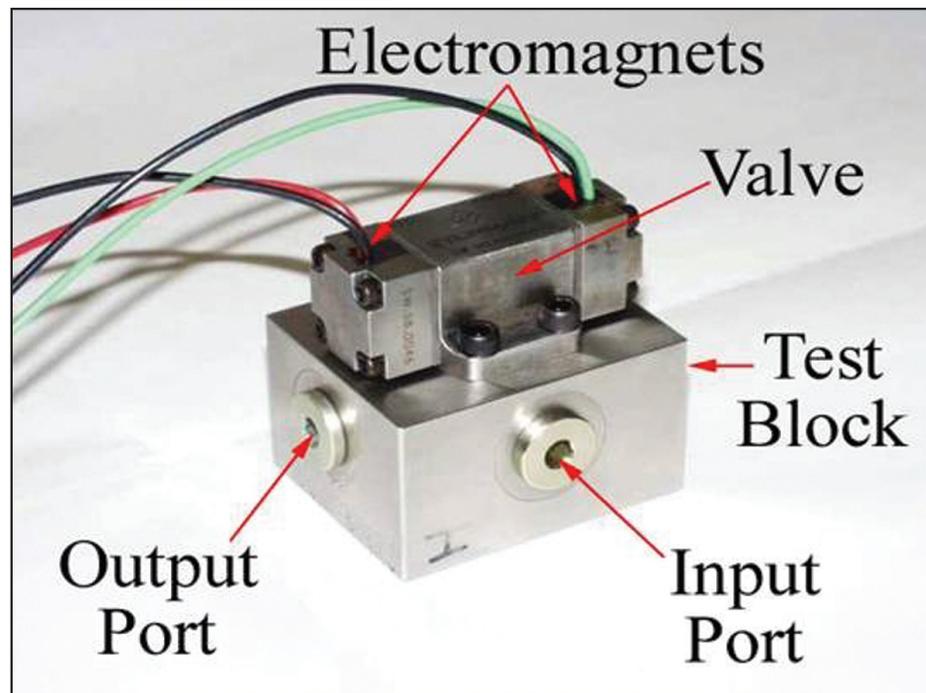




Success Story

HIGH-RESPONSE FUEL VALVE IMPROVES PERFORMANCE AND REDUCES COSTS



The Propulsion Directorate Controls and Engine Health Management (CEHM) team has successfully managed the development of a high-response fuel valve that controls fuel system pulsations to improve combustion stability. This newly developed valve enables active control of the turbine engine combustion process, resulting in improved turbine engine fuel system stability.



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Accomplishment

Dr. Al Behbahani heads the directorate's CEHM team and Mr. Ken Semega is the program manager. The directorate recently accepted delivery of a new high-response valve that is capable of modulating fuel at a frequency as high as 650 Hz and changing the average fuel flow by as much as $\pm 54\%$ at the fuel delivery nozzle. The valve's flow capacity is up to 2,000 lbs per hour. This electromagnetic valve was tested in a 600° F environment. The benefit is a significant reduction in the combustion phenomenon known as "screech," which can cause metal fatigue and premature engine failures.

Background

Combustion instability in a gas turbine power plant is the root cause of a phenomenon known as "screech". In modern, low-emission engines, conditions are ripe for screech to occur, with attendant damage to internal components from metal fatigue and premature failure of internal thermal protective coatings. Damage from screech is difficult to assess and repair, frequently requiring unscheduled engine entry, meaning the engine must be removed from the aircraft, disassembled, the affected parts replaced, and the engine tested to assure serviceable condition. This process is expensive, time consuming, and seriously impacts the mission readiness of combat units.

Continuing research of screech and its effects has identified the potential benefits a high-response fuel valve can provide. The CEHM team worked closely with Mide Technology and Scientific Monitoring, Inc. to develop the valve under a Small Business Innovation Research program. This effort also included a cooperative agreement with the Pratt and Whitney Company to perform verification and flight certification testing of the valve. If successful, this technology may be a candidate for transition into the operational fleet where the potential cost savings and improved mission availability may be realized.

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Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (04-PR-06)