BIOGRAPHICAL SKETCH
Matthew Powelson was born in Huntsville, Alabama, and spent his childhood in Fayetteville, Tennessee. A longtime RC airplane enthusiast, when he enrolled at Tennessee Technological University in 2012, he quickly gained an interest in microcontrollers, programming, and all things robotic. In May of 2016 he graduated from Tennessee Tech with a Bachelor of Science in mechanical engineering before beginning graduate school there in August of that year. During his time as a graduate student, Matthew studied dry adhesives, micromachining, climbing robots, and machine learning. He received his Master of Science in mechanical engineering from Tennessee Technological University in May 2018.

EDUCATION
M.S., Mechanical Engineering
Tennessee Technological University, 2016-2018
B.S., Mechanical Engineering
Tennessee Technological University, 2012-2016
ABSTRACT

Commercial mobile climbing robots most commonly use magnets or active suction as their adhesive elements, but dry elastomer adhesives and particularly bio-inspired patterned elastomer adhesives are an area of increasing interest in robotics research. These adhesives are capable of adhering to a variety of metallic and nonmetallic surfaces and enable adhesion without active actuation. In order to be useful in design, the performance of such adhesives must be understood. Therefore, the author proposes novel models for three commercially available dry adhesives – two flat elastomer adhesives and a micro suction tape known as Regabond-S that can be used for climbing robot design. Further, a novel manufacturing method is proposed for patterned elastomer dry adhesives based on micromachining techniques instead of the cost prohibitively expensive stereo lithography methods typically used. The use of these dry adhesives in track-based climbing mobile robots using force distributing suspensions is then explored, and a robot model is developed. A technique for the integration of that model with the adhesive models is presented, a complete design process is developed, and a robot example is given. The force distributing suspension is demonstrated to enable payloads significantly higher than those of robots found in the literature. This allows track-type climbing robots to be designed to achieve arbitrarily high payloads and thus enable applications previously impossible.