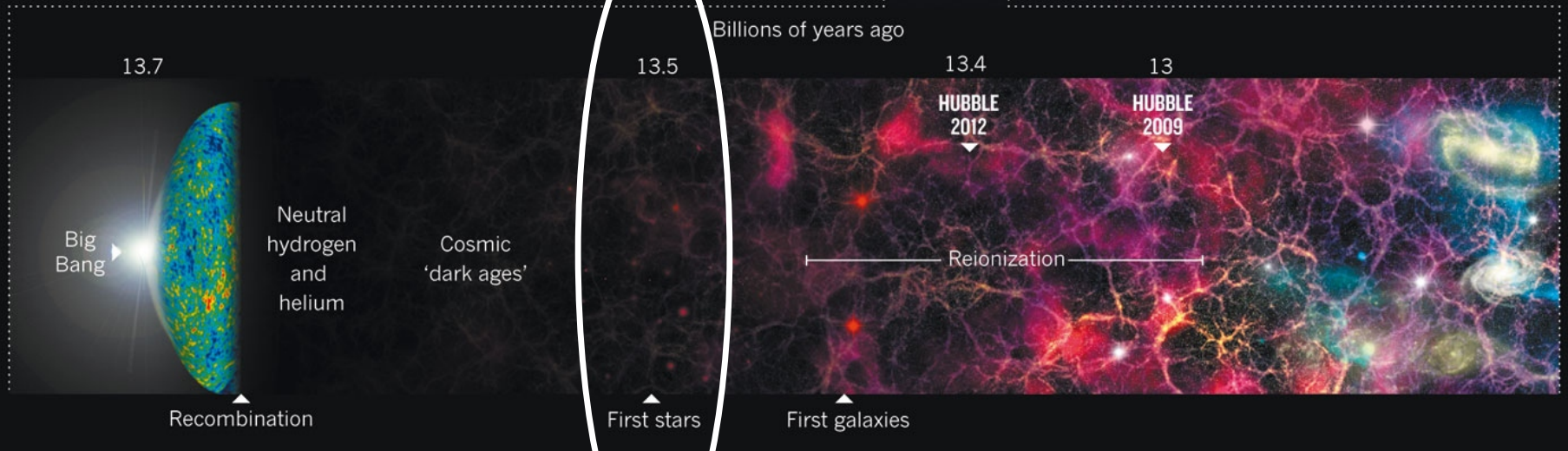
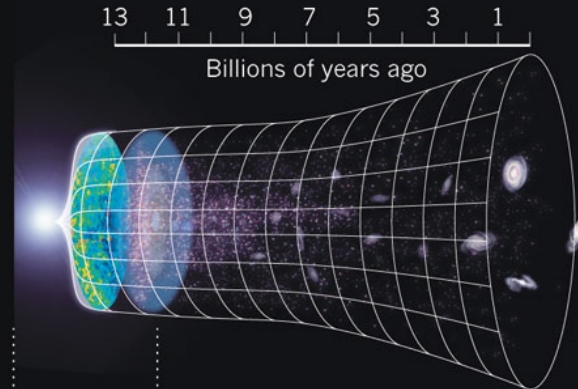




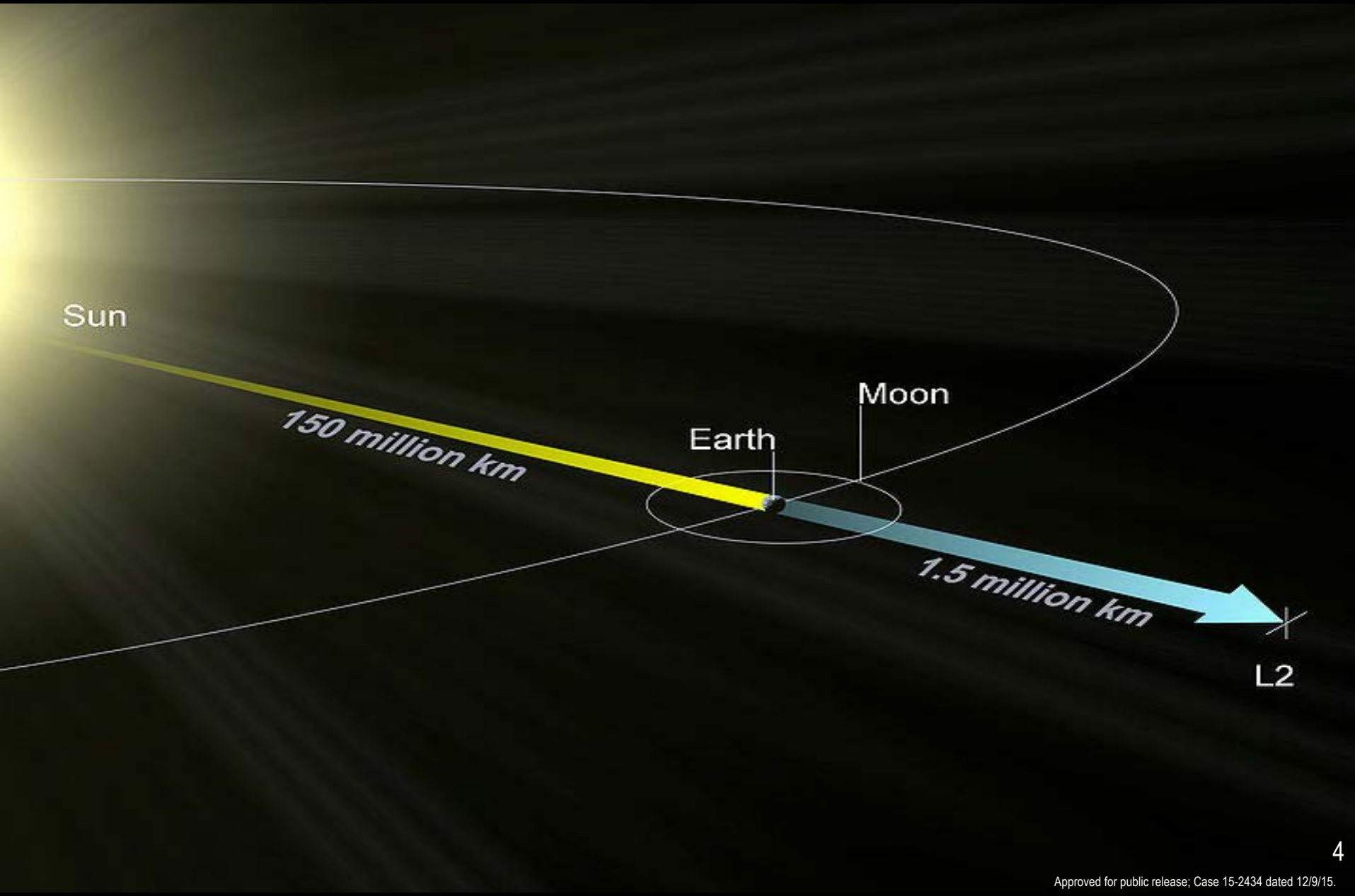
13,500,000,000

DAWN'S EARLY LIGHT

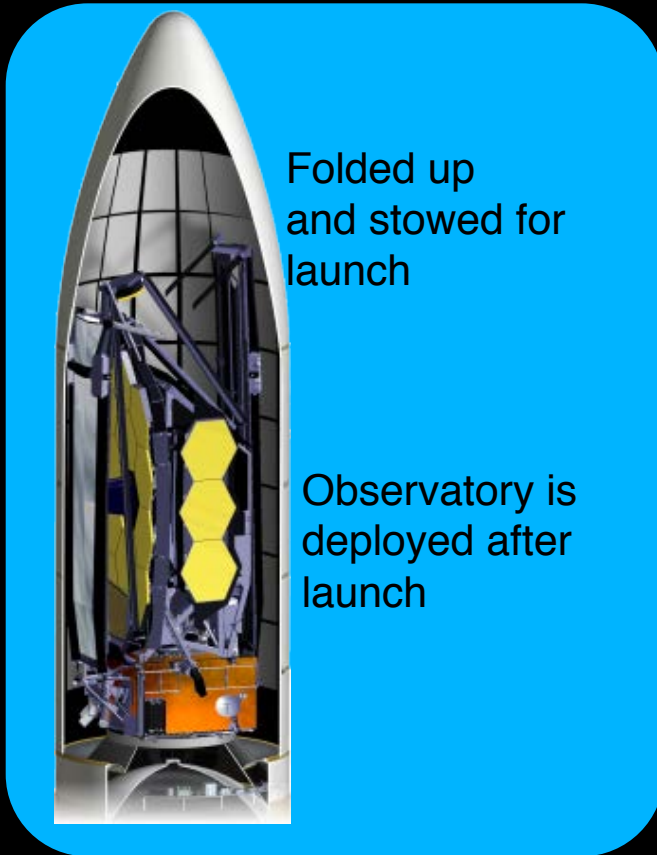
The Big Bang generated a haze of primordial hydrogen and helium. After about 370,000 years, cosmic expansion cooled it enough for electrons and protons to form neutral atoms ('recombination'). During the resulting 'dark ages', when the Universe had no stars to light it, gravity magnified slight fluctuations in density and caused the neutral gas to clump. The densest clumps eventually became the first stars and galaxies. Their ultraviolet light ionized the remaining neutral gas ('reionization'), allowed light to stream freely into space, and brought the dark ages to an end.



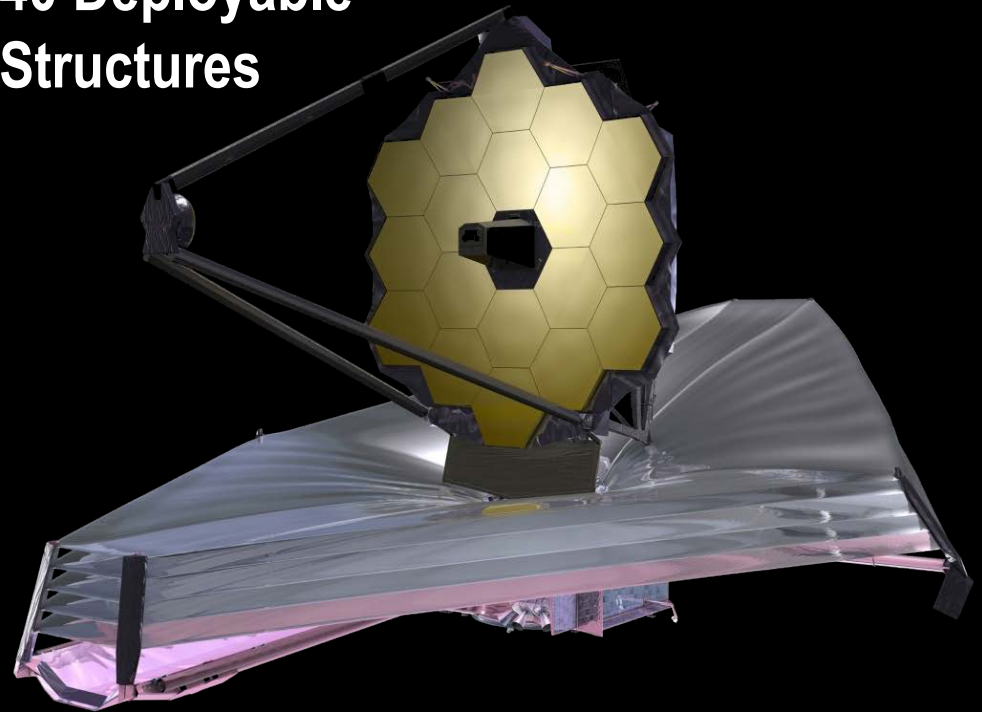
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40 & 178

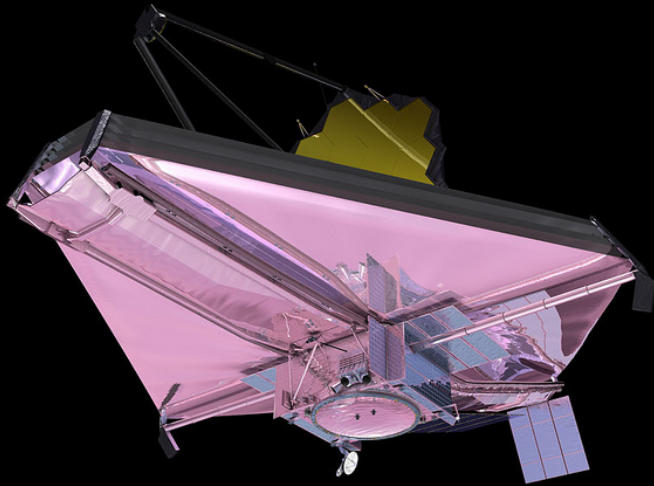


40 Deployable Structures



178 Release Devices

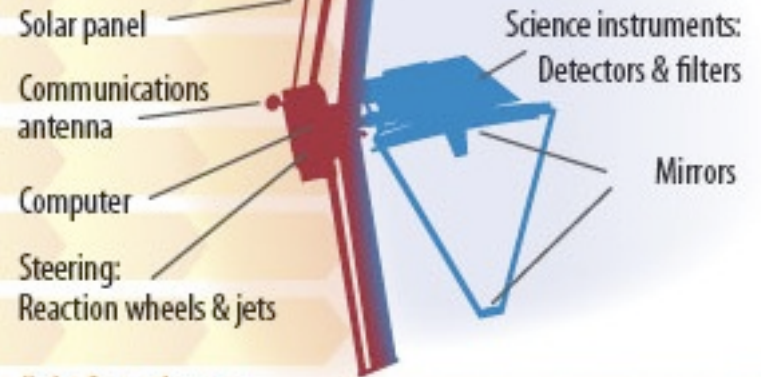
-388



The Two Sides of the Webb Telescope

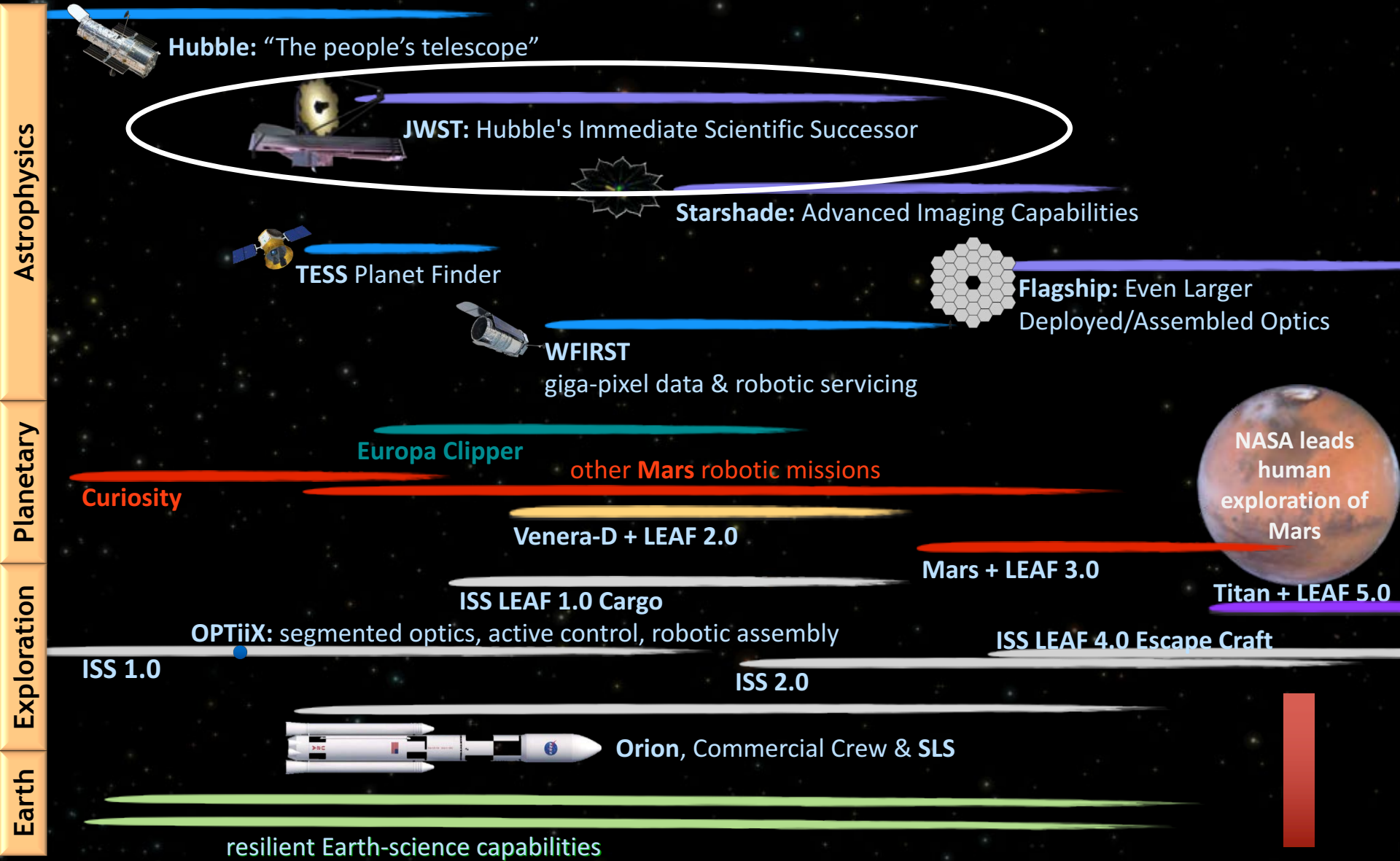
Hot side
185° Fahrenheit
(85° Celsius)

Cold side
-388° Fahrenheit
(-233° Celsius)



10+

NORTHROP GRUMMAN



NASA leads human exploration of Mars

ISS 1.0

OPTiX: segmented optics, active control, robotic assembly

ISS 2.0

ISS LEAF 4.0 Escape Craft

Orion, Commercial Crew & SLS

resilient Earth-science capabilities

2015

2020

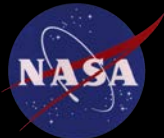
2025

2030

2035

NASA's James Webb Space Telescope Deployment





Technical Progress: Telescope Complete

NORTHROP GRUMMAN

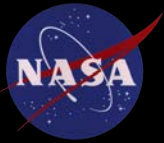




6.5 Meter Optic

NORTHROP GRUMMAN



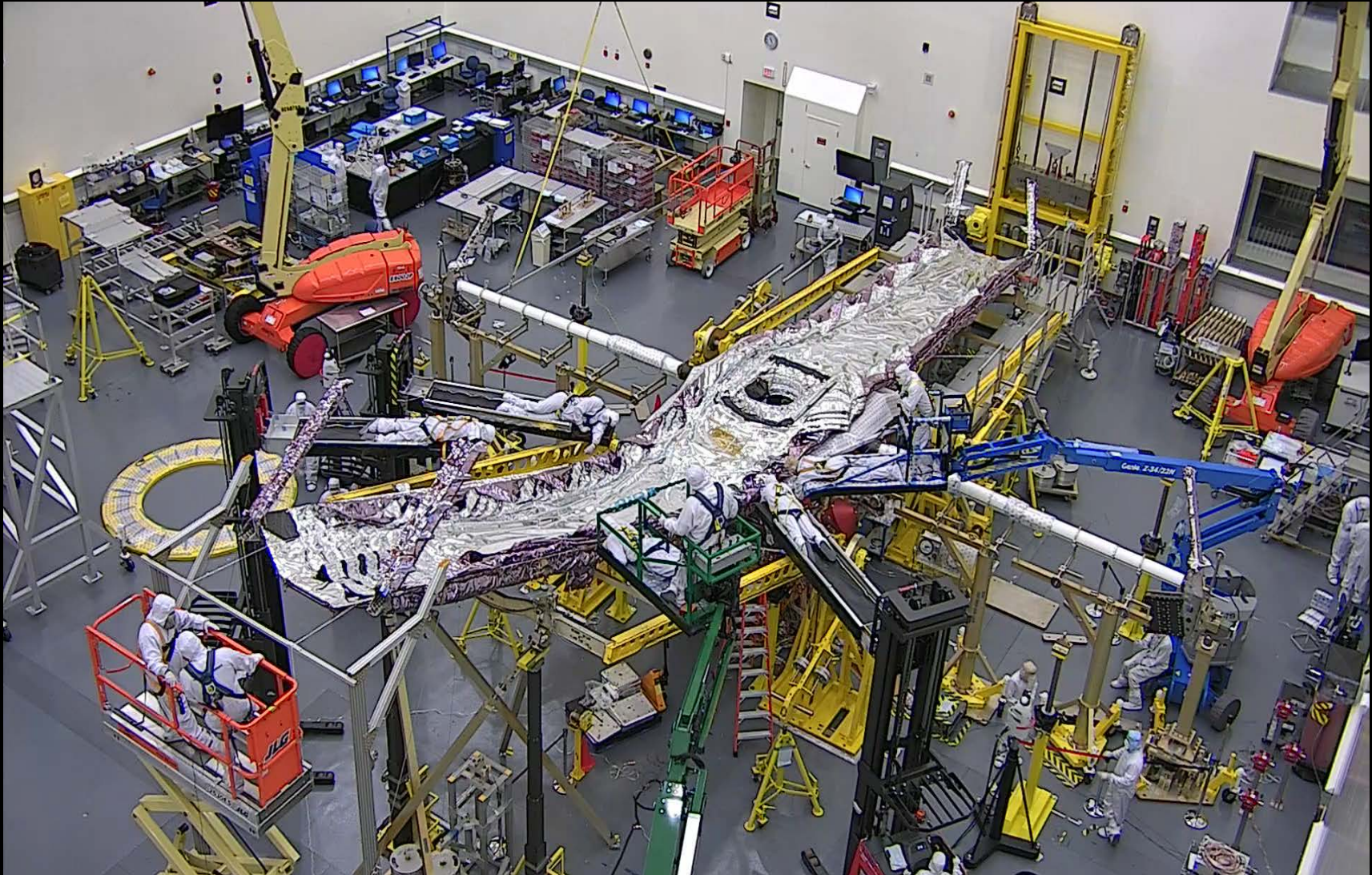


Sunshield Validation Article - Deployed

NORTHROP GRUMMAN

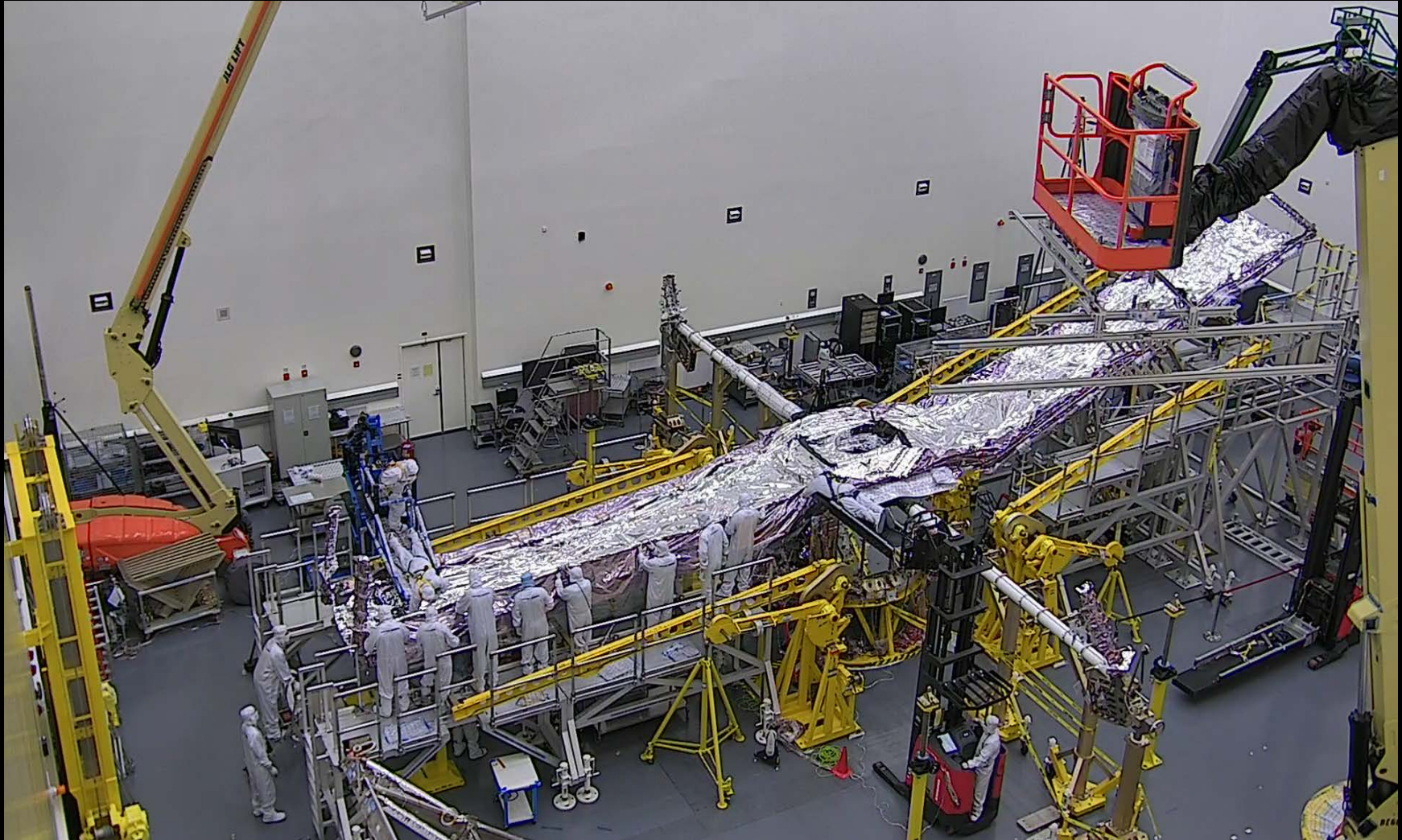


NASA Sunshield Installation in Membrane Stack





Cover Rollout for Integration



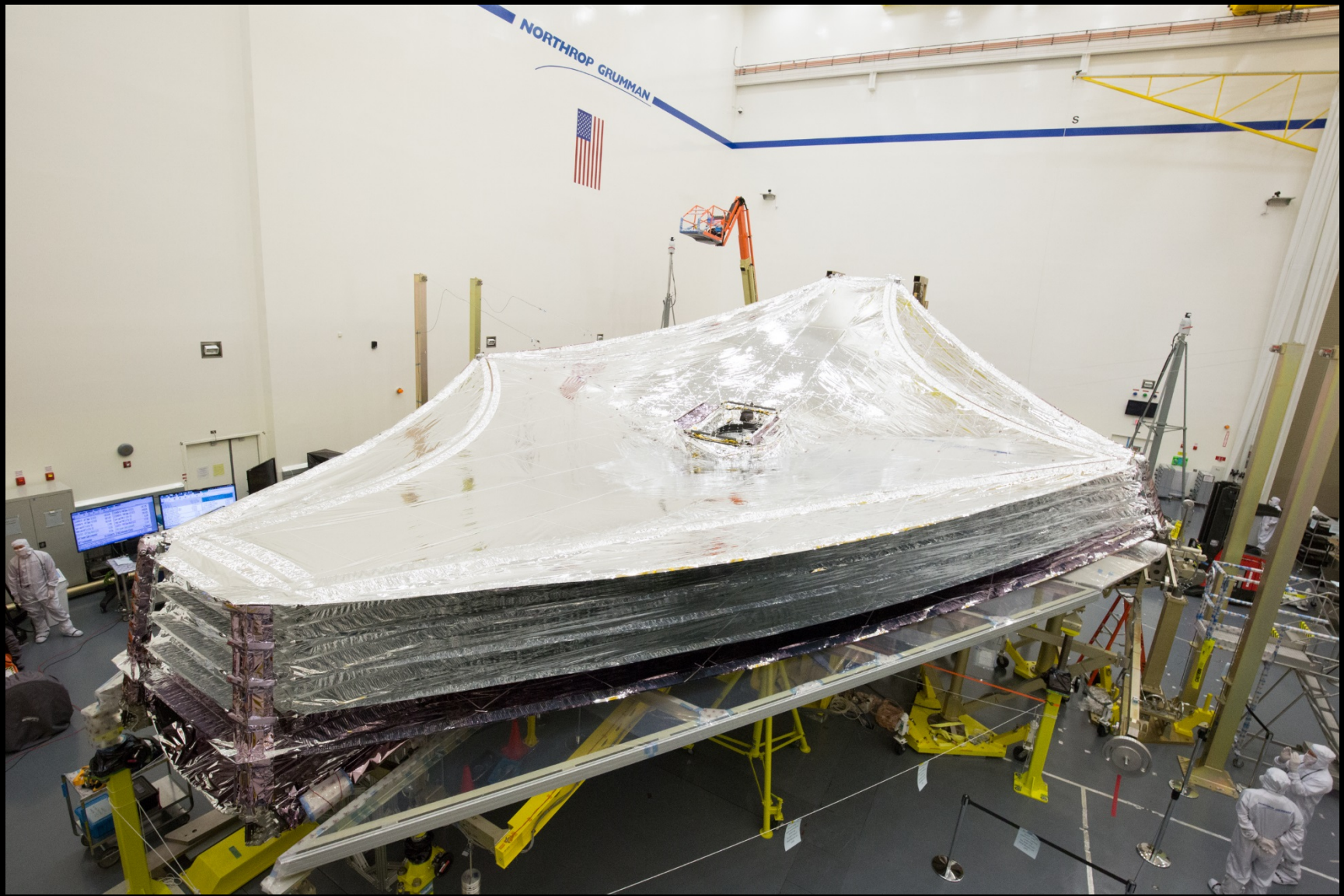


Integrated Flight Sunshield Membranes



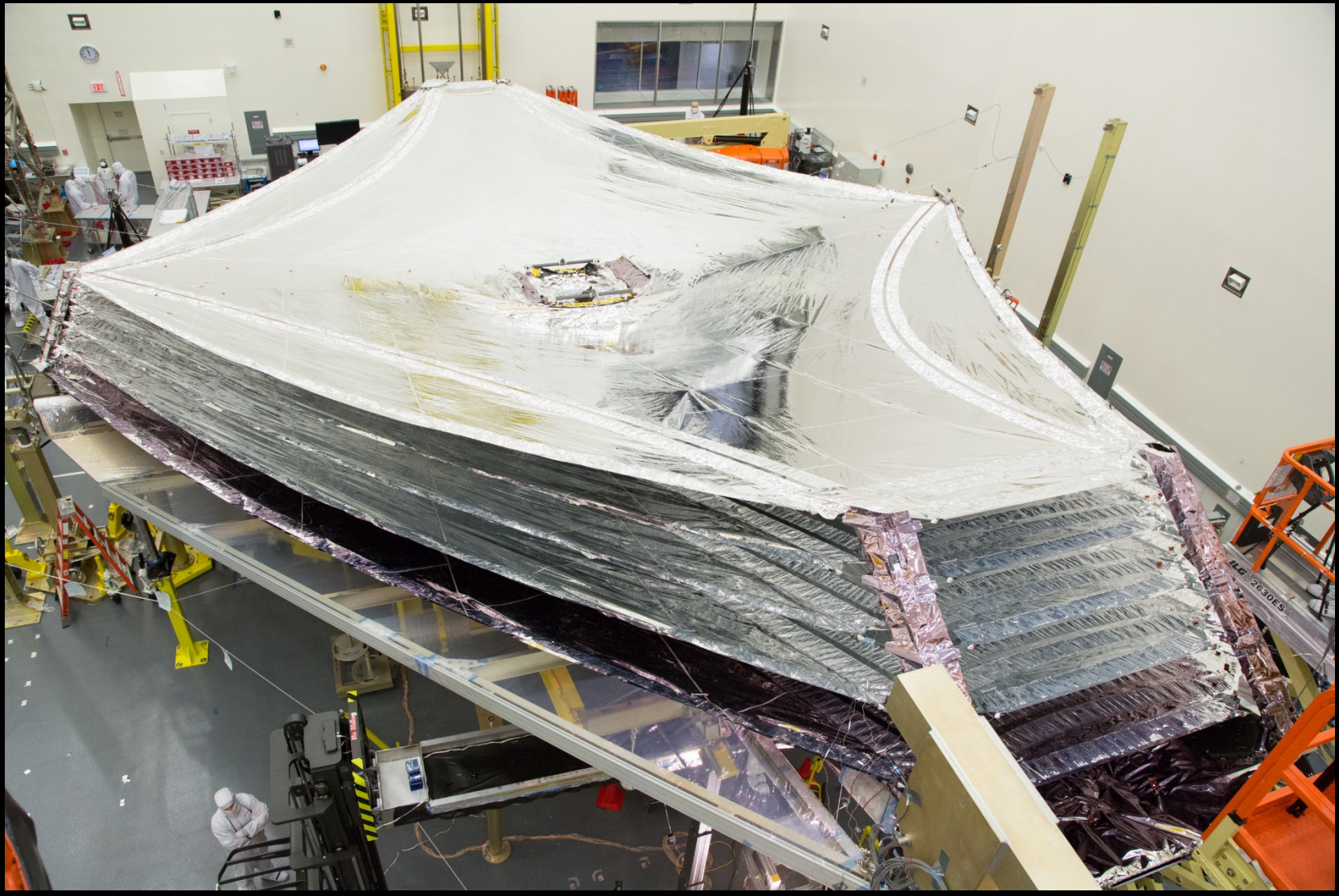


Sunshield Layers Tensioned



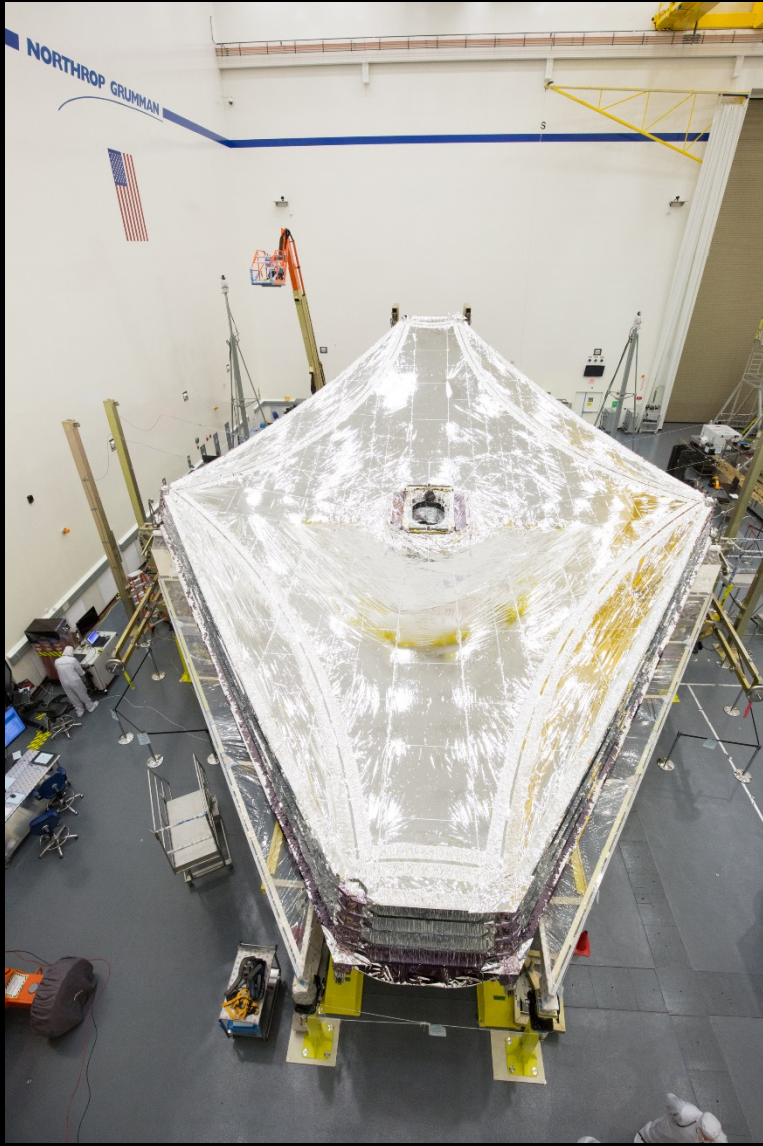


Sunshield Layers Tensioned





Sunshield Layers Tensioned



Q & A



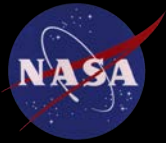
BACKUP CHARTS



Sunshield Flight Layer 3

NORTHROP GRUMMAN





James Webb Space Telescope

NORTHROP GRUMMAN

- Named for 2nd NASA Administrator
- 6.5m Telescope
- Launch in 2018 to L2
- Successor to Hubble & Spitzer
- 4 instruments - *infrared*
- Complementary to future planned ground-based telescopes



- NASA + ESA + CSA: 15 countries
- Lead: Goddard Space Flight Center (GSFC)
- Prime: Northrop Grumman
- Operations: STScI
- Senior Project Scientist: Nobel Laureate John Mather