

Introduction

NASA/Johnson Space Center (JSC) is a leader in human spaceflight. The center has three major human spaceflight programs and conducts space science research. Although the Space Shuttle and International Space Station Programs are mature, constant advancements in engineering and science are essential for successful operations of these programs. With the advent of the Exploration missions, JSC engineers and scientists are working to meet new challenges as we forge ahead to accomplish these missions. The authors of these reports are employed by the U.S. government, aerospace companies, universities, and other partners.

The purpose of this report is to highlight the technical and diverse science and engineering efforts for our colleagues. JSC wants to engage the public and private sectors in our research and technology needs, leading to collaborations of mutual interest. This report is a valuable compilation of many advances in research and technology accomplished by our talented engineers and scientists.

Some salient examples of what you will find in this report reflect astromaterials research and exploration science, life and medical science, engineering, extravehicular activity, White Sands Test Facility, and education and center operations.

Examples of astromaterials research and exploration science demonstrate major improvements in the handling and analysis of extremely small solar and asteroid particles.

Life and medical sciences research includes neuro-vestibular research and arterial and cardiac function in 6-degree head-down tilt bed rest.

Our engineering research includes the designing of a prototype ultra-wide band tracking system for lunar operations where navigation tools (e.g., Global Positioning Systems) are not available. This research will have valuable applications on Earth for tracking firefighters in forest fires or in buildings. JSC engineers are determining how to do on-orbit repairs, with curing and verification technologies for self-reliant systems using carbon nanotubes and microwave energy getting promising results. We are also studying the

ramifications of applying laser peening – a relatively recent surface treatment technique for increasing fatigue properties where failure is caused by surface-initiated cracks – to friction stir welding for space operations.

The extravehicular program is developing the best medical and engineering practices to maintain a productive, healthy crew during these very difficult and dangerous work situations. Lunar activities require lighter payloads, with more recycle capabilities.

Our White Sands Test Facility is a world leader in testing and evaluating technologies. Its research on ignition testing on multiple spacesuit materials placed in various oxygen concentrations is critical for future Exploration missions.

As this brief glimpse into our diverse research endeavors indicates, we are working to make NASA's Exploration missions a reality!

JSC's commitment to science, technology, engineering, and math (STEM) educational programs for elementary schools through post-doctorate programs is strong. JSC also leads science education activities through the digital learning network. Finally, advances in technology are needed for our work with the community and to facilitate space center operations.

Collaborating with Johnson Space Center

NASA and JSC have a long history of working with colleges and universities, industry, federal laboratories, and other research and technology development organizations. Several vehicles are available to accomplish the collaboration and partnership objectives. Collaborative agreements, both reimbursable and non-reimbursable, can be used to provide mutual leverage of government, university, and industry resources in the cooperative pursuit of joint-interest research and technology development efforts. We look forward to hearing from you.

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