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Scientific payload for the Space Shuttle

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Launch preparations for the Space Shuttle Columbia, the world's first reusable space vehicle, are proceeding at launch pad 39A at the Kennedy Space Center in Florida for a mid-October takeoff.

A small spill of rocket propellant on Sept. 22, which damaged some of the vehicle's protective tiles, will postpone the Shuttle's second flight a number of days past the Oct. 9 launch date. By the next afternoon, NASA determined that the damage could be repaired on the launch pad, avoiding a longer delay. Otherwise, the preparations have been proceeding without a hitch.

The Columbia has successfully completed its Dry Countdown Demonstration with all systems in place. Astronauts Joe Engle and Richard Truly ran through the last two hours of the countdown, simulating the procedures they will follow in mid-October. The Tanking Test, which involved transferring the propellants into the main engine's fuel tanks, was performed successfully. The minor accident occurred as the hypergolic propellants, used in the small thrusters that maneuver the spacecraft while in orbit, were being loaded into their engines.

The main change on the second flight, little publicized by the press, is the addition of the Shuttle's first scientific payload in its cargo bay. Designated OSTA-1 (for NASA's Office of Space and Terrestrial Applications), the payload consists of five scientific experiments mounted on a pallet developed by the European Space Agency. The experiments will be exposed to the space atmosphere when the payload bay's doors are opened. The experiment package consists of new types of Earth remote-sensing technology for improved observations by Landsat and future satellite systems.

The largest piece of equipment on the pallet is the Shuttle Imaging Radar Experiment. This 30-foot long antenna will send and receive radar signals that will be used to create images of the Earth's surface for use in geological exploration. The Shuttle Multispectral Infrared Radiometer (SMIRR) will also perform geological mapping from space. Ground-based data have indicated that the infrared range is preferentially absorbed by rocks contaning different minerals, so the SMIRR could help determine the electromagnetic signature of various rock types and their mineral contents. FILE, or Feature Identification and Location Experiment, is an on-board data management technique that is designed to aid sensors identify and select out specific kinds of data.

An experiment for the Measurement of Air Pollution from Satellites will measure the unique radiation absorption lines that carbon monoxide forms as it travels through the Earth's atmosphere. Finally, the Ocean Color Experiment will attempt to provide a scientific map for finding schools of fish, locating by color the concentrations of green chlorophyll characteristic of algae.

In addition to the instrument pallet, the Shuttle will carry and test the Remote Manipulator Arm Systems (RMS) built in Canada. This 50-foot arm, with maneuverable elbow, shoulder, and hand joints, will be used on future flights to catch and grapple satellites for examination and repair by the Shuttle crews.

On July 27, the Columbia began its Orbiter Integrated Test at the Orbiter Processing Facility, where the connections between the Orbiter and its payload were checked out. Then on Aug. 10, the Shuttle was transferred to the huge Vehicle Assembly Building (VAB) for continued tests and the final mating to its External Tank and Solid Rocket Boosters. At the VAB, the Shuttle underwent a nine-day Shuttle Interface Test designed to check out the mechanical and electrical connections between the Orbiter, external tank, and the boosters, as well as the functioning of the on-board systems.

The first part of this test lasts 112 hours, as communications channels between the Orbiter and its other elements are verified, leak checks are made, and a complete review of the safety systems is performed. The Orbiter's main engine nozzles, elevons, rudder and speedbrake, and body flaps are moved, as they will be in flight; and the solid rocket boosters undergo exhaustive testing. For about 55 hours, backup crews for the flight participate in the flight simulation tests.

Whereas the initial Columbia flight was aimed at testing the Orbiter's main systems, the second flight is designed to submit the vehicle to potential problems that could arise and to enhance the capability of the system. For example, astronaut Engle, the commander of the flight, will test the automatic landing system, which Commander John Young did not use on the first flight. This computer-guided system will be used to land the Shuttle when the spacecraft begins operating on a routine basis.