Space Shuttle Program
FLIGHT DATA FILE

JSC-48024-130

EVA Checklist

STS-130 Flight Supplement

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

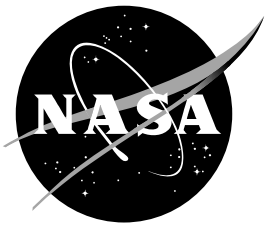
Final
December 4, 2009

NOTE

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

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas



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

SMS FDF CHANGE NOTIFICATION	SIM PACK 182	DATE INITIATED 12/1/09	DATE RECEIVED (PMO) 12-02-09
BOOK TITLE: EVA FS	BK ISSUE (Ed, Rev, PCN): Final	SIM PACK NUMBER: SIM-182	
Change is for flights (Also give SMS load if load dependent): STS-130		SMS UNIQUE? ☐ YES ☒ NO	DEVELOPMENTAL? ☐ YES ☒ NO

FABRICATED ITEM CHANGE? ☒ NONE ☐ CUE CARDS ☐ TRANSPARENCIES ☐ Other _____

INSTRUCTIONS TO USER:

Use this SIM Pack for STS-130 EVA FS Section 7, EVA 2 only
This SIM Pack Replaces the EVA 2 content in the EVA FS Final Book
All procedures remain in working form

Please make the following changes to STS-130 EVA FS Final:
- Replace Pages FS7-41 thru FS7-76,
- After page FS7-76, add pages FS7-76a and FS7-76b.

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

Supervisor deems necessary

*Refer to Crew Procedures Management Plan

OTHER AFFECTED FDF BOOKS

None

Are all SIM PACKS submitted? ☐ YES ☐ NO

IMPLEMENTATION REQUIREMENTS

☐ Limited Distribution (List in comments)

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

☒ NO LATER THAN (Date and/or Sim ID) 12/9/09 FD7 EVA 2 Sim

BOOK MGR (Signature/Date)	SUPERVISOR (If required, Signature/Date)	FDF COORD or FDF MGR (Signature/Date)
12/1/09	12/2/09	12/2/09

COMMENTS:

MOD Form SP-1, AUG 1998

MISSION OPERATIONS DIRECTORATE

EVA CHECKLIST
STS-130 FLIGHT SUPPLEMENT

FINAL
December 4, 2009

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Incorporates the following:
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AREAS OF TECHNICAL RESPONSIBILITY

Book Manager	DX321/A. Kanelakos	281-483-8687

EVA CHECKLIST
STS-130 FLIGHT SUPPLEMENT

LIST OF EFFECTIVE PAGES

FINAL 12/04/09

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CBM
SSRMS LEE LATCH DRIVE
SSRMS JOINT DRIVE
MSS EXTENSION CABLE
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AIRLOCK PREP (50 min)

AIRLOCK CONFIG

Retrieve or unstow following equipment:

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

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

1. √Inner hatch Equal vlv (two) – OFF

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) and perform pull test to verify latches fully seated in helmet brackets
9. Disconnect helmets from Airlock EMUs, temp stow
10. Remove comm caps from LTA Restraint Bags and connect to electrical harnesses
11. Install helmets (not reqd if proceeding directly to EMU Checkout)
12. Remove LTA Restraint Bags
13. Disconnect waist rings; remove and stow any equipment stowed in HUT/LTA
14. Stow LTA Restraint Bags on AAPs
15. √Thermal cover clear of waist ring
16. Waist ring – engage posn
17. Connect LTA to HUT, lock
18. Remove 20-g Crash Bag from middeck EMU, as reqd

EMU CHECKOUT PREP (30 min)

Airlock
1. LTG FLOOD (four) – on
2. If necessary, remove Airlock Floor Bag from Airlock
3. Unbuckle SCU straps, Velcro SCU to wall
4. Disconnect helmets from EMUs, temp stow
5. √DIDB restraint bags installed
6. Remove comm caps (4) from LTA Restraint Bags (kangaroo pouches)
   For EMU 3004 (Be)
   Connect comm cap Be1 to EMU electrical harness
   Temp stow comm cap Be2 (for Be ECOK, step 9)
   For EMU 3005 (Pk)
   Connect comm cap Pk1 to EMU electrical harness
   Temp stow comm cap Pk2 (for Pk ECOK, step 9)
7. Disconnect LTA Restraint Bag straps from AAP; temp stow
8. Disconnect waist rings; remove Be, Pk ECOKs
9. Stow comm caps: Be2 in Be ECOK, Pk2 in Pk ECOK
10. Remove EVA Sys Xfer Bag from Be ECOK
11. Temp stow Be, Pk ECOKs in Airlock
12. Temp stow LTA Restraint Bags on AAPs (bottom)
13. Install full DIDB in restraint bag (Velcroed in HUT)
14. √Thermal cover clear of waist rings
15. Waist rings – engage position
16. Connect LTAs to HUTs, lock

Middeck Vol H (MD23R)
17. Unstow:
    Inboard Bag:
    From EMU Equipment Bag
    SCOFs (2) – Temp stow for EMU Checkout
    LTA Donning Handles (2) – Temp stow for EMU Checkout
    EMU Servicing Kit s/n XXXX – Temp stow for EMU Checkout

Airlock
18. Temp stow ECOKs and EVA Sys Xfer Bag for “EVA Prep for Transfer to ISS”
19. Unstow ISS EVA Cuff C/L (2) from SODF locker
    Stow Be and Pk C/L on EMUs, left arm

NOTE

SCOFs (2) and LTA Donning Handles (2) will be stowed in EMU Equipment Bag which is stowed in Inboard Bags in Vol H after 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

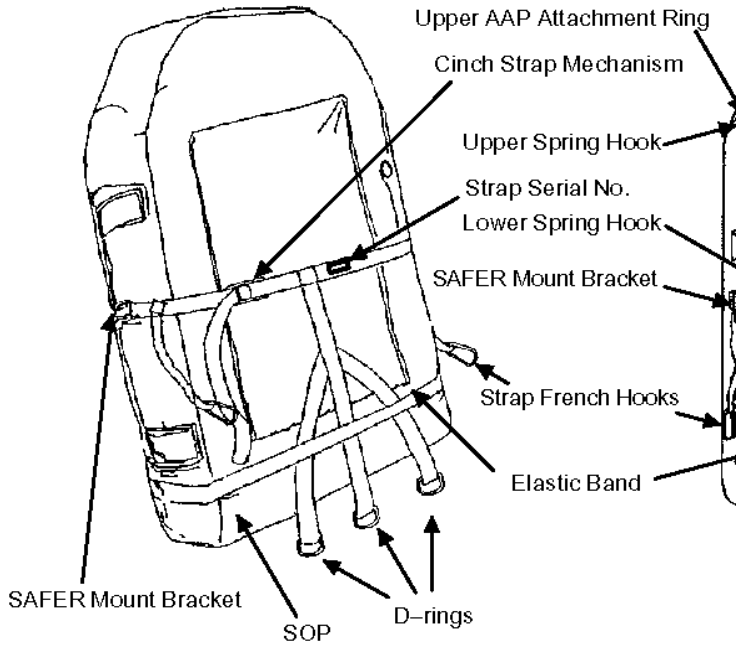
LTA RESTRAINT STRAP INSTALLATION (15 min)

NOTE

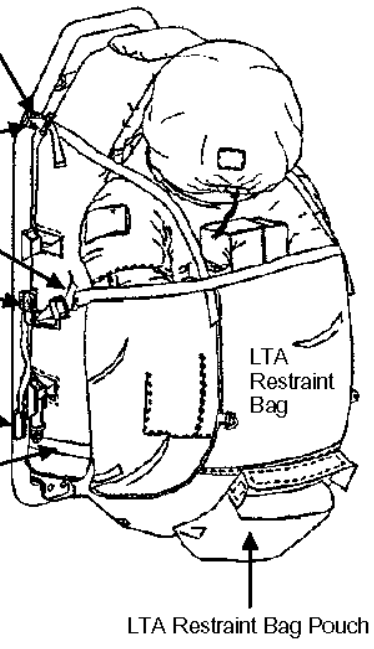
May be performed on EMU 1 and 2 simultaneously. Perform steps as reqd for current EMU config. Procedure written to install in Launch/Landing config shown below

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

LTA RESTRAINT STRAP APPLICATION



EMU LAUNCH AND LANDING CONFIGURATION
(LTA Restraint Strap installed)



NOTE

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

EVA PREP FOR TRANSFER TO ISS (90 min)

Middeck
Vol H (MD23R)

1. Restow:
   Inboard Bag:
   EMU Equipment Bag
   SCOFs (2)
   LTA Donning Handles (2)

BOTH EMUs/ DCM

2. √PWR – SCU
3. √PURGE vlv – op (up)
4. √WATER – OFF, switch guard installed
5. √O2 ACT – OFF
6. Retrieve the following:

Be ECOK
Pk ECOK
Bag "G"
EVA Sys Xfer Bag (from Be ECOK)
NH3 Jumpers (4) (from Bag C & D)
NH3 MLI (3) (from Bag C & D)

7. Take B/U gloves (Be2 and Pk2) out of Bag G and stow in respective ECOKs
8. Verify items according to tables below:

BAG "G"

☐ ☐ EMU Gloves – 2 pair (Be2, Pk2)
☐ ☐ 2 LIOHs (for EVA 2)
☐ ☐ ☐ ☐ DIDBs (4 empty)
☐ EMU Battery 2088 (for EVA 2, then rotation)
☐ ☐ 2 SCOFs (for rotation only)
☐ BTA (for rotation only)
☐ Wire Ties (20 short)
☐ P612 Dust Cap
☐ Adjustable Equipment Tethers (14)
☐ Gap Spanners (4)
☐ NPV
☐ NPV MLI
☐ NPV Base MLI
☐ 5/16-in Socket Extension
☐ NH3 MLI/Jumper Routing Tethers (2)
☐ NH3 Jumper Bag
☐ OIH Bags (2)

EMU 3004 (Be)	**EMU 3005 (Pk)**
☐ DIDB Restraint Bag (with full DIDB)	**☐ DIDB Restraint Bag (with full DIDB)**
☐ Comm Cap (Be1) (installed during EMU C/O prep)	☐ Comm Cap (Pk1) (installed during EMU C/O prep)
☐ Helmet (√sun shade down, cover installed) ☐ Valsalva	☐ Helmet (√sun shade down, cover installed) ☐ Valsalva
☐ EMU Gloves (Be1)	☐ EMU Gloves (Pk1)
☐ Cuff C/L (installed during EMU C/O Prep)	☐ Cuff C/L (installed during EMU C/O Prep)
☐☐ Wrist Mirror (2)	☐☐ Wrist Mirror (2)
☐ LTA	☐ LTA

EVA Sys Xfer Bag

Add to Xfer Bag from Temp Stow Location

☐ EMU Servicing Kit s/n 5005

Add to Xfer Bag from FDF and SODF Lockers

☐ ISS EVA Systems Checklist (STS-130 copy with BROWN stripe)
☐ FDF: EVA Checklist (2) (1 ORANGE and 1 BROWN stripe)
☐ SODF Depress/Repress CC (2)
☐ STS-130 CONSUMABLES TRACKING CUE CARD/STS-130 BATTERY RECHARGE CUE CARD
☐ EXPEDITED SUIT DOFFING CUE CARD/EMERGENCY UNDOCKING EVA TRANSFER (Cue Card)
☐ Ammonia Contamination CC

☐ Old SODF ziplock (empty)

ECOK's

☐ ECOK (Be)
- ☐☐☐ Be EVA 1, 2, *3 Ziplock Bag
  - ☐☐ MAGs (w/Ziplock Bags) (2 per EVA)
  - ☐☐ TCUs (top, bottom)
  - ☐☐ Socks
  - ☐☐ Wristlets
  - ☐☐ Comfort Gloves
  - ☐ EV identifier stripes (EV1) (Bag 2 only)
  - ☐ Mission patch (STS-130)
  - ☐ US flag
- ☐ LCVG (Be1)(with biomed sternal harness and signal conditioner) – stowed after EMU C/O
- ☐ B/U Comm Cap (Be2)
- ☐ B/U Gloves (Be2)

*NOTE: Be EVA 3 Ziplock will be found in the contingency ECOK, stowed in middeck Bag "E"

☐ ECOK (Pk)
- ☐☐☐ Pk EVA 1, 2, *3 Ziplock Bags
  - ☐☐ MAGs (w/Ziplock Bags) (2 per EVA)
  - ☐☐ TCUs (top, bottom)
  - ☐☐ Socks
  - ☐☐ Wristlets
  - ☐☐ Comfort Gloves
  - ☐ EV identifier stripes (EV2) (Bag 2 only)
  - ☐ Mission patch (STS-130)
  - ☐ US flag
  - ☐ Croakie
- ☐ LCVG (Pk1) (with biomed sternal harness and signal conditioner) – stowed after EMU C/O
- ☐ B/U Comm Cap (Pk2)
- ☐ B/U Gloves (Pk2)

*NOTE: Pk EVA 3 Ziplock will be found in the contingency ECOK, stowed in middeck Bag "E"

EVA UNPACK AND STOW (60 min)

NOTE

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

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

Item	Initial Location (After Transfer)	Final Destination (On Shuttle)	Transfer Status (Cplt/Not Cplt)
EMU 3004 (Be)		Stbd – AAP	
EMU 3018 (Pk)		Port – AAP	
EMU Servicing Kit	EVA Sys Transfer Bag	Vol H Inboard (MD23R)	
Bag “G”	Middeck	Middeck	
☐ ISS EVA Systems Checklist (no colored stripe) ☐ EXPEDITED SUIT DOFFING CUE CARD/ EMERGENCY UNDOCKING EVA TRANSFER (Cue Card) ☐ STS-130 CONSUMABLES TRACKING CUE CARD/STS-130 BATTERY RECHARGE CUE CARD ☐ Ammonia Contamination CC	EVA Sys Transfer Bag	SODF Locker	
☐ FDF: EVA Checklist (Orange stripe)	EVA Sys Transfer Bag	FDF Locker	

POST DOCKING EVA TRANSFER AND RECONFIG (60 min)

NOTE

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

1. Transfer the following EVA equipment to ISS:

Item	Final Destination	Transfer Status
EMU 3004 (Be)	E-Lk aft EDDA	
EMU 3005 (Pk)	E-Lk fwd EDDA	
ECOK (Be)	E-Lk	
ECOK (Pk)	E-Lk	
EVA Sys Xfer Bag	E-Lk	
Bag "G"	Node 1	
NH3 Jumpers (4)	C-Lk	
NH3 MLI (3)	C-Lk	

EVA Sys Xfer Bag

2. Unstow following Items and position in E-Lk/C-Lk
   - ☐ STS-130 CONSUMABLES TRACKING CUE CARD/ STS-130 BATTERY RECHARGE CUE CARD
   - ☐ ISS EVA Systems Checklist (2) (Brown Stripe and NO stripe)
   - ☐ DEPRESS/REPRESS (Cue Card) (2) (one in C-LK, and one in E-LK)
   - ☐ FDF EVA Checklist STS-130 (1) (Brown Stripe)
   - ☐ EXPEDITED SUIT DOFFING CUE CARD/EMERGENCY UNDOCKING EVA TRANSFER (Cue Card)
   - ☐ Ammonia Contamination Cue Card (place in C-LK staging bag)

   NOTE: Don't swap EMU Servicing Kit until post last EVA

3. Install Helmet Lights/EMU TV assembly per STS-130 CONSUMABLES TRACKING CUE CARD

4. Install SCOFs (from Bag 'G') into EMU Equipment bag (on A/L wall)

5. Install BTA (from Bag 'G') into MO2 'Prep and Ops' Bag s/n 1038, in outside pocket

6. Report transfer status to **MCC-H** as time permits

POST EVA RECONFIG AND TRANSFER TO SHUTTLE (150 min)

NOTE

Figures in the Nominal Sizing Matrix FS XX-XX may be used for reference.

This procedure assumes the following procedure has been completed following EVA 3: {1.240 POST EVA} (SODF: ISS EVA SYS: EVA PREP/POST)

EMUs 3004, 3005

1. Remove the following and stow in MO2 'Prep and Ops' bag s/n 1038:
   - ☐☐ REBAs
   - ☐☐☐☐ Helmet Light/EHIP batteries
   - ☐☐ Metox Canisters
   - ☐☐ EMU battery s/n's 2086, 2087
2. Install used LiOH from EVA 1 (REF: STS-130 CONSUMABLES TRACKING CUE CARD)

EMU 3004

3. Reconnect Be gloves
4. Remove Helmet Lights and EMU TV
   Temp stow items in ISS Equipment Lock
5. Remove Comm Cap and stow in Be ECOK
6. √Helmet installed, sun shades down, cover installed
7. Insert Be LCVG into ECOK. Install ECOK into HUT
8. Connect LTA
9. Remove boots (stow in MO2 'Soft Goods' bag s/n 1010)
10. Install boots s/n 214 (located in pre-gather bag)
11. Install EMU battery s/n 2083
12. Remove EMU 3004 from EDDA and temp stow for transfer to shuttle

EMU 3018

13. Install in FWD EDDA

EMU 3005

14. Disconnect Helmet and remove comm cap. Stow Comm Cap in Pk ECOK

EMU 3005/ 3018

15. Swap LTAs, upper arms, and gloves. Refer to FS XX-XXX. Verify serial numbers and sizing for Pk down suit (EMU 3018)
16. Remove EMU 3018 from EDDA and temp stow for transfer to shuttle
17. Remove EMU Servicing Kit s/n 5005 from Bag 'G', and deploy in A/L
18. Config/verify items listed below are in specified bags. Transfer bags and EMUs to shuttle. Report transfer complete to **MCC-H**

POST EVA RECONFIG AND TRANSFER TO SHUTTLE (150 min) (Cont)

Bag "G"

- ☐ ☐ 2 expended LiOHs
- ☐ EMU Battery 2084
- ☐ Adjustable Equipment Tethers (14) (s/n's 1013, 1014, 1015, 1036, 1037, 1082, 1087, 1088, 1089, 1095, 1096, 1097, 1098, 1099)
- ☐ 5/16-in Socket Extension
- ☐ NH3 Jumper Bag
- ☐ OIH Bags (2)
- ☐ Be2 Gloves
- ☐ Pk2 Gloves
- ☐ Pre-gather bag
  - ☐☐ 2 SCOFs (s/n's 1003/1006)
  - ☐ BTA (s/n 1008)
  - ☐ EMU Comfort Patch Kit (labeled "Launched on STS-126")
  - ☐ EMU Battery s/n 2079
  - ☐ Old SODF/FDF

EMU 3004 (Be)	**EMU 3018 (Pk)**
☐ DIDB Restraint Bag	☐ DIDB Restraint Bag
☐ Helmet (√sun shade down, cover installed)	☐ Helmet (√sun shade down, cover installed)
☐ Valsalva	☐ Valsalva
☐ EMU Gloves (Be 1)	☐ EMU Gloves (Pk 1)
☐ Cuff C/L	☐ Cuff C/L
☐☐ Wrist Mirror (2)	☐☐ Wrist Mirror (2)
☐ EMU Battery s/n 2083	☐ EMU Battery s/n 2085
☐ LiOH (from Bag "G")	☐ LiOH (from Bag "G")
☐ LTA	☐ LTA

EVA SYS Xfer Bag

- ☐ ISS EVA Systems Checklist (Brown stripe)
- ☐ FDF: EVA Checklist (Brown stripe)
- ☐ STS-130 CONSUMABLES TRACKING CUE CARD/STS-130 BATTERY RECHARGE CUE CARD
- ☐ EXPEDITED SUIT DOFFING CUE CARD/EMERGENCY UNDOCKING EVA TRANSFER (Cue Card)
- ☐ EMU Servicing Kit s/n 5004 (labeled "for use and return on STS-130")

STS-130 EVA SUMMARY TIMELINES ..... FS 7-3
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STS-130 (20A) EVA 1 TIMELINE ..... FS 7-5
EVA 1 BRIEFING CARD ..... FS 7-6
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EVA 1 NOTES/CAUTIONS/WARNINGS ..... FS 7-9
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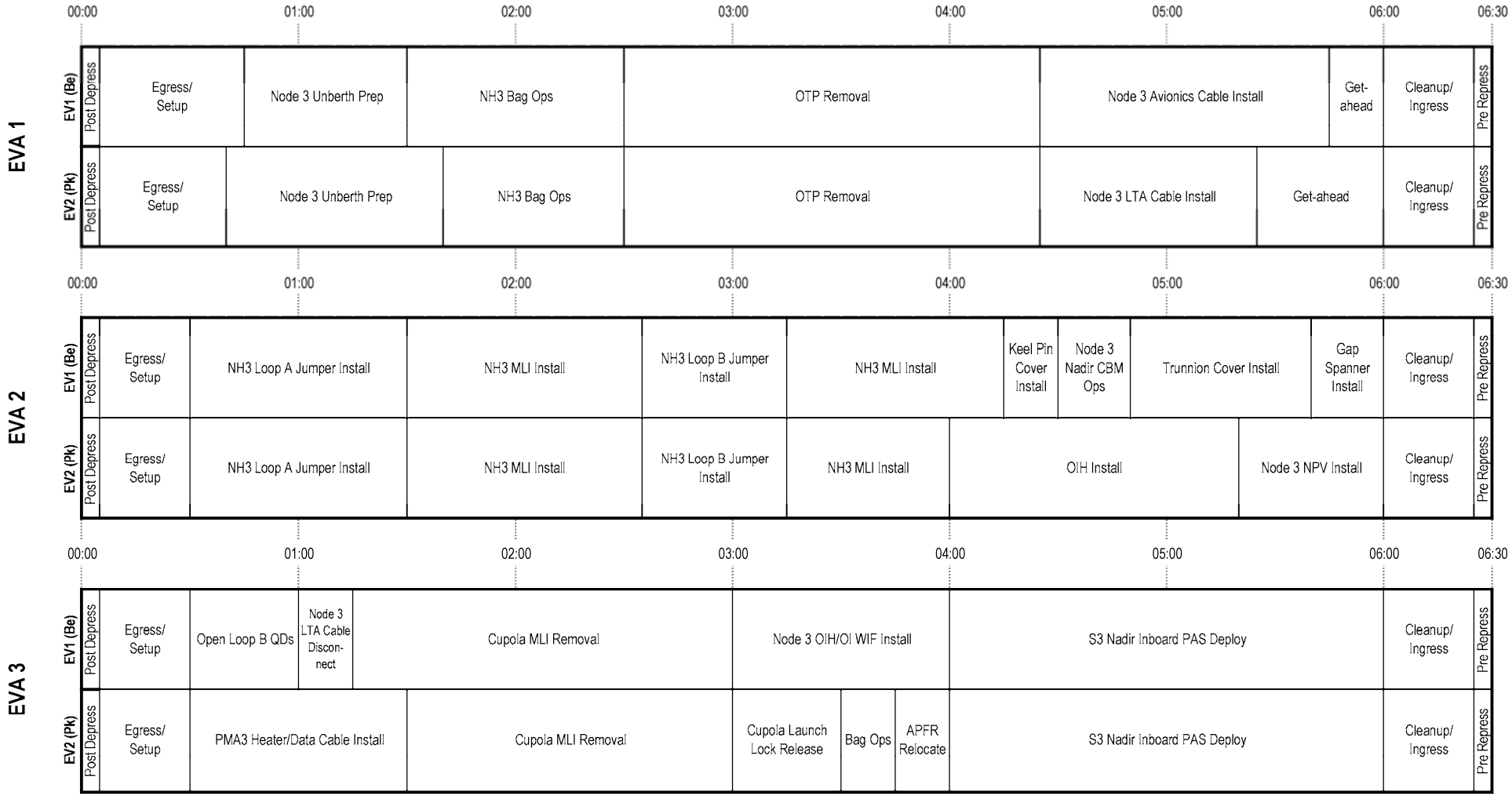
STS-130 EVA SUMMARY TIMELINES



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STS-130 (20A) EVA 1 TIMELINE

PET HR : MIN	IV/SSRMS	EV1 (Be)	EV2 (Pk)	
00:00		POST DEPRESS (00:05)	POST DEPRESS (00:05)	00:00
		EGRESS/SETUP (00:45) • Open Node 1 Port CBCS Flap (00:05) • OTP Bag Stow (00:15)	EGRESS/SETUP (00:35)	
	1. √**MCC-H** GO for NODE 3 DEACT A15 2. APCU 1, 2 CONV (two) – OFF SM 179 POWER TRANSFER		NODE 3 UNBERTH PREP (01:00) • 1553 BUS Terminator Install (00:20) • Orbiter LTA Cable Removal (00:25) • Orbiter LTA Cable Stow in TSA (00:15)	
01:00	CRT √PTU 1, 2 APCU OUT VOLTS < 10 V A15 APCU 1, 2 OUTPUT (two) – OFF	NODE 3 UNBERTH PREP (00:45) • PCBM Contamination Cover Removal (00:45)		01:00
		NH3 BAG OPS (00:55) • NH3 MLI Bag Ops (00:55)	NH3 BAG OPS (00:50) • NH3 Jumper Bag Ops (00:50)	
02:00				02:00
	• Verify OTP inhibits in Place	OTP REMOVAL (01:55) • OTP Removal Setup (00:30)	OTP REMOVAL (01:55) • OTP Removal Setup (00:30)	
03:00		• OTP Removal (00:20) • OTP Stow (00:40)	• OTP Removal (00:20) • OTP Stow (00:40)	03:00
04:00		• OTP Cleanup (00:25)	• OTP Cleanup (00:25)	04:00
	• Verify NOD3 Avionics inhibits in Place • Verify NOD3 LTA inhibits in Place	NODE 3 AVIONICS CABLES INSTALL (01:20) • Demate NOD3 Ch 1/4 Avionics Dust Caps (00:20) • Mate NOD3 Ch 1/4 Avionics (00:15) • Demate NOD3 Ch 12/3 Avionics Dust Caps (00:10) • Mate NOD3 Ch 2/3 Avionics (00:35)	NODE 3 LTA CABLES INSTALL (01:00) • Install P612 NOD3 LTA Cable (00:25) • Install P602 NOD3 LTA Cable (00:35)	
05:00			GET-AHEAD (00:35)	05:00
		GET-AHEAD (00:15)		
06:00		CLEANUP/INGRESS (00:25)	CLEANUP/INGRESS (00:25)	06:00
06:30		PRE REPRESS (00:05)	PRE REPRESS (00:05)	06:30

EVA 1 BRIEFING CARD

Generic STS-130 EVA Brief: (release folks as you can)

1. Campout (wake-up and start per the timeline to keep ground/flight team in sync) (EV1)
   - Bio-med prior to opening hatch if possible
   - Food requests?
2. Task IV visits A/L to verify tools on suits per timeline: When? (Task IV)
3. Suit-up IVs verify bag/tools in A/L per EVA specific Section 8 (Suit-up IVs)
   - Help required for SAFER install?
   - Pictures?
4. Communications protocol (EV1)
   - (EV1/EV2 during depress/repress, “Break-Break” for messages/emergency response)
   - Lost communication
5. Summary timeline (include get-ahead tasks at end) (Task IV)
6. EVA specific hazards Task IV)
7. First actions (EV1 and EV2)
8. EVA specific concerns (if not addressed during summary timeline brief) (EV1 and All)
9. Retreat plan/path (rapid return, incapacitated, lost crewmember-SAFER ops) (EV1)
10. Lost tools (velocity and direction estimate, when last seen) (EV1)
11. Communications plan for Arm ops (if required) (EVs/IV/M1/R1)
12. Hopping, safety tether awareness, stability and control, get-ahead risk, fatigue

EVA 1 INHIBIT PAD

Orbiter

ALL EVAs

TCS {*prior to egress*}
IV L12 1. √TCS POWER – OFF
Install Switch Guard to remain there for all 3 EVA

KU-Band Antenna {*prior to egress*}
MCC-H – INCO
1. √KU-BAND Mask – active
2. √KU-BAND EVA Protect Box – active

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

LOCATION DEPENDENT INHIBITS

Orbiter LTA Cable Disconnect {*prior to egress*}
{Expect inhibits in place just prior to LTA cable disconnect (starts 01:45 thermal clock for LCS); do not remove inhibits until crew clear of hot SPDU connector}

IV A15 CRT A15
1. Verify **MCC-H** GO, perform NODE 3 HEATER DEACT:
APCU 1, 2 CONV (two) – OFF
SM 179 POWER TRANSFER
√PTU 1, 2 APCU OUT VOLTS: < 10 V
APCU 1, 2 OUTPUT (two) – OFF

Ground

ALL EVAs

Ground Radar {*prior to egress*}
MCC-H – TOPO
1. √TOPO console, ground radar restrictions in place for EVA

USOS

ALL EVAs

PCU {*prior to egress*}

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

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

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

LOCATION DEPENDENT INHIBITS

S-Band (SASA) Antennas {*prior to egress*}
MCC-H – CATO
If EV crew < 3.6 feet from S1 SASA [P1 SASA]
1. P1 SASA (S1 SASA) – Active
2. S1 SASA [P1 SASA] – Powered down

Mobile Transporter {*prior to egress*}
MCC-H – ROBO
If EV crew <1.5 meters from MT
1. √MT latched

SPDM {*prior to egress*}
MCC-H – ROBO
??????????????????

LAB Window {*prior to egress*}
IV If EV crew less than 10 feet from window or in window FOV, close window shutter

EVA 1 INHIBIT PAD (Cont)

USOS cont

LOCATION DEPENDENT INHIBITS

NODE 3 LTA Cable Connect {*prior to egress*}
MCC-H – Phalcon

1. 602 Mate – RPCM N1-RS2-B – RPCs 1-5, 12-16
   RPC – Open and Close Command Inhibited
2. 612 Demate/mate – RPCM N1-RS1-B – RPCs 1,2,15,16
   RPC – Open and Close Command Inhibited

NODE 3 Avionics Cable Connect {*prior to egress*}
MCC-H – Phalcon

1. J113 Connector – MBSU 1 RBI 13 OPEN
2. J108 Connector – MBSU 2 RBI 2 OPEN
3. J114 Connector – MBSU 2 RBI 13 OPEN
4. J101 Connector – MBSU 4 RBI 4 OPEN

COL

ALL EVAs

Ham Radio {*prior to egress*}
IV 1. ARISS (Ham Radio) – Deactivate or VHF (144-146 MHz) TX only

JLP

ALL EVAs

ICS-EF Antenna {*prior to egress*}
SSIPC

1. ICS MOD Off
2. ICS UPC Off
3. ICS HPA Off

RSOS

ALL EVAs

SM Antennas {*prior to egress*}
IV 1. GTS – Deactivate

IMPULSE {*prior to egress*}
MCC-M 1. IMPULSE (ИПИ-100) – Is not activated

EVAs ON PMA1 OR RSOS (LOCATION DEPENDENT)

FGB Thrusters {*prior to egress*}
MCC-M

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

Soyuz Thrusters {*prior to egress*}
MCC-M

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

FGB Antennas {*prior to egress*}
MCC-M 1. √FGB KURS P [КУРС Р] – Deactivated

Soyuz Antennas {*prior to egress*}
MCC-M 1. √Soyuz KURS A [КУРС А] – Deactivated

EVA 1 NOTES/CAUTIONS/WARNINGS

NOTES

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

CAUTION

ISS Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture shafts (drylube)
   2. PIP pins
   3. EVA Crane [PMA1]
   4. TCS Reflectors [PMA2,PMA3]
   5. APAS hardware [PMA2,PMA3]
   6. CETA Lights (Z-93 paint) [LAB,S1, NODE 1]
   7. Deployed MISSEs [Columbus EPF]
   8. Passive UMAs
   9. MBS/SSRMS/SPDM/JEMRMS taped radiative surfaces: VDU, ACU, JEU, LEU, MCU, CRPCMs, and Cameras
   10. Deployed TUS cable [Nadir CETA rail]
   11. S0 aft face Radiator
   12. GPS Antennas (S13 paint) [S0,JLP]
   13. UHF Antennas [LAB,P1]
   14. ETCS Radiator flexhoses and panels [S1,P1]
   15. EETCS/PV Radiator flexhoses, bellows and panels [P6,P4,S4,S6]
   16. SASA RF Group [S1,P1]
   17. Heat pipe radiators [Z1]
   18. PCU cathode and HCA ports [Z1]
   19. Ku-Band Antenna (SGANT) dish [Z1]
   20. CMG cover/shells [Z1]
   21. SPDM SJEU, EP, OTCM, LEU, and LEE VDU Radiator surfaces
   22. Open CBM petal covers, LAB window shutter, and JPM window shutter
   23. FPMU [S1]
   24. OTSD
   25. COL HAM radio antennas [COL-Nadir]
   26. JTVE Cameras [JEM]
   27. JEM A/L Target and Pins
   28. S0/NODE 2 Fluid Tray Hardlines at NODE 2 end are limited to 25 lb

CAUTION

ISS Constraints (Cont)

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

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

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

E. For structural reasons
   1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
   2. Avoid performing shaking motions (sinusoidal functions) more than four cycles
   3. Avoid kicking S1/P1 radiator beam

   If any of these occur, wait 2 to 5 min to allow structural response to dissipate

CAUTION

ISS Constraints (Cont)

F. Other
   1. ITT Cannon connector: On demated connectors, do not rotate collar or manipulate cable/connector using collar or connector tool
   2. WIS Antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
   3. Lubricant from Ku-Band SGANT gimbals [Z1], CMGs [Z1], and RTAS Ground Strap fasteners [P6,P4,S4,S6] can contaminate EMU
   4. MLI handholds are not rated for crewmember translation loads
   5. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged
   6. Prevent inadvertent contact of the tether shuttle with ETRS when the P3 Tether Shuttle Stop is raised away from the rail

CAUTION

Shuttle Constraints

G. Avoid inadvertent contact with
   1. OBSS and SRMS Composite Sections Joint Torque Arms, Grapple Fixture Shafts, and Cable Harnesses
   2. LCS (silver Teflon) and LDRI (silver Teflon) and ITVC (gold foil) [OBSS]
   3. WVS Antenna [ODS Truss and PLB Sill]
   4. Payload Bay and Camera wire harnesses, cables, cable guides, and connectors

H. No touch
   1. LDRI diffuser [OBSS]
   2. OBSS saddle contacts (when OBSS unberthed) [OBSS]
   3. Monkey fur [PLB]
   4. Cameras: Metallic surfaces [PLB]
   5. Ku-Band Antenna black dish and gold thermal blankets [PLB]

CAUTION

HTV/HTV EP Constraints

A. Avoid inadvertent contact with
   1. EVA Cover [HTV] (does not meet EVA kick loads)
   2. Wheel guide [HTV] (snag hazard)
   3. HBCS (berthing camera) [HTV EP]
   4. HCSM (solid lubricant) [HTV EP]
   5. HCAM (solid lubricant) [HTV EP]
   6. EP PIU (solid lubricant and Black/White Paint) [HTV EP]

WARNING

ISS Constraints

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

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

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

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

WARNING

ISS Constraints (Cont)

E. RF radiation exposure
   1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1]
   2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1]
   3. Stay 1 ft from UHF Antenna when powered [LAB,P1]
   4. Stay 0.3 ft from fwd/aft JPM PROX antenna

F. Sharp Edges
   1. Inner edges of WIF sockets
   2. APFR active WIF probes
   3. Mating surfaces of EVA connectors Avoid side loads during connector mating
   4. Back side of MMOD shield fasteners
   5. Spring loaded captive EVA fasteners (e.g., 6B-boxes, BMRRM, RTAS, SARJ Covers); the end of the spring may protrude
   6. PMA umbilical launch restraints-exposed bolt threads
   7. Adjustable Fuse Tether (Fish Stringer) buckles stowed in Node Bag
   8. Nickel coated braided copper Ground Straps may contain frayed wires [P6,P4,S4,S6]
   9. SPDM OTCM gripper jaws

WARNING

ISS Constraints (Cont)

F. Sharp Edges (Cont)
   10. Solar Array Blanket Box [P6,S6]
   11. Keep hands away from SSRMS LEE/POA/SPDM LEE/JEMRMS EE opening, snares, and PDGF curvic coupling (teeth)
   12. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing
   13. Outboard MT rail attachment lug near P6 handrail 5333 and gap spanner
   14. P2 connector on EWIS box TAA-06 [Zenith/Forward Corner 1 of P5 – SARJ at 0 deg]
   15. Port/Aft portion of A/L circular HR [HR 0506]
   16. Interior of JEMRMS HRMs
   17. JEM A/L hatch corners

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

WARNING

ISS Constraints (Cont)

G. Thermal (Cont)

6. Stay ≥ 1 ft away from PMAs and MMOD shields > 270 degF if EMU sun visor up; limit time to 15 min or less if > 300 degF
7. Stay at least 0.5 ft away from PMA and MMOD shields > 325 degF
8. Do not touch EMU protective visor if temp has been < -134 degF for > 15 min
9. No EMU TMG contact with PMAs and MMOD shields > 320 degF
10. No EMU boot contact with foot restraint when temp < -120 degF or > 200 degF
11. Columbus end cones may violate touch temperature constraints when $-75 \leq \beta \leq -60$ or $60 \leq \beta \leq 75$V
12. PDGF surfaces may not meet touch temperature requirements for unlimited contact when $\beta \leq -70$ or $\beta \geq 70$
13. JPM port end cones and JLP port nadir may violate touch temperature constraints when $\beta > 60$ deg

H. Electrical Shock

1. Stay ≥ 2 ft from ungrounded floating connectors if not unpowered
   - SSPTS connectors include NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA2 Stbd and Port

WARNING

ISS Constraints (Cont)

H. Electrical Shock (Cont)

- MBS Cross-Connect jumpers (translate past these using UMA handrails) include S0 EVA Power Cables (inside S0 Bay 00 Face 4, Bay 01 Face 3) ESP-2 jumper (inside S0 Bay 03 Face 4)

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

WARNING

Shuttle Constraints

A. Arcing/Molten Debris

1. Stay ≥ 2 ft from exposed EFGF connector when OBSS berthed, powered, and EFGF not grappled [PLB]
2. Stay ≥ 2 ft from exposed Stbd Fwd MPM contacts [PLB]
3. Stay above PLB sill when within 1 ft of powered ROEU connector [PLB]

B. Pinch

1. PRLA operation [PLB]

C. RF radiation exposure

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

WARNING

Shuttle Constraints (Cont)

D. Sharp Edges
   1. PRLA grounding wipers [PLB]
   2. LDRI baffles (also an entrapment hazard) [OBSS]
   3. Keep hands away from SRMS EE opening and snares
   4. TCS connector backshells have exposed threads [ODS]

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

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

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

WARNING

HTV/HTV EP Constraints

A. Avoid inadvertent contact with
   1. HTV solar array panels (kick loads can shatter panel and generate sharp edges) [HTV]
   2. HTV fwd RCS thrusters [HTV]

B. Pinch
   1. HSM connector moving parts (pinch hazard and dry film lube) [HTV EP]
   2. EP wheels (pinch point) [HTV EP]

C. RF radiation exposure
   1. Stay 0.7 ft from IOS-N antenna [HTV]
   2. Stay 0.7 ft from IOS-Z antenna [HTV]
   3. Stay 0.3 ft from PLS-Z antenna [HTV]

EVA 1 FLIGHT SPECIFIC NOTES/CAUTIONS/WARNINGS (TBD)

NOTES

1.

CAUTION

A.

1.

WARNING

A.

1.

EVA 1 TOOL CONFIG

EV 1

- ☐☐ Adj Equip Tether (L wrist)
- ☐☐ MWS
  - ☐☐ BRT (L)
    - ☐☐ RET (eq-eq)
    - ☐☐ Wire Tie (2)
  - ☐☐ T-Bar
    - ☐☐ RET (eq-eq)
    - ☐☐ RET w/PIP Pin
    - ☐☐ Adj Equip Tether
    - ☐☐ Wire Tie (2)
    - ☐☐ Small Shuttle Trash Bag
    - ☐■ Gap Spanner #1 (-307) (outside)
  - ☐☐ Swing Arm (R)
    - ☐☐ RET (eq-eq) (to Lg Trash Bag PIP Pin ring)
      - ☐■ **PCBM Lg Trash Bag**
        - ☐■ Adj Equip Tether (Lg-eq)
        - ☐■ Adj Equip Tether
        - ☐■ Wire Tie (long) (2)
        - ☐■ Wire Tie (short) (bottom)
    - ■☐ Camera Bracket (outside bag)
      - ■☐ EVA Camera
- ☐☐ D-ring Extender (2, R & L D-ring)
  - ☐☐ 85-ft Safety Tether (R D-ring Ext)
- ☐☐ Waist Tether (2, R on D-ring to ST & L on D-ring Ext)
- ☐☐ SAFER
- ☐☐ WVS

Tether Counts: (RED RETs)	
RETs (eq-eq) = 16	Adj Equip Tethers = 26
RETs (Lg-eq) = 6	Adj Equip Tethers (Lg-eq) = 2
RETs (PIP Pin) = 5	Fish Stringers = 2

NOTE: Prior to use, inspect the following hardware:

- ❑ RET cords for fraying
- ❑ Safety Tether/Waist Tether LAS: No Red Visible
- ❑ ISS Trash Bag: Bristle deformation/damage, after having stowed tools in trash bag
- ❑ BRT joint screws not loose
- ❑ IV caps removed on all connectors
- ❑ Bails aft on QDs and un-capped connectors
- ❑ Detent buttons secured on QDs
- ❑ Load Alleviating Straps (Safety Tether/Waist Tether); ref FS 8-??

EV 2

- ☐☐ Adj Equip Tether (L wrist)
- ☐☐ MWS
  - ☐☐ BRT (L)
    - ☐☐ RET (eq-eq)
    - ☐☐ Wire Tie (2 out, 1 in)
  - ☐☐ T-Bar
    - ☐☐ RET w/PIP Pin
    - ☐☐ Adj Equip Tether
    - ☐☐ Wire Tie (2)
    - ☐☐ Small ISS Trash Bag
      - ☐☐ RET
        - ☐■ P612 Dust Cap
  - ☐☐ Swing Arm (R)
    - ☐☐ RET (eq-eq)
      - ☐☐ PGT [**B7** 25.5 ft-lb, **CAL**, MTL **30.5**] s/n _____
      - ☐☐ PGT Battery s/n _____
      - ☐☐ 7/16 (wobble) Socket-6 ext
- ☐☐ D-ring Extender (2, R & L D-ring)
  - ☐☐ 85-ft Safety Tether (L D-ring Ext)
  - ☐■ Spare 85-ft Safety Tether (R D-ring Ext)
- ☐☐ Waist Tether (2, R on D-ring Ext & L on D-ring to ST)
- ☐☐ SAFER
- ☐☐ WVS

AIRLOCK CONFIG

- ☐■ RET (Lg-eq)
  - ☐■ **NH3 Jumper Bag** (flap between each jumper) (EV2)
    - ☐■ Adj Equip Tether (3) (outside, 2 on hinge side, 1 on front left corner)
    - ☐■ RET (3) (eq-eq) (internal loops)
      - ☐■ NH3 Jumpers (3) (M2, M4, M3 (bottom) – NOD3/bent end on RET)
        - ☐■ Wire Ties (3) (integral to bag and on each jumper to prevent uncoiling)
      - ☐■ Fish Stringer (sm hook attached to M1 LAB-end bail; 1 Lg hook attached outside bag)
        - ☐■ RET (eq-eq)
          - ☐■ Male N2 Vent Tool
      - ☐■ Fish Stringer (sm hook attached to M1 NOD3-end bail, 1 Lg hook on internal loop and other Lg hook attached outside bag)
        - ☐■ NH3 Jumpers (M1)
          - ☐■ Adj (Lg-eq) (Jumper #1 midpoint)
          - ☐■ Wire Tie (integral to bag on jumper to prevent uncoiling)

AIRLOCK CONFIG (Cont)

- ☐☐ RET (Lg-eq)
  - ☐■ **NH3 MLI Bag** (Lg ORU Bag) – stays outside for Cupola (EV1)
    - ☐■ Adj Equip Tether (3) (outside, 2 on front, 1 shortened on hinge side)
    - ☐■ Camera Bracket (tether to outside bag)
      - ☐■ EVA Camera (constrained w/Adj Equip Tether; stuffed inside bag)
    - ☐■ RET (eq-eq) (outside)
      - ☐■ **Avionics Lg Trash Bag** (constrained w/Adj Equip Tether; stuffed inside bag)
    - ☐■ RET (eq-eq) (3) (inside)
      - ☐■ NH3 MLI (3) (√top Velcro tabs folded over, √LAB Bracket-end extension secured via Velcro) (LAB blanket on top, Loop B on bottom)
        - ☐■ Adj Equip Tether (7) (2 on each N3 side MLI, 1/end; 3 on LAB side, 2 on LAB-end and 1 on bracket-end)
    - ☐■ Adj Equip Tether (3) (across each MLI to hold in bag)

- ■☐ RET (Lg-eq)
  - ■☐ **PCBM Lg Trash Bag** (EV1)
    - ■☐ Adj Equip Tether (Lg-eq)
    - ■☐ Adj Equip Tether
    - ■☐ Wire Tie (long) (2)
      - ■☐ PCBM Contamination Covers (8)
        - ■☐ Wire Tie (short) (bottom)
    - ■☐ Spare 85-ft Safety Tethers (2)

- ☐☐ RET (Lg-eq)
  - ☐☐ **OTP Crewlock Bag** (EV1)
    - ☐☐ RET w/PIP Pin (outside)
    - ☐☐ RET (Lg-eq) (internal D-ring)
    - ☐■ Spare 85-ft Safety Tether (R D-ring Ext) (outside)
    - ☐☐ Ratchet Wrench
      - ☐☐ 7/16 (rigid) Socket-2 ext
    - ☐☐ Pry Bar
    - ☐☐ Square Scoop (2 out, 1 in)
    - ☐☐ LDTD Tethers (2 out, __ in), √free hook strap fully extended

- ☐☐ RET (Lg-eq)
  - ☐☐ **OI WIF Crewlock Bag**
    - ☐☐ RET w/PIP Pin (outside)
    - ☐■ OI WIFs (3)

EVA 1 TOOL CONFIG (Cont)

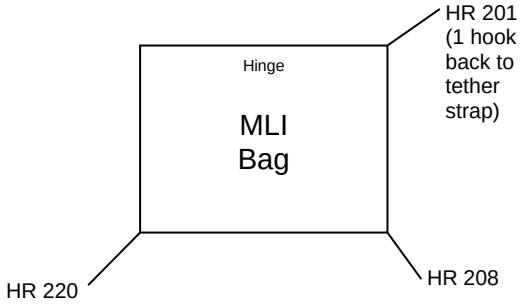
AIRLOCK CONFIG (Cont)

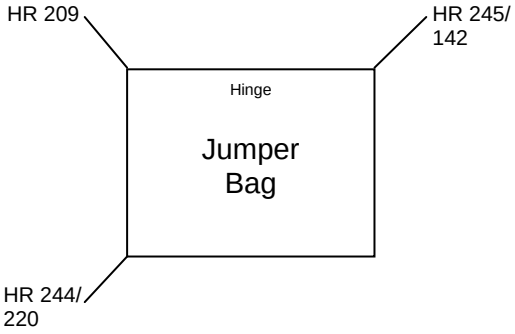
- ☐☐ RET (Lg-eq)
  - ☐☐ **Avionics Crewlock Bag** (EV2/EV1)
    - ☐☐ RET (eq-eq) (outside)
    - ☐☐ Adj Equip Tether (inside)
      - ☐☐ Wire Tie (long) (inside)
    - ☐☐ RET (eq-eq) (internal D-ring)
      - ■☐ J104 Velcro Strap
    - ☐☐ Adj Equip Tether (internal RET)
      - ■☐ J104 Dust Cap
      - ☐■ J104 1553 BUS Terminator
    - ☐☐ Adj Equip Tether (internal RET)
      - ☐■ J6XX Dust Cap (hook mouth away from structure)
      - ☐■ J6YY Dust Cap
    - ■☐ Square Scoop (1)
    - ☐☐ Adj Equip Tether (internal RET)
      - ☐■ J2FGB 1553 BUS Terminator
      - ☐■ J1FGB MLI
    - ☐☐ Adj Equip Tether (internal RET)
      - ☐■ J1FGB 1553 BUS Terminator
      - ☐■ J2FGB MLI
    - ☐☐ RET w/PIP Pin (eq-eq) (internal D-ring)
      - ☐☐ Wire Tie Caddy (9, __ left)
    - ☐■ Gap Spanner #2 (-303)
    - ■☐ **Avionics Lg Trash Bag** (attached to Crewlock Bag)
      - ■☐ NOD3 Avionics Cable Dust Caps (8)
      - ■☐ NOD3 Avionics Jack Dust Caps (10)
      - ■☐ NOD3 Avionics MLI thermal covers (2)

AIRLOCK CONFIG (Cont)

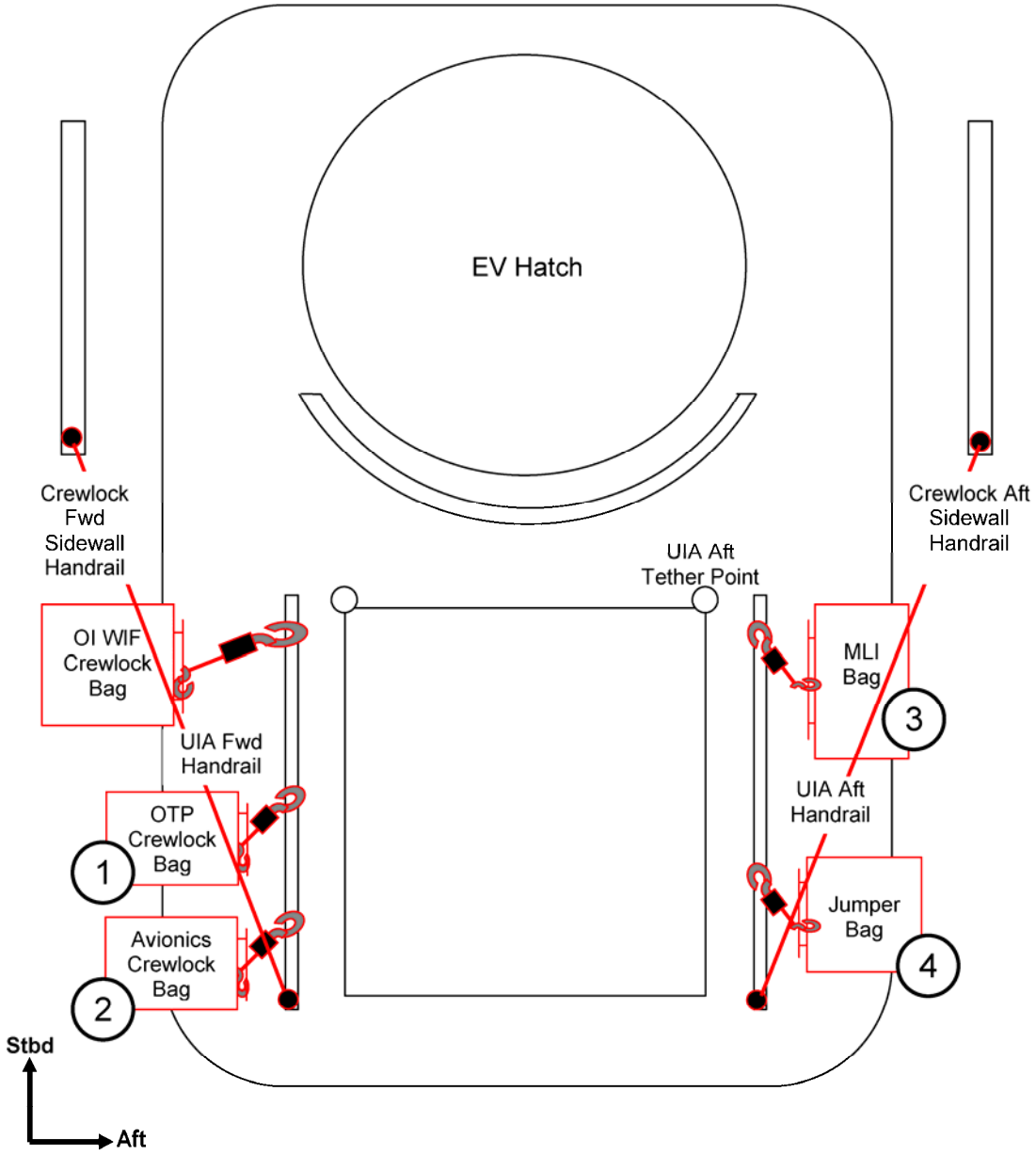
- ☐☐ Staging Bag
  - ☐☐ Fish Stringer Tether
    - ☐☐ Wire Tie Caddy
    - ☐☐ Velcro/Tape Caddy
    - ☐☐ PGT s/n _____
      - ☐☐ PGT Battery s/n _____
      - ☐☐ 7/16 (wobble) Socket-6 ext
    - ☐☐ Vise Grips
    - ☐☐ Ratchet Wrench
      - ☐☐ 7/16 (rigid) Socket-9 ext
    - ☐☐ Needle Nose Pliers
 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

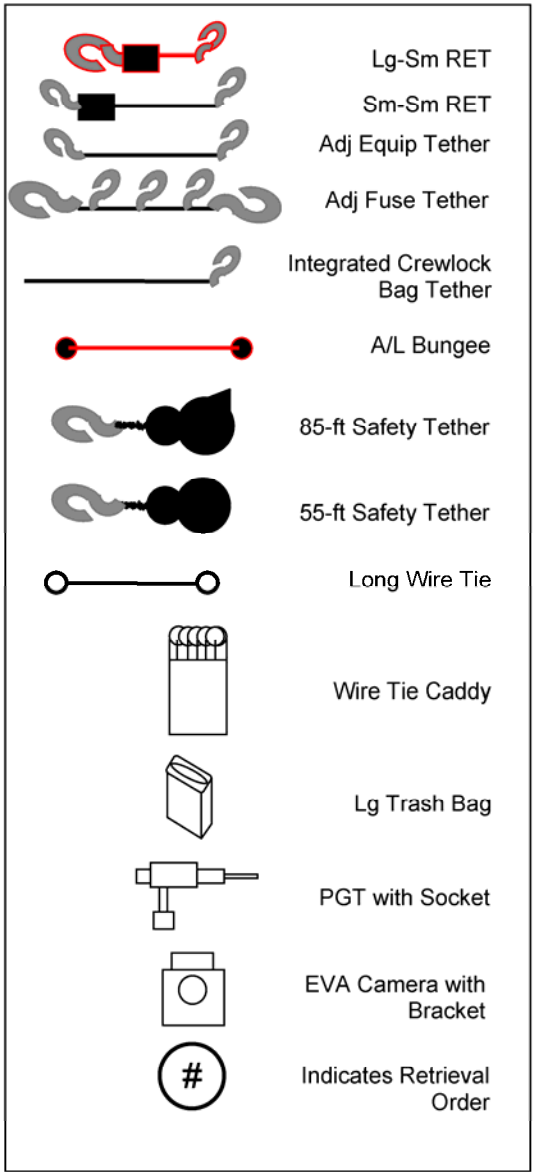
- ☐☐ IV Bag
  - ☐☐ Towels (2)
  - ☐☐ Contamination Detection Kit
  - ☐☐ GP Caddy (2)
    - ☐☐ Adjustable Thermal Mittens (2)
  - ☐☐ Socket Caddy (hatch cont) w/RET (eq-eq) (Black)
    - ☐☐ 1/2 Socket-8 ext
    - ☐☐ 7/16 (wobble) Socket-6 ext (spare)
  - ☐☐ DCM Plug (SAFER Hardmount) (2)
  - ☐☐ RET (eq-eq,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





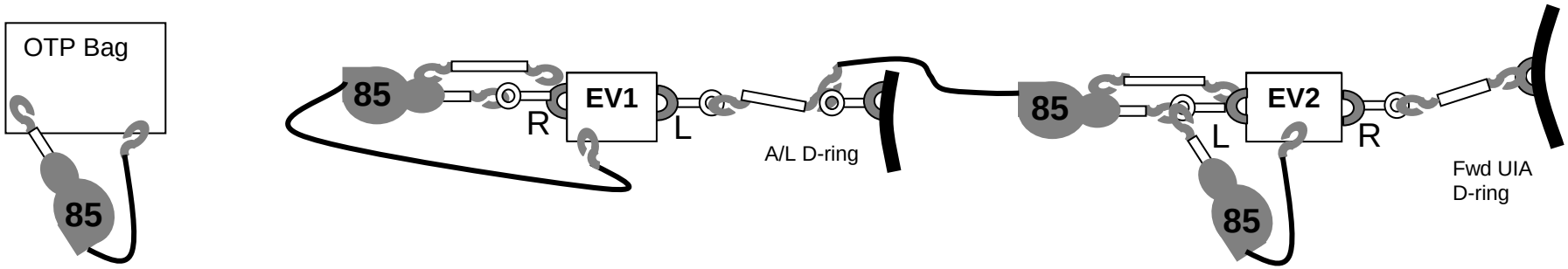
EVA 1 AIRLOCK CONFIG





Tool Legend

EVA 1 EGRESS/SETUP (00:45/00:35)

IV	EV1 (Be)	EV2 (Pk)
		
	Initial Conditions: ❑ R D-ring ❑ D-ring Ext ❑ A/L 85-ft Safety Tether to MWS ❑ Waist Tether to A/L Safety Tether ERCM ❑ L D-ring ❑ D-ring Ext ❑ Waist Tether to A/L D-ring Ext ❑ Hooks closed and locked (Safety Tether reel ends, A/L Safety Tether anchor, L Waist Tether)	Initial Conditions: ❑ R D-ring ❑ D-ring Ext ❑ Waist Tether to fwd UIA D-ring ❑ L D-ring ❑ D-ring Ext ❑ A/L 85-ft Safety Tether to A/L D-ring Ext ❑ Spare 85-ft Safety Tether to MWS ❑ Waist Tether to A/L Safety Tether ERCM ❑ Hooks closed and locked (Safety Tether reel ends, R Waist Tether)
	<u>EGRESS</u> (00:15) 1. Open A/L thermal cover 2. Egress A/L 3. Attach EV1 Safety Tether to aft A/L D-ring ❑ Anchor hook closed and locked ❑ Reel unlocked 4. Release Waist Tether from A/L D-ring Ext 5. Relocate EV2 Safety Tether anchor from internal A/L D-ring Ext to fwd A/L D-ring ❑ Hook closed and locked ❑ Reel unlocked	<u>EGRESS</u> (00:15)
1. Post crew egress: WVS Software: Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max	6. Stow OTP Crewlock Bag on BRT	1. Transfer OTP Crewlock Bag to EV1, A/L RET to A/L D-ring ext
	7. Receive Avionics Crewlock Bag	2. Transfer Avionics Crewlock Bag to EV1, A/L RET to A/L D-ring ext 3. Egress A/L 4. Close A/L thermal cover

EVA 1 EGRESS/SETUP (00:45/00:35) (Cont)

IV	EV1 (Be)	EV2 (Pk)
2. √SAFER handles down (MAN ISO vlv (L) – open; HCM (R) – closed)	8. √SAFER handles down 9. √ERCA green LED (if no WVS) 10. √Tethers and Tools	5. √SAFER handles down 6. √ERCA green LED (if no WVS) 7. √Tethers and Tools
	SETUP (00:10)	SETUP (00:20) 8. Perform translation adaptation
	11. Transfer Avionics Crewlock Bag to EV2	9. Stow Avionics Crewlock Bag on BRT
3. √**MCC-H** GO for NODE 3 DEACT A15 4. APCU 1, 2 CONV (two) – OFF SM 179 POWER TRANSFER CRT √PTU 1, 2 APCU OUT VOLTS < 10 V A15 APCU 1, 2 OUTPUT (two) – OFF 5. On completion of IV step 4, give EV2 GO for 1153 install and LTA cable disconnect	12. Translate to LAB HR 0231, EV2 leads 10. Install Gap Spanner #1 (LAB HR 0231 (aft) → LAB HR 0232 (aft)) OPEN NODE 1 PORT CBCS FLAP (00:05) 13. Translate to NOD1 Port CBCS flap 14. Expose mating Velcro 15. Release flap fastener snap 16. Open CBCS flap, secure with mating Velcro and snap 17. √Velcro secure OTP BAG STOW (00:15) 18. Translate to stbd CETA Cart via CETA spur 19. Stow OTP Crewlock Bag on stbd CETA Cart, retrieve spare 85-ft Safety Tether 20. Translate to NOD2 nadir endcone 21. Perform Safety Tether swap on NOD2 HR 0310 (fwd endcone) 22. √Spare Safety Tether ❑ Anchor hook closed and locked ❑ Reel hook closed and locked ❑ Reel unlocked 23. √Waist Tether ❑ Lg hook closed and locked on ERCM 24. Stow A/L Safety Tether on HR ___ 25. Fairlead on stbd ODS HR using Adj Equip Tether 26. Translate to NOD3 PCBM covers (PLB aft) via stbd route	11. Translate to NOD2 nadir endcone via port nadir route 12. Perform Safety Tether swap on NOD2 HR 0307 (fwd endcone) 13. √Spare Safety Tether ❑ Anchor hook closed and locked ❑ Reel unlocked 14. √Waist Tether ❑ Lg hook closed and locked on ERCM 15. Stow A/L Safety Tether on HR ___ 16. Fairlead on port ODS HR using Adj Equip Tether 17. Translate to SPDU (PLB port, bay 7) via port route

EVA 1 TASK DATA – NOD1 PORT CBCS FLAP

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:05

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
NOD1 Port CBCS Flap			

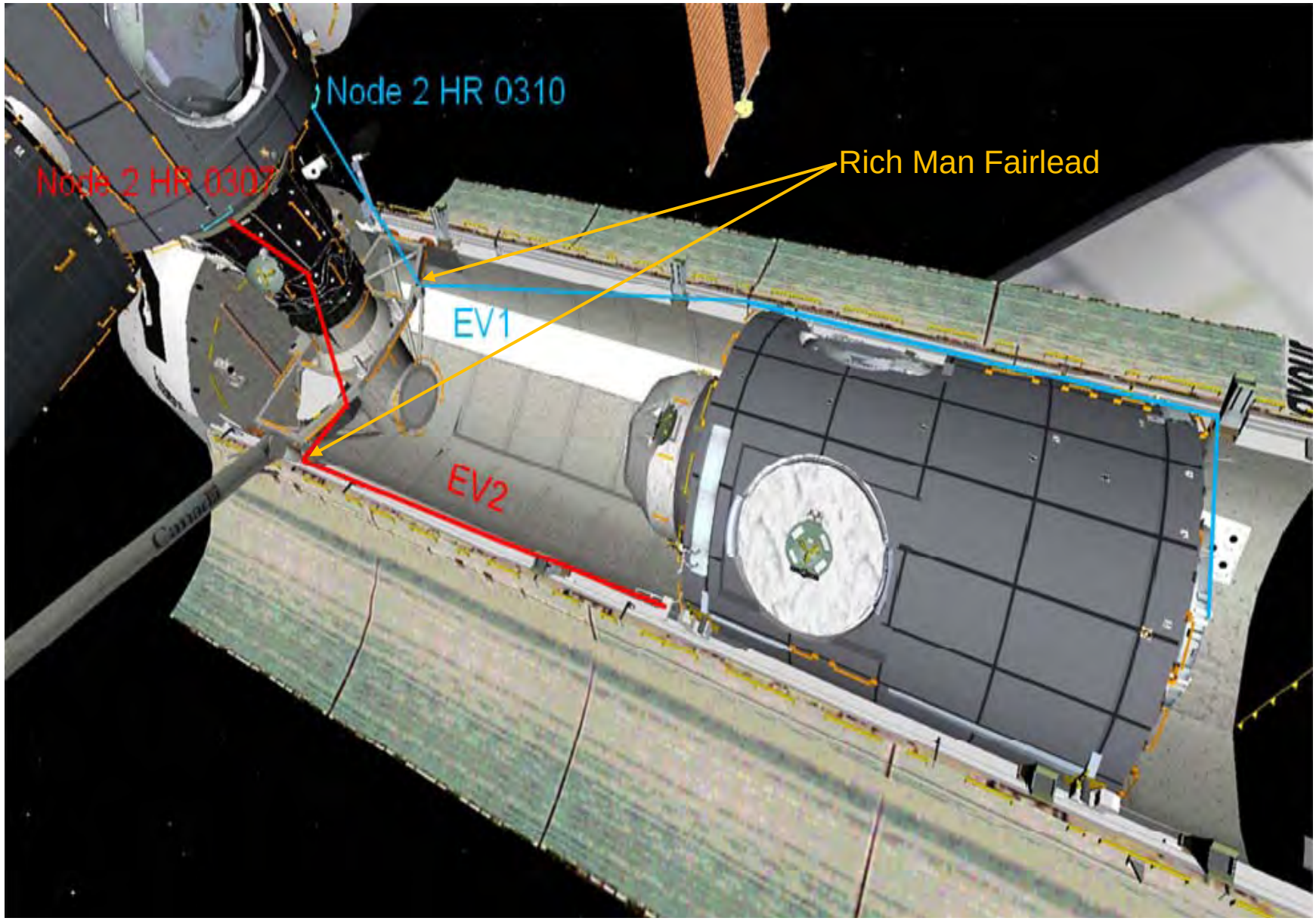
Notes:

1.
2.
3.
4.
5.

Timeline Considerations:

1. Must be opened prior to NOD3 berthing to NOD1 port; can be accomplished prior to Bag ops by EV1
2.
3. Per the ULF-3 JOP we are not going to have it open pre Unberth; ref FR ???
4.
5.

EVA 1 TASK DATA – NOD1 PORT CBCS FLAP (Cont)



EVA 1 NODE 3 UNBERTH PREP (00:45/01:00)

IV/SSRMS	EV1 (Be)	EV2 (Pk)
1. Point PLB camera away from EV1 if too close	PCBM CONTAMINATION COVER REMOVAL (01:00) 1. Perform Glove Inspection 2. Remove PCBM contamination covers (8) a. Attach RET to contamination cover b. Remove cover and stow in Lg Trash Bag c. Secure cover with Wire Tie (long) d. Remove RET from cover e. Visually inspect PCBM sealing surface Cover Number: ❑1 ❑2 ❑3 ❑4 ❑5 ❑6 ❑7 ❑8 3. Cinch Adj Equip Tether around Lg Trash Bag 4. Notify IV, when clear of NOD3	1553 BUS TERMINATOR INSTALL (00:20) 1. Perform Glove Inspection 2. Open TA clamps (3) on Node 3 3. Remove orbiter LTA cable from clamp, close clamp 4. Translate to NOD3 J104 5. RET to and remove J104 Velcro strap 6. On IV GO, tether to and open Node 3 Port Avionics MLI thermal cover with tape 7. Stow J104 Velcro strap in Avionics Crewlock Bag 8. Tether to J104 Dust Cap with Avionics Crewlock Bag RET 9. ❑ Dust Cap ←|→ J104 10. Stow Dust Cap in Avionics Crewlock Bag 11. Retrieve 1553 BUS Terminator from Avionics Crewlock Bag 12. ❑ 1553 BUS Terminator →|← J104 13. Ensure grounding strap conductive Velcro mated 14. Re-install NOD3 Port Avionics MLI (Velcro)
		ORBITER LTA CABLE REMOVAL (00:25) 15. Translate to NOD3 end of orbiter LTA cable 16. RET around LTA cable 17. Demate connectors, use RET to restrain cables ❑ J6XX ←|→ P6XX ❑ J6YY ←|→ P6YY 18. Mate Dust Caps (2) on J6XX and J6YY; check RET orientation ❑ Dust Cap →|← J6XX ❑ Dust Cap →|← J6YY 19. Install NOD3 J6XX/J6YY MLI thermal cover; secure Velcro 20. Coil orbiter LTA cable, restrain with integral wire tie (continue coiling as needed) 21. Translate to SPDU sill bracket 22. Remove orbiter LTA cable from clamp, close clamp 23. Demate connectors ❑ J1 ←|→ P1 ❑ J2 ←|→ P2 24. Secure remaining cable with 2nd integral Wire Tie

EVA 1 NODE 3 UNBERTH PREP (00:45/01:00) (Cont)

IV/SSRMS	EV1 (Be)	EV2 (Pk)
2. √EVs clear of 2 ft KOZ of SPDU 3. When EVs out of SPDU 2 ft KOZ, perform the following: A15 APCU 2 OUTPUT – ON APCU 2 CONV – ON 4. √EVs clear of NOD 3 5. When both EVs clear of NOD3, notify SSRMS EVs clear for NOD3 Unberth Ops ☐ **Avionics Crewlock Bag** (EV2/EV1) ☐ RET (eq-eq) (outside) ☐ Adj Equip Tether (inside) ☐ Wire Tie (long) (inside) ☐ RET (eq-eq) (internal D-ring) ☐ J104 Velcro Strap ☐ Adj Equip Tether (internal RET) ☐ J104 Dust Cap ☐ Adj Equip Tether (internal RET)		<u>ORBITER LTA CABLE STOW IN TSA</u> (00:15) 25. Translate to port TSA 26. Notify IV when clear of NOD3 27. Release latches on Port TSA door (4 ¼-turns) 28. Open TSA door and flight specific door 29. Stow orbiter LTA cable in flight specific cushion with integral Adj Equip Tether 30. Close flight specific cushion and TSA door 31. Rotate latches to locked position (4 ¼-turns), verify arrows align 32. Perform Avionics Crewlock Bag Inventory

EVA 1 TASK DATA – PCBM CONTAMINATION COVERS

Estimated Task Duration:

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

Tools:

EV1
Lg Trash Bag
Adj Equip Tether (Lg-eq)
Wire Tie (long) (2)

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
PCBM Contamination Cover			

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
PCBM Contamination Cover		

Notes:

1. Numbers on covers numbered clockwise
2. Covers fit in Lg Trash Bag oriented so sealing surface sides face the sides of the trash bag
3.
4.
5.

Timeline Considerations:

1. Notify IV when clear of NOD3 for SSRSM Ops (Unberth NOD3 from PLB)
2.
3.
4.
5.

EVA 1 TASK DATA – 1553 BUS TERMINATOR

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:20

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
J104 Velcro Strap			
J104 Dust Cap			
J104 1553 BUS Terminator			

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
J104 Velcro Strap		
J104 Dust Cap		
J104 1553 BUS Terminator		

EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
J104 1553 BUS Terminator	N/A	NOD3 J104	0		

Inhibits:

ORU/Task	Location	Inhibit
J104		

Notes:

1. Port Avionics MLI not captive
2.
3.
4.
5.

Timeline Considerations:

1. Task must be completed prior to internal routing of 1553 cables for Robotics SSRMS termination
2.
3.
4.
5.

EVA 1 TASK DATA – ORBITER LTA (SPDU) CABLE

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:40

Tools:

EV2
Wire Ties (2, integral to wire harness)

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
LTA Cable			
J6XX, J6YY Dust Caps			

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
LTA Cable		
J6XX, J6YY Dust Caps		

EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
LTA Cable	PLB SPDU	NOD3 J6XX, J6YY	3 (2 on NOD3, 1 on SPDU bracket)		NOD3 heater power

Inhibits:

ORU/Task	Location	Inhibit
LTA Cable	Prior to removing LTA cable from NOD3 and SPDU bracket on PLB sill	A15 APCU 1, 2 CONV (two) – OFF SM 179 POWER TRANSFER CRT √PTU 1, 2 APCU OUT VOLTS < 10 V A15 APCU 1, 2 OUTPUT (two) – OFF

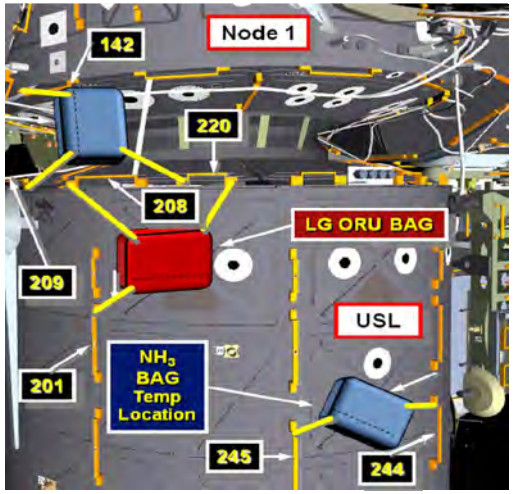
Notes:

1. Orbiter LTA MLI captive
2. Two Wire Ties Installed on Orbiter LTA Cable to aid in coiling; Wire Ties are anchored approximately 20-in apart on NOD3 side of cable
3. Two Orbiter LTA Cables are tied together with lacing cord
4. One Shuttle Style Adj Equip Tether is configured with 1 hook attached to PBAS/PAD cushion handle; other hook for LTA Cable
5.

Timeline Considerations:

1. If having trouble with stowage in TSA, cable can be coiled up and stowed inside or strapped outside on the Crewlock bag; cable then returned inside via the airlock
2. Notify IV when clear of NOD3 for SSRSM Ops (Unberth NOD3 from PLB)
3.
4.
5.

EVA 1 NH3 BAG OPS (00:55/00:50)

IV	EV1	EV2
 1. When EV1 clear of NOD1 port, notify SSRMS EV clear to mnvr to " " posn	NH3 MLI BAG OPS (00:55) 1. Retrieve Adj Equip Tether from ODS HR 2. Translate to NODE 2 HR 0310 3. Perform Safety Tether swap to A/L Safety Tether 4. √A/L Safety Tether ❑ LAS hook closed and locked ❑ Reel unlocked 5. √Waist Tether ❑ Lg hook closed and locked on ERCM 6. Stow spare Safety Tether anchor on MWS 7. Translate to A/L 8. Stow PCBM Lg Trash Bag on A/L circular HR 0550 (port of hatch on E/L) 9. Stow spare 85-ft Safety Tethers on Lg Trash Bag 10. Perform Glove Inspection 11. Open thermal cover 12. Retrieve NH3 MLI Bag, stow on BRT 13. Close A/L thermal cover 14. √SAFER handles down 15. Translate to LAB HR 0219 (aft/nadir) via aft route 16. Stow NH3 MLI Bag (Lg ORU Bag) on LAB HR 0208 (zenith), HR 0201 (aft), and HR 0220 (nadir), hinge fwd 17. Stow EVA Camera and Bracket from NH3 MLI Bag, on swing arm 18. Stow RET and Avionics Lg Trash Bag on MWS 19. Translate to NOD1 aft endcone 20. Notify IV when clear of port NOD1 21. Stow Avionics Lg Trash Bag on NOD1 HR 0106 (port circumferential HR on aft endcone)	NH3 JUMPER BAG OPS (00:50) 1. Retrieve Adj Equip Tether from port ODS HR 2. Translate to NODE 2 HR 0307 3. Perform Safety Tether swap to A/L Safety Tether 4. √A/L Safety Tether ❑ LAS hook closed and locked ❑ Reel unlocked 5. √Waist Tether ❑ Lg hook closed and locked on ERCM 6. Stow spare Safety Tether anchor on MWS 7. Translate to A/L 8. Stow Avionics Crewlock Bag on A/L HR 0555 (fwd of hatch) 9. Stow spare 85-ft Safety Tethers on PCBM Lg Trash Bag 10. Perform Glove Inspection 11. Open thermal cover 12. Retrieve NH3 Jumper Bag, stow on BRT 13. Close A/L thermal cover 14. √SAFER handles down 15. Translate to LAB HR 0244 (nadir/aft) via fwd route 16. Stow NH3 Jumper Bag on LAB HR 0244 (nadir) and HR 0245 (nadir)

EVA 1 TASK DATA – NH3 JUMPER BAG

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:50

Tools:

EV2
Adj Equip Tethers

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
NH3 Jumper Bag			

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
NH3 Jumper Bag		

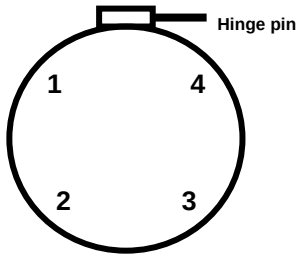
Notes:

1. The Jumper Bag can collapse and fit in the A/L attick with the other ORU bags if required
2.
3.
4.
5.

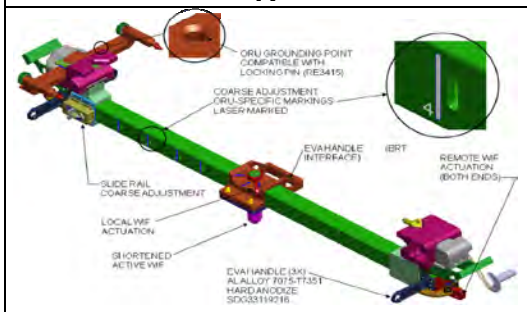
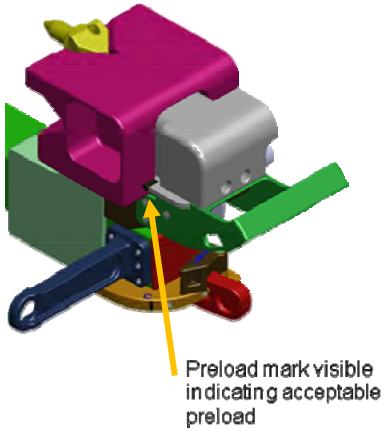
Timeline Considerations:

1.
2.
3. Mnvr: 10 min for PRLA/AKA, 100 min for ROBO, and 50 min for OSO
4.
5.

EVA 1 OTP REMOVAL (01:55)

IV	EV1 (Be)	EV2 (Pk)
1. √OTP inhibits in place 2. Give EV1/EV2 GO for SPDM ops	OTP REMOVAL SETUP (00:30) 1. Translate to stbd CETA cart via CETA spur 2. Engage parking brake on CETA Cart (left handle) 3. √CETA Cart brake handles clear of worksite 4. Retrieve Square Scoop from OTP Crewlock Bag 5. On IV GO, install Square Scoop on SPDM outrigger 6. Perform Glove Inspection	OTP REMOVAL SETUP (00:30) 1. Translate to stbd CETA Cart via CETA spur 2. Engage parking brake on CETA Cart (left handle) 3. √Stbd CETA swing arm #1 = **[0 degrees]** 4. √Stbd CETA WIF 1 to **[12,GG]** (bumper port, WIF fwd) 5. √APFR in WIF 1 **[6,OO,E,6]** 6. Retrieve Square Scoop from OTP Crewlock Bag 7. On IV GO, install Square Scoop on OTP (handle pointing toward EDF interface); do not remove EV2 RET 8. Ingress APFR 9. Perform Glove Inspection
 OTP interface	OTP REMOVAL (00:20) 7. Receive PGT from EV2 8. Release and remove EDFs #1 and #4 **[B7,CCW2,30.5]**, ~5 turns ❑ 7/16-in (wobble) Socket-6-in ext ❑ (25.5 ft-lb, 30 RPM) 9. Stow EDF #4 in "pull tab" MLI loop 10. Release and remove hinge pin **[B4,CCW2,30.5]**, ~10 turns ❑ 7/16-in (wobble) Socket-6-in ext ❑ (19.4 ft-lb, 30 RPM)	OTP REMOVAL (00:20) 10. Transfer PGT to EV1
	11. Transfer PGT to EV2 12. Remove Square Scoop from SPDM outrigger 13. Translate to OTP Crewlock Bag and stow Square Scoop	11. Receive PGT from EV1
	14. When clear of OTP, give EV2 GO to release EDFs	12. On EV1 GO, release and remove EDF #2, #3 **[B7,CCW2,30.5]**, ~5 turns ❑ 6-in ext wobble 7/16-in ❑ (25.5 ft-lb, 30 RPM)
	15. Finger tighten hinge pin	13. Remove OTP from SPDM 14. Position OTP for EV1 to drive hinge pin

EVA 1 OTP REMOVAL (01:55) (Cont)

IV	EV1 (Be)	EV2 (Pk)
	OTP STOW (00:40) 16. RET and BRT to Square Scoop on OTP 17. Translate to OTSD (S0 stbd wedge) via nadir route 18. Position OTSD active carriage to midpoint (pull lock slider away from WIF and squeeze release paddles together; slide carriage away from WIF) 19. Stow single pin on active carriage (pin button)	OTP STOW (00:40) 15. Release RET from Square Scoop 16. When OTP clear, soft dock EDFs 1, 2 and 3 17. Egress APFR 18. Stow Ingress Aid against APFR boot plate 19. Translate to OTSD (S0 stbd wedge) via zenith S0 HR 3436 and gap spanner 20. Fairlead on S0 HR 3454 using Adj Equip Tether 21. Set OTSD passive carriage to position 5 (rotate locking lever and push toward WIF on actuation tabs; slide carriage away from WIF) 22. Tether to OTP square grid with Adj Equip Tether and RET
	20. Release Square Scoop, stow Scoop on MWS	
	21. Position OTP into OTSD 22. Tether to OTSD 23. Push active carriage towards WIF to capture OTP micro-square 24. Rotate preload lever towards WIF to set preload (squeeze locking lever) 25. √Proper preload (only black mark visible)	23. Position OTP into OTSD 24. Verify micro-square soft-captive 25. Tether to OTSD
	26. Perform light pull test 27. Remove OTSD from WIF (push locking lever and rotate release lever to 'release') 28. Once OTSD release, position release lever to 'capture'	26. Perform light pull test
	29. Translate to S0 WIF 11 30. Install OTSD in S0 WIF 11 **[active carriage stbd]** (slide release lever to 'lock')	27. Translate to S0 WIF 11 28. Install OTSD in S0 WIF 11 **[passive carriage port]** (slide release lever to 'lock') 29. Perform light pull test
☐ **OTP Crewlock Bag** (EV1) ☐ RET (eq-eq) (outside) ☐ RET (Lg-eq) (outside) ☐ Ratchet Wrench ☐ 7/16 (rigid) Socket-2 ext ☐ Pry Bar ☐ Square Scoop (2 out, 1 in) ☐ LDTD Tethers (2 out, __ in)	OTP CLEANUP (00:25) 31. Translate to A/L, stow Square Scoop in Avionics Crewlock Bag (A/L HR 0555, fwd of hatch) 32. Stow Avionics Crewlock Bag on BRT 33. Translate to NOD3 nadir stbd endcone via aft route	OTP CLEANUP (00:25) 30. Remove Adj Equip Tether and RET from OTP 31. Retrieve Adj Equip Tether fairlead 32. Translate to stbd CETA Cart 33. Perform OTP Crewlock Bag Inventory 34. Stow OTP Crewlock Bag on BRT

EVA 1 OTP REMOVAL (01:55) (Cont)

IV	EV1 (Be)	EV2 (Pk)
	34. Stow Avionics Crewlock Bag on NOD3 HR 0619 (aft/nadir on stbd endcone) 35. Perform Glove Inspection	35. Position CETA Cart brake handles pointing fwd 36. Disengage parking brake with brake petal (2 taps) 37. Translate to A/L, stow OTP Crewlock Bag on A/L HR 0555 (fwd of hatch) 38. Perform Glove Inspection

EVA 1 TASK DATA – OTP REMOVAL

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	N/A
Two EV Crew	N/A	01:55

Tools:

EV1 & EV2	EV1 & EV2
PGT w/7/16 (wobble) Socket-6 ext	LDTD Tethers (2) (contingency)
Square Scoops (2)	Prybar (contingency)
OTSD	Ratchet Wrench w/7/16 (rigid) Socket-2 ext (contingency)
	RET (Lg-eq) (contingency)

OTSD:

Task	WIF	OTSD Setting
Initial stowage location	S0-7	Passive Carriage = 6 WIF Clocking = 7
Final stowage location	S0-11	Passive Carriage = 5 WIF Clocking = 6

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
OTP			
OTSD			

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
OTP	78	
OTSD	74	

EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
EDFs			4					
Hinge Pin			1					

Inhibits:

ORU/Task	Location	Inhibit

Notes:

1.
2.
3.
4.
5.

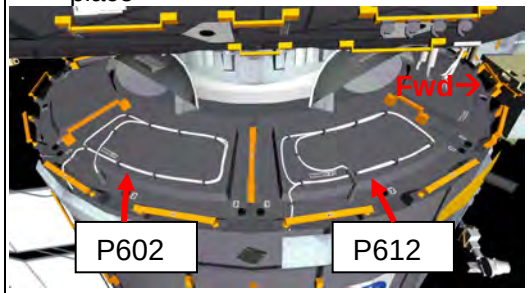
Timeline Considerations:

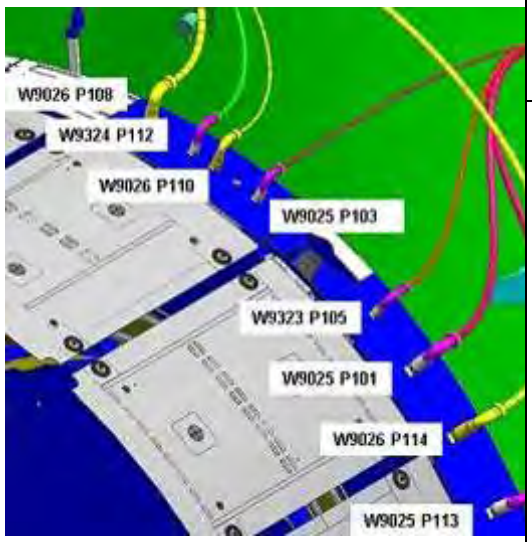
1. Contingency Tie-Down on the CETA Cart can be found in section 16
2. OTP stowage on OTSD takes approximately the same time as stowage on CETA Cart
3. Temp stow of OTP on something other than OTSD may require additional restraints on latter EVAs
4.
5. Mnvr: 10 min for PRLA/AKA, 100 min for ROBO, and 50 min for OSO

EVA 1 NODE 3 AVIONICS CABLES INSTALL (01:20)/NODE 3 LTA CABLE INSTALL (01:00)

IV

1. √NOD3 Avionics inhibits in place
2. √NOD3 LTA inhibits in place
3. Give EVs GO for LTA Cables when NOD3 A bolts driven and inhibits in place





EV1

DEMATE NOD3 CH 1/4 AVIONICS DUST CAPS (00:20)

1. Configure Lg Trash Bag
2. On IV GO, remove aft avionics MLI, stow in Avionics Lg Trash Bag
3. Remove nadir avionics MLI, stow in Avionics Lg Trash Bag
4. Remove NOD3 ch 1/4 avionics dust caps (4 caps tied together, J103 not tied), stow in Avionics Lg Trash Bag
   - ❑ J113 ←|→ cap
   - ❑ J114 ←|→ cap (2/3 cable)
   - ❑ J101 ←|→ cap
   - ❑ J105 ←|→ cap
   - ❑ J103 ←|→ cap
5. Remove dust caps from NOD3 ch 1/4 avionics cables (4), stow in Avionics Lg Trash Bag

MATE NOD3 CH 1/4 AVIONICS (00:15)

6. Release Wire Ties holding cable 1/4 to NOD1 HR 0107/0118
7. Route cables to NOD3 nadir avionics panel (HR 0670)
8. Mate the following connectors:
   - ❑ P113 →|← J113 (1/4 cable) – power
   - ❑ P101 →|← J101 (1/4 cable) – power
   - ❑ P105 →|← J105 (1/4 cable)
   - ❑ P103 →|← J103 (1/4 cable)

EV2

INSTALL P612 NOD3 LTA CABLE (00:25)

1. Translate to NOD1 HR 0112 (port/nadir) via fwd route
2. Move Gap Spanner from LAB HR 0208 to NOD1 HR 0112 (stbd)
3. On IV GO, release TA clamps (9) on P612 LTA cable
4. Remove loose cable from TA clamps
5. Demate LTA cable P612 ←|→ dummy receptacle (NOD3)
6. Route P612 to NOD1
7. Demate P1 ←|→ J612 (A/L shell heater cable form NOD1)
8. Install Dust Cap on P1 (from Small Trash Bag)
9. Stow P1 (A/L shell heater cable) with Wire Tie from BRT on NOD1 HR 0132
10. Mate P612 →|← J612 (NOD3 LTA cable to NOD1)
11. Configure MLI as reqd
12. Use pre-integrated Wire Ties to route P612 on NOD1 HR 0132 (port), 0143 (nadir), and 0142 (nadir), keep slack on Node 3 side

EVA 1 NODE 3 AVIONICS CABLES INSTALL (01:20)/NODE 3 LTA CABLE INSTALL (01:00) (Cont)

IV	EV1	EV2
	NOTE J107 dust cap does not get removed DEMATE NOD3 CH 2/3 AVIONICS DUST CAPS (00:10) 9. Remove NOD3 ch 2/3 avionics dust caps (1 set tied together), stow in Avionics Lg Trash Bag ❑ J1FGB ←|→ cap ❑ J110 ←|→ cap ❑ J112 ←|→ cap ❑ J2FGB ←|→ cap ❑ J108 ←|→ cap 10. Remove dust caps from NOD3 ch 2/3 avionics cables (4), stow in Avionics Lg Trash Bag	INSTALL P602 NOD3 LTA CABLE (00:35) 13. Translate to NOD3 P602 (aft loop) 14. Release TA clamps (9) on P602 LTA cable (aft) 15. Remove loose cable from TA clamps 16. Demate LTA cable P602 ←|→ dummy receptacle 17. Route P602 to NOD1 18. Mate P602 →|← J602 (y-jumper) 19. Use pre-integrated Wire Ties on P612 to route P602 on NOD1 HR 0143 (nadir) and 0142 (nadir), keep slack on Node 3 side 20. Use pre-integrated Wire Tie to route P612 on HR 0681 (nadir), keep slack on NOD3 side 21. Use pre-integrated Wire Ties to route P602 on HR 0681 (zenith) and HR 0682 (zenith), keep slack on Node 3 side 22. Close all nadir TA clamps (10) 23. Move Gap Spanner from NOD1 HR 0112 (stbd) to LAB HR 0220 (port)
☐ **Avionics Crewlock Bag** (EV2/EV1) ☐ RET (eq-eq) (outside bag) ☐ RET (eq-eq) (internal D-ring) ☐ J104 Velcro Strap ☐ Adj Equip Tether (internal RET) ☐ J104 Dust Cap ☐ Adj Equip Tether (internal RET) ☐ Adj Equip Tether (internal RET) ☐ Adj Equip Tether (internal RET) ☐ RET w/PIP Pin (eq-eq) (internal D-ring) ☐ Wire Tie Caddy (10, __ left) ☐ **Avionics Lg Trash Bag** (attached to Crewlock Bag) ☐ RET (eq-eq) (outside bag) ☐ NOD3 Avionics Cable Dust Caps (8) ☐ NOD3 Avionics Jack Dust Caps (10) ☐ NOD3 Avionics MLI thermal covers (2)	MATE NOD3 CH 2/3 AVIONICS (00:35) 11. Release Wire Ties holding cable 2/3 to NOD1 HR 0106/0118 12. Route cables to NOD3 aft avionics panel (HR 0671) 13. Mate the following connectors: ❑ P114 →|← J114 (2/3 cable) – power ❑ P110 →|← J110 (2/3 cable) ❑ P112 →|← J112 (2/3 cable) ❑ P108 →|← J108 (2/3 cable) – power ❑ P1 FGB Terminator →|← J1 FGB (from Avionics Crewlock Bag) ❑ P2 FGB Terminator →|← J2 FGB (from Avionics Crewlock Bag) 14. Retrieve P2 FGB BUS Terminator MLI from Avionics Crewlock Bag 15. Install MLI over P2 FGB BUS terminator 16. √Velcro connected and MLI not covering label 17. Retrieve P1 FGB BUS Terminator MLI from Avionics Crewlock Bag 18. Install MLI over P1 FGB BUS terminator 19. √Velcro connected and MLI not covering label 20. Install Wire Ties to route both sets of cables as reqd 21. Retrieve Gap Spanner #2 from Avionics Crewlock Bag 22. Install Gap Spanner #2 (NOD1 HR 0106 (zenith) → NOD3 HR 0673 (zenith))	

EVA 1 TASK DATA – NODE 3 LTA CABLE INSTALL

Estimated Task Duration:

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

Tools:

EV2
Wire Ties (integral to HRs and LTA cables)

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
P612 LTA Cable			
P602 LTA Cable			
P612 Dust Cap			

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
P612 LTA Cable		
P602 LTA Cable		
P612 Dust Cap		

EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
P612				21	
P602				21	
P1				21	

Inhibits:

ORU/Task	Location	Inhibit
P612	Prior to demating P1 from NOD1 J612	612 Demate/mate – RPCM N1-RS1-B – RPCs 1,2,15,16 RPC – Open and Close Command Inhibited
P602	Prior to removing dust cap from J602 NOD1/ESP-2 Y-jumper	602 Mate – RPCM N1-RS2-B – RPCs 1-5, 12-16 RPC – Open and Close Command Inhibited

Notes:

1. No FPP (floating connector) bootie is required for J602/P602 because P602 is built with a grounding cable within the MLI sheath
2.
3.
4.
5.

Timeline Considerations:

1. This task can be shortened if EV1 assists EV2:
2.
3.
4.
5.

EVA 1 TASK DATA – NODE 3 AVIONICS INSTALL

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	01:20
Two EV Crew	N/A	01:00

Tools:

EV1
Lg Trash Bag
Wire Ties (integral to avionics cables)
Wire Tie Caddy

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
Chn 1/4 Cable			
Chn 2/3 Cable			
Chn 1/4 Dust Caps (Cable/Jack)			
Chn 2/3 Dust Caps (Cable/Jack)			
P1/P2 FGB 1553 BUS Terminator			
P1/P2 FGB 1553 BUS Terminator MLI			
NOD3 Avionics MLI			

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
Chn 1/4 Cable		
Chn 2/3 Cable		
Chn 1/4 Dust Caps (Cable/Jack)		
Chn 2/3 Dust Caps (Cable/Jack)		
P1/P2 FGB 1553 BUS Terminator		
P1/P2 FGB 1553 BUS Terminator MLI		
NOD3 Avionics MLI		

EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
P113		NOD3 J113	0		
P101		NOD3 J101	0		
P105		NOD3 J105	0		
P103		NOD3 J103	0		
P114		NOD3 J114	0		
P110		NOD3 J110	0		
P112		NOD3 J112	0		
P108		NOD3 J108	0		
P1 FGB	N/A	NOD3 J1 FGB	0		BUS Termination
P2 FGB	N/A	NOD3 J2 FGB	0		BUS Termination

Inhibits:

ORU/Task	Location	Inhibit
NOD3 Avionics Install	Prior to demating dust caps from NOD3 J113, J101, J114, J108	J113 Connector – MBSU 1 RBI 13 OPEN J108 Connector – MBSU 2 RBI 2 OPEN J114 Connector – MBSU 2 RBI 13 OPEN J101 Connector – MBSU 4 RBI 4 OPEN

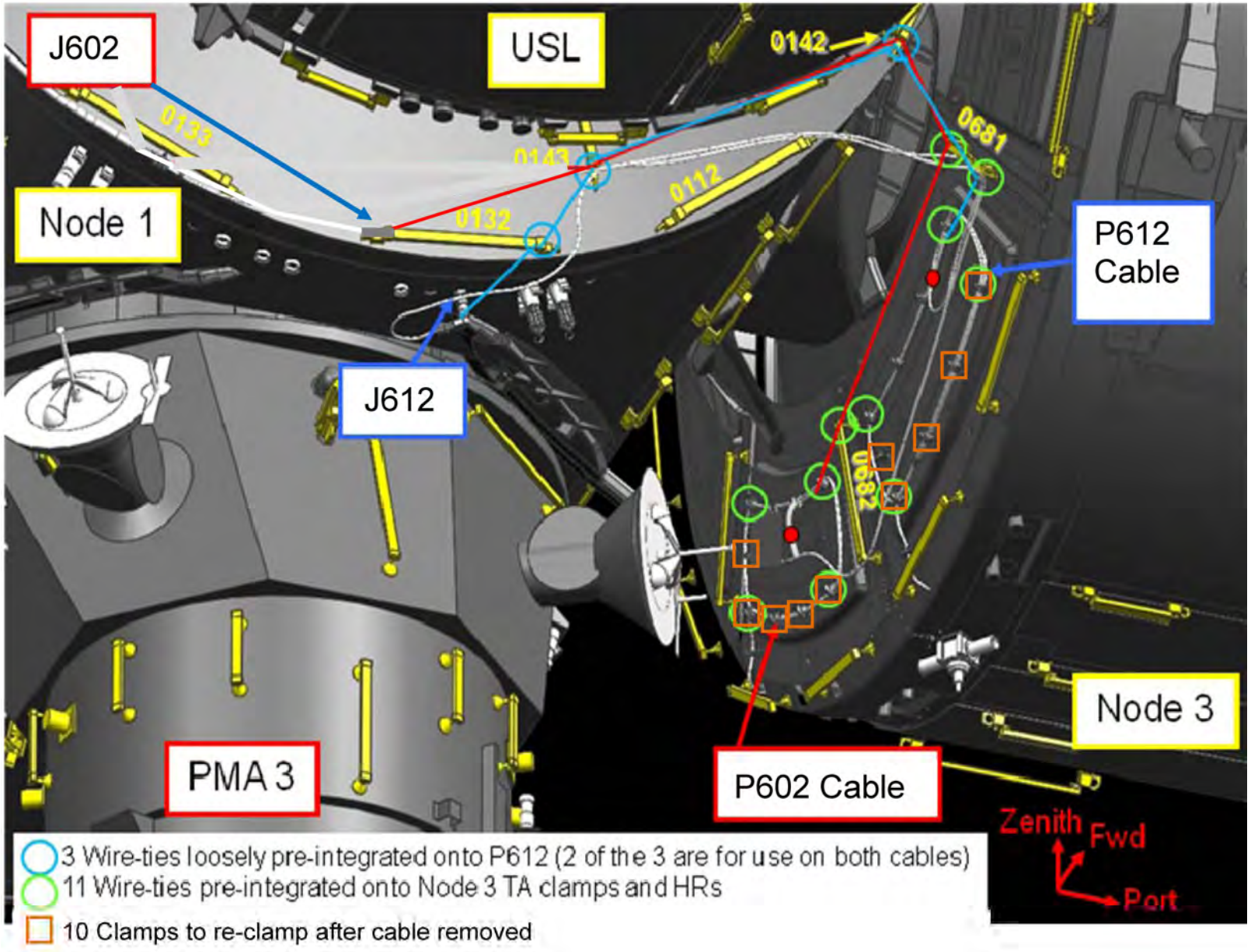
Notes:

1. Inhibits for J105, J103, J110, J108 are not incorporated due to the facts that these cables carry data; inhibits are not needs due to low voltage
2.
3.
4.
5.

Timeline Considerations:

1.
2.
3.
4.
5.

EVA 1 NODE 3 LTA CABLE INSTALL (01:00)



EVA GET-AHEAD (00:15/00:35)

IV	EV1	EV2
	GET-AHEAD 1. Reference FS-??	GET-AHEAD 1. Reference FS-??

EVA 1 CLEANUP/INGRESS (00:25)

IV	EV1 (Be)	EV2 (Pk)
1. Record number of Wire Ties left in Wire Tie Caddy ____	CLEANUP (00:10) 1. Perform Avionics Crewlock Bag/Lg Trash Bag Inventory 2. Perform Tool Inventory 3. Stow Avionics Crewlock Bag/Lg Trash Bag on BRT 4. Translate to A/L	CLEANUP (00:10) 1. Perform Tool Inventory 2. Translate to A/L
	INGRESS (00:15)	INGRESS (00:15) 3. Open thermal cover 4. If applicable, stow OI WIF Crewlock Bag in A/L 5. Retrieve OTP Crewlock Bag from A/L circular HR 0506 (outboard); stow in A/L
	5. Transfer Avionics Crewlock Bag/Lg Trash Bag to EV2 6. Retrieve PCBM Lg Trash Bag from A/L HR 0550, transfer to EV2	6. Receive Avionics Crewlock Bag/Lg Trash Bag from EV1; stow in A/L 7. Receive PCBM Lg Trash Bag from EV1, stow in A/L
		8. Attach Waist Tether to UIA fwd D-ring 9. √Waist Tether ❑ Hook closed and locked
	7. On EV2 GO, relocate EV2 Safety Tether anchor point from fwd A/L D-ring to A/L D-ring Ext 8. Attach Waist Tether to A/L D-ring Ext 9. √Waist Tether ❑ Hook closed and locked 10. Release Safety Tether from aft A/L D-ring, attach to MWS	10. Give EV1 GO to relocate EV2 Safety Tether 11. Ingress A/L
	11. On EV2 GO, ingress A/L 12. Close thermal cover	12. Give EV1 GO to ingress
1. Perform WVS PWR DWN (PHOTO/TV, WVS Cue Card)	13. Remove SCU from stowage pouch 14. Remove DCM cover 15. Connect SCU to DCM, √locked	13. Remove SCU from stowage pouch 14. Remove DCM cover 15. Connect SCU to DCM, √locked
	NOTE A TCV setting 8 – Max C minimizes time for SCU cooling	

EVA 1 CLEANUP/INGRESS (00:25) (Cont)

IV	EV1 (Be)	EV2 (Pk)
	16. Water – OFF (fwd); expect “H2O IS OFF” msg CAUTION Do not close hatch until EMU water off for 2 min 17. Verify no hardware blocking the hatch 18. EV Hatch Handle – verify position per hatch decal 19. EV Hatch – close and lock 20. Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)	16. Water – OFF (fwd); expect “H2O IS OFF” msg

STS-130 (20A) EVA 2 TIMELINE

PET HR : MIN	IV	EV1 (Be)	EV2 (Pk)	
00:00		POST DEPRESS (00:05)	POST DEPRESS (00:05)	00:00
		EGRESS/SETUP (00:35)	EGRESS/SETUP (00:35)	
		NH3 MLI LAYOUT (00:20)	NH3 MLI LAYOUT (00:20)	
01:00		NH3 JUMPER INSTALL (01:25) • Route/Vent F1 Jumper (00:15) • Route/Vent F2 Jumper (00:10) • Mate NOD3 Loop A QDs (00:20) • Route/Vent F4 Jumper (00:10) • Route/Vent F3 Jumper (00:10) • Mate NOD3 Loop B QDs (00:20)	NH3 JUMPER INSTALL (01:25) • Route/Vent F1 Jumper (00:15) • Route/Vent F2 Jumper (00:10) • Mate LAB Loop A QDs (00:20) • Route/Vent F4 Jumper (00:10) • Route/Vent F3 Jumper (00:10) • Mate NOD3 Loop B QDs (00:20)	01:00
02:00				02:00
		NH3 MLI INSTALL (00:45)	NH3 MLI INSTALL (00:45)	
03:00	• Verify Loop A shutdown complete	OPEN LAB LOOP A QDS (00:20) • Open NOD3 Loop A QDs (00:20)	OPEN LAB LOOP A QDS (00:20) • Open LAB Loop A QDs (00:20)	03:00
		NH3 MLI CLOSURE (00:40) • NOD3 Loop A Hood Close (00:10) • NOD3 Loop B Hood Closure (00:10) • NH3 Jumper Cleanup (00:20)	NH3 MLI CLOSURE (00:30) • LAB Hood Closure (00:15) • NH3 Jumper Cleanup (00:15)	
04:00	• Verify Port TRRJ locked	NODE 3 OUTFITTING (01:50) • Keel Pin Cover Install (00:15) • Open NOD3 Nadir CBCS Flap (00:05) • Deploy NOD3 Nadir CBM Petals (00:15) • Install Trunion Covers (00:60)	NODE 3 OUTFITTING (02:00) • NOD3 OIH Install (01:20)	04:00
05:00		• Cleanup NOD3 Gap Spanners (00:15)	• Remove NPV Vent Plate (00:20) • Install ACS NPV (00:20)	05:00
06:00		CLEANUP/INGRESS (00:25)	CLEANUP/INGRESS (00:25)	06:00
06:30		PRE REPRESS (00:05)	PRE REPRESS (00:05)	06:30

EVA 2 BRIEFING CARD

Generic STS-130 EVA Brief: (release folks as you can)

1. Campout (wake-up and start per the timeline to keep ground/flight team in sync) (EV1)
   - Bio-med prior to opening hatch if possible
   - Food requests?
2. Task IV visits A/L to verify tools on suits per timeline: When? (Task IV)
3. Suit-up IVs verify bag/tools in A/L per EVA specific Section 8 (Suit-up IVs)
   - Help required for SAFER install?
   - Pictures?
4. Communications protocol (EV1)
   - (EV1/EV2 during depress/repress, "Break-Break" for messages/emergency response)
   - Lost communication
5. Summary timeline (include get-ahead tasks at end) (Task IV)
6. EVA specific hazards Task IV)
7. First actions (EV1 and EV2)
8. EVA specific concerns (if not addressed during summary timeline brief) (EV1 and All)
9. Retreat plan/path (rapid return, incapacitated, lost crewmember-SAFER ops) (EV1)
10. Lost tools (velocity and direction estimate, when last seen) (EV1)
11. Communications plan for Arm ops (if required) (EVs/IV/M1/R1)
12. Hopping, safety tether awareness, stability and control, get-ahead risk, fatigue

EVA 2 INHIBIT PAD

Orbiter

ALL EVAs

KU-Band Antenna {*prior to egress*}
MCC-H – INCO
1. √KU-BAND Mask – active
2. √KU-BAND EVA Protect Box – active

RCS {*prior to egress*}
If EV crew < 27 feet from FRCS
IV O14,15,16
1. √DAP: VERN, FREE, LO Z (flt specific check with GNC)
2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF
LOGIC (four) – OFF

MCC-H – Prop
3. √Above RCS config

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

Ground

ALL EVAs

Ground Radar {*prior to egress*}
MCC-H – TOPO
1. √TOPO console, ground radar restrictions in place for EVA

USOS

ALL EVAs

PCU {*prior to egress*}

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

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

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

USOS (Cont)

ALL EVAs

CUCU {*prior to egress*}
IV – (LAB1O4)
1. √ cb POWER A, B [two] - OPEN
2. √ cb LINK 1,2 [two] - OPEN

LOCATION DEPENDENT INHIBITS

LAB Window (Setup and NH3 Jumper/MLI Tasks) {*prior to egress*}
IV If EV crew less than 10 feet from window or in window FOV, close window shutter

Open Loop A Jumpers {*prior to task*}
MCC-H – THOR
ETCS Loop A Shutdown per 2.510 ETCS Loop A(B) Pump Module Shutdown (SODF: TCS: Nominal: ETCS)

Port TRRJ (OIH / NPV / Trunnion Cover Install) {*prior to task*}
MCC-H - THOR
1. √DLA (1) – LOCKED

NPV Install {*prior to egress*}
MCC-H - ECLSS
PCS - Node 3: ECLSS: PCA: PCA Commands
Node 3 PCA Commands
1. 'PCA'
Verify State – Monitor
2. 'Positive Pressure Relief'
Verify Status – Inhibited

COL

ALL EVAs

Ham Radio {*prior to egress*}
IV 1. ARISS (Ham Radio) – Deactivate or VHF (144-146 MHz) TX only

JLP

ALL EVAs

ICS-EF Antenna {*prior to egress*}
SSIPC
1. ICS MOD Off
2. ICS UPC Off
3. ICS HPA Off

EVA 2 INHIBIT PAD (Cont)

RSOS

ALL EVAs

SM Antennas {*prior to egress*}

IV 1. GTS – Deactivate

IMPULSE {*prior to egress*}

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

EVAs ON PMA1 OR RSOS (LOCATION DEPENDENT)

Soyuz Thrusters (NOD1/PMA translation path) {*prior to egress*}

MCC-M

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

EVA 2 NOTES/CAUTIONS/WARNINGS

NOTES

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

CAUTION

ISS Generic Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture shafts (drylube)
   2. PIP Pins
   3. Passive UMAs
   4. MBS/SSRMS/SPDM taped radiative surfaces: VDU, ACU, JEU, LEU, MCU, CRPCMs, and Cameras
   5. SPDM SJEU, EP, OTCM, LEU, and LEE VDU radiator surfaces
   6. OTSD

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

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

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

CAUTION

ISS Generic Constraints (cont)

E. For structural reasons
   1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints.
   2. Avoid performing shaking motions (sinusoidal functions) more than four cycles.

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

CAUTION

ISS Truss Constraints

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

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

CAUTION

ISS Truss Constraints (cont)

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

CAUTION

ISS U.S. Pressurized Elements Constraints

A. Avoid inadvertent contact with
1. EVA crane [PMA 1]
2. TCS reflectors [PMA 2, PMA 3]
3. APAS hardware [PMA 2, PMA 3]
4. CETA lights (Z-93 paint) [LAB, S1, Node 1]
5. UHF antennas [LAB, P1]
6. Open CBM petal covers and LAB window shutter
7. S0/Node 2 fluid tray hardlines at Node 2 end, which are limited to 25 lbs

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

EVA 2 NOTES/CAUTIONS/WARNINGS (Cont)

CAUTION

ISS I.P. Elements Constraints

COL

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

JEM

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

B. For structural reasons
   1. Avoid kicking MMOD shields between JLP and JPM.
   2. Avoid tool impact on ICS-EF sensor.

CAUTION

Shuttle Constraints

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

B. No touch
   1. LDRI diffuser [OBSS]
   2. OBSS saddle contacts (when OBSS unberthed) [OBSS]
   3. Monkey fur [PLB]
   4. Cameras: metallic surfaces [PLB]
   5. Ku-Band antenna black dish and gold thermal blankets [PLB]

EVA 2 NOTES/CAUTIONS/WARNINGS (Cont)

WARNING

ISS Generic Constraints

A. Avoid inadvertent contact with
1. Grapple fixture targets and target pins

B. Pinch
1. NZGL connector linkage. Use caution when mating/locking.
2. ITT Cannon connector rotating housing

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

D. Sharp Edges
1. Inner edges of WIF sockets
2. APFR active WIF probes
3. Mating surfaces of EVA connectors Avoid side loads during connector mating.
4. Back side of MMOD shield fasteners
5. Spring loaded captive EVA fasteners (eg 6B-boxes, BMRRM, RTAS, SARJ Covers); the end of the spring may protrude.
6. SPDM OTCM gripper jaws
7. Keep hands away from SSRMS LEE/POA/SPDM LEE opening, snares, and PDGF curvic coupling (teeth).
8. MMOD strikes on ISS exterior

WARNING

ISS Generic Constraints (cont)

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

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

WARNING

ISS Truss Constraints

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

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

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

EVA 2 NOTES/CAUTIONS/WARNINGS (Cont)

WARNING

ISS Truss Constraints (cont)

D. Electrical Shock
1. Stay ≥ 2 ft from ungrounded floating connectors if powered.
   MBS cross-connect jumpers (translate past these using UMA handrails)
   S0 EVA power cables (inside S0 Bay 00 Face 4, Bay 01 Face 3)
   ESP2 jumper (inside S0 Bay 03 Face 4)

E. Thermal
1. ELC may exceed touch temperatures when β > 75 deg.

WARNING

ISS U.S. Pressurized Elements Constraints

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

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

C. RF radiation exposure
1. Stay 1 ft from UHF antenna when powered [LAB, P1].

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

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

WARNING

ISS U.S. Pressurized Elements Constraints (cont)

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

EVA 2 NOTES/CAUTIONS/WARNINGS (Cont)

WARNING

ISS I.P. Elements Constraints

COL
A. Avoid inadvertent contact with
1. SOLAR [COL EPF]

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

JEM
A. Avoid inadvertent contact with
1. ICS-EF sensors

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

WARNING

ISS I.P. Elements Constraints (cont)

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

D. RF radiation exposure
1. Stay 0.3 ft from Fwd/Aft JPM PROX antenna

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

WARNING

Shuttle Constraints

A. Arcing/Molten Debris
1. Stay ≥ 2 ft from exposed EFGF connector when OBSS berthed, powered, and EFGF not grappled [PLB].
2. Stay ≥ 2 ft from exposed Stbd Fwd MPM contacts [PLB].
3. Stay above PLB sill when within 1 ft of powered ROEU connector [PLB].

B. Pinch
1. PRLA operation [PLB]

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

EVA 2 NOTES/CAUTIONS/WARNINGS (Cont)

WARNING

Shuttle Constraints (cont)

D. Sharp Edges
1. PRLA grounding wipers [PLB]
2. LDRI baffles (also an entrapment hazard) [OBSS]
3. Keep hands away from SRMS EE opening and snares
4. TCS connector backshells have exposed threads [ODS]

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

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

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

EVA 2 FLIGHT SPECIFIC NOTES/CAUTIONS/WARNINGS

NOTES

1. Thermal stabilization dwell may be required if holes do not align

CAUTION

A. Fluid QDs
   1. 20-min QD exposure to direct sun without thermal covers can cause seal damage

WARNING

A. Keep Out Zone
   1. CBM Petals will spring open if latches are not engaged

EVA 2 TOOL CONFIG

EV1

- ☐☐ Adj Equip Tether (L wrist)
- ☐☐ MWS
  - ☐☐ BRT (L)
    - ☐☐ RET (eq-eq)
    - ☐☐ Wire Tie (2)
  - ☐☐ T-Bar
    - ☐☐ RET (eq-eq)
    - ☐☐ RET w/PIP Pin
    - ☐☐ Adj Equip Tether (1)
    - ☐☐ Wire Tie (2)
    - ☐☐ Small Shuttle Trash Bag
  - ☐☐ Swing Arm (R)
    - ☐☐ Camera Bracket
      - ☐☐ Camera
- ☐☐ D-ring Extender (2, R & L D-ring)
  - ☐☐ 85-ft Safety Tether (R D-ring Ext)
- ☐☐ Waist Tether (2, R on D-ring to ST & L on D-ring Ext)
- ☐☐ SAFER
- ☐☐ WVS

Tether Counts: (RED RETs)	
RETs (eq-eq) = 16	Adj Equip Tethers = 26
RETs (Lg-eq) = 4	Adj Equip Tethers (Lg-eq) = 1
RETs (PIP Pin) = 5	Fish Stringers = 2

NOTE: Prior to use, inspect the following hardware:

- ❑ RET cords for fraying
- ❑ Load Alleviating Straps (Safety Tether/Waist Tether); ref FS 8-??
- ❑ Trash Bag: Bristle deformation/damage and Hinge damage, after having stowed tools in trash bag
- ❑ IV caps removed on all connectors

EV2

- ☐☐ Adj Equip Tether (L wrist)
- ☐☐ MWS
  - ☐☐ BRT (L)
    - ☐☐ RET (eq-eq)
    - ☐☐ Wire Tie (2)
  - ☐☐ T-Bar
    - ☐☐ RET (eq-eq)
    - ☐☐ RET w/PIP Pin
    - ☐☐ Adj Equip Tether (1)
    - ☐☐ Wire Tie (2)
    - ☐☐ Small ISS Trash Bag
  - ☐☐ Swing Arm (R)
    - ☐☐ RET (eq-eq)
      - ☐☐ PGT [**A2** 3.8 ft-lb, **CAL**, MTL **30.5**] s/n _____
        - ☐☐ PGT Battery s/n _____
        - ☐☐ 7/16 (wobble) Socket-6 ext
- ☐☐ D-ring Extender (2, R & L D-ring)
  - ☐☐ 85-ft Safety Tether (L D-ring Ext)
- ☐☐ Waist Tether (2, R on D-ring Ext & L on D-ring to ST)
- ☐☐ SAFER
- ☐☐ WVS

AIRLOCK CONFIG

- ☐☐ RET (Lg-eq)
  - ☐☐ **OIH Bag** (EV2)
    - ☐☐ Zip Tie (secure lid)
    - ☐☐ Integral Tether (strap through 2nd loop on opposite side of bag; hook to 1st loop and 1/4-turn receptacle on C/L bag)
    - ☐☐ OIH Adj Tether (1 hook to 1st loop and 1/4-turn receptacle on C/L bag; 2 hook to 3rd loop and D-ring on C/L bag; strap through 2nd loop)
    - ☐☐ Adj Equip Tether (clove hitch)
      - ☐■ OIHs (2, 0633, 0634)
    - ☐■ OIHs (6)
  - ☐☐ **Crewlock Bag**
    - ☐☐ RET (outside bag, D-ring opposite integral strap)
    - ■☐ NPV Cover Plate
    - ☐■ NPV (ensure vent open) (tether so does not interfere with structure)
      - ☐■ NPV MLI
      - ☐☐ Base MLI (on integral tether)
    - ☐☐ RET w/PIP Pin
      - ☐☐ 5/16 (rigid) Socket-7 ext

AIRLOCK CONFIG

- ☐■ RET (Lg-eq)
  - ☐■ **Trunnion Cover Crewlock Bag** (EV1)
    - ☐■ RET (eq-eq) (outside)
    - ☐■ RET (eq-eq)
      - ☐■ MMOD T-handle tool (short)
    - ☐■ RET (eq-eq)
      - ☐■ Keel Pin Cover (#5 (top))
    - ☐■ Trunnion Covers (4) (#3, #2, #4, #1 (bottom))
    - ☐■ Adj Equip Tether (1 end outside, 1 end inside)
    - ☐■ Gap Spanner #3 (-305) (on bottom of trunnion covers)

- ☐☐ RET (Lg-eq)
  - ☐☐ PGT [**A2** 3.8 ft-lb, **CAL**, MTL **30.5**] s/n _____
    - ☐☐ PGT Battery s/n _____
    - ☐☐ 7/16 (wobble) Socket-6 ext

- ■☐ RET (Lg-eq)
  - ■☐ **NH3 Jumper Bag** (EV1)
    - ■☐ Adj Equip Tether (3) (outside)
    - ■☐ RET (3) (internal loops)
    - ■☐ Fish Stringer (NOD3)
      - ■☐ NOD3 MLI (2)
      - ■☐ NOD3-end Male QD Caps (4)
    - ■☐ Fish Stringer (LAB)
      - ■☐ RET (eq-eq)
        - ■☐ Male N2 Vent Tool
      - ■☐ LAB-end Male QD Caps (4)
    - ■☐ Adj Equip Tether (4) (from MLI)
    - ■☐ Adj Equip Tether (3) (from MLI Bag)
    - ■☐ Adj (Lg-sm) (Jumper midpoint)
    - ■☐ Wire Ties (4) (integral to bag)
    - ■☐ **Cap Crewlock Bag**
      - ■☐ Adj Equip Tethers (4) (clove hitch on internal RETs)
        - ■☐ Female QD Caps (8)
      - ■☐ RET (eq-eq)
        - ■☐ 1-in Bail Lever Drive
    - ■☐ **Trunnion Cover Crewlock Bag** (EV1)
      - ■☐ RET (eq-eq) (outside)
      - ■☐ RET (eq-eq) (2)
      - ■☐ MMOD T-handle tool (short)
      - ■☐ Adj Equip Tether

EVA 2 TOOL CONFIG (Cont)

AIRLOCK CONFIG (Cont)

- ☐☐ RET (Lg-eq)
  - ☐☐ **Contingency Crewlock Bag**
    - ☐☐ RET w/PIP Pin (outside)
    - ☐☐ Ratchet Wrench (no palm wheel)
      - ☐☐ 7/16 (rigid) Socket-2 ext
    - ☐☐ 1-in QD Release Tool
    - ☐☐ 1-in Button Depress Tool
      - ☐☐ Aft Key Tool (AKT)

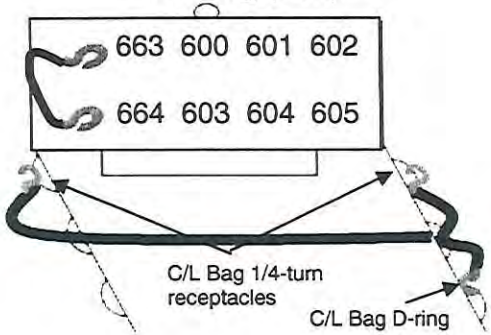
- ☐☐ RET (Lg-eq)
  - ☐☐ **Get-ahead OIH Bag** (EV1)
    - ☐☐ Zip Tie (secure lid)
    - ☐☐ Integral Tether (strap through 2nd loop on opposite side of bag; hook to 1st loop)
    - ☐■ OIHs (5)
    - ☐☐ Adj Equip Tether (2) (clove hitch)
      - ☐■ OI WIFS (3)
      - ☐■ OIH (0612)

- ☐☐ Staging Bag
  - ☐☐ Fish Stringer Tether
    - ☐☐ Wire Tie Caddy
    - ☐☐ Velcro/Tape Caddy
    - ☐☐ PGT s/n _____
      - ☐☐ PGT Battery s/n _____
      - ☐☐ 7/16 (wobble) Socket-6 ext
    - ☐☐ Vise Grips
    - ☐☐ Ratchet Wrench
      - ☐☐ 7/16 (rigid) Socket-9 ext
    - ☐☐ Needle Nose Pliers
    - ☐☐ Spare 55-ft Safety Tether
    - ☐☐ **Hammer**
  - ☐☐ Fish Stringer Tether
    - ☐☐ Connector Cleaner Tool Kit
    - ☐☐ Connector Pin Straightener
    - ☐☐ Probe
    - ☐☐ **Pry Bar**
    - ☐☐ MWS Key Strap Assy
    - ☐☐ **Long Duration Tie-Down Tethers (2)**
    - ☐☐ **Cheater Bar**
    - ☐☐ **Shuttle A/L Hatch Tool (for PRLA)**

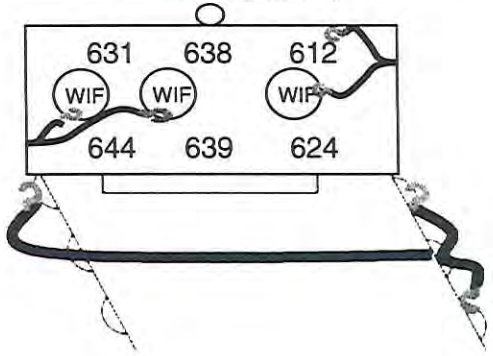
AIRLOCK CONFIG (Cont)

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

OIH Bag (EV2)



OIH Bag (EV1)



EXTERNAL CONFIG

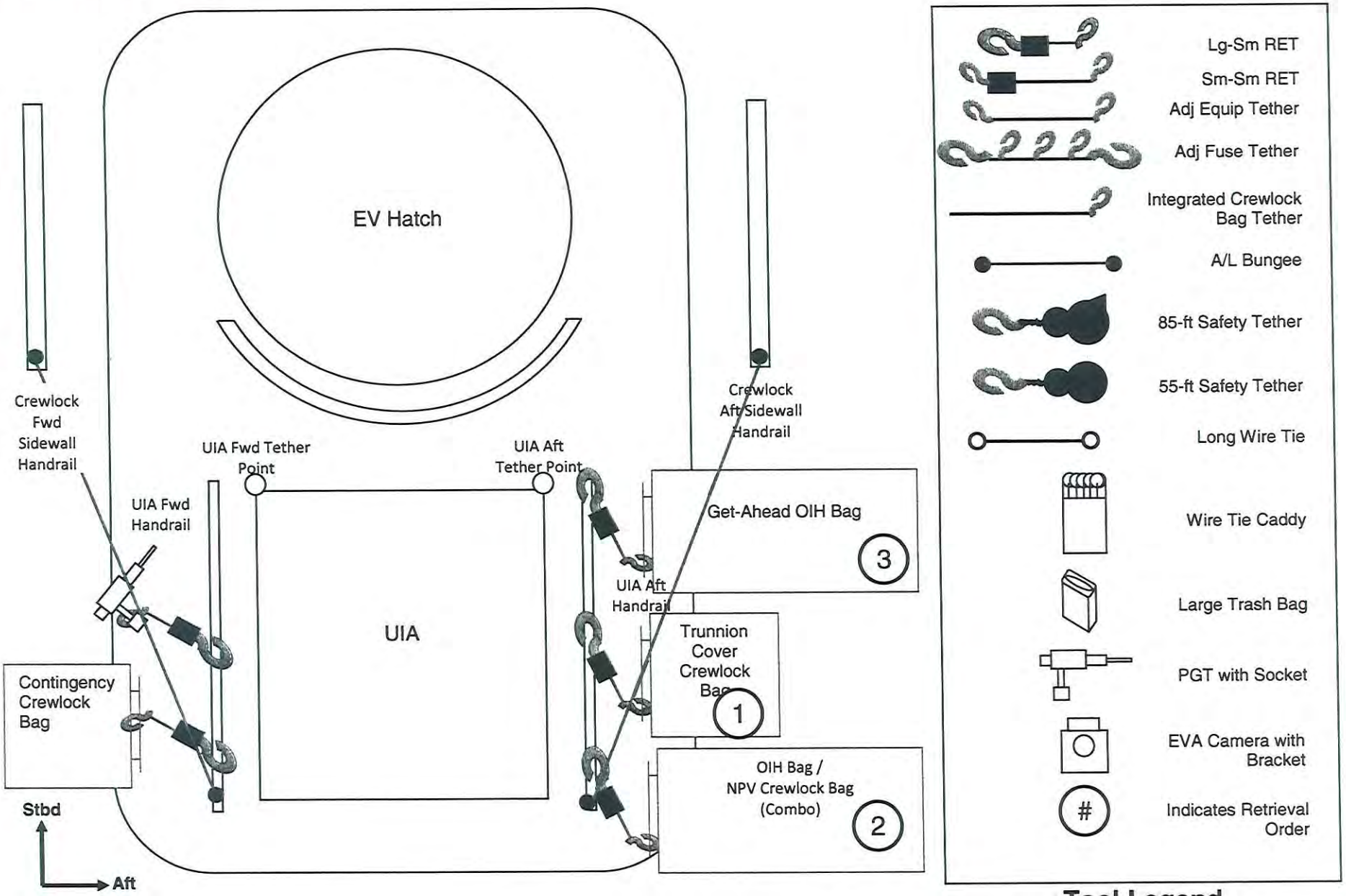
LAB HR 0244/0245

- ☐■ **NH3 Jumper Bag** (flap between each jumper)
  - ☐■ Adj Equip Tether (3) (outside bag)
  - ☐■ RET (3) (eq-eq) (internal loops)
    - ☐■ NH3 Jumpers (3) (M2, M4, M3 (bottom) – NOD3/bent end on RET) (QD caps installed)
      - ☐■ Wire Ties (3) (integral to bag and on each jumper to prevent uncoiling)
    - ☐■ Fish Stringer (sm hook attached to M1 LAB-end bail; 1 Lg hook attached outside bag)
      - ☐■ RET (eq-eq)
        - ☐■ Male N2 Vent Tool
    - ☐■ Fish Stringer (sm hook attached to M1 NOD3-end bail, 1 Lg hook on internal loop and other Lg hook attached outside bag)
      - ☐■ NH3 Jumper (M1) (QD cap installed)
        - ☐■ Adj (Lg-eq) (Jumper #1 midpoint)
        - ☐■ Wire Tie (integral to bag on jumper to prevent uncoiling)
    - ☐■ **Cap Crewlock Bag**
      - ☐■ Adj Equip Tethers (4) (clove hitch on internal RETs)
      - ☐■ RET (eq-eq)
        - ☐■ 1-in Bail Lever Drive

LAB HR 0201/0208/0220

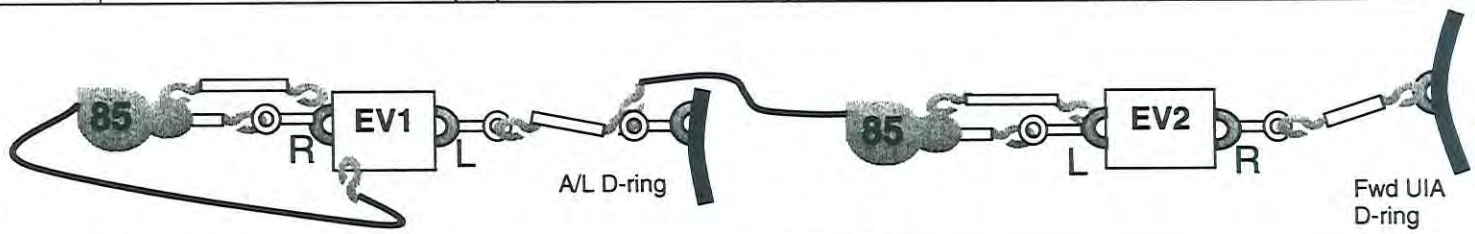
- ☐☐ **NH3 MLI Bag** (Lg ORU Bag) – stays outside for Cupola
  - ☐☐ Adj Equip Tether (3) (outside)
  - ☐☐ RET (eq-eq) (2) (inside, 1 free, 1 to MLI)
    - ☐■ NH3 MLI (√top Velcro tabs folded over, √Loop A/B-end on top, LAB-end on bottom)
      - ☐■ Adj Equip Tether (5) (2 on each LAB-end side MLI, 1 on Loop A-end to Loop B-end, 1 on Loop B-end, 1 at midpoint)
  - ☐■ Adj Equip Tether (2) (across middle and top of MLI to hold in bag)
  - ☐■ Adj Equip Tether (1) (internal straps of lid)
  - ☐■ Gap Spanner α (-305) (1)
  - ☐■ Gap Spanner β, γ, δ (-303) (3)
  - ☐■ Gap Spanner ε (-301) (1)

EVA 2 AIRLOCK CONFIG

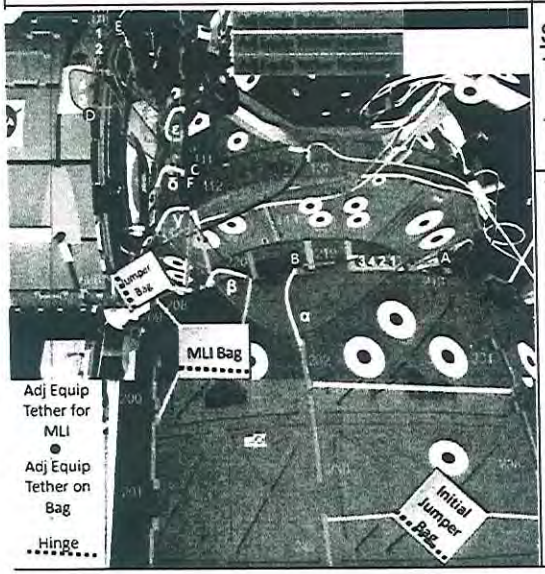


Tool Legend

EVA 2 EGRESS/SETUP (00:35)

IV	EV1 (Be)	EV2 (Pk)
		
	Initial Conditions: ❑ R D-ring ❑ D-ring Ext ❑ A/L 85-ft Safety Tether to MWS ❑ Waist Tether to A/L Safety Tether ERCM ❑ L D-ring ❑ D-ring Ext ❑ Waist Tether to A/L D-ring Ext ❑ Hooks closed and locked (Safety Tether reel end, L Waist Tether)	Initial Conditions: ❑ R D-ring ❑ D-ring Ext ❑ Waist Tether to fwd UIA D-ring ❑ L D-ring ❑ D-ring Ext ❑ A/L 85-ft Safety Tether anchor to A/L D-ring Ext ❑ Waist Tether to A/L Safety Tether ERCM ❑ Hooks closed and locked (Safety Tether reel end, R Waist Tether)
	EGRESS (00:15) 1. Open A/L thermal cover 2. Egress A/L 3. Attach EV1 Safety Tether anchor to aft A/L D-ring ❑ Hook closed and locked ❑ Reel unlocked 4. Release Waist Tether from A/L D-ring Ext 5. Relocate EV2 Safety Tether anchor from internal A/L D-ring Ext to fwd A/L D-ring ❑ Hook closed and locked ❑ Reel unlocked	EGRESS (00:15)
1. Post crew egress: WVS Software: Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max	6. Stow Trunnion Cover Crewlock Bag from EV2 on BRT	1. Transfer Trunnion Cover Crewlock Bag to EV1 2. Transfer OIH Bag/Crewlock Bag to EV1 3. Egress A/L 4. Close A/L thermal cover
	7. Transfer OIH Bag/Crewlock Bag to EV2	5. Receive OIH Bag/Crewlock Bag from EV1, stow on BRT

EVA 2 EGRESS/SETUP (00:35)

IV	EV1 (Be)	EV2 (Pk)
2. √SAFER handles down (MAN ISO vlv (L) – open; HCM (R) – closed)	8. √SAFER handles down 9. √ERCA green LED (if no WVS) 10. √Tethers and Tools	6. √SAFER handles down 7. √ERCA green LED (if no WVS) 8. √Tethers and Tools
	SETUP (00:20) 11. Translate to NOD3 HR 0619 (stbd/aft HR) via aft route 12. Stow Trunnion Cover Crewlock Bag on NOD3 HR 0619	SETUP (00:20) 9. Translate to NOD3 HR 0665 (zenith/fwd HR) via fwd route 10. Stow OIH/Crewlock Bag on NOD3 HR 0665
	13. If Jumper Bag not relocated on EVA 1 a. Translate to receive NH3 Jumper Bag (LAB HR 0208) b. As required, relocate NH3 Jumper Bag from Lab nadir to LAB HR 0209 (nadir), HR 0208 (stbd), and NOD3 HR 0667 (zenith) with Adj Equip Tethers (3), hinge zenith 14. Perform Glove Inspection	11. If Jumper Bag not relocated on EVA 1 a. Translate to NH3 Jumper Bag (LAB HR 0244/0245) b. As required, relocate NH3 Jumper Bag from Lab nadir to LAB HR 0209 (nadir), HR 0208 (stbd), and NOD3 HR 0667 (zenith) with Adj Equip Tethers (3), hinge zenith 12. Verify APFR; LAB WIF 4 **[1,RR,F,12]** 13. Perform Glove Inspection

EVA 2 NH3 MLI LAYOUT (00:20)

IV

√	G-S	1st HR	2nd HR	SN
	α	0219 (port)	0232 (aft)	-305
	β	0220 (port)	0220 (stbd)	-303
	γ	0112 (port)	0142 (stbd)	-303
	δ	0111 (fwd)	0128 (fwd)	-303
	ε	0111 (aft)	0110 (fwd)	-301

EV1 (Be)

NH3 MLI LAYOUT (00:20)

1. Translate to receive Gap Spanners
2. Install Gap Spanners (ε, δ, γ) to 1st HR per table
3. Receive NOD3 side NH3 MLI
4. Attach NOD3 side NH3 MLI to NOD3 HR 0669 (aft) and 0670 (fwd), using Adj Equip Tethers (2) (D and E)
5. Attach NH3 MLI midpoint Adj Equip Tether to HR Bracket (FWD) (F)

EV2 (Pk)

NH3 MLI LAYOUT (00:20)

1. Open NH3 MLI Bag, secure lid
2. Install Gap Spanners (β, α) to 1st HR per table
3. Release Adj Equip Tether restraining 1st half MLI in bag
4. Deploy NOD3 side NH3 MLI to EV1
5. Release Adj Equip Tether restraining 2nd half MLI in bag
6. Attach Lab side NH3 MLI to LAB HR 0218 (stbd) and 0219 (port), using Adj Equip Tethers (2) (A and B)

EVA 2 NH3 JUMPER INSTALL (01:25)

IV	EV1 (Be)	EV2 (Pk)
	CAUTION 20-min QD exposure to direct sun without thermal covers can cause seal damage	
	ROUTE/VENT F1 JUMPER (00:15) 1. √NH3 Jumper Bag tethers cinched on HRs 2. Open NH3 Jumper Bag, secure lid 3. Stow Cap Crewlock Bag on ESP1 HR1 (aft) - leave tethered to NH3 bag 4. Remove F1 QD Jumper Caps (2) (pull back on release ring to demate), stow in Crewlock Bag 5. Release F1 Jumper from Wire Tie	ROUTE/VENT F1 JUMPER (00:15)
	6. Transfer LAB Fish Stringer (w/LAB end of F1 jumper and Vent Tool) to EV2	1. Receive LAB Fish Stringer from EV1
	7. Relocate NOD3 Fish Stringer (w/NOD3 end of F1 jumper) to HR 0669 and 0670 8. Attach sm Adj Equip Tether hook (C) (on jumper #1 midpoint) to NOD1 HR 0111 (fwd)	2. Attach Fish Stringer to LAB HR 0218 and 0219 3. Stabilize on LAB HR 0219 4. Retrieve Vent Tool from Fish Stringer; remove QD cap 5. Perform Block A – Vent OPS for F1: EVA QD OPS CUE CARD
	ROUTE/VENT F2 JUMPER (00:10) 9. Translate to Jumper Bag 10. Remove F2 QD Jumper Caps (2) (pull back on release ring to demate), stow in Crewlock Bag 11. Release F2 Jumper from Wire Tie	ROUTE/VENT F2 JUMPER (00:10)
	12. Transfer LAB end of F2 jumper to EV2 13. Route NOD3 end of F2 jumper to NOD3 Fish Stringer	6. Receive LAB end of F2 jumper from EV1 7. Attach F2 QD bail to LAB Fish Stringer
	14. Attach F2 midpoint to NOD1 HR 0111 Adj Equip Tether (C) (Lg hook) 15. Verify no kinks/twists in lines	8. Perform Block A – Vent OPS for F2: EVA QD OPS CUE CARD 9. Install QD cap on Vent Tool 10. Verify no kinks/twists in lines

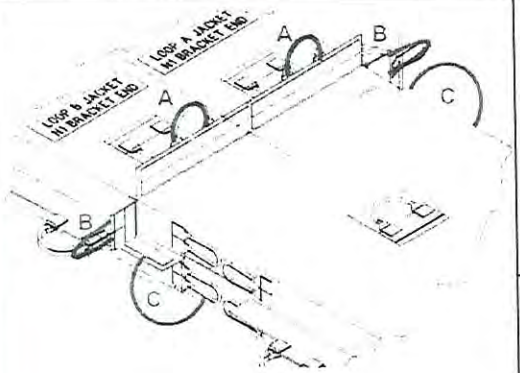
EVA 2 NH3 JUMPER INSTALL (01:25)

IV	EV1 (Be)	EV2 (Pk)
	MATE NOD3 LOOP A QDs (00:20) 16. Remove NOD3 M1/M2 MLI, stow on Fish Stringer 17. Perform Block B – Mate Ops for NOD3 F1/M1 (aft QD): EVA QD OPS CUE CARD 18. Perform Block B – Mate Ops for NOD3 F2/M2: EVA QD OPS CUE CARD	MATE LAB LOOP A QDs (00:20) 11. Open LAB MLI QD cozy 12. Ingress APFR; LAB WIF 4 **[1,RR,F,12]**
		13. Perform Block B – Mate Ops for LAB F1/M1 (stbd QD): EVA QD OPS CUE CARD 14. Perform Block B – Mate Ops for LAB F2/M2: EVA QD OPS CUE CARD
	ROUTE/VENT F4 JUMPER (00:10) 19. Translate to NH3 Jumper Bag 20. Remove F4 QD Jumper Caps (2) (Pull back on release ring to demate QD), stow in Crewlock Bag 21. Release F4 Jumper form Wire Tie	ROUTE/VENT F4 JUMPER (00:10)
Potential get aheads: ☐ Stage C/L Bag tethers for caps ☐ Relocate Adj Eq Tethers (3) from MLI bag to NH3 bag ☐ Close NH3 MLI bag ☐ Route NH3 lines inside MLI	22. Transfer LAB end of F4 jumper to EV2 23. Route NOD3 end of F4 jumper to NOD3 Fish Stringer 24. Attach F4 midpoint to NOD 1 HR 0111 Adj Equip Tether (C) (Lg hook)	15. Receive LAB end of F4 jumper from EV1 16. Attach F4 QD bail to LAB Fish Stringer 17. Retrieve Vent Tool from LAB Fish Stringer; remove QD cap 18. Perform Block A – Vent OPS for F4: EVA QD OPS CUE CARD
	ROUTE/VENT F3 JUMPER (00:10) 25. Translate to NH3 Jumper Bag 26. Remove F3 QD Jumper Caps (2) (Pull back on release ring to demate QD), stow in Crewlock Bag 27. Release F3 Jumper from Wire Tie	ROUTE/VENT F3 JUMPER (00:10)
	28. Transfer LAB end of F3 jumper to EV2 29. Route NOD3 side F3 jumper to NOD3 Fish Stringer 30. Attach F3 midpoint to NOD 1 HR 0111 Adj Equip Tether (C) (Lg hook) 31. Verify no kinks/twists in lines	19. Receive LAB end of F3 jumper from EV1 20. Attach F3 QD bail to LAB Fish Stringer 21. Perform Block A – Vent OPS for F3: EVA QD OPS CUE CARD 22. Install QD cap on Vent Tool 23. Verify no kinks/twists in lines

EVA 2 NH3 JUMPER INSTALL (01:25)

IV	EV1 (Be)	EV2 (Pk)
	MATE NOD3 LOOP B QDs (00:20) 32. Translate to NOD3 M3/M4 33. Remove NOD3 M3/M4 MLI, stow on Fish Stringer 34. Perform Block B – Mate Ops for F4/M4 (aft QD): EVA QD OPS CUE CARD 35. Perform Block B – Mate Ops for F3/M3: EVA QD OPS CUE CARD	MATE LAB LOOP B QDs (00:20) 24. BRT to LAB HR 0219 25. Move F4/M4 to RET
	36. √MLI around NOD3 QD panel securely attached	26. Perform Block B – Mate Ops for F4/M4 (stbd QD) : EVA QD OPS CUE CARD 27. Move F3/M3 to RET 28. Perform Block B – Mate Ops for F3/M3: EVA QD OPS CUE CARD

EVA 2 NH3 MLI INSTALL (00:45)

<table>
<tr><th>IV</th><th>EV1 (Be)</th><th>EV2 (Pk)</th></tr>
<tr><td rowspan="2"> 
</td><td><u>NOD3 SIDE NH3 MLI INSTALL</u> (00:15)

1. Close Loop A MLI around M1 and M2 jumpers
2. Mate Loop A MLI side Velcro tabs
3. √Tabs (1→8) are aligned
4. Close Loop B MLI around M3 and M4 jumpers
5. Mate Loop B MLI side Velcro tabs
6. √Tabs (1→6) are aligned</td><td><u>LAB SIDE NH3 MLI INSTALL</u> (00:15)

1. Close LAB MLI around all 4 jumpers
2. Mate LAB MLI side Velcro tabs
3. √Tabs (1→11) are aligned</td></tr>
<tr><td><u>NH3 MLI INTERFACE INSTALL</u> (00:10)

7. Retrieve Adj Equip Tether
❑ Jumper Midpoint Lg-sm on NOD1 HR 0111 (C)
8. Mate NOD3 side to LAB side Velcro tabs (A, B, C)
9. Install MLI grounding PIP pin in HR Bracket
10. Perform WVS survey of bracket interface</td><td><u>NH3 MLI INTERFACE INSTALL</u> (00:10)

4. Mate NOD3 side to LAB side Velcro tabs (A, B, C)</td></tr>
<tr><td></td><td><u>GAP SPANNER INSTALL</u> (00:20)

11. Install Gap Spanners around NH3 MLI, smooth creases
12. Retrieve Adj Equip Tether
❑ MLI Midpoint on NOD1 HR 0111 (F)</td><td><u>GAP SPANNER INSTALL</u> (00:20)

5. Install Gap Spanners around NH3 MLI, smooth creases</td></tr>
<tr><td>1. Verify ETCS Loop A shutdowns complete, give EVs GO to open QDs</td><td colspan="2"><table>
<tr><th>Installed √</th><th>Gap Spanner</th><th>1st HR</th><th>2nd HR</th><th>SN</th></tr>
<tr><td></td><td>α</td><td>0219 (port)</td><td>0232 (aft)</td><td>-305</td></tr>
<tr><td></td><td>β</td><td>0220 (port)</td><td>0220 (stbd)</td><td>-303</td></tr>
<tr><td></td><td>γ</td><td>0112 (port)</td><td>0142 (stbd)</td><td>-303</td></tr>
<tr><td></td><td>δ</td><td>0111 (fwd)</td><td>0128 (fwd)</td><td>-303</td></tr>
<tr><td></td><td>ε</td><td>0111 (aft)</td><td>0110 (fwd)</td><td>-301</td></tr>
</table></td></tr>
</table>

EVA 2 OPEN LOOP A QDS (00:20)

IV	EV1 (Be)	EV2 (Pk)
	OPEN NOD3 LOOP A QDs (00:20) 1. Perform NOD3 Nadir CBM Ops as time permits	OPEN LAB LOOP A QDs (00:20) 1. If reqd, ingress APFR 2. On IV GO, perform Block C – Open Valve Ops for LAB M1/F1: EVA QD OPS CUE CARD 3. Perform Block C – Open Valve Ops for LAB M2/F2: EVA QD OPS CUE CARD
	2. On IV GO, perform Block C – Open Valve Ops for NOD3 M1/F1: EVA QD OPS CUE CARD 3. Perform Block C – Open Valve Ops for NOD3 M2/F2: EVA QD OPS CUE CARD	4. If reqd, egress APFR (avoid contact with jumpers), position Ingress Aid against module
1. Once all bails are open, give **MCC-H** GO to restart ETCS LOOP A	4. √MLI around NOD3 QD panel securely attached 5. Relocate NOD3 Fish stringer for MLI install (HR 0669)	

EVA 2 NH3 MLI CLOSURE (00:40/00:30)

IV

☐ RET (Lg-eq)
- ☐ **NH3 Jumper Bag** (EV1)
  - ☐ Adj Equip Tether (3) (outside)
  - ☐ RET (3) (internal loops)
  - ☐ Fish Stringer (NOD3)
    - ☐ NOD3 MLI (2)
    - ☐ NOD3-end Male QD Caps (4)
  - ☐ Fish Stringer (LAB)
    - ☐ RET (eq-eq)
      - ☐ Male N2 Vent Tool
    - ☐ LAB-end Male QD Caps (4)
  - ☐ Adj Equip Tether (4) (from MLI)
  - ☐ Adj Equip Tether (3) (from MLI Bag)
  - ☐ Adj (Lg-sm) (Jumper midpoint)
  - ☐ Wire Ties (4) (integral to bag)
  - ☐ **Cap Crewlock Bag**
    - ☐ Adj Equip Tethers (4) (clove hitch on internal RETs)
      - ☐ Female QD Caps (8)
    - ☐ RET (eq-eq)
      - ☐ 1-in Bail Lever Drive

1. Verify Port TRRJ locked

EV1 (Be)

NOD3 LOOP A MLI CLOSURE (00:10)

1. Close Loop A hood
2. Secure hood over QDs with cinch hook
3. Perform WVS survey of QD interface
   √ No gaps
4. Retrieve Adj Equip Tether (1)
   ❑ Loop A MLI to NOD3 HR 0670 (E)

NOD3 LOOP B MLI CLOSURE (00:10)

5. Close Loop B hood
6. Secure hood over QDs with cinch hook
7. Perform WVS survey of QD interface
   √ No gaps
8. Retrieve Adj Equip Tether (1)
   ❑ Loop A MLI to NOD3 HR 0669 (D)
9. √ MLI final config (Loop A, Loop B)

	Loop A	Loop B
Side tabs mated		
QD hoods cinched		
Bracket interface		

JUMPER CLEANUP (00:20)

10. Retrieve Fish Stringer from NOD3 HR 0669
11. Stow Fish Stringer and Adj Equip Tethers (3) in NH3 Jumper Bag
12. Relocate Adj Equip Tethers (3) from inside NH3 MLI Bag to NH3 Jumper Bag
13. Perform NH3 Jumper Bag inventory
14. Close NH3 Jumper Bag
15. Perform NH3 MLI Bag inventory
16. Close NH3 MLI Bag
17. Perform Glove Inspection

EV2 (Pk)

LAB MLI CLOSURE (00:15)

1. Close LAB hood
2. Secure hood over QDs with cinch hook
3. Perform WVS survey of QD interface
   √ No gaps
4. Retrieve Adj Equip Tethers (2)
   ❑❑ LAB MLI to LAB HR 0218 and 0219 (A and B)
5. √ MLI final config (LAB):

	LAB
Side tabs mated	
QD hoods cinched	
Bracket interface	
Grounding PIP Pins	

JUMPER CLEANUP (00:15)

6. Retrieve Fish Stringer from LAB HR 0219
7. Stow Adj Equip Tethers (2) on Fish Stringer
8. Stow Fish Stringer in NH3 Jumper Bag
9. Perform Glove Inspection

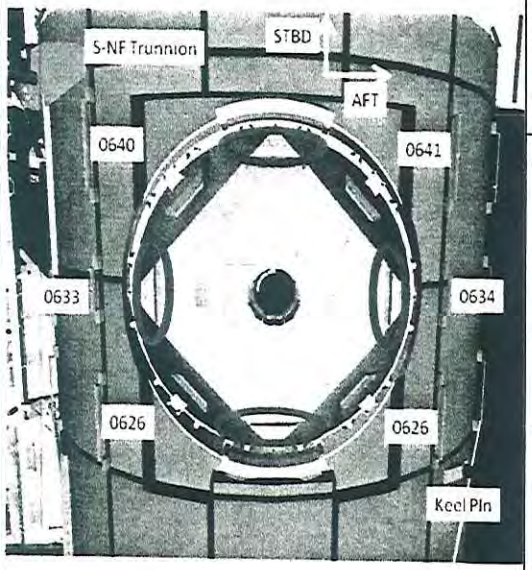
EVA 2 NODE 3 OUTFITTING (01:50/02:00)

IV

1. Use Camera B & C for Keel Pin views

2. Use Camera B & C for CBM views

NODE 3 Nadir CBM



EV1 (Be)

KEEL PIN COVER INSTALL (00:15)

1. Retrieve Keel Pin Cover #5 from Trunnion Cover Crewlock Bag (NOD3 HR 0619)
2. Translate to Keel Pin (points aft/nadir)
3. Open Velcro flaps around keel pin (2)
4. Attach Keel Pin Cover #5 (tether loops stbd)
5. Attach Velcro flaps onto cover
6. √Velcro secure

OPEN NOD3 NADIR CBCS FLAP (00:05)

7. Translate to NOD3 Nadir CBCS flap
8. Expose mating Velcro
9. Release flap fastener snap
10. Open CBCS flap, secure with mating Velcro and snap
11. √Velcro secure

DEPLOY NOD3 NADIR CBM PETALS (00:15)

> WARNING
> CBM Petals will spring open if latches are not engaged

12. Release launch locks (2) for all 4 petals
    ❑ Port (2) ❑ Stbd (2) ❑ Fwd (2) ❑ Aft (2)
13. Visually inspect PCBM sealing surface, if petals open

EV2 (Pk)

NOD 3 OIH INSTALL (01:20)

1. Translate to NOD3 HR 0665; BRT to HR
2. Install OIHs in the following order, per block D – OIH Install:

√	OIH	Location Type	Bolt 1 Trq (ft-lb)/ Turns		Bolt 2 Trq (ft-lb)/ Turns	
	0664	Circumferential				
	0663	Circumferential				
	0600	Longitudinal				
	0601	Longitudinal				
	0602	Longitudinal				
	0603	Longitudinal				
	0604	Longitudinal				
	0605	Longitudinal				

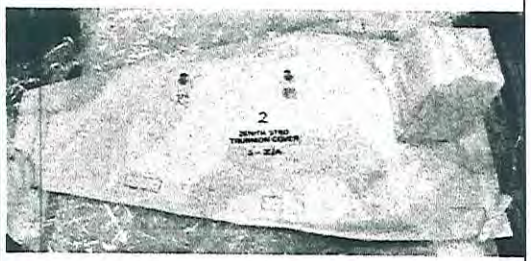
Block D – OIH Install

1. √Soft dock armed
2. √Label and orientation matches module
3. Install OIH; √fully seated
4. Drive bolts (2) **[A2,CW2,30.5]** ~8 turns
   - ❑ 7/16-in (wobble) Socket-6-in ext
   - ❑ (3.8 ft-lb, 30 RPM)
5. √Fully seated

EVA 2 NODE 3 OUTFITTING (01:50/02:00) (Cont)

IV

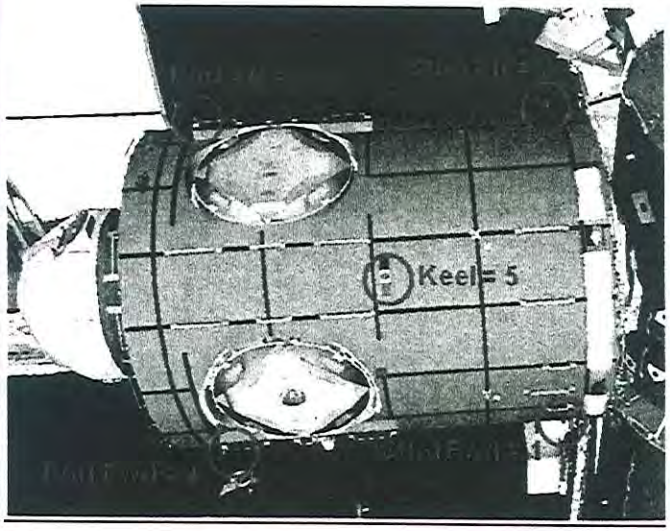
Block E – Trunnion Cover Install
1. Retrieve T-handle Tool and Trunnion Cover from Trunnion Cover Crewlock Bag (NOD1 HR 0118)
2. Translate to worksite
3. Mate ¼-turn fasteners (2) (use alignment markings on covers)
4. Secure Velcro



EV1 (Be)

INSTALL TRUNNION COVERS (01:00)

14. Install Trunnion Covers per Block E – Trunnion Cover Install
    - ❑ #3 P-ZA
    - ❑ #2 S-ZA (BRT to NOD3 HR 0677) (1 of 2 fasteners)
    - ❑ #4 P-NF
    - ❑ #1 S-NF
15. Perform Glove Inspection
16. Stage Gap Spanner #3 (NOD3 HR 0667 (nadir) → LAB HR 0208 (zenith))



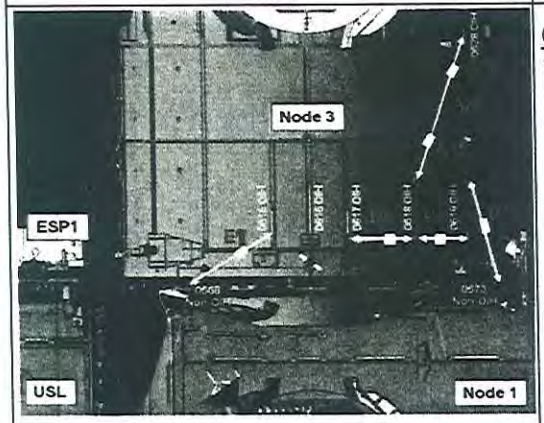
EV2 (Pk)

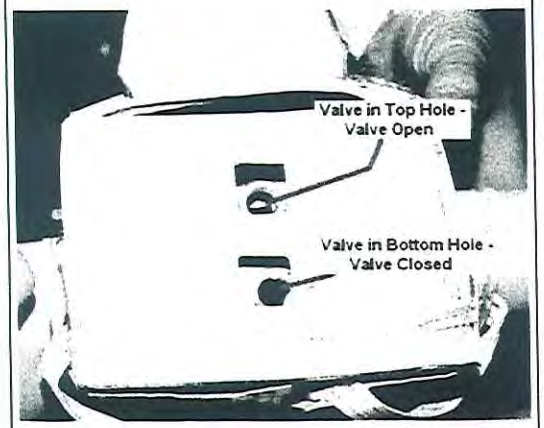
REMOVE NPV VENT PLATE (00:20)

3. Translate to HR 0608 (fwd/circ HR – port endcone)
4. Stow OIH/Crewlock Bag on HR 0608
5. RET to Vent Plate with OIH Crewlock Bag RET
6. Swap PGT Socket to 5/16-in (rigid) Socket-7-in ext
7. Release Vent Plate bolts (4) **[A5,CCW2,30.5]** ~10 turns
   - ❑ 5/16-in (rigid) Socket-7-in ext
   - ❑ (7.0 ft-lb, 30 RPM)
8. Retrieve base MLI from OIH Crewlock Bag
9. Attach MLI to Vent Plate, stow in Crewlock Bag
10. Swap PGT Socket to 7/16-in (wobble) Socket-6-in ext

EVA 2 NODE 3 OUTFITTING (01:50/02:00) (Cont)

IV





EV1 (Be)

CLEAN UP NOD3 GAP SPANNERS (00:15)

17. Remove tape on gap spanner per table below; stow in Small Trash Bag

Tape #	HR (stand off)	→	HR (stand off)	√ Removed	√ Turn Test
A1 A2 A3	NOD3 0618 (port)		NOD3 0628 (stbd)	(3 pieces)	
B	NOD3 0673 (zenith)		NOD3 0619 (port)		
C	NOD3 0619 (stbd)		NOD3 0618 (stbd)		
D	NOD3 0618 (stbd)		NOD3 0617 (stbd)		
E	NOD3 0615 (stbd)		NOD3 0668 (fwd)		

EV2 (Pk)

INSTALL ACS NPV (00:20)

11. Retrieve NPV from OIH Crewlock Bag
12. √NPV is open (valve position in outboard hole)

NOTE
Thermal stabilization dwell may be required if holes do not align

13. Soft dock NPV to alignment guide (tether point outboard)
14. Open NPV thermal cover lid
15. Hand start bolts 2-3 turns using X pattern
16. Drive NPV bolts (4), using X pattern **[A2,CW2,30.5]** ~10 turns
    - ❑ 7/16-in (wobble) Socket-6-in ext
    - ❑ (3.8 ft-lb, 30 RPM)

Bolt	Trq (ft-lb)	Turns
1		
2		
3		
4		

17. Close NPV thermal cover
18. Perform OIH Bag/Crewlock Bag inventory
19. Stow OIH Bag/Crewlock Bag on BRT
20. Perform Glove Inspection

EVA 2 CLEANUP/INGRESS (00:25) (Cont)

IV	EV1 (Be)	EV2 (Pk)
	CLEANUP (00:10) 1. Stow Trunnion Cover Crewlock Bag on NH3 Jumper Bag 2. Perform Tool Inventory 3. BRT to NH3 Jumper Bag 4. Install Gap Spanner #3 (NOD3 HR 0667 (nadir) → LAB HR 0208 (zenith)) 5. Translate to A/L	CLEANUP (00:10) 1. If time, relocate MLI Bag near NOD3 nadir CBM (HR 641) 2. If time, move Gap Spanner from LAB HR 0200 to NOD1 HR 0112 (port) 3. Perform Tool Inventory 4. Translate to A/L
	INGRESS (00:15)	INGRESS (00:15) 5. Open thermal cover 6. Stow OIH/Crewlock Bag in A/L 7. Ingress A/L 8. Attach Waist Tether to UIA fwd D-ring 9. √Waist Tether ❑ Hook closed and locked
	6. Transfer NH3 Jumper Bag to EV2 7. On EV2 GO, relocate EV2 Safety Tether anchor point from fwd A/L D-ring to A/L D-ring Ext 8. Attach Waist Tether to A/L D-ring Ext 9. √Waist Tether ❑ Hook closed and locked 10. Release Safety Tether from aft A/L D-ring, attach to MWS	10. Receive NH3 Jumper Bag from EV1, stow in A/L 11. Give EV1 GO to relocate EV2 Safety Tether
	11. On EV2 GO, ingress A/L 12. Close thermal cover (Velcro tab)	12. Give EV1 GO to ingress
1. Perform WVS PWR DWN (PHOTO/TV, WVS Cue Card)	13. Remove SCU from stowage pouch 14. Remove DCM cover 15. Connect SCU to DCM, √locked	13. Remove SCU from stowage pouch 14. Remove DCM cover 15. Connect SCU to DCM, √locked

EVA 2 CLEANUP/INGRESS (00:25) (Cont)

IV	EV1 (Be)	EV2 (Pk)
	NOTE A TCV setting 8 – Max C minimizes time for SCU cooling	
	16. Water – OFF (fwd); expect "H2O IS OFF" msg CAUTION Do not close hatch until EMU water off for 2 min 17. Verify no hardware blocking the hatch 18. EV Hatch Handle – verify position per hatch decal 19. EV Hatch – close and lock 20. Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)	16. Water – OFF (fwd); expect "H2O IS OFF" msg

EVA 2 TASK DATA – NH3 JUMPER VENT AND INSTALL

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	N/A
Two EV Crew	N/A	01:25

Tools:

EV1	EV2
Fish Stringer	Fish Stringer
Adj Equip Tether (Lg-eq)	Vent Tool

Foot Restraints:

Task	WIF	APFR Setting
NH3 Loop A Mate (EV2 LAB side)	LAB 04	[1,RR,F,12]

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
M1 and M2	683-99525		
QD booties	683-63447-2 (right) 683-63447-3 (left)		
QD Dust Caps			

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
M1 and M2		
QD booties		
QD Dust Caps		

EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
M1/M2 Jumpers	LAB M1/M2	NOD3 M1/M2	1 each	1"	NOD3 Primary Cooling

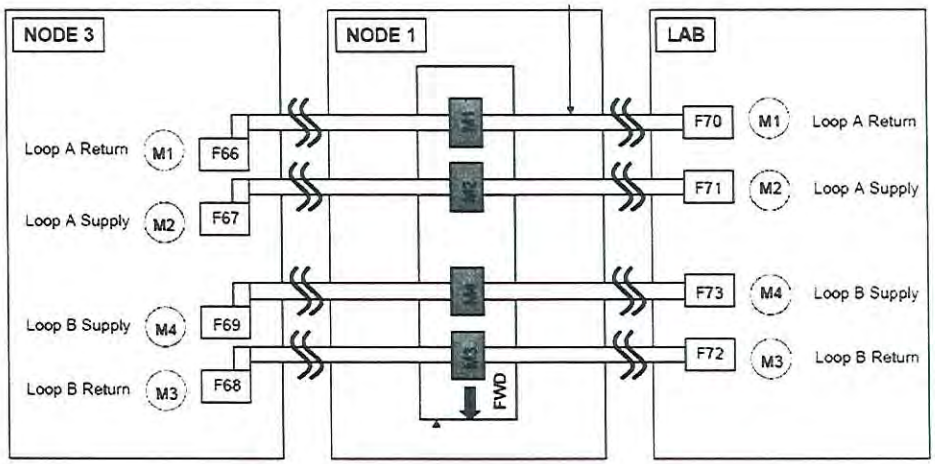
Inhibits:

ORU/Task	Location	Inhibit
M1/M2 jumper mate	Prior to removing caps from LAB and NOD3	ETCS Loop A Shutdown per 2.510 ETCS Loop A(B) Pump Module Shutdown (SODF: TCS: Nominal: ETCS)

Notes:

Timeline Considerations:

1. QDs may be opened in any order



EVA 2 TASK DATA – NH3 MLI INSTALL

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	N/A
Two EV Crew	N/A	01:55+00:40

Tools:

EV1	EV2
Wire Ties (integral to NOD1 HR bracket)	Wire Ties (integral to NOD1 HR bracket)
Adj Equip Tethers	Adj Equip Tethers

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
LAB NH3 MLI			
NOD3 LOOP A NH3 MLI			
NOD3 LOOP B NH3 MLI			

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
LAB NH3 MLI		
NOD3 LOOP A NH3 MLI		
NOD3 LOOP B NH3 MLI		

Notes:

1.
2.
3.
4.
5.

Timeline Considerations:

1.
2.
3.
4.
5.

EVA 2 TASK DATA – KEEL PIN/TRUNNION COVER INSTALL

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	01:05
Two EV Crew	N/A	00:45

Tools:

EV1
MMOD T-handle Tool (short)

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
Keel Pin Cover			
Trunnion Covers (4)			

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
Keel Pin Cover		
Trunnion Covers (4)		

EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Trunnion Cover 1/4-Turn grounding fasteners			2/cover				1/4	

Notes:

1.
2.
3.
4.
5.

Timeline Considerations:

1.
2.
3.
4.
5.

EVA 2 TASK DATA – NODE 3 CBM PREP

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:20

Tools:

EV1
Adj Equip Tether

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
CBM Petal			
NOD3 Nadir CBCS Flap			

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
CBM Petal		
NOD3 Nadir CBCS Flap		

Notes:

1.
2.
3.
4.
5.

Timeline Considerations:

1. Must be opened prior to Cupola berthing to NOD3 nadir; can be accomplished by either crewmember
2.
3.
4.
5.

EVA 2 TASK DATA – NODE 3 OIH INSTALL

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	01:20

Tools:

EV2
PGT w/7/16 (wobble) Socket-6 ext

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
OIH			

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
OIH		

EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
OIH Bolts		7/16	2/OIH					

Notes:

1. Safety tethering to on-orbit installed OIHs, specifically those installed with a PGT setting of 'A2,' is acceptable
2.
3.
4.
5.

Timeline Considerations:

1.
2.
3.
4.
5.

EVA 2 TASK DATA – NPV INSTALL

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:40

Tools:

EV2
PGT w/7/16 (wobble) Socket-6 ext
5/16 (rigid) Socket-7 ext

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
NPV			
NPV Cover Plate			
NPV MLI			
NPV Base MLI			

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
NPV		
NPV Cover Plate		
NPV MLI		
NPV Base MLI		

EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
NPV		5/16	4	3.9				
NPV Cover Plate		7/16	4					

Notes:

1. H2, CO2, and MCA NPVs (3) are contingency only, and are not launched on 20A
2. NPV is launched in NOD3
3. Valve open/close bolt has machine/wear markings on it
4. Small metal debris shavings were noticed on O-ring during CEIT
5. The NPV base MLI will be removed from the NPV and installed on the NPV Cover Plate assy. If there is a problem with the NPV, the NPV Cover Plate would be re-installed to protect sealing surface

Timeline Considerations:

1. If internal valve is unable to be check out correctly, the NPV is required to depress the Cupola volume; priority of this task will be raised so that it is to be completed right after NH3 MLI Closure Task
2.
3.
4.
5.

EVA 2 TASK DATA – NODE 3 GAP SPANNER INSTALL/CLEANUP

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	00:20

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
On-orbit Installed Gap Spanner			
Ground Installed Gap Spanner			

Mass & Dimensions:

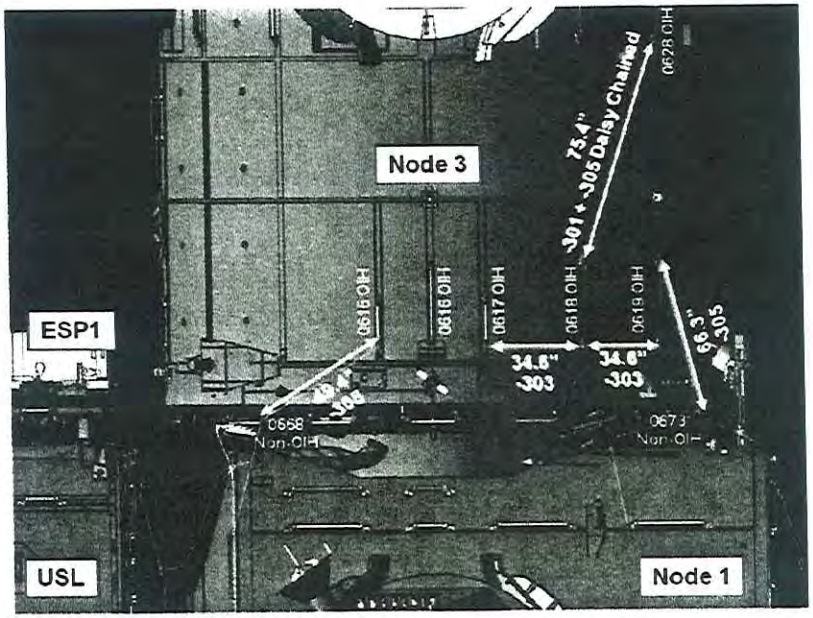
ORU	Mass (lb)	Dimensions (in)
On-orbit Installed Gap Spanner		
Ground Installed Gap Spanner		

Notes:

1. Two Gap Spanners are installed during EVA 1; 1 is installed on EVA 2 during cleanup
2.
3.
4.
5.

Timeline Considerations:

1.
2.
3.
4.
5.



20A EVA CUE CARD

Block A – Vent Ops

1. Remove female QD bootie
2. Inspect male and female QDs for debris or damage
3. On female QD:
   - √Detent button – up
   - √Locking collar – locked position
   - √Fwd white band – not visible
4. Mate QD
   - √Fwd white band – visible
5. Perform snapback test
   - √Fwd white band visible
6. Perform pull test
7. Perform visual gap test
8. Locking collar – unlocked
9. Open valve (Press detent button and push bail to forward position)
   - √Aft white band visible
   - √Detent button – up
10. Wait 10 sec for venting
11. Push bail fwd significant force while pressing detent button, then move bail aft (close valve)
    - √Fwd white band visible
    - √Detent button up
12. Locking collar – locked
13. Pull back on release ring and demate QD
    - √Release ring – retracted
    - √Fwd white band not visible
14. Inspect male and female QD for debris or damage
15. Install female QD bootie

Block B – Mate Ops

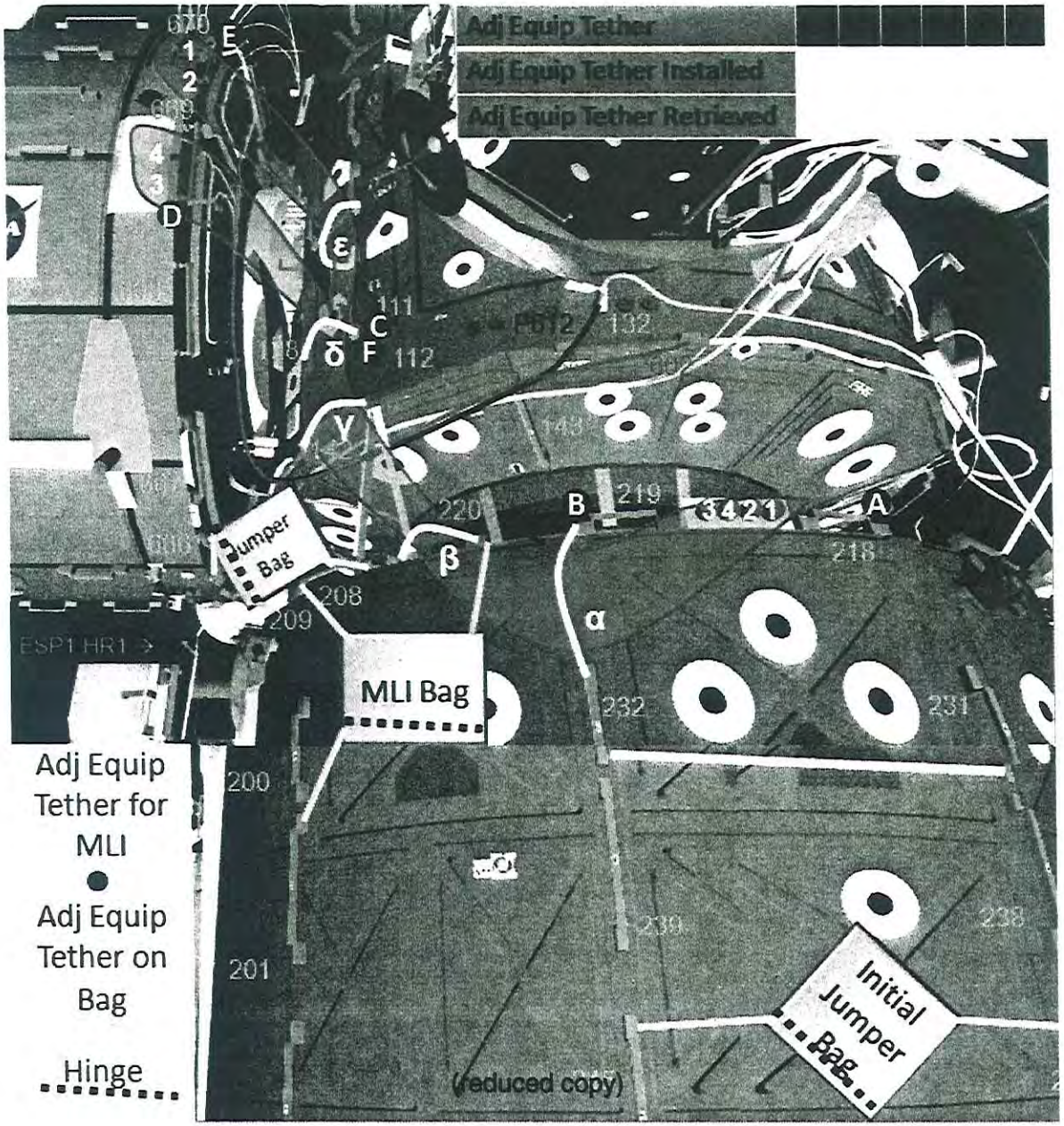
1. Tether and remove Male QD Cap (3 turns), stow on Fish Stringer
2. Remove female QD bootie
3. Inspect male and female QDs for debris or damage
4. On female QD:
   - √Detent button – up
   - √Locking collar – locked position
   - √Fwd white band – not visible
5. Assess side loads
6. Mate QD
   - √Fwd white band – visible
7. Perform snapback test
   - √Fwd white band – visible
8. Perform pull test
9. Perform visual gap test and 📷 WVS survey
10. Remove Fish Stringer
11. For F3 and F4, install female QD bootie

Block C – Open Valve Ops

1. For F3 and F4, remove female QD bootie
2. Locking collar – unlocked
   - √QD clocking (LAB=aft, NOD3=port)
3. Open valve (Press detent button and push bail to forward position)
   - √Aft white band visible
   - √Detent button – up
4. Locking collar – locked
5. Install female QD bootie
   - √For good closure (wire tie as needed)
6. 📷 Perform WVS survey of QD interface

(reduced copy)

20A EVA CUE CARD



STS-130 (20A) EVA 3 TIMELINE

PET HR : MIN	IV	EV1 (Be)	EV2 (Pk)	
00:00		POST DEPRESS (00:05)	POST DEPRESS (00:05)	00:00
		EGRESS/SETUP (00:25)	EGRESS/SETUP (00:25)	
		OPEN LOOP B QDS (00:30)	PMA3 HEATER/DATA CABLE INSTALL (01:00)	
	Insert inhibits			
01:00		NODE 3 LTA CABLE DEMATE (00:15)		01:00
	Insert inhibits	CUPOLA MLI REMOVAL (01:45)		
			CUPOLA MLI REMOVAL (01:30)	
02:00				02:00
03:00		NODE 3 OIH INSTALL (01:00)	CUPOLA LAUNCH LOCK RELEASE (00:30)	03:00
			BAG OPS (00:15)	
			APFR RELOCATE (00:15)	
04:00		S3 NADIR INBOARD PAS DEPLOY (02:00)	S3 NADIR INBOARD PAS DEPLOY (02:00)	04:00
05:00				05:00
06:00		CLEANUP/INGRESS (00:25)	CLEANUP/INGRESS (00:25)	06:00
06:30		PRE REPRESS (00:05)	PRE REPRESS (00:05)	06:30

EVA 3

EVA 3 BRIEFING CARD

Generic STS-130 EVA Brief: (release folks as you can)

1. Campout (wake-up and start per the timeline to keep ground/flight team in sync) (EV1)
   - Bio-med prior to opening hatch if possible
   - Food requests?
2. Task IV visits A/L to verify tools on suits per timeline: When? (Task IV)
3. Suit-up IVs verify bag/tools in A/L per EVA specific Section 8 (Suit-up IVs)
   - Help required for SAFER install?
   - Pictures?
4. Communications protocol (EV1)
   - (EV1/EV2 during depress/repress, “Break-Break” for messages/emergency response)
   - Lost communication
5. Summary timeline (include get-ahead tasks at end) (Task IV)
6. EVA specific hazards Task IV)
7. First actions (EV1 and EV2)
8. EVA specific concerns (if not addressed during summary timeline brief) (EV1 and All)
9. Retreat plan/path (rapid return, incapacitated, lost crewmember-SAFER ops) (EV1)
10. Lost tools (velocity and direction estimate, when last seen) (EV1)
11. Communications plan for Arm ops (if required) (EVs/IV/M1/R1)
12. Hopping, safety tether awareness, stability and control, get-ahead risk, fatigue

EVA 3 INHIBIT PAD

Orbiter

ALL EVAs

KU-Band Antenna {*prior to egress*}
MCC-H – INCO
1. √KU-BAND Mask – active
2. √KU-BAND EVA Protect Box – active

RCS {*prior to egress*}
If EV crew < 27 feet from FRCS
IV O14,15,16
1. √DAP: VERN, FREE, LO Z (flt specific check with GNC)
2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF
LOGIC (four) – OFF

MCC-H – Prop
3. √Above RCS config

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

Ground

ALL EVAs

Ground Radar {*prior to egress*}
MCC-H – TOPO
1. √TOPO console, ground radar restrictions in place for EVA

USOS

ALL EVAs

PCU {*prior to egress*}

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

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

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

USOS cont

LOCATION DEPENDENT INHIBITS

NODE 3 LTA Cable Disconect {*prior to egress*}
MCC-H – Phalcon
1. RPCM N1-RS1-B – RPCs 1,2,15,16, Open, Close Cmd Inh

Lab Window {*prior to egress*}
IV If EV crew less than 10 feet from window or in window FOV, close window shutter

Open Loop B Jumpers {*just prior to task}*
MCC-H – THOR
??????????????????
??????????????????????

Mobile Transporter {*prior to egress*}
MCC-H – ROBO
If EV crew <1.5 meters from MT
1. √MT latched

Starboard TRRJ {*prior to egress*}
MCC-H 1. √DLA (1) – LOCKED

PMA3 Heater Cable {*prior to egress*}
MCC-H
1. √RPCM N32A2B_B2 RPCs 4-13, Open, Close Cmd Inh
2. DDCU N32A or DDCU N32B Converter Off

S3 Nadir Inboard PAS (PAS 4) {*prior to egress*}
MCC-H 1. RPCM S31A-A RPC 13 – Open, Close Cmd Inhibit

COL

ALL EVAs

Ham Radio {*prior to egress*}
IV 1. ARISS (Ham Radio) – Deactivate or VHF (144-146 MHz) TX only

JLP

ALL EVAs

ICS-EF Antenna {*prior to egress*}
SSIPC
1. ICS MOD Off
2. ICS UPC Off
3. ICS HPA Off

EVA 3 INHIBIT PAD (Cont)

RSOS

ALL EVAs

SM Antennas {*prior to egress*}
IV 1. GTS – Deactivate

IMPULSE {*prior to egress*}
MCC-M 1. IMPULSE (ИПИ-100) – Is not activated

EVAs ON PMA1 OR RSOS (LOCATION DEPENDENT)

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

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

FGB Antennas {*prior to egress*}
MCC-M 1. √FGB KURS P [КУРС Р] – Deactivated

Soyuz Antennas {*prior to egress*}
MCC-M 1. √Soyuz KURS A [КУРС А] – Deactivated

EVA 3 NOTES/CAUTIONS/WARNINGS

NOTES

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

CAUTION

ISS Constraints

A. Avoid inadvertent contact with
   1. Grapple fixture shafts (drylube)
   2. PIP pins
   3. EVA Crane [PMA1]
   4. TCS Reflectors [PMA2,PMA3]
   5. APAS hardware [PMA2,PMA3]
   6. CETA Lights (Z-93 paint) [LAB,S1, NODE 1]
   7. Deployed MISSEs [Columbus EPF]
   8. Passive UMAs
   9. MBS/SSRMS/SPDM/JEMRMS taped radiative surfaces: VDU, ACU, JEU, LEU, MCU, CRPCMs, and Cameras
   10. Deployed TUS cable [Nadir CETA rail]
   11. S0 aft face Radiator
   12. GPS Antennas (S13 paint) [S0,JLP]
   13. UHF Antennas [LAB,P1]
   14. ETCS Radiator flexhoses and panels [S1,P1]
   15. EETCS/PV Radiator flexhoses, bellows and panels [P6,P4,S4,S6]
   16. SASA RF Group [S1,P1]
   17. Heat pipe radiators [Z1]
   18. PCU cathode and HCA ports [Z1]
   19. Ku-Band Antenna (SGANT) dish [Z1]
   20. CMG cover/shells [Z1]
   21. SPDM SJEU, EP, OTCM, LEU, and LEE VDU Radiator surfaces
   22. Open CBM petal covers, LAB window shutter, and JPM window shutter
   23. FPMU [S1]
   24. OTSD
   25. COL HAM radio antennas [COL-Nadir]
   26. JTVE Cameras [JEM]
   27. JEM A/L Target and Pins
   28. S0/Node 2 Fluid Tray Hardlines at NODE 2 end are limited to 25 lb

CAUTION

ISS Constraints (Cont)

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

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

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

E. For structural reasons
   1. Avoid vigorous body motions, quick grabs and kickoffs against tether restraints
   2. Avoid performing shaking motions (sinusoidal functions) more than four cycles
   3. Avoid kicking S1/P1 radiator beam

   If any of these occur, wait 2 to 5 min to allow structural response to dissipate

CAUTION

ISS Constraints (Cont)

F. Other
   1. ITT Cannon connector: On demated connectors, do not rotate collar or manipulate cable/connector using collar or connector tool
   2. WIS Antennas: Do not use as handholds [NODE 1,LAB,P6,Z1]
   3. Lubricant from Ku-Band SGANT gimbals [Z1], CMGs [Z1], and RTAS Ground Strap fasteners [P6,P4,S4,S6] can contaminate EMU
   4. MLI handholds are not rated for crewmember translation loads
   5. CBM petal covers may not be used as handholds unless both launch restraint pins are engaged
   6. Prevent inadvertent contact of the tether shuttle with ETRS when the P3 Tether Shuttle Stop is raised away from the rail

CAUTION

Shuttle Constraints

G. Avoid inadvertent contact with
   1. OBSS and SRMS Composite Sections Joint Torque Arms, Grapple Fixture Shafts, and Cable Harnesses
   2. LCS (silver Teflon) and LDRI (silver Teflon) and ITVC (gold foil) [OBSS]
   3. WVS Antenna [ODS Truss and PLB Sill]
   4. Payload Bay and Camera wire harnesses, cables, cable guides, and connectors

H. No touch
   1. LDRI diffuser [OBSS]
   2. OBSS saddle contacts (when OBSS unberthed) [OBSS]
   3. Monkey fur [PLB]
   4. Cameras: Metallic surfaces [PLB]
   5. Ku-Band Antenna black dish and gold thermal blankets [PLB]

CAUTION

HTV/HTV EP Constraints

A. Avoid inadvertent contact with
   1. EVA Cover [HTV] (does not meet EVA kick loads)
   2. Wheel guide [HTV] (snag hazard)
   3. HBCS (berthing camera) [HTV EP]
   4. HCSM (solid lubricant) [HTV EP]
   5. HCAM (solid lubricant) [HTV EP]
   6. EP PIU (solid lubricant and Black/White Paint) [HTV EP]

WARNING

ISS Constraints

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

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

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

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

WARNING

ISS Constraints (Cont)

E. RF radiation exposure
   1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1]
   2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1]
   3. Stay 1 ft from UHF Antenna when powered [LAB,P1]
   4. Stay 0.3 ft from fwd/aft JPM PROX antenna

F. Sharp Edges
   1. Inner edges of WIF sockets
   2. APFR active WIF probes
   3. Mating surfaces of EVA connectors Avoid side loads during connector mating
   4. Back side of MMOD shield fasteners
   5. Spring loaded captive EVA fasteners (e.g., 6B-boxes, BMRRM, RTAS, SARJ Covers); the end of the spring may protrude
   6. PMA umbilical launch restraints-exposed bolt threads
   7. Adjustable Fuse Tether (Fish Stringer) buckles stowed in Node Bag
   8. Nickel coated braided copper Ground Straps may contain frayed wires [P6,P4,S4,S6]
   9. SPDM OTCM gripper jaws

WARNING

ISS Constraints (Cont)

F. Sharp Edges (Cont)
   10. Solar Array Blanket Box [P6,S6]
   11. Keep hands away from SSRMS LEE/POA/SPDM LEE/JEMRMS EE opening, snares, and PDGF curvic coupling (teeth)
   12. Fastener threads on back of Z1 U-jumper male FQD panel, if nutplate cap missing
   13. Outboard MT rail attachment lug near P6 handrail 5333 and gap spanner
   14. P2 connector on EWIS box TAA-06 [Zenith/Forward Corner 1 of P5 – SARJ at 0 deg]
   15. Port/Aft portion of A/L circular HR [HR 0506]
   16. Interior of JEMRMS HRMs
   17. JEM A/L hatch corners

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

WARNING

ISS Constraints (Cont)

G. Thermal (Cont)

6. Stay ≥ 1 ft away from PMAs and MMOD shields > 270 degF if EMU sunvisor up; limit time to 15 min or less if > 300 degF
7. Stay at least 0.5 ft away from PMA and MMOD shields > 325 degF
8. Do not touch EMU protective visor if temp has been < -134 degF for > 15 min
9. No EMU TMG contact with PMAs and MMOD shields > 320 degF
10. No EMU boot contact with foot restraint when temp < -120 degF or > 200 degF
11. Columbus end cones may violate touch temperature constraints when $-75 \leq \beta \leq -60$ or $60 \leq \beta \leq 75$V
12. PDGF surfaces may not meet touch temperature requirements for unlimited contact when $\beta \leq -70$ or $\beta \geq 70$
13. JPM port end cones and JLP port nadir may violate touch temperature constraints when $\beta > 60$ deg

H. Electrical Shock

1. Stay ≥ 2 ft from ungrounded floating connectors if not unpowered
   - SSPTS connectors include NOD1 Stbd/Fwd HR 0130, LAB Stbd/Fwd HR 0273, PMA2 Stbd and Port

WARNING

ISS Constraints (Cont)

H. Electrical Shock (Cont)

- MBS Cross-Connect jumpers (translate past these using UMA handrails) include S0 EVA Power Cables (inside S0 Bay 00 Face 4, Bay 01 Face 3) ESP-2 jumper (inside S0 Bay 03 Face 4)

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

WARNING

Shuttle Constraints

A. Arcing/Molten Debris

1. Stay ≥ 2 ft from exposed EFGF connector when OBSS berthed, powered, and EFGF not grappled [PLB]
2. Stay ≥ 2 ft from exposed Stbd Fwd MPM contacts [PLB]
3. Stay above PLB sill when within 1 ft of powered ROEU connector [PLB]

B. Pinch

1. PRLA operation [PLB]

C. RF radiation exposure

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

EVA 3 NOTES/CAUTIONS/WARNINGS (Cont)

WARNING

Shuttle Constraints (Cont)

D. Sharp Edges
   1. PRLA grounding wipers [PLB]
   2. LDRI baffles (also an entrapment hazard) [OBSS]
   3. Keep hands away from SRMS EE opening and snares
   4. TCS connector backshells have exposed threads [ODS]

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

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

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

WARNING

HTV/HTV EP Constraints

A. Avoid inadvertent contact with
   1. HTV solar array panels (kick loads can shatter panel and generate sharp edges) [HTV]
   2. HTV fwd RCS thrusters [HTV]

B. Pinch
   1. HSM connector moving parts (pinch hazard and dry film lube) [HTV EP]
   2. EP wheels (pinch point) [HTV EP]

C. RF radiation exposure
   1. Stay 0.7 ft from IOS-N antenna [HTV]
   2. Stay 0.7 ft from IOS-Z antenna [HTV]
   3. Stay 0.3 ft from PLS-Z antenna [HTV]

EVA 3 FLIGHT SPECIFIC NOTES/CAUTIONS/WARNINGS

NOTES

1.

CAUTION

A. Fluid QDs
   1. 20-min QD exposure to direct sun without thermal covers can cause seal damage

B. PAS
   1. Do not close ADP lock bracket unless installed in a stowage hole
   2. Avoid installing the hinge ADPs between the truss beam and PAS hinge beam
   3. Ensure ADP is on the outboard side of the deploy clevis during deploy clevis install
   4. Limit 10 lbf when removing or installing Yoke PIP pin and ADP
   5. To prevent hinge damage, limit diagonal brace to ~7 deg maximum out of plane
   6. To avoid platform detents, do not exceed 30 inches between yoke ADP and Deploy Clevis Bracket
   7. EBCS target is susceptible to contact damage. Do not remove MLI until all work inside truss complete

WARNING

A.
   1.

EVA 3 TOOL CONFIG

EV1

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

Tether Counts: (Red RETs)

RETs (eq-eq) = X	Adj Equip Tethers = X
RETs (Lg-eq) = X	Adj Equip Tethers (Lg-eq) = X
RETs (PIP Pin) = X	Fish Stringers = X

NOTE: Prior to use, inspect the following hardware:

- ❑ RET cords for fraying
- ❑ Safety Tether/Waist Tether LAS: No Red Visible
- ❑ ISS Trash Bag: Bristle deformation/damage, after having stowed tools in trash bag
- ❑ BRT joint screws not loose
- ❑ IV caps removed on all connectors
- ❑ Bails aft on QDs and un-capped connectors
- ❑ Detent buttons secured on QDs

EV2

- ☐☐ Adj Equip Tether (L wrist)
- ☐☐ MWS
  - ☐☐ BRT (L)
    - ☐☐ RET (eq-eq)
    - ☐☐ Wire Tie (2)
  - ☐☐ T-Bar
    - ☐☐ RET w/PIP Pin
    - ☐☐ Adj Equip Tether (1)
      - ☐■ PMA3 Connector Cap
    - ☐☐ Wire Tie (2)
    - ☐☐ Small Station Trash Bag
      - ☐☐ RET (eq-eq)
        - ☐■ PMA3 Connector Cap
  - ☐☐ Swing Arm (R)
    - ☐☐ RET (eq-eq)
      - ☐☐ PGT [**X** X ft-lb, **CAL**, MTL **30.5**] s/n _____
        - ☐☐ PGT Battery s/n _____
        - ☐☐ 7/16 (wobble) Socket-6 ext
- ☐☐ D-ring Extender (2, R & L D-ring)
  - ☐☐ 85-ft Safety Tether (L D-ring Ext)
- ☐☐ Waist Tether (2, R on D-ring Ext & L on D-ring to ST)
- ☐☐ SAFER
- ☐☐ WVS

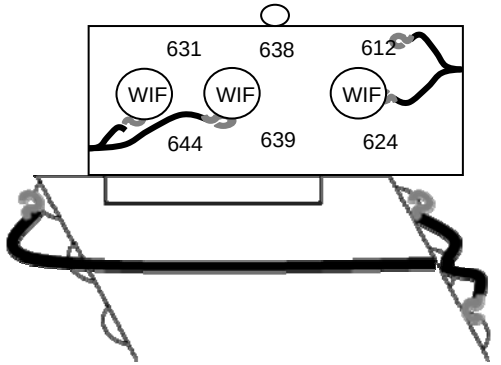
AIRLOCK CONFIG

- ☐☐ RET (Lg-eq)
  - ☐☐ **OIH Bag** (EV1)
    - ☐☐ RET (eq-eq) (outside)
    - ☐☐ Zip Tie (secure lid)
    - ☐☐ Integral Tether (strap through 2nd loop on opposite side of bag; hook to 1st loop and 1/4-turn receptacle on C/L bag)
    - ☐☐ OIH Adj Tether (1 hook to 1st loop and 1/4-turn receptacle on C/L bag; 2 hook to 3rd loop and D-ring on C/L bag; strap through 2nd loop)
    - ☐☐ Adj Equip Tether (2) (clove hitch)
      - ☐■ OI WIFS (3)
      - ☐■ OIH (0612)
    - ☐■ OIHs (5)
    - ☐☐ Adj Equip Tether (outside)
    - ☐☐ Camera Bracket (outside)
      - ☐☐ EVA Camera

AIRLOCK CONFIG (Cont)

- ☐☐ RET (Lg-eq)
  - ☐☐ **PAS Crewlock Bag** (EV2)
    - ☐☐ RET (eq-eq) (outside)
    - ☐☐ 85-ft Safety Tether (2)
    - ☐☐ Adj Equip Tether (Lg-sm)
    - ☐☐ Hammer
    - ☐☐ DRT (2)

- ☐☐ RET (Lg-eq)
  - ■☐ **MLI Bag** (Lg ORU Bag)
    - ■☐ Adj Equip Tethers (3) (outside)
    - ■☐ RET (3) (eq-eq) (inside)
      - ■☐ Cupola MLI (2)



EVA 3 TOOL CONFIG (Cont)

AIRLOCK CONFIG (Cont)

- ☐☐ RET (Lg-eq)
  - ☐☐ **Contingency Crewlock Bag**
    - ☐☐ RET (eq-eq) (outside)
    - ☐☐ Ratchet Wrench
      - ☐☐ 7/16 (rigid) Socket-2 ext
    - ☐☐ 1-in Bail Lever Drive
    - ☐☐ 1-in QD Cap Tool
    - ☐☐ RET w/PIP Pin
      - ☐☐ 1-in Button Depress Tool
    - ☐☐ RET w/PIP Pin
      - ☐☐ 1-in QD Release Tool

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

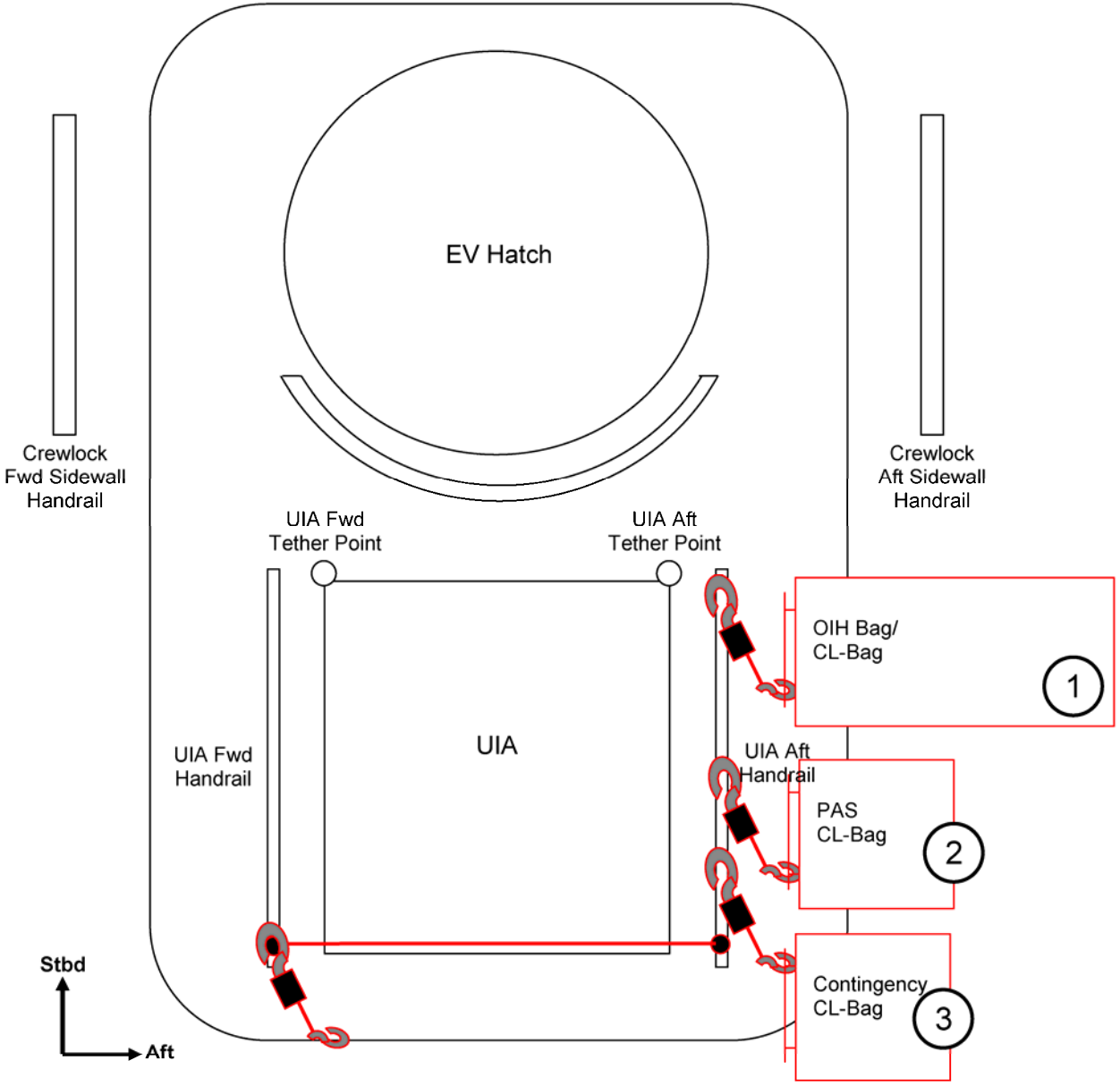
- ☐☐ IV Bag
  - ☐☐ Towels (2)
  - ☐☐ Contamination Detection Kit
  - ☐☐ GP Caddy (2)
    - ☐☐ Adjustable Thermal Mittens (2)
  - ☐☐ Socket Caddy (hatch cont) w/RET (eq-eq) (Black)
    - ☐☐ 1/2 Socket-8 ext
    - ☐☐ 7/16 (wobble) Socket-6 ext (spare)
  - ☐☐ DCM Plug (SAFER Hardmount) (2)
  - ☐☐ RET (eq-eq,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

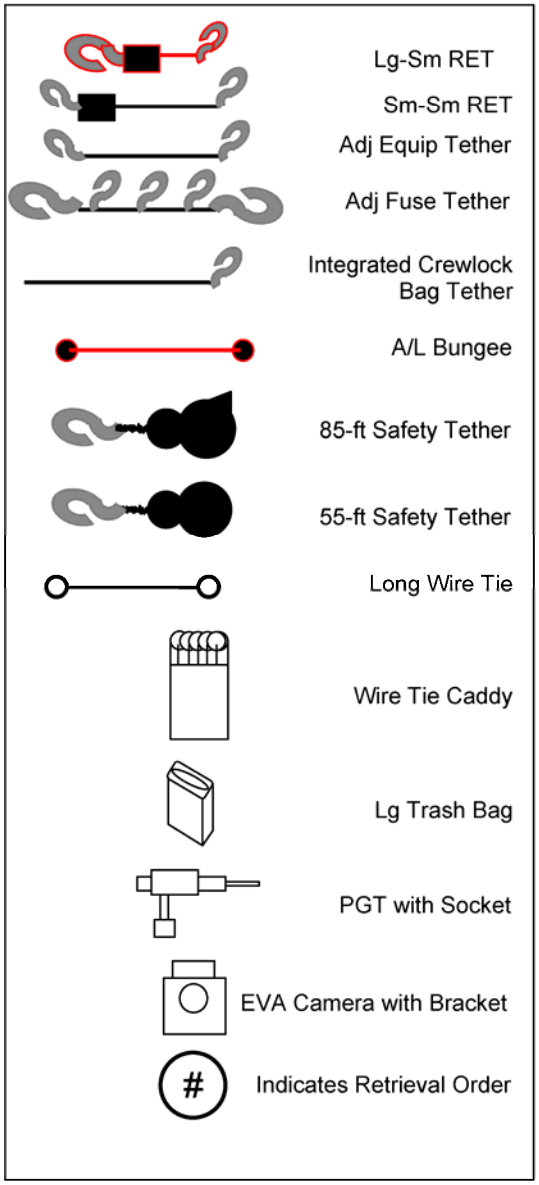
EXTERNAL CONFIG

LAB HR 0201/0208/0220

- ☐■ **MLI Bag** (Lg ORU Bag)
  - ☐■ Adj Equip Tethers (3) (outside)
  - ☐■ Adj Equip Tethers (3) (inside)
  - ☐■ RET (3) (eq-eq) (inside)

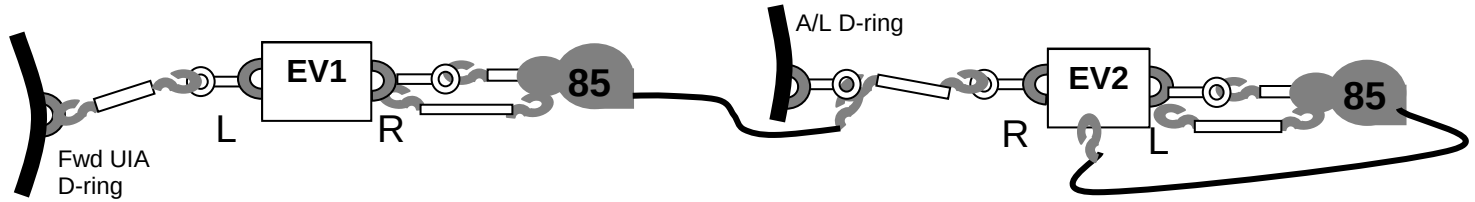
EVA 3 AIRLOCK CONFIG





Tool Legend

EVA 3 EGRESS/SETUP (00:25)

IV	EV1 (Be)	EV2 (Pk)
		
	Initial Conditions: ❑ R D-ring ❑ D-ring Ext ❑ A/L 85-ft Safety Tether to A/L D-ring Ext ❑ Waist Tether to A/L Safety Tether ERCM ❑ L D-ring ❑ D-ring Ext ❑ Waist Tether to fwd UIA Tether Point ❑ Hooks closed and locked (Safety Tether reel end, L Waist Tether)	Initial Conditions: ❑ R D-ring ❑ D-ring Ext ❑ Waist Tether to A/L D-ring Ext ❑ L D-ring ❑ D-ring Ext ❑ A/L 85-ft Safety Tether to MWS ❑ Waist Tether to A/L Safety Tether ERCM ❑ Hooks closed and locked (Safety Tether reel end, R Waist Tether)
	<u>EGRESS</u> (00:15)	<u>EGRESS</u> (00:15) 1. Open A/L thermal cover 2. Egress A/L 3. Attach EV2 Safety Tether to aft A/L D-ring ❑ Hook closed and locked ❑ Reel unlocked 4. Release Waist Tether from A/L D-ring Ext 5. Relocate EV1 Safety Tether anchor from internal A/L D-ring Ext to fwd A/L D-ring ❑ Hook closed and locked ❑ Reel unlocked
1. Post crew egress: WVS Software: Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max	1. Transfer OIH Bag/Crewlock Bag to EV2	6. Receive OIH Bag/Crewlock Bag from EV1, temp stow on A/L circular HR 0506 (outboard)
	2. Transfer PAS Crewlock Bag to EV2 3. Egress A/L 4. Close A/L thermal cover	7. Temp stow PAS Crewlock Bag on A/L circular HR 0506

EVA 3 EGRESS/SETUP (00:25) (Cont)

IV	EV1 (Be)	EV2 (Pk)
2. √SAFER handles down (MAN ISO vlv (L) – open; HCM (R) – closed)	5. √SAFER handles down 6. √ERCA green LED (if no WVS) 7. √Tethers and Tools	8. √SAFER handles down 9. √ERCA green LED (if no WVS) 10. √Tethers and Tools
	SETUP (00:10) 8. Translate to NOD3/NH3 Jumper interface (M3/M4) interface on NOD3 via fwd route 9. Perform Glove Inspection	SETUP (00:10) 11. Translate to NOD3 port endcone via aft route (gap spanner) 12. Perform Glove Inspection

EVA 3 OPEN LOOP B QDs (00:30) & NODE 3 LTA CABLE DISCONNECT (00:30)/PMA3 CABLE INSTALL (01:00)

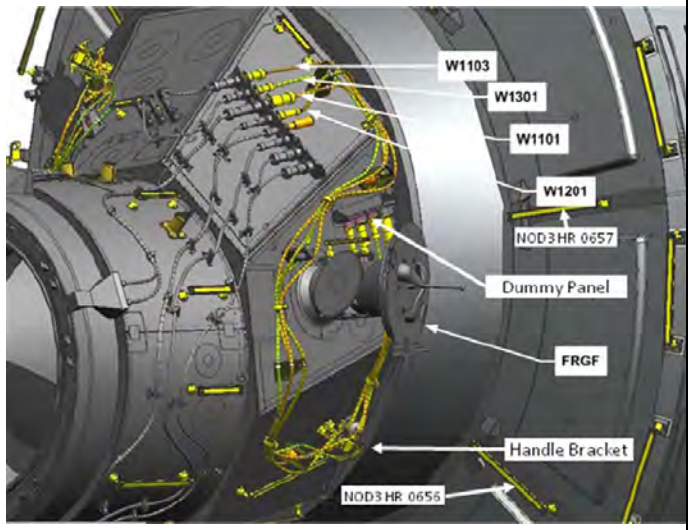
<table>
<tr><th>IV</th><th>EV1 (Be)</th><th>EV2 (Pk)</th></tr>
<tr>
<td>1. Verify Loop B shutdowns complete</td>
<td><u>OPEN LAB SIDE LOOP B QDs</u> (00:15)

<u>CAUTION</u>
20-min QD exposure to direct sun without thermal covers can cause seal damage

1. Translate to LAB end of NH3 Jumpers
2. Open LAB NH3 MLI hood</td>
<td rowspan="3"><u>PMA3 CABLE DISCONNECT FROM PMA3</u> (00:35)

1. Release all TA clamps, beginning with clamp closest to NOD3 HR 0658 (heater cable coils around PMA3 grapple shaft)
2. Release PMA3 heater cable connectors (4) from dummy panel (any order)
❑ P601 ←|→ dummy panel
❑ P602 ←|→ dummy panel
❑ P603 ←|→ dummy panel
❑ P608 ←|→ dummy panel

3. Attach MWS EE to handle bracket (bracket closest to dummy panel); release bracket from soft dock

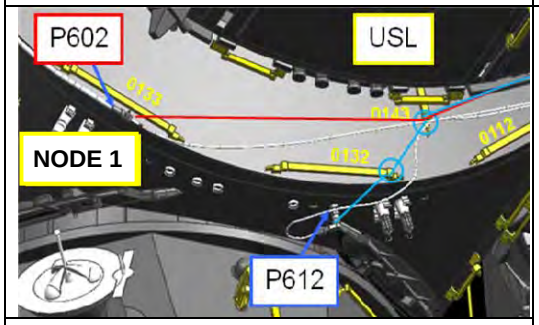
 
</td>
</tr>
<tr>
<td>2. On MCC-H GO, give EV1 GO to open LAB side QDs</td>
<td>3. On IV GO, perform Block C – Open Valve Ops for M3/F3 <u>EVA QD OPS CUE CARD</u>
4. Perform Block C – Open Valve Ops for M4/F4 <u>EVA QD OPS CUE CARD</u>
5. Close LAB hood
6. Cinch hood and attach hook
7. Perform WVS survey of QD interface

<u>OPEN NODE 3 SIDE LOOP B QDs</u> (00:15)
8. Open Loop B NH3 MLI hood</td>
</tr>
<tr>
<td>3. On MCC-H GO, give EV1 GO to open NOD3 side QDs

4. Once all bails are open, give MCC-H GO to RESTART ETCS LOOP B

5. Verify LTA inhibits</td>
<td>9. On IV GO, perform Block C – Open Valve Ops for M4/F4 <u>EVA QD OPS CUE CARD</u>
10. Perform Block C – Open Valve Ops for M3/F3
11. Close Loop B NH3 MLI hood
12. Cinch hood, attach hook
13. Perform WVS survey of QD interface</td>
</tr>
</table>

EVA 3 OPEN LOOP B QDs (00:30) & NODE 3 LTA CABLE DISCONNECT (00:30)/PMA3 CABLE INSTALL (01:00) (Cont)

IV	EV1 (Be)	EV2 (Pk)
	DEMATE NOD3 LTA P612 CABLE (00:15) 14. Translate to NOD1 HR 0132 15. Demate P612 ←|→ J612 (NOD3 ←|→ NOD1) 16. Stow P612 (NOD3) with Wire Tie on NOD1 HR 0132 17. Demate P1 ←|→ dust cap (A/L ←|→ dust cap) 18. Mate P612 →|← dust cap (NOD3 →|← dust cap) 19. Mate P1 →|← J612 (A/L →|← NOD1) 20. Secure cables with Wire Tie as reqd 21. Configure booties (2) as reqd	PMA3 CABLE CONNECT TO NOD3 (00:25) 4. Translate to NOD3 Port Avionics MLI 5. Tether to and open MLI 6. Mate PMA3 heater cable ❑ P602 →|← NOD3 J106 7. Mate PMA3 data cable ❑ P601 →|← NOD3 J103 8. Install connector caps (2) on unmated PMA3 cable connectors 9. Re-install NOD3 Port Avionics MLI (Velcro) 10. Wire Tie cable to: (or use TA-clamps on endcone) ❑ NOD3 HR 0660 ❑ NOD3 HR 0655 11. Bundle unmated PMA3 heater cable connectors (2) and Wire Tie to NOD3 HR 0655 12. Perform WVS survey
On EV2 GO, give **MCC-H GO** for PMA3 heater activation	CUPOLA MLI BAG SETUP (00:15) 22. Retrieve MLI Bag (LAB HR 0201, 0208, 0220) 23. Translate to Cupola 24. Temp stow MLI Bag on nadir surface of Cupola using Adj Equip Tethers (under Cupola MLI) 25. Tether Assy 1 to MLI Bag using RET 26. Tether Assy 2 to MLI Bag using RET	13. Give IV GO for PMA3 heater activation

EVA 3 TASK DATA – OPEN LOOP B QDs

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	
Two EV Crew	N/A	

Tools:

EV1	EV2
Fish Stringer	Fish Stringer
Adj Equip Tether (Lg-eq)	Vent Tool

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
M3 and M4	683-99525		
QD booties	683-63447-2 (right) 683-63447-3 (left)		
QD Dust Caps			
NOD 1 HR 0111 NH3 Jumper Bracket	683-99530		

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
M3 and M4		
QD booties		
QD Dust Caps		
NOD 1 HR 0111 NH3 Jumper Bracket		

EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
M3/M4 Jumpers	LAB M1/M2	NOD3 M1/M2	1 each	1”	NOD3 Primary Cooling

Inhibits:

ORU/Task	Location	Inhibit
M3/M4 jumper mate	Prior to removing caps from LAB and NOD3	????????

Notes:

1. Initial assessment shows it takes about 20 lb per line to move the jumper once pressurized
2. TA Clamp ID is 1.75 inches – Fluid Flex Hose OD (w/sleeve) is 1.45 inches
3. Jumpers are installed on clamp between the labels on the jumper (about 8 inches apart)
4.
5.

Timeline Considerations:

1.
2.
3.
4.
5. Approval to open the QDs in any order

EVA 3 TASK DATA – NODE 3 LTA CABLE DISCONNECT

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	
Two EV Crew	N/A	

Tools:

EV2
Wire Ties (integral to HRs and LTA cables)

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
P612 LTA Cable			
P602 LTA Cable			
P612 Dust Cap			

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
P612 LTA Cable		
P602 LTA Cable		
P612 Dust Cap		

EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function
P612				21	
P602				21	
P1				21	

Inhibits:

ORU/Task	Location	Inhibit
P612	Prior to demating P1 from NOD1 J612	612 Demate/mate – RPCM N1 – RS1-B – RPCs 1,2,15,16 RPC – Open and Close Command Inhibited
P602	Prior to removing dust cap from J602 NOD1/ESP-2 Y-jumper	602 Mate – RPCM N1-RS2-B – RPCs 1-5, 12-16 RPC – Open and Close Command Inhibited

Notes:

1. No FPP (floating connector) bootie is required for J602/P602 because P602 is built with a grounding cable within the MLI sheath
2.
3.
4.
5.

Timeline Considerations:

1. This task can be shortened if EV1 assists EV2:
2.
3.
4.
5.

EVA 3 TASK DATA – PMA3 CABLE INSTALL

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	
Two EV Crew	N/A	

Tools:

EV2
Wire Ties
PGT

ORU Identification:

ORU	Part Number	Serial Number	EVA Label

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)

EVA Fasteners:

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

EVA Connectors:

Harness	From	To	Clamps (#)	Conn Size	Function

Inhibits:

ORU/Task	Location	Inhibit

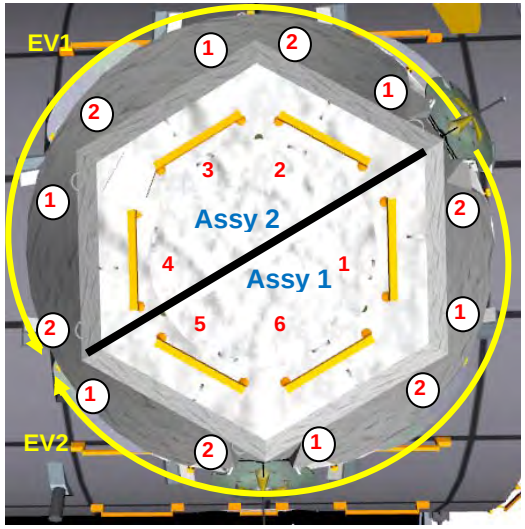
Notes:

1. No FPP (floating connector) bootie is required for J602/P602 because P602 is built with a grounding cable within the MLI sheath
2.
3.
4.
5.

Timeline Considerations:

1. This task can be shortened if EV1 assists EV2:
2.
3.
4.
5.

EVA 3 CUPOLA MLI REMOVAL (01:30)

IV	EV1 (Be)	EV2 (Pk)
<table><tr><th>Panel</th><th>Bolt 1</th><th>Bolt 2</th><th>Roll</th></tr><tr><td>1</td><td></td><td></td><td></td></tr><tr><td>2</td><td></td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td></tr><tr><td>4</td><td></td><td></td><td></td></tr><tr><td>5</td><td></td><td></td><td></td></tr><tr><td>6</td><td></td><td></td><td></td></tr></table>	REMOVE CUPOLA GROUNDING FASTENERS (00:30)	REMOVE CUPOLA GROUNDING FASTENERS (00:30) 1. Translate to Cupola 2. Use Adj Tether to fairlead to HR ???
	1. Perform Glove Inspection 2. Release ground fasteners (6) **[B7,CCW2,30.5]** ~? turns ❑ 7/16-in (wobble) Socket-6-in ext ❑ (25.5 ft-lb, 30 RPM)	3. Perform Glove Inspection 4. Release ground fasteners (6) **[B7,CCW2,30.5]** ~? turns ❑ 7/16-in (wobble) Socket-6-in ext ❑ (25.5 ft-lb, 30 RPM)
	ROLL ASSY 1 MLI (00:30) 3. Perform Block F – MLI Roll and Fold Ops, 2 panels 4. Use Adj Equipment Tether to fairlead as reqd	ROLL ASSY 1 MLI (00:30) 5. Perform Block F – MLI Roll and Fold Ops, 1 panel 6. Translate to Nadir surface of Cupola 7. Assist EV1 in restraining panel rolls
	5. Separate Velcro joining Assy 1 to Assy 2 6. Stow Assy 1 in MLI Bag	8. Separate Velcro joining Assy 1 to Assy 2 9. Stow Assy 1 in MLI Bag
	ROLL ASSY 2 MLI (00:30) 7. Perform Block F – MLI Roll and Fold Ops, 2 panels	ROLL ASSY 2 MLI (00:30) 10. Perform Block F – MLI Roll and Fold Ops, 1 panel 11. Translate to Nadir surface of Cupola 12. Assist EV1 in restraining panel rolls
 Fwd Port	8. Stow Assy 2 in MLI Bag **Block F – MLI Roll and Fold Ops** 1. Release Velcro from panel 2. Roll panel, avoid rolling up Velcro straps 3. Restrain roll with one Velcro strap	13. Stow Assy 2 in MLI Bag 14. Perform Glove Inspection

EVA 3 TASK DATA – CUPOLA MLI REMOVAL

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	
Two EV Crew	N/A	

Tools:

EV1
PGT w/7/16 (wobble) Socket-6 ext
Large ORU Bag

ORU Identification:

ORU	Part Number	Serial Number	EVA Label

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)

EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
			2/flap					

Notes:

1.
2.
3.
4.
5.

Timeline Considerations:

1.
2.
3.
4.
5.

EVA 3 OI WIF/OIH INSTALL & OUTFITTING CLEANUP (01:30)/CUPOLA LAUNCH LOCK RELEASE (00:30)

IV

Block G – OI WIF Install

1. Retrieve OI WIF from Crewlock Bag
2. Slide OI WIF on dove tail receptacle
3. √Both spring plungers are down
4. Perform pull test

√	OIH	Bolt 1 Trq (ft-lb)/Turns		Bolt 2 Trq (ft-lb)/Turns	
	0612				
	0638				
	0631				
	0624				
	0639				
	0644				

Block D – OIH Install

1. Install OIH (soft dock armed)
2. √OIH label # and orientation matches mount #
3. √Fully seated
4. Drive OIH bolts (2) **[A2,CW2,30.5]** ~8 turns
   - ❑ 7/16-in (wobble) Socket-6-in ext
   - ❑ (3.8 ft-lb, 30 RPM)
5. √Fully seated

EV1 (Be)

BAG OPS (00:15)

1. Perform tool inventory
2. Stow MLI Bag on BRT
3. Translate to A/L
4. Temp stow MLI Bag on A/L HR 0506
5. Retrieve OIH Bag from A/L HR 0506, stow on BRT

NODE 3 OI WIF INSTALL (00:15)

6. Translate to NOD3 HR 0600 (stbd endcone fwd/zenith) via fwd route
7. Temp stow OIH Bag on NOD3 HR 0600/0601
8. Perform Glove Inspection
9. Install OI WIFs in the following order per Block G – OI WIF Install:
   - ❑ 01
   - ❑ 02
10. Install OIH 0612 per Block D – OIH Install:
    - ❑ 0612
11. Install OI WIF per Block G – OI WIF Install:
    - ❑ 06

NODE 3 OIH INSTALL (01:00)

12. Translate to NOD3 port endcone, relocate OIH Bag as needed
13. Retrieve and Install OIHs in the following order per Block D – OIH Install:
    - ❑ 0638
    - ❑ 0631
    - ❑ 0624
14. Translate to port/fwd trunnion (cover #4)
15. Install OIH 0639 per Block D – OIH Install:
    - ❑ 0639
16. Translate to port/aft trunnion (cover #3)
17. Install OIH 0644 per Block D – OIH Install:
    - ❑ 0644

EV2 (Pk)

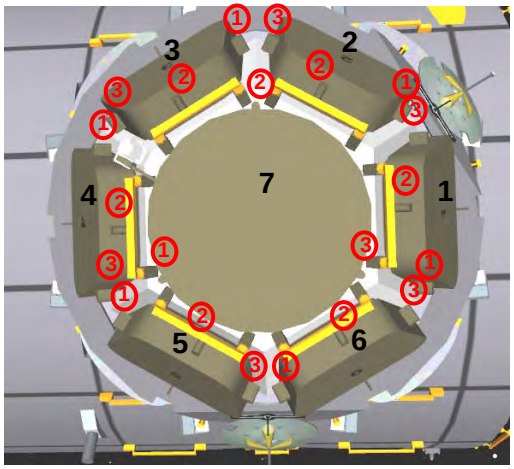
CUPOLA LAUNCH LOCK RELEASE (01:15)

NOTE

Window Cover may not be used as translation aid once launch locks are removed

1. Release Cupola launch lock bolts (3 per cover) **[B7,CCW2,30.5]**, ~5 turns; bolts will spring out
   - ❑ 7/16-in (wobble) Socket-6-in ext
   - ❑ (25.5 ft-lb, 30 RPM)

Cover	Bolt 1	Bolt 2	Bolt 3
1			
2			
3			
4			
5			
6			
7			



EVA 3 OI WIF/OIH INSTALL & OUTFITTING CLEANUP (01:30)/CUPOLA LAUNCH LOCK RELEASE (00:30) (Cont)

IV	EV1 (Be)	EV2 (Pk)
☐ RET (Lg-eq) (outside) ☐ **OIH Bag** ☐ Adj Equip Tether (clove hitch) ☐ Adj Equip Tether (attaching bags) ☐ OIH Tether (attaching bags) ■ OIHs (6) ■ OI WIFs (3)	OUTFITTING CLEANUP (00:30) 18. Perform Glove Inspection 19. Perform Bag Inventory 20. Translate to A/L 21. Stow OIH Bag on A/L HR 0506 22. Retrieve PAS Crewlock Bag from A/L HR 0506; stow on BRT	APFR RELOCATE (00:15) 2. Translate to LAB WIF 4 (port/nadir side) 3. Retrieve APFR, stow on BRT 4. Translate to STBD A/L toolbox 5. Install APFR [9,RR,F,11] ❑ Black on Black ❑ Pull test

EVA 3 TASK DATA – CUPOLA LAUNCH LOCK RELEASE

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	
Two EV Crew	N/A	

Tools:

EV1
PGT w/7/16 (wobble) Socket-6 ext

ORU Identification:

ORU	Part Number	Serial Number	EVA Label

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)

EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
			2/flap					

Notes:

1.
2.
3.
4.
5.

Timeline Considerations:

1.
2.
3.
4.
5.

EVA 3 TASK DATA – OI WIF INSTALL

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	
Two EV Crew	N/A	

Tools:

EV1
PGT w/7/16 (wobble) Socket-6 ext

ORU Identification:

ORU	Part Number	Serial Number	EVA Label

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)

EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
			2/flap					

Notes:

1.
2.
3.
4.
5.

Timeline Considerations:

1.
2.
3.
4.
5.

EVA 3 TASK DATA – OIH INSTALL

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	

Tools:

EV2
PGT w/7/16 (wobble) Socket-6 ext

ORU Identification:

ORU	Part Number	Serial Number	EVA Label
OIH			

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)
OIH		

EVA Fasteners:

Fastener Name	Label	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
OIH Bolts		7/16	2/OIH					

Notes:

1. Safety tethering to on-orbit installed OIHs, specifically those installed with a PGT setting of 'A2,' is acceptable
2.
3.
4.
5.

Timeline Considerations:

1.
2.
3.
4.
5.

EVA 3 PAS DEPLOY (01:30)

IV	EV1 (Be)	EV2 (Pk)
1. √PAS inhibits in place TRRJ @ -45 deg	PAS SETUP (00:15) 1. Translate to S3 nadir inboard PAS via nadir route, fairlead forward of nadir light stanchions 2. Perform Safety Tether swap on S1 HR 3225 3. √Spare Safety Tether ❑ Anchor hook closed and locked ❑ Reel unlocked 4. √Waist Tether ❑ Lg hook closed and locked 5. Stow A/L Safety Tether on HR ___ 6. Temp stow PAS Crewlock Bag on S3 HR 3006 7. Fairlead tether on S3 HR 3007 (aft HR, clear of PAS) 8. Perform Glove Inspection	PAS SETUP (00:15) 1. Translate to S3 nadir inboard PAS via face 1 2. Perform Safety Tether swap on S1 HR 3201 3. √Spare Safety Tether ❑ Anchor hook closed and locked ❑ Reel unlocked 4. √Waist Tether ❑ Lg hook closed and locked 5. Stow A/L Safety Tether on HR ___ 6. Translate nadir at Bay 17, fairlead tether outboard around nadir trunnion (clear of PAS) 7. Perform Glove Inspection
	REMOVE DEPLOY CLEVIS BRACKET 9. Attach sm hook of Lg-sm Adj Tether to stbd standoff of S3 HR 3016 10. Stage Adj Tether from MWS on S3 HR 3024 11. RET to Deploy Clevis Bracket with Crewlock Bag internal RET 12. Release Deploy Clevis Bracket bolts (3 of 4) [**B7/CCW2/30.5]** 10 turns ❑ 6-in -Ext-7/16-in ❑ (25.5 ft-lb, 30 RPM) 13. Loosen remaining Deploy Clevis Bracket bolt 5 turns 14. Rotate Deploy Clevis Bracket out of work area RELEASE YOKE PIP PIN AND ADP 15. Release yoke PIP pin 16. Release yoke ADP, avoid closing bracket 17. Attach lg hook of Lg-sm Adj Tether to yoke ADP hole	HINGE LINE PREP 8. Remove hinge line ADPs (2) 9. Insert in stowage hole, avoid installing between truss and hinge beams ❑ √ADP closed: Inboard ❑ √ADP closed: Outboard REMOVE DIAGONAL BRACE 10. Release Diagonal Brace (cup-cone bolt) **[B6/CCW3/30.5]** 35 turns, **stop on turns (do not exceed 37 turns)** ❑ 6-in -Ext-7/16-in ❑ (24.0 ft-lb, 60 RPM)
	18. Tend platform “into” the truss	11. Assist EV1 as necessary to tend platform “into” truss

EVA 3 PAS DEPLOY (01:30) (Cont)

IV	EV1 (Be)	EV2 (Pk)
	REMOVE STOW CLEVIS BRACKET 19. RET to Stow Clevis Bracket 20. Release Stow Clevis Bracket bolts (4) **[B7/CCW2/30.5]** 10 turns ❑ 6-in -Ext-7/16-in ❑ (25.5 ft-lb, 30 RPM) 21. Temp stow Clevis Bracket	
	22. Receive Diagonal Brace from EV2; temp stow stbd of PAS worksite using adj equipment tether on S3 HR 3024 DEPLOY PLATFORM 23. Deploy platform out until UMA clears longeron 24. On EV2 GO, rotate yoke from out to in	12. Guide Diagonal Brace to EV1, limit to 7 deg out of plane DEPLOY PLATFORM 13. Monitor UMA to longeron clearance and inform EV1 when UMA clears longeron 14. Assist EV1 as needed with yoke
2. Brace Bolt Installation: Torque | Turns |	REINSTALL DIAGONAL BRACE 25. Release Diagonal Brace from S3 HR 3041 and move into position for re-installation 26. Release Lg-Sm adj tether as needed for brace clearance 27. Reinstall Lg-Sm adj tether to S3 HR 3016 once brace is clear	REINSTALL DIAGONAL BRACE 15. Assist EV1 with brace installation 16. Engage Diagonal Brace (cup-cone bolt) to **hard stop**, ~35 turns **[B2/CW2/30.5]** ❑ 6-in -Ext-7/16-in ❑ (16.0 ft-lb, 30 RPM) 17. Retrieve Adj Tether from S3 HR 3024

<table>
<tr><th>IV</th><th>EV1 (Be)</th><th>EV2 (Pk)</th></tr>
<tr>
<td>3. Deploy Clevis Bracket Install:
<table>
<tr><th>Bolt #</th><th>Initial Torque</th><th>Turns</th><th>Final Torque</th></tr>
<tr><td>1</td><td></td><td></td><td></td></tr>
<tr><td>2</td><td></td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td><td></td></tr>
<tr><td>4</td><td></td><td></td><td></td></tr>
</table>
</td>
<td>REINSTALL DEPLOY CLEVIS BRACKET
28. Finger-start Deploy Clevis Bracket (3 of 4), 1-2 turn
29. Engage Deploy Clevis Bracket bolts (4) to hard stop using star pattern, expect 10 turns [B5/CW2/30.5]
❑ 6-in -Ext-7/16-in
❑ (22.0 ft-lb, 30 RPM)
30. Apply final Torque to Deploy Clevis Bracket bolts (4) [RCW/30.5]. Two MTL clicks on each bolt
❑ 6-in -Ext-7/16-in

INSTALL YOKE
31. Disconnect Lg-Sm adj equipment tether
32. Install yoke in deploy clevis bracket
❑ Release wire tie securing PIP pin and ADP to yoke (if used)
❑ Install yoke ADP, √lock bracket engaged
❑ Install yoke PIP Pin
33. Retrieve Lg-Sm adj equipment tether from HR; stow in PAS Crewlock Bag
34. Stow Clevis Bracket in PAS Crewlock Bag</td>
<td></td>
</tr>
<tr>
<td>4. Give MCC-H GO to power up IMCA
√All tasks inside truss prior to UMA prep complete (including EBCS prep)
√Tools cleared from inside truss</td>
<td>UMA PREP
35. Translate under PAS UMA
36. Tether to hitch pin from EVA OVERRIDE anti-rotation cap, remove hitch pin
37. Remove anti-rotation cap and stow in trash bag</td>
<td>EBCS TARGET PREP

CAUTION
EBCS target susceptible to contact damage

18. Translate to EBCS target and perform:
❑ Verify both EV clear of target area
❑ Remove target cover; stow on backside of target assy</td>
</tr>
</table>

EVA 3 PAS DEPLOY (01:30) (Cont)

<table>
<tr><th>IV</th><th>EV1 (Be)</th><th>EV2 (Pk)</th></tr>
<tr><td>5. Obtain GO from MCC-H for RTL Checkout

<table><tr><td>RTL #</td><td>1</td><td>2</td><td>3</td></tr><tr><td>PIP Pin</td><td></td><td></td><td></td></tr></table></td><td></td><td><u>RTL CHECKOUT</u>
19. Translate to each Guide Vane (3) and perform:
❑ Remove launch restraint PIP pin from guide vane; stow in trash bag
❑ On MCC-H GO, depress and hold RTL lever for 15 sec, then release
❑ Verify with MCC-H good checkout, move to next guide vane</td></tr>
<tr><td></td><td><u>PAS CLEANUP</u>
38. Perform Glove Inspection
39. √SAFER MAN ISOL vlv – OP (dn) and HCM (dn)
40. Perform PAS Crewlock Bag tool inventory
41. Stow PAS Crewlock Bag on BRT
42. Translate to A/L; EV2 leads</td><td><u>PAS CLEANUP</u>
20. Perform Glove Inspection
21. √SAFER MAN ISOL vlv – OP (dn) and HCM (dn)
22. Translate to S3 HR 3008
23. Tether swap to A/L 85-ft safety tether
√Both bails closed, sliders locked
√Reel unlocked
24. Translate to A/L</td></tr>
</table>

EVA 3 TASK DATA – PAS DEPLOY

Estimated Task Duration:

	With RMS	Without RMS
One EV Crew	N/A	N/A
Two EV Crew	N/A	01:30

Tools:

EV1	EV2

ORU Identification:

ORU	Part Number	Serial Number	EVA Label

Mass & Dimensions:

ORU	Mass (lb)	Dimensions (in)

EVA Fasteners:

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

Inhibits:

ORU/Task	Location	Inhibit

Notes:

1.
2.
3.
4.
5.

Timeline Considerations:

1.
2.
3.
4.
5.

EVA 3 CLEANUP/INGRESS (00:25)

IV	EV1 (Be)	EV2 (Pk)
	CLEANUP (00:10) 1. Perform Tool Inventory	CLEANUP (00:10) 1. Perform Tool Inventory
	INGRESS (00:15) 2. Open thermal cover 3. Stow PAS Crewlock Bag in A/L 4. Ingress A/L 5. Attach Waist Tether to fwd UIA D-ring 6. √Waist Tether ❑ Hook closed and locked	INGRESS (00:15)
	7. Stow OIH Bag from EV2 in A/L 8. Stow MLI Bag from EV2 in A/L	2. Retrieve OIH Bag from A/L HR 0506 and transfer to EV1 3. Retrieve MLI Bag from A/L HR 0506 and transfer to EV1
	9. Give EV2 GO to relocate EV1 Safety Tether	4. On EV1 GO relocate EV1 Safety Tether anchor point from fwd A/L D-ring to A/L D-ring Ext 5. Attach Waist Tether to A/L D-ring Ext 6. √Waist Tether (R) ❑ Hook closed and locked 7. Release EV2 Safety Tether from aft A/L D-ring, attach to MWS
	10. Give EV2 GO to ingress	8. On EV1 GO, ingress A/L 9. Close thermal cover
1. Perform WVS PWR DWN (PHOTO/TV, WVS Cue Card)	11. Remove SCU from stowage pouch 12. Remove DCM cover 13. Connect SCU to DCM, √locked	10. Remove SCU from stowage pouch 11. Remove DCM cover 12. Connect SCU to DCM, √locked
	NOTE A TCV setting 8 – Max C minimizes time for SCU cooling	

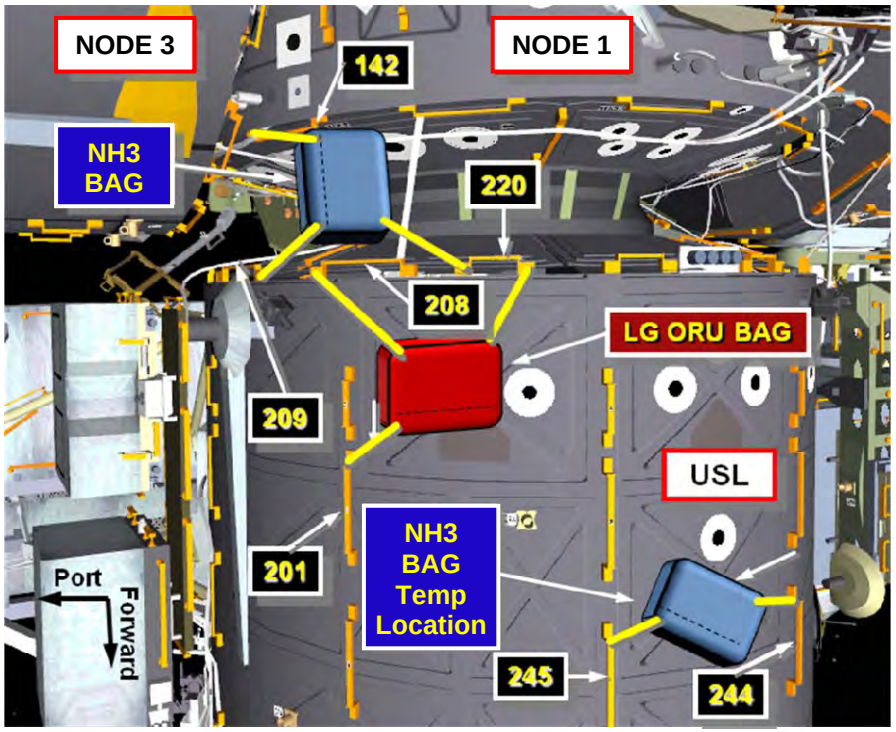
EVA 3 CLEANUP/INGRESS (00:25) (Cont)

IV	EV1 (Be)	EV2 (Pk)
	14. Water – OFF (fwd); expect “H2O IS OFF” msg	13. Water – OFF (fwd); expect “H2O IS OFF” msg CAUTION Do not close hatch until EMU water off for 2 min 14. Verify no hardware blocking the hatch 15. EV Hatch Handle – verify position per hatch decal 16. EV Hatch – close and lock 17. Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)

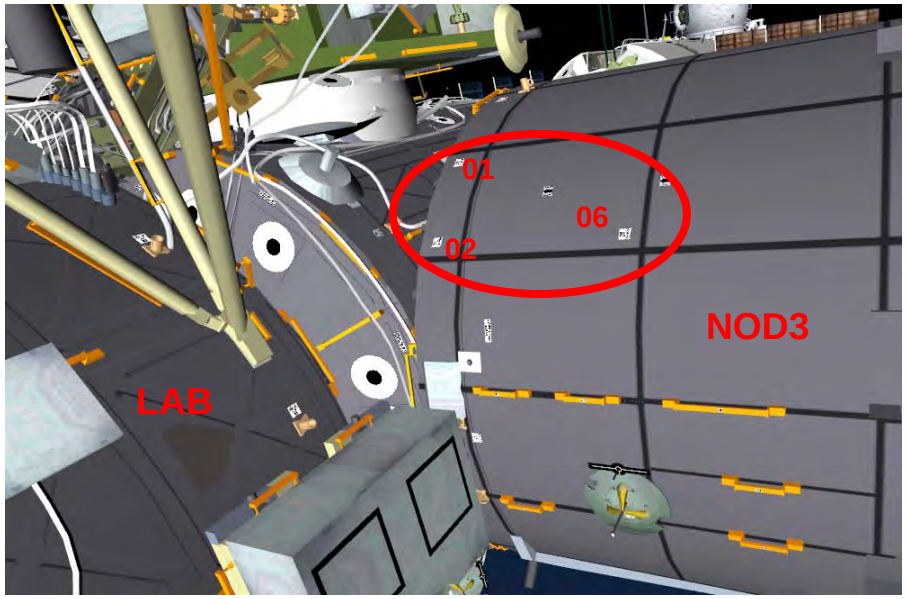
STS-130/20A EVA GET-AHEADS

Task (in priority order)	EV – Time (hr:mn) Required	EVA Applicable
NH3 Jumper Bag Relocate	1 EV – 00:20	1
NODE 3 OI WIF Install	1 EV – 00:20	1, 2
NODE 3 Gap Spanner Cleanup	1 EV – 00:20	1
Primary OIH Install	1 EV – 01:50 (30 min setup/cleanup; 10 min per OIH)	1
Secondary OIH and OI WIF Install	1 EV – 01:50 (30 min setup/cleanup; 10 min per OIH; 20 min for OI WIF)	2
A/L HR 0537 MMOD Photo	1 EV – 00:20	1, 2, 3
S1/S3 Fluid Jumper Install	1 EV – 00:45 (from S worksite)	3
Break Trq on S1 ATA Bolt #1	1 EV – 00:30	1, 2, 3
S1 FHRC P-Clamp Release	1 EV – 00:15 per clamp (from S worksite)	3
VSC Video Fiber Optic Cable Routing	2 EV – 01:30	3
STS-131 Gap Spanner Install	1 EV – 00:10	3

GET-AHEAD – NH3 JUMPER BAG RELOCATE (00:20)

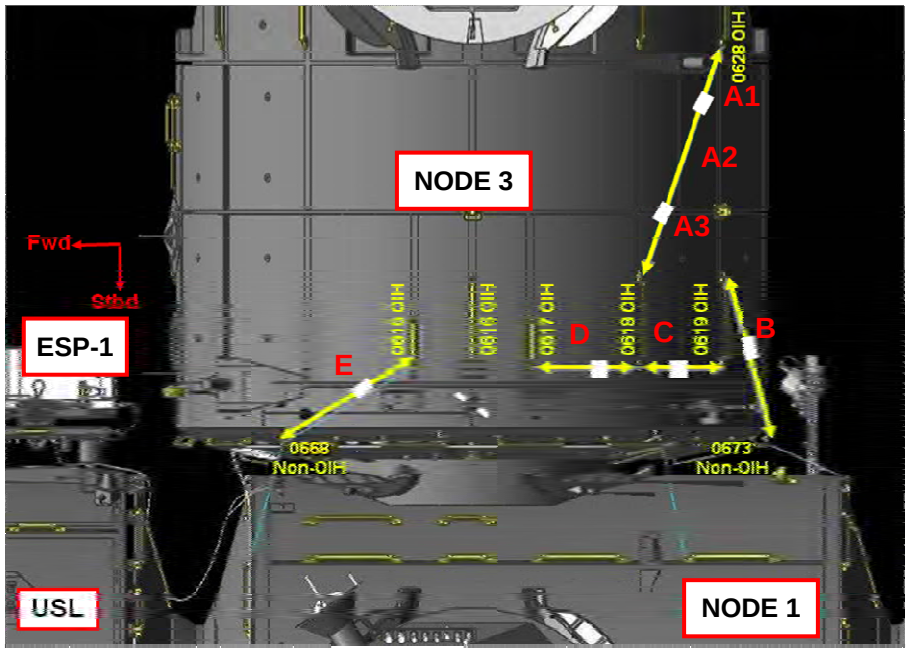
IV/SSRMS	EV1
	NH3 JUMPER BAG RELOCATE (00:20) 1. Translate to LAB HR 0209 (port/aft) via fwd route 2. Stow NH3 Jumper Bag on LAB HR 0209 (nadir), HR 0220 (port), and NOD1 HR 0142 (zenith) with Adj Equip Tethers (3), hinge zenith

GET-AHEAD – NODE 3 OI WIF INSTALL (00:20)

IV/SSRMS	EV1
	NODE 3 OI WIF INSTALL (00:20) 3. Translate to A/L 4. Open thermal cover 5. Retrieve OI WIF Crewlock Bag; stow on BRT 6. Close thermal cover 7. Translate to NOD3 HR 0600 (stbd endcone fwd/zenith) via fwd route 8. Perform Glove Inspection 9. Install OI WIFs in the following order per Block A – OI WIF Install: ❑ 01 ❑ 02 ❑ 06 10. BRT to OI WIF Crewlock Bag **Block A – OI WIF Install** 1. Retrieve OI WIF from Crewlock Bag 2. Slide OI WIF on dove tail receptacle 3. √Both spring plungers are down 4. Perform pull test

GET-AHEAD – NODE 3 GAP SPANNER CLEANUP (00:20)

IV/SSRMS



EV1

CLEANUP NOD3 GAP SPANNER (00:20)

1. Remove tape on gap spanner per table below, stow in Small Trash Bag

Tape #	HR (standoff)		HR (standoff)	√Removed	√Turn Test
A1 **A2** **A3**	NOD3 0618 (port)		NOD3 0628 (stbd)	(3 pieces)	
B	NOD3 0673 (zenith)		NOD3 0619 (port)		
C	NOD3 0619 (stbd)	→	NOD3 0618 (stbd)		
D	NOD3 0618 (stbd)		NOD3 0617 (stbd)		
E	NOD3 0615 (stbd)		NOD3 0668 (fwd)		

GET-AHEAD – NODE 3 PRIMARY OIH INSTALL (01:50)

IV/SSRMS	EV1

NOD 3 OIH INSTALL (01:10)

1. Translate to NOD3 zenith on stbd endcone; BRT to NOD3 HR 0678
2. Install OIHs in the following order, per block D – OIH Install:

√	OIH	Location Type	Bolt 1 Trq (Ft-lbs)/Turns		Bolt 2 Trq (Ft-lbs)/Turns	
	0663	Circumferential				
	0664	Circumferential				
	0600	Longitudinal				
	0601	Longitudinal				
	0602	Longitudinal				
	0603	Longitudinal				
	0604	Longitudinal				
	0605	Longitudinal				

Block D – OIH Install

1. √Soft dock armed
2. √Label and orientation matches module
3. Install OIH; √fully seated
4. Drive bolts (2) **[A2,CW2,30.5]** ~8 turns
   - ❑ 7/16-in (wobble) Socket-6-in ext
   - ❑ (3.8 ft-lb, 30 RPM)
5. √Fully seated

GET-AHEAD – SECONDARY OIH AND OI WIF INSTALL (01:50) (TBD)

GET-AHEAD – A/L HR 0537 MMOD PHOTO (00:20) (TBD)

GET-AHEAD – S1/S3 FLUID JUMPER INSTALL (00:45) (TBD)

GET-AHEAD – BREAK TRQ ON S1 ATA BOLT #1 (00:30) (TBD)

GET-AHEAD – S1 FHRC P-CLAMP RELEASE (00:15/BOLT) (TBD)

GET-AHEAD – VSC VIDEO FIBER OPTIC CABLE ROUTING (01:30) (TBD)

10 black Velcro ties removed at Bench Review
3 Wire Ties: #1=S0 loop, #2=both loops, #3=FGB loop

GET-AHEAD – STS-131 GAP SPANNER INSTALL (00:10) (TBD)

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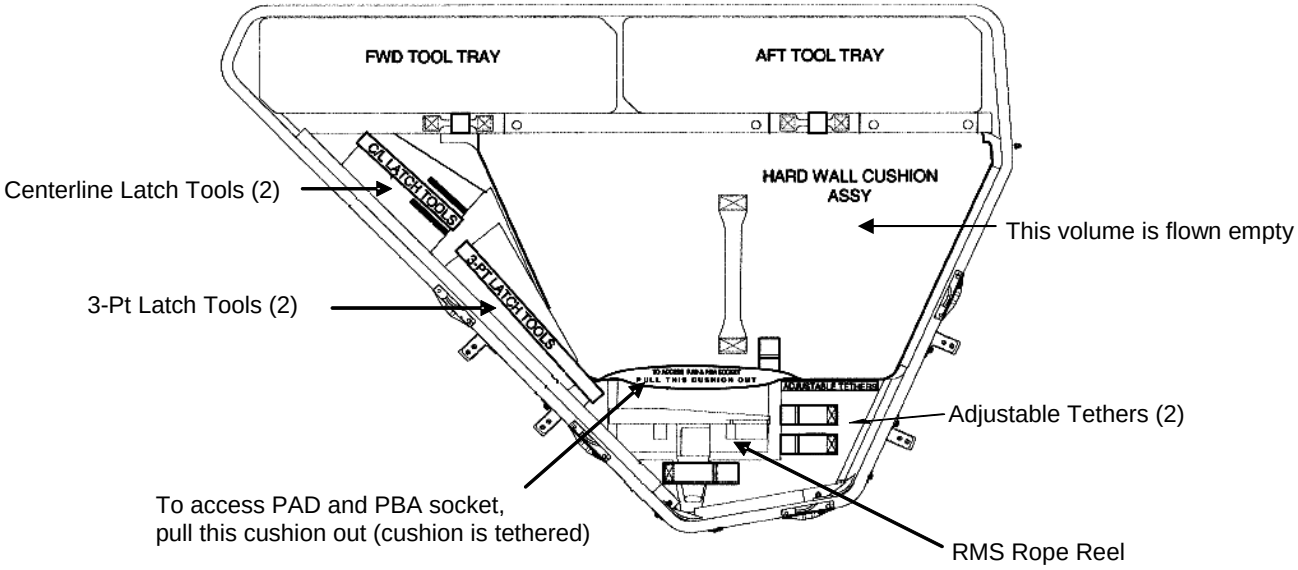
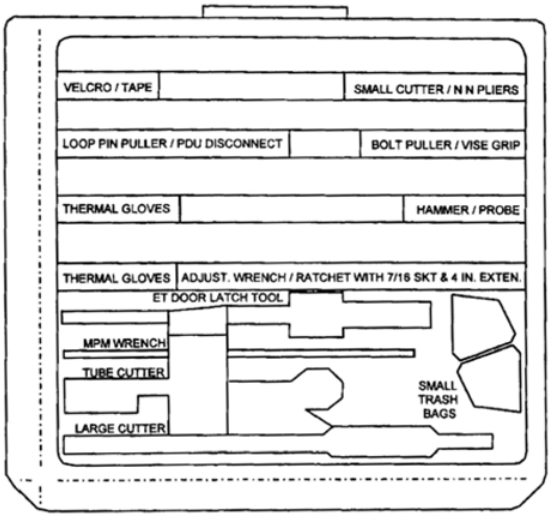
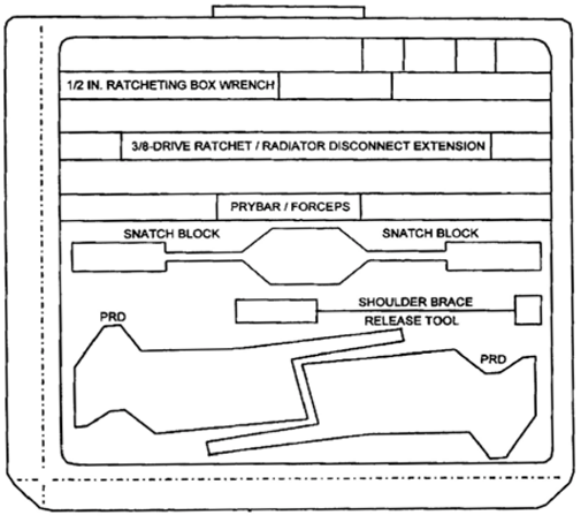
TOOBOX STOWAGE – STS-130 (20A) ..... FS 8-12

PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA)

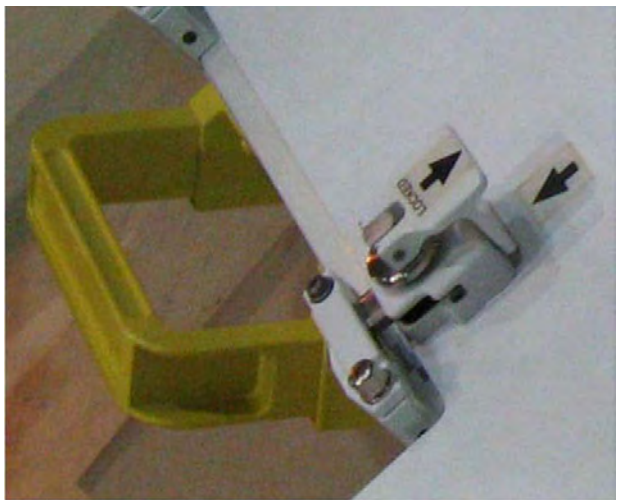




Forward Tray Layout and Labels



Aft Tray Layout and Labels



When closing TSA doors, ensure locking tabs on latches are closed “Arrow to Arrow”

APFR MANAGEMENT – STS-130 (20A)

APFR DESIGNATOR	APFR 1	APFR 2 (10A sticky locking collar)	APFR 3 s/n 1005 (Inc12 suspected sharp edge on locking collar and possible sticky locking collar)	APFR 4 (TS, old ORU tether, heat shield)	APFR 5 (TS, old ORU tether, heat shield)	APFR 6 (heat shield removed on 12A.1 stage)	APFR 7 s/n 1008	IAPFR 1	IAPFR 2	CRANE (old ORU tether)	TS (from APFR 5)	TS	ORU stanchion/ TERA headless	OTSD
Post STS-129	P6 WIF 22 [12,QQ,C,1] Yaw & Roll Settings are Approximate	A/L WIF 9 [12,PP,F,12]	Lab WIF 4 [1,RR,F,11] Ingress Aid toward LAB (not against boot plate)	Z1 WIF 10 [3,LL,B,6] TS at 4 o'clock	PMA1 WIF 2 TS/HS [6,KK,F,6]	Stbd CETA cart WIF 1 [6,OO,E,6] Ingress Aid	P6 WIF 10 [12,GG,E,6] Ingress Aid	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5	TBD	S0 port wedge face	S0 port wedge face	S0 WIF 7 CL=7
Post EVA 1	P6 WIF 22 [12,QQ,C,1] Yaw & Roll Settings are Approximate	A/L WIF 9 [12,PP,F,12]	Lab WIF 4 [1,RR,F,11] Ingress Aid toward LAB (not against boot plate)	Z1 WIF 10 [3,LL,B,6] TS at 4 o'clock	PMA1 WIF 2 TS/HS [6,KK,F,6]	Stbd CETA cart WIF 1 [6,OO,E,6] Ingress Aid	P6 WIF 10 [12,GG,E,6] Ingress Aid	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5	TBD	S0 port wedge face	S0 port wedge face	S0 WIF 7 CL=7
Post EVA 2	P6 WIF 22 [12,QQ,C,1] Yaw & Roll Settings are Approximate	A/L WIF 9 [12,PP,F,12]	Lab WIF 4 [1,RR,F,11] Ingress Aid toward LAB (not against boot plate)	Z1 WIF 10 [3,LL,B,6] TS at 4 o'clock	PMA1 WIF 2 TS/HS [6,KK,F,6]	Stbd CETA cart WIF 1 [6,OO,E,6] Ingress Aid	P6 WIF 10 [12,GG,E,6] Ingress Aid	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5	TBD	S0 port wedge face	S0 port wedge face	S0 WIF 7 CL=7
Post EVA 3	P6 WIF 22 [12,QQ,C,1] Yaw & Roll Settings are Approximate	A/L WIF 9 [12,PP,F,12]	Stbd A/L Tool Box [9,RR,F,11] Ingress Aid	Z1 WIF 10 [3,LL,B,6] TS at 4 o'clock	PMA1 WIF 2 TS/HS [6,KK,F,6]	Stbd CETA cart WIF 1 [6,OO,E,6] Ingress Aid	P6 WIF 10 [12,GG,E,6] Ingress Aid	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5	TBD	S0 port wedge face	S0 port wedge face	S0 WIF 7 CL=7

55-FT SAFETY TETHERS – STS-130 (20A)

	#67 s/n 1017 Lg-sm	#68 s/n 1018 Lg-sm	#69 s/n 1019 Lg-sm	#72 s/n 1022 Lg-sm	#71 s/n 1021 Lg-sm (has retracting issues – AR written-2J/A) (2J/A saw kink in braided cable)	#73 s/n 1023 has retracting issues – ARs 1J, 2J/A) (2J/A saw kink in braided cable & noted brown smudges on the LAT)	#60 s/n 1008 Lg-sm (has retracting issues) (2J/A – LATs are pretty brown & may need inspection before use)	#70 s/n 1020 Lg-sm (2J/A – LATs are pretty brown & may need inspection before use)	#66 s/n 1016 Sm-sm 2J/A noted brown smudges on the LAT-GO for EVA
ULF3 Stage	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	**RETURNED: STS-128/17A**	**RETURNED: STS-128/17A**	**RETURNED: STS-128/17A**	**RETURNED: STS-128/17A**	**RETURNED: STS-128/17A**
Post EVA 1	INSIDE: tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area					
Post EVA 2	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area					
Post EVA 3	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area					

85-FT SAFETY TETHERS – STS-130 (20A)

	#22 s/n 1002 Lg-sm (2 J/A – retracting issue)	#21 s/n 1001 Lg-sm	#24 s/n 1004 Lg-sm	#29 s/n 1009 Lg-sm (Up on ULF3)	#25 s/n 1005 Lg-sm	#27 s/n 1007 Lg-sm	##28 s/n 1008 Lg-sm
ULF3 Stage	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	**STS-130/20A Middeck**	**STS-130/20A Middeck**	**RETURNED: STS-129/ULF3**
Post EVA 1	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	**STS-130/20A Middeck**	**STS-130/20A Middeck**	
Post EVA 2	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	**STS-130/20A Middeck**	**STS-130/20A Middeck**	
Post EVA 3	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	INSIDE: Tether staging area	**STS-130/20A Middeck**	**STS-130/20A Middeck**	

TOOLBOX STOWAGE – STS-130 (20A)

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

WATER RECHARGE ..... TEMP FS 10-2
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WATER FILL ..... TEMP FS 10-2
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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(flr) 5. √EMU O2 ISOL VLV – OP

AW82B 6. EV1,2 O2 vlv (two) – OP

DCM 7. PWR – SCU

WATER FILL

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

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

SM 60 TABLE MAINT

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

11. Log value before recharge

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

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

13. √H2O TKB quantity decreasing

NOTE
Full charge requires ~15 min

WATER FILL VERIFICATION

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

SM 60 TABLE MAINT

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

16. Log value after recharge

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

Cont next page

TOP

HOOK VELCRO

STS-130 CONSUMABLES TRACKING CUE CARD

		EVA 1	EVA 2	EVA 3
METOX for Campout & 10.2 Ops	**Serial Numbers**	05 & 07	11 & 13	15 & 16

PWR Usage: Use 1012, 1023, 1025, 1026 in that order until drained
Dump CWC: 1059 for all EVAs

	EV	EMU	LiOH (s/n)	Metox (s/n)	EMU Batt (s/n)	REBA (s/n)	EHIP Batts (s/n)	ERCA (address)	SAFER (s/n)	PGT Batt (s/n)	PGT Batt Spare (s/n)
EVA 1 (FD 5)	EV1 Be	3003	xxxx ~launched in suit	N/A	2086 ~launched in suit	1006	1025 1026	16	1004	1004	1008
	EV2 Pk	3005	xxxx ~launched in suit	N/A	2087 ~launched in suit	1008	1028 1029	18	1006	1005	1009
EVA 2 (FD 7)	EV1 Be	3003	xxxx	N/A	2084	1006	1025 1026	16	1004	1004	1008
	EV2 Pk	3005	xxxx	N/A	2088	1008	1028 1029	18	1006	1005	1009
EVA 3 (FD 9)	EV1 Be	3003	N/A	19	2086	1006	1025 1026	16	1004	1004	1008
	EV2 Pk	3005	N/A	20	2087	1008	1028 1029	18	1006	1005	1009
Return Config	EV1 Be	3003	s/n xxxx	N/A	2083	N/A	N/A	N/A	N/A	N/A	N/A
	EV4 Pk	3018	s/n xxxx	N/A	2085	N/A	N/A	N/A	N/A	N/A	N/A

EVA-5a/130/O/A

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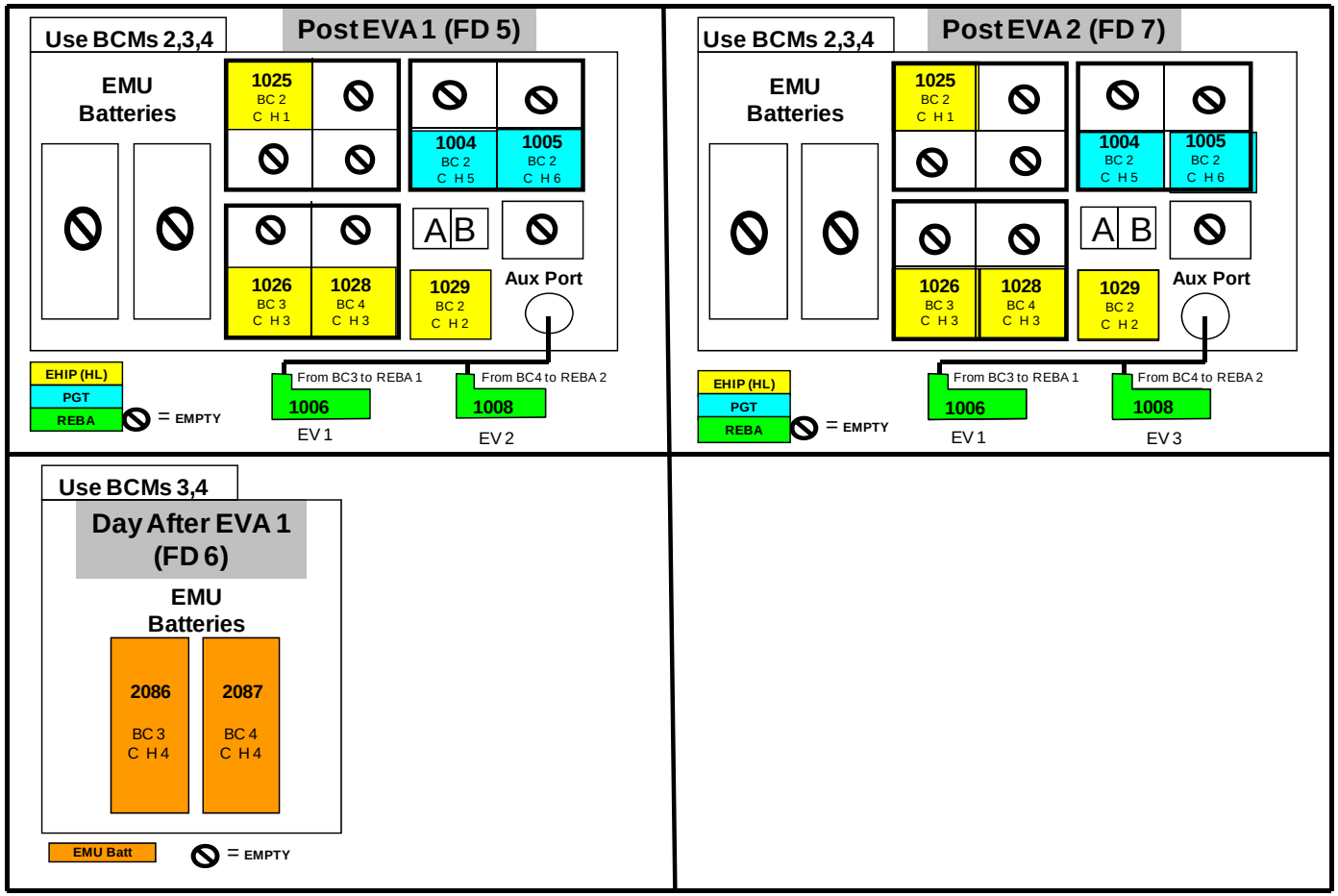
TOP
BACK OF 'STS-130 CONSUMABLES TRACKING CUE CARD'

HOOK VELCRO

STS-130 BATTERY RECHARGE CUE CARD



EVA-5b/130/O/A

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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:
8. √Display – O2 POS XX, expect FAN SW OFF msg, DISP – PRO
9. As reqd, FAN – ON
If display blank or locked up:
10. Contact MCC
If SCU power desired:
11. √SCU connected to DCM
AW18H 12. PWR/BATT CHGR EMU 1(2) MODE – PWR
BUS SEL – MNA(MNB)
13. √EMU INPUT 1(2) Volts = 18.0 – 20.0
DCM 14. PWR – SCU
DCM 15. √Display – O2 POS XX

VACUUM H2O RECHARGE (MANNED)

> WARNING
> Procedure should be used only if performing a contingency EVA

EV 1. Perform AIRLOCK INGRESS, Cuff C/L, 30 (Close hatch, partially engage latches)
2. √Helmet purge vlv – cl, locked
DCM 3. √PURGE vlv – cl (dn)
4. √WATER – OFF
IV MO13Q 5. √ARLK H2O S/O VLV – OPEN (tb-OP)
MD(flr) 6. √EMU O2 ISOL VLV – OP
ML86B:C 7. √cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – op
AW82B 8. √EV-1(EV-2) O2 vlv – OP
EV AW18H 9. PWR/BATT CHGR EMU 1(2) BUS SEL – MNA(MNB)
DCM 10. PWR – SCU (fwd), WARN TONE
IV R11L If SPLY H2O XOVR VLV closed (tb-CL or bp) (water transfer config):
11. SPLY H2O TKA OUTLET – CL (tb-CL)
If SPLY H2O XOVR VLV open (tb-OP) (nominal config):
L1 12. √RAD CNTLR OUT TEMP – NORM
13. √FLASH EVAP CNTLR PRI A,B (two) – OFF
ML31C 14. SPLY H2O TKD OUTLET – CL (tb-CL)
R11L 15. SPLY H2O TKB OUTLET – CL (tb-CL)
√TKA OUTLET – CL (tb-CL)
TKC INLET – CL (tb-CL)
TKC OUTLET – OP (tb-OP)

TOP

HOOK
VELCRO

EMERGENCY UNDOCKING
EVA TRANSFER

Critical

- EMUs (Be & Pk)
- CCAs (Be & Pk)
- Gloves (Be & Pk)
- LCVG (Be & Pk)
- *EMU Batteries (2), (s/n 2083 & 2084 preferred)*

Desired

- ECOKS (Be, Pk)
- EMU Servicing Kit
- Adj Eq Tethers (6)
- Remove the following items from EMUs and leave on ISS
    - o Helmet Lights, TV, REBA, METOX
    - o ISS Tethers and Tools

EVA-6a/130/O/A

TOP
BACK OF 'EMERGENCY UNDOCKING EVA TRANSFER'

HOOK
VELCRO

EXPEDITED SUIT DOFFING CUE CARD

CAUTION
Verify EV crew is clear of hatch mechanism

IV — When equalization complete:
1. Open IV Hatch per decal

SUIT DOFFING

DCM
2. O2 ACT → OFF
3. PURGE vlv → op (up)
4. sw REBA → OFF (toward left arm of suit)
5. EMU TV Power Cable ←|→ EMU TV
6. √STATUS: SUIT P < 0.4 (compare with gauge)
7. Glove ←|→ EMU (leave donned, disconnected)
8. Helmet ←|→ EMU

DCM
9. sw FAN → OFF

SAFER DOFFING

SAFER
10. Latch → ENG
11. Latch ↶ until release (~90 deg)
12. PLSS ←|→ Thruster Towers

SUIT DOFFING (Cont)

PLSS
13. Engage EMU in EDDA
14. Lower Arm Cables ←|→ Gloves
15. Gloves ←|→ EMU
16. Comm Mode → OFF
17. Doff EMU

If taking EMUs to shuttle:

UIA
18. sw PWR EV-1,2 (two) → OFF
    √PWR EV-1,2 LEDs (four) – Off

DCM
19. SCU ←|→ DCM
20. LTA →|← HUT
21. Gloves →|← EMU
22. Helmet →|← EMU
23. Go to **EMERGENCY UNDOCKING EVA TRANSFER** on reverse side

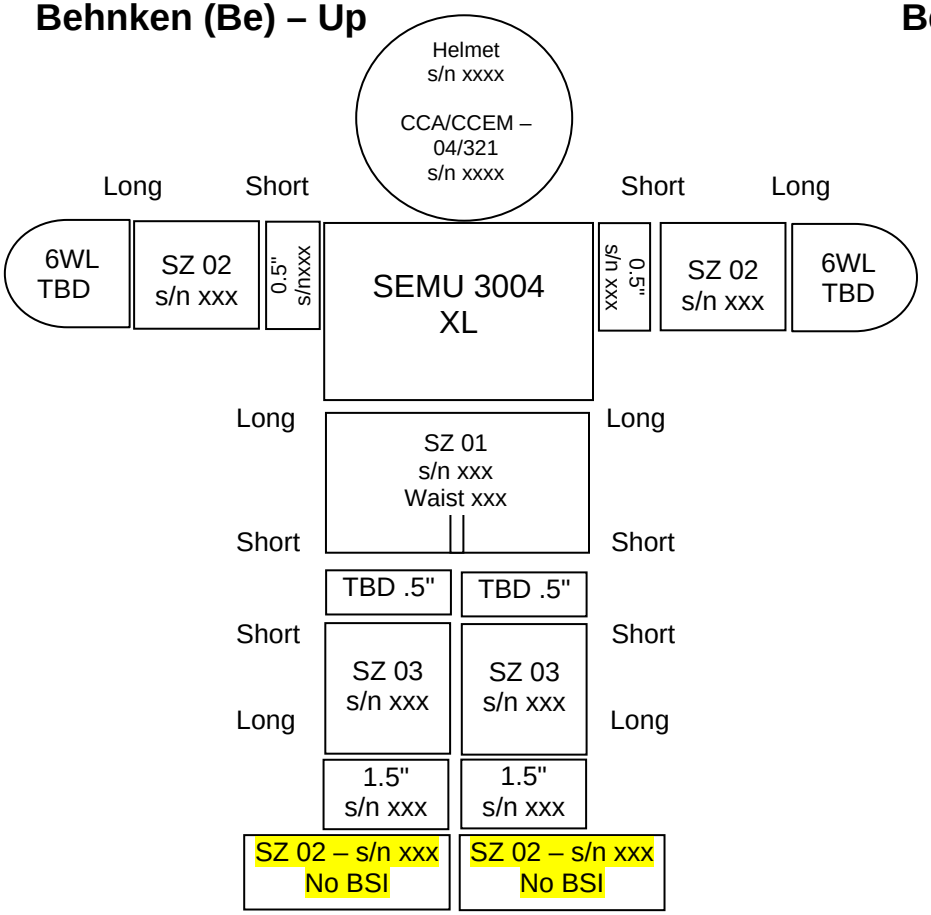
EVA-6b/130/O/A

EMU CONTINGENCY RESIZE MATRIX (STS-130/20A)

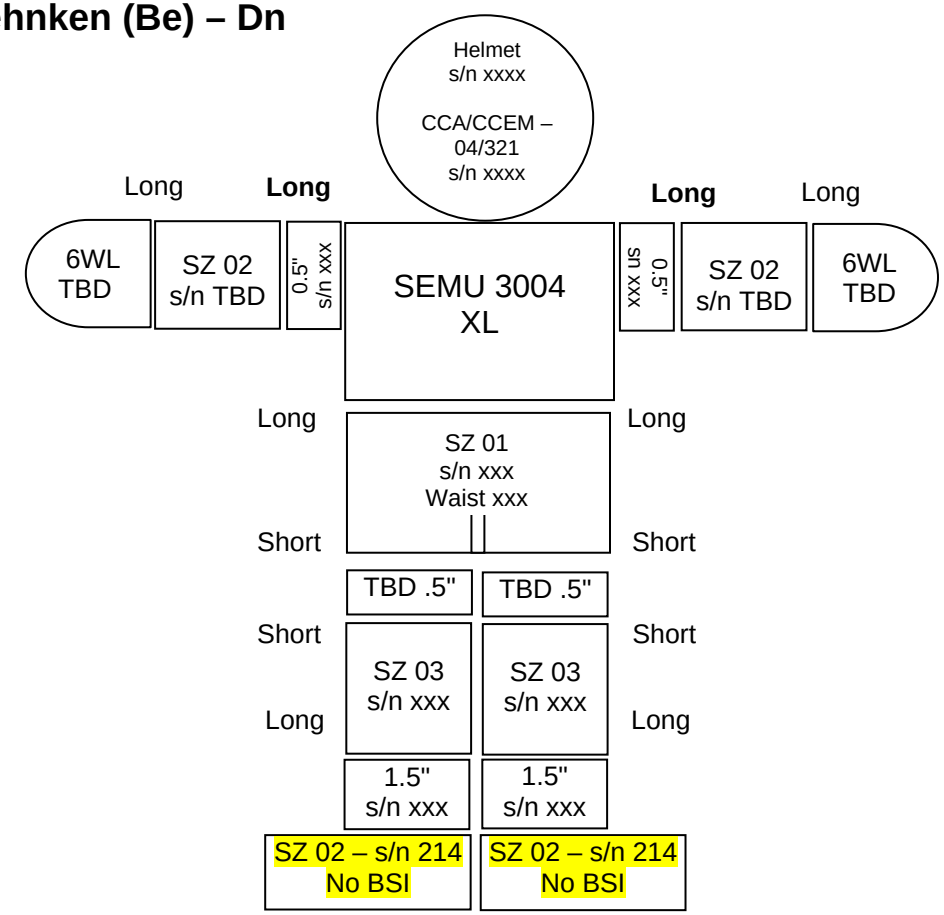
FOR LOSS OF:	EV1 – Behnken	EV2 – Patrick
HUT/PLSS	Use EMU 3018, XL 1. Remove glove/arm assys 2. Use primary arms, gloves 3. √Arm red connects to right, √locks, √cams 4. Use primary LTA 5 Swap EMU PLSS identifier stripes, national flag 6. Swap helmet, comm cap, LiOH/Metox, EMU battery, REBA	Use EMU 3018, XL 1. Remove ring/glove/arm assys 2. Use primary ring, arms, gloves 3. √Arm red connects to right, √locks, √cams 4. Use primary LTA 5. Swap EMU PLSS identifier stripes, national flag 6. Swap helmet, comm cap, LiOH/Metox, EMU battery, REBA
CCA	Use size 04/321 s/n 1213/1014 Location: ECOK (Be)	Use size 06/321 CCA s/n 1187/1045 Location: ECOK (Pk)
Lower Arm Segment	Use size 02 arm s/n 331/332 from ISS. Cams S/L (red = right, blue = left) 1. √Locks, √cams	Use size 02 arm s/n 331/332 from ISS. Cams L/L (red = right, blue = left) 1. √Locks, √cams
Gloves	Back-up: Use 6BB gloves s/n 6219 Location: ECOK (Be)	Back-up: Use 6C3 gloves s/n 6263 Location: ECOK (Pk)
Waist Brief	Use size 01 waist brief s/n 2076 (045) from ISS. Cams L/S 1. Use prime legs, leg rings, and boots 2. √Locks, √cams 3. Swap EMU brief identifier stripes	Use size 01 waist brief s/n 2076 (045) from ISS. Cams S/S 1. Use prime legs and boots 2. √Locks, √cams 3. Swap EMU brief identifier stripes
Leg Segment	Use size 03 leg from ISS s/n 233/234. Cams S/L 1. √Locks, √cams	Use size 02 leg from ISS s/n 215/216. Cams S/L 1. √Locks, √cams
Boot	Use size 02 boots s/n 214 from ISS 1. √NO BSI or Toe Cap 2. √Locks	Use size 02 boots s/n 219 from ISS 1. √NO BSI or Toe Cap 2. √Locks
Sizing Rings	• 0.5" Thigh: Use s/n 127/128 from ISS M-O2 Bag • 1.5" Leg: Use s/n 125/126 from ISS M-O2 Bag	• 1.0" Leg: Use s/n 117/118 from ISS M-O2 Bag
LCVG	(05/05) 1. Use s/n 3167 Location: Bag "E" 2. Transfer biomed and dosimeter	(0505) 1. Use s/n 3167 Location: Bag "E" 2. Transfer biomed and dosimeter

STS-130 NOMINAL EMU SIZING

Behnken (Be) – Up



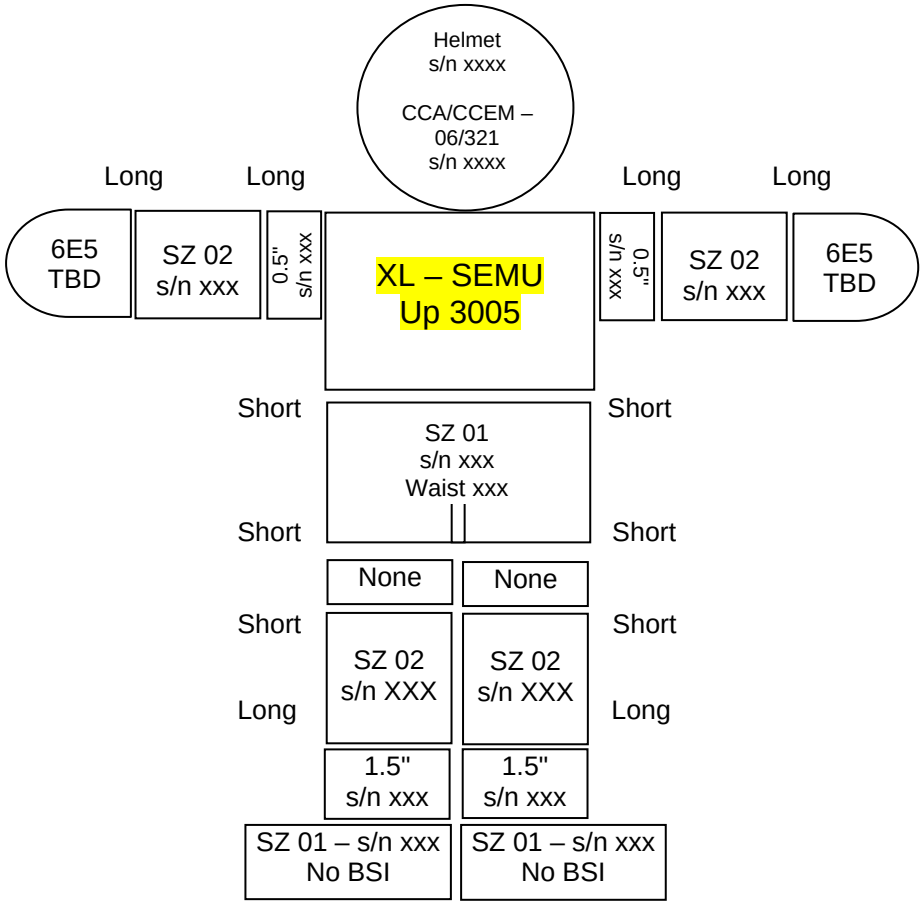
Behnken (Be) – Dn



	Croakie	Fresnel	Valsalva	LCVG/BLVD	MAG	TCU Top	TCU Bottom	Comfort Gloves	Socks
Be	None	None	Mod -308	04/05	709	L	L	-10 & .06	Thermax Sock Liner

STS-130 NOMINAL EMU SIZING (Cont)

Patrick (Pk) – Up



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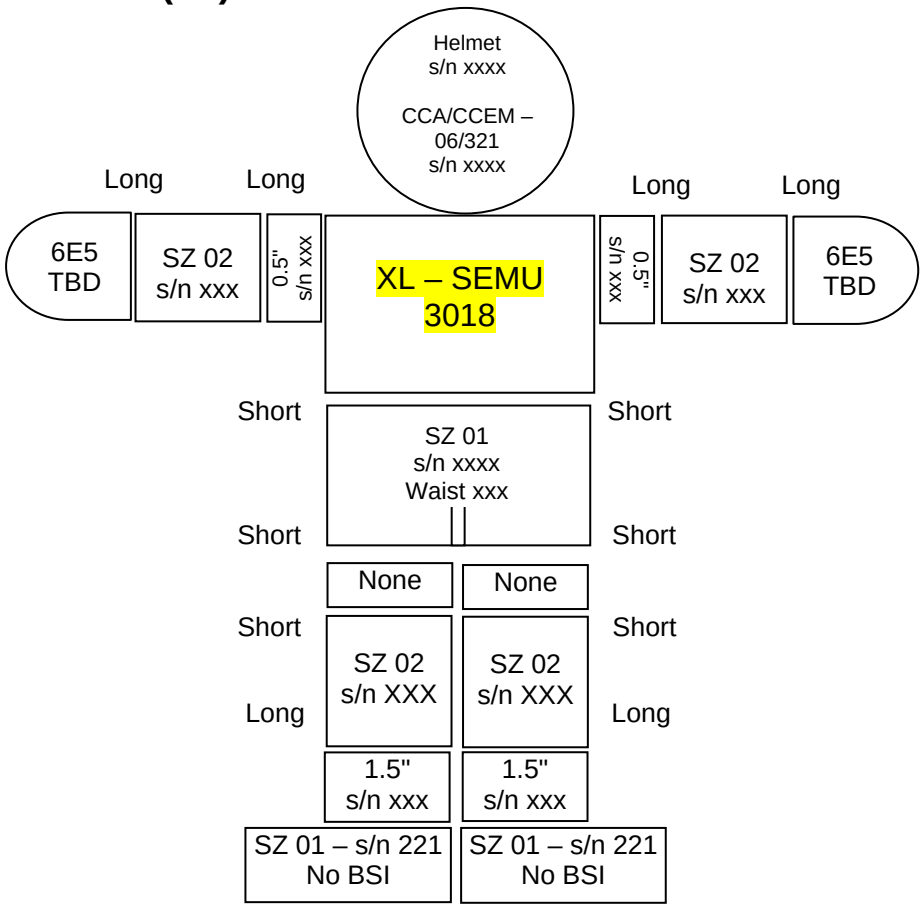

	Croakie	Fresnel	Valsalva	LCVG/BLVD	MAG	TCU Top	TCU Bottom	Comfort Gloves	Socks
PK	1	None	-309	05/05	709	L	M	Custom	Tube

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- TUS CABLE DISCONNECT FROM IUA
- SARJ TBA R&R
- SARJ DLA R&R
- FGB RELEASE
- AGB RELEASE
- FRAM

STS-130/20A WORKAROUND CRIBSHEET

EVA 1 CONTINGENCIES

TASK	FAILURE	ACTION
Egress		
Hatch	A. Hatch fails to open	If lever does not rotate Check for FOD
1553 BUS Terminator Install		
Clover Leaf Dust Cap	B. Connector cap (Twist) will not release	1. Increase force 2. Use tether hook for additional leverage 3. On **MCC-H GO**: Attach equip hook to cap tether point and use strap of adj tether to release cap ?
Terminator	C. Connector fails to soft dock	1. Verify correct plug and jack 2. Verify bail fully aft 3. Verify backshell fully aft and remains fully aft. If backshell not fully aft, pull and hold in fully aft position while attempting to soft dock connector 4. Inspect the following: – O-ring seal – FOD – Bend radius – Soft dock springs – Connector keying feature 5. Verify alignment (avoid excessive rolling or rocking the plug as this could unseat soft dock springs) – Connector should snap into soft dock with little force once half shells are aligned
	D. Connector fails to mate	1. Verify half-shells are fully seated on both sides 2. Verify cable and backshell free to move (no clamps) 3. Push forward on connector backshell while actuating bail 4. Detach from soft dock and inspect: – Pins – FOD – EMI band – Bend radius – TA clamps – P clamps – Bail linkages and rivets – Soft dock springs – O-ring seal and main joint gasket – Connector keying feature 5. Cycle bail while disconnected (push forward on connector backshell for additional leverage)
Orbiter LTA Cable Remove		
TA Clamp	E. TA clamp fails to release	1. With handle up, press down on top of rounded clamp 2. With handle up, use tether hook to pry drawhook from capture pin
LTA Connector	F. Bail bar fails to slide over-center	1. Inspect bail for FOD 2. Inspect bail linkage for damage and report to **MCC-H** 3. Check alignment and sideloads 4. Verify sufficient TA clamps are open 5. Increase force on bail 6. Attach 2 hooks from adj tether to connector bail and use adj strap to pull bail into demated position 7. On **MCC-H GO**: Retrieve vise grips to help increase force on bail

TASK	FAILURE	ACTION
	G. Backshell fails to slide (after over-center mechanism has been overcome)	1. Verify sufficient TA clamps are open 2. Check for cable harness and hardware interference 3. Check alignment and sideloads 4. Inspect bail and connector for FOD 5. Inspect bail linkage for damage and report to **MCC-H** 6. Wiggle/jiggle connector while pushing or pulling on backshell 7. Attach 2 hooks from adj tether to connector bail and use adj strap to pull bail into demated position 8. On **MCC-H GO**: Retrieve vise grips to help increase force on bail
	H. Connector fails to release from soft dock	1. Verify bail fully thrown, undamaged, and backshell fully aft 2. If backshell springs forward, pull and hold in fully aft position (will have to overcome spring force, approx 5-10 lb) while attempting to demate connector 3. Verify sufficient TA clamps are open 4. Check for cable harness and hardware interference 5. Check alignment and sideloads 6. Relieve compression on connector interface due to cable loads by pulling backshell away from jack 7. Push the plug towards the jack to compress the soft dock 8. Wiggle/jiggle connector. (Use slight rolling motion)
Clover Leaf Dust Cap	I. Connector cap (Twist) will not install	1. Check for FOD 2. Increase force 3. Use tether hook for additional leverage
TSA	J. Latch fails to open	Release 7/16 EVA bolt on latch bracket; rotate bracket clear of latch **PGT [A2 (3.8), CCW2, 30.5], 7/16 - 6 ext** 1-2 turns
	K. Latch fails to close	Close remaining latches (3 of 4 required for landing)
Open Port CBCS Flap		
CBCS Flap	L. Flap unable to be secured open	Use wire ties to restrain open
OTP Removal		
EDFs	M. EDF does not release with recommended torque	1. Use manual Ratchet Mode on PGT for 1 turn only, continue releasing at nominal torque 2. Remove EDF with prybar (only if head not free spinning)
	N. EDF cannot be removed from lug/clevis after untorqued	1. Twist outer washer (lanyard washer) back and forth while pulling outward 2. Verify lanyard not snagged 3. Drive EDF ccw 2 turns (start EDF by hand when re-installing) 4. Gently tap along EDF major axis with back of equipment hook or hammer (EDF head must not be free spinning), and pull outward with lanyards 5. Use equipment hook over EDF bolt head to remove (EDF head must not be free spinning) 6. EVA prybar (EDF head must not be free spinning)
	O. Cannot softdock EDF into lug/clevis interface	1. Verify lug/clevis free of FOD 2. Twist EDF bolt head by hand to seat on tip hex head, retry insertion; verify head not free spinning 3. Drive EDF 2 addl turns ccw, retry insertion; verify head not free spinning 4. Remove EDF and verify collets not expanded

TASK	FAILURE	ACTION
NODE 1 LTA Cable Install/NODE 3 Avionics Install		
TA Clamp	P. TA clamp fails to release	1. With handle up, press down on top of rounded clamp 2. With handle up, use tether hook to pry drawhook from capture pin
Connectors	Q. Bail bar fails to slide over-center	1. Inspect bail for FOD 2. Inspect bail linkage for damage and report to **MCC-H** 3. Check alignment and sideloads 4. Verify sufficient TA clamps are open 5. Increase force on bail 6. Attach 2 hooks from adj tether to connector bail and use adj strap to pull bail into demated position 7. On **MCC-H GO**: Retrieve vise grips to help increase force on bail
	R. Backshell fails to slide (after over-center mechanism has been overcome)	1. Verify sufficient TA clamps are open 2. Check for cable harness and hardware interference 3. Check alignment and sideloads 4. Inspect bail and connector for FOD 5. Inspect bail linkage for damage and report to **MCC-H** 6. Wiggle/jiggle connector while pushing or pulling on backshell 7. Attach 2 hooks from adj tether to connector bail and use adj strap to pull bail into demated position 8. On **MCC-H GO**: Retrieve vise grips to help increase force on bail
	S. Connector fails to release from soft dock	1. Verify bail fully thrown, undamaged, and backshell fully aft 2. If backshell springs forward, pull and hold in fully aft position (will have to overcome spring force, approx 5-10 lb) while attempting to demate connector 3. Verify sufficient TA clamps are open 4. Check for cable harness and hardware interference 5. Check alignment and sideloads 6. Relieve compression on connector interface due to cable loads by pulling backshell away from jack 7. Push the plug towards the jack to compress the soft dock 8. Wiggle/jiggle connector. (Use slight rolling motion)
	T. Connector fails to soft dock	1. Verify correct plug and jack 2. Verify bail fully aft 3. Verify backshell fully aft and remains fully aft. If backshell not fully aft, pull and hold in fully aft position while attempting to soft dock connector 4. Inspect the following: – O-ring seal – FOD – Bend radius – Soft dock springs – Connector keying feature 5. Verify alignment (avoid excessive rolling or rocking the plug as this could unseat soft dock springs) – Connector should snap into soft dock with little force once half shells are aligned

TASK	FAILURE	ACTION
	U. Connector fails to mate	1. Verify half-shells are fully seated on both sides 2. Verify cable and backshell free to move (no clamps) 3. Push forward on connector backshell while actuating bail 4. Detach from soft dock and inspect: – Pins – FOD – EMI band – Bend radius – TA clamps – P clamps – Bail linkages and rivets – Soft dock springs – O-ring seal and main joint gasket – Connector keying feature 5. Cycle bail while disconnected (push forward on connector backshell for additional leverage)
Clover Leaf Dust Cap	V. Connector cap (Twist) will not release	1. Increase force 2. Use tether hook for additional leverage 3. On **MCC-H GO**: Attach equip hook to cap tether point and use strap of adj tether to release cap ?
Ingress		
Hatch	W. Hatch fails to close	1. Check hatch seated and no FOD on sealing surface 2. If lever does not rotate a. Check for FOD
	X.	

EVA 2 CONTINGENCIES

TASK	FAILURE	ACTION
Egress		
Hatch	A. Hatch fails to open	If lever does not rotate Check for FOD
NODE 3 FQD Jumpers		
TA Clamp	B. TA clamp fails to close	1. Check for FOD 2. Wire tie FQD jumper to TA clamp
NOTE Troubleshooting steps outlined in this cribsheet are a generic starting point. Flight specific situations may require different actions. If troubleshooting requires the crew to leave the worksite, verify that female QDs are covered to prevent exposure to direct sunlight. For thermal clocks refer to flight rules		
Mating Ops	C. QD fails to mate	1. Check for debris, damage, or crystals 2. Verify release ring is retracted. (Fwd white band is not visible) 3. Check alignment and verify no side loads
	D. Release ring snap back test fails	1. Push release ring forward. (Release ring will not slide fwd if QD is in FID) 2. QD is in FID; demate QD, verify fwd white band not visible, and remate QD
	E. Gap check fails (visual or FID gauge)	Retract release ring, demate QD, verify fwd white band not visible, and remate QD
Valve Ops	F. Detent button is partially unthreaded	Rethread detent button a. Load bail handle (button will free spin if not loaded) – If valve is open, pull bail handle aft – If valve is closed, push bail handle fwd b. Rotate button cw (8 turns max)
	G. Detent button is missing NOTE Detent button is only required for BDT ops and 1 in SPD ops	1. Use equipment hook to depress detent button shaft 2. Use tether strap around gloved finger to depress detent button shaft 3. Retrieve and use Beta Gimbal Antirotation Latch Tool to depress detent button shaft 4. On **MCC-H GO**: Install spare detent button. (Buttons are stowed IVA and must be configured prior to EVA use)
	H. Bail fails to travel fwd	1. Check for debris, damage, or crystals 2. Retrieve and use QD bail drive lever (3/4, 1, & 1-1/2 in only); notify **MCC-H**
	I. Bail fails to travel to full fwd (valve open) position (button does not pop up)	1. Neutralize sideloads 2. Apply greater opening force to QD bail handle 3. Retrieve and use QD bail drive lever (3/4, 1, & 1-1/2 in only); notify **MCC-H** 4. If applicable, retrieve and install SPD; notify **MCC-H**
Demating Ops	J. Female QD fails to demate	1. Verify release ring is fully retracted while attempting to demate 2. Verify TA or P clamps are released 3. Verify detent button is up (locking collar can be rotated under button) 4. Verify trigger linkage is still attached to release ring (1-1/2 in only) 5. Neutralize sideloads or manipulate flexhose to relieve mating forces on female QD 6. Apply greater force to release ring and female QD 7. Retrieve and use QD release tool (QRT) to apply greater force; notify **MCC-H**

TASK	FAILURE	ACTION
	K. Thermal bootie fails to remain securely closed	Install wire tie around bootie to keep QD fully covered
	L. Cap will not demate	1. Verify pulling out on cap before rotating to ensure locking tab is disengaged 2. Wait for day pass if possible and reattempt cap removal 3. If force is too great for hand actuation or crystals visible around the QD, male may be leaking; notify **MCC-H** – Prepare for quick mate on **MCC-H GO** 4. Retrieve QD cap tool (1/4, 1/2, & 1 in only) – Use QD cap tool to turn stuck cap a maximum of 2 turns (cap vents at ~2 turns). Finish removal of cap by hand (~1 additional turn)
Leaks	M. Mated QD leaks in valve open position (bail fwd)	1. Remove SPD and fully open valve (bail fwd) 2. If leak continues close valve (bail aft)
	N. Male QD leaks after cap removal	Reinstall cap; notify **MCC-H** – Prepare for quick QD mate on **MCC-H GO**
	O. Female QD leaks during or after bail actuation to fwd position (valve open)	1. Return bail to aft position (valve closed) 2. Perform release ring snap back test – If FID is observed, demate and remate QD – If no FID, neutralize sideloads and cycle bail to fwd position (valve open)
	P. Leaking QD after SPD install	1. Remove SPD, open valve fully (bail fwd), verify detent button is up, and aft white line is visible – If leak stops rotate locking collar to lock 2. Close valve (bail aft), verify detent button is up, fwd white line is visible, and rotate locking collar to lock 3. If applicable, close valve of appropriate QD in flowpath, verify detent button is up, and fwd white line is visible
	Q. Female QD leaks after demate	Fully mate to destination male as quickly as possible
	R. Male QD leaks after demate (male sleeve may be visibly stuck open)	1. Remate female QD and open valve (bail fwd) a. Depress button and use significant force to push bail forward; release button b. With QD in open position (bail fwd) apply significant force to aft end of the female QD in back and forth, up and down directions c. Attempt to close valve (bail aft) d. Demate QD and inspect 2. If applicable, close valve of appropriate QD in flowpath, verify detent button is up, and fwd white line is visible 3. Install cap (1/4, 1/2, & 1 in only)
	S. Leak detected by **MCC-H** after valve ops (possible male sleeve stuck open)	1. Cycle QD to open position (bail fwd) a. Depress button and use significant force to push bail forward; release button b. With QD in valve open (bail fwd) position apply significant force to aft end of the female QD in back and forth, up and down directions c. Attempt to close valve (bail aft) d. Demate QD and inspect 2. If applicable, close valve of appropriate QD in flowpath, verify detent button is up, and fwd white line is visible

TASK	FAILURE	ACTION
	T. Frozen NH3 present on female or male QD	1. Leave QD exposed to vacuum; wait maximum of 5 min for sublimation (check periodically) 2. On **MCC-H GO**: Continue QD ops
NODE 3 FQD MLI		
MLI Install	U. MLI will not mate/fit	1. Check MLI oriented correctly 2. Secure MLI using Wire Ties
Gap Spanner Install		
Gap Spanner	V. Gap spanner will not install on HR	???
Keel Pin Cover Install		
Keel Pin Cover	W. Trunnion cover grounding fastener will not install	Check MLI oriented correctly
NODE 3 Nadir CBM		
CBCS Flap	X. Flap unable to be secured open	Use wire ties to restrain open
Petals	Y. Zenith CBM petal will not release	1. Wrap adjustable tether strap or equipment hook around latch to aid in release 2. If no joy, can be release via IV bolt-driving command
Trunnion Cover Install		
Trunnion Cover	Z. Trunnion cover grounding fastener will not install	1. If 1 of 2 fasteners installed successfully, no action – press with next task 2. If both fasteners will not install, contact **MCC-H**
OIH Install		
OIH	AA. HR will not install in seat track or fails to soft dock	1. Verify HR installed in correct direction 2. Verify HR shoes are completely released and soft dock armed 3. Check for FOD on HR and seat track 4. Verify HR bolt completely released: **PGT [A1 2.5 ft-lb, CCW2 30 RPM, MTL 30.5]** 5. If HR in seat track but soft dock will not engage, attempt to drive HR bolts 6. Rotate HR 180 deg and reattempt installation; notify **MCC-H** 7. Finish installing other OIHs 8. Bring back to airlock or attempt to install a different OIH in this location; report results to **MCC-H**
	BB. HR bolt fails to fully engage	1. If torqued, remove HR: **PGT [A2 (3.8), CCW2, 30.5], 7/16 - 6-ext** – To break torque **PGT [A1 (2.5), CCW2, 30.5], 7/16 - 6-ext** – For removal – Check for FOD and reinstall using original torque 2. Increase PGT setting: **PGT [A3 (4.8), CW2, 30.5], 7/16 - 6-ext** 3. Finish installing other OIHs 4. Bring back to airlock or attempt to install a different OIH in this location; report results to **MCC-H**
	CC. HR bolt jammed and can be neither installed nor removed	WARNING Do not use failed OIH for any translation, BRT, etc 1. If 1 of 2 bolts is installed, no action is required but do not use the OIH 2. If both bolts failed, tie down the HR: – OIH(1206): Tether to HR1122 with LDT – OIH(1204): Tether to HR1119 with LDT – OIH(1116): Tether to HR1185 with Adj Equip Tether

TASK	FAILURE	ACTION
NPV Install		
	DD. Unable to release vent plate bolt	1. Apply higher torque for one turn: PGT: [B7 (25.5), CCW2, MTL 30.5] 2. Reset to lower torque used in step 1: PGT: [A5 (7.0), CCW2, MTL 30.5] for remaining turns
	EE. NPV bolt does not engage	?
	FF. NPV bolt jams on install	?
Ingress		
Hatch	GG. Hatch fails to close	1. Check hatch seated and no FOD on sealing surface 2. If lever does not rotate a. Check for FOD
	HH.	

EVA 3 CONTINGENCIES

TASK	FAILURE	ACTION
Egress		
Hatch	A. Hatch fails to open	If lever does not rotate Check for FOD
NODE 3 FQD Jumpers		
	NOTE Troubleshooting steps outlined in this cribsheet are a generic starting point. Flight specific situations may require different actions. If troubleshooting requires the crew to leave the worksite, verify that female QDs are covered to prevent exposure to direct sunlight. For thermal clocks refer to flight rules	
Valve Ops	B. Detent button is partially unthreaded	Rethread detent button a. Load bail handle (button will free spin if not loaded) – If valve is open, pull bail handle aft – If valve is closed, push bail handle fwd b. Rotate button cw (8 turns max)
	C. Detent button is missing NOTE Detent button is only required for BDT ops and 1 in SPD ops	1. Use equipment hook to depress detent button shaft 2. Use tether strap around gloved finger to depress detent button shaft 3. Retrieve and use Beta Gimbal Antirotation Latch Tool to depress detent button shaft 4. On **MCC-H GO**: Install spare detent button. (Buttons are stowed IVA and must be configured prior to EVA use)
	D. Bail fails to travel fwd	1. Check for debris, damage, or crystals 2. Retrieve and use QD bail drive lever (3/4, 1, & 1-1/2 in only); notify **MCC-H**
	E. Bail fails to travel to full fwd (valve open) position (button does not pop up)	1. Neutralize sideloads 2. Apply greater opening force to QD bail handle 3. Retrieve and use QD bail drive lever (3/4, 1, & 1-1/2 in only); notify **MCC-H** 4. If applicable, retrieve and install SPD; notify **MCC-H**
Leaks	F. Mated QD leaks in valve open position (bail fwd)	1. Remove SPD and fully open valve (bail fwd) 2. If leak continues close valve (bail aft)
	G. Male QD leaks after cap removal	Reinstall cap; notify **MCC-H** – Prepare for quick QD mate on **MCC-H GO**
	H. Female QD leaks during or after bail actuation to fwd position (valve open)	1. Return bail to aft position (valve closed) 2. Perform release ring snap back test – If FID is observed, demate and remate QD – If no FID, neutralize sideloads and cycle bail to fwd position (valve open)
	I. Leaking QD after SPD install	1. Remove SPD, open valve fully (bail fwd), verify detent button is up, and aft white line is visible – If leak stops rotate locking collar to lock 2. Close valve (bail aft), verify detent button is up, fwd white line is visible, and rotate locking collar to lock 3. If applicable, close valve of appropriate QD in flowpath, verify detent button is up, and fwd white line is visible
	J. Female QD leaks after demate	Fully mate to destination male as quickly as possible

TASK	FAILURE	ACTION
	K. Male QD leaks after demate (male sleeve may be visibly stuck open)	1. Remate female QD and open valve (bail fwd) a. Depress button and use significant force to push bail forward; release button b. With QD in open position (bail fwd) apply significant force to aft end of the female QD in back and forth, up and down directions c. Attempt to close valve (bail aft) d. Demate QD and inspect 2. If applicable, close valve of appropriate QD in flowpath, verify detent button is up, and fwd white line is visible 3. Install cap (1/4, 1/2, & 1 in only)
	L. Leak detected by **MCC-H** after valve ops (possible male sleeve stuck open)	1. Cycle QD to open position (bail fwd) a. Depress button and use significant force to push bail forward; release button b. With QD in valve open (bail fwd) position apply significant force to aft end of the female QD in back and forth, up and down directions c. Attempt to close valve (bail aft) d. Demate QD and inspect 2. If applicable, close valve of appropriate QD in flowpath, verify detent button is up, and fwd white line is visible
	M. Frozen NH3 present on female or male QD	1. Leave QD exposed to vacuum; wait maximum of 5 min for sublimation (check periodically) 2. On **MCC-H GO**: Continue QD ops
NODE 3 FQD MLI		
MLI Install	N. MLI will not mate/fit	1. Check MLI oriented correctly 2. Secure MLI using Wire Ties
NODE 1 LTA Connector Demate		
Connectors	O. Bail bar fails to slide over-center	1. Inspect bail for FOD 2. Inspect bail linkage for damage and report to **MCC-H** 3. Check alignment and sideloads 4. Verify sufficient TA clamps are open 5. Increase force on bail 6. Attach 2 hooks from adj tether to connector bail and use adj strap to pull bail into demated position 7. On **MCC-H GO**: Retrieve vise grips to help increase force on bail
	P. Backshell fails to slide (after over-center mechanism has been overcome)	1. Verify sufficient TA clamps are open 2. Check for cable harness and hardware interference 3. Check alignment and sideloads 4. Inspect bail and connector for FOD 5. Inspect bail linkage for damage and report to **MCC-H** 6. Wiggle/jiggle connector while pushing or pulling on backshell 7. Attach 2 hooks from adj tether to connector bail and use adj strap to pull bail into demated position 8. On **MCC-H GO**: Retrieve vise grips to help increase force on bail

TASK	FAILURE	ACTION
	Q. Connector fails to release from soft dock	1. Verify bail fully thrown, undamaged, and backshell fully aft 2. If backshell springs forward, pull and hold in fully aft position (will have to overcome spring force, approx 5-10 lb) while attempting to demate connector 3. Verify sufficient TA clamps are open 4. Check for cable harness and hardware interference 5. Check alignment and sideloads 6. Relieve compression on connector interface due to cable loads by pulling backshell away from jack 7. Push the plug towards the jack to compress the soft dock 8. Wiggle/jiggle connector. (Use slight rolling motion)
	R. Connector fails to soft dock	1. Verify correct plug and jack 2. Verify bail fully aft 3. Verify backshell fully aft and remains fully aft. If backshell not fully aft, pull and hold in fully aft position while attempting to soft dock connector 4. Inspect the following: – O-ring seal – FOD – Bend radius – Soft dock springs – Connector keying feature 5. Verify alignment (avoid excessive rolling or rocking the plug as this could unseat soft dock springs) – Connector should snap into soft dock with little force once half shells are aligned
	S. Connector fails to mate	1. Verify half-shells are fully seated on both sides 2. Verify cable and backshell free to move (no clamps) 3. Push forward on connector backshell while actuating bail 4. Detach from soft dock and inspect: – Pins – FOD – EMI band – Bend radius – TA clamps – P clamps – Bail linkages and rivets – Soft dock springs – O-ring seal and main joint gasket – Connector keying feature 5. Cycle bail while disconnected (push forward on connector backshell for additional leverage)
Port Axial CBM Shield Install		
CBM Shield	T. 1/4-turn fastener will not rotate	1. Use tether hook to rotate 1/4-turn 2. Okay with 1 of 2 fasteners? 3. Wire tie
	U. 1/4-turn fastener will not engage receptacle	1. Okay with 1 of 2 fasteners? 2. Wire tie
CBCS Flap	V. Flap unable to be secured closed	Use wire ties to restrain closed

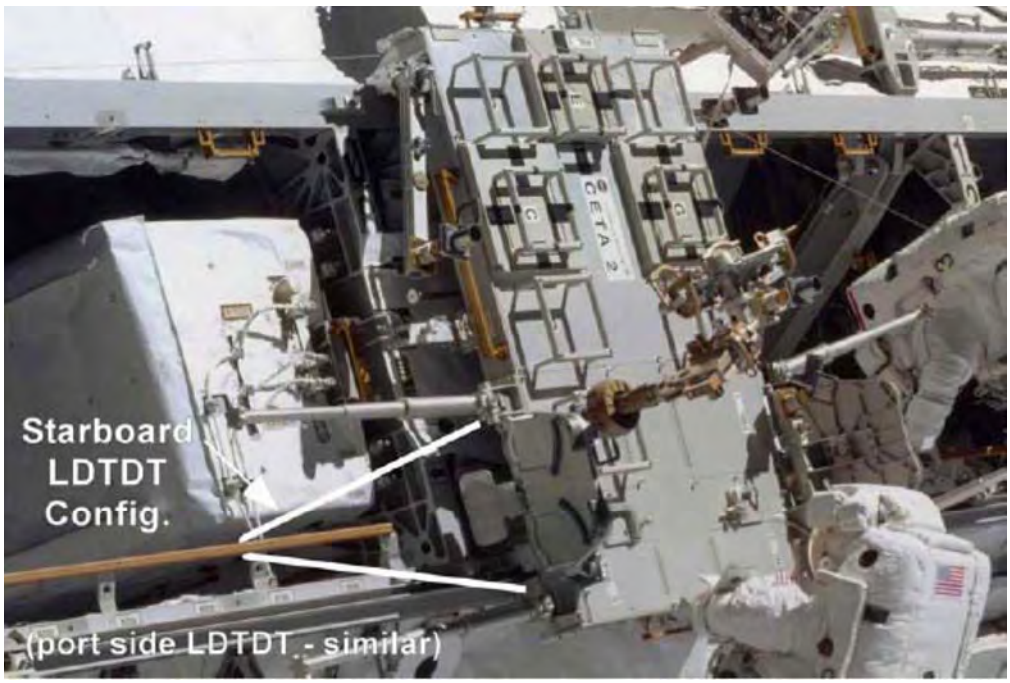
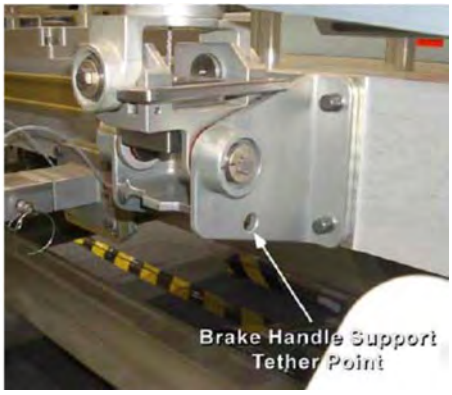
TASK	FAILURE	ACTION
Cupola MLI		
Grounding Fastener	W. Fasteners will not release	1. Apply higher torque for one turn: PGT: [B7 (25.5), CCW2, MTL 30.5] 2. Use Manual Ratchet 3. Use Prybar
Cupola Launch Locks		
Launch Lock	X. Bolt will not release	1. Apply higher torque for one turn: PGT: [B7 (25.5), CCW2, MTL 30.5] 2. Use Manual Ratchet 3. Use Prybar
OI WIF Install		
OI WIF	Y. OI WIF cannot be locked on dovetail	1. Check for FOD and structural interference, cycle soft dock pins; reattempt installation 2. Verify WIF is co-planar 3. Install a different WIF at this location 4. Bring back to airlock or attempt installation of WIF in a different location; report results to **MCC-H**
OIH Install		
OIH	Z. HR will not install in seat track or fails to soft dock	1. Verify HR installed in correct direction 2. Verify HR shoes are completely released and soft dock armed 3. Check for FOD on HR and seat track 4. Verify HR bolt completely released: **PGT [A1 2.5 ft-lb, CCW2 30 RPM, MTL 30.5]** 5. If HR in seat track but soft dock will not engage, attempt to drive HR bolts 6. Rotate HR 180 deg and reattempt installation; notify **MCC-H** 7. Finish installing other OIHs 8. Bring back to airlock or attempt to install a different OIH in this location; report results to **MCC-H**
	AA. HR bolt fails to fully engage	1. If torqued, remove HR: **PGT [A2 (3.8), CCW2, 30.5], 7/16 - 6-ext** – To break torque **PGT [A1 (2.5), CCW2, 30.5], 7/16 - 6-ext** – For removal – Check for FOD and reinstall using original torque 2. Increase PGT setting: **PGT [A3 (4.8), CW2, 30.5], 7/16 - 6-ext** 3. Finish installing other OIHs 4. Bring back to airlock or attempt to install a different OIH in this location; report results to **MCC-H**
	BB. HR bolt jammed and can be neither installed nor removed	WARNING Do not use failed OIH for any translation, BRT, etc 1. If 1 of 2 bolts is installed, no action is required but do not use the OIH 2. If both bolts failed, tie down the HR: – OIH(1206): Tether to HR1122 with LDT – OIH(1204): Tether to HR1119 with LDT – OIH(1116): Tether to HR1185 with Adj Equip Tether
	CC.	1.
	DD.	1.

GENERIC CONTINGENCIES

TASK	FAILURE	ACTION
APFR/IAPFR		
	A. APFR/IAPFR fails to install into WIF	1. Verify APFR collar in install position (black-on-black) 2. Check for FOD in WIF or structural interference 3. Attempt APFR install in alternate clocking 4. If no joy, attempt APFR install in alternate WIF 5. If no joy, APFR failure – Use another APFR
	B. Joint fails to actuate	1. Verify no load is applied to joint and/or jiggle APFR joint while actuating knob – For pitch joint, push knob in during rotation. (Class I pitch joints known to be stiff) 2. Increase force applied in order to free joint
	C. Boot becomes stuck in APFR boot plate	1. Have other EV crewmember assist with getting boot out 2. Loosen 7/16-in EVA bolts (3) on heel clip using EVA ratchet or PGT: **PGT: [B1 (12.0), CCW2, 30.5], 7/16 - 6-ext** 3. Remove 7/16-in EVA bolts (3 – captive) on heel clip (non-captive) using EVA ratchet or PGT: **PGT: [B1 (12.0), CCW2, 30.5], 7/16 - 6-ext** 5 turns
	D. Boot becomes stuck in IAPFR boot plate	1. Have other EV crewmember assist with getting boot out 2. If wearing Small EMU boot, have other EV crewmember adjust boot sizing to Large 3. Loosen 7/16-in EVA bolts (2) on heel clip using EVA ratchet or PGT: **PGT: [B2 (16.0), CCW2, 30.5], 7/16 - 6-ext** 4. Remove 7/16-in EVA bolts (2) on heel clip using EVA ratchet or PGT: **PGT: [B2 (16.0), CCW2, 30.5], 7/16 - 6-ext** 4 turns
Ballstack		
	A. ECOM fails to release from ISS Structure	On **MCC-H GO**: Tether ballstack to handrail and leave outside
	B. ECOM fails to release from MUT EE	Leave together and return inside
	C. Ballstack fails to rigidize	On **MCC-H GO**: Use secondary tethers to assist in restraining payload
BRT		
	A. BRT jaws fail to release	1. Loosen rigidizing collar to relieve sideloads 2. Shake BRT while depressing paddles to alleviate sideloads from handrail 3. Detach BRT from suit and tether to structure
Cannon Connector		
	A. Connector fails to release	1. Check for FOD, damage or misalignment 2. Verify cable routing is not impeding connector rotation. (Release TA clamps as required) 3. Use cannon connector tool for more leverage
	B. Connector/Cap fails to soft dock	1. Verify collar unlocked. (White on connector shell tip should align with white on receptacle backplate) 2. Check for FOD or damage

TASK	FAILURE	ACTION
	C. Connector/Cap fails to lock	1. Remove connector/cap, check for FOD or damage 2. Check alignment, remate, rock connector back and forth as required. (Once locked, white on connector shell tip should align with black on receptacle backplate) 3. Use cannon connector tool for more leverage
	D. High cable stiffness prevents mating	1. Verify all TA clamps are released 2. Use second crewmember 3. Use APFR
	E. Connector/Jack pin bent	1. Describe pin location and condition – Obtain WVS view of interface if possible 2. On **MCC-H GO**: For 16, 20, or 22 gauge pins only, retrieve pin straightener and attempt pin repair 3. On **MCC-H GO**: Retrieve needle nose pliers and attempt pin repair – **MCC-H** will verify pin size prior to retrieving tools
	F. Connector/Jack FOD	On **MCC-H GO**: Obtain connector cleaner tool to remove FOD
	G. Connector EMI band bent	On **MCC-H GO**: Obtain needle nose pliers or forceps to remove band
CETA Cart		
	A. Wheel bogie fails to release from truss	1. Verify brakes are fully released 2. Ensure trigger is being depressed while attempting to rotate handle 3. On **MCC-H GO**: Perform {6.100.125 CETA Cart Wheel Bogie R&R} – There is no spare wheel bogie on-orbit, so after the CETA cart is relocated the failed wheel bogie will be reinstalled
	B. Wheel bogie fails to install on truss	There is no spare wheel bogie on-orbit. 4 of 4 bogies are required. Real time call on whether MT couple or CETA cart tiedown required. For tiedown see block G
	C. Parking brake fails to engage	1. Use parking brake handle on other side of CETA cart 2. Couple CETA cart to MT and utilize other WIF if possible
	D. Parking brake fails to disengage	1. Hold pedal down for brake release 2. Use pedal on other side of CETA cart to release parking brake
	E. Dynamic brake fails to engage	Limit translation rates to allow manual stopping
	F. CETA active coupler fails to capture or lock	1. Cycle active coupler 2. If at least 1 CETA cart is stbd of the MT, swap active couplers 3. On **MCC-H GO**: Tie down CETA cart. See block G

TASK	FAILURE	ACTION
	G. CETA cart tiedown	1. On **MCC-H GO**: Perform the following tie-down procedure (see figure 1) a. Translate CETA cart to TBD location (not over truss segment joint) b. Engage parking brake c. Retrieve 2 Long Duration Tie Down (LDTD) tethers from P6 AUX Bag (fwd face of Z1) d. Route 1 LDTD tether on stbd side of CETA cart as follows: 1. Attach 1 hook to zenith brake handle support tether point 2. Loop tether strap around CETA rail HR standoff 3. Attach second hook to nadir brake handle support tether point 4. Lightly cinch tether and close buckle 5. Close MLI flap over buckle and any excess strap e. Repeat on port side of CETA cart
	H. Coupler knob fails to unlock	1. On **MCC-H GO**: Release active coupler by removing wire ties (2) (reinstall of wireties not required) and PIP pins (2) 2. On **MCC-H GO**: Release passive coupler via EVA bolt: **PGT: [B7 (25.5), CCW2, 30.5], 7/16 - 6-ext** TBD turns – Bolt is attached by lanyard
	I. Swing arm fails to deploy	Use alternate swing arm or WIF
	J. Swing arm fails to stow	On **MCC-H GO**: Remove swing arm via EVA bolts (4): **PGT: [B7 (25.5), CCW2, 30.5], 7/16 - 6-ext** TBD turns (Captive bolts?)
	K. Swing arm fails to lock	Restrain in stowed position with wire ties

TASK	FAILURE	ACTION
	 Figure 1.- CETA Cart Tiedown. 	
EVA Wrench (Torque & Ratchet)		
	A. Ratchet teeth slip	Ratchet to new set of teeth and reapply torque
	B. Wrench does not ratchet	Hold the ratchet selector and socket in opposite hands and rotate in opposite directions

TASK	FAILURE	ACTION
Fluid QD Ops		
	NOTE Troubleshooting steps outlined in this cribsheet are a generic starting point. Flight specific situations may require different actions. If troubleshooting requires the crew to leave the worksite, verify that female QDs are covered to prevent exposure to direct sunlight. For thermal clocks refer to flight rules	
	Mating Ops	
	A. QD fails to mate	1. Check for debris, damage, or crystals 2. Verify release ring is retracted. (Fwd white band is not visible) 3. Check alignment and verify no side loads
	B. Release ring snap back test fails	1. Push release ring forward. (Release ring will not slide fwd if QD is in FID) 2. QD is in FID; demate QD, verify fwd white band not visible, and remate QD
	C. Gap check fails (visual or FID gauge)	Retract release ring, demate QD, verify fwd white band not visible, and remate QD
	Valve Ops	
	D. Detent button is partially unthreaded	Rethread detent button a. Load bail handle. (Button will free spin if not loaded) – If valve is open, pull bail handle aft – If valve is closed, push bail handle fwd b. Rotate button cw (8 turns max)
	E. Detent button is missing NOTE Detent button is only required for BDT ops and 1 in SPD ops	1. Use equipment hook to depress detent button shaft 2. Use tether strap around gloved finger to depress detent button shaft 3. Retrieve and use Beta Gimbal Antirotation Latch Tool to depress detent button shaft 4. On **MCC-H GO**: Install spare detent button. (Buttons are stowed IVA and must be configured prior to EVA use)
	F. Bail fails to travel fwd	1. Check for debris, damage, or crystals 2. Retrieve and use QD bail drive lever (3/4, 1, & 1-1/2 in only); notify **MCC-H**
	G. Bail fails to travel to full fwd (valve open) position (button does not pop up)	1. Neutralize sideloads 2. Apply greater opening force to QD bail handle 3. Retrieve and use QD bail drive lever (3/4, 1, & 1-1/2 in only); notify **MCC-H** 4. If applicable, retrieve and install SPD; notify **MCC-H**
	H. Detent button fails to depress during valve closing WARNING Bail may kick back and contact crew when button is depressed if a leaking primary seal allowed pressure build-up in spring cavity	1. Verify locking collar fully rotated (1/2, 3/4, & 1 in only) 2. Push and hold bail handle fwd (to open) with significant force to relieve load on button while simultaneously depressing the detent button – If button depresses, vent by pulling bail aft until release ring covers aft white band – Push bail fwd to valve open and check button depresses 3. Retrieve QD bail drive lever and repeat step 2 (3/4, 1, & 1-1/2 in only); notify **MCC-H** 4. Contact **MCC-H** to reduce NH3 temperature if possible 5. On **MCC-H GO**: Retrieve and install QD button depress tool (BDT) (1/4, 3/4, & 1 in only)

TASK	FAILURE	ACTION
	I. Bail fails to travel to full aft (valve closed) position (button does not pop up)	1. Inspect QD for retaining wire protrusion 2. Neutralize possible side loading 3. Depress button and increase force on bail 4. Retrieve and use QD bail drive lever (3/4, 1, & 1-1/2 in only); notify **MCC-H**
	Demating Ops	
	J. Female QD fails to demate	1. Verify release ring is fully retracted while attempting to demate 2. Verify TA or P clamps are released 3. Verify detent button is up. (Locking collar can be rotated under button) 4. Verify trigger linkage is still attached to release ring (1-1/2 in only) 5. Neutralize sideloads or manipulate flexhose to relieve mating forces on female QD 6. Apply greater force to release ring and female QD 7. Retrieve and use QD release tool (QRT) to apply greater force; notify **MCC-H**
	K. Thermal bootie fails to remain securely closed	Install wire tie around bootie to keep QD fully covered
	L. Cap will not demate	1. Verify pulling out on cap before rotating to ensure locking tab is disengaged 2. Wait for day pass if possible and reattempt cap removal 3. If force is too great for hand actuation or crystals visible around the QD, male may be leaking; notify **MCC-H** – Prepare for quick mate on **MCC-H GO** 4. Retrieve QD cap tool (1/4, 1/2, & 1 in only) – Use QD cap tool to turn stuck cap a maximum of 2 turns (cap vents at ~2 turns). Finish removal of cap by hand (~1 additional turn)
	Leaks	
	M. Mated QD leaks in valve open position (bail fwd)	1. Remove SPD and fully open valve (bail fwd) 2. If leak continues close valve (bail aft)
	N. Male QD leaks after cap removal	Reinstall cap; notify **MCC-H** – Prepare for quick QD mate on **MCC-H GO**
	O. Female QD leaks during or after bail actuation to fwd position (valve open)	1. Return bail to aft position (valve closed) 2. Perform release ring snap back test – If FID is observed, demate and remate QD – If no FID, neutralize sideloads and cycle bail to fwd position (valve open)
	P. Leaking QD after SPD install	1. Remove SPD, open valve fully (bail fwd), verify detent button is up, and aft white line is visible – If leak stops rotate locking collar to lock 2. Close valve (bail aft), verify detent button is up, fwd white line is visible, and rotate locking collar to lock 3. If applicable, close valve of appropriate QD in flowpath, verify detent button is up, and fwd white line is visible
	Q. Female QD leaks after demate	Fully mate to destination male as quickly as possible

TASK	FAILURE	ACTION
	R. Male QD leaks after demate (male sleeve may be visibly stuck open)	1. Remate female QD and open valve (bail fwd) a. Depress button and use significant force to push bail forward; release button b. With QD in open position (bail fwd) apply significant force to aft end of the female QD in back and forth, up and down directions c. Attempt to close valve (bail aft) d. Demate QD and inspect 2. If applicable, close valve of appropriate QD in flowpath, verify detent button is up, and fwd white line is visible 3. Install cap (1/4, 1/2, & 1 in only)
	S. Leak detected by **MCC-H** after valve ops (possible male sleeve stuck open)	1. Cycle QD to open position (bail fwd) a. Depress button and use significant force to push bail forward; release button b. With QD in valve open (bail fwd) position apply significant force to aft end of the female QD in back and forth, up and down directions c. Attempt to close valve (bail aft) d. Demate QD and inspect 2. If applicable, close valve of appropriate QD in flowpath, verify detent button is up, and fwd white line is visible
	T. Frozen NH3 present on female or male QD	1. Leave QD exposed to vacuum; wait maximum of 5 min for sublimation (check periodically) 2. On **MCC-H GO**: Continue QD ops

TASK	FAILURE	ACTION
	QD Blocks	

MATE QD

1. Remove QD caps as required
2. Inspect male and female QD for debris or damage
3. Verify female QD ready to mate
   - √Detent button – up
   - √Locking collar – locked position
   - √Fwd white band – not visible
4. Assess side load potential prior to mate
5. Mate QD
   - √Fwd white band – visible
6. Perform snapback test
   - √Fwd white band visible
7. Perform pull test. (Stay clear of button and release ring)
8. Perform visual gap test
   - √For FID

Open Valve

1. Assess side loads
2. Rotate locking collar to unlocked position
3. Depress detent button
4. Push bail to forward position
5. √Aft white band visible
6. √Detent button – up
7. Rotate locking collar to locked position

Close Valve, Demate QD

1. √Aft white band visible
2. √Detent button fully installed
3. √Detent button up
4. Rotate locking collar to unlocked position
5. √Detent button can be depressed
6. Assess side loads prior to bail movement
7. Push bail toward open position with significant force while depressing detent button (unstick male sleeve seals)
8. Depress detent button, move bail aft (close valve)
9. √Fwd white band visible
10. √Detent button up
11. Rotate locking collar to locked position
12. Assess side loads prior to demate
13. Pull back on release ring and demate QD
14. √Release ring – retracted (FWD white band not visible)
15. Inspect male and female QD for debris, damage, or anomalous conditions (ammonia crystals)
16. Install QD caps as required; verify lock tab engaged

TASK	FAILURE	ACTION
FRAM		
	A. Active FRAM fails to seat on passive FRAM	1. Check for FOD in mechanism 2. Check alignment. (Engage 2 forward shear pins first to ensure connector door is not jamming)
	B. Primary FRAM bolt fails to release	1. Confirm socket fully engaged to release anti-rotation mechanism 2. Increase PGT setting: SAPA, MAPA, LAPA, LWAPA **PGT: [TBD (TBD), CCW2, 30.5], 7/16 - 6-ext** ExPA **PGT: [TBD (TBD), CCW2, 30.5], 7/16 - 6-ext** CEPA **PGT: [TBD (TBD), CCW2, 30.5], 7/16 - 6-ext** 3. On **MCC-H GO**: Increase PGT setting: SAPA, MAPA, LAPA, LWAPA **PGT: [TBD (TBD), CCW2, 30.5], 7/16 - 6-ext** ExPA **PGT: [TBD (TBD), CCW2, 30.5], 7/16 - 6-ext** CEPA **PGT: [TBD (TBD), CCW2, 30.5], 7/16 - 6-ext**

TASK	FAILURE	ACTION
	C. Primary FRAM bolt fails to engage	1. Verify FRAM seated 2. Check for FOD 3. Back out primary bolt fully: SAPA, MAPA, LAPA, LWAPA **PGT: [TBD (TBD), CCW2, 30.5], 7/16 - 6-ext** ExPA **PGT: [TBD (TBD), CCW2, 30.5], 7/16 - 6-ext** CEPA **PGT: [TBD (TBD), CCW2, 30.5], 7/16 - 6-ext** And reattempt engagement SAPA, MAPA, LAPA, LWAPA **PGT: [TBD (TBD), CW2, 30.5], 7/16 - 6-ext** ExPA **PGT: [TBD (TBD), CW2, 30.5], 7/16 - 6-ext** CEPA **PGT: [TBD (TBD), CW2, 30.5], 7/16 - 6-ext** 4. Increase PGT setting: SAPA, MAPA, LAPA, LWAPA **PGT: [TBD (TBD), CW2, 30.5], 7/16 - 6-ext** ExPA **PGT: [TBD (TBD), CW2, 30.5], 7/16 - 6-ext** CEPA **PGT: [TBD (TBD), CW2, 30.5], 7/16 - 6-ext** 5. On **MCC-H GO**: Increase PGT setting: SAPA, MAPA, LAPA, LWAPA **PGT: [TBD (TBD), CW2, 30.5], 7/16 - 6-ext** ExPA **PGT: [TBD (TBD), CW2, 30.5], 7/16 - 6-ext** CEPA **PGT: [TBD (TBD), CW2, 30.5], 7/16 - 6-ext** 6. Consider hold for thermal stabilization between active and passive FRAM 7. Engage contingency pins: – Front pins (all FRAMs) **PGT: [A4 (6.3), CW2, 30.5], 7/16 - 6-ext** 14.11 – (1.25 ***** Turns on Primary Bolt) turns – Aft pins for LWAPA, SAPA, CEPA, and ExPA – Remove bolt from STOW location and engage in INSTALL location – Manually turn bolt as far as possible – **PGT: [B1 (12.0), CW2, 30.5], 7/16 - 6-ext** TBD turns – Aft pins for MAPA and LAPA – **PGT: [TBD (TBD), CW2, 30.5], 7/16 - 6-ext** TBD turns
	D. Latch dogs fail to retract during FRAM removal from Square Grid Interface	1. Lift FRAM so that latch dogs contact square grid 2. Cycle primary drive bolt
	E. Latch dogs not retracted prior to installation onto Square Grid Interface	Push latch dogs to retracted position with tool or tether hook

TASK	FAILURE	ACTION
MMOD Shield		
	A. MMOD shield Dzus fastener fails to release WARNING Do not touch back side of MMOD shield or handle fastener fragments due to sharp edges Fastener and shield/tool interface must be covered to avoid potential projectiles	1. On **MCC-H GO**: Retrieve pry bar and emptied med ORU bag 2. Release other Dzus fasteners 3. Assess clearance between MMOD shield and tools 4. If possible, rotate fastener to position tangs off of tools 5. Place med ORU bag over failed fastener 6. Insert pry bar under MMOD shield by failed fastener and pry shield away from structure
	B. MMOD shield Dzus fastener fails to engage	1. Verify center fastener is engaged first 2. Check Dzus fastener aligned with bracket (floating receptacles on endcones) 3. Verify fastener clocking correct per alignment mark 4. Push firmly and rotate 5. Engage other fasteners: 2 out of 3 required 6. If 2 of 3 not achieved: – Option 1 (Wire Tie) (see figures 2-4): 1 properly secured wire tie = 1 Dzus fastener; using a long wire tie, squish the loop on one end, feed it through the bracket on structure (may need to push floating receptacle inboard to get it out of way), secure wire tie w/3 twists. Feed one end of wire tie around Dzus head (on outside of shield) and secure with 3 twists. If HR nearby can also secure wire tie to HR. (Goal is for the wire tie to push shield in toward body of structure and toward center if endcone shield) – Option 2 (LDTDT): Use 1 adj (attach to tether point on T tool and to structure HR) and 1 LDTDT across shield to hold shield in position
	C. T-handle tool fails to engage shield	Remove adjacent fasteners and attempt reinstallation
	D. MLI grounding strap Dzus fails to release	On **MCC-H GO**: Cut ground wire near Dzus fastener

TASK	FAILURE	ACTION

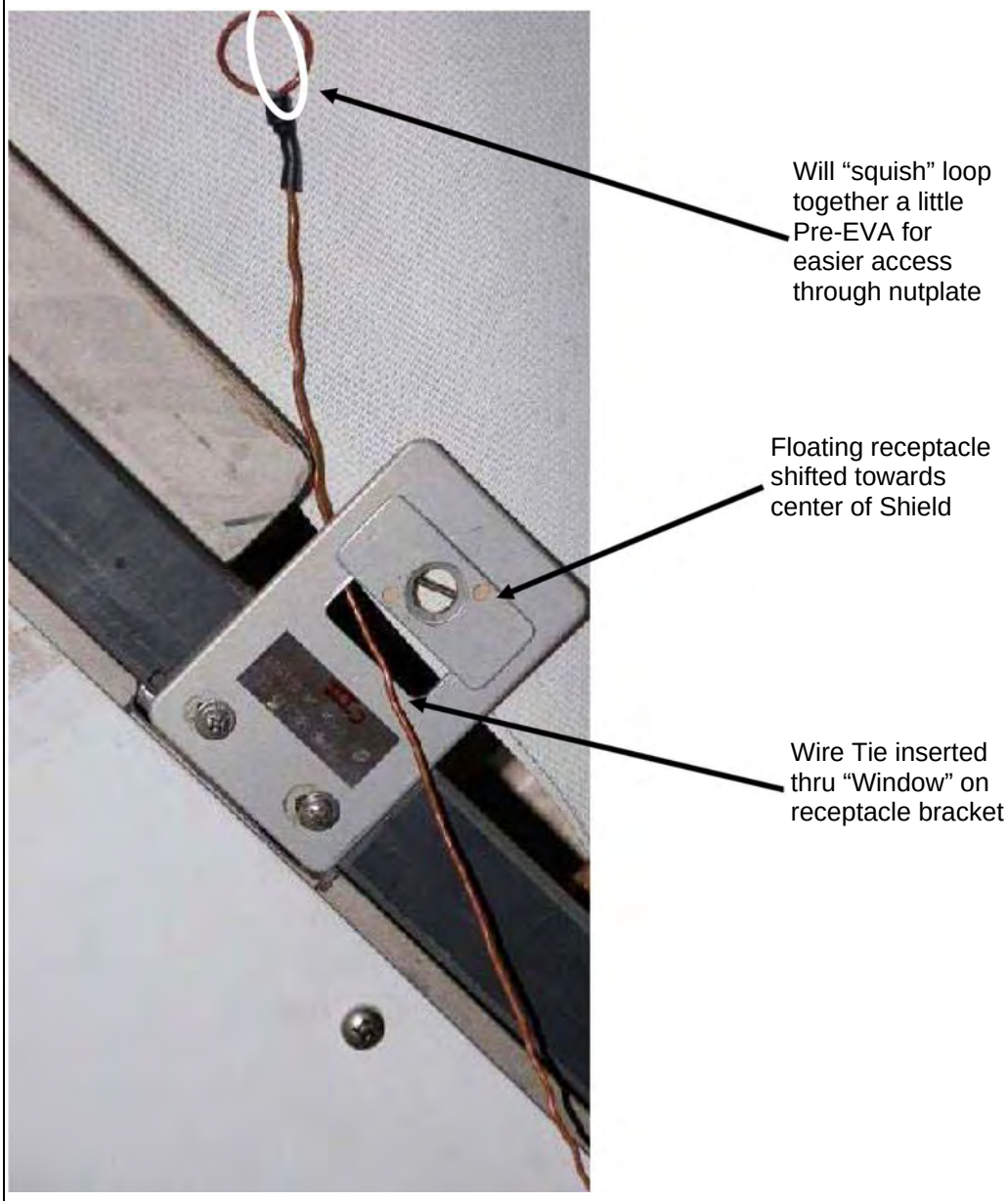


Figure 2.- MMOD Shield Wire Tie Option.

TASK	FAILURE	ACTION

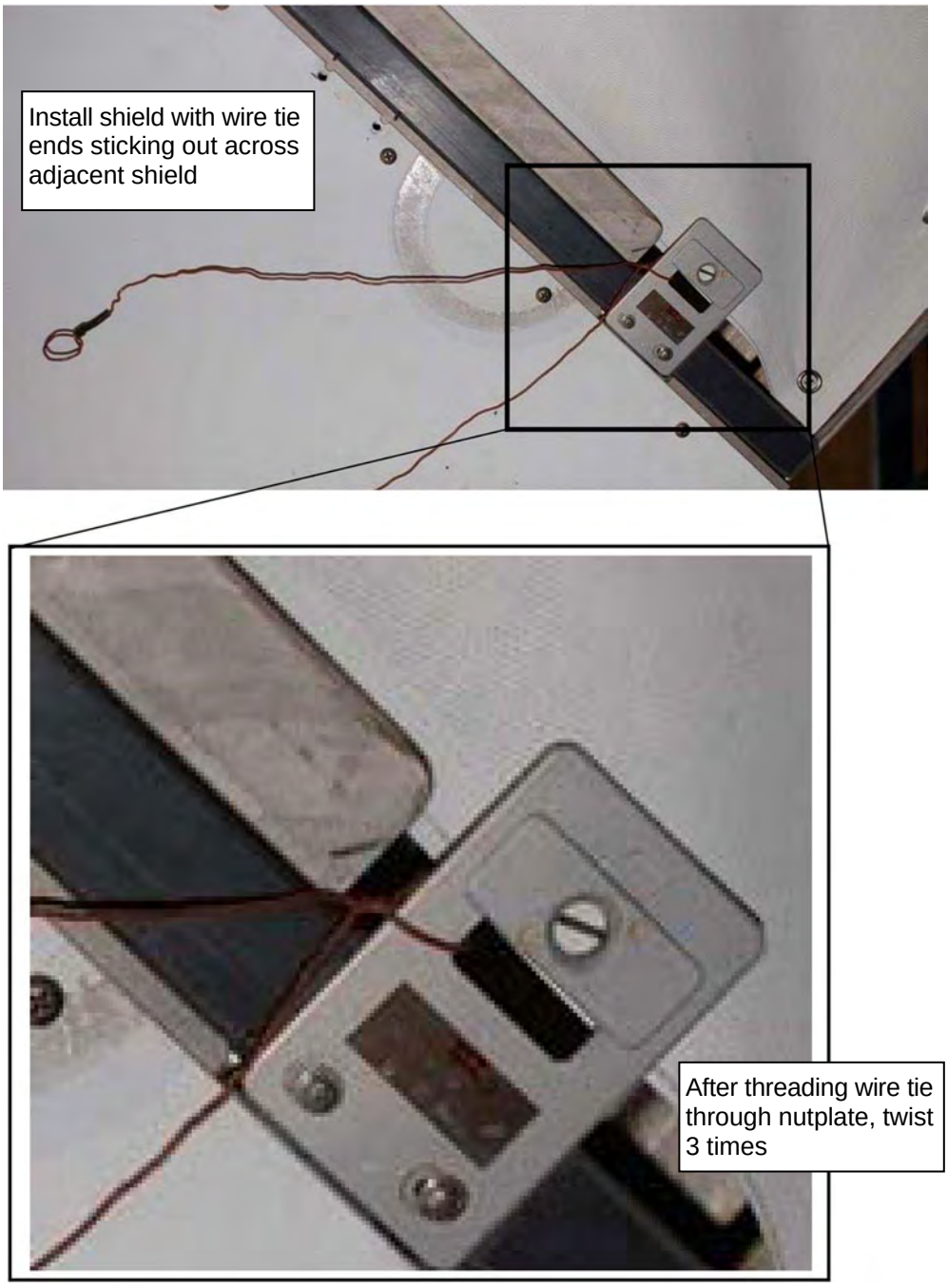


Figure 3.- MMOD Shield Wire Tie Option. (Cont)

TASK	FAILURE	ACTION

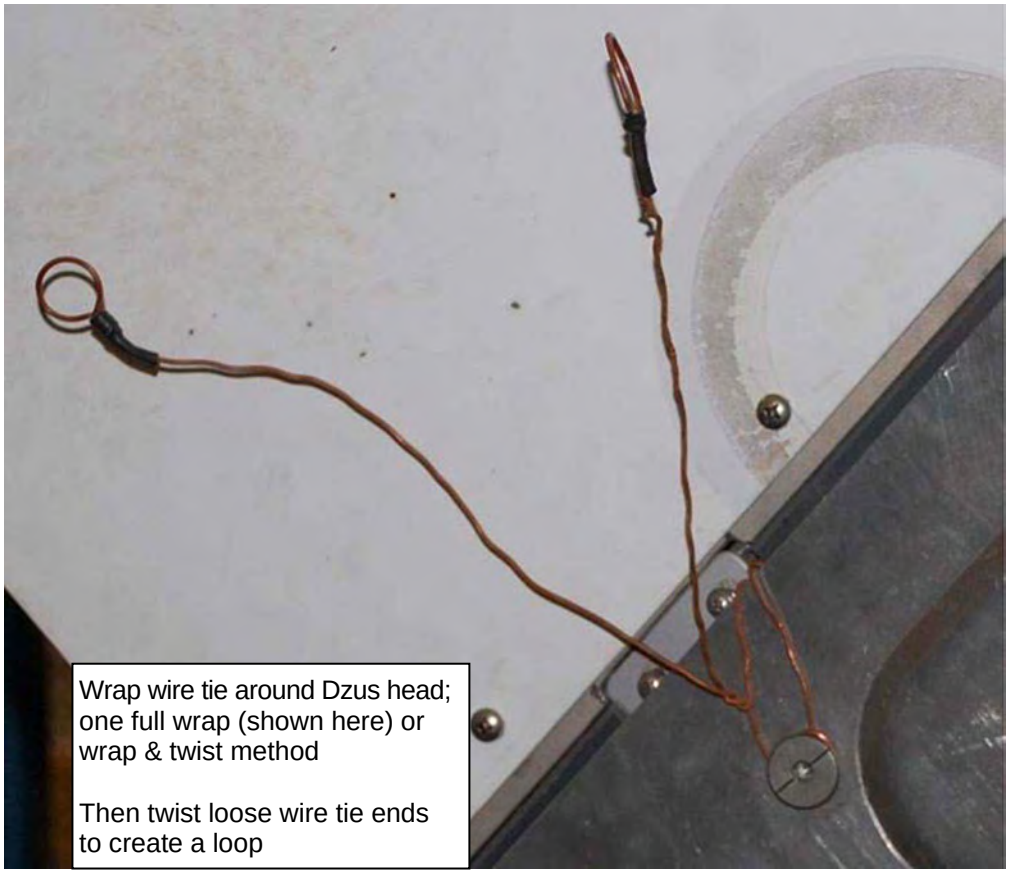


Figure 4.- MMOD Shield Wire Tie Option. (Cont)

TASK	FAILURE	ACTION
MUT EE		
	A. MUT EE jaws fail to release	1. Verify locking collar fully released 2. Shake MUT EE while depressing paddles to alleviate sideloads from handrail 3. Release MUT EE ECOM socket and tether MUT EE to structure
MWS		
	A. MWS EE is sticky	Known problem. Report degree of stickiness to **MCC-H** and any noted correlation with thermal environment. Post EVA, report s/n of affected unit (s/n located on "stem" of T-bar)
	B. MWS EE cord fails to retract	1. Verify MWS EE tether lock in unlock position 2. Cycle MWS EE tether lock 3. Check tether reel opening for FOD 4. Pull out small amount of tether and allow reel to retract while holding light tension on the tether
	C. MWS T-bar fails to pivot	1. Check sideloads on T-bar while depressing button 2. Slip T-bar clutch (40-60 lb force required)
NZGL Connectors		
	A. Bail bar fails to slide over-center	1. Inspect bail for FOD 2. Inspect bail linkage for damage and report to **MCC-H** 3. Check alignment and sideloads 4. Verify sufficient TA clamps are open 5. Increase force on bail 6. Attach 2 hooks from adj tether to connector bail and use adj strap to pull bail into demated position 7. On **MCC-H GO**: Retrieve vise grips to help increase force on bail
	B. Backshell fails to slide (after over-center mechanism has been overcome)	1. Verify sufficient TA clamps are open 2. Check for cable harness and hardware interference 3. Check alignment and sideloads 4. Inspect bail and connector for FOD 5. Inspect bail linkage for damage and report to **MCC-H** 6. Wiggle/jiggle connector while pushing or pulling on backshell 7. Attach 2 hooks from adj tether to connector bail and use adj strap to pull bail into demated position 8. On **MCC-H GO**: Retrieve vise grips to help increase force on bail
	C. Connector fails to release from soft dock	1. Verify bail fully thrown, undamaged, and backshell fully aft 2. If backshell springs forward, pull and hold in fully aft position (will have to overcome spring force, approx 5-10 lb) while attempting to demate connector 3. Verify sufficient TA clamps are open 4. Check for cable harness and hardware interference 5. Check alignment and sideloads 6. Relieve compression on connector interface due to cable loads by pulling backshell away from jack 7. Push the plug towards the jack to compress the soft dock 8. Wiggle/jiggle connector. (Use slight rolling motion)

TASK	FAILURE	ACTION
	D. Connector fails to soft dock	1. Verify correct plug and jack 2. Verify bail fully aft 3. Verify backshell fully aft and remains fully aft. If backshell not fully aft, pull and hold in fully aft position while attempting to soft dock connector 4. Inspect the following: – O-ring seal – FOD – Bend radius – Soft dock springs – Connector keying feature 5. Verify alignment (avoid excessive rolling or rocking the plug as this could unseat soft dock springs) – Connector should snap into soft dock with little force once half shells are aligned
	E. Connector fails to mate	1. Verify half-shells are fully seated on both sides 2. Verify cable and backshell free to move (no clamps) 3. Push forward on connector backshell while actuating bail 4. Detach from soft dock and inspect: – Pins – FOD – EMI band – Bend radius – TA clamps – P clamps – Bail linkages and rivets – Soft dock springs – O-ring seal and main joint gasket – Connector keying feature 5. Cycle bail while disconnected (push forward on connector backshell for additional leverage)
	F. Connector pin bent	1. Rotate connector to bail up position and describe pin location and condition – Obtain WVS view of interface if possible 2. On **MCC-H GO**: For 16, 20, or 22 gauge pins only, retrieve pin straightener and attempt pin repair 3. On **MCC-H GO**: Retrieve needle nose pliers and attempt pin repair – **MCC-H** will verify pin size prior to retrieving tools 4. Inspect plug and jack prior to re-mating
	G. Connector FOD	1. On **MCC-H GO**: Retrieve connector cleaner tool <u>NOTE</u> One N2 cartridge is already captured in the tool (the other is lanyarded inside the caddy). In order to puncture the cartridge, it must be threaded into the tool until the indicator line passes out of sight under the collar of the tool. Puncture connector cleaner cartridge only when ready to perform actual cleaning. Use entire N2 cartridge prior to reentering airlock 2. Attempt cleaning

TASK	FAILURE	ACTION
	H. Connector EMI band bent (add picture of EMI band)	On **MCC-H GO**: Retrieve needle nose pliers or forceps to remove band – Bail may need to be pushed forward while demated to expose EMI band for removal
	I. Connector bail linkage failure	1. On **MCC-H GO**: Reattempt connector mate/demate with broken bail – Impart load through undamaged side of bail linkage – Assist bail motion with hand on backshell once bail linkage has passed over-center – May take multiple pushes on the bail to mate/demate connector 2. Tether hook or vise grips may be used for additional leverage
	J. Connector soft dock spring bent (add picture)	On **MCC-H GO**: Retrieve needle nose pliers and remove bent spring. (Does bail position help?)
	K. Connector O-ring or main joint gasket seal loose (seal and O-ring required in 1-G only)	1. Remove seal with tether hook 2. On **MCC-H GO**: Retrieve additional tools to remove seal (ex: Wire tie, needle nose pliers, probe, loop pin puller)
	L. Connector cap (Twist) will not release	1. Increase force 2. Use tether hook for additional leverage 3. On **MCC-H GO**: Attach equip hook to cap tether point and use strap of adj tether to release cap ?
On-Orbit Installed HR		
	A. HR will not install in seat track or fails to soft dock	1. Verify HR installed in correct direction per arrow on underside of HR 2. Verify HR shoes are completely released and soft dock armed 3. Check for FOD on HR and seat track 4. Verify HR bolt completely released: **PGT [A1 (2.5), CCW2, 30.5], 7/16 - 6-ext** 5. If HR in seat track but soft dock will not engage, attempt to drive HR bolts 6. On **MCC-H GO**: Depending on HR priority, attempt to install 180 out or a different HR at this location
	B. HR bolt fails to fully engage	1. If torqued, remove HR: **PGT [A2 (3.8), CCW2, 30.5], 7/16 - 6-ext** – To break torque **PGT [A1 (2.5), CCW2, 30.5], 7/16 - 6-ext** – For removal – Check for FOD on HR and seat track and reinstall using original torque 2. Increase PGT setting: **PGT [A3 (4.8), CW2, 30.5], 7/16 - 6-ext** 3. On **MCC-H GO**: Depending on HR priority, attempt to install 180 out or a different HR at this location
On-Orbit Installed WIF		
	A. WIF fails to soft dock	1. Check for FOD and structural interference, cycle soft dock pins; reattempt installation 2. Verify WIF is co-planar 3. Install a different WIF at this location 4. On **MCC-H GO**: Attempt installation of WIF in a different location 5. Return WIF inside

TASK	FAILURE	ACTION
PAD		
	A. Release knob fails to rotate open	1. Verify knob in release position (J-hook not locked) 2. Attempt to rotate knob using ratchet on knob's 7/16 in hex stud 3. Release contingency release bar captive bolts (2) **PGT [A6 (8.3), CCW2, 30.5], 7/16 - 6 ext** 5 turns (Verify hook released from striker bar)
PGT		
	A. No LEDs	1. Perform LED test 2. Use display torque
	B. LEDs and torque messages do not agree	Use torque message and notify **MCC-H**
	C. Mode switch breaks	Retrieve spare PGT
	LCD Messages	
	D. BATTRY HITEMP	1. Power off PGT 2. If alternate battery available; change battery 3. Retrieve spare PGT 4. Switch to ratchet mode
	E. BATTRY LOTEMP (blinking)	1. Drive tool with no load to increase battery temperature 2. If alternate battery available; power off and change battery 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	F. BATTRY LOVOLT (blinking)	1. Continue using tool until unable to deliver sufficient torque 2. Retrieve spare PGT 3. Power off and switch to ratchet mode
	G. CAL FAILED	1. Press, release trigger to repeat calibration 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	H. COLLAR ERROR	1. Cycle torque and speed collars to clear error 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	I. COMPAR ERROR	1. Cycle torque collar and A/B mode switch 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	J. EEPROM WR ERR (blinking) HYBRID HITEMP OVER CURR SLFTST FAIL X	1. Power cycle and calibrate 2. Retrieve spare PGT 3. Power off and switch to ratchet mode
	K. HI TORQ	1. Contact **MCC-H** and report torque. (Real time engineering assessment required) 2. On **MCC-H GO**: Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	L. HICURR	1. Reattempt operation – Can be caused by excessive rotation of the PGT body while torquing 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode

TASK	FAILURE	ACTION
	M. LO TORQ (expected during bolt release)	1. Reattempt operation until desired torque is reached 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	N. LOCURR	1. Reattempt operation 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	O. LOG IS FULL (blinking)	1. Cycle torque and speed collars to clear message 2. Continue operation
	P. MOTOR HITEMP	1. Power off PGT 2. Retrieve spare PGT 3. Switch to ratchet mode
Safety Tether		
	A. Safety tether fails to retract/tend	1. Verify reel is unlocked 2. Verify tether reel and/or cable guide (for 85-ft tethers) is clear of FOD 3. Pull out small amount of cable and allow reel to retract while holding light tension on the cable 4. Tap side of reel housing during retraction 5. Report ID # of faulty tether to **MCC-H** and use alternate safety tether 6. Coil safety tether to bring inside 7. For 85-ft tether, on **MCC-H GO**: If coiling tether is not practical, release level wind mechanism bypass on back of safety tether. (Red indicator will show around edge of bypass once released) NOTE Once level wind has been released cable guide will likely be frozen in place. This will limit the amount of tether that can be successfully retracted into the tether housing and may require coiling of excess tether. Level wind release will require safety tether be returned for ground servicing. If tether fails to retract due to thermal issue, normal tether function may return after tether brought IVA
	B. Safety tether red stripe showing (any length)	Safety tether cannot be used – Report ID # of faulty tether to **MCC-H** – Use alternate safety tether
	C. Crew hook fails	1. On load alleviating end: Use waist tether to replace alleviating strap – Report ID # of faulty tether to **MCC-H** – Retrieve replacement safety tether 2. On anchor end: Report ID # of faulty tether to **MCC-H** and use an alternate safety tether
Scoops		
	A. Scoop will not release from fitting	1. If actuator will not pull back while in locked position, tap actuator with tool to release 2. On **MCC-H GO**: Leave scoop in place 3. On **MCC-H GO**: Remove non-captive contingency screws; 5 turns. Stow in trash bag **PGT [A1 (2.5), CCW2, 30.5], 5/32 Allen drive** – Square Scoop: 4 screws (figure 5) – Round Scoop: 7 screws (figure 6)

TASK	FAILURE	ACTION

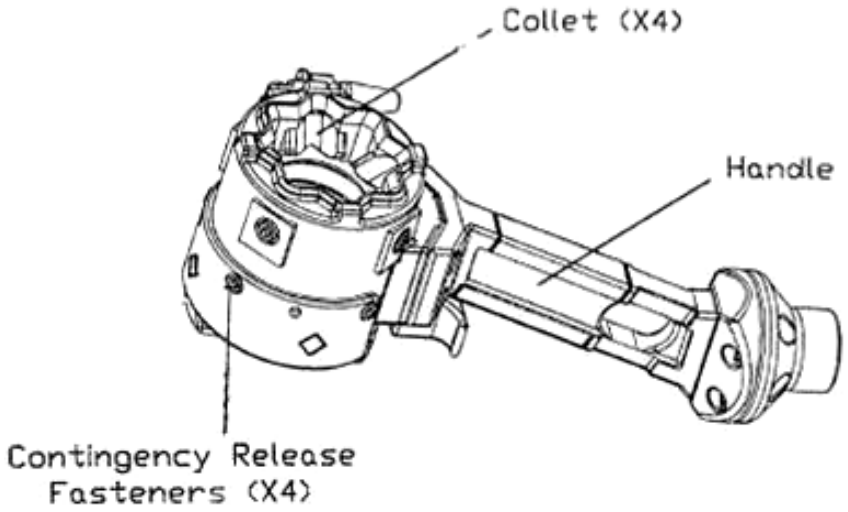


Figure 5.- Square Scoop.

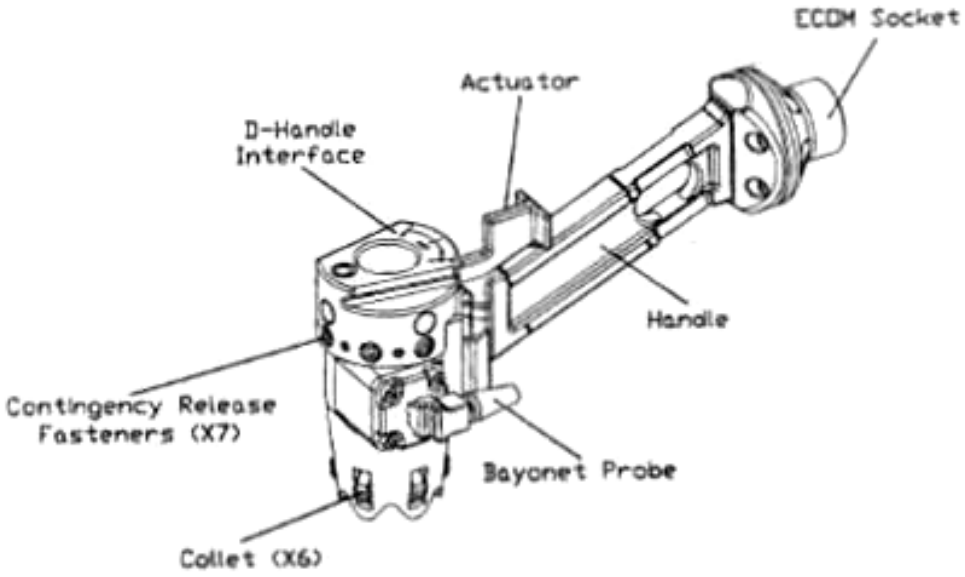
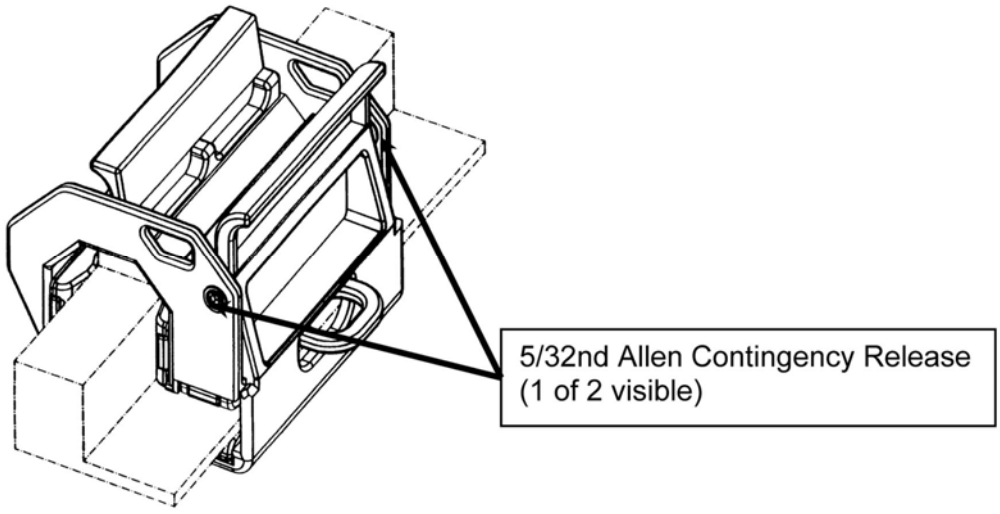
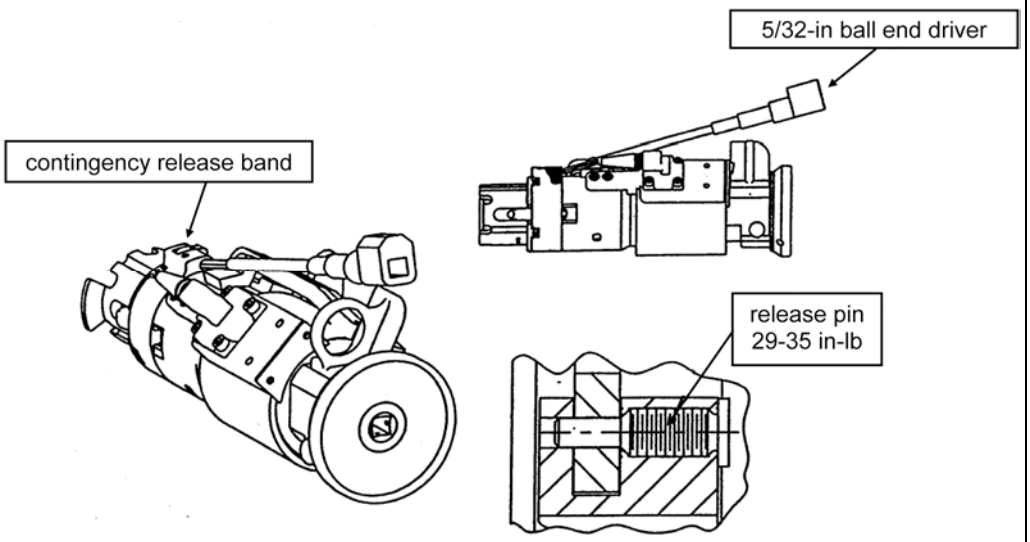


Figure 6.- Round Scoop.

TASK	FAILURE	ACTION
Socket Caddy		
	A. Socket fails to release from socket caddy	1. Verify PIP pin fully inserted into drop proof tether interface on socket 2. Reattempt using a different PIP pin
TA Clamp		
	A. TA clamp fails to release	1. With handle up, press down on top of rounded clamp 2. With handle up, use tether hook to pry drawhook from capture pin
Tether Shuttle		
	A. Tether shuttle will not release from CETA/MT rail	1. Verify slider in unlock and no obstructions to paddle actuation 2. Verify safety tethered to structure and safety tether removed from tether shuttle anchor point 3. On **MCC-H GO**: Remove non-captive screws (2) at hingeline to release nadir section with slide lock (not captive) (figure 7). TBD turns. Stow screws in trash bag **PGT [A1 (2.5), CCW1, 30.5], 5/32 Allen drive**
	 Figure 7.- Tether Shuttle.	
Torque Multiplier		
	A. TM will not release from fitting	1. Place TM anti-backlash in neutral, if unable: **PGT [RCW, 30.5]** – Apply cw torque while pushing anti-backlash button to neutral. Reattempt removal 2. If able to lift TM off of bolt, attempt to rock off of fitting (Square TM only) 3. On **MCC-H GO**: Release TM contingency release band pin 20 turns (do not exceed 28 turns) (figure 8): **PGT [A1 (2.5), CCW2, 30.5], 5/32 ball end driver** – When band springs open remove TM

TASK	FAILURE	ACTION
	 Figure 8.- Torque Multiplier.	
TSA		
	A. Latch fails to open	Release 7/16 EVA bolt on latch bracket; rotate bracket clear of latch **PGT [A2 (3.8), CCW2, 30.5], 7/16 - 6 ext** 1-2 turns
	B. Latch fails to close	Close remaining latches (3 of 4 required for landing)

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FLIGHT SPECIFIC EVA REFERENCE

PAYLOAD BAY LAYOUT ..... FS 18-3
EVA TRANSFER ..... FS 18-4
CUPOLA MATED TO NODE 3 ..... FS 18-5
NH3 JUMPER BAG ..... FS 18-6
NH3 JUMPER MLI BAG (TBD)
NH3 JUMPER BAG LOCATION (TBD)
NH3 JUMPER AND MLI BAGS LOCATION ..... FS 18-9
NODE 1 CBM PETALS AND FLAP (TBD)
SPECIAL PURPOSE DEXTEROUS MANIPULATOR (SPDM) (TBD)
ORU TEMPORARY PLATFORM ..... FS 18-12
OTSD ..... FS 18-13
TIE-DOWN PLAN ..... FS 18-16
NODE 1 612 LTA CABLE JACKS (TBD)
NODE 3 612 LTA CABLE ..... FS 18-18
NODE 3 602 LTA CABLE ..... FS 18-19
NODE 3 CONNECTORS ..... FS 18-20
NODE 3 AMMONIA LINES ..... FS 18-21
AMMONIA LINE ROUTING ..... FS 18-23
AMMONIA (NH3) VENT TOOL ..... FS 18-24
NH3 HANDRAIL BRACKET ..... FS 18-25
NH3 MLI – LOOP B JACKET ..... FS 18-26
NH3 MLI – LOOP A JACKET ..... FS 18-27
NH3 MLI – LAB JACKET ..... FS 18-28
NH3 MLI AND ROUTING ..... FS 18-29
LAB COZY ..... FS 18-30
NODE 3 ..... FS 18-32
NODE 3 (ZENITH AFT VIEW – A) ..... FS 18-34
NODE 3 (FWD NADIR VIEW) ..... FS 18-35
NODE 3 (ZENITH AFT VIEW – B) ..... FS 18-36
TRUNNION/KEEL PIN COVERS ..... FS 18-37
NODE 3 GAP SPANNERS ..... FS 18-38
NODE 3 ORBIT-INSTALLED HANDRAILS (OIH) ..... FS 18-40
NODE 3 NON-PROPULSIVE VENT (NPV) ..... FS 18-41
CBM ..... FS 18-43
PMA3 ..... FS 18-46
CUPOLA MLI (TBD)
CUPOLA LAUNCH LOCKS ..... FS 18-48
CUPOLA ..... FS 18-49
NODE 3 ORBIT-INSTALLED WIFs ..... FS 18-57
NODE 3 ORBIT-INSTALLED HANDRAILS ..... FS 18-58

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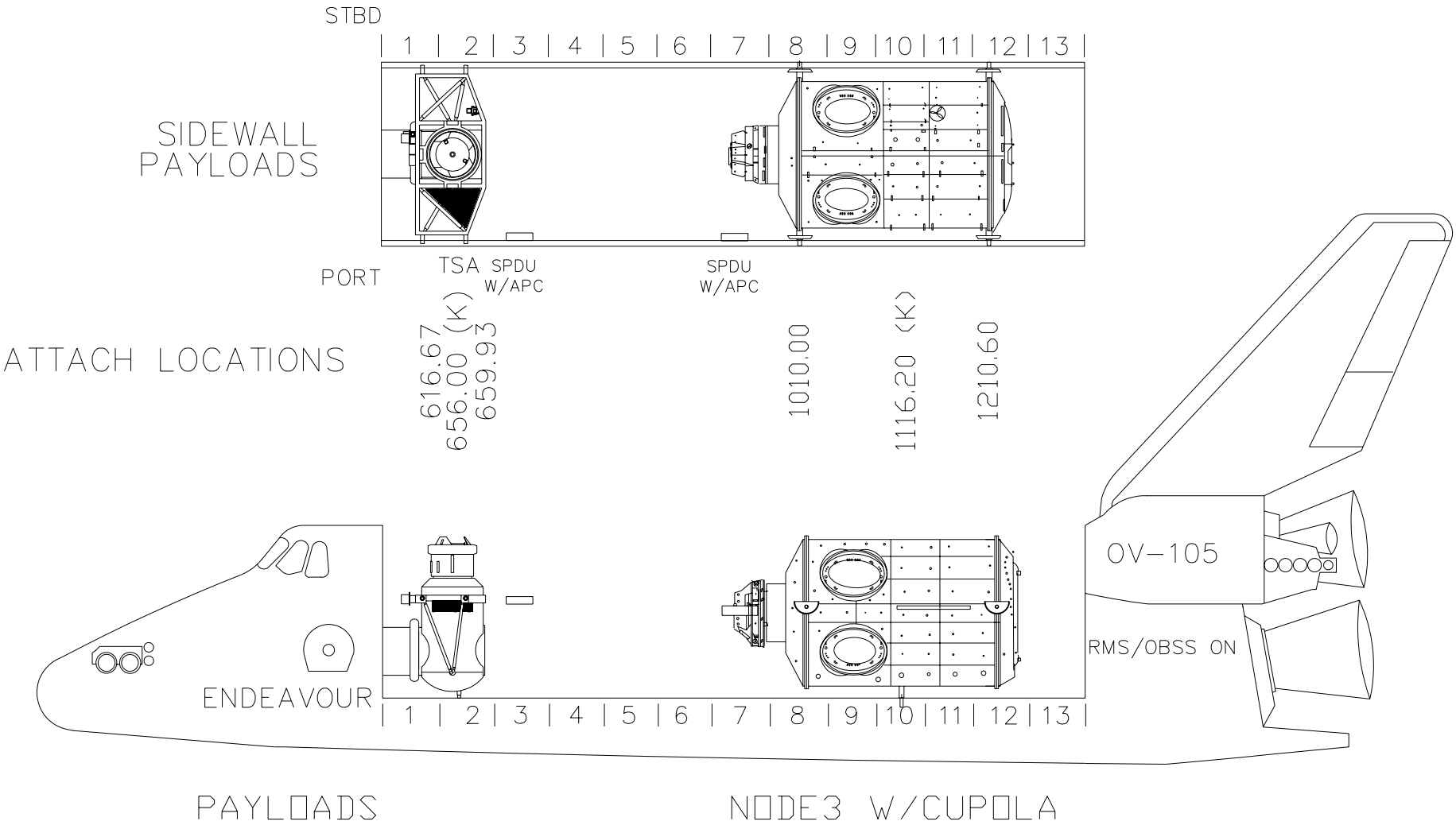
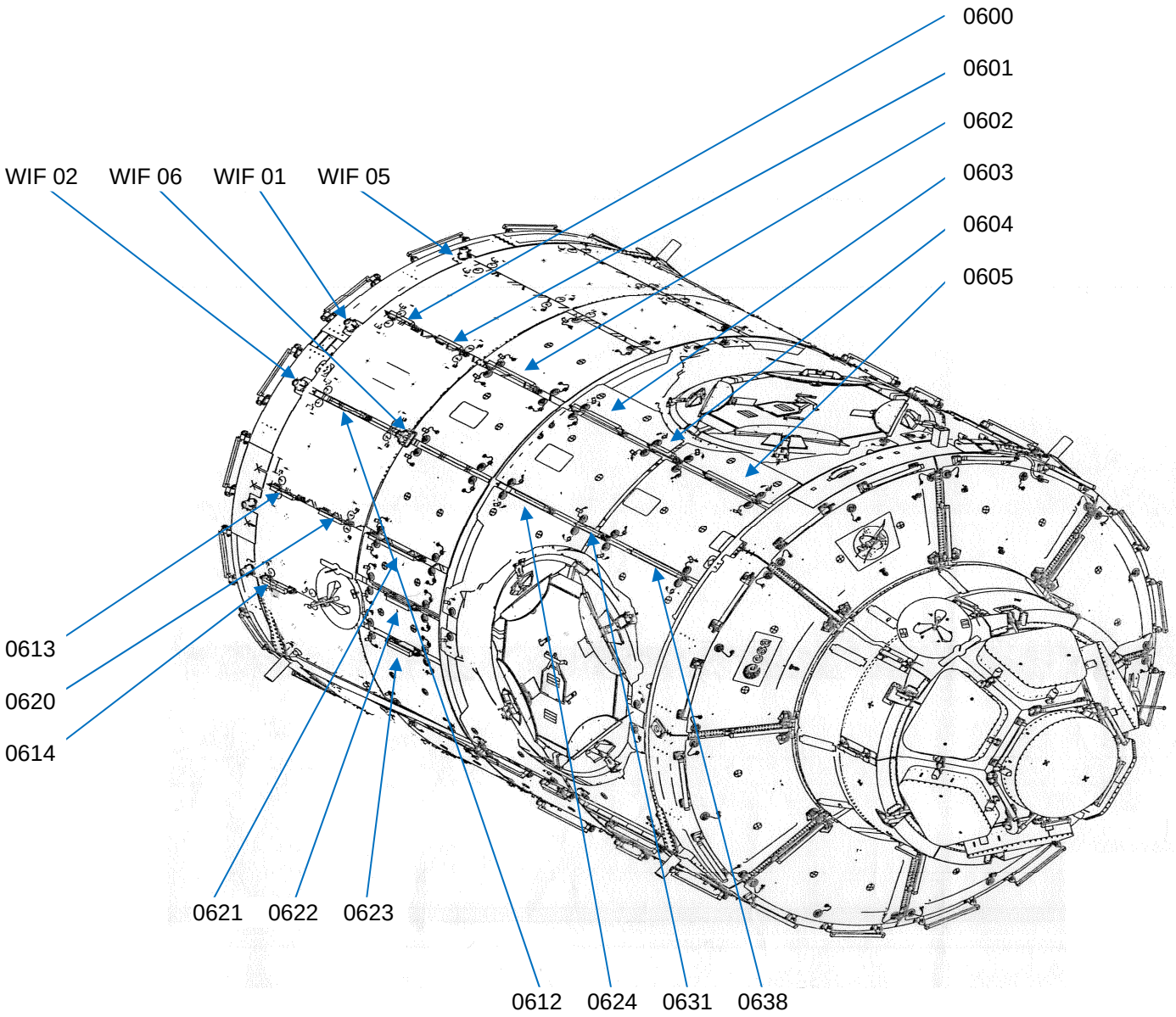
PAYLOAD BAY LAYOUT

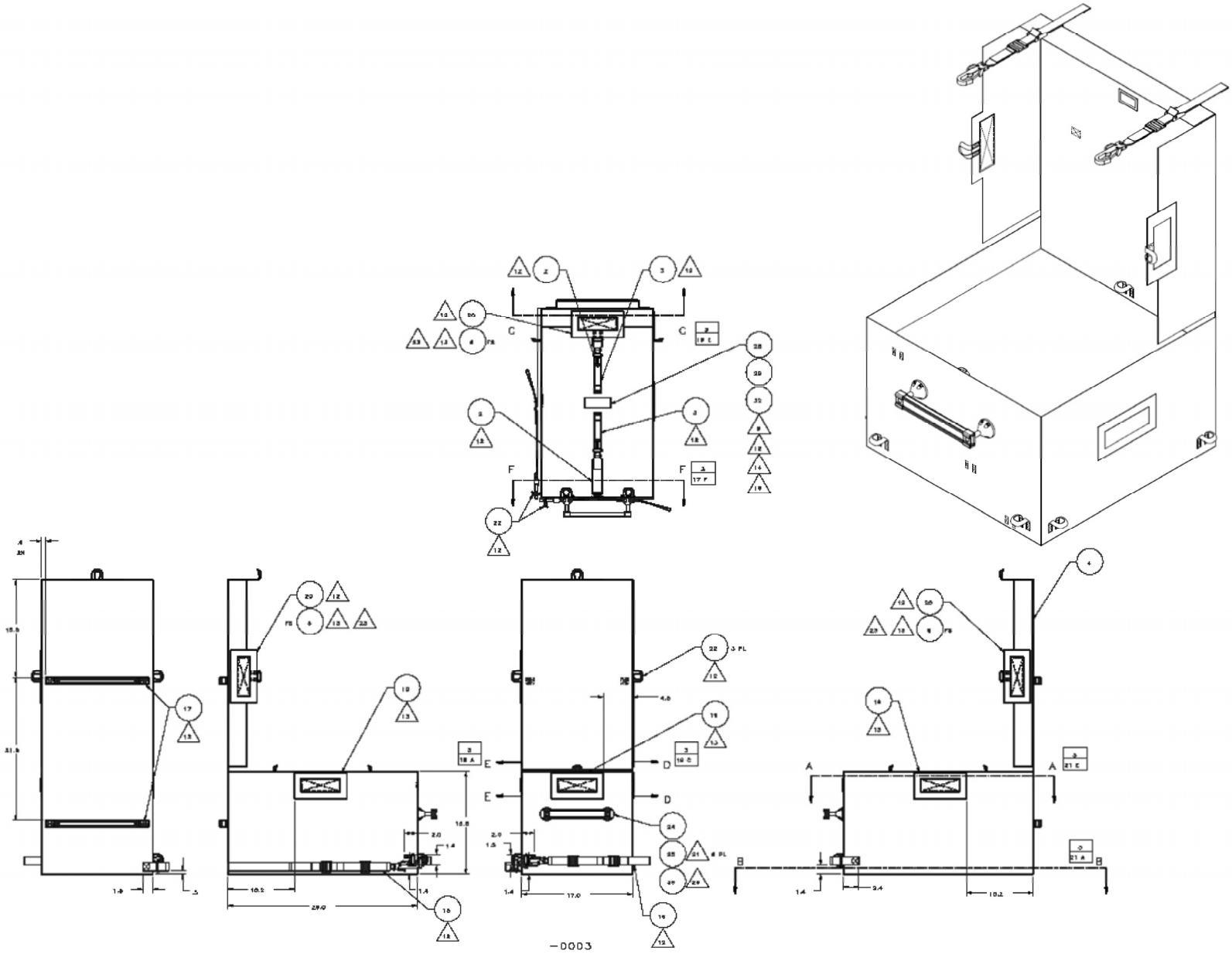


EVA TRANSFER

CUPOLA MATED TO NODE 3



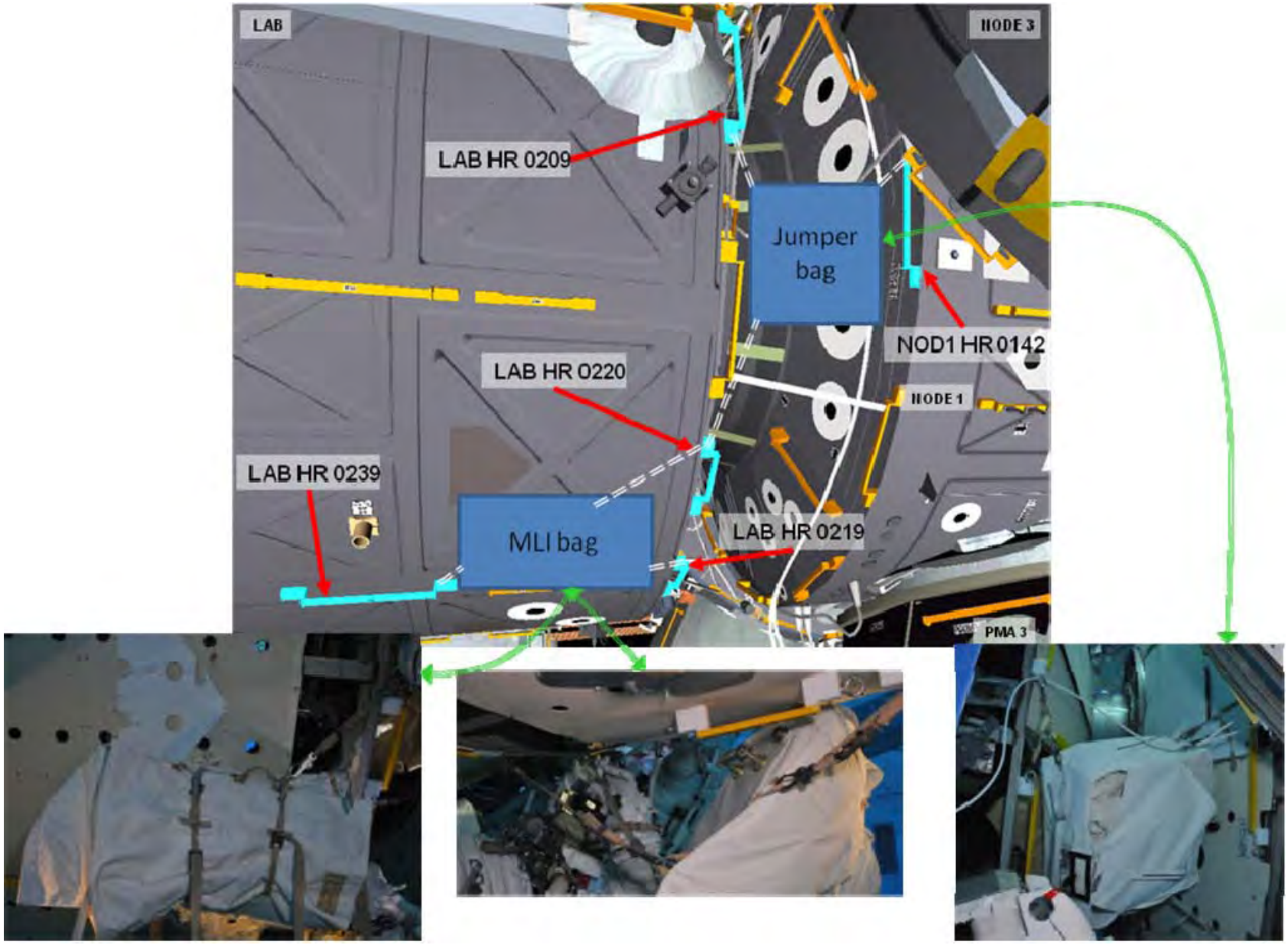
NH3 JUMPER BAG



NH3 JUMPER MLI BAG (TBD)

NH3 JUMPER BAG LOCATION (TBD)

NH3 JUMPER AND MLI BAGS LOCATION



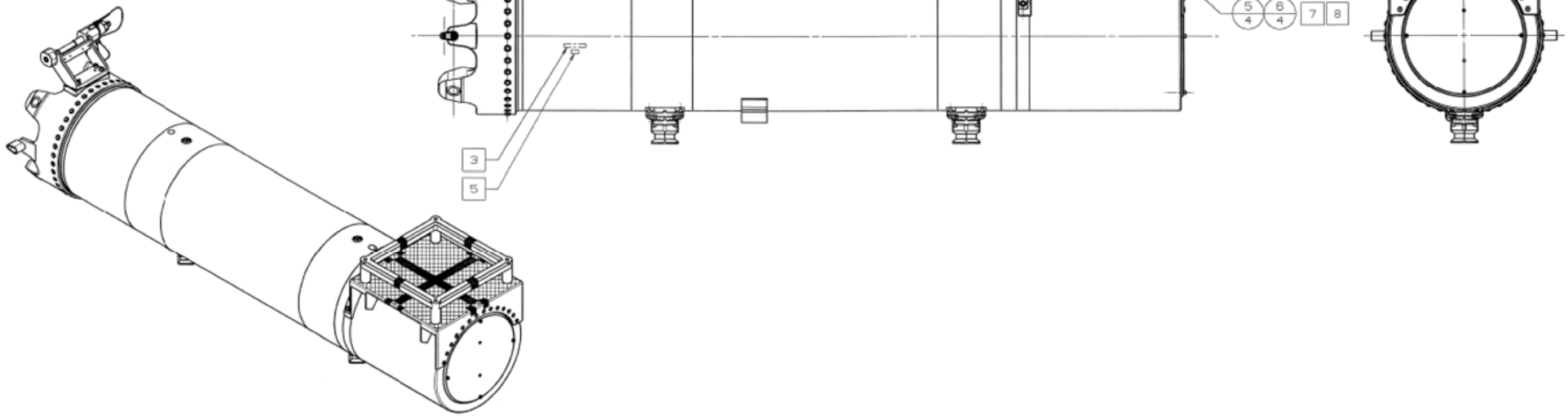
NODE 1 CBM PETALS AND FLAP (TBD)

SPECIAL PURPOSE DEXTEROUS MANIPULATOR (SPDM) (TBD)

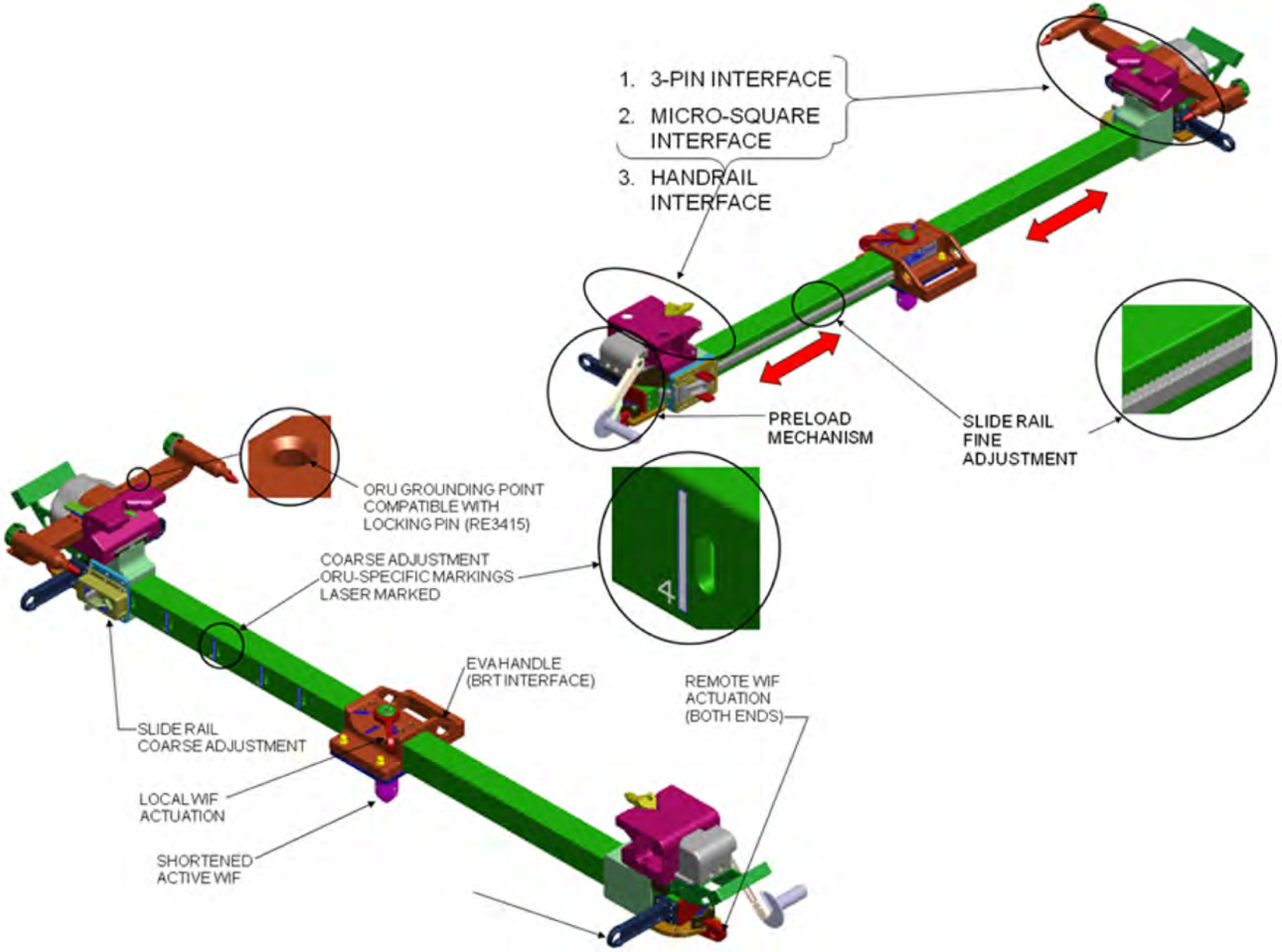
ORU TEMPORARY PLATFORM

NOTES:

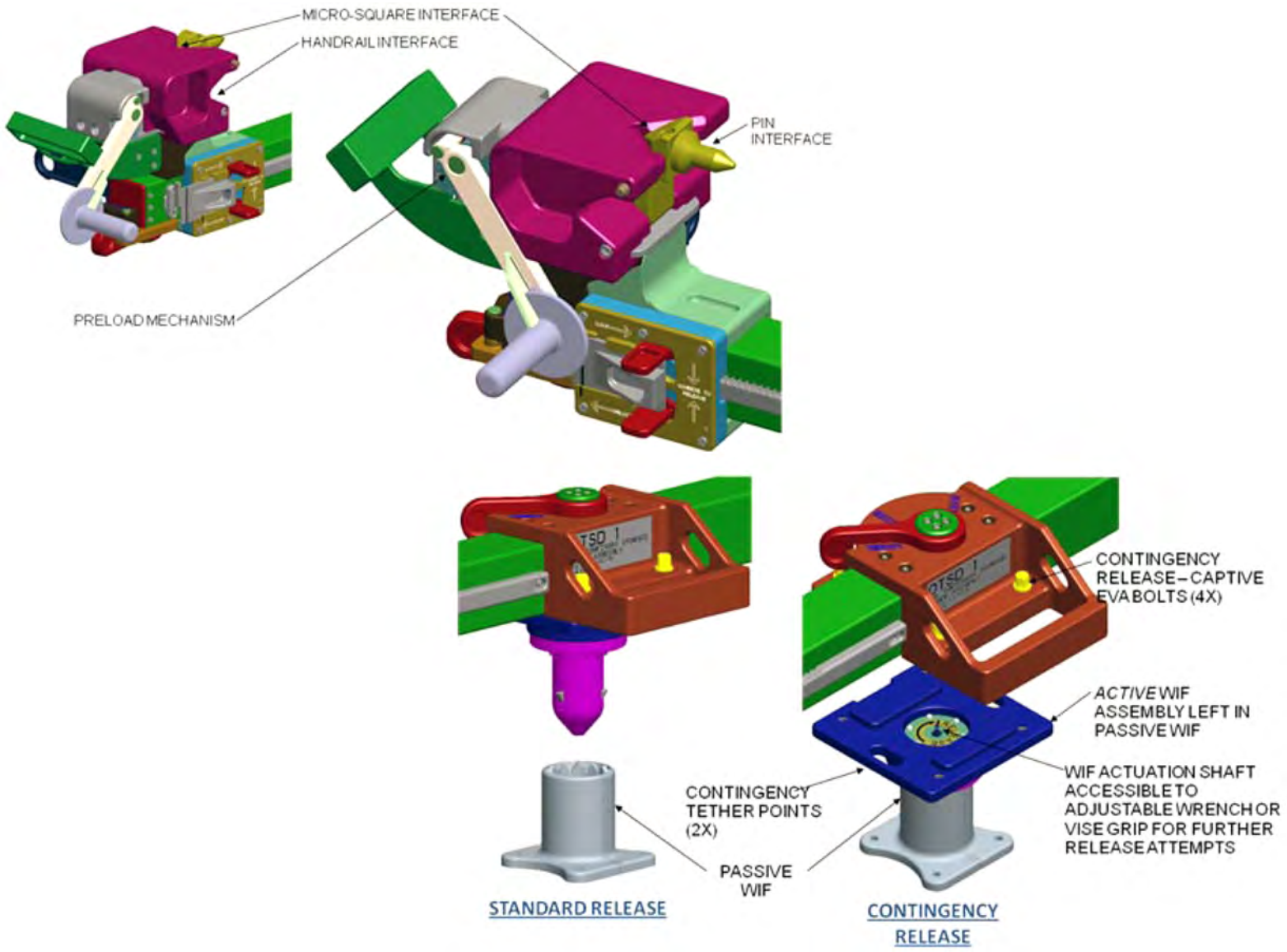
1. INTERPRET DRAWING PER ASME Y14.100-2000. INCLUDING APPENDICES A TO E.
2. ALL DIMENSIONS SHOWN ARE FINISH OPERATIONAL DIMENSIONS WHICH INCLUDE RESIDUAL COATINGS UNLESS OTHERWISE SPECIFIED.
3. IDENTIFY WITH CAGE CODE AND PIN 38309-51602-7002-551. MARKING PER PCR 05:01, METHOD B. OVERCOAT WITH ATOMIC OXYGEN RESISTANT COATING PER PCR 05:01.
4. CLEANING, HANDLING AND TEMPORARY STORAGE PER PCR 10:01 TYPE II.
5. SERIALIZE PER PE-PR.039. MARKING PER PCR 05:01, METHOD B. OVERCOAT WITH ATOMIC OXYGEN RESISTANT COATING PER PCR 05:01.
6. ASSEMBLE PER PCR 16:01 METHOD I.
7. ASSEMBLE PER PCR 16:01 METHOD III.
8. TORQUE FASTENERS IN ACCORDANCE WITH 1000815 EXCEPT TORQUE VALUE TO BE 535 - 587 LB IN (REF 5.6.1 STRUCTURAL REPORT LMSEAT-34098). THE TORQUE REQUIRED TO OVERCOME THE LOCKING FEATURE SHALL BE DETERMINED AND ADDED TO THE ABOVE VALUE. TORQUE STRIPE ALL EXTERNAL FASTENERS PER 1000815.
9. TEST FOR CLASS S BOND PER SPAR-TM-1896. REMOVAL OF ANODIZE ON OAI BRACKET, ANY WHERE AWAY FROM PAINTED AREAS, BY ABRASION OVER Ø.3 AREA FROM ALUMINUM SURFACE FOR TEST IS ACCEPTABLE. REFINISH ABRADED AREA BY CHEMICAL CONVERSION COAT PER MIL-C-5541, CLASS 1A.



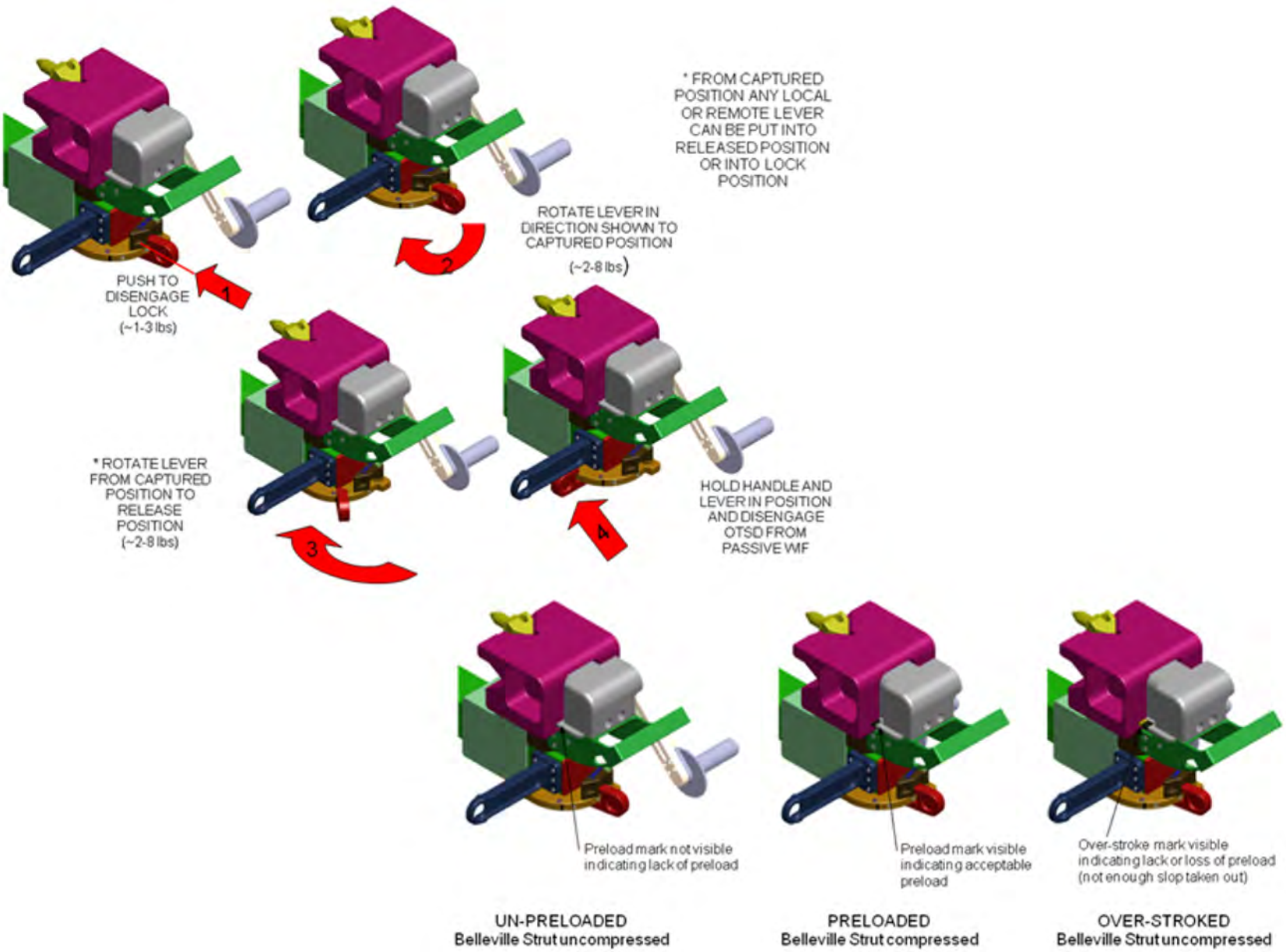
OTSD


1. 3-PIN INTERFACE
2. MICRO-SQUARE INTERFACE
3. HANDRAIL INTERFACE
PRELOAD MECHANISM
SLIDE RAIL FINE ADJUSTMENT
ORU GROUNDING POINT COMPATIBLE WITH LOCKING PIN (RE3415)
COARSE ADJUSTMENT ORU-SPECIFIC MARKINGS LASER MARKED
EVA HANDLE (BRT INTERFACE)
REMOTE WIF ACTUATION (BOTH ENDS)
SLIDE RAIL COARSE ADJUSTMENT
LOCAL WIF ACTUATION
SHORTENED ACTIVE WIF

OTSD (Cont)


MICRO-SQUARE INTERFACE
HANDRAIL INTERFACE
PIN INTERFACE
PRELOAD MECHANISM
CONTINGENCY RELEASE – CAPTIVE EVA BOLTS (4X)
ACTIVE WIF ASSEMBLY LEFT IN PASSIVE WIF
WIF ACTUATION SHAFT ACCESSIBLE TO ADJUSTABLE WRENCH OR VISE GRIP FOR FURTHER RELEASE ATTEMPTS
CONTINGENCY TETHER POINTS (2X)
PASSIVE WIF
STANDARD RELEASE
CONTINGENCY RELEASE

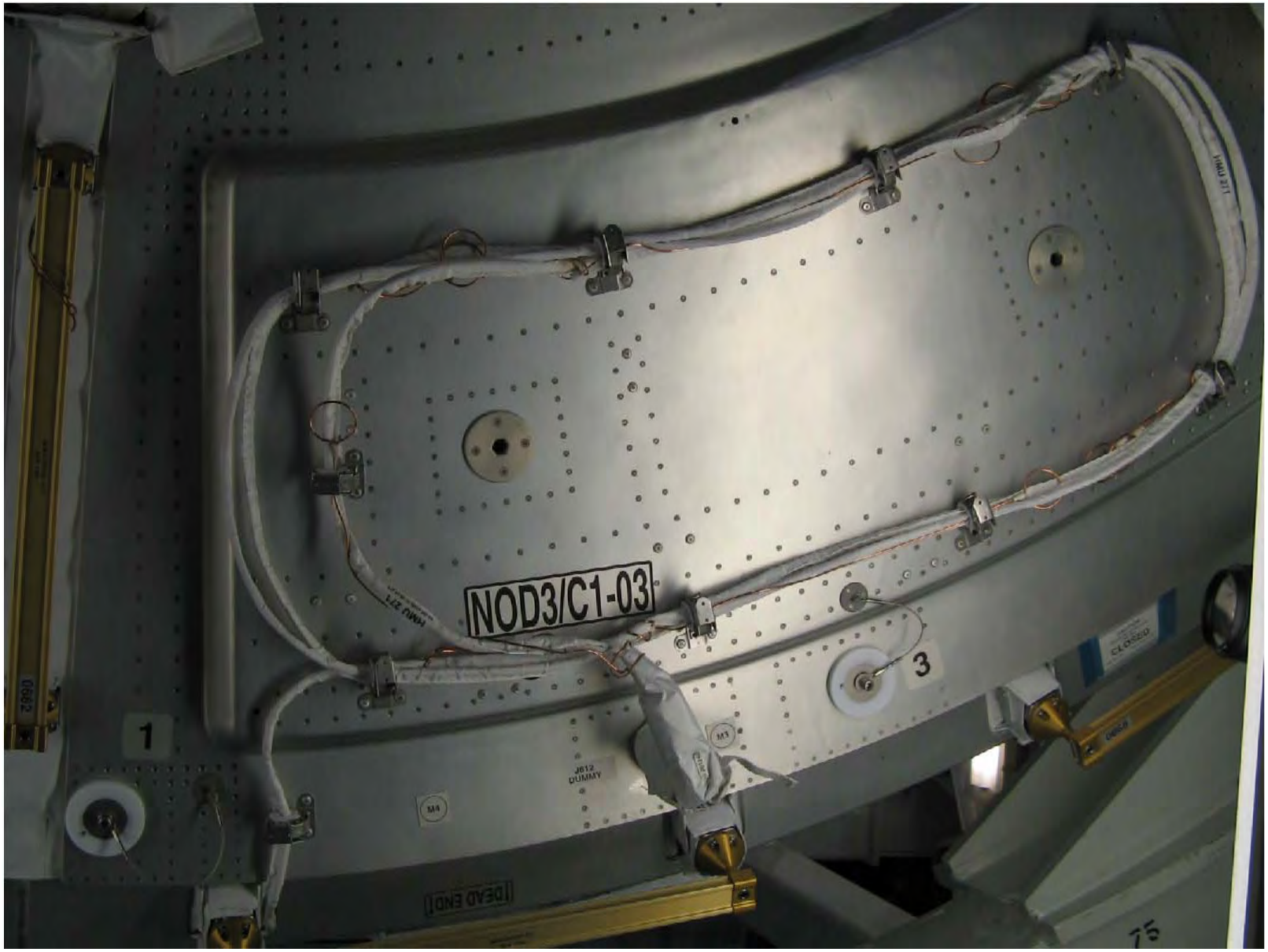
OTSD (Cont)


* FROM CAPTURED POSITION ANY LOCAL OR REMOTE LEVER CAN BE PUT INTO RELEASED POSITION OR INTO LOCK POSITION
ROTATE LEVER IN DIRECTION SHOWN TO CAPTURED POSITION (~2-8 lbs)
PUSH TO DISENGAGE LOCK (~1-3 lbs)
1
2
* ROTATE LEVER FROM CAPTURED POSITION TO RELEASE POSITION (~2-8 lbs)
3
4
HOLD HANDLE AND LEVER IN POSITION AND DISENGAGE OTSD FROM PASSIVE MF
Preload mark not visible indicating lack of preload
Preload mark visible indicating acceptable preload
Over-stroke mark visible indicating lack or loss of preload (not enough slop taken out)
UN-PRELOADED
Belleville Strut uncompressed
PRELOADED
Belleville Strut compressed
OVER-STROKED
Belleville Strut uncompressed

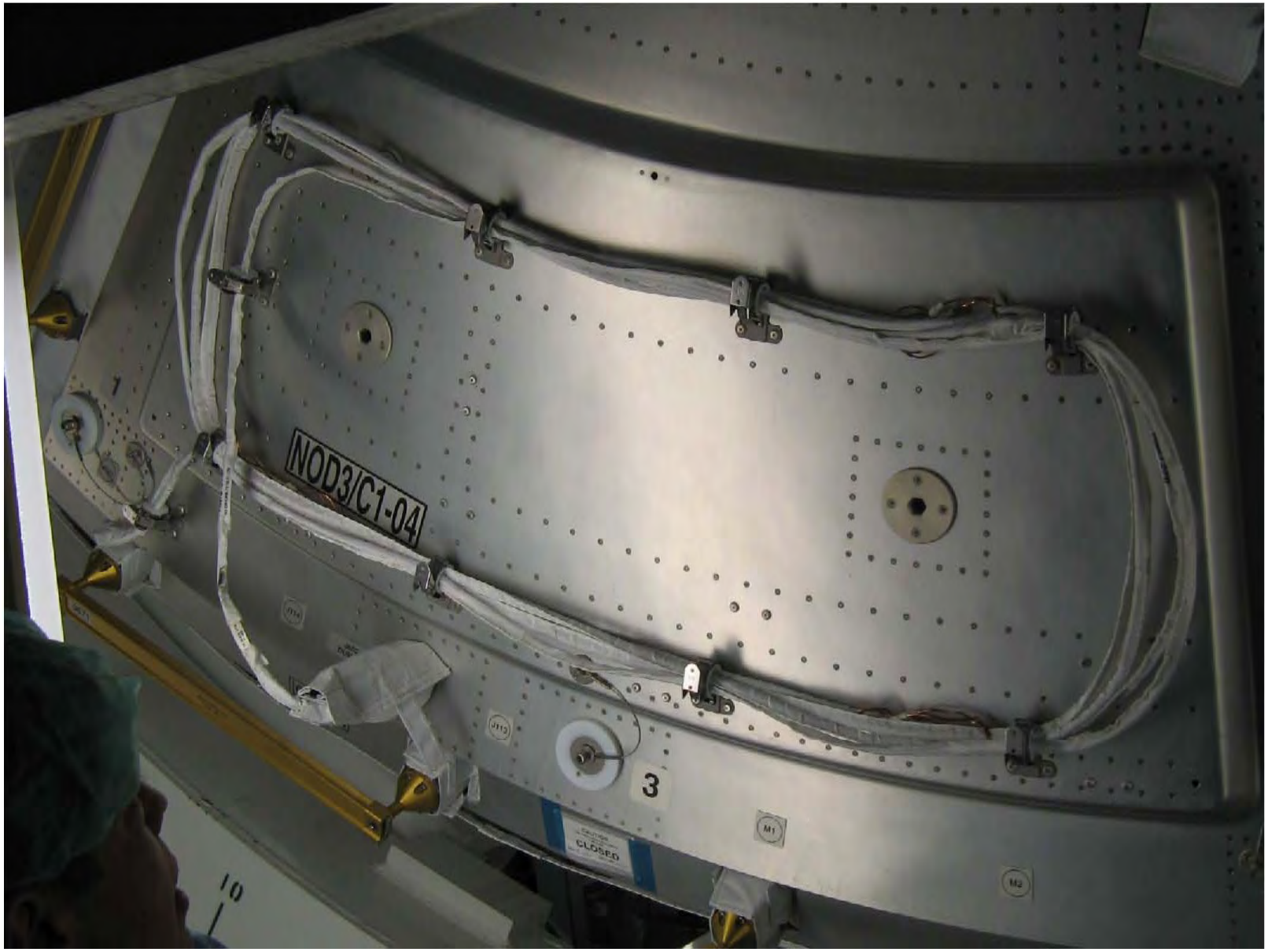
TIE-DOWN PLAN (TBD)

NODE 1 612 LTA CABLE JACKS (TBD)

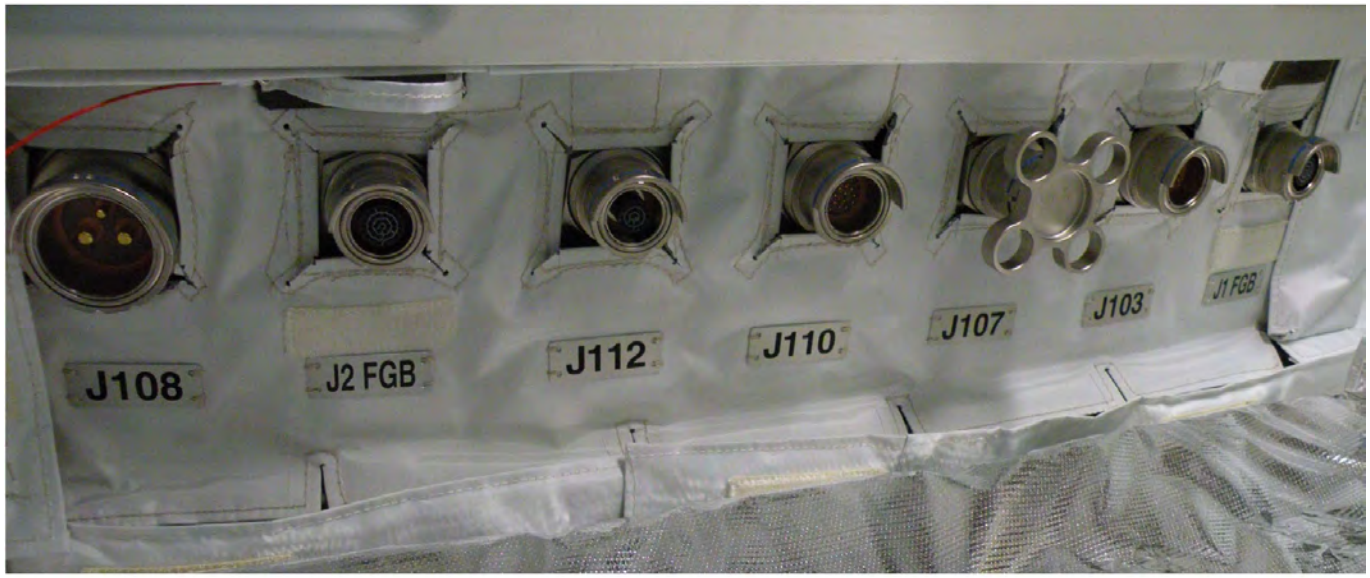
NODE 3 612 LTA CABLE

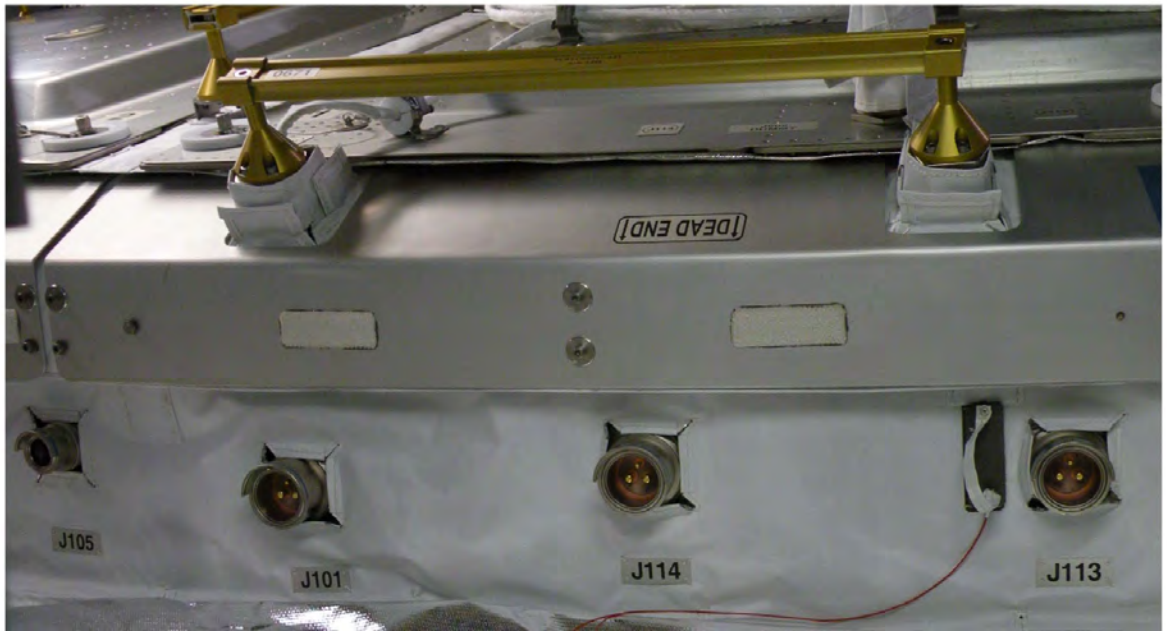


NODE 3 602 LTA CABLE

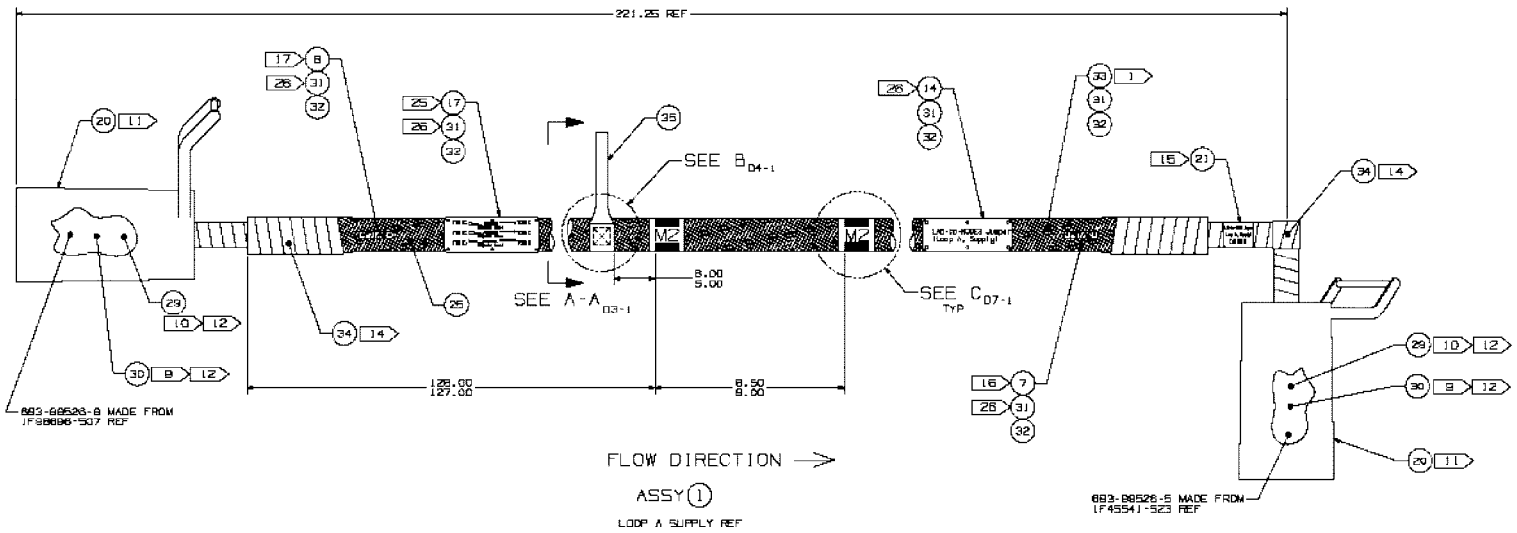


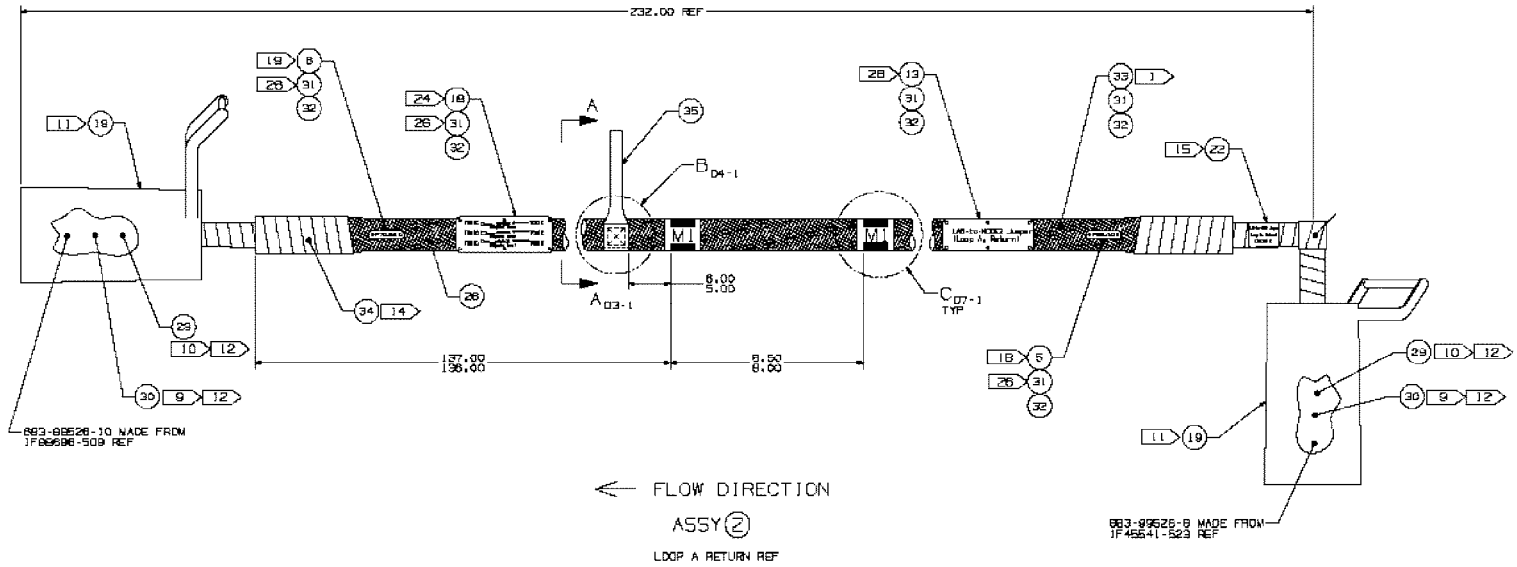
NODE 3 CONNECTORS



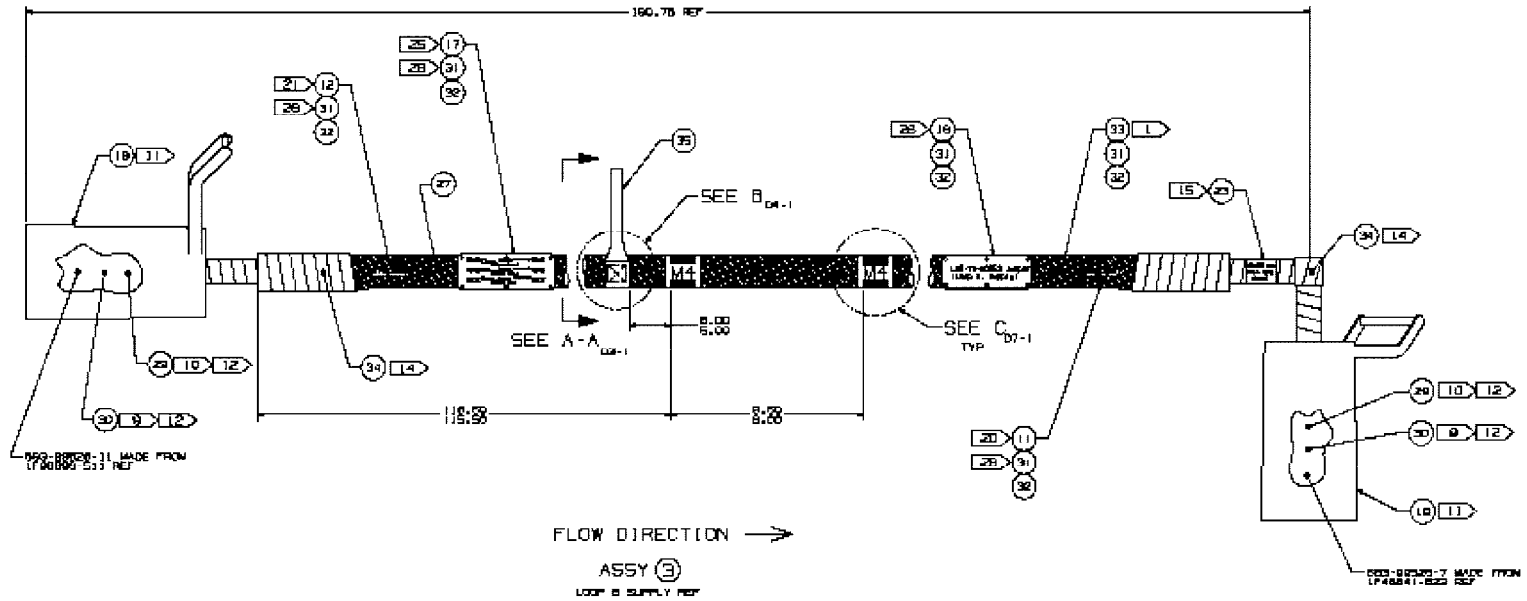


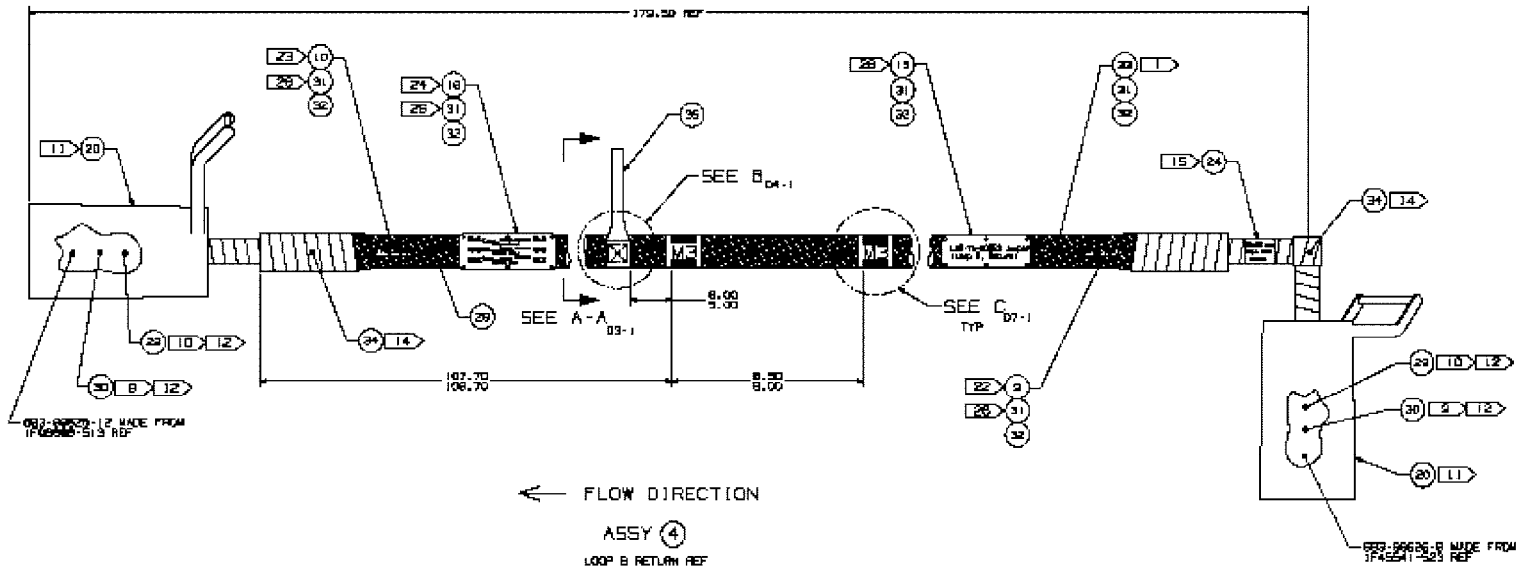
NODE 3 AMMONIA LINES



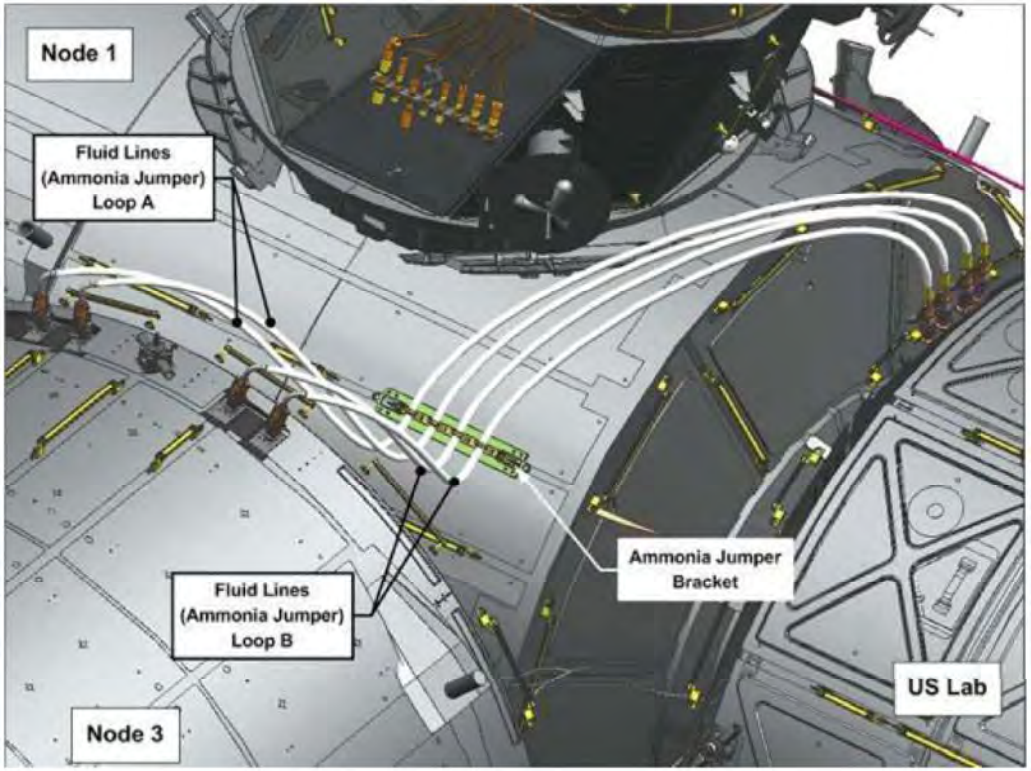


NODE 3 AMMONIA LINES (Cont)

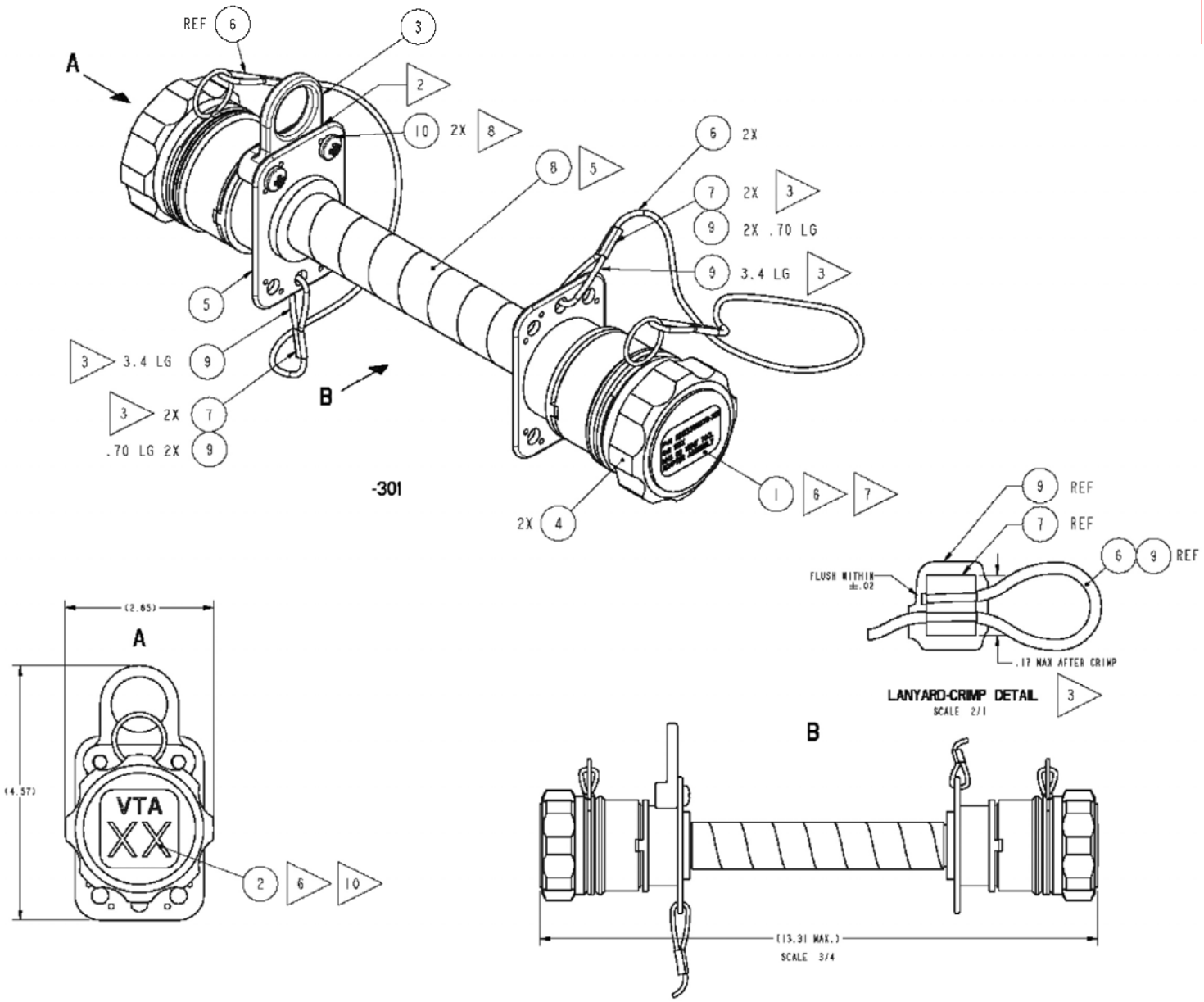




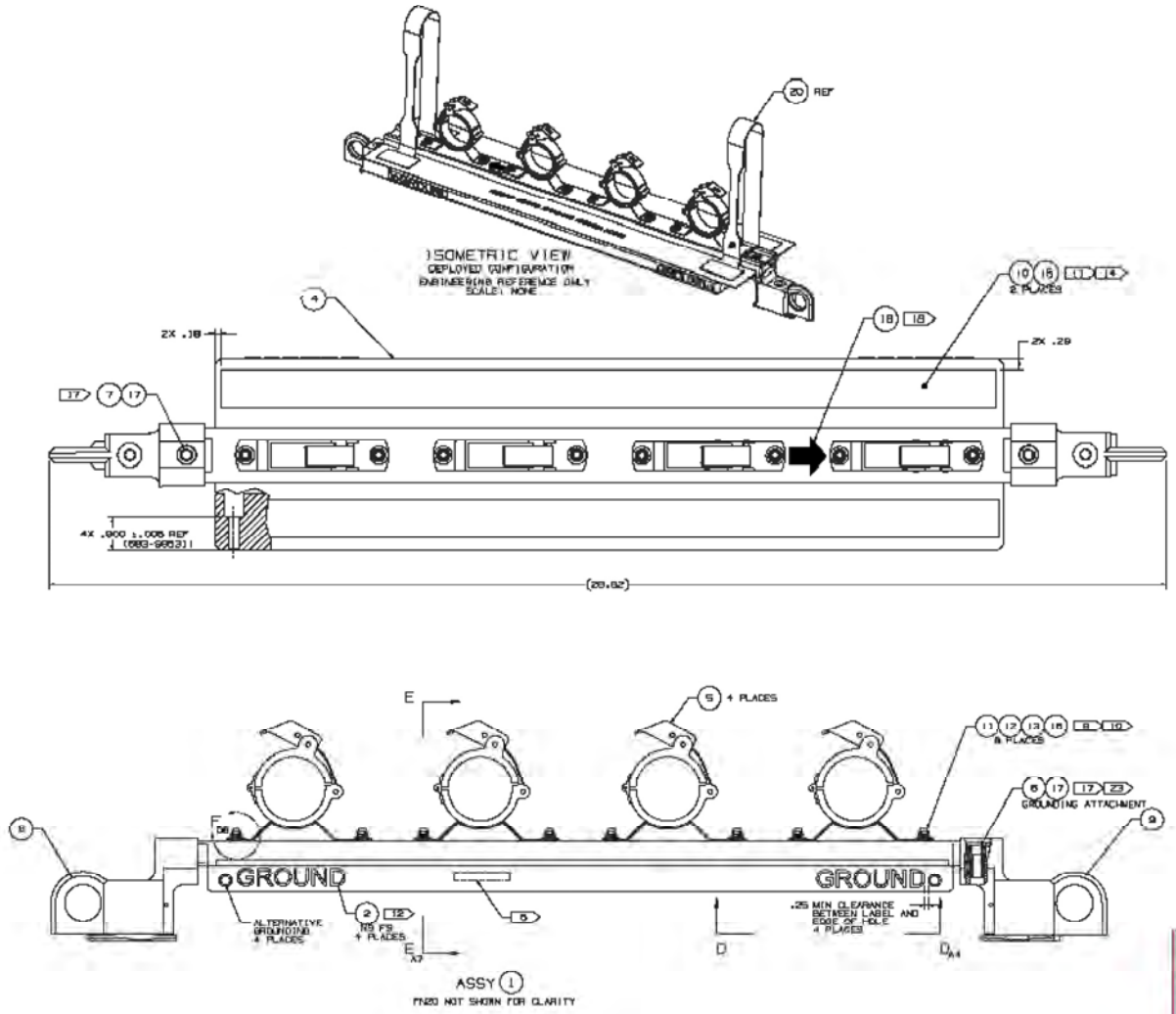
AMMONIA LINE ROUTING

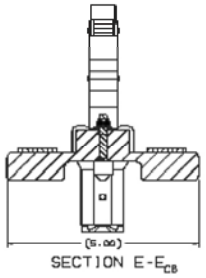


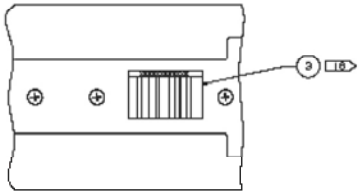
AMMONIA (NH3) VENT TOOL

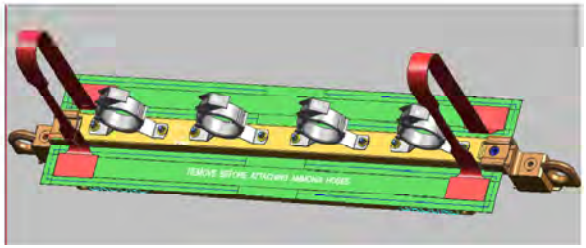


NH3 HANDRAIL BRACKET

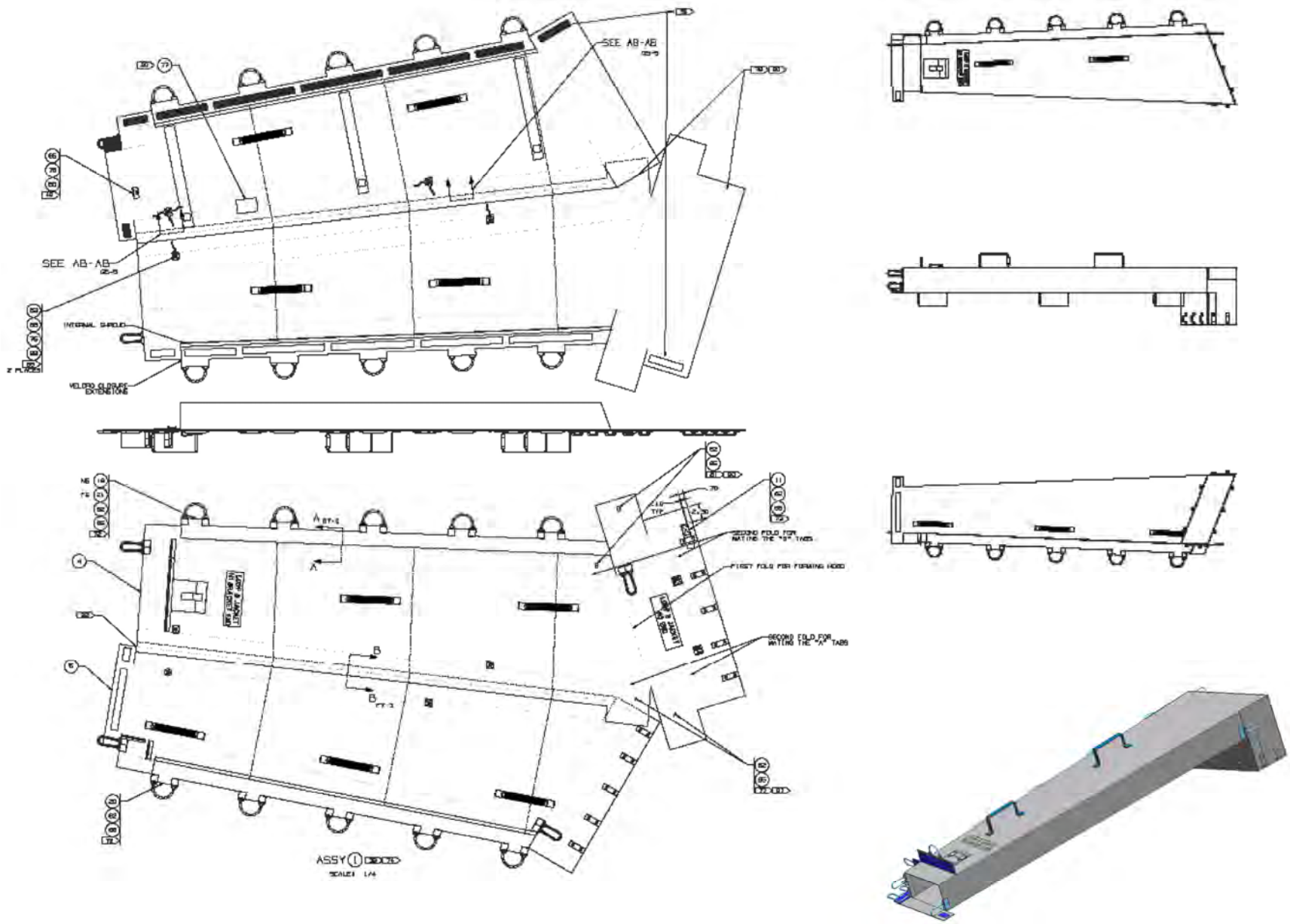




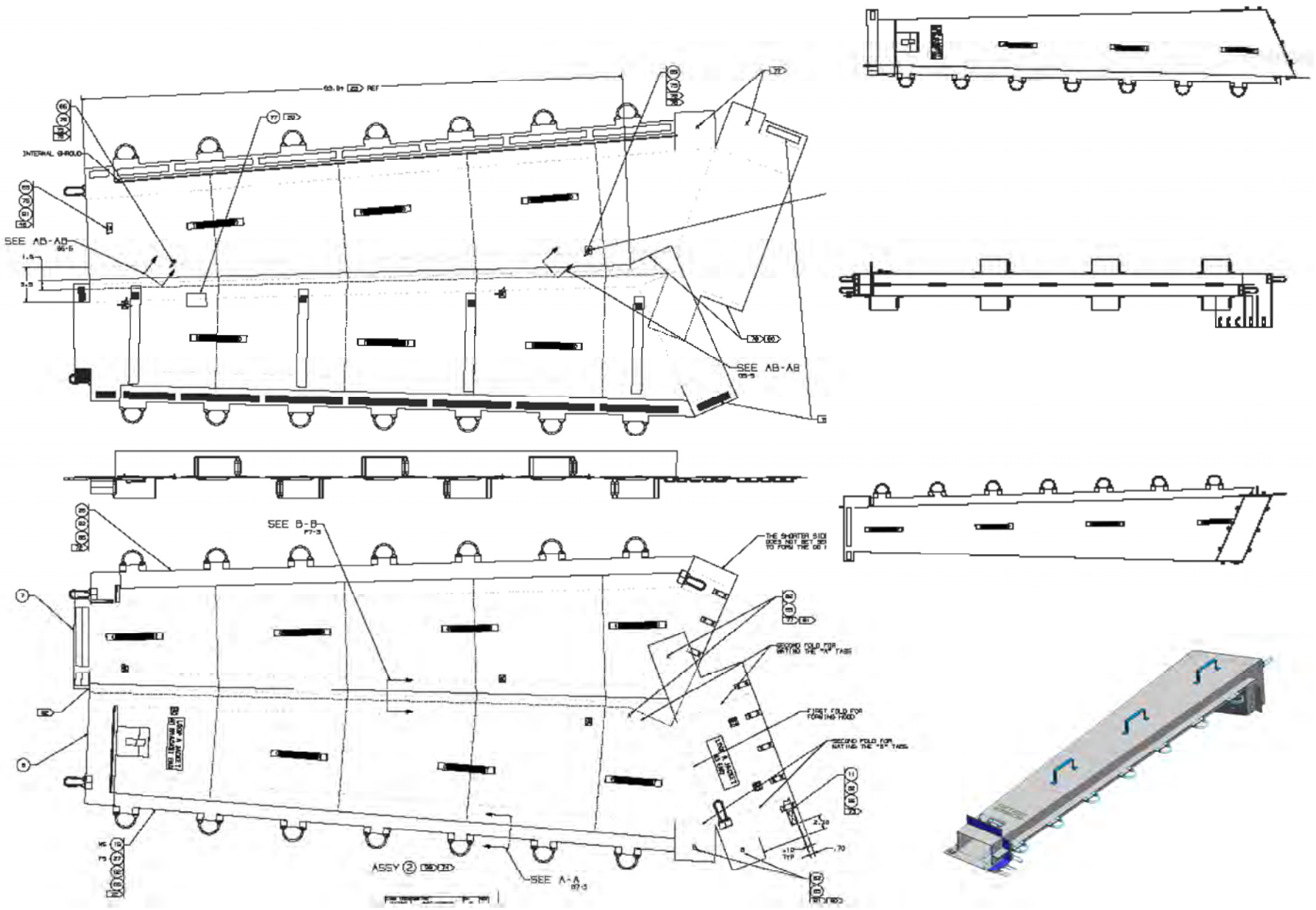




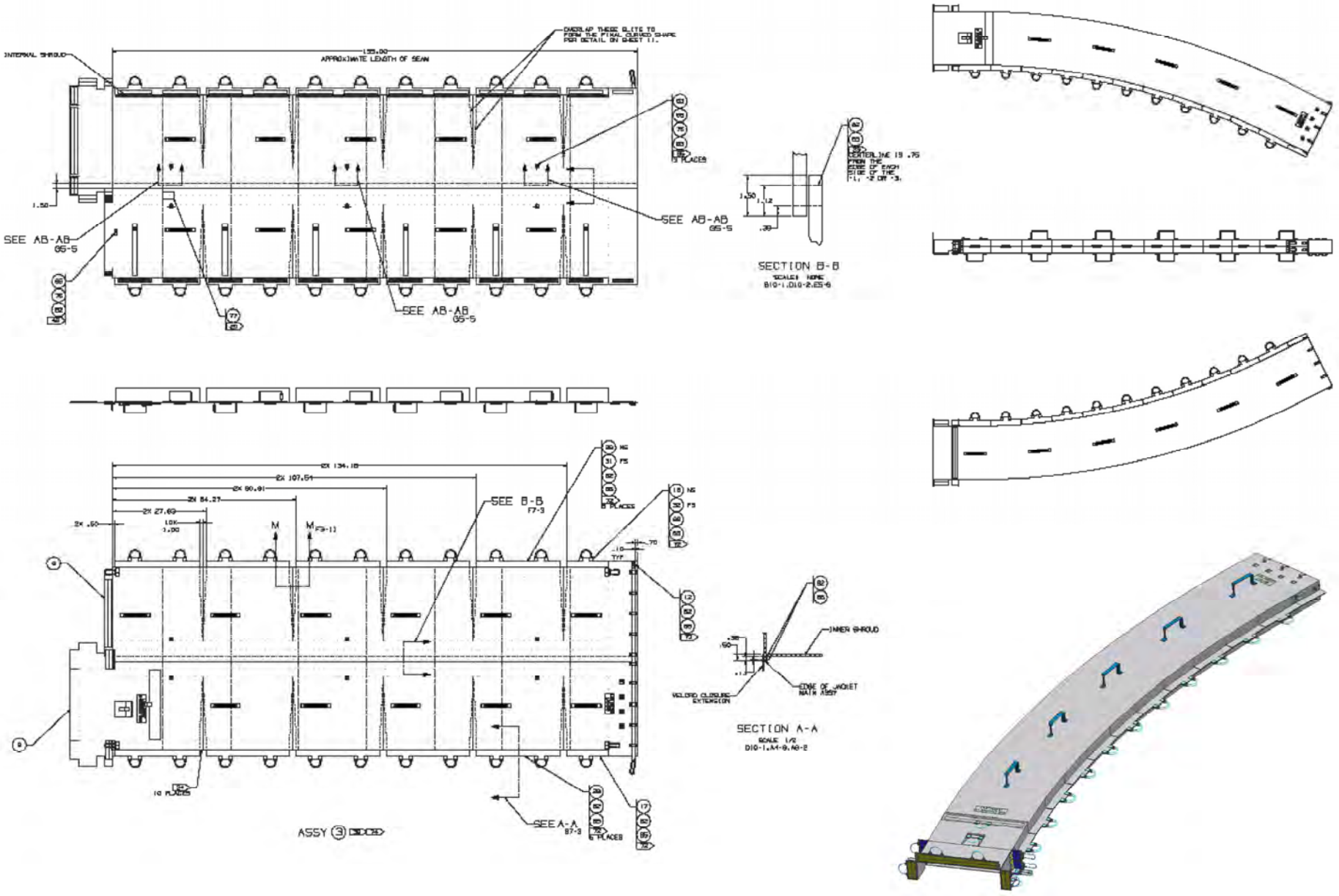
NH3 MLI – LOOP B JACKET



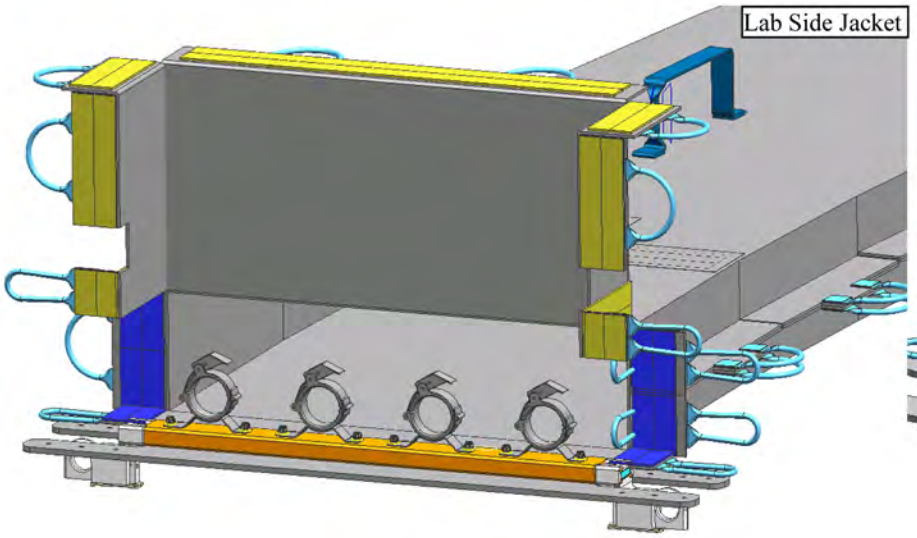
NH3 MLI – LOOP A JACKET

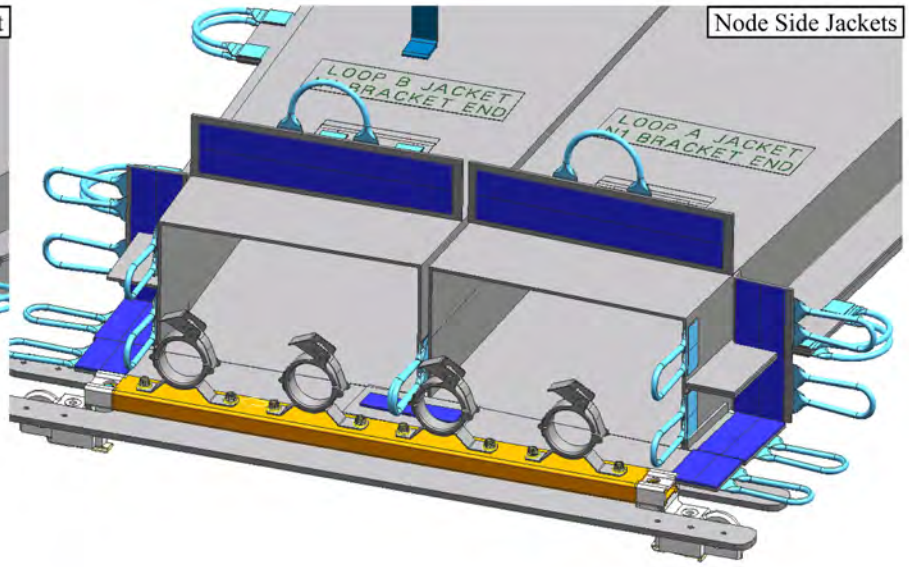


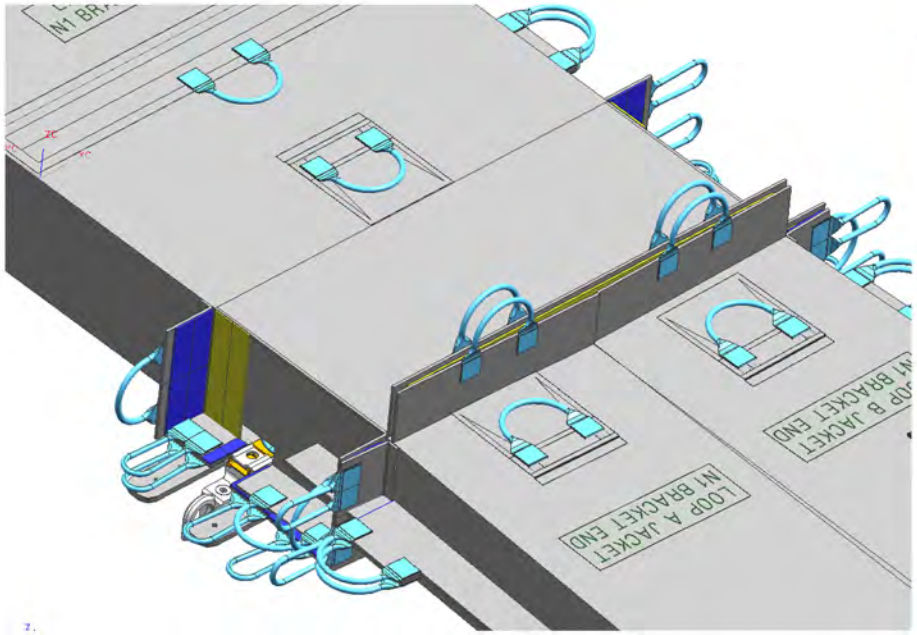
NH3 MLI – LAB JACKET

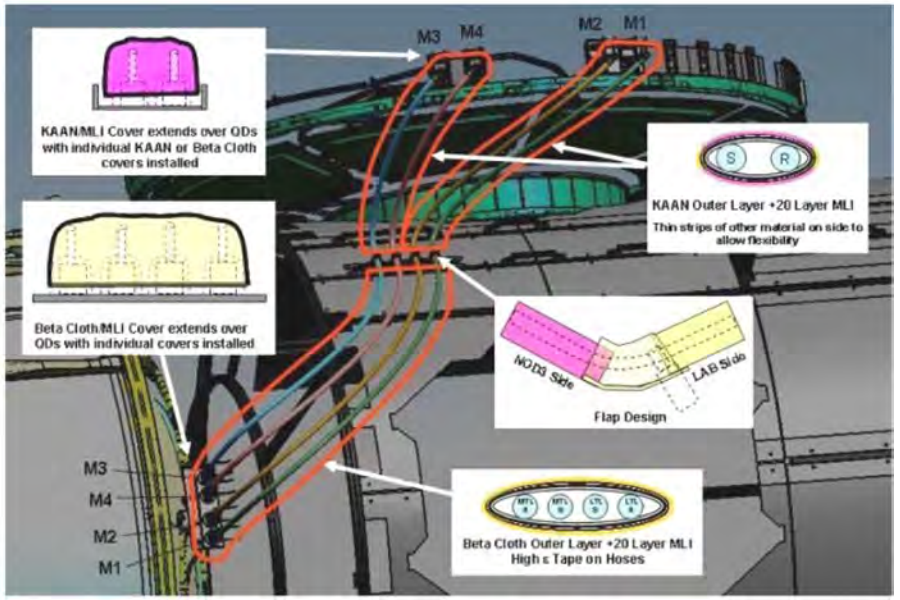


NH3 MLI AND ROUTING

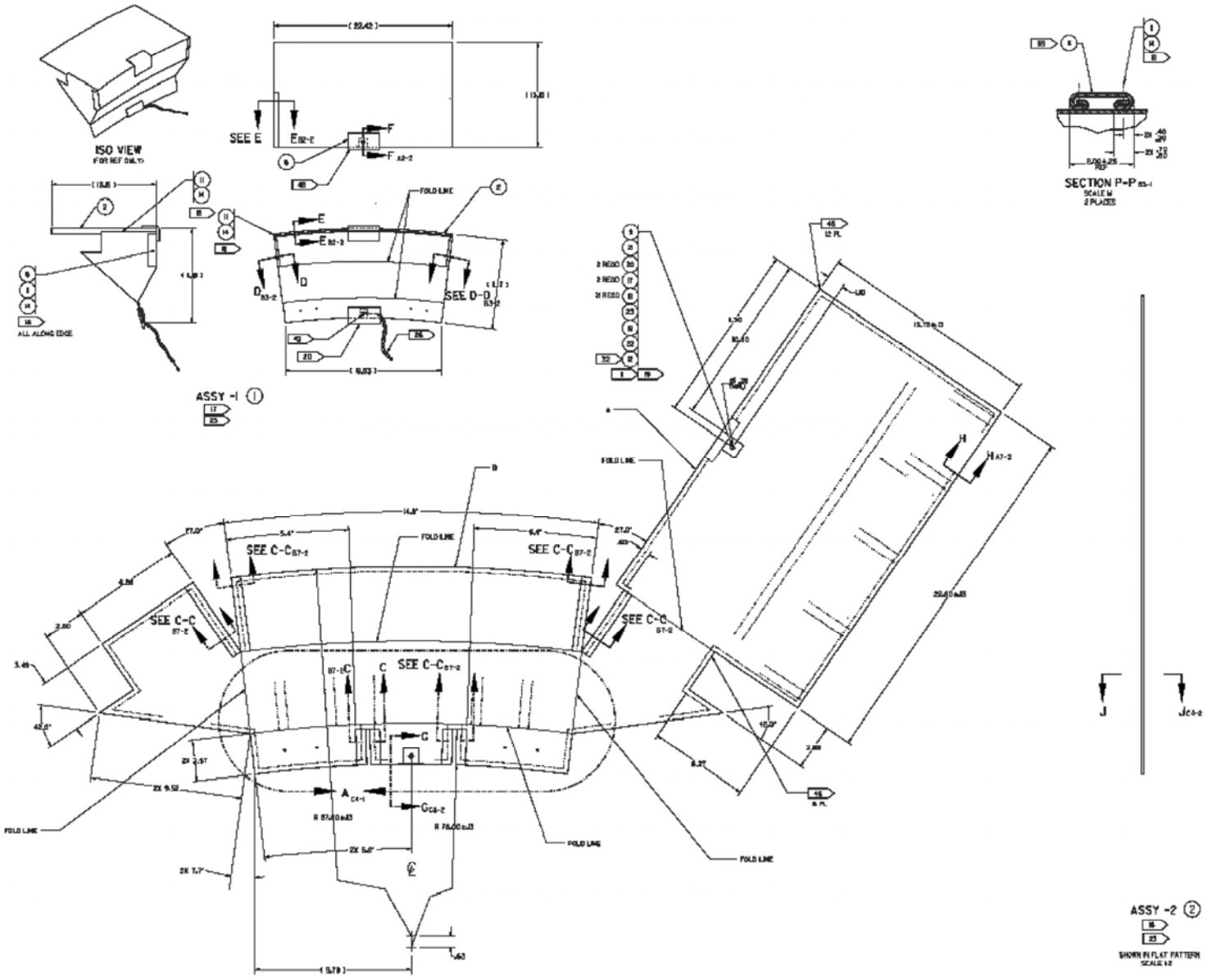




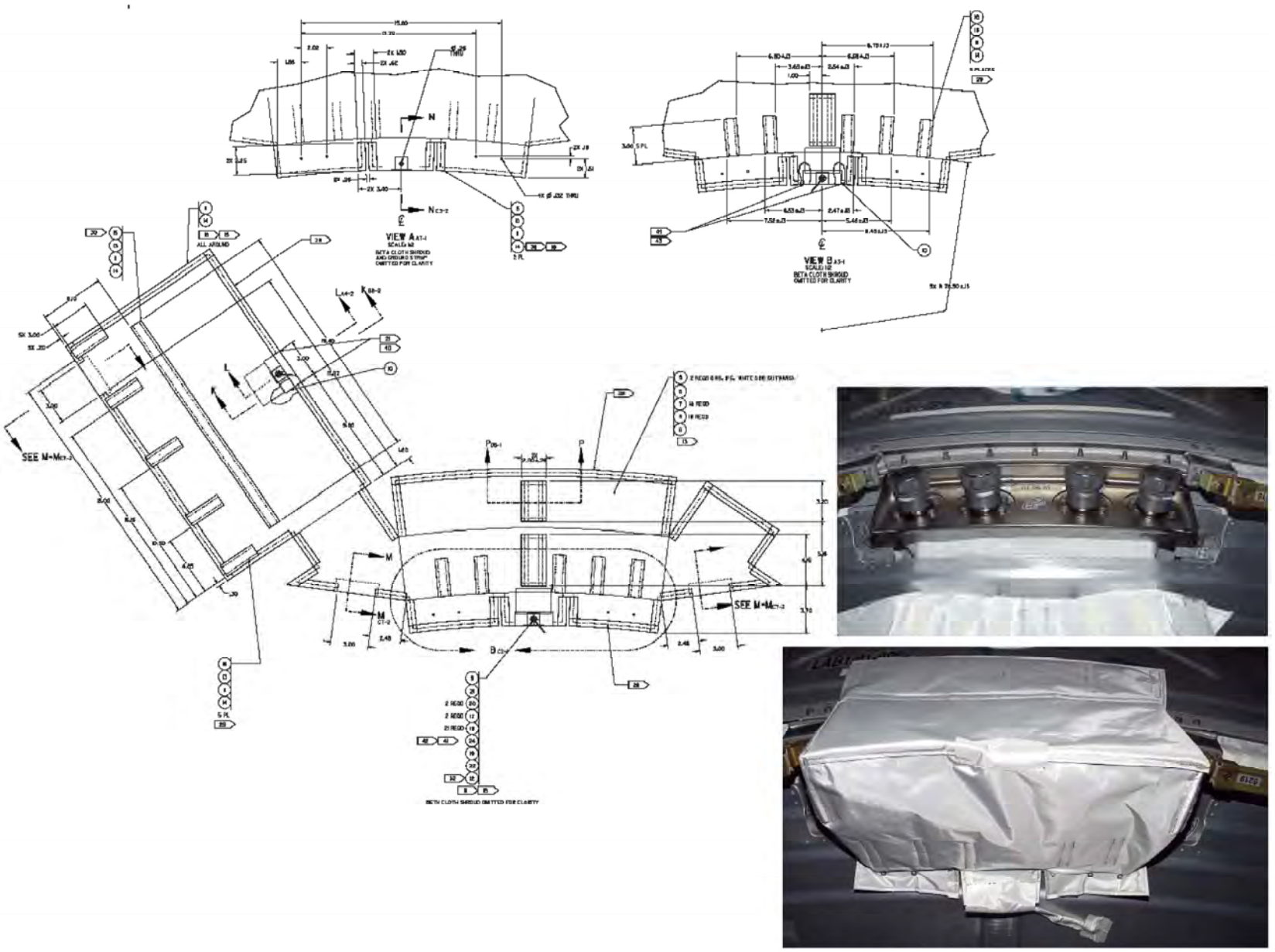




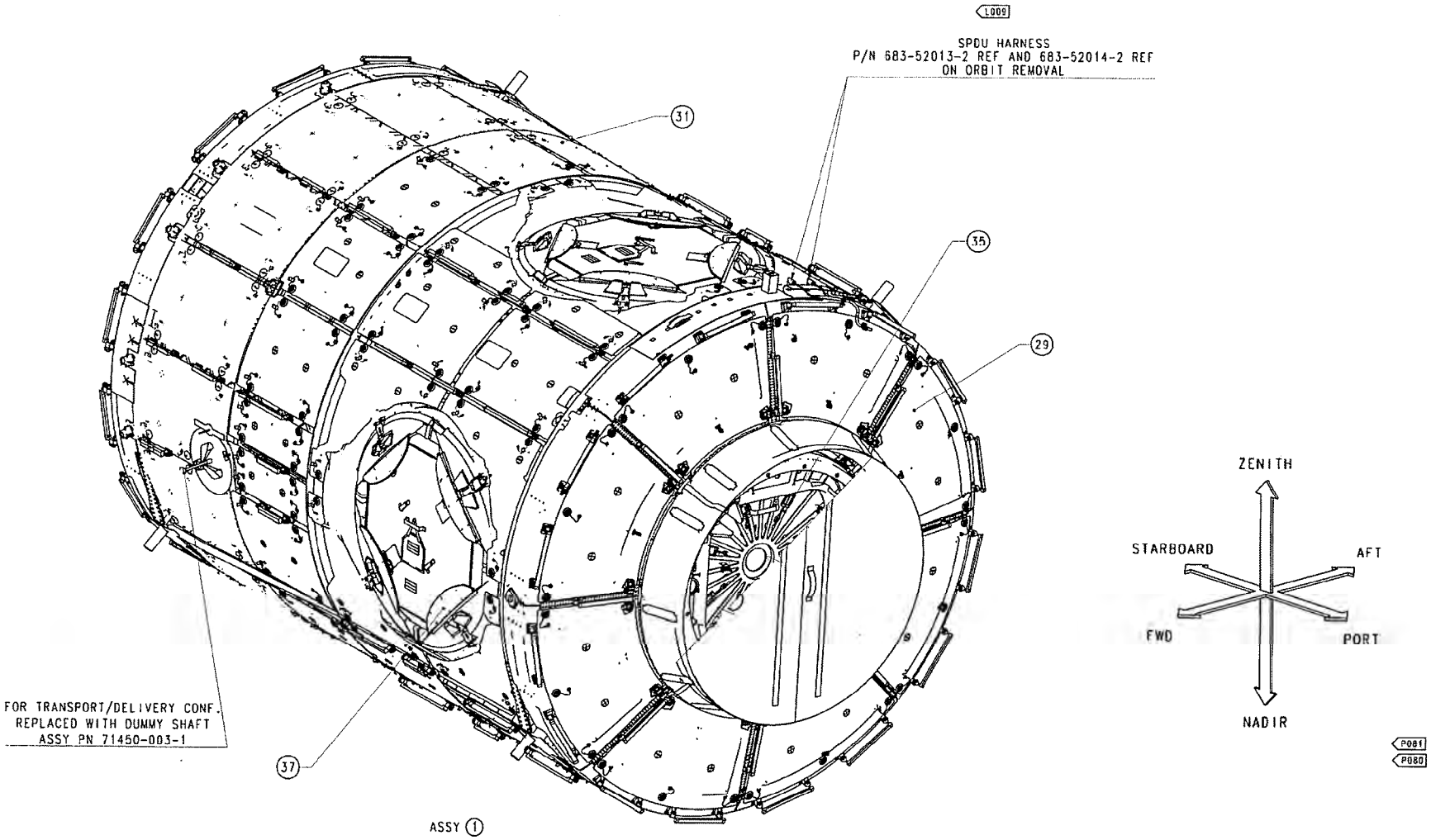
LAB COZY


ISO VIEW
FOR REF ONLY
SEE E
FOLD LINE
SEE D-D
ASSY -1
ALL ALONG EDGE
SECTION P-P
SCALE M
2 PLACES
SEE C-C
FOLD LINE
ASSY -2
SHOWN IN FLAT PATTERN

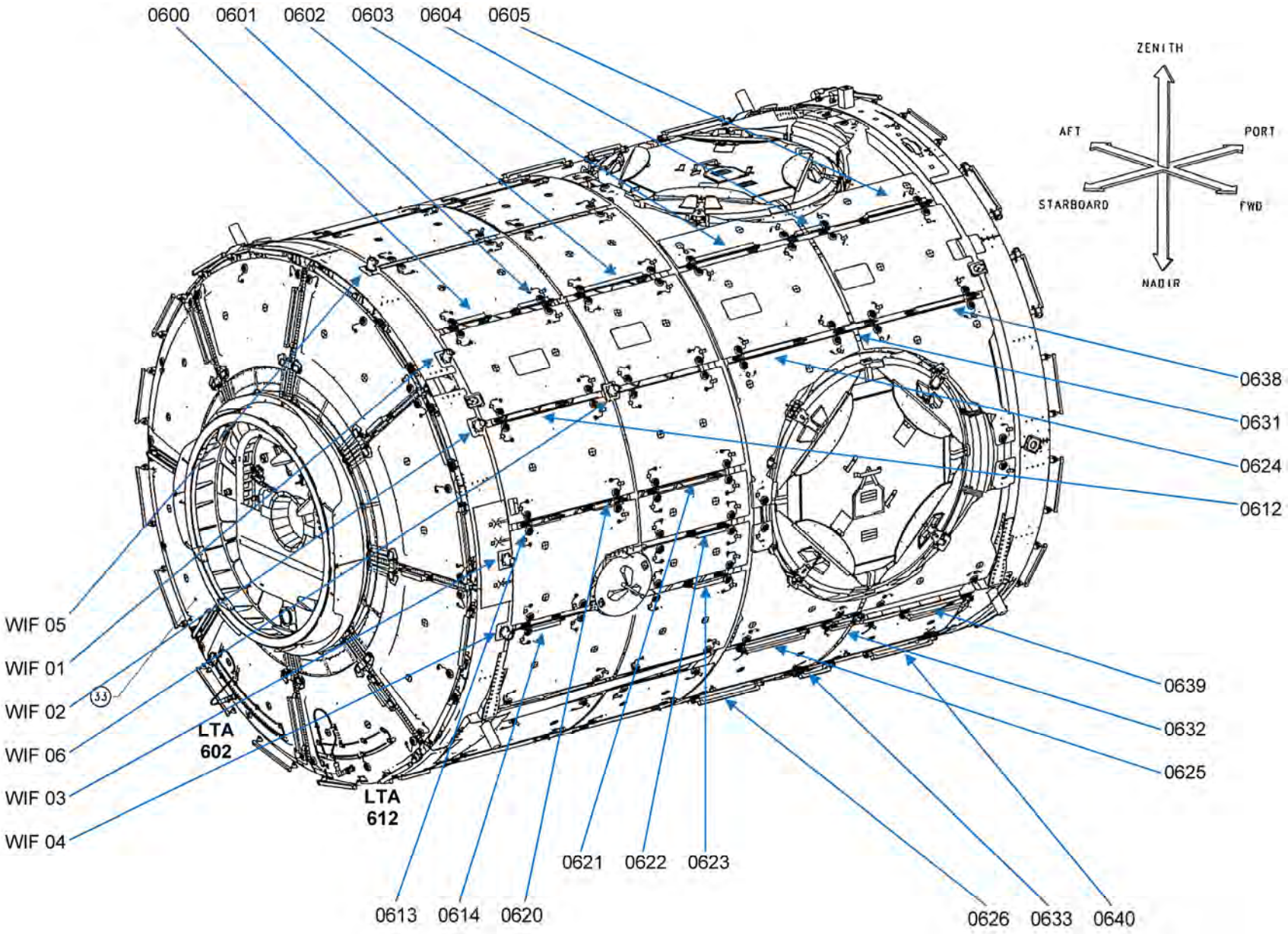
LAB COZY (Cont)



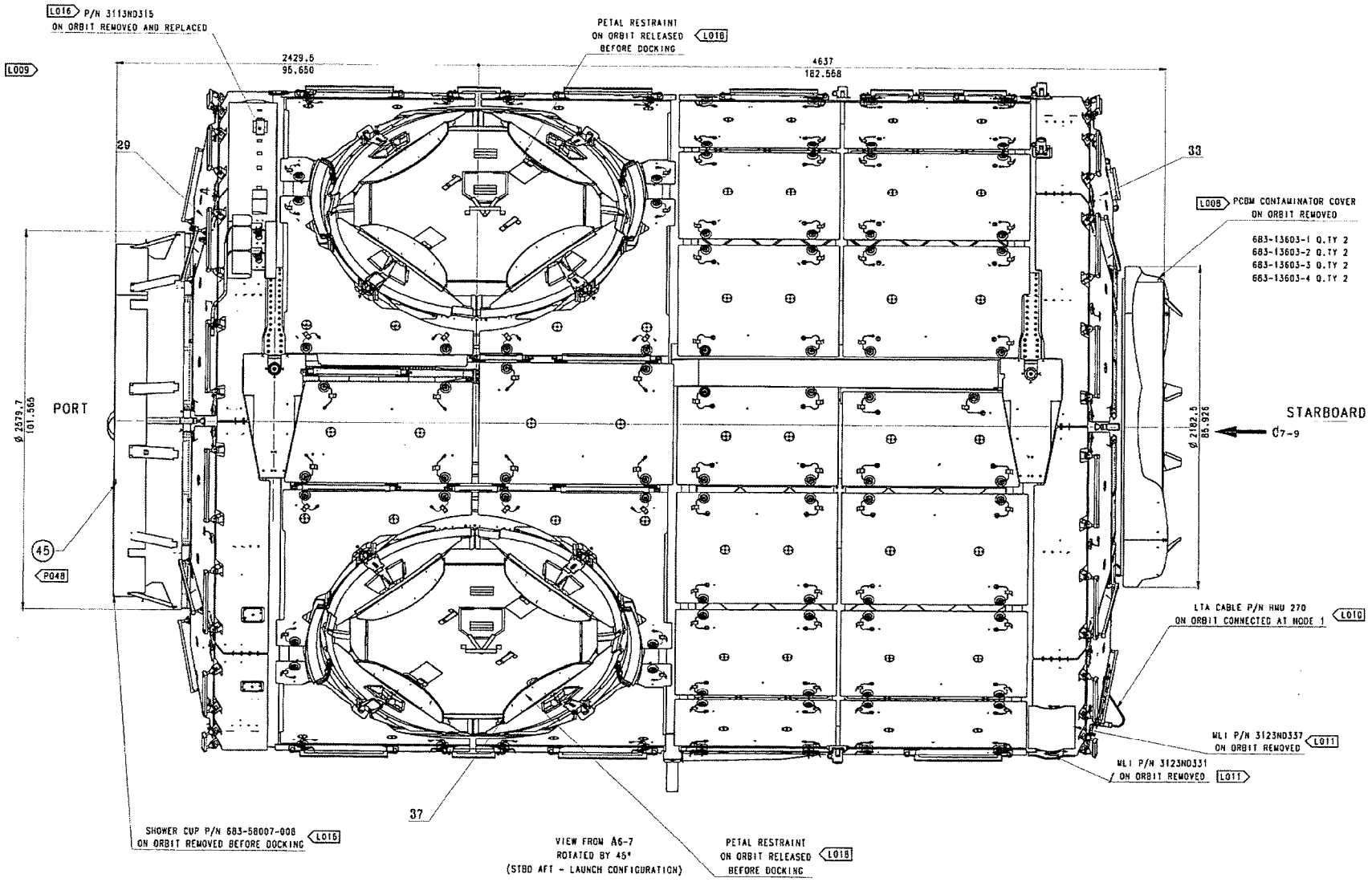
NODE 3


L009
SPDU HARNESS
P/N 683-52013-2 REF AND 683-52014-2 REF
ON ORBIT REMOVAL
31
35
29
37
FOR TRANSPORT/DELIVERY CONF.
REPLACED WITH DUMMY SHAFT
ASSY PN 71450-003-1
ASSY 1
ZENITH
STARBOARD
AFT
FWD
PORT
NADIR
P081
P080

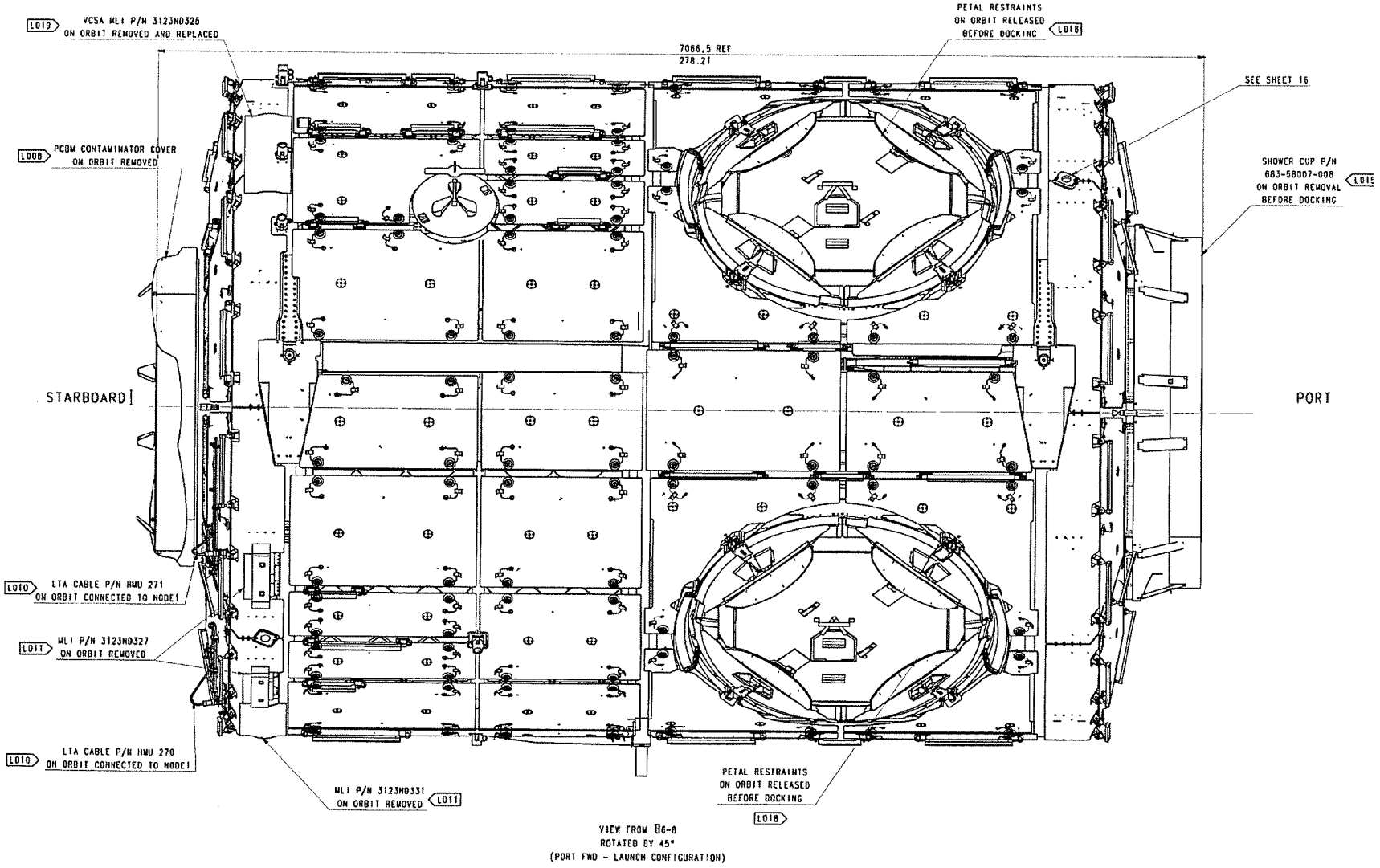
NODE 3 (Cont)


0600
0601
0602
0603
0604
0605
ZENITH
AFT
PORT
STARBOARD
FWD
NADIR
0638
0631
0624
0612
WIF 05
WIF 01
WIF 02
WIF 06
WIF 03
WIF 04
33
LTA
602
LTA
612
0639
0632
0625
0621
0622
0623
0613
0614
0620
0626
0633
0640

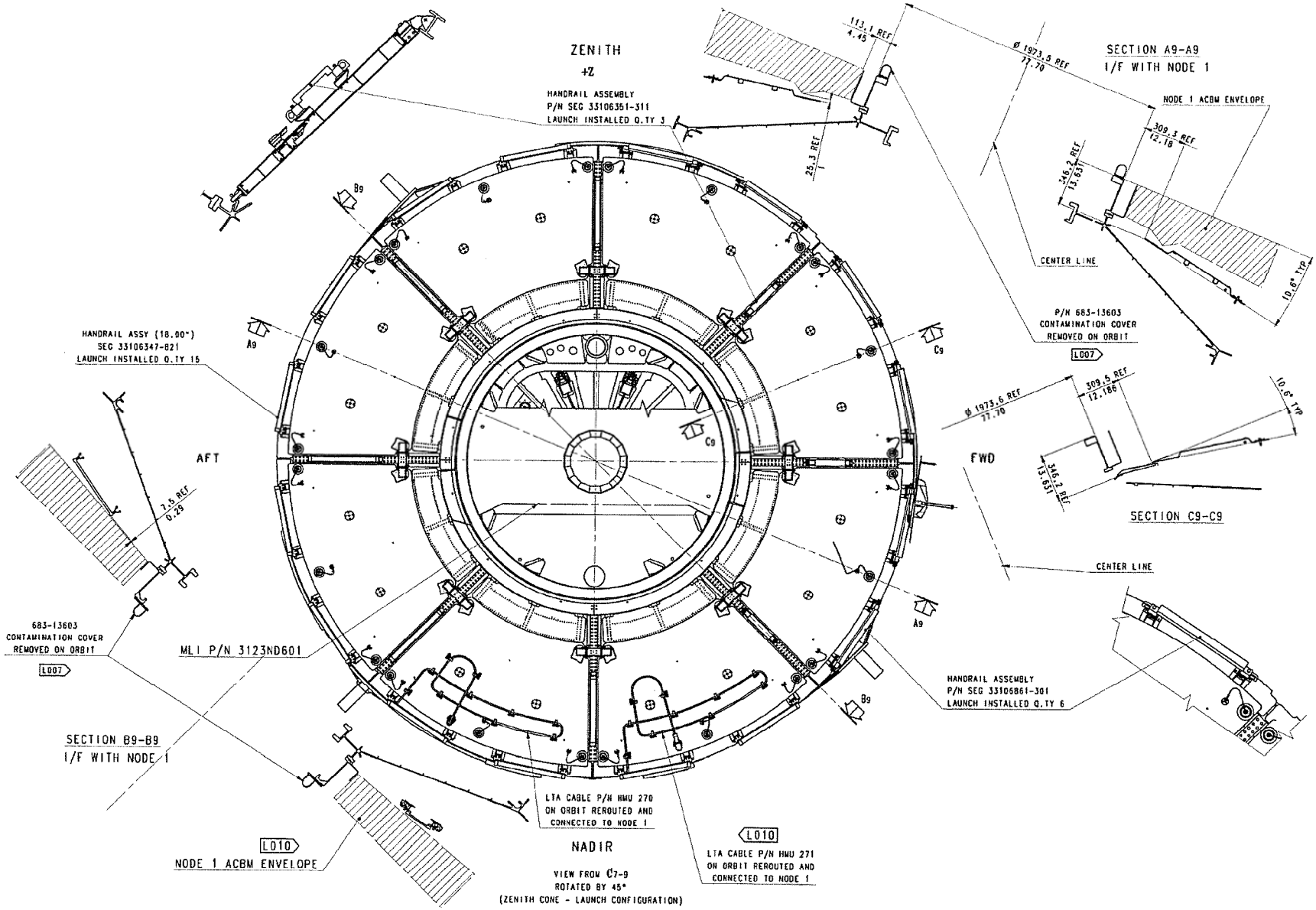
NODE 3 (ZENITH AFT VIEW – A)



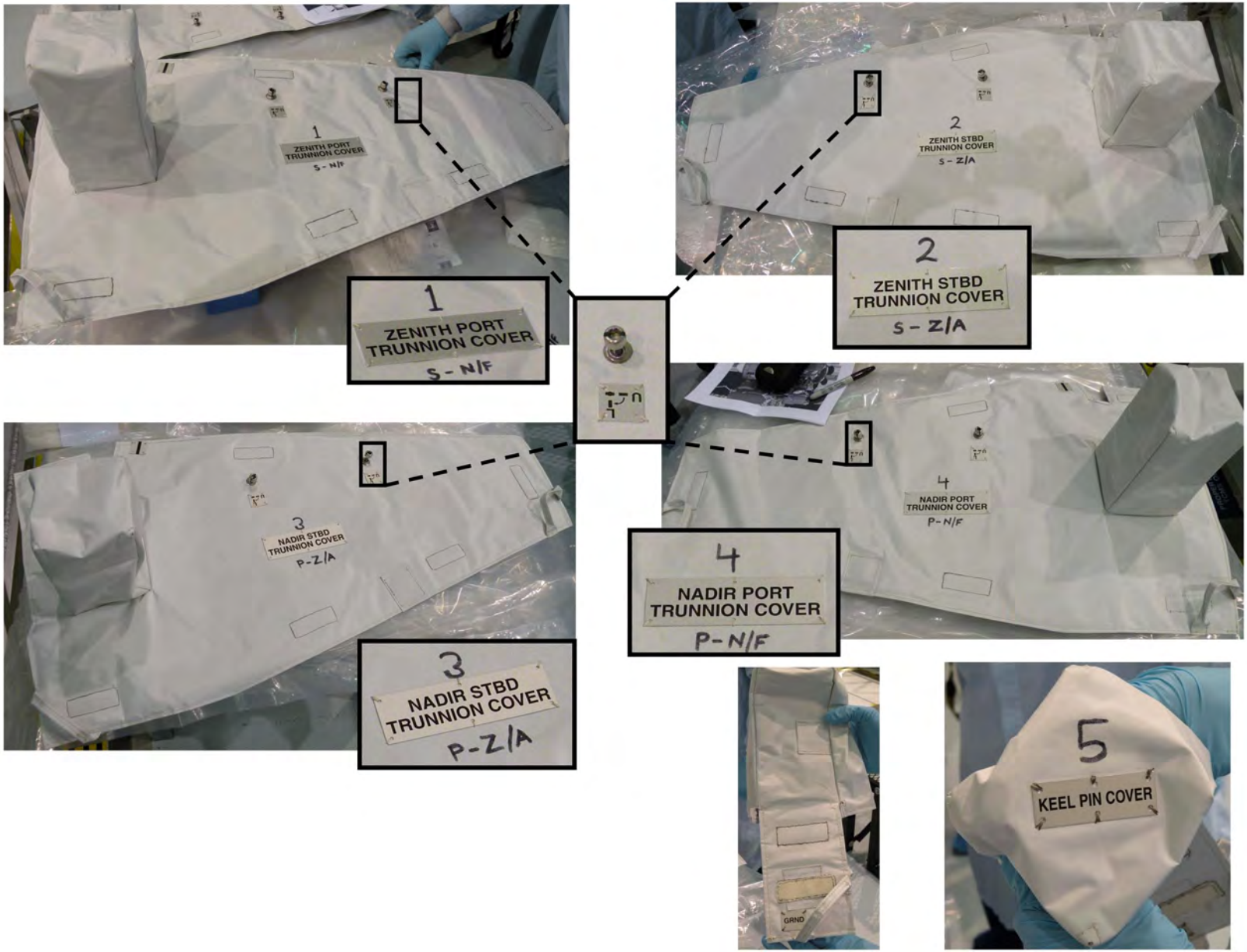
NODE 3 (FWD NADIR VIEW)



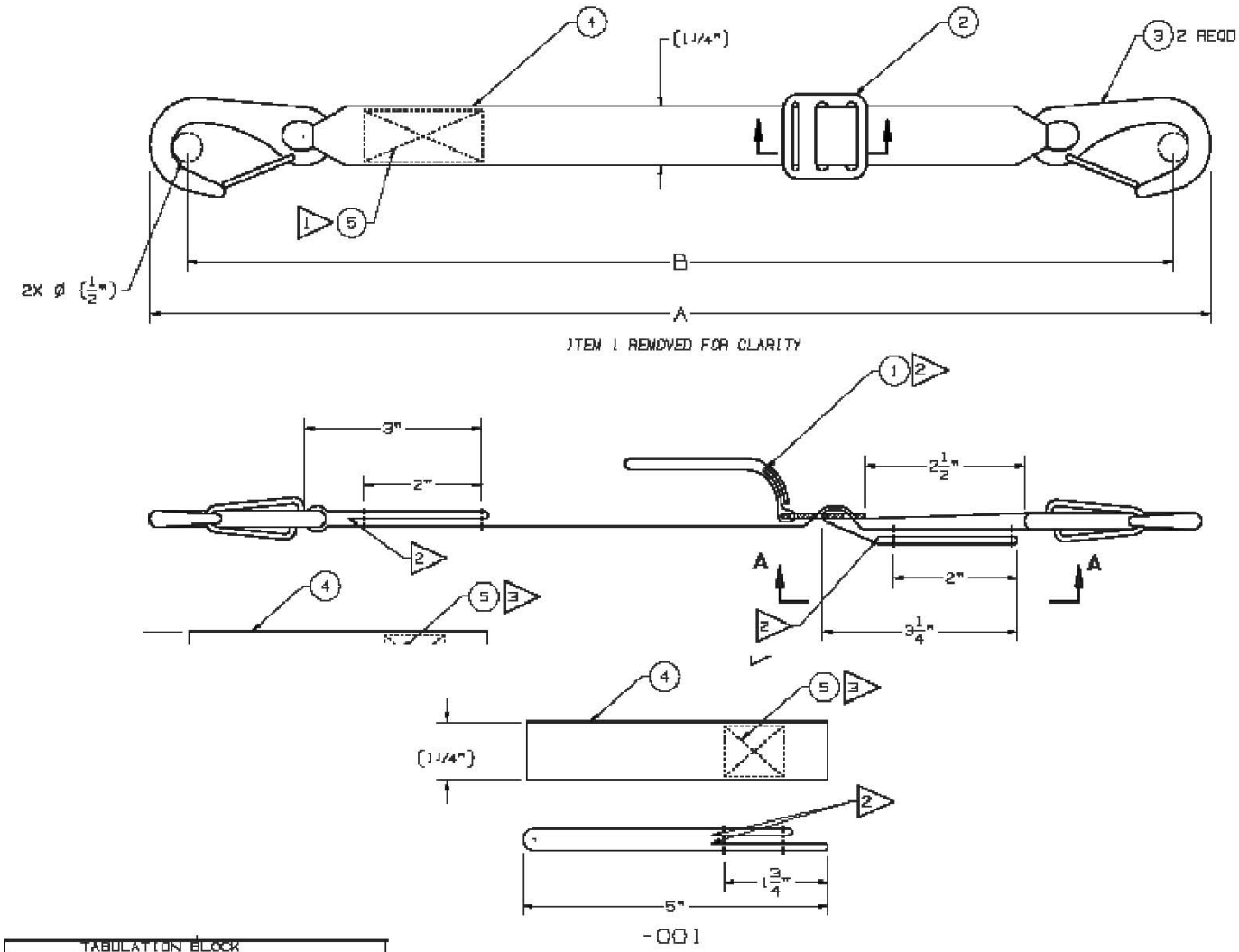
NODE 3 (ZENITH AFT VIEW – B)



TRUNNION/KEEL PIN COVERS

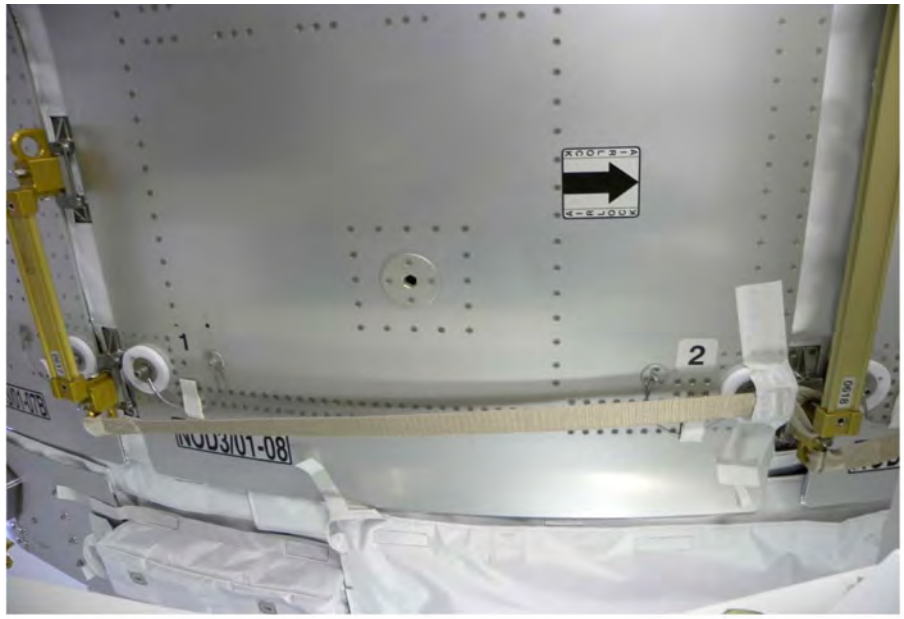


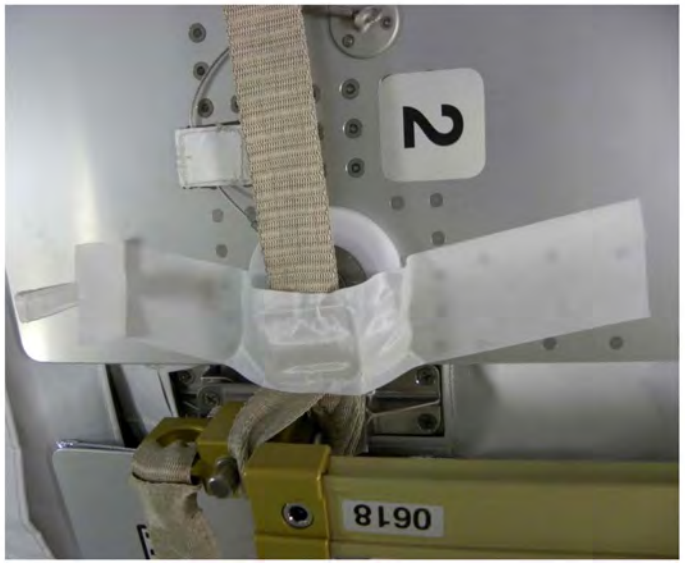
NODE 3 GAP SPANNERS

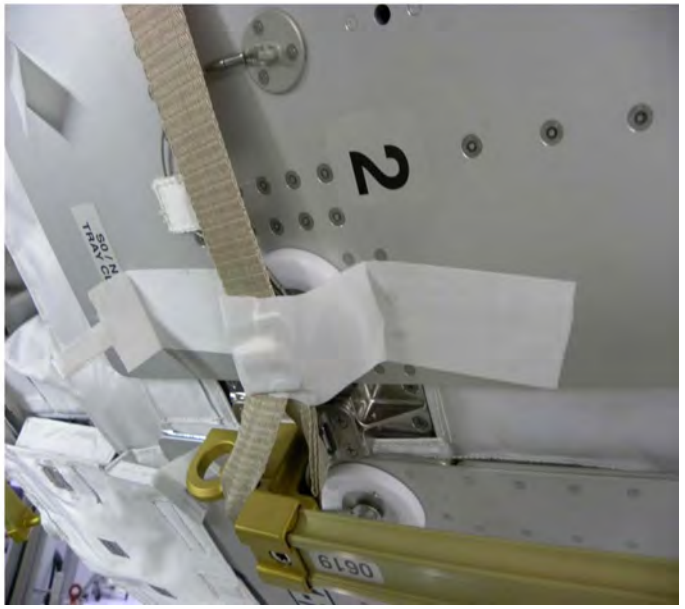


TABULATION BLOCK		
DASH NO.	DIM (A)	MINIMUM ADJUSTABLE RANGE "B"
-301	(22-1/2)	18"-21"
-303	(31-3/4)	21"-30"
-305	(46-1/2)	30"-45"
-307	(74)	45"-72"

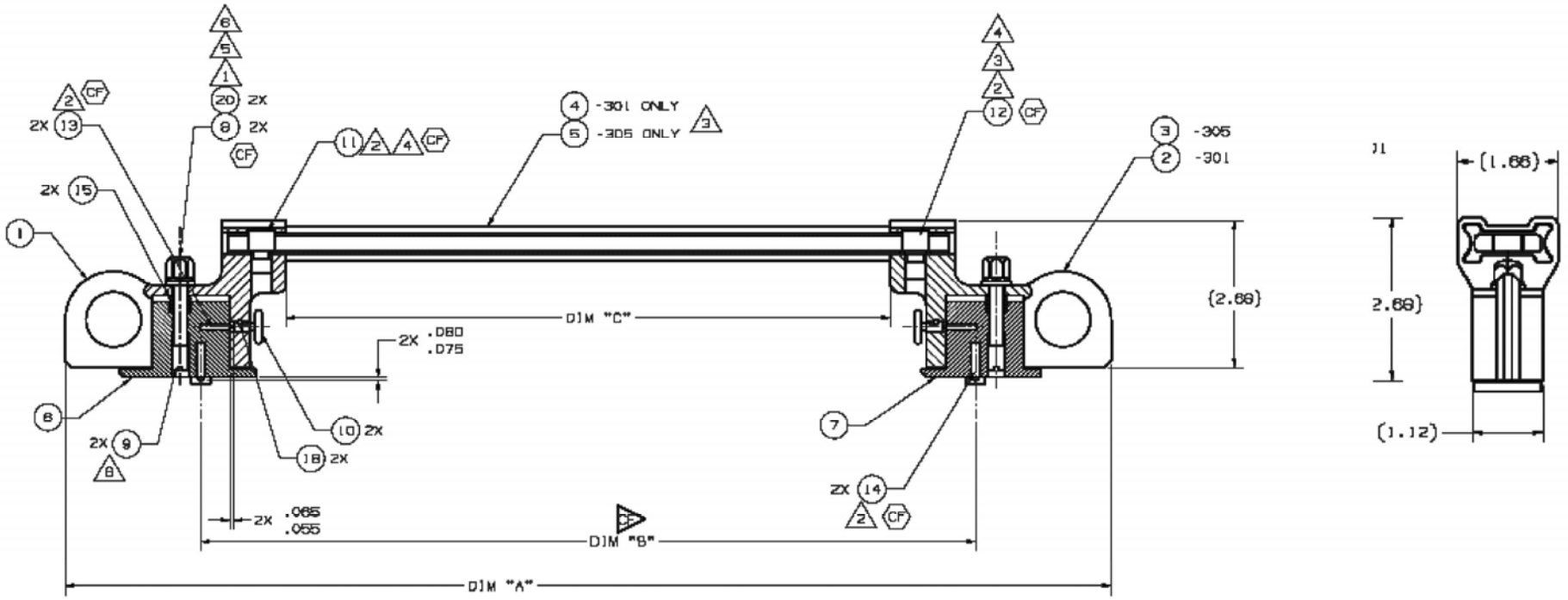
NODE 3 GAP SPANNERS (Cont)





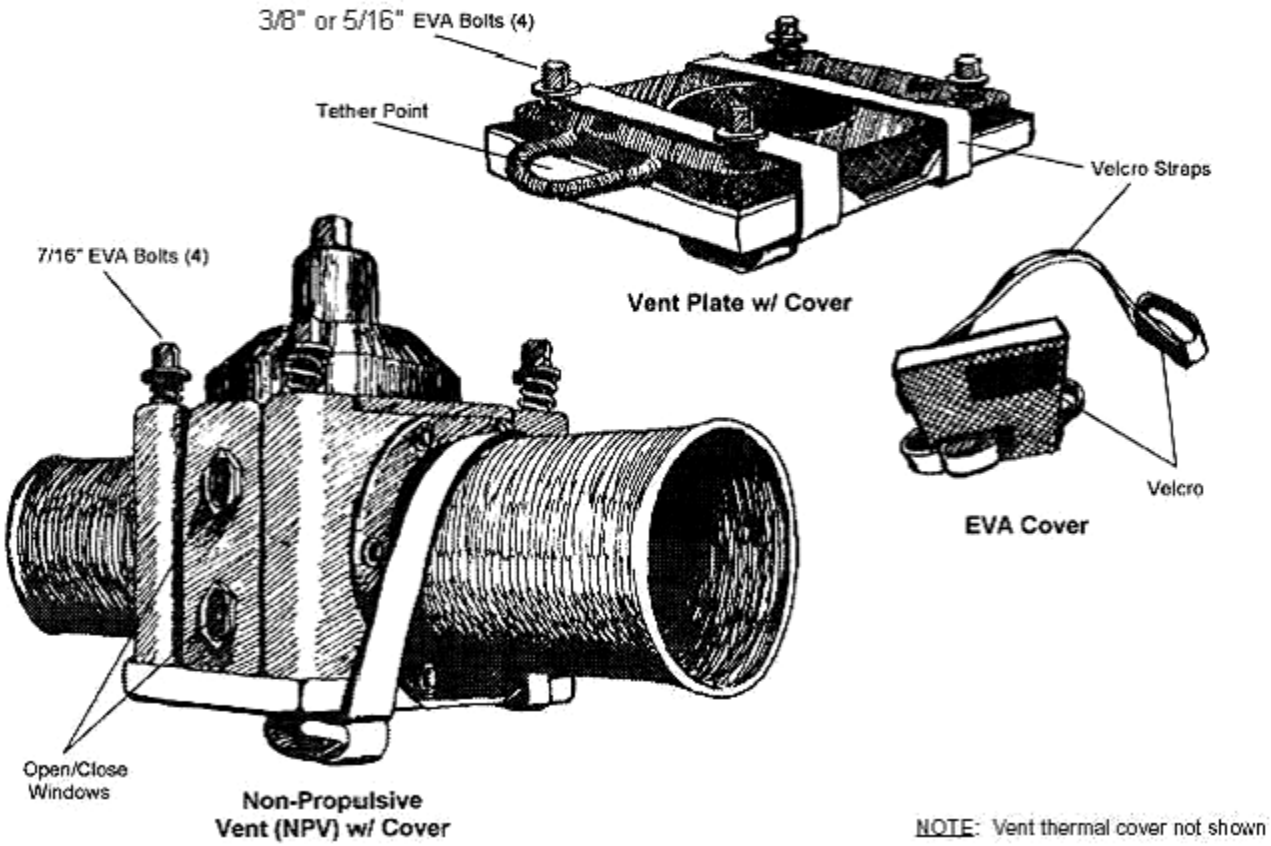


NODE 3 ORBIT-INSTALLED HANDRAILS (OIH)



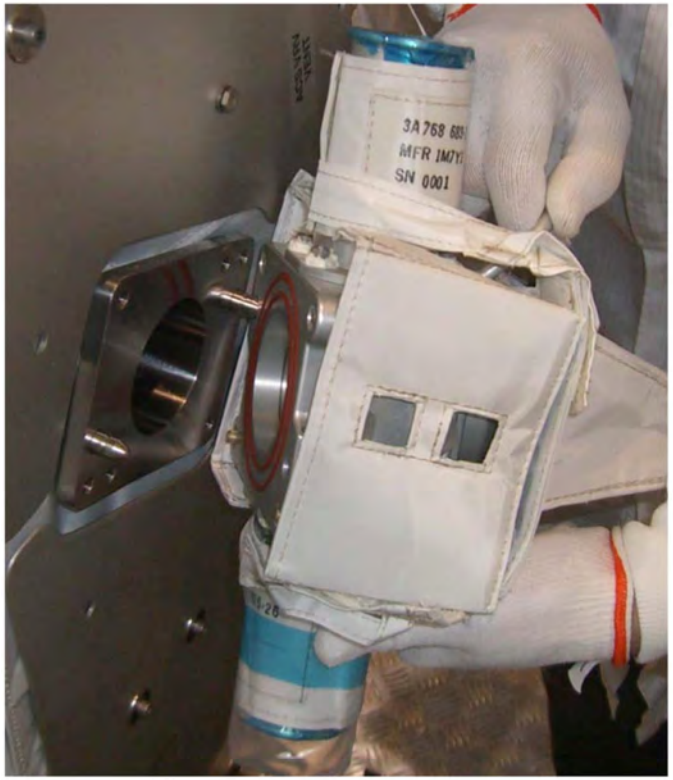
NODE 3 NON-PROPULSIVE VENT (NPV)

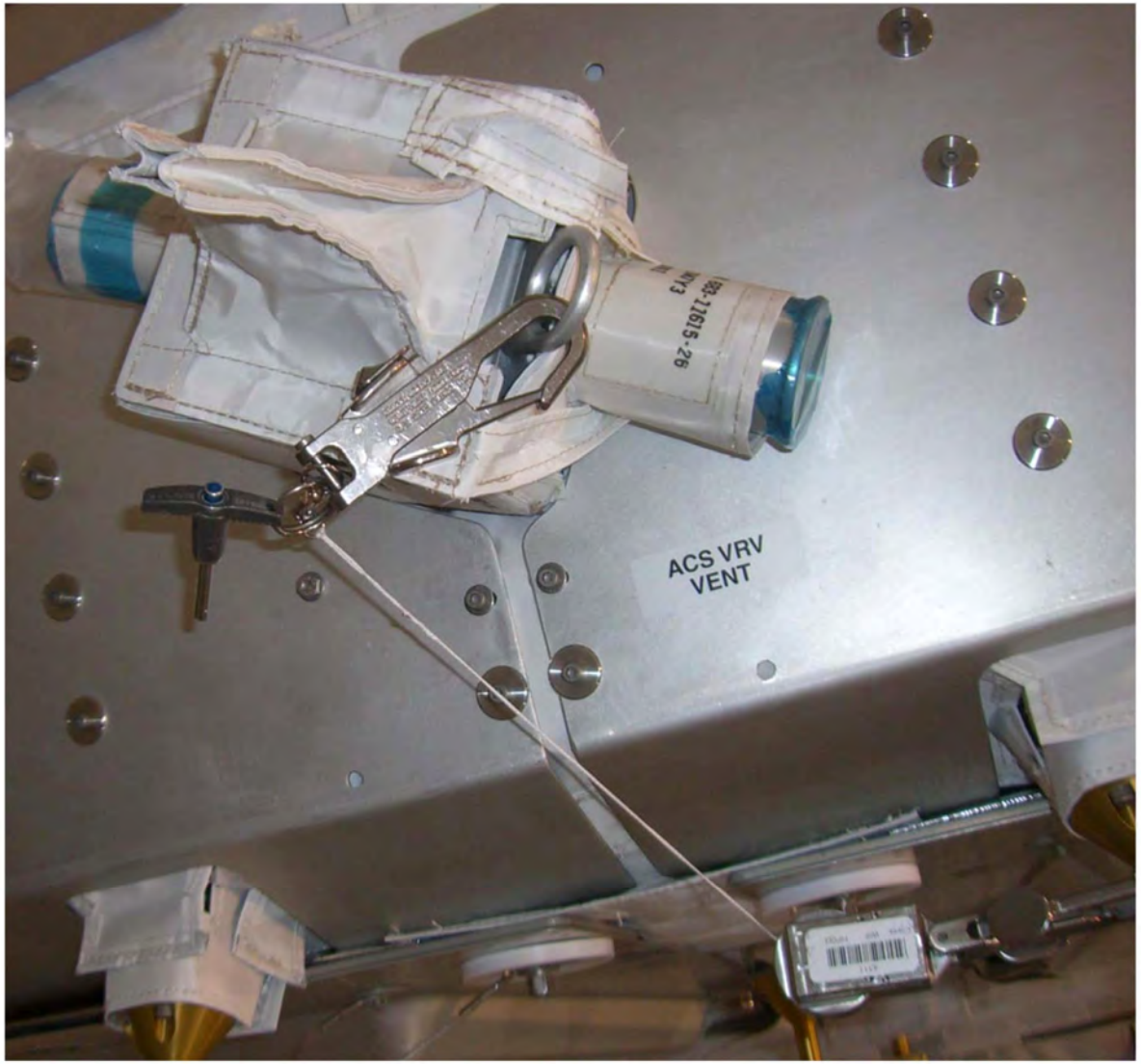
NON–PROPULSIVE VENT (NPV), VENT PLATE, AND EVA COVER



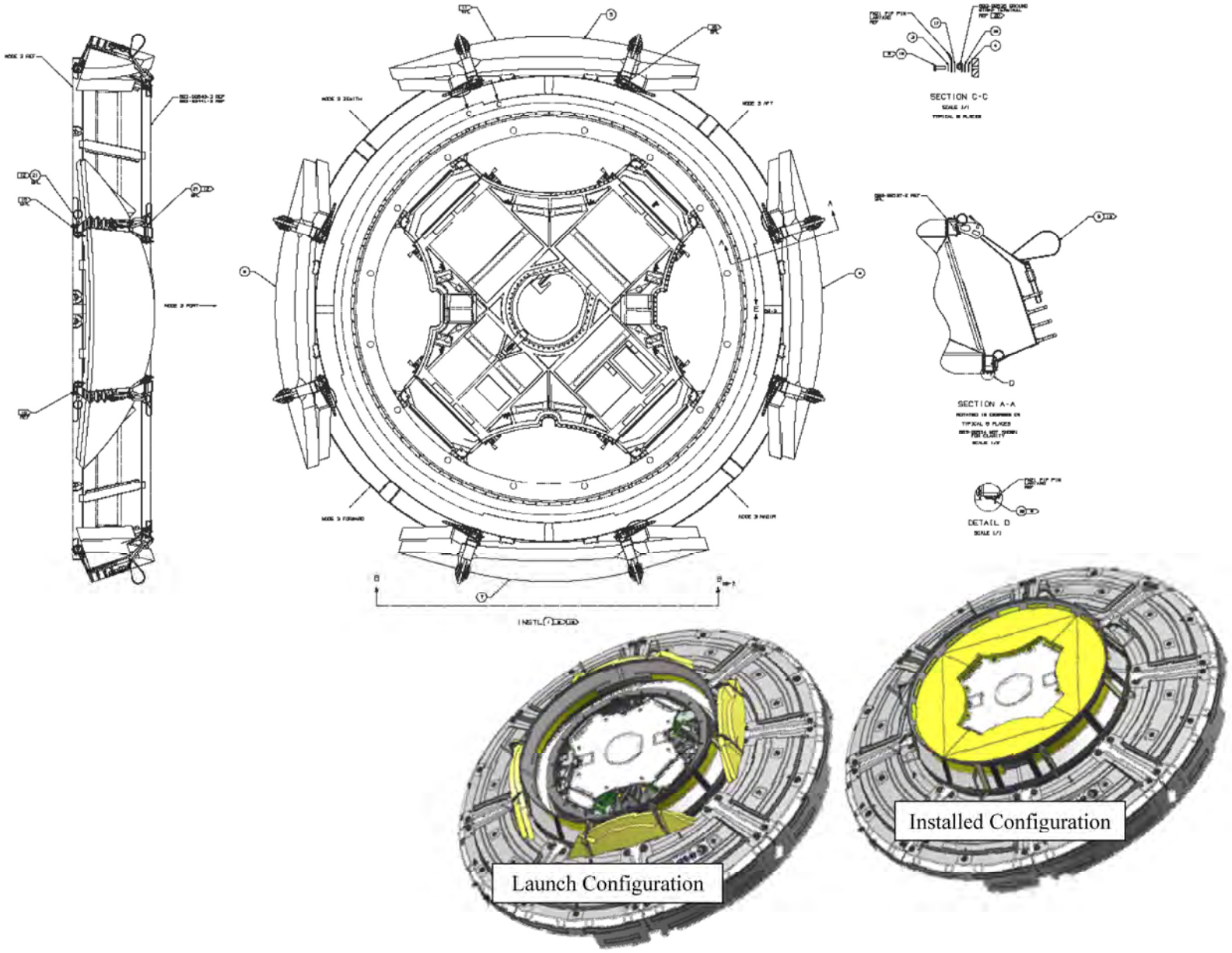
NOTE: Vent thermal cover not shown

NODE 3 NON-PROPULSIVE VENT (NPV) (Cont)

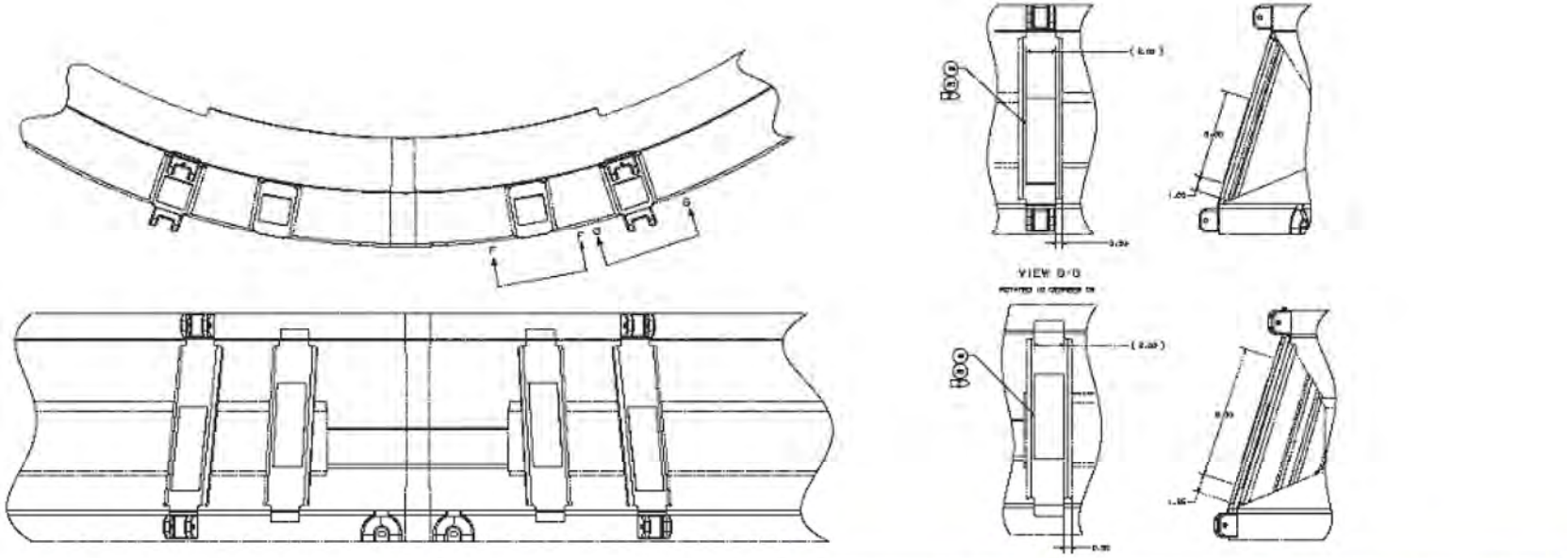


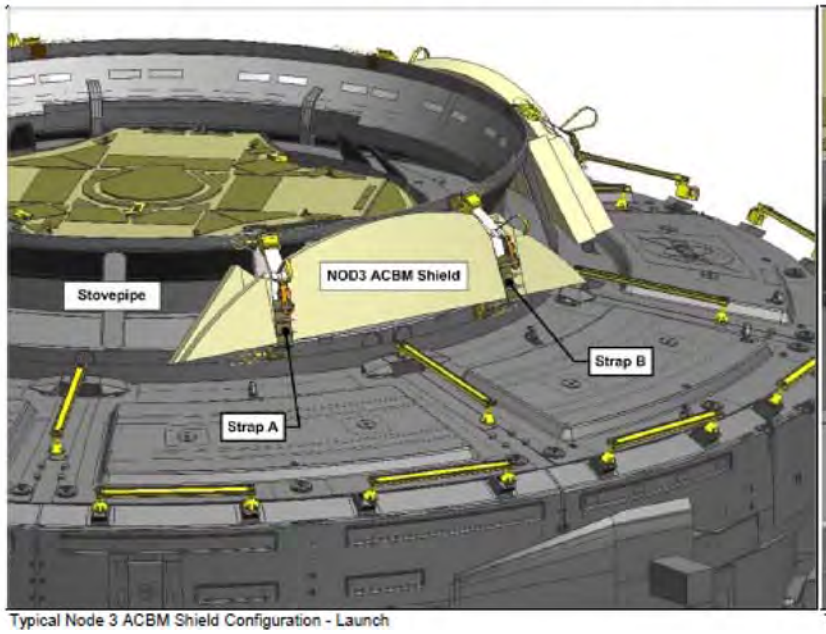


CBM

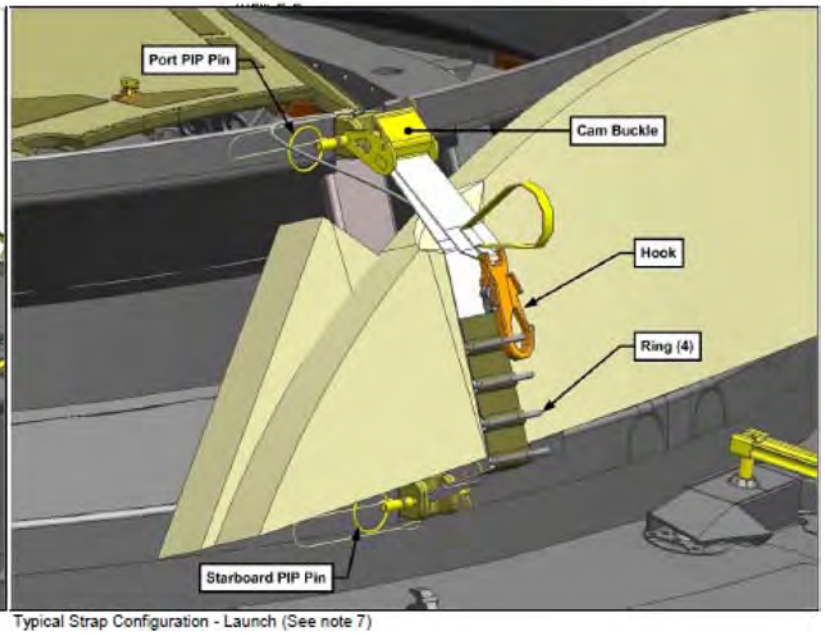

SECTION C-C
SECTION A-A
DETAIL D
Launch Configuration
Installed Configuration

CBM (Cont)



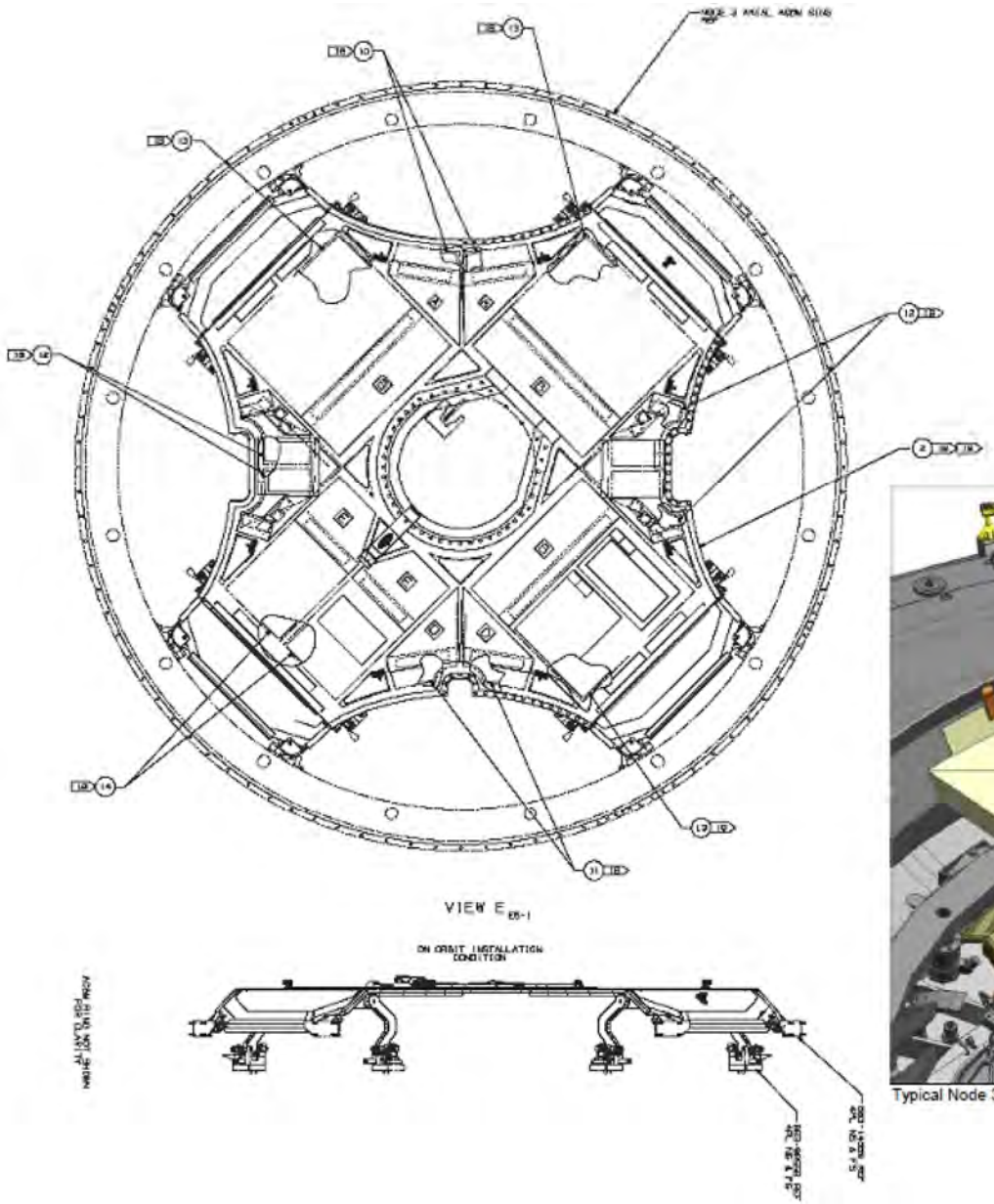


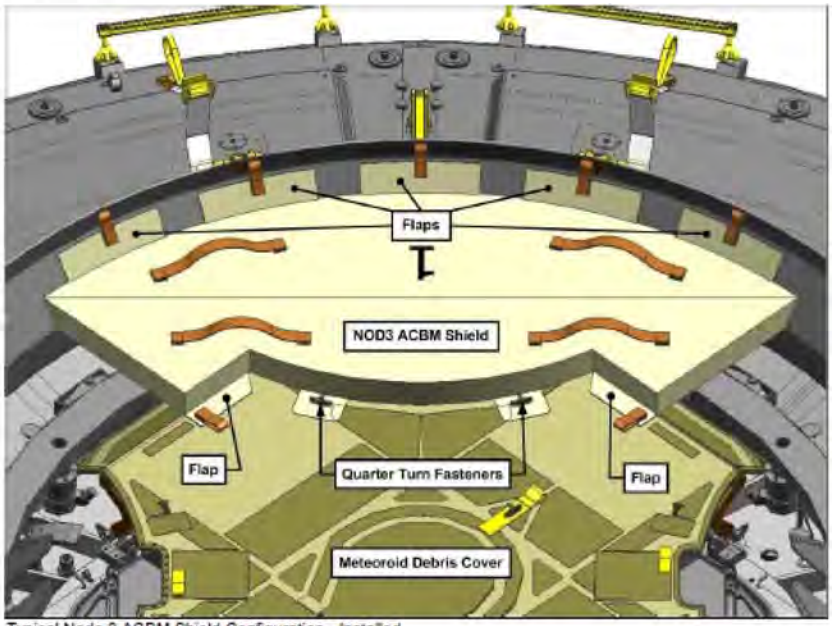
Typical Node 3 ACBM Shield Configuration - Launch



Typical Strap Configuration - Launch (See note 7)

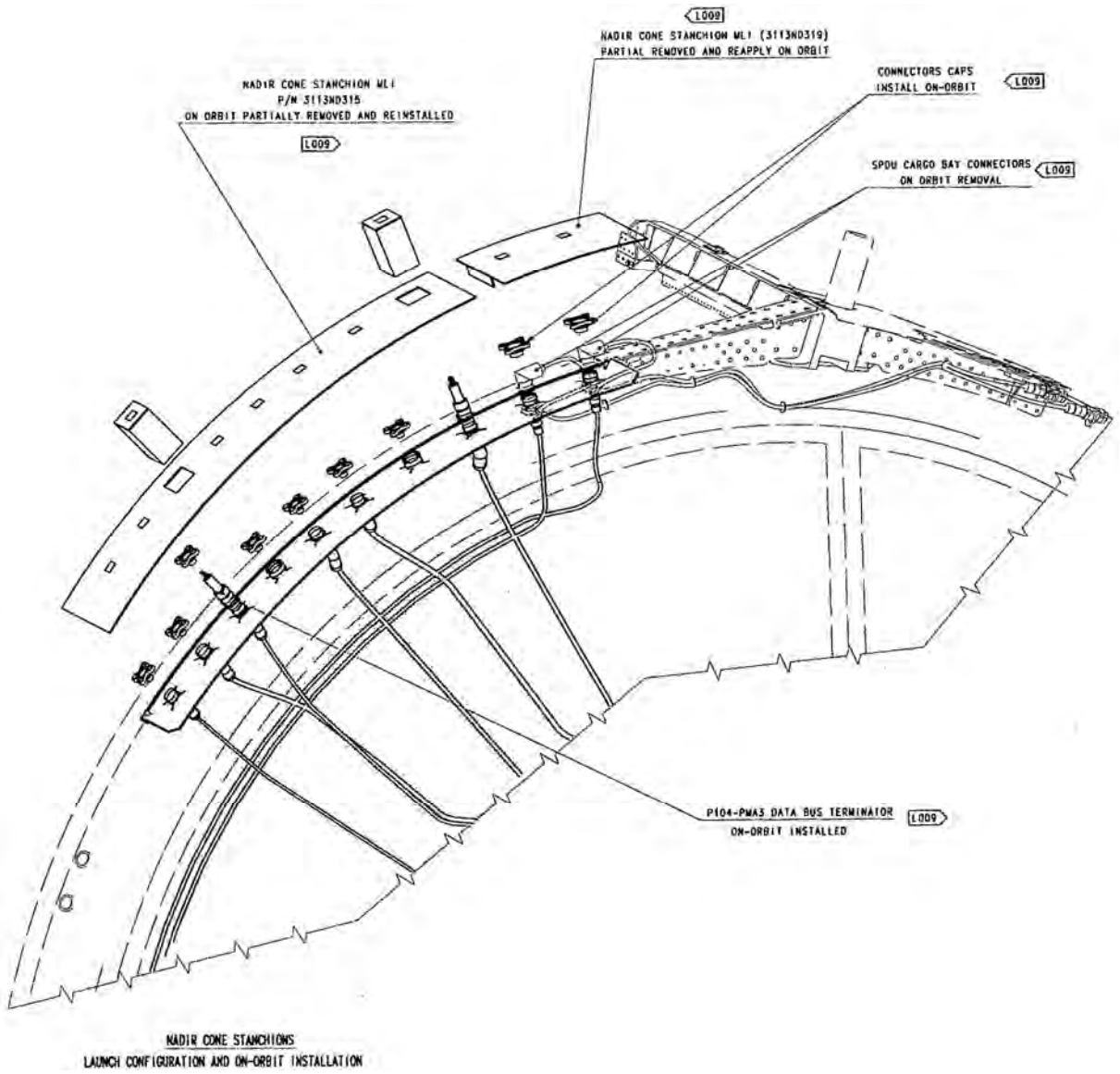
CBM (Cont)





Typical Node 3 ACBM Shield Configuration - Installed

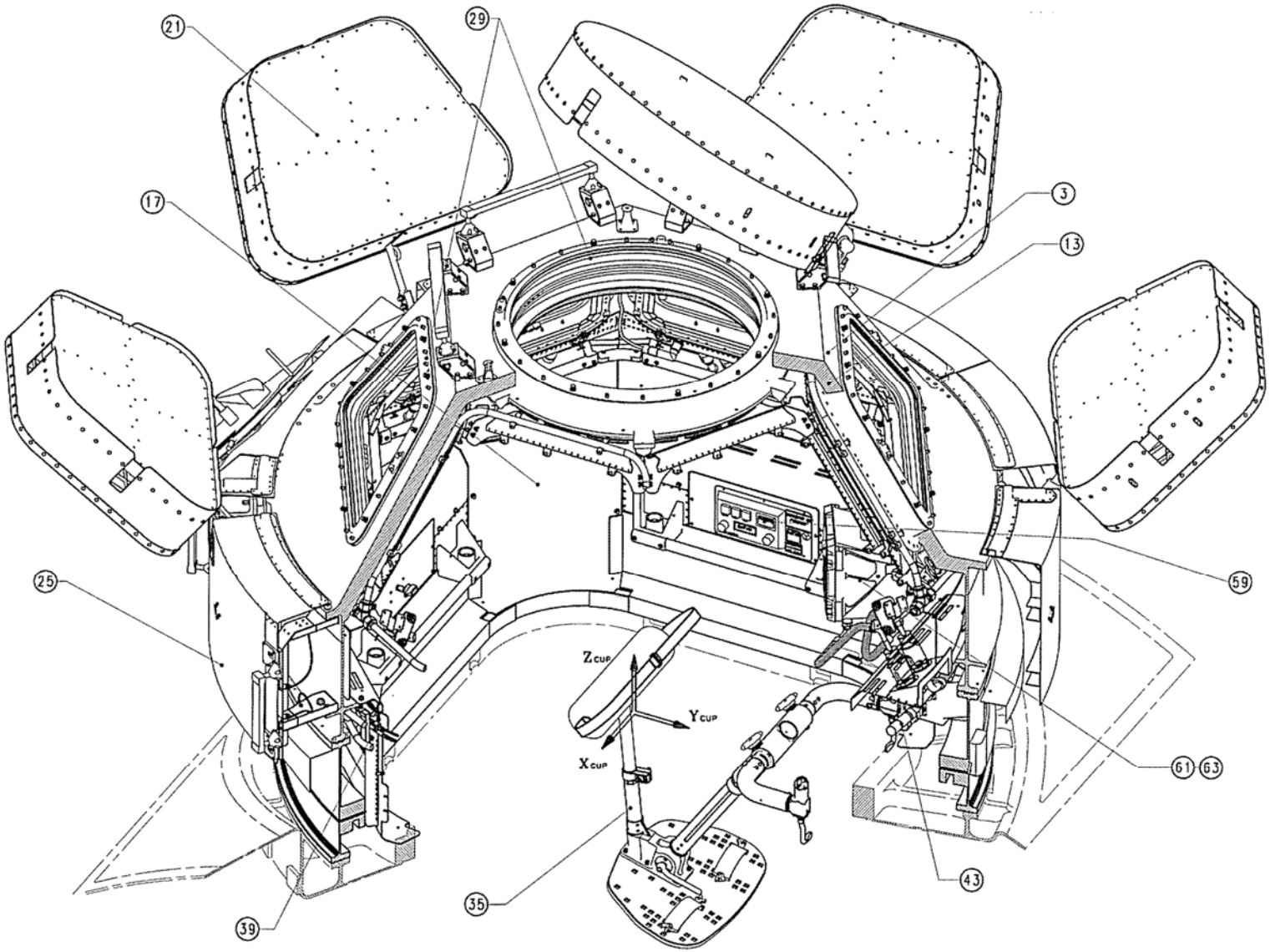
PMA3


L009
NADIR CONE STANCHION MLI (3113ND319)
PARTIAL REMOVED AND REAPPLY ON ORBIT
CONNECTORS CAPS
INSTALL ON-ORBIT
L009
NADIR CONE STANCHION MLI
P/N 3113ND315
ON ORBIT PARTIALLY REMOVED AND REINSTALLED
L009
SPDU CARGO BAY CONNECTORS
ON ORBIT REMOVAL
L009
P104-PMA3 DATA BUS TERMINATOR
ON-ORBIT INSTALLED
L009
NADIR CONE STANCHIONS
LAUNCH CONFIGURATION AND ON-ORBIT INSTALLATION

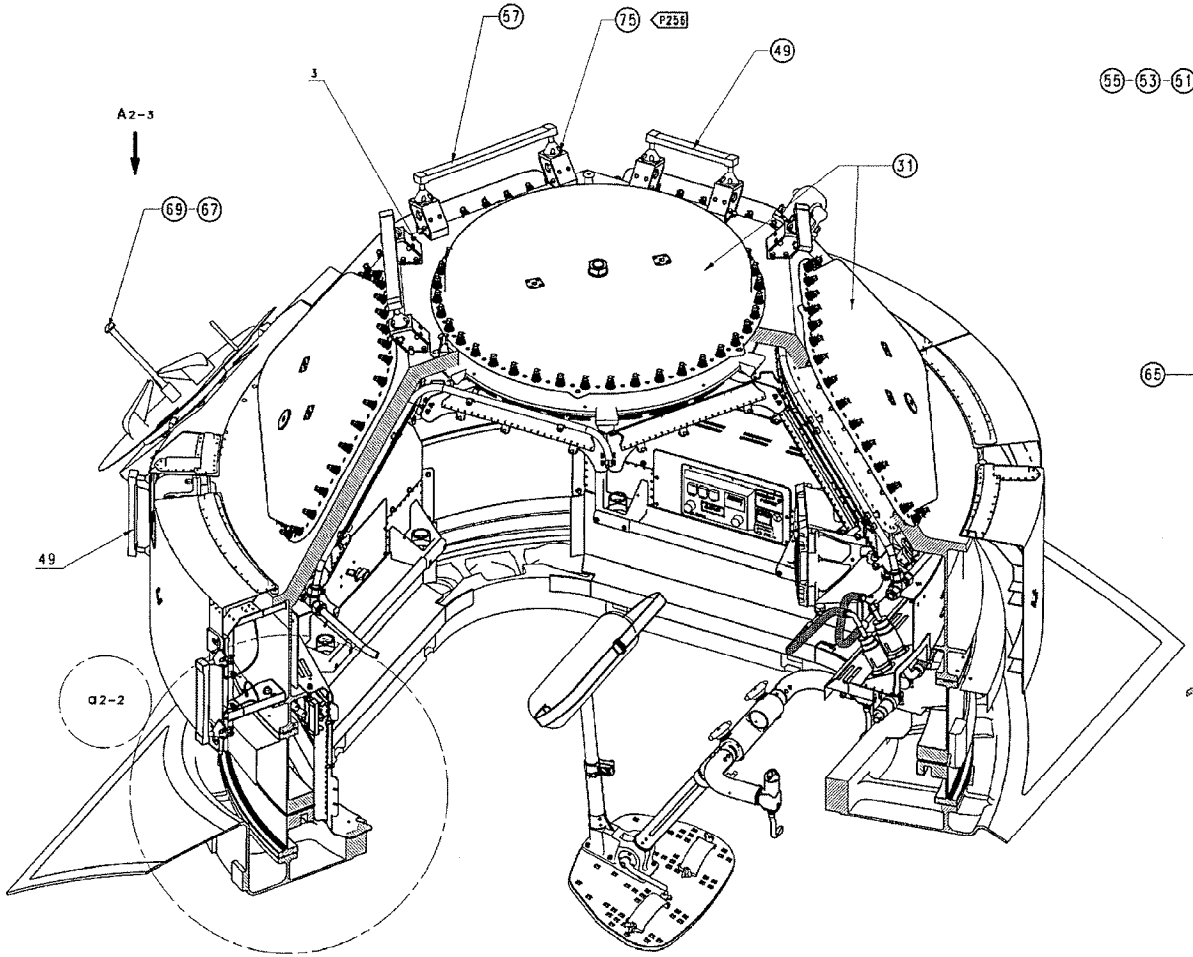
CUPOLA MLI (TBD)

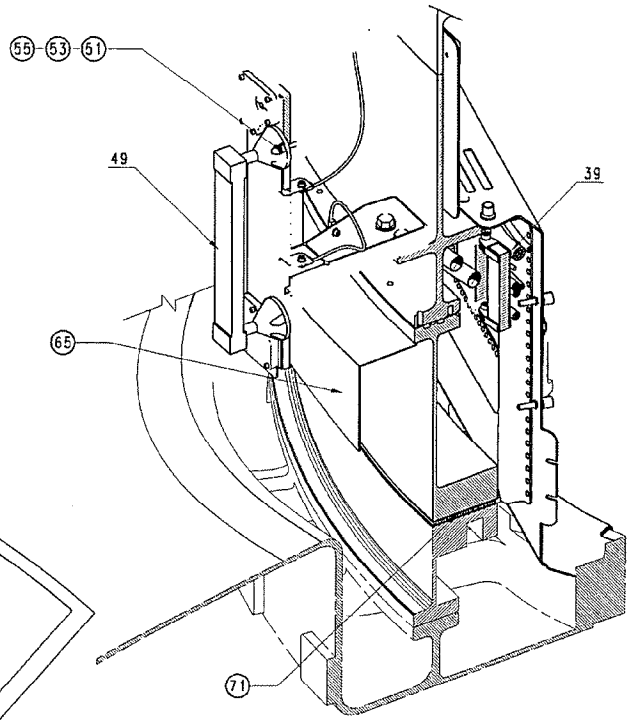
CUPOLA LAUNCH LOCKS

CUPOLA



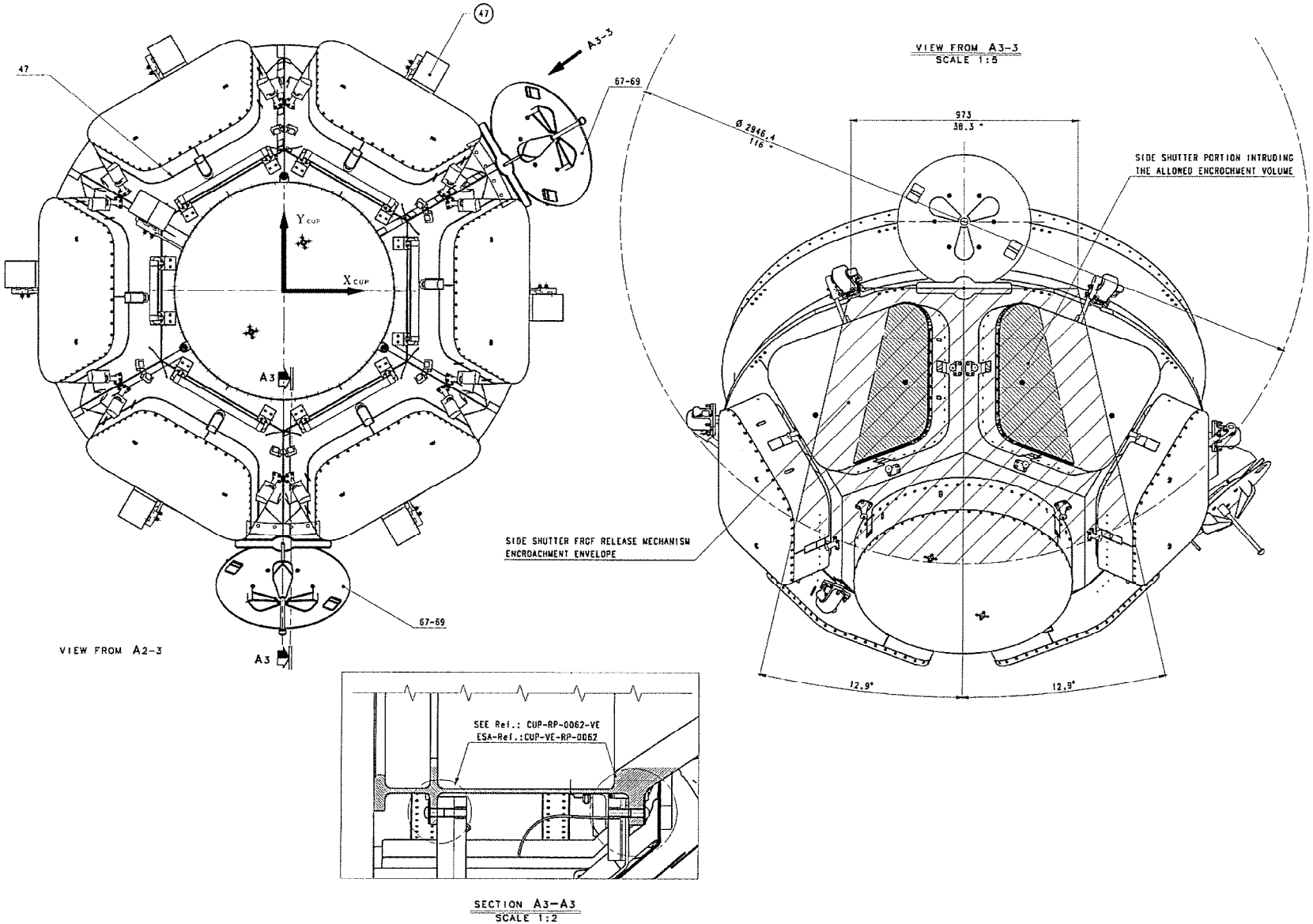
CUPOLA (Cont)



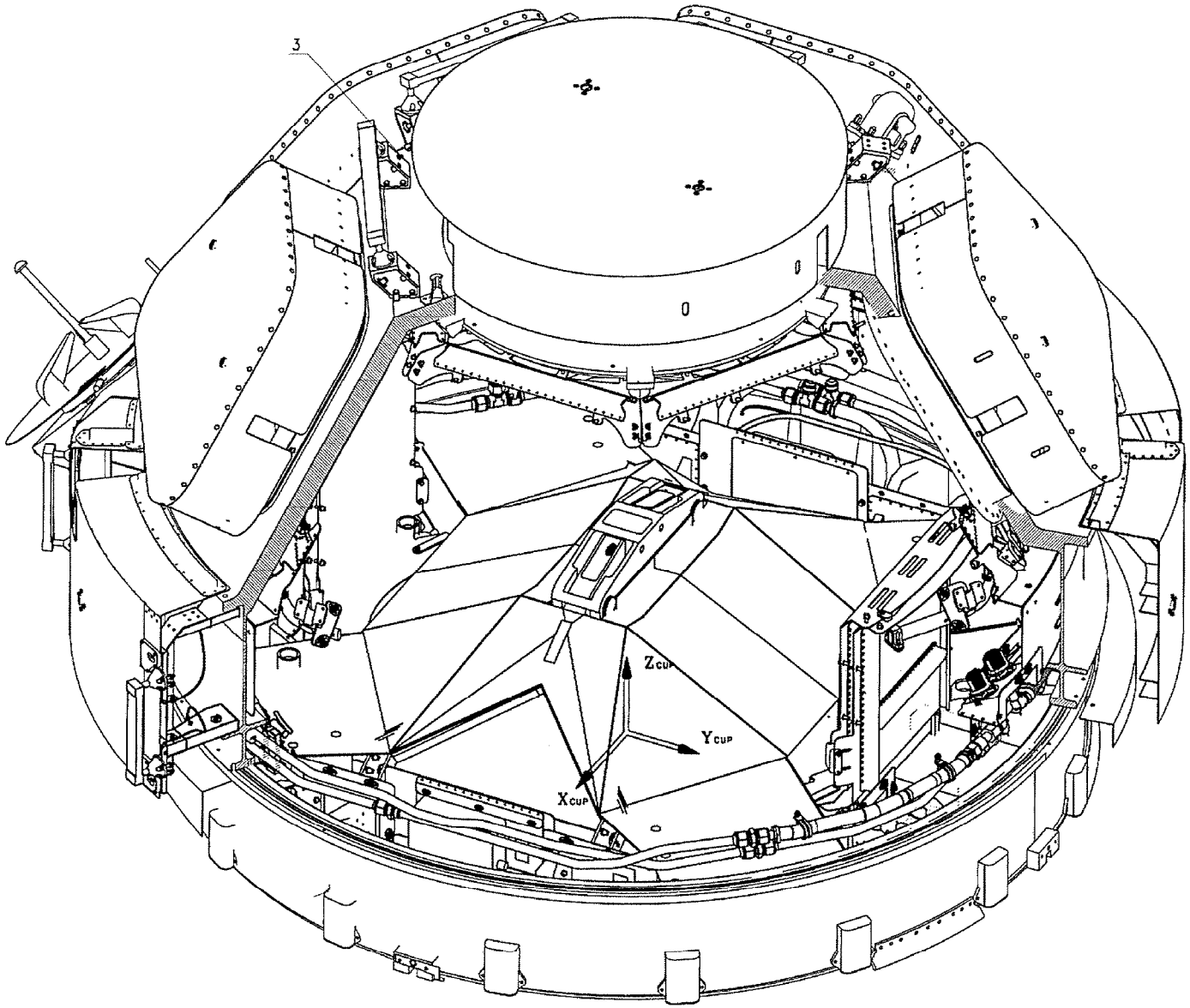


DETAIL a2-2

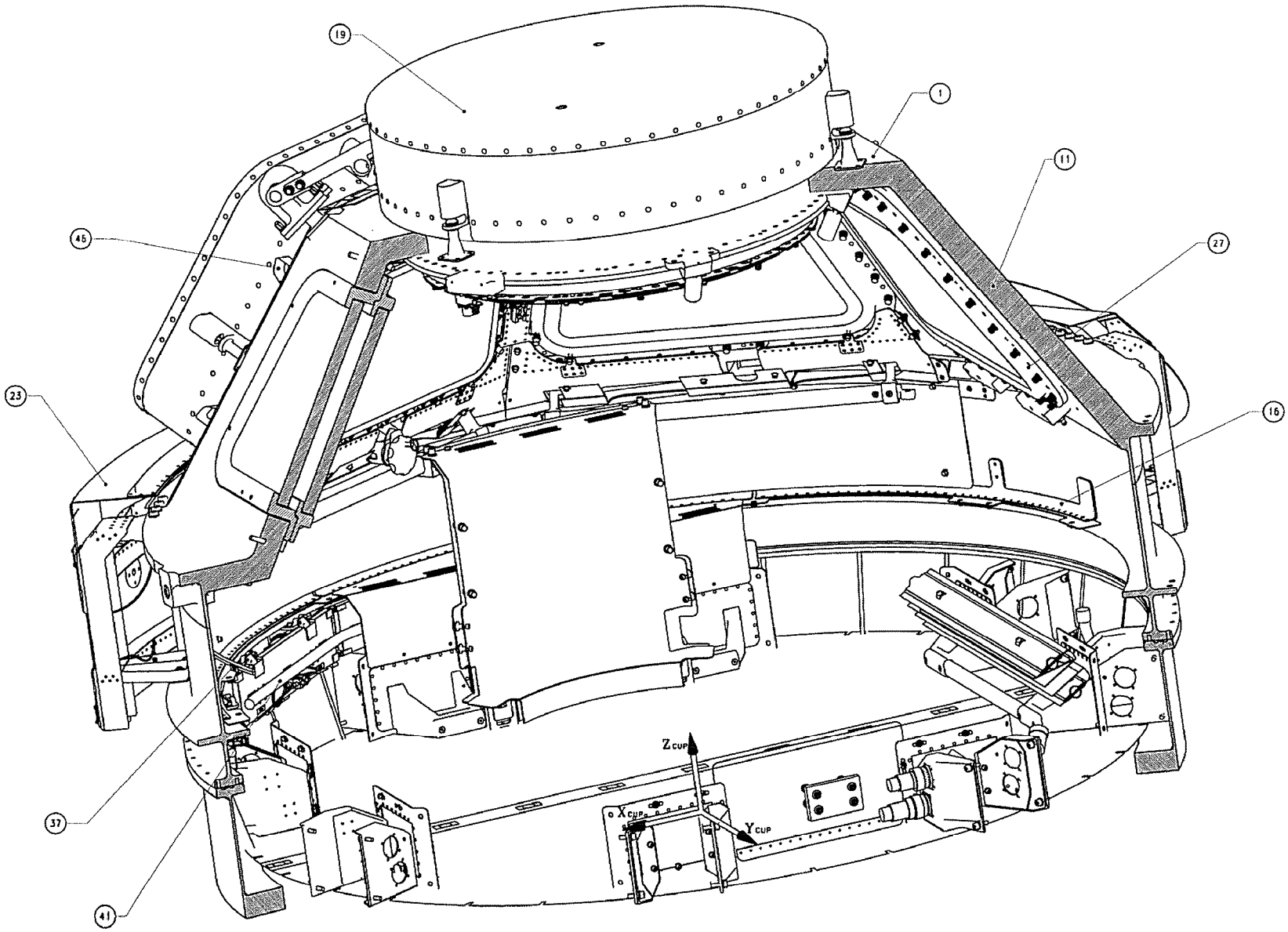
NOTE :
-ITEM 21 NOT SHOWN FOR CLARITY
-ITEM 47 NOT SHOWN FOR CLARITY
-THE SIDE C-O COVER SHOWN IN THE ALLOWED LOCATIONS


47
A3-3
67-69
Y CUP
X CUP
A3
67-69
A3
VIEW FROM A2-3
VIEW FROM A3-3
SCALE 1:5
Ø 2846.4
116
973
38.3
SIDE SHUTTER PORTION INTRUDING
THE ALLOWED ENCROCHMENT VOLUME
SIDE SHUTTER FROF RELEASE MECHANISM
ENCROACHMENT ENVELOPE
12.9°
12.9°
SEE Ref.: CUP-RP-0062-VE
ESA-Ref.:CUP-VE-RP-0062
SECTION A3-A3
SCALE 1:2

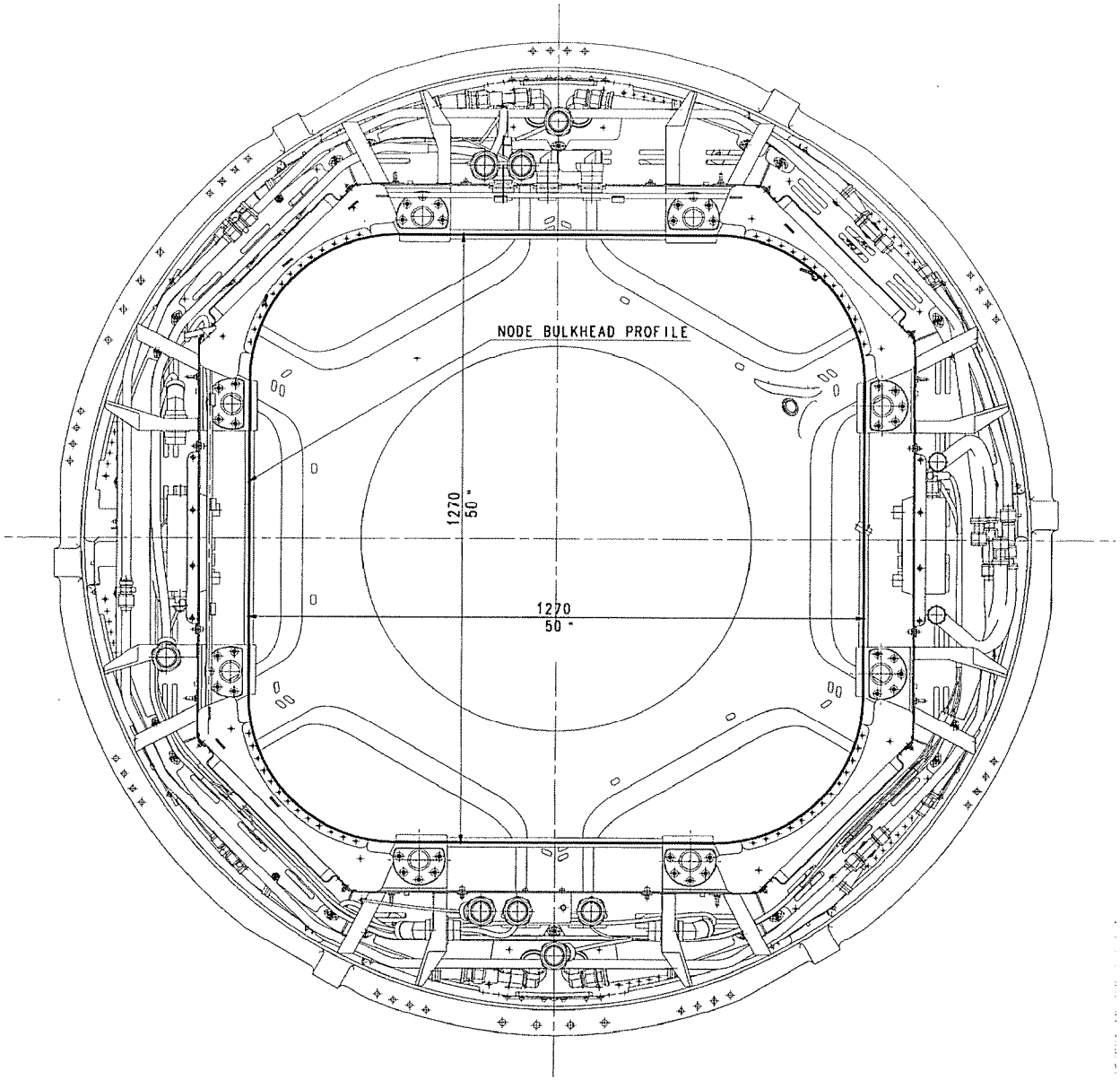
CUPOLA (Cont)



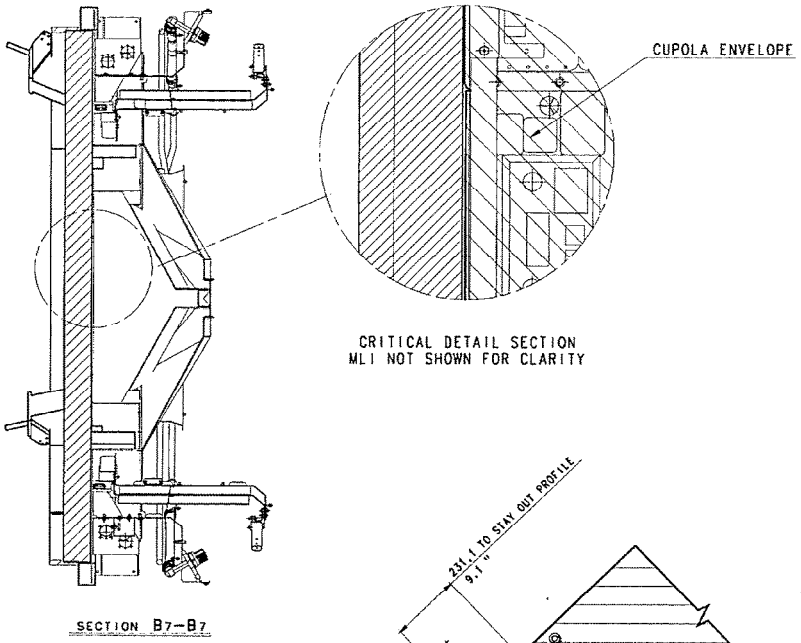
CUPOLA (Cont)



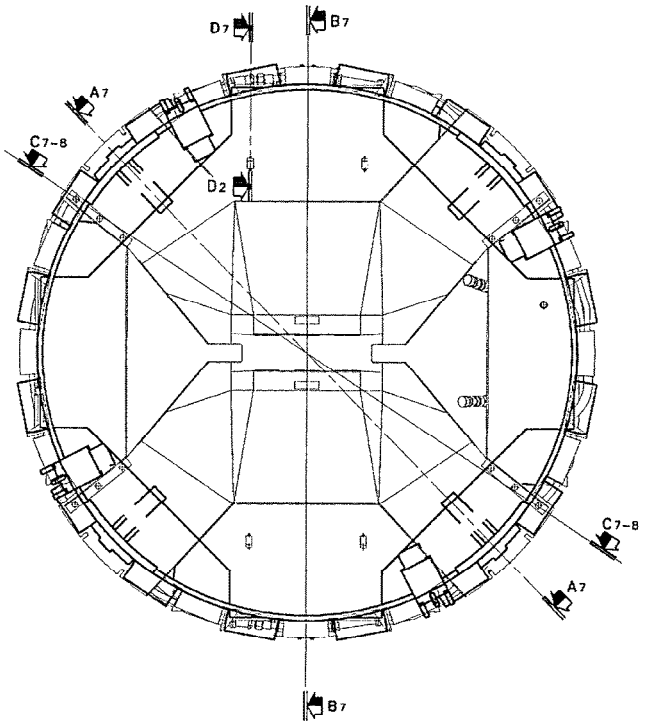
CUPOLA (Cont)

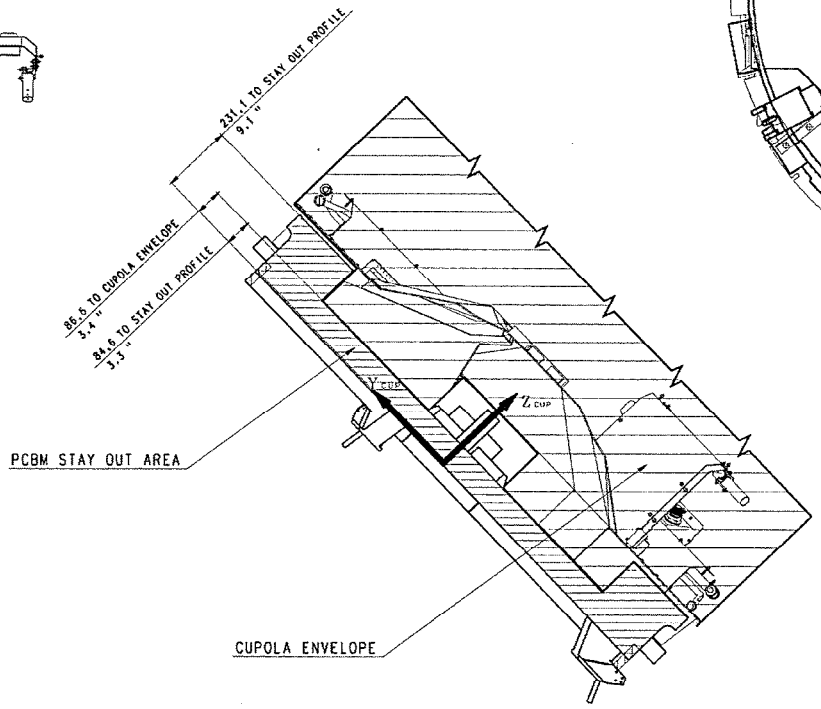


CUPOLA (Cont)



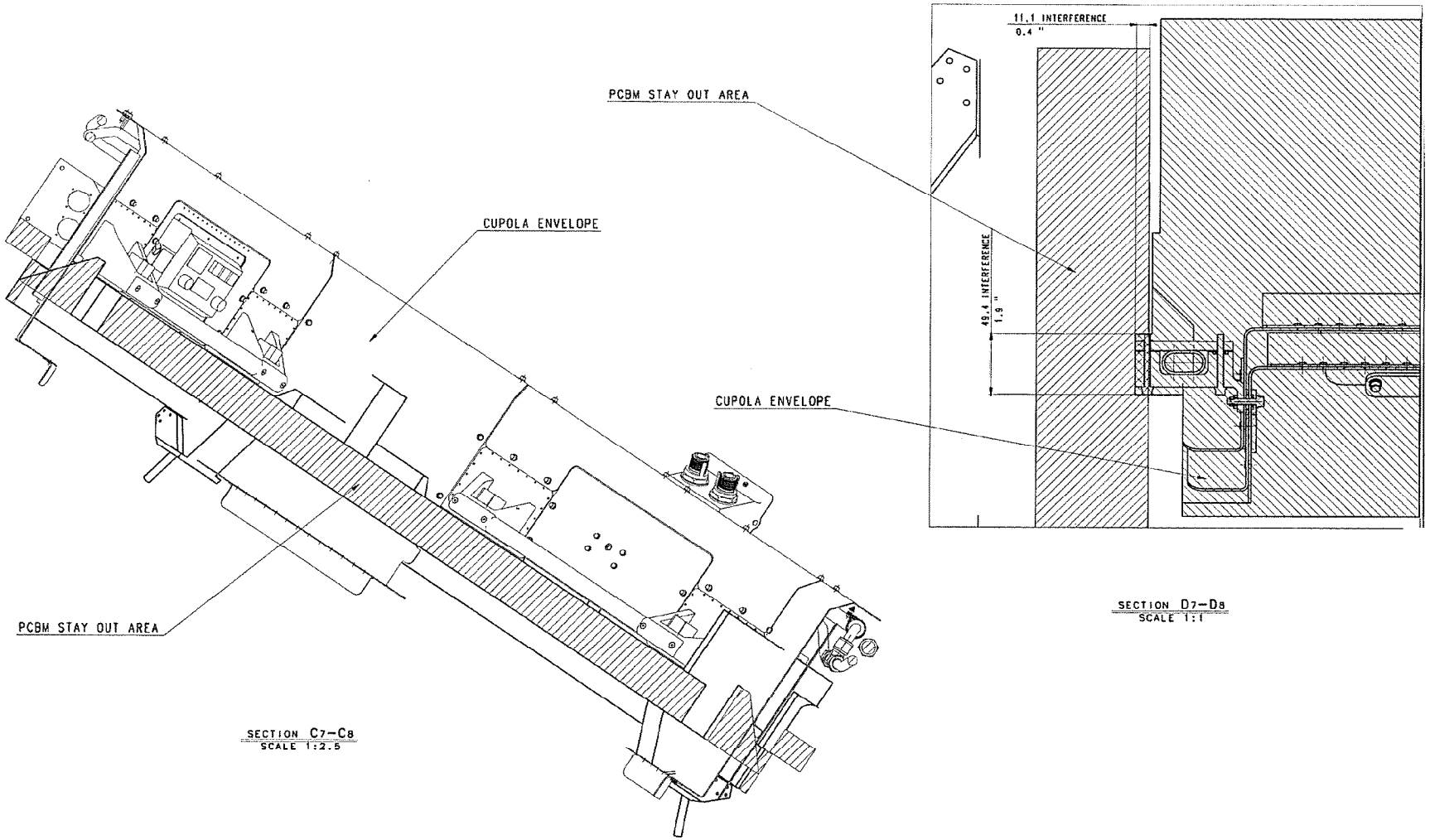
SECTION B7–B7



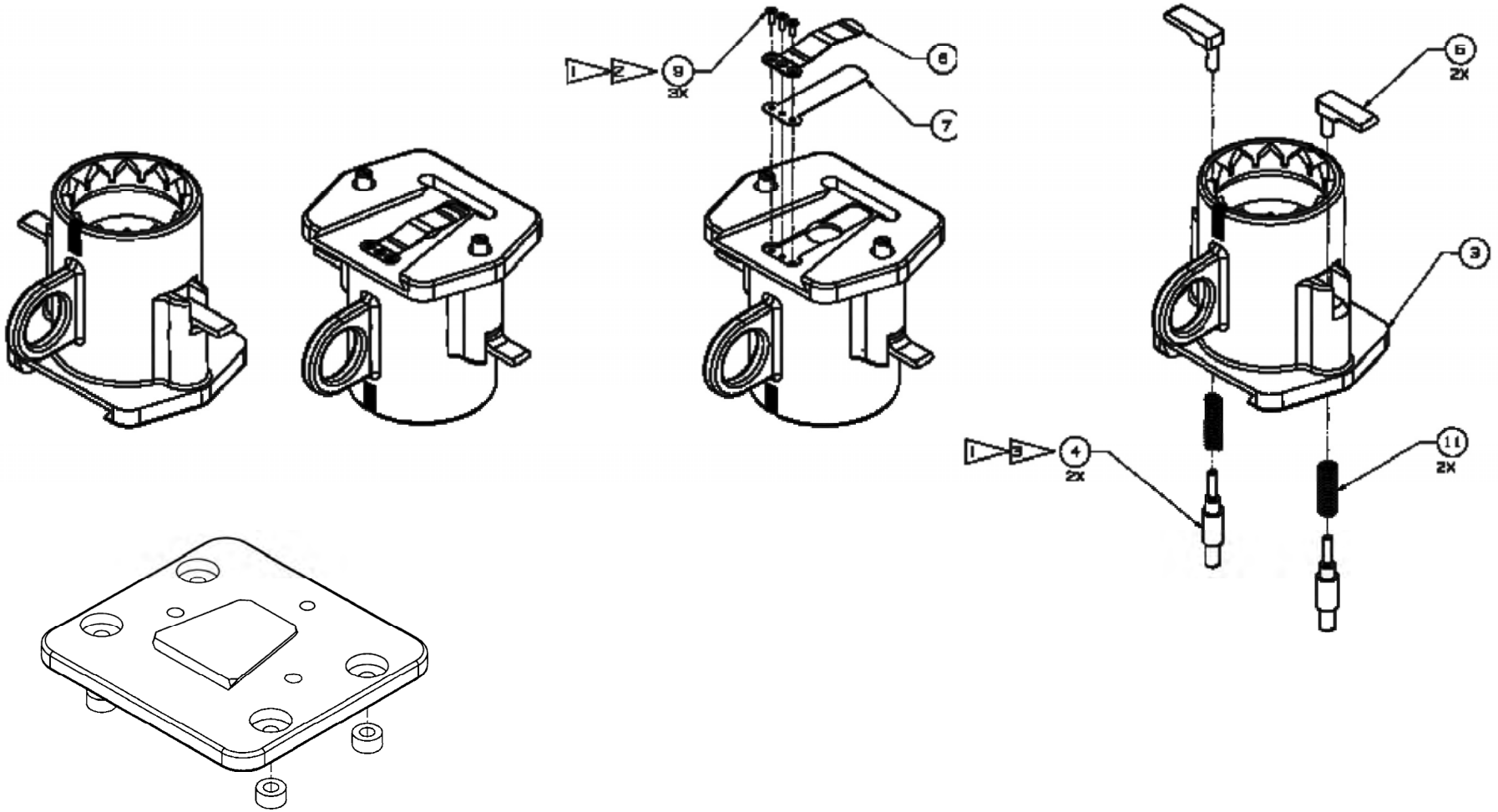


SECTION A7–A7

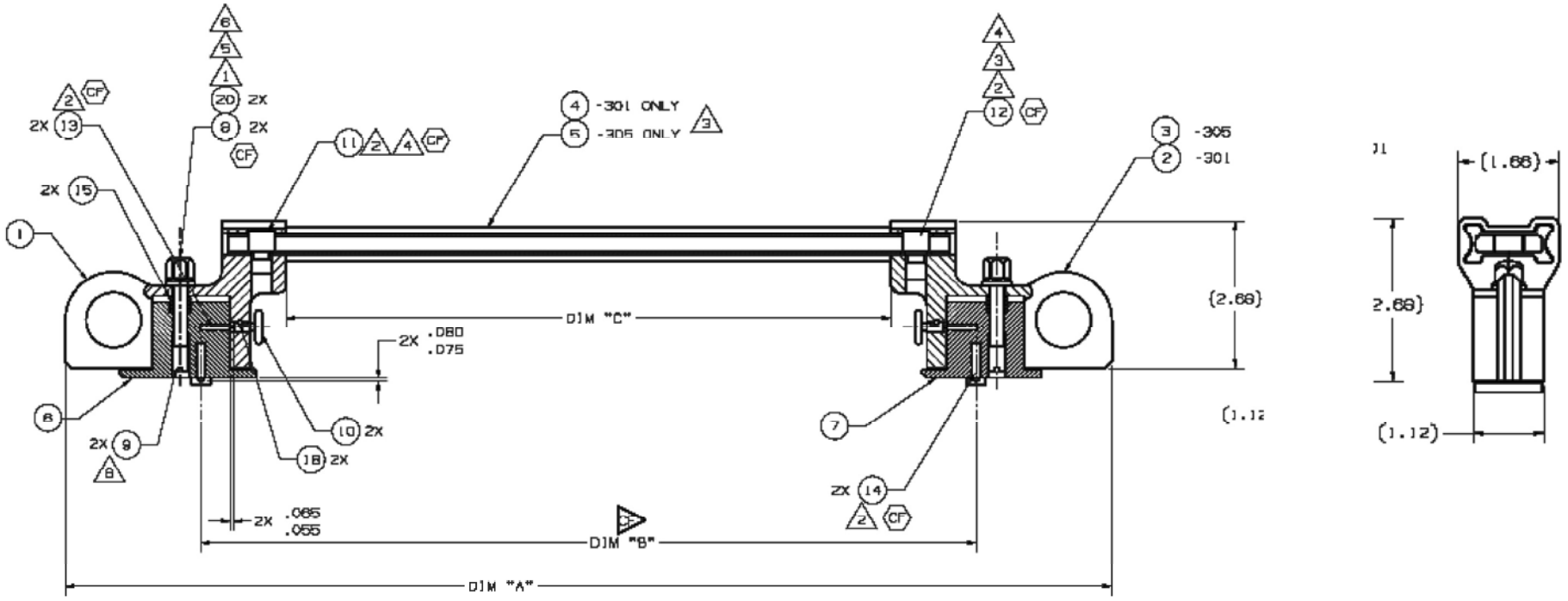
CUPOLA (Cont)


PCBM STAY OUT AREA
CUPOLA ENVELOPE
CUPOLA ENVELOPE
PCBM STAY OUT AREA
11.1 INTERFERENCE
0.4 "
49.4 INTERFERENCE
1.9 "
SECTION C7–C8
SCALE 1:2.5
SECTION D7–D8
SCALE 1:1

NODE 3 ORBIT-INSTALLED WIFs



NODE 3 ORBIT-INSTALLED HANDRAILS



Space Shuttle Program
FLIGHT DATA FILE

JSC-48024-130
FINAL

EVA CHECKLIST

STS
130

Flight Cover (trim bottom to expose tabs)