

Passive Multi-Stage Extinguishing System

Abstract By:

Mr. Ron Dexter
SURVICE Engineering Company
4141 Colonel Glenn Hwy, Suite 209
Beavercreek, OH 45430
E-mail: ron.dexter@survice.com
Phone: (937) 431-9914

Mr. Chad DeVere
Firetrace Aerospace
15690 N. 83rd Way, Suite B
Scottsdale, AZ 85260
E-mail: cdevere@ftaero.com
Phone: (480) 607-1218

THE SIXTH TRIENNIAL INTERNATIONAL AIRCRAFT FIRE AND CABIN SAFETY RESEARCH CONFERENCE

Suggested Topic Area: Systems Fire Safety

Summary

This paper will present results of a Phase I Small Business Innovative Research (SBIR) program completed in 2010 which researched, prototyped, and successfully tested a fully passive multi-stage fire extinguishing system (PMES). All phases of the effort will be discussed including research, modeling and simulation, and testing.

Discussion

The Air Force led SBIR was issued to address the problem of dry-bay fires in aircraft which are identified as the one of the largest contributors to military and commercial aircraft vulnerability. The SBIR focus was on passive detection and suppression technology development that can be easily retrofitted into existing aircraft. An additional requirement was that the technology must be capable of extinguishing multiple fires within the same location without the requirement of electrical power. A completely passive system technology was researched, designed, developed, prototyped, and successfully tested under this Phase I SBIR.

Several concepts were researched, designs were generated, and a prototype system was produced and assembled for evaluation. The design incorporates heat sensitive flexible tubing which is pressurized with agent and connected to an agent storage container and a newly designed agent release valve system. The tubing is routed wherever fire is anticipated (e.g. such as cargo compartments, electrical bays, behind interior panels, etc.). This first stage tubing and valve assembly is interconnected to a second stage assembly that consists of independent heat sensitive tubing, a second newly designed actuator valve, and a second agent storage container. The second stage tubing is initially unpressurized. When a fire is present, the first stage pressurized tubing fails due to heat (i.e. a rupture or hole forms that acts as a nozzle) and ejects agent through the fail point hole directly onto the fire. This pressure is also fed to the second stage valve, via an interconnect tube, which then arms the second stage valve and pressurizes the second stage tubing with agent. The second stage is then armed and ready for a second fire immediately after the first is extinguished, or even days later. The second stage tubing does not fail initially because it is not pressurized.

Note that the system will work with any type of fire as heat is the mechanism for activation. The system is also fully customizable as many types of agents can be used depending on the anticipated type of fire (e.g. wood, chemical, electrical, etc.). This flexibility adds to the commercialization potential for many different applications.