STEREEO Project

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## Technical
- Both Observatories operational. Completed the prime science mission successfully and are now in our first extended mission.

## Schedule
- Routine operations – HGA and instrument cals, momentum dumps.

## Resources
- Extended mission proposal has been accepted and APL is under contract until the end of September 2010.

## Programmatic
- No issues at this time.

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G: No current problem. All commitments can be met

Y: Major problem. Identified solution. Commitment is in jeopardy

R: Major problem. No identified solution. Commitment cannot be met
Operations
- Began automated unattended tracks April 30, 2007
- Operations team is 6 full time staff. Total manpower is approximately 11 MM/M
- Mission operations center collecting greater than 5 Gbits per day in support of the science mission.

Special Observatory Events
- >100 instrument calibration events and roll events
- 22 High Gain Antenna Calibrations
- 50 Momentum Dumps (~every 6 weeks on both spacecraft)

Science
- Over 250 CMEs observed.
- Full 3-D reconstruction on about 2 dozen.
2010

- Apr - 240 kbps Rate Change – AHEAD (7 hr tracks)
- Aug - DSN DCD Transition – replaces CDR
- Sep - SLE TLM Implementation
- Sep - 160 kbps Rate Change (both S/C, 8 hr tracks)
- Nov - 120 kbps Rate Change – BEHIND

2011

- Jan – DSN Service Scheduling Software Implementation
- Apr - 120 kbps Rate Change – AHEAD
- Jul - Update DSN Schedule File Format
- Sep - 96 kbps Rate Change (both S/C)
STEREO Post Launch Problem Failure Reports (PFRs)

STEREO Cumulative Total and Closed Post-Launch PFRs as of 28 February 2010

2 PFRs Remain Open
What we know:
- DOY 2010-027, 07:56z, Star Tracker dropped into INIT Mode and would not promote back to Autonomous Attitude Determination (AAD) Mode.
- Almost identical to event on Behind 2007-355, 10:10z
- Events lasted 0D 12Hr on Ahead and 2D 9Hr on Behind.
- In both cases ST promoted back to AAD mode w/o cause.

Problem if not mitigated:
- Spacecraft cannot ascertain absolute knowledge of attitude
  - Potential for HGA to drift off of Earth.
  - Potential for difficulty re-acquiring GT lock (if it is lost)
  - Spacecraft fails to meet its science roll pointing requirement.

What we suspect:
- A diffuse object (e.g.: Nebulae) in the ST FOV combined with low spacecraft rates are causing issues with transitioning between ST sub-windows.

Mitigation:
- Plan in place to roll the ST FOV into a new part of the sky. This should force the ST to promote.
- Can use knowledge of HGA beam pattern to ascertain roll position allowing MOPS to manually keep the HGA on the Earth.
open pfr #2: pfr st-p-310
ahead roll pointing anomaly

what we know:
– doy 2009-253, 1615z. roll pointing became intermittently unstable causing the spacecraft to lose hga communications.
– problem is associated with bug in g&c version 3.2.6

problem if not mitigated:
– spacecraft randomly loses roll stability causing spacecraft to miss-point the hga
– spacecraft fails to meets it roll pointing science requirement.

what we highly suspect:
– the bug is isolated to new functionality that allows the use of gt data to update quaternion that relates the inertial frame to the gyro frame.
  • this functionality was an enhancement.

mitigation:
– at 1907z, commands were sent to the spacecraft to disable this functionality.
– functionality was also disabled on spacecraft b.
– problem has not appeared since
Telemetry Rates:
Sun-Probe- Earth Angle and Range

Sun-Probe-Earth Angle (Gimbal angle when pointing to Earth)

Date (UTC)
Data Rate Capability with 34m DSN
10 deg elev, 95% weather, nominal attitude, ignores PFD restr.
2 dB downlink margin, ranging on for 633bps to 720Kbps
3 dB downlink margin, ranging off for 12bps and 35bps
6 dB uplink margin (HGA supports 2K throughout)
Potential Solutions

- **HGA Downlink:**
  - ~60 Kbps downlink rate (not standard) will be tested and added to the array of selectable downlinks.

- **LGA Down and Uplinks**
  - *Used in the event of a spacecraft emergency.*
  - *Options:*
    - Configure spacecraft for “EA Bypass”.
    - In the event of an emergency, request “70m and 34m arrayed” tracks.
    - Narrow tracking (Doppler) loop BW on DSN Receivers.

- **Next question:**
  - *Solar Conjunction*
Downlink Power

Total Downlink Received Power to 70m DSN
(10 deg elev, 95% weather)
DL carrier is 4.1 or 9.8 dB lower

-122 dBm lower limit for 360 Kbps
with 3 dB margin
(34 m will support ~ 90 kbps)

-162 dBm lower limit for 12 bps
with 3 dB margin

Carrier only tracking threshold
(1 Hz loop BW, no margin)
Began extended mission January 22nd, 2009
The observatories are in operational mode and about 135 degrees apart.
APL Team activities:
  – Guidance interaction and star tracker anomaly investigation
  – SLE Telemetry testing
  – Internet Security
Continuing to collect science data, averaging about 5 Gbits/day.
Supporting science team any way necessary.

Let us know how we can help