

Strategic Environmental Research and Development Program (SERDP)

FY 2018 STATEMENT OF NEED

Weapons Systems and Platforms (WP) Program Area

INNOVATIVE APPROACHES TO FLUORINE-FREE AQUEOUS FILM FORMING FOAM

1. Objective of Proposed Work

The objective of this limited-scope Statement of Need (SON) is to develop a fluorine-free surfactant formulation for use in Aqueous Film Forming Foam (AFFF) fire-suppression operations. Proposed research should identify and test fluorine-free surfactants for use in AFFF that could potentially meet the performance requirements defined in Section 3.4, 4.7.13.1, and 4.7.13.2 of MIL-F-24385F. Proposers should consider including testing to validate persistence and aquatic toxicity of alternative materials. Proposers should show clear understanding of past research efforts in this area to avoid duplication of prior work.

2. Expected Benefits of Proposed Work

New fluorine-free surfactants will enable sustained manufacture and use of AFFF by meeting environmental requirements while maintaining equivalent performance to ensure safety of Department of Defense (DoD) personnel at airfields and onboard ships.

3. Background

AFFF is a water-based foam used by the military since the 1970s for fire suppression in ships, shore fixed systems, aircraft hangers, and to extinguish liquid fuel fires. The DoD used AFFF mixtures containing significant quantities of perfluorooctane sulfonate (PFOS) and related perfluoroalkyl sulfonates until 2002, when production stopped; however, the DoD continued to use PFOS-containing AFFF stocks for some time after. It is estimated that there is 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. Although the DoD's legacy use of AFFF included various fluorotelomer-based formulations, the vast majority of DoD's environmental liability likely results from the use of PFOS-based AFFF. Multiple DoD installations have detected PFOS and perfluorooctanoic acid (PFOA) at 3 to 4 orders of magnitude greater than the current EPA health advisory.

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 PFOS or PFOA. 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.

Worldwide regulation and effective bans of PFOA and PFOS led manufacturers to support a

voluntary replacement program for the long-chain fluorosurfactants. Starting in 2006, the EPA and the Fire Fighting Foam Coalition (FFFC) initiated the voluntary global 2010/2015 PFOA Stewardship Program. This committed foam manufacturers to a 95% reduction in PFOA, PFOA precursors, and other long-chain polymers by 2010 and elimination of those chemicals in manufacturing emissions and finished foam by 2015. New formulations are made with telomer-based fluorosurfactants (six fluorinated carbons or fewer) that have been shown to more readily breakdown in the environment but may still have long term environmental impacts (e.g., persistence) or degrade to produce fluoroalkyl compounds of equal environmental concern. Industry, in coordination with the EPA, has conducted studies to determine the potential impact of the breakdown products of C6 foams, which have been found to be of low toxicity, low biopersistence, and not bioaccumulative, especially when compared to PFOS and PFOA.

At this time, AFFFs used by the military must contain fluorinated surfactants (and other compounds) per MIL-F-24385F. Industry has identified potential fluorine-free alternative foams; however, none of these technologies meet the performance required for military applications. 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. The FAA authorizes airport operators to only use AFFF products that meet the Mil-Spec as confirmed in 2011 in CertAlert No. 11-02, "Identifying Mil-Spec Aqueous Film Forming Foam (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 pool fires.

4. Cost and Duration of Proposed Work

Limited-scope proposals for funding up to \$200,000 and duration of approximately one year are sought. Such proposals may be eligible for follow-on funding if they result in a successful initial project.

5. Point of Contact

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