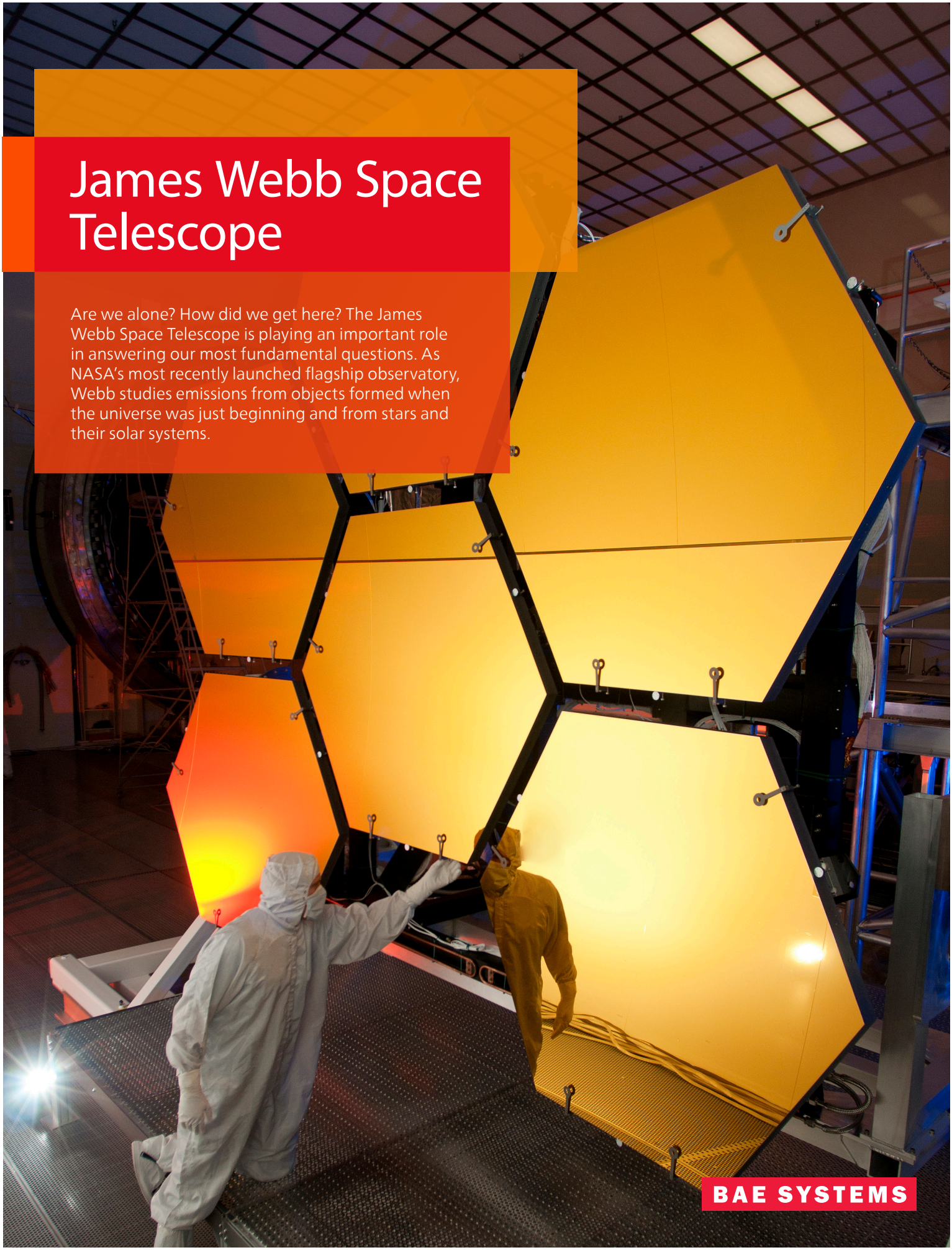

James Webb Space Telescope

Are we alone? How did we get here? The James Webb Space Telescope is playing an important role in answering our most fundamental questions. As NASA's most recently launched flagship observatory, Webb studies emissions from objects formed when the universe was just beginning and from stars and their solar systems.

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Overview

Serving as the flagship observatory, Webb is revolutionizing our understanding of the cosmos as it studies every phase of our universe's history, from the first luminous glows after the Big Bang to the evolution of our own solar system.

Webb successfully launched in December 2021. As the world's largest infrared telescope, Webb offers unprecedented resolution and sensitivity from long-wavelength visible light, near-infrared and mid-infrared. It can detect objects up to 400 times more faint than can be observed by current ground- and space-based telescopes. Webb has four scientific goals:

- Search for the first light after the Big Bang
- Determine how galaxies evolved
- Observe the birth of stars and protoplanetary systems
- Investigate the properties of planetary systems and the origins of life

Our Role

Our extensive space hardware experience on all four of NASA's Great Observatories made BAE Systems the best choice for leading the development, design and manufacture of Webb's Optical Telescope Element (OTE) system, including the primary, secondary, tertiary and fine-steering mirrors. We supported integration and test on these systems. BAE Systems is a principal subcontractor to Northrop Grumman Space Systems, the prime contractor for this mission.

Not only did we build the 18 beryllium mirror segments, but the algorithims and systems used to align the mirrors were also developed by BAE Systems. Using a process called Wavefront Sensing and Control, our advanced software calculates the optimum position of each of the mirrors. To accurately align the telescope, each primary mirror segment has seven cryogenic actuators (tiny, mechanical motors) built by BAE Systems with both coarse- and fine-positioning capability to enable Webb's high-quality, sharp images. The actuators adjust the mirrors in 10 nanometer steps — that's 1/10,000 the thickness of a human hair.

We enable Webb to discover objects from the dawn of the universe with the largest, most innovative, deployable and adaptive mirror system ever developed.

Quick Facts

- Webb's primary mirror is comprised of 18 hexagonal mirror segments, each 1.3 m (4.3 ft) in diameter
- Each mirror segment weighs about 20 kg (46 lbs.)
- The primary mirror's total diameter is 6.5 m (21 ft 4 in.)
- The primary mirror's gold coating is highly reflective over all the wavelengths the telescope sees from visible to mid-infrared
- Because Webb is an infrared telescope, the mirrors and actuators must function at temperatures as low as -400°F
- Webb is the largest mirror and the first segmented telescope ever flown in space
- Webb is the first mirror to deploy in space. The efficient folding scheme allowed the primary mirror to fit into an Ariane launch vehicle

Credits: NASA, ESA, CSA, and STScI

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