PROPULSION DIRECTORATE

Monthly Accomplishment Report
April 2006

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DR. GANGULY'S CAREER ACHIEVEMENTS HONORED BY AFMC: The Propulsion Directorate's Dr. Biswa N. Ganguly was recently selected to receive the 2005 AFMC Career Achievement Award. This award is presented as part of the 2005 AFMC Engineering & Technical Management Awards. Dr. Ganguly, a Senior Research Physicist in AFRL/PR's Electrical Technology and Plasma Physics Branch (AFRL/PRPE) at Wright-Patterson AFB, Ohio, distinguished himself over the course of a fruitful 24-year career. During this span, he worked on developing and transitioning new plasma technologies that have application to hypersonic flight and advanced high temperature, high efficiency military electronics. He is a recognized world leader in the interaction of shock waves and weakly ionized plasmas. This technology has the potential to revolutionize future hypersonic vehicles by reducing drag, decreasing hypersonic thermal problems, and greatly improving combustion efficiency and specific fuel consumption. Dr. Ganguly also leads a research team in the development of novel manufacturing techniques for emerging Silicon Carbide (SiC) electronic devices. These techniques hold the promise of dramatically improving processing performance at significantly reduced cost as well as providing the potential for a two-fold reduction in the size and weight of electronic equipment. (Mr. Joe Weimer, AFRL/PRPE, (937) 255-6236)

Dr. Biswa was recently selected to receive the 2005 AFMC Career Achievement Award

ORBITEC SUCCESSFULLY IGNITES VCCW ENGINE: Orbital Technologies Corp. (ORBITEC) of Madison, Wisconsin, has successfully demonstrated the ability to ignite a small-scale LOX*/Propane Vortex Combustion Cold Wall (VCCW) engine. The engine firings that demonstrated this capability were accomplished in support of a Congressionally Funded Phase III Small Business Innovation Research (SBIR) Program. These firings demonstrated the ability to successfully ignite the engine, refine the ignition sequence, and safely decrease the ignition duration while avoiding a catastrophic explosion. Controlling the ignition is considered to be a significant accomplishment. One engine firing was for a 1/2 second duration with a 560 lb_f peak thrust, and the other firing was for a 1 second duration with a 160 lb_f peak thrust. The chamber wall static pressure for these tests was 140 psia. Steady-state operation, which has yet to be demonstrated, will be at a chamber wall pressure of 200 psia and a thrust of 800 lb_f. In a VCCW engine, the hot combustion gasses do not directly contact the combustion chamber wall. Therefore, the chamber wall is not exposed to high temperatures and remains cool, which leads to a greater durability. The goal of this project is to facilitate commercialization of the VCCW technology to enable more affordable, higher performing, longer lasting, and more operable sub-orbital launch vehicles. (Mr. Carl E. Ousley, AFRL/PRSE, (661) 275-6346)

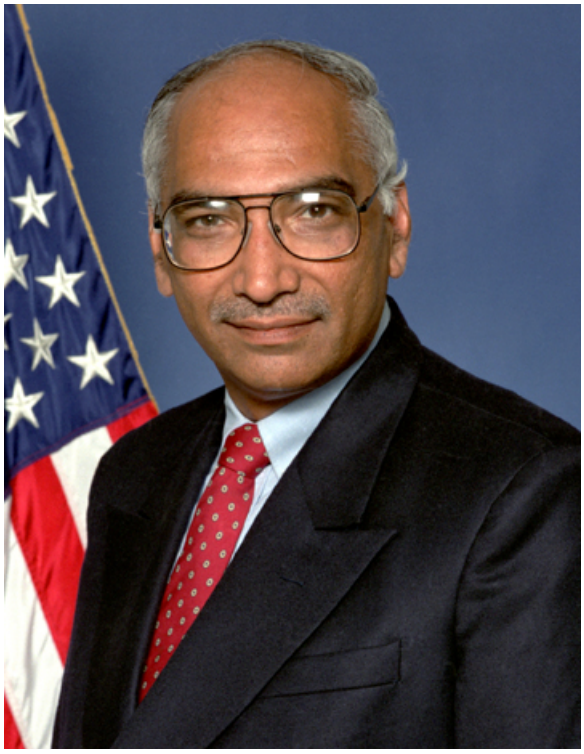
* LOX = liquid oxygen

Testing of ORBITEC's Vortex Combustion Cold Wall (VCCW) engine

MS. HOWARD WINS IPMA FEDERAL EMPLOYEE OF THE YEAR AWARD: The Propulsion Directorate's Ms. Elizabeth Howard was recently selected to receive the International Personnel Management Association (IPMA) Federal Employee of the Year Award in the Human Resources Management and Affirmative Action category. Ms. Howard is a Management Analyst in AFRL/PR's Business Services Branch (AFRL/PROB) at Wright-Patterson AFB, Ohio. She is responsible for AFRL/PR's Military Personnel Program at Wright-Patterson AFB and she also has oversight of the AFRL/PR organizations located at Edwards AFB, California. Ms. Howard's knowledge of military personnel is very broad, and she is an outstanding performer in the planning, implementation, execution, and overall management of this program. Her efforts allow each of AFRL/PR's divisions to more effectively project and manage their military assets. Ms. Howard also manages summer hires through the Student Temporary Employment Program

Ms. Elizabeth Howard was selected to receive the IPMA Federal Employee of the Year Award in the Human Resources Management and Affirmative Action category

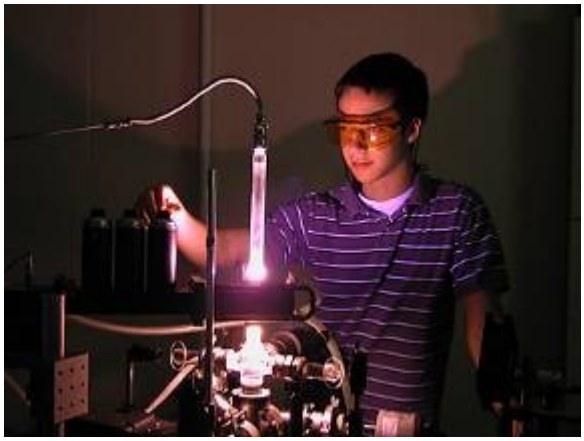
(STEP) for AFRL/PR organizations located at Wright-Patterson AFB, and she maintains oversight of the PR organizations located at Edwards AFB. AFRL/PR employs more than 40 students through this program. Ms. Howard's skill and efficiency in processing the numerous student requests for personnel actions ensures that the needs of both management and students are met. (Ms. Sharon Steltz, AFRL/PROB, (937) 255-1889)


Dr. Suresh Suri

A SUPERIOR APPROACH TO THE SYNTHESIS OF ENERGETIC IONIC LIQUIDS: The Propulsion Directorate's Dr. Suresh Suri and Mr. Jacob Marcischak have developed a superior methodology for the synthesis of nitrate derived ionic liquids. Interest in nitrate derived ionic liquids derives from their possible use as replacements for state-of-the-art energetic materials for explosives and rocket propellants. Typically, the synthesis of nitrate ionic liquids involves the use of an excess of alkyl iodide to form corresponding iodide salts, followed by metathesis of iodide anion with nitrate using silver nitrate ($AgNO_3$). This technology has drawbacks: (1) alkyl iodide is expensive, (2) silver nitrate is difficult to work with, and (3) traces of silver salt need to be removed from the final product. The new methodology is superior to other known methodologies in that the by-products are gaseous, thus isolation of the product is not labor intensive, it requires inexpensive reagents, and it does not require alkyl iodide and silver nitrate for the synthesis of nitrate derived ionic liquids. Thus, the use of this new methodology will significantly reduce the cost of production of nitrate derived ionic liquids. This methodology has been successfully demonstrated by using imidazolium salts with the new agent. (Dr. Suresh Suri, AFRL/PRSP, (661) 275-5952)

WRIGHT SCHOLAR PROGRAM KICKS OFF FIFTH YEAR: The Wright Scholar Research Assistant Program kicked-off its fifth year with a new student orientation at the University of Dayton in Dayton, Ohio, on April 22, 2006. The Wright Scholar Program is a Propulsion Directorate sponsored program designed to offer summer employment to high school and college bound students from the Wright-Patterson AFB commuting area. This highly competitive program has consistently attracted some of the area's brightest high school juniors and seniors. In the program, these students obtain hands-on experience in a variety of science and engineering career fields. The University of Dayton and the Air Force Institute of Technology both actively participate in the program by offering short tutorials in various scientific and engineering disciplines, including the analysis and operation of a real jet engine! This year, there will be 21 new students participating in the program, 6 returning students from the 2005 program, as well as 5 new students from the Springfield School District hired as contractors through AVeTEC. The students will be working in various locations across Wright-Patterson

AFB including AFRL's Propulsion (AFRL/PR), Air Vehicles (AFRL/VA), Sensors (AFRL/SN), and Human Effectiveness (AFRL/HE) Directorates, Aeronautical Systems Center (ASC), and the Air Force Institute of Technology (AFIT). (Ms. Shelley Rich, AFRL/PROP (UTC), (937) 255-1870 and Mr. John Horner, AFRL/PROP, (937) 255-6710)



Former Wright Scholars