STEREO MOC Status Report
Time Period: 2019:042 – 2019:048

STEREO Ahead (STA) Status:

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

   - On day 044, during the DSS-14 support, turbo decoder lock was lost intermittently at 0113z through 0137z. This anomaly resulted in the loss of 2046 frames of real—time and SSR data. See DR# G119787 for more information.

   - On day 047, during the DSS-63 support, MOC commanding was delayed 30 minutes as monitor data was delayed for 1.7 hours due to an issue with the monitor data server. This anomaly resulted in the loss of 30 minutes of commanding and 1.7 hours of monitor data. All SSR data was received. See DR# N111080 for more information.

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

   - On day 042, the 46th SECCHI stepped calibration was executed at 1015z for the midpoint in the Ahead orbit. This was the 15th SECCHI stepped calibration roll to be conducted without gyro use.

   - The average daily science data return for Ahead was 5.5 Gbits during this week.

STEREO Behind (STB) Status:

1. Four years after the initial loss of communications anomaly with the Behind observatory, NASA directed to cease recovery operations on October 17, 2018.

2. Detailed history and status of the recovery activities are listed below. Additional information can be found by copying and pasting the link below in a web browser:

   https://stereo-ssc.nascom.nasa.gov/behind_status.shtml

- The Behind loss of communication anomaly occurred on October 1, 2014 from simultaneous failures of the star tracker and the 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.

- To re-establish a power positive, 3-axis control of the observatory, system momentum had to be reduced to a level that would allow the reaction wheels to resume attitude control. Significant obstacles that were overcome included reliably command the uncontrolled rotating spacecraft at a distance of 2 AU, powering on the spacecraft that was never designed to be off without collapsing the battery voltage, and warming a frozen propulsion subsystem with a degraded battery and limited solar array input. An autonomous momentum dump in the blind was conducted and telemetry on the HGA indicated 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 telemetry received was on September 18, 2016 with final carrier detection on September 23, 2016.

- From the 283 telemetry packets received during the recovery attempt, an assessment review held on February 24, 2017. It was concluded that the Behind observatory status was as follows: main bus voltage is low, 3 out of 11 battery cells are bypassed, and 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. After all commanded thruster firing had terminated the angle between the angular momentum vector and sun vector steadily increased at ~0.03 deg/min. This tends to further support the hypothesis that something was being expelled.

- In July 2017, with collaboration with GSFC, the recovery plan was revised and 61 procedures were developed and tested. Significant improvements include:
    - Using the –Z LGA as it provides 2 dB more than +Z LGA
    - Recovering in C&DH standby mode to better protect the battery
    - Minimize fault protection usage
    - Close latch valves after each thrusting operation
    - Refined autonomous momentum dump to re-establish 3-axis attitude control
        - Use IMUA as it will leave solar arrays Sun pointing
        - Power wheels on after momentum dump