Facts

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STS-99/Endeavour

Shuttle Radar Topography Mission: Putting our planet on the map

The Space Shuttle Endeavour mission will chart a new course, using two antennae and a 200-foot-long mast protruding from its payload bay to produce unrivaled 3-D images of the Earth's surface.

The result of the Shuttle Radar Topography Mission could be close to 1 trillion measurements of the Earth's topography. Besides contributing to the production of better maps, these measurements could lead to improved water drainage modeling, more realistic flight simulators, better locations for cell phone towers, and enhanced navigation safety.

Just about any project that requires accurate knowledge of the shape and height of the land can benefit from the data. Some examples are flood control, soil conservation, reforestation, volcano monitoring, earthquake research, and glacier movement monitoring. The measurements, which once processed are expected to be accurate to within 50 feet, may be tailored to meet the needs of the military, civil, and scientific user communities, bettering the lives of people across the planet.

Other possible uses of the information include aiding the selection of locations for cellular phone towers and improving topographical maps for backpackers, firefighters and geologists.

The 11-day mission is a partnership between NASA and the Department of Defense's National Imagery and Mapping Agency (NIMA), together with the German and Italian space agencies. The U.S. military, the primary customer of the data gathered during the mission, will use the 3-D pictures, called visualizations, to help in mission planning and rehearsal, modeling and simulation.

Creating these 3-D images of the Earth's surface will require the first on-orbit use of a technique called single-pass radar interferometry. Radar beams will be bounced off the surface and received by two antennae -- one by the same radar antennae used to take radar images from the Shuttle's payload bay on STS-59 and STS-68, and another by a similar antenna at the end of the 60-meter mast extending from the payload bay.

Deploying the mast, which is two-thirds as long as the International Space Station, will be an accomplishment in itself. Extending the longest rigid structure ever flown in space -- stored accordion-style inside a canister attached to the side of the main antenna -- will require the first use of a new Shuttle piloting technique called the "flycast maneuver." The maneuver, practiced on STS-93, will help reduce structural loads on the mast.

Endeavour will be launched in an orbit with an inclination of 57 degrees to allow the entire land surface that lies between 60 degrees north and 56 degrees south latitude to be covered.

Radar imaging was used previously by NASA's uncrewed Magellan spacecraft to map the surface of Venus. A key advantage to radar technology is that it can "see" the Earth's surface through the clouds, which cover nearly 40 percent of the planet, and in darkness.

The crew will spend approximately 80 hours traveling 145 statute miles (126 nautical miles/233 kilometers) above the Earth, making observations.

During a minimum of 159 consecutive orbits, Endeavour will map 30-meter squares of the planet's surface at a time. In order to maintain the continuous observations, the crew will divide into a pair of three-person teams to conduct two work shifts of 12 hours each day. The resulting collection of information is expected to total 9.8 terabytes -- enough material to fill 15,000 compact discs. It will take scientists at least one year to process the massive volume of data recorded during the mission.

No spacewalks are planned during the mission. The crew, however, will be prepared for the possibility of as many as three spacewalks if it becomes necessary to deploy or retract parts of the radar systems manually. The crew's responsibilities include activating the payload, deploying and stowing the mast, aligning the inboard and outboard structures, monitoring payload flight systems, operating the on-board computers and recorders and handling any contingencies that arise.

The 97th Space Shuttle launch and the 14th flight of Endeavour will begin with a liftoff from Launch Pad 39A. Endeavour will ascend at a 57-degree inclination to the equator for direct insertion into orbit. The mission is scheduled for 11 days.

Landing is planned at Kennedy Space Center's Shuttle Landing Facility.

The Crew

Commander Kevin R. Kregel is an experienced space flier who has been a pilot on two previous missions and a commander on another. During a distinguished career as a U.S. Air Force pilot, the New York native accumulated more than 5,000 flight hours in 30 different aircraft.

Kregel left active service in 1990 to join NASA as an aerospace engineer and instructor pilot, flying in the Shuttle Training Aircraft and conducting the initial flight test of the T-38 avionics upgrade aircraft. He entered the astronaut program in 1992. Kregel holds degrees in astronautical engineering and public administration.

Pilot Dominic Gorie (Cmdr., U.S. Navy) will make his second space flight since joining the astronaut program in 1995. He served the same role on STS-91, the final docking mission to the Russian space station Mir.

Gorie, who attended high school in Miami, earned numerous honors as a naval aviator and flew 38 combat missions during Operation Desert Storm. He has a master's degree in aviation systems. While awaiting his first Shuttle flight, he served as a spacecraft communicator in Mission Control for numerous missions.

Mission Specialist Janet L. Kavandi, Ph.D., also served on STS-91, her first space flight. She joined the space program in 1995 and worked in payload integration for the International Space Station before receiving her first flight assignment. The Missouri native has a doctorate in analytical chemistry.

During more than a decade of work as an engineer in industry, she contributed to a variety of projects, including Space Station, Lunar and Mars Base studies, Inertial Upper Stage, Advanced Orbital Transfer Vehicle, Get-Away Specials, Small Spacecraft, Air Launched Cruise Missile, Minuteman and Peacekeeper. Her work on pressure-indicating paints has resulted in two patents.

Mission Specialist Janice Voss, Ph.D., is the crew's most experienced member, having logged more than 909 hours in space on four previous missions. She earned a master's degree in electrical engineering from Massachusetts Institute of Technology in 1977 and obtained a doctorate in aeronautics/astronautics from MIT 10 years later.

Since she joined the astronaut program in 1991, her technical assignments have included working on Spacelab/Spacehab issues for the Astronaut Office Mission Development Branch and on robotics issues for the EVA/Robotics Branch. Her most recent mission, STS-94, was a completion of the shortened STS-83 flight.

Mission Specialist Mamoru Mohri, Ph.D., represents NASDA, the Japanese space agency, on his second space flight. He holds a doctorate in chemistry and has published more than 100 papers in the fields of material and vacuum sciences. He established himself as an expert in nuclear fusion during an academic career and was selected in 1980 to participate in the first group of exchange scientists under the U.S./Japan Nuclear Fusion Collaboration Program.

Mohri served as a prime payload specialist on STS-47, a cooperative mission between the United States and Japan launched in 1992. He was selected to NASA's astronaut program in 1996.

Mission Specialist Gerhard P.J. Thiele, Ph.D., makes his first space flight as a representative of the European Space Agency (ESA). With a doctorate in environmental physics, he has written extensively on physical and chemical oceanography.

He served as an alternate payload specialist on the STS-55 Spacelab D-2 mission. Since 1994, Thiele has served as an active member of the International Academy of Astronautics Subcommittee on Lunar Development. He joined ESA in 1998.

Other Experiments

The secondary objectives of the mission include crew support of EarthKAM, an ongoing experiment to provide middle school students with observations of the planet from space. EarthKAM stands for Earth Knowledge Acquired by Middle School Students, and it was first flown on STS-89. As part of the experiment, the crew will point a digital camera toward Earth. Students will use these images as part of their Earth Science lessons.

Related NASA web sites

Mission and crew press kit:
www.shuttlepresskit.com/

Mission and crew - Johnson Space Center:
spaceflight.nasa.gov/

Shuttle countdown - Kennedy Space Center:
www.ksc.nasa.gov/shuttle/countdown/

Multimedia prelaunch guest presentation:
www-pao.ksc.nasa.gov/kscpao/briefing/