

LUNABOTICS ROBOTIC MINING COMPETITION FOR UNIVERSITIES R. P. Mueller¹, ¹National Aeronautics & Space Administration (NASA), Kennedy Space Center, Swamp Works, M/S: UB-E-2, KSC, Florida 32899

Space Mining for resources such as water ice, and regolith, which contain many elements in the form of metals, minerals, volatiles and other compounds, is a necessary step for In-Situ Space Resource Utilization (ISRU). One of the primary goals is to extract propellants from the regolith and water ice, such as oxygen and hydrogen which could then be used for in-space transportation. In addition, the space mining system can be used for various construction tasks that can benefit human and robotic exploration as well as scientific investigations based on excavated exposed topography, such as the side walls of trenches.

The National Aeronautics & Space Administration (NASA) "Lunabotics" Robotic Mining Competition (RMC) is a university-level competition designed to engage and retain students in science, technology, engineering and mathematics (STEM). NASA has directly benefited from the competition by encouraging the development of innovative lunar excavation concepts from universities which has resulted in clever ideas and solutions which could be applied to an actual lunar excavation device or payload. The challenge is for students to design and build a remote controlled or autonomous 80 kg mass lightweight excavator, called a "lunabot", which can collect and deposit a minimum of 10 kilograms of lunar simulant within 15 minutes. In recent years the goal has been changed to excavate a minimum of 1 kg of simulated icy regolith which is found under an overburden of regolith simulant. The complexities of the challenge include the abrasive characteristics of the lunar regolith simulant, the weight and size limitations of the lunabot, and the ability to control the lunabot from a remote mission control center or operate it autonomously.

This presentation will summarize the results of the Lunabotics Robotic Mining Competitions held in May 2022. Each year, since 2010, over 50 university teams have attended, resulting in over 500 lunabot designs and subsequent prototypes. Over 6,000 university students have been part of the on-site competition at KSC, and many are employed in the space sector today with thriving careers. Even more students and the public were engaged via internet broadcasting and social networking media. Examples of how this translates to hiring opportunities for commercial sponsors will also be discussed. Overall, this competition has proven to be popular with multi-disciplinary university senior design classes and a valuable tool for NASA and academia in educating and inspiring the next generation of space engineers.

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NASA Robotic Mining Competition (RMC) Rules: <https://www.nasa.gov/offices/education/centers/kennedy/technology/nasarmc/about>