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TEST POWER GENERATOR FOR SPACE PASSES 30,000-HOUR MARK AT LEWIS

A power generator, with potential for use in Earth orbital and deep space missions, has been in operation for 30,000 hours without a break and is heading for a 50,000-hour goal at NASA's Lewis Research Center, Cleveland, Ohio.

For more than three years, a Brayton Space Power Generator -- a closed cycle gas turbine system -- has been running uninterruptedly 24 hours a day, seven days a week.

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In its test mode, conventional laboratory electric heaters provide the energy to power the generator. But in space the generator would draw its energy from the Sun or from a nuclear source.

"The Brayton engine shatters the myth that only static, non-rotating systems have the endurance potential for long space voyages or exploration," said Jack A. Heller, Lewis engineer in charge of advanced Brayton space power work.

"Our system not only is clearly showing reliability but it is performing at a high energy efficiency level of 25 per cent or better without any signs of degradation," Heller added.

Rigorous space environment conditions of temperature, pressure and speed are being simulated for this prototype, Heller said. For example, the closed gas loop reaches a high temperature of 871 degrees C (1,600 degrees F.) in the turbine, with the latter turning at 36,000 rpm. (Automobile engines commonly turn at 3,600 rpm with cylinders cooled to less than 149 degrees C (300 degrees F.).)

Energy-conscious Lewis engineers recycle the test generator's electrical output of 10 kilowatts by feeding some of it back into the laboratory's lighting system.

Testing of the complete Brayton system (named after George B. Brayton, an American engineer) began in 1970 at Lewis' Plum Brook Station near Sandusky, Ohio, in a huge 30-meter (100-foot)-diameter vacuum chamber duplicating space environments.

The generator now runs around-the-clock and unattended at Lewis' main research complex on Brookpark Road. It could be scaled up to larger sizes with relative simplicity and result in even higher efficiencies, Heller believes.

Lewis' closed Brayton power system is similar in principle to an aircraft gas turbine engine. It consists of a rotating unit, a recuperator, a heat source and a waste heat radiator. The rotating unit includes a compressor, turbine and alternator, all mounted on a single, high-speed shaft supported on gas bearings. The gas bearings support the shaft on a film of gas that is less than the thickness of a human hair.

The Brayton project was initiated at Lewis in 1963 under the leadership of the NASA center's present Deputy Director, Dr. Bernard Lubarsky.

Another Brayton system under development is a 1.3 kilowatt radioisotope-powered unit. It is being considered for power needs of Shuttle-launched global communication satellites. The NASA center is working with the Energy Research and Development Administration on this much smaller version.

Lewis is also studying advanced Brayton systems of 60-kilowatt magnitude in support of studies by NASA's Johnson Space Center, Houston, Tex., and Marshall Space Flight Center, Huntsville, Ala., of an orbiting construction base in space.

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