

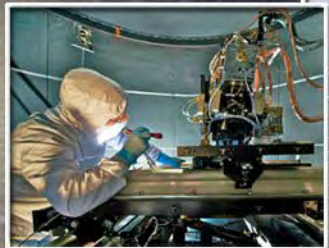
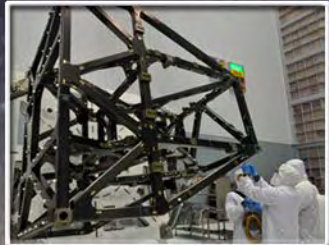
JAMES WEBB SPACE TELESCOPE (JWST)

Presentation to the JWST Users Committee

JWST Systems Engineering Status

September 15, 2023

Mike Menzel

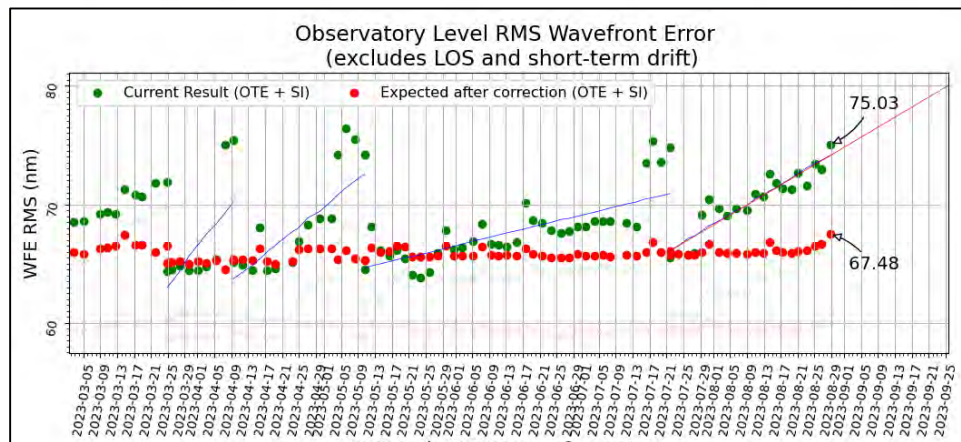


Observatory Science Performance



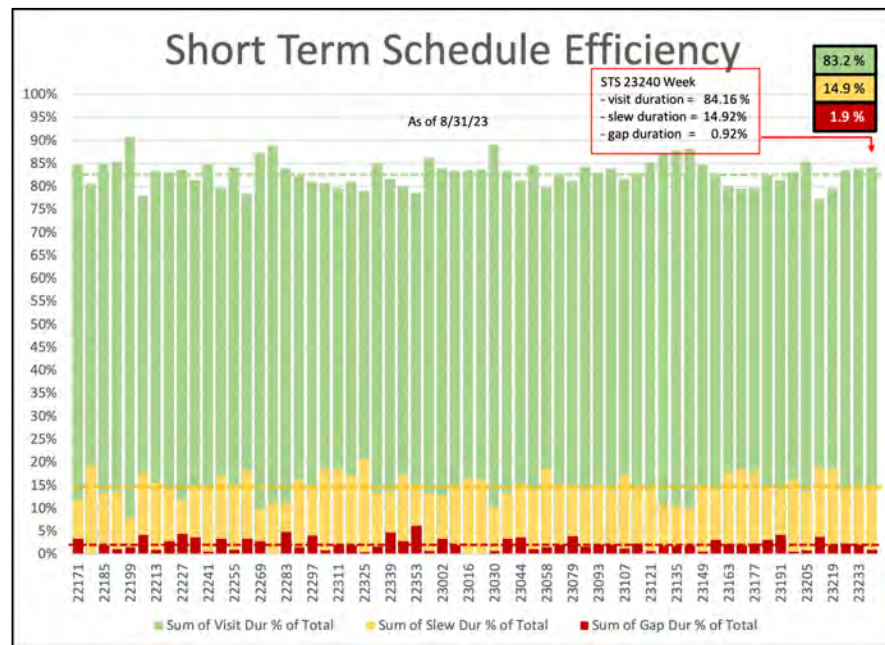
Optical Performance:

- Observatory Wave Front Error (WFE) performance at a wavelength of 2 microns shown on the upper right.
 - Does not include Line of Sight (LOS) contributions currently at ~1 mas.
- Currently the observatory WFE is 75.03 nm and is approaching levels for the next correction.
- WFE Stability has been excellent requiring corrections on the average every 47 days. (Requirement was 14 days)



Observing Efficiency Performance:

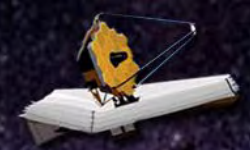
- Schedule Efficiency performance for the science mission to date shown on the lower right.
- Average schedule efficiency to date is at 83.2%



Fine Guide Performance as of July 2023:

- Fine Guide Sensors have successfully acquired and locked onto Guide Stars on first attempt 90% of the time.
- Successful retries 8% of the time
- Failures resulting in skipped visit 2% of the time

Observatory Life Parameters



■ Environments:

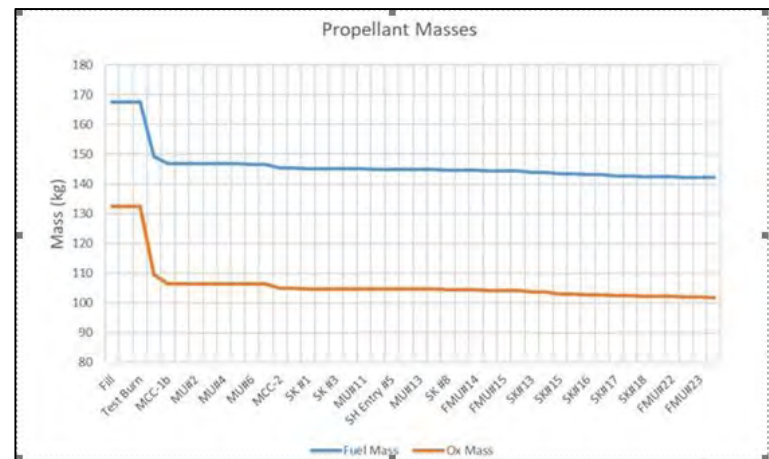
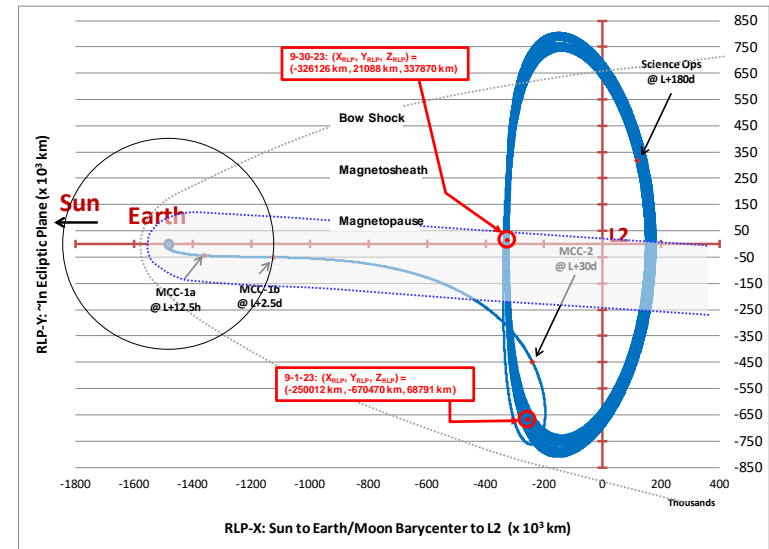
- JWST has completed almost 3 full orbits around the L2 point and has been exposed to its full range of environments with no unexpected performance degradation. (Orbit and locations shown on upper right)
- Solar Environments (Flares, Coronal Mass Ejections)
- Geo-Magnetic Environments
- Meteoroid environments (both sporadic and showers)

■ Propellant Life:

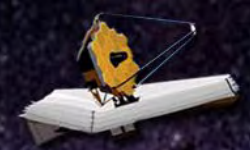
- 20 successfully station keeping maneuvers have been executed as well as 23 momentum unloads.
- Remaining Hydrazine and Oxidizer shown on the lower right.
- Updated conservative analysis conducted by Northrop Grumman Propulsion Engineers predict propellant life of 23 years.

■ Mechanism Life

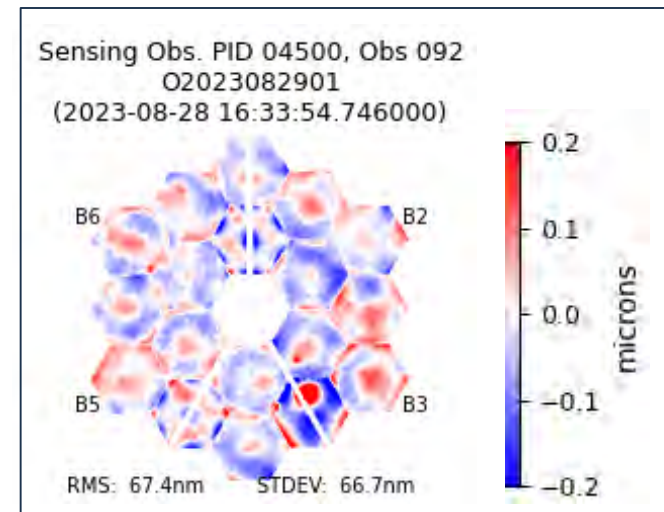
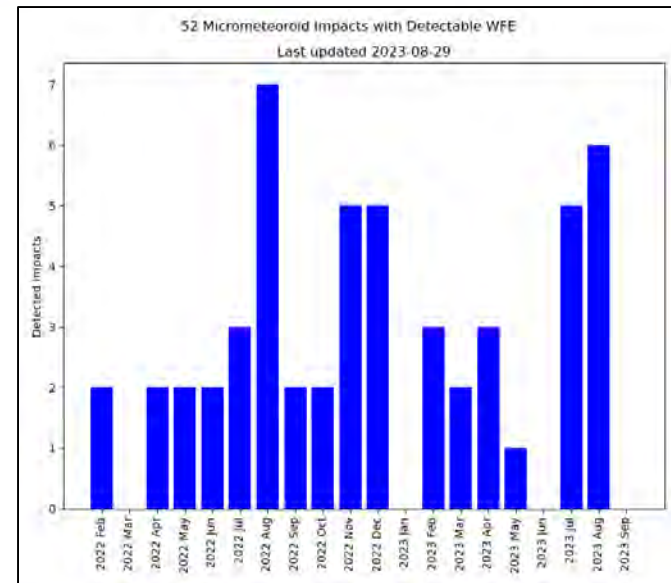
- MIRI Grating Wheel Assembly continues to operate in the new preferred region, -30 to -60 full rotations from "Zero" position. Torque friction remaining comfortably low.



Micro-Meteoroids



- **As of 8-31-23 there have been 52 micro-meteoroid events that resulted in a measurable WFE on the Primary Mirror.**
 - The average rate of events is 2.6 events per month.
 - The histogram on the upper right shows the events counts.
- **With exception of an event that occurred in May 2022, all events have produced minor WFE,**
 - Total WFE contribution at the system level has been ~1 nm for these MM events.
 - Most of the resulting WFE's have been correctable.
 - Pre-launch allocation for MM induced WFE was 31 nm for a 5.5 year life.
- **At the present time overall observatory WFE of the NIRCam channel is 75.0 nm and the OTE is 67.4 nm.**
 - This includes the contributions from the anomalous May 2022 event.
 - See OTE WFE map on the lower right.



Open Anomalies



- Currently there are 6 open anomalies monitored by Anomaly Management Boards (AMBs), summarized below.
- None impact science operations at this time.
- The 3 associated with the series of anomalies in Dec. 2022 (shown in green), will be closed shortly, following the recent release of a closure report from the December Anomaly Working Group.

AR Number	Problem Description	AMB Status
4593	The MIRI Medium Resolution Spectrometer channels have been showing a degradation in optical throughput particularly in the longer wave channels.	AMB meeting #5 was held on 8-30-23. Data for the MIRI channels was presented and displayed similar behavior to those of the MRS channels in terms of wavelength and time variation, but the amplitude of the effects is lower than MRS. The approved path forward included new observations of 8 UMi and HD 37962 to constrain the temporal variation of the MIRI Imager throughput, estimated to take 3.03 hours. The review of proposed further on-orbit test observations was delayed, following a new possible root cause involving radiation effects on the detectors. The proposed testing will be modified to allow better confirmation of this new root cause candidate. Review of the modified test expected in the early October.
3411	ADU Error when Starting OP resulted in IPM and ISIM Preferred Safe Mode	AMB meeting on 12-18-22 reviewed data that showed after the recovery from the previous RTS-63, the first visit was a WFSC visit which put the ADU in CMU Mode. ACS required ADU in FSM Mode. This triggered error which put observatory in IPM. This was the first time an RTS-63 was executed without RTS-2 running which could have cleaned up the ADU Mode. AMB concluded that future recoveries would require a checklist.
3396	OSS Exception during SAM led to RTS-63 resulting in an IPM with ISIM in a Preferred Safe Mode.	AMB meeting on 12-18-22 reviewed data that showed the ZERO-SAM cmd in OSS Patch 8.3.0.1 for a COARSE visit, caused the observatory to slew back to the attitude of the previous Guided visit. This slew took longer than 30 min. AMB concluded that OSS Patch 8.3.0.1 was to be removed.
3287	Safe Haven #7 due to Attitude Error from Excessive IRU drift during a prolonged state without STA inputs to the Attitude Control Subsystem	AMB #2 meeting on 12-8-22 concluded with a plan forward that included patch 8.3.0.1 that set Slew Type 0 to avoid prolonged periods with a Slew Type 1 setting, which blocks STA data from the ACS leaving it susceptible to IRU drift, which could result in attitude errors large enough to initiate a Safe Haven. This would be done via Zero SAM cmd.
2173	MIRI safed due to a failed grating wheel move on DOY 236. Investigations indicating increased friction most probable cause	Last AMB meeting on 11-7-22 reviewed and approved the start of Phase 2 of the MIRI MRS recovery plan.
782	Intermittent CFDP Latency results in delays that can trigger observatory alarms and delay completion of Ka-Band downloads. To date ~ 50 occurrences, with last being on DOY 254.	Status meeting held on 2-9-23. No significant progress since the last AMB Meeting on 6-19-22 approved path forward to investigate root cause and move JWST high-rate data to low latency queue with voice (120Kbps). Contact time has been increased to 12 hours per day as stop-gap.