

Summary of Research Topics in the Proposal Submitted to the FAA

- 2.6.1 Materials standardization and shared databases:
 - Develop database for uncured, liquid molding and wet layup materials
 - Identify characteristics of raw materials that directly correlate to physical and mechanical properties of the cured composite.
 - Develop a reasonable standard of equivalence testing for composite materials.
 - Improve procedures for evaluating and approving changes to qualified materials
- 2.6.2 Bonded joints processing issues:
 - Coupled Chemical Mechanical Models for Long Term Reliability of Bonded Joints
 - Development of Non Destructive Measurement of Adhesive Bond Strength.
 - Modified Adhesives using Nanotechnologies



Summary of Research Topics in the Proposal Submitted to the FAA (Continued)

- 2.6.3 Structural substantiation
 - Advanced Methods for Damage Analysis
 - Substantiation Methodologies for Resin Infused Structures
 - Development of Methods for Scaling
- 2.6.4 Damage tolerance and durability
 - Develop reliability-based damage tolerant structural design methodology
 - Study relationship between the damage growth rate and fracture parameters.
 - Develop analytical methods for determining damage growth rate of a typical fuselage structure under mechanical cyclic loading
 - Measure/study material and chemical degradation of “aged” polymeric composite structures retired from the commercial fleet
 - Develop active digital control systems that accommodate for structural variations with time (e.g., weight changes due to moisture adsorption, stiffness changes due to cracking or delaminations, “softening” of bonded joints, material degradation due to radiation, etc)



Summary of Research Topics in the Proposal Submitted to the FAA (Continued)

- 2.6.5 Maintenance practices:
 - Develop Quick Permanent Repairs of Composite Structures
 - NDI Methods for Accurate Depth Inspection and Substructure at Joints
- 2.6.6 Advanced material forms and processes
 - Development of nanoscale engineered matrices for fiber reinforced composites
 - Development of the next-generation Fiber-Metal Laminates (FMLs)
- 2.6.7 Flammability and crashworthiness
 - Review of existing literature, especially from other industries (e.g., racecars)
 - Coupon and structure element tests
 - Numerical analyses



Summary of Research Topics in the Proposal Submitted to the FAA (Continued)

- 2.6.8 Nanotechnologies for composite structures
 - Carbon nanotube composite materials
 - Inhibition of ice-crystal growth using genetically engineered proteins
- 2.6.9 Life management of materials for improved aircraft maintenance practices
 - Structural health monitoring systems based on embedded optical fibers
 - Power harvesting using embedded piezoelectric fibers
 - Wireless communication between sensors and a central processing unit

