



James Webb Space Telescope

OTE Omni
Secondary Mirror Support Structure
Frill

Secondary Mirror Assembly
Secondary Mirror
18 Segment Primary Mirror
Aft Optics Subsystem

Stationkeeping SCAT Thrusters
Spacecraft Bus Radiation Shades
-J2 Equipment Panel
Star Trackers
Spacecraft Omni
LV Adapter Ring
Gimballed Antenna Assembly

Sunshield Layer 5
Forward Spreader Bars
Sunshield Layer 1
Forward UPS Assembly
Mid Boom
Mid Spreader Bar
Membrane Tensioning System
Spacecraft Bus

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Eric P. Smith

JWST Program Office

Recent Updates

- Programmatic
 - Standing Review Board assesses 70% confidence LRD approximately May 2020
 - Breach letter sent to Congress 26-March
 - Independent Review Board being convened to examine remaining activities to-go through commissioning to bolster NASA confidence in program plans as the agency establishes a new firm LRD; we expect to baseline new LRD in late June 2018
 - Changes implemented across Webb program to improve performance
 - Briefings: OMB, House, Senate, NAS subcommittees, NAC/APAC, ESA, CSA
- Spacecraft Element
 - Thrusters reinstalled, membrane tensioning system additional hardware being installed, final closeouts and MLI being installed, element is ready for env. testing
- OTIS (Optical Telescope + Integrated Science instruments)
 - Installed into M8 clean room and placed on roll over fixture
- Science
 - Cycle I General Observer proposal due date moved to NET February 2019

Current Issues

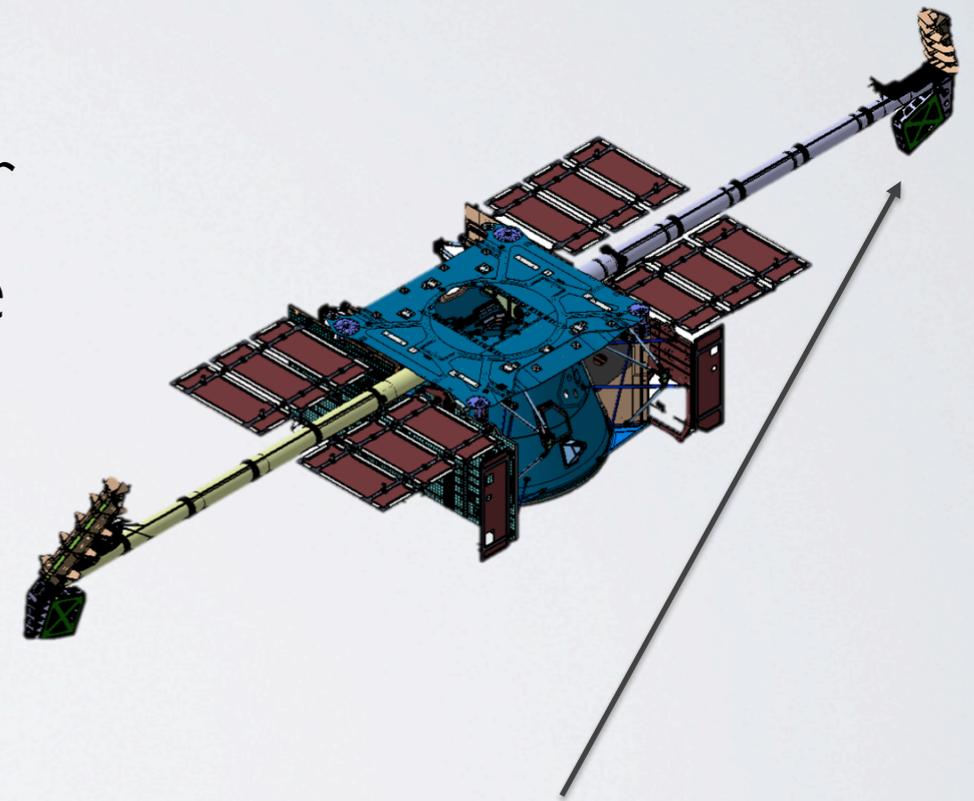
- Schedule performance
- ~~Membrane Tensioning System~~
- ~~Dual Thruster Modules~~

Webb 18 Month LRD Impact from October 2018 LRD

- 15 months of technical issues
 - Sunshield Complications – 7 months
 - 4 months – Deploy/Fold/Stow (2 months to go)
 - 2 months – Tear repairs (1 month to go)
 - 1 month – Snag guard implementation (0.5 months to go)
 - Propulsion Execution Issues – 5 months
 - 2 months – Valve leak recovery (320 days of activity resulted in 2 months schedule loss)
 - 3 months – Pressure transducer overstress
 - Observatory I&T Replan – 3 months
 - 3 months – OTE lessons learned and applied to SCE & reduction in parallel task activities
- 3 months additional funded schedule reserve

Membrane Tensioning System

- During first avionics-driven sunshield tensioning on the +J2 (port) Midboom Membrane Tensioning System (MTS) a release of Light Line cables from snubber clips resulted in excess slack inside of the MTS and Mid-Elbow.
- Designs for controlling cable slack in the MTS are complete. Testing complete. Flight parts are being installed before environmental testing



MTS inside mid-Elbow

Dual Thruster Modules

- Leak checking of the propulsion subsystem Monopropellant thrusters for attitude and momentum control failed because of a higher than expected leak rate.
- A Failure Review Board (FRB) determined seals within valves in the thrusters caused the leaks. Valves have been refurbished and delivered to NGAS.
- Thrusters all rebuilt. All thrusters installed and passed leak checking. Thermal enclosures being installed prior to environmental testing



Technician works on easily accessible Thruster Assembly

Remaining I&T Activities*

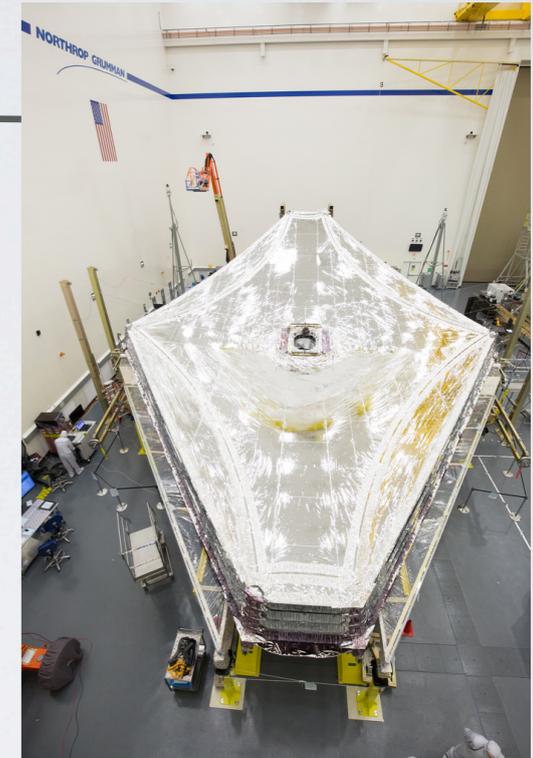
Science Payload

- OTIS Deployments at NGAS
(secondary mirror & ISIM radiator) (1 mo)



Spacecraft Element

- Acoustics, vibe, & thermal vacuum tests (3.5 mo)
- Post-Environmental deployment (2.5 mo)



Observatory Integration

- Pre-environ. Observatory deployment
- Observatory fold and stow
- Observatory system (electrical) test
- Observatory vibration, acoustics tests
- Observatory deployment
- Observatory fold and stow for launch
- Observatory final system test

First-time activity

NOTE: *Top-level tasks to go.
Many activities are associated
with each of these steps

Fiscal Year 2018 JWST HQ Milestones

Month	Milestone	FY2017 Deferral	Comment
Oct-17	1 Science & Operations Center software package Release 2		<u>Completed 10/2/17</u>
	2 Hold Consent to Warm Up Telescope following cryovacuum testing meeting		<u>Completed 10/21/17</u>
	3 Deliver Launch Rehearsal Plan to NASA		<u>Completed 10/2/17</u>
	4 Pre-Environmental testing Sunshield Deployment		<u>Completed 10/23/17</u>
Nov-17	5 Tension the Flight Membranes while on the Spacecraft	•	<u>Completed 10/25/17</u>
	6 Complete Telescope cryovacuum test	•	<u>Completed 10/20/17</u>
Dec-17	7 Issue Cycle 1 General Observer call for proposals		<u>Completed 11/30/17</u>
	8 Backup Mission Operation Center ready for use		<u>Completed 11/17/17</u>
	9 Conduct Operational Readiness Exercise #4		<u>Completed 12/7/17</u>
Jan-18	10 Complete Wave Front Sensing & Control commissioning exercise		<u>Completed 3/10/18</u>
	11 Install spacecraft horizontal radiator panels	•	<u>Completed 1/3/18</u>
Feb-18	12 Complete Spacecraft Element (combined spacecraft and sunshield) Acoustic Test	•	<u>Delayed till April by Integration and Test (I&T) delays</u>
	13 Conduct Observatory Deployment Review #3		<u>Completed 1/31/18</u>
Mar-18	14 Complete Spacecraft Element Vibration Test		<u>Delayed to May by I&T delays</u>
	15 Spacecraft thrusters modules ready for installation		<u>Completed 2/19/18</u>
	16 Ship Telescope from Johnson Space Center to Northrop-Grumman		<u>Completed 2/2/18</u>
Apr-18	17 Deliver results from Spacecraft Element acoustic and vibration tests	•	<u>Delayed to July by I&T delays</u>
	18 Complete post shipment functional testing of the Telescope		
May-18	19 Begin Spacecraft element thermal vacuum test	•	<u>Delayed to June by I&T delays</u>
	20 Deliver analysis of launch effects on JWST Observatory	•	<u>Delayed to July by I&T delays</u>
Jun-18	21 Launch Readiness Exercise #1		
	22 Deliver final version of the spacecraft handbook to NASA		
Jul-18	23 Complete Ground Segment test #2		
	24 Retension sunshield after thermal vacuum testing of the Spacecraft Element		
	25 Conduct Spacecraft Element Compliance Review, part 1		
	26 Complete Johnson Space Center Chamber A decommissioning		
Aug-18	27 Complete Telescope delivery to Northrop-Grumman		
	28 Conduct Integrated Team Exercise #1		
	29 Cycle 1 General Observers proposal selection		
	30 Deliver Spacecraft Element to Observatory Integration and Test		
Sep-18	31 Complete integration of the Telescope onto the Spacecraft Element		

Blue font(underline) denotes milestones accomplished ahead of schedule, orange font denotes milestones accomplished late. "*" denotes 2017 milestones carried forward.

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	Deferred more than one quarter
FY2011	21	21	6	3	0	0
FY2012	37	34	16	2	3	3
FY2013	41	38	20	5	3	2
FY2014❖	36	23	10	8	11	10
FY2015	48	44	22	12	4	3
FY2016	45	39	25	7	6	2
FY2017	38	32	12	13	8	5
FY2018	31	14	5	6*	0	0

*Late milestones have been completed late within the year or are forecast to complete late within the year. Deferred milestones are not included in the number-completed-late tally.

- ❖ Milestone accounting in FY2014 was complicated by the government shutdown and multicomponent milestones

Spacecraft Element and OTIS

