

ACS Status

Ken Sembach

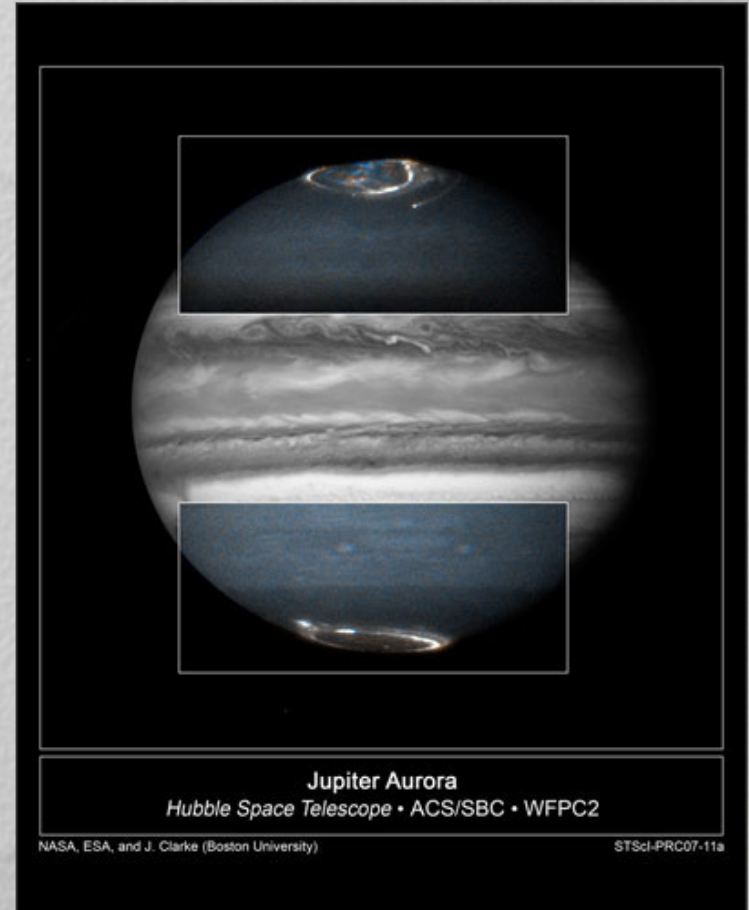
**STUC Presentation
April 12, 2007**

ACS Failure in January 2007

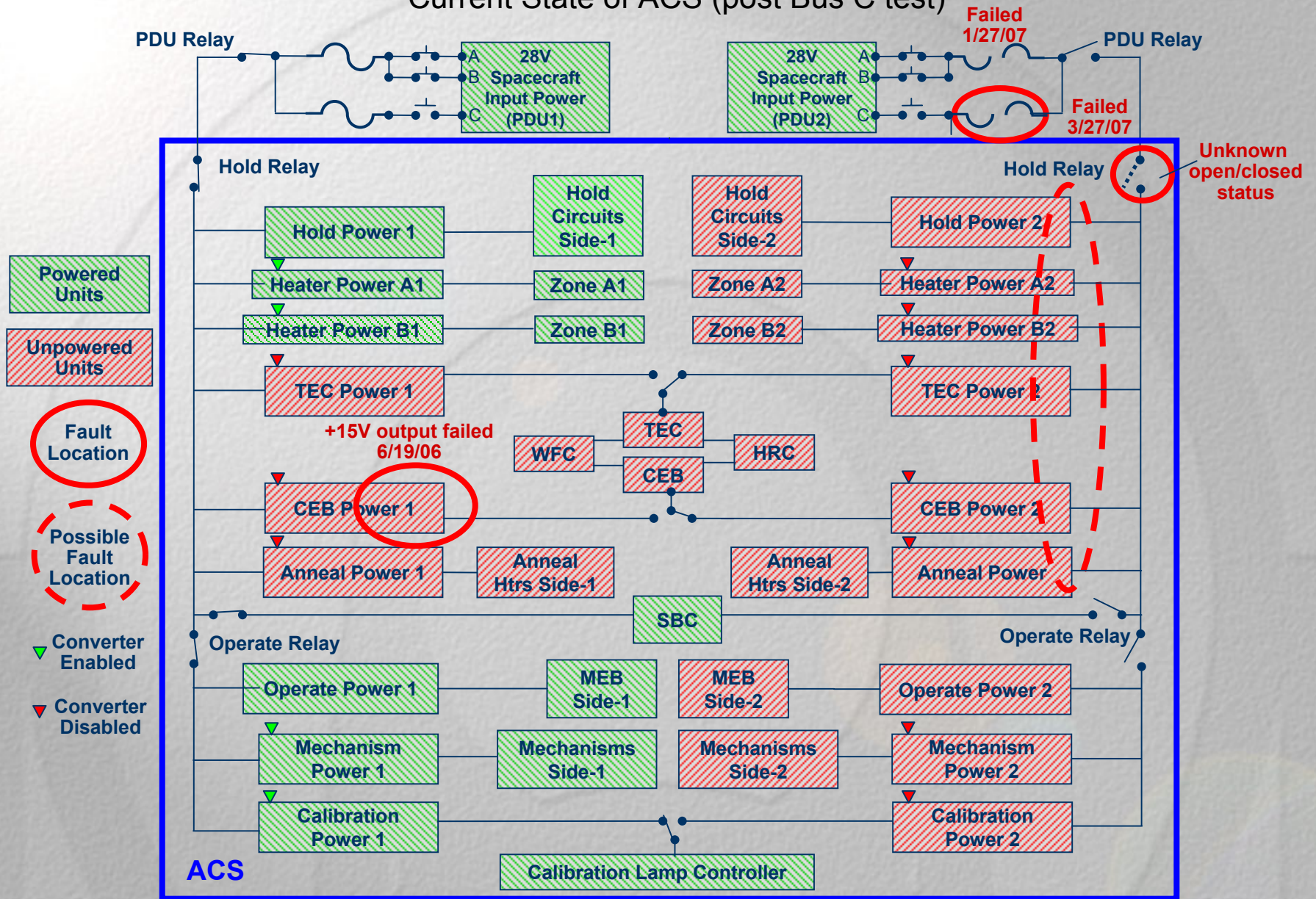
- HST entered inertial hold on Saturday, January 27, 2007
 - All operating instruments were functioning nominally until this time
 - Root cause was an electrical short in ACS, which was operating with its (redundant) Side-2 electronics
 - 📖 Side-1 electronics for the CCDs failed in June 2006
 - 📖 Problem was unrelated to Side-1 failure or September 2006 ACS suspension
- Sequence of events
 - Serious electrical short inside ACS
 - 📖 Location: Low Voltage Power Supply Box or the Auxiliary Power Box
 - 📖 Side-2 Bus A/B 20-amp fuse in Power Distribution Unit blew
 - Discharge of volatile gas from ACS (part destruction)
 - NSSC-I detected anomalous ACS states and safed ACS
 - Total Pressure Sensor in the Aft Shroud detected an increase in pressure
 - 📖 NICMOS Cooling System was safed
 - 📖 FGS high voltage was shut off
 - 📖 Fixed Head Star Trackers were shut off
 - 📖 HST entered inertial hold

Present ACS Status

- At this time, the Wide Field Channel (WFC) and High Resolution Channel (HRC) are unusable
 - Servicing options during SM4 to be discussed tomorrow by P. Burch & D. Leckrone
- Solar Blind Channel (SBC)
 - Operating nominally (recovered February 19, 2007)
 - SBC science accounts for ~10% of ACS observing time in Cycle 15
- Bus-C test executed on March 27, 2007
 - Fuse cleared within ~120 msec (55 A current draw)
 - Mild outgassing, ~1.7% of January event
 - Confirms short is on Side-2 Hold Power circuitry
 - ACS returned to Side-1 SBC operations after test
 - No additional on-orbit tests planned



Current State of ACS (post Bus C test)



ACS Observations and Calibrations

- WFC and HRC
 - Neill Reid will discuss conversion of Cycle 15 ACS programs
- SBC
 - 312 orbits (GO+calibration) of Cycle 14/15 time remained post Side-2 failure
 - ~100 of these were in GO10862 (PI=Clarke) "Comprehensive Auroral Imaging of Jupiter and Saturn During the International Heliophysical Year"
 - 250 orbits (GO+calibration) remain as of April 1, 2007
- ACS calibration impacts
 - Analysis prepared by Ron Gilliland (see accompanying charts)

ACS Calibrations - post Side 2 loss (provided by Ron Gilliland and the ACS Team)

- SBC continues to operate nominally, and we will continue standard approach to calibrations for this.
- Switch to Side-2 electronics was made on July 4, 2006 and included a reduction of the WFC operating temperature by 4 degrees.
- This led to significant changes of QE and flat fields for WFC – most primary calibrations have now been finished, but significant work remains to have the full set of July '06 to January '07 data covered with expected calibration accuracies.
- With seven months of data in PI's hands with the new conditions, it is important that priority be given to obtaining full calibrations of this.
- Significant changes were not expected for the HRC, but work to quantitatively demonstrate this has not been substantial.

ACS Calibrations - post Side 2 loss

- The Cycle 15+16 calibrations were submitted with a planned coverage of December 2006 - June 2008.
- Only a small fraction of the new calibrations executed, primary losses:
 - A new approach to CTE definition of 30 orbits returned no data. It has been three years since publishing the last analyses for WFC. Obtaining the best possible results from extensive calibrations over 2004-2006, although not of the desired style/quality must be our highest priority.
 - Our Photo-Spectrophotometry Absolute Calibration program had observations of M,L, and T dwarfs having STIS+NICMOS spectra. These would have been used to help define QE beyond 900 nm, without this may have extra 3-5% uncertainty in QE in this red tail for WFC after T change. Alternate approaches for this can be explored.
- For primary calibrations on QE changes, flat fields, and geometric distortion after the switch to Side 2 last July we should have adequate data to approach analyses in standard way.

ACS Calibrations - post Side 2 loss

- Critical calibration activities: CTE for both WFC and HRC, flat field for WFC F850LP, QE curve update for WFC post-cooldown.
- High priority calibrations: New L-flats for WFC and HRC (pre- and post-cooldown), verification of HRC properties post Side-2 switch, accounting for time dependent geometric distortion.
- Medium priority calibrations: Biases and darks averaged over 6-month intervals, bias jumps (detection and treatment), internal CTE, flat fields for HRC F220W and F250W, astrometric CTE correction formulae, ramp and grism wavelength updates, ramp sensitivities and flats (outsourced).
- Low priority calibrations: bad pixel update tables, study of pixel-to-pixel QE changes for HRC, WFC quadrant-to-quadrant offsets, hot pixel/annealing study update, PSF and orbit phase studies.
- Active SBC calibrations: geometric distortion update, red leak calibrations and general QE update, color dependent flat fields, SBC darks and QE as a function of temperature, update of L-flats with improved technique, update for time-dependent sensitivity, improved wavelengths for SBC prisms.

ACS Repair Impacts on STScI Work

- Commanding
 - New reconfigurations (e.g., Boot \leftrightarrow Operate)
 - Updated macros to support flight software changes
 - Instrument safing, test SMSs, etc.
- Calibration
 - WFC (and possibly HRC) detectors will need full calibration
 - Noise (bias, dark) may be different than pre-failure performance
- SMOV Planning
 - ACS requirements need to be updated
 - Proposals to test/tune new electronics will be added
- Miscellaneous
 - Documentation (Handbooks, Cycle 17 Call for Proposals, website)
 - Exposure time calculator
 - Parallels development (scheduling and buffer management)