

# Composite Safety and Certification Initiatives



Federal Aviation  
Administration

- *Background*
  - *Objectives*
  - *Recent Accomplishments*
  - *Support from JAMS*
- *Challenges for JAMS*
  - *Future relevance*
  - *Expand industry involvement*
- *Safety Management*
  - *Role of CACRC & CMH-17*
  - *New WSU project*

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CS&TA

Federal Aviation  
Administration

July 10, 2007

# Ongoing 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 practices

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

# Technical Thrust Areas

*Advancements depend on close integration between areas*

Material Control, Standardization  
and Shared Databases

## 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**

## 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

## Flammability & Crashworthiness

*Support to cabin  
safety research groups*

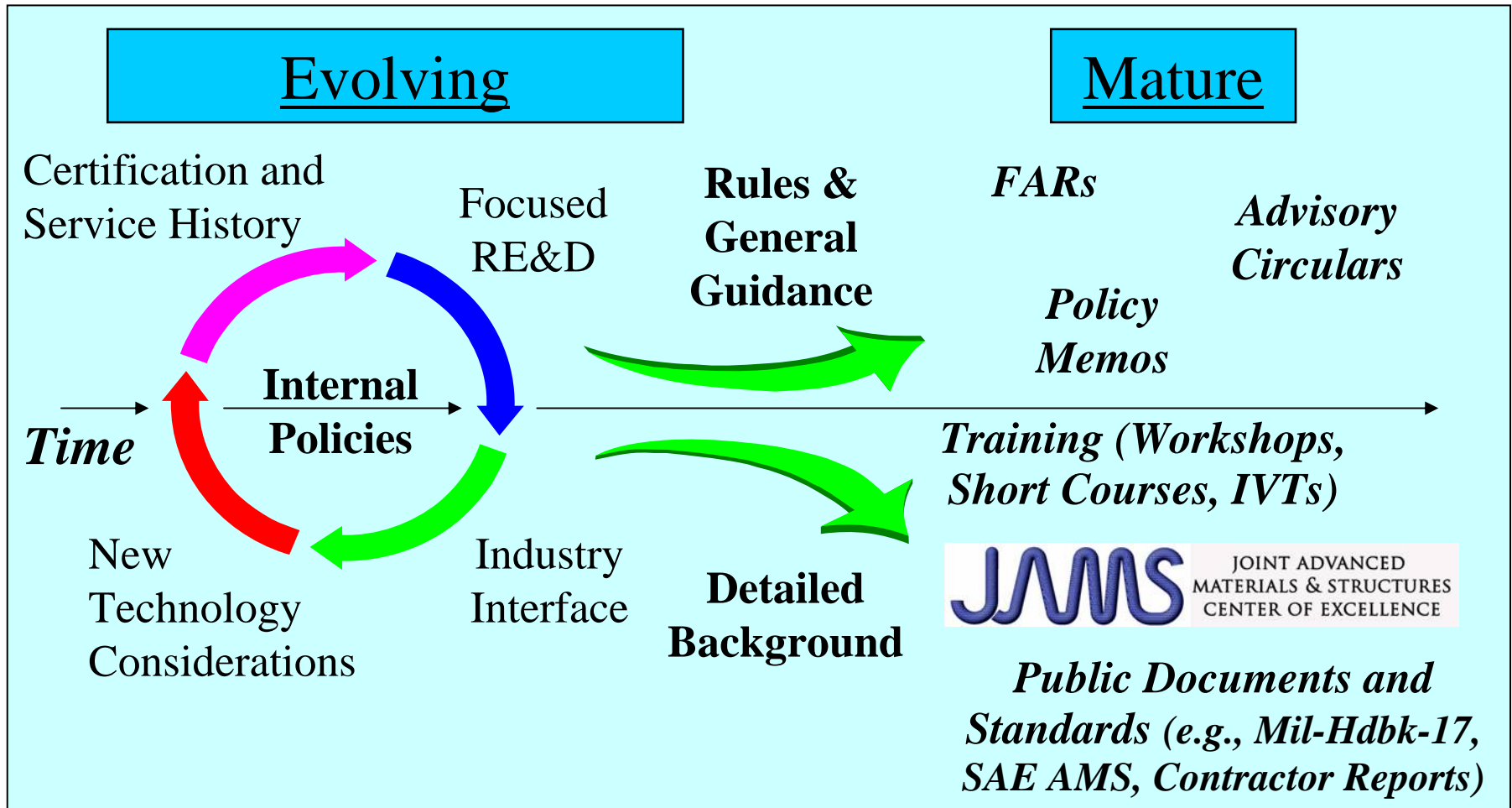
Bonded Joint  
Processing Issues

Advanced Material  
Forms and  
Processes

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



# FAA Approach to Composite Safety and Certification Initiatives



# FAA Composite Team Members

Represented Group	Team Member Name	FAA Organization Number & Routing
FAA Tech. Center	<i>Curtis Davies</i>	<i>AAR-450 (FAA Technical Center)</i>
	<i>TBD (Peter's replacement)</i>	<i>AAR-450 (FAA Technical Center)</i>
International	John Masters	AEU-100 (Brussels Aircraft Certification Staff)
Directorates	Lester Cheng	ACE-111 (Small Airplane Directorate)
	Bob Stegeman	ACE-111 (Small Airplane Directorate)
	Charles Harrison	ASW-110 (Rotorcraft Directorate)
	Ian Won	ANM-115 (Transport Airplane Directorate)
	Jay Turnberg	ANE-110 (Engine & Propeller Directorate)
DC Certification	James Kabbara	AIR-120 (Aircraft Standards Division)
Flight Standards	Rusty Jones	AFS-309 (Aircraft Maintenance Division)
	Gary Goodwin	ANM-200 (Seattle AEG)
ACOs, MIDOs, & CMOs	Roger Caldwell	ANM-100D (Denver ACO)
	Mark Freisthler	ANM-120S (Seattle ACO)
	Ed Garino	ACE-117A (Atlanta ACO)
	<i>Hassan Amini</i>	<i>ACE-117A (Atlanta ACO)</i>
	Fred Guerin	ANM-120L (Los Angeles ACO)
	Angie Kostopoulos	ACE-116C (Chicago ACO)
	David Ostrodka	ACE-118W (Wichita ACO)
	Richard Noll	ANE-150 (Boston ACO)
	John Harding	ANM-108B (Seattle CMO)
	David Swartz	ACE-115N (Anchorage ACO)
CS&TA	<i>Larry Ilcewicz</i>	<i>ANM-115N (CS&amp;TA, Composites)</i>

*Those attending the JAMS Meeting are highlighted in blue italics.*

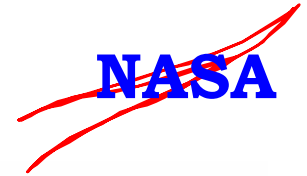
## CSTA and STS Advisors:

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, e.g., CMH-17, SAE P-17, CACRC, ASTM, SAMPE, AGATE, SATS, RITA, SAS/IAB/AACE



Training  
Databases  
Standardization  
Engineering guidelines

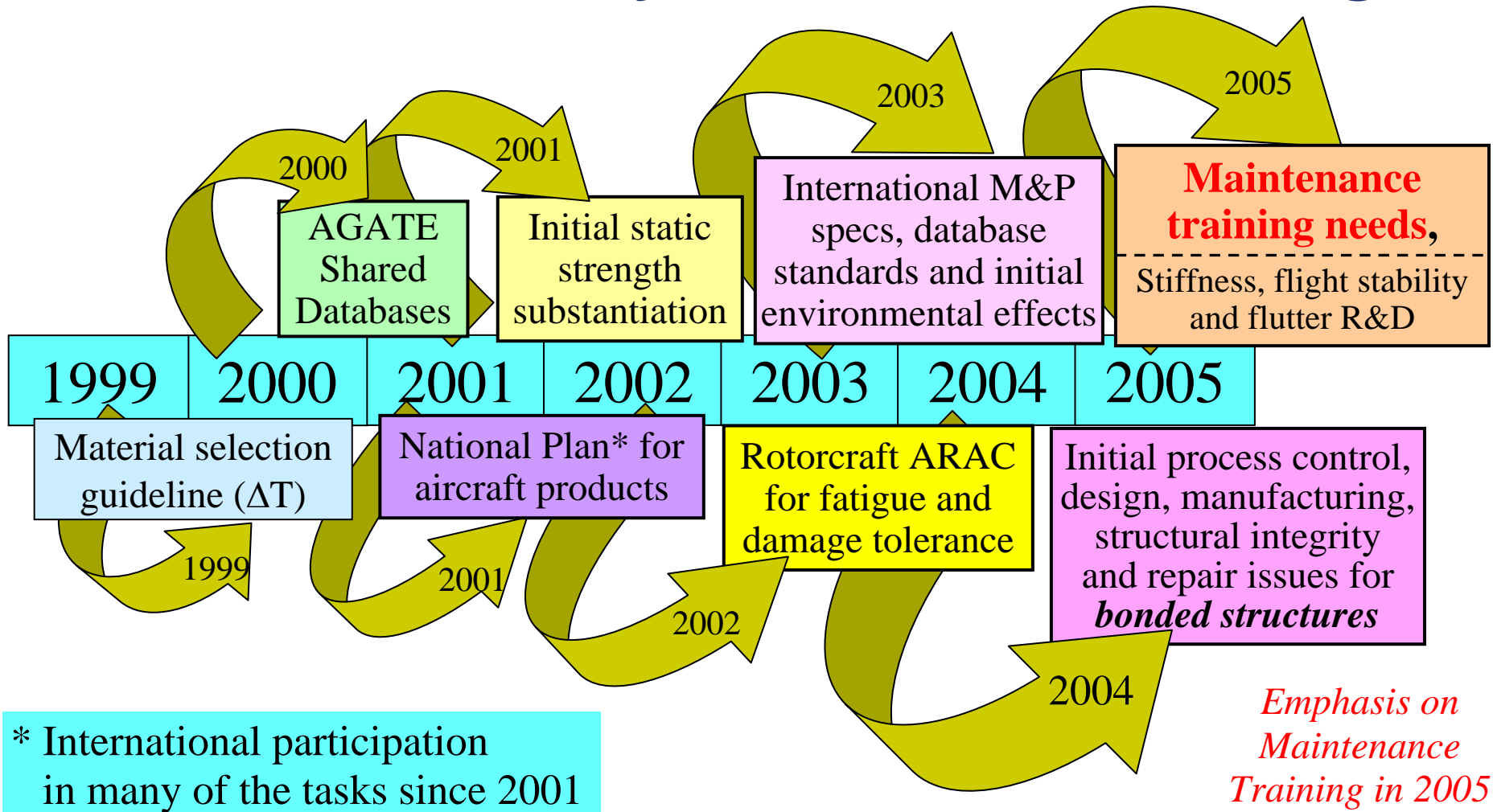


- DOD and DARPA research
- EASA and other foreign research/standardization





# Past Milestones for Composite Safety & Certification Policy, Guidance & Training

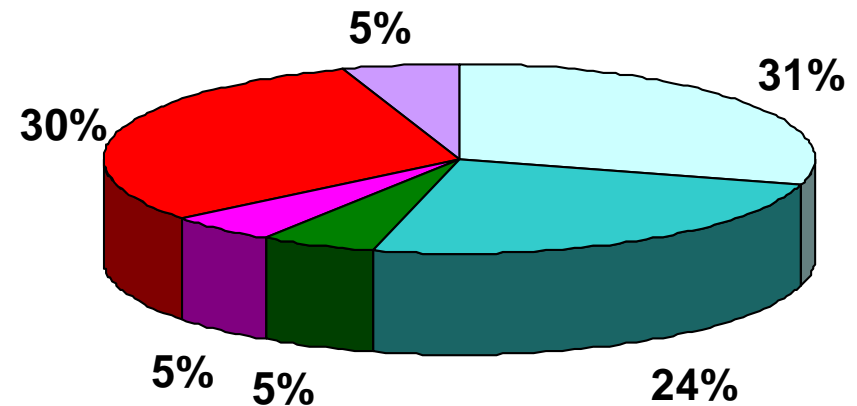


# Joint Efforts by Industry & Regulatory Experts to Standardize a Course on Critical Composite Maintenance & Repair Issues

- 2004: Initial workshops to define framework (incl. course objectives on the key areas of awareness for engineers, technicians & inspectors)
- 2005: 11 course modules drafted for workshop review
- 2006: Update modules and develop course standards with SAE CACRC
- 2007: Coordinated FAA/industry release of course standards



**Total Costs = \$930K** (est. thru FY06)



□ Industry Match (JAMS COE R&D)

□ FAA JAMS COE R&D (\$)

□ FAA Development Manpower (\$)

□ Industry/EASA Review Manpower (\$)

□ Industry/EASA Workshop Manpower & Travel (\$)

□ FAA Workshop Manpower+Contracts+Travel (\$)

**Training  
Development  
Costs: \$598K**

**11/04 & 9/05 Workshop Costs: \$332K**



**Federal Aviation  
Administration**



# Composite Maintenance Training Reports

## FAA Technical Document

- Unofficial FAA document for informational purposes only
- Written by FAA (L. Cheng & L. Ilcewicz)
- *Not a formal reference that is archived*



## FAA JAMS Technical Report

- FAA document of JAMS R&D used for educational purposes to support course development
- Written by Edmonds CC. (C. Seaton)
- *Formal reference that is archived*



Import  
Key  
Content

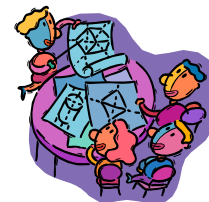
## SAE CACRC AIR Report

- *International standard to describe essential course content*
- Drafted & approved by CACRC
- Formal reference that is archived

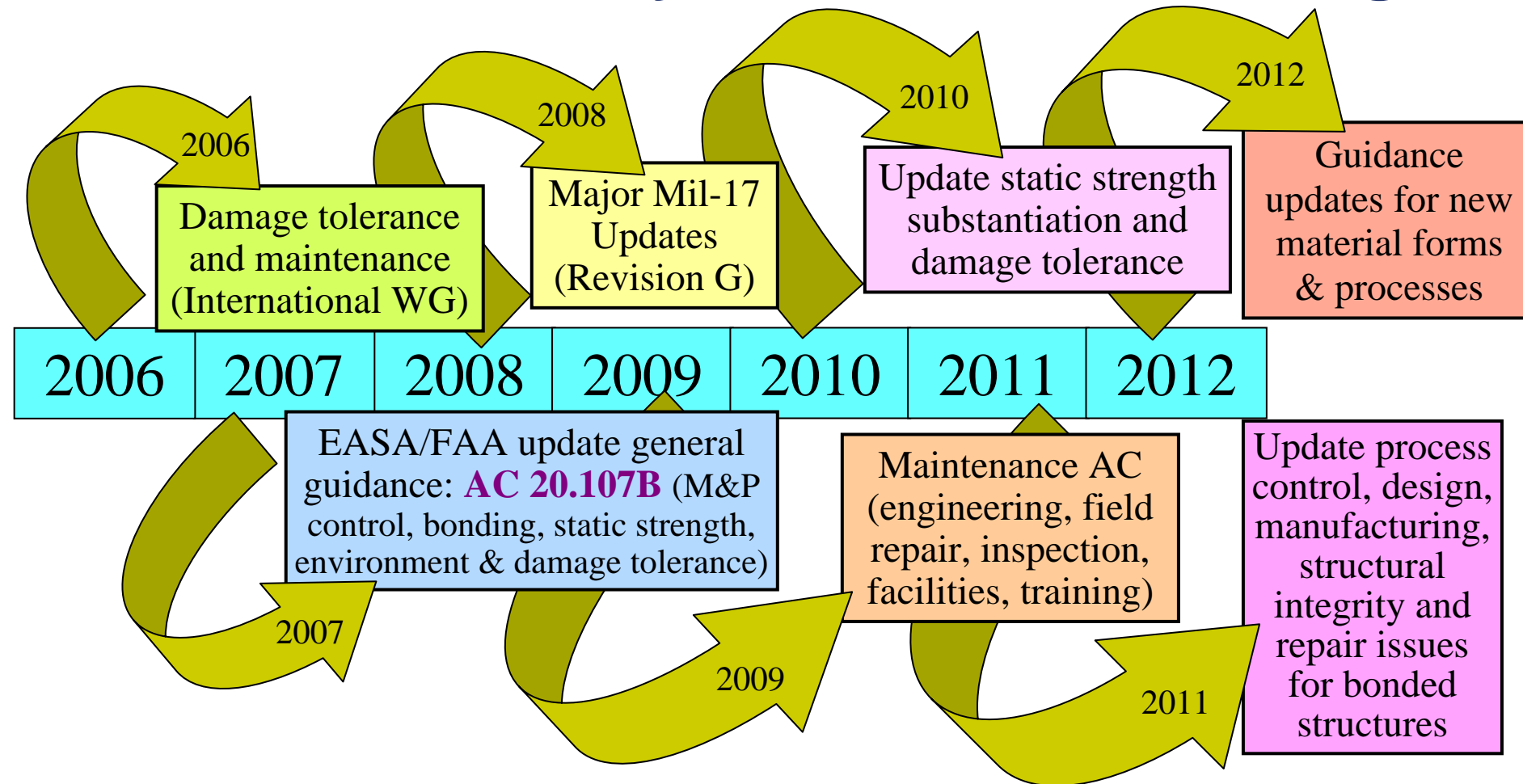


## Industry Interface, CMH-17 Mtgs. and FAA Workshops

- *Basis for all reports & documents*
- Expert inputs and review of draft reports & course content
- Testimonials, graphics, videos & other teaching aids
- Edmonds CC. Beta courses



# Future milestones for Composite Safety & Certification Policy, Guidance & Training



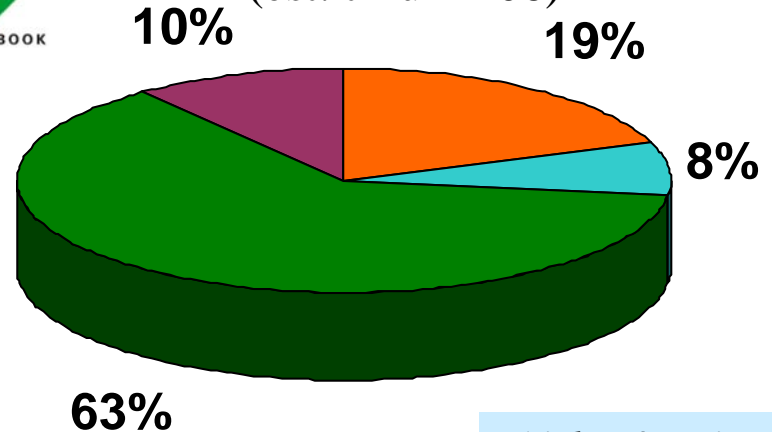
# Other FAA/EASA/Industry Working Groups for Damage Tolerance and Maintenance

- Started in 2005
  - New content for CMH-17 chapters on damage tolerance and supportability
  - Efforts initiated with Airbus and Boeing, then expanded to other industry groups in workshops
  - Update OEM source documentation (MPD, SRM, etc.) as appropriate
- 2006 & 2007 Composite Damage Tolerance and Maintenance Workshops



**Total Costs=\$670K**

(est. thru FY06)



Industry/EASA WG  
Manpower+Travel (\$)

FAA Manpower, Travel &  
Contracts (\$)

Industry/EASA 7/06 Workshop  
Manpower+Travel (\$)

FAA 7/06 Workshop  
Manpower+Contracts+Travel (\$)

*Airbus/Boeing  
EASA/FAA  
WG Costs  
\$182K*

*7-06  
Workshop  
Costs  
\$488K*

## Other Examples of JAMS R&D Directly Related to CS&CI in Damage Tolerance & Maintenance

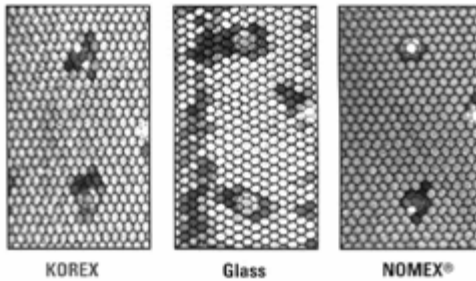
Future composite guidance, policy and training development in areas driven by industry needs

*Related research (examples shown below)*

# Structural Substantiation Protocol



# Sandwich Fluid Ingression



## Impact Threat Assessment

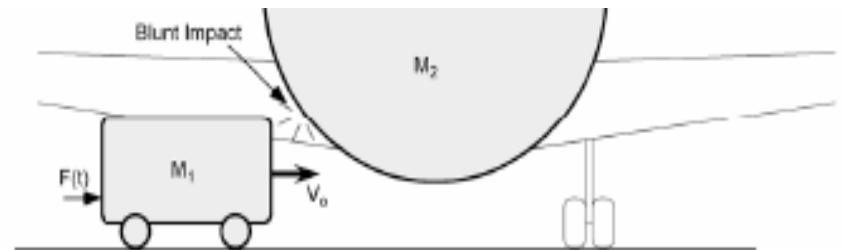
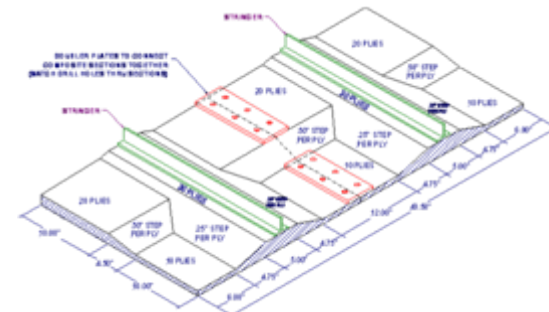


Figure 1. Blunt Impact on Aircraft Fuselage

# NDI Standards



# FAA Perspectives on JAMS

## Research & Educational Developments

FAA is primarily interested in studying service incidents and emerging safety threats but will also evaluate new technology being used in product certification

- Primary goal: study “real-world” issues for advanced materials & structures, with emphasis on the factors affecting safety
- Secondary goals: evaluate new technology applied in product certification (e.g., composite fuselage damage tolerance)
  - Supporting technologies such as test methods, process controls and analysis methods can also be studied to ID limits & establish protocol for use  
*(pre-requisites: must have relevance to safety and industry is close to using them for certification & airworthiness assessments)*
- Deliverables should ultimately lead to guidance, policy, standard training materials and protocol for acceptable industry practices

# Challenges for JAMS

## *Future Relevance*

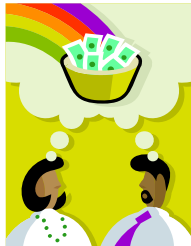
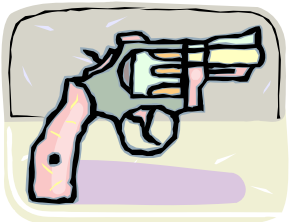
- Emphasis must be on safety & certification
  - Experts from industry & regulatory bodies must be active in JAMS research & educational developments such that deliverables have relevance and utility
  - Need an assessment of whether that is happening in a continuous review of our programs throughout the year
- Most FAA research projects are expected to have a near-term focus (*results used in the field within 1 to 2 years*)
  - Safety & certification R&D with a low risk of failure
- Longer-term projects must retain an emphasis on safety & certification - *not developing technology for industry*
  - Payoffs from more demanding R&D (not higher risk of failure)



# Ilcewicz Anecdotes for JAMS R&D



***The FAA can't afford to go for the home run with limited R&D resources and a high potential for strikeouts that don't mitigate the risk of aircraft accidents.***



***Silver bullets, The Holy Grail and a Pot of Gold at the End of the Rainbow only seem to work in the movies***



***Government investments are generally low risk with a guaranteed payoff ("Buy U.S. Savings Bonds!")***



# Links with Mil-17 (CMH-17), SAE CACRC and Safety Management

Existing Problem:  
Volunteer participants  
are not always the  
ones you need for a  
given technical issue

- Mil-17 (Composite Materials Handbooks, CMH-17)
  - ~ 100 industry engineers meet every 8 months
  - FAA/EASA/Industry WG deliverables to update CMH-17, Vol. 3 Chapters on Damage Tolerance & Supportability for Rev. G
  - New CMH-17 Safety Management WG has been initiated
  - *FAA strategy: use CMH-17 as a forum to develop guidance and establish educational services to offset costs*
- SAE CACRC (Commercial Aircraft Composite Repair Committee)
  - ~ 50-75 industry engineers meet every 6 months (~7 WG)
  - Airlines have dropped out of CACRC over time, requiring more OEM and MRO leadership for organization to survive
  - New CACRC Safety Management WG has been initiated
  - *FAA strategy: use CACRC as a forum to develop guidance and support industry composite maintenance standards & training efforts*



# New Wichita State Univ. Project

## Development and Safety Management of Composite Certification Guidance

- Engage industry on technical matters of relevance in mitigating the risk of accidents, incidents and emerging safety threats
- Facilitate the development of strategies for CMH-17 and CACRC
- Support workshops, industry meetings and web-based forum
- FY07/FY08 tasks supporting the following initiatives
  - Joint CACRC/CMH-17 Safety Management WG Mtg. (Wichita, 11/07)
  - CMH-17/NCAMP strategies for data review and dissemination
  - New CMH-17 Tutorial (V3/C3:Aircraft Structure Certification & Compliance)
  - Updates to main composite advisory circular (AC 20-107B)
- Future tasks to facilitate more complete and continuous industry review of individual JAMS R&D programs
- Principles of safety management and industry standards groups (CMH-17 & CACRC) will be used