

# NANCY GRACE ROMAN



## SPACE TELESCOPE

### Roman Mission Status Update

January 12, 2025

Thomas Barclay

Operations Scientist

- **Roman is making excellent progress toward an October 2026 launch**
- **Systems Integration Review completed**
  - Major milestone for transition from Phase C to Phase D (final approval planned for next week)
  - Phase D continues to the end of in-orbit checkout
- **Mission Operations Review Passed**
  - This review assessed the status of ground systems components (e.g., the mission operations center, the science operations center, the science support center etc.) and their operational interfaces with the flight systems.
  - The review team found no issues and provided many helpful suggestions on how to ensure that the science community can hit the ground running at the start of science operations.
- **Definition of the surveys has reached a significant milestone with the delivery of reports from the definition committees**
  - These reports go to the higher-level Roman Observations Time Allocation Committee who will deliver final the report in Spring 2025.
- **Numerous engagement opportunities for the science community ramping up this year**
  - Two major opportunities for funding out or to be released this year (ROSES + first GI call)
  - Launching the Roman Science Collaboration
  - Working Groups are making meaningful and tangible contributions to the mission
- **All major hardware items now delivered to Goddard and undergoing integration**
  - Observatory integration has made significant progress over the last 3 months
  - We will shortly only have two large hardware pieces; these undergo testing separately before final integration in fall next year.



- **Wide Field Infrared surveys**
  - Imaging and spectroscopy to >26.5 AB mag

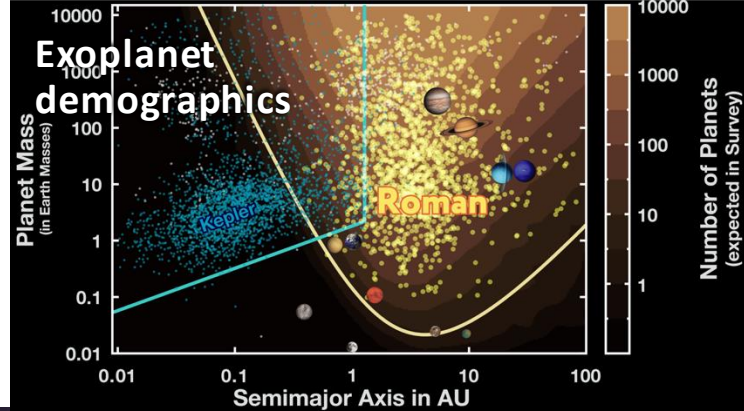
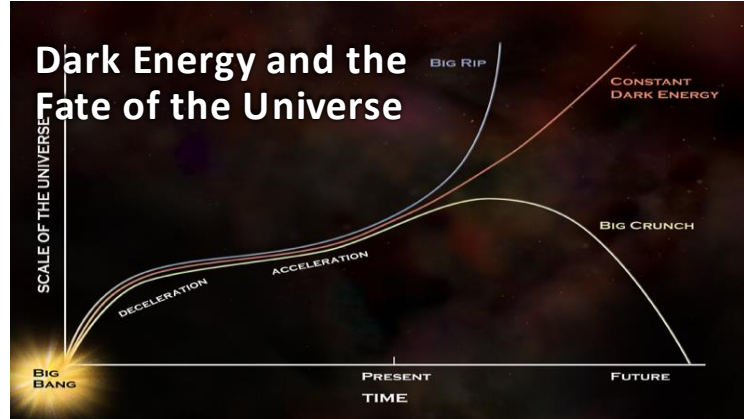
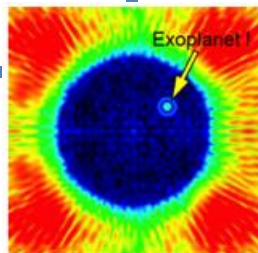
- **Expansion history of the Universe**
  - Using supernova, weak lensing and galaxy redshift survey techniques

- **Growth of Structure in the Universe**
  - Weak lensing, redshift space distortions and galaxy cluster techniques

- **Exoplanet Census**
  - Statistical census of exoplanets from outer habitable zone to free floating planets

- **General Astrophysics Surveys**
  - Devote substantial fraction of mission lifetime to peer reviewed program

- **Coronagraph technology demonstration**
  - Demonstrate exoplanet coronagraphy with active wavefront control



# Observations Enable Roman Mission Objectives

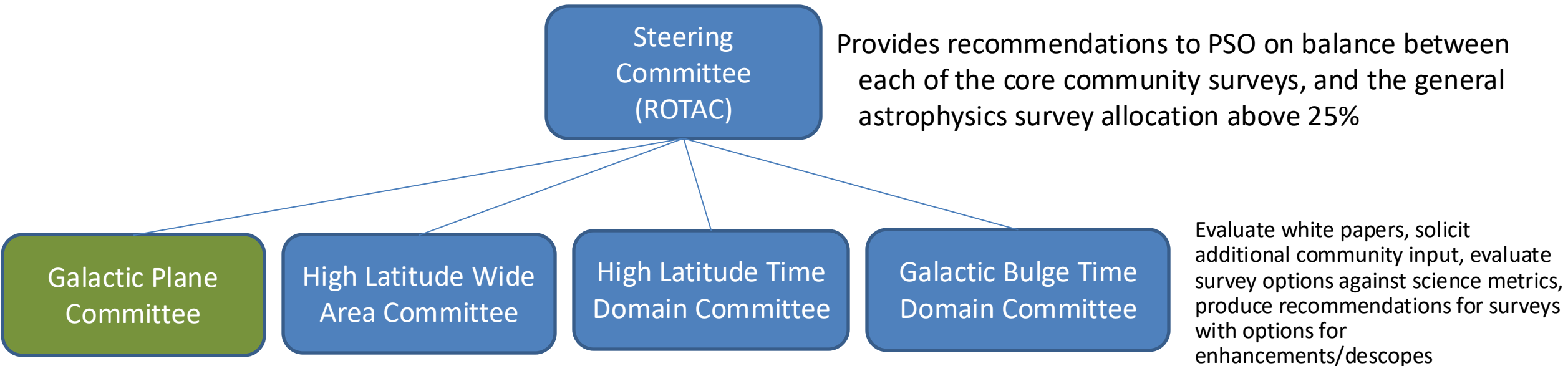


- We meet Roman’s goals through the Core Community Surveys, the General Astrophysics Surveys, and the Coronagraph technology demonstration
- Three Core Community Surveys address the 2010 Decadal Survey science goals while providing broad scientific power
  - High Latitude Wide Area Survey
    - Wide area multiband survey with slitless spectroscopy
    - Enables weak lensing, and galaxy redshift cosmology mission objectives
  - High Latitude Time Domain Survey
    - Tiered, multiband time domain observations of 10s of deg<sup>2</sup> at high latitudes
    - Enables Type Ia supernova cosmology mission objectives
  - Galactic Bulge Time Domain Survey
    - ~<15 min cadence observations over few deg<sup>2</sup> towards galactic bulge
    - Enables exoplanet microlensing mission objectives
- Minimum 25% time allocated to General Astrophysics Surveys
  - Mostly via peer reviewed proposals and some additional community defined surveys
  - Galactic Plane General Astrophysics Survey currently being defined via community process
- 90 days for Coronagraph technology demonstration observations, within first 18 months of mission



Astrophysics with wide-field near-IR surveys

- **Tiered committee structure to do the work of recommending survey definitions based on community input**
  - Committees include representatives of numerous science areas to be addressed by each survey (determined from white paper submissions etc.)



- **Survey committees reports are planned to be released this month**

# The Galactic Plane Survey



- In 2021 we solicited comments on (a) whether to pre-select a General Astrophysics Survey, and (b) to outline and submit survey concepts that would demonstrably benefit from early definition.
  - Twenty submissions were reviewed by a committee, that “found that there was sufficient justification to execute an early-definition survey for the Roman telescope”. They recommended that the mission define a survey of the Galactic Plane.
- The Galactic Plane Survey Definition Committee started in September 2024 and is currently working toward generating a survey that would use up to a month of Roman General Astrophysics Survey observing time. Their report is expected in April 2025.
  - It is feasible that this survey could measure multicolor photometry for **tens-of-billions of stars** in the Milky Way
- If the GPS process is successful, the project may consider additional community defined General Astrophysics Surveys to be executed later in the mission.



We selected five Project Infrastructure Teams, service-oriented groups expected to work closely with Project and science centers to ensure that the community can achieve Roman science objectives

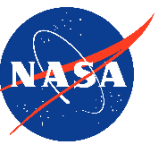
- **Maximizing Cosmological Science with the High Latitude Imaging Survey**
  - Develop, implement and validate a weak lensing measurement and analysis infrastructure
- **Project Infrastructure for the Roman Galaxy Redshift Survey**
  - Develop, implement and validate infrastructure to enable robust measurements of Baryon Acoustic Oscillations and Redshift Space Distortions
- **A Roman Project Infrastructure team to Support Cosmological Measurements with Type Ia Supernova**
  - Develop infrastructure to enable Supernova Cosmology
- **The Roman Galactic Exoplanet Survey Project Infrastructure Team**
  - Develop infrastructure to enable Exoplanet microlensing
- **RAPID**
  - Develop infrastructure to enable Time Domain Astrophysics



- **The Roman Galactic Exoplanet Survey Project Infrastructure Team**
  - Develop infrastructure to enable Exoplanet microlensing
  - Led by Scott Gaudi
- **Laying the Foundation for a Comprehensive View of Transiting Exoplanets with the Galactic Bulge Survey**
  - Build the infrastructure to support transiting exoplanet science
  - Led by Elisa Quintana + Robby Wilson
- **Spots, Faculae, and Ages: The Promise of Rotation with Roman and Deep Learning**
  - Plan strategies in measuring stellar rotation periods, inferring gyrochronological ages, and distinguishing between magnetic structures on stellar surfaces.
  - Led by Jamie Tayar + Zach Claytor
- **Asteroseismology Using The Galactic Bulge Time Domain Survey**
  - Laying the foundations for studying more than a half million evolved red giant stars
  - Led by Marc Pinsonneault



# Upcoming calls for proposals

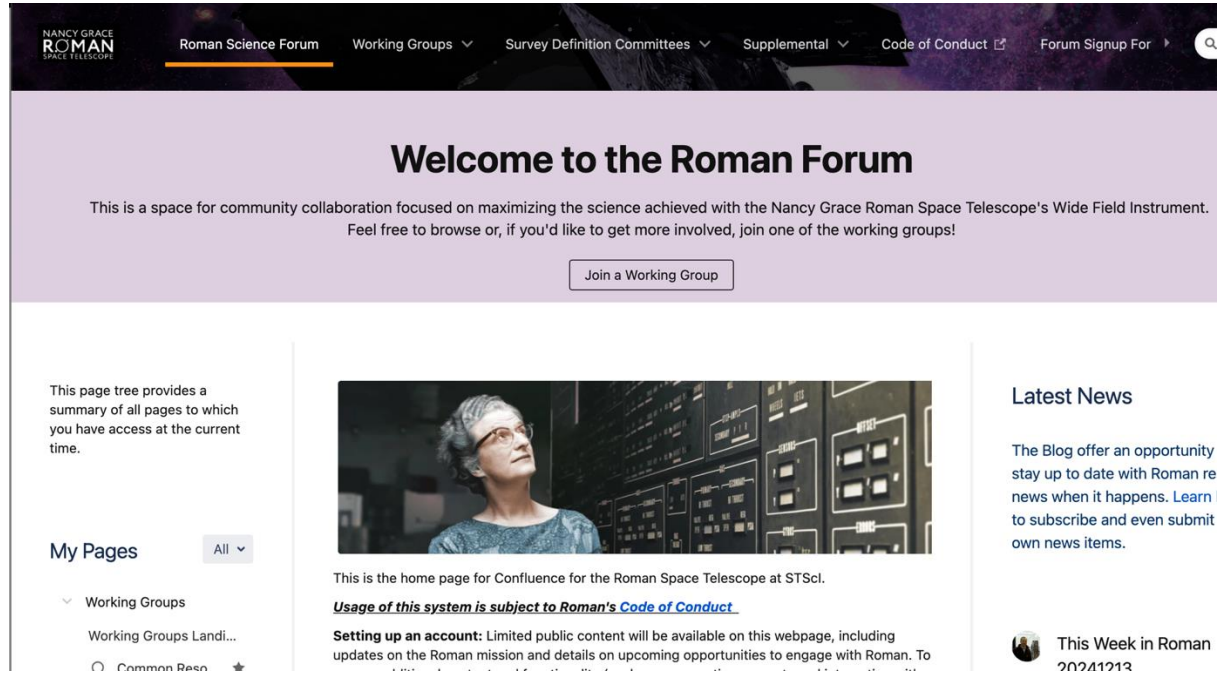


- **Roman Space Telescope Research and Support Participation Opportunities**
  - <https://roman.gsfc.nasa.gov/science/roses.html>
  - Proposals due March 6, 2025
  - Wide Field Science (WFS)
    - Supports investigations that prepare for and/or enhance the science return of Roman that can be addressed with its Wide Field Instrument (WFI)
    - Two different scales of project: Regular (two-year term, up to \$150K/year) and Large (two-year term,  $\lesssim$ \$500K/year)
    - Expect to award  $\approx$ 12 WFS proposals with a roughly 2:1 balance of Regular:Large, subject to budgetary limits and sufficient meritorious proposals
  - Coronagraph Community Participation Program (CPP)
    - Solicits individuals or very small teams to work with the Coronagraph Instrument team to plan and execute its technology demonstration observations.
    - Selected proposals will have three-year terms; available funding can support  $\lesssim$ \$200K/year awards
    - Expect to select around three CPP proposals; [PIs] members will join the single team that plans and executes Coronagraph Instrument observations

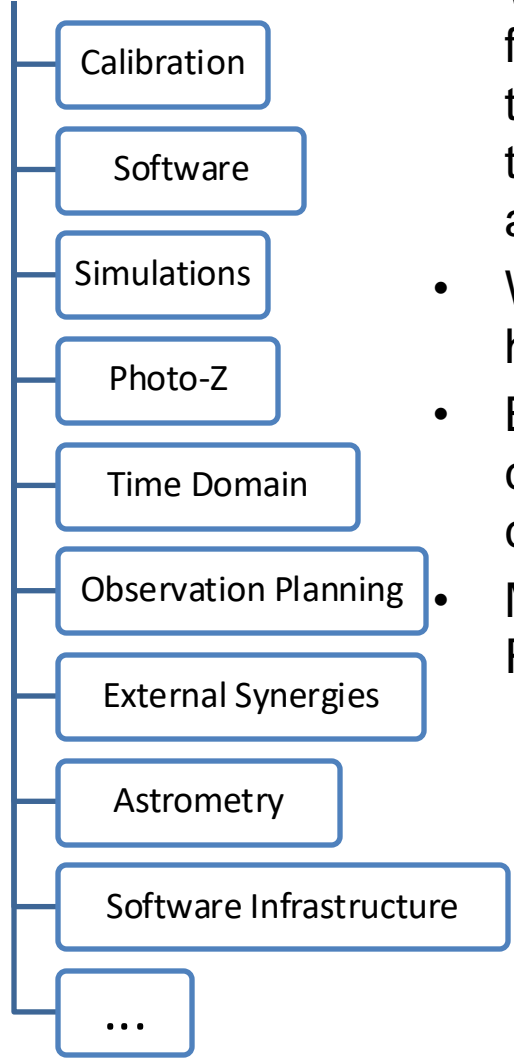
- **Roman Cycle 1 General Investigator Program**
  - We will solicit multiple program categories.
    - The largest fraction of these will be archival/data analysis/data driven/final-name-TBD. These are proposals for funding to exploit data from previously collected and planned Roman observations.
    - General Astrophysics Surveys will be solicited. We may provide guidance that programs that benefit from early execution will be prioritized in Cycle 1.
    - We are planning to also solicit theory programs
  - Expected to be released fall 2025
  - Management of the program is led by IPAC, leveraging experience on Spitzer + other programs
  - Funding available will be commensurate with other Astrophysics Flagship observatories

# Engage with Roman – Roman Forum and WFI Working Groups

- The Roman Forum is a space for collaboration between members of the science community interested in the Wide Field instrument
- <https://outerspace.stsci.edu/display/RSWGS/Sign-Up+Form>



## Science Working Group



- Working groups are a forum for people to work together on topics/methods that cut across science areas
- Where actual work happens
- Brings together science community, science centers, and project
- Membership is via the Roman Forum



# Engage with Roman – The Roman Science Collaboration

- **The goal** is to amplify the science returns from the Roman mission and the benefits of Roman science investigations to the astronomical community, by sparking collaborations and drawing on the creative insights and talents of researchers with complementary interests and expertise.
- **Membership** provides a framework and tools to support collaborative teams
- Collaboration co-spokespersons are Jessica Lu and David Weinberg.
- Membership in the RSC is voluntary, and no one is required to be a member of the RSC to do science with Roman data or to apply for Roman observing time or related funding opportunities.
- More information will be presented at the Roman Town Hall

# BIG DATA

172

Terabytes

Hubble's data archive

30 years (1990–2020)

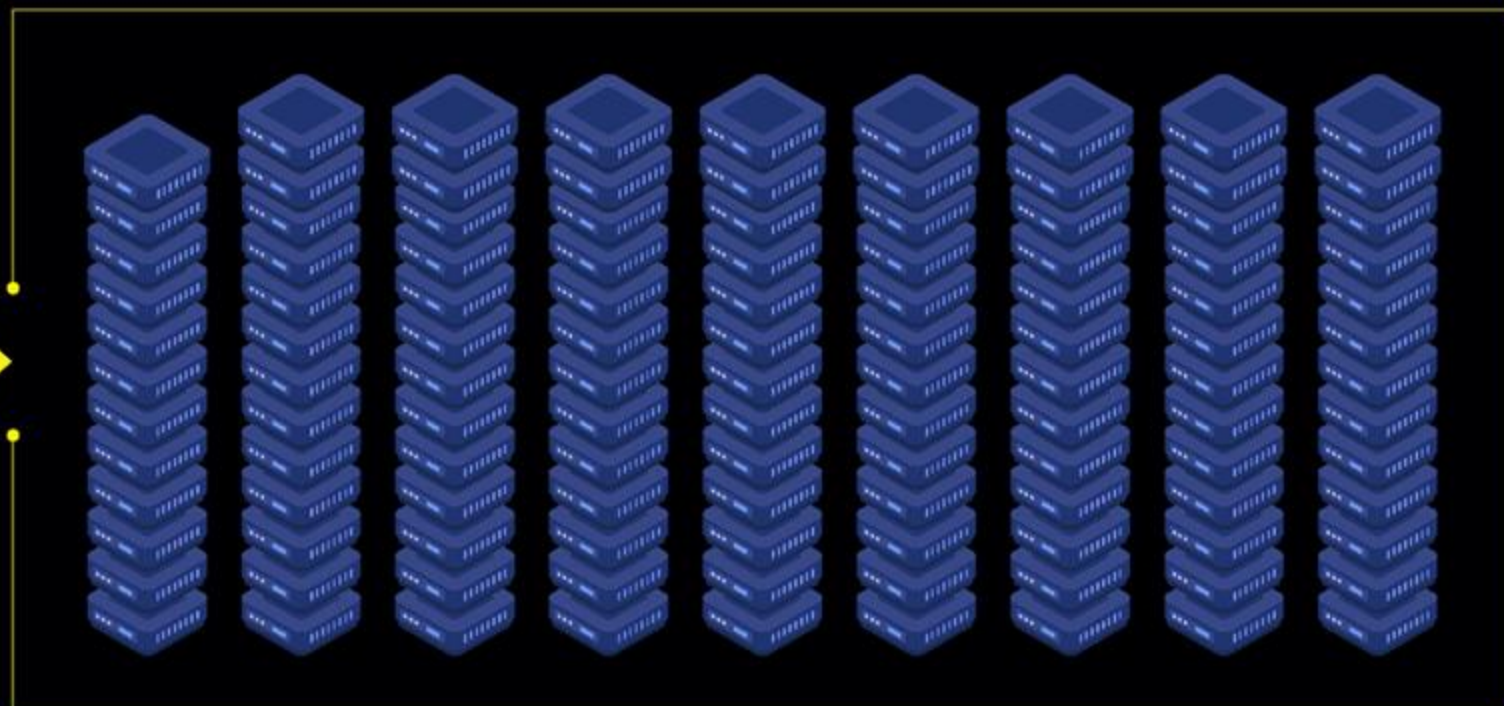


20,000

Terabytes

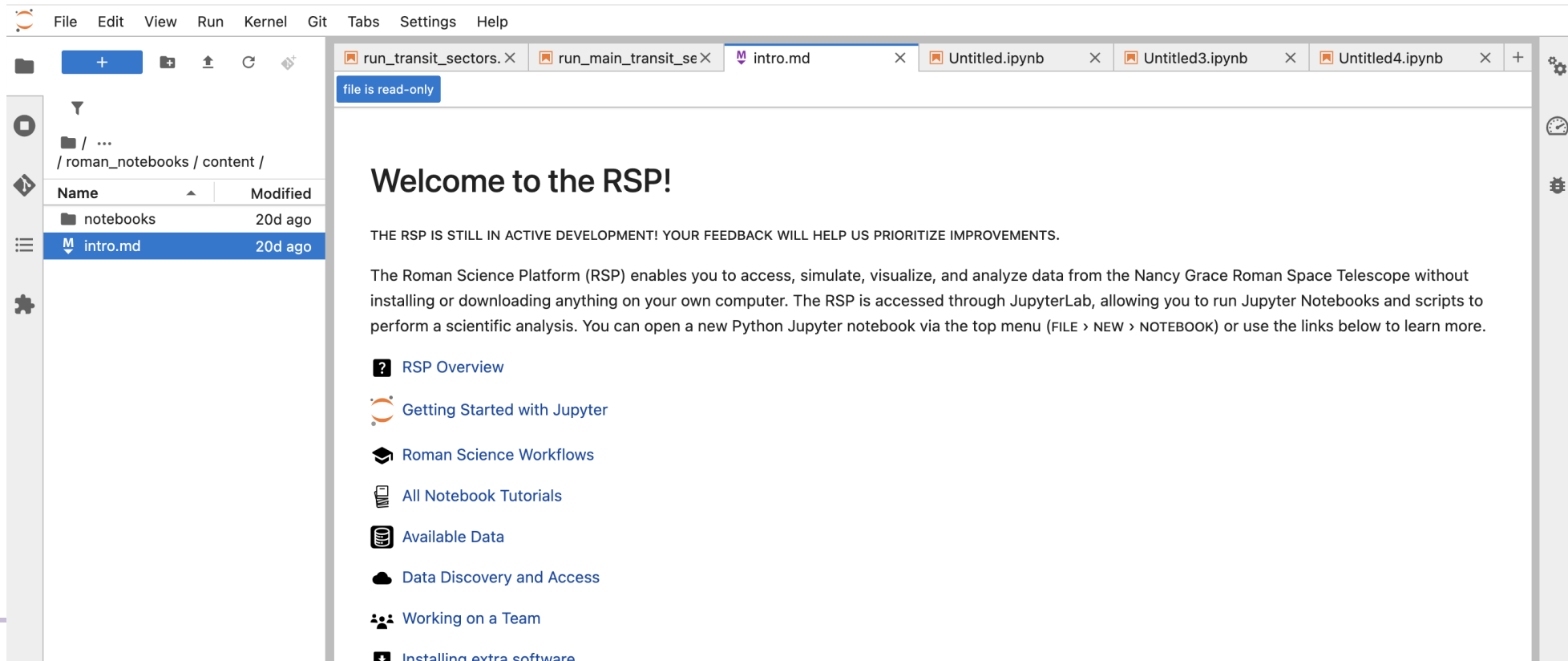
Roman's data archive

5 year primary mission  
(projected)



(All Roman data will be publicly available)

- **Roman Research Nexus:** Roman’s large data volumes mean it will not be feasible for most users to download and process data. The primary interface for the community to access Roman data will be a science platform, hosted in the cloud, with a Roman software environment to make it easy for people to do Roman analysis.
  - In September 2024, SOC hosted a workshop where participants got hands-on executing software on the platform.
  - Today - January AAS meeting - there is another hands-on workshop for community members to get experience using the platform.

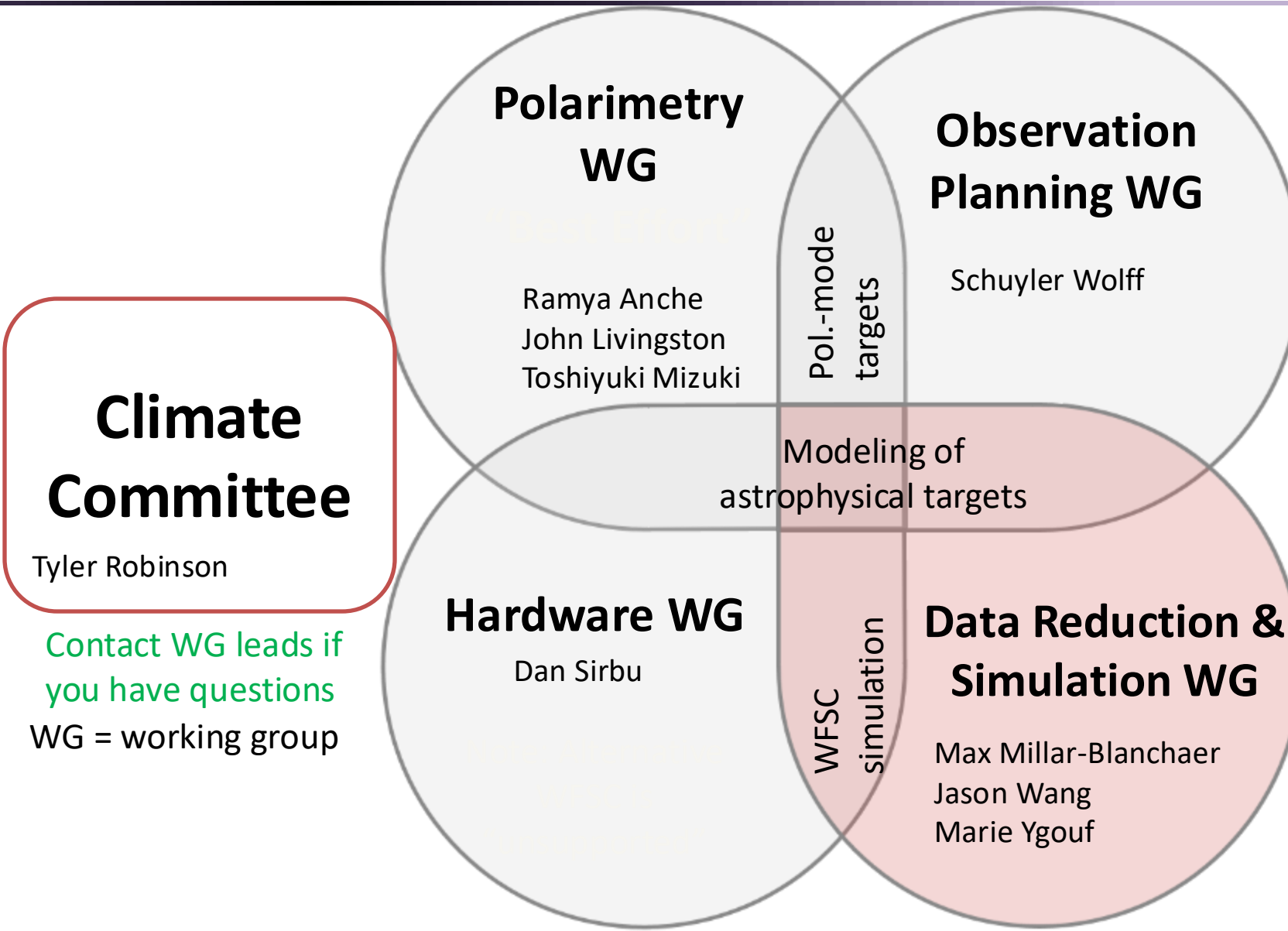


The screenshot shows a JupyterLab interface with the following elements:

- File Browser (Left):** Shows a directory structure with 'roman\_notebooks / content /'. A file named 'intro.md' is selected, showing it was modified '20d ago'.
- Kernel and Tabs (Top):** The kernel is 'run\_transit\_sectors'. There are several open tabs, including 'intro.md' and three 'Untitled.ipynb' notebooks.
- Main Content Area:**
  - Header:** 'Welcome to the RSP!' with a 'file is read-only' warning.
  - Text:** 'THE RSP IS STILL IN ACTIVE DEVELOPMENT! YOUR FEEDBACK WILL HELP US PRIORITIZE IMPROVEMENTS.'
  - Paragraph:** 'The Roman Science Platform (RSP) enables you to access, simulate, visualize, and analyze data from the Nancy Grace Roman Space Telescope without installing or downloading anything on your own computer. The RSP is accessed through JupyterLab, allowing you to run Jupyter Notebooks and scripts to perform a scientific analysis. You can open a new Python Jupyter notebook via the top menu (FILE > NEW > NOTEBOOK) or use the links below to learn more.'
  - Links:**
    - [RSP Overview](#)
    - [Getting Started with Jupyter](#)
    - [Roman Science Workflows](#)
    - [All Notebook Tutorials](#)
    - [Available Data](#)
    - [Data Discovery and Access](#)
    - [Working on a Team](#)
    - [Installing extra software](#)



- The CPP enables US and international researchers to become integral parts of Coronagraph team
- CPP leadership is made up of NASA project team members, science leaders of funded ROSES ROSES program teams, and members selected by international partners.
- Membership covers more than 50 scientists/engineers.
- Coronagraph observation prioritization is a joint exercise between the instrument team and the CPP
- CPP are conduit for community input to observation planning

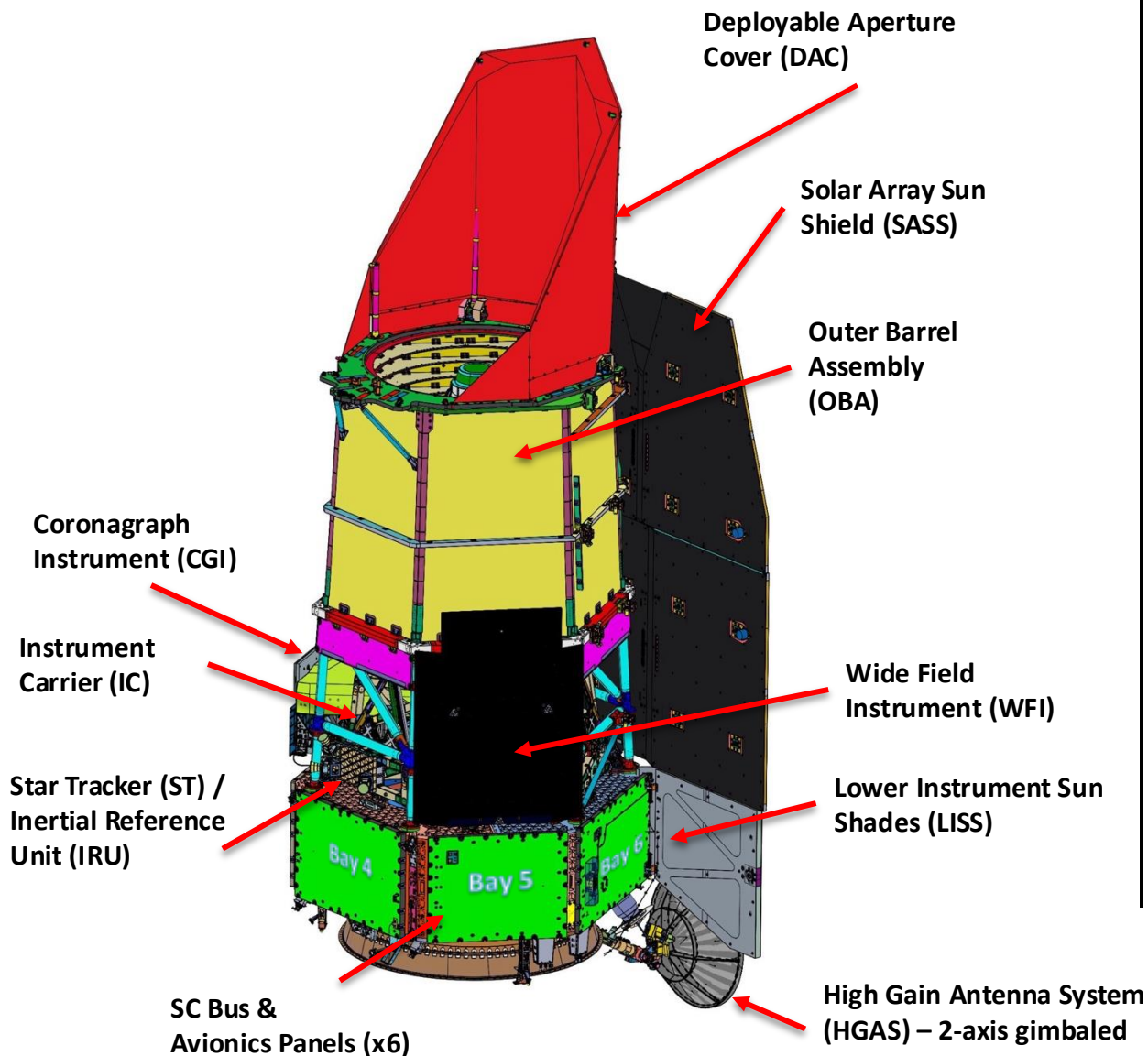


- **Upcoming major CPP engagement activities**
  - This Tuesday for those at AAS: Splinter session Tuesday, January 14th from 10 am to 12 pm EST.  
([https://roman.ipac.caltech.edu/mtgs/cpp\\_aas245\\_splinter.html](https://roman.ipac.caltech.edu/mtgs/cpp_aas245_splinter.html))
  - To be announced this week:
    - A community interest survey
    - Release of a primer document
  - CPP proposals solicited through the ROSES call for new funded members
  - Later this year: CPP issues call for whitepapers to flesh out specific concepts

# Roman Hardware Status





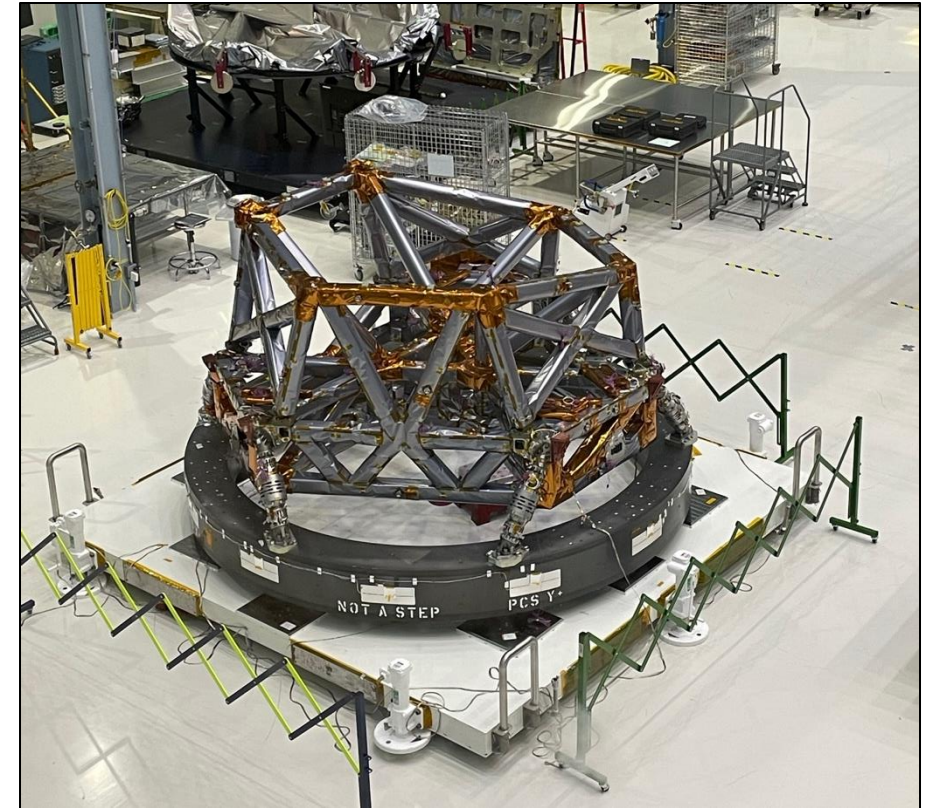
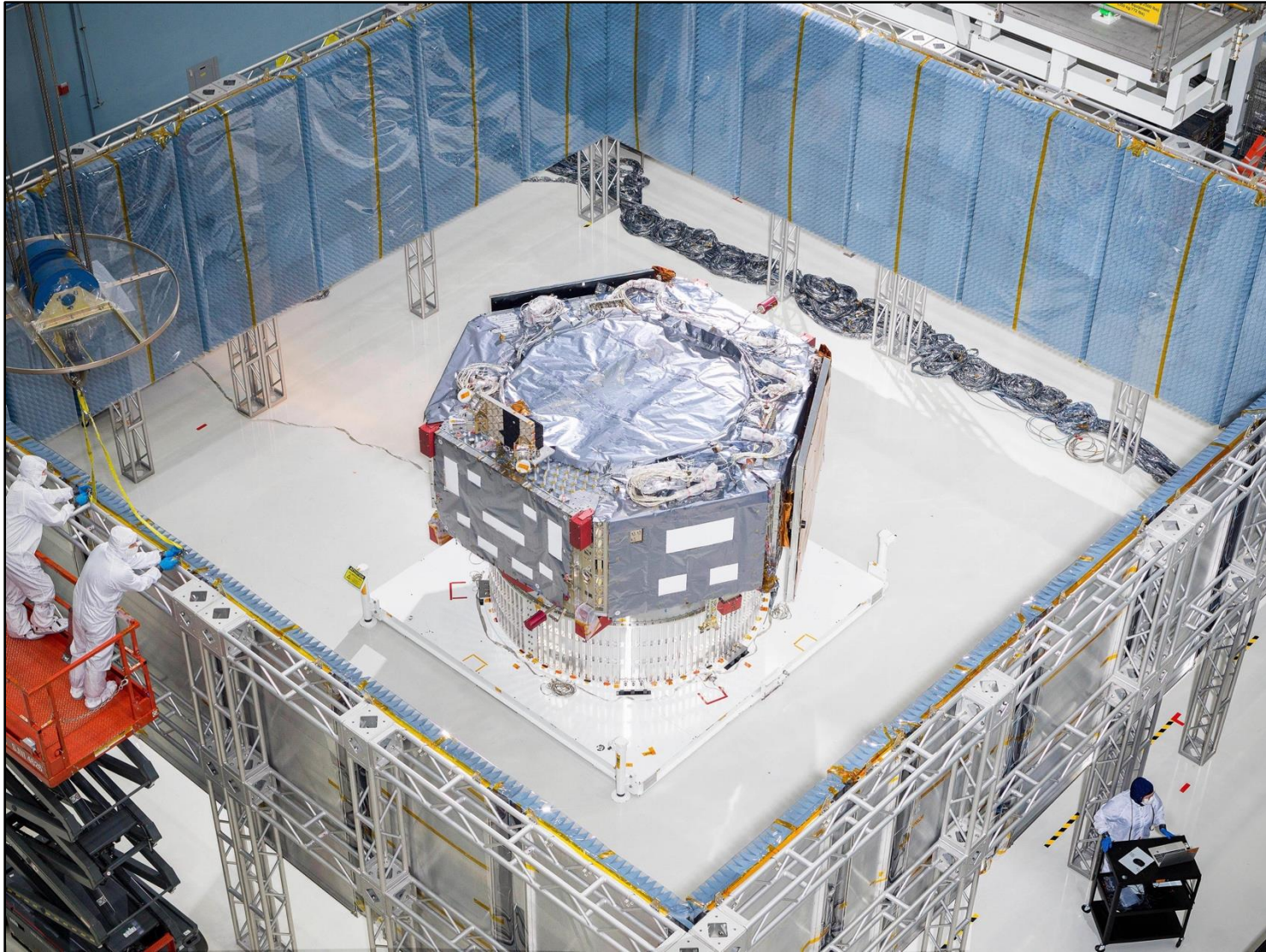


## Observatory Overview

- **Telescope:** 2.4m aperture
- **Instruments:**
  - Wide Field Imager / Slitless Spectrometer
  - Coronagraph Technology Demonstration
- **Orbit:** Sun-Earth L2
- **Data Volume:** 11 Tb/day
- **Launch Vehicle:** Falcon Heavy
- **Launch Date:** Planned October 2026, but No Later Than May 2027
- **Mission Duration:** 5 yr nominal, 10 yr goal



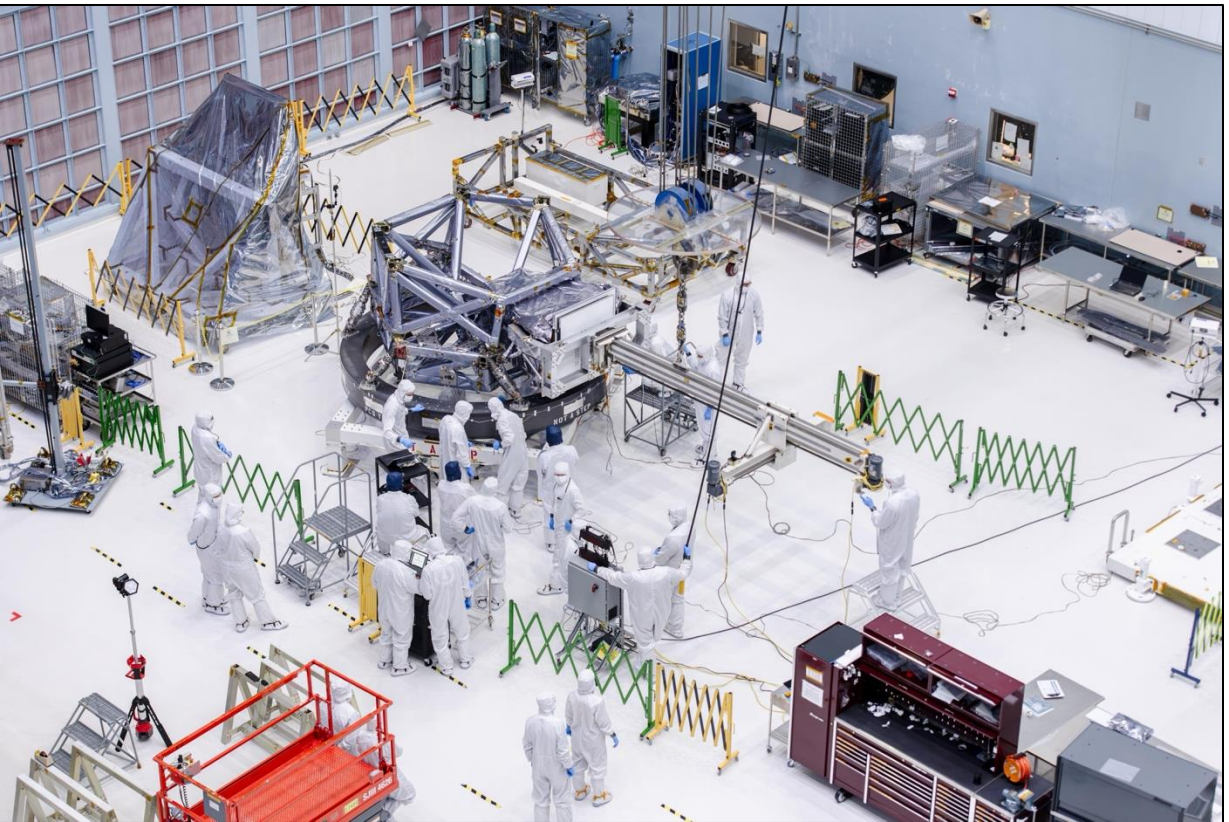
# Spacecraft Bus and Instrument Carrier



Date: Late September 2024



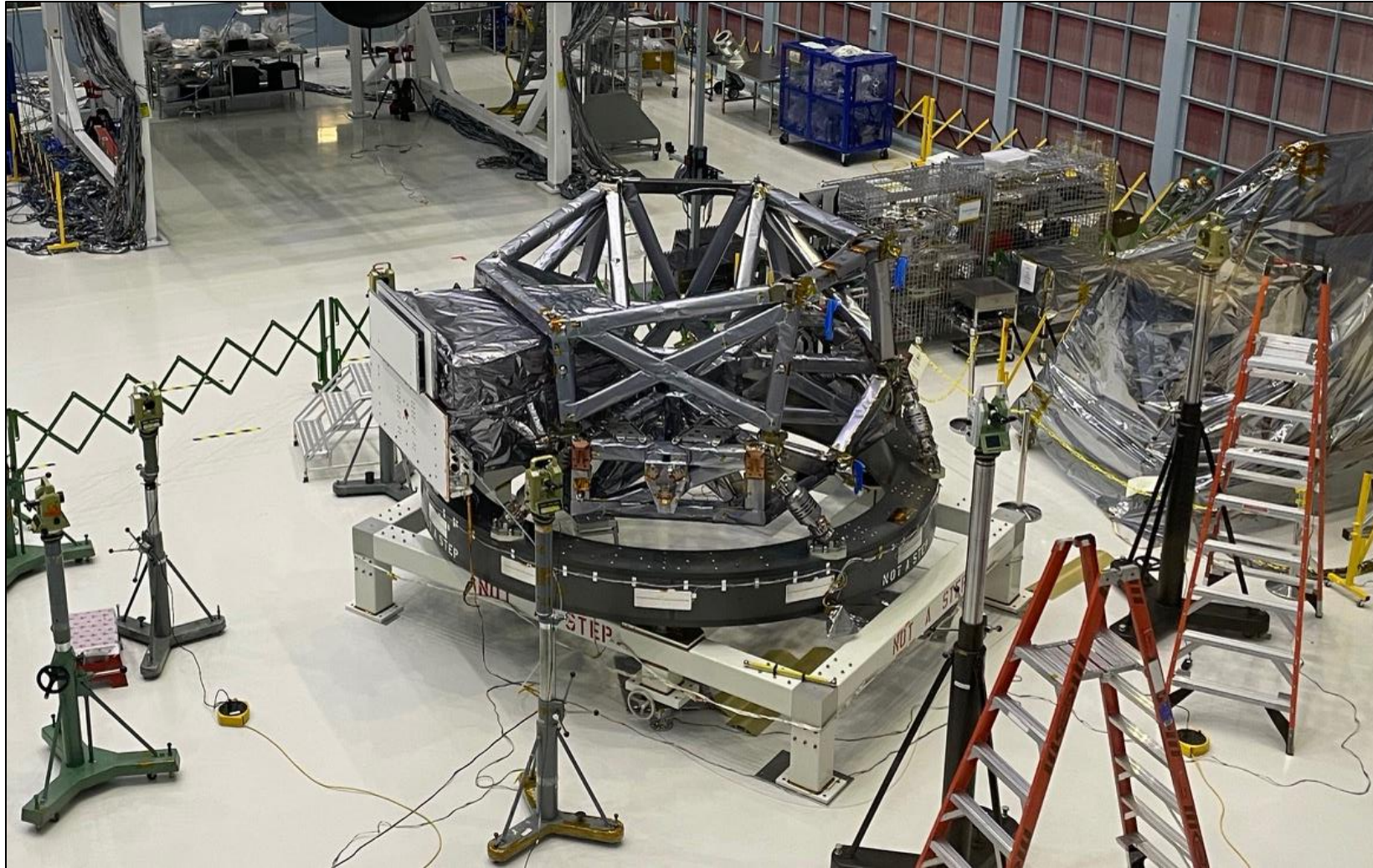
# Roman Coronagraph Integration



Date: Late October 2024



# Roman Coronagraph Integration



Date: Late October 2024



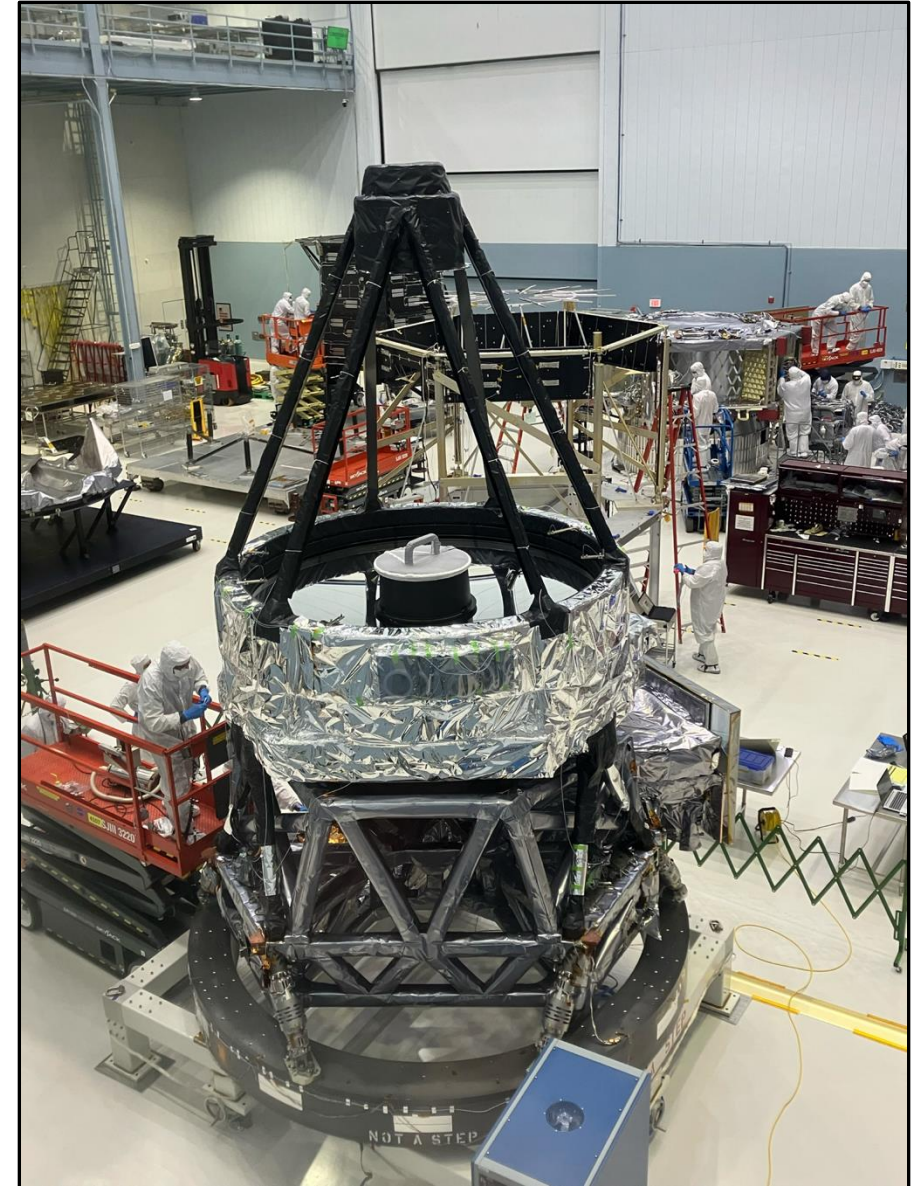
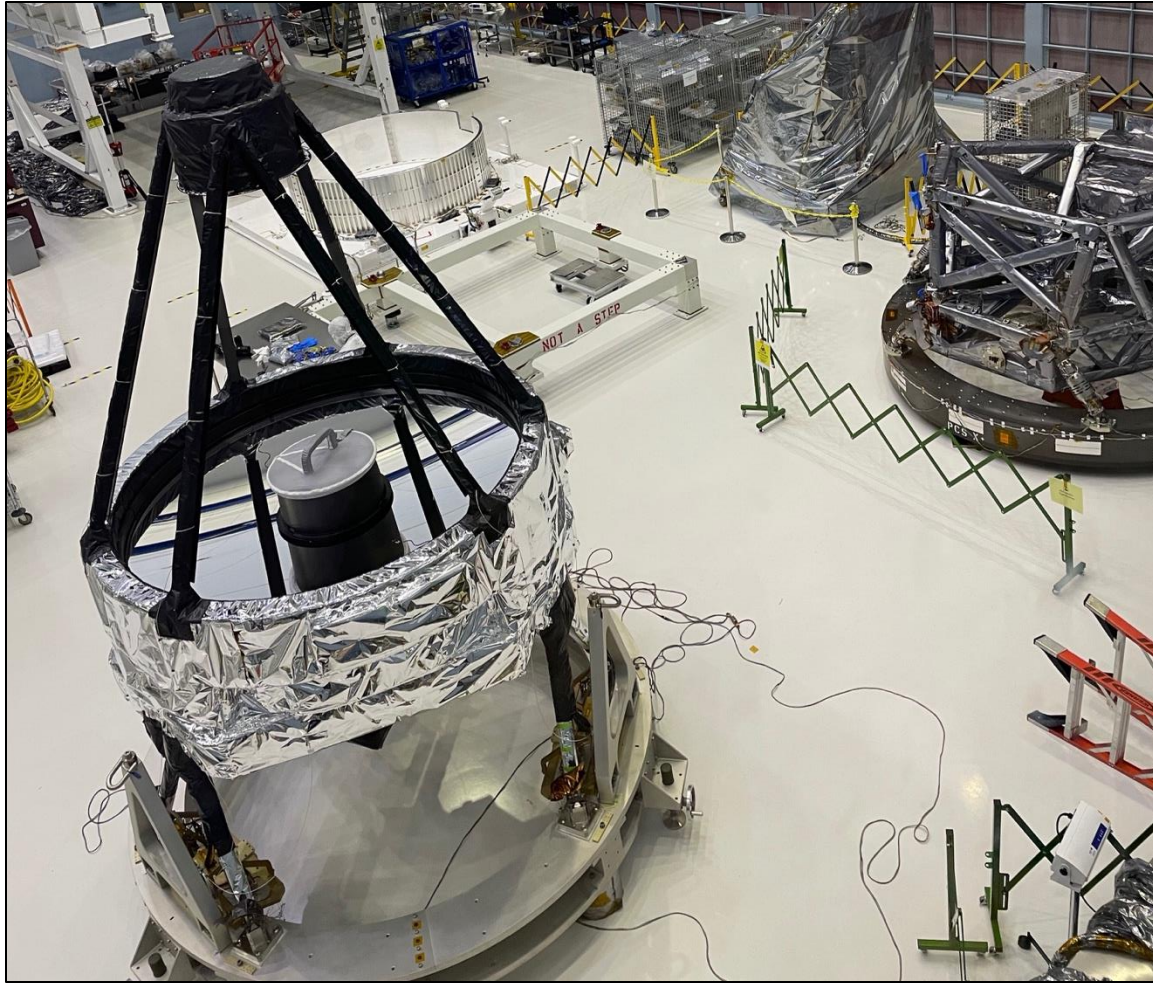
# Optical Telescope Assembly Delivery and Integration



Date: Late November 2024



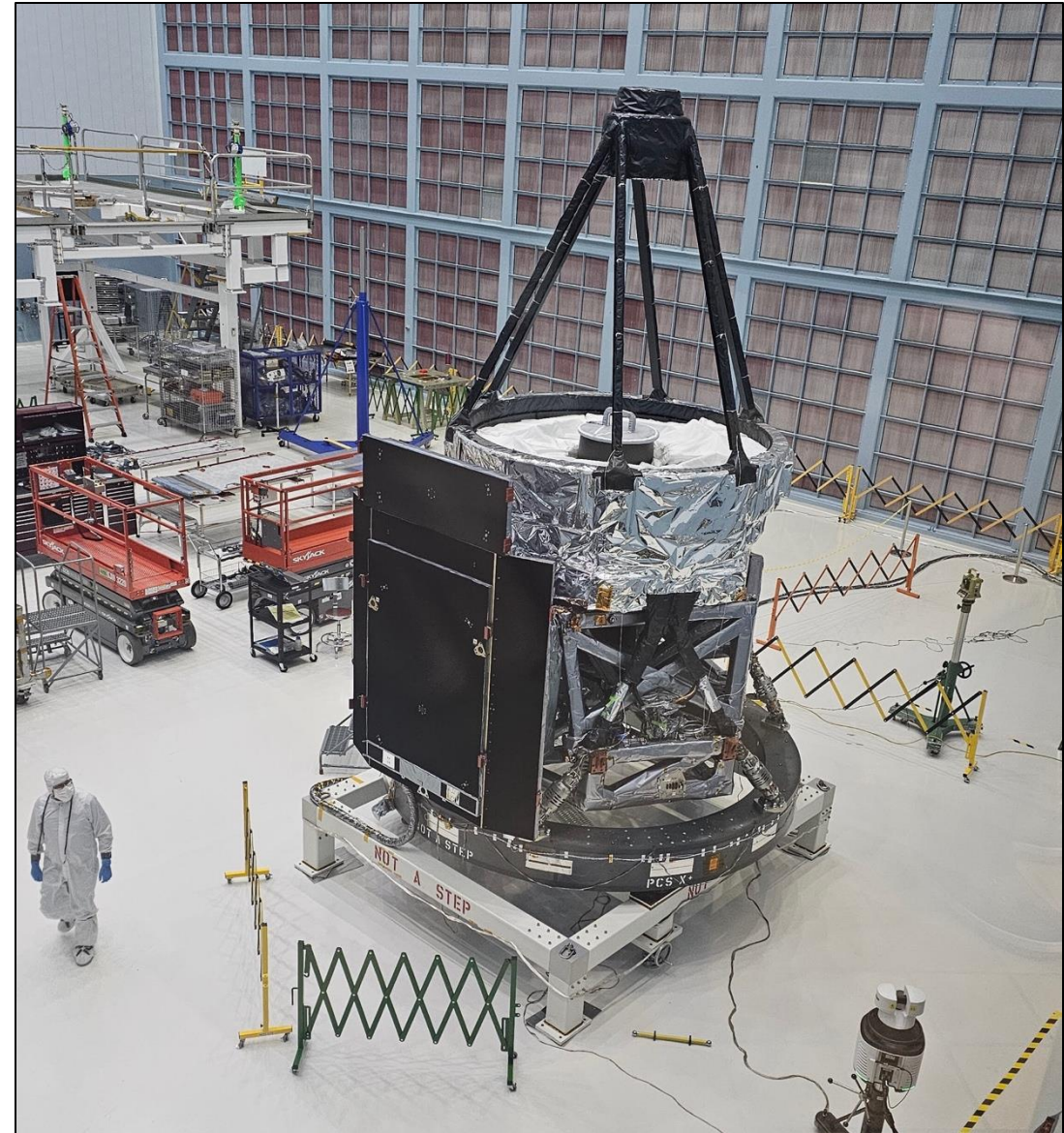
# Optical Telescope Assembly Delivery and Integration



Date: Late November 2024



# Wide Field Instrument Integration



Date: Dec 10, 2024



# Integrated Payload Assembly



Date: Dec 10, 2024



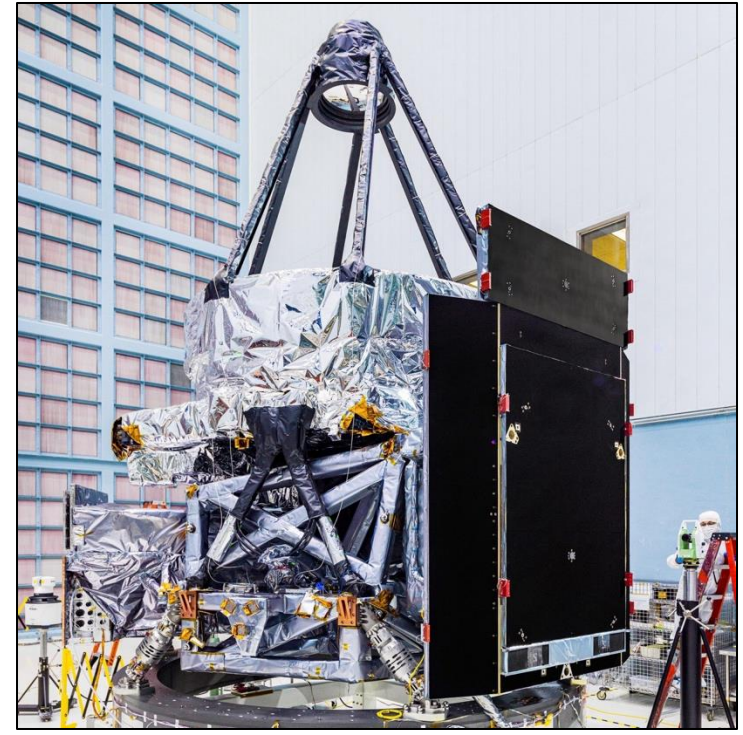
# Integration of SCIPA

Spacecraft Bus (SC)



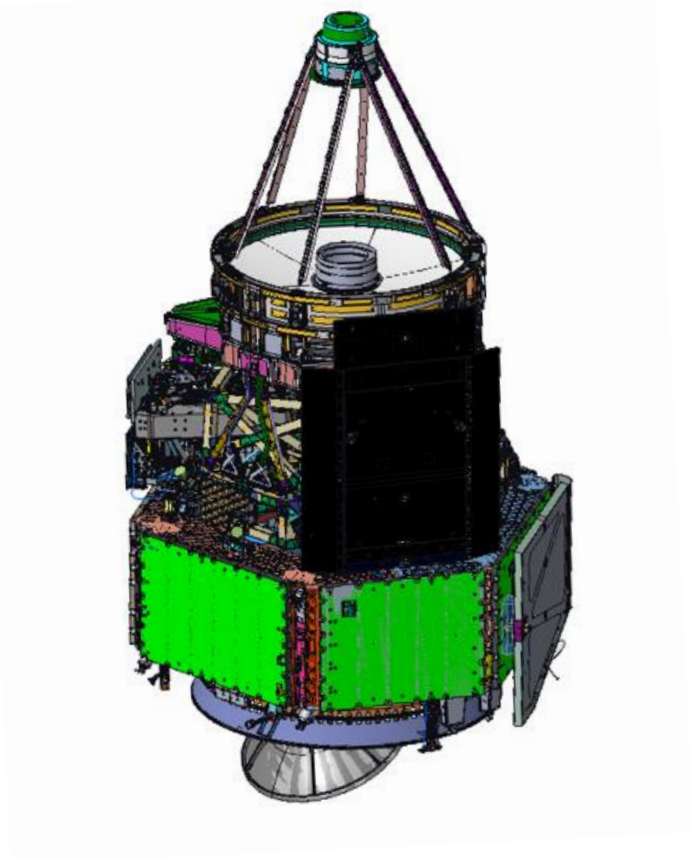
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Integrated Payload Assembly (IPA)



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Spacecraft and Integrated Payload Assembly (SCIPA)



Date: Week before Christmas



# Next Steps for Roman Testing



SCIPA environmental testing planned for Feb – Sep 2025

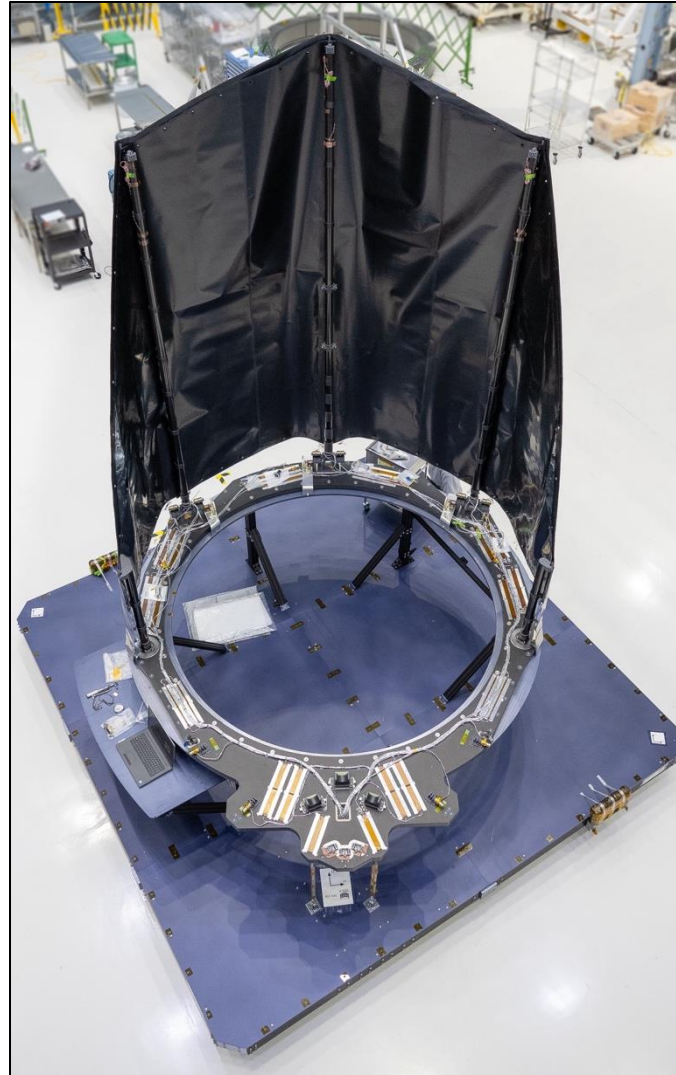


# Other Observatory Hardware is also now Complete

Outer Barrel Assembly (OBA)



Deployable Aperture Cover (DAC)



Solar Array Sun Shield (SASS)



# (a small subset of) Roman Events at the AAS

Session Title	Date and Time	Location
<b>Splinter:</b> Roman Spectroscopy Data Challenge (Part 1/3)	<b>Monday</b> , January 13 10:00 am - 11:30 am	Chesapeake F
<b>Town Hall:</b> NASA	<b>Monday</b> , January 13 12:45 pm - 1:45 pm	Potomac Ballroom AB
<b>Splinter:</b> Project Infrastructure Teams for the Roman Space Telescope	<b>Tuesday</b> , January 14 9:00 am - 12:00 pm	National Harbor 13
<b>Splinter:</b> Advancing the Roman Coronagraph Instrument to Flight: Project Status and Coronagraph Community Participation Program Activities	<b>Tuesday</b> , January 14 10:00 am - 12:00 pm	Chesapeake C
<b>Town Hall:</b> Nancy Grace Roman Space Telescope	<b>Tuesday</b> , January 14 6:30 pm - 8:00 pm	National Harbor 11
<b>Splinter:</b> Maximizing Science with Roman-Rubin Data Synergies	<b>Wednesday</b> , January 15 10:00 am - 11:30 am	Chesapeake J/K/L
<b>Splinter:</b> Enhancing the Science of the Roman Space Telescope with Simulations	<b>Wednesday</b> , January 15 2:00 pm - 3:30 pm	Chesapeake D/E
<b>Special Session:</b> Time Domain Insights from the Roman Space Telescope	<b>Wednesday</b> , January 15 2:00 pm - 3:30 pm	National Harbor 2
<b>Special Session:</b> Open Science: NASA Astrophysics in the Roman Era	<b>Wednesday</b> , January 15 2:00 pm - 3:30 pm	Chesapeake 4-5



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  - Send an e-mail to [roman-news-join@lists.nasa.gov](mailto:roman-news-join@lists.nasa.gov) subject 'join'