

An artistic rendering of the James Webb Space Telescope in space. The telescope is shown from a side-on perspective, with its large, segmented primary mirror reflecting a vibrant, colorful nebula. The background is a deep purple and blue space filled with stars and distant galaxies. In the upper left corner, a portion of the Earth is visible, showing its blue oceans and white clouds. The Moon is also visible in the upper left, appearing as a bright, cratered sphere. The overall scene is a dramatic and futuristic representation of the telescope's mission.

James Webb Space Telescope

Committee on Astronomy and Astrophysics

Project Status

March 31, 2020



Topics



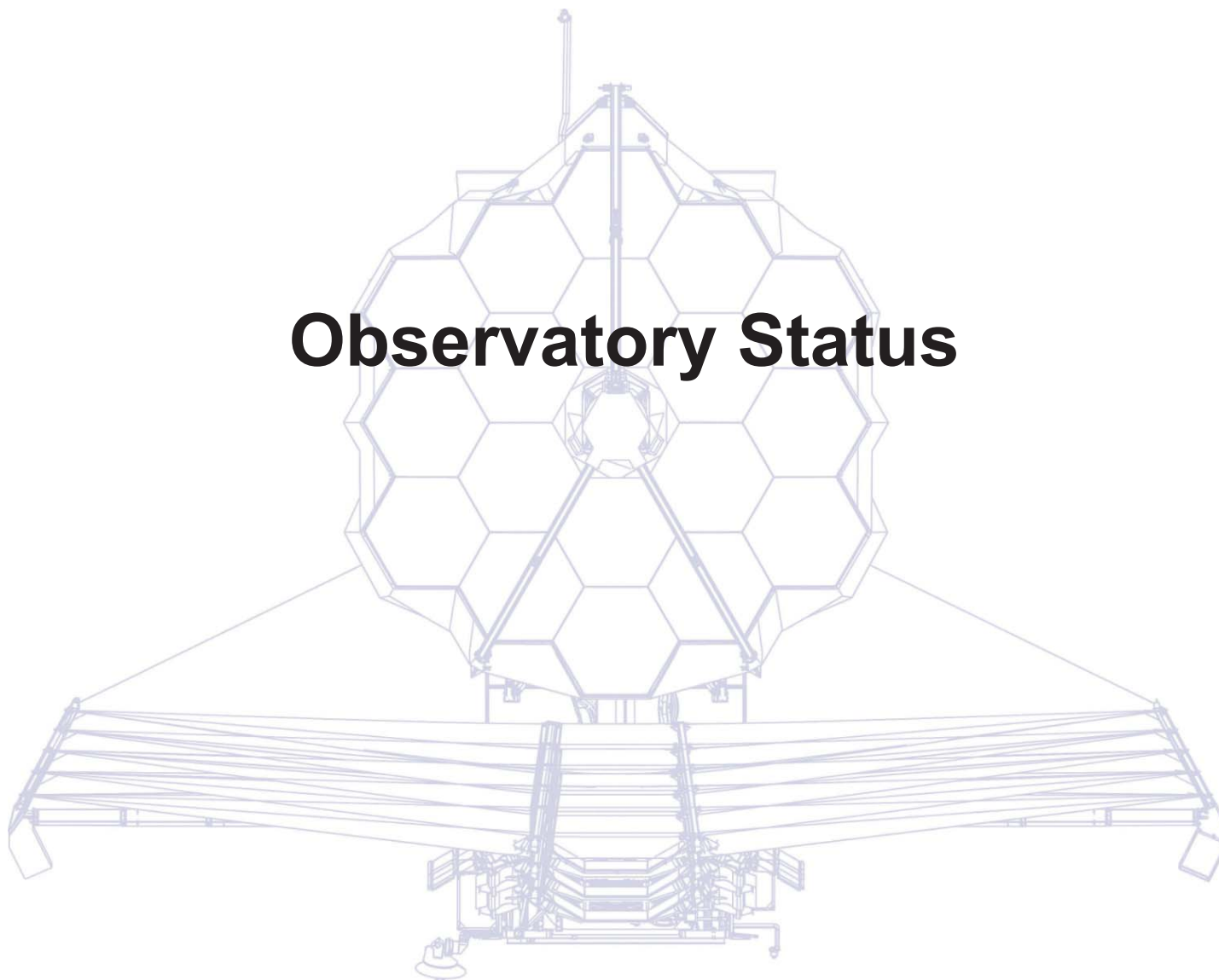
- **Project Status**
 - Observatory I&T
 - Ground System and Operations
 - Launch Vehicle
 - Commissioning

- **Schedule**

- **COVID-19**



Observatory Status





Observatory Major Accomplishments



- **Spacecraft Element: Spacecraft Bus + Sunshield completed its environmental testing (launch vibration and acoustics, thermal vacuum)**
- **Completed Secondary Mirror Deployment**
- **Completed System Integration Review**
- **Spacecraft Element and Telescope/Science Instruments (OTIS) Integrated**
- **Completed Deployment Tower Assembly (DTA) deployment/stow**
- **Completed Sunshield Deployment**
- **Completed Sunshield Membrane Folding**
- **Completed anomalous Command/Telemetry Processor (CTP) and Traveling Wave Tube Amplifier (TWTA) replacements**
 - **Root cause for both anomalous flight boxes identified – both random part failures which don't impugn other units**
- **Deployed/Stowed Primary Mirror Wings as part of Observatory Pre-Environmental Deployments**



Secondary Mirror Deployment



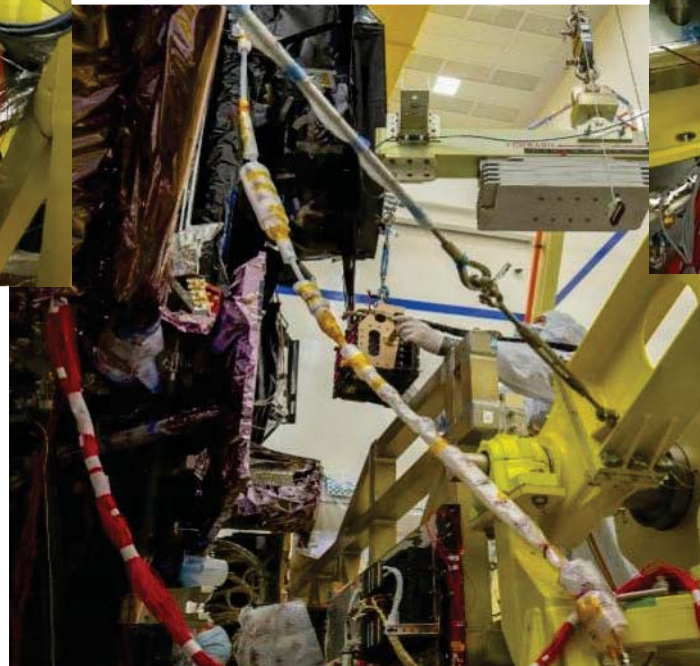
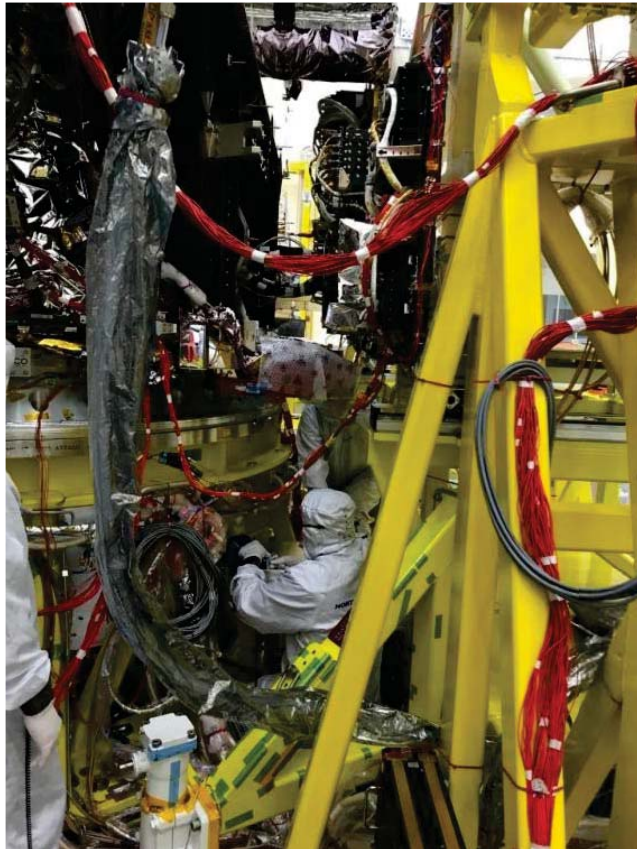


Observatory Integration and Sunshield Deployment Time Lapse Video





TWTA and CTP Replacement

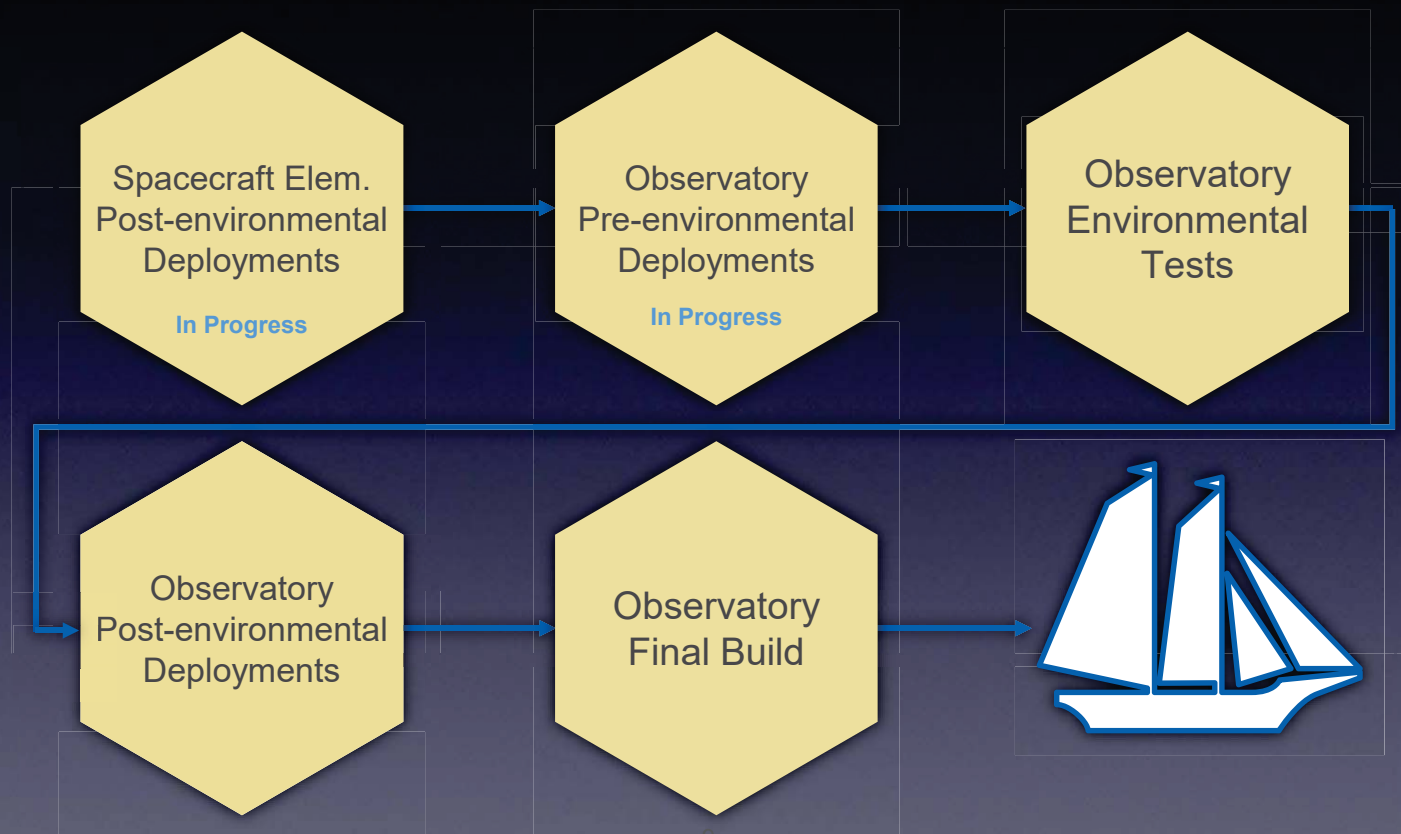




Sunshield Preps For Folding

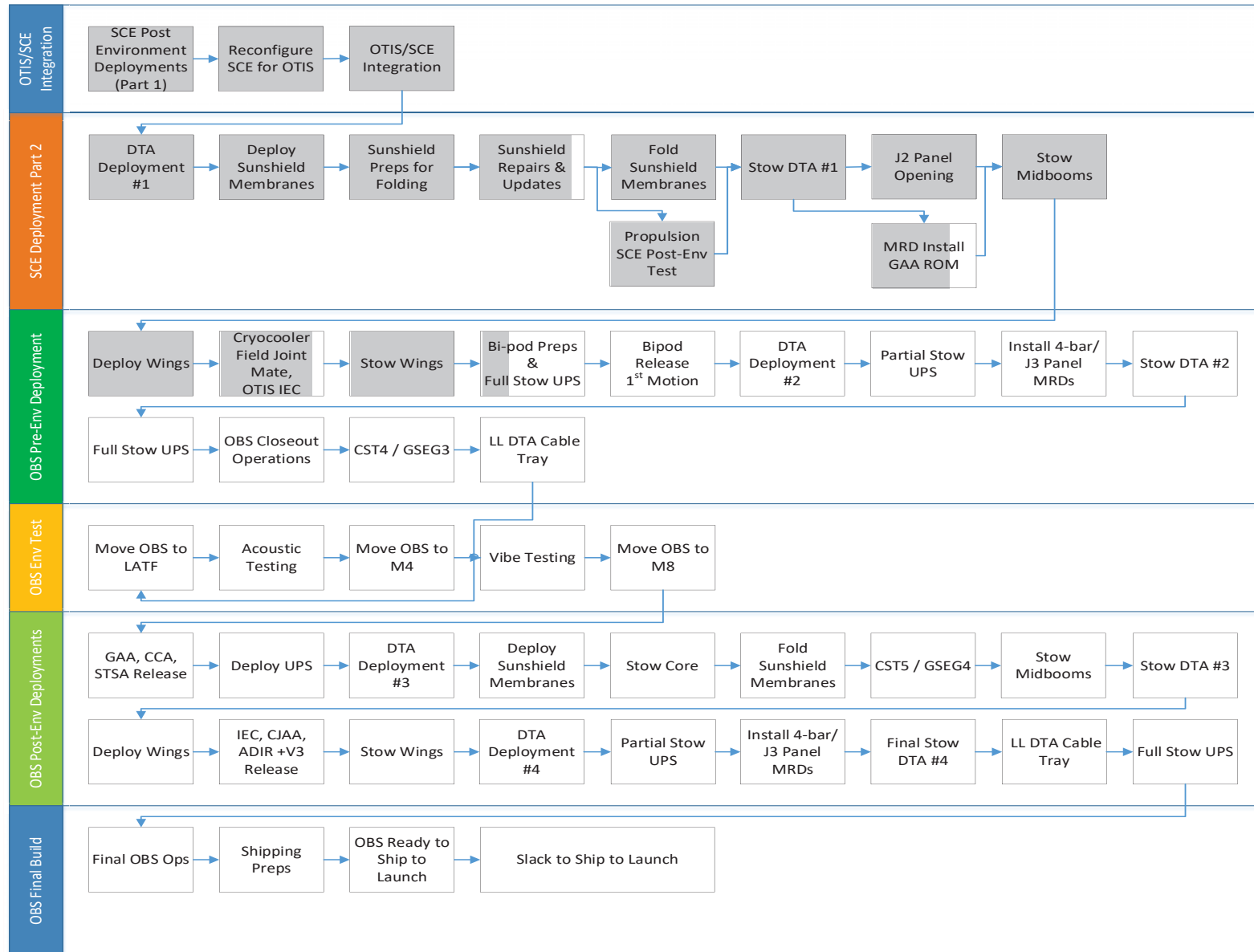


Remaining I&T Activities



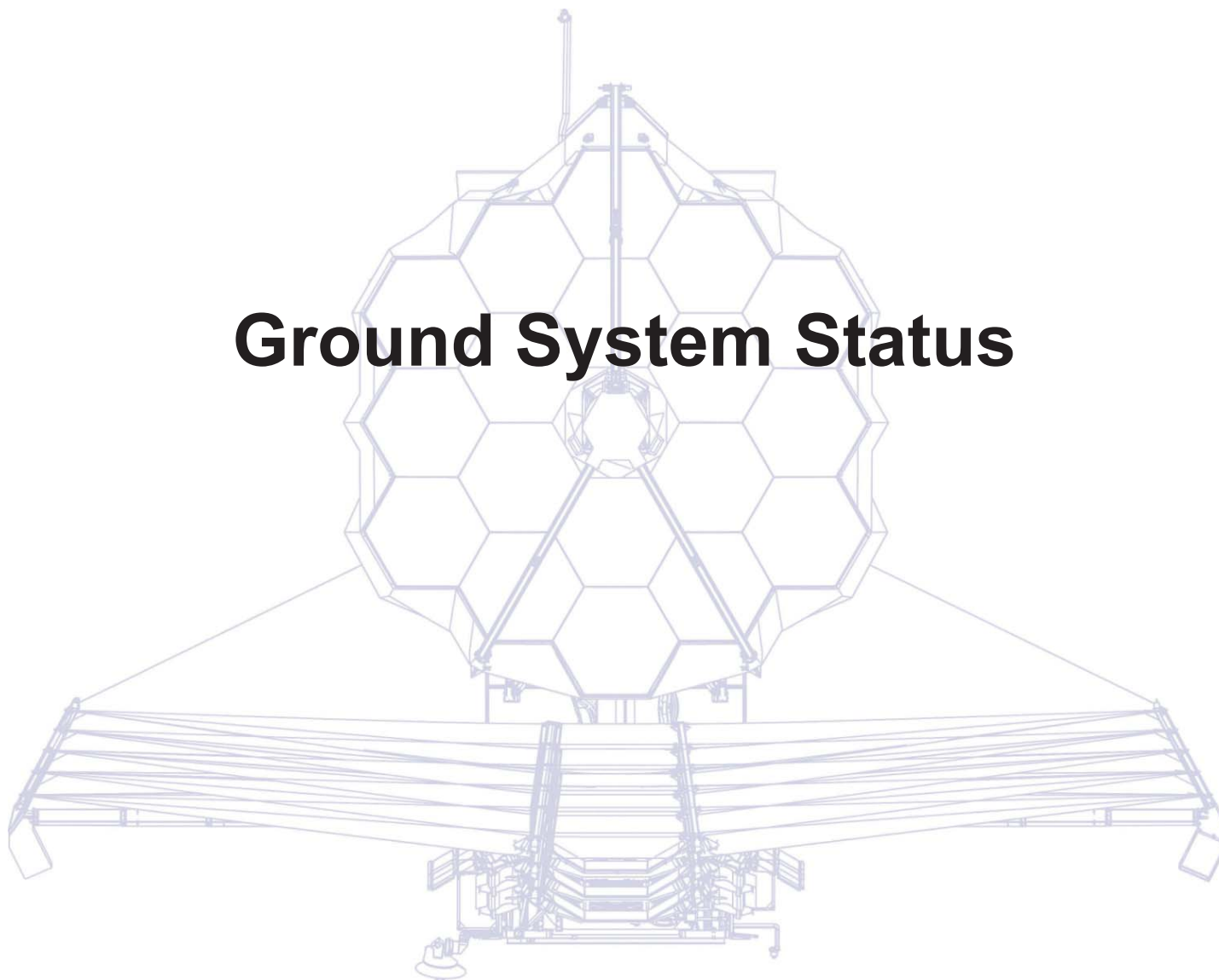


Remaining I&T Activities





Ground System Status





JWST Ground System



- **Both Science Operations and Mission Operations are conducted at the Space Telescope Science Institute at John Hopkins in Baltimore Maryland**
- **All systems required for both Science and Mission Operations are complete**
- **Call for Cycle 1 proposals was released**
 - Establishes first year of science
 - Proposal submittal delayed due to COVID-19
- **All operational products are essentially complete with “tweaks” being made based on testing, mission rehearsals, and contingency planning**
- **Flight Operations Team is fully staffed**
- **Mission Rehearsals**
 - 13 have been completed
 - 17 more mission rehearsals are planned between now and March 2021





Rocket and Launch Site Status





Rocket and Shipping to Launch Site



- **Rocket is provided by the European Space Agency as part of their contribution to JWST**
 - Ariane5 Rocket launched out of the Guiana Space Center (CSG) in Kourou, French Guiana
- **Rocket Hardware**
 - Fairing customization is in process
 - Standard rocket components are in various stages of manufacturing as a “batch”
 - “Cherry Picking” of JWST specific components starts approximately 1 year prior to launch
- **Chartered ocean vessel – Port of Long Beach to Kourou sea port for shipping JWST to launch site**
 - NASA has leveraged the US Transportation Command to ensure the safest and most secure transport possible.





At The Launch Site



- **Complexity of JWST presents challenges to any remote operation and launching from CSG presents even further challenges due to its uniqueness**
 - Last NASA launch out of CSG in early 90's
 - Logistics getting to and operating at CSG adds complexity
- **Launch Site preps begin long before JWST arrives**
 - ~ 300-400 tasks need to be completed before we arrive at CSG
 - Range anywhere from developing procedures to building a contamination system which will be brought to CSG
 - All task are on milestone based schedule and monitored weekly
- **At the launch site**
 - ~ 800 tasks must be completed prior to launch
 - Includes electrical testing, communication testing, etc.
 - All tasks are reviewed regularly to look for efficiencies, etc.
- **JWST is at the launch site for ~ 72 days**



On-Orbit Commissioning





Commissioning Planning Status



- **Commissioning Overview**

- 180 day time allocation
 - 30 days for launch, spacecraft activation, mid-course corrections, and deployment
 - 91 days for cool down, telescope phasing, and activation of instruments and cryo-cooler
 - 59 days for science instrument calibrations

- **Commissioning Organization**

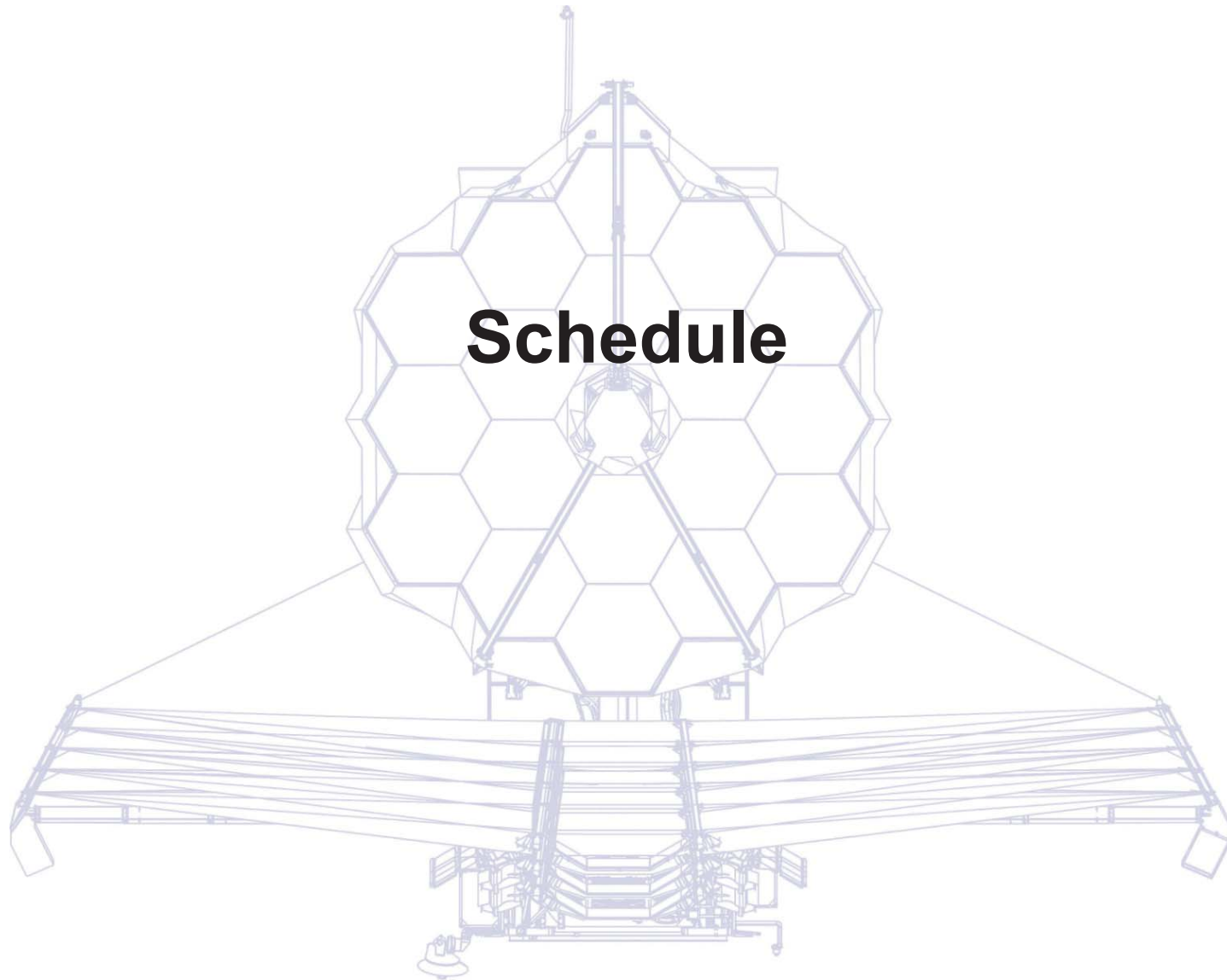
- Established activity based Commissioning team organization
 - Each on-orbit activity has a specific responsible engineer to insure I&T hardware behavior, flight operational products, and nominal and contingency plans are consistent and complete.
- Established key systems engineering positions
 - Spacecraft Commissioning phase lead and Cool Down/OTIS phase lead

- **Examples of Technical and Risk Reduction Activities**

- Updated timeline and activities in support of time critical mid-course correction maneuvers
- Completed several trades to fine tune deployment step order and better phase activities with mission operations shifting
- Full review of all hardware test behavior, failures, etc. for any impact on flight operations nominal and contingency planning
- Enhanced spacecraft attitude control system capabilities to spin/shake observatory to support any significant deployment anomalies
- Completed full commissioning timeline review to synchronize with final correlated model predictions for cool down and contamination heater control

- **Commissioning Reviews**

- Activity leads will conduct deep dive peer review for each on-orbit activity
 - Detailed walk-thru of nominal and contingency operations with combined engineering and flight operations teams.
- Will conduct overall Commissioning Systems Review to roll-up peer review findings and address/close out system level planning, i.e., cool down plan, water migration analyses, etc.



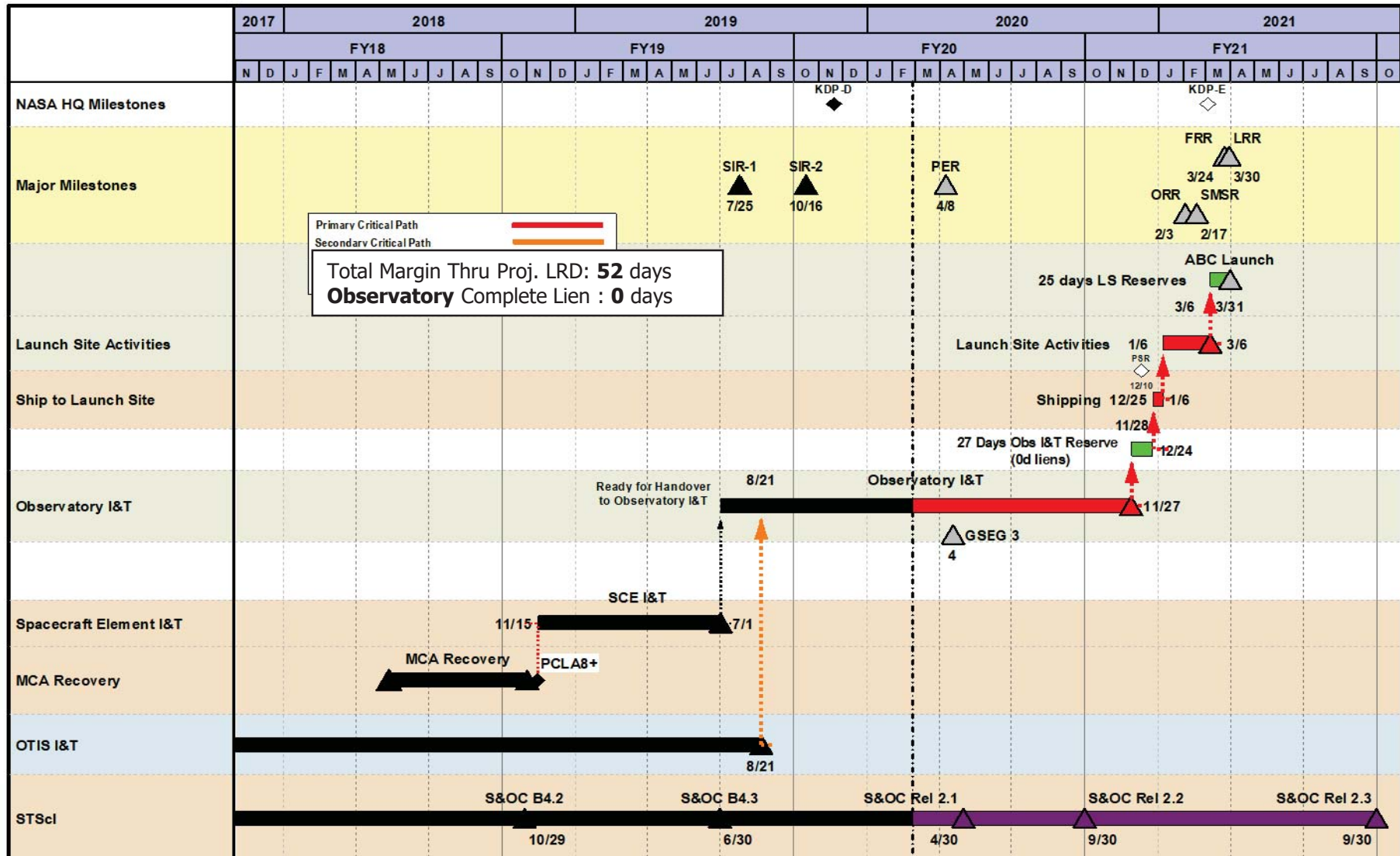


JWST Master Schedule

March 2021 LRD



Pre- COVID-19

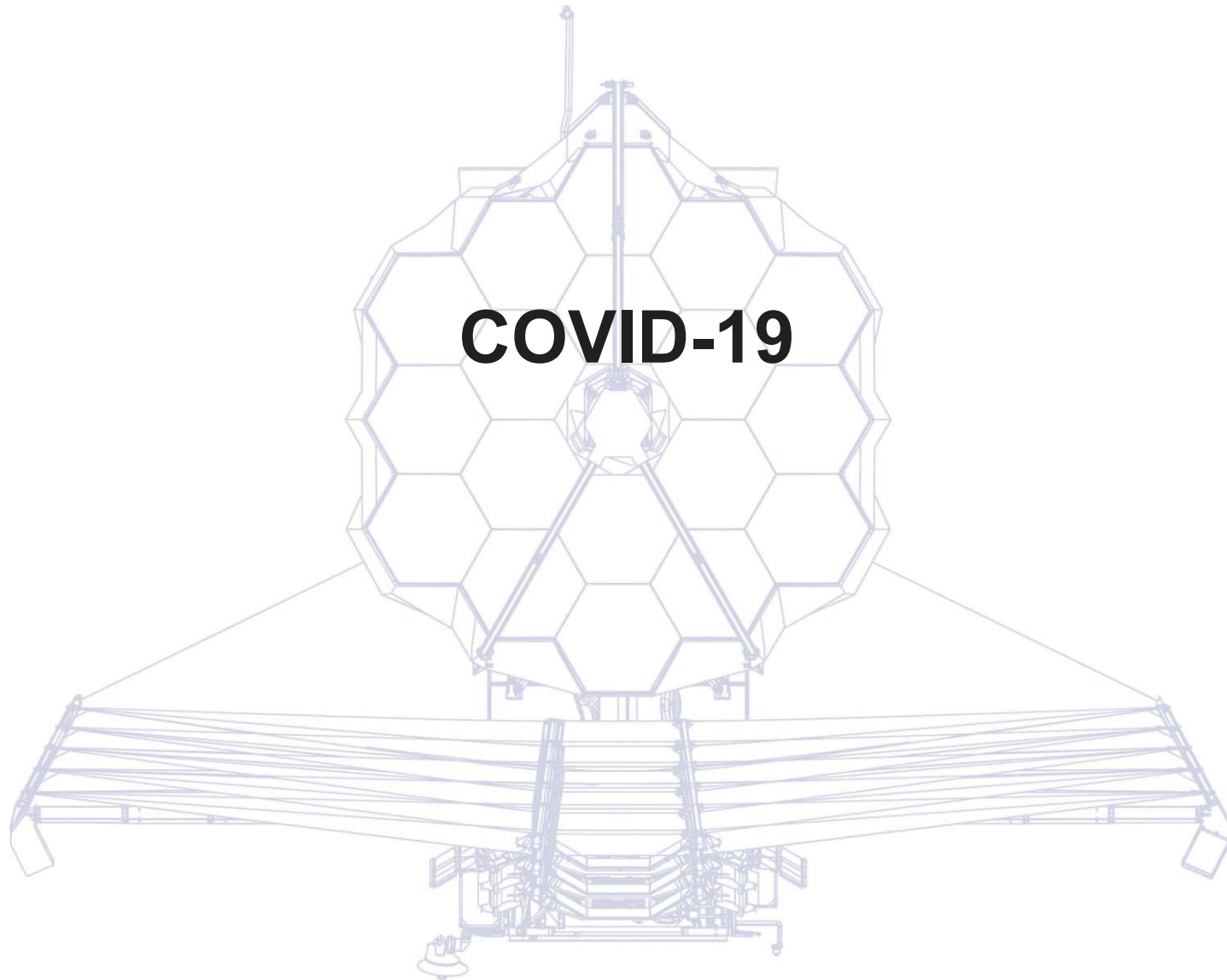




FY 2020 JWST HQ Milestones



Month	Milestone	Org	Comment
Oct '19	SCE Post-Environment Deployments Complete	NGAS	Complete
Nov '19	Flight Software Build 3.4 Delivered Deliver Data Management Subsystem Build 7.4	NGAS STScI	Complete Complete
Dec '19	Replacement TWTAs Delivered	NGAS	Complete
Jan '20	SCE Sunshield Post-Environment Folding Complete Deployable Tower Assembly Deployment Complete	NGAS NGAS	Complete Complete
Feb '20	Flight Couple Loads Analysis #2 Delivered Command/Telemetry Processor #2 Replacement Delivered	NGAS NGAS	Complete Complete
Mar '20	-J Panel Opening/Closing & CTP/TWTA Replacement Complete DTA Deploy Complete Conduct Early Commissioning Exercise #4	NGAS NGAS STScI	Complete Complete
Apr '20	CST4 Test Readiness Review Complete Deliver Science and Operations Center Release 2.1	NGAS STScI	
May '20	Observatory Acoustics Testing Complete (break of configuration)	NGAS	
Jun '20	Observatory Vibration Testing Complete (break of configuration)	NGAS	
Jul '20	Telescope Wing Deployment complete Launch Readiness Exercise #2 Conducted	NGAS NASA	
Aug '20	Final Sunshield Membrane Tensioning Complete Evaluation of Cycle 1 General Observers Proposals (by Time Allocation Committee)	NGAS STScI	
Sep '20	Launch Readiness Exercise #3 Conducted	NASA	





COVID-19



- **JWST activities across the mission are and will be impacted over the coming weeks**
 - GSFC under COVID-19 Stage 4 Operations
 - Mandatory telework is in place, GSFC is closed except to mission-essential personnel to protect life and critical infrastructure, and all travel is suspended
 - JWST is granted an exception, but have taken conservative approach and following Stage 4 guidelines
 - STScI is closed with mandatory telework in place through at least April 10th
 - Launch site in Kourou, French Guiana is closed
- **Operations at NGSS**
 - Integration and test work at Northrop Grumman Space Systems is continuing, the number of personnel and shifts are being reduced
 - NASA presence at NGSS has been reduced from ~ 45 people to ~ 15 people (a small number of east coast folks remain, but primarily consists of west coast contractors working for NASA or DCMA personnel)
 - I&T will operate in this manner till just before DTA in April, and then we will shut down I&T operations
 - Activities from DTA Deployment on require the full NASA/NGSS I&T team to safely proceed and in some instances our international partners
 - In addition, all activities are reevaluated on a minimum of a weekly basis to determine what changes may need to be made based on COVID-19 updates and/or lack of personnel
 - No I&T activity is executed without all appropriate personnel present



Conclusion



JWST has been making excellent progress

From the period of early December through early March execution schedule was maintained without using any schedule reserve

Activities across JWST are being impacted and will be fully assessed once COVID operating restrictions are lifted