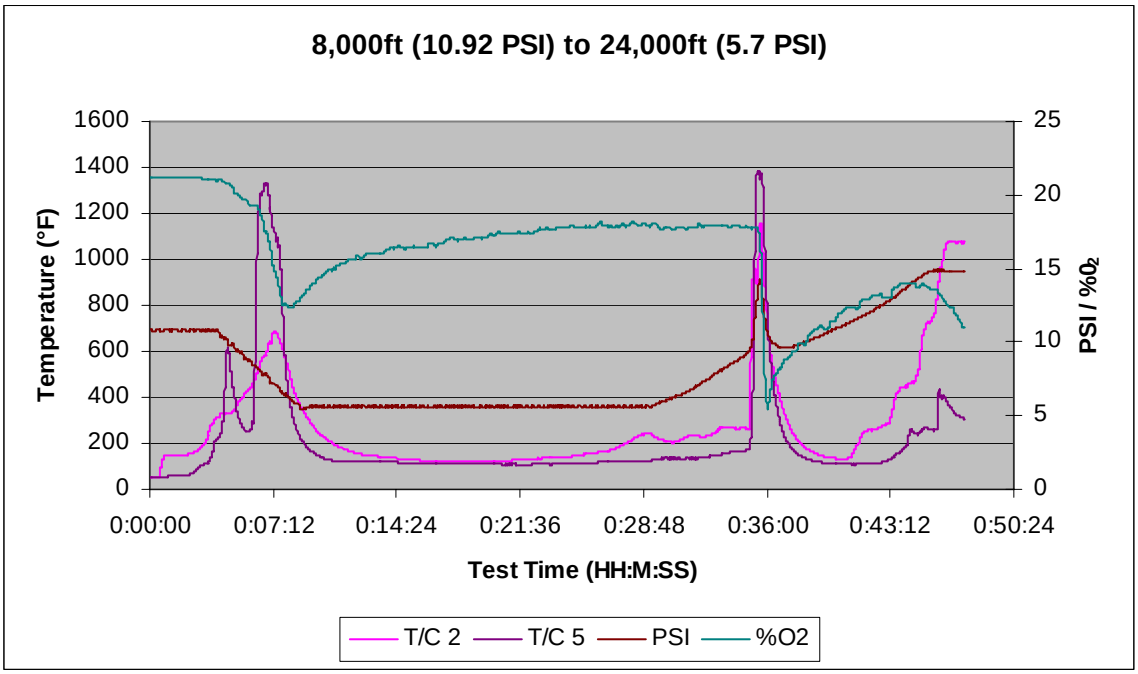
CARGO FIRE CONTROL BY DEPRESSURIZATION

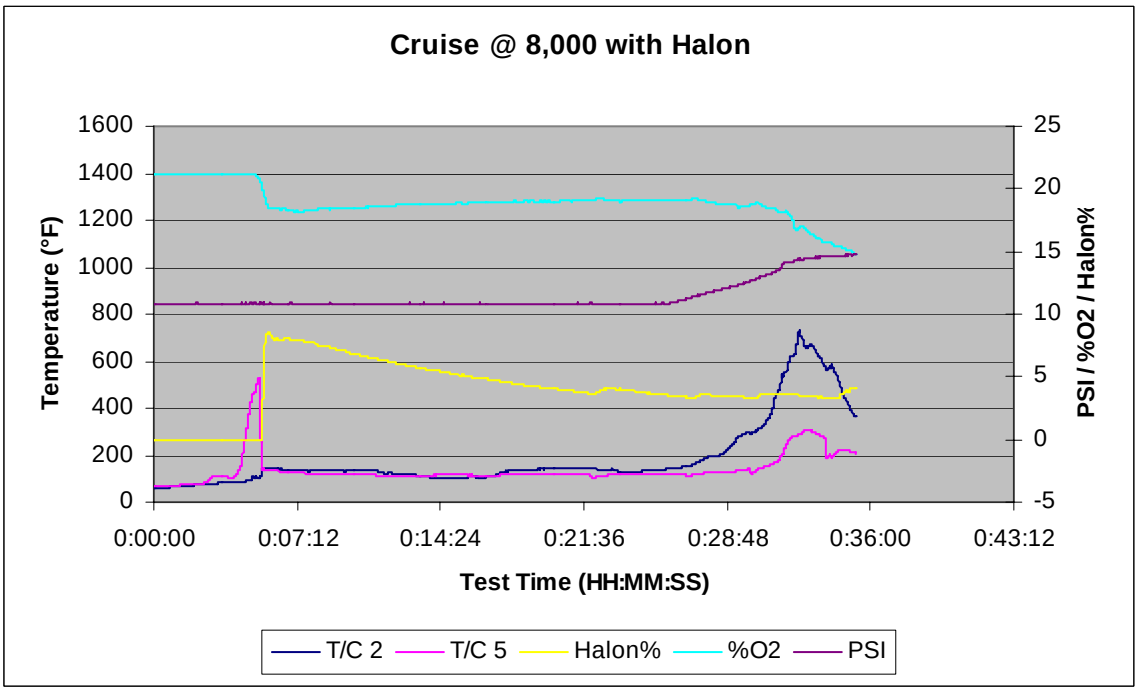
A test program was conducted in a pressure vessel to examine the effectiveness of aircraft depressurization, an FAA-accepted procedure for controlling fires in freighter (all cargo) aircraft, in response to an NTSB recommendation following a destructive freighter fire. Two series of test were conducted. In the first series, several scenarios with different fire sources were tested at varying altitudes to measure the effect of altitude (ambient pressure) on fire source intensity and burn time. For each scenario, the variation in mass weight loss versus time at different altitudes or the burn rate versus altitude were examined. The results demonstrated that cargo fires suppressed in this manner may re-ignite as the aircraft descends and ambient pressure rises. For the second series, tests were performed to determine the effect of varying altitude after a cargo fire was detected. Four flight scenarios or profiles were tested. Testing commenced for each flight profile at 8,000ft., which corresponds to the normal aircraft pressure in flight. Once a rapid temperature rise was observed, indicating that the cargo had ignited, a descent was simulated by increasing the pressure in the vessel over a 20 minute period of time. At the end of the 20 minute descent, the pressure vessel was brought back to a sea level condition.

Series one test results showed a reduced burn rate for all materials tested as the altitude increased (pressure decreased). The decreased burn rate was nearly linear, slightly greater than a reduced rate of 2% per 1000 feet. Testing of lithium metal and lithium ion batteries, a fire safety area of concern for all transportation modes, showed that altitude had little or no effect on the reaction. However, the time needed to heat the batteries to the point of reaction was increased, because of the reduced burn rate of the fuel supplying the heat, as altitude was increased (pressure reduced).

Series two test results showed that although depressurization reduced the initial burning, the fire intensity on decent was greatly accelerated. The highest depressurization altitude evaluated (25,000 feet) produced the best initial results but the largest fire on decent. The results of the depressurization tests were compared to the use of Halon 1301 under similar conditions. Halon 1301 is used to suppress cargo compartment fires in passenger-carrying airplanes. The use of halon provided much greater control of the fire. An FAA technical report for public distribution was drafted describing the findings.

Richard Hill
AJP-6320
609 485 5997





Comparing Depressurization (Top) to the Use of Halon 1301 (Bottom)