JWST Update

Eric P. Smith
JWST Program Office
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2020 RECAP

Significant progress during a challenging year

- Observatory

  Successfully completed its environmental testing (launch vibration and acoustics)

  Successfully completed pre-environmental comprehensive system testing (electrical functional)

  Nearly finished with all post-environmental test deployments

  Launch date moved from March to October

- Science & Operations Center: commissioning rehearsals, Cycle 1 proposal receipt

RECENT UPDATES

➓Programmatic

NASA and Northrop continuing to work but with COVID19 social distancing protocols meaning some reduced efficiencies

Sufficient funds and schedule margin for 31-Oct launch readiness date

➓Observatory

Completed the final sunshield deployments and the flight stow process has begun

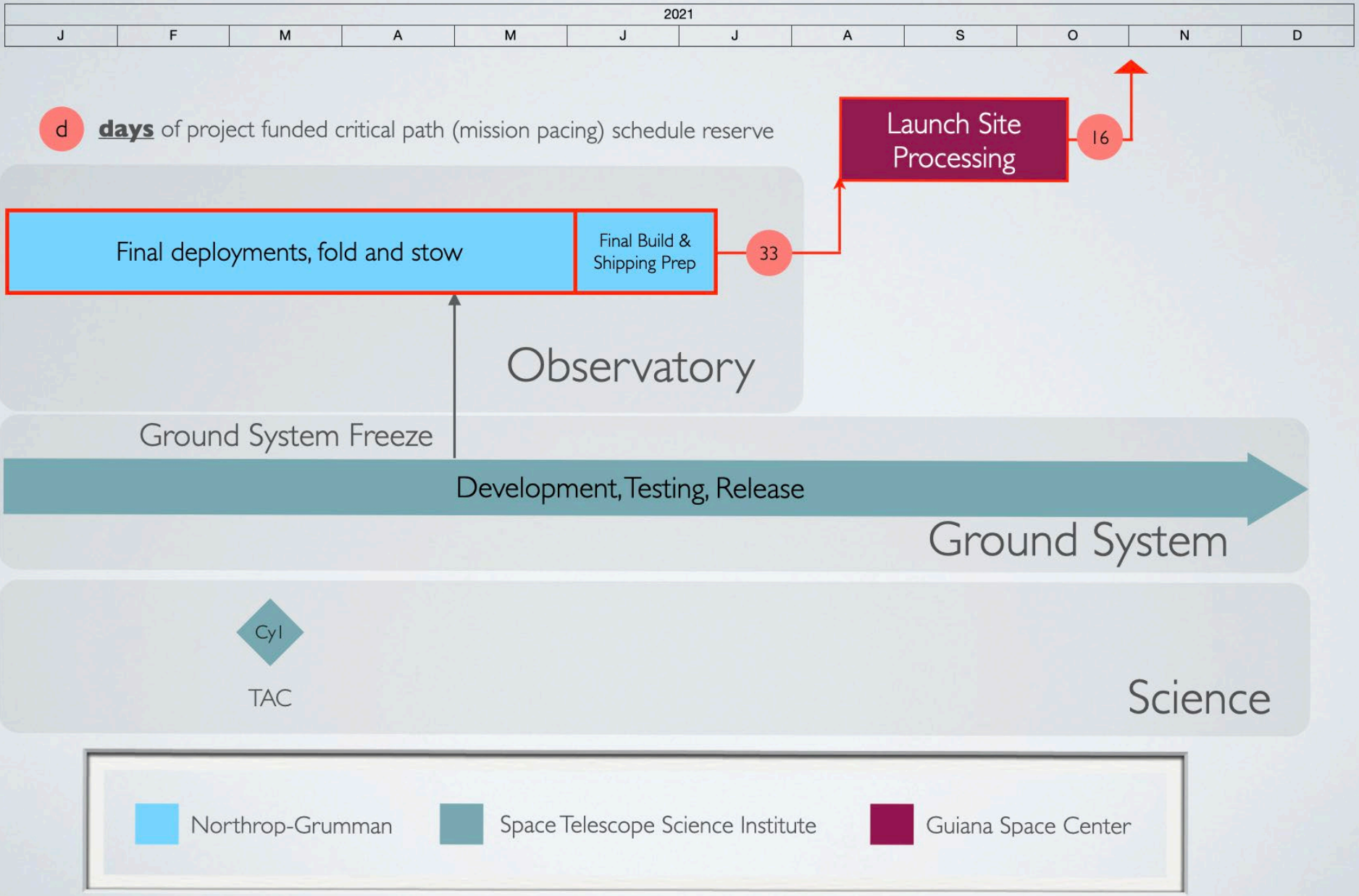
- Working some anomalies along the way but nothing that invalidates the deployment and are preparing the data to present to the Standing Review Board

• Science and Operations

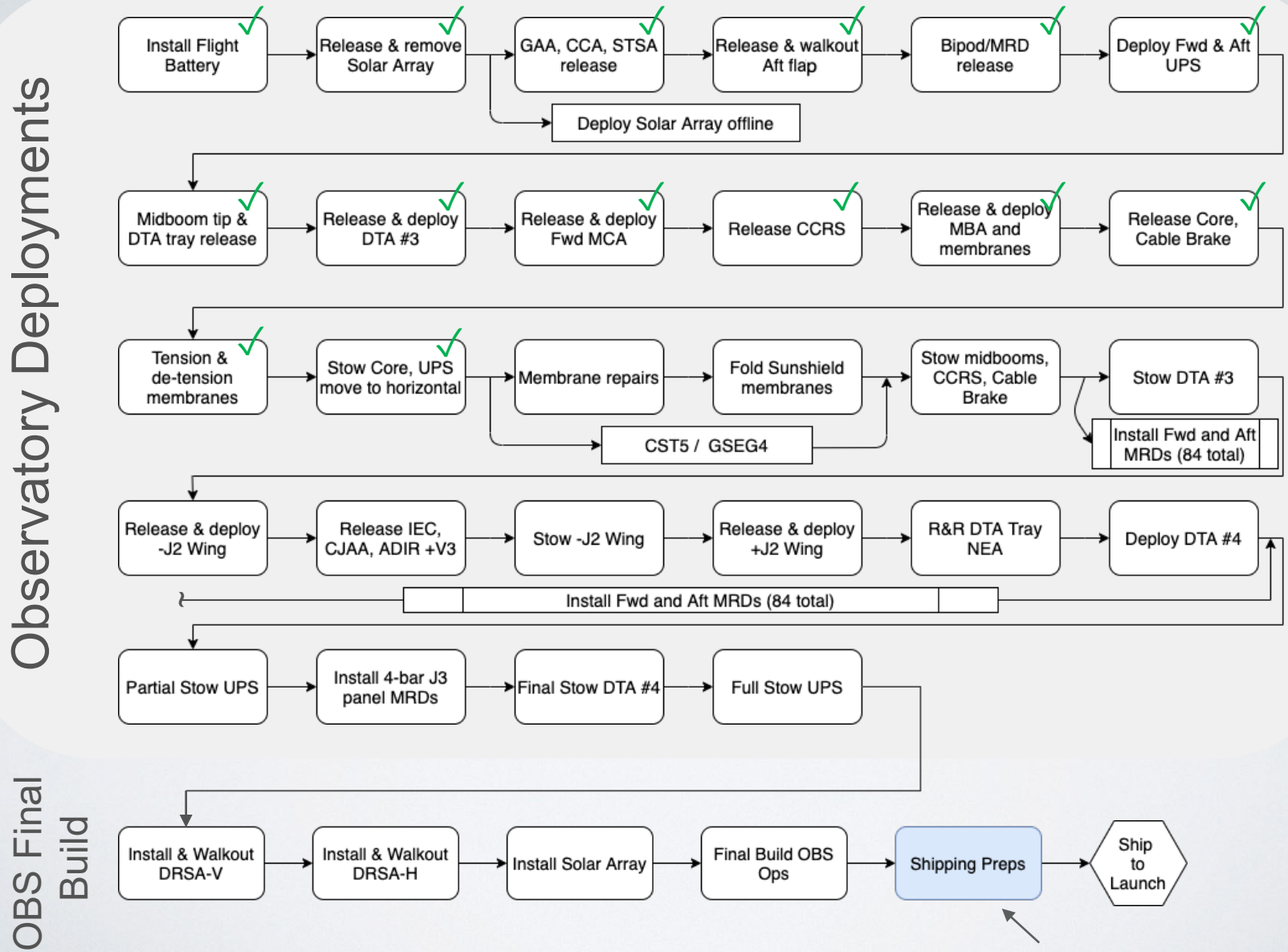
Ground segment testing and operations rehearsals continuing

1173 Cycle 1 General Observers proposals received

SIMPLIFIED SCHEDULE

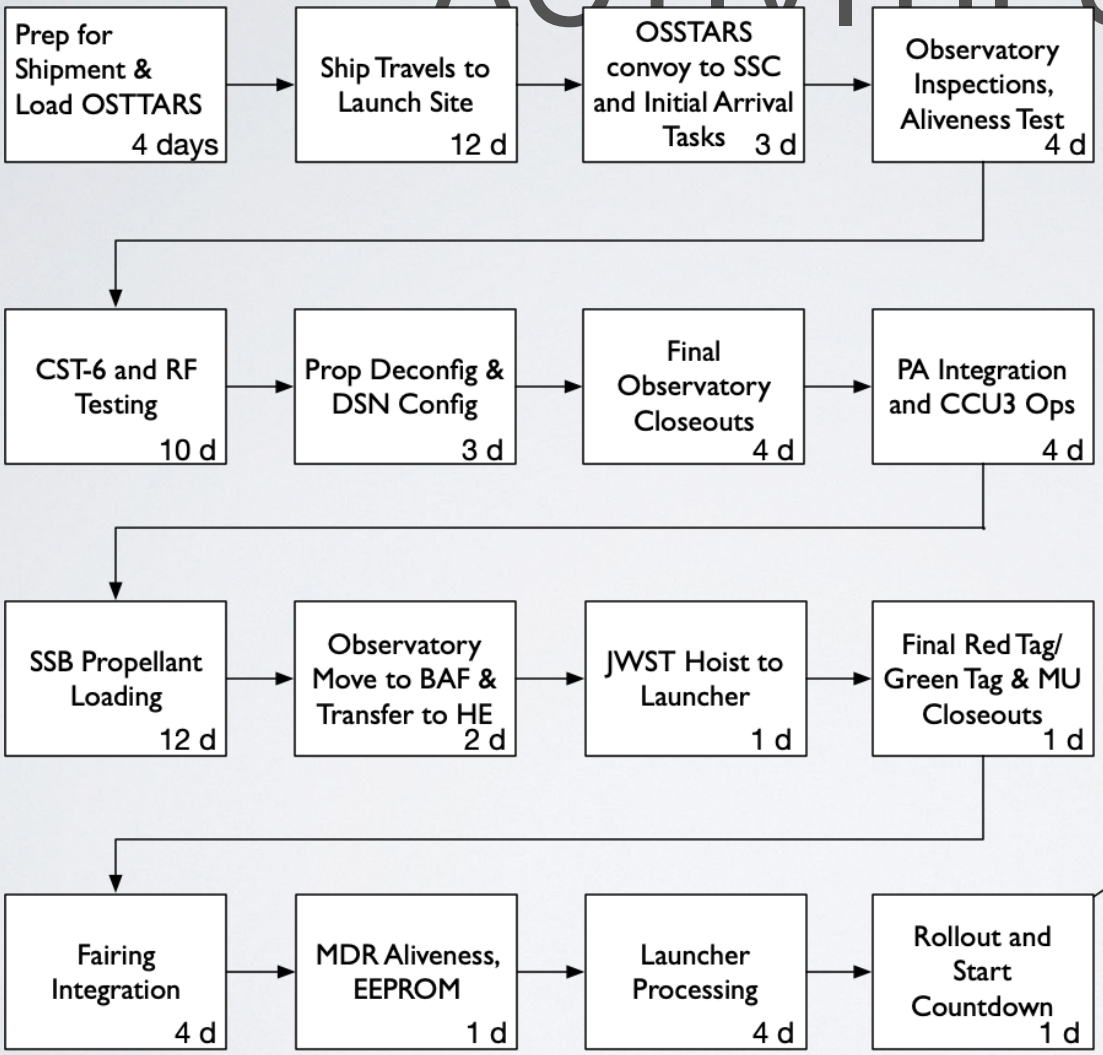


REMAINING I&T STEPS



Blue box indicates first time activity

KOUROU ACTIVITIES



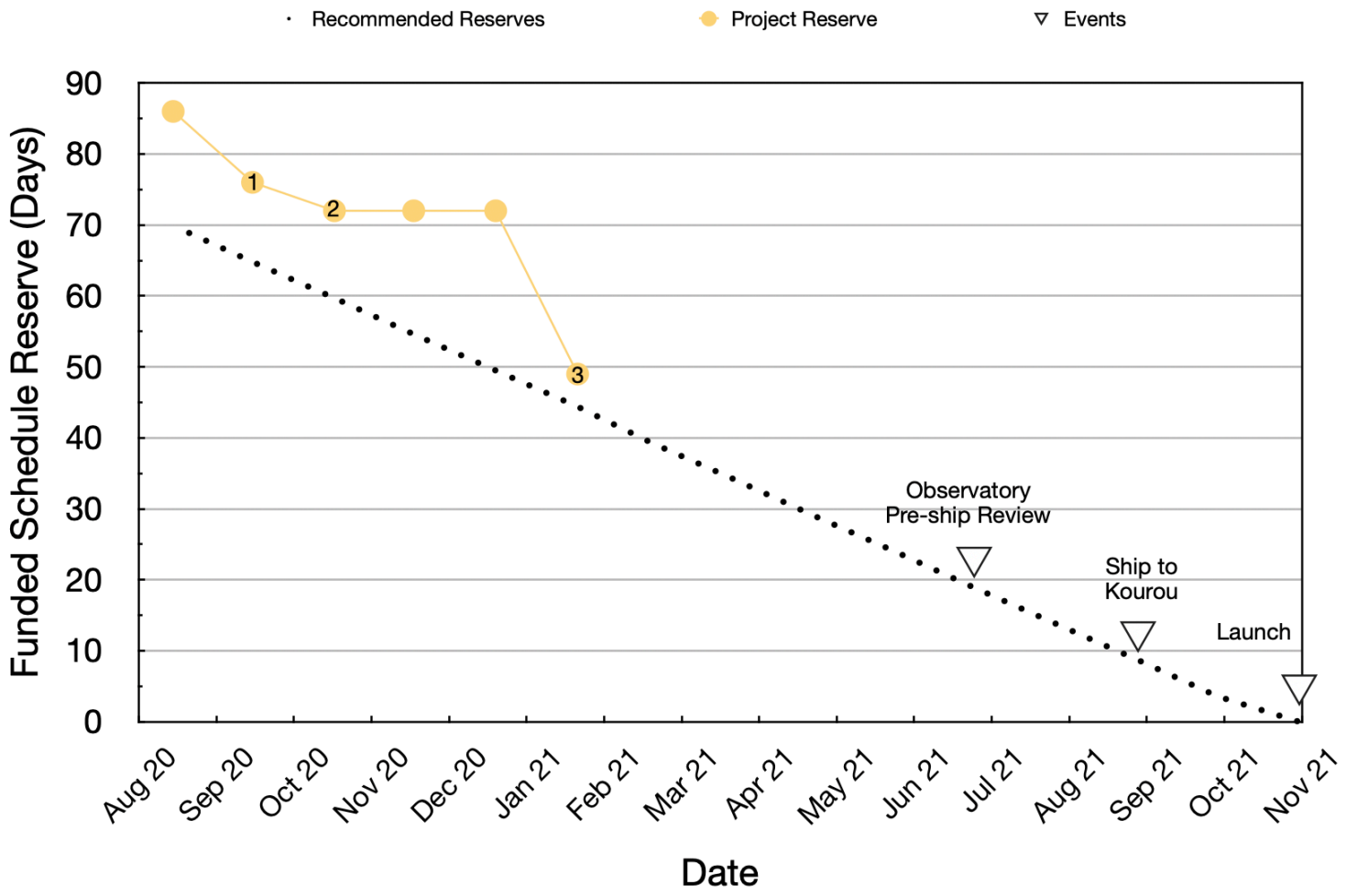
+16 days of schedule reserve

Fiscal Year 2021 JWST HQ Milestones

Month		Milestone	Comment
Oct-20	1	Complete Observatory Envronmental Testing	Completed 10/2/20
Nov-20			
Dec-20	2	Complete Post Environmental Testing Spacecraft Bus Deployments	Completed 11/12/20
Jan-21	3	Complete Post Environmental Testing Sunshield Deployments	Completed 12/16/20
Feb-21	4	Complete Comprehensive System Test #5	
Mar-21	5	Complete Cycle 1 Geneal Observer Proposal Reviews	
	6	Sunshield Fold Complete	
	7	Launch Readiness Exercise #2	
Apr-21			
May-21	8	Final Deployable Tower deployment	
Jun-21			
Jul-21	9	Final Observatory Stow Complete	
	10	Observatory Pre-Ship Review	
	11	Launch Readiness Exercise #4	
Aug-21	12	Operational Readiness Review	
	13	Ship Observatory to Launch Site	
Sep-21			

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

CURRENT FUNDED SCHEDULE RESERVE



Reserve uses: (1) Bldg M4 issues, additional Z-axis vibe run, (2) Ka-band measurements, APCO adapter (3) Planned sunshield repairs and patching

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	25	22	10	10	3	2
FY2020	17*	12	5	0	0	0
FY2021	13	3	2	0	0	0

❖ Milestone accounting in FY2014 was complicated by the government shutdown and multicomponent milestones. *Milestone reporting stopped during COVID-19 impacted months

TECHNICAL ISSUES STATUS

MEMBRANE RELEASE DEVICES (MRD) & NON-EXPLOSIVE ACTUATORS (NEA)

- MRD
  - Evaluation of simultaneous ascent (mechanical, acoustic) and pressure loads show negative margins on some highly-loaded MRDs
  - Built 5 new MRDs with new material. Three were installed for Observatory environments, 2 went through a series of offline tests.
  - Resolution: All MRDs will have positive margins based on either additional proof testing or replacing Collets and Stems with alternate material
- NEA
  - The NEA for one sunshield MRD failed to release when actuated using the redundant side only electrical signal.
  - The NEA fired correctly when signaled on the primary side.
  - The anomaly has been localized to the NEA portion of this actuator
  - New NEAs have been manufactured and will be ready in time for installation during final observatory stow before shipping.

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 residual pressure ($\Delta pressure \leq 90$ pascals, capability 18 pascals).
- Actions:
  - More sensitive pressure transducers flown on three Ariane 5 flights confirm that there is residual pressure within the faring that exceeds the capabilities (measured values ~ 55 Pa).
  - Passive open-vents first flight 18-Feb measured value ~32 Pa (~65 deg opening)
  - Second flight with passive vents included 1] the new vents (opened to the full 80 deg) and 2] a sealed fairing to trap residual air in the fairing honeycomb, measured 31 Pa

Fairing Vent

FAIRING DEPRESSURIZATION

- Plan: Determine that the Sunshield MRDs, membranes and telescope and spacecraft hardware can tolerate 2X fairing pressure level at jettison (i.e., 0.36 Pa). This is a joint NASA and Northrop effort.
- NASA and Northrop performed independent assessments as cross-checks.
- Final coupon testing revealed more capability in the membrane material than first assumed
- Two locations on layer 5 (layer closest to the primary) are being patched (additional thickness), but all other location exonerated by testing.

FASTENER RETORQUING

- Issue Description:

  Data sampling method used during installation of fasteners specified to be torqued “above run-in torque” was inadequate to capture the full range of running torques

Action Plan/Status:

Re-audit of all JWST drawings that require above run-in torque (COMPLETE)

Pre-OBS Environment Assessment (COMPLETE)

Identification of hardware rework prior to Post-OBS Deployments (COMPLETE)

Flight Exoneration (COMPLETE)

Identification of hardware rework after Post-OBS Deployments (COMPLETE)

Running Torque Flight Exoneration Review/Technical Interchange Meeting (COMPLETE)

- Expected Resolution:

  Fasteners either re-torqued or exonerated by analysis prior to Launch

  Approximately 450 were retorqued prior to environmental testing and ~120 fasteners are being retorqued during the final stowing process and will be complete next month

CYCLE 1 GO CALL

- The JWST Cycle 1 GO/AR deadline was on November 24 2020
  - A total of 1174 submissions were received by this date
  - Extension requests from 29 PIs for 40 proposals – all granted
  - All proposals save one were completed by the extension deadline on December 3 2020
- The 1173 complete proposals include
  - 1084 GO proposals for ~24,500 hours, ~4:1 oversubscription
  - 14 Survey proposals for at least 860 hours
  - 75 AR proposals (including theory, cloud computing, data analysis tools)
  - 374 proposal led by ESA PIs (31.9%)
  - 44 proposals led by Canadian PIs (3.8%)
  - 12766 Co-investigators in total – ~50% more than HST Cycle 28
  - 4332 Unique investigators (PI, co-PI & co-I) - ~25% more than HST Cycle 28
    - 1985 investigators have not previously applied for HST time
- Representation from
  - 44 Countries
  - 45 US states + DC and the Virgin Islands
- TAC meeting scheduled for February 16-19 (Galactic panels), February 23-26 (Extragalactic panels) & March 1-4 2021 (Ex. Comm)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