

# James Webb Space Telescope (JWST) Program Status

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**Mark Clampin**  
**JWST Observatory Project Scientist**  
**NASA/Goddard Space Flight Center**





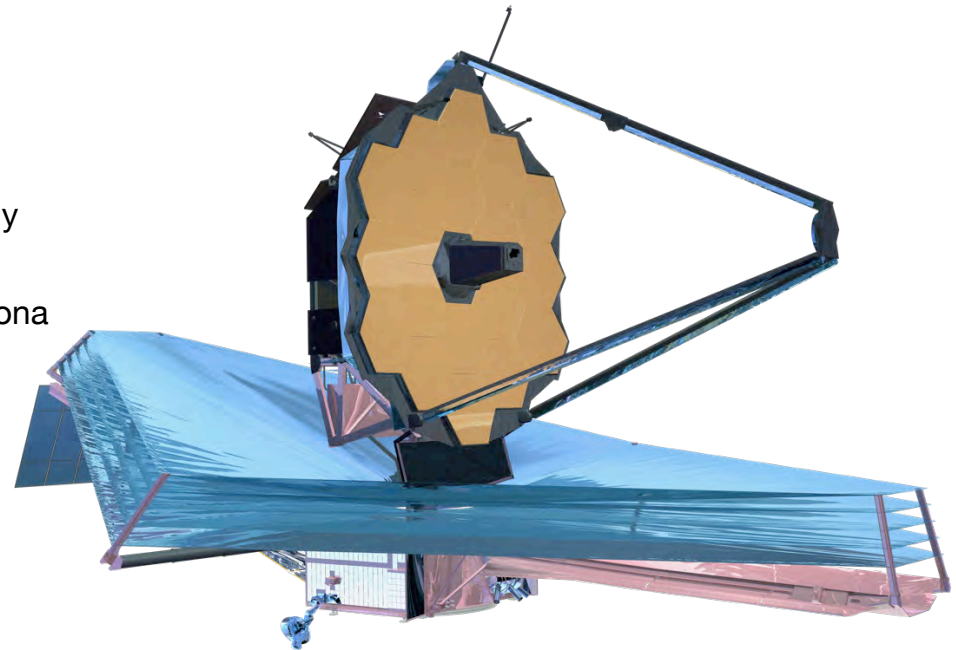
# James Webb Space Telescope (JWST)

## Organization

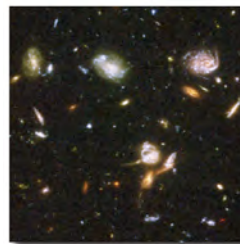
- **Mission Lead:** Goddard Space Flight Center
- **Project Scientist:** Dr John Mather (Nobel Laureate)
- **International collaboration:** ESA & CSA
- **Prime Contractor:** Northrop Grumman Space Technology
- **Instruments:**
  - Near Infrared Camera (NIRCam) – Univ. of Arizona
  - Near Infrared Spectrograph (NIRSpec) – ESA
  - Mid-Infrared Instrument (MIRI) – JPL/ESA
  - Fine Guidance Sensor (FGS) – CSA
- **Operations:** Space Telescope Science Institute

## Description

- Deployable infrared telescope with 6.5 meter diameter segmented adjustable primary mirror
- Cryogenic temperature telescope and instruments for infrared performance
- Launch June 2013 on an ESA-supplied Ariane 5 rocket to Sun-Earth L2
- 5-year science mission (10-year goal)



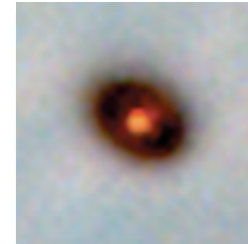
## JWST Science Themes



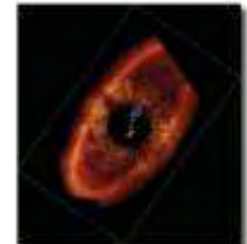
**End of the dark ages: First light and reionization**



**The assembly of galaxies**



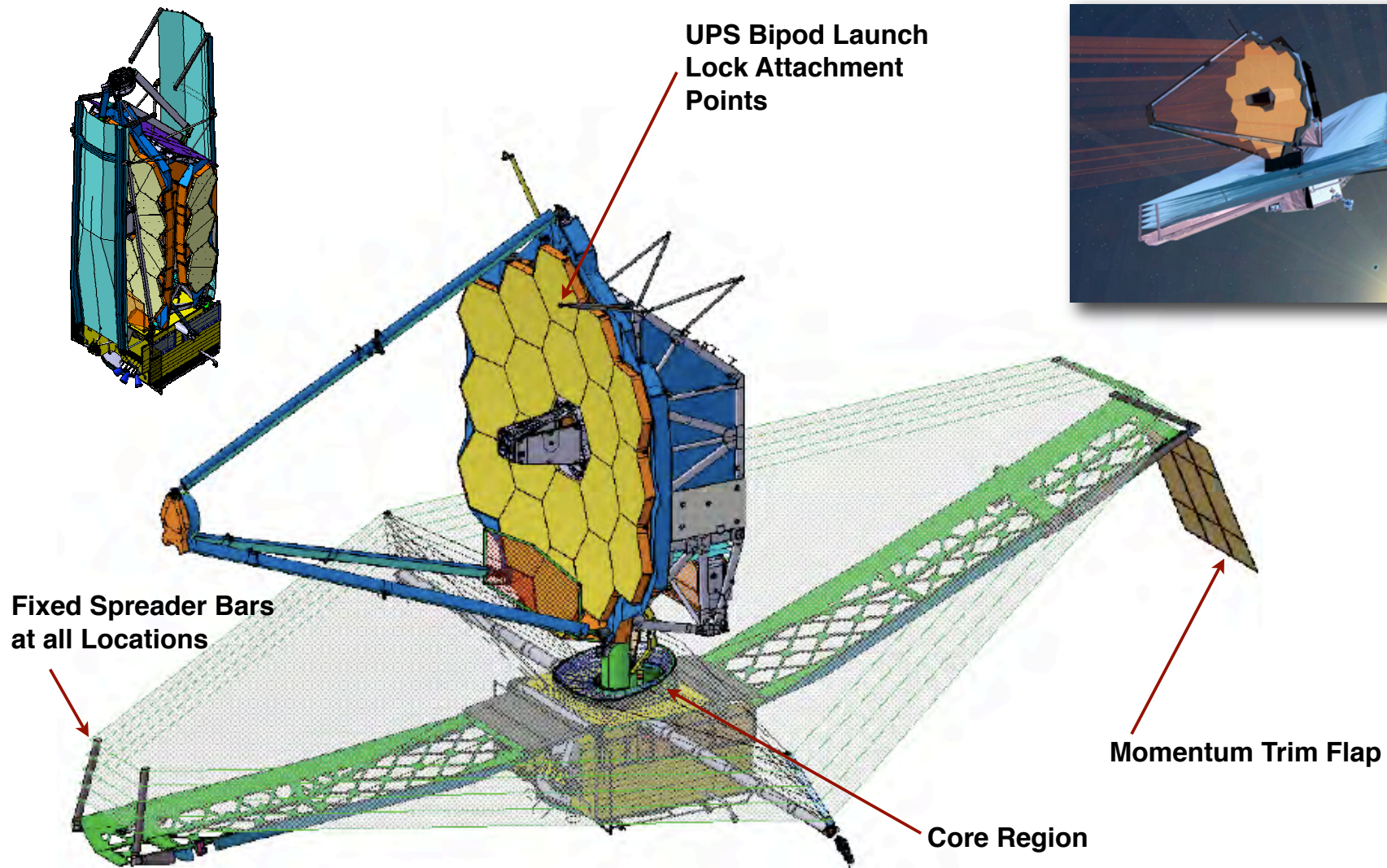
**Birth of stars and proto-planetary systems**



**Planetary systems and the origin of life**



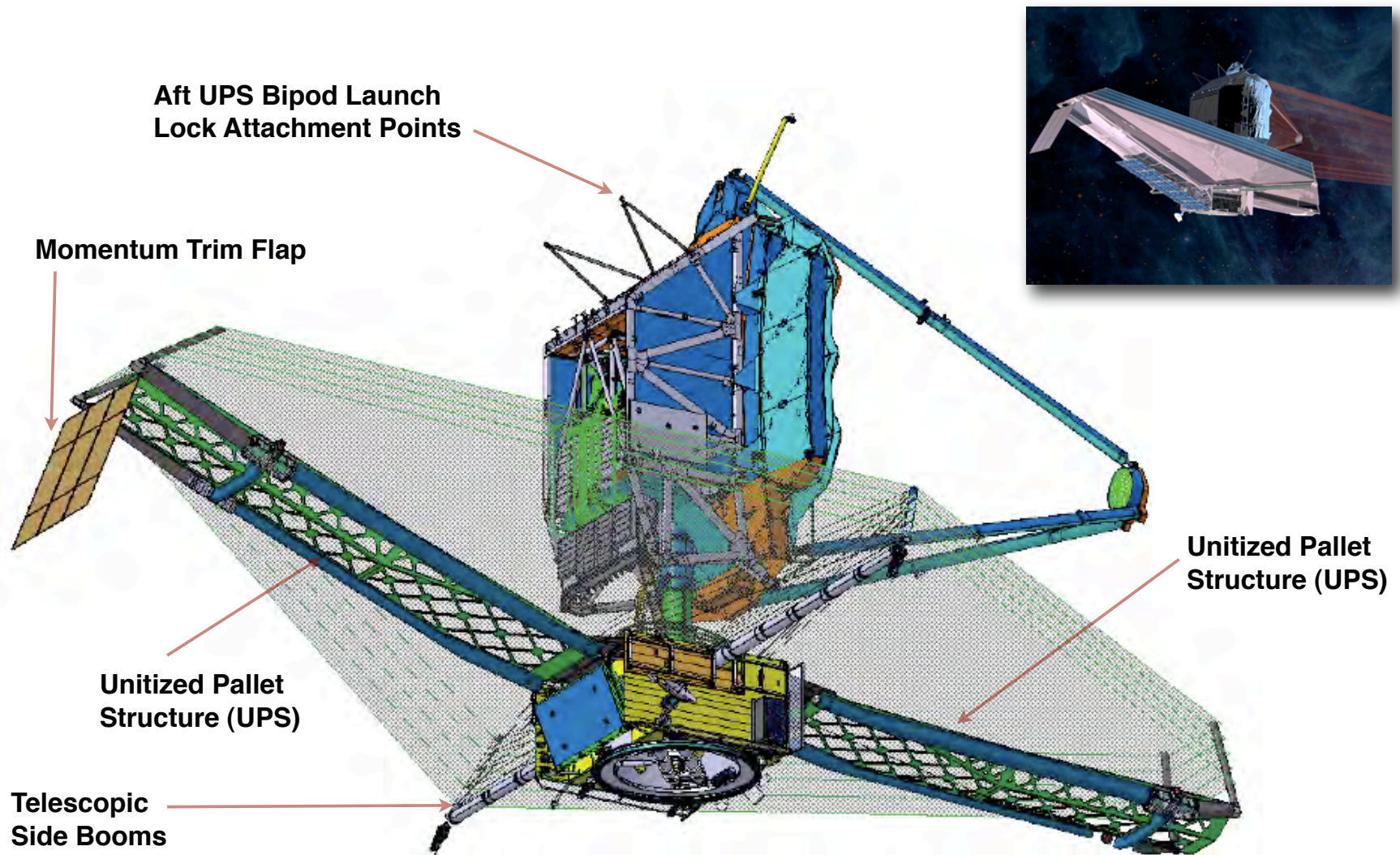
# JWST Sunshield: I





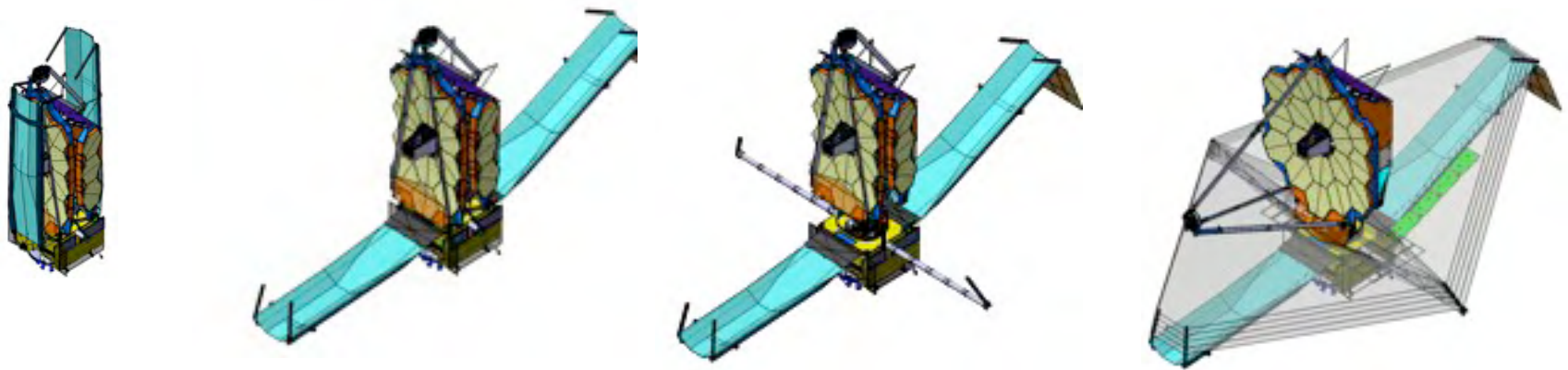


# JWST Sunshield: II

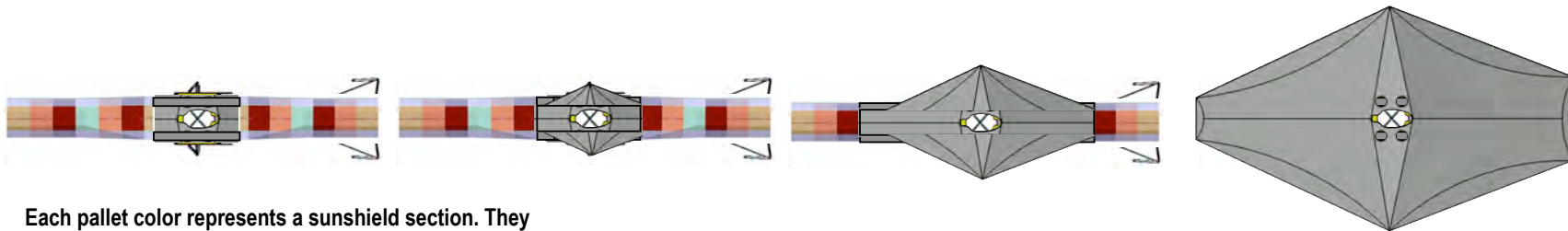




# Sunshield: Deployment



Sunshield membrane deployment is now fully managed: sunshield is released and extended one pallet section at a time



Each pallet color represents a sunshield section. They are released one at a time during deployment





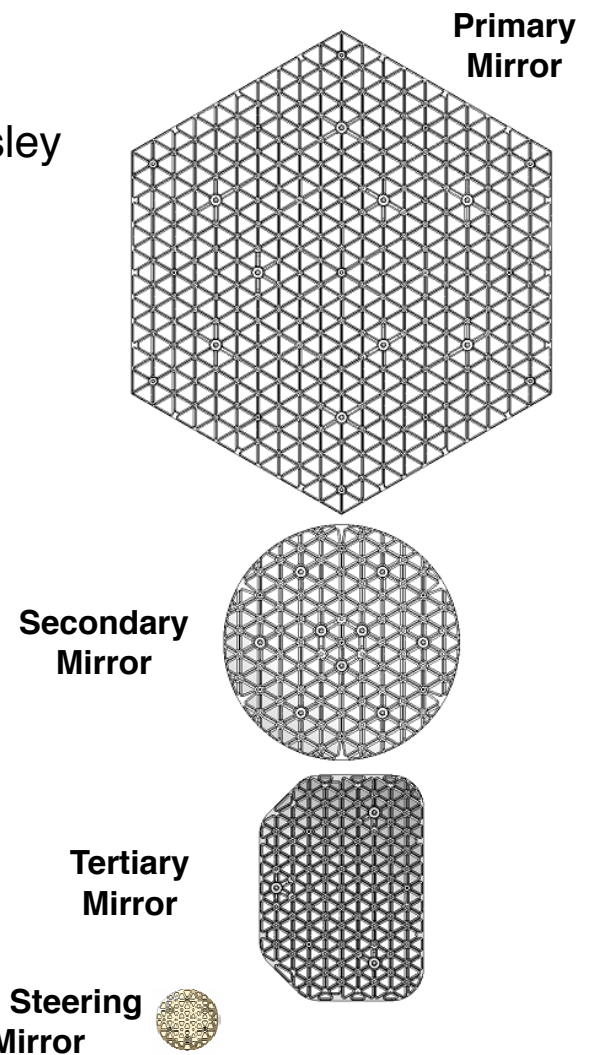
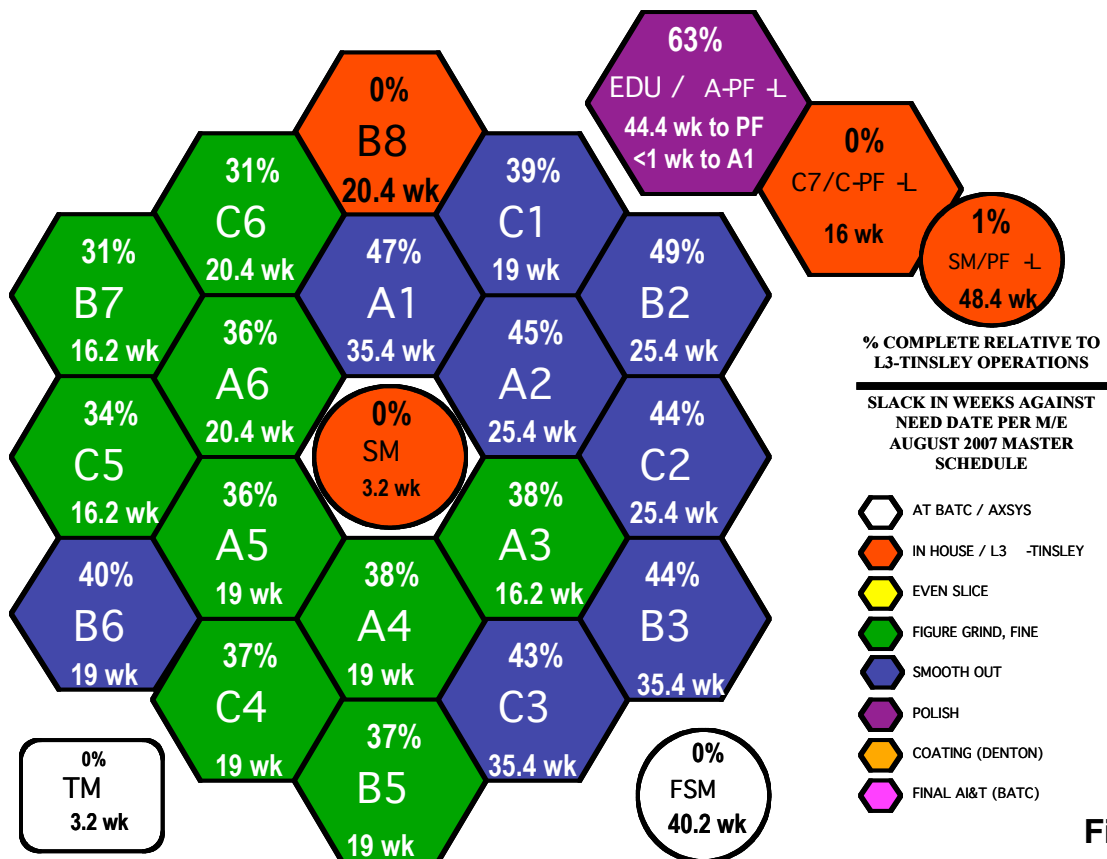
# Sunshield: Membrane Development





# JWST Mirror Development

- Flight PM/SM segments are all being figured at Tinsley
- Tertiary and Fine Steering mirror ready for delivery to Tinsley



Mirror sizes to scale





# JWST Mirror Status



PMSA #1 (EDU-A / A1 / A1)



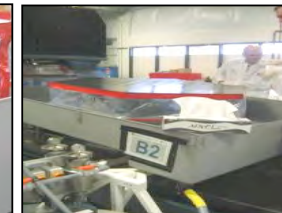
PMSA #2 (11 / B3 / B3)



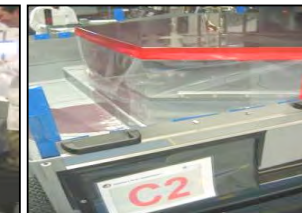
PMSA #3 (12 / C3 / C3)



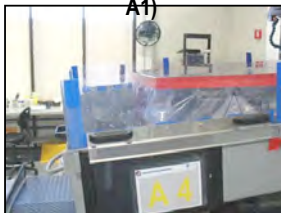
PMSA #4 (5 / A2 / A2)



PMSA #5 (6 / B2 / B2)



PMSA #6 (7 / C2 / C2)



PMSA #7 (13 / A4 / A4)



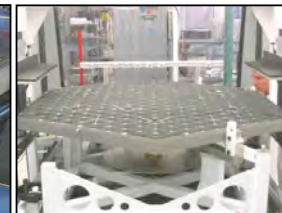
PMSA #8 (17 / B5 / B5)



PMSA #9 (4 / C1 / C1)



PMSA #10 (16 / A5 / A5)



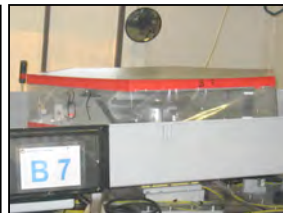
PMSA #11 (20 / B6 / B6)



PMSA #12 (15 / C4 / C4)



PMSA #13 (8 / A3 / A3)



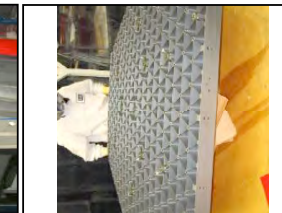
PMSA #14 (22 / B7 / B7)



PMSA #15 (18 / C5 / C5)



PMSA #16 (19 / A6 / A6)



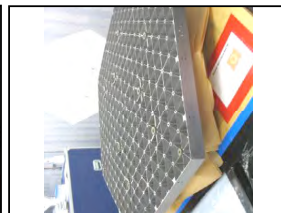
PMSA #17 (23 / B8 / B8)



PMSA #18 (21 / C6 / C6)



PM EDU (EDU-B / EDU / EDU)



PM PFL-C (24 / C7 / C7)



SM PFL (SM2 / SM1 / SM1)



SM Flight (SM1 / SM2 / SM2)



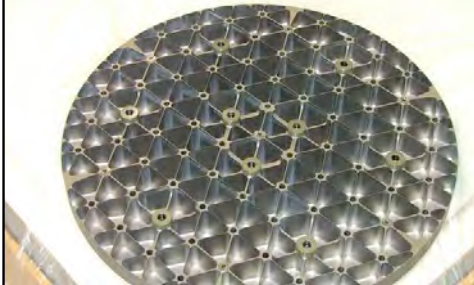
TM Flight (TM1 / TM1 / TM1)





# JWST Mirror Status: III

**SM Back Surface**



**SM Front Surface**

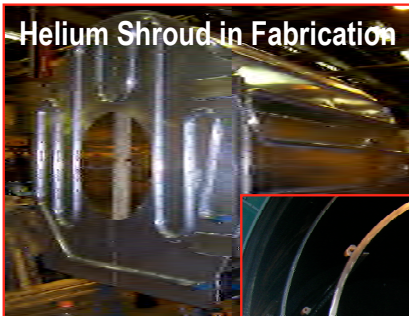


SM Pathfinder Light and Flight segments have completed machining at Axsys Technologies. Processing is beginning at Tinsley Laboratories.

**ATPL in Preparation of Polishing**



**Helium Shroud in Fabrication**



The helium shroud and regeneration system has been delivered to BATC and tested down to 6K.

The Aspheric Test Plate Lens and Illumination Lens is nearing completion at Tinsley Laboratories.



**Illumination Lens in Optical Test**



**Helium Shroud Installation**



The SMA Optical GSE Mount and associated hardware has been built and assembled at BATC. (Proof Load Shown)



# EDU Mirror



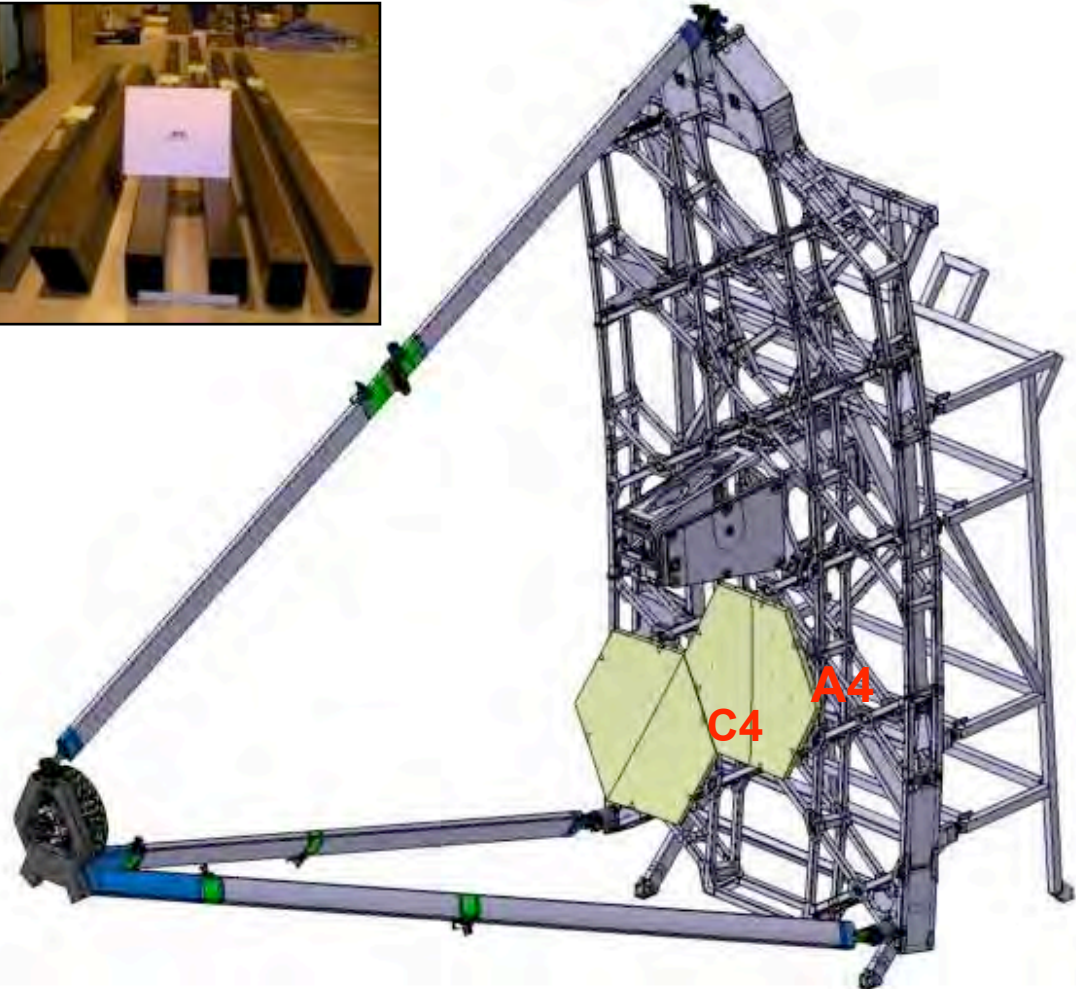
- EDU mirror is on schedule for completion of fine polishing this March
- Cryo-Polish cycle will follow





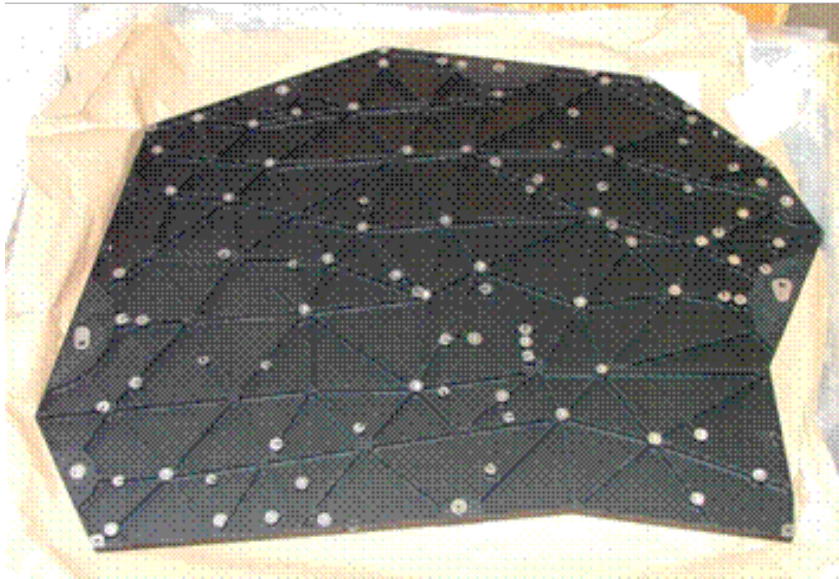
# Primary Mirror Backplane

- Pathfinder fabrication:
  - 118 of 153 billets completed through acceptance
  - Piece part fabrication at 46% complete
  - Billets fabricated include V1 and drop tubes, flat plates and two T300 latch plane V1 tubes
- Flight fabrication:
  - 34 of the 184 total flight center section billets are through cure
  - Overall center section piece part fabrication at 3%

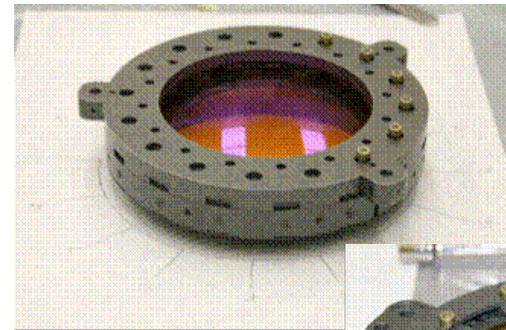




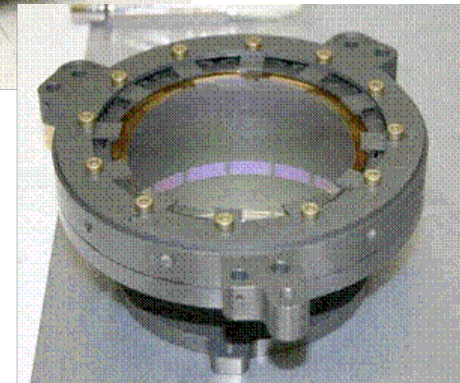
# NIRCam ETU Hardware



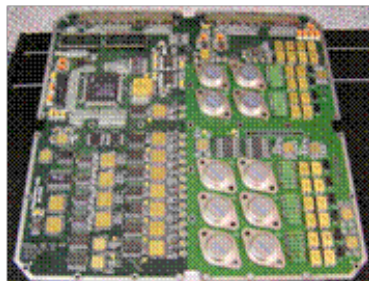
Bench panel after anodizing



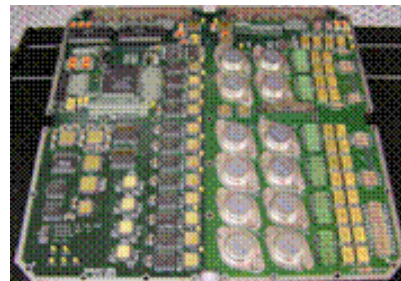
ZnSe  
Collimator



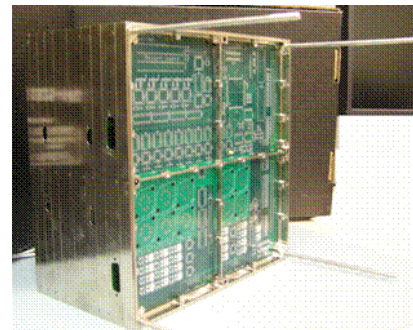
BaF<sub>2</sub>  
Camera



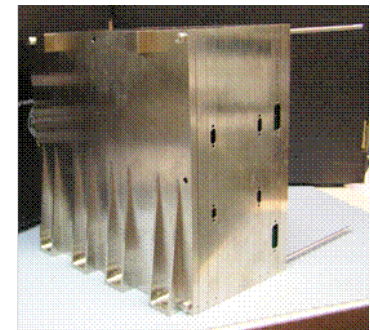
Filter Wheel Drive Board



Focus Mech Drive Board



Instrument Control Electronics



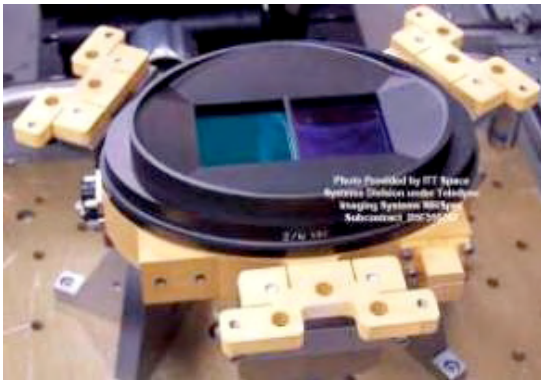




# NIRSpec ETU/Qual Model Hardware



Fore Optics



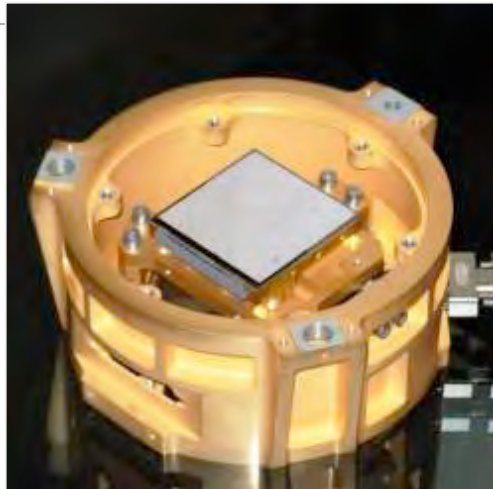
Focal Plane Assembly



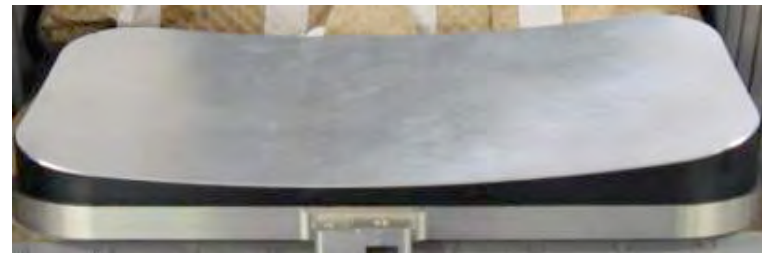
Optical Bench



# FGS Hardware



Demo Unit  
Focal Plane



Primary Mirror Blank



Prototype Etalon



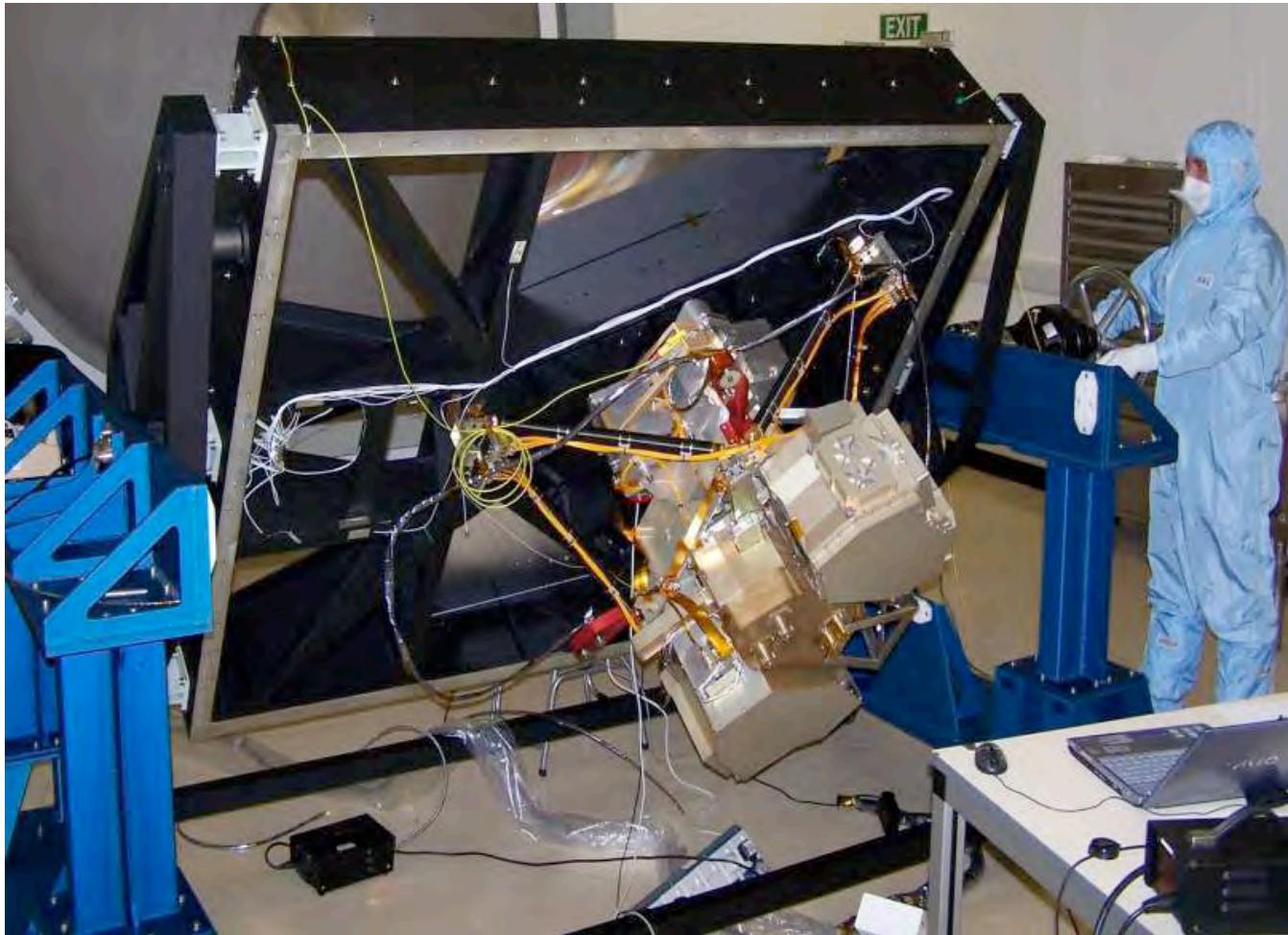
ETU Guider Optical Bench

25/09/2007





# MIRI Verification Model



**Performing gravity sag test at the Rutherford Appleton Lab, UK**

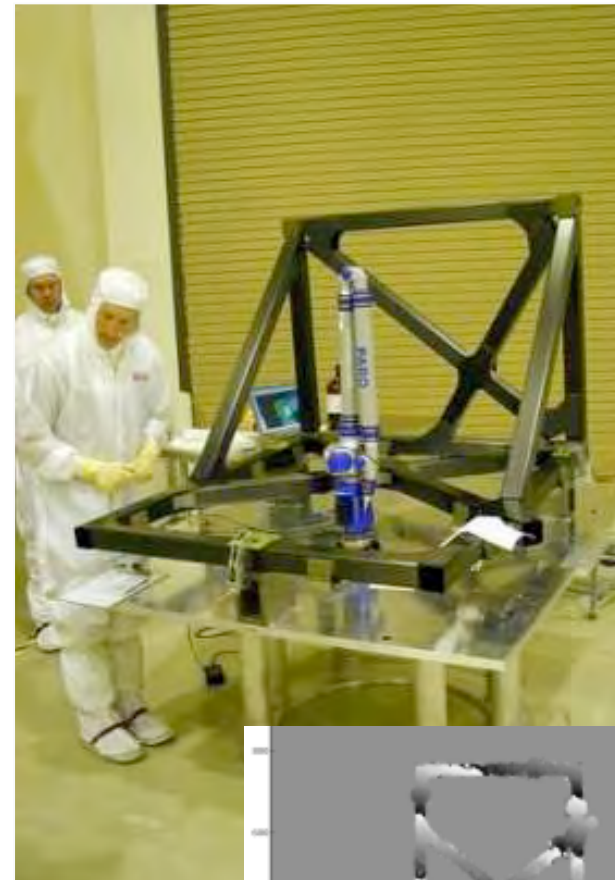


# ISIM Subsystems



ISIM Electronics Compartment Demo Model

ICDH ETU  
SpaceWire Card



ISIM Structure  
Thermal Distortion  
Test Article







# ISIM Structure Harness Mockup



*Currently in Bldg 29*

09/26/2007