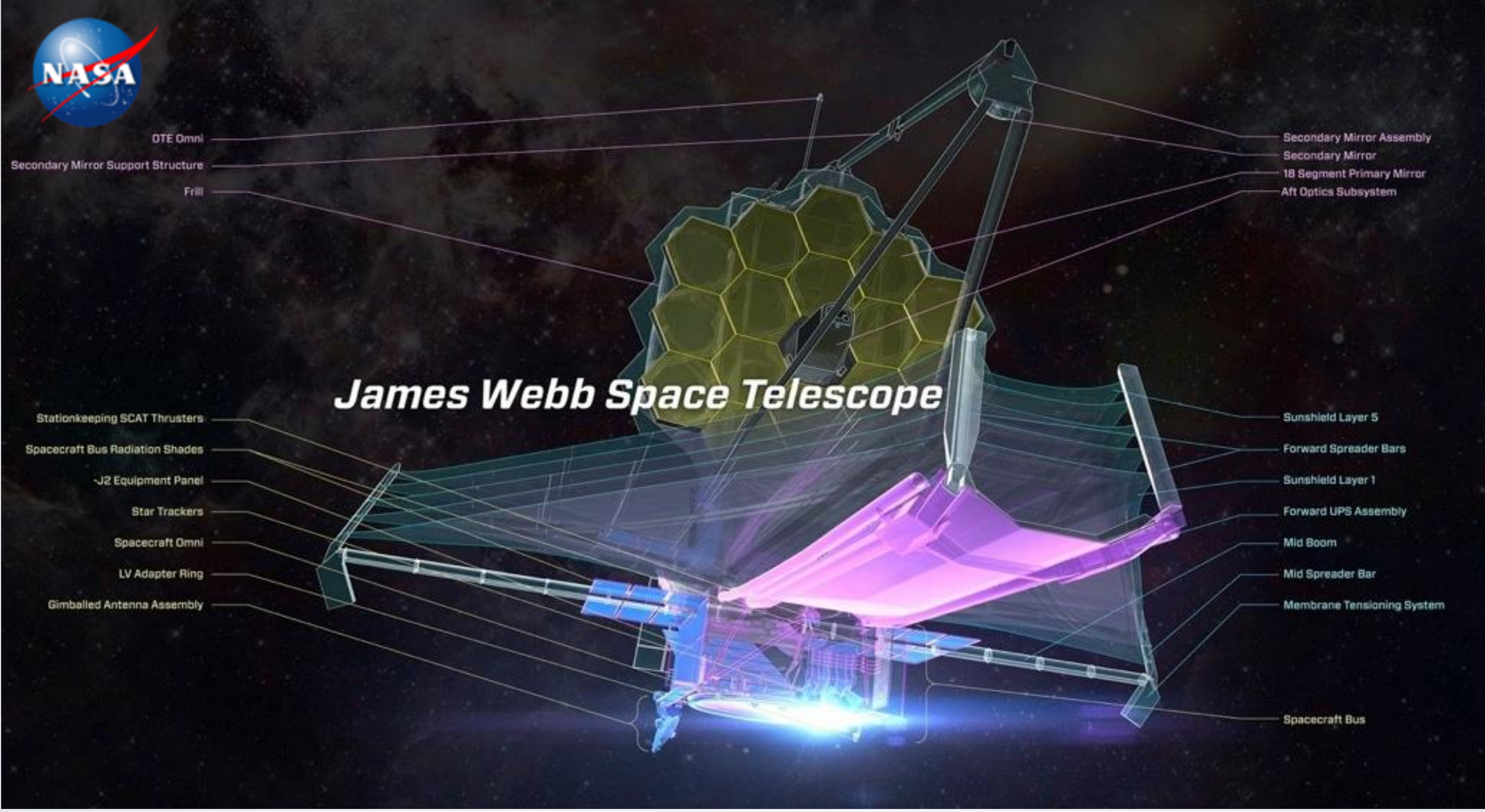


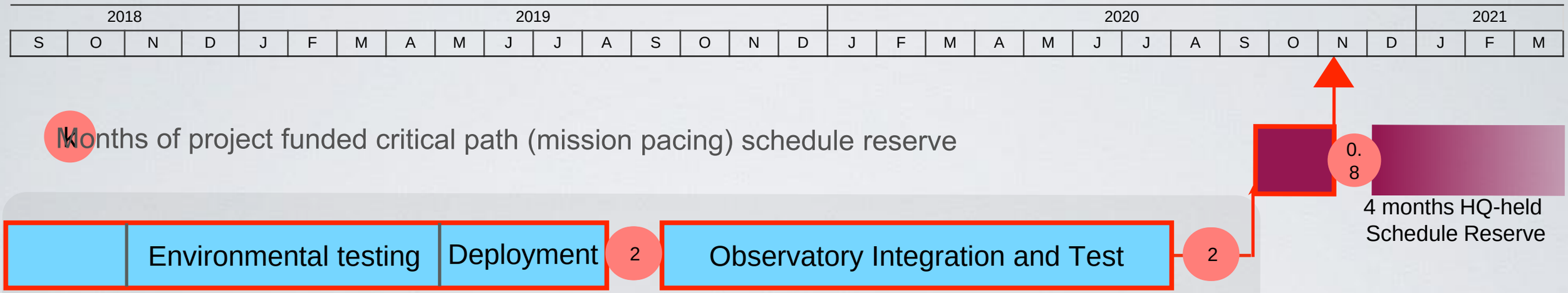
October 22, 2018

Eric P. Smith

JWST Program Office

10-October-2018

SIMPLIFIED SCHEDULE



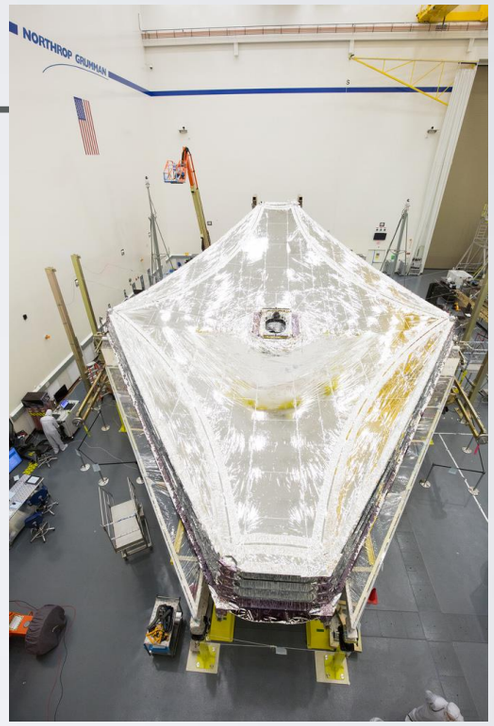
Remaining I&T Activities*

Science Payload

- OTIS Deployment at NGAS
  (secondary mirror support structure)

Spacecraft Element

- **Acoustics, (w/repaired hardware) vibe, & thermal vacuum tests**
- Post-Environmental deployment



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

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

First-time activity

Recent Updates

- Programmatic
  - Implemented Independent Review Board recommendations, final meetings with the board scheduled for last week of Nov., first week of Dec.
  - Held normal status updates with GAO annual audit team
- Spacecraft Element
  - Spacecraft Element has been returned to its environmental testing configuration and final closeouts are taking place.
  - Testing resumes mid-November with acoustics retesting, followed about one week later with vibration testing. Thermal vacuum testing in early 2019.
- OTIS (Optical Telescope + Integrated Science instruments)
  - Completed additional “get ahead” warm functional tests of telescope commanded by the spacecraft electronics
- Science and Operations
  - Ground segment testing and operations rehearsals continuing

Current Technical Issues

- Maintaining schedule performance
- Depressurization at fairing jettison
- OTIS Problem Failure Report (PFR) progress
  - Mirror stability
  - NIRCam pupil wheel

Fairing Depressurization

- Issue: Residual air trapped in folded sunshield membrane may cause an over-stress condition at the time of fairing separation due to the depress rate ($\Delta pressure \leq 0.013$ psi, capability 0.005 psi).

- Actions:
  - Validated capability of membrane material
  - Developing better understanding (through modeling) of architecture's outgassing during depress and pressure measurements from vendors
  - Investigated holding onto fairing longer to allow more outgassing prior to separation (doesn't make a difference for realistic separation event times)
  - Investigating keeping fairing vents latched open to resolve issue.

OTIS PFRs

- PFR JWST-190: Primary Mirror Segment Assembly (PSMA) Stability
  - Closes with PMSA closeout modifications and final wavefront assessments ~January (need to wait for Spacecraft to leave clean room to perform final OTE modifications and modeling)
- PFR JWST-192: NIRCam Module-B, ICE-1, SW Pupil Wheel element move failure
  - During the execution of the Warm ISIM Functional (WIF) Test, a command from the NIRCam Instrument Control Electronics (ICE) Box #1 to move the Module B Short Wave (SW) B-Side Pupil Wheel (PW) showed anomalous current in the trend data.
  - The anomaly was repeated both during additional steps in the WIF, and during follow-on diagnostic data gathering.
  - Failure Review Board is wrapping up.
  - Leading cause appears to be a failed ICE Box 1 printed wiring board solder joint in the PW drive circuit to the PW redundant coils.
  - Board has recommended destructive parts analysis of 4 spares to determine if the bond wire interconnect within an op amp had degraded, results by the end of October.
  - While this drive path is no longer viable, there are still three functioning configurations to drive the wheel (ICE-1 primary drive, ICE-2 primary and redundant drives)

Blue underlined text indicates changes from last meeting

APAC Recommendations (1)

- *Recommendation:* In response to the JWST delay, the APAC recommends that a plan be developed for identifying and minimizing the science impact of the delayed launch and requests a presentation of such a plan during the fall meeting of the APAC

- *Response:* The largest impact is likely to be the decreased overlap with a fully operational Hubble. Counter to that, you have a better match with TESS operational lifetime (if extended in senior review), and possibly greater overlap with WFIRST operations. GTO and ERS programs are largely unaffected since target swaps are possible and the delay only may affect when a program is executed during year one rather then whether it will be executed. The delay may help the community be more familiar with transient and multi-messenger science having had an additional 2 years experience with LIGO follow-up. The EXOPAG is looking into how the delay affects their community. Finally, because you, the community ultimately select the science Webb will perform via peer review we know it will address the most exciting science available when it is operational.

APAC Recommendations (2)

- *Recommendation:* The APAC found that, given the complexity, the visibility, and the precedent status of the JWST mission, a Lessons Learned report from this project would be of tremendous value to all flagship missions going forth. The APAC recommends a speedy preparation of such a report to benefit future efforts.

- *Response:* The Webb Program, in collaboration with SMD and GSFC management, has developed a set of lessons learned by querying NASA and Northrop management organizations, (including the project and program personnel). Responses were collated and condensed into a set that is being presented to a NASA Agency Program Management Council meeting on 6-Nov. Many are general lessons for the agency's large programs and others are Webb specific.

Portion of the lesson learned candidate map from GSFC's Ed Rogers


20 TON CAP.
JLG
Main Switch Box
Austrian Aerospace
REAR

Backup

Fiscal Year 2018 JWST HQ Milestones

Month		Milestone	FY2017 Deferral	Comment
Oct-17	1	Science & Operations Center software package Release 2		Completed 10/2/17
	2	Hold Consent to Warm Up Telescope following cryovacuum testing meeting		Completed 10/21/17
	3	Deliver Launch Rehearsal Plan to NASA		Completed 10/2/17
	4	Pre-Environmental testing Sunshield Deployment		Completed 10/23/17
Nov-17	5	Tension the Flight Membranes while on the Spacecraft	•	Completed 10/25/17
	6	Complete Telescope cryovacuum test	•	Completed 10/20/17
Dec-17	7	Issue Cycle 1 General Observer call for proposals		Completed 11/30/17
	8	Backup Mission Operation Center ready for use		Completed 11/17/17
	9	Conduct Operational Readiness Exercise #4		Completed 12/7/17
Jan-18	10	Complete Wave Front Sensing & Control commissioning exercise		Completed 3/10/18
	11	Install spacecraft horizontal radiator panels	•	Completed 1/3/18
Feb-18	12	Complete Spacecraft Element (combined spacecraft and sunshield) Acoustic Test	•	Completed 3/25/18
	13	Conduct Observatory Deployment Review #3		Completed 1/31/18
Mar-18	14	Complete Spacecraft Element Vibration Test		Deferred to FY19
	15	Spacecraft thrusters modules ready for installation		Completed 2/19/18
	16	Ship Telescope from Johnson Space Center to Northrop-Grumman		Completed 2/2/18
Apr-18	17	Deliver results from Spacecraft Element acoustic and vibration tests	•	Deferred to FY19
	18	Complete post shipment functional testing of the Telescope		Deferred to FY19
May-18	19	Begin Spacecraft element thermal vacuum test	•	Deferred to FY19
	20	Deliver analysis of launch effects on JWST Observatory	•	Deferred
Jun-18	21	Launch Readiness Exercise #1		Deferred
	22	Deliver final version of the spacecraft handbook to NASA		Completed 5/9/18
Jul-18	23	Complete Ground Segment test #2		Completed 7/25/18
	24	Retension sunshield after thermal vacuum testing of the Spacecraft Element		Deferred to FY19
	25	Conduct Spacecraft Element Compliance Review, part 1		Deferred to FY19
	26	Complete Johnson Space Center Chamber A decommissioning		Completed 6/14/18
Aug-18	27	Complete Telescope delivery to Northrop-Grumman		Deferred to FY19
	28	Conduct Integrated Team Exercise #1		Deferred
	29	Cycle 1 General Observers proposal selection		Deferred
	30	Deliver Spacecraft Element to Observatory Integration and Test		Deferred to FY19
Sep-18	31	Complete integration of the Telescope onto the Spacecraft Element		Deferred to FY20

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	18	7	2	13	13
FY2019	32	0	0	0	0	0

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

FY19 milestones still being discussed