



JOHN KELLY

THE SKY IS NO LIMIT:

Space-Related Research on the Rise at Boise State

By Erin Ryan

For centuries, mankind has looked to the stars for answers *and* essential questions. Some of the most exciting advancements in knowledge and technology have come from scientists and engineers in the aerospace field, and Boise State is fast becoming a launch pad for related research.

Faculty members have initiated about a dozen NASA-funded projects since 2007 in disciplines ranging from geophysics to materials science, and students are just as motivated. In 2009 alone, an interdisciplinary research team shared runner-up honors with MIT in an international lunar outpost design competition, and an engineering research team completed a lunar rover traction experiment for NASA's Microgravity University program. Two new teams are participating in Microgravity University 2010, thanks in part to the inspiration and guidance of former NASA astronaut Barbara Morgan, who is Boise State's distinguished educator in residence.

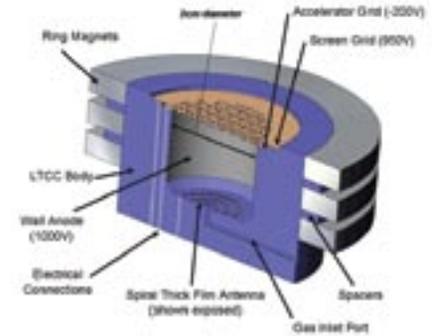
That's a lot of Broncos with their eyes on the sky. But in the wake of President Obama's recent budget proposal, the aerospace community is shifting gears. NASA is moving away from manned missions

in order to ramp up robotic exploration and Earth observation, and one research project in Boise State's College of Engineering fits particularly well into this modified vision for the American space program.

The project aims to develop an affordable, micro-propulsion system that could strategically point small satellites and enable them to maintain position while in Earth's orbit, and it received a \$630,479 NASA EPSCoR grant last year. NASA's Glenn Research Center is a partner in the effort to miniaturize an electric thruster, using plasma and low-temperature, co-fired ceramic (LTCC) materials to integrate fluidics and electronics in order to reduce the volume of propellant and increase satellite lifespan.

"Very few organizations do research with LTCC, and Boise State is essentially the only one focused on spacecraft propulsion," says principal investigator and mechanical engineering professor Don Plumlee. "The beauty of our concept is that the power to produce thrust comes from an electrical system charged by a solar array, bringing cost and complexity way down."

"Our plasma system produces 1,000 times

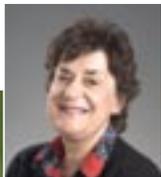


more energy than a traditional chemical rocket," says co-principal investigator Jim Browning, a professor of electrical and computer engineering. "And it uses a lot less propellant."

The research team (pictured above), also includes professors Sin Ming Loo and Inanc Senocak, graduate students Sonya Shawver, Matthew McCrink, Carl Lee and Jack Woldtvedt and intern Logan Knowles, a 16-year-old student at the Treasure Valley Math and Science Center (TVMSC). Knowles played a significant role in retrofitting a vacuum chamber for testing the thruster, and he is contributing to the overall process from design to fabrication.

"I've learned that things don't just work — you have to develop new skills and solve problems as you go," Knowles says, adding that his love of science has now expanded to engineering, especially where it concerns aerospace. "I always wanted to be on the cutting edge, and space is the ultimate challenge."

OTHER PROJECTS:



MARIA MITKOVA

Mitkova will test the potential utility of chalcogenide glasses in a new generation of radiation sensors that could enable satellites and spacecraft to probe farther into space or be used to more effectively monitor high-level nuclear waste on Earth.



JAMES FERGUSON

Ferguson seeks to improve the performance of gas turbine machinery used in aerospace and defense by developing new experimental techniques for analyzing how to best use cooling air to optimize fuel consumption, mechanical integrity and thermal efficiency.



SONDRA MILLER

Miller is developing new methods to accurately monitor air pollution on-site in various environments by using wireless sensor networks to remotely identify, characterize and quantify particulate matter.



INANC SENOCAK

Senocak and his team are developing a new computational fluid dynamics code that integrates graphics processing units, or GPUs, in powerful computing clusters to accelerate time-to-results in aerodynamics simulations.