

Design of an Off-Vehicle Tire Testing Device for Endurance, Wear, and Traction

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EXTENDED ABSTRACT

Design Objective

This abstract describes the first phase of a multi-year project to design a means to test tires off-vehicle for long distances under varying terrains and environments, specifically sand and soft soil. The developed test apparatus will test tires with an improved degree of accuracy and under more realistic conditions than currently available methods.

Experimental data relating to endurance, wear, and traction are required to support the design of lunar wheels. This project is a significant component of a collaborative project between NASA, Clemson University, and industry to deliver mobility solutions for the manned US return to the moon in 2019.

Design Team

This project is undertaken by an all-female, interdisciplinary, undergraduate design team in collaboration with the aforementioned research group. The team is comprised of students ranging in class status from freshman to junior. The team members are mechanical and electrical engineering majors. The team is guided by a mechanical engineering graduate student coach and faculty advisor.

Design Approach

This long term design project is currently in the first of four phases. The first phase consists of the conceptual design of a means to test the durability, wear, and traction of non-pneumatic tires. This will include the use of design tools such as brainstorming, morphological charts, and decision matrices. The first phase will conclude with a preliminary design review. The subsequent stages are detailed design and sizing, construction, and experimental assessment of the testing device.

Design Deliverables

The ultimate project deliverables will include a written design report with full documentation of the conceptual development, physical prototypes, a patentable design, a fully-functioning device, and experimental validation. It is anticipated that the work presented at this conference will include a conceptual design complete with design requirements, benchmarking, concept exploration, and systems analysis; these are our phase one deliverables. The final deliverables are directly within the critical path of the larger project, so failure is not an option.

After all, it's just not cool to get stuck on the moon.