

Missouri University of Science and Technology

The Rover Report

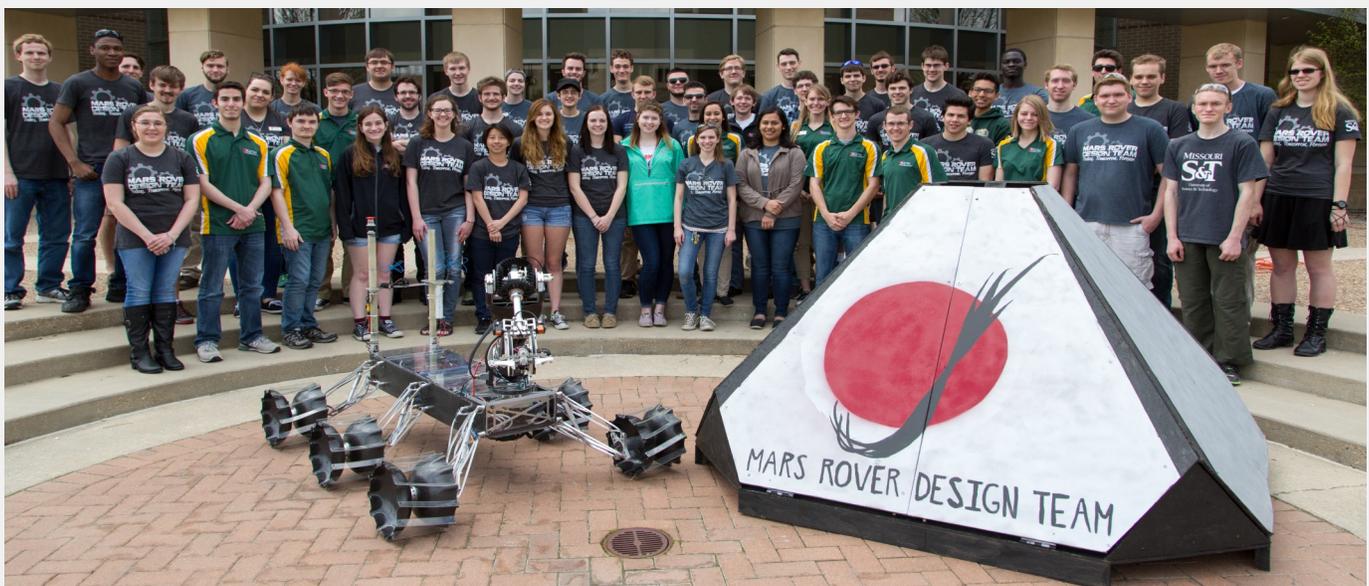


Rover Reveal

Meet *Zenith*, our fourth and most innovative rover. *Zenith* was revealed on April 15th to the delight of students, parents, Missouri S&T faculty and staff and the local Rolla media. Instead of the usual curtains, the team built a “lander” that was constructed similar to the landers sent to Mars to reveal the rover, much to the suspense of the crowd.

Zenith is the third iteration of the “Phoenix” platform, which means its six wheel independent suspension is remarkably similar to its predecessors. *Zenith* displays the similar strong propulsion system and 6-axis differential robotic arm, but a closer inspection will show how far the design has come. The main improvement points include the brand new gas spring suspension, improved carbon fiber wheels, and carbon fiber robotic arm bicep. So even though the style of this rover is similar to that of those before it, the team has reached new heights with the abilities and designs of *Zenith*.

The “zenith” is the point directly above a horizon, a subtle note to the team’s progress and expectations for competition this year. These three sister rovers, Pheonix, Horizon, and *Zenith*, are a perfect metaphor for the team’s continual growth and maturity. The reveal was a great success, and the team would like to thank everyone who attended or supported the team. We can’t wait to make you proud!



Chris Lenahan—2016-2017 Chief Executive Officer

Major: Mechanical Engineering Year: Senior
Hometown: Springfield, Missouri

Why he loves being on Rover: I get to apply my technical knowledge from the classroom to a real-world project in a simulated working environment. Rover also allows me to stay connected with friends in and out of the classroom.

Favorite Quote: "Life moves pretty fast. If you don't stop and look around once in a while, you could miss it." - Ferris Bueller



Alyssa McCarthy—2016-2017 Chief Financial Officer

Major: Business & Management Systems/ Information Science & Technology. Year: Junior Hometown: Valmeyer, Illinois

Why she loves being on Mars Rover: MRDT gives me an opportunity to lead an amazing group of dedicated, passionate and energetic people.

Favorite quote: "You are braver than you believe, stronger than you seem, and smarter than you think." - A.A. Milne

James Zandstra—2016-2017 Chief Technology Officer

Major: Mechanical Engineering Year: Junior
Hometown: St. Charles, Missouri

Why he loves being on Mars Rover: I create high-performance robotic platforms and have the ability to mentor and build a passionate and problem-solving team.

Favorite quote:
"That's a Laser-Raptor! Those things have been extinct for thousands of years!" - Kung Fury



Brianna Zandstra—2016-2017 Chief Administrative Officer

Major: Engineering Management Year: Junior
Hometown: St. Louis, Missouri

Why she loves being on Mars Rover: I love MRDT because it's a great group of people and I enjoy learning about other engineering disciplines more than just my major.

Favorite Quote: "That's what it means to be an adult, you buy your own Kleenexes." - Ms. Keeton

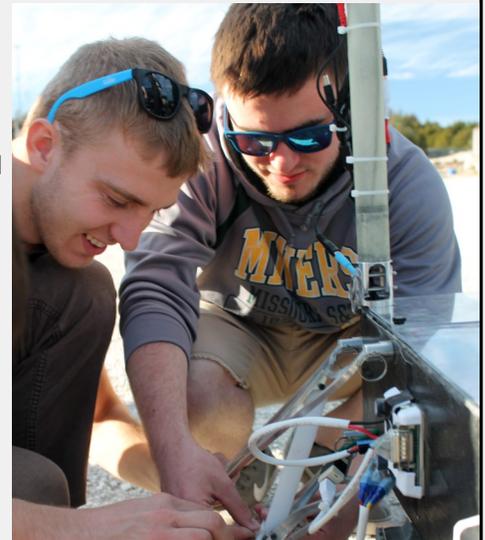
Tech Update from CTO, Katelyn Brinker

Team members have been putting in long hours to get *Zenith* ready for competition. Each weekend travel team is completing a task simulation as well as skill building sessions, failure scenario simulations, and intervention procedures.

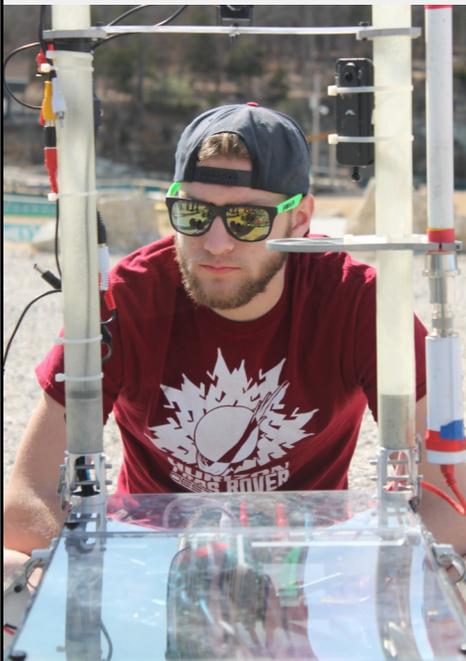
Zenith will utilize its modularity to be configured differently for each of the four University Rover Challenge competition tasks. For example, in the Terrain Traversing Task the rover will be in a six wheel configuration with the gimbal on board. In the case of the Astronaut Assistance task, this means adding the robotic arm, gripper, and drop bays to the base Terrain Traversing Task configuration.



The mechanical sub-team has finished the fabrication and testing of their core systems. The gas springs, which will save the team money and cut weight, along with new wheels have been integrated into the rover and have made *Zenith* ready to take on the one meter drop, rock beds, and steep inclines. Now, the focus is on the auxiliary systems needed for the different task configurations, such as the camera gimbal, gripper, and drop bays. The mechanical sub-team is also providing support to the science sub-team in order to make the team's custom Raman-Fluorescence Spectrometer more reliable and robust.



The science sub-team has been streamlining their base station experiment procedures, studying up on geobiology, and testing the drill and sensor sheath. The drill will have an auger bit and a sheath with two temperature and two moisture sensors embedded in it. The sensors in the drill sheath will allow for competition necessary readings to be taken while a sample is being retrieved. Multiple sensor readings will ensure precise measurements and the science sub-team to better debrief the judges at the end of the Sample Return task.



Taking measurements wouldn't be possible, though, without the Telemetry and Controls Sub-Team. Telemetry and Controls has been working on integrating all the control features the team needs for its systems into our custom base station software, RED. RED needs to be able to send commands to drive and complete actions like actuating the arm and end effectors. Controlling the rover in these ways also requires a strong signals setup, and that is exactly what Telemetry and Controls has also been working towards. They have been going out and completing in-field signals tests and have been doing a lot of research in order to determine the best antenna and frequency combination. The tasks at competition will really put our signals set up to the test, so completing this testing now is imperative to our success.

The power sub-team has been working with telemetry and controls to implement some software features, such as base station, current limiting, and *Zenith* power cycling. They have also completed a revision of the power board that will make it more reliable and are in the process of constructing a spare battery pack.

MRDT is super excited for what the next few weeks of training and testing have in store for us and *Zenith*. Three more weeks until competition!

From the CEO—Alyssa McCarthy

Rover Reveal is over, and I'm so incredibly proud of each and every one of our team members who created *Zenith*. Our most innovative rover ever will now be put through rigorous training to prepare the team to compete in our 4th University Rover Challenge. Our travel team members will be fully prepared for the rigors of Utah, and I know they will represent our team and our university to the best of their ability. I hope for S&T to return as one of the top teams in the world! I can't stress enough how much your support means to our success. As always, I want to hear from you!

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University Rover Challenge

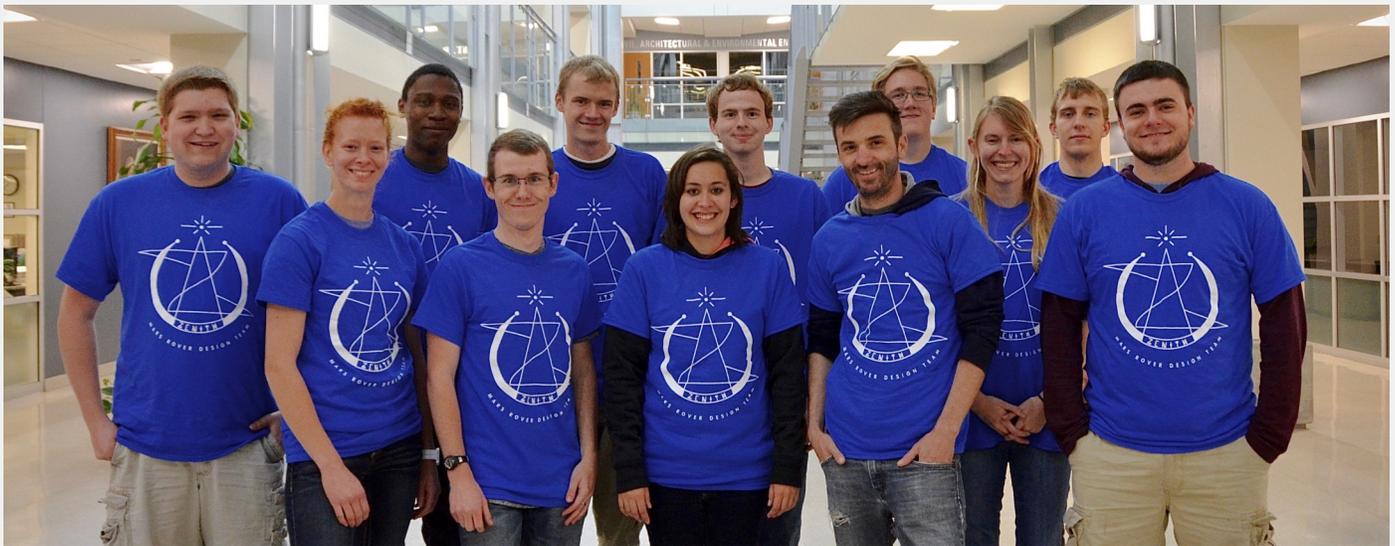
Competition is broken into the following four tasks:

Terrain Traversing—the rover must go up steep inclines, go over rocks, and over a 1 meter drop

Astronaut Assistance—retrieve tools and deliver them to astronauts at designated GPS locations

Equipment Servicing—perform a series of tasks needed to operate a generator

Sample Return —obtain a soil sample and perform analysis on board of the rover and at the base station on it



2016 University Rover Challenge Travel Team

The University Rover Challenge Travel Team 2016 has spend the last several weekends testing and practicing with *Zenith* to prepare for the competition in June. All of them are pictured above.

Left to right: Michael Alexander, Ashley Reisig, Olugbenga Osibodu, Isaac Foster, Ethan Wilhelm, Alyssa McCarthy, Josh Reed, Judah Schad, Cameron Shilko, Katie Brinker, James Zandstra, Michael Miles



Academy of Civil Engineers, GGPE Department, Engineering Management & System
Engineering Department, Helene Hardy Pierce, Missouri S&T Innovation Team



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