

EVA Checklist

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

**Generic, Rev G
July 28, 2000**

NOTE
For STS-106 and subsequent (chronological)
flights per current schedule.

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).
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EVA CHECKLIST	GENERIC, REV G (July 28, 2000)
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PCN-6 (Aug 30, 2002) Sheet 1 of 1

List of Implemented Change Requests (482s):

EVA-1437	EVA-1447
EVA-1440	EVA-1448
EVA-1441	

NOTE
For STS-112 and subsequent flights

Incorporate the following:

1. Replace iii thru vi
2. Replace 1-7 & 1-8
3. Replace 3-1 thru 3-4, 3-7 & 3-8
4. Replace 4-5 thru 4-8
5. Replace 9-1 & 9-2, 9-5 & 9-6
6. After 11-2, add 11-3 & 11-4

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Encl: 22 pages

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MISSION OPERATIONS DIRECTORATE

EVA CHECKLIST

GENERIC, REV G
July 28, 2000

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Incorporates the following:		
482#:	EVA-1064	EVA-1091
	EVA-1066	EVA-1092
	EVA-1068	EVA-1093
	EVA-1084	EVA-1094
	EVA-1086	EVA-1095
	EVA-1088	EVA-1097
	EVA-1089	EVA-1098
	EVA-1090	

AREAS OF TECHNICAL RESPONSIBILITY

Book Manager	DX35/B. Peavey	281-483-6017
Systems Procedures	DX35/R. M. Hembree	281-483-3969

EVA CHECKLIST

LIST OF EFFECTIVE PAGES

GENERIC	12/07/87
REV G	07/28/00
PCN-1	12/15/00
PCN-2	10/18/01
PCN-3	01/25/02
PCN-4	03/28/02
PCN-5	06/21/02
PCN-6	08/30/02

Sign Off	*	ALL/GEN G	4-7	ALL/GEN G,2
ii	*	ALL/GEN G	4-8	ALL/GEN G,6
iii	*	ALL/GEN G,6	4-9	ALL/GEN G,5
iv	*	ALL/GEN G,6	4-10	ALL/GEN G,5
v	*	ALL/GEN G,5	5-1	ALL/GEN G
vi	*	ALL/GEN G,6	5-2	ALL/GEN G,2
vii	*	ALL/GEN G,5	5-3	ALL/GEN G
viii	*	ALL/GEN G,5	5-4	ALL/GEN G
1-1		ALL/GEN G,2	A6-1	NOM/GEN G
1-2		ALL/GEN G	CC A6-2	NOM/GEN G,5
1-3		ALL/GEN G,3	B6-1	TNL/GEN G
1-4		ALL/GEN G	CC B6-2	TNL/GEN G,5
1-5		ALL/GEN G	6-3	ALL/GEN G
1-6		ALL/GEN G,3	CC 6-4	ALL/GEN G,1
1-7		ALL/GEN G,6	7-1	ALL/GEN G Δ
1-8		ALL/GEN G,4	7-2	ALL/GEN G Δ
1-9		ALL/GEN G,4	8-1	ALL/GEN G,4
1-10		ALL/GEN G,2	8-2	ALL/GEN G
2-1		ALL/GEN G,5	8-3	ALL/GEN G
2-2		ALL/GEN G,2	8-4	ALL/GEN G
2-3		ALL/GEN G	8-5	ALL/GEN G
2-4		ALL/GEN G	8-6	ALL/GEN G,4
2-5		ALL/GEN G,5	9-1	ALL/GEN G,1
2-6		ALL/GEN G,5	9-2	ALL/GEN G,6
3-1		ALL/GEN G,1	9-3	ALL/GEN G,5
3-2		ALL/GEN G,6	9-4	ALL/GEN G,5
3-3		ALL/GEN G,6	9-5	ALL/GEN G,6
3-4		ALL/GEN G,1	9-6	ALL/GEN G
3-5		ALL/GEN G,1	10-1	ALL/GEN G,5
3-6		ALL/GEN G,1	10-2	ALL/GEN G,2
3-7		ALL/GEN G,6	10-3	ALL/GEN G,2
3-8		ALL/GEN G,6	10-4	ALL/GEN G
CC 3-9		ALL/GEN G	10-5	ALL/GEN G
CC 3-10		ALL/GEN G,1	10-6	ALL/GEN G,1
3-11		ALL/GEN G,1	10-7	ALL/GEN G,5
3-12		ALL/GEN G,1	10-8	ALL/GEN G,5
4-1		ALL/GEN G,5	10-9	ALL/GEN G
4-2		ALL/GEN G,2	10-10	ALL/GEN G,1
4-3		ALL/GEN G,1	11-1	ALL/GEN G
4-4		ALL/GEN G,5	11-2	ALL/GEN G,2
4-5		ALL/GEN G,5	11-3	ALL/GEN G,6
4-6		ALL/GEN G,6	11-4	ALL/GEN G,6

* - Omit from flight book
 Δ - Replace with page from Flight Supplement, if applicable.
 Otherwise, not flown

12-i	ALL/GEN G	14-18	ALL/GEN G,1
12-ii	ALL/GEN G	14-19	ALL/GEN G,1
12-1	ALL/GEN G,2	14-20	ALL/GEN G,1
12-2	ALL/GEN G,2	14-21	ALL/GEN G,1
12-3	ALL/GEN G,2	14-22	ALL/GEN G,1
12-4	ALL/GEN G	15-1	ALL/GEN G
12-5	ALL/GEN G	15-2	ALL/GEN G
12-6	ALL/GEN G,5	15-3	ALL/GEN G
12-7	ALL/GEN G,2	15-4	ALL/GEN G,3
12-8	ALL/GEN G,2	15-5	ALL/GEN G
12-9	ALL/GEN G,2	15-6	ALL/GEN G
12-10	ALL/GEN G,2	15-7	ALL/GEN G
12-11	ALL/GEN G,2	15-8	ALL/GEN G
12-12	ALL/GEN G,2	15-9	ALL/GEN G
12-13	ALL/GEN G,2	15-10	ALL/GEN G
12-14	ALL/GEN G,2	15-11	ALL/GEN G
12-15	ALL/GEN G,2	15-12	ALL/GEN G,1
12-16	ALL/GEN G,2	15-13	ALL/GEN G
12-17	ALL/GEN G,2	15-14	ALL/GEN G
12-18	ALL/GEN G,2	16-i	ALL/GEN G
13-1	ALL/GEN G	16-ii	ALL/GEN G
13-2	ALL/GEN G	16-1	ALL/GEN G
13-3	ALL/GEN G	16-2	ALL/GEN G
13-4	ALL/GEN G	17-1	Δ ALL/GEN G
14-1	ALL/GEN G,1	17-2	Δ ALL/GEN G
14-2	ALL/GEN G	18-1	Δ ALL/GEN G
14-3	ALL/GEN G	18-2	Δ ALL/GEN G
14-4	ALL/GEN G	19-i	ALL/GEN G
14-5	ALL/GEN G	19-ii	ALL/GEN G
14-6	ALL/GEN G	19-1	ALL/GEN G,2
14-7	ALL/GEN G	19-2	ALL/GEN G
14-8	ALL/GEN G	19-3	ALL/GEN G
14-9	ALL/GEN G	19-4	ALL/GEN G
14-10	ALL/GEN G	19-5	ALL/GEN G
14-11	ALL/GEN G	19-6	ALL/GEN G
14-12	ALL/GEN G	19-7	ALL/GEN G,2
14-13	ALL/GEN G,2	19-8	ALL/GEN G,2
14-14	ALL/GEN G,3	19-9	ALL/GEN G,2
14-15	ALL/GEN G,1	19-10	ALL/GEN G
14-16	ALL/GEN G,1	20-1	* ALL/GEN G
14-17	ALL/GEN G,1	20-2	* ALL/GEN G,1

EVA CUE CARDS

<u>Title</u>	<u>Ref. Page</u>	<u>Card No.</u>
SAFER CHECKOUT RESULTS (Front)	CC 3-9	EVA-3a/O/C
SAFER STATUS TROUBLESHOOTING (Back)	CC 3-10	EVA-3b/O/D
DEPRESS/REPRESS		
Nominal Configuration		
(Front)	CC A6-2	EVA-1a/NOM/O/H
Tunnel Adapter Configuration		
(Front)	CC B6-2	EVA-2a/TNL/O/T
FAILED LEAK CHECK		
(Back of DEPRESS/REPRESS)	CC 6-4	EVA-1b/O/I EVA-2b/O/I

Δ — Replace with page from Flight Supplement, if applicable.
Otherwise, not flown

* — Omit from flight book

<u>CONTENTS</u>	<u>PAGE</u>
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
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	2-1
AIRLOCK PREP	2-2
EMU SWAP	2-3
BOOSTER FAN DEACTIVATION/REMOVAL	2-4
INSTALLATION/ACTIVATION	2-4
EVA TOOL TRANSFER	2-4
EMU REMOVAL	2-4
INSTALLATION	2-4
CHECKOUT PREP	2-5
LTA RESTRAINT STRAP REMOVAL	2-6
INSTALLATION	2-6
CHECKOUTS	3-1
EMU CHECKOUT	3-2
EMU POWERUP	3-2
COMM CHECK	3-2
PRIMARY REGULATOR/FAN/PUMP CHECK	3-3
SOP CHECK	3-5
BATTERY CHARGE CHECK INIT	3-5
TERM	3-6
EMU SWAP DURING CHECKOUT	3-6
POST EMU C/O RECONFIG	3-7
SAFER CHECKOUT	3-7
SELF TEST SEQUENCE	3-8
SAFER CHECKOUT RESULTS	CC 3-9
STATUS TROUBLESHOOTING	CC 3-10
REBA POWERED HARDWARE CHECKOUT	3-11
EVA PREP	4-1
MIDDECK PREP	4-2
EVA PREP	4-2
PREP FOR DONNING	4-2
EMU DONNING	4-4
CHECK	4-5
EMU PURGE	4-6
EMU PREBREATHE	4-6
SAFER DONNING	4-6
EVA COMM CONFIG	4-8
DECONFIG	4-8
CO2 RMVL SYS DEACT	4-9
ACT	4-9
EMU STATUS	5-1
EMU STATUS	5-2

DEPRESS/REPRESS	6-1
DEPRESS/REPRESS (NOM A/L)	CC A6-2
(TNL)	CC B6-2
FAILED LEAK CHECK	6-3
FAILED LEAK CHECK (5 PSI)	CC 6-4
(14.7/10.2 PSI)	CC 6-4
FLIGHT SPECIFIC TIMELINES	7-1
TOOLS AND STOWAGE	8-1
PSA STOWAGE	8-2
PGT CHECKOUT	8-3
760XD PGSC-PGT CONNECTION	8-4
PROGRAM PGT SETTINGS	8-4
DOWNLOAD/ERASE EVENT LOG	8-5
PGT CONTINGENCIES	8-6
POST EVA	9-1
POST EVA	9-2
SUIT DOFFING	9-2
SAFER DOFFING	9-2
EMU WATER RECHARGE	9-3
SAFER STOW	9-4
SUIT DRYING/SEAL WIPE	9-4
OXYGEN RECHARGE VERIFICATION	9-4
WATER FILL VERIFICATION	9-4
EMU POWERDOWN	9-5
EMU MAINT/RECHARGE	10-1
WATER RECHARGE	10-2
EMU POWERUP	10-2
WATER FILL	10-2
OXYGEN RECHARGE VERIFICATION	10-3
WATER FILL VERIFICATION	10-3
EMU LiOH CHANGEOUT	10-4
MIDDECK EMU BATTERY RECHARGE/LiOH REPLACEMENT	10-5
INITIATE	10-5
TERMINATE	10-5
IN-SUIT EMU BATTERY RECHARGE/CHARGE VERIFICATION	10-6
INITIATE	10-6
TERMINATE	10-6
EMU POWERDOWN	10-6
HELMET LIGHT/PGT BATTERY RECHARGE	10-7
INITIATE	10-7
TERMINATE	10-7
REBA BATTERY INSTALLATION	10-8
EMU BATTERY REMOVAL/INSTALL	10-8
HELMET LIGHT BULB CHANGEOUT	10-9
REBA BATTERY RECHARGE	10-10
INITIATE	10-10
TERMINATE	10-10
POST EVA ENTRY PREP	11-1
POST EVA ENTRY PREP	11-2
SAFER ENTRY STOW	11-2
POST ISS EVA ENTRY PREP	11-3
SAFER ENTRY STOW	11-3

<u>OFF-NOMINAL PROCEDURES</u>	12-i
EMU CONTINGENCY PROCS	12-1
DISPLAY LOSS DURING POWER TRANSFER (WARM RESTART)	12-2
VACUUM H2O RECHARGE (MANNED)	12-2
LiOH REPLACEMENT (MANNED)	12-3
BATTERY REPLACEMENT (MANNED)	12-4
WATER DUMP	12-5
SCU SWAP (UNMANNED)	12-6
(MANNED)	12-6
EMU COLD RESTART (MANNED)	12-6
12.1 CHEMICAL CHECK/DECONTAMINATION	12-7
CONTAMINATION TEST	12-10
SAFER BATTERY CHANGEOUT	12-11
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (IN-SUIT)	12-12
BTA PREP	12-12
TREATMENT	12-12
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (PHASE 2 DOFFING)	12-14
BTA PREP	12-14
TREATMENT	12-14
EMU RESIZE	12-17
 DAP/EVA RESCUE/RETRIEVE	13-1
EVA ORBITER CONFIGURATION	13-2
RESCUE/RETRIEVE	13-4
 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
EVA TIMELINE	14-14
CAPTURE LATCH MANUAL RELEASE (ODS/PMA)	14-19
96 BOLT EVA LAYOUT	14-21
 EVA CUFF CHECKLIST (CIL)	15-1
NORMAL EVA STATUS	15-2
EVA COMM FREQUENCIES	15-2
EMU MAL INDEX	15-2
DECOMPRESSION SICKNESS (DCS)	15-3
ABORT EVA	15-3
TERMINATE EVA	15-3
SOP O2 ON	15-4
BATT AMPS HIGH	15-4
VDC LOW	15-4
SUIT P LOW	15-4
HIGH	15-5
SOP P LOW	15-5
O2 USE HIGH	15-5
SUBLM PRESS	15-5
H2O GP LOW	15-6
RESRV H2O ON	15-6
NO VENT FLOW	15-6
CO2	15-6
COMM FAILURE	15-7
MISC MSGS	15-7
AIR FLOW CONTAMINATION	15-7
RADIATOR ACTUATOR DISCONNECT	15-8

PLBD DRIVE CUT	15-8
DOOR DRIVE RESTRAINT	15-8
DISCONNECT	15-9
WINCH OPERATIONS	15-9
3-PT TOOL INSTALLATION	15-9
CL LATCH TOOL	15-10
TOOL RESET	15-10
AIRLOCK LATCH DISCONNECT	15-10
HINGE DISCONNECT	15-10
RMS JOINT ALIGN	15-10
SHOULDER BRACE RELEASE	15-10
MPM STOW/DEPLOY	15-10
RMS TIEDOWN	15-11
FLIGHT RELEASABLE GRAPPLE FIXTURE RELEASE	15-11
PRLA OPEN/CLOSE	15-11
KU ANTENNA STOW	15-12
AIRLOCK EGRESS	15-12
INGRESS	15-12
<u>FLIGHT SPECIFIC REFERENCE</u>	16-i
UNSCHEDULED/CONTINGENCY EVA TASKS	16-1
EVA REFERENCE	17-1
FLIGHT SPECIFIC	18-1
<u>EVA EMERGENCY</u>	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
19.1 DCS TREATMENT	19-7
CUE CARD CONFIGURATION	20-1

10.2 PSI CABIN

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
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

10.2 PSI CABIN

MASK PREBREATHE INITIATE

1. Take one aspirin tablet (325 mg) if not taken previously
 2. Configure Quick Don Mask, HIU, and 14 ft comm/O2 Umbilicals (two)
 - C7
L2 3. ✓LEH O2 SPLY 1,2 vlv (two) – OP
 4. O2 XOVR SYS 2 – CL
 - C6,
MO32M,
MO69M 5. LEH O2 4(5,6,7) outlet – connect O2 hose
 - MO39M 6. MIDDECK COMM CCU PWR – OFF
outlet – connect comm cable
CCU PWR – ON
 7. Decrease HIU volume control
 - C6,
MO32M,
MO69M 8. LEH O2 4(5,6,7) vlv – OP
 9. Don mask
- WARNING**
Positive mask O2 pressure and fit are necessary to ensure adequate prebreathe
10. Set mask O2 control to EMERGENCY
 11. Momentarily pull mask away from face and verify O2 flow
 12. ✓Comm
 13. Configure ATU for PTT/PTT as reqd to alleviate comm noise
- WARNING**
Do not terminate prebreathe until cabin pressure at 10.2 psia and 1 hr prebreathe completed
14. Note time and continue mask prebreathe at least 1 hr

PREP FOR 10.2 PSI CABIN

PRESS/CRYO SYS CONFIG

- L2
1. ✓O2 SYS 1,2 SPLY (two) – ctr (tb–OP)
 ✓XOVR SYS 1 – OP
 2 – CL
 2. ✓N2 SYS 1,2 SPLY (two) – ctr (tb–OP)
 ✓REG INLET (two) – ctr (tb–OP)
 3. O2/N2 CNTLR VLV SYS 1 – OP (N2)
 2 – CL (O2)
- SM 88 APU/ENVIRON THERM**
- L1
4. If FLASH EVAP CNTLR PRI A,B – OFF:
 If FREON LOOP 1,2 EVAP OUT T between
 41–47 degF:
 RAD CNTLR OUT TEMP – HI
 When FREON EVAP OUT TEMP > 50 degF,
 RAD CNTLR OUT TEMP – NORM (then
 immediately)
 FLASH EVAP CNTLR PRI A(B) – ON
 After ~1 min
 ✓FREON EVAP OUT TEMP ~39 degF
 If FREON LOOP 1,2 EVAP OUT T not between
 41–47 degF:
 FLASH EVAP CNTLR PRI A(B) – ON
- L1
- If FLASH EVAP CNTLR PRI A(B) – ON,
 continue:

AIRLOCK/MIDDECK PREP

- MO10W
5. O2 REG INLET SYS 1 vlv – CL
 2 vlv – OP
 6. ✓N2 XOVER vlv – CL
 If internal airlock:
- ML31C
7. ✓VAC VENT ISOL VLV BUS SEL – MNA
 ✓CNTL – ctr (tb–OP)
 ✓NOZ HTR – ON
 8. If CO2 RMVL SYS flown: Perform CO2 RMVL
 SYS DEACT, 4–8
- AW18A
9. LTG FLOOD (four) – ON
- DCM
10. ✓PURGE vlv – op (up)
 11. Remove LTA restraint bag (1 ea EMU)
- AW82B
12. AIRLK DEPRESS vlv cap – vent, remove

RESET FDA & C/W LIMITS

- X: SM 60 SM TABLE MAINT**
13. Contact MCC for uplink of B/U C/W and SM
 ALERT TMBU (if desired)
 Changes enclosed in

PARAMETER NAME	C/W CHL	H/W C/W		H/W & B/U ENA/INH	PARA ID	B/U C/W	
		LO V	HI V			LO EU	HI EU
CABIN PRESS (OV102)	4	2.50	3.85	ENA	0612405	10.0	15.2
(OV103)	4	2.45	3.80	ENA	0612405	10.0	15.2
(OV104)	4	2.50	3.85	ENA	0612405	10.0	15.2
(OV105)	4	2.50	3.85	ENA	0612405	10.0	15.2
O2 FLOW 1	14		4.90	INH	0612105		4.9
2	24		4.90	INH	0612205		4.9
PPO2 A	34	2.55	3.60	ENA	0612511	2.55	3.6
B	44	2.55	3.60	ENA	0612513	2.55	3.6
N2 FLOW 1	54		4.90	INH	0612553		4.9
2	64		4.90	INH	0612554		4.9
FAN ΔP	74	1.75	4.25	ENA	0612556	2.8	6.8

PARAMETER NAME	ENA/INH	PARA ID	SM ALERT	
			LOW	HIGH
AV BAY FAN ΔP 3 (OV104)	ENA	0612658	2.0	5.1
IMU FAN ΔP	ENA	0612869	2.7	4.95
CABIN O2 CONCENTRATION	ENA	0922104		28.5
AIRLK P	INH	0640101	13.8	15.7
EXT AIRLK P	INH	0640126	13.8	15.7
H2O LOOP ICH OUT T1	ENA	0612744	33.0	
T2	ENA	0612724	33.0	

CABIN DEPRESS TO 10.2 PSI

WARNING

Do not initiate depress until EV1 and EV2 have completed 45 min of mask prebreathe

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

1. Plot initial CABIN P vs PPO2 on 10.2 PSIA DEPRESS CHART using SM SYS SUMM 1

WARNING

Cabin O2 concentration (SM SYS SUMM 1) must be maintained below 28.5% to protect against increased flammability risk

Terminate all WCS activity while flowing N2 thru 14.7 CAB REG INLET SYS 1

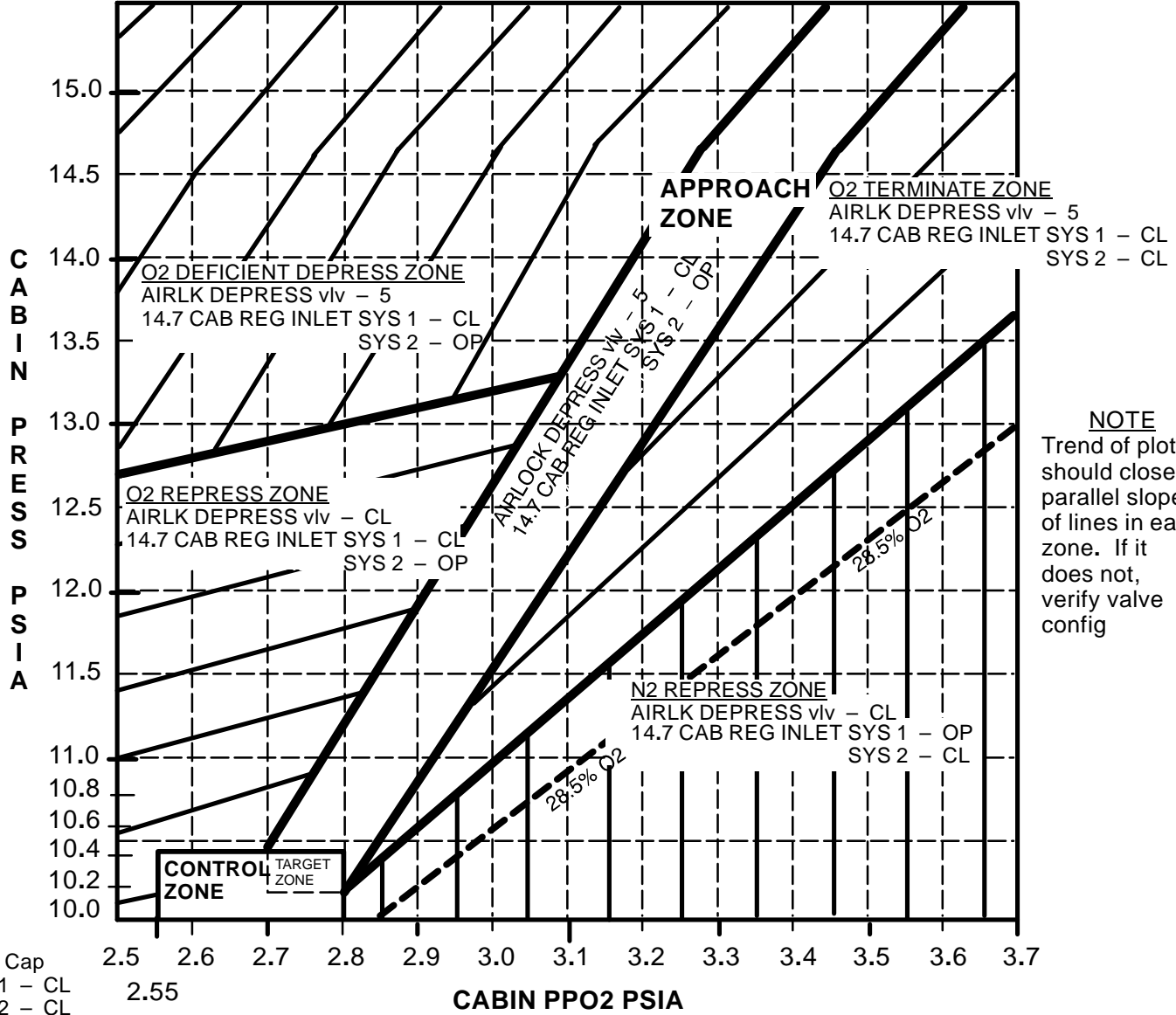
NOTE

Expect klaxon each time airlock depress valve opened

AW82B,
MO10W

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

10.2 PSIA DEPRESS CHART



NOTE
Trend of plot should closely parallel slope of lines in each zone. If it does not, verify valve config

When in **CONTROL ZONE** (**TARGET ZONE** preferred):
STOP DEPRESS
AIRLK DEPRESS vlv - CL
Install AIRLK DEPRESS vlv Cap
14.7 CAB REG INLET SYS 1 - CL
SYS 2 - CL

10.2 PSI CABIN CONFIG

X: SM 60 SM TABLE MAINT

- R13
- Reset FDA & C/W limits:
Changes enclosed in
 - Contact MCC for uplink of B/U C/W and SM ALERT TMBU (if desired)

PARAMETER NAME	C/W CHL	H/W C/W		H/W & B/U ENA/INH	PARA ID	B/U C/W	
		LO V	HI V			LO EU	HI EU
CABIN PRESS (OV102)	4	2.50	2.70	ENA	0612405	10.0	10.6
(OV103)	4	2.45	2.65	ENA	0612405	10.0	10.6
(OV104)	4	2.50	2.70	ENA	0612405	10.0	10.6
(OV105)	4	2.50	2.70	ENA	0612405	10.0	10.6
PPO2 A	34	2.55	2.90	ENA	0612511	2.55	2.9
B	44	2.55	2.90	ENA	0612513	2.55	2.9
FAN ΔP	74	1.75	3.05	ENA	0612556	2.8	4.88

PARAMETER NAME	ENA/INH	PARA ID	SM ALERT	
			LOW	HIGH
AV BAY FAN ΔP 1	ENA	0612642	2.5	3.3
2	ENA	0612647	2.5	3.3
3 (OV102)	ENA	0612658	2.5	3.3
3 (OV103)	ENA	0612658	2.5	3.3
3 (OV104)	ENA	0612658	2.0	3.5
3 (OV105)	ENA	0612658	2.5	3.3
IMU FAN ΔP	ENA	0612869	2.7	3.8
H2O LOOP ICH OUT T1	ENA	0612744	35.0	
T2	ENA	0612724	35.0	

- Perform SM CHECKPOINT INITIATE (ORB OPS, DPS)

If internal airlock and CO2 RMVL SYS flown:

- Perform CO2 RMVL SYS ACT (EVA PREP)

L2

- O2 XOVR SYS 2 – OP

MO69M

- If O2 bleed orifice not installed:
 LEH O2 vlv 8 – CL
 Unstow and insert O2 bleed orifice in O2 QD
 LEH O2 vlv 8 – OP

MASK PREBREATHE TERMINATE

WARNING

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

- Set mask O2 control to NORMAL
- Doff mask

C6,
MO32M,
MO69M

- LEH O2 4(5,6,7) vlv – CL

MO39M

- MIDDECK COMM CCU PWR – OFF
 outlet – Disconnect comm cable
 CCU PWR – ON

- Depress Mask O2 control

C6,
MO32M,
MO69M

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

- Stow mask, HIU, and 14 ft comm/O2 umbilical

10.2 PSI MAINTENANCE

WARNING

Cabin O2 concentration (SM SYS SUMM 1) must be maintained below 28.5%. See chart this page

Terminate all WCS activity while flowing N2 thru 14.7 CAB REG INLET SYS 1

CAUTION

Do not perform 10.2 PSI MAINTENANCE in parallel with EMU purge

X: SM SYS SUMM 1

NOTE

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

1. If PPO2 < 2.70 psia:

If pre-sleep:

OCAC

Perform OCAC filter cleaning as reqd

OCAC PWR – OFF

C5

DIRECT O2 – OP

2. When PPO2 ~2.70 psia or when

CABIN PRESS ~10.4 psia:

DIRECT O2 – CL

If pre-sleep:

OCAC

OCAC PWR – ON

MO10W

3. If CABIN PRESS < 10.40 psia:

14.7 CAB REG INLET SYS 1 vlv – OP (N2)

When CABIN PRESS ~10.40 psia:

14.7 CAB REG INLET SYS 1 vlv – CL

CABIN LEAK MONITORING

4. Log 10.2 PSI MAINTENANCE times (MET)

- | | |
|----------|----------|
| 1. _____ | 5. _____ |
| 2. _____ | 6. _____ |
| 3. _____ | 7. _____ |
| 4. _____ | 8. _____ |

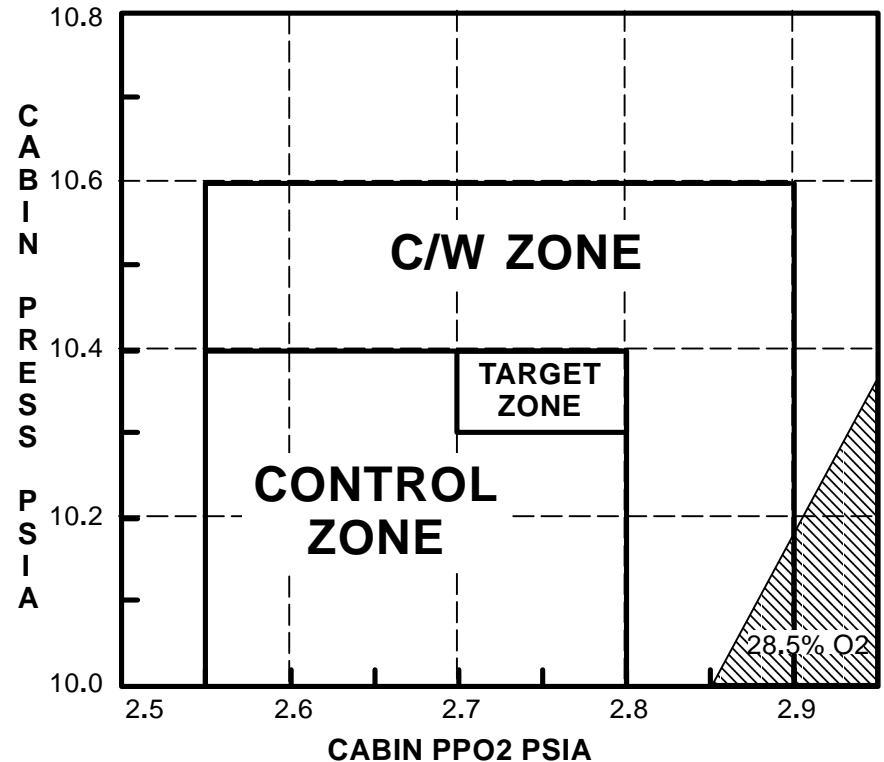
NOTE

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

5. If successive maintenance reqd because CABIN PRESS decreased from 10.40 to 10.00 psia:

For $\Delta t < 40$ min, perform O2(N2) FLOW HIGH/CAB P LOW/dP/dT (ORB PKT, ECLS)

For $40 \text{ min} < \Delta t < 10 \text{ hr}$, perform MAL, ECLS SSR-8, SMALL CABIN-LEAK ISOL



CABIN REPRESS TO 14.7 PSI

WARNING

Terminate all WCS activity during repress to 14.7 psia

SETUP

NOTE

Verify outer hatch(es) closed

X: SM 60 SM TABLE MAINT

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

PARAMETER NAME	C/W CHL	H/W C/W		H/W & B/U ENA/INH	PARA ID	B/U C/W	
		LO V	HI V			LO EU	HI EU
CABIN PRESS (OV102)	4	2.50	3.85	ENA	0612405	10.0	15.2
(OV103)	4	2.45	3.80	ENA	0612405	10.0	15.2
(OV104)	4	2.50	3.85	ENA	0612405	10.0	15.2
(OV105)	4	2.50	3.85	ENA	0612405	10.0	15.2
PPO2 A	34	2.55	3.60	ENA	0612511	2.55	3.6
B	44	2.55	3.60	ENA	0612513	2.55	3.6
FAN ΔP	74	1.75	4.25	ENA	0612556	2.8	6.8

PARAMETER NAME	ENA/INH	PARA ID	SM ALERT	
			LOW	HIGH
AV BAY FAN ΔP 1	ENA	0612642	2.5	4.3
2	ENA	0612647	2.5	4.3
3 (OV102)	ENA	0612658	2.5	4.3
3 (OV103)	ENA	0612658	2.5	4.5
3 (OV104)	ENA	0612658	2.0	5.1
3 (OV105)	ENA	0612658	2.5	4.3
IMU FAN ΔP	ENA	0612869	2.7	4.95
H2O LOOP ICH OUT T1	ENA	0612744	33.0	
T2	ENA	0612724	33.0	

REPRESS

X: SM 66 ENVIRONMENT

- MO10W 3. 14.7 CAB REG INLET SYS 1,2 vlv (two) – OP

L2

4. ✓O2/N2 CNTLR VLV SYS 1 – OP
2 – AUTO

5. Contact MCC to determine if FES should remain ON

6. If FES operation not reqd:
FLASH EVAP CNTLR PRI A(B) – OFF

L1

14.7 PSI CABIN CONFIG

ORBITER PCS 1(2) CONFIG

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

RESET C/W AND FDA LIMITS

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

PARAMETER NAME	C/W CHL	H/W C/W		H/W & B/U ENA/INH	PARA ID	B/U C/W	
		LO V	HI V			LO EU	HI EU
CABIN PRESS (OV102) (OV103) (OV104) (OV105)	4	3.45	3.85	ENA	0612405	13.8	15.2
	4	3.45	3.80	ENA	0612405	13.8	15.2
	4	3.45	3.85	ENA	0612405	13.8	15.2
	4	3.45	3.85	ENA	0612405	13.8	15.2
O2 FLOW 1 2	14		4.90	ENA	0612105		4.9
	24		4.90	ENA	0612205		4.9
PPO2 A B	34	2.7	3.60	ENA	0612511	2.7	3.6
	44	2.7	3.60	ENA	0612513	2.7	3.6
N2 FLOW 1 2	54		4.90	ENA	0612553		4.9
	64		4.90	ENA	0612554		4.9
FAN ΔP	74	2.60	4.25	ENA	0612556	4.2	6.8

PARAMETER NAME	ENA/INH	PARA ID	SM ALERT	
			LOW	HIGH
AV BAY FAN ΔP 3 (OV104)	ENA	0612658	2.9	5.1
IMU FAN ΔP	ENA	0612869	3.7	4.95
CABIN O2 CONCENTRATION	ENA	0922104		25.9
AIRLK P	ENA	0640101	13.8	15.7
EXT AIRLK P	ENA	0640126	13.8	15.7
H2O LOOP ICH OUT T1 T2	ENA	0612744	35.0	
	ENA	0612724	35.0	

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

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AIRLOCK CONFIG

AIRLOCK PREP	2-2
EMU SWAP	2-3
BOOSTER FAN DEACTIVATION/REMOVAL	2-4
INSTALLATION/ACTIVATION	2-4
EVA TOOL TRANSFER	2-4
EMU REMOVAL	2-4
INSTALLATION	2-4
CHECKOUT PREP	2-5
LTA RESTRAINT STRAP REMOVAL	2-6
INSTALLATION	2-6

**AIRLOCK
CONFIG**

AIRLOCK PREP (50 min)

|

Retrieve or unstow following equipment:

MF28G 3/8-in breaker bar, 4-in ext w/3/8-in drive
IFM Tool Kit 1/2-in socket w/3/8-in drive
Vol H EMU Equipment Bag – attach to middeck lockers/wall
Cooling Loop Jumper – stow in EMU Equipment Bag
EMU Servicing Kit – temp stow
Helmet Lights – remove covers
EVA Bag

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

AW18A 1. ✓ Inner hatch Equal vlv (two) – OFF
2. LTG FLOOD (four) – ON
3. Remove from airlock, as reqd:
Airlock Stowage Bag
Airlock Floor Pallet using 3/8-in breaker bar, 4-in ext w/3/8-in drive,
and 1/2-in socket w/3/8-in drive

CAUTION

Do not stow EMU lights in locker with batteries installed

4. Stow Vol H Bags in Vol H
5. Transfer to airlock:
EVA Bag – install on airlock wall
DEPRESS/REPRESS Cue Card
Helmet Lights
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 all helmets, temp stow
10. Remove comm caps from LTA restraint bags and connect to electrical harnesses
11. Remove LTA restraint bags
12. Disconnect waist rings; remove and stow any equipment stowed in HUT/LTA
13. Remove Drink Bag restraint bags – stow in EV1, EV2 mesh bags
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. ✓ Tether hook operation
19. Remove 20-g Crash Bag from middeck EMU, as reqd

AIRLOCK
CONFIG

EMU SWAP (30 min)

NOTE

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

- | | |
|----------------|---|
| EMU X
AW18H | 1. Install gloves |
| | 2. ✓PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
✓MODE (two) – OFF |
| DCM | 3. Disconnect SCU; install DCM cover |
| | 4. Stow SCU on AAP, Velcro to wall |
| | 5. Connect LTA to HUT; lock (if reqd) |
| | 6. Disconnect helmet, stow |
| | 7. Release EMU from AAP, transfer EMU to middeck |
| | 8. Install helmet |
| | 9. Remove 20–g Crash Bag on middeck EMUs (if flown) |
| EMU Y | 10. ✓Helmet disconnected, stowed |
| | 11. Remove comm cap from LTA restraint bag and connect to electrical
harness (if reqd) |
| | 12. Remove LTA restraint bag |
| | 13. Release EMU from middeck AAP, transfer to airlock |
| | 14. Mount EMU on AAP |
| | 15. Disconnect waist ring; remove and stow any equipment stowed in
HUT/LTA |
| | 16. Waist ring – engage posn |
| | 17. Connect LTA to HUT, lock |
| | 18. ✓Tether hook operation |

NOTE

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

- | | |
|-------|--|
| AW82B | 19. If performing EMU CHECKOUT of EMU Y:
EV–1(EV–2) O2 vlv – CL |
| EMU X | 20. Attach EMU to middeck AAP |
| | 21. Attach LTA restraint bag |

BOOSTER FAN DEACTIVATION/REMOVAL (15 min)

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

BOOSTER FAN INSTALLATION/ACTIVATION (15 min)

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

EVA TOOL TRANSFER (30 min)

- 1. Remove tools from Spacehab/ODS per EVA Equipment Stowage List (EVA FS, TOOLS/TIMELINES)
- 2. As reqd, stow in middeck, airlock, or tunnel adapter

EMU REMOVAL (30 min)

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

EMU INSTALLATION (30 min)

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

EMU CHECKOUT PREP (30 min)

- AW18A 1. LTG FLOOD (four) – ON
- 2. Remove Airlock Stowage Bag from airlock (if flown)
- Vol H 3. Unstow:
 - EMU Equipment Bag – attach to middeck lockers/wall
 - EMU Servicing Kit – mark with Gray Tape; label “Shuttle”; temp stow
 - Drink Bags for later use (stow on top of Vol H bags)
- 4. Stow Vol H bags in Vol H
- 5. Unbuckle SCU straps, Velcro SCU to wall
- 6. Remove 20–g Crash Bag from middeck EMU (if flown)
- 7. Disconnect all helmets, temp stow
- 8. Remove comm caps from LTA restraint bags and connect to electrical harnesses in EMU
- 9. Remove LTA restraint bags
- 10. Disconnect waist rings; remove and temp stow any equipment stowed in HUT/LTA
- 11. Stow LTA restraint bags on AAP
- 12. ✓ Thermal cover clear of waist rings
- 13. Waist ring – engage position
- 14. Connect LTA to HUT, lock
- 15. ✓ Tether hook operation
- 16. Install helmet, lock (not reqd if proceeding directly to EMU Checkout)

LTA RESTRAINT STRAP REMOVAL (15 min)

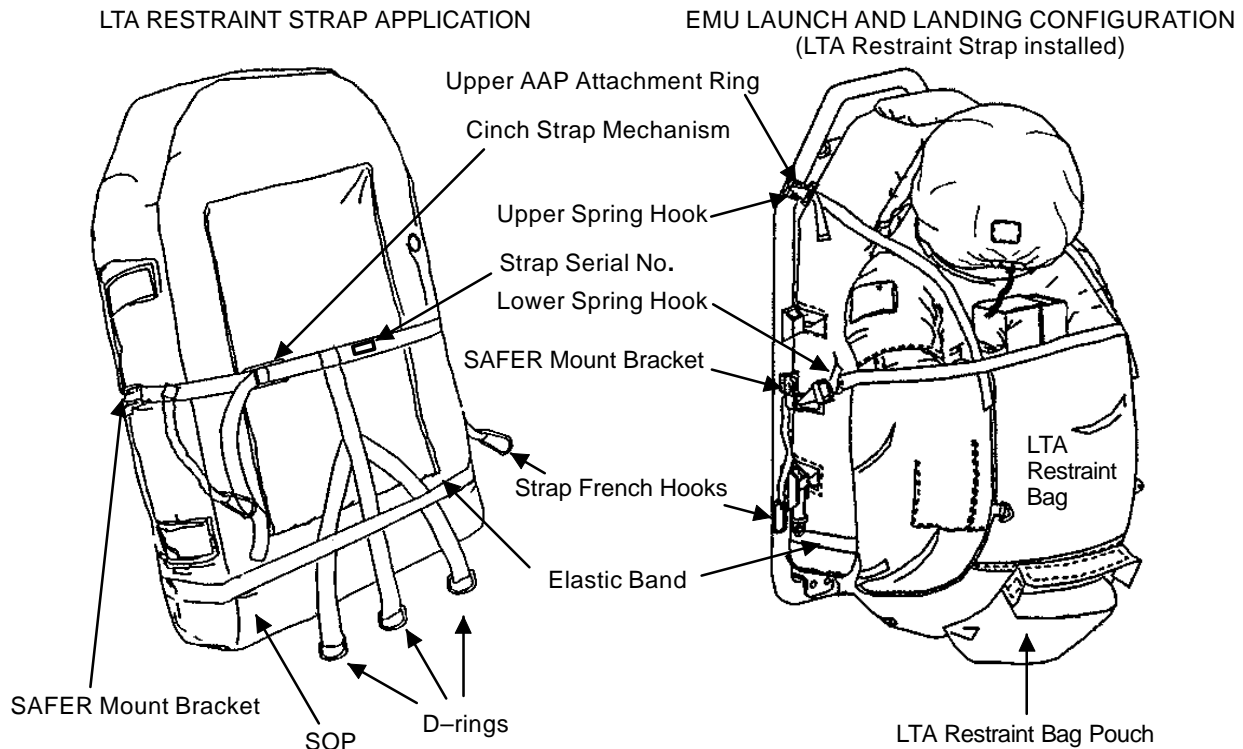
NOTE: May be performed on EMU 1 and 2 simultaneously. Perform steps as reqd for current EMU config

1. Disconnect all attachments (six) from SAFER mount brackets (two)
2. Loosen cinch strap mechanism, remove SAFER mount brackets
3. Remove strap from PLSS
4. Stow strap in LTA restraint bag pouch with D-rings (three) connected
5. Engage EMU in AAP
6. 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

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



NOTE

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

CHECKOUTS

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

- IVA ATU 10. ✓AUD PWR – AUD/TONE
A/G 1,2 (two) – OFF
A/A – T/R
ICOM A,B (two) – OFF (as reqd)
- R14:C 11. ✓cb MNA UHF EVA – cl
✓MNC UHF EVA – cl
- O6 12. ✓UHF SPLX/EVA PWR AMP – OFF
MODE – EVA
- BOTH 13. ✓Helmets disconnected
- 14. Don comm caps
- 15. Perform onboard A/A comm check per table

EMUs		IV1 O6:	
MODE	FREQ	EVA STRING	UHF SPLX/EVA XMIT FREQ
ALT	LOW	2	259.7/414.2
ALT	HIGH	2	296.8/417.1
PRI	HIGH	1	296.8/417.1
PRI	LOW	1	259.7/414.2

- A1R 16. AUD CTR UHF A/A – OFF
- IV1 17. Perform EVA COMM CONFIG, steps 4 thru 6 and 8 (EVA PREP)
- BOTH 18. Verify RF comm with MCC
- 19. Doff comm caps
- IV1 20. AUD CTR UHF A/G 1 – OFF

.....
 . If procedure is being repeated for 3rd EMU # _____ only, then on other,
 . previously checked EMU # _____ :
 . 21. Install helmet, lock
 . DCM 22. COMM mode – HL
 . AW18H 23. PWR/BATT CHGR EMU 1(2) BUS SEL – OFF
 . MODE – OFF

PRIMARY REGULATOR/FAN/PUMP CHECK (40 min)

If external airlock:

- MD(flr) 24. EMU O2 ISOL VLV – OP
- DCM 25. STATUS: ✓O2 P = 850–950

EMU	1	2	3	4
25. O2 P				

- AW82B 26. EV–1, EV–2 O2 vlv (two) – OP
- 27. Install helmet, lock
- 28. ✓Suit arms aligned
- 29. ✓Gloves locked
- 30. ✓Helmet purge vlv – cl, locked
- DCM 31. PURGE vlv – cl (dn)
- 32. O2 ACT – IV
- 33. STATUS: ✓SUIT P = 0.4–1.4 and stable (compare w/gauge)

EMU	1	2	3	4
33. SUIT P (IV)				

- 34. O2 ACT – PRESS
- 35. STATUS: ✓SUIT P = 4.2–4.4 and stable (compare w/gauge)
 ✓H2O TEMP = ambient
 ✓H2O GP/WP = 14.0–16.0

EMU	1	2	3	4
35. SUIT P (PRESS) H2O TEMP H2O GP H2O WP				

- 36. O2 ACT – IV, start timing manual leak check
 (2 min, SUIT ΔP ≤ 0.3 psi)

EMU	1	2	3	4
36. ΔP				

* If ΔP > 0.3 psi, go to FAILED LEAK CHECK *
 * (14.7/10.2 PSI) Cue Card, CC 6–4 *

- DCM 37. O2 ACT – OFF
- DCM 38. PURGE vlv – op (up)
- 39. STATUS: ✓SUIT P < 0.4 (compare w/gauge)
- 40. Disconnect gloves, temp stow in airlock
- 41. Disconnect helmet, temp stow
- 42. Disconnect waist ring – secure LTA to outer hatch handrail
- DCM 43. Connect LCVG, ✓locked
- DCM 44. ✓Temp control vlv – Max C

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

- AW18H 45. FAN – ON (PWR RESTART may occur)
- AW18H 46. ✓EMU INPUT amps = 1.5–4.7 (1.5–5.0 at 14.7)

EMU	1	2	3	4
46. INPUT AMPS				

- DCM 47. Install SCOF, lock
- DCM 48. O2 ACT – IV, 'NO VENT FLOW' msg, PROC
- DCM 49. STATUS: ✓H2O TEMP decrease from step 35

EMU	1	2	3	4
49. H2O TEMP				

- AW18H 50. ✓EMU INPUT amps = 1.5–3.6 (1.5–4.0 at 14.7)
 ✓EMU INPUT amps decrease from step 46

EMU	1	2	3	4
50. INPUT AMPS				

- DCM 51. PWR – BATT
 52. STATUS: ✓BAT VDC ≥ 16.5
 ✓BAT AMPS = 2.3–3.7 (2.4–4.0 at 14.7)
 ✓RPM = 19.0–20.0 K

EMU	1	2	3	4
52. BAT VDC BAT AMPS RPM				

53. ✓Fan noise steady
 54. O2 ACT – OFF
 55. FAN – OFF
 56. PWR – SCU

SOP CHECK (5 min)

- DCM 57. STATUS: ✓SOP P = 5800–6800, cycle to SUIT P

EMU	1	2	3	4
57. SOP P				

- SOP 58. ✓SOP gauge 5800–6800, note SOP interstage gauge

EMU	1	2	3	4
58. SOP GAUGE INT GAUGE				

59. Depress SOP manual override (50 sec max):
 ✓SOP interstage gauge < 600
 STATUS: ✓SUIT P = 3.4–3.9

DCM

EMU	1	2	3	4
59. SUIT P INT GAUGE				

60. Remove SCOF, stow
 If EMU to be used for EVA:
 61. Stow LCVG in HUT
 Else:
 62. Disconnect LCVG, stow

63. Install helmet, LTA, gloves
 DCM 64. COMM mode – HL

BATTERY CHARGE CHECK INIT (15 min)

- AW18H 65. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
 MODE (two) – CHARGE
 BUS SEL (two) – MNA(MNB)

66. Continue charge 15 min, minimum
 67. Perform REBA BATTERY RECHARGE TERMINATE (EMU MAINT/RECHARGE), as reqd
 EMU ___ 68. Perform REBA BATTERY INSTALLATION (EMU & ___ MAINT/RECHARGE), as reqd

Cont next page

BATTERY CHARGE CHECK TERM

When PWR/BATT CHGR EMU INPUT AMPS < 1 and 15 min minimum charge complete:

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

• EMU SWAP DURING CHECKOUT (30 min) (If reqd) •

• NOTE •

• EMU(s) # _____ to be removed from airlock. •

• EMU(s) # _____ to be installed in airlock. •

• Procedure written for swap of one or two EMUs •

- EMU ____ 70. ✓Gloves installed •
- DCM 71. Disconnect SCU; install DCM cover •
- 72. Stow SCU on AAP, Velcro to wall •
- 73. Disconnect helmet, stow •
- 74. Release EMU from AAP, transfer EMU to middeck •
- 75. Install helmet •
- EMU ____ 76. Disconnect helmet, stow •
- 77. Remove comm cap from LTA restraint bag and connect to •
electrical harness •
- 78. Remove LTA restraint bag •
- 79. Release EMU from middeck AAP, transfer to airlock •
- 80. Install EMU on AAP •
- 81. Disconnect waist ring; remove and stow any equipment •
stowed in HUT/LTA •
- 82. Waist ring – engage posn •
- 83. Connect LTA to HUT, lock •
- 84. ✓Tether hook operation •

• NOTE •

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

- AW82B 85. EV-_____ O2 vlv – CL •
- EMU ____ 86. Install EMU on middeck AAP •
- 87. Attach LTA restraint bag, as reqd •
- 88. Go to EMU POWERUP, 3-2 •

Cont next page

POST EMU C/O RECONFIG (5 min)

When EMU C/O for all EMUs complete:

- IV O6 89. UHF MODE – OFF
 - ✓SPLX/EVA XMIT FREQ – 259.7/414.2
 - ✓PWR AMP – OFF
 - ✓SPLX SQUELCH – ON
 - R10 90. BIOMED CH 1,2 (two) – as reqd
- If external airlock and EMU C/O for all EMUs complete:
- AW82B 91. EV-1, EV-2 O2 vlv (two) – CL
 - BOTH DCM 92. Remove SCUs; install DCM covers
 - 93. Stow SCU on AAP, Velcro to wall
 - IV ML86B:C 94. cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – cl

**SAFER CHECKOUT (30 min if first checkout of SAFER unit,
20 min for subsequent checks)**

NOTE

Procedures written for simultaneous
c/o of SAFER 1&2

- BOTH 1. Remove SAFER and SAFER CHECKOUT RESULTS Cue Card from Stowage Bag/FDF Locker
- PM 2. ✓Inhibitor installed, properly engaged
- HCM If first SAFER CHECKOUT:
 - 3. Remove power switch guard
 - 4. Stow HCM
 - 5. Remove Stowage Straps from thruster towers, unfold towers
 - 6. Inspect:
 - Thruster tower hinges
 - Tower latches
 - ✓TMG not blocking thrusters
 - 7. Fold thruster towers
 - 8. Install Stowage Straps
- PM 9. MAN ISOL vlv – OP (dn)
- 10. Deploy HCM; ✓proper deployment

CAUTION

Minimize time with SAFER powered (~1 min)

NOTE

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

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

Cont next page

11. As reqd, review SELF TEST SEQUENCE (refer to box below)
12. Perform Self Test:
 - HCM Start timer
 - PWR – TST/ON
 - Wait until **GN2 XX% PWR XX%** displayed
 - ✓AAH LED on
 - PWR – ON
 - PWR – TST/ON
 - Follow displayed instructions on HCM:
 - ✓**SELF TEST – WAIT** displayed; if able, count thruster clicks (twenty four)

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

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

13. ✓**GO FOR EVA** or **FAILED TEST** displayed
14. PWR – ON
15. DISP: Record GN2%, PWR%, BATT V (SAFER CHECKOUT RESULTS Cue Card)
16. PWR – OFF
17. Stop timer, record 'ON Time' (~1 min desired)
18. ✓GN2% ≥ 87
- ✓PWR% ≥ 45
- ✓BATT V ≥ 35
19. Report status and SAFER serial number to MCC
- HCM 20. MODE – ROT

NOTE

When stowing HCM, verify that umbilical will not snag on deploy mechanism when HCM deployed

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

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

- HCM 1. NSI circuit test
2. **SELF TEST – WAIT**; ✓Twenty-four thruster clicks and THR LED flashing
3. **DEPRESS AAH**
4. **MODE – ROT** (if in TRAN)
- MODE – TRAN**
5. HC grip detent test
6. **HC +X** (fwd), (–X, +Y (rt), –Y, +Z (dn), –Z, +P (twist up), –P)
7. **RATE CHECK**; rotate SAFER at least + and – 3 deg/sec sequentially in each rotational axis

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SAFER CHECKOUT RESULTS

SAFER SERIAL # _____

	GMT	ON Time	GN2%	PWR%	BATT V		GMT	ON Time	GN2%	PWR%	BATT V
1						27					
2						28					
3						29					
4						30					
5						31					
6						32					
7						33					
8						34					
9						35					
10						36					
11						37					
12						38					
13						39					
14						40					
15						41					
16						42					
17						43					
18						44					
19						45					
20						46					
21						47					
22						48					
23						49					
24						50					
25						51					
26						52					

BATTERY CHANGEOUT

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

GMT	OLD BATT SERIAL #	NEW BATT SERIAL #

TOP
(Back of 'SAFER CHECKOUT RESULTS')

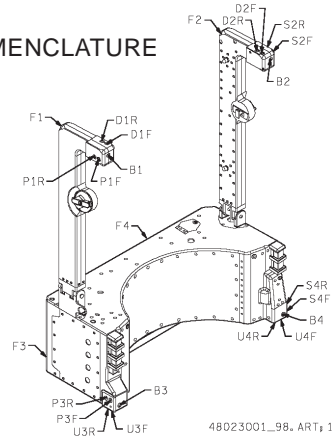
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SAFER STATUS TROUBLESHOOTING

GMT:					NOMINAL STATUS
GN2%					87-99%
PWR%					45-99%
TANK P					> 6575 psia
TANK T					-40 to 140 degF
RATE R					± 30 deg/s
RATE P					± 30 deg/s
RATE Y					± 30 deg/s
DISPL R					± 99.9 deg
DISPL P					± 99.9 deg
DISPL Y					± 99.9 deg
BATT V					≥ 35.0 V
BATT T					50 to 90 degF
Leak					NO LEAK
GMT:					NOMINAL STATUS
GN2%					87-99%
PWR%					45-99%
TANK P					> 6575 psia
TANK T					-40 to 140 degF
RATE R					± 30 deg/s
RATE P					± 30 deg/s
RATE Y					± 30 deg/s
DISPL R					± 99.9 deg
DISPL P					± 99.9 deg
DISPL Y					± 99.9 deg
BATT V					≥ 35.0 V
BATT T					50 to 90 degF
Leak					NO LEAK

SAFER JET NOMENCLATURE



EVA-3b/O/D

(reduced copy)

REBA POWERED HARDWARE CHECKOUT (15 min)

NOTE

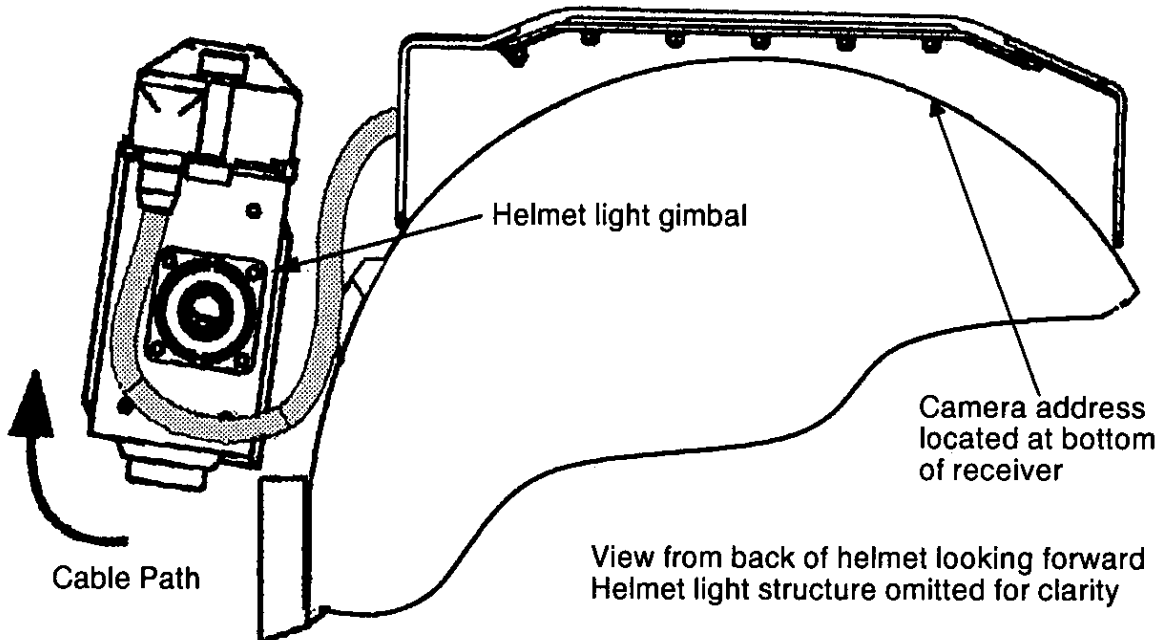
Procedure written for simultaneous c/o of 12 volt HDW on all EMUs

- All EMUs
- 1. Perform REBA BATTERY INSTALL (EMU MAINT/RECHARGE), as reqd
 - 2. ✓REBA sw (1 per EMU) – OFF
- If EMU TV:
- 3. Install EMU TV on helmets 1,2; note camera addresses EV1 ____, EV2 ____ (see figure below)
 - 4. Unstow EMU TV power cable, disconnect from ground plug
 - 5. Mate EMU TV power cable to EMU TV
- If no EMU TV:
- 6. ✓EMU TV power cable mated to ground plug
 - 7. ✓Upper arm connections mated
 - 8. Connect lower arm pwr harness to Gloves

NOTE

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

- 9. REBA sw (1 per EMU) – ON, pull tab toward right arm of suit
 - 10. Glove heater sw (two per EMU) – ON
- When heat detected on all outside fingertips:
- 11. Glove heater sw (two per EMU) – OFF
- If EMU TV:
- 12. EMU TV power pb – press, ✓Green LED illuminated
 - 13. EMU TV power pb – press, ✓Green LED not illuminated
- 14. REBA sw (1 per EMU) – OFF, pull tab toward left arm of suit
 - 15. Disconnect lower arm pwr harness from Gloves
 - 16. Stow lower arm and glove pwr harness connectors under TMG
- EMU ____
- 17. Attach LTA restraint bag, as reqd



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EVA PREP

MIDDECK PREP	4-2
EVA PREP	4-2
PREP FOR DONNING	4-2
EMU DONNING	4-4
CHECK	4-5
EMU PURGE	4-6
EMU PREBREATHE	4-6
SAFER DONNING	4-6
EVA COMM CONFIG	4-8
DECONFIG	4-8
CO2 RMVL SYS DEACT	4-9
ACT	4-9

<p>WARNING</p> <p>Payload bay floods exceed EMU thermal limits during operation. If EVA crew will be operating in vicinity of PLB floods, floods must be turned off now. Cooldown time may be as long as 6 hr</p>
--

MIDDECK PREP (30 min)

- AW18A 1. LTG FLOOD (four) – ON
- 2. ✓EVA Bag installed in airlock
- 3. ✓REBA sw – OFF
- If EMU TV:
 - 4. Demate EMU TV power cable; connect ground plug
- HUT 5. Disconnect helmets; Velcro to lockers
- 6. Remove Drink Bag restraint bag
- 7. Fill Drink Bag from galley, remove gas and insert Drink Bag in restraint bag
- 8. Install Drink Bag restraint bag in HUT and dispose of fill tool in wet trash
- 9. Apply anti-fog (EMU Servicing Kit), wipe off:
 - Helmets (not Fresnel lens)
 - EV glasses, attach to comm cap
- 10. Stow EMU Servicing Kit
- 11. Install Helmets; lock
- 12. Attach Cuff C/L to EMUs

EVA PREP (90 min)

MET ____/____:____	MET ____/____:____	MET ____/____:____
--------------------	--------------------	--------------------

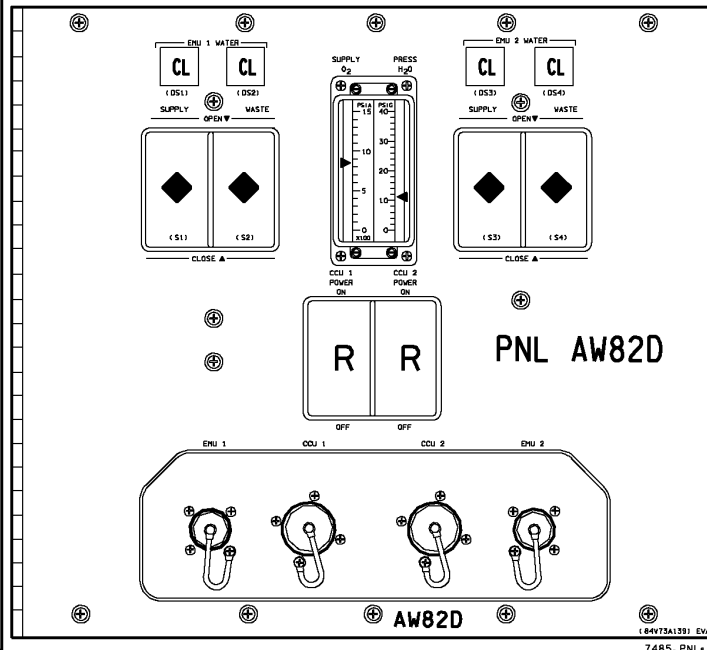
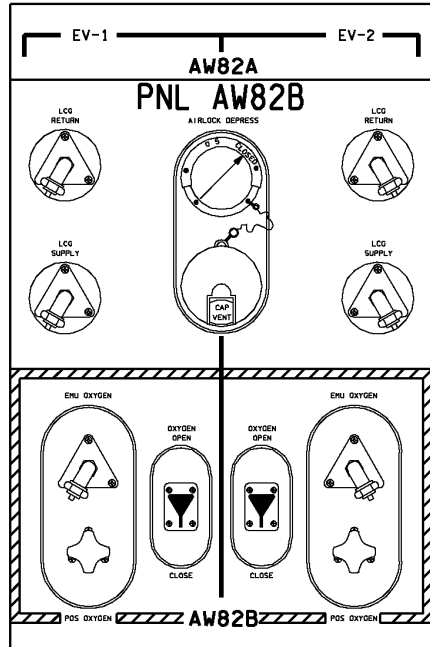
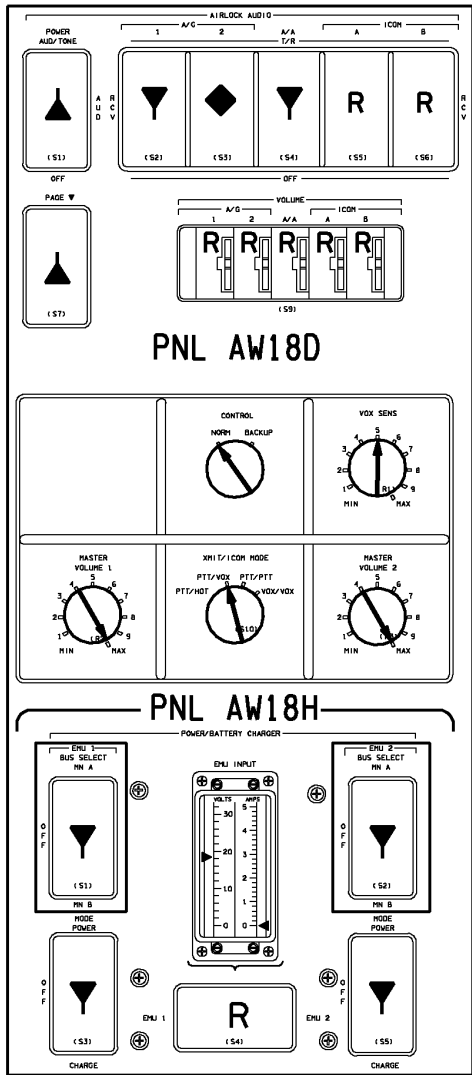
PREP FOR DONNING (30 min)

- If internal airlock:
 - ML31C 1. ✓VAC VENT ISOL VLV CNTL tb – OP
 - ✓NOZ HTR – ON
- If external airlock:
 - BOTH DCM 2. Retrieve, position SCU; remove DCM cover
 - 3. Connect SCU to DCM, ✓locked
 - AW82B 4. EV-1, EV-2 O2 vlv (two) – op
 - MO13Q 5. ✓ARLK H2O S/O VLV – OP (tb-OP)
 - MD(flr) 6. ✓EMU O2 ISOL VLV – OP
 - ML86B:C 7. ✓cb MNC EXT ARLK HTR ZN 1,2 (two) – op
 - L2 8. ✓O2 XOVR SYS 1,2 (two) – OP
 - BOTH DCM 9. PWR – BATT

EVA PREP

<p>CAUTION</p> <p>EMU must be on BATT pwr when airlock power supply turned on</p>
--

- AW18H 10. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR
- BUS SEL (two) – MNA(MNB)
- DCM 11. PWR – SCU
- 12. Verify panels as shown next page



- If REBA battery:
- IV1 59. ✓Glove heater sw (two) – OFF
60. Connect lower arm pwr harness to gloves
61. Stow slack under arm TMG
62. ✓Cuff C/L posn

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

- EV1 DCM 63. FAN – ON (PWR RESTART may occur)
64. Don helmet, IV1 ✓locked
 DCM 65. O2 ACT – IV
66. ✓Helmet purge vlv – cl, locked
 DCM 67. PURGE vlv – cl (dn)
 If EMU TV:
68. Unstow EMU TV power cable; disconnect from ground plug
69. Mate EMU TV power cable to EMU TV
 EV2 70. Repeat steps 29–69

EMU CHECK (5 min)

- BOTH 71. ✓Cooling

* If cooling insufficient, IV1 depress *
 * and hold pump priming vlv on *
 * back of EMU (30 sec min) *

72. Temp control vlv – as reqd
73. ✓Wrist rings – covered
74. ✓Waist rings – covered
 DCM 75. ✓COMM mode – HL
76. ✓WATER – OFF
77. ✓PWR – SCU
78. ✓FAN – ON
79. ✓Comm FREQ – LOW
80. ✓Helmet purge vlv – cl, locked
 DCM 81. ✓PURGE vlv – cl (dn)

NOTE

During LEAK CHECK procedure, when ‘SET O2 IV’ msg displayed, wait 30 sec and ✓SUIT P gauge stable (4.2–4.4) before moving O2 ACT–IV

82. STATUS: LEAK CHECK?, PROC follow displayed instructions

* If LEAKAGE HI| SUIT P X.X, go to *
 * FAILED LEAK CHECK (14.7/10.2 PSI), *
 * CC 6–4 (Cue Card) *

EMU PURGE

MET ____/____:____	MET ____/____:____	MET ____/____:____
--------------------	--------------------	--------------------

NOTE

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

CABIN P	PURGE DURATION (min)
10.2	8
14.7	12

- BOTH DCM
- 1. O2 ACT – PRESS
 - 2. PURGE vlv – op (up), begin purge clock
 - 3. When N2 purge complete (per table):
PURGE vlv – cl (dn)
O2 ACT – IV

EMU PREBREATHE

MET ____/____:____	MET ____/____:____	MET ____/____:____
--------------------	--------------------	--------------------

- | | | | CABIN P | | PREBREATHE |
|-----|-------|--|---------|-------|------------|
| | | | | | DURATION |
| IV1 | R1 | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 4. Begin prebreathe clock | | | |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 5. O2 TK3 HTR A(B) – as reqd | | | |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 6. Egress AAP, stow handles | | | |
| IV1 | AW82B | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 7. AIRLK DEPRESS vlv cap – vent, remove, stow | 10.2 | 12 hr | 01:15 |
| | | | | 24 hr | 00:40 |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 8. Remove loose equipment | 14.7 | | 04:00 |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 9. If reqd, stow REBA jumper cable | | | |

SAFER DONNING (If reqd)

- IV1
- 10. Remove SAFER from Stowage Bag
 - 11. Remove Stowage Straps from thruster towers; stow in EMU Equipment Bag; unfold towers
 - 12. Inspect:
Thruster tower hinges
Tower latches
✓TMG not blocking thrusters
- PM
- 13. ✓TMG clear from SAFER striker plate on EMU PLSS
 - 14. Remove Inhibitor; close, fasten port cover
 - 15. MAN ISOL vlv – OP (dn)
 - 16. Latch – PRELOAD
 - 17. Rotate latch to recess butterfly in housing

CAUTION

Rotating ccw past softstop can bind latch

- 18. Rotate latch ccw to softstop
- 19. Latch – ENGAGE
- 20. Mate PLSS to thruster towers
- 21. Push latch in and rotate cw until stop (~90°)

* If latch will not engage: *
* Latch – PRELOAD *
* Rotate latch ccw until stop *
* Return to step 19 *

- 22. Latch – PRELOAD
- 23. Rotate latch cw until ratcheting

CAUTION

Rotating ccw may disengage SAFER

- 24. Continue ratcheting until lock marking on latch, tower aligned
- 25. Latch – LOCK
- 26. ✓Access to HCM deploy lever
- 27. ✓TMG not blocking thruster
- 28. Repeat for SAFER 2

IV1

- 29. Install MWS and BRTs (as reqd)
- 30. EVA tools installed in airlock
- 31. As reqd, perform BOOSTER FAN DEACTIVATION/REMOVAL (AIRLOCK CONFIG)
- A/L 32. Remove, stow appropriate vent ducts to allow hatch closure
- MD (flr) 33. As reqd, disconnect vent duct from middeck floor fitting, stow
- 34. As reqd, unstow, install diffuser cap on middeck floor fitting
- 35. Loose middeck–stowed items clear of inner hatch and middeck diffuser cap air flow
- DCM 36. Remove WATER switch guard (two), stow in EMU Equipment Bag
- 37. REBA sw – ON
- If EMU TV:
 - 38. EMU TV power pb – press, ✓Green LED illuminated
- If external airlock with aft hatch:
 - A/L (flr) 39. Deploy floor hatch supports
 - 40. Egress airlock
 - 41. Inner hatch – close, lock
 - 42. Inner hatch Equal vlv caps (two) – removed
 - 43. Inner hatch Equal vlv (two) – OFF
- If internal airlock:
 - 44. If flown: Perform CO2 RMVL SYS DEACT
 - 45. When prebreathe time complete, ✓MCC for go to DEPRESS/REPRESS (Cue Card)

EVA COMM CONFIG																				
O6	1. ✓UHF SPLX/EVA XMIT FREQ – 259.7/414.2 ✓PWR AMP – OFF ✓EVA STRING – 1 MODE – EVA If docked with ISS and EVA comm on A/G 1:																			
	NOTE In step 2, A/G 1 docked hardline is disabled. UHF will become A/G 1 Shuttle to ISS link																			
A1R	2. ✓MCC and ISS that UHF configured and in Public Call SPACELAB A/G 1 – OFF																			
	3. AUD CTR VOICE RCD SEL CH 1 – A/G 1(2) 2 – ICOM A																			
	4. AUD CTR UHF A/G 1(2) – T/R ✓2(1) – OFF ✓A/A – OFF																			
IVA ATU R10	5. ✓AUD A/G 1(2) – T/R 6. BIOMED CH 1 – EVA 1 2 – EVA 2																			
DCM	7. Comm FREQ – LOW COMM mode – PRI																			
	Perform as reqd for IV volume control: 8. On ATUs in use by IV, adjust VOL A/G 1(2) tw for comfortable EVA volume; then adjust VOL A/G 2(1) tw for comfortable MCC volume. (MCC uplinks on both A/G 1 and A/G 2.) Record ATU tw settings	ATU tw settings <table border="1"> <thead> <tr> <th>LOC</th> <th>A/G 1</th> <th>A/G 2</th> </tr> </thead> <tbody> <tr> <td>CDR</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>PLT</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>MS</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>MD1</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>MD2</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>	LOC	A/G 1	A/G 2	CDR	_____	_____	PLT	_____	_____	MS	_____	_____	MD1	_____	_____	MD2	_____	_____
LOC	A/G 1	A/G 2																		
CDR	_____	_____																		
PLT	_____	_____																		
MS	_____	_____																		
MD1	_____	_____																		
MD2	_____	_____																		

EVA COMM DECONFIG		
O6	1. UHF MODE – OFF ✓SPLX/EVA XMIT FREQ – 259.7/414.2 ✓PWR AMP – OFF ✓SPLX SQUELCH – ON If docked with ISS and EVA comm on A/G 1:	
A1R	2. SPACELAB A/G 1 – ON 3. AUD CTR UHF A/G 1(2) – OFF ✓2(1) – OFF ✓A/A – OFF VOICE RCD SEL CH 1 – OFF 2 – OFF	
R10	4. BIOMED CH 1,2 (two) – as reqd	

CO2 RMVL SYS DEACT

MO51F CO2 RMVL SYS CNTLR 1(2) MODE – STBY (hold 3 sec)
Wait 6 sec

✓CO2 RMVL SYS CNTLR 1(2) OPER It – off
✓FAIL It – on

CO2 RMVL SYS ACT

MO51F CO2 RMVL SYS AC1(3) – OFF (hold 3 sec)
MNA(C) – OFF
✓CNTLR 1(2) FAIL It – off
AC1(3) – ON (hold 3 sec)
MNA(C) – ON
CNTLR 1(2) MODE – OPER (hold 3 sec)
Wait 6 sec
✓CO2 RMVL SYS CNTLR 1(2) OPER It – on

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EMU STATUS

EMU STATUS

EMU STATUS

EMU STATUS

	EV1	EV2	EV1	EV2	EV1	EV2	EV1	EV2	EV1	EV2	EV1	EV2	
TIME EV													TIME EV
TIME LF													TIME LF
% PWR													% PWR
% O2													% O2
SUIT P													SUIT P
O2 P													O2 P
SOP P													SOP P
SUBLM P													SUBLM P
BAT VDC													BAT VDC
BAT AMP													BAT AMP
RPM													RPM
CO2													CO2
H2O TEMP													H2O TEMP
H2O GP													H2O GP
H2O WP													H2O WP
GAUGE													GAUGE

Report status to MCC when:

- Any parameter outside normal range
- TIME LF \leq reqd
- Limiting Consumable changes (PWR \leftrightarrow O2)
- Δ TIME LF between EV1 and EV2 \geq 1 hr

	EV1	EV2	EV1	EV2
TIME EV				
TIME LF				
% PWR				
% O2				

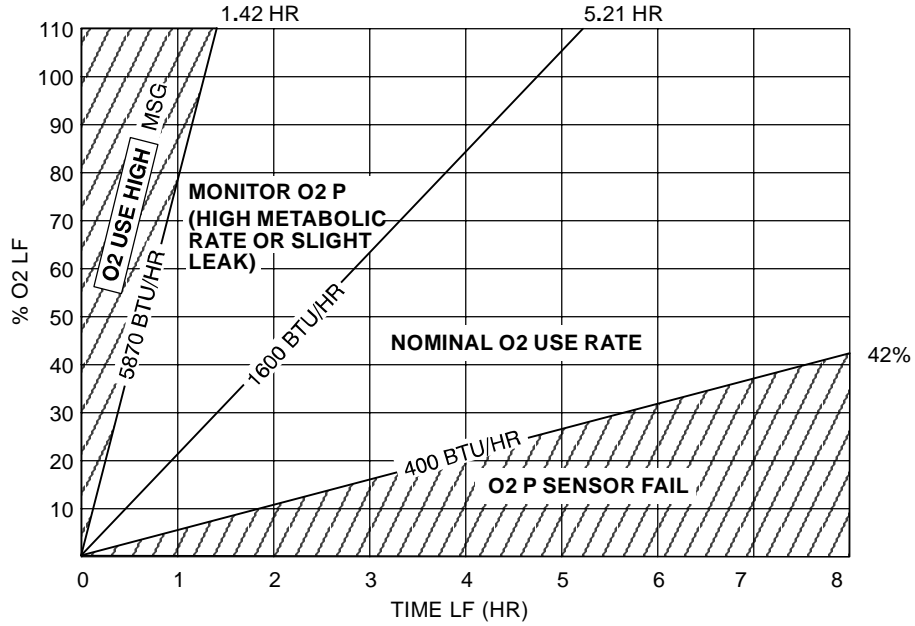
NORMAL STATUS

O2 POS	EVA
• TIME EV	HR:MIN since PWR-BATT
• TIME LF/limit consum	HR:MIN remaining at present use rate
• % O2 (PWR) LF	Displayed if not limiting consumable
SUIT P	4.2-4.4 psid
O2 P	60-900 psid
SOP P	5800-6800 psia
SUBLM P	2.0-4.2 psia
BAT VDC	16.3-17.0
BAT AMP	3.0-4.0
RPM	19.0-20.0 k
CO2	0.2-0.5 mmH
H2O TEMP	32-75 degF
H2O GP/WP	14.0-16.0 psid

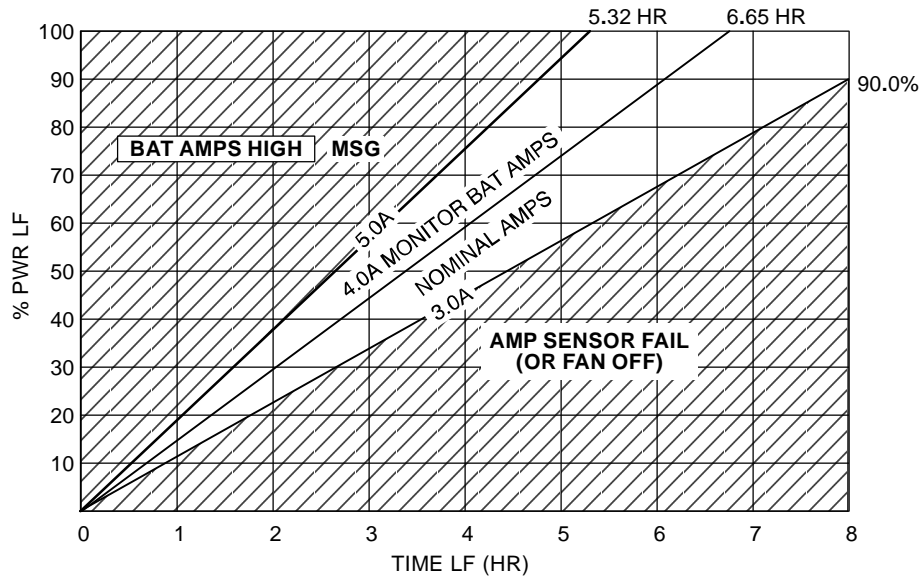
Airlock Egress

Airlock Ingress

IF O2 LIMITING CONSUMABLE



IF POWER LIMITING CONSUMABLE



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DEPRESS/
REPRESS

DEPRESS/REPRESS

NOM AIRLOCK

A6-1

EVA/NOM/GEN G

TOP

HOOK
VELCRO

HOOK
VELCRO

DEPRESS/REPRESS

<p>DEPRESS (10 MIN) When prebreathe complete</p> <p>AW82B 1. AIRLK DEPRESS vlv – 5, ALERT TONE, monitor suit P gauge < 5.5 * If gauge > 5.5, <u>stop depress</u>, ✓MCC *</p> <p>2. Airlock at 6.0, ALERT TONE</p> <p>3. When airlock at 5.0, AIRLK DEPRESS vlv – CL, ALERT TONE</p> <p>BOTH DCM 4. STATUS: <u>LEAK CHECK ?</u>, PROC, follow displayed instructions * If <u>LEAKAGE HI SUIT P X.X</u>, go to <u>FAILED</u> * * <u>LEAK CHECK (5 PSI)</u>, reverse side *</p> <p>5. ✓O2 ACT – EVA</p> <p>6. ✓STATUS, Cuff C/L, 1</p> <p>AW82B 7. AIRLK DEPRESS vlv – 0, ALERT TONE, monitor suit P gauge < 5.5 * If gauge > 5.5, <u>stop depress</u>, ✓MCC *</p> <p>8. Attach waist tether(s) to A/L D–ring for egress</p> <p>9. Airlock dP/dT ~0, ALERT TONE</p> <p>BOTH 10. When outer hatch ΔP < 0.5, outer hatch – open, stow</p> <p>AW82B 11. AIRLK DEPRESS vlv – CL</p> <p>12. Configure UHF, EVA COMM CONFIG (<u>EVA PREP</u>)</p>		<p>PRE REPRESS (5 MIN) If external airlock:</p> <p>IV1 ML86B:C 1. ✓cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – op</p> <p>MD(flir) 2. ✓EMU O2 ISOL vlv – OP</p> <p>BOTH 3. ✓Outer hatch closed and locked</p> <p>DCM 4. ✓WATER – OFF</p> <p>5. Disc waist tethers, attach to EMU</p> <p>6. Retrieve, position SCUs; remove DCM covers</p> <p>7. Connect SCUs to DCM, ✓locked</p> <p>AW82B 8. ✓EV–1, EV–2 O2 vlv (two) – OP</p> <p>AW18H 9. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – MNA(MNB)</p> <p>DCM 10. PWR – SCU, WARN TONE (IV1 record MET __: __)</p>	
<p>POST DEPRESS (5 MIN)</p> <p>BOTH DCM 1. PWR – BATT, WARN TONE (IV1 record MET __: __) <u>PET = 00:00</u></p> <p>AW18H 2. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF</p> <p>3. Disc SCU; install DCM cover</p> <p>4. Stow SCU on AAP, Velcro to wall</p> <p>DCM 5. Temp control vlv – Max H</p> <p>6. WATER – ON</p> <p>7. ✓DCM blank, BITE off</p> <p>8. Temp control vlv – as reqd</p> <p>9. ✓STATUS, Cuff C/L, 1 (IV1 Record)</p> <p>10. Visors as reqd</p> <p>11. Go to AIRLOCK EGRESS, Cuff C/L, 42, or Flight Specific Timeline</p> <p>If internal airlock and CO2 RMVL SYS flown: 12. Perform CO2 RMVL SYS ACT (<u>EVA PREP</u>)</p> <p>IV1 If external airlock: ML86B:C 13. cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – cl</p>		<p>REPRESS (10 MIN)</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u> If on SOP, leave O2 ACT – EVA thru airlock repress</p> </div> <p>BOTH DCM 1. O2 ACT – PRESS</p> <p>2. COMM mode – HL</p> <p style="text-align: center;"><u>NOTE</u></p> <p>IV1 expect dP/dT alarm during repress</p> <p>AW82B 3. ✓AIRLK DEPRESS vlv – CL</p> <p>4. Inner hatch Equal vlv (one) – throttle OFF to NORM (as reqd), ALERT TONE</p> <p>5. Airlock at 4.0, ALERT TONE</p> <p>6. When airlock at 5.0, Equal vlv – OFF, ALERT TONE</p> <p>DCM 7. ✓Airlock pressure integrity (2 min, ΔP ≤ 0.1 psi)</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u> If CUFF 1 symp resolve upon repress, report as CUFF 2 If any DCS, leave O2 ACT – PRESS</p> </div> <p>8. O2 ACT – IV</p> <p>9. Inner hatch Equal vlv (one) – NORM, ALERT TONE</p> <p>10. Airlock dP/dT ~0, ALERT TONE</p> <p>11. Go to <u>POST EVA</u> EVA–1a/NOM/O/H</p>	

HOOK
VELCRO

HOOK
VELCRO

DEPRESS/
REPRESS

DEPRESS/REPRESS

TNL ADAPTER

B6-1

EVA/TNL/GEN G

TOP

HOOK
VELCRO

HOOK
VELCRO

DEPRESS/REPRESS

<p>DEPRESS (25 MIN) When prebreathe complete</p> <p>AW82B 1. AIRLK DEPRESS vlv – 5, ALERT TONE, monitor suit P gauge < 5.5 * If gauge > 5.5, <u>stop depress</u>, ✓MCC *</p> <p>2. Airlock at 6.0, ALERT TONE</p> <p>3. When airlock at 5.0, AIRLK DEPRESS vlv – CL, ALERT TONE</p> <p>BOTH DCM 4. STATUS: <u>LEAK CHECK ?</u>, PROC, follow displayed instructions * If <u>LEAKAGE HI</u> <u>SUIT P X.X</u>, go to <u>FAILED</u> * * <u>LEAK CHECK (5 PSI)</u>, reverse side *</p> <p>5. ✓O2 ACT – EVA</p> <p>6. ✓STATUS, Cuff C/L, 1 ✓MCC for aft module pressure integrity</p> <p>AW82B 7. AIRLK DEPRESS vlv – 0, ALERT TONE, monitor suit P gauge < 5.5 * If gauge > 5.5, <u>stop depress</u>, ✓MCC *</p> <p>8. Airlock dP/dT ~0, ALERT TONE</p> <p>IV1 9. Configure UHF, EVA COMM CONFIG (<u>EVA PREP</u>)</p>	<p>PRE REPRESS (5 MIN) If external airlock:</p> <p>IV ML86B:C 1. ✓cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – op</p> <p>MD(flr) 2. ✓EMU O2 ISOL vlv – OP</p> <p>BOTH 3. ✓EVA hatch closed, locked</p> <p>DCM 4. ✓WATER – OFF</p> <p>5. Disc waist tethers, attach to EMU</p> <p>6. Retrieve, position SCUs; remove DCM covers</p> <p>7. Connect SCU to DCM, ✓locked</p> <p>AW82B 8. ✓EV-1, EV-2 O2 vlv (two) – OP</p> <p>AW18H 9. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – MNA(MNB)</p> <p>DCM 10. PWR – SCU, WARN TONE (IV1 record MET __: __)</p>
<p>POST DEPRESS (15 MIN)</p> <p>BOTH DCM 1. PWR – BATT, WARN TONE (IV1 record MET __: __) <u>PET = 00:00</u></p> <p>AW18H 2. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF</p> <p>3. Disc SCUs; install DCM covers</p> <p>4. Stow SCUs on AAP, Velcro to wall</p> <p>5. When EVA hatch ΔP < 0.5, EVA hatch – part op</p> <p>AW82B 6. AIRLK DEPRESS vlv – CL</p> <p>7. Attach waist tether(s) to A/L D-ring for egress</p> <p>8. EVA hatch – open, stow</p> <p>DCM 9. Temp control vlv – Max H</p> <p>10. WATER – ON</p> <p>11. ✓DCM blank, BITE off</p> <p>12. Temp control vlv – as reqd</p> <p>13. ✓STATUS, Cuff C/L, 1 (IV1 Record)</p> <p>14. Visors as reqd</p> <p>15. Go to AIRLOCK EGRESS, Cuff C/L, 42, or Flight Specific Timeline</p> <p>If internal airlock and CO2 RMVL SYS flown: 16. Perform CO2 RMVL SYS ACT (<u>EVA PREP</u>)</p> <p>If external airlock: ML86B:C 17. cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – cl</p>	<p>REPRESS (20 MIN)</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u> If on SOP, leave O2 ACT – EVA thru airlock repress</p> </div> <p>BOTH DCM 1. O2 ACT – PRESS</p> <p>2. COMM mode – HL</p> <p style="text-align: center;"><u>NOTE</u></p> <p>IV1 expect dP/dT alarm during repress</p> <p>AW82B 3. ✓AIRLK DEPRESS vlv – CL</p> <p>4. Inner hatch Equal vlv (one) – throttle OFF to NORM (as reqd), ALERT TONE</p> <p>5. Airlock at 4.0, ALERT TONE</p> <p>6. When airlock at 5.0, Equal vlv (two) – OFF, ALERT TONE</p> <p>DCM 7. ✓Airlock pressure integrity (4 min, ΔP ≤ 0.1 psi)</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u> If CUFF 1 symp resolve upon repress, report as CUFF 2 If any DCS, leave O2 ACT – PRESS</p> </div> <p>8. O2 ACT – IV</p> <p>9. Inner hatch Equal vlv (one) – NORM, ALERT TONE</p> <p>10. Airlock dP/dT ~0, ALERT TONE</p> <p>11. Go to <u>POST EVA</u> EVA-2a/TNL/O/T</p>

HOOK
VELCRO

HOOK
VELCRO

FAILED LEAK CHECK

	HOOK VELCRO		HOOK VELCRO	
	FAILED LEAK CHECK (5 PSI)		FAILED LEAK CHECK (14.7/10.2 PSI)	
	<ol style="list-style-type: none"> 1. Leaking EMU: Repeat leak check on watch and gauge as follows: O2 ACT – PRESS until P > 4.2 – IV (1 min, Max ΔP = 0.3 psi) 2. If leak check passed: Return to <u>DEPRESS/REPRESS</u> Cue Card, DEPRESS, step 5 (suit pressure sensor unreliable) >> 3. O2 ACT – IV 4. Equal vlv (one) – NORM When ΔP < 0.5, open inner hatch Equal vlv (one) – OFF 5. Repeat leak check as follows: PURGE vlv – cl (dn) O2 ACT – PRESS, until P > 4.2 – IV, start timing (1 min, Max ΔP = 0.3 psi) 6. Contact MCC 	<p>IV1</p> <p>DCM</p>	<ol style="list-style-type: none"> 1. Leaking EMU: O2 ACT – PRESS 2. Rotate lower arm assemblies one rev 3. ✓Suit arms aligned 4. ✓Sizing rings locked 5. Swivel hips from side to side 6. Repeat leak check as follows: ✓Helmet purge vlv – cl, locked ✓PURGE vlv – cl (dn) ✓O2 ACT – PRESS until SUIT P = 4.2–4.4 and stable (compare w/gauge) O2 ACT – IV, start timing, 1 min (during EMU CHECKOUT, 2 min) (Max ΔP = 0.3 psi) 7. If leak check passed, go to step 11 If leak check failed: PURGE vlv – op (up), O2 ACT – OFF FAN – OFF (if EVA PREP) Cycle/inspect suit disconnects as follows: Helmet (leave off), Gloves LTA FAN – ON (if EVA PREP) 8. Install Helmet, repeat leak check step 6, then: 9. If leak check passed, go to step 11 If leak check failed: PURGE vlv – op (up), O2 ACT – OFF FAN – OFF (if EVA PREP) Cycle/inspect suit disconnects as follows: Helmet (leave off), Gloves Helmet purge vlv, Sizing rings LiOH cartridge (O-rings) FAN – ON (if EVA PREP) 10. Install Helmet, repeat leak check step 6, then: 11. If leak check passed: ✓Waist ring, wrist rings covered Continue EMU CHECKOUT or EVA PREP >> 12. If leak check failed (EMU lost): PURGE vlv – op (up) Contact MCC, go to POST EVA, 9–2 	
<p>BOTH</p> <p>IV1 Inner Hatch</p> <p>DCM</p>				
	HOOK VELCRO		HOOK VELCRO	
		EVA–1b/O/I EVA–2b/O/I		

FLIGHT SPECIFIC TIMELINES

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TOOLS AND STOWAGE

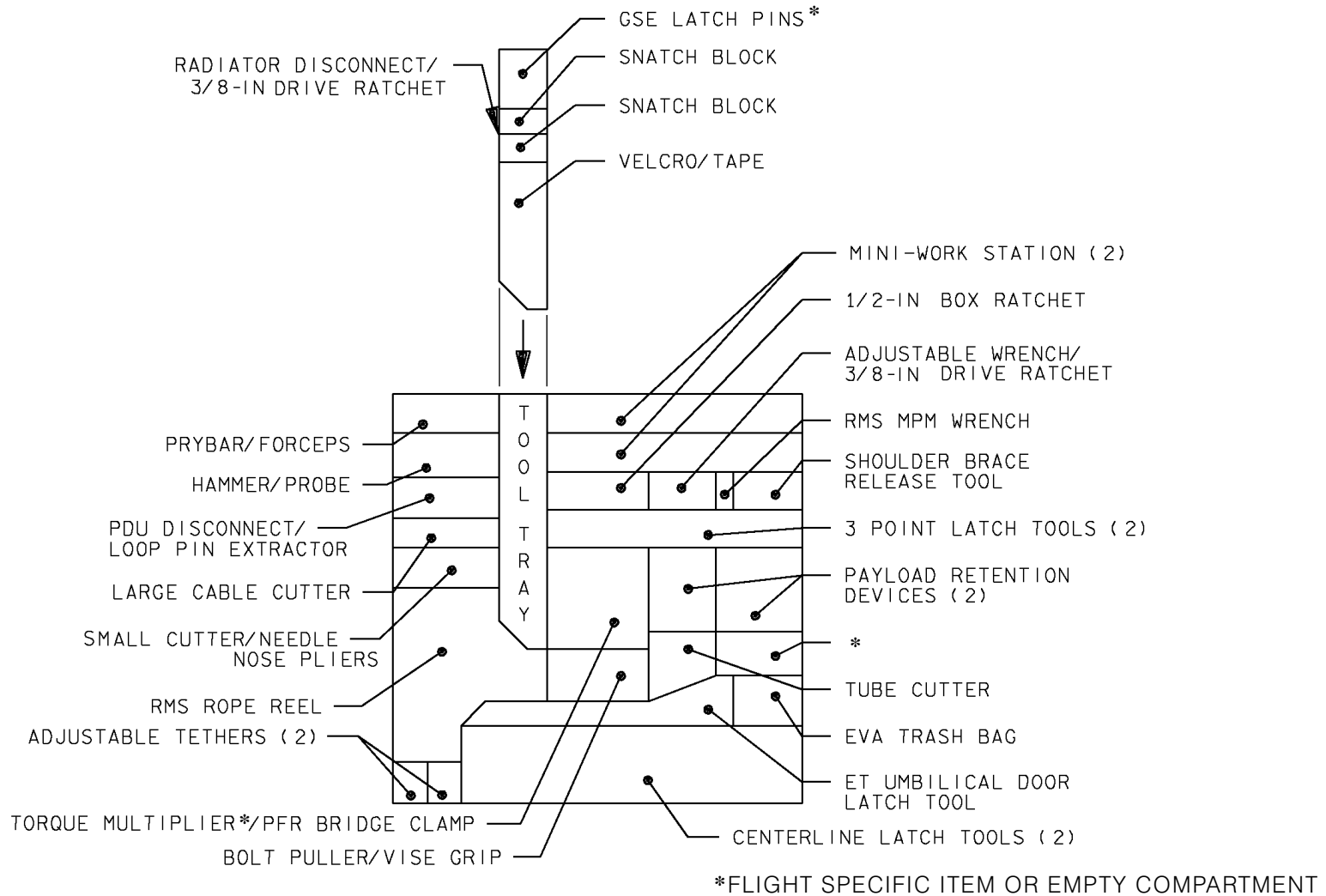
PSA STOWAGE	8-2
PGT CHECKOUT	8-3
760XD PGSC-PGT CONNECTION	8-4
PROGRAM PGT SETTINGS	8-4
DOWNLOAD/ERASE EVENT LOG	8-5
PGT CONTINGENCIES	8-6

**TOOLS AND
STOWAGE**

TOOLS AND STOWAGE

- INBOARD -

PSA STOWAGE



SMALL

173250400, ART. 4

PGT CHECKOUT

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

760XD PGSC–PGT CONNECTION

1. ✓ PGSC equipped with RS422 PCMCIA card and adapters (two)
2. ✓ PGT PWR – OFF
3. ✓ PGT battery installed
4. Ratchet collar – not MTR

CAUTION

Do not over–torque cover screw

5. Open PGT serial port cover using 3/32–in Allen Wrench attached to PGT–RS422 cable
6. Connect PGT–RS422 cable to PGT Remote Programming port
7. Connect other end of PGT–RS422 cable to COM 2 or COM 4 adapter box, as desired
8. PGT PWR – ON
9. If PGSC is not powered, PGSC pwr – on
10. Select SHUTTLE APPS icon on PGSC Windows desktop
11. Select PGT icon that corresponds to COM port selected in step 7
12. ✓ Tool Communications Check dialog box appears
13. ✓ Serial Connection Verified
14. ✓ Intool software version 2.2
15. Select CONTINUE

PROGRAM PGT SETTINGS

1. Perform 760XD PGSC–PGT CONNECTION
- If loading settings from a set file in C:\SPOCAPPS\PGT32\SETTINGS:
2. Select FILE, OPEN ...
 3. Select desired settings file, OPEN
 4. Select TORQUE/REVOLUTIONS SETTINGS tab in Pistol Grip Tool Remote Software window
 5. Enter changes to table as necessary
 6. Select SPEED & POWER MANAGEMENT SETTINGS tab
 7. Enter changes to table as necessary
 8. ✓ Ratchet collar – not MTR
 9. Select IOOL, SEND DATA TO TOOL
 10. Select desired tables for upload
 11. ✓ All sent settings – black on gray (programmed successfully)
- If saving new settings to a file:
12. Select FILE, SAVE AS ...
 13. Type in new file name, SAVE
 14. Verify programmed settings on PGT by cycling MODE/torque collar/speed collar; compare displayed values to expected values

DOWNLOAD/ERASE EVENT LOG

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

PGT CONTINGENCIES

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

POST EVA

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

|

POST EVA

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

SUIT DOFFING

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

CAUTION
 Hold hatch away from airlock to avoid damaging vent duct (N/A for tunnel adapter, ext A/L)

- IV1 MD (flr) 1. When $\Delta P < 0.5$, open hatch
- 2. As reqd, remove diffuser cap at middeck floor, stow
- 3. As reqd, unstow airlock vent duct, connect end to middeck floor fitting
- A/L 4. Configure appropriate vent ducts for airflow into airlock
- 5. As reqd, perform BOOSTER FAN INSTALLATION/ACTIVATION (AIRLOCK CONFIG)
- EV 6. ✓Gloves clean

* If reqd, IV use damp towel to clean gloves *

- IV1 7. Perform EVA COMM DECONFIG (EVA PREP)
- BOTH DCM 8. O2 ACT – OFF
- 9. PURGE vlv – op (up)
- 10. ✓COMM mode – HL
- IV1 DCM 11. Install WATER sw guards (two)
- If EMU TV: 12. EMU TV power pb – press, ✓Green LED not illuminated
- If REBA battery: 13. ✓Glove heaters sw (two) – OFF
- PLSS 14. REBA sw – OFF
- 15. Disconnect lower arm pwr harness from gloves
- 16. Stow lower arm and glove pwr harness connectors under TMG
- If EMU TV: 17. Demate EMU TV power cable, mate to ground plug
- 18. STATUS: ✓SUIT P < 0.4 (compare w/gauge); disconnect gloves, stow
- 19. Disconnect helmet, stow
- AW82B 20. AIRLK DEPRESS vlv – install cap

POST EVA

SAFER DOFFING (10 min) (If reqd)

- IV 21. Latch – ENGAGE
- 22. Rotate latch ccw until release (~90 deg)
- 23. Demate PLSS from thruster towers
- 24. Latch – PRELOAD
- 25. Rotate latch cw until lock markings on latch and tower recess aligned
- 26. Push in latch, latch – LOCK
- 27. Fold thruster towers
- 28. Transfer to middeck
- 29. Install inhibitor
- BOTH PM 30. MAN ISOL vlv – CL (up)
- 31. Temp stow SAFER
- 32. Repeat for SAFER 2

Cont next page

- PLSS 33. If reqd, unstow REBA jumper cable
- 34. AAP release handles to 90°
- BOTH 35. Engage HUT in AAP (IV1 assist as reqd)
- 36. AAP release handles to lock
- DCM 37. FAN – OFF (fwd)
- 38. Disconnect waist ring, LCVG, biomed
- 39. Doff comm cap
- 40. ✓Wrist disconnects – op
- 41. Doff EV glasses
- 42. Doff HUT
- 43. Doff LTA, secure to handrail
- 44. Remove dosimeter from LCVG; insert in inflight garment
- 45. Doff: Biomed (disc pigtail, stow in EMU Servicing Kit)
LCVG (secure to HUT)
MAG (UCD, clamp), stow in wet trash
- 46. Stow HUT Multiple Water Connector in left arm
- 47. Remove EVA Bag and tools as reqd
- R1 48. O2 TK3 HTR A(B) – as reqd
- If external airlock:
- ML86B:C 49. cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – cl

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• EMU WATER RECHARGE (5 min) (If reqd) (✓MCC for config, if reqd)

• If external airlock:

- MO13Q 50. ✓ARLK H2O S/O VLV – OP (tb–OP)
- R11L If SPLY H2O XOVR VLV closed (tb–CL or bp) (water transfer config):
 - 51. SPLY H2O TKA OUTLET – CL (tb–CL)

SM 60 TABLE MAINT

- CRT 52. Use TKB quantity:
PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC
- R11L If SPLY H2O XOVR VLV open (tb–OP) (nominal config):
- L1 53. ✓RAD CNTLR OUT TEMP – NORM
- 54. ✓FLASH EVAP CNTLR PRI A,B (two) – OFF
- ML31C 55. SPLY H2O TKD OUTLET – CL (tb–CL)
- R11L 56. ✓SPLY H2O TKA OUTLET – CL (tb–CL)
TKB OUTLET – CL (tb–CL)
TKC OUTLET – OP (tb–OP)
✓INLET – CL (tb–CL)

SM 60 TABLE MAINT

- CRT 57. Use TKC quantity:
PARAM ID – ITEM 1 +0 6 2 0 5 4 8 EXEC
- 58. Log value before recharge

Recharge #	H2O TKB(C) %
1	
2	
3	
4	
5	

- AW82D 59. ✓EMU 1,2 H2O WASTE tb (two) – CL
SPLY (two) – OP (tb–OP)
- CRT 60. ✓H2O TKB(C) quantity decreasing

.....

SAFER STOW (10 min) (If reqd)

- PM 61. ✓ Inhibitor installed
- 62. ✓ Thruster towers folded
- 63. Unstow stowage straps from EMU Equipment Bag; install
- 64. ✓ MAN ISOL vlv – CL (up)
- 65. Stow SAFER in Stowage Bag

SUIT DRYING/SEAL WIPE

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

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

- 67. Wipe crotch with stericide (in EMU Servicing Kit)
- 68. Lightly wipe seals on LTA waist ring, arm wrist rings, HUT neck ring with lint-free wipe (in Servicing Kit)
- 69. Clean, refurbish biomed
- 70. Remove drink bag from HUT and dispose in wet trash

OXYGEN RECHARGE VERIFICATION

- DCM 71. STATUS: O2 P XXX
- 72. Continue charge until O2 P ~850

WATER FILL VERIFICATION (10 min) (If reqd)

- DCM 73. STATUS: ✓ H2O WP 8–15 psi and stable for ~30 sec (indicates charging complete)

SM 60 TABLE MAINT

R11L If SPLY H2O XOVR VLV closed (tb-CL or bp) (water transfer config):

- CRT 74. Use TKB quantity:
PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC

R11L If SPLY H2O XOVR VLV open (tb-OP) (nominal config):

- CRT 75. Use TKC quantity:
PARAM ID – ITEM 1 +0 6 2 0 5 4 8 EXEC

- 76. Log value after recharge

Recharge #	H2O TKB(C) %
1	
2	
3	
4	
5	

NOTE

Full charge = ~6%/EMU

R11L If SPLY H2O XOVR VLV closed (tb-CL or bp) (water transfer config):

- 77. SPLY H2O TKA OUTLET – OP (tb-OP)

If SPLY H2O XOVR VLV open (tb-OP) (nominal config):

- 78. SPLY H2O TKC OUTLET – CL (tb-CL)
TKB OUTLET – OP (tb-OP)

ML31C 79. SPLY H2O TKD OUTLET – OP (tb-OP)

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

Cont next page

- ~
- WCS
 - If WCS:
 - 81. ✓FAN SEP same as HOSE BLOCK
 - 82. MODE – COMMODE/MANUAL/EMU, posn guard over sw (✓airflow, WCS ON It on)
 - If EDO WCS:
 - EDO WCS 83. ✓URINAL SEL sw same as URN DIV VLV
 - 84. Unstow urinal hose; posn guard strap over hose yoke (✓airflow)
 - AW82D 85. EMU 1,2 H2O SPLY (two) – CL (tb–CL)
 - 86. Install SCOFs, lock
 - DCM 87. O2 ACT – IV
 - AW82H 88. EMU 1,2 H2O WASTE reg (two) – MAN OP
 - AW82D 89. EMU 1(2) H2O WASTE (one) – OP (tb–OP) (1 min), then
 - CL (tb–CL)
 - Repeat for other EMU
 - AW82H 90. EMU 1,2 H2O WASTE reg (two) – REGULATING
 - DCM 91. O2 ACT – OFF
 - 92. Remove SCOFs, stow
 - WCS
 - If WCS:
 - 93. MODE – AUTO (✓WCS ON It off)
 - If EDO WCS:
 - 94. Stow urinal hose
-

EMU POWERDOWN

- 95. Install helmets
- AW18D 96. AIRLK AUD PWR – OFF
- AW18H 97. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
 - MODE (two) – OFF
- AW82D 98. ✓EMU 1,2 H2O WASTE, SPLY tb (four) – CL
- If external airlock:
 - AW82B 99. EV–1, EV–2 O2 vlv (two) – CL
 - If not performing in–suit EMU battery recharge:
 - BOTH DCM 100. Remove SCU; install DCM cover
 - 101. Stow SCU on AAP, Velcro to wall

If last EVA completed:

X: SM 60 SM TABLE MAINT

- 102. Contact MCC for uplink of SM ALERT TMBU (if desired)
Changes enclosed in

<u>Param Name</u>	<u>Param ID</u>	<u>Lower Limit</u>	<u>Upper Limit</u>
EXT A/L H2O LINE T 1			
SPLY ZN 1 T	0640181	43	<input type="text" value="145"/>
LCG 2 SPLY ZN 1 T	0640182	<input type="text" value="49"/>	<input type="text" value="145"/>
EXT A/L H2O LINE T 2			
SPLY ZN 2 T	0640184	48	<input type="text" value="145"/>
LCG 2 SPLY ZN 2 T	0640185	<input type="text" value="45"/>	<input type="text" value="145"/>
EXT A/L O2 LN T			
SPLY ZN 2 T	0640186	OSL	<input type="text" value="OSL"/>

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EMU MAINT/RECHARGE

WATER RECHARGE 10-2
 EMU POWERUP 10-2
 WATER FILL 10-2
 OXYGEN RECHARGE VERIFICATION 10-3
 WATER FILL VERIFICATION 10-3
EMU LiOH CHANGEOUT 10-4
MIDDECK EMU BATTERY RECHARGE/LiOH REPLACEMENT 10-5
 INITIATE 10-5
 TERMINATE 10-5
IN-SUIT EMU BATTERY RECHARGE/CHARGE VERIFICATION 10-6
 INITIATE 10-6
 TERMINATE 10-6
EMU POWERDOWN 10-6
HELMET LIGHT/PGT BATTERY RECHARGE 10-7
 INITIATE 10-7
 TERMINATE 10-7
REBA BATTERY INSTALLATION 10-8
EMU BATTERY REMOVAL/INSTALL 10-8
HELMET LIGHT BULB CHANGEOUT 10-9
REBA BATTERY RECHARGE 10-10
 INITIATE 10-10
 TERMINATE 10-10

WATER RECHARGE

IF EMU NOT ALREADY POWERED UP:

EMU POWERUP

- If external airlock:
- 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)

- If external airlock:
- MD (flr)
- AW82B
- DCM
5. ✓EMU O2 ISOL VLV – OP
 6. EV1,2 O2 vlv (two) – OP
 7. PWR – SCU

WATER FILL (✓MCC for config, if reqd)

- If external airlock:
- MO13Q
- R11L
8. ✓ARLK H2O S/O VLV – OP (tb-OP)
 9. ✓SPLY H2O XOVR VLV closed (tb-CL or bp) (water transfer config):
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
- R11L
- L1
- If SPLY H2O XOVR VLV open (tb-OP) (nominal config):
11. ✓RAD CNTLR OUT TEMP – NORM
 12. ✓FLASH EVAP CNTLR PRI A,B (two) – OFF
 13. SPLY H2O TKD OUTLET – CL (tb-CL)
 14. ✓SPLY H2O TKA OUTLET – CL (tb-CL)
TKB OUTLET – CL (tb-CL)
TKC OUTLET – OP (tb-OP)
✓INLET – CL (tb-CL)

SM 60 TABLE MAINT

- CRT
15. Use TKC quantity:
PARAM ID – ITEM 1+0 6 2 0 5 4 8 EXEC
 16. Log value before recharge

Recharge #	H2O TKB(C) %
1	
2	
3	
4	
5	

- AW82D
17. ✓EMU 1,2 H2O WASTE tb (two) – CL
SPLY (two) – OP (tb-OP)
- CRT
18. ✓H2O TKB(C) quantity decreasing

NOTE

Full charge requires ~15 min

Cont next page

OXYGEN RECHARGE VERIFICATION

- DCM 19. STATUS: O2 P XXX
 20. Continue charge until O2 P ~850

WATER FILL VERIFICATION

- DCM 21. STATUS: ✓H2O WP 8–15 psi and stable for ~30 sec (indicates charging complete)

SM 60 TABLE MAINT

- R11L CRT If SPLY H2O XOVR VLV closed (tb–CL or bp) (water transfer config):
 22. Use TKB quantity:
 PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC
- R11L CRT If SPLY H2O XOVR VLV open (tb–OP) (nominal config):
 23. Use TKC quantity:
 PARAM ID – ITEM 1 +0 6 2 0 5 4 8 EXEC
24. Log value after recharge

Recharge #	H2O TKB(C)%
1	
2	
3	
4	
5	

NOTE

Full charge = ~6%/EMU

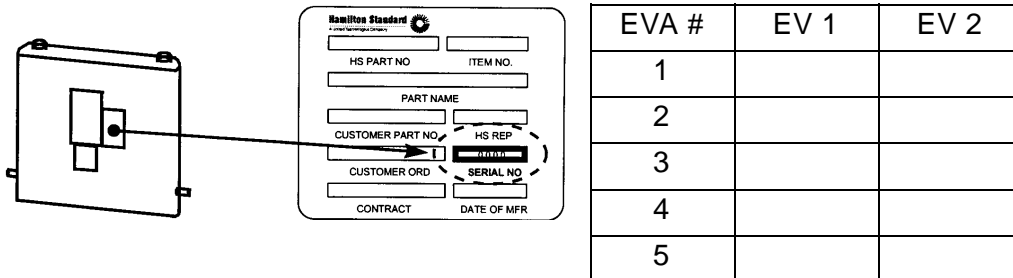
- R11L CRT If SPLY H2O XOVR VLV closed (tb–CL or bp) (water transfer config):
 25. SPLY H2O TKA OUTLET – OP (tb–OP)
- If SPLY H2O XOVR VLV open (tb–OP) (nominal config):
 26. SPLY H2O TKC OUTLET – CL (tb–CL)
 TKB OUTLET – OP (tb–OP)
- ML31C 27. SPLY H2O TKD OUTLET – OP (tb–OP)
 28. If FES reqd, perform TOPPING FES STARTUP (ORB OPS, ECLS)
- If WCS:
 WCS 29. ✓FAN SEP same as HOSE BLOCK
 30. MODE – COMMODE/MANUAL/EMU, posn guard over sw
 (✓airflow, WCS ON It on)
- If EDO WCS:
 EDO WCS 31. ✓URINAL SEL sw same as URN DIV VLV
 32. Unstow urinal hose; posn guard strap over hose yoke (✓airflow)
- AW82D 33. EMU 1,2 H2O SPLY (two) – CL (tb–CL)
 34. Install SCOFs, lock
- DCM 35. O2 ACT – IV
- AW82H 36. EMU 1,2 H2O WASTE reg (two) – MAN OP
- AW82D 37. EMU 1(2) H2O WASTE (one) – OP (tb–OP) (1 min), then
 – CL (tb–CL)
 – Repeat for other EMU
- AW82H 38. EMU 1,2 H2O WASTE reg (two) – REGULATING
- DCM 39. O2 ACT – OFF
 40. Remove SCOFs, stow
- If WCS:
 WCS 41. MODE – AUTO (✓WCS ON It off)
- If EDO WCS:
 42. Stow urinal hose
43. If EMU powerup performed, go to EMU POWERDOWN

EMU LiOH CHANGEOUT (20 min)

CAUTION

If 10.2 cabin used, possible ΔP across LiOH cartridge caps. Direct ports away from face

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



6. Remove, mark used LiOH cartridge

IF EMU BATTERY TO BE REPLACED:

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

CAUTION

Do not allow battery to impact airlock wall

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

11. Holding new LiOH cartridge with aluminum plate serial number facing self, remove caps (left first), install LiOH (attach Velcro retainer strap)
12. Close thermal cover zipper
13. Reinstall EMU in AAP
14. Place caps on used LiOH cartridge
15. Stow used batteries, LiOH in middeck lockers

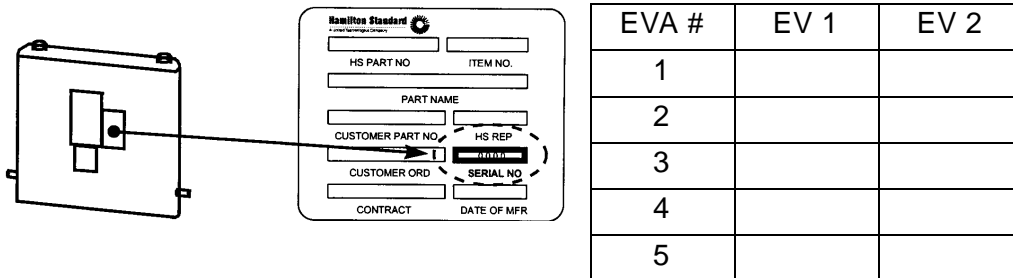
MIDDECK EMU BATTERY RECHARGE/LiOH REPLACEMENT

INITIATE (30 min)

NOTE

Refer to REF DATA for specific plug-in location

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



4. Remove, mark, stow used LiOH cartridge
5. ✓ PWR – SCU
6. Remove, stow used battery
7. Holding new LiOH cartridge with aluminum plate serial number facing, remove caps (left first), install LiOH (attach Velcro retainer strap)
8. Close thermal cover zipper, stow EMU in middeck
9. Unstow middeck battery charger
10. ✓ DC UTIL PWR – OFF
11. Configure battery(s), charger, and straps for charge
12. Connect charger cable(s) to battery(s)
13. Stow battery(s)/charger for charge
14. Connect power cable to utility outlet
15. DC UTIL PWR – ON
16. ✓ Charge light(s) – RED
- ✓ Ready light(s) – GREEN (mom), OFF

TERMINATE (15 min)

17. When charge complete:
 - ✓ Charge light(s) – OFF
 - ✓ Ready light(s) – GREEN
 - DC UTIL PWR – OFF
 - Disc cable(s) from battery(s)
18. Unzip thermal cover, Velcro to top of EMU
19. Remove LiOH cartridge
20. Open battery latch
21. Install charged battery (✓connector alignment), latch
22. Reinstall LiOH (attach Velcro retainer strap)
23. Close thermal cover zipper

IN-SUIT EMU BATTERY RECHARGE/CHARGE VERIFICATION

INITIATE

If external airlock:

1. Retrieve, position SCUs; remove DCM covers
2. Connect SCUs to DCM, ✓locked

- AW18H 3. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
MODE (two) – CHARGE
BUS SEL (two) – MNA(MNB)
4. Continue charge as reqd:
Verification: 15 min, minimum
Full Charge: Up to 20 hr

TERMINATE

- AW18H 5. ✓PWR/BATT CHGR EMU INPUT AMPS < 1 for both EMUs
6. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
MODE (two) – OFF

If external airlock:

7. Remove SCU; install DCM cover
8. Stow SCU on AAP, Velcro to wall

EMU POWERDOWN

- AW18D 1. AIRLK AUD PWR – OFF
- AW18H 2. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
MODE (two) – OFF
- AW82D 3. ✓EMU 1,2 H2O WASTE,SPLY tb (four) – CL

If external airlock:

4. Remove SCU; install DCM cover
5. Stow SCU on AAP, Velcro to wall

If helmet light batteries charged:

2. Install batteries in lights
3. ✓ EMU light ops
Velcro to lockers

CAUTION

Do not stow EMU lights in locker with batteries installed

If PGT batteries charged, perform for each battery:

4. Unplug battery from PGT battery adapter; reinstall cap on cable

NOTE

PGT battery will not function if jumper is not installed

5. Re-install battery jumper
6. Rotate battery door into place, tighten screw using screwdriver
7. Mark batteries "charged", stow in locker
8. Remove PGT battery adapter from charger
9. DC UTIL PWR – OFF
10. Stow:
Battery Pack Charger
Y-pwr cable
PGT Battery Adapters (2)
PGT Batteries (2)

REBA BATTERY INSTALLATION

1. Unstow REBA from locker or charger
2. Remove EMU from AAP
3. ✓ Glove heater sw (two) – OFF
4. Remove REBA J1 connector cover
5. Install REBAs on EMUs
6. Route REBA sw pull tabs thru TMG loops
7. ✓ REBA sw (one per EMU) – OFF
8. Connect EMU power harness to REBA (P1/J1)
9. Install EMU on AAP

EMU BATTERY REMOVAL/INSTALL (5 min)

CAUTION

Do not allow battery to impact airlock wall

WARNING

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

DCM

1. ✓ PWR – SCU

If SCU connected to DCM:

AW18H
PLSS

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

HELMET LIGHT BULB CHANGEOUT (15 min)

NOTE

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

CAUTION

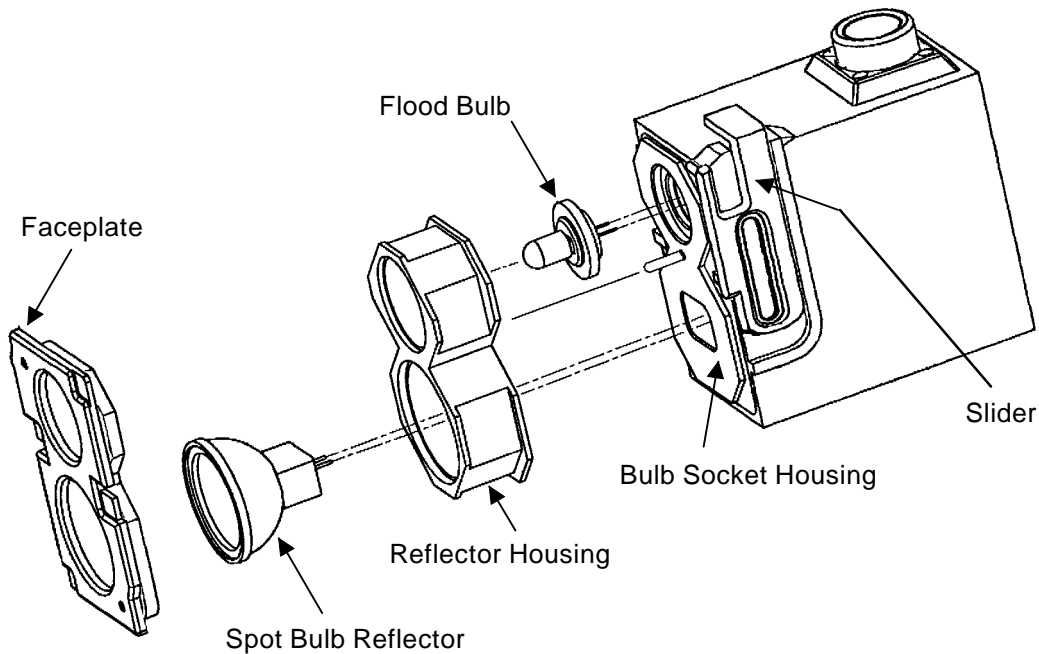
Handle bulbs with care. Do not touch bulbs with bare hands (could degrade bulb life span)

1. Remove battery from affected side of lights
2. Obtain, don Comfort Glove
3. Depress Faceplate; open Faceplate Sliders (two) on affected side of lights
4. Remove Faceplate
5. Remove Reflector Housing by pulling straight out
6. Remove affected bulbs as reqd; replace
7. Mark, stow used bulbs

NOTE

Contacts on Spot Bulb may be difficult to reseat fully into socket

8. Install Reflector Housing; seat Spot Bulb
9. Install Faceplate; lock Sliders (two)
10. Install battery; ✓EMU light ops



REBA BATTERY RECHARGE

INITIATE (10 min)

NOTE

Refer to REF DATA for specific plug-in plan location

1. Unstow: REBA Charger
Y-pwr cable
REBA Charger extension cable (if reqd)
 2. ✓DC UTIL PWR – OFF
If in-suit recharge:
 3. Plug Y-pwr cable into charger, REBA Charger extension cable into Y-pwr cable, REBA Charger extension cable into orbiter power supply
 - Else:
 4. Plug Y-pwr cable into charger and orbiter power supply
 5. DC UTIL PWR – ON
✓Blue LEDs (two) illuminated
 - * If blue LED not illuminated: *
 - * ✓DC UTIL PWR – ON *
 - * ✓cb – cl *
 - * ✓Cable connections mated *
 - * If blue LED still not illuminated: *
 - * DC UTIL PWR – OFF *
 - * Unplug Y-pwr cable from charger *
 - * Change fuse (4.0 Amps) *
 - * Plug Y-pwr cable into charger *
 - * DC UTIL PWR – ON *
- REBA Charger
6. ✓REBA sw (two) – OFF
 7. Demate REBA jumper cables (two)
 8. Mate Charge cables (two) to REBA jumper cables
 9. ✓Yellow LEDs (two) illuminated; temp stow charger on wall
- REBA Charger

* If yellow LED not illuminated, see chart below *

Indicator	Problem	Solution
Green and red LED illuminated	Cold batt (≤ 50 degF)	Leave REBA connected to charger (REBA will warm up and change LED to yellow automatically)
Red LED illuminated	Hot batt (≥ 113 degF)	Leave REBA connected to charger (REBA will cool and LED will change to yellow automatically)

TERMINATE (10 min)

NOTE

Refer to REF DATA for specific plug-in plan location

1. When green LEDs (two) illuminated, disconnect REBAs from Charger
2. Mate REBA jumper cables
3. DC UTIL PWR – OFF
4. Stow: REBA Charger
Y-pwr cable
REBA Charger extension cable (if reqd)

POST EVA ENTRY PREP

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OFF-NOMINAL PROCEDURES

----- OFF-NOMINAL PROCS -----

-----OFF-NOMINAL PROCS-----

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EMU CONTINGENCY PROCS

DISPLAY LOSS DURING POWER TRANSFER (WARM RESTART)	12-2	
VACUUM H2O RECHARGE (MANNED)	12-2	
LiOH REPLACEMENT (MANNED)	12-3	
BATTERY REPLACEMENT (MANNED)	12-4	
WATER DUMP	12-5	
SCU SWAP (UNMANNED)	12-6	
(MANNED)	12-6	
EMU COLD RESTART (MANNED)	12-6	
12.1 CHEMICAL CHECK/DECONTAMINATION	12-7	
CONTAMINATION TEST	12-10	
SAFER BATTERY CHANGEOUT	12-11	
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (IN-SUIT)	12-12	
BTA PREP	12-12	
TREATMENT	12-12	
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (POST SUIT DOFFING)	12-14	
BTA PREP	12-14	
TREATMENT	12-14	
EMU RESIZE	12-17	

**EMU CONT
PROCS**

DISPLAY LOSS DURING POWER TRANSFER (WARM RESTART)

- DCM 1. FAN – OFF
- If PWR – SCU:
- AW18H 2. PWR/BATT CHGR EMU 1(2) BUS SEL – OFF (7 sec)
- DCM 3. PWR – BATT
- AW18H 4. ✓DISPLAY – ‘O2 POS – XX’
- 5. PWR/BATT CHGR EMU 1(2) MODE – PWR
- BUS SEL – MNA(MNB)
- 6. ✓EMU INPUT 1(2) volts = 18.0–20.0
- DCM 7. PWR – SCU
- 8. ✓DISPLAY – ‘O2 POS – XX’
- If PWR – BATT:
- 9. PWR – SCU
- AW18H 10. PWR/BATT CHGR EMU 1(2) BUS SEL – OFF (7 sec)
- DCM 11. PWR – BATT
- 12. ✓DISPLAY – ‘O2 POS – XX’
- 13. If reqd, FAN – ON

VACUUM H2O RECHARGE (MANNED)

WARNING
Procedure should be used only if performing a contingency EVA

- EV 1. Perform AIRLOCK INGRESS, Cuff C/L, 43 (Close hatch, partially engage latches)
- DCM 2. ✓Helmet purge vlv – cl, locked
- 3. ✓PURGE vlv – cl (dn)
- 4. ✓WATER – OFF
- If external airlock:
- IV MO13Q 5. ✓ARLK H2O S/O VLV – OP (tb–OP)
- MD(flr) 6. ✓EMU O2 ISOL VLV – OP
- ML86B:C 7. ✓cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – op
- EV 8. Remove DCM cover
- 9. Connect SCU to DCM
- 10. COMM mode – HL
- AW82B 11. ✓EV–1(EV–2) O2 vlv – OP
- AW18H 12. PWR/BATT CHGR EMU 1(2) BUS SEL – MNA(MNB)
- DCM 13. PWR – SCU (fwd), WARN TONE
- R11L If SPLY H2O XOVR VLV closed (tb–CL or bp) (water transfer config):
- 14. SPLY H2O TKA OUTLET – CL (tb–CL)
- If SPLY H2O XOVR VLV open (tb–OP) (nominal config):
- IV L1 15. ✓RAD CNTLR OUT TEMP – NORM
- 16. ✓FLASH EVAP CNTLR PRI A,B (two) – OFF
- ML31C 17. SPLY H2O TKD OUTLET – CL (tb–CL)
- R11L 18. SPLY H2O TKB OUTLET – CL (tb–CL)
- ✓TKA OUTLET – CL (tb–CL)
- TKC OUTLET – OP (tb–OP)
- EV AW82D 19. ✓EMU 1(2) H2O WASTE – CL (tb–CL)
- SPLY – OP (tb–OP)

WARNING
O2 will be off. IV1 stand by inner hatch
Equal vlvs for emergency repress

- EV DCM 20. O2 ACT – OFF, monitor SUIT P (✓SUIT P > 3.6)
- * When SUIT P ≤ 3.6: *
- * O2 ACT – PRESS until SUIT P = 4.2–4.4 *
- * – OFF *
- 21. STATUS: ✓H2O WP ~8–15 psi and stable for ~30 sec (indicates charging complete), then:
- O2 ACT – PRESS until SUIT P = 4.2–4.4
- EVA

- | | | |
|----|-------|--|
| IV | R11L | If SPLY H2O XOVR VLV closed (tb-CL or bp) (water transfer config):
22. SPLY H2O TKA OUTLET – OP (tb-OP)
If SPLY H2O XOVR VLV open (tb-OP) (nominal config):
23. SPLY H2O TKC OUTLET – CL (tb-CL)
TKB OUTLET – OP (tb-OP) |
| | ML31C | 24. SPLY H2O TKD OUTLET – OP (tb-OP)
25. If FES reqd, perform TOPPING FES STARTUP (ORB OPS, ECLS) |
| EV | AW82D | 26. EMU 1(2) H2O SPLY – CL (tb-CL)
27. COMM mode – PRI(ALT)
28. ✓COMM freq – LOW(HIGH) |

NOTE

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

29. Go to DEPRESS/REPRESS Cue Card, DEPRESS, step 10
(POST DEPRESS, step 1, if tunnel adapter)

LiOH REPLACEMENT (MANNED)

CAUTION
If 10.2 cabin used, possible ΔP across LiOH cartridge caps. Direct ports away from face

- | | | |
|-----|----|--|
| IV1 | 1. | Unstow new LiOH cartridge with aluminum plate serial number facing, remove caps (left first) |
| IV1 | 2. | Unzip EMU thermal cover, fold back, Velcro to top of EMU |

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

CAUTION
Vent loop is pressurized. Restrain LiOH cartridge

- | | | |
|-----|-----|--|
| DCM | 3. | ✓O2 ACT – IV |
| | 4. | Helmet purge vlv – op |
| | 5. | FAN – OFF |
| IV1 | 6. | Remove used cartridge |
| | 7. | Holding new LiOH cartridge with aluminum plate serial number facing, install LiOH (attach Velcro retainer strap) |
| DCM | 8. | FAN – ON (PWR RESTART may occur) |
| | 9. | Helmet purge vlv – cl, locked |
| DCM | 10. | O2 ACT – PRESS |
| | 11. | PURGE vlv – op (up) |
| | 12. | Begin timing 2–min purge |
| IV1 | 13. | Close EMU thermal cover zipper |
| | 14. | Place caps on used LiOH cartridge |
| IV1 | 15. | Mark used cartridge, stow in middeck |
| | | When purge time = 2 min: |
| DCM | 16. | PURGE vlv – cl (dn) |
| | 17. | O2 ACT – IV |

NOTE

A minimum of 40 min of prebreathe reqd to condition LiOH cartridge

18. Continue EVA PREP or EMU PREBREATHE with minimum of 40 min prebreathe

BATTERY REPLACEMENT (MANNED)

IV1

1. Unstow new battery

<p>CAUTION Do not allow battery to impact airlock wall</p>

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

<p>WARNING Power switch must be in SCU during battery changeout</p> <hr/> <p>Fan will be off during changeout. Perform changeout as quickly as possible</p>
--

If no SCU power available:

3. ✓O2 ACT – IV
4. Helmet purge vlv – op
5. FAN – OFF
6. PWR – SCU

If degraded/dead battery:

DCM

7. ✓PWR – SCU
8. ✓O2 ACT – IV
9. Helmet purge vlv – op
10. FAN – OFF (fwd)
11. Open battery latch
12. Open LiOH cartridge latches

<p>CAUTION Vent loop is pressurized. Hold LiOH cartridge in place</p>
--

13. Rotate LiOH cartridge outward until limited by Velcro retainer strap
14. Remove used battery
15. Install new battery (✓connector alignment), latch
16. ✓LiOH cartridge seated, rotate downward until latch pins engage
17. Close LiOH cartridge latches

If no SCU power available:

DCM

18. PWR – BATT
19. FAN – ON (aft) (PWR RESTART may occur)
20. Helmet purge vlv – cl, locked
21. Close EMU thermal cover zipper
22. Perform EMU COLD RESTART (EMU CONT PROCS)
23. Continue EVA Prep

- * If LiOH cartridge seal broken, purge EMU, *
- * LiOH REPLACEMENT (EMU CONT PROCS), *
- * begin at step 10 *

SCU SWAP (UNMANNED)

- BOTH DCM 1. ✓FAN – OFF
- 2. ✓O2 ACT – OFF
- 3. ✓COMM mode – HL
- AW18H 4. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
- DCM 5. Swap SCUs
- 6. PWR – BATT
- AW18H 7. ✓PWR/BATT CHGR EMU 1,2 MODE (two) – PWR
- 8. BUS SEL (two) – MNA(MNB)
- 9. ✓EMU INPUT 1,2 volts = 18.0–20.0
- DCM 10. PWR – SCU

SCU SWAP (MANNED)

- BOTH DCM 1. Temp control vlv – Max C
- O6:A1R 2. Perform EVA COMM CONFIG (EVA PREP), steps 1,4,5,7
- 3. PWR – BATT
- AW18H 4. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
- DCM 5. Swap SCUs
- AW18H 6. ✓PWR/BATT CHGR EMU 1,2 MODE (two) – PWR
- 7. BUS SEL (two) – MNA(MNB)
- 8. ✓EMU INPUT 1,2 volts = 18.0–20.0
- DCM 9. PWR – SCU
- 10. COMM mode – HL
- 11. Temp control vlv – as reqd

EMU COLD RESTART (MANNED)

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

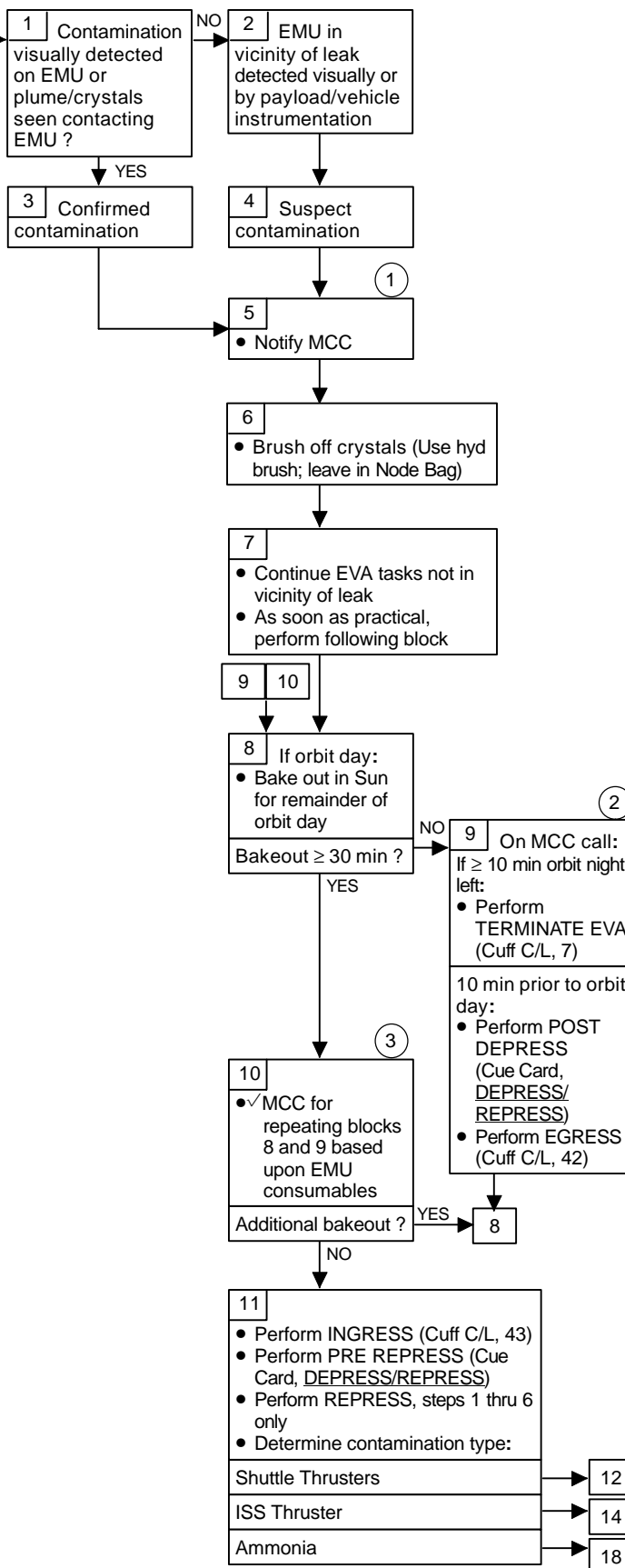
- DCM 1. FAN – OFF
- 2. O2 ACT – OFF
- If PWR – SCU:
 - 3. PWR – BATT (2 sec)
 - 4. PWR – SCU
- If PWR – BATT:
 - 5. PWR – SCU (2 sec)
 - 6. PWR – BATT
- 7. O2 ACT – IV
- 8. FAN – ON

12.1 CHEMICAL CHECK/DECONTAMINATION

During EVA
If crew visually detects plume, white crystals, or "snow" coming from payload/vehicle

OR

If payload/vehicle chemical system leak suspected due to steady (not step function) decrease in pressure or temperature

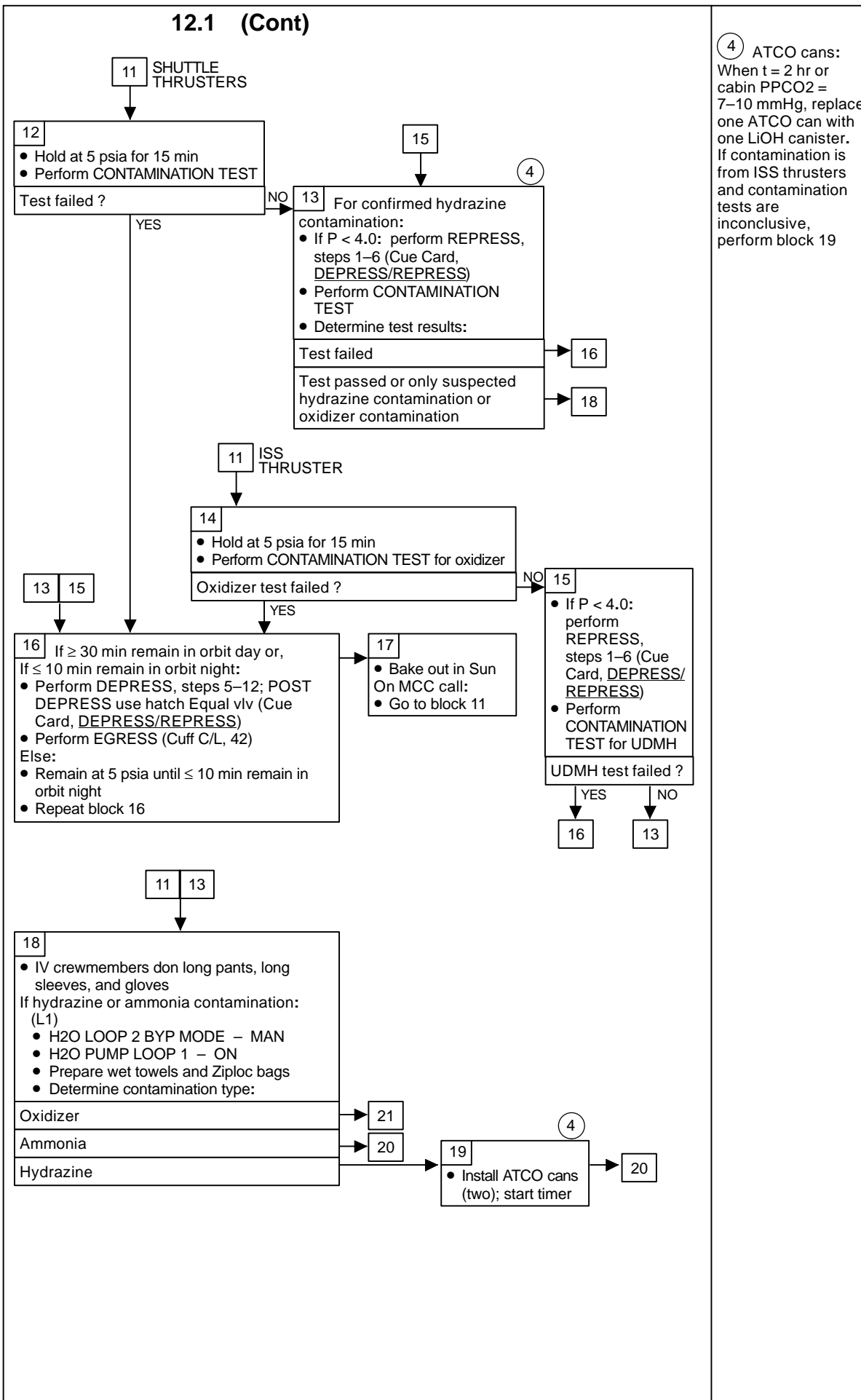


① If contamination is only suspected, MCC may direct crew to bypass blocks 6,8,9,10. For vapor only leaks, blocks 18 thru 21 are reqd only if contamination test fails

② During orbit night, the EMU should be in the airlock which is a warm environment. This raises the surface temperature of the EMU which increases the rate of contaminant sublimation

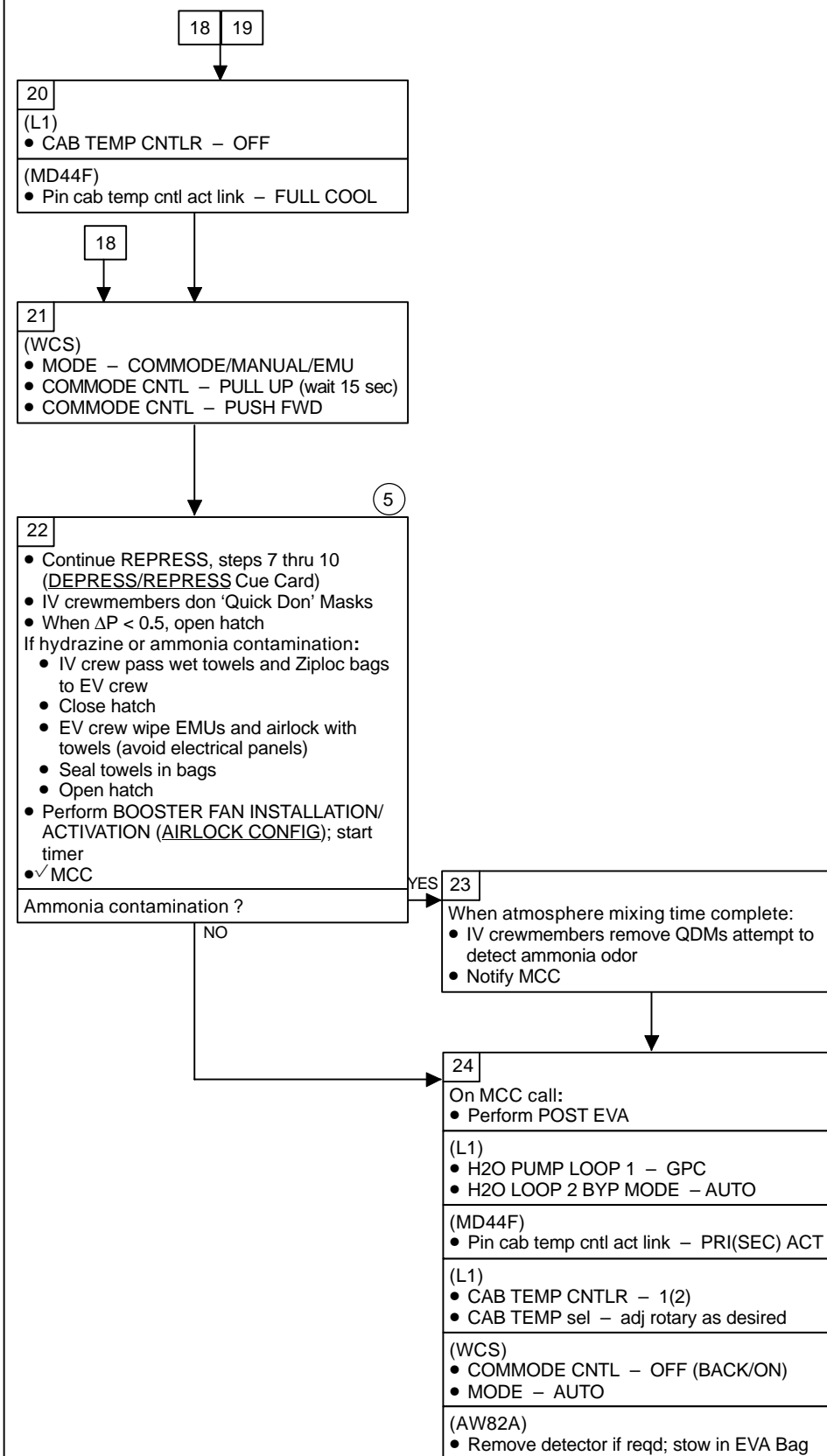
③ Because detection equipment is available for hydrazine and oxidizer, only one bakeout needs to be performed prior to airlock repress and contamination test

12.1 (Cont)



④ ATCO cans:
When t = 2 hr or cabin PPO₂ = 7–10 mmHg, replace one ATCO can with one LiOH canister. If contamination is from ISS thrusters and contamination tests are inconclusive, perform block 19

12.1 (Cont)



⑤ IV crew must remain on the QDMs and EV crew must remain in EMU for as long as cabin PPO2 and EMU PPO2 levels will allow. The minimum time breathing O2 should be 20 min following booster fan activation to allow for the two atmospheres to mix and to allow any localized pockets of contaminants to dissipate

CONTAMINATION TEST

To be performed after airlock ingress and partial airlock repress following suspected hydrazine or oxidizer contamination

- EV
- 1. ✓ Inner hatch Equal vlv (two) – OFF
 - AW82B 2. Attach hydrazine detector cap over depress valve
 - 3. ✓ Helmet lights – OFF
 - AW18A 4. ✓ LTG FLOOD (four) – ON

For suspected oxidizer contamination:

- 5. Tear open Dräger pouch
 - ✓ Initial tube color pale green

* Use new tube if not proper color *

- 6. Insert arrow end of Dräger tube into detector holder

For suspected hydrazine contamination:

- 7. Tear open Gold Salt pouch
 - ✓ Initial coupon color white

* Use new coupon if not proper color *

- 8. Insert indicator into detector holder

NOTE

Test performed at 5 psi. For oxidizer, depress for 1.5 min.
For MMH and UDMH, depress for 10 min

- 9. AIRLK DEPRESS vlv – 5 (ALERT TONE may occur)
- 10. Wave detector near EMUs
- 11. After specified depress time, AIRLK DEPRESS vlv – CL (ALERT TONE may occur)
- 12. ✓ Detector for color change. Determine if test failed based upon following criteria and inform MCC:
 - Oxidizer – any gray/blue reacted crystals
 - MMH – > 25 ppb
 - UDMH – > 50 ppb
- 13. Continue 12.1 CHEMICAL CHECK/DECONTAMINATION

SAFER BATTERY CHANGEOUT (15 min)

- PM 1. Install Inhibitor
- 2. ✓MAN ISOL vlv – CL (up)
- HCM 3. ✓PWR – OFF
- PM 4. Loosen screws (eight) using 9/64-in Hex Wrench
- 5. Remove battery; disconnect battery umbilical connector
- 6. Mark, stow used battery
- 7. Obtain new battery
- 8. Record new battery serial number (SAFER CHECKOUT RESULTS Cue Card)
- 9. Connect battery umbilical connector; install battery
- 10. Tighten screws (eight)
- 11. Go to SAFER CHECKOUT

BENDS TREATMENT ADAPTER (BTA) INSTALLATION (IN-SUIT)

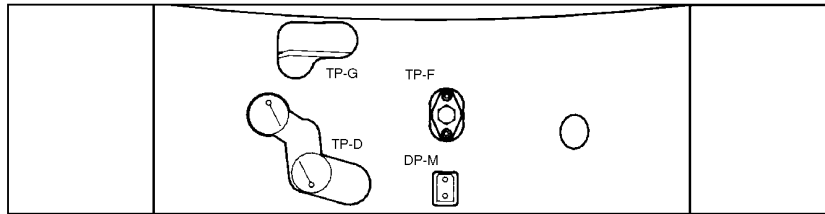
BTA PREP

- EMU
1. Unstow BTA with 3/8-in Wrench
 2. Cut/break TMG tacks (see 12-16)
 3. Unzip PLSS TMG (avoid pulling on antenna cable)
 4. Remove Impact Shield
 5. Disconnect hatch marked cable P3 (see 12-16); cut cable if reqd

NOTE

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

6. Remove Test Port F Plug on SOP using 3/8-in end of BTA Wrench (4-6 turns ccw) (see **SECONDARY OXYGEN PACKAGE** below)



SECONDARY OXYGEN PACKAGE

- BTA
7. Stow Test Port F Plug (see 12-16) on BTA
 8. Unstow poppet keeper screw from BTA, temp stow (in EMU Servicing Kit)

BTA TREATMENT

9. ✓ SCU connected to DCM
 10. Connect BTA to PPRV (cw), ✓ locked
- AW82B
MD (flr)
DCM
11. ✓ EV-1(EV-2) O2 vlv – OP
 12. If external airlock: ✓ EMU O2 ISOL vlv – OP
 13. ✓ PWR – SCU
 14. ✓ FAN – ON
 15. ✓ COMM MODE – HL, vol as reqd (for biomed downlink, COMM MODE – PRI(ALT))
- If WCS:
- WCS
16. ✓ FAN SEP same as HOSE BLOCK
 17. MODE – COMMODE/MANUAL/EMU, posn guard over sw (✓ airflow, WCS ON It on)
- If EDO WCS:
18. ✓ URINAL SEL sw same as URN DIV VLV
 19. Unstow urinal hose; posn guard strap over hose yoke (✓ airflow)
- AW82D
AW82H
AW82D
20. ✓ EMU 1(2) H2O SPLY – CL (tb-CL)
 21. WASTE reg – MAN OP
 22. EMU 1(2) H2O WASTE – OP (tb-OP) (until H2O WP < 7 and stable for ~ 1 min)
- AW82H
23. EMU 1(2) H2O WASTE – CL (tb-CL)
 24. SPLY WASTE reg – REGULATING
- If WCS:
- WCS
25. MODE – AUTO (✓ WCS ON It off)
- If EDO WCS:
26. Stow urinal hose

27. ✓ SUI P = 4.2–4.4
28. O2 ACT – OFF (until SUI P stabilizes)

CAUTION

If BTA gauge pressure increases while O2 ACT – PRESS, set O2 ACT – OFF immediately to prevent a hazardous condition; contact MCC. Note that the BTA gauge increases nominally when O2 ACT – OFF. Actual Suit P = 4.7–5.5 psi above BTA gauge pressure

29. O2 ACT – PRESS (for 15 sec), ✓ BTA gauge not increasing when O2 ACT – PRESS
30. O2 ACT – OFF, status to H2O GP, ✓ stable
31. Repeat steps 29,30 until H2O GP = 6.0 psid and stable on DCM display with O2 ACT – OFF

As reqd to maintain H2O GP = 6.0 psid:

32. Repeat steps 29,30

NOTE

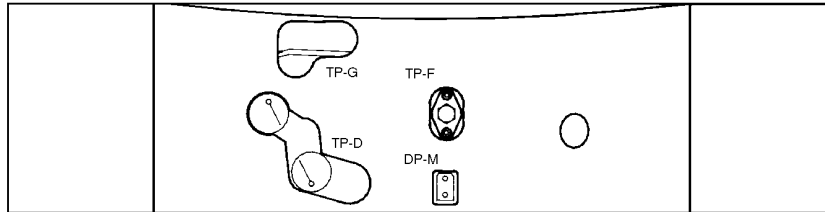
Initial treatment will be at 6 psid for Cuffs 2 and 3 and will be increased to 8 psid if symptoms do not resolve. Initial treatment for Cuff 4 will be 8 psid

33. Contact Surgeon for treatment length and changes in treatment pressure

BENDS TREATMENT ADAPTER (BTA) INSTALLATION (POST SUIT DOFFING)

BTA PREP

- EMU
1. Unstow BTA with 3/8-in Wrench
 2. Cut/break TMG tacks (see 12-16)
 3. Unzip PLSS TMG (avoid pulling on antenna cable)
 4. Remove Impact Shield
 5. Disconnect or cut hatch marked cable P3 (see 12-16)
 6. Remove Test Port F Plug on SOP using 3/8-in end of BTA Wrench (4-6 turns ccw) (see SECONDARY OXYGEN PACKAGE below)



SECONDARY OXYGEN PACKAGE

- BTA
7. Stow Test Port F Plug (see 12-16) on BTA
- If LiOH replacement reqd by MCC:
8. Unstow new LiOH cartridge
 9. Remove, mark used LiOH cartridge
 10. Holding new LiOH cartridge w/aluminum plate serial number facing self, remove caps (left first), install LiOH (attach Velcro retainer strap)
 11. Install caps on used cartridge

BTA TREATMENT

- BTA
- EMU
- AW82B
- MD (flr)
- DCM
12. ✓SCU connected to DCM
 13. Unstow Poppet Keeper Screw from BTA
 14. Open Positive Pressure Relief Valve (PPRV) using BTA poppet keeper (thread cw to hard stop, pull, tighten nut) (see 12-16)
 15. Connect BTA to PPRV (cw), ✓locked
 16. Don MAG, LCVG, biomed
 17. Fill drink bag from galley, remove gas and insert drink bag in restraint bag
 18. Install drink bag restraint bag in HUT and dispose of fill tool in wet trash
 19. ✓EV-1(EV-2) O2 vlv – OP
 20. If external airlock: ✓EMU O2 ISOL vlv – OP
 21. PWR – BATT

CAUTION

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

- AW18H
- DCM
22. PWR/BATT CHGR EMU 1(2) MODE – PWR
 23. BUS SEL – MNA(MNB)
 24. PWR – SCU
 25. ✓Waist ring – op
 26. Don lower torso; as reqd, attach donning handles
 27. ✓Suit arms aligned
 28. ✓Wrist disconnects – op
 29. Remove cooling garment connector jumper
 30. Don thumb loops
 31. ✓Biomed connector outside of HUT
 32. Don upper torso
 33. Release thumb loops
 34. ✓Suit arms aligned
 35. Don comm cap

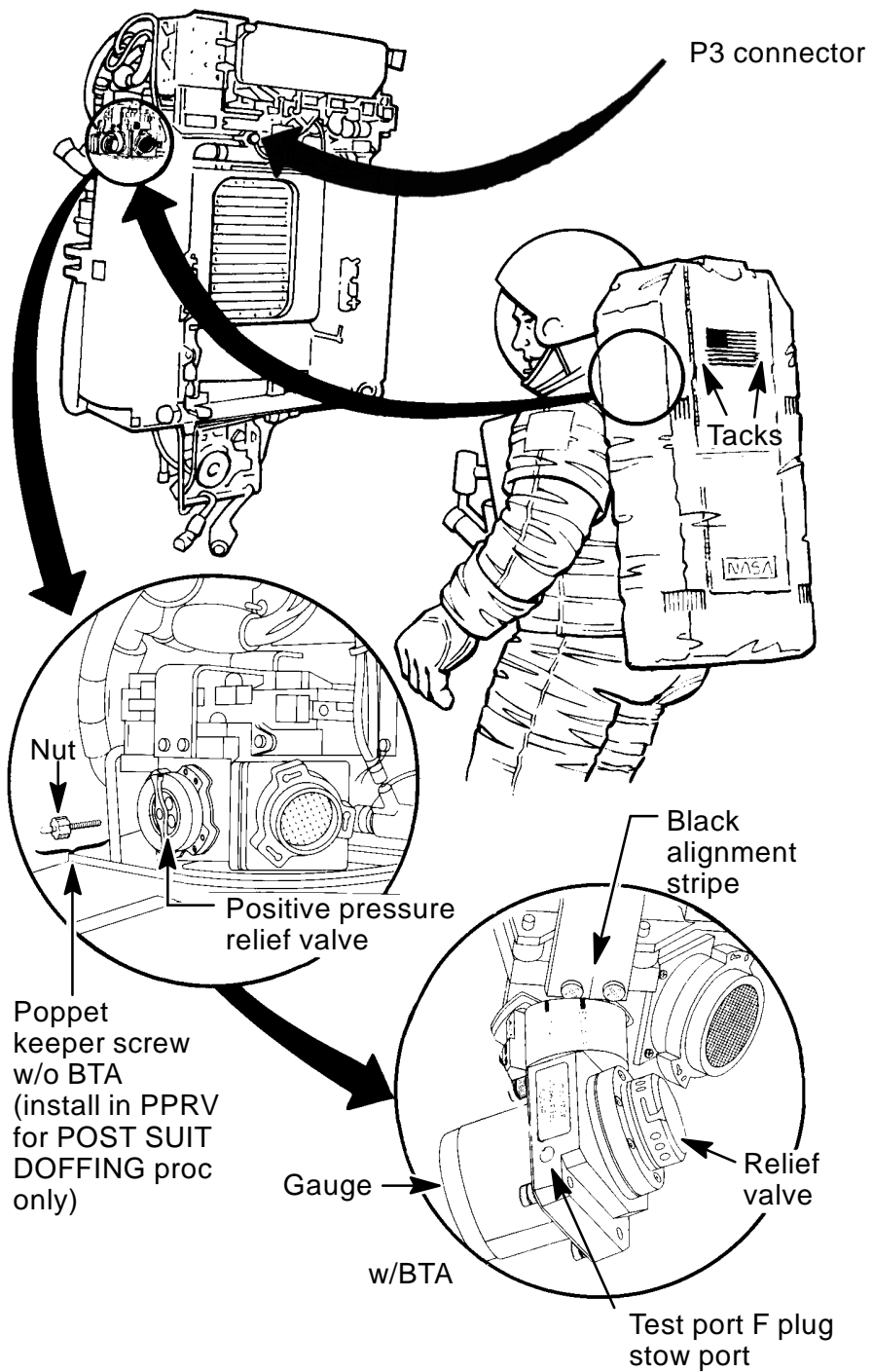
- DCM 36. ✓COMM MODE – HL, vol as reqd (for biomed downlink, perform EVA
COMM CONFIG (EVA PREP))
37. Connect biomed to elec harness
38. Connect cooling garment, ✓locked
39. ✓Thermal cover clear of waist ring
40. Waist ring – engage posn
41. Connect waist ring, ✓locked
42. Wrist rings – engage posn
43. Don EV Gloves, ✓locked
44. ✓Elec harness clear of neck ring
45. ✓Mike boom posn
- DCM 46. FAN – ON
47. Don helmet, ✓locked
48. ✓Helmet purge vlv – cl, locked
49. ✓PURGE vlv – op
50. O2 ACT – PRESS, begin purge clock (12 min)
- If WCS:
- WCS 51. ✓FAN SEP same as HOSE BLOCK
52. MODE – COMMODE/MANUAL/EMU, posn guard over sw (✓airflow,
WCS ON It on)
- If EDO WCS:
53. ✓URINAL SEL sw same as URN DIV VLV
54. Unstow urinal hose; posn guard strap over hose yoke (✓airflow)
- AW82D 55. ✓EMU 1(2) H2O SPLY – CL (tb–CL)
- AW82H 56. WASTE reg – MAN OP
- AW82D 57. WASTE – OP (tb–OP)
- When N2 purge time = 12 min:
58. EMU 1(2) H2O WASTE – CL (tb–CL)
- AW82H 59. SPLY WASTE reg – REGULATING
- If WCS:
- WCS 60. MODE – AUTO (✓WCS ON It off)
- If EDO WCS:
61. Stow urinal hose
- DCM 62. PURGE vlv – cl (dn)
63. ✓Suit P = 4.2–4.4
64. O2 ACT – OFF (until Suit P incr stabilizes)
65. – PRESS (for 15 sec)
66. Repeat steps 64,65 until Suit P = 6.0 psig on BTA gauge

NOTE

BTA relief valve relieves at 8.04–8.45 psig

As reqd to maintain Suit P = 6.0 psig:

67. Repeat steps 64,65
68. Contact Surgeon for treatment length and changes in treatment pressure



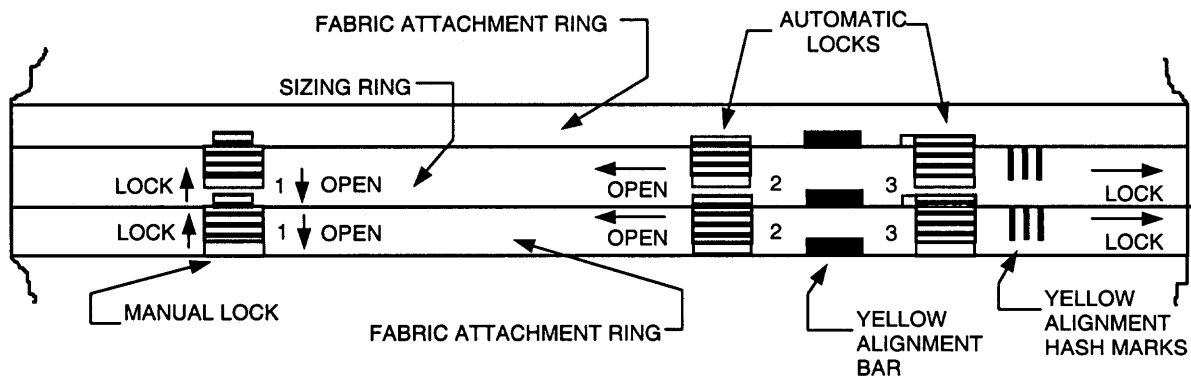
BTA LOCATION ON EMU

EMU RESIZE (30 min)

NOTE

Procedures written for arm, thigh, and boot disconnects. Arm, thigh, and boot sizing rings are not interchangeable and cannot be stacked. See figures on 12–18 as reference during procedure

- | | |
|-----------------------|--|
| Old component(s)/ EMU | <ol style="list-style-type: none"> 1. Identify component(s) to be installed per appropriate resize matrix 2. Peel back TMG from disconnect <p>If replacing arm components</p> <ol style="list-style-type: none"> 3. ✓ REBA sw – OFF 4. Disconnect lower arm power harness from gloves and upper arm 5. Lock 1 – OPEN (on arm, lock may reengage due to bladder) 6. Lock 2 – hold OPEN while turning ring to engage lock 2 OPEN against disconnect 7. Lock 3 – hold OPEN while turning ring in OPEN direction 8. Demate segment/ring 9. Install protective caps on ends of components; place rings in protective pouches 10. Repeat steps 2–9 as reqd |
| New Component(s)/ EMU | <ol style="list-style-type: none"> 11. ✓ Proper size located on bladder by disconnect 12. ✓ All seals, threads and wipe with lint-free wipe (Prep Kit) 13. Lock 1 – OPEN (on arm, lock may reengage due to bladder) 14. Align new component yellow hash marks with yellow bar on disconnect 15. Turn rings in LOCK direction 16. ✓ Lock 2,3 – locked 17. Lock 1 – LOCK 18. ✓ Cam adjustments (4 per segment) per appropriate resize matrix 19. If Lower arm replaced, connect lower arm power harness to upper arm 20. Remate TMG covering disconnect 21. Repeat steps 11–20 as reqd |
| Old component(s)/ EMU | <ol style="list-style-type: none"> 22. Stow replaced component(s) |



DISCONNECT IN LOCKED POSITION

(Cont on next page)

EMU RESIZE (Cont)

ARM CAM ADJUSTMENT

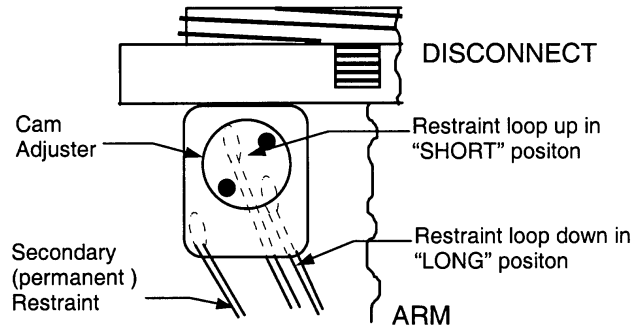
(0.25-in per cam)

NOTES

Cam Adjuster only rotates in one direction.

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

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



WAIST CAM ADJUSTMENT

(1.0-in per cam)

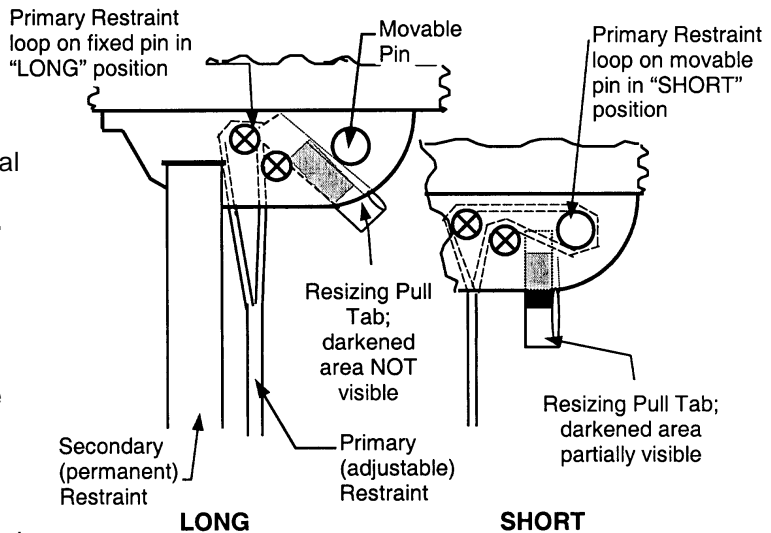
NOTES

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

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

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

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



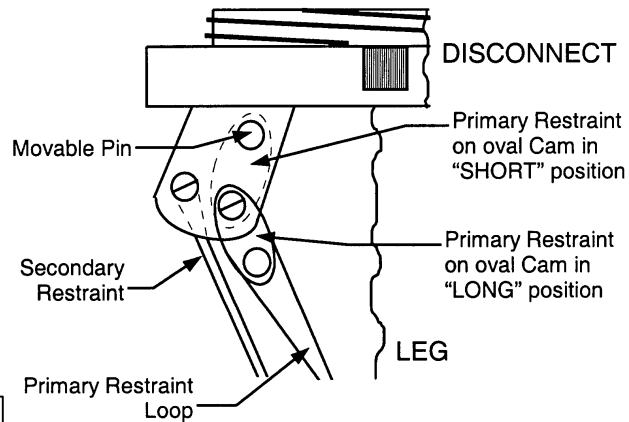
LEG CAM ADJUSTMENT

(0.5-in per cam)

NOTE

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

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



CAUTION

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

In LONG position, the restraint must NOT be around the Movable Pin; verify that oval cam and restraint are down

DAP/EVA RESCUE/RETRIEVE

EVA ORBITER CONFIGURATION 13-2
RESCUE/RETRIEVE 13-4

**DAP/
EVA RESCUE**

EVA ORBITER CONFIGURATION

1. GENERIC ORBITER CONFIGURATION
 A6U SENSE – as reqd
 FLT CNTLR PWR – OFF
 DAP TRANS: PULSE/PULSE/PULSE

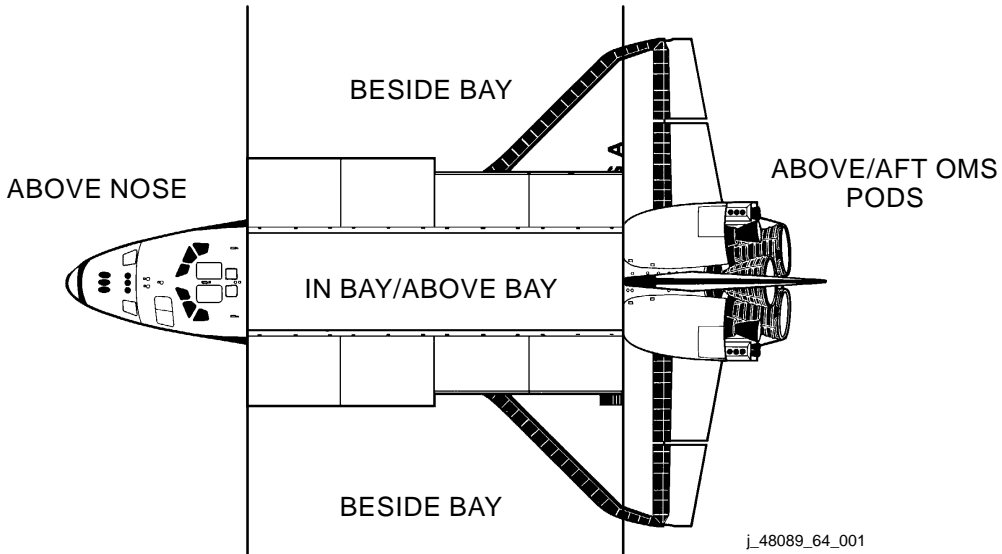
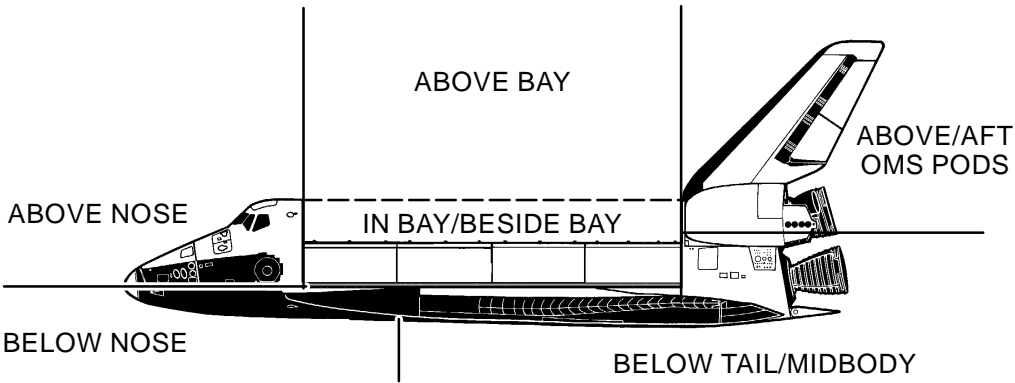
O14, cb MNA,C DDU AFT (two) – cl
 O15, Pri RJD LOGIC,DRIVER (sixteen) – ON
 O16

GNC 20 DAP CONFIG

CRT ✓PRI TRAN PLS – ITEM 17 +0.10
 ✓ITEM 37 +0.05

A1U ✓KU CNTL – CMD
 PWR – STBY

Unstow, review EVA RESCUE procedure



j_48089_64_001

DAP/
EVA RESCUE

2. REGION-SPECIFIC ORBITER CONFIGURATION

Using region charts, determine region(s) in which EVA crewmembers will be located

Working in order top of table to bottom using the most restrictive region, configure orbiter systems per following table, performing any Initial Configuration Actions which contain a '✓'

Items which do not have a '✓' may be configured as desired to meet mission-specific requirements

WARNING
 Deviating from orbiter systems configuration called out in following table may put EVA crewmembers at risk of being plumed by RCS jets

NOTE

The following table should be used for initial configuration. It should not be used during the EVA (e.g., for EVA RESCUE).

If VERNs not available, use ALT instead. All other configuration actions remain unchanged

		In Bay	Above Bay	Above Nose	Above/Aft OMS Pods	Below Tail/Midbody	Below Nose	Beside Bay
INITIAL CONFIGURATION ACTIONS								
D	VERN	✓	✓	✓				✓
A	ALT				✓	✓	✓	
P	LOW Z		✓					
	No LOW Z			✓		✓	✓	
SPEC 20	P/Y/JET OPTION (PRI & ALT, DAP A & B) – ALL				✓	✓		
	P/Y/JET OPTION (PRI & ALT, DAP A & B) – TAIL			✓			✓	
SPEC 23	OVRD L/R MANFs 1,2,4 (six) – CL				✓			
	L3L,R3R (two) – DES				✓			
	OVRD L/R MANFs 2,3,4 (six) – CL					✓		
	L1L,R1R (two) – DES					✓		
O14,	RJDA L1/R1 (L2/R2, L4/R4) DRIVER (three) – OFF				✓			
O15,	RJDA L2/R2 (L3/R3, L4/R4) DRIVER (three) – OFF					✓		
O16	RJD MANF L5/F5/R5 DRIVER – OFF				✓	✓	✓	
	RJDF F1(F2,F3,F4) MANF DRIVER – OFF (four)			✓			✓	
MISC	FLT CNTLR PWR (three) – OFF				✓	✓		✓

3. POST-EVA RECONFIGURATION

Return orbiter to desired/required systems configs

EVA RESCUE/RETRIEVE

NOTE

Assumes that EVA ORBITER CONFIGURATION procedure has already been performed

- A6U
1. CONFIGURATION
DAP: FREE(INRTL)
- O14:F,
O15:F,
O16:F
O16:F
- ✓ SENSE SWITCH as desired
 - ✓ Pri RJD LOGIC, DRIVER (sixteen) – ON
 - ✓ RJD MANF L5/F5/R5 DRIVER – ON

GNC 23 RCS

- A1U
- OVRD L/R MANF – OP (if OVRD CLOSED earlier)
 - KU CNTL – PNL

2. OPERATIONS

NOTE

When EVA crewmember clear of RCS jets,
FLT CNTLR PWR ON and DAP INRTL

If TRANSLATION:

| DAP: LO Z, as reqd (DAP A has larger TRANS PULSE size)

If ROTATION:

DAP: VERN(PRI), as reqd

NOTE

Translate, then rotate, as reqd to center crewmember over bay.

Null translational rates, then establish closing(opening) rate as reqd to crewmember in bay.

Use RMS and/or other EVA crewmember to assist if possible

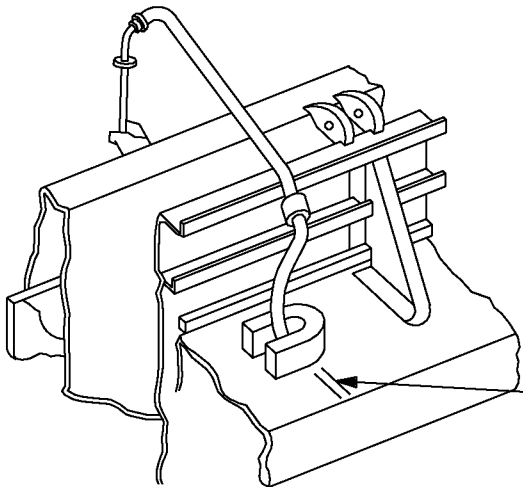
ORBITER CONTINGENCY EVA

PAYLOAD BAY EVA NOMENCLATURE	14-2
RMS/PRLA CONTINGENCY EVA	14-3
96 BOLT PRE-EVA TOOL CONFIG	14-13
EVA TIMELINE	14-14
CAPTURE LATCH MANUAL RELEASE (ODS/PMA)	14-19
96 BOLT EVA LAYOUT	14-21

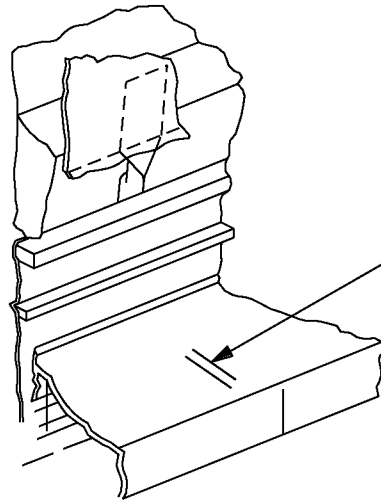
ORB CONT
EVA

ORB CONT
EVA

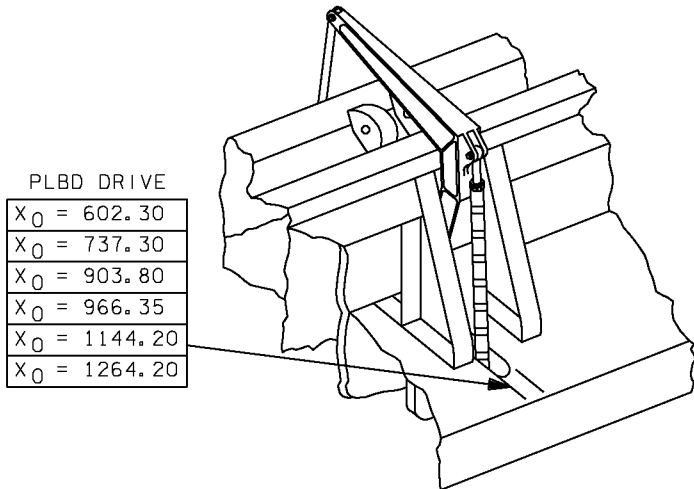
PAYLOAD BAY EVA NOMENCLATURE



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



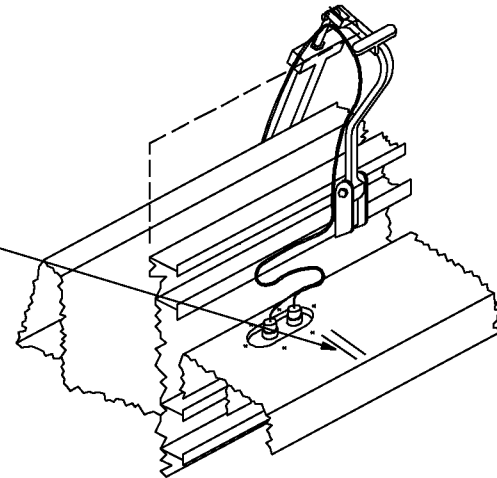
RADIATOR	
HINGE	ACTUATORS
	$X_0 = 611.68$
$X_0 = 614.50$	
$X_0 = 680.50$	
	$X_0 = 725.60$
$X_0 = 745.50$	
$X_0 = 774.50$	
	$X_0 = 794.95$
$X_0 = 857.30$	
	$X_0 = 906.80$
$X_0 = 927.00$	



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

ELECTRICAL CROSSOVER

$X_0 = 725.60$
 $X_0 = 794.95$
 $X_0 = 863.31$
 $X_0 = 1019.75$
 $X_0 = 1084.75$
 $X_0 = 1214.25$



9466. ART; 1

RMS/PRLA CONTINGENCY EVA

FOR RMS/PRLA FAILURES:

<u>PRE EVA RMS CONFIG</u> [1]	
IV	
A8L	If MRL fails to latch: ✓RMS R-F-L tb (three) – gray ✓RMS tb – STO Go to RMS TIEDOWN [4]
A8L	If MPM fails to stow(deploy): ✓RMS RETEN LAT – LAT (tb-LAT) ✓MPMs stowed(deployed) as far as possible Go to MPM STOW/DEPLOY [5]
	If Joint fails: Position RMS for easy striker bar access Go to RMS JOINT ALIGN [6]

<u>PRE EVA EE/GF CONFIG</u> [2]	
IV	
A8U	BRAKES – ON (tb-ON)
	EE MODE – OFF
A8L	RMS SEL – OFF
	Go to RMS FLIGHT RELEASABLE GRAPPLE FIXTURE RELEASE [8]

<u>PRE EVA PRLA CONFIG</u> [3]	
IV	
MA73C:C	cb MCA PWR AC1 3Φ MID 1 – op
:D	AC2 3Φ MID 3 – op
R13L	PL BAY MECH PWR 1,2 (two) – OFF
A6U	PL RETEN LOGIC PWR SYS 1,2 (two) – OFF
	LAT (five) – OFF
	Go to PRLA OPEN/CLOSE [9]

RMS/PRLA CONTINGENCY EVA (Cont)

FOR RMS/PRLA FAILURES (Cont):

RMS TIEDOWN 4

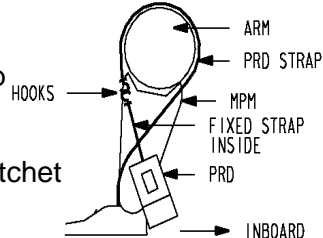
IV If MRL fail to latch – monitor EV1 and EV2

Refer to RMS TIEDOWN figure, following page, as reqd

RMS TIEDOWN

TOOL BOX – PRDs (2), EVA TRASH BAG
 IFM – 9/64-in ALLEN WRENCH (AW)
ELBOW – PRD aft of MPM, peel blanket (fwd of MPM) toward EE; feed hook under cable harness (if reqd, remove cable harness clamp bolt with AW, bend clamp out of way), adjust strap as far fwd as possible
WRIST – PRD aft of MPM, strap rests just fwd of pitch joint opening
END EFFECTOR – PRD fwd of PM, peel blankets aft and fwd, strap rests aft–most on yaw joint (at roll/yaw I/F), adjust strap under bolt studs

1. Figure eight the strap
2. Pull minimum 6-in slack in strap
3. Ratchet PRD snug (14 full strokes reqd)
4. ✓ Strap in correct arm location, ratchet tight
5. Reattach blankets



173250507, ART# 1

EVA CUFF C/L 36 09/30/96

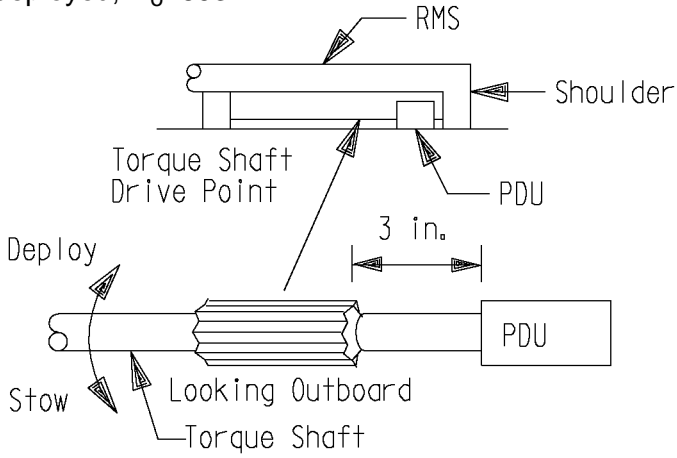
MPM STOW/DEPLOY 5

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

MPM STOW/DEPLOY

TOOL BOX – MPM WRENCH

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

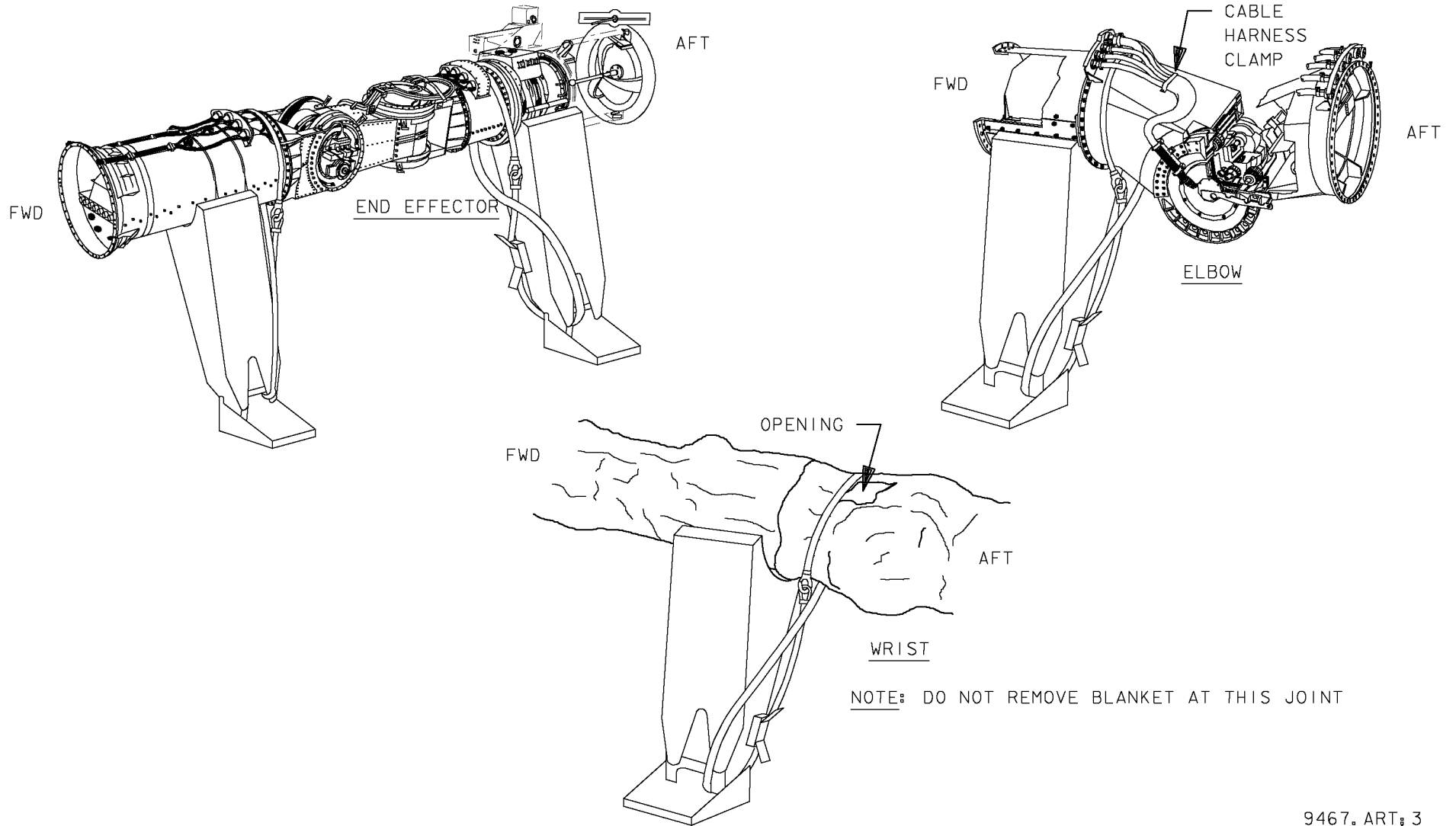


9469, ART# 1

EVA CUFF C/L 35 10/29/93

IV A8L When MPMs in stow(deploy) position:
 ✓RMS tb – STO(DPY)
 or
4: SM 94 PDRS CONTROL
 ✓RMS STO/DPY
 11 00 (00 11)

RMS/PRLA CONTINGENCY EVA (Cont)

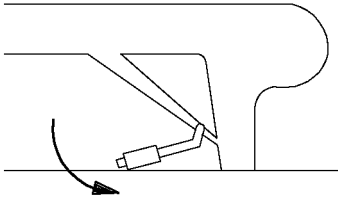


RMS TIEDOWN

RMS/PRLA CONTINGENCY EVA (Cont)

FOR RMS/PRLA FAILURES (Cont):

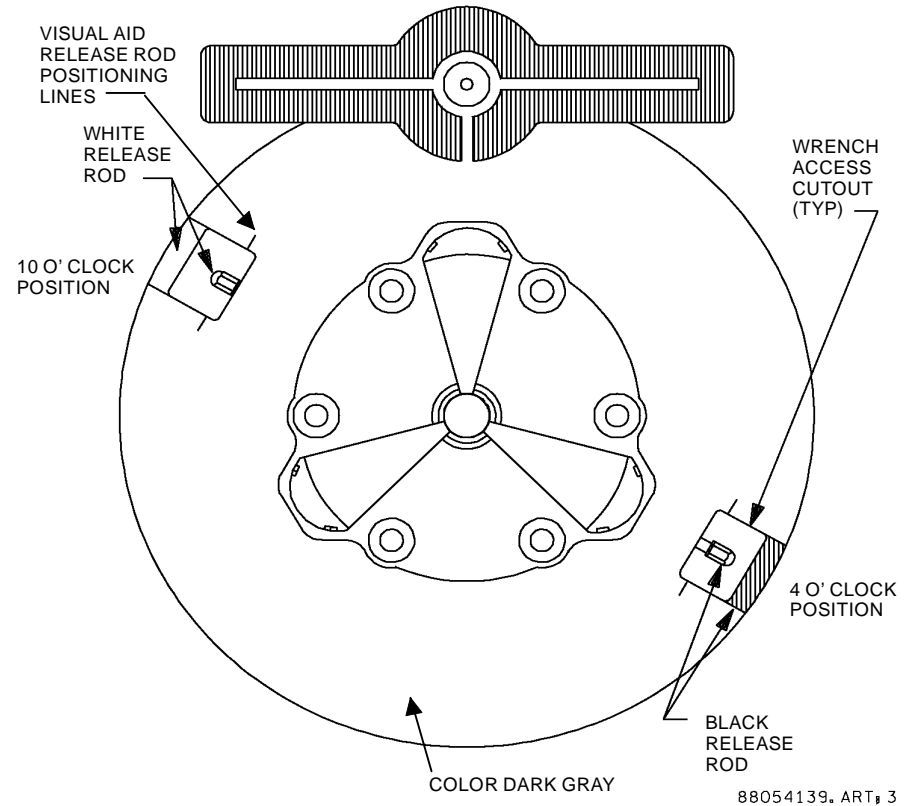
<p>RMS JOINT ALIGN 6</p>	
IV	<p>If Joint Fail – reposition RMS as reqd for RMS rope attachment – monitor EV1 and EV2</p>
<p>RMS JOINT ALIGN</p>	
<p>TOOL BOX – ADJ TETHERs, SNATCH BLOCKs (2), RMS ROPE REEL</p>	
	<ol style="list-style-type: none"> 1. Attach RMS rope around end effector under handrail. Translate to avoid wrapping rope around RMS 2. Attach snatch block(s) to handrail(s) and route rope as reqd
IV1	<ol style="list-style-type: none"> 3. Reposition RMS as required for cradling 4. Pull RMS down into MPMs 5. Perform final positioning by hand to allow MRLs to latch
<p>~ ~ ~</p>	
<p>EVA CUFF C/L 34 10/29/93</p>	
IV	<p>When RMS ready to latch:</p> <p>R13L PL BAY MECH PWR SYS (two) – ON A8L RMS RETEN LAT – LAT (tb–LAT 18 sec max) – OFF</p> <p>If MPMs deployed: ✓ Elbow Camr in aligned posn: Pan 90° from X–AXIS Tilt per DECAL</p> <p>A8L RMS – STO (tb–STO, 68 sec max) – OFF</p> <p>A8U BRAKES – ON (tb–ON)</p> <p>R13L PL BAY MECH PWR SYS (two) – OFF</p>

<p>RMS SHOULDER BRACE RELEASE 7</p>	
IV	<p>A8 ✓RMS SELECT – OFF</p>
<p>RMS SHOULDER BRACE RELEASE</p>	
<p>TOOL BOX – RMS SHOULDER BRACE RELEASE TOOL</p>	
	
	<ol style="list-style-type: none"> 1. Fold aside rub strip and thermal blankets 2. Insert tool and move handle down 3. Remove tool and reconfigure blankets
<p>9468. ART# 1</p>	
<p>EVA CUFF C/L 34 10/29/93</p>	

RMS/PRLA CONTINGENCY EVA (Cont)

FOR RMS/PRLA FAILURES (Cont):

RMS FLIGHT RELEASABLE GRAPPLE FIXTURE RELEASE		8
RMS FLIGHT RELEASABLE GRAPPLE FIXTURE RELEASE		
AIRLOCK – JETTISON STOWAGE BAG TOOL BOX – 1/2-in BOX RATCHET, VELCRO/TAPE		
EV	1.	Rotate white release rod ccw to hard stop (32 strokes of 90 deg)
	2.	Rotate black release rod cw to hard stop (32 strokes of 90 deg – shaft will release from grapple fixture)
IV	3.	Clear worksite for RMS powerdown: RMS SEL – PORT Perform <u>RMS POWERDOWN</u> (PDRS OPS)
A8	4.	Tape end of shaft to restrain slug within shaft
	5.	Cover end effector with jettison stowage bag to restrain grapple shaft
EVA CUFF C/L		37
		09/30/96



RMS/PRLA CONTINGENCY EVA (Cont)

EFGF GRAPPLE SHAFT RELEASE

Tools Req'd:

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

EV

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

WARNING

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

IV

4. ✓ Electrical connector disconnected

EV

5. If electrical connector not disconnected, insert probe into connector release port ~5.25 in for full release

IV

6. Clear worksite for RMS cradle

EV

7. Perform RMS POWERDOWN (PDRS OPS)
8. Cover end effector with jettison stowage bag to restrain grapple shaft

SPARE SHAFT REPLACEMENT (If req'd)

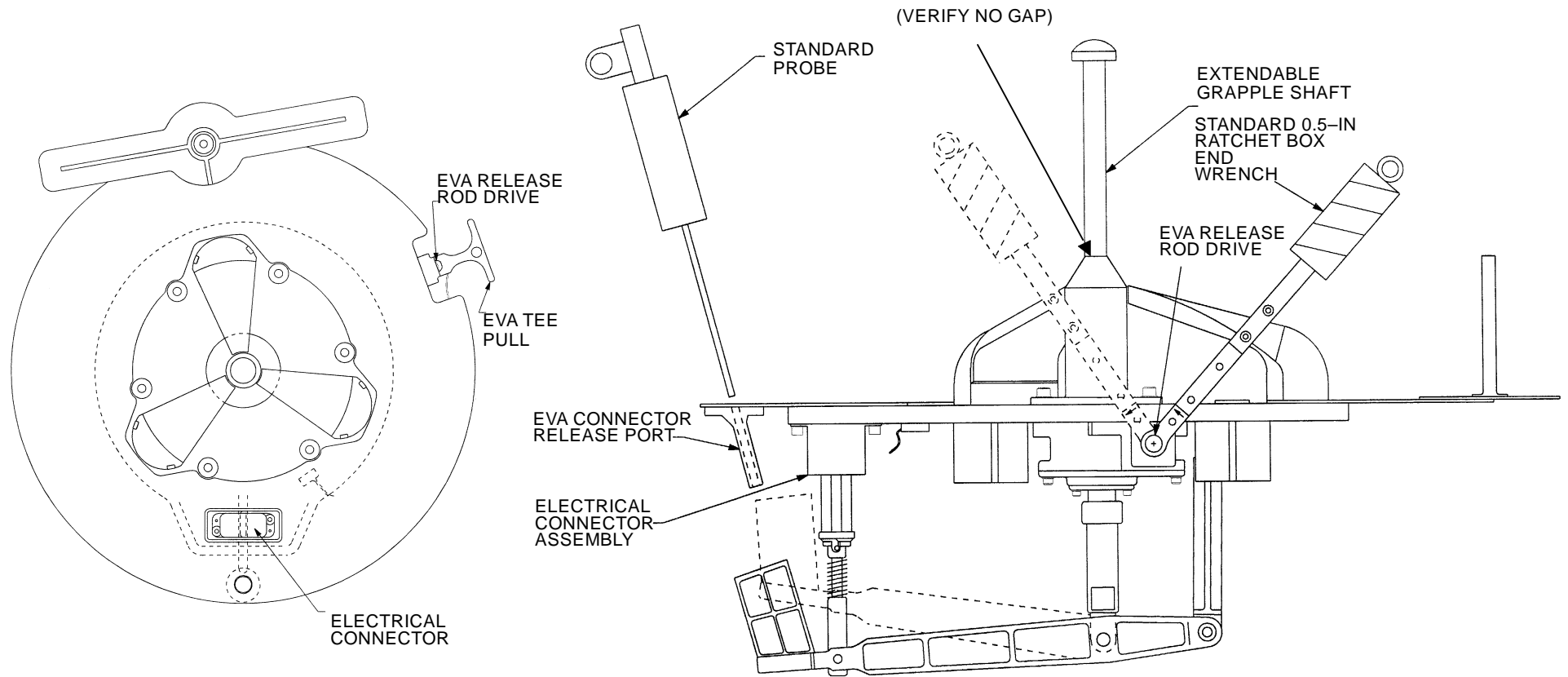
EV

9. Rotate release rod cw to hardstop then rotate ccw five strokes of ~70 deg (at least one full rev req'd). This will insure that grapple shaft can be released for future failures
10. Insert spare shaft (~5 lb to overcome ball detent) using alignment pin and guide
11. Rotate release rod ccw to hardstop (~90 strokes of ~70 deg), apply slight axial pressure to grapple shaft for initial rotations. This is required to aid in engagement of Acme threads

If grapple shaft not engaged after four revs of release rod, repeat steps 9–11

12. Verify no gap between grapple shaft shoulder and grapple fixture cone. If gap is visible, release shaft and repeat insertion procedures
13. Replace tee pull

RMS/PRLA CONTINGENCY EVA (Cont)



9282, ART4

ELECTRICAL FLIGHT GRAPPLE FIXTURE

RMS/PRLA CONTINGENCY EVA (Cont)

FOR RMS/PRLA FAILURES (Cont):

PRLA OPEN/CLOSE 9

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

PRLA OPEN/CLOSE

AIRLOCK-RATCHET WITH 7/16 SOCKET

IV ✓PRLA PWR OFF

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

To open latch:

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

To close latch:

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

IV ✓PRLA tb LAT

Cont next page

EVA CUFF C/L

38

07/20/00

PRLA OPEN/CLOSE (CONT)

- EV 6. Apply PRLA locking feature if applicable

To lock:

7. Rotate each bolt (2) cw 1/2 turn

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

EVA CUFF C/L

39

07/20/00

IV MA73C:C cb MCA PWR AC1 3Φ MID 1 - cl
:D AC2 3Φ MID 3 - cl

To verify PL Latches op/cl:

A6U

✓PL RETEN LAT 1(2,3,4,5) tb - LAT(REL)

POST EVA RMS CONFIG 10

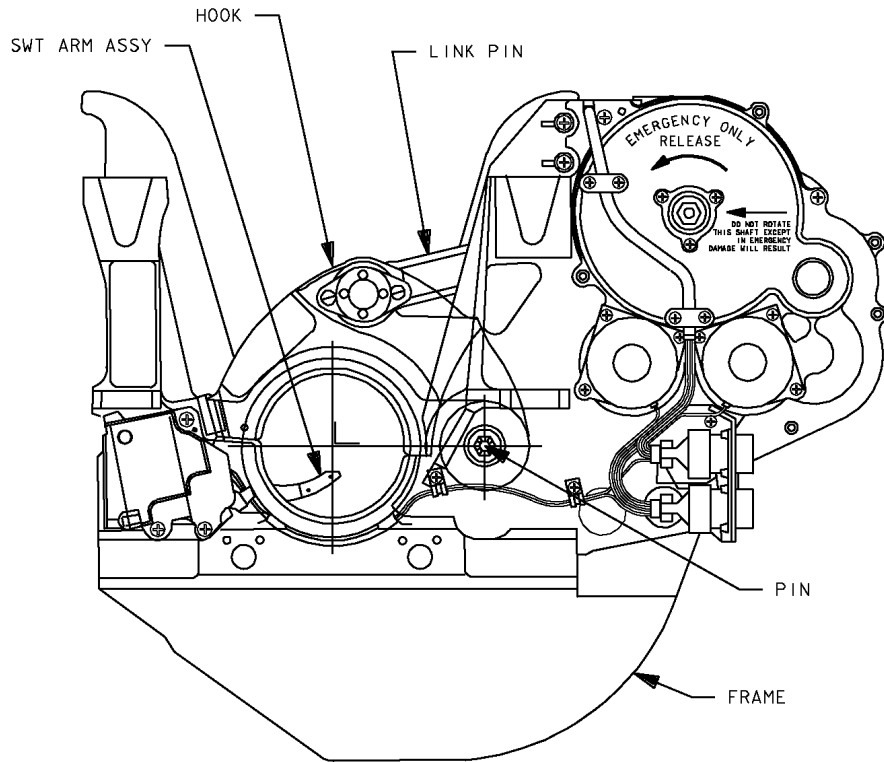
IV A8U

✓BRAKES - ON (tb-ON)

Complete RMS POWERDOWN (PDRS OPS)

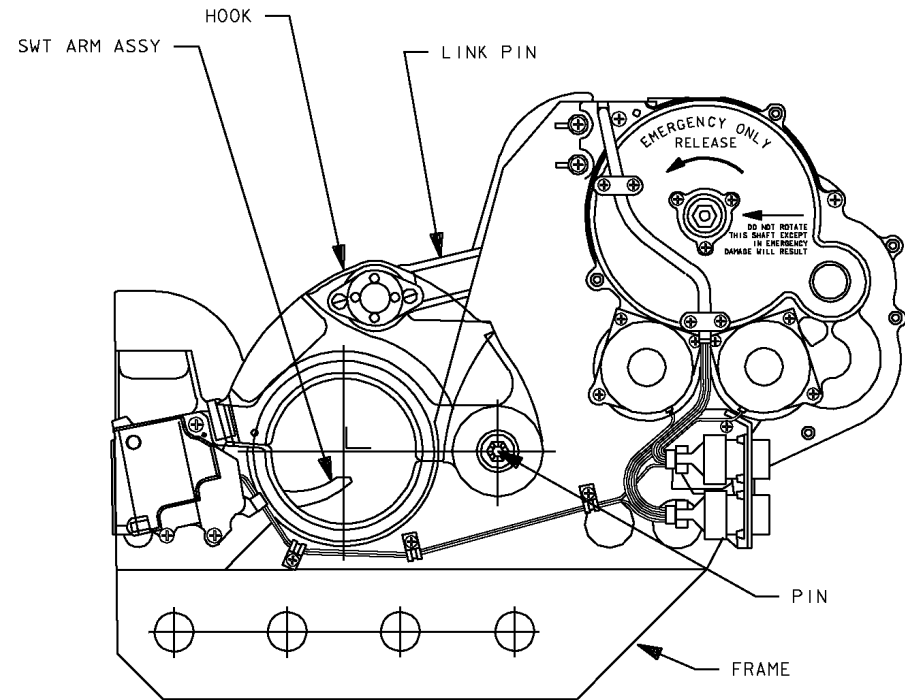
RMS/PRLA CONTINGENCY EVA (Cont)

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



LWLL/MWLL/SMWLL

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



MMWL

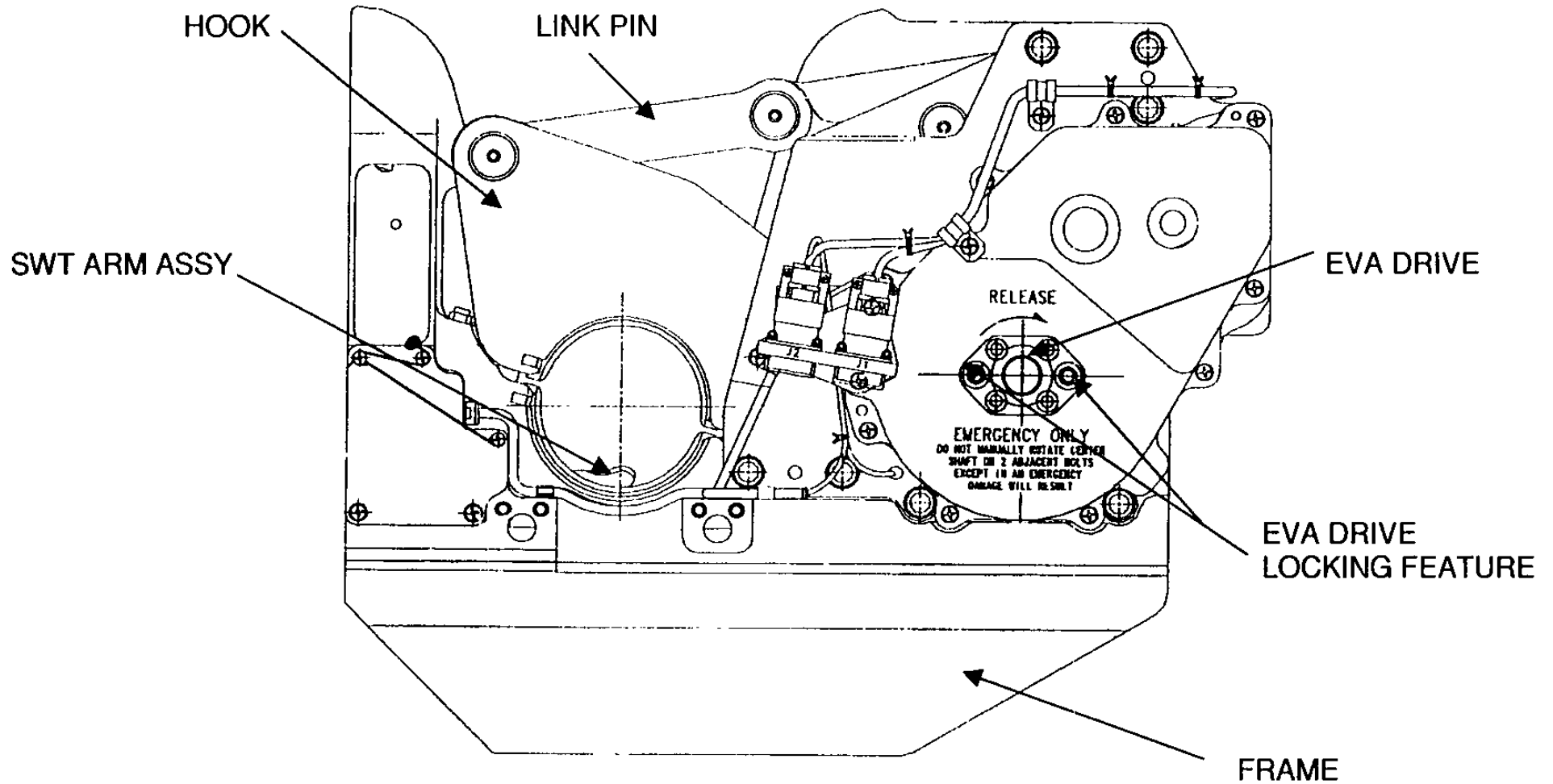
MODIFIED MIDDLEWEIGHT LATCH

173253111. ART. 1

EVA RELEASABLE PAYLOAD RETENTION LATCHES

RMS/PRLA CONTINGENCY EVA (Cont)

In-board end of shaft extends to show yellow stripe when motor disengaged



STANDARD WEIGHT LATCH

EVA RELEASABLE PAYLOAD RETENTION LATCHES (Cont)

96 BOLT PRE-EVA TOOL CONFIG

STOWAGE LOCATIONS AT LAUNCH

Flight specific Middeck stowage and PFR configuration will be uplinked

EMUs:	Node Bag:	Configure Crewlock EVA Bag:
MWS Baseplates (2)	96 Bolt Bag:	PGT Spare Battery
Retractable Tethers (2)	7/16-in Box End Wrenches (2)	Socket Caddies w/6-in Exts (2), RAD (Spare)
Adj Equip Tethers (2)	ODS Clamps (2)	
Waist Tethers (4)	ODS Clamp Handles (2)	Configure Adj Fuse Tether with one of following:
	PB Articulating Socket	GP Caddies (2)
	Bridge Rail Clamp	PGTs w/Batteries (2)
	RAD w/7/16-in Sockets (2)	
Middeck:	TSA (Port):	
MWS T-bars (2)	Large Cutter	Stow Adj Fuse Tether, Crewlock Bag, Jettison
MWS Swing Arms (3)	PRDs (2)	Stowage Bag in Airlock pre-EVA
BRT (2)	Sm EVA Trash Bags (2)	
Waist Tethers Ext (2) (If flown)		
General Purpose (GP) Caddies (2)		
Adj Equip Tethers (2)		
Retractable Tethers (2)		
Crewlock Bag	Fwd Bulhead:	Remove ODS Centerline Camera pre-EVA
Right Angle Drive (RAD)	PFR	
Socket Caddy		
6-in Exts (2)		
PGTs (2)	Port PLB (Bay 2):	
PGT Batteries (3)	Bridge Rail Clamp	
Adj Fuse Tether	PB Articulating Socket	
Jettison Stowage Bag		

96 BOLT EVA TIMELINE

PET	IV/RMS	EV1	EV2
-00:25	ML86B:D 1. cb MNA MMU GN2 SPLY ISOL VLV A – cl R13L 2. MMU GN2 SPLY ISOL VLV A – CL (tb-CL) ML86B:D 3. cb MNA MMU GN2 SPLY ISOL VLV A – op	1. Perform DEPRESS (<u>DEPRESS/REPRESS</u>)	2. Perform DEPRESS (<u>DEPRESS/REPRESS</u>)
-00:20	✓ DOCKING MECHANISM POWERDOWN (RNDZ, <u>APDS</u>) before start of EVA Confirm TCS powerdown		
00:00	MET at PWR – BATT ____/____ : ____	3. Perform POST DEPRESS (<u>DEPRESS/REPRESS</u>)	4. Perform POST DEPRESS (<u>DEPRESS/REPRESS</u>)
00:15		5. Perform AIRLOCK EGRESS (CUFF C/L, 42) Add the following steps to AIRLOCK EGRESS:	6. Perform AIRLOCK EGRESS (CUFF C/L, 42) Add the following steps to AIRLOCK EGRESS:
00:30	✓ ODS powered down AW64L(E) GN2 XFER PANEL GO2 XFER PANEL	6a. Translate to GO2 ISOLATION VALVE on outside of airlock (aft port side) 6b. Open thermal cover; remove pip pin 6c. GO2 XFER ISO VLV – CL AW64L(E) 6d. Re-install pip pin; close thermal cover	6e. ✓ ODS hatch $\Delta P < 0.5$ 6f. Open ODS Hatch per decal 6g. Remove docking lights (two): Release elec connector (one) at each light pip pin (one) on each light boom; stow in bag 6h. Remove Cross-Hair assembly; stow in bag 6i. VENT – OP; FLOW – OP GN2 XFER PANEL 6j. VENT – OP; FLOW – OP GO2 XFER PANEL 6k. ✓ Pressure gauges (two) – zero 6l. Close ODS hatch per decal 6m. ✓ ODS Equal vlvs (two) capped

96 BOLT EVA TIMELINE (Cont)

PET	IV/RMS	EV1	EV2
02:05	<p>Record Cables cut at following locations:</p> <ul style="list-style-type: none"> Bolt 32 – 1 cable _____ Bolt 24 – 7 cables _____ Bolt 21 – 1 cable _____ Bolt 19 – 1 cable _____ Bolt 1 – 1 cable _____ Bolt 95 – 2 cables _____ Bolt 74 – 2 cables _____ Bolt 69 – 3 cables _____ Line 69 – 1 line N2 _____ Line 66 – 1 line O2 _____ Bolt 51 – 1 cable _____ Bolt 47 – 2 cables _____ 	<p><u>IF PFR REQUIRED:</u></p> <ol style="list-style-type: none"> 1. Retrieve Art Socket and Bridge Rail Clamp from 96 Bolt Bag 2. Install bridge rail clamp and art socket on stbd bridge rail in aft–most available half–hole, knob inboard 3. Retrieve PFR from port side <p><u>PFR SETUP FOR CLAMP INSTALL</u></p> <ol style="list-style-type: none"> 1. Art Socket: P = 2, Y = 6 2. PFR: P = 10, R = A, Y = 8 <div style="border: 3px double black; padding: 5px; text-align: center; margin: 10px 0;"> <p><u>WARNING</u> Cut ends of O2 and N2 lines present sharp edge hazard</p> </div>	<p><u>IF PFR REQUIRED:</u></p> <p>Port Bridge Rail Camp and Art Socket launched in second to fwd–most available half–hole</p> <ol style="list-style-type: none"> 1. Move clamp assy to fwd–most available half–hole, knob inboard 2. Retrieve fwd bulkhead PFR and install <p><u>PFR SETUP FOR CLAMP INSTALL</u></p> <ol style="list-style-type: none"> 1. Art Socket: P = 1, Y = 6 2. PFR: P = 10.5, R = A, Y = 3 <div style="border: 3px double black; padding: 5px; text-align: center; margin: 10px 0;"> <p><u>WARNING</u> Cut ends of O2 and N2 lines present sharp edge hazard</p> </div> <p><u>CUT CABLES AND LINES</u></p> <ol style="list-style-type: none"> 1. Use Large Cutter to cut all cables at 96 bolt interface 2. Bend cables w/cutter to verify cables separated 4. Cut O2 and N2 lines 3. Stow Large Cutter on available handrail
03:15	<p>PGT: 25.5 ft–lb, CCW2, 30.5</p>	<p><u>USE BRT FOR BOLT RELEASE</u></p> <ol style="list-style-type: none"> 1. Release bolts 1–33, 40–48 and grounding strap between bolts 9 and 10 <p><u>SURVEY VESTIBULE</u></p> <ol style="list-style-type: none"> 1. ✓ All bolts except 34,39,82,87 locked up 2. ✓ All cables cut (21), all gas lines cut (two), and ground strap removed 3. ✓ All tools, tethers removed from vestibule 4. ✓ Separation plane clear of all cables and lines 	<p><u>USE BRT FOR BOLT RELEASE</u></p> <ol style="list-style-type: none"> 1. Release bolts 49–81, 88–96 <p><u>SURVEY VESTIBULE</u></p> <ol style="list-style-type: none"> 1. ✓ All bolts except 34,39,82,87 locked up 2. ✓ All cables cut (21), all gas lines cut (two), and ground strap removed 3. ✓ All tools, tethers removed from vestibule 4. ✓ Separation plane clear of all cables and lines

96 BOLT EVA TIMELINE (Cont)

PET	IV/RMS	EV1	EV2
03:25	✓FREE DRIFT PGT: 25.5 ft-lb, CCW2, 30.5	<u>PREP FOR RELEASE</u> 1. Receive PRD from temp stow on Truss 2. Attach PRD fixed end to handrail, retractable end to Clamp Handle 3. Before releasing last two bolts, ✓FREE DRIFT 4. Release bolts 34,39; pull to lock up 5. Notify IV, GO for Clamp Release	<u>PREP FOR RELEASE</u> 1. Receive PRD from temp stow on Truss 2. Attach PRD fixed end to handrail, retractable end to Clamp Handle 3. Before releasing last two bolts, ✓FREE DRIFT 4. Release bolts 82,87; pull to lock up 5. Notify IV, GO for Clamp Release
03:50	Give EV GO for Clamp Release	<u>CLAMP RELEASE</u> 1. Retract Clamp Handle pip pin; ✓green stripe visible <div style="border: 1px solid black; padding: 5px; text-align: center;"> CAUTION Posn body below separation plane for clamp release During clamp release, do not apply any sideload on ODS gusset (may puncture A/L) </div>	<u>CLAMP RELEASE</u> 1. Retract Clamp Handle pip pin; ✓green stripe visible <div style="border: 1px solid black; padding: 5px; text-align: center;"> CAUTION Posn body below separation plane for clamp release During clamp release, do not apply any sideload on ODS gusset (may puncture A/L) </div>
04:00		2. Coordinate with IV and give EV2 short count for simo release 3. Simo with EV2, pull on PRD strap to open clamp 4. After clamp open, inform IV, "Clamp open and EV1 clear"	2. Simo with EV1, pull on PRD strap to open clamp 3. After clamp open, inform IV, "Clamp open and EV2 clear"
04:05	SEPARATION BURN	<u>CLEANUP</u> 1. Translate to TSA w/96 Bolt Bag Remove Right Angle Drives (two) from PGTs (two) using pip pin on 96 Bolt Bag; stow in 96 Bolt Bag 2. Remove ODS Clamp and Handle from ODS gusset; stow Clamp, Handle, 7/16-in Box End Wrench in 96 Bolt Bag 3. Stow Waist Tether on EMU 4. Remove and stow 96 Bolt Bag in airlock 5. Stow PRD, Trash Bag in Port TSA IF USED: 6. Configure stbd PFR assy for landing: Bridge Rail Clamp: second to aft–most available half-hole; ✓knob locked 7. Art Socket: P = 11.5, Y = 3; ✓locked 8. PFR to EV2 port side	<u>CLEANUP</u> 1. Translate to TSA 2. Stow PGTs (two) on Adj Fuse Tether 3. Stow Adj Fuse Tethers in airlock 4. Remove ODS Clamp and Handle from ODS gusset; stow Clamp, Handle, 7/16-in Box End Wrench in 96 Bolt Bag 5. Stow Waist Tether on EMU 6. Stow Large Cutter, Trash Bag, PRD in Port TSA 7. Close TSA door, close all latches IF USED: 8. Configure port PFR socket assy for landing: Bridge Rail Clamp: second to fwd–most available half-hole; ✓knob locked 9. Art Socket: P = 11.5, Y = 3; ✓locked 10. PFR: P = 10, R = A, Y = 6; ✓locked

96 BOLT EVA TIMELINE (Cont)

PET	IV/RMS	EV1	EV2
04:40		<u>VERIFY 96 BOLT BAG STOWAGE</u> ODS Clamps (2) ODS Clamp Handles (2) Right Angle Drives with 7/16-in Socket (2) 7/16-in Box End Wrenches (2)	<u>VERIFY AIRLOCK STOWAGE</u> Adj Fuse Tethers PGTs w/batteries (2) GP Caddies (2) ODS Thermal Blankets with Adj Equip Tethers (2) 96 Bolt Bag Crewlock Bag: PGT spare battery Socket Caddy w/6-in Exts (2), RAD
05:15		<u>PERFORM AIRLOCK INGRESS, CUFF C/L, 43</u> ✓EMU equipment: MWS w/swing arm BRT Retractable Tethers (2) Adj Equip Tethers (2) Waist Tethers (2)	<u>PERFORM AIRLOCK INGRESS, CUFF C/L, 43</u> ✓EMU equipment: MWS w/swing arm BRT Retractable Tethers (2) Adj Equip Tethers (2) Waist Tethers (2)
05:30			

CAPTURE LATCH MANUAL RELEASE (ODS/PMA)

|

IV	EV
<p>A7 If APDS powered: pb PWR OFF – push ✓STATUS Lt (eighteen) – off Perform DOCKING MECHANISM POWERDOWN (RNDZ, <u>APDS</u>)</p> <p>Cont next page</p>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;"><u>TOOLS REQD</u></p> <p>Jettison Stowage Bag Russian Capture Latch Tool (if reqd, in Node Bag)</p> </div> <p>BOTH 1. Configure Waist Tethers as safety line inside ODS</p> <p>EV1 Attach at ODS Hatch D–ring nearest capture latches</p> <p>EV2 Attach at A/L D–ring behind EV1</p> <p>EV2 2. Open outer hatch to improve EMU sublimator performance</p> <p>EV1 3. ODS/PMA interface: Open ODS hatch Remove docking lights (two): Release elec connector (one) at each light pip pin (one) on each light boom Stow lights and booms in bag</p> <p style="text-align: center;"><u>NOTE</u> EV2 restrain/aid EV1 as reqd</p> <p>EV1 4. Remove Cross–Hair assembly Stow in bag</p> <p>5. ✓IV GO for release</p> <p>6. Release capture latch</p> <p>Cont next page</p>

CAPTURE LATCH MANUAL RELEASE (ODS/PMA) (Cont)

IV	EV
	<p data-bbox="1167 310 1680 435" style="text-align: center;"><u>NOTE</u> If reqd, EV2 retrieve Russian Capture Latch Tool from Node Bag (requires safety tether reel ops)</p> <ol style="list-style-type: none"><li data-bbox="1083 500 1650 529">7. Notify IV when capture latch released<li data-bbox="1083 561 1650 591">8. Close hatch at capture latch interface<li data-bbox="961 623 1839 688">EV2 9. If used, temp stow Russian Capture Tool in A/L and perform <u>AIRLOCK INGRESS</u> (CUFF C/L, 43)<li data-bbox="1066 721 1377 750">10. Close outer hatch<li data-bbox="961 782 1419 812">BOTH 11. Go to A/L REPRESS

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EVA CUFF CHECKLIST

NORMAL EVA STATUS	15-2
EVA COMM FREQUENCIES	15-2
EMU MAL INDEX	15-2
DECOMPRESSION SICKNESS (DCS)	15-3
ABORT EVA	15-3
TERMINATE EVA	15-3
SOP O2 ON	15-4
BATT AMPS HIGH	15-4
VDC LOW	15-4
SUIT P LOW	15-4
HIGH	15-5
SOP P LOW	15-5
O2 USE HIGH	15-5
SUBLM PRESS	15-5
H2O GP LOW	15-6
RESRV H2O ON	15-6
NO VENT FLOW	15-6
CO2	15-6
COMM FAILURE	15-7
MISC MSGS	15-7
AIR FLOW CONTAMINATION	15-7
RADIATOR ACTUATOR DISCONNECT	15-8
PLBD DRIVE CUT	15-8
DOOR DRIVE RESTRAINT	15-8
DISCONNECT	15-9
WINCH OPERATIONS	15-9
3-PT TOOL INSTALLATION	15-9
CL LATCH TOOL	15-10
TOOL RESET	15-10
AIRLOCK LATCH DISCONNECT	15-10
HINGE DISCONNECT	15-10
RMS JOINT ALIGN	15-10
SHOULDER BRACE RELEASE	15-10
MPM STOW/DEPLOY	15-10
RMS TIEDOWN	15-11
FLIGHT RELEASABLE GRAPPLE FIXTURE RELEASE	15-11
PRLA OPEN/CLOSE	15-11
KU ANTENNA STOW	15-12
AIRLOCK EGRESS	15-12
INGRESS	15-12

EVA CUFF C/L

EVA CUFF C/L

	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">O2 POS</td> <td>EVA</td> <td style="text-align: right;">NORMAL EVA STATUS</td> <td style="text-align: right;">DCM CONFC</td> </tr> <tr> <td>TIME EV</td> <td>HR:MIN</td> <td>since PWR-BATT</td> <td></td> </tr> <tr> <td>TIME LF/ limit consum</td> <td>HR:MIN</td> <td>remaining at present use rate</td> <td style="text-align: right;">INDEX</td> </tr> <tr> <td>% O2 (PWR) LF</td> <td colspan="3">Displayed if not limiting consumable</td> </tr> <tr> <td>SUIT P</td> <td colspan="3">4.2-4.4 psid</td> </tr> <tr> <td>O2 P</td> <td colspan="3">60-900 psia</td> </tr> <tr> <td>SOP P</td> <td colspan="3">5800-6800 psia</td> </tr> <tr> <td>SUBLM P</td> <td colspan="3">2.0-4.2 psia</td> </tr> <tr> <td>BAT VDC</td> <td colspan="3">16.3-17.0</td> </tr> <tr> <td>BAT AMP</td> <td colspan="3">3.0-4.0</td> </tr> <tr> <td>RPM</td> <td colspan="3">19.0-20.0 K</td> </tr> <tr> <td>CO2</td> <td colspan="3">0.2-0.5 mm</td> </tr> <tr> <td>H2O TEMP</td> <td colspan="3">32-75 degF</td> </tr> <tr> <td>H2O GP/WP</td> <td colspan="3">14.0-16.0 psid</td> </tr> <tr> <td>GAUGE</td> <td colspan="3">4.2-4.4 psid</td> </tr> </table>	O2 POS	EVA	NORMAL EVA STATUS	DCM CONFC	TIME EV	HR:MIN	since PWR-BATT		TIME LF/ limit consum	HR:MIN	remaining at present use rate	INDEX	% O2 (PWR) LF	Displayed if not limiting consumable			SUIT P	4.2-4.4 psid			O2 P	60-900 psia			SOP P	5800-6800 psia			SUBLM P	2.0-4.2 psia			BAT VDC	16.3-17.0			BAT AMP	3.0-4.0			RPM	19.0-20.0 K			CO2	0.2-0.5 mm			H2O TEMP	32-75 degF			H2O GP/WP	14.0-16.0 psid			GAUGE	4.2-4.4 psid		
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	1	07/20/00																																																											

DCM
CONFC

INDEX

EVA COMM FREQUENCIES

LOW=414.2 MHz HIGH=417.1 MHz

2

07/20/00

EMU MAL INDEX			
ABORT EVA	6	PWR LF (%)	22
AIR FLOW CONT	23	RESRV H2O ON	17
BATT AMPS HI	9	RLF V FAIL	21
BATT VDC LOW	10	SET H2O OFF	22
BITE light	21	SET O2 EVA	22
COMM FAIL	20	SET O2 PRESS	22
CO2 HIGH	19	SET PWR SCU	22
DCS	4	SOP O2 ON	8
FAN SW OFF	22	SOP P LOW	13
H2O GP LOW	16	SUBLM P	15
H2O IS OFF	22	SUIT P EMERG	21
LIMITS BAD	21	SUIT P HIGH	12
MONITOR CO2	19	SUIT P LOW	11
NO VENT FLOW	18	TERMINATE EVA	7
O2 IS OFF	22	TIME LF = XX	22
O2 LF (%)	22	VENT SW FAIL	21
O2 USE HIGH	14		
NOTE: BOLDFACE ind detailed proc			
3		07/25/00	

<p style="text-align: center;">DECOMPRESSION SICKNESS (DCS)</p> <p style="text-align: center;">Class 1</p> <p>Symp: Mild pain (single/multiple sites) and/or single extremity numbness/tingling. Difficult to discern from suit P points. Symp do not interfere with performance.</p> <p>DCS Action: Report in POST EVA PMC</p> <p style="text-align: center;">Class 2</p> <p>Symp: Moderate Class 1 symp that interfere with performance or symp that resolve upon repress.</p> <p>Action: Perform worksite cleanup, minimize activity of affected crewmember. TERM EVA; REPRESS</p> <p style="text-align: right;">4 07/20/00</p>	<p style="text-align: center;">DECOMPRESSION SICKNESS (DCS) (CONT)</p> <p style="text-align: center;">Class 3</p> <p>Symp: Severe Class 1 symp or migratory, trunkal/multiple site numbness/tingling; unusual headache</p> <p>Action: Assist affected crewmember to A/L, safe PLB. TERM EVA; REPRESS</p> <p style="text-align: center;">Class 4</p> <p>Symp: Serious symp - central neurological, cardiopulmonary</p> <p>Action: ABORT EVA. Assisted return of affected crewmember to A/L, repress affected crewmember solo. Unaffected crewmember safe PLB, TERM EVA; REPRESS</p> <p style="text-align: right;">5 07/20/00</p> <p style="text-align: right;">ABORT EVA ----- TERM EVA</p>
<p style="text-align: center;">ABORT EVA</p> <div style="border: 2px dashed black; padding: 5px; margin: 10px auto; width: fit-content;"> <p>BOTH: Ingress airlock Unhook from reel Outer (EVA) hatch - close and lock Go to <u>EMER REPRESS</u> decal (airlock hatches)</p> </div> <p>ABORT EVA ----- TERM EVA</p> <p style="text-align: right;">6 07/20/97</p>	<p style="text-align: center;">TERMINATE EVA</p> <ol style="list-style-type: none"> 1. Ingress airlock 2. Connect SCU <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;">WARNING</p> <p>If terminating due to Batt AMPS HIGH (system short), do not perform step 3</p> </div> <p>AW18H 3. PWR/BATT CHGR EMU 1(2) BUS SEL - MNA(MNB) IV If EXT A/L: ✓EMU 02 ISOL VLV - OP</p> <p>AW82B 4. ✓EV-1(EV-2) 02 vlv - OP</p> <p style="text-align: center;"><u>NOTE</u></p> <p>If fan stops during power transfer: Cycle FAN sw - OFF, ON</p> <p>DCM 5. Power - SCU (fwd) 6. WATER - OFF (fwd) 7. ✓SUIT P ≥ 3.3 and stable 8. Monitor EMU status 9. Coordinate ingress with EV1(2)</p> <p style="text-align: right;">7 04/01/99</p> <p style="text-align: right;">SOP</p>

<p style="text-align: center;">SOP 02 ON</p> <p>SOP 02 ON TIME LF XX:XX</p> <p>1. Go to ABORT EVA, 6 >></p> <p style="text-align: center;"><u>NOTE</u></p> <p>Msg triggered when: SUIT P < 4.05 <u>and</u> SOP RATE > 36.0 psi/min</p> <p>SOP</p> <p style="text-align: right;">8 04/01/99</p>	<p style="text-align: center;">BATT AMPS HIGH</p> <p>BAT AMPS HI BAT AMPS X.X BAT VDC XX.X</p> <p style="text-align: right;">BATT</p> <p>If BAT VDC < 16.3:</p> <ol style="list-style-type: none"> 1. Helmet purge vlv - op 2. FAN - OFF 3. WATER - OFF <p style="padding-left: 20px;">If BAT AMP w/o fan 0.7-1.3 (fan short):</p> <ol style="list-style-type: none"> 4. Go to TERM EVA, 7 >> <p style="padding-left: 20px;">If BAT AMP w/o fan > 1.3 (system short):</p> <ol style="list-style-type: none"> 5. Notify IV/EV of impending COMM loss 6. PWR - SCU, do <u>not</u> activate airlock power 7. Go to TERM EVA, 7 >> <p>If BAT VDC > 16.3 (amp sensor fail):</p> <ol style="list-style-type: none"> 8. ✓Fan RPM 19.0-20.0 K: 9. Continue EVA, monitor BAT VDC, RPM <p><u>NOTE:</u> Msg triggered when AMPS > 5.0 Normal BAT AMP = 3.0-4.0 Normal BAT AMP w/o fan = 0.7-1.3</p> <p style="text-align: right;">9 01/10/02</p>
<p style="text-align: center;">BATT VDC LOW</p> <p>BATT</p> <p>BAT VDC LOW BAT VDC XX.X</p> <p>If fan RPMS degraded and/or comm lost:</p> <ol style="list-style-type: none"> 1. Go to TERM EVA, 7 >> <p>If comm and fan normal (sensor fail):</p> <ol style="list-style-type: none"> 2. Continue EVA <p style="text-align: center;"><u>NOTE</u></p> <p>Msg triggered when VOLTS < 15.7 Normal BAT VDC = 16.3-17.0 Normal Fan RPM = 19.0-20.0 K</p> <p style="text-align: right;">10 07/28/00</p>	<p style="text-align: center;">SUIT P LOW</p> <p>SUIT P LOW SUIT P X.X</p> <p>If 02 USE HIGH msg present:</p> <ol style="list-style-type: none"> 1. Go to ABORT EVA, 6 >> <p>If 02 USE HIGH msg not present:</p> <ol style="list-style-type: none"> 2. Continue EVA, monitor SUIT P, SOP P, and gauge <p style="padding-left: 40px;">If gauge < 4.0 and SOP P decreasing:</p> <ol style="list-style-type: none"> 3. Go to TERM EVA, 7 >> <p style="text-align: center;"><u>NOTE</u></p> <p>Msg triggered when SUIT P < 4.05</p> <p style="text-align: right;">11 05/03/99</p> <p style="text-align: right;">SUIT P</p>

<p style="text-align: center;">SUIT P HIGH</p> <p style="text-align: center;">SUIT P HIGH O2 RATE XX.X SOP RATE XXX</p> <p>If O2 RATE > 7.0 or SOP RATE > 8 : 1. Go to TERM EVA, 7 >> If O2 RATE < 7.0 and SOP RATE < 8 : 2. Monitor SUIT P, SOP P, and gauge 3. Continue EVA</p> <p style="text-align: center;"><u>NOTE</u> Msg triggered when SUIT P > 4.55 Normal O2 RATE ≈1.7 psi/min</p> <p style="text-align: right;">12 04/01/99</p>	<p style="text-align: center;">SOP P LOW</p> <p style="text-align: center;">SOP P LOW SOP P XXX0 SOP RATE XXX</p> <p>1. Go to TERM EVA, 7 >></p> <p style="text-align: center;"><u>NOTE</u> Msg triggered when SOP P < init SOP P - 600 (SOP P initialized at EMU powerup)</p> <p style="text-align: right;">O2 USE SUBLM PRESS</p> <p style="text-align: right;">13 10/11/96</p>
<p style="text-align: center;">O2 USE HIGH</p> <p style="text-align: center;">O2 USE HIGH O2 RATE XX.X</p> <p>If SUIT P LOW msg present: 1. Go to ABORT EVA, 6 >> If O2 P erratic or ~0: 2. Continue EVA 3. Recharge O2 periodically >> If O2 RATE > 7.0: 4. Go to TERM EVA, 7 >> Otherwise: 5. Recharge O2 as reqd 6. Continue EVA</p> <p style="text-align: center;"><u>NOTE</u> Msg triggered when: O2 RATE > 10.2 psi/min or O2 P < 150 and TIME EV < 5 hr Normal O2 RATE ≈1.7 psi/min</p> <p style="text-align: right;">14 10/11/96</p>	<p style="text-align: center;">SUBLM PRESS</p> <p style="text-align: center;">SUBLM P XX.X SET H2O OFF</p> <p>1. ✓WATER - OFF (fwd) If SUBLM P < 1.0 and stable: When cooling desired, then: 2. Temp control vlv - Max H 3. WATER - ON (aft) 4. Temp control vlv - as reqd If cooling insufficient: 5. Go to TERM EVA, 7 >> If cooling sufficient: 6. Continue EVA, monitor SUBLM P and cooling >> If SUBLM P ≥ 1.0 and stable (sensor fail): 7. Perform steps 2-4, continue EVA, monitor H2O GP/WP and cooling</p> <p style="text-align: center;"><u>NOTE</u> Msg triggered when SUBLM P < 1.5 or > 5.3 Normal SUBLM P = 2.0-4.2</p> <p style="text-align: right;">H2O</p> <p style="text-align: right;">15 10/11/96</p>

<p style="text-align: center;">H2O GP LOW</p> <p>H2O GP LOW</p> <p>If H2O WP < 13.5 (H2O reg fail): If cooling insufficient: 1. Go to TERM EVA, 7 >> If cooling sufficient: 2. Monitor cooling 3. Continue EVA >> If H2O WP ≥ 13.5 (xdr fail): 4. Monitor H2O WP If H2O WP drops to < 12.0: 5. Go to TERM EVA, 7</p> <p style="text-align: center;"><u>NOTE</u> Msg triggered when H2O GP < 13.5 Normal H2O TEMP = 32-75 degF WP = 14.0-16.0</p> <p>H2O</p> <p style="text-align: right;">16 12/06/96</p>	<p style="text-align: center;">RESRV H2O ON</p> <p>RESRV H2O ON TIME LF :XX</p> <table border="1" data-bbox="1144 267 1722 544"> <thead> <tr> <th>H2O GP</th> <th>H2O WP</th> <th>ACTION</th> </tr> </thead> <tbody> <tr> <td>~15</td> <td>~0</td> <td>1. Monitor SUBLM P and H2O TEMP (WP xdr fail)</td> </tr> <tr> <td>>17.0</td> <td>~15</td> <td>2. Monitor H2O WP and H2O TEMP (GP xdr fail) If H2O WP drops to < 12.0: 3. Go to TERM EVA, 7</td> </tr> <tr> <td>~15</td> <td><12.0</td> <td>4. Go to TERM EVA, 7 (reserve H2O on)</td> </tr> </tbody> </table> <p><u>NOTE:</u> Msg triggered when GP minus WP > 2.1 psi Normal SUBLM P = 2.0-4.2 psia H2O TEMP = 32-75 degF GP/WP = 14.0-16.0</p> <p style="text-align: right;">17 10/10/96</p>	H2O GP	H2O WP	ACTION	~15	~0	1. Monitor SUBLM P and H2O TEMP (WP xdr fail)	>17.0	~15	2. Monitor H2O WP and H2O TEMP (GP xdr fail) If H2O WP drops to < 12.0: 3. Go to TERM EVA, 7	~15	<12.0	4. Go to TERM EVA, 7 (reserve H2O on)	<p style="text-align: center;"><u>NO VENT</u></p> <p style="text-align: center;">CO2</p>
H2O GP	H2O WP	ACTION												
~15	~0	1. Monitor SUBLM P and H2O TEMP (WP xdr fail)												
>17.0	~15	2. Monitor H2O WP and H2O TEMP (GP xdr fail) If H2O WP drops to < 12.0: 3. Go to TERM EVA, 7												
~15	<12.0	4. Go to TERM EVA, 7 (reserve H2O on)												
<p style="text-align: center;">NO VENT FLOW</p> <p><u>NO VENT FLOW</u></p> <p>If fan is not running: 1. Cycle FAN sw - OFF, ON If fan restarts: 2. Continue EVA >> If fan does not start: 3. Helmet purge vlv - op 4. Go to TERM EVA, 7 >> If fan is running: If RPM < 19.0 K: 5. Helmet purge vlv - op 6. Go to TERM EVA, 7 >> If RPM ≥ 19.0 K: 7. Assess helmet CO2 level 8. Go to CO2 HIGH, 19, step 3</p> <p style="text-align: center;"><u>NOTE</u> Msg triggered when flow < 3.7 cfm Normal vent flow = 6-8 cfm</p> <p style="text-align: right;">18 10/11/96</p>	<p style="text-align: center;">CO2</p> <p>CO2 XX.X MM MONITOR CO2 - PPCO2 > 3.0 MM 1. Minimize physical activity 2. Assess phys condition then go to step 3 below</p> <p>CO2 HIGH OPEN PURGE V - PPCO2 > 8.0 MM 1. ✓ DCM PURGE vlv - cl, ✓ Helmet purge vlv - op If symptoms noted prior to opening purge vlv: 2. Go to TERM EVA, 7 >> If no symptoms noted (or inconclusive): 3. Close/open helmet purge vlv as reqd to assess phys condition for high CO2 If symptoms noted: 4. Helmet purge vlv - op 5. Go to TERM EVA, 7 >> If no symptoms noted: 6. Helmet purge vlv - cl, locked 7. Monitor phys condition & PPCO2 8. Continue EVA</p> <p><u>NOTE:</u> Normal PPCO2 = 0.2-0.5 MM</p> <p style="text-align: right;">19 04/20/99</p>	<p style="text-align: center;"><u>COMM FAIL</u></p> <p style="text-align: center;"><u>MISC</u></p>												

<p>COMM FAIL</p> <hr/> <p>MISC</p>	<p style="text-align: center;">COMM FAILURE</p> <p>ALL 1. ✓Proper config, EMU & orbiter (Mode, Vol, Freq) Perform following sequence until comm restored:</p> <p>BOTH If EV cm hears intermittent sidetones/comm or no sidetones:</p> <p>MISC 2. Clear structure to recover comm (signal blockage) If unresolved:</p> <p>3. Aff cm select ALT(PRI)(notify MCC)</p> <p>IV If IV no comm with EV1 and EV2:</p> <p>4. IV select STRING 2(1)</p> <p>ALL If unresolved:</p> <p>5. Perform coordinated freq change If unable to restore minimum of relay comm:</p> <p>6. Go to TERM EVA, 7</p> <p style="text-align: right;">20 04/23/99</p>		<p style="text-align: center;">MISC MSGS</p> <p>SUIT P EMERG CLOSE PURGE V - SUIT P < 3.1</p> <p>RLF V FAIL STOP DEPRESS - stop DEPRESS, contact MCC, SUIT P > 5.7</p> <p><u>Built-in tests</u></p> <p>BITE light illuminated - CWS unreliable, contact MCC</p> <p>LIMITS BAD - Warnings unreliable, monitor status list, continue EVA</p> <p>VENT SW FAIL - Vent flow sensor unreliable</p> <p style="text-align: right;">21 10/06/87</p>	<p>MISC</p> <hr/> <p>AIR CONT</p>											
<p>MISC</p> <hr/> <p>AIR CONT</p>	<p style="text-align: center;">MISC MSGS (CONT)</p> <p>Consumables</p> <table border="1" style="display: inline-table;"> <tr><td>XX% O2 LF</td><td>TIME LF :XX</td></tr> <tr><td>XX% PWR LF</td><td>TIME LF :XX</td></tr> </table> <p>} Triggered w/30 min remaining</p> <table border="1" style="display: inline-table; margin-top: 10px;"> <tr><td>SET O2 EVA</td></tr> <tr><td>SET O2 PRESS</td></tr> <tr><td>SET H2O OFF</td></tr> <tr><td>FAN SW OFF</td></tr> <tr><td>SET PWR SCU</td></tr> <tr><td>O2 IS OFF</td></tr> <tr><td>H2O IS OFF</td></tr> </table> <p>} Verify proper config</p> <p style="text-align: right;">22 07/30/84</p>	XX% O2 LF	TIME LF :XX	XX% PWR LF	TIME LF :XX	SET O2 EVA	SET O2 PRESS	SET H2O OFF	FAN SW OFF	SET PWR SCU	O2 IS OFF	H2O IS OFF		<p style="text-align: center;">AIR FLOW CONTAMINATION</p> <p>If flow exiting helmet vent contaminated by caustic water or LiOH dust:</p> <ol style="list-style-type: none"> 1. Helmet purge vlv - op 2. FAN - OFF 3. WATER - OFF <p>If contamination still present:</p> <ol style="list-style-type: none"> 4. Go to ABORT EVA, 6 >> <p>Otherwise:</p> <ol style="list-style-type: none"> 5. Go to TERM EVA, 7 >> <p>If excessive water in vent loop or helmet:</p> <ol style="list-style-type: none"> 6. Contact MCC <p style="text-align: center;"><u>NOTE</u></p> <p style="text-align: center;">EMU water tanks hold ≈1 gal H2O</p> <p style="text-align: right;">23 10/10/96</p>	<p>RAD DISC</p>
XX% O2 LF	TIME LF :XX														
XX% PWR LF	TIME LF :XX														
SET O2 EVA															
SET O2 PRESS															
SET H2O OFF															
FAN SW OFF															
SET PWR SCU															
O2 IS OFF															
H2O IS OFF															

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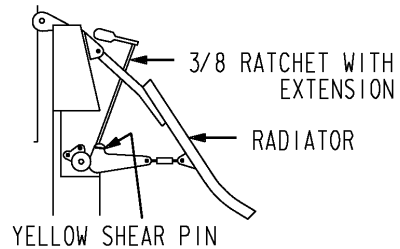
RAD
DISC

24 05/01/88

RADIATOR ACTUATOR DISCONNECT

IFM - 1/4-in ALLEN HEAD DRIVER
 TOOL BOX - RADIATOR DISCONNECT/ 3/8 DRIVE RATCHET
 IV1 ✓ Pwr off
 Actuator disc sequence - aft to fwd
 1. Yellow shear pins (4) - retract to stop
 (6 revs ccw)
 When all actuators are disengaged:
 2. Manually close radiator panels and hold
 IV1 ✓ Pwr on
 IV1 Latches - close

PLB
CUT
DOOR
TAPE



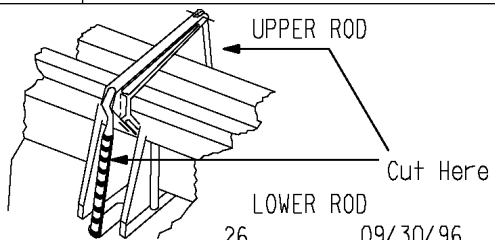
25 04/20/99

PLB
CUT
DOOR
TAPE

PLBD DRIVE CUT

TOOL BOX - TUBE CUTTER, VELCRO/TAPE
 IV1 ✓ Pwr off
 Cut #1, stow antenna if stbd side, perform WINCH
 OPS, 29, steps 1 & 2, then cut #6 thru #2 and
 perform WINCH OPS, 30, steps 3 thru 7

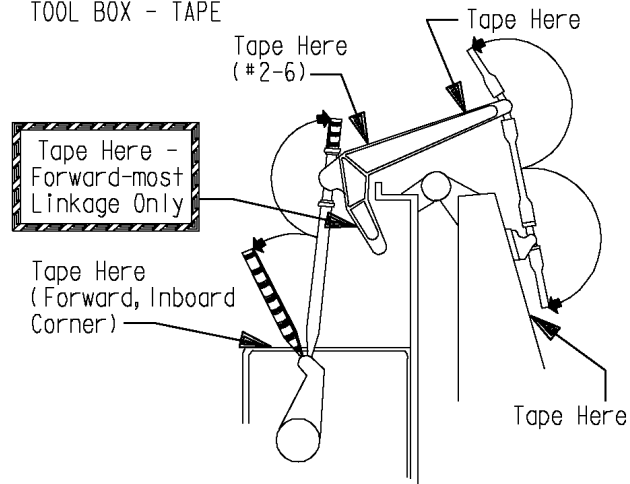
BANDS VISIBLE	CORRECTIVE ACTION
1-6	Cut upper rod in middle & restrain (27)
7-10	Cut lower rod between 2nd & 3rd bands from top and restrain (27)



26 09/30/96

DOOR DRIVE RESTRAINT

TOOL BOX - TAPE



DOOR
DISC
WINCH
OPS

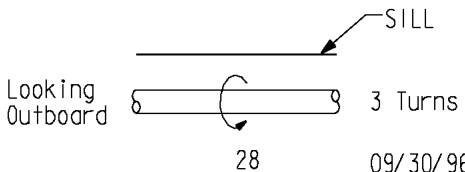
27 10/06/87

DOOR DRIVE DISCONNECT

TOOL BOX - PDU DISC TOOL, TRASH BAG
 IV1 ✓ Pwr off

1. Perform WINCH OPS, 29, steps 1, 2
2. Remove fabric cover(s)
3. Insert Disc Tool in Door Drive PDU
 Xo - 798, port OR stbd
4. Rotate tool cw to stop (60 deg) and leave tool in PDU
5. Rotate torque shaft at least 3 turns (see below)
6. Perform WINCH OPS, 30, steps 3-7
7. If reqd for other door, rotate tool ccw 60 deg and remove from PDU

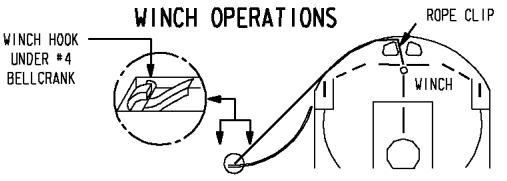
DOOR DISC
WINCH OPS



3 Turns

28 09/30/96

WINCH OPERATIONS



IV1 Radiators - stow and latch

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

Cont next pg
29

WINCH OPS
3-PT TOOL

WINCH OPERATIONS (CONT)

IV1 ✓ Pwr off

3. PLBD(s) - close with winch
 If aft not READY TO LATCH, repeat steps 1 & 3 at aft winch

IV1 ✓ Pwr on

IV1 Latches - close

4. Winch hook - remove from PLBD
5. Rope - reel in excess
6. Handle - stow
7. Repeat steps 5-7 for aft winch, if reqd

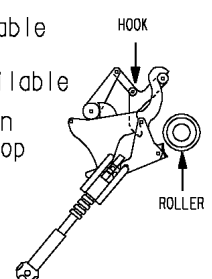
WINCH OPS
3-PT TOOL

30 10/06/87a

3-PT TOOL INSTALLATION

TOOL BOX - 3-PT TOOLS, ADJUSTABLE TETHERS
 IV1 ✓ Pwr off

1. Position installation handles as reqd
2. Tools - install in sequence
 Fwd-2, 4 } If 2 tools available
 Aft-2, 3 }
 Fwd-1, 2, 3, 4 } If 4 tools available
 Aft-1, 2, 3 }
3. Ratchet select lever - green
4. Handle - ratchet to hard stop
 - stow handle or restrain with Adj tether



TOOL RESET

1. Ratchet - red
2. Handle - ratchet to stop
3. Tool - compress to latch handles

31 09/11/96

CL TOOL
A/L DISC

CL LATCH TOOL

TOOL BOX - CL LATCH TOOLS
 IV1 ✓ Pwr off

- Tools - install
 - 1st gang - 1, 3
 - 2nd gang - 6, 8
 - 3rd gang - 9, 11
 - 4th gang - 14, 16
- Trigger - safety off
 - depress
- Ratchet select lever - green
- Handle - ratchet to hard stop
 - stow

TOOL RESET

- Ratchet - red
- Handle - ratchet to stop
 - stow
- Tool - compress to latch

32 09/30/96

CL
TOOL
A/L
DISC

AIRLOCK LATCH DISCONNECT

TOOL BOX/A/L - ADJ WRENCH, RATCHET WITH 7/16 SOCKET
 TOOL BOX - EVA TRASH BAG, ADJ TETHERS

- Remove bolt A, stow in trash bag
- Rotate actuator handle

If no rotation - jammed actuator:

- Force latches open
- Seal hatch w/repress & secure for 1dg (IV)

If free rotation - jammed latch:

- Locate & remove jam
- Reconnect actuator

HINGE DISCONNECT

TOOL BOX - ADJ TETHERS, VELCRO/TAPE

- Remove hinge pin, as reqd
- Restrain hinge arm(s) & pin pins clear of opening, ingress airlock, posn hatch for closing
- Close, lock hatch

33 05/03/99

RMS
ALIGN
MPM

RMS JOINT ALIGN

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

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

RMS SHOULDER BRACE RELEASE

TOOL BOX - RMS SHOULDER BRACE RELEASE TOOL

- Fold aside rub strip and thermal blankets
- Insert tool and move handle down
- Remove tool and reconfigure blankets

34 10/29/93

RMS
ALIGN
MPM

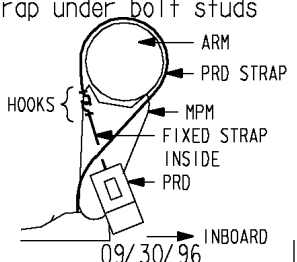
MPM STOW/DEPLOY

TOOL BOX - MPM WRENCH

- Rotate torque shaft (8 revs) until MPMs are stowed/deployed, X0=693

35 10/29/93

RMS
TIEDN
RMS
REL

<p>RMS TIEDN</p> <p>RMS REL</p>	<p style="text-align: center;">RMS TIEDOWN</p> <p>TOOL BOX - PRDs (2), EVA TRASH BAG IFM - 9/64-in ALLEN WRENCH (AW) <u>ELBOW</u> - PRD aft of MPM, peel blanket (fwd of MPM) toward EE; feed hook under cable harness (if reqd, remove cable harness clamp bolt with AW, bend clamp out of way), adjust strap as far fwd as possible <u>WRIST</u> - PRD aft of MPM, strap rests just fwd of pitch joint opening <u>END EFFECTOR</u> - PRD fwd of MPM, peel blankets aft and fwd, strap rests aft-most on yaw joint (at roll/yaw I/F), adjust strap under bolt studs</p> <ol style="list-style-type: none"> 1. Figure eight the strap 2. Pull minimum 6-in slack in strap 3. Ratchet PRD snug, (14 full strokes reqd) 4. ✓ Strap in correct arm location, ratchet tight 5. Reattach blankets  <p style="text-align: right;">36 09/30/96</p>	<p style="text-align: center;">RMS FLIGHT RELEASABLE GRAPPLE FIXTURE RELEASE</p> <p>AIRLOCK - JETTISON STOWAGE BAG TOOL BOX - 1/2-in BOX RATCHET, VELCRO/TAPE</p> <p>EV</p> <ol style="list-style-type: none"> 1. Rotate white release rod ccw to hard stop (32 strokes of 90 deg) 2. Rotate black release rod cw to hard stop (32 strokes of 90 deg - shaft will release from grapple fixture) 3. Clear worksite for RMS powerdown 4. Tape end of shaft to restrain slug within shaft 5. Cover end effector with jettison stowage bag to restrain grapple shaft <p style="text-align: right;">37 09/30/96</p>
<p>PRLA</p>	<p style="text-align: center;">PRLA OPEN/CLOSE</p> <p>AIRLOCK - RATCHET WITH 7/16 SOCKET</p> <p>IV ✓ PRLA pwr off</p> <p>EV</p> <ol style="list-style-type: none"> 1. Rotate ratchet in release direction (as marked above EVA drive) to shear pin 2. View yellow indicator as applicable 3. Continue to rotate drive 4 1/2 revs to disc gear train from drive shaft <p>To open latch:</p> <ol style="list-style-type: none"> 4. Continue rotation in release direction (as marked above EVA drive) until latch open against stop <p>To close latch:</p> <ol style="list-style-type: none"> 5. Rotate EVA drive in opposite direction of release (as marked above EVA drive) until latch closed against hardstop and over center <p>IV ✓ PRLA to LAT</p> <p style="text-align: center;">Cont next pg</p> <p style="text-align: right;">38 07/20/00</p>	<p style="text-align: center;">PRLA OPEN/CLOSE (CONT)</p> <p>EV</p> <ol style="list-style-type: none"> 6. Apply PRLA locking feature if applicable To lock: 7. Rotate each bolt (2) cw 1/2 turn <p>For subsequent PRLA ops, release locking feature before operating EVA drive (2 bolts ccw 1/2 turn); relock after operation</p> <p style="text-align: right;">39 07/20/00</p>

<p style="text-align: center;">KU ANTENNA STOW</p> <ol style="list-style-type: none"> Secure tether reel clear of antenna dish with wrist tether <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;">CAUTION</p> <p>Antenna dish is very fragile. Avoid contact with gold thermal blankets & black painted surfaces</p> </div> <ol style="list-style-type: none"> Align α (dish roll) and β (dish pitch) gimbals for pin engagement Give IV GO to drive pins in short pulses <p style="text-align: center;">NOTE</p> <p>Top lockarm (by wide beam horn and gold foil) drives fully before bottom lockarm (by silver gyro box)</p> <p>KU ANT</p> <p style="text-align: right;">40 10/11/96</p>	<p style="text-align: center;">KU ANTENNA STOW (CONT)</p> <p style="text-align: right;">A/L EGRS A/L INGRS</p> <p style="text-align: right;">41 07/25/00</p>
<p style="text-align: center;">AIRLOCK EGRESS</p> <p>A/L EGRS</p> <p>A/L INGRS</p> <ol style="list-style-type: none"> EV1 Thermal cover - open Egress airlock EV1's reel - remove from container, attach to EMU D-ring, unlock EV2's reel - remove from container, transfer to EV2 EV2 Attach reel to EMU D-ring, unlock BOTH Waist tethers - attach to self, stow extra in A/L clear of hatch EV2 Egress airlock If external A/L, close thermal cover BOTH Tether line - unstrap strap (1) <ul style="list-style-type: none"> - remove from Velcro straps - release fastener on slidewire cover (1), \checkmarkhook guard <p style="text-align: right;">42 11/06/00</p>	<p style="text-align: center;">AIRLOCK INGRESS</p> <ol style="list-style-type: none"> \checkmarkTOOL BOX - closed, latched BOTH Secure Velcro on slidewire cover Secure tether line thru Velcro straps: <ul style="list-style-type: none"> ODS Routing - sill, FWD truss, reel box BHD Routing - slidewire link, cabin attach fitting EV2 4. Ingress airlock, attach waist tether(s) to A/L D-ring 5. Attach EV1's waist tether(s) to A/L D-ring 6. Lock tether reel, transfer to EV1 EV1 7. Reels (both) - retract cable slack, stow in container, \checkmarklocked 8. Ingress airlock BOTH 9. WATER - OFF (fwd) 10. Thermal cover - close 11. Outer (EVA) hatch - close and lock 12. Go to PRE REPRESS (<u>DEPRESS/REPRESS</u> Cue Card) <p style="text-align: right;">43 07/25/00</p>

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44 07/25/00

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FLIGHT SPECIFIC REFERENCE

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UNSCHEDULED/CONTINGENCY EVA TASKS

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EVA REFERENCE

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EVA EMERGENCY

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EMERGENCY PROCEDURES

EMERGENCY AIRLOCK REPRESS 19-3
 EMERGENCY AIRLOCK REPRESS 19-4
 POST EMERGENCY AIRLOCK REPRESS 19-4
SAFER RESCUE 19-5
 SAFER RESCUE 19-6
19.1 DCS TREATMENT 19-7 |

EMER PROCS

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EMERGENCY AIRLOCK REPRESS

EMERGENCY AIRLOCK REPRESS

NOTE: Ignore CWS functions

Outer (EVA) hatch – close and lock

Inner hatch Equal vlv (two) – EMER

AW82B: ✓AIRLK DEPRESS vlv – CL

DCM: WATER – OFF (fwd)

Open inner hatch

Go to POST EMERGENCY AIRLOCK
REPRESS

POST EMERGENCY AIRLOCK REPRESS

For affected crewmember:

- DCM 1. PURGE vlv – op (up)
- 2. O2 ACT – OFF, FAN – OFF
- 3. ✓Suit P < 0.4; disconnect gloves, helmet
- 4. Connect SCU to DCM
- AW18H 5. PWR/BATT CHGR EMU 1(2) BUS SEL – MNA(MNB)
- DCM 6. PWR – SCU

For unaffected crewmember:

- DCM 7. O2 ACT – IV
- 8. Connect SCU to DCM
- AW18H 9. PWR/BATT CHGR EMU 1(2) BUS SEL – MNA(MNB)
- DCM 10. PWR – SCU

If single crewmember aborting EVA:

- 11. Outer (EVA) hatch Equal vlv caps (two) – remove, stow
- 12. ✓MCC

SAFER RESCUE

SAFER
RESCUE

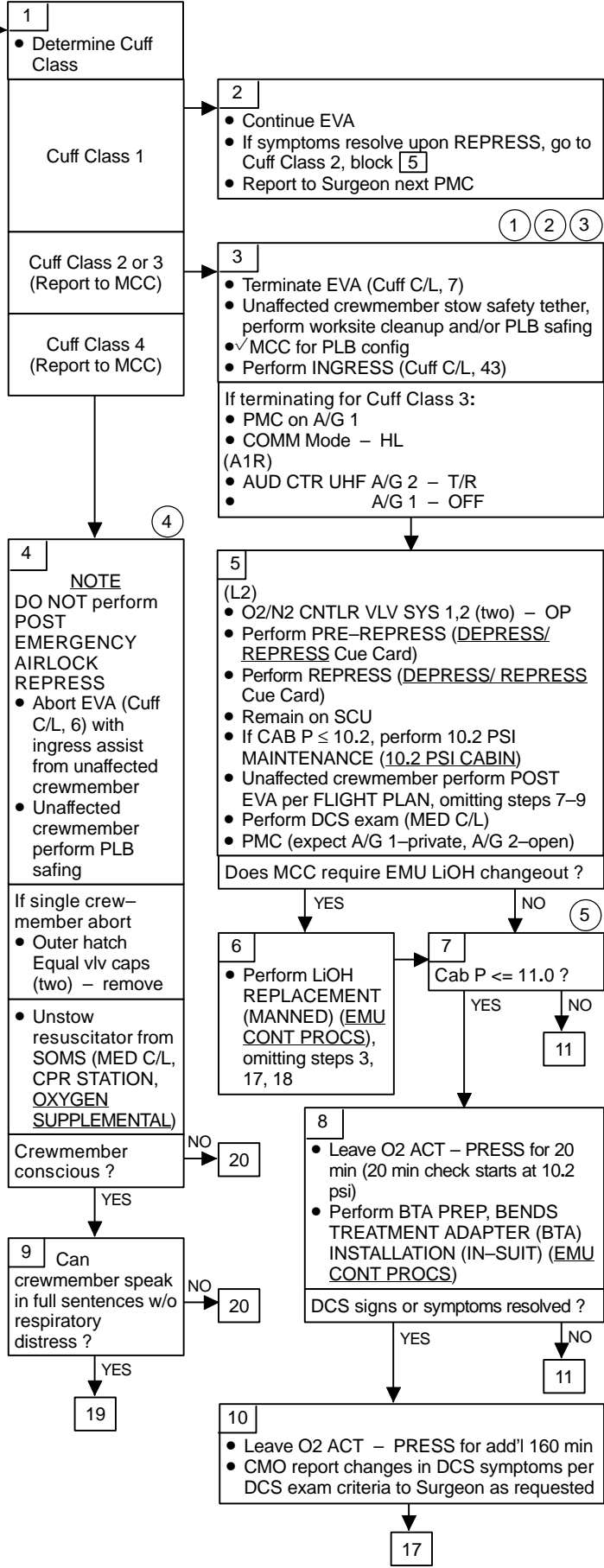
SAFER RESCUE

1. Deploy SAFER HCM
2. PWR – ON
3. Fly back
Monitor GN2% and PWR%
IV/other EV GCA as reqd
 - * If no gas flow: *
 - * ✓MAN ISOL vlv – OP (dn) *
4. Tether to nearest structure; ✓connection
5. PWR – OFF
6. MAN ISOL vlv – CL (up)
7. Tether to available safety tether or other EV crewmember; ✓connection
8. ✓MCC

SAFER
RESCUE

19.1 DCS TREATMENT

DCS Signs and Symptoms Associated with Each Cuff Class Defined in Cuff C/L



① EVA terminated to prevent progression to Cuff Class 4. If Cuff 2, affected crewmember will assist other EV with minor worksite cleanup, if possible, to expedite cleanup and then terminate EVA

② If estimated time reqd for DCS treatment exceeds LiOH consumables, a changeout should be performed. If 10 or 12 reqd, minimum treatment is ~3 hr

③ For Cuff Class 3 only, affected crewmember waiting in A/L needs to be in contact with Surgeon via PMC due to severity and potential progression of symptoms

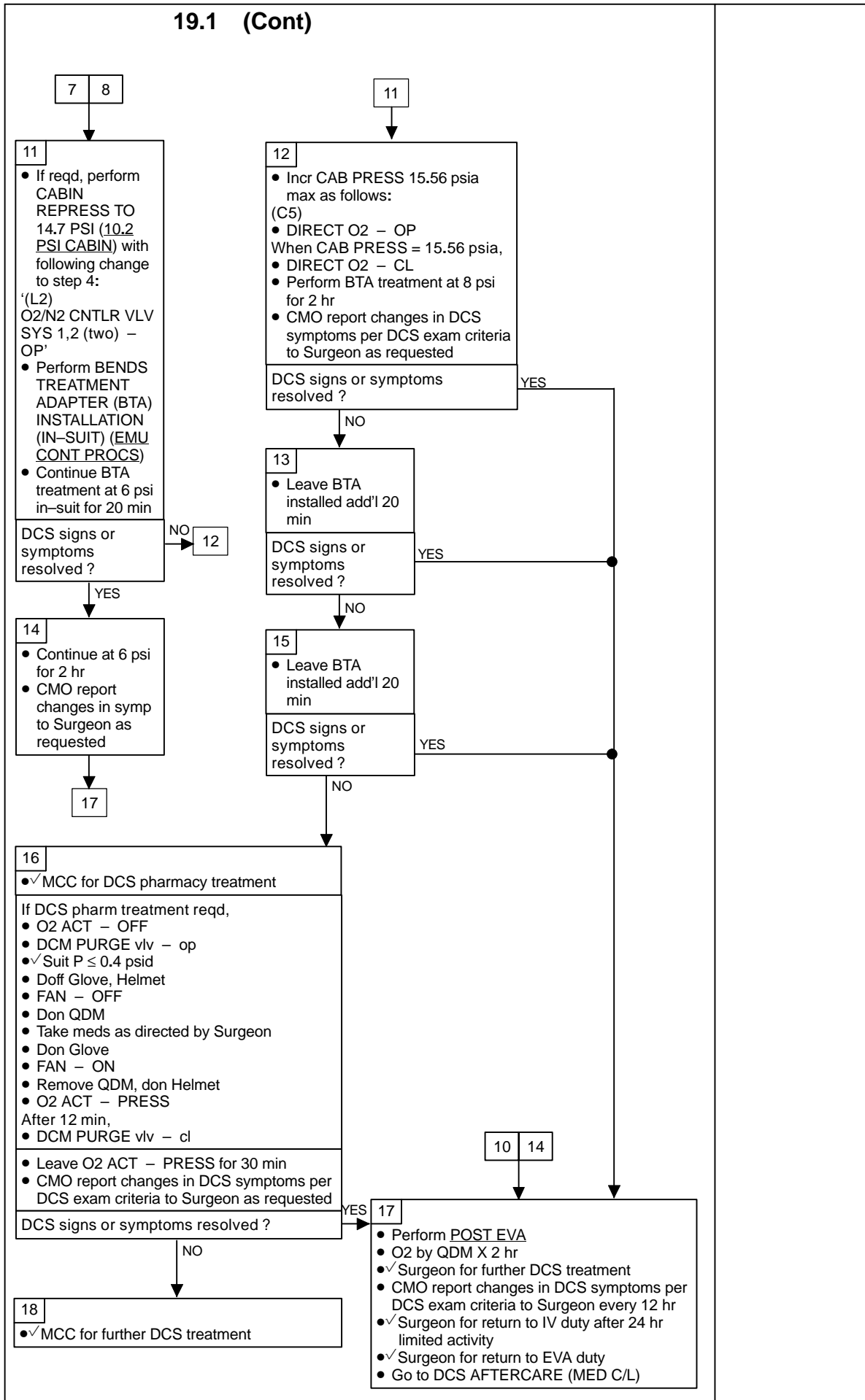
④ Cuff Class 4 symptoms may be secondary to Type 2 DCS which is a medical emergency. Unstowing the resuscitator enables IV crew to be prepared to administer CPR, if reqd. Because it is critical to repress a Class 4 quickly, this may result in a one crewmember repress

⑤ This decision block determines whether the cabin is being operated within 10.2 psi control range. Minor fluctuations above 10.6 have been seen; therefore, 11 psi was used to cover all 10.2 scenarios. Otherwise, cabin is being controlled at 14.7 psi

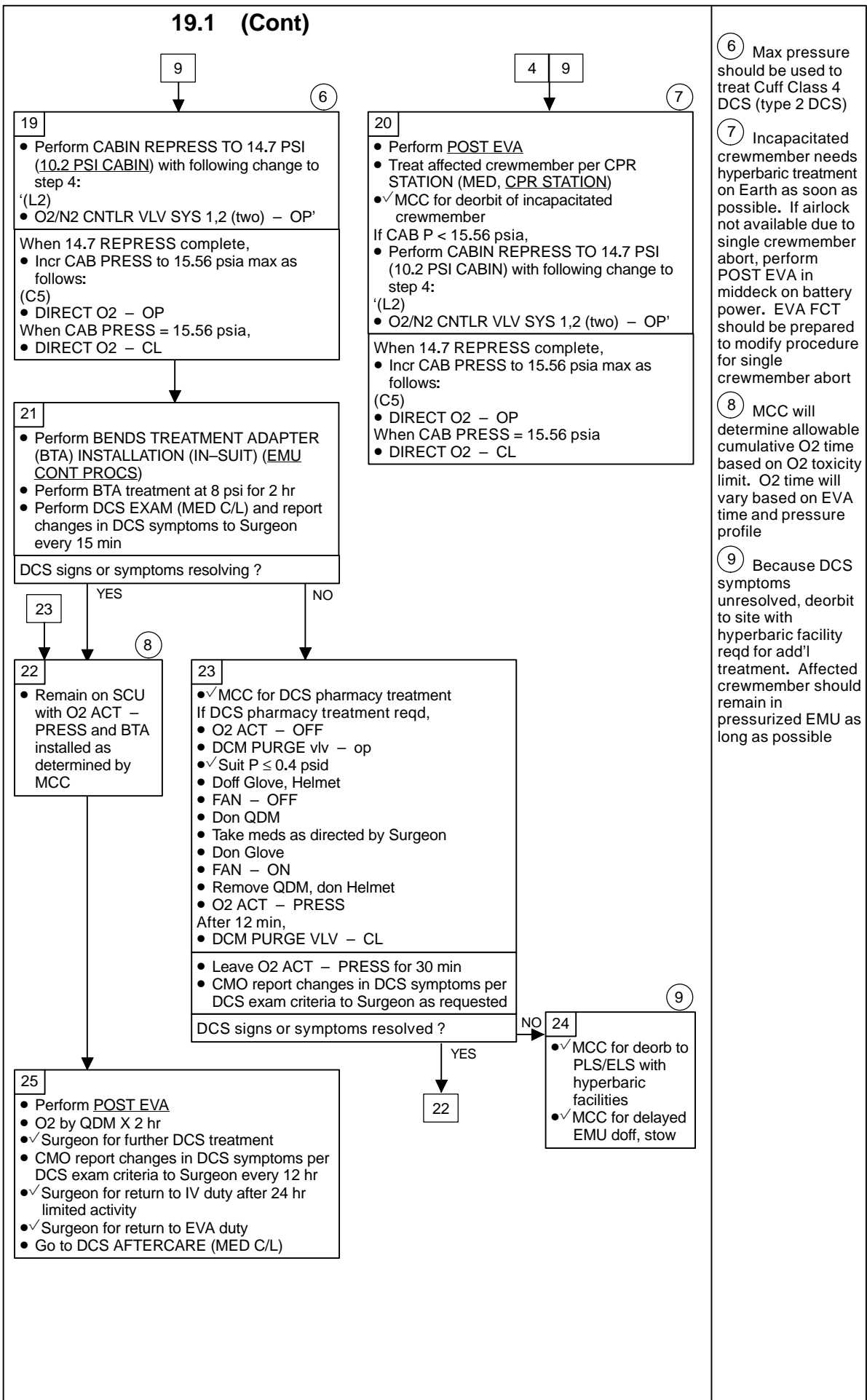
DCS PROC

19.1 (Cont)

DCS PROC



19.1 (Cont)

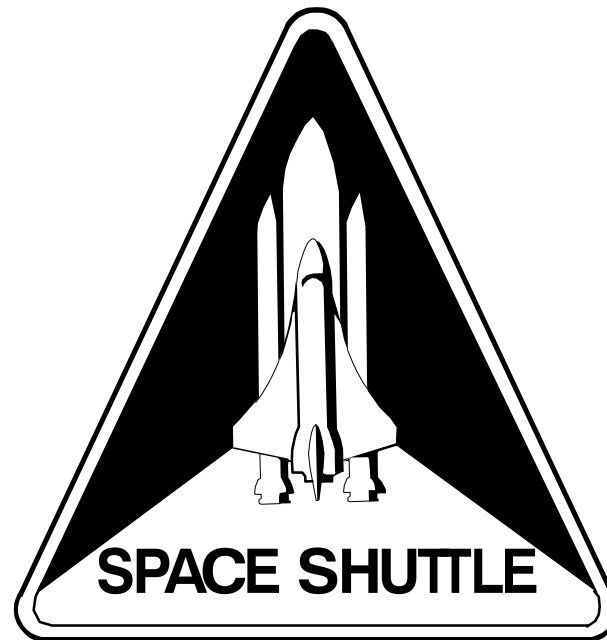


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CUE CARD CONFIGURATION

Refer to the following pages for cue cards and decals in this document:

- CC 3-9 SAFER CHECKOUT RESULTS Cue Card
- CC 3-10 SAFER STATUS TROUBLESHOOTING Cue Card
- CC A6-2 DEPRESS/REPRESS Cue Card (Nominal Config)
- CC B6-2 DEPRESS/REPRESS Cue Card (Tunnel Adapter)
- CC 6-4 FAILED LEAK CHECK Cue Card
- 19-4 EMERGENCY AIRLOCK REPRESS Decal



EVA
CHECKLIST

STS
ALL