SAND2015-10592R

Project Accomplishment Summary

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Sandia National Laboratories
Operated for the U.S. Department of Energy by
Sandia Corporation
Albuquerque, New Mexico

PROJECT ACCOMPLISHMENTS SUMMARY

Cooperative Research and Development Agreement (#1791.01.00)

between **Sandia National Labs** and **Boeing Research and Technology**

Note: This Project Accomplishments Summary will serve to meet the requirements for a final abstract and final report as specified in Article XI of the CRADA.

Title: Decontaminant Delivery and Application Methods to Enhance Decontamination Process and Efficacy

Final Abstract:

The objective for the experimental effort was to provide validation for the electrostatic aerosol transport models for particle size and deposition rate and to determine the feasibility of an electrostatic spray process in delivering non-corrosive decontaminants to complex interior spaces, such as an aircraft. The project utilized ITW (Illinois Tool Works) rotary atomizing induction charged nozzle to disperse small, charged droplets of liquid decontaminants uniformly through a contaminated space. Particle size and deposition studies were conducted prior to the feasibility study where the ITW nozzle was optimized and characterized for two decontaminants: EasyDecon^{TM}200 (DF-200) and Steriplex$^{®}$ SD. In addition to the validation studies, two feasibility studies were conducted with anthrax simulant (*B. atrophaeus*) and sarin simulant (diphenol chlorophosphate, DPCP). Running parameters for the two studies varied according to the starting contaminant challenges (1.0×10^8 CFU/m^2 for *B. atrophaeus* and 1.0 g/m^2 for DPCP), the amount of decontaminant deposition, and, finally, decontaminant to agent contact time. Results for the DPCP study confirm that our spray method met and exceeded the threshold criteria of <10 mg/m^2, post-decontamination, for Teflon and aluminum coupons. Results from this study also showed that polycarbonate and rubber coupons can be reduced by <98% and <92%, respectively. Results for the *B. atrophaeus* study presented a slightly different challenge due to coupon size, however, increasing the size of the coupon confirmed that it is possible for our spray method to meet the threshold criteria of <100 CFU/m^2. In addition, a computational model was developed in ANSYS Fluent to solve for the air flow, space charge, electric field, and droplet motion involved in electrostatic aerosol transport. Comparison of the model to experiments resulted in good agreement in deposition pattern and total mass deposited on surfaces. Finally, as a consequence of this project, the methodology used for decontamination could be used to improve future contamination scenarios by eliminating or reducing contaminant hazards, thereby allowing equipment and/or facilities, previously unusable, to be reclaimed rather than discarded, resulting in an overall cost savings to the customer.

Background:

The FY11 supplemental service call placed by JSTO-CBD, DTRA sought “new innovative decontamination delivery and application approaches for decontamination of chemical and biological warfare agents on a range of materials.” The solicitation specifically focused on the science necessary to enhance future apparatus design.

Description:

The Boeing Company, Sandia National Laboratories (SNL), and Illinois Tool Works (ITW) team proposed a systems approach to (i) develop a modeled guided experimental setup for investigation of the transport, deposition, surface-interactions, efficacy, and material compatibility achievable when decontaminants are applied as “charged-aerosols with airstream transport”; (ii) perform experimental investigation on a set of test coupons of materials and geometric features which are representative of military aircrafts, using a set of decontaminants and simulants; (iii) develop methods to determine optimal configurations of the

decontamination system, and the settings of its independent variables, which best suited to the contaminated scenarios selected for the analysis.

Benefits to the Department of Energy:

This project addresses DOE's need to anticipate and resolve emerging national security challenges by using a specific decontamination delivery method that enhances the decontamination process and efficacy after a contamination scenario. This project improves upon the current decontamination techniques used today and would help to protect public health and safety, as well as, the environment. This mythology, although not in use today, could help reduce hazards associated with contaminated area and could eliminate the need to discard, rather than reuse, effected equipment and/or facilities.

Economic Impact:

As a consequence of this project, the methodology used for decontamination could be used to improve future contamination scenarios by eliminating or reducing contaminant hazards, thereby allowing equipment and/or facilities, previously unusable, to be reclaimed rather than discarded, resulting in an overall cost savings to the customer. In addition, by eliminating or reducing contaminant hazards, it would also improve environmental, safety and health concerns.

Project Status:

The "Decontaminant Delivery and Application Methods to Enhance Decontamination Process and Efficacy" project is complete.

ADDITIONAL INFORMATION

Laboratory/Department of Energy Facility Point of Contact for Information on Project

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Company Size and Points of Contact

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CRADA Intellectual Property

None

Technology Commercialization

None

Project Examples

Final Report (SAND2014-4045)
Poster (SAND2014-3232P)

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between **Sandia National Laboratories** and **Boeing Research and Technology**

This summary has been approved for public release by Sandia and Boeing Research and Technology

Sandia National Laboratories for Mark Tucker

By _____ 7/30/15
Mark Tucker — Date
Principal Investigator

Sandia National Laboratories

By _____ 4·20·15
Manager — Date
WFO/CRADA Agreements

Boeing Research and Technology

By _____ _____
Title: — Date

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