

Subject: Ops TIM  
Date: October 28 & 29, 2003  
Location: GSFC Room E280, Bldg 14  
Attendees: M. Rackley, D. Small, M. Davis, D. Spiegel, M. Woodard, R. Cox, B. Wagner, J. Nagy, J. Degumbia, E. Canevari

Agenda topics are in **bold**:

### **LEO Timeline (Mark Davis)**

*1st Cut 9:15 10/28*

- Spectrum held an internal review which resolved initial issues on the first day of the timeline. The first day activities include all deployments.
  - Once GLAST is power positive, LEO activities will be intertwined between the spacecraft and the instruments.
  - Spectrum lead engineers will be here for support for a period of time during LEO.
  - Spectrum will be able to access level 0 data from ITOS web server.
- Ground stations will be scheduled for dumping engineering data. The Ku antenna will not initially be deployed. The ground stations will also be scheduled since Ku is attitude dependent.

*2nd Time*

- Talked through Mark Davis's slides
- Information is still needed for the initial slide concerning activities at KSC.
- \*\* Mark to inquire why separation takes so long.
- May want to move the GPS or Ku-band antenna deployment out to Day 2 since it is more of an instrument activity.
- Spectrum will have a prime shift and a replan shift for LEO.
- The GDS Team will need to determine if the MOC will need to see data from KSC and then from the spacecraft after launch through separation?
- The GDS Team will need to determine if the spacecraft has the option to propagate orbit ephemeris versus using GPS data once GPS is turned on?
- The GDS Team will need to determine how to be able to demonstrate auto-repoint on-orbit without relying on LAT.
- The GDS Team will need to determine if LAT has a test command to verify auto-repoint and burst msg.
- DTAS will be available for parameter level data analysis.

### **KSC ground/ops-related activities**

*1st Cut 9:35 10/28*

- Howard and Mike updated the drawing.

### **Space/Ground ICD (MOC portion)/CDRL 4 (Reviewed Mike's walking around schedule)**

*1st Cut 9:36 10/28*

- The GDS Team will need to look at maturity and level on content for all CDRLs. Mark has preliminary draft of CDRL 4. This should include performing a content review of the GLAST version versus the Swift version to ensure nothing is missing.

- With Spectrum schedule changes, the GDS Team will need to determine the rippling effect on all ground system activities. What impact does CDR slipping have on ground system development. GRTs are to remain fixed while ETEs will move along with project schedule.
- More specifically, the CDRLs are contractually tied to dates such as CDR, and changes in those dates have potential effect on the ground system activities.

### **Observatory Ops Description Manual (OODM)/CDRL 5**

*1st Cut 9:48 10/28*

- The Spectrum version of a proc will need to be signed off during intermediate releases of OODM.
- The GDS Team will develop the approach for Spectrum to concur. How does FOT get dynamic updates to the CDRL (i.e. how does Spectrum provide interim procedure releases)? The FOT will provide Mark with a potential process. Mark will bring it back to SAI for review. The MOA will be used to document the process (AI E. Canevari). Doug would prefer an on-line database for procedures and PROCs (i.e. Docushare). Determine how documents will be managed and work out the logistics of how to ensure procedures are up to date.

### ***Other Ops Documents***

*9:52 10/28*

- Flight Ops Plan vs Mission Ops Plan. FOP the SAI catch all. Mark has used Swift as a draft, get soft copy.

### **T&C Database**

*1st Cut 9:54 10/28*

- Part of validation would be matching bit patterns of commands sent from the MOC versus being sent from I&T (verification that the MOC is issuing the proper patterns). Need to determine HotBench fidelity for validation purposes. Once issues with ingest process is resolved, Ernest will need to incorporate the details into DFCD. What are the limits to AstroRT vs. ITOS. Is there a preferred way to populate ITOS without causing any AstroRT ingest problems. Ernest will work with GBM and folks to determine resolution of ingest issues.

### **PROC development/Validation**

*1st Cut 10:01 10/28*

- Philosophy will be in MOA with responsibilities. MTS vs Hotbench in use of product validation. What does validation mean? How will instrument PROCs be validated which will be used in observatory testing? MOA should contain validation philosophy while MOP has the process.

- Process will be in Mission Ops Doc.

*2nd Time*

- CM Process will be a ground system/ops CCB process.
- The MOC CM system will be used and will be in place for GRTs, ETEs, etc
- At minimum, the CM system will be used for procs used against the spacecraft.
- Procs will be considered officially validated once they are executed against the HotBench or the spacecraft.
- The MTS is intended for use during initial proc development and test.

- The CCR process must allow CCR submitter to attach supporting data.
- For Proc/Procedures to be documented in MOA a CCR will be used. CCRs can accumulate for next CDRL delivery, but once CCR is approved, the FOT can move forward with updating PROCs.

**Hiatus period planning for ground system/ops (Mike) (Mike supplied e-mail of minutes)**

*1st Cut 10:07 10/28*

- The GDS Team will need to sufficiently resolve so that Spectrum can cost efforts. Reviewed minutes of the hiatus meeting.

*2nd Time*

- Reviewed Mike's e-mail minutes.
- PDB will be inspected to ensure that instrument APIDs are within their allotted range.
- Instrument supplied database will NOT BE used with the spacecraft.
- Spectrum will be getting instrument databases from IOTs during spacecraft I&T.
- \*\* Mike Rackley to inquire when instrument simulators are expected at SAI and initial database input.

Schedule:

- Initial tests would begin May 2005 timeframe.
- Requirements to begin testing -
  - Testing with Spectrum simulator.
  - 8 - 3 months prior GDS/SAI will determine which procs to be exec.
  - 2 months prior SAI supplies procedures to FOT.
  - Initial procs must be ready.

- Procedures can then roll into the OODM.
- Testing will be completed by November 2005.

GOAL: To facilitate using HotBench, the FOT should be capable of running HotBench by end of bus I&T.

Simulators –

- Will need CTS no later than 2/05 for Hiatus Period testing regardless of schedule.
- Doug would like to have the CTS no later than the currently scheduled January 28th date for MOC release 1.
- CTS will be installed at Omitron lab.
- Will need to work issues: Where CTS and MTS will be delivered and how will the Omitron and MOC systems access the simulators.

\*\* Doug to review MOC release development plan and schedule to ensure reflection of availability of complete system in MOC facility.

\*\* Mark to determine amount of independence FOT will have with HotBench.

- HotBench will require minimal level of support to answer questions.
- HotBench will require assistance in troubleshooting 3 x 24 = 72

- HotBench will require 72 run time
- LAT HotBench simulator will request 24 hours
- GBM HotBench simulator will request 24 hours

Personnel –

- Will need personnel to support/review procs, ...

Spacecraft -

Primary goals are : validate as much of the MOC interfaces with the spacecraft as possible to understand how the subsystems work. (The spacecraft to ground ICD). Procs will be operationally oriented but not necessarily used in operations.

The goals would include RT HK tlm and RT commanding, stored cmd load build/uplink, memory/FSW load receipt/packaging/uplink, memory dumps, SSR dumps.

Secondary goals are: burst telemetry (with HotBench), diagnostic data, and ground based attitude determination.

Estimating 20 procs with 4-5 hours to cycle spacecraft up and down -> 5 procs per day. Need minimum of 32 hours of usable spacecraft time. This does not include SAI's bring-up and take-down time.

\*\* Mark to talk to Lisa and get a feel for how much time she had to put into the Swift MOR as well as how much support she needed from others at Spectrum.

- Hiatus period testing allows ETE test to have additional operation flavor.
- In addition will need support for proc development and other ETE preparations.

### **End-to-End Tests**

*1st Cut 10:09 10/28*

- Need more meat for test goals to incorporate into Test Plan
- Spectrum was concerned about who is leading the testing efforts.
  - FOT will lead script and proc development.
  - Spectrum has lead on overall effort and final say on all matters.
- Requirements will be in Ground System Test Plan.
- ETE is any test that involves the ground system and the spacecraft. ETE 1 should not wait for instrument ship. MOA describes the roles and responsibilities. Define titles in MOA test/director/conductor and put in organization chart hierarchy.

### **End-to-End Tests (continued)**

*2nd Time*

- Assume that there is a roof top antenna
- In general, TDRSS will be used.
- \*\* Bruce to include drawing for ETE tests.

### **Mission Ops Simulations/Rehearsals**

*1st Cut 10:24 10/28*

- Deleted from agenda

## **Simulators**

*1st Cut 10:25 10/28*

- Eric had lead and John Teter taking over for Project lead.
  - Mike will deliver comments from MTS simulator splinter. Walkthrough with Mark on the scope of the requests and work beyond scope issues with Teter.
  - Project will not pay for second HotBench. When will HotBench be available to the FOT? Need a statement for the number of hours of availability. No discussion on effect of slip on delivery of simulators.
  - For an 8-hour test, a 24-hour minimum is required to prepare for a test. Will need 3 x the Hotbench time for each 1x of ETE.
  - The CTS does not exist but will get an early version of MTS with minimum capabilities. Proposed deleting CTS and getting an earlier version of MTS.
- Need to trace dependencies of the MOC release 1 – integrated schedule with external dependencies

*2nd Time*

- Instrument models need to use the HotBench for proc validation.
  - Need instrument capability on MTS.
  - \*\* Omitron will develop requirements for instrument simulation capabilities on MTS. Work with GSOM to incorporate with other comments.
  - \*\* Ross will incorporate comments and take to CDRL meeting.
- MTS is tied to ETEs for proc development. Would like to have at least four months between MTS delivery and first ETE.

## **Diagnostic Data**

*1st Cut 10:40 10/28*

- Mark has charts for later

*2nd Time*

- Similar to Swift
  - Types are:
    - File System Directory contents
    - Dumps
    - SSR, GPS, and 1553 command responses
    - Star Tracker CCD Image
    - Telecommand and codeblock log
    - Event and console messages

- Console messages are generated by FSW about command out of range for example.

\*\*Mark Davis to create a draft list of tools to be provided that will integrate with ITOS to troubleshoot diagnostic data.

\*\* Mark Davis what are command echoes?

\*\*Mark Davis to confirm that time stamp on commands is time of execution.

- \*\*Mark D. Verify if filtering is done on the generation side or the dump side
- \*\*Mark D. Confirm which channel S-band diagnostic comes down on?
- \*\*Mark D. Update VCID table containing FOT mark-ups with Jonathan Yount.
- \*\* Doug to propose how to document the tools and their functions being provided by Spectrum and the MOC interface to the tools.

- VC11 includes safe mode telemetry.

### **Safe Mode**

*1st Cut 10:41 10/28*

- Mike passed out paper.
- Mark Davis has contingency tree from Swift. What does the spacecraft plan to do and what does it expect the ground to do?

### **Ku-band data handling approach (Howard)**

*1st Cut 10:42 10/28*

- How to handle the 40Mbps stream during I&T.  
MOC will be implementing front end for WSC. Kronberg? Contractor for high rate data cards.
- Ron Zitek should be involved

### **Science Data handling in Observatory I&T**

*1st Cut 10:44 10/28*

- Ron Zitek should be involved
- BOX at Spectrum which is front end for MOC and then ship to KSC for launch. Eventually become WSC spare?
- Walked-through WSC GLAST WAN architecture.
- If HotBench remains at the SAI facility, will the MOC need access to 40 Mbps stream? Go only S-band? Project believes FSW maintenance will have HotBench for long term. FOT will need continued access for PROC validation and contingency support. If it remains at SAI, will FOT still have access?

### **Potential APID range allocation**

*2nd Time 11:06 10/28*

- LAT looking for additional HK APIDs
- We need to determine what diagnostic is and exactly why LAT will need more HK.
- \*\*Mark Davis will close issue by switching HK and Diagnostic. HK =224, Diag = 96 for both LAT and GBM.
- \*\*Ross to investigate how LAT is planning on populating APIDS and what they will use Diagnostic APIDs for.
- \*\*Ross to verify with LAT if they are issuing alert data on VC11.

### **Virtual Channels**

- Discuss Mark Davis's e-mail and how to apply operationally.
- Anything that will need to be decommutated by the MOC must be parameter data (i.e. – HK, not table/memory dumps) that are defined in the database.

- MOC will sort either by individual APIDs or groups of APIDs and deliver Level 0 file.
- MOC will not merge data from different APIDs.
- Spacecraft event messages are handled uniquely with separate tool from Spectrum.
- \*\*Investigate if and how any diagnostic data will need to be handled/processed in real-time.

- VC 10 - 1, 2, 4, or 8 kbps via S-band

\*\* Mark Davis to inquire as to why VC10 is called out separately from VC1.

\*\* Mark Davis to inquire if FOT can command MAF with MAR is still supported and at what rate. How is rate determined for MA?

- VC 0 should read real-time observatory telemetry.
- Will add "real-time" on VC 1
- Will add "real-time" on VC10 and VC11

### **GPS failure Contingency Planning (Ross)**

*1st Cut 11:08 10/28*

- No mission requirements without GPS, what does science require without GPS? Provide concept at CDR for degraded ops. Time is currently the issue since orbit seems to be addressed.
- DOWD looks feasible with 85 to 300 meters for accuracy.
- Ross talking to Al Levine and looking into loading from scheduling TDRSS for performing DOWD.
- The GDS Team will need to learn more about the transponder to determine the benefit of using SSA vs MA.
- Time accuracy is still a concern for impact to science.

### **Ground Station trade (Howard)**

*1st Cut 11:17 10/28*

- \*\* Howard has action to determine requirements. What, when, and why does SAI need to know?
- Which ground stations will FOT use? Mila upgrades, Wallops and Donara interference: All have comparable S-Band range and link margin. Will this affect SAI ICD? This should not be a design driver for Spectrum. Perform 10m Hawaii as minimum baseline and nothing worse.

### **Ground system/Ops documents status/plans/etc. (Mike)**

*1st Cut 11:22 10/28*

- Ernest generated MOA in rough draft form.
- The Test Director and such positions will be incorporated.
- Jack Leiber as Mission Manager in MOA? Who is the launch director etc? Will the Swift model be used?

## SUMMARY OF ACTION ITEMS

- 1) Mark to inquire why separation takes so long.
- 2) Mike Rackley to inquire when instrument simulators are expected at SAI and initial database input.
- 3) Doug to review MOC release development plan and schedule to ensure reflection of availability of complete system in MOC facility.
- 4) Mark to determine amount of independence FOT will have with HotBench.
- 5) Mark to talk to Lisa and get a feel for how much time she had to put into the Swift MOR and how much support she needed from others at Spectrum.
- 6) Bruce to include drawing for ETE tests.
- 7) Omitron will develop requirements for instrument simulation capabilities on MTS. Work with GSOM to incorporate with other comments.
- 8) Ross will incorporate comments and take to CDRL meeting.
- 9) Mark Davis to create draft list of tools to be provided that will integrate with ITOS to troubleshoot diagnostic data.
- 10) Mark Davis what are command echoes?
- 11) Mark Davis to confirm that time stamp on commands is time of execution.
- 12) Mark D. Verify if filtering is done on the generation side or the dump side
- 13) Mark D. Confirm which channel S-band diagnostic comes down on?
- 14) Mark D. Update VCID table containing FOT mark-ups with Jonathan Yount.
- 15) Doug to propose how to document the tools and their functions being provided by Spectrum and the MOC interface to the tools.
- 16) Mark Davis will close issue by switching HK and Diagnostic. HK =224, Diag = 96 for both LAT and GBM.
- 17) Ross to investigate how LAT is planning on populating APIDS and what they will use Diagnostic APIDs for.
- 18) Ross to verify with LAT if they are issuing alert data on VC11.
- 19) Investigate if and how any diagnostic data will need to be handled/processed in real-time.
- 20) Mark Davis to inquire as to why VC10 is called out separately from VC1.
- 21) Mark Davis to inquire if FOT can command MAF with MAR is still supported and at what rate. How is rate determined for MA?
- 22) Howard has action to determine requirements