

James Webb Space Telescope : Update

Eric P. Smith

JWST Program Scientist

Assoc. Director for Research, Astrophysics Division

NASA Headquarters

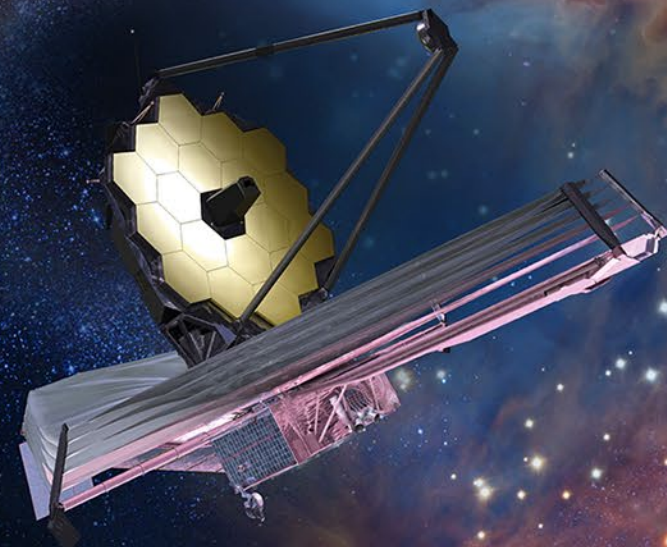
AAAC Meeting 27-September-2022



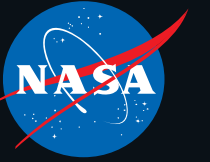
esa



National Aeronautics and Space Administration



Webb Is an International Collaboration





Webb's View of Neptune

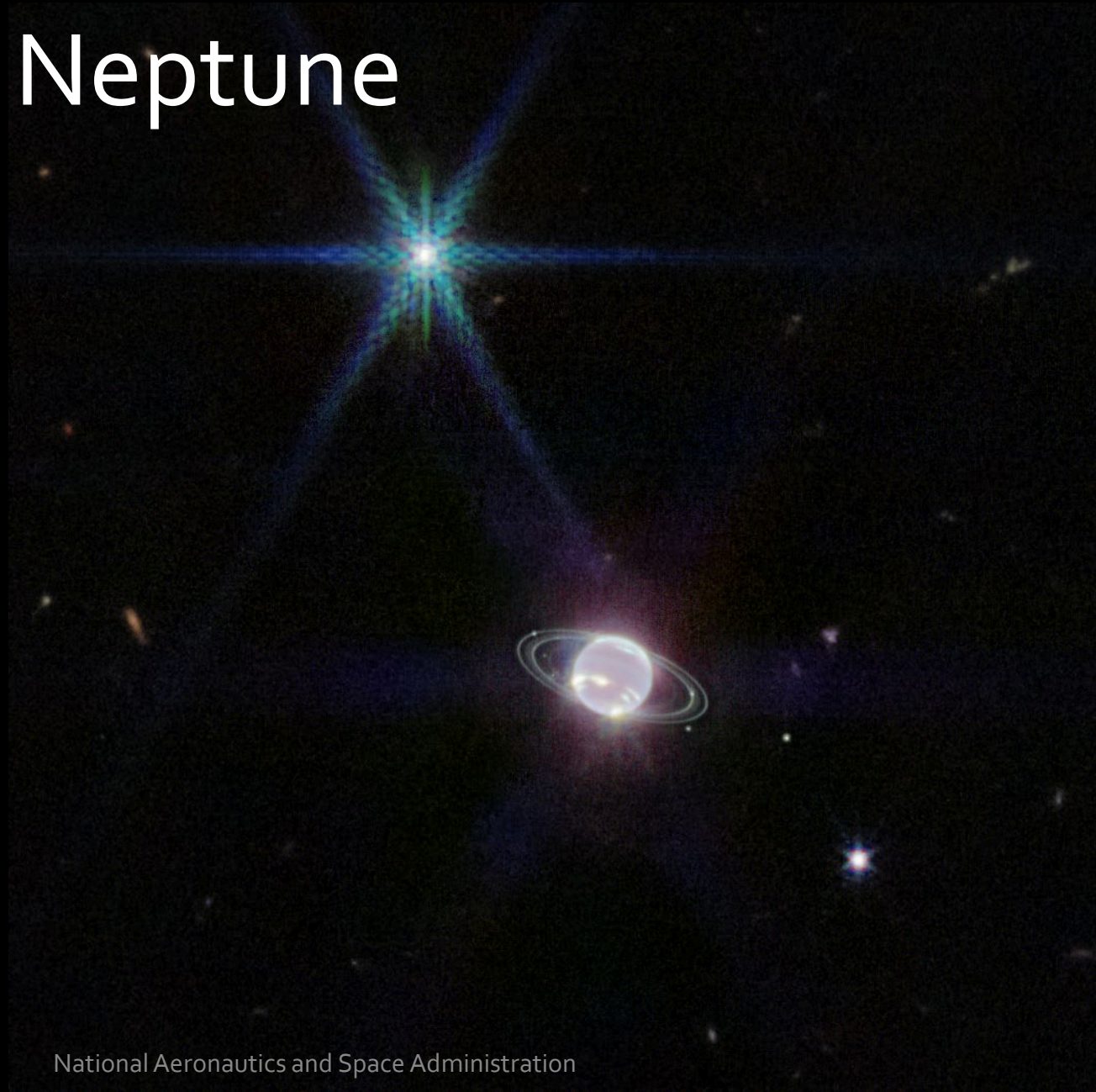


Image credit: NASA, ESA, CSA, STScI





Performance Metrics

- Lifetime: > 2x initial goal, 4x requirement
- Diffraction limit: 1.1 μm vs 2 μm requirement
- Sensitivity: ~35% better than requirement (NIRCam W)
- Pointing Stability: Factor of ~6-7 better than requirement
- Photometric Stability: better than 1%
- Thermal Stability: within 40mK noise of the sensors
- Moving Target Tracking: > 2x required rate (req:30 mas/sec)
- Backgrounds: NIR (lower than predicted), MIR (as predicted)



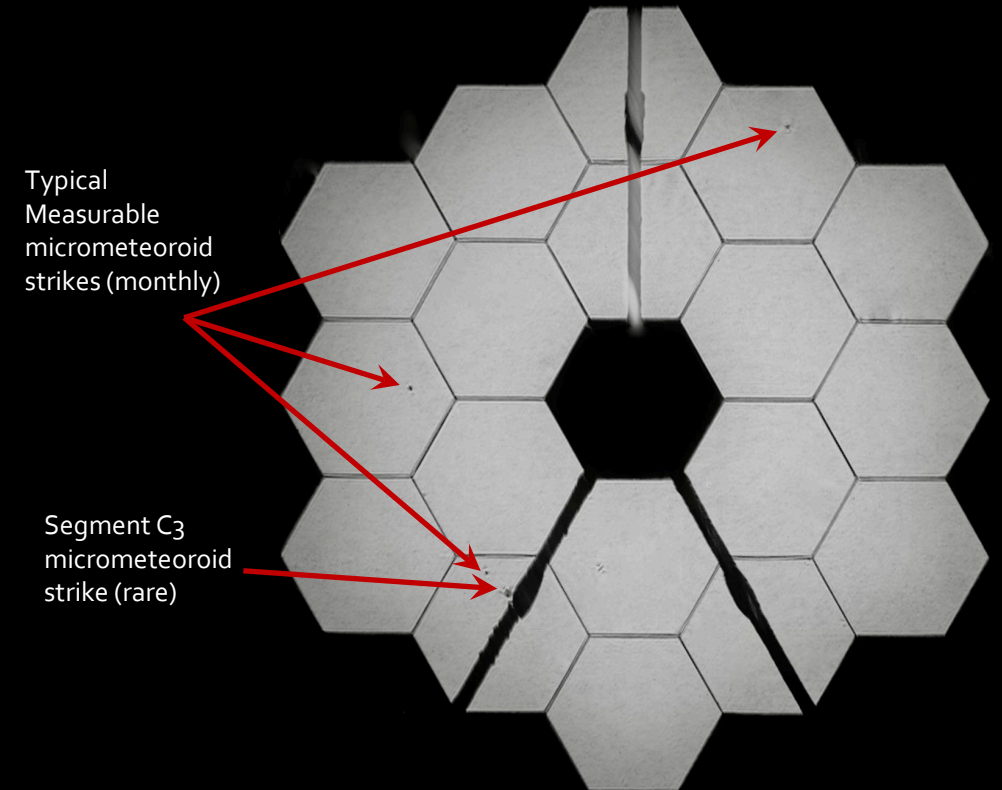
Early Science

- Early Release Observations (EROs) Early Release Science (ERS), Guaranteed Time Observers (GTOs), General Observers
 - Over 2000 hours of data in these categories has zero exclusive use period
- 104 Preprints in arXiv as of 9/26/2022 (averaging about 3-4/day)

Micrometeoroids: Summary



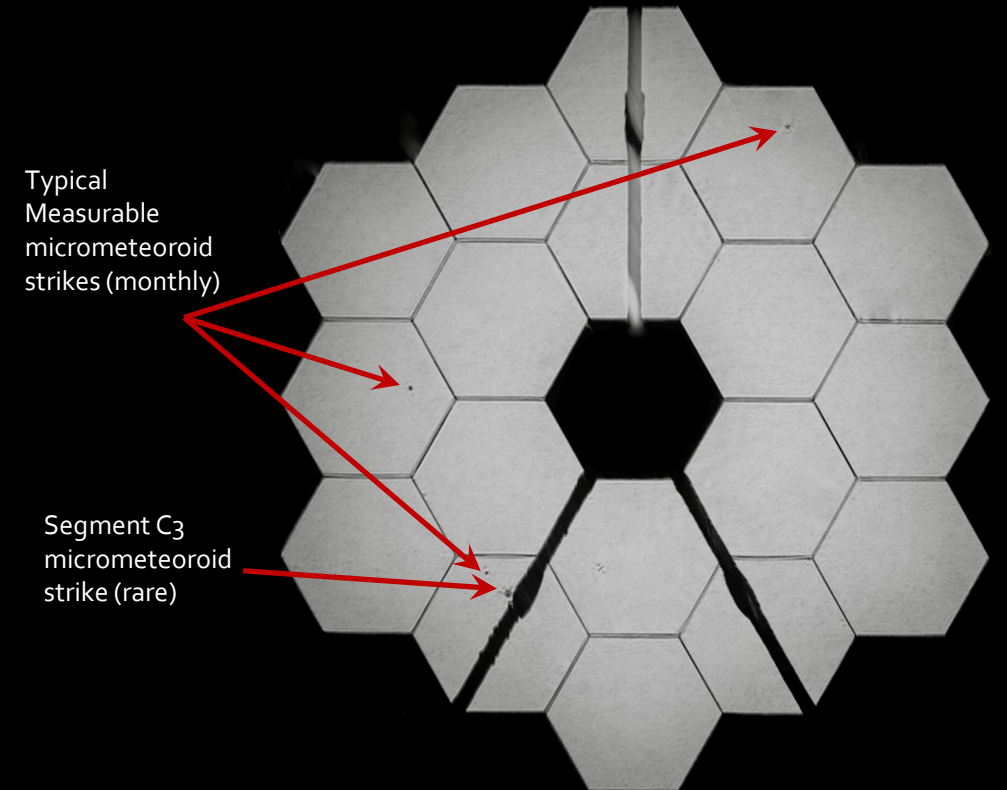
- The rates of micrometeoroids hitting the primary mirror are consistent with pre-launch predictions
 - Total of 14 micrometeoroid impacts that had a measurable change in wavefront error since launch
 - Total of 33 smaller particles detectable in pupil image but no change to wavefront error
- Of those measurable, all but one are consistent with error budget allocations for micrometeoroid effects over expected prime lifetime
- Between May 22nd-24th we had a larger than expected strike on segment C₃, increased system wavefront from 50 to 59 nanometers rms, versus a requirement of 150nm

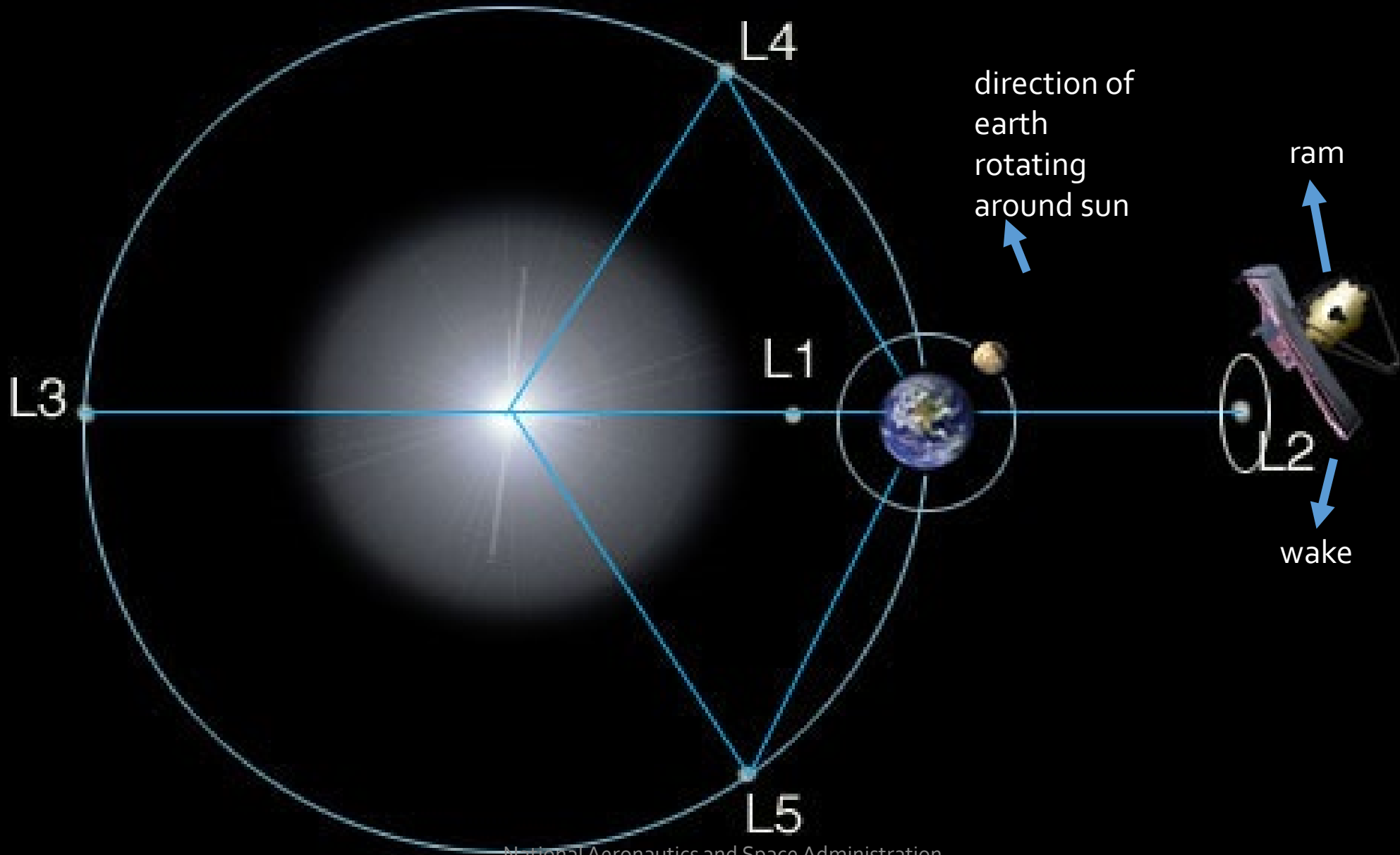


Micrometeoroids: Analysis



- Team used the measured and detected micrometeoroid rate data and pointing history to assess the statistically likely energy of the C₃ strike
- Team performed 3D hydrodynamics impact and finite element modeling of cryogenic mirror using the statistically likely energy
- Best explanation is the C₃ micro-meteoroid was a higher energy particle (statistically unlikely) and hit a particularly sensitive part of the mirror and structure. Based on this, strikes similar to C₃ can occur but will be infrequent (and at a statistical distribution)



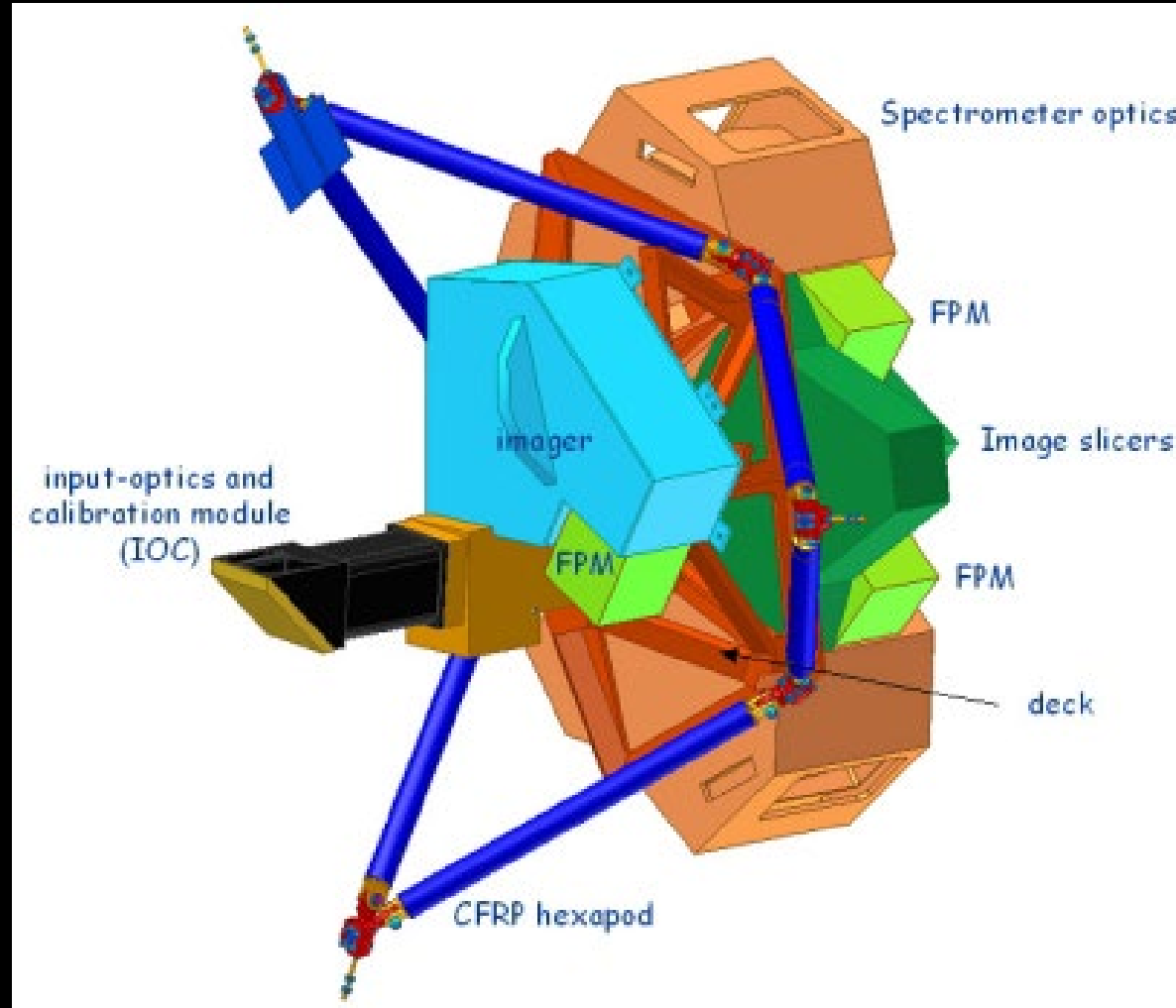




MIRI Grating Wheel Mechanism

- The James Webb Space Telescope's Mid-Infrared Instrument (MIRI) has four observing modes. On Aug. 24, a mechanism that supports one of these modes, known as medium-resolution spectroscopy (MRS), exhibited what appears to be increased friction during setup for a science observation. This mechanism is a grating wheel that allows scientists to select between short, medium, and longer wavelengths when making observations using the MRS mode. Following preliminary health checks and investigations into the issue, an anomaly review board was convened to assess the best path forward.
- The Webb team has paused in scheduling observations using this particular observing mode while they continue to analyze its behavior and are currently developing strategies to resume MRS observations as soon as possible. The observatory is in good health, and MIRI's other three observing modes – imaging, low-resolution spectroscopy, and coronagraphy – are operating normally and remain available for science observations.

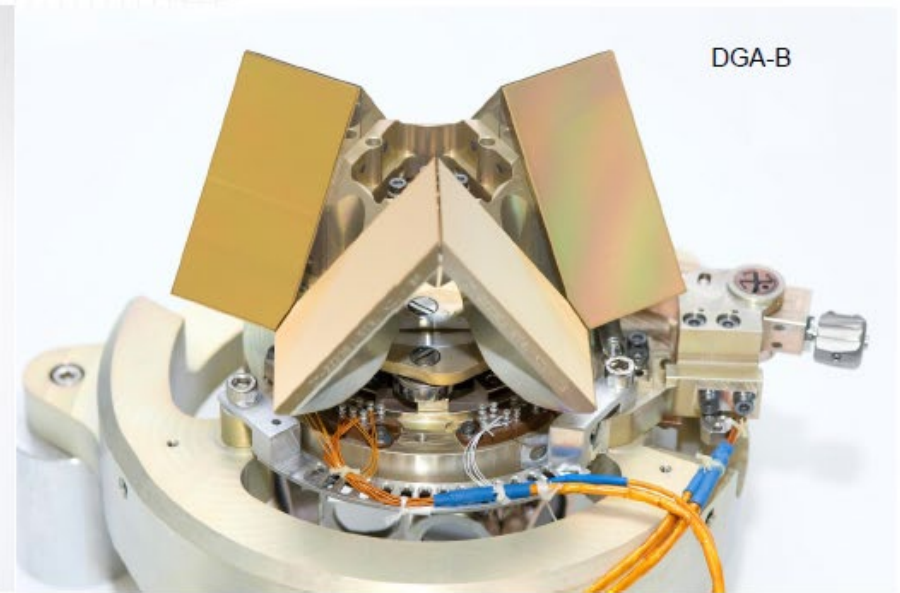
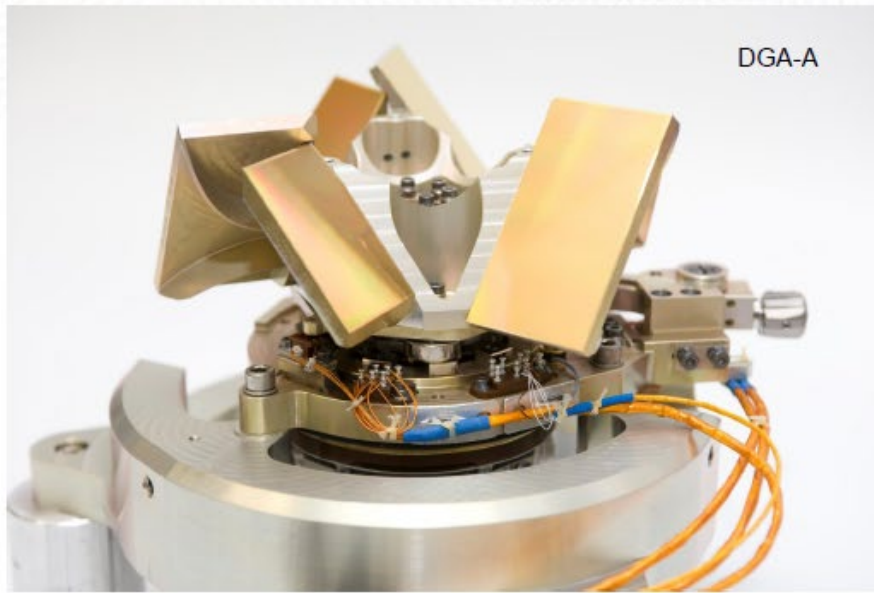
MIRI Instrument Diagram



MIRI "DGA" Mechanism

MIRI Mechanism
Dichroic and Grating Wheel Assembly

HENSOLDT Optronics | Vision drives Decision



What's Webb Observing Now?

- Visit: <https://www.stsci.edu/jwst/science-execution/observing-schedules> to see what JWST is observing