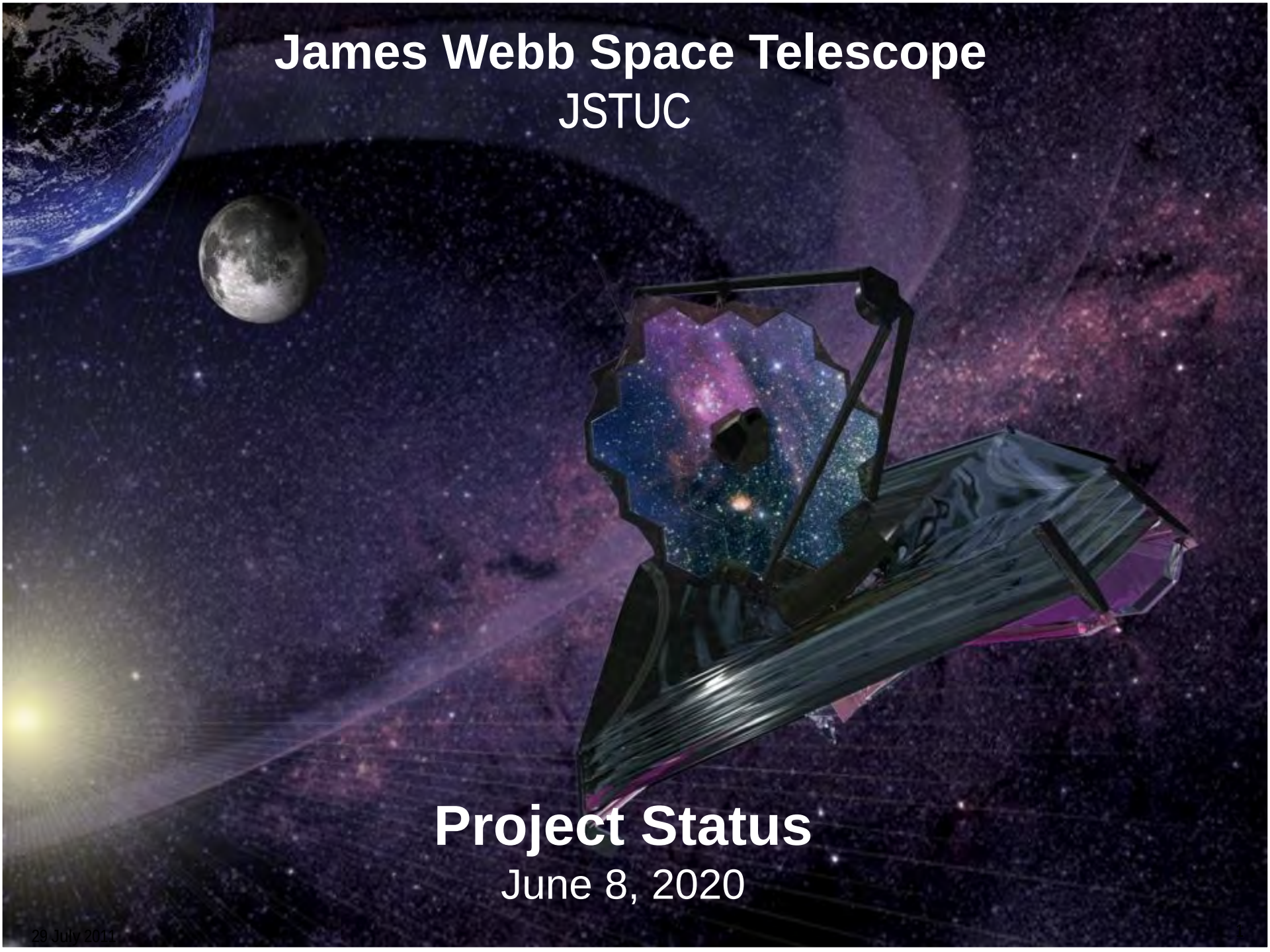


James Webb Space Telescope

JSTUC

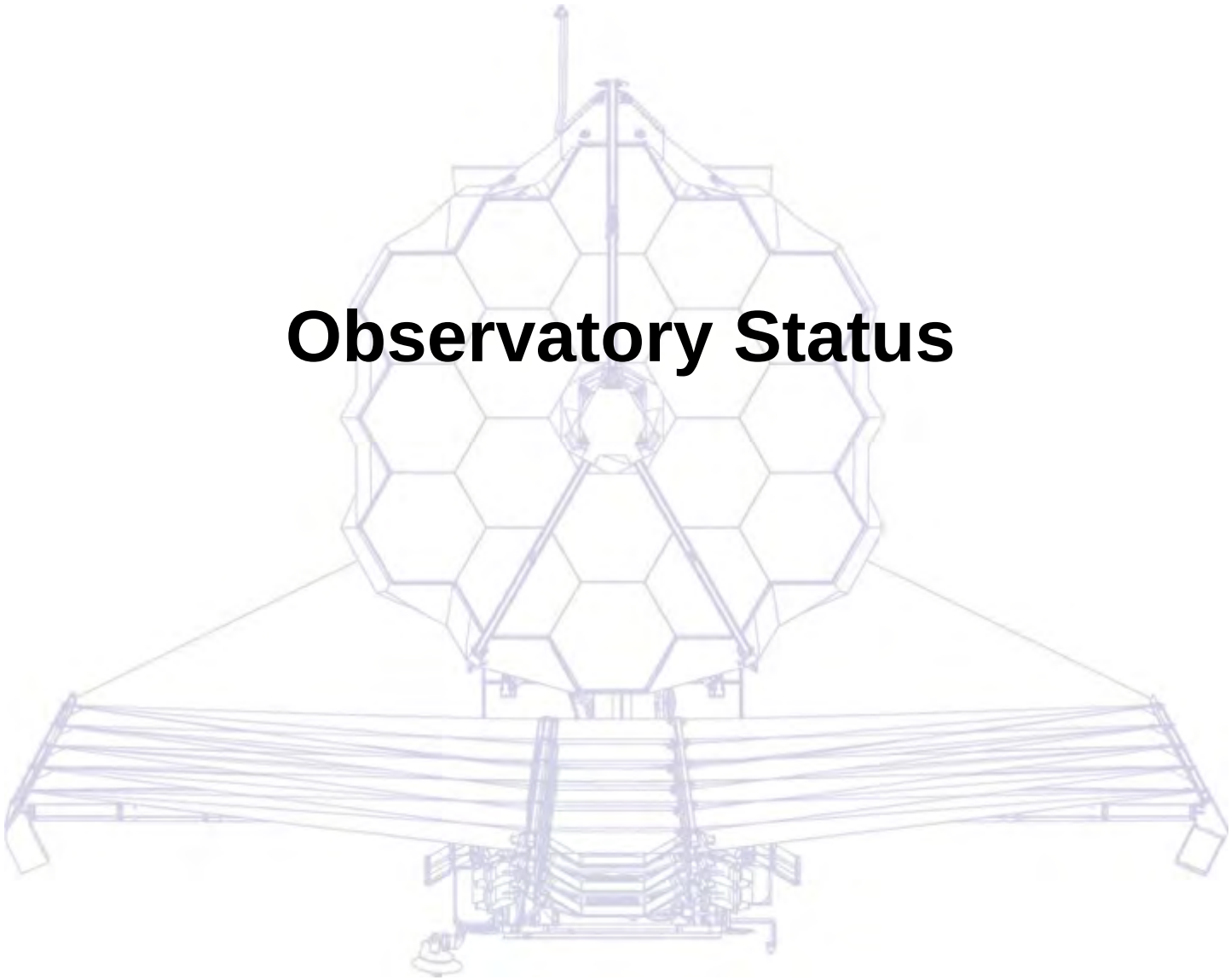
Project Status

June 8, 2020

Topics

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

Observatory Status



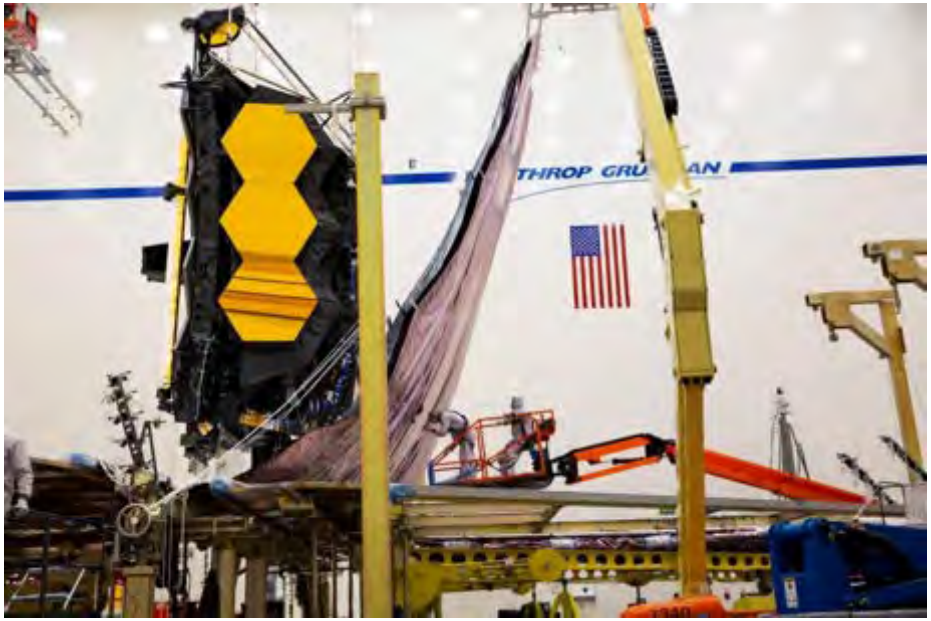
Observatory Major Accomplishments

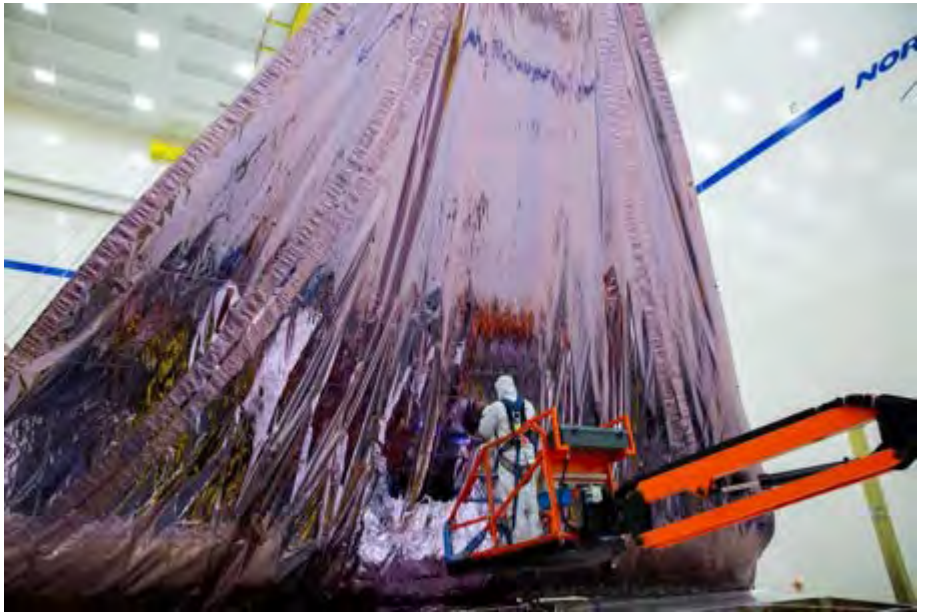
- Completed Deployment Tower Assembly (DTA) deployment/stow (#1)
- Completed Sunshield Deployment
- Completed Sunshield Membrane Folding
- Completed anomalous Command/Telemetry Processor (CTP) and Traveling Wave Tube Amplifier (TWTA) replacements
  - Root cause for both anomalous flight boxes identified – both random part failures which don't impugn other units
- Deployed/Stowed Primary Mirror Wings as part of Observatory Pre-Environmental Deployments
- MIRI Cryocooler Fill Complete
- Sunshield (SS) Bi-Pod First Motion Test Successfully Complete
- DTA Deployment (#2) Complete
- Partial Stow SS Unitized Pallet Structure Complete

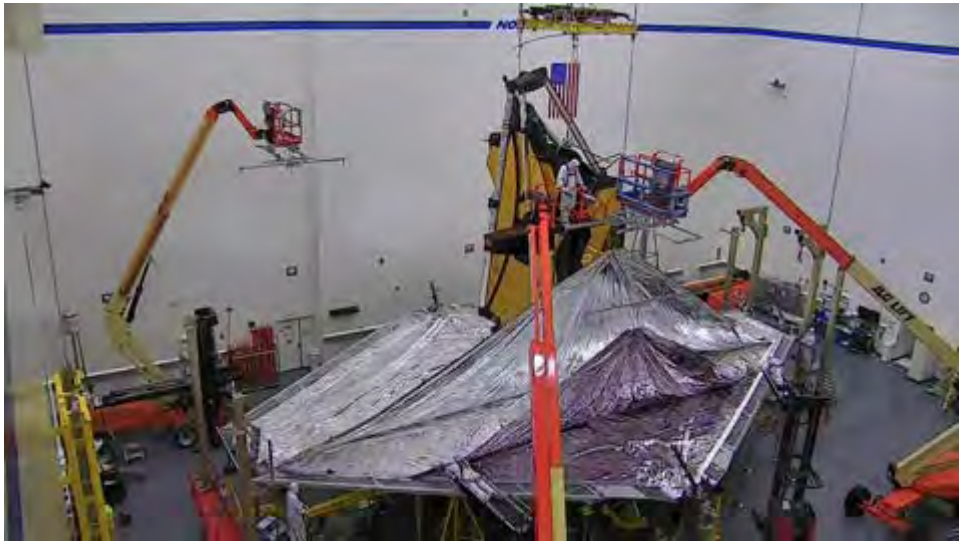
TWTA and CTP Replacement

Deployed Primary Mirror

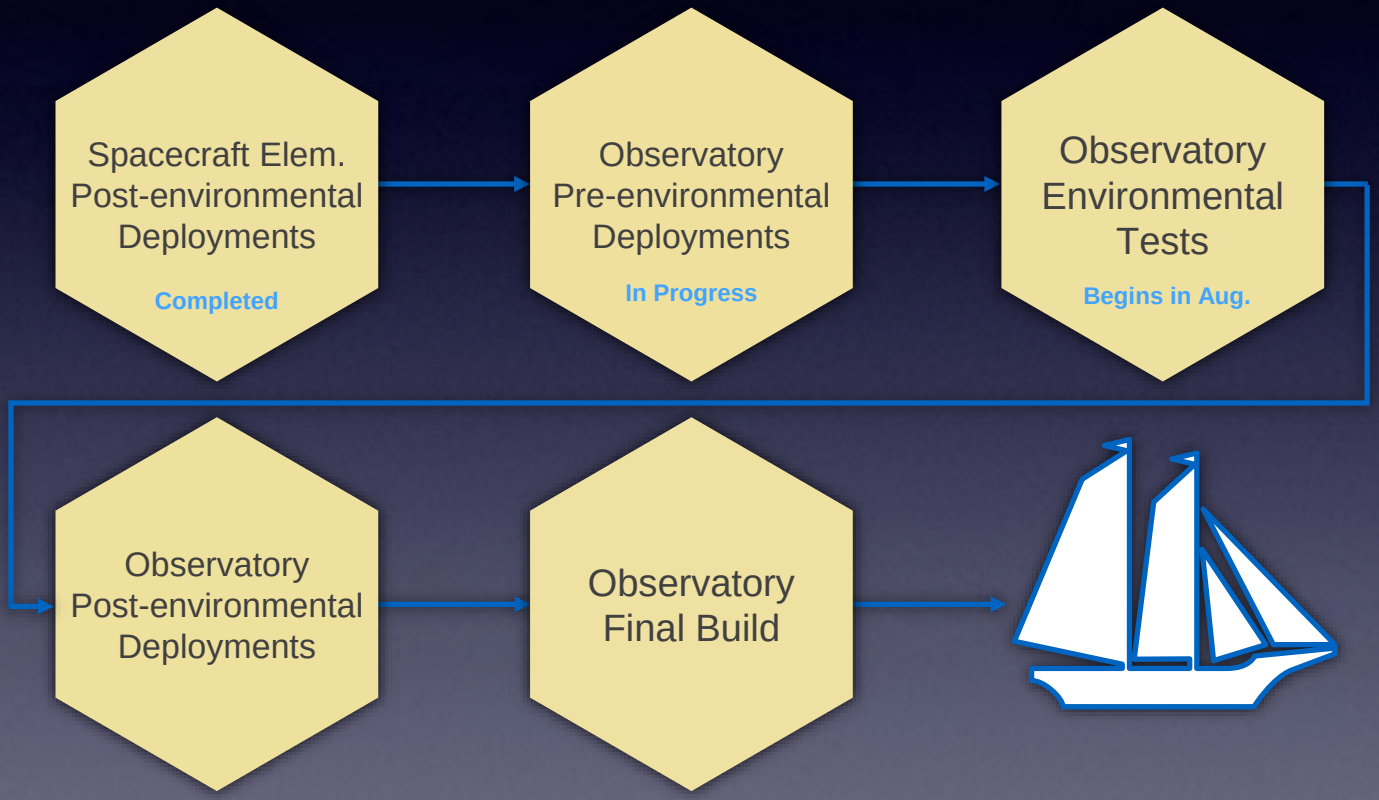
Sunshield Preps For Folding



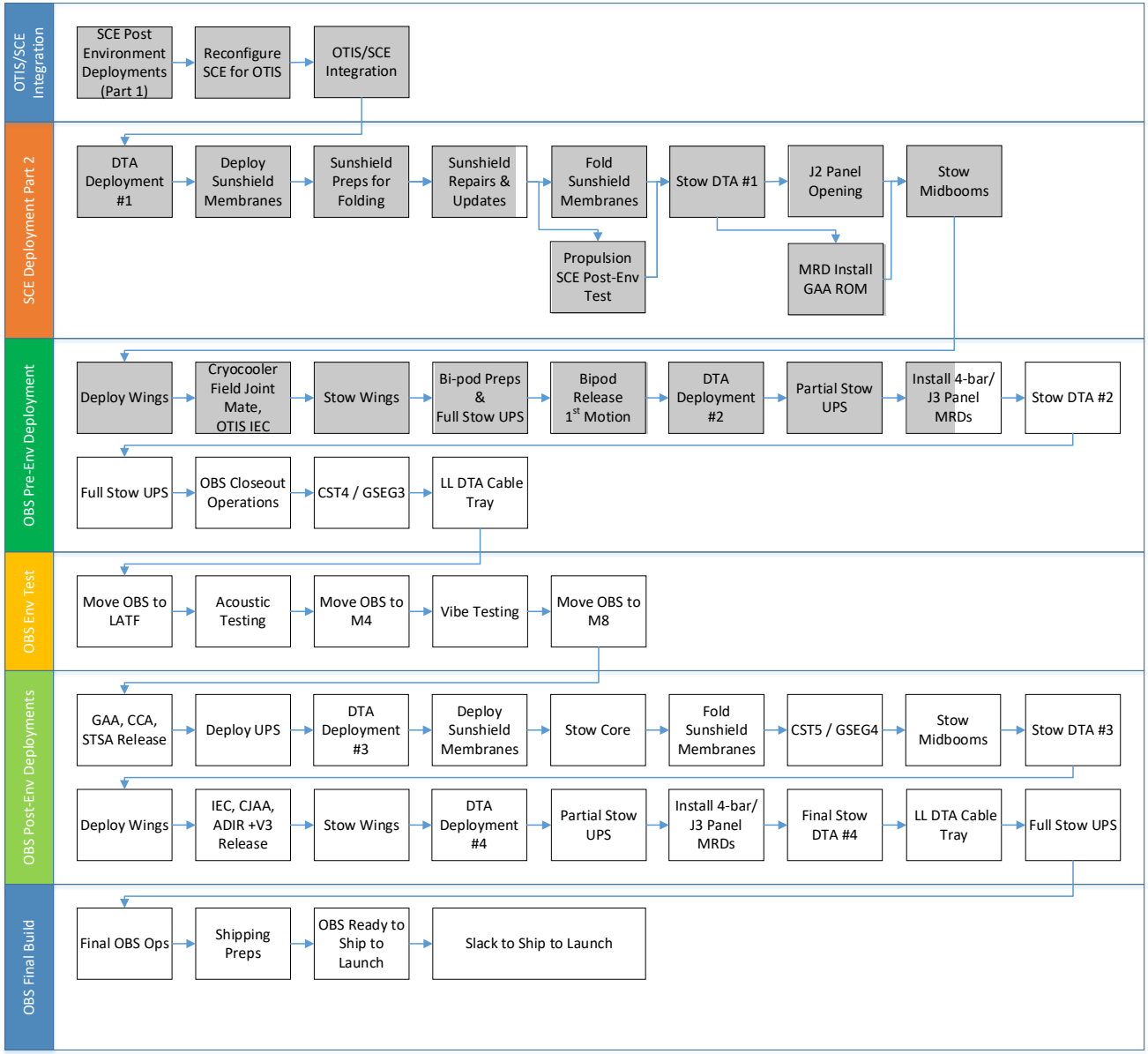


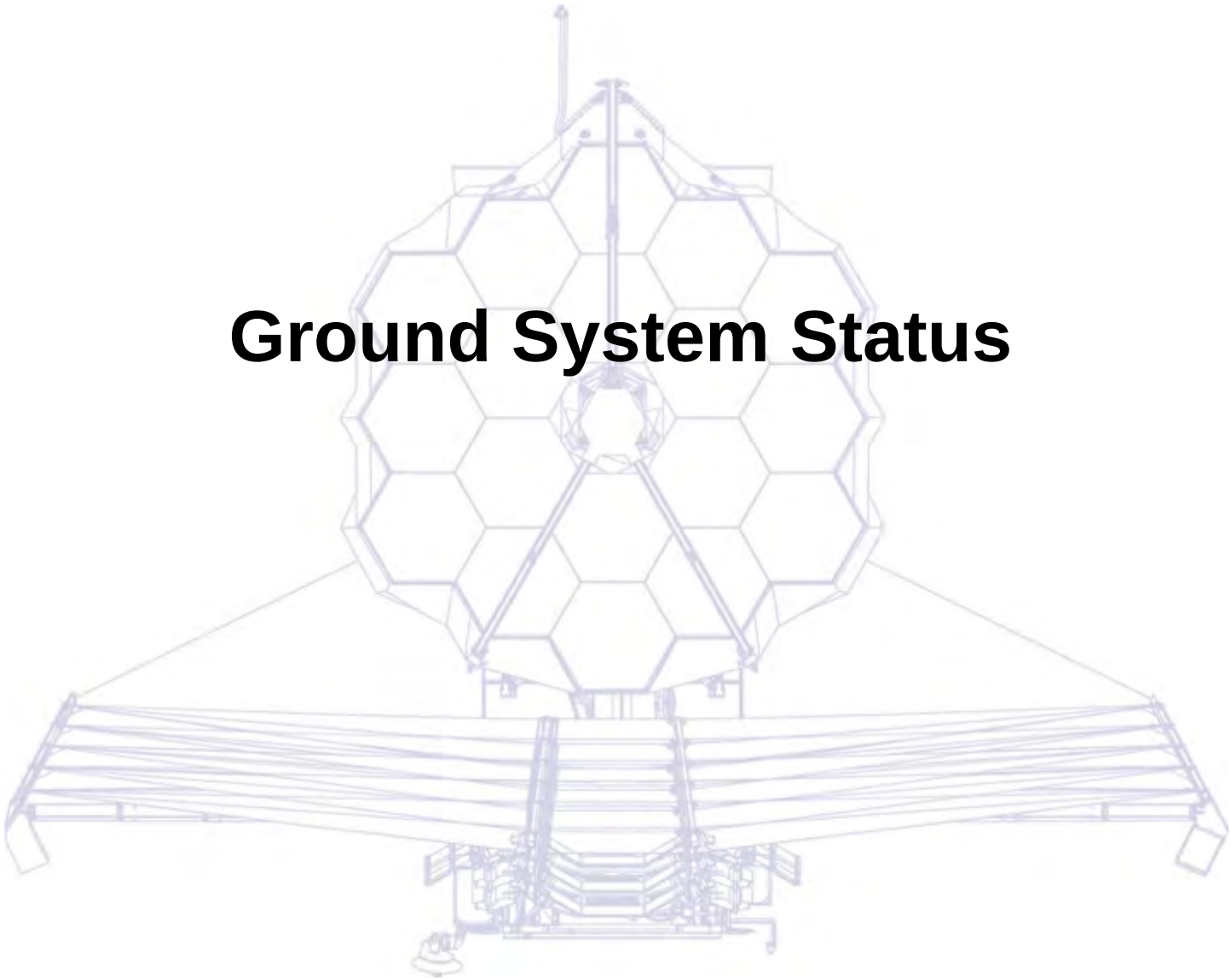


Remaining I&T Activities



Remaining I&T Activities

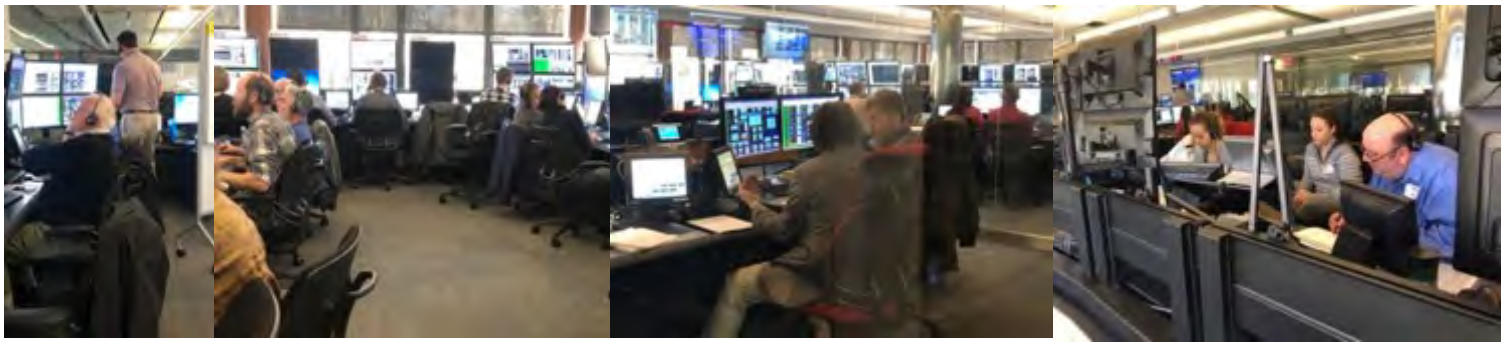




Ground System Status

JWST Ground Segment and Operations

- **All systems required for both Science and Mission Operations are complete**
  - Science and Operations Center (S&OC) running Release 2.1, delivered in April 2020
  - Preparing to support interface testing between the S&OC and the Observatory (GSEG-3) in July 2020
  - Work continues (even in the current environment) on discrepancy report fixes, enhancements and requirements verification
- **Flight Operations Team is fully staffed and all operational products are essentially complete with "tweaks" being made based on testing, mission rehearsals, and contingency planning**
- **Mission Rehearsals**
  - The most recent rehearsals, Early Commissioning Exercise #4 and Contingency Planning Rehearsal 4, were completed in February 2020
  - Strategies for formal rehearsal campaign (Launch Readiness Exercises, Integrated Crew Exercises, Mission Dress Rehearsal) are being worked to account for current COVID protocols



Rocket and Launch Site Status

Rocket and Shipping to Launch Site

- **LV mechanical qualification complete, GNC qualification nearing completion**
  - SQR planned end of June; JWST Qualification-Certificate to be signed in Aug.

- **Rocket Hardware**
  - Fairing customization design & mfg., and qualification review complete
    - Demo flight with full customization scheduled for late July (TBR)
  - Standard rocket components 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.

At The Launch Site

- **Launch site operations have been slowed during the Covid-19 phase of the effort but significant work has been enabled to continue Launch Site Readiness**
  - HEPA Filter build and performance testing has started at GSFC
  - Laser Radar calibration and preparation for shipment to Nelson Engineering in Ohio to support JWST transporter proof testing has started at GSFC.

- **Launch site technical risk has been reduced with improvements in the flow which eliminate significant complexity in the Observatory processing.**
  - For example, simplification of contamination control, elimination of the need to remove and reinstall the SA, minimizing lifts of JWST, etc.

- **At the launch site**
  - JWST is at the launch site for ~ 72 days with the Observatory present for 65 days.
  - NASA and NGAS staffing at Launch site finalized.

Launch Site Work at GSFC during Phase 4

HEPA Filter Build-Up at GSFC

Laser Radar Calibration at GSFC

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
  - 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
  - Completed assessment of deployment order to determine if updates needed.
    - Updated Sunshield tensioning sequence – reduces possibility of slack/loose cables
    - Investigated early deployment of secondary mirror – only used in contingency plan
    - Investigated swapping +-J2 Sunshield mid booms to achieve more benign antenna gimbal temperatures – only used in contingency planning

Commissioning Planning Status – cont.

- **Commissioning Reviews…..**
  - Completed a very detailed of series of internal audits with entire Commissioning Team
    - April 20-23 – Spacecraft Commissioning (Launch and Ascent, Mid-Course Corrections, Spacecraft Subsystem Activation and Checkout
    - April 28-30 – Wavefront Control/Line of Site (Attitude Control and Fine Guiding)
    - May 12-14 – ISIM Systems, Cooler, Cool-Down
  - Audit utilized internal review team with tracked findings and actions
  - Commissioning planning is extremely mature and audit findings are being used to finalize and prioritize work and planning priorities,
  - Deployments activity audit planned for August…will utilize external peer review team consisting of outside deployment experts.
  - System Roll up review planning has started. Will summarize audits and focus on system level Commissioning activities,

- **Contingency Planning**
  - Contingency planning status was reviewed as part of audits.
  - Currently focused on completely contingency response flows for all deployments for project office review and approval.

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 are being fully assessed along with a preplanned Schedule Risk Assessment