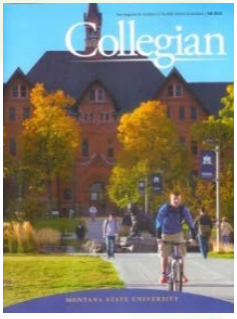

NASA taps MSU professor for next phase in building space computer technology

Montana State University engineering professor Brock LaMeres has received a two-year grant for $200,000 from NASA to continue building a radiation-tolerant computer system that is rocket ready.

The funding is a third boost from NASA for LaMeres' work on a radiation-hardened computing platform. LaMeres, an associate professor in MSU's Electrical and Computer Engineering Department, and his two doctoral students, Justin Hogan and Raymond Weber, successfully flew their computer on a NASA high-altitude balloon and ran it without failures for 10 hours. Their second major test comes in March of 2014 when their computer system will fly on a rocket that will take it 73 miles into space and return to Earth 15 minutes after launch. For that phase of work, MSU received $100,000 from NASA.

Work on the project began in 2010 with a three-year, $750,000 grant LaMeres received from NASA's EPSCoR (Experimental Program to Stimulate Competitive Research). This latest nod from NASA is a lesser grant amount, but it comes with the ultimate carrot, LaMeres said.

If the "environmentally aware" computer LaMeres and his students are developing performs during on-the-ground vacuum-chamber and thermal tests in 2015, LaMeres said the MSU team would be invited to submit an application for inclusion on one of the space agency's CubeSat launch vehicles, which puts small research satellites into orbit.

"It's a great thing for us because we've matured the architecture of this computer all the way from drawing it up on a whiteboard to where it's pretty close to being flight-ready," LaMeres said. "If we can show that it is ready, then we can apply for a ride on a (NASA) rocket."

Once aboard a satellite, the real test of the technology would finally begin.

"Out there in the extreme radiation environment of space, things can turn hostile in a hurry," LaMeres said. "The computers we use on the surface of the earth are protected from radiation by our atmosphere and magnetosphere. But out in space, radiation can wreak havoc."

While most of the radioactive particles streaming through space are not likely to damage a computer, there are certain widely dispersed particles that pack particularly high energy and can pass right through a space vehicle and traverse an entire computer chip, LaMeres said.

"At that point ones can become zeros and zeros can be switched to ones," he added.

But these radiation hits, called single-event effects, don't come as a continual bombardment, and a satellite might only encounter one or two of these during a typical pass through orbit. The problem is that no amount of shielding can stop these high-energy particles, so a computer crash using modern parts is imminent—the question is how to handle it.

"There is a vibrant small spacecraft community within America's universities, and with this initiative NASA seeks to increase our collaboration with that community," said Andrew Petro, program executive for NASA's Small Spacecraft Technology Program. "The universities will benefit from the extensive experience NASA has in space research and technology, and NASA will benefit from fresh ideas and cost-conscious innovation at the universities."

—Sepp Jannotta

Bringing the Mountains Even Closer

Many students are drawn to MSU because it offers strong academic programs and outdoor adventure. A recent $2.8 million federal grant for the Main Street to the Mountains trail system will make access to the outdoors even easier. The grant will fund a paved, multi-use trail from the Story Mill area trails north of Bozeman to the "M" and Drinking Horse trails.

ILLUSTRATION COURTESY F MSU'S SPACE SCIENCE AND ENGINEERING LABORATORY

Launched in 2011, MSU's student-built satellite, HRBE, is still orbiting Earth. Having received three separate grants from NASA, a team from the MSU College of Engineering is hoping they will have a chance to launch a research satellite to study a radiation-tolerant computer they're building.