



HST Program Status

Presentation to:

**Space Telescope
User's Committee**

Preston M. Burch

November 13, 2008



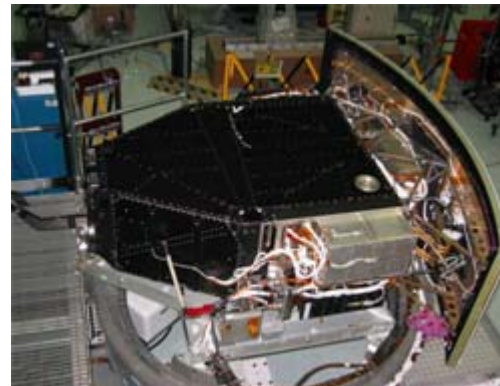
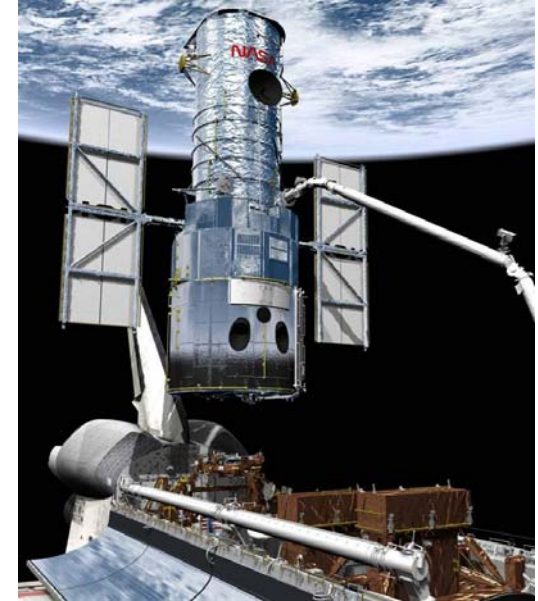
Topics

- **Program Update**
- **Observatory Health**
- **SM4 Preparations and Status**

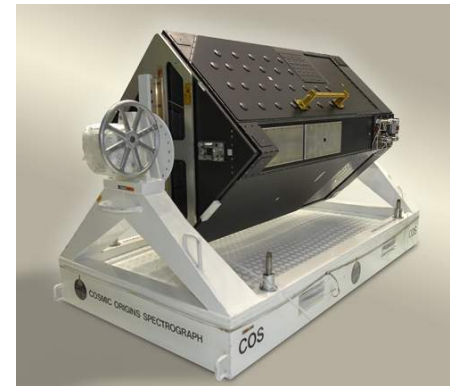


SM4 Mission Overview

- **Launch on Atlantis, October 14, 2008**
- **5 planned EVAs + 1 contingency EVA**
- **Payload weight 22,182 lb**
- **Hubble upgrades**
 - WFC3: New panchromatic imaging camera
 - COS: Most powerful UV spectrograph ever flown
 - 6 new gyros
 - 6 new batteries
 - Refurbished FGS
 - Repair of STIS and ACS
 - New Outer Blanket Layers
 - Soft Capture Mechanism
- **All elements were on track for launch on October 14, 2008**



WFC3



COS

Expanding HST's Capability with WFC3 and COS



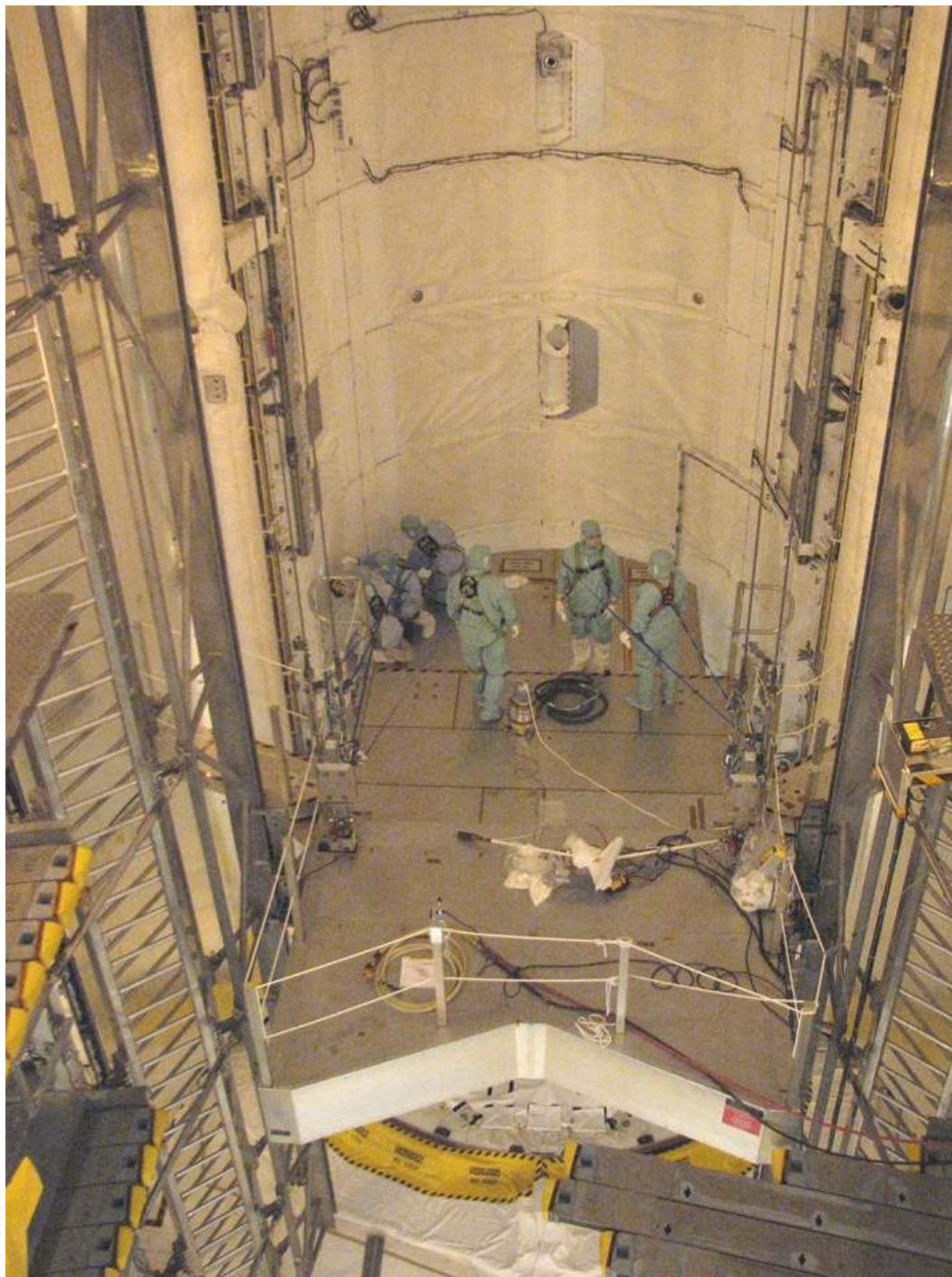
HST Flight Hardware Status

- **HST replacement hardware fully tested and certified, ready to fly**
 - WFC3: Installed on SLIC
 - COS: Installed on ORUC (returned to shipping container; at KSC)
 - Gyros: Installed on ORUC
 - Batteries: Installed on SLIC (returned to cold storage at GSFC)
 - STIS Repair: Installed
 - ACS Repair: Installed
 - FGS: Installed on ORUC
 - NOBLs: Installed on MULE
 - SCM: Installed on FSS
- **All four Carriers fully tested and certified, ready to fly pending completion of end-to-end test, final battery charging, and final closeouts at the Pad**
- **HST provided EVA Crew Aids and Tools fully certified and ready to fly, pending completion of open CATs work:**
 - CATs GCARs submittal completed week of 9/22 (Closes Payload CoFR 2 items)
 - Mid-Deck tools (2 Mini-power Tools, Battery Connector Cap Caddy and Ground Strap Harness Bag) delivered to KSC on 9/25









Payload Bay Cleaning at Pad

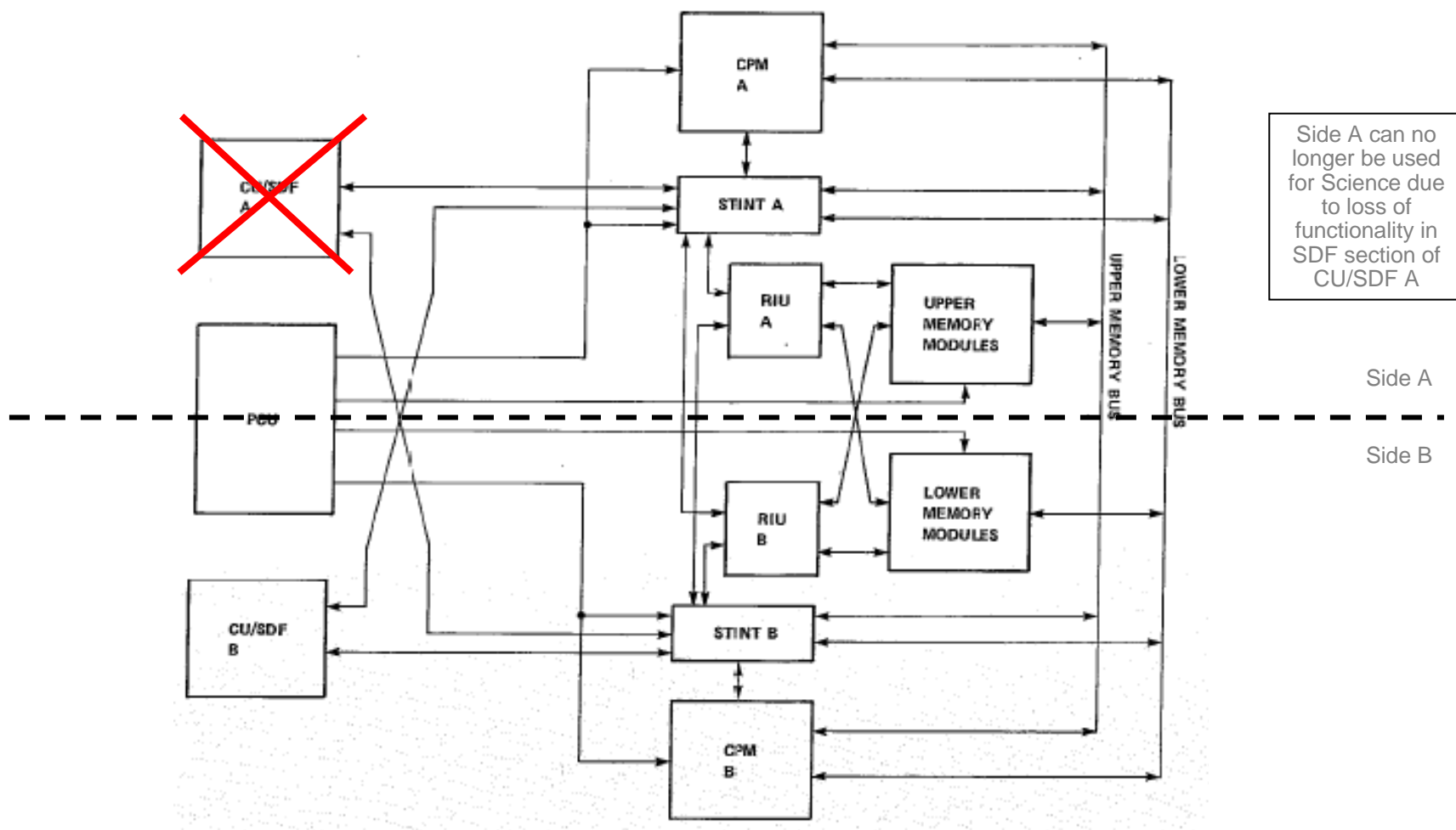


On-Orbit Failure Summary

- **SI/C&DH 1 is presently on-orbit supporting HST science instruments**
 - HST operated successfully on A side of SI/C&DH 1 for 18 years (1990 – 2008)
 - A recent on-orbit anomaly on A side of SI/C&DH 1 necessitated a transition to the B side of HST SI/C&DH 1
 - SI/C&DH 1 operated for 32 hours on B side prior to experiencing a transitory shutdown event
 - SI/C&DH 1 is presently back in operation on the B side
 - Successfully returned to science operation on Oct 23, 2008
- **Directed by NASA Administrator to add SI/C&DH change-out to SM4 manifest**
 - HST is presently zero fault tolerant to loss of science

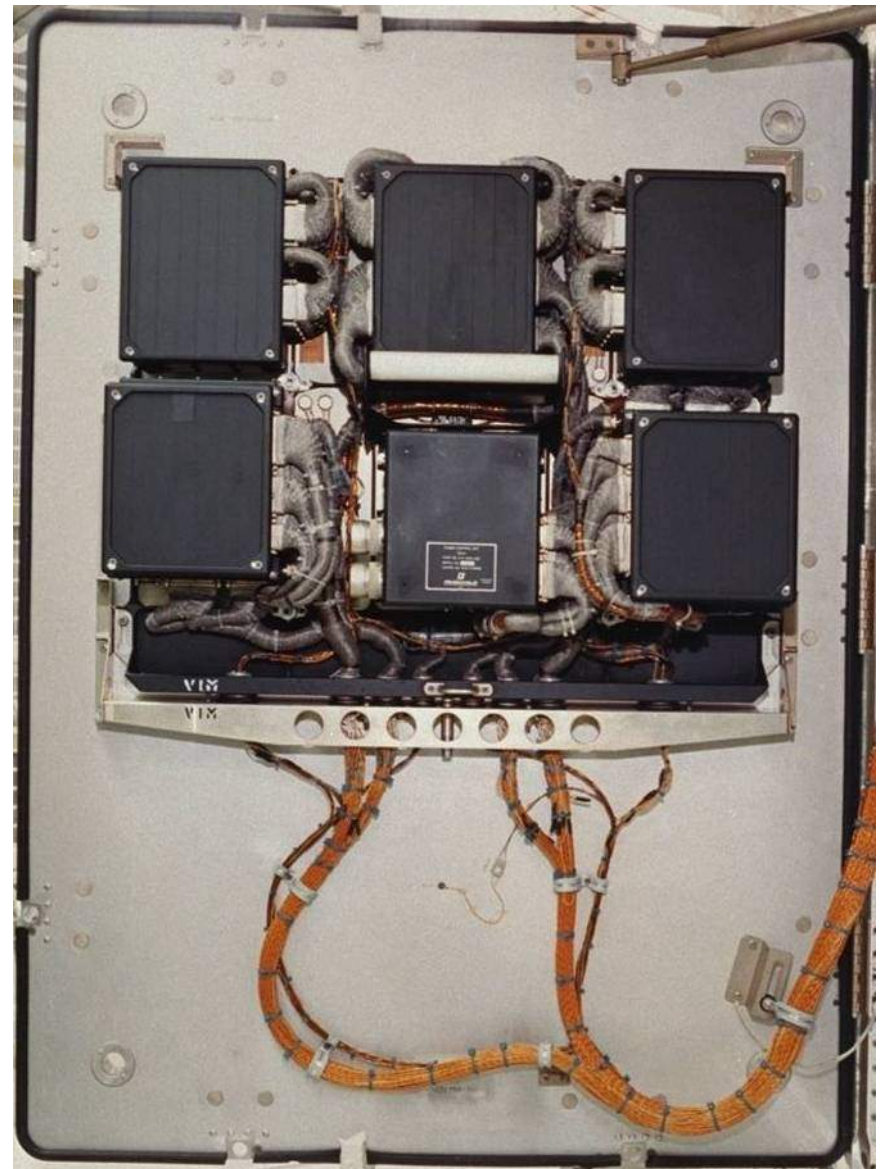
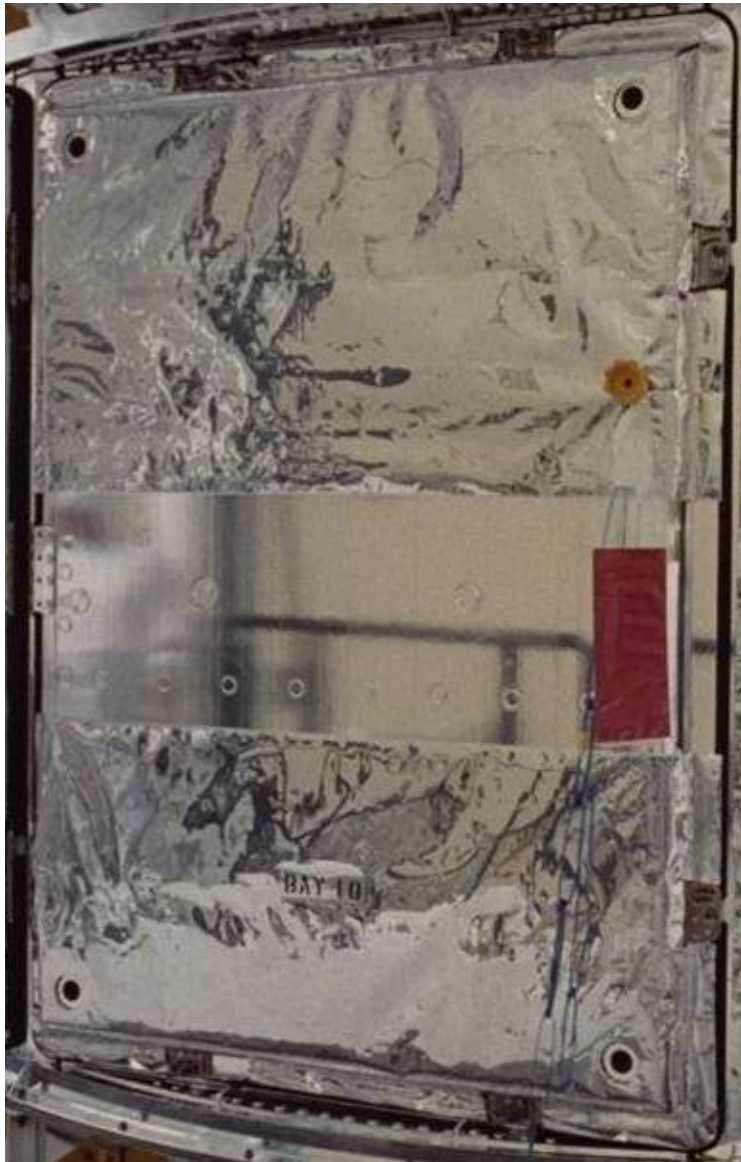


SI/C&DH Block Diagram (Post Side A Anomaly)



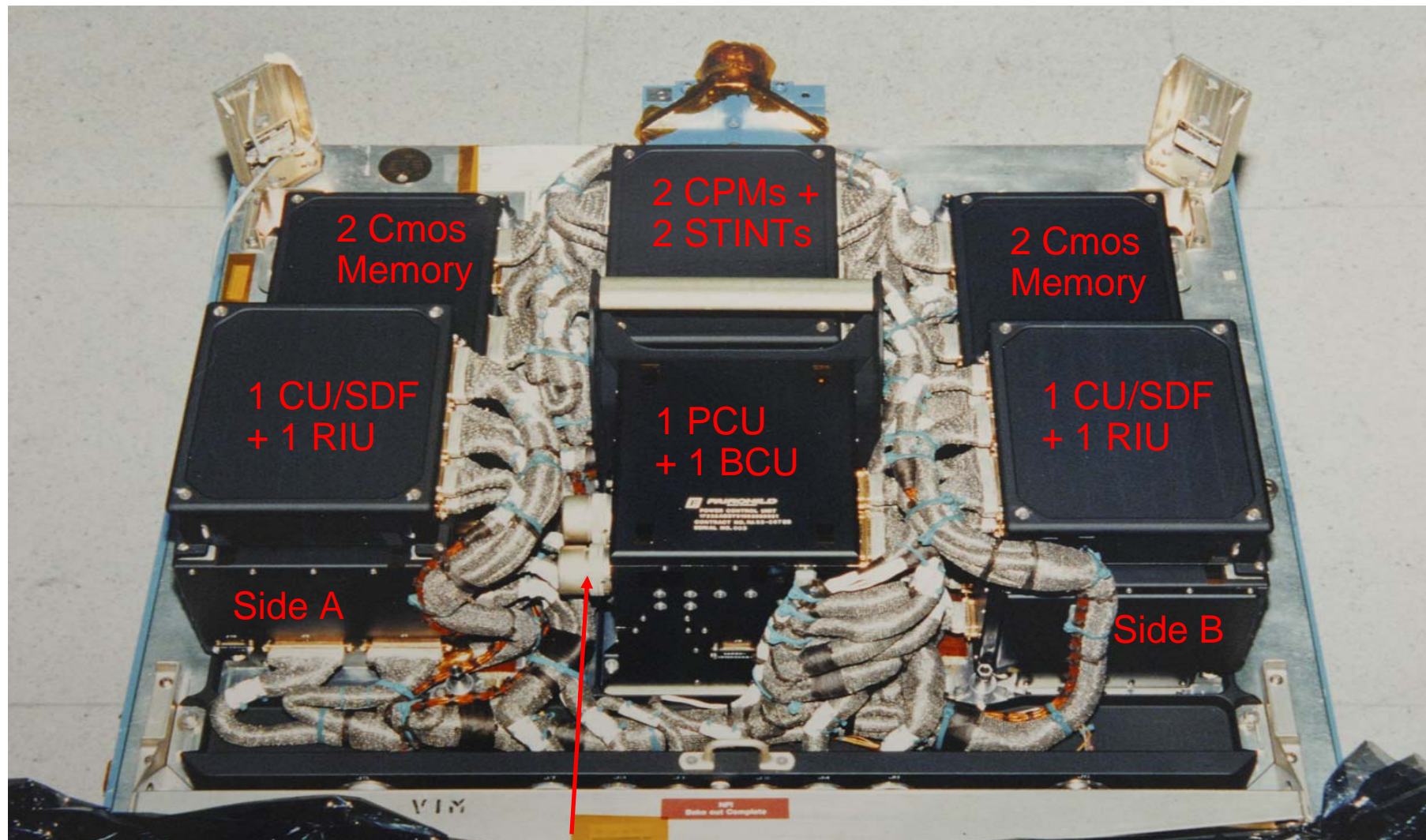


SI/C&DH Bay 10 Configuration





SI/C&DH2 as Shipped to GSFC



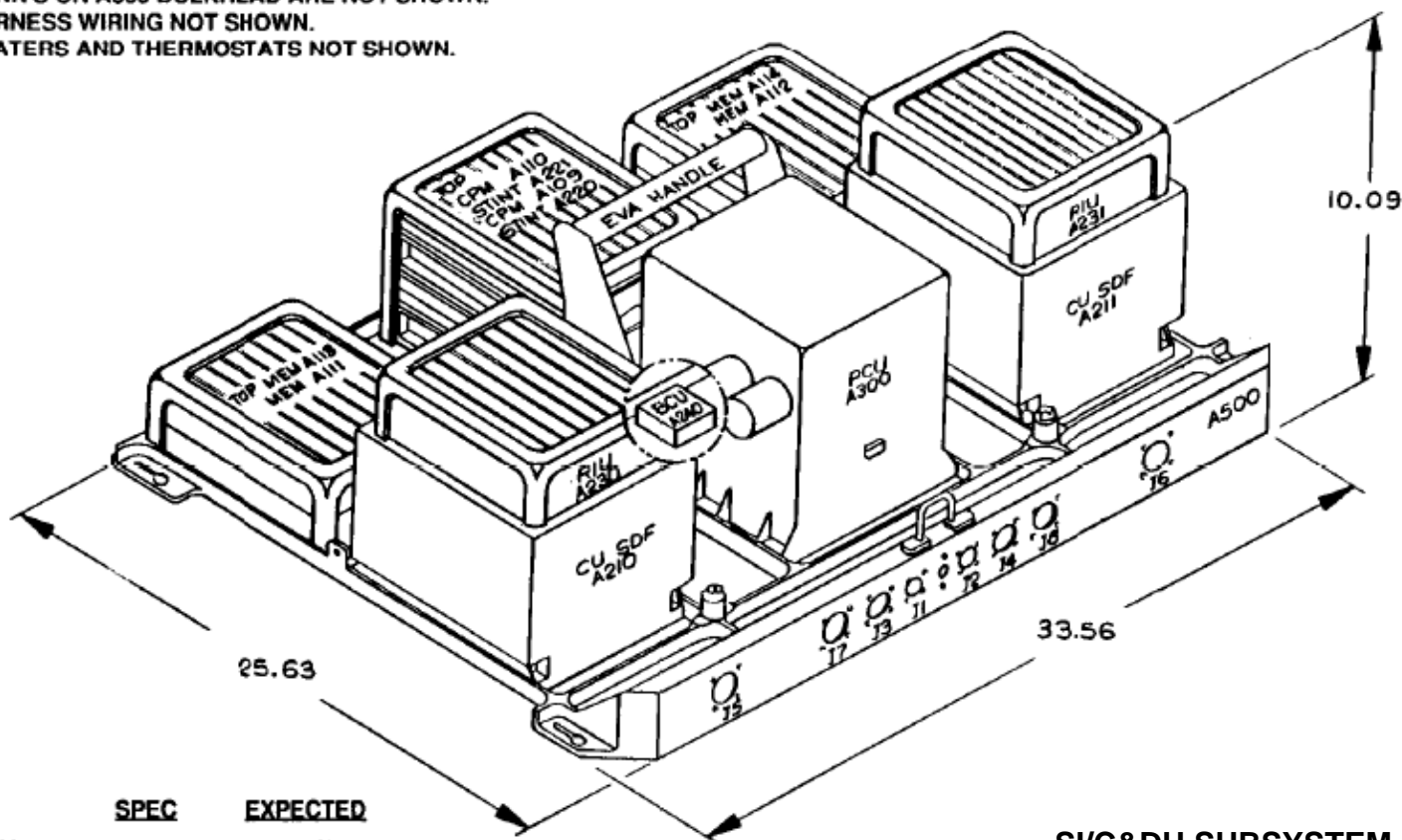
2 Fuse Plugs



SI/C&DH ORU End Item - Overview

NOTES:

1. CONN'S ON A500 BULKHEAD ARE NOT SHOWN.
2. HARNESS WIRING NOT SHOWN.
3. HEATERS AND THERMOSTATS NOT SHOWN.

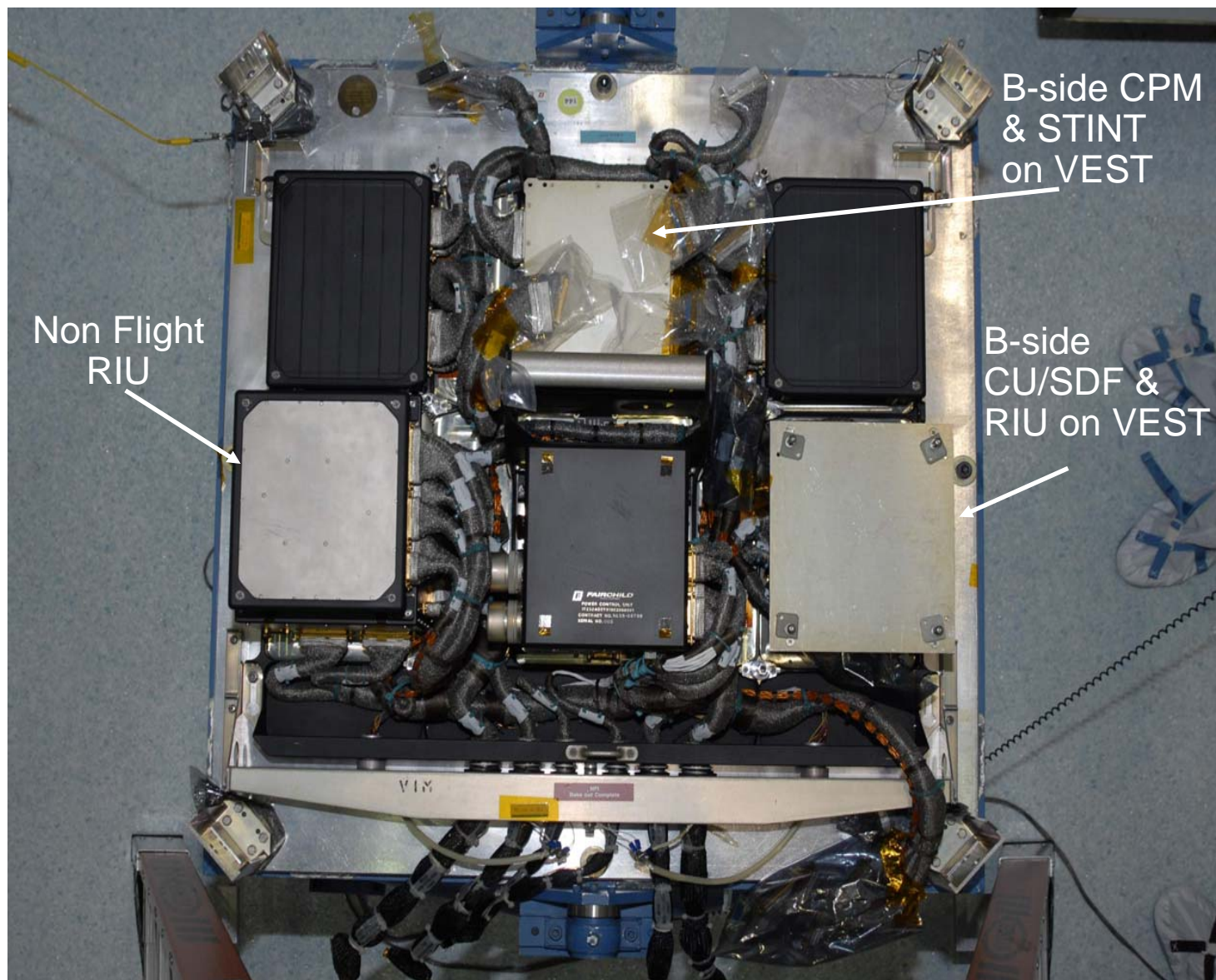


	<u>SPEC</u>	<u>EXPECTED</u>
NORMAL MODE	108.0	108.0 W
FIXED MODE	45.0	44.8 W
WEIGHT	115.6	99.0 LBS

SI/C&DH SUBSYSTEM
91900000001 S/N 002



SI/C&DH2 ORU as pulled from Storage





HST Program Status

- **HST payload operations resumed on October 23**
 - SI/C&DH B-side operation recovered on October 23
 - WFPC2 science observing began on October 25
 - ACS Solar Blind Channel observing began on October 29
 - WFPC2 image issued in press release on October 30
- **Presented SI/C&DH flight hardware certification schedule to SMD/Astrophysics on October 24**
 - Directed to develop schedule with appropriate slack to support May 12 launch opportunity
- **Conducted SI/C&DH flight certification review on October 30**
- **Discussed budget impact of mid-May SM4 launch date with SMD/Astrophysics on October 28**



Cost Implications of Launch Slip

- **Projected cost = \$67M (~7 months x ~\$9.5M/month)**
- **SMD/Astrophysics is providing \$54M; HSTP is providing \$13M, taken out of Hubble Operations**
 - \$13M from science operations and data analysis
- **Impact to science operations and data analysis absorbed in near term by major reductions in year-to-year carryover; must be compensated by SMD in future years to avoid even more serious problems later**
- **Bottom line: business as usual for grant funding, including supplementary programs**
 - Possible short delays in grant funds being disbursed
- **STUC should be aware of very large cuts to operations (including grants) beginning in FY12**



For detailed flow operations refer to
Preliminary Manifest Option 08A-41A

Flight Assignment Working Group (FAWG) Planning Manifest

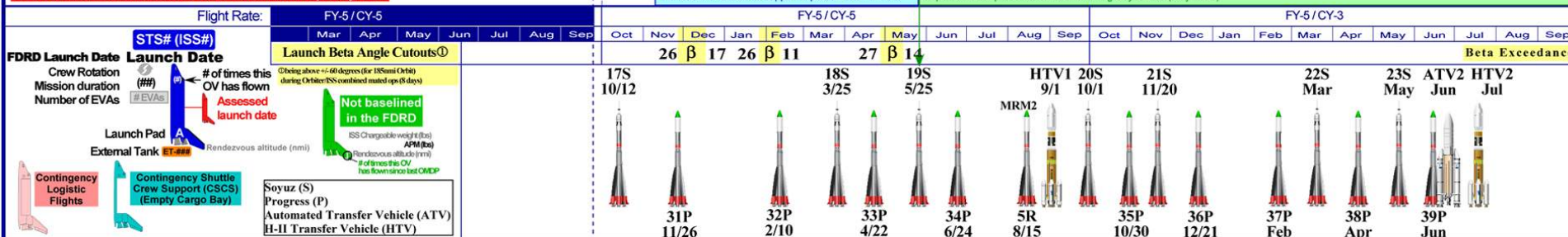
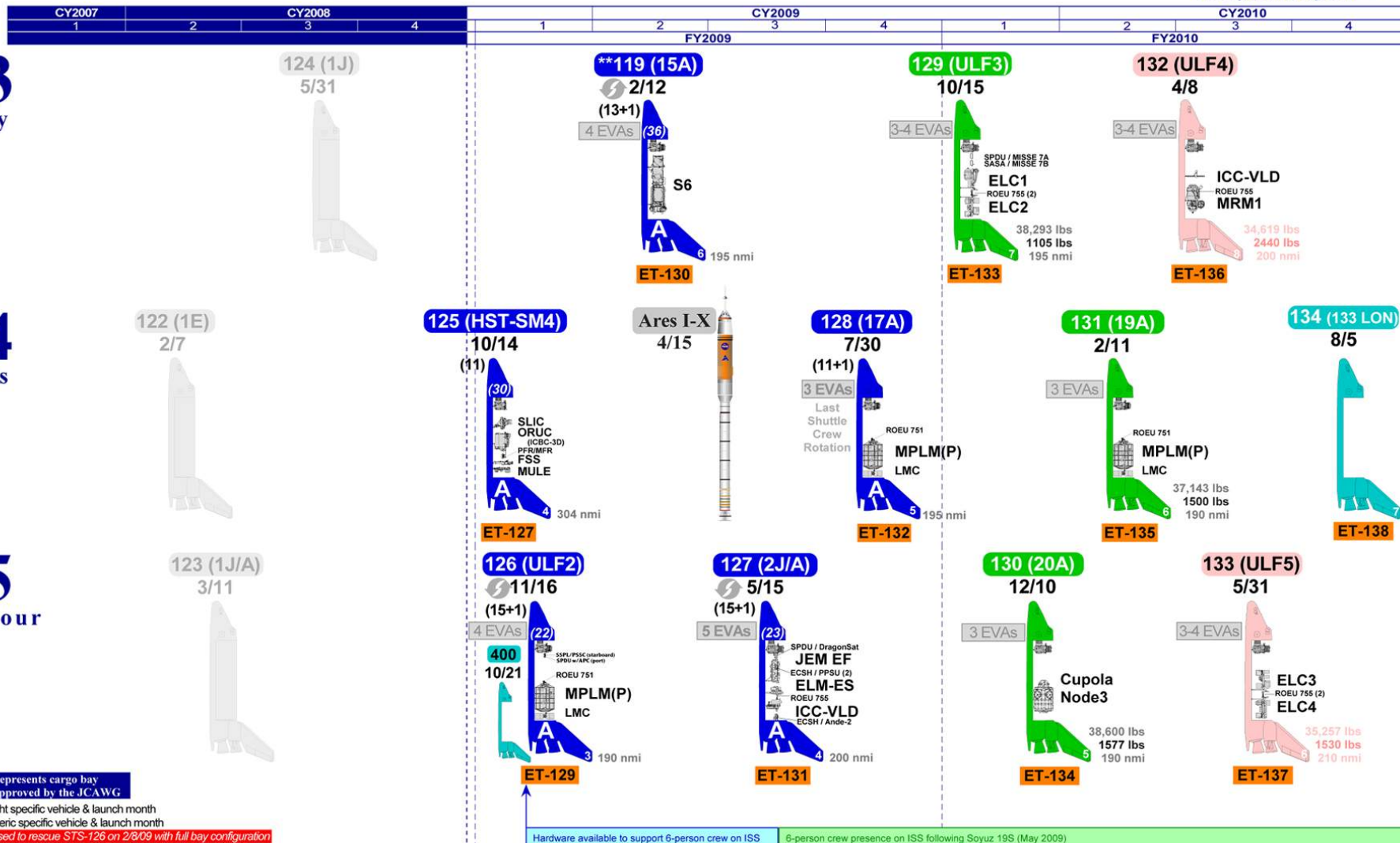
NASA Official: *JoAnn Coggeshall*
USA Project Lead: *Barton K. Gibson*
Chart updated: 24-Sep-2008



103
Discovery

104
Atlantis

105
Endeavour



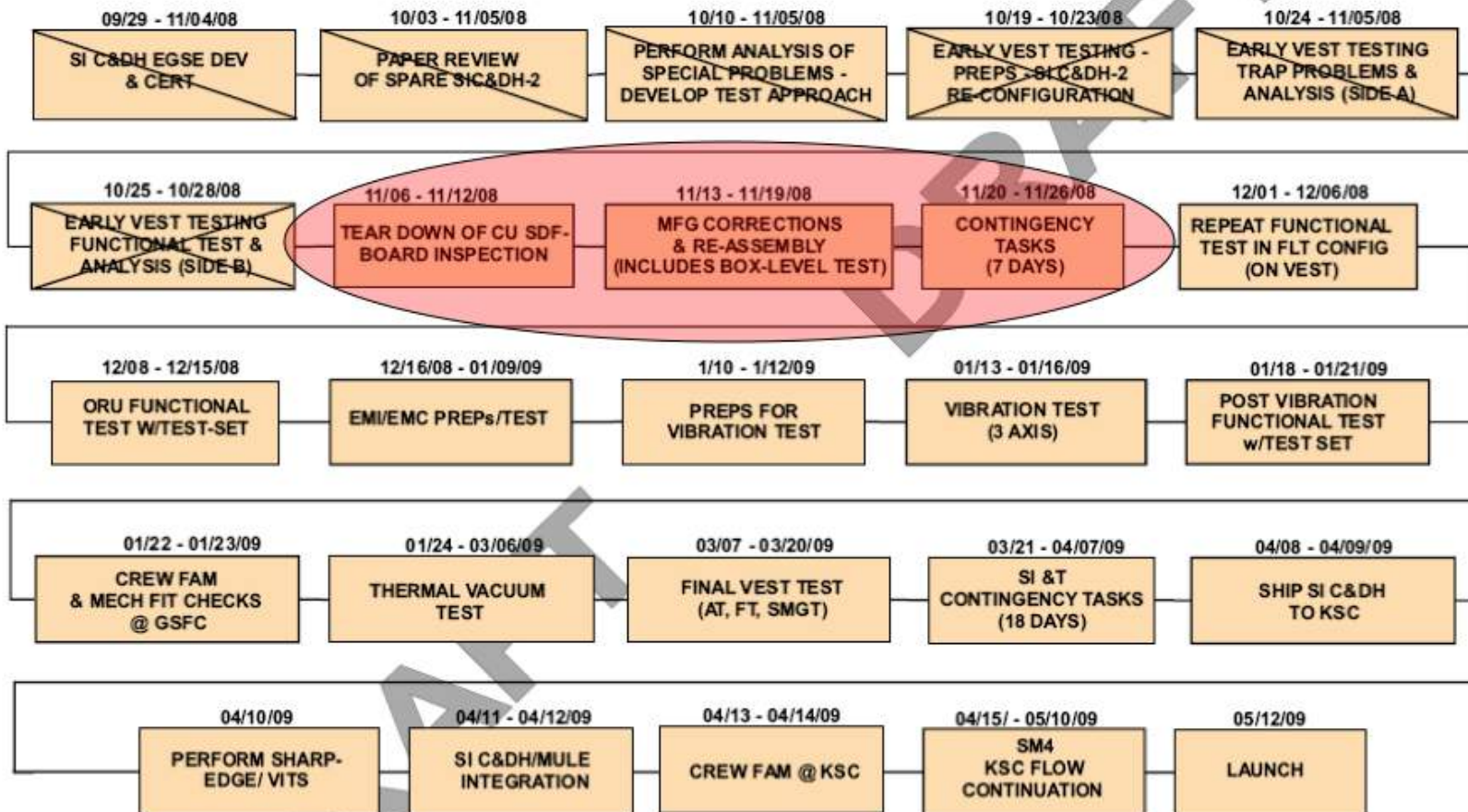


HST SM4 Development Project Code 442

Scientific Instruments Command & Data Handling (SI/C&DH-2)

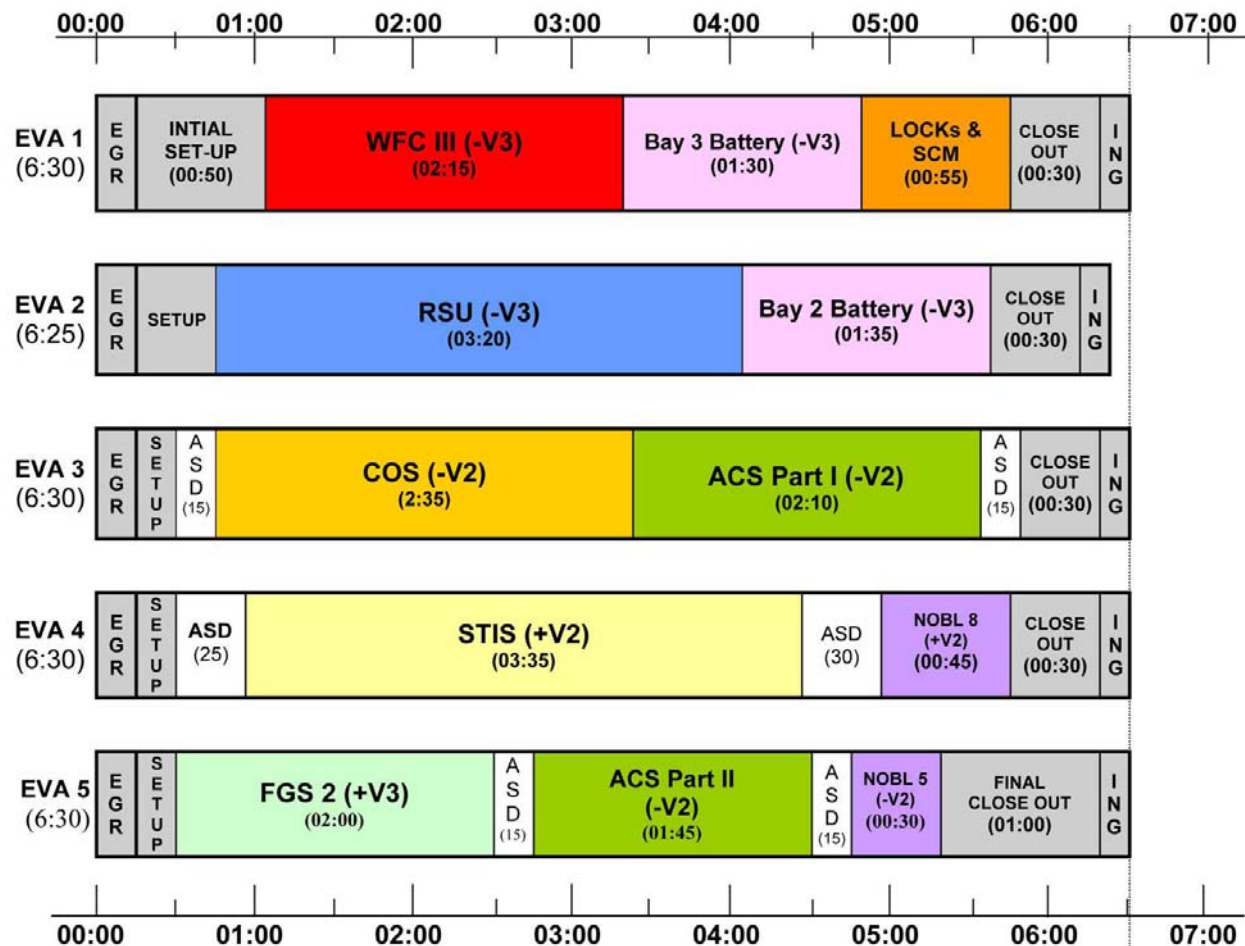
(05/12/2009 Launch Date Plan - F)

Status as of 10/29/08





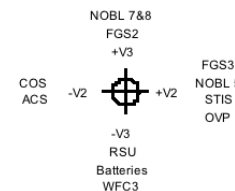
HST SM4 EVA Timeline



Priority	Task Times
1. RSUs (3)	3:20
2. WFC3	2:15
3. COS	2:35
4. Bay 3 Battery Mod.	1:30
Bay 2 Battery Mod.	1:35
5. STIS Repair or ACS Repair ⁽¹⁾	3:35
	(1) 2:10 (2) 1:45
6. FGS 2	2:00
7. Remaining instrument repair	
8. NOBL 8	0:45
NOBL 5	0:30 ⁽²⁾
9. NOBL 7	
10. SCM	0:15
11. Reboost	

Notes:

- Choice of first instrument repair will be made based on EVA efficiency and mission circumstances
- Time for NOBL 5 is an estimate until completion of NOBL runs



Note:



indicates a sun protect attitude is required from start of opening aft shroud door to closing of aft shroud door. The length of the arrow is not to scale of task time between door opening and closing

Notes:

- At the end of ACS Part I, two cards have been removed.
- Aft shroud door open/close for -V2 doors is shorter than the other doors due to LOCKs being installed.
- An additional 55-60 min will be required to complete ACS during EVA 3, without LOCKs installed.

Note: LOCKs (the Latch Over Center Kit) are replacement door latches to be installed to reduce the time it takes to open and close the -V2 aft shroud doors.

JSC EVA/T. Gonzalez-Torres & C. Hansen



KSC Launch Site Operations

- **The four carriers have been configured for storage and bagged**
- **COS was moved to its shipping container**
 - GN2 purge and ion pump operations are nominal
- **Battery Modules were shipped back to Goddard**
 - Batteries are in cold storage
 - An additional discharge cycle was required to let 2 cells down (a total of 3 performed)
- **MULE harness and electrical system was tested and confirmed operational**
- **KSC Team has been reduced to 4 people**
- **First cut at reactivation has activities starting in early March for a May 12 launch**



SI/C&DH Mission Integration

Carriers

- Electrical and mechanical modifications to MULE
- Enclosure design, fabrication, and testing
- Thermal analysis for heater design, EVA transport and landing
- Develop contingency capability for late Pad installation

EVA

- NBL mockups of SI/C&DH-1/2 complete
- Supported NBL 08.9 on November 3-6
- ACS board removal timeline runs scheduled at Goddard in December
- Coordinate additional Crew Fams at Goddard and KSC



SI/C&DH Mission Integration (cont'd)

Tools

- **Selected preliminary tools designs**
 - One planned and one contingency tool
- **NBL versions evaluated last week**

Systems Engineering

- **Updating VLA model**
- **Updating safety assessments and preparing documentation for review**
- **Updating training program for NBLs, SIMs, and JISs**
- **Updating mission documentation**



HST SM4 Development Project Code 442

Scientific Instruments Command & Data Handling (SI/C&DH-2)

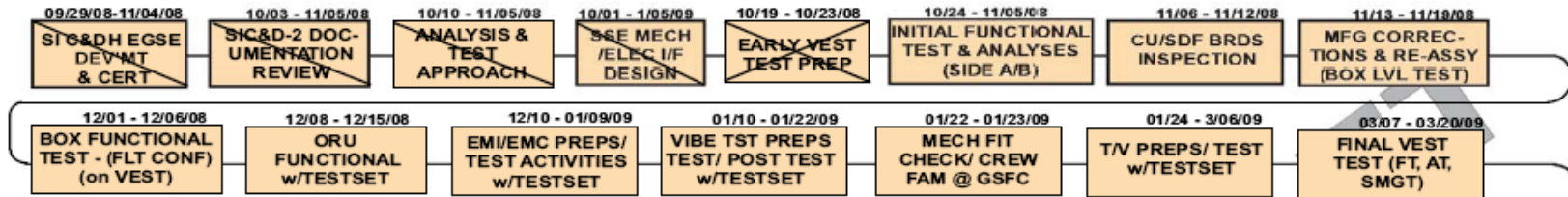
(05/12/2009 Launch Date Plan)

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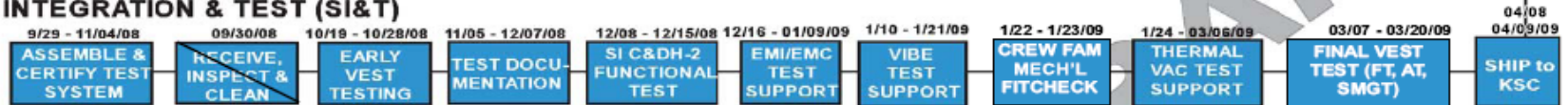


Goddard Space Flight Center

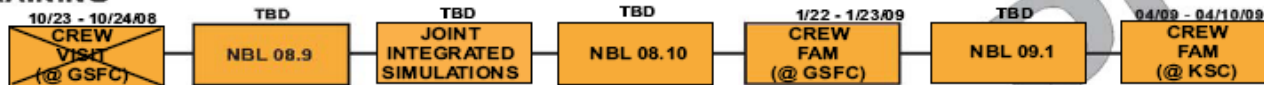
SIC&DH-2 SPACE FLIGHT HARDWARE CERTIFICATION



SYSTEM INTEGRATION & TEST (SI&T)



CREW TRAINING



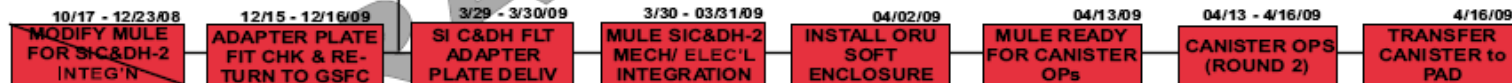
MULE ACCOMMODATIONS FOR SIC&DH-2



SYSTEM ENGINEERING/MISSION DOCUMENTATION



HST OPERATIONS AT KSC



OPS/ SYSTEM 441

