# NASA Tests New Breed of Propulsion Engine

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NASA engineers have successfully tested a new breed of reaction control engine and propulsion system. Aimed at furthering NASA's space exploration goals, the tests helped investigate the possibility of future space travel fueled by non-toxic propellants.

The Reaction Control Engine and the Auxiliary Propulsion System Test Bed were tested in January at NASA's White Sands Test Facility near Las Cruces, N.M. The engine, a prototype thruster used for maneuvering a vehicle in space, was designed and developed by Aerojet of Sacramento, Calif., in cooperation with NASA's Marshall Space Flight Center in Huntsville, Ala., and Johnson Space Center in Houston.

The Reaction Control Engine is unique in its use of non-toxic propellants -- liquid oxygen and ethanol, or alcohol made out of corn. Environmentally friendly, inexpensive and easily vaporized, the propellants have the potential to create a safer work environment for ground operators, lower costs and increase efficiency. Other significant potential benefits include lower maintenance and quicker turn-around between missions.

The Auxiliary Propulsion System test bed simulates the tanks, propellant feed lines and other components of an integrated spacecraft propulsion system. The system includes integration of three Aerojet Reaction Control Engines, plus three engine simulators.

The recent tests were performed in a vacuum chamber to simulate the space environment.

The test bed was first tested by flowing propellants through the system without igniting the engines, also called cold flow testing, to verify components and subsystems. Engineers then conducted a series of hot-fire tests on the system's three Reaction Control Engines.

The engines were tested individually to ensure each one operated properly with the Auxiliary Propulsion System's propellant feed system and results were similar to those obtained during Aerojet's original open-air testing. The three engines also were tested in various combinations with each other under differing propellant temperature and pressure conditions, similar to operations experienced during an actual mission in space.

The series included pulse mode and steady-state testing. In pulse mode, the engines are repeatedly fired and turned off at varying intervals. Steady-state testing allows the engines to fire and burn continuously for a specified period of time.

Data obtained from the engine and system tests will advance auxiliary propulsion system design and modeling for future flight demonstrators.

NASA's Auxiliary Propulsion Project is an advanced development effort aimed at furthering the state-of-the-art in orbital maneuvering and reaction control systems for spacecraft propulsion, using non-toxic propellants. The project is aimed at eliminating environmental and toxicity hazards of some current propellant combinations, and could result in future vehicles that consolidate system and subsystem components, such as tanks and plumbing, thus reducing weight.

The project is led by the Marshall Center, with the Johnson Space Center providing support for the design, fabrication and operation of the Auxiliary Propulsion System Test Bed at White Sands, a Johnson facility.

Source: NASA