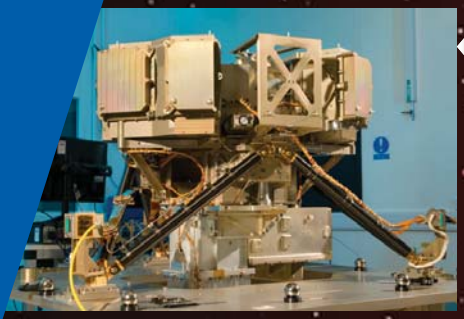
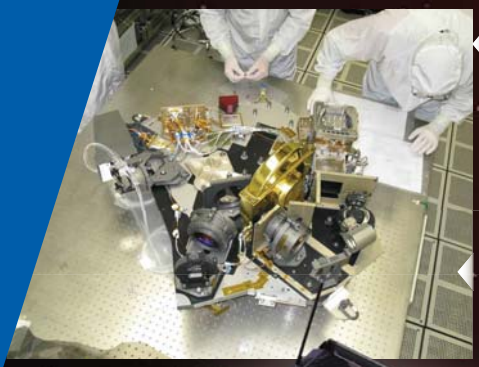


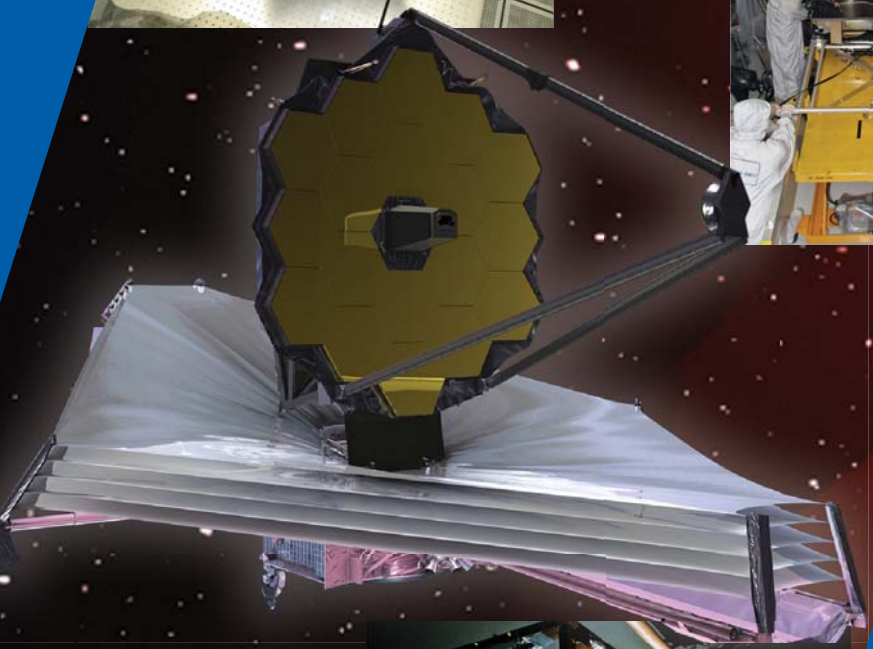
MIRI undergoing testing

Sunshield test article



NIRCam ready for shipment

FGS ready for cryotesting



James Webb Space Telescope

Observing cosmic history

Flight mirrors complete final cryotesting

ISIM structure at Goddard Space Flight Center

Sunshield flight template

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James Webb Space Telescope

Observing cosmic history

The Mission

NASA's James Webb Space Telescope will peer into the past to a time when new stars and developing galaxies were first beginning to form, measuring and capturing images and spectra of galaxies that originated billions of years ago.

The Webb telescope will use its superb angular resolution and near-infrared instruments to discover and study planetary systems similar to our own, analyze the atmospheres of extrasolar planets, and directly image Jupiter-size planets orbiting nearby stars.

By extending our knowledge of the cosmos, the Webb telescope will play an important role in our quest to answer the compelling questions "How did we get here?" and "Are we alone?"

Identified as a top priority for astronomy and astrophysics by the National Research Council, the Webb telescope is a key program for NASA and the scientific community and is central to the nation's ground- and space-based astrophysics program.

The Design

To observe objects at distances billions of light years away, the Webb telescope's primary mirror must be large enough to gather light from very faint objects, and its optics and detectors must be cold enough to see in infrared wavelengths.

The powerful observatory's design features a 6.5-meter diameter aperture primary mirror, comprised of 18 hexagonal segments. This large mirror, which could fit seven Hubble Space Telescope mirrors within its surface area, gives the telescope the light-collecting ability to see objects hundreds of times fainter than those currently observed by ground- and space-based telescopes.

The five-layer sunshield, nearly the size of a tennis court, will shield the telescope from sunlight and allow it to passively cool to a frigid temperature of approximately 45 degrees Kelvin (-380°F). The extreme cold enables the Webb telescope to detect distant objects at infrared wavelengths. This infrared capability also permits Webb to detect starlight from newly forming stars and planets in our galaxy. These objects form behind dense, dusty clouds that block visible light.

To fit inside the Ariane 5 rocket faring, the large primary mirror must be folded in sections for launch, then unfolded precisely into place after launch, making it the first segmented optical system deployed in space. Once in space, the sunshield will deploy to its full size and keep the telescope shadowed from the sun.

The Progress

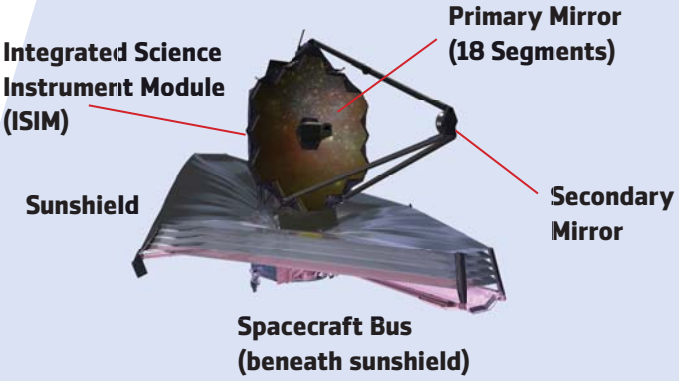
As of December 2011, all 18 hexagonal flight mirrors have been manufactured, polished with reflective gold coating, and have successfully completed final cryotesting. The smaller secondary and tertiary mirrors are also complete. With the challenging task of making, polishing and coating the mirror segments accomplished, and with results confirmed by rigorous testing, the most difficult task involved in Webb's construction is now over.

The flight instruments as well as the structure of the Integrated Science Instrument Module (ISIM) are undergoing testing in Europe, Canada and the United States. Flight templates of the majority of the five-layer sunshield have been manufactured and are undergoing precision measurement of their three-dimensional shape. The spacecraft bus is progressing according to plan, with the demanding attitude control system having passed critical design review.

The program is on a path to complete an extensive integration and test program on schedule for launch in 2018.

Characteristics

Primary mirror	6.5-meter diameter aperture
Wavelength coverage	0.6 to 28.5 microns
Diffraction limit	2.0 microns
One-year sky coverage	100%
Orbit	L2 (the Second Sun-Earth Lagrange Point), 1,500,000 km from Earth
Mission lifetime	5 years (10-year goal)
Telescope operating temperature	Approx. 45 Kelvin (-380˚F)
Mass	Approx. 6,500 kg



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