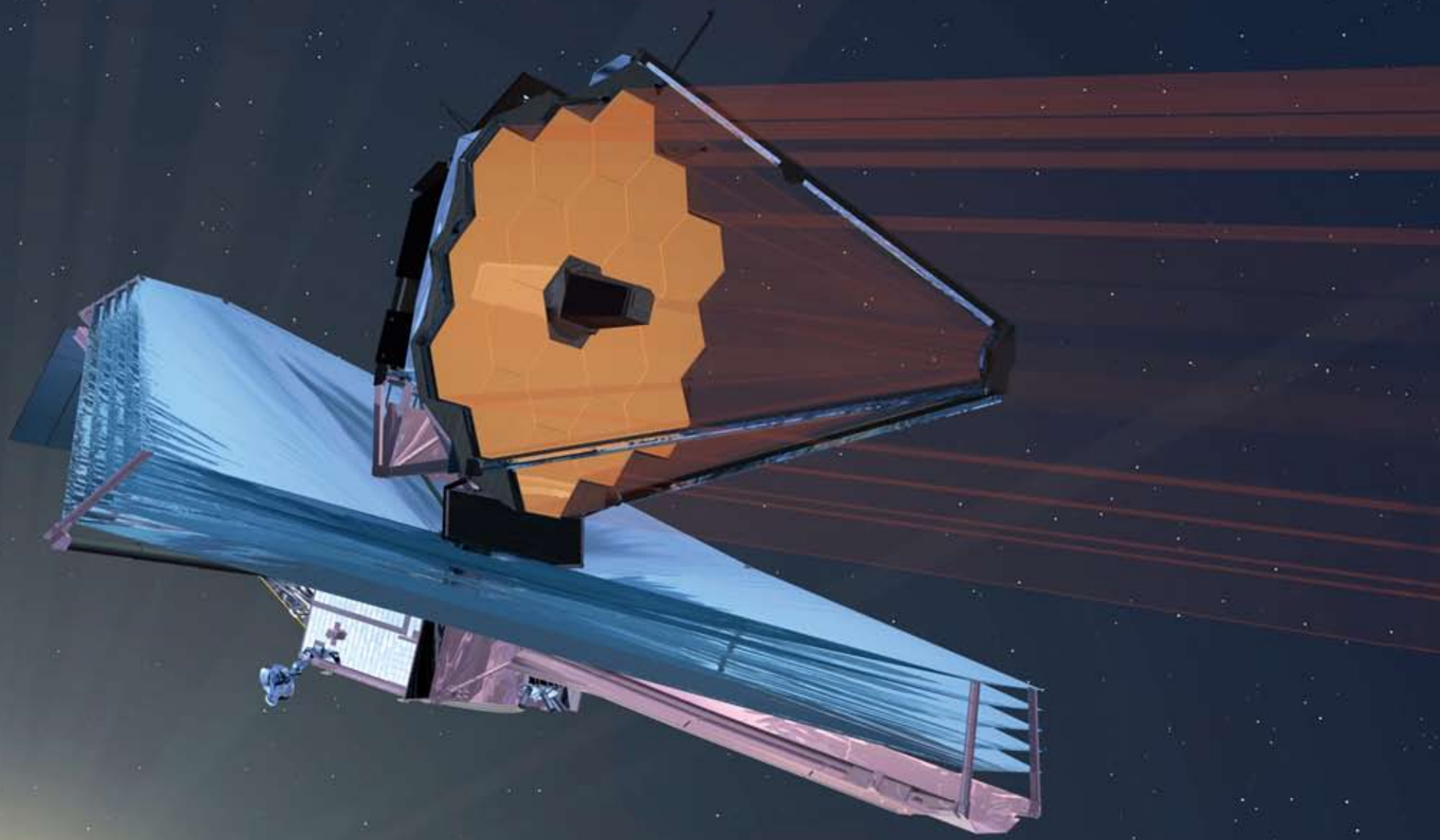
NORTHROP GRUMMAN



JAMES WEBB SPACE TELESCOPE

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The Mission

When launched early in the next decade, the James Webb Space Telescope will peer into the past to a time when new stars and developing galaxies were first beginning to form. The Webb Telescope's infrared instruments will measure and capture images of spectra and clusters of galaxies that formed billions of years ago.

The Webb Telescope will use unprecedented near- and mid-infrared sensitivity and resolution to discover and study dusty disks around stars and solar systems like our own, analyze the molecular composition of extrasolar planets' atmospheres, 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 by the National Research Council as this decade's top priority for astronomy and astrophysics, the Webb Telescope is a key program in the nation's Vision for Space Exploration.

The Design

To observe objects at such great 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-shaped 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 very old and 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 Integrated Science Instrument Module will house the Webb Telescope instruments that take pictures and make measurements of stars, galaxies, and other astronomical objects. The four main instruments include the Mid-Infrared Instrument (MIRI), provided by the European Consortium with the European Space Agency and the NASA Jet Propulsion Laboratory; the Near-Infrared Camera (NIRCam), provided by the University of Arizona; the Near-Infrared Spectrograph (NIRSpec), provided by the European Space Agency with components provided by NASA Goddard Space Flight Center, and the Fine Guidance Sensor (FGS), provided by the Canadian Space Agency. The Fine Guidance Sensor contains a dedicated Guider and a Tunable Filter Camera.

The Webb Telescope will take its place at the second Lagrange point, L2, approximately 1.5 million kilometers beyond Earth's orbit, nearly four times the distance from the Earth to the moon. At L2, all the major heat sources (the sun, Earth, and moon) lie in one direction, as seen from the telescope. The observatory then can be positioned so that the sunshield blocks the light and heat from these sources, therefore allowing the telescope temperature to remain stable.

The Team

The National Aeronautics and Space Administration (NASA) leads an international partnership that includes the European Space Agency and the Canadian Space Agency. NASA's Goddard Space Flight Center is managing the Webb Telescope project, and the Space Telescope Science Institute is responsible for science and mission operations, as well as ground station development.

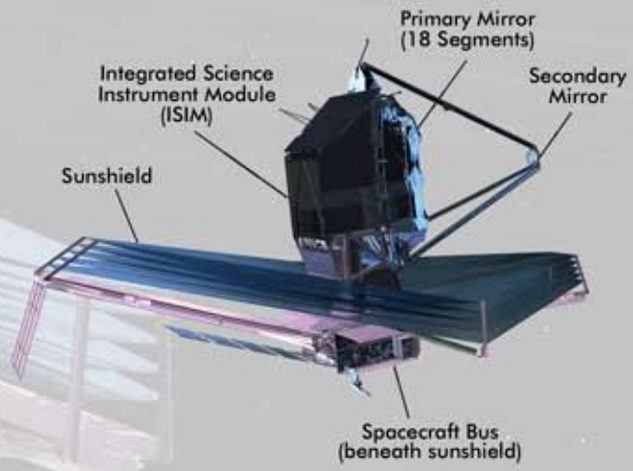
In 2002, NASA selected Northrop Grumman as prime contractor to develop the James Webb Space Telescope. Northrop Grumman will design and build the deployable sunshield, provide the spacecraft and integrate the total system.

The observatory subsystems are developed by a Northrop Grumman-led team with vast experience in developing space-based observatories:

- Ball Aerospace provides the telescope's optical design and mirrors, and the wavefront sensing and control design and algorithms.
- ITT integrates and tests the optical telescope.
- Alliant Techsystems provides the telescope's composite structures.

Characteristics

Primary mirror	6.5-meter diameter aperture
Wavelength coverage	0.6 to >27 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	~45 Kelvin (-380°F)
Mass	Approximately 6,500 kg



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