Credits: NASA/Chris Gunn

NASA's James Webb Space Telescope

Observing Cosmic History

THE MISSION

NASA's James Webb Space Telescope (Webb) examines every phase of cosmic history: from the first luminous objects after the Big Bang to the evolution of our own solar system. Peering over 13.5 billion years into the past when the first stars and galaxies were forming, Webb captures images and spectra that are helping us better understand our universe in crucial ways.

Webb uses its superb angular resolution and near-infrared instruments to study planetary systems similar to our own, analyzing the molecular composition of extra-solar planets' atmospheres, and directly capturing images of Jupiter-size planets orbiting nearby stars.

By extending our knowledge of the cosmos, Webb plays an important role in our quest to answer compelling questions such as: "When were the first stars and galaxies formed?" or "How do planets form?" and "How do we fit in the cosmos?"

Identified as NASA's top science mission, Webb is enabling the next generation of astrophysics discoveries and served the international science community.

THE DESIGN

Webb is a one-of-a kind scientific instrument incorporating innovative design, advanced technology and groundbreaking engineering designed and developed by Northrop Grumman and key partners around the world. To observe objects billions of light years away, Webb's primary mirror is large enough to gather their dim light, and its optics and detectors are cold enough to see their faint infrared emissions.

The powerful observatory's design features an aperture primary mirror that measure 21.4 feet (6.5 meters) in diameter, composed of 18 hexagonal segments. Together with the highly sensitive infrared detectors, this 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, shields the telescope from sunlight and allows it to passively cool to a frigid temperature of approximately 45 Kelvin (-380˚F; -228˚ Celsius). The extreme cold enables Webb to detect distant objects at infrared wavelengths. This infrared capability also permits Webb to detect light from newly forming stars and planets in our galaxy. These objects form within dense, dusty clouds that block visible light.

To fit inside the Ariane 5 rocket fairing, the large primary mirror was 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 deployed to its full size and block light from the Earth, the sun and moon.

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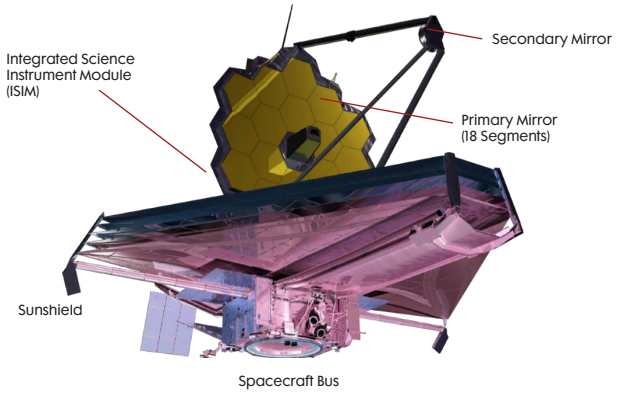
During its first year of science operations, Webb observed the deepest and sharpest infrared image of the distant universe, furthered our critical understanding of exoplanets and assisted astronomers to better analyze early star formation. Webb is reshaping humankind's perspective of the cosmos and the limits of our understanding.

THE TEAM

Northrop Grumman led the industry team for NASA's Webb, the largest, most powerful space telescope ever built. NASA led an international partnership that included the European Space Agency and the Canadian Space Agency. NASA'S Goddard Space Flight Center manages the Webb project, and the Space Telescope Science Institute is responsible for science and mission operations. Northrop Grumman was recently awarded a sustainment contract by NASA to continue support through June 24, 2027. The company will provide the products and services required to monitor and maintain Webb spacecraft systems including the spacecraft bus, optics/telescope structure and sunshield; maintain and update the spacecraft flight software; and trend spacecraft performance and recommend corrections and updates required for spacecraft health and safety. To learn more about Northrop Grumman's role on the observatory, visit our website today.

CHARACTERISTICS	
PRIMARY MIRROR	21.4 feet (6.5 meter) diameter aperture
WAVELENGTH COVERAGE	0.6 to 28.5 microns
DIFFRACTION LIMIT	1.1 µm
ONE-YEAR SKY COVERAGE	100%
ORBIT	A halo orbit around the Second Lagrange Point (L2) approximately 1 million miles from Earth (1.5 million km)
MISSION LIFETIME	5 years (10-year goal)
TELESCOPE OPERATING TEMPERATURE	Approximately 45 Kelvin (-380˚F; -228˚Celsius)
MASS	Approximately 6,500 kg



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