STEREO MOC Status Report
Time Period: 2015:075 – 2015:081

STEREO Ahead (STA) Status:

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

   - On day 075, during the DSS-43 support, turbo decoder lock
     was lost intermittently throughout the track due to the
     effects of solar scintillation. While the uplink was
     locked, no commands were received. These anomalies
     resulted in 10 no-op and 3 SECCHI commands not being
     received, which were resent on the subsequent track, and
     the loss of 1052 frames (29%) of spacecraft SSR playback
     and real-time data.

   - On day 075, during the DSS-63 support, turbo decoder lock
     was lost intermittently throughout the track due to the
     effects of solar scintillation. This anomaly resulted in
     the loss of 5 no-op, 2 SECCHI, and 2 C&DH commands not
     being received and 761 frames (38%) of spacecraft SSR
     playback and real-time data.

   - On day 075, during the DSS-14 support, the spacecraft
     transponder did not lock uplink until 1843z. The station
     performed a re-sweep at 1855z. Because of the late uplink
     acquisition, all initial no-op commands and PLASTIC
     commands failed to be received; however, 7 of 11 SECCHI
     commands were successfully received. POC queue "Sent"
     commands were moved back to the staging queues and uplinked
     again. For the 2nd transmission attempt, 26 of 30 PLASTIC
     commands and 5 of 11 SECCHI commands were successfully
     uplinked. The turbo decoder lock was lost intermittently
     throughout the track corrupting the Stored Command Buffer
     dump data due to the effects of solar scintillation. These
     anomalies resulted in the loss of 54 commands not being
     received and 595 frames (25%) of spacecraft SSR playback
     and real-time data.

   - On day 076, during the DSS-14 support, turbo decoder lock
     was lost intermittently throughout the track due to the
     effects of solar scintillation. Three attempts were made
     to downlink the Stored Command Buffer image for PLASTIC
     timetag command verification; however, all three sets of
     dump data were corrupted by missing packets lost in

downlink. This anomaly resulted in the loss of 295 frames (8%) of spacecraft SSR playback and real-time data.

- On day 077, during the DSS-63 support, due to the effects of solar scintillation, only 4 of 15 initial NO_OP commands were received by the spacecraft. Two attempts to load instrument power-off timetags failed with only 2 of 10 commands successfully received. The write pointer for SSR partition #7 was successfully reset to 1 to free space for solar conjunction recording; however, commands to reset the write pointers for partitions #6 and #11 were not received by the spacecraft (i.e., 1 of 3 commands successfully received). Out of 9 SECCHI commands radiated, none were received by the spacecraft. These anomalies resulted in the loss of 30 commands not being received and 593 frames (25%) of spacecraft SSR playback and real-time data.

  Note – During days 076 and 077, the strongest geomagnetic storm of this solar cycle occurred with a Kp index of 8.

- On day 078, during the DSS-63 support, due to the effects of solar scintillation, 11 of 15 initial no-op commands were received by the spacecraft. Instrument power-off timetags were loaded and verified successfully. Write pointers for partitions #6 and #11 were successfully reset to 1 to free space for solar conjunction recording. Out of 6 SECCHI commands radiated, only 2 were received by the spacecraft. These anomalies resulted in the loss of 8 commands not being received and 333 frames (14%) of spacecraft SSR playback and real-time data.

- On day 078, during the DSS-14 support, turbo decoder lock was lost intermittently throughout the track due to the effects of solar scintillation. This anomaly resulted in the loss of one no-op command not being received and 333 frames (18%) of spacecraft SSR playback and real-time data.

- On day 079, during the DSS-63 support, due to the effects of solar scintillation an earlier CME emanating from a region perpendicular to the observatory-Earth line, 4 of 15 initial no-op commands were received by the spacecraft. PLASTIC, IMPACT, and SECCHI powered down were verified with SWAVES remaining on for solar conjunction. As SECCHI is powered down, loaded G&C wheel gains parameter (3 of 10 repeated load commands succeeded, 2 of 4 repeated dump commands succeeded). Dumped the Data Summary Table (2 of 2

dump commands succeeded). These anomalies resulted in the loss of 20 commands not being received and 2296 frames (58%) of spacecraft SSR playback and real-time data.

- On day 079, during the DSS-14 support, turbo decoder lock was lost intermittently throughout the track due to the effects of solar scintillation. At 2032z, the 500 bps uplink rate was tested as commanding at a higher uplink rates have a better probability of success. 31 out of 40 commands were received at the 500 bps uplink rate. This anomaly resulted in the loss of 9 no-op command not being received and 657 frames (20%) of spacecraft SSR playback and real-time data.

- On day 080, during the DSS-63 support, turbo decoder lock was lost intermittently throughout the track due to the effects of solar scintillation. This anomaly resulted in the loss of 6 no-op commands, and 132 frames (4%) of spacecraft SSR playback and real-time data.

- On day 080, during the DSS-14 support, turbo decoder lock was lost intermittently throughout the track due to the effects of solar scintillation. This anomaly resulted in the loss of 3 no-op commands, and 8 frames (0.2%) of spacecraft SSR playback and real-time data.

- On day 081, during the DSS-63 support, turbo decoder lock was lost intermittently throughout the track due to the effects of solar scintillation. This anomaly resulted in the loss of 4 no-op commands, and 45 frames (2%) of spacecraft SSR playback and real-time data.

- On day 081, during the DSS-14 support, turbo decoder lock was lost intermittently throughout the track due to the effects of solar scintillation. This anomaly resulted in the loss of 4 no-op commands, and 350 frames (9%) of spacecraft SSR playback and real-time data.

2. The following spacecraft/instrument events occurred during this week. Note that the Ahead observatory is operating on the second side lobe of the HGA to prevent overheating of the HGA feed assembly which is currently at 113 degrees C with the HGA angle at 8.1 degrees, with respect to the spacecraft-Sun line.

- On day 076, the 77th momentum dump was executed successfully at 2300z, which imparted a delta V of 0.106 m/sec. The momentum target was set to 13 Nms vice 15 Nms so as to have a relatively low (~7 Nms) system momentum level while rotating during solar conjunction.

- On day 079, the PLASTIC and IMPACT instruments were powered down at 1600z and SECCHI at 1605z on STEREO Ahead in preparation for superior solar conjunction entry on day 083. The SWAVES instrument remains on as planned.

- The average daily science data return for Ahead, while operating on the second side lobe on the HGA, was 12 Mbits during this week.

STEREO Behind (STB) Status:

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

   - None.

2. Detailed status of the activities that occurred on the Behind loss of communication anomaly, which occurred on day 2014-274, are listed below.

   - The Behind observatory entered superior solar conjunction at the two degree SPE angle on day 022. Recovery efforts will resume post solar conjunction on day 124, May 4th; with implementing the Failure Review Board recommendations and increasing the ground transmit power through arraying uplink stations.

Significant findings to date:

1. Analysis of the three DSN extracted telemetry frames from the carrier signal just before the planned observatory reset/anomaly occurred on day 2014-274, October 1st, showed nominal performance of the spacecraft, i.e., no anomalies, IMU off, and the star tracker providing an attitude solution.

2. Post reset, from the very limited telemetry, three packets, extracted from the carrier signal by the DSN, the X-axis gyro on IMU-A had failed. Unfortunately, this telemetry

contained only G&C anomaly data and no spacecraft summary
data, i.e., the state of the RF, G&C, fault protection and
other subsystems is not known at the time of the
anomaly. With a failed IMU and the star tracker being off-
line for an undetermined duration, the sun sensors will
keep the observatory pointed at the Sun, though the G&C
will not have any roll knowledge, and cannot roll the
observatory as part of the safing configuration to re-
establish communications on the LGAs. From analysis of
this telemetry and initial G&C simulations, it is highly
suspected that the observatory is rotating about the
principal axis of inertia due to an autonomous momentum
dump initiated by biased gyro data flagged good by the IMU,
but this has not yet been confirmed.

3. At least two anomalies occurred post reset, the star
   tracker not promoting to AAD mode and the X-axis gyro
   failure. Unfortunately, due to the number of possible
   combinations, the STEREO fault protection system is not
   designed for simultaneous failures.

The cause and effect analysis of the loss of communications from
the LGAs is continuing. G&C simulations using the biased gyro
data flagged good by the IMU are continuing to better understand
the potential impact to the observatory state. Recovery from a
negative power state is also being investigated. While the
recovery and analysis efforts continue on Behind, as the Ahead
observatory will enter superior solar conjunction in March, the
primary focus of the engineering team is on developing
operational configuration changes to add robustness to the G&C
rate sensor usage to ensure the Ahead observatory's continued
safety.

Once communications are restored and the anomaly resolved, the
Behind observatory will be returned to nominal science data
collection as soon as it is safely possible.