

**Environmental Security Technology Certification Program (ESTCP)**

**DEMONSTRATION AND VALIDATION OF PFAS-FREE FIRE SUPPRESSION ALTERNATIVES**

**OBJECTIVE**

The Department of Defense's (DoD's) goal is to eliminate per and polyfluoroalkyl substances (PFAS) from firefighting formulations as soon as possible. Towards this end, projects are sought to demonstrate and validate more environmentally sustainable PFAS-free fire suppression alternatives against the current performance requirements outlined in [MIL-PRF-24385F \(SH\)](#) with interim amendment 3. The intent of this solicitation is to determine the maximum available performance using mature PFAS-free firefighting agents against the current military requirements and uses. The following considerations are of interest:

- Demonstration of PFAS-free fire suppression agents that can be utilized with the delivery mechanisms and rates specified in the current performance requirements noted above.
- Demonstration of PFAS-free fire suppression agents that utilize alternative delivery mechanisms or rates, but still meet other critical performance criteria. Of particular interest is examination of PFAS-free fire suppression agent compatibility with both aspirated and non-aspirated delivery methods.
- Evaluation of current test methodologies in MIL-PRF-24385F to determine minimum performance requirements needed to mitigate fires in operational environments or development of novel test methodologies for screening firefighting formulations for liquid pool fires.
- Evaluation of the impact that elevated ambient air temperatures have on the fire performance of PFAS-free firefighting agents and reference MILSPEC qualified aqueous film forming foams (AFFFs) in order to address known concerns on the effectiveness of firefighting agents in equatorial environments.

Due to the expense of large scale testing, only PFAS-free fire suppression alternatives that demonstrate promise based on initial small scale testing (28 ft<sup>2</sup> and 50 ft<sup>2</sup> tests of the current MILSPEC) are of interest for large scale demonstrations. Information on the historical 1260 ft<sup>2</sup> pool fire test is available in Section 4.7.7.3 of [MIL-F-24385B](#).

The materials and processes to be demonstrated/validated should already be developed to at least a Technology Readiness Level (TRL) of 4, and the proposed project should bring them to TRL 7 or higher. Alternative formulations should be production-level materials rather than laboratory-scale samples. Projects must demonstrate producibility, defined as the ability to be produced in the near term to meet the current DoD airfield or shipboard use requirement.

Field testing in military relevant environments should be included in the proposed project. Alternative formulations must be compatible with generally used storage equipment (e.g., polyethylene) and piping (steel, copper-nickel, bronze alloys), while providing comparable

corrosion rates to current AFFF. Formulations should meet requirements with fresh and salt water at multiple delivered concentrations. In addition, formulation stability must be demonstrated. Proposals may include approaches to demonstrate similar correlation between large and small scale fire tests with PFAS-free fire suppression alternatives, in lieu of large scale tests.

Proposals should include an assessment of the human health and environmental impacts of proposed ingredients, formulations, and byproducts if such testing has not already been completed. This should expand on commonly used aquatic toxicity, chemical oxygen demand and biodegradability testing required in the MIL-PRF- 24385F. These proposals should establish a baseline lifecycle framework and identify the lifecycle inventory elements currently known, those to be investigated during the project, and those beyond the scope of the proposed work. Any completed testing on human health and environmental impacts of proposed ingredients, formulations, and byproducts should be summarized in the proposal.

All projects must involve at least one DoD organization as a funded co-performer that is considered a stakeholder for the intended application. Proposals should also indicate the involvement of other DoD stakeholders at the consultant level and higher.

## **BACKGROUND**

AFFF is a water-based foam used by the military since the 1970s for fire suppression in ships, shore fixed systems, aircraft hangars, and to extinguish liquid fuel fires. AFFF mixtures containing significant quantities of perfluorooctane sulfonate (PFOS) and related perfluoroalkyl sulfonates were in use until 2002, when production stopped; however, the DoD continued to use PFOS-containing AFFF stocks for some time after the halt in production. It is estimated that there are still over 500,000 gallons of PFOS-based AFFF in stock in the DoD inventory. The Air Force and Navy are the primary users for AFFF, with an estimated current stockpile of 423,000 and 97,000 gallons, respectively.

New AFFF formulations with telomer-based, short-chain fluorosurfactants (C6 or shorter) have been shown to have a reduced environmental impact. However, these materials still have the potential to persist in the environment or even to contain trace quantities of PFOS or perfluorooctanoic acid (PFOA). The current specification, MIL-PRF-24385F (SH) w/ interim amendment 3, does not require the presence of a fluorocarbon surfactant, and sets a maximum allowable content for PFOA and PFOS. Current regulations for the short-chain compounds are less strict, but it is uncertain what the long-term environmental remediation requirements may be for these materials.

Since 2006, use of AFFF containing PFOS and PFOA has generally been replaced by foams that have fluorosurfactants of 6 carbons or fewer. These newer foams are thought to be less toxic and biopersistent and bioaccumulative, though concerns remain.

The 2020 National Defense Authorization Act requires that the DoD publish a new military specification for PFAS-free foam by 31 January 2023 and that PFAS-free foam be available for use by 1 October 2023. In addition, the procurement and use of fluorinated AFFF would be prohibited after 1 October 2023 and 1 October 2024 respectively.

Industry has identified potential PFAS-free alternative foams; however, none of these technologies meet the fire performance or intercompatibility required for military applications. MIL-PRF-24385 requires the DoD to evaluate AFFF for foamability and sealability using specific test conditions (nozzles and application rate) to meet specific fire extinguishment and burn back times. Many PFAS-free alternatives can be used to extinguish pool fires, but do not meet the strict requirements outlined in MIL-PRF-24385F (SH) w/ interim amendment 3.

This problem is not unique to military operations. Civil aviation continues to use AFFF or fluorosurfactant-free fire suppression foams that do not meet the performance of AFFF. Alternatives that meet or exceed current AFFF performance requirements without fluorosurfactants would dramatically reduce the environmental impact of fire suppression training and operations while maintaining the safety of personnel at crash sites or around liquid poolfires.

#### **POINT OF CONTACT**

Robin A. Nissan, Ph. D.

Program Manager for Weapons Systems and Platforms

Environmental Security Technology Certification Program (ESTCP)

4800 Mark Center Dr., Suite 16F16

Alexandria, VA 22350

Telephone: 571-372-6399

E-mail: [robin.a.nissan.civ@mail.mil](mailto:robin.a.nissan.civ@mail.mil)

For pre-proposal submission due dates, instructions, and additional solicitation information, visit the [ESTCP website](#).