Monthly Cost/Schedule/Mission Review

GLAST LAT Calorimeter
June 2, 2004

W. Neil Johnson
Naval Research Lab
neil.johnson@nrl.navy.mil
Outline

Technical Status:
- Last Month's Accomplishments
- Near-term Milestones & Status towards them for next 3 months (from F2F)
- Drawing Release Plan & Status required to achieve production milestones
- Summary of issues & concerns
- Status of Subsystem's Documentation & qualification program

Cost & Schedule
- Variances
- Actions required to retain zero schedule variance
CDEs

- **CsI Crystals**
  - To date Kalmar has delivered ~1443 tested crystals to NRL. They have received ~1800 (out of 1950) from Amcrys-H. Approximately 100 crystals have been returned to Amcrys for non-compliance.
  - NRL has corrected light taper on ~150 crystals that did not meet spec.

- **PIN Photodiode Assembly (PDA)**
  - ~ 3300 (out of 4800) flight PDAs have been manufactured, tested and delivered to Swales.

- **CDE Assembly Process**
  - 864 CDEs have been bonded at Swales
  - Wrapping, capping and acceptance testing is recovering from an early delay in availability of end caps.
  - 804 have been wrapped and capped
  - 680 have been tested and delivered to NRL
  - The planned production 60 CDE per week is well within capabilities
## Significant Accomplishments

### May 2004 (2)

- **Composite Structure Manufacture – LLR Ecole Polytechnique**
  - Ten flight structures have been manufactured (#3 - #12).
    - Expect to complete 2 more before June 9 when prepreg expires.
    - New prepreg, cut and kitted, will be available end of June.
  - Seven of these have successfully completed strength verification vibration test.
  - Six of these are at NRL.

- **Structure Assembly – NRL**
  - Titanium stand off for TEM/TPS have been manufactured and plated.

- **PEM Assembly**
  - Four PEMs have been completely assembled.
  - All four have completed cosmic muon verification testing with the EGSE checkout electronics.
Significant Accomplishments
May 2004 (3)

AFEE Electronics

- **ASICs**
  - 85 GCFE and GCRC with GSE have been delivered to GSFC for qualification.
  - All radiation testing complete, no issues. Draft report on TID has been circulated to GLAST radiation test team.

- **AFEE-TEM interface cable.**
  - 16 copies of the AFEE-TEM cable have been received.
  - Minor design mod’s have been made (and verified) to avoid potential stay clear violation
  - 1st production deliveries early in July.
  - Mechanical support and shield for AFEE cable have been released for fabrication.
AFEE Electronics (cont)

- Flight AFEE (X & Y) have been manufactured.
  - Six of each PCB fab’ed at two vendors. Coupons have been delivered to GSFC.
    - Neither vendor’s product is perfect. Nick is investigating quality control issues with both vendors and will select one for production run.
  - All flight parts have been delivered to assembly vendor.
  - Virmani and Raynor have visited assembly house for process inspection and witness of 1st article board assembly.
  - 10 boards have been SMT assembled; two of these should arrive at NRL today.
  - Release of remaining boards awaits 1st article test completion.
### CAL Near Term Milestones

**GLAST Calorimeter**

**Monthly Cost / Schedule / Mission**

**May 2004**

**Naval Research Lab**

**Washington DC**

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Path to first flight CAL Module (FMA)

GLAST Calorimeter

Completion Dates (Float)

- Dual PIN Photodiode
  - NRL
  - 12/03/03

- Crystal Detector Elements (CDE)
  - NRL/Swales
  - 2/09/04

- CSL Crystals
  - Sweden
  - 08/13/03

- Carbon Composite Structure
  - AL base, closeouts, plastic parts
  - LLR/Ecole Polytechnique, NRL
  - 03/11/04

- Pre Electronics Module
  - NRL
  - 04/29/04

- Analog Front End Electronics (AFEE)
  - NRL
  - 06/18/04

- ASICs
  - SLAC, NRL
  - 03/22/04

- Other EEE parts
  - Parts Qual/Screen
  - NRL
  - 05/10/04

- Tantalum Caps
  - NRL
  - 05/10/04

- PCB
  - NRL
  - 05/24/04

- Ready for Integration (RFI)
  - 09/07/04
  - [BL: 07/09/04]

- Calibration Environmental Test
  - NRL
  - 08/27/04

Critical Path in Red

- EM2 TEM/TPS
  - 06/29/04

- Cal Module
  - NRL
  - 07/08/04

Monthly Cost / Schedule / Mission
May 2004
New Impact on FM A Delivery

TVAC
- This schedule includes TVAC of FMA alone
  - unplanned cost, but improves delivery by about 2 weeks.

AFEE Boards
- Boards from both vendors showed quality flaws that are being reviewed with vendors. Incoming inspection selected best boards for assembly.
  - Non-uniform solder flow, under-etch of copper and other visual inspection issues.
  - Coupons are at GSFC for evaluation.
- Production run – 108 boards – on hold until electrical test of 1st articles
- 1st article AFEE boards are being assembled in parallel with coupon inspection.
- 4 of 1st articles assumed usable for FMA module. Potential for another 3 – 4 week schedule impact, if they can’t be used.

EM2 TEM/TPS – apparent critical path
- Prior to TEM/TPS use with CAL Flight Hardware
  - Perform workmanship vibration test on each TEM/TPS
  - Burn in each TEM/TPS with load for at least 48 hours at maximum permissible temperature.
  - TEM/TPS functional test procedure
  - CAL – TEM safe to mate procedure.
## Flight Hardware Drawings

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<td>AFEE Cable support &amp; shield – 3 parts.</td>
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<td>PEM Assy</td>
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<td>Structure</td>
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<td>Includes CAL-TEM stand off</td>
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<td><strong>42</strong></td>
<td><strong>42</strong></td>
<td><strong>100% Complete</strong></td>
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Issues and Concerns

AFEE Assembly
- Verify design and manufacturing process with 1st article tests.
- Release production build

Current TVAC cycle time breaks budget (schedule/cost by ~40%)
- TVAC test plans are being reviewed.
- Likely cost increase of $130K ($50K in FY04) required to cover additional duration of 8 TVACs.
Documentation and Qualification Program

- CDE manufacture and test procedures – 100% complete
- Composite Structure manufacture and test procedures – 100% complete
- PEM Assembly and Test – 100% complete
- EEE qualification and screening procedures – 100% complete
- AFEE PCB manufacture and assembly
  - Procurement specifications – 100% complete
  - Parts lists and assembly drawings – 100% complete
  - AFEE functional test procedure – 90% complete.
- Module Assembly and Qualification/Acceptance
  - EM versions of procedures exist from EM qualification program. Need modifications for flight protoflight/acceptance testing.
  - Working on new EMI/EMC test procedure to meet recent direction
Cost Variance: + $594 cum ( -$157 for April)
- +270: Mgmt, Eng, R&QA, ~ 1 FTE labor, rest travel
- +290: CDE Manuf.
  - PDA manufacturing - materials cost underrun.
  - CDE manufacturing - labor underrun (+230)
- +29: PEM
  - Invoicing delay in facilities preparation
- -82: AFEE
  - Much higher labor costs balanced by savings in GSE materials
- +5: Module Ass’y & Test
- +61: GSFC allocated funds
Schedule Variance: - $767 cum (-284 for March)

- 104: CDE Manuf.
  - Stopped bonding CDE for about 1 month due to lack of end caps to complete CDEs. Material storage problem. (No issue: CDE manufacturing is weeks off of the CAL critical path)

- 167: PEM
  - Delay in delivery of 1st composite structures.

- 340: AFEE
  - Delay in delivery of ASICs causing delay in screening and qualification work
  - Problems in manufacture of AFEE PCB.

- 137: Module Assy & Test
  - Delay in electronics delivery for module A&T