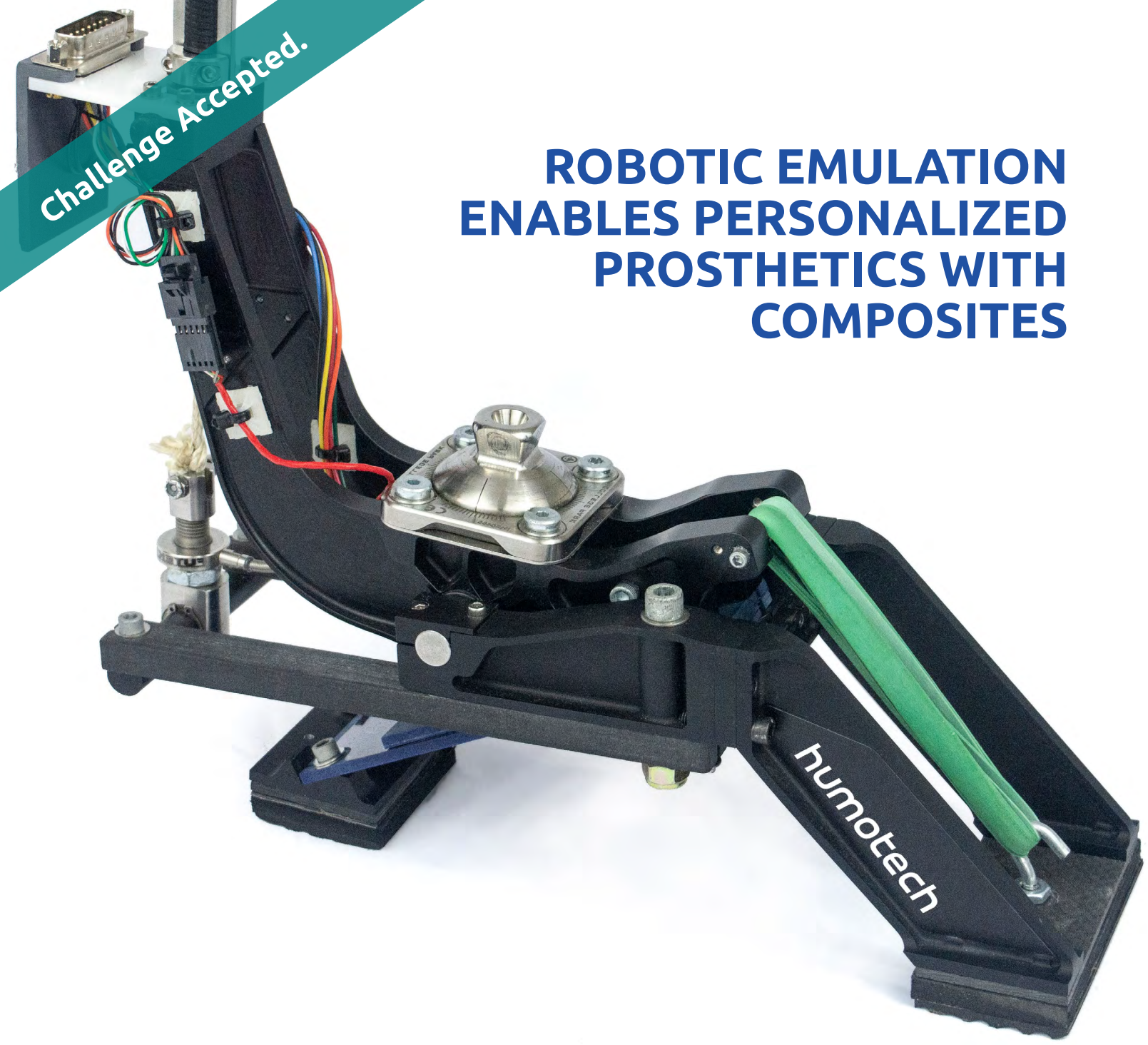
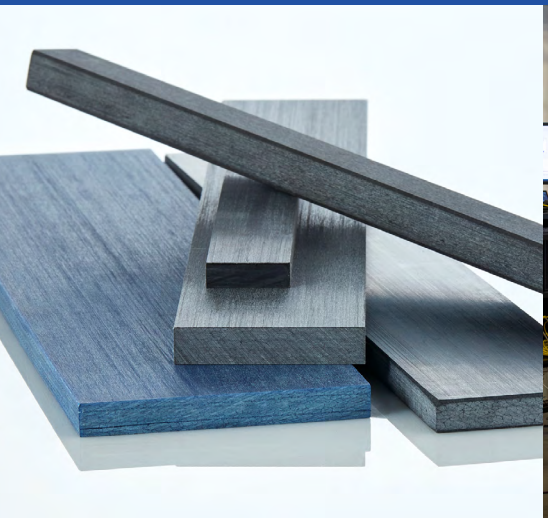
Challenge Accepted.

ROBOTIC EMULATION ENABLES PERSONALIZED PROSTHETICS WITH COMPOSITES



AVIENT™

» **CASE STUDY:** GORDON COMPOSITES™ THERMOSET SPRINGS



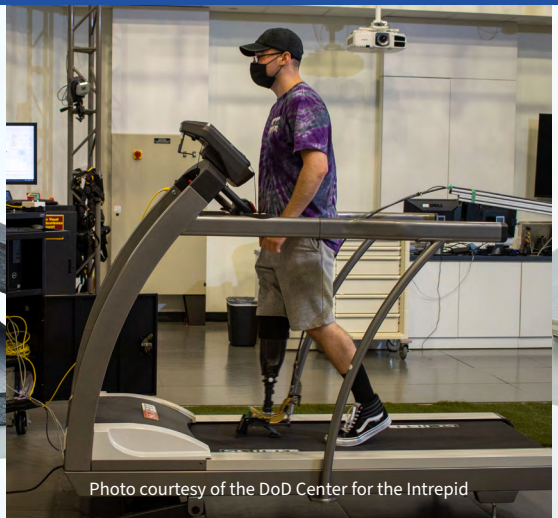
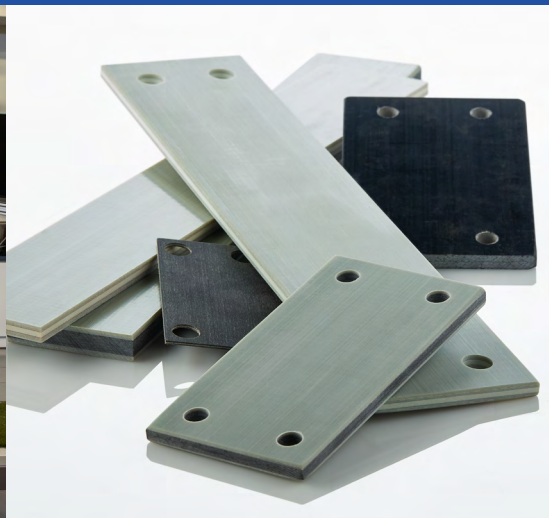


Photo courtesy of the DoD Center for the Intrepid



COMPOSITE SPRINGS PROVIDE FLEXIBILITY IN PROSTHETIC PERFORMANCE AND DESIGN

THE CHALLENGE

The loss of a limb to injury or disease is devastating, both emotionally and physically. In addition to adjusting to a new way of life, amputees are often challenged with identifying and acquiring an appropriate prosthetic device. In the case of prosthetic legs and feet, the device must align with the patient's natural gait, activity level, and mobility goals, while also maintaining comfort and safety. This process has traditionally been conducted through trial and error with clinicians, using commercially available prostheses with access only to biased data and knowledge from past patient feedback.

Enter Humotech, a company focused on accelerating the discovery of innovative real-world solutions to enhance and augment human mobility through research and development of prostheses, exoskeletons, and other wearable machines.

Humotech Caplex™ PRO-002 is a wearable device that is used to design and evaluate experimental prosthetic mechanical properties or to emulate and test-drive the mechanical properties of commercially-available prosthetic feet. Through the use of a software interface, a patient is given physical sensations of different prostheses while operators select various brands and models. They try different stiffness categories and lengths, while examining the patient's balance and performance. Working together, the Caplex robotic system and the PRO-002 prosthetic foot will predict the patient's long-term preference for a particular model.

THE SOLUTION

In the development of the Caplex PRO-002, Humotech sought a material solution that would provide high torque, flexibility, and durability for key components of the foot. The robotically-controlled forefoot component needed to store energy and reduce torque tracking errors. And the modular passive heel components had to enable quick and easy reconfiguration of heel stiffness. They looked to the engineering team at Avient for material selection and manufacturing guidance. Together, the collaborative team evaluated various Gordon Composites™ spring materials and configurations, trialing different lengths, thicknesses and fiberglass-to-resin ratios to achieve the required properties.

"Avient's team of engineers was very helpful in determining the right materials and refining our manufacturing process," said Josh Caputo, president and CEO of Humotech.

THE IMPACT

The high energy storage characteristics of Gordon Composites thermoset springs provide Humotech's prosthetic foot a natural flex, responding similarly to human calf muscles with the roll and rebound required for the patient to achieve a natural gait. Because the springs are easily machined and available in various thicknesses, the design of the prosthetic can be optimized to offset patients' natural weight and gait differences. Humotech is currently working with the US Department of Defense, US Department of Veterans Affairs, and others to develop, evaluate, and validate this emulator-based test-drive strategy.

To learn more, please go to humotech.com.

To learn more, please contact Avient at 1.844.4AVIENT (1.844.428.4368) or visit www.avient.com.

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