2025 CoSMIC Competition - Team CREED
Capstone Senior Design Project - Spring 2025

ME - Alex Christensen, Courtney Olivier, Colin Ro, Khang Nguyen, William Traywick
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Sponsor: Student Success Fee (SSF)

PROJECT OVERVIEW

Problem:

The 2025 CoSMIC Competition, held at Iowa State University, challenges college students to design, develop, build, test, and compete with a prototype lunar robot.

Goal:

The goal of the competition is to simulate tasks that support NASA's In-Situ Resource Utilization initiatives, whose goals are to use lunar resources for sustainable space exploration by mimicking the extraction, handling, and transportation of regolith.

Deliverables:

The engineering deliverables include a prototyped rover that is fully functional that is to full-scale, and that can perform excavation, transportation, and autonomous navigation tasks in a lunar environment. The controls will include a power distribution board, E-stop, batteries, a system block, and sensors.

TEAM MEMBERS

Mechanical Engineers:


Courtney Olivier


William Traywick


Alex Christensen


Colin Ro


Khang Nguyen

Electrical & Computer Engineers:


Ryan Greaves

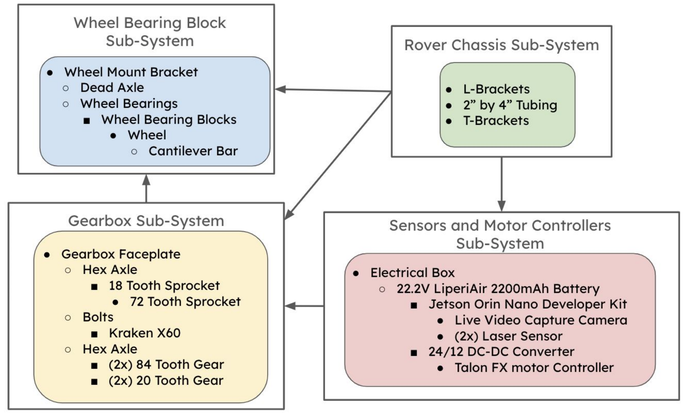

Felix Monasterio Mata


Garrett Guisinger

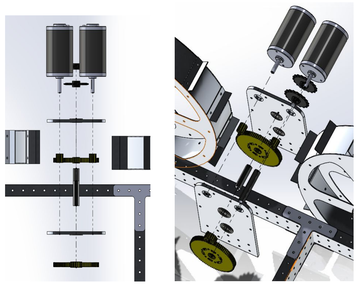

Rafael Lara

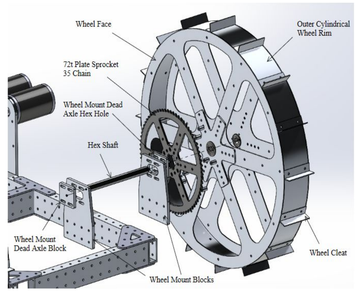

Steven Kourani

SYSTEM LEVEL DIAGRAM

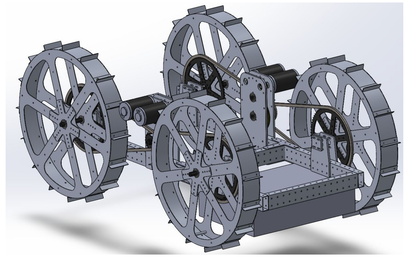


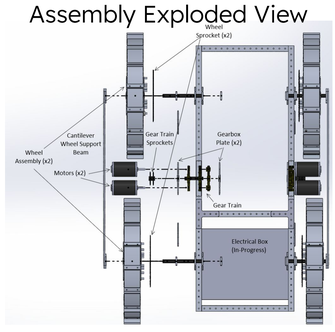
MECHANICAL DESIGN


Drivetrain Gearbox Sub Assembly Exploded View



Drivetrain Wheel Sub Assembly Exploded View


DriveTrain and Electrical Box Assembly



Final CAD Exploded View

ACKNOWLEDGEMENTS

Team CREED would like to thank Iowa State University for hosting the 2025 CoSMIC competition. We would also like to extend our appreciation to San Diego State University for the opportunity and funding along with faculty advisors Dr. Shaffar, Professor Dorr, Oscar Correa, and mentor, Ryan Liu for their guidance.

COSMIC REQUIREMENTS & STRATEGY

Dimensional and Mass Constraints
- Must fit within 1.50 m (L) × 0.75 m (W) × 0.75 m (H) in stowed configuration. May deploy up to 2.0 m in height.
- Maximum system mass: 80 kg

Power and Safety
- Fully self-powered with onboard batteries.

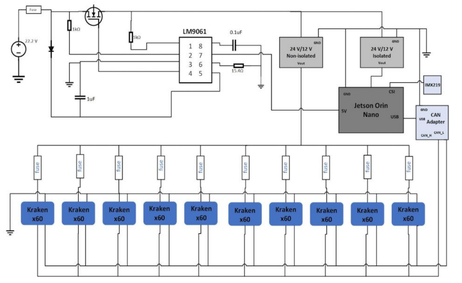
Control and Communication
- Supports telerobotic and autonomous operation.
- Teams must provide their own Wifi hardware.

Mobility and Terrain
- Must be capable of traversing coarse regolith simulant with embedded rocks and craters.
- Excavation material must be sourced from a designated zone and transported to the berm construction area.

Regulatory Compliance
- All components must simulate off-world plausibility (e.g., no reliance on atmospheric processes).
- PPE-compliant design to ensure safety during handling and operation.

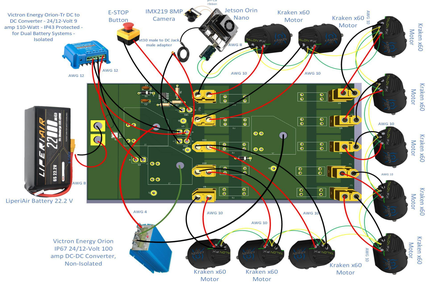
Strategy
- Our strategy consists of making a lightweight and simple rover, while also being able to collect 100lbs of regolith for the berm resulting in the least amount of cycles needed for the rover to accomplish its goal. This will minimize transit time by having a high load capacity.
- For our autonomy routine, we will collect a noticeable amount of regolith, drive directly backwards with the guide of our lidar sensor and deposit into the berm zone.

ELECTRICAL EQUIPMENT



System Block
- Jetson Nano controls key communication between on board systems.
- Up to ten Kraken x60 motors are able to be utilized.

Designed PCB
- Power Distribution Board designed for heat tolerance and kill switch functionality.
- Provides power to both sensitive electronics and necessary motors.



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