DATE: March 30, 2011

SUBJECT: NSG Guam Architecture/SGSS/TDRS-K Minutes

LOCATION: JSC, Regents Park III

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## INTRODUCTION

Mr. Jim Bangerter convened the March 30, 2011, Network Support Group (NSG) Guam Architecture, Space Network (SN) Ground Segment Sustainment (SGSS), Tracking and Data Relay Satellite (TDRS)-K overview meeting (refer to the presentation, *SGSS Overview*). Please note that a TDRS-K Overview presentation was provided but is only available by permission of Mr. James A. Bangerter, Human Spaceflight (HSF) Network Director (ND).

## MEETING

A. GDIS Overview. Mr. David Glasscock provided a GDIS overview.
   1. GDISR provided serial data between WSC and Guam.
   2. RAID 1 is for logging functions; storing operational software and log files for reliability. Each hard drive has 275 Gb, but if a single hard drive goes down the system is out.
   3. The A and B side are configured at each site. The serial data comes in and is aggregated into IP.
   4. The data goes into the network via the DS3s. There is a primary and backup DS3. If one line is lost, there is automatic failover. Each DS3 is routed via a separate router.
   5. Mr. Glasscock reviewed the status of the STS-133 In Flight Anomaly (IFA). It is believed that IPE 02 is the primary failure site for the 192-bkps and 2-Mbps data. Investigation continues and additional testing is planned. A Contingency Plan for STS-134 is being drafted and will be updated per results of the investigation. Mr. Ben Smith asked if the Orbiter has been cleared as a potential problem source. Mr. Jay Lipford stated that the Orbiter would not be the source due to the fact that problem was only on the 275 satellite IPE data flow. Mr. Steve Sypher stated that the IPE has been in place at WSC since July without issue. There have been no customer problems other than the Space Shuttle. WSC has been unable to find a 'smoking gun' with the IPE. The data was corrupted, but the frame sync was good. The events followed Space Shuttle passes. Mr. Lipford reported that the data showed a massive amount of uncorrected Reed-Solomon (R-S) code errors. Mr. Kraesig stated that the data from the vehicle was good. Mr. Sypher stated that WSC is trying all that it can and is working with RT Logic, but the Orbiter should not be ruled out. Mr. Bob Marriott asked if anything has been learned since STS-133. The majority of issues were with the B-side 2-Mbps data. But there were also problems with the 192-kbps S-band data. The Channel 2 data on the A side was clean. The 192-kbps data was corrupt on both sides. Mr. Bangerter stated that a telecon will be scheduled when the contingency plan is ready. He stated that he did not think this was an Orbiter problem and Mr. Sypher disagreed stating that the Orbiter has not been exonerated yet. He stated that the hoped for resolution should not be pinned on the IPE. Mr. Bangerter stated that further investigation will continue. The network needs to be ready to respond if this is a ground problem.

B. SGSS Overview. Mr. Jim Clapsadle provided an SGSS overview.
   1. The SGSS mission is to implement a flexible and extensible ground segment, maintain the high level of service quality and reliability, accommodate new users and capabilities, and reduce the effort required to operate and maintain the system.
   2. SGSS will meet the mission goals by implementing a modern communications system based on open standards.

3. SGSS has the charter to modernize the SN ground segment while minimizing customer impacts. The SGSS project does not want to disturb the legacy interfaces, services, or data formats. SNAS will be maintained. Mr. Scott Douglas asked if the 4800-bit block format will be retained. Mr. Clapsadle stated that it would if a customer is using it. Customer network interfaces will require only minor changes (e.g., IP addresses, firewall rules, etc.).
4. SGSS will modify the three existing ground terminals: WSGT, STGT, and GRGT.
5. Mr. Clapsadle reviewed the SGSS project organization. Mr. Al Vernacchio is the Project Manager. Mr. Keith Walyus is the Deputy Project Manager. Mr. Tom Gitlan is the Deputy Project Manager – Technical and Mr. Dave Jacintho is the Deputy Project Manager – Resources.
6. Mr. Clapsadle provided a Space Network Ground Segment (SNGS) versus SGSS overview. SGSS replaces a major portion of the SNGS. The SGSS will be designed to function within a context characterized by existing SNGS internal and external physical and functional interfaces.
7. Mr. Clapsadle reviewed the SGSS system architecture.
8. Mr. Clapsadle provided an SGSS system functional summary. The summary provided an overview of the Space to Ground Link (SGL), Digital Signal Processing (DSP), User Services Gateway (USG), Fleet and Ground Management (FGM), Service Management (SM), and Enterprise Infrastructure (EI) functions.
9. Mr. Clapsadle provided an SGSS project status/schedule overview. The SGSS team is currently working towards the System Requirements Review (SRR). The SRR is scheduled for June. Final Acceptance Review is scheduled for late 2015.
10. SGSS will utilize a phased transition approach. SGSS begins with initial hardware and software deliveries to WSC for the SGSS Network Operations Control (SNOC) at WSGT. All antennas and equipment at WSGT will be replaced before starting work at STGT. STGT and GRGT antennas will be upgraded in parallel. One antenna and TDRS at a time will be transitioned, scheduled, and controlled suing the new SGSS system. An Operational Readiness Review (ORR) is required prior to each TDRS transition to SGSS. User scheduling of services for existing customer will continue to appear as it does today.
11. Mr. Clapsadle stated that customer support is necessary for transition and verification for scheduling, command, telemetry, racking, and ranging services.
12. SGSS is committed to communicating project status and issues to management-level customer contacts and soliciting feedback and communicating the incorporation of the customer feedback. Periodic customer interface meetings between the SGSS project and the customer community will be held. SGSS is committed to ensuring that the customers experience a smooth transition to SGSS.
13. Support for the SGSS project will be via the Network Integration and Management Office (NIMO) and the Network Director (ND) (e.g., identifying SN customers, Points of Contact [POC], and coordinating with customers for testing sand transition).
14. Mr. Clapsadle stated that new services will be based on the Consultative Committee for Space Data Systems (CCSDS) standards. The SN does not want to have to build unique services for each customer. The SN would like the customers to build to the SN requirements.

15. Mr. Bob Marriott stated that the JSC Mission Control Center (MCC)-21 concept is similar. JSC does not want to have to build unique interfaces for each customer. Customers will be able to operate out of the MCC-21 or the interface can be extended out to the customer's control center.
16. Mr. Scott Greatorex asked if during the phased approach, one customer could be on each site and it would be transparent to the customer. Mr. Clapsadle stated that the legacy systems will remain with new scheduling system interfaces. SNAS interfaces will be accepted.
17. It was stated that one antenna/one SGLT will be down at a time and Guam will be down some as well. The data system through Guam will not be touched until necessary.
18. The question was raised as to whether loading analysis will be done. Mr. Clapsadle stated that spacecraft will be moved as systems are ready. This is a conservative approach used not to impact the customer.
19. Mr. Jim Cappellari asked if the processing capability will be upgraded. It was stated that this is not known yet. Mr. Cappellari stated that some functions are obsolete and some could be cleaned up. The FDF is looking to make suggestions. Ms. Sue Hoge stated that FDF is working on a list to take to the SGSS project.

C. TDRS-K Overview. Mr. Jim Bangerter provided a TDRS-K/L overview.

1. Mr. Bangerter stated that the presentation was provided by the TDRS-K/L project at GSFC.
2. The presentation was put together because the project is soliciting ISS participation in launch and onorbit testing.
3. Mr. Bangerter reviewed the TDRS System description, TDRS system overview, and TDRS system attributes which provided a high-level introduction to TDRSS.
4. Mr. Bangerter reviewed the TDRS system elements which provided more detailed information. The diagram illustrated the legacy TDRS constellation and the future spacecraft. TDRS-K/L are similar to the current spacecraft with a combination of services. The spacecraft will have all legacy services and MA beam forming will be on the ground again. The new spacecraft will be capable of higher data rates on the MA services.
5. Mr. Bangerter reviewed the TDRS-K satellite (deployed) diagram.
6. Mr. Bangerter reviewed the TDRS-K project overview for users. There will be two new satellites. Modifications will be made to the ground systems. There will be NCCDS database updates for TDRS-K/L for scheduling. There will also be FDF updates for TDRS-K/L for relay and orbit determination services.
7. Mr. Bangerter reviewed the improved communications performance. The new generation of satellites will provide higher SA S-band and Ku-band EIRP, higher MAF EIRP, higher telemetry EIRP, more return signal margin, increased FOV for autotrack, and improved MAR performance. The capability will exist to support multiple MA users on the return service. This will help with ATV and HTV support. It will not be possible to support Ka- and Ku-band forward user simultaneously.
8. Mr. Bangerter reviewed the TDRS-K return frequency plan.
9. TDRS-K launch is currently scheduled for NET April 2012. TDRS-L launch is scheduled for February 2013. There will be 14 days of engineering testing and user

support is being requested. ISS will be requested to identify passes where there is no critical activity taking place.

10. The TDRS-K/L have a spacecraft mission life of 15 years after In-orbit Test Phase (IOT). The storage phase includes up to 4 years of onorbit storage for future utilization.
11. Mr. Bangerter reviewed the onorbit test schedule overview and Level-6 test summary. The test summary includes items that would not involve the ISS and are noted and 'Not ISS'. ISS is not being requested to test MA or Ka-band services. The project may ask for ATV and HTV support if they are onorbit at the time.
12. Mr. Bangerter reviewed the overlap visibility between 171 and TDRS-K for Level 6 testing diagram.

**ACTION ITEM REVIEW**

No action items were assigned at the March 30, 2011, SGSS, TDRS-K, and Guam architecture overview meeting.

(Original Approved By)
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