

## TECH PREVIEW

### NONEQUILIBRIUM MHD POWER GENERATOR FACILITY

For future high temperature power systems, MHD generators may be attractive alternatives to conventional turbogenerators. In an MHD generator a hot high-speed conducting gas flows through a magnetic field. As a result of this motion, a voltage is induced. This voltage drives a current through a load and generates electric power. MHD generators which produce many megawatts of electric power have been built. These have operated using the exhaust of high temperature rockets. In these cases because of the high temperature, the equilibrium electrical conductivity of the rocket exhaust was sufficient to insure good operation. For future space power systems, the temperature source will be high temperature nuclear reactors. Even the most advanced solid core nuclear reactor will not provide sufficiently high output temperature to permit good equilibrium MHD power generator operation. For such applications nonequilibrium MHD generators will be required. In a nonequilibrium generator, the internal heating, which accompanies the passage of the generated current, is selectively used to raise the electrical conductivity above the equilibrium value for the hot gas. A steady state closed-loop facility to conduct tests on nonequilibrium MHD generators has been constructed and tested. The loop was operated at the following conditions: the mass flow, 1.8 kg/sec; stagnation temperature, 2100° K; stagnation pressure, 4 atm abs; Mach number, 0.3 to 0.5. At these conditions, the thermal efficiency of the heater exceeds 80 percent. Plasma and electrode shorting limited the generated power to low values in the initial generator experiments. However, generator modifications are being made which should reduce these problems.

#### MHD GENERATOR EXPERIMENT

