FOR IMMEDIATE RELEASE | June 16, 2020

Cambium Biomaterials and the US Navy produce breakthrough in bio-based fire-resistant composite materials for aerospace, space transport, and other unmet advanced material needs

Product demo marks the first time a bio-based product has been tested in a filmed fire-in-flight simulation and shows this technology outperforming an industry standard product

Berkeley, California and **China Lake, California** — Cambium Biomaterials, Inc., a Bay Area venture-backed startup, just became the first company to field test a novel bio-based fire-resistance product in a fire-in-flight demonstration. Cambium and the US Naval Air Warfare Center, Weapons Division in China Lake, Calif. (NAWCWD) are collaborating to develop bio-based, high-temperature composite materials capable of providing enhanced fire protection to aircraft, ships, submarines, spacecraft, and other applications. This collaboration was created to deliver never-seen-before, ultra-high-performance advanced biomaterials for both interior and exterior surface applications by synergistically combining synthetic biology, chemistry, materials science, machine learning, and robotics.

Fire is an ever-present danger for crews aboard aircraft, ships, submarines, and land vehicles. Many organic polymer-based materials are flammable, and the conventional fire-resistant coatings or additives used to protect them contain halogens that give off hazardous smoke once they succumb to fire. Cambium and NAWCWD are collaborating to develop new materials that can both control the spread of flames and reduce the toxicity of the smoke from fire.

If successful, this new approach to materials development could change the way both exterior and interior surfaces are engineered, not just for the military, but also throughout aerospace, space transport systems, renewable energy platforms, and other fields where the rapid, catastrophic, and lethal consequences of fire and smoke are a constant danger.

In a recent demonstration, Cambium affixed an experimental bio-based material to one wing of a remote-controlled (RC), scale-model aircraft, and an aviation-industry-standard [bisphenol A (BPA)-based] comparator material on the other wing. A flammable gel pack was placed symmetrically on each wing and set alight simultaneously. In this simulated aircraft fire-in-flight demo, the RC plane executed a 60-second takeoff-flight-landing sequence at a test-flight airfield. The demo was filmed with a fuselage-mounted GoPro HERO8 camera to capture head-to-head performance.

Compared to the BPA-based material, flames on the Cambium product-covered wing rapidly transitioned to heavy char deposits to create a protective barrier that prevented flames from spreading more broadly to the wings and fuselage.

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Cambium Chief Technology Officer Andrew Guenthner said, "Our team accomplished a great first demonstration of how well our scalable, robust, and readily-manufactured high-performance biomaterial technology performs in flight. This achievement illustrates that our unique partnership between an entrepreneurial company and a world-class Department of Defense laboratory is able to transition revolutionary technology at astonishing speed. In my 20 years in government and industry R&D I have seen nothing even close to this before."

Cambium CEO Simon Waddington added, "Cambium is on a mission to redefine the perception of biomaterials by creating never-seen-before ultra-high-performance products that deliver radical step changes in performance and sustainability. This first-of-its-kind demonstration shows both the revolutionary aspects of the materials themselves and the speed we can transition innovations within defense agency laboratories to in-use product demonstrations. Biomaterials are fully capable of becoming an increasingly important component of the wider advanced materials industry."

Working with Cambium Biomaterials, researchers at NAWCWD, who originally developed this class of thermosetting resins, enabled Cambium's product demo to be executed in a fraction of the time that it normally takes to transition a TRL2-phase innovation from the lab to a more real-world TRL6 demo simulation — at a fraction of the typical cost for this sort of demo.

"We need more than just incremental innovation," said NAWCWD Commander Rear Adm. Scott Dillon. "With everything that is happening around the world today it has never been more important that we identify opportunities to innovate and then collaborate to rapidly turn promising new concepts into the fielded products that our front-line forces require."

NAWCWD Senior Research Chemist Dr. Ben Harvey added, "Researchers at NAWCWD have been working on bio-inspired high performance materials for more than a decade. The new collaboration with Cambium is allowing us to transition technology out of the laboratory, from the test tube to the Warfighter, in record time. This synergistic relationship combines NAWCWD's expertise in catalysis, synthetic chemistry, high-throughput conversion of bio-based substrates to high performance polymers, and composite fabrication with Cambium's expertise in synthetic biology, materials engineering, and computational prediction of polymer properties. The result has been the development of next-generation composites capable of addressing key military and commercial needs. As the NAWCWD/Cambium relationship evolves, we plan to establish an on-demand biomass-to-materials pipeline through which crude biomass sources can be converted to next-generation materials for military and commercial use. This approach is expected to enhance the capabilities of the Warfighter, support rapid prototyping and speed-to-fleet initiatives, all while reducing costs and the environmental impact of production."

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About Cambium Biomaterials
Cambium develops never-seen-before, ultra-high-performance biomaterials for fields such as defense, space transport, aerospace, and renewable energy. Leveraging the Deep Tech convergence between synthetic biology, materials science, computation & automation, we deliver radical step changes in advanced material performance and sustainability to improve today's products and enable tomorrow's.

About NAWCWD
NAWCWD boasts a variety of state-of-the-art and one-of-a-kind facilities that enable unparalleled research, development, acquisition, test, and evaluation in support of the nation's warfighters. This includes operation of more than 1.1 million acres of land ranges and multiple laboratories for the Department of the Navy at Naval Air Weapons Station, China Lake, located 150 miles north of Los Angeles.

About TRL
TRL2 refers to technologies for which practical applications haven't been evaluated or observed beyond lab tests. TRL6 marks the point when the core technology has been formulated and integrated with reasonably realistic supporting elements to the point that it can be tested in a simulated environment.

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