Program-Title	Regolith Excavation Centennial Challenge	STEM Inventory	Entry# 133
Org-Type	Government-based		
Lead	NASA	PoC	Matt Everingham
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URL			
Service-Region	Nationwide		
Type	Student Program		
Subjects	Physics|Space|Engineering|Robotics|Technology		
Level	High School (9-12th grade)|Undergraduate|Graduate		
Other-Objectives			
Served-per-Year		Demographics	
Content	The Regolith Excavation Challenge promotes the development of new technologies to excavate lunar regolith. Excavation is a necessar first step towards lunar resource utilization, and the unique physical properties of lunar regolith make excavation a difficult technical challenge. Advances in lunar regolith extraction have the potential to contribute significantly to the nation's space exploration operations. Teams competing in the Regolith Excavation Challenge will build autonomously operating systems to excavate lunar regolith and deliver it to a collector. Due to the moon's lack of atmosphere, it is completely exposed to impact with micrometeorites and space weather (such as solar wind and radiation). The geology of the moon has been shaped not by water, wind, and volcanic processes as on the earth, but predominantly by its exposure to the space environment. This results in a highly compacted surface soil with interlocking particles. The resulting high resistance to penetration and BLOCKING properties make excavation a special challenge on the lunar surface. The unique properties of lunar regolith coupled with the weight, power and time limitations imposed by interplanetary travel make lunar excavation a unique challenge, which is as of yet unmet by excavation technologies developed for terrestrial use. The systems designed to excavate lunar regolith will need to be lighter, more power efficient and able to operate autonomously in order to be effective in a real lunar mission scenario. Current excavation technologies are very heavy, use large amounts of power, and require human operators. In order to facilitate in-situ lunar resource utilization, significant technology development is needed. The Regolith Excavation Challenge is intended to encourage competitors to expand the design envelope beyond what is possible with existing excavation systems.		
Outcomes	The Regolith Excavation Challenge can help the nation's space exploration program by contributing insightful solutions to problems faced during regolith excavation. The challenge will also help to find novel and lower-cost solutions to engineering obstacles in civil space and aeronautics from new sources of innovation in industry, academia, and the public.		
Started		Funded-Through	
Length		Cost	
Primary-Funding		Primary-$	
Materials			
Other-Funding			
How-Assessed			
Best-Practice-Why	The Regolith Excavation Challenge is a competition that will allow us to expand our knownledge of space. The innovations of participants from industry, academia, and the public will lead to better solutions for an official regolith excavator.		
Promising-Practice			
Sponsor		Sponsor-Org	
Sponsor-Phone		Sponsor-Email	
Other-Orgs	California Space Authority (CSA) California Space Education and Workforce Institute (CSEWI)		