

*Use of HFC-125 as a Simulant for Engine Fire Extinguishing Testing*

Katherine Whelply, Lockheed Martin Aeronautics Company, Marietta, GA, USA

In March 2006, Lockheed Martin Aeronautics Company (LM Aero) completed certification testing of the CF6-80C2L1F engine fire extinguishing (firex) system installed on the C-5M aircraft. The C-5M CF6 nacelle production firex agent is Halon 1301 but because of its ozone-depleting qualities, an environmentally-friendly regulatory alternative (HFC-125), in accordance with the Clean Air Act 40 CFR 82.270 (b)(3), was discharged during system development and certification testing.

To demonstrate compliance with federal regulations, the CF6-80C2L1F engine nacelle firex system was discharged on the ground during simulation of the critical severe flight condition. The test was recorded and evaluated with the Halonyzer III System, specialized gas analysis equipment capable of recalibration to monitor HFC-125 agent distribution and concentration. Because of the different gas and liquid characteristics of HFC-125 ( $\text{CHF}_2\text{CF}_3$ ) and Halon 1301 ( $\text{CBrF}_3$ ), the test conditions were tailored to account for the differences in gas dispersion characteristics, vapor pressure and Jakob's number of the two test materials. Simulant fill parameters for a fire extinguishing system simulating Halon 1301 with HFC-125 were determined by following the guidelines in FAA/DOT/AR-TN99/64 and MIL-E-22285.

According to MIL-E-22285, the agent level of Halon 1301 must be greater than 6% by volume for a minimum of 0.5 seconds simultaneously on 12 sample probes located throughout the protected fire zone. Using HFC-125 as a simulant, CF6-80C2L1F engine firex system agent concentration exceeded FAR 25.1195(b) certification requirements. Based on the positive results, LM Aero has demonstrated the potential to eliminate the release of Halon 1301 for purposes other than actual fire extinguishing.