STEREO MOC Status Report
Time Period: 2017:247- 2017:253

STEREO Ahead (STA) Status:

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

   - On day 247, during the DSS-14 support, SLE command and telemetry binds were lost at 1843z. At 1856z, command and telemetry binds were re-established. This anomaly resulted in the loss of 13 minutes of commanding and real-time telemetry data.

   - On day 250, during the DSS-34 support, a DSN project interface test was conducted to validate SLE telemetry server operations and data delivery with SLE software V1.4 As this was a test track, there was no SSR playback or instrument commanding. The MOC configured the primary command workstation to connect to the test SLE server at the DSN with the backup command workstation using the operational SLE server. Each workstation received the same number of telemetry frames for each virtual channel. Four commands were successfully received by the Ahead observatory.

   - On day 253, during the DSS-63 support, turbo decoder lock was lost briefly at 1747z. This anomaly resulted in the loss of 2 frames of SSR data.

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

   - On day 247, the star tracker on STEREO Ahead reset at 11:32:38z. The star tracker was immediately promoted back to AAD mode by fault protection at 247-11:32:57z. Diagnostic data indicated the reset cause was due to a CPU Error, same as previous resets. With no rate data available, a 0.4 degree X-axis roll error occurred which resulted in the loss of fine pointing for a total of 85 seconds, from 11:32:44z through 11:34:09z. This was the 6th star tracker reset on the Ahead observatory since launch.

- On day 249, the 102nd momentum dump was executed successfully at 1730z, which imparted an estimated delta V of 0.108 m/sec. This was the 21st momentum dump that did not use the IMU. After thruster operations complete, there was a 0.42 degree of roll angle error which was dampened out over the next 4.2 minutes. Fine pointing stabilized 2.25 minutes after completion of the momentum dump.

- The average daily science data return for Ahead was 5.8 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 247, during a 3.5 hour support with DSS-14, 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 248, during a 3 hour support with DSS-14, the uplink was delayed due to low transmit power. The transmitter was recalibrated for 20 kW at 1233z and 207 commands were transmitted for battery state of charge recovery. This anomaly resulted in the loss of commanding during the first two frequency segments. See DR #G118420 for more information.

   - On day 249, during a 4 hours support with DSS-14, 440 commands were sent for transmitter carrier recovery. No carrier was detected by either the DSN station or the radio science receiver team. Due to the duration of the support and the increased commands for each step, only 22 of the 36 frequency segments were commanded. Three commands must be received sequentially to power on the transmitter.

   - On day 250, during a 3 hour support with DSS-14, the uplink was delayed 24 minutes due to transmitter calibration issue. The transmitter was recalibrated for 17 kW at 1242z and 280 commands were transmitted during the support. See

DR #G118427 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 251, during a 4 hour support with DSS-14, the maximum transmit power was limited to 16 kW, due to a transmitter calibration issue, and 420 commands were transmitted during the support. See DR #G118430 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 252, during a 4 hour support with DSS-14, 420 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 253, during a 4 hour support with DSS-14, the transmitter tripped off-line for 11 minutes at 1319z. See DR #G118439 for more information. 399 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 from simultaneous failures of star tracker and IMU. 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.