

Canadian Aviation Conversion to Fluorine Free Synthetic Foam

Meeting Transport Canada 8 exemption requirement prior to fluorine free conversion

In June 2019, the Director General of the Canadian Civil Aviation, on behalf of the Minister of Transport signed into effect a set of 8 exemptions which permitted the immediate transition from persistent AFFF to biodegradable synthetic fluorine free alternatives. The exemption applies to all Canadian airport operators and ceases to apply to a Canadian airport operator who breaches a condition of the exemption.

Increasing adoption of Synthetic Fluorine Free Foam (SFFF) amongst European & Australian airports has not been replicated to the same extent in the Americas. That's changing as Canada leads the way with the 2019 rule of synthetic fluorine free foam acceptance at commercial airports. Meeting Transport Canada set of 8 exemptions is a requirement prior to a synthetic fluorine free firefighting foam conversion of ARFF vehicles. The firefighting foam manufacturer of choice must be able to support and provide appropriate documentation ensuring the Canadian commercial airport does not breach one of the 8 exemption conditions.

First, a review of the 8 exemptions as defined by the Transport Canada guidance document. Synthetic fluorine free foam is acceptable with the following caveats:

- 1) Airport to maintain readiness
- 2) Compatible with existing foam system
- 3) Compatible with dry powder
- 4) High environmental credentials
- 5) Limited and defined environmental impact
- 6) Performance testing
- 7) Water demand
- 8) Authority compliance & notification

The Toronto Pearson International Airport, after reviewing various commercially available synthetic fluorine free foams, selected National Foam Avio^{F3}Green 3% ICAO level "C". National Foam developed an 8-points conversion pathway process which helps enable the airport to meet Transport Canada's 8 exemption conditions mentioned above.

1) Airport Readiness

It's clear, there should be no interruption to airport readiness during the conversion as this would reduce the category of the airport and limit aircraft movements. Reducing category would breach a condition on this exemption. National Foam worked with Toronto Pearson International Airport (YYZ), as well as other regional Canadian airports to ensure the airport readiness exemption condition was achieved.

2) Compatibility with existing foam systems

Avoiding high viscosity alternatives can be crucial as certain proportioning systems may not be able to properly proportion viscous foam concentrates. National Foam's 8-point conversion pathway provided the necessary verifiable documentation to demonstrate compatibility with Toronto's new ARFF trucks. Like many airports around the world, Toronto operates the Rosenbauer Panther ARFF vehicles. The FIXMIX 2.0 around the pump proportioning system dealt successfully with the new foam without any hardware alterations.

Likewise, care needs to be taken to ensure that the replacement concentrate is no more corrosive (preferably less) than both the existing foam & other synthetic fluorine free foam alternatives. Not all synthetic fluorine free foams are created equal & there have been end-user reports of alternatives causing corrosion in pipework & tanks where none was evident before.



National Foam Avio^{F3}Green ICAO level "C" firefighting foam live fire testing at DFW

2) Compatibility with fixed systems continued

End-users also need to take note of the need to dispose of any legacy foam responsibly and in accordance with local regulations. This usually means high temperature incineration via a certified waste disposal company. All equipment in contact with PFAS foams should be decontaminated before refilling if a retrofit is being undertaken, generally this is not an issue with new vehicles entering service. It is a prerequisite of the 8 exemption conditions that evidence is provided to support the transition which may be requested by the Ministry for scrutiny.

3) Compatibility with dry powder

National Foam Avid^{F3} Green 3% ICAO level "C" has been tested with Monnex™ & Purple-K dry chemical powders. Evidence is required that can be assessed by Transport Canada that the alternative foam concentrate can be used effectively with dry chemical powder. Application of Monnex™ prior to ignition & foam application had no significant effect on control times and application of Monnex™ to the foam blanket after extinguishment had no significant effect on burnback times. Testing with Purple-K also showed acceptable results with more comprehensive testing being undertaken by the US Department of Defence through their ESTCP research program. This investigation again concluded that Avid^{F3} Green 3% ICAO level "C" continued to show acceptable performance when used in conjunction with Purple-K.



National Foam Avid^{F3} Green ICAO level "C" firefighting foam live fire testing at DFW

4 & 5) Environmental Credentials and Defined Environmental Impact

Any alternative foam should not contain intentionally added fluorinated compounds such as per- and polyfluoroalkyl substances (PFAS) which include entire groups of fluorinated substances such as fluorosurfactants, fluoropolymers or organofluorines. National Foam Avid^{F3} Green 3% ICAO level "C" carries the independent GreenScreen™ Certification, whose mission is to identify products that are validated as being 'PFAS-free' and avoid other known chemicals of high concern. This enables users to make informed decisions about their environmental policies, capture and containment efforts during and after an incident. Any potential foam supplier must provide a substantial amount of applicable and mandated environmental impact data as set out in the 8 exemption conditions.



"The synthetic fluorine free foam of choice should pass all aspects of the Boeing Corrosion test as a concentrate, and as a foam solution."

It's also worth noting the important related issue of potential corrosion to aircraft parts, operators look to minimize the risk of consequential aircraft damage. Any new synthetic fluorine free foam would have advantages if it complied with the Boeing Corrosion test (both in concentrate & solution form). Users should look for third party accreditation based on real world material tests with the new product following Boeing's test procedure.

6) Performance Testing

A third party certified ICAO level "C" synthetic fluorine free foam concentrate will have passed NFPA 403 (2018), with a Level "C" test application rate of 0.04 gpm/ft² and also meets the requirements of NFPA 412 & 414.

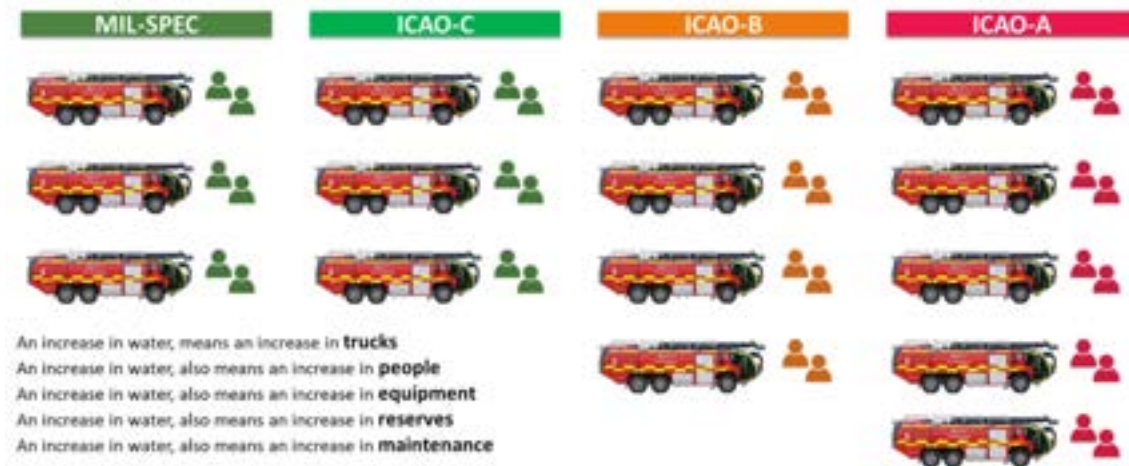


Firefighter training with the "roll on" and "rain down" application technique at .13 gpm/ft² using standard equipment with Avid^{F3} Green

7) Water Demand

Water demand will be determined by the performance level of the firefighting foam. The lower performance of the foam the higher the application density. The ICAO level “C” standard is the highest performance standard within ICAO and can bring benefits from reduced application rates. ICAO level B requires 40% more foam concentrate and water versus the higher performing ICAO level “C” foam concentrates or currently used AFFF.

Using an ICAO level “B” foam concentrate would require a 40 % increase in response hardware, manpower, foam concentrate and water versus an ICAO level “C” foam concentrate.



Emergency Response incident resources required based on firefighting foam performance

8) Authority compliance & notification

In order to comply with the 8 exemption conditions for transition to synthetic fluorine free foam, the foam manufacturer must be able to provide all necessary third party supporting certification. The foam manufacturer will play a key role in working with the airport emergency management team to ensure all required documentation is presented in the proper format allowing airport management to notify the minister of transport they are in compliance with the 8 exemption conditions. Any deviation may constitute a legal breach of these exemption conditions and invalidate an attempted transition to a fluorine free foam. The key to a successful transition is always in the paperwork.

In short. . . commercial airports continue their move to fluorine free firefighting foam

The vast majority of Europe is using synthetic fluorine free foam. Twenty four of the twenty six commercial airports in Australia are using synthetic fluorine free foam (the two that aren't are required to use U.S. MilSpec), and I can go on. While the use of synthetic fluorine free firefighting foam at commercial airports may be new in the Americas, we have been supporting airports in other parts of the world for years.



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Philip manages the portfolio of firefighting foam concentrates as well as fixed and response foam system hardware. Philip is the former Global Director of Tyco Foam Systems and is a member of the Fire Fighting Foam Coalition (FFFC).