An Introduction to the Biennial Research and Technology Development Report 2009

The Johnson Space Center's (JSC's) core mission is human space flight and human space exploration. Center personnel have focused on human space flight for the past 5 decades, making great strides in engineering, science, and technology innovations and developments. Currently, JSC supports three major human space flight programs: the Space Shuttle, International Space Station (ISS), and Constellation Programs. To implement its assigned technical missions, JSC supports active engineering, mission operations, space and life sciences, and planetary science research in support of human space flight. JSC's talented scientists and engineers bridge the gap between conceptual laboratory research and technology development and real-life space flight applications. These research and technology developments have matured and evolved over the years. Each year the center's engineers and scientists innovate, collaborate, and share knowledge with cohorts in the U.S. government, international partners, aerospace companies, universities, industry, and various institutes to meet the new opportunities and challenges that are always occurring.

This Biennial Research and Technology Development Report highlights the diverse technical, scientific, and engineering research and technology development under way at JSC.

We want to engage the commercial, public, and academic sectors through our research and technology development, leading to collaborations of mutual interest with both commercial and academic groups. As all indicators point to a burgeoning commercial aerospace industry, we would like members of the commercial aerospace enterprise to look through the pages of this report and contact us concerning potential collaborative efforts in technologies of mutual interest.

To make this report user-friendly, we have organized the contents into the following nine broad categories:

Human health and medicine: Addresses topics from decision-making to practicing medicine in hostile/extreme environments, and analog medical research such as medical issues in Antarctica to new, cutting-edge medical technologies.

Environmental technologies: Covers resource recycling and recovery technologies, air quality monitoring, and radiation protection research.

Materials development and testing: Includes new developments in nondestructive evaluation tests and acoustic characterization of pressure vessels, single-wall carbon nanotube growth, and inflatable materials development.

Flammability and explosion testing, including protection and testing standards: Deals with the many NASA-pioneered testing methodologies in this arena as well as with the standards NASA helped to develop for use in industry.

Power, battery, and propulsion technologies: Encompasses NASA fuel cell and battery development efforts and high-sensitivity measurements for permeation of materials such as hypergol.

Robotics and automation technologies: Focuses on engineering and software developments for robotic systems, including human-assisted robotic devices for space and surface operations.

Technologies for harsh environments, including EVA [extravehicular activity] technologies: Contains reports on technologies such as ventilation systems, a potable life support system, and a water egress and survival training system.

Space and ground operations: Consists of software developments for ISS operations, data mining, and a low-impact docking system.

Planetary sciences: Concentrates on reports of new discoveries of cometary particle and results from planetary and rover research, educational, and outreach initiatives using Earth Observation imagery from ISS.

NASA's rigorous engineering and scientific demands to accomplish its mission lead either to the creation of new technologies or improvement and customization of those already available. Once proven, these technologies can potentially be used in a multitude of commercial products and markets.

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