

Seshat's Composites

Grant Proposal

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SESHAT'S COMPOSITES

SUSTAINABLE HEMP-BASED BALLISTIC MATERIALS FOR MILITARY APPLICATIONS

**A Revolutionary Approach to
Military-Grade Ballistic Protection**

Marie Seshat Landry, CEO

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1 Executive Summary

Seshat's Composites presents a revolutionary approach to military-grade composite materials by harnessing hemp's natural triform of carbon, oil, and lignin. This bio-based composite promises lightweight, sustainable ballistic protection aligned with NATO and Canadian defense innovation priorities. Our Phase 1 proposal seeks CAD \$350,000 to develop prototypes, execute ballistic and environmental testing, and lay the foundation for scalable production.

2 Problem & Market Need

Current military armor solutions rely heavily on steel, ceramics, and synthetic fibers that pose environmental challenges and operational limitations due to weight and toxicity. NATO and Canadian defense sectors emphasize sustainable, high-performance materials that reduce carbon footprints without compromising protection. There is an urgent need for renewable, durable composites tailored to evolving battlefield requirements.

3 Technical Objectives

- Develop carbonized hemp fiber composites integrated with bio-based epoxy derived from hemp oil and lignin.
- Achieve ballistic resistance meeting NIJ 0101.07 standards for personal and vehicular armor.
- Validate thermal stability, electromagnetic interference (EMI) shielding, and mechanical resilience.
- Establish scalable manufacturing protocols aligned with environmental sustainability.

4 R&D Plan

Phase 1 (0–12 months):

- Optimize carbonization parameters for hemp fibers producing high tensile strength carbon composites.
- Formulate and test bio-based resin systems incorporating hemp oil and lignin for mechanical robustness.
- Fabricate lab-scale composite panels for preliminary ballistic and environmental testing.

- Collaborate with accredited ballistic test facilities for validation.

Phase 2 (12–24 months):

- Scale-up composite production, refine processing techniques, and conduct extensive ballistic testing per NATO protocols.
- Integrate feedback into material formulation and manufacturing improvements.

Phase 3 (24+ months):

- Pilot field deployments and qualification for defense contracts.
- Explore dual-use civilian applications and commercialization pathways.

5 Technical Description of Seshat’s Composites

Seshat’s Composites leverage hemp’s natural triform: carbonized hemp fibers provide structural strength; hemp oil contributes plasticizing and resin-compatible properties; and hemp lignin offers adhesive and thermal stabilization functions. This combination creates a composite material with:

- High specific strength and stiffness.
- Thermal resistance suitable for operational extremes.
- Biodegradability and carbon-negative lifecycle potential.
- Tunable electromagnetic properties for stealth and EMI reduction.

6 Manufacturing & Scale-Up Strategy

- Source industrial-grade hemp fiber from sustainable Canadian suppliers.
- Utilize controlled pyrolysis facilities for carbonization with adjustable temperature and atmosphere parameters.
- Produce bio-based epoxy resin blends incorporating hemp oil and lignin using green chemistry methods.
- Employ compression molding and vacuum-assisted resin transfer molding (VARTM) for composite fabrication.
- Develop quality control protocols focusing on fiber-resin interface and panel consistency.

7 Commercialization Path

- Target defense R&D funding and government procurement programs (NATO DI-ANA, Canadian IDEaS).
- License technology to military-grade composite manufacturers and defense contractors.
- Expand applications to first responder protective gear, eco-friendly automotive components, and aerospace materials.
- Pursue strategic partnerships to accelerate adoption and production scale.

8 Dual-Use Relevance

The eco-friendly nature of Seshat's Composites addresses military sustainability goals while offering commercial markets in civilian personal protection, automotive, and industrial sectors, promoting environmental responsibility and innovation beyond defense.

9 Budget & Timeline

Item	Cost (CAD)	Timeline
Material sourcing	50,000	Months 1–3
Lab carbonization process	70,000	Months 1–6
Resin formulation	40,000	Months 1–6
Composite fabrication	40,000	Months 3–9
Ballistic testing	80,000	Months 6–12
Project management & overhead	70,000	Months 1–12
Total	350,000	

10 Impact – Environmental, Social, Strategic

- Reduces military reliance on non-renewable, toxic materials.
- Supports Canada and NATO's commitments to green defense innovation.
- Enhances soldier safety through advanced ballistic materials.
- Stimulates the Canadian hemp economy and sustainable supply chains.
- Advances global leadership in organic, sustainable materials science.

11 Team & Facilities

- Marie Seshat Landry, CEO & Principal Investigator – Expertise in sustainable materials and AI-driven science innovation.
- Collaborative network of Canadian hemp growers and composite manufacturing experts.
- Access to ballistic test facilities certified for NIJ and NATO standards.
- Partnerships with academic research institutions specializing in bio-based materials.