News

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CLEVELAND, Ohio, September 16 -- NASA's Lewis Research Center here will be honored in Chicago today for the "development of one of the 100 most significant technical products of the year."

The award is being presented for the electron bombardment ion thruster, a type of electric rocket engine, invented by Harold R. Kaufman, Assistant Chief of the Electromagnetic Propulsion Division at Lewis.

Winners are selected by a panel of some of the country's best known scientists and engineers including a nobel prize laureate. The IR-100 awards are sponsored by Industrial Research Inc. of Beverly Shores, Indiana.

Lewis has been honored four times in previous years since first entering the competition in 1966. The winners are selected by a panel of leading scientists and engineers.

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There are two electron bombardment ion thrusters presently on a spacecraft orbiting the Earth to demonstrate the engine's ability to function reliably for long periods of time in space. The spacecraft, called SERT II for Space Electric Rocket Test, was launched February 3 of this year. The first engine operated continuously for 3,785 hours, a little more than five months. The second engine has been operated for more than 1,000 hours now and it is hoped it will meet the objective of continuous operation for six months in space.

In the future the ion thrusters may be used to position Earth-orbiting satellites or as a primary propulsion system to propel spacecraft to distant planets.

Despite its name an electron bombardment ion thruster is a relatively simple device. In the engine, liquid mercury is heated until it vaporizes. The vapor then passes into a chamber where electrons bombard it separating the mercury atoms into electrons and positively charged ions. The resulting ions are then attracted rearward by a negatively charged electric field and stream out of the engine at very high speeds to produce thrust. After the ions leave the engine they are neutralized by a stream of electrons to prevent them from being attracted back to the spacecraft.

Ion thrusters produce only tiny amounts of thrust. The SERT II engines for instance produce six one thousandths of a pound. However, the ion thruster is 10 times more effective in producing thrust for each pound of propellant than either chemical or nuclear rocket engines. This means that a greater portion of a spacecraft powered by an electron bombardment thruster can be devoted to payload.

Unlike chemical rocket engines, ion thrusters cannot operate in the atmosphere because the air molecules would get in the way of the ions and cause electrical arcing in the engines. Since they operate only in the vacuum of space they could be used on spacecraft, satellites and upper stages of launch vehicles.

The development of the electron bombardment ion engine has spanned many years. Initial studies started back in the 1950's at Lewis. By 1964 the first space test was conducted on a suborbital flight which proved this type of thruster would work and produce useful thrust in space. The SERT II orbital flight of this year is proving the thruster is ready for application to a wide variety of space missions.

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