# NASA SBIR/STTR Technologies

# Tailorable Structural Composite for GCR and Albedo Neutron Protection on the Lunar Surface

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## Identification and Significance of the Innovation

A polyethylene epoxy composite with boron coated carbon fabric provides a multi-functional, non-parasitic structural shield material having tailored shielding properties with the following benefits:

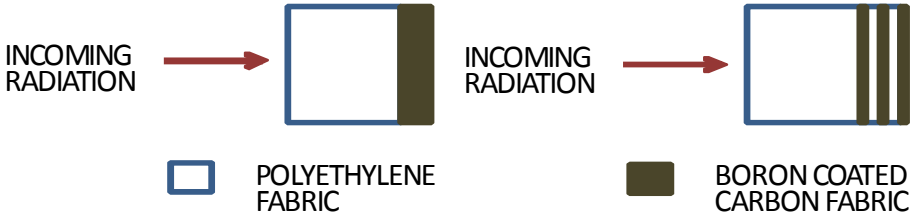
♦ Shielding against Galactic Cosmic Rays and Solar Energetic Particles and albedo neutrons on lunar surface.

♦ Incorporation of $^{10}B$ as a structural element via innovative LPVPS coating deposition process onto high-strength C fabric.

♦ Uniformly $^{10}B$ coated carbon fabric inserted optimally for maximum shielding and structural properties with minimum materials/fabrication cost.

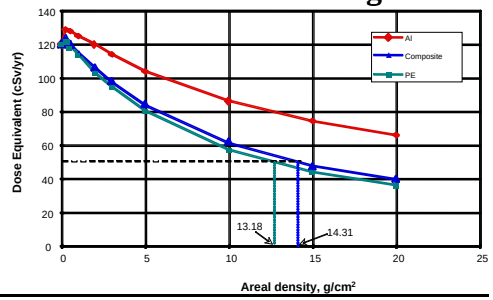
♦ Specific strength: 2-3 times stronger than aluminum alloys.

**Expected TRL Range at the end of the Contract (1-9): 4**




**Possible $^{10}B$ Insertion Profiles for Tailorable Radiation Shielding Composite to Provide Maximum Shielding Against GCR and Albedo Neutrons on the Lunar Surface While Maintaining Structural Strength**

Transport simulations demonstrate GCR shielding properties of composite comparable to pure PE




## Technical Objectives and Work Plan

• Select the most promising materials.

• Deposit B coating via innovative Low Pressure Vacuum Plasma Spray (LPVPS) onto high strength carbon fabric.

• Enhance bonding and adhesion between the polyethylene fabric, B coated C fabric, and epoxy matrix.

• Optimize $^{10}B$ insertion profile in composite to satisfy both radiation shielding and mechanical strength requirements.

• Perform transport calculations, neutron exposure, and mechanical testing to characterize the composite.

## NASA and Non-NASA Applications

• Improved structural radiation shielding for space transportation vehicles, Ares V, orbiters, landing vehicles, rovers, habitats – for humans living & working on the moon.

• Commercial Applications Include: particle accelerators, nuclear reactors, radioactive biological and nuclear waste containment vessels, satellite hardware shielding, high-altitude planes.

## Firm Contacts

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NON-PROPRIETARY DATA