

NASA, Industry Partners Complete Tests of Solar Sails

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NASA engineers and their industry partners have successfully deployed two 400-square-meter solar sails during ground testing. This is a critical milestone in the development of a unique propulsion technology that uses the Sun to propel vehicles through space.

Solar sail propulsion technologies bounce sunlight off giant, reflective sails made of lightweight material 40 to 100 times thinner than a piece of writing paper. The continuous pressure provides sufficient thrust to perform spacecraft maneuvers, such as hovering at a fixed point in space or rotating the vehicle's position in orbit, which would in some cases require too much propellant for conventional rocket systems to be desirable. Because the Sun provides the necessary propulsive energy, solar sails also require no onboard propellant, thus reducing payload mass.

The 20-by-20-meter solar sail systems, large, sprawling sheets of material that resemble extremely thin pieces of aluminum foil supported by a series of booms, were developed by two engineering firms, ATK Space Systems of Goleta, Calif., and L'Garde Inc., of Tustin, Calif. Their work is led by the In-Space Propulsion Technology Office at NASA's Marshall Space Flight Center in Huntsville, Ala.

Both companies successfully and safely completed a series of system tests at NASA Glenn Research Center's Plum Brook Station in Sandusky, Ohio. The tests were conducted in Plum Brook's Space Power Facility, the world's largest space environment simulation chamber.

L'Garde concluded its systems and deployment testing in July. The tests subjected the sail to temperatures as cold as minus 112 degrees Fahrenheit to simulate the conditions of space. The sail technology uses an inflatable, thermally rigidized boom system, which is heated prior to inflation and then becomes stiff in cold space environment conditions. The boom is the core of the support structure for the thin, reflective solar sail itself and includes a stowage structure and built-in deployment mechanism. Engineers used a computer-controlled boom pressurization system to initiate deployment of the boom and sail system.

ATK Space Systems completed testing of its 400-square-meter solar sail system in May. This sail employs a “coilable” graphite boom, extended or uncoiled via remote control -- much the way a screw is rotated to remove it from an object. The boom supports the lightweight sail, which is made of an aluminized, temperature-resistant material called CP-1. Named NASA's 1999 Invention of the Year, CP-1 was invented by NASA's Langley Research Center in Hampton, Va., and is produced under exclusive license by SRS Technologies of Huntsville. The boom system also includes a central stowage structure and deployment mechanism.

Data from the tests will be used by NASA to design and build a solar sail system for a future flight validation mission in space.

Solar sail technology was selected for development in August 2002 by NASA's Science Mission Directorate in Washington. Along with the sail system design projects, NASA's Jet Propulsion Laboratory in Pasadena, Calif., developed an integrated set of computer-based solar sail simulation tools. The Langley Center provided data recording systems, such as cameras and related instrumentation, during test operations for both companies.

Solar sail technology is being developed by the In-Space Propulsion

Technology Program, managed by NASA's Science Mission Directorate and implemented by the In-Space Propulsion Technology Office at Marshall. The program's objective is to develop in-space propulsion technologies that can enable or benefit near and mid-term NASA space science missions by significantly reducing cost, mass and travel times.

NASA TV will feed b-roll and sound bites related to solar sail propulsion Tuesday, Sept. 27 and Wednesday, Sept. 28, 2005, at 10 a.m., Noon and 3 p.m. EST.

Source: NASA

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