News Releases

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NASA, Industry and Air Force Team Achieves Critical Milestone in Liquid Oxygen-Liquid Methane Engine Development Program

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NASA, industry and the U.S. Air Force have achieved a major milestone in the development of next-generation spaceflight technologies, successfully completing a 103-second hot-fire test of an engine fueled by liquid oxygen and liquid methane.

The "LOX-methane" test -- believed to be longest in duration for such an engine developed and hot-fire tested in the United States -- fuels the promise of using such technology to support the Vision for Space Exploration. The vision plans for a return to the moon, human exploration of Mars and journeys throughout the solar system in coming years.

The successful test comes three years into a collaboration by NASA's Marshall Space Flight Center in Huntsville, Ala., the U.S. Air Force Research Laboratory at Kirtland Air Force Base, N.M., and KT Engineering Corporation in Huntsville.

"This type of engine is a strong candidate for use in a launch vehicle propulsion system that is low cost, but offers the high operational responsiveness needed to pursue our aggressive space exploration goals," said Robert L. Sackheim, assistant center director and chief engineer for space propulsion at the Marshall Center. "As we move forward, the technology offers the opportunity to fly more and learn more."

"As a result of these tests, NASA engineers have learned a great deal about different configurations for LOX-methane propulsion systems," said David Stephenson, project manager for the Radial Segmented Launch Vehicle at the Marshall Center. The benefits of LOX-methane engines, Stephenson said, stem from their strong performance in supporting missions with heavy payloads. "Compared to engines powered by traditional storable hypergolic liquid fuels, LOX-methane engines have additional capabilities in supporting a large spacecraft's descent and landing on a planetary surface."

The collaboration's focus has been the development and testing of a pressure-fed type of LOX-methane engine -- meaning the engine has pressurized propellant tanks with a separate gas supply to force fuel into the combustion chamber. Using this configuration, engineers developed engine start and shutdown sequences and evaluated LOX-methane engine performance over a range of fuel-mixture ratios and chamber pressures. Producing a vacuum-rated thrust of 20,000 pounds, the engine is integrated into a propulsion system test bed at the Marshall Center, a propulsion-research leader with world-class development and testing facilities.

The tests tapped the developmental engineering and integration capabilities of Marshall's test laboratory. "We have increased the existing technical expertise and experience working with LOX-methane propulsion systems," said Pete Rodriguez, director of the test laboratory managed by the Engineering Directorate at the Marshall Center. "We also have an exceptional testing infrastructure that has enabled us to accomplish this long-duration test. I am proud of the accomplishment of this government-contractor team."

Testing to date has demonstrated stable combustion over a range of propellant mixture ratios, engine throttle capability between 60 percent and 100 percent of rated thrust, and engine efficiencies consistent with the performance needs of future exploration missions.

Three additional hot fire tests are planned using this current engine configuration. Engineers then will replace the engine with a more flight-like test article incorporating a range of new design, material and manufacturing technologies. These technologies offer the promise of further increasing the performance and lowering the manufacturing cost of flight-rated engines.

The flight-like test article engine will undergo a similar series of cold flow and hot fire tests to validate performance and provide critical engineering data required to develop the flight design. This work is being performed under a Small Business Innovation Research, or SBIR, agreement between KT Engineering and the Air Force Research Laboratory with sponsorship from NASA and the Missile Defense Agency, a Department of Defense organization.

For more information about the Vision for Space Exploration, visit:

http://www.nasa.gov/exploration/

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