Hybrid Nanocomposites for Efficient Aerospace Structures
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OBJECTIVES
1. To Identify Target Areas for Hybrid Composites in Aircraft
2. To Assess Benefits of Hybrid Composites to Aircraft
3. To Prepare for Phase II Hybrid Composite Materials Demonstration

ACCOMPLISHMENTS

NOTABLE DELIVERABLES PROVIDED
Technical reports reviewing program accomplishments and challenges
Composites limited by interlaminar properties and manufacturing costs
Single-aisle aircraft represent significant market opportunity
Stitched hybrid composite properties
  • Offer structural and multifunctional performance improvements
  • 35% improvement in fracture toughness over toughened prepreg
  • 107% improvement over resin film infusion
Lifecycle cost reduction with hybrid composites
  • Fracture toughness has significant effect on aircraft lifecycle cost
  • Cost-effective even with 35% higher fabrication cost
  • 20 Megatonne reduction in lifetime CO2 emissions
Transition roadmap for materials development and characterization

KEY MILESTONES MET
Demonstrated stitched hybrid composites
  • Fabricated stitched coupons using CNT yarns
  • Improved fracture toughness
Quantified benefits of stitched composites
  • Developed toolset to evaluate cost reduction
  • Identified target application areas
  • Quantified cost reduction
Identified roadmap for future efforts
  • Further materials and component characterization
  • Industry partnerships to accelerate development

FUTURE PLANNED DEVELOPMENTS

PLANNED POST-PHASE II PARTNERS
Aircraft OEM: technical guidance
UDRI: processing optimization & testing
NanoComp: CNT yarn supplier & scale-up
NanoSperse: Multifunctional CNT supplier

PLANNED/POSSIBLE MISSION INFUSION
NASA
  • Advanced Composites Project
  • Advanced Air Transport Technology
DoD
  • Joint Strike Fighter
  • Long Range Strike Bomber (AF)
  • Affordable Attributable Aircraft (AF)

PLANNED/POSSIBLE COMMERCIALIZATION
Commercial aircraft
  • Interfaces and wing skins
  • Lightning protection, deicing
Defense aerospace
  • High-temp composites
  • Multifunctional composites
Transportation & automotive
  • Energy storage

CONTRACT (CENTER) NNX15CL46P (LaRC)  SOLICITATION-PHASE SBIR 2015-I
SUBTOPIC A1.01 Structural Efficiency-Hybrid Nanocomposites  TA 10.1.1 Lightweight Materials

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