CubeSat mission selected by NASA to study solar particles and space weather

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NASA has selected Southwest Research Institute (SwRI) to develop CuSPP, a CubeSat mission to study Solar Particles over the Earth's Poles. SwRI will also lead mission science operations and data analysis.

During the five-year project, engineers and scientists will design, develop and integrate a CubeSat—a nano-satellite launched as a secondary payload on another satellite mission—carrying a novel miniaturized Suprathermal Ion Sensor (SIS) developed at SwRI. The SIS will measure the sources and acceleration mechanisms of solar energetic particles that are harmful to astronauts as well as Earth-based technologies.

CuSPP can also be used to support space weather research by measuring particles that escape ahead of powerful shock waves in the solar wind. Upon striking the Earth, solar particles and shock waves can cause severe electromagnetic storms, damage satellites, disrupt radio communication and navigation signals, damage electric power grids and corrode pipelines.

In addition, CuSPP is designed to measure the properties of ion populations entering the ionosphere, the uppermost portion of the Earth's atmosphere.

"Upon successful completion, we expect CuSPP to have achieved several key goals, such as increasing the technological readiness level and reducing the risks and costs of flying a new class of SwRI science

instruments for studying heliophysics—the Sun's effects on the solar system," says Dr. Mihir Desai, CuSPP principal investigator and a staff scientist in the SwRI Space Science and Engineering Division. "We also expect to provide critical measurements that shed light on the origins of hazardous charged particle populations accelerated at the Sun and interplanetary space, as well as play a major role in developing reliable nano-satellites for NASA and other sponsors."

CuSPP will fly as a secondary payload as early as 2017. It will reside in a high-inclination (> 65 degrees) low-Earth orbit, approximately 500 km above Earth, for the duration of its mission. The primary satellite on which CuSPP will launch will be named at a later date.

The CubeSat concept was developed in 1999 as an academic tool to provide students with an inexpensive way to gain hands-on experience in designing and building satellites. More recently, they have been used for scientific research, exploration, technology development and operations. A standard CubeSat is a 10 centimeter cube with a one-liter volume. CuSPP is 30 by 10 by 10 centimeters with a volume of three liters.

NASA has increased the reliability and functionality of CubeSats to extend the use of this miniaturized platform into deep space. The agency recently implemented a new CubeSat initiative for its Science Mission Directorate (SMD).

SwRI is collaborating with the NASA Goddard Space Flight Center, Greenbelt, Md., to produce the CubeSat, including the flight segment (integrated at SwRI), ground segment (provided by the NASA Wallops Flight Facility) and payload (developed at SwRI). CuSPP was selected as part of the 2013 Heliophysics-Technology and Instrument Development for Science (H-TIDeS) 2013 competition, with funding from the new NASA SMD-wide CubeSat initiative managed by NASA's Heliophysics Division.