



JWST Program Office

Eric P. Smith
Program Deputy Director
Program Scientist

Briefing to CAA
March 7, 2013



The James Webb Space Telescope

Science Instrument Module

Houses all of Webb's cameras and science instruments

Trim flap

Helps stabilize the satellite

Solar power array

Always facing the Sun, panels convert sunlight into electricity to power the observatory

Earth-pointing antenna

Sends science data back to Earth and receives commands from NASA's Deep Space Network

Spacecraft bus

Contains most of the spacecraft steering and control machinery, including the computer and the reaction wheels

Primary Mirror

18 hexagonal segments made of the metal beryllium and coated with gold to capture faint infrared light

Secondary Mirror

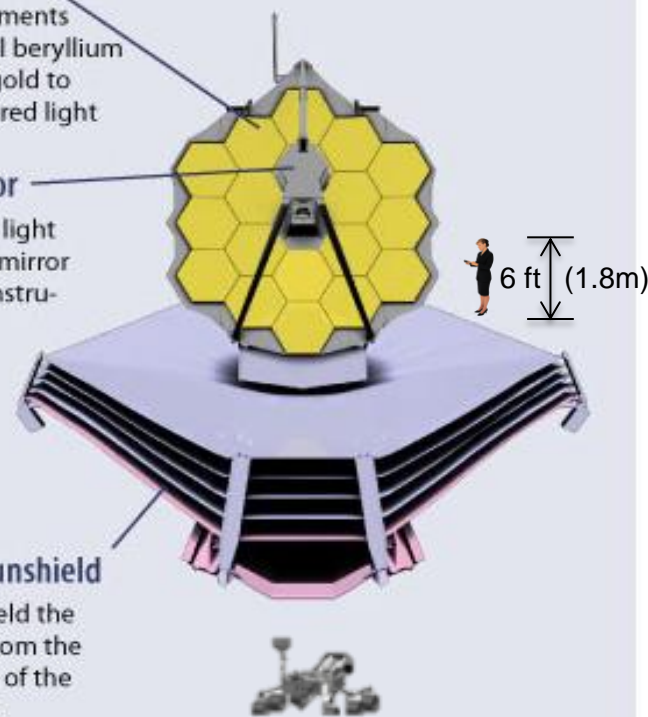
Reflects gathered light from the primary mirror into the science instruments

Multilayer sunshield

Five layers shield the observatory from the light and heat of the Sun and Earth

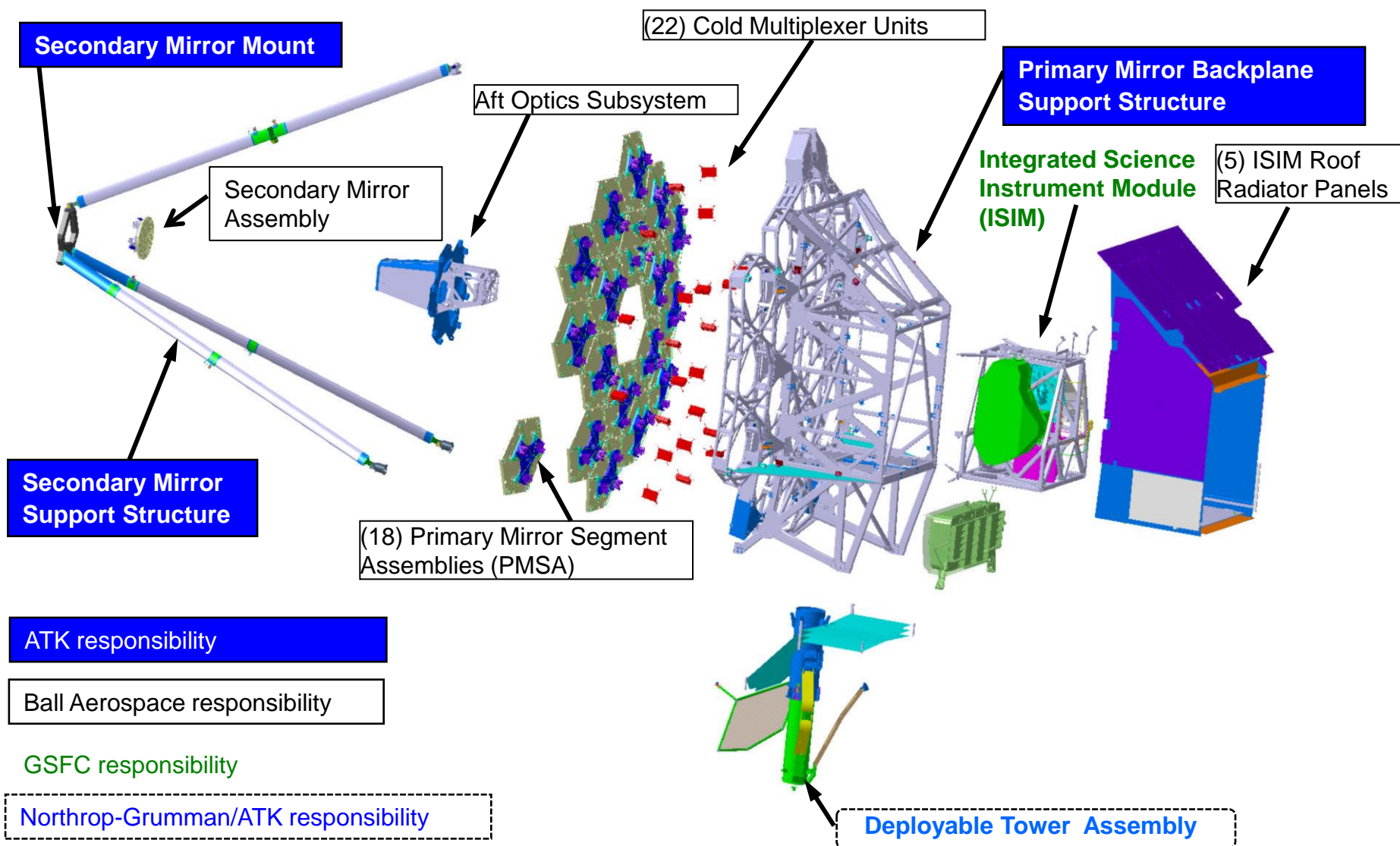
Star trackers

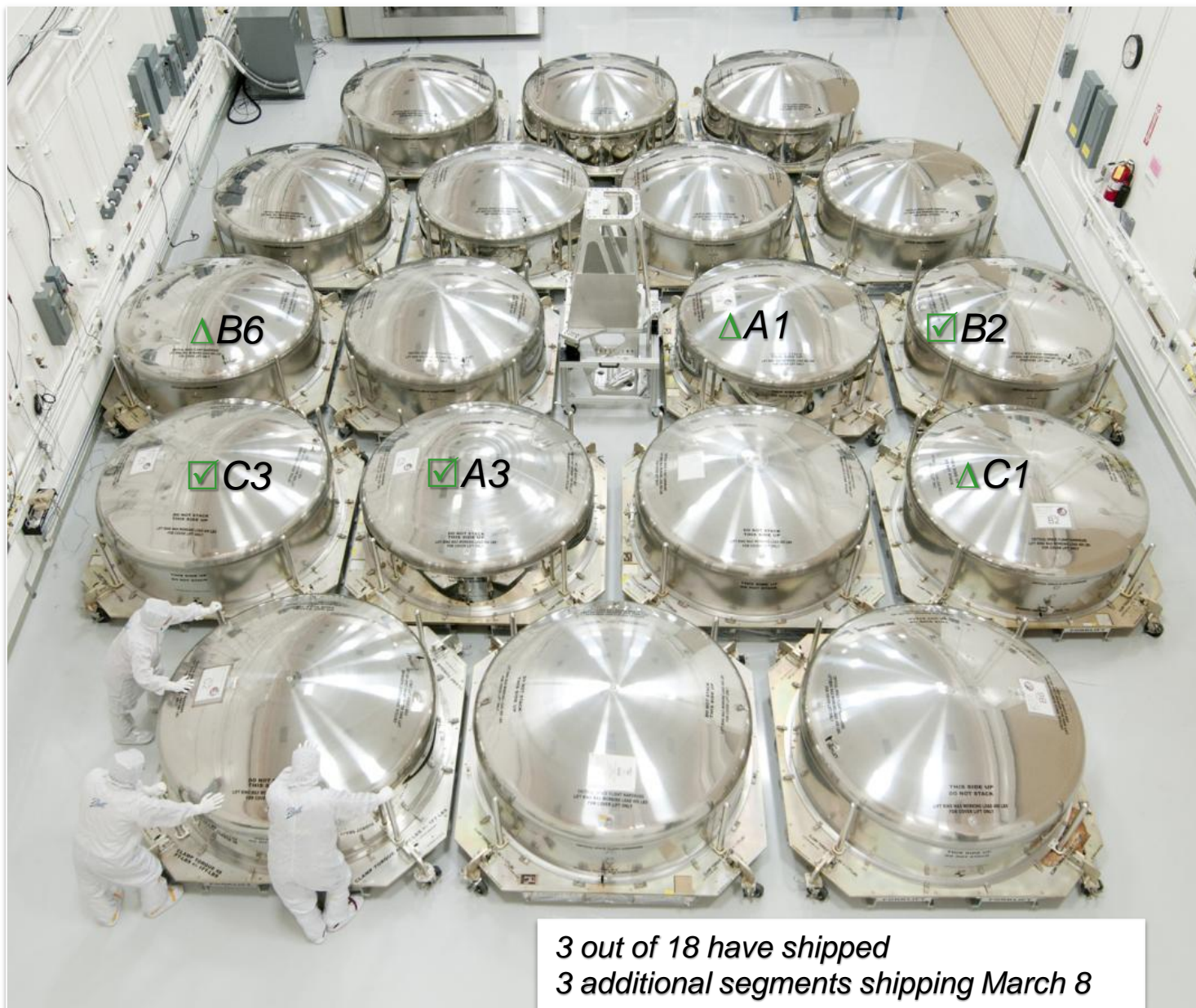
Small telescopes that use star patterns to target the observatory



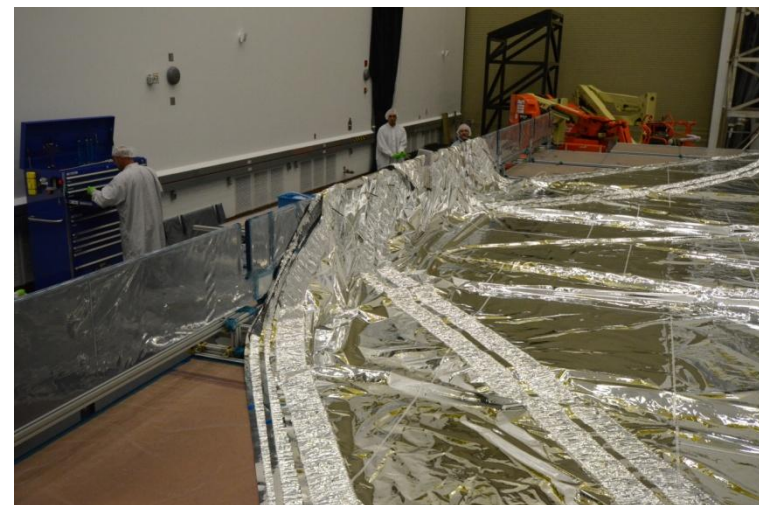
Curiosity Rover

Telescope Architecture





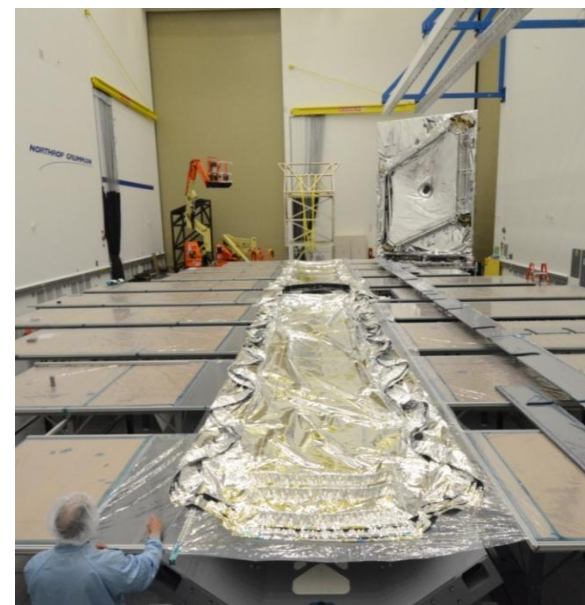
- 1/3rd scale sunshield test completed successfully for thermal model validation
- Deployment subsystems and flight sunshield see multiple deployment tests before flight
- Template Layers 2-5 - Completed & Delivered
- Template Layer 1
 - Shape test completed & hole punching in process



Template Layers 3-5 Folding Operations



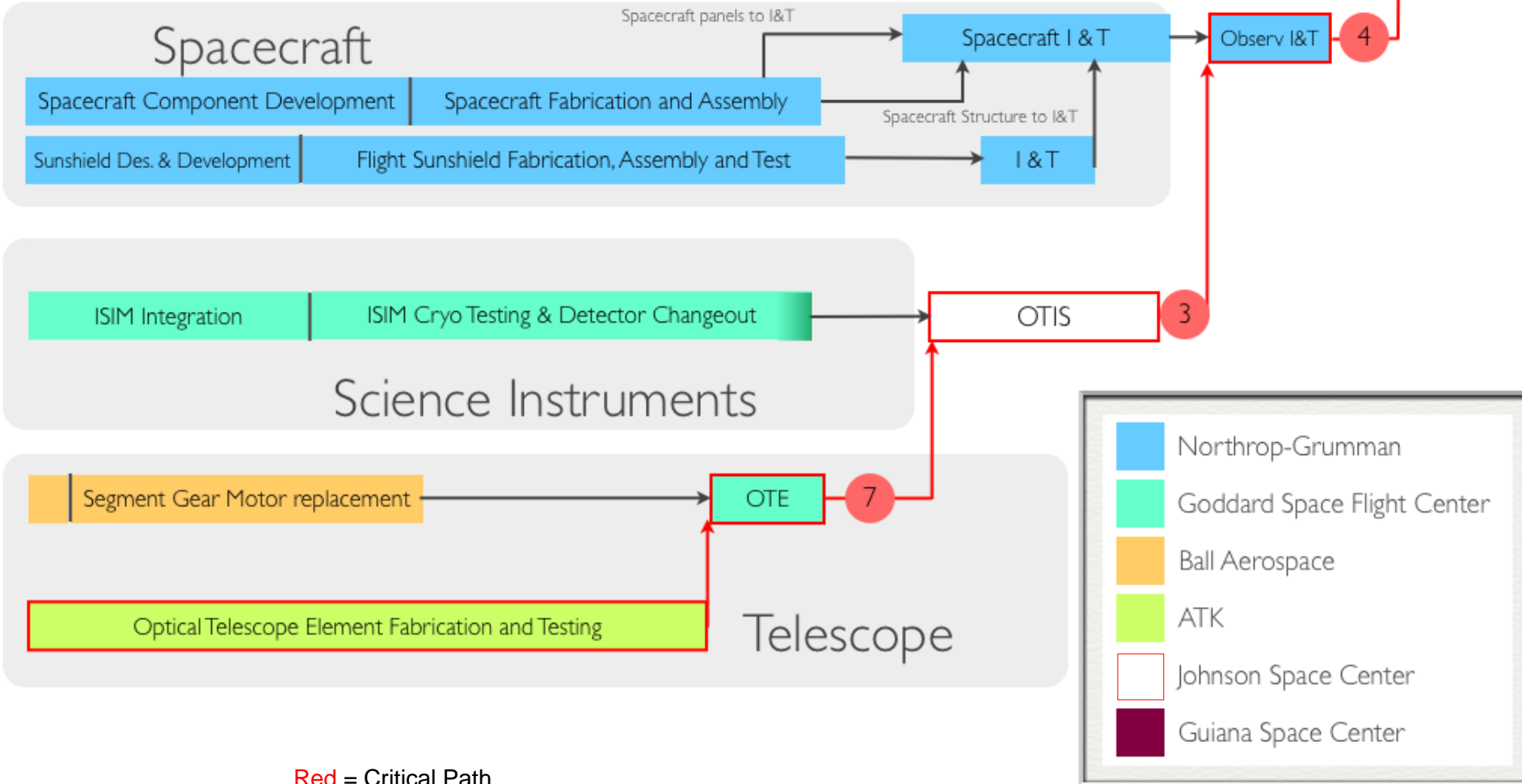
Hole Tool Operations



2012												2013												2014												2015												2016												2017												2018											
J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D

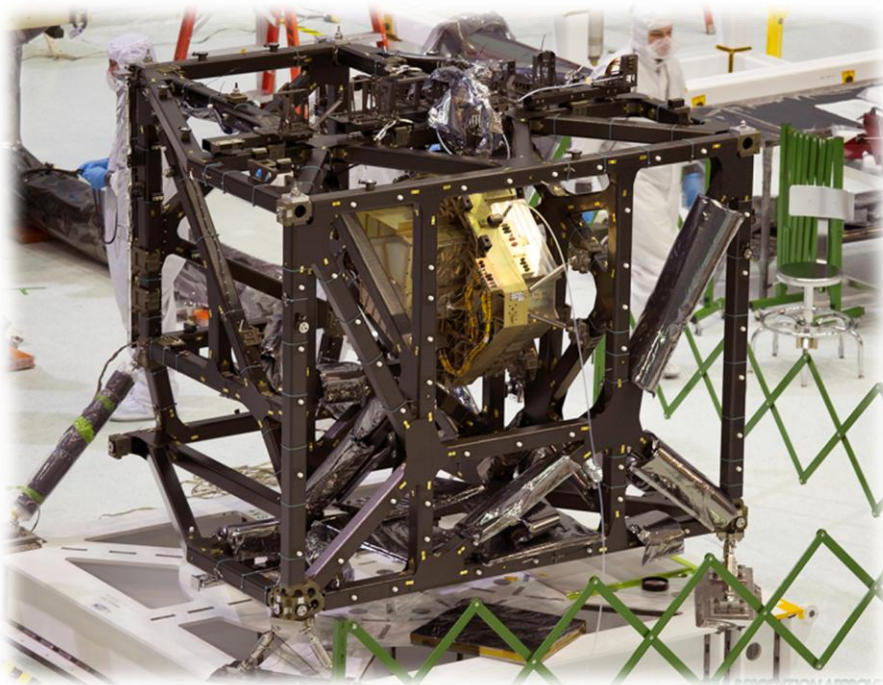
OTE = Optical Telescope Element
 OTIS = Optical Telescope + ISIM

k months of critical path (mission pacing) slack

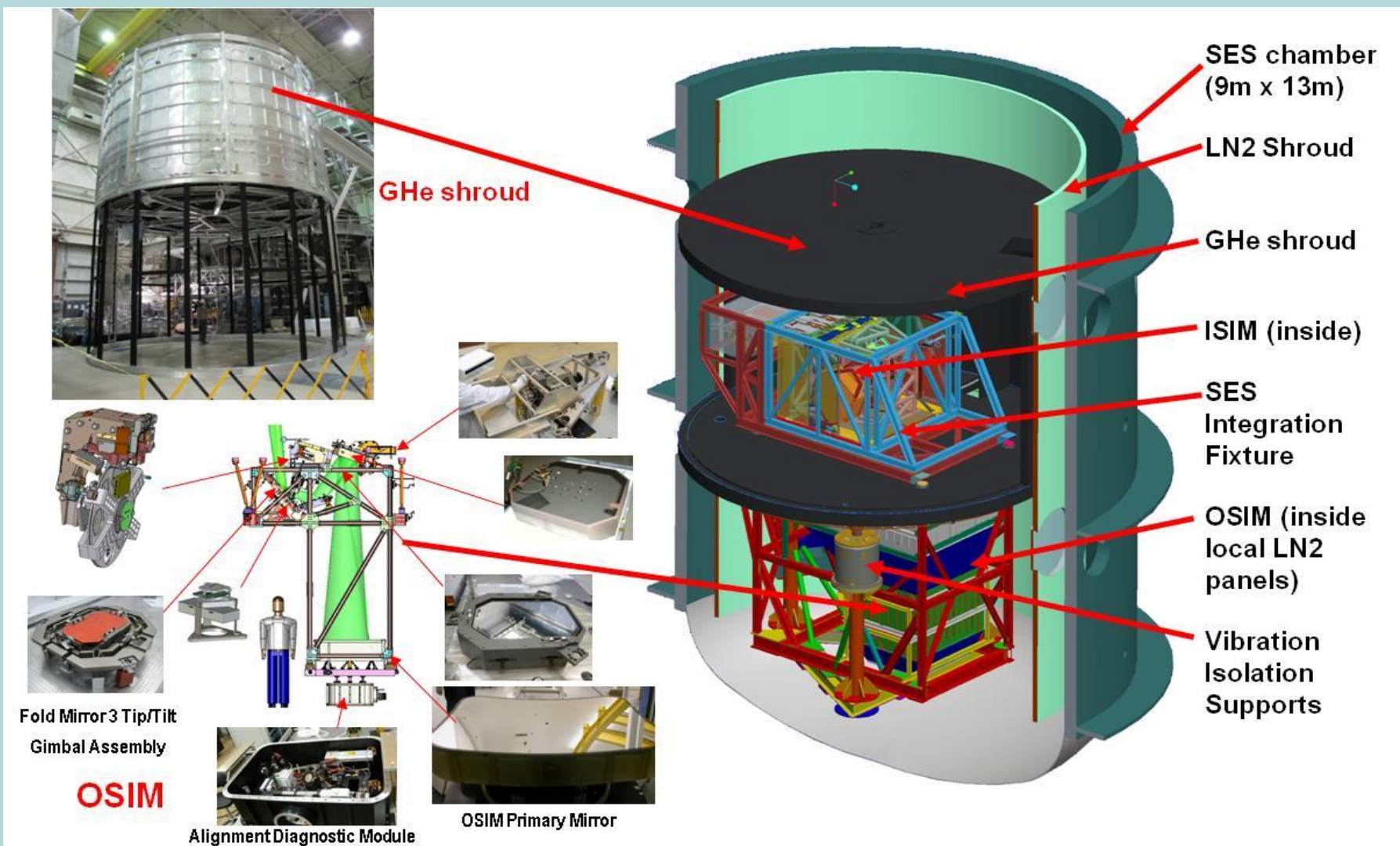


Red = Critical Path

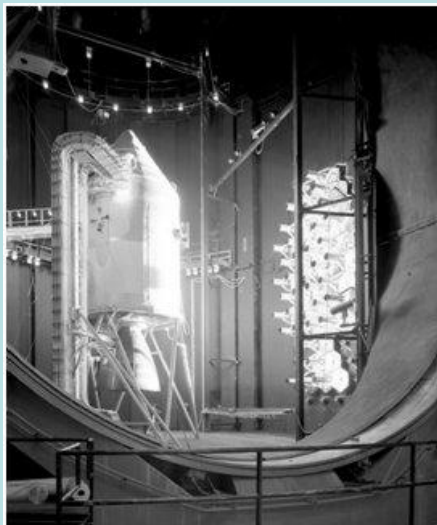
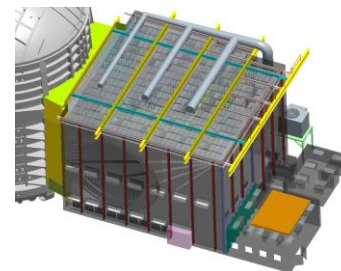
CSA FGS/NIRISS first flight instrument installed into ISIM, Friday March 1



Space Environment Simulator Chamber at GSFC



Chamber A at the Johnson Space Center



*Boilerplate Apollo S/C
008 in Chamber A with
side-sun solar*



http://www.nasa.gov/mission_pages/webb/news/chamber-a.html



Staying Focused



Focus on

- Execution: Do what we said we are going to do – and where possible, better
- Communication: Maintain and increase open communications with NASA senior management, partners, customers and stakeholders
- Education: Highlighting the tremendous science returns we will achieve from JWST
- **Execution: Know where we are now and project ahead**
 - Tight teamwork between Program and Project Office – Clearly understand and respect the roles
 - Develop the PP&C capability for the HQ Program Office partnering with GSFC Code 400 for an integrated evaluation capability for the day-to-day (monthly) monitoring/assessment/and projection capabilities
 - Both GSFC and HQ see the data at the same time
 - Increase the technical capability in support of the HQ Program Office for targeted opportunities
 - Series of daily, weekly, monthly, quarterly interchange meetings
- **Communication: Maintain open communications with partners, customers and stakeholders**
 - Standardize the messaging focusing on key swing point issues for a consistent message with NASA Senior Management, Hill, OMB, OSTB, etc
 - Senior Executive quarterlies with senior leadership with contractors, Centers, and HQ
 - Close coordination of the integrated Program assessment with senior management working with all HQ oversight organizations.
 - Establishment of HQ level milestones reported to stakeholders
 - All-hands with Centers and contractors
 - Quarterly tag ups with International Partners
 - Deputy Program Director oversees the communication planning ensuring an integrated message leading to a crescendo at launch
- **Education: Highlighting the tremendous science returns we will achieve from JWST**
 - Partner with the outreach office and NASA Chief Scientist for Agency strategic messaging related to science



Examples of recent successes



- **NIRCam performance improvement**
 - Coordinated effort between NASA AA, Program Office, Center Director, Project Manager to ensure PI and LM were actively engaged and aware of the urgency. Coordinated approach all in tight coordination with the Project Manager
 - NASA AA met with LM Senior leadership
 - Center Director met with LM VP
 - Program Director met with LM Deputy VP
 - Program Director conducted all-hands at LM
- **Launch Vehicle Mass Margin Study**
 - Strategic planning between Program Director and Project Manager resulted in ESA leading a launch vehicle mass margin study with likely result of additional mass available to JWST prior to spacecraft CDR
- **Senior Executively quarterly**
 - Tight coordination with Program and Project Manager to ensure the right topics were being presented at the SEQ
- **Cost analysis**
 - Project is performing its own cost/performance (EAC) analysis from what contractors provide, starting in January, Project is also providing same analysis for ISIM. GSFC Code 400 will provide assessment across the 4 reports looking for major inconsistencies, contractor messaging between JWST and other projects, etc
- **Deputy Program Director is now also the Program Scientist**
 - Increases communications and consistency with the science community during the development phase
- **Communications**
 - Deputy Program Director leading effort to develop an overall communication strategy and plan for a tightly integrated messaging with yearly themes. Developing a speaker series
- **Program Office communications with SMD**
 - Increased the monthly Flight Program Reviews from 45 minutes to 2.5 hours to address key issues with SMD Deputy AA for Programs
 - SRB and GAO invited to attend on a quarterly basis for execution awareness
- **GAO relationship improvements**
 - Scheduling quarterly GAO meeting to discuss issues, misunderstandings, and schedule projections for GAO activities
- **Improved Stakeholder communication**
 - House and Senate Approps and Auth staff very complimentary of depth and frequency of communications
 - OMB and OSTP very complimentary of depth and frequency of communications



Milestone Performance



- Since the September 2011 replan JWST reports high-level milestones monthly to numerous stakeholders

	Total Milestones	Total Milestones Completed	Number Completed Early	Number Completed Late	Deferred to Next Year
FY 2011	21	21	6	3	0
FY2012	37	34	16	2	3
FY2013	41	16	9	3*	0

*Late milestones are forecast to complete in FY13



Fiscal 2013 Milestones



Month	Milestone	Comment
October 2012	<ol style="list-style-type: none"> Headquarters delivery to project of funding plan for fiscal 2013 Spacecraft batteries preliminary design review Spacecraft command & telemetry computer review (Northrop internal review) Second review of optical test equipment for Johnson Space Center (JSC) thermal vacuum chamber test of telescope and instruments (OTIS) 	<ol style="list-style-type: none"> Completed 9/15 Completed 9/6 Completed 8/30 Completed 10/17
November 2012	<ol style="list-style-type: none"> Spacecraft-to-Optical Telescope Element/science instruments stray light and thermal barrier structures preliminary design review Port side spacecraft equipment panel design review (Northrop internal review) Complete electrical checkout of combined mid-infrared instrument (MIRI) and integrated science instrument module (ISIM) 	<ol style="list-style-type: none"> Completed 10/18 Completed 10/4 Completed 11/19, 2 days of testing required in Jan. due to FSW bug (divide by zero)
December 2012	<ol style="list-style-type: none"> First engineering model of the spacecraft command and telemetry computer delivered to test bed Reinstall beam image analyzer onto telescope simulator (OSIM) used in ISIM cryogenic testing Complete electrical checkout of combined fine guidance sensor (FGS) and ISIM 	<ol style="list-style-type: none"> Completed 11/8 Completed 12/19 Completed 12/20
January 2013	<ol style="list-style-type: none"> Aft optical system complete Receive JWST carrier container to be used in moving the observatory to testing and launch sites System design review of the software employed in managing all the data returned from the spacecraft to the operations center Deliver MIRI cover/thermal shield to ISIM integration and test (I&T) 	<ol style="list-style-type: none"> Completed 1/10 Completed 11/16 Completed 12/6 Dynamics and Thermal issue have delayed delivery to March, Two weeks of schedule margin still exists to need date
February 2013	<ol style="list-style-type: none"> Secondary Mirror Support Structure I&T tooling fixture complete Primary mirror backplane support wing assemblies complete Spacecraft Primary Structure Manufacturing Readiness Review Start cryogenic certification test of OSIM 	<ol style="list-style-type: none"> Completed 2/27 Completed 2/19 Completed 1/28 Moved to March 2013 – delayed by Global Precipitation Measurement exit from SES chamber
March 2013	<ol style="list-style-type: none"> Deliver last primary mirror actuator motor electronics unit (Cryo Multiplex Unit) Spacecraft fine sun sensor critical design review Space Vehicle Thermal Simulator systems requirements review Complete FGS & MIRI integration onto ISIM 	



Fiscal 2013 Milestones



Month	Milestone	Comment
April 2013	24. Sunshield Template Membrane Layer #2 fabrication complete 25. Spacecraft-to-ground communications subsystem critical design review 26. Software build v 1.1 for the system that senses and controls Webb's active mirrors	
May 2013	27. Telescope primary mirror backplane support fixture (BSF) assembly complete (holds ISIM, primary mirror and spacecraft together for launch)	
June 2013	28. Spacecraft thermal control system critical design review 29. Spacecraft wiring critical design review 30. Rods that suspend telescope and instruments from ceiling of JSC thermal vacuum chamber for testing complete 31. Start first ISIM cryogenic test (risk reduction activity)	31. Moved to July 2013 – delayed by Global Precipitation Measurement exit from SES Chamber
July 2013	32. MIRI detector cooling attachment (flight Cold Head Assembly) delivered to GSFC [delayed fiscal 2012 milestone] 33. Spacecraft flight software build 2.1 test readiness review	
August 2013	35. Latest acceptable date of Near Infrared Camera (NIRCam) into ISIM integration and test flow for inclusion in second ISIM cryogenic test 36. BSF/ Primary mirror backplane center section integration complete	
September 2013	37. Latest acceptable arrival for Flight of Near Infrared Spectrograph (NIRSpec) for inclusion in second ISIM cryogenic test 38. Sunshield membrane cover manufacturing readiness review 39. Completion of studies and trades for mission mass margin in preparation of spacecraft critical design review 40. Complete first ISIM cryogenic test 41. JSC thermal vacuum chamber frame that holds test equipment suspended above the JWST mirror and instruments ready for painting	

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



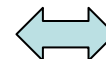
Near Term Focus Areas



Cryo Cooler Schedule and Technical Issues



ISIM Test Flow



NIRCam Stray Light and Schedule



NIRSpec Micro-shutter Array



Replacement Detector Fabrication



Mass Margin Recovery



Observatory Stray Light and Frill



Sunshield Material Edge Waviness and Shape





Yearly Themes



- ✓ **2013: Instrument Integration:** The Science instruments will be finished and begin their testing as an integrated science payload
- ✓ **2014: Manufacturing the Spacecraft:** Construction will commence of the spacecraft that will carry the science instruments and the telescope
- ✓ **2015: Assembling the Mirror:** The mirror segments, secondary mirror and aft optics will all be assembled into the telescope
- ✓ **2016: Observatory Assembly:** The three main components of the observatory will be completed (instruments, telescope, spacecraft)
- ✓ **2017: Observatory Testing:** The three main components of the observatory will be tested and readied for assembly (instruments, telescope, spacecraft) into a single unit
- ✓ **2018: Kourou Countdown:** All parts of the observatory will be brought together, tested and readied for launch in Kourou, French Guiana