

*SDT #3*  
*WFIRST-AFTA Telescope Status*

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# Outline

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- 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)

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- 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

## 250K Operating Temperature Evaluation /Risk Reduction (In Progress/Planned)

- 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)

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- 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

AFTA-WFIRST (JPL) Integrated Master Schedule Status Date: Sun 3/30/14													
ID	Suml WBS	CAM	Custom	Task Name	% Complet	Duration	Start	Finish	Gantt Chart				
									1st Half	Qtr 1	Qtr 2	2nd Half	Qtr 3
539	H.3	BP	RVIN	OTA Telescope FY '14	43%	249 days	Tue 10/1/13	Fri 9/26/14	[Gantt bar: 43% complete]				
540	H.3	BP	RVIN	JPL START Telescope FY '14 Schedule	100%	0 days	Tue 10/1/13	Tue 10/1/13	[Gantt bar: 100% complete]				
541	H.3	BP	RVIN	Management	35%	232 days	Thu 10/24/13	Fri 9/26/14	[Gantt bar: 35% complete]				
545	H.3	BP	RVIN	Update Cycle 4 Telescope Error Budget	100%	19 days	Thu 10/24/13	Tue 11/19/13	[Gantt bar: 100% complete]				
550	H.3	BP	RVIN	Exelis/JPL Resolve Hardware Inventory Accounting	100%	0 days	Thu 12/5/13	Thu 12/5/13	[Gantt bar: 100% complete]				
551	H.3	BP	RVIN	Exelis/JPL Exelis Contract Begins 12-19-2013	100%	0 days	Thu 12/19/13	Thu 12/19/13	[Gantt bar: 100% complete]				
552	H.3	BP	RVIN	Inventory and Catalog Coupons (Task 3)	100%	38 days	Mon 1/6/14	Mon 3/3/14	[Gantt bar: 100% complete]				
557	H.3	BP	RVIN	CTE Testing of Coupons (Task 4)	99%	22 days	Mon 2/24/14	Wed 3/26/14	[Gantt bar: 99% complete]				
558	H.3	BP	RVIN	ATK Batch 1: CTE Testing of Coupons (40 Samples)	100%	12 days	Mon 2/24/14	Tue 3/11/14	[Gantt bar: 100% complete]				
559	H.3	BP	RVIN	Batch 2: CTE Testing of Coupons (10 Samples)	100%	8 days	Mon 3/3/14	Wed 3/12/14	[Gantt bar: 100% complete]				
560	H.3	BP	RVIN	Exelis/ATK Test Report Documentation for Each Unique Material Coupon Tested	0%	0 days	Wed 3/26/14	Wed 3/26/14	[Gantt bar: 0% complete]				
561	H.3	BP	RVIN	Mechanical Material Property Tests (Task 5)	30%	27 days	Wed 3/12/14	Thu 4/17/14	[Gantt bar: 30% complete]				
562	H.3	BP	RVIN	ITT-Exelis Mechanical Material Property Tests (Coupon Strength Testing) following cold cyclings to 235K	30%	25 days	Wed 3/12/14	Tue 4/15/14	[Gantt bar: 30% complete]				
563	H.3	BP	RVIN	ITT-Exelis Test Report Documentation for Each Unique Material Coupon Tested	0%	0 days	Tue 4/15/14	Tue 4/15/14	[Gantt bar: 0% complete]				
564	H.3	BP	RVIN	JPL Del Material Coupon Measurement Report for AFTA Telescope	0%	0 days	Thu 4/17/14	Thu 4/17/14	[Gantt bar: 0% complete]				
565	REF	BP	RVIN	GSFC Rec Material Coupon Measurement Report for AFTA Telescope	0%	0 days	Thu 4/17/14	Thu 4/17/14	[Gantt bar: 0% complete]				
566	H.3	BP	RVIN	Telescope-Instrument ICD development	99%	92 days	Mon 11/18/13	Fri 4/4/14	[Gantt bar: 99% complete]				
567	H.3	BP	RVIN	JPL Received BiPod model updates	100%	0 days	Mon 11/18/13	Mon 11/18/13	[Gantt bar: 100% complete]				
568	H.3	BP	RVIN	JPL Checking Interface between telescope spacecraft	100%	4 days	Mon 11/18/13	Thu 11/21/13	[Gantt bar: 100% complete]				
569	H.3	BP	RVIN	JPL Telescope-Instrument ICD Development cont.	100%	73 days	Fri 11/22/13	Thu 3/13/14	[Gantt bar: 100% complete]				
570	H.3	BP	RVIN	JPL Deliver FEM to GSFC	100%	0 days	Thu 2/20/14	Thu 2/20/14	[Gantt bar: 100% complete]				
571	H.3	BP	RVIN	JPL Del AFTA Telescope-Instrument Draft ICD	100%	0 days	Mon 3/17/14	Mon 3/17/14	[Gantt bar: 100% complete]				
572	REF	BP	RVIN	GSFC Rec AFTA Telescope-Instrument Draft ICD	100%	0 days	Mon 3/17/14	Mon 3/17/14	[Gantt bar: 100% complete]				
573	H.3	BP	RVIN	JPL Del Updated CAD and Thermal Models	0%	0 days	Fri 4/4/14	Fri 4/4/14	[Gantt bar: 0% complete]				
574	REF	BP	RVIN	GSFC Rec Updated CAD and Thermal Models	0%	0 days	Fri 4/4/14	Fri 4/4/14	[Gantt bar: 0% complete]				
575	H.3	BP	RVIN	CAD Model Update	0%	27 days	Fri 4/4/14	Mon 5/12/14	[Gantt bar: 0% complete]				
576	H.3	BP	RVIN	ITT-Exelis CAD Models from Exelis (for actuators and other items that were removed but will be added back in)	0%	0 days	Fri 4/4/14	Fri 4/4/14	[Gantt bar: 0% complete]				
577	H.3	BP	RVIN	JPL Use CAD models from ITT to fill in the missing hardware	0%	27 days	Fri 4/4/14	Mon 5/12/14	[Gantt bar: 0% complete]				
578	H.3	BP	RVIN	Update MEL (Task 6)	0%	42 days	Tue 5/13/14	Fri 7/11/14	[Gantt bar: 0% complete]				
579	H.3	BP	RVIN	JPL Update MEL with values consistent with the CAD and finite element models	0%	42 days	Tue 5/13/14	Fri 7/11/14	[Gantt bar: 0% complete]				
580	H.3	BP	RVIN	JPL Updated MEL with more detailed mass breakdown	0%	0 days	Fri 7/11/14	Fri 7/11/14	[Gantt bar: 0% complete]				
581	H.3	BP	RVIN	ITT-Exelis Telescope Verification and Validation Planning	0%	54 days	Mon 7/14/14	Fri 9/26/14	[Gantt bar: 0% complete]				
582	H.3	BP	RVIN	ITT-Exelis Begin Development of V&V Test Procedures of AFTA Flight Hardware including zero-G optical metrology measurements in a	0%	54 days	Mon 7/14/14	Fri 9/26/14	[Gantt bar: 0% complete]				
583	H.3	BP	RVIN	ITT-Exelis Draft Verification and Validation Plan Report	0%	0 days	Fri 9/26/14	Fri 9/26/14	[Gantt bar: 0% complete]				
584	H.3	BP	RVIN	ITT-Exelis Final Cost Report	0%	0 days	Fri 9/26/14	Fri 9/26/14	[Gantt bar: 0% complete]				
585	H.3	BP	RVIN	END Telescope FY14 Schedule	0%	0 days	Fri 9/26/14	Fri 9/26/14	[Gantt bar: 0% complete]				

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