



MSU News Service

MSU students, robot to return to Kennedy Space Center for national championship

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BOZEMAN - Eight Montana State University students and a robot named "Montana ALE" will soon head to Florida to see if they can reclaim the national title in NASA's Lunabotics Mining Competition.

Sixty robots will dodge boulders and craters and dig simulated moon dirt during the third annual contest, to be held May 21 to 26 at the Kennedy Space Center, said team adviser [Brock LaMeres](#), an assistant professor in the Department of [Electrical and Computer Engineering](#). Students will be judged on their robot's mining performance, team spirit, a slide presentation, an engineering paper and public outreach.

If [MSU wins the overall title](#) like it did in 2010, the team will receive \$5,000, the opportunity to watch NASA test its future rovers in the high desert near Flagstaff, Ariz., and \$1,000 for each team member and one faculty member to attend a NASA launch.

Montana ALE stands about two feet tall and weighs about 88 pounds, LaMeres said. That's half the weight that's allowed and several feet shorter than MSU's first two robots. This year's robot also has a suspension system and a different way of digging dirt. Instead of using buckets in a system that looks like a Ferris wheel, Montana ALE has a barrel with scoops. The new design digs, holds and dumps the dirt.

MSU's robot is much smaller this year because NASA drastically changed the goals for the competition, LaMeres said. Instead of just seeing which robot can dig the most dirt, NASA is now promoting autonomy and smaller robots. Students can use wireless controls to operate their robots, but they won't earn as many points as teams whose robots work independently. Montana ALE, in fact, refers to Autonomous Lunar Excavator.

Creating an autonomous robot means the robot has to be programmed to handle every task itself, LaMeres said. It has to cross a giant sandbox called a "LunaArena," sense obstacles and decide whether to climb over them or navigate around them. It has to dig as much simulated moon dirt - called regolith - as possible in 10 minutes. Regolith is powdery and extremely fine on the surface, but beneath it are small jagged particles as hard as concrete. The robot then has to make its way back through the LunaArena and dump the dirt so it can be weighed.

"If you can do that and deliver at least 10 kilograms (22 pounds) of dirt, you collect a whole bunch of points," LaMeres said.

LaMeres said the team knew that building an autonomous robot would be its biggest challenge this year, so



MSU students built this robot, named Montana ALE, for NASA's third annual Lunabotics Mining Competition at the Kennedy Space Center in Florida. (Photo courtesy of Brock LaMeres.)

the electrical and mechanical engineering students sped up their work to give the [computer science](#) students more time to do theirs. The robot was built by April 1, giving the computer science students about a month to test computer systems and make sure Montana ALE could work autonomously. NASA requires each team to submit a [video](#) by April 30 that shows its robot moving, digging and dumping.

Logan Warberg, an MSU sophomore from Kalispell, said it was also a challenge for underclassmen like him to apply knowledge they haven't yet learned in class.

"At times, it was pretty overwhelming," he said.

Alison Figueria, a sophomore from Lake Carmel, N.Y., said, "We ended up learning a lot, especially from our older team mate."

Warberg, Figueira, and senior Seth Berardinelli of Bozeman are the team's computer science majors.

Kevin Love of Dillon, a senior in [mechanical engineering technology](#), was responsible for welding the robot. Welding took up a large portion of his spring break and Christmas break, but the team saved about \$3,000 by not hiring someone outside the team, he said.

"It was a great experience, a lot of work and a lot of time, but it was definitely worth it in the end," Love added.

Other team members are 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.

All eight team members going to Florida are undergraduates.

Jennifer Hane from Fort Shaw, an MSU graduate student in electrical engineering and part of the championship team in 2010, handled public outreach this year. For that, MSU built a miniature version of Montana ALE and the LunaArena and shared the lunabot experience with area elementary students. Instead of moving the robot through the regolith that NASA uses in national competition or the masonry sand that MSU uses in its practice pit, elementary students ran the robot through dried red beans.

Team advisers in addition to LaMeres are [Hunter Lloyd](#) in computer science and [Mike Edens](#) in mechanical engineering. LaMeres and Lloyd will accompany the undergraduates to Florida.

Funding this year - approximately \$23,000 - included corporate donations for the first time, LaMeres said. Corporate donations covered about half of the total cost. Sponsors included Newmont Mining, NorthWestern Energy, Blattner Energy, Electrical Consultants Inc. Advanced Electronic Design, and both the Central and Eastern Sections of IEEE Region 6. The rest was funded by NASA, the MSU College of Engineering and the Montana Space Grant Consortium.

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