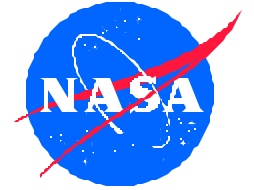




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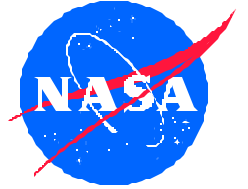


STS-100/6A Flight Readiness Review EVA Project Office

**Tara Jochim
Johnson Space Center
April 5, 2001**



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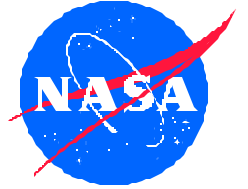
EVA Mission Overview

- **EVA Capability**
 - Consumables to support two 10.2psi scheduled EVA's
 - One Unscheduled EVA at 10.2psi for ISS Contingencies
 - Two Contingency EVA's for Orbiter, RMS, & ODS contingencies
- **Training**
 - Crew to be fully trained on all EVA tasks by April 5, 2001
 - Training ratio is 10:1
 - All planned tasks can be accommodated within scheduled 6:30 timelines for both EVA's



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EVA Mission Overview



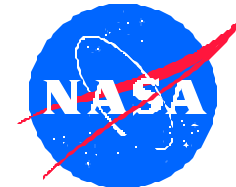
- **EVA 1 (Flight Day 4) - 6:30**

- Flight Support Equipment-Grapple Fixture (FSEGF) cable connect (provides keep alive power to SSRMS on SLP)
- UHF antenna install (7A Airlock communications)
- Deploy SSRMS (7A Airlock install)
 - Remove Thermal Blankets (8)
 - Jackbolt Release (32)
 - Superbolts Remove/Stow (8)
 - Initial Boom Raise
 - Boom Unfold
 - Expandable Diameter Fastener (EDF) Torquing
 - FSEGF Hook Link Release



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EVA Mission Overview (cont.)

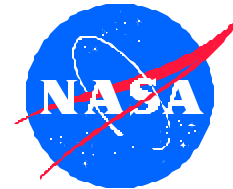


- **EVA 2 (Flight Day 6) - 6:30**
 - J400 Panel Reconfiguration (Supply power to lab PDGF for SSRMS walk-off)
 - Remove and replace one MMOD Shield, mate/de-mate 4 connectors
 - Starboard ECOMM Antenna Removal (7A Airlock install)
 - FSEGF Cable Disconnect
 - VSC Removal (IVA stowed spare, will be installed on UF-2)
 - DCSU Transfer from Space Lab Pallet to External Stowage Platform (Critical Spare)
 - Transfer Contingency Fiber Optic Cable from TSA to Airlock (IVA stowed)

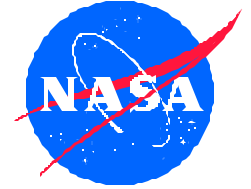


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EMU and SAFER Logistics



- **Three EMU's Manifested/One EMU On-orbit**
 - Two XL Pivoted and one Large Planar for 6A operations
- **Two SAFER's left on orbit by STS-97/4A**
 - SAFER logistics plan STS-100/6A will launch and use two new SAFER's for EVA1 and EVA2
 - 6A will swap SAFER's and batteries and return 4A units
- **EMU/SAFER FIAR's or cert issues**
 - Glove 12 V Heater anomaly—Special topic

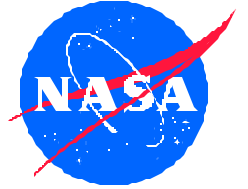


- **EMU and SAFER first flight hardware**
 - Increased Capacity EMU Battery
 - Increases capability from 6 to 32 cycles, 270 days on-orbit time and 425 days wet-life
 - MetOx Canisters
 - Metal Oxide vs. Lithium Hydroxide, now a regenerable system (55 uses)
 - First use on 7A
 - ISS EMU Umbilical
 - IEU's provide same function in Joint Airlock as SCU's in Orbiter
- **EMU and SAFER hardware left on ISS after STS-100/6A**
 - Two Large ORU EMU's (one from STS-98/5A)
 - Two SAFER's and three SAFER batteries
 - MPLM hardware flown for 7A Airlock staging (stowage IVA)



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EVA Tools and Crew Aids Manifest Summary

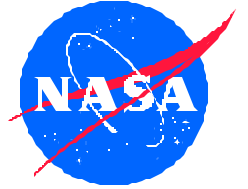


- **EVA Tools and Crew Aids First Flight Items**
 - Flight Support Equipment Grapple Fixture Contingency 11/16” Wrench
- **Non-GFE EVA Hardware First Flight Items**
 - None
- **Standard contingency tools in Port TSA**
- **Starboard TSA**
 - APFR
 - FSEGF Contingency 11/16” Wrench
 - 60’ Contingency Fiber Optic Cable
 - PAD with WIF Adapter attached
 - Safety tether
- **Sill-Mounted PFR Configuration**
 - Full stack (Bay 2 Port Location)
- **Standard complement of slidewires, safety tethers, crew hook locks, and winches in PLB**
- **All EVA hardware will be on dock at KSC by April 6, 2001**



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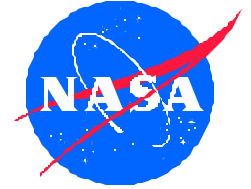
EVA Tools and Crew Aids Manifest Summary



- **EVA Tools and Crew Aids Left On-Orbit**
 - APFR (stowed on LAB WIF)
 - WIF Adapter (EVA stowed on SSRMS)
 - EVA Crew Lock Bag (stowed IVA)
- **EVA Tools and Crew Aids Swapped On-Orbit**
 - Two SAFER's and three SAFER Batteries
- **EVA Tools and Crew Aids Returned**
 - None



EVA Fit Checks

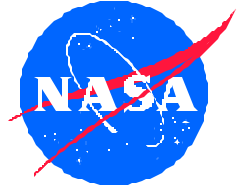


- **Tool-to-tool Fit Checks (343 total interfaces)**
 - 90 percent Total Complete (307 of 343)
 - 118/118 MPLM fit checks = 100 percent
 - 11/13 Payload Bay = 85 percent
 - 2 will not be completed due to PLB closed out prior to STS-98 return
 - 37/69 TSA = 54 percent
 - 32 TSA fit checks will not be completed, 28 related to MMWS Bayonet receptacle replacement, 4 because TSA closed out prior to STS-98 return
 - 141/143 Middeck = 99 percent
 - Awaiting paperwork from USA to close out remaining fit check-planned closure 4/4/01
 - All incomplete fit checks have been dispositioned as acceptable through the EVA CoFR process
- **Tool-to-Interface and Interface-to-Interface Fit Checks (290 total tasks)**
 - 284/290 complete = 98 percent
 - Two fit checks awaiting SLP transfer to PLB and FRAM install (NLT: 4/10/01)
 - Remaining four fitchecks will not be completed
 - Four fitchecks have been dispositioned through ISSP CoFR process
 - See back up charts



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EVA Sharp Edge Inspections

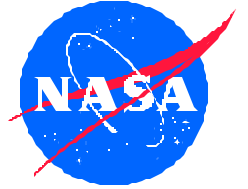


- **Sharp Edge Inspections**
 - 100 percent complete on UHF Antenna, SLP, SSRMS
 - PLB will be completed by pad walk down on April 7, 2001



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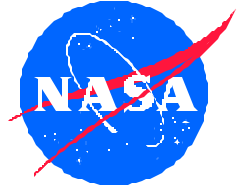
In Flight Anomalies



- **Inadvertent loss of Payload Attachment Device (PAD) and Worksite Interface Adapter (WIF) during EVA**
 - Hardware inadvertently released by crewmember operation of large crew hook
 - EVA tether protocol continues to be emphasized during EVA training
 - EVA community is reviewing possible modification options which may prevent reoccurrence
 - Current PAD and WIF inventory supports STS-100/6A and subs



Phase VI Glove Damage From 12-Volt Heaters



- **Background**

- Following crewmember Forrester's human rated thermal vacuum chamber run, 2/15/01, all 10 heater elements had bonded to the restraint fingernail re-enforcement
- Subsequent inspection found glove bladder (Urethane) deformation from over-heating
- Only gloves which have seen heater use during EVA exhibited similar bladder damage
- Gloves flown on STS-102/5A.1 were operationally controlled with a limited duty cycle which mitigated risk of bladder damage
- The EMU had a 3V, self-contained glove heater system
- Now there is a 12V Rechargeable EMU Battery Assembly (REBA), which powers the glove heaters and Wireless Video System
- 12V heater system certified by analysis based on 3V system
- Similarity analysis used in going from 3V to 12V was inaccurate
- Power to heaters in 12V system much higher than expected

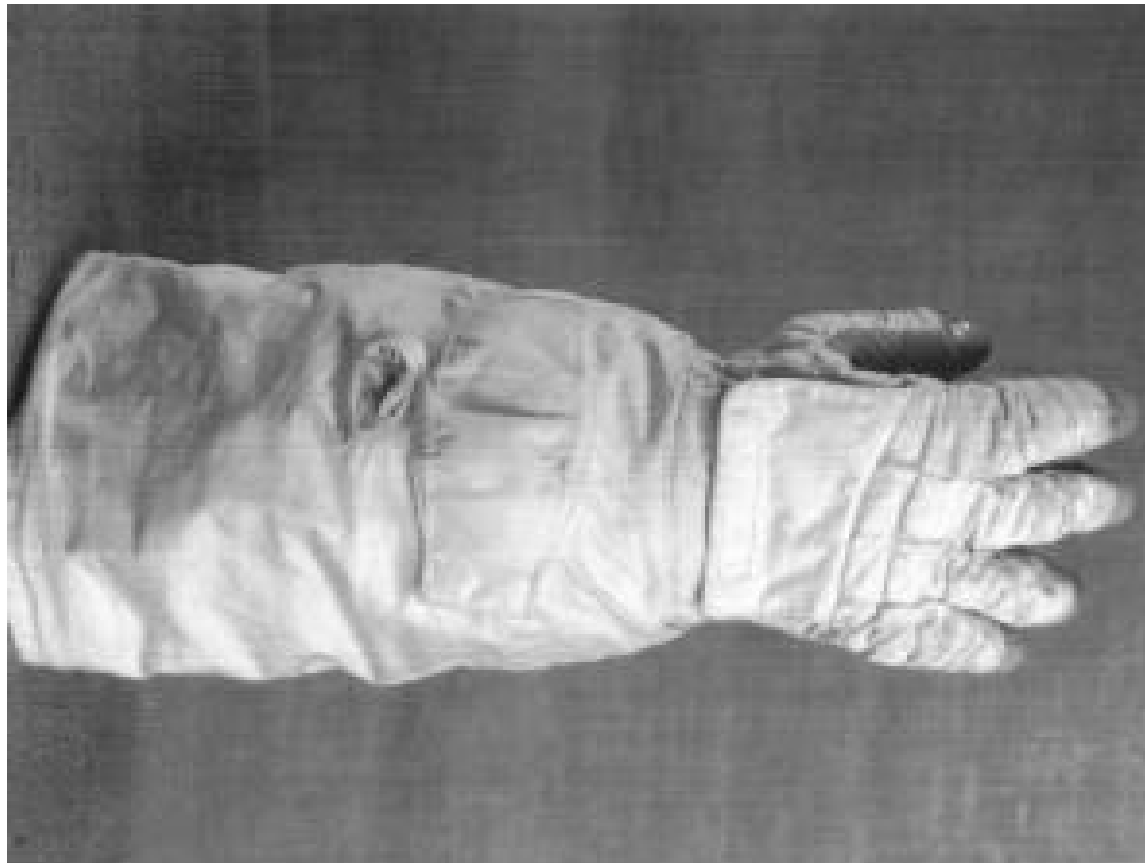
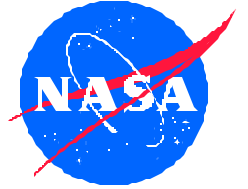
- **Mission Impact**

- None - implemented hardware recovery plan for STS-100



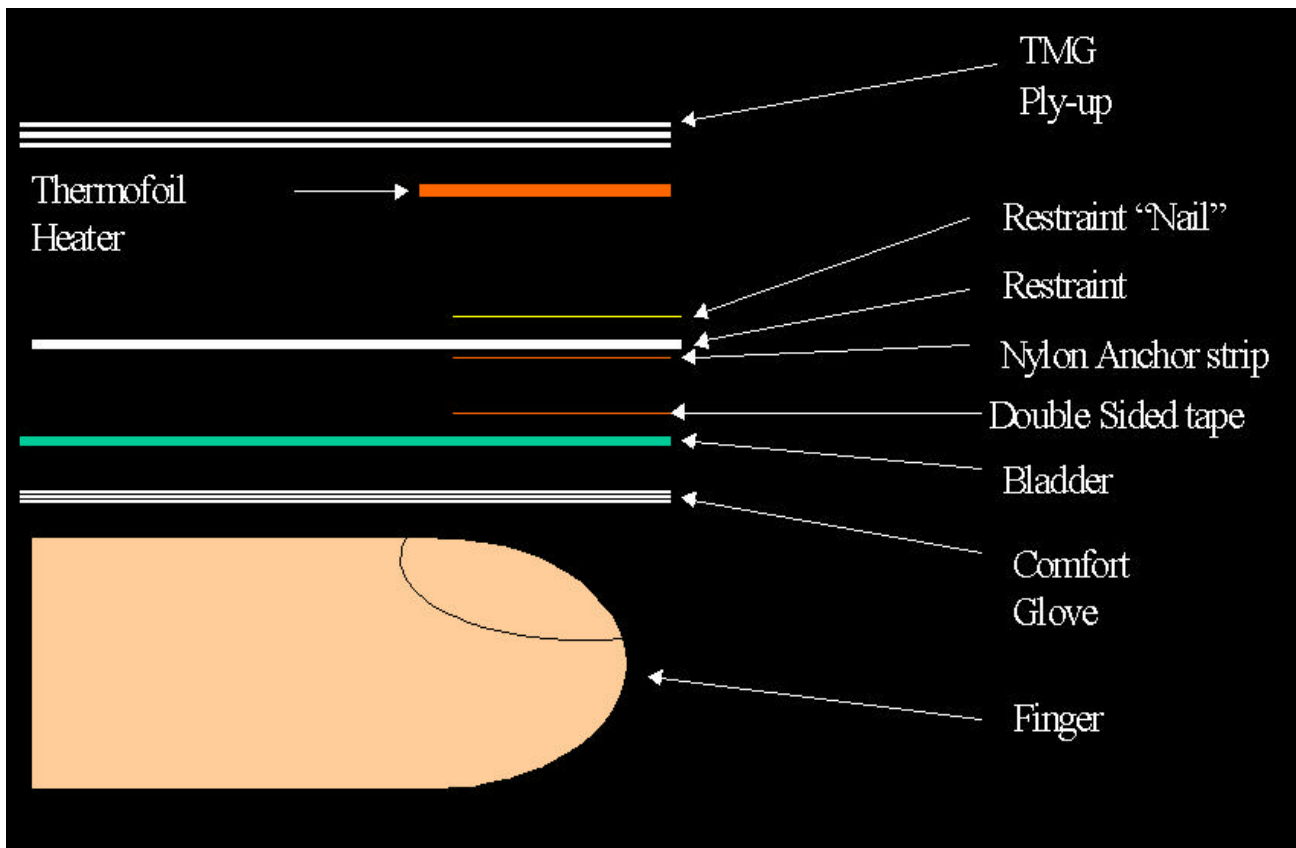
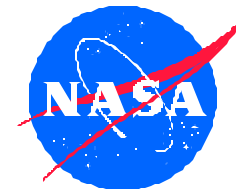
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Phase VI Glove Damage From 12-Volt Heaters





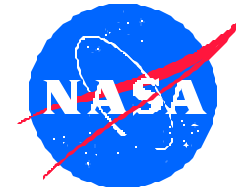
Phase VI Glove Damage From 12-Volt Heaters



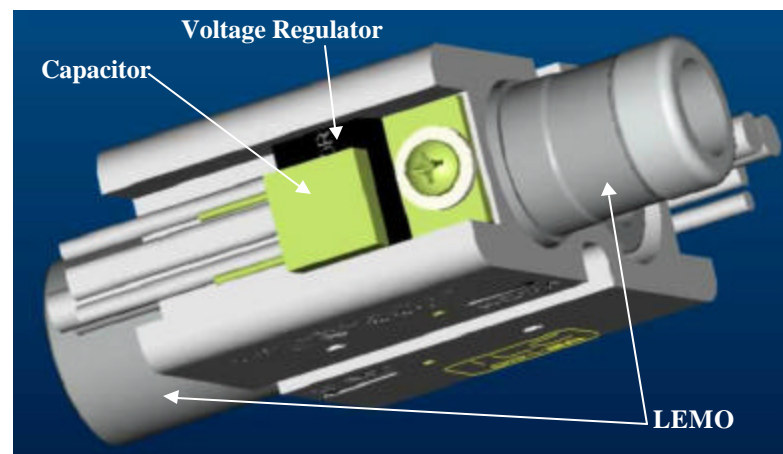
Glove Finger Layers



Phase VI Glove Damage From 12-Volt Heaters

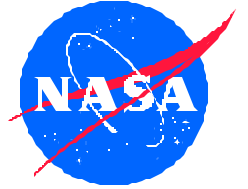


- **Recovery Plan STS-100**
 - Addition of a Voltage Regulator limits voltage to the heaters to 9V
 - Unmanned test showed a 9.25V input takes 38 minutes, in warm environment, for the bladder temperature to reach 160F
 - Continuous use temperature of bladder is 170F
- **Crewmember can use heaters without operational controls with voltage regulated to 9V**





Phase VI Glove Damage From 12-Volt Heaters

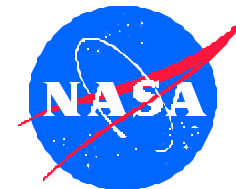


- **Logistics**
 - 6A EMU's have voltage regulators
 - Post 6A, two EMU's left on-orbit
 - One left from 5A (no voltage regulator), s/n 3005
 - One left from 6A (voltage regulator), s/n 3011
 - Increment crew (between 6A and 7A) will not use two EMU's left on-orbit
 - Three EMU's for 7A will have voltage regulators and all three EMU's remain on-orbit for Increment use
 - Two EMU's (s/n 3011 and 3005) return on 7A for Shuttle contingency use (one unit without voltage regulator is acceptable for contingency EVA)
 - Shuttle contingency EVA's do not require use of glove heaters
- **Conclusion**
 - EMU's are ready for EVA on 6A



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STS-100/6A Planned Forward Work

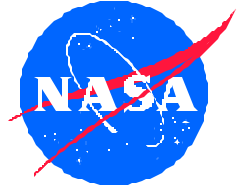


CoFR 1 Item ID	Title/Description	Plan to Close	Resp. Org	ECD	Risk to Flight
SOW	V1103	V1103	EC/MOD	4/10/01	Low
PFW	Sharp Edge Inspection	Plan to be completed during Crew PLB Walkdown	VITT/CB	4/7/01	Low
PFW	Middeck Fit checks	Plan in place to complete	XA	4/4/01	Low
PFW	Tool to Interface Fit checks	Plan in place to complete	XA	4/10/01	Low
PFW	Glove Anomaly Resolution	Plan in place to complete	XA	4/5/01	Low



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STS-100/6A FRR



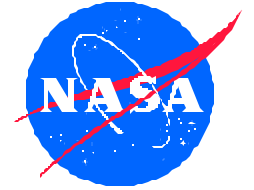
- **There are no EVA exceptions for STS-100/6A FRR**
- **The EVA Project Office is ready to proceed with 6A launch and on-orbit stage operations pending completion of the planned forward work**
- **All open work will be closed or dispositioned by L-2**

Original signed by:

G. Allen Flynt
Acting Manager, EVA Project Office



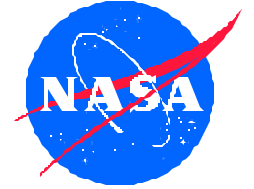
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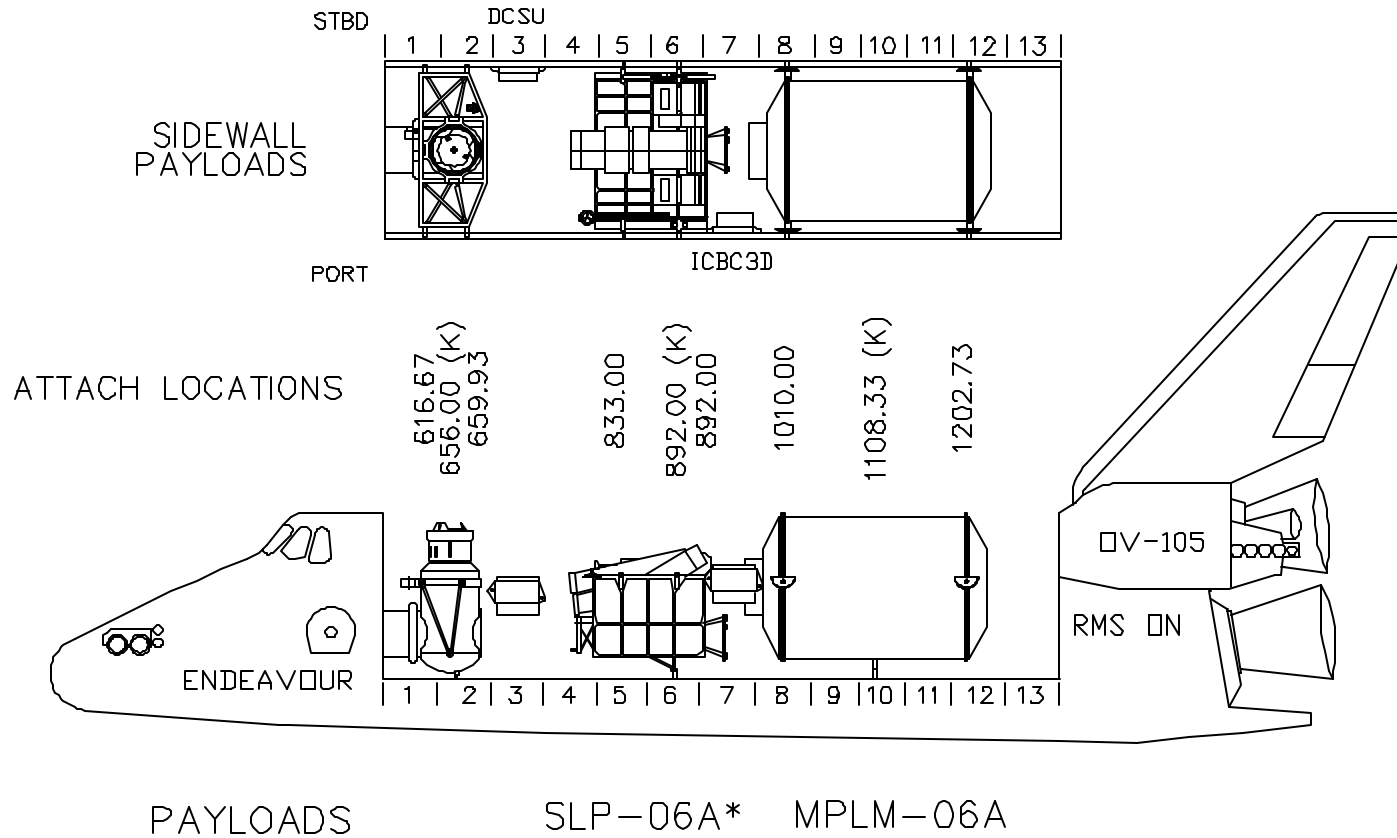
Backup Charts



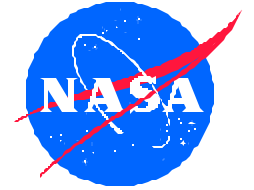
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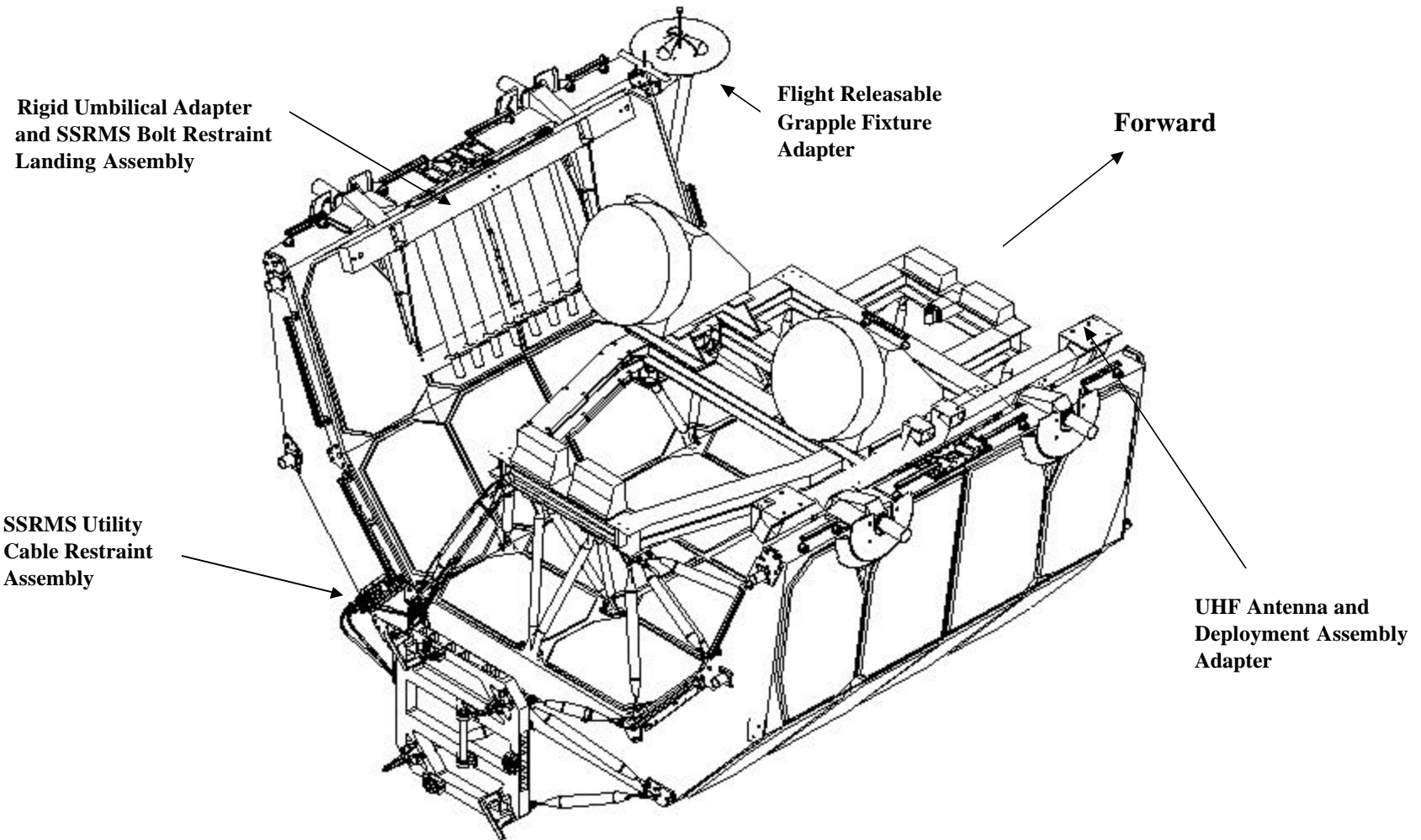
Payload Bay Configuration

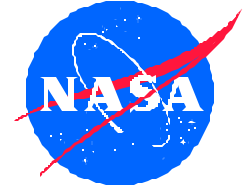


ISS SLP configuration release drawing not available.



SLP in Landing Configuration





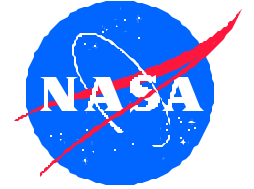
EVA Fit Checks

- **Tool-to-Interface and Interface-to-Interface Fit Checks (290 total tasks)**
 - 284/290 complete = 98 percent
 - Four items that will NOT be completed for flight:
 - 6A DCSU interface (Square Grid) to ESP
 - Square Grid Interface-Will complete fit check between Class I Square Grid and Flight FRAM upon completion of FRAM
 - Dispositions accepted through 5A.1 CoFR
 - 6A Fiber Optic Contingency Cable to lab connectors, LAB VSC, SLP VSC
 - Flight Cable completed after launch of lab and flight close out of VSC
 - 6A launched VSC to UF-2 FGB-VSC plate
 - FGB VSC plate was fit checked with a mockup VSC, the 6A VSC was not manufactured prior to FGB launch
 - UF-2 Fiber Optic Cable to 6A VSC
 - Fiber Optic Cable fit checked to a flight VSC, but not to 6A VSC
 - All incomplete fit checks have been dispositioned by the ISSP CoFR process



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Phase VI Glove Damage From 12-Volt Heaters



Bonded Heater



Damaged Bladder