# 2008 Summary of Research Reports

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**Project:** MIcroDosimeter iNstrument (MIDN) Suitable for Spaceflight
**Sponsor:** National Space Biomedical Institute

**Statement of Work:**

The specific aims of this research project are to develop a rugged, portable, low power, low mass, solid-state microdosimeter suitable for spaceflight and verify its performance through radiation beam testing and computer modeling. This objective was expanded to include development of an instrument suite for the MidSTAR-I spacecraft under construction at the Naval Academy by midshipmen to be launched in October 2006. This will provide a portable instrument for consideration for use on the ISS and flights of the CEV and provide a benchmark for future improvements. A microdosimeter has the ability to directly assess radiation risk since it measures energy- deposition events in silicon cells comparable in size to tissue cells. Since a microdosimeter measures the charge deposited in microvolumes, it is also a superior device to assess the potential damaging effects of radiation to digital electronic devices.

**Project:** Debris Resistive/Acoustic Grid Orbital Navy Sensor (DRAGONS)
**Sponsor:** NASA

**Statement of Work:**

This proposal to the NASA Orbital Debris Program Office at the Johnson Space Center is to develop and test an engineering model of an instrument called DRAGONS (Debris Resistive/Acoustic Grid Orbital Navy Sensor) that can be used to demonstrate the viability of the concept to measure the flux of hypervelocity debris and dust particles in space. The engineering model will consist of a resistive grid and an acoustic system in which the resistive grid can measure the size of the impact and the acoustic system can measure the energy of an impacting particle. The engineering model will consist of an acoustic array of approximately 50x50 cm which would hold an array of 3x3 resistors. Each resistor consists of nominally 1100 parallel traces 75 µm wide of a NiCr alloy, with a 75 µm wide space between traces. The acoustic system will consist of one to four acoustic transducer(s) per resistor. The engineering model will be connected to a personal computer that will simulate a microprocessor to process the data from the resistive grid and acoustic system during impact testing. During the fiscal year the Engineering Unit will be constructed and tested to evaluate performance. The team will also interact with the STP program office to investigate flight opportunities and prepare a conceptual design if appropriate. The delivery will be a report describing the design of the engineering model and test results. If the STP identifies a flight opportunity, a conceptual design of a flight instrument will be provided if sufficient time is available.

**Project:** Micrometeoroid and Lunar Secondary Ejecta (MMSE) Impact Sensor
**Sponsor:** Johnson Space Center

**Statement of Work:**

We propose to develop a micrometeoroid and lunar secondary ejecta (MMSE) impact sensor system for future exploration missions on the Moon. The first objective of our proposal is to improve the MMSE environment definition on the surface of the Moon by developing and testing concepts for attaching acoustic sensors to a large surface area of a dedicated experiment or to the suitable exterior of any large-scale structures proposed for early exploration of the Moon. Characterization of the MMSE environment will include fundamentally the impact flux, but also, where possible, the impact speed and mass of the impacting particle. The data collected can then be utilized to provide reliable impact risk assessments for future missions, and to develop proper shielding design to reduce MMSE impact risks for future robotic and human exploration activities on the Moon. The second objective is to explore the feasibility of utilizing the acoustic sensor system to monitor potential MMSE impact damage on any large-scale exploration permanent structures on the surface of the Moon.