

**Strategic Environmental Research and Development Program
(SERDP)**

FY 2017 STATEMENT OF NEED

Weapons Systems and Platforms (WP) Program Area

FLUORINE-FREE AQUEOUS FILM FORMING FOAM

1. Objective of Proposed Work

The objective of this 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 meet the performance requirements defined in MIL-F-24385F. New formulations must be compatible with existing AFFF and supporting equipment. Proposers should include testing to validate persistence and aquatic toxicity of alternative materials. In addition, full proposals will be required to include an assessment of the human health and environmental impacts of proposed ingredients, formulations, and byproducts. The full proposals should establish a baseline lifecycle framework and identify the elements of a life cycle inventory that are already known, those that will be investigated during the course of the project, and those that are beyond the scope of the proposed work. Proposers should show clear understanding of past research efforts in this area to avoid duplication of prior work.

2. Expected Benefits of Proposed Work

Legacy AFFF consists of long-chain fluorosurfactants (perfluorinated compounds [PFCs]) that contain either perfluorooctanoic acid (PFOA) or perfluorooctanesulfonic acid (PFOS). These materials are no longer manufactured and the Department of Defense (DoD) relies on stockpiles to supply active fire-suppression systems. Costly remediation efforts are already in process for treatment of PFCs in groundwater at or around military installations. New AFFF 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. New fluorine-free surfactants will enable sustained manufacture and use of AFFF by meeting environmental requirements while maintaining equivalent performance to ensure safety of DoD personnel at airfields and onboard ships.

3. Background

AFFF is a water-based foam used by the military for fire suppression in ships, shore fixed systems, aircraft hangers, and to extinguish liquid fuel fires. From 1970 until 2002, AFFF formulations contained long-chain PFCs (PFOS-based) as surfactants along with other synthetic detergents. 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. Multiple DoD installations have detected PFCs at 3 to 4 orders of magnitude greater than the current EPA health advisory.

PFCs have been found to be endocrine disruptors and have adverse effects on development, the immune system, and multiple organ systems. They are very stable and persistent in the environment, highly soluble and have been detected in the environment worldwide and in the blood of the general U.S. population. Worldwide regulation and effective bans of PFOA and PFOS led manufacturers to support a voluntary replacement program for the long-chain fluorosurfactants. In 2002, the EPA used the Toxic Substances Control Act (TSCA) Significant New Use Rule (SNUR) to require notification before new manufacture of any PFOS. 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 even contain PFCs as impurities 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

The cost and time to meet the requirements of this SON are at the discretion of the proposer. Two options are available:

Standard Proposals: These proposals describe a complete research effort. The proposer should incorporate the appropriate time, schedule, and cost requirements to accomplish the scope of work proposed. SERDP projects normally run from two to five years in length and vary considerably in cost consistent with the scope of the effort. It is expected that most proposals will fall into this category.

Limited Scope Proposals: Proposers with innovative approaches to the SON that entail high technical risk or have minimal supporting data may submit a Limited Scope Proposal for funding up to \$200,000 and approximately one year in duration. Such proposals may be eligible for follow-on funding if they result in a successful initial project. The objective of these proposals should be to acquire the data necessary to demonstrate proof-of-concept or reduction of risk that will lead to development of a future Standard Proposal. Proposers should submit Limited Scope Proposals in accordance with the SERDP Core Solicitation instructions and deadlines.

5. Point of Contact

Robin A. Nissan, Ph.D.
Program Manager for Weapons Systems and Platforms
Strategic Environmental Research and Development Program (SERDP)
4800 Mark Center Drive, Suite 17D08
Alexandria, VA 22350-3605
Phone: 571-372-6399
E-Mail: Robin.A.Nissan.civ@mail.mil

For Core proposal submission due dates, instructions, and additional solicitation information, visit the SERDP website at www.serdp-estcp.org/Funding-Opportunities/SERDP-Solicitations.