STEREO MOC Status Report
Time Period: 2017:226 - 2017:232

STEREO Ahead (STA) Status:

1. The following Ground System anomalies/events occurred during this reporting period:

   - On day 227, during the DSS-34 support, turbo decoder lock was lost briefly at 0505z and 0532z. This anomaly resulted in the loss of 4 frames of real-time telemetry and SSR data.

   - On day 227, during the DSS-14 support, BOT was 31 minutes late as a result of a waveguide interlock issue at the antenna. Once the interlock was cleared, telemetry was received in the MOC at 1841z and SSR pointers repositioned. All SSR data was recovered. See DR #G118359 for more information.

   - On day 228, during the DSS-14 support, BOT was 52 minutes late as a result of a waveguide coolant leak at the antenna. Once the leak was repaired, telemetry was received in the MOC at 1842z and SSR pointers repositioned. Later, turbo decoder lock was lost intermittently at 1914z through 1917z. These anomalies resulted in the loss of 17 frames of real-time telemetry data only. All SSR data was recovered. See DR #G118362 for more information.

   - On day 230, a Return-To-Service (RTS) engineering demo was conducted with DSS-24. The purpose was to validate X-band tracking performance after the completion of the Membrane Dichroic testing. No uplink monitor data was received by the MOC for the duration of the support. See DR #G118366 for more information. The MOC sent four commands successfully. As the tracking, telemetry, and command data from this support were non-committed, the SSR was not played back and no instrument commands were sent.

2. The following spacecraft/instrument events occurred during this week. The Ahead observatory operated nominally during this week.

   - The average daily science data return for Ahead was 5.7 Gbits during this week.

STEREO Behind (STB) Status:

1. Detailed status of the recovery activities this week to restore operations is listed below.

   - On day 226, during a 3.2 hour support with DSS-14, command uplink was delayed 33 minutes to recalibrate the transmitter. This anomaly resulted in the loss of 3 command segments. A total of 259 commands were transmitted during the support. See DR #G118356 for more information. No carrier was detected by either the DSN station or the radio science receiver team after attempting to power on the TWTA for 30 minutes. Transitioned to battery recovery operations for the remainder of the support which consists of repeatedly sweeping a 4 kHz uplink range and sending commands for IEM switched power and PDU 1553 interface bus off.

   - On day 228, during a 3.7 hour support with DSS-43, 380 commands were transmitted during the support. No carrier was detected by either the DSN station or the radio science receiver team after attempting to power on the TWTA for 30 minutes. Transitioned to battery recovery operations for the remainder of the support which consists of repeatedly sweeping a 4 kHz uplink range and sending commands for IEM switched power and PDU 1553 interface bus off.

   - On day 230, during a 3.75 hour support with DSS-43, 380 commands were transmitted during the support. No carrier was detected by either the DSN station or the radio science receiver team after attempting to power on the TWTA for 30 minutes. Transitioned to battery recovery operations for the remainder of the support which consists of repeatedly sweeping a 4 kHz uplink range and sending commands for IEM switched power and PDU 1553 interface bus off.

2. The Behind loss of communication anomaly occurred on October 1, 2014. Post superior solar conjunction, recovery operations resumed on November 30, 2015. By implementing the NASA Failure Review Board recommendations, the first recovery attempt began with carrier detection by the DSN on August 21st, through September 23, 2016. At a spacecraft range of ~2 AU, the observatory was found to be rotating slowly about its principal axis of inertia for which the uncontrolled attitude allowed some solar array input and continuous uplink and

downlink communications on the LGA at emergency data rates. Over the next 22 continuous days, significant obstacles to recovery were overcome with a collaborative effort of the JHU/APL engineering team, NASA GSFC, DSN, FDF, SSMO scheduling, and Mission Operations teams. This consisted of:

- Reliably commanding a rotating spacecraft with uncontrolled attitude at a distance of 2 AU
- How to power on the spacecraft that was never designed to be off without collapsing the battery voltage
- Acquiring telemetry at 35 bps from a spacecraft that is rotating with an uncontrolled attitude
- Warming a frozen propulsion subsystem with a degraded battery and limited solar array input with an uncontrolled attitude
- Configuring, loading, and verifying EA, C&DH, and G&C parameters and macros with very limited telemetry
- Conducting an autonomous momentum dump in the blind and transitioning to C&DH standby mode and successfully receiving telemetry on the HGA indicating star tracker lock and decreasing system momentum.

However, system momentum level remained above the threshold for re-establishing attitude control with the reaction wheels. Due to the uncontrolled attitude, communication degraded and the last detection of the carrier was on September 23rd.

Behind Observatory Status – From the last telemetry received on September 18th and the telemetry assessment review held on February 24th, main bus voltage is low, 3 out of 11 battery cells are bypassed, attitude remains uncontrolled, rotating about its principal axis of maximum moment of inertia. While likely all ~42 kg of hydrazine remains and is frozen, both pressure transducers are not functioning. EA mode is enabled and autonomy is disabled. The battery charge rate is C/10. RF is configured for the +Z LGA at emergency data rates and the range of the expected best lock frequency is known. Necessary macro sequences have been tested to allow the peak power tracker in C&DH standby mode to protect the battery. These macro sequences will be loaded to EEPROM when the communications supports longer commands.

Based on G&C geometric analysis and GSFC modeling, daily recovery efforts begin on August 21st utilizing a 70m track which consists of attempting to power on the transmitter for 30 minutes. If no carrier signal is detected, battery

recovery operations will commence which consist of repeatedly sweeping a 4 kHz uplink range and sending commands for IEM switched power and PDU 1553 interface bus off.

To evaluate the readiness of the project for recovering the observatory upon the next signal detection, a STEREO Behind Recovery Readiness Review will be held on Tuesday, August 29th, at 9 AM EDT at JHU/APL.