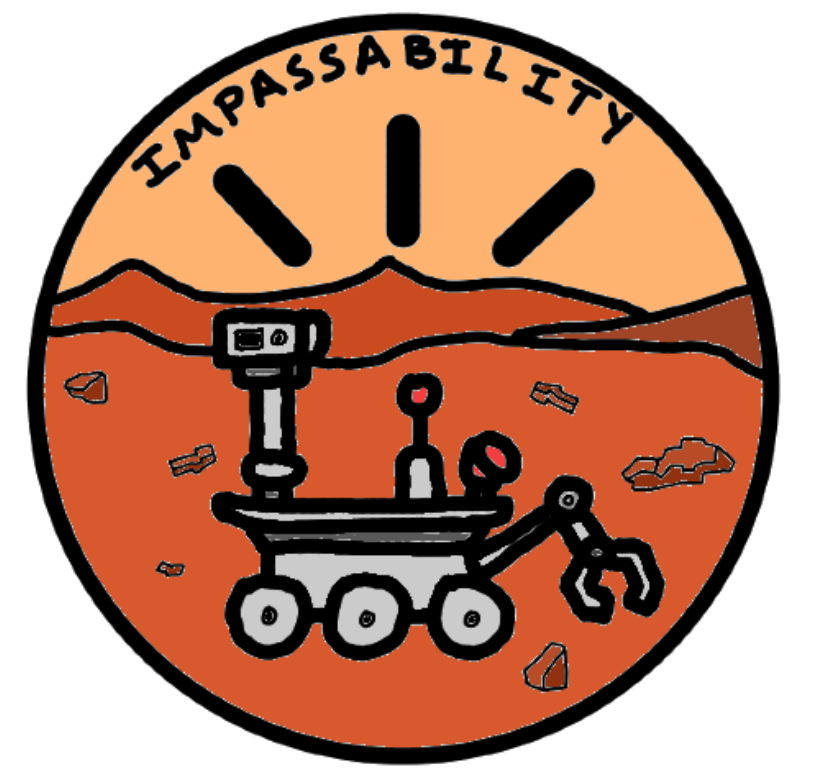**Mechanical Engineering CAL POLY**
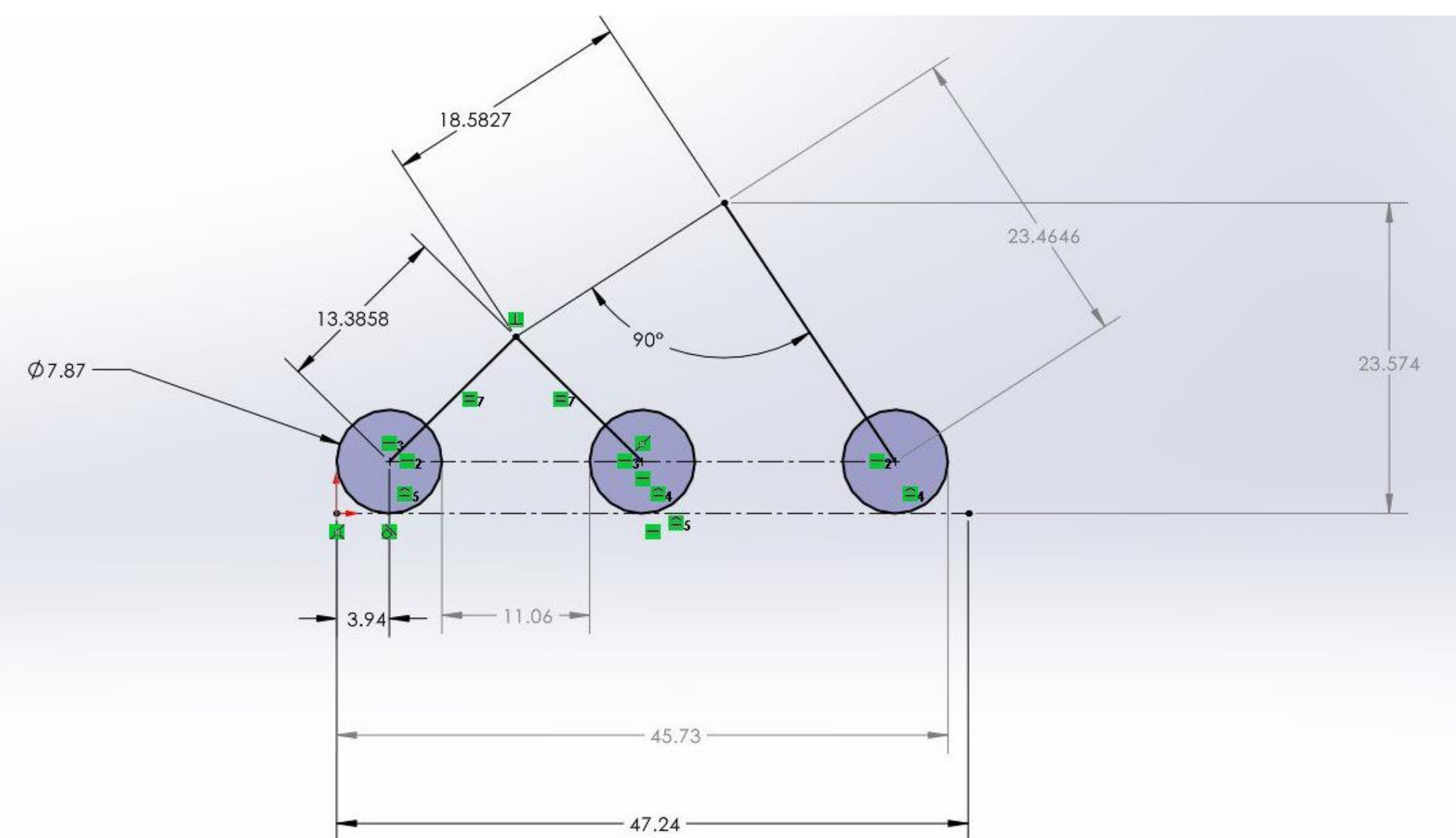
University Rover Challenge -Team Impassability-

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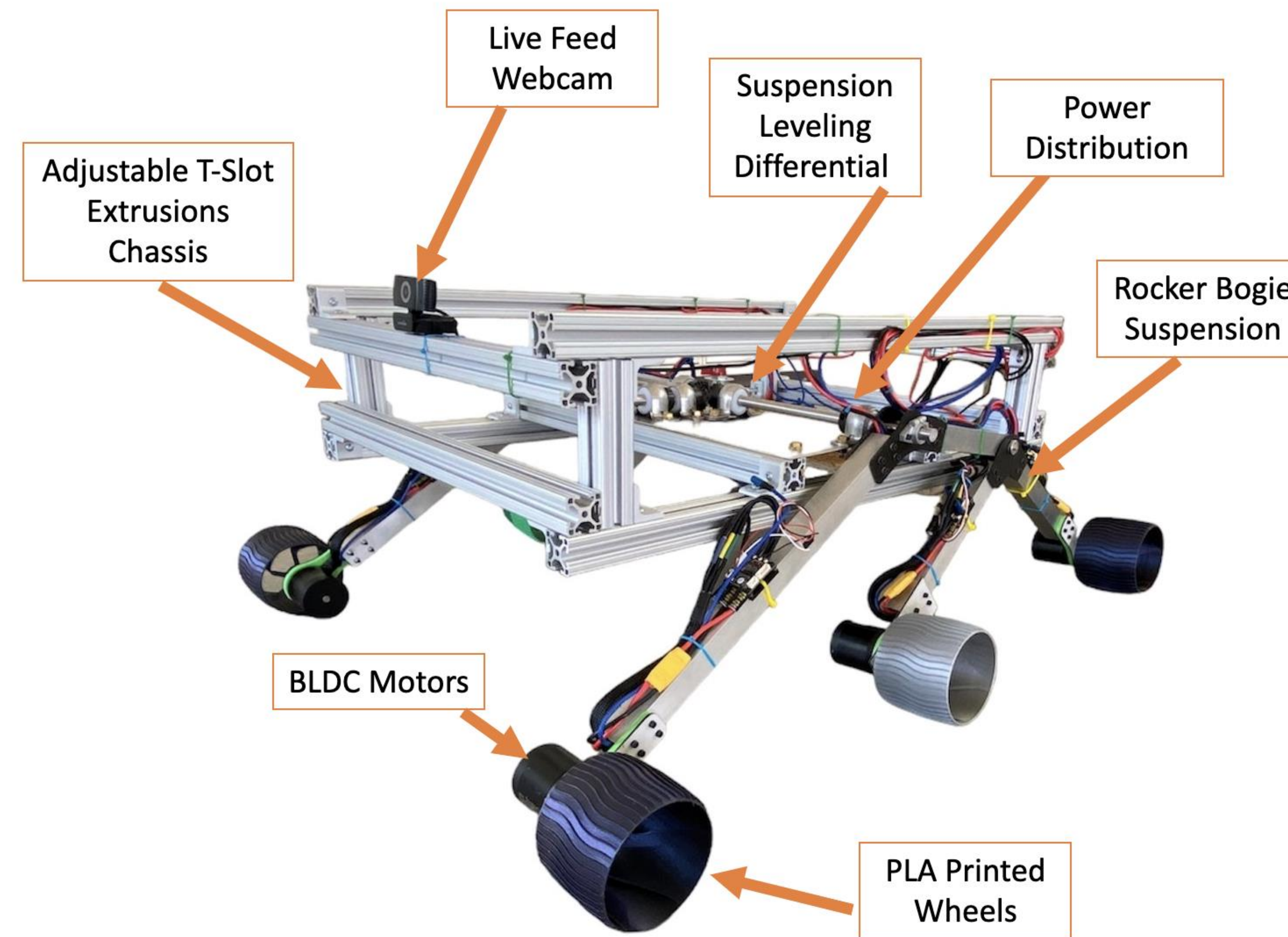
Our Mission:

Our mission is to establish the foundation for future Cal Poly teams in the University Rover Challenge. The challenge entails building a remote-operated rover for desert environments, capable of autonomous navigation, equipment servicing, terrain maneuvering, and science sampling. We concentrated on developing the chassis, suspension, drivetrain, and communication systems to provide a solid starting point for future teams to build upon and compete in the challenge.

Design Process:

Our rover is designed for modularity, with flexible mounting options for future implements and devices while remaining within competition constraints. We chose aluminum extrusions for the chassis and used readily available purchase parts for easy replacements. We prioritized manufacturability and assembly by minimizing complex machine operations and focused on design for assembly to enable easy replication of parts.

Suspension dimension analysis

Previous design iteration

Labels: Live Feed Webcam; Suspension Leveling Differential; Power Distribution; Adjustable T-Slot Extrusions Chassis; Rocker Bogie Suspension; BLDC Motors; PLA Printed Wheels
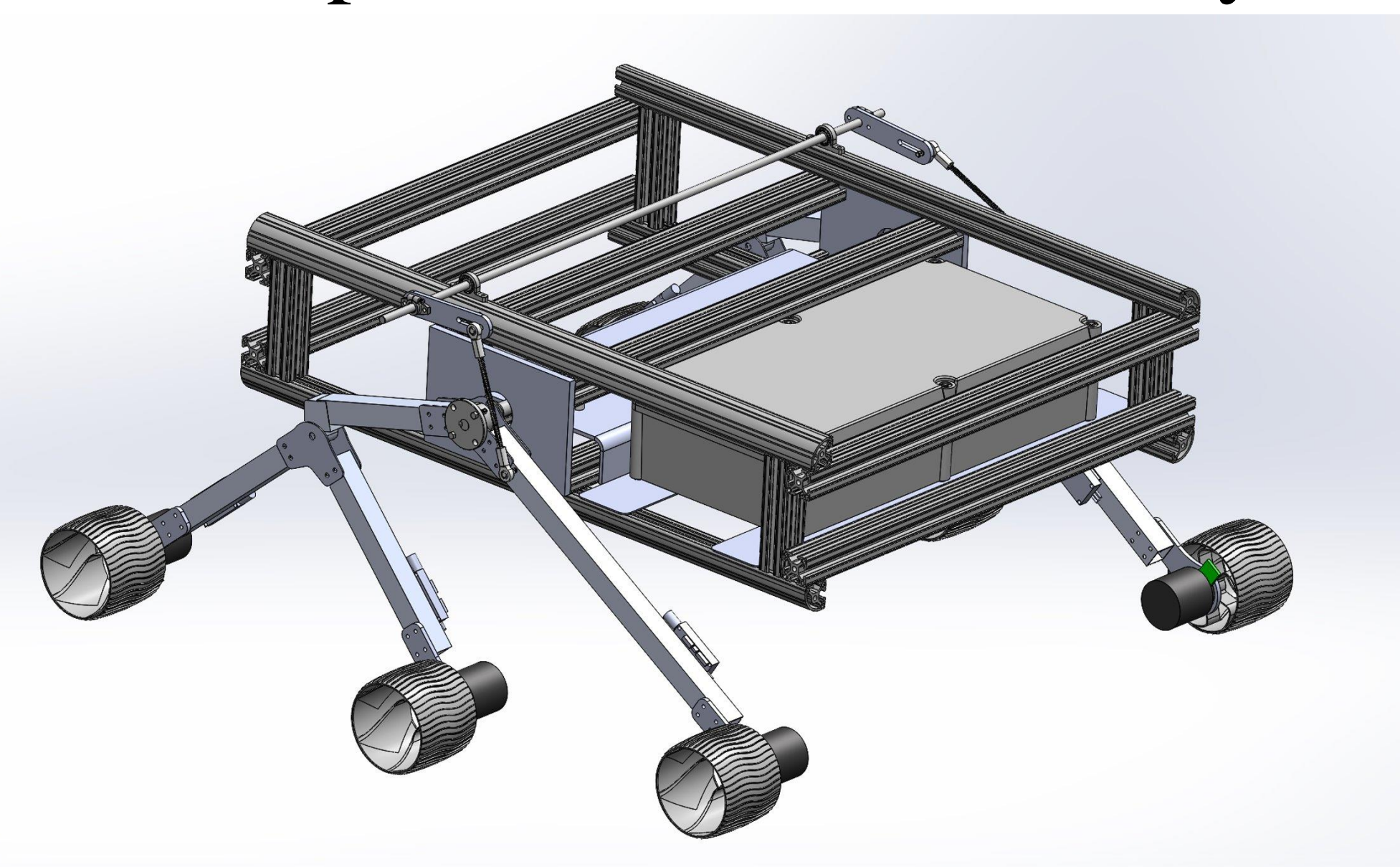
Manufacturing:

3D print wheels

Waterjet suspension brackets

Mill suspension links

A majority of our manufacturing was done through easily repeatable and automated processes. This keeps replacement parts identical and reduces potential for mistakes.

Testing:

Methodology:
- Measure RPM and Power output at different Duty Cycles and Load Cases
- Test wireless communication and data transmission at different distances

Results:

Motor Drive Test

Case	RPM	Power [W]
No Load 10% Duty	2644	2.892
No Load 20% Duty	6087	6.96
Friction Load 5% Duty	907	9.799
Friction Load 10% Duty	2491	17.2

Wireless Communications Test

Distance [m]	Connected [P/F]
0	Pass
5	Pass
10	Pass

Conclusion/Next Steps:

- Successfully created working foundation that operates within competition constraints:
  - 77 lb. (35 kg) / 50 kg
  - 1.168 x 0.991 x 0.457 m / 1.2 m cube
- Compiled operation and maintenance knowledge for future teams.
- Handoff CAD files and software documentation for future use.
- Recommend design revisions and further improvements for future teams.