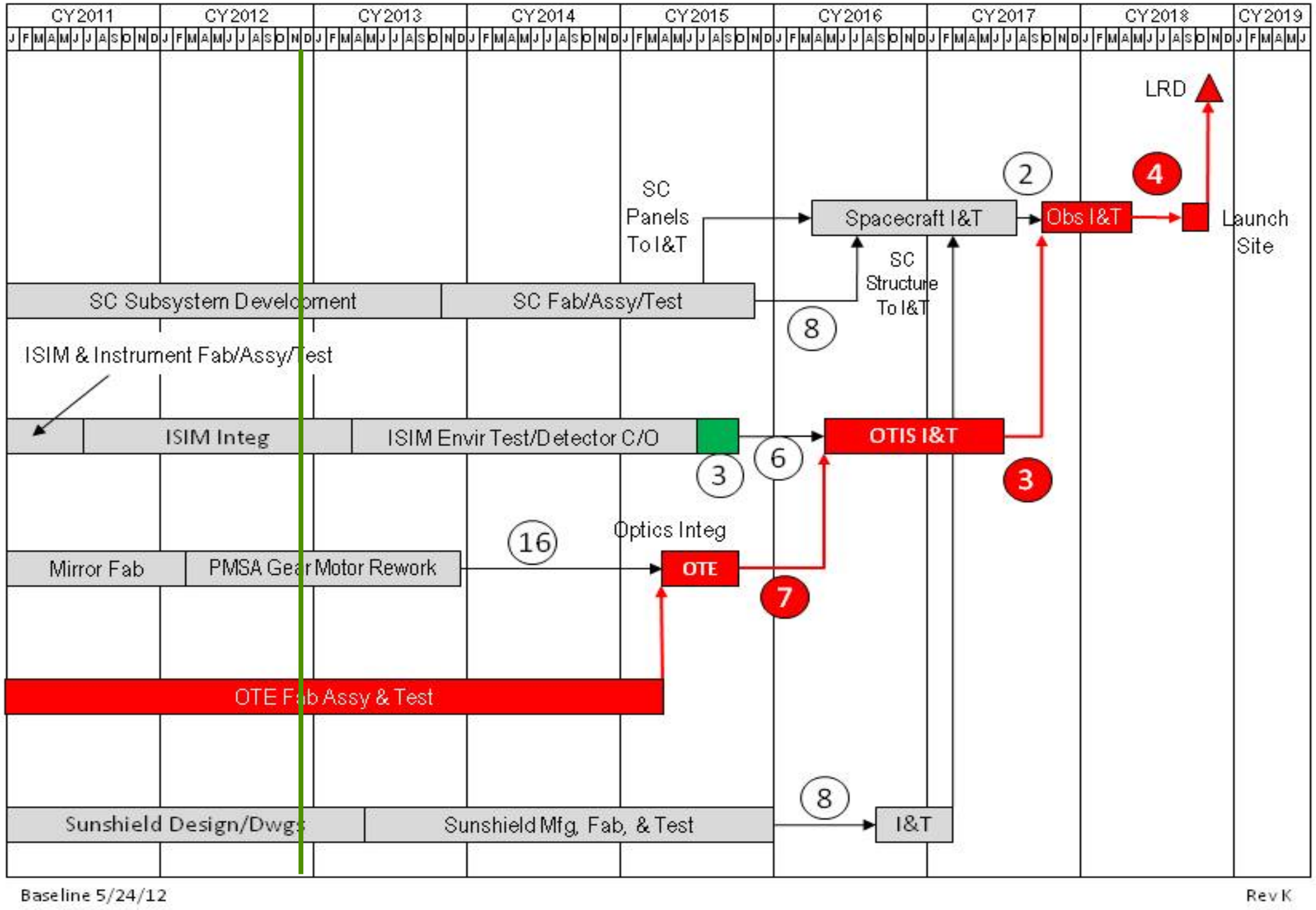
JWST UPDATE

Astronomy & Astrophysics Advisory Committee
30-November-2012

Eric P. Smith
JWST Deputy Program Director

JWST SCHEDULE (SIMPLIFIED)

Project is performing to replan schedule



James Webb Space Telescope Program FY12 Milestones

Month	Milestone	Comments
Oct '11	Begin construction of 140,000-lb robotic facility to build segmented main mirror at GSFC	Assembly began 10/4
Nov '11	Complete electronics simulator model for Integrated Science Instrument Module ("ISIM") Deliver tools for software development environment and verification	Completed 11/15 Completed 10/27
Dec '11	Install Helium shroud floor at Johnson Space Center thermal vacuum chamber ("JSC TVC") Determine root cause of NIRSpec optical bench flaw	Completed 10/26 Completed 12/15
Jan '12	Conduct Critical Design Review for Spacecraft-to-Optical Telescope Element vibration isolation system Finish building Center of Curvature Optical Assembly ("COCOA") for testing primary mirror in JSC TVC Review preliminary requirements for ground structure for spacecraft equipment panels Complete Aft Optic System integration and alignment Update Program Plan and Program Commitment Agreement to reflect replan	Completed 12/15 Completed 1/13 Completed 12/1 Completed 12/22 Completed 1/28
Feb '12	Complete assembly and initial testing of main mirrors at Marshall Space Flight Center Install Helium shroud walls at JSC TVC	Completed 12/19 Completed all panels 2/2
Mar '12	Complete assessment of System Engineering Team thermal margins Deliver ISIM computer #2 to ISIM integration and testing Complete analysis of JSC TVC telescope testing equipment plans	Completed 3/19 SDRAM part failure in T/V. Completed 5/16 Completed 3/1

Blue font denotes milestones accomplished ahead of schedule, orange font denotes milestones accomplished late.

James Webb Space Telescope Program FY12 Milestones

Apr ’12	Receive Flight Mid-infrared Instrument (MIRI) from Europe, first of the telescope’s four science instruments Complete Critical Design Review for Sunshield Support Structure Complete all composite parts for mechanism that lifts telescope away from spacecraft after launch (Deployable Tower Assembly)	Received 5/29 Completed 3/21 Completed 2/28
May‘12	Finish testing the COCOA Measure Sunshield template layer 5 shape to confirm its accuracy Conduct budgetary and schedule review of initial program and project performance since completing the 2011 replan	Completed 3/9 Completed 4/23 Completed 5/30
Jun ’12	Complete modifications of JSC TVC Complete Critical Design Review for telescope-ground communications system Complete designs for structures that will hold telescope inside JSC TVC Complete Preliminary Design Review for equipment that tests Sunshield deployment	Completed 6/30 Completed 6/13 Completed 6/21 Completed 6/28
Jul ’12	Reach agreement with Program Office on FY13 spending plan Deliver Flight Fine Guidance Sensor Deliver flight software to ISIM Integration and Testing (“ISIM I & T”) Complete Solar array Preliminary Design Audit Deliver MIRI Cryo Cooler “Cold Head Assembly” (critical component of MIRI cooling) to ISIM I&T Complete fabrication of end fitting for Secondary Mirror Support Structure	Completed 7/10 Completed 7/30 Completed 5/11 Completed 6/14 Flight CHA to be delivered in June 2013. No schedule, impact, work around in place. Completed 7/13
Aug ’12	Order remaining JSC thermal vacuum chamber vibration isolators	Completed 8/9
Sep ‘12	Deliver NIRCam Deliver telescope simulator for ISIM I&T Start testing of cryogenic camera system, used for subsequent JSC I & T Complete center section of Backplane Support Structure for main mirror Deliver NIRSpec	Now early 2013, work arounds Completed 8/17 Completed 8/9 Completed 3/28 Delivery date Summer 2013.

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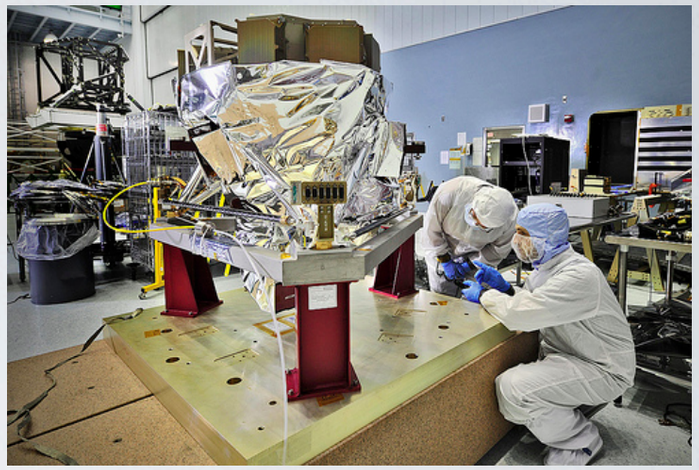
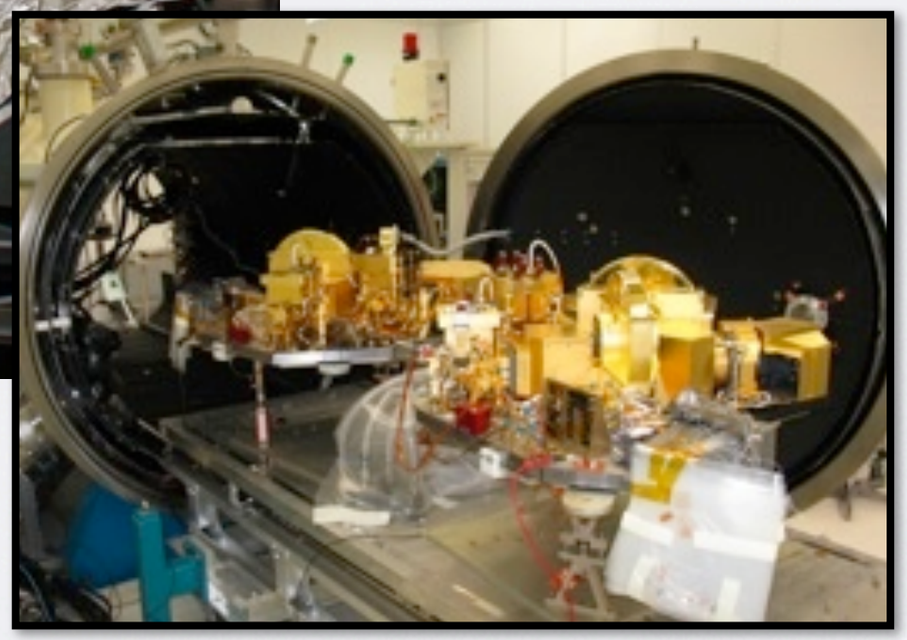
HARDWARE PROGRESS

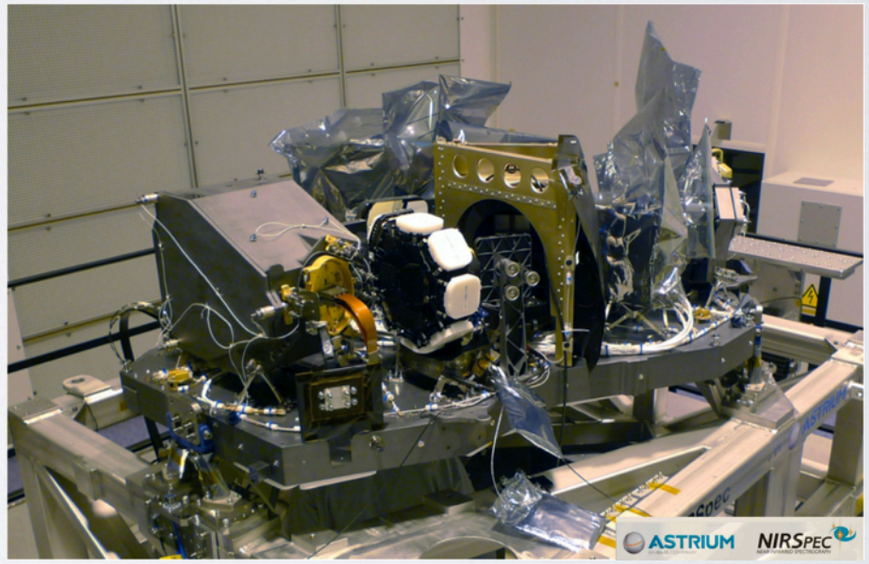
Sunshield Template Folding at NGAS



CSA's Fine Guidance Sensor (left)
and MIRI now at GSFC for integration



NIRCam A & B modules currently in
Thermal-Vac testing at LM test facility



Fully Reassembled NIRSpec, Thermal
Vac testing to commence in
mid-December 2012

Fiscal 2013 Milestones

Month	Milestone	Comment
October 2012	1. Headquarters delivery to project of funding plan for fiscal 2013 2. Spacecraft batteries preliminary design review 3. Spacecraft command & telemetry computer review (Northrop internal review) 4. Second review of optical test equipment for Johnson Space Center (JSC) thermal vacuum chamber test of telescope and instruments (OTIS)	1. Completed 9/15 2. Completed 9/6 3. Completed 8/30 4. Completed 10/17
November 2012	5. Spacecraft-to-Optical Telescope Element/science instruments stray light and thermal barrier structures preliminary design review 6. Port side spacecraft equipment panel design review (Northrop internal review) 7. Complete electrical checkout of combined mid-infrared instrument (MIRI) and integrated science instrument module (ISIM)	5. Completed 10/18 6. Completed 10/4 7. Completed 11/19, 2 days of testing required in Jan. due to FSW bug (divide by zero)
December 2012	8. First engineering model of the spacecraft command and telemetry computer delivered to test bed 9. Reinstall beam image analyzer onto telescope simulator (OSIM) used in ISIM cryogenic testing 10. Complete electrical checkout of combined fine guidance sensor (FGS) and ISIM	
January 2013	11. Aft optical system complete 12. Receive JWST carrier container to be used in moving the observatory to testing and launch sites 13. System design review of the software employed in managing all the data returned from the spacecraft to the operations center 14. Deliver MIRI cover/thermal shield to ISIM integration and test (I&T)	
February 2013	15. Secondary Mirror Support Structure I&T tooling fixture complete 16. Primary mirror backplane support wing assemblies complete 17. Spacecraft Primary Structure Manufacturing Readiness Review 18. Start cryogenic certification test of OSIM	
March 2013	20. Deliver last primary mirror actuator motor electronics unit (Cryo Multiplex Unit) 21. Spacecraft fine sun sensor critical design review 22. Space Vehicle Thermal Simulator systems requirements review 23. Complete FGS & MIRI integration onto ISIM	

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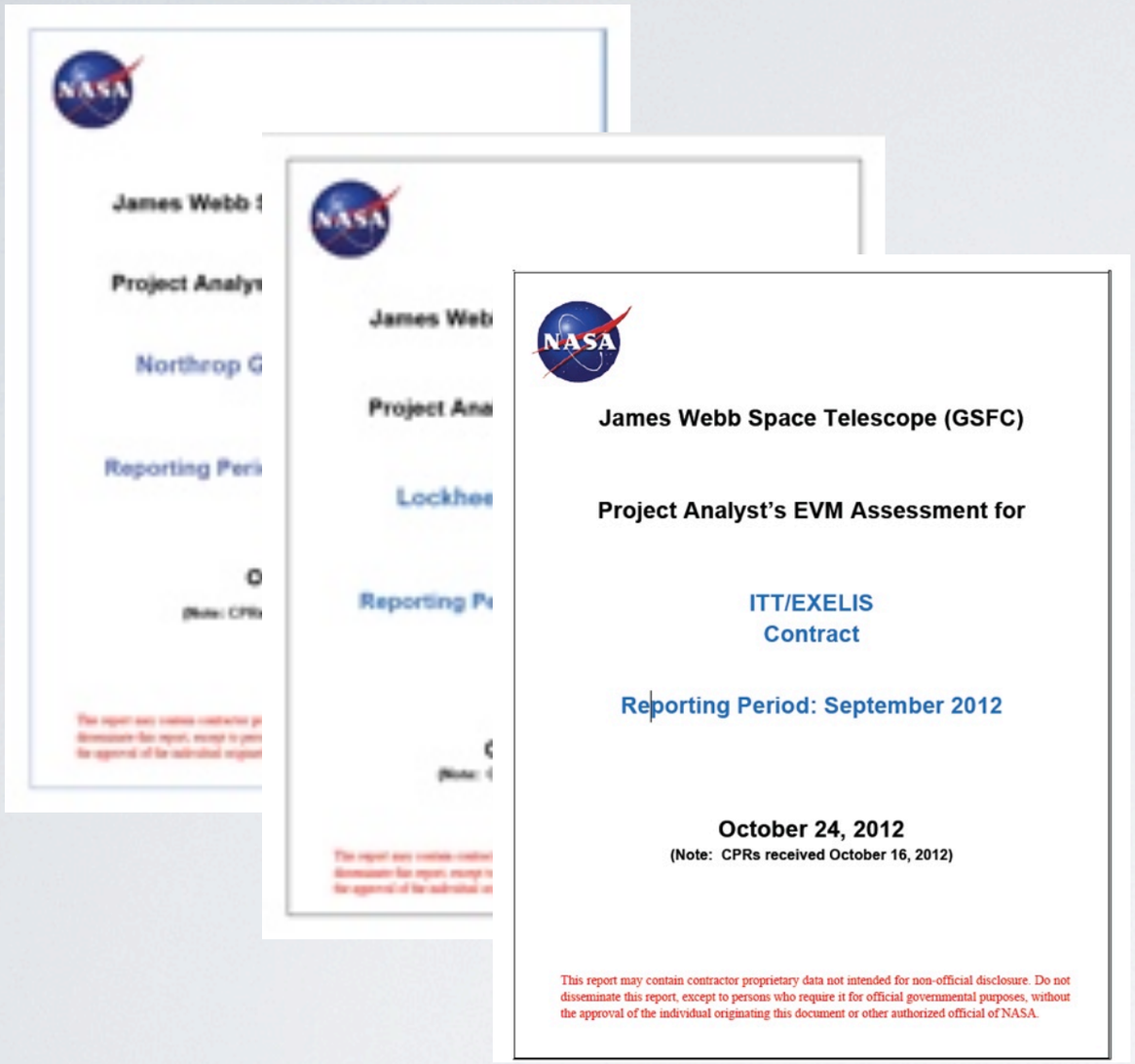
11/29/12

PROGRAM COST & SCHEDULE CONTROLS

COST/SCHEDULE METRICS



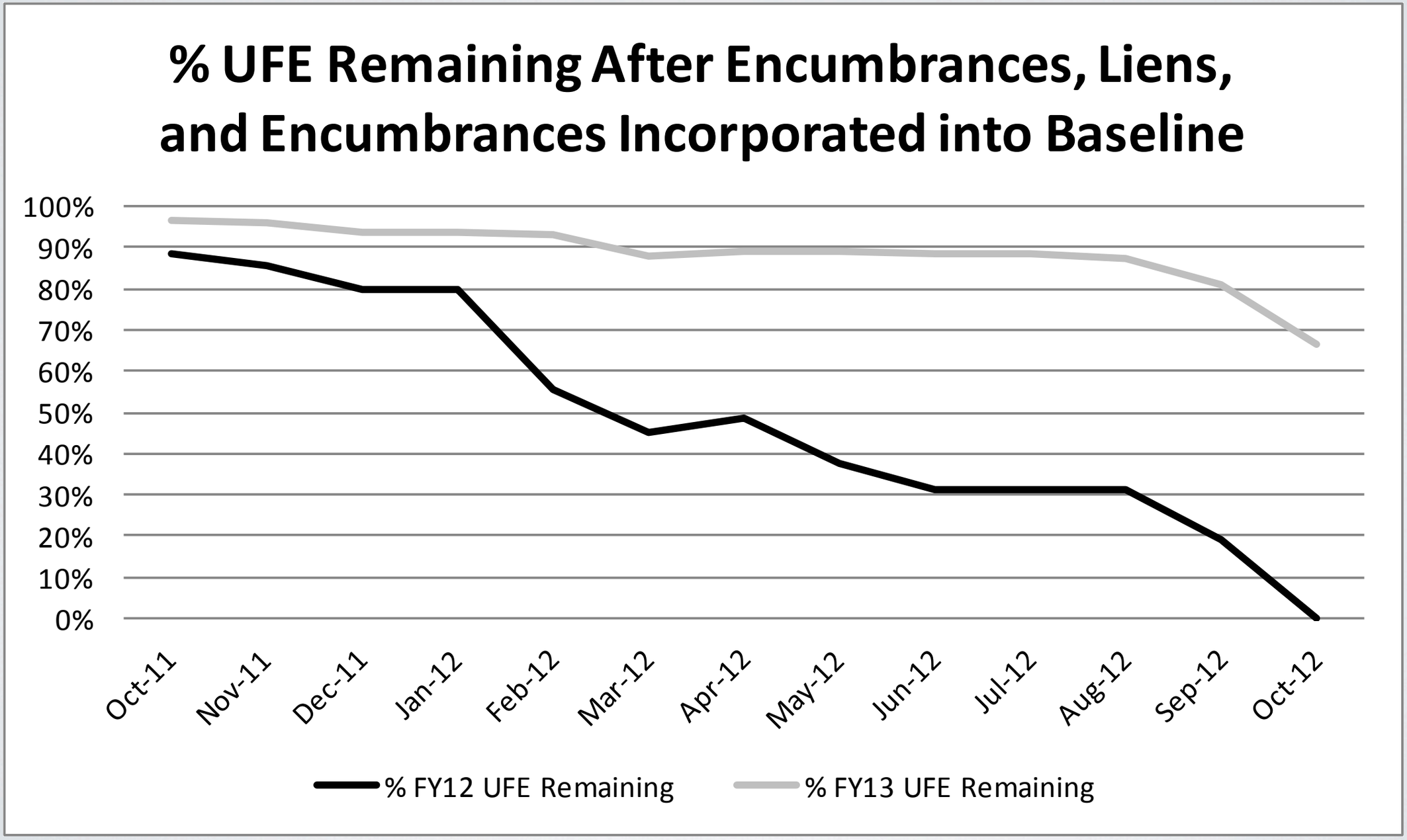
Tracking good performance and forecasting problem areas

Cost metrics: CPI, TCPI, Cost variances, Budget-at-complete, management reserve, burn rates, *etc.* (>20 in total)

Schedule metrics: schedule variances, logical consistency, leads, lags, constraints, float, missed tasks, critical path index, tripwires, *etc.* (23 in total)

Budget and UFE

Current (FY13 Budget, FY14 guidelines) Life-Cycle Cost Estimate by Year and Phase/ Includes Program-held UFE, Indirect, Labor and CoF) $K											
	Prior	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	CTC	Total
Total	3528.9	530.6	627.6	659.1	646.6	621.6	571.1	536.9	305.0	197.5	610.0	8834.9
Pre-Formulation & Formulation	1800.1	-	-	-	-	-	-	-	-	-	-	1800.1
Development	1728.8	530.6	627.6	659.1	646.6	621.6	571.1	536.9	228.0	47.5	-	6197.8
Operations	-	-	-	-	-	-	-	-	77.0	150.0	610.0	837.0



GAO REPORT ON NASA EVM

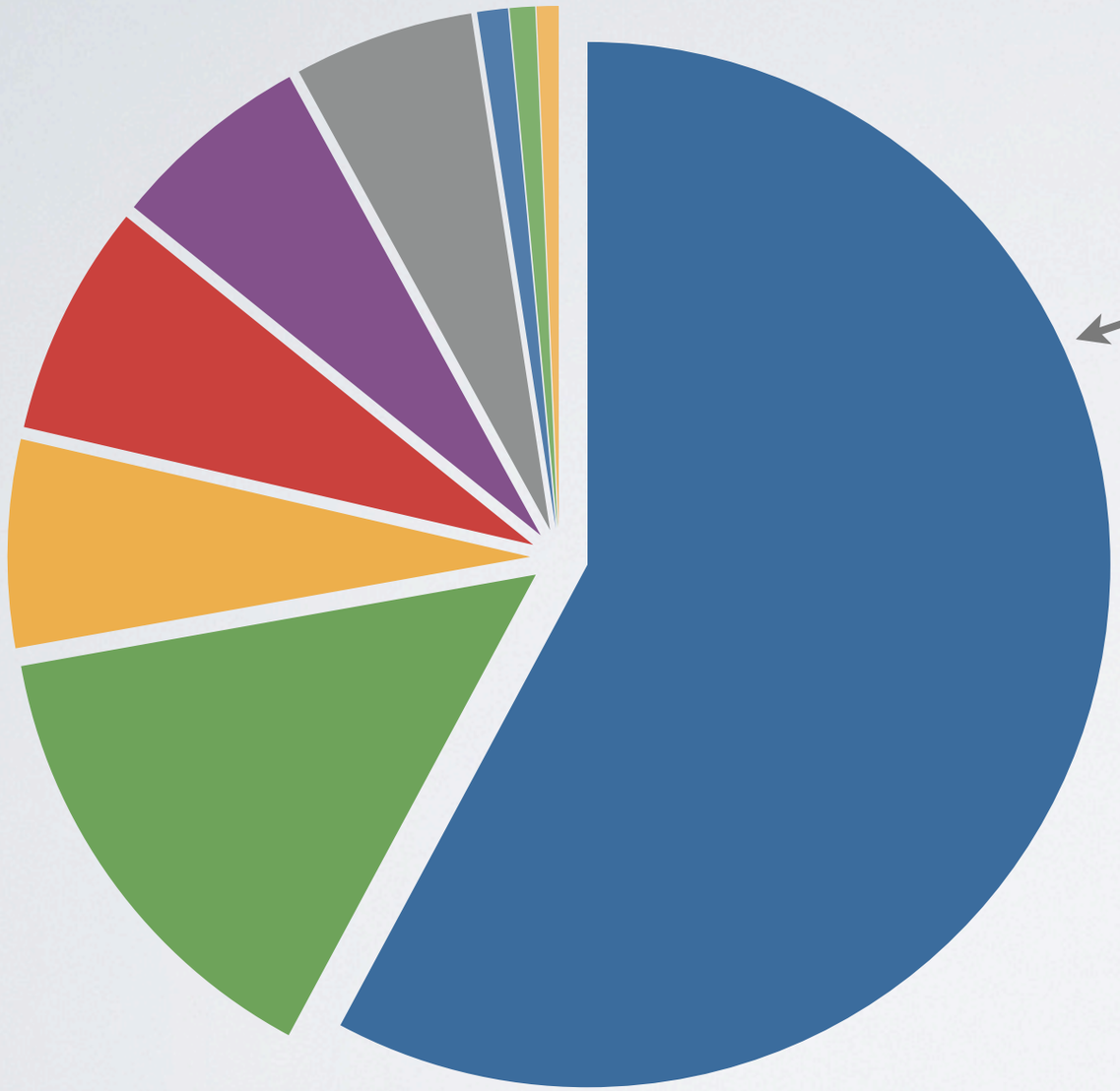
- GAO conducted a NASA-wide study of EVM practices (http://www.gao.gov/assets/660/650233.pdf)

Table 2: Summary of the 10 NASA Spaceflight Projects Use of Three Fundamental EVM Practices and Reliability of the Data

Projects	Used A certified EVM system compliant with ANSI/EIA standard	Conducted an integrated baseline review	EVM System surveillance is being performed	Data resulting from the EVM system are reliable
Global Precipitation Measurement	●	●	●	◐
James Webb Space Telescope	●	●	●	◐
Landsat Data Continuity Mission	●	●	●	◐
Lunar Atmosphere and Dust Environment Explorer	○	●	◐	◐
Magnetospheric Multiscale	○	●	◐	◐
Mars Atmosphere and Volatile Evolution Mission	◐	●	◐	●
Orbiting Carbon Observatory 2[a]	●	●	◐	●
Radiation Belt Storm Probes	○	●	◐	●
Stratospheric Observatory for Infrared Astronomy Project	◐	◐	◐	◐
Tracking and Data Relay Satellite Replenishment	●	●	●	◐

JWST EVM implementation was one of the best within the agency

WORK-TO-GO



FY2013 through commissioning fraction of NASA spending on each element

- Sunshield, Spacecraft (46%)
- Ground System (67%)
- ISIM (17%)
- System Level I&T (68%)
- Labor & Related Expenses (40%)
- Project Support (46%)
- Optical Telescope Element (34%)
- JPL Cryocooler (21%)
- Science & SWG (61%)

Fraction of work left to go on each element

SUMMARY

- Project is making great technical progress
  - Instruments are in ISIM Integration & Test phase or final instrument level testing
    - Completed flight mirrors are arriving at GSFC
- Project is performing within cost and schedule and has accelerated some hardware elements
- Project has entered its long and challenging I&T activities (ISIM, followed by OTE, OTIS and System-level)

HOW TO STAY CURRENT

- Mission status
  - http://www.jwst.nasa.gov/ (navigation links on left, "Status")
- Hardware images and videos
  - http://www.flickr.com/photos/nasawebbtelescope/
  - http://www.youtube.com/user/NASAWebbTelescope
- Exposure time estimators
  - http://jwstetc.stsci.edu/etc/