NANCY GRACE ROMAN SPACE TELESCOPE

Observatory Implementation and Challenges

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DR. NANCY GRACE ROMAN

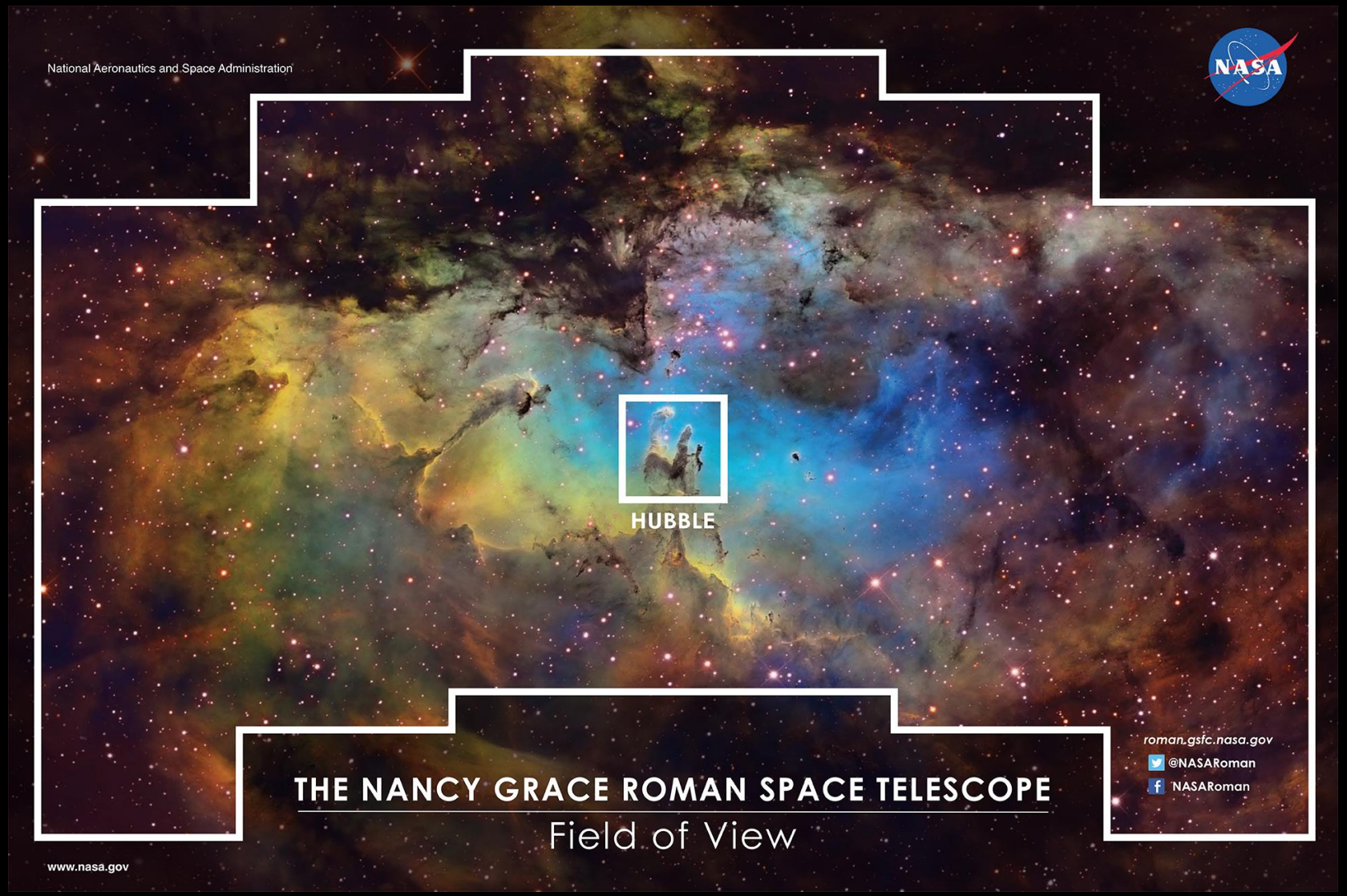
- Astronomer
- Pioneer
- "Mother of Hubble"

- Queen of Plan B

https://en.wikipedia.org/wiki/Nancy_Roman

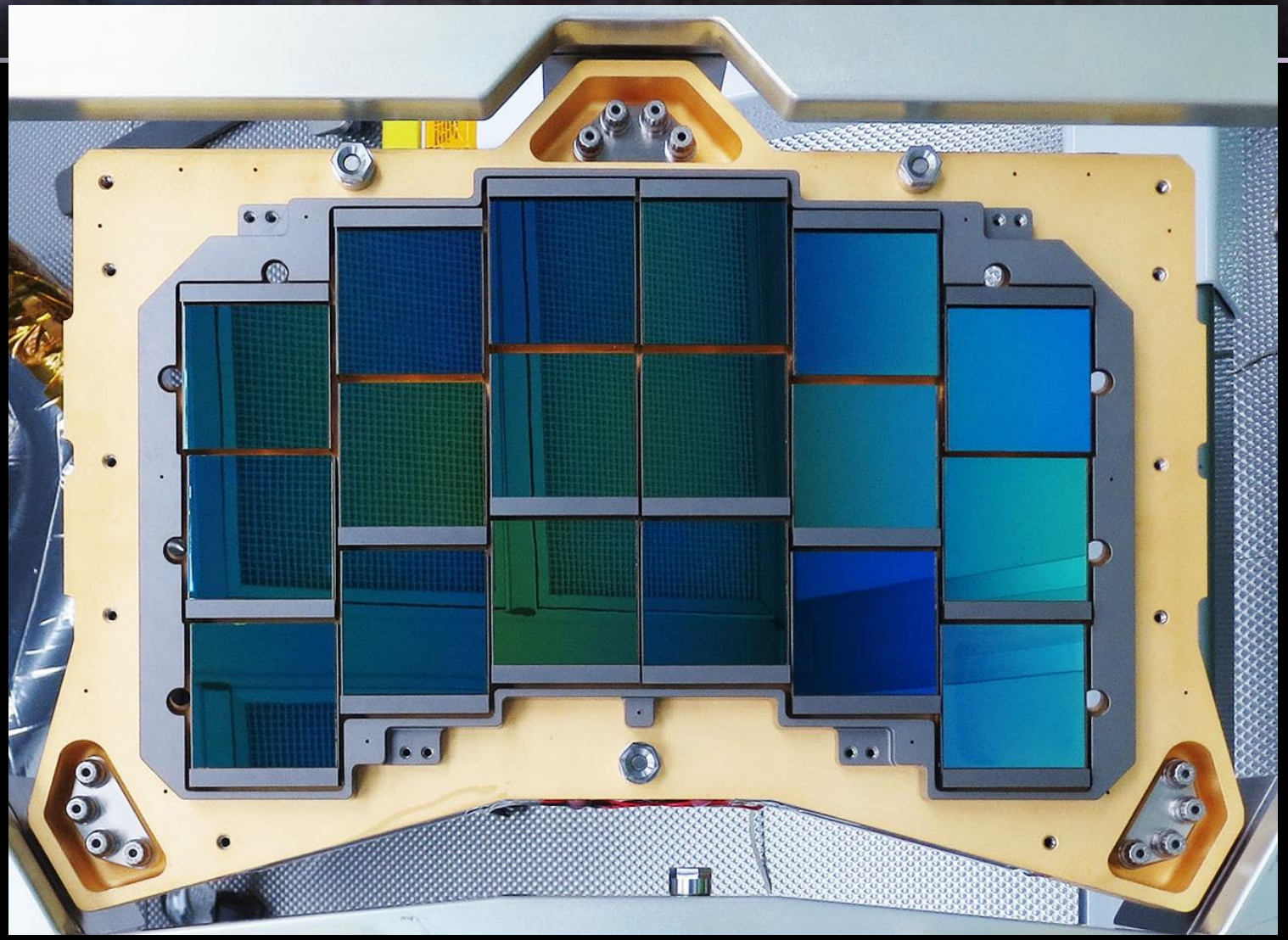
SCIENCE

- Science objectives
  - Dark energy
  - Dark matter
  - Near-infrared astronomy
  - Exoplanet census
- Technology demo of exoplanet coronagraphy
- Guest investigator program



MISSION

- Class A
- L2 orbit
- 5-year Mission life, 10-year goal
- 0.28 square degree instrument FOV
  - 18 4kx4k-pixel HgCdTe detector arrays
- Repurposed telescope components
- Survey mission

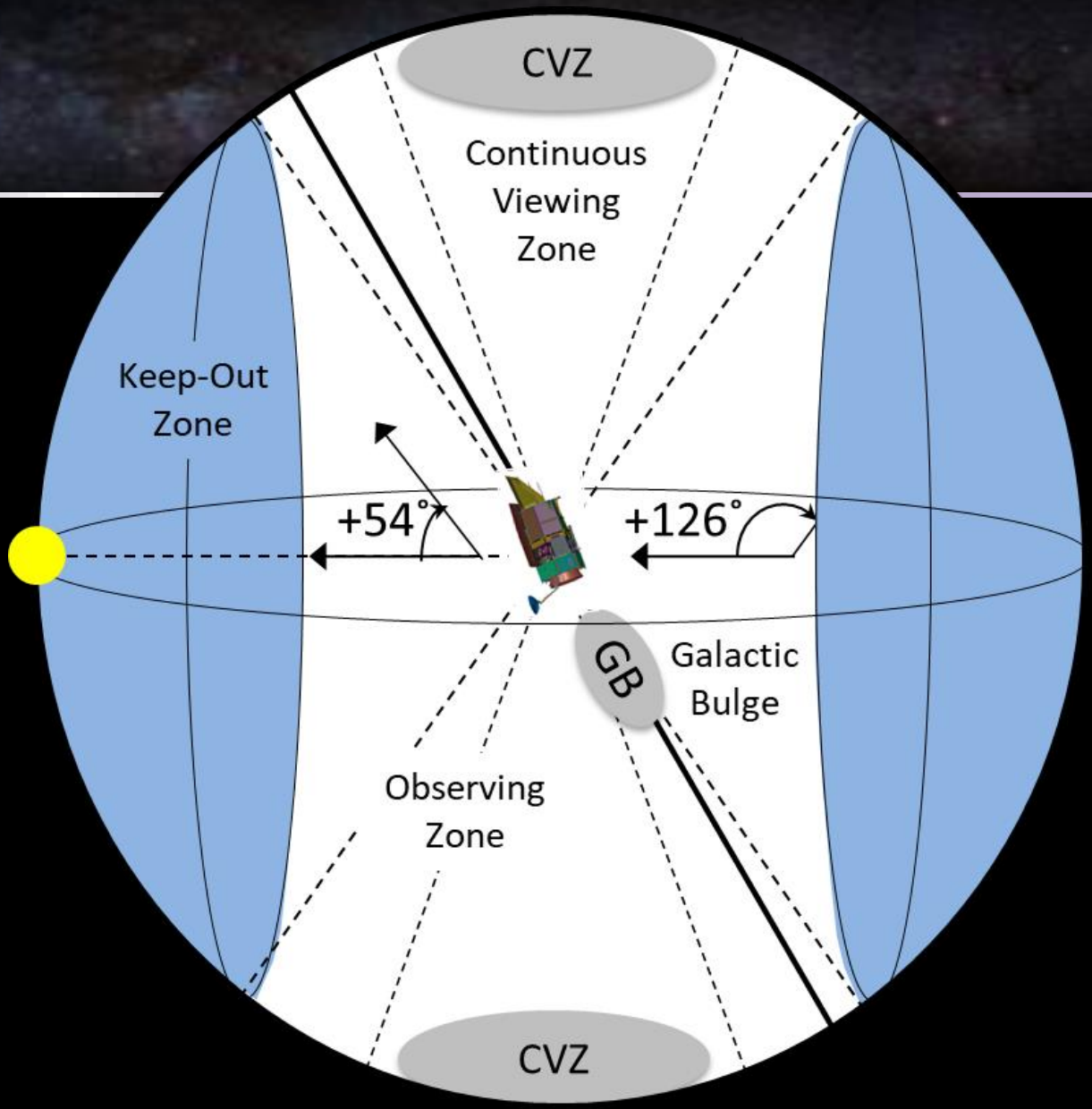


Wide Field Instrument Mosaic Plate Assembly Development Unit

FIELD OF REGARD

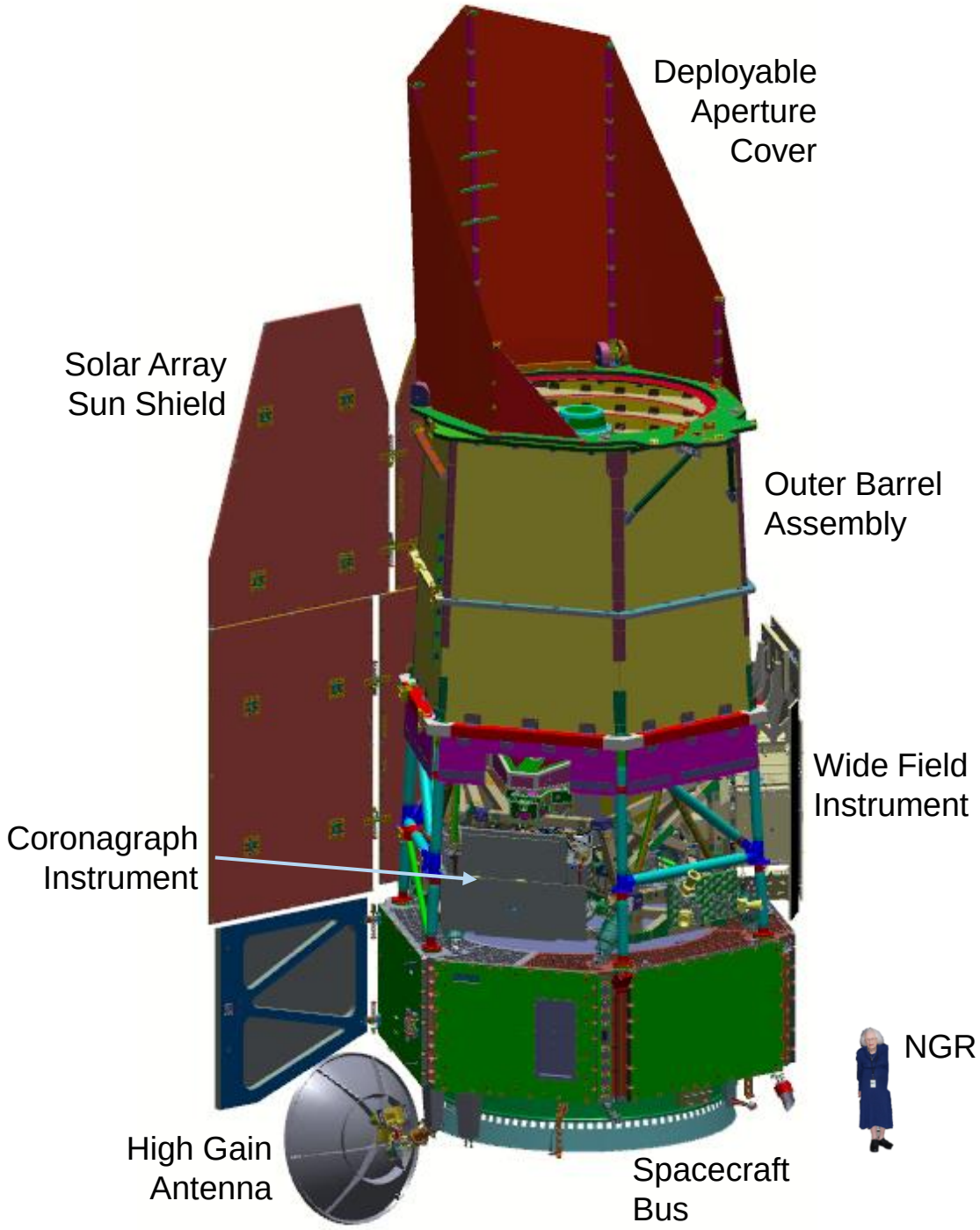
- Centered on ecliptic poles
- 360° swath with keep-out zones toward sun and anti-sun
- ±15° roll about the boresight

➲ Full sky coverage available over a year

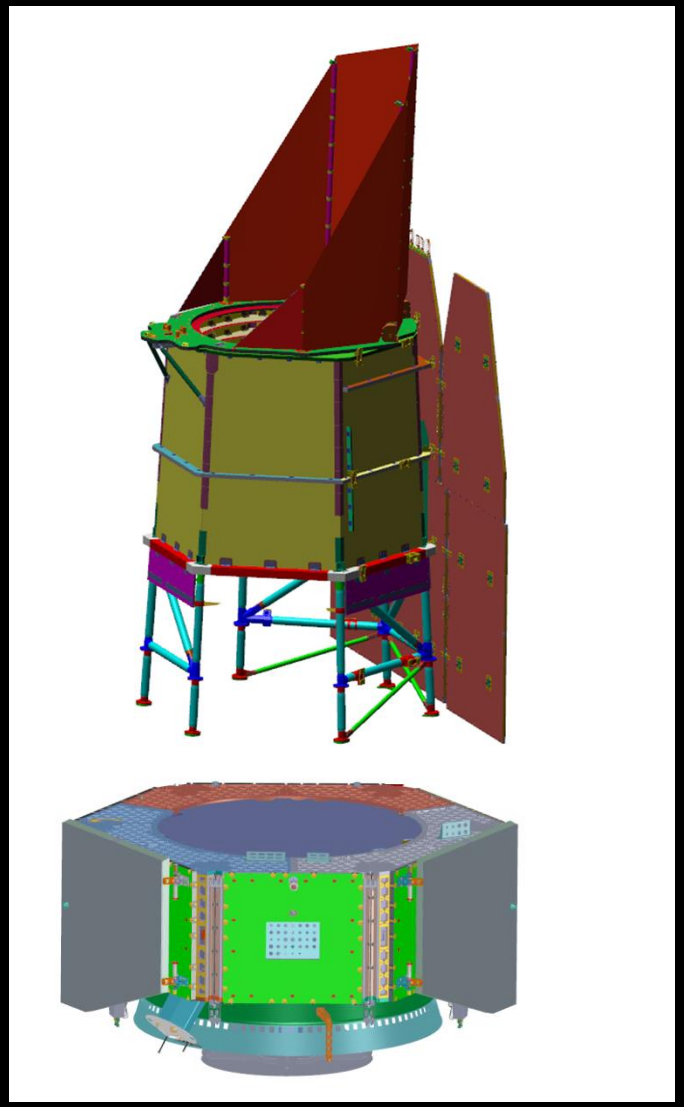


OBSERVATORY

- ~12.7-m height, 10,500 kg, 4500W
- 3-axis stabilized, mono-prop hydrazine propulsion
- 1.7-m High Gain Antenna
- Vibration isolation between Payload and Spacecraft
- Tight thermal control



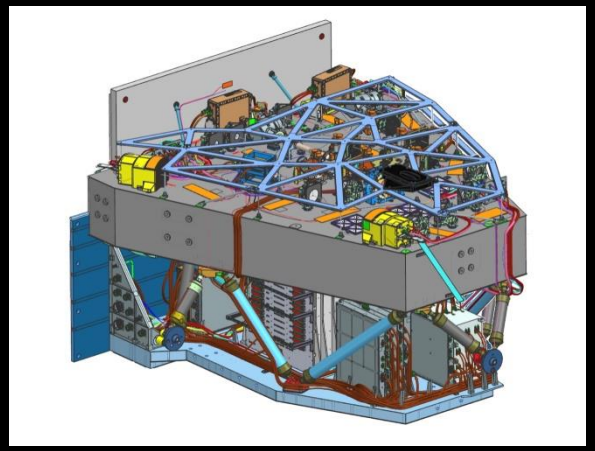
OBSERVATORY



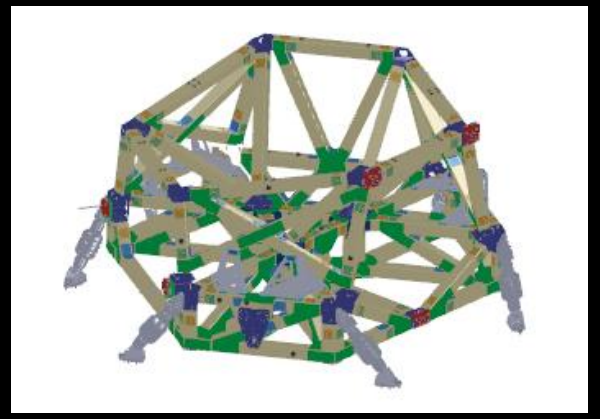
Spacecraft
(NASA/GSFC)

Optical
Telescope
Assembly
(L3Harris)

Electronics not shown

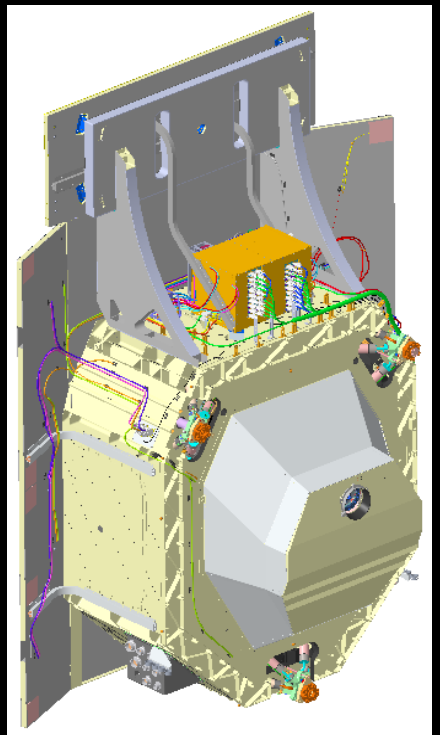


Coronagraph
Instrument
(JPL)



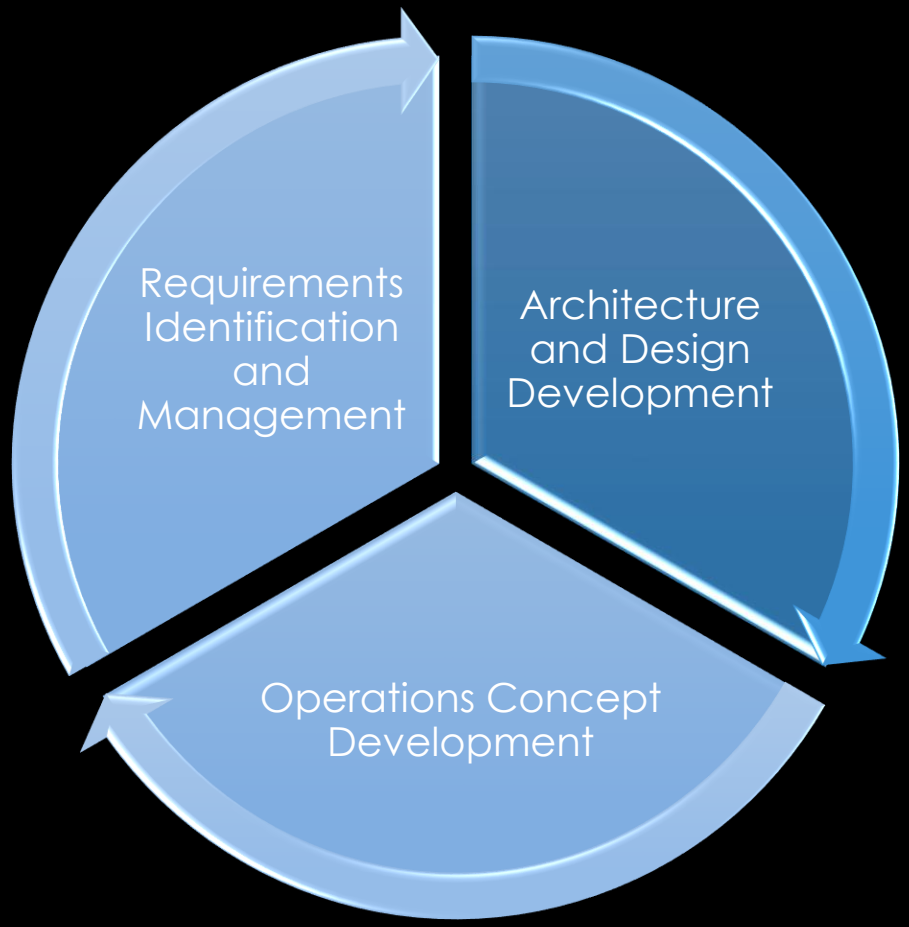
Instrument Carrier
(NASA/GSFC +
Northrop Grumman)

Wide Field
Instrument
(NASA/GSFC +
Ball Aerospace)



Electronics not shown

SYSTEMS ENGINEERING TOOLS



Implementation focus

- Architecture
  - Heritage
  - Trade Studies
- Operations Concept
  - Design Reference Mission

★Communication and Collaboration

SURVEY MISSION CHALLENGE

~630,000 exposures in 5 years

Observing efficiency

Stability

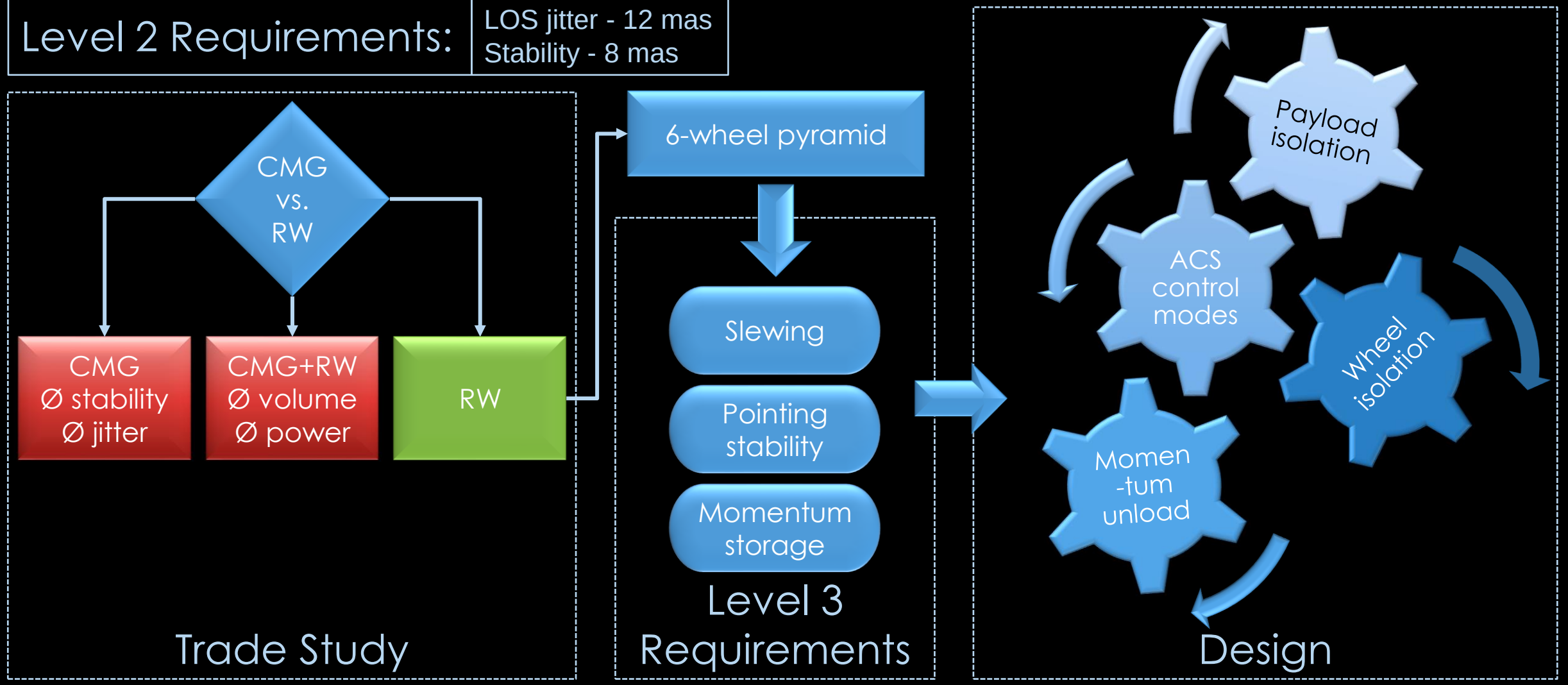
Event-driven operations

Fast slew and settle

Minimize disturbances

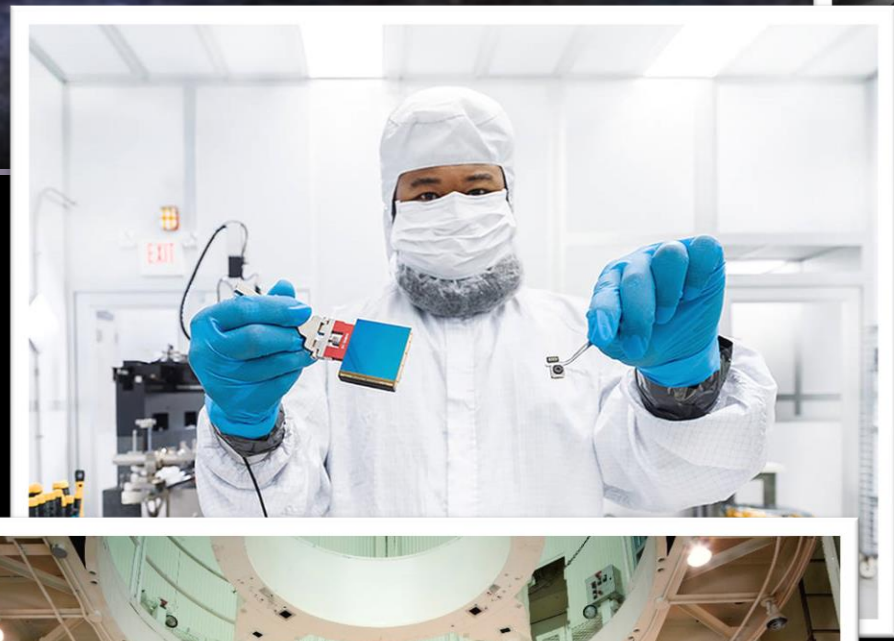
SURVEY MISSION CHALLENGE

Level 2 Requirements:	LOS jitter - 12 mas Stability - 8 mas

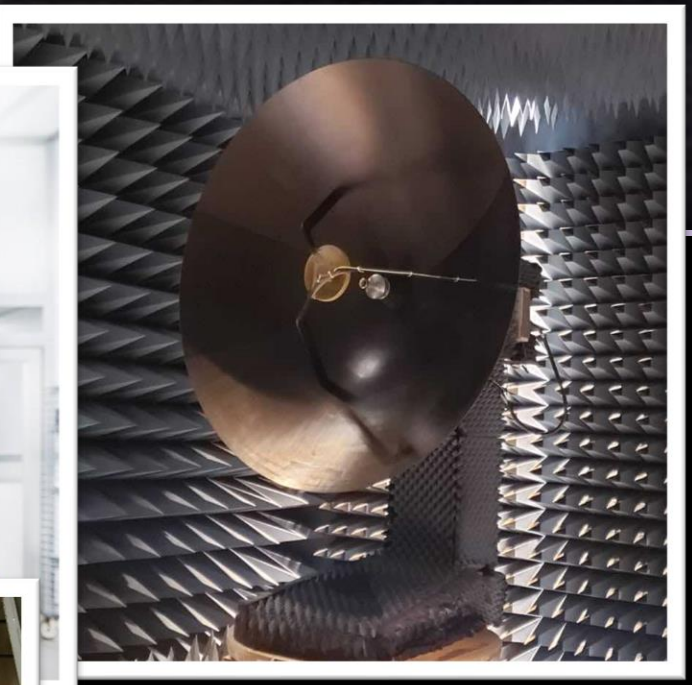


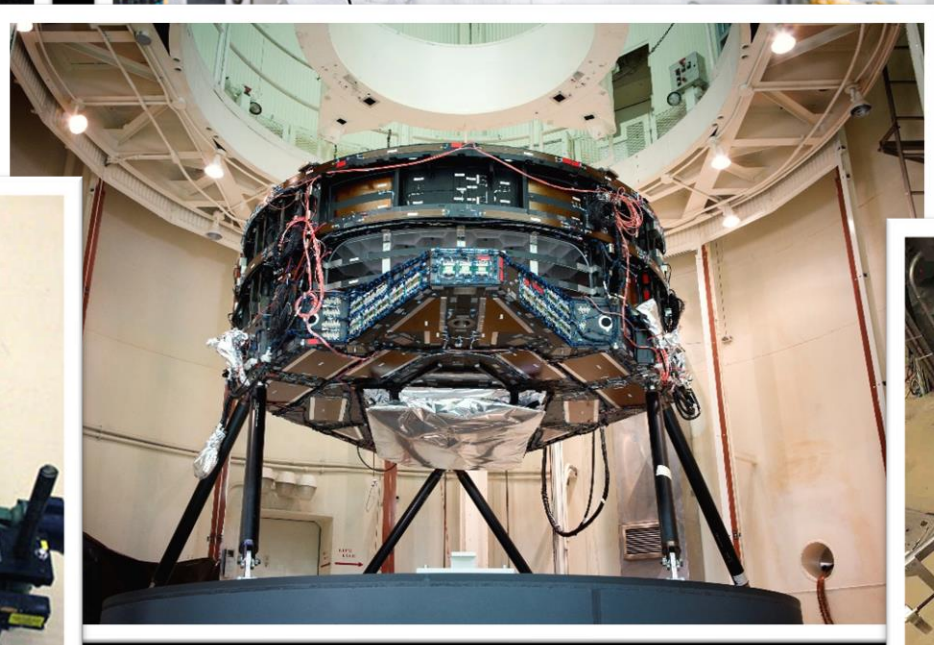
▲ SASS Engineering Unit in TVAC Chamber

▼ Roman detector array compared to a cell phone camera

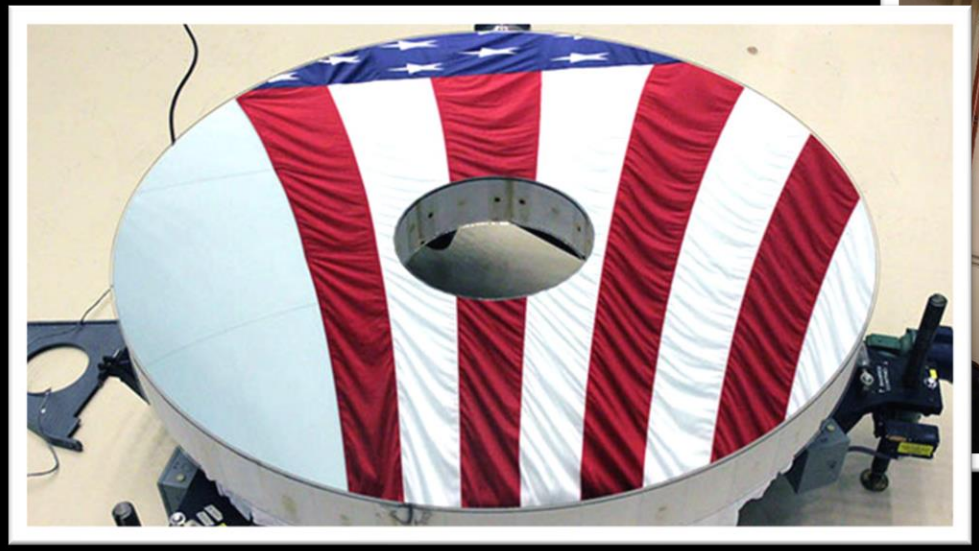


▼ HGA Engineering Unit





▲ Telescope Forward Metering Structure and Primary Mirror Assembly



▲ Flight Primary Mirror

▼ Stowed DAC Engineering Unit

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https://roman.gsfc.nasa.gov/index.html