Backgrounder

National Aeronautics and
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NASA to test inflatable heat shield in flight

A NASA flight test designed to demonstrate the feasibility of inflatable spacecraft technology is coming down to the wire.

The Inflatable Reentry Vehicle Experiment (IRVE-3) is the third in a series of suborbital flight tests of this new technology. It is scheduled to launch from the Wallops Flight Facility on Virginia's Eastern Shore this summer.

Technicians will vacuum pack the uninflated, 10-foot diameter cone of high-tech inner tubes into a 22-inch diameter, three-stage Black Brant XI sounding rocket. During the flight test an on board system will inflate the tubes - stretching a thermal blanket that covers them - to create a heat shield also called an aeroshell. That heat shield will protect a payload that consists of four segments including the inflation system, steering mechanisms, telemetry equipment and camera gear.

NASA's Inflatable Reentry Vehicle Experiment, shown here in a wind tunnel test, was developed to demonstrate that inflatable heat shields may be used to protect future spacecraft.

After launch the rocket will take about six minutes to climb about 280 miles into the skies over the Atlantic Ocean. The 680-pound IRVE-3 will separate from the rocket. An inflation system similar to the air tanks used by scuba divers will pump the inner tubes full of nitrogen. Then the inflated heat shield and payload will plummet back through Earth's atmosphere. It will splash down in the Atlantic Ocean about 20 minutes after launch - 350 miles down range from Wallops. During reentry four video cameras will transmit images to the Wallops control room to confirm that the IRVE-3 is holding its shape. Instruments on board will also send temperature and pressure data to researchers the entire time.

Engineers at NASA's Langley Research Center in Hampton, Va., who are overseeing the project, have spent the last three years preparing for the test. Researchers and technicians have studied designs, assessed materials in laboratories and wind tunnels and subjected hardware to thermal and pressure loads beyond what it should face in flight.

One of the last hurdles before launch was a shakedown of the system in NASA Langley's Transonic Dynamics Tunnel, which technicians de-pressurized to mimic the vacuum of outer space where the aeroshell will be deployed. The team collected data as they watched the simulated 20-minute flight of IRVE-3.

Since a vacuum chamber test can't replicate the actual flight, including separation of the spacecraft from the sounding rocket, visible results began more than seven minutes after the test started. That's when cutters snipped the strings on the bag that contained the packed heat shield. The inflatable rings and their thermal blanket unfurled as the inflation system pumped nitrogen in the correct sequence.

Following that successful ground test, the last stop for the Inflatable Reentry Vehicle Experiment was NASA Wallops where it is being mated with its rocket and readied for launch.

The inflatable heat shield developed by NASA's Langley Research Center fits inside a 22-inch diameter launch vehicle fairing.

IRVE-3 will be launched from a Black Brant XI sounding rocket from NASA's Wallops Flight Facility.

IRVE-3 is one of NASA's many research efforts to develop new technologies to advance space travel. It's part of a project called HIAD for Hypersonic Inflatable Aerodynamic Decelerator– within NASA's Office of the Chief Technologist's Space Technology's Game Changing Development Program.

An inflatable heat shield could change the way we explore other worlds by accommodating larger payloads that could deliver more science instruments and tools for exploration.

For more information, please go to: http://www.nasa.gov/hiad