USAF Aircraft Structural Integrity Program
ASIP Conference 2007

Panel Session #1:

Composite and Hybrid Structures Certification Issues

Panel Members

- Mr. Richard Reams – *USAF ASC/EN, Structures Technical Advisor*
- Dr. Larry Ilcewicz – *FAA, Chief Scientific and Technical Advisor for Advanced Composite Materials*
- Col Robert Fredell – *USAF, Military Assistant to the AF Chief Scientist*
- Mr. Jens Hinrichsen – *ALCOA Technical Center, Director Product Strategy and Development*
- Mr. Mike Woodward – *Lockheed Martin, F-35 Chief Engineers Office*
- Mr. Benson Black – *Boeing*
- Mr. Phillip Larson – *USAF, Advanced Composites Office*

Panel Agenda

- Introduction to Topic
- Introduction of Panel Members
- Panel Member Briefings
  - *FAA*
  - *USAF Chief Scientist's Office*
  - *ALCOA Technical Center*
  - *Lockheed Martin*
  - *Boeing*
  - *USAF Advanced Composites Office*
- Questions and Discussion
- Closing Comments

Topic Introduction

- Definition of a Composite Structure:

  "A structure composed of a material system of two or more distinctly dissimilar materials designed to act in concert to provide properties superior or unique to the individual constituents."

  - Fiber reinforced polymer composite structures flying on several DoD, commercial and civil airframes
  - Polymer, metal or ceramic matrix composites
  - Today seeing increased use of composites - B-2, F-22, F-35, Boeing 777 & 787, and Airbus A380

Topic Introduction

- Definition of a Hybrid Structure is more vague:
  - More aggressive use of tailored engineered materials
  - Structure composed of composite and metallic elements
  - Hybrid composites: 3 or more material elements designed/tailored for a specific component function and/or environment
  - Several hybrids have been developed in past
    - Fiber metal laminates - continuous fibers laminated between metal sheets – e.g., ARALL, GLARE, TiGre
    - Discontinuous fibers placed in a liquid or powder metallurgy matrix

Topic Introduction

- Certification – A Definition: “Recognition by a certification authority that a product complies with the requirements.”
- The certification process involves:
  1. demonstrating an acceptable level of safety
  2. ensuring conformity with the type design
  3. issuing a certificate declaring that 1 and 2 have been satisfied
- Requirements include those from the regulatory agency (e.g. – FAA) and those provided in the contract acquiring the product

Topic Introduction

- Certification Questions for the Panel:
  - How have composites and hybrids been certified on past programs?
  - What policies / regulations / initiatives have been put in place to deal with these structures and materials?
  - What lessons have been learned?
  - How can civilian and military organizations improve the certification process?
  - What changes in certification processes are imminent?
  - What new materials are on the horizon?
  - How will the certification agencies ensure safety of the next generation composites and hybrids?
  - What challenges do we face in the future?