):**
- Bridge Rail Clamp
- PB Articulating Socket

**Node Bag:**
- Configure Crewlock EVA Bag:
  - PGT Spare Battery
  - Socket Caddies w/6-in Exts (2), RAD (Spare)

**Configure Adj Fuse Tether with one of following:**
- GP Caddies (2)
- PGTs w/Batteries (2)

**Stow Adj Fuse Tether, Crewlock Bag, Jettison Stowage Bag in Airlock pre-EVA**

**Remove ODS Centerline Camera pre-EVA**
<table>
<thead>
<tr>
<th>PET</th>
<th>IV/RMS</th>
<th>EV1</th>
<th>EV2</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40:00</td>
<td>[DOCKING MECHANISM &lt;br&gt;POWERDOWN (RNDZ, APDS)&lt;br&gt;before start of DEPRESS</td>
<td>1. Perform DEPRESS (DEPRESS/REPRESS)</td>
<td>2. Perform DEPRESS (DEPRESS/REPRESS)</td>
</tr>
<tr>
<td></td>
<td>ML86B:D 1. cb MNA MMU GN2 &lt;br&gt;SPLY ISOL VLV A – cl</td>
<td>3. Perform POST DEPRESS (DEPRESS/REPRESS)</td>
<td>4. Perform POST DEPRESS (DEPRESS/REPRESS)</td>
</tr>
<tr>
<td></td>
<td>R13L  2. MMU GN2 SPLY ISOL VLV A – CL (tb-CL)</td>
<td>5. Perform AIRLOCK EGRESS (CUFF C/L, 47)</td>
<td>6. Perform AIRLOCK EGRESS (CUFF C/L, 47)</td>
</tr>
<tr>
<td></td>
<td>ML86B:D 3. cb MNA MMU GN2 &lt;br&gt;SPLY ISOL VLV A – op</td>
<td>Add the following steps to AIRLOCK EGRESS:</td>
<td>Add the following steps to AIRLOCK EGRESS:</td>
</tr>
<tr>
<td>-00:25</td>
<td></td>
<td>6a. Translate to GO2 ISOLATION VALVE on outside &lt;br&gt;of airlock (aft port side)</td>
<td>6e. ∆ODS hatch ∆P &lt; 0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6b. Open thermal cover; remove PIP pin</td>
<td>6f. Open ODS Hatch per decal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6c. GO2 XFER ISO VLV – CL AW64L(E)</td>
<td>6g. Remove docking lights (two): &lt;br&gt;Release elec connector (one) at each light &lt;br&gt;PIP pin (one) on each light boom; close thermal cover</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6d. Re-install PIP pin; close thermal cover</td>
<td>6h. Remove Cross-Hair assembly; stow in bag &lt;br&gt;6i. VENT – OP; FLOW – OP GO2 XFER PANEL</td>
</tr>
<tr>
<td>-00:20</td>
<td>Confirm TCS powerdown</td>
<td>00:00</td>
<td>00:15</td>
</tr>
<tr>
<td>00:00</td>
<td>MET at PWR – BATT</td>
<td>MET at PWR – BATT</td>
<td>MET at PWR – BATT</td>
</tr>
<tr>
<td>00:15</td>
<td></td>
<td>5. Perform AIRLOCK EGRESS (CUFF C/L, 47)</td>
<td>6. Perform AIRLOCK EGRESS (CUFF C/L, 47)</td>
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<td></td>
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<td></td>
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<td>6h. Remove Cross-Hair assembly; stow in bag &lt;br&gt;6i. VENT – OP; FLOW – OP GO2 XFER PANEL</td>
</tr>
</tbody>
</table>
96 BOLT EVA TIMELINE (Cont)

<table>
<thead>
<tr>
<th>PET</th>
<th>IV/RMS</th>
<th>EV1</th>
<th>EV2</th>
</tr>
</thead>
</table>
| 01:00 | PAYLOAD BAY SETUP | 1. Retrieve 96 Bolt Bag from Node Bag | 1. Retrieve following items from port TSA:  
PRDs (2)  
Large Cutter  
2. Close and latch TSA door  
3. Temp stow PRDs (two) on Truss  
4. Temp stow Large Cutter on stbd ODS using Adj Equip Tether |
| 01:00 | 2. Attach 96 Bolt Bag to Ext A/L Truss near port TSA | 5. Retrieve Adj Fuse Tether from A/L; temp stow on Truss  
6. Remove thermal blanket covering ODS bolts; temp stow in A/L with Adj Equip Tether |
| 01:00 | 3. Remove thermal blanket covering ODS bolts; temp stow in A/L with Adj Equip Tether | 7. Retrieve GP Caddy from Adj Fuse Tether; attach to MWS |
| 01:00 | 4. Retrieve GP Caddy from Adj Fuse Tether; attach to MWS | TOOL CONFIG | Toolkit to  Adj Fuse Tether, wait for EV1 |
| 01:20 | TOOL CONFIG | 1. Translate to Adj Fuse Tether, wait for EV1 | 2. Configure PGTs (two) with Right Angle Drives using RET w/pip pin or pip pin in 96 Bolt Bag |
| 01:20 | 1. Retrieve Right Angle Drives from 96 Bolt Bag and meet EV2 at Adj Fuse Tether | 3. Retrieve ODS Clamp from EV1, attach Waist Tether from EMU to ODS Clamp |
| 01:20 | 2. Retrieve ODS Clamp and Handle from 96 Bolt Bag; install handle in clamp, \( \sqrt{ } \) locked; hand off to EV2 | 4. Retrieve 7/16-in Box End Wrench from 96 Bolt Bag; attach to GP Caddy |
| 01:20 | 3. Retrieve ODS Clamp and Handle from 96 Bolt Bag; install handle in clamp; \( \sqrt{ } \) locked; attach Waist Tether from EMU to ODS Clamp | CAUTION | During clamp installation, do not apply any sideload on ODS gusset (may puncture A/L) |
| 01:20 | 4. Retrieve 7/16-in Box End Wrench from 96 Bolt Bag; attach to GP Caddy | INSTALL CLAMP – STBD | 1. Tether ODS Clamp to handrail at worksite  
2. Release bolts 35 to 38 (four); pull to lock up  
3. Retract Clamp pip pin  
4. Install clamp between bolts 36,37  
5. Set clamp  
  Turn bolt at top of clamp until upper jaws contact vestibule ring, then add 1 3/4 turn; insert pip pin  
6. \( \sqrt{ } \) Clamp Handle locked  
PGT: 25.5 ft-lb, CCW2, 30.5 |
| 01:45 | INSTALL CLAMP – PORT | 1. Tether ODS Clamp to handrail at worksite  
2. Release bolts 83 to 86 (four); pull to lock up  
3. Retract Clamp pip pin  
4. Install clamp between bolts 84,85  
5. Set clamp  
  Turn bolt at top of clamp until upper jaws contact vestibule ring, then add 1 3/4 turn; insert pip pin  
6. \( \sqrt{ } \) Clamp Handle locked |
### 96 BOLT EVA TIMELINE (Cont)

<table>
<thead>
<tr>
<th>PET</th>
<th>IV/RMS</th>
<th>EV1</th>
<th>EV2</th>
</tr>
</thead>
<tbody>
<tr>
<td>02:05</td>
<td>Record Cables cut at following locations:</td>
<td>1. Art Socket: $P = 2$, $Y = 6$</td>
<td>1. Port Bridge Rail Clamp and Art Socket launched in second to fwd-most available half-hole</td>
</tr>
<tr>
<td></td>
<td>Bolt 32 – 1 cable</td>
<td>2. PFR: $P = 10$, $R = A$, $Y = 8$</td>
<td>1. Move clamp assy to fwd-most available half-hole, knob inboard</td>
</tr>
<tr>
<td></td>
<td>Bolt 24 – 7 cables</td>
<td></td>
<td>2. Retrieve fwd bulkhead PFR and install</td>
</tr>
<tr>
<td></td>
<td>Bolt 21 – 1 cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bolt 19 – 1 cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bolt 1 – 1 cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bolt 95 – 2 cables</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bolt 74 – 2 cables</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bolt 69 – 3 cables</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Line 69 – 1 line N2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Line 56 – 1 line O2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bolt 51 – 1 cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bolt 47 – 2 cables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PGT: 25.5 ft-lb, CCW2, 30.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03:15</td>
<td>USE BRT FOR BOLT RELEASE</td>
<td></td>
<td>1. Release bolts 49-81, 88-96</td>
</tr>
<tr>
<td></td>
<td>1. Release bolts 1-33, 40-48 and grounding strap between bolts 9 and 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SURVEY VESTIBULE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. All bolts except 34,39,82,87 locked up</td>
<td></td>
<td>1. All bolts except 34,39,82,87 locked up</td>
</tr>
<tr>
<td></td>
<td>2. All cables cut (21), all gas lines cut (two), and ground strap removed</td>
<td></td>
<td>2. All cables cut (21), all gas lines cut (two), and ground strap removed</td>
</tr>
<tr>
<td></td>
<td>3. All tools, tethers removed from vestibule</td>
<td></td>
<td>3. All tools, tethers removed from vestibule</td>
</tr>
<tr>
<td></td>
<td>4. Separation plane clear of all cables and lines</td>
<td></td>
<td>4. Separation plane clear of all cables and lines</td>
</tr>
</tbody>
</table>
### 96 BOLT EVA TIMELINE (Cont)

<table>
<thead>
<tr>
<th>PET</th>
<th>IV/RMS</th>
<th>EV1</th>
<th>EV2</th>
</tr>
</thead>
</table>
| 03:25 | √FREE DRIFT PGT: 25.5 ft-lb, CCW2, 30.5 | 1. Receive PRD from temp stow on Truss  
2. Attach PRD fixed end to handrail, retractable end to Clamp Handle  
3. Before releasing last two bolts, √FREE DRIFT  
4. Release bolts 34,39; pull to lock up  
5. Notify IV, GO for Clamp Release | 1. Receive PRD from temp stow on Truss  
2. Attach PRD fixed end to handrail, retractable end to Clamp Handle  
3. Before releasing last two bolts, √FREE DRIFT  
4. Release bolts 82,87; pull to lock up  
5. Notify IV, GO for Clamp Release |
| 03:50 | Give EV GO for Clamp Release |  | |
| 04:00 |  | 2. Coordinate with IV and give EV2 short count for simo release  
3. Simo with EV2, pull on PRD strap to open clamp  
4. After clamp open, inform IV, “Clamp open and EV1 clear” | 2. Simo with EV1, pull on PRD strap to open clamp  
3. After clamp open, inform IV, “Clamp open and EV2 clear” |
| 04:05 | SEPARATION BURN | 1. Translate to TSA w/96 Bolt Bag  
Remove Right Angle Drives (two) from PGTs (two) using pip pin on 96 Bolt Bag; stow in 96 Bolt Bag  
2. Remove ODS Clamp and Handle from ODS gusset; stow Clamp, Handle, 7/16-in Box End Wrench in 96 Bolt Bag  
3. Stow Waist Tether on EMU  
4. Remove and stow 96 Bolt Bag in airlock  
5. Stow PRD, Trash Bag in Port TSA  
6. Configure stbd PFR assay for landing:  
   - Bridge Rail Clamp: second to aft-most available half-hole; √knob locked  
   - Art Socket: P = 11.5, Y = 3; √locked  
7. PFR to EV2 port side | 1. Translate to TSA  
2. Stow PGTs (two) on Adj Fuse Tether  
3. Stow Adj Fuse Tethers in airlock  
4. Remove ODS Clamp and Handle from ODS gusset; stow Clamp, Handle, 7/16-in Box End Wrench in 96 Bolt Bag  
5. Stow Waist Tether on EMU  
6. Stow Large Cutter, Trash Bag, PRD in Port TSA  
7. Close TSA door, close all latches  
IF USED:  
8. Configure port PFR socket assay for landing:  
   - Bridge Rail Clamp: second to fwd-most available half-hole; √knob locked  
   - Art Socket: P = 11.5, Y = 3; √locked  
9. Art Socket: P = 11.5, Y = 3; √locked  
10. PFR: P = 10, R = A, Y = 6; √locked |
<table>
<thead>
<tr>
<th>PET</th>
<th>IV/RMS</th>
<th>EV1</th>
<th>EV2</th>
</tr>
</thead>
<tbody>
<tr>
<td>04:40</td>
<td><strong>VERIFY 96 BOLT BAG STOWAGE</strong></td>
<td>ODS Clamps (2)</td>
<td>Adj Fuse Tethers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ODS Clamp Handles (2)</td>
<td>PGTs w/batteries (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Right Angle Drives with 7/16-in Socket (2)</td>
<td>GP Caddies (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7/16-in Box End Wrenches (2)</td>
<td>ODS Thermal Blankets with Adj Equip Tethers (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>VERIFY AIRLOCK STOWAGE</strong></td>
<td>96 Bolt Bag</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PERFORM AIRLOCK INGRESS, CUFF C/L, 30</strong></td>
<td>Crewlock Bag:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>^EMU equipment:</td>
<td>PGT spare battery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MWS w/swing arm</td>
<td>Socket Caddy w/6-in Exts (2), RAD</td>
</tr>
<tr>
<td>05:15</td>
<td></td>
<td>Retractable Tethers (2)</td>
<td><strong>PERFORM AIRLOCK INGRESS, CUFF C/L, 30</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adj Equip Tethers (2)</td>
<td>^EMU equipment:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Waist Tethers (2)</td>
<td>MWS w/swing arm</td>
</tr>
<tr>
<td>05:30</td>
<td></td>
<td></td>
<td>BRT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Retractable Tethers (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Adj Equip Tethers (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Waist Tethers (2)</td>
</tr>
</tbody>
</table>
### CAPTURE LATCH MANUAL RELEASE (ODS/PMA)

<table>
<thead>
<tr>
<th>IV</th>
<th>EV</th>
</tr>
</thead>
</table>
| If APDS powered: | TOOLS REQD  
| A7 pb PWR OFF – push | Jettison Stowage Bag  
| √STATUS It (eighteen) – off | Russian Capture Latch Tool (if reqd, in Node Bag)  
| Perform DOCKING MECHANISM POWERDOWN |  
| (RNDZ, APDS) |  |

**BOTH**

1. Configure Waist Tethers as safety line inside ODS

**EV1**

Attach at ODS Hatch D-ring nearest capture latches

**EV2**

Attach at A/L D-ring behind EV1

**EV2**

2. Open outer hatch to improve EMU sublimator performance

**EV1**

3. ODS/PMA interface:
   - Open ODS hatch  
   - Remove docking lights (two):  
     - Release elec connector (one) at each light  
     - pip pin (one) on each light boom  
   - Stow lights and booms in bag

   **NOTE**  
   - EV2 restrain/aid EV1 as reqd

**EV1**

4. Remove Cross-Hair assembly  
   - Stow in bag

5. √ IV GO for release

6. Release capture latch

Cont next page
## CAPTURE LATCH MANUAL RELEASE (ODS/PMA) (Cont)

<table>
<thead>
<tr>
<th>IV</th>
<th>EV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>NOTE</strong>&lt;br&gt; If reqd, EV2 retrieve Russian Capture Latch Tool from Node Bag (requires safety tether reel ops)</td>
</tr>
<tr>
<td></td>
<td>7. Notify IV when capture latch released</td>
</tr>
<tr>
<td></td>
<td>8. Close hatch at capture latch interface</td>
</tr>
<tr>
<td>EV2</td>
<td>9. If used, temp stow Russian Capture Tool in A/L and perform AIRLOCK INGRESS (CUFF C/L, 30)</td>
</tr>
<tr>
<td></td>
<td>10. Close outer hatch</td>
</tr>
<tr>
<td>BOTH</td>
<td>11. Go to A/L REPRESS</td>
</tr>
</tbody>
</table>
## PLBD LATCH TOOL PLACEMENT WITH DUAL LATCH GANG FAILURES

<table>
<thead>
<tr>
<th>CASE*</th>
<th>FAILED GANG 1</th>
<th>FAILED GANG 2</th>
<th>Three Point Latch Tool Positions</th>
<th>Centerline Latch Tool Positions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cuff C/L, 37</td>
<td>Cuff C/L, 38</td>
<td>Cuff C/L, 37</td>
<td>Cuff C/L, 38</td>
</tr>
<tr>
<td>A</td>
<td>Fwd Bulkhead Port</td>
<td>Fwd Bulkhead Stbd</td>
<td>FWD #2**</td>
<td>FWD #4**</td>
</tr>
<tr>
<td>B</td>
<td>Fwd Bulkhead Port</td>
<td>Centerline Fwd</td>
<td>FWD #2</td>
<td>FWD #4</td>
</tr>
<tr>
<td>C</td>
<td>Fwd Bulkhead Stbd</td>
<td>Centerline Fwd</td>
<td>FWD #2</td>
<td>FWD #4</td>
</tr>
<tr>
<td>D</td>
<td>Centerline Fwd</td>
<td>Centerline Mid Fwd</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>E</td>
<td>Centerline Mid Fwd</td>
<td>Centerline Mid Aft</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Other combinations of Two-Gangs Out involve doors in the crush pressure zone (latches in compression) or have at least one closed gang between failed gangs (no tension loads bleeding between gangs, giving load distributions identical to single latch gang failures)

**Install both 3-pt tools on same side (Port or Stbd)
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NORMAL EVA STATUS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>O2 POS</td>
<td>EVA</td>
</tr>
<tr>
<td>SUBLM P</td>
<td>2.0-4.2 psia</td>
</tr>
<tr>
<td>TIME EV</td>
<td>HR:MIN since PWR-BATT</td>
</tr>
<tr>
<td>TIME LF?</td>
<td>limit consum HR:MIN remaining at present use rate</td>
</tr>
<tr>
<td>% O2 (PWR) LF</td>
<td>Non-limiting consumable will be displayed</td>
</tr>
<tr>
<td>% O2 (PWR) LF</td>
<td>4.2-4.4 (4.7 during/after depress) psid</td>
</tr>
<tr>
<td>O2 P</td>
<td>150-900 psia</td>
</tr>
<tr>
<td>O2 RATE</td>
<td>0-4.0 ps/minute</td>
</tr>
<tr>
<td>SOP P</td>
<td>5410-8800 psia</td>
</tr>
<tr>
<td>BAT VDC</td>
<td>≥ 16.7</td>
</tr>
<tr>
<td>BAT AMP</td>
<td>3.0-4.0</td>
</tr>
<tr>
<td>RPM</td>
<td>18.0-20.0 K</td>
</tr>
<tr>
<td>CO2</td>
<td>0.2-4.0 mm</td>
</tr>
<tr>
<td>H2O TEMP</td>
<td>32-75 degF</td>
</tr>
<tr>
<td>H2O GP</td>
<td>14.0-16.0 psid</td>
</tr>
<tr>
<td>H2O WP</td>
<td>14.0-16.0 psid</td>
</tr>
<tr>
<td>DATA? COMBO</td>
<td>4.2-4.4 psid (4.7 during/after depress) psid</td>
</tr>
</tbody>
</table>

NOTE: BOLDFACE ind detailed proc

EMU MALFUNCTION INDEX

<table>
<thead>
<tr>
<th>Malfunction</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>14V SUP FAIL</td>
<td>27</td>
<td>O2 ACT FAULT</td>
</tr>
<tr>
<td>5V REF FAIL</td>
<td>27</td>
<td>O2 IS OFF</td>
</tr>
<tr>
<td>ABORT EVA</td>
<td>6</td>
<td>O2 LF (%)</td>
</tr>
<tr>
<td>AIR FLOW CONT</td>
<td>24</td>
<td>O2 USE HIGH</td>
</tr>
<tr>
<td>BATT AMPS HIGH</td>
<td>24</td>
<td>RESRV H2O ON</td>
</tr>
<tr>
<td>BATT V DECAY OR</td>
<td>10</td>
<td>O2 LF (%)</td>
</tr>
<tr>
<td>BATT VDC LOW</td>
<td>11</td>
<td>RLF V FAIL</td>
</tr>
<tr>
<td>BITE light</td>
<td>27</td>
<td>SCU PWR AVAL</td>
</tr>
<tr>
<td>BUS CK FAIL</td>
<td>27</td>
<td>SET H2O OFF</td>
</tr>
<tr>
<td>COMM FAIL</td>
<td>23</td>
<td>SET O2 EVA</td>
</tr>
<tr>
<td>CO2 HIGH</td>
<td>21</td>
<td>SET O2 PRESS</td>
</tr>
<tr>
<td>CO2 SNR BAD</td>
<td>22</td>
<td>SOP O2 ON</td>
</tr>
<tr>
<td>DCS</td>
<td>4</td>
<td>SOP P LOW</td>
</tr>
<tr>
<td>DRAM FAIL</td>
<td>27</td>
<td>SUBLM P</td>
</tr>
<tr>
<td>EE CSUM FAIL</td>
<td>27</td>
<td>SUIT P EMERG</td>
</tr>
<tr>
<td>FAN SW OFF</td>
<td>28</td>
<td>SUIT P HIGH</td>
</tr>
<tr>
<td>FW ANOMALY</td>
<td>27</td>
<td>SUIT P LOW</td>
</tr>
<tr>
<td>H2O GP LOW</td>
<td>17</td>
<td>SW/FAN FAIL</td>
</tr>
<tr>
<td>H2O IS OFF</td>
<td>28</td>
<td>TERMINATE EVA</td>
</tr>
<tr>
<td>H2O WP HIGH</td>
<td>19</td>
<td>TIME LF: XX</td>
</tr>
<tr>
<td>LOSS OF COOLING</td>
<td>25</td>
<td>VENT SW FAIL</td>
</tr>
<tr>
<td>MONITOR CO2</td>
<td>21</td>
<td>WAT DOG FAIL</td>
</tr>
<tr>
<td>NO VENT FLOW</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: BOLDFACE ind detailed proc
### DECOMPRESSION SICKNESS (DCS)

#### Class 1
**Symptoms:** Mild pain (single/multiple sites) and/or single extremity numbness/tingling. Difficult to discern from suit pressure points. Symptoms do not interfere with performance.

**Action:** Report in POST EVA PMC.

#### Class 2
**Symptoms:** Moderate Class 1 symptoms that interfere with performance or symptoms that resolve upon repress.

**Action:** Perform worksite cleanup, minimize activity of affected crewmember. TERM EVA; REPRESS.

#### Class 3
**Symptoms:** Severe Class 1 symptoms or migratory, trunkal/multiple site numbness/tingling; unusual headache.

**Action:** Assist affected crewmember to A/L, safe PLB, TERM EVA; REPRESS.

#### Class 4
**Symptoms:** Serious symptoms – central neurological, cardiopulmonary.

**Action:** ABORT EVA. Assisted return of affected crewmember to A/L, repress affected crewmember solo. Unaffected crewmember safe PLB, TERM EVA; REPRESS.

### TERMINATE EVA

1. Ingress airlock
2. Connect SCU

**WARNING**
If terminating due to BATT AMPS HIGH (system short), do not perform step 3.

**NOTE**
If fan stops during power transfer:
Cycle FAN sw – OFF, ON

#### ABORT EVA

- **BOTH:** Ingress airlock.
- Unhook from reel
- Outer (EVA) hatch – close and lock
- Go to EMER REPRESS decal (airlock hatches)

#### TERM EVA

- **AW18H 3.** PWR/BATT CHGR EMU 1(2) BUS SEL – MNA(MNB)
- **IV 4.** E MU O2 ISOL vlv – OP
- **AW82B 5.** EV-1(EV-2) O2 vlv – OP
- **DCM 6.** PWR – SCU (fwd)
- **7.** WATER – OFF (fwd)
- **8.** Verify SUIT P ≥ 3.3 and stable
  - If SUIT P < 3.3:
    - **9.** Go to ABORT EVA, 6
  - **10.** Monitor EMU status
  - **11.** Coordinate ingress with EV1(2)

**SUIT P EMERG**
**ON**

**SOP**

**04/28/06**
**SUIT P EMERG**

If Suit P gauge ≤ 4.0
1. DCM PURGE vlv – closed
   □ □ □ □ □ □
2. Helmet purge vlv – closed and locked
3. O2 ACT – EVA

If Suit P gauge > 4.0 (sensor failed)
4. Continue EVA, monitor Suit P gauge

**NOTE**
Message triggered when SUIT P < 3.1

---

**SOP O2 ON**

1. Go to ABORT EVA, 6

**NOTE**
Msg triggered when:
- SUIT P < 4.05 and
- SOP RATE > 36.0 psi/min

---

**BATT AMPS HIGH**

1. Helmet purge vlv – op
2. FAN – OFF
3. WATER – OFF
4. Notify IV/EV of impending comm loss
5. PWR – SCU, do not activate airlock power
6. Go to TERM EVA, 7

**NOTE**
Msg triggered when BATT AMPS > 5.0
Normal BATT AMP = 3.0-4.0
Normal BATT AMP w/o fan = 0.7-1.3

---

**BATT V DECAY OR BATT VDC LOW**

If BATT VDC < 13.0 and fan and communications still working:
1. Continue EVA (sensor failure) >>
2. BEGIN TRANSLATING TO AIRLOCK FOR TERMINATE EVA
3. WHEN VENT FLOW LOST, HELMET PURGE VLV → op
4. Go to TERM EVA, 7

**WARNING**
Impending fan and comm loss

**NOTE**
BATT V DECAY message triggered when BATT VDC < 17.5
BATT VDC LOW message triggered when BATT VDC < 16.5
Normal Lithium Ion BATT VDC ≥ 18.0
Normal ICB BATT VDC ≥ 16.7
Normal Fan RPM: 19.0 to 20.0K
### SUIT P LOW

<table>
<thead>
<tr>
<th>SUIT P LOW</th>
<th>SUIT P X.X</th>
</tr>
</thead>
<tbody>
<tr>
<td>If O2 USE HIGH msg present:</td>
<td></td>
</tr>
<tr>
<td>1. Go to ABORT EVA, 6</td>
<td></td>
</tr>
<tr>
<td>If O2 USE HIGH msg not present:</td>
<td></td>
</tr>
<tr>
<td>2. Continue EVA, monitor SUIT P, SOP P, and gauge</td>
<td></td>
</tr>
<tr>
<td>If gauge &lt; 4.0 and SOP P decreasing:</td>
<td></td>
</tr>
<tr>
<td>3. Go to TERM EVA, 7</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
Msg triggered when SUIT P < 4.05

---

### SUIT P HIGH

<table>
<thead>
<tr>
<th>SUIT P HIGH</th>
<th>O2 RATE XX.X</th>
<th>SOP RATE XXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>If O2 RATE &gt; 7.0 or SOP RATE &gt; 8:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Go to TERM EVA, 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If O2 RATE &lt; 7.0 and SOP RATE ≤ 8:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Monitor SUIT P, SOP P, and gauge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Continue EVA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
Msg triggered when SUIT P > 4.55
Normal O2 RATE = 1.7 psi/min

---

### SOP P LOW

<table>
<thead>
<tr>
<th>SOP P LOW</th>
<th>SOP P XXX0</th>
<th>SOP RATE XXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Go to TERM EVA, 7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
Msg triggered when SOP P < 4500, or SOP P < init SOP P – 600 (SOP P initialized at EMU powerup)

---

### O2 USE HIGH

<table>
<thead>
<tr>
<th>O2 USE HIGH</th>
<th>O2 RATE XX.X</th>
</tr>
</thead>
<tbody>
<tr>
<td>If SUIT P LOW msg present:</td>
<td></td>
</tr>
<tr>
<td>1. Go to ABORT EVA, 6</td>
<td></td>
</tr>
<tr>
<td>If O2 P erratic or ~0:</td>
<td></td>
</tr>
<tr>
<td>2. Continue EVA</td>
<td></td>
</tr>
<tr>
<td>3. Recharge O2 periodically</td>
<td></td>
</tr>
<tr>
<td>If O2 RATE &gt; 7.0:</td>
<td></td>
</tr>
<tr>
<td>4. Go to TERM EVA, 7</td>
<td></td>
</tr>
<tr>
<td>Otherwise:</td>
<td></td>
</tr>
<tr>
<td>5. Recharge O2 as reqd</td>
<td></td>
</tr>
<tr>
<td>6. Continue EVA</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
Msg triggered when:
- O2 RATE > 10.2 psi/min or
- O2 P < 150 and TIME EV < 5 hr
Normal O2 RATE = 1.7 psi/min

---

### O2 USE LOW

<table>
<thead>
<tr>
<th>O2 USE LOW</th>
<th>H2O GP</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>05/11/06</td>
</tr>
</tbody>
</table>

---

### SUML PRESS

<table>
<thead>
<tr>
<th>SUML PRESS</th>
<th>H2O GP</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>05/11/06</td>
</tr>
</tbody>
</table>
**SUBLM PRESS**

SUBLM P XX.X | SET H2O OFF
---|---
1. WATER – OFF (fwd)
   - If SUBLM P < 1.0 and stable:
     - When cooling desired, then:
     - 2. Temp control vlv – Max H
     - 3. WATER – ON (aft)
     - 4. Temp control vlv – as reqd
       - If cooling insufficient:
         - 5. Go to LOSS OF COOLING, 25, step 2 >>
       - If cooling sufficient:
         - 6. Continue EVA, monitor SUBLM P and cooling >>
   - If SUBLM P ≥ 1.0 and stable (sensor fail):
     - 7. Perform steps 2-4, continue EVA, monitor cooling

**NOTE**
Msg triggered when SUBLM P < 1.5 or > 5.3
Normal SUBLM P = 2.0-4.2

---

**H2O GP LOW**

If H2O GP < 13.5:
- If cooling insufficient (H2O reg fail):
  1. Go to LOSS OF COOLING, 25, step 2
- If cooling sufficient (H2O reg shifted):
  2. Monitor cooling
  3. Continue EVA >>

If H2O GP ≥ 13.5 (sensor fail):
- 4. Monitor H2O GP (RESRV H2O ON msg may be inhibited)
  - If H2O GP drops to < 12.0:
    - 5. Go to TERM EVA, 7

**NOTE**
Msg triggered when H2O GP < 13.5
Normal H2O TEMP = 32-75 degF
WP = 14.0-16.0

---

**RSRV H2O ON**

**RESRV H2O ON | TIME LF :XX**

<table>
<thead>
<tr>
<th>H2O GP</th>
<th>H2O WP</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>~15</td>
<td>~0</td>
<td>1. Monitor SUBLM P and H2O TEMP (WP xdc fail)</td>
</tr>
</tbody>
</table>
| > 17.0 | ~15 | 2. Monitor H2O WP and H2O TEMP (GP xdc fail)
  - If H2O WP drops to < 12.0:
    - 3. Go to TERM EVA, 7 |
| ~15 | < 12.0 | 4. Go to TERM EVA, 7 (reserve H2O on) |

**NOTE**
Msg triggered when GP minus WP > 2.1 psi
Normal SUBLM P = 2.0-4.2 psia
H2O TEMP = 32-75 degF
GP/WP = 14.0-16.0

---

**H2O WP HIGH**

If H2O WP < 16.0 (H2O WP sensor failed):
- 1. Monitor cooling (RESRV H2O ON msg inhibited)
- 2. Continue EVA >>

If O2 RATE > 7.0 (H2O reg failed open):
- 3. Go to TERM EVA, 7 >>

If O2 RATE ≤ 7.0 (H2O reg shifted):
- 4. Monitor Suit P gauge and cooling
- 5. Continue EVA

**NOTE**
Message triggered when H2O WP > 17.0
Normal H2O WP and H2O GP: 14.0-16.0
Normal H2O TEMP: 32 to 75 degF
Normal O2 RATE ~ 1.7 psi/min
Normal Suit P: 4.2-4.4 psi
NO VENT FLOW

If fan is not running:
1. Cycle FAN sw – OFF, ON
   If fan restarts:
   2. Continue EVA >>
   If fan does not start:
   3. Helmet purge vlv – op
   4. Go to TERM EVA, 7 >>
If fan is running:
   If RPM < 18.0 K:
   5. Helmet purge vlv – op
   6. Go to TERM EVA, 7 >>
   If RPM ≥ 18.0 K:
   7. Assess helmet CO2 level
   8. Go to CO2 HIGH, 21, step 3

NOTE
Msg triggered when flow < 3.7 cfm
Normal vent flow = 6-8 cfm

CO2 SNSR BAD

1. Periodically monitor physical condition (CO2 sensor failed)
   If CO2 symptoms noted:
   2. Helmet purge vlv – op
   3. Go to TERM EVA, 7 >>
   4. Continue EVA

NOTE
Message triggered when PPCO2 increases from nominal value to ≥ 40 MM in < 2 min.
Normal PPCO2: 0.2-4.0 MM

CO2 HIGH OR MONITOR CO2

CO2 XX.X MM | MONITOR CO2 | PPCO2 > 8.0 MM
1. Minimize physical activity
2. Assess physical condition then go to step 3 below

CO2 HIGH | OPEN PURGE V | PPCO2 > 12.4 MM
1. \( \sqrt{DCM} \) PURGE vlv – cl, \( \sqrt{Helmet} \) purge vlv – op
   If symptoms noted prior to opening purge vlv:
   2. Go to TERM EVA, 7 >>
   If no symptoms noted (or inconclusive):
   3. Close/open helmet purge vlv as reqd to assess physical condition for high CO2
   4. Helmet purge vlv – op
   5. Go to TERM EVA, 7 >>
   If no symptoms noted:
   6. Helmet purge vlv – cl, locked
   7. Monitor physical condition and PPCO2
   8. Continue EVA

NOTE
Normal PPCO2 = 0.2-4.0 MM
If Suit P sensor failed: MONITOR CO2: 3.0 MM, CO2 HIGH: 8.0 MM

CO2 SNSR COMM FAIL

CO2 SNSR BAD

1. Periodically monitor physical condition (CO2 sensor failed)
   If CO2 symptoms noted:
   2. Helmet purge vlv – op
   3. Go to TERM EVA, 7 >>
   4. Continue EVA

NOTE
Message triggered when PPCO2 increases from nominal value to ≥ 40 MM in < 2 min.
Normal PPCO2: 0.2-4.0 MM

COMM FAILURE

ALL
1. \( \sqrt{Proper} \) config, EMU and orbiter (Mode, Vol, Freq)
   Perform following sequence until comm restored:
   2. Clear structure to recover comm (signal blockage)
   If unresolved:
   3. Aff cm select ALT(PRI) (notify MCC)

IV
4. IV select STRING 2(1)

O6
5. Perform coordinated freq change
If unable to restore minimum of relay comm:
6. Go to TERM EVA, 7

NOTE
Message triggered when PPCO2 increases from nominal value to ≥ 40 MM in < 2 min.
Normal PPCO2: 0.2-4.0 MM

AIR FLOW LOSS COOL

15-7  
EVA/ALL/GEN H,4
AIR FLOW CONTAMINATION
If flow exiting helmet vent contaminated by caustic water or LiOH dust:
1. Helmet purge vlv – op
2. FAN – OFF
3. WATER – OFF
If contamination still present:
4. Go to ABORT EVA, 6 >> Otherwise:
5. Go to TERM EVA, 7 >> If excessive water in vent loop or helmet:
6. Contact MCC

NOTE
EMU water tanks hold ≈1 gal H2O

LOSS OF COOLING
1. Temp Control vlv – cycle 3 to Max C; leave in Max C
   If cooling restored, continue EVA >>
2. Begin translation to airlock for TERM EVA
   If SCU cannot be connected prior to overheating:
   3. Helmet purge vlv – op, lock
      4. If vent flow excessively hot:
         DCM
         FAN – OFF
   If helmet purge flow insufficient for cooling:
   5. Helmet purge vlv – cl, lock
      6. DCM purge vlv – op
      7. Connect SCU to DCM
      8. \FAN – ON
3. helmet purge vlv – cl, locked
4. DCM purge vlv – cl, locked
If cooling sufficient:
5. Go to TERM EVA, 7
If cooling insufficient:
6. Perform steps 3-6
7. Go to TERM EVA, 7

FW ANOMALY – Feedwater discretes in disagreement
SW/FAN FAIL – Verify RPMs nominal
VENT SW FAIL – Vent flow sensor unreliable
Built-In Tests
(BITE light illuminated) – may be accompanied by one of the following messages:
For all cases, perform following sequence:
1. \STATUS, IV record
   14V SUP FAIL
   If status list nominal:
   2. Continue EVA, inform MCC >>
      5V REF FAIL
      If status list unreadable or erroneous:
      3. Go to TERM EVA, 7
      BUS CK FAIL
      DRAM FAIL
      EE CSUM FAIL
      WAT DOG FAIL
      4. Inform MCC

NOTE
Message triggered when SUIT P > 5.7

AW82B
1. AIRLK DEPRESS vlv – CL
2. \Suit P gauge
3. Contact MCC

RLF V FAIL
STOP DEPRESS SUIT P X.X

RLF V FAIL
RLF V FAIL
STOP DEPRESS SUIT P X.X

AW82B
1. AIRLK DEPRESS vlv – CL
2. \Suit P gauge
3. Contact MCC

NOTE
Message triggered when SUIT P > 5.7

RLF VLV
RLF V FAIL
STOP DEPRESS SUIT P X.X

MISC 1
Message triggered when SUIT P > 5.7

MISC MSGS 1
FW ANOMALY – Feedwater discretes in disagreement
SW/FAN FAIL – Verify RPMs nominal
VENT SW FAIL – Vent flow sensor unreliable
Built-In Tests
(BITE light illuminated) – may be accompanied by one of the following messages:
For all cases, perform following sequence:
1. \STATUS, IV record
   14V SUP FAIL
   If status list nominal:
   2. Continue EVA, inform MCC >>
      5V REF FAIL
      If status list unreadable or erroneous:
      3. Go to TERM EVA, 7
      BUS CK FAIL
      DRAM FAIL
      EE CSUM FAIL
      WAT DOG FAIL
      4. Inform MCC

NOTE
Message triggered when SUIT P > 5.7
MISC MSGS (CONT) / TIME LF

- PAN SW OFF
- H2O IS OFF
- O2 ACT FAULT
- O2 IS OFF
- SET H2O OFF
- SET O2 EVA
- SET O2 PRESS
- SCU PWR AVAL

Verify proper config

Consumables

| XX% O2 LF | TIME LF 'MM |
| XX% PWR LF | TIME LF 'MM |

Triggered with 30 min of calculated time remaining for limiting consumable

1. Contact MCC to confirm calculation
   * If no comm with MCC: *
   * Go to TERM EVA, 7 *

AIRLOCK INGRESS

1. √ TOOL BOX – closed, latched
2. Ingress airlock
3. Attach waist tether to A/L internal D-ring; lock hook
4. Attach EV2’s safety tether, retracting end to waist tether; lock hooks
5. Disconnect EV1 safety tether, retracting end – attach to self
6. Ingress airlock

TOOL BOX – closed, latched

EV2

EV1

BOTH

7. Unstow SCU, remove DCM cover, connect SCU to DCM (not reqd for tunnel adapter)
8. DCM WATER – OFF (fwd)
9. Thermal cover – close

CAUTION
Do not close hatch until EMU WATER is OFF for 2 min

10. EVA hatch handle – pre close posn
11. √ EVA hatch seal clear, outer (EVA) hatch – close, lock
12. Go to PRE REPRESS (DEPRESS/REPRESS Cue Card)

AIRLOCK LATCH DISCONNECT

TOOL BOX/A/L – ADJ WRENCH, RATCHET WITH 7/16 SOCKET
TOOL BOX – EVA TRASH BAG, ADJ TETHERS
1. Remove bolt A, stow in trash bag
2. Rotate actuator handle
3. Force latches open
4. Seal hatch w/repress and secure for ldg (IV)

If no rotation – jammed actuator:
5. Locate and remove jam
6. Reconnect actuator

If free rotation – jammed latch:
5. Close, lock hatch

Hinge Disconnect

TOOL BOX – ADJ TETHERS, VELCRO/TAPE
1. Restrained hinge arm(s) and PIP pins clear of opening, ingress airlock, posn hatch for closing
2. Close, lock hatch

RADIATOR ACTUATOR DISCONNECT

IFM – 1/4-in ALLEN HEAD DRIVER
TOOL BOX – RADIATOR DISCONNECT/ 3/8 DRIVE RATCHET

IV √ Pwr off
Actuator disc sequence – aft to fwd
1. Yellow shear pins (4) – retract to stop (6 revs ccw)

When all actuators are disengaged:
2. Manually close radiator panels and hold

IV √ Pwr on

IV Latches – close

NOT IN EV CUFF

30 11/03/06

31 03/20/06

15-9
**PLBD DRIVE CUT**

TOOL BOX – TUBE CUTTER, VELCRO/TAPE

IV  

Pwr off

Cut #1, stow antenna if stbd side, perform WINCH OPS, 35, steps 1,2, then cut #6 thru #2 and perform WINCH OPS, 36, steps 3-7

<table>
<thead>
<tr>
<th>BANDS VISIBLE</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-6</td>
<td>Cut upper rod in middle and restrain (27)</td>
</tr>
<tr>
<td>7-10</td>
<td>Cut lower rod between 2nd and 3rd bands from top and restrain (27)</td>
</tr>
</tbody>
</table>

**DOOR DRIVE RESTRAINT**

TOOL BOX – TAPE

IV

Pwr off

1. Perform WINCH OPS, 35, steps 1,2
2. Remove fabric cover(s)
3. Insert Disc Tool in Door Drive PDU
   Xo – 798, port OR stbd
4. Rotate tool cw to stop (60 deg) and leave tool in PDU
5. Rotate torque shaft at least 3 turns (see below)
6. Perform WINCH OPS, 36, steps 3-7
7. If reqd for other door, rotate tool ccw 60 deg and remove from PDU

**DOOR DRIVE DISCONNECT**

TOOL BOX – PDU DISC TOOL, TRASH BAG

IV  
Pwr off

1. Perform WINCH OPS, 35, steps 1,2
2. Remove fabric cover(s)
3. Insert Disc Tool in Door Drive PDU
   Xo – 798, port OR stbd
4. Rotate tool cw to stop (60 deg) and leave tool in PDU
5. Rotate torque shaft at least 3 turns (see below)
6. Perform WINCH OPS, 36, steps 3-7
7. If reqd for other door, rotate tool ccw 60 deg and remove from PDU

**WINCH OPERATIONS**

IV  

Radiators – stow and latch

1. Winch
   CONTROL – REEL OUT
   Handle ratchet – blue (center)
   Attach rope to wrist tether
   Rope: Fwd – in clip and over rollers
   Aft – rope guide, under handrail, and over rollers
   Winch hook – under #4 latch bellcrank
2. Ratchet in rope slack only

Cont next pg
WINCH OPERATIONS (CONT)

IV

Pwr off
1. Position installation handles as reqd
2. Tools – install in sequence per IV table
3. Ratchet select lever – green
4. Handle – ratchet to hard stop
   – stow handle or
   - restrain with
   Adj tether

TOOL RESET
1. Ratchet – red
2. Handle – ratchet to stop
3. Tool – compress to latch handles

3-PT TOOL INSTALLATION

TOOL BOX – 3-PT TOOLS, ADJUSTABLE TETHERS

IV

Pwr off
1. Position installation handles as reqd
2. Tools – install in sequence per IV table
3. Ratchet select lever – green
4. Handle – ratchet to hard stop
   – stow handle or
   - restrain with
   Adj tether

TOOL RESET
1. Ratchet – red
2. Handle – ratchet to stop
3. Tool – compress to latch handles

CL LATCH TOOL

TOOL BOX – CL LATCH TOOLS

IV

Pwr off
1. Tools – install per IV table
2. Trigger – safety off
   – depress
3. Ratchet select lever – green
4. Handle – ratchet to hard stop
   – stow

TOOL RESET
1. Ratchet – red
2. Handle – ratchet to stop
   – stow
3. Tool – compress to latch handles

RMS JOINT ALIGN

TOOL BOX – ADJ TETHERS, SNATCH BLOCKS (2), RMS ROPE REEL

IV

1. Attach RMS rope around end effector under handrail. Translate to avoid wrapping rope around RMS
2. Attach snatch block(s) to handrail(s) and route rope as reqd
3. Reposition RMS as required for cradling
4. Pull RMS down into MPMs
5. Perform final positioning by hand to allow MRLs to latch

RMS SHOULDER BRACE RELEASE

TOOL BOX – RMS SHOULDER BRACE RELEASE TOOL

1. Fold aside rub strip and thermal blankets
2. Insert tool and move handle down
3. Remove tool and reconfigure blankets
MPM STOW/DEPLOY

TOOL BOX – MPM WRENCH
1. Rotate torque shaft (8 revs) until MPMs are stowed/deployed, $X_0 = 693$

RMS

Torque Shaft

Drive Point

3 inch

Deploy

Looking Outboard

Torque Shaft

Stow

PDU

RMS TIEDOWN

TOOL BOX – PRDs (2), EVA TRASH BAG
IMF – 9/64-in ALLEN WRENCH (AW)
ELBOW – PRD aft of MPM, peel blanket (fwd of MPM) toward EE; feed hook under cable harness (if reqd, remove cable harness clamp bolt with AW, bend clamp out of way), adjust strap as far fwd as possible
WRIST – PRD aft of MPM, strap rests just fwd of pitch joint opening
END EFFECTOR – PRD fwd of MPM, peel blankets aft and fwd, strap rests aft-most on yaw joint (at roll/yaw I/F), adjust strap under bolt studs
1. Figure eight the strap
2. Pull minimum 6-in slack in strap
3. Ratchet PRD snug, (14 full strokes reqd)
4. √ Strap in correct arm location, ratchet tight
5. Reattach blankets

END EFFECTOR

– PRD fwd of MPM, peel blankets aft and fwd, strap rests aft-most on yaw joint (at roll/yaw I/F), adjust strap under bolt studs
1. Figure eight the strap
2. Pull minimum 6-in slack in strap
3. Ratchet PRD snug, (14 full strokes reqd)
4. √ Strap in correct arm location, ratchet tight
5. Reattach blankets

NOT IN EV CUFF 40 03/20/06

RMS FLIGHT RELEASABLE GRAPPLE FIXTURE RELEASE

AIRLOCK – JETTISON STOWAGE BAG
TOOL BOX – 1/2-in BOX RATCHET, VELCRO/TAPE
EV 1. Rotate 10 o’clock posn release rod ccw to hard stop (~36 strokes of 90 deg)
2. Rotate 4 o’clock posn release rod cw to hard stop (~36 strokes of 90 deg – shaft will release from grapple fixture)
3. Clear worksite for RMS powerdown
4. Tape end of shaft to restrain slug within shaft
5. Cover end effector with jettison stowage bag to restrain grapple shaft

PRLA OPEN/CLOSE

AIRLOCK – RATCHET WITH 7/16 SOCKET
IV √PRLA PWR OFF
EV 1. Rotate ratchet in release direction (as marked above EVA drive) to shear pin
2. View yellow indicator as applicable
3. Continue to rotate drive 4-1/2 revs to disc gear train from drive shaft
To open latch:
4. Continue rotation in release direction (as marked above EVA drive) until latch open against stop
To close latch:
5. Rotate EVA drive in opposite direction of release (as marked above EVA drive) until latch closed against hardstop and over center

IV √PRLA tb LAT

Cont next pg

NOT IN EV CUFF 40 03/20/06

NOT IN EV CUFF 41 03/20/06

NOT IN EV CUFF 42 12/19/07

NOT IN EV CUFF 43 03/20/06

15-12

EVA/ALL/GEN H,13
PRLA OPEN/CLOSE (CONT)

EV

6. Apply PRLA locking feature if applicable
   To lock:
   7. Rotate each bolt (two) cw 1/2 turn

For subsequent PRLA ops, release locking feature before operating EVA drive (two bolts ccw 1/2 turn); relatch after operation

---

KU ANTENNA STOW

1. Secure tether reel clear of antenna dish with wrist tether

**CAUTION**
Antenna dish is very fragile. Avoid contact with gold thermal blankets and black painted surfaces

2. Align $\alpha$ (dish roll) and $\beta$ (dish pitch) gimbals for pin engagement
3. Give IV GO to drive pins in short pulses

**NOTE**
Top lockarm (by wide beam horn and gold foil) drives fully before bottom lockarm (by silver gyro box)

---

KU ANTENNA STOW (CONT)

---

AIRLOCK EGRESS

DAISY CHAIN: EV2 waist tether to A/L internal D-ring EV2 safety tether (retracting end) to EV1 waist tether

**EV1**
1. Thermal cover – open
2. Egress airlock
3. Attach safety tether, retracting end to ODS dogbone handrail (or orbiter handrail tether point); lock hook, reel unlocked
4. Attach EV2's safety tether, retracting end to separate ODS dogbone handrail; lock hook, reel unlocked

**BOTH**
5. Waist tethers – attach to self, stow extra waist tether (if reqd) in A/L clear of hatch

**EV2**
6. Egress airlock
7. Thermal cover – close
FLIGHT SPECIFIC REFERENCE
UNSCHEDULED/CONTINGENCY EVA TASKS
EVA REFERENCE
Replace this page with page(s) from Flight Supplement
EMERGENCY PROCEDURES

EMERGENCY AIRLOCK REPRESS ................................................................. 19-3
EMERGENCY AIRLOCK REPRESS ................................................................. 19-4
POST EMERGENCY AIRLOCK REPRESS ..................................................... 19-4
SAFER RESCUE ............................................................................................ 19-5
SAFER RESCUE ............................................................................................ 19-6
DAP/EVA RESCUE/RETRIEVE ................................................................. 19-7
EVA ORBITER CONFIG ........................................................................ 19-7
RESCUE/RETRIEVE ................................................................................ 19-9
19.1 DCS TREATMENT .............................................................................. 19-10
CONTINGENCY SHUTTLE AIRLOCK INGRESS FROM ISS ...................... 19-13
EMERGENCY AIRLOCK REPRESS
EMERGENCY AIRLOCK REPRESS

NOTE: Ignore CWS functions

Outer (EVA) hatch – close and lock

Inner hatch Equal vlv (two) – EMER

AW82B: √AILRK DEPRESS vlv – CL

DCM: WATER – OFF (fwd)

Open inner hatch

Go to POST EMERGENCY AIRLOCK REPRESS

POST EMERGENCY AIRLOCK REPRESS

WARNING
This procedure should not be performed following a Cuff 4 DCS incident

For affected crewmember:
DCM
1. PURGE vlv – op (up)
2. O2 ACT – OFF
3. √STATUS: [SUIT P] < 0.4 (compare with gauge)
4. Disconnect gloves
5. Disconnect helmet
6. Connect SCU to DCM

AW18H
7. PWR/BATT CHGR EMU 1(2) BUS SEL – MNA(MNB)

DCM
8. PWR – SCU

For unaffected crewmember:
DCM
9. O2 ACT – IV
10. Connect SCU to DCM

AW18H
11. PWR/BATT CHGR EMU 1(2) BUS SEL – MNA(MNB)

DCM
12. PWR – SCU

If single crewmember aborting EVA:
13. Outer (EVA) hatch Equal vlv caps (two) – remove, stow
14. √MCC
SAFER RESCUE
SAFER RESCUE

1. Deploy SAFER HCM
2. PWR – ON
3. Wait for AAH, line up with separation point
   Fly to vehicle
   Monitor GN2% and PWR%
   
   * If no gas flow:  
   *  √MAN ISOL vlv – OP (dn) *

IV/other EV  4. Provide GCA (as reqd)
   Provide range and range rate using Laser Range Finder, as reqd
   Configure WVS and vehicle cameras to assist
   Turn on external vehicle lights, as reqd

5. Tether to nearest structure, √connection
6. Tether to available safety tether or other EV crewmember, √connection
7. PWR – OFF
8. MAN ISOL vlv – CL (up)
9. √MCC
1. GENERIC ORBITER CONFIGURATION

- A6U
  - SENSE – as reqd
  - FLT CNTLR PWR – OFF
  - DAP TRANS: PULSE/PULSE/PULSE

- O14,
  - cb MNA,C DDU AFT (two) – cl
- O15,
  - Pri RJD LOGIC, DRIVER (sixteen) – ON
- O16

**GNC 20 DAP CONFIG**

- CRT
  - √ PRI TRAN PLS – ITEM 17 +0.10
  - √ ITEM 37 +0.05

- A1U
  - √ KU CNTL – CMD
  - PWR – STBY

Unstow, review EVA RESCUE procedure
2. REGION-SPECIFIC ORBITER CONFIGURATION
Using region charts, determine region(s) in which EVA crewmembers will be located.
Working in order top of table to bottom using the most restrictive region, configure orbiter systems per following table, performing any Initial Configuration Actions which contain a ‘√’. Items which do not have a ‘√’ may be configured as desired to meet mission-specific requirements.

WARNING
Deviating from orbiter systems configuration called out in following table may put EVA crewmembers at risk of being plumed by RCS jets.

NOTE
The following table should be used for initial configuration. It should not be used during the EVA (e.g., for EVA RESCUE).
If VERNs not available, use ALT instead. All other configuration actions remain unchanged.

<table>
<thead>
<tr>
<th>INITIAL CONFIGURATION ACTIONS</th>
<th>In Bay</th>
<th>Above Bay</th>
<th>Above Nose</th>
<th>Above/Alt OMS Pods</th>
<th>Below Tail/Midbody</th>
<th>Below Nose</th>
<th>Beside Bay</th>
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<tbody>
<tr>
<td>D</td>
<td>VERN</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
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<tr>
<td>A</td>
<td>ALT</td>
<td></td>
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<td></td>
<td></td>
<td>√</td>
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<tr>
<td>P</td>
<td>LOW Z</td>
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<td>√</td>
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<td>√</td>
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<td>No LOW Z</td>
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<td>SPEC</td>
<td>P/Y/JET OPTION (PRI &amp; ALT, DAP A &amp; B) – ALL</td>
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<td>20</td>
<td>P/Y/JET OPTION (PRI &amp; ALT, DAP A &amp; B) – TAIL</td>
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<tr>
<td>SPEC</td>
<td>OVRD L/R MANFs 1,2,4 (six) – CL</td>
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<tr>
<td>23</td>
<td>L3L,R3R (two) – DES</td>
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<td>OVRD L/R MANFs 2,3,4 (six) – CL</td>
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<td>L1L,R1R (two) – DES</td>
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<tr>
<td>O14, O15, O16</td>
<td>RJDA L1/R1 (L2/R2, L4/R4) DRIVER (three) – OFF</td>
<td></td>
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<td></td>
<td>RJDA L2/R2 (L3/R3, L4/R4) DRIVER (three) – OFF</td>
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<tr>
<td></td>
<td>RJD MANF L5/F5/R5 DRIVER – OFF</td>
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<td></td>
<td>RJD MANF F1(F2,F3,F4) MANF DRIVER – OFF (four)</td>
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<tr>
<td>Misc</td>
<td>FLT CNTLR PWR (three) – OFF</td>
<td></td>
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</tr>
</tbody>
</table>

3. POST-EVA RECONFIGURATION
Return orbiter to desired/required systems configs.
EVA RESCUE/RETRIEVE

NOTE
Assumes that EVA ORBITER CONFIG procedure has already been performed

1. CONFIGURATION
A6U
DAP: FREE(INRTL)

√SENSE SWITCH as desired
O14:F, √Pri RJD LOGIC, DRIVER (sixteen) – ON
O15:F,
O16:F
O16:F √RJD MANF L5/F5/R5 DRIVER – ON

GNC 23 RCS
OVRD L/R MANF – OP (if OVRD CLOSED earlier)
A1U
KU CNTL – PNL

2. OPERATIONS

NOTE
When EVA crewmember clear of RCS jets,
FLT CNTLR PWR ON and DAP INRTL

If TRANSLATION:
DAP: LO Z, as reqd (DAP A has larger TRANS PULSE size)

If ROTATION:
DAP: VERN(PRI), as reqd

NOTE
Translate, then rotate, as reqd to center crewmember over bay.

Null translational rates, then establish closing(opening) rate as reqd to crewmember in bay.

Use RMS and/or other EVA crewmember to assist if possible
1. DCS TREATMENT

DCS Signs and Symptoms Associated with Each Cuff Class Defined in C/L

1. Determine Cuff Class

Cuff Class 1

2. Continue EVA
   - If symptoms resolve upon REPRESS, go to Cuff Class 2, block 5
   - Report to Surgeon next PMC

Cuff Class 2 or 3

(Report to MCC)

3. TERMINATE EVA (Cuff C/L, 7)
   - Unaffected crewmember stow safety tether, perform worksite cleanup and/or PLB safing
   - MCC for PLB config
   - Perform AIRLOCK INGRESS (Cuff C/L, 30)

If terminating for Cuff Class 3:

- Report to Surgeon
- If private comm wanted:
  - PMC on A/G 1, COMM Mode – HL (A1R)
  - AUD CTR UHF A/G 2 – T/R
  - AUD CTR UHF A/G 1 – OFF

Cuff Class 4

(Report to MCC)

4. NOTE
   DO NOT perform POST EMERGENCY AIRLOCK REPRESS
   - ABORT EVA (Cuff C/L, 6) with ingress assist from unaffected crewmember
   - Unaffected crewmember perform PLB safing

If single crewmember abort

- Outer hatch Equal vlv caps (two) – remove
- Unstow resuscitator from SOMS (MED C/L, CPR STATION, OXYGEN SUPPLEMENTAL)

Crewmember conscious?

Yes

Yes

Can crewmember speak in full sentences w/o respiratory distress?

Yes

DCC signs or symptoms resolved?

Yes

Does MCC require EMU LiOH changeout?

Yes

5. (L2)
   - O2/N2 CNTLR VLV SYS 1.2 (two) – OP
   - Perform PRE-REPRESS (DEPRESS/REPRESS Cue Card)
   - Perform REPRESS (DEPRESS/REPRESS Cue Card)
   - Remain on SCU
   - If CAB P = 10.2, perform 10.2 PSI MAINTENANCE (10.2 PSI CABIN)
   - Unaffected crewmember perform POST EVA per FLIGHT PLAN, omitting step 42
   - Perform DCS exam (MED C/L)
   - Report to Surgeon

No

MCC for PLB config

6. Perform LiOH REPLACEMENT (MANNED) (EMU CONT PROCs), omitting steps 3, 17, 18

7. Cab P ≤ 11.0?
   - Yes
   - Leave O2 ACT – PRESS for 20 min (20 min check starts at 10.2 psi)
   - Perform BTA PREP, BENDS TREATMENT ADAPTER (BTA) INSTALLATION (IN-SUIT) (EMU CONT PROCs)

8. DCS signs or symptoms resolved?
   - Yes
   - Report to Surgeon

No

CAB P = 10.2, perform 10.2 PSI MAINTENANCE (10.2 PSI CABIN)

9. Can crewmember speak in full sentences w/o respiratory distress?

No

No

10. EVA terminated to prevent progression to Cuff Class 4. If Cuff 2, affected crewmember will assist other EV with minor worksite cleanup, if possible, to expedite cleanup and then terminate EVA

If estimated time reqd for DCS treatment exceeds LiOH consumables, a changeout should be performed. If 10 or 12 reqd, minimum treatment is ~3 hr

For Cuff 2 or 3, private comm not required to allow for expedited treatment. For Cuff Class 3 only, affected crewmember waiting in A/L needs to be in contact with Surgeon due to severity and potential progression of symptoms

Cuff Class 4 symptoms may be secondary to Type 2 DCS which is a medical emergency. Unstowing the resuscitator enables IV crew to be prepared to administer CPR, if reqd. Because it is critical to repress CPR, this may result in a one crewmember repress

This decision block determines whether the cabin is being operated within 10.2 psi control range. Minor fluctuations above 10.6 have been seen; therefore, 11 psi was used to cover all 10.2 scenarios. Otherwise, cabin is being controlled at 14.7 psi
19.1 (Cont)

10 If req'd, perform 
CABIN REPRESS 
TO 14.7 PSI (10.2 
PSI CABIN) with 
following change to 
step 4: 
• Perform BENDS 
TREATMENT 
ADAPTOR (BTA) 
INSTALLATION 
(IN-SUIT) (EMU 
CONT PROCs) 
• Continue BTA 
treatment at 6 psi 
in-suit for 20 min 
DCS signs or 
symptoms resolved? 

11 
• Incr CAB PRESS 15.56 psia 
max as follows: 
(C5) 
• DIRECT O2 – OP 
When CAB PRESS = 15.56 psia, 
• DIRECT O2 – CL 
• Perform BTA treatment at 8 psi 
for 2 hr 
• CMO report changes in DCS 
symptoms per DCS exam 
criteria to Surgeon as requested 
DCS signs or symptoms resolved? 

12 
• Leave BTA 
installed add'l 
20 min 
DCS signs or symptoms resolved? 

13 
• Continue at 6 psi 
for 2 hr 
• CMO report 
changes in symp 
to Surgeon as 
requested 

14 
• Leave BTA 
installed add'l 20 
min 
DCS signs or symptoms resolved? 

15 
• MCC for DCS pharmacy treatment 
If DCS pharm treatment reqd, 
• O2 ACT – OFF 
• DCM PURGE vlvs – op 
• Suit P ≤ 0.4 psid 
• Doff Glove, Helmet 
• FAN – OFF 
• Don QDM 
• Take meds as directed by Surgeon 
• Don Glove 
• FAN – ON 
• Remove QDM, don Helmet 
• O2 ACT – PRESS 
After 12 min, 
• DCM PURGE vlvs – cl 
• Leave O2 ACT – PRESS for 30 min 
• CMO report changes in DCS symptoms per 
DCS exam criteria to Surgeon as requested 
DCS signs or symptoms resolved? 

16 
• Leave O2 ACT – PRESS for add'l 
160 min 
• CMO report 
changes in DCS 
symptoms per 
DCS exam criteria to Surgeon as requested 

17 
• MCC for further 
DCS treatment 

8 

18 
• MCC for further 
DCS treatment 

19-11 EVA/ALL/GEN H
Max pressure should be used to treat Cuff Class 4 DCS (type 2 DCS).

Incapacitated crewmember needs hyperbaric treatment on Earth as soon as possible. If airlock not available due to single crewmember abort, perform POST EVA in middeck on battery power. EVA FCT should be prepared to modify procedure for single crewmember abort.

MCC will determine allowable cumulative O2 time based on O2 toxicity limit. O2 time will vary based on EVA time and pressure profile.

Because DCS symptoms unresolved, deorbit to site with hyperbaric facility reqd for add'l treatment. Affected crewmember should remain in pressurized EMU as long as possible.

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Perform CABIN REPRESS TO 14.7 PSI (10.2 PSI CABIN) with following change to step 4:
- O2/N2 CNTLR VLV SYS 1,2 (two) – OP

When 14.7 REPRESS complete,
- Incr CAB PRESS to 15.56 psia max as follows:
  - DIRECT O2 – OP
  - DIRECT O2 – CL

Perform POST EVA
- Treat affected crewmember per CPR STATION (MED, CPR STATION)
- MCC for further action or incapacitated crewmember
- If CAB P < 15.56 psia,
  - Perform CABIN REPRESS TO 14.7 PSI (10.2 PSI CABIN) with following change to step 4:
    - O2/N2 CNTLR VLV SYS 1,2 (two) – OP

When 14.7 REPRESS complete,
- Incr CAB PRESS to 15.56 psia max as follows:
  - DIRECT O2 – OP
  - DIRECT O2 – CL

Perform POST EVA
- Treat affected crewmember per CPR STATION (MED, CPR STATION)
- MCC for further action or incapacitated crewmember
- If CAB P < 15.56 psia,
  - Perform CABIN REPRESS TO 14.7 PSI (10.2 PSI CABIN) with following change to step 4:
    - O2/N2 CNTLR VLV SYS 1,2 (two) – OP

Perform BENDS TREATMENT ADAPTER (BTA) INSTALLATION (IN-SUIT) (EMU CONT PROCES)
- Perform BTA treatment at 8 psi for 2 hr
- Perform DCS EXAM (MED C/L) and report changes in DCS symptoms to Surgeon every 15 min

DCS signs or symptoms resolving?

- MCC for DCS pharmacy treatment if DCS pharmacy treatment reqd,
  - O2 ACT – OFF
  - DCM PURGE vlv – op
  - Suit P ≤ 0.4 psid
  - Doff Glove, Helmet
  - FAN – OFF
  - Don QDM
  - Take meds as directed by Surgeon
  - Don Glove
  - FAN – ON
  - Remove QDM, don Helmet
  - O2 ACT – PRESS After 12 min,
  - DCM PURGE VLV – CL

- Leave O2 ACT – PRESS for 30 min
- CMO report changes in DCS symptoms per DCS exam criteria to Surgeon as requested

DCS signs or symptoms resolved?

- MCC for delayed EMU doff, stow

- MCC for further action and possible deorb to PLS/ELS with hyperbaric facilities

- MCC for return to IV duty after 24 hr limited activity
- MCC for return to EVA duty
- Go to DCS AFTERCARE (MED C/L)
CONTINGENCY SHUTTLE AIRLOCK INGRESS FROM ISS

CREWLOCK EGRESS

If EV hatch closed and $\Delta P < 0.5$ psi:

EV
1. $\sqrt{\text{Tethers connected to crewlock D-ring, open EV hatch, stow}}$
2. Perform POST DEPRESS steps as reqd on CREWLOCK DEPRESS/REPRESS CUE CARD (SODF: ISS EVA SYS: EVA PREP/POST)

EV1
3. Open thermal cover, egress crewlock
4. Configure safety tethers for EV1 and EV2, $\sqrt{\text{locked}}$

EV2
5. Egress crewlock, close thermal cover

SHUTTLE AIRLOCK PREP

NOTE
EV1 will translate to prep and open shuttle airlock hatch while EV2 remains to close ISS crewlock hatch after shuttle hatch is open

EV1
6. Retrieve two external spare safety tethers
7. Translate to shuttle airlock stopping at PMA/shuttle interface
8. Attach load alleviating strap of EV2 spare safety tether on shuttle side
9. Attach EV1 spare safety tether to shuttle, swap to spare safety tether
10. Stow ISS safety tether on ISS side
11. Retrieve EV2 safety tether anchor hook, attach to mini-workstation, continue to Ext A/L Aft Hatch

IV Aft Hatch MDK12
12. Ext A/L Aft Hatch Equal vlv caps (two) – vent, remove caps, stow
13. Close Inner Hatch:
   - Position handle to preclosing position per decal
   - Hatch – rotate about hinge and push
   - Handle – ccw to LATCH
   - Lock lever to LOCKED
14. $\sqrt{\text{Inner Hatch Equal vlvs (two) – OFF, caps installed}}$

EV1
15. Open Ext A/L Aft Hatch thermal cover
16. $\sqrt{\text{MCC for attitude control}}$

EV1
17. On IV GO: Ext A/L Aft Hatch Equal vlvs (two) – EMER

IF CABIN DP/DT OR O2(N2) FLOW HI ALARM DURING AIRLOCK DEPRESS

EV crew: Ext A/L Aft Hatch Equal vlvs (two) – OFF
IV crew: Verify Inner Hatch closed and Inner Hatch Equal vlvs (two) – OFF

EV1
18. Monitor Ext A/L Aft Hatch $\Delta P$ gauge
   When $\Delta P < 0.5$ psi (~10 min), open hatch and ingress A/L, connect waist tether to A/L D-ring

EV1
19. Give EV2 GO for closing ISS crewlock EV Hatch
20. Connect anchor hook of EV2 spare safety tether to A/L D-ring

SHUTTLE AIRLOCK INGRESS

EV2
21. Open ISS crewlock thermal cover
22. On EV1 GO, close ISS crewlock EV Hatch:
   - Verify hatch clear of FOD and obstructions
   - EV hatch handle – preclose
   - Handle – cw to LATCH
   - Lock lever to LOCKED
   - Close thermal cover
23. Translate to PMA/shuttle interface
24. Swap to spare safety tether, stow ISS safety tether on ISS side
25. Retrieve EV1 safety tether anchor hook, attach to mini-workstation
26. Translate to shuttle airlock, ingress
27. Close thermal cover

BOTH
28. Retrieve, position SCU; remove DCM cover
29. Connect SCU to DCM, \locked

AW82B
30. EV-1,EV-2 O2 vlv (two) – OP

BOTH
31. WATER – OFF (fwd)

CAUTION
Do not close hatch until EMU WATER – OFF for 2 min

32. \Ext A/L Aft Hatch clear of FOD and obstructions, close hatch:
   Position handle to preclosing position per decal
   Hatch – rotate about hinge and push
   Handle – ccw to LATCH
   Lock lever to LOCKED

33. Ext A/L Aft Hatch Equal vlvs (two) – OFF, install caps

IV
34. Go to PRE-REPRESS/REPRESS (DEPRESS/REPRESS
   Cue Card)
CUE CARD CONFIGURATION
Refer to the following pages for cue cards and decals in this document:

- CC 3-10  SAFER CHECKOUT RESULTS Cue Card
- CC 3-11  SAFER STATUS TROUBLESHOOTING Cue Card
- CC A6-2  DEPRESS/REPRESS Cue Card (Nominal Config)
- CC B6-2  DEPRESS/REPRESS Cue Card (Tunnel Adapter)
- CC 6-4   FAILED LEAK CHECK Cue Card
- 19-4     EMERGENCY AIRLOCK REPRESS Decal