SDT #3

WFIRST-AFTA Telescope Status

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Outline

- **250K Operation Evaluation/Risk Reduction Tasks**
  - Completed Tasks
  - InProgress/Planned Tasks

- **FY14 Plans**
  - Plans include expanded scope given increased funding from NASA

- **Current Schedule**
250K Operating Temperature Evaluation
/Risk Reduction (Completed)

• Cold Test of Composite Engineering Test Units (reported at SDT#2, Completed Oct, 2013)
  – Successful cold box test results show no observed damage that would affect the stability and strength of the test articles after thermal cycling from room temperature down to 235K.

• Test Coupon Inventory (Completed Feb, 2014)
  – All available test coupons of laminates from the FOA and OBA have been inventoried in preparation for additional testing at operating temperatures.

• CTE Measurements of laminates from room temperature down to 235K. (Completed Mar, 2014)
  – See summary on Slide 5
• Measure **mechanical properties** of existing laminate coupons @ room temp after thermal cycling (in progress)
  – “Exelis is on plan to measure the tensile modulus and strength of the FOA laminates once cycled to the mission temperature to ensure structural integrity. This task will be complete by mid-April.”
  – This measures composite strength at launch following numerous thermal environmental tests.

• Test **adhesives** used in laminate-to-laminate and laminate-to-metal bonds, both before and after thermal cycling (using existing laminates) (FY14)
  – This measures adhesive quality at launch following numerous thermal environmental tests.

• Measure **mechanical properties** of existing laminate coupons @ 250K after thermal cycling (FY14)
  – This measures composite strength on orbit following numerous thermal environmental tests.

• **Bond Joint Testing @ 250K (FY14-FY16)**
  – Fabricate laminate test coupons in preparation for Bond Joint Testing @ 250K (FY14)
  – Fabricate metal fittings in preparation for Bond Joint Testing @ 250K (FY15)
  – Test Bond Joint coupons @ 250K after thermal cycling (FY15/FY16)
  – Can be completed in FY15 if funding allows
Laminate Coupon CTE Measurement Status

- “Representative samples for each of the 8 unique laminate types on the FOA were tested to determine room temperature CTE and CTE at the expected mission temperature. All samples were tested at room temperature to form a baseline to compare against historical measurements.”

- “The measured CTE for all laminates was the same as the measured CTE when originally fabricated within the test uncertainty.”

- “Strain was measured over the entire temperature range from room temperature to the expected nominal mission temperature so CTEs can be determined at any temperature within this range if desired. The CTE acceptance criteria range for each laminate is used as a basis for Monte Carlo analyses used to verify FOA optical performance.”

- “For 50 of 51 coupons, the measured CTE of the FOA laminates at the new mission temperature fell within this the original acceptance criteria range for the laminates as designed. This data along with the temperature dependent mechanical properties for the other materials in the FOA (metal, glass, adhesives) will allow the FOA performance predictions to be updated.”

- “The coupon that exceeded the design acceptance range was within 2%.”
FY14 Plans

- Develop draft FOA/OBA delivery schedule (in progress)
  - This is part of Integration, Verification, and Validation planning.
  - Will identify all tasks and tests needed to successfully deliver the FOA/OBA to Payload AI&T.
  - Will be “grassroots” cost & schedule based on both planned and actual build schedules from original program.
  - Detailed plans will help reduce uncertainty and cost estimates

- Develop Telescope/Instrument-SC Interface Configuration Document (ongoing task)
  - Obtain existing ICD documentation and
  - Create new ICD documentation based on WFIRST-AFTA design

- Primary Mirror V&V planning

- Telescope/Payload AI&T Verification planning
  - Possible use of phase diversity wavefront sensing
FY14 Plans (cont)

- Refine MEL of FOA/OBA to reflect detailed existing hardware (both flight and GSE/STE) and build-to-print replacement electronics
- Update thermal and FEM models with measured CTE values
- Comprehensive Telescope STOP analysis at 250K operating temperature
  - Includes measured material CTE properties
  - Thermal control design at 250K
AFTA-WFIRST Telescope Schedule FY14

*Inclusion of expanded FY14 work pending; will be added to schedule soon.