

Defense Industrial Supply Chain Summit

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Charlotte, NC

Hosted by:

Office of Senator Thom Tillis

Office of Senator Ted Budd

NC Military Business Center

NC Defense Technology Transition Office



Case Studies: Presenting Your Company and Technologies to Federal Agencies

Speakers:

- **Advanced Materials Manufacturing**
- Stitch Partners
- Windlift, Inc.
- WT&C Innovates, Inc.



SCOUT CARD: Composite Metal Foam Ground Vehicles Application

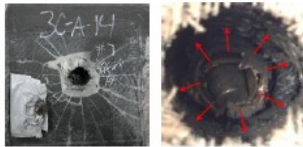


Problem

Problem: To withstand attacks from ever-increasing rival threats, military ground vehicles must employ specialized materials to remain lightweight yet effective. These specialized materials are often high performance in only one domain, leaving performance across many domains to be desired (for example, optimized for ballistics protections but not fire protection).

Solution: Advanced Materials Manufacturing's (AMM) novel branch of metallic materials, Composite Metal Foam (CMF), offers lightweight with no detriments to quality while improving performance across multiple domains concurrently.

Value Proposition: The use of CMF materials to replace traditional fully-solid materials would improve the performance of aerospace products across multiple performance parameters simultaneously while weighing up to 70% less. CMF can enhance the performance, efficiency, and safety of any product that it is incorporated into.



CMF can absorb high impact loads from ballistics, blast and frag. The above photos show CMF after stopping a .50 Cal AP round.

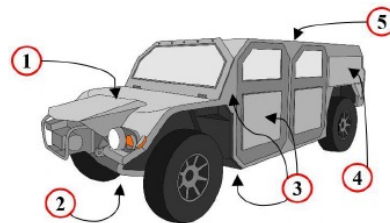
CMF's Properties Compared to its Solid Parent Metal

- 3 times lighter than solid metals.
- 100+ times higher impact energy absorption.
- Steel-CMF offers 7+ times longer fire protection vs solid steel.
- Ballistics and blast fragment absorption with force isolation.
- Steel-CMF is as light as aluminum, Mg-CMF can be lighter than water.
- Steel CMF offers 54 times lower thermal conductivity than solid aluminum at equal weight.
- 0.6" thick steel CMF withstands 2,200 °F temperature jet fires for over 30-minutes, never exceeding a back plate temperature of 800 °F. A piece of equal sized, 3X heavier solid steel fails in only 4 minutes and equal weight solid aluminum completely melts in seconds.
- CMF can be manufactured out of nearly any metal, alloy, or combination and can be crafted into any shape or size, can be welded, joined, and can be fine-tuned per application.
- Improved vibration, sound, and shock absorption.
- Withstands over 1,000,000 high load cycles.
- 70% lower raw material use/cost.

Impact and Technical Approach

CMF Ground Vehicle Applications

- 1: CMF engine, motor, and/or electronics protections.
- 2: Underbody skid plates and/or fuel tank protections.
- 3: Increased IED and ballistics protections on the underbody, vehicle skin, and door panels.
- 4: Lightweight construction to increase payload capacity.
- 5: Lightweight armor allows for rapid and easy vehicle modification. Modular CMF panel construction allows for quick local replacement of damaged panels. Using lightweight Composite Metal Foam on US Military ground vehicles will increase protections from blast and ballistics while simultaneously lowering the vehicles weight. This combination will increase the safety, performance, and efficiency of each vehicle.



History

Advanced Materials Manufacturing was founded by the global expert and inventor of CMF, Dr. Afsaneh Rabiei. Internationally recognized for her work in advanced materials and engineering, and with over 20 years of academic and 10 years of industry experience in engineering and research with over 100 published peer-reviewed journal and conference papers, books, booklets, book chapters, and patents, Dr. Rabiei is suited to take CMF to the next level in military applications.

AMM also employs Mr. Jesse Heidrich, an aerospace engineer with mechanical, electrical, aerospace, and product engineering along with substantial entrepreneurship experience as well, helping a start-up grow from \$100,000 to \$13M in revenue across 5 years. AMM is in process of hiring additional engineers and machine workers, preferably from the US veterans pool of applicants to further strengthen our manufacturing team.



Steel CMF can heat to 2,000 °F while remaining touchable only ~2" away.

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SCOUT CARD: Removing & Deactivating Airborne Pathogens



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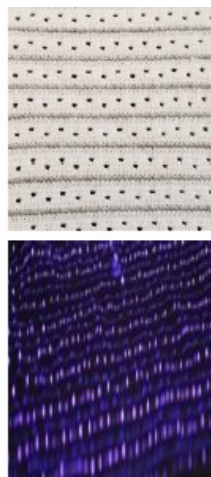
Problem

SPAR Filter:

SPAR is a novel air filter technology that removes and deactivates aerosolized viruses and bacteria. SPAR is a 2mm thin, lightweight fabric filter imbedded with conductive fibers, and when a charge is applied, it creates a non-thermal surface plasma array.

Health Threats From Infectious Diseases:

Warfighters working, traveling, and living in close quarters are infected with the flu and other diseases by simply breathing the air. When ill warfighters are out of commission, their units' capabilities could be compromised.



Solution Specifics

How do you solve the problem?

- Unlike HEPA filters that only remove airborne pathogens, and when moved can release them back into the air, SPAR removes and deactivates up to 99.9% of airborne viruses & bacteria.
- This 2mm thin, lightweight filter utilizes little space and can be integrated into military transports, medical facilities, and other spaces.
- Utilizes low power and can be made into a portable device.
- Easily scaled up or down to meet specific size requirements.
- Unlike bulking, heavy, and power consuming UVC technology, SPAR does not require a slow airflow for deactivation to occur.

Impact and Technical Approach

Technology Readiness Level (TRL): 6

Manufacturing Readiness Level (MRL): 8

Impact of SPAR Filter

- Increased warfighter productivity with fewer illnesses
- Reduced infections in medical settings
- Lower chance of spreading illnesses in high military populations
- Readiness for future pandemics
- Possible applications for combating chemical warfare

Performance

End-user payoff/expected for SPAR Filter:

- Cleaner and Safer Air
- Fewer Illnesses
- Less Time in Doctors' Offices and Hospitals
- Increased Readiness

Dual-Use (Commercial / Military) applications for SPAR Filter:

- School Hallways & Classrooms
- Commercial Buildings
- Medical Offices & Waiting Rooms
- Hospitals
- Public Transportation (aircraft, subways, trains, etc.)

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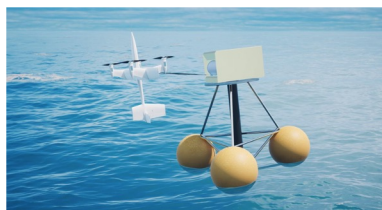
Problem

Airborne Power Generator (APG):

- Mobile, modular, rigid-kite that flies autonomously, extracting wind energy.

What problem do you solve?

- Electrification of the battlespace requires reliable, on-site generation. Wind power will reduce reliance on logistically and financially challenging supply lines.



Solution Specifics

How do you solve the problem?

- Deployable in a variety of configurations for unlimited use cases, the APG can produce power day and night with wind >5m/s. By having a reliable power source, troops and/or systems can recharge without needing dangerous supply lines to delivery costly liquid fuel.

Why you? What makes you different from the competition?

- Executing OSD OEPF SBIR Phase 3. Single-source justification with USG.
- Multiple patents for system and advance proprietary modeling & sim.

Impact and Technical Approach

Technology Readiness Level (TRL): 3

Manufacturing Readiness Level (MRL): 2

What is the Impact of your Solution?

- Reduced reliance on dangerous and costly supply lines.
- Persistent power in austere environments on land or at sea.

What is the Technical Approach?

- Design, build, test in digital environment. Design, build, test in real world. Assess and apply findings to next iteration.

Performance

End-user payoff/expected operational value/new capability:

- Technology will enable new and more flexible operational and tactical capabilities as fuel supply lines become obsolete for many systems.
- Enormous cost savings to DOD and taxpayers.

Dual-Use (Commercial / Military) applications for the technology:

- Raising equity for R&D for commercial, grid-scale, offshore system.
- By 2050: 2.5 TW of APG power & 6.2 Gigatons GHG avoided annually.

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SCOUT CARD: IR Signature Suppression Material



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Problem

The ALEC2 (ARIS Lightweight Eco Ceramic Composite) material technology is a unique option for gun barrel IR (infrared) signature suppression. Pictures on slide 2. ALEC2 provides a new material for manufacturing products with beneficial characteristics including IR signature suppression, fireproof (not just fire resistant), corrosion proof and lightweight.

Adversaries are increasing their use of (IR) signature sensing technology to locate and lock onto Warfighter targets to deliver lethal ordinance.

Solution Specifics

- The ALEC2 ceramic composite material's molecular structure can be used to manufacture products specific to individual small arms barrel shapes. This external application mitigates the intensity of the rapid firing events generated IR signature.
- ALEC2 is a very recent, patent pending, USA invented ceramic composite material. To our knowledge there is no equivalent material that combines all the characteristics (fireproof, not just fire resistant, uses no polymer, corrosion proof and light weight) and benefits in one unique material.
- ALEC2, when externally added to small arms barrels, will reduce the detection of the Warfighters' IR signature location, even under rapid fire.

Impact and Technical Approach

Technology Readiness Level (TRL): TRL is 4

Manufacturing Readiness Level (MRL): MRL is 4

- When manufactured to attach to the barrels of small arms ALEC2 will significantly suppress the IR signature of the soldiers' weapon. Adversaries IR detection technology will be much less effective and improve the soldiers' safety under rapid fire engagements.

Technical Approach

- The ALEC2 technology is ready for contracts to design and test a pilot unit for a specific rifle barrel to use in client testing and data collection feedback. The approach will be similar to a 2020 BAA funded project that tested an inferior material.

Performance

End-User Payoff/Expected Operational Value/New Capability

The use of ALEC2 material for IR signature suppression is expected to reduce the lethal risks to the Warfighters from IR targeting weapons.

Dual-Use Applications for the technology solution:

The ALEC2 material technology's IR signature suppression properties have limited non-military applications. However, ALEC2's structural insulation, fireproof, corrosion proof and lightweight characteristics have generated interest in the commercial shipbuilding, building material and FRP structures industries.