College of Engineering
UNIVERSITY OF GEORGIA

Capstone Senior Design Project Abstract

Project Title: NASA Human Exploration Rover Challenge

Sponsor: NASA

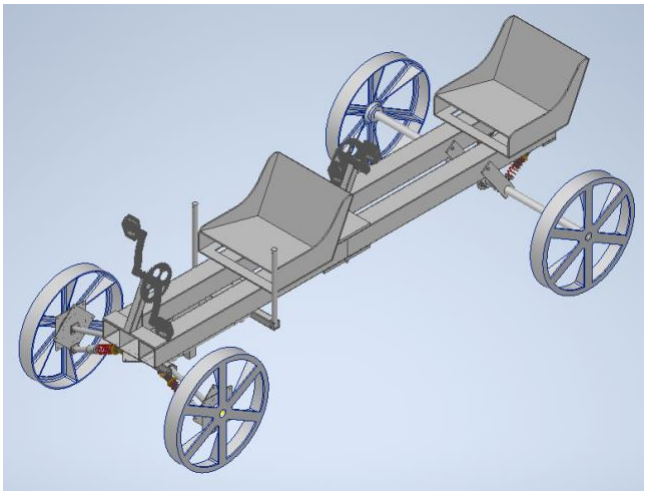
Team Members: Dustin Browning, Phillipe Jennings, Emily Lembcke, Ty Allen, Jacques du Plessis, Ryan O'Hara, Daniel McNaboe, Jacob Gattari, Jake Hafer, Ben Chong, Heather Riley, Karl Karch

Faculty Mentor: Dr. Ramana Pidaparti

The purpose of NASA's Human Exploration Rover Challenge (HERC) is to facilitate a competition where teams from all over the world can compete in the developing and racing of human powered rovers. These rovers are to be developed by the members of each team and be capable of traversing terrain found on other planets while carrying two people. As mention, these rovers are human powered and are prohibited from carrying any type of stored energy for propulsion, whether it be from a mechanical device, chemical reaction, batteries, or anything else. Other important aspects of the rover include the weight, size, durability, and safety of the drivers.

The University of Georgia (UGA) team began the development of the rover by doing an in-depth review of NASA's requirements and studying the designs from previous competitors. NASA's competition was based on team's ability to successfully navigate through obstacles where each obstacle was assigned a number of points. Additional points were awarded for lighter rovers and rovers with minimal assembly. The team's goal was to successfully complete all obstacles.

The design was created in Autodesk Inventor. Inventor is a 3D design software with structural analysis tools and was already familiar to many on the team. The design was created to have the two riders inline with each other, both facing forward. With safety being a key concern, restraints would be employed to secure the rider to the rover along with helmets and safety glasses worn by the drivers. The rover would be powered by both front and rear axles where each driver would power an axle using pedals linked by a high strength chain. The wheels would each have its own independent suspension using spring coils. The steering was designed to be as simple as possible with a push-pull system that would steer the rover from the front according to the motion of the front driver. Since weight and size were an issue, aluminum was selected for all major components of the rover and a method for collapsing it was designed. A hinge was placed in the center of the rover to allow it to fold lengthwise, bringing the front wheels to sit inside the rear wheels. Finally, the wheels were designed using welded spokes from a center hub to an outer rim. Each part of the rover was individually designed and tested using Inventor's structural analysis tool to ensure strength and durability. Additional analysis was placed on the wheels using ANSYS to guarantee their performance in overcoming harsh impacts and difficult terrain.



In conclusion, even though the HERC competition was canceled for 2020, the process for completing the rover has allowed each member to use a wide range of tools learned during the time spent as students at UGA. Members participated in researching, designing, integrating, constructing, modifying, and finalizing the rover. In addition, communication, teamwork, and diligence was required to successfully complete this project. It is the determination of the UGA team, that if able to compete, the UGA rover would have been able to win the NASA HERC competition.

All content should be limited to 1 page. Text should be 11pt Times New Roman font. Images and figures can be included.