Space Shuttle Program
FLIGHT DATA FILE

JSC-48024-127

EVA Checklist

STS-127 Flight Supplement

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

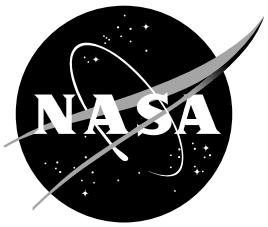
Final
May 22, 2009

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

MISSION OPERATIONS DIRECTORATE

EVA CHECKLIST
STS-127 FLIGHT SUPPLEMENT

FINAL
May 22, 2009

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Incorporates the following:		
482#:	EVA FS-00257	EVA FS-00264
	EVA FS-00258	EVA FS-00265
	EVA FS-00259	EVA FS-00266
	EVA FS-00260	EVA FS-00267
	EVA FS-00261	EVA FS-00268
	EVA FS-00262	EVA FS-00269
	EVA FS-00263	EVA FS-00270

AREAS OF TECHNICAL RESPONSIBILITY

Book Manager	DX3/T. York	281-483-5364

EVA CHECKLIST
STS-127 FLIGHT SUPPLEMENT

LIST OF EFFECTIVE PAGES

FINAL 05/22/09

Sign Off	*	127/FIN
FS ii	*	127/FIN
iii	*	generic
iv	*	generic
FS v	*	127/FIN
FS vi	*	127/FIN
FS vii	*	127/FIN
FS viii	*	127/FIN
FS ix	*	127/FIN
FS x	*	127/FIN
FS xi	*	127/FIN
FS xii	*	127/FIN
FS xiii		127/FIN
FS xiv		127/FIN
FS xv		127/FIN
FS xvi		127/FIN
FS xvii		127/FIN
FS xviii		127/FIN
FS xix		127/FIN
FS xx		127/FIN
1-1		generic
1-2		generic
1-3		generic
1-4		generic
1-5		generic
1-6		generic
1-7		generic
1-8		generic
1-9		generic
1-10		generic
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2-3		generic
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FS 2-18		127/FIN
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3-3		generic
3-4		generic
3-5		generic
3-6		generic
3-7		generic
3-8		generic
3-9		generic
CC 3-10		generic
CC 3-11		generic
3-12		generic
4-1		generic
4-2		generic
4-3		generic
4-4		generic
4-5		generic
4-6		generic
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4-10		generic
4-11		generic
4-12		generic
5-1		generic
5-2		generic
5-3		generic
5-4		generic
A6-1		generic
CC A6-2		generic
6-3		generic
CC 6-4		generic
FS 7-1		127/FIN
FS 7-2		127/FIN
FS 7-3		127/FIN
FS 7-4		127/FIN
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FS 7-111 ..... ⊗ 127/FIN
FS 7-112 ..... ⊗ 127/FIN
FS 7-113 ..... 127/FIN
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FS 7-115 ..... 127/FIN
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FS 7-120 ..... ⊗ 127/FIN
FS 7-121 ..... ⊗ 127/FIN
FS 7-122 ..... ⊗ 127/FIN
FS 7-123 ..... ⊗ 127/FIN
FS 7-124 ..... ⊗ 127/FIN

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FS 7-125 ..... ⊗ 127/FIN
FS 7-126 ..... 127/FIN
FS 7-127 ..... ⊗ 127/FIN
FS 7-128 ..... 127/FIN
FS 7-129 ..... 127/FIN
FS 7-130 ..... ⊗ 127/FIN
FS 7-131 ..... ⊗ 127/FIN
FS 7-132 ..... ⊗ 127/FIN
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FS 7-165 ..... 127/FIN
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FS 7-171 ..... 127/FIN
FS 7-172 ..... ⊗ 127/FIN
FS 7-173 ..... ⊗ 127/FIN
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FS 7-176 ..... ⊗ 127/FIN
FS 7-177 ..... 127/FIN
FS 7-178 ..... ⊗ 127/FIN
FS 7-179 ..... 127/FIN
FS 7-180 ..... ⊗ 127/FIN
FS CC 7-181..... ⊗ 127/FIN
FS CC 7-182..... ⊗ 127/FIN
FS CC 7-183..... ⊗ 127/FIN
FS CC 7-184..... 127/FIN
FS 7-185..... 127/FIN
FS 7-186..... 127/FIN
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FS 7-188..... ⊗ 127/FIN
FS 7-189..... ⊗ 127/FIN
FS 7-190..... ⊗ 127/FIN
FS 7-191..... ⊗ 127/FIN
FS 7-192..... 127/FIN
TEMP FS 8-1..... 127/FIN
TEMP FS 8-2..... ⊗ 127/FIN
8-3 ..... generic
8-4 ..... generic
8-5 ..... generic
8-6 ..... generic
8-7 ..... generic
8-8 ..... generic
FS 8-9..... 127/FIN
FS 8-10..... 127/FIN
FS 8-11..... 127/FIN
FS 8-12..... 127/FIN
FS 8-13..... 127/FIN
FS 8-14..... ⊗ 127/FIN
FS 8-15..... 127/FIN
FS 8-16..... 127/FIN
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FS 8-19..... 127/FIN
FS 8-20..... 127/FIN
FS 8-21..... 127/FIN
FS 8-22..... 127/FIN
FS 8-23..... ⊗ 127/FIN
FS 8-24..... ⊗ 127/FIN
FS 8-25..... ⊗ 127/FIN
FS 8-26..... ⊗ 127/FIN
9-1 ..... generic
9-2 ..... generic
9-3 ..... generic
9-4 ..... generic
9-5 ..... generic
9-6 ..... generic
TEMP FS 10-1..... 127/FIN
TEMP FS 10-2..... ALL/FIN
10-3 ..... generic
10-4 ..... generic
10-4a ..... generic
10-4b ..... generic
10-5 ..... generic
10-6 ..... generic
10-7 ..... generic
10-8 ..... generic
10-9 ..... generic
10-10 ..... generic

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10-11 ..... generic
10-12 ..... generic
10-13 ..... generic
10-14 ..... generic
FS CC 10-15 ..... 127/FIN
FS CC 10-16 ..... 127/FIN
FS CC 10-17 ..... ⊗ 127/FIN
FS CC 10-18 ..... ⊗ 127/FIN
11-1 ..... generic
11-2 ..... generic
11-3 ..... generic
11-4 ..... generic
12-i ..... generic
12-ii ..... generic
TEMP FS 12-1 ..... 127/FIN
TEMP FS 12-2 ..... ALL/FIN
12-3 ..... generic
12-4 ..... generic
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12-8 ..... generic
12-9 ..... generic
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12-11 ..... generic
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12-13 ..... generic
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12-15 ..... generic
12-16 ..... generic
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12-18 ..... generic
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12-24 ..... generic
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12-26 ..... generic
FS 12-27 ..... ⊗ 127/FIN
FS 12-28 ..... ⊗ 127/FIN
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FS 12-30 ..... 127/FIN
FS CC 12-31 ..... ⊗ 127/FIN
FS CC 12-32 ..... ⊗ 127/FIN
FS 13-1 ..... 127/FIN
FS 13-2 ..... 127/FIN
14-1 ..... generic
14-2 ..... generic
14-3 ..... generic
14-4 ..... generic
14-5 ..... generic
14-6 ..... generic
14-7 ..... generic
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16-ii ..... generic
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17-1 ..... * generic
17-2 ..... * generic
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FS 18-100 ..... ⊗ 127/FIN
FS 18-101 ..... ⊗ 127/FIN
FS 18-102 ..... ⊗ 127/FIN
19-i ..... generic
19-ii ..... generic
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19-2 ..... generic
19-3 ..... generic
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19-14 ..... generic
20-1 .....***** generic
20-2 .....***** generic

⊗ – Flight copies of this page contain color

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EVA CUE CARDS

Title	Ref. Page	Card No.
SAFER CHECKOUT RESULTS (Front)	CC 3-10	generic
SAFER STATUS TROUBLESHOOTING (Back)	CC 3-11	generic
DEPRESS/REPRESS (NOM A/L) (Front)	CC A6-2	generic
FAILED LEAK CHECK (Back of DEPRESS/REPRESS)	CC 6-4	generic
BATTERY CUE CARD 1 (Front)	FS CC 7-181	EVA-7a/127/O/A
JAXA MLI CUE CARD (Back)	FS CC 7-182	EVA-7b/127/O/A
BATTERY CUE CARD 2 (Front)	FS CC 7-183	EVA-8a/127/O/A
(Back)	FS CC 7-184	EVA-8b/127/O/A
STS-127 CONSUMABLES TRACKING CUE CARD (Front)	FS CC 10-15	EVA-5a/127/O/A
(Back)	FS CC 10-16	EVA-5b/127/O/A
STS-127 EVA BATTERY RECHARGE PLAN (Front)	FS CC 10-17	EVA-6a/127/O/A
(Back)	FS CC 10-18	EVA-6b/127/O/A
EXPEDITED SUIT DOFFING CUE CARD (Front)	FS CC 12-31	EVA-4a/127/O/A
EMERGENCY UNDOCKING CUE CARD (Back)	FS CC 12-32	EVA-4b/127/O/A

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CONTENTS PAGE

10.2 PSI CABIN 1-1
MASK PREBREATHE INITIATE 1-2
PREP FOR 10.2 PSI CABIN 1-3
CABIN DEPRESS TO 10.2 PSI 1-4
10.2 PSIA DEPRESS CHART 1-5
10.2 PSI CABIN CONFIG 1-6
MASK PREBREATHE TERMINATE 1-6
10.2 PSI MAINTENANCE 1-7
CABIN REPRESS TO 14.7 PSI 1-8
14.7 PSI CABIN CONFIG 1-9

AIRLOCK CONFIG ..... TEMP FS 2-1
AIRLOCK PREP ..... TEMP FS 2-2
EMU SWAP 2-3
BOOSTER FAN DEACTIVATION/REMOVAL 2-4
BOOSTER FAN INSTALLATION/ACTIVATION 2-4
EMU REMOVAL 2-4
EMU INSTALLATION 2-4
EMU CHECKOUT PREP ..... TEMP FS 2-5
LTA RESTRAINT STRAP REMOVAL ..... TEMP FS 2-6
LTA RESTRAINT STRAP INSTALLATION ..... TEMP FS 2-6
EVA PREP FOR TRANSFER TO ISS ..... FS 2-7
EVA TRANSFER TO ISS ..... FS 2-10
EMU RECONFIG FOR EVA 2 ..... FS 2-12
EMU SWAP FOR EVA 3 ..... FS 2-14
EMU RECONFIG/SWAP FOR EVA 4 ..... FS 2-15
EVA PREP FOR TRANSFER TO SHUTTLE ..... FS 2-18
EVA TRANSFER TO SHUTTLE ..... FS 2-21
EVA UNPACK AND STOW ..... FS 2-22

CHECKOUTS 3-1
EMU CHECKOUT 3-2
EMU POWERUP AND COMM CHECK 3-2
PRIMARY REGULATOR/FAN/PUMP CHECK 3-4
SOP CHECK 3-5
BATTERY CHARGE CHECK INIT 3-6
BATTERY CHARGE CHECK TERM 3-6
EMU SWAP DURING CHECKOUT 3-7
POST EMU C/O RECONFIG 3-7
SAFER CHECKOUT 3-8
SELF TEST SEQUENCE 3-9
SAFER CHECKOUT RESULTS ..... CC 3-10
SAFER STATUS TROUBLESHOOTING ..... CC 3-11
REBA POWERED HARDWARE CHECKOUT 3-12

EVA PREP 4-1
MIDDECK PREP 4-2
EVA PREP 4-3
PREP FOR DONNING 4-3
EMU DONNING 4-5
EMU CHECK 4-7
EMU PURGE 4-7
EMU PREBREATHE 4-8
SAFER DONNING 4-8
EVA COMM CONFIG 4-10
EVA COMM DECONFIG 4-10
APPROVED NON-EMU HARDWARE MATRIX 4-11

EMU STATUS 5-1
EMU STATUS 5-2

DEPRESS/REPRESS A6-1
DEPRESS/REPRESS (NOM A/L) ..... CC A6-2
FAILED LEAK CHECK 6-3
FAILED LEAK CHECK (5 PSI) ..... CC 6-4
FAILED LEAK CHECK (14.7/10.2 PSI) ..... CC 6-4

TIMELINES ..... FS 7-1
STS-127 ISS-2J/A OVERVIEW TIMELINES ..... FS 7-3
EVA 1
EVA 1 SUMMARY TIMELINE ..... FS 7-4
EVA 1 TOOL CONFIG ..... FS 7-5
EVA 1 INHIBIT PAD ..... FS 7-7
EVA 1 NOTES/CAUTIONS/WARNINGS ..... FS 7-10
EGRESS/SETUP ..... FS 7-15
JPM BM/JEF PREP ..... FS 7-17
CETA CART RECONFIG/P1 ATA FGB BOLT RELEASE/ TOOL RETRIEVAL ..... FS 7-20
P3 UCCAS DEPLOY ..... FS 7-22
S3 ZENITH OUTBOARD PAS DEPLOY ..... FS 7-24
EVA 1 CLEANUP AND A/L INGRESS ..... FS 7-27
EVA 2
EVA 2 SUMMARY TIMELINE ..... FS 7-41
EVA 2 TOOL CONFIG ..... FS 7-42
EVA 2 INHIBIT PAD ..... FS 7-44
EVA 2 NOTES/CAUTIONS/WARNINGS ..... FS 7-47
EGRESS/SETUP ..... FS 7-52
ICC-VLD ORU TRANSFER TO ESP3 ..... FS 7-54
FWD JEF VE INSTALL ..... FS 7-59
EVA 2 CLEANUP AND A/L INGRESS ..... FS 7-61
EVA 3
EVA 3 SUMMARY TIMELINE ..... FS 7-77
EVA 3 TOOL CONFIG ..... FS 7-78
EVA 3 INHIBIT PAD ..... FS 7-80
EVA 3 NOTES/CAUTIONS/WARNINGS ..... FS 7-83
EGRESS/SETUP ..... FS 7-88
JLE PAYLOAD PREP/WIF 14 RELOCATE/JEM OIH & OIW INSTALLATION ..... FS 7-89
SAFETY TETHER PACK (STP) RELOCATE ..... FS 7-91
P6 BATTERY R&R ..... FS 7-93
EVA 3 CLEANUP AND A/L INGRESS ..... FS 7-96
EVA 4
EVA 4 SUMMARY TIMELINE ..... FS 7-113
EVA 4 TOOL CONFIG ..... FS 7-114
EVA 4 INHIBIT PAD ..... FS 7-116
EVA 4 NOTES/CAUTIONS/WARNINGS ..... FS 7-120
EGRESS/SETUP ..... FS 7-125
P6 BATTERY R&R ..... FS 7-127
STP RELOCATE – INBOARD ..... FS 7-131
AFT JEF VE INSTALL ..... FS 7-133
EVA 4 CLEANUP AND A/L INGRESS ..... FS 7-135
EVA 5
EVA 5 SUMMARY TIMELINE ..... FS 7-150
EVA 5 TOOL CONFIG ..... FS 7-151
EVA 5 INHIBIT PAD ..... FS 7-153
EVA 5 NOTES/CAUTIONS/WARNINGS ..... FS 7-156
EGRESS/SETUP ..... FS 7-161
Z1 PATCH PANEL ..... FS 7-162

SPDM COVERS ..... FS 7-164
S3 NADIR OUTBOARD PAS ..... FS 7-165
S3 NADIR INBOARD PAS ..... FS 7-168
CP1 WETA INSTALL ..... FS 7-170
EVA 5 CLEANUP AND A/L INGRESS ..... FS 7-172
BATTERY CUE CARD 1 ..... FS CC 7-181
JAXA MLI CUE CARD ..... FS CC 7-182
BATTERY CUE CARD 2 ..... FS CC 7-183
GET-AHEADS
GET-AHEAD: S3 ZENITH INBOARD PAS ..... FS 7-185
GET-AHEAD: APFR 5 RETRIEVE/TS RELOCATE ..... FS 7-187
GET-AHEADS: JPM OIH AND OIW INSTALL ..... FS 7-188
GET-AHEAD: FPP SLEEVES INSTALL/LAB CABLE TIE DOWN ..... FS 7-189
GET-AHEAD: NOD2 GAP SPANNER INSTALL ..... FS 7-191

TOOLS AND STOWAGE ..... TEMP FS 8-1
PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA) ..... TEMP FS 8-2
PGT CHECKOUT 8-3
PGSC-PGT CONNECTION (A31P AND 760XD) 8-4
PROGRAM PGT SETTINGS 8-5
DOWNLOAD/ERASE EVENT LOG 8-5
PGT CONTINGENCIES 8-6
PGT STANDARD SETTINGS 8-7
TOOLBOX STOWAGE – PRE STS-127 (2J/A) ..... FS 8-9
TOOLBOX STOWAGE – POST STS-127 (2J/A) ..... FS 8-10
TOOLBOX PANEL AND SLOT LABELS ..... FS 8-11
Z1 TOOLBOX INTERNAL LAYOUT ..... FS 8-12
AIRLOCK TOOLBOX INTERNAL LAYOUT ..... FS 8-13
APFR MANAGEMENT – STS-127 (2J/A) ..... FS 8-14
SAFETY TETHERS – STS-127 (2J/A) ..... FS 8-15
EVA TOOLS MANAGEMENT ..... FS 8-17
GREASE GUN PREP ..... FS 8-23
GREASE GUN CLEANUP ..... FS 8-25
APFR THERMAL SHIELD REMOVAL ..... FS 8-26

POST EVA 9-1
POST EVA 9-2
SUIT DOFFING 9-2
SAFER DOFFING 9-2
EMU WATER RECHARGE 9-3
SAFER STOW 9-3
SUIT DRYING/SEAL WIPE 9-4
OXYGEN RECHARGE VERIFICATION 9-4
WATER FILL VERIFICATION 9-4
EMU POWERDOWN/OVERNIGHT STOW 9-5

EMU MAINT/RECHARGE ..... TEMP FS 10-1
WATER RECHARGE ..... TEMP FS 10-2
EMU POWERUP ..... TEMP FS 10-2
WATER FILL ..... TEMP FS 10-2
WATER FILL VERIFICATION ..... TEMP FS 10-2
EMU LiOH CHANGEOUT 10-4
MIDDECK EMU BATTERY RECHARGE (STAND-ALONE) 10-4a
MIDDECK EMU BATTERY RECHARGE/LiOH REPLACEMENT 10-5
INITIATE 10-5
TERMINATE 10-6

IN-SUIT EMU BATTERY RECHARGE/CHARGE VERIFICATION 10-7
INITIATE 10-7
TERMINATE 10-7
EMU POWERDOWN 10-7
HELMET LIGHT/PGT BATTERY RECHARGE 10-8
INITIATE 10-8
TERMINATE 10-9
REBA BATTERY INSTALLATION 10-9
EMU BATTERY REMOVAL/INSTALL 10-10
HELMET LIGHT BULB CHANGEOUT 10-11
REBA BATTERY RECHARGE 10-12
INITIATE 10-12
TERMINATE 10-13
STS-127 CONSUMABLES TRACKING CUE CARD ..... FS CC 10-15
STS-127 EVA BATTERY RECHARGE PLAN ..... FS CC 10-17

POST EVA ENTRY PREP 11-1
POST EVA ENTRY PREP 11-2
SAFER ENTRY STOW 11-2
POST ISS EVA ENTRY PREP 11-3

OFF-NOMINAL PROCEDURES 12-i
EMU CONTINGENCY PROCS ..... TEMP FS 12-1
DISPLAY LOSS DURING POWER TRANSFER (WARM RESTART) ..... TEMP FS 12-2
VACUUM H2O RECHARGE (MANNED) ..... TEMP FS 12-2
LiOH REPLACEMENT (MANNED) 12-3
BATTERY REPLACEMENT (MANNED) 12-4
WATER DUMP 12-6
SCU SWAP (UNMANNED) 12-7
SCU SWAP (MANNED) 12-7
EMU COLD RESTART (MANNED) 12-7
12.1 STS EVA DECONTAMINATION 12-8
CONTAMINATION TEST 12-15
SAFER BATTERY CHANGEOUT 12-18
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (IN-SUIT) 12-19
BTA PREP 12-19
BTA TREATMENT 12-19
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (POST SUIT DOFFING) 12-21
BTA PREP 12-21
BTA TREATMENT 12-21
EMU RESIZE 12-24
STS-127 NOMINAL EMU SIZING ..... FS 12-27
STS-127 EMU CONTINGENCY RESIZE MATRIX ..... FS 12-29
EXPEDITED SUIT DOFFING CUE CARD ..... FS CC 12-31
EMERGENCY UNDOCKING CUE CARD ..... FS CC 12-32

TPS REPAIR ..... FS 13-1

ORBITER CONTINGENCY EVA 14-1
PAYLOAD BAY EVA NOMENCLATURE 14-2
RMS/PRLA CONTINGENCY EVA 14-3
96 BOLT PRE-EVA TOOL CONFIG 14-13
96 BOLT EVA TIMELINE 14-14
CAPTURE LATCH MANUAL RELEASE (ODS/PMA) 14-19
96 BOLT EVA LAYOUT 14-21
PLBD LATCH TOOL PLACEMENT WITH DUAL LATCH GANG FAILURES 14-22

EVA CUFF CHECKLIST (CIL) 15-1
NORMAL EVA STATUS 15-2
DCM CONFIGURATION 15-2
EMU MALFUNCTION INDEX 15-2
DECOMPRESSION SICKNESS (DCS) 15-3
DECOMPRESSION SICKNESS (DCS) (CONT) 15-3
ABORT EVA 15-3
TERMINATE EVA 15-3
SUIT P EMERG 15-4
SOP O2 ON 15-4
BATT AMPS HIGH 15-4
BATT V DECAY OR BATT VDC LOW 15-4
SUIT P LOW 15-5
SUIT P HIGH 15-5
SOP P LOW 15-5
O2 USE HIGH 15-5
SUBLM PRESS 15-6
H2O GP LOW 15-6
RESRV H2O ON 15-6
H2O WP HIGH 15-6
NO VENT FLOW 15-7
CO2 HIGH OR MONITOR CO2 15-7
CO2 SNSR BAD 15-7
COMM FAILURE 15-7
AIR FLOW CONTAMINATION 15-8
LOSS OF COOLING 15-8
RLF V FAIL 15-8
MISC MSGS 1 15-8
MISC MSGS (CONT)/TIME LF 15-9
AIRLOCK LATCH DISCONNECT 15-9
AIRLOCK INGRESS 15-9

FOLLOWING PAGES NOT IN EV CUFF

RADIATOR ACTUATOR DISCONNECT 15-9
PLBD DRIVE CUT 15-10
DOOR DRIVE RESTRAINT 15-10
DOOR DRIVE DISCONNECT 15-10
WINCH OPERATIONS 15-10
WINCH OPERATIONS (CONT) 15-11
3-PT TOOL INSTALLATION 15-11
CL LATCH TOOL 15-11
RMS JOINT ALIGN 15-11
MPM STOW/DEPLOY 15-12
RMS TIEDOWN 15-12
RMS FLIGHT RELEASABLE GRAPPLE FIXTURE RELEASE 15-12
PRLA OPEN/CLOSE 15-12
PRLA OPEN/CLOSE (CONT) 15-13
KU ANTENNA STOW 15-13
KU ANTENNA STOW (CONT) 15-13
AIRLOCK EGRESS 15-13

FLIGHT SPECIFIC REFERENCE 16-i
UNSCHEDULED/CONTINGENCY EVA TASKS ..... TEMP FS 16-1
2JA WORKAROUNDS CRIBSHEET ..... TEMP FS 16-2
EFBM CONTINGENCY CHECKOUT INHIBIT PAD ..... FS 16-22
JEF EFBM (PASSIVE) MANUAL RELEASE ..... FS 16-23
EFBM CAPTURE LATCH CONTINGENCY OPS:
CAPTURE LATCH CLOSED ..... FS 16-24
EFBM CAPTURE LATCH CONTINGENCY OPS: CAPTURE LATCH OPEN ..... FS 16-25

EFBM STRUCTURAL CONTINGENCY OPS ..... FS 16-26
EFBM UMBILICAL MECHANISM CONTINGENCY OPS: CONNECT ..... FS 16-27
EFBM UMBILICAL MECHANISM CONTINGENCY OPS:
FLUID QD RECONFIG ..... FS 16-28
JAXA ICS-EF EVA CONTINGENCY TASKS ..... FS 16-37
PAYLOAD RELEASE FROM PAM ..... FS 16-40
JLE PIU MANUAL RELEASE ..... FS 16-42
JEF EEU MANUAL RELEASE ..... FS 16-44
JEM RMS JEU REMOVE/REPLACE ..... FS 16-47
P3 UCGAS LUBRICATION AND PULL ..... FS 16-50
RELEASE ROEU LATCHES ..... FS 16-52
LATCH ROEU LATCHES ..... FS 16-55
STOW ROEU ARM ..... FS 16-58
MATE ROEU ARM ..... FS 16-61
ROEU OVERVIEW ..... FS 16-63

GENERIC EVA REFERENCE 17-1

FLIGHT SPECIFIC EVA REFERENCE ..... FS 18-1
STS-127 PAYLOAD BAY LAYOUT ..... FS 18-3
JEF HANDRAILS AND WIF LOCATIONS – PORT FACE ..... FS 18-4
JEF HANDRAILS AND WIF LOCATIONS – STARBOARD FACE ..... FS 18-5
JEF HANDRAILS AND WIF LOCATIONS – ZENITH FACE ..... FS 18-6
JEF HANDRAILS AND WIF LOCATIONS – FORWARD FACE ..... FS 18-7
JEF HANDRAILS AND WIF LOCATIONS – NADIR FACE ..... FS 18-8
JEF HANDRAILS AND WIF LOCATIONS – AFT FACE ..... FS 18-9
JEF OVERVIEW PHOTOS ..... FS 18-10
JEF LTA ..... FS 18-13
JEF LTA – EVA 1 RECONFIG ..... FS 18-14
JEF LTA – EVA 4 RECONFIG ..... FS 18-15
JEF ECSH ..... FS 18-16
JEF VE ..... FS 18-17
JEF EFU ..... FS 18-19
JEF EFBM ..... FS 18-20
JLE HANDRAILS AND WIF LOCATIONS ..... FS 18-21
JLE OVERVIEW PHOTOS ..... FS 18-23
JLE ROEU ..... FS 18-27
JLE MAXI ..... FS 18-28
JLE SEDA-AP ..... FS 18-29
JLE ICS-EF ..... FS 18-30
JLE MLI ..... FS 18-31
ICC-VLD HANDRAILS AND WIF LOCATIONS – FORWARD FACE ..... FS 18-32
ICC-VLD HANDRAILS AND WIF LOCATIONS – AFT FACE ..... FS 18-33
ICC-VLD OVERVIEW PHOTOS ..... FS 18-34
ICC-VLD LTA ..... FS 18-38
ICC-VLD ECSH ..... FS 18-39
ICC-VLD SGANT ..... FS 18-40
ICC-VLD PM ..... FS 18-41
ICC-VLD LDU ..... FS 18-42
ICC-VLD BATTERIES ..... FS 18-43
JEM RMS GROUNDING TAB ..... FS 18-49
JEM BM ..... FS 18-50
JEM OIH AND OIW ..... FS 18-51
NODE 1/2 CBCS FLAP ..... FS 18-52
Z1 PATCH PANEL – AFT FACE ..... FS 18-54
Z1 PATCH PANEL – FORWARD FACE ..... FS 18-55
US LAB CABLE TIE DOWN ..... FS 18-56

P3 UCCAS TIE DOWN ..... FS 18-57
S3 PAS ..... FS 18-60
ESP3 FRAM LAYOUT ..... FS 18-61
ESP3 ON-ORBIT PHOTOS ..... FS 18-63
PMA1 APFR 5/TOOL STANCHION ..... FS 18-65
MISC FIXED GRAPPLE BAR ..... FS 18-66
MISC FIXED GRAPPLE BAR RELOCATE – ON P1 ATA ..... FS 18-68
MISC FRAM ..... FS 18-69
MISC FPP SLEEVES LOCATION ..... FS 18-74
MISC ORBIT INSTALLED WIF – OIW ..... FS 18-76
MISC MT STOP – P3 ..... FS 18-77
MISC SPDM MLI REMOVAL ..... FS 18-78
MISC WETA ..... FS 18-80
MISC WETA PANEL A78 ..... FS 18-82
MISC WETA VSSA STANCHION ..... FS 18-83
TOOLS SAFETY TETHER PACK (STP) ..... FS 18-84
TOOLS UCCAS DETENT TOOL ..... FS 18-85
TOOLS TSA ..... FS 18-87
2JA TIE DOWN PLAN – JEF VE ..... FS 18-88
2JA TIE DOWN PLAN – BATTERIES ..... FS 18-91
2JA TIE DOWN PLAN – WETA ..... FS 18-95

EVA EMERGENCY 19-i
EMERGENCY PROCEDURES 19-1
EMERGENCY AIRLOCK REPRESS 19-3
EMERGENCY AIRLOCK REPRESS 19-4
POST EMERGENCY AIRLOCK REPRESS 19-4
SAFER RESCUE 19-5
SAFER RESCUE 19-6
DAP/EVA RESCUE/RETRIEVE 19-7
EVA ORBITER CONFIG 19-7
EVA RESCUE/RETRIEVE 19-9
19.1 DCS TREATMENT 19-10
CONTINGENCY SHUTTLE AIRLOCK INGRESS FROM ISS 19-13

CUE CARD CONFIGURATION 20-1

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AIRLOCK PREP ..... TEMP FS 2-2
EMU SWAP 2-3
BOOSTER FAN DEACTIVATION/REMOVAL 2-4
BOOSTER FAN INSTALLATION/ACTIVATION 2-4
EMU REMOVAL 2-4
EMU INSTALLATION 2-4
EMU CHECKOUT PREP ..... TEMP FS 2-5
LTA RESTRAINT STRAP REMOVAL ..... TEMP FS 2-6
LTA RESTRAINT STRAP INSTALLATION ..... TEMP FS 2-6
EVA PREP FOR TRANSFER TO ISS ..... FS 2-7
EVA TRANSFER TO ISS ..... FS 2-10
EMU RECONFIG FOR EVA 2 ..... FS 2-12
EMU SWAP FOR EVA 3 ..... FS 2-14
EMU RECONFIG/SWAP FOR EVA 4 ..... FS 2-15
EVA PREP FOR TRANSFER TO SHUTTLE ..... FS 2-18
EVA TRANSFER TO SHUTTLE ..... FS 2-21
EVA UNPACK AND STOW ..... FS 2-22

AIRLOCK PREP (50 min)

Retrieve or unstow following equipment:

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

1. √Inner hatch Equal vlv (two) – OFF

AW18A

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

AIRLOCK CONFIG

EMU CHECKOUT PREP (30 min)

Airlock
1. LTG FLOOD (four) – on
2. Remove External Airlock Floor Bag from Airlock
3. Unbuckle SCU straps, velcro SCU to wall
4. Disconnect helmets from EMUs, temp stow
5. √DIDB restraint bags in correct position
6. Remove comm caps (4) from LTA Restraint Bag kangaroo pouches
   For EMU 3003 (Wf) on stbd AAP, connect comm cap labeled 'WF1' to electrical harness on suit. Temp stow comm cap labeled 'KO1'
   For EMU 3018 (Cs) on port AAP, connect comm cap labeled 'CS1' to electrical harness on suit. Temp stow comm cap labeled 'MB1'
7. Remove LTA Restraint Bags and stow on AAP
8. Disconnect waist rings; remove Wf & Cs ECOKs (mesh bags)
9. Remove crew specific tags from Wf & Cs ECOKs; attach to ECOK drawstring
10. Remove EVA Sys Xfer Bag from Wf ECOK
11. Stow comm caps labeled 'KO1' and 'MB1' in EVA Sys Xfer Bag
12. Temp stow Wf & Cs LCVGs for EMU Checkout
13. √Thermal cover clear of waist rings
14. Waist rings – engage position
15. Connect LTAs to HUTs, lock
16. Transfer ECOKs to Middeck

Middeck Vol H
17. Unstow:
    Inboard Bag:
    SCOFs (2), from EMU Equipment Bag shared compartment – temp stow for EMU Checkout
    EMU Servicing Kit s/n 5005
18. Stow EMU Servicing Kit s/n 5005 in EVA Sys Xfer Bag:
19. Stow Vol H Bags in Vol H
    (SCOFs (2) will be stowed back in EMU Equipment Bag in Vol H after EMU C/O)
20. Temp stow ECOKs and EVA Sys Xfer Bag for "EVA Prep for Transfer to ISS"

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

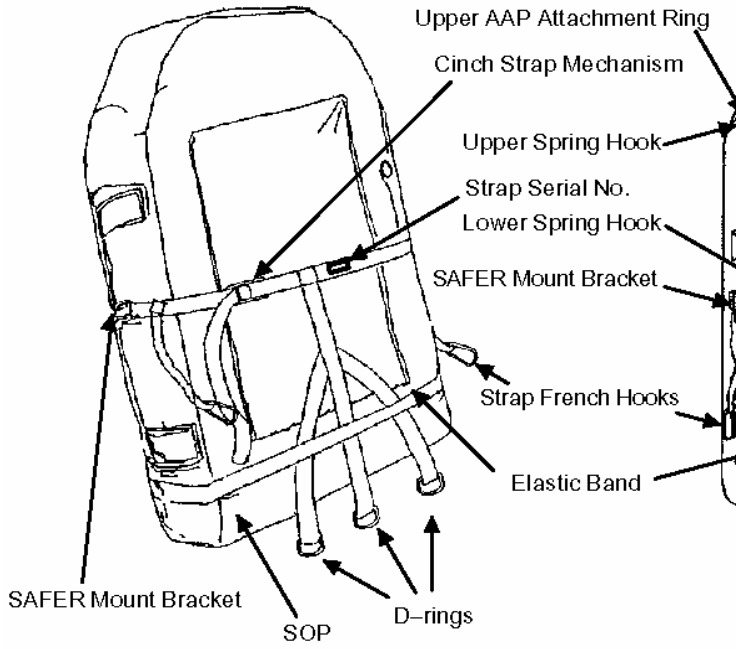
LTA RESTRAINT STRAP INSTALLATION (15 min)

NOTE

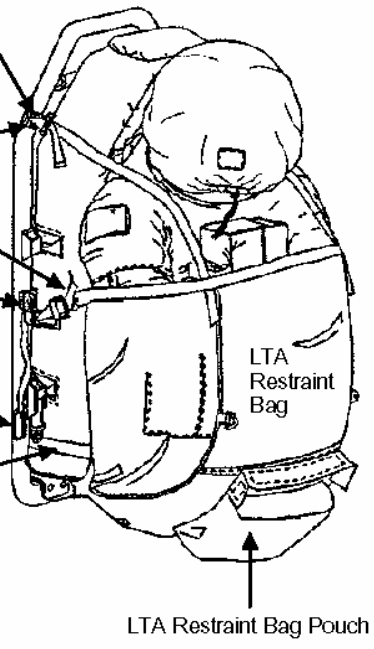
May be performed on EMU 1 and 2 simultaneously. Perform steps as reqd for current EMU config. Procedure written to install in Launch/Landing config shown below

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)

BOTH EMUs/ DCM

1. √PWR – SCU
2. √PURGE vlv – op (up)
3. √WATER – OFF, switch guard installed
4. √O2 ACT – OFF
5. Retrieve Wf ECOK, Cs ECOK, and EVA Sys Xfer Bag temp stowed during EMU Checkout Prep
6. Retrieve EVA Task Xfer Bag from Cs ECOK
7. Retrieve Ko ECOK from Bag H
   Retrieve Mb ECOK and P. ECOK from Bag A
8. Remove waist tethers (1 per EMU) and stow in P. ECOK
9. Configure/verify items according to table below:

EMU 3003 (Wf)	**EMU 3018 (Cs)**
☐ DIDB Restraint Bag	☐ DIDB Restraint Bag
☐ CCA (WF1)	☐ CCA (CS1)
☐ Helmet (√sun visors down, cover installed)	☐ Helmet (√sun visors down, cover installed)
☐ Valsalva	☐ Valsalva
☐ EMU Gloves (WF1)	☐ EMU Gloves (CS1)
☐ Wrist Mirror (2)	☐ Wrist Mirror (2)
☐ Adjustable Equipment Tether (1)	☐ Adjustable Equipment Tether (1)
☐ EMU Battery (verified during EMU c/o)	☐ EMU Battery (verified during EMU c/o)
☐ LiOH (will be verified in EVA Xfer to ISS)	☐ LiOH (will be verified in EVA Xfer to ISS)
☐ LTA	☐ LTA

EVA PREP FOR TRANSFER TO ISS (90 min) (Cont)

Verify items below in Wf ECOK: ☐ LCVG (WF1)(w/biomed sternal harness & signal conditioner) ☐☐ Wf EVA 1 & 2 ziplocks EVA 1 bag includes: ☐ Glass Retention Device **Gather and stow items below in Wf ECOK:** From P. ECOK ☐ Wf EVA 3 ziplock From Bag H ☐ CCA (WF2)	**Verify items below in Cs ECOK:** ☐ LCVG (CS2)(w/biomed sternal harness & signal conditioner) ☐☐ Cs EVA 3 & 4 ziplocks **Gather and stow items below in Cs ECOK:** From P. ECOK ☐ Cs EVA 5 ziplock From Bag H ☐ Lower Arms – 411/412 (Cs b/u)
Verify items below in Mb ECOK: ☐☐☐ Mb EVA 2, 4, & 5 ziplocks EVA 2 & 5 bag includes: ☐ EV identifier stripes (EV3) ☐ Mission patch (STS-127) ☐ American flag **Gather and stow items below in Mb ECOK:** From EVA Sys Xfer Bag ☐ CCA (MB1) From Bag A ☐ EMU Gloves – 1 pair (MB1) ☐ LCVG (MB1)(w/biomed sternal harness & signal conditioner)	**Verify items below in Ko ECOK:** ☐ Ko EVA 1 ziplock EVA 1 bag includes: ☐ EV identifier stripes (EV2)(not red) ☐ Mission patch (STS-127) ☐ American flag ☐ ☐Ko Contingency ziplock (2) Contingency 1 bag includes: ☐ EV identifier stripes (EV1 & EV2) ☐ Mission patch (Exp 19) ☐ American flag ☐ Exp 20 EVA ziplock **Gather and stow items below in Ko ECOK:** From EVA Sys Xfer Bag ☐ CCA (KO1) From Bag H ☐☐ EMU Gloves – 2 pair (KO1/KO2) ☐ LCVG (KO1)(w/biomed sternal harness & signal conditioner)

EVA PREP FOR TRANSFER TO ISS (90 min) (Cont)

Verify items below in EVA Sys Xfer Bag:

☐ EMU Servicing Kit s/n 5005

Gather and stow items below in EVA Sys Xfer Bag:

From Bag G:

- ☐ ☐ LiOH (any two)
  (Report s/ns later)

From FDF Locker (MD43C)

- ☐ EVA ziplock
  - ☐ Cuff Checklists (4)
  - ☐ ISS EVA Systems Checklist
    (STS-127 copy with orange stripe)
  - ☐ SODF Depress/Repress CC (2)
  - ☐ STS-127 Consumables Tracking CC
  - ☐ STS-127 EVA Battery Recharge Plan CC
  - ☐ Expedited Suit Doffing/Emergency Undock EVA Transfer CC
  - ☐ SODF Exercise Pre-breathe CC
  - ☐ Old SODF ziplock (empty)
- ☐ ISS EVA Systems Checklist
  (ISS copy, no stripe)
- ☐ FDF EVA Checklist STS-127 (2)
- ☐ Old SODF ziplock (empty)

Gather and stow items below in EVA Task Xfer Bag:

From Bag H

- ☐ EVA Caps ziplock
  - ☐ ISS2 Mode Plug
  - ☐ Receptacle Protective Caps Size 17 (2)
- ☐ 1/4" Allen Driver/Extension
- ☐ MUT EE
- ☐ Detent Release Tool (2)
- ☐ Adjustable Equipment Tethers (6)

From Bag A

- ☐ 85-ft Safety Tethers (2)

Verify items below in P. ECOK:

- ☐ Wf Contingency ziplock
- ☐ Cs Contingency ziplock
- ☐ Waist Tethers (2)

After items verified above, stow P. ECOK in Bag A to be left on shuttle

EVA TRANSFER TO ISS

NOTE

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

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

Item	Destination	Transfer list item #	Transfer Status
EMU 3003 (Wf)	E-Lk aft EDDA	Ref Transfer List	
EMU 3018 (Cs)	Node 1	Ref Transfer List	
ECOK (Wf)	E-Lk	Ref Transfer List	
ECOK (Ko)	E-Lk	Ref Transfer List	
ECOK (Mb)	Node 1	Ref Transfer List	
ECOK (Cs)	Node 1	Ref Transfer List	
EVA Sys Xfer Bag	E-Lk	Ref Transfer List	
EVA Task Xfer Bag	E-Lk	Ref Transfer List	

EMU 3003/3018

2. Check LiOH s/n and record (will report later):
   s/n _____ in EMU 3003
   s/n _____ in EMU 3018

3. Gather b/u CCAs for Ko, Mb, and Cs from E-Lk and stow in crew specific ECOKs

4. Gather old ISS EVA Systems Checklist, old Dep/Rep CC (2), and Old EVA Cuff Checklist ziplock with old Cuff C/L (3) inside
   Record Cuff C/L serial numbers (will report later)
   s/ns: _____, _____, and _____

EVA Sys Transfer Bag

5. Unstow following items and position in E-Lk:
   - ☐ STS-127 CONSUMABLES TRACKING CUE CARD
   - ☐ STS-127 EVA BATTERY RECHARGE PLAN Cue Card
   - ☐ ISS EVA Systems Checklist (2)
   - ☐ DEPRESS/REPRESS Cue Card (2)
   - ☐ FDF EVA Checklist STS-127 (2)
   - ☐ EXPEDITED SUIT DOFFING CUE CARD/ EMERGENCY UNDOCKING CUE CARD
   - ☐ Cuff Checklists (4)
   - ☐ Old SODF ziplock

6. Stow items gathered in step 4 in Old SODF ziplock and stow in EVA Sys Xfer Bag for return

7. Remove LiOH (2) from EVA Sys Xfer Bag:
   Temp stow one for install in EMU 3005 for EVA 1
   Place other in Wf ECOK for EVA 3
   Record s/ns below (will report later):
   s/n _____ temp stowed for EMU 3005
   s/n _____ in Wf ECOK

EMU 3003

8. Install EHIP w/batteries and ERCA for EVA 1 per STS-127 CONSUMABLES TRACKING CUE CARD

9. Install ISS EVA Cuff C/L (EV1)

ECOK (Ko)

10. Unstow the following items and temp stow for install on EMU 3005
    - ☐ CCA (KO1)
    - ☐ EMU gloves (KO1)

EMU 3005

11. Disconnect helmet, temp stow

12. Connect CCA (KO1) to electrical harness

13. Install helmet

14. Remove lower arm covers and connect EMU gloves (KO1)

15. Install LiOH s/n _____ temp stowed earlier in step 7

16. Check EMU Battery, EHIP Batteries, and REBA installed for EVA 1 per STS-127 CONSUMABLES TRACKING CUE CARD

17. Install ISS EVA Cuff C/L (EV2)

18. Retrieve following from Ko ECOK and install on EMU:
    - ☐ STS-127 Mission patch
    - ☐ American flag
    - ☐ Crew Identifier stripes

19. Stow EVA Sys Xfer Bag in Node 1

EMU 3003/3005

20. Verify suit config for Wf and Ko using STS-127 NOMINAL EMU SIZING in section 12

21. Report transfer status and s/ns from steps 2, 4, and 7 to MCC-H
    Fill in STS-127 CONSUMABLES TRACKING CUE CARD with LiOH s/ns per MCC-H

EMU RECONFIG FOR EVA 2 (30 min)

NOTE

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

EMU 3005 ☐ 1. Remove following from EMU and stow in Ko ECOK:
- ☐ STS-127 Mission patch
- ☐ American flag
- ☐ Crew Identifier stripes
- ☐ ISS EVA Cuff C/L (EV2)

☐ 2. Disconnect EMU gloves (KO1) and CCA (KO1) from electrical harness
Stow in Ko ECOK

☐ 3. Gather other EV2 (Ko) EMU crew-specific items and place in Ko ECOK
Transfer Ko ECOK to Node 1

☐ 4. Connect waist ring to HUT

☐ 5. Remove Helmet Lights and EMU TV
Temp stow entire assembly

☐ 6. √Helmet removed, sun visors down, cover installed
Temp stow

☐ 7. Gather bag labeled ‘KO/MB Resize’

EMU 3005 ☐ 8. Remove lower arms (s/n 375/376) and temp stow

☐ 9. Install lower arms (s/n 347/348)
Verify arm cams are in ‘short/short’ positions

☐ 10. Remove 1.5" leg sizing rings (s/n 125/126) and temp stow

☐ 11. Install 1.0" leg sizing rings (s/n 117/118)

☐ 12. Put upper leg cam in ‘short’ position
Put lower leg cam in ‘long’ position

☐ 13. Disconnect boots and remove BSIs and temp stow

☐ 14. Stow lower arms, 1.5" sizing rings, and BSIs in ‘KO/MB Resize’ bag
Stow bag in Node 1

☐ 15. Transfer Mb ECOK to E-Lk

☐ 16. Unstow CCA (MB1) from Mb ECOK and connect to electrical harness

☐ 17. Install helmet (s/n 1078) from EMU 3011

☐ 18. Install Helmet Lights and EMU TV
√Sun visors down, cover installed

☐ 19. Install helmet (s/n 1074), temp stowed earlier, on EMU 3011

☐ 20. Unstow EMU gloves (MB1) from Mb ECOK and connect to EMU

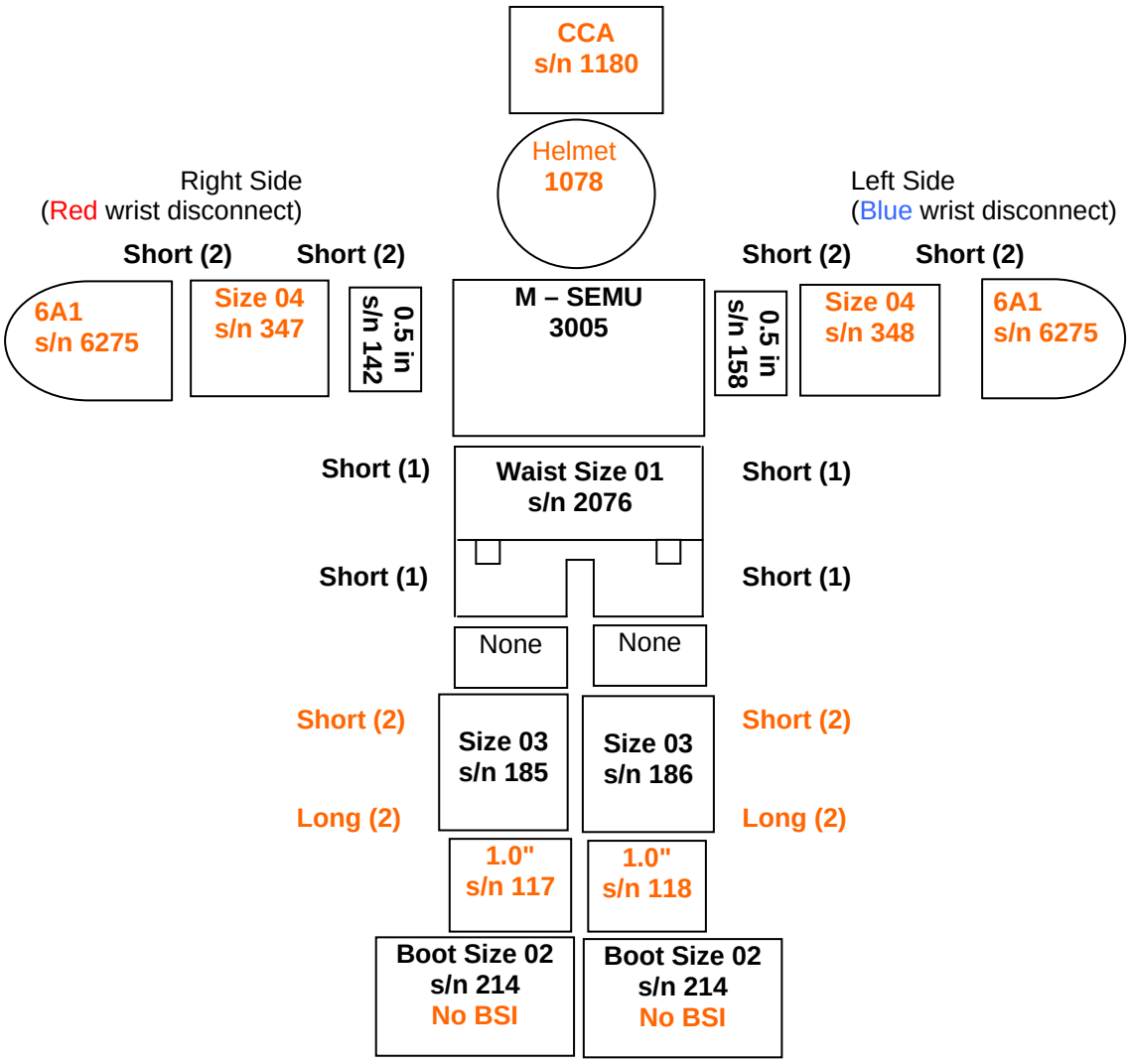
☐ 21. Retrieve following from Mb ECOK and install on EMU:
- ☐ STS-127 Mission patch
- ☐ American flag
- ☐ Crew Identifier stripes
- ☐ ISS EVA Cuff C/L (EV3)

☐ 22. √Wrist Mirrors (two) installed

☐ 23. Verify final config of EMU 3005 per following figure:

NOTE

All labels show serial numbers on top
BLACK font indicates hardware already on EMU 3005
ORANGE font indicates new hardware for Marshburn



FINAL EMU 3005 CONFIG FOR MARSHBURN

EMU SWAP FOR EVA 3 (30 min)

NOTE

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

EMU 3005

☐ 1. Remove Helmet Lights and EMU TV
Temp stow entire assembly

☐ 2. Connect waist ring to HUT

☐ 3. Connect MB1 gloves to lower arms

☐ 4. √Helmet installed, sun visors down, cover installed

☐ 5. Remove EMU from fwd EDDA
Transfer EMU to Node 1

☐ 6. Gather EV3 (Mb) EMU crew-specific items and place in Mb ECOK
Transfer ECOK to Node 1

EMU 3018

☐ 7. Transfer EMU and Cs ECOK to E-Lk
Install EMU on fwd EDDA

☐ 8. Install Helmet Lights and EMU TV
√Sun visors down, cover installed

☐ 9. Retrieve EV4 cuff checklist from Cs ECOK
Install on EMU left arm

☐ 10. √Wrist Mirrors (two) installed

☐ 11. Verify suit config for Cs using STS-127 NOMINAL EMU SIZING in section 12

EMU RECONFIG/SWAP FOR EVA 4 (90 min)

NOTE

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

EMU 3003/3018

☐ 1. Connect waist ring to HUT

☐ 2. Connect gloves to lower arms

☐ 3. √Helmet installed, sun visors down, cover installed

EMU 3003/3011 Leg Swap

☐ 4. If present, remove LTA Restraint Strap/Bag from EMU 3011

☐ 5. Disconnect from EMU 3011 and temp stow following:
Thigh Sizing Rings (s/n 121/122)
Leg Segments (s/n 153/154)
Leg Sizing Rings (s/n 128/129)
Boots (s/n 213)

☐ 6. Disconnect from EMU 3003 and temp stow following:
Thigh Sizing Rings (s/n 140/141)
Leg Segments (s/n 215/216)
Leg Sizing Rings (s/n 125/126)
Boots (s/n 227)

☐ 7. Remove BSI from boots (s/n 227) if installed
Stow in 'KO/MB Resize' bag

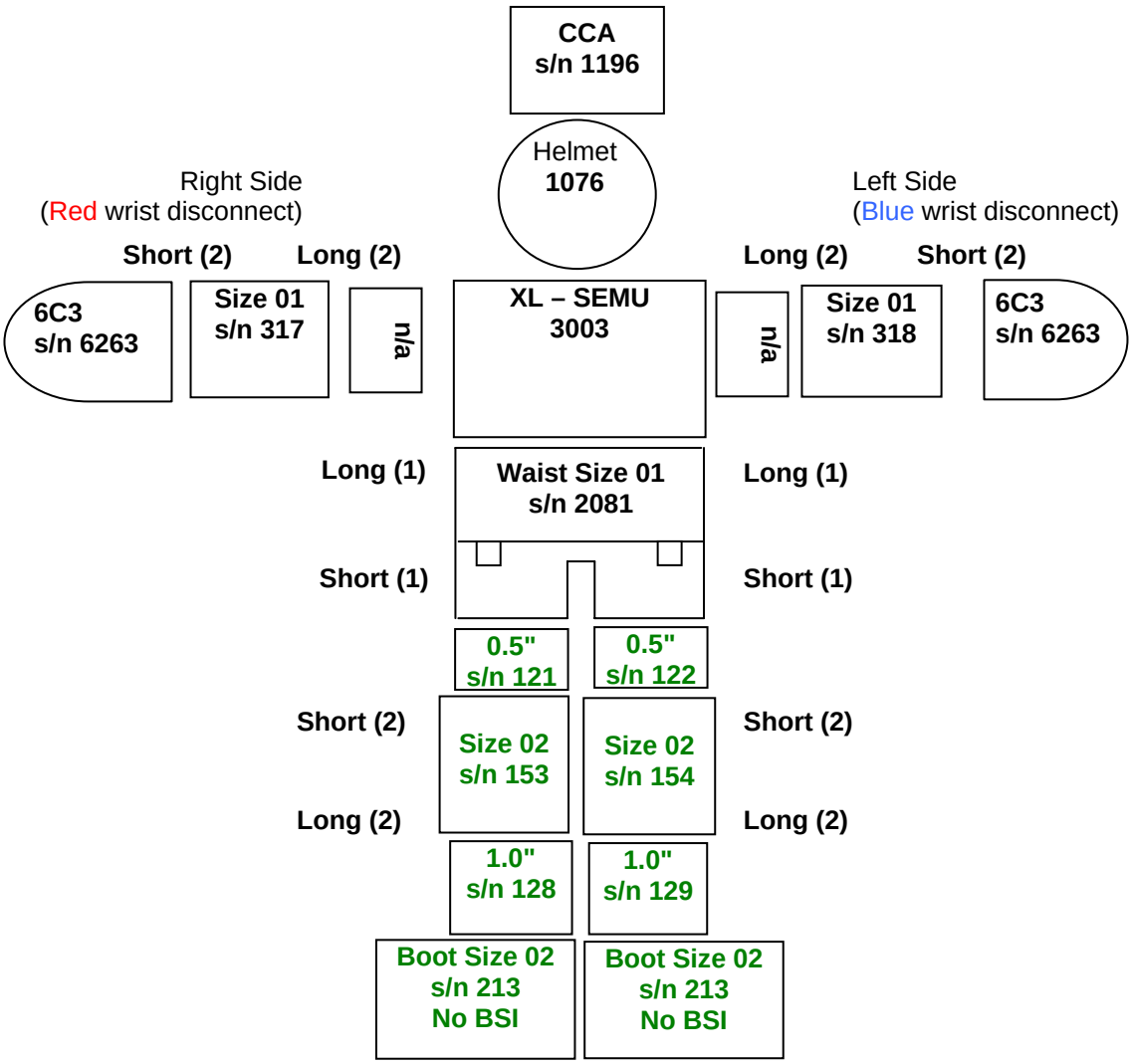
☐ 8. Connect to EMU 3003:
Thigh Sizing Rings (s/n 121/122)
Leg Segments (s/n 153/154)
Leg Sizing Rings (s/n 128/129)
Boots (s/n 213)

☐ 9. Connect to EMU 3011:
Thigh Sizing Rings (s/n 140/141)
Leg Segments (s/n 215/216)
Leg Sizing Rings (s/n 125/126)
Boots (s/n 227)

☐ 10. Verify final config of EMU 3003 per following figure:

NOTE

All labels show serial numbers on top
BLACK font indicates hardware already on EMU 3003
GREEN font indicates hardware removed from EMU 3011 in Node 1



FINAL EMU 3003 CONFIG FOR WOLF

EMU 3003

☐ 11. Remove REBA from PLSS, stow

☐ 12. Remove Helmet Lights and EMU TV
Temp stow entire assembly

☐ 13. Remove EMU from aft EDDA
Transfer EMU to Node 1

☐ 14. Gather EV1 (Wf) EMU crew-specific items and place in Wf ECOK
Transfer ECOK to Node 1

EMU 3018

☐ 15. Remove EMU from fwd EDDA
Install EMU on aft EDDA

EMU 3005

☐ 16. Transfer EMU and Mb ECOK to E-Lk
Install EMU on fwd EDDA

☐ 17. Install Helmet Lights and EMU TV
√Sun visors down, cover installed

☐ 18. √Wrist Mirrors (two) installed

EVA PREP FOR TRANSFER TO SHUTTLE (90 min)

EMU PRE-PACK

EMU 3005/3018 ☐ 1. Connect waist ring to HUT

☐ 2. √Helmet installed, sun visors down, cover installed

☐ 3. Remove REBA from PLSS, stow

EMU 3005 ☐ 4. Retrieve following and stow in Mb ECOK:
- ☐ STS-127 Mission patch
- ☐ American flag
- ☐ Crew Identifier stripes
- ☐ EMU Gloves (MB1)
- ☐ CCA (MB1)
- ☐ MB1 Crew Specific items

☐ 5. Transfer Mb ECOK to Node 1

☐ 6. Retrieve EMU gloves (KO1) and connect to lower arms

EMU 3018 ☐ 7. Connect EMU gloves (CS1) to lower arms

☐ 8. Remove Helmet Lights and EMU TV

EMU 3011 ☐ 9. Install Helmet Lights and EMU TV
√Sun visors down, cover installed

EMU 3018 ☐ 10. Remove EMU from fwd EDDA
Transfer EMU to Node 1

☐ 11. Gather EV4 (CS) EMU crew-specific items and place in Cs ECOK
Transfer ECOK to Node 1

EMU 3005 ☐ 12. Remove EMU from aft EDDA
Install EMU on fwd EDDA

EMU 3006 ☐ 13. Install EMU on aft EDDA

EMU 3003/3018 ☐ 14. Install and verify LiOH canisters and EMU batteries for return per STS-127 CONSUMABLES TRACKING CUE CARD

EMU 3003/3005/ 3006/3018 ☐ 15. √PWR – SCU
√PURGE vlv – op (up)
√O2 ACT – OFF
√WATER – OFF, switch guard installed

E-Lk ☐ 16. Unstow EMU Servicing Kit s/n 5005 from EVA Sys Xfer Bag
Stow in Airlock

☐ 17. Stow EMU Servicing Kit s/n 5004 in EVA Sys Xfer Bag for return

☐ 18. Remove E20 ECOK from Ko ECOK

☐ 19. Inspect and compare all on-orbit EMU wrist mirrors (10)
Stow best quality wrist mirrors (6) in E20 ECOK
Install remaining wrist mirrors (4) on EMUs 3003 and 3018 for return
Record s/ns of 4 wrist mirrors selected for return
s/ns: _____ , _____ , _____ , & _____
Report to MCC-H

☐ 20. Gather EVA Cuff C/Ls (4) from ECOKs
Remove STS-127 flight specific pages

☐ 21. Stow Flight specific pages in crew specific ECOKs
Stow EVA Cuff C/Ls (4) in E20 ECOK

☐ 22. Unstow lower arms from Cs ECOK
Stow on 'KO/MB Resize' bag

☐ 23. Verify/configure all items for transfer per table:

EVA PREP FOR TRANSFER TO SHUTTLE (90 min) (Cont)

EMU 3003 (Wf)	**EMU 3018 (Cs)**
☐ DIDB Restraint Bag ☐ Helmet s/n 1076 (√sun visors down, cover installed) ☐ EMU Gloves (WF1) ☐ Wrist Mirror (2) ☐ EMU Battery (s/n 2068) ☐ CCC (LiOH) (used) ☐ LTA	☐ DIDB Restraint Bag ☐ Helmet s/n 1071 (√sun visors down, cover installed) ☐ EMU Gloves (CS1) ☐ Wrist Mirror (2) ☐ EMU Battery (s/n 2069) ☐ CCC (LiOH) (used) ☐ LTA
EMU Crew Options Kit (Wf) ☐ CCA (WF1) ☐ CCA (WF2) ☐ LCVG (WF1) (w/biomed sternal harness & signal conditioner) ☐☐☐ Wf EVA 1, 2, & 3 Ziplock Bags (one set of TCUs for Cont EVA) ☐ Flight Specific pages from Cuff C/L	**EMU Crew Options Kit (Cs)** ☐ CCA (CS1) ☐ CCA (SW2) ☐ LCVG (CS1) (w/biomed sternal harness & signal conditioner) ☐☐☐ EVA 3, 4, & 5 Ziplock Bags (one set of TCUs for Cont EVA) ☐ Flight Specific pages of Cuff C/L
EMU Crew Options Kit (Mb) ☐☐☐ EVA 2, 4, & 5 Ziplock Bags ☐ Patches and stripes from EMU 3005 ☐ CCA (MB1) ☐ CCA (WK2) ☐ LCVG (MB1) (w/biomed sternal harness & signal conditioner) ☐ EMU Gloves (MB1) ☐ Flight Specific pages from Cuff C/L	**EVA Systems Transfer Bag** ☐ STS-127 CONSUMABLES TRACKING CUE CARD ☐ STS-127 EVA BATTERY RECHARGE PLAN Cue Card ☐ EXPEDITED SUIT DOFFING CUE CARD/ EMERGENCY UNDOCKING CUE CARD ☐ ISS EVA Systems Checklist (Flight Specific with orange stripe) ☐ FDF EVA Checklist STS-127 (2) ☐ EMU Servicing Kit (s/n 5004) ☐ Old SODF ziplock ☐ Old ISS EVA Systems Checklist ☐ Old Dep/Rep CC (2) ☐ Old ISS EVA Cuff C/L (3)
EVA Task Transfer Bag ☐ 85-ft Safety Tether (2) (#s 25 & 27) ☐ Adjustable Equipment Tethers (8) (s/ns 1006, 1089, 1010, 1013, 1014, 1015, ####, ####) ☐ 1/4" Allen Driver/Extension	

EVA TRANSFER TO SHUTTLE (30 min)

NOTE

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

1. Transfer following EVA equipment to shuttle:

Item	Destination	Transfer Status
EMU 3003 (Wf)	Temp stow in Middeck	
EMU 3018 (Cs)	Temp stow in Middeck	
ECOK (Wf)	Temp stow in Middeck	
ECOK (Cs)	Temp stow in Middeck	
ECOK (Mb)	Temp stow in Middeck	
EVA Sys Xfer Bag	Temp stow in Middeck	
EVA Task Xfer Bag	Temp stow in Middeck	

2. Report transfer status to MCC

EVA UNPACK AND STOW (60 min)

NOTE

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

1. Remove all CCAs from ECOKs (2 per ECOK)

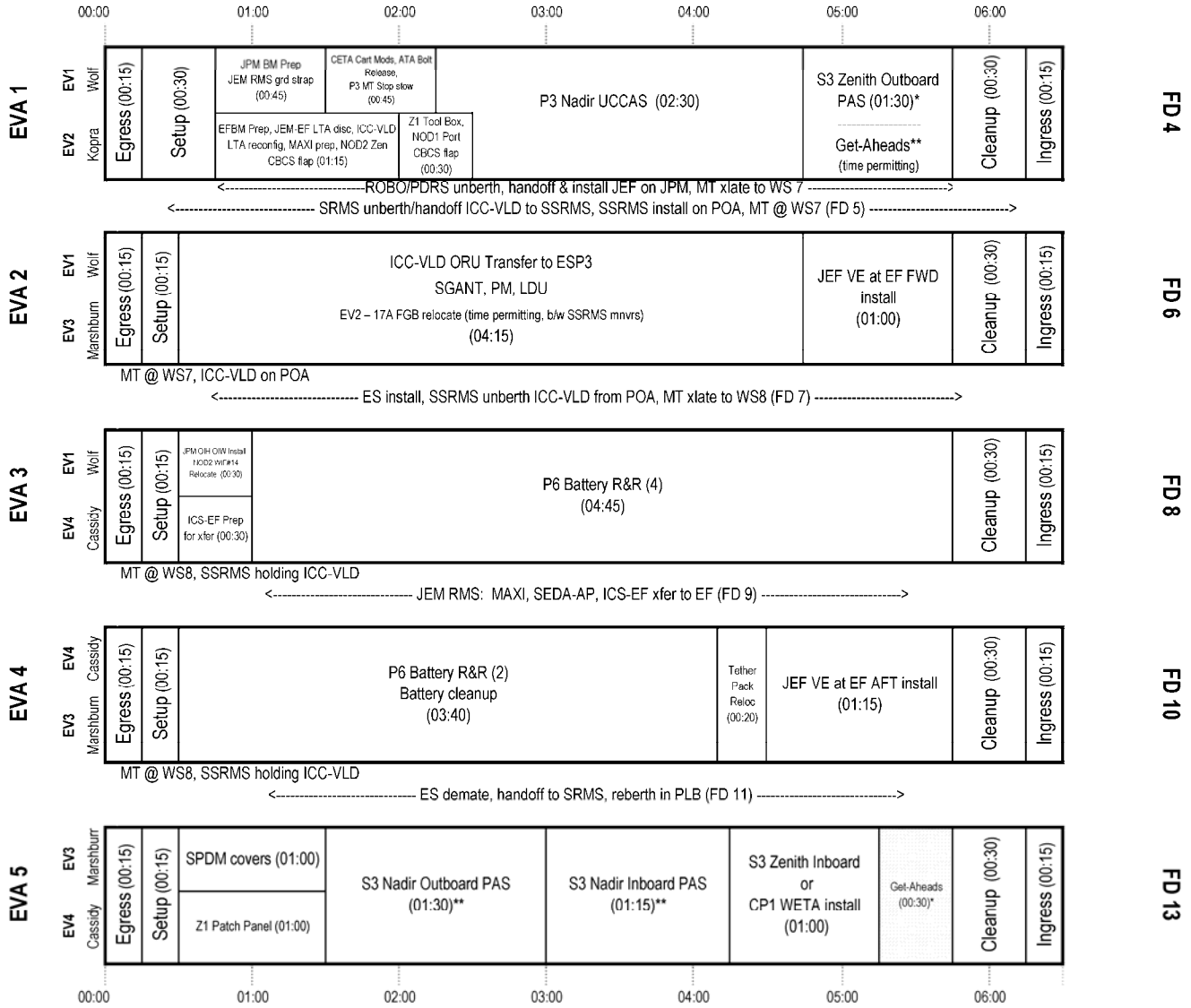
2. Unpack and stow items per table below; report status to MCC when complete:

Current Location	Item	Final Stowage Location	Status
Middeck	EMU 3003 (Wf)	External A/L (Stbd AAP)	
"	EMU 3018 (Cs)	External A/L (Port AAP)	
"	ECOK (Wf)	EMU 3003 (Wf)	
"	ECOK (Cs)	EMU 3018 (Cs)	
"	ECOK (Mb)	Bag A	
"	CCA (WF1 & WF2)	EMU 3003 LTA Restraint Bag	
"	CCA(CS1)	EMU 3018 LTA Restraint Bag	
"	CCA(SW2)	EMU 3018 LTA Restraint Bag	
"	CCA(MB1)	Bag H	
"	CCA(WK2)	Bag H	
EVA Sys Xfer Bag	STS-127 CONSUMABLES TRACKING CUE CARD	Locker MF43C	
"	STS-127 Battery Recharge Plan	Locker MF43C	
"	EXPEDITED SUIT DOFFING CUE CARD/EMERGENCY UNDOCKING CUE CARD	Locker MF43C	
"	ISS EVA Systems Checklist (1)	Locker MF43C	
"	FDF EVA Checklist STS-127 (2)	Locker MF43C	
"	Cuff Checklist (3)	Locker MF43C	
"	SODF Dep/Rep CC	Locker MF43C	
"	EMU Servicing Kit (s/n 5004)	Vol H Inboard	
"	LiOH (2)	Bag H	
"	Empty EVA Sys Xfer Bag	Bag H	
EVA Task Xfer Bag	85-ft Safety Tether (2) (#s 25 & 27)	Bag A	
"	Adj Equip Tethers (8) (s/ns 1006, 1089, 1010, 1013, 1014, 1015, ####, ####)	Bag H	
"	¼" Allen Driver/Extension	Bag H	
"	Empty Task Xfer Bag	Bag H	

STS-127 ISS-2J/A OVERVIEW TIMELINES ..... FS 7-3
EVA 1
EVA 1 SUMMARY TIMELINE ..... FS 7-4
EVA 1 TOOL CONFIG ..... FS 7-5
EVA 1 INHIBIT PAD ..... FS 7-7
EVA 1 NOTES/CAUTIONS/WARNINGS ..... FS 7-10
EGRESS/SETUP ..... FS 7-15
JPM BM/JEF PREP ..... FS 7-17
CETA CART RECONFIG/P1 ATA FGB BOLT RELEASE/TOOL RETRIEVAL ..... FS 7-20
P3 UCCAS DEPLOY ..... FS 7-22
S3 ZENITH OUTBOARD PAS DEPLOY ..... FS 7-24
EVA 1 CLEANUP AND A/L INGRESS ..... FS 7-27
EVA 2
EVA 2 SUMMARY TIMELINE ..... FS 7-41
EVA 2 TOOL CONFIG ..... FS 7-42
EVA 2 INHIBIT PAD ..... FS 7-44
EVA 2 NOTES/CAUTIONS/WARNINGS ..... FS 7-47
EGRESS/SETUP ..... FS 7-52
ICC-VLD ORU TRANSFER TO ESP3 ..... FS 7-54
FWD JEF VE INSTALL ..... FS 7-59
EVA 2 CLEANUP AND A/L INGRESS ..... FS 7-61
EVA 3
EVA 3 SUMMARY TIMELINE ..... FS 7-77
EVA 3 TOOL CONFIG ..... FS 7-78
EVA 3 INHIBIT PAD ..... FS 7-80
EVA 3 NOTES/CAUTIONS/WARNINGS ..... FS 7-83
EGRESS/SETUP ..... FS 7-88
JLE PAYLOAD PREP/WIF 14 RELOCATE/JEM OIH & OIW INSTALLATION ..... FS 7-89
SAFETY TETHER PACK (STP) RELOCATE ..... FS 7-91
P6 BATTERY R&R ..... FS 7-93
EVA 3 CLEANUP AND A/L INGRESS ..... FS 7-96
EVA 4
EVA 4 SUMMARY TIMELINE ..... FS 7-113
EVA 4 TOOL CONFIG ..... FS 7-114
EVA 4 INHIBIT PAD ..... FS 7-116
EVA 4 NOTES/CAUTIONS/WARNINGS ..... FS 7-120
EGRESS/SETUP ..... FS 7-125
P6 BATTERY R&R ..... FS 7-127
STP RELOCATE – INBOARD ..... FS 7-131
AFT JEF VE INSTALL ..... FS 7-133
EVA 4 CLEANUP AND A/L INGRESS ..... FS 7-135
EVA 5
EVA 5 SUMMARY TIMELINE ..... FS 7-150
EVA 5 TOOL CONFIG ..... FS 7-151
EVA 5 INHIBIT PAD ..... FS 7-153
EVA 5 NOTES/CAUTIONS/WARNINGS ..... FS 7-156
EGRESS/SETUP ..... FS 7-161
Z1 PATCH PANEL ..... FS 7-162
SPDM COVERS ..... FS 7-164
S3 NADIR OUTBOARD PAS ..... FS 7-165
S3 NADIR INBOARD PAS ..... FS 7-168
CP1 WETA INSTALL ..... FS 7-170
EVA 5 CLEANUP AND A/L INGRESS ..... FS 7-172
BATTERY CUE CARD 1 ..... FS CC 7-181
JAXA MLI CUE CARD ..... FS CC 7-182
BATTERY CUE CARD 2 ..... FS CC 7-183

GET-AHEADS
GET-AHEAD: S3 ZENITH INBOARD PAS ..... FS 7-185
GET-AHEAD: APFR 5 RETRIEVE/TS RELOCATE..... FS 7-187
GET-AHEADS: JPM OIH AND OIW INSTALL..... FS 7-188
GET-AHEAD: FPP SLEEVES INSTALL/LAB CABLE TIE DOWN..... FS 7-189
GET-AHEAD: NOD2 GAP SPANNER INSTALL..... FS 7-191

STS-127 ISS-2J/A OVERVIEW TIMELINES



* if not enough time for PAS deploy will fill in from get aheads list

**Get-Aheads: APFR 5 retrieval, FPP sleeves/Lab Cable tie down, JEM OIH & OIW, NOD2 gap spanner install, S3 Zenith Inboard PAS

EVA 1

EVA 1 SUMMARY TIMELINE

PET TIME (HR : MIN)	EVA 1		
	IV/SSRMS	**EV1 – Wolf (FF)**	**EV2 – Kopra (FF)**
00:00	**(00:00-00:45)**	**EGRESS/SETUP** (00:45) ■ Post Depress and Egress (00:15) ■ Setup (00:30)	**EGRESS/SETUP** (00:45) ■ Post Depress and Egress (00:15) ■ Setup (00:30)
01:00	**(00:45-01:30)** JEMRMS: Grounding tab worksite SSRMS: JEF remove from PLB	**JPM EFBM Prep** (00:45) ■ Active BM MLI Removal ■ JEM RMS EE grounding tabs	**PLB Prep** (01:15) ■ EFBM passive MLI removal ■ JEF LTAB disconnect/reconfig/stow ■ MAXI Contamination Cover Removal ■ ICC-VLD LTA disconnect/reconfig/stow ■ NOD2 Zenith CBCS Flap
02:00	**(01:30-02:15)**	**CETA CART Mods** (00:45) ■ ATA bolts ■ CETA cart brake handle and WIF reconfig ■ P3 MT stop stow	**TOOL RETRIEVE/NOD1 CBCS** (00:30) ■ Z1 tool retrieval ■ NOD1 port CBCS
03:00	**(02:15-04:45)**	**P3 Nadir UCCAS** (02:30)	**P3 Nadir UCCAS** (02:15)
04:00			
05:00	**(04:45-05:45)**	**S3 Zenith Outboard PAS (01:00)** Time permitting: ■ FPP sleeves ■ Lab cable tie down	**S3 Zenith Outboard PAS (01:00)** Time permitting: ■ FPP sleeves ■ Lab cable tie down
06:00	**(05:45-06:30)**	**CLEANUP/INGRESS** (00:45) ■ Cleanup (00:30) ■ Ingress and Pre Repress (00:15)	**CLEANUP/INGRESS** (00:45) ■ Cleanup (00:30) ■ Ingress and Pre Repress (00:15)
	EVA Time 06:30		

Get-Aheads: FPP sleeves, NOD2 gap spanner install, S3 Zenith Inboard PAS, LAB cable tie down, APFR 5 retrieve

EVA 1 TOOL CONFIG

EV1
EMU D-rings
- ❑❑ Ext on left side
  - ❑❑ STP **RED** alleviator hook
  - ❑❑ STP **GRN** alleviator hook
    - ❑❑ STP **YEL** anchor hook to 85' ERCM
- ❑❑ Ext on right side
  - ❑❑ Waist Tether (right EXT, √locked)

MWS
- ❑❑ Small Trash Bag
  - ❑❑ Wire Tie
  - ❑❑ PAS anti-rotation cap (2)
  - ❑❑ RTL PIP pins (6)
- ❑❑ RET (with PIP pin)
- ❑❑ RET
- ❑❑ 3 – AETs
- ❑❑ Swing Arm (right side)
  - ❑❑ 2 – RET (Attach to PGT)
    - ❑❑ PGT s/n _____
      - ❑❑ 6-in ext
- ❑❑ BRT (left side)
  - ❑❑ RET
    - ❑❑ C/L Bag pack – V/B
  - ❑❑ 5 – wire ties (4 Long by jaws, 1 Short)
- ❑❑ STP **85'** anchor hook
- ❑❑ Lg trash bag (int RET #4)
  - ❑❑ AET lg-sm (from ¼ turn to mouth)
  - ❑❑ RET sm-sm
  - ❑❑ LDTD (4)

❑❑ RET Lg-sm (A/L stowage)
- ❑❑ **C/L Bag – PAS Bag (M)**
  - ❑❑ AET (ext D-ring)
  - ❑❑ AET lg-sm (ext D-ring)
  - ❑❑ RET sm-sm (int D-ring #1 to door handle)
  - ❑❑ Camera w/bracket (bracket RET to int D-ring #2)
    - ❑❑ RET sm-sm
  - ❑❑ RET w/PIP pin (int D-ring #3)
    - ❑❑ EVA wipe (bundled)
  - ❑❑ Ratchet (int RET #1)
    - ❑❑ 2" ext
  - ❑❑ Int RET #2 to door handle
  - ❑❑ Int RET #3 to door handle
  - ❑❑ SARJ scraper (int RET #4)
  - ❑❑ Wire ties Long (2) (ext D-rings across back of bag)
    - ❑❑ Stow clevis bracket

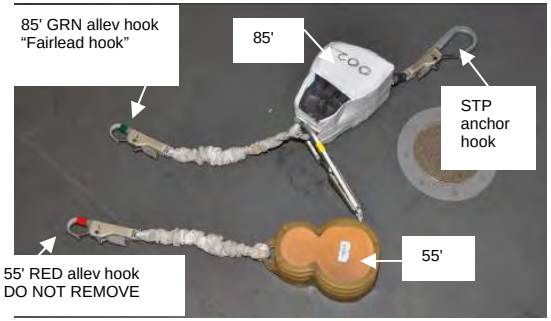
EV2
EMU D-rings
- ❑❑ Ext on left side
  - ❑❑ STP **RED** alleviator hook
  - ❑❑ STP **GRN** alleviator hook
    - ❑❑ STP **YEL** anchor hook to 85' ERCM
- ❑❑ Ext on right side
  - ❑❑ Waist Tether (right Ext to MWS, √locked)

MWS
- ❑❑ Small Trash Bag
  - ❑❑ Wire Tie
  - ❑❑ ISS2 mode plug
  - ❑❑ LTA mode plug
- ❑❑ 2 – Wire tie as tether loop
- ❑❑ RET w/PIP pin (L D-ring)
- ❑❑ RET (R D-ring) (ingress to plug in TB)
- ❑❑ 2 – AET
- ❑❑ Swing Arm (right side)
  - ❑❑ RET (Attach to PGT)
    - ❑❑ PGT s/n _____
      - ❑❑ 6-in ext
- ❑❑ BRT (left side)
  - ❑❑ RET
  - ❑❑ 3 – wire ties (long)

❑❑ RET Lg-sm (A/L stowage)
- ❑❑ **MLI Bag (Lg ORU)**
  - ❑❑ AET ext
  - ❑❑ AET ext
  - ❑❑ Fish stringer #1 (empty)
  - ❑❑ Fish stringer #2 (outside bag, under flap)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Wire tie caddy w/long wire ties (9)
  - ❑❑ Fish stringer #3
    - ❑❑ JPM OIH 1116
    - ❑❑ JPM OIH 1204
    - ❑❑ JPM OIH 1206
    - ❑❑ JPM OIW 43
    - ❑❑ JPM OIW 36
    - ❑❑ Gap spanner (72") – split across two hooks

ISS Configuration
MT @ WS6, CETA 1 Port, CETA 2 Stbd
ICC-VLD in PLB
JEF in PLB
JLE in PLB
SSRMS based on Node 2

Safety Tether config (STP = safety tether pack, 55+85)



Review PGT ops
- Report "green light" (for torque down ops)
- Report torque and turns
- Expect LOTORQ fault msg, Fault LED and Red LED for bolt release ops

Record:
EV1 PGT (serial _____, bat # _____)
EV2 PGT (serial _____, bat # _____)
Spare PGT (serial _____, bat # _____)

Prior to EVA, perform the following inspections:
1. RET cords for fraying
2. Safety and waist tether load alleviation straps for damage and discoloration, verify no red line visible
3. Inspect ISS trash bags for deformation/damage
4. Inspect EMU gloves for damage
5. Inspect BRTs and ballstacks for loose fittings/screws
6. Use Blue RETs only

EVA 1 TOOL CONFIG (Cont)

- ❑❑ RET Lg sm (A/Lstowage)
  - ❑❑ **C/L Bag – Battery Bag (B)**
    - ❑❑ AET (ext D-ring)
    - ❑❑ RET sm-sm (int D-ring #1 to door handle)
    - ❑❑ Sq Torque Multiplier (int RET #1)
      - ❑❑ 7/16" Rec socket
    - ❑❑ Sleeve (size 33/37) (int RET #2)
    - ❑❑ Sleeve (size 33/37) (int RET #3)
    - ❑❑ sq scoop (int RET #4)
    - ❑❑ RET sm-sm (int D-ring #2)
      - ❑❑ sq scoop
  - ❑❑ **C/L Bag – DR Tools Bag (V) – strap to B bag**
    - ❑❑ AET (ext D-ring)
    - ❑❑ RET sm-sm (int D-ring #1 to door handle)
    - ❑❑ DRT #1(int RET #1)
    - ❑❑ DRT #2 (int RET #2)
    - ❑❑ Wire tie caddy w/9 long wire ties (int RET #3)
    - ❑❑ Lg trash bag (int RET #4, moves to EV1)
      - ❑❑ AET lg-sm (on ¼ turn fastener)
      - ❑❑ RET sm-sm (on fabric loop)

Staging Bag

- ❑❑ Fish Stringer #1
  - ❑❑ socket caddy (hook #1)
    - ❑❑ RAD
    - ❑❑ 6" ext
    - ❑❑ 1/4" Hex Drive, 6" ext (EFBM cont)
  - ❑❑ Velcro/Tape Caddy (hook #2)
  - ❑❑ PGT (hook #3) s/n _____
    - ❑❑ PGT Battery s/n _____
    - ❑❑ 7/16-in (wobble) Socket – 6 ext
  - ❑❑ Vise Grips (hook #4)
  - ❑❑ Ratchet Wrench (hook #5)
    - ❑❑ 7/16-in (rigid) Socket – 9 ext
  - ❑❑ Cheater Bar (hook #6)
  - ❑❑ Hammer (hook #7)
- ❑❑ RET Lg-sm
  - ❑❑ Bolt Puller
- ❑❑ Fish Stringer #2
  - ❑❑ Spare Torque Wrench w/MLI (hook #1)
  - ❑❑ Connector Cleaner Tool Kit (hook #2)
  - ❑❑ Pin Straightener Assy (hook #3)
  - ❑❑ Probe w/BRS Pin Tool Sheath (hook #4)
  - ❑❑ Prybar (hook #5)
  - ❑❑ Needlenose Pliers (hook #6)
  - ❑❑ Grease gun (hook #7) tip sticking out of bag
    - ❑❑ EVA wipe
    - ❑❑ wire tie
  - ❑❑ MWS Key Strap Assy (on wire tie, to strap)

Crewlock Zenith Handrail

- ❑❑ Spare STP

IV Bag

- ❑❑ 2 – Towel
- ❑❑ Contamination Detection Kit
- ❑❑ 2 – GP Caddy
  - ❑❑ Thermal Mittens (1 pair)
- ❑❑ RET (sm-sm) (Black)
  - ❑❑ Socket Caddy
    - ❑❑ 1/2-in (wobble) Socket – 8 ext
    - ❑❑ 7/16-in (wobble) Socket – 6 ext
- ❑❑ 2 – DCM Plug (SAFER Hardmount)
- ❑❑ 2 – RET (sm-sm, black)

Tether counts:	**used**	**available**
RET sm-sm -381	13	16
RET lg-sm -385	3	8
RET sm-sm pp -383	3	5
AET sm-sm	10	8 ISS/8 STS
AET lg-sm	2	2

EVA 1 INHIBIT PAD

Orbiter (1)

ALL EVAs

TCS

L12 1. √TCS POWER – OFF

KU-Band Antenna (performed during egress)

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

RCS (on call, crew not expected in area)

If EV crew < 27 feet from FRCS

IV 1. √DAP: VERN, FREE, LO Z (flt specific check with GNC)

O14,15,16 2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF
LOGIC (four) – OFF

MCC-H 3. √Above RCS config

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

Ground

ALL EVAs

Ground Radar

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

LOCATION DEPENDENT INHIBITS

S-Band Antennas

NOTE

Possible loss of comm when forced LL FWD antenna

IV If EV crew < 2 feet from S-Band antenna

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

If no comm, or **On MCC GO**

C3 3. S-BAND PM ANT – LL FWD

When EVA crewmember at least 2 feet away from all S-Band upper antennas

C3 4. S-BAND PM ANT – GPC

USOS (1)

ALL EVAs

PCU

NOTE

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

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

If one or both PCUs failed

2. No more than two arrays unshunted and oriented < 105º from velocity vector

LOCATION DEPENDENT INHIBITS

Lab Window (on call, crew not expected in area)

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

KU-Band (SGANT Antenna) (on call, crew not expected in area)

MCC-H If EV crew < 3.3 feet from KU-BAND antenna

1. Park KU-BAND
1.1 Pointing Mode – Inhibit
1.2 PLC – Reset
1.3 Autotrack Continuous Retry – Inhibit

S-Band (SASA) Antennas (on call, crew not expected in area)

MCC-H If EV crew < 3.6 feet from S1 SASA [P1 SASA]

1. P1 SASA (S1 SASA) – Active
2. S1 SASA [P1 SASA] – Powered down

Mobile Transporter

MCC-H If EV crew < 1.5 meters from MT

1. √MT latched

EVA 1 INHIBIT PAD (Cont)

USOS (2)

LOCATION DEPENDENT INHIBITS

S3 SARJ (S3 PAS deploy)
MCC-H If EV crew working within 2 feet or outboard of SARJ
1. √DLA (1) – LOCKED
2. All motor setpoints set to zero
3. All motors deselected

P3 SARJ (P3 UCCAS deploy)
MCC-H If EV crew working within 2 feet or outboard of SARJ
1. √DLA (1) – LOCKED
2. All motor setpoints set to zero
3. All motors deselected

TRRJ (S3 PAS and P3 UCCAS deploy)
MCC-H If EV crew working within 2 feet of P1 TRRJ rotation envelope
1. √DLA (1) – LOCKED

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

FPMU (on call, crew not expected in area)
MCC-H If EV crew working within 5 feet of Floating Potential Measurement Unit
1. FPMU power – Off

SSPTS (on call, FPP sleeves and Lab cable tie down)
MCC-H If EV crew working within 2 ft of SSPTS cables
1. RPCM LA1A4A D RPC 3 – Open, Close Cmd Inhibit
2. RPCM LA2A3B D RPC 1 – Open, Close Cmd Inhibit
3. RPCM Z14B A RPC 2 – Open, Close Cmd Inhibit
4. RPCM Z13B A RPC 2 – Open, Close Cmd Inhibit

P3 Nadir UCCAS (UCCAS 2) (egress)
MCC-H
1. RPCM P31A A RPC 13 – Open, Close Cmd Inhibit
2. RPCM P32B A RPC 13 – Open, Close Cmd Inhibit

S3 Zenith Outboard PAS (PAS 1) (egress)
MCC-H
1. RPCM S31A A RPC 12

COL (1)

ALL EVAs

EuTEF
COL-CC 1. √PLEGpay Power Status (ETF_PLEGPAY_Pwr_Stat) – OFF

JEM (1)

LOCATION DEPENDENT INHIBITS

JPM Windows (JPM MLI removal and grounding tabs)
IV JPM port end cone window shutters (both) closed

JEMRMS (grounding tabs)
SSIPC If EV crew working within vicinity (5 ft) of JEMRMS
1. RIP MA Brake – ON
2. MDP Main Mode – Stby Mode

or
1. JEMRMS Rack – OFF

JPM PROX Antenna (JPM MLI removal and grounding tabs)
SSIPC If EV crew working within 0.3 ft of JPM PROX Antenna
1. TRX Power – OFF
2. TX Power – OFF

or
1. JPM PROX Antennas – OFF

JEMRMS (Grounding Tabs)
SSIPC
1. PDB RMS Ext4 Vout: 0.0V
2. VCU_b TVC WVE Sig Stat – No signal
3. VLU EE Pwr – Op
4. JEU Interlock – Inh
5. JEU RT – Inh
6. MDP Ang/Mtr Cross Ck – Inh

JPM Aft JTVE (JPM MLI removal and grounding tab)
SSIPC PDB B2 RPC 4 Open

EFBM (JPM MLI removal)
IV √P011B on Jumper Cable is disconnected for BEP

SSIPC PDB A2 RPC01 – Op

EVA 1 INHIBIT PAD (Cont)

RSOS (1)

ALL EVAs

SM Antennas

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

IMPULSE

MCC-M
1. IMPULSE (ИПИ-100) – Deactivate

EVAs ON PMA1 OR RSOS (LOCATION DEPENDENT)(on call for APFR 5 relocate)

FGB Thrusters

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

Soyuz Thrusters

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

FGB Antennas

MCC-M
1. √FGB KURS P [КУРС Р] – Deactivated

Soyuz Antennas

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)
7. 85-ft safety tether retract force may affect body positioning

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, JEF VE 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
   29. JEF ORUs and EFU (paint, lubricant)
   30. MAXI front panel (paint)
   31. SEDA-AP sensors (HIT, SDOM, AOM) and MPAC & SEED

CAUTION

ISS Constraints (Cont)

A. Inadvertent contact (Cont)
   32. Con'PIU, Trunnions and UCM (paint, lubricant) [ICS-EF,MAXI,SEDA-AP]
   33. JLE – PIU, Alignment guide and UCM (paint, lubricant) [ICS-EF,MAXI,SEDA-AP]

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
   4. Avoid tool impact on ICS-EF sensor

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 & 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]

EVA 1 NOTES/CAUTIONS/WARNINGS (Cont)

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 & 566, A/L Tank 2 nad/fwd & 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, JEF VE)
7. JEM EFBM capture latches
8. JEM EFU latching arms
9. JEF SSE latch
10. ICS-EF antenna boom
11. SEDA-AP Mast
12. JLE SLM latch

WARNING

ISS Constraints (Cont)

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

E. RF radiation exposure
1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1]
2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1]
3. Stay 1 ft from UHF Antenna when powered [LAB,P1]
4. Stay 0.3 ft from fwd/aft JPM PROX antenna
5. Stay 246 ft from ICS-EF if powered

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
18. ICS-EF AHM gears
19. MAXI Visual Star Camera
20. PIU springs [ICS-EF,MAXI,SEDA-AP]

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/JEF VE 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 powered
      - 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) ESP2 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

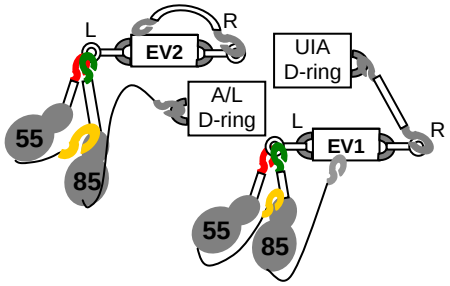
A. Avoid inadvertent contact with
1. HTV solar array panels (kick loads can shatter panel and generate sharp edges) [HTV]
2. HTV fwd RCS thrusters [HTV]

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]

D. Thermal
1. EP handrails may be hot. Handling may need to be limited

EGRESS/SETUP (00:45)

IV/RMS	EV1 WOLF (FF)	EV2 KOPRA (FF)
	**Initial Configuration:** 1. Waist tether to UIA D-ring ❑ √Gate closed ❑ √Hook locked 2. D-ring Ext (L) ❑ STP 55-ft **RED** alleviator hook ❑ STP 85-ft **GRN** alleviator hook 3. **85-ft** anchor hook to MWS <u>EGRESS/INITIAL SETUP</u>	**Initial Configuration:** 1. **85-ft** anchor hook to A/L D-ring ❑ √Gate closed ❑ √Hook locked 2. Waist tether to MWS 3. D-ring Ext (L) ❑ STP 55-ft **RED** alleviator hook ❑ STP 85-ft **GRN** alleviator hook <u>EGRESS/INITIAL SETUP</u> 4. Open hatch thermal cover 5. Egress A/L
		6. Anchor Waist Tether to external D-ring ❑ √Gate closed D-ring side ❑ √Hook locked D-ring side ❑ √Gate closed ext side ❑ √Hook locked ext side
	4. On EV2 GO, retrieve EV2's **85-ft** anchor hook; transfer to EV2	7. Give EV1 go to release **85-ft** (EV2's) anchor hook 8. Receive **85-ft** anchor hook; stow on MWS
	5. Transfer M bag to EV2	9. Receive M bag; stow outside A/L
	6. Transfer MLI Bag to EV2	10. Receive MLI Bag; stow on BRT
	7. Transfer (EV1's) **85-ft** anchor hook to EV2	11. Anchor EV1's 85-ft anchor hook to ext D-ring ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked
1. Post crew egress: WVS Software: Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max √Verify good WVS video from both EV's	8. On EV2 GO, release waist tether 9. Egress airlock	12. Give EV1 GO to release waist tether
	10. Verify V/B Bag config	13. Close hatch thermal cover Transfer EV2's 85-ft anchor hook to EV1's NOT **YEL** **55-ft** ERCM D-ring

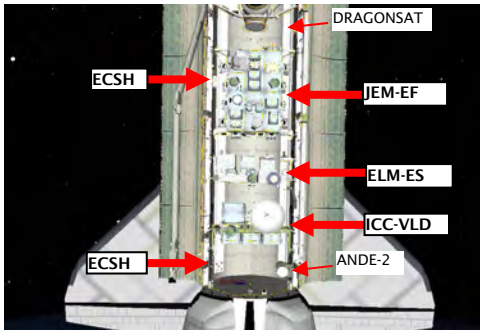
EGRESS/SETUP (00:45) (Cont)

IV/RMS	EV1 WOLF (FF)	EV2 KOPRA (FF)
2. IV: Put inhibits in place JPM ❑ IV √JPM Window Shutters (both) closed ICC-VLD ❑ IV L12(SSP2) ICC PFRAM HTRS – OFF L12(SSP2) ICC BATT HTRS – OFF R1 PL PRI MNC – OFF (tb-OFF) JEM-EF ❑ IV A15 APCU 1,2 CONV (two) – OFF A15 APCU 1 OUTPUT – OFF ❑ IV JPM port end cone window shutters (both) closed **3. Verify with MCC-H JEM inhibits in place**	11. Verify STP config 12. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed) 13. Xlate to S0 HR 3483 14. Attach EV2's **85-ft** anchor hook ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked 15. Inform EV2: EV2 safety tether anchored 16. Xlate past S0 HR 3516 17. Attach waist tether ❑ √Gate closed ext side ❑ √Hook locked ext side ❑ √Gate closed HR side ❑ √Hook locked HR side 18. Give EV2 GO to release anchor hook 19. Stow V/B bag pack on stbd CETA cart 20. Glove inspection 21. Xlate to JPM EFBM	14. Verify STP config 15. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed) 16. Perform translation adaptation 17. On EV1 GO, release EV1's anchor hook 18. Stow on NOT YEL (**55 ft**) ERCM D-ring 19. Xlate to S0 HR 3516 20. Attach EV1's 85-ft anchor hook ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked 21. Inform EV1: EV1 safety tether anchored 22. Glove inspection 23. Xlate to LAB 24. Stow MLI bag LAB HR 0263 25. Xlate to PLB

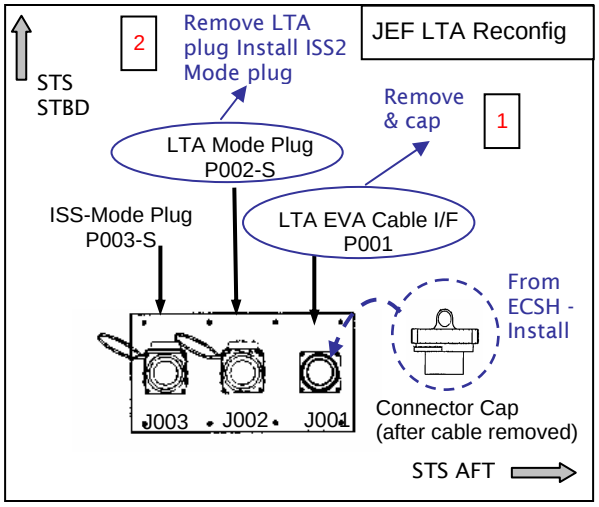
JPM BM/JEF PREP (01:15)

IV/RMS

1. On EV1 GO, give MCC-H GO for EFBM Capture Latch Deploy



2. JEF LTA cables in a nutshell:
   - Remove the LTA cable and stow
   - Temp stow cap from J002
   - New cap from trash bag goes on J002
   - Stow removed cap in trash bag
   - Cap from ECSH goes on J001



EV1 WOLF (FF)

JPM ACTIVE MECHANISM MLI REMOVAL

WARNING
Avoid pinch point on EFBM capture latches

CAUTION
Avoid inadvertent contact with the EFBM berthing surface (silver Teflon), guide vane (solid lubricant), and EFBM base

1. Fairlead GRN alleviator hook
2. Xlate to JPM active mechanism
3. Remove large cover; at each location
   Remove bonding strap; reattach to structure (1)
   1/4 turn fastener (1)
   - ❑ FWD
   - ❑ AFT
   - ❑ Nadir
   - ❑ Zenith
4. Stow MLI behind MWS
5. WVS Survey of EFBM mating surface
6. When clear of capture latches, give IV GO for EFBM Capture Latch Deploy
7. Jettison MLI cover

JEMRMS GROUNDING TABS

WARNING
Avoid pinch point on WVE

CAUTION
Avoid inadvertent contact with the WVE and JEMRMS EE (silver Teflon)

8. Translate to JEMRMS EE
9. Wrap protruding EE grounding tabs (2) around WVE I/F cables
10. Attach grounding tabs (2) to each other via Velcro
11. If reqd, use wire tie around grounding tabs to secure in place

EV2 KOPRA (FF)

JEF PASSIVE MLI REMOVAL

CAUTION
Avoid inadvertent contact with the EFBM berthing surface (silver Teflon), guide vane (solid lubricant), and Shield Finger

1. Fairlead on ODS (AET); Port translation path
2. Xlate to JEF
3. Remove EFBM passive MLI; at each location:
   Remove bonding strap; reattach to structure (1)
   1/4 turn fastener (2)
   - ❑ Port-Zenith
   - ❑ Port-Nadir
   - ❑ Stbd-Nadir
   - ❑ Stbd-Zenith
4. WVS Survey of EFBM mating surface
5. Temp stow MLI on ODS truss
   - ❑ √Clear of JEF xlation path
6. Fairlead GRN alleviator hook

JEF LTA RECONFIG

7. Xlate to JEF ECSH
8. Retrieve cap from J1
9. Release TA clamps (8)
10. Xlate to JEF LTAB
11. Remove LTA MLI
12. On IV GO: Demate LTA cable
    - ❑ Inspect LTA cable connectors for FOD or damage
    - ❑ Inspect LTAB receptacle for FOD or damage
13. Install cap on J001
14. On IV GO: Remove LTA plug from J002 (middle); stow on MWS
    - ❑ Inspect J002 for FOD or damage
15. Retrieve ISS2-Mode plug from trash bag
16. On IV GO: Install ISS2 plug to J002 (middle)
    - ❑ Inspect plug for FOD or damage prior to install
    - ❑ Stow LTA plug in trash bag
17. Reinstall MLI (no rotation)

JPM BM/JEF PREP (01:15) (Cont)

IV/RMS	EV1 WOLF (FF)	EV2 KOPRA (FF)
3. On EV1 GO, give MCC-H GO to repower AFT JTVE **4. Verify EV2 clear of JEF lift envelope** ❑ √Tethers clear **5. Notify SSRMS** ❑ JEF LTAB complete ❑ EV 2 clear of JEF lift envelope ❑ Tethers clear of JEF lift envelope 6. <u>VCC LTA cables in a nutshell</u>: • LTA cable removed and stow on ECSH **7. Verify with SSRMS OK for EV to xlate FWD in PLB**	12. WVS Survey of grounding tabs 13. Verify MCC-H good with grounding tabs 14. Retrieve GRN alleviator hook 15. When clear of JPM endcone, give IV GO to repower AFT JTVE 16. Xlate to P1 ATA Nadir face	18. Stow LTA cable on ECSH ❑ Inspect ECSH J1 for FOD or damage ❑ √Cable around 3 cleats (inboard/cw) ❑ √3 Velcro tabs installed ❑ Mate LTA cable to J1 on ECSH ❑ √Verify TA clamps closed 19. Xlate to ICC-VLD; ensure tether clear of JEF lift path 20. When clear of JEF lift path; notify IV <u>ICC-VLD LTA RECONFIG</u> 21. Xlate to ICC-VLD LTA Box 22. Open MLI booties 23. On IV GO: Demate LTA cable ❑ P01 from J01 (port) ❑ P02 from J02 (stbd) ❑ Inspect LTA connectors for FOD or damage ❑ Inspect LTA Box receptacle for FOD or damage 24. Release TA clamps (3) ❑ Inspect ECSH connectors for FOD or damage 25. Stow LTA cable on ECSH ❑ √Cable around 3 cleats ❑ √3 Velcro tabs installed ❑ Mate P01 to J1/J2 ❑ Mate P02 to J1/J2 <u>MAXI CONTAMINATION COVER REMOVAL</u> <u>WARNING</u> Image (MAXI) Visual Star Camera (VSC) Baffle has sharp edges, avoid contact <u>CAUTION</u> Avoid inadvertent contact with the front panel (paint) 26. Xlate to MAXI (FWD port on JLE) 27. Remove contamination cover; temp stow behind MWS 28. On IV GO, xlate FWD in PLB to TSA 29. Xlate to TSA 30. Stow MAXI MLI in rope reel slot; secure Velcro strap

JPM BM/JEF PREP (01:15) (Cont)

IV/RMS	EV1 WOLF (FF)	EV2 KOPRA (FF)
8. On EV GO, repower PL PRI MN C **√R1 PL PRI MNC – ON (tb-ON)**		31. Stow EFBM in open area; secure with AET from TSA 32. Glove inspection 33. Retrieve **GRN** alleviator hook 34. Retrieve tether fairlead (AET) 35. When clear of PLB, give IV GO to repower payload 36. Perform tool inventory ❑ √Retrieved 2 AETs ❑ JEF LTA mode plug in trash bag <u>NOD2 ZENITH CBCS FLAP</u> 37. Xlate to NOD2 Zenith CBM 38. Xlate along center disk cover edge for access to flap 39. Release flap fastener, rotate flap to open 40. Open Velcro cover; secure flap to Velcro 41. Secure snap fastener 42. Xlate to stbd CETA cart 43. Retrieve B bag

CETA CART RECONFIG/P1 ATA FGB BOLT RELEASE (00:45)/TOOL RETRIEVAL (00:30)

IV/RMS	EV1 WOLF (FF)	EV2 KOPRA (FF)
1. √Port TRRJ and SARJ locked	P1 ATA FGB Bolts (EV2 can do as needed) 1. Loosen P1 ATA Grapple Bolts (four), 20 turns **PGT [B7 (18.4 ft-lb), CCW2, 30.5], 2-Ext 7/16** ❑ Bolt 1 ❑ Bolt 2 ❑ Bolt 3 ❑ Bolt 4 WARNING 2-ft Keep-Out Zone for floating cables between MT and MBS. Stay on UMA handrails during translation underneath MT CETA CART RECONFIG (00:30) 2. Xlate to stbd CETA cart; retrieve V bag 3. Xlate to port CETA cart 4. Release port-nadir TFR swing arm 5. Rotate TFR 180 deg (hard stop, position 30) 6. Lock TFR swing arm 7. Tie-down port brake handles; 1 long wire tie each handle 8. Zenith brake handle to SGI ❑ √3 twists each end of wire tie ❑ √1 wire tie each handle 9. Nadir brake handle to TFR toe clip ❑ √3 twists each end of wire tie ❑ √1 wire tie each handle 10. Fold port brake handles over; wire tie as necessary 11. Xlate to WIF 5, pitch inboard min 45 deg 12. Xlate to WIF 4; pitch inboard min 45 deg 13. Xlate to stbd side of cart 14. Fold stbd brake handles over; wire tie as necessary 15. Glove inspection 16. Retrieve V bag	NOD1 PORT CBCS FLAP 1. Xlate to NOD1 Port CBM 2. Xlate along center disk cover edge for access to flap 3. Release flap fastener, rotate flap to open 4. Open Velcro cover; secure flap to Velcro 5. Secure flap fastener CAUTION Potential sharp edges: Stbd toolbox has MMOD damage D-handle has tape covering MMOD hit TOOL RETRIEVAL (00:45) 6. Xlate to Z1 Port toolbox; retrieve: ❑ Transfer D-handle to round scoop ❑ Sq Scoop (external) 7. Xlate to Z1 Stbd toolbox; retrieve: ❑ Sq TM (slot 1; stbd door) ❑ Sq Rec Socket (slot 1) ❑ Sq Scoop (external) 8. Xlate to A/L 9. Stow B bag 10. Retrieve M bag 11. Xlate to P3 Nadir UCCAS 12. Verify STP anchor as pass by ❑ √Gate closed ❑ √Hook locked

CETA CART RECONFIG/P1 ATA FGB BOLT RELEASE (00:45)/TOOL RETRIEVAL (00:30) (Cont)

IV/RMS	EV1 WOLF (FF)	EV2 KOPRA (FF)
	STOW MT STOP 17. Xlate to P3 MT stop 18. Pull MT stop assembly away from bulkhead notch 19. Rotate MT stop 90 deg until target plate is clear of stop pin 20. Push MT stop toward bulkhead to engage target plate to stop pin 21. Verify MT stop clear of MT translation path 22. Xlate to P3 Nadir UCCAS	

P3 MT Rail Stop

NOTE: PIP pin no longer present, removed on 12A

P3 UCCAS DEPLOY (02:30)

IV/RMS	EV1 WOLF (FF)	EV2 KOPRA (FF)
	CAUTION Avoid inadvertent contact with grapple fixture shafts and target pins When attempting to install Yoke PIP pin and ADP, do not impart more than 10 lbf EBCS target has finished surface that is susceptible to damage by contact. Do not remove MLI until all work inside truss is complete	
	INSTALL DRT 1. Loosen tie downs as needed to provide slack 2. Xlate inside truss; enter face 4 3. Install DRT into outboard hinge ❑ Depress tongs ❑ Engage tool pins into detent holes to softdock tool ❑ √Verify install; perform tug test ❑ √Verify tongs out 4. Rotate knob ccw until points of black making visible, ~7 turns, do not exceed 30 in-lb	INSTALL DRT 1. Xlate to hinge line 2. Install DRT into inboard hinge ❑ Depress tongs ❑ Engage tool pins into detent holes to softdock tool ❑ √Verify install; perform tug test ❑ √Verify tongs out 3. Rotate knob ccw until points of black making visible, ~ 7 turns, do not exceed 30 in-lb 4. Xlate to yoke 5. Remove yoke ADP
	MOVE UCCAS FROM DETENT TO FINAL DEPLOY POSITION 5. Assist EV2 as needed	MOVE UCCAS FROM DETENT TO FINAL DEPLOY POSITION 6. Move platform from detent to deploy position 7. Install yoke into Deploy Clevis Bracket ❑ Release wire tie securing PIP pin and ADP ❑ Install yoke ADP; √Lock bracket engaged ❑ Install yoke PIP pin
	CLEANUP UCCAS 6. Retrieve DRT ❑ Rotate knob cw to hard stop ❑ Depress tongs and remove DRT 7. Stow in V bag	CLEANUP UCCAS 8. Retrieve DRT ❑ Rotate knob cw to hard stop ❑ Depress tongs and remove DRT 9. Stow in V bag 10. Retrieve LDTDs (4); stow in large trash bag
1. IV: Give MCC-H GO to power up IMCA **√All tasks inside truss prior to UMA prep complete** **√Tools cleared from inside truss**	PREP UMA 8. Xlate under UCCAS UMA 9. Tether to hitch pin from EVA OVERRIDE anti-rotation cap, remove hitch pin 10. Remove anti-rotation cap and stow in trash bag	

P3 UCCAS DEPLOY (02:30) (Cont)

IV/RMS

2. IV: Obtain GO from MCC-H for RTL checkout

RTL #	1	2	3
PIP Pin			
Test Complete			

3. √Stbd SARJ and TRRJ locked for PAS deploy

4. Tool inventory:

❑ **C/L Bag – PAS Bag (M)**
- ❑ AET (ext D-ring)
- ❑ AET lg-sm (ext D-ring)
- ❑ RET sm-sm (int D-ring #1 to door handle)
- ❑ Camera w/bracket (bracket RET)
  - ❑ RET sm-sm
- ❑ Ratchet (int RET #1)
  - ❑ 2" ext
- ❑ Int RET #2 to door handle
- ❑ Int RET #3 to door handle
- ❑ SARJ scraper (int RET #4)
- ❑ Wire ties Long (2) (ext D-rings across back of bag)
  - ❑ Stow clevis bracket

❑ **C/L Bag – DR Tools Bag (V) – strap to B bag**
- ❑ AET (ext D-ring)
- ❑ RET sm-sm (int D-ring #1 to door handle)
- ❑ DRT #1 (int RET #1)
- ❑ DRT #2 (int RET #2)
- ❑ Wire tie caddy w/9 long wire ties (int RET #3)
- ❑ Wire ties Long (2) (ext D-rings across back of bag)
  - ❑ Stow clevis bracket

❑ EV1:
- ❑ 3 PIP pins and 1 anti rotation caps in trash bag
- ❑ Lg trash bag
  - ❑ AET lg-sm (from ¼ turn to mouth)
  - ❑ RET sm-sm
  - ❑ LDTD (4)

5. IV: WIF 3 settings [___,____,____,____]
6. On EV GO, inform MCC ready for Port SARJ rotations

EV1 WOLF (FF)

RTL CHECKOUT
11. Xlate 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

EBCS TARGET PREP
12. Xlate to EBCS target and perform:
    - ❑ Verify both EV clear of target area
    - ❑ Remove target cover; stow on backside of target assy
13. Glove inspection
14. Verify SAFER config
    - ❑ √L handle down (MAN ISO Vlv-Open)
    - ❑ √R handle down (HCM-Closed)
15. Retrieve V bag stow on APFR in P3 WIF 29
16. Retrieve Large trash bag w/LDTDs
17. Tool inventory
18. Retrieve APFR stow on BRT

WARNING
2-ft Keep-Out Zone for floating cables between MT and MBS.
Stay on UMA handrails during translation underneath MT

19. Xlate to Stbd CETA cart
20. Inform IV when ready for Port SARJ rotation (Crew, tools, & tethers clear of Port SARJ)
21. Stow APFR in WIF3 low profile (read settings)
22. Retrieve V bag and large trash bag
23. If PET < 04:45, Xlate to S3 Outboard Zenith PAS; else, perform get aheads or cleanup

EV2 KOPRA (FF)

11. Retrieve M bag
12. Glove inspection
13. Perform tool inventory
14. Verify SAFER config
    - ❑ √L handle down (MAN ISO Vlv-Open)
    - ❑ √R handle down (HCM-Closed)
15. Xlate Stbd
16. Inform IV when ready for Port SARJ rotation (Crew, tools, & tethers clear of Port SARJ)
17. If PET < 04:45, Xlate to S3 Outboard Zenith PAS; else, perform get aheads or cleanup

S3 ZENITH OUTBOARD PAS DEPLOY (01:00)

IV/SSRMS	EV1 WOLF (FF)	EV2 KOPRA (FF)
	CAUTION • When attempting to remove the Yoke PIP pin and ADP, do not impart more than 10 lbf • Yoke ADP does not have a stowage hole. Do not close ADP lock bracket when ADP is not inserted in a stowage/clevis hole • Do not exceed 30 in between the yoke ADP and Deploy Clevis Bracket • Exceeding this could allow platform to enter detent position • Do not lift diagonal brace more than ~7 deg out of rotation plane to prevent damage to hinge end • Avoid inadvertent contact with grapple fixture shafts and target pins • When attempting to install the Yoke PIP pin and ADP, do not impart more than 10 lbf • EBCS target has finished surface that is susceptible to damage by contact. Do not remove MLI until all work inside truss is complete	
	HINGE LINE PREP 1. Remove hinge line ADPs (2) 2. Insert in stowage hole (toward station forward), ❑ √ADP closed: Inboard ❑ √ADP closed: Outboard REMOVE SARJ BRACES 3. Release SARJ Launch Bolt by hand, ~ 3 turns ccw 4. **PGT [B6** 24.0 ft-lb, **CCW3** 60 RPM, 30.5**]**-7/16-2-in ext Release SARJ Brace (cup-cone bolt), 35 turns, **Stop on turns; do not exceed 37 turns** REMOVE DIAGONAL BRACES 5. Attach SARJ Brace to Diagonal Strut, hand tighten SARJ Launch Bolt 1 turn cw 6. **PGT [B6** 24.0 ft-lb, **CCW3** 60 RPM, 30.5**]**-7/16-2-in ext Release Diagonal Brace (cup-cone bolt), **Stop on turns 35 (do not exceed 37 turns)** 7. Guide Diagonal Brace and temp stow with tether DEPLOY LG-SM AET 8. Deploy lg-sm AET DEPLOY PLATFORM 9. Monitor UMA to longeron clearance 10. Inform EV2 when UMA just clears the longeron 11. Assist EV2 as needed with yoke	REMOVE DEPLOY CLEVIS BRACKET 1. RET to Deploy Clevis Bracket **PGT [B7** 25.5 ft-lb, **CCW2** 30 RPM, 30.5**]**-7/16 6-in ext Release Deploy Clevis Bracket botls (4) 10 turns 2. Temp stow Deploy Clevis Bracket with RET RELEASE YOKE ADP AND PIP PIN 3. Release yoke PIP pin 4. Release yoke ADP 5. Tend platform “into” the truss REMOVE STOW CLEVIS BRACKET 6. RET to Stow Clevis Bracket 7. **PGT [B7** 25.5 ft-lb, **CCW2** 30 RPM, 30.5**]**-7/16-6-in ext Release Stow Clevis Bracket (4) 10 turns 8. Stow Clevis Bracket on M bag DEPLOY PLATFORM 9. Deploy platform out until UMA clears longeron 10. On EV1 GO, Rotate yoke from out to in 11. Attach lg hook of AET to ADP hole

S3 ZENITH OUTBOARD PAS DEPLOY (01:00) (Cont)

IV/SSRMS

1. Brace Bolt Installation:

Bolt	SARJ Brace	Diagonal
Torque		
Turns		

2. Deploy Clevis Bracket Install:

Bolt #	1	2	3	4
Initial Torque				
Turns				
Final Torque				

3. Stow Clevis Bracket Install:

Bolt #	5	6	7	8
Initial Torque				
Turns				
Final Torque				

4. **IV: Give MCC-H GO to power up IMCA**
   √All tasks inside truss prior to UMA prep complete
   √Tools cleared from inside truss

5. **IV: Obtain GO from MCC-H for RTL Checkout**

RTL #	1	2	3
PIP Pin			
Test Complete			

EV1 WOLF (FF)

REINSTALL DIAGONAL BRACES
12. Assist EV2 with brace installation
13. Release AET as needed for brace clearance
14. **PGT [B2** 16.0 ft-lb, **CW2** 30 RPM, 30.5**]**-7/16-2-in ext
    Engage Diagonal Brace (cup-cone bolt) to **hard stop**,
    ~ 35 turns

REINSTALL SARJ BRACES
15. Release SARJ Brace via SARJ Launch Bolt by hand,
    ~ 1 turn ccw

16. **PGT [B2** 16.0 ft-lb, **CW2** 30 RPM, 30.5**]**-7/16-2-in ext
    Engage SARJ Brace (Cup-Cone bolt) to **hard stop**,
    ~ 38 turns

17. Re-engage SARJ Launch Bolt bolt for temp stow;
    hand tighten cw 2-3 turns

REINSTALL STOW CLEVIS BRACKET (OPTIONAL)
18. Finger start Stow Clevis Bracket bolts (4), approx 1-2 turns
19. **PGT [B2** 16.0 ft-lb, **CW2** 30 RPM, 30.5**]-7/16-2-in ext**
    Engage Stow Clevis Bracket bolts (4) to hard stop,
    expect 10 turns
20. Retrieve RET from bracket

PREP UMA
21. Xlate under PAS UMA
22. Tether to hitch pin from EVA OVERRIDE anti-rotation cap,
    remove hitch pin
23. Remove anti-rotation cap and stow in trash bag

RTL CHECKOUT
24. Xlate 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

EV2 KOPRA (FF)

REINSTALL BRACES
12. Move Diagonal Brace into position for re-installation
13. Release AET as needed for brace clearance
14. Reinstall AET once brace is clear

15. Retrieve tether from brace temp stow location

REINSTALL DEPLOY CLEVIS BRACKET
16. Finger start Deploy Clevis Bracket bolts (4), 1-2 turn
17. **PGT [B5** 22.0 ft-lb, **CW2** 30 RPM, 30.5]-7/16-6-in ext
    Engage Deploy Clevis Bracket bolts (4) to hard stop,
    expect **10 turns**

18. **PGT [RCW**, **30.5**]-7/16-6-in ext, two clicks each bolt
    Apply final Torque to Deploy Clevis Bracket bolts (4) in
    Ratchet Mode

19. Retrieve RET from bracket
20. Stow in M bag

INSTALL YOKE
21. Disconnect AET
22. Install yoke in deploy clevis bracket
    - ❑ Release wire tie securing PIP pin and ADP to yoke
    - ❑ Install yoke ADP, √lock bracket engaged
    - ❑ Install yoke PIP Pin

23. Retrieve Lg-sm AET from HR; stow in M bag

S3 ZENITH OUTBOARD PAS DEPLOY (01:00) (Cont)

IV/SSRMS	EV1 WOLF (FF)	EV2 KOPRA (FF)
6. Tool Config ❑ **C/L Bag – PAS Bag (M)** ❑ AET (ext D-ring) ❑ AET lg-sm (ext D-ring) ❑ RET sm-sm (int D-ring #1 to door handle) ❑ Camera w/bracket (bracket RET) ❑ RET sm-sm ❑ Ratchet (int RET #1) ❑ 2" ext ❑ Int RET #2 to door handle ❑ Int RET #3 to door handle ❑ SARJ scraper (int RET #4) ❑ Wire ties Long (2) (ext D-rings across back of bag) ❑ Stow clevis bracket ❑ **C/L Bag – DR Tools Bag (V) – strap to B bag** ❑ AET (ext D-ring) ❑ RET sm-sm (int D-ring #1 to door handle) ❑ DRT #1 (int RET #1) ❑ DRT #2 (int RET #2) ❑ Wire tie caddy w/9 long wire ties (int RET #3) ❑ Wire ties Long (2) (ext D-rings across back of bag) ❑ Stow clevis bracket ❑ EV1: 6 PIP pins and 2 anti rotation caps in trash bag	EBCS TARGET PREP (AFTER RTL CHECKOUT) 25. Xlate to EBCS target and perform: ❑ Verify both EV clear of target area ❑ Remove target cover; stow on backside of target assy CLEANUP 26. Glove inspection 27. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed) 28. Retrieve V bag 29. Tool inventory	CLEANUP 24. Glove inspection 25. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed) 26. Retrieve M bag 27. Tool inventory

EVA 1 CLEANUP AND A/L INGRESS (00:45)

IV/RMS	EV1 WOLF (FF)	EV2 – KOPRA (FF)
1. Pre crew ingress WVS PWRDN (PHOTO/TV, WVS CUE CARD)	CLEANUP 1. Xlate to A/L 2. Tool inventory INGRESS AND PRE-REPRESS 3. Open hatch thermal cover 4. Ingress airlock 5. Stow V bags 6. Attach waist tether to UIA D-ring ❑ √Gate closed ❑ √Hook locked 7. Xfer STP to EV 2 8. Receive B bag; stow 9. Remove SCU from stowage pouch 10. Remove DCM cover; Velcro to DCM 11. Connect SCU to DCM; √SCU Locked 12. WATER – OFF (fwd), expect H2O IS OFF msg	CLEANUP 1. Xlate to A/L 2. Install AET FL at A/L HR 0538 3. Tool inventory INGRESS AND PRE-REPRESS 4. Stow EV1's 55-ft **RED** alleviator on FWD A/L D-ring ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked 5. Stow EV1's 85-ft **GRN** alleviator ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked 6. Xfer M & B bag to EV1 7. Partially ingress airlock 8. Attach waist tether to A/L D-ring ❑ √Gate closed ❑ √Hook locked 9. Stow 55-ft **RED** alleviator on AFT A/L D-ring ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked 10. Stow 85-ft **GRN** alleviator ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked 11. Ingress Airlock 12. Close thermal cover; attach Velcro strap 13. Remove SCU from stowage pouch 14. Remove DCM cover; Velcro to DCM 15. Connect SCU to DCM; √SCU Locked 16. WATER – OFF (fwd), expect H2O IS OFF msg

EVA 1 CLEANUP AND A/L INGRESS (00:45) (Cont)

IV/RMS	EV1 WOLF (FF)	EV2 – KOPRA (FF)
		CAUTION Do not close hatch until EMU Water OFF for 2 min. Verify outer hatch clear of hardware 17. Verify outer hatch clear of hardware 18. Verify handle position per hatch decal; close and lock hatch
	Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)	Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)

EFBM PREP TASK DATA

JPM Active EFBM MLI

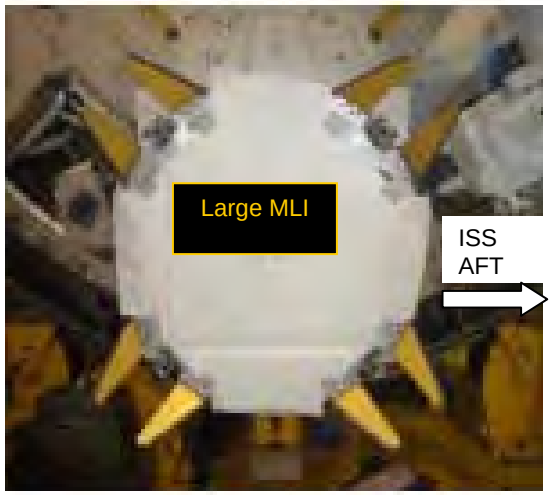
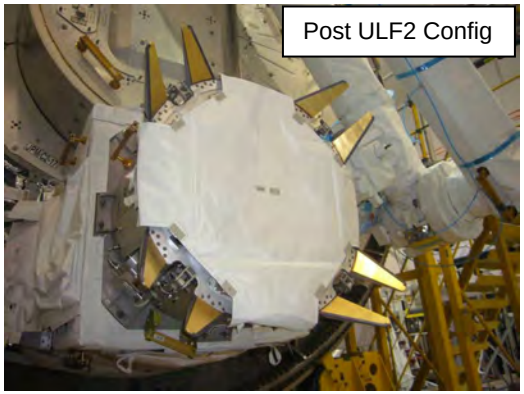
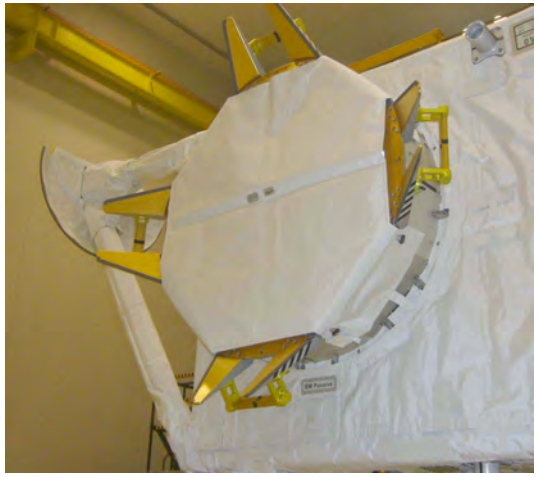


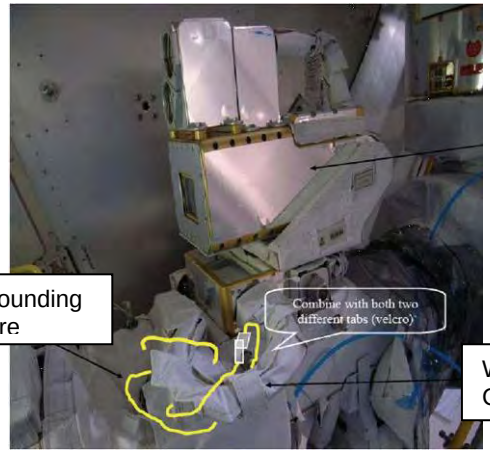
Fig 8: JPM BM MLI

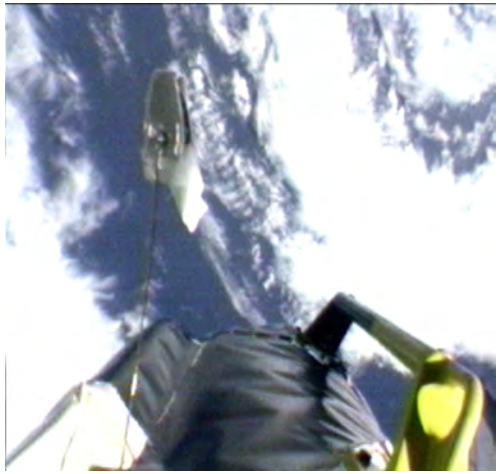


JEF Passive EFBM MLI



JEM RMS Grounding Tab





JEF LTAB RECONFIG TASK DATA

Estimated Task Duration:

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

EVA Connectors:

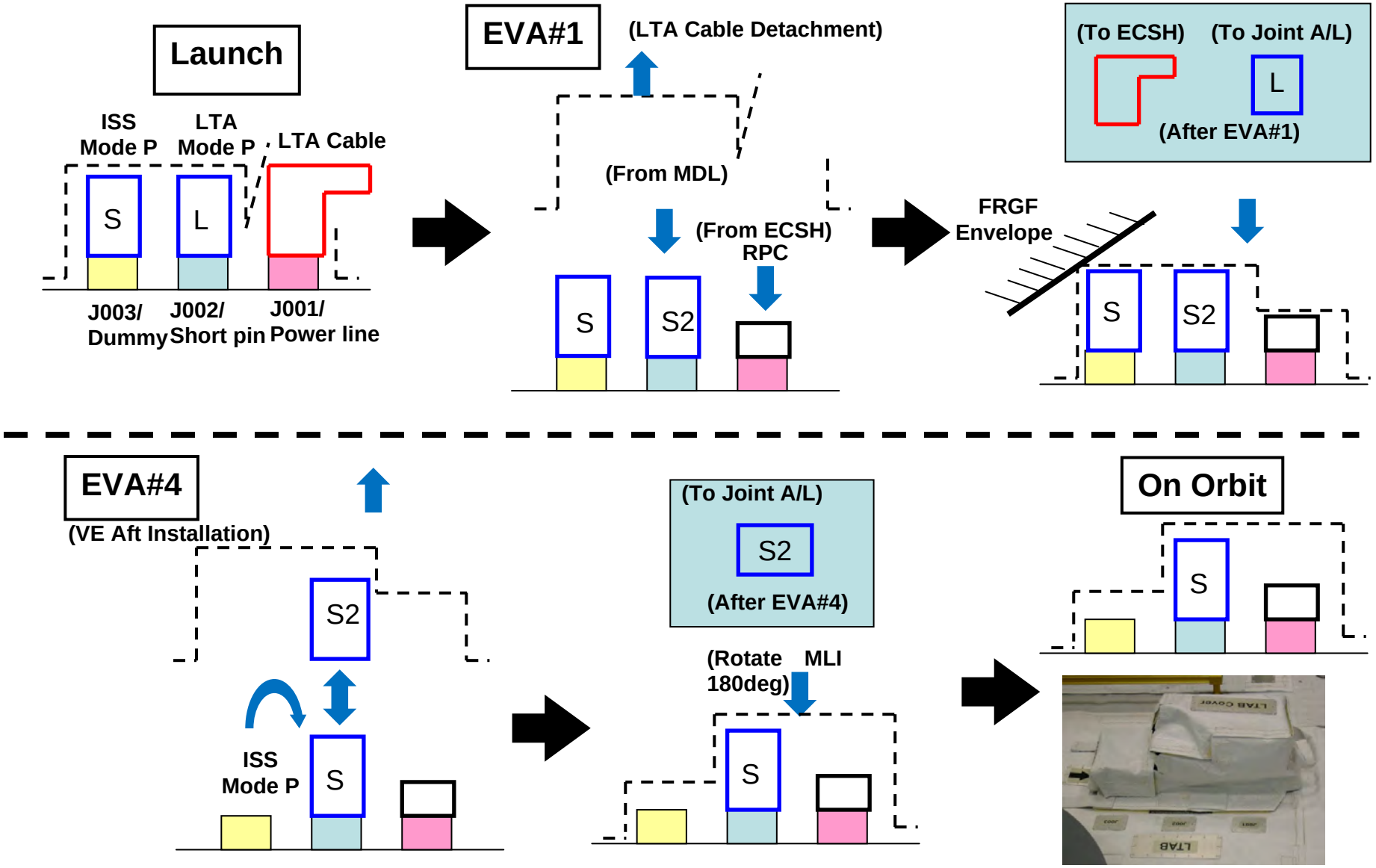
Harness	From	To	Type	Conn Size	Function
46P77W889/P101 (EVA1)	JEF	ECSH	NZGL	25	J001(ECSH,too) is for power, and J002 is for power & heater
LTA Cap (EVA1)	ECSH	J001	NZGL	NZGL-RPC-N-25-0-MS	
ISS Mode Plug 2 (EVA1)	MDK	J002	NZGL	25	
ISS Mode Plug (EVA4)	J003	J002	NZGL	25	

JEF ECSH – Launch Config

JEF ECSH – Landing Config

Launch Config

Reconfig: LTA disconnected, ISS2 installed


Launch
ISS Mode P
LTA Mode P
LTA Cable
S
L
J003/ Dummy
J002/ Short pin
J001/ Power line
EVA#1
(LTA Cable Detachment)
(From MDL)
(From ECSH) RPC
S
S2
(To ECSH)
(To Joint A/L)
L
(After EVA#1)
FRGF Envelope
S
S2
EVA#4
(VE Aft Installation)
S2
ISS Mode P
S
(To Joint A/L)
S2
(After EVA#4)
(Rotate 180deg)
MLI
S
On Orbit
S

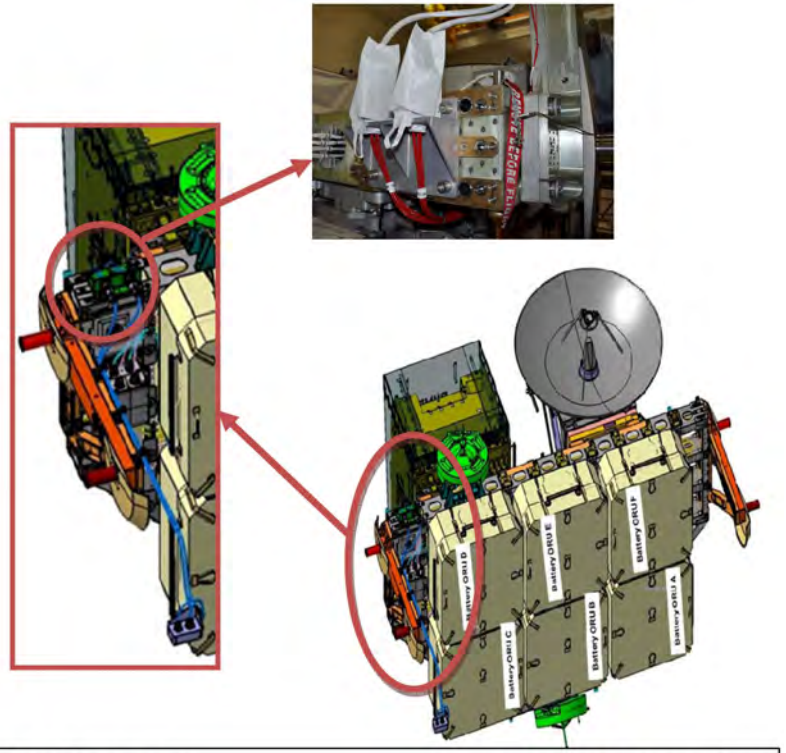
ICC-VLD LTA RECONFIG TASK DATA

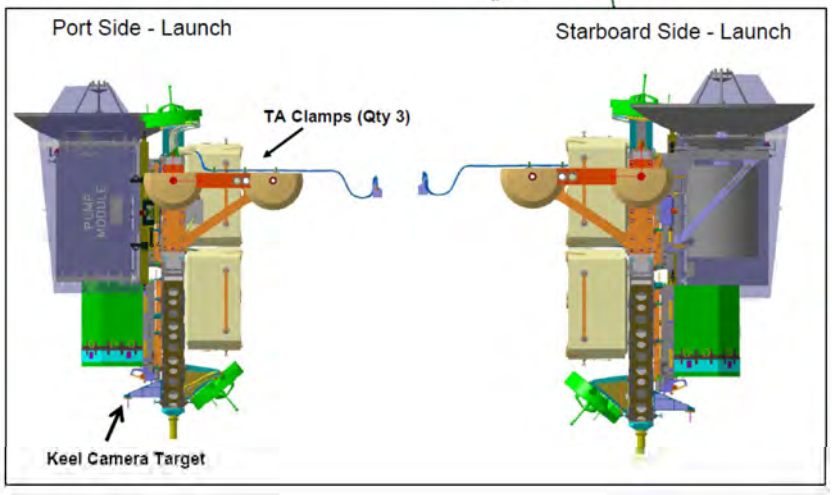
EVA Connectors:

Harness	From	To	Type	Conn Size	Function
P01	J01	ECSH dummy	NZGL06G2 525LN7SC	25	LTA cable
P02	J02	ECSH dummy	NZGL06G2 525LN7SC	25	LTA cable

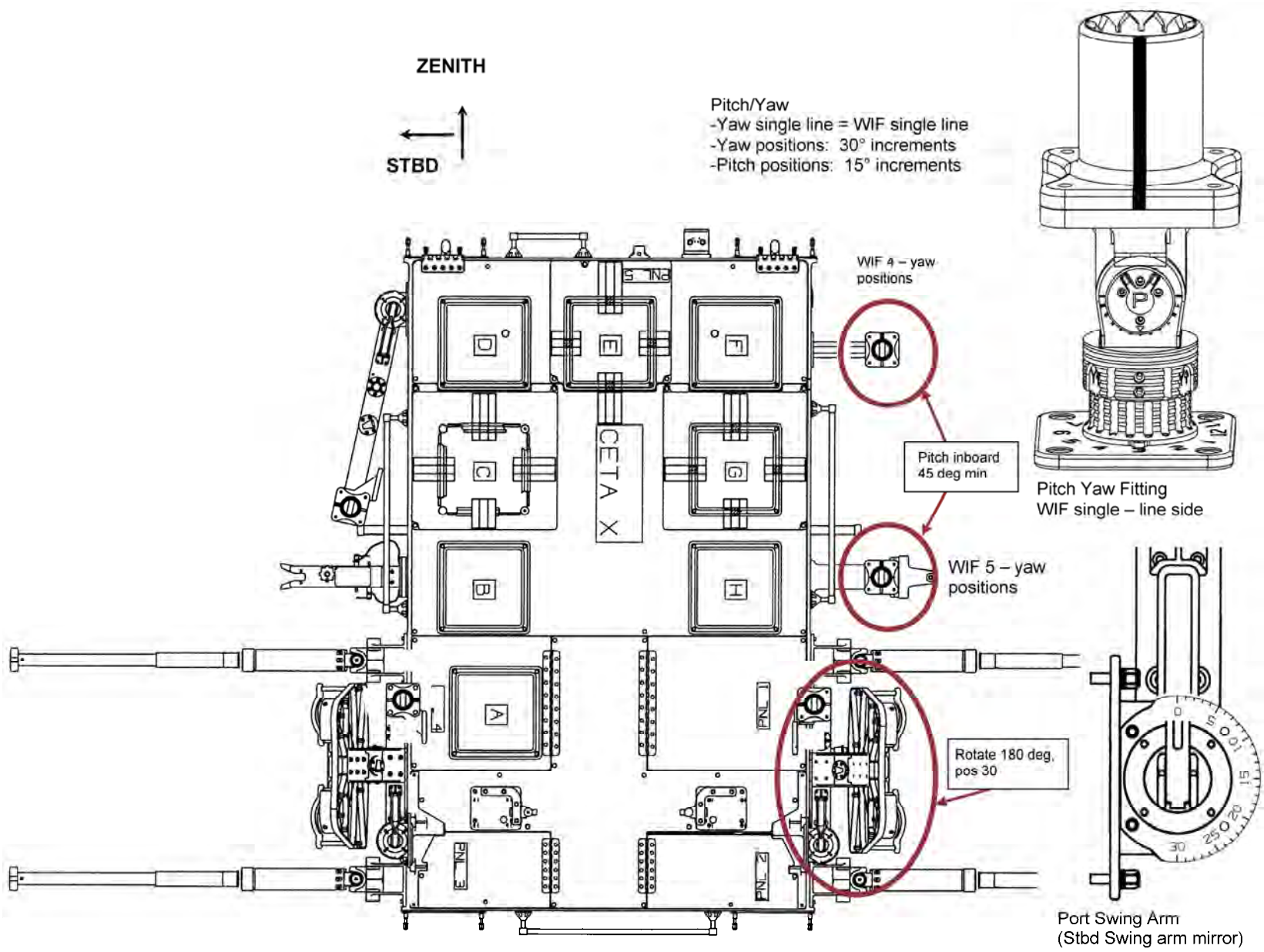
ECSH – Launch config

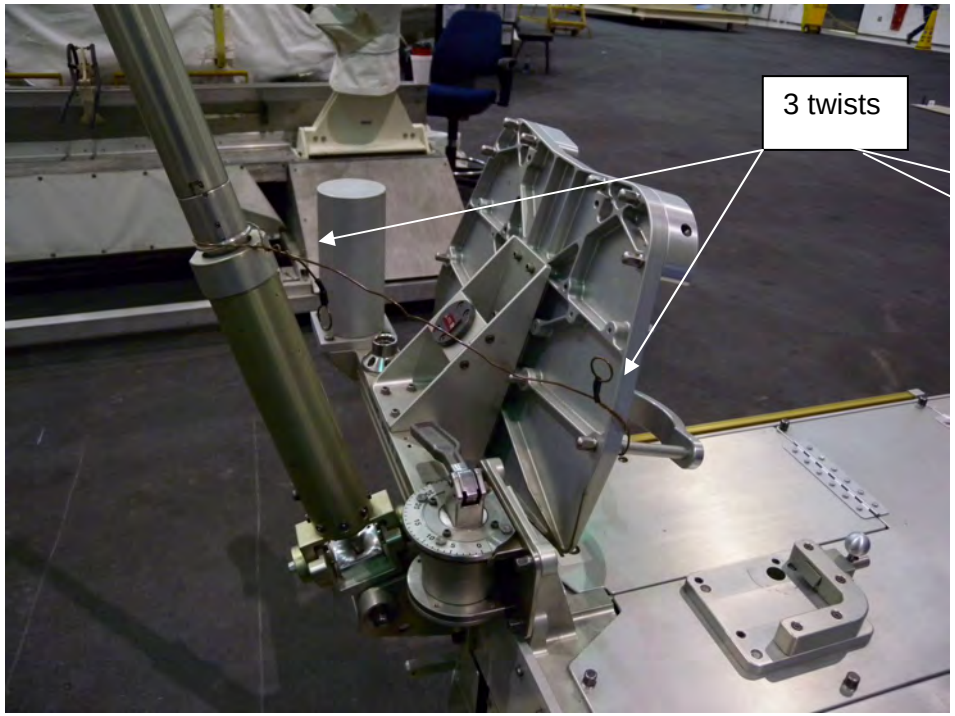
ECSH – Landing config



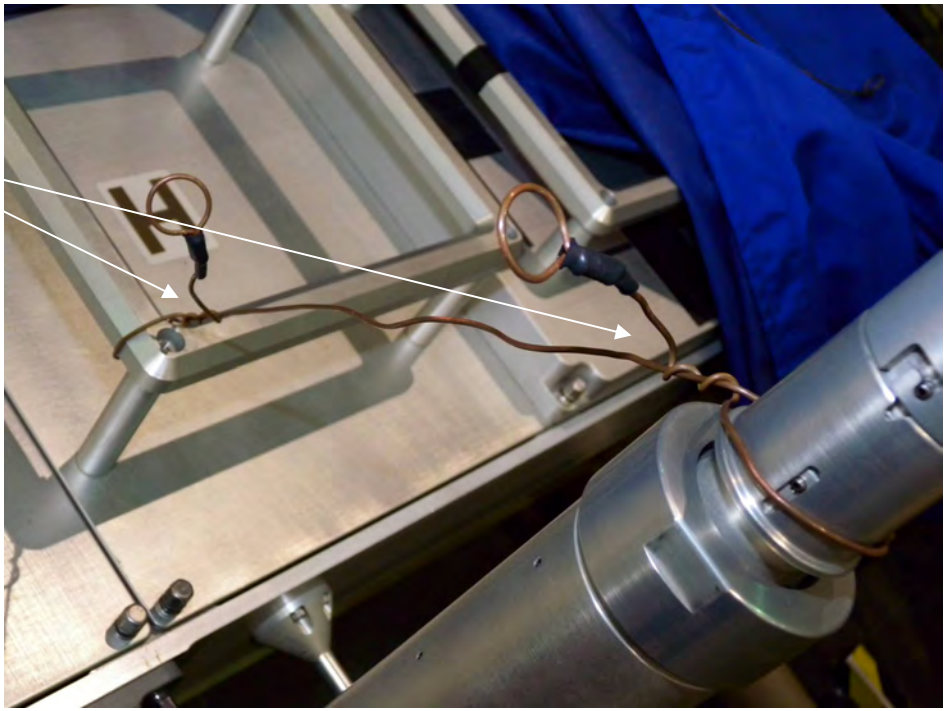


PORT CETA CART RECONFIG TASK DATA



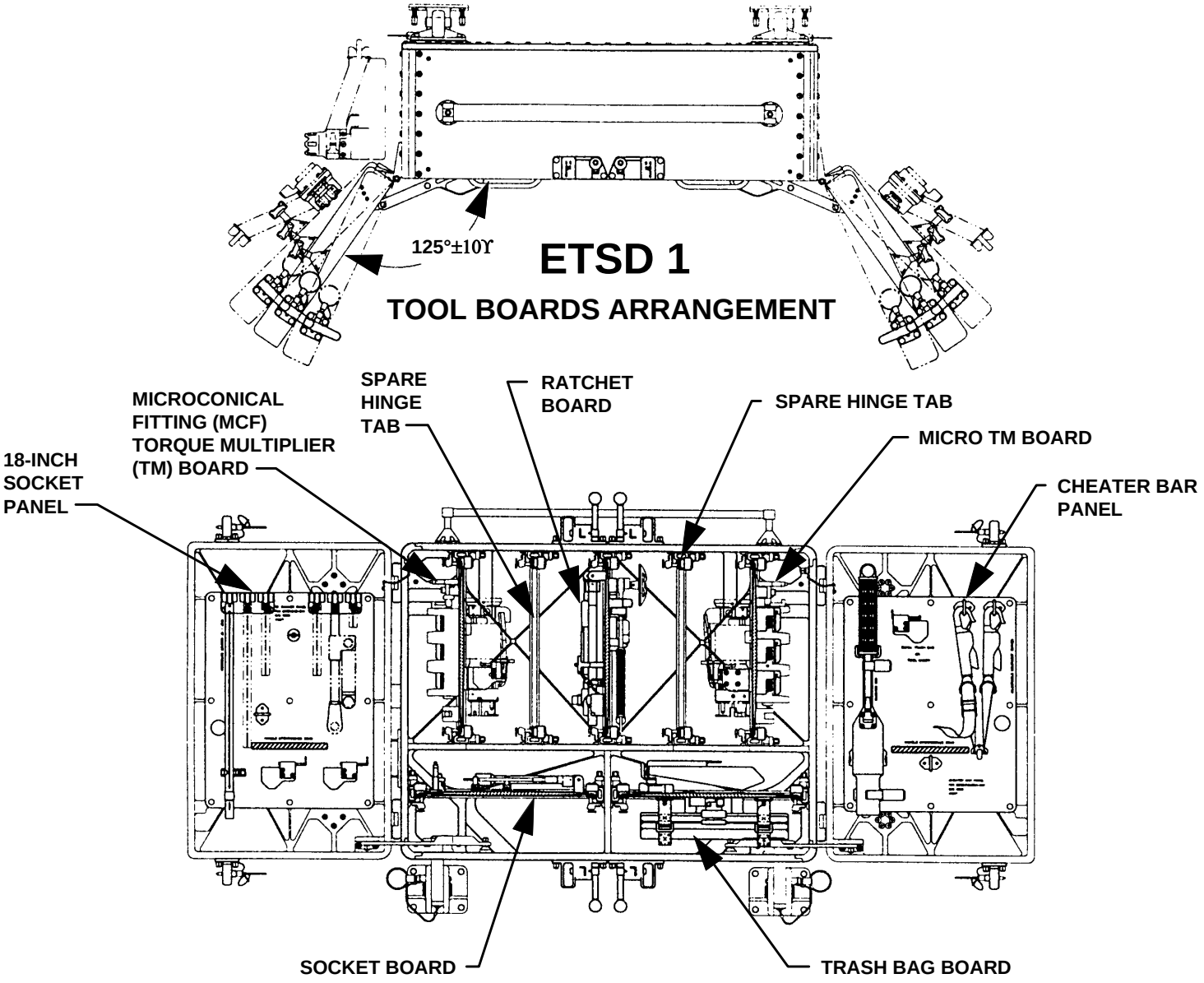


Zenith Port brake handle

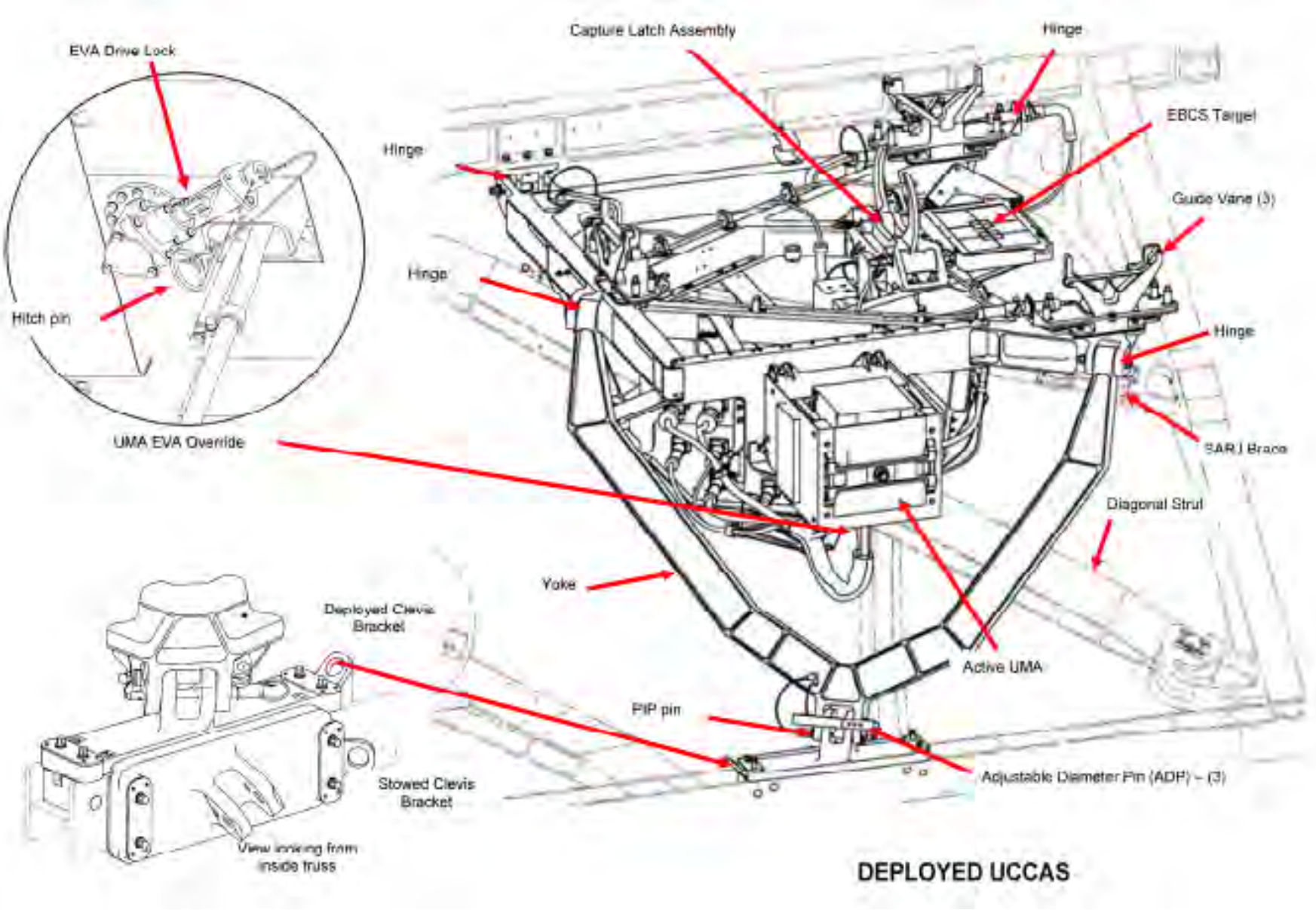


Nadir Port brake handle

TOOL RETRIEVAL TASK DATA



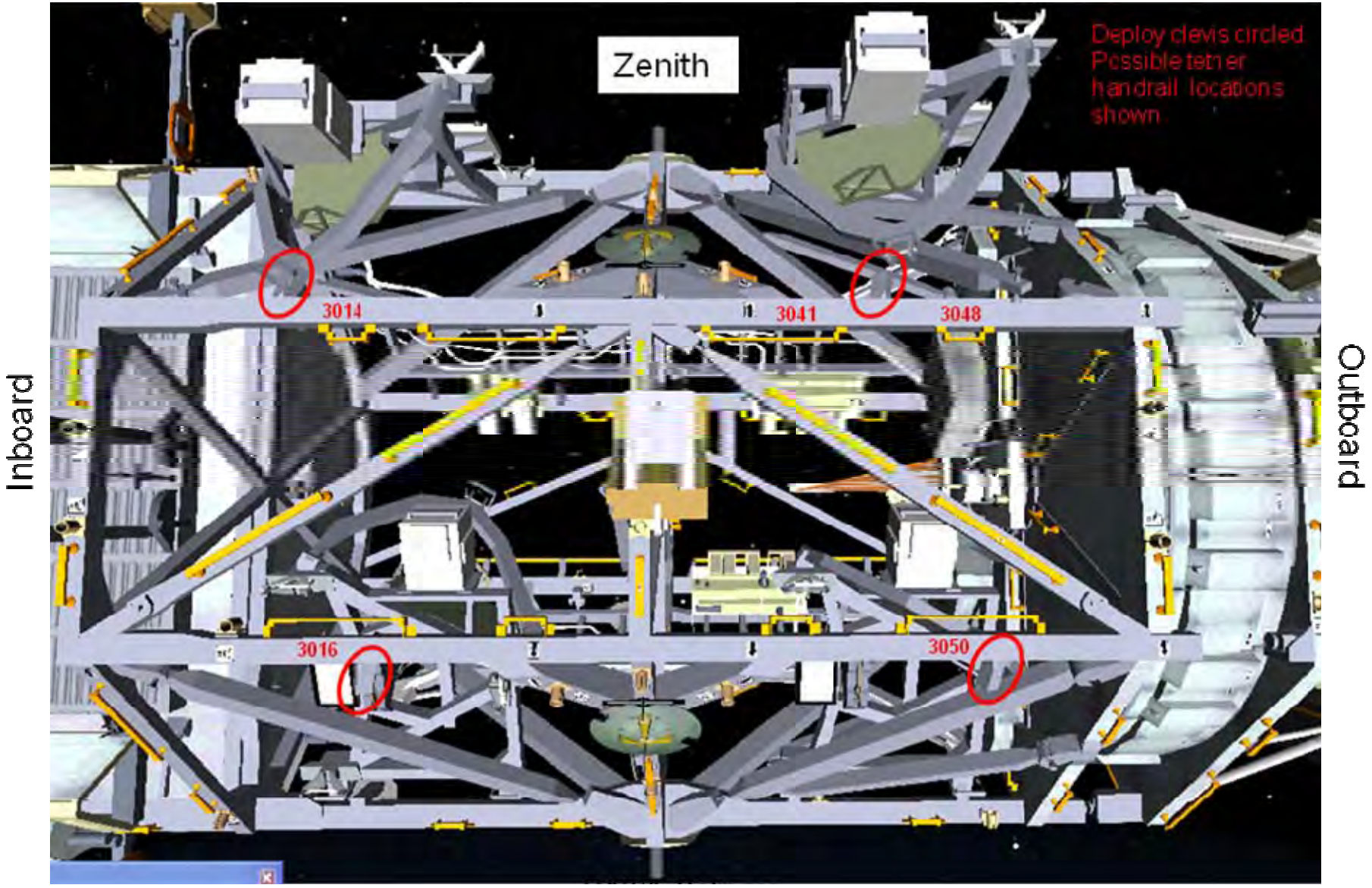
PAS/UCCAS TASK DATA



PAS/UCCAS TASK DATA (Cont)

HINGE LINE ADP ORIENTATION

PAS/UCCAS TASK DATA (Cont)



PAS/UCCAS TASK DATA (Cont)

Estimated Task Duration:

	Without SSRMS
One EV Crew	N/A
Two EV Crew	01:00

Tools:

EV1	EV3
PGT	PGT
7/16-6-in socket ext	7/16-6-in socket ext
	Adj – 45-72-in Gap Spanner (Large) – Adj

EVA Fasteners:

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

Inhibits:

Inhibit
S3/S4 SARJ Locked

Foot Restraints (Contingency Yoke Alignment):

Task	WIF	APFR Setting
Zenith/Outboard PAS	S3-11	5, PP, G, 12
Zenith/Inboard PAS	S3-15	3, RR, F, 10
Nadir/Outboard PAS	S3-17	3, PP, F, 12
Nadir/Inboard PAS	S3-25	11, PP, F, 12
Nadir UCCAS	P3-11	3, PP, H, 12

Notes:

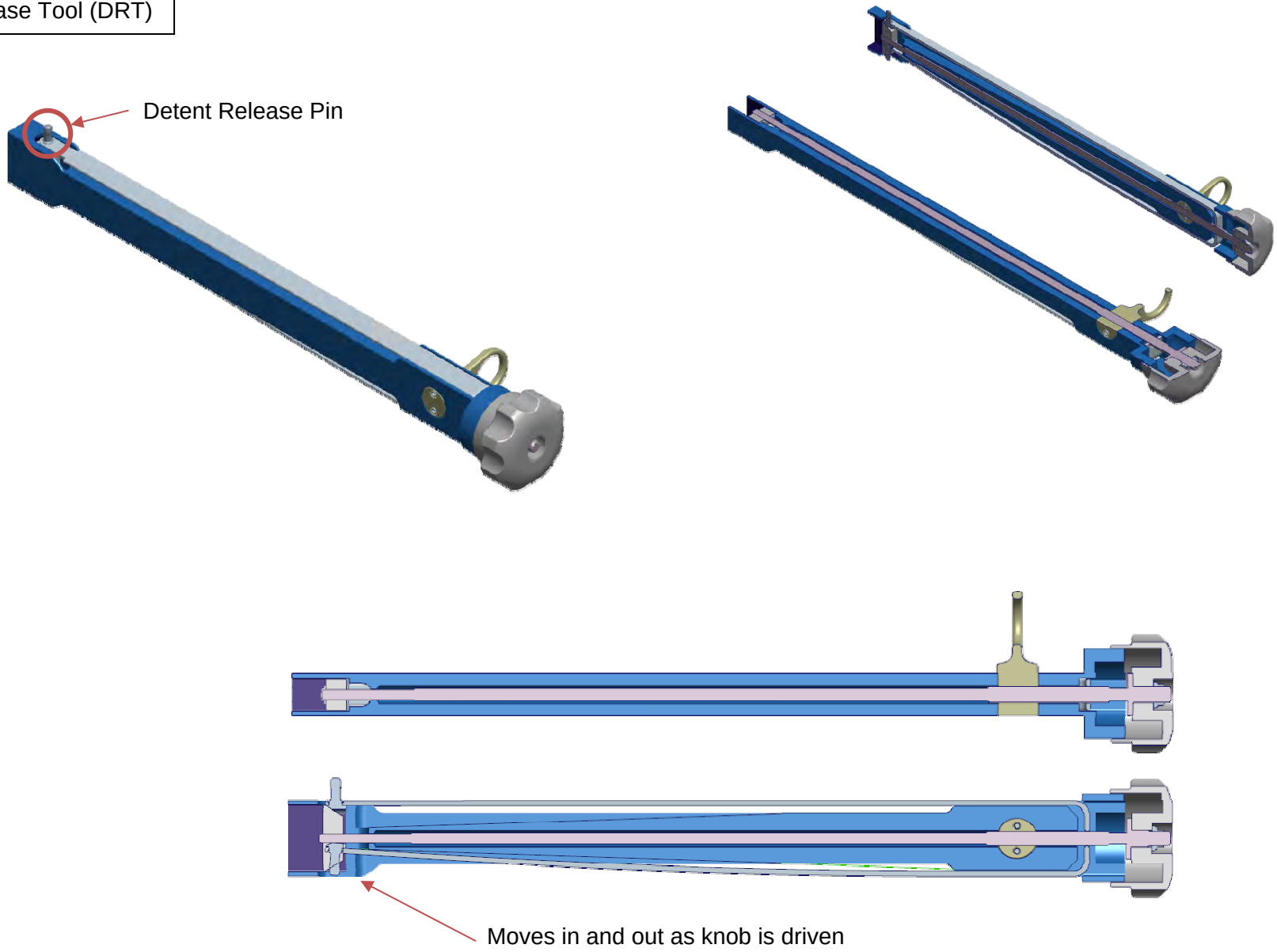
1. UMA EVA Override anti-rotation cap must be removed prior to first use of UMA on PAS
2. EBCS target cover must be removed prior to cargo attachment to PAS. Protects target from MMOD and inadvertent contact. Remove as last activity
3. RAD may be needed for re-install of deployed clevis bracket. It will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

Cautions:

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

Warnings:

Detent Release Tool (DRT)



EVA 2 SUMMARY TIMELINE

PET TIME (HR : MIN)	EVA 2		
	IV/SSRMS	**EV1 – Wolf (SSRMS)**	**EV2 – Marshburn (FF)**
00:00	**(00:00-00:30)**	**EGRESS/SETUP** (00:30) ■ Post Depress and Egress (00:15) ■ Setup (00:15)	**EGRESS/SETUP** (00:30) ■ Post Depress and Egress (00:15) ■ Setup (00:15)
	(00:30-04:30)	**ICC-VLD ORU Transfer to ESP3** (04:05)	**ICC-VLD ORU Transfer to ESP3** (03:25)
	00:30-01:15	■ Set-up SSRMS (00:45)	■ Fixed Grapple Bar (FGB) Prep (00:45)
01:00			
	01:15-01:35	■ Space-to-Ground Antenna (SGANT) ■ Retrieve (00:20)	■ Space-to-Ground Antenna (SGANT) ■ Retrieve (00:20)
02:00			
	01:35-02:05	■ Install (00:30)	■ Install (00:30)
	02:05-02:25	■ Pump Module (PM) ■ Retrieve (00:20)	■ Pump Module (PM) ■ Retrieve (00:20)
03:00			
	02:25-02:55	■ Install (00:30)	■ Install (00:30)
	02:55-03:15	■ Linear Drive Unit (LDU) ■ Retrieve (00:20)	■ FGB Relocate Install (00:20)
04:00	03:15-03:45	■ Install (00:30)	■ Linear Drive Unit (LDU) ■ Install/Cleanup (00:40)
	03:45-04:35	■ Cleanup SSRMS (00:50)	**FWD VE Install on JEF** (01:50)
	(04:35-05:45)	**FWD VE Install on JEF** (01:10)	
05:00	**Bingo Time: Must start VE camera task by PET 05:00**		
	(05:45-06:30)	**CLEANUP/INGRESS** (00:45) ■ Cleanup (00:30)	**CLEANUP/INGRESS** (00:45) ■ Cleanup (00:30)
06:00		■ Ingress and Pre Repress (00:15)	■ Ingress and Pre Repress (00:15)
	Total EVA Time 6:30		

GET-AHEADS: FPP Sleeves, JEM OIH & OIW, Node 2 Gap Spanner Install, Lab Cable Tie Down, APFR 5 retrieve

EVA 2 TOOL CONFIG

EV1
EMU D-rings
- ❑❑ Ext on left side
- ❑❑ Ext on right side
- ❑❑ Waist Tethers (right EXT, √locked)

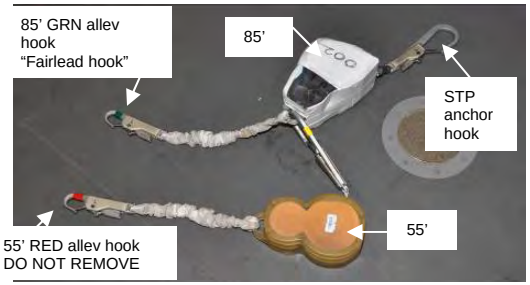
MWS
- ❑❑ Small Trash Bag
  - ❑❑ Wire Tie (long)
- ❑❑ 1 – Wire tie as tether loops
- ❑❑ RET (with PIP pin)
- ❑❑ RET
  - ❑❑ WIF adapter w/PIP Pin
- ❑❑ 3 – AET
- ❑❑ 55' Safety Tether
- ❑❑ Swing Arm (right side)
  - ❑❑ 2 – RET (Attach to PGT)
    - ❑❑ PGT s/n _____
    - ❑❑ 6-in ext
- ❑❑ BRT (left side)
  - ❑❑ RET
  - ❑❑ 3 – wire ties (long)
  - ❑❑ wire tie (short)

EV2
EMU D-rings
- ❑❑ Ext on left side
- ❑❑ Ext on right side
- ❑❑ Waist Tethers (right Ext to MWS, √locked)

MWS
- ❑❑ Small Trash Bag
  - ❑❑ Wire Tie (short)
- ❑❑ 1 – Wire tie as tether loop
- ❑❑ RET w/PIP pin (L D-ring)
- ❑❑ RET (R D-ring)
- ❑❑ 2 – AET (b/w D-rings)
- ❑❑ Swing Arm (right side)
  - ❑❑ 2 – RET (Attach to PGT)
    - ❑❑ PGT s/n _____
    - ❑❑ 6-in ext
- ❑❑ BRT (left side)
  - ❑❑ RET
  - ❑❑ wire tie (long)
  - ❑❑ wire tie (short)

ISS Configuration
MT @ WS7 w/CETA 1 Port, CETA 2 Stbd
SSRMS base B, on PDGF3
SPDM on Lab
ICC-VLD on POA
JEF installed to JPM
JLE in PLB
Port SARJ locked
Port TRRJ locked

Safety Tether config (STP = safety tether pack, 55+85)
EV1 ST pack (55+85) to be anchored at S0 HR 3516
EV2 ST pack (55+85) to be anchored at S0 HR 3483
Fairlead at ALK HR 0538 (AET)



Review PGT ops
- Report "green light" (for torque down ops)
- Report torque and turns
- Expect LOTORQ fault msg, Fault LED and Red LED for bolt release ops

Record:
EV1 PGT (serial _____, bat # _____)
EV2 PGT (serial _____, bat # _____)
Spare PGT (serial _____, bat # _____)

Prior to EVA, perform the following inspections:
1. RET cords for fraying
2. Safety and waist tether load alleviation straps for damage and discoloration, verify no red line visible
3. Inspect ISS trash bags for deformation/damage
4. Inspect EMU gloves for damage
5. Inspect BRTs and ballstacks for loose fittings/screws
6. Use Blue RETs only

❑❑ RET Lg-sm (A/L stowage)
- ❑❑ **Crewlock Bag – MISC Bag (M)**
  - ❑❑ AET (ext D-ring)
  - ❑❑ 55' Safety Tether (int RET #1)
  - ❑❑ Camera w/bracket (bracket RET to int D-ring #1)
    - ❑❑ RET sm-sm
  - ❑❑ RET sm-sm (int D-ring #2 to door handle)
    - ❑❑ WIF adapter
  - ❑❑ RET sm-sm (int D-ring #3 to door handle)

❑❑ RET Lg-sm (A/L stowage)
- ❑❑ **Crewlock Bag – JEF VE Bag (J)**
  - ❑❑ AET (ext D-ring)
  - ❑❑ VE Cap – Size 17 (1) (int RET #1)
  - ❑❑ Ratchet (int RET #2)
    - ❑❑ 2" ext
  - ❑❑ Socket caddy (int RET #3)
    - ❑❑ Right Angle Drive
      - ❑❑ 2" ext
    - ❑❑ 6" ext
  - ❑❑ Round Scoop (int RET #4)
  - ❑❑ RET sm-sm (int D-ring #1 to door handle)
    - ❑❑ VE I/F cable
  - ❑❑ RET sm-sm (int D-ring #2 to door handle)
    - ❑❑ VE Launch Lock
  - ❑❑ RET sm-sm (int D-ring #3 to door handle)
    - ❑❑ VE MLI (upper)
  - ❑❑ RET sm-sm (int D-ring #4 to door handle)
    - ❑❑ VE MLI (lower)

EVA 2 TOOL CONFIG (Cont)

Staging Bag
- ❑❑ Fish Stringer #1
  - ❑❑ Wire Tie Caddy (hook #1)
    - ❑❑ 9 wire ties
  - ❑❑ Velcro/Tape Caddy (hook #2)
  - ❑❑ PGT (hook #3) s/n _____
    - ❑❑ PGT Battery s/n _____
    - ❑❑ 7/16-in (wobble) Socket – 6 ext
  - ❑❑ Vise Grips (hook #4)
  - ❑❑ Ratchet Wrench (hook #5)
    - ❑❑ 7/16-in (rigid) Socket – 9 ext
  - ❑❑ Cheater Bar (hook #6)
  - ❑❑ Hammer (hook #7)
- ❑❑ RET Lg-sm
  - ❑❑ Bolt Puller
- ❑❑ Fish Stringer #2
  - ❑❑ Spare Torque Wrench w/MLI (hook #1)
  - ❑❑ Connector Cleaner Tool Kit (hook #2)
  - ❑❑ Pin Straightener Assy (hook #3)
  - ❑❑ Probe w/BRS Pin Tool Sheath (hook #4)
  - ❑❑ Prybar (hook #5)
  - ❑❑ Needlenose Pliers (hook #6)
  - ❑❑ MWS Key Strap Assy (on wire tie, to strap)

Crewlock Zenith Handrail
- ❑❑ Spare STP
- ❑❑ RET Lg-sm **(Lg hook attached outside bag to Zenith C/L Handrail & small Hook attached to FPP sleeve)**
  - ❑❑ FPP sleeves (sz 33/37) (**FPP stuffed in staging bag**)
- ❑❑ RET Lg-sm **(Lg hook attached outside bag to Zenith C/L Handrail & small Hook attached to FPP sleeve)**
  - ❑❑ FPP sleeves (sz 33/37) (**FPP stuffed in staging bag**)

IV Bag
- ❑❑ 2 – Towel
- ❑❑ Contamination Detection Kit
- ❑❑ 2 – GP Caddy
  - ❑❑ Thermal Mittens (1 pair)
- ❑❑ RET (sm-sm) (Black)
  - ❑❑ Socket Caddy
    - ❑❑ 1/2-in (wobble) Socket – 8 ext
    - ❑❑ 7/16-in (wobble) Socket – 6 ext
- ❑❑ 2 – DCM Plug (SAFER Hardmount)
- ❑❑ 2 – RET (sm-sm, black)

Tether counts:	**used**	**available**
RET sm-sm -381	15	16
RET lg-sm -385	4	8
RET sm-sm pp -383	2	5
AET sm-sm	10	8 ISS/8 STS
AET lg-sm	0	2

ISS External
{Nominally Left Outside from EVA1 – Lab/Zenith/Fwd}
- ❑❑ **MLI Bag (Lg ORU)**
  - ❑❑ AET ext
  - ❑❑ AET ext
  - ❑❑ Fish stringer #1 (empty)
  - ❑❑ Fish stringer #2 (outside bag, under flap)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Wire tie caddy w/long wire ties (9)
  - ❑❑ Fish stringer #3
    - ❑❑ JPM OIH 1116
    - ❑❑ JPM OIH 1204
    - ❑❑ JPM OIH 1206
    - ❑❑ JPM OIW 43
    - ❑❑ JPM OIW 36
    - ❑❑ Gap spanner (72") – split across two hooks

EVA 2 INHIBIT PAD

Orbiter

TCS

L12 1. √TCS POWER – OFF

KU-BAND ANTENNA (performed during egress)

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

RCS (on call, crew not expected in area)

If EV crew < 27 ft from FRCS

IV 1. √DAP: VERN, FREE, LO Z (flt specific check with GNC)

O14,15,16 2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF
LOGIC (four) – OFF

MCC-H 3. √Above RCS config

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

S-BAND ANTENNAS

NOTE

Possible loss of comm when forced LL FWD antenna

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

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

If no comm, or on MCC GO

C3 3. S-BAND PM ANT – LL FWD

When EVA crewmember at least 2 ft away from all S-Band upper antennas

C3 4. S-BAND PM ANT – GPC

Ground

All EVAs

Ground Radar

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

USOS

ALL EVAs

PCU

NOTE

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

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

Mobile Transporter

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

ESP-3

MCC-H 1. RPCM P3 3AE RPCM1 – OPEN
2. RPCM P4 4BE RPCM2 – OPEN

P1 TRRJ (ORU transfers)

MCC-H TRRJ LOCKED at 0 deg
1. √DLA (1) – LOCKED

Lab Window (on call, crew not expected in area)

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

KU-Band (SGANT Antenna) (on call, crew not expected in area)

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

EVA 2 INHIBIT PAD (Cont)

USOS (Cont)

LOCATION DEPENDENT INHIBITS

S-Band (SASA) Antennas (on call, crew not expected in area)
MCC-H If EV crew < 3.6 feet from S1 SASA [P1 SASA]
1. P1 SASA (S1 SASA) – Active
2. S1 SASA [P1 SASA] – Powered down

FPMU (on call, crew not expected in area)
MCC-H If EV crew working within 5 feet of Floating Potential Measurement Unit
1. FPMU power – Off

P3 SARJ
MCC-H SARJ locked at any angle
1. √DLA (1) – LOCKED
2. All motor setpoints set to zero
3. All motors deselected

SSPTS (on call, FPP sleeves and Lab cable tie down)
MCC-H
1. RPCM LA1A4A D RPC 3 – Open, Close Cmd Inhibit
2. RPCM LA2A3B D RPC 1 – Open, Close Cmd Inhibit
3. RPCM Z14B A RPC 2 – Open, Close Cmd Inhibit
4. RPCM Z13B A RPC 2 – Open, Close Cmd Inhibit

ICC-VLD (EVA 2 power down for ORU Retrieve)
MCC-H
1. CRPCM 2P RPC2 – OPEN
2. CRPCM 2R RPC2 – OPEN

COL

EuTEF
COL-CC 1. √PLEGpay Power Status (ETF_PLEGPAY_Pwr_Stat) – OFF

JEM

JEMRMS (VE camera install)
SSIPC If EV crew working within vicinity (5 ft) of JEM RMS
1. RIP MA Brake – On
2. MDP Main Mode – Stby Mode
Or
1. JEMRMS Rack – OFFEMRMS

JPM Window (VE camera install)
IV Close JPM AFT window shutter
If crew within 3ft, close FWD shutter

EFBM (VE camera install)
IV √P011B on Jumper Cable is disconnected for BEP
SSIPC PDB A2 RPC01 – Op

JPM PROX Antenna (VE camera install)
SSIPC If EV crew working within 0.3 ft of JPM PROX Antenna
1. TRX Power – OFF
2. TX Power – OFF
Or
1. JPM PROX Antennas – OFF

EFU (VE camera install)
SSIPC JEF PDB a RPC03 – Op
JEF PDB b RPC20 – Op
EFU [X] Sel Status – Not_select [X=1 to 12]
EEU Mode – EFU_stop

SSE SLM (VE camera install)
SSIPC SSE SLM Ops Ena/Inh Status1 – Enable
SSE SLM Ops Ena/Inh Status2 – Enable

EVA 2 INHIBIT PAD (Cont)

JEM (Cont)

JEF Fwd VE (VE camera install, can be done prior to task start)

SSIPC
PDB b RPC26 – Open
PDB b RPC22 – Open
PDB b RPC23 – Open
HCE a sw11 – Open
HCE b sw65 – Open

JPM JTVE (aft) (VE camera install)
SSIPC PDB b2 RPC4 – Open

RSOS (1)

ALL EVAs

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

IMPULSE
MCC-M
1. IMPULSE (ИПИ-100) – Deactivate

RSOS (1) (Cont)

EVAS ON PMA 1 OR RSOS (LOCATION DEPENDENT) (on call for APFR 5 relocate)

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

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

FGB Antennas
MCC-M
1. √FGB KURS P [КУРС Р] – Deactivated

Soyuz Antennas
MCC-M
1. √Soyuz KURS A [КУРС А] – Deactivated

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 Constraints

A. Avoid inadvertent contact with
   34. Grapple fixture shafts (drylube)
   35. PIP pins
   36. EVA Crane [PMA1]
   37. TCS Reflectors [PMA2,PMA3]
   38. APAS hardware [PMA2,PMA3]
   39. CETA Lights (Z-93 paint) [LAB,S1, Node 1]
   40. Deployed MISSEs [Columbus EPF]
   41. Passive UMAs
   42. MBS/SSRMS/SPDM/JEMRMS taped radiative surfaces: VDU, ACU, JEU, LEU, MCU, CRPCMs, and Cameras
   43. Deployed TUS cable [Nadir CETA rail]
   44. S0 aft face Radiator
   45. GPS Antennas (S13 paint) [S0,JLP]
   46. UHF Antennas [LAB,P1]
   47. ETCS Radiator flexhoses and panels [S1,P1]
   48. EETCS/PV Radiator flexhoses, bellows and panels [P6,P4,S4,S6]
   49. SASA RF Group [S1,P1]
   50. Heat pipe radiators [Z1]
   51. PCU cathode and HCA ports [Z1]
   52. Ku-Band Antenna (SGANT) dish [Z1]
   53. CMG cover/shells [Z1]
   54. SPDM SJEU, EP, OTCM, LEU, and LEE VDU Radiator surfaces
   55. Open CBM petal covers, LAB window shutter, and JPM window shutter
   56. FPMU [S1]
   57. OTSD
   58. COL HAM radio antennas [COL-Nadir]
   59. JTVE, JEF VE Cameras [JEM]
   60. JEM A/L Target and Pins
   61. S0/Node 2 Fluid Tray Hardlines at Node 2 end are limited to 25 lb
   62. JEF ORUs and EFU (paint, lubricant)
   63. MAXI front panel (paint)
   64. SEDA-AP sensors (HIT, SDOM, AOM) and MPAC & SEED

CAUTION

ISS Constraints (Cont)

A. Inadvertent contact (Cont)
   32. Con'PIU, Trunnions and UCM (paint, lubricant) [ICS-EF,MAXI,SEDA-AP]
   33. JLE – PIU, Alignment guide and UCM (paint, lubricant) [ICS-EF,MAXI,SEDA-AP]

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
   4. Avoid tool impact on ICS-EF sensor

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 & 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 & 566, A/L Tank 2 nad/fwd & 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, JEF VE)
7. JEM EFBM capture latches
8. JEM EFU latching arms
9. JEF SSE latch
10. ICS-EF antenna boom
11. SEDA-AP Mast
12. JLE SLM latch

WARNING

ISS Constraints (Cont)

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

E. RF radiation exposure
1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1]
2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1]
3. Stay 1 ft from UHF Antenna when powered [LAB,P1]
4. Stay 0.3 ft from fwd/aft JPM PROX antenna
5. Stay 246 ft from ICS-EF if powered

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
18. ICS-EF AHM gears
19. MAXI Visual Star Camera
20. PIU springs [ICS-EF,MAXI,SEDA-AP]

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/JEF VE 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 powered
      - 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) ESP2 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

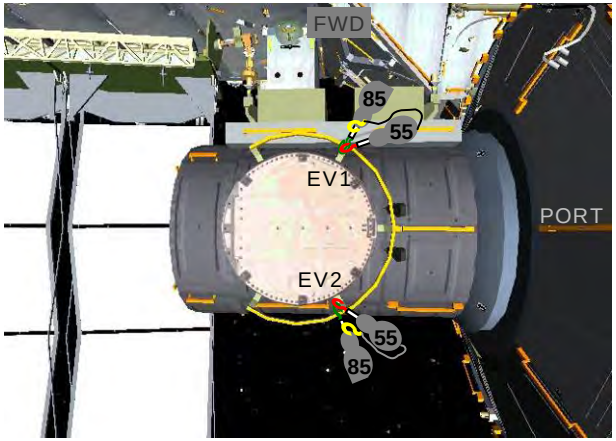
A. Avoid inadvertent contact with
1. HTV solar array panels (kick loads can shatter panel and generate sharp edges) [HTV]
2. HTV fwd RCS thrusters [HTV]

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]

D. Thermal
1. EP handrails may be hot. Handling may need to be limited

EGRESS/SETUP (00:30)

IV/RMS	EV1 – WOLF (FF)	EV2 – MARSHBURN (FF)
 Post crew egress: WVS Software: Select page – RF Camera sel 'Advanced controls' S-Band level (two) – max (Required after A/L egress) **IV: √Port TRRJ and SARJ are both locked**	**Initial Configuration:** 1. Waist tether to UIA D-ring ❑ √Gate closed ❑ √Hook locked ❑ M Bag on BRT <u>EGRESS/INITIAL SETUP</u> 2. On EV2 GO, release EV2 waist tether from A/L D-ring 3. **Transfer J Bag** to EV2 4. On EV2 GO, retrieve waist tether from UIA 5. **Egress crewlock** 6. Close hatch thermal cover 7. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed) 8. Depart A/L	**Initial Configuration:** 1. Waist tether to A/L D-ring ❑ √Gate closed ❑ √Hook locked <u>EGRESS/INITIAL SETUP</u> 2. **Open hatch thermal cover** 3. Egress airlock 4. Attach AFT 55-ft **RED** alleviator hook to (L) D-ring EXT ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked ❑ LAS Inspection 5. Attach AFT 85-ft **GRN** alleviator hook to D-ring EXT (L) 6. Verify 55-ft **YEL** anchor hook to 85' ERCM ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked ❑ LAS Inspection 7. **Receive J Bag**; stow on BRT 8. Attach FWD 55-ft **RED** alleviator hook to EV1 D-ring EXT(L) ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked ❑ LAS Inspection 9. Attach 85-ft **GRN** alleviator hook to EV1 D-ring EXT (L) 10. Verify 55-ft **YEL** anchor hook to 85-ft ERCM ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked ❑ LAS Inspection 11. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed) 12. Perform translation adaptation 13. Depart A/L

EGRESS/SETUP (00:30) (Cont)

IV/RMS	EV1 – WOLF (FF)	EV2 – MARSHBURN (FF)
	9. Xlate to S0; verify STP anchor point (S0 HR 3516) ❑ √Gate closed ❑ √Hook locked 10. **Xlate to S0 WIF 42** 11. **Temp stow M Bag** on APFR; retrieve APFR	14. Xlate to S0; verify STP anchor point (S0 HR 3483) ❑ √Gate closed ❑ √Hook locked 15. **Xlate to S0**; **temp stow J bag** (Lab Zenith near port strut)

ICC-VLD ORU TRANSFER TO ESP3 (04:05)

IV/RMS

FGB Bolt Install	Torque	Turns
1		
2		
3		
4		

1. Give GO to SSRMS operator to maneuver to **SGANT Retrieve**

EV1 – WOLF (SSRMS)

SET UP SSRMS

1. **Xlate to P1 APFR/SSRMS setup location**
2. **Temp Stow M Bag** on P1 HR _____
3. As needed, **GCA** SSRMS to perform arm setup
4. Install WIF Adapter into SSRMS (install tether point towards EE)
   - ❑ Black on Black
   - ❑ Pull Test
5. Install APFR in WIF Adapter **[12, KK, F, 6]**
   - ❑ Black on Black
   - ❑ Pull Test
6. Perform tether swap onto SSRMS EE HR
   - ❑ √Gate closed
   - ❑ √Hook locked
   - ❑ √Reel unlocked
   - ❑ √Locally tethered to SSRMS
   - ❑ √Off-going tether pack stowed on P1 HR (3664) _____
7. √Local tether clear of SSRMS
8. **GCA** SSRMS for APFR ingress
9. Ingress APFR
10. Perform Glove Inspection
11. Give SSRMS GO for APFR Backaway and SGANT Retrieval **(~15 min)**
12. Verify Ingress Aid is clear and retracted

EV2 – MARSHBURN (FF)

FIXED GRAPPLE BAR RELOCATE

1. **Xlate to ESP2 PM**
2. Open PM MLI in prep for FGB removal
3. Loosen ESP2 PM FGB Bolts (four), 10-11 turns:
   PGT [B7 (25.5 ft-lb), CCW 3, 30.5], 6-Ext 7/16
   - ❑ Bolt 1
   - ❑ Bolt 2
   - ❑ Bolt 3
   - ❑ Bolt 4
4. Remove FGB from PM, place on BRT
5. **Xlate to P1 ATA**
6. Softdock FGB on nadir side of P1 ATA (soft dock on bolt 3)

NOTE

Bolts are started by hand in any order. Torque must be delivered to bolts in a star pattern (no specified first bolt)

7. Engage FGB bolts (four), 10-11 turns:
   PGT [A7 (9.2 ft-lb), CW2, 30.5], 6-Ext 7/16
8. Provide WVS Survey
9. **Xlate to ICC-VLD**

WARNING

Avoid contact and EVA kickloads to ICC-VLD keel camera target

NOTE

FRAM has a 5.5 lb magnetic soft dock at fwd 2 corners and a 3.5 lb soft dock at aft 2 corners

ICC-VLD ORU TRANSFER TO ESP3 (04:05) (Cont)

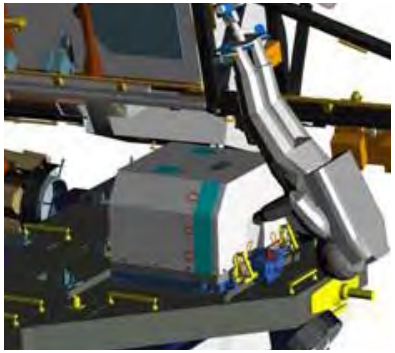
IV/RMS	EV1 – WOLF (SSRMS)	EV2 – MARSHBURN (FF)
  2. Give SSRMS go to maneuver to **SGANT Hover** and maneuver to **SGANT Pre-Install** 3. Give SSRMS operator Go to back away and maneuver to **Pump Module Retrieve** Primary FRAM Bolt (Install) | Torque | Turns SGANT | |	RETRIEVE OF SGANT FROM ICC-VLD 13. **GCA** SSRMS to SGANT Retrieve position 14. Perform the following before SGANT is released: ❑ Attach RET to SGANT ❑ √Boots are locked into boot plate ❑ √Cooling, glove heaters, visor, tools, tethers ❑ INSPECT GLOVES 15. Retrieve EV2 PGT 16. On IV and EV1 GO: **PGT [A4 (6.3 ft-lb), CCW2, MTL 30.5], 6-ext 7/16** Verify 0 Turn Count Release primary FRAM bolt ~11 turns to hard stop (push ~10 lb to release locking tabs) 17. Give SSRMS go to maneuver to **SGANT Hover** and maneuver to **SGANT Pre-Install** position **(~15 min)** INSTALL SGANT TO ESP3 – FRAM 5 18. **GCA** SSRMS for install of SGANT 19. Position SGANT for soft dock 20. On IV GO: **PGT [A4 (6.3 ft-lb), CW2, MTL 30.5], 6-ext 7/16** Verify 0 Turn Count Engage primary FRAM bolt ~ 11 turns to hard stop (push ~10 lb to release locking tabs) Verify FRAM Visual Indicator 21. Verify from EV2 SGANT installed; remove SGANT tether 22. Give SSRMS GO for back away and maneuver to **Pump Module Retrieve** position **(~15 min)** 23. Perform Glove Inspection 24. Verify Ingress Aid is clear and retracted	RETRIEVE OF SGANT FROM ICC-VLD 10. If time permits: ❑ Open 1/4 turn fasteners on Port side of PM: Open/Fluff/Close ❑ Open 1/4 turn fastener on Aft face of LDU: (stbd most): Open/Fluff/Close 11. Stage EV2 PGT for EV1 use 12. Retrieve EV2 PGT 13. Position body on PORT edge of ICC looking STBD for SGANT clearance monitoring 14. **Xlate to ESP3** INSTALL SGANT TO ESP3 – FRAM 5 15. Position body for overall clearance monitoring on zenith edge of ESP3 with head aft 16. Notify SSRMS Operator EV2 in position for **SGANT Pre-Install** viewing support 17. Before bolting, re-position body to inboard face to stabilize SGANT 18. Perform pull test of SGANT on AFRAM 19. Perform Glove Inspection 20. **Xlate to ICC-VLD**

ICC-VLD ORU TRANSFER TO ESP3 (04:05) (Cont)

IV/RMS	EV1 – WOLF (SSRMS)	EV2 – MARSHBURN (FF)
  4. Give SSRMS operator Go to back away and maneuver to **Pump Module Pre-Install** 5. Give SSRMS operator Go to back away and maneuver to **LDU Retrieve**	RETRIEVE OF PUMP MODULE (PM) FROM ICC-VLD 25. **GCA** SSRMS retrieve pump module 26. Perform the following before PM is released: ❑ Attach RET to PM ❑ **√RET locked** ❑ √Boots are locked into boot plate ❑ √Cooling, glove heaters, visor, tools, tethers 27. Give EV2 GO for PM FRAM release 28. Give SSRMS go to back away and maneuver to **Pump Module Pre-Install (~15 min)** 29. During arm trajectory, rotate PM 90 deg ccw for install INSTALL PM to ESP3 – FRAM 3 30. **GCA** SSRMS to install PM 31. Position PM for soft dock 32. Verify from EV2 PM installed, Remove PM tether 33. Standby while EV2 removes Ingress Aid from APFR 34. Give SSRMS operator GO to back away and maneuver to **LDU Retrieve** position **(~15 min)**	RETRIEVE OF PUMP MODULE (PM) FROM ICC-VLD 21. If not previously completed: ❑ Open 1/4 Turn Fasteners on Port Side: Open/Fluff/Close ❑ Open 1/4 turn fastener on Aft face of PM: (stbd most): Open/Fluff/Close 22. On IV and EV1 GO: **PGT [A4 (6.3 ft-lb), CCW2, MTL 30.5], 6-ext 7/16** Verify 0 Turn Count Release primary FRAM bolt ~11 turns to hard stop (push ~10 lb to release locking tabs) 23. Verify PM clear of ICC-VLD, give EV1 GO for mnvr 24. **Xlate to ESP3** INSTALL PM to ESP3 – FRAM 3 25. Initially position on port edge of FHRC tombstone for clearance of APFR/IA to FHRC 26. Xlate to position head Aft, Nadir of FHRC 27. Assist EV1 to soft dock 28. On IV GO: **PGT [A4 (6.3 ft-lb), CW2, MTL 30.5], 6-ext 7/16** Verify 0 Turn Count Engage primary FRAM bolt ~ 11 turns to hard stop (push ~10 lb to release locking tabs) Verify FRAM Visual Indicator 29. Perform pull test of PM 30. Retrieve Ingress Aid from EV2 APFR 31. Xlate to M Bag, temp stow Ingress Aid 32. **Xlate** as required to complete FGB Relocate Task

Primary FRAM Bolt (Install)	Torque	Turns
Pump Module		

ICC-VLD ORU TRANSFER TO ESP3 (04:05) (Cont)

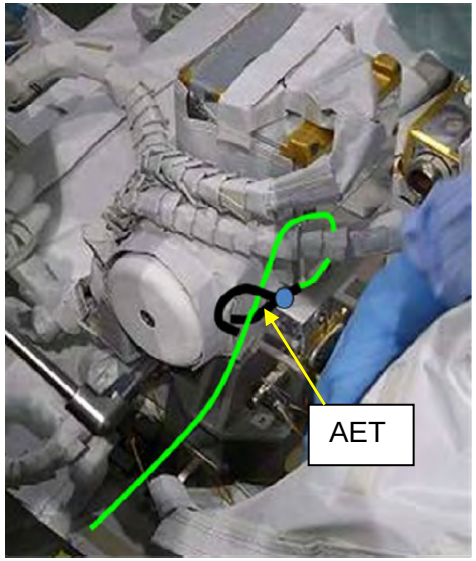
IV/RMS	EV1 – WOLF (SSRMS)	EV2 – MARSHBURN (FF)
	RETRIEVE OF LDU FROM ICC-VLD 35. **GCA** SSRMS to Retrieve LDU 36. Perform the following before LDU is released: ❑ Attach RET to LDU ❑ √Boots are locked into boot plate ❑ √Cooling, glove heaters, visor, tools, tethers 37. On IV and EV1 GO: **PGT [A4 (6.3 ft-lb), CCW2, MTL 30.5], 6-ext 7/16** Verify 0 Turn Count Release primary FRAM bolt ~11 turns to hard stop (push ~10 lb to release locking tabs)	RETRIEVE OF LDU FROM ICC-VLD 33. Only if required, assist EV1
6. Give go to SSRMS Operator to back away and maneuver to **LDU Pre-Install** 7. Verify EV2 is in position for clearance views before GCA of LDU install	38. Give go to SSRMS Operator to back away and maneuver to **LDU Pre-Install (~15 min)** 39. During trajectory, rotate LDU 180 deg for install	
Primary FRAM Bolt (Install) / Torque / Turns LDU	INSTALL LDU TO ESP3 – FRAM4	INSTALL LDU TO ESP3 – FRAM 4 34. **Before GCA start** position body to provide clearance views during LDU install – on P3 (Face 4 – looking zenith) 35. Provide GCA calls as necessary
	40. After EV2 is in position for viewing**, GCA** SSRMS to install LDU 41. During trajectory, rotate LDU 180 deg for install 42. Position LDU for soft dock 43. On IV GO: **PGT [A4 (6.3 ft-lb), CW2, MTL 30.5], 6-ext 7/16** Verify 0 Turn Count Engage primary FRAM bolt ~ 11 turns to hard stop (push ~10 lb to release locking tabs) Verify FRAM Visual Indicator 44. Verify from EV2 LDU installed, Remove LDU tether 45. Give GO to SSRMS Operator to back away and maneuver to **APFR Egress (~15 min)**	36. Pull test on LDU
8. Give Go to SSRMS operator to back away and maneuver to **APFR Egress**	46. Perform Glove Inspection	

ICC-VLD ORU TRANSFER TO ESP3 (04:05) (Cont)

IV/RMS	EV1 – WOLF (SSRMS)	EV2 – MARSHBURN (FF)
		37. Re-configure CETA Cart Brake Handle as needed
9. **IV: Move to JPM FWD Window** √JPM AFT window shutter closed	CLEAN UP SSRMS 47. **GCA** SSRMS to Egress APFR 48. Egress APFR 49. As needed, GCA SSRMS to de-configure arm 50. Attach 55-ft **RED** alleviator hook to D-ring EXT (L) ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked 51. Attach 85-ft **GRN** alleviator hook to D-ring EXT (L)	38. Perform Glove Inspection 39. **Xlate to S0**; **retrieve J bag** 40. **Xlate to JEF** 41. Fairlead at Node2 HR 0344
10. Give GO to SSRMS operator to maneuver to **Overnight Park** position	52. Remove 55-ft SSRMS safety tether from SSRMS; stow in M bag 53. Retrieve APFR; stow on BRT 54. Retrieve WIF Adapter; stow in M bag 55. Notify SSRMS operator arm is de-configured – GO for maneuver to **Overnight Park** 56. **Retrieve M bag**; temp stow on APFR 57. **Xlate to S0 WIF 42**; Install APFR; **settings [__,___,___,___]** 58. **Xlate to JEF**	

FWD JEF VE INSTALL (01:10)

IV/RMS	EV 1/2
1. IV: Verify VE inhibits **SSIPC** JEF PDB b RPC26 – Open JEF PDB b RPC22 – Open JEF PDB b RPC23 – Open JEF PDB b2 RPC4 – Open HCE a sw11 – Open HCE b sw65 – Open	CAUTION White paint on DCU is a not touch area Once MLI removed, PTU becomes pinch point 1. Xlate to JEF AFT VE launch location 2. **EV2 – Temp stow J bag** HR 7037 (b/w R-ORU &DCU plate) MLI/LAUNCH LOCK RETRIEVE (EV2) 3. Attach 2-RETs to VE MLI 4. Open MLI 5. Retrieve RAD w/2-in ext from J bag; install on PGT 6. Stow 6-in on socket caddy (as reqd) 7. **PGT [B5, CCW2, 30.5] RAD, 2"-ext 7/16;** Release upper Launch Lock bolts (2) 16 turns (at socket) ❑ Bolt 1 ❑ Bolt 2 8. Release MLI grounding wires 9. Remove upper & lower VE MLI; stow outside J bag 10. RET from J Bag to Launch Lock 11. **PGT [B5, CCW2, 30.5] RAD, 2"-ext 7/16;** Release lower Launch Lock bolts (2) 16 turns (at socket) ❑ Bolt 3 ❑ Bolt 4 12. Stow launch lock in J bag CABLE DISCONNECT (EV1) 13. On IV GO, disconnect VE I/F cable ❑ J007 JEF Deck/P007 bootie ❑ P004 VE bootie 14. Stow cable in J bag 15. Retrieve connector cap; install on JEF Deck J007 STANCHION BOLT RETRIEVE (EV2) 16. Tether VE w/AET on VE Cable (alternate tether point method) 17. **PGT [B5, CCW2, 30.5] RAD w/2 ext 7/16;** Release EVA stanchion bolts (2);15 turns (at socket) ❑ Port ❑ Stbd



AET alternate tether point
(wrap around VE cable and back onto tether strap)

FWD JEF VE INSTALL (01:10) (Cont)

IV/RMS	EV 1/2
	18. Stow PGT on R-ORU 19. Remove VE 20. Install Scoop to VE 21. RET to Scoop 22. Remove AET alt tether point INSTALL IN FWD LOCATION (EXT-A) (EV2) 23. Receive VE from EV1 24. Install VE; soft dock 10.5 lb (47 N) 25. Verify position indicator; black not visible
	26. **PGT [B2, CW2, 30.5] 6 ext 7/16;** Install EVA bolts (2);15 turns ❑ Bolt 1 ❑ Bolt 2
	27. Open cable MLI 28. On IV GO, perform connector reconfig ❑ Demate P009 from dummy jack J009 ❑ Inspect for FOD or damage ❑ Mate P009 to VE J004 29. Replace cable MLI; verify tabs secure
2. **IV: Notify MCC-H VE installed and GO for VE heater activation** 3. **IV: Verify AFT JPM window shutter closed for EV translation**	CLEANUP (EV2) 30. Stow RAD w/2-in on socket caddy 31. **Retrieve J Bag** 32. Glove inspection

VE Install Bolts	Torque	Turns
Bolt 1		
Bolt 2		

EVA 2 CLEANUP AND A/L INGRESS (00:45)

IV/RMS	EV1 – WOLF (FF)	EV2 – MARSHBURN (FF)
1. IV: Pre crew ingress WVS PWRDN (PHOTO/TV, WVS CUE CARD) **Crewlock Bag – MISC Bag (M)** ❑ AET (ext D-ring) ❑ 55' Safety Tether (int RET #1) ❑ Camera w/bracket (bracket RET to int D-ring #1) ❑ RET sm-sm ❑ RET sm-sm (int D-ring #2 to door handle) ❑ WIF adapter ❑ RET sm-sm (int D-ring #3 to door handle) **Crewlock Bag – JEF VE Bag (J)** ❑ AET (ext D-ring) ❑ Ratchet (int RET #2) ❑ 2" ext ❑ Socket caddy (int RET #3) ❑ Right Angle Drive ❑ 2" ext ❑ 6" ext ❑ Round Scoop (int RET #4) ❑ RET sm-sm (int D-ring #1 to door handle) ❑ VE I/F cable ❑ RET sm-sm (int D-ring #2 to door handle) ❑ VE Launch Lock ❑ RET sm-sm (int D-ring #3 to door handle) ❑ VE MLI (upper) ❑ RET sm-sm (int D-ring #4 to door handle) ❑ VE MLI (lower)	CLEANUP 1. **Xlate to WIF 42; retrieve M Bag from APFR**, place on BRT 2. Perform Tool Inventory INGRESS AND PRE REPRESS 3. Open hatch thermal cover 4. Ingress A/L 5. Attach waist tether to UIA D-ring ❑ √Gate closed ❑ √Hook locked 6. Transfer tether pack to EV2 7. **Stow M bag** 8. **Receive J bag**; stow 9. Remove SCU from stowage pouch 10. Remove DCM cover; Velcro to DCM 11. Connect SCU to DCM; √SCU Locked 12. Set TCV as required 13. WATER – OFF (fwd), expect H2O IS OFF msg Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)	CLEANUP 1. **Xlate to ESP2**, close PM MLI 2. Xlate to A/L; **reinstall FL A/L HR 0538 (AET)** 3. Perform Tool Inventory INGRESS AND PRE REPRESS 4. Receive EV1's tether pack 5. Stow EV1's 55-ft **RED** alleviator hook on FWD A/L D-ring ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked 6. Stow EV1's 85-ft **GRN** alleviator hook on FWD A/L D-ring 7. **Transfer J bag** to EV1 8. Partially ingress A/L 9. Attach waist tether to A/L D-ring ❑ √Gate closed ❑ √Hook locked 10. Stow 55-ft **RED** alleviator hook on AFT A/L D-ring ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked 11. Stow 85-ft **GRN** alleviator hook on AFT A/L D-ring 12. Ingress A/L 13. Close thermal cover; attach Velcro strap 14. Remove SCU from stowage pouch 15. Remove DCM cover; Velcro to DCM 16. Connect SCU to DCM; √SCU Locked 17. Set TCV as required 18. WATER – OFF (fwd), expect H2O IS OFF msg CAUTION Do not close hatch until EMU Water OFF for 2 min Verify outer hatch clear of hardware 19. Verify outer hatch clear of hardware 20. Verify handle position per hatch decal; close and lock hatch Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)

ICC-VLD ORU TRANSFER TASK DATA

Estimated Task Duration:

	With SSRMS
Two EV Crew	04:05

ORU Identification:

ORU	Part number
Space to Ground Antenna **(SGANT)**	10033206-2
Pump Module **(PM)**	IF96100-503
Linear Drive Unit (**LDU)**	D60699001-01

ORU Specs:

ORU	Mass
Space to Ground Antenna **(SGANT)**	731.0 lbm
Pump Module **(PM)**	1392.9 lbm
Linear Drive Unit (**LDU)**	596.5 lbm

Tools:

EV1 (SSRMS)	EV2 (FF)
APFR	PGT 6" Socket – Wobble

Foot Restraints (APFR):

Task	WIF	APFR Setting	Ingress Aid
SGANT	SSRMS	[12,KK,F,6]	YES
PM	SSRMS	[12,KK,F,6]	YES
LDU	SSRMS	[12,KK,F,6]	NO

Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	PGT Setting
SGANT – FRAM Bolt (Primary)	7/16	1	TBD	6.3	TBD	11	**A4 (6.3 ft-lb), CCW2, MTL 30.5**
PM – FRAM Bolt (Primary)	7/16	1	TBD	6.3	TBD	11	**A4 (6.3 ft-lb), CCW2, MTL 30.5**
LDU – FRAM Bolt (Primary)	7/16	1	TBD	6.3	TBD	11	**A4 (6.3 ft-lb), CCW2, MTL 30.5**

LDU Notes:

1. Installs onto ESP3 FRAM 4 – Outboard (Port) side
2. MLI ¼ turn fastener #6 (Aft Face – Stbd most fastener while on VLD) must be released prior to transfer to ESP3

SGANT Notes:

1. Installs onto ESP3 FRAM 5 – Inboard (Starboard) side

PM Notes:

1. Installs onto ESP3 FRAM 3 – Outboard (Port) side
2. MLI ¼ turn fasteners on Stbd face while on VLD must be released prior to transfer to ESP3

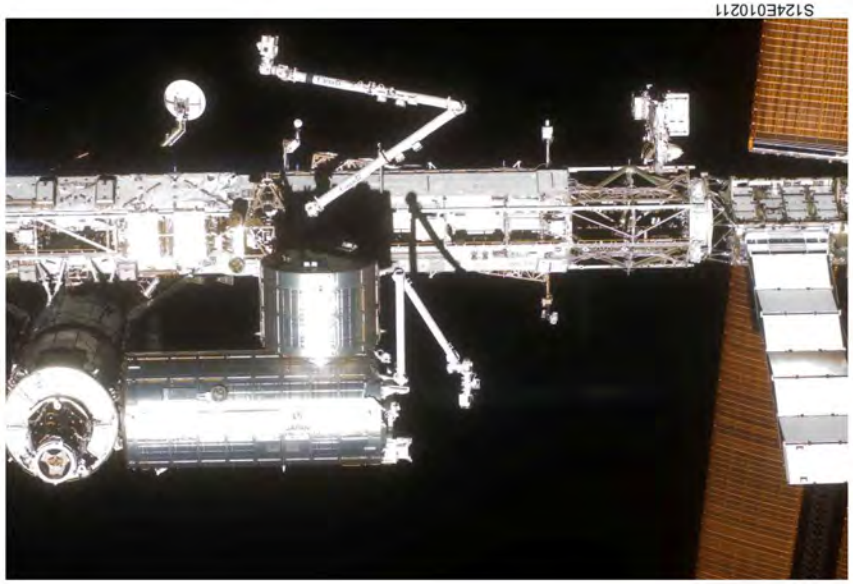
General Notes:

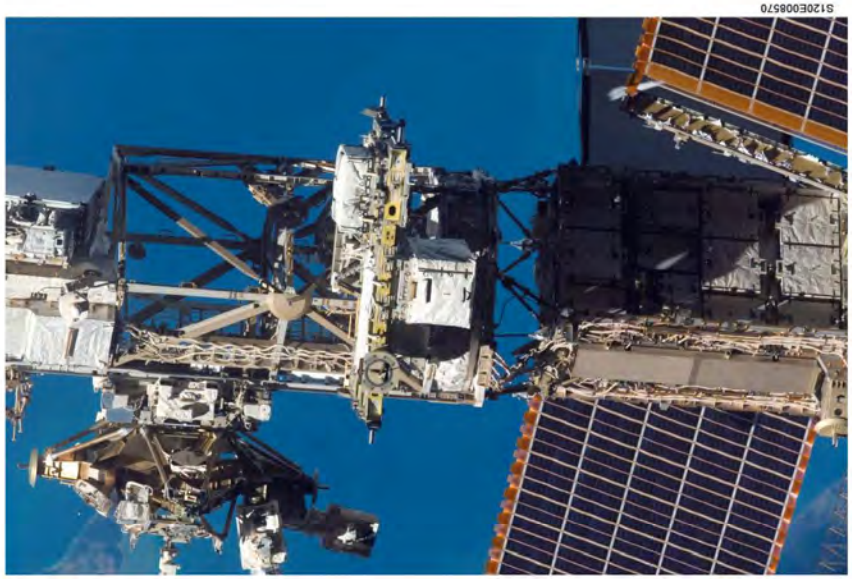
Cautions:

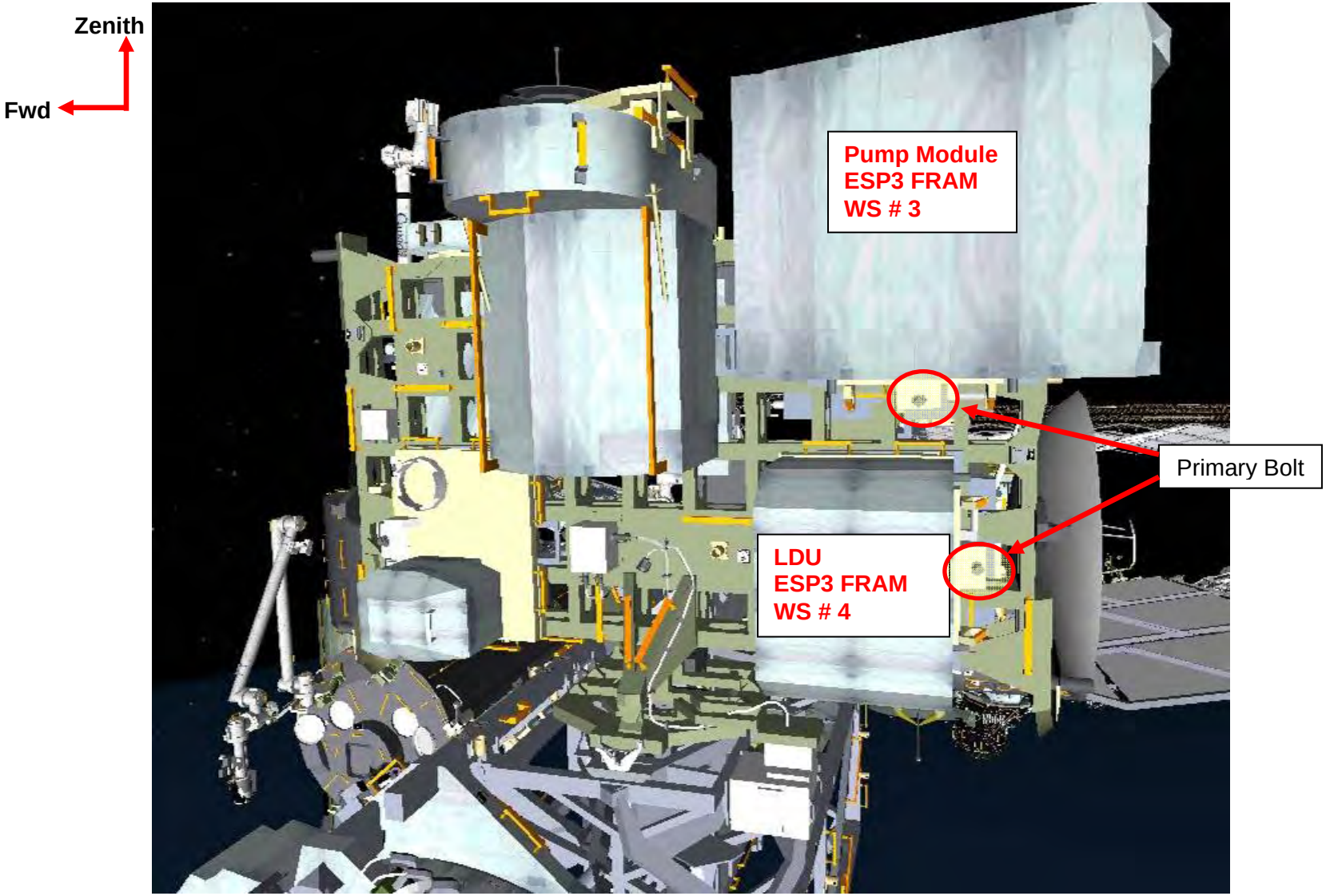
Warnings:

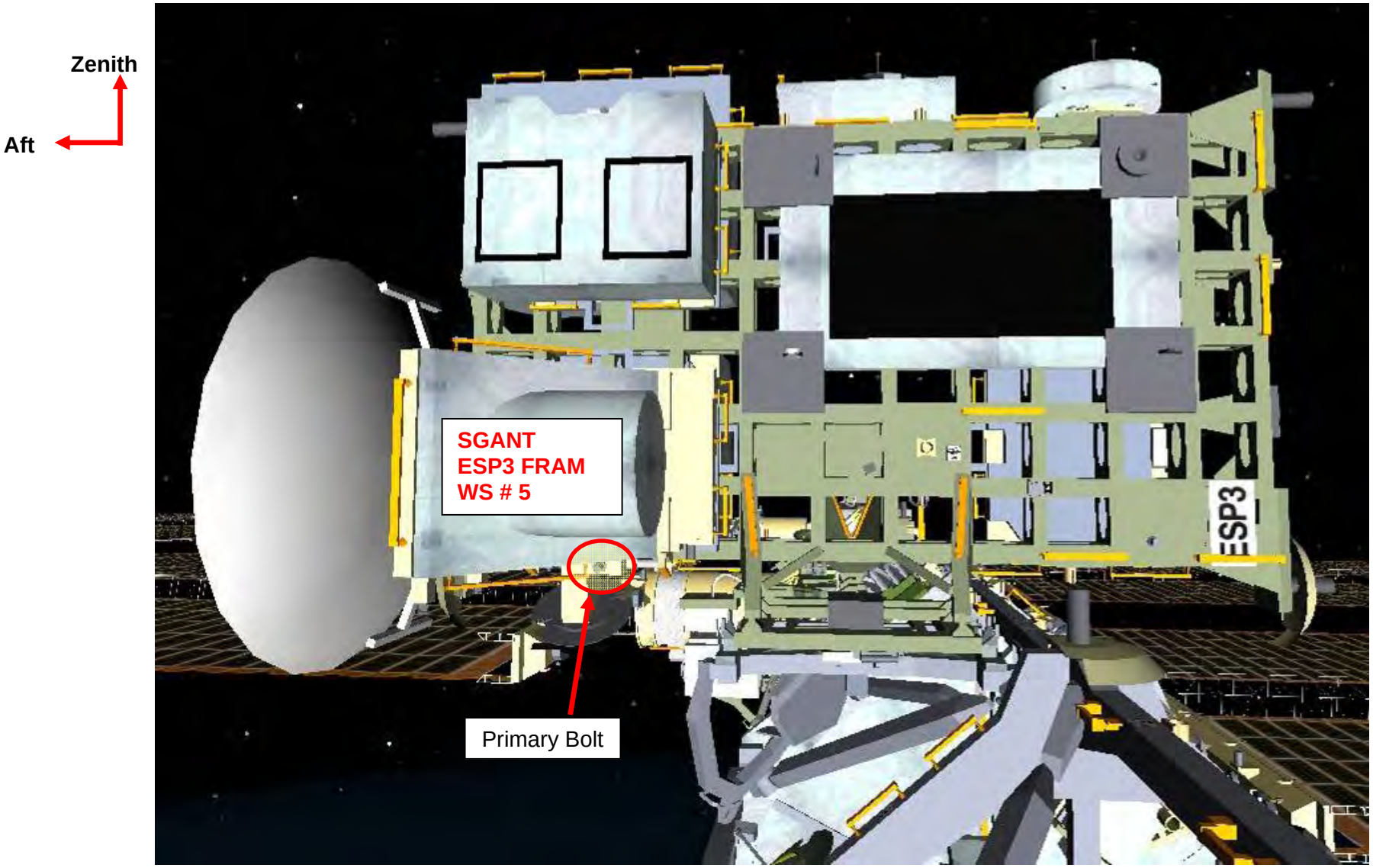
1. Keel Target on ICC-VLD does not meet kick loads

ICC-VLD ORU TRANSFER TASK DATA (Cont)





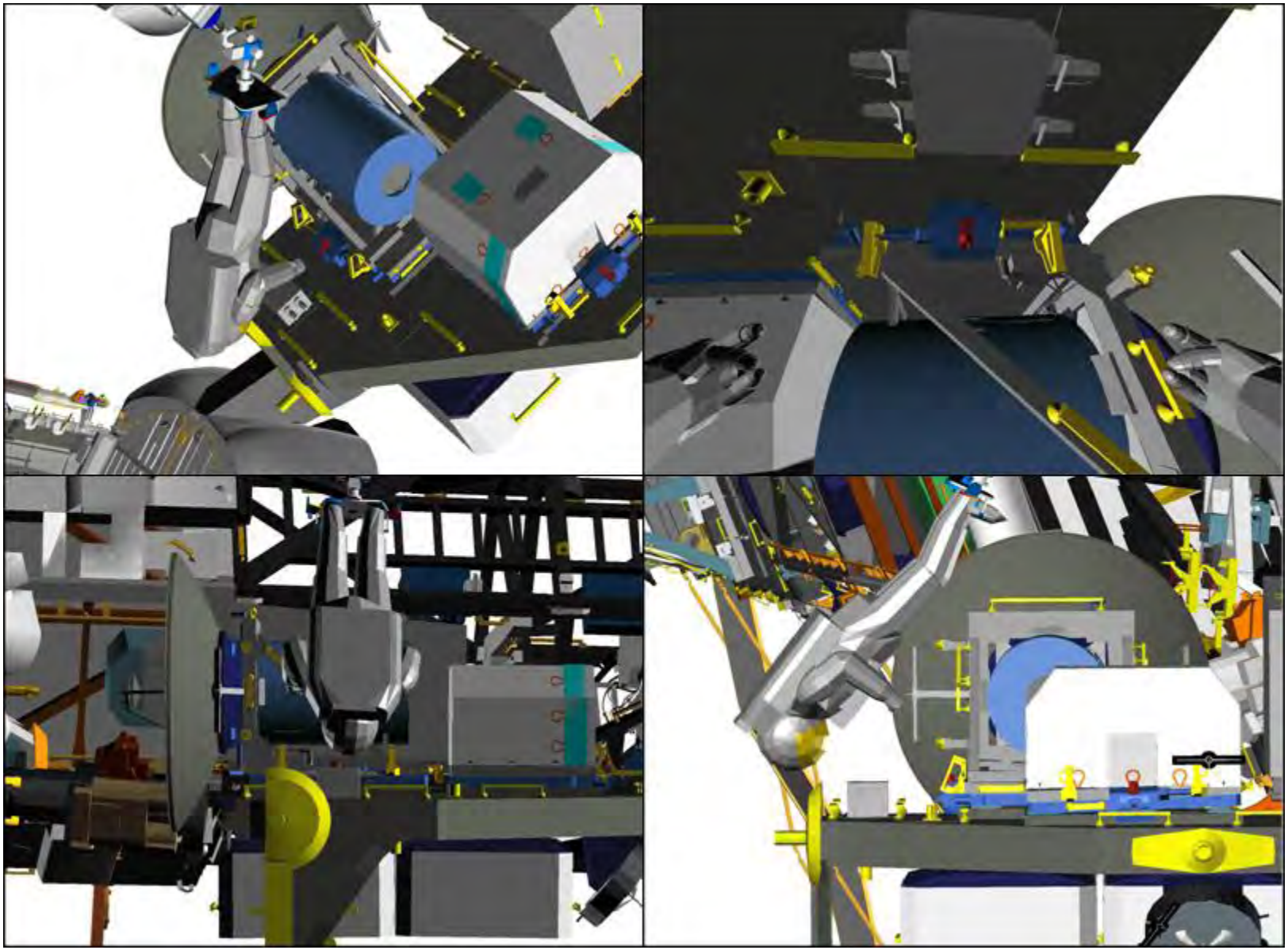

Zenith
Fwd
Pump Module
ESP3 FRAM
WS # 3
Primary Bolt
LDU
ESP3 FRAM
WS # 4
Outboard (PORT) Side



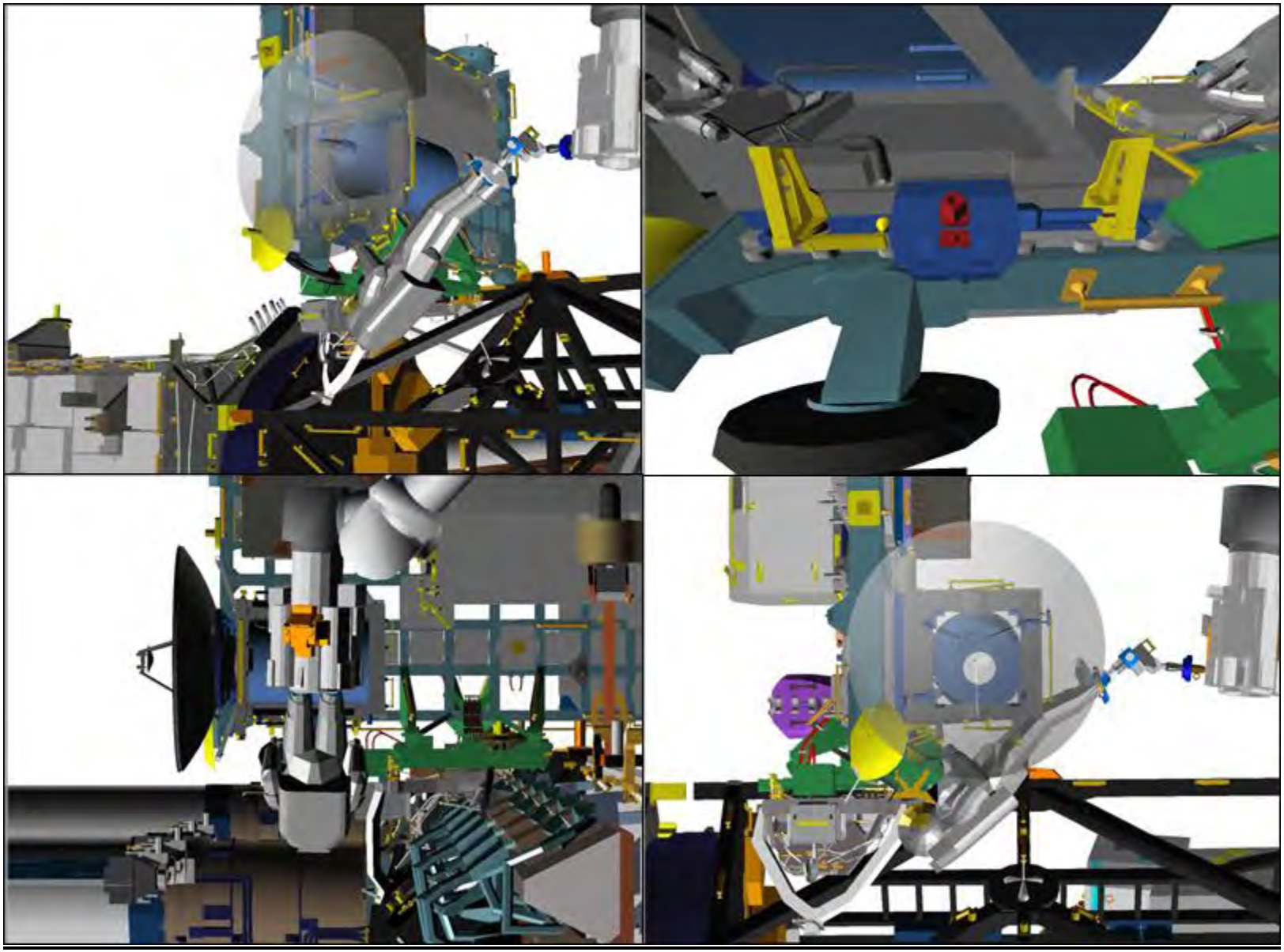
Inboard (STARBOARD) Side

ICC-VLD ORU TRANSFER TASK DATA (Cont)

AFT Side

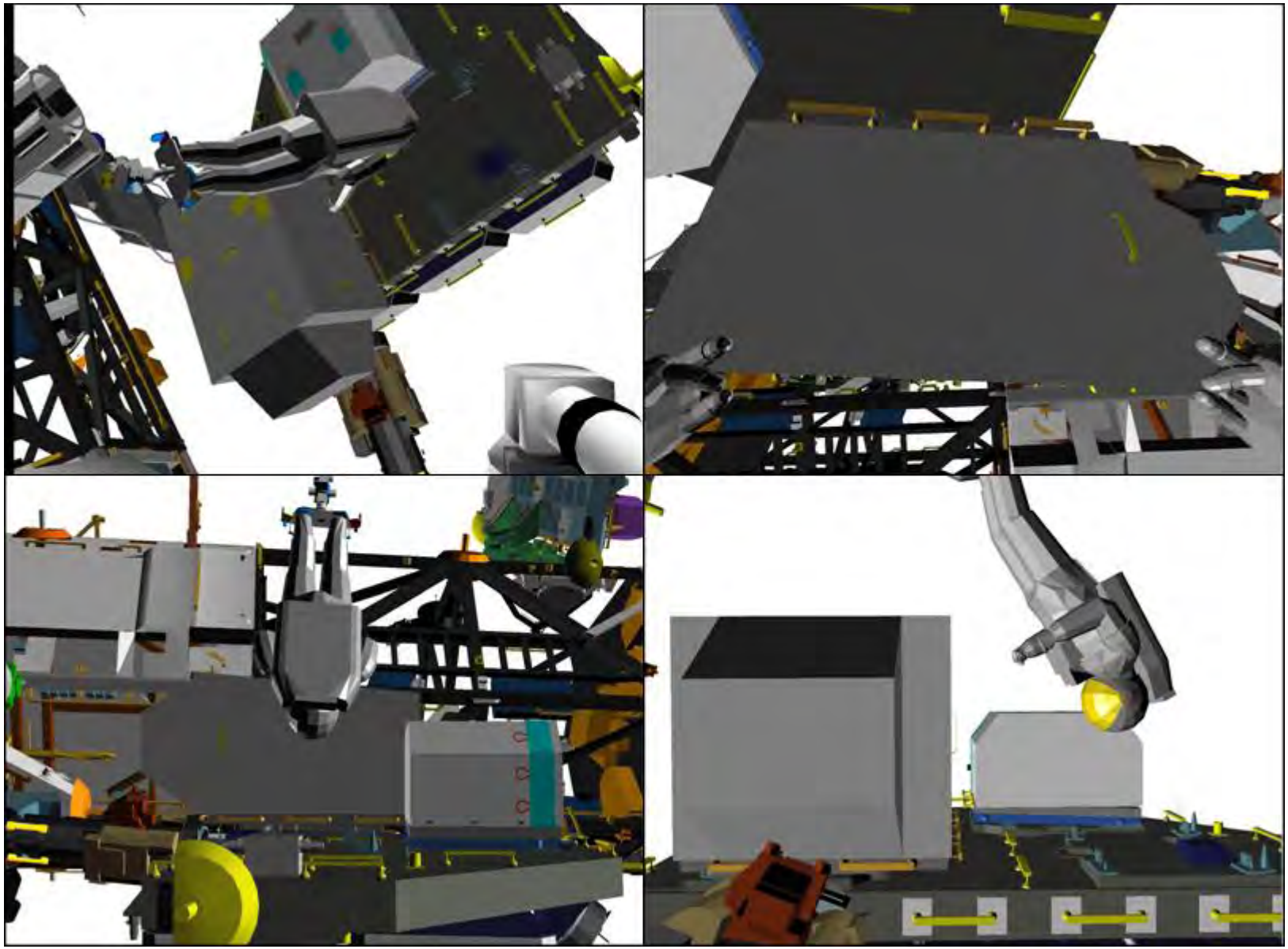


SGANT Retrieve from VLD



SGANT Install on ESP3

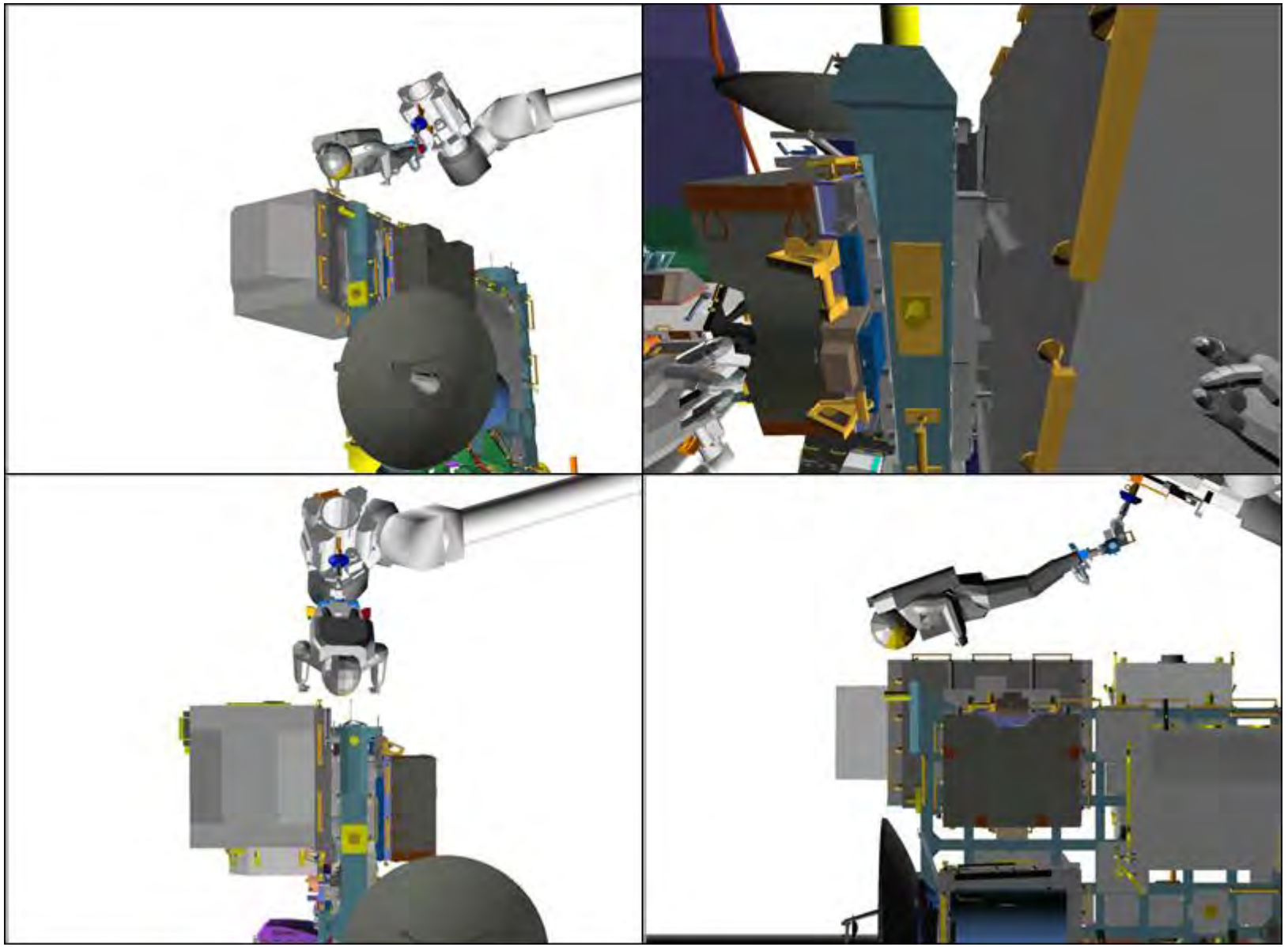
ICC-VLD ORU TRANSFER TASK DATA (Cont)



NOTE: MLI on PM not shown & FGB not attached on flight unit, but shown in picture

PM Retrieve from VLD

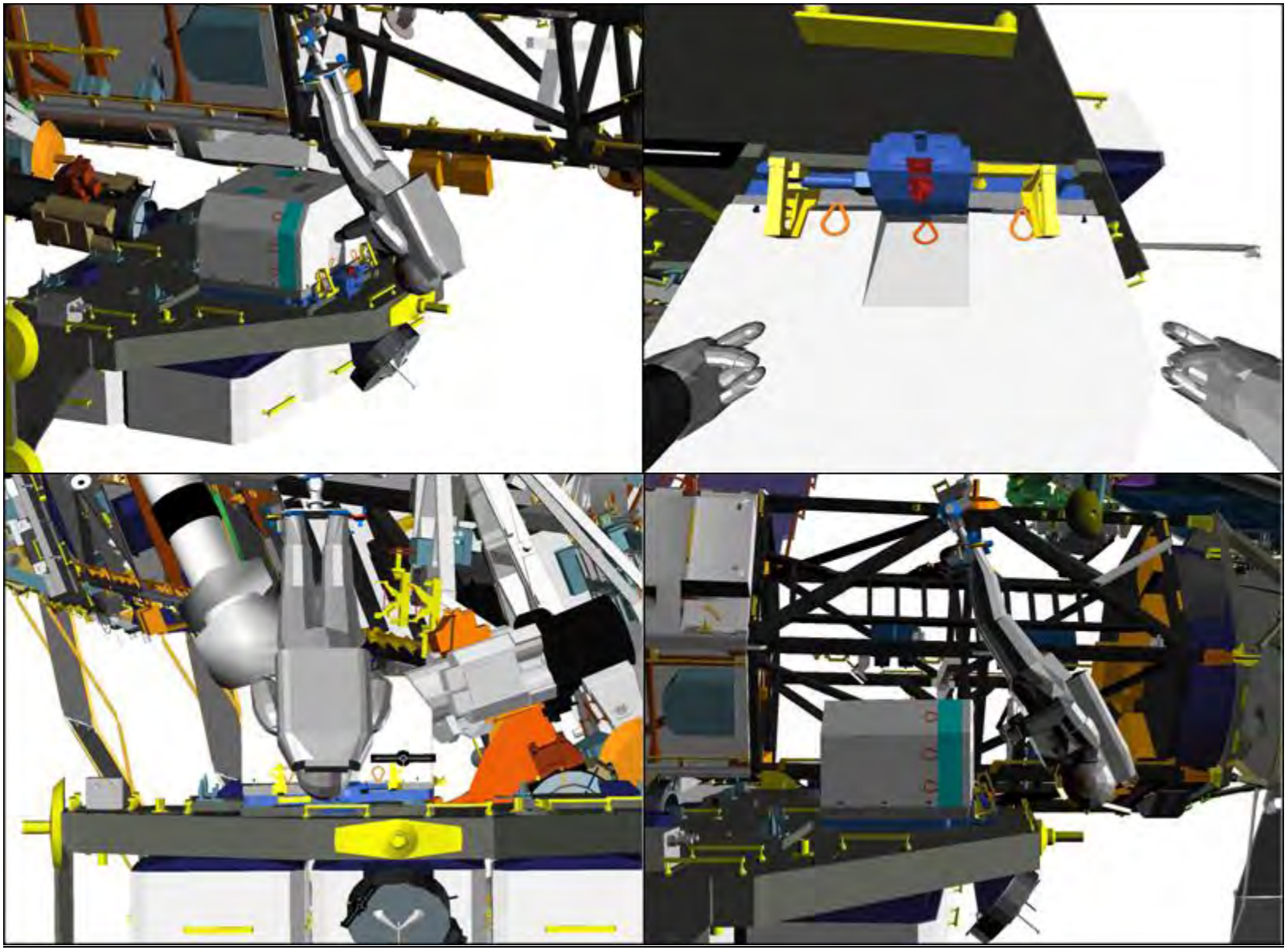
ICC-VLD ORU TRANSFER TASK DATA (Cont)



NOTE: MLI on PM not shown & FGB not attached on flight unit, but shown in picture

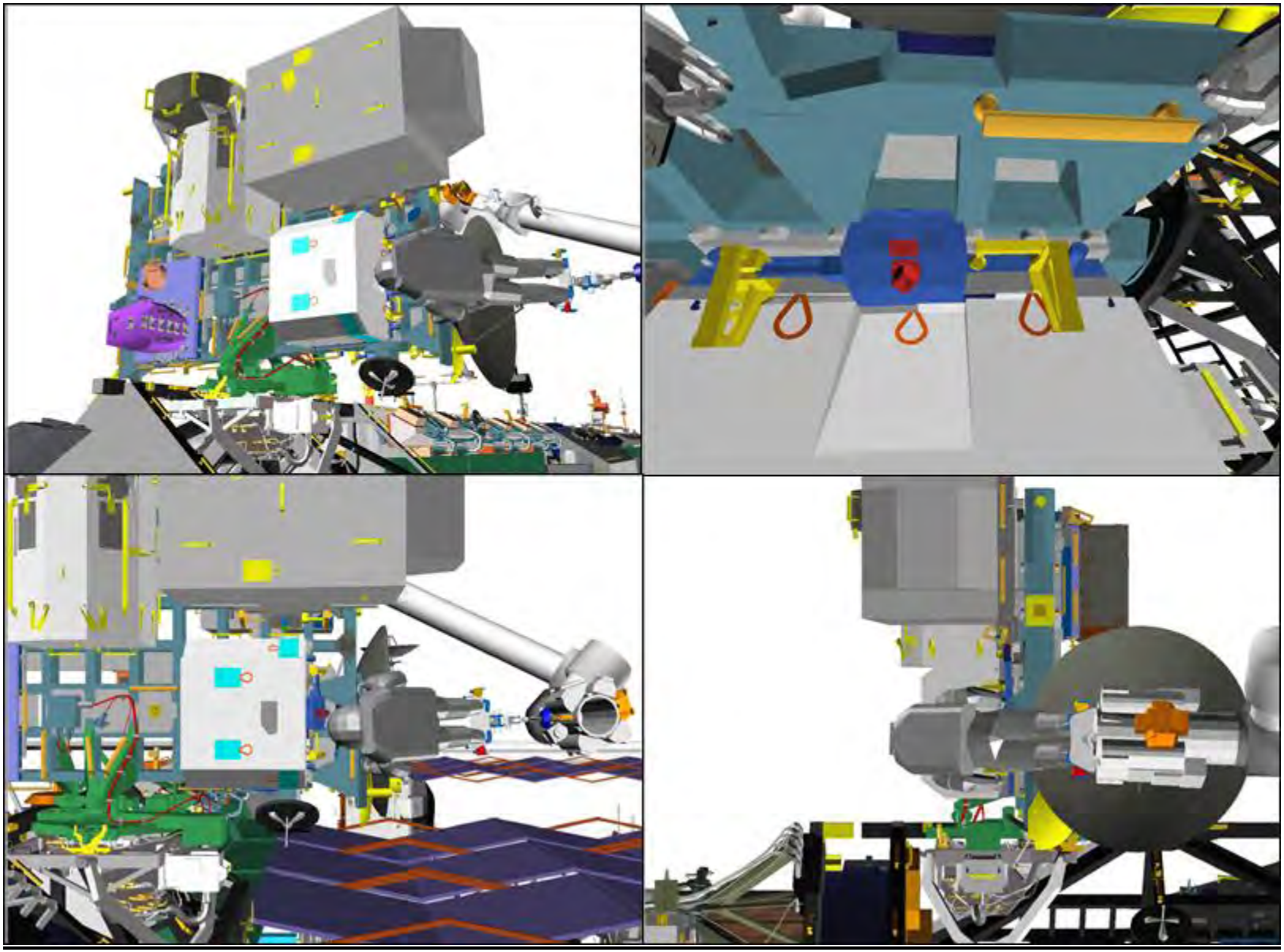
PM Install on ESP3

ICC-VLD ORU TRANSFER TASK DATA (Cont)



LDU Retrieve from VLD

ICC-VLD ORU TRANSFER TASK DATA (Cont)



LDU Install on ESP3

FIXED GRAPPLE BAR (FGB) TASK DATA

Estimated Task Duration:

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

NOTE
Any 2 of 4 bolts are needed to be considered for install
Bolt 3 has the detent

Tools:

EV1	EV2
RET (FGB) PGT with 7/16, 6-inch extension BRT	N/A

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
ATA FGB GP bolt release	7/16	4	---	25.5	47.4	20
ATA FGB GP bolt install	7/16	4	9.2	---	16.1	10 to 11

NOTE
FGB FSE bolts must be backed out at least 20 turns to remove the FGB. Running torque will decrease at ~18 turns when the locking “poly patch” ends.
The bolts are fully backed out at 33 turns, but torque should not be applied at this point to avoid breaking the castellated nut captive feature

AFT JEF VE INSTALL TASK DATA

Estimated Task Duration:

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

ORU Identification:

ORU	Part number
Vision Equipment **(VE)** – Forward Mounted [Aft Mounted Launch Config]	NFTCA170300 G11

ORU Specs:

ORU	Dimensions
Vision Equipment **(VE)** – Forward Mounted [Aft Mounted Launch Config]	NFTCA170300G11

Tools:

EV1 (FF)	EV2 (FF)
PGT 6" Socket – Wobble Right Angle Drive AET	PGT 6" Socket – Wobble Right Angle Drive Round Scoop

EVA Connectors:

Harness	From	To	Type	Conn Size	Function
VE I/F Cable (Keep Alive) AFT Launch location	J007	J004	NZGL	17	LTA power to VE
VE Interface Cable (Keep Alive) FWD Launch location	J005	J006	NZGL	17	LTA power to VE
Cable assy, EF A (AFT install location)	P008/J008	J006	NZGL	17	Power/command/ video lines to VE
Cable assy, EF A (FWD install location)	P009/J009	J004	NZGL	17	Power/command/ video lines to VE
LTAB ISS Mode 2	J002	IVA	NZGL	25	Power/heater
LTAB ISS Mode	J003	J002	NZGL	25	Power/heater

Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	PGT Setting
VE Launch Lock Bolts	7/16	4	N/A	18.29	33.7	16	**B4**
VE Structure Bolts	7/16	2	<21.16 (17.34)	21.17	33.7	15	**B5**

VE Notes:

1. VE in Aft launch position to be installed into ISS FWD mount. VE in FWD launch position to be installed into ISS AFT mount
2. Two connector caps are brought out by EV crew and installed where VE keep alive cable is disconnected and brought inside
3. VE has round MCF (Micro-Conical Fixture) for scoop attachment handling
4. VE has launch lock plate with four bolts

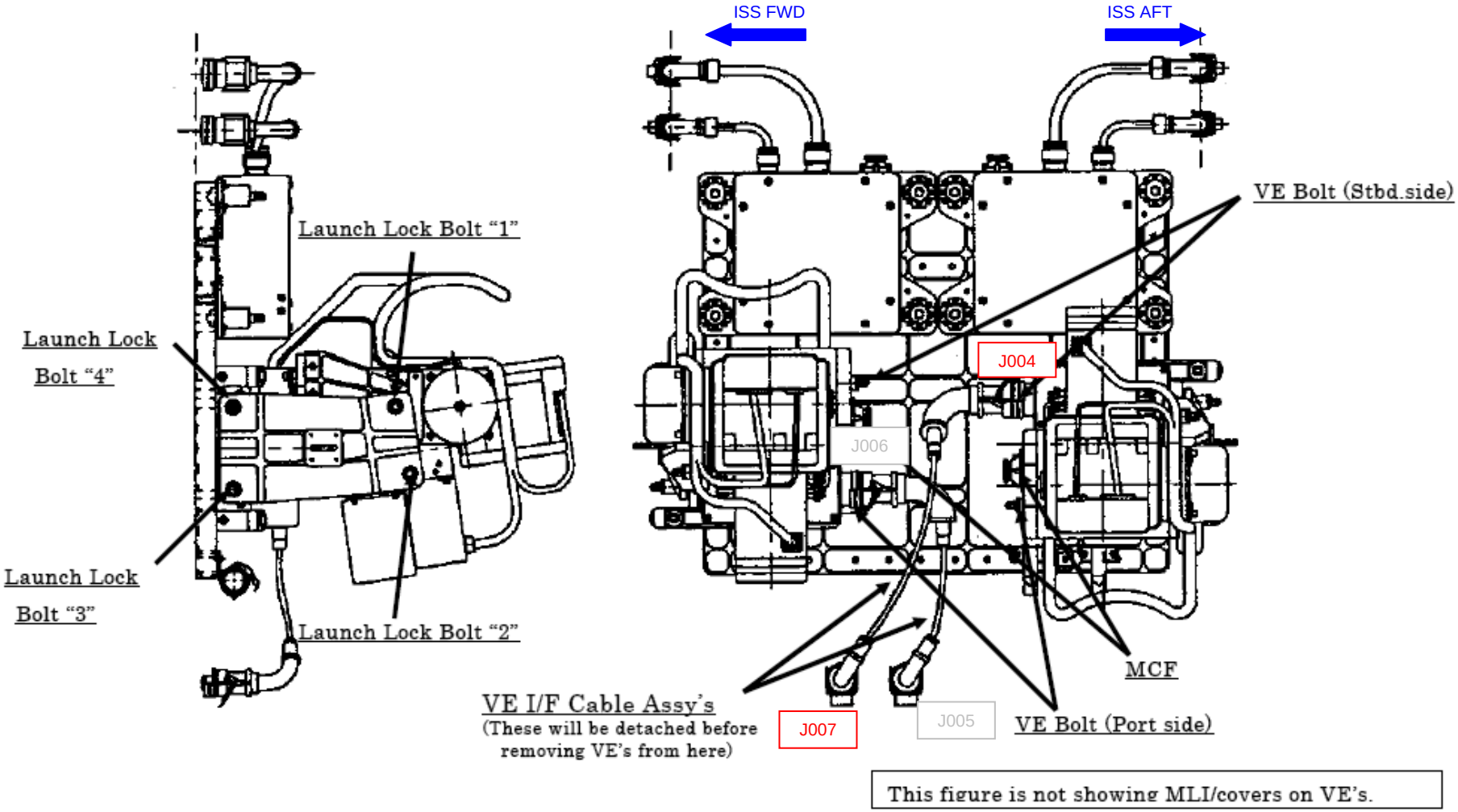
General Notes:

Cautions:

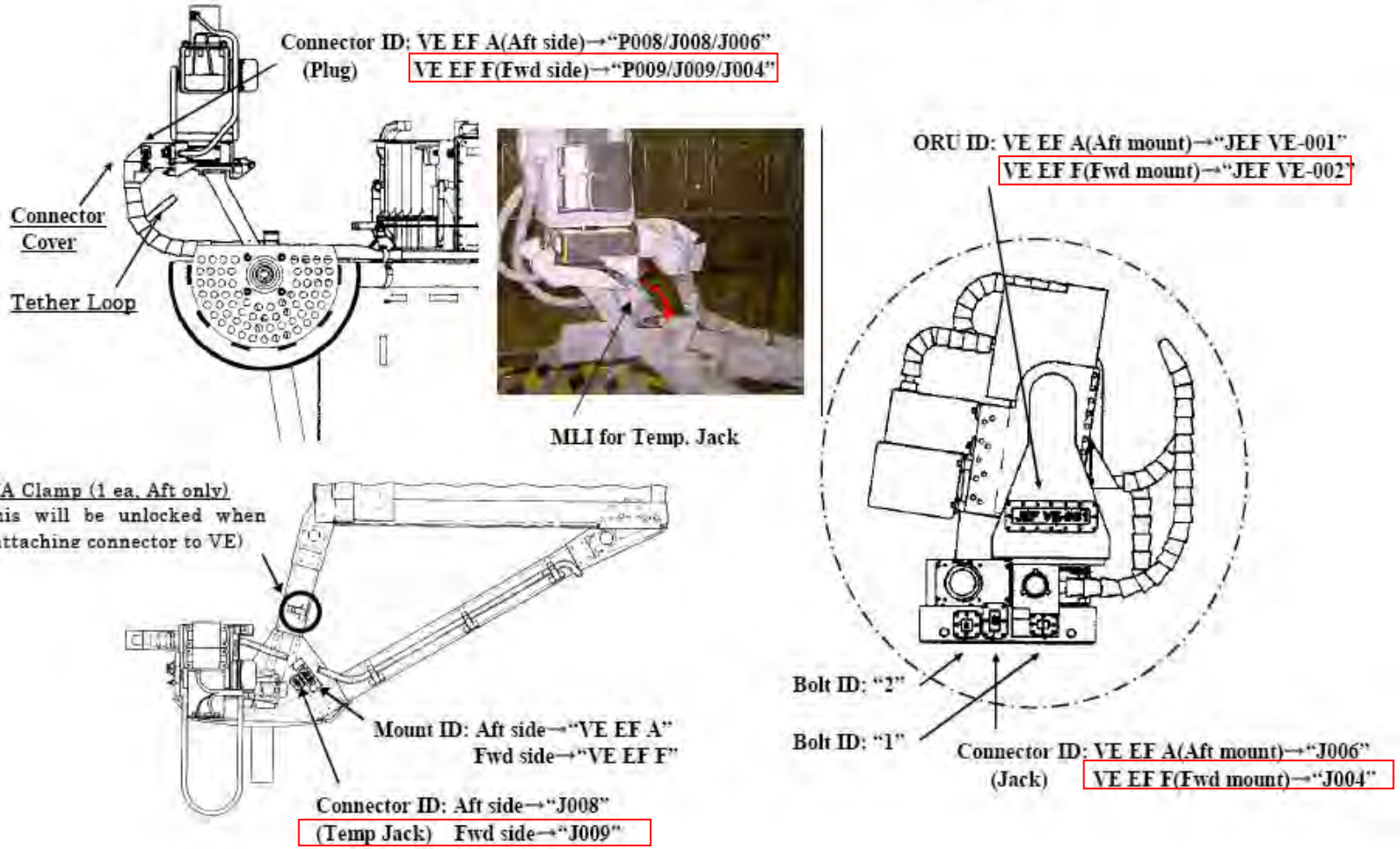
1. No touch white paint, silver teflon and solid lubricant
2. No touch DCU (DC-DC Converter Unit)

Warnings:

VE Connector Information



JEM-EF EVA Task Information



EVA 3 SUMMARY TIMELINE

PET TIME (HR : MIN)	EVA 3		
	IV/SSRMS	**EV1 – Wolf (FF)**	**EV2 – Cassidy (FF)**
00:00	**(00:00-00:30)** JEM RMS grappled to ICS-EF	**EGRESS/SETUP** (00:30) ❑ Post Depress And Egress (00:15) ❑ Setup (00:15)	**EGRESS/SETUP** (00:30) ❑ Post Depress And Egress (00:15) ❑ Setup (00:15)
01:00	**(00:30-01:00)** SSRMS at WS 8 with ICC-VLD at P6	**WIF 14 RELOCATE/JEM OIH & OIW INSTALL (**00:30) ❑ NOD2 WIF 14 move to COL WIF2 ❑ JPM OIH & OIW Installation ❑ STP Relocate	**JLE PYLD Prepl** (00:30) ❑ ICS-EF ❑ SEDA-AP ❑ STP Relocate
02:00	**(01:00-05:45)**	**P6 Battery R&R** (04:45) ❑ Stow battery 1 ❑ Install battery A	**P6 Battery R&R** (04:45) ❑ Stow battery 1 ❑ Install battery A
03:00		❑ Install battery B ❑ Install battery C	❑ Install battery B ❑ Install battery C
04:00		❑ Install battery D ❑ Install battery 1	❑ Install battery D ❑ Install battery 1
05:00		❑ Prep for EVA 4	❑ Prep for EVA 4
06:00	**(05:45-06:30)**	**CLEANUP/INGRESS** (00:45) ■ Cleanup (00:30) ■ Ingress And Pre Repress (00:15)	**CLEANUP/INGRESS** (00:45) ■ Cleanup (00:30) ■ Ingress And Pre Repress (00:15)
	Total EVA Time 6:30		

Get-aheads: FPP sleeves, NOD2 gap spanner install, LAB cable tie down

EVA 3 TOOL CONFIG

EV1
EMU D-rings
- ❑❑ Ext on left side
- ❑❑ Ext on right side
  - ❑❑ Waist Tether (right EXT, √locked)

MWS
- ❑❑ Small Trash Bag
  - ❑❑ Wire Tie
- ❑❑ 1 – Wire tie as tether loops
- ❑❑ RET (with PIP pin)
- ❑❑ RET sm-sm
- ❑❑ 3 – AETs
- ❑❑ Swing Arm (right side)
  - ❑❑ 2 – RET sm-sm (Attach to PGT)
    - ❑❑ PGT s/n _____
      - ❑❑ 6-in ext
- ❑❑ BRT (left side)
  - ❑❑ RET sm-sm
    - ❑❑ V/B Bag pack
    - ❑❑ 3 – wire ties

EV2
EMU D-rings
- ❑❑ Ext on left side
- ❑❑ Ext on right side
  - ❑❑ Waist Tether (right Ext to MWS, √locked)

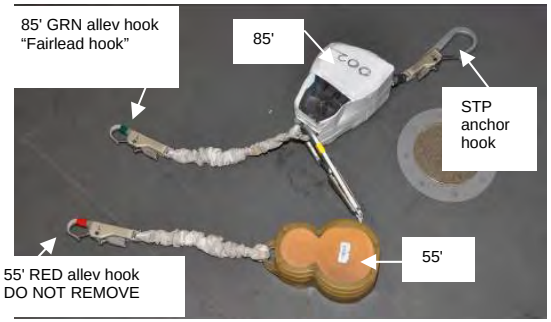
MWS
- ❑❑ RET w/PIP pin (R D-ring)
- ❑❑ RET sm-sm (L D-ring)
- ❑❑ AET (b/w D-rings)
- ❑❑ Swing Arm (right side)
  - ❑❑ 2-RET sm-sm (Attach to PGT)
    - ❑❑ PGT s/n _____
    - ❑❑ Camera w/bracket
      - ❑❑ RET sm-sm
- ❑❑ BRT (left side)
  - ❑❑ RET sm-sm
  - ❑❑ AET (wrap @ top loop)
  - ❑❑ 2 – long wire ties
  - ❑❑ 2 – short wire ties

ISS Configuration

MT @ WS8 CETA Port/Stbd (Port reconfiged)
ICC-VLD on SSRMS at P6
JLE w/payloads installed berthed to JEF
Port SARJ at 45 degrees, 4A locked at 255 deg

Safety Tether config (STP = safety tether pack, 55+85)

EV1 ST pack (55+85) **85-ft** anchor at S0 HR 3516
EV2 ST pack (55+85) **85-ft** anchor at S0 HR 3483
Fairlead (AET) at A/L HR 0538 (zenith standoff)



❑❑ RET Lg-sm (A/L stowage)
- ❑❑ **C/L Bag – Battery Temp Stow (B)**
  - ❑❑ AET (ext D-ring)
  - ❑❑ sq scoop (int RET #1)
  - ❑❑ sq scoop (int RET #2)
  - ❑❑ MUT EE (int RET #3)
  - ❑❑ Small Trash Bag (int RET #4)
  - ❑❑ Camera w/bracket (bracket RET to int D-ring #1)
    - ❑❑ RET sm-sm
  - ❑❑ RET sm-sm (int D-ring #2 to handle)
  - ❑❑ AET (ext, secure BS/MUT EE to outside of bag)
    - ❑❑ Ballstack
      - ❑❑ MUT EE
      - ❑❑ RET sm-sm (use to secure BS/MUT EE)
    - ❑❑ RET sm-sm (in D-ring # 3)
- ❑❑ **C/L Bag – Battery VCC Bag (V) – strap to B Bag**
  - ❑❑ AET (ext D-ring)
  - ❑❑ Sq Torque Multiplier (int RET #1)
    - ❑❑ 7/16" Rec socket
  - ❑❑ Ratchet wrench (int RET #2)
    - ❑❑ 6" ext
  - ❑❑ sq scoop (int RET #3)
  - ❑❑ sq scoop (int RET #4)

❑❑ RET Lg-sm (A/L stowage)
- ❑❑ **C/L Bag – JLE Prep (J)**
  - ❑❑ AET (ext D-ring)
  - ❑❑ RET sm-sm (int D-ring #1 to door handle)
  - ❑❑ RET sm-sm (int D-ring #2 to door handle)
  - ❑❑ Socket Caddy (int RET #1)
    - ❑❑ 9" ext
  - ❑❑ ICS-EF Sensor Cover (int RET #2)

Review PGT ops
- Report "green light" (for torque down ops)
- Report torque and turns
- Expect LOTORQ fault msg, Fault LED and Red LED for bolt release ops

Record:
EV1 PGT (serial _____, bat # _____)
EV2 PGT (serial _____, bat # _____)
Spare PGT (serial _____, bat # _____)

Prior to EVA, perform the following inspections:
1. RET cords for fraying
2. Inspect safety and waist tethers for damage/discoloration. Verify no red line visible on load alleviation straps
3. Inspect ISS trash bags for deformation/damage
4. Inspect EMU gloves for damage
5. Inspect BRTs and ballstacks for loose fittings/screws
6. Use **BLUE** RETs only

EVA 3 TOOL CONFIG (Cont)

Staging Bag
- ❑❑ Fish Stringer #1
  - ❑❑ Wire Tie Caddy (hook #1)
    - ❑❑ 9 wire ties
  - ❑❑ Velcro/Tape Caddy (hook #2)
  - ❑❑ PGT (hook #3) s/n _____
    - ❑❑ PGT Battery s/n _____
    - ❑❑ 7/16-in (wobble) Socket – 6 ext
  - ❑❑ Vise Grips (hook #4)
  - ❑❑ Ratchet Wrench (hook #5)
    - ❑❑ 7/16-in (rigid) Socket – 9 ext
  - ❑❑ Cheater Bar (hook #6)
  - ❑❑ Hammer (hook #7)
- ❑❑ RET Lg-sm
  - ❑❑ Bolt Puller
- ❑❑ Fish Stringer #2
  - ❑❑ Spare Torque Wrench w/MLI (hook #1)
  - ❑❑ Connector Cleaner Tool Kit (hook #2)
  - ❑❑ Pin Straightener Assy (hook #3)
  - ❑❑ Probe w/BRS Pin Tool Sheath (hook #4)
  - ❑❑ Prybar (hook #5)
  - ❑❑ Needlenose Pliers (hook #6)
  - ❑❑ MWS Key Strap Assy (on wire tie, to strap)

Crewlock Zenith Handrail
- ❑❑ Spare STP
- ❑❑ RET Lg-sm **(Lg hook attached outside bag to Zenith C/L Handrail & small Hook attached to FPP sleeve)**
  - ❑❑ FPP sleeves (sz 33/37) (**FPP stuffed in staging bag**)
- ❑❑ RET Lg-sm **(Lg hook attached outside bag to Zenith CL Handrail & small Hook attached to FPP sleeve)**
  - ❑❑ FPP sleeves (sz 33/37) (**FPP stuffed in staging bag**)

IV Bag
- ❑❑ 2 – Towels
- ❑❑ Contamination Detection Kit
- ❑❑ 2 – GP Caddy
  - ❑❑ Thermal Mittens (1 pair)
- ❑❑ RET (sm-sm) (Black)
  - ❑❑ Socket Caddy
    - ❑❑ 1/2-in (wobble) Socket – 8 ext
    - ❑❑ 7/16-in (wobble) Socket – 6 ext
- ❑❑ 2 – DCM Plug (SAFER Hardmount)
- ❑❑ 2 – RET (sm-sm, black)

Tether counts:	**used**	**available**
RET sm-sm -381	14	16
RET lg-sm -385	5	8
RET sm-sm pp -383	2	5
AET sm-sm	12	8 ISS/4 STS
AET lg-sm	0	2

ISS EXTERNAL

JPM
- ❑❑ **MLI Bag (Lg ORU)**
  - ❑❑ AET ext
  - ❑❑ AET ext
  - ❑❑ Fish stringer #1 (empty)
  - ❑❑ Fish stringer #2 (outside bag, under flap)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Wire tie caddy w/ long wire ties (9)
  - ❑❑ Fish stringer #3
    - ❑❑ JPM OIH 1116
    - ❑❑ JPM OIH 1204
    - ❑❑ JPM OIH 1206
    - ❑❑ JPM OIW 43
    - ❑❑ JPM OIW 36
    - ❑❑ Gap spanner (72") – split across two hooks

EVA 3 INHIBIT PAD

ALL EVAs

TCS

L12 1. √TCS POWER – OFF

KU-Band Antenna (not expected)

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

RCS (on call, crew not expected in area)

If EV crew < 27 ft from FRCS

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

Ground

ALL EVAs

Ground Radar

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

LOCATION DEPENDENT INHIBITS

S-Band Antennas

NOTE

Possible loss of comm when forced LL FWD antenna

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

ALL EVAs

PCU

NOTE

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

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

LOCATION DEPENDENT INHIBITS

Lab Window (on call, crew not expected in area)

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

KU-Band (SGANT Antenna) (on call, crew not expected in area)

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

S-Band (SASA) Antennas (on call, crew not expected in area)

MCC-H If EV crew < 3.6 ft from S1 SASA [P1 SASA]
1. P1 SASA (S1 SASA) – Active
2. S1 SASA [P1 SASA] – Powered down

Mobile Transporter

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

ICC-VLD (Battery R&R)

MCC-H 1. √Verify CRPCM 1P RPC 3 Open
2. √Verify CRPCM 1R RPC 3 Open

EVA 3 INHIBIT PAD (Cont)

LOCATION DEPENDENT INHIBITS (Cont)

IEA (Battery R&R)
Battery Set 1 (Batteries 2B11 and 2B12)

MCC-H
1. DCSU 2B RBI 2 Open
2. BCDU 2B1 Converter Off and FI Open
3. BCDU 2B1 CP RBI Open
4. BCDU 2B1 BSCCM A Power Off
5. BCDU 2B1 BSCCM B Power Off
6. BCDU 2B1 Heater Switch A Open
7. BCDU 2B1 Heater Switch B Open

Battery Set 2 (Batteries 2B21 and 2B22)

MCC-H
1. DCSU 2B RBI 3 Open
2. BCDU 2B2 Converter Off and FI Open
3. BCDU 2B2 CP RBI Open
4. BCDU 2B2 BSCCM A Power Off
5. BCDU 2B2 BSCCM B Power Off
6. BCDU 2B2 Heater Switch A Open
7. BCDU 2B2 Heater Switch B Open

Battery Set 3 (Batteries 2B31 and 2B32)

MCC-H
1. DCSU 2B RBI 4 Open
2. BCDU 2B3 Converter Off and FI Open
3. BCDU 2B3 CP RBI Open
4. BCDU 2B3 BSCCM A Power Off
5. BCDU 2B3 BSCCM B Power Off
6. BCDU 2B3 Heater Switch A Open
7. BCDU 2B3 Heater Switch B Open

LOCATION DEPENDENT INHIBITS

S3 SARJ (Battery R&R)

MCC-H S3 SARJ locked at 45
1. √DLA (1) – LOCKED
2. All motor setpoints set to zero
3. All motors deselected

P3 SARJ (Battery R&R)

MCC-H P3 SARJ locked at 45
1. √DLA (1) – LOCKED
2. All motor setpoints set to zero
3. All motors deselected

BGAs

MCC-H 2B locked at 0 deg
1. √Latch (L2) – LATCHED

MCC-H 4A locked at 256 deg
1. √Latch (L2) – LATCHED

TRRJ (Battery R&R)

MCC-H If EV crew working within 2 ft of P1 TRRJ rotation envelope
1. √DLA (1) – LOCKED

FPMU (on call, crew not expected in area)

MCC-H If EV crew working within 5 ft of Floating Potential Measurement Unit
1. FPMU power – Off

SSPTS (Reqd if FPP sleeves not installed)

MCC-H If EV crew working within 2 ft of SSPTS cables
1. RPCM LA1A4A D RPC 3 – Open, Close Cmd Inhibit
2. RPCM LA2A3B D RPC 1 – Open, Close Cmd Inhibit
3. RPCM Z14B A RPC 2 – Open, Close Cmd Inhibit
4. RPCM Z13B A RPC 2 – Open, Close Cmd Inhibit

EVA 3 INHIBIT PAD (Cont)

COL (1)

ALL EVAs

EuTEF
COL-CC 1. √PLEGpay Power Status (ETF_PLEGPAY_Pwr_Stat) – OFF

JEM

LOCATION DEPENDENT INHIBITS

JPM Windows (JLE prep and JPM OIH/OIW install)
IV JPM port end cone AFT window shutter closed
If crew within 3FT of FWD window, close shutter

JEMRMS (JLE prep and JPM OIH/OIW install)
SSIPC If EV crew working within vicinity (5ft) of JEMRMS
1. RIP MA Brake – ON
2. MDP Main Mode – Stby Mode
or
1. JEMRMS Rack – OFF

JPM PROX Antenna (JLE prep and JPM OIH/OIW install)
SSIPC If EV crew working within 0.3 ft JPM PROX Antenna
1. TRX Power – OFF
2. TX Power – OFF
or
1. JPM PROX Antennas – OFF

JPM JTVE Aft (JLE prep and JPM OIH/OIW install)
SSIPC PDB b2 RPC 4 Open

EFBM (JLE Payload Prep)
IV √P011B on Jumper Cable is disconnected for BEP
SSIPC PDB A2 RPC01 – Op

JEF FWD VE (JLE Payload Prep)
SSIPC JEF PDB b RPC22 – Open

EFU (JLE Payload prep)
SSIPC JEF PDB a RPC03-Op
JEF PDB b RPC20-Op
EFU[X] Sel Status – not selected [X=1 to 12]
EEU Mode – EFU stop

JEM (Cont)

LOCATION DEPENDENT INHIBITS

SSE SLM (JLE Payload prep and JPM OIH/OIW install)
SSIPC SSE SLM Ops Ena/Inh Status 1 – Enable
SSE SLM Ops Ena/Inh Status 2 – Enable

JLE SLM (JLE prep and JPM OIH/OIW install)
SSIPC JLE PCU RPC1 – Op

RSOS

ALL EVAs

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

IMPULSE
MCC-M 1. IMPULSE (ИПИ-100) – Deactivate

EVAs ON PMA1 OR RSOS (LOCATION DEPENDENT)(on call for APFR 5 relocate)

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

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

FGB Antennas
MCC-M 1. √FGB KURS P [КУРС Р] – Deactivated

Soyuz Antennas
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)
7. 85-ft safety tether retract force may affect body positioning

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, JEF VE 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
   29. JEF ORUs and EFU (paint, lubricant)
   30. MAXI front panel (paint)
   31. SEDA-AP sensors (HIT, SDOM, AOM) and MPAC & SEED

CAUTION

ISS Constraints (Cont)

A. Inadvertent contact (Cont)
   32. Con'PIU, Trunnions and UCM (paint, lubricant) [ICS-EF,MAXI,SEDA-AP]
   33. JLE – PIU, Alignment guide and UCM (paint, lubricant) [ICS-EF,MAXI,SEDA-AP]

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
   4. Avoid tool impact on ICS-EF sensor

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 & 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 & 566, A/L Tank 2 nad/fwd & 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, JEF VE)
7. JEM EFBM capture latches
8. JEM EFU latching arms
9. JEF SSE latch
10. ICS-EF antenna boom
11. SEDA-AP Mast
12. JLE SLM latch

WARNING

ISS Constraints (Cont)

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

E. RF radiation exposure
1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1]
2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1]
3. Stay 1 ft from UHF Antenna when powered [LAB,P1]
4. Stay 0.3 ft from fwd/aft JPM PROX antenna
5. Stay 246 ft from ICS-EF if powered

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
18. ICS-EF AHM gears
19. MAXI Visual Star Camera
20. PIU springs [ICS-EF,MAXI,SEDA-AP]

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/JEF VE 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 powered
      - 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) ESP2 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

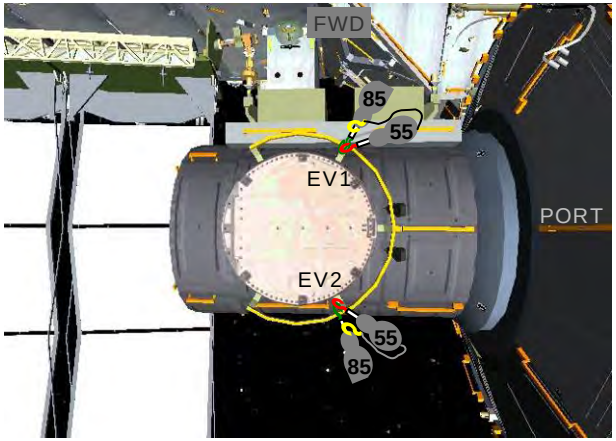
A. Avoid inadvertent contact with
1. HTV solar array panels (kick loads can shatter panel and generate sharp edges) [HTV]
2. HTV fwd RCS thrusters [HTV]

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]

D. Thermal
1. EP handrails may be hot. Handling may need to be limited

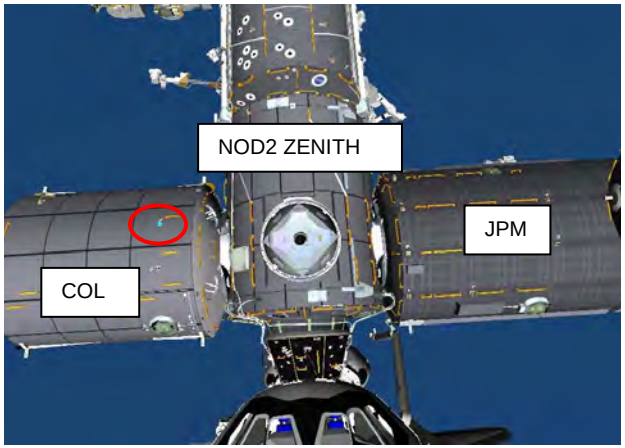
EGRESS/SETUP (00:30)

IV/RMS	EV1 (FF) WOLF	EV2 (FF) CASSIDY
	**Initial Configuration:** 1. Waist tether to UIA D-ring ❑ √Gate closed ❑ √Hook locked EGRESS/INITIAL SETUP	**Initial Configuration:** 1. Waist tether to A/L D-ring ❑ √Gate closed ❑ √Hook locked EGRESS/INITIAL SETUP 2. Open hatch thermal cover 3. Egress airlock **4.** Attach AFT 55-ft **RED** alleviator hook to D-ring EXT (L) ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked ❑ LAS inspection 5. Attach AFT 85-ft **GRN** alleviator hook to D-ring EXT (L) 6. Verify 55-ft **YEL** anchor hook to 85-ft ERCM ❑ √Gate closed ❑ √Hook locked ❑ √Reel Unlocked ❑ LAS inspection
	2. On EV2 GO, release EV2 waist tether from A/L D-ring 3. Transfer J Bag to EV2 4. Stow bag RET on A/L D-ring	7. Receive J Bag: stow on BRT **8.** Attach FWD 55-ft **RED** alleviator hook to EV1 D-ring EXT (L) ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked ❑ LAS inspection 9. Attach FWD 85-ft **GRN** alleviator hook to EV1 D-ring EXT (L) 10. Verify 55-ft **YEL** anchor hook to 85-ft ERCM ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked ❑ LAS inspection
1. Post crew egress: WVS Software: Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max √Verify good WVS video from both EVs	5. On EV2 GO, Retrieve waist tether from UIA 6. Egress crewlock 7. Close hatch thermal cover 8. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed) 9. Xlate to S0; Verify safety tether anchor point (S0 HR 3516) ❑ √Gates closed ❑ √Hook locked 10. Xlate to NOD2	11. Verify V/B Bag Config on EV1 BRT 12. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed) 13. Perform translation adaptation 14. Xlate to S0; verify safety tether anchor hook (S0 HR 3483) ❑ √Gate closed ❑ √Hook locked 15. Xlate to LAB HR 0246; stow V/B Bag Pack 16. Xlate to JLE; FL NOD2 HR 0344 (poor man's)

JLE PAYLOAD PREP/WIF 14 RELOCATE/JEM OIH & OIW INSTALLATION (00:30)

IV/RMS

1. Reference JAXA MLI Cue Card

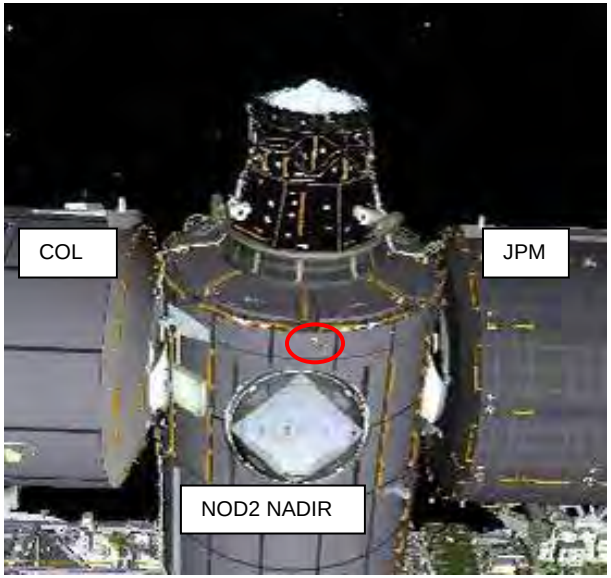


New location COL WIF2

Bolt	Torque	Turns	Release
AHM Bolt A			❑
AHM Bolt B			❑

EV1 (FF) WOLF

NOD2 WIF 14 REMOVE
1. Glove Inspection
2. Xlate to NOD 2 NADIR WIF 14
3. Remove OIW
   - ❑ Tether to WIF
   - ❑ Pull up side lift-tabs
   - ❑ Remove from dovetail



Old location NOD2 WIF 14

NOD2 WIF 14 RELOCATE TO COL WIF 2
4. Xlate to COL WIF 2 (Zenith)
5. Install OIW in WIF 2 bracket
   - ❑ Pull up side lift-tabs on WIF
   - ❑ Slide WIF over dovetail on base
   - ❑ Release lift-tabs to engage locking pins in base receptacles
   - ❑ Verify wings down
6. Xlate to MLI bag

EV2 (FF) CASSIDY

MLI REMOVAL
1. Fairlead GRN alleviator above JPM A/L
2. Fairlead FWD edge of JEF
3. Glove inspection

ICS-EF MLI REMOVAL/AHM RELEASE

> WARNING
> Pinch point between ICS-EF structure and antenna
> Earth and Fine Sensors are no touch areas
> Sharp edge on worm wheel gear

> CAUTION
> PIU has lubricated areas, avoid contact

PIU Cover
4. Xlate to ICS-EF port side
5. Peel top flap off
6. Release belt strap flaps (2)
7. Pull belt straps; remove cover
8. Jettison – provide count and direction

Top Cover Remove
9. Xlate to FWD side of payload
10. Release top cover velcro from sensor cover
11. Pull belt strap, remove top cover
12. Jettison – provide count and direction

AHM Release
13. Install 9-in ext
    - ❑ √Verify pull test
14. **PGT** [**B2** (16 ft-lb), **CCW2**, 30.5] 9-Ext Release AHM Bolt B, 8 turns
15. Verify “RELEASE” on Worm Wheel
16. **PGT** [**B2** (16 ft-lb), **CCW2**, 30.5] 9-Ext Release AHM Bolt A, 8 turns
17. Verify “RELEASE” on Worm Wheel

JLE PAYLOAD PREP/WIF 14 RELOCATE/JEM OIH & OIW INSTALLATION (00:30) (Cont)

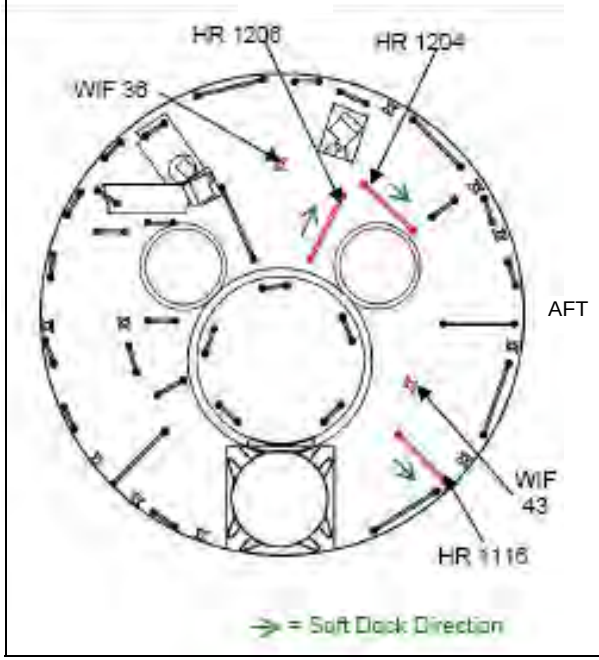
IV/RMS

HR	Mount bolt #		Torque	Turns
1116	6	Zenith		
	5	Nadir		
1204	4	Zenith		
	3	Nadir		
1206	2	Zenith		
	1	Nadir		

OIH
- ❑ 1116
- ❑ 1204
- ❑ 1206

OIW
- ❑ 43
- ❑ 36

Zenith



EV1 (FF) WOLF

JEM OIH/OIW INSTALLATION
7. Retrieve MLI bag
8. Xlate to JPM Port endcone
9. Stow MLI bag on JPM AFT

NOTE
Tether hook may become entrapped between OIH standoff point and pressurized module; ensure tether hook is above OIH interface on standoff point when installing to softdock.

EV must be restrained during installation to avoid loads into OIH until both bolts secured

CAUTION
Avoid inadvertent contact with JEM Airlock target and pin

WIF INSTALLATION
10. Pull up side lift-tabs on WIF
11. Slide WIF over dovetail on base
12. Release lift-tabs to engage locking pins in base receptacles
13. Verify wings down

HANDRAIL INSTALLATION
14. Arm HR soft dock (push both buttons)
15. Install HR to seat track direction arrow on bottom
16. **PGT [A2 (3.8 ft-lb), CW2, MTL 30.5], 6-ext 7/16**:
    Engage handrail bolts (2) ~8 turns to torque
17. Report torque and turns to IV
18. Glove inspection

EV2 (FF) CASSIDY

SEDA-AP BLM BUTTON RELEASE
18. Mnvr to SEDA-AP Zenith
19. Push BLM Release Button
    √Verify button depressed

Sensor Cover (to J Bag)/Bottom Cover
20. Remove sensor cover; stow in J Bag

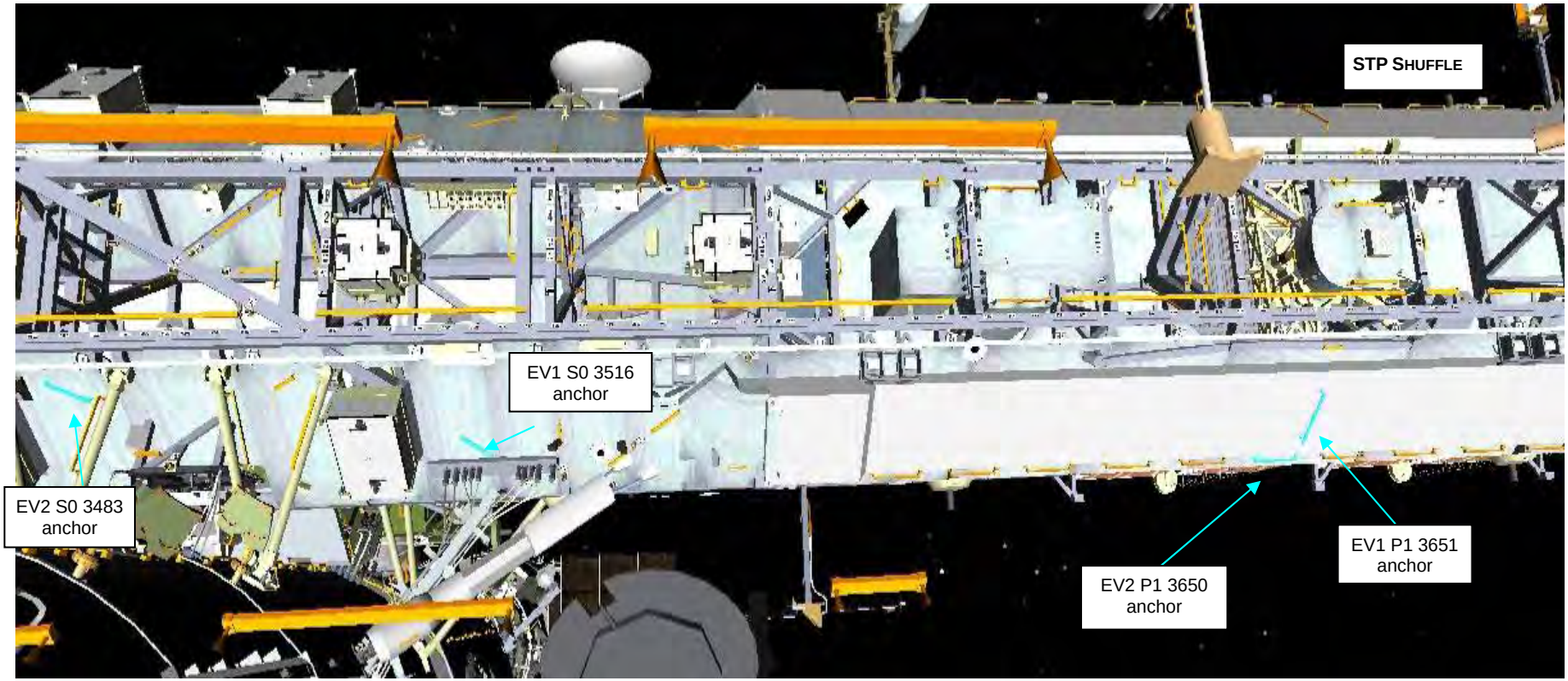
Bottom Cover
21. On EV1 GO, pull belts (2), remove bottom cover
22. Jettison – provide count and direction

23. Retrieve socket caddy
24. Swap PGT to 6-ft ext; stow 9-in on socket caddy
    - ❑ √Verify pull test Socket Caddy
    - ❑ √Verify pull test PGT

25. Retrieve J bag
26. Glove Inspection

SAFETY TETHER PACK (STP) RELOCATE

IV/RMS	EV1 (FF) WOLF	EV2 (FF) CASSIDY
1. IV: When EV clear of JPM give MCC-H GO to repower JTVE AFT	STP RELOCATE 1. Xlate to S0 WIF 45 2. Retrieve IA stow on BRT 3. Xlate to Lab HR 0246; retrieve V/B bag pack 4. Xlate to S0 HR 3483 (EV2's anchor point) 5. On EV2 GO; release EV2 85-ft anchor hook 6. Xlate to P1 HR 3650 (EV2's new anchor point) 7. Attach EV2 85-ft anchor hook ❑ √Gate closed ❑ √Hook locked 8. Give EV2 GO to release waist tether 9. Xlate past P1 3651; attach waist tether ❑ √Gate closed (structure) ❑ √Hook locked (structure) ❑ √Gate closed (R D-ring ext) ❑ √Hook locked (R D-ring ext) 10. Give EV2 GO to release 85-ft anchor hook 11. On EV2 GO, release waist tether 12. Glove inspection 13. Xlate to P6	STP RELOCATE 1. Xlate to STBD Strut; stow J bag 2. Retrieve V/B bag 3. Attach waist tether ❑ √Gate closed (structure) ❑ √Hook locked (structure) ❑ √Gate closed (R D-ring ext) ❑ √Hook locked (R D-ring ext) 4. Give EV1 GO to release anchor hook 5. On EV1 GO, release waist tether 6. Xlate to S0 HR 3516 (EV1's anchor point) 7. On EV1 GO, release EV1 85-ft anchor hook 8. Xlate to S0 WIF 45 9. Retrieve IA; stow on BRT 10. Xlate to P1 HR 3651 (EV1's new anchor point) 11. Attach EV1 85-ft anchor hook ❑ √Gate closed ❑ √Hook locked 12. Give EV1 GO to release waist tether 13. Glove inspection 14. Xlate to P6


STP SHUFFLE
EV1 S0 3516 anchor
EV2 S0 3483 anchor
EV2 P1 3650 anchor
EV1 P1 3651 anchor

P6 BATTERY R&R (04:45)

IV/RMS	EV1 (FF) WOLF	EV2 (FF) CASSIDY
1. Reference Battery Cue Card	WORKSITE PREP	WORKSITE PREP
	WARNING 2A and 4B (AFT arrays) tracking. Maintain 2 ft KOZ 2B and 4A (FWD arrays) locked Avoid contact and EVA kickloads to ICC-VLD keel camera target Outboard MT rail attachment lug near P6 handrail 5333 and gap spanner	
	1. Fairlead **GRN** alleviator hook P5 5316 2. Glove inspection 3. Xlate to P6 WIF 10; install ingress aid 4. Verify APFR per cue card 5. Xlate to WIF 30 nadir route; FL tether for shepherding zenith,outboard of APFR	1. Fairlead **GRN** alleviator hook P5 HR 5312 2. Stow V/B bag P5 HR 5333 3. Xlate to P6 IEA 4. Glove inspection 5. Retrieve MUT EE(2) and ballstack from B bag 6. Install on HR 5339 ❑ √MUT 1 black on black ❑ √MUT 1 paddles out ❑ √MUT 2 black on black ❑ √MUT 2 paddles out ❑ √Verify pull test ❑ √AET to HR ❑ √RET stowed for battery tethering 7. Retrieve sq scoops (2); stow on MWS
	TEMP STOW BATTERY 6. Assist EV2 as required	TEMP STOW BATTERY 8. Xlate to battery 1 9. Install scoops per cue card 10. Xlate to P6 WIF 30 APFR2; verify settings, ingress
	7. GCA battery removal	11. Block C - Remove Batt 1 - IEA 12. Present H2 scoop to EV1 13. Egress APFR
	8. Shepherd to temp stow location 9. Install scoop on MUT EE ❑ √Paddles out ❑ √RET to Battery ❑ √Verify fins pointing to space ❑ √Verify clear of radiator 10. Translate to WIF 10; ingress APFR	14. Shepherd to temp stow location 15. Assist with temp stow as required 16. Retrieve camera w/bracket 17. Stow near WIF18

P6 BATTERY R&R (04:45) (Cont)

IV/RMS	EV1 (FF) WOLF	EV2 (FF) CASSIDY
C/L Bag – Battery Temp Stow (B) P6 HR 5333 ❑ AET (ext D-ring) ❑ Small trash bag (int RET #4) ❑ RET sm-sm (int D-ring #2 to door handle) ❑ RET sm-sm (int D-ring #3 to door handle) C/L Bag – Battery VCC Bag (V) P6 HR 5322 ❑ AET (ext D-ring) ❑ Sq Torque Multiplier (int RET #1) ❑ 7/16-ft Rec socket ❑ Ratchet wrench (int RET #2) ❑ 6-ft ext ❑ sq scoop (int RET #3) ❑ sq scoop (int RET #4) P6 HR 5339 ❑ MUT EE ❑ Ballstack ❑ MUT EE ❑ RET sm-sm stowed on BS ❑ AET to HR Battery 5 ❑ sq scoop ❑ sq scoop Retrieved ❑ AET – EV1 FL ❑ AET – EV2 FL	11. GCA pallet for battery removal BATTERY R&R 12. Perform per cue card ❑ Block A - Remove Batt A - VCC ❑ Block B - Install - Batt A into slot 1 - IEA ❑ Block C - Remove Batt 4 - IEA ❑ Block D - Install - Batt 4 slot A - VCC ❑ Block A - Remove Batt B - VCC ❑ Block B - Install - Batt B into slot 4 - IEA ❑ Glove inspection ❑ Block C - Remove Batt 3 - IEA ❑ Block D - Install - Batt 3 slot B - VCC ❑ Block A - Remove Batt C - VCC ❑ Block B - Install - Batt C into slot 3 - IEA ❑ Block C - Remove Batt 2 - IEA ❑ Block D - Install - Batt 2 slot C - VCC ❑ Block A - Remove Batt D - VCC ❑ Block B - Install - Batt D into slot 2 - IEA TEMP STOW BATTERY TO ICC-VLD 13. Retrieve Batt 1 from Temp Stow – IEA 14. Block D - Install - Batt 1 slot D - VCC EVA 4 PREP 15. Xlate to P6 WIF 10; ingress APFR 16. Break Torque on Batteries E & F **17. PGT [A5 (H1 ft-lb) CCW2, 30.5), sq TM 7/16** Release H1 1 turn **18. PGT [A5 (H2 ft-lb) CCW2, 30.5), 6 ext 7/16** Release H2 1 turn	18. Retrieve V bag 19. Translate to ICC-VLD BATTERY R&R 20. Perform per cue card ❑ Block A - Remove Batt A - VCC ❑ Block B - Install - Batt A into slot 1 - IEA ❑ Block C - Remove Batt 4 - IEA ❑ Block D - Install - Batt 4 slot A - VCC ❑ Block A - Remove Batt B - VCC ❑ Block B - Install - Batt B into slot 4 - IEA ❑ APFR Reconfig ❑ Glove inspection ❑ Block C - Remove Batt 3 - IEA ❑ Block D - Install - Batt 3 slot B - VCC ❑ Block A - Remove Batt C - VCC ❑ Block B - Install - Batt C into slot 3 - IEA ❑ Block C - Remove Batt 2 - IEA ❑ Block D - Install - Batt 2 slot C - VCC ❑ Block A - Remove Batt D - VCC ❑ Block B - Install - Batt D into slot 2 - IEA TEMP STOW BATTERY TO ICC-VLD 21. Retrieve Batt 1 from Temp Stow – IEA 22. Block D - Install - Batt 1 slot D - VCC EVA 4 PREP 23. Stow sq scoops (2) on Battery 5 ❑ √Locked 24. Retrieve camera w/bracket and RET; stow on swing arm 25. Perform tool inventory 26. Stow B bag at P6 HR 5333 ❑ √B bag secure ❑ √Doors facing structure

P6 BATTERY R&R (04:45) (Cont)

IV/RMS	EV1 (FF) WOLF	EV2 (FF) CASSIDY
2. On EV1 GO, give SSRMS go to mnvr to "Overnight Park"	19. Stow tools in V bag; ❑ Scoops(2) ❑ 6" ext ❑ TM 20. Perform tool inventory 21. Retrieve V bag; stow on BRT 22. Egress APFR; verify IA stowed ❑ Handle retracted ❑ Stowed against boot plate 23. Stow V bag at P6 HR 5322 ❑ √V bag secure ❑ √Doors facing structure 24. Glove inspection 25. When clear of ICC-VLD; give IV GO to mnvr to "Overnight Park" 26. Retrieve **GRN** alleviator hook 27. Xlate to airlock	27. Glove inspection 28. Retrieve **GRN** alleviator hook 29. Xlate to S0 Stbd strut; retrieve J bag 30. Xlate to airlock; install Fairlead at A/L HR 0538

EVA 3 CLEANUP AND A/L INGRESS (00:45)

IV/RMS	EV1 (FF) WOLF	EV2 (FF) CASSIDY
1. Pre crew ingress WVS PWRDN (PHOTO/TV, WVS CUE CARD)	CLEANUP 1. Perform full tool inventory INGRESS AND PRE REPRESS 2. Open hatch thermal cover 3. Ingress airlock 4. Attach waist tether to UIA D-ring ❑ √Gate closed ❑ √Hook locked 5. Transfer tether pack to EV2 6. Receive J bag; stow 7. Remove SCU from stowage pouch 8. Remove DCM cover; Velcro to DCM 9. Connect SCU to DCM; √SCU Locked 10. WATER – OFF (fwd), expect H2O IS OFF msg Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)	CLEANUP 1. Perform full tool inventory INGRESS AND PRE REPRESS 2. Receive EV1's tether pack 3. Stow EV1's 55-ft **RED** alleviator hook on FWD A/L D-ring ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked 4. Stow EV1's 85-ft **GRN** alleviator hook on FWD A/L D-ring 5. Transfer J bag to EV1 6. Partially ingress airlock 7. Attach waist tether to A/L D-ring ❑ √Gate closed ❑ √Hook locked 8. Stow 55-ft **RED** alleviator hook on AFT A/L D-ring ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked 9. Stow 85-ft **GRN** alleviator hook on AFT A/L D-ring 10. Ingress Airlock 11. Remove SCU from stowage pouch 12. Remove DCM cover; Velcro to DCM 13. Connect SCU to DCM; √SCU Locked 14. WATER – OFF (fwd), expect H2O IS OFF msg 15. Close thermal cover; attach Velcro strap CAUTION Do not close hatch until EMU Water OFF for 2 min. Verify outer hatch clear of hardware 16. Verify outer hatch clear of hardware 17. Verify handle position per hatch decal; close and lock hatch Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)

JLE PAYLOAD PREP TASK DATA

Estimated Task Duration:

	With SSRMS	Without RMS
One EV Crew	N/A	30 min
Two EV Crew	N/A	30 min

Tools:

EV1 (FF)	EV2 (FF)
N/A	PGT 9" ext

Foot Restraints (APFR):

Task	WIF	APFR Setting
N/A	N/A	N/A

Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	PGT Setting
ICS-EF AHM A – bolt	7/16	1	8.89	10.84	64.96	8	B2(16) cw/ccw 2
ICS-EF AHM B – bolt	7/16	1	9.83	12.01	64.96	8	B2(16) cw/ccw 2

Notes:

N/A

Cautions:

1. PIU has lubricated areas, avoid contact

Warnings:

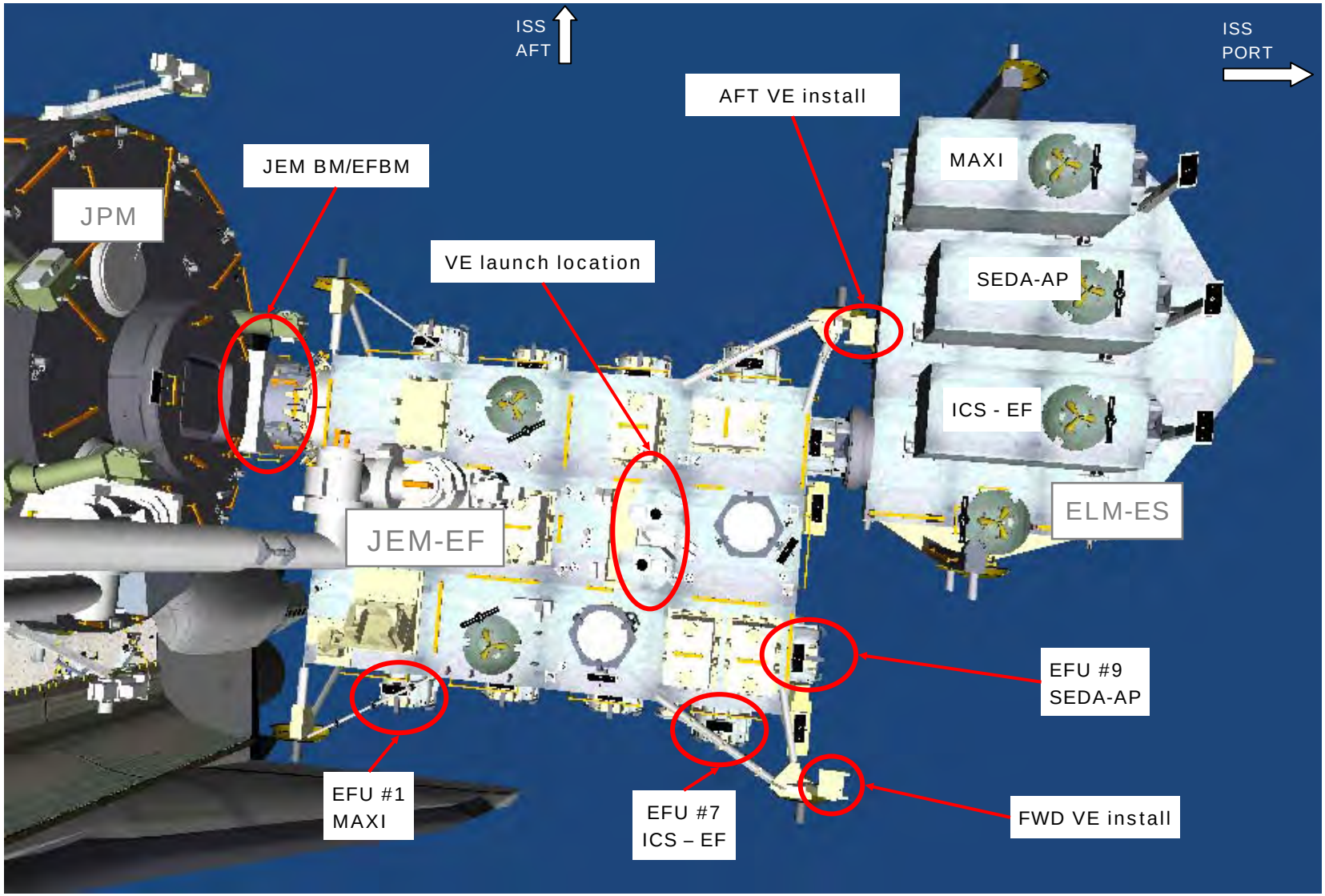
1. Pinch point between ICS-EF structure and antenna
2. Earth and Fine Sensors are no touch areas
3. Sharp edge on worm wheel gear

General Notes:

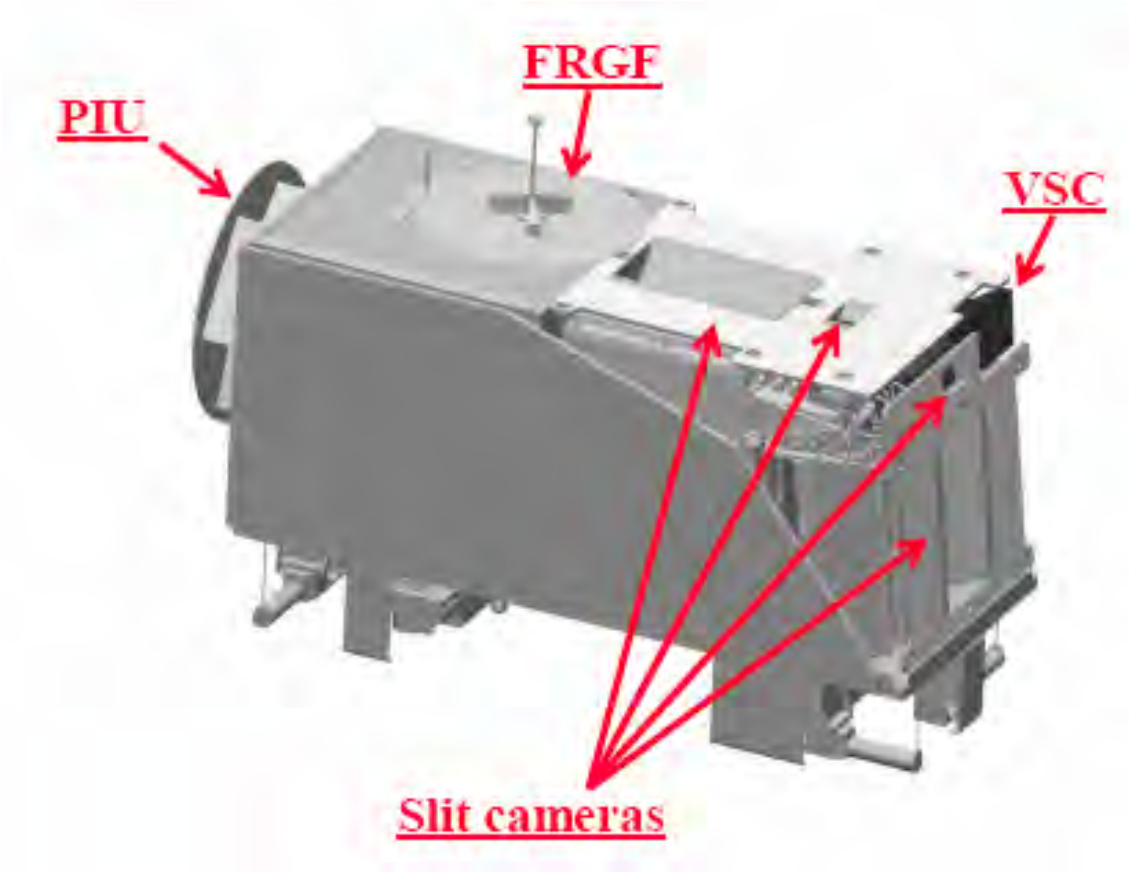
1. Reference MLI cue card

JLE PAYLOAD PREP TASK DATA (Cont)

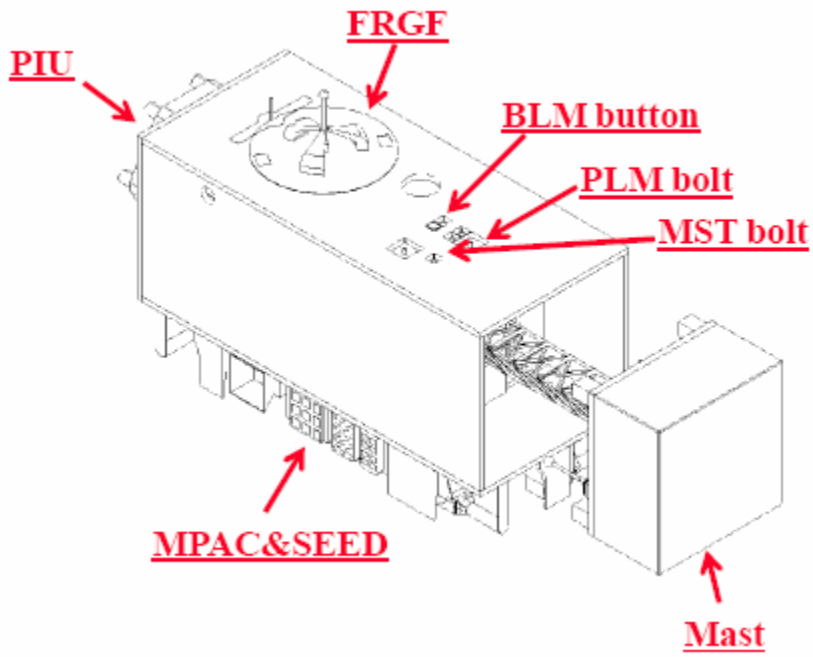
JEM WORKSITES



MAXI

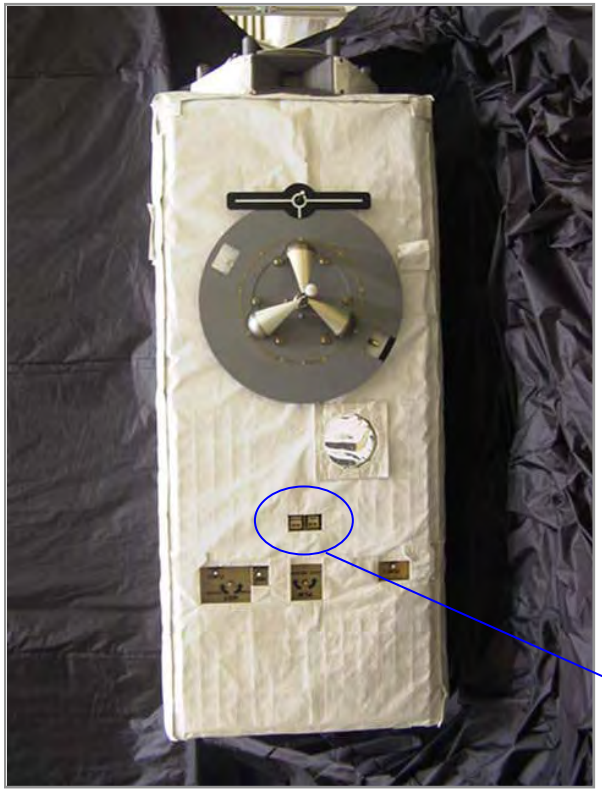


SEDA-AP



Mast Deployed

SEDA-AP

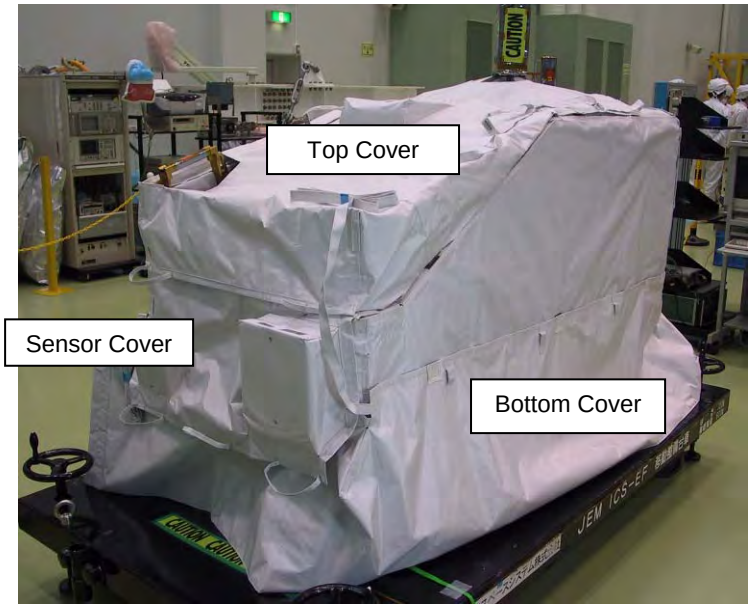


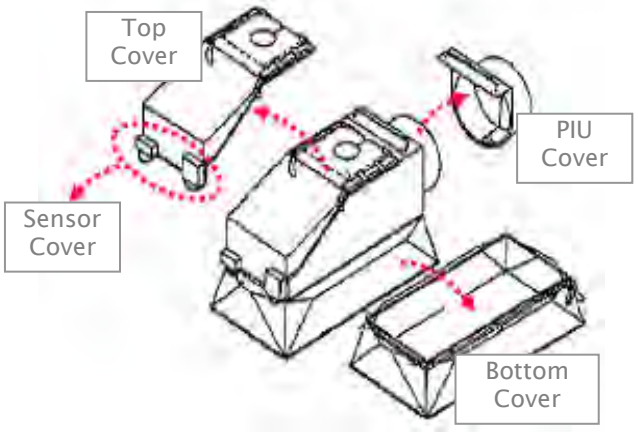
EVA Contingency Interfaces

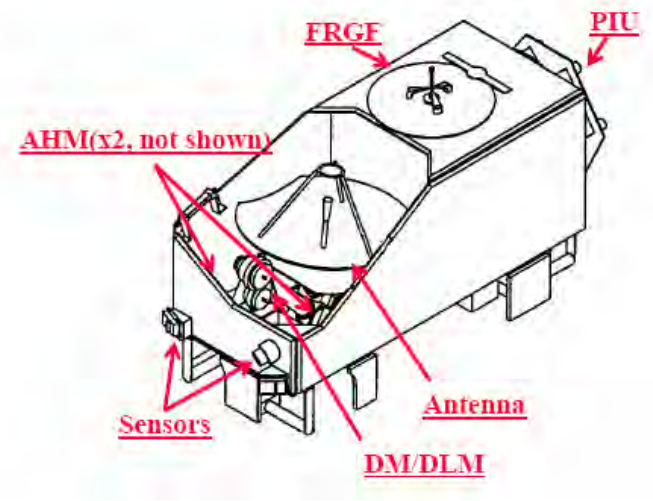
BLM button

JLE PAYLOAD PREP TASK DATA (Cont)

ICS-EF MLI



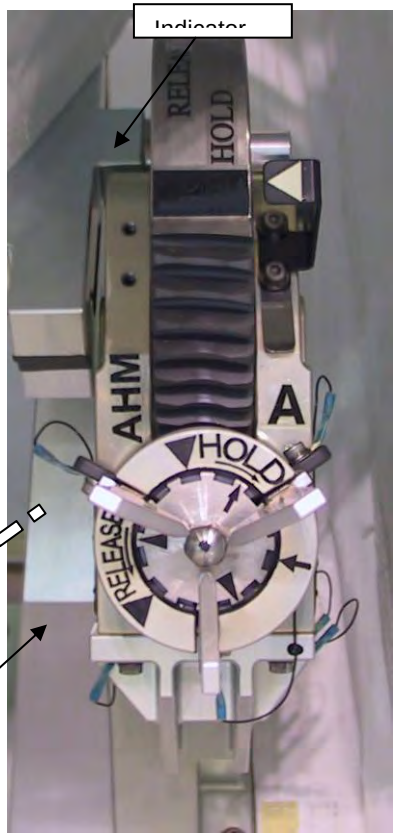




JLE PAYLOAD PREP TASK DATA (Cont)

ICS-EF AHM

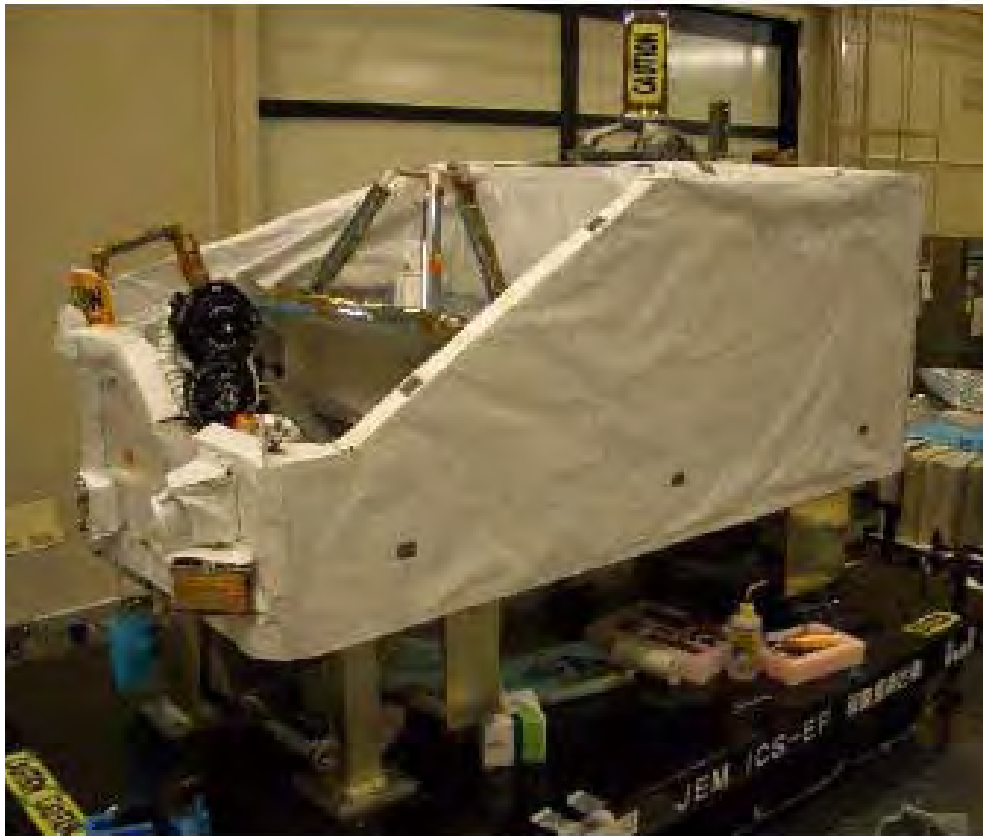
AHM#B



AHM#A

JLE PAYLOAD PREP TASK DATA (Cont)

ICS-EF EVA CONTINGENCY INTERFACES



P6 BATTERY R&R TASK DATA

Estimated Task Duration:

	With SSRMS	Without RMS
One EV Crew	N/A	N/A
Two EV Crew	N/A	04:45 for 4 batteries

ORU Identification:

ORU	Part number	Serial Number
Battery	RE1804, 3304,	See cue card

Tools:

EV1 (FF)	EV2 (FF)
PGT TM 6" wobble ext Sq Scoops (2) MUTEE/BS/MUTEE	PGT TM 6" wobble ext Sq Scoops (2)

Foot Restraints (APFR):

Task	WIF	APFR Setting
Battery R&R	Ref cue card	Ref cue card

Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	PGT Setting
IEA							
H1	7/16	6	8.3	29.2/9.2	84.6	5-6	B2 rel A6 inst
H2 (jacking)	7/16	6	8.3	31/9.2	69.8	16-17	B2 rel A6 inst
ICC-VLD							
H1	7/16	6	16	29.2/9.2	70	8	A5w/TM/ A7 rel B2 inst
H2 (jacking)	7/16	6	16	31/9.2	70	18	A5w/TM/ A7 rel B2 inst

Cautions:

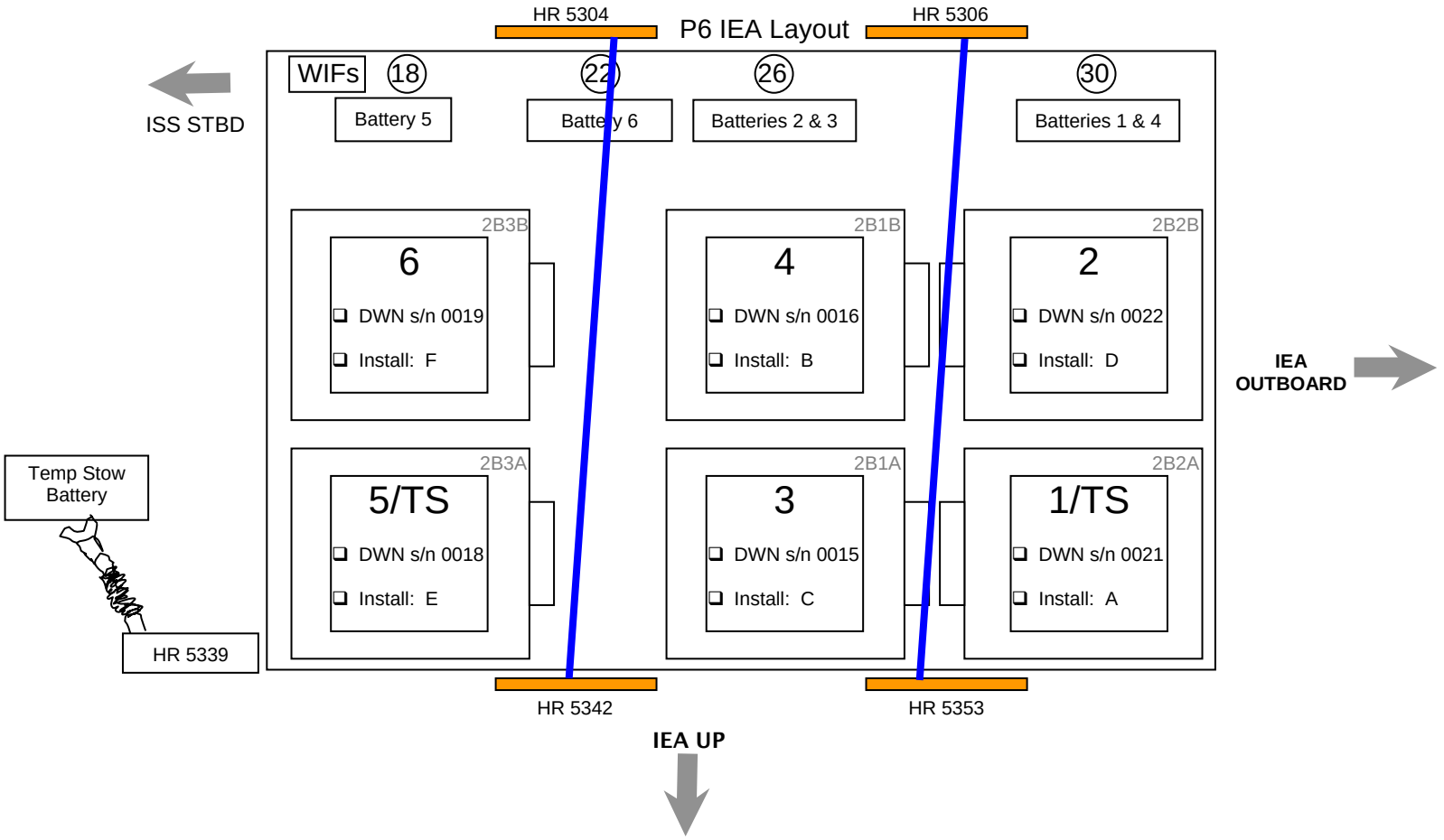
1. Battery fins are sharp edge hazard
2. Doghouse connectors no touch area

Warnings:

1. 2A and 4B (AFT arrays) tracking. Maintain 2 ft KOZ
2. 2B and 4A (FWD arrays) locked
3. Avoid contact and EVA kickloads to ICC-VLD keel camera target
4. Outboard MT rail attachment lug near P6 handrail 5333 and gap spanner

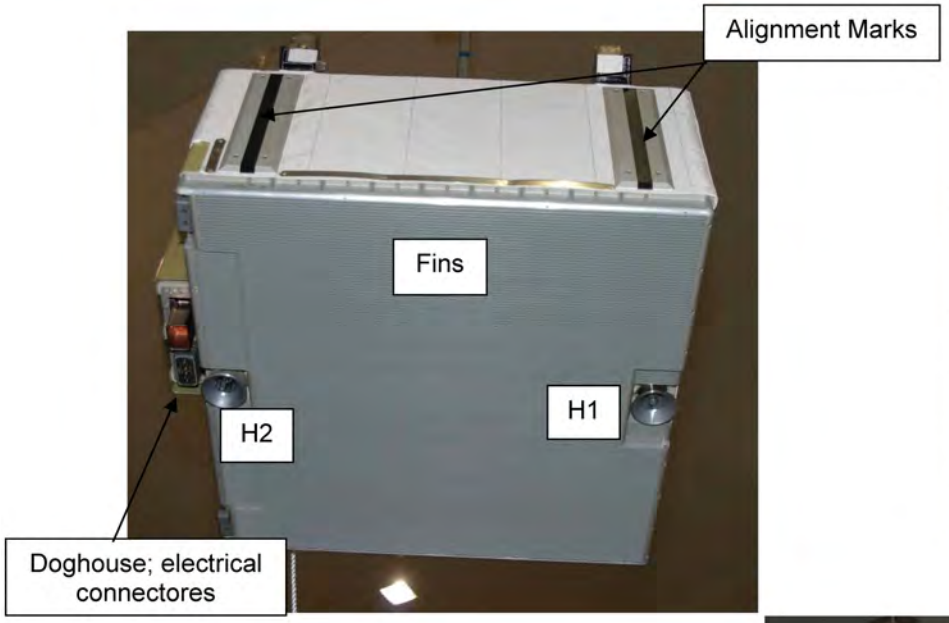
P6 BATTERY R&R TASK DATA (Cont)

BATTERY WORKSITES

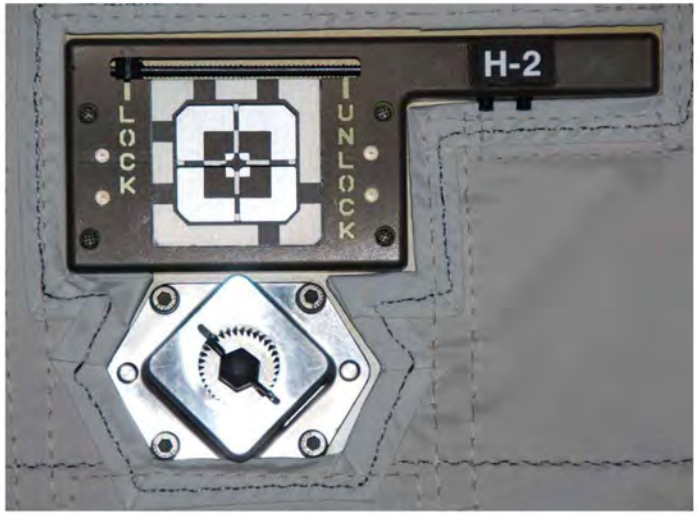


BATTERY R&R TASK DATA

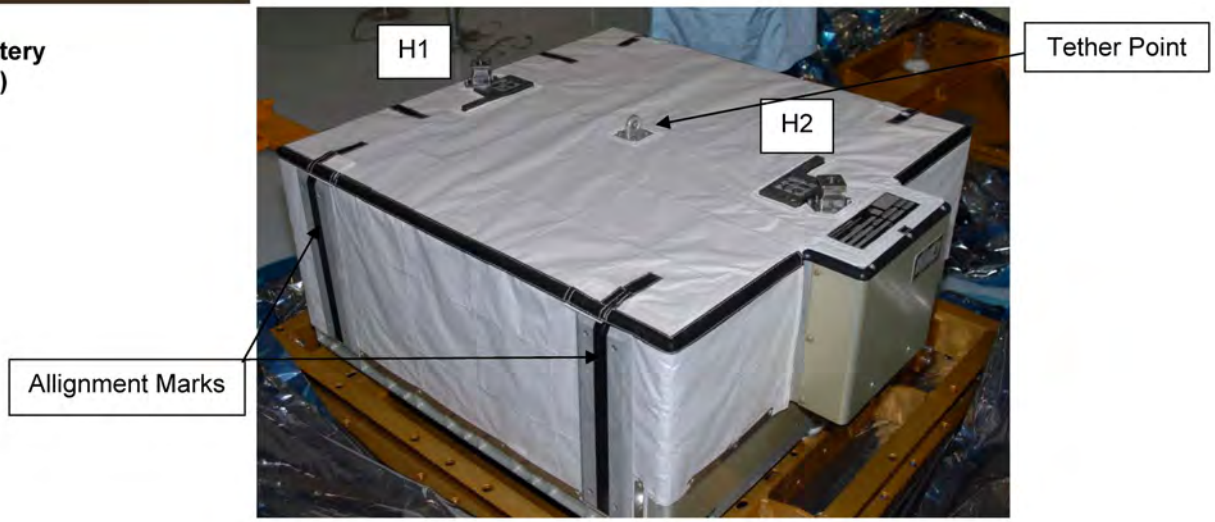
BATTERY WORKSITES



Backside of Battery (to Structure)



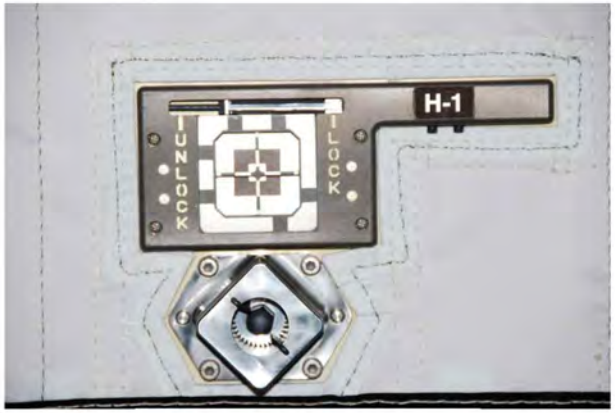
Lock/Unlock Indicator



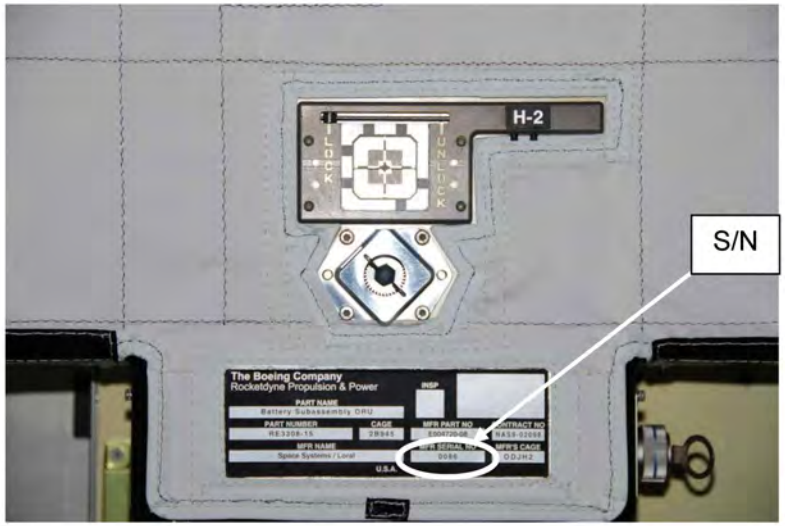
Top of Battery

BATTERY R&R TASK DATA (Cont)

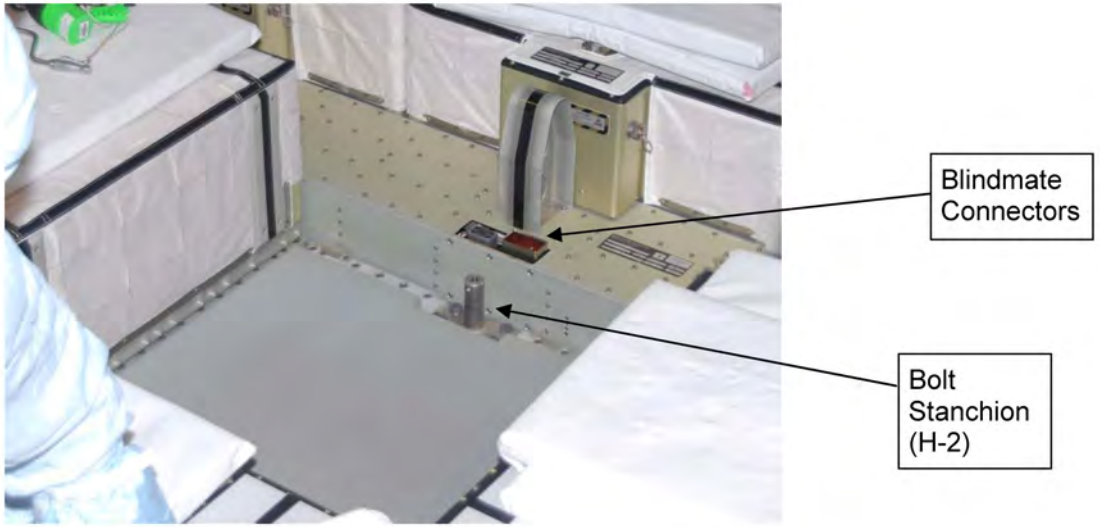
BATTERY ORU



H-1



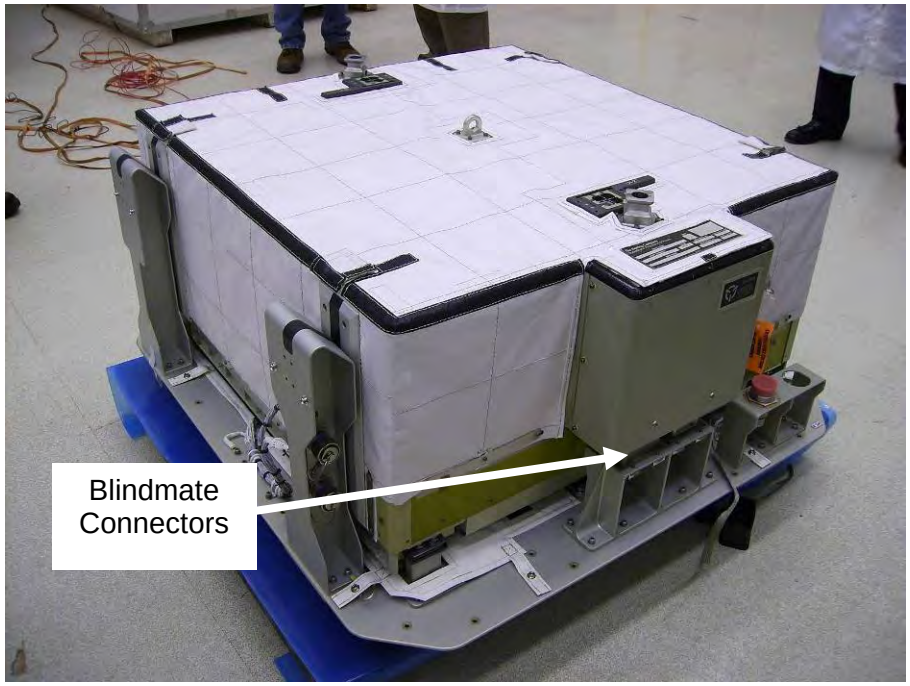
H-2 Lock/Unlock Indicator

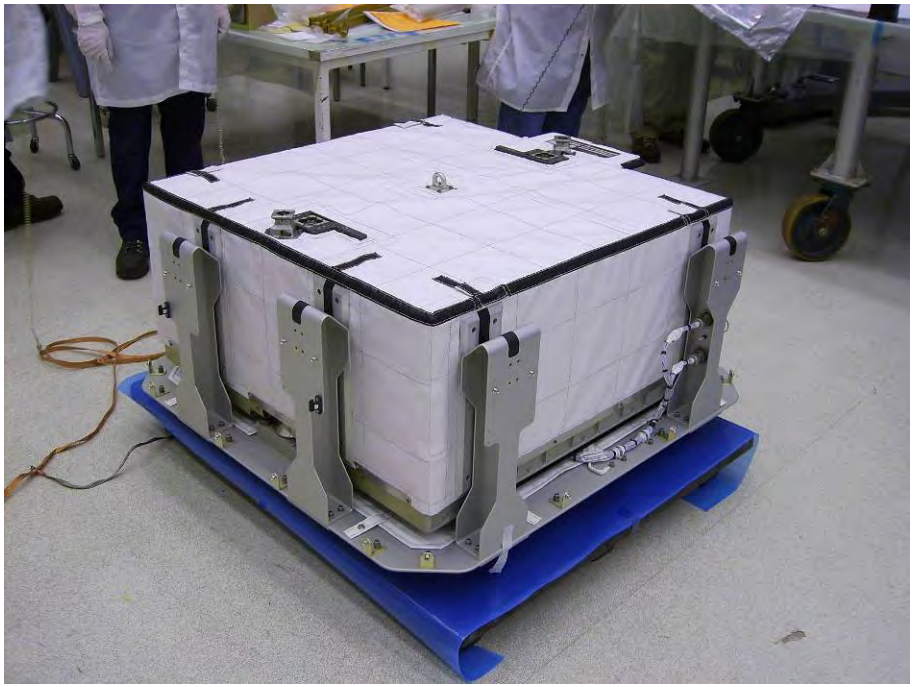


IEA Interface

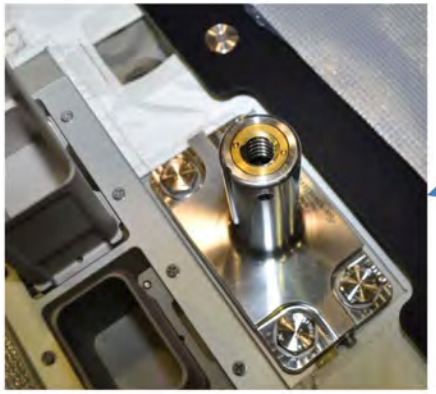
BATTERY R&R TASK DATA (Cont)

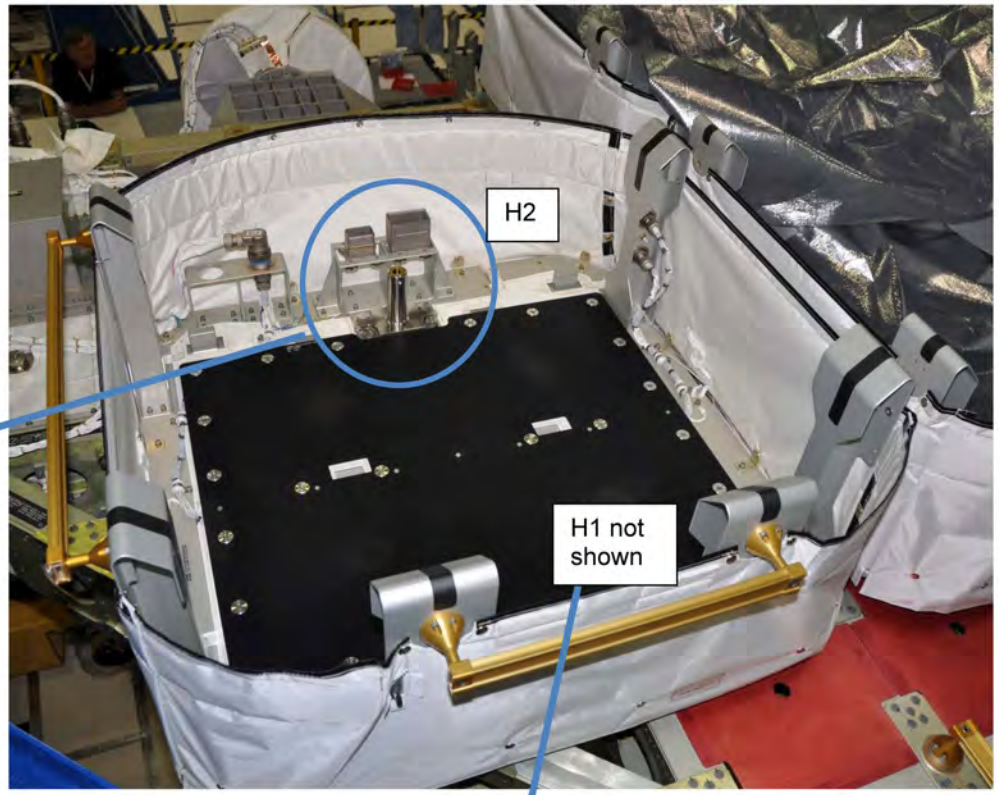
BATTERY INSTALLED ON FSE





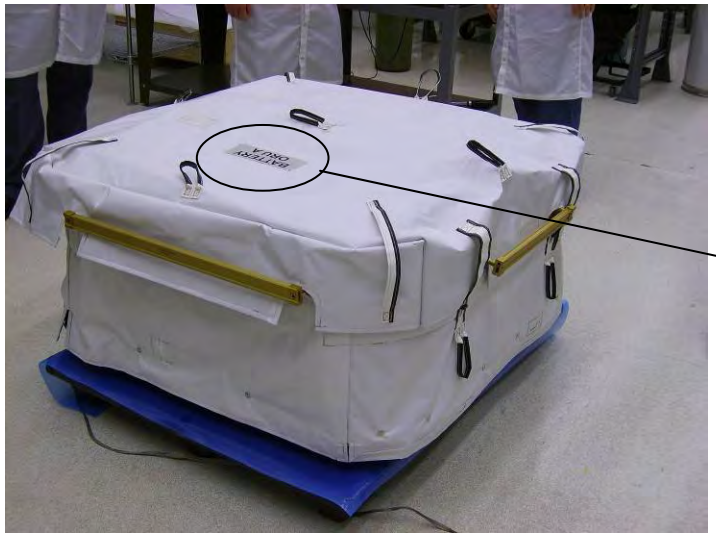
BATTERY FSE SHEAR PIN YELLOW STANCHION

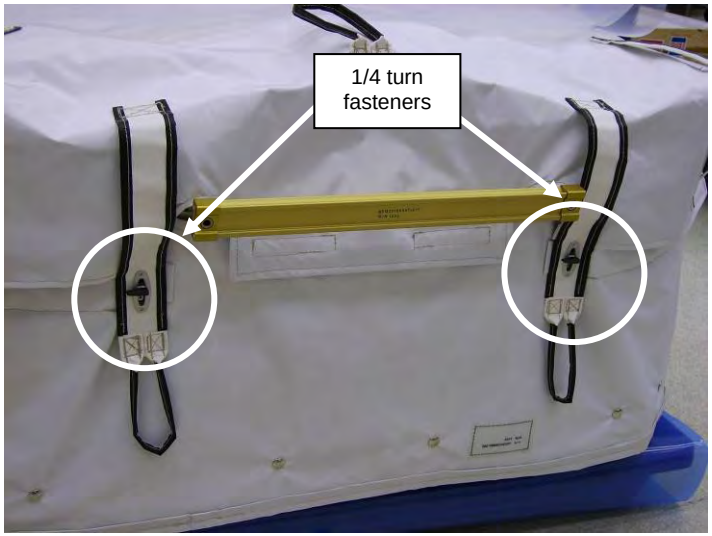


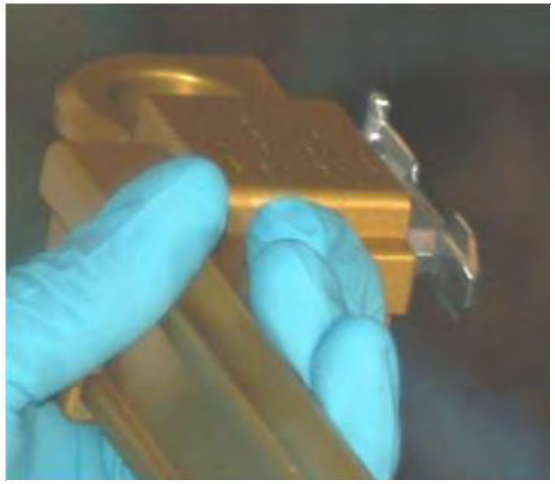


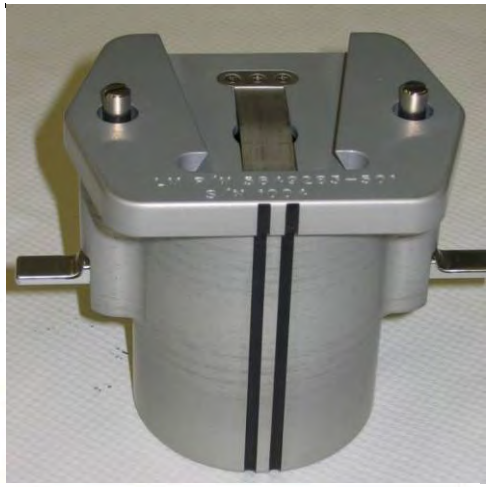
BATTERY R&R TASK DATA (Cont)

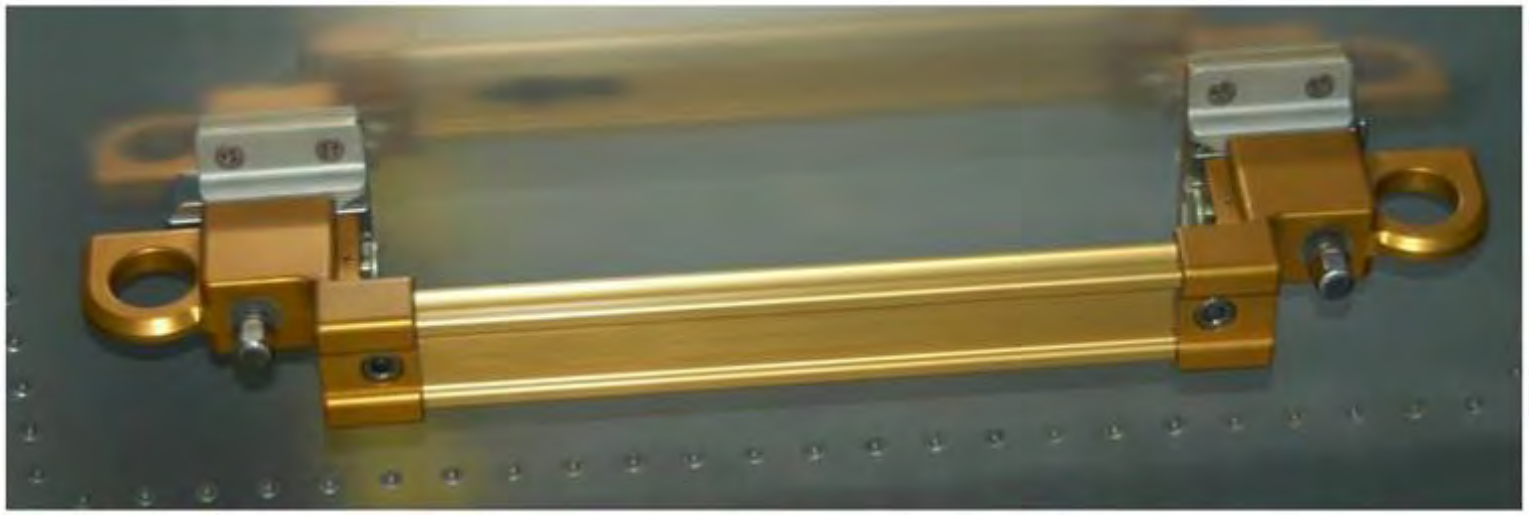
FSE MLI











EVA 4 SUMMARY TIMELINE

PET TI0. ME (HR : MIN)	EVA 4		
	IV/SSRMS	**EV1 – Cassidy (FF)**	**EV2 – Marshburn (FF)**
00:00	**(00:00-00:30)** SSRMS at WS 8 with ICC-VLD at P6	**EGRESS/SETUP** (00:30) ❑ Post Depress and Egress (00:15) ❑ Setup (00:15)	**EGRESS/SETUP** (00:30) ■ Post Depress and Egress (00:15) ■ Setup (00:15)
01:00	**(00:30-04:10)**	**P6 Battery R&R** (03:40) ❑ Temp Stow Battery 5 ❑ Install Battery E	**P6 Battery R&R** (03:40) ❑ Temp Stow Battery 5 ❑ Install Battery E
02:00		❑ Install Battery F ❑ Install Battery 5	❑ Install Battery F ❑ Install Battery 5
03:00		❑ Cleanup	❑ Cleanup
04:00	SSRMS mnvr ICC-VLD to P6 clear position **(04:10-04:30)**	**STP Relocate – Inboard** (00:20)	**STP Relocate – Inboard** (00:20)
05:00	**(04:30-05:45)**	**AFT JEF-VE Install** (01:15) ❑ LTA Reconfig	**AFT JEF-VE Install** (01:15)
06:00	**(05:45-06:30)**	**CLEANUP/INGRESS** (00:45) ■ Cleanup (00:30) ■ Ingress and Pre Repress (00:15)	**CLEANUP/INGRESS** (00:45) ■ Cleanup (00:30) ■ Ingress and Pre Repress (00:15)
	EVA Time 6:30		

EVA 4 TOOL CONFIG

EV1
EMU D-rings
- ❑❑ Ext on left side
- ❑❑ Ext on right side
  - ❑❑ Waist Tethers (right EXT, √locked)

MWS
- ❑❑ RET w/PIP pin
- ❑❑ RET sm-sm
- ❑❑ **1 –** AET
- ❑❑ Swing Arm (right side)
  - ❑❑ 2 – RET sm-sm (Attach to PGT)
    - ❑❑ PGT s/n ____
- ❑❑ BRT (left side)
  - ❑❑ RET sm-sm
  - ❑❑ AET (wrap @ top loop)
  - ❑❑ 2 – long wire ties
  - ❑❑ 2 – short wire ties

❑❑ RET Lg-sm (A/L stowage)
- ❑❑ **C/L Bag – Battery Temp Stow (B)**
  - ❑❑ AET (ext D-ring)
  - ❑❑ sq scoop (int RET #1)
  - ❑❑ sq scoop (int RET #2)
  - ❑❑ MUT EE (int RET #3)
  - ❑❑ Small Trash Bag (int RET #4)
    - ❑❑ Gap spanner chains (2)
  - ❑❑ Camera w/bracket (bracket RET to int D-ring #1)
    - ❑❑ RET sm-sm
  - ❑❑ RET sm-sm (int D-ring #2 to handle)
  - ❑❑ AET (ext, secure BS/MUT EE to outside of bag)
    - ❑❑ Ballstack
      - ❑❑ MUT EE
      - ❑❑ RET sm-sm (use to secure BS/MUT EE)
  - ❑❑ RET sm-sm (in D-ring # 3)
- ❑❑ **C/L Bag – Battery VCC Bag (V) – strap to B Bag**
  - ❑❑ AET (ext D-ring)
  - ❑❑ Sq Torque Multiplier (int RET #1)
    - ❑❑ 7/16" Rec socket
  - ❑❑ Ratchet wrench (int RET #2)
    - ❑❑ 6" ext
  - ❑❑ sq scoop (int RET #3)
  - ❑❑ sq scoop (int RET #4)

EV2
EMU D-rings
- ❑❑ Ext on left side
- ❑❑ Ext on right side
  - ❑❑ Waist Tethers (right Ext to MWS, √locked)

MWS
- ❑❑ Small trash bag
  - ❑❑ Wire Tie
- ❑❑ 1 – Wire tie as tether loop
- ❑❑ RET w/PIP pin (R D-ring)
- ❑❑ RET sm-sm (L D-ring)
- ❑❑ 2 – AET (b/w D-rings)
- ❑❑ Swing Arm (right side)
  - ❑❑ 2 – RET (Attach to PGT)
    - ❑❑ PGT s/n _____
      - ❑❑ 6-in ext
- ❑❑ BRT (left side)
  - ❑❑ RET sm-sm
  - ❑❑ 2 – wire ties

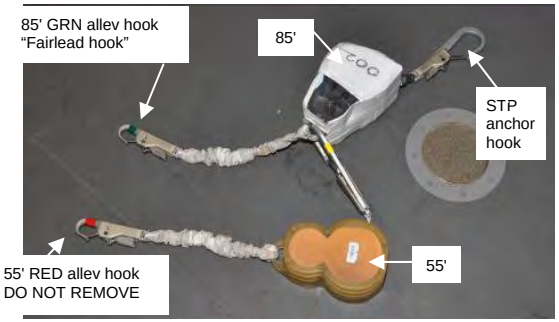
❑❑ RET Lg-sm (A/L stowage)
- ❑❑ **Crewlock Bag – JEF VE (J)**
  - ❑❑ AET (ext D-ring)
  - ❑❑ LTA ISS2 Cap (int RET #1)
  - ❑❑ VE Cap size 17 (1) (int RET #1)
  - ❑❑ Socket caddy (int RET #2)
    - ❑❑ Right Angle Drive
      - ❑❑ 2" ext
  - ❑❑ Round Scoop (int RET #3)
  - ❑❑ VE I/F cable (int RET #4)
  - ❑❑ Camera w/bracket (bracket RET to int D-ring #1)
    - ❑❑ RET sm-sm
  - ❑❑ RET sm-sm (int D-ring #2 to door handle)
    - ❑❑ VE Launch Lock
  - ❑❑ RET sm-sm (int D-ring #3 to door handle)
    - ❑❑ VE MLI upper
  - ❑❑ RET sm-sm (int D-ring #4 to door handle)
    - ❑❑ VE MLI lower

ISS Configuration

MT @ WS8 CETA1 Port/CETA2 Stbd
ICC-VLD on SSRMS at P6
JLE w/payloads installed berthed to JEF
Port SARJ at 45 degrees, 4A locked at 255 deg

Safety Tether config (STP = safety tether pack, 55+85)

EV1 ST pack (55+85) **GRN** anchor at P1 HR 3651
EV2 ST pack (55+85) **GRN** anchor at P1 HR 3650
Fairlead (AET) at ALK HR 0538



Review PGT ops
- Report "green light" (for torque down ops)
- Report torque and turns
- Expect LOTORQ fault msg, Fault LED and Red LED for bolt release ops

Record:
EV1 PGT (serial _____, bat # _____)
EV2 PGT (serial _____, bat # _____)
Spare PGT (serial _____, bat # _____)

Prior to EVA, perform the following inspections:
1. RET cords for fraying
2. Inspect waist tethers, safety tethers and D-ring extenders for damage. Verify no red line visible on safety and waist tether load Alleviation straps
3. Inspect ISS trash bags for deformation/damage
4. Inspect EMU gloves for damage
5. Inspect BRTs and ballstacks for loose fittings/screws
6. **Use BLUE RETs only**

EVA 4 TOOL CONFIG (Cont)

ISS EXTERNAL

P6 HR 5333/5334 (prior to egress/come back in this EVA)
- ❑ C/L Bag – Battery Temp Stow (B)
  - ❑ AET (ext D-ring)
  - ❑ Small trash bag (int RET #4)
  - ❑ RET sm-sm (int D-ring #2 to door handle)
  - ❑ RET sm-sm (int D-ring #3 to door handle)

P6 HR 5322/5318 (prior to egress/come back in this EVA)
- ❑ C/L Bag – Battery VCC Bag (V)
  - ❑ AET (ext D-ring)
  - ❑ Sq Torque Multiplier (int RET #1)
    - ❑ 7/16" Rec socket
  - ❑ Ratchet wrench (int RET #2)
    - ❑ 6" ext
  - ❑ sq scoop (int RET #3)
  - ❑ sq scoop (int RET #4)

P6 HR 5339 (prior to egress/come back in this EVA)
- ❑ MUT EE
  - ❑ Ballstack
    - ❑ MUT EE
      - ❑ RET sm-sm stowed on BS
      - ❑ AET to HR

Battery 5 (prior to egress/come back in this EVA)
- ❑ sq scoop
- ❑ sq scoop

JPM
- ❑❑ **MLI Bag (Lg ORU)**
  - ❑❑ AET ext
  - ❑❑ AET ext
  - ❑❑ Fish stringer #1 (empty)
  - ❑❑ Fish stringer #2 (outside bag, under flap)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Wire tie caddy w/long wire ties (9)
  - ❑❑ Fish stringer #3
    - ❑❑ Gap spanner (72") – split across two hooks

Staging Bag
- ❑❑ Fish Stringer #1
  - ❑❑ Wire Tie Caddy (hook #1)
    - ❑❑ 9 wire ties
  - ❑❑ Velcro/Tape Caddy (hook #2)
  - ❑❑ PGT (hook #3) s/n _____
    - ❑❑ PGT Battery s/n _____
    - ❑❑ 7/16-in (wobble) Socket – 6 ext
  - ❑❑ Vise Grips (hook #4)
  - ❑❑ Ratchet Wrench (hook #5)
    - ❑❑ 7/16-in (rigid) Socket – 9 ext
  - ❑❑ Cheater Bar (hook #6)
  - ❑❑ Hammer (hook #7)
- ❑❑ RET Lg-sm
  - ❑❑ Bolt Puller
- ❑❑ Fish Stringer #2
  - ❑❑ Spare Torque Wrench w/MLI (hook #1)
  - ❑❑ Connector Cleaner Tool Kit (hook #2)
  - ❑❑ Pin Straightener Assy (hook #3)
  - ❑❑ Probe w/BRS Pin Tool Sheath (hook #4)
  - ❑❑ Prybar (hook #5)
  - ❑❑ Needlenose Pliers (hook #6)
  - ❑❑ MWS Key Strap Assy (on wire tie, to strap)

Crewlock Zenith Handrail
- ❑❑ Spare STP
- ❑❑ RET Lg-sm **(Lg hook attached outside bag to Zenith C/L Handrail & small Hook attached to FPP sleeve)**
  - ❑❑ FPP sleeves (sz 33/37) (**FPP stuffed in staging bag**)
- ❑❑ RET Lg-sm **(Lg hook attached outside bag to Zenith CL Handrail & small Hook attached to FPP sleeve)**
  - ❑❑ FPP sleeves (sz 33/37) (**FPP stuffed in staging bag**)

IV Bag
- ❑❑ 2 – Towels
- ❑❑ Contamination Detection Kit
- ❑❑ 2 – GP Caddy
  - ❑❑ Thermal Mittens (1 pair)
- ❑❑ RET (sm-sm) (Black)
  - ❑❑ Socket Caddy
    - ❑❑ 1/2-in (wobble) Socket – 8 ext
    - ❑❑ 7/16-in (wobble) Socket – 6 ext
- ❑❑ 2 – DCM Plug (SAFER Hardmount)
- ❑❑ 2 – RET (sm-sm, black)

Tether counts:	**used**	**available**
RET sm-sm -381	14	16
RET lg-sm -385	5	8
RET sm-sm pp -383	2	5
AET sm-sm	10	8 ISS/4 STS
AET lg-sm	0	2

STS EXTERNAL

Port TSA
- ❑❑ EFBM passive MLI
- ❑❑ MAXI contamination cover

EVA 4 INHIBIT PAD

Orbiter (1)

ALL EVAs

TCS

L12 1. √TCS POWER – OFF

KU-Band Antenna (on call, crew not expected in area)

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

RCS (on call, crew not expected in area)

If EV crew < 27 ft from FRCS

IV 1. √DAP: VERN, FREE, LO Z (flt specific check with GNC)

O14,15,16 2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF
LOGIC (four) – OFF

MCC-H 3. √Above RCS config

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

Ground

ALL EVAs

Ground Radar

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

LOCATION DEPENDENT INHIBITS

S-Band Antennas (not expected)

NOTE

Possible loss of comm when forced LL FWD antenna

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

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

If no comm, or on **MCC GO**

C3 3. S-BAND PM ANT – LL FWD

When EVA crewmember at least 2 ft away from all S-Band upper antennas

C3 4. S-BAND PM ANT – GPC

ALL EVAs

PCU

NOTE

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

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

If one or both PCUs failed

2. No more than two arrays unshunted and oriented < 105 deg from velocity vector

LOCATION DEPENDENT INHIBITS

Lab Window (on call, crew not expected in area)

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

KU-Band (SGANT Antenna) (on call, crew not expected in area)

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

S-Band (SASA) Antennas (on call, crew not expected in area)

MCC-H If EV crew < 3.6 ft from S1 SASA [P1 SASA]
1. P1 SASA (S1 SASA) – Active
2. S1 SASA [P1 SASA] – Powered down

Mobile Transporter

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

ICC-VLD (Battery R&R)

MCC-H 1. √Verify CRPCM 1P RPC 3 Open
2. √Verify CRPCM 1R RPC 3 Open

EVA 4 INHIBIT PAD (Cont)

LOCATION DEPENDENT INHIBITS (Cont)

IEA (Battery R&R)

Battery Set 1 (Batteries 2B11 and 2B12)

MCC-H
1. DCSU 2B RBI 2 Open
2. BCDU 2B1 Converter Off and FI Open
3. BCDU 2B1 CP RBI Open
4. BCDU 2B1 BSCCM A Power Off
5. BCDU 2B1 BSCCM B Power Off
6. BCDU 2B1 Heater Switch A Open
7. BCDU 2B1 Heater Switch B Open

Battery Set 2 (Batteries 2B21 and 2B22)

MCC-H
1. DCSU 2B RBI 3 Open
2. BCDU 2B2 Converter Off and FI Open
3. BCDU 2B2 CP RBI Open
4. BCDU 2B2 BSCCM A Power Off
5. BCDU 2B2 BSCCM B Power Off
6. BCDU 2B2 Heater Switch A Open
7. BCDU 2B2 Heater Switch B Open

Battery Set 3 (Batteries 2B31 and 2B32)

MCC-H
1. DCSU 2B RBI 4 Open
2. BCDU 2B3 Converter Off and FI Open
3. BCDU 2B3 CP RBI Open
4. BCDU 2B3 BSCCM A Power Off
5. BCDU 2B3 BSCCM B Power Off
6. BCDU 2B3 Heater Switch A Open
7. BCDU 2B3 Heater Switch B Open

LOCATION DEPENDENT INHIBITS (Cont)

S3 SARJ (Battery R&R)

MCC-H S3 SARJ locked at 45
1. √DLA (1) – LOCKED
2. All motor setpoints set to zero
3. All motors deselected

P3 SARJ (Battery R&R)

MCC-H P3 SARJ locked at 45
1. √DLA (1) – LOCKED
2. All motor setpoints set to zero
3. All motors deselected

BGAs

MCC-H 2B locked at 0 deg
1. √Latch (L2) – LATCHED

MCC-H 4A locked at 256 deg
1. √Latch (L2) – LATCHED

TRRJ (Battery R&R)

MCC-H If EV crew working within 2 ft of P1 TRRJ rotation envelope
1. √DLA (1) – LOCKED

FPMU (on call, crew not expected in area)

MCC-H If EV crew working within 5 ft of Floating Potential Measurement Unit
1. FPMU power – Off

SSPTS (Reqd if FPP sleeves not installed)

MCC-H If EV crew working within 2 ft of SSPTS cables
1. RPCM LA1A4A D RPC 3 – Open, Close Cmd Inhibit
2. RPCM LA2A3B D RPC 1 – Open, Close Cmd Inhibit
3. RPCM Z14B A RPC 2 – Open, Close Cmd Inhibit
4. RPCM Z13B A RPC 2 – Open, Close Cmd Inhibit

EVA 4 INHIBIT PAD (Cont)

COL (1)

ALL EVAs

EuTEF

COL-CC 1. √PLEGpay Power Status (ETF_PLEGPAY_Pwr_Stat) – OFF

JEM (1)

LOCATION DEPENDENT INHIBITS

JPM Windows (VE install)

IV JPM port end cone AFT window shutter closed
If crew within 3 ft of FWD window, close shutter

JEMRMS (VE install)

SSIPC If EV crew working within vicinity of JEMRMS
1. RIP MA Brake – ON
2. MDP Main Mode – Stby Mode
or
1. JEMRMS Rack – OFF

JPM PROX Antenna (VE install)

SSIPC If EV crew working within 0.3 ft JPM PROX Antenna
1. TRX Power – OFF
2. TX Power – OFF
or
1. JPM PROX Antennas – OFF

JEMRMS (JLE prep and JPM OIH/OIW install)

SSIPC PDB RMS Ext4 Vout: 0.0V
VCU_b TVC WVE Sig Stat – No signal
VLU EE Pwr – Op
JEU Interlock – Inh
JEU RT – Inh
MDP Ang/Mtr Cross Ck – Inh

JPM Aft JTVE (VE install, prior to task)

SSIPC PDB b2 RPC 4 Open

EFBM (VE install)

IV √P011B on Jumper Cable is disconnected for BEPSSIPC

SSIPC √PDB A2 RPC01 – Op

JEF FWD VE (VE install)

SSIPC JEF PDB b RPC22 – Open

JEM (1) (Cont)

LOCATION DEPENDENT INHIBITS (Cont)

JLE SLM (VE install)

SSIPC JLE PCU RPC1 – Op

JEF AFT VE (VE install)

SSIPC JEF PDB b RPC26 – Open
JEF PDB a RPC5 – Open
JEF PDB a RPC6 – Open
HCE a sw9 – Open
HCE a sw12 – Open
HCE b sw67 – Open
HCE b sw69 – Open

JEF LTA (VE install)

SSIPC JEF PDB b RPC18 – Open
JEF PDB b RPC25 – Open
JEF PDB b RPC26 – Open

ICS-EF Antenna (VE install)

SSIPC ICS MOD Off
ICS UPC Off
ICS HPA Off

SEDA-AP Mast, PLAM-S (VE install)

SSIPC JEF PDB a RPC17 – Open

EFU (VE install)

SSIPC JEF PDB a RPC03 – Op
JEF PDB b RPC20 – Op
EFU[X] Sel Status – not selected [X=1 to 12]
EEU Mode – EFU stop

SSE SLM (VE install)

SSIPC SSE SLM Ops Ena/Inh Status 1 – Enable
SSE SLM Ops Ena/Inh Status 2 – Enable

EVA 4 INHIBIT PAD (Cont)

RSOS (1)

ALL EVAs

SM Antennas

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

IMPULSE

MCC-M
1. IMPULSE (ИПИ-100) – Deactivate

EVAS ON PMA 1 OR RSOS (LOCATION DEPENDENT) (on call for APFR 5 relocate)

FGB Thrusters

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

Soyuz Thrusters

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

FGB Antennas

MCC-M
1. √FGB KURS P [КУРС Р] – Deactivated

Soyuz Antennas

MCC-M
1. √Soyuz KURS A [КУРС А] – Deactivated

EVA 4 NOTES/CAUTIONS/WARNINGS

NOTES

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

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, JEF VE 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
   29. JEF ORUs and EFU (paint, lubricant)
   30. MAXI front panel (paint)
   31. SEDA-AP sensors (HIT, SDOM, AOM) and MPAC & SEED

CAUTION

ISS Constraints (Cont)

A. Inadvertent contact (Cont)
   32. Con'PIU, Trunnions and UCM (paint, lubricant) [ICS-EF,MAXI,SEDA-AP]
   33. JLE – PIU, Alignment guide and UCM (paint, lubricant) [ICS-EF,MAXI,SEDA-AP]

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
   4. Avoid tool impact on ICS-EF sensor

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 & 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 & 566, A/L Tank 2 nad/fwd & 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, JEF VE)
7. JEM EFBM capture latches
8. JEM EFU latching arms
9. JEF SSE latch
10. ICS-EF antenna boom
11. SEDA-AP Mast
12. JLE SLM latch

WARNING

ISS Constraints (Cont)

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

E. RF radiation exposure
1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1]
2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1]
3. Stay 1 ft from UHF Antenna when powered [LAB,P1]
4. Stay 0.3 ft from fwd/aft JPM PROX antenna
5. Stay 246 ft from ICS-EF if powered

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
18. ICS-EF AHM gears
19. MAXI Visual Star Camera
20. PIU springs [ICS-EF,MAXI,SEDA-AP]

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/JEF VE 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 powered
      - 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) ESP2 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

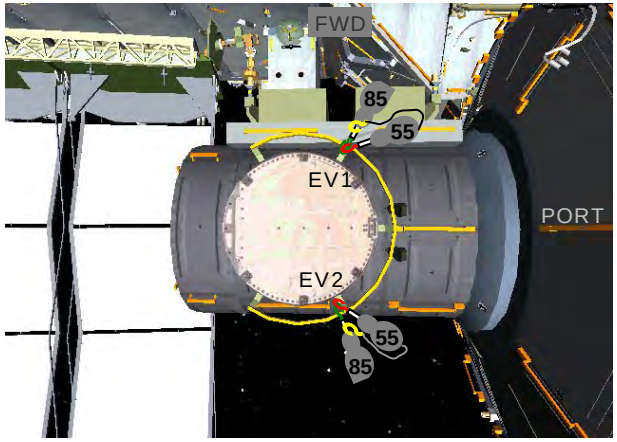
A. Avoid inadvertent contact with
1. HTV solar array panels (kick loads can shatter panel and generate sharp edges) [HTV]
2. HTV fwd RCS thrusters [HTV]

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]

D. Thermal
1. EP handrails may be hot. Handling may need to be limited

EGRESS/SETUP (00:30)

IV/RMS	EV1 (FF) CASSIDY	EV2 (FF) MARSHBURN
	**Initial Configuration:** 1. Waist tether to UIA D-ring ❑ √Gate closed ❑ √Hook locked EGRESS/INITIAL SETUP	**Initial Configuration:** 1. Waist tether to A/L D-ring ❑ √Gate closed ❑ √Hook locked EGRESS/INITIAL SETUP 2. Open hatch thermal cover 3. Egress airlock 4. Attach AFT 55-ft **RED** alleviator hook to D-ring EXT (L) ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked ❑ Inspect LAS for damage 5. Attach AFT 85-ft **GRN** alleviator hook to D-ring EXT (L) ❑ Inspect LAS for damage 6. Verify 55-ft **YEL** anchor hook to 85-ft ERCM ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked ❑ Inspect LAS for damage
	2. On EV2 GO, release EV2 waist tether from A/L D-ring 3. Transfer J Bag to EV2 4. Stow bag RET on A/L D-ring	7. Receive J Bag; stow on BRT 8. Attach FWD 55-ft **RED** alleviator hook to EV1 D-ring EXT (L) ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked ❑ Inspect LAS for damage 9. Attach FWD 85-ft **GRN** alleviator hook to EV1 D-ring EXT (L) ❑ Inspect LAS for damage 10. Verify 55-ft **YEL** anchor hook to 85-ft ERCM ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked ❑ Inspect LAS for damage
1. Post crew egress: WVS Software: Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max √Verify good WVS video from both EVs	5. On EV2 GO, retrieve waist tether from UIA 6. Verify J bag config 7. Egress crewlock 8. Close hatch thermal cover 9. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed)	11. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed) 12. Xlate to LAB HR 0247 stow J bag 13. Retrieve camera w/bracket; stow on swing arm

EGRESS/SETUP (00:30) (Cont)

IV/RMS	EV1 (FF) CASSIDY	EV2 (FF) MARSHBURN
	10. Xlate to P1; verify safety tether anchor point ❑ √Gates closed ❑ √Hook locked 11. Xlate to P6 (nadir)	14. Xlate to P1; verify safety tether anchor hook ❑ √Gate closed ❑ √Hook locked 15. Xlate to P6 (zenith)

P6 BATTERY R&R (03:40)

IV/RMS

1. Reference Battery Cue Card
2. **IV: Verify with MCC-H Battery IEA and ICC-VLD inhibits in place**

3. IV: √Verify batt E & F s/ns:
   Batt E: Expect 097
   Batt F: Expect 0100

Break Torque on Batt E

H1	H2
Turns	Turns

Break Torque on Batt F

H1	H2
Turns	Turns

Remove Battery 5 – IEA

H1	H2
Turns	Turns

EV1 (FF) CASSIDY

WORKSITE PREP

WARNING
2A and 4B (AFT arrays) tracking. Maintain 2 ft KOZ
2B and 4A (FWD arrays) locked
Avoid contact and EVA kickloads to ICC-VLD keel camera target
Outboard MT rail attachment lug near P6 handrail 5333 and gap spanner

1. Fairlead **GRN** alleviator hook P6 HR 5316
2. Retrieve V bag from P6 HR 5321 & 5318
3. Glove inspection
4. Xlate to P6 WIF 10
5. Verify APFR/IA: [12, GG, F, 6]
6. GCA pallet
7. Xlate to ICC-VLD
8. Stow V bag
9. Open MLI on batts E & F; verify s/n to IV

10. Break torque on Batts E & F
    PGT [A5 (H2 31 ft-lb,H1 29.2 ft-lb), CCW2, 30.5], TM Rec 7/16; release H1, H2 maximum 5 turns PGT (1 turn TM)

11. Stow TM in V bag; install 6" ext from ratchet on PGT
12. Install scoops on Batt E
    Left: Down & Out Right: Down

REMOVE AND TEMP STOW BATTERY 5 – IEA

13. Assist EV2 as required

14. GCA battery removal (BRT to HR 5333)
15. Temp stow battery
    - ❑ √Paddles out
    - ❑ √Verify fins pointing to space
    - ❑ √Verify clear of radiator
    - ❑ √RET from Battery to Ballstack
    - ❑ √Verify AET from Ballstack to HR
16. Translate to WIF 10; ingress APFR

EV2 (FF) MARSHBURN

WORKSITE PREP

1. Fairlead **GRN** alleviator hook P6 HR 5312
2. Xlate to P6 IEA
3. Glove inspection
4. Stow camera on HR 5331
5. Xfer APFR from WIF 26 to WIF 18
6. Verify MUTEE/BS/MUTEE on HR 5339
   - ❑ √MUT 1 black on black
   - ❑ √MUT 1 paddles out
   - ❑ √MUT 2 black on black
   - ❑ √MUT 2 paddles out
   - ❑ √Verify pull test
   - ❑ √AET from ballstack to HR 5339
   - ❑ √RET stowed for battery tethering

7. Verify sq scoops (2); installed on Batt 5
   Left: Down & Out Right: Down

REMOVE AND TEMP STOW BATTERY 5 – IEA

8. Verify APFR settings WIF 18: 12, QQ, F, 12
9. Ingress, set local tether
10. Check gap spanner position
11. **PGT [A7 (9.2 ft-lb), CCW2, 30.5],** 6-ext 7/16
    Release H1 5-6 turn
12. RET to battery from ballstack
13. **PGT [A7 (9.2 ft-lb), CCW2, 30.5],** 6-ext 7/16
    Release H2 16-17 turn
14. Remove Battery, soft dock < 20 lbf
15. Rotate battery 180 deg; present H2 scoop to EV1
16. Assist with temp stow as required

17. Clear wrist cluster; provide safety tether clearances

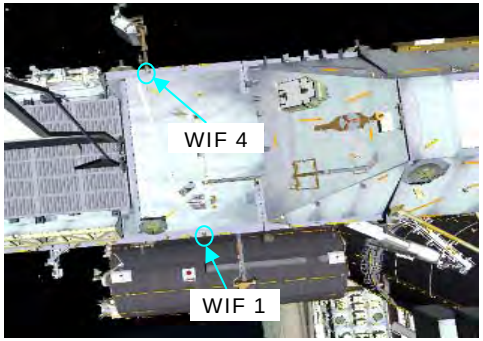
P6 BATTERY R&R (03:40) (Cont)

IV/RMS	EV1 (FF) CASSIDY	EV2 (FF) MARSHBURN
Remove Battery E – ICC-VLD H1 / H2 Turns / Turns Install Battery E into Slot 5 – IEA H1 (Torque, Turns) / H2 (Torque, Turns) Remove Battery 6 – IEA H1 (Torque, Turns) / H2 (Torque, Turns)	17. GCA ICC-VLD to Battery retrieve position REMOVE BATTERY E – ICC-VLD 18. √Verify EV2 tether is clear for ICC-VLD translation 19. GCA ICC-VLD for removal 20. **PGT [A7 (9.2 ft-lb), CCW2, 30.5**], 6-ext 7/16; release H1 5-6 turn 21. **RET to battery** 22. **PGT [A7(9.2 ft-lb), CCW2, 30.5**], 6-ext 7/16; release H2 16-17 turn 23. Remove Battery, soft dock < 20 lbf 24. Verify yellow stanchion inserts still present 25. Begin GCA INSTALL BATTERY E INTO SLOT 5 – IEA 26. FOD check ❑ Inspect install location ❑ Inspect Battery fins 27. Batt 6 Handoff (APFR to APFR) ❑ Roll APFR ❑ **Swap RET** INSTALL BATTERY 6 INTO SLOT E – VCC 28. GCA ICC-VLD for install 29. FOD check 30. Inspect install location	REMOVE BATTERY E – ICC-VLD 18. Assist EV1 as required INSTALL BATTERY E INTO SLOT 5 – IEA 19. FOD check ❑ Inspect install location ❑ Inspect Battery fins 20. Hand off batt 6 to EV1 (APFR to APFR) 21. Install Battery, soft dock < 20 lbf 22. **PGT [A6 (8.6 ft-lb), CW2, 30.5]**, 6-ext 7/16 Install H2 16-17 turn Install H1 5-6 turn 23. Shift scoops to Battery 6 Left: Up & Out Right: Down 24. Reconfig APFR for next battery WIF 22: [12, QQ, C, 1] REMOVE BATTERY 6 – IEA 25. Check gap spanner position 26. **PGT [A7 (9.2 ft-lb), CCW2, 30.5]**, 6-ext 7/16; release H1 5-6 turn **27. RET to battery** 28. **PGT [A7 (9.2 ft-lb), CCW2, 30.5],** 6-ext 7/16; release H2 16-17 turn 29. Remove Battery, soft dock < 20 lbf INSTALL BATTERY 6 INTO SLOT E – VCC 30. FOD check ❑ Inspect install location ❑ Inspect Battery fins

P6 BATTERY R&R (03:40) (Cont)

IV/RMS	EV1 (FF) CASSIDY	EV2 (FF) MARSHBURN
Install Battery 6 into Slot E – ICC-VLD H1 / H2 (Torque, Turns, Torque, Turns)	31. Inspect Battery fins 32. Install Battery, soft dock < 20 lbf 33. **PGT [B2 (16 ft-lb), CW2, 30.5],** 6-ext 7/16 Install H2 16-17 turn Install H1 5-6 turn 34. Close MLI on installed battery 35. Glove inspection	
	<u>REMOVE BATTERY F – ICC-VLD</u> 36. √Verify EV2 tether is clear for ICC-VLD translation 37. GCA ICC-VLD for removal	<u>REMOVE BATTERY F – ICC-VLD</u> 31. √Verify EV2 tether is clear for ICC-VLD translation
Remove Battery F Removal – ICC-VLD H1 / H2 (Torque, Turns, Torque, Turns)	38. **PGT [A7 (9.2 ft-lb), CCW2, 30.5**], 6-ext 7/16; release H1 5-6 turn 39. **RET to battery** 40. **PGT [A7(9.2 ft-lb), CCW2, 30.5]**, 6-ext 7/16; release H2 16-17 turn 41. Remove Battery, soft dock < 20 lbf 42. GCA for removal 43. Verify yellow stanchion inserts still present	32. Shift scoops to Battery F Left: Up & Out Right: Down 33. Glove inspection 34. Verify yellow stanchion inserts still present
Install Battery F into Slot 6 – IEA H1 / H2 (Torque, Turns, Torque, Turns)	<u>INSTALL BATTERY F INTO SLOT 6 – IEA</u> 44. Handoff from APFR to APFR ❑ EV2 to roll EV1's APFR ❑ **Swap RET** 45. FOD check ❑ Inspect install location ❑ Inspect Battery fins	<u>INSTALL BATTERY F INTO SLOT 6 – IEA</u> 35. Handoff from APFR to APFR ❑ EV2 to roll EV1's APFR ❑ **Swap RET** 36. FOD check 37. Inspect install location ❑ Inspect Battery fins 38. Install Battery, soft dock < 20 lbf 39. **PGT [A6 (8.6 ft-lb), CW2, 30.5]**, 6-ext 7/16 Install H2 16-17 turn Install H1 5-6 turn
Install Temp Stow Battery into Slot F – ICC-VLD H1 / H2 (Torque, Turns, Torque, Turns)	<u>INSTALL TEMP STOW BATTERY INTO SLOT F – ICC-VLD</u> 46. Retrieve Batt 5 from temp stow – IEA; hand off to EV2 47. Ingress APFR 48. GCA ICC-VLD for install 49. FOD check ❑ Inspect install location ❑ Inspect Battery fins 50. Install Battery, soft dock < 20 lbf 51. **PGT [B2 (16 ft-lb), CW2, 30.5],** 6-ext 7/16 Install H2 16-17 turn Install H1 5-6 turn	<u>INSTALL TEMP STOW BATTERY INTO SLOT F – ICC-VLD</u> 40. Retrieve Batt 5 from temp stow – IEA 41. Hand off to EV2 (after EV2 APFR ingress) 42. Roll EV1's APFR 43. Xlate to ICC-VLD 44. √Verify IA clear of ICC-VLD 45. FOD check ❑ Inspect install location ❑ Inspect Battery fins 46. Check ingress aid position 47. Xlate to IEA

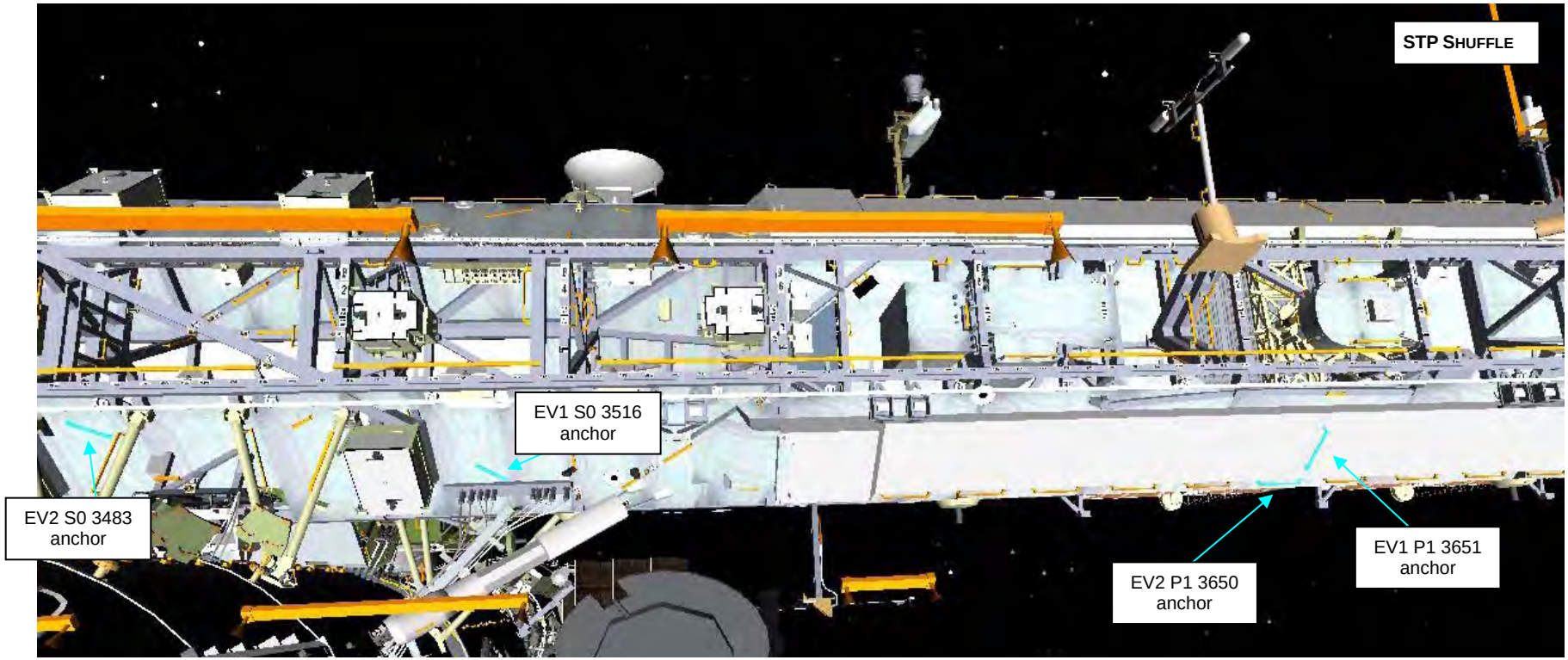
P6 BATTERY R&R (03:40) (Cont)

IV/RMS	EV1 (FF) CASSIDY	EV2 (FF) MARSHBURN
❑ **C/L Bag – Battery Temp Stow (B)** ❑ AET (ext D-ring) ❑ sq scoop (int RET #1) ❑ sq scoop (int RET #2) ❑ MUT EE (int RET #3) ❑ Small Trash Bag (int RET #4) ❑ Gap spanner chains (2) ❑ Camera w/bracket (bracket RET to int D-ring #1) ❑ RET sm-sm ❑ RET sm-sm (int D-ring #2 to handle) ❑ AET (ext, secure BS/MUT EE to outside of bag) ❑ Ballstack ❑ MUT EE ❑ RET sm-sm (use to secure BS/MUT EE) ❑ RET sm-sm (in D-ring # 3) ❑ **C/L Bag – Battery VCC Bag (V) – strap to B Bag** ❑ AET (ext D-ring) ❑ Sq Torque Multiplier (int RET #1) ❑ 7/16" Rec socket ❑ Ratchet wrench (int RET #2) ❑ 6" ext ❑ sq scoop (int RET #3) ❑ sq scoop (int RET #4) **3. Give SSRMS GO to mnvr ICC-VLD to P6 Clear** √Tethers clear of ICC-VLD √Tools removed from ICC-VLD	WORKSITE CLEANUP 52. Retrieve/stow in V bag sq scoops (2) TM 53. Close MLI on installed battery 54. Perform tool inventory 55. Retrieve V bag; egress to IEA 56. Stow V bag on APFR in WIF 10 57. Give SSRMS GO to mnvr ICC-VLD to P6 clear position 58. Retrieve APFR/IA/V bag; stow on BRT 59. Retrieve **GRN** alleviator hook 60. Glove inspection APFR RELOCATE 61. Xlate to P1 WIF 4 (zenith) 62. Stow APFR [8,QQ,G,11] ❑ Black on black ❑ Pull test ❑ √Verify IA against boot plate 63. Retrieve V bag  	WORKSITE CLEANUP 48. Retrieve trash bag (B bag) 49. Retrieve Gap spanner chains (2); stow in trash bag 50. Stow trash bag in B bag 51. Retrieve/stow in B bag ❑ sq scoops (2) ❑ MUT EE (2) ❑ Ballstack w/RET & AET ❑ Camera w/bracket and RET sm-sm 52. Perform tool inventory 53. Glove inspection 54. Retrieve B bag; stow on APFR WIF 22 55. Retrieve FL (AET) 56. Retrieve APFR; stow on BRT 57. Retrieve **GRN** alleviator hook APFR RELOCATE 58. Xlate to P1 WIF 1 (nadir) 59. Stow APFR [6, WW, K, 4] ❑ Black on black ❑ Pull test 60. Retrieve B bag

STP RELOCATE – INBOARD (00:20)

IV/RMS	EV1 (FF) CASSIDY	EV2 (FF) MARSHBURN
1. IV: √Verify JPM Aft window closed for translation **2. IV: √Verify JTVE AFT inhibits in place** **SSIPC** PDB b2 RPC4 – Op	MOVE STP ANCHORS TO S0 1. Xlate to P1 3650 (EV2's anchor point) 2. Attach waist tether ❑ √Gate closed (structure) ❑ √Hook locked (structure) ❑ √Gate closed (D-ring ext) ❑ √Hook locked (D-ring ext) 3. Give EV2 GO to release EV1's 85-ft anchor hook 4. On EV2 GO, release waist tether 5. On EV2 GO, retrieve EV2 **85-ft** anchor hook from HR 3650; stow on NOT **YEL** ERCM 6. Xlate to S0 HR 3483 (EV2's new anchor point) 7. Attach EV2 **85-ft** anchor hook at S0 HR 3483 ❑ √Gate closed ❑ √Hook locked 8. Give EV2 GO to release waist tether 9. Stow V bag – bundle with B bag 10. Glove inspection 11. Xlate to JEF	MOVE STP ANCHORS TO S0 1. Xlate to P1 3651 (EV1's anchor point) 2. On EV1 GO, retrieve EV1 **85-ft** anchor hook; stow on NOT **YEL** ERCM 3. Xlate to S0 3516 (EV1's new anchor point) 4. Attach EV1 **85-ft** anchor hook ❑ √Gate closed ❑ √Hook locked 5. Give EV1 GO to release waist tether 6. Xlate STBD past S0 HR 3483 (EV2's new anchor point) 7. Attach Waist tether ❑ √Gate closed (structure) ❑ √Hook locked (structure) ❑ √Gate closed (D-ring ext) ❑ √Hook locked (D-ring ext) 8. Give EV1 GO to release EV2's 85-ft anchor hook 9. Stow B bag 10. Retrieve J bag 11. On EV2 GO, release waist tether 12. Glove inspection 13. Xlate to JEF

STP RELOCATE – INBOARD (00:20) (Cont)



AFT JEF VE INSTALL (01:15)

IV/RMS	EV1 (FF) CASSIDY/EV2 (FF) MARSHBURN
1. IV: √Verify VE and LTAB inhibits in place JEF Aft VE SSIPC JEF PDB b RPC26 – Open JEF PDB a RPC5 – Open JEF PDB a RPC6 – Open HCE a sw9 – Open HCE a sw12 – Open HCE b sw67 – Open HCE b sw69 – Open JEF LTA SSIPC JEF PDB b RPC18 – Open JEF PDB b RPC25 – Open JEF PDB b RPC26 – Open 2. EV2 – Position at camera with feet pointing Port	CAUTION White paint on DCU is a no touch area Once MLI removed, PTU becomes pinch point 1. Xlate to JEF FWD VE launch location 2. EV2 drops FL (AET) Node2 FWD 3. Stow J bag HR 7037 (b/w R-ORU & DCU plate) MLI/LAUNCH LOCK REMOVAL (EV2) 4. Attach 2 – RETs to VE MLI 5. Open MLI 6. Retrieve RAD w/2" ext from J bag; install on PGT 7. Stow 6" on socket caddy (as required) 8. **PGT [B5** (22 ft-lb), **CCW2, 30.5]** RAD, 2"-ext 7/16 Release Launch Lock bolts (2) 16 turns (at socket) ❑ Bolt 1 ❑ Bolt 2 9. Release MLI grounding wires 10. Remove upper & lower VE MLI; stow outside J bag 11. RET from J Bag to Launch Lock 12. **PGT [B5** (22 ft-lb), **CCW2, 30.5]** RAD, 2"-ext 7/16 Release Launch Lock bolts (2) 16 turns (at socket) ❑ Bolt 3 ❑ Bolt 4 13. Stow launch lock in J bag CABLE DISCONNECT (EV1) 14. Retrieve connector cap from J bag 15. Retrieve scoop from J bag and stow on MMWS 16. Connect RET from J bag to VE I/F cable 17. Disconnect VE I/F cable ❑ J005 JEF Deck/P005 bootie ❑ P006 VE bootie 18. Stow cable in J bag 19. Retrieve connector cap; install on JEF Deck J005

AFT JEF VE INSTALL (01:15) (Cont)

IV/RMS	EV1 (FF) CASSIDY/EV2 (FF) MARSHBURN

3. IV: √Verify AFT JPM window closed for EV translation prior to first EV leaving worksite

VE bolt	Torque	Turns
FWD		
AFT		

Crewlock Bag – JEF VE (J)

- ❑ AET (ext D-ring)
- ❑ LTA ISS2 Cap (int RET #1)
- ❑ Socket caddy (int RET #2)
  - ❑ Right Angle Drive
    - ❑ 2" ext
- ❑ Round Scoop (int RET #3)
- ❑ VE I/F cable (int RET #4)
- ❑ RET sm-sm (int D-ring #2 to door handle)
  - ❑ VE Launch Lock
- ❑ RET sm-sm (int D-ring #3 to door handle)
  - ❑ VE MLI upper
- ❑ RET sm-sm (int D-ring #4 to door handle)
  - ❑ VE MLI lower

STANCHION BOLT REMOVAL (EV2)

20. **PGT [B5** (22 ft-lb), **CCW2, 30.5]** RAD, 2"-ext 7/16
    Loosen EVA stanchion bolts (2); 15 turns
    - ❑ Port
    - ❑ Install rd scoop (from EV1)
    - ❑ Stbd
21. Remove VE

INSTALL IN AFT LOCATION (EF-A) (EV1)

22. Install VE; soft dock 10.5 lb (47 N)
23. Verify position indicator; black not visible

24. **PGT [B2 (16.0 ft lb), CW2, 30.5] 6 ext 7/16;**
    install EVA bolts (2); 15 turns
    - ❑ FWD
    - ❑ AFT

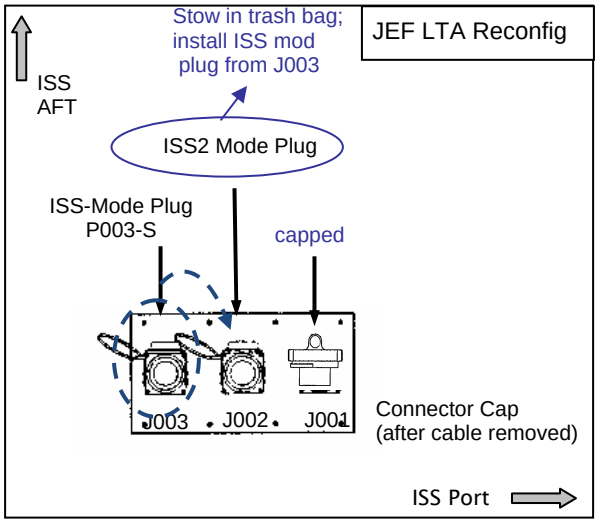
25. Open cable MLI
26. Perform connector reconfig
    - ❑ Demate P008 from dummy jack J008
    - ❑ Inspect for FOD, damage or bent pins
    - ❑ √Verify EMI band present
    - ❑ Mate P008 to VE J006

27. Replace cable MLI; verify tab secured

DCU MLI RECONFIG (EV2)

28. Xlate to J bag
29. Stow RAD w/2" on socket caddy
30. Attach J bag to BRT

31. Flip DCU MLI to cover plates; secure Velcro
32. Glove inspection



LTAB RECONFIG

33. Xlate to JEF LTAB
34. Remove LTA MLI
35. On IV GO: Demate ISS2 mode plug from J002 (middle); stow in J bag
    - ❑ Inspect J002 for FOD or damage
36. On IV GO: Move ISS-Mode plug from J003 (Stbd) to J002
    - ❑ Inspect plug for FOD or damage prior to install
37. Reinstall MLI to align arrows (rotate 180 deg)
38. Glove inspection

EVA 4 CLEANUP AND A/L INGRESS (00:45)

IV/RMS	EV1 (FF) CASSIDY	EV2 (FF) MARSHBURN
1. Pre crew ingress WVS PWRDN (PHOTO/TV, WVS CUE CARD)	CLEANUP 1. Xlate to S0; retrieve V/B bag pack 2. Xlate to A/L 3. Initiate EMU cold soak 4. Perform full tool inventory	CLEANUP 1. Xlate to NOD2 FWD; retrieve FL (AET) 2. Xlate to A/L: Set A/L Fairlead HR 0538 3. Initiate EMU cold soak 4. Perform full tool inventory
2. IV: Notify MCC-H VE installed, LTAB reconfig complete and GO for heater activation		
3. IV: When EV clear of JPM AFT; give MCC-H GO to repower JTVE AFT	INGRESS AND PRE REPRESS 5. Open hatch thermal cover 6. Ingress airlock 7. Stow V/B bag pack	INGRESS AND PRE REPRESS
	8. Attach waist tether to UIA D-ring ❑ √Gate closed ❑ √Hook locked	
	9. Xfer STP to EV 2	5. Stow EV1's **RED** alleviator on FWD A/L D-ring ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked 6. Stow EV1's **GRN** alleviator on FWD A/L D-ring
	10. Receive J bag; stow	7. Xfer J bag to EV1
		8. Partially ingress airlock 9. Attach waist tether to A/L D-ring ❑ √Gate closed ❑ √Hook locked
		10. Stow **RED** alleviator on AFT A/L D-ring ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked 11. Stow **GRN** alleviator on AFT A/L D-ring 12. Ingress Airlock
	11. Remove SCU from stowage pouch 12. Remove DCM cover; Velcro to DCM 13. Connect SCU to DCM; √SCU Locked 14. WATER – OFF (fwd), expect H2O IS OFF msg	13. Remove SCU from stowage pouch 14. Remove DCM cover; Velcro to DCM 15. Connect SCU to DCM; √SCU Locked 16. WATER – OFF (fwd), expect H2O IS OFF msg 17. Close thermal cover; attach Velcro strap

EVA 4 CLEANUP AND A/L INGRESS (00:45) (Cont)

IV/RMS	EV1 (FF) CASSIDY	EV2 (FF) MARSHBURN
		CAUTION Do not close hatch until EMU Water OFF for 2 min Verify outer hatch clear of hardware 18. Verify outer hatch clear of hardware 19. Verify handle position per hatch decal; close and lock hatch
	Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)	Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)

P6 BATTERY R&R TASK DATA

Estimated Task Duration:

	With SSRMS	Without RMS
One EV Crew	N/A	N/A
Two EV Crew	N/A	04:45 for 4 batteries

ORU Identification:

ORU	Part number	Serial Number
Battery	RE1804, 3304	See cue card

Tools:

EV1 (FF)	EV2 (FF)
PGT	PGT
TM	TM
6" wobble ext	6" wobble ext
Sq Scoops (2)	Sq Scoops (2)
MUTEE/BS/MUTEE	

Foot Restraints (APFR):

Task	WIF	APFR Setting
Battery R&R	Ref cue card	Ref cue card

Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	PGT Setting
IEA							
H1	7/16	6	8.3	29.2/9.2	84.6	5-6	B2 rel A6 inst
H2 (jacking)	7/16	6	8.3	31/9.2	69.8	16-17	B2 rel A6 inst
ICC-VLD							
H1	7/16	6	16	29.2/9.2	70	8	A5w/TM/ A7 rel B2 inst
H2 (jacking)	7/16	6	16	31/9.2	70	18	A5w/TM/ A7 rel B2 inst

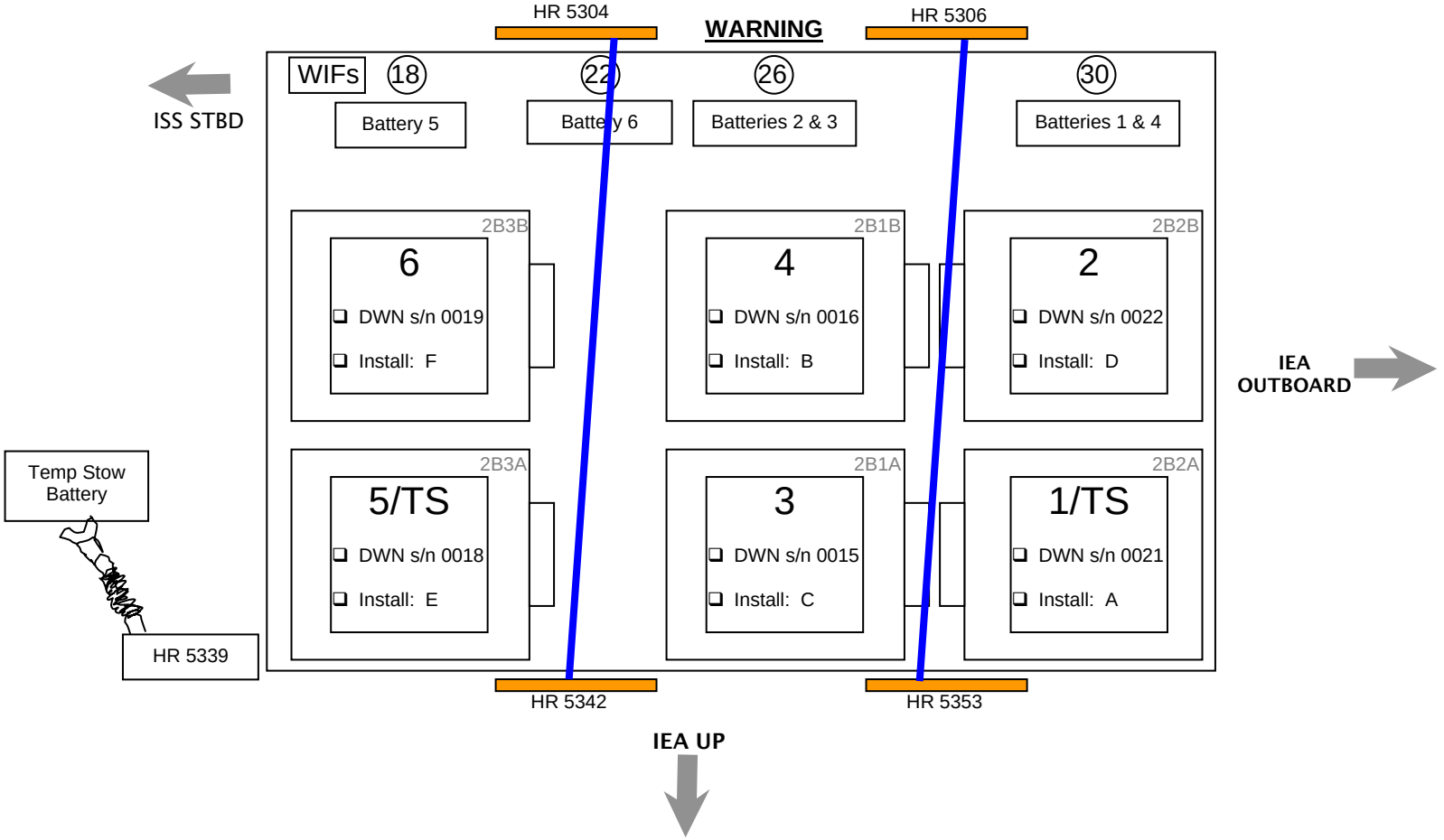
Cautions:

1. Battery fins are sharp edge hazard
2. Doghouse connectors no touch area

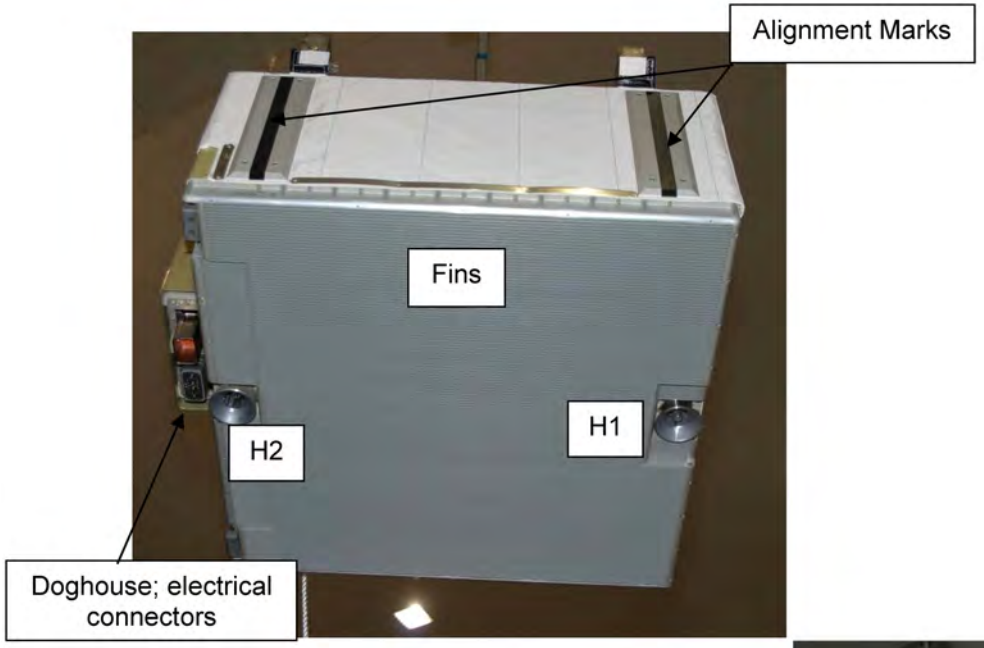
Warnings:

1. 2A and 4B (AFT arrays) tracking. Maintain 2 ft KOZ
2. 2B and 4A (FWD arrays) locked
3. Avoid contact and EVA kickloads to ICC-VLD keel camera target
4. Outboard MT rail attachment lug near P6 handrail 5333 and gap spanner

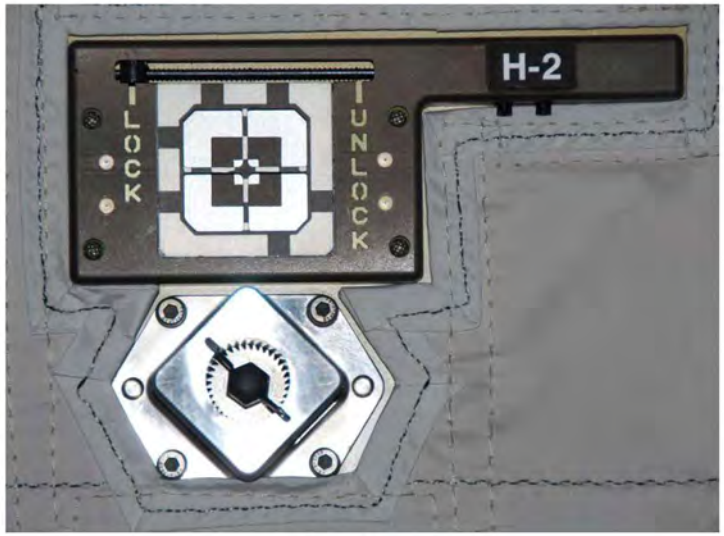
BATTERY WORKSITES



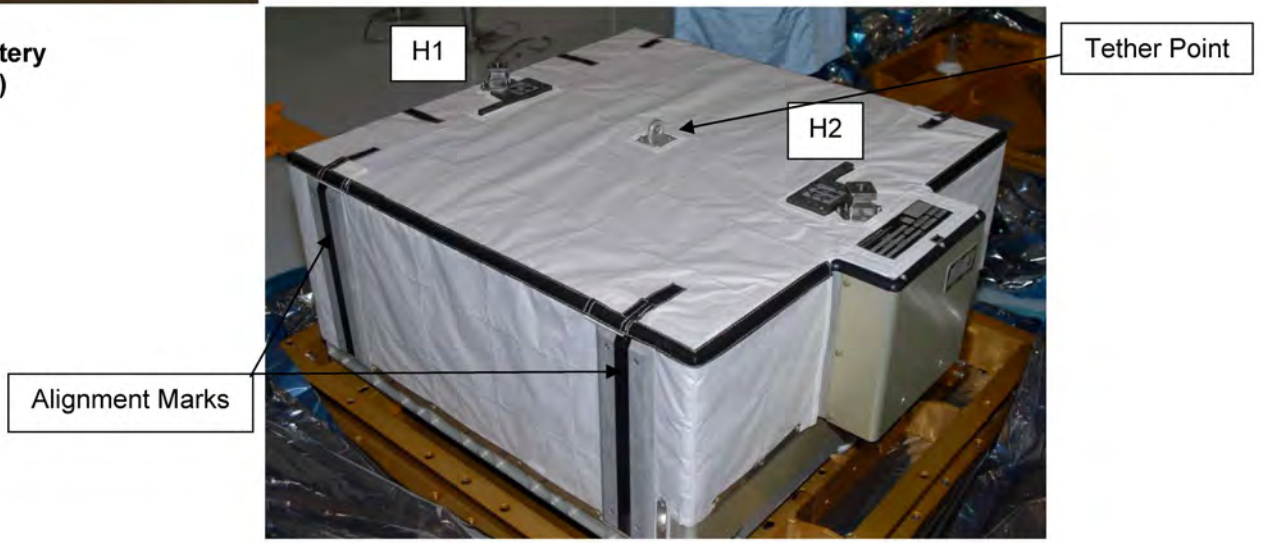
BATTERY R&R TASK DATA



Backside of Battery (to Structure)

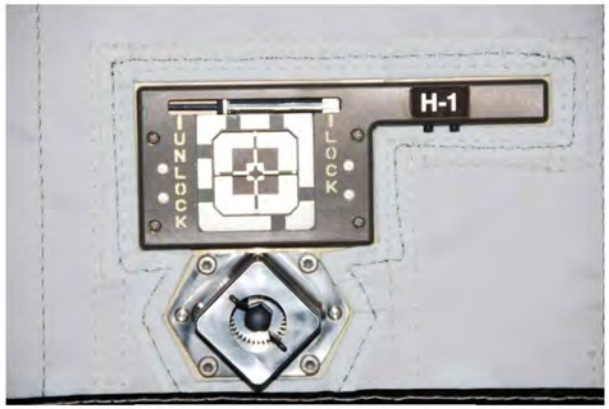


Lock/Unlock Indicator

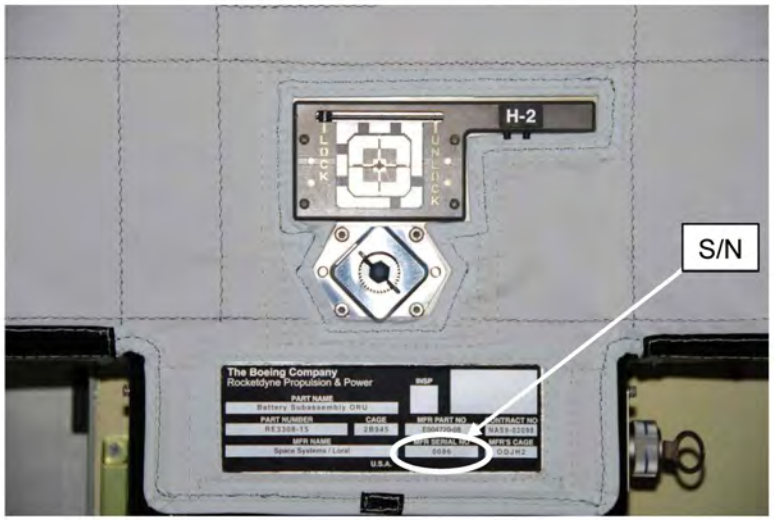


Top of Battery

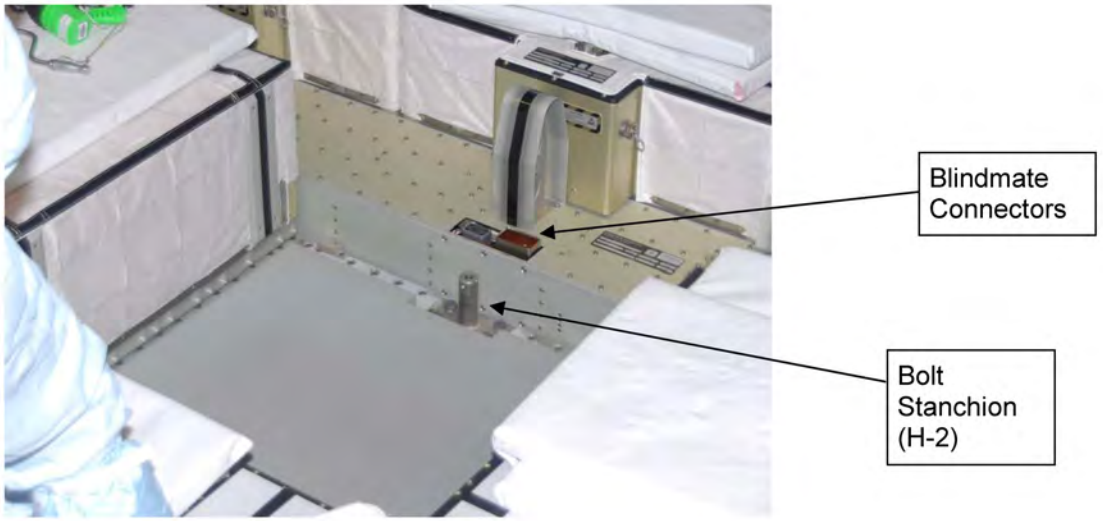
BATTERY ORU



H-1



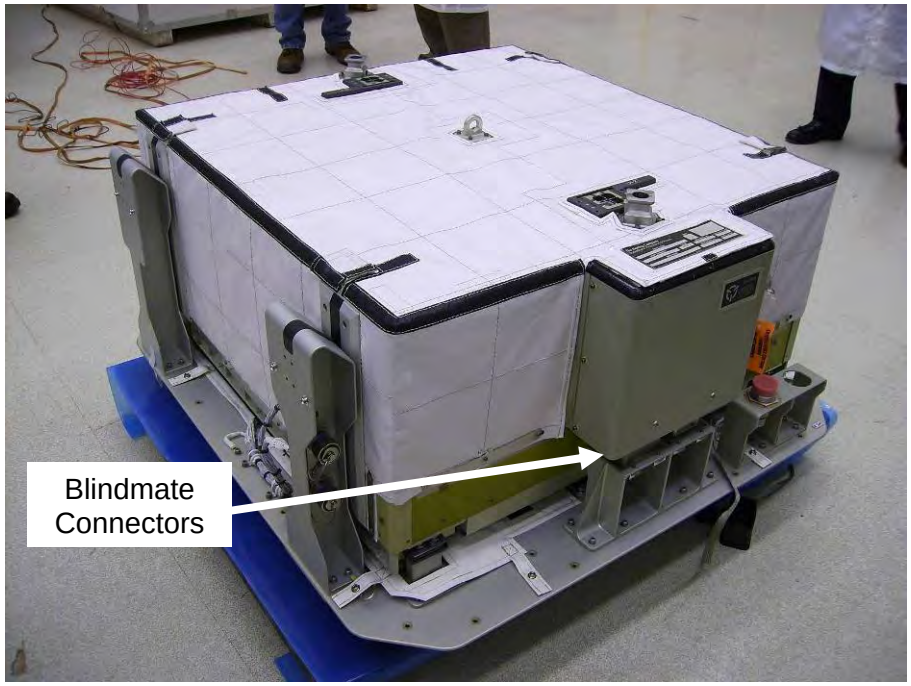
H-2 Lock/Unlock Indicator

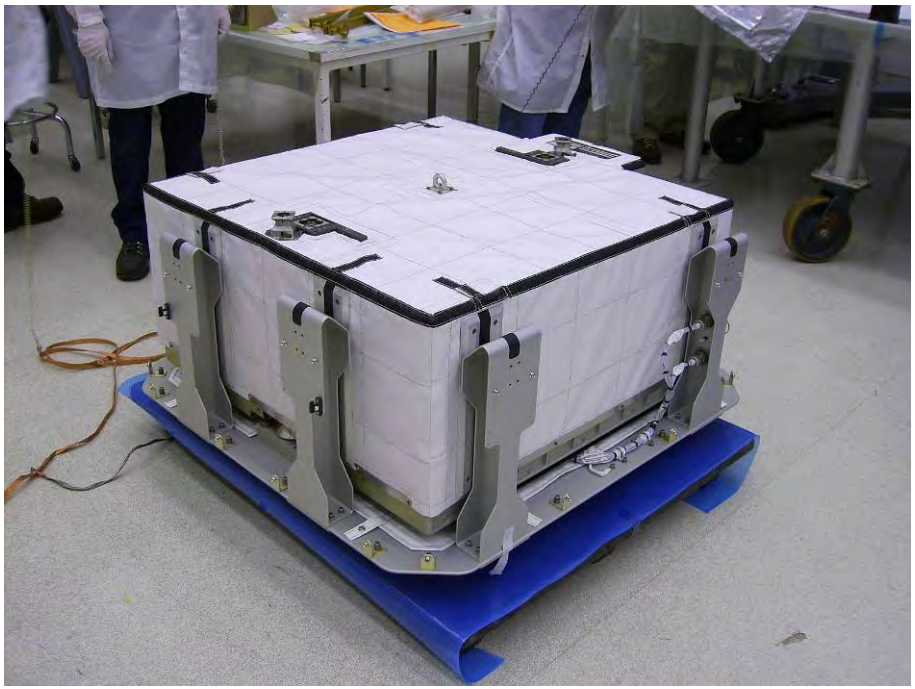


IEA Interface

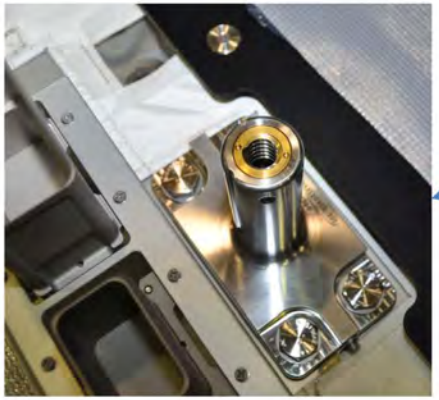
BATTERY R&R TASK DATA (Cont)

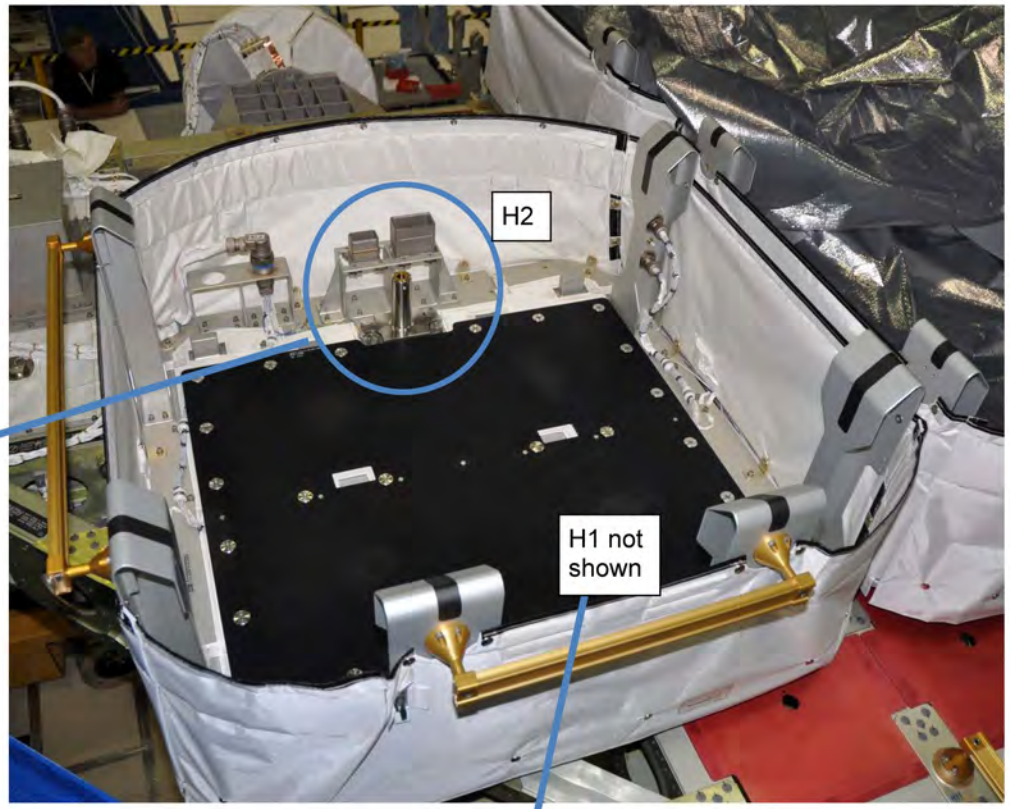
BATTERY INSTALLED ON FSE





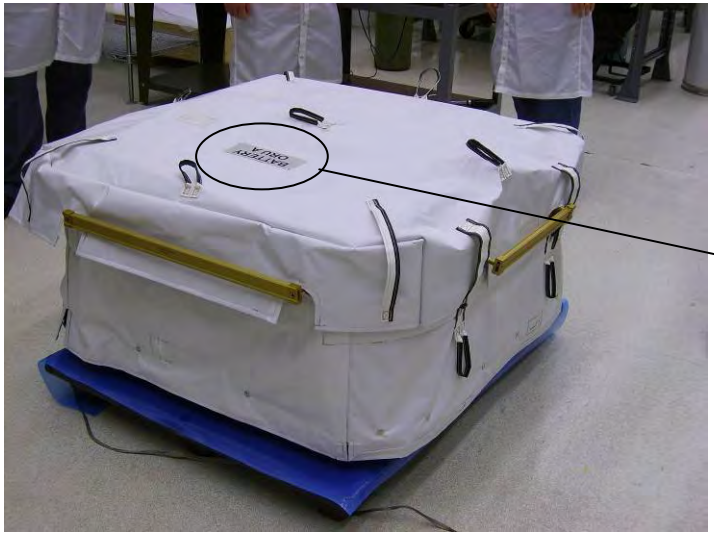
BATTERY FSE SHEAR PIN YELLOW STANCHION

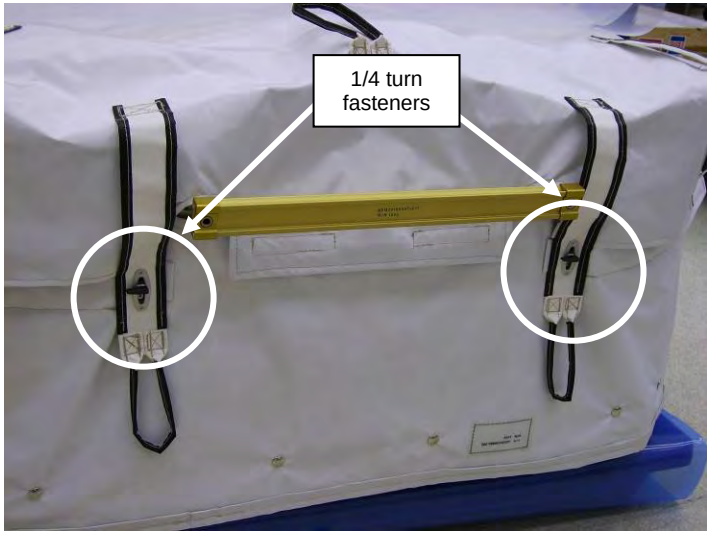




BATTERY R&R TASK DATA (Cont)

FSE MLI





FWD JEF VE INSTALL TASK DATA

Estimated Task Duration:

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

ORU Identification:

ORU	Part number
Vision Equipment **(VE)** – Forward Mounted [Aft Mounted Launch Config]	NFTCA170300G11

ORU Specs:

ORU	Dimensions
Vision Equipment **(VE)** – Forward Mounted [Aft Mounted Launch Config]	NFTCA170300G11

Tools:

EV1 (FF)	EV2 (FF)
PGT 6" Socket – Wobble Right Angle Drive AET	PGT 6" Socket – Wobble Right Angle Drive Round Scoop

EVA Connectors:

Harness	From	To	Type	Conn Size	Function
VE I/F Cable (Keep Alive) AFT Launch location	J007	J004	NZGL	17	LTA power to VE
VE Interface Cable (Keep Alive) FWD Launch location	J005	J006	NZGL	17	LTA power to VE
Cable assy, EF A (AFT install location)	P008/J008	J006	NZGL	17	Power/command/ video lines to VE
Cable assy, EF A (FWD install location)	P009/J009	J004	NZGL	17	Power/command/ video lines to VE
LTAB ISS Mode 2	J002	IVA	NZGL	25	Power/heater
LTAB ISS Mode	J003	J002	NZGL	25	Power/heater

Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	PGT Setting
VE Launch Lock Bolts	7/16	4	N/A	18.29	33.7	16	**B4**
VE Structure Bolts	7/16	2	< 21.16 (17.34)	21.17	33.7	15	**B5**

VE Notes:

1. VE in Aft launch position to be installed into ISS FWD mount. VE in FWD launch position to be installed into ISS AFT mount
2. Two connector caps are brought out by EV crew and installed where VE keep alive cable is disconnected and brought inside
3. VE has round MCF (Micro-Conical Fixture) for scoop attachment handling
4. VE has launch lock plate with four bolts

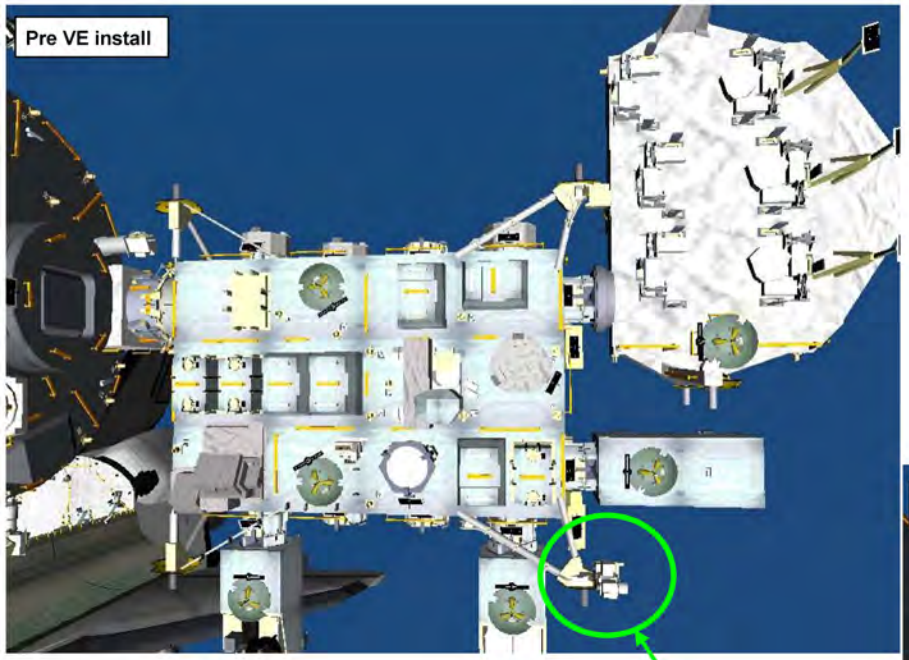
General Notes:

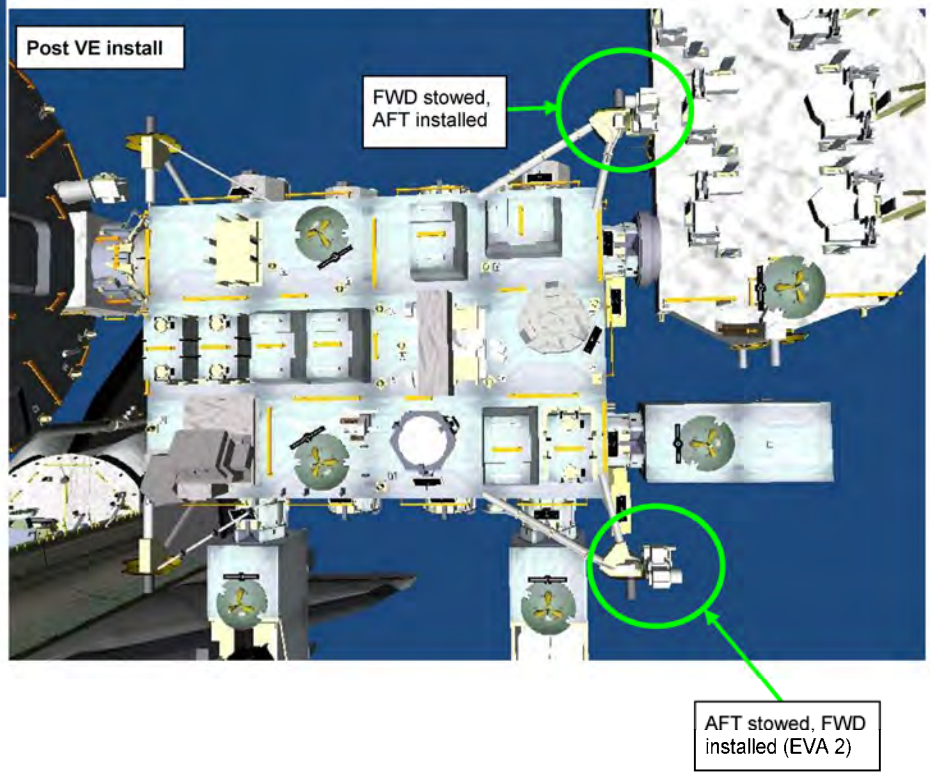
Cautions:

1. No touch white paint, silver teflon and solid lubricant
2. No touch DCU (DC-DC Converter Unit)

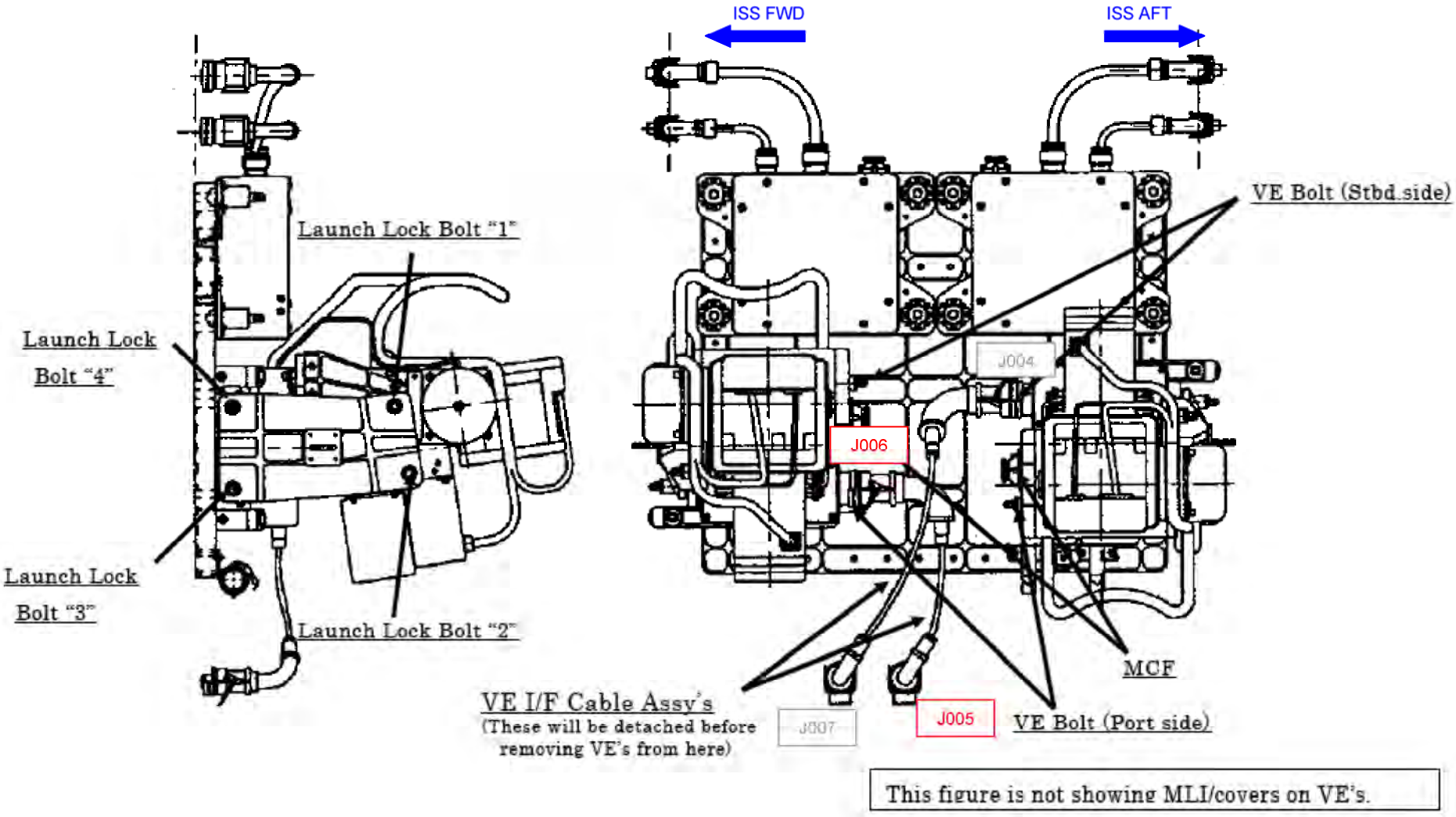
Warnings:

AFT JEF VE INSTALL TASK DATA



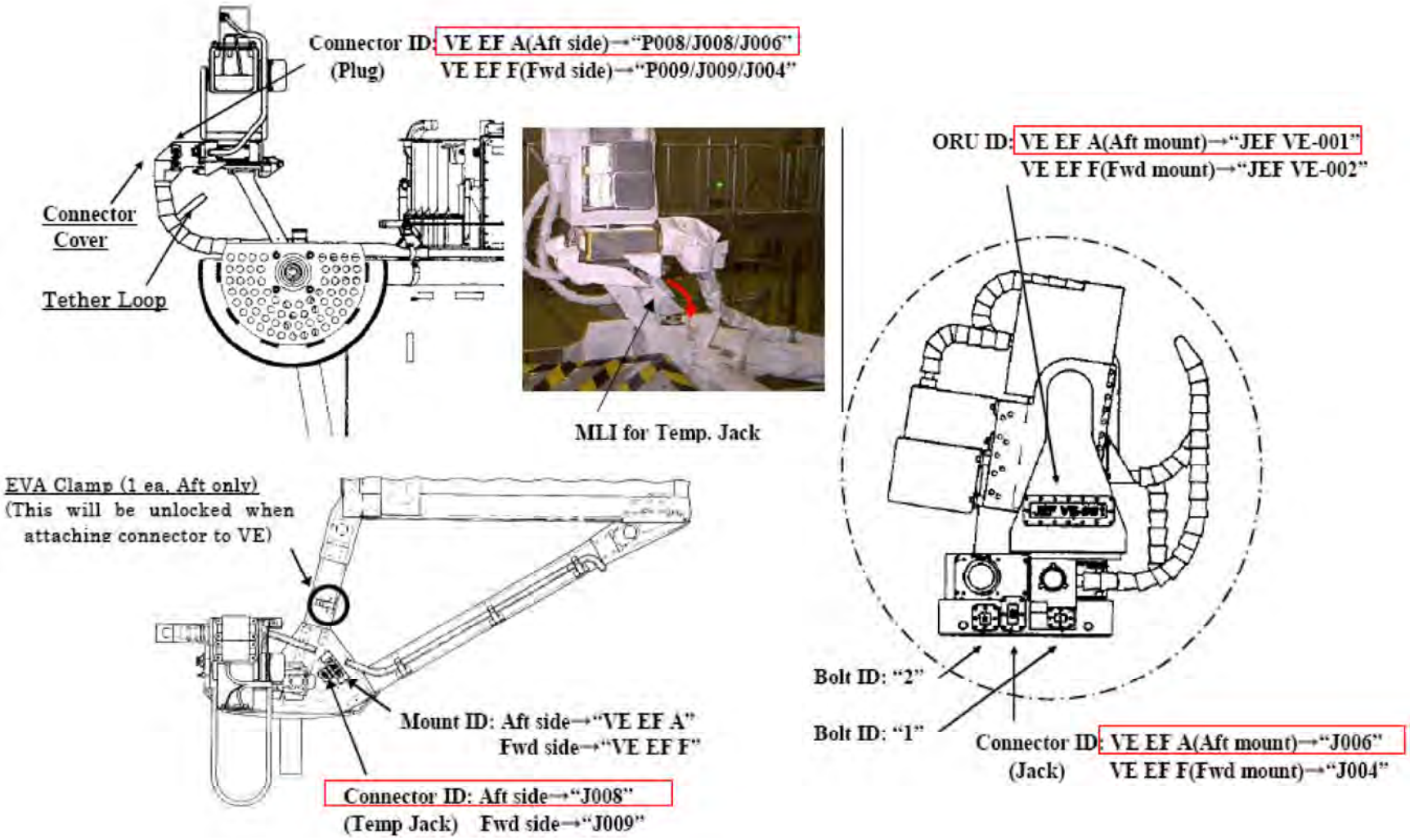


VE Connector Information

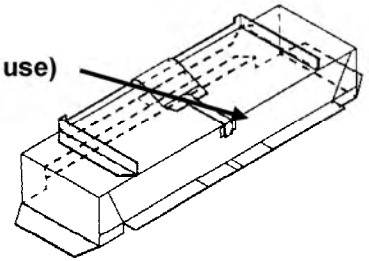


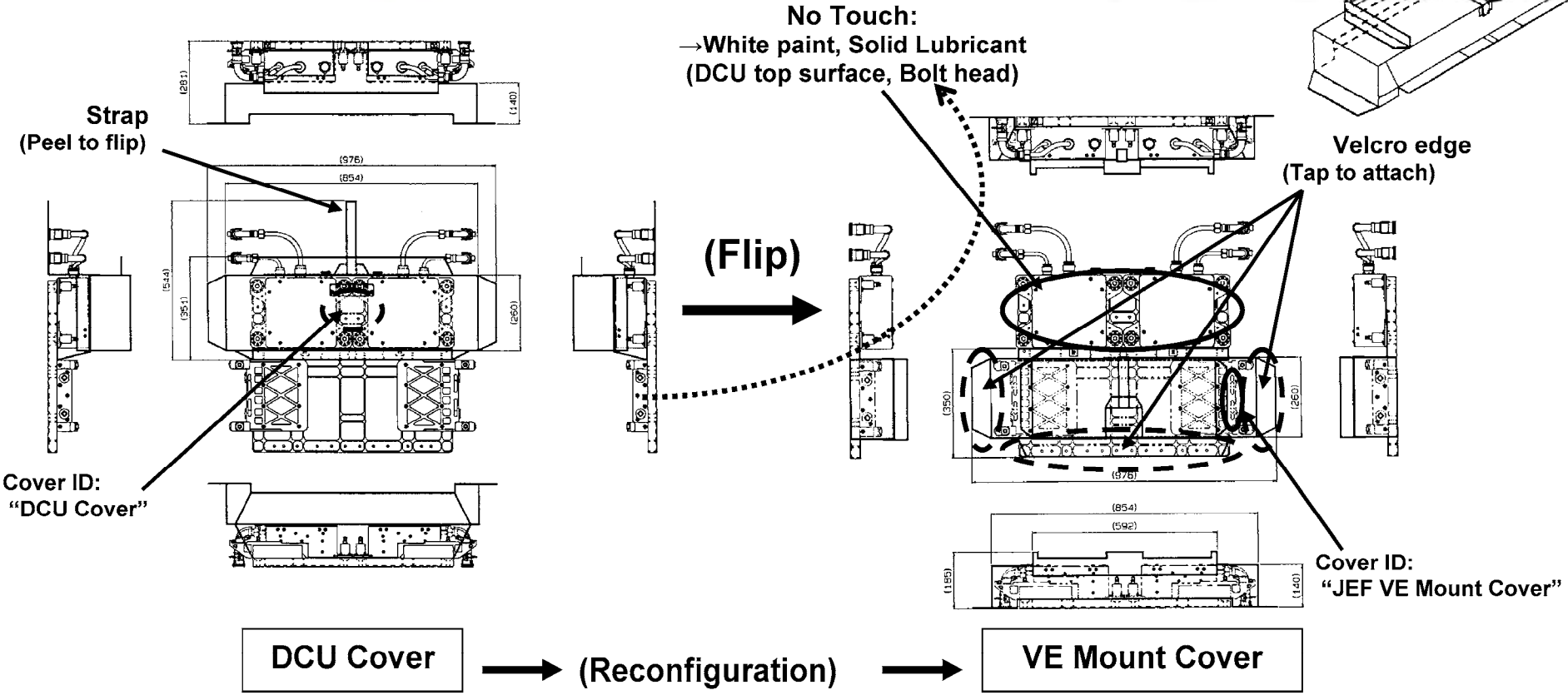
AFT JEF VE INSTALL TASK DATA (Cont)

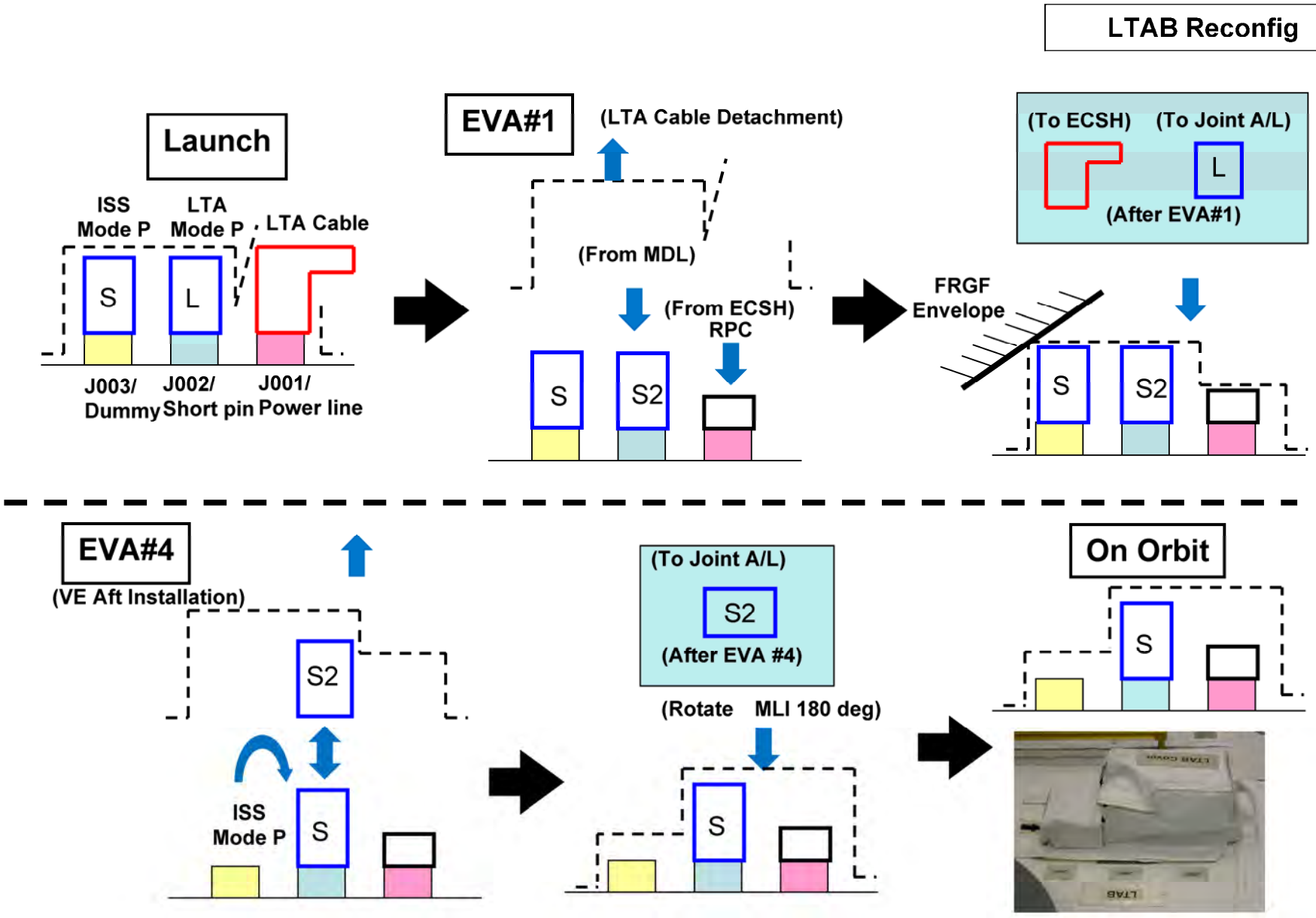
VE Connector Information



DCU MLI Reconfig






LTAB Reconfig
Launch
ISS Mode P
LTA Mode P
LTA Cable
S
L
J003/ Dummy
J002/ Short pin
J001/ Power line
EVA#1
(LTA Cable Detachment)
(From MDL)
(From ECSH) RPC
S
S2
(To ECSH)
(To Joint A/L)
L
(After EVA#1)
FRGF Envelope
S
S2
EVA#4
(VE Aft Installation)
S2
ISS Mode P
S
(To Joint A/L)
S2
(After EVA #4)
(Rotate MLI 180 deg)
S
On Orbit
S

EVA 5 SUMMARY TIMELINE

PET TIME (HR : MIN)	EVA 5		
	IV/SSRMS	**EV1 – Marshburn (FF)**	**EV2 – Cassidy (FF)**
00:00	**(00:00-00:30)**	**EGRESS/SETUP** (00:30) ■ Post Depress and Egress (00:15) ■ Setup (00:15)	**EGRESS/SETUP** (00:30) ■ Post Depress and Egress (00:15) ■ Setup (00:15)
01:00	**(00:30-01:30)**	**SPDM covers** (01:00)	**Z1 patch panel** (01:00)
02:00	**(01:30-03:00)**	**S3 Nadir Outboard PAS** (01:30)	**S3 Nadir Outboard PAS** (01:30)
03:00	**(03:00-04:15)**	**S3 Nadir Inboard PAS** (01:15)	**S3 Nadir Inboard PAS** (01:15)
04:00			
	(04:15-05:15)	**CP1 WETA Install** (01:00)	**CP1 WETA Install** (01:00)
05:00			
	(05:15-05:45)	**Get-Aheads** (00:30)	**Get-Aheads** (00:30)
	(05:45-06:30)	**CLEANUP/INGRESS** (00:45) ■ Cleanup (00:30) ■ Ingress and Pre Repress (00:15)	**CLEANUP/INGRESS** (00:45) ■ Cleanup (00:30) ■ Ingress and Pre Repress (00:15)
06:00	EVA Time 6:30		

Get-aheads: FPP sleeves, NOD2 gap spanner install, S3 Zenith Inboard PAS, LAB cable tie down

EVA 5 TOOL CONFIG

EV1
EMU D-rings
- ❑❑ Ext on left side
- ❑❑ Ext on right side
- ❑❑ Waist Tethers (right EXT, √locked)

MWS
- ❑❑ Small Trash Bag
  - ❑❑ Wire Tie
- ❑❑ 2 – Wire ties as tether loops
- ❑❑ RET (with PIP pin)
- ❑❑ RET sm-sm
- ❑❑ 2 – AETs
- ❑❑ Swing Arm (right side)
  - ❑❑ RET sm-sm (Attach to PGT)
    - ❑❑ PGT s/n _____
    - ❑❑ 6-in ext
- ❑❑ BRT (left side)
  - ❑❑ RET sm-sm
    - ❑❑ V bag
  - ❑❑ wire ties – 1 long, 1 short

❑❑ RET Lg-sm (A/L stowage)
- ❑❑ **C/L Bag – PAS Bag (M)**
  - ❑❑ AET (ext D-ring)
  - ❑❑ AET lg-sm (ext D-ring)
  - ❑❑ RET sm-sm (int D-ring #1 to door handle)
  - ❑❑ Camera w/bracket (int RET #1)
    - ❑❑ RET sm-sm
  - ❑❑ RET sm-sm (int D-ring #2 to door handle)
  - ❑❑ RET sm-sm (int D-ring #3 to door handle)
- ❑❑ **C/L Bag – DR Tools Bag (V) strap to M bag**
  - ❑❑ AET (ext D-ring)
  - ❑❑ RET sm-sm (int D-ring #1 to door handle)
  - ❑❑ DRT #1(int RET #1)
  - ❑❑ DRT #2 (int RET #2)
  - ❑❑ AET lg-sm (int RET #3)
  - ❑❑ GP caddy (int RET #4) (from EV2)
    - ❑❑ Compound cutter
    - ❑❑ Vice grips
- ❑❑ Wire ties Long (2) (ext D-rings across back of bag)
  - ❑❑ Stow clevis bracket
  - ❑❑ Stow clevis bracket

EV2
EMU D-rings
- ❑❑ Ext on left side
- ❑❑ Ext on right side
- ❑❑ Waist Tethers (right Ext to MWS, √locked)

MWS
- ❑❑ Small Trash Bag
  - ❑❑ Wire Tie
- ❑❑ AET
- ❑❑ GP caddy
  - ❑❑ Compound cutter
  - ❑❑ Vice grips
- ❑❑ RET w/PIP pin (R D-ring)
- ❑❑ RET (L D-ring)
- ❑❑ Swing Arm (right side)
  - ❑❑ RET sm-sm (Attach to PGT)
    - ❑❑ PGT s/n _____
    - ❑❑ 2-in ext
- ❑❑ BRT (left side)
  - ❑❑ RET sm-sm
  - ❑❑ 2 – wire ties
  - ❑❑ AET at base
  - ❑❑ AET at base (moved from caddy)

❑❑ RET (Lg-sm) (A/L stowage)
- ❑❑ WETA (with MLI)
  - ❑❑ Round Scoop
  - ❑❑ RET (sm-sm) on WETA tether point
  - ❑❑ **C/L Bag – WETA bag (J) strap to WETA**
    - ❑❑ AET (ext D-ring)
    - ❑❑ AET (ext D-ring)
    - ❑❑ AET (ext D-ring)
    - ❑❑ WETA MLI (int RET #1)
    - ❑❑ RET (sm-sm) (from WETA) (int D-ring #1)
    - ❑❑ RET sm-sm (int D-ring #2)
      - ❑❑ Dummy Box (from WETA)
    - ❑❑ RET sm-sm (int D-ring #3)
      - ❑❑ Round Scoop (from WETA)

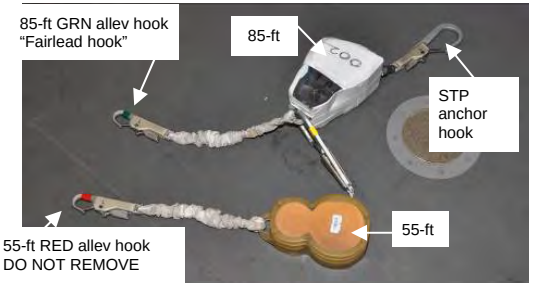
❑❑ RET (Lg-sm) (A/L stowage)
- ❑❑ APFR #5

ISS Configuration

MT @ WS4 CETA 1 STBD, CETA 2 PORT
ICC-VLD in PLB
JEF installed on JPM
JLE in PLB
SSRMS based on NOD2

Safety Tether config (STP = safety tether pack, 55+85)

EV1 ST pack (55+85) **GRN** anchor at S0 HR 3516
EV2 ST pack (55+85) **GRN** anchor at S0 HR 3483
EV2 Fairlead (AET) at A/L HR 058



Review PGT ops
- Report "green light" (for torque down ops)
- Report torque and turns
- Expect LOTORQ fault msg, Fault LED and Red LED for bolt release ops

Record:
EV1 PGT (serial _____, bat # _____)
EV2 PGT (serial _____, bat # _____)
Spare PGT (serial _____, bat # _____)

Prior to EVA, perform the following inspections:
1. RET cords for fraying
2. Safety and waist tether load alleviation straps for damage/discoloration, verify no red line visible
3. Inspect ISS trash bags for deformation/damage
4. Inspect EMU gloves for damage
5. Inspect BRTs and ballstacks for loose fittings/screws
6. **Use Blue RETs only**

Staging Bag
- ❑❑ Fish Stringer #1
  - ❑❑ Wire Tie Caddy (hook #1)
    - ❑❑ 9 wire ties
  - ❑❑ Velcro/Tape Caddy (hook #2)
  - ❑❑ PGT (hook #3) s/n _____
    - ❑❑ PGT Battery s/n _____
    - ❑❑ 7/16-in (wobble) Socket – 6 ext
  - ❑❑ Vise Grips (hook #4)
  - ❑❑ Ratchet Wrench (hook #5)
    - ❑❑ 7/16-in (rigid) Socket – 9 ext
  - ❑❑ Cheater Bar (hook #6)
  - ❑❑ Hammer (hook #7)
- ❑❑ RET Lg-sm
  - ❑❑ Bolt Puller
- ❑❑ Fish Stringer #2
  - ❑❑ Spare Torque Wrench w/MLI (hook #1)
  - ❑❑ Connector Cleaner Tool Kit (hook #2)
  - ❑❑ Pin Straightener Assy (hook #3)
  - ❑❑ Probe w/BRS Pin Tool Sheath (hook #4)
  - ❑❑ Prybar (hook #5)
  - ❑❑ Needlenose Pliers (hook #6)
  - ❑❑ socket caddy (hook #7)
    - ❑❑ RAD
    - ❑❑ 6" ext
  - ❑❑ MWS Key Strap Assy (on wire tie, to strap)

Crewlock Zenith Handrail
- ❑❑ Spare STP
- ❑❑ RET Lg-sm **(Lg hook attached outside bag to Zenith C/L Handrail & small Hook attached to FPP sleeve)**
  - ❑❑ FPP sleeves (sz 33/37) (**FPP stuffed in staging bag**)
  - ❑❑ FPP sleeves (sz 33/37) (**FPP stuffed in staging bag**)

IV Bag
- ❑❑ 2 – Towel
- ❑❑ Contamination Detection Kit
- ❑❑ 2 – GP Caddy
  - ❑❑ Thermal Mittens (1 pair)
- ❑❑ RET (sm-sm) (Black)
  - ❑❑ Socket Caddy
    - ❑❑ 1/2-in (wobble) Socket – 8 ext
    - ❑❑ 7/16-in (wobble) Socket – 6 ext
- ❑❑ 2 – DCM Plug (SAFER Hardmount)
- ❑❑ 2 – RET (sm-sm, black)

Tether counts:	**used**	**available**
RET sm-sm -381	14	16
RET lg-sm -385	5	8
RET sm-sm pp -383	2	5
AET sm-sm	13	8 ISS/8 STS
AET lg-sm	2	2

ISS EXTERNAL

JPM
- ❑❑ **MLI Bag (Lg ORU)**
  - ❑❑ AET ext
  - ❑❑ AET ext
  - ❑❑ Fish stringer #1 (empty)
  - ❑❑ Fish stringer #2 (outside bag, under flap)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Sleeve (size 21/25)
    - ❑❑ Wire tie caddy w/long wire ties (9)
  - ❑❑ Fish stringer #3
    - ❑❑ Gap spanner (72") – split across two hooks

EVA 5 INHIBIT PAD

Orbiter (1)

ALL EVAs

TCS

L12 1. √TCS POWER – OFF

KU-Band Antenna (performed during egress)

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

RCS (on call, crew not expected in area)

If EV crew < 27 ft from FRCS

IV 1. √DAP: VERN, FREE, LO Z (flt specific check with GNC)

O14,15,16 2. √RJDF F1, F2, F3, F4 MANF DRIVER (four) – OFF
LOGIC (four) – OFF

MCC-H 3. √Above RCS config

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

Ground

ALL EVAs

Ground Radar

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

LOCATION DEPENDENT INHIBITS

S-Band Antennas

NOTE

Possible loss of comm when forced LL FWD antenna

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

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

If no comm, or **On MCC GO**

C3 3. S-BAND PM ANT – LL FWD

When EVA crewmember at least 2 ft away from all S-Band upper antennas

C3 4. S-BAND PM ANT – GPC

USOS (1)

ALL EVAs

PCU

NOTE

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

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

If one or both PCUs failed

2. No more than two arrays unshunted and oriented < 105 deg from velocity vector

LOCATION DEPENDENT INHIBITS

Lab Window (on call, crew not expected in area)

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

KU-Band (SGANT Antenna) (on call, crew not expected in area)

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

S-Band (SASA) Antennas (on call, crew not expected in area)

MCC-H If EV crew < 3.6 ft from S1 SASA [P1 SASA]
1. P1 SASA (S1 SASA) – Active
2. S1 SASA [P1 SASA] – Powered down

Mobile Transporter

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

EVA 5 INHIBIT PAD (Cont)

USOS (2)

LOCATION DEPENDENT INHIBITS

SARJ (S3 at egress, P3 not expected)
MCC-H If EV crew working within 2 ft or outboard of SARJ
1. √DLA (1) – LOCKED
2. All motor setpoints set to zero
3. All motors deselected

TRRJ (S1 at egress, P1 not expected)
MCC-H If EV crew working within 2 ft of P1 TRRJ rotation envelope
1. √DLA (1) – LOCKED
MCC-H If EV crew working within 2 ft of S1 TRRJ rotation envelope
1. √DLA (1) – LOCKED

FPMU (not expected)
MCC-H If EV crew working within 5 ft of Floating Potential Measurement Unit
1. FPMU power – Off

SSPTS (Reqd if FPP sleeves not installed)
MCC-H If EV crew working within 2 ft of SSPTS cables
1. RPCM LA1A4A D RPC 3 – Open, Close Cmd Inhibit
2. RPCM LA2A3B D RPC 1 – Open, Close Cmd Inhibit
3. RPCM Z14B A RPC 2 – Open, Close Cmd Inhibit
4. RPCM Z13B A RPC 2 – Open, Close Cmd Inhibit

Z1 Patch Panel (at egress)
MCC-H
1. RPCM Z13B B RPC 18 – Open, Close Cmd Inhibit
2. RPCM S02B D RPC 17 – Open, Close Cmd Inhibit

S3 Nadir Outboard (PAS 3) (at egress)
MCC-H IMCA PWR: RPCM S32B A RPC 13

S3 Nadir Inboard (PAS 4) (at egress)
MCC-H IMCA PWR: RPCM S31A A RPC 13

S3 Zenith Inboard (PAS 2) (on call)
MCC-H IMCA PWR: RPCM S32B A RPC 12

CP1 WETA INSTALL (on call)
MCC-H RPCM S31A_A RPC 15 – Open, Close Cmd Inh
RPC 16 – Open, Close Cmd Inh
RPCM S32B_A RPC 15 – Open, Close Cmd Inh
RPC 16 – Open, Close Cmd Inh

COL (1)

ALL EVAs

EuTEF
COL-CC 1. √PLEGpay Power Status (ETF_PLEGPAY_Pwr_Stat) – OFF

JEM (1)

LOCATION DEPENDENT INHIBITS

JPM Windows (on call, MLI bag retrieval)
IV JPM port end cone AFT window shutter closed
If crew within 3 ft of FWD window, close shutter

JEMRMS (on call, not expected)
SSIPC If EV crew working within vicinity of JEMRMS
1. RIP MA Brake – ON
2. MDP Main Mode – Stby Mode
or
1. JEMRMS Rack – OFF

JPM PROX Antenna (on call, not expected)
SSIPC If EV crew working within 0.3 ft JPM PROX Antenna
1. TRX Power – OFF
2. TX Power – OFF
or
1. JPM PROX Antennas – OFF

JEMRMS (on call, not expected)
SSIPC PDB RMS Ext4 Vout: 0.0V
VCU_b TVC WVE Sig Stat – No signal
VLU EE Pwr – Op
JEU Interlock – Inh
JEU RT – Inh
MDP Ang/Mtr Cross Ck – Inh

JPM Aft JTVE (on call, MLI bag retrieval)
SSIPC PDB b2 RPC 4 Open

EVA 5 INHIBIT PAD (Cont)

JEM (2)

EFBM (on call, MLI bag retrieval)
IV √P011B on Jumper Cable is disconnected for BEPSSIPC
SSIPC √PDB A2 RPC01 – Op

JEF FWD/AFT VE (on call, not expected)
SSIPC JEF PDB a RPC5 – Open
JEF PDB b RPC22 – Open

JLE SLM (on call, not expected)
SSIPC JLE PCU RPC1 – Op

ICS-EF Antenna (at egress)
SSIPC ICS MOD Off
ICS UPC Off
ICS HPA Off

SEDA-AP Mast, PLAM-S (on call, not expected)
SSIPC JEF PDB a RPC17 – Open

EFU (on call, not expected)
SSIPC JEF PDB a RPC03 – Op
JEF PDB b RPC20 – Op
EFU[X] Sel Status – not selected [X=1 to 12]
EEU Mode – EFU stop

SSE SLM (on call, not expected)
SSIPC SSE SLM Ops Ena/Inh Status 1 – Enable
SSE SLM Ops Ena/Inh Status 2 – Enable

RSOS (1)

ALL EVAs

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

IMPULSE
MCC-M
1. IMPULSE (ИПИ-100) – Deactivate

EVAs ON PMA1 OR RSOS (LOCATION DEPENDENT) (on call for APFR 5 relocate)

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

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

FGB Antennas
MCC-M
1. √FGB KURS P [КУРС Р] – Deactivated

Soyuz Antennas
MCC-M
1. √Soyuz KURS A [КУРС А] – Deactivated

EVA 5 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 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, JEF VE 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
   29. JEF ORUs and EFU (paint, lubricant)
   30. MAXI front panel (paint)
   31. SEDA-AP sensors (HIT, SDOM, AOM) and MPAC & SEED

CAUTION

ISS Constraints (Cont)

A. Inadvertent contact (Cont)
   32. Con'PIU, Trunnions and UCM (paint, lubricant) [ICS-EF,MAXI,SEDA-AP]
   33. JLE – PIU, Alignment guide and UCM (paint, lubricant) [ICS-EF,MAXI,SEDA-AP]

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
   4. Avoid tool impact on ICS-EF sensor

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 & 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 & 566, A/L Tank 2 nad/fwd & 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, JEF VE)
7. JEM EFBM capture latches
8. JEM EFU latching arms
9. JEF SSE latch
10. ICS-EF antenna boom
11. SEDA-AP Mast
12. JLE SLM latch

WARNING

ISS Constraints (Cont)

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

E. RF radiation exposure
1. Stay 3.6 ft from S-Band (SASA) high gain Antenna when powered [S1,P1]
2. Stay 1.3 ft from S-Band (SASA) low gain Antenna when powered [S1,P1]
3. Stay 1 ft from UHF Antenna when powered [LAB,P1]
4. Stay 0.3 ft from fwd/aft JPM PROX antenna
5. Stay 246 ft from ICS-EF if powered

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
18. ICS-EF AHM gears
19. MAXI Visual Star Camera
20. PIU springs [ICS-EF,MAXI,SEDA-AP]

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/JEF VE 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 powered
      - 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) ESP2 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

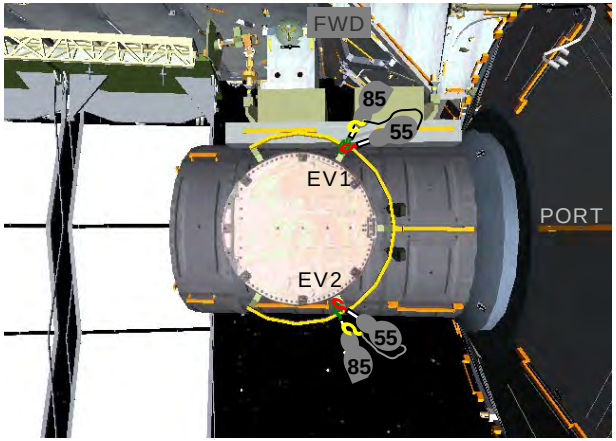
A. Avoid inadvertent contact with
1. HTV solar array panels (kick loads can shatter panel and generate sharp edges) [HTV]
2. HTV fwd RCS thrusters [HTV]

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

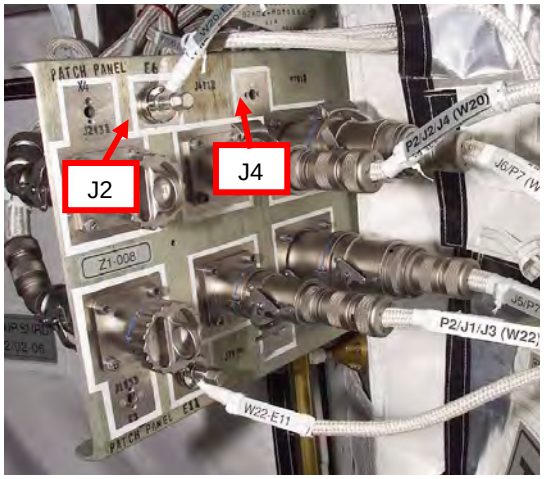
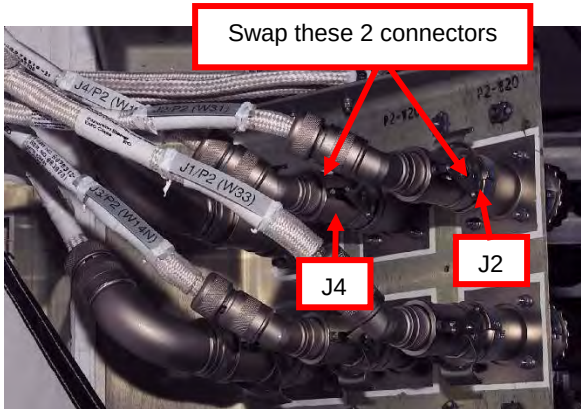
C. RF radiation exposure
1. Stay 0.7 ft from IOS-N antenna [HTV]
2. Stay 0.7 ft from IOS-Z antenna [HTV]
3. Stay 0.3 ft from PLS-Z antenna [HTV]

D. Thermal
1. EP handrails may be hot. Handling may need to be limited

EGRESS/SETUP (00:30)

IV/RMS	EV1 MARSHBURN (FF)	EV2 CASSIDY (FF)
	**Initial Configuration:** 1. Waist tether to UIA D-ring ❑ √Gate closed ❑ √Hook locked <u>EGRESS/INITIAL SETUP</u>	**Initial Configuration:** 1. Waist tether to A/L D-ring ❑ √Gate closed ❑ √Hook locked <u>EGRESS/INITIAL SETUP</u> 2. Open hatch thermal cover 3. Egress airlock **4.** Attach AFT 55-ft **RED** alleviator hook to D-ring EXT (L) ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked ❑ Inspect LAS for damage 5. Attach AFT 85-ft **GRN** alleviator hook to D-ring EXT (L) 6. Verify 55-ft **YEL** anchor hook to 85-ft ERCM ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked ❑ Inspect LAS for damage
	2. On EV2 GO, release EV2 waist tether from A/L D-ring	7. Receive M/V bag; temp stow at A/L
	3. Transfer M/V bag to EV2	8. Receive APFR
	4. Transfer APFR to EV2	9. Stow in Stbd A/L tool box [9,ZZ,L,10] P [AA}
		10. Attach FWD 55-ft **RED** alleviator hook to EV1's D-ring EXT (L) ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked ❑ Inspect LAS for damage
	5. Retrieve waist tether from UIA	11. Attach FWD 85-ft **GRN** alleviator hook to EV1's D-ring EXT (L)
	6. Egress crewlock	12. Verify 55-ft **YEL** anchor hook to 85-ft ERCM ❑ √Gate closed ❑ √Hook locked ❑ √Reel unlocked ❑ Inspect LAS for damage
1. Post crew egress: WVS Software: Select page – RF camera Sel 'Advanced Controls' S-Band Level (two) – Max √Verify good WVS video from both EV's	7. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed) 8. Xlate to LAB/SPDM	13. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed) 14. Close thermal hatch cover 15. Xlate to Z1 patch panel

Z1 PATCH PANEL (01:00)

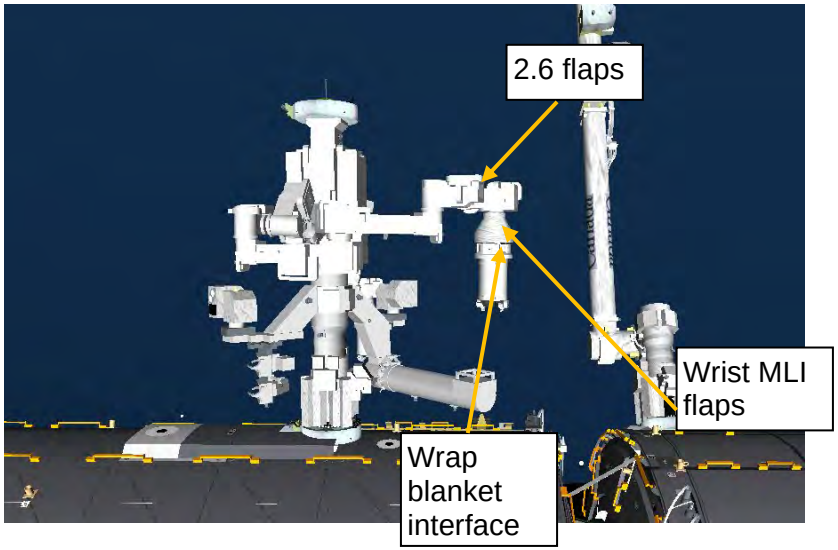
IV	EV2 CASSIDY (FF)
1. √**MCC-H**: Patch panel inhibits in place: √RPCM Z13B B RPC 18 – Open, close cmd inh √RPCM S02B D RPC 17 – Open, close cmd inh 2. Give EV GO for patch panel reconfig APFR Setting if reqd: Z1 WIF 04 [10,PP,B,12]	TRANSLATE TO Z1 PATCH PANEL CAUTION Avoid inadvertent contact with heat pipe radiators NOTE √No FOD, No bent pins, Good EMI band. Connectors J2 and J4 are restrained by tie-wrap and may prevent mating of connectors. Tie-wrap may be cut if required 1. On IV GO, on Front Panel: ❑ Remove dust cap on J2 (upper left) 2. On IV GO, on Back Panel: ❑ Demate connector J2 from Upper Right receptacle ❑ Cut tie wraps as required ❑ Assess clearance, mobility, and operation of the cable ❑ Report findings to MCC-H 3. Front Panel Reconfig ❑ Xlate to front panel ❑ Move bail on J4 (upper middle) fully aft ❑ Assess bail stiffness, maneuverability ❑ Report findings to MCC-H ❑ Leave bail open 4. Back Panel Reconfig ❑ Xlate to back panel ❑ Demate connector J4 from Upper Middle receptacle ❑ Cut tie wraps as required ❑ Assess clearance, mobility, and operation of the cable ❑ Report findings to MCC-H ❑ Inspect and Mate J2 to Upper Middle receptacle (Back Panel) ❑ Inspect and Mate J4 to Upper Right receptacle (Back Panel) 5. Front panel cleanup ❑ Push bail of J4 fwd to mate connector (Front Panel) ❑ Install dust cap on J2 (Front Panel) 6. Give GO to IV for patch panel power up 7. Glove inspection  
3. Give GO to **MCC-H** for patch panel power up	

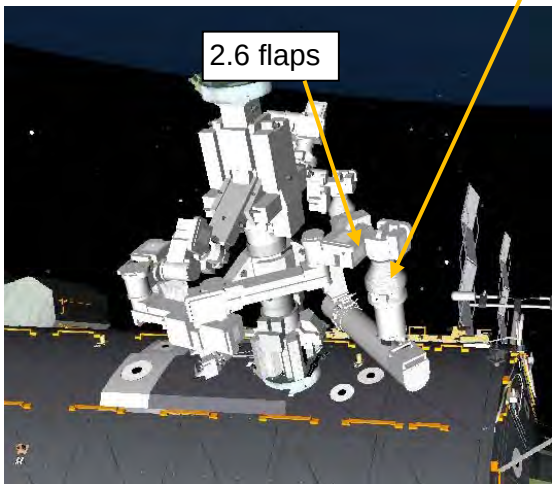
Z1 PATCH PANEL (01:00) (Cont)

IV	EV2 CASSIDY (FF)
	8. Xlate to A/L 9. Stow GP caddy/cutter in V bag 10. Retrieve M/V bag 11. Xlate to S3 (Nadir path) 12. Stow M/V bag

SPDM COVERS (01:00)

IV/SSRMS





Wrap Blanket – Detail 1

EV1 MARSHBURN (FF)

OTCM COVER RECONFIGURATION

1. Adjust MWS down (increase clearance with SPDM), as reqd

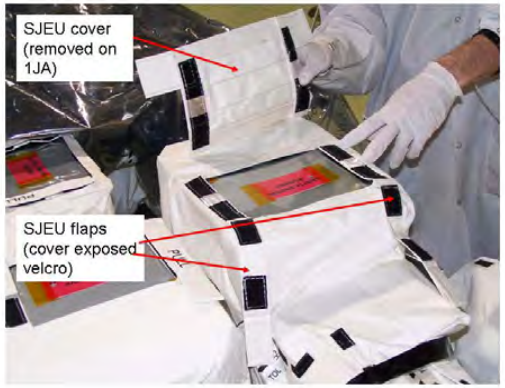
2. Adjust MLI as required
   - ❑ 2.6 Flaps mated to corresponding Velcro patches
   - ❑ Wrist roll flaps
   - ❑ Wrist blanket

STP ANCHOR HOOK CHECK

3. Xlate to S0; verify EV2's 85-ft safety tether anchor hook (S0 HR 3483)
   - ❑ √Gate closed
   - ❑ √Hook locked
4. Xlate to S0; verify EV1's 85-ft safety tether anchor hook (S0 HR 3516)
   - ❑ √Gate closed
   - ❑ √Hook locked

5. Xlate to S3 (Zenith path)

2.6 Flaps (SJEU) – Detail



S3 NADIR OUTBOARD PAS (01:30)

IV/SSRMS	EV1 MARSHBURN (FF)	EV2 CASSDIY (FF)
	CAUTION • When attempting to remove the Yoke PIP pin and ADP, do not impart more than 10 lbf • Yoke ADP does not have a stowage hole. Do not close ADP lock bracket when ADP is not inserted in a stowage/clevis hole • Do not exceed 30" between the yoke ADP and Deploy Clevis Bracket • Exceeding this could allow platform to enter detent position • Do not lift diagonal brace more than ~7 deg out of rotation plane to prevent damage to hinge end • Avoid inadvertent contact with grapple fixture shafts and target pins • When attempting to install the Yoke PIP pin and ADP, do not impart more than 10 lbf • EBCS target has finished surface that is susceptible to damage by contact. Do not remove MLI until all work inside truss is complete	
	HINGE LINE PREP 1. Remove hinge line ADPs (2) 2. Insert in stowage hole (toward station forward) ❑ √ADP closed: Inboard ❑ √ADP closed: Outboard REMOVE SARJ BRACES 3. Release SARJ Launch Bolt by hand, ~ 3 turns ccw 4. **PGT [B6 24.0 ft-lb, CCW3 60 RPM, 30.5]-7/16-6-in ext**; release SARJ Brace (cup-cone bolt), 35 turns, **stop on turns; do not exceed 37 turns** REMOVE DIAGONAL BRACES 5. Attach SARJ Brace to Diagonal Strut, hand tighten SARJ Launch Bolt 1 turn cw 6. **PGT [B6 24.0 ft-lb, CCW3 60 RPM, 30.5]-7/16-6-in ext**; release Diagonal Brace (cup-cone bolt), **stop on turns 35 (do not exceed 37 turns)** 7. Guide Diagonal Brace and temp stow with tether DEPLOY LG-SM AET 8. Deploy lg-sm AET DEPLOY PLATFORM 9. Monitor UMA to longeron clearance 10. Inform EV2 when UMA just clears the longeron 11. Assist EV2 as needed with yoke	REMOVE DEPLOY CLEVIS BRACKET 1. RET to Deploy Clevis Bracket **PGT [B7 25.5 ft-lb, CCW2 30 RPM, 30.5]-7/16 2-in ext**; release Deploy Clevis Bracket bolts (4) 10 turns 2. Temp stow Deploy Clevis Bracket with RET RELEASE YOKE ADP AND PIP PIN 3. Release yoke PIP pin 4. Release yoke ADP 5. Tend platform “into” the truss REMOVE STOW CLEVIS BRACKET 6. RET to Stow Clevis Bracket 7. **PGT [B7 25.5 ft-lb, CCW2 30 RPM, 30.5]-7/16-2-in ext**; release Stow Clevis Bracket (4) 10 turns 8. Stow Clevis Bracket on M bag DEPLOY PLATFORM 9. Deploy platform out until UMA clears longeron 10. On EV1 GO, rotate yoke from out to in 11. Attach lg hook of AET to ADP hole

S3 NADIR OUTBOARD PAS (01:30) (Cont)

IV/SSRMS

1. Brace Bolt Installation:

Bolt	SARJ Brace	Diagonal
Torque		
Turns		

2. Deploy Clevis Bracket Install:

Bolt #	1	2	3	4
Initial Torque				
Turns				
Final Torque				

3. Stow Clevis Bracket Install:

Bolt #	5	6	7	8
Initial Torque				
Turns				
Final Torque				

4. **IV: Give MCC-H GO to power up IMCA**
   √All tasks inside truss prior to UMA prep complete
   √Tools cleared from inside truss

5. **IV: Obtain GO from MCC-H for RTL Checkout**

RTL #	1	2	3
PIP Pin			
Test Complete			

EV1 MARSHBURN (FF)

REINSTALL DIAGONAL BRACES
12. Assist EV2 with brace installation
13. Release AET as needed for brace clearance
14. **PGT [B2 16.0 ft-lb, CW2 30 RPM, 30.5]-7/16-2-in ext**; engage Diagonal Brace (cup-cone bolt) to hard stop, ~ 35 turns

REINSTALL SARJ BRACES
15. Release SARJ Brace via SARJ Launch Bolt by hand, ~ 1 turn ccw

16. **PGT [B2 16.0 ft-lb, CW2 30 RPM, 30.5]-7/16-2-in ext**; engage SARJ Brace (Cup-Cone bolt) to **hard stop**, ~ 38 turns

17. Re-engage SARJ Launch Bolt bolt for temp stow; hand tighten cw 2-3 turns

REINSTALL STOW CLEVIS BRACKET (OPTIONAL)
18. Finger start Stow Clevis Bracket bolts (4), approx 1-2 turns
19. **PGT [B2 16.0 ft-lb, CW2 30 RPM, 30.5]-7/16-6-in ext**; engage Stow Clevis Bracket bolts (4) to hard stop, expect 10 turns
20. Retrieve RET from bracket

PREP UMA
21. Xlate under PAS UMA
22. Tether to hitch pin from EVA OVERRIDE anti-rotation cap, remove hitch pin
23. Remove anti-rotation cap and stow in trash bag

RTL CHECKOUT
24. Xlate 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

EV2 CASSDIY (FF)

REINSTALL BRACES
12. Move Diagonal Brace into position for re-installation
13. Release AET as needed for brace clearance
14. Reinstall AET once brace is clear

15. Retrieve tether from brace temp stow location

REINSTALL DEPLOY CLEVIS BRACKET
16. Finger start Deploy Clevis Bracket bolts (4), 1-2 turn
17. **PGT [B5 22.0 ft-lb, CW2 30 RPM, 30.5]-7/16-6-in ext**; engage Deploy Clevis Bracket bolts (4) to hard stop, expect **10 turns**

18. **PGT [RCW, 30.5]-7/16-6-in ext**, two clicks each bolt Apply final Torque to Deploy Clevis Bracket bolts (4) in Ratchet Mode

19. Retrieve RET from bracket
20. Stow in M bag

INSTALL YOKE
21. Disconnect AET
22. Install yoke in deploy clevis bracket
    - ❑ Release wire tie securing PIP pin and ADP to yoke
    - ❑ Install yoke ADP, √lock bracket engaged
    - ❑ Install yoke PIP Pin

23. Retrieve Lg-sm AET from HR; stow in M bag

S3 NADIR OUTBOARD PAS (01:30) (Cont)

IV/SSRMS	EV1 MARSHBURN (FF)	EV2 CASSDIY (FF)
	EBCS TARGET PREP (AFTER RTL CHECKOUT) 25. Xlate to EBCS target and perform: ❑ Verify both EV clear of target area ❑ Remove target cover; stow on backside of target assy CLEANUP 26. Glove inspection 27. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed) 28. Xlate to S3 Nadir Inbd PAS	CLEANUP 24. Glove inspection 25. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed) 26. Xlate to S3 Nadir Inbd PAS

S3 NADIR INBOARD PAS (01:30)

IV/RMS

1. Brace Bolt Installation:

Bolt	Diagonal
Torque	
Turns	

2. Deploy Clevis Bracket Install:

Bolt #	1	2	3	4
Initial Torque				
Turns				
Final Torque				

3. Stow Clevis Bracket Install:

Bolt #	5	6	7	8
Initial Torque				
Turns				
Final Torque				

EV1 MARSHBURN (FF)

HINGE LINE PREP
1. Remove hinge line ADPs (2)
2. Insert in stowage hole (toward station forward)
   - ❑ √ADP closed: Inboard
   - ❑ √ADP closed: Outboard

REMOVE DIAGONAL BRACES
3. **PGT [B6 24.0 ft-lb, CCW3 60 RPM, 30.5]-7/16-6-in ext**; release Diagonal Brace (cup-cone bolt), **stop on turns 35 (do not exceed 37 turns)**

4. Guide Diagonal Brace and temp stow with tether

DEPLOY LG-SM AET
5. Deploy lg-sm AET

DEPLOY PLATFORM
6. Monitor UMA to longeron clearance
7. Inform EV2 when UMA just clears the longeron
8. Assist EV2 as needed with yoke

REINSTALL DIAGONAL BRACES
9. Release AET as needed for brace clearance
10. **PGT [B2 16.0 ft-lb, CW2 30 RPM, 30.5]-7/16-2-in ext**; engage Diagonal Brace (cup-cone bolt) to **hard stop**, ~ 35 turns

REINSTALL STOW CLEVIS BRACKET (OPTIONAL)
11. Finger start Stow Clevis Bracket bolts (4), approx 1-2 turns
12. **PGT [B2 16.0 ft-lb, CW2 30 RPM, 30.5]-7/16-6-in ext**; engage Stow Clevis Bracket bolts (4) to hard stop, expect 10 turns
13. Retrieve RET from bracket

EV2 CASSDIY (FF)

REMOVE DEPLOY CLEVIS BRACKET
1. RET to Deploy Clevis Bracket **PGT [B7 25.5 ft-lb, CCW2 30 RPM, 30.5]-7/16 2-in ext**; release Deploy Clevis Bracket bolts (4) 10 turns
2. Temp stow Deploy Clevis Bracket with RET

RELEASE YOKE ADP AND PIP PIN
3. Release yoke PIP pin
4. Release yoke ADP
5. Tend platform “into” the truss

REMOVE STOW CLEVIS BRACKET
6. RET to Stow Clevis Bracket
7. **PGT [B7 25.5 ft-lb, CCW2 30 RPM, 30.5]-7/16-2-in ext**; release Stow Clevis Bracket (4) 10 turns
8. Stow Clevis Bracket on M bag

DEPLOY PLATFORM
9. Deploy platform out until UMA clears longeron
10. On EV1 GO, rotate yoke from out to in
11. Attach lg hook of AET to ADP hole

REINSTALL BRACES
12. Move Diagonal Brace into position for re-installation
13. Release AET as needed for brace clearance
14. Reinstall AET once brace is clear

15. Retrieve tether from brace temp stow location

REINSTALL DEPLOY CLEVIS BRACKET
16. Finger start Deploy Clevis Bracket bolts (4), 1-2 turn
17. **PGT [B5 22.0 ft-lb, CW2 30 RPM, 30.5]-7/16-6-in ext**; engage Deploy Clevis Bracket bolts (4) to hard stop, expect **10 turns**

18. **PGT [RCW, 30.5]-7/16-6-in ext**, two clicks each bolt Apply final Torque to Deploy Clevis Bracket bolts (4) in Ratchet Mode

S3 NADIR INBOARD PAS (01:15) (Cont)

IV/RMS	EV1 MARSHBURN (FF)	EV2 CASSDIY (FF)
4. **IV: Give MCC-H GO to power up IMCA** **√All tasks inside truss prior to UMA prep complete** **√Tools cleared from inside truss**		19. Retrieve RET from bracket 20. Stow in M bag INSTALL YOKE 21. Disconnect AET 22. Install yoke in deploy clevis bracket ❑ Release wire tie securing PIP pin and ADP to yoke ❑ Install yoke ADP, √lock bracket engaged ❑ Install yoke PIP Pin
5. IV: Obtain GO from MCC-H for RTL Checkout RTL # | 1 | 2 | 3 PIP Pin | | | | Test Complete | | | | 6. Tool inventory **C/L Bag – PAS Bag (M)** ❑ AET (ext D-ring) ❑ AET lg-sm (ext D-ring) ❑ RET sm-sm (int D-ring #1 to door handle) ❑ Camera w/bracket (int RET #1) ❑ RET sm-sm ❑ RET sm-sm (int D-ring #2 to door handle) ❑ RET sm-sm (int D-ring #3 to door handle) **C/L Bag – DR Tools Bag (V) strap to M bag** ❑ AET (ext D-ring) ❑ RET sm-sm (int D-ring # 1 to door handle) ❑ DRT #1 (int RET #1) ❑ DRT #2 (int RET #2) ❑ AET lg-sm (int RET #3) ❑ GP caddy (int RET #4) (from EV2) ❑ Compound cutter ❑ Vice grips ❑ Wire ties Long (2) (ext D-rings across back of bag) ❑ Stow clevis bracket ❑ Stow clevis bracket	PREP UMA 14. Xlate under PAS UMA 15. Tether to hitch pin from EVA OVERRIDE anti-rotation cap, remove hitch pin 16. Remove anti-rotation cap and stow in trash bag RTL CHECKOUT 17. Xlate 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 EBCS TARGET PREP (AFTER RTL CHECKOUT) 18. Xlate to EBCS target and perform: ❑ Verify both EV clear of target area ❑ Remove target cover; stow on backside of target assy CLEANUP 19. Glove inspection 20. Tool inventory 21. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed) 22. Xlate to CP1	23. Retrieve Lg-sm AET from HR; stow in M bag CLEANUP 24. Glove inspection 25. Tool inventory 26. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed) 27. Xlate to A/L

CP1 WETA INSTALL (01:00)

IV/RMS

1. IV: √**MCC-H** WETA inhibits in place:

   RPCM S31A_A RPC 15 – Open, Close Cmd Inh
   RPC 16 – Open, Close Cmd Inh
   RPCM S32B_A RPC 15 – Open, Close Cmd Inh
   RPC 16 – Open, Close Cmd Inh

2. Install WETA

	Torque	Turns
Center		
Left		
Right		

EV1 MARSHBURN (FF)

SETUP
1. Temp stow C/L Bag on S3 Face 4 at HR 3029 and HR 3020
2. Temp stow camera w/RET at HR 3029

DUMMY BOX REMOVAL
3. Tether to dummy box with C/L bag RET
4. **PGT [A5 7.0 ft-lb, CCW2, 30.5]-7/16-6-in ext**; release captive fasteners; 7-12 turns (bolt will pop up)
   - ❑ left
   - ❑ right
5. **PGT[A5 7.0 ft-lb, CCW2, 30.5]-7/16-6-in ext**; release center jack screw 24-30 turns
6. Remove dummy box
7. Xfer dummy box to EV2

WETA INSTALL
8. Receive WETA from EV2
9. Install WETA on the stanchion by sliding it along two guide pins into soft dock position
10. **RET WETA to structure**
11. RET to and Remove round scoop; stow on MWS or xfer to EV2 for C/L bag stowage
12. **PGT [A7 9.2 ft-lb, CW2, 30.5]-7/16-6-in ext**; push in and engage WETA center jack bolt to hardstop ~24-30 turns
13. Visually check for contact between WETA front wedge and support structure

NOTE
Start BOTH side fasteners before going to hardstop

14. **PGT [A7 9.2 ft-lb, CW2, 30.5]-7/16-6-in ext**; push in and engage left and right fasteners to hardstop ~7-12 turns
15. Retrieve **WETA** RET; stow in C/L bag

EV2 CASSDIY (FF)

WETA RETRIEVAL
1. Xlate to A/L
2. Open thermal cover
3. Ingress A/L
4. Retrieve WETA/J bag
5. Egress A/L
6. Close thermal cover
7. Verify SAFER config
   - ❑ √L handle down (MAN ISO Vlv-Open)
   - ❑ √R handle down (HCM-Closed)
8. Xlate to CP1

DUMMY BOX REMOVAL
9. Receive dummy box from EV1 and stow in C/L bag

WETA INSTALL
10. Xfer WETA to EV1

CP1 WETA INSTALL (01:00) (Cont)

IV/RMS	EV1 MARSHBURN (FF)	EV2 CASSDIY (FF)
3. Give **MCC-H** GO to power up WETA	MATE CONNECTORS 16. Release TA clamps 17. Demate W8200 cable connectors P2, P3 and P4 from dummy panel A296 ❑ P2 from J2 ❑ P3 from J3 ❑ P4 from J4	MATE CONNECTORS 11. IV GO: Demate deadface connectors and connector cap from panel A78 J2, J3 and J4; temp stow ❑ J2 ❑ J3 ❑ J4
4. Tool inventory **C/L Bag – WETA bag (J) strap to WETA** ❑ AET (ext D-ring) ❑ AET (ext D-ring) ❑ AET (ext D-ring) ❑ WETA MLI (int RET #1) ❑ RET (sm-sm) (from WETA) (int D-ring #1) ❑ RET sm-sm (int D-ring #2) ❑ Dummy Box (from WETA) ❑ RET sm-sm (int D-ring #3) ❑ Round Scoop (from WETA)	18. Inspect and Mate deadface connectors (J2 & J3) and twist cap (J4) to A296 dummy panel ❑ P2 NZGL Cap (size 15) to J2 ❑ P3 NZGL Cap (size 13) to J3 ❑ P4 Twist Cap to J4 19. RET to MLI 20. Remove and stow in C/L bag 21. Close TA clamps or Wire tie cables as necessary 22. Tool Inventory 23. Glove inspection 24. Retrieve J bag 25. Xlate to A/L 26. Inform IV when ready for Stbd SARJ rotation (Crew, tools, & tethers clear of Stbd SARJ)	12. Inspect and Mate W8200 cable connectors to S3 panel A78 receptacles (any order) ❑ P2 to J2 ❑ P3 to J3 ❑ P4 to J4 13. Glove inspection 14. Retrieve V/M bag pack 15. Xlate to A/L 16. Retrieve A/L Fairlead (AET) 17. Inform IV when ready for Stbd SARJ rotation (Crew, tools, & tethers clear of Stbd SARJ)
5. On EV GO, inform MCC ready for Stbd SARJ rotation		

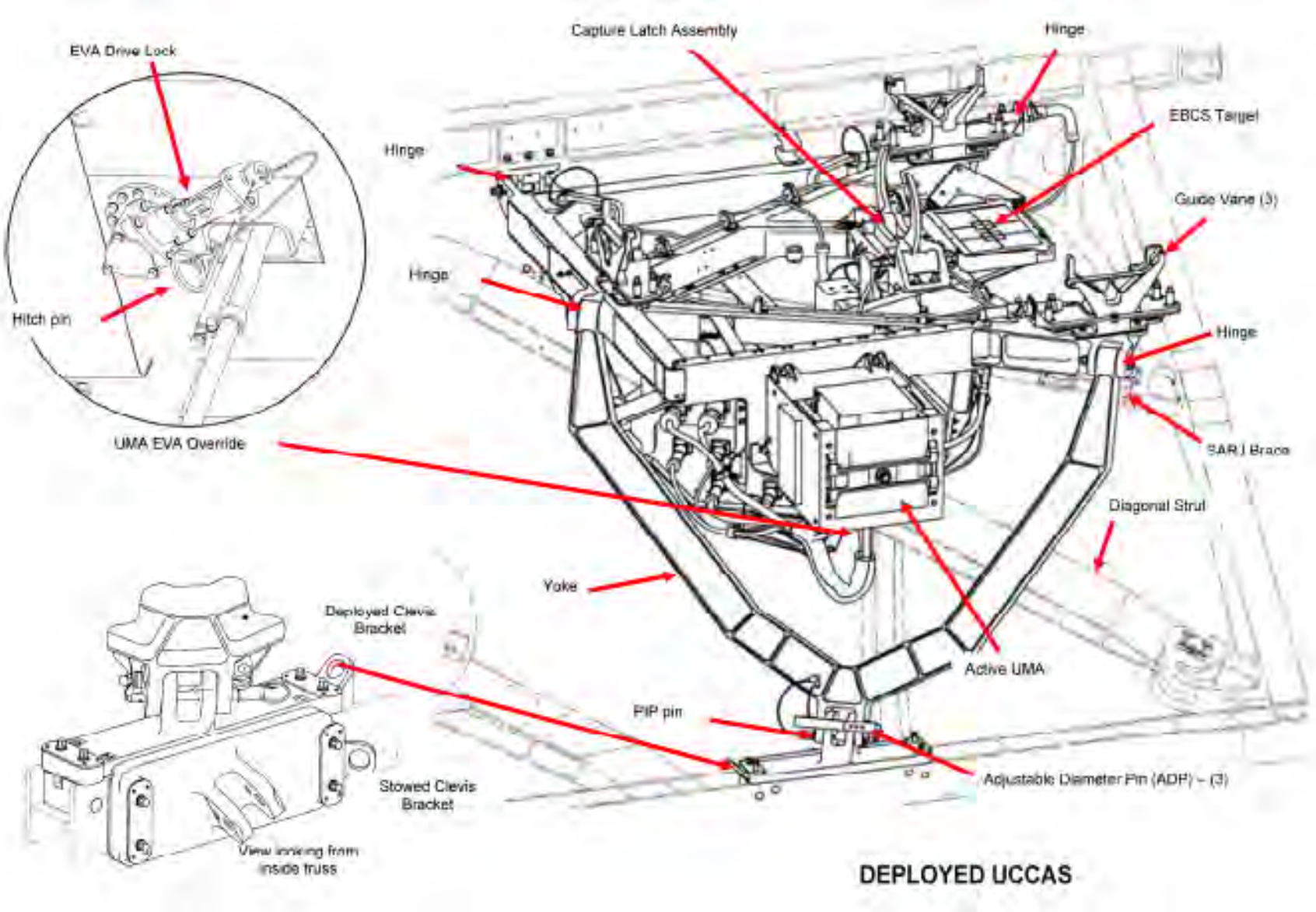
EVA 5 CLEANUP AND A/L INGRESS (00:45)

IV/RMS	EV1 MARSHBURN (FF)	EV2 CASSIDY (FF)
1. Pre crew ingress WVS PWRDN (PHOTO/TV, WVS CUE CARD)	RETRIEVE EV2 ANCHOR HOOK 1. Xlate to HR Port of S0 HR 3516 (EV1 anchor point) 2. Attach waist tether ❑ √Gate closed (structure) ❑ √Hook locked (structure) ❑ √Gate closed (D-ring ext) ❑ √Hook locked (D-ring ext) 3. Give EV2 GO to release EV1's 85-ft anchor hook 4. On EV2 GO, release waist tether 5. Xlate to EV2's anchor point S0 HR 3483 RETRIEVE EV1 ANCHOR HOOK 6. On EV2 GO, release EV2's 85-ft anchor hook 7. Stow on NOT YEL (55-ft) ERCM D-ring 8. Xlate to A/L 9. Retrieve AET FL from A/L HR 0538 10. Perform full tool inventory 11. Ingress A/L 12. Stow J bag 13. Receive V/M bag pack; stow	RETRIEVE EV2 ANCHOR HOOK 1. Xlate to S0 HR 3516 2. On EV1 GO, release EV1 anchor hook 3. Stow on NOT YEL (55-ft) ERCM D-ring 4. Xlate to A/L 5. Open thermal cover 6. Ingress A/L 7. Anchor EV1 85-ft anchor hook to UIA D-ring ❑ √Gate closed ❑ √Hook locked 8. Give EV1 GO to release waist tether 9. Attach waist tether to A/L int D-ring (ext) ❑ √Gate closed (structure) ❑ √Hook locked (structure) ❑ √Gate closed (D-ring ext) ❑ √Hook locked (D-ring ext) RETRIEVE EV1 ANCHOR HOOK 10. Give EV1 GO to release EV2's 85-ft anchor hook 11. Xfer V/M bag pack to EV1 12. Perform full tool inventory 13. Ingress A/L 14. Close thermal cover

EVA 5 CLEANUP AND A/L INGRESS (00:45) (Cont)

IV/RMS	EV1 MARSHBURN (FF)	EV2 CASSIDY (FF)
	PRE REPRESS 14. Remove SCU from stowage pouch 15. Remove DCM cover; Velcro to DCM 16. Connect SCU to DCM; √SCU Locked 17. WATER – OFF (fwd), expect H2O IS OFF msg Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)	PRE REPRESS 15. Remove SCU from stowage pouch 16. Remove DCM cover; Velcro to DCM 17. Connect SCU to DCM; √SCU Locked 18. WATER – OFF (fwd), expect H2O IS OFF msg 19. Close thermal cover; attach Velcro strap CAUTION Do not close hatch until EMU Water OFF for 2 min Verify outer hatch clear of hardware 20. Verify outer hatch clear of hardware 21. Verify handle position per hatch decal; close and lock hatch Go to PRE-REPRESS (DEPRESS/REPRESS Cue Card)

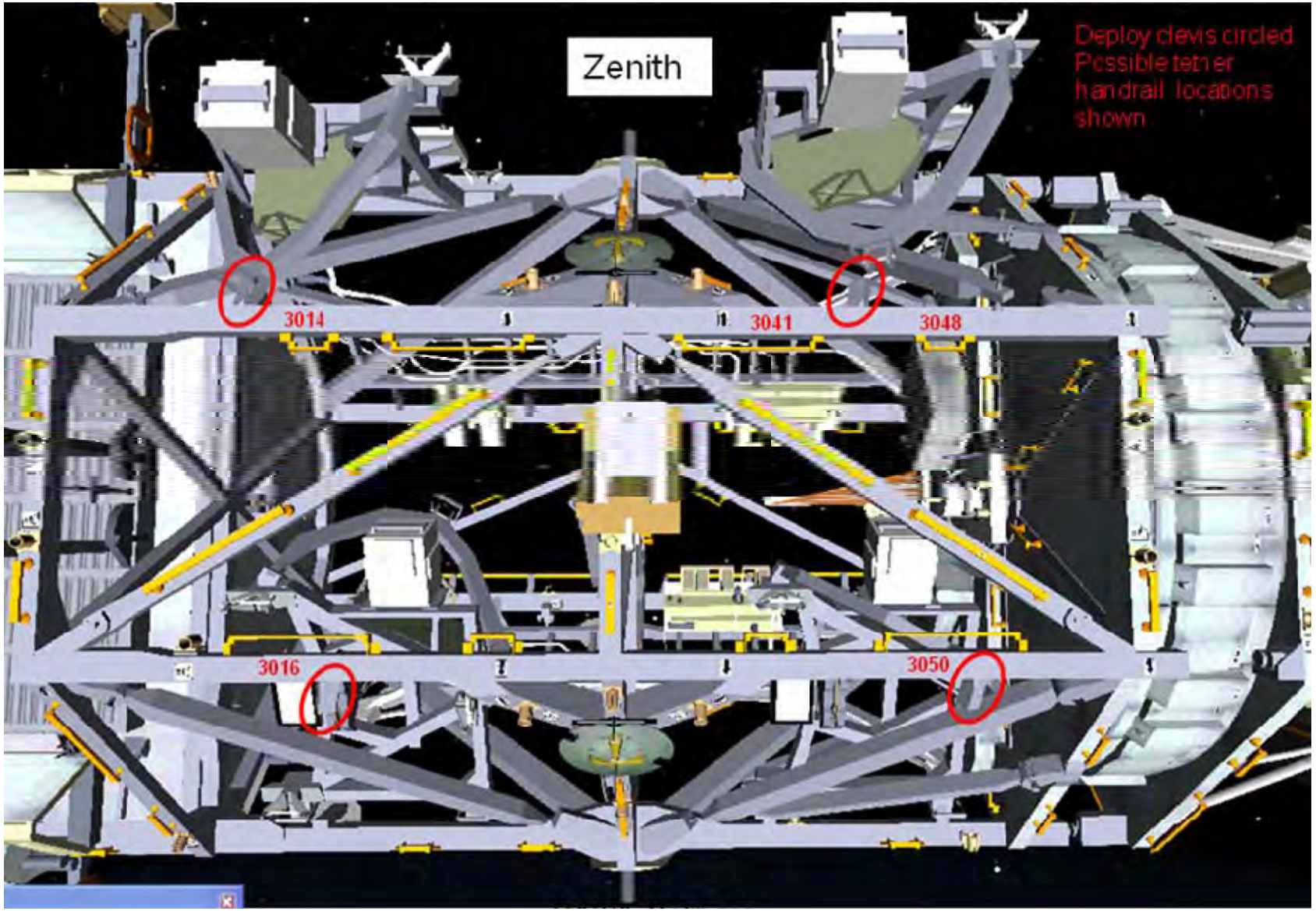
PAS TASK DATA



PAS TASK DATA (Cont)

HINGE LINE ADP ORIENTATION

PAS TASK DATA (Cont)



PAS TASK DATA (Cont)

Estimated Task Duration:

	Without SSRMS
One EV Crew	N/A
Two EV Crew	01:00

Tools:

EV1	**EV3**
PGT	PGT
7/16-6-in socket ext	7/16-6-in socket ext
	Adj – 45-72-in Gap Spanner (Large) – Adj

EVA Fasteners:

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

Inhibits:

Inhibit
S3/S4 SARJ Locked

Foot Restraints (Contingency Yoke Alignment):

Task	**WIF**	**APFR Setting**
Zenith/Outboard PAS	S3-11	5, PP, G, 12
Zenith/Inboard PAS	S3-15	3, RR, F, 10
Nadir/Outboard PAS	S3-17	3, PP, F, 12
Nadir/Inboard PAS	S3-25	11, PP, F, 12
Nadir UCCAS	P3-11	3, PP, H, 12

Notes:

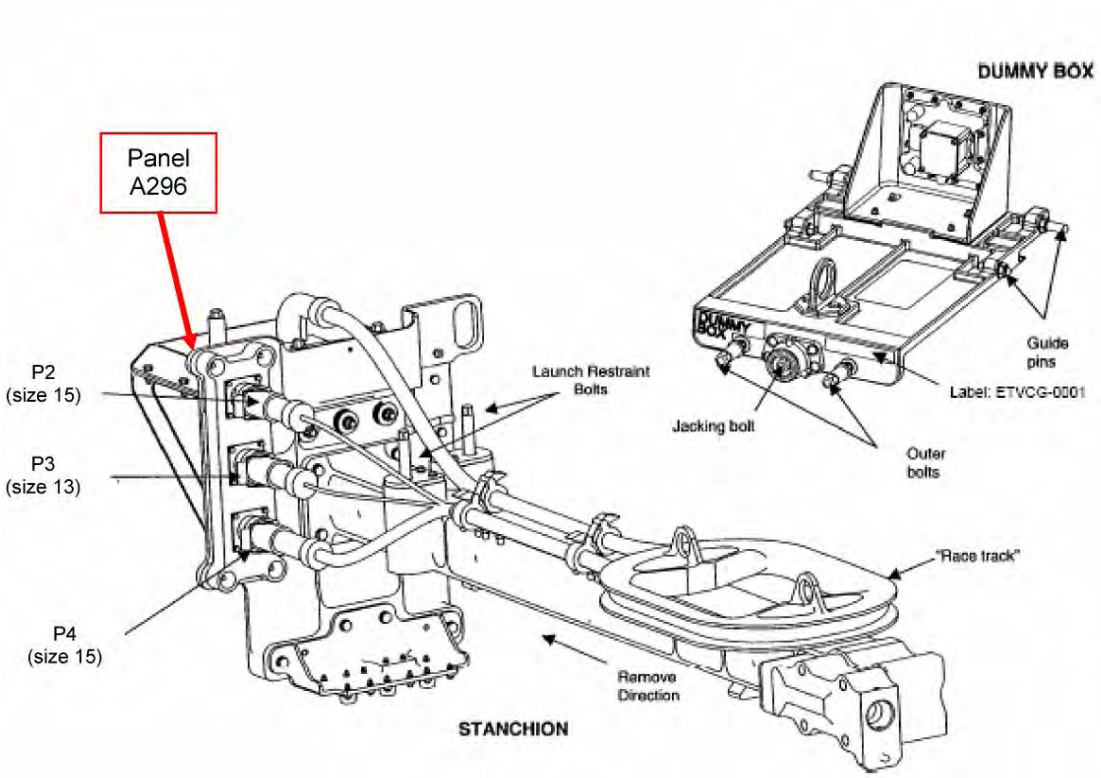
1. UMA EVA Override anti-rotation cap must be removed prior to first use of UMA on PAS
2. EBCS target cover must be removed prior to cargo attachment to PAS. Protects target from MMOD and inadvertent contact. Remove as last activity
3. RAD may be needed for re-install of deployed clevis bracket. It will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

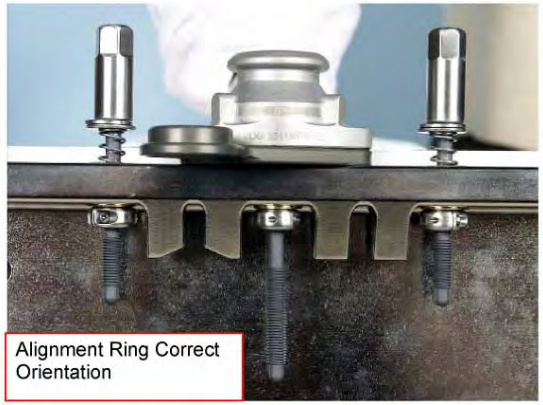
Cautions:

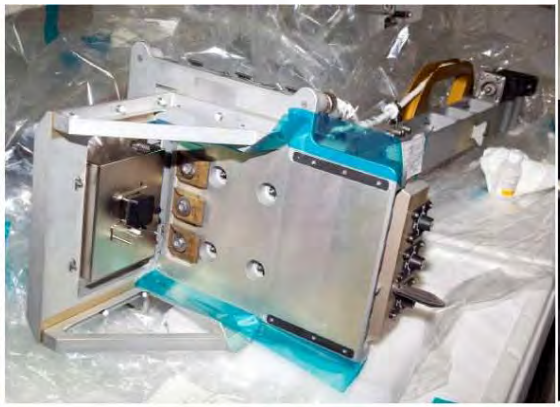
1. Do not lift diagonal brace greater than 7 deg out of rotation plane when rotating to temp stowage location so as to not bend hinge end
2. Do not close ADP lock bracket when ADP is not inserted in a stowage/clevis hole. The pin can fall apart
3. EBCS target has finished surface that is susceptible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

Warnings:

CP1 WETA INSTALL TASK DATA







CP1 WETA INSTALL TASK DATA (Cont)

Estimated Task Duration:

	Without SSRMS	
Two EV Crew	N/A	00:40

ORU Identification:

ORU	Part number	Serial Number
WETA	16103320-301	1003

ORU Specs:

ORU	Dimensions (in)	Mass (lb)
WETA	34x18x18	105.8

Tools:

EV1 (FF)	EV2 (FF)
PGT	PGT
7/16-6-in wobble	7/16-6-in wobble
Round Scoop (on WETA in A/L)	
Wire ties	

Foot Restraints: None

Connector Inhibits:
1. RPCM S31A_A RPC 15 – Open, Close Cmd Inhibit
2. RPCM S31A_A RPC 16 – Open, Close Cmd Inhibit
3. RPCM S32B_A RPC 15 – Open, Close Cmd Inhibit
4. RPCM S32B_A RPC 16 – Open, Close Cmd Inhibit

Timeline Considerations:
WETA thermal clock is 9 hr with thermal cover and 4 hr with no thermal cover
WETA thermal cover must be removed before WETA heater activation

Notes:
1. Dummy panel A296 is on bottom of VSSA mounting plate ~4 ft from
2. S3 face 4; S3 A78 is just inside S3 face 4

Cautions:
N/A

Warnings:
N/A

EVA Fasteners:

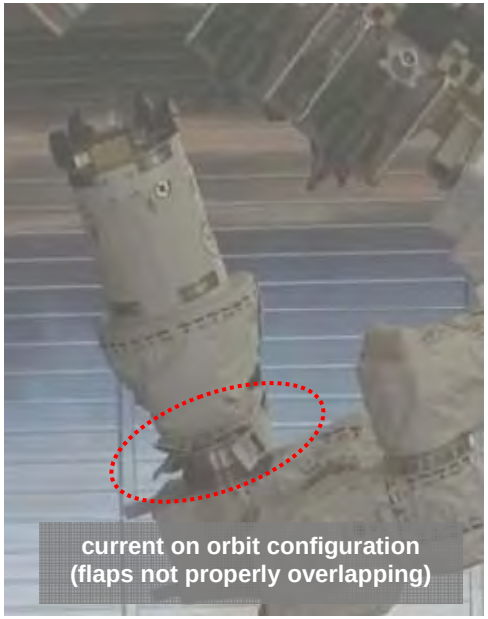
Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	RPM
Dummy Box (Outer)	7/16	2	N/A	7.0	17.1	6.8-11.8	30
Dummy Box (Center)	7/16	1	N/A	7.0	17.1	24.4-30.4	30
WETA (Outer)	7/16	2	9.2	N/A	13.2	6.8-12.8	30
WETA (Center)	7/16	1	9.2	N/A	13.2	24.4-30.4	30

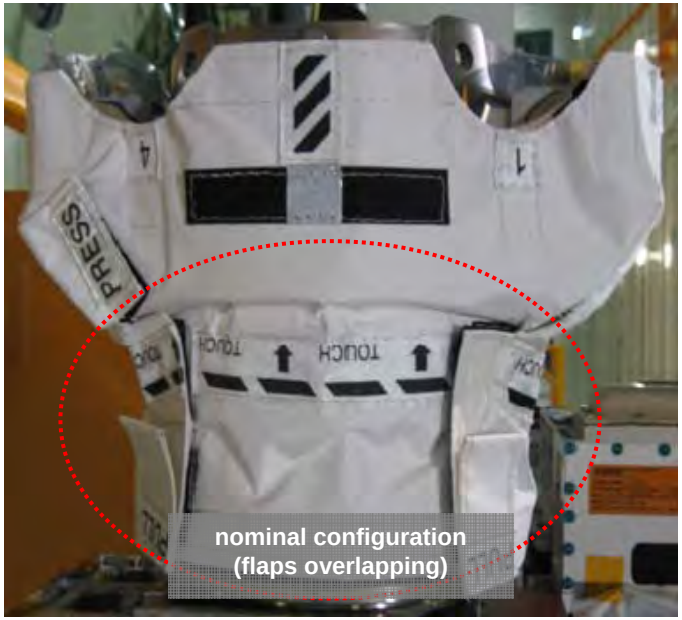
Electrical Connectors:

Harness	From	To	Size
Dead Face Connector	S3 J2	VSSA Dummy Panel	15
Dead Face Connector	S3 J3	VSSA Dummy Panel	13
Connector Cap	S3 J4	VSSA Dummy Panel	15
W8200-P2	VSSA Dummy Panel	S3 J2	15
W8200-P3	VSSA Dummy Panel	S3 J3	13
W8200-P4	VSSA Dummy Panel	S3 J4	15

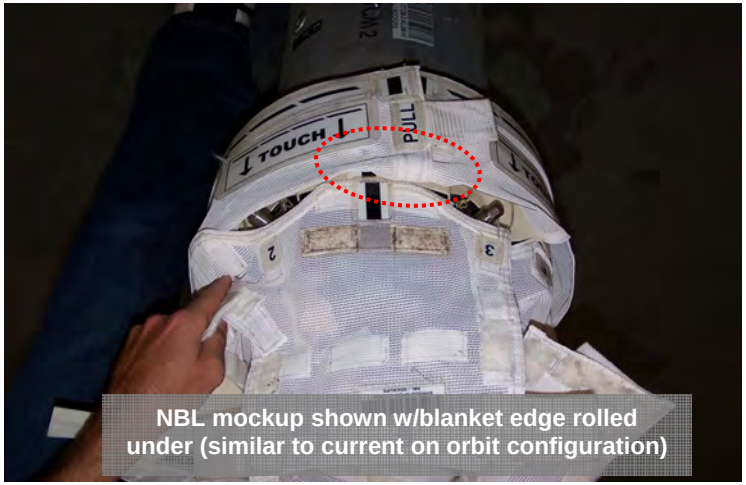
SPDM COVERS TASK DATA

Wrist Roll Flaps – Detail





Wrap Blanket – Detail



TOP

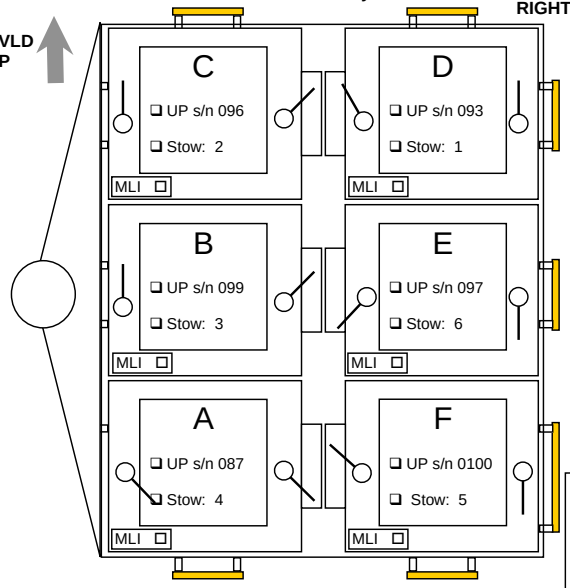
BATTERY CUE CARD 1

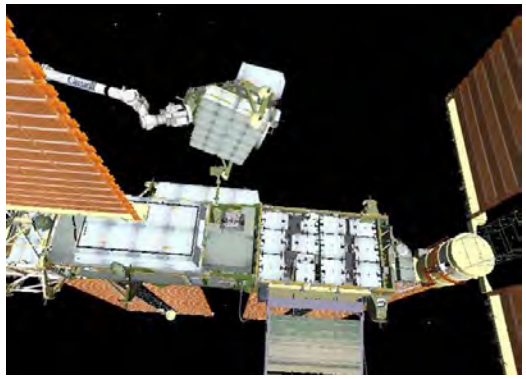
HOOK VELCRO

ICC-VLD Layout

ICC-VLD UP

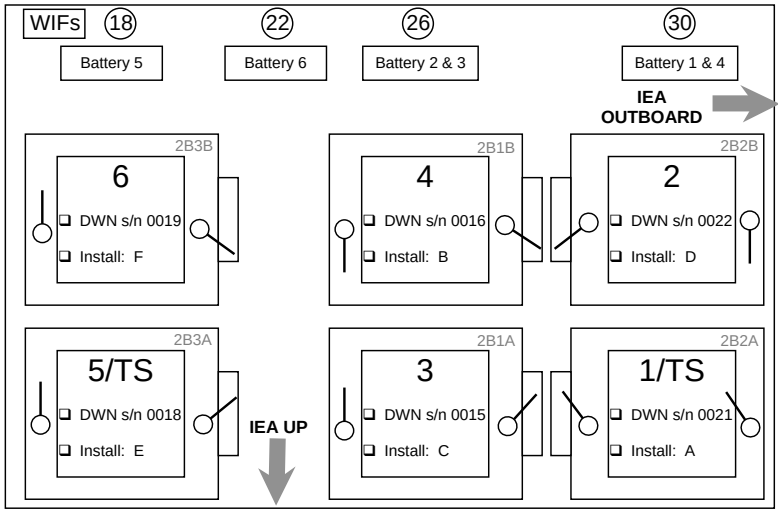
ICC-VLD RIGHT





ISS ZENITH

P6 IEA Layout

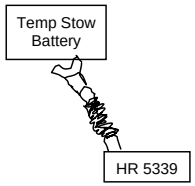


ISS STBD

NOTE

Stow ingress aid between EVAs.

EV2 should egress the ICC-VLD prior to backoff for battery removal



EVA-7a/127/O/A

(reduced copy)

TOP
BACK OF 'BATTERY CUE CARD 1'

HOOK VELCRO

JAXA MLI CUE CARD

JPM MLI

JPM BM (figure 8)	
Large MLI	ft/s

JLE MLI

MAXI (figure 5)		
Contamination Cover (PLB)	(TSA)	
ICS-EF (figure 7)		
PIU	ft/s	
Top Cover	ft/s	
Sensor Cover (stow in J bag)		
Bottom Cover	ft/s	

JEF MLI

EFBM (figure 6)		
Center Cover (PLB)	(TSA)	
VE (figure 4)		
FWD VE	U	L
AFT VE	U	L

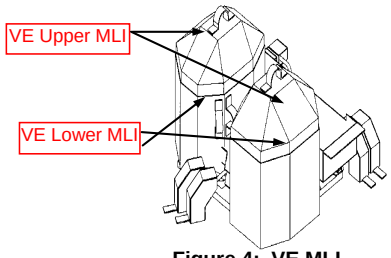


Figure 4: VE MLI

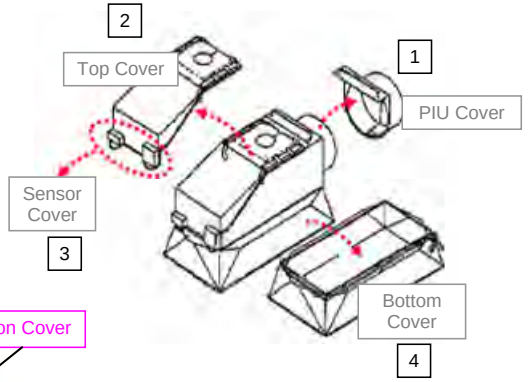


Figure 7: ICS-EF MLI

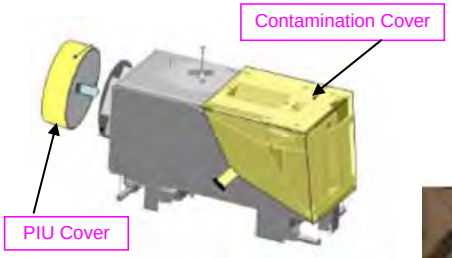


Figure 5: MAXI MLI

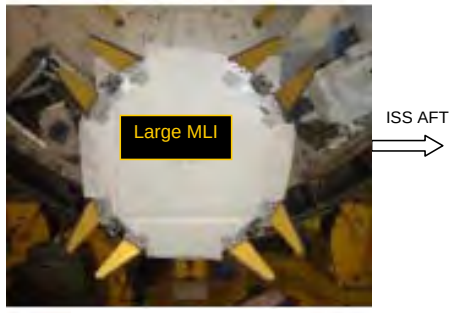


Figure 8: JPM BM MLI

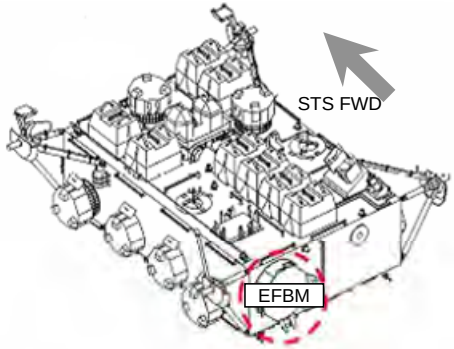


Figure 6: EFBM MLI (in PLB)

EVA-7b/127/O/A

(reduced copy)

TOP

HOOK VELCRO

BATTERY CUE CARD 2

BLOCK A: ICC-VLD Battery Removal

1. GCA ICC-VLD for removal
   √Verify EV2 tether is clear for ICC-VLD translation
2. Reposition V bag as necessary
3. Temp stow TM outside of V bag
4. Open MLI; verify battery s/n
5. **PGT [A5 (H2 31 ft-lb,H1 29.2 ft-lb), CCW2, 30.5],** TM Rec 7/16; release H1, H2 maximum 5 turns PGT (1 turn TM)
6. Install scoops
7. Stow TM
8. **PGT [A7 (9.2 ft-lb), CCW2, 30.5], 6-ext 7/16; release H1 5-6 turn**
9. **RET to battery**
10. **PGT [A7(9.2 ft-lb), CCW2, 30.5], 6-ext 7/16; release H2 16-17 turn**
11. √Verify EV2 tether is clear for ICC-VLD translation
12. Remove Battery, soft dock < 20 lbf
13. Verify yellow stanchion inserts still present

BLOCK B: IEA Battery Install

1. FOD check
   - ❑ Inspect install location
   - ❑ Inspect Battery fins
2. Install Battery, soft dock < 20 lbf
3. **PGT [A6 (8.6 ft-lb), CW2, 30.5]**, 6-ext 7/16
   Install H2 16-17 turn
   Install H1 5-6 turn
4. Shift scoops to next battery
5. Reconfig APFR for next battery

BLOCK C: IEA Battery Removal

1. Verfiy scoops installed per cue card
2. Check gap spanner position
3. **PGT [A7 (9.2 ft-lb), CCW2, 30.5],** 6-ext 7/16; release H1 5-6 turn
4. **RET to battery**
5. **PGT [A7 (9.2 ft-lb), CCW2, 30.5],** 6-ext 7/16; release H2 16-17 turn
6. Remove Battery, soft dock < 20 lbf

BLOCK D: ICC-VLD Battery Install

1. GCA ICC-VLD for install
2. FOD check
   - ❑ Inspect install location
   - ❑ Inspect Battery fins
3. Install Battery, soft dock < 20 lbf
4. **PGT [B2 (16 ft-lb), CW2, 30.5],** 6-ext 7/16
   Install H2 16-17 turn
   Install H1 5-6 turn
5. Open MLI on next battery
6. Break torque on next battery
7. **PGT [A5 (H2 31 ft-lb,H2 29.2 ft-lb), CCW2, 30.5]**, TM Rec 7/16; release H1, H2 max 5 turns PGT (1 turn TM)
8. Shift scoops to next battery (stow in V bag for batt 4 & 6)
9. Close MLI on installed battery
10. GCA to next battery
    √Verify EV2 tether is clear for ICC-VLD translation

IEA Bolt Data

	Slot		H1 Torque	H1 Turns	H2 Torque	H2 Turns	W	APFR
EVA 3	1	Remove 1					30	12, QQ,F,12
		Install A						
	4	Remove 2					30	12, QQ, C, 6
		Install D						
	3	Remove 3					26	12, QQ, F, 12
		Install C						
	2	Remove 4					26	12, RR, J, 12
		Install B						
EVA 4	5	Remove 5					18	12, QQ, F, 12
		Install E						
	6	Remove 6					22	12, QQ, C, 1
		Install F						

ICC-VLD Bolt Data

	Slot		H1 Torque	H1 Turns	H2 Torque	H2 Turns	W	APFR
EVA 3	A	Remove A					10	12, GG, F, 6
		Install 4						
	B	Remove B					10	12, GG, F, 6
		Install 3						
	C	Remove C					10	12, GG, F, 6
		Install 2						
	D	Remove D					10	12, GG, F, 6
		Install 1						
EVA 4	E	Remove E					10	12, GG, F, 6
		Install 6						
	F	Remove F					10	12, GG, F, 6
		Install 5						

NOTE

EV2 unhooks fairlead each time crosses over to pallet to ensure clear tether path

EVA-8a/127/O/A

(reduced copy)

TOP
BACK OF ‘BATTERY CUE CARD 2’

HOOK
VELCRO

EVA-8b/127/O/A

(reduced copy)

GET-AHEAD: S3 ZENITH INBOARD PAS (01:15)

IV/SSRMS	EV1	EV2
1. IV: √Check inhibits in place MCC-H IMCA PWR: RPCM S32B A RPC 12	CAUTION • When attempting to remove the Yoke PIP pin and ADP, do not impart more than 10 lbf • Yoke ADP does not have a stowage hole. Do not close ADP lock bracket when ADP is not inserted in a stowage/clevis hole • Do not exceed 30" between the yoke ADP and Deploy Clevis Bracket • Exceeding this could allow platform to enter detent position • Do not lift diagonal brace more than ~7 deg out of rotation plane to prevent damage to hinge end • Avoid inadvertent contact with grapple fixture shafts and target pins • When attempting to install the Yoke PIP pin and ADP, do not impart more than 10 lbf • EBCS target has finished surface that is susceptible to damage by contact	
	HINGE LINE PREP 1. Remove hinge line ADPs (2) 2. Insert in stowage hole (toward station forward) ❑ √ADP closed: Inboard ❑ √ADP closed: Outboard	REMOVE DEPLOY CLEVIS BRACKET 1. RET to Deploy Clevis Bracket **PGT [B7 25.5 ft-lb, CCW2 30 RPM, 30.5]-7/16 2-in ext**; release Deploy Clevis Bracket bolts (4) 10 turns 2. Temp stow Deploy Clevis Bracket with RET
2. Deploy Clevis Bracket Bolts Released | | 1 | 2 | 3 | 4 | | Bolt | | | | |	REMOVE BRACES 3. **PGT [B6 24.0 ft-lb, CCW3 60 RPM, 30.5]-7/16-6-in ext**; release Diagonal Brace (cup-cone bolt), **stop on turns 35 (do not exceed 37 turns)** 4. Guide Diagonal Brace and temp stow with tether	RELEASE YOKE ADP AND PIP PIN 3. Release yoke PIP pin 4. Release yoke ADP 5. Tend platform “into” the truss
3. Stow Clevis Bracket Bolts Released | | 5 | 6 | 7 | 8 | | Bolt | | | | |		REMOVE STOW CLEVIS BRACKET 6. RET to Stow Clevis Bracket 7. **PGT [B7 25.5 ft-lb, CCW2 30 RPM, 30.5]-7/16-2-in ext**; release Stow Clevis Bracket (4) 10 turns 8. Stow Clevis Bracket on M bag
	DEPLOY PLATFORM 5. Monitor UMA to longeron clearance 6. Inform EV2 when UMA just clears the longeron 7. Assist EV2 as needed with yoke	DEPLOY PLATFORM 9. Install sm hook of lg-sm AET to HR 10. Deploy platform out until UMA clears longeron 11. On EV1 GO, rotate yoke from out to in 12. Attach lg hook of AET to ADP hole
	REINSTALL BRACES 8. Assist EV2 with brace installation 9. Release AET as needed for brace clearance 10. **PGT [B2 16.0 ft-lb, CW2 30 RPM, 30.5]-7/16-2-in ext**; engage Diagonal Brace (cup-cone bolt) to **hard stop**, ~ 35 turns	REINSTALL BRACES 13. Move Diagonal Brace into position for re-installation 14. Release AET as needed for brace clearance 15. Reinstall AET once brace is clear 16. Retrieve tether from brace temp stow location
4. Brace Bolt Installation: | Bolt | Diagonal | | Torque | | | Turns | |		

GET-AHEAD: S3 ZENITH INBOARD PAS (01:15) (Cont)

IV/SSRMS

5. Deploy Clevis Bracket Install:

Bolt #	1	2	3	4
Initial Torque				
Turns				
Final Torque				

6. IV: Give MCC-H GO to power up IMCA
√All tasks inside truss prior to UMA prep complete
√Tools cleared from inside truss

7. IV: Obtain GO from MCC-H for RTL Checkout

RTL #	1	2	3
PIP Pin			
Test Complete			

EV1

PREP UMA
11. Xlate under PAS UMA
12. Tether to hitch pin from EVA OVERRIDE anti-rotation cap, remove hitch pin
13. Remove anti-rotation cap and stow in trash bag

RTL CHECKOUT
14. Xlate 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

EBCS TARGET PREP
15. Xlate to EBCS target and perform:
    - ❑ Verify both EV clear of target area
    - ❑ Remove target cover; stow on backside of target assy

CLEANUP
16. Glove inspection
17. Verify SAFER config
    - ❑ √L handle down (MAN ISO Vlv-Open)
    - ❑ √R handle down (HCM-Closed)

EV2

REINSTALL DEPLOY CLEVIS BRACKET
17. Finger start Deploy Clevis Bracket bolts (4), 1-2 turn
18. **PGT [B5 22.0 ft-lb, CW2 30 RPM, 30.5]-7/16-6-in ext**; engage Deploy Clevis Bracket bolts (4) to hard stop, expect **10 turns**

19. **PGT [RCW, 30.5]-7/16-6-in ext**, two clicks each bolt Apply final Torque to Deploy Clevis Bracket bolts (4) in Ratchet Mode

20. Retrieve RET from bracket
21. Stow in M bag

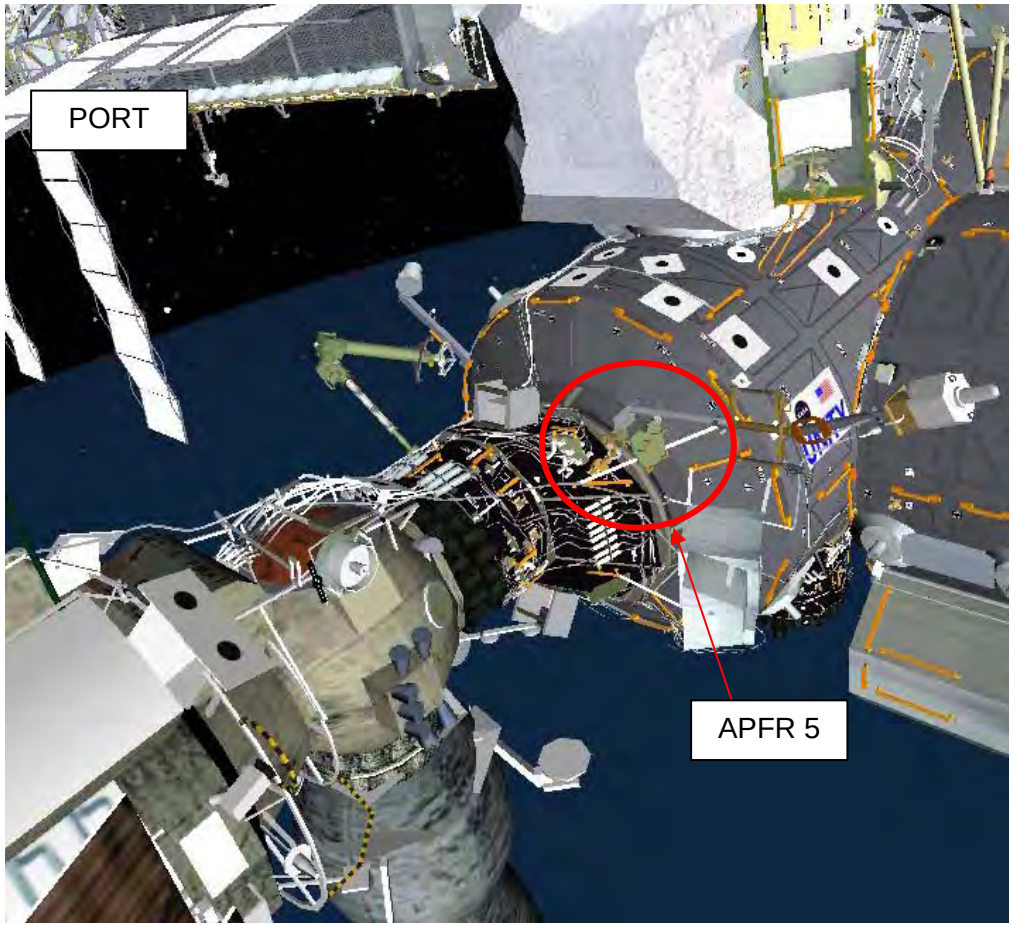
INSTALL YOKE
22. Disconnect AET
23. Install yoke in deploy clevis bracket
    - ❑ Release wire tie securing PIP pin and ADP to yoke
    - ❑ Install yoke ADP, √lock bracket engaged
    - ❑ Install yoke PIP Pin

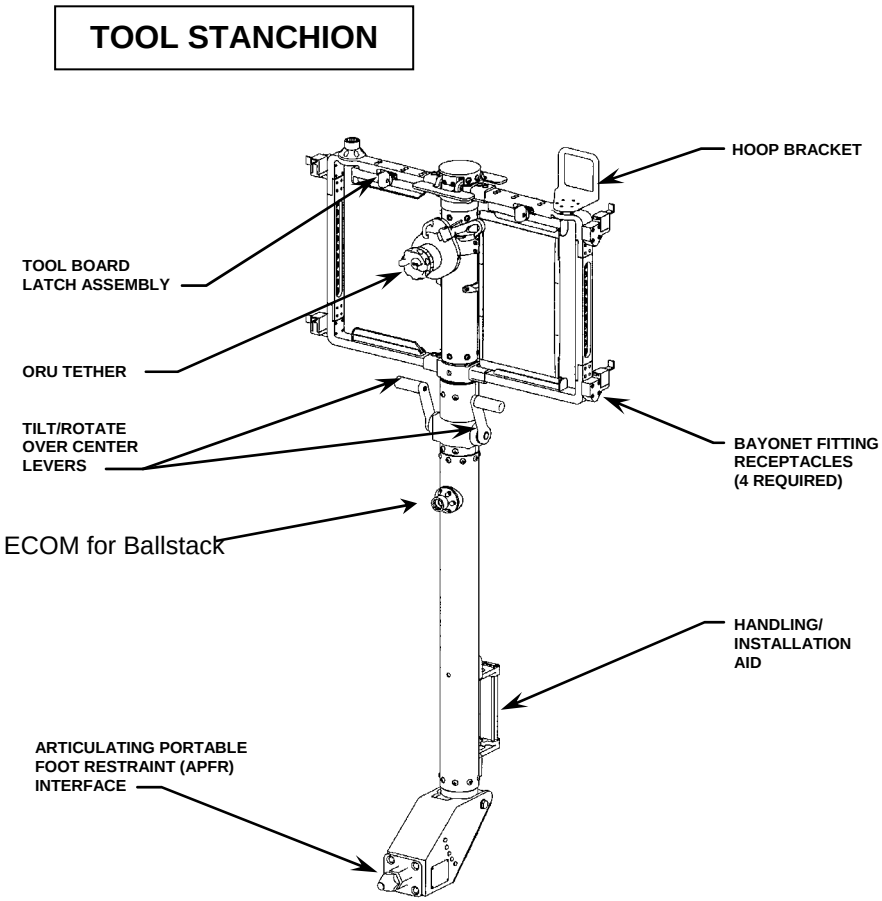
24. Retrieve Lg-sm AET from HR; stow in M bag

CLEANUP
25. Glove inspection
26. Verify SAFER config
    - ❑ √L handle down (MAN ISO Vlv-Open)
    - ❑ √R handle down (HCM-Closed)

GET-AHEAD: APFR 5 RETRIEVE/TS RELOCATE (00:45)

IV/RMS	EV1	EV2
1. **IV: √inhibits in place for PMA1 and RSOS**	TOOL STANCHION RETRIEVE 1. Xlate to PMA1 WIF2 2. Retrieve tool stanchion; stow on BRT 3. Xlate to TBD; stow TS on APFR 4. Report clocking [____]	APFR RELOCATE 1. Xlate to PMA1 WIF2 2. Assist EV1 with TS removal as needed 3. Retrieve APFR 4. Xlate to A\L





GET-AHEADS: JPM OIH AND OIW INSTALL (00:30)

IV/RMS

1. IV verify Inhibits in place

JPM Windows
IV JPM port end cone window shutters closed

JEMRMS
SSIPC If EV crew working within vicinity of JEMRMS
1. RIP MA Brake – ON
2. MDP Main Mode – Stby Mode
or
1. JEMRMS Rack – OFF

JPM PROX Antenna
SSIPC If EV crew working within 0.3 ft JPM PROX Antenna
1. TRX Power – OFF
2. TX Power – OFF
or
1. JPM PROX Antennas – OFF

JEMRMS
SSIPC PDB RMS Ext4 Vout: 0.0V
VCU_b TVC WVE Sig Stat – No signal
VLU EE Pwr – Op
JEU Interlock – Inh
JEU RT – Inh
MDP Ang/Mtr Cross Ck – Inh

JPM Aft JTVE
SSIPC PDB b2 RPC 4 Open

EV

SETUP
1. Xlate to MLI bag (LAB Zenith)
2. Retrieve MLI bag; stow on BRT
3. Xlate to JEF
4. Stow bag on JEF HR 7011 (stbd edge by EFBM)

NOTE
Tether hook may become entrapped between OIH standoff point and pressurized module; ensure tether hook is above OIH interface on standoff point when installing to softdock.

EV must be restrained during installation to avoid loads into OIH until both bolts secured

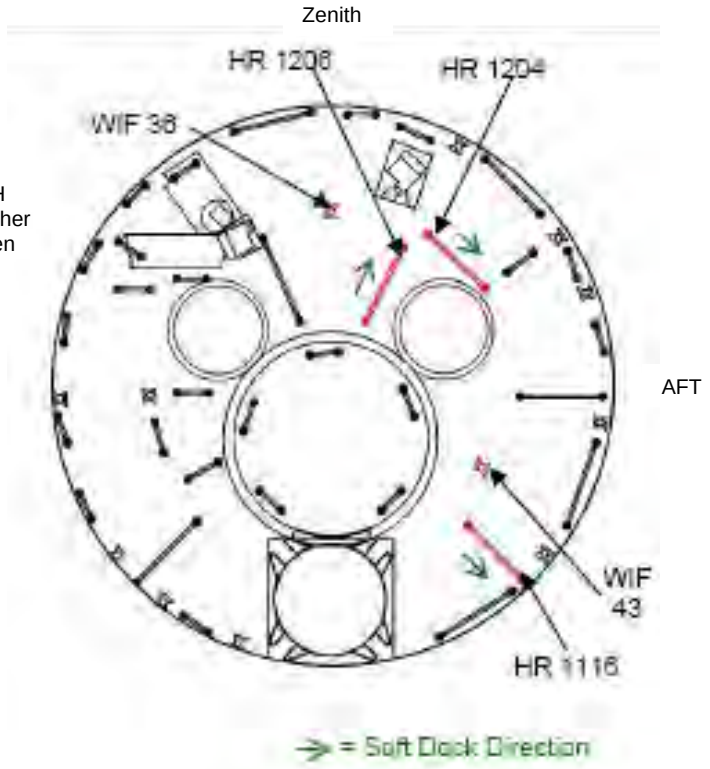
CAUTION
Avoid inadvertent contact with JEM Airlock target and pin

OIH
- ❑ 1204
- ❑ 1206
- ❑ 1116

OIW
- ❑ 43
- ❑ 36

WIF INSTALLATION
1. Pull up side lift-tabs on WIF
2. Slide WIF over dovetail on base
3. Release lift-tabs to engage locking pins in base receptacles
4. Verify wings down

HANDRAIL INSTALLATION
1. Arm HR soft dock (push both buttons)
2. Install HR to seat track direction arrow on bottom
3. **PGT [A2 (3.8 ft-lb), CW2, MTL 30.5], 6-ext 7/16**:
4. Engage handrail bolts (2) ~8 turns to torque
5. Report torque and turns to IV



HR	Mount bolt #		Torque	Turns
1116	6	Zenith		
	5	Nadir		
1204	4	Zenith		
	3	Nadir		
1206	2	Zenith		
	1	Nadir		

GET-AHEAD: FPP SLEEVES INSTALL/LAB CABLE TIE DOWN (00:30)

IV/RMS

1. IV/MCC-H: Verify Inhibits are in place:

	Location	Inhibits
☐	LAB FWD/STB & NOD 1 FWD	√RPCM Z1 3B_A2 √RPCM Z1 4B_A2
☐	PMA2 (Port)	√RPCM LA 1A4A_D3 √RPCM Z1 4B_A2
☐	PMA2 (Stbd)	√RPCM LA 2A3B_D1 √RPCM Z1 3B_A2

EV1/2

FPP SLEEVES: LAB FWD/STB

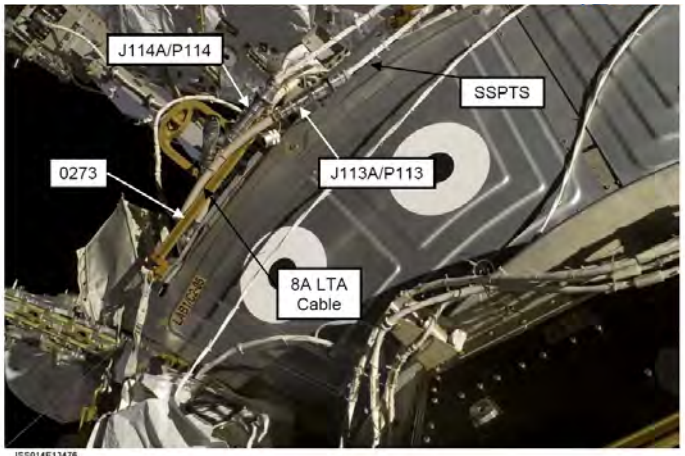
1. Xlate to MLI bag
2. Retrieve sleeves (2) (sz 21/25)
3. Retrieve wire tie caddy; stow on MWS
4. On IV GO (inhibits complete)
5. Xlate to LAB FWD/STB – HR Lab 0273
6. Install sleeves (2)
   - ❑ P113/J113A
   - ❑ P114/J114A
7. WVS Survey

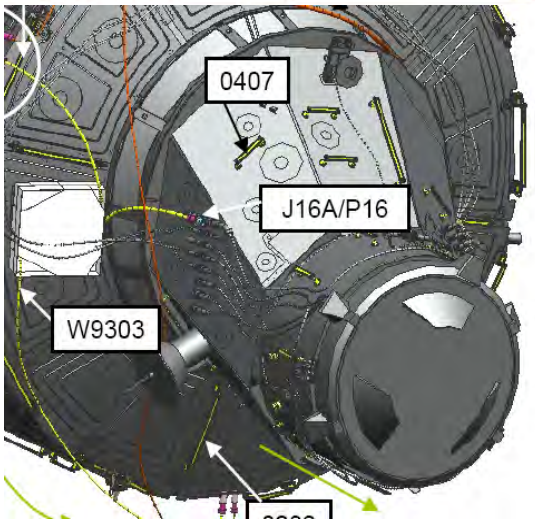
LAB CABLE TIE DOWN (PORT/STBD)

8. Tie down protruding LAB cables (STBD)
   - ❑ Min bend radius 5 in
9. Xlate to FWD/PORT side of LAB
10. Tie down protruding LAB cables (PORT)
    - ❑ Min bend radius 5 in

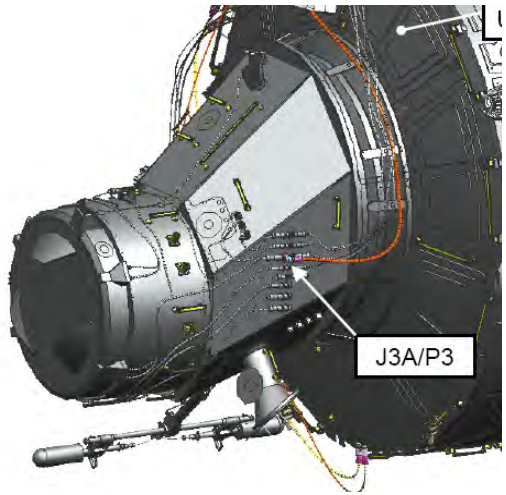
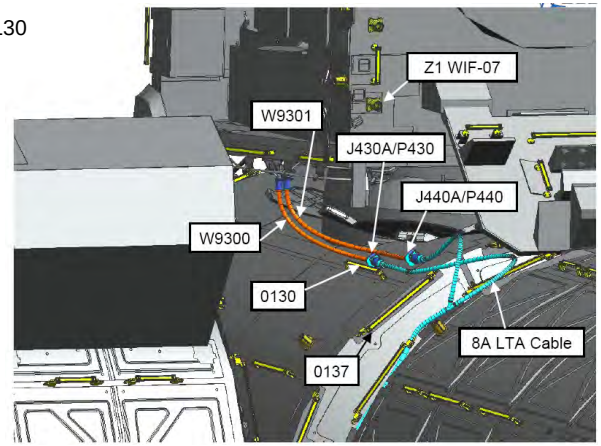
FPP SLEEVES: PMA2 STBD

11. Xlate to MLI bag
12. Retrieve sleeve (2) (sz 21/25)
13. On IV GO (inhibits complete)
14. Xlate to PMA2 stbd (midway) – HR 0407
15. Install sleeve (1)
    - ❑ P16/J16A
16. WVS Survey



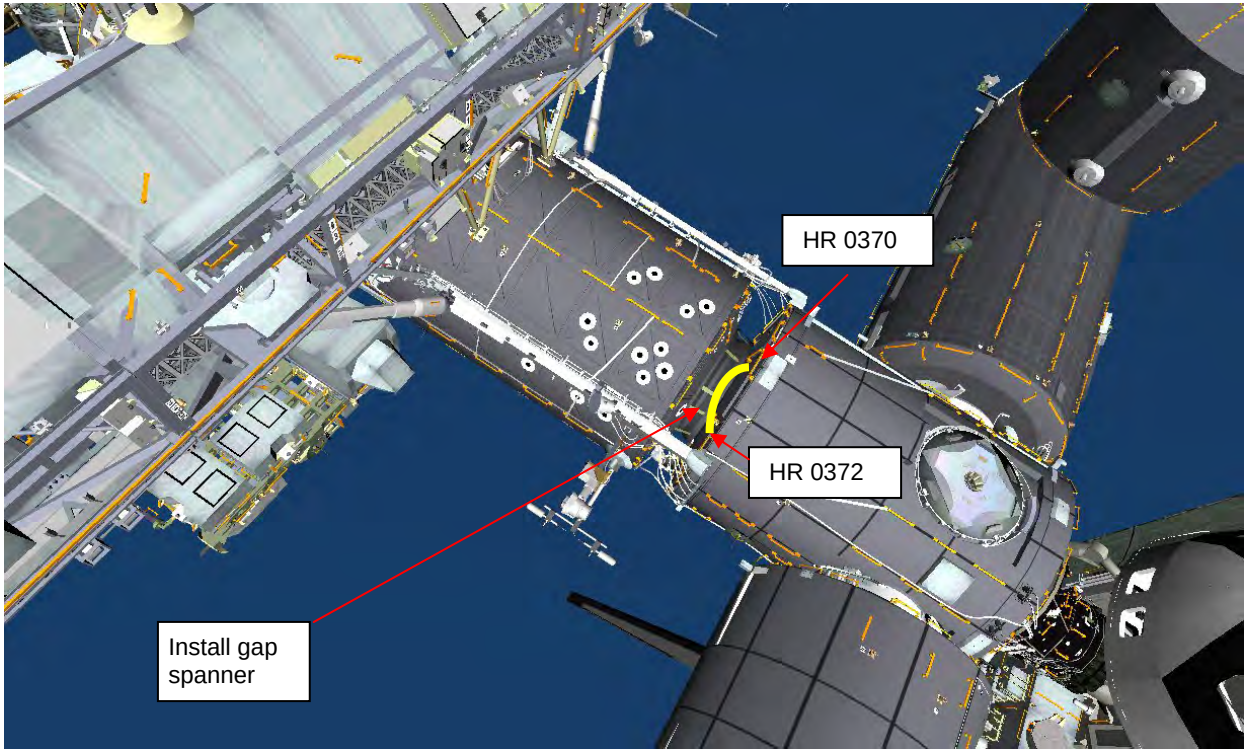


GET-AHEAD: FPP SLEEVES INSTALL/LAB CABLE TIE DOWN (00:30) (Cont)

IV/RMS	EV1/2
	FPP SLEEVES: PMA2 PORT 17. On IV GO (inhibits) 18. Xlate to PMA2 port (midway) 19. Install sleeve (1) sz 21/25) ❑ J3A/P3 20. WVS Survey 21. Xlate to MLI bag 22. Stow wire tie caddy  FPP SLEEVES: NODE 1 FWD 23. Xlate to A/L: B bag 24. Retrieve sleeves (2) (sz 33/37) 25. Xlate to NOD1 FWD 26. On IV GO (inhibits complete) 27. Xlate to Node 1 FWD (stbd, zenith) – HRs N1 0137 & N1 0130 28. Install sleeves ❑ P430/J430A ❑ P440/J440A 29. WVS Survey 30. Glove inspection 

GET-AHEAD: NOD2 GAP SPANNER INSTALL (00:15)

IV/RMS	EV1/2	
	SETUP 1. Retrieve gap spanner (72") from MLI bag 2. Xlate to NOD2 Zenith AFT endcone 3. Install gap spanner between HR 0372 and HR 0370	



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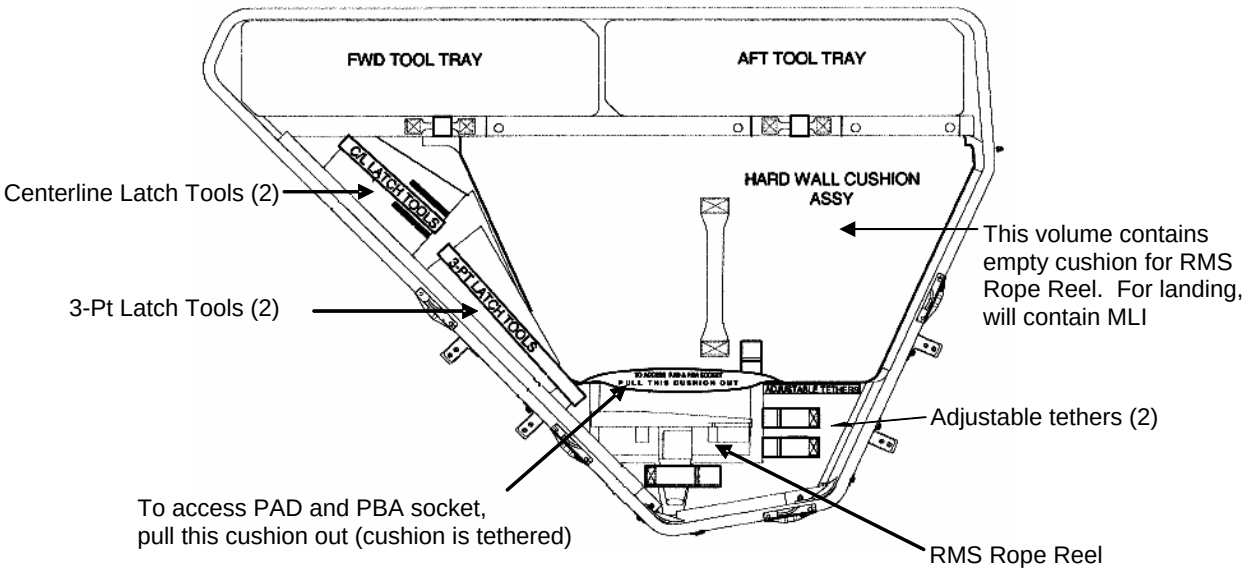
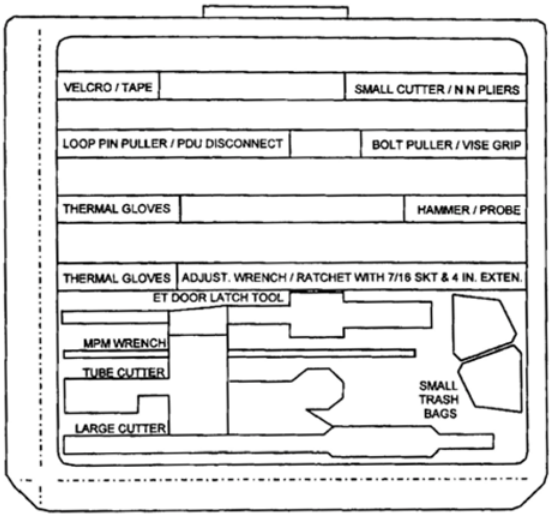
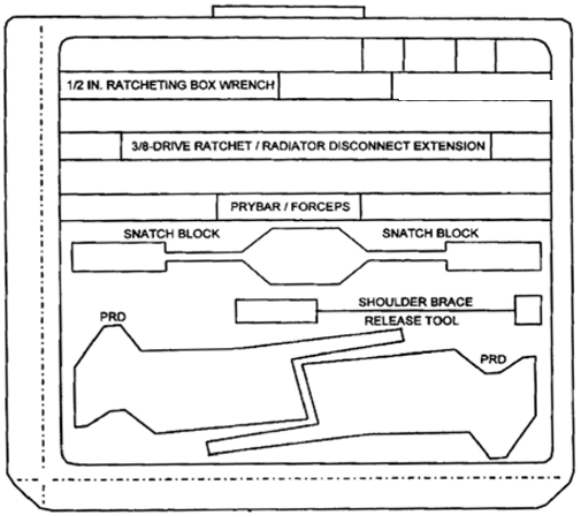
PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA) ..... TEMP FS 8-2
PGT CHECKOUT 8-3
PGSC-PGT CONNECTION (A31P AND 760XD) 8-4
PROGRAM PGT SETTINGS 8-5
DOWNLOAD/ERASE EVENT LOG 8-5
PGT CONTINGENCIES 8-6
PGT STANDARD SETTINGS 8-7
TOOLBOX STOWAGE – PRE STS-127 (2J/A) ..... FS 8-9
TOOLBOX STOWAGE – POST STS-127 (2J/A) ..... FS 8-10
TOOLBOX PANEL AND SLOT LABELS ..... FS 8-11
Z1 TOOLBOX INTERNAL LAYOUT ..... FS 8-12
AIRLOCK TOOLBOX INTERNAL LAYOUT ..... FS 8-13
APFR MANAGEMENT – STS-127 (2J/A) ..... FS 8-14
SAFETY TETHERS – STS-127 (2J/A) ..... FS 8-15
EVA TOOLS MANAGEMENT ..... FS 8-17
GREASE GUN PREP ..... FS 8-23
GREASE GUN CLEANUP ..... FS 8-25
APFR THERMAL SHIELD REMOVAL ..... FS 8-26

PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA)





Forward Tray layout and Labels



Aft Tray Layout and Labels

TOOLBOX STOWAGE – PRE STS-127 (2J/A)

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

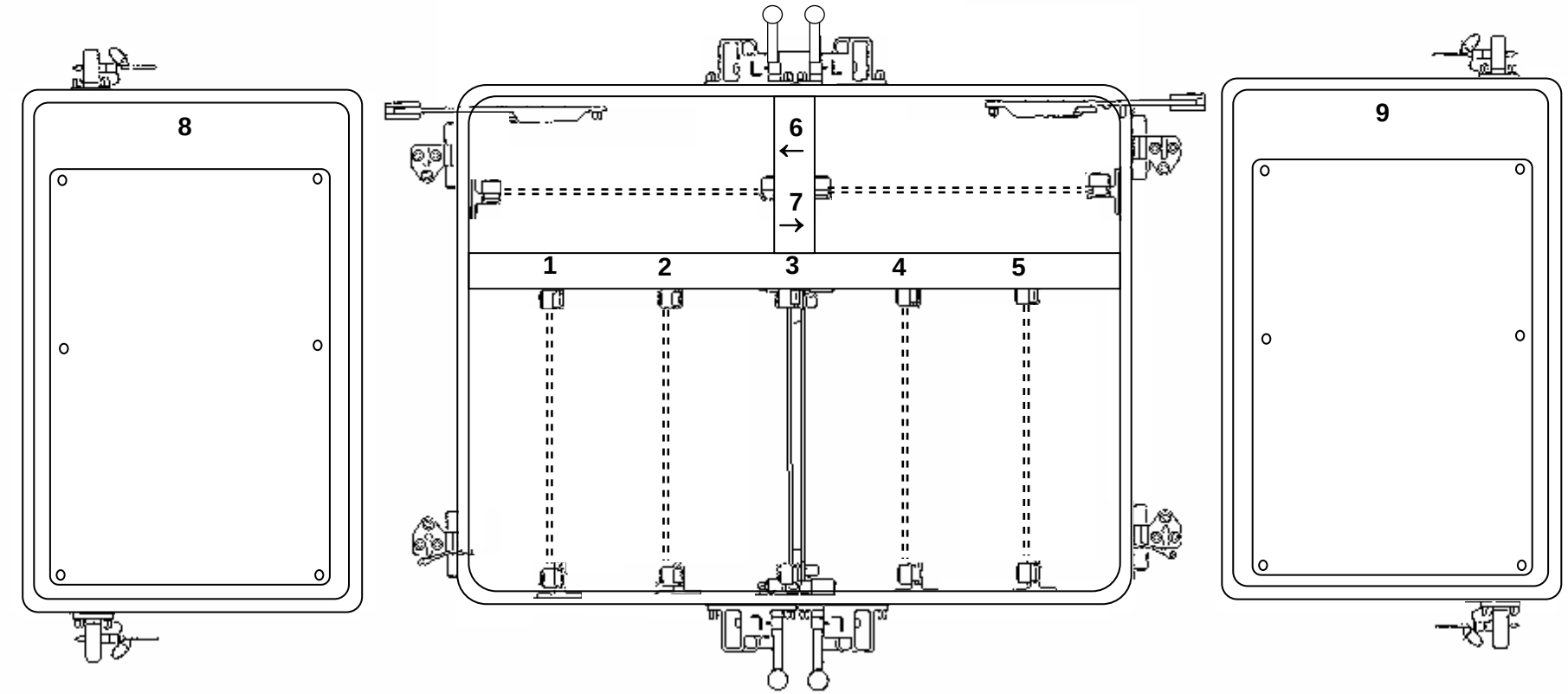
TOOLBOX STOWAGE – POST STS-127 (2J/A)

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

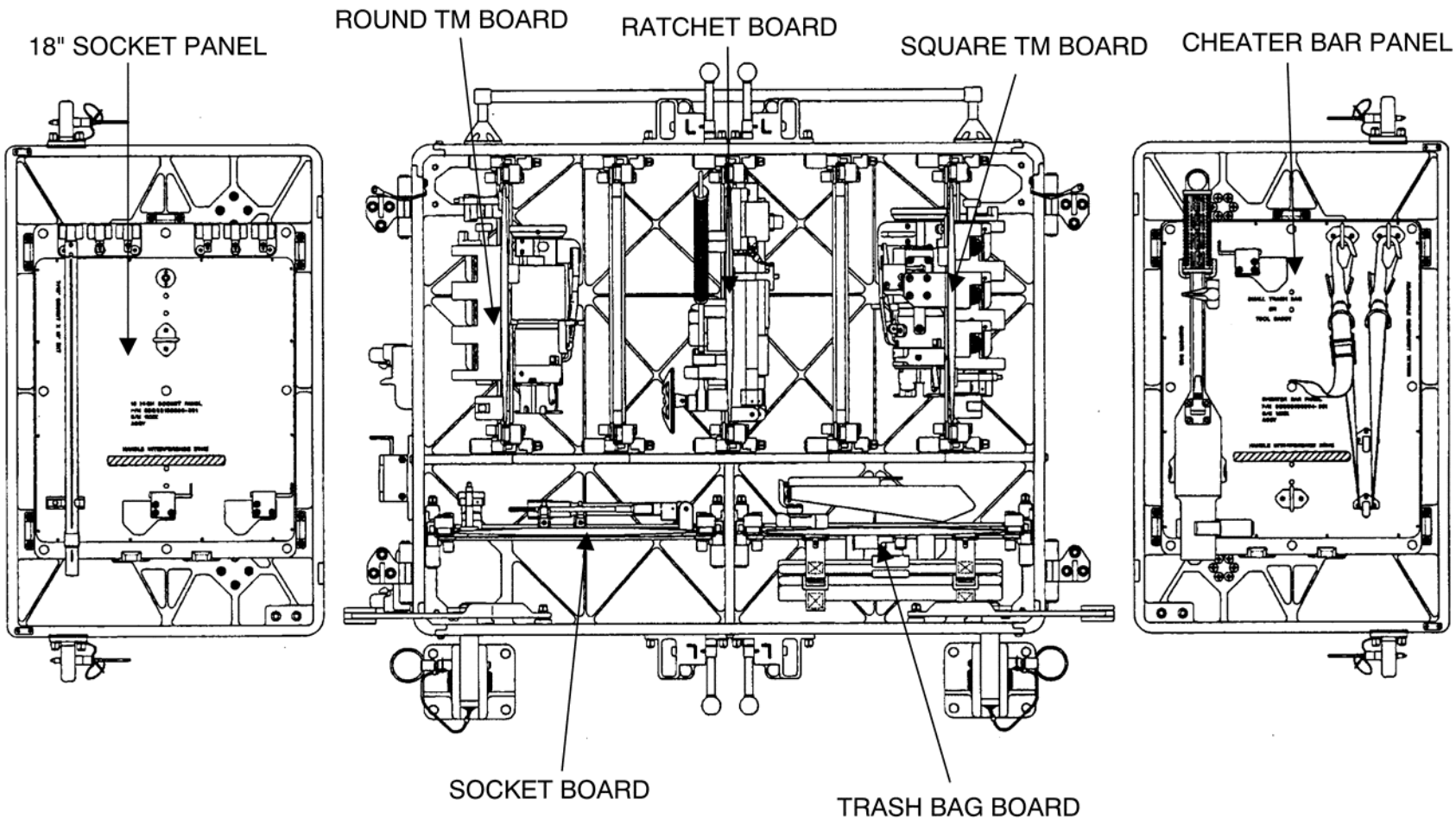
TOOLBOX PANEL AND SLOT LABELS

NOTE

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

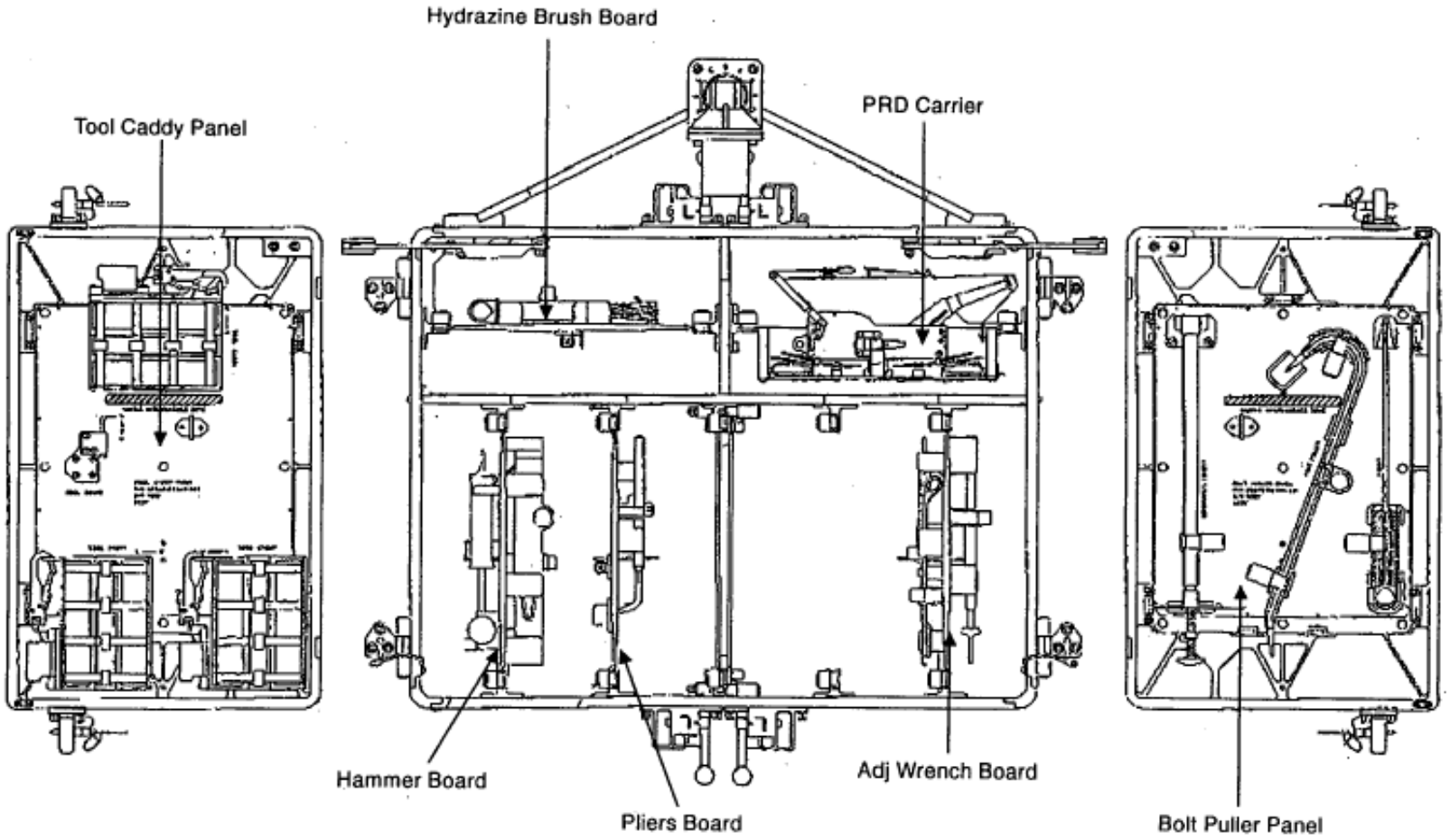


Z1 TOOLBOX INTERNAL LAYOUT



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

AIRLOCK TOOLBOX INTERNAL LAYOUT



APFR MANAGEMENT – STS-127 (2J/A)

APFR DESIGNATOR	APFR 1 (8A, 13A.1 Pitch knob problem)	APFR 2 (US EVA 9 Pitch knob problem, 10A sticky locking collar)	APFR 3 s/n 1005 (no pitch knob prob 9A-inc12 suspected sharp edge on locking collar and possible sticky locking collar)	APFR 4 (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-119	P6 WIF 30 [12,PP,F,12]	P3 WIF 29 [12,NN,F,12] UCCAS tie-down	S0 WIF 42 [1,PP,F,6] ingress aid	Z1 WIF08 [7,PP,B,6] TS at 4 o'clock	PMA1 WIF 2 TS/HS [12,KK,F,6]	S1 WIF 1 [10,TT,L,12]	P6 WIF 10 [6,GG,E,6]	Z1 WIF 1 [12,PP,F,12]	Z1 WIF 3 [6,PP,F,12]	PMA1 WIF 5		S0 port wedge face	S0 port wedge face	S0 WIF 7 CL=7
Post EVA 1	P6 WIF 30 [12,PP,F,12]	Stbd CETA cart [1,TT,C,11]	Port CETA cart WIF 3 [low profile] ingress aid	Z1 WIF08 [7,PP,B,6] TS at 4 o'clock	Inside for thermal shroud removal	S1 WIF 1 [10,TT,L,12]	P6 WIF 10 [6,GG,E,6]	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 30 [12,PP,F,12]	Stbd CETA cart [1,TT,C,11]	S0 WIF 42 Low profile ingress aid	Z1 WIF08 [7,PP,B,6] TS at 4 o'clock	Inside for thermal shroud removal	S1 WIF 1 [10,TT,L,12]	P6 WIF 10 [6,GG,E,6]	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 26 or 22 [12,PP,F,12]	Stbd CETA cart [1,TT,C,11]	S0 WIF 42 Low profile	Z1 WIF08 [7,PP,B,6] TS at 4 o'clock	Inside for thermal shroud removal	S1 WIF 1 [10,TT,L,12]	P6 WIF 10 [6,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 4	P1 WIF 1 [6,WW,K,4]	Stbd CETA cart [1,TT,C,11]	S0 WIF 42 Low profile	Z1 WIF08 [7,PP,B,6] TS at 4 o'clock	Inside for thermal shroud removal	S1 WIF 1 [10,TT,L,12]	P1 WIF 4 Ingress aid [8,QQ,G,11]	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 5	P1 WIF 1 [6,WW,K,4]	Stbd CETA cart [1,TT,C,11]	S0 WIF 42 Low profile	Z1 WIF08 [7,PP,B,6] TS at 4 o'clock	Stbd A/L tool box [9,ZZ,L,10] P [AA}	S1 WIF 1 [10,TT,L,12]	P1 WIF 4 Ingress aid [8,QQ,G,11]	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

SAFETY TETHERS – STS-127 (2J/A)

	55-ft tethers							**85-ft tethers**			
	#59 s/n 1007 Sm-sm	#71 s/n 1021 Lg-sm	#72 s/n 1022 Lg-sm (had 10A – retraction issues)	#73 s/n 1023 Lg-sm (AR written against this one) (1JA – slow retractor)	#60 s/n 1008 Lg-sm (has retracting issues)	#70 s/n 1020 Lg-sm	#66 s/n 1016 Sm-sm	#22 s/n 1002 Lg-sm	#28 s/n 1008 Lg-sm	#25 s/n 1005 (Shuttle safety tethers)	#27 s/n 1007 (Shuttle safety tethers)
119 Stage	Ground	INSIDE tether staging area	Ground	INSIDE tether staging area	S0 HH 3539 or HH 3530 Tether on 3539 had retracting issues	S0 HH 3539 or HH 3530 Tether on 3539 had retracting issues	INSIDE tether staging area	INSIDE tether staging area	INSIDE tether staging area	n/a	n/a
Post EVA 1	Ground	Attached to 85 ft anchored on S0 HR 3483 or 3516	Ground	Attached to 85 ft anchored on S0 HR 3483 or 3516	S0 HH 3539 or HH 3544 Tether on 3539 had retracting issues	S0 HH 3539 or HH 3544 Tether on 3539 had retracting issues	Spare STP staged in Crewlock	INSIDE tether staging area or Spare STP staged in Crewlock	INSIDE tether staging area or Spare STP staged in Crewlock	Anchored on S0 HR 3483 or 3516	Anchored on S0 HR 3483 or 3516
Post EVA 2	Ground	Attached to 85 ft anchored on S0 HR 3483 or 3516	Ground	Attached to 85 ft anchored on S0 HR 3483 or 3516	S0 HH 3539 or HH 3544 Tether on 3539 had retracting issues	S0 HH 3539 or HH 3544 Tether on 3539 had retracting issues	Spare STP staged in Crewlock (NOTE: 55 ft is used for SSRMS and then returned to spare STP post EVA)	INSIDE tether staging area or Spare STP staged in Crewlock	INSIDE tether staging area or Spare STP staged in Crewlock	Anchored on S0 HR 3483 or 3516	Anchored on S0 HR 3483 or 3516
Post EVA 3	Ground	Attached to 85 ft anchored on P1 HR 3650 or 3651	Ground	Attached to 85 ft anchored on P1 HR 3650 or 3651	S0 HH 3539 or HH 3544 Tether on 3539 had retracting issues	S0 HH 3539 or HH 3544 Tether on 3539 had retracting issues	Spare STP staged in Crewlock	INSIDE tether staging area or Spare STP staged in Crewlock	INSIDE tether staging area or Spare STP staged in Crewlock	Anchored on P1 HR 3650 or 3651	Anchored on P1 HR 3650 or 3651

SAFETY TETHERS – STS-127 (2J/A) (Cont)

	55-ft tethers							85-ft tethers			
Post EVA 4	Ground	Attached to 85 ft anchored on S0 HR 3483 or 3516	Ground	Attached to 85 ft anchored on S0 HR 3483 or 3516	S0 HH 3539 or HH 3544 Tether on 3539 had retracting issues	S0 HH 3539 or HH 3544 Tether on 3539 had retracting issues	Spare STP staged in Crewlock	INSIDE tether staging area or Spare STP staged in Crewlock	INSIDE tether staging area or Spare STP staged in Crewlock	Anchored on either S0 HR 3483 or 3516	Anchored on either S0 HR 3483 or 3516
Post EVA 5	Ground	INSIDE tether staging area	Ground	INSIDE tether staging area	S0 HH 3539 or HH 3544 Tether on 3539 had retracting issues	S0 HH 3539 or HH 3544 Tether on 3539 had retracting issues	INSIDE tether staging area	INSIDE tether staging area	INSIDE tether staging area	Shuttle	Shuttle

NOTE

During US EVA #8, EV2 reported that her 55-ft safety tether (P/N SEG33106674-307 s/n 1023, #73) was not retracting properly. EV2 attempted to perform the usual technique of pulling out some cable and then letting it reel in, but there came a point when EV2 was neither able to extend or retract the line with 6-8 ft of tether cable still extended. EV2 also cycled the tether from UNLOCK to LOCK and back to UNLOCK, with no joy. The tether was temp stowed as is until later (EV2 was attached to an 85-ft tether at this point.) During EVA cleanup, EV1 attempted to troubleshoot the tether, placing it in LOCK and extending quite a few more feet of cable from the tether. When the tether was placed back in UNLOCK it retracted completely, with a little bit of coaxing for the last couple feet of cable (typical behavior). The tether was brought inside. No further action required

EVA TOOLS MANAGEMENT

Flight Day 3 – EVA 1 Tool Config

1. From EVA Task Transfer Bag, retrieve and distribute as follows:

Retrieve item	QTY	Transfer to
ISS2 mode plug	☐ 1	EV2 trash bag
DRT	☐ ☐ 2	V bag
85 ft safety tether	☐ ☐ 2	Tether wall
¼" Hex driver	☐ 1	Staging bag socket caddy, FS #1 hook #1
AETs	☐ ☐☐ ☐☐ 8 ☐☐ ☐	Tether wall

2. Perform EVA 1 TOOL CONFIG in EVA 1 Timeline pages (section 7)
   - ❑ When installing long wire ties on M bag, crush loops
   - ❑ DRT prep
     - Cycle DRT knob in/out once
     - Verify knob to full cw to hardstop prior to stowing in bag
   - ❑ STP prep
     - From ISS temp stow mesh bag retrieve Ziploc "Velcro for Safety Tethers"
     - Retrieve Shuttle 85-ft Safety Tethers from tether wall
     - Apply 1 square of **pile** to larger diameter portion of "peanut" on back of Safety Tether Housing (opposite Lock/Unlock lever)
     - Apply Velcro such that Safety Tether Housings align when 55-ft and 85-ft tethers are Velcro-ed together, and Lock/Unlock levers facing out

Flight Day 5 – EVA 1 Tool Deconfig/EVA 2 Tool Config

1. Deconfigure the following:

M Bag:

Remove item	QTY	Transfer to
Camera w/bracket and RET sm-sm	☐ 1	Battery to charging
SARJ scraper	☐ 1	ISS temp stow
Stow clevis bracket	☐ 1	ISS temp stow
Ratchet w/2" socket	☐ 1	J bag int RET
Lg-sm RET	☐ 1	EVA 5
EVA wipe	☐ 1	If clean – ISS temp stow; if used check MCC-H

B Bag:

Remove item	QTY	Transfer to
Square Torque multiplier w/Rec socket	☐ 1	V bag int RET
Square Scoops	☐☐ 2	Remain in bag
FPP sleeve 33/37	☐☐ 2	Stow w/Lg-sm RETs in C/L per tool config

EVA TOOLS MANAGEMENT (Cont)

V Bag:

Remove item	QTY	Transfer to
Detent Retention Tool (DRT)	☐☐ 2	EVA 5 bag
Wire tie caddy	☐ 1	Staging bag FS 1 hook #1 (swap with socket caddy)
Lg-sm AET	☐ 1	EVA 5

Staging Bag:

Remove item	QTY	Transfer to
Socket caddy w/RAD, 6" ext, ¼" hex driver	☐ 1	¼" hex to Task Transfer Bag; rest to ISS temp stow
Grease gun w/EVA wipe	☐ 1	Stage as needed for deconfig

EV1 MMWS

Remove item	QTY	Transfer to
PAS EVA override cap	☐☐ 2	ISS temp stow
RTL PIP pins	☐☐ 6 ☐☐ ☐☐	ISS temp stow
Large trash bag w/4 LDTDs	☐ 1	ISS temp stow

EV2 MMWS

Remove item	QTY	Transfer to
LTA mode plug	☐ 1	ISS temp stow

2. From EVA Task Transfer Bag, retrieve and distribute as follows:

Retrieve item	QTY	Transfer to
VE cap size 17	☐ 1	J bag int RET

3. Retrieve EVA 2 bag and distribute as follows:

Retrieve item	QTY	Transfer to
WIF adapter	☐ 1	EV1 MMWS

4. Perform EVA 2 TOOL CONFIG per EVA 2 Timeline pages (section 7)
   - ❑ Stow/retrieve tethers on tether wall as needed
   - ❑ Retrieve 55-ft tether from spare STP in C/L. Stow on EV1 MMWS

EVA TOOLS MANAGEMENT (Cont)

Flight Day 7 – EVA 2 Tool Deconfig/EVA 3 Tool Config

1. Deconfigure the following:

M Bag

Item removed	QTY	Stowage
Camera w/bracket and sm-sm RET	☐ 1	B bag; Battery charging
WIF adapter	☐ 1	ISS temp stow
55 ft safety tether	☐ 1	C/L; reconfigure spare STP

J Bag:

Item removed	QTY	Stowage
Ratchet w/2" ext	☐ 1	Ratchet to V bag 2" ext to socket caddy in ISS temp stow bag
Socket caddy w/RAD w/2" ext, 6" ext	☐ 1	Socket caddy stays in bag; RAD w/2" to EVA 4 bag, 6" to ratchet transferred to V bag
Round scoop	☐ 1	EVA 4 bag
VE I/F cable	☐ 1	ISS temp stow
VE MLI (U/L)	☐ ☐ 2	ISS temp stow
VE Launch lock	☐ 1	ISS temp stow

2. Retrieve EVA 3 bag and distribute as follows:

Item retrieved	QTY	Stowage
Sq scoops	☐☐ 2	V bag int RETs
MUT EE	☐ 1	B bag int RET
Ballstack w/MUT EE	☐ 1	B bag ext
9" ext	☐ 1	J bag socket caddy

3. Perform EVA 3 TOOL CONFIG in EVA 3 Timeline pages (section 7)
   - ❑ Stow/retrieve tethers on tether wall as needed

Flight Day 9 – EVA 3 Tool Deconfig/EVA 4 Tool Config

1. Deconfigure the following:

J Bag

Item removed	QTY	Stowage
9" ext	☐ 1	ISS temp stow socket caddy
Socket caddy	☐ 1	Stays in bag
ICS-EF sensor cover	☐ 1	ISS temp stow

EV2 MMWS

Item removed	QTY	Stowage
Camera w/bracket	☐ 1	J bag; Battery to charging

2. From EVA Task Transfer Bag, retrieve and distribute as follows:

Item retrieved	QTY	Stowage
VE cap size 17	☐ 1	J bag int RET

EVA TOOLS MANAGEMENT (Cont)

3. Retrieve EVA 4 bag and distribute as follows:

Item retrieved	QTY	Stowage
RAD w/2" ext	☐ 1	J bag socket caddy
Round scoop	☐ 1	J bag int RET

4. Perform EVA 4 TOOL CONFIG (see updated EVA 4 tool config msg)
   - ❑ Stow/retrieve tethers on tether wall as needed

Flight Day 11 – EVA 4 Tool Deconfig/EVA 5 Tool Config

1. Deconfigure the following:

J Bag:

Item removed	QTY	Stowage
ISS2 mode plug	☐ 1	ISS temp stow
Socket caddy w/RAD w/2" ext	☐ 1	Staging bag, FS2 hook #7
Round scoop	☐ 1	WETA
VE I/F cable	☐ 1	ISS temp stow
VE MLI (U/L)	☐ ☐ 2	ISS temp stow
VE Launch lock	☐ 1	ISS temp stow

B Bag:

Item removed	QTY	Stowage
Camera w/bracket and sm-sm RET	☐ 1	M bag; Battery charging
Sq scoops	☐☐ 2	ISS temp stow
MUT EE	☐☐ 2	ISS temp stow
Ballstack	☐ 1	ISS temp stow
Small trash bag w/4 gap spanners	☐ 1	Trash bag to EV1 MMWS; gap spanners to ISS temp stow

V Bag:

Item removed	QTY	Stowage
Torque multiplier w/Rec socket	☐ 1	ISS temp stow
Sq scoops	☐☐ 2	ISS temp stow
Ratchet w/6" ext	☐ 1	ISS temp stow

2. Retrieve EVA 5 bag and distribute as follows:

Item retrieved	QTY	Stowage
GP caddy w/ Compound cutter & Vice grips	☐ 1	EV2 MMWS
DRTs	☐☐ 2	V bag int RETs
Lg-sm AET	☐ 1	V bag int RET
Lg-sm AET	☐ 1	M bag ext D-ring

3. Retrieve ISS temp stow bag and distribute as follows:

Item retrieved	QTY	Stowage
2" ext	☐ 1	EV2 PGT

EVA TOOLS MANAGEMENT (Cont)

4. Perform EVA 5 TOOL CONFIG in EVA 5 Timeline pages (section 7)
   - ❑ Stow/retrieve tethers on tether wall as needed
   - ❑ If APFR heat shield has been removed; stage APFR #5 in C/L. Use Lg-sm RET from FPP sleeves stowed in C/L. Combine sleeves to single lg-sm or remove from C/L. Inform MCC-H of config
   - ❑ DRT prep
     - o Cycle DRT knob in/out once
     - o Verify knob to full cw to hardstop prior to stowing in bag

Flight Day 13 – EVA 5 Tool Deconfig

1. Deconfigure the following:

M Bag:

Item removed	QTY	Stowage
Camera w/bracket	☐ 1	Stage for Photo/TV procedure

V bag

Item retrieved	QTY	Stowage
GP caddy w/ Compound cutter & Vice grips	☐ 1	ISS temp stow; inspect compound cutter tape for damage; provide MCC-H status
	☐ 1	ISS temp stow; inspect tape for damage; notify MCC-H if damage
	☐ 1	ISS temp stow
Stow clevis bracket	☐☐ 2	ISS temp stow
DRTs	☐☐ 2	ISS temp stow

J Bag:

Item removed	QTY	Stowage
WETA MLI	☐ 1	ISS temp stow
Dummy bag	☐ 1	ISS temp stow
Round scoop	☐ 1	ISS temp stow

Large ORU/MLI bag:

Item removed	QTY	Stowage
Adj Fuse tethers	☐☐☐ 3	Tether wall
Wire tie caddy	☐ 1	ISS temp stow

2. Return all tethers to airlock tether staging area
   - ❑ STP deconfigure
     - Separate the tether packs
     - Stow all 55-ft and 85-ft tethers #71 and #73 on tether wall
     - Stow 85-ft tethers #25 and #27 in EVA Task Transfer Bag
       NOTE: Tape can be left on the hooks

3. Stow crewlock bags in airlock endcone
   - ❑ Remove letter labels

4. Stow the following tethers on the EMUs (1 each)

Item Description	QTY
AET	☐ ☐ 2

EVA TOOLS MANAGEMENT (Cont)

5. Deconfigure MMWSs

Item removed	QTY	Stowage
PGT	☐ ☐ 2	❑ Remove sockets stow in CTB 1161 PGT H/W ❑ Remove batteries and return to BSA ❑ Stow PGT in CTB 1161 PGT H/W
Small trash bags	☐ ☐ 2	CTB 1075 (A/L 1O0 behind closeout) or ISS temp stow
BRTs	☐ ☐ 2	CTB 1013 (A/L 1O0 behind closeout) or ISS temp stow

GREASE GUN PREP (LOAD CARTRIDGE)

OBJECTIVE:
Load a grease gun for use on STS-127/2JA P3 UCCAS troubleshooting

DURATION:
30 minutes

PARTS:
Straight Nozzle Gun (Grease) (A/L1_Crewlock, SARJ Hardware, CTB 1061)
Grease Cartridge (A/L1_Crewlock, SARJ Hardware, CTB 1061)
EVA Wipe (A/L1_Crewlock, SARJ Hardware, CTB 1061)
EVA Wire Tie (short)

MATERIALS:
Dry towel
Nitrile gloves (NOD104_C1, CTB 1125)
Ziplock bag

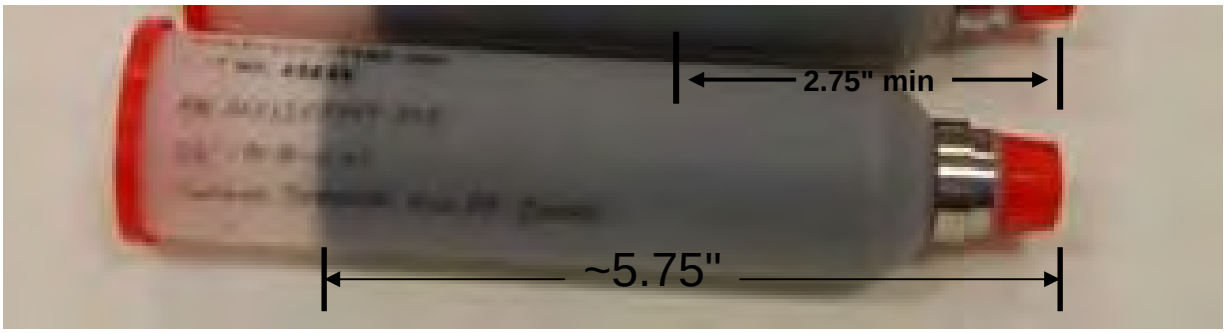


Figure 1.- Grease Gun Measurement (Full Cartridge shown).

1. Retrieve grease cartridges
2. Measure grease in a cartridge. Minimum of 2.75" of grease needed. [Measured from red tip cap to end of grease]. Refer to figure 1 for measurement location
3. Retrieve
    a. Dry towel
    b. Ziplock bag
    c. Nitrile gloves
4. Verify plunger disengaged (black triangle down)
5. Verify valve closed (shutoff knob perpendicular to nozzle)
6. Remove MLI cover from grease gun
7. Fully retract plunger
8. Remove nozzle/shutoff valve, temp stow in Ziplock
9. Remove red flange cap from grease cartridge; stow in Ziplock
10. Install grease cartridge into grease cartridge housing, leaving red tip cap on cartridge
11. Screw trigger assembly onto grease gun housing (cw at least 1.5 turns)
12. Verify plunger disengaged (black triangle down)

GREASE GUN PREP (LOAD CARTRIDGE) (Cont)

13. Remove red tip cap (ccw, use Allen wrench if reqd from NOD1D4_G2 in Drawer 4); stow in Ziplock
14. Retrieve nozzle/shutoff valve from Ziplock
15. Install nozzle/shutoff valve (cw), attempt to install so nozzle is straight vertical on grease gun
16. Verify valve closed (shutoff knob perpendicular to nozzle)
17. Install MLI cover on grease gun
18. Install MLI tip cover

Good Config

Bad Config (too much zip tie visible)

Figure 2.- Zip-tie Configuration.

19. Verify zip tie not visible (MLI should cover zip tie head). Refer to figure 2
20. Prime grease gun by disengaging plunger and gently pushing fwd on back of triangle until resistance met
21. Secure EVA Wipe over nozzle with wire tie aft of shutoff valve to secure valve in off position
22. Stow towel (if used) in Ziplock
23. If not already completed, configure Green Mesh Bag (label “ISS Temp Stow”)
24. Stow Ziplock in “ISS Temp Stow” Mesh Bag
25. Stow grease gun in Staging Bag

GREASE GUN CLEANUP

PARTS:
Straight Nozzle Gun (Grease) (Staging Bag)
Grease Cartridge Ziplock (_____, SARJ Hardware, 3.0 CTB 1061)
EVA Wipe (Crewlock Bag, Staging Bag)
Ziplock w/Red Grease Cartridge Caps (“ISS Temp Stow” Mesh Bag)

MATERIALS:
Dry towel
Nitrile gloves (NOD104_C1, 0.5 CTB 1159)
Ziplock bags

1. Retrieve the following hardware:
    a. Dry towel
    b. Ziplock bags (2); label Ziplock bags “STS” and “ISS”
    c. Nitrile gloves (NOD1O4_C1, 0.5 CTB 1159)
    d. Grease Cartridge Ziplock (JPM1A5, SARJ Hardware, 3.0 CTB 1061)
2. Don Nitrile gloves
3. Retrieve Ziplock bag w/grease gun cartridge caps (“ISS Temp Stow” Mesh Bag)
4. Retrieve EVA wipes
5. Stow used wipes in Ziplock “STS” and stow clean wipes in SARJ Hardware, 3.0 CTB 1061
6. Verify plunger disengaged (black triangle down)
7. Verify valve closed (shutoff knob perpendicular to nozzle)
8. Remove MLI cover from grease gun
9. Fully extend plunger
10. Remove nozzle/shutoff valve from used cartridge (ccw); note valve will be full of grease
11. Wipe any excess grease around nozzle using towel; stow towel in Ziplock “STS”
12. Temp stow nozzle/shutoff valve in Ziplock “ISS”
13. Unscrew grease cartridge housing from trigger assembly (ccw)
14. Remove used cartridge from grease gun housing
15. Attach red caps to used grease cartridge
16. Estimate if cartridge is > 1/4 full (~1.5" of grease)

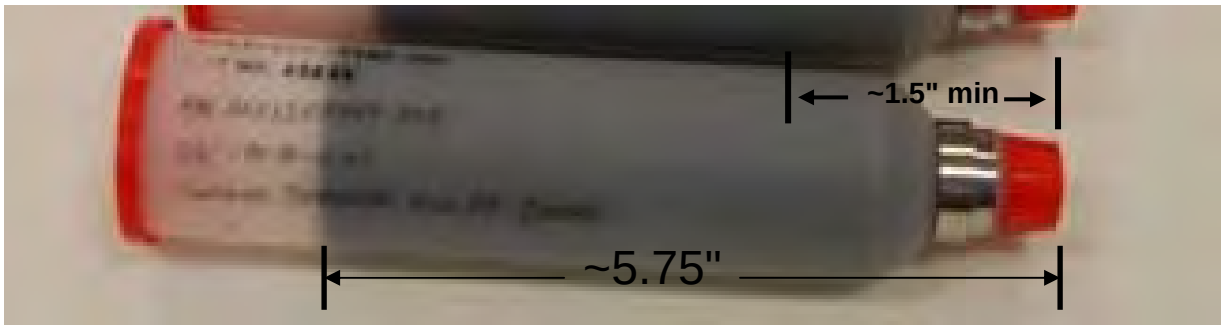


Figure 1.- Grease Cartridge Measurement (Full Cartridge Shown).

17. Stow used grease cartridge in Ziplock “STS” if < 1/4 full, and in Ziplock with other cartridges if > 1/4 full
18. Screw trigger assembly onto grease gun housing
19. Install MLI cover on grease gun
20. Install MLI tip cover
21. Stow grease gun in Ziplock “ISS”
22. Doff Nitrile gloves; stow in Ziplock “STS”
23. Inform MCC-H: Number of wipes, towels, and grease cartridges in “STS” Ziplock
24. Stow Ziplock “STS” in “EVA Task Transfer” Mesh Bag
25. Stow Ziplock “ISS” and grease cartridge Ziplock in SARJ Hardware, 3.0 CTB 1061

APFR THERMAL SHIELD REMOVAL

1. Retrieve the following:
   APFR
   Dry Wipes
   Ziplock Bag
   Sharpie
   Driver Handle, 3/8-in Drive – Drawer 2
   #8 Long Torq Driver, 3/8-in Drive – Drawer 3

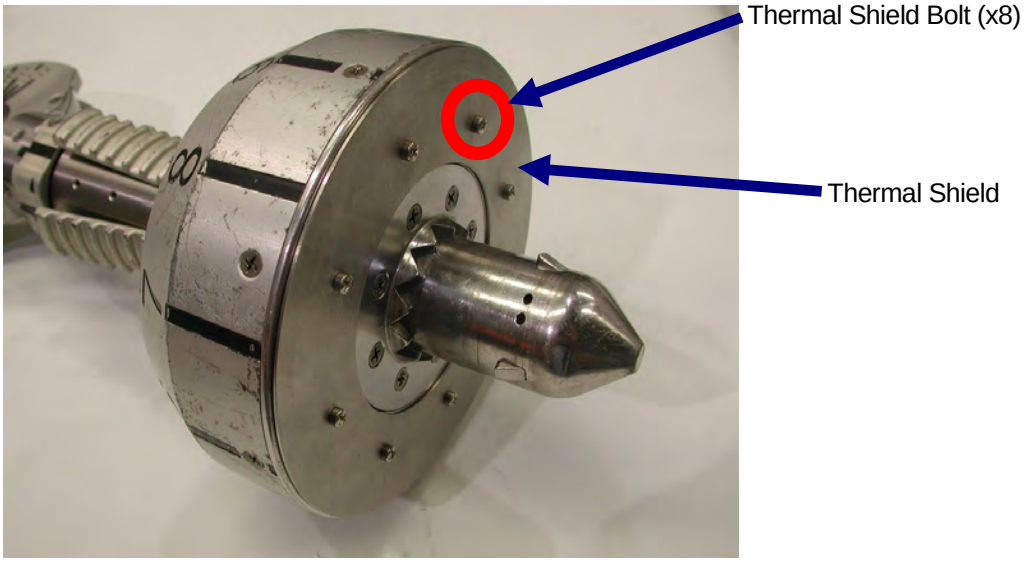


Figure 1.- Thermal Shield Location on APFR.

2. Remove APFR thermal shield non-captive screws (eight) (Driver, Handle, 3/8-in Drive; #8 Long Torq Driver, 3/8-in Drive). Expect a breaking torque of 10-30 in-lb
   Refer to figure 1
   Stow screws in Ziplock Bag

CAUTION
Do not pry Thermal Shield off, damage could occur

3. Remove Thermal Shield; light tapping applied from side of Thermal Shield may be required (Driver Handle, 3/8-in Drive, blunt end)
   Temp stow thermal shield in Ziplock Bag

4. Inspect bottom of APFR Load Limiter for sharp edges

5. Wipe off Vibratite from bottom of Load Limiter (Dry Wipes). Vibratite may not come completely off; it is not essential to remove all residue

6. Label Ziplock Bag “15A APFR Thermal Shield, GMT 2009/XXX” and stow (Sharpie)

WATER RECHARGE ..... TEMP FS 10-2
EMU POWERUP ..... TEMP FS 10-2
WATER FILL ..... TEMP FS 10-2
WATER FILL VERIFICATION ..... TEMP FS 10-2
EMU LiOH CHANGEOUT 10-4
MIDDECK EMU BATTERY RECHARGE (STAND-ALONE) 10-4a
MIDDECK EMU BATTERY RECHARGE/LiOH REPLACEMENT 10-5
INITIATE 10-5
TERMINATE 10-6
IN-SUIT EMU BATTERY RECHARGE/CHARGE VERIFICATION 10-7
INITIATE 10-7
TERMINATE 10-7
EMU POWERDOWN 10-7
HELMET LIGHT/PGT BATTERY RECHARGE 10-8
INITIATE 10-8
TERMINATE 10-9
REBA BATTERY INSTALLATION 10-9
EMU BATTERY REMOVAL/INSTALL 10-10
HELMET LIGHT BULB CHANGEOUT 10-11
REBA BATTERY RECHARGE 10-12
INITIATE 10-12
TERMINATE 10-13
STS-127 CONSUMABLES TRACKING CUE CARD ..... FS CC 10-15
STS-127 EVA BATTERY RECHARGE PLAN ..... FS CC 10-17

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

STS-127 CONSUMABLES TRACKING CUE CARD

HOOK VELCRO

		EVA 1	EVA 2	EVA 3	EVA 4	EVA 5
METOX for Campout & 10.2 Ops	**Serial Numbers**	05 & 22	16 & 21	15 & 17	05 & 22	16 & 21

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 4)	EV1 WF	3003	s/n _____ ~launched in suit	n/a	2078 ~launched in suit	1006	1022 1025	16	1004	1004	1009
	EV2 KO	3005	s/n _____	n/a	2068	1008	1026 1028	18	1007	1005	1009
Metox Regen				05 & 22							
EVA 2 (FD 6)	EV1 WF	3003	n/a	7	2069	1006	1029 1030	16	1004	1006	1009
	EV2 MB	3005	n/a	11	2076	1008	1031 1035	18	1007	1008	1009
Metox Regen				16 & 21							
EVA 3 (FD 8)	EV1 WF	3003	s/n _____	n/a	2068	1006	1022 1025	16	1004	1004	1009
	EV2	3018	s/n _____ ~launched in suit	n/a	2079 ~launched in suit	1009	1026 1028	18	1007	1005	1009
Metox Regen				15 & 17							
EVA 4 (FD 10)	EV1 CS	3018	n/a	12	2076	1009	1029 1030	18	1004	1006	1009
	EV2 MB	3005	n/a	13	2078	1008	1031 1035	16	1007	1008	1009
EVA 5 (FD 13)	EV1 MB	3005	n/a	19	2079	1008	1022 1025	16	1004	1004	1009
	EV2 CS	3018	n/a	20	2069	1009	1026 1028	18	1007	1005	1009
Return Config	EV1 WF	3003	s/n _____	n/a	2068	n/a	n/a	n/a	n/a	n/a	n/a
	EV4 CS	3018	s/n _____	n/a	2069	n/a	n/a	n/a	n/a	n/a	n/a

EVA-5a/127/O/A

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TOP
BACK OF ‘CONSUMABLES TRACKING CUE CARD’

HOOK VELCRO

EVA-5b/127/O/A

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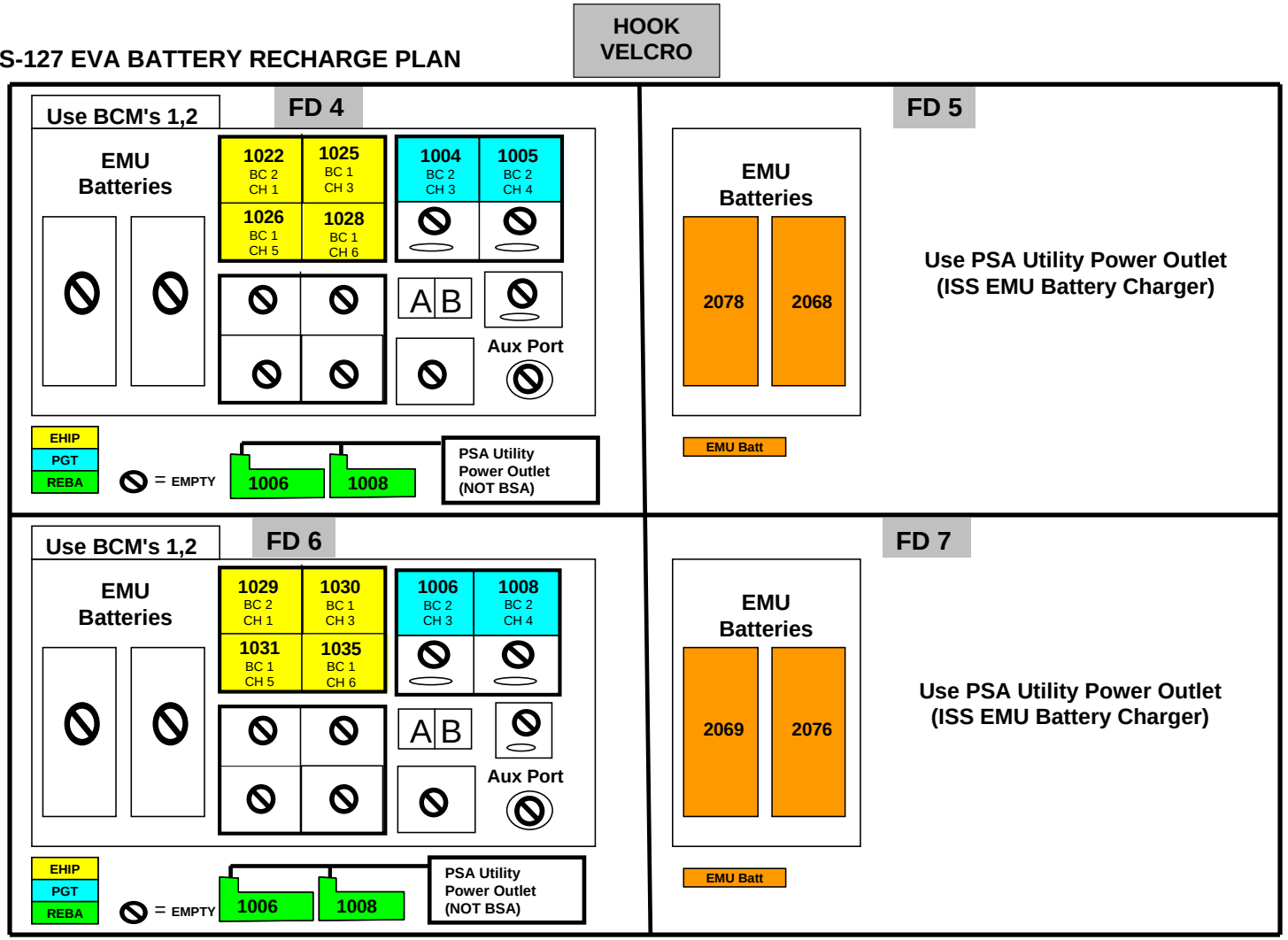
TOP

STS-127 EVA BATTERY RECHARGE PLAN



EVA-6a/127/O/A

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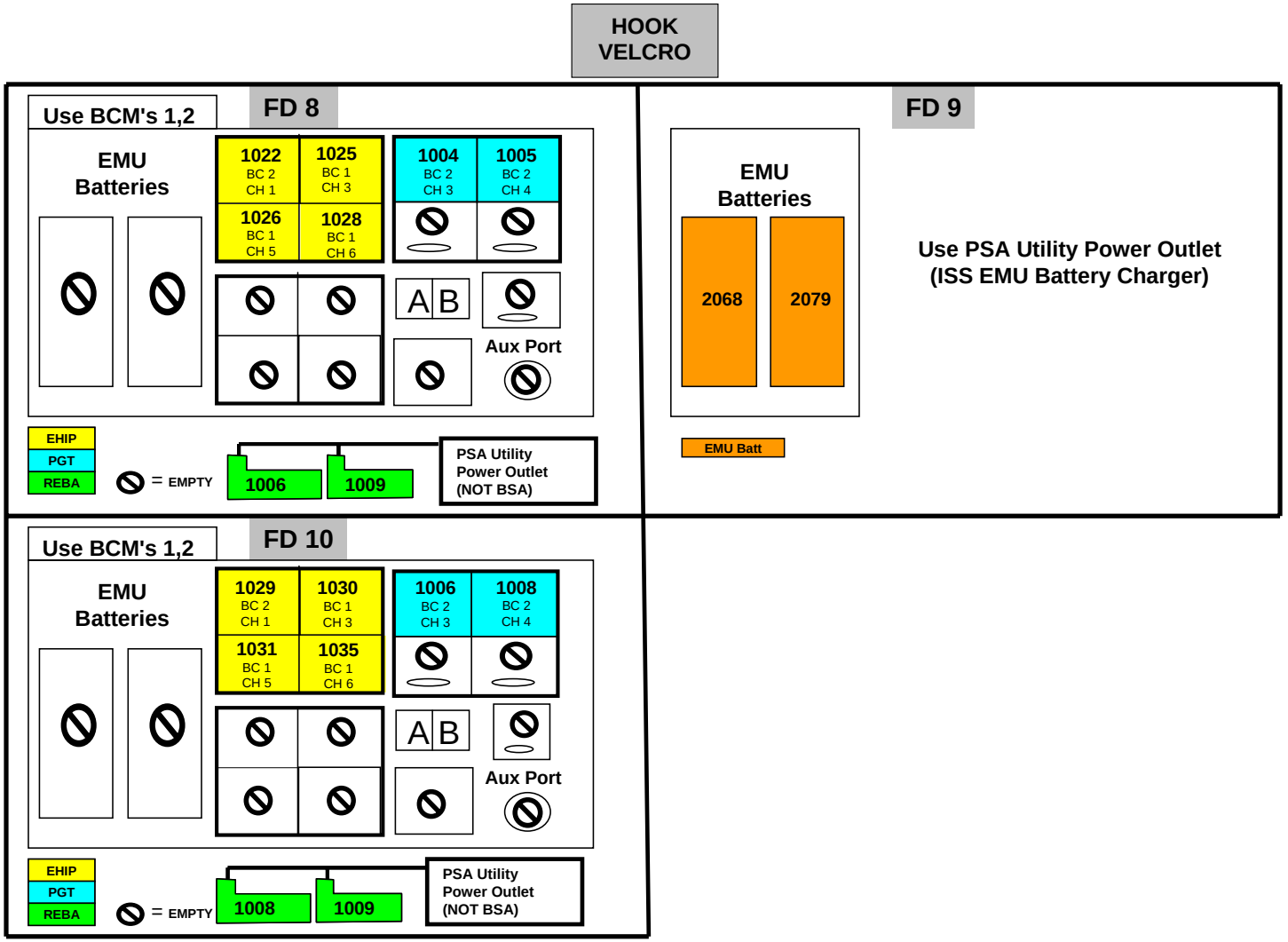
TOP
BACK OF 'STS-127 EVA BATTERY RECHARGE PLAN'



EVA-6b/127/O/A

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DISPLAY LOSS DURING POWER TRANSFER (WARM RESTART)..... TEMP FS 12-2
VACUUM H2O RECHARGE (MANNED)..... TEMP FS 12-2
LiOH REPLACEMENT (MANNED)..... 12-3
BATTERY REPLACEMENT (MANNED) 12-4
WATER DUMP 12-6
SCU SWAP (UNMANNED)..... 12-7
SCU SWAP (MANNED)..... 12-7
EMU COLD RESTART (MANNED) 12-7
12.1 STS EVA DECONTAMINATION..... 12-8
CONTAMINATION TEST..... 12-15
SAFER BATTERY CHANGEOUT 12-18
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (IN-SUIT) 12-19
BTA PREP 12-19
BTA TREATMENT 12-19
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (POST SUIT DOFFING) 12-21
BTA PREP 12-21
BTA TREATMENT 12-21
EMU RESIZE..... 12-24
STS-127 NOMINAL EMU SIZING ..... FS 12-27
STS-127 EMU CONTINGENCY RESIZE MATRIX..... FS 12-29
EXPEDITED SUIT DOFFING CUE CARD ..... FS CC 12-31
EMERGENCY UNDOCKING CUE CARD ..... FS CC 12-32

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

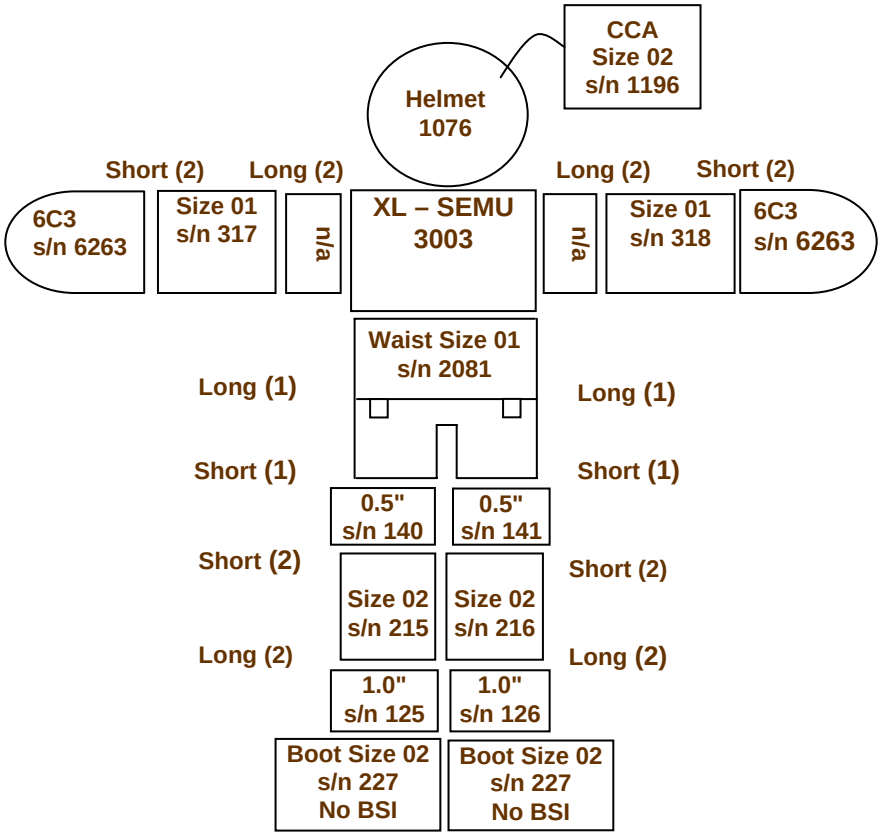
DCM 4. FAN – OFF (expect FAN SW OFF msg, DISP – PRO)
IV 5. Inform affected EV crewmember of impending comm loss
DCM 6. PWR – SCU (7 sec)
7. PWR – BATT
When power restart complete:
8. √Display – O2 POS XX, expect FAN SW OFF msg, DISP – PRO
9. As reqd, FAN – ON
If display blank or locked up:
10. Contact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

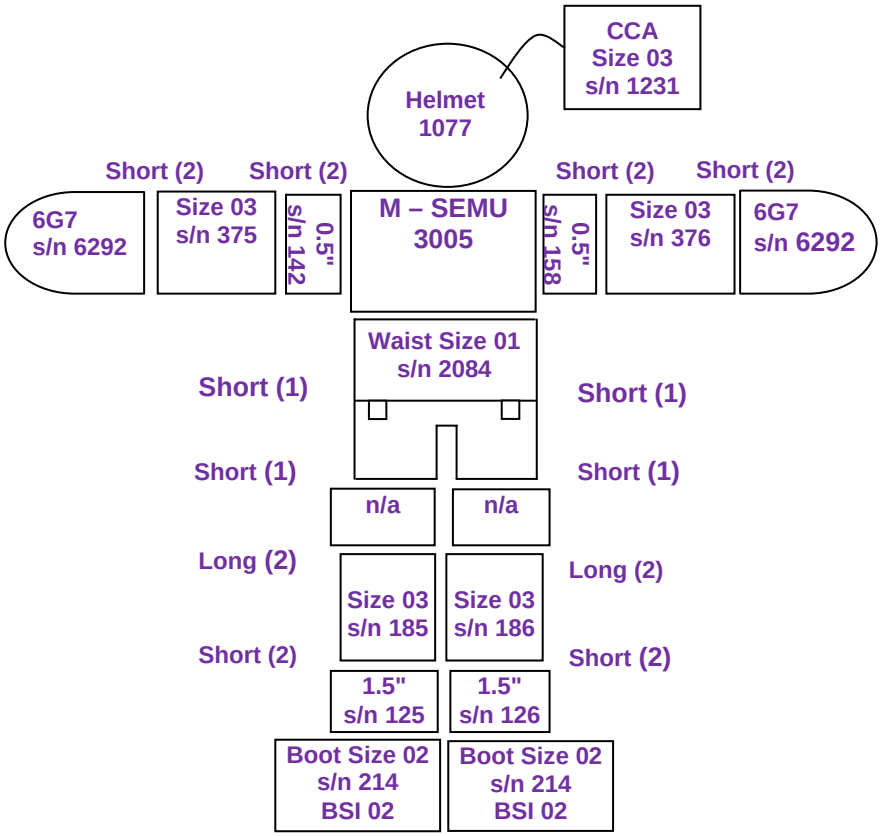
> WARNING
> Procedure should be used only if performing a contingency EVA

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)

STS-127 NOMINAL EMU SIZING



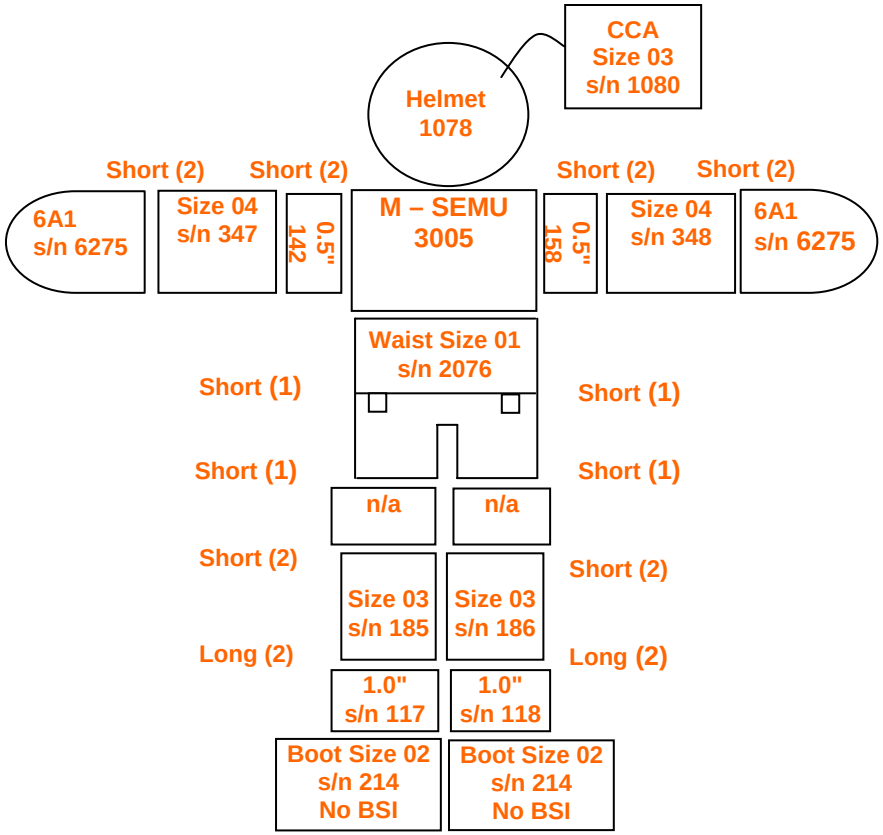
EMU 3003 for Wf



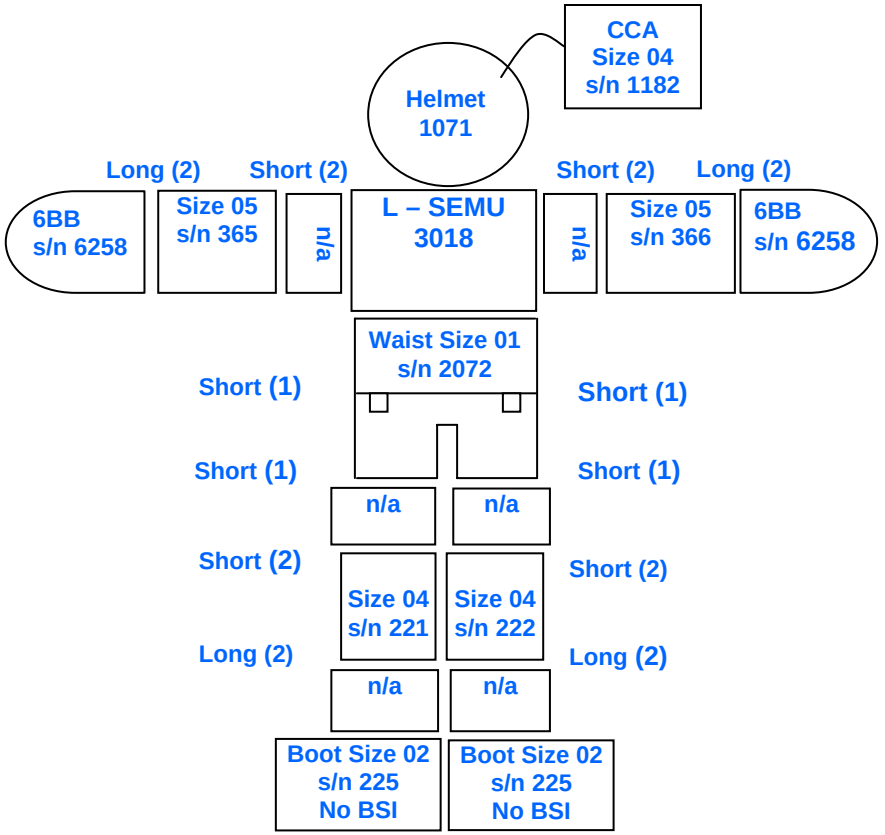
EMU 3005 for Ko

	TCU Top/Bottom/MAG	Socks	LCVG	Signal Conditioner	Comfort Gloves/ Wristlets	Valsalva	Fresnel Lens/ Croakie
Wolf	L / L / 711	Therm Slips: 07 Tube	06 (s/n 3213)	pr: 108 b/u: 104	Lg, Thin, Spectra/ No	Original	--/Yes
Kopra	L / S / 709	Therm Slips: n/a Polyproplyene [L]	04 (s/n 3203)	pr: 106 b/u: 121	Lg, Thin, Spectra/ Yes	Modified	--/--

STS-127 NOMINAL EMU SIZING (Cont)



EMU 3005 for Mb



EMU 3018 for Cs

	TCU Top/Bottom/MAG	Socks	LCVG	Signal Conditioner	Comfort Gloves/ Wristlets	Valsalva	Fresnel Lens/ Croakie
Marshburn	M / S / 711	Therm Slips: 07 Tube	04 (s/n 3186)	pr: 117 b/u: 121	Lg, Manzella, MB3 [-03]/Yes	Modified	--/--
Cassidy	L / M / 711	Therm Slips: 07 Tube	07 (s/n 3184)	pr: 113 b/u: 104	Lg, Thin, Spectra/Yes	Modified	--/--

STS-127 EMU CONTINGENCY RESIZE MATRIX

LOSS OF:	EV1 – Wolf (Wf)	EV2 – Kopra (Ko)	EV3 – Marshburn (Mb)	EV4 – Cassidy (Cs)
Helmet	(1076) 1. Use on-orbit Helmet 1077 2. May need to replace Valsalva	(1074) 1. Use on-orbit Helmet 1077 2. May need to replace Valsalva	(1078) 1. Use on-orbit Helmet 1077 2. May need to replace Valsalva	(1071) 1. Use on-orbit Helmet 1077 2. May need to replace Valsalva
CCA	(02/327-1196/1044) 1. Use Wf b/u CCA 02/327-1176/1067	(03/321-1231/1049) 1. Use on-orbit CCA 03/321-1179/1012 (FN b/u)	(03/327-1080/1057) 1. Use on-orbit CCA 03/327-1232/1040 (WK b/u)	(04/327-1182/1070) 1. Use on-orbit CCA 04/327-1172/1074 (SW b/u)
LCVG	(06-3213) 1. Use Wf b/u LCVG 06/3216 2. Transfer: biomed and dosimeter	(04-3203) 1. Use Ba b/u LCVG 04/3160 (dry) 2. Reference ISS EVA System C/L; 1.525 LCVG Water Fill 3. Transfer: biomed and dosimeter	(04-3186) 1. Use Ba b/u LCVG 04/3160 (dry) 2. Reference ISS EVA System C/L; 1.525 LCVG Water Fill 3. Transfer: biomed and dosimeter	(07-3184) 1. Use Pl b/u LCVG 07/3183 (dry) 2. Reference ISS EVA System C/L; 1.525 LCVG Water Fill 3. Transfer: biomed and dosimeter
HUT/PLSS	(XL-EMU 3003) 1. Use on-orbit XL HUT ORU 2026 2. Remove gloves, lower arms, LTA from prime HUT 3. Reference ISS EVA System C/L; 2.415 HUT ORU Changeout 4. Install prime Wf lower arms and gloves 5. √Locks, √cams 6. Use prime Wf CCA, Helmet, LTA 7. Swap EMU PLSS identifier stripes, mission patch, and national flag	(M-EMU 3005) 1. Use on-orbit L HUT 3011 2. Remove gloves, lower arms, arm sizing rings, LTA from prime HUT 3. Install prime Ko arm sizing rings 4. Install lower arms (03-319/320) 5. Set lower arm cams: S/L (for prime gloves) L/L (for b/u gloves) 6. Install prime Ko gloves 7. √Locks, √cams 8. Use prime Ko CCA, Helmet, LTA 9. Set lag cams: S/S 10. Swap EMU PLSS identifier stripes, mission patch, and national flag	(M-EMU 3005) 1. Use on-orbit L HUT 31011 2. Remove gloves, lower arms, arm sizing rings, LTA from prime HUT 3. Install prime Mb lower arms and gloves 4. √Locks, √cams 5. Use prime Mb CCA, Helmet, LTA 6. Swap EMU PLSS identifier stripes, mission patch, and national flag	(L-EMU 3018) 1. Use on-orbit L HUT 3011 2. Remove gloves, lower arms, LTA from prime HUT 3. Install prime Cs lower arms and gloves 4. √Locks, √cams 5. Use prime Cs CCA, Helmet, LTA 6. Swap EMU PLSS identifier stripes, mission patch, and national flag
Arm Sizing Ring (1)	N/A	(0.5"-142/158) 1. Use on-orbit arm sizing rings 0.5"-145/146	(0.5"-142/158) 1. Use on-orbit arm sizing rings 0.5"-145/146	N/A
Lower Arm Segment (2) and cams (2a/2b)	(01, L/S-317/318) 1. Use on-orbit lower arm segments 01-297/298 2. Verify cams: L/S 3. √Locks, √cams	(03, S/S-375/376) 1. Use on-orbit Pl b/u lower arm segments 03-309/310 2. Verify cams: S/S 3. √Locks, √cams	(04, S/S-347/348) 1. Use on-orbit AC prime lower arm segments 04-381/382 2. Verify cams: S/S 3. √Locks, √cams	(05, S/L-365/366) 1. Use CS b/u lower arm segments 05-411/412 2. Verify cams: S/L 3. √Locks, √cams

STS-127 EMU CONTINGENCY RESIZE MATRIX (Cont)

LOSS OF:	EV1 – Wolf (Wf)	EV2 – Kopra (Ko)	EV3 – Marshburn (Mb)	EV4 – Cassidy (Cs)
Gloves	For loss of Prime (6C3^{RE}/6263): 1. Use Wf b/u gloves 6E5^{P}/6262 2. Set lower arm cams: S/L For loss of B/U (6E5^{P}/6262): **√MCC-H**	For loss of Prime (6G7^{RE}/6292): 1. Use Ko b/u gloves 6G7^{P}/6305 2. Set lower arm cams: S/L For loss of B/U (6G7^{P}/6305): **√MCC-H**	For loss of Prime (6A1^{RE}/6275): 1. Use Mb b/u gloves 6A1^{P}/6214 For loss of B/U (6A1^{P}/6214): **√MCC-H**	For loss of Prime (6BB^{RE}/6258): 1. Use Cs b/u gloves 6BB^{P}/6255 For loss of B/U (6BB^{P}/6255): **√MCC-H**
Waist Brief (3) and cams (3a/3b)	(01, L/S-2081/018) 1. Use on-orbit waist brief 01-2075/029 2. Verify waist brief cams: L/S 3. Install Wf thigh sizing rings, leg segments, leg sizing rings and boots 4. √Locks, √cams	(01, S/S – 2076/045) 1. Use on-orbit waist brief 01-2084/002 2. Verify waist brief cams: S/S 3. Install Ko leg segments, leg sizing rings and boots 4. √Locks, √cams	(01, S/S-2076/045) 1. Use on-orbit waist brief 02-2084/002 2. Verify waist brief cams: S/S 3. Install Mb leg segments, leg sizing rings and boots 4. √Locks, √cams	(01, S/S-2072/072) 1. Use on-orbit waist brief 01-2076/045 2. Set waist brief cams: S/S 3. Install Cs leg segments and boots 4. √Locks, √cams
Thigh Sizing Ring (4)	(0.5"-140/141) 1. Use on-orbit thigh rings 0.5"-121/122 2. √Locks	N/A	N/A	N/A
Leg Segment (5) and cams (5a/5b)	(02, S/L-215/216) 1. Use on-orbit leg segment 02-153/154 2. Verify cams: S/L 3. √Locks, √cams	(03, L/S-185/186) 1. Use on-orbit leg segments 03-231/232 2. Verify cams: L/S 3. √Locks, √cams	(03, S/L-185/186) 1. Use on-orbit leg segments 03-231/232 2. Verify cams: S/L 3. √Locks, √cams	(04, S/L-221/222) 1. Use on-orbit leg segment 04-212 2. Verify cams: S/L 3. √Locks, √cams
Leg Sizing Ring (6)	(1.0"-125/126) 1. Use on-orbit leg rings 1.0"-128/129 2. √Locks	(1.5"-125/126) 1. Use on-orbit leg rings 1.5"-141/142 2. √Locks	(1.0"-117/118) 1. Use on-orbit leg rings 1.0"-144/145 2. √Locks	N/A
Boot	(02/227) 1. Use on-orbit boots 02/213 2. Use Wf prime waist brief, thigh rings, legs, and leg rings 3. √Locks	(02/214) 1. Use on-orbit boots 02/213 2. Remove BSI/Toe Caps from prime boots 3. Install 02 BSI/Toe Caps 4. Use Ko prime waist brief, legs, and leg sizing rings 5. √Locks	(02/214) 1. Use on-orbit boots 02/213 2. Use Mb prime waist brief, legs, and leg sizing rings 3. √Locks	(02/225) 1. Use on-orbit boots 02/213 2. Use Cs prime waist brief and legs 3. √Locks

TOP

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 CUE CARD** on reverse side

EVA-4a/127/O/A

(reduced copy)

TOP
BACK OF 'EXPEDITED SUIT DOFFING CUE CARD'

HOOK
VELCRO

EMERGENCY UNDOCKING CUE CARD

Critical:

- **EMUs 3003 (Wf) & 3018 (Cs)**
  - **Remove: Helmet Lights, ERCA, REBA, ISS Tools**
- **CCAs (Wf & Cs)**
- **Gloves (Wf & Cs)**
- **LCVGs (Wf & Cs)**
- **ECOKs (Wf & Cs)**
- **EMU Batteries (2): preferably charged**
- **85-ft Safety Tethers (2)**
- **Adjustable Equipment Tethers (6)**

Desired:

- **EMU Servicing Kit labeled 'Use and Return on 127'**
- **Mb's CCA, Gloves, LCVG, & ECOK**
- **LiOH (4)**

EVA-4b/127/O/A

(reduced copy)

TPS REPAIR

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

A PDF and a WORD version of the procedures can be found at: http://mod.jsc.nasa.gov/do3/FDF/FDFBooks/Status%20Sheets/index.html. Select the "As Flown" Status sheet for STS-127 and the link to the procedures can be found with the link to the EVA FS. The procedures can also be found on the FDF Books CD provided to the FAO console

BOOM TPS INSPECTION
- BOOM POINT INSPECTION SUMMARY TIMELINE ..... FS 13-3
- BOOM POINT INSPECTION TOOL CONFIG ..... FS 13-4
- BOOM POINT INSPECTION ..... FS 13-5
- BOOM WLE MAPPING SUMMARY TIMELINE ..... FS 13-15
- BOOM WLE MAPPING TOOL CONFIG ..... FS 13-17
- BOOM WLE MAPPING ..... FS 13-18
- EVA WLE MAPPING INSPECTION ..... FS 13-24

BOOM CONTINGENCY
- BOOM FRGF SHAFT RELEASE ..... FS 13-29
- BOOM FRGF SHAFT INSTALLATION ..... FS 13-30
- BOOM EFGF SHAFT RELEASE ..... FS 13-32
- BOOM MPM STOW/DEPLOY ..... FS 13-34
- BOOM ASSISTED LATCHING ..... FS 13-35

TILE REPAIR
- EMU PREP FOR TPS REPAIR ..... FS 13-36
- POST TPS REPAIR DOFFING ..... FS 13-37
- EWA MATERIAL MIXING ..... FS 13-38
- EWA REF DATA ..... FS 13-39
- EWA TILE REPAIR – DOCKED/ORM SUMMARY TIMELINE ..... FS 13-40
- EWA TILE REPAIR – DOCKED/ORM TOOL CONFIG ..... FS 13-41
- EWA TILE REPAIR – DOCKED/ORM ..... FS 13-42
- SSRMS GAP FILLER REMOVAL SUMMARY TIMELINE ..... FS 13-50
- BOOM GAP FILLER REMOVAL SUMMARY TIMELINE ..... FS 13-51
- GAP FILLER REMOVAL ..... FS 13-52

RCC REPAIR
- RCC CRACK REPAIR BAG ASSEMBLY ..... FS 13-57
- TEMP SENSOR DISASSEMBLY POST-EVA ..... FS 13-60
- RCC CRACK REPAIR BAG DISASSEMBLY POST-EVA ..... FS 13-61
- TEMPERATURE PROBE ASSEMBLY ..... FS 13-63
- CRM APPLICATOR ASSEMBLY ..... FS 13-63
- CRM APPLICATOR NOZZLE INSTALLATION (DAY OF EVA) ..... FS 13-64
- RCC CRACK REPAIR ..... FS 13-65
- RCC PLUG TRANSFER BAG ASSEMBLY ..... FS 13-77

NOTES, CAUTIONS, WARNINGS
- EVA TPS INSPECTION/REPAIR INHIBIT PAD ..... FS 13-89
- TPS REPAIR CAUTIONS AND WARNINGS ..... FS 13-92
- TPS REPAIR NOTES ..... FS 13-93
- BOOM OPERATIONAL WARNINGS ..... FS 13-94
- BOOM OPERATIONAL NOTES ..... FS 13-95

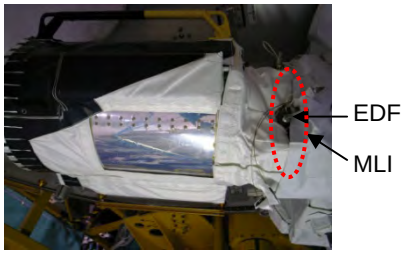
TPS REF DATA
PREFERRED EMU POSITIONING FOR TPS REPAIR ..... FS 13-96
EVA TPS REACH AND ACCESS ..... FS 13-97
POINT INSPECTION REACH AND ACCESS WHILE DOCKED ..... FS 13-98
WLE MAPPING INSPECTION WHILE DOCKED ..... FS 13-100
TILE LAYUP ..... FS 13-101
85-FOOT SAFETY TETHER ..... FS 13-102
PFR ATTACHMENT DEVICE (PAD) ..... FS 13-103
WIF EXTENDER ..... FS 13-104
EVA DIGITAL CAMERA ..... FS 13-105
EVA IR CAMERA ..... FS 13-107
OVERLAY TILE REPAIR SYSTEM (OTRS) ..... FS 13-109
OTRS MARKING TEMPLATE AND INSULATION BAGS ..... FS 13-110
AUGER HOUSING ..... FS 13-111
OTRS RELEASED CONFIGURATION ..... FS 13-112
ORU BAG INSERT FOR OTRS ..... FS 13-113
BOOM REF DATA
RTF BOOM OVERVIEW ..... FS 13-114
BOOM TRANSITIONS WITH MLI ..... FS 13-115
BOOM BASE END AND MODIFIED EFGF ..... FS 13-116
BOOM BASE END EFGF ADAPTER PLATE ..... FS 13-117
EVA-ASSISTED EFGF CONNECTOR DEMATE ..... FS 13-118
BOOM BASE END SADDLE AND MPM ..... FS 13-119
BOOM MID SECTION AND MODIFIED FRGF ..... FS 13-120
BOOM MID SECTION FRGF ADAPTER PLATE ..... FS 13-121
BOOM TIP END AND SENSORS ..... FS 13-122
BOOM SENSOR DETAILS ..... FS 13-124
SENSOR PACKAGE 1 (SP1): LDRI/ITVC ..... FS 13-126
SENSOR PACKAGE 2 (SP2): LCS ..... FS 13-128
POSSIBLE PRD ROUTING FOR EVA ASSISTED LATCHING OF BOOM IN MPMS ..... FS 13-130
BOOM CONTINGENCIES ..... FS 13-131
GRAPPLE SHAFTS ..... FS 13-132
PDGF GRAPPLE SHAFT COVER ..... FS 13-133
BOOM FRGF FSE ..... FS 13-134

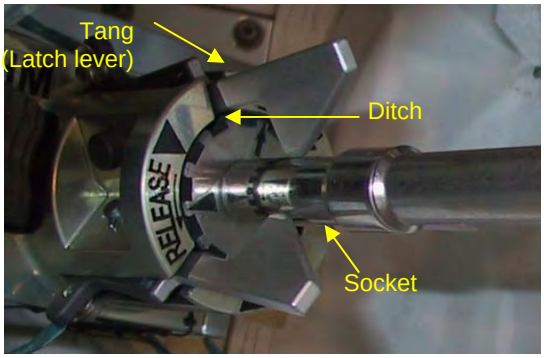
2JA WORKAROUNDS CRIBSHEET ..... TEMP FS 16-2
EFBM CONTINGENCY CHECKOUT INHIBIT PAD ..... FS 16-22
JEF EFBM (PASSIVE) MANUAL RELEASE ..... FS 16-23
EFBM CAPTURE LATCH CONTINGENCY OPS: CAPTURE LATCH CLOSED .... FS 16-24
EFBM CAPTURE LATCH CONTINGENCY OPS: CAPTURE LATCH OPEN ..... FS 16-25
EFBM STRUCTURAL CONTINGENCY OPS ..... FS 16-26
EFBM UMBILICAL MECHANISM CONTINGENCY OPS: CONNECT ..... FS 16-27
EFBM UMBILICAL MECHANISM CONTINGENCY OPS: FLUID QD RECONFIG ... FS 16-28
JAXA ICS-EF EVA CONTINGENCY TASKS ..... FS 16-37
PAYLOAD RELEASE FROM PAM ..... FS 16-40
JLE PIU MANUAL RELEASE ..... FS 16-42
JEF EEU MANUAL RELEASE ..... FS 16-44
JEM RMS JEU REMOVE/REPLACE ..... FS 16-47
P3 UCGAS LUBRICATION AND PULL ..... FS 16-50
RELEASE ROEU LATCHES ..... FS 16-52
LATCH ROEU LATCHES ..... FS 16-55
STOW ROEU ARM ..... FS 16-58
MATE ROEU ARM ..... FS 16-61
ROEU OVERVIEW ..... FS 16-63

2JA WORKAROUNDS CRIBSHEET

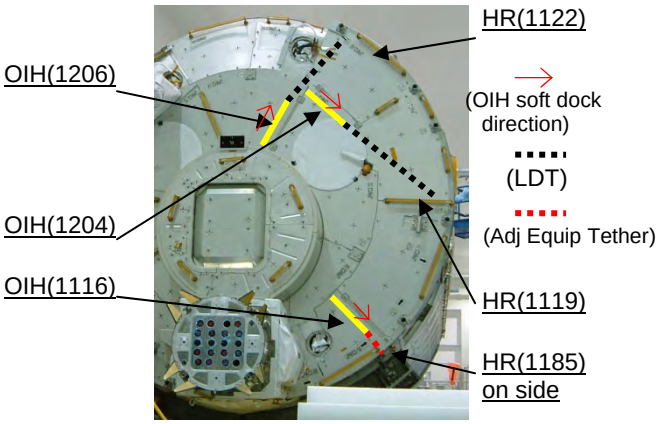
JAXA FLIGHT SPECIFIC

TASK	FAILURE	ACTION
I. EFBM ACTIVE/ PASSIVE COVER REMOVAL	A. 1/4-turn fastener cannot rotate	Retrieve Vise Grips and rotate fastener with tool
II. MAXI CONTAMI-NATION COVER REMOVAL	A. Belt strap torn off from cover and the cover remained on MAXI	WARNING Sharp edge on the inside of Visual Star Camera CAUTION No touch on radiator (white paint) under the cover Pinch the edge of cover carefully and remove the cover without strap
III. JEF LTA CABLE DETACH	A. Connector cap fails to release from ECSH	See NZGL Connectors (GENERIC TASKS)
	B. LTA Connector fails to demate	1. See NZGL Connectors (GENERIC TASKS) 2. On MCC-H GO, attempt to disconnect the cable from PLB side, cut cable clip and stow cables on JEF w/TA clamps and wire ties 3. Check MCC-H for cable cut options
	C. Connector cap fails to install on LTAB (J001)	1. Return cap to airlock WARNING Do not push MLI cover into connector (Risk of pin short) NOTE Connector J001 will have exposed and energized pins when JEF berthed to JPM and powered with ISS2 mode plug on J002. Check with MCC-H for further restrictions 2. Install new cap in subsequent EVA if it is a cap failure (alternate cap exists on orbit)
	D. LTA Mode plug fails to release from LTAB(J002)	See NZGL Connectors (GENERIC TASKS)
	E. ISS2 Mode Connector fails to install on J002	1. See NZGL Connectors (GENERIC TASKS) 2. If no joy, on MCC-H GO, install ISS Mode plug to J002 instead (NOTE: If ISS Mode plug is used, LTA heater cannot be supplied to JEF VEs. VE will/may fail due to cold temp, but JEF activation is the most important)
	F. Connector fails to softdock on ECSH	Use wire tie to secure connector/cable (NOTE: Connector will be hot once APCU power is re-enabled)
	G. TA clamp fails to release	See NZGL Connectors (GENERIC TASKS)
IV. JEM RMS GROUND-ING TABS	A. Tab is inaccessible due to JEMRMS position	1. Attempt different body positions/worksite access 2. If no joy, report MCC-H and go to next task

TASK	FAILURE	ACTION
	A. Velcro on tabs does not stick together and unable to secure with wire tie	1. Check both Velcro's loop/hook orientation is correct to match. Also check FOD on the Velcro 2. Attempt to tuck each tab(grounding wire) under permanent MLI near EDF on the arm/EE  3. Retrieve EVA scissors tool from LTA and cut grounding wires
V. VE REMOVAL/ INSTALL (EVA2)	A. Connector & cap remove/install	See generic cribsheet NZGL connectors
	B. Launch lock bolts cannot remove	1. Increase torque up to **PGT [B7 (25.5), CCW2, 30.5] w/RAD or w/o RAD;** rotate 1 turn to break a torque 2. Use PGT in Manual Ratchet **(RCCW 30.5)** or Ratchet Wrench to break a torque 3. If no joy, check with MCC-H for further actions
	C. Grounding wire's terminal from MLI cover is stuck on launch lock bolt	Stow MLI cover with launch lock to bring back together
	D. EVA stanchion bolts cannot remove	1. Increase torque up to **PGT [B7 (25.5), CCW2, 30.5] w/RAD;** rotate 1 turn to break torque 2. Use Ratchet Wrench to break torque 3. If no joy, on MCC-H GO, reattach VE I/F cable to Aft launched VE for survival heater power
	E. Soft dock failure	1. Check for FOD and verify soft dock indicator (black mark is hidden by side plate) 2. Pushing the VE w/Scoop against mount, drive VE bolt to install
	F. EVA stanchion bolts cannot install	1. Check VE is correctly seated in soft dock position 2. Attempt to cycle the bolt with nominal torque: a. **PGT [B4 (19.4), CCW2, 30.5];** rotate 1 turn back b. **PGT [B4 (19.4), CW2, 30.5];** rotate < 15 turns 3. Increase torque up to **PGT [B7 (25.5), CW2, 30.5];** rotate < 15 turns 4. If no joy, go for next workaround (V.G)
	G. Camera cannot install in FWD mount location	1. If 1of 2 bolts is fasten properly, no further action required (TBD) 2. If both bolts failed, tie down the VE (TBD) 3. If no joy, on MCC-H GO, 1) Bring back to ISS airlock or 2) Return VE to Aft launched mount & reconnect VE I/F cable (TBD)
VI. ICS-EF COVER REMOVAL	A. Belt strap torn off from cover	WARNING Pinch point between antenna and ICS-EF structure Sharp edge on AHM worm gear CAUTION No touch on sensors and solid lubricant under the cover Pinch the edge of cover carefully and remove the cover without straps

TASK	FAILURE	ACTION
VII. ICS-EF AHM RELEASE	A. EVA bolt doesn't release	1. Check socket is fully inserted on bolt head and all 3 tangs (latch levers) are opened out of ditches  2. Increase torque up to **PGT [B7 (25.5), CCW2, 30.5];** rotate 1 turn to break torque 3. Use PGT in Manual Ratchet **(RCCW 30.5)** 4. If no joy, check with MCC-H for further actions
VIII. SEDA-AP BLM RELEASE	A. BLM button doesn't depress	1. Check for FOD in a hole of button 2. Press down the "LOCK" button and verify "RELEASE" button is up. Then retry to press RELEASE button. If moving gradually, repeat this step
IX. MAXI PIU COVER REMOVAL	A. Belt strap torn off from cover	WARNING Pinch point at SLM latches CAUTION No touch on paint(target) and solid lubricant (PIU) Translate to JLE zenith using target standoff (lower side) and remove the cover without strap
	B. Separated cover halves stuck on JLE structure on zenith	Same workaround as above (IX.A)
X. VE REMOVAL/ INSTALL (EVA 4)	A. Connector & cap remove/install	See generic cribsheet NZGL connectors
	B. Launch lock bolts cannot remove	1. Increase torque up to **PGT [B7 (25.5), CCW2, 30.5] w/RAD or w/o RAD;** rotate 1 turn to break torque 2. Use PGT in Manual Ratchet **(RCCW 30.5)** or Ratchet Wrench to break torque 3. If no joy, check with MCC-H for further actions
	C. Grounding wire's terminal from MLI cover is stuck on launch lock bolt	Stow MLI cover with launch lock to bring back together
	D. EVA stanchion bolts cannot remove	1. Increase torque up to **PGT [B7 (25.5), CCW2, 30.5] w/RAD;** rotate 1 turn to break torque 2. Use Ratchet Wrench to break torque 3. If no joy, on MCC-H GO, reattach VE I/F cable to Fwd launched VE for survival heater power, and terminate the task (Skip ISS2 mode plug reconfiguration). Check with MCC-H for further actions
	E. Soft dock failure	1. Check for FOD and verify soft dock indicator (black mark is hidden by side plate) 2. Pushing the VE w/Scoop against mount, drive VE bolt to install

TASK	FAILURE	ACTION
	F. EVA stanchion bolts cannot install	1. Check VE is correctly seated in soft dock position 2. Attempt to cycle the bolt with nominal torque: a. **PGT [B4 (19.4), CCW2, 30.5];** rotate 1 turn back b. **PGT [B4 (19.4), CW2, 30.5];** rotate < 15 turns 3. Increase torque up to **PGT [B7 (25.5), CW2, 30.5];** rotate < 15 turns 4. If no joy, go for next workaround (X.G)
	G. Camera will not install in AFT mount location	1. If 1of 2 bolts is fasten properly, no further action required (TBD) 2. If both bolts failed, tie down the VE (TBD) 3. If no joy, on MCC-H GO, 1) Bring back to ISS airlock or 2) Return VE to Fwd launched mount & reconnect VE I/F cable (TBD)
	H. TA clamp fails to release	See NZGL Connectors (GENERIC TASKS)
	I. DCU cover cannot attach onto VE launch mounts	1. Check for FOD on Velcro 2. Remove the cover and bring back to airlock (TBD)
	J. ISS2 Mode plug fails to release or ISS Mode plug fails to install on LTAB(J002)	1. See NZGL Connectors (GENERIC TASKS) 2. If ISS Mode plug failed to install and no joy, on MCC-H GO, reinstall ISS Mode2 plug to J002
XI. JEF MLI COVER REMOVAL	A. Cover is stuck to remove (EFU and R-ORU covers)	Check strap belts are released completely and verify no snagging on hardware
	B. Grounding tab/wire cannot tuck under permanent MLI and sticks out partially (SSE covers)	1. No action required unless the tab/wire is long enough to reach SFA and Tool Fixture openings 2. On MCC-H GO, retrieve EVA scissors and cut the wire
XII. JPM OIH/ OIWIF INSTALL	A. 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
	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 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

TASK	FAILURE	ACTION
	C. 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 
	D. OIWIF cannot be locked on dovetail	1. Check for FOD and structural interference, cycle soft dock pins; reattempt installation 2. Verify WIF is co-planar 3. Install a different WIF at this location 4. Bring back to airlock or attempt installation of WIF in a different location; report results to MCC-H
XIII. PAS/ UCCAS DEPLOY	A. Deploy/Stow clevis bracket bolt fails to break torque	1. Use PGT in manual ratchet mode [**RCCW, 30.5 MTL**] 2. Retrieve torque wrench from A/L staging bag. Set to **41 ft-lb** and reattempt release
	B. ADP/PIP pin does not release	Retrieve hammer from staging bag and with ADP in full open position, tap it in farther. Reattempt removal
	C. Yoke PIP pin does not release after loosening clevis bolts	1. Loosen Stow Clevis Bracket bolts (4) **PGT [B7 25.5 ft-lb, CCW2 30 RPM, 30.5]-7/16-6-in ext**, approx 4 turns each 2. Re-attempt removal of yoke PIP pin and/or yoke ADP, secure using pre-installed wire tie 3. If does not release after loosening bolts; retrieve hammer from staging bag and tap out PIP pin
	D. SARJ launch bolt fails to break torque	Increase to **PGT [B7 25.5 ft-lb, CCW2 30 RPM, 30.5]** for 1 turn, then return to original setting
	E. Cup-cone bolt fails to break torque	Increase to **PGT [B7 25.5 ft-lb, CCW2 30 RPM, 30.5]**. (Do not go to hard stop at this setting)
	F. Strut cone cannot be removed from cup interface	1. Inspect for clearance between cup and cone, if reqd, **PGT [A7 9.2 ft-lb, CCW2 30 RPM]-6 ext 7/16:** Release bolt to hardstop 2. Wiggle brace (worked during VITT deploys) 3. Retrieve hammer and tap brace with plastic end of hammer
	G. Clevis bracket bolt fails to achieve full torque and turns	Back out the bolts fully and reattempt installation

TASK	FAILURE	ACTION
	H. Yoke PIP pin does not install	1. Open handle of Yoke ADP and reattempt installation. If joy, close ADP handle 2. If no joy, manipulate yoke to align PIP pin holes. If joy, close ADP handle
	I. Yoke will not install in Deploy Clevis Bracket	1. Loosen Deploy Clevis Bracket bolts (4), approx 4-6 turns, **PGT [RCW, 30.5]-7/16-6-in ext** 2. Re-attempt yoke installation, wiggle brace/yoke 3. If joy, remove yoke, re-tighten Deploy Clevis Bracket bolts (4) **PGT [B5 22.0 ft-lb, CW2 30 RPM, 30.5]-7/16-6-in ext**, to hard stop, approx 4-6 turns 4. Apply final torque, **PGT [RCW, 30.5]-7/16-6-in ext**, 2 clicks
	J. ADP will not install in Deploy Clevis Bracket	1. Loosen Deploy Clevis Bracket bolts (4), approx 4-6 turns a. Some bolts will require Torque Wrench 2-in ext at 31 ft-lb b. Remaining bolts, **PGT [RCW, 30.5]-7/16-6-in ext** 2. Re-attempt ADP installation 3. Re-attempt PIP pin installation 4. Engage Deploy Clevis Bracket bolts (4) to hard stop, approx 4-6 turns ❑ Some bolts will require RAD (attempt w/fingers first) ❑ **PGT [A7 9.2 ft-lb, CW2 30 RPM, 30.5]**-RAD w/7/16-2-in ext (count turns at bolt head) ❑ Remaining bolts, **PGT [B5 22.0 ft-lb, CW2 30 RPM, 30.5]-7/16-6-in ext** 5. Apply Final Torque ❑ Torque wrench 2-in ext at 31 ft-lb ❑ Remaining bolts, **PGT [RCW, 30.5]-7/16-6-in ext**
XIV. DETENT RELEASE TOOL	A. Unable to install DRT in softdock position	1. Verify DRT knob fully driven in release direction (cw) 2. Check hinge interface for FOD or other interference 3. Squeeze DRT tongs and verify pins are fully recessed inside DRT housing 4. Inspect DRT for FOD or other interference 5. Attempt to install tool at different angle relative to hinge 6. Attempt install with second DRT if not yet installed
	B. Unable to achieve 7 turns or black markings not visible	1. Inspect tool/hinge area to verify both DRT pins engaged in hinge holes, no FOD or other interference 2. Access DRT lever arms to determine if one arm is driven significantly more than the other (indicating possible stuck plunger) 3. **PGT [A1 2.5 ft-lbs, CCW2, 30.5]**: Drive DRT knob until points of black marking visible (~7 turns total) 4. If DRT arms equally driven, install second DRT (if reqd), loosen tiedown tethers and attempt UCCAS/PAS deploy 5. Remove DRT, **PGT [A1 2.5 ft-lbs, CW2, 30.5]**, inspect for damage 6. Cycle uninstalled DRT, verify knob turn 7 turns ccw, points of black marking exposed and pins locked in extended position 7. Reattempt DRT installation

TASK	FAILURE	ACTION
	C. Unable to release/remove DRT from hinge	1. If knob not fully flush with top of DRT housing a. Cycle DRT knob to full install position (ccw), then full release (cw) b. **PGT [A1 2.5ft-lbs, CW2, 30.5]**: Drive knob in release direction till flush with top of DRT housing c. Secure DRT with wire tie through hinge ADP hole and leave in place 2. If knob flush with top of DRT housing a. Apply additional force to retract pins using equipment hooks or tether wrapped around lever arms b. Re-engage DRT to fully driven position until points of black markings visible, ~7 ccw c. Secure DRT with wire tie through hinge ADP hole and leave in place
	D. Unable to release UCCAS from detent position using DRTs	Refer to UCCAS LUBRICATION AND PULL
XV. FIXED GRAPPLE BAR	A. FGB grapple bolt fails to release from PM	1. For first turn only, PGT PWR – OFF, Ratchet Collar – RCCW; reattempt release, then **PGT [B7]** for remaining turns 2. If no joy, notify MCC
	B. Ball Plunger at GP3 location is stuck	1. Apply more force when attempting to slide FGB baseplate past bolts 2. If no joy, attempt to depress/unstuck plunger using EVA hook
	C. FGB fails to install onto PM	1. Verify no MLI interference; re-attempt 2. Verify FGB GP3 ball plunger is not stuck 3. As reqd, release bolts an additional 2-3 turns
	D. FGB grapple bolt fails to engage	1. **PGT [B7 (25.5), CCW2, 30.5]**, back out bolt 2-3 turns, then reattempt engagement **[A7 (9.2), CW2, 30.5]** 2. **PGT [B7 (25.5), CCW2, 30.5]**, back out all bolts 2-3 turns, inspect for FOD; re-attempt 2-3 turns at a time in a cross pattern (start with GP2) **[A7 (9.2), CW2, 30.5]** 3. If no joy, notify MCC
XVI. FRAM	A. Primary FRAM bolt fails to release	1. Confirm socket fully engaged to release anti-rotation mechanism 2. Increase PGT setting: **PGT: [B2 (16.0), CCW2, 30.5], 7/16 - 6-ext 1 turn only to break torque; reset PGT to A4 (6.3) for full run-out of bolt** 3. If no joy, on MCC-H GO: Increase PGT setting: **PGT: [B4 (16.0), CCW2, 30.5], 7/16 - 6-ext 1 turn only to break torque; reset PGT to A4 (6.3) for full run-out of bolt** 4. If no joy engage contingency locking pins (4) to secure active FRAM to passive FRAM (see block C step 6)
	B. Active FRAM fails to seat on passive FRAM	1. Check for FOD in mechanism 2. Check alignment (engage 2 forward shear pins first and bias FRAM in direction of primary bolt to ensure connector door is not jamming)

TASK	FAILURE	ACTION
	C. Primary FRAM bolt fails to engage NOTE 4 of 4 contingency pins required for PLB shuttle return 3 of 4 contingency pins required for On-Orbit stowage	1. Verify FRAM seated properly 2. Check for FOD 3. Back out primary bolt fully at nominal setting a. If removal isn't successful at nominal setting: **PGT: [B2 (16.0), CCW2, 30.5], 7/16 - 6-ext 1 turn only to break torque; reset PGT to A4 (6.3) for full run-out of bolt** b. If no joy, on MCC-H GO: **PGT: [B4 (16.0), CCW2, 30.5], 7/16 - 6-ext 1 turn only to break torque; reset PGT to A4 (6.3) for full run-out of bolt** 4. Reattempt engagement **PGT: [A7 (9.2), CW2, 30.5], 7/16 - 6-ext** a. If no joy: **PGT: [B2 (16.0), CW2, 30.5], 7/16 - 6-ext** b. On MCC-H GO: **PGT: [B4 (19.4), CW2, 30.5], 7/16 - 6-ext** 5. Consider hold for thermal stabilization between active and passive FRAM 6. Engage front contingency pins: **PGT: [A4 (6.3), CW2, 30.5], 7/16 - 6-ext** 14.11 – (1.25***** Turns on Primary Bolt) = **# of total turns needed** 7. Engage aft contingency pins: Pump Module (LAPA) **PGT: [A4 (6.3), CW2, 30.5], 7/16 - 6-ext** 16.858 – (1.25***** Turns on Primary Bolt) = **# of total turns needed** SGANT & LDU (SAPA) If > 6.5 turns on primary bolt, aft contingency pins are not needed If < 6.5 turns on primary bolt, aft contingency pins: a. Remove bolt from STOW location and engage in INSTALL location b. Manually turn bolt as far as possible (expect ~ 3.5 turns) c. **PGT: [B1 (12.0), CW2, 30.5], 7/16 - 6-ext**
	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
XVII. BATTERY BOLTS	A. IEA Bolt Removal: H1, H2	1. Increase PGT setting: **PGT: [B7 (25.5), CCW2, 30.5], 7/16 - 6-ext** 2. PGT: Manual ratchet 3. Check MCC-H for tie down plan
	B. IEA Bolt Installation: H1	1. Back out and reattempt installation 2. Increase PGT setting: **PGT: [B7 (25.5), CCW2, 30.5], 7/16 - 6-ext** If no joy: Check MCC-H for tie down plan

TASK	FAILURE	ACTION
	C. IEA Bolt Installation: H2	1. Verify pushing while installing (to overcome antirotation device) 2. Verify relieving side loading; push down on H1 end of box 3. If high running torque, backout and reattempt installation 4. If still no joy; backout completely and inspect surfaces (IEA and battery) for FOD; reattempt installation If still no joy: Check MCC-H
	D. ICC-VLD Removal: Torque Break H1	1. Increase PGT setting: **PGT: [B1 (12.0), CCW2, 30.5], TM Rec 7/16** 2. If no joy releasing bolt; Reinstall bolt 3. If no joy reinstalling bolt: Check MCC-H
	E. ICC-VLD Removal: Torque Break H2	1. Verify relieving side loading; push down on H1 end of box 2. Increase PGT setting: **PGT: [B1 (12.0), CCW2, 30.5], TM Rec 7/16** 3. If no joy releasing bolt; reinstall bolt 4. If no joy reinstalling bolt: Check MCC-H
	F. ICC-VLD Removal: Bolt release H1	1. Increase PGT setting: **PGT: [B7 (25.5), CCW2, 30.5], 7/16 - 6 ext** 2. If no joy releasing bolt; reinstall bolt 3. If no joy reinstalling bolt: Check MCC-H
	G. ICC-VLD Removal: Bolt Release H2	1. Verify relieving side loading; push down on H1 end of box 2. Increase PGT setting: **PGT: [B7 (25.5), CCW2, 30.5], 7/16 - 6 ext** 3. If no joy releasing bolt; reinstall bolt 4. If no joy reinstalling bolt: Check MCC-H
	H. ICC-VLD installation: H1	1. Back out and reattempt installation 2. Increase PGT setting: **PGT: [B7 (25.5), CCW2, 30.5], 7/16 - 6-ext** 3. If no joy: Check MCC-H for tie down plan
	I. ICC-VLD Installation: H2	1. Verify pushing while installing (to overcome antirotation device) 2. Verify relieving side loading; push down on H1 end of box 3. If high running torque, backout and reattempt installation 4. If still no joy; backout completely and inspect surfaces (ICC-VLD and battery) for FOD; reattempt installation 5. If still no joy: Check MCC-H
XVIII. WETA INSTALL	A. Dummy box outer bolt does not release	Increase to **PGT [B7 25.5 ft-lb, CCW2 30 RPM, 30.5]** for 1 turn, then return to original setting
	B. Dummy box center jacking bolt does not release	1. Ensure outer bolts (2) are fully released 2. Increase to **PGT [B7 25.5 ft-lb, CCW2 30 RPM, 30.5]** for 1 turn, then return to original setting
	C. WETA center bolt does not engage	Remove WETA; inspect stanchion interface for FOD or damage; reattempt installation
	D. WETA center bolt does achieve minimum turn count (24 turns)	Increase to **PGT [B1 12 ft-lb, CCW2 30 RPM, 30.5]**
	E. WETA outer bolt does not engage	1. Engage opposite outer bolt; reattempt installation of failed bolt 2. Increase to **PGT [B1 12 ft-lb, CCW2 30 RPM, 30.5]**

TASK	FAILURE	ACTION
XIX. GENERIC	**APFR**	
	A. APFR 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
	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
	CETA Cart	
	A. 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
	B. 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
	C. Dynamic brake fails to engage	Limit translation rates to allow manual stopping
	D. Swing arm fails to deploy	Use alternate swing arm or WIF
	E. 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?)
	F. Swing arm fails to lock	Restrain in stowed position with wireties
	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 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 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)
	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

TASK	FAILURE	ACTION
	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. Female QD leaks after demate	Fully mate to destination male as quickly as possible
	Q. Male QD leaks after demate (male sleeve may be visibly stuck open)	1. Remate female QD and 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)

TASK	FAILURE	ACTION
	R. 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
	S. Frozen NH3 present on female or male QD	1. Leave QD exposed to vacuum; wait maximum of 5 min for sublimation (check periodically) 2. On MCC-H GO: Continue QD ops

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

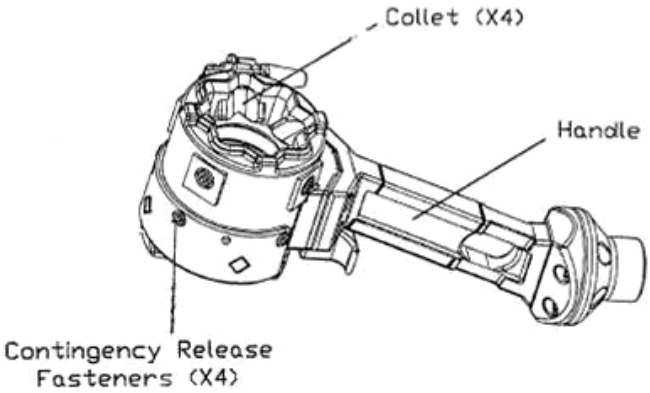
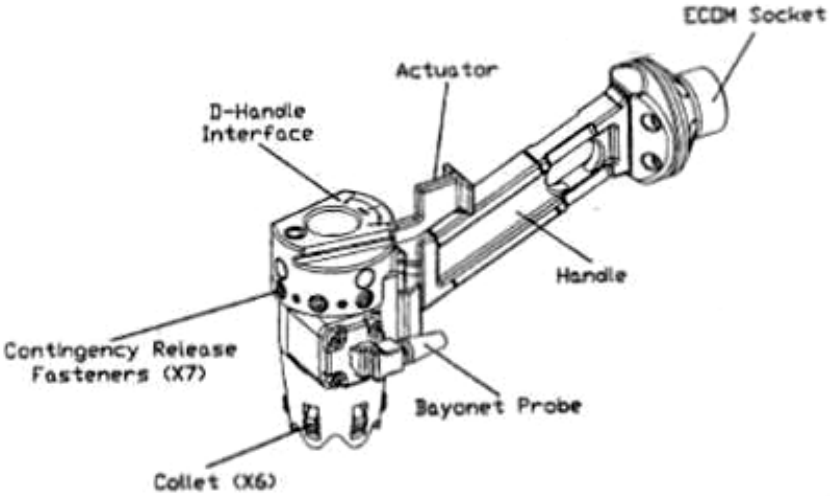
TASK	FAILURE	ACTION
	MUT EE	
	A. MUT EE jaws fail to release	1. Verify locking collar fully released 2. Shake MUT EE while depressing paddles to alleviate sideloads from handrail 3. Release MUT EE ECOM socket and tether MUT EE to structure
	MWS	
	A. MWS EE is sticky	Known problem. Report degree of stickiness 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)

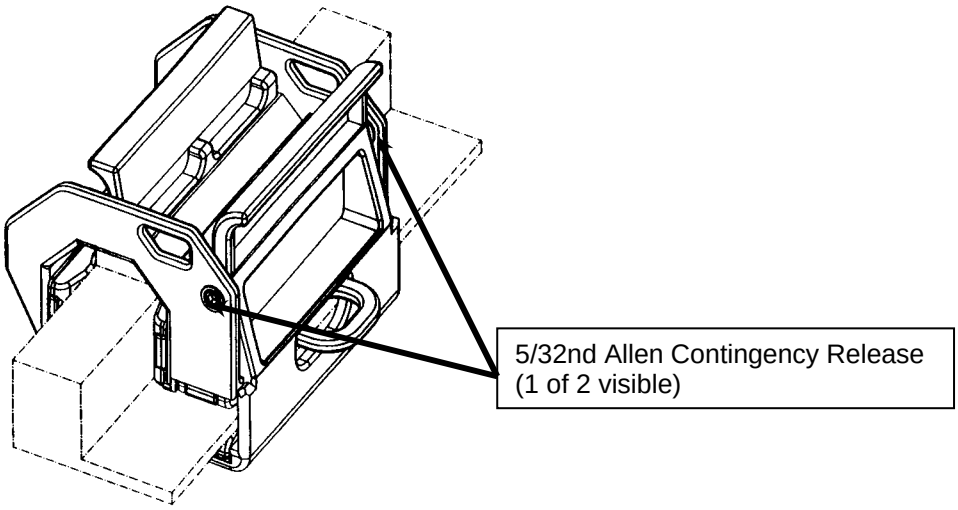
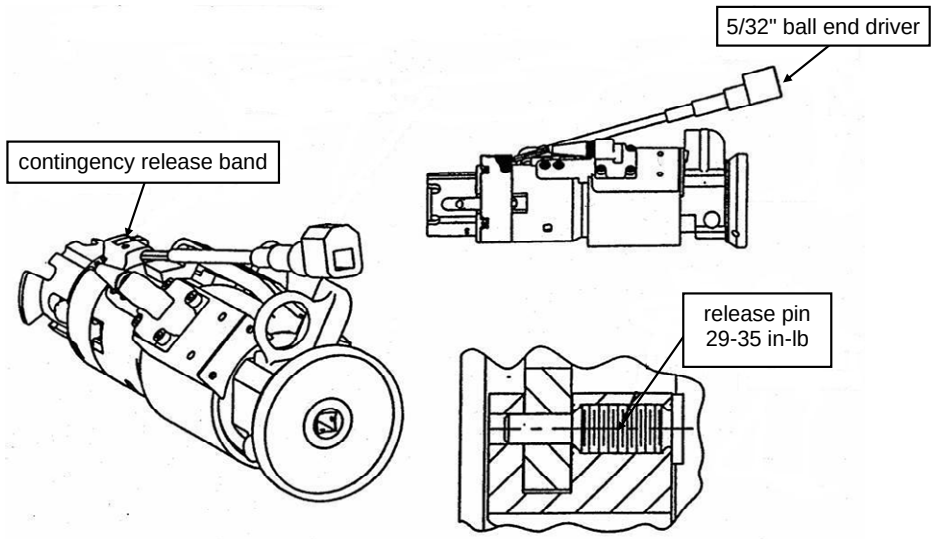
TASK	FAILURE	ACTION
	D. Connector fails to soft dock	1. Verify correct plug and jack 2. Verify bail fully aft 3. Verify backshell fully aft and remains fully aft. If backshell not fully aft, pull and hold in fully aft position while attempting to soft dock connector 4. Inspect the following: – O-ring 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
	H. Connector EMI band bent	On MCC-H GO: Retrieve needle nose pliers or forceps to remove band – Bail may need to be pushed forward while demated to expose EMI band for removal

2JA WORKAROUNDS CRIBSHEET (Cont)

TASK	FAILURE	ACTION
	I. Connector bail linkage failure	On MCC-H GO: Re-attempt connector mate with broken bail – Tether hook or vise grips may be used for additional leverage – Hand on backshell is easiest once bail linkage has passed over-center – May take 4-5 pushes on the bail to mate connector
	J. Connector soft dock spring bent	On MCC-H GO: Retrieve needle nose pliers and remove bent spring
	K. Connector O-ring or main joint gasket seal loose (seal and O-ring required in 1-G only)	1. Remove seal with tether hook 2. On MCC-H GO: Retrieve needle nose pliers and remove seal
	L. Twist (connector) cap will not release	1. On MCC-H GO: Increase force 2. On MCC-H GO: Attach equip hook to cap tether point and use strap of adj tether to release cap
	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. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode

TASK	FAILURE	ACTION
	L. HICURR	1. Reattempt operation – Can be caused by excessive rotation of the PGT body while torquing 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	M. LO TORQ (Expected during bolt release)	1. Reattempt operation until desired torque is reached 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	N. LOCURR	1. Reattempt operation 2. Power cycle and calibrate 3. Retrieve spare PGT 4. Power off and switch to ratchet mode
	O. LOG IS FULL (blinking)	1. Cycle torque and speed collars to clear message 2. Continue operation
	P. MOTOR HITEMP	1. Power off PGT 2. Retrieve spare PGT 3. Switch to ratchet mode
	Safety Tether	
	A. Safety tether fails to retract/tend	1. Verify reel is unlocked 2. Verify tether reel and/or cable guide (for 85' 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
	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
	D. Level wind fails (85 ft only)	On MCC-H GO: Release level wind mechanism bypass on back of safety tether (Red indicator will show around edge of bypass once released)
	Scoops	
	A. Scoop will not release from fitting	1. If actuator will not pull back while in locked position, tap actuator with tool to release 2. On MCC-H GO: Leave scoop in place 3. On MCC-H GO: Remove non-captive contingency screws; 5 turns: **PGT [A5 (7.0), CCW2, 30.5], 5/32 allen drive** – Square Scoop: 4 screws (figure 1) – Round Scoop: 7 screws (figure 2)

TASK	FAILURE	ACTION
	 Figure 1.– Square Scoop.	
	 Figure 2.– Round Scoop.	
	Socket Caddy	
	A. Socket fails to release from socket caddy	1. Verify PIP pin fully inserted into drop proof tether interface on socket 2. Reattempt using a different PIP pin
	TA Clamp	
	A. TA clamp fails to release	1. With handle up, press down on top of rounded clamp 2. With handle up, use tether hook to pry drawhook from capture pin
	Tether Shuttle	
	A. Tether shuttle will not release from CETA/MT rail	On MCC-H GO: Remove non-captive screws (2) at hingeline to release nadir section with slide lock (not captive) (figure 3): **PGT [A7 (9.2), CCW1, 30.5], 5/32 allen drive**

TASK	FAILURE	ACTION
	 Figure 3.– 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 4): **PGT [A1 (2.5), CCW2, 30.5], 5/32 ball end driver** – When band springs open remove TM
	 Figure 4.– 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)

EFBM CONTINGENCY CHECKOUT INHIBIT PAD

JEM

JPM Windows (JPM MLI removal and grounding tabs) **IV** JPM port end cone window shutters closed

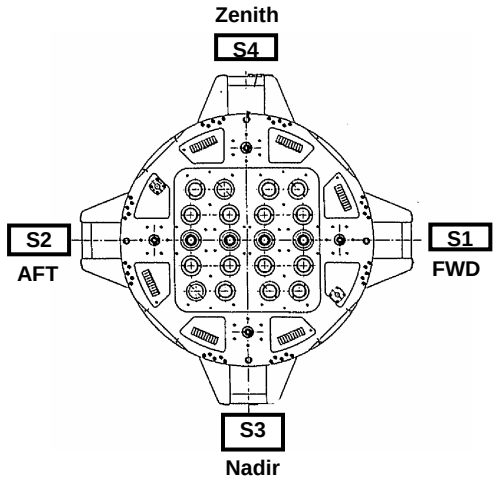
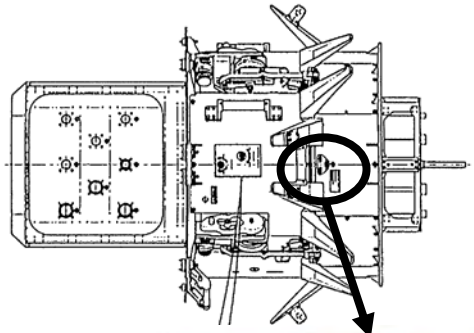
JEMRMS (grounding tabs) **SSIPC** If EV crew working within vicinity of JEMRMS 1. RIP MA Brake – ON 2. MDP Main Mode – Stby Mode or 1. JEMRMS Rack – OFF

JPM PROX Antenna (grounding tabs) **SSIPC** If EV crew working within 0.3 ft JPM PROX Antenna 1. TRX Power – OFF 2. TX Power – OFF or 1. JPM PROX Antennas – OFF

JPM Aft JTVE **SSIPC** PDB B2 RPC 4 – Open

EFBM (LTAB Reconfig) IV √P011B on Jumper Cable is disconnected for BEP **SSIPC** PDB A2 RPC01 – Open

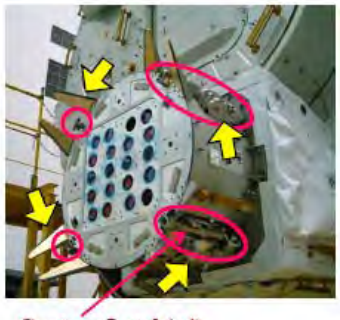
JEF EFBM (PASSIVE) MANUAL RELEASE

IV	EV
  	WARNING Stay clear of capture latch envelope CAUTION Do not touch EFBM mating surface (silver teflon), guide vanes (solid lubricant), and MLI on base EFBM CONTINGENCY RELEASE 1. Translate to fwd side of EFBM (nut plate 1, S1) 2. **PGT [TBD TBD ft-lb, CCW2 30 RPM, MTL 30.5]-6 ext** 1/4" hex drive. Release Nut Separation Screws #1&#2 TBD turns; #3 – TBD turns 3. Take picture of Nut Separation Screws 4. Repeat steps 2-3 for: □ Nut plate 2, S2 AFT □ Nut plate 3, S3 Nadir □ Nut plate 4, S4 Zenith

S1 – FWD	S2 – AFT	S3 – Nadir	S4 – Zenith
❑ Screw 1	❑ Screw 1	❑ Screw 1	❑ Screw 1
❑ Screw 2	❑ Screw 2	❑ Screw 2	❑ Screw 2
❑ Screw 3	❑ Screw 3	❑ Screw 3	❑ Screw 3

EFBM CAPTURE LATCH CONTINGENCY OPS: CAPTURE LATCH CLOSED

IV



EVA Access Port

1. When SSRMS is in safe config, give EV GO for drive of EVA Drive Shaft

Marking for Close Position

Capture Latch (Close)

EV1

WARNING
Stay clear of capture latch envelope

CAUTION
Do not touch EFBM mating surface (silver Teflon), guide vanes (solid lubricant), and MLI on base

NOTE
Capture latches must be driven closed simultaneously at diagonal locations

EFBM CONTINGENCY CAPTURE LATCH CLOSE

1. Translate to fwd-nadir side of EFBM (capture latch #1)
2. √MODE SELECT is in 'AUTO'
3. Flip the MODE SELECT to 'MANUAL'
4. If no joy, **PGT [A1 2.5 ft-lb, CW1 10 RPM, MTL 30.5]-6 ext 7/16**; drive MODE SELECT to 'MANUAL'; **0.25 turns**
5. On IV GO: Drive EVA Drive Shaft to 'RELEASE'; **~2.7 turns in 60 degree increments; ratchet w/6" ext**
6. √Status indicator marking is below line
7. Flip the MODE SELECT to 'AUTO'
8. Take picture of capture latch condition
9. Repeat for:
   - Capture latch #3 (aft-nadir)

EV2

EFBM CONTINGENCY CAPTURE LATCH CLOSE

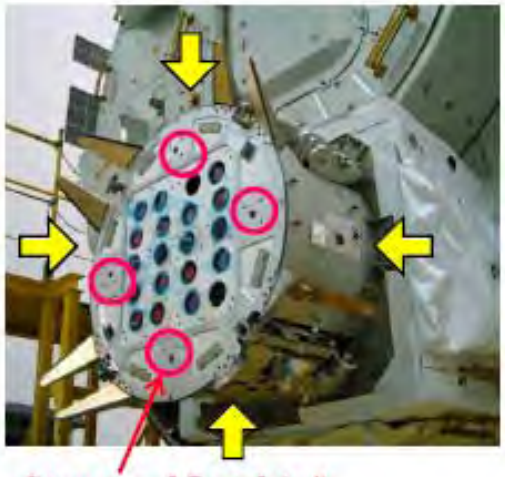
1. Translate to aft-zenith side of EFBM (capture latch #2)
2. √MODE SELECT is in 'AUTO'
3. Flip the MODE SELECT to 'MANUAL'
4. If no joy, **PGT [A1 2.5 ft-lb, CW1 10 RPM, MTL 30.5]-6 ext 7/16**; drive MODE SELECT to 'MANUAL'; **0.25 turns**
5. On IV GO: Drive EVA Drive Shaft to 'RELEASE'; **~2.7 turns in 60 degree increments; ratchet w/6" ext**
6. √Status indicator marking is below line
7. Flip the MODE SELECT to 'AUTO'
8. Take picture of capture latch condition
9. Repeat for:
   - Capture latch #4 (fwd-zenith)

EFBM CAPTURE LATCH CONTINGENCY OPS: CAPTURE LATCH OPEN

IV	EV
 Capture Latch (Open)	EFBM CONTINGENCY CAPTURE LATCH OPEN 1. Translate to fwd-nadir side of EFBM (capture latch #1) 2. √MODE SELECT is in 'AUTO' 3. Flip the MODE SELECT to 'MANUAL' 4. If no joy, **PGT [A1 2.5 ft-lb, CW1 30 RPM, MTL 30.5]-6 ext 7/16**; drive MODE SELECT to 'MANUAL'; **0.25 turns** 5. **PGT [A2 3.8 ft-lb, CCW1 10 RPM, MTL 30.5]-6 ext 7/16**; drive EVA Drive Shaft to 'RELEASE'; **~2.7 turns** 6. √Latching arm is outside of guide vane 7. Flip MODE SELECT to 'AUTO' If latch arm cannot be opened: 8. **PGT [A2 3.8 ft-lb, CW1 10 RPM, MTL 30.5]-6 ext 7/16**; drive EVA Drive Shaft to 'CAPTURE'; **max 2.5 turns** 9. √Status indicator marking is below line 10. Leave MODE SELECT in MANUAL 11. 📷 Take picture of capture latch condition 12. Repeat for: □ Capture latch #2 (aft-zenith) □ Capture latch #3 (aft-nadir) □ Capture latch #4 (fwd-zenith)

EFBM STRUCTURAL LATCH CONTINGENCY OPS

IV



EV1

WARNING
Stay clear of capture latch envelope

CAUTION
Do not touch EFBM mating surface (silver Teflon), guide vanes (solid lubricant), and MLI on base

Do not drive the EVA Drive Shaft to hard stop; drive till structural latch is flush with EFBM mating surface

NOTE
Capture latches must be driven closed simultaneously at diagonal locations

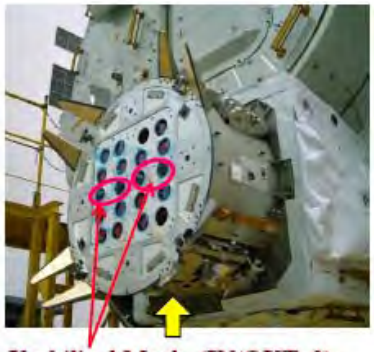
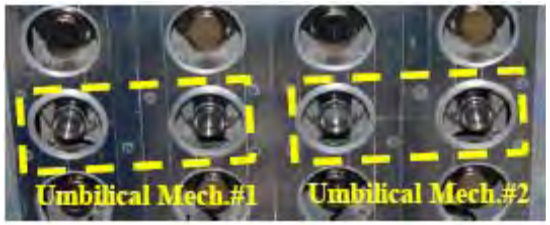
EFBM CONTINGENCY STRUCTURAL LATCH CLOSE

1. Translate to fwd side of EFBM (Structural latch #1)
2. √MODE SELECT is in 'AUTO'
3. **PGT [A1 2.5 ft-lb, CW1 10 RPM, MTL 30.5]-6 ext 7/16**; drive MODE SELECT to 'MANUAL'; **0.25 turns**
4. **PGT [A1 2.5 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16**; drive EVA Drive Shaft to 'FASTEN'; **<200 turns**
   Expected for #1: at least 177.4 turns and #3: at least 175.2 turns
5. **PGT [A1 2.5 ft-lb, CCW1 10 RPM, MTL 30.5]-6 ext 7/16**; drive MODE SELECT to AUTO; **0.25 turns**
6. 📷 Take picture of structural latch condition
7. Repeat steps 2-7 for:
   - ☐ Structural latch #3 (nadir)

EFBM CONTINGENCY STRUCTURAL LATCH CLOSE

1. Translate to aft side of EFBM (Structural latch #2)
2. √MODE SELECT is in 'AUTO'
3. **PGT [A1 2.5 ft-lb, CW1 10 RPM, MTL 30.5]-6 ext 7/16**; drive MODE SELECT to 'MANUAL'; **0.25 turns**
4. **PGT [A1 2.5 ft-lb, CW2 30 RPM, MTL 30.5]-6 ext 7/16**; drive EVA Drive Shaft to 'FASTEN'; **<200 turns**
   Expected for #2: at least 179.2 turns, and #4: at least 171.4 turns
5. **PGT [A1 2.5 ft-lb, CCW1 10 RPM, MTL 30.5]-6 ext 7/16**; drive MODE SELECT to AUTO; **0.25 turns**
6. 📷 Take picture of structural latch condition
7. Repeat steps 2-7 for:
   - ☐ Structural latch #4 (zenith)

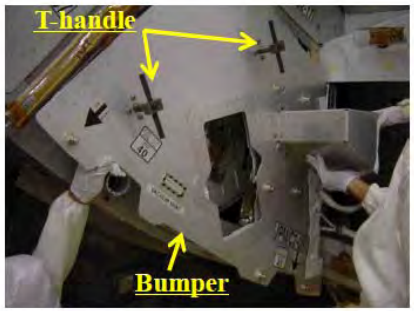
EFBM UMBILICAL MECHANISM CONTINGENCY OPS: CONNECT

IV	EV
 EVA Access Port  	**WARNING** Stay clear of capture latch envelope **CAUTION** Do not touch EFBM mating surface (silver Teflon), guide vanes (solid lubricant), and MLI on base EFBM CONTINGENCY UMBILICAL MECHANISM CLOSE 1. Translate to fwd-nadir side of EFBM (umbilical mechanism #1) 2. √MODE SELECT #2 is in 'NORMAL' 3. **PGT [A1 2.5 ft-lb, CW1 10 RPM, MTL 30.5]-6 ext 7/16**; drive MODE SELECT #2 to 'MANUAL CONNECT'; **0.25 turns** 4. √MODE SELECT #1 is in 'AUTO' 5. **PGT [A1 2.5 ft-lb, CW1 10 RPM, MTL 30.5]-6 ext 7/16**; drive MODE SELECT #1 to 'MANUAL'; **0.25 turns** 6. **PGT [A6 8.3 ft-lb, CW1 10 RPM, MTL 30.5]-6 ext 7/16**; drive EVA Drive Shaft to 'CONNECT'; **~16 turns** 7. √Status indicator is in 'CONNECT' position 8. **PGT [A1 2.5 ft-lb, CCW1 10 RPM, MTL 30.5]-6 ext 7/16**; drive MODE SELECT #1 to 'AUTO'; **0.25 turns** 9. **PGT [A1 2.5 ft-lb, CCW1 10 RPM, MTL 30.5]-6 ext 7/16**; drive MODE SELECT #2 to 'NORMAL'; **0.25 turns** 10. 📷 Take picture of umbilical mechanism condition 11. Repeat for: □ Umbilical mechanism #2 (aft-nadir)

EFBM UMBILICAL MECHANISM CONTINGENCY OPS: FLUID QD RECONFIG

IV/RMS

EFBM base (ISS fwd)



JPM MMOD Shield (JPM/C2-08) with MMOD T-tools installed

EV1 (FF)

WARNING
Stay clear of capture latch envelope

Sharp edges exist on back side of JPM MMOD Shield fasteners

CAUTION
Do not touch EFBM mating surface (silver Teflon), guide vanes (solid lubricant), and MLI on base

QDs exposed to direct sun without thermal covers can overtemp in a matter of minutes

EFBM CONTINGENCY FLUID QD RECONFIGURATION

1. Retrieve 2 MMOD T-tools
2. Attach MMOD T-tools to JPM MMOD shield (JPM/C2-08)
3. **PGT [A2 3.8 ft-lb, CCW2 30 RPM, 30.5]-7/16-6-in ext**
   Loosen MMOD shield bolts (8), **~10 turns**
4. Remove MMOD shield; transfer to EV2
5. Remove MLI cover from fwd EFBM base and temp stow

6. Release TA clamp (1) on F5 flexhose line

F6 CLOSE AND DEMATE FROM M6

7. F6: Verify aft white band is visible
8. Verify detent button fully installed and can be depressed
   √Detent button – up
9. Assess side loads prior to bail movement
10. Push bail toward open position with significant force while depressing detent button (unstick male sleeve seals)
11. To close valve:
    Depress detent button
    Pull bail to aft position (QD mated; valve closed)
    √Fwd white band – visible
    √Detent button – up
12. Assess side load potential prior to demate
13. To demate QD:
    Pull back on release ring
    √Release ring – retracted (fwd white band not visible)

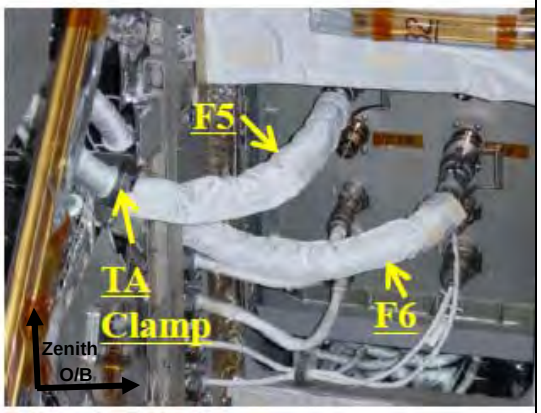
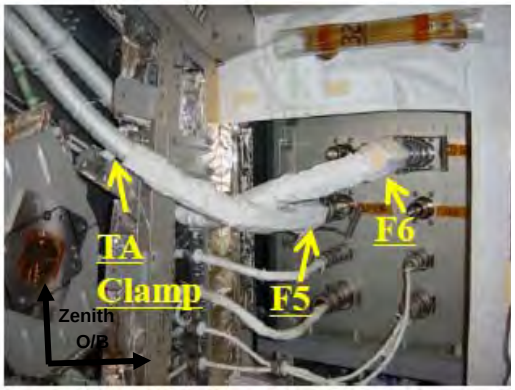
EV2 (FF)

NOTE
F6 needs to be relocated to M8 prior to manipulating F5 due to line length limits
Fluid lines contain non-toxic Flourinert
Fluid QDs are 3/4, but do not have locking collars

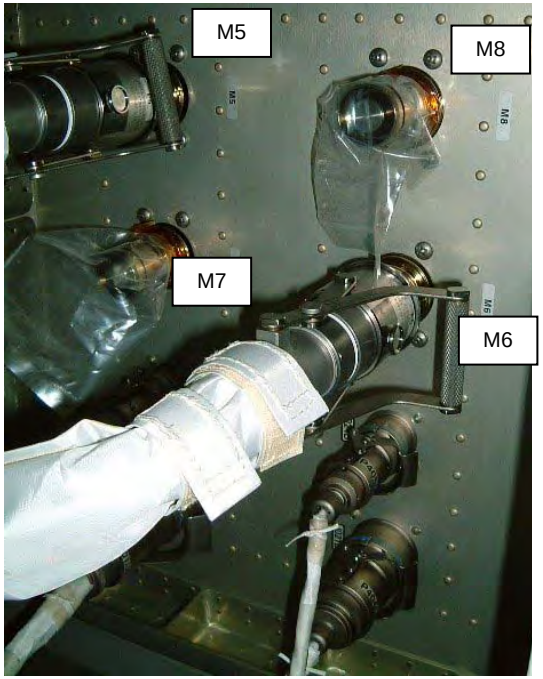
EFBM CONTINGENCY FLUID QD RECONFIGURATION

1. Receive MMOD shield from EV1

EFBM UMBILICAL MECHANISM CONTINGENCY OPS: FLUID QD RECONFIG (Cont)

IV/RMS	EV1 (FF)	EV2 (FF)
 Fluid QD Initial Configuration  Fluid QD Final Configuration	F6 MATE AND OPEN TO M8 14. Inspect male and female QD for debris or damage 15. Verify F6 female QD ready to mate √Detent button – up √Fwd white band – not visible (release ring retracted) 16. Assess side load potential prior to mate 17. Mate F6 to M8 √Fwd white band – visible 18. Snapback test: Verify release ring snaps forward (forward white band still visible) 19. Pull test: Stay clear of button and release ring 20. Gap check: √For FID – visual or gauge 21. Check side loads prior to bail movement 22. To open valve Depress detent button Push bail to forward position (QD mated; valve open) √Aft white band – visible √Detent button – up F5 CLOSE AND DEMATE FROM M5 23. F5: Verify aft white band is visible 24. Verify detent button fully installed and can be depressed √Detent button – up 25. Assess side loads prior to bail movement 26. Push bail toward open position with significant force while depressing detent button (unstick male sleeve seals) 27. To close valve: Depress detent button Pull bail to aft position (QD mated; valve closed) √Fwd white band – visible √Detent button – up 28. Assess side load potential prior to demate 29. To demate QD: Pull back on release ring √Release ring – retracted (fwd white band not visible) F5 MATE AND OPEN TO M7 30. Route F5 flexhose line nadir of F6 line	

EFBM UMBILICAL MECHANISM CONTINGENCY OPS: FLUID QD RECONFIG (Cont)

IV/RMS	EV1 (FF)	EV2 (FF)
 Close up of Initial Configuration (showing M labels)	31. Inspect male and female QD for debris or damage 32. Verify F5 female QD ready to mate √Detent button – up √Fwd white band – not visible (release ring retracted) 33. Assess side load potential prior to mate 34. Mate F5 to M7 √Fwd white band – visible 35. Snapback test: Verify release ring snaps forward (forward white band still visible) 36. Pull test: Stay clear of button and release ring 37. Gap check: √For FID – visual or gauge 38. Check side loads prior to bail movement 39. To open valve Depress detent button Push bail to forward position (QD mated; valve open) √Aft white band – visible √Detent button – up 40. Reinstall MLI cover 41. Retrieve MMOD shield from EV2 42. Reinstall MMOD shield 43. **PGT [A2 3.8 ft-lb, CW2 30 RPM, 30.5]-7/16-6-in ext** Engage MMOD shield bolts (8) to hard stop, expect 10 turns 44. Remove 2 MMOD T-tools	2. Transfer MMOD shield to EV1

EFBM CONTINGENCY TASK DATA

Estimated Task Duration:

	With SSRMS	Without SSRMS
One EV Crew	00:15 per latch or mechanism	N/A
Two EV Crew	N/A	N/A

Tools:

EV	
PGT	Ratchet Wrench
7/16 (wobble) Socket-6 ext	

Foot Restraints: N/A

EVA Fasteners:

Fastener	Head Size (in)	Qty	Install Trq (ft-lbs)	Release Trq (ft-lbs)	Failure Trq (ft-lbs)	Turns	RPM
Mode Select Shaft (capture latch)	7/16	1x4	9.98	9.98	9.98	0.25	10
Manual Drive Shaft (capture latch)	7/16	1x4	34.7	34.7	34.7	2.7	2.6
Mode Select Shaft (structural latch)	7/16	1x4	9.98	9.98	9.98	0.25	10
Manual Drive Shaft (structural latch)	7/16	1x4	5.85	1.80	I) 5.85 R) 1.80	200	54
Mode Select Shaft (structural latch)	7/16	2x2	9.98	9.98	9.98	0.25	10
Manual Drive Shaft (structural latch)	7/16	1x2	13.6	13.6	13.6	16	15
JPM MMOD Shield	7/16	8	TBD	TBD	TBD	10	30

EVA Connectors: N/A

Notes: N/A

Cautions:

1. Do not touch EFBM mating surface (silver Teflon), guide vanes (solid lubricant), and MLI on base
2. Do not drive the EVA Drive Shaft to hard stop; drive till structural latch is flush with EFBM mating surface

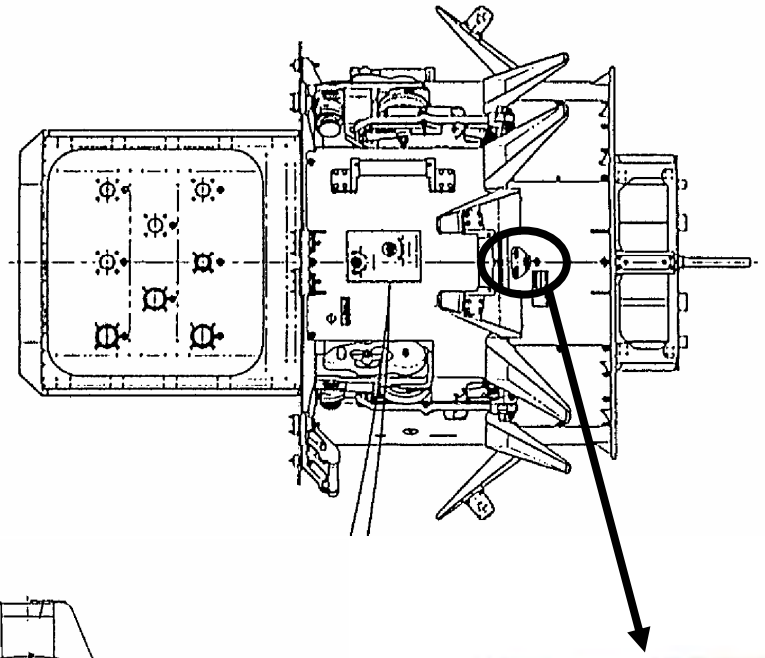
Warnings:

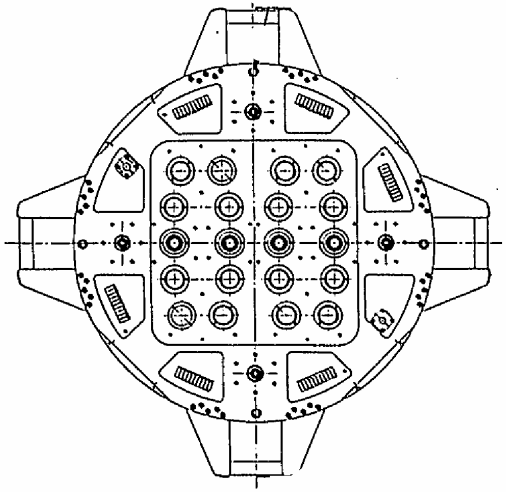
1. Stay clear of capture latch envelope

Timeline Considerations:

1. The Capture Latch Mode Select shaft can be actuated by fingers

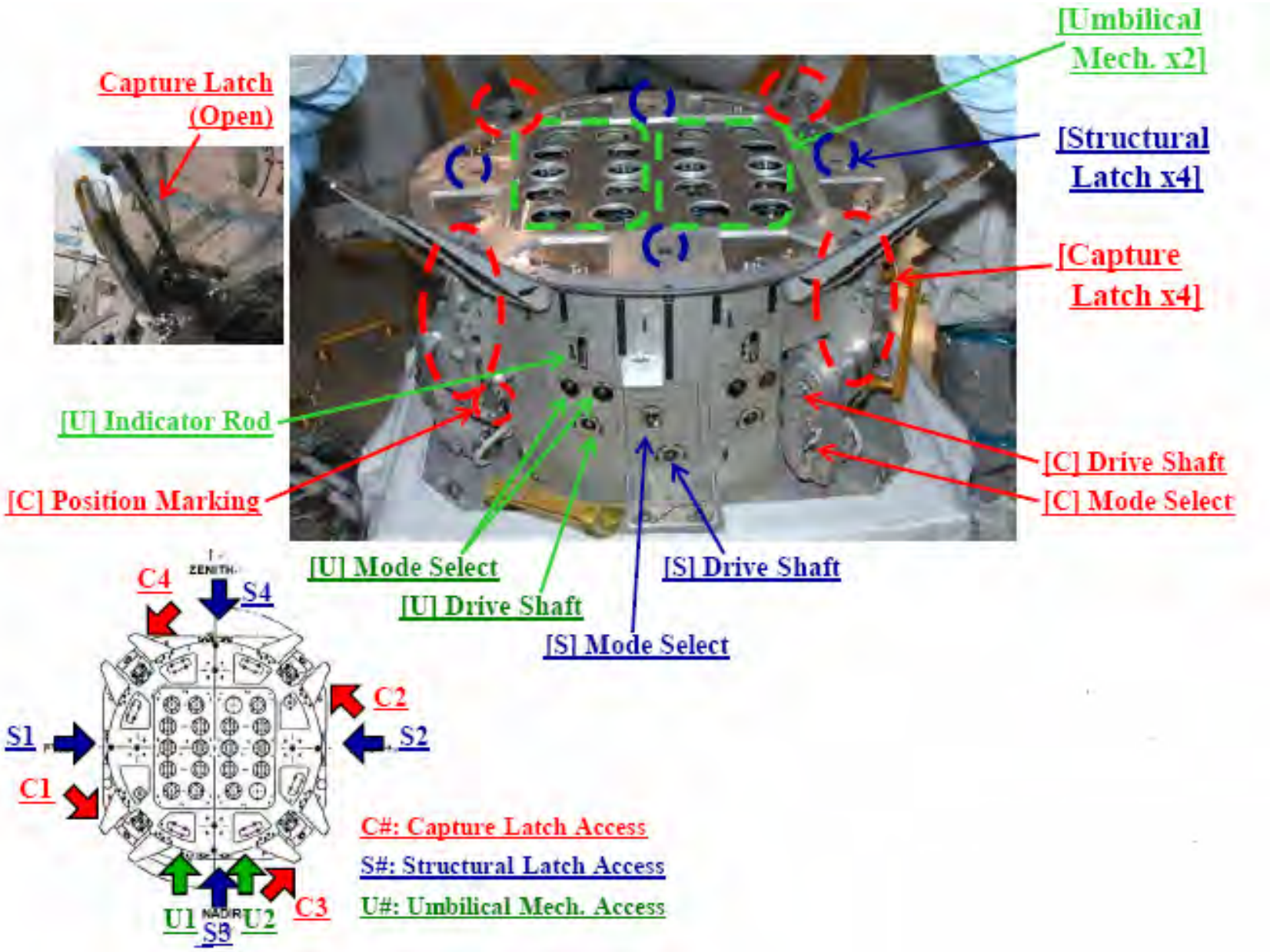
EFBM CONTINGENCY TASK DATA (Cont)





Latch Locations
4 places

Nut Layout
4 places


[Umbilical Mech. x2]
Capture Latch (Open)
[Structural Latch x4]
[Capture Latch x4]
[U] Indicator Rod
[C] Position Marking
[C] Drive Shaft
[C] Mode Select
[U] Mode Select
[U] Drive Shaft
[S] Drive Shaft
[S] Mode Select
ZENITH
C4
S4
C2
S1
S2
C1
C3
U1
NADIR
S3
U2
C#: Capture Latch Access
S#: Structural Latch Access
U#: Umbilical Mech. Access

EFBM CONTINGENCY TASK DATA (Cont)

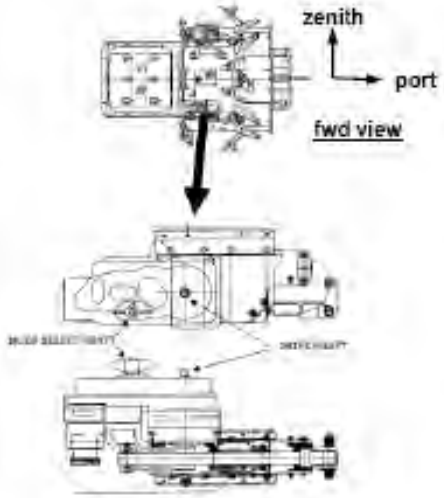


Figure-2 EVA I/F for Capture Latch

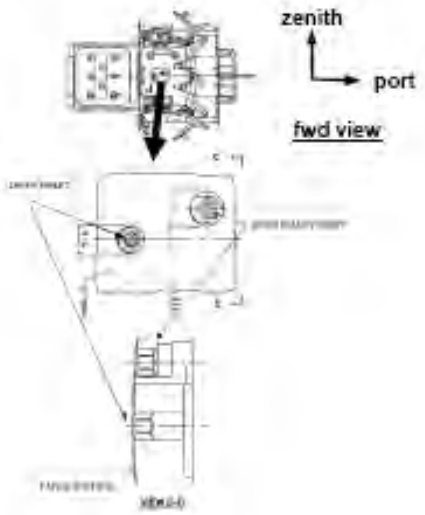
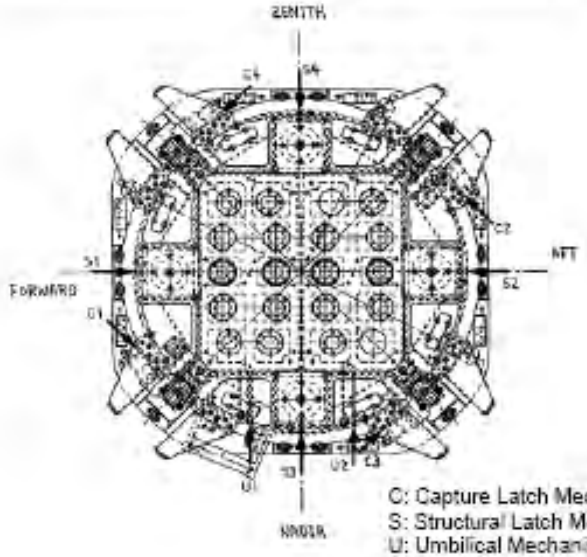


Figure-3 EVA I/F for Structure Latch



C: Capture Latch Mechanism
S: Structural Latch Mechanism
U: Umbilical Mechanism

Figure-1 EFBM Active

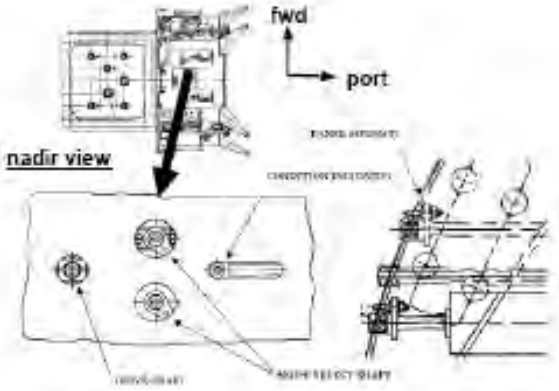


Figure-4 EVA I/F for Umbilical Mechanism

EFBM CONTINGENCY TASK DATA (Cont)

Figure-5 Structure Latch#2 (lower) and Capture Latch#1 (upper)

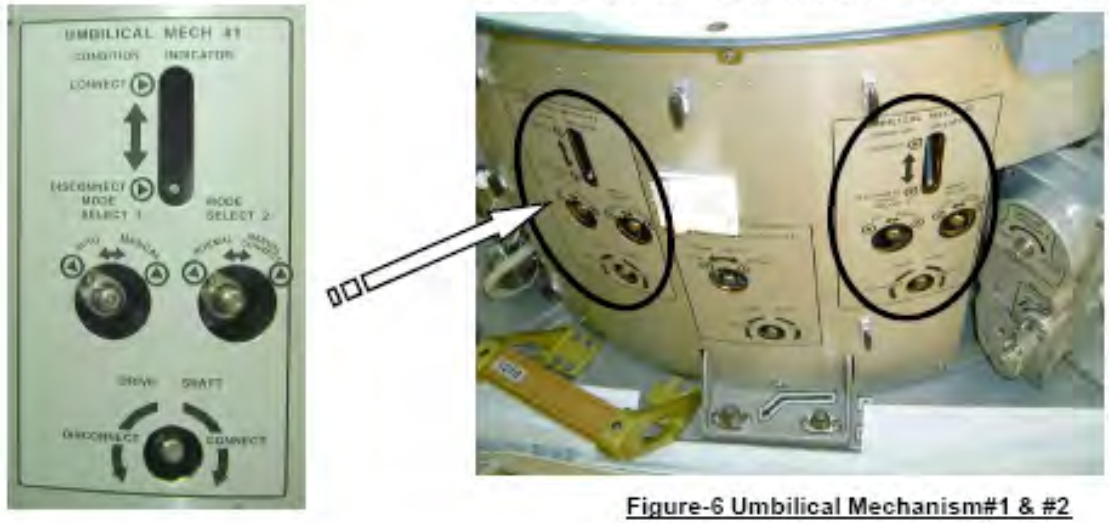
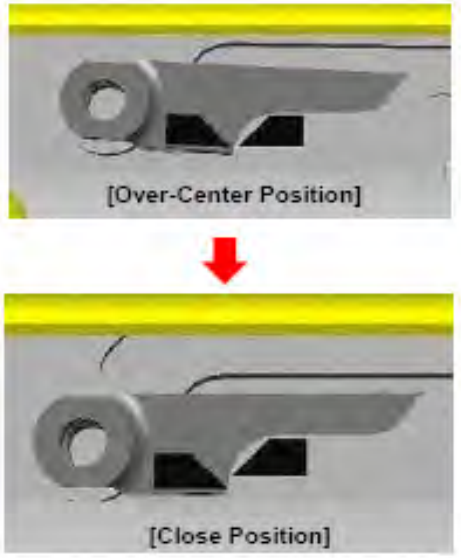


Figure-6 Umbilical Mechanism#1 & #2

EFBM CONTINGENCY TASK DATA (Cont)

Figure-7 Capture Latch(Visual Mark)

For close, visual marking("wedge" shape) on the arm should pass the over-center position.



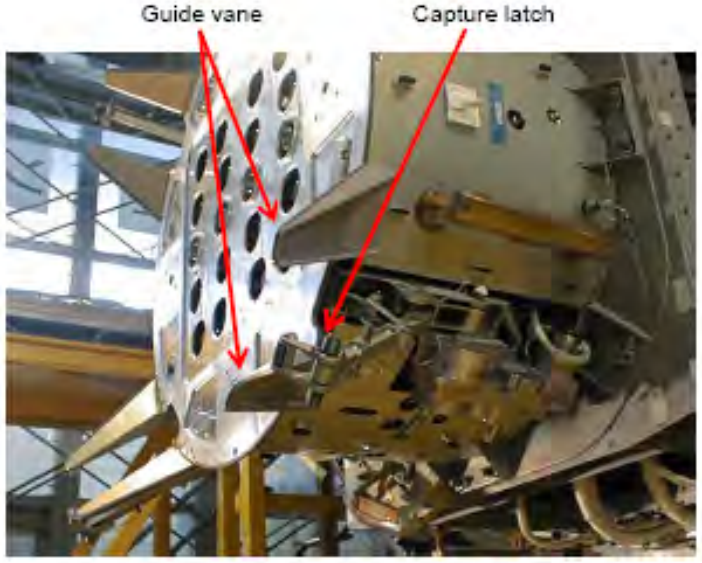


Figure-8 Capture Latch(Outside of Guide Vane)

Drive shaft must be stopped when Structural Latch is flush with EFBM mating surface.

Figure-9 Structural Latch(RELEASE=Retract)

JAXA ICS-EF EVA CONTINGENCY TASKS

IV/RMS

1. Verify with **MCC-H** inhibits in place for ICS-EF tasks. Give EV GO to proceed

JAXA ICS-EF:
SSIPC ICS MOD Off
ICS UPS Off
ICS HPA Off
DM
DM / DLM DRV ON
DM ENA
DM STEP

APM-X
APM-X / Y DRV ON
APM-X ENA VALID
APM-X STEP

APM-Y
APM-X / Y DRV ON
APM-Y ENA VALID
APM-Y STEP

Notify **MCC-H** antenna deployed

EV1 (SSRMS)

WARNING
During PGT operations, drew should remain outside of moving envelope of DM, APM-X and APM-Y

To prevent shearing/pinching due to rotation of DM, no load should be applied to Boom/APM/ANT in DM rotating direction

CAUTION
Pinch point between ICS-EF structure and antenna
Earth and Fine Sensors are no touch areas
Sharp edge on worm wheel gear

DM DEPLOYMENT
Objective: Manually deploy the ICS-EF antenna. Assumes the antenna has already been unlocked

PREP (00:45)
1. Retrieve WIF Adapter and 7/16 12-ext socket
2. Retrieve APFR
3. Translate to SSRMS setup location
4. Install WIF Adapter
5. Install APFR [TBD]
6. GCA SSRMS for ingress; attach local tether and ingress
7. Give SSRMS GO for MNVR to ICS-EF
8. Install 12-ext on PGT; perform pull test
9. GCA SSRMS for bolt drive (body position to avoid deploying antenna?)

ICS-EF ANTENNA DEPLOY (00:TBD)
On IV GO (inhibits in place):

10. **PGT [A1 2.5, CW2 30 RPM, 30.5] 12-Ext 7/16**
Drive DM EVA bolt in DEPLOY direction, 55 turns
❑ DM Bolt (initial)
11. Verify antenna deploying
12. Using ratchet wrench or finger, lightly turn DM bolt to hard stop, 9 turns (<0.5 ft-lb)
❑ DM Bolt (final)
13. Check indicator arrow at DEPLOY position
14. Inform IV – antenna deployed

EV2 (FF)

NOTE
ICS-EF is Inter-Orbit Communication System – Exposed Facility.
Task Data based primarily upon JAXA EVA Task CD information

JAXA ICS-EF EVA CONTINGENCY TASKS (Cont)

IV/RMS	EV1 (SSRMS)	EV2 (FF)
	CLEANUP (00:15) 15. Egress APFR; retrieve APFR and WIF Adapter 16. Translate to airlock; stow APFR DLM LATCH Objective: Secures the ICS-EF deployed antenna into place. Assumes the antenna has been unlocked and deployed PREP (00:45) 1. Retrieve WIF Adapter and 7/16 12-ext socket 2. Retrieve APFR 3. Translate to SSRMS setup location 4. Install WIF Adapter 5. Install APFR [TBD] 6. GCA SSRMS for ingress; attach local tether and ingress 7. Give SSRMS GO for MNVR to ICS-EF 8. Install 12-ext on PGT; perform pull test 9. GCA SSRMS for bolt drive (body position to avoid deploying antenna?) ICS-EF ANTENNA DEPLOY (00:TBD) On IV GO (inhibits in place): 10. **PGT [A1 2.5, CW2 30 RPM, 30.5] 12-Ext 7/16** Drive EVA bolt in LATCH direction, 20 turns ❑ DLM Bolt (initial) 11. **PGT [A1 2.5, CW1 10 RPM, 30.5] 12-Ext 7/16 (CD says torque = 0.17 ft-lb max)** Drive EVA bolt in LATCH direction, 3 turns ❑ DLM Bolt (final)	
Notify **MCC-H** DLM latched	12. Check indicator arrow at LATCH position 13. Inform IV – DLM latched CLEANUP (00:15) 14. Egress APFR; retrieve APFR and WIF Adapter 15. Translate to airlock	

JAXA ICS-EF EVA CONTINGENCY TASKS TASK DATA

Estimated Task Duration:

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

Tools:

EV1 (SSRMS)	EV2 (FF)
PGT w/ 7/16, 12-inch extension BRT Square Scoop	N/A

EVA Fasteners (Data based on LSAR):

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns	PGT Setting
DM EVA Release bolt	7/16	1	0.5		0.5	64	
DLM EVA Release bolt	7/16	1	0.5		0.17	25	

EVA Connectors:

	From	To	Conn Size	Function	Dummy Receptacle
N/A					

Connector Inhibits:

Task	Inhibit
ICS-EF	SSIPC ICS MOD Off ICS UPC Off ICS HPA Off

PAYLOAD RELEASE FROM PAM

IV/RMS	EV1 (FF)
1. Verify inhibits	<u>PAM SLM #1 & #2 RELEASE</u> On IV GO (inhibits in place): 1. Remove MLI #1 2. **PGT [A1 2.5, CCW2 30 RPM, 30.5] 12-Ext 7/16**, Release EVA bolt ~58 turns 3. Verify claw open, visual indicator 4. Close MLI #1 5. Remove MLI #2 6. **PGT [A1 2.5, CCW2 30 RPM, 30.5] 12-Ext 7/16**, Release EVA bolt ~58 turns 7. Verify claw open, visual indicator 8. Close MLI #2 9. Relocate for SLM #3 & #4 <u>PAM SLM #3 & #4 RELEASE</u> 10. Remove MLI #3 11. **PGT [A1 2.5, CCW2 30 RPM, 30.5] 12-Ext 7/16**, Release EVA bolt ~58 turns 12. Verify claw open, visual indicator 13. Close MLI #3 14. Remove MLI #4 15. **PGT [A1 2.5, CCW2 30 RPM, 30.5] 12-Ext 7/16**, Release EVA bolt ~58 turns 16. Verify claw open, visual indicator 17. Close MLI #4

PAYLOAD RELEASE FROM PAM (Cont)

Table 1. Estimated Task Duration

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

Table 2. Tools

EV1	EV2
PGT w/ 7/16, 12-inch extension APFR	N/A

Table 3. EVA Fasteners (Data based on LSAR)

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
SLM	7/16	4	N/A	1.4	1.4	58 +/- 2

Table 4. EVA Connectors

Harness	From	To	Conn Size	Function	Dummy Receptacle
N/A					

Table 5. Connector Inhibits

Task	Inhibit

JLE PIU MANUAL RELEASE

IV/RMS	EV1 (SSRMS)
1. Verify inhibits: Main power: 1) RPC "off" on EF-PDB for main power to ELM-ES 2) RPC "off" on PDU for main power to EF-PDB (ELM-ES) Heater power: 1) RPC "off" on SPB for heater power to ELM-ES (before SPB powered off) 2) RPC "off" on EF-PDB for heater power to ELM-ES	WARNING PIU is a keep out zone after separation: sharp edge on harness when cut, shearing/pinching hazard and molten metal hazard HARNESS CUT On IV GO (inhibits in place): 1. Remove PIU bolt MLI; stow in large trash bag 2. Tether PIU to structure 3. Ingress APFR 4. Open MLI to harness 5. Cut harnesses (2) 6. Close MLI RELEASE PIU BOLTS 7. **PGT [B6 24.0 CCW 2 30RPM, 30.5] 7/16 - RAD w/2" ext** Release EVA bolts (12), 9.4 turns Verify bolt popped up 8. Egress APFR, move to second location 9. Tether (second) PIU to structure (if needed) 10. **PGT [B6 24.0 CCW 2 30RPM, 30.5] 7/16 - RAD w/2" ext** Release EVA bolts (12), 9.4 turns Verify bolt popped up 11. Verify PIU/Adapter separated from JLE 12. Egress APFR 13. Deconfigure SSRMS 14. Give IV GO for SSRMS to mnvr to JLE grapple

JLE PIU MANUAL RELEASE TASK DATA

Table 1. Estimated Task Duration

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

Table 2. Tools

EV1	EV2
PGT w/ 7/16, 12-inch extension APFR RAD GP cutter Large trash bag	N/A

Table 3. EVA Fasteners (Data based on LSAR)

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
PIU	7/16	24	N/A	23.7-45.3	89.2	9.4

Table 4. EVA Connectors

Harness	From	To	Conn Size	Function	Dummy Receptacle
PIU (2)					

Table 5. Connector Inhibits

Task	Inhibit

JEF EEU MANUAL RELEASE

IV/RMS	EV1 (SSRMS)
1. Verify inhibits: IV crew must turn off power to EXT2, disconnect JEMRMS joint motor power line from EXT2 and attach to dummy connector After EXT2 disconnect, JEMRMS should be reactivated to LIMP MODE	WARNING Latching arms are pinch points CAUTION No Touch: EFU has solid lubricant on the I/F surface, latching arms, Target and EVA bolt RELEASE TO EXTENDED POSITION On IV GO (inhibits in place): 1. Ingress APFR 2. **PGT [A2 3.8, CCW2 30 RPM, 30.5] 7/16 - 6" ext** Release EVA bolt, 192 ± 5 turns 3. Verify visual marking, indicator in line with casing 4. Egress APFR, move to safe distance 5. Give IV GO (JEMRMS LIMP MODE → BRAKEMODE)
2. IV: Give JEMRMS GO (LIMP MODE → BRAKEMODE) 3. IV: Verify with JEMRMS GO for EV to reenter worksite 4. IV: Give EV GO to reenter worksite	RELEASE TO OPEN POSITION 6. On IV GO: Ingress APFR 7. **PGT [A2 3.8, CCW2 30 RPM, 30.5] 7/16 - 6" ext** Release EVA bolt, 81 ± 5 turns 8. Egress APFR, move to safe distance 9. Give IV GO (JEMRMS → LIMP MODE & REMOVE P/L)
5. IV: Give JEMRMS GO (JEMRMS → LIMP MODE & REMOVE P/L) 6. IV: Verify with JEMRMS GO for EV to reenter worksite 7. IV: Give EV GO to reenter worksite	CLOSE EFU LATCHES 10. On IV GO: Ingress APFR 11. **PGT [A2 3.8, CW2 30 RPM, 30.5] 7/16 - 6" ext** Drive EVA bolt 273 turns

JEF EEU MANUAL RELEASE TASK DATA

Table 1. Estimated Task Duration

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

Table 2. Tools

EV1	EV2
PGT w/ 7/16, 6-inch extension APFR	N/A

Table 3. EVA Fasteners (Data based on LSAR)

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
JEF EEU Manual Drive	7/16	1	N/A	3.0	5.7	192 to extend 81 to open 273 +/-10 total

Table 4. EVA Connectors

Harness	From	To	Conn Size	Function	Dummy Receptacle
N/A					

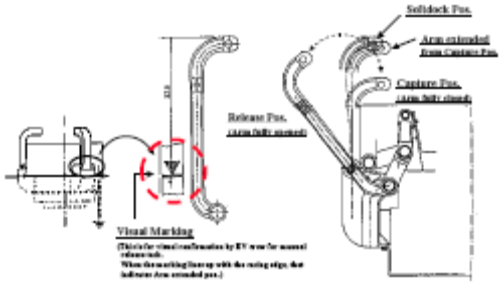
Table 5. Connector Inhibits

Task	Inhibit

Latching Arm (3 per EFU)

EVA Bolt (1 per EFU)

PIU(P/L side) ←→ EFU(JEF side)



Visual Marking(1 per arm)

JEM RMS JEU REMOVE/REPLACE

IV	EV (FF)
	REMOVAL OF JEU 1. Translate to failed JEU CAUTION Contact to silver teflon area on JEU could cause scratch of silver teflon and contamination to silver teflon. Failure to comply could result in degradation of optical characteristic of silver teflon area 2. Remove MLI cover from CLM bolt 3. Check indicator of CLM (black dot = lock) 4. Push button of CLM 5. Check indicator of CLM (no black dot = unlock) 6. **PGT [A1 (2.5), CCW2, 30.5] W/2" EXT** – engage CLM bolt 15 turns to demate connector 7. Verify connector separation 8. Attach MMOD Shield T-handle tool (2) to failed JEU 9. **PGT [B7 (25.5), CCW2, 30.5] W/2" EXT** – engage JEU bolts (5) 7-10 turns 10. Remove failed JEU REPLACE JEU 11. Retrieve spare JEU 12. Align Alignment markings on JEU with alignment markings on Joint and install JEU to JHU NOTE Softdock is 4.2-6.4 lb of force to install JEU to JHU 13. **PGT [B6 (24.0), CW2, 30.5] W/2" EXT** – engage JEU bolts (5) 16 turns 14. **PGT [A1 (2.5), CW2, 30.5] W/2" EXT** – engage CLM bolt 15 turns to mate connector 15. Verify connector mated, attach MLI cover to CLM bolt 16. Retrieve failed JEU

JEM RMS JEU REMOVE/REPLACE TASK DATA

Estimated Task Duration:

	With SSRMS	Without SSRMS
One EV Crew	N/A	TBD
Two EV Crew	N/A	TBD

Tools:

EV1	EV2
BRT PGT 2" ext – 7/16" Socket MMOD Shield T-handle tool (3)	

ORU Identification:

ORU	Part number	Serial Number

EVA Fasteners:

Fastener Name	Head Size	Qty	Install Torque (ft-lb)	Release Torque (ft-lb)	Failure Torque (ft-lb)	Turns
CLM	7/16"	1	2.29	3.41	Rel: 24.1 Inst: 3.9	15
JEU Bolt	7/16"	5	19.6-24.5	18.7-22.8	33.7	6.9-9.8

Notes:

1.

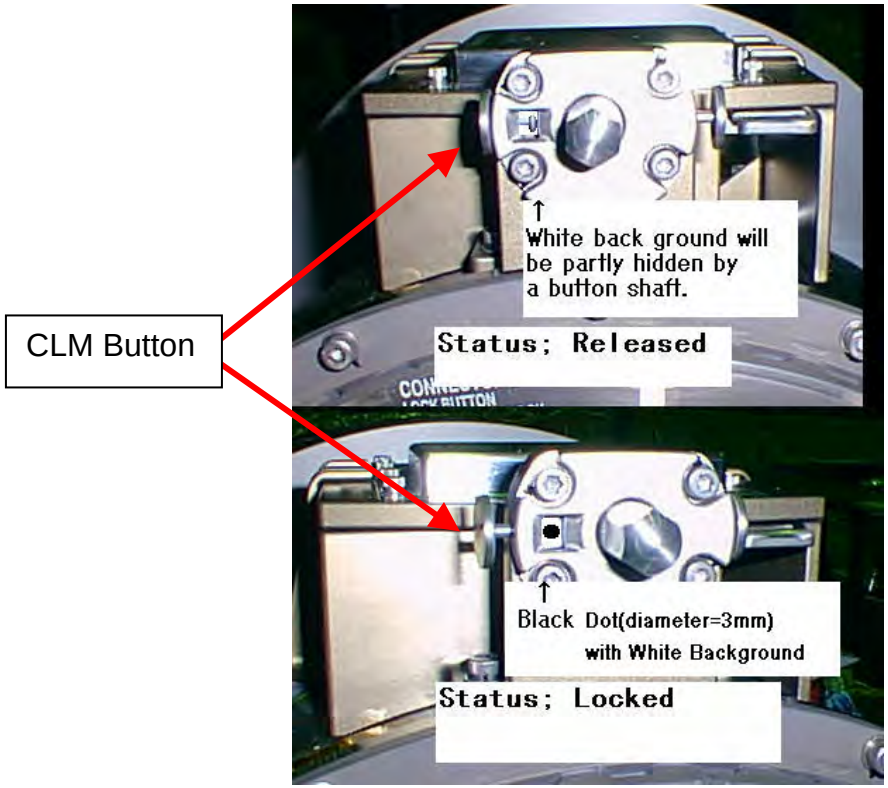
Cautions:

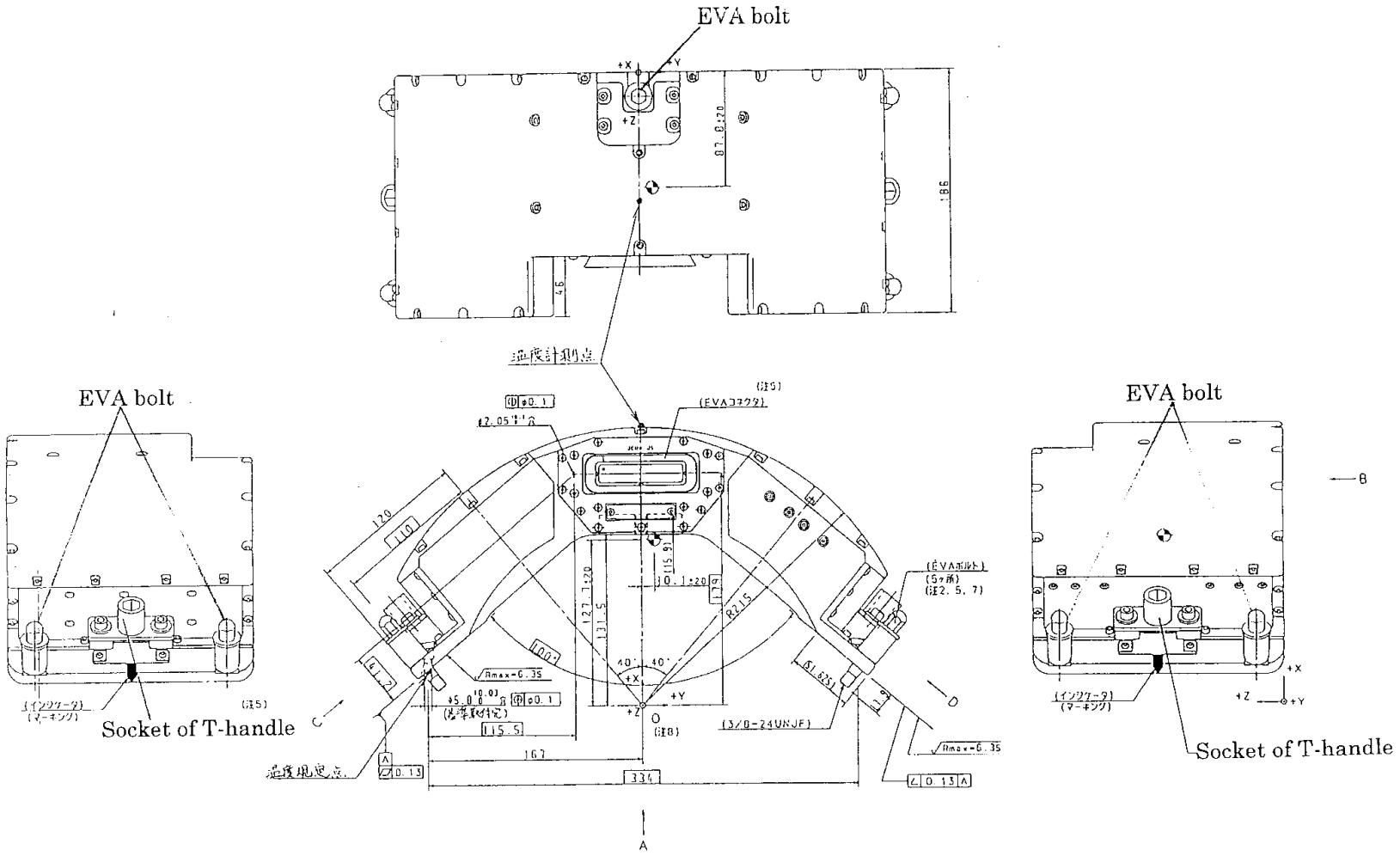
1.

Warnings:

1. Do not touch the latching arms of hold and release mechanisms

CLM Indication





NOTE
This figure is applicable to JEU1-JEU5

EVA tool interfaces

P3 UCCAS LUBRICATION AND PULL

IV/RMS	EV1 (FF)	EV2 (FF)
	GREASE GUN RETRIEVE 1. Xlate to A/L 2. Retrieve grease gun/EVA wipe from staging bag; stow behind T-bar on MWS 3. Close thermal cover 4. Verify SAFER config ❑ √L handle down (MAN ISO Vlv-Open) ❑ √R handle down (HCM-Closed) 5. Xlate to UCCAS 6. Xlate inside truss; enter Face 4 GREASE APPLICATION 7. Retrieve SARJ scraper and EVA wipe from V bag 8. Remove grease gun from EVA wipe 9. Prep grease gun a. Engage teeth by rotating plunger 180 deg (black triangle up) b. Remove MLI tip cover c. Rotate shutoff knob such that FLOW pointing towards nozzle 10. Apply small bead (~ 2 clicks?) of grease to inside of hinge, using SARJ scraper as required to spread grease 11. Verify grease wetting required surfaces by viewing gap between hinge and platform, repeat lubing as required 12. Repeat for second detent site and other hinge 13. Safe and stow grease gun in EVA wipe a. Disengage teeth by rotating plunger 180 deg (black triangle down) b. Rotate shutoff knob such that FLOW is perpendicular to nozzle c. Install MLI tip cover 14. Clean SARJ scraper with EVA wipe and stow TBD 15. Re-install DRTs ❑ Depress tongs ❑ √Verify install; perform tug test ❑ √Verify tongs out 16. Rotate knob ccw until points of black marking visible (~7 turns), do not exceed ~30 in-lb (2.5 ft-lb) 17. Egress truss 18. Loosen tiedown tethers	GREASE APPLICATION 1. Assist EV1 as reqd

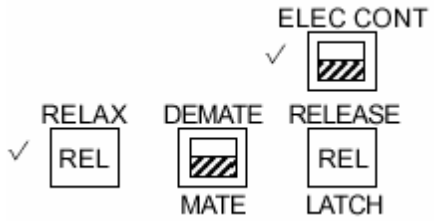
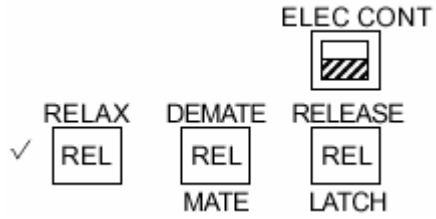
P3 UCCAS LUBRICATION AND PULL (Cont)

IV/RMS	EV1 (FF)	EV2 (FF)
	LOAD APPLICATION 19. Xlate to yoke 20. Release wire tie securing PIP pin and ADP CAUTION Do not apply more than 314 lbs at yoke Allow Z sec between pulls for structural response to dissipate 21. Apply up to X lb at yoke, with Z sec between cycles 22. Once platform free of detent, install yoke into Deploy Clevis Bracket ❑ Install yoke ADP, √lock bracket engaged ❑ Install yoke PIP pin	LOAD APPLICATION 2. Assist EV1 as reqd

RELEASE ROEU LATCHES

IV	EV
CAUTION After step 1, 2 hr LCS Thermal Clock starts	Tools reqd: Ratchet with 3-in Ext (Airlock)
	WARNING For release, do not close access cover until ROEU stowed. Latches may not snap back to closed posn
1. Deadface ROEU	
SSP1 √MPLM CH 1,2 HTR PWR – OFF (tb-bp)	
APCU 1,2 CONV – OFF (tb-bp)	
√1 OUTPUT RLY – OP (tb-bp)	
R1 PRI PL MNC – OFF (tb-OFF)	
2. ROEU SAFING	
R13L √PL BAY MECH PWR SYS 1,2 (two) – OFF	
A6U √RETEN LOGIC PWR SYS 1,SYS 2 (two) – OFF	
PL SEL – 1	
Give EV GO to release ROEU	
	1. On IV GO, open latch drive access cover: Break safety cord, release access cover (3/4 turn ccw) Open access cover (~120°) Manual drive to RELEASE: Rotate control lever to RELEASE Rotate latch drive cw (~9 ft-lb) to hard stop (~3/4 turn) Remove drive ratchet, clear worksite

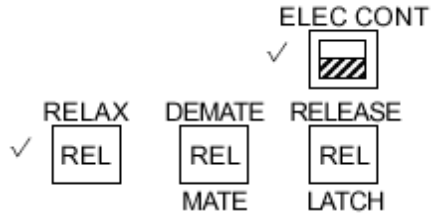
RELEASE ROEU LATCHES (Cont)

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

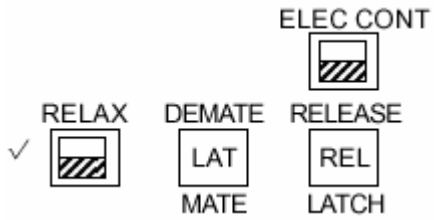
RELEASE ROEU LATCHES (Cont)

IV	EV
4. <u>ENABLE POWER</u> R1 PRI PL MNC – ON (tb-ON) SSP1 APCU 2 OUTPUT RLY – CL CONV – ON (tb-gray) √APCU 2 OUTPUT RLY tb – gray 5. End Thermal Clock ____:____	2. Reengage latch actuator: Rotate control lever to neutral posn Close, secure access cover (3/4 turn cw) Clear worksite

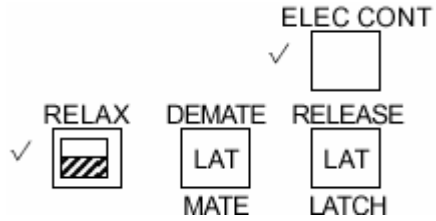
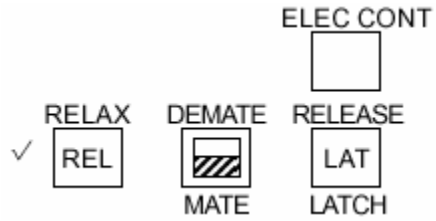
LATCH ROEU LATCHES

IV	EV
1. <u>CONFIGURE FOR ROEU MATE</u> A6U Install ROEU A6U PANEL OVERLAY R13L √PL BAY MECH PWR SYS 1,2 (two) – OFF A6U RETEN LOGIC PWR SYS 1, SYS 2 (two) – OFF PL RETEN PL SEL – 2 SM 97 PL RETENTION CRT √LAT 1,2,3 (six): 0 * If LATCH 2,3 LAT msw shows 1, drive latch for single motor time A6U  SSP1 √MPLM CH 1,2 HTR PWR – OFF (tb-bp) APCU 1,2 CONV – OFF (tb-bp) √1 OUTPUT RLY – OP (tb-bp) R1 PRI PL MNC – OFF (tb-OFF)	Tools reqd: Ratchet with 3-in Ext (Airlock)

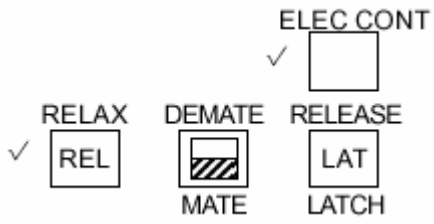
LATCH ROEU LATCHES (Cont)

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

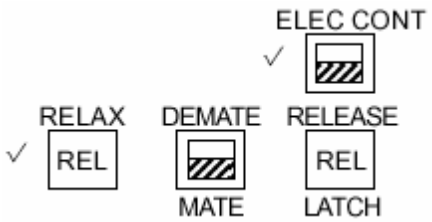
LATCH ROEU LATCHES (Cont)

IV	EV
4. <u>VERIFY TALKBACKS</u> A6U PL RETEN PL SEL – 2  5. <u>RELAX ROEU</u> R13L PL BAY MECH PWR SYS 1,2 (two) – ON A6U RETEN LOGIC PWR SYS 1,SYS 2 (two) – ON <u>NOTE</u> Monitor PL SEL 2 LATCH 1 REL SYS msws on SPEC 97 Note single motor time (> 12 sec) RELAX – RELAX (tb-REL), 24 sec max When LATCH 1 REL A(B) msw changes to 1: RELAX – OFF  PL RETEN LOGIC PWR SYS 1,2 (two) – OFF R13L BAY MECH PWR SYS 1,2 (two) – OFF	2. Reengage latch actuator: Rotate control lever to neutral posn Close, secure access cover (3/4 turn cw) Clear worksite

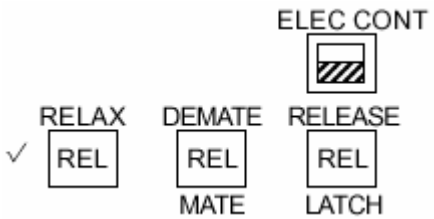
STOW ROEU ARM

IV	EV
CAUTION After step 1, 2 hr LCS Thermal Clock starts 1. RELEASE ROEU LATCHES SSP 1 √MPLM CHAN 1,2 HTR PWR – OFF (tb-bp) APCU 1,2 CONV – OFF (tb-bp) √1 OUTPUT RLY – OP (tb-bp) R1 PRI PL MNC – OFF (tb-OFF) A6U Install ROEU A6U PANEL OVERLAY √PL RETEN LAT (five) – OFF PL SEL – 2 SM 97 PL RETENTION √REL 2,3 (four) – 0 * If LATCH 2,3 REL msw shows 1, drive latch for single motor time *  	Tools reqd: Ratchet with 3-in Ext (Airlock)

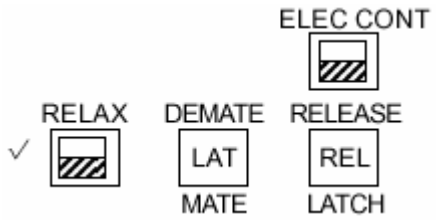
STOW ROEU ARM (Cont)

IV	EV
2. <u>RELEASE LATCHES</u> PL RETEN LOGIC PWR SYS 1,2 (two) – ON R13L BAY MECH PWR SYS 1,2 (two) – ON Note single motor time (> 20 sec) RELEASE/LATCH – REL (tb-REL), 40 sec max – OFF  3. <u>ROEU SAFING</u> R13L PL BAY MECH PWR SYS 1,2 (two) – OFF A6U RETEN LOGIC PWR SYS 1, SYS 2 (two) – OFF PL SEL – 1 Give EV GO to stow ROEU	1. On IV GO, open latch drive access cover: Break safety cord, release access cover (3/4 turn ccw) Open access cover (~120°) Manual drive to STOW: Rotate control lever to STOW Rotate arm drive ccw (~23 ft-lb) to hard stop and pull arm inboard to verify Remove drive ratchet

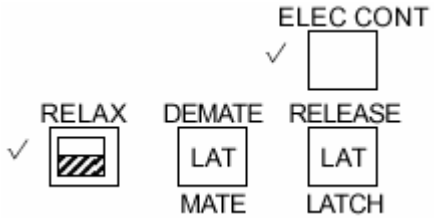
STOW ROEU ARM (Cont)

IV	EV
4. VERIFY TALKBACKS A6U PL RETEN PL SEL – 2  5. ENABLE POWER R1 PRI PL MNC – ON (tb-ON) SSP 1 APCU 2 OUTPUT RLY – CL CONV – ON (tb-gray) √OUTPUT RLY tb – gray 6. End Thermal Clock ____:____	2. Reengage arm actuator: Rotate control lever to neutral posn Close, secure access cover (3/4 turn cw) Clear worksite

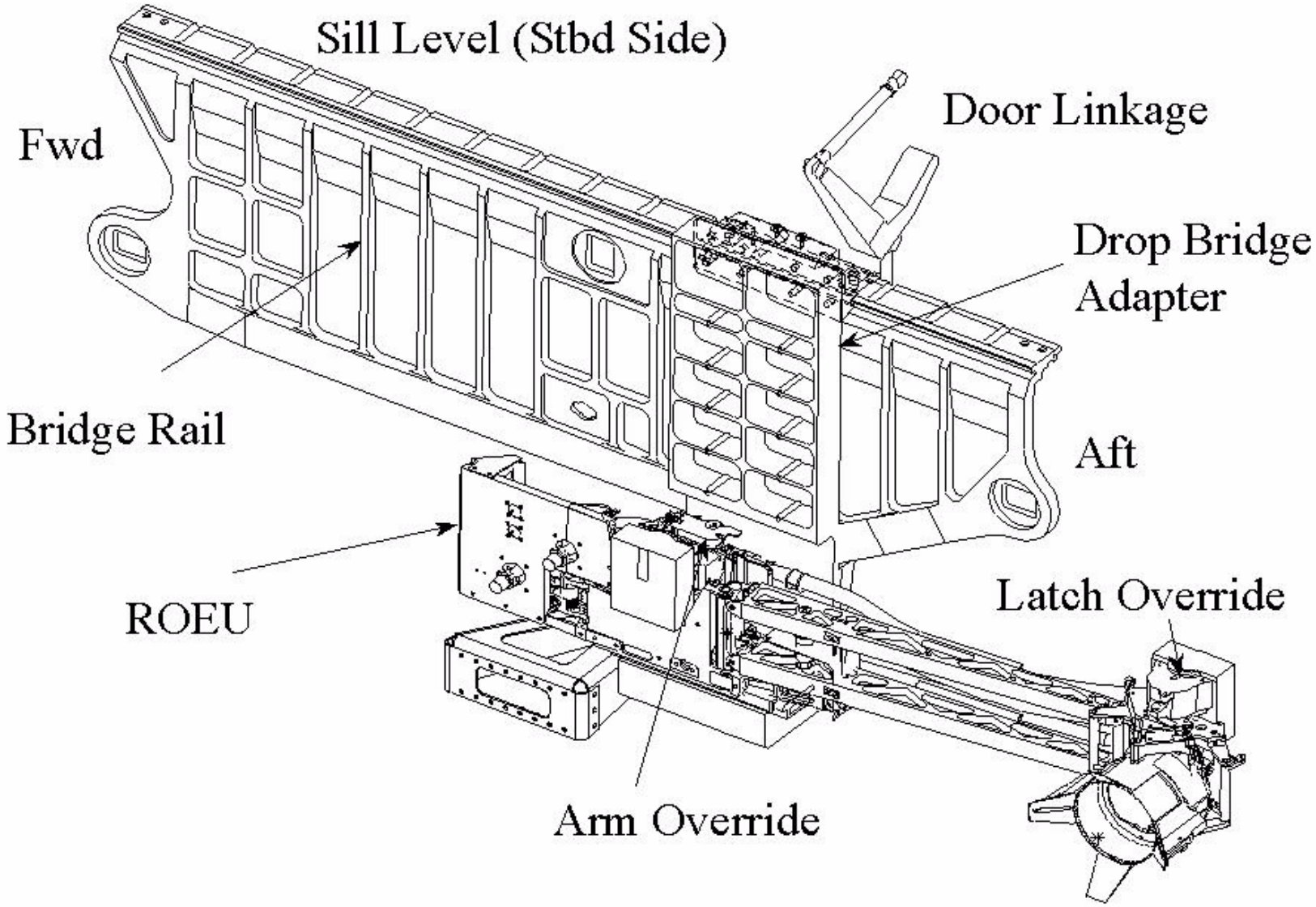
MATE ROEU ARM

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

MATE ROEU ARM (Cont)

IV	EV
4. <u>LATCH LATCHES</u> R13L PL BAY MECH PWR SYS 1,2 (two) – ON A6U RETEN LOGIC PWR SYS 1,SYS 2 (two) – ON Note single motor time (> 20 sec) RELEASE/LATCH – LATCH (tb-LAT), 40 sec max – OFF  PL RETEN LOGIC PWR SYS 1,SYS 2 (two) – OFF R13L BAY MECH PWR SYS 1,2 (two) – OFF 5. <u>RELAX ROEU (EVA)</u> Monitor PL RETEN LAT 1 tb Give EV GO to STOW arm, halt once RELAX tb – REL	2. <u>RELAX ROEU (EVA)</u> On IV GO, rotate control lever to STOW: Ratchet arm drive ccw until IV receives RELAX 1 tb – REL. Remove drive ratchet 3. Reengage arm actuator: Rotate control lever to neutral posn Close, secure access cover (3/4 turn cw) Clear worksite

ROEU OVERVIEW



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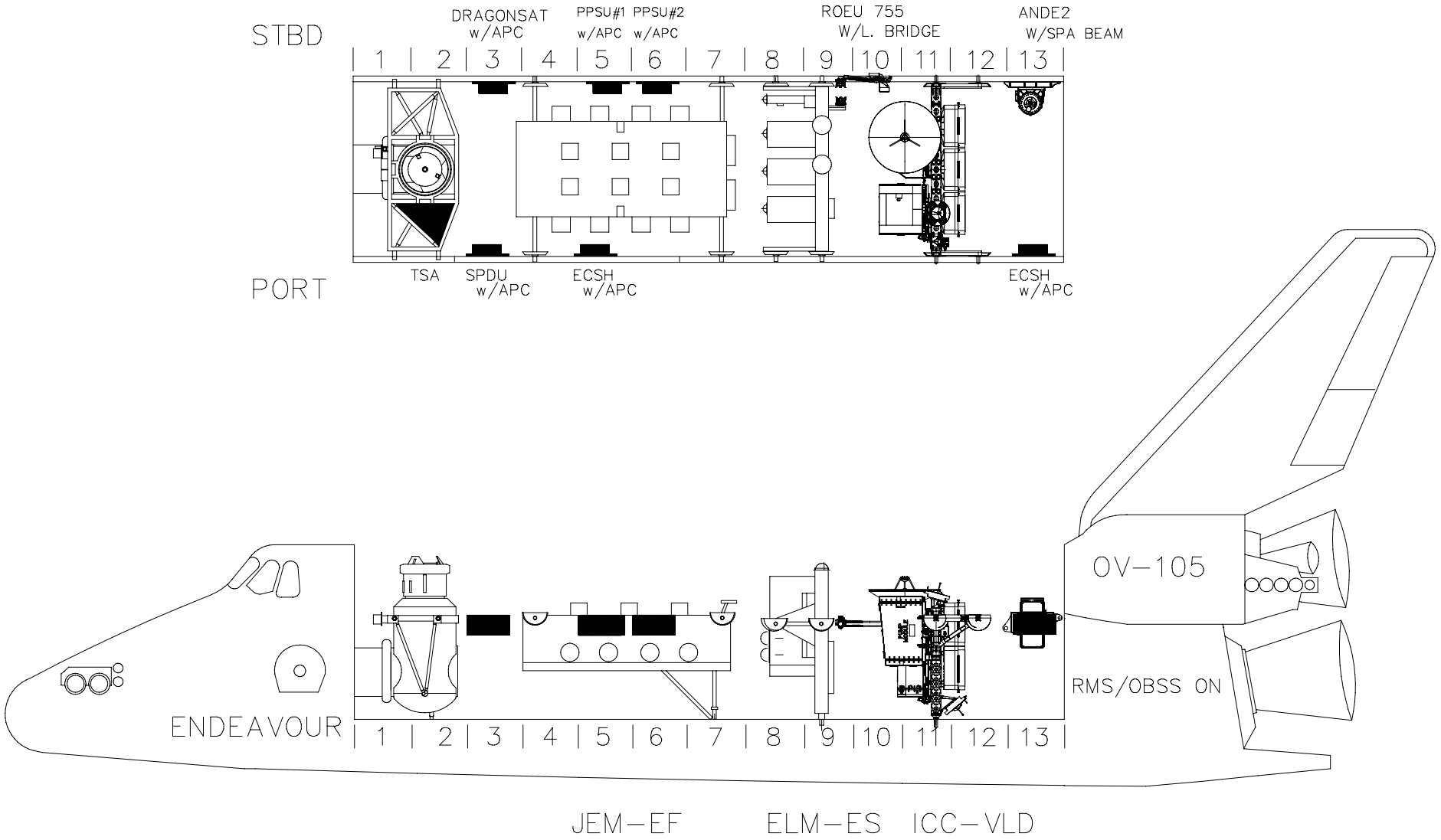
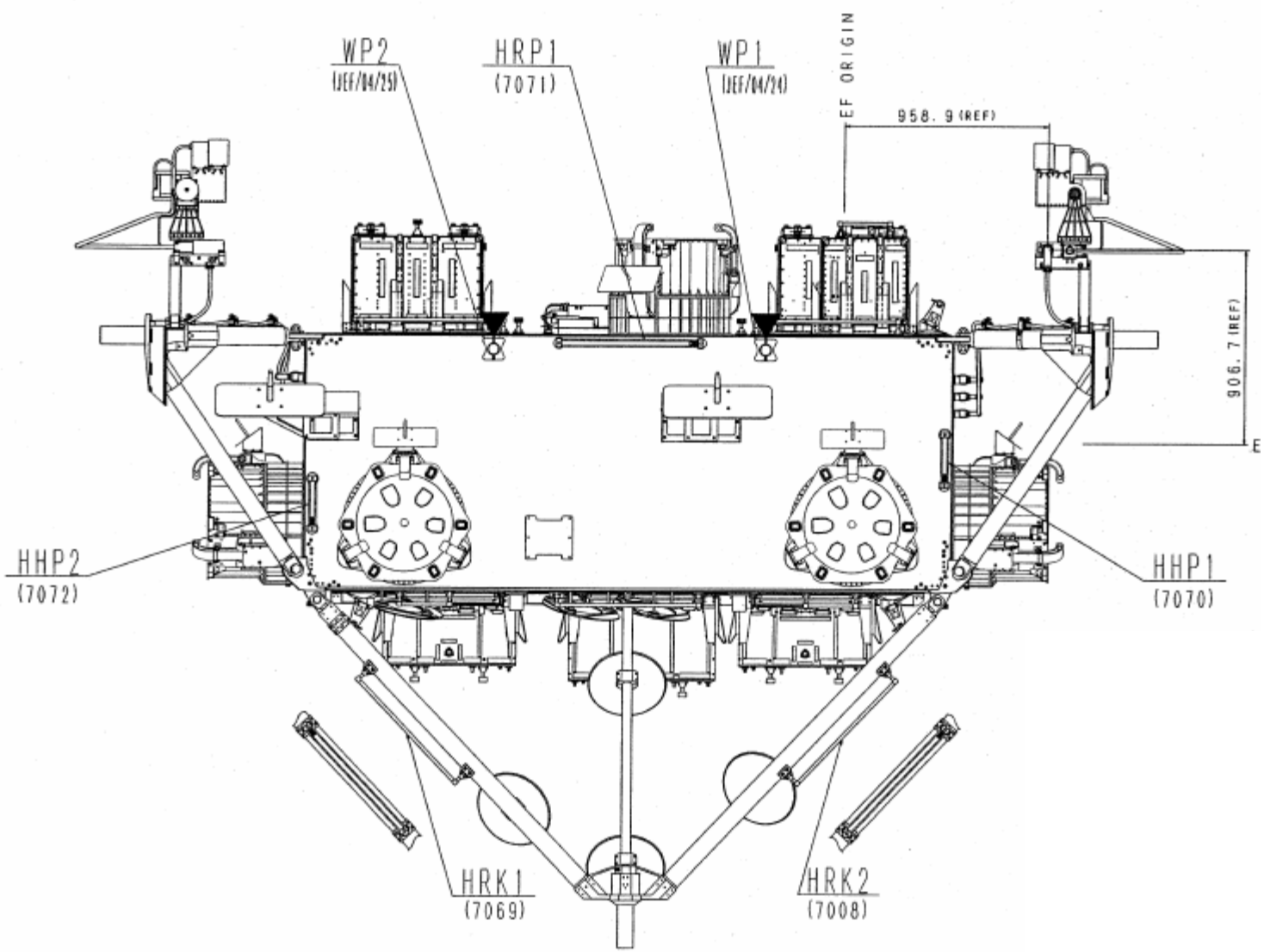
STS-127 PAYLOAD BAY LAYOUT ..... FS 18-3
JEF HANDRAILS AND WIF LOCATIONS – PORT FACE ..... FS 18-4
JEF HANDRAILS AND WIF LOCATIONS – STARBOARD FACE ..... FS 18-5
JEF HANDRAILS AND WIF LOCATIONS – ZENITH FACE ..... FS 18-6
JEF HANDRAILS AND WIF LOCATIONS – FORWARD FACE ..... FS 18-7
JEF HANDRAILS AND WIF LOCATIONS – NADIR FACE ..... FS 18-8
JEF HANDRAILS AND WIF LOCATIONS – AFT FACE ..... FS 18-9
JEF OVERVIEW PHOTOS ..... FS 18-10
JEF LTA ..... FS 18-13
JEF LTA – EVA 1 RECONFIG ..... FS 18-14
JEF LTA – EVA 4 RECONFIG ..... FS 18-15
JEF ECSH ..... FS 18-16
JEF VE ..... FS 18-17
JEF EFU ..... FS 18-19
JEF EFBM ..... FS 18-20
JLE HANDRAILS AND WIF LOCATIONS ..... FS 18-21
JLE OVERVIEW PHOTOS ..... FS 18-23
JLE ROEU ..... FS 18-27
JLE MAXI ..... FS 18-28
JLE SEDA-AP ..... FS 18-29
JLE ICS-EF ..... FS 18-30
JLE MLI ..... FS 18-31
ICC-VLD HANDRAILS AND WIF LOCATIONS – FORWARD FACE ..... FS 18-32
ICC-VLD HANDRAILS AND WIF LOCATIONS – AFT FACE ..... FS 18-33
ICC-VLD OVERVIEW PHOTOS ..... FS 18-34
ICC-VLD LTA ..... FS 18-38
ICC-VLD ECSH ..... FS 18-39
ICC-VLD SGANT ..... FS 18-40
ICC-VLD PM ..... FS 18-41
ICC-VLD LDU ..... FS 18-42
ICC-VLD BATTERIES ..... FS 18-43
JEM RMS GROUNDING TAB ..... FS 18-49
JEM BM ..... FS 18-50
JEM OIH AND OIW ..... FS 18-51
NODE 1/2 CBCS FLAP ..... FS 18-52
Z1 PATCH PANEL – AFT FACE ..... FS 18-54
Z1 PATCH PANEL – FORWARD FACE ..... FS 18-55
US LAB CABLE TIE DOWN ..... FS 18-56
P3 UCCAS TIE DOWN ..... FS 18-57
S3 PAS ..... FS 18-60
ESP3 FRAM LAYOUT ..... FS 18-61
ESP3 ON-ORBIT PHOTOS ..... FS 18-63
PMA1 APFR 5/TOOL STANCHION ..... FS 18-65
MISC FIXED GRAPPLE BAR ..... FS 18-66
MISC FIXED GRAPPLE BAR RELOCATE – ON P1 ATA ..... FS 18-68
MISC FRAM ..... FS 18-69
MISC FPP SLEEVES LOCATION ..... FS 18-74
MISC ORBIT INSTALLED WIF – OIW ..... FS 18-76
MISC MT STOP – P3 ..... FS 18-77
MISC SPDM MLI REMOVAL ..... FS 18-78
MISC WETA ..... FS 18-80
MISC WETA PANEL A78 ..... FS 18-82
MISC WETA VSSA STANCHION ..... FS 18-83
TOOLS SAFETY TETHER PACK (STP) ..... FS 18-84

TOOLS UCCAS DETENT TOOL ..... FS 18-85
TOOLS TSA ..... FS 18-87
2JA TIE DOWN PLAN – JEF VE ..... FS 18-88
2JA TIE DOWN PLAN – BATTERIES ..... FS 18-91
2JA TIE DOWN PLAN – WETA ..... FS 18-95

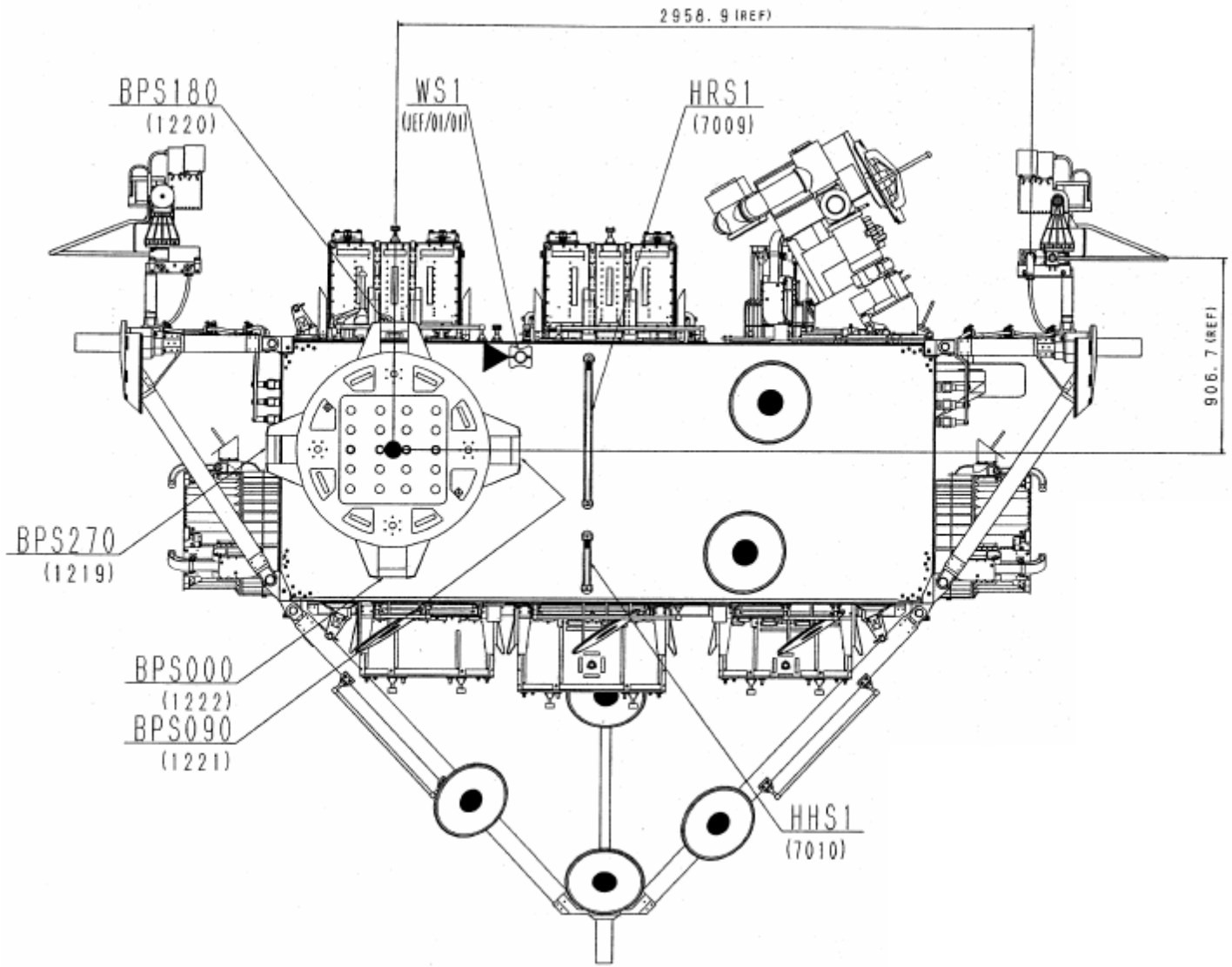
STS-127 PAYLOAD BAY LAYOUT



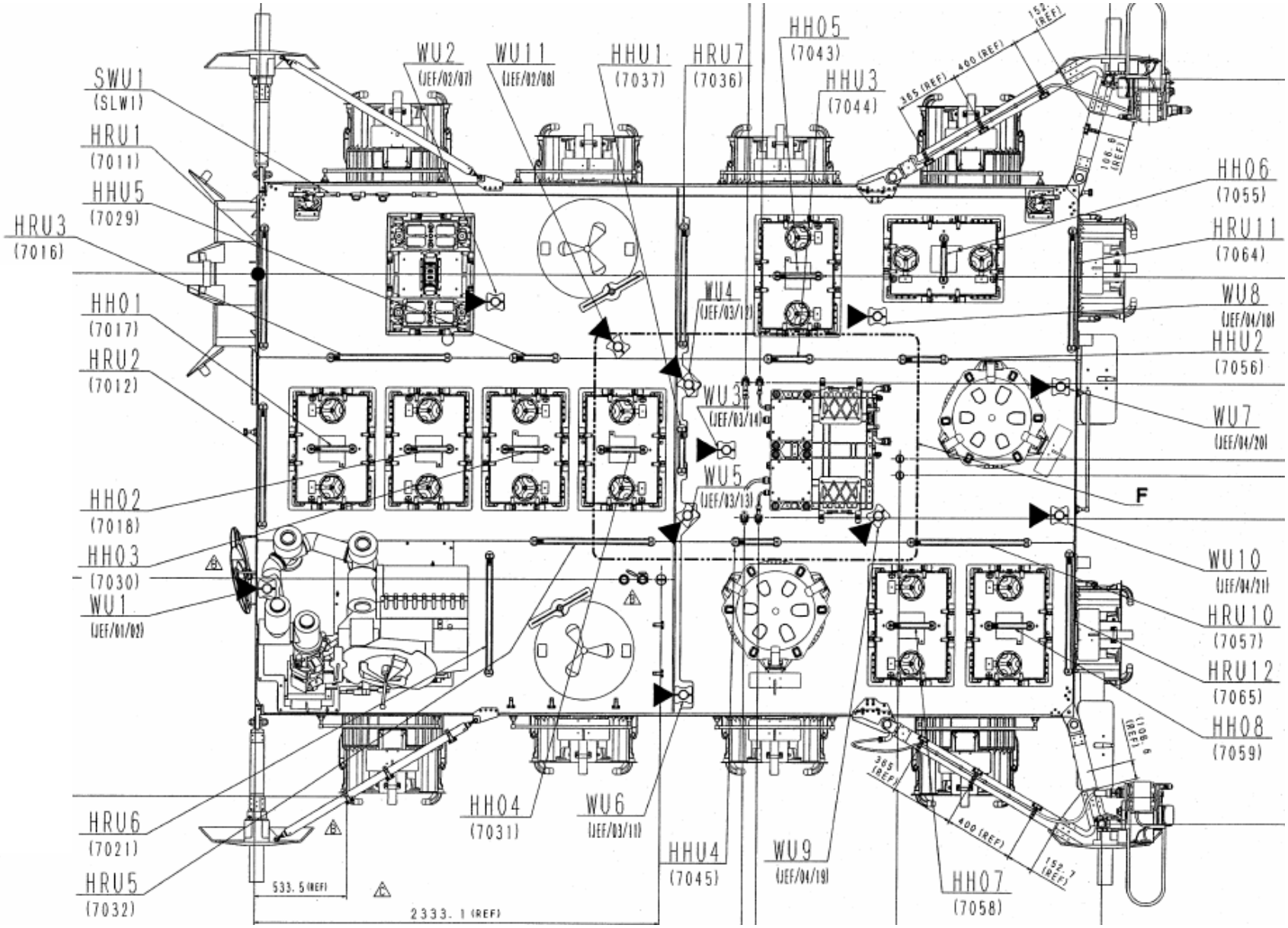
JEF HANDRAILS AND WIF LOCATIONS – PORT FACE



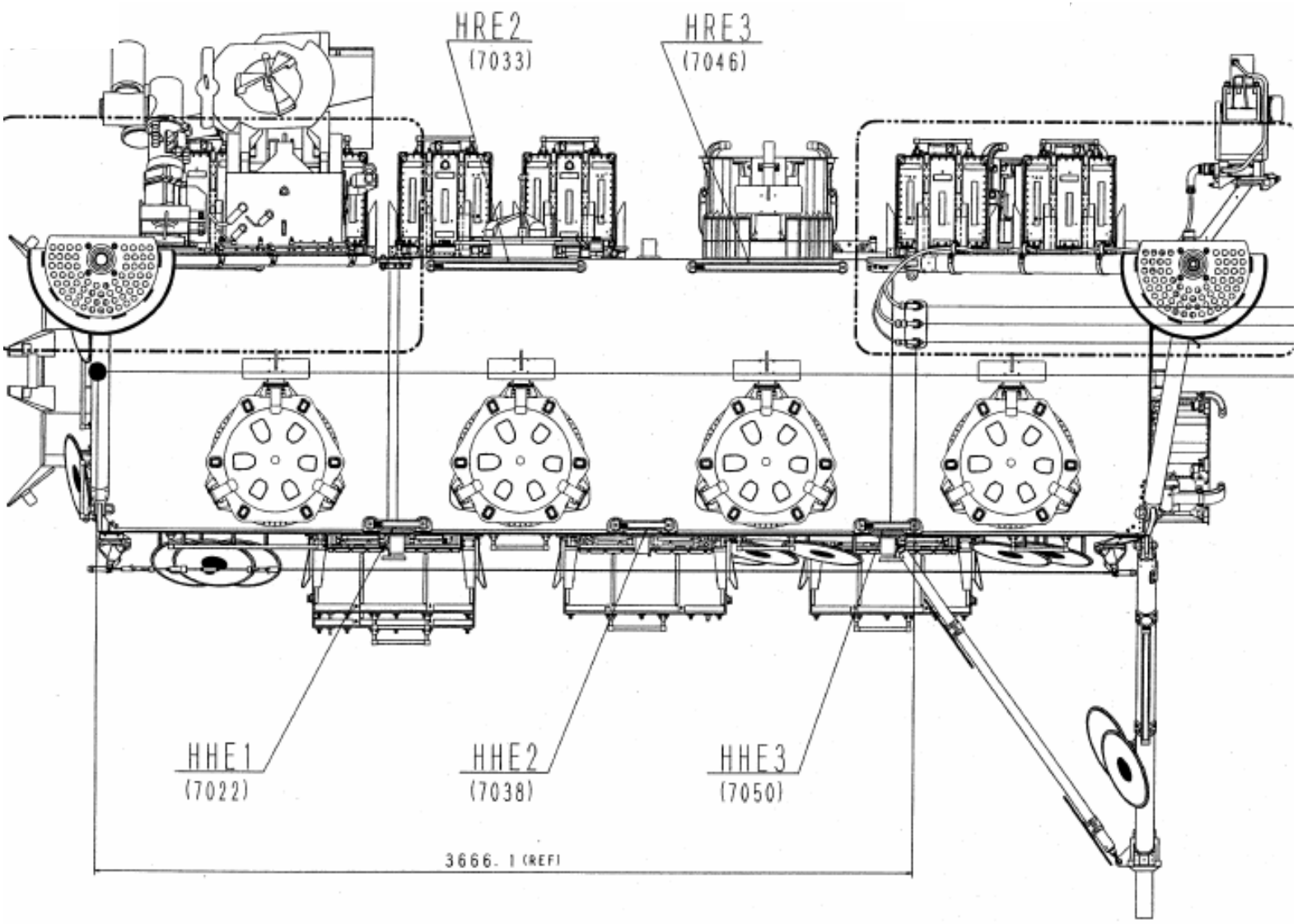
JEF HANDRAILS AND WIF LOCATIONS – STARBOARD FACE



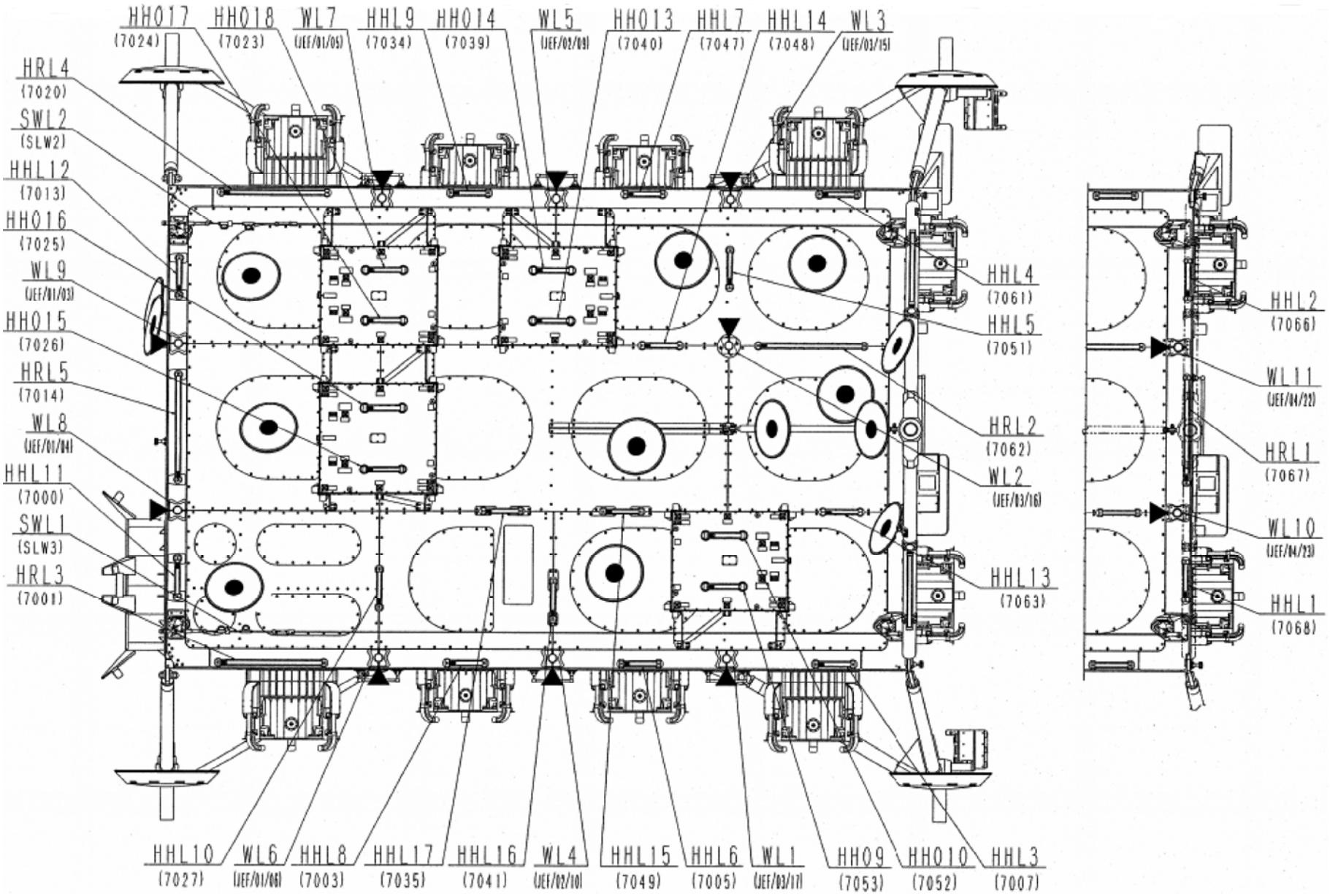
JEF HANDRAILS AND WIF LOCATIONS – ZENITH FACE



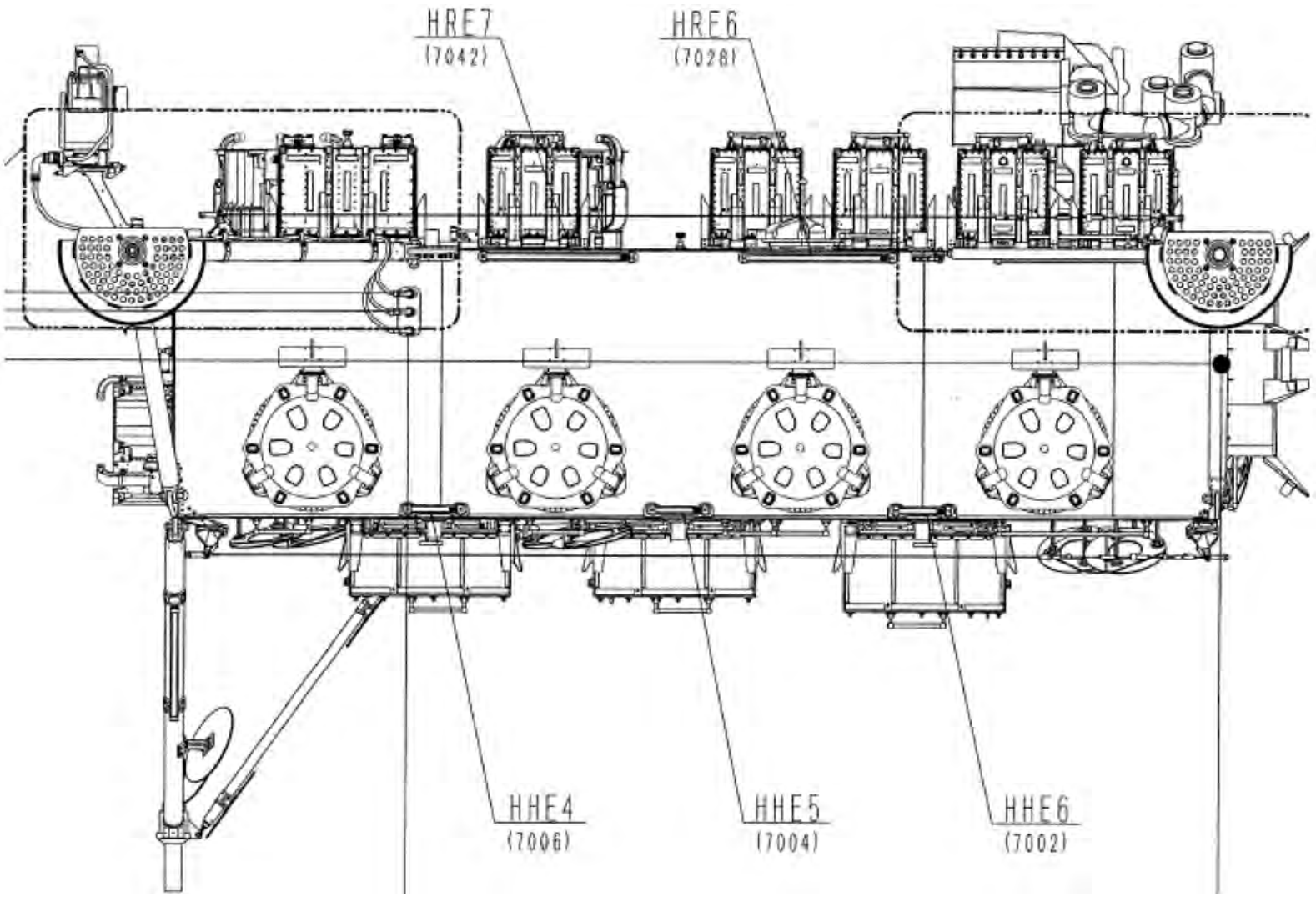
JEF HANDRAILS AND WIF LOCATIONS – FORWARD FACE



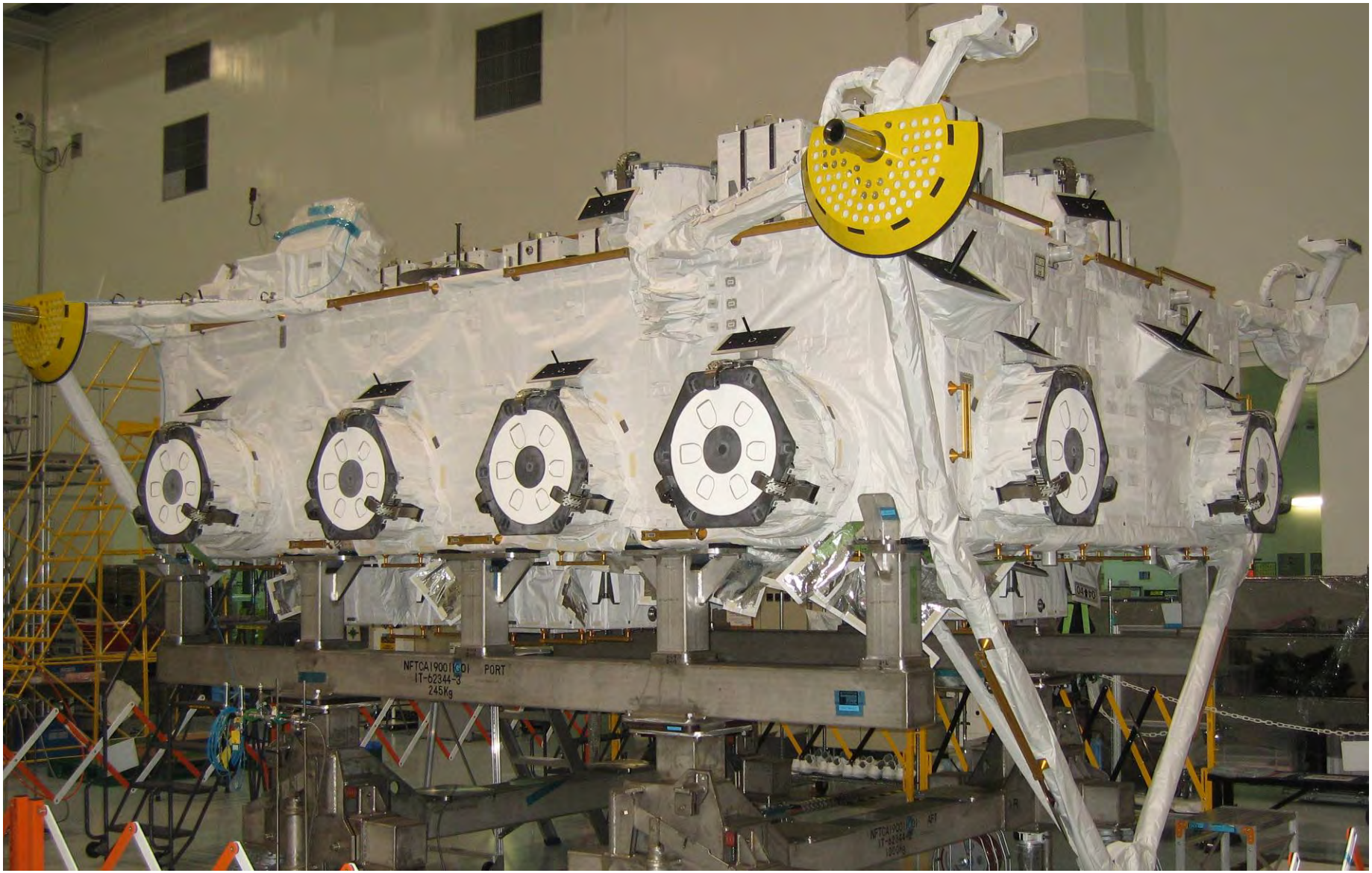
JEF HANDRAILS AND WIF LOCATIONS – NADIR FACE



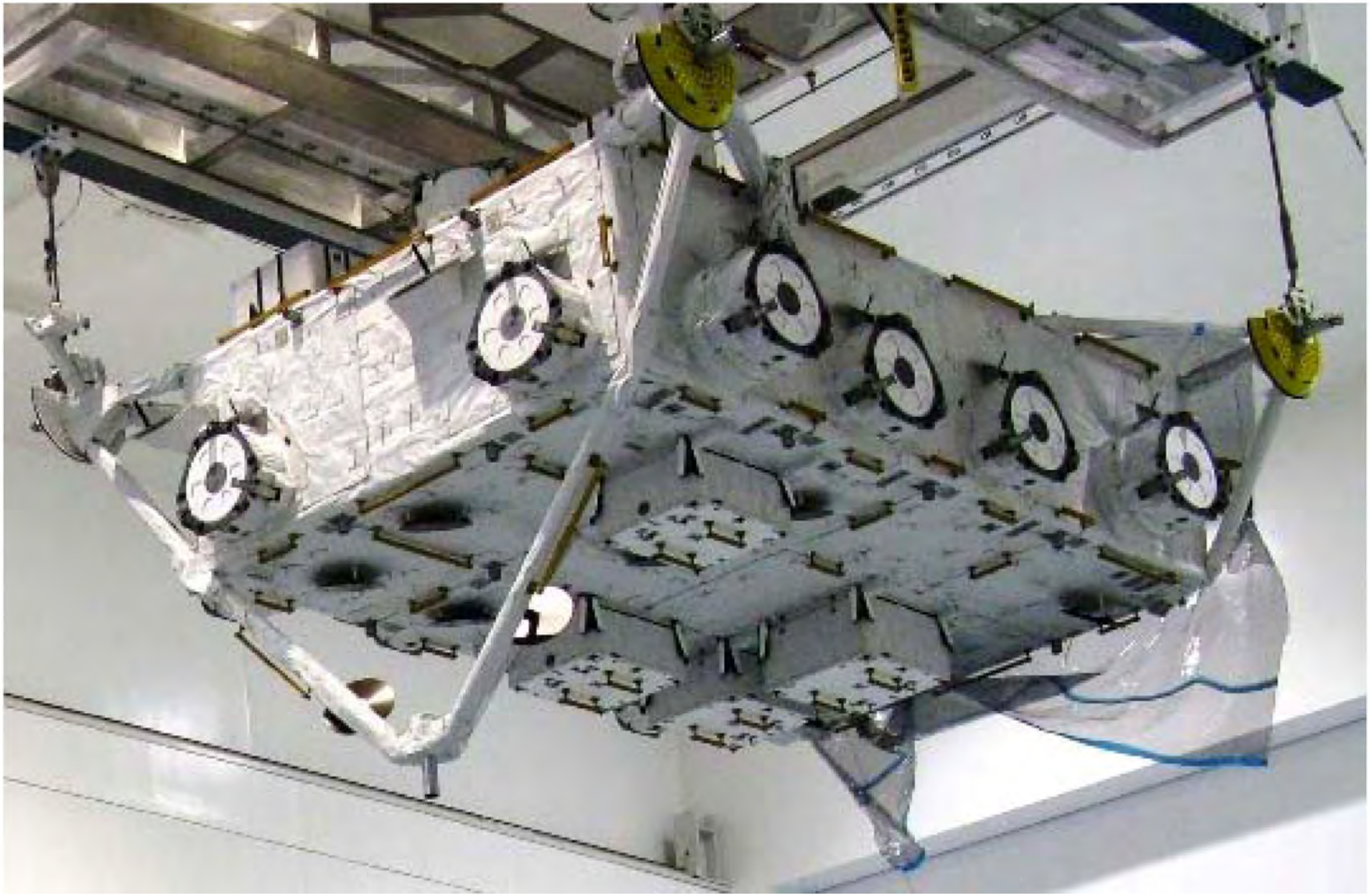
JEF HANDRAILS AND WIF LOCATIONS – AFT FACE



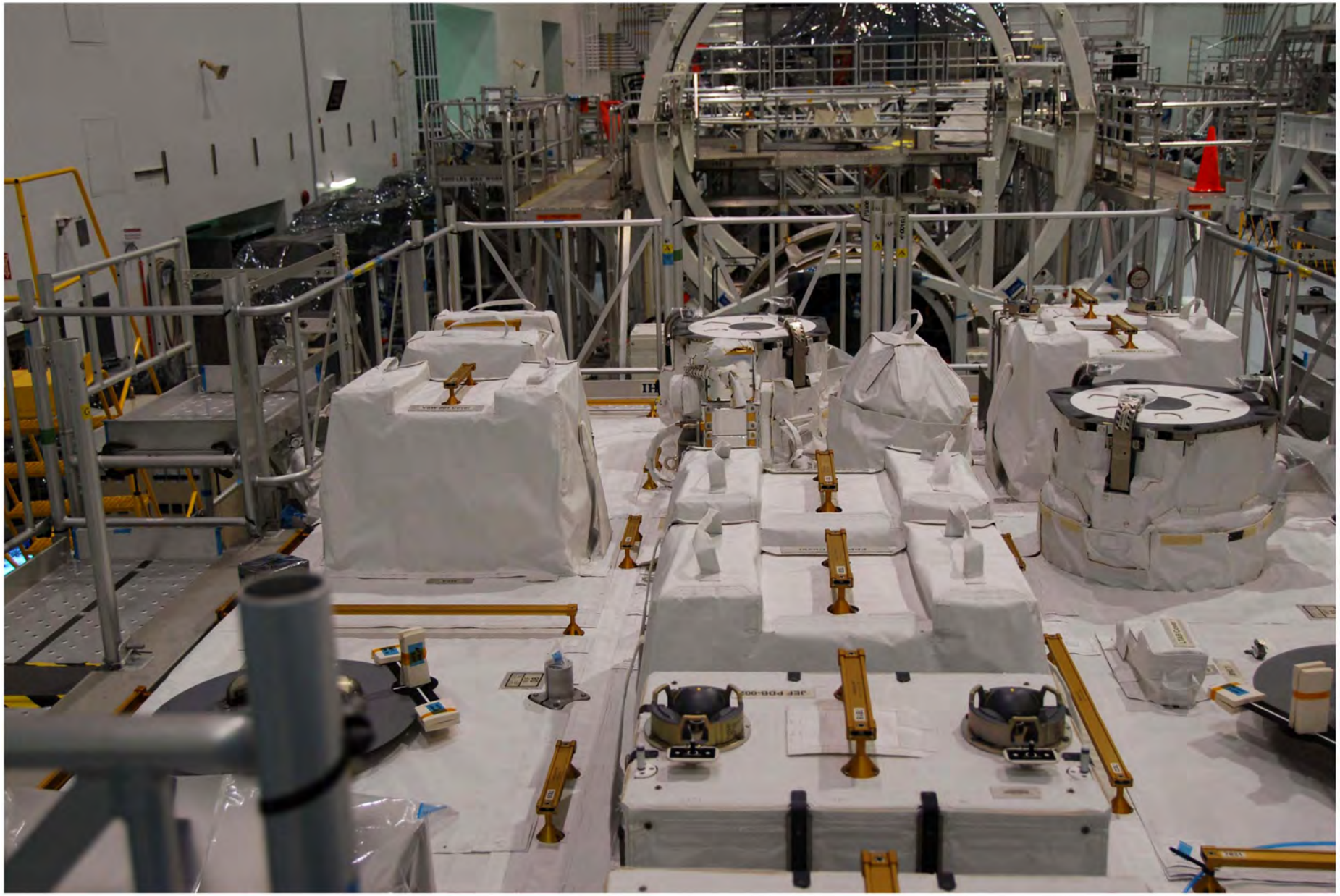
JEF OVERVIEW PHOTOS



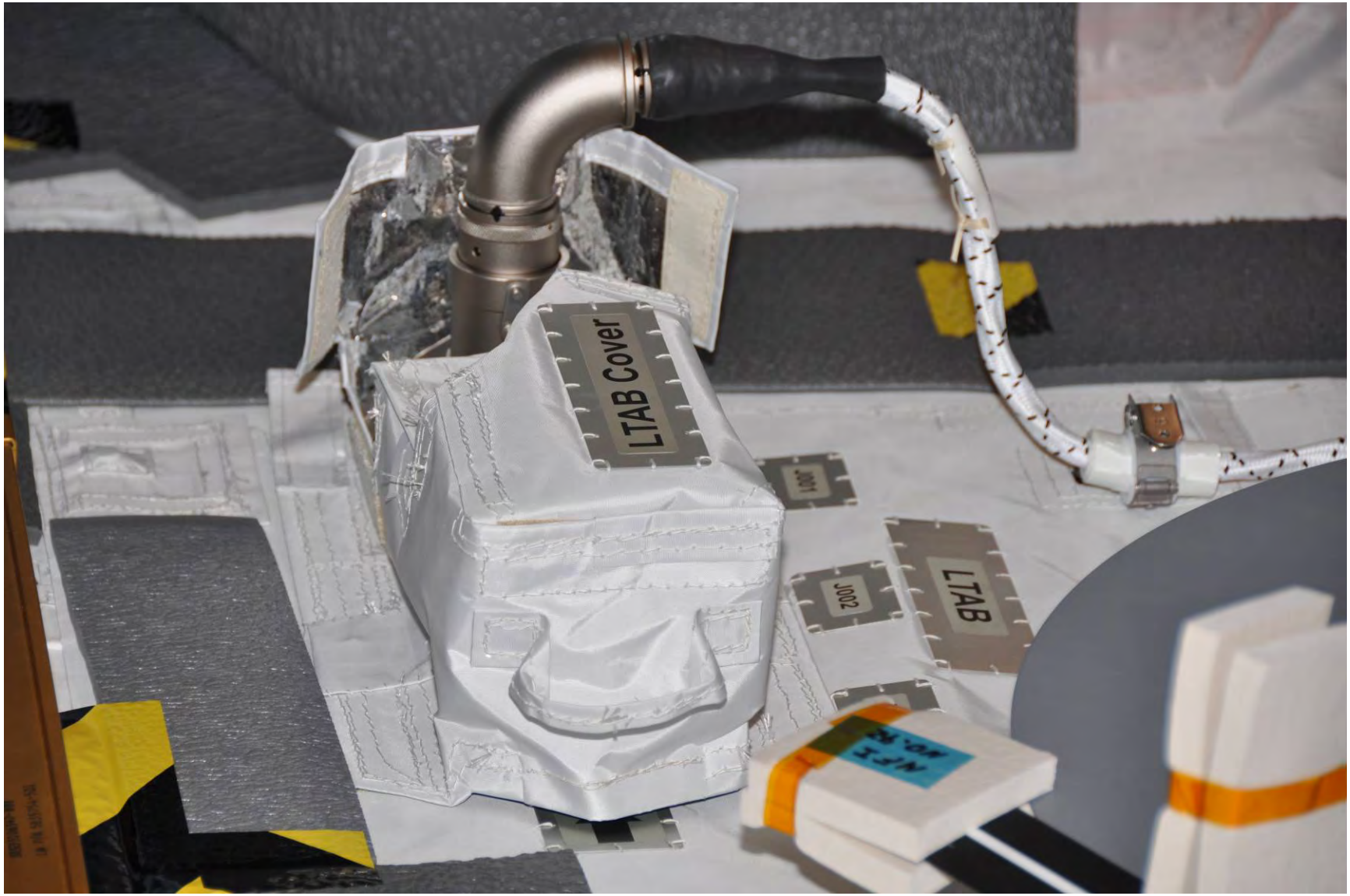
JEF OVERVIEW PHOTOS (Cont)



JEF OVERVIEW PHOTOS (Cont)



JEF LTA



EVA 1 – LTA Reconfig

3: Remove **LTA** Mode **Plug** – Bring Inside

1: Remove LTA Cable – Install on ECSH

LAUNCH CONFIG

4: Install **ISS2 Mode Plug** – from Inside

2: Install Cap from ECSH

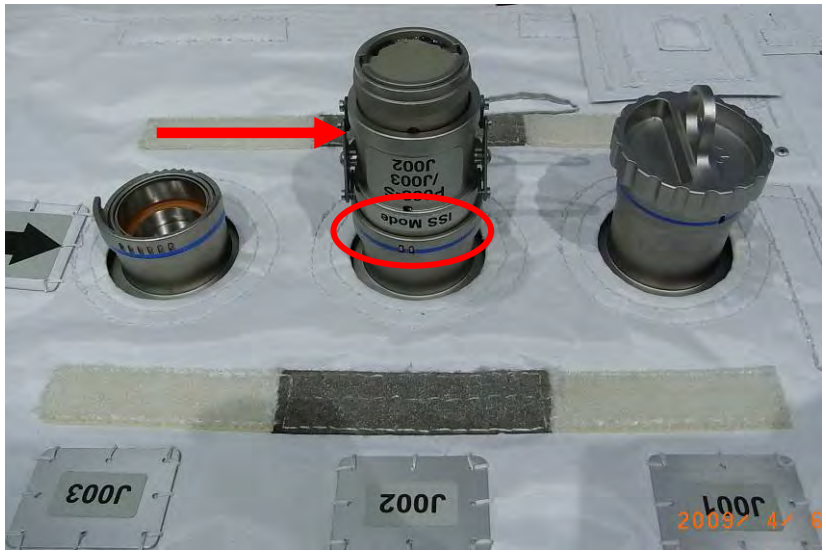
POST EVA 1 CONFIG

EVA 4 – LTA Reconfig

1: Remove **ISS2 Mode Plug** – Bring Inside

2: Relocate **ISS Mode Plug**

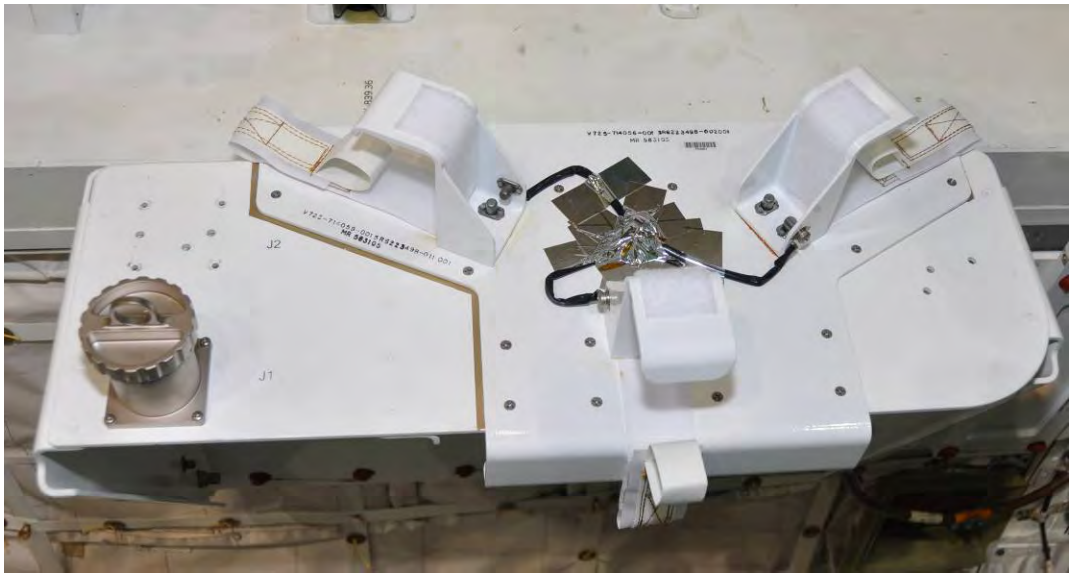
POST EVA 1 CONFIG



POST EVA 4 CONFIG

JEF ECSH

LAUNCH CONFIG



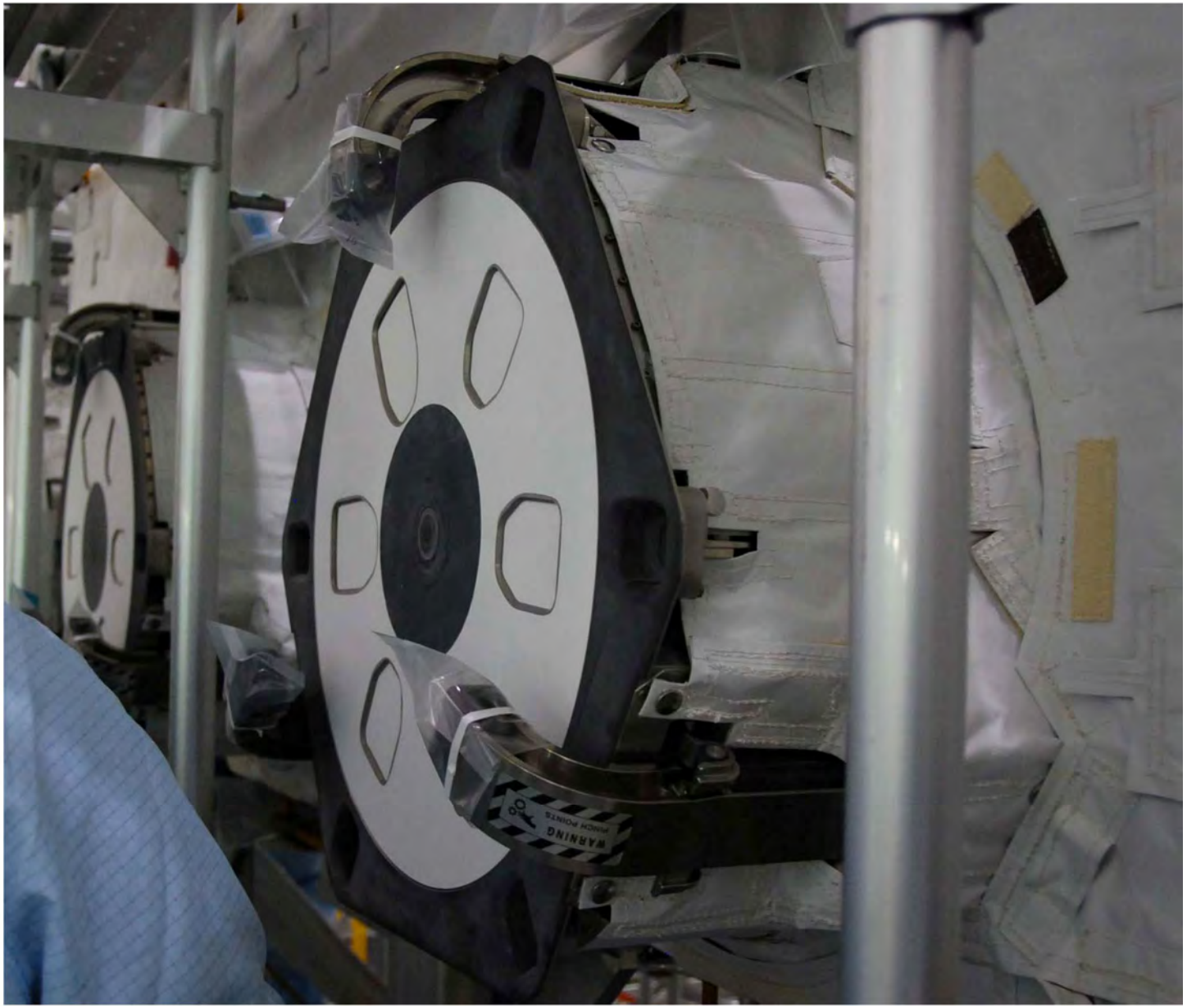
LANDING CONFIG

JEF VE

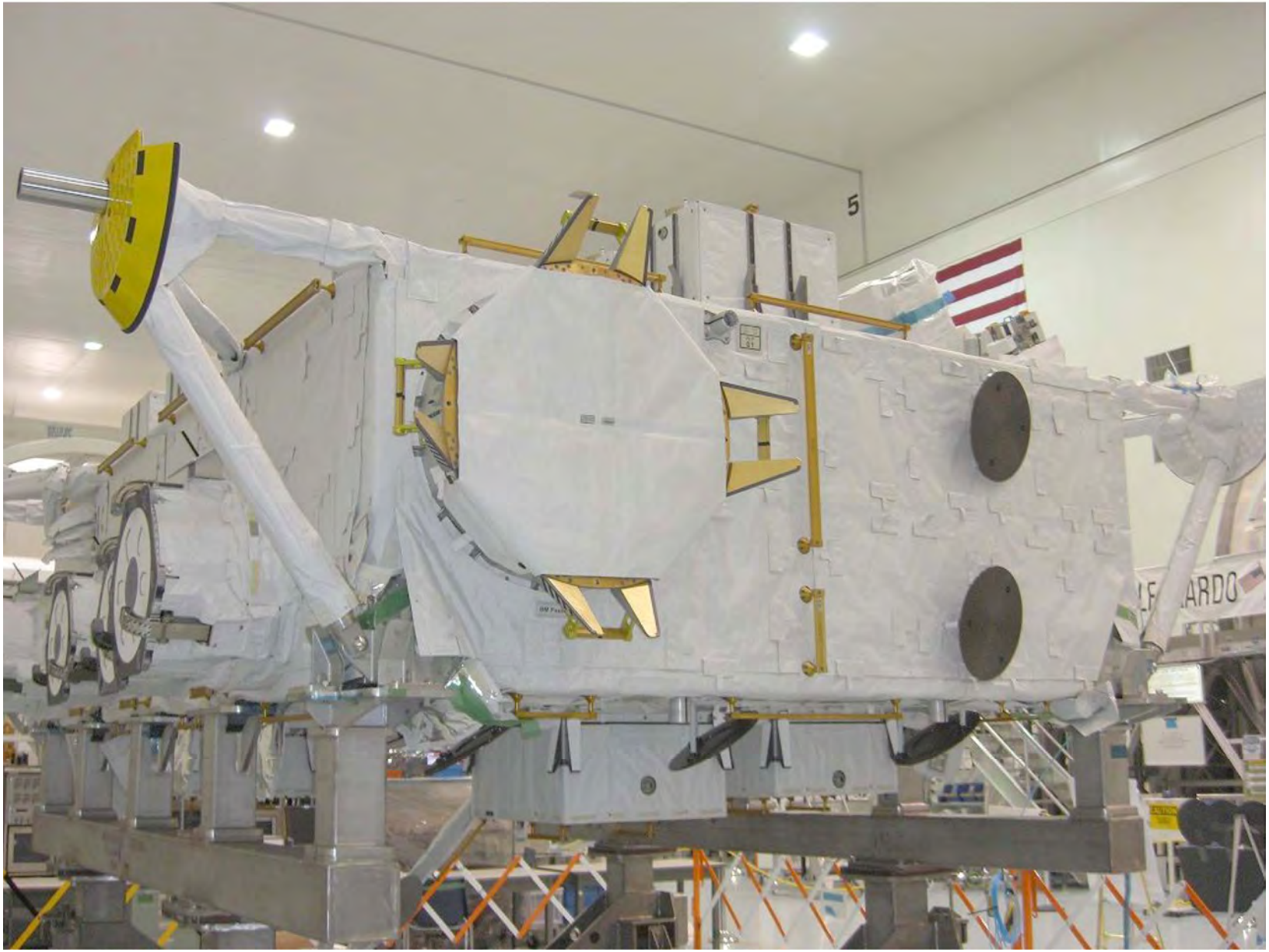
JEF VE (Cont)

VE Cable and MLI

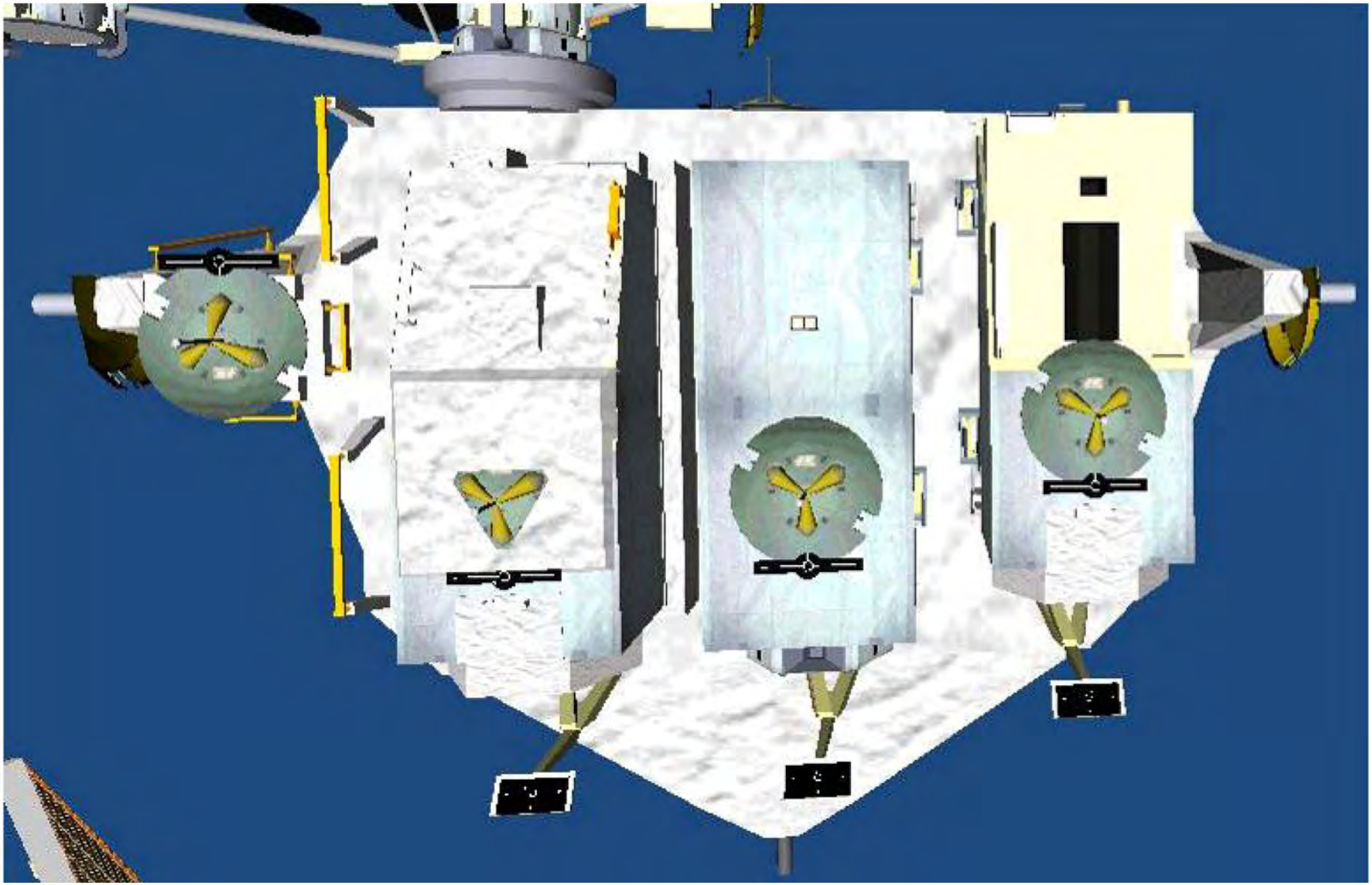
JEF EFU



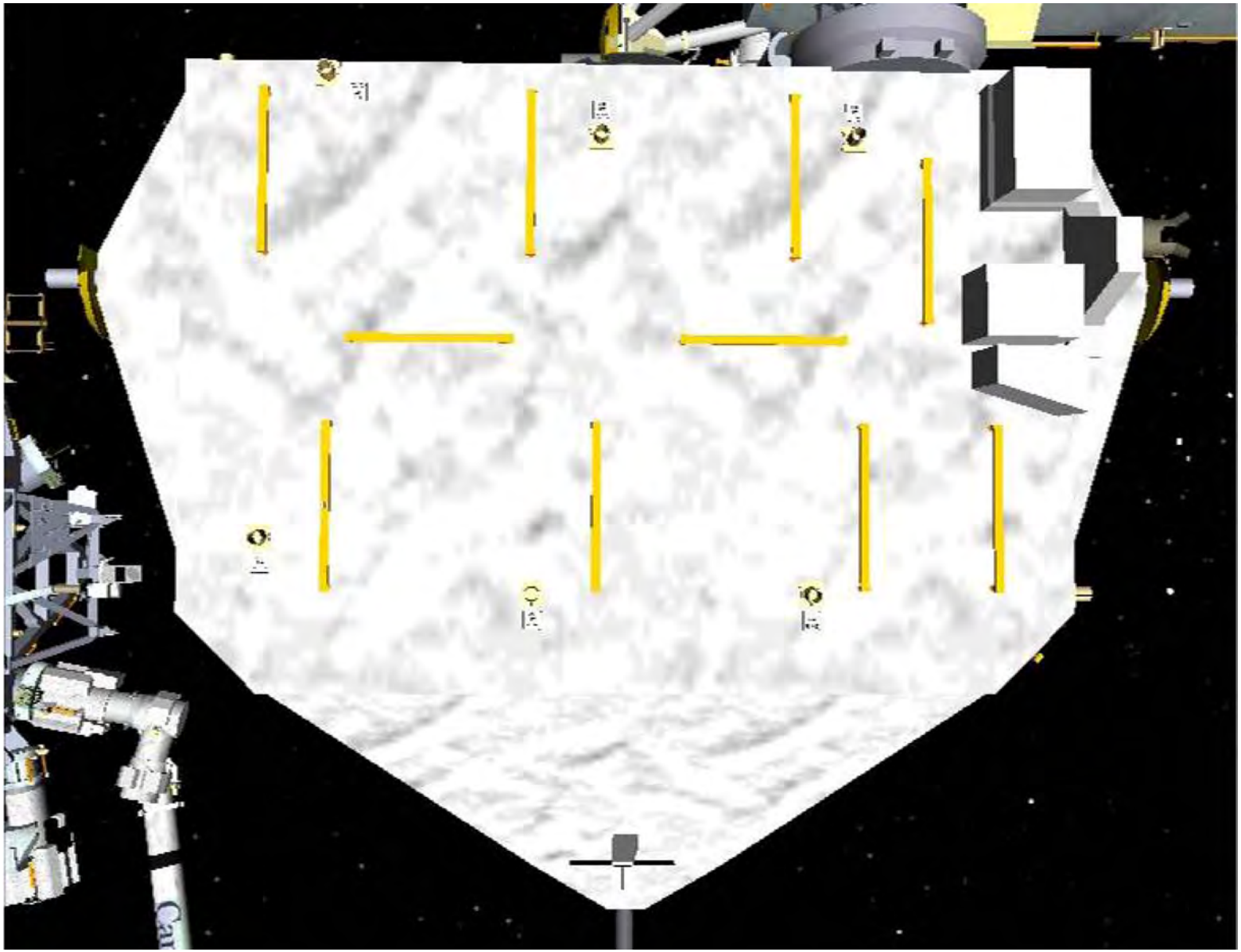
JEF EFBM



JLE HANDRAILS AND WIF LOCATIONS



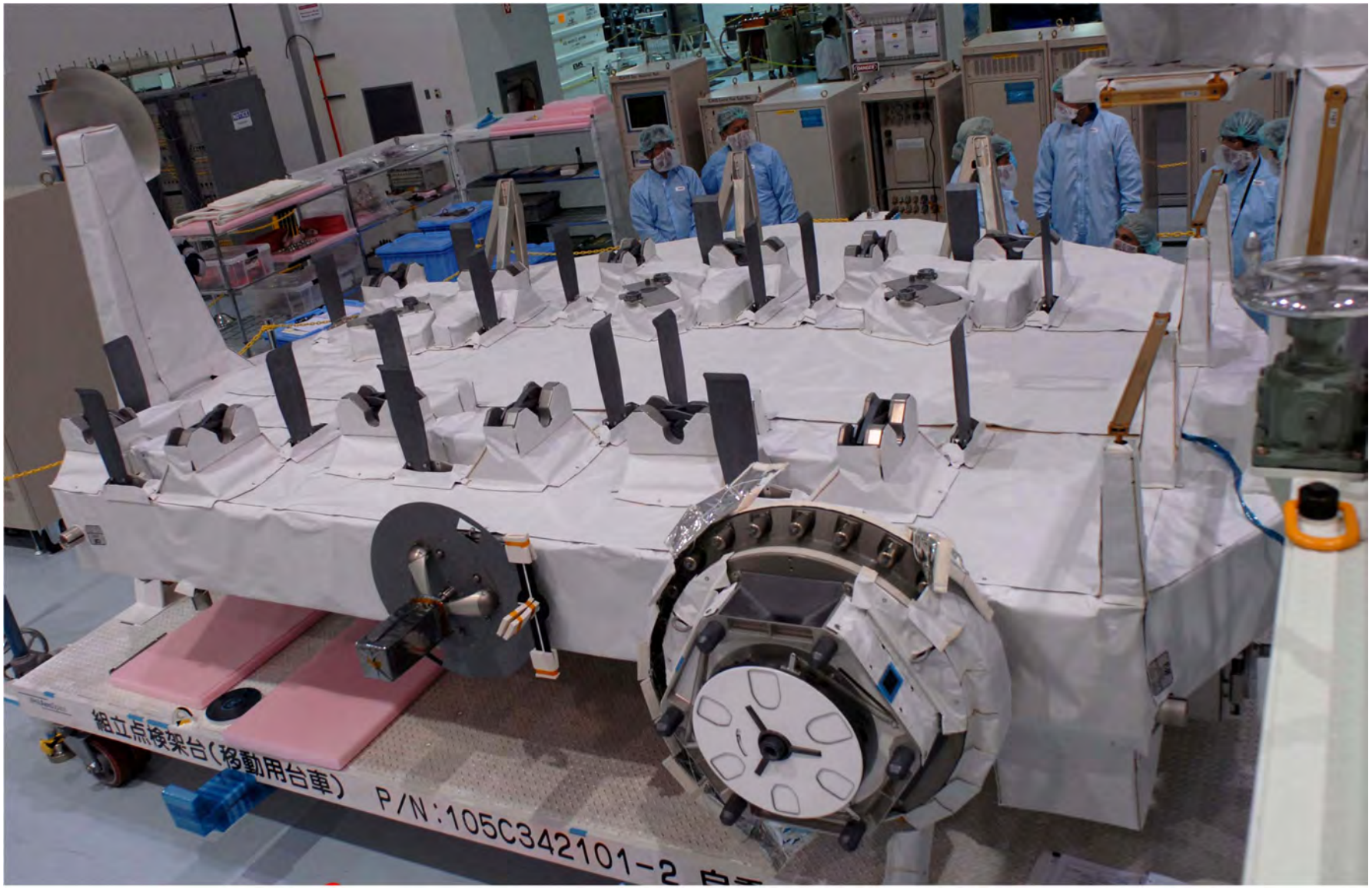
JLE HANDRAILS AND WIF LOCATIONS (Cont)



JLE OVERVIEW PHOTOS

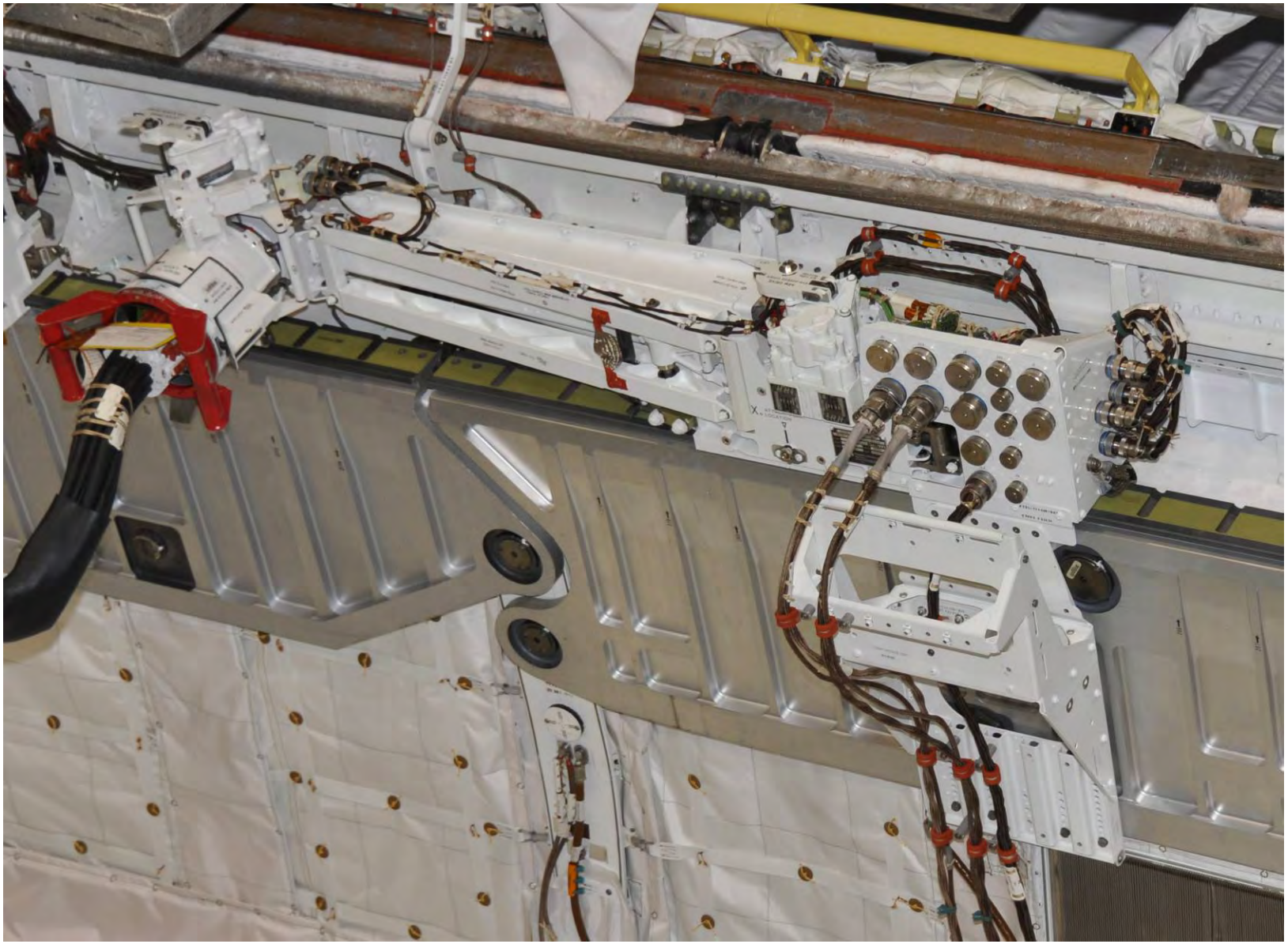
JLE OVERVIEW PHOTOS (Cont)

JLE OVERVIEW PHOTOS (Cont)



JLE OVERVIEW PHOTOS (Cont)

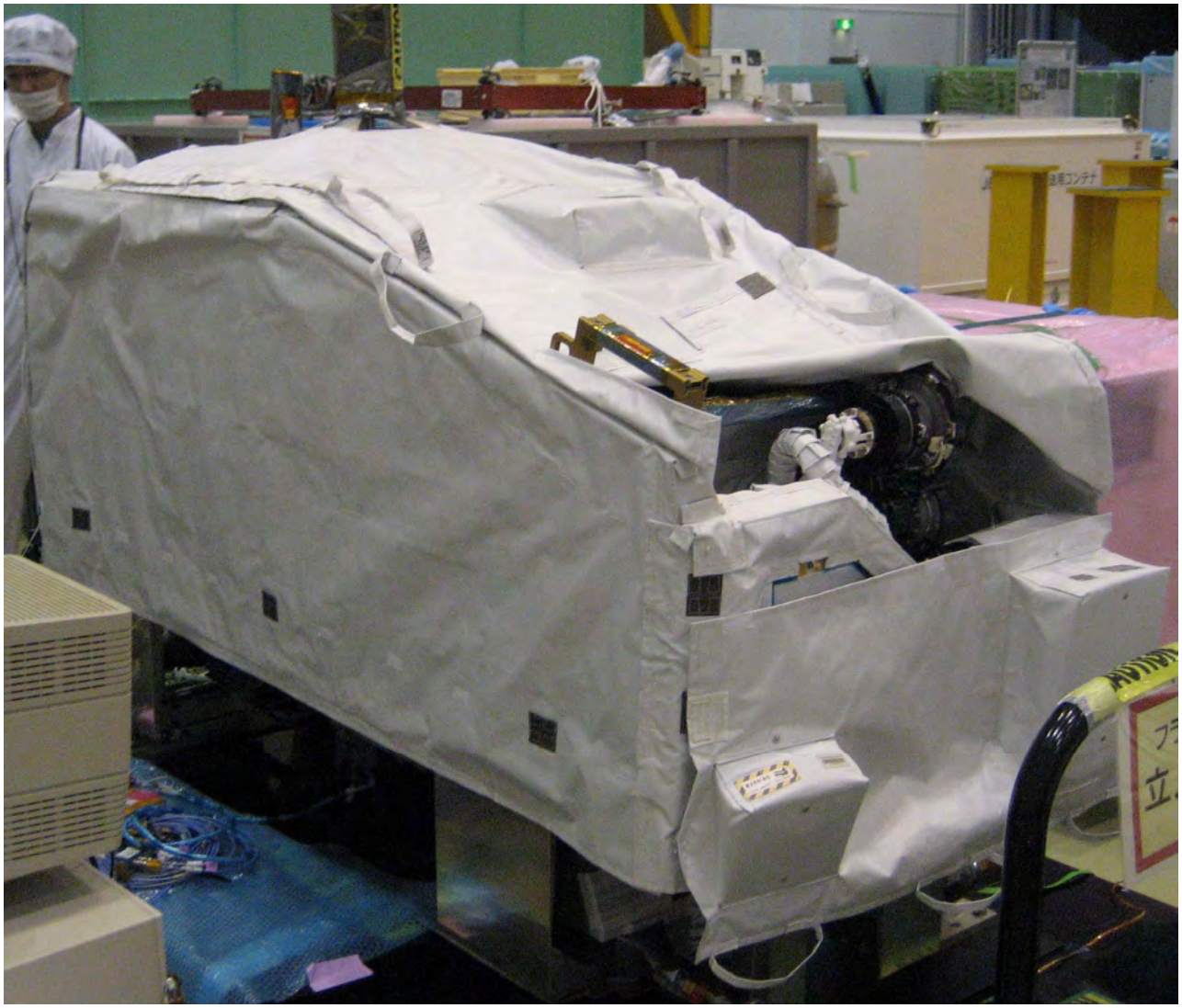
JLE ROEU



JLE MAXI

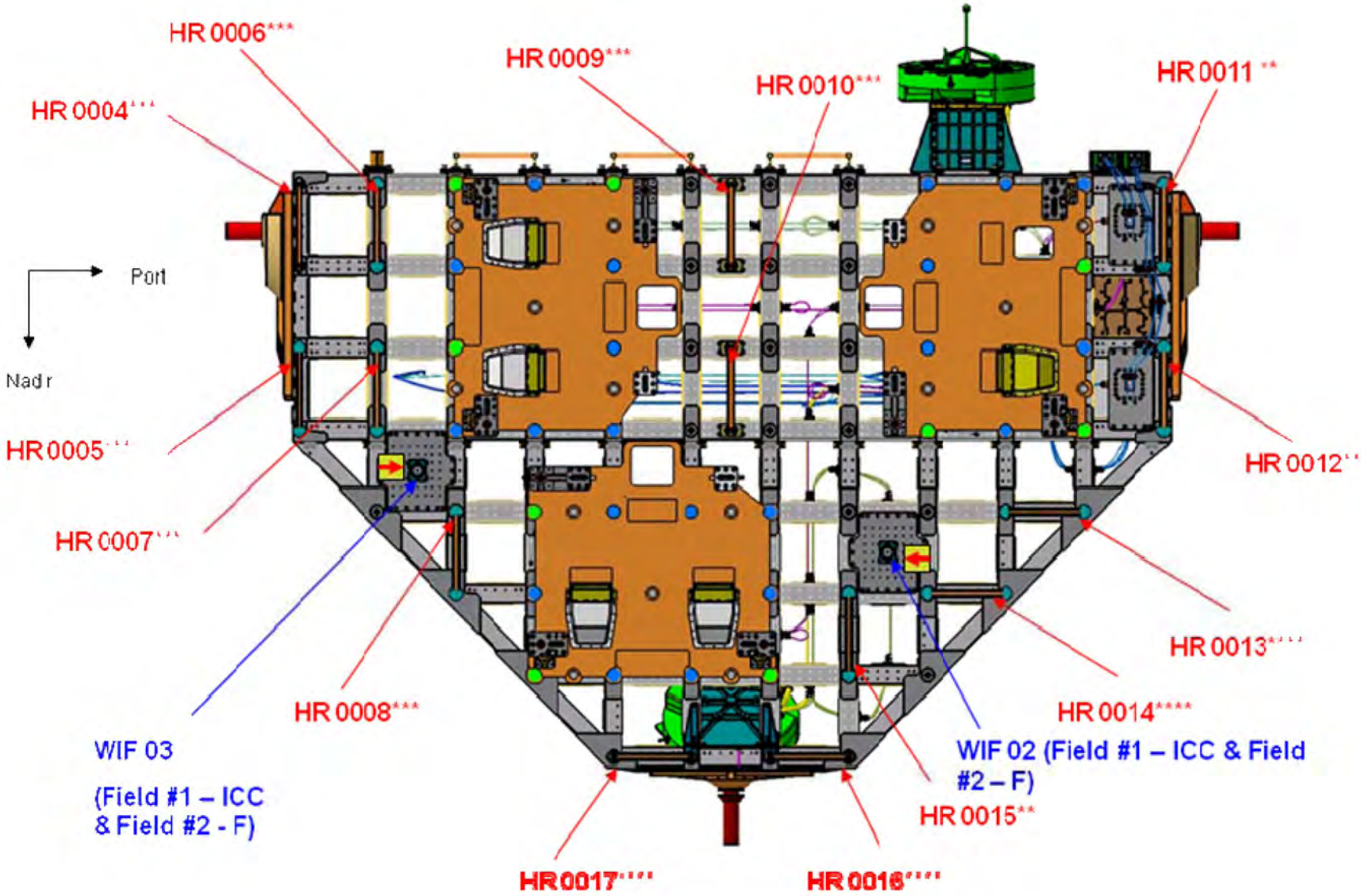
JLE SEDA-AP

PLM(1)
PLM
RELEASE
MST
STATUS
MST
EXTEND
STOW
PLM(2)
BLM
LOCK
BLM

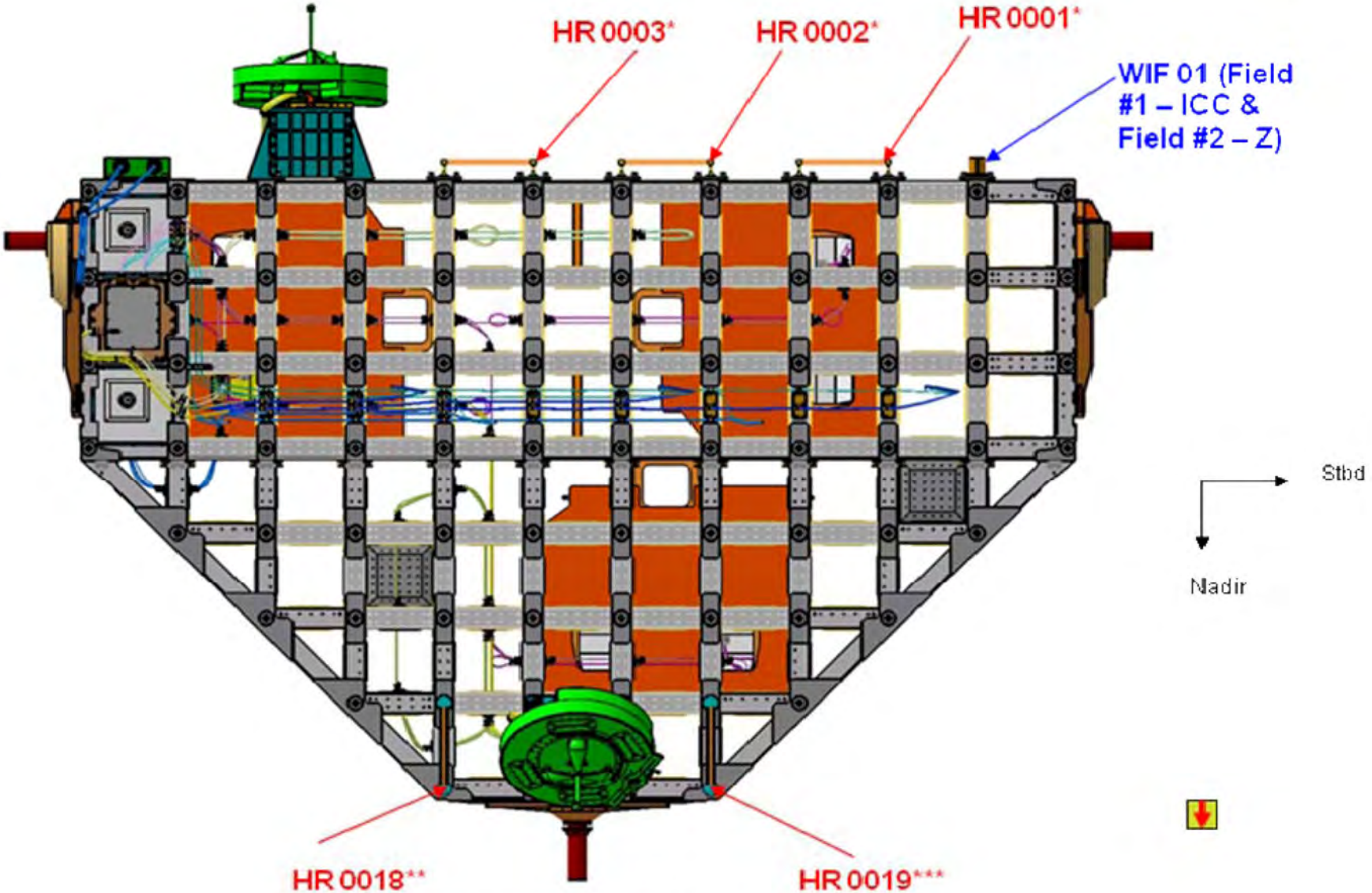


JLE MLI

ICC-VLD HANDRAILS AND WIF LOCATIONS – FORWARD FACE



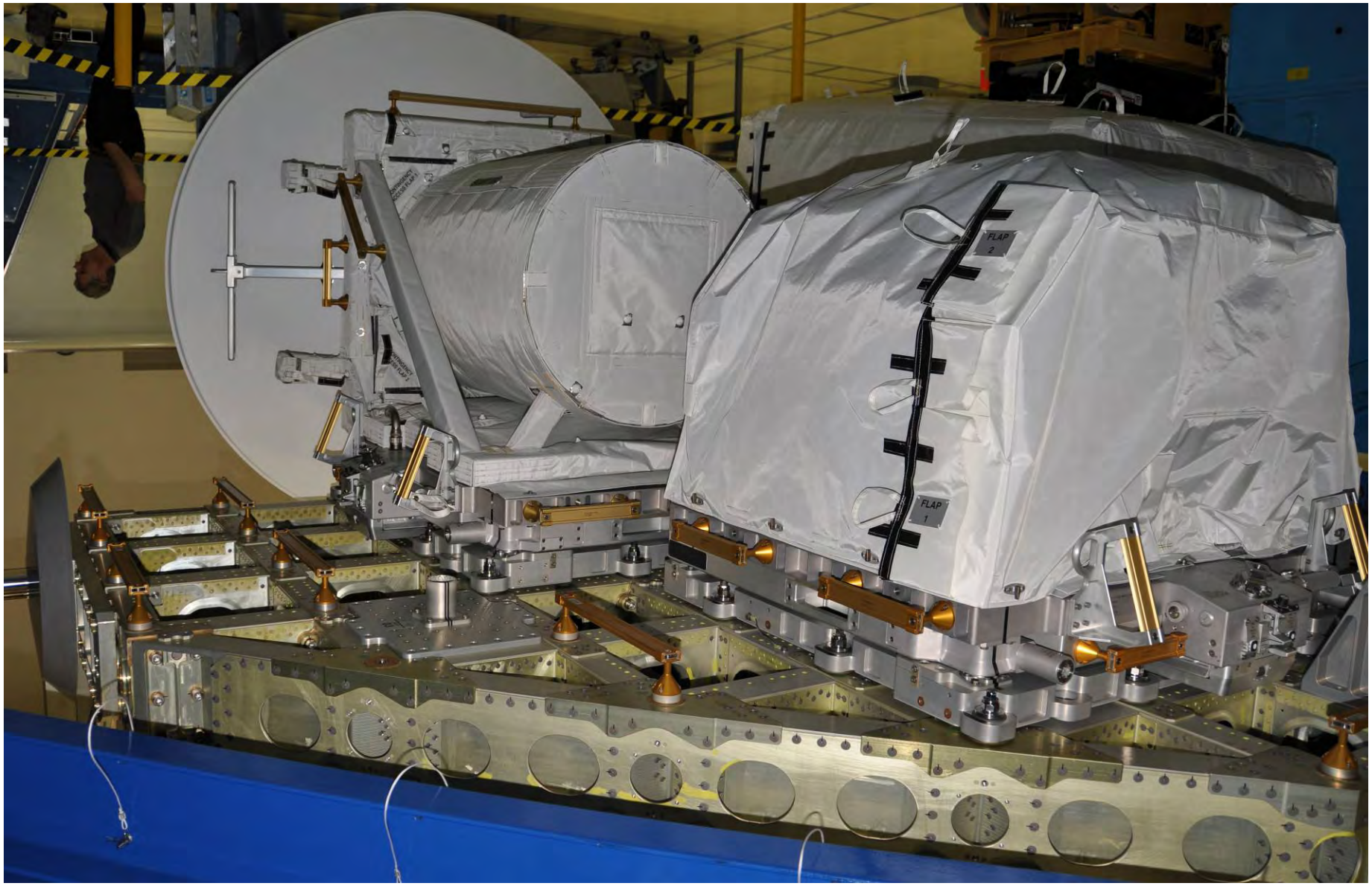
ICC-VLD HANDRAILS AND WIF LOCATIONS – AFT FACE



ICC-VLD OVERVIEW PHOTOS

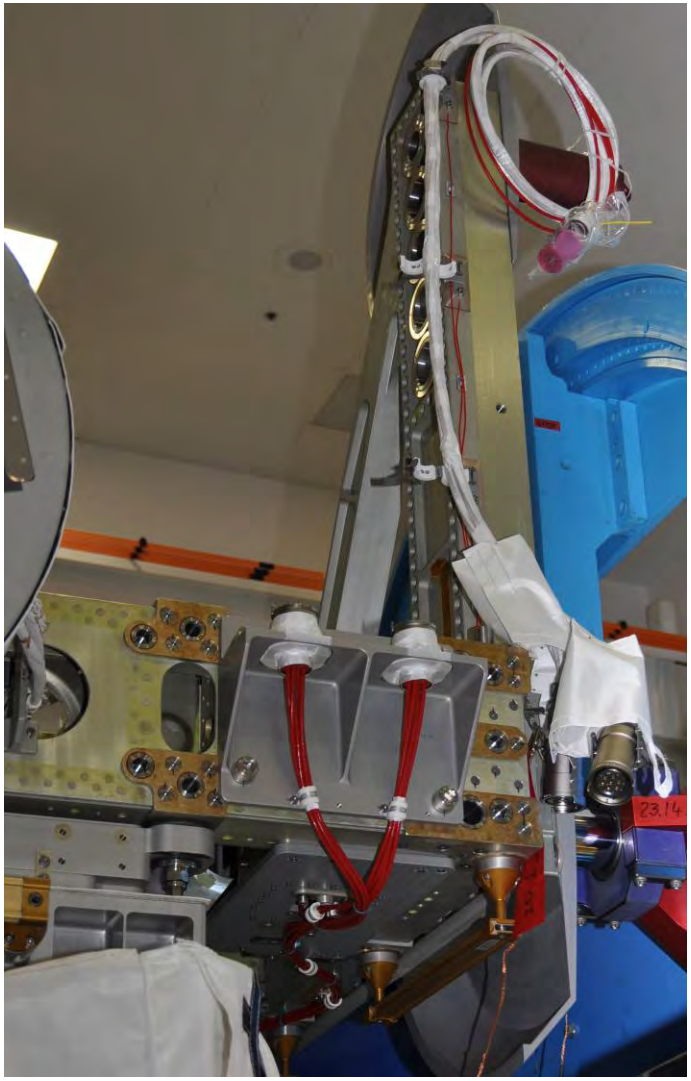
ICC-VLD OVERVIEW PHOTOS (Cont)

ICC-VLD OVERVIEW PHOTOS (Cont)

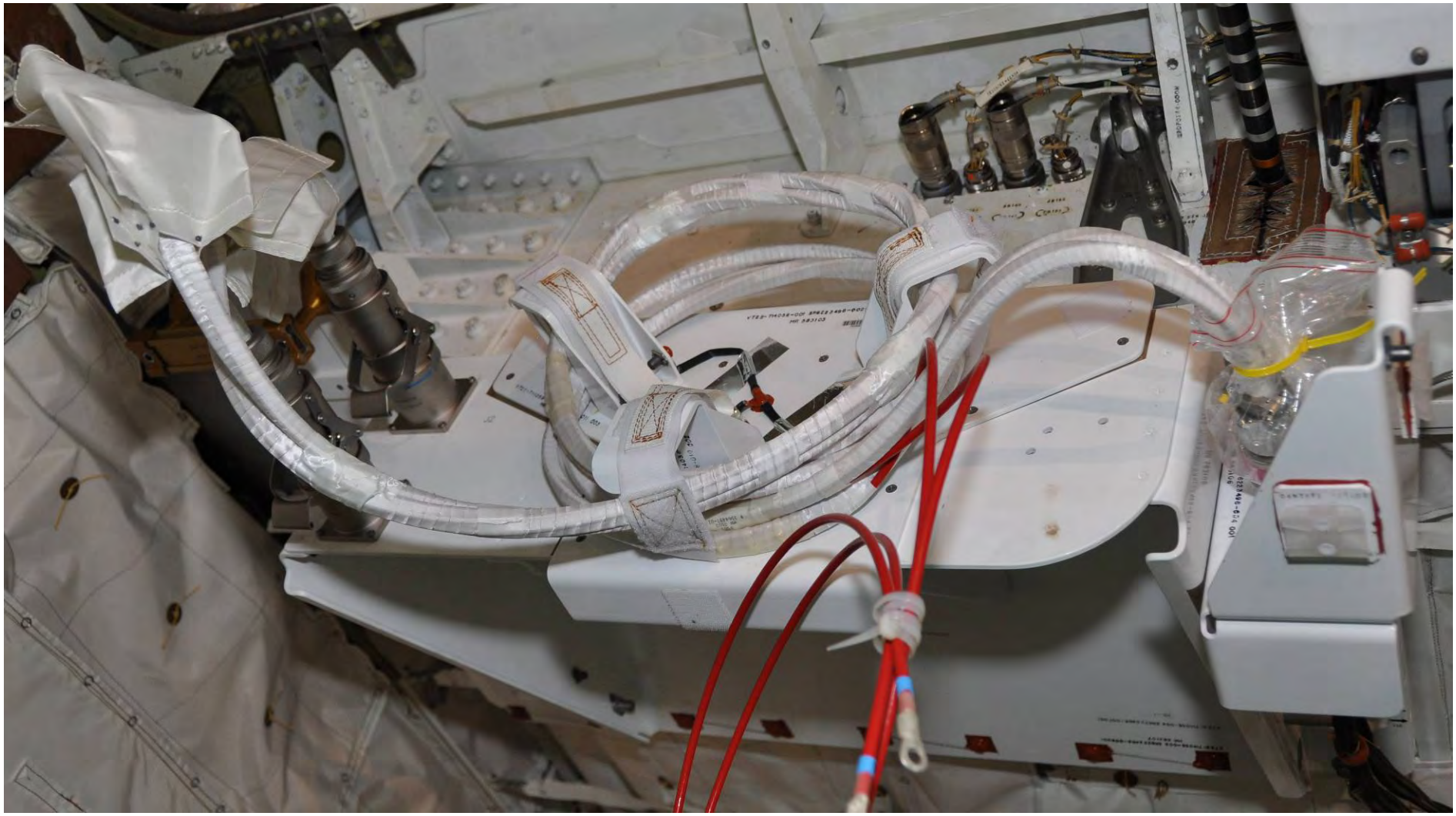


ICC-VLD OVERVIEW PHOTOS (Cont)

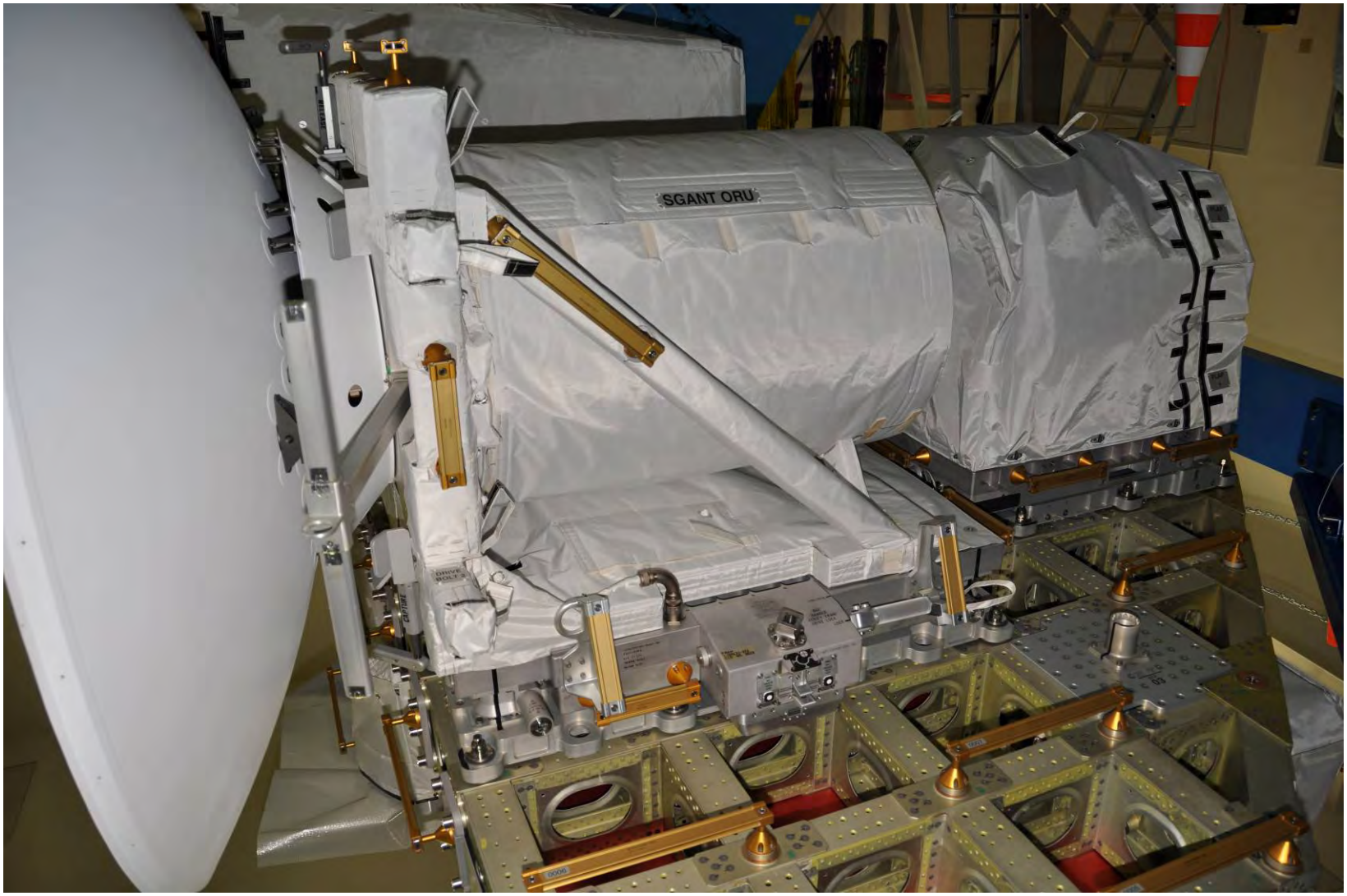
ICC-VLD LTA



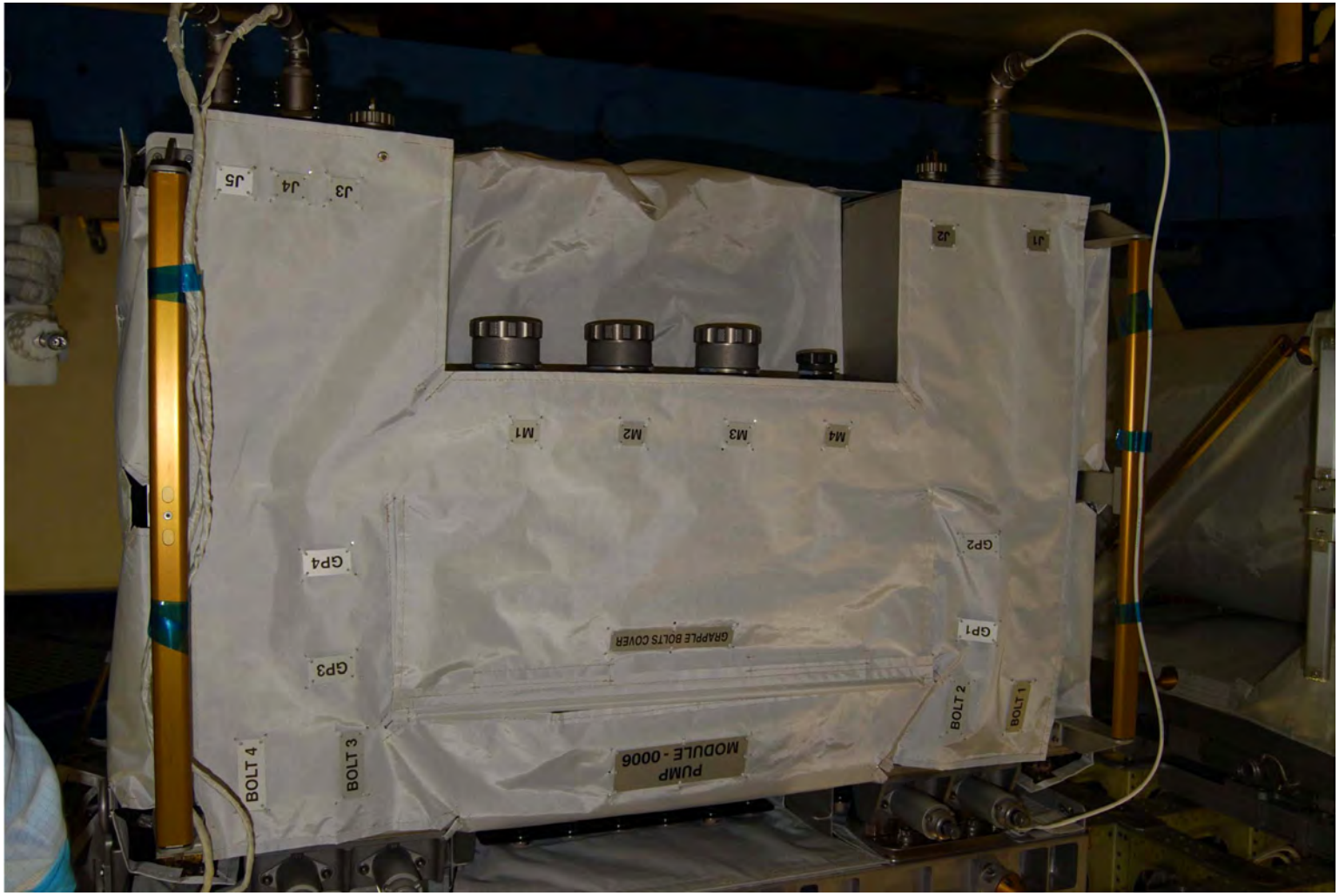
ICC-VLD ECSH



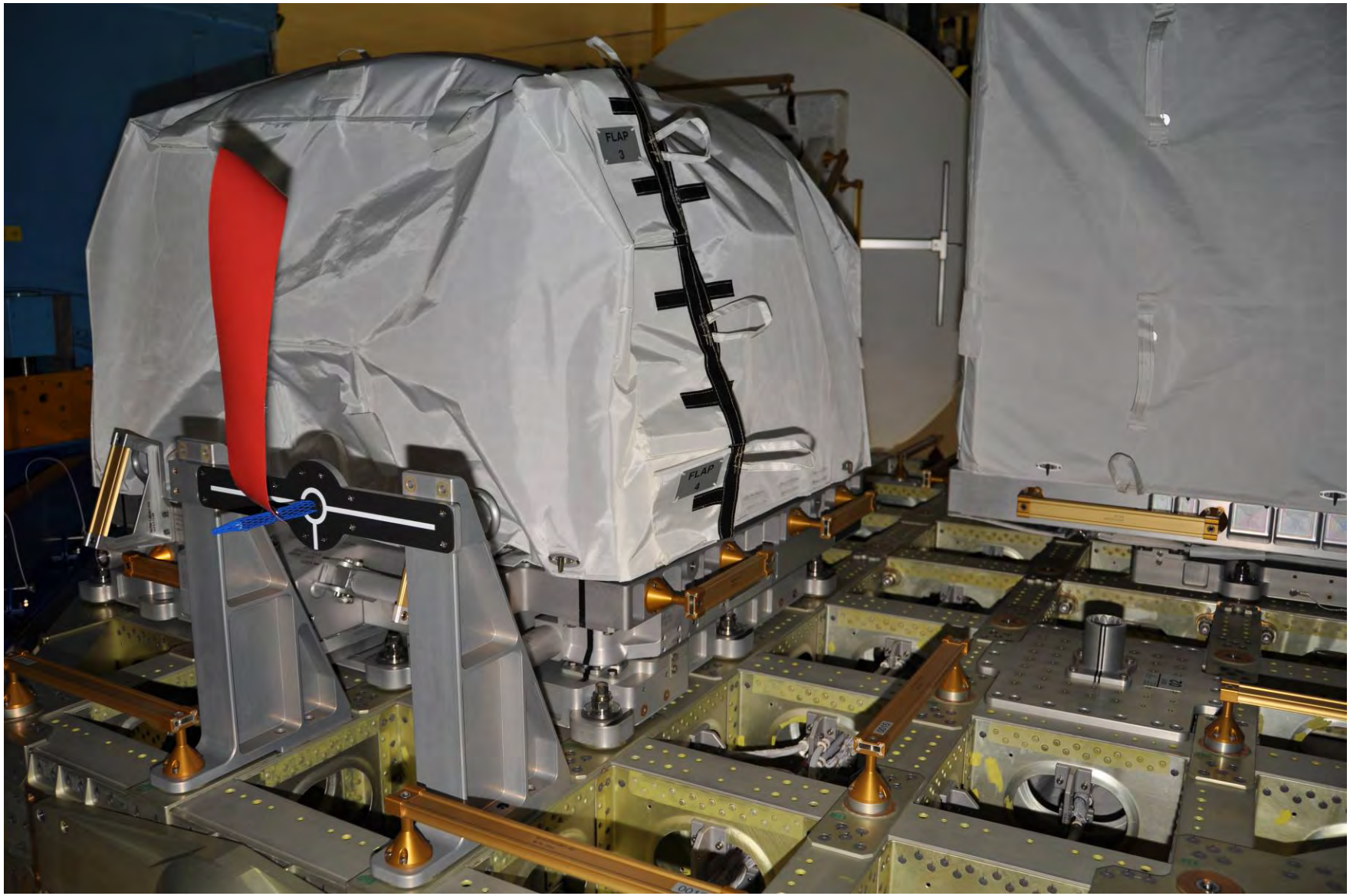
ICC-VLD SGANT



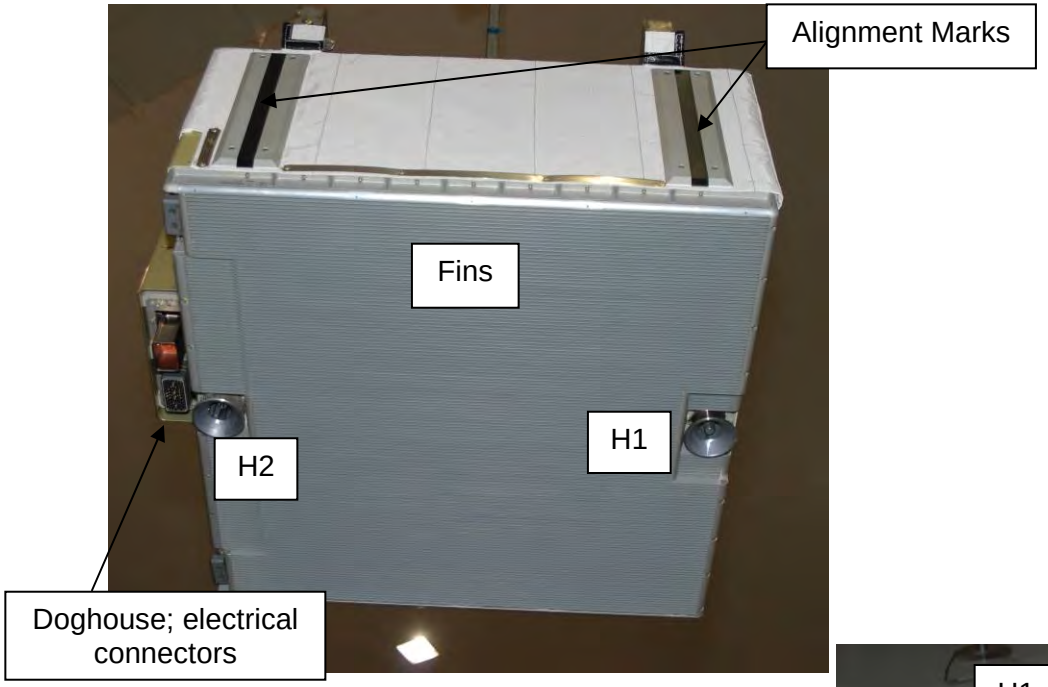
NOTE: PM MLI IS REMOVED IN THIS PHOTO



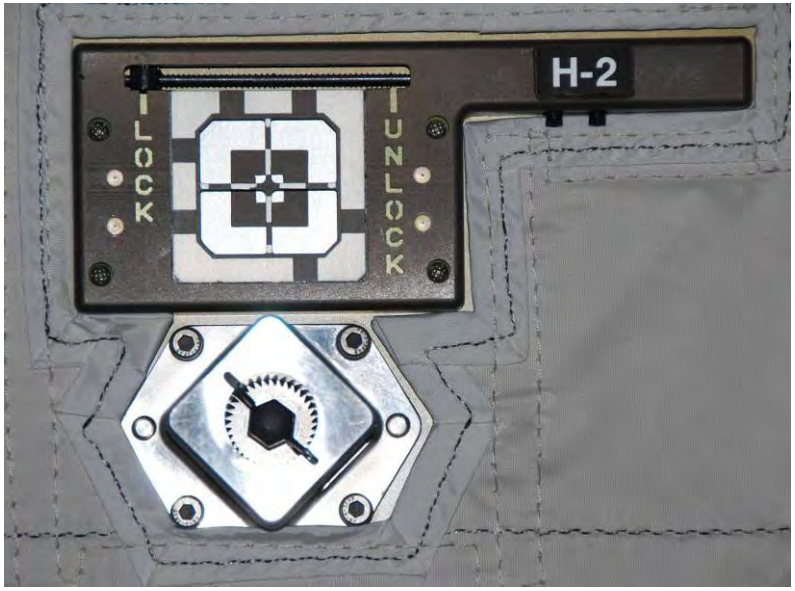
ICC-VLD LDU



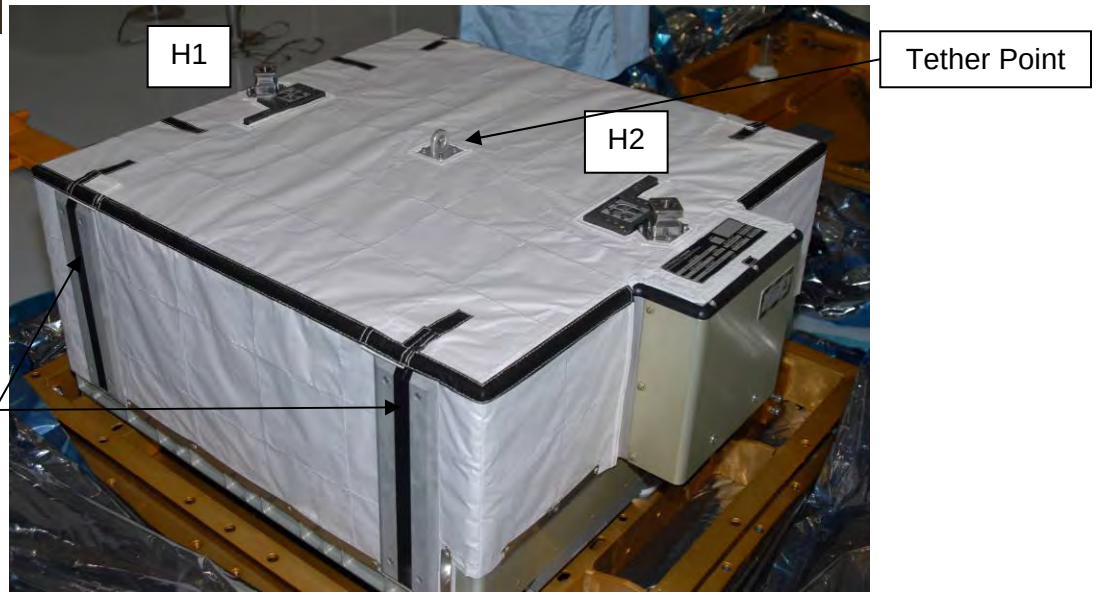
ICC-VLD BATTERIES



Backside of Battery (to Structure)



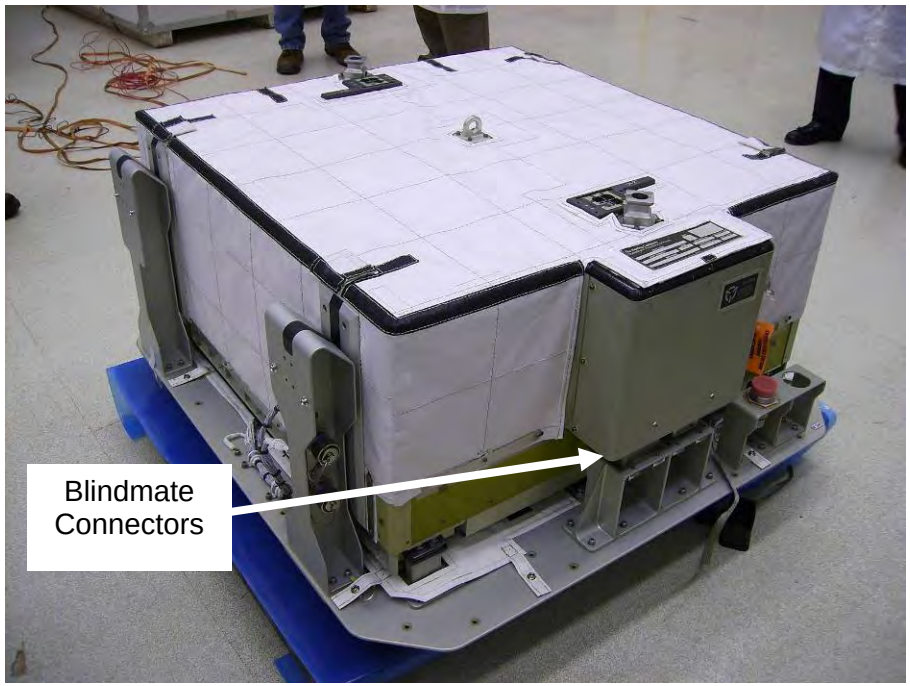
Lock/Unlock Indicator

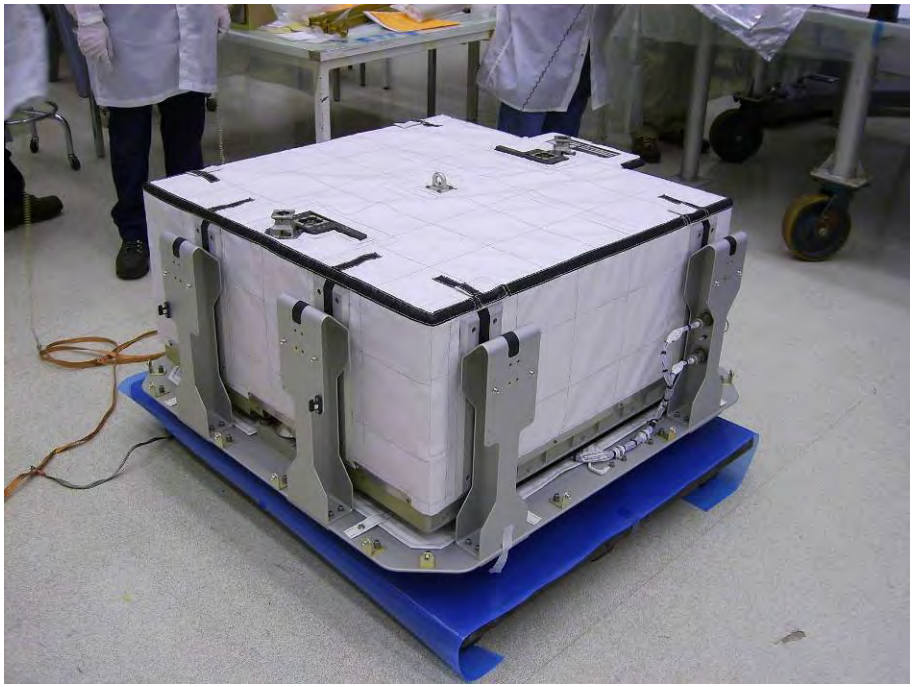


Top of Battery

ICC-VLD BATTERIES (Cont)

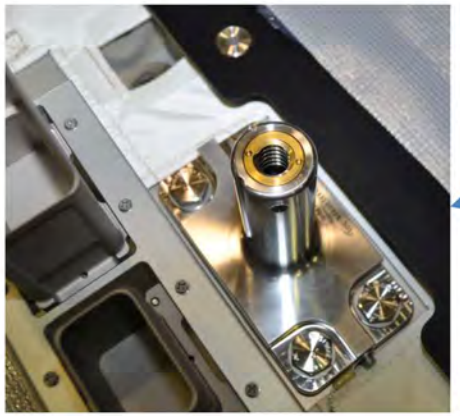
BATTERY INSTALLED ON FSE

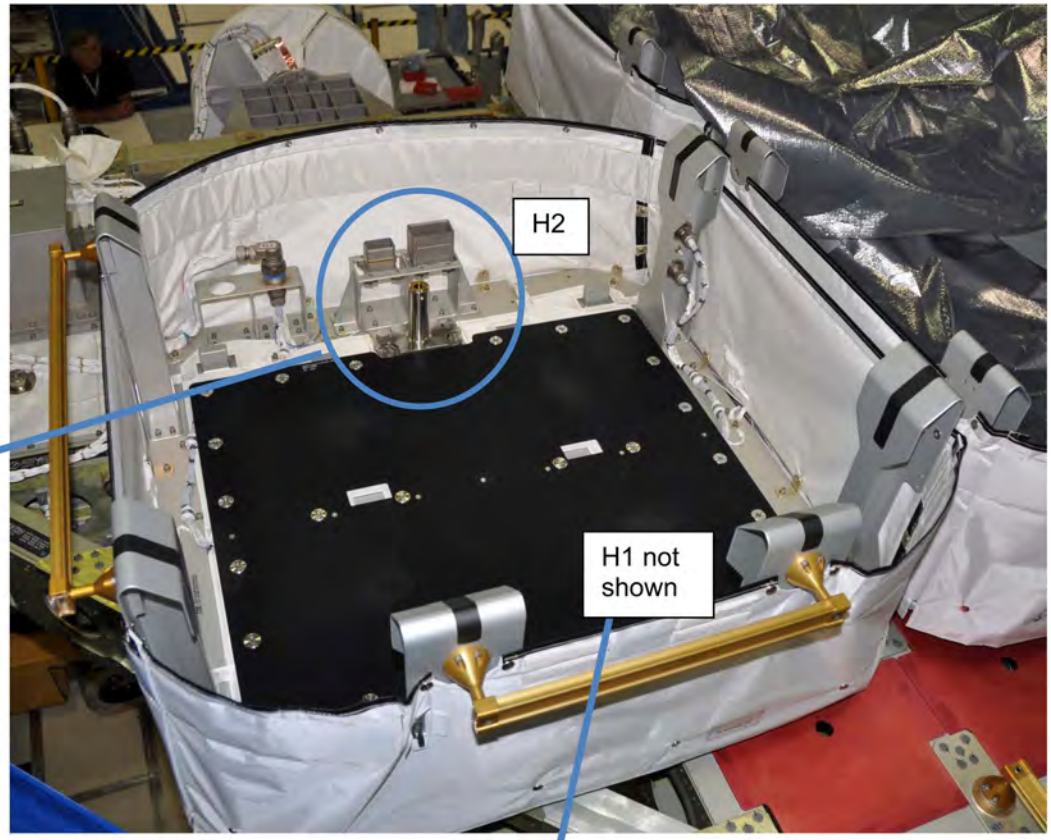




ICC-VLD BATTERIES (Cont)

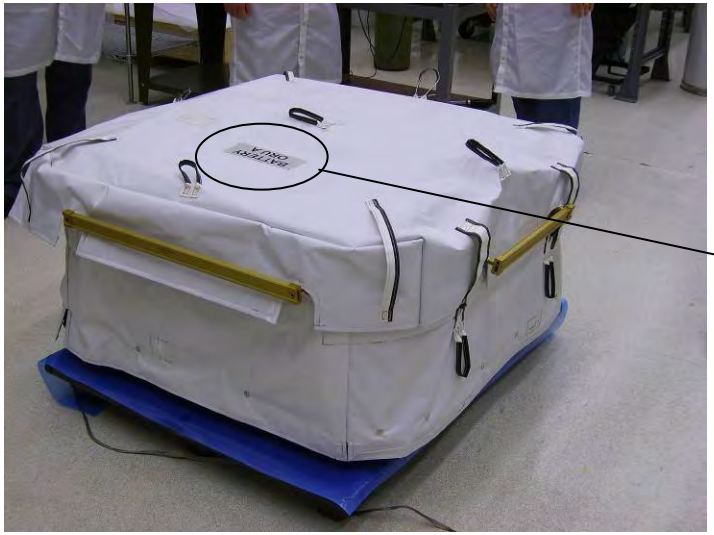
BATTERY FSE SHEAR PIN YELLOW STANCHION

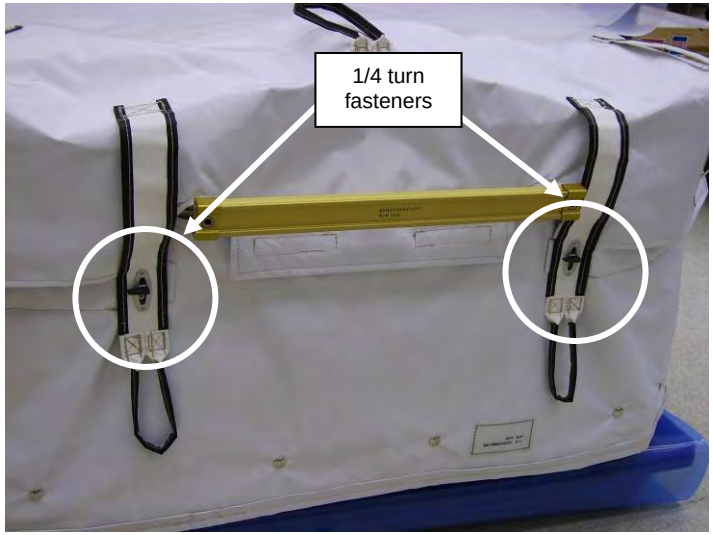




ICC-VLD BATTERIES (Cont)

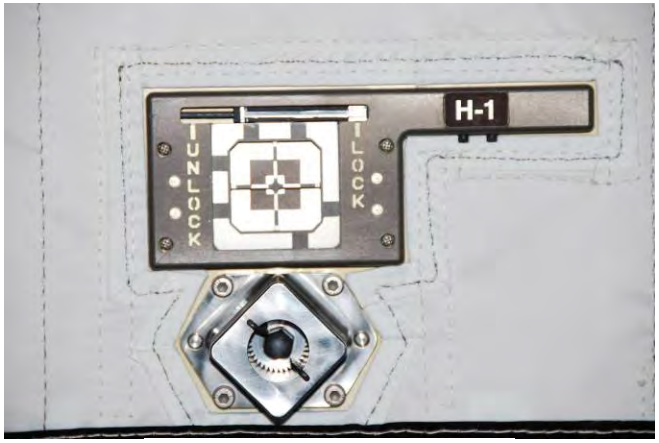
FSE MLI



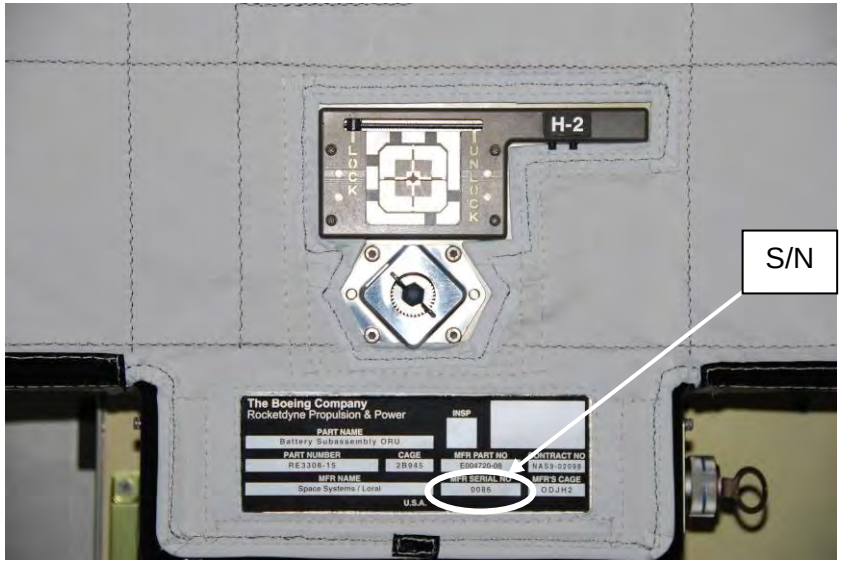


ICC-VLD BATTERIES (Cont)

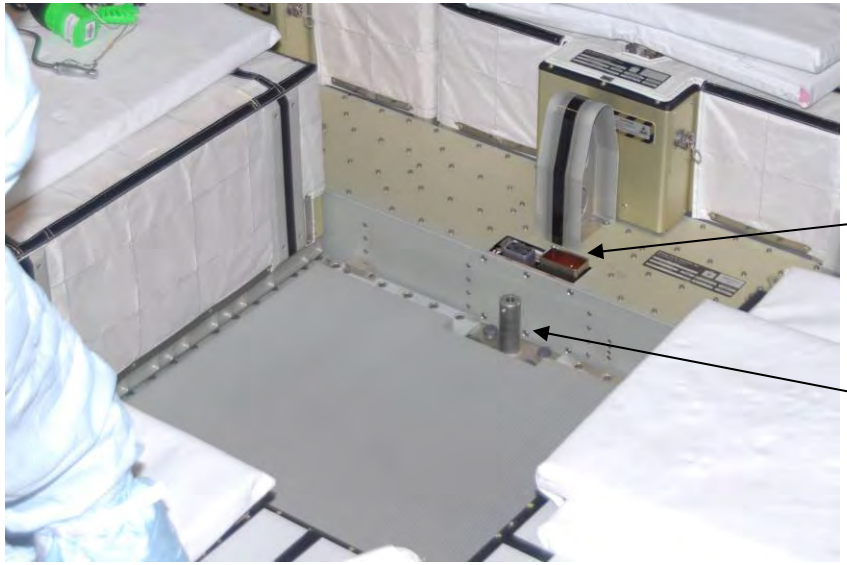
BATTERY ORU



H-1

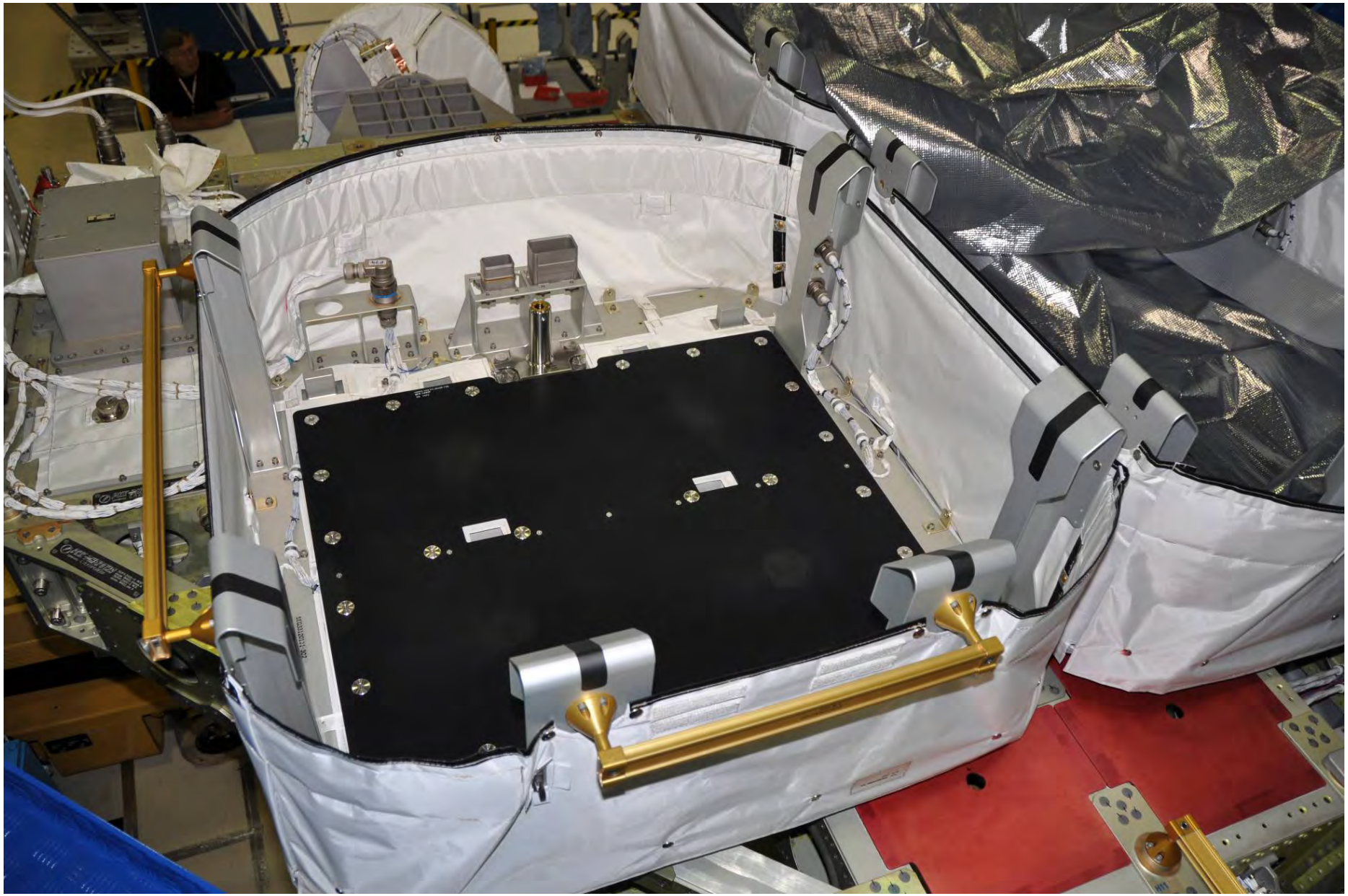


H-2 Lock/Unlock Indicator

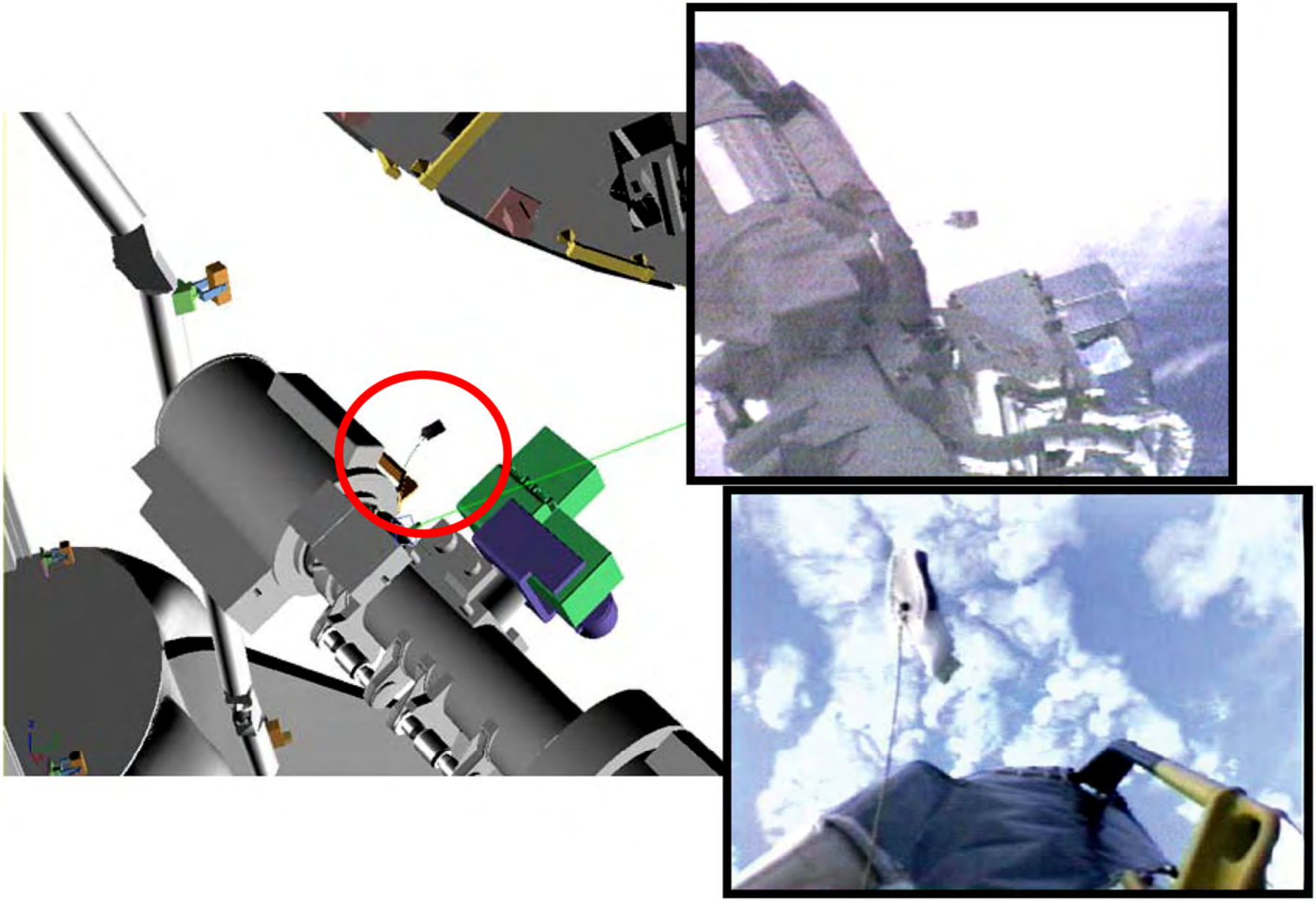


IEA Interface

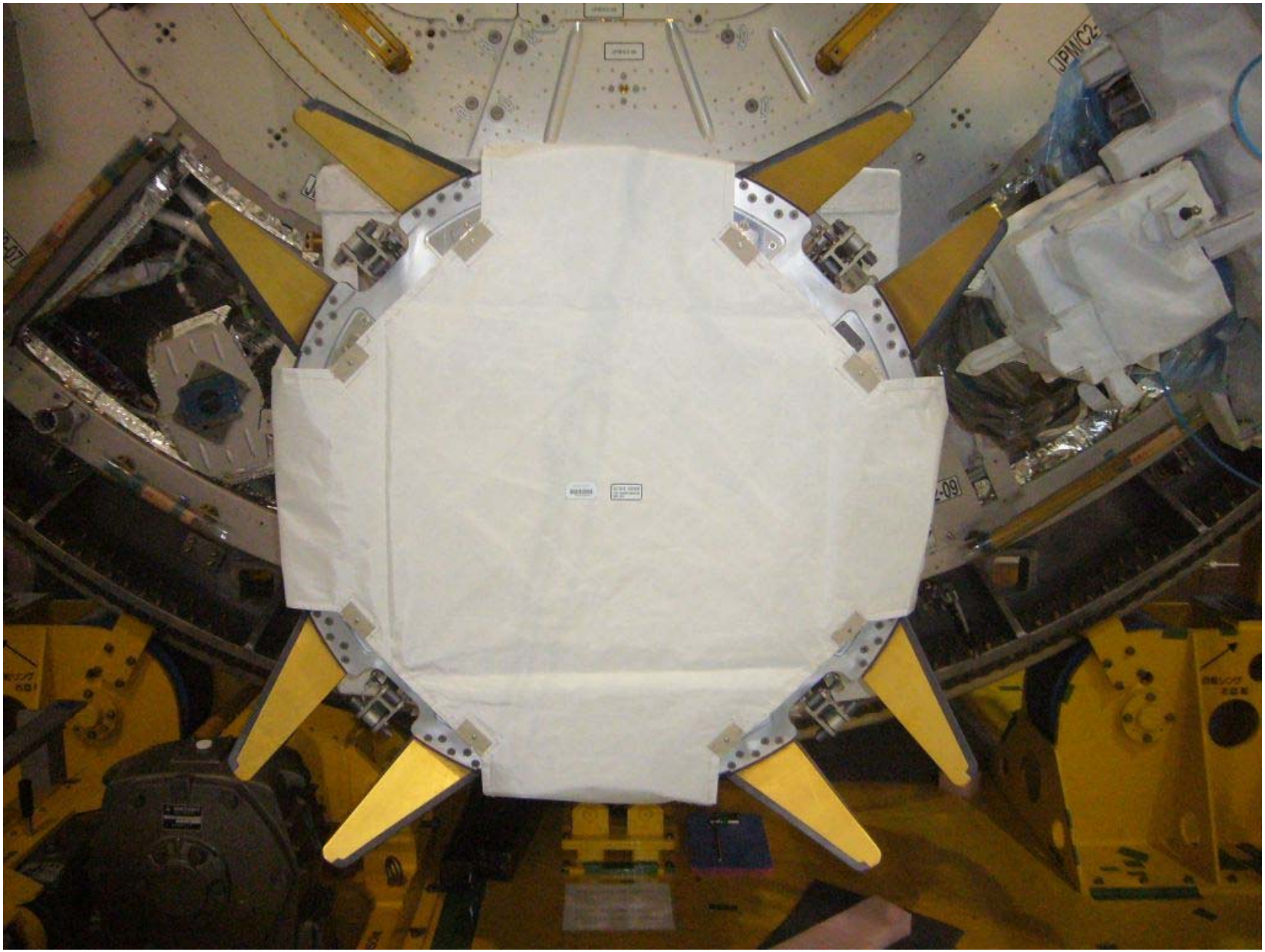
ICC-VLD BATTERIES (Cont)



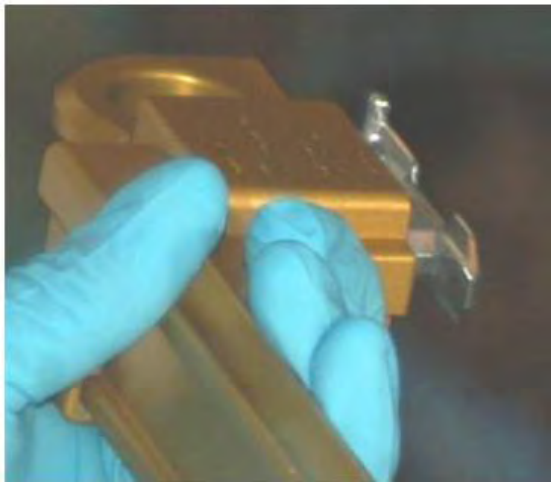
JEM RMS GROUNDING TAB

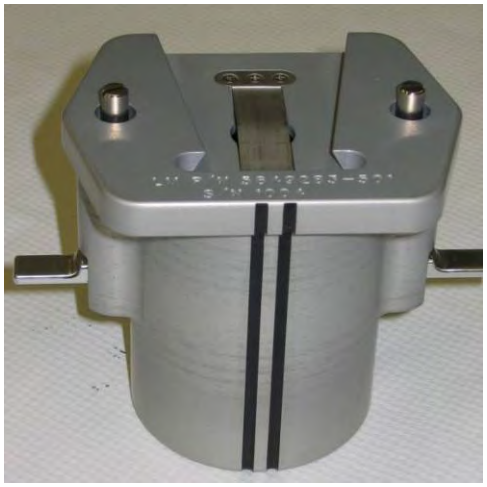


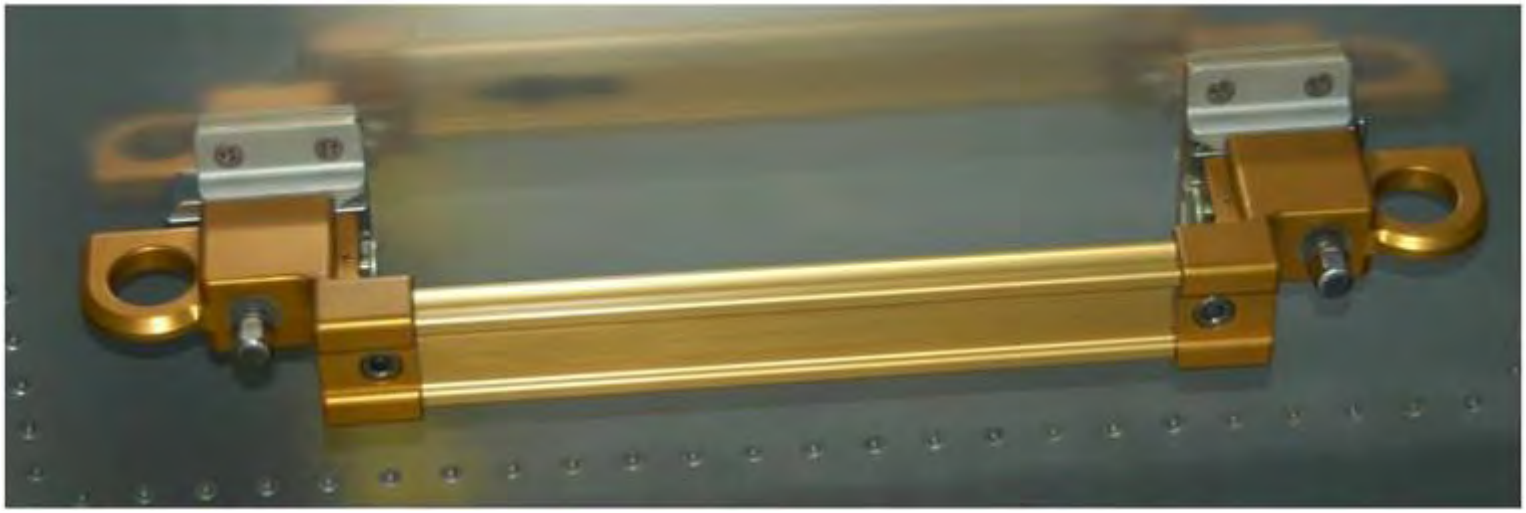
JEM BM



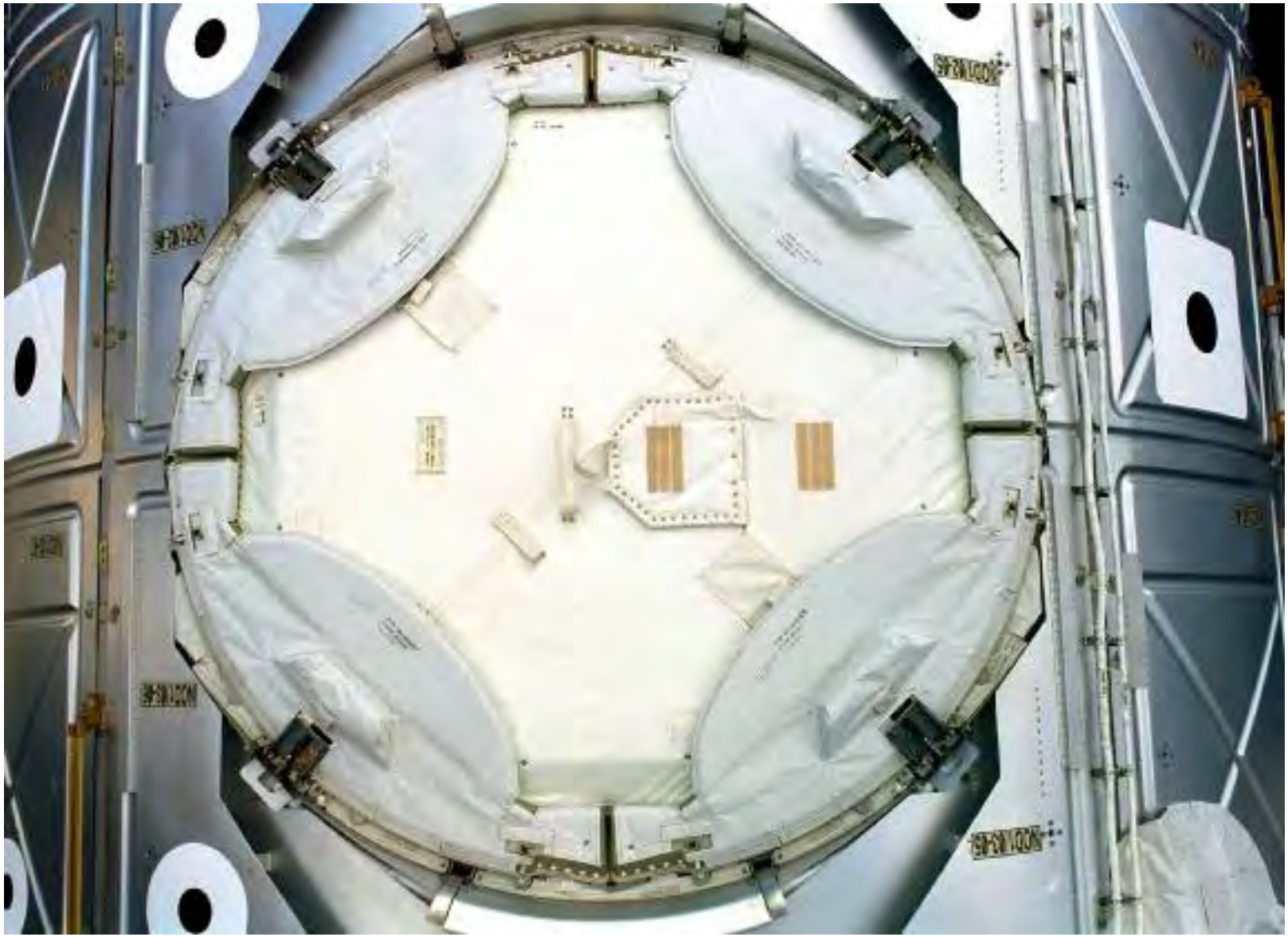
JEM OIH AND OIW



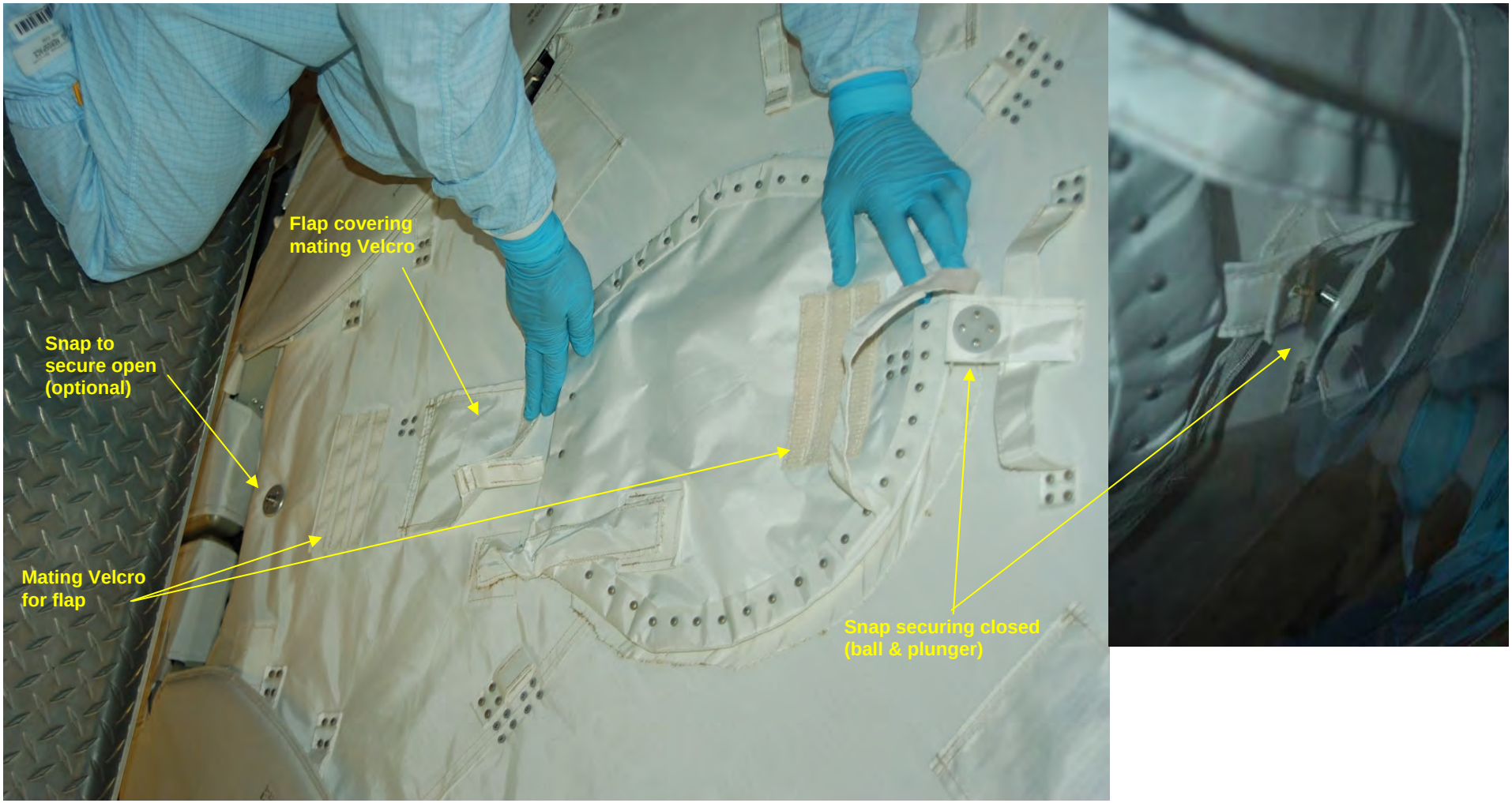




NODE 1/2 CBCS FLAP



NODE 1/2 CBCS FLAP (Cont)



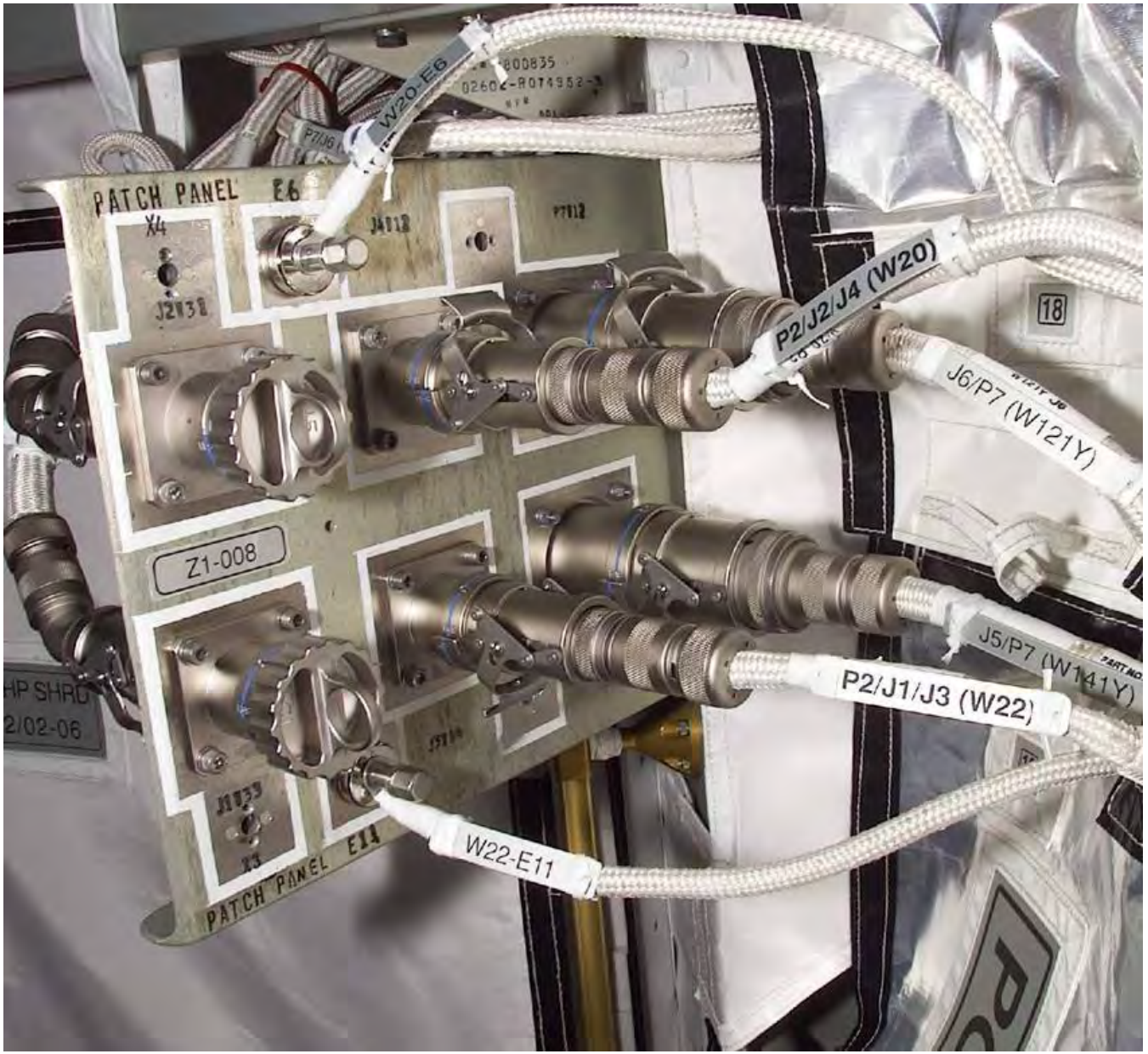
CBCS Flap

Z1 PATCH PANEL – AFT FACE

REFERRED TO AS
“FRONT SIDE”

ZENITH

AFT

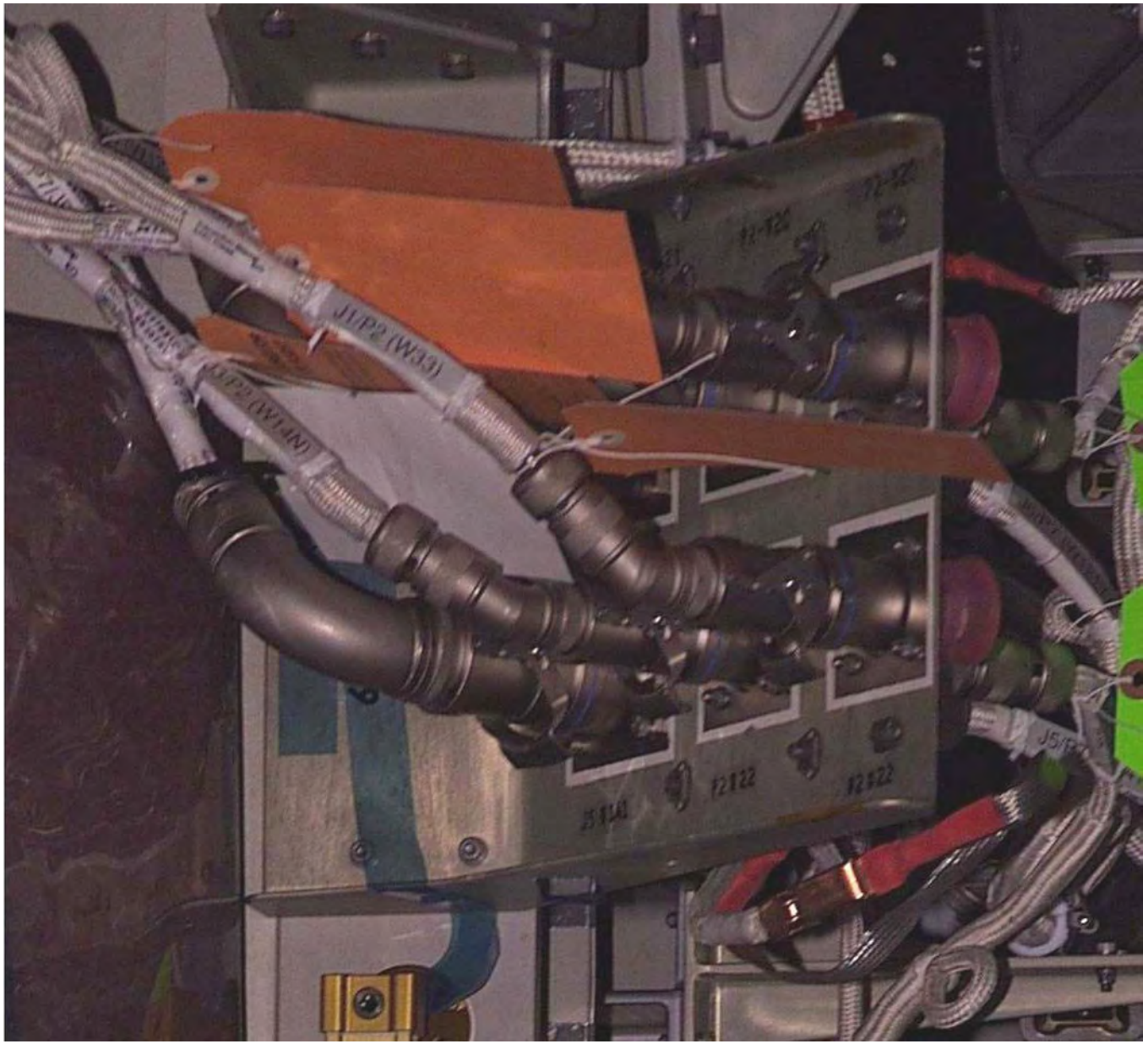


Z1 PATCH PANEL – FORWARD FACE

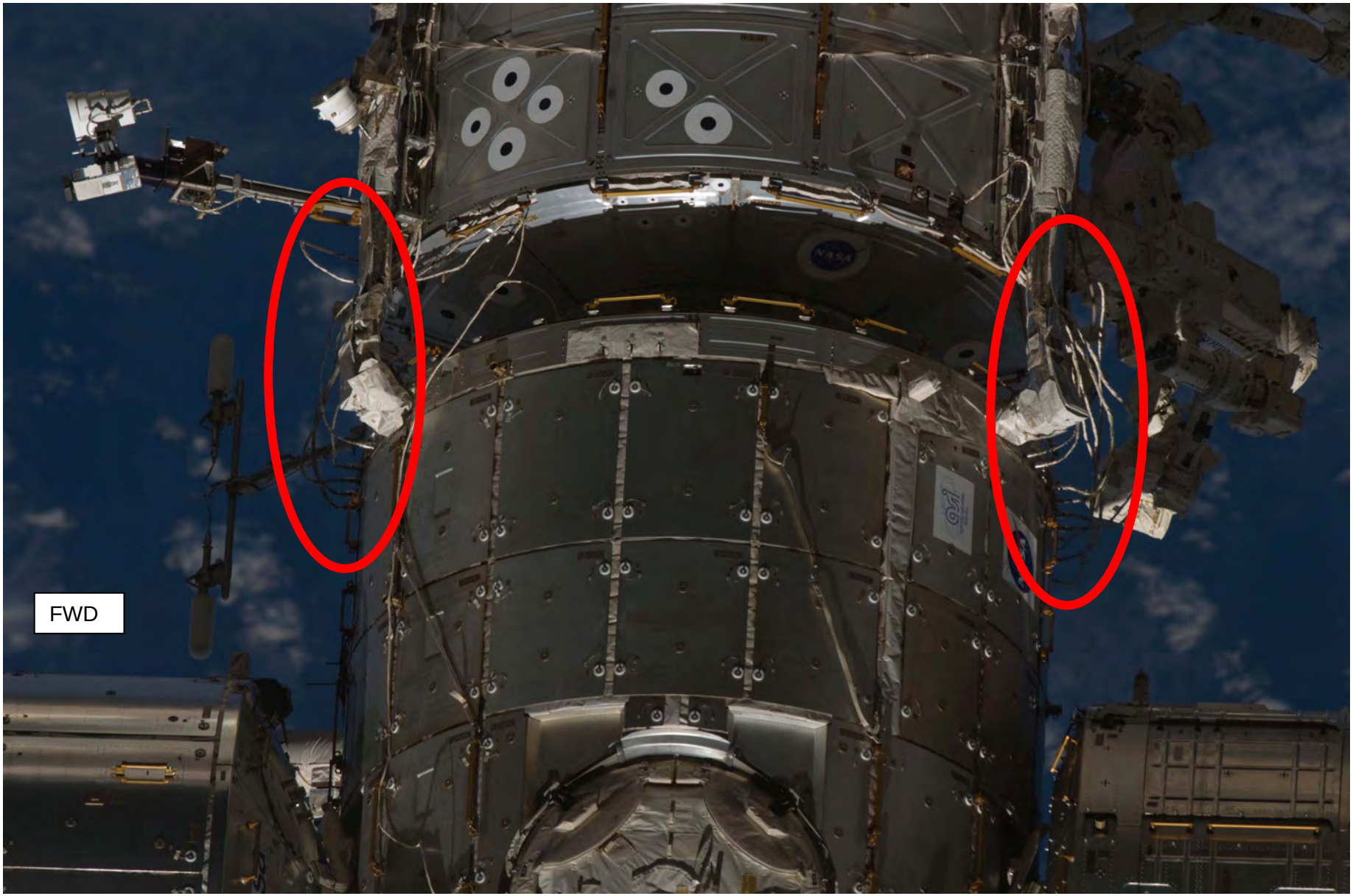
REFERRED TO AS
“BACK SIDE”

ZENITH

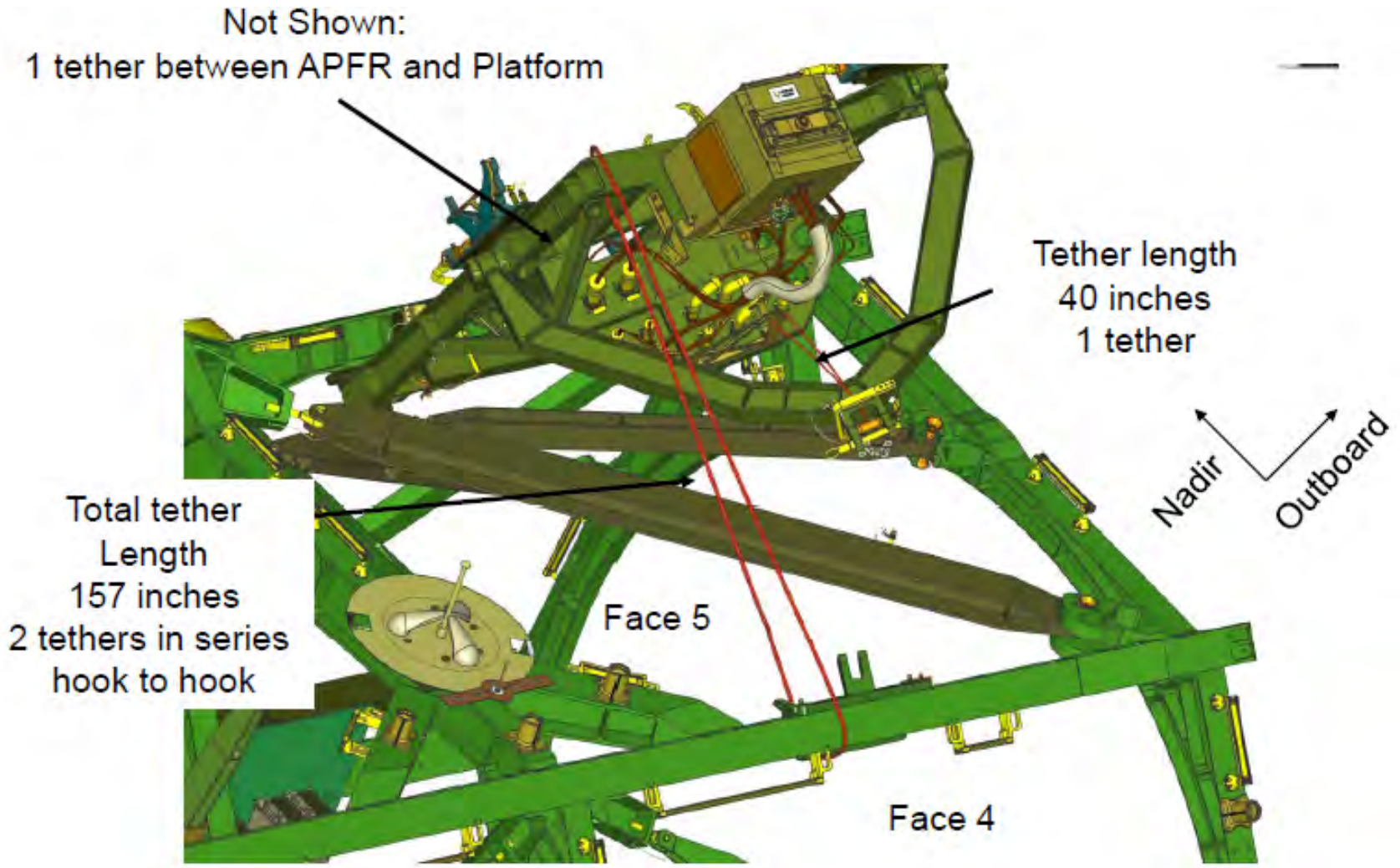
AFT



US LAB CABLE TIE DOWN

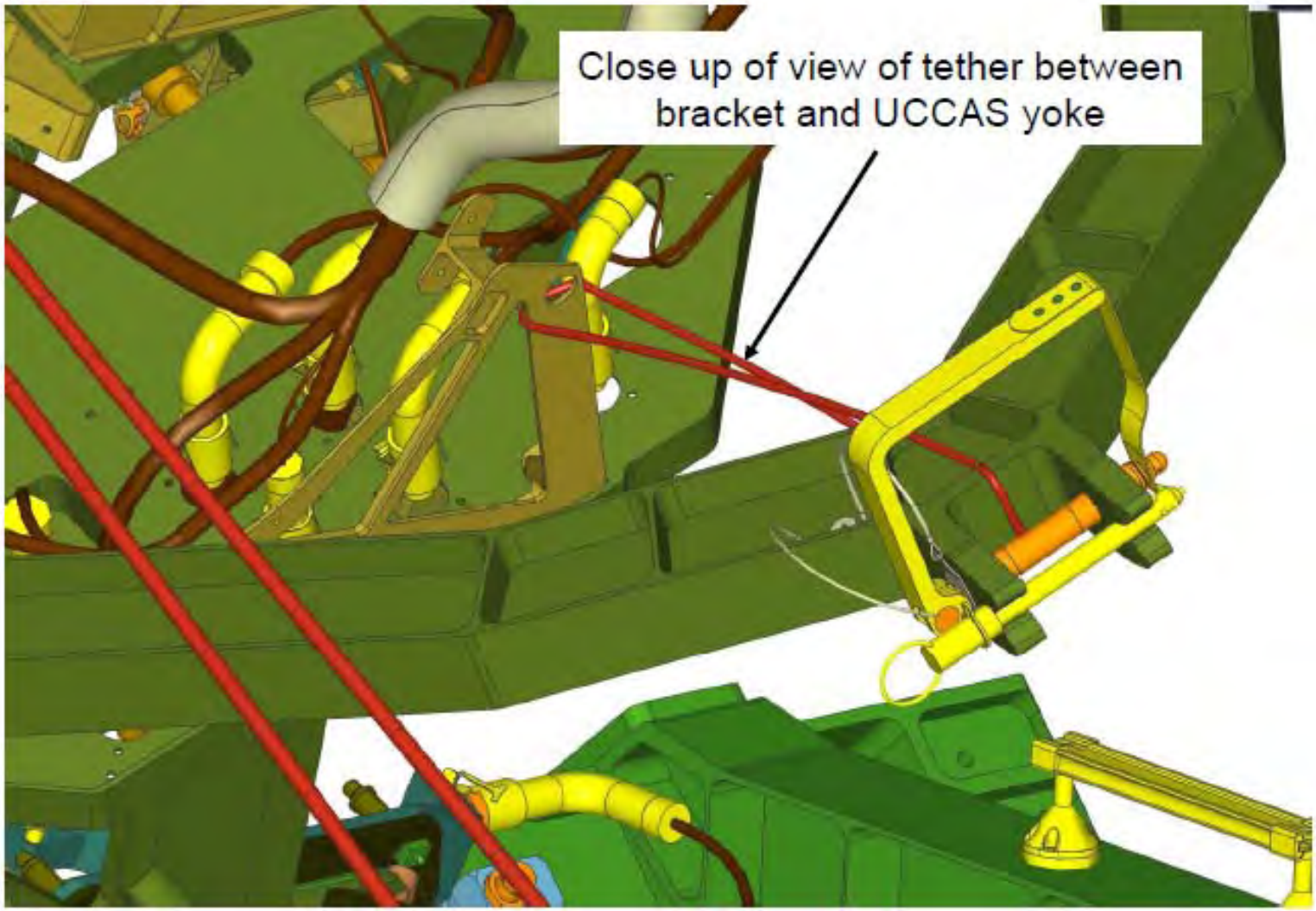


P3 UCCAS TIE DOWN

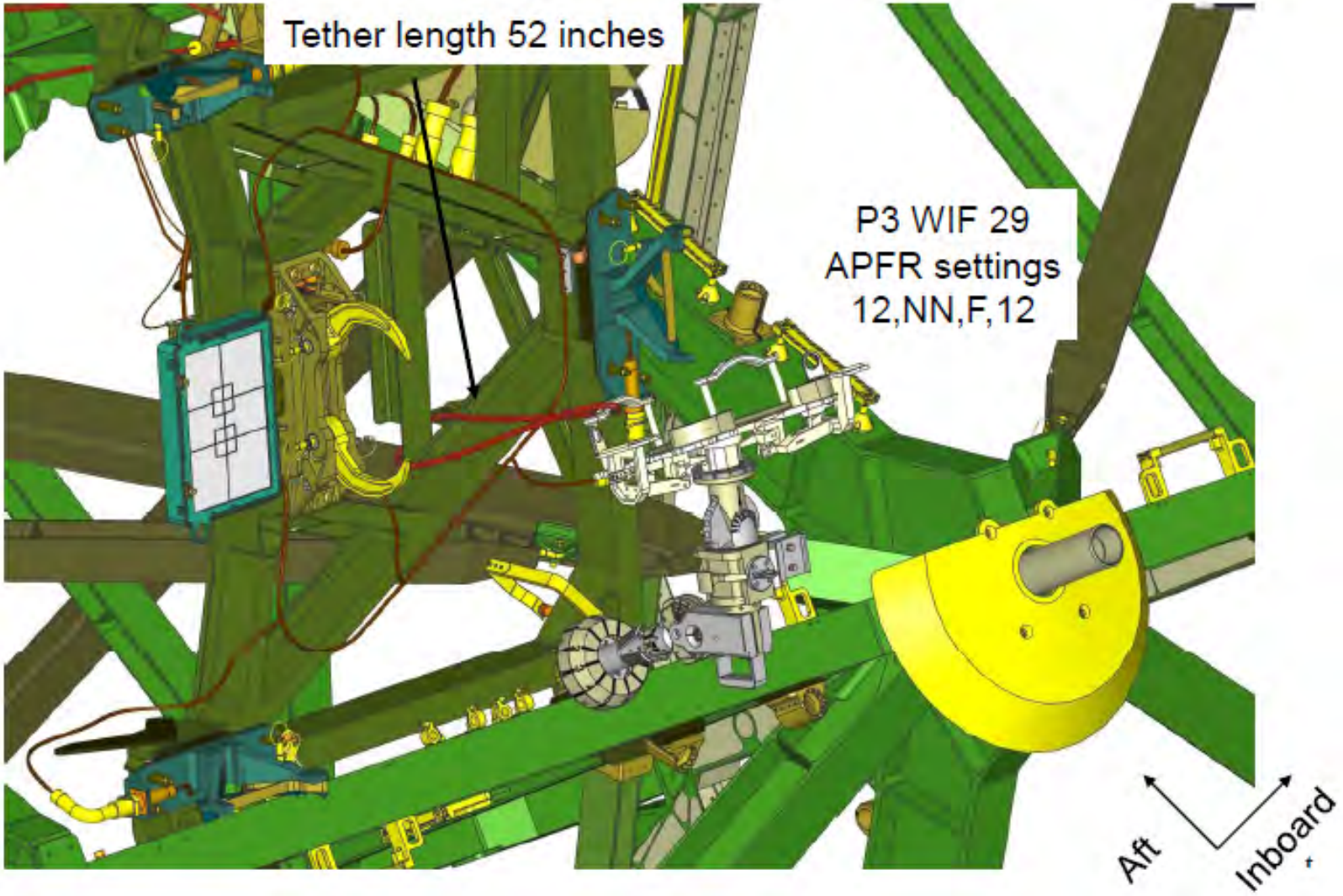


Current tie down utilizes 4 Long Duration Tie Down Tethers

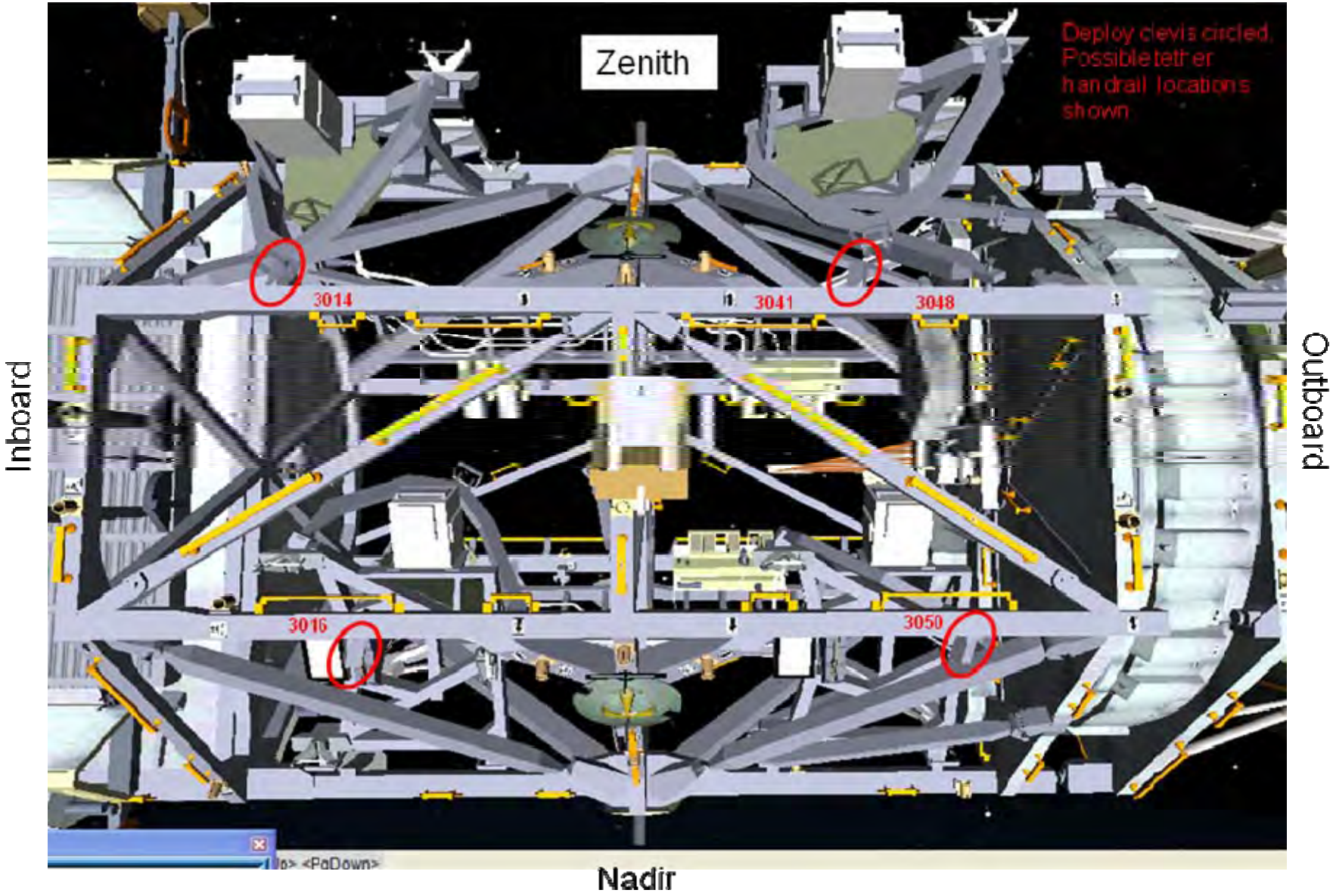
P3 UCCAS TIE DOWN (Cont)



P3 UCCAS TIE DOWN (Cont)

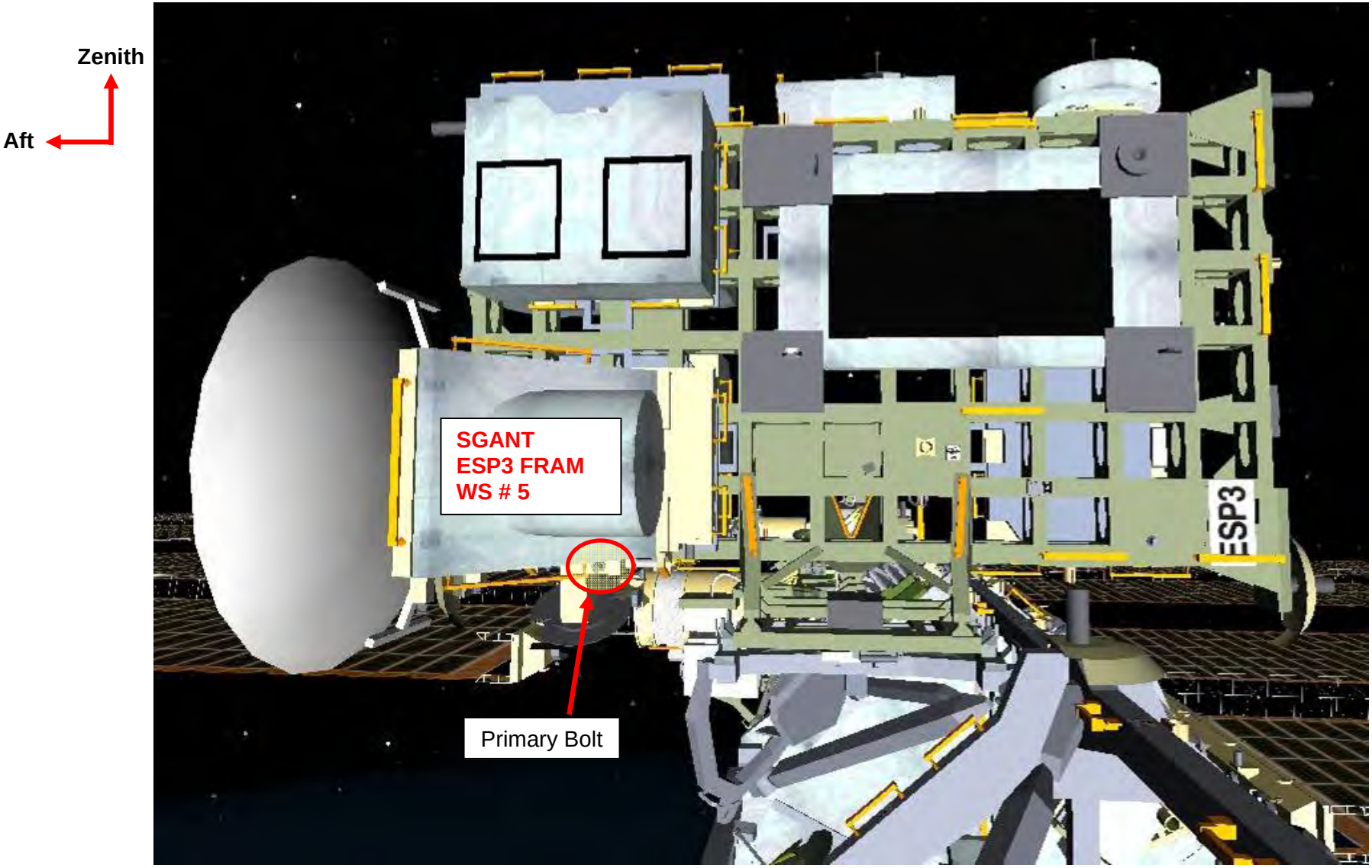


S3 PAS



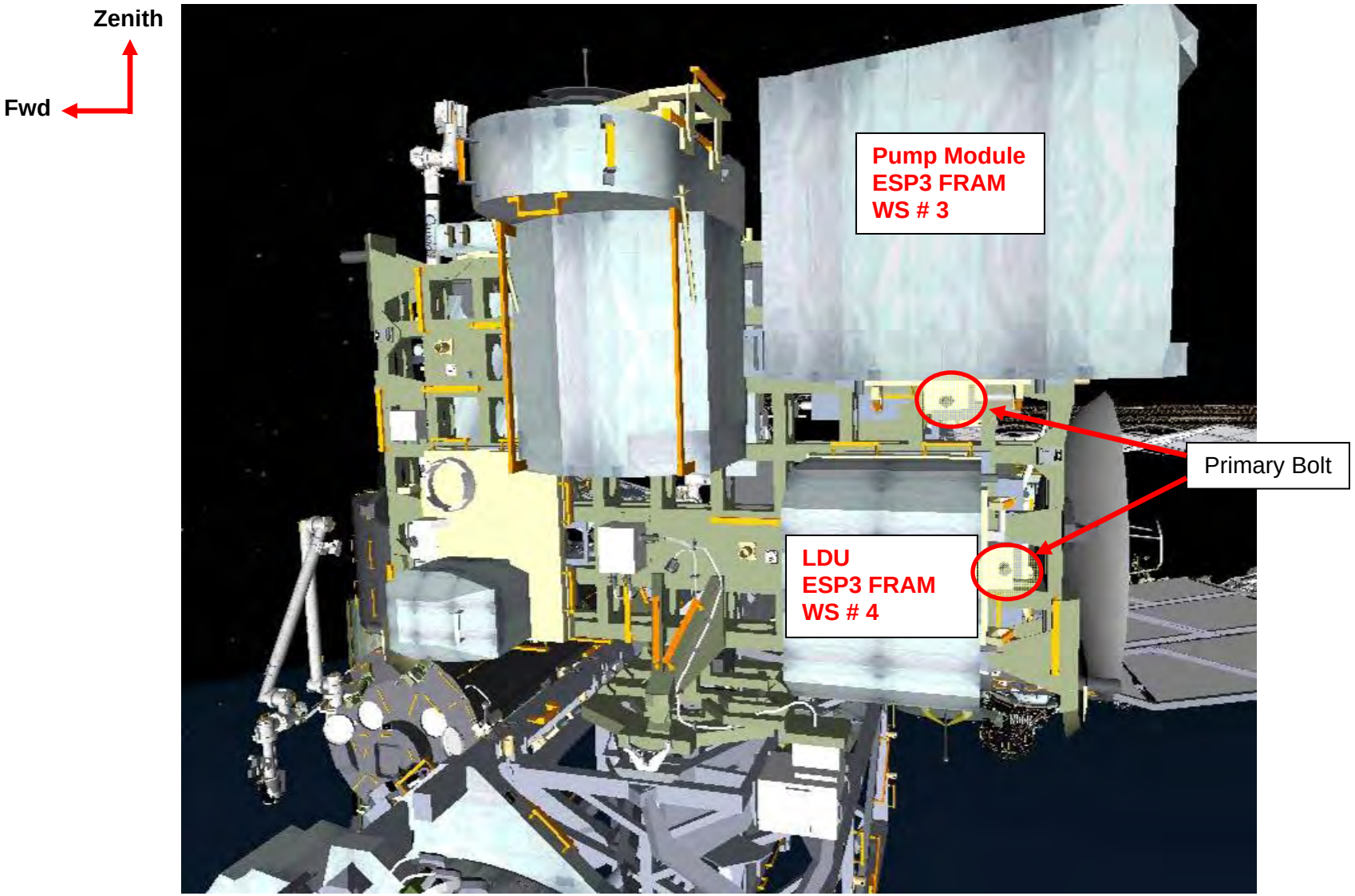
S3 handrail possibilities for Lg-Sm Adjustable Tether

ESP3 FRAM LAYOUT

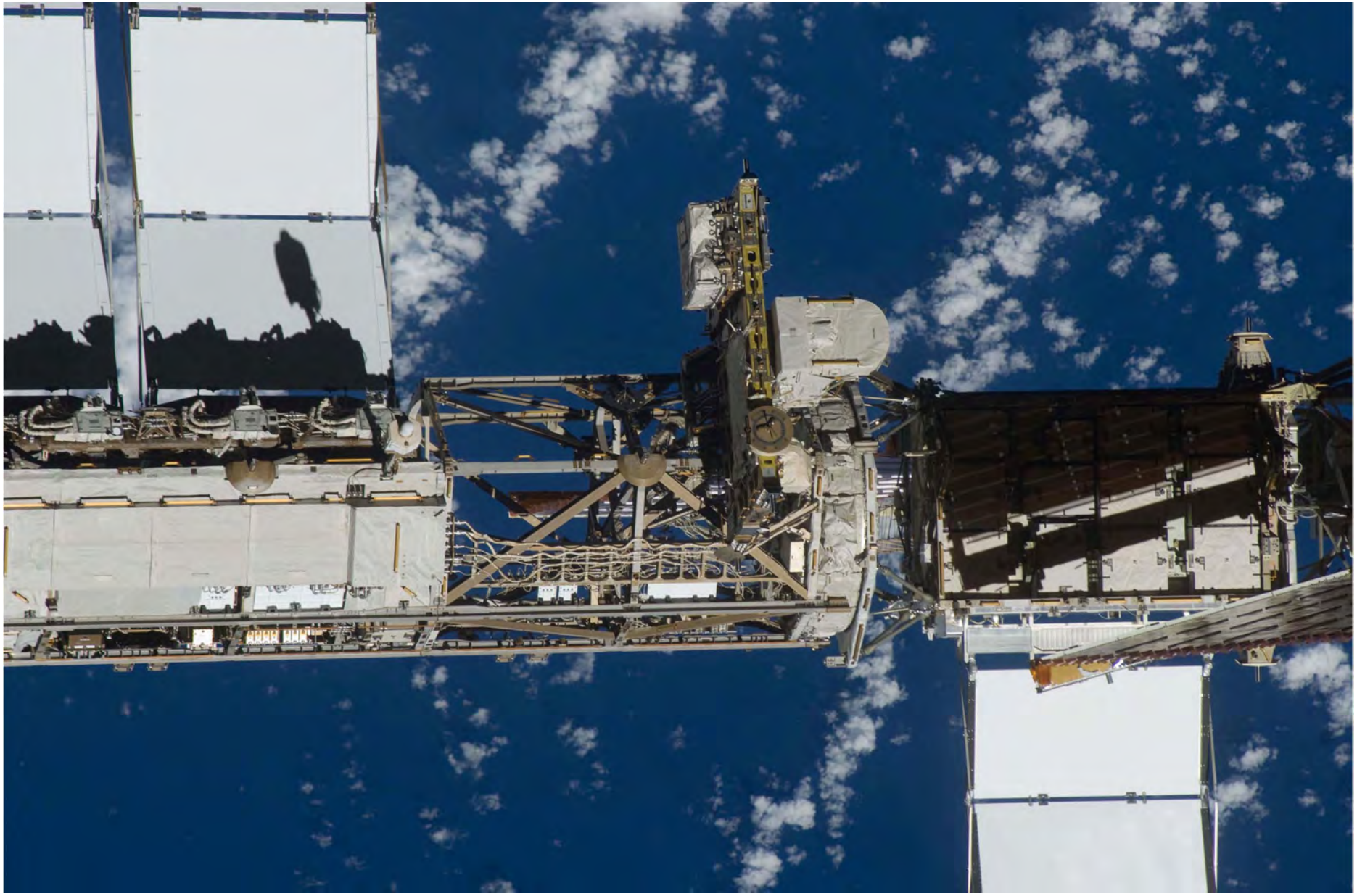


Inboard (STARBOARD) Side

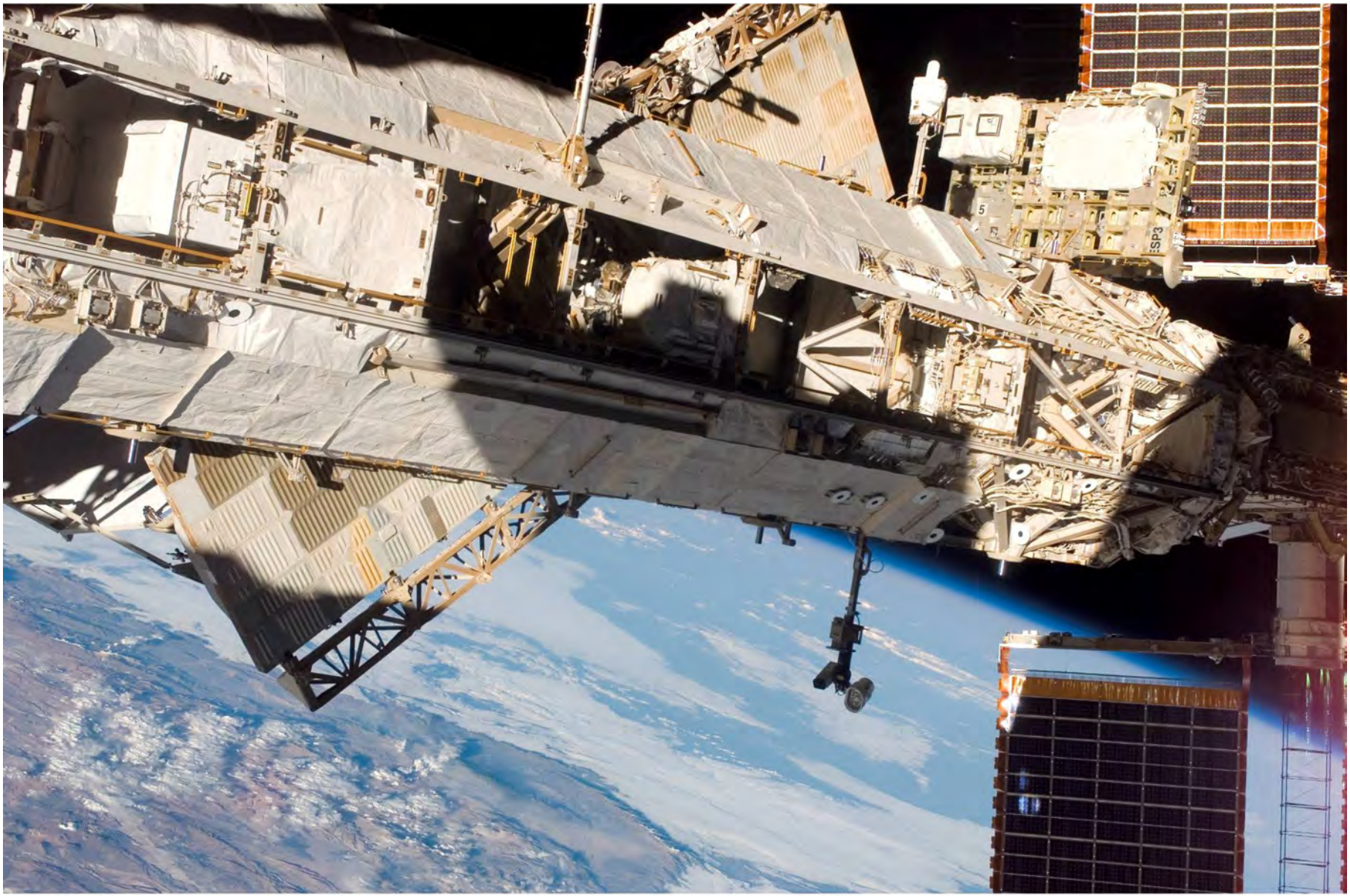
ESP3 FRAM LAYOUT (Cont)



ESP3 ON-ORBIT PHOTOS

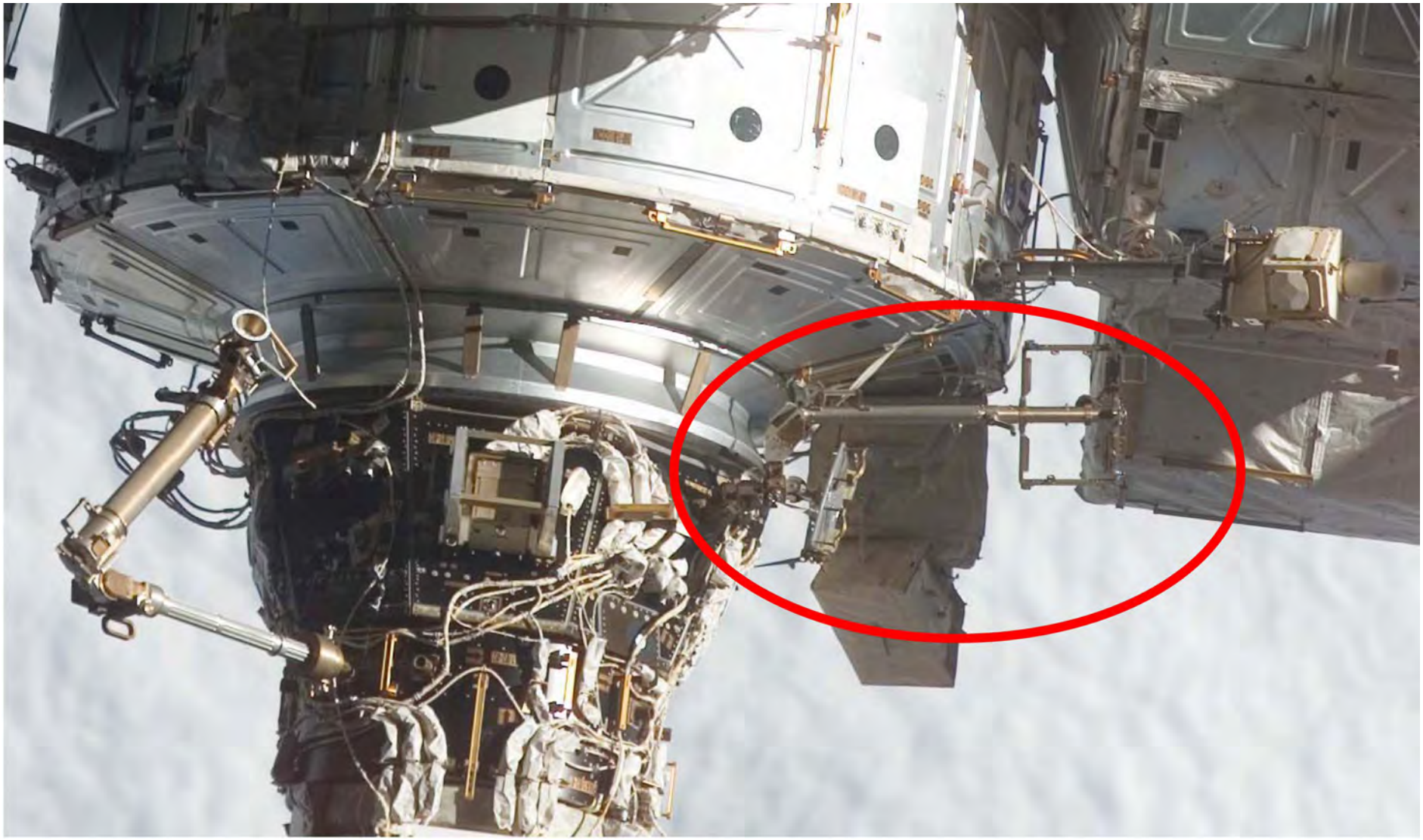


ESP3 ON-ORBIT PHOTOS (Cont)



S123E009051

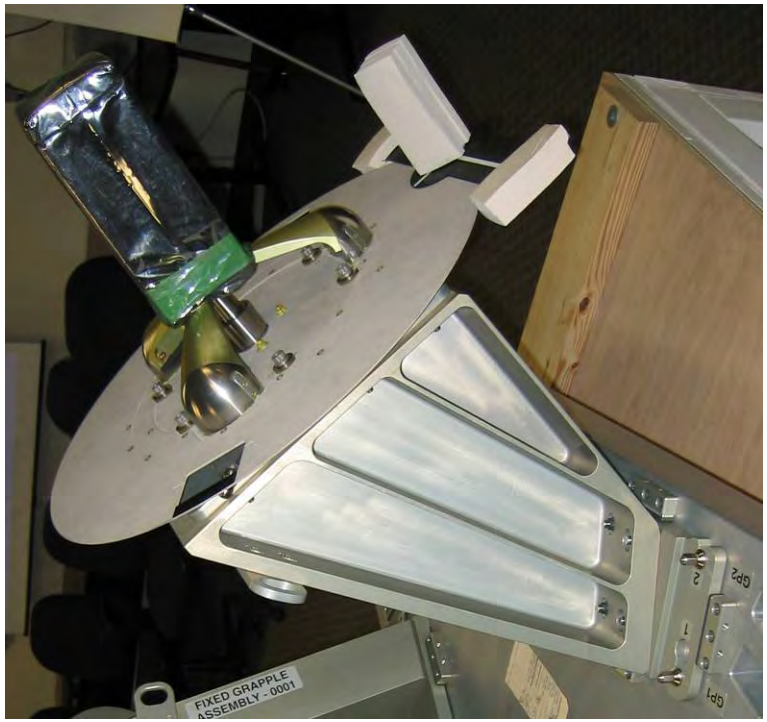
PMA1 APFR 5/TOOL STANCHION



PMA1 – ZENITH

STARBOARD

MISC FIXED GRAPPLE BAR

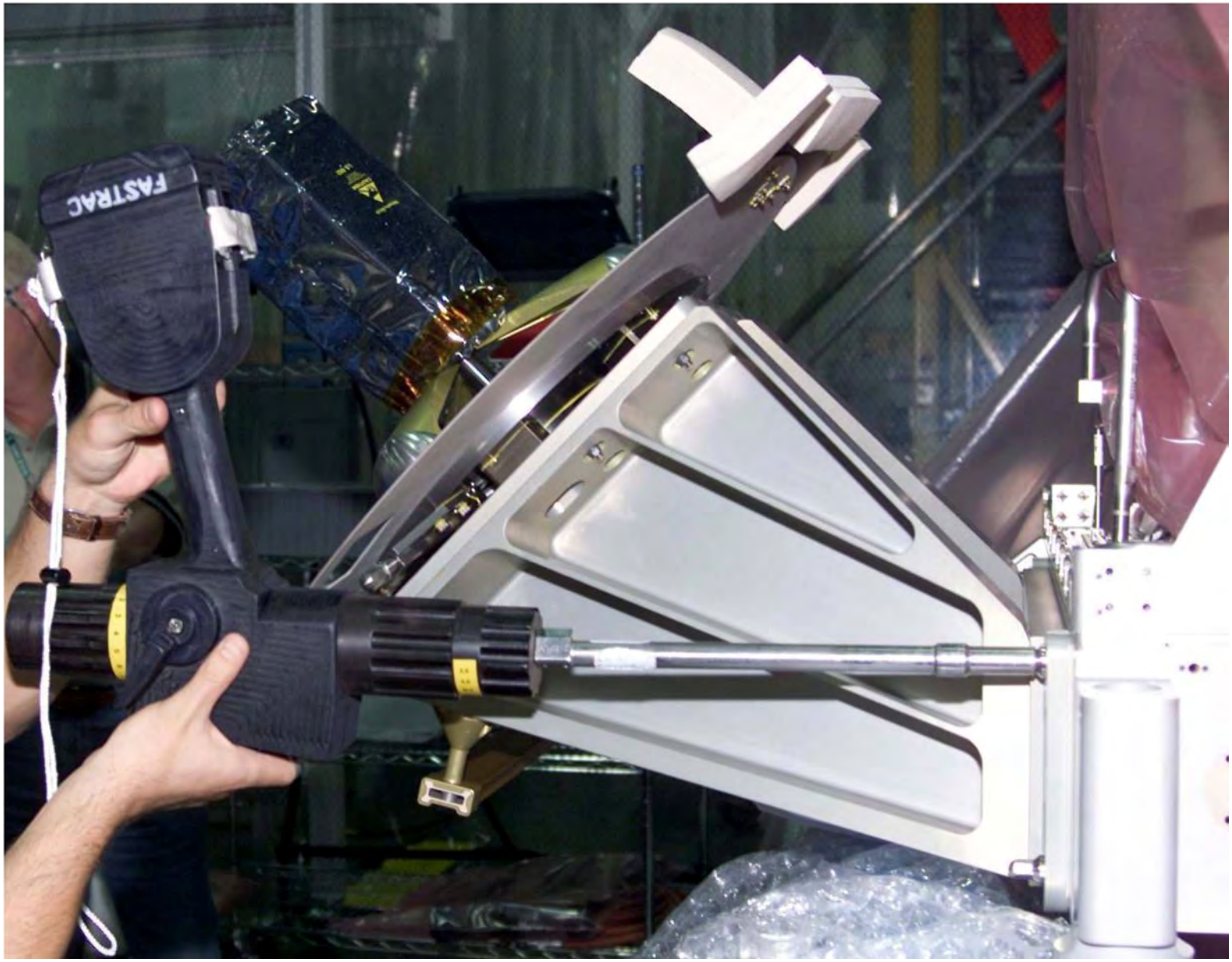


MISC FIXED GRAPPLE BAR (Cont)

DETENT ON BOLT 3 ONLY

MISC FIXED GRAPPLE BAR – ON P1 ATA

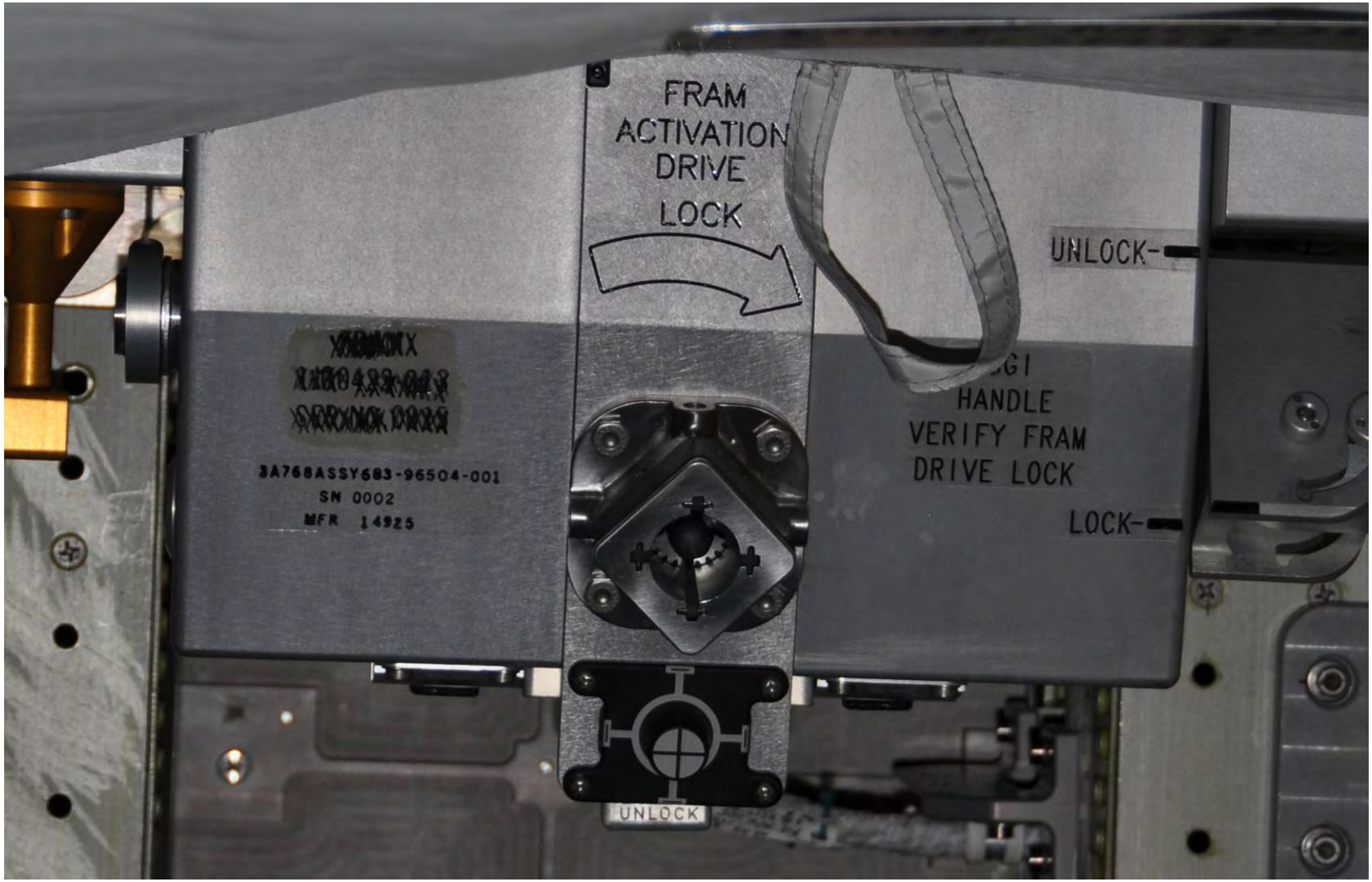
NOTE: 12" SOCKET PICTURED, BUT 6" PASSED FIT CHECK



MISC FRAM

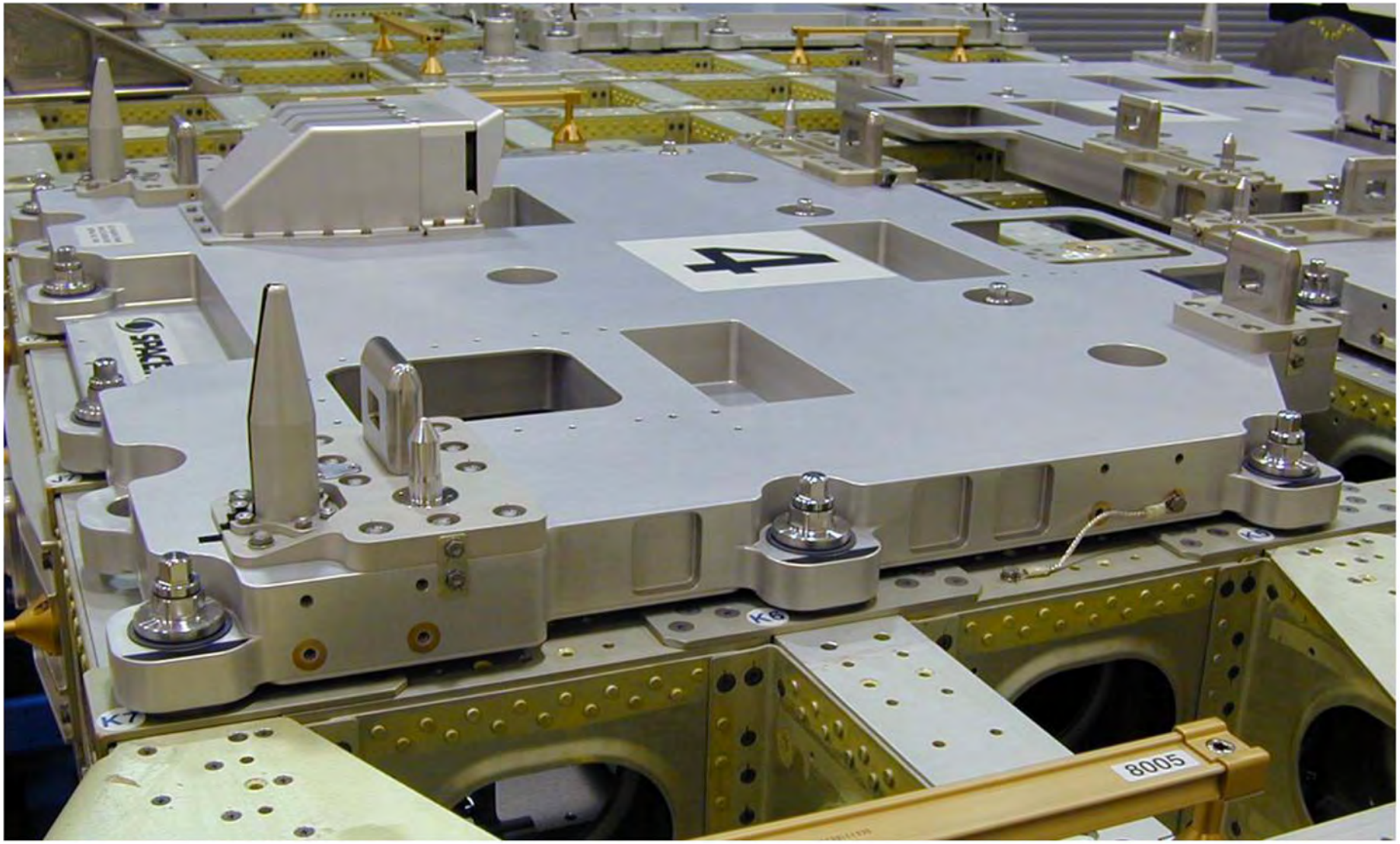
FRAM
1J00422-013
SER NO. 0026
UNLOCK
SGI
HANDLE
VERIFY FRAM
DRIVE LOCK
LOCK
SOFT CAPTURE CONT. REL.
(IND)
IN=
UNLOCK
OUT=
LOCK
DISENG
ENGAGE
PUSH
TO
ENGAGE
DISENG
ENGAGE
(IND)
IN=
UNLOCK
OUT=
LOCK

MISC FRAM (Cont)



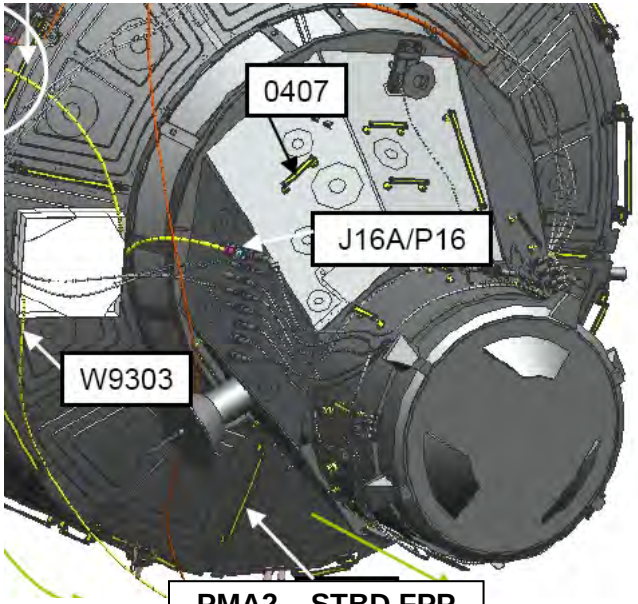
MISC FRAM (Cont)

MISC FRAM (Cont)

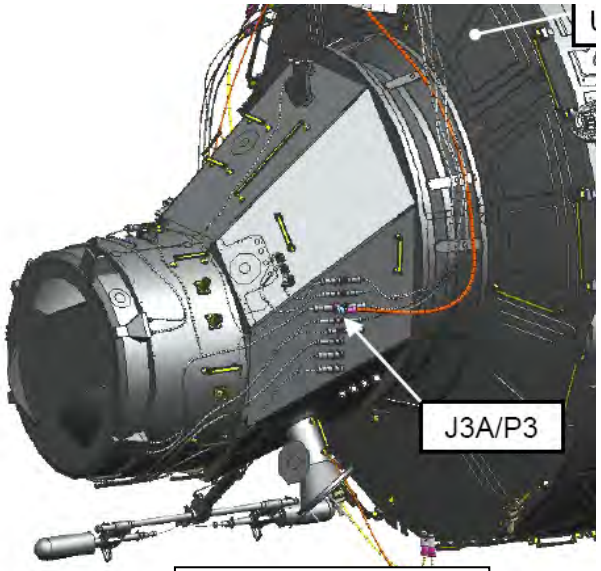


MISC FRAM (Cont)

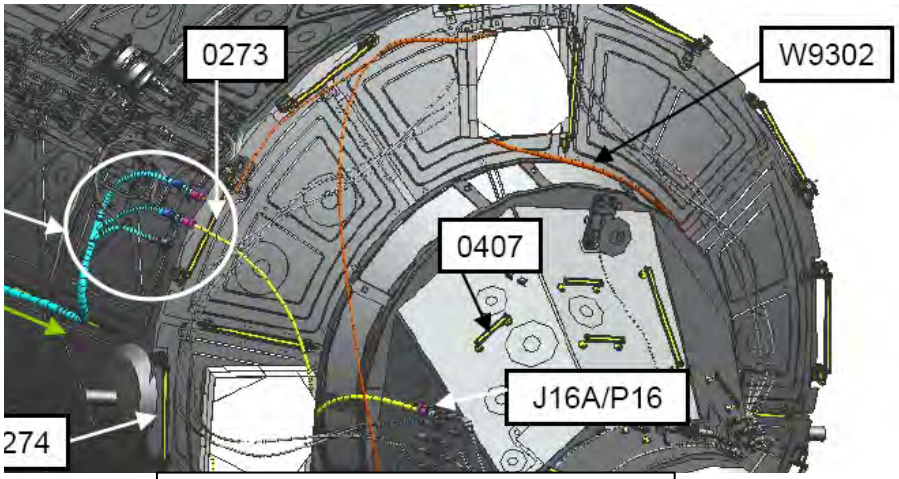
MISC FPP SLEEVES LOCATION



PMA2 – STBD FPP
P16/J16A

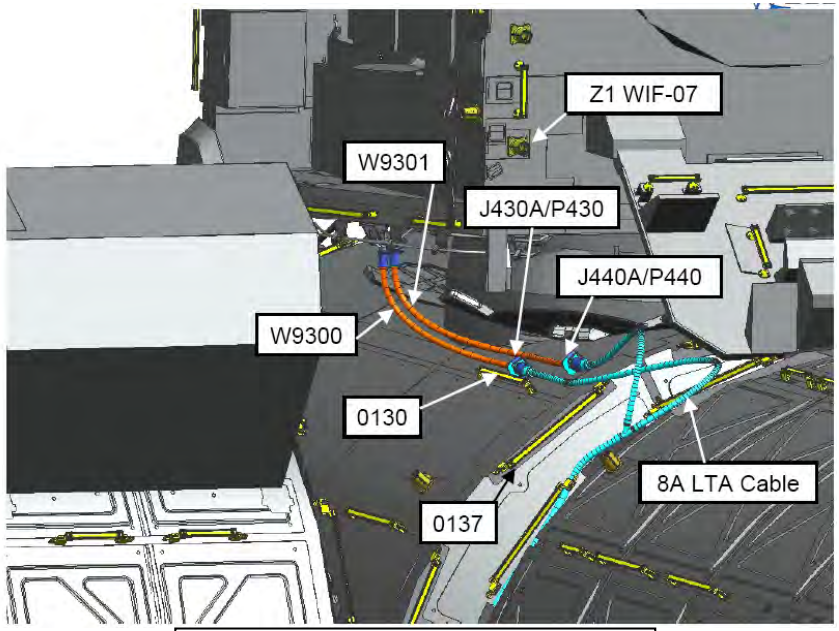


PMA2 – PORT FPP
P3/J3A

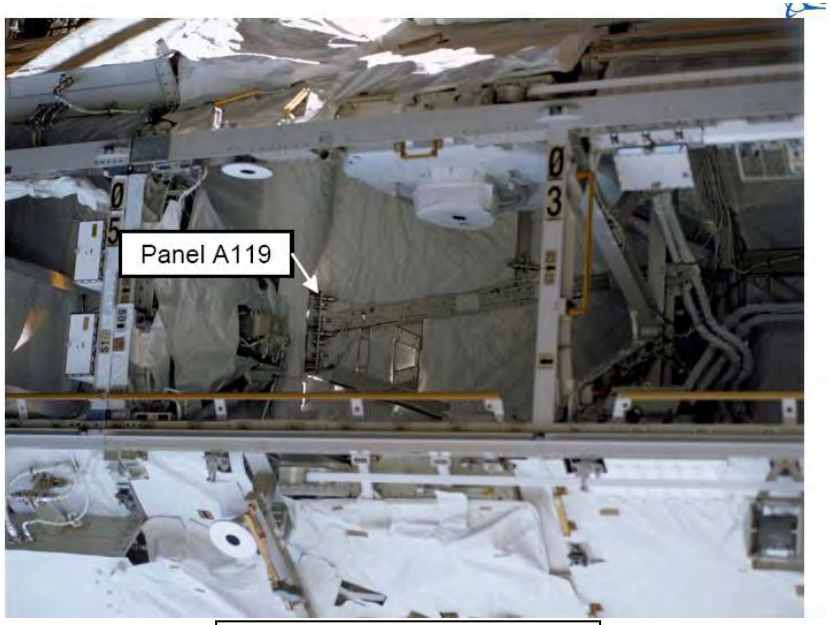


LAB FPP
P113/J113A & P114/J114A

MISC FPP SLEEVES LOCATION (Cont)

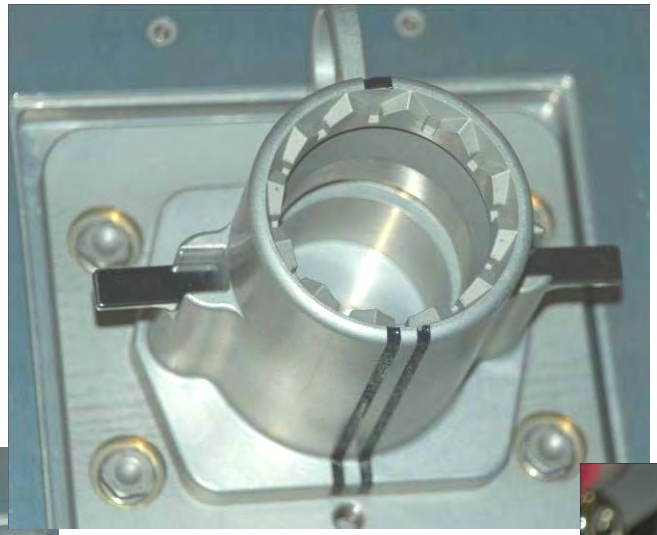


NODE1 FPP –
P430/J430A & P440/J440A



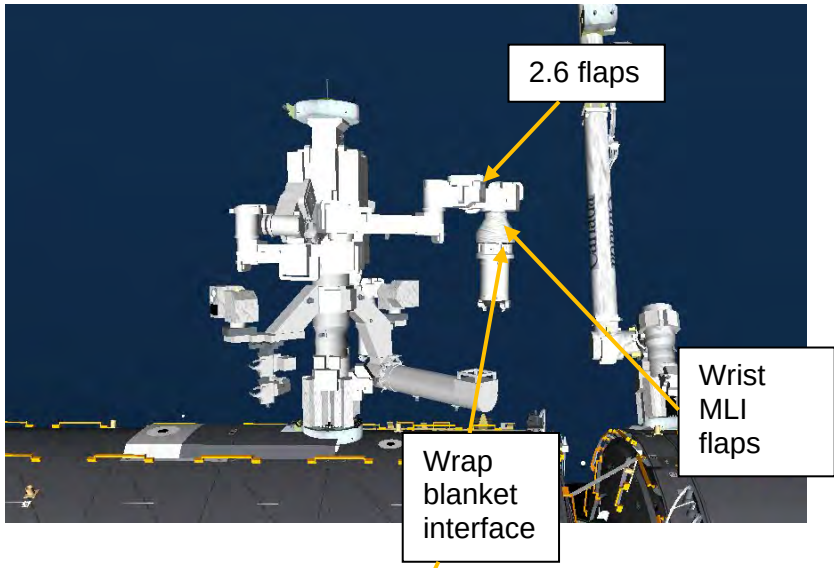
SO (BAY3) FPP – P57/J57A

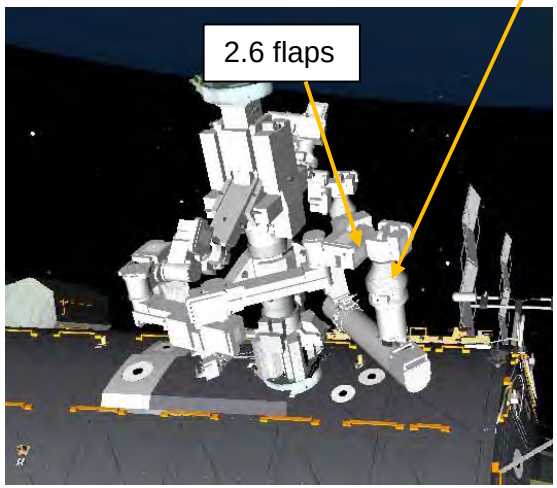
MISC ORBIT INSTALLED WIF – OIW



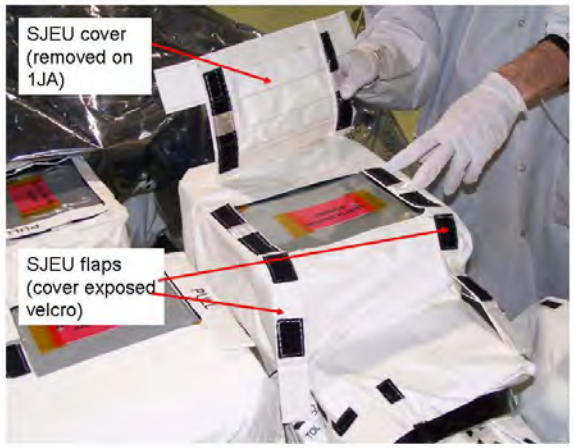
MISC MT STOP – P3

MISC SPDM MLI REMOVAL





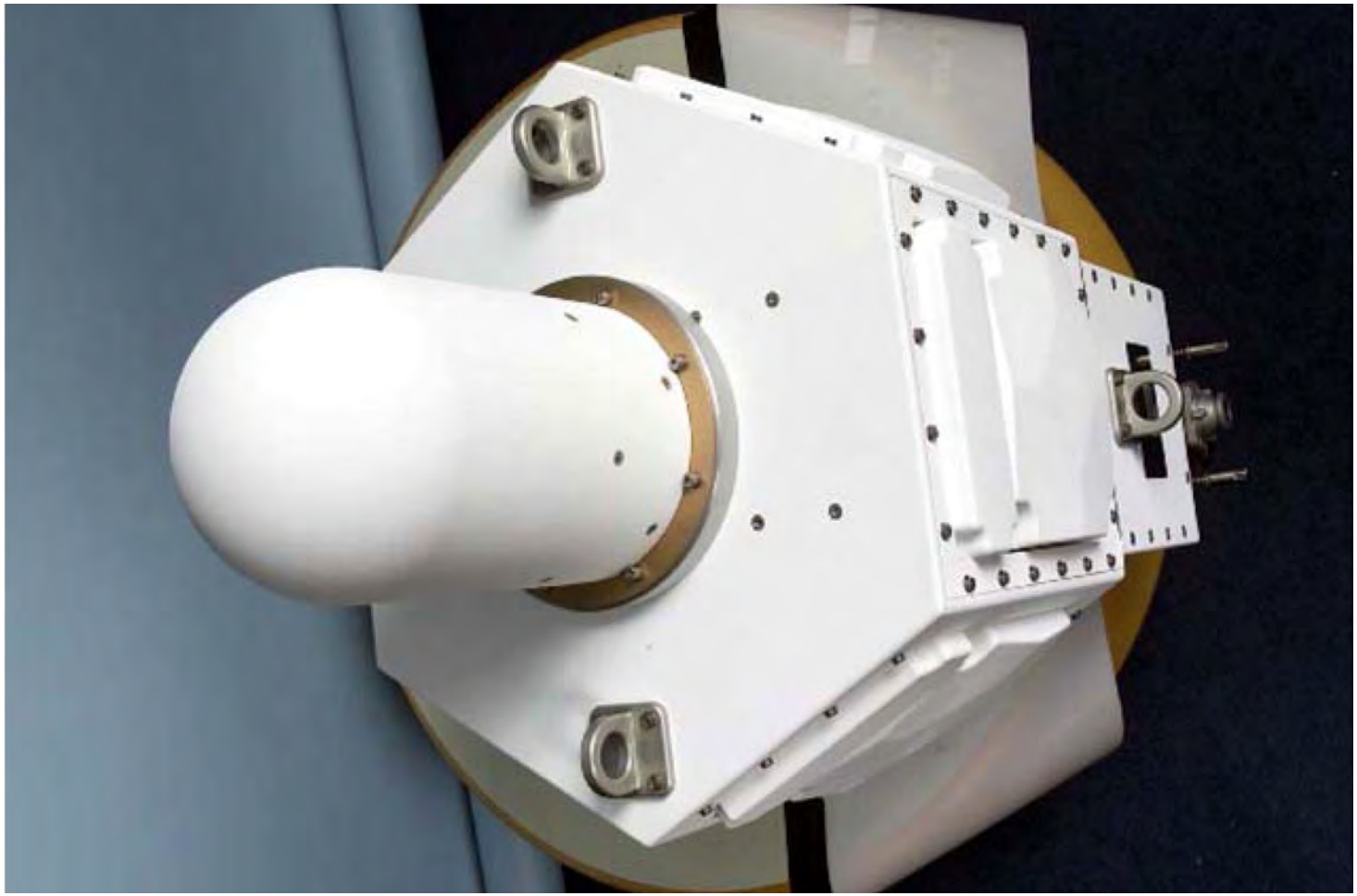
2.6 Flaps (SJEU) – Detail



Wrap Blanket – Detail 1

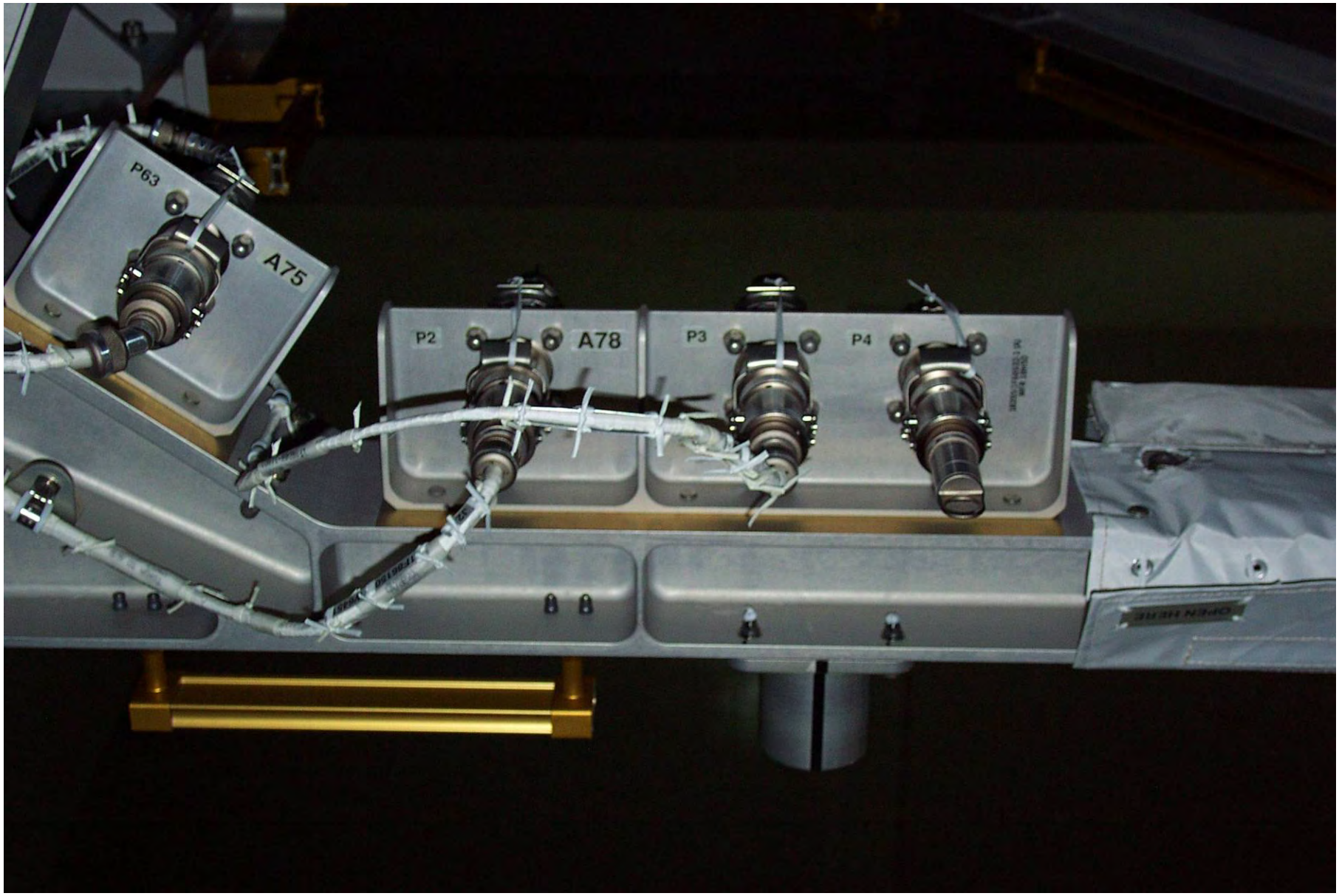
MISC SPDM MLI REMOVAL (Cont)

MISC WETA

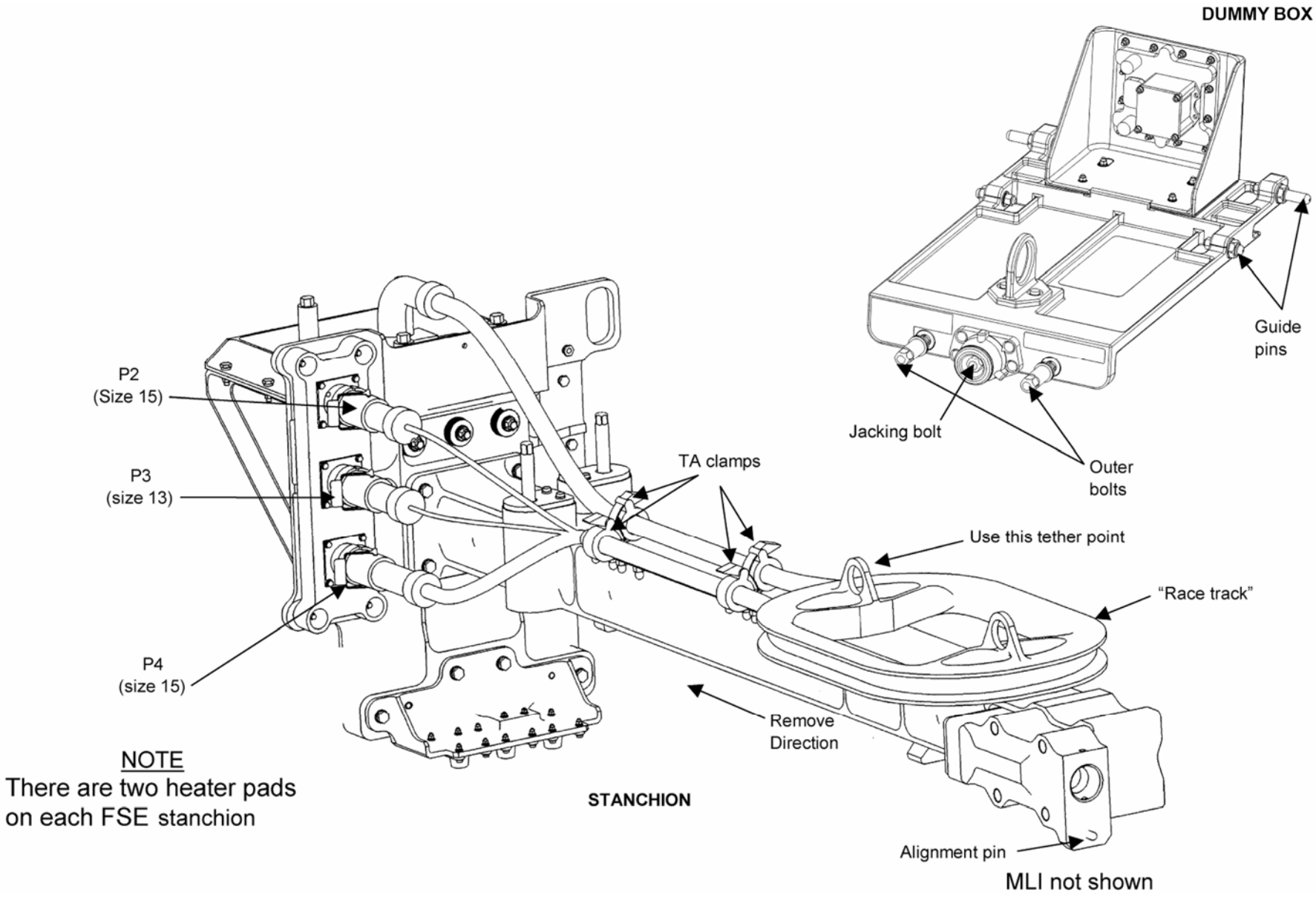


MISC WETA (Cont)

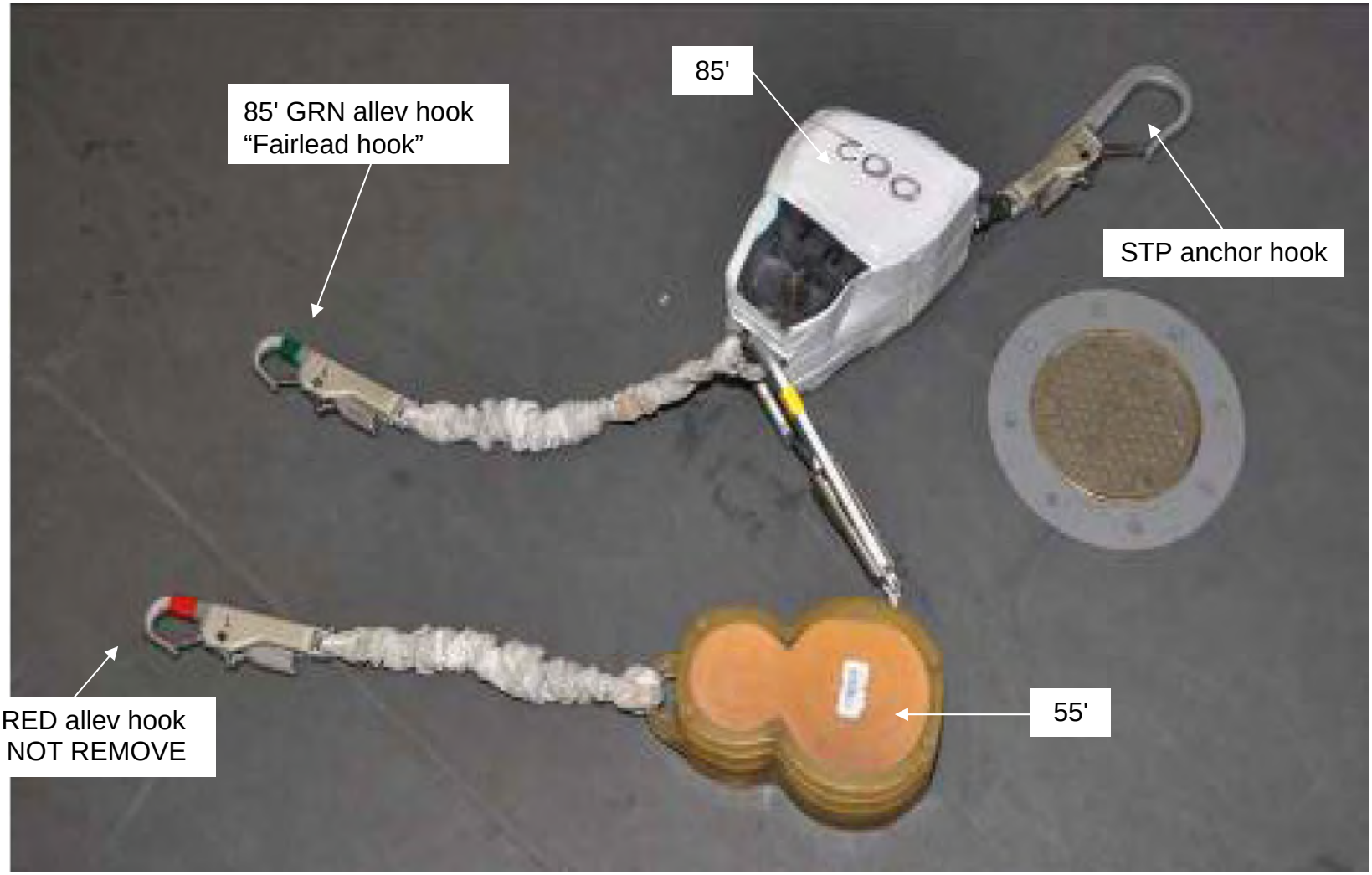
MISC WETA PANEL A78



MISC WETA VSSA STANCHION

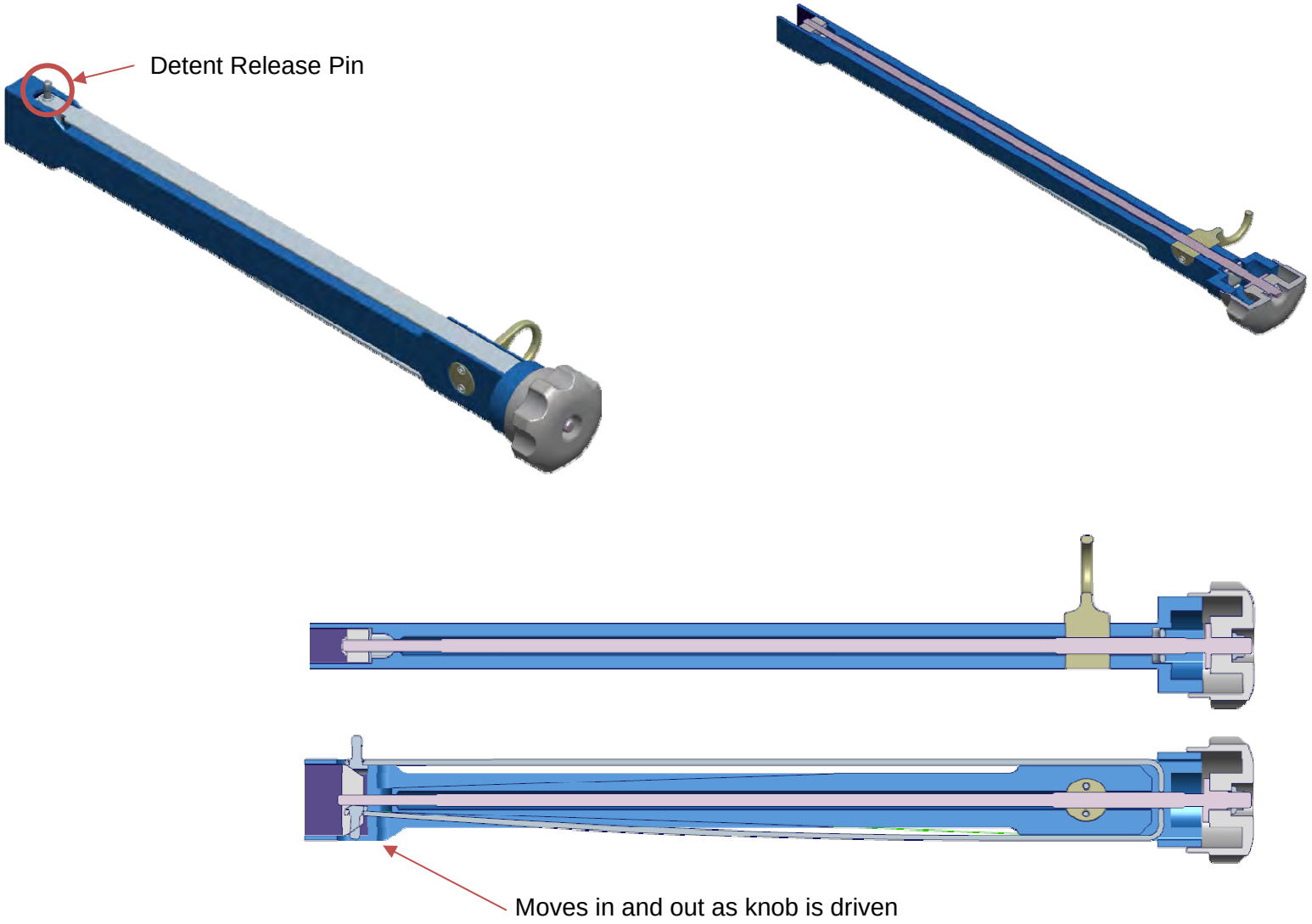


TOOLS SAFETY TETHER PACK (STP)

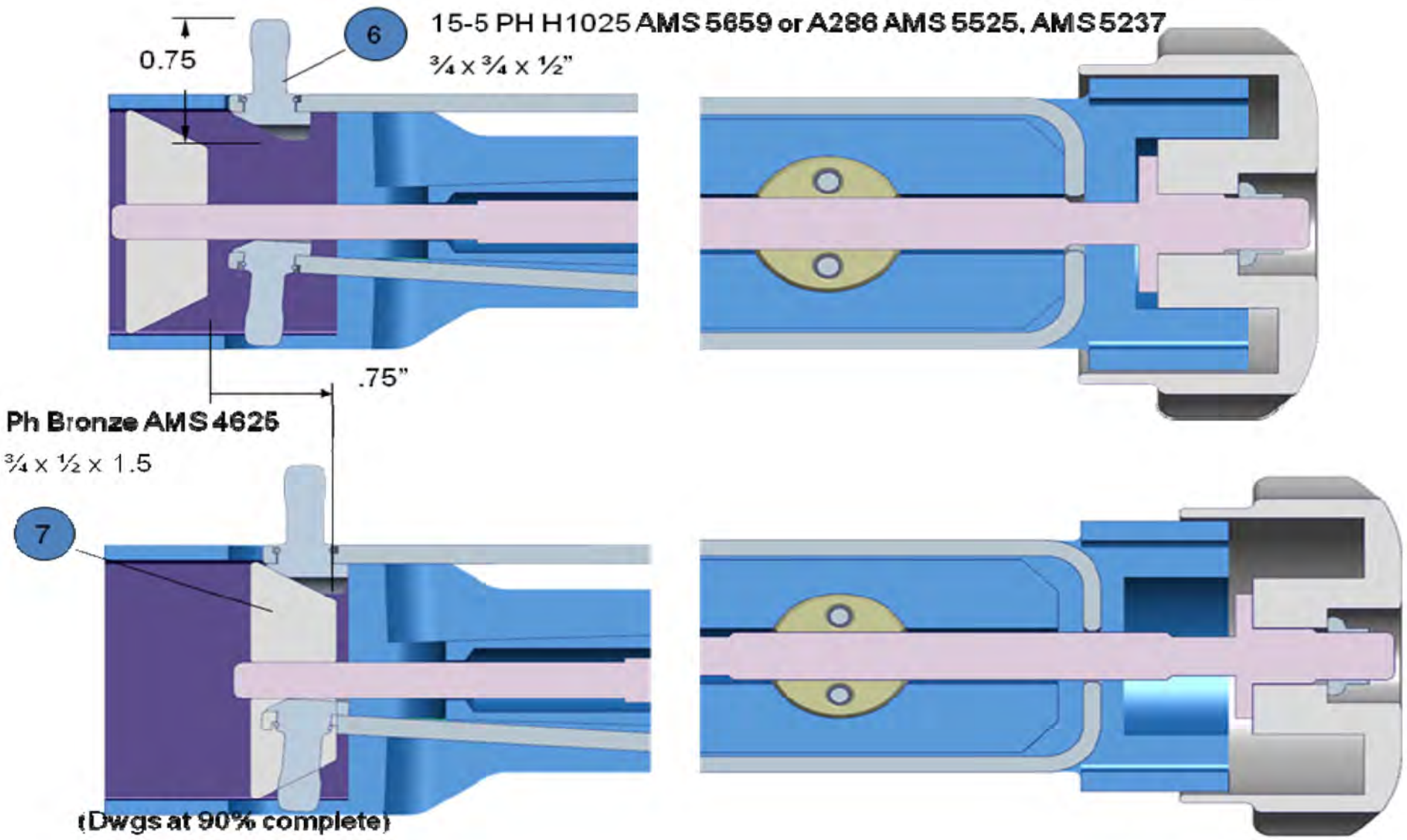


TOOLS UCCAS DETENT TOOL

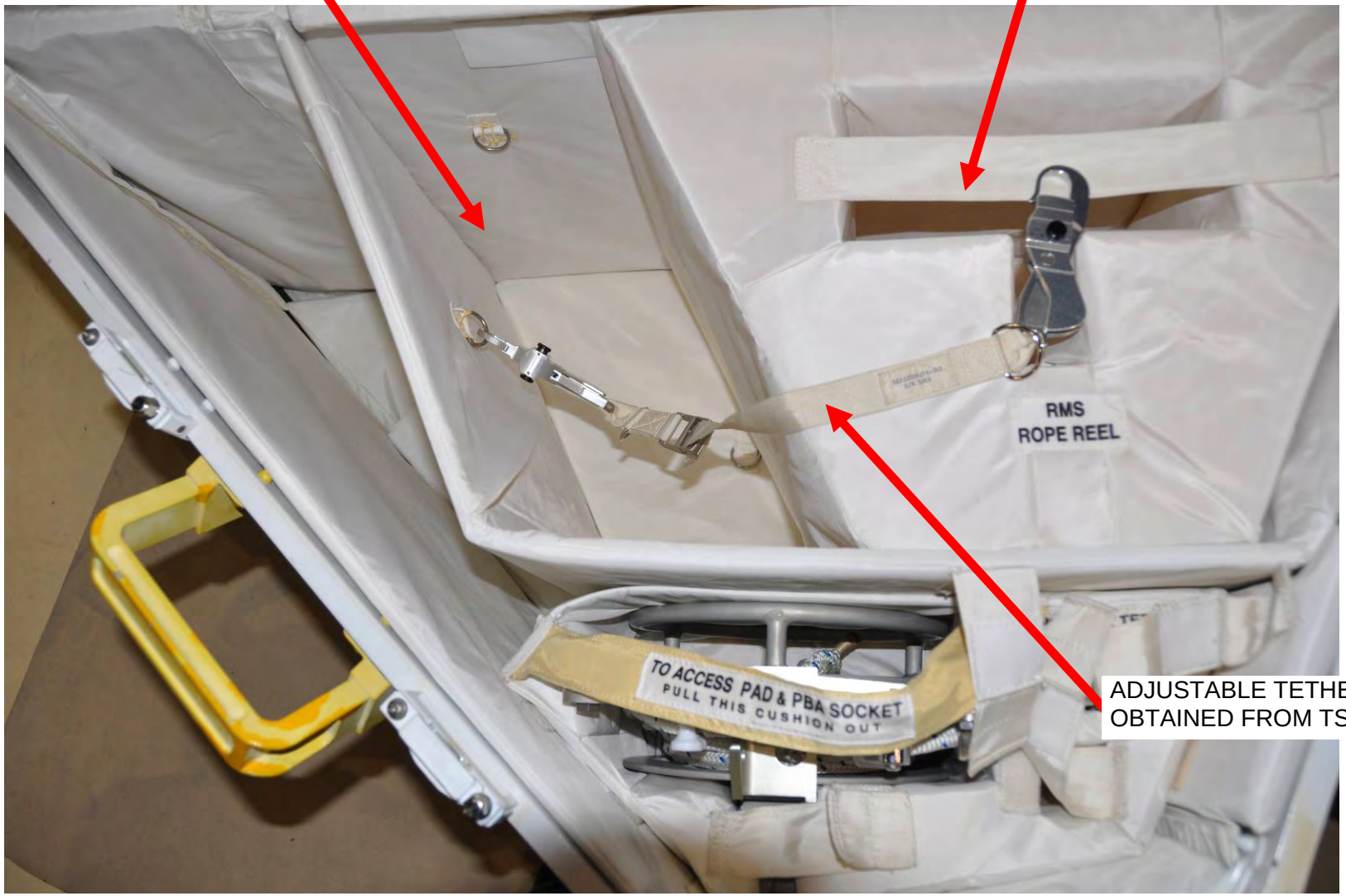
Detent Release Tool (DRT)



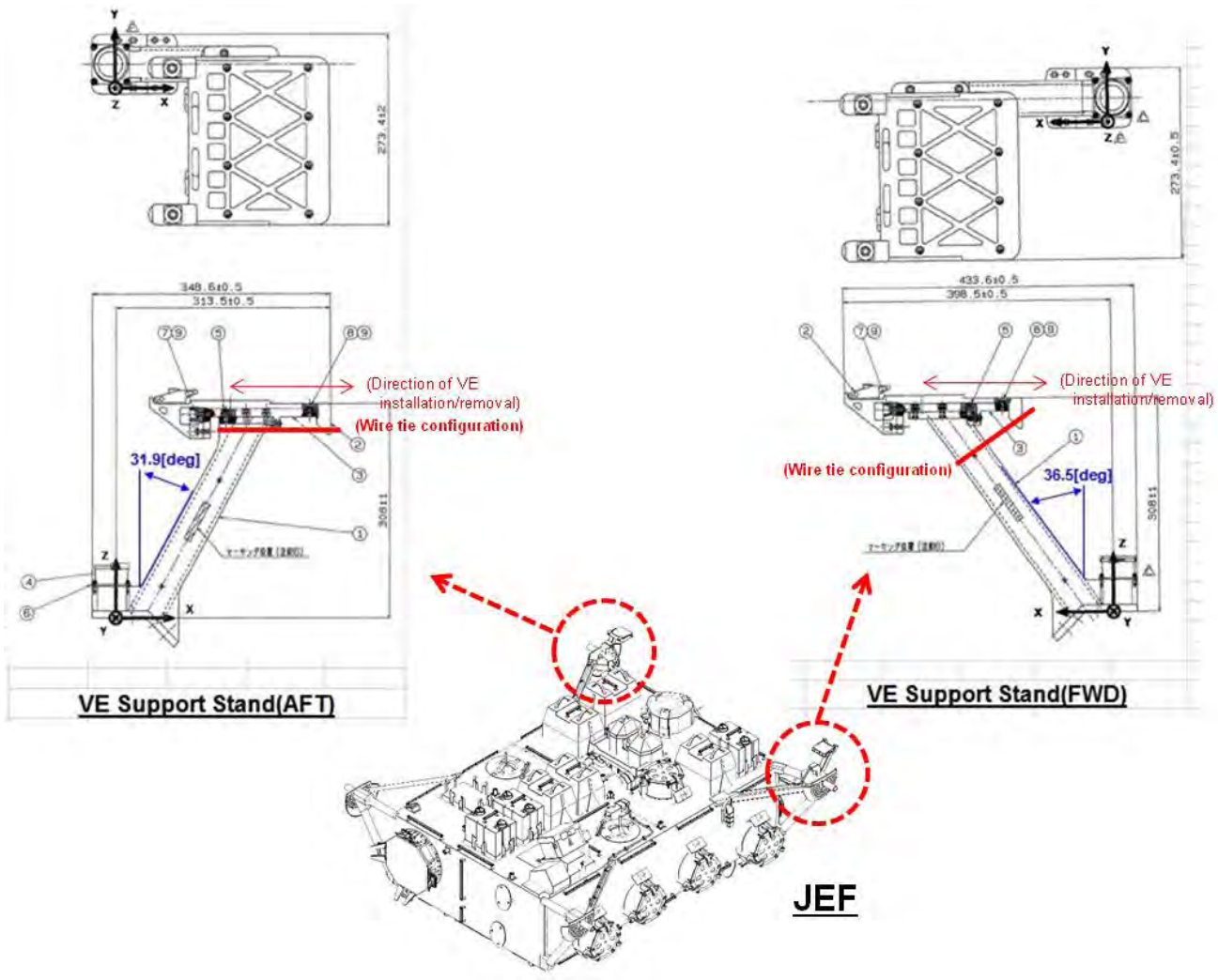
TOOLS UCCAS DETENT TOOL (Cont)



TOOLS TSA

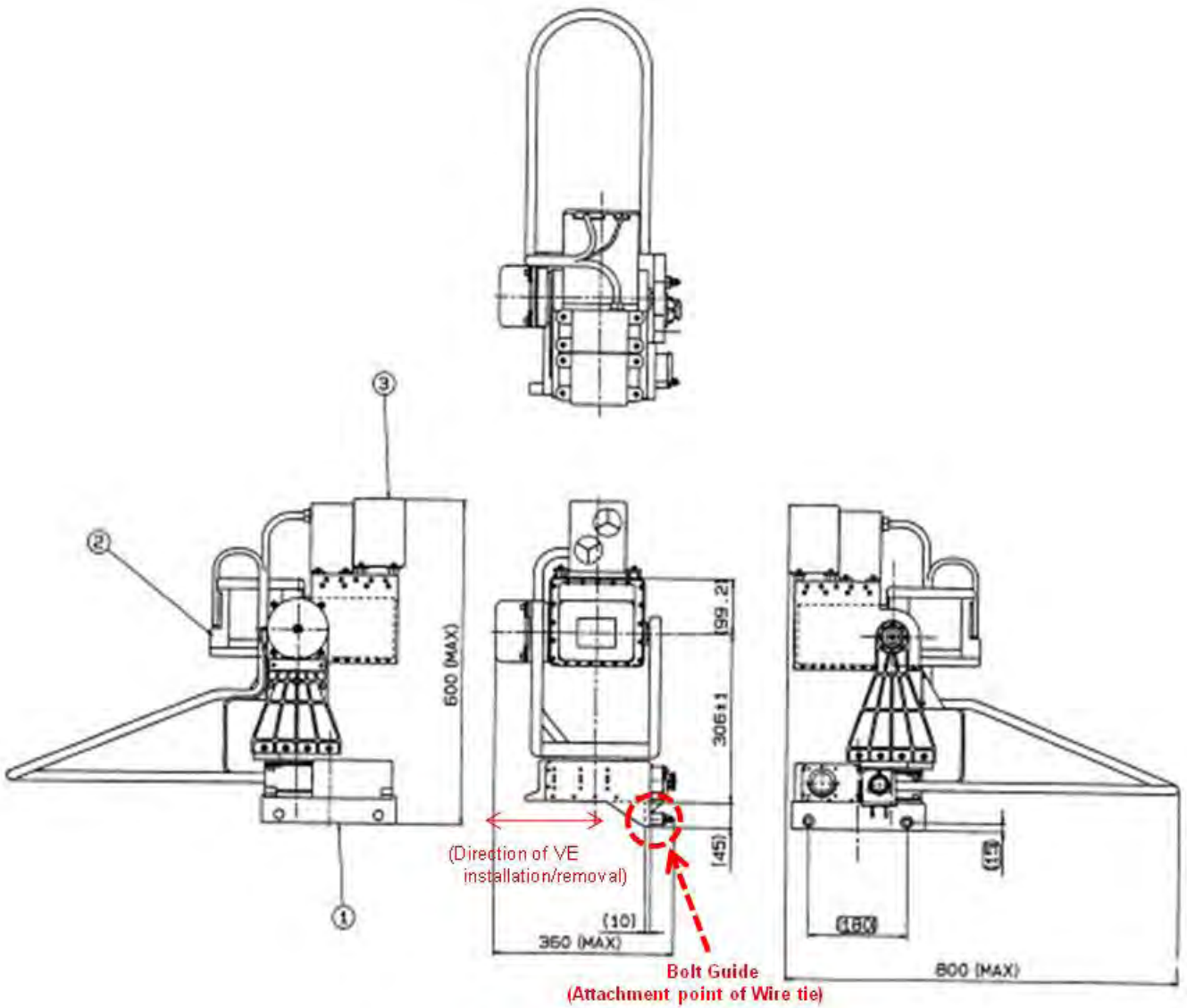

JEF EFBM COVER STOWED HERE DURING EVA 1
MAXI COVER STOWED HERE DURING EVA 1
RMS ROPE REEL
TO ACCESS PAD & PBA SOCKET PULL THIS CUSHION OUT
ADJUSTABLE TETHER OBTAINED FROM TSA HERE

2JA TIE DOWN PLAN – JEF VE



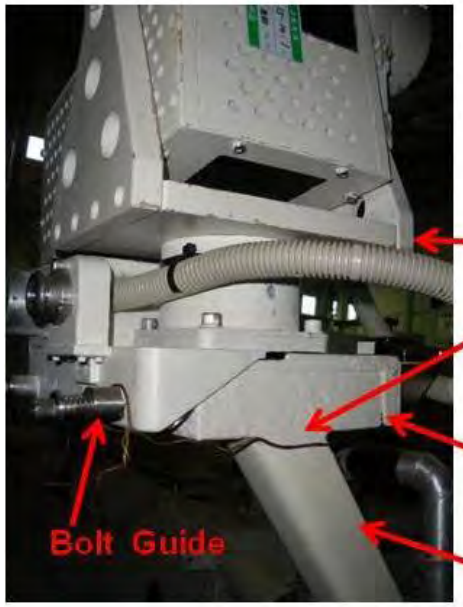
VE Support Stands Configuration

2JA TIE DOWN PLAN – JEF VE (Cont)



Shape of VE

2JA TIE DOWN PLAN – JEF VE (Cont)

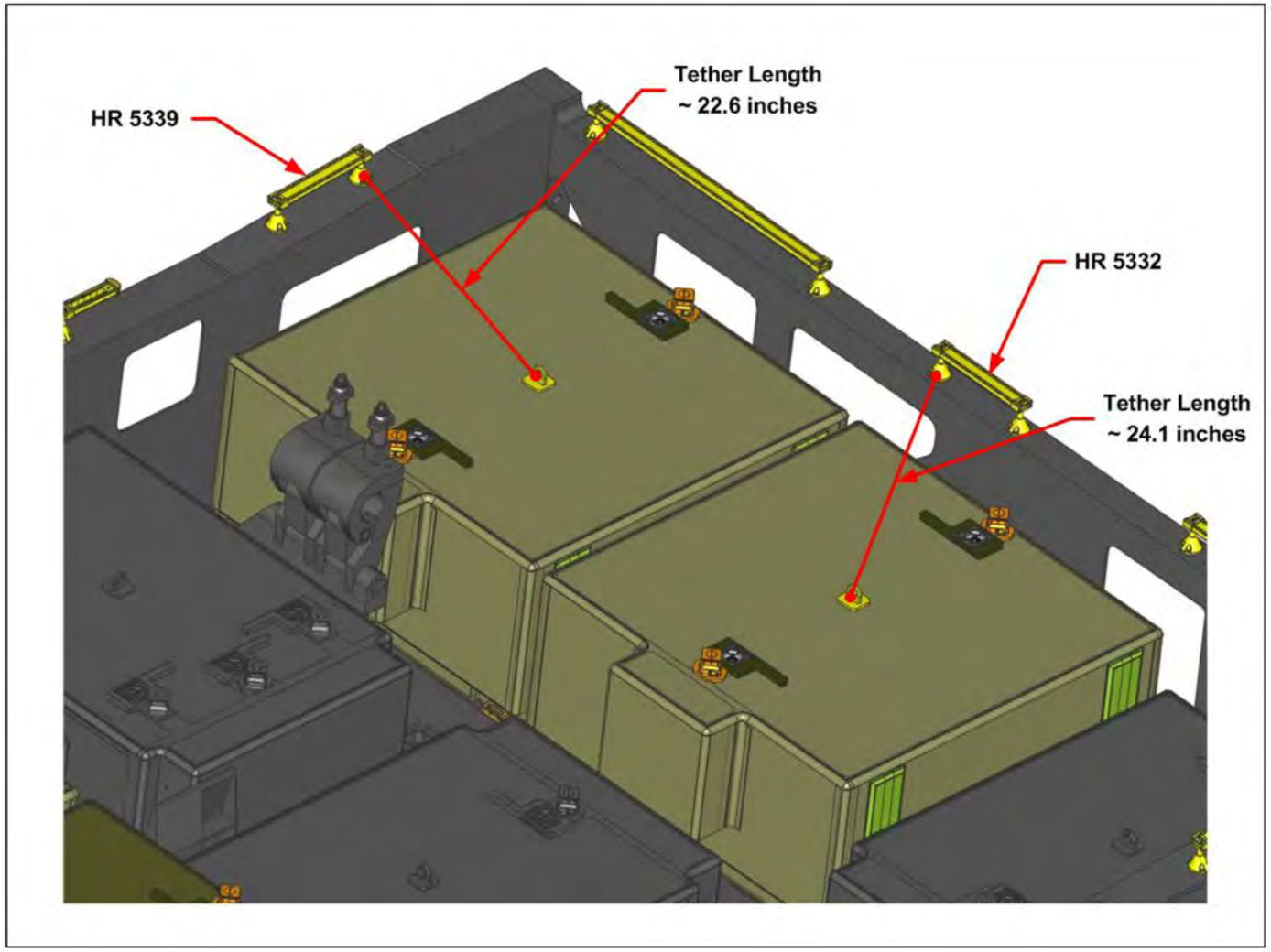


2JA TIE DOWN PLAN – BATTERIES

P6 IEA Battery on Upper Deck

Tethers are Long Duration Tie Down

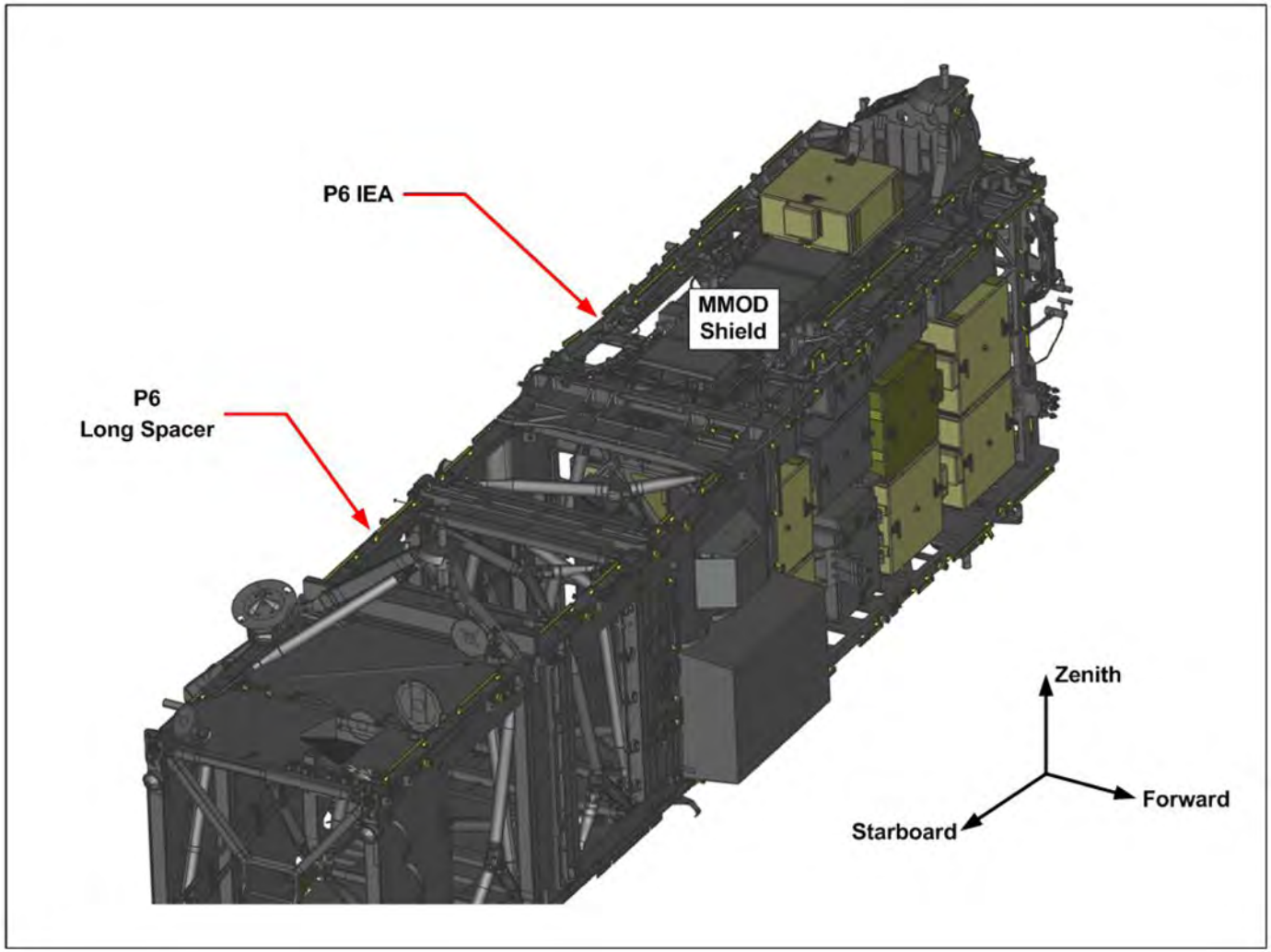
2JA TIE DOWN PLAN – BATTERIES (Cont)



P6 IEA Battery on Upper Deck

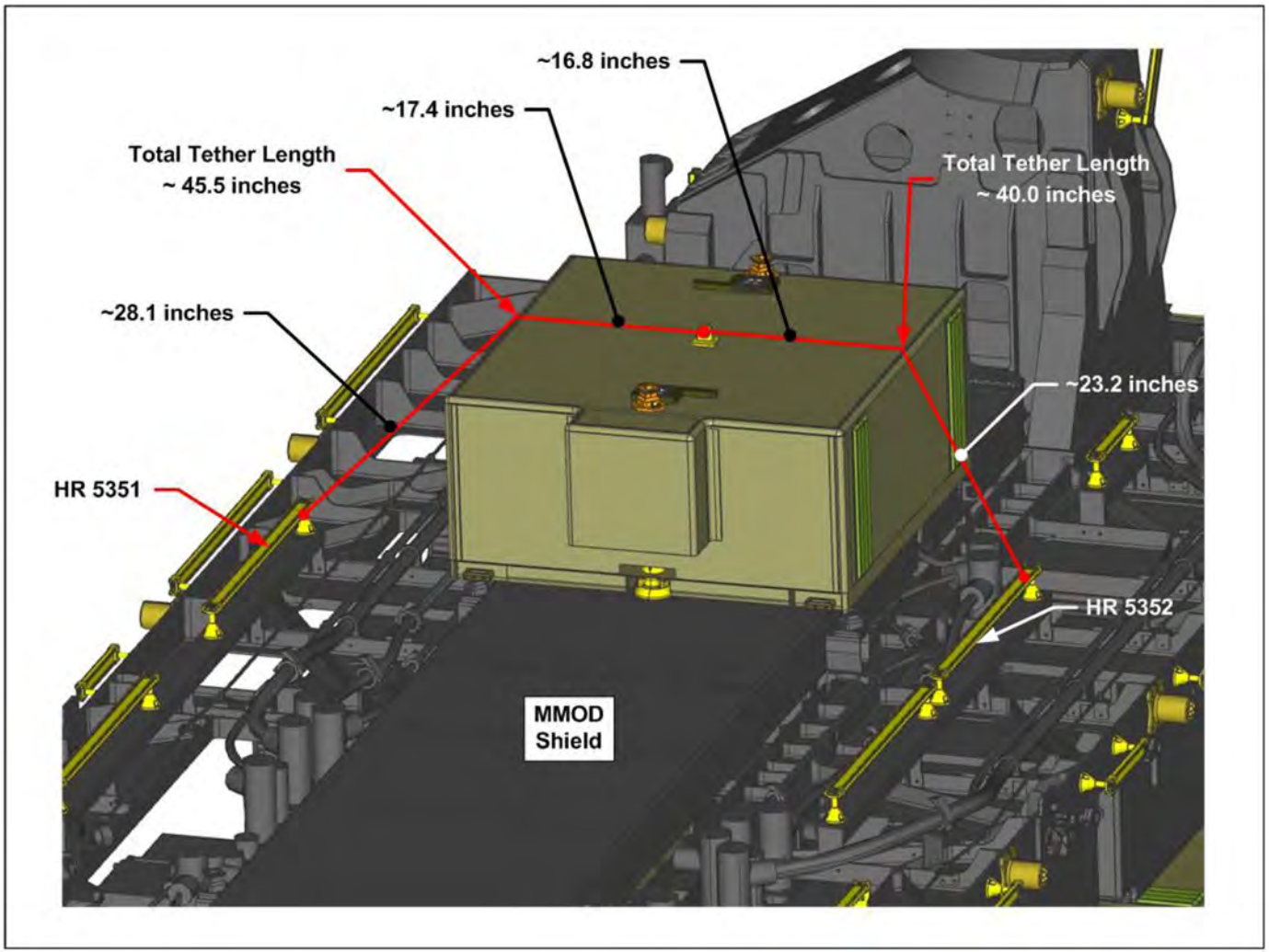
Tethers are Long Duration Tie Down

2JA TIE DOWN PLAN – BATTERIES (Cont)



P6 IEA Battery on MMOD Shield

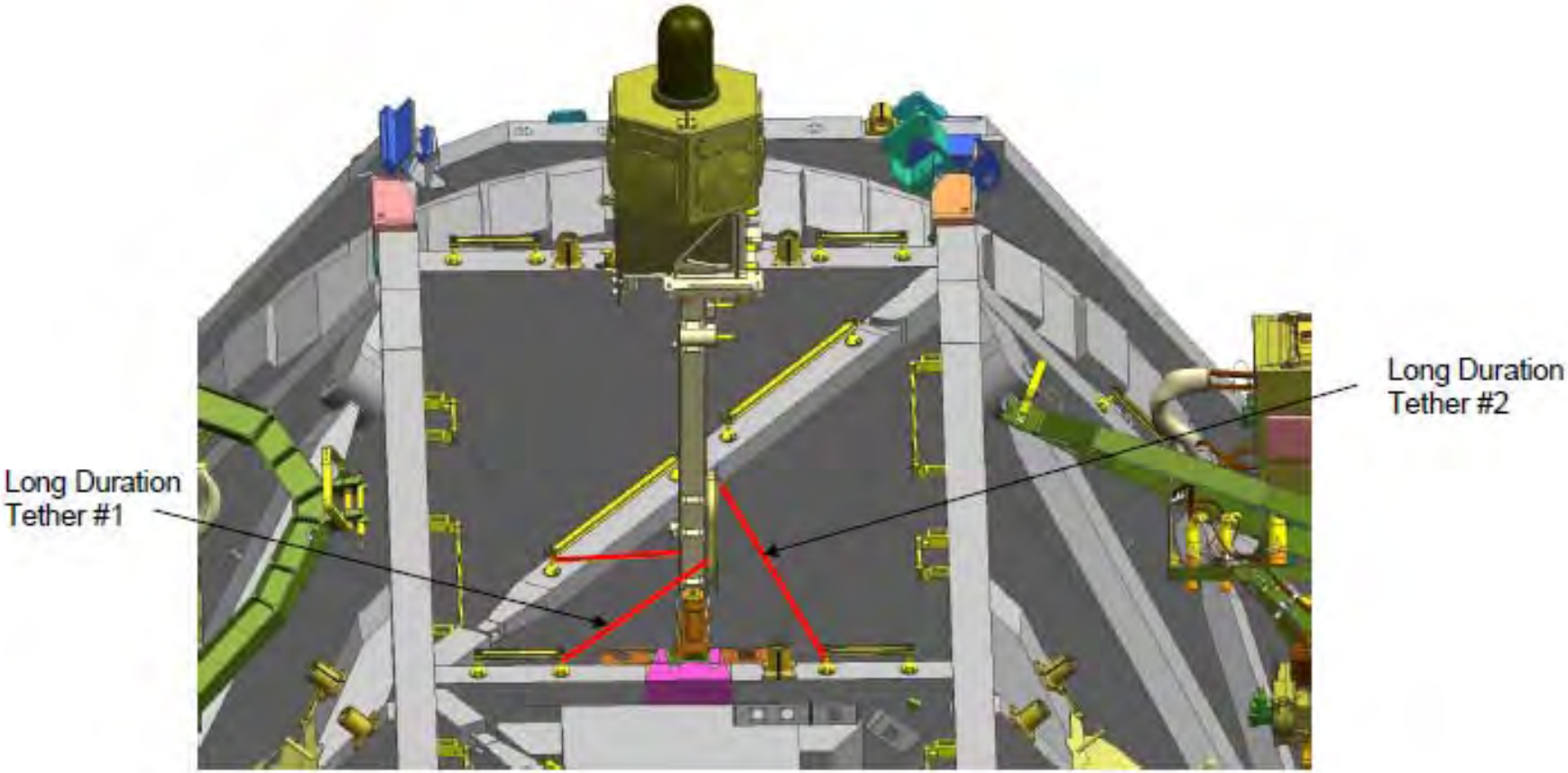
2JA TIE DOWN PLAN – BATTERIES (Cont)



P6 IEA Battery on MMOD Shield

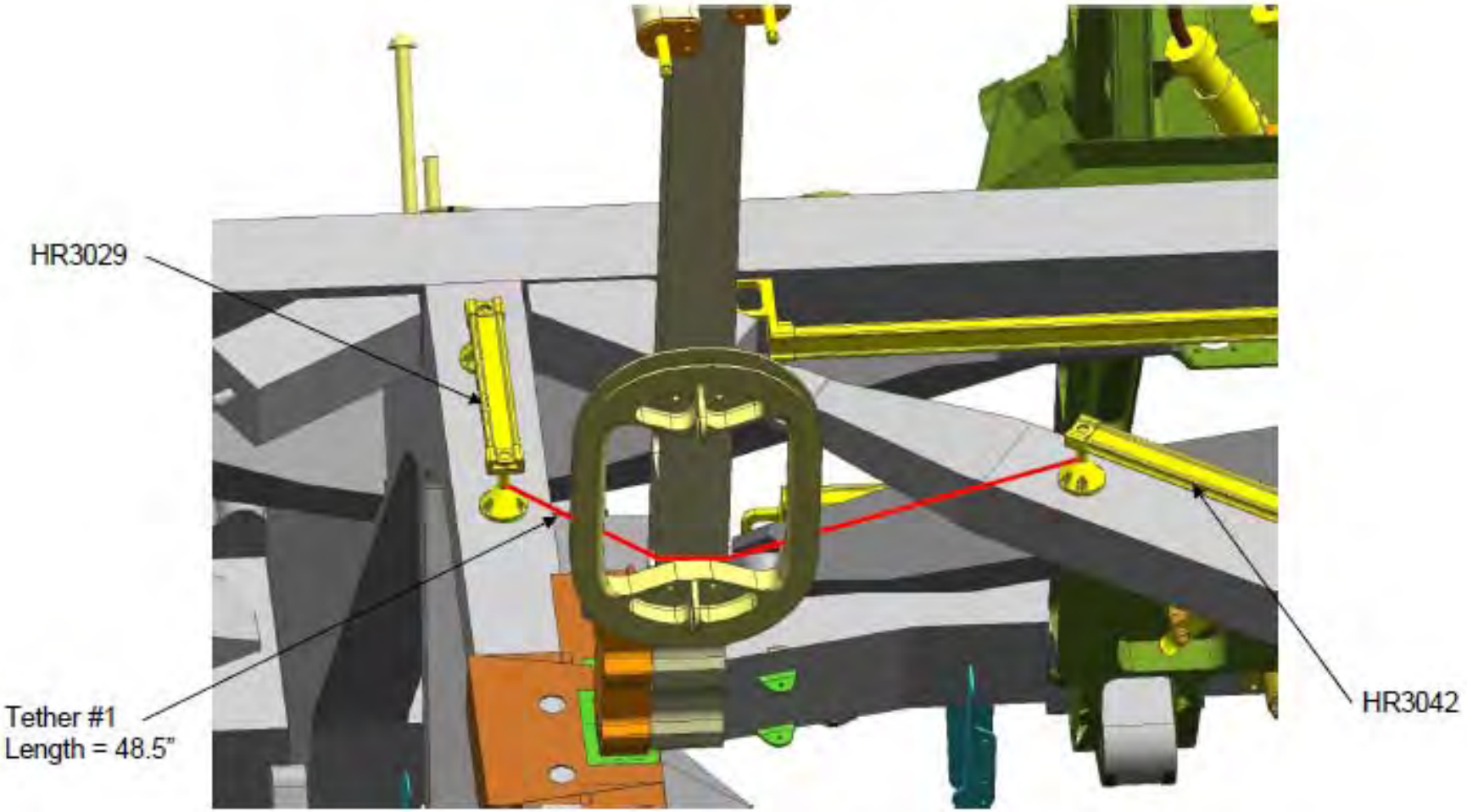
Tethers are Long Duration Tie Down

2JA TIE DOWN PLAN – WETA



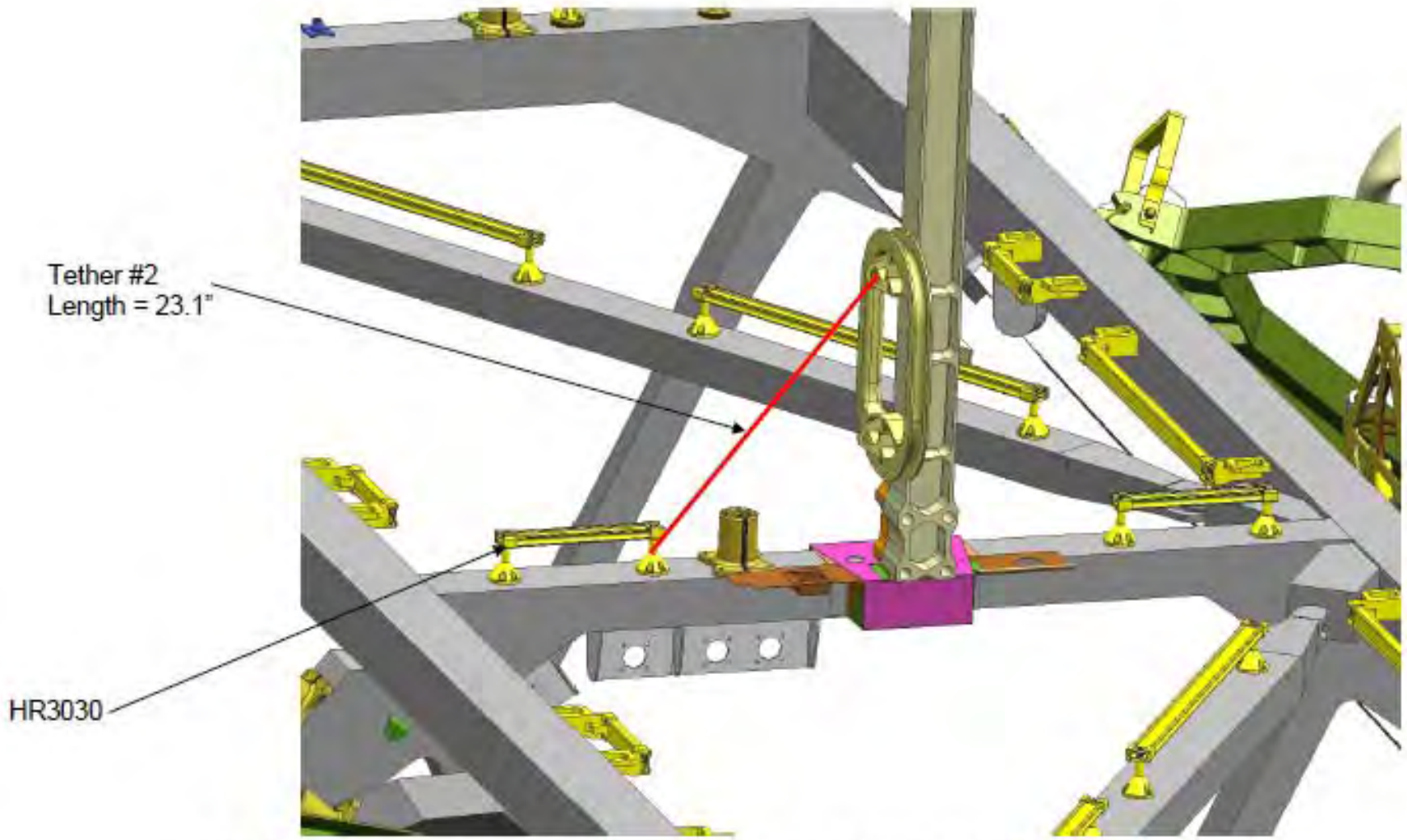
S3 WETA Overview

2JA TIE DOWN PLAN – WETA (Cont)



Tether #1 is a Long Duration Tether which hooks onto the stanchion of HR3029, loops around the VSSA support assembly and then hooks to the stanchion of HR3042. Hooking two adjustable tethers would not be desirable in this situation because the buckles would fall directly onto hardware.

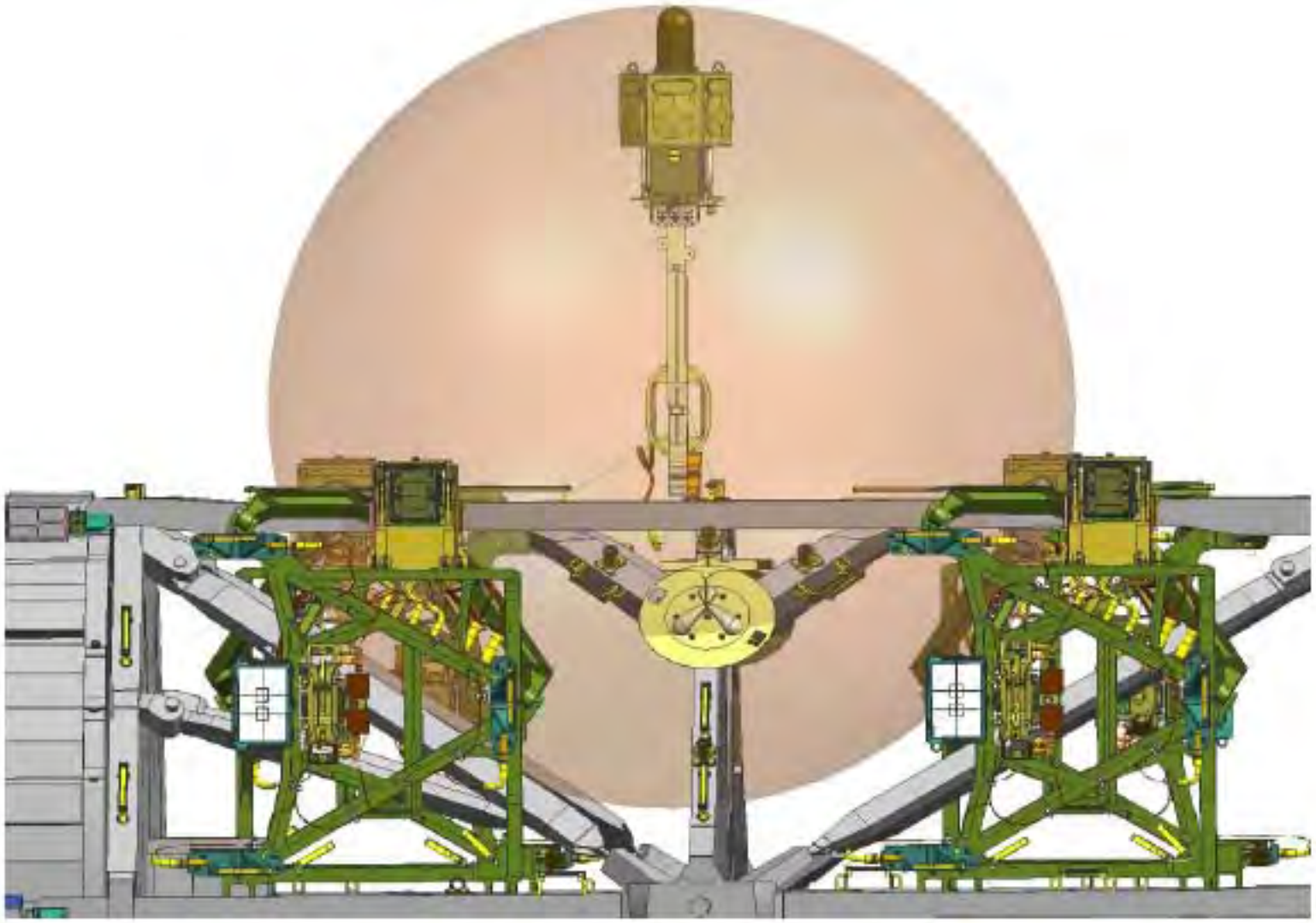
Tether #1 Close-up



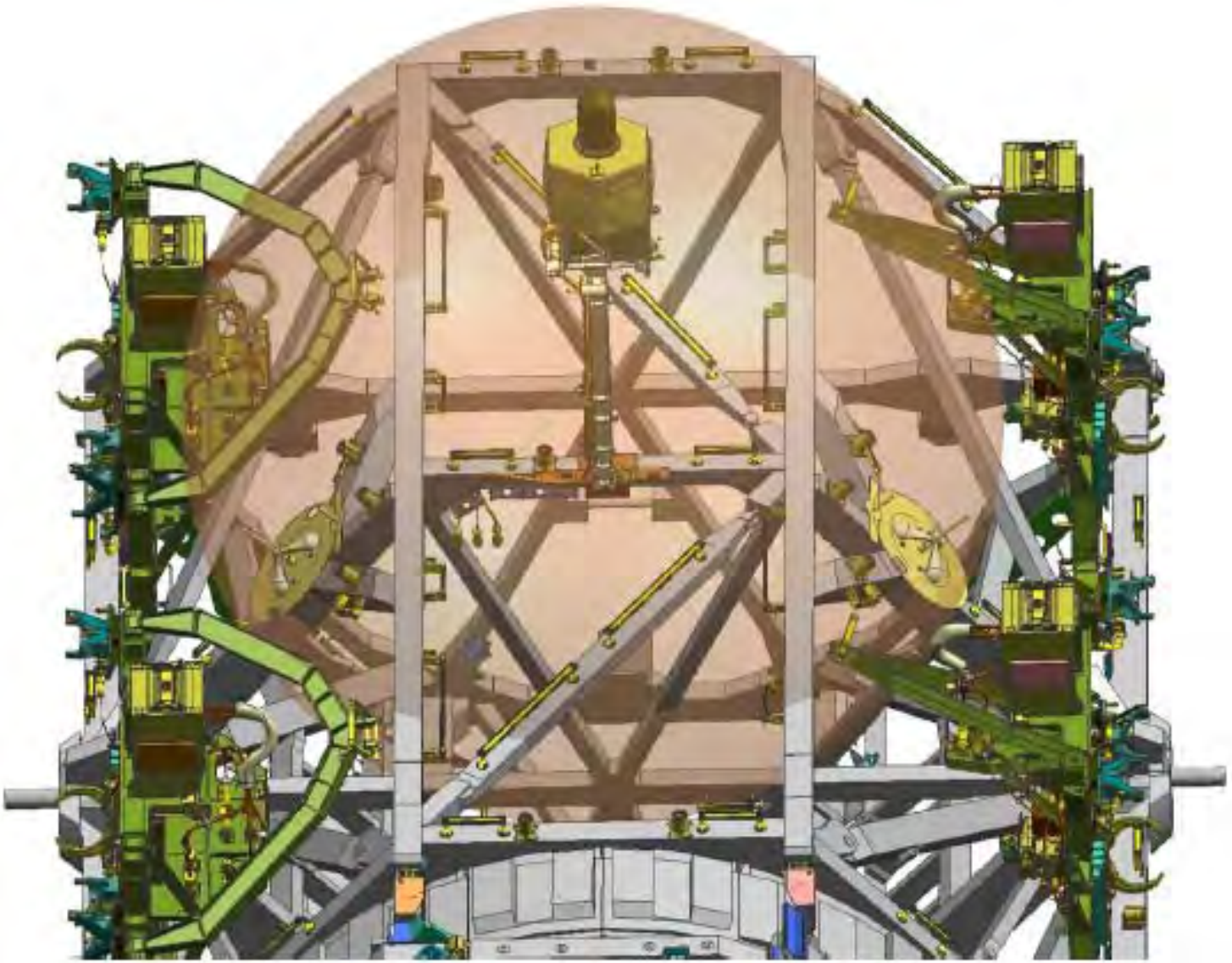
Tether #2 is an Adjustable Tether which hooks onto the stanchion of HR3030 and the tether loop on the VSSA support assembly.

Tether #2 Close-up

2JA TIE DOWN PLAN – WETA (Cont)

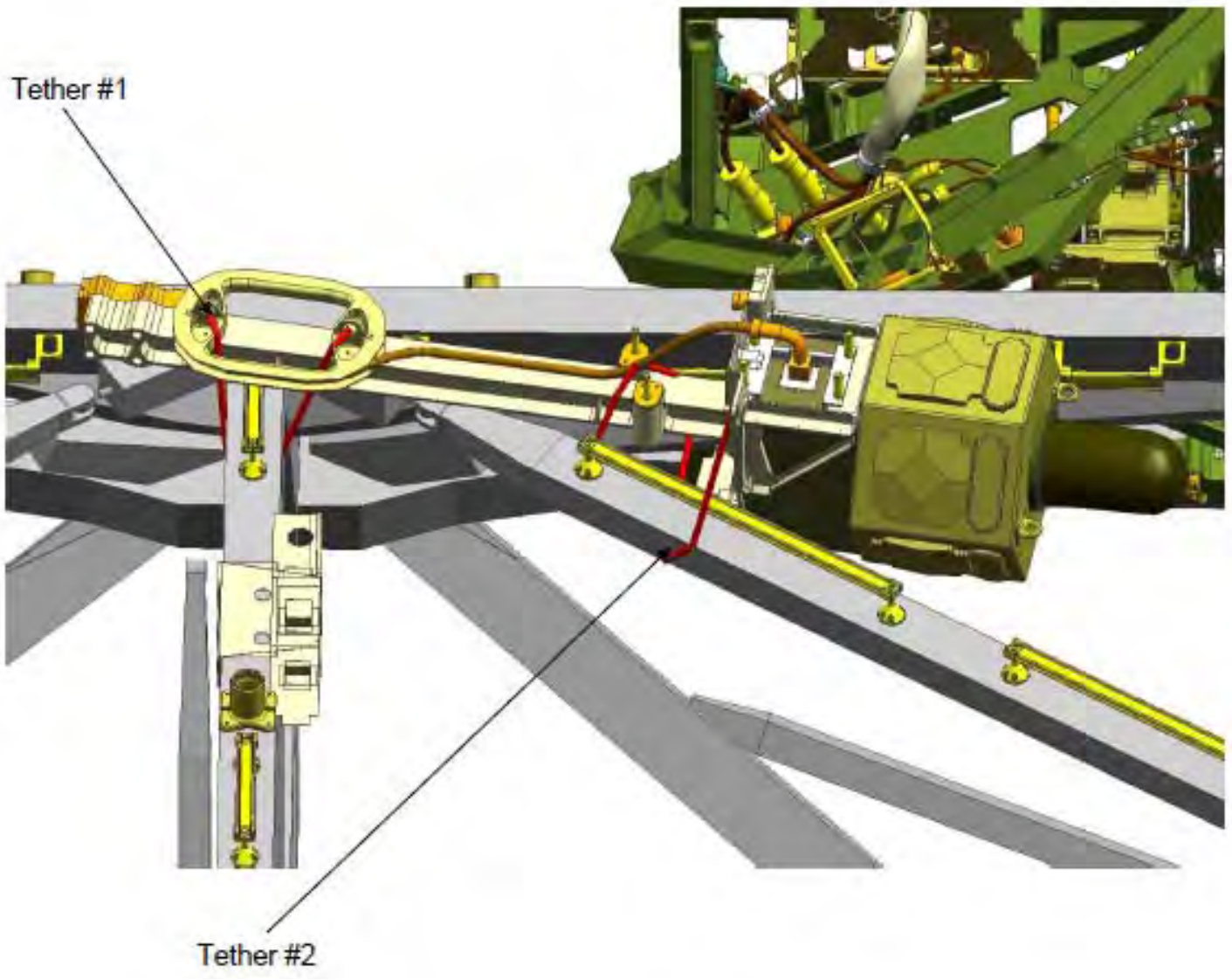


Sphere of Contact

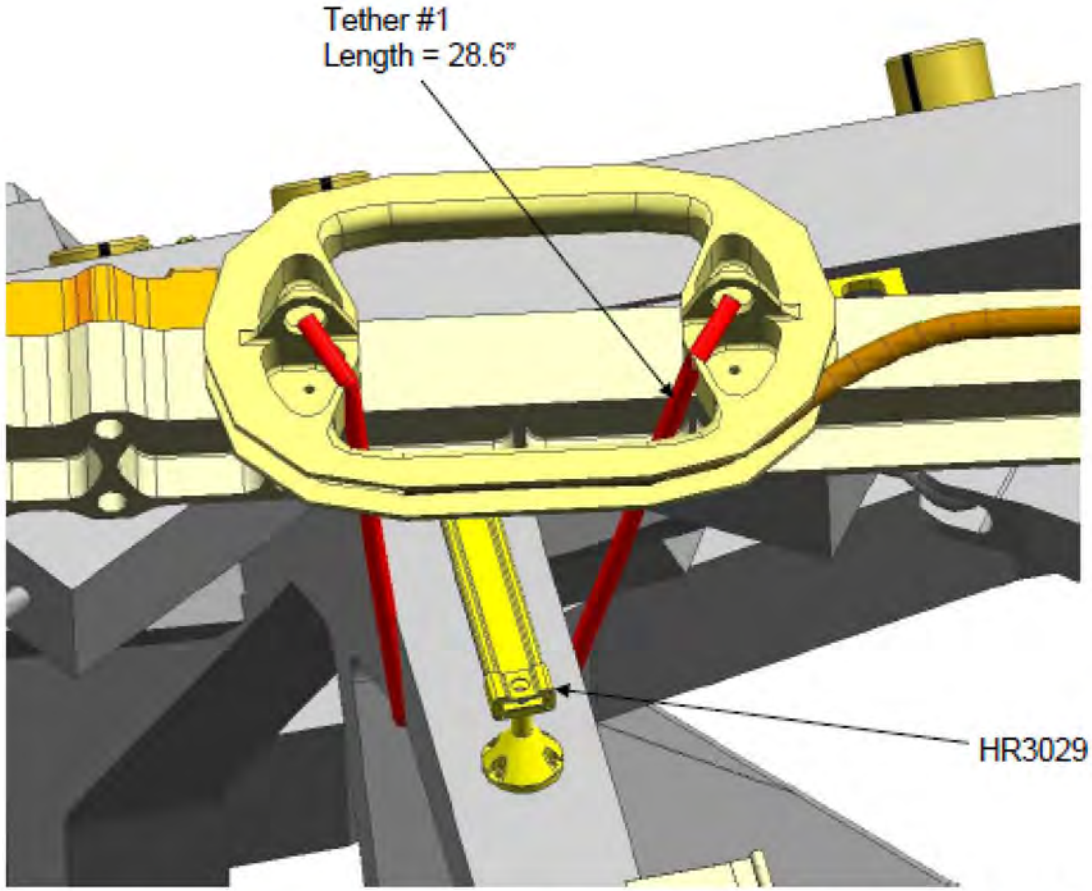


Sphere of Contact – Alternate View

2JA TIE DOWN PLAN – WETA (Cont)



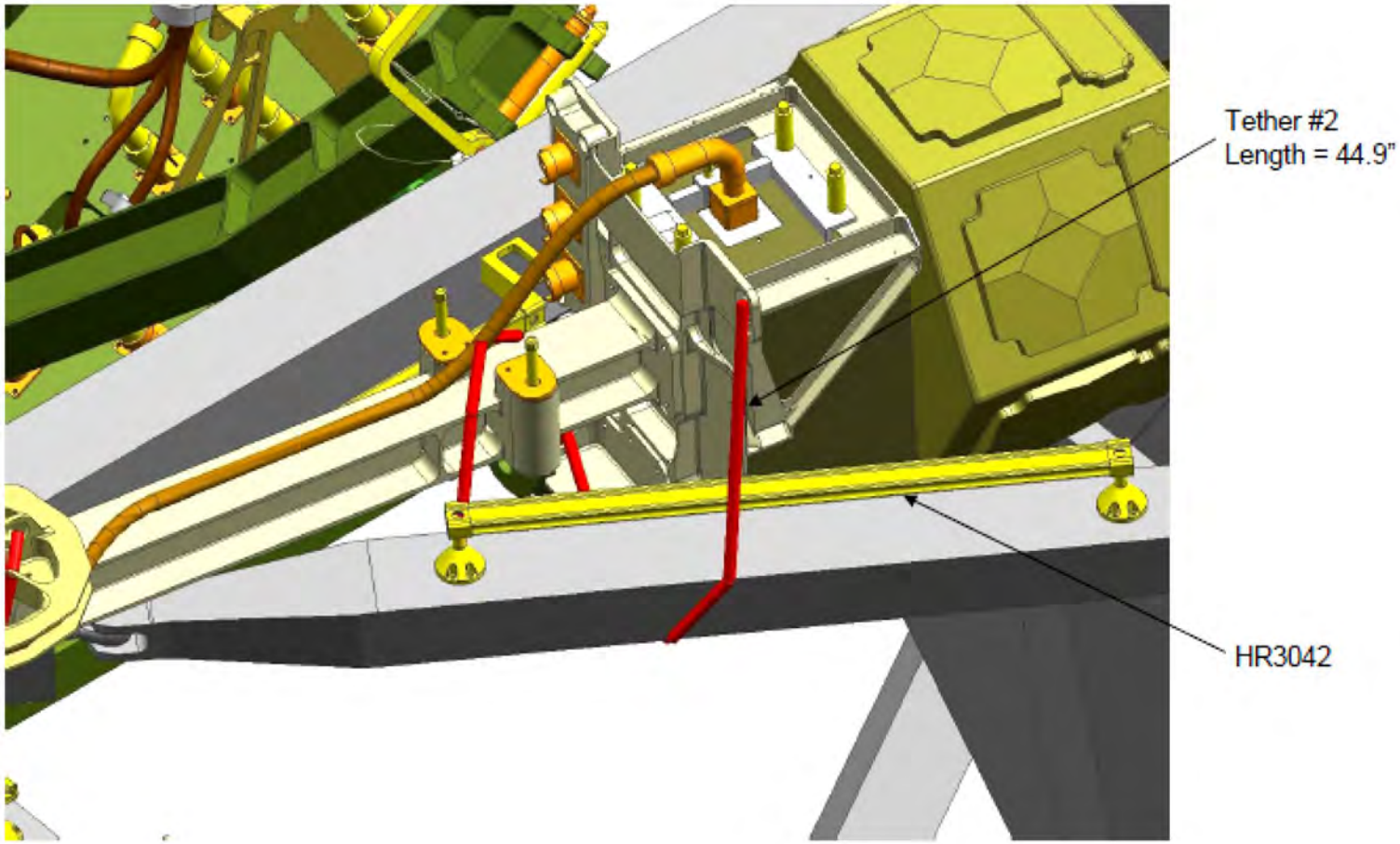
Laydown Overview



Tether #1 is a Long Duration Tether which hooks onto the tether loop on the WETA Racetrack, wraps around S3 structure and HR3029 and then hooks back onto the other tether loop on the WETA Racetrack

Laydown Tether #1

2JA TIE DOWN PLAN – WETA (Cont)



Tether #2 is a Long Duration Tether which hooks onto the tether loop on the VSSA Stanchion, wraps around S3 structure and HR3042 and then hooks back onto the stanchion of HR3042

Laydown Tether #2

Space Shuttle Program
FLIGHT DATA FILE

JSC-48024-127
FINAL

EVA CHECKLIST

STS
127

Flight Cover (trim bottom to expose tabs)