SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Future Space Transportation Systems Verification and In-Flight Experimentation (6)

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SPACEX DRAGONLAB AS A PLATFORM FOR MICROGRAVITY RESEARCH

Abstract

Microgravity experimentation and utilization are of interest to many fields of scientific research, engineering development and commercial manufacturing. Although many flown payloads have yielded highly successful and promising results, infrequent flight opportunities and irregular re-flight options have impeded the development of sustained research programs or plausible commercial business models. The SpaceX Falcon 9 launch vehicle and Dragon spacecraft are both slated for inaugural flights in 2009 with multiple missions annually thereafter. Flights will be to the ISS and also as commercial free-flyer missions, dubbed "DragonLab", specifically for in-space experimentation. Both pressurized and unpressurized payloads can be accommodated with recovery of pressurized payloads as a standard service. DragonLab's flexible capability and launch rate will make access to microgravity significantly more frequent and affordable. The prospect of routine access to space will enable researchers in a variety of fields to expand their microgravity research while fostering the growth of new industries and research possibilities. SpaceX has added to its manifest two free-flying missions of its "DragonLab" spacecraft. This improvement in access to the orbital microgravity environment has piqued the interest of the scientific community as microgravity research opportunities abound in both the physical and life sciences. Potential areas of physical science research include the material, fluid and combustion sciences among others. Crystal growth and metallic deposition are examples of specific material science fields where significant possibilities are known to exist with crystals grown in microgravity exhibiting more diverse structures with fewer defects and inclusions than otherwise possible. Vast life science research possibilities include fundamental biology, biotech and space medicine. Many of these processes have been found to be modified or enhanced in a microgravity environment and may be critical to manned missions to the moon and beyond.

Aside from fundamental microgravity research, DragonLab also serves as a platform for research in material sciences and radiation effects, especially space environment effects on surfaces and coatings. DragonLab offers both recoverable and non-recoverable payload accommodations with exposure to the space environment. DragonLab will also be capable of carrying instruments and sensors into space for on-orbit testing, verification and the attendant accumulation of flight heritage. This paper emphasizes the value of DragonLab as an on-orbit scientific platform for microgravity research and manufacturing by outlining and discussing the various known and potential areas it will make available.