NASA's new ion engine ready for missions in space

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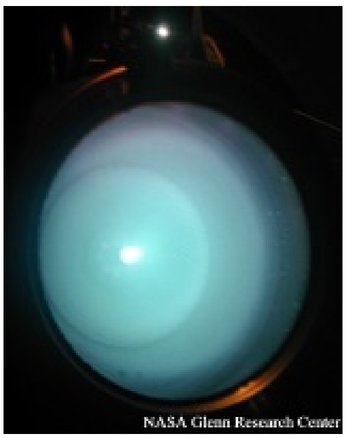

40 cm Ion Thruster in Operation

(PhysOrg.com) -- A small robotic surveyor arrives to explore a near-Earth asteroid. Another robotic spacecraft is returning to Earth with a pristine comet surface sample. Meanwhile, a robotic explorer is approaching Uranus, carrying scientific instruments that will allow us to learn more about our solar system. What do all these mission concepts have in common?

These scenarios, analyzed and recommended by the planetary science community in its recent study "Visons and Voyages for Planetary Science in the Decade 2013-2022," all may use the exceptional performance and lifetime capability of an advanced ion engine developed by NASA's Glenn Research Center.

The ion engine, NASA's Evolutionary Xenon Thruster (NEXT), is the next generation of the ion engine now propelling the Dawn spacecraft to asteroids Vesta and Ceres.

In its continuing effort to improve the NEXT ion engine, NASA recently completed a series of tests that mimic the requirements of a wide range of ambitious missions. An engine lifetime demonstration, initiated in June, 2005, recently achieved two milestones in electric propulsion testing.

Surpassing the longest operating duration of previous ion engines by 5,000 hours, NEXT has operated for more than 35,500 hours, more than four years of cumulative time. In addition, over 600 kilograms of xenon propellant have been expended, twice as much as originally required. These two measures are essential to accomplishing long-duration scientific space exploration missions.

Long lifetime allows the mission designer to build a simpler ion propulsion system by reducing the number of engines required, while providing more science payload capability and higher reliability.

Engineers at Glenn predict that the engine will continue to operate for at least two more years, further extending the capability of the ion propulsion system and providing more mission opportunities. "The engineers at Glenn and Aerojet have done an incredible job in designing out the lifetime limitations of prior generations of ion engines," said Michael J. Patterson, NEXT principal investigator and senior propulsion technologist at Glenn. "A new standard in electric propulsion lifetime has been set."

While traditionally-used chemical propulsion typically performs accelerating burns for several minutes, then coasts, the ion engine operates continuously for several years, providing constant acceleration to the spacecraft. By providing a small, constant thrust over long periods of time, the engine accelerates spacecraft to thousands of kilometers per hour, while using less than a tenth of the propellant of a conventional, chemical rocket. This efficiency will allow spacecraft to reach more distant and difficult scientific targets throughout the solar system. For that reason, demonstration of long duration operations is critical to the technology validation.

The NEXT project is a joint technology and engineering development program led by Glenn to develop a next generation electric propulsion system, including power processing, propellant management and other components. The Aerojet Corporation, Redmond, Wash., has successfully advanced the Glenn NEXT engine technology concept to a flight-ready design. Other members of the NEXT team include NASA's Jet Propulsion Laboratory, Pasadena, Calif.; and L-3 Communications Electron Technologies, Torrance, Calif.

Provided by JPL/NASA