

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

**FY 2013 STATEMENT OF NEED**

**Weapons Systems and Platforms (WP) Program Area**

**NON-ISOCYANATE POLYMERS FOR MILITARY TOPCOATS**

**1. Objective of Proposed Work**

The objective of this statement of need (SON) is to develop a high performing exterior topcoat without the use of diisocyanate compounds. Respondents may propose to investigate 1) alternative reaction chemistries that produce polyurethanes without using diisocyanates, or 2) alternative coating formulations that utilize resin systems other than polyurethanes. Proposers should address performance requirements contained in one or more military topcoat specifications, especially: MIL-DTL-53039D (Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant); MIL-DTL-64159B (Camouflage Coating, Water Dispersible Aliphatic Polyurethane, Chemical Agent Resistant); or MIL-PRF-85285D (Coating, Polyurethane, Aircraft and Support Equipment). Proposals addressing military topcoat specifications other than the three identified must provide ample justification and will be reviewed on a case-by-case basis. At a minimum, proposals should attempt to achieve the following topcoat requirements as identified in the relevant specifications: flexibility, recoatability, adhesion, water resistance, solvent resistance, hydrocarbon resistance, weather resistance, gloss and infrared reflectance. All proposals should include an assessment of the human health and environmental impacts of proposed ingredients, formulations and byproducts to ensure they are not only less harmful than diisocyanates (and other baseline materials) but also supportive of long-term sustainability goals.

**2. Expected Benefits of Proposed Work**

Nearly all high performance exterior topcoats used on military equipment are based on polyurethane chemistry. A list of such topcoats includes the Army's Chemical Agent Resistant Coating used on ground vehicles and Army helicopters as well as the Navy's standard aircraft coating used on Navy and Air Force helicopters and airplanes. Polyurethane coatings have excellent properties for exterior applications, but increasing focus on the environmental and human health impacts of their constituents could lead to restriction or elimination of their use. Usage of such products is estimated at well over 2,000,000 gallons per year. Even at 0.1% hexamethylene diisocyanate (HDI) by weight, this represents a total usage of more than 20,000 pounds HDI per year. Topcoats formulated without diisocyanates would make Department of Defense topcoating operations more sustainable with respect to human health and the environment.

### **3. Background**

Military polyurethane coatings are formed through reaction of polyols with polyisocyanate compounds, typically HDI. Diisocyanate compounds are coming under increased regulatory scrutiny as dermal and inhalation sensitizers/irritants, and chronic exposure to diisocyanates has been associated with asthma and lung damage. Many current and proposed regulations target the aromatic compounds methylene diphenyl diisocyanate (MDI) and toluene diisocyanate (TDI) rather than the aliphatic HDI, primarily because MDI and TDI are used and emitted in comparatively larger volumes. However, the impetus for regulation is the fact that MDI and TDI are used in spray-applied adhesives, sealants, and coatings, so it is reasonable to anticipate similar regulatory actions against spray-applied HDI coatings in the future. All three compounds (MDI, TDI, and HDI) are already listed as hazardous air pollutants (HAPs) under the Clean Air Act. It should be noted that existing topcoats can be labeled accurately as “organic HAP-free” provided that the weight percent of HDI monomer is less than 1%, which is the required reporting threshold for non-carcinogenic ingredients on material safety data sheets. Still, the continued use of HDI-based topcoats is not conducive to the long-term sustainability of military weapons systems.

### **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 \$150,000 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 web site at [www.serdp-estcp.org/Funding-Opportunities/SERDP-Solicitations](http://www.serdp-estcp.org/Funding-Opportunities/SERDP-Solicitations).