The Hubble Space Telescope Advanced Camera for Surveys: Post-Servicing Mission 4

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Abstract:

Prior to 2007, the Advanced Camera for Surveys (ACS) was the workhorse instrument on the Hubble Space Telescope, accounting for over 70% of scheduled programs. ACS suffered two anomalies in 2006, leading to a switch to the redundant set of electronics. This restored operation of all three channels on the instrument: the Wide Field Channel (WFC), the High Resolution Channel (HRC), and the Solar Blind Channel (SBC).

On January 27, 2007, the instrument was rendered inoperable as a result of a failure of the ACS Side-2 power harnesses, which would defeat restoring the HRC by supplying power to the HRC from the new LVPS using the origin WFC. The repair hardware also provides the possibility of restoring the HRC by supplying power to both the WFC and HRC

The repair will replace the existing WFC CCD Electronics Box (CEB) and power it using a replacement Low Voltage Power Supply (LVPS). While the highest priority is restoring the HRC, the repair hardware also provides the possibility of restoring the HRC by supplying power to both the WFC and HRC

Introduction:

- Installed during SM3B in March 2002, replacing the FOC in axial instrument bay 3
- Powerful 3rd generation HST imager, covering UV/visible wavelengths (115-1050 nm)
- Prime Contractor: Ball Aerospace
- Three imaging channels:
  - Wide Field Channel (WFC): HST’s most sensitive, largest field-of-view (FOV) visible/near-infrared imager
  - High Resolution Channel (HRC): HST’s highest spatial resolution and near-ultraviolet (NUV) sensitivity
  - Solar Blind Channel (SBC): HST’s most sensitive ultraviolet (UV) photon-counting detector

The ACS repair concept replaces the CEB in the WFC. The replacement CEB will be powered by a replacement LVPS that is completely independent of the failed unit. The replacement CEB will communicate with the WFC CEB, as well as with the rest of the instrument for command and data, via the edge connectors in the original CEB. The replacement LVPS draws power from the ACS primary power connectors, accessed via a splitter cable installed by the astronauts. The repair concept also provides a path for restoring the High Resolution Channel (HRC). In this scenario, the repaired LVPS would provide power to the original power bus, accessed at the WFC CEB. The HRC CEB is wired in parallel with this power bus, which means that, in principle, it could be powered up and operated with power from the new LVPS. There is some risk that the fault(s) in the LVPS shared the power harnesses, which would defeat restoring the HRC.

ACS Installation During SM4

The ACS was configured for Side-1 operations using the SBC-only on February 15, 2007

Almost immediately after the January 2007 anomaly, the HST Project assembled a team to examine the options for the repair. In a remarkably short time, the instrument condition was assessed, a repair concept developed, and implementation began for a system that will be deployed during Servicing Mission 4 (SM4) in August 2008.

If successful, the repair will restore all three cameras to full operation after SM4, making them available for the Cycle 17 Call for Proposals.

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Restored State

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