Alternatives to foam for hangar fire protection

For the past several years a perfect storm has been brewing within the aviation hangar industry. A perfect storm, a term popularized by Sebastian Junger in his book of the same name, is the rare combination of events that lead to an unusually bad situation. For aircraft hangars this perfect storm consists of three multiple factors. These factors include the high costs of foam discharges without actual fire, negative environmental impacts of foam and new developments in emerging aircraft technology.

Aaron Johnson

Insurers are having a hard time finding, gathering and analysing any data that shows a hangar foam fire-suppression system being activated by an ignited fuel spill. Rather, what they are discovering is that there are a disproportionate number of claims involving uncommanded activations, unintentional dispersion of foam, erroneous operation of fire suppression systems, inadvertent discharge and virtually no claims related to a system discharge in response to fuel spill fire.

These lead to an average foam discharge claim of more than $1 million in addition to damages associated with physical damage to the aircraft, lost time and business opportunities, environmental damage and clean-up, and fire-suppression system repair and restoration.

Aqueous film-forming foam (AFFF) has been used for decades as an effective fire extinguishing agent, particularly on class B fires. However, the last few years have proven that these foams contain hazardous per- and polyfluoroalkyl substances (PFAS). This PFAS or PFOA is hazardous to the environment, as well as to the personnel who may have handled these foams. Now, these foams are being banned through legislation.

▼ **Low-pressure watermist systems offer greater effectiveness, quick response, and reduced water usage.**

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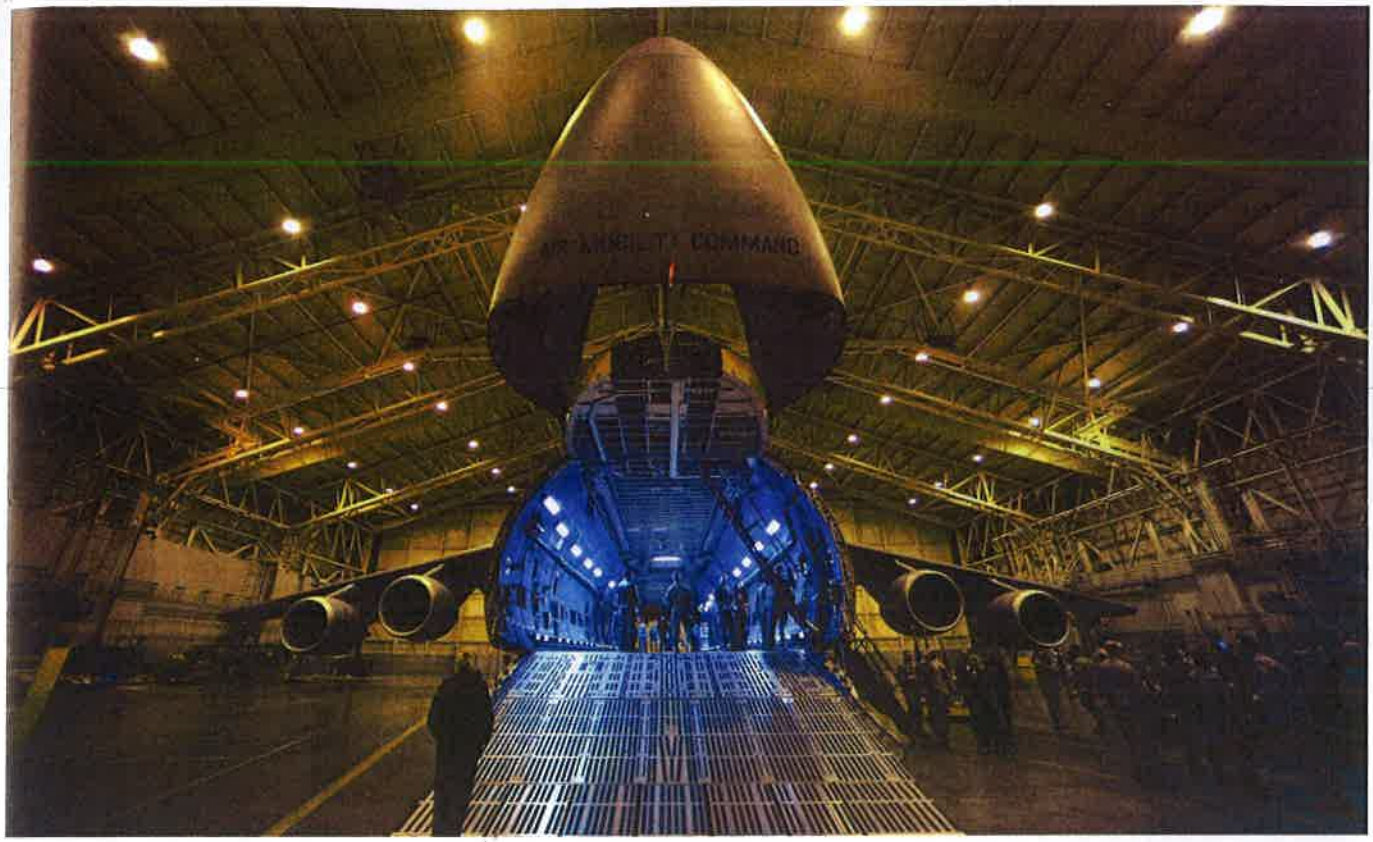

▲ NFPA 409, 2022 edition allows for alternative fire-protection methods and options.

As the world turns to alternative energy sources, such as electric and hydrogen, the aviation world is following suit, or perhaps leading the charge. There are more than 200 companies that are developing aircraft that are powered by electrical energy sources, hydrogen energy sources, or a hybrid version of these. This move away from traditional liquid carbon-based fuels is driving the need for new and effective fire protection methods.

In response to this perfect storm, the newest edition, 2022, of NFPA 409, *Standard on Aircraft Hangars*, provides a solution by introducing new alternative fire protection methods and options. NFPA 409 now allows a risk-based or a performance-based design approach to determine the most appropriate fire-protection requirements. This risk-based evaluation will consider 'fire risks, hazards associated with the site, services provided, the business continuity planning, and disaster restoration capabilities' unique to each specific hangar. There are 21 risk management elements that must be addressed in the risk assessment:

1. Type and quantity of fuel in the aircraft
2. Type of operations and activities performed
3. Risk of flammable or combustible liquid spills and process for containment and control
4. Life safety considerations for emergency events within the hangar
5. Fire threat to the hangar occupants and exposed properties or operations
6. Continuity of service, operation and the effects of business interruption or loss of aircraft
7. Quantity, size and value of the aircraft within the hangar
8. Size and value of the hangar structure
9. Economic loss from business interruption
10. Economic loss from equipment damage
11. Regulatory and reputation impact
12. Potential environmental impact
13. Construction and compartmentation of the hangar
14. Fire suppression and detection features provided
15. Response time to the location by local emergency responders
16. Local firefighting capabilities and resources
17. Evaluation and acknowledgement of hull and hangar insurance representatives
18. Redundant infrastructure, including off-site and support operations
19. Redundant equipment, including replacement aircraft and other equipment
20. Life safety of emergency responders, the general public and building occupants
21. Life cycle costs

Based on these criteria it is easy to see how a foam-based fire-protection system may not be the best protection option, and could even contribute to the total loss, rather than prevent or minimize it. If the risk assessment determines that a foam or water-based system is not the best fire-protection option, how else may the space be protected? There are four other fire-protection options that could be considered.

Novec 1230

Novec 1230 is a clean agent that leaves no residue and requires no clean-up. The agent is stored as a liquid but is discharged as a gas. The Novec 1230 system has been shown to discharge and extinguish faster than water-based systems. This extinguishing agent is safe for electronics and paper documents. Electronics or paper products can be completely submerged into the Novec 1230 and removed with no damage and flawless continued operability. Additionally, Novec 1230 is environmentally safe and is not harmful to humans. With advances in electric-powered aircraft and in the interests of business continuity and

© Image courtesy of Fire Rover

◀ **Using advanced analytics with human intervention eliminates the risk of unintentional discharge.**

disaster restoration, Novec 1230 rises to the top as a viable fire-protection option. Industrial Fire Protection has a great side-by-side comparison video of their Titan 1230 system versus a foam system discharging and extinguishing a hangar fire. The Titan 1230 system activates, discharges and fully extinguishes within four seconds, while the foam system takes up to a full minute to extinguish. Additionally, after the Titan 1230 activation, there is no clean-up process needed, or residue left over. View the video at www.sevoifp.com/airplane-hangars

Ignitable liquid drainage floor assembly

New language added to NFPA 409 specifically states the allowance of a new type of fire protection system, an ignitable liquid drainage floor assembly. NFPA 409 requires that these systems be utilized with an automatic sprinkler protection system. Safespill is the leading manufacturer of these systems, which extinguish fire by removing the fuel component. The system is installed in the floor of the hangar, and can be installed in new construction or retrofitted to existing hangars. The flooring planks have small holes in them that allow any flammable liquids to flow through. When a liquid is detected in these openings a water spray system, beneath the floor, activates to push the liquid into a trench drain for safe containment and disposal. These systems are FM approved under standard 6090, *Approval Standard for Ignitable Liquid Drainage Floor Assemblies*. For more information visit, www.safespill.com.

Fire Rover

The Fire Rover system uses advanced analytics with human verification. This system virtually eliminates the risk of unintentional discharge. The Fire Rover is a stand-alone unit that can be deployed in a field setting or installed directly to an existing fire-protection system. It is equipped with state-of-the art thermal and video detection equipment. This data is constantly transmitted to a UL-listed, FM-approved central monitoring station. This signal is reviewed by a live operator, and when a fire is confirmed, the operator can remotely control the suppression nozzles. See more at www.firerover.com

Low-pressure watermist

Low-pressure watermist systems extinguish fire by removing the heat and oxygen elements. The benefits over more traditional fire protection options include greater effectiveness on hydrocarbon fire extinguishment, quick response time and activation, and reduced water usage, resulting in faster and easier clean up. Traditionally used in local flooding applications, advances in watermist technology have shown these systems to be effective for large area protection. A newer market for these systems is in aircraft hangars. VID Fire-Kill, a leader in low-pressure watermist systems, has seen much success with these installations in hangar applications. These systems and the watermist can be applied from floor nozzles or a combination of floor and overhead water mist nozzles. These low-pressure watermist system applications are FM Approved and should be designed to NFPA 750, *Standard on Water Mist Fire Protection Systems*. Learn more at www.vidaps.dk

These are not the only alternative options, but they provide a view of what is available and direction on where to look. As the aviation world continues to evolve, the fire-protection requirements must do the same. There is now a path forward, provided for and outlined in NFPA 409, *Standard on Aircraft Hangars*. The latitude is now in place to allow for the best and most appropriate fire-protection technology to be installed. Utilizing the new guidance for risk-assessments or a performance-based approach the most appropriate fire protection system can be installed.

For more information, go to www.aaronj.org