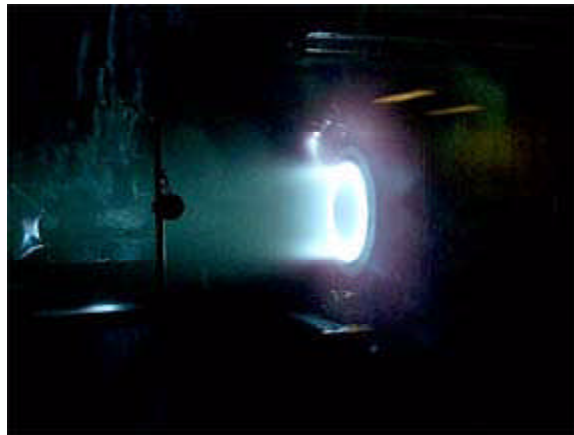


# 1000 Hours of Testing Completed on 10-kW Hall Thruster

Between the months of April and August 2000, a 10-kW Hall effect thruster, designated T-220, was subjected to a 1000-hr life test evaluation. Hall effect thrusters are propulsion devices that electrostatically accelerate xenon ions to produce thrust. Hall effect propulsion has been in development for many years, and low-power devices (1.35 kW) have been used in space for satellite orbit maintenance. The T-220, shown in the photo, produces sufficient thrust to enable efficient orbital transfers, saving hundreds of kilograms in propellant over conventional chemical propulsion systems. This test is the longest operation ever achieved on a high-power Hall thruster (greater than 4.5 kW) and is a key milestone leading to the use of this technology for future NASA, commercial, and military missions.



*T-220 Hall effect thruster during operation.*

The T-220 was developed by the NASA Glenn Research Center, TRW, and Space Power Incorporated under the NASA Advanced Space Transportation Program. The thruster provides over 500 mN of thrust at a specific impulse of 2450 sec and 59-percent total efficiency with 10 kW of input power. The 1000-hr test was conducted at Glenn's Electric Propulsion Laboratory, in Vacuum Facility 12. The T-220 performed well throughout the test with discharge current oscillations and propellant utilization improving over time. Thrust, specific impulse, and efficiency measurements taken at periodic intervals during the test showed less than 2-percent variation.

A key objective of the test was to characterize the amount of material erosion occurring on the ceramic discharge chamber. Material erosion results from the collision of high-energy ions on the annular chamber near the thruster exit plane. The erosion causes a chamfering effect on the corners of the chamber walls, which can lead to ion beam divergence, performance degradation, and potentially thruster failure. Correlated Solutions Incorporated and Glenn developed two methods for erosion measurement employing laser profilometry and video correlation. One method required removal of the thruster from the vacuum chamber and installation on a rotatable stand permitting full circumferential

surveys of the inner and outer rings in 1° increments with 0.01-mm accuracy. The other method accommodated more frequent, in situ erosion measurements of two discrete locations on the discharge chamber with 0.2-mm accuracy. The erosion data taken during this test will assist researchers in the design and development of longer life thrusters.

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