NASA Human Exploration Rover Challenge

ME 4371-302: Engineering Design II Team Members: Kierya Freiboth, Nova Goulet-Cyr, Travis Isburgh, Alexis Jimenez, Mateo Robles, Mary Roccaforte, Rebecca Stokes, Tianzheng Wang Instructor: Dr. Jeffrey Hanson Faculty Advisors: Roy Mullins and David Myers

Introduction:

The NASA Human Exploration Rover Challenge is an annual international competition where colleges and high schools are tasked with creating a human-powered rover to explore the surface of Mars and complete water collection tasks.

Requirements:

- Must collapse and fit into a 5ft cube
- Non-pneumatic wheels
- Custom manufactured wheels
- Single tool for collecting samples
- Two pilots (at least one female)
- Non-chain drive system
- Must be safe to operate



Completed Rover



<u>Design</u>

<u>Chassis</u> - Aluminum square tubing w/ central hinge Powertrain - Aluminum supports, cv-axle, front/back diffs with v-belts drive system Suspension - Doublewishbone pushrod Wheels - Aluminum base wheel, PVC rings, 3D TPU printed tread Tool - Plastic tubing on an extendable rod with an electronic pump Steering - U-shaped aluminum pivoting handlebars with crossing steel tie rods Braking - Inboard hydraulic brakes on either side of differential

Manufacturing





- 1. Steering shaft being threaded on the lathe
- 2. Pedal support on the lathe
- 3. Wheel hub and plate
- 4. 3D printing the wheel tread
- 5. Finished tool assembly
- 6. CNC plasma cutting triangle plate on chassis





Testing/ Competition

NASA HERC Timeline:
September 8, 2022 - Proposal Due in NASA STEM Gateway
November 17, 2022 - Design Review (DR) Report and Presentation
Nov 28 - Dec 16, 2022 - DR Presentations Design Completed and
Construction in Progress
February 2, 2023 - Final List of Team Members Due and Team Photo
Due

March 2, 2023 - Operational Readiness Review (ORR) Report and Presentation Due and Photos of Completed Rover for Verification Due March 6-23, 2023 - ORR Presentations Rover/Components Completed, and Testing in Progress

March 30, 2023 - STEM Engagement Report(s) Due April 20-22, 2023 - NASA Competition



The team travelled to the U.S. Space and Rocket Center in Huntsville, Alabama to compete against 37 universities in the NASA HERC Competition. The rover was piloted through several obstacles on a half-mile course through two rounds of competition and was awarded the Safety Award.



