NASA's Ion Engine Breaks Performance Record

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An ion engine prototype developed at NASA's Glenn Research Center has now accumulated more than 12,000 hours of operation and processed over 245 kilograms of xenon, setting a record for most propellant throughput ever demonstrated by an ion engine.

The engine is the critical component of NASA's Evolutionary Xenon Thruster (NEXT) system, which uses xenon gas and solar electric power to drive future robotic science spacecraft to distant asteroids, comets, planets and their moons.

The propellant throughput achieved exceeds the previous record of 235 kilograms demonstrated by the 30,000 hour ground life test of the spare Deep Space 1 engine.

Additionally, the ion engine has demonstrated over 10 million Newton-seconds total impulse, the highest total impulse ever demonstrated by an ion engine in the history of space propulsion.

"Total impulse is the product of the engine's thrust and firing duration and is a direct measure of its capability to perform missions," according the Mike Patterson, Glenn's NEXT principal investigator. "This test validates NEXT technology for a wide range of NASA solar system exploration missions, as well as the potential for Earth-space commercial ventures."

Today's chemical propulsion systems get their big boost and then coast at

constant speed until the next boost. An ion engine can produce its small thrust continually and thereby provide near constant acceleration and shorter travel times. Ion propulsion is also ten times more fuel efficient than chemical onboard propulsion systems. This greater efficiency means less propellant is needed for a mission. Spacecraft can then be smaller and lighter, with lower launch costs.

The NEXT engine builds on the success of NASA's Solar Electric Propulsion Technology Applications Readiness (NSTAR) thruster, which successfully propelled NASA's Deep Space 1 mission. It will more than triple the power level achievable with NSTAR while increasing efficiency and system performance characteristics.

"The NEXT engine performance remains constant and the wear rates of critical thruster components are consistent with model predictions estimating throughput capability," said Daniel Herman, aerospace engineer overseeing the ion engine testing at Glenn.

"Achieving this throughput milestone is critical in demonstrating the readiness of NEXT for mission opportunities in the next few years," said Scott Benson, Glenn's NEXT project manager.

The NEXT project is developing most of the components necessary for an ion propulsion system, including the thruster, power processing unit, xenon feed system, gimbal and associated algorithms and controller hardware. These components can be combined in a range of system configurations to best meet any particular mission's needs.

Glenn has led development of the NEXT system since 2002. Other members of the NEXT team include NASA's Jet Propulsion Laboratory, Pasadena, Calif.; Aerojet, Redmond, Wash.; and L-3 Communications Electron Technologies, Torrance, Calif.

The NEXT project is being conducted under the In-Space Propulsion Technology Program, managed by NASA's Science Mission Directorate in Washington and implemented by Glenn.

Source: NASA