

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

FY 2017 STATEMENT OF NEED

Weapons Systems and Platforms (WP) Program Area

**SURFACE MORPHOLOGY MODIFICATION BY NON-CHEMICAL
METHODS TO ENHANCE COATING ADHESION AND MECHANICAL
BONDING OF METAL SURFACES**

1. Objective of Proposed Work

The objective of this Statement of Need (SON) is to develop non-chemical methods and processes to impart surface morphology modification to metallic substrates used for Department of Defense (DoD) weapons systems. Proposed technologies must maintain paint adhesion and mechanical bonding durability as well as improve the corrosion resistance of the target substrate material. The primary interest of this effort is on substrate materials such as aluminum and titanium alloys found on currently fielded aircraft; however, proposals focused on steels such as those used on military ground vehicles and ships would also be accepted. Proposals that focus on Navy ship hull applications also may investigate using the proposed technology as an alternative to copper-laden barnacle inhibition coatings or other pretreatments applied prior to current coating systems.

The proposed treatment process should be a single-step process that does not require any chemical processing or treatments. Surface treatments for adhesive bonding applications must meet the long-term durability requirements of the substrate material. Surface treatments for coating adhesion applications must meet the adhesion and long-term corrosion requirements of the total coating system specified in MIL-PRF-32239, Type 2, but not the stand-alone corrosion requirements of MIL-PRF-5541: Chemical Conversion Coatings.

Developing an understanding of the physical mechanisms to improve adhesion and corrosion protection by altering the surface structure and morphology is necessary to effectively transition non-chemical methods. Proposals should include efforts to develop a quantitative understanding of how the proposed technology addresses the performance objectives of the SON.

2. Expected Benefits of Proposed Work

The proposed research effort will greatly reduce the environmental impact of chemical surface treatments used in the manufacture and maintenance of DoD weapons systems. The environmental risks and costs of managing millions of gallons of spent chemical processing solutions as hazardous waste also will be greatly reduced. Legacy surface treatment processes involve sequential applications of toxic chemicals. A single-step, non-chemical process will significantly reduce processing times and worker exposure thereby reducing labor and worker

protection costs. In addition, energy savings will be realized by eliminating heating and agitating large processing tanks.

3. Background

Aluminum-skinned aircraft are typically chemical conversion coated (MIL-PRF-5541) or anodized prior to application of coating systems or adhesive bonding. The process to prepare the substrate surface requires multiple steps including cleaning, degreasing, deoxidizing and either anodizing or chemical conversion coating. These immersion or spray processes result in long cycle times, exposure of workers to hazardous and toxic fumes, and require significant amounts of energy for spraying, agitating, and/or heating. Immersion tanks range from 1,000 to 40,000 gallons depending on part size and volume of work. Many of these baths contain hexavalent chromium, other hazardous air pollutants, and/or cyanide. Millions of gallons of spent chemical solutions are disposed of annually as hazardous waste. This results in a significant cost to the DoD and consumes valuable landfill space.

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

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