

# NASA Radiation Belt Storm Probes to launch, UNH components aboard

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At 4:08 a.m. Thursday, August 23, NASA's twin Radiation Belt Storm Probes are scheduled to launch from Cape Canaveral, Florida on a two-year mission to investigate Earth's hazardous radiation belt environment as never before. On board both spacecraft will be a host of scientific hardware and software from teams at the University of New Hampshire's Space Science Center (SSC).

Harlan Spence, director of the UNH Institute for the Study of Earth, Oceans, and Space, is lead scientist or "principal investigator" of the [Energetic Particle](#), Composition, and Thermal Plasma (ECT) instrument suite on the twin spacecraft, and Roy Torbert, director of the SSC, is a co-investigator on the Electric and Magnetic Field Instrument Suite and Integrated Science (EMFISIS) experiment.

Collectively, the mission's five instrument suites will make the most [precise measurements](#) to date of the high-[energy particles](#) and magnetic and electric fields and waves in this near-Earth region of space where "space weather" occurs and hundreds of spacecraft operate.

Space weather is caused largely by activity from the sun, including enormous [solar storms](#) known as coronal mass ejections. The RBSP mission will enable better understanding and prediction of space weather conditions in the radiation belts, which can influence the performance and reliability of space-borne and ground-based technological systems and can endanger human life or health.

The [Van Allen radiation belts](#), named after James Van Allen who discovered them in 1958 during the flight of the Explorer 1 satellite that initiated U.S. space exploration, are two donut-shaped regions of high-energy particles trapped by Earth's magnetic field. At the time of their discovery the radiation belts were thought to be relatively stable structures, but subsequent observations have shown they are highly dynamic—and the reasons for this behavior remain a mystery.

For example, sometimes after a solar storm the number of particles (protons and electrons) that populate the belts can increase dramatically and their speeds can approach the speed of light or become "relativistic"—about 186,000 miles per second. (At such speeds even miniscule particles like electrons can inflict serious damage to any matter they hit.) However, at other times after similar space weather events, the particles decrease in number and speed, or conditions seem to stay the same.

Says Spence, "There can be a solar storm and the radiation belts will get pumped up, or nothing happens, or they'll nearly disappear entirely. That's puzzling, and right now we don't understand enough to say why it's the case."

To decipher the mystery, the unprecedented dual RBSP spacecraft will brave the storm and investigate the region for a minimum of two years. The satellites will chase each other in common, highly elliptical orbits to achieve simultaneous spatial and temporal measurements of the particles and the magnetic and electric fields and waves.

"We know we can't study the particles in the absence of the electromagnetic fields that are causing them to change," says Spence. "Until RBSP there has never been a comprehensive, coordinated investigation with two spacecraft simultaneously."

The ECT suite is comprised of three main instruments including one, the Magnetic Electron Ion Spectrometer, which has four versions on each satellite. Other instruments in the ECT suite include the Helium Oxygen Proton Electron spectrometer and the Relativistic Electron Proton Telescope. The suite's science goals address the top-level mission objective to provide understanding—ideally to the point of predictability—of how populations of relativistic electrons and penetrating ions in space form or change in response to variable inputs of energy from the sun.

The ECT instrument development led by Spence is a multi-institutional effort and involves the Los Alamos National Laboratory, Southwest Research Institute, The Aerospace Corporation, and the University of Colorado. Other U.S. partner institutions on the ECT science team include Dartmouth College, UCLA, NASA Goddard Space Flight Center, and NOAA [Space Weather](#) Prediction Center, as well as international partners at the University of Alberta, the British Antarctic Survey, and the Office National d'Études et de Recherches Aérospatiales (ONERA) in Toulouse, France.

The SSC contribution for EMFISIS, which is led by the University of Iowa, is a computer that will be tasked with coordinating the timing of the onboard field and wave experiments and "packaging" the data for transmission back to Earth.

Says Torbert, "The EMFISIS suite will measure the electric and magnetic fields and waves that both result from [radiation belt](#) particle interactions and have a significant effect on both the energization and loss of these particles. Having two satellites in the same orbit gives us new insights into these processes and how they change in time and space."

RBSP is part of NASA's Living With a Star program to explore aspects

of the connected sun-Earth system that directly affect life and society. The spacecraft were built for NASA by the Johns Hopkins University Applied Physics Laboratory, which will also manage the mission for NASA.

**More information:** Details on NASA's Monday, August 20 pre-launch press conferences can be viewed at [www.nasa.gov/home/hqnews/2012/... Launch\\_Coverage.html](http://www.nasa.gov/home/hqnews/2012/... Launch_Coverage.html)

Provided by University of New Hampshire

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