Hubble Facts

National Aeronautics and
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The Advanced Camera for Surveys

Hubble's Powerful New Tool for Discovery

Hubble science instruments generate the incredible images and scientific data produced by the Hubble Space Telescope, including beautiful images of new galaxies and colliding galaxies, formation of new stars and death of old stars, and proof for the existence of black holes. With the addition of the Advanced Camera for Surveys (ACS), Hubble's new scientific instrument, astronomers will have the opportunity to discover celestial objects far beyond the reach of current instruments in a fraction of the time, unlocking more of the Universe's secrets. The ACS can survey a field on the sky twice as large as the original Hubble Deep Field, to the same exposure depth, three to four times faster than the camera that took the original Hubble Deep Field observations, the Wide Field and Planetary Camera 2 (WFPC2). A deep "core sample," looking back in time to shortly after stars and galaxies began to form, requires about 10 days of dedicated Hubble observing with the WFPC2, but less than 3 days with the ACS. This higher efficiency will allow Hubble to survey more areas of the sky or perform additional scientific observations in the same amount of time, greatly improving the productivity of this precious astronomical resource.

Advanced Camera for Surveys

Astronauts will install ACS into the location currently held by the Faint Object Camera—the last of Hubble's original instruments. ACS will become Hubble's new workhorse, surveying far regions of the Universe, searching for extra-solar planets, and observing weather and other features on planets in our own solar system. With its wider field of view, superb image quality, and exquisite sensitivity, ACS will take full advantage of Hubble's unique position as a space-based telescope. This instrument is sensitive to wavelengths ranging from ultraviolet to the far red (115-1050 nanometers).

ACS is a large phone booth sized instrument consisting of three different, specialized channels. Each channel plays a unique imaging role, enabling ACS to contribute to many different areas of astronomy and cosmology. This instrument was manufactured by Ball Aerospace Technologies, Boulder, Co.

Wide Field Channel: Surveying the Universe

The Wide Field Channel will conduct vast sky surveys to study the nature and distribution of galaxies. It was designed with a wide field of view to search for galaxies and clusters of galaxies in the early universe, helping astronomers understand how our universe evolved. Its field of view is Hubble's largest ever—more than twice the size of Hubble's current surveyor, WFPC2.

ACS's Wide Field Channel holds two state-of-the-art, 8-million pixel detectors called charge coupled devices (CCDs). These CCDs collect the light from astronomical objects and record their images. Designed to collect the most light in the shortest time possible, the Wide Field Channel uses highly reflective, silver-coated mirrors and an enhanced anti-reflection coating on its CCD detectors. This design allows this channel to collect four and a half times more light in a given exposure time than any of its predecessors. The Wide Field Channel is optimized to detect red light (600-800nm), which allows it to observe very old, very distant objects whose spectra are red-shifted due to the expansion of the universe.

High Resolution Channel: Capturing the Details

The High Resolution Channel will take extremely detailed pictures of the inner regions of galaxies, and search neighboring stars for planets and planets-to-be. This channel uses a one-million-pixel CCD, and a coronagraph to suppress light from bright objects, enabling astronomers to view nearby faint objects. Scientists will use this capability to examine the galactic neighborhoods around bright quasars.

The High Resolution Channel will also polarize and disperse light. These functions will allow Hubble users to study light in the centers of galaxies with massive black holes, as well as ordinary galaxies, star clusters, and gaseous nebulae.

Solar Blind Channel: Seeing in Ultraviolet

The Solar Blind Channel is sensitive to only the shorter wavelengths of ultraviolet light. Some features—such as emission lines that indicate the presence of certain molecules—can be detected only in the ultraviolet portion of the spectrum. The Solar Blind Channel uses a highly sensitive photon-counting detector to enhance the visibility of these features. It will search for hot stars and quasars, and will study aurora and weather on planets in our own solar system.

ACS Performance Characteristics

	Wide Field Channel	High Resolution Channel	Solar Blind Channel
Spectral Range (nm)	350-1050	200-1050	115-180
Detector Array Size (pixels)	4096^2	1024^2	1024^2
Field of View (arc sec)	200 x 204	26 x 29	35 x 31
Pixel Size (microns)	15 x 15	21 x 21	25 x 25
Sampling at 500nm	Half	Full	-
Maximum Throughput*, including HST Telescope (%)	38 at 650 nm	24 at 600nm	5 at 125 nm

* Throughput is a measure of the efficiency of data transfer through the telescope and instruments.

ACS was manufactured by Ball Aerospace Technologies in Boulder, Co.

FOR ADDITIONAL INFORMATION CONTACT:

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