



**Jet Propulsion Laboratory**  
California Institute of Technology

# Roman Coronagraph Post-Delivery Plan

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Pasadena, CA 91109

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## Outline

- Observatory I&T plan summary – CGI post-delivery support in the next two years
- Preparation for Commissioning – CGI’s focus in the next two years
- “Enhanced Coronagraph” tasks – beyond TTR5 requirement tech demo
- Q&A

# CGI Integration with Integrated Payload (IPA) and Spacecraft



## CGI Integration & Alignment

- Orient MI&T Stand to Crane Axes
- Install HIT Adapter & Toque Tool
- Mate HIT & Remove CGI from IC Sim
- Move to HIT Stand
- Inspect & Refurbish Latches (TBR)
- Integrate CGI to IPA
- Metrology Check
- IPA-Level CGI E2E Pupil Measurement
- Final Closeouts & ICD Verifications

Oct – Nov, 2024

## Mate IPA to SC Bus via LLVIS

- Remove IPA LLVIS Surrogates
- Install Flight LLVIS to SC
- Lift and Install IPA to SC
- Safe to Mate (LLVIS Harness)
- Mate LLVIS Flight Connectors
- Metrology Check

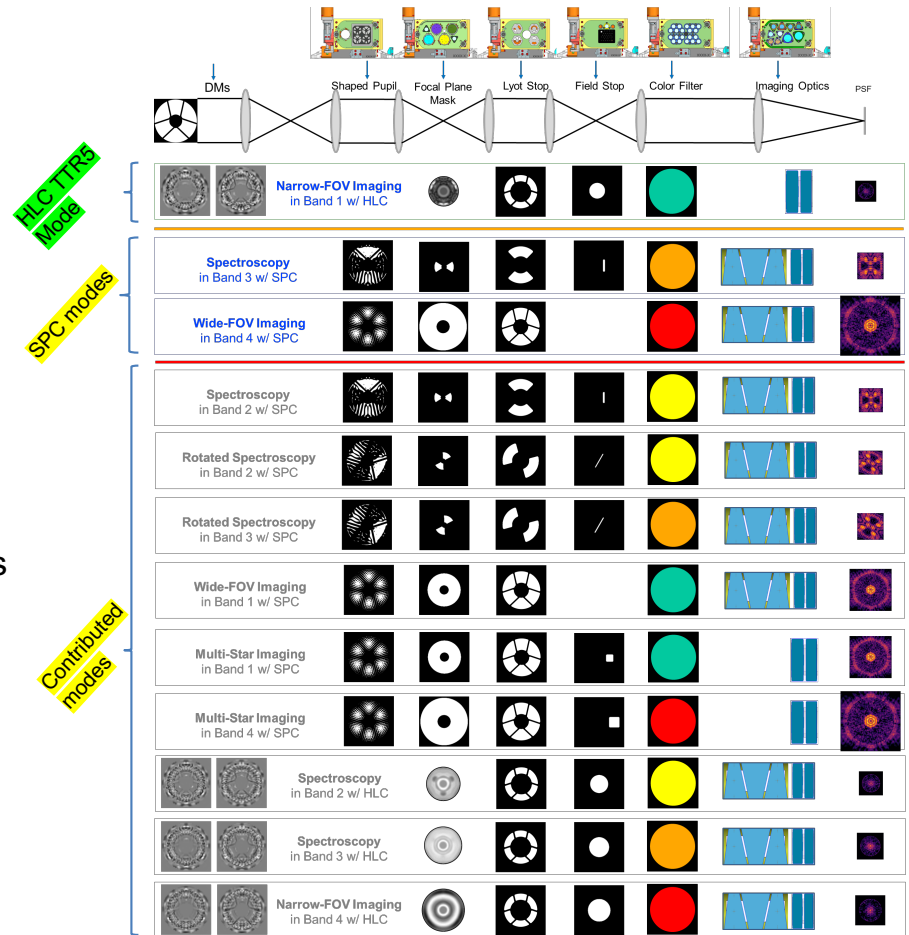
~ Dec 2024 – Feb, 2025



# CGI “Enhanced Configurations/modes”

- 2/2020: KDP-C. Coronagraph team directed to focus only **threshold (TTR5) requirement with HLC configuration** but retain PDR design (HLC + two SPC configurations)
- 10/2020: Coronagraph team received prioritized “contributed masks” to populate remainder slots on Precision Alignment Mechanisms (PAMs) → *Contributed configurations*
  - Priority list from “stakeholders group”
  - Mask design and fab paid by ExEP
- 11/2021: CGI’s potential science with these “enhanced observational modes” is cited in Astro2020 decadal report
- 8/2022: CGI received a priority task list for any overguide (beyond PLRA) from “stakeholders group”.
- 3/2024: CGI received direction from HQ to perform additional tests under “overguide funding”:
  - Spectrometer/polarimeter calibration in TVAC
  - Demonstrate LOWFS Z4-Z11 in TVAC
  - Test beyond TTR5 mode in TVAC

“**Enhanced configurations and observation modes**” = everything besides the HLC configuration/mode



# Post-TVAC Program Direction from ASMP to CGI (May 30, 2024)

This action implements the direction of the Astrophysics Division (APD) Director to provide authorization to conduct activity beyond the threshold performance level (specifically, Threshold Technical Requirement 5), to augment required documentation, and demonstrate enhanced performance.

The **three tasks** specifically authorized are:

- Support existing CGI personnel to author refereed papers (i.e. for SPIE/JATIS) on CGI flight hardware test results, calibrations, lessons learned, etc. with an emphasis on information relevant to the future Habitable Worlds Observatory community;
- Produce enhanced mode performance simulations based on the as-built CGI hardware, making these simulations to the Coronagraph Community Participation Program and wider community; and
- Deliver a flight spare EMCCD to the Functional Testbed to enable a cooled camera for ultra-low noise performance to aid in mission operations, including enhanced mode operations, and to work with ExEP on the possibility of delivering space EMCCD components or systems to the HCIT.

The CGI project shall manage this additional work to ensure that no adverse impact is made on the continued support of the Coronagraph flight hardware and operations preparation. Status of the three tasks will be reported in the Monthly Management Review (MMR) and at weekly Program/Project tag-ups.

This authorization is to be at no cost to the Nancy Grace Roman Project and no additional cost to the CGI Project, using only funds already provided by APD for technology risk reduction for future missions.

**ROMAN CORONAGRAPH INSTRUMENT**


Publication Date	Submission Deadline	
April-June 2025	1 October 2024	<div style="background-color: yellow; padding: 5px; display: inline-block;">Submit a Manuscript</div> <div style="background-color: gray; color: white; padding: 5px; display: inline-block;">Author Guidelines</div>

**Special Section Editors**

<p><b>Olivier Guyon</b>          Subaru Telescope, National Observatory of Japan          and          University of Arizona, USA          guyon@naoj.org</p>	<p><b>Motohide Tamura</b>          University of Tokyo, Japan          and          National Astronomical Observatory of Japan          motohide.tamura@nao.ac.jp</p>
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**Scope**

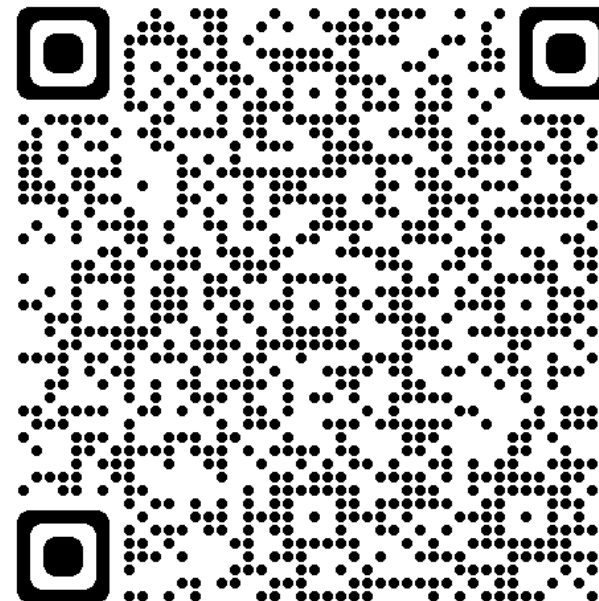
The Roman Coronagraph Instrument, previously named the WFIRST-AFTA Coronagraph Instrument, is a technology demonstration that advances a range of new technologies, including advanced coronagraph occulters/masks, deformable mirrors, advanced wavefront sensing and control, and photon-counting detectors. Since the [Special Section on WFIRST-AFTA Coronagraphs](#) in 2016, the instrument has advanced and is now undergoing final flight integration and test. This work is highly relevant to the Habitable Worlds Observatory (HWO), given the need for high contrast coronagraphs that are capable of direct imaging of nearby Earth-like planets. HWO will benefit from Roman Coronagraph development not only in new technologies but also engineering and programmatic aspects.



This special section calls for submission on Roman Coronagraph Instrument development and testing, including but not limited to:

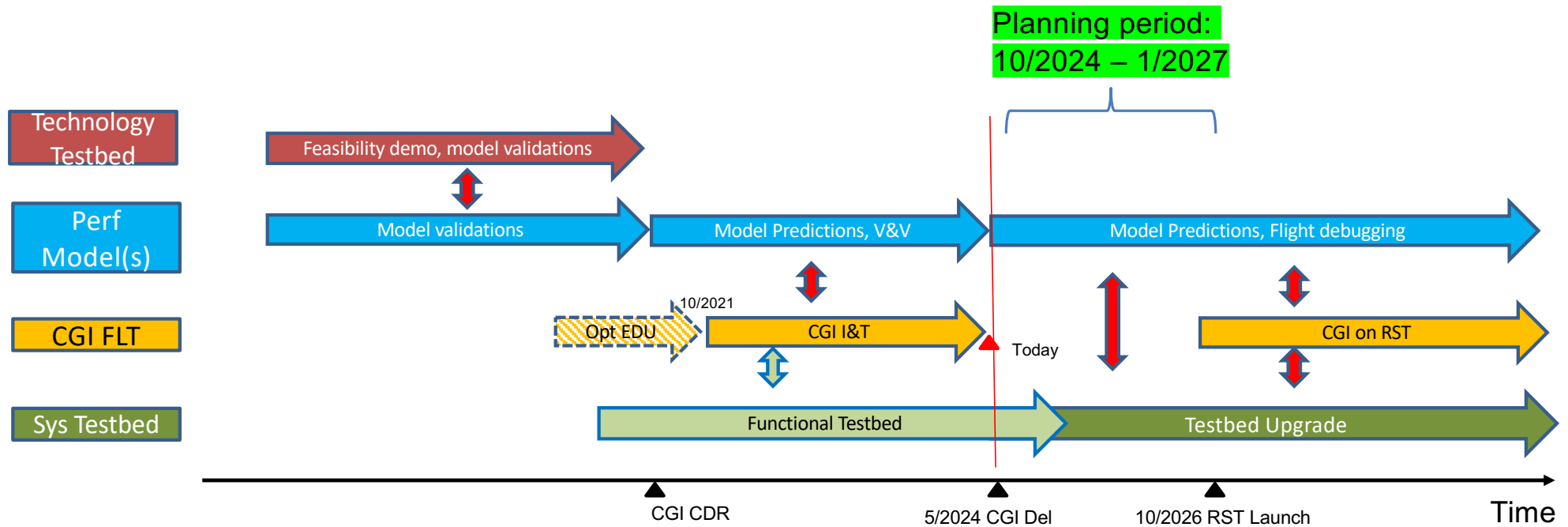
- Roman Coronagraph optical integration and test results
- Wavefront sensing (high order and low order) test results
- Coronagraph performance model validation
- EMCCD calibration and test results at instrument level
- Key active optical subsystems such as deformable mirror, fast steering mirror, focus control mirror, and precision alignment mechanisms
- Instrument electronics and software
- Coronagraph opto-mechanical design and thermal controls
- Instrument operations
- Level 1 – Level 4 (L1 – L4) data processing pipelines
- Key ground support equipment
- Target selection and synergy with ground-based telescopes
- Lessons learned

- [Call For Papers \(spiedigitallibrary.org\)](https://spiedigitallibrary.org)



## Task #2 Enhanced Mode Performance Simulations

- Task #2: Produce enhanced mode performance simulations based on the as-built CGI hardware, making these simulations to the Coronagraph Community Participation Program and wider community; and

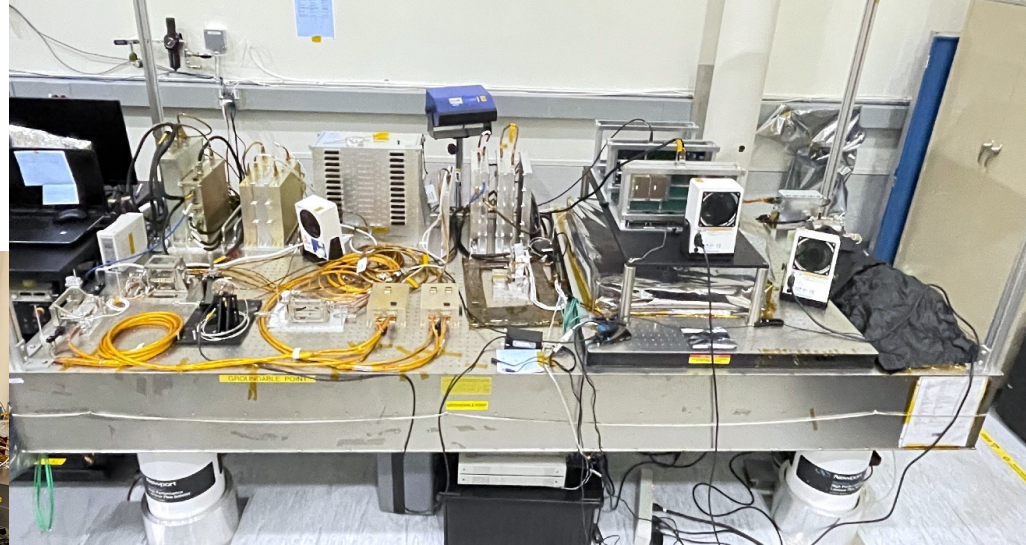




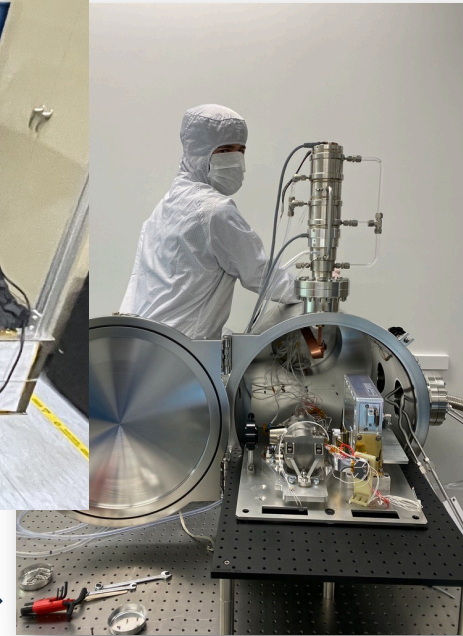
# Task #3 Cooled EMCCD Addition to Functional Testbed

Task #3: Deliver a flight spare EMCCD to the Functional Testbed to enable a cooled camera for ultra-low noise performance to aid in mission operations, including enhanced mode operations

Existing Functional Testbed (FTB1) and Spacecraft Interface Simulator (SIS)



Move Camera Test Chamber and integrate to FTB, to allow camera noise performance tuning



## Preparation for Commissioning (In-Orbit Checkout)

- Remaining GSW releases
- Mission Operations Readiness (MOR) Review: 12/10/2024
- GRTs (Ground-system Readiness Tests)
- MRTs (Mission Readiness Tests)
- Day-in-the-life tests
- Data pipelines
- Roman launch ~ 10/2026
- Commissioning: 11/1/2026 – 1/31/2027
- Tech demo: 2/1/2027 – 8/1/2029
- Post-tech demo Phase E operations ??? – 8/1/2029

## Summary

- CGI completed all required tests successfully!
- CGI was delivered to Roman on May 19, 2024 ahead of need date!
  - CGI is the first element delivered to Roman!
- Next steps: (1) Payload and observatory integration and tests; (2) Ground systems (CTC + SSC + MOC) development and tests → Commissioning (IOC) ~ 11/2026 --1/2027
- CGI post-delivery plan includes both (1) HLC tech demo to demonstrate TTR5, (2) “enhanced coronagraph” modes to support CPP