Hangar Fire Foam Suppression Systems: Is it time for an alternative?

photo source: Global Aerospace

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The NFPA 409 Standard on Aircraft Hangars was originally created sometime in the 1930s. When wide-body aircraft with extensive wing areas become more prominent, the NFPA feared that a sprinkler discharge might not be adequate to contain a fuel spill fire in a large aircraft hangar. At that time, foam suppression systems were shown to be a highly effective way of combating fuel spill fires. Foam suppression systems requirements for aircraft hangars housing business/fighter jets and larger aircraft are based on standards set in the mid-1970s. Foam suppression systems are still a highly effective way to combat fuel spill fires; however, aircraft insurers are becoming disillusioned with foam fire protection because of the frequency of false system activations and the resulting damage to aircraft.

Hangar Accidental Foam Discharges

Since implementation of NFPA 409 foam suppression systems, occurrences of a fuel spill in a US hangar have been rare. Inadvertent hangar foam system discharges, however, are increasing in frequency, becoming more damaging, and in one case deadly.

In 2019, the University of Maryland's Department of Fire Protection Engineering (UMD) undertook a study of the impact of low-expansion foam, high-expansion foam, and deluge systems in aircraft hangars. The UMD research team collected data from seven insurance companies (including AXA XL), two Fixed Base Operators (FBOs), and media outlets. The survey covered a 17-year period. Out of the 233 incidents, only one incident involved the foam system discharging in response to a

fire and that was a fuel spill and not a fire. In this study, no fires required a foam suppression system. Overall, an average of 11.8 accidental foam discharges occurred per year. The frequency trend of accidental discharges increased by almost one discharge each year.

The UMD study also collected damage estimates. The total damage estimates for accidental foam discharges were $66.3M, with an average loss of $0.745M per incident. In comparison, the total of all damage estimates for the incidents involving foam discharges in response to a fire was $22.2M, an average loss of $0.74M per incident. Cost of clean-up and mitigation due to environmental damage from a foam discharge was not captured in the UMD study. However, NATA (National Air Transportation Association) did capture clean-up costs in nine incidents and estimated that the overall clean-up and aircraft damage costs of those nine events was between $64 million and $235 million

The one fatality resulting from an inadvertent high expansion foam discharge (HEF) occurred on January 8, 2014, at **Eglin Air Force Base**. Temperatures at the Florida Air Force Base had been fluctuating numerous times a day around 32 degrees. This repeated freezing and thawing can often lead to increased stress on water pipes, which is what happened on the morning of the accidental discharge. About 15 minutes before the incident, the crew discovered a separated pipe and a slow leak in the building's wet sprinkler system. They called the fire department and emergency responders acted quickly to evacuate employees from Hangar 130 and the proximate Hangar 129. Within minutes, Hangar 130 was filled with about 17 feet of HEF.

When Hangar 129 was cleared for access and re-entry, four civilian contractors reentered Hangar 129 via the catwalk connecting Hangar 129 to Hangar 130. Hangar 130 was still off-limits and was not cleared for re-entry. The civilian crew took photographs of the foam from their vantage point on the catwalk. They exited the building via the elevator, which opened on the first floor of Hangar 130. They were immediately engulfed in HEF. Two of the contractors escaped within minutes, one was subsequently found and rescued by emergency personnel, and the fourth, tragically, was unable to find his way out and ultimately went into cardiac arrest.

The tragedy demonstrates the crucial importance of understanding the true nature of the risks of foam suppression systems. The foam produced by an HEF system can engulf a person, inhibit sight and movement. It partially suppresses sound, making it very difficult for someone immersed in, and surrounded by foam, to remain oriented and safely find a building exit. It also hampers rescuers trying to locate someone immersed in foam.

HEF is often used to avoid the chronic health and environmental issues associated with AFFF (aqueous film forming foams). Earlier this year, the residents of the Town of Peshtigo, Wisconsin, reached a $17M settlement with the manufacturers of AFFF. The lawsuit resolved claims around contaminated drinking water at one location and 600 additional lawsuits alleging bodily injury and environmental contamination due to perfluoroalkyl substances (PFAS) – the chemical components of AFFF.

Commonly known as "a forever chemical", PFAS does not break down in the environment and moves easily through soil and drinking water sources

In June of this year, a contractor applied PFAS foam to a chemical fire at the **Chemtool plant fire**. Both state and federal environmental officials raised concerns to the Chemtool plant owners about using PFAS on the fire, but the foam was sprayed on the fire for about 3 hours. The Rockton community, worried about water and environmental contamination, asked Illinois environmental officials to test ground water and the nearby Rock River to determine if any "chemical of concern" had contaminated the environment.

The Insurance Response

"While property insurers are understandably reluctant to forgo the firefighting benefits of foam suppression protection, concerns center about HEF engulfment issues and the health and environmental issues associated with AFFF," says Eric Donofrio, AXA XL Chief Underwriting Officer for Aerospace in the Americas. "Insurance exposures to these foam suppression systems are expanding beyond simple property and bodily injury claims to now include longer tail claims of health and environmental risks. At this moment, there is no easy solution to the hangar foam issue, at least one that answers everyone's concerns. We are all waiting to see what the NFPA is going to do."

Currently, NATA (National Air Transportation Association) is leading a collaborative effort among aviation industry professional associations, airport users and operators, fire protection experts and aviation insurance providers to influence the NFPA 409 technical committee to replace the existing foam fire suppression requirements for large aircraft hangars. On July 12, 2021, the **NFPA technical committee** on airport facilities voted to approve revisions to NFPA for aircraft hangar protection requirements. In the press, "NATA is pleased that the Technical Committee acknowledged that the requirements

for foam in Group II hangars have not kept pace with the current risk of fire in modern hangar operations and aircraft," stated Megan Eisenstein, the trade association's managing director of industry and regulatory affairs. "The low risk of fuel spill fires in non-hazardous operations hangars warrants modified protection requirements." If no written objections are submitted by the NFPA membership, the revisions will be ratified at the NFPA annual meeting, slated for June 2022.

Final Thoughts

As this article was being written, NATA (National Aviation the NFPA Technical Committee on Airport Facilities (which governs aircraft hangars), was also evaluating a new technology called an **Ignitable Liquid Drainage Floor Assembly**. The technology allows burning fuel to flow through small holes in the floor deck into shallow sub-floor channels. The holes act as a flame arrester to extinguish the fire. The fuel is flushed away with water to a holding tank for later disposal. No foam is used in this system.

A side-by-side comparison of this technology against a HEF (high expansion foam) system shows that the Ignitable Liquid Drainage Floor Assembly extinguishes the fire before a good high expansion foam blanket is developed. The technology eliminates all concerns about engulfment while delivering equal or better performance. There is a similar comparison to AFFF. This is a multi-win technology that meets the needs of hangar operators, aircraft owners, insurers of all types, and local authorities. There is a FM Approval for this technology that manufacturers can also obtain.

If you are considering building a new hangar – and the NFPA agrees to adopt the new technology – the Ignitable Liquid Drainage Floor Assembly should be your first consideration. It solves everyone's concerns. One final thought, whatever you decide to do, conventional sprinklers will still be needed at the ceiling level to handle other types of fires that could occur in a hangar.