FIRE MARSHAL TOOLKIT

Storage Hangar

A storage hangar simply stores private and corporate jets.

No maintenance or hazardous operations are performed in a storage hangar.

FBO Fixed Base Operator

An FBO is the primary service provider to general aviation aircraft operators.

An FBO can provide aircraft fueling services, hangaring (interior parking), tie-down, cabin cleaning, aircraft washing, flight training, or minor maintenance.

Major aircraft repair, overhaul or hazardous operations (hot work, etc.) are typically not performed at an FBO but, rather, at an MRO. In addition, aircraft battery charging, particularly lithium-ion batteries, is typically not performed in the hangar bay.

There are more than 3,500 FBOs at airports around the country.

MRO Maintenance Repair and Overhaul

An MRO performs major aircraft maintenance and hazardous operations, such as engine overhaul, fuel cell bladder repair, landing gear repair and similar operations.

While an airport may have storage hangars and an MRO facility, storage hangars are not MRO facilities.

TYPES OF FOAM

Aqueous Film Forming Foam (AFFF)

Low expansion (small bubbles)

Provides a foam film layer between the fuel and air to help suppress the fire.

AFFF is mixed with water in 1%, 3% or 6% concentrations with 3% being the most common.

Typically sprays no higher than waist height to cover the hangar bay.

High-Expansion (High-Ex)

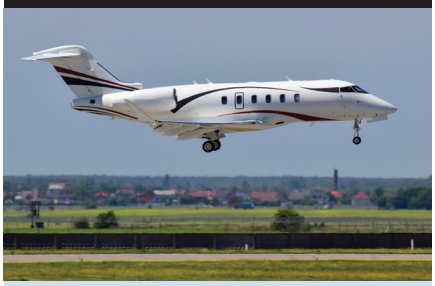
Large bubbles (like a bubble bath)

Separates fuel source from oxygen (air) through a large layer of foam bubbles.

Is typically mixed with water in 2% or 2.75% concentrations (based on the foam manufacturer).

Typically designed to fill the hangar to 1 meter in depth in 4 minutes.

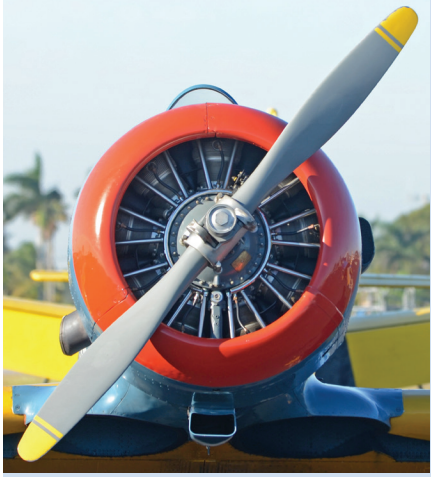
AVIATION FUEL FACTS



Jet A Fuel

Used by turbine engines (jet aircraft)

- Essentially kerosene
- Class II combustible liquid (flash point at least 100°F)
- Significantly less volatile than Avgas and automobile gasoline



Avgas Fuel

Used by piston engines (typically fewer than 6 seats)

- Essentially gasoline with other additives
- Class IB flammable liquid (flash point less than -35°F)

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FIRE MARSHAL TOOLKIT

Aircraft Hangar Fire Protection Regulations

- Most jurisdictions require compliance with National Fire Protection Association (NFPA) Standard 409, *Standard on Aircraft Hangars.* NFPA 409 classifies aircraft hangars into four "groups" *(See chart below).*
- Hangars storing fueled aircraft must have a foam-water fire suppression system. Unfueled aircraft can be protected by water-only sprinklers.
- The purpose of a foam fire suppression system is to control/extinguish a fire related to a fuel spill. The overhead fire sprinkler system is designed to control fires not related to a fuel spill.

NFPA 409 Classifies Aircraft Hangars Into Four "Groups"

GROUP I

Door height greater than 28 feet

OR

Fire area (hangar bay) greater than 40,000 square feet

Most FBOs and Storage Hangars fall under the Group II classification, however, some may be classified as Group I.

GROUP II

Door height 28 feet or less

AND

Fire area (hangar bay) less than 40,000 square feet

GROUP III

Door height 28 feet or less

AND

Fire area (hangar bay) typically less than 12,000 square feet (actual area based on construction type)

Fire Protection System Requirements

OPTION 1
Deluge (open-head), AFFF-water sprinkler system with low-level foam system if the aircraft wing area is greater than 3,000 square feet

OPTION 2
Closed-head, water only sprinkler system with low-level, AFFF foam system

OPTION 3
Closed-head, water only sprinkler system with low-level, high-expansion foam system

OPTION 1
Any system permitted for a Group I hangar

OPTION 2
Closed-head, AFFF-water sprinkler system

OPTION 3
Closed-head, water only sprinkler system with low-level, AFFF foam system.

OPTION 4
Closed-head, water only sprinkler system with low-level, high-expansion foam system

Note: The IBC exempts a Group II FBO hangar, storing transient aircraft only, from foam requirements.

Water-only sprinkler system if required by building code

For hazardous operations, provide any system permitted for a Group II hangar

GROUP IV

Membrane covered hangars, regardless of size

Fire area (hangar bay) greater than 12,000 square feet: low-level AFFF or high-expansion system.

Fire area (hangar bay) less than 12,000 square feet and hazardous operations: Automatic sprinkler system.

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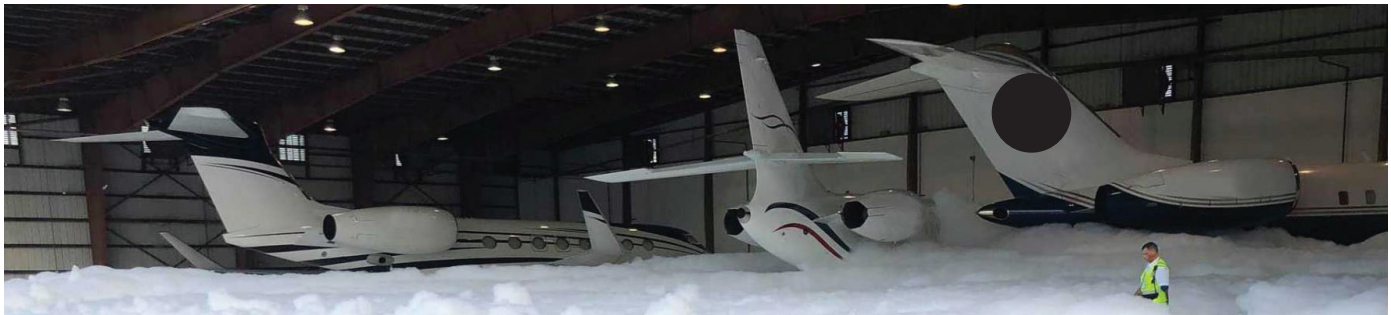

SO YOU'VE HAD AN ACCIDENTAL FOAM DISCHARGE, NOW WHAT?

	✓ DO	✗ DON'T
RELAX	Breathe.	**DON'T** panic.
SAFETY FIRST	Make sure all personnel are safe and out of the hangar bay.	**DON'T** enter the hangar bay during foam discharge.
MAKE THE CALL	Ensure the fire department has been called. If not, call 911 or your local emergency number.	
CONTROL PANEL	Preserve the condition of the foam releasing system as much as possible *If permitted by the fire department:* ■ Shut the control valve supplying foam into the hangar bay. ■ Press the silence button on the releasing system control panel and/or building fire alarm control panel to silence the notification devices. ■ Photograph the control panel display and any lights that are lit. ■ Write down what the display says.	**DON'T** power down the foam releasing control panel. **DON'T** press "RESET" on the foam releasing control panel just yet. **DON'T** open or reset any manual release stations. The condition of the control panel and manual release stations are critical to determining the cause of the discharge.
REENTRY	Take necessary steps to limit damage to aircraft and equipment, when safe to enter the hangar bay.	**DON'T** enter the hangar bay until it is deemed safe by the fire department.
DOCUMENT	Preserve any CCTV/Security camera footage of the hangar bay. Notify NATA (All information will be confidential)	

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WHAT'S THE CONCERN WITH FOAM?

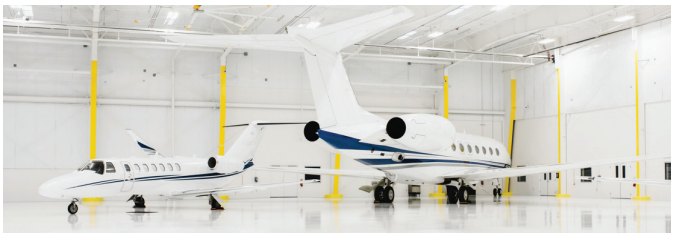
Hangar Foam Discharge Data

NATA commissioned the University of Maryland Fire Protection Engineering Department to review foam system activation data from its members, as well as insurance carriers.

FUEL FIRE RISK

0 Number of reportable fuel spills in aircraft hangars in 2019 (source: US Coast Guard).

0 Number of foam discharges related to a fuel spill fire over a 16-year period (2004-2019).



FOAM DISCHARGE RISK

174 Foam system activations over a 16-year period (2004-2019).

1 Inadvertent foam system discharges per month over a 16-year period (2004-2019).

1M Approximate cost of damage per occurrence to building and aircraft.

? Foam fire suppression systems installed in US storage hangars.

Life Safety

All foam is dangerous if ingested or aspirated.

AFFF can be very slippery to walk on.

The foam delivery method can be dangerous due to high pressures.

High-ex foam can be extremely disorientating to humans. Fire department infrared cameras will not be able to locate a human thermal image.

Personnel can be forced to seek refuge in or on top of aircraft until safe to egress (could be hours).

Environment

Both AFFF and high-ex can be dangerous to aquatic life as they form a barrier between the liquid surface and air.

AFFF is more apt to flow to natural waterways as it flows similarly to water.

Both high-ex and AFFF can cause issues with wastewater treatment plants if the foam concentrate or solution enters a sanitary sewer.

AFFF can contain chemicals that do not biodegrade and can contaminate groundwater and drinking water (*see PFAS/PFOS*).

Aircraft

AFFF can be extremely damaging to aircraft and aircraft components.

Both AFFF and high-ex have essentially the same pH as their water source but can be extremely corrosive to hardware line circuit boards and similar as the foam tends to stay on the board rather than run off.

One major brake pad manufacturer will not warranty brake pads if they come in contact with any foam solution, either AFFF or high-ex.

Foam exposure warrants thorough aircraft inspection and possibly market devaluation.

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WHAT'S THE CONCERN WITH FOAM?

PFAS/PFOS

Recently, there has been a lot of news related to the environmental impacts of fire fighting foams, particularly related to PFAS and PFOS.

At least seven states have filed lawsuits against foam manufacturers and others related to PFAS/PFOS. Additional states are considering legal action.

The fluorine surfactant in AFFF (the chemical that helps create the film layer) is the point of concern.

DoD has recently "banned" the installation of new AFFF systems and has spent more than $200 million in analysis & cleanup through 2016.

There is currently no requirement to change your foam, this is a business decision. Unfortunately, the process to change out your foam is a little more involved than simply emptying the tank and replacing the foam.

However, all AFFF with fluorine has PFAS.

Flushing the system will NOT get rid of PFAS in the piping or tank, no matter how many times you flush it.

Most importantly, your AFFF is still effective in suppressing a fuel fire. AFFF has a shelf life of approximately 20 years.

None of the above is applicable to high-expansion foam.

Causes of Unwanted Foam Discharge

Device Failure
- Age
- Corrosion

Poor Design
- Improper detector type
- Improper detector placement

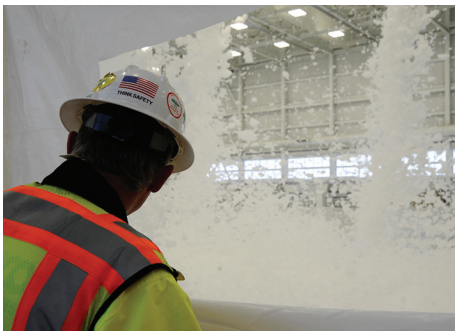
Poor Installation
- Devices not protected from water
- Lack of warning signs

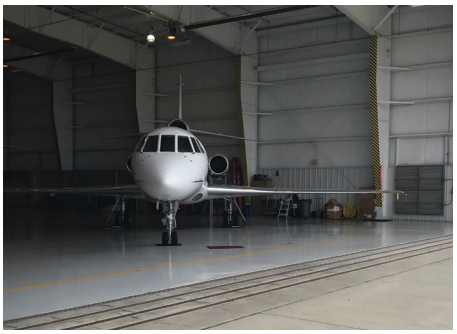
Improper Maintenance
- Unqualified personnel

Improper Testing
- Incorrect sequence of events
- Mislabeled devices

False Positive
- Welding
- BBQ in the hangar

Intentional Activation
- Disgruntled employee
- General public





INSURANCE

There are typically two different entities providing insurance at a storage hangar

Hangar keepers insurance (property insurance) carried by the hangar owner

Covers the building, equipment and possessions within the building

Aircraft insurance carried by the aircraft owner/operator

Covers the aircraft itself from damage

Foam discharge events cause 10x-20x in losses compared to the value of the building

Where are we going from here?

NATA is proposing revisions to the next edition of NFPA 409.

1. In a Group II hangar, only require foam fire suppression where hazardous operations occur.
2. Increase the Group II hangar tail height limit to 35 ft to accommodate current and proposed general aviation aircraft.
3. Reinstate the "Cluster Hangar" exemption that was inadvertently removed during the previous edition.

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