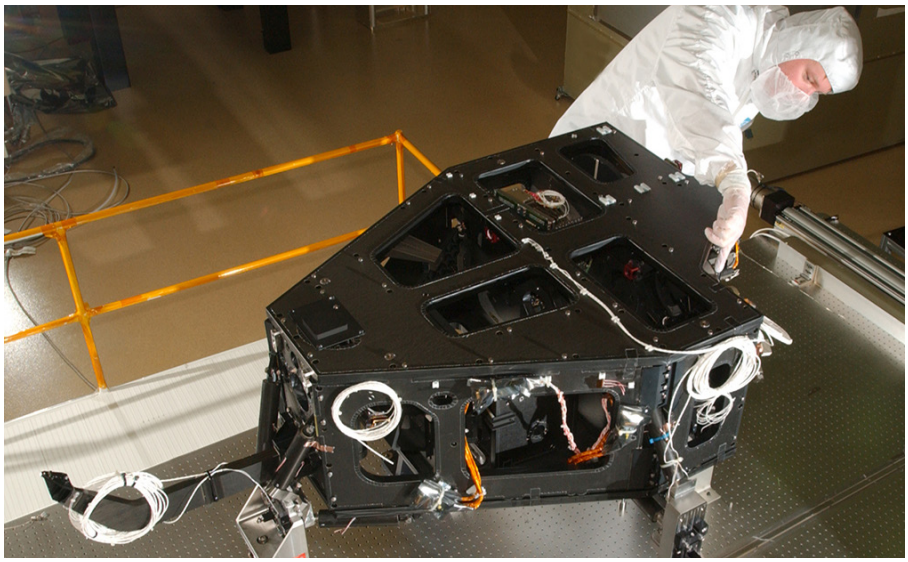
HUBBLE SPACE TELESCOPE



GO BEYOND WITH BALL.®

Pioneering optics made by Ball Aerospace are responsible for the Hubble Space Telescope's iconic images and revolutionary discoveries. In total, Ball has built seven instruments for Hubble, including the five currently aboard the telescope. Beginning with the first servicing mission in 1993 through the fourth in 2009, Ball's advanced optical technologies have extended Hubble's operational life and enabled the telescope to help us understand our universe as never before.

OUR ROLE

Since scientists began formulating the idea for Hubble, the first major optical telescope in space, Ball played a part, providing a total of seven science instruments flown on Hubble. Today, Ball supports COS, WFC3, ACS, STIS and NICMOS and provides on-orbit mission operations support. After the last servicing mission in 2009, Hubble's unprecedented science capabilities made it the premier space-based telescope for ultraviolet, optical and near-infrared astronomy.

Cosmic Origins Spectrograph (COS)

COS is the most sensitive ultraviolet spectrograph ever built for space and replaced the Ball-built COSTAR in 2009. COS improved Hubble's ultraviolet sensitivity at least 10 times and up to 70 times when observing very faint objects, like distant quasars, massive celestial objects, too faint for previous spectrographs. With built-in corrective optics, COS is designed to observe the greatest amount of light and give astrophysicists data about the physical characteristics of planets, stars, galaxies, and interstellar and intergalactic matter.

Wide Field Camera 3 (WFC3)

A fourth generation imaging instrument, WFC3 was built on a successful history of previous instruments with new technologies and capabilities added. With a Ball-built optical assembly, instrument electronics, detection assemblies and software, WFC3 improved Hubble's imaging capability by providing an expansive field of view, high sensitivity and wide spectral coverage. WFC3 provides 10 times better coverage in near ultraviolet wavelengths than previous Hubble instruments and about 30 times more coverage in near infrared wavelengths. WFC3's ability to see in multiple wavelengths, paired with the visible light capabilities of the ACS, gives scientists a view of the universe with unprecedented completeness and clarity.

Advanced Camera for Surveys (ACS)

The Ball-built ACS generates some of Hubble's most iconic images. ACS doubled Hubble's field of view with sharp image quality and larger, more sensitive detectors. By observing in wavelengths from the far ultraviolet to visible light, ACS gives Hubble the ability to image celestial objects far beyond the reach of previous instruments in a faction of the time. ACS replaced the Faint Object Spectrograph in 2002 and was repaired in 2009 along with STIS.

Near-Infrared Camera and Multi-Object Spectrometer (NICMOS)

NICMOS was installed during Hubble's second servicing mission, and together with STIS, replaced the GHRS and the Faint Object Spectrograph. Observing in the near infrared, NICMOS captures enhanced detail with more clarity. NICMOS' three cameras view three adjacent fields of view. Each NICMOS camera has different magnification capabilities: one has a wide-angle lens and takes pictures of large areas in space, while the other two cameras resemble telescopic lenses and zoom in on smaller areas in space.

QUICK FACTS

- Ball-built seven science instruments for Hubble, two star trackers, five major leave-behind equipment subsystems.
- Each of the five science instruments now operating on the telescope were Ball-designed and built.
- Ball-built COSTAR was installed during Servicing Mission 1 in 1993 along with JPL's WFPC-2 to correct Hubble's hazy vision.
- Ball developed more than eight custom tools to support astronauts during servicing missions.

Space Telescope Imaging Spectrograph (STIS)

Designed with built-in corrective optics, STIS greatly expanded the capabilities of two highly successful first-generation instruments, the Faint Object Spectrograph and the Ball-built GHRS. Astronomers use STIS to search for black holes because the instrument can sample 500 points along a celestial object at the same time in one exposure. STIS observations also reveal changes in objects as the universe evolves.

Corrective Optics Space Telescope Axial Replacement (COSTAR)

COSTAR, along with the Jet Propulsion Laboratory's Wide Field Planetary Camera 2, helped correct Hubble's hazy vision. Ball designed and produced the complex COSTAR optics in only 28 months instead of the usual 48-month timespan. COSTAR removed during the last servicing mission in 2009.

Goddard High Resolution Spectrograph (GHRS)

One of the original instruments launched on the Hubble, GHRS was designed to detect the ultraviolet light that comes from celestial objects. Using GHRS, astronomers were able to study the composition, temperature, motion and other chemical and physical properties of stars, galaxies and planets in very fine spectral detail. After a successful 7-year mission, GHRS was replaced by STIS.

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