NASA Facts

National Aeronautics and
Space Administration

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Huntsville, Alabama 35812

Return to Flight Focus Area

Space Shuttle External Tank and Solid Rocket Booster Camera Systems

Returning the Space Shuttle to flight is the first step in realizing the Vision for Space Exploration, which calls for a stepping stone strategy of human and robotic missions to achieve new exploration goals. NASA fuels discoveries that make the world smarter, healthier and safer. The Shuttle will be used to complete assembly of the International Space Station, a vital research platform for human endurance in space and a test bed for technologies and techniques that will enable longer journeys to the Moon, Mars and beyond.

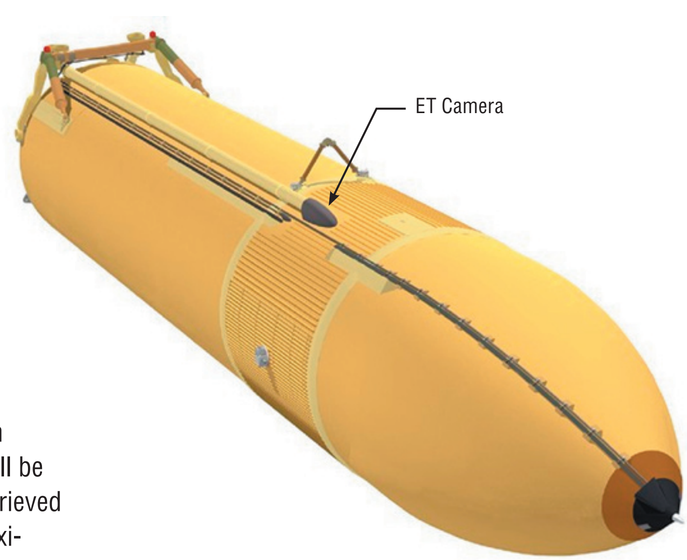
When the Space Shuttle returns to flight, NASA will have video cameras on the vehicle to help assess the performance of the Shuttle's Thermal Protection System—a combination of materials and technologies that work together to protect the spacecraft and its occupants. These cameras will supplement ground-based imagery by providing views of the Orbiter's underside and the External Tank until the tank separates from the Shuttle—approximately 8.5 minutes after launch.

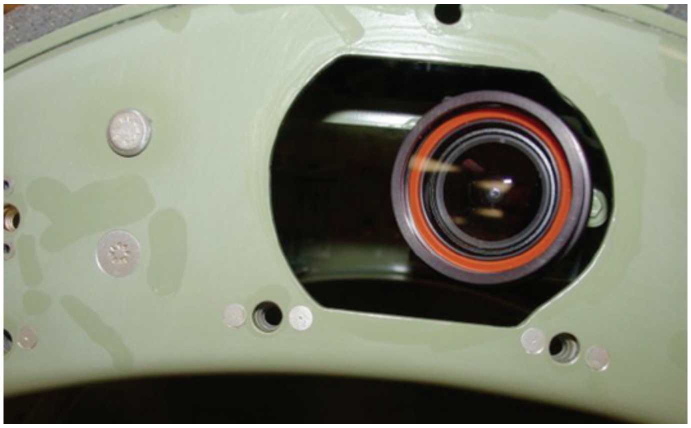
Three cameras—one on the External Tank and one on each of the two Solid Rocket Boosters—will fly on the Space Shuttle as it returns to flight on STS-114.

During launch, the External Tank camera will provide a live video feed while the video from the cameras on the Solid Rocket Boosters will be available for review after the Boosters are retrieved and returned to Cape Canaveral, Fla.—approximately two to three days after launch.

External Tank Camera

The External Tank will fly with a Sony XC-999 video camera—the same type of camera that flew on the STS-112 mission in October 2002. The camera will be mounted inside the tank's liquid oxygen feedline fairing, a metal covering that protects the area where the fuel feedline penetrates the intertank—the structure near the center of the External Tank that attaches the liquid hydrogen tank to the liquid oxygen tank. From this location, the 3.5 mm lens camera will provide a field of view of about 100 degrees, offering a look at the vicinity of the tank's bipod attachment area, a portion of the External Tank where the liquid hydrogen tank and intertank flange area are adjoined, and a portion of the bottom side of the Orbiter.





ET camera inside fairing.

The camera's battery pack includes 20 nickel-metal hydride batteries—similar to cordless phone battery packs—that will provide approximately 28 volts DC. Though the batteries will last for about 70 minutes, the camera is expected to operate about 18 minutes during launch countdown and ascent.

The camera's battery pack and transmitter will be contained in an electronics box mounted on top of the Solid Rocket Booster crossbeam inside the External Tank.

The camera also has two "blade" S-Band antennas—antennas with a frequency range between 1.55 to 3.9 gigahertz, most often used for telemetry downlink. Each is about 2.5 inches long, and will transmit a 10 watt signal to the ground stations. The antennas are located on the opposite side of the tank from the Orbiter about 45 degrees from the tank center line.

The complete camera system, weighing 32 pounds, will activate approximately three minutes prior to launch and operate for about 15 minutes following liftoff. The video will be downlinked from the tank during flight to several different NASA data receiving sites, and then relayed for broadcast on NASA TV. The ground stations include PDL, the NASA Tracking Station at Ponce DeLeon Inlet 35 miles north of Kennedy Space Center, Fla.; JDMTA, the Air Force tracking station in south Florida at Jupiter Inlet; MILA, the NASA tracking station at Kennedy; and Wallops Flight Facility, Virginia Eastern Shore.

Participating in the design, development and testing of the tank camera system were the Marshall Space Flight Center in Huntsville, Ala.; Johnson Space Center in Houston, Goddard Space Flight Center in Greenbelt, Md.; and Kennedy Space Center. Lockheed Martin Space Systems of New Orleans developed the camera specifications and integrated the camera into the tank system. Lockheed Martin Space Operations of Houston developed the camera housing. Crosslink, Inc. of Boulder, Colo., provided the radio transmitter/power supply unit. Physical Science Laboratory of New Mexico State University in Las Cruces, N.M., developed the antennas. The hardware for the camera system is made from commercially available, off-the-shelf components that were extensively tested.

Solid Rocket Booster Cameras

ET observation camera view.

The Solid Rocket Booster camera that will fly on STS-114 is called the External Tank Observation Camera. Named because it was originally certified to give NASA engineers a closer look at the insulating foam on the External Tank's intertank—the mid-section that joins the liquid hydrogen and liquid oxygen tanks. The camera has flown on five missions: STS-93 in July 1998, STS-95 in October 1998, STS-96 in May 1999, STS-101 in May 2000 and STS-103 in December 1999. It consists of an off-the-shelf SuperCircuits PC 17 video camera and Sony mini-DV tape recorder positioned in each forward skirt section of the two boosters and offers a view of the Orbiter's nose, the tank's intertank and, at separation, the booster opposite the camera.

The camera's 2.5 mm lens provides a wide-angle, 90 degree horizontal field of view. Recording will begin at launch and will continue until after drogue parachute deployment whereupon the recorder switches over to a second identical camera looking out the top to record main parachute deployment. Audio is also recorded which allows some correlation between the video and various flight events. The recorder battery pack is a 7.2 volt Lithium Ion battery which supports 90 minutes of operation, enough to support launch and then descent back to the Atlantic Ocean. The camera battery pack is a 24V Ni-Cad battery pack.

Video from the cameras will be available for engineering review approximately 24 hours after the arrival of the boosters on the dock at Kennedy Space Center, usually about 52 hours after the launch. The video will be hand delivered to the Kennedy Space Center Inter-center Photo Working Group Office. That office will electronically distribute the imagery to photo working group offices at Marshall Space Flight Center and Johnson Space Center, so a collaborative analysis can be performed.

For more information, visit **http://www.nasa.gov**.

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