Composite Damage Tolerance and Maintenance Workshop

Welcome and Introduction

By: Curtis Davies
Research Manager
Advanced Materials and Structures and
Program Manager
Joint FAA Advanced Materials and Structures
Center of Excellence

Date: July 19-21, 2006

Welcome and Thanks for Participating

- **Thank you for taking time from your summer activities to support this effort**

- **A quick look at who is here:**
  - Academia 8
  - Manufacturers 46
  - Regulators/Customers 44
  - Other 37

Logistics

- **Restaurant Guide available on the back table**
- **Restrooms are down the hall from the room, directly across from the restaurant.**
- **All agenda times including break end times will be strictly enforced!!!**

Websites

- **Composite Damage Tolerance and Maintenance Workshop**
  - Presentations available here
  - http://www.jams-coe.org
- **FAA Technical Center Research Reports**
  - http://actlibrary.tc.faa.gov

Workshop Social

- **Thursday Evening**
- **6:00 - 7:30 PM**
- **Atrium**
- **Cash Bar**
- **Appetizers**

Comments on Agenda

Wednesday, July 19, 2006

AM

1:00 - 1:15	*FAA Composites Overview*	- Curtis Davies (FAA)
1:15 - 1:45	*Training Developments for Critical Composite Maintenance and Repair Issues*	- Charles Seaton (Edmonds CC)
1:45 - 2:25	*Composite Damage Tolerance & Maintenance Safety Issues*	- Larry Ilcewicz (FAA)
2:25 - 3:00	*Safety Management*	- Bjorn Backman (Structured Research)
3:00 - 3:15	*Break*	

Session 1: Applications and Service Experiences: Transport Aircraft

3:15 - 4:00	*Airbus Composites - Damage Tolerance Methodology*	- Chantal Fualdes (Airbus)
4:00 - 4:45	*Boeing Transport Experience with Composite Damage Tolerance & Maintenance*	- Allen Fawcett & Gary Oakes (Boeing)
4:45 - 5:15	*FAA/EASA/Boeing/Airbus Damage Tolerance & Maintenance WG*	- Tom Walker (NSE Composites)

Thursday, July 20, 2006

AM

Session 1: Applications & Service Experiences: Small Airplanes + Rotorcraft

8:00 - 8:30	*Staying Ahead Of The Game: Keeping a Composite Airplane Fleet Airworthy*	- Paul Brey, Tim Timmerman & Andrew Rokala (Cirrus Design Corp.)
8:30 - 9:00	*Composites in Rotorcraft Industry and Damage Tolerance Requirements*	- D.J. Reddy, consultant
9:00 - 9:10	Break	

Session 2: Substantiation of Structural Damage Tolerance

9:10 - 9:40	*Damage Tolerance Considerations in Composite Aircraft Structure*	- Joe Soderquist, consultant
9:40 - 10:10	*Effect of Damage on Performance of Composite Structures - Applications to Static and Fatigue Strength Predictions*	- Christos Kassapaglou, consultant
10:10 - 10:40	*NASA Langley Damage Tolerance Experiences*	- Ivantury Raju (NASA)
10:40 - 10:50	Break	

Session 3: Structural Test Protocol

10:50 - 11:20	*FAA R&D in Composite Sandwich Structures*	- Peter Shyprykevich (FAA)
11:20 - 11:50	*Load Enhancement Factor for Composite Test Spectra*	- Ric Abbott (Abbott Aerospace Composites, LLC.)
11:50 - 12:20	*FAA Research on Large-Scale Test Substantiation*	- John Tomblin (WSU)

Thursday, July 20, 2006

PM

12:20 - 1:15 Lunch – Sponsored by Wichita State University

Session 4: Substantiation of Maintenance Inspection & Repair Methods

1:15 - 1:45	*MRO Repair of Composites, A 20 Year History:*	- Jim Epperson (Nordam)
1:45 - 2:15	*United Airline Composite Maintenance Experiences*	- Eric Chesmar (United Airlines)
2:15 - 2:45	*Safe Composite Repairs - Substantiation Database Framework*	- Mike Borgman & John Welch (Spirit)
2:45 - 3:15	*Composites at Airbus - Maintenance & Repairs*	- Roland Thevenin (Airbus)
3:15 - 3:30	Break	

Session 5: Damage/Defect Types and Inspection Technology

3:30 - 4:00	*FAA Inspection Research Activities for Composite Materials*	- Dave Galella (FAA)
4:00 - 4:30	*Damage/Defect Types and Inspection - Some Regulatory Concerns*	- Simon Waite (EASA)
4:30 - 5:00	*Unified Treatment for Impact - Probabilistic & Deterministic*	- John Halpin (JCH Consultants), Keith Kedward (UCSB),

Paolo Feraboli (Univ. of Washington), and Hyonny Kim (Purdue Univ.)

5:00 - 5:15 Closure (review tomorrow's breakout sessions)

Friday, July 21, 2006

AM

Session 6: Technical Breakout Sessions

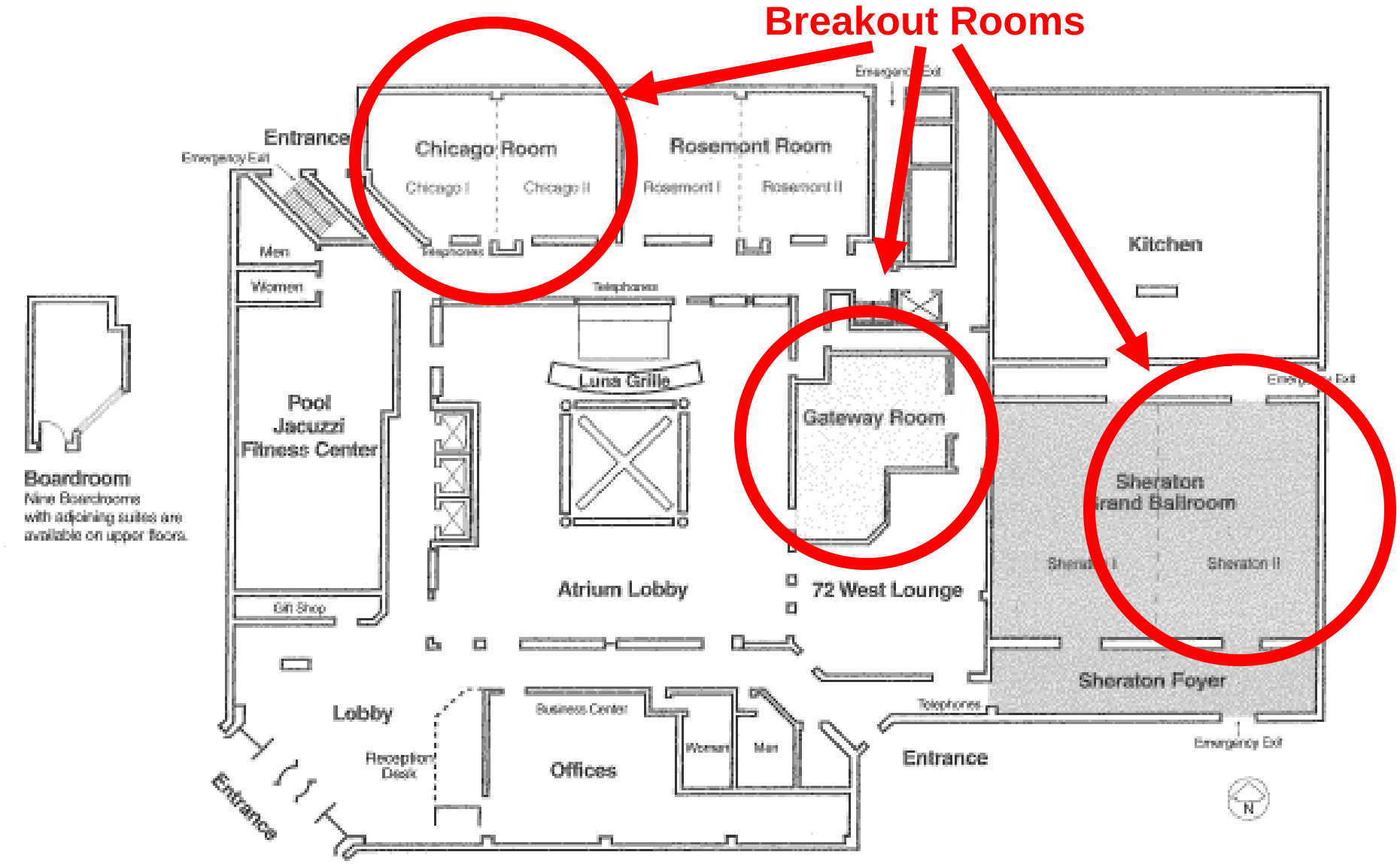
8:00 - 10:00	*Substantiation of Structural Damage Tolerance*	- Tom Walker (NSE) and Larry Ilcewicz (FAA)
	Structural Test Protocol	- John Tomblin (WSU) & Peter Shyprykevich (FAA)
	Substantiation of Maintenance Inspection & Repair Methods	- Gary Oakes (Boeing) & Mike Borgman (Spirit Aero)
	Damage/Defect Types and Inspection Technology	- Curtis Davies (FAA) & Larry Gintert (Concurrent Tech. Inc.)
10:00-10:20	Break	

Session 7: Technical Breakout Summaries and Workshop Recap

10:20-10:45	*Brainstorm subjects desired at 2007 Workshop*	- Kristin Strole (WSU)
10:45 - 11:45	Technical Breakout Summaries	
	Substantiation of Structural Damage Tolerance	- Tom Walker (NSE) and Larry Ilcewicz (FAA)
	Structural Test Protocol	- John Tomblin (WSU) & Peter Shyprykevich (FAA)
	Substantiation of Maintenance Inspection & Repair Methods	- Gary Oakes (Boeing) & Mike Borgman (Spirit Aero)
	Damage/Defect Types and Inspection Technology	- Curtis Davies (FAA) & Larry Gintert (Concurrent Tech. Inc.)
11:45-12:00	*Recap/Actions/Closure*	- Larry Ilcewicz & Curtis Davies (FAA)

Discussion on Subject Areas

- **On Friday Morning**
  - Participants are assigned a room.
  - We will divide into four groups to allow better discussion on each subject area
    - Substantiation of Structural Damage Tolerance
      - Tom Walker (NSE) and Larry Ilcewicz (FAA)
    - Structural Test Protocol
      - John Tomblin (WSU) & Peter Shyprykevich (FAA)
    - Substantiation of Maintenance Inspection & Repair Methods
      - Gary Oakes (Boeing) & Mike Borgman (Spirit Aero)
    - Damage/Defect Types and Inspection Technology
      - Curtis Davies (FAA) & Larry Gintert (Concurrent Tech. Inc.)
  - You have a colored strip on your badge this identifies you as member of a particular group and which room
    - Green — Sheraton II
    - Purple — Gateway
    - Blue — Chicago I
    - Red — Chicago II
  - These discussions will be summarized when the workshop reconvenes.


Breakout Rooms
Entrance
Emergency Exit
Chicago Room
Chicago I
Chicago II
Rosemont Room
Rosemont I
Rosemont II
Kitchen
Men
Women
Telephones
Luna Grille
Pool
Jacuzzi
Fitness Center
Gateway Room
Boardroom
Nine Boardrooms with adjoining suites are available on upper floors.
Sheraton Grand Ballroom
Sheraton I
Sheraton II
Gift Shop
Atrium Lobby
72 West Lounge
Sheraton Foyer
Lobby
Business Center
Reception Desk
Offices
Women
Men
Telephones
Entrance
Emergency Exit
Entrance
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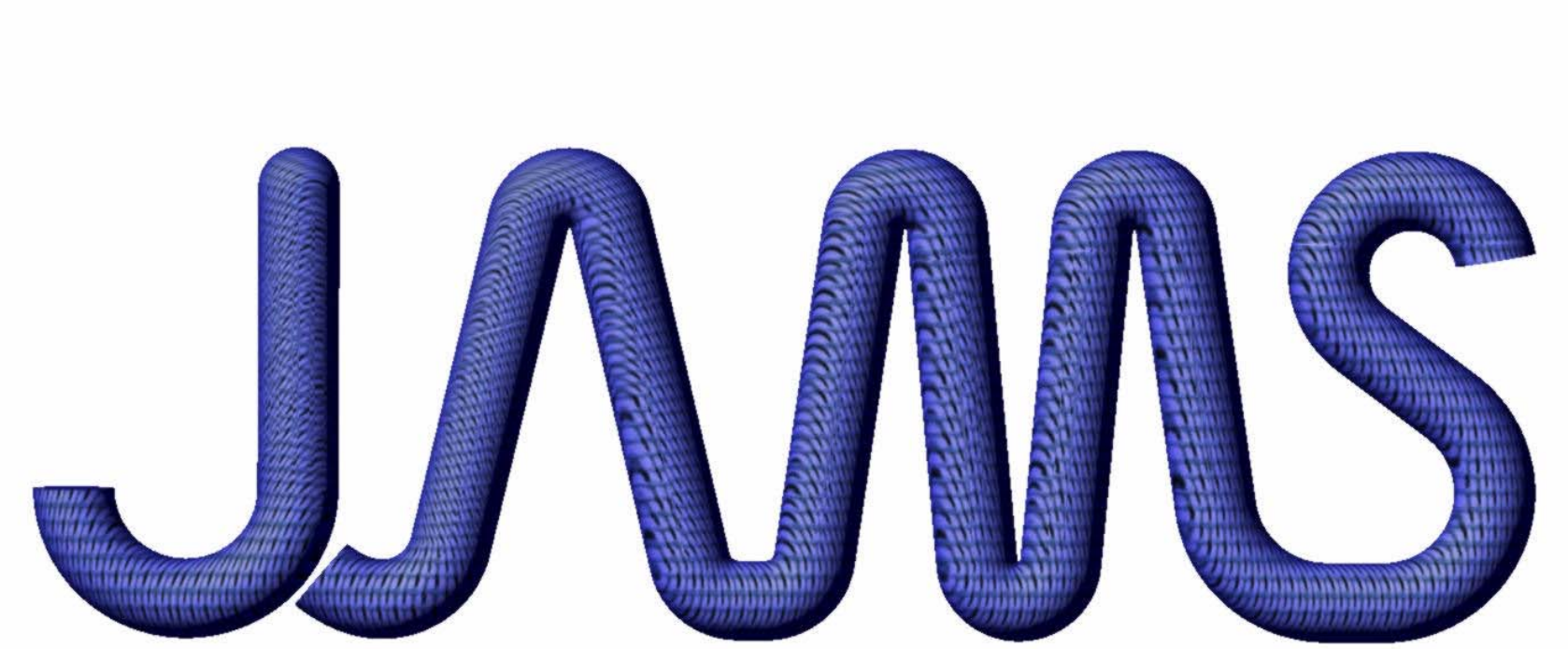


JAMS-CoE Member Schools

- **The joint center consists of two groups and includes ten institutions**
- **AMTAS (Advanced Materials for Transport Aircraft Structures)**
  - Director, Dr. Mark Tuttle
  - University of Washington, Lead
  - Washington State University
  - Oregon State University
  - Edmonds Community College
- **CECAM (Center for Composite and Advanced Materials)**
  - Director, Dr. John Tomblin
  - Wichita State University, Lead
  - Northwestern University
  - Purdue University
  - Tuskegee University
  - University of Delaware
  - University of California at Los Angeles

CoE Technical Focus Areas

- Structural Substantiation
- Damage Tolerance and Durability
- Bonded Joints Processing Issues
- Maintenance Practices
- Material Standardization and Shared Databases
- Advanced Material Forms and Processes
- Cabin Safety and Crashworthiness
- Life Management of Materials for Improved Aircraft Maintenance Practices
- Nanotechnology for Composite Structures

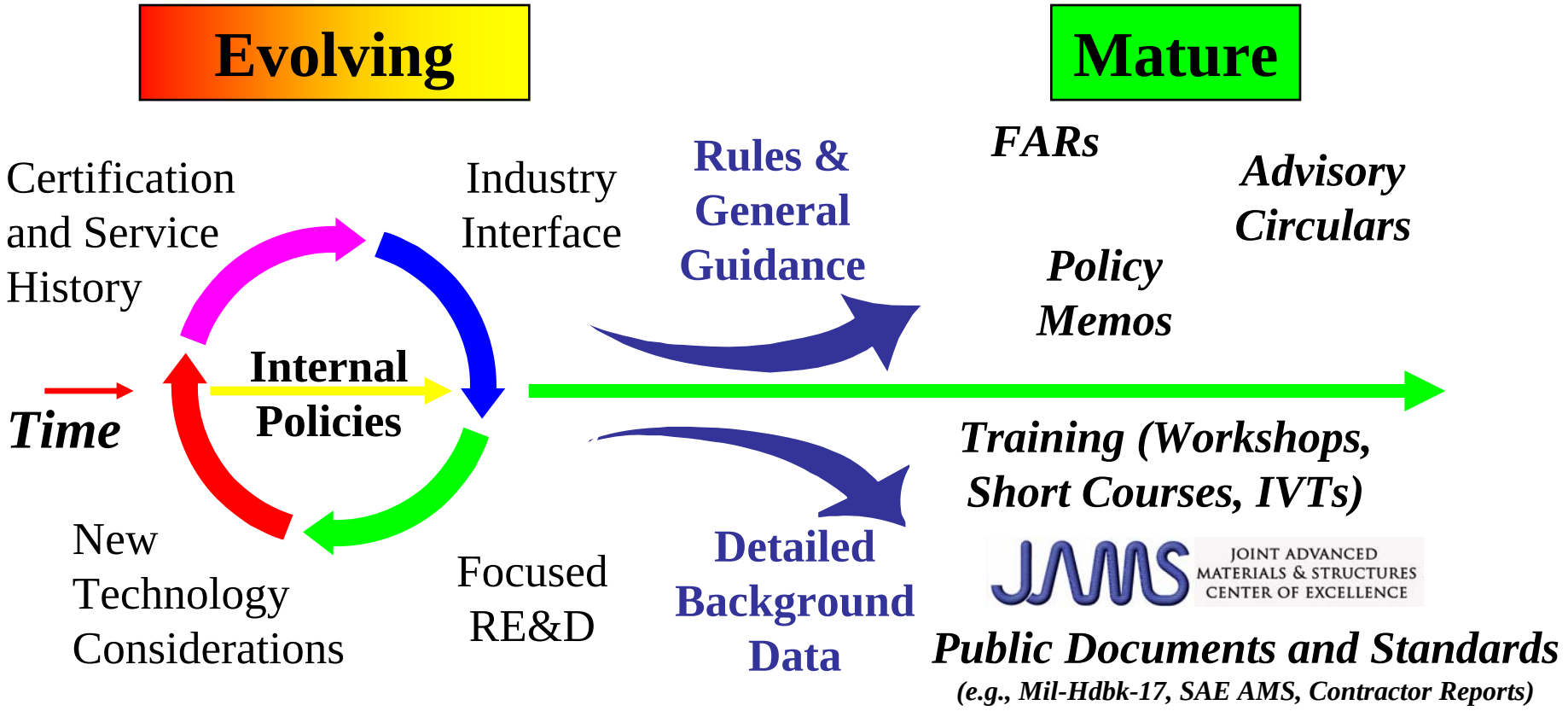
Composite Safety & Certification Initiatives Objectives

1) Work with industry, other government agencies, and academia to ensure safe and efficient deployment of composite technologies used in existing and future aircraft

2) Update policies, advisory circulars, training, and detailed background used to support standardized composite engineering practices

** Efforts started in 1999 to address issues associated with increasing composite applications*

FAA Approach to Composite Safety and Certification Initiatives



Technical Thrust Areas

Advancements depend on close integration between areas

Material Control, Standardization and Shared Databases

Damage Tolerance and Maintenance Practices

- Critical defects (impact & mfg.)
- Bonded structure & repair issues
- Fatigue & damage considerations
- Life assessment (tests & analyses)
- Accelerated testing
- NDI damage metrics/service POD
- Equivalent levels of safety
- Training standards

Structural Substantiation

- Advances in analysis & test building blocks
- Statistical significance
- Environmental effects
- Manufacturing integration

FAA and NASA R&D is currently active in most of these areas

NASA

Bonded Joint Processing Issues

Advanced Material Forms and Processes

Flammability & Crashworthiness

Support from cabin safety research groups

Significant progress, which has relevance to all aircraft products, has been gained to date

FAA Composite Team Members

Represented Group	Team Member Name	FAA Organization Number & Routing
FAA Tech. Center	Curtis Davies	AAR-450 (FAA Technical Center)
	Peter Shyprykevich	AAR-450 (FAA Technical Center)
International	John Masters	AEU-100 (Brussels Aircraft Certification Staff)
Directorates	Lester Cheng	ACE-111 (Small Airplane Directorate)
	Mark James	ACE-111 (Small Airplane Directorate)
	Charles Harrison	ASW-111 (Rotorcraft Directorate)
	Ian Won	ANM-115 (Transport Airplane Directorate)
	Jay Turnberg	ANE-110 (Engine & Propeller Directorate)
Flight Standards	Rusty Jones	AFS 309 (Aircraft Maintenance Division)
ACOs, MIDOs & CMOs	Roger Caldwell	ANM-100D (Denver ACO)
	Mark Freisthler	ANM-120S (Seattle ACO)
	Ed Garino	ACE-117A (Atlanta ACO)
	Fred Guerin	ANM-120L (Los Angeles ACO)
	John Harding	ANM-108B (Seattle CMO)
	Angie Kostopoulos	ACE-116C (Chicago ACO)
	David Ostrodka	ACE-118W (Wichita ACO)
	Richard Noll	ANE-150 (Boston ACO)
	David Swartz	ACE-115N (Anchorage ACO)
CS&TA	Larry Ilcewicz	ANM-115N (CS&TA, Composites)

Not intended to be inclusive. More team members are encouraged and currently needed.

CSTA and STS Advisors:
Al Broz, Robert Eastin, John Howford, Terry Khaled, Steve Soltis, Dave Walen, Chip Queitzsch

Important Teammates

- **NASA has been a leader for composite applications**
  - Significant research support since 1970/1980s
  - AA587, A300-600 accident investigation
  - NCAMP support to material standardization
- **Partnerships with industry have been essential**
  - Examples: Mil-17, SAE P-17, CACRC, ASTM, SAMPE, AGATE, SATS, RITA, SAS/IAB/AACE

Training
Databases
Standardization
Engineering guidelines

- **DOD and DARPA research**
- **EASA and other foreign research/standardization**

Past Accomplishments of FAA Composite Team

- **Pro-active efforts under Composite Safety & Certification Initiatives (CS&CI) started in 1999**
  - Progress releasing policy & guidance *(at least 1/yr. since 1999)*
  - Early emphasis on material & process control *(2000-2003: AGATE shared databases, equivalency sampling, AC23-20)*
  - Policy on static strength substantiation (2001) and bonded structures (2005)
  - *Draft rule & AC for rotorcraft fatigue & damage tolerance (2002)*
- **Future CS&CI are resource limited**
  - Some transfer of existing guidance to other aircraft products
  - *Technical emphasis on damage tolerance & maintenance*
  - *Voices from the field want near-term emphasis on "training"*
  - Continue using industry resources in composite standards orgs.

Again Welcome
and
Thank You
for
Your Participation