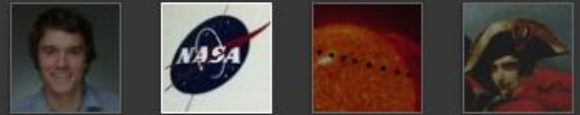


Mountains & Minds



Two medals, bold move

MSU students won two medals in NASA's third annual Lunabotics Mining Competition at the Kennedy Space Center. They also attracted attention and praise by making last-minute changes to their robot, Montana ALE. The students hoped the changes would catapult them into first place, but they agreed it was a risky move. [READ MORE](#)



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MSU News Service

MSU students earn medals, kudos for robot's showing at Kennedy Space Center

May 30, 2012 -- By Evelyn Boswell, MSU News Service

BOZEMAN - Eight Montana State University students who built a robot for a national competition at the Kennedy Space Center returned to Montana with two medals, as well as praise for last-minute adjustments said to be risky and bold.

One of 60 teams in NASA's Lunabotics Mining Competition May 21-26, MSU took first place in the Systems Engineering Paper category, earning \$750 and an all-expense-paid trip for one MSU student to present the paper at an American Institute of Aeronautics and Astronautics conference.

NASA's annual Lunabotics Mining Competition involves student-built robots vying to collect the most simulated moon dirt in an arena sprinkled with boulders and craters. Student teams are also judged on their robot's mining performance, team spirit, a slide presentation, an engineering paper and public outreach. MSU won the inaugural competition in 2010.

[Brock LaMeres](#), one of three faculty advisers for the project, said MSU's winning paper explained how the team followed the systems engineering process as it built its robot, called Montana ALE (Autonomous Lunar Excavator). The systems engineering process is important for NASA and other large organizations that build complex systems, LaMeres said.

In the outreach category, MSU won second place for its efforts exposing elementary school students to robotics. Led by Jennifer Hane of Fort Shaw, a graduate student in electrical engineering, the team's outreach involved building a miniature version of Montana ALE - the original weighs 88 pounds -- and a replica of the sandbox arena where the competition is held at the Kennedy Space Center. Instead of moving the robot through simulated moon dirt, however, Montana elementary students ran the robot through dried red beans.

In the most visible portion of the competition, MSU won eighth place by digging 16.6 kilograms of simulated moon dirt, or regolith, in a LunaArena filled with craters and rocks. Only 15 teams out of 60 dug the minimum of 10 kilograms they needed to qualify.

MSU's design team included computer science majors Logan Warberg of Kalispell, Alison Figueria of Lake Carmel, N.Y., and Seth Berardinelli of Bozeman; Kevin Love of Dillon, majoring in mechanical engineering technology; Daniel Benson of Bozeman and Lars Osborne of Fairbanks, Alaska, both majoring in mechanical engineering; and Garth Grubb of Conrad and Bethany Higgins of Bremerton, Wash., both majoring in electrical engineering.

The eighth place finish came after the MSU students decided to take a major risk and try to win the



Montana ALE sits in a sandbox where MSU students practiced operating the robot before heading to the official arena for NASA's Lunabotics Mining Competition. Behind Montana ALE is an Orion spacecraft. (Photo by Brock LaMeres).

competition. Sitting comfortably in third place after the first round, the students realized they could earn extra points with a lighter robot. That led to an early morning run to Walmart for lighter batteries and then a race to change and fine tune the new power source.

The students ran into a problem with their new, lighter batteries: fully charged, they caused the motor to run erratically. The team had to find a fine balance between removing enough charge for the motor to run properly and leaving enough power for the robot to dig regolith for 10 minutes, LaMeres said.

The students finished their work just in time for Montana ALE to compete in round two. Because of its wheel suspension, Montana ALE didn't need to avoid rocks or craters. It just drove over them. Montana ALE was one of only five teams to earn points for partial autonomy by getting through the obstacle zone without input from the control room. It then picked up a barrel of regolith, returned across the course autonomously and dumped it for weighing.

Montana ALE made another run across the course and refilled its barrel, but a problem arose. Because the new batteries were lighter, they no longer counteracted the weight of the barrel holding the regolith, and Montana ALE tipped into the neighboring arena. The students remedied the situation by having Montana ALE dump the regolith in the adjacent mining field where Middle Tennessee University was competing at the same time. Since it didn't interfere with Middle Tennessee, the ALE was allowed to continue. Montana ALE regained its balance and started moving again, but it was too late for more regolith. MSU ended up with 6.6 kilograms for the second round, which wasn't enough to qualify for round two.

MSU won eighth place after the two rounds were averaged.

"The team has mixed feelings right now about not getting a second qualifying run," LaMeres emailed Saturday from Florida. "I know as time passes they will realize how fantastic a job they did down here and that not playing it safe was the right call."

Back in his office Tuesday, LaMeres said he asked the MSU team if it was worth all the extra energy to enter the lunabotics competition rather than completing the more traditional capstone project required of seniors. They overwhelmingly told him that MSU was right to compete, and it should continue.

"They said this was the greatest experience they have had in college," LaMeres said. "They learned more about the application of engineering in one week than all their classes combined."

The students also saw that MSU can compete with much larger, prestigious schools that seemed to have unlimited resources for their robots, LaMeres said. Iowa State University -- with an enrollment of nearly 30,000 -- had more than 20 students attend the competition and won first place. The University of Alabama - with an enrollment of roughly 32,000 -- won the Joe Kosmo award for excellence.

MSU's decision to make dramatic changes drew repeated comment from NASA Edge television, and received emailed praise from supporters back home.

"I like the aggressiveness. I like the attempt to win," said NASA Edge cohost Blair Allen. "It's hard to be upset about taking a calculated risk."

[Chris Jenkins](#), head of MSU's Department of [Mechanical and Industrial Engineering](#), wrote, "These inter-collegiate competitions are vitally important to making our engineering/computer science programs real and vibrant. We claim we have great programs, and we prove it."

[Rob Maher](#), head of MSU's [Department of Electrical and Computer Engineering](#), wrote, "Bravo to the team and to the advisors. It shows true Bobcat spirit to study the problem, to carefully assess the risks and benefits, and to act boldly to meet the challenge. You earned our respect and admiration."

[John Paxton](#), head of MSU's [Department of Computer Science](#), wrote, "It is fantastic that MSU is able to compete effectively in an international, NASA-sponsored competition. When a team of interdisciplinary students must work together to produce a working robot, it allows them to hone numerous skills that will

serve them well in their post-MSU lives."

The Lunatobics program is one of the largest interdisciplinary design projects in the MSU College of Engineering and is advised by LaMeres from the Department of Electrical and Computer Engineering, [Hunter Lloyd](#) from the Department of Computer Science and [Mike Edens](#) from the Department of Mechanical and Industrial Engineering. This year's team was funded through corporate donations in addition to funding from NASA, the [Montana Space Grant Consortium](#) and the [College of Engineering](#).

For a related article, see, "[MSU students, robot to return to Kennedy Space Center for national championship](#)"

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