



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

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Project Title Treads or Wheels? The More Efficient Option	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project is to measure robot efficiency when using treads versus wheels for first responder use in natural disasters or national emergencies. The goal of the project is to determine whether treads or wheels are faster and use less energy on various terrains selected.</p> <p>Methods/Materials To conduct this test, use LEGO Mindstorms EV3 set, 6 AA Eneloop Ni-HM batteries, 2 AAA Eneloop Ni-HM batteries, Volt Ohmmeter/Digital multimeter, metric tape measure, stop watch, screwdriver, and a computer. First, insert AA batteries into the power brick (central brick) and AAA batteries into the Remote IR control using a screwdriver. Build a robot that can be configured to switch from treads to wheels; it must include the head for the IR control. Second, use a metric tape, measure 3 meters of each terrain, asphalt, concrete, grass, dirt, and sand. Next, attach wires from the battery box to the Multimeter and set the multimeter so it provides energy readings every second in addition to the time it takes to complete. Run the robot through each terrain five times, stopping to input the data into the computer through an Excel spreadsheet. Once all tests are complete, switch treads for wheels and repeat all tests on the same terrain. Finally, construct a second robot configuration and run through all steps again to see if configuration plays a major role in efficiency.</p> <p>Results Robot 1, TRACK3R, and robot 2, GRIPP3R, were tested on five terrains. TRACK3R was able to complete all tests with treads and three tests with wheels. GRIPP3R was able to complete asphalt and concrete tests only. GRIPP3R was slower and used more energy than TRACK3R.</p> <p>Conclusions/Discussion Wheels were 19-21% faster and used 14-22% less energy when on concrete and asphalt. Treads were 100-123% faster and used 100-160% less energy on dirt, grass, and sand.</p>	
Summary Statement This project is about finding the most efficient configuration for robots that can aid first responders in various situations.	
Help Received Mother helped proofread and test; Father helped test; Mrs. Gillum advised and proofread	