7-21-2016

Selected Research and Development Projects

Advanced Structures & Composites Center, University of Maine

THE UNIVERSITY OF MAINE

ADVANCED STRUCTURES & composites center

Selected Research & Development Projects

VolturnUS 1:8

In Summer 2013, we deployed the first grid-connected offshore wind turbine in the United States and the only floating turbine with a concrete hull in the world. The VolturnUS technology is the culmination of more than a decade of collaborative research and development conducted by the University of Maine-led DeepCwind Consortium.

- A 65 foot tall floating turbine prototype; 1:8th the scale of a 6 megawatt (MW), 425-foot rotor diameter design.
- Designed and built at UMaine, assembled at Cianbro's facility in Brewer, ME, and towed 30 miles from Brewer to Castine, ME by Maine Maritime Academy.
- Two full-scale 6 MW VolturnUS will be deployed in 2018 or 2019.

DeepCLiDAR

DeepCLiDAR is an advanced metocean buoy outfitted with LIDAR, created with funding from the US Department of Energy and the Maine Technology Institute. DeepCLiDAR can be used in remote marine environments to provide high quality, low-cost offshore wind resource data, metocean monitoring, and ecological characterization capabilities. Developed in partnership with Dr. Neal Pettigrew of the UMaine Physical Oceanography Group, AWS Truepower, and NRG Renewable Systems.

- Prototype deployed alongside VolturnUS 1:8.
- A second deployment in a deepwater, far from shore, is underway.
- Product offers bankable data for the international offshore wind industry.

Composite Arch Bridge System

The Composite Arch Bridge System, commonly known as Bridge-in-a-Backpack™, is a lightweight, corrosion resistant system for short to medium span bridge construction using composite arch tubes that act as reinforcement and formwork for cast-in-place concrete. Our innovative composite bridge system is American Association of State Highway and Transportation Officials (AASHTO) approved, lowers construction costs, extends structural lifespan up to 100 years, and is a greener alternative to concrete and steel construction.

Longest composite bridge in the world

Longterm durability of bridges is a major concern for transportation departments across the country. In response to this concern, the UMaine Composites Center validated a hybrid composite beam designed by HC Bridge Company, LLC, that was fabricated by Harbor Technologies in Brunswick, Maine. The hybrid composite beam, made of fiber-reinforced polymer, is lightweight, corrosion-resistant, and strong enough to be used for bridge construction.

The Knickerbocker Bridge, over Back River in Boothbay, ME, is the longest composite bridge in the world at 540 feet long and is 32 feet wide. The bridge opened to traffic in 2011.

For more information, contact:

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ACCREDITED

An ISO 17025 accredited testing laboratory.

MAKO

Designed in partnership with Hodgdon Defense Composites and Maine Marine Manufacturing, the UMaine Composites Center performed testing on a special operations boat with a fully composite hull to replace the aluminum hull craft currently used by US Navy Seals. This 83-foot long, impact-resistant prototype is the result of a $15 Million research and development project that resulted in the first all-composites hull for the US Navy.

Secure Hybrid Composite Shipping Container

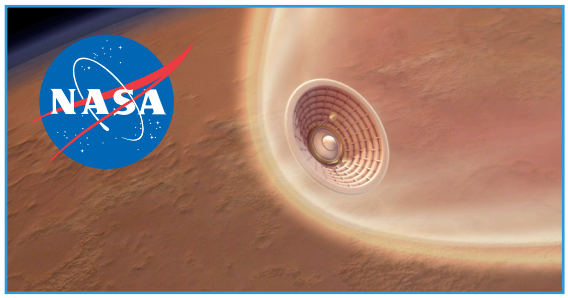
Funded by the Department of Homeland Security, the UMaine Composites Center developed a shipping container that mitigates security risks associated with marine cargo.

Georgia Tech Research Institute designed the security system for the container, featuring embedded sensors to detect intrusions, door opening sensors to monitor access to the container, and a communication system capable of reporting the security status from anywhere in the world. This technology is now in field trials toward commercialization.

Modular Ballistic Protection System (MBPS)

MBPS, developed in partnership with the US Army Natick Soldier RD&E Center, provides soldiers with enhanced ballistic protection in the field where it never existed before.

MBPS is a quickly erectable, re-deployable, and lightweight ballistic protection system. MBPS provides ballistic protection for personnel and equipment in expeditionary base camps where mobility and rapid deployment requirements prevent the immediate use of heavyweight systems like sandbags and concrete barriers. MBPS requires no tools to up-armor a standard issue 20 ft x 32 ft tent and can be deployed in less than 30 minutes by 4 soldiers.



NASA HIAD

HIAD (Hypersonic Inflatable Aerodynamic Decelerator) is a nose-cone-mounted inflatable structure consisting of multiple, concentric, nitrogen-filled tori that is designed to decelerate and protect spacecraft during atmospheric re-entry. NASA successfully demonstrated HIAD on a small-scale, but their models were not aligning with expectations. The UMaine Composites Center was engaged by NASA to validate a model that will facilitate optimized HIAD designs to deploy on critical missions with confidence.

Blast Resistant Structures

In partnership with the US Army Corps of Engineers ERDC, the UMaine Composites Center developed blast-resistant structures with coated wood framing members, panels and subassemblies. These blast-resistant materials are economically coated to enhance the construction material's ductility and energy dissipation capacity.

In addition to superior blast resistance, benefits of these structures include: cost-efficiencies, ease of assembly, environmental durability, rapid deployment, high strength to weight ratios, and protection from moisture absorption, termites, ants and biodegradation. The images to the left show Blast Resistant Modular Construction (top) vs Conventional construction (bottom) after truck bomb equivalent.