

# Workshop Recap: Tuesday, September 15

- **General agreement that the safety concerns expressed in presentations on regulatory perspectives are valid**
  - Cert. efficiency for composite seats require more industry/regulatory interface
  - Workforce education is considered a priority need in transfer technology throughout the world of new products and the related field experiences
- **Sandwich disbond initiative has industry interest.**
  - Current funding organizations are committed to completing this effort
  - Additional industry support can help expedite the process
  - Moisture/fluid diffusion/ingression processes are of interest to technical community
  - Airbus bonded repair awareness campaign results would benefit future workshop
- **Bonded repair (general agreement with ongoing initiatives)**
  - Operator experiences indicate a need for a full range of damage considerations
  - “Combined airline voice” is best (+ more airlines/MRO needed at next workshop)
  - All OEM are pursuing additional applications for bonded repairs
  - Advances that consider field issues are showing promise
  - Must develop separate sandwich guidance that considers related special needs
  - Tech. transfer work is needed (due to proprietary limits & overall lack of industry standardization)
  - Repair substantiation guidelines & practical competency measures need more work
  - Case studies will be useful in illustrating differences in part criticality



# Workshop Recap: Wednesday, September 16

- **HEWABI means “To cut in pieces” “a” “wind”, polish translation: “to cut (or more politely, *pass*) wind”**
- **HEWABI progress to date is incomplete due to a need for further operations and maintenance interface (but there are other such initiatives active)**
  - Further studies are needed to provide guidelines that minimize false calls
  - Too many potential Category 5 damage events to completely address through testing
  - Calibrated analysis for a particular structure can be used to help understand likely failure modes and establish conditional inspection instructions (strongly dependent on specific design detail)
  - Difficult to simulate HEWABI events that cause significant damage at subcomponent levels
  - Advanced NDE focused on reliably detecting the damage that justifies delayed or cancelled flight
- **Composite Fatigue and Damage Tolerance has years of PSE experience**
  - Damage threats/design criteria are linked to selected detection/inspection schemes
  - Composite structural behavior suggests efficiency from more reliance on subcomponent tests
  - Large damage capability helps avoid a more rigorous assessment of the effects of impact variables (e.g., impactor geometry & hardness) on damage detectability and residual strength
  - Time should be spent to evaluate the potential damage threat differences for small and large aircraft
  - Significant industry experience has been documented in CMH-17 but there are lots of future needs to meet the goals, which would provide a strong basis for the ongoing ARAC
  - Some emerging multi-LEF methods show promise for hybrid FSFT (deferred spectrum)
  - Composite/metal hybrid structure aging requires a need to allow adjustments based on field experience; however, fleet leader programs assume closer ties between OEM & airlines than exist

# Workshop Recap: Thursday, September 17

- **Damage Tolerance (Special Subjects)**
  - Many different building block strategies exist but the common need exists to link structural analyses with test performance for parts representative of as-manufactured hardware
  - All OEM are pursuing more efficient procedures for “certification by analysis supported by tests”
  - Specific LEF for different structural details may best be addressed at subcomponent test levels; however, there is still a need to address the hybrid issues for the different elements in an assembly
  - ARAC should consider the future ability to address composite repeated load tolerance in a mix of subcomponent (with LEF) and full-scale fatigue (without LEF) testing
  - Thermal contribution to metal fatigue and hybrid structure static strength can be very significant
  - Full-scale test evidence is practically available in validating structural temperatures and thermal load levels (through tests performed with configured structure)
  - Some variations in material CTE suggests further study in documenting standard practices
- **Smarter testing**
  - Analysis developments linked with less tests, for purposes of covering specified design spaces
  - **Ask Kevin to collect additional summary statements**
- **Probability assessments**
  - Probabilistic assessments can supplement design criteria, identify/minimize testing, safety analyses
  - Some OEM have successfully applied probabilistic approaches to generalize damage threats for purposes of structural zoning and establishing maintenance inspection intervals
  - Moisture & temp. design criteria will likely be updated by probabilistic assessments in near term
- **Major Mods, Alterations and Repairs**
  - Good DER are constrained by existing practice and lack of specific standards/guidelines
  - Best practice may be similar to tech transfer for part mfg (first part qual, destructive inspection, etc.)

# Workshop Support



- **Thanks to Primary Organizers**

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(Steven Zibreira, Magali Deschenes, Salamon Haravan)
- Michelle Thomsen-Curwen, TTC Event Management
- Diana Elting (Boeing)
- Wichita State University (Tracee Freiss, John Tomblin)

- **Thanks to Session Organizers**

- Regulatory Perspectives (Cindy Ashforth)
- Bonded Repair (Mike Borgman, Rusty Jones, Lamia Salah)
- HEWABI (Hyonny Kim, Lester Cheng)
- Composite F&DT (D.M. Hoyt, Waruna Seneviratne)
- Smarter Testing (Boeing)
- Use of Probabilistic Methods (Airbus)

