SERDP and ESTCP Reorganize to Tackle Energy and Climate Change Challenges

SERDP and ESTCP are modifying their management structure to align with changes in the Department of Defense’s (DoD) environmental technology requirements. The impetus for these changes is reflected in testimony to the House Armed Services Committee Subcommittee on Readiness by Dr. Dorothy Robyn, Deputy Under Secretary of Defense (Installations and Environment), who stated, “The recently released 2010 Quadrennial Defense Review (QDR) makes clear that crafting a strategic approach to energy and climate change is a high priority for the Department of Defense.” SERDP is responding by investing in efforts to develop climate change assessment tools, while ESTCP is leading DoD’s effort to accelerate the transition of innovative energy technologies from laboratories to military end users.

To manage investments in these areas more effectively, SERDP and ESTCP are creating two new program areas: Energy and Water and Resource Conservation and Climate Change. Starting in August 2010, SERDP and ESTCP projects will be managed under the following five program areas:

- Energy and Water (EW). Technologies to improve energy efficiency, increase the use of renewable energy, and enhance

SERDP and ESTCP Launch New Web Site—Combined and Completely Redesigned

Features Advanced Search Capability and Improved Navigation

Just as SERDP and ESTCP are reorganizing their management structure, the Programs are launching a completely redesigned and integrated web site to better reflect the interrelated nature of SERDP and ESTCP and to foster technology transfer. The new web site features enhanced access to information on applying environmental solutions, the new management structure, improved navigation, and an advanced search capability to enable users to more easily find program and project information and technical documents. The web site also will highlight featured initiatives that SERDP and ESTCP are supporting through projects and related work that respond to high-priority and high-visibility DoD requirements. Visit www.serdp-estcp.org.
Dr. Jim Galvin to Manage Energy and Water Program Area

SERDP and ESTCP are pleased to announce Dr. James (Jim) Galvin as the Acting Program Manager for Energy and Water. Dr. Galvin has led and managed information and technology start-up programs totaling more than $50 million for the Department of Defense and the Department of Energy for the past eight years. These programs helped implement innovative energy and information management technologies and practices that have been featured in major news publications, including the Washington Post and the New York Times, for their transformative impact.

On detail from the National Renewable Energy Laboratory (NREL), Dr. Galvin has managed a $7 million budget and led a 50-person, multifunctional team of energy efficiency and renewable energy experts to help Hawaii achieve its clean energy goals. His efforts resulted in many policy and technological implementations that contributed to the state’s energy and sustainability goals.

Dr. Galvin earned his Ph.D. in Industrial and Systems Engineering from Virginia Tech; his M.S. in Operations Research and Systems Analysis from the Naval Postgraduate School in Monterey, California; and his B.S. in Mechanical Engineering from the U.S. Military Academy at West Point.

SERDP and ESTCP are fortunate to have Dr. Galvin on board to help advance energy efficiency and renewable energy technology development and implementation across DoD. Please join us in welcoming Dr. Galvin as the Acting Program Manager for Energy and Water.

Under SERDP and ESTCP’s new management structure, Dr. John Hall, previously the Sustainable Infrastructure Program Manager, will serve as the Program Manager for Resource Conservation and Climate Change.

Resource Conservation and Climate Change (RC). Research that advances DoD’s management of its natural and cultural resources and improves understanding of climate change impacts.

Weapons Systems and Platforms (WP). Research and technologies to reduce, control, and understand the sources of waste and emissions in the manufacture, maintenance, and use of weapons systems and platforms.

Most facility infrastructure and natural resource projects that were managed under the Sustainable Infrastructure (SI) focus area have been transferred to either the EW or RC program areas, respectively. SERDP and ESTCP Principal Investigators are being notified as to which program areas under the new structure their projects will be managed. These changes will also be reflected in the SERDP and ESTCP Management System (SEMS).
Reference Book “Breaks Down” In Situ Remediation of Chlorinated Solvent Plumes

*In Situ Remediation of Chlorinated Solvent Plumes*, the second monograph in an Environmental Restoration Monograph Series, describes the process design and engineering for physical, chemical, and biological technologies used to treat complex chlorinated solvent plumes. Scheduled to be released in August, this monograph was written by several leading experts from academia and industry and edited by Dr. Hans F. Stroo of HydroGeoLogic, Inc. and Dr. C. Herb Ward of Rice University.

While significant progress has been made in developing innovative and cost-effective environmental restoration technologies, efforts are needed to facilitate broader use of these technologies in the field. *In Situ Remediation of Chlorinated Solvent Plumes* will serve as a reference for decision makers, practicing engineers, and hydrologists who select, design, and operate remedial systems, as well as researchers seeking to improve the state of the art.

The initial chapters of the monograph provide a general overview of groundwater contamination and challenges associated with chlorinated solvent-contaminated sites. The authors also describe the evolution and current state of the science with a focus on the chemistry and key microbial and abiotic processes responsible for chlorinated solvent degradation. Subsequent chapters describe how source zone architecture impacts the characterization and remediation of chlorinated solvents and provide a thorough review of the diverse physical, chemical, and biological technologies currently in use for remediating chlorinated solvent plumes. The final chapters provide insight into factors that influence technology costing the most and a view of the research needed to address more cost-effectively what remains of a legacy environmental contamination problem.

A series of related reference books will follow on topics that include in situ chemical oxidation for groundwater remediation, delivery and mixing strategies to enhance subsurface remediation, bioaugmentation for groundwater remediation, and remediation of contaminated sediments. Additional volumes will be written as new environmental technologies are developed and validated.


**Military Installations as Test Beds for Innovative Energy Technologies**

The Department of Defense operates more than 500 installations with approximately 300,000 buildings and 160,000 non-tactical support vehicles. This size coupled with DoD's enormous buying power and technical capabilities uniquely position DoD to transform the energy technology marketplace, improve national security, and transition innovative energy concepts into certifiable solutions. This growing role for DoD as a test bed for advanced energy technologies and its potential for helping reduce greenhouse gas (GHG) emissions was the focus of “Missing Weapons,” a recent article by Dr. Daniel Sarewitz in *Nature*.

In the article, which is based on an interview with SERDP and ESTCP Director Dr. Jeffrey Marqusee, the author states that implementation of energy-efficient technologies has progressed slowly over the past 30 years despite the proliferation of incentives, regulations, and voluntary programs aimed at reducing GHG emissions. Dr. Marqusee cites organizational issues as the primary culprit, including conflicting goals and interests among the multitude of stakeholders who develop, install, and maintain these technologies in the civilian sector.

Dr. Marqusee notes that because DoD is responsible for setting design specifications and purchasing, using, and maintaining such equipment, most conflicts that prevent widespread adoption and implementation disappear when DoD is the end customer. Moreover, national security considerations are propelling energy innovation and DoD represents a large market for these technologies, sufficient to spur competition that stimulates innovation and reduces cost. The end result is that DoD has unsurpassed capacity and motivation to implement new energy technologies and increase consumer confidence, leading to their acceptance and proliferation in the commercial marketplace. Only with such broad-scale implementation will the United States be able to reduce GHG emissions to meet more stringent regulatory requirements and to minimize impacts associated with climate change.

Defense leadership has recognized the significance of DoD’s role in testing innovative energy technologies and the utility of ESTCP as a vehicle for transitioning these technologies to the commercial market. This is evidenced by the significant increase in funding available to ESTCP over the past three years specifically for energy technologies. ESTCP now has a large portfolio of ongoing energy demonstrations that collectively address energy efficiency, renewable energy, and energy storage and management. As the true cost and performance of these technologies are verified and implementation proceeds, DoD’s potential in transforming the energy technology marketplace will begin to be realized. For more information on ongoing ESTCP demonstrations, explore Featured Initiatives/Installation Energy at www.serdp-estcp.org.

SERDP and ESTCP projects in Munitions Response (MR) focus on technologies to detect and remediate remnant munitions on former and current ranges, burning or open detonation areas, and burial pits—one of the Department of Defense’s most pressing environmental problems. In 2010, SERDP and ESTCP continued efforts to develop and demonstrate sensors and data analysis techniques to remediate munitions present in both land and underwater environments. Technologies include advanced electromagnetic induction (EMI), magnetometry, sonar systems, neutron interrogation, residual risk assessment, advanced enabling technologies, phenomenology modeling, and various data analysis and modeling approaches. Results from these initiatives will provide new capabilities to cost-effectively characterize and remediate munitions response sites through high-fidelity munitions detection, an enhanced ability to distinguish munitions from other nonhazardous materials, and improved capabilities to deploy advanced technologies for a wide diversity of site conditions.

SPOTLIGHT on SERDP and ESTCP FY 2010
New projects in the SERDP and ESTCP program areas are highlighted throughout

SERDP Research

Additional information on these efforts can be found at www.serdp-estcp.org under the Program Areas/Munitions Response link.

Bulk Magnetization Effects in EMI-Based Classification and Discrimination (MR-1711)
Principal Investigator: Thomas Bell - SAIC

The objective of this project is to exploit all information available in the EMI response of a ferrous object in an effort to classify buried unexploded ordnance (UXO) and distinguish them from clutter. When an EMI signal is transmitted into an object, the bulk magnetization response produces a demagnetizing field in the object that can be fit to a simple parametric model and used to describe an object’s size and shape. This project will improve understanding of the basic elements of UXO/clutter discrimination and lead to improved discrimination performance.

Bistatic Portable Electromagnetic Induction Sensor with Integrated Positioning (MR-1712)
Principal Investigator: Benjamin Barrowes - U.S. Army Engineer Research and Development Center-Cold Regions Research and Engineering Laboratory

This project will research and develop decoupled EMI sensor configurations in which the transmitters (Tx) and receivers (Rx) are physically separated. The sensor will be able to be operated in either a cart-mounted or man-portable configuration. Physically decoupling the Tx and Rx coils will result in enhanced data quality and information content and provide a means to perform local positioning of the receivers, resulting in improved detection and discrimination of UXO.

Innovative Processing, Feature Development, and Specialized Data Collection for Underwater Munitions Advanced Classifier Design (MR-1713)
Principal Investigator: Eugene Lavely - BAE Systems

The objective of this project is to improve low-frequency sonar detection and classification of buried underwater munitions by developing new features that are highly diagnostic of target shape and composition. An innovative inversion algorithm will be applied to high-fidelity acoustic data obtained from various exemplar munition-like targets. The data from these targets can be modeled and utilized for improved detection and classification of underwater munitions. This research will lead to reductions in false alarm rates and improved classification using currently deployed low-frequency acoustic systems.

Exploiting VLF/LF Electric and Magnetic Fields for Underwater Munitions Characterization (MR-1714)
Principal Investigator: Gregory Schultz - Sky Research, Inc.

This project will evaluate the information available in the very low frequency/low frequency (VLF/LF) range to exploit both magnetic and electric field information for detection, localization, and discrimination of underwater UXO. The initial research phase will be followed by fabrication of a platform with optimal sensor configuration to investigate this low frequency band, which has never been fully analyzed for this application. Based on the results from SERDP project MR-1632, further research in this area has the potential to provide unique information to enhance detection and discrimination of underwater UXO.

Cost-Aware Design of a Discrimination Strategy for Unexploded Ordnance Cleanup (MR-1715)
Principal Investigator: Jeremiah Remus - Clarkson University

The objective of this SERDP Exploratory Development (SEED) project is to reanalyze existing UXO survey data for improved feature selection and UXO discrimination while applying a cost-aware design. Using high-quality data from the ESTCP Classification Studies at Camp Sibert, Alabama, and Camp San Luis Obispo, California, the robustness of four distinct classifiers will be assessed to ascertain which features exhibit behavior most consistent with the goal of detecting and distinguishing UXO from clutter. Improved data processing techniques and feature selection will provide more information to make “dig/no dig” decisions while investigating UXO and lead to cost savings.

High Sensitivity Magnetoresistive Sensors for DC and EMI Magnetic Field Mapping (MR-1716)
Principal Investigator: Sy-Hwang Liou - University of Nebraska

This project will investigate a lightweight, low-power, compact, practical high-sensitivity magnetic sensor system suitable for both DC and wide frequency band EMI magnetic field mapping. The envisioned sensor will be based on solid-state magnetic tunneling junction devices, which have sensitivity in the sub-picotesla range. A prototype will be built in a dual-mode system to characterize target size, shape, and location for a standard 20 mm shell and small munitions. Decreasing the weight of the sensor as well as maintaining high sensor sensitivity will enable investigation in difficult terrain and complicated geology.
Buried Underwater Munitions and Clutter Discrimination (MR-1717)
Principal Investigator: Jesse McNinch - U.S. Army Engineer Research and Development Center (ERDC)-Coastal and Hydraulics Laboratory

The long-term objective of this joint research effort involving ERDC and the Naval Research Laboratory (NRL) is to develop automated methods for discriminating buried underwater munitions from clutter. Researchers will extend NRL’s acoustic 2-D clutter classification techniques to the 3-D sub-bottom environment. The final 3-D Munitions and Clutter Classifier (MACC) will rely on NRL’s 2-D automated detection techniques, using derived bottom clutter and roughness as well as information from components derived from modeled and measured data to perform the discrimination. The improved discrimination techniques developed will significantly reduce time, effort, false alarms, and thus operational costs associated with typical underwater UXO remediation efforts.

Tools for Risk-Based UXO Remediation (MR-1718)
Principal Investigator: Dean Keiswetter - SAIC

This project will develop statistical tools to support residual risk-based assessment of sites contaminated by UXO. The tools will be based on and derived from three functions: (1) known spatial distribution of target of interest, (2) the probability of target detection, and (3) the probability of target classification. These tools will be tailored to the newly emerging sensors and algorithms developed for UXO investigations and provide a principled, grounded, and comprehensive method for determining UXO residual risk.

A Low-Frequency Electromagnetic Sensor for Underwater Geolocation (MR-1719)
Principal Investigator: Fridon Shubitidze - Dartmouth College

This SEED project will assess the feasibility of implementing low-frequency magnetic field transmission for underwater geolocation. This technology is based on the transmission of a pulsed low-frequency AC or a pulsed DC field for a large moment magnetic dipole transmitter towed along the sea surface. The primary magnetic field will penetrate the ocean medium to a set of triaxial receivers that will measure the field vector and the field gradient tensor. The capability to accurately determine underwater sensor position will enable high-resolution mapping of underwater sites and provide information for improved characterization and feature extraction of underwater targets.

All aspect, Mixed Aperture Processing for Imaging of Buried, Underwater Unexploded Ordnance (MR-1720)
Principal Investigator: Steven Wright - EdgeTech

The objective of this SEED project is to develop a new acoustic array processing approach that can be used in the development of a towed or unmanned underwater vehicle. The envisioned array is intended for wide area assessment as well as for detailed surveys of buried and proud underwater munitions. The array processing design will be developed by writing sonar modeling algorithms that use a mixture of synthetic and physical apertures where the mixed aperture effectively moves around the target. The initial design study is expected to produce a new imaging technology that can be implemented for imaging and classifying buried and partially buried underwater UXO.

Identification of UXO Using the Associated Particle Neutron Time-of-Flight Technique (MR-1769)
Principal Investigator: Sudeep Mitra - Brookhaven National Laboratory

This project will demonstrate the utility of the associated particle neutron time-of-flight (APNTOF) technique to detect and classify UXO by identifying an item’s contents as either nonhazardous or filled with high explosives. This technique uses an electronically collimated tagged neutron beam system to simultaneously provide a 3-D image of an object along with its elemental composition. This technique will afford new solutions to ascertain which recovered munitions present an explosive hazard and which do not.

Expanded Processing Techniques for EMI Systems (MR-1772)
Principal Investigator: Mark Prouty - Geometrics, Inc.

This project will perform a retrospective analysis on the high-quality data acquired during ESTCP’s Classification Study at the former Camp San Luis Obispo in California. The data analysis will be directed toward improving the performance of next-generation EMI sensors, developing powerful data processing algorithms, and providing a technical basis for determining the optimal configuration of a more advanced EMI system. This advanced analysis will lead to more efficient and cost-effective surveys, where fewer anomalies need to be revisited in a cued mode for identification.

ESTCP Demonstrations

Additional information on these efforts can be found at www.serdp-estcp.org under the Program Areas/Munitions Response link.

Clutter Identification Using Electromagnetic Survey Data (MR-201001)
Principal Investigator: Thomas Bell - SAIC

The objective of this project is to demonstrate that EMI survey data can be processed using position error tolerant techniques and algorithms to reliably distinguish anomalies caused by buried munitions from those caused by clutter items. A baseline will be established of what can be accomplished with standard EM61 survey data, advanced time-domain electromagnetic (TEM) sensor data will be analyzed to produce performance improvements, and performance on different sites will be documented. If successful, the reliable classification of targets detected during digital geophysical mapping (DGM) of a military munitions response site may lead to significant cost savings during the excavation and recovery phase.

See FY 2010 MR INITIATIVES, page 8
SERDP and ESTCP projects in **Weapons Systems and Platforms** (WP) focus on characterizing and reducing the environmental impact of producing, maintaining, and using Department of Defense weapons systems. In 2010, SERDP initiated research to develop sustainable resins and fibers used in military composites; environmentally friendly, non-aqueous cleaners; environmentally benign, high-performance non-media paint strippers; and replacements for ammonium perchlorate used in missiles and rocket motors, as well as to improve scientific understanding of the impact of lead-free electronics. ESTCP projects are demonstrating and validating alternatives to copper-beryllium alloy bushings; alternatives to perchlorate oxidizers in flare compositions; protective coatings for gas turbine engine compressor airfoils; non-chromate, non-VOC primers; and self-sealing fasteners. Results from these investments will provide DoD with several benefits, including a reduction in hazardous waste from certain industrial and maintenance processes, increased performance of targeted weapons systems, cost savings from replacing environmentally harmful substances, and compliance with more stringent environmental regulations.

**SERDP Research**

Additional information on these efforts can be found at [www.serdp-estcp.org](http://www.serdp-estcp.org) under the Program Areas/Weapons Systems and Platforms link.

**The Role of Trace Elements in Tin Whisker Growth (WP-1751)**
Principal Investigator: Thomas Woodrow - The Boeing Company

This project will quantify the effectiveness of certain alternatives to lead for reducing or eliminating whisker formation in electronic devices. Identification of elements besides lead that can suppress tin whisker growth when added to tin platings (or when deposited over the platings) would offer DoD users new mitigation strategies for preventing electrical shorting due to tin whiskers growing on circuit assemblies.

**Microstructurally Adaptive Constitutive Relations and Reliability Assessment Protocols for Lead-Free Solder (WP-1752)**
Principal Investigator: Peter Borgesen - SUNY Binghamton

The objective of this project is to develop quantitative knowledge and understanding of lead-free solder joints as well as lead-free joints mixed with tin-lead. Test protocols and guidelines for the interpretation of test results in terms of life in long-term service will be defined. Benefits to DoD users and the scientific community will include the identification of critical parameters to be controlled and practical tools for predicting and assessing the life of lead-free solder joints under a range of potential service conditions.

**Tin Whisker Testing and Modeling (WP-1753)**
Principal Investigator: Stephan Meschter - BAE Systems

This project will perform systematic tin whisker testing to assess the key manufacturing and environmental variable combinations hypothesized to contribute to whisker growth. In addition, two types of conformal coatings will be evaluated against non-coated assemblies for whisker growth and the potential mitigation effectiveness of those coatings for functional products. Studying interactions associated with component selection, manufacturing assembly process materials, and environmental test protocols will provide insight to whisker growth and potential mitigation actions for risk reduction at the product level.

**Contributions of Stress and Oxidation on the Formation of Whiskers in Lead-Free Solders (WP-1754)**
Principal Investigator: Elizabeth Hoffman - Savannah River National Laboratory

The objective of this project is to improve understanding of the role of stress and oxide formation on whisker growth in lead-free solders. Several commercially relevant lead-free solders will be evaluated for susceptibility to whisker growth as a function of stress and oxygen consumption. This will be done for both individual solders and solders in combination.

**Environmentally Compliant VER Composite Matrix Resin Derived from Renewable Resources (WP-1755)**
Principal Investigator: Yongwoo Lee - Foster-Miller, Inc.

This project will demonstrate the feasibility of producing a sustainable, environmentally safe vinyl ester resin (VER) economically from biowaste materials, namely lignin recovered from wood wastes and glycerin recovered from biodiesel wastes. Successful completion of the project will provide a sustainable, economical, environmentally compliant, and reliable source of VER needed for military and commercial composites.

**Identification of Important Process Variables for Fiber Spinning of Protein Nanotubes Generated from Waste Materials (WP-1756)**
Principal Investigator: Charlene Mello - U.S. Army Natick Soldier Research, Development & Engineering Center

The objective of this project is to develop and characterize environmentally friendly military relevant fibers. The availability of fibers that can be spun or assembled at high concentrations from sustainable resources and environmentally friendly processes and in which the fibers themselves have structural integrity provide the potential for multifunctionality.

**Directed Biosynthesis of Oriented Crystalline Cellulose for Advanced Composite Fibers (WP-1757)**
Principal Investigator: Hugh O’Neill - Oak Ridge National Laboratory

This project will develop a novel approach to induce orientation in cellulose fibers as they are extruded by cellulose-producing bacteria to ultimately yield unidirectionally orientated, highly regular, and crystalline cellulose nanofibers. The knowledge gained in this project will be applied to developing techniques to produce carbon fibers and other novel composite fibers with high structural strength and controlled properties.
Weapons Systems and Platforms Projects
the year. Weapons Systems and Platforms efforts are featured here.

Bio-Based Carbon Fibers and Thermosetting Resins for Use in DoD Composite Applications (WP-1758)
Principal Investigator: John LaScala - Army Research Laboratory

This project seeks to prepare high-performance carbon fiber and thermosetting matrix resins with high strength and high thermal resistance from renewable resources derived from plants and other sources. The use of biological resources to make these fibers and resins will help reduce the dependence of military composites on the volatile cost of petroleum, thereby reducing the cost of composite materials for DoD.

Cyanate Ester Composite Resins Derived from Renewable Polyphenol Sources (WP-1759)
Principal Investigator: Andrew Guenthner - Naval Air Warfare Center, Weapons Division

The objective of this project is to demonstrate the feasibility of converting diaryl polyphenols extracted from sustainable and renewable plant sources such as creosote bush to cyanate ester resins (polycyanurates) for use in high-performance polymer composites. Cyanate esters represent a “next generation” material with superior thermal stability, fire resistance, moisture resistance, and health and safety characteristics compared to epoxy resins.

Use of Non-Thermal Plasma for Cleaning and Decontaminating Weapons Systems and Platforms (WP-1760)
Principal Investigator: M.D. Cheng - Oak Ridge National Laboratory

The objectives of this project are to develop a non-thermal plasma cleaning technology in response to the need for an environmentally friendly, non-aqueous cleaner and to conduct a proof-of-principle investigation of the technique using metallic and non-metallic samples. The non-thermal plasma cleaning technology to be developed could be a valuable addition to the military decontamination and cleaning tool box.

Lipophilic Super-Absorbent Swelling Gels as Cleaners for Use on Weapons Systems and Platforms (WP-1761)
Principal Investigator: Veera Boddu - U.S. Army Engineer Research and Development Center-Construction Engineering Research Laboratory

The objective of this project is to develop a new cleaning technology based on lipophilic super-absorbent swelling gels for the removal of oil, grease, and particulate matters from metal and non-metal surfaces. If successful, this research will provide an environmentally benign, volatile organic compound (VOC)-exempt, hazardous air pollutant (HAP)-free surface cleaning technology.

Atmospheric Plasma Depainting (WP-1762)
Principal Investigator: Jerome Cuomo - North Carolina State University

The objective of this project is to develop an innovative media-free atmospheric plasma-based coating removal system for DoD ships and vehicle platforms. The PlasmaFlux™ technology offers a dry, media-free process that reduces the volume of solid waste, significantly lowers costs, and increases overall process efficiency compared to currently used processes.

Novel Oxygen-Rich Materials as Potential Ammonium Perchlorate Alternatives (WP-1764)
Principal Investigator: Greg Drake - U.S. Army, Redstone Arsenal

This SERDP Exploratory Development (SEED) project will explore the design, synthesis, and characterization of novel energetic oxidizers that pose less threat to human health and the environment than ammonium perchlorate and have the potential to replace it in propulsion system applications. This research has the potential to make available a large new class of oxygen-rich, less sensitive materials with a wide array of DoD applications.

Perchlorate- and Halogen-Free High Energy Density Oxidizers (WP-1765)
Principal Investigator: Thomas Klapotke - Ludwig-Maximilian University Munich

The objective of this SEED project is to explore the chemical synthesis of high-energy density oxidizers as possible replacements for ammonium perchlorate as the oxidizer in tactical missile rocket motors. Researchers will investigate the synthesis, sensitivities, thermal stability, binder compatibility, and decomposition pathways of these new high-oxygen materials, which have the potential to provide an environmentally benign (chlorine- and perchlorate-free) strong oxidizer for DoD applications.

Trinitromethyl Ethers and Other Derivatives as Superior Oxidizers (WP-1766)
Principal Investigator: Robert Chapman - Naval Air Warfare Center, Weapons Division

The objective of this SEED project is to develop a synthetic methodology leading to any example of the chemical class of trinitromethyl ethers, but especially those that appear competitive with ammonium perchlorate as an oxidizer in rocket motor applications. A critical issue to be addressed is the feasibility of preparing certain classes of compounds that may be suitable as ammonium perchlorate replacement oxidizers.

ESTCP Demonstrations

Additional information on these efforts can be found at www.serdp-estcp.org under the Program Areas/Weapons Systems and Platforms link.

Demonstration and Validation of Alternatives to CuBe Alloy Bushings for Low Frequency Rotational Wear Applications in Landing Gear (WP-201007)
Principal Investigator: Doug Ball - U.S. Air Force, Ogden Air Logistics Center

This project will demonstrate and validate two commercial bushing alloys as potential replacement materials for copper-beryllium (CuBe) bushing alloy in wear joint designs. Exposure to Be fine particulate would be eliminated by replacing the CuBe bushings on military aircraft with a bushing alloy that does not contain Be, providing a safer environment for maintenance workers.

Elimination of Perchlorate Oxidizers from Green Pyrotechnic Flare Compositions (WP-201008)
Principal Investigator: John Maassen - Naval Surface Warfare Center-Crane Division

The objective of this project is to demonstrate improved perchlorate-free green pyrotechnic compositions for colored flares. These perchlorate-free pyrotechnic flare compositions will eliminate adverse impacts to the environment from perchlorate manufacturing and testing and lead to a reduction in future cleanup costs of military facilities contaminated by perchlorate during the life cycle of the flares.

See FY 2010 WP INITIATIVES, page 8
**FY 2010 WP INITIATIVES, from page 7**

**Compressor Airfoil Protective Coatings for Turbine Engine Fuel Efficiency (WP-201009)**
Principal Investigator: Gregory Kilchenstein - Office of the Secretary of Defense, Maintenance Policy & Programs

The objective of this project is to demonstrate erosion-resistant coatings that can be applied to gas turbine engine compressor airfoils. These coatings decrease fuel consumption, lower carbon emissions, and decrease maintenance support requirements for fixed-wing and land-based weapon system platforms.

**Electrocoat Process for Non-Chromate Primers in DoD Manufacturing (WP-201010)**
Principal Investigator: Bill Nickerson - Naval Air Warfare Center, Aircraft Division

This project will demonstrate a novel electrodeposited, non-chromate, no VOC primer technology that is environmentally acceptable, efficient, and cost effective. This electrocoat process eliminates harmful chromates and VOCs and provides consistent film thicknesses and improved paint coverage on complex parts.

**FY 2010 MR INITIATIVES, from page 5**

**Autonomous Underwater Vehicle Munitions and Explosives of Concern Detection System (MR-201002)**
Principal Investigator: Ryan Steigerwalt - Weston Solutions, Inc.

This project will demonstrate the utility of commercial off-the-shelf technology in a modular autonomous underwater vehicle (AUV) equipped with an internally integrated magnetometer sensor and noise compensator for munitions detection in underwater environments. The AUV munitions and explosives of concern (MEC) detection system will integrate laboratory tested, off-the-shelf deployment and detection devices capable of performing wide area assessment as well as focused DGM surveys in underwater environments. This autonomous and self-contained system will provide cost savings over current surface vessel systems by reducing the mobilization and demobilization effort, requiring less manpower for operation, and reducing or eliminating the need for a surface support vessel.

**Vortex Lattice UXO Mobility Model for Reef-Type Range Environments (MR-201003)**
Principal Investigator: Gerald D'Spain - Scripps Institution of Oceanography

The objective of this project is to develop modifications to the previously developed UXO Mobility Model software that would implement reef geomorphology in the model grid building scheme. This feature will allow the model to predict UXO migration and burial in a reef environment without reliance on dense LiDAR bathymetric grids that limit the model’s computational domain. The long-term goal is to include the UXO mobility and burial model output in forthcoming risk evaluation models specifically configured to support munitions response programs.

**Practical Strategies for UXO Discrimination (MR-201004)**
Principal Investigator: Leonard Pasion - Sky Research, Inc.

This project will adapt and extend existing strategies for discrimination of UXO to emerging next-generation EMI sensors and test discrimination performance and techniques at increasingly complex and cluttered sites. The techniques that will be used and analyzed to improve discrimination include statistical classification of polarization tensor parameters, library matching, and statistical classification of data-based features. This project aims to provide flexible, reliable, robust, efficient, and effective signal processing algorithms and strategies that can be adapted to any site conditions and EMI sensor technologies.

**Self-Sealing Fastener Technology for Reduction of Hazardous Materials (WP-201011)**
Principal Investigator: Frederick Lancaster - Naval Air Systems Command

This project will demonstrate self-sealing fasteners as alternatives to separately applied sealant used on aerospace fasteners, which have severe performance requirements in operational environments. Precoated fasteners will reduce the amount of sealant used and ultimately disposed of as hazardous materials by 70 percent.

**Demonstration of an Ultrasonic Method for Three-Dimensional Visualization of Shallow Buried Underwater Objects (MR-201006)**
Principal Investigator: Michael Putnam - SPAWAR Systems Center Pacific

The objective of this project is to demonstrate the utility of a three-dimensional ultrasonic visualization system (3-D UVS) for undisturbed characterization and identification of submerged shallow-buried objects underwater. The 3-D UVS is composed of an underwater probe consisting of a 1-2 MHz broadband ultrasonic array with a tracking system and position sensor. The system generates an ultrasonic pulse and reads the echo, creating an image of the submerged object. It provides a visual image of individual buried UXO not visible on the surface.
The Symposium & Workshop will commence with presentations by distinguished Plenary Session speakers who will discuss emerging environmental challenges facing DoD. Rear Admiral David Titley is Oceanographer and Navigator of the Navy. Dr. Paul Anastas is Assistant Administrator for EPA’s Office of Research and Development. Dr. Robert Costanza is the Gund Professor of Ecological Economics and Director of the Gund Institute for Ecological Economics at the University of Vermont. Also, as part of the Plenary Session, SERDP and ESTCP principal investigators who have helped DoD achieve its mission while improving its environmental performance will be honored as the SERDP and ESTCP Project-of-the-Year Awards are announced.

Technical sessions will cover a variety of scientific and technical subjects. Following are this year’s topics.

- Sea Level Rise: Assessing Vulnerabilities and Impacts
- Opening the Arctic: Science Challenges to Understanding the Impacts of Climate Change
- National Environmental Monitoring and Indicator Systems: Implications for DoD
- Military Installations as Test Beds for Innovative Energy Efficiency Technologies
- Minimizing Hexavalent Chromium Use in DoD Operations
- Aviation and the Environment: Deicing and Noise
- Lead-Free Electronics
- Passive Sampling Approaches for Contaminated Sediment Management
- Remediation and Management of Persistent Chlorinated Solvent Contamination
- Monitoring and Mitigation of Vapor Intrusion from Contaminated Groundwater Sites
- Evaluating the Environmental Impacts of Energetic Materials
- Maintaining Sustainability of Forward Operating Bases
- Classification Methods for Military Munitions Response
- Military Munitions in the Underwater Environment

Short courses will offer unique training opportunities on emerging technologies and methods in munitions response and environmental restoration. Following are this year’s topics.

- Principles and Practices of In Situ Chemical Oxidation
- Measurement and Use of Mass Discharge and Mass Flux at Contaminated Sites
- Advances in Classification Methods for Military Munitions Response

Symposium & Workshop attendees will have access to:

- Information about world-class research and demonstrations addressing environmental challenges
- More than 450 posters supporting the technical program theme
- Booths offering information about funding opportunities in related research programs

Registration Now Available!
For the most up-to-date technical program information or to register, visit www.serdp-estcp.org/symposium.
Program Update

SERDP

SERDP released a Federal Call for Proposals and a Broad Agency Announcement (BAA) for its FY 2011 Core Solicitation on October 29, 2009. By the January 7, 2010, submission deadline for the BAA, the Program Office received 299 pre-proposals in response to 15 Statements of Need (SON). SERDP extended 127 requests for full proposals to submitters of the most qualified pre-proposals. One hundred twenty-one full proposals from the private sector and 87 proposals responding to the Federal Call for Proposals were received by March 11. In April, these private sector and federal proposals underwent an independent peer review evaluation with a subsequent review in June by the SERDP Technical Committees (STC).

On October 29, SERDP also released its FY 2011 SERDP Exploratory Development (SEED) Solicitation. SEED efforts are high risk and potentially high payoff projects that last no longer than one year and have budgets of $150,000 or less. Eighty SEED proposals responding to three SONs also were received by the March 11 deadline. These proposals underwent SERDP Staff review and were also reviewed at the STC proposal selection meetings in June.

The STCs have made recommendations to the SERDP Executive Director for the FY 2011 Core and SEED efforts. Proposers are in the process of being notified of the results.

For more information on the SERDP solicitation process, visit www.serdp-estcp.org under Funding Opportunities.

ESTCP

The ESTCP Solicitation for both environmental and energy technology demonstrations was released on January 7, 2010. The non-DoD Federal Call for Proposals and BAA solicited pre-proposals in four topic areas listed in the box to the right. The DoD Call for Proposals solicited pre-proposals in the four focus areas—Environmental Restoration, Munitions Management, Sustainable Infrastructure, and Weapons Systems and Platforms—as well as Energy. By the March 4 deadline, 128 pre-proposals were submitted by DoD organizations, and 249 pre-proposals were received from non-DoD federal and private sector organizations. In May and June, the ESTCP Technical Committees (ETC) reviewed the pre-proposals and recommended successful proposers to submit full proposals in early August for further review by the ETCs in September. Proposers will be notified of the results in October.

For more information on the ESTCP solicitation process, visit www.serdp-estcp.org under Funding Opportunities.

FY 2011 ESTCP BAA and Non-DoD Federal Topics

- Protection and Remediation of Contaminated Groundwater
- Military Munitions Detection, Discrimination, and Remediation
- Ecosystem Service Methodologies and Tools for Department of Defense Installations
- Energy Efficiency and Renewable Energy for DoD Installations

Congratulations to...

SERDP Principal Investigator Dr. Jo Ann Ratto and Mr. Jason Niedzwiecki of the U.S. Army Natick Soldier Research Development and Engineering Center—Combat Feeding Directorate (NSRDEC–CFD) Advanced Materials Engineering Team, who were selected as the first place winner of the annual packaging design competition supported by the National Institute of Packaging, Handling & Logistics Engineers (NIPHEL). The design entry, Advanced Secondary Packaging for Military Rations, was submitted under the Short-Life Packaging category, which emphasizes protection in the shipping environment. The research material and findings resulted from the successful execution of two projects—Lightweight and Compostable Packaging for the Military (WP-1479) and Multi-

Functional Secondary Packaging—funded by SERDP and the Combat Feeding Research & Engineering Program, respectively. This award-winning design has advanced efforts to make military combat ration packaging lightweight and compostable while dramatically eliminating post-use waste generated during training and combat activities.

ESTCP Principal Investigator Dr. Patrick Evans and colleagues from CDM who were awarded the American Academy of Environmental Engineers’ (AAEE) 2010 Superior Achievement Award for Environmental Engineering Excellence for their work on in situ remediation of perchlorate in vadose zone soil using gaseous electron donors. Perchlorate is a highly mobile groundwater contaminant widely used as an oxidizer in rocket fuel, munitions, fireworks, and road flares. Treatment technologies for groundwater contamination to date have not been successful in addressing source contamination in soil leaching into groundwater. Under ESTCP project ER-200511, CDM used its patented gaseous electron donor injection technology to demonstrate that indigenous bacteria in soil will consume perchlorate and nitrate in the presence of injected hydrogen gas.
New SERDP and ESTCP Resources

The following are samples of new publications now available on the SERDP and ESTCP web site (www.serdp-estcp.org). Access them from the Search box by entering the project number noted after the report title (e.g., 0125). Other documents may be accessed by entering an appropriate keyword.

Environmental Restoration

- Cost & Performance Report: Comparative Demonstration of Active, Semi-Passive, and Passive In Situ Bioremediation Approaches for Perchlorate-Impacted Groundwater (ESTCP ER-200219)
- Cost & Performance Report: Adaptive Long-Term Monitoring at Environmental Restoration Sites (ESTCP ER-200629)
- Cost & Performance Report: Using Electrical Resistivity Imaging to Evaluate Permanganate Performance during an In Situ Treatment of an RDX-Contaminated Aquifer (ESTCP ER-200635)
- Final Report: In Situ Bioremediation of Perchlorate in Vadose Zone Soil Using Gaseous Electron Donors (ESTCP ER-200511)
- Final Report: Dissolution Rate, Weathering Mechanics, and Friability of TNT, Comp B, and Octol (SERDP ER-1482)
- State-of-the-Practice Overview: Critical Evaluation of State-of-the-Art In Situ Thermal Treatment Technologies for DNAPL Source Zone Treatment (ESTCP ER-200314)
- Substrate Design Tool: Loading Rates and Impacts of Substrate Delivery for Enhanced Anaerobic Bioremediation (ESTCP ER-200627)

Munitions Response

- Cost & Performance Report: Predicting the Mobility and Burial of Underwater Munitions and Explosives of Concern Using the VORTEX Model (ESTCP MR-200417)
- Cost & Performance Report: Efficient Shallow Underwater UXO Retrieval (ESTCP MR-200606)
- Cost & Performance Report: Next Generation HeliMag UXO Mapping Technology (ESTCP MR-200741)
- Final Report: Demonstration and Validation of an Improved Airborne Electromagnetic System for UXO Detection and Mapping (ESTCP MR-200743)
- Final Report: Development of Autonomous UAV Helicopter-Magnetometer System for Wide Area Assessment-Phase II (SERDP MR-1509)

Resource Conservation and Climate Change

- Final Report: Predictive Modeling of Marine Mammal Density from Existing Survey Data and Model Validation Using Upcoming Surveys (SERDP RC-1391)

Weapons Systems and Platforms

- Cost & Performance Report: Replacement of Chromium Electroplating on Helicopter Dynamic Components Using HVOF Thermal Spray Technology (ESTCP WP-200127)
- Final Report: Near-Infrared Radiation-Based Composite Repair Using Thermoplastics as Adhesives (SERDP WP-1581)
- Final Report: Rapidly Degradable Pyrotechnic System (SERDP WP-1622)
- Final Report: Cyclic Dinitroureas as Self-Remediating Munition Charges (SERDP WP-1624)
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| SERDP Scientific Advisory Board (SAB) meeting | Environmental Restoration (ER) IPR meeting | GovEnergy 2010  
| Arlington, Virginia      | November 8-10 | Dallas, Texas  
|                          | Energy and Water (EW) IPR meeting | For more information, visit www.govenergy.com.  
|                          | November 30-December 2 | October 17-22, 2010             |
|                          | 2010 Partners in Environmental Technology | Society of Exploration Geophysicists (SEG)  
|                          | Technical Symposium & Workshop | International Exposition and 80th Annual Meeting  
|                          | Washington, D.C. | Denver, Colorado  
| OCTOBER 2010             | November 7-11, 2010 | For more information, visit www.seg.org.  
| October 5-6              | November 17-19, 2010 | November 7-11, 2010             |
| Munitions Response (MR) In-Progress Review (IPR) meeting | Green Build International Conference and Expo 2010 | Society of Environmental Toxicology and Chemistry  
| October 15               | December 6-9, 2010 | (SETAC) North America 31st Annual Meeting  
| SERDP and ESTCP quarterly progress reports due for the fourth quarter of government FY 2010 | ACES (A Community on Ecosystem Services)  
| October 19-21            | December 13-17, 2010 | Conference 2010  
| SERDP SAB meeting        | 2010 American Geophysical Union (AGU)  
| Arlington, Virginia      | Fall Meeting  
| October 25-26            | San Francisco, California  
| Weapons Systems and Platforms (WP) IPR meeting | For more information, visit www.agu.org/  
| October 28               | meetings/fm10.  
| Resource Conservation and Climate Change (RC) IPR meeting | February 7-10, 2011 | Battelle’s Sixth International Conference on  
| October 28               | November 17-19, 2011 | Remediation of Contaminated Sediments  
| Federal Call for Proposals and Broad Agency  
| Announcement for SERDP FY 2012 project funding | New Orleans, Louisiana  
| (Core and SEED solicitations) released on or about this date | For more information, visit www.battelle.org/conferences/sediments.  
|                         | December 6-9, 2010 | Battelle’s Sixth International Conference on  
|                         | ACES (A Community on Ecosystem Services)  
|                         | Conference 2010 | Remediation of Contaminated Sediments  
|                         | Phoenix, Arizona | New Orleans, Louisiana  
|                         | For more information, visit conference.ifas.ufl.edu/aces. | For more information, visit www.battelle.org/conferences/sediments.  
|                         | December 13-17, 2010 | Battelle’s Sixth International Conference on  
|                         | 2010 American Geophysical Union (AGU)  
|                         | Fall Meeting | Remediation of Contaminated Sediments  
|                         | San Francisco, California | New Orleans, Louisiana  
|                         | For more information, visit www.agu.org/  
|                         | meetings/fm10. | Battelle’s Sixth International Conference on  
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|                         | Remediation of Contaminated Sediments | For more information, visit www.battelle.org/conferences/sediments. |