



U.S. ARMY
RDECOM

Extremely Lightweight, Adaptive, Durable,
Damage Tolerant (XLADD) Structures



open
campus

S&T Campaign: Sciences for Maneuver Logistics and Sustainability

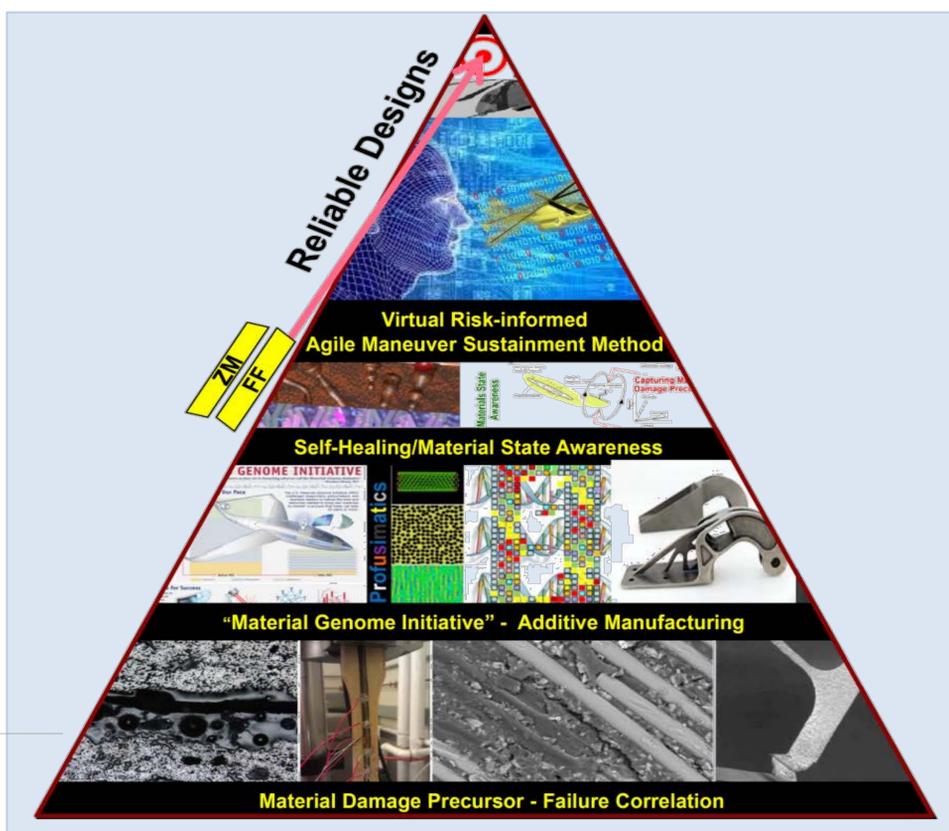
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Research Objective

- Establish and mature XLADD structures to enable “fatigue-free” operation of Army Future Vertical Lift (FVL)
- Engage in discovery of novel concepts and physics-based models to improve fatigue resistance for enhanced structural reliability and durability

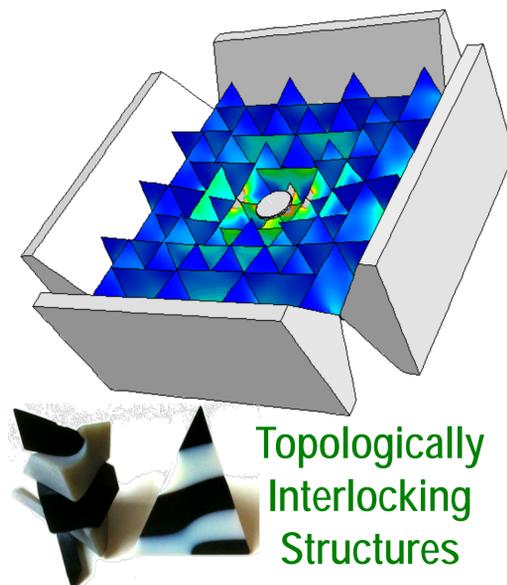


ARL Facilities and Capabilities Available to Support Collaborative Research

- Quasi-static, fatigue, and “high-cycle fatigue” testing capability including 100-kN Servo-hydraulic Mechanical Testing Machines; 1-kHz, 22-kN Servo-hydraulic Mechanical Testing Machine; and 5-kN Electromechanical Testing Machine with Environmental Chamber
- ASTM test fixtures for tension, compression, and bending tests of metals and composites
- Temperature and humidity chamber for accelerated aging experiments
- Dimension Elite and Replicator 2X for 3-D printing multifunctional structural components



Durable Hybrid Composites



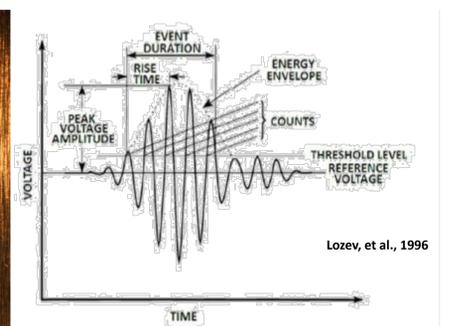
Topologically Interlocking Structures

Challenges

- Lightweight, high-strength composite/metallic and multifunctional structural configurations and designs are sought to increase damage tolerance
- Advancement of probabilistic algorithms for fatigue life management by increasing prediction accuracy and reducing computational time
- Additive manufacturing of multifunctional fatigue-resistant lightweight structural components



Fatigue-Resistant Structures



Next-Generation Rotorcraft Concept

Complementary Expertise/Facilities/Capabilities Sought in Collaboration

- Advanced characterization and modeling of precursors to damage with particular emphasis on fatigue failure initiation
- Advances to enable the next generation of self-healing structures
- Hybridization of materials and processes for 3-D printing multifunctional structural nanocomposites with hierarchical ordering