FAA Composite Research Overview

Presented to: AMTAS

By: Larry Ilcewicz and Cindy Ashforth

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Composite Research Topics

- **Under Structural Integrity of Composites research group, we create research requirements by top-level subject**
  - Think of as “buckets” projects fit within
- **For FY2020, the subjects are:**
  - SIC.1: Damage Tolerance of Composite Structures
  - SIC.2: Composite Maintenance Practices
  - SIC.12: Continued Operational Safety (COS) and Certification Efficiency (CE) for Emerging Composite Technologies
  - SIC.14 Certification and Maintenance Protocols for Bonded Joints
- **Some projects are still being completed from FY18 or 19 under other research subjects**
  - In particular, SIC.5 was for Adhesive Bonding

FAA Composite Research

All of our JAMS research projects are funded through one of those line items. Open AMTAS Projects:

SIC.1	Failure of Notched Laminates Under Out-of-Plane Bending	J. Parmigiani
SIC.1	Evaluation of Parameters Used in Progressive Damage Models	J. Parmigiani
SIC.1	Development and Evaluation of Fracture Mechanics Test Methods for Sandwich Composites - Damage Tolerance Test Method Development	D. Adams
SIC.1	Moisture Diffusion in Sandwich Composites	M. Tuttle
Carryover	Development of a Building Block Approach for Crashworthiness Testing	D. Adams
Carryover	Effect of Surface Contamination on Composite Bond Integrity and Durability Project	D. McDaniel
Carryover	Durability of Adhesively Bonded Joints for Aircraft Structures Project	D. Adams
Carryover	Durability of Bonded Aerospace Structures	L. Smith
Carryover	Improving Adhesive Bonding of Composites Through Surface Characterization	B. Flinn
Carryover	Nanomechanical Characterization of Adhesive Bondlines	B. Flinn
SIC.12	Certification of Discontinuous Fiber Composite Material Forms for Aircraft Structure	Marco, J.K.

Composite Research Topics

- **For FY16-FY19, we also had congressionally-mandated additional research funds, and we created a new research line item to manage them, which may also be in the FY20 budget:**
  - SIC.13: Advanced Materials Standardization Development

Program	Budget Request	Conference Agreement
Fire Research and Safety	$4,867,000	7,200,000
Propulsion and Fuel Systems	555,000	2,100,000
Advanced Materials/Structural Safety	2,300,000	14,720,000
Aircraft Icing /Digital System Safety	7,684,000	9,253,000
Continued Airworthiness	4,969,000	11,269,000
Aircraft Catastrophic Failure Prevention Research	---	1,570,000
Flightdeck/Maintenance/System Integration Human Factors	5,052,000	7,305,000
System Safety Management	799,000	5,500,000
Air Traffic Control/Technical Operations Human Factors	1,436,000	5,800,000
Aeromedical Research	3,875,000	9,080,000
Weather Program	6,580,000	15,476,000
Unmanned Aircraft Systems Research	3,318,000	24,035,000
Alternative Fuels for General Aviation	---	1,900,000
Commercial Space	2,500,000	2,500,000
Total Safety	43,935,000	117,708,000

FY19 composite money comes from here and has directed spending

Advanced material/structural safety.—The conferees provide $14,720,000 for advanced material/structural safety, including $6,000,000 to advance the use of new additive materials (both metallic and non-metallic based additive processes) into the commercial aviation industry, and $4,000,000 to advance the use of fiber reinforced composite material into the commercial aviation industry through the FAA joint advanced materials and structures center of excellence.

FAA Composite Activities

- **The research request is crafted with tasks that support the *FAA AVS Strategic Composite Plan***
  - A short document that summarizes potential safety risks and opportunities for standardization associated with the use of composites in aviation products, *called Initiatives*
  - Defines mitigating actions for the FAA - rulemaking, policy, guidance, and training materials - as well as actions for industry (new FY2020), *called Deliverables*
    - Identifies research activities that support Deliverables
  - Divided into subjects under Continued Operational Safety, Certification Efficiency and Workforce Education

FY20 FAA Composite Plan Proposed List of Initiatives

Changes from last approved version (9/2017) in red

Continuous Operational Safety (COS)	Certification Efficiency (CE)	Workforce Education (WE)
COS A: Bonded Structure	*CE A:* Fatigue & Damage Tolerance Substantiation	*WE A:* Workforce Training
COS B: Closed	*CE B:* Closed	*WE B: Industry Training and International Outreach*
COS C: Failure Analysis of Composites Subjected to Fire	*CE C:* Composite Structural Modifications	
	CE D: Composite Quality Assurance	
	CE E: Bonded Structure Guidance	
	CE F: General Composite Structure Guidance	
	CE G: Engine Applications Guidance	
	CE H: Composite TSO	

Document that summarizes potential safety risks and opportunities for standardization (*Initiatives*) associated with the use of composites in aviation products

Defines mitigating actions (*Deliverables*) for the FAA - rulemaking, policy, guidance, and training materials – and industry

Most AMTAS research to date has either supported COS A / CE E for Bonded Structure or CE A for Fatigue and Damage Tolerance

The Role of FAA Research

- **We select composite research to:**
  1. Evaluate new tools and techniques proposed by applicants
  2. Provide publically available data where none exists that supports continued operational safety (support publishing lessons learned)
  3. Answer specific questions related to service events
  4. Develop tools to promote standardization and increase certification efficiency

Research Definition Process

- **The way the process works:**
  - Three years before execution, we develop subject “buckets”
  - At that time we also identify specific research goals/requirements under each bucket using criteria that the projects:
    - Support the composite plan
    - Have an appropriate research role
  - We have flexibility to update requirements during the year of execution
- **All gets bypassed when we have a congressional plus-up**
  - We will fund research as requested but all projects align with overall goals
    - May accelerate some projects or may supplement projects, typically by focusing on certification efficiency aspects and new materials

For Tomorrow

- **Be thinking about:**
  - What kind of projects you would like to do?
  - What “bucket” would it would fit in, or do we need a new one?
  - Will it support the composite plan (will explain further tomorrow)?
  - What role will the research play?