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UNH Space Scientists Awarded Over \$8 Million To Build Unique Detector For Next-Generation Weather Satellites

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DURHAM, N.H. – Astrophysicist Jim Connell’s Angle Detecting Inclined Sensors (ADIS) system is simple and elegant in its design, reliable in operation, and relatively inexpensive. In part because of those merits, an ADIS-based instrument was recently selected for the future National Polar-orbiting Operational Environmental Satellite System. A team of scientists, engineers, and students at the University of New Hampshire will design and construct two identical instruments for delivery sometime in 2010-11.

NPOESS is a multi-agency, multibillion-dollar program that consolidates existing polar-orbiting, Earth-observing satellite systems under a single, ongoing national program. These next-generation satellites collect and disseminate data on Earth's weather, atmosphere, oceans, land, and near-space environment. The polar orbiters are able to monitor the entire planet and provide data for long-range weather and climate forecasts. In addition, they are able to monitor the forces that control “space weather” – coronal mass ejections from the sun and disturbances in the Earth's magnetic field – and this is where ADIS comes in.

ADIS is the heart of an instrument called the High Energy Particle Sensor or HEPS, which is currently being designed by a UNH team headed by Connell of the Institute for the Study of Earth, Oceans, and Space (EOS) and the Department of Physics. The HEPS-ADIS instrument will identify high-energy, heavy ions (charged particles) in space that can bombard, damage, and disable spacecraft electronics, and can be a danger to humans in space or on polar-route aircraft.

“When there’s a big solar event nasty things happen to electronics in space, including satellites dying – satellites that cost hundreds of millions of dollars - so there’s an obvious interest in trying to detect these ions,” says Connell. For example, a direct hit on a microcircuit by a heavy ion like iron could deal a fatal blow to spacecraft electronics.

For the current project, UNH is a subcontractor to Ball Aerospace and Technologies Corporation of Boulder, Colorado, which will provide the Space Environmental Sensor Suite for spacecraft constructed by Northrop Grumman Space Technology, the prime contractor for the project. Connell notes that the UNH team will build two HEPS instruments at a cost of more than \$8 million for a spacecraft that will carry a host of instruments, some of which will cost over \$100 million a piece.

Traditionally, energetic ions have been identified by complicated position-sensing detectors that

require more electronics, more power, and more computational corrections to calculate the angle of incidence that, in turn, helps identify the ion. But by virtue of a series of oval-shaped, quarter-sized inclined sensors, ADIS can identify ions with relative ease.

Says Connell, “What’s unique about ADIS is that it is a very simple and conservative approach in terms of the technology, which is what you want for an operational mission – the instruments have to be very reliable.” And yet, despite its simplicity, ADIS can collect data above and beyond the mission goals, and the device – and perhaps generations of ADIS-like instruments – will provide scientists with a wealth of information that can be used for science for years to come.

In addition to ADIS’s design and operational strengths, UNH is well positioned to continue work in the business of detecting high-energy, heavy ions. Connell and colleagues Bruce McKibben and Cliff Lopate have a long history investigating heavy ions (first at the University of Chicago and now as members of the UNH Space Science Center) and there is a rich heritage of similar work that has been done at UNH over the last 50 years. The shared vision in the SSC amongst scientists, technicians, and students is to continue to build a series of ADIS-based instruments for a variety of space missions well into the future.

Berrien Moore, director of EOS, noted the elegance of the ADIS concept, the university’s long tradition of delivering exceptional space instrumentation to the nation, and the brilliant future based upon ADIS and other recent NASA awards to EOS for space hardware.

NPOESS is a Department of Commerce, Department of Defense, and National Aeronautic and Space Administration program and is managed by the Integrated Program Office within the DOC's National Oceanic and Atmospheric Administration. For more information, visit <http://www.ipc.noaa.gov>. For more on the UNH Space Science Center, visit <http://www.eos.unh.edu/Resctr/SSC>.