

PN-ACD-237



Science Applications International Corporation
An Employee Owned Company

September 29, 1996

Ms Natalie Brand
Office for Central Europe and Eurasia, FO 2014
National Research Council
2101 Constitution Avenue, N W
Washington, D C 20418

Dear Ms Brand

We are pleased to forward our final report on the work accomplished under the CAST grant awarded to us in July of 1995 to host Professor Boris Smirnov from the former Soviet Union

We appreciate the opportunity afforded us to participate in this CAST program. It was a rewarding professional experience to NIST/SAIC, and especially to me. It was great working with Professor Smirnov.

If you have questions or comments regarding our report, please contact me at (301) 601-5665

Sincerely,

Science Applications International Corporation

A handwritten signature in black ink that reads "Ashot Nazarian". The signature is fluid and cursive, with a long horizontal stroke at the end.

Ashot Nazarian
Senior Scientist

bc

Enclosure

NATIONAL RESEARCH COUNCIL

OFFICE OF INTERNATIONAL AFFAIRS

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1055 Thomas Jefferson Street N W
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Date November 19, 1996
To USAID Center for Development, Information, Evaluation
From Sharon Vandivere
Subject CAST final reports

At the suggestion of John Daly of USAID's Bureau for Global Programs, I am sending the enclosed final reports of projects conducted under the Cooperation in Applied Science and Technology (CAST) program. The CAST program is funded by USAID and administered by the National Academy of Sciences. As I receive additional final reports, I will be sure to forward to you.

If you have any questions regarding the reports or the program, please contact me at 202-334-2644 or <occe@nas.edu>

Final Report

Cooperation in Applied Science and Technology (CAST) Program

Date September 27, 1996

U S Host Dr Ashot Nazarian, Science Applications International Corporation

Visiting Scientist Professor Boris M Smirnov, Moscow Institute of High Temperature, Russian Academy of Sciences

Date of Visit October 1995-July 1996

Scientific Objectives of the Visit

Theoretical/mathematical modeling of physical-chemical processes, in support of the joint Science Applications International Corporation (SAIC) and the U S Department of Commerce National Institute of Standards and Technology (NIST) Laser Driven Thermal Reactor (LDTR) project. Theoretical models of thermal destruction processes of some type of wastes and waste components were developed. Modeling results have been compared against the laboratory simulated measurement. In addition to providing the basis for improved waste destruction, these models may supply data that will be useful in the development of new national thermal characteristics standards.

Within the next year, simulated and actual waste streams will be analyzed to set new standards for thermal destruction. Commercial contracts for thermal analyses of waste will be signed (clients such as the U S Navy have been identified). Thermal destruction of waste will be carried out, and results will be analyzed and tabulated. The comparison of mathematical models against actual data will rely heavily on the work done by Professor Smirnov under this grant.

Current Location of the Foreign Colleague

After completion of the scientific and technical portion of the project, Professor Smirnov returned to Russia on July 5, 1996. He resumed work at the Moscow Institute of High Temperature, Russian Academy of Sciences as a Head of Sector and Chief Scientist.

Evaluation of the Project

Contemporary technologies for such processes as the combustion of fuels and propellants and incineration and thermal treatment of wastes require data to optimize system design and

operation. These data include thermodynamic parameters of the chemical reactions chains in specific processes, whose kinetics and rates will determine the course and results of the process. Having obtained data on rates of these phenomenological processes, one can then optimize a technology for given operating objectives. The development of the LDTR was inspired by the need to obtain such data. The LDTR method and device were demonstrated in a thermal decomposition of a liquid propellant. The LDTR provided quantitative information to help develop accurate models for understanding and optimizing treatment technologies for the propellant.

The LDTR can be used to determine the process conditions that optimize the thermal destruction of waste, minimize emissions, and satisfy environmental regulatory requirements. Different applications for LDTR technology in waste treatment and energetic materials field were identified and modeled. Theoretical models of thermal waste destruction processes developed by Dr. Smirnov during the project have been compared to laboratory results obtained with the LDTR, particularly for thermal destruction of a liquid propellant such as nitromethane. The work has provided a better understanding of kinetics and thermodynamics of this chemical process and can improve waste-fuel destruction and supply data that will be useful in the development of new thermal characteristics standards.

Development of a new, more efficient waste-fuel destruction technology will benefit not only the United States, but Russia and other countries of the former Soviet Union who have large quantities of rocket propellants/wastes. These chemicals are hazardous to the environment and human health. The LDTR technology has a potential for extensive implementation, which could be accomplished through joint licensing agreements, for the benefit of entrepreneurs in both the former Soviet Union and the U.S. Implementation would also mean increased opportunities for technical exchange. SAIC is committed to promoting technological initiatives and competence of the former Soviet Union scientific community in the U.S. Although not springing specifically from military research in the former Soviet Union, this project has direct application for both military and civilian use, as stated above, in destroying hazardous materials.

Publications/Presentations

The results of this project were incorporated and presented as papers at international conferences and a symposium. Technical papers on these studies were entitled "Thermal Characterization of Mixed Wastes," presented at Waste Management 96, February 25-29, 1996, in Tucson, AZ, "Characterization and Modeling of the Thermal Process of Hazardous Wastes and Propellants," presented at the International Conference on Incineration and Thermal Treatment Technologies, May 6-10, 1996, in Savannah, GA, and "Thermal Modeling and Characterization of Propellants," presented at the Fourth International Symposium on Special Topics in Chemical Propulsion, May 27-31, 1996, Stockholm, Sweden.