

### *Aerojet Solid Propellant and Hybrid Fire Extinguishers for Halon Replacement*

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Solid propellants are an effective and efficient means of generating large quantities of working gas upon command. This has been exploited in a variety of applications ranging from automotive airbag inflation to fire extinguishment. Aerojet currently utilizes this technology for the production of their Solid Propellant Fire Extinguishers (SPFEs) and Hybrid Fire Extinguishers (HFEs).

Fast-acting chemically inert SPFEs have been proven to be effective against aircraft dry bay fire threats. Aerojet currently supplies SPFEs for dry bay fire protection on V-22 Osprey and F/A-18 E/F Super Hornet aircraft. Additional research and testing has been used to advance SPFE technology with the addition of chemically active additives. This increases the effectiveness of the effluent gases, thus allowing the size and weight of a system to be reduced even further. SPFEs are a light-weight, efficient alternative to Halon for aircraft dry bays and many other fire suppression applications.

The working gas from solid propellants can also be used to dispense common fire suppression fluids such as aqueous solutions and fluorinated hydrocarbons. This concept is used in Hybrid Fire Extinguisher (HFE) technology developed by Aerojet. The ability of HFEs to quickly dispense fluid makes them very effective against the explosive-like fire threats that are experienced in military vehicle crew compartments. Aerojet's HFE technology is also utilized to protect Crown Victoria Police Interceptor vehicles during fires resulting from rear-end collisions (even at seventy-five mile per hour impacts).

HFE technology is well suited for aircraft engine nacelle and auxiliary power unit fire protection. For this application, solid propellant can be used to generate the working gas rather than using nitrogen overpressure that is common in blow-down systems. This makes the system insensitive to orientation and temperature conditions. It also allows more liquid to be housed in the same size bottle, since fill density can be ninety percent for an HFE versus fifty percent for a nitrogen overpressure system. The characteristics of the solid propellant can be adjusted to create the desired discharge pressure and duration for the system, making it a drop-in replacement for existing Halon bottles. Chemically active propellant increases the effectiveness of the HFE. Due to their design, HFEs provide more compact fire suppression: providing the same fire suppression for less volume and weight, or providing more fire protection at the same volume and weight as the current state of the art.