Breakout Session on:
*Substantiation of Maintenance Inspection & Repair Methods*

The following charts document the results of a session conducted at the July 2006 FAA Composite Damage Tolerance & Maintenance Workshop.

The basic charts were prepared in advance of the session to facilitate brainstorming and discussion, and the text and/or slides highlighted in red represent comments and feedback provided by workshop participants during the session.
Breakout Session on Substantiation of Maintenance Inspection & Repair Methods

**Primary objective:** Address safety concerns & technical issues for substantiation of maintenance inspection and repair methods.

**Secondary objectives**
1. Discuss factors affecting the substantiation of maintenance inspection & repair methods (design, analysis, testing)
2. Discuss elements of safety management needed for damage detection, disposition, and repair
3. Identify needs for regulatory requirements & guidance
4. Identify training development needs for inspection procedures and repair processing
5. Identify needs for standards (guidelines, databases and tests)
6. Provide directions for research
Damage Detection, Disposition & Repair

• Discussion of types that may be found in service, but do not require repair
  – Category 1: Allowable damage that may go undetected

• Discussion of types that require detection and repair
  – Category 2: Damage detected by field inspection
  – Category 3: Obvious damage detected within a few flights
  – Category 4: Discrete source damage known to pilot
  – Category 5: Severe damage created by anomalous ground or flight events (not covered by previous inspection & repair substantiation)

• Safety concern: if the associated technical issues for detection, disposition and repair of a given category of damage are not covered by current industry practices

• Other discussion points (as time allows)
  – Damage threat assessments
  – Structural design construction
Safety Concerns for Damage Detection, Disposition and Repair

Damage Categories

– Should be re-cast in terms of detect-ability AND residual strength
Safety Concerns for Damage Detection, Disposition and Repair

Detection

- Need better way of reporting damage events and need expansion of training (and recurrent training) so ALL personnel (GA, Large Transport, Rotorcraft, etc...) understand that ALL events MUST be reported.

- Believe we are fairly well covered for Damage Categories 1 through 4 with a few exceptions.
  - Undetected fluid accumulation

- Could not say we are 100% covered for category 5.
  - Believe there is some probability for “Escapements”
  - Blunt low velocity large area impact to bonded structure which disbands internal structure with OML returning to original contour and masking internal damage
  - Don’t know how probable, recommend work devoted to quantifying
Safety Concerns for Damage Detection, Disposition and Repair

Disposition

• **Current Architecture**
  – Need better definition and documentation of what IS allowable damage
  – Practices are generally acceptable
    (Assumes adequate ability to find everything relevant)

• **Future Architecture**
  – Need complete definition and documentation of what IS allowable damage
Safety Concerns for Damage Detection, Disposition and Repair

Repair

• Current Architecture
  – Don’t believe system is sufficient to quickly dispatch repairs
  – Training for ACO and DER Personnel?
    • Reluctance to accept non-SRM solutions (need standard approach for use by everyone)
    • Need to unify level of confidence in dealing with composite repairs
  – Need more emphasis on STANDARD methods for repair, analysis, approval
  – More work required on acceptable substitute materials
Safety Concerns for Damage Detection, Disposition and Repair

Repair

• Future Architecture
  – Repairs Should Be Categorized In Terms Of...
    • Primary / Secondary Structure Application
    • Structural Criticality (Primary Structures Have Benign Areas)
    • Difficulty to Successfully Perform
    • Levels Of Quality Verification
  – Consider Establishing “REPAIR COE’S” Equipped To Perform Difficult Structurally Demanding Repairs and Train Level X Technicians
    • SWAT TEAM For Critical Repairs
  – Bonded Repair Tech “Certification”
    • Similar to certified welder
Discussions on Substantiation of Maintenance Inspection & Repair Methods

- Other safety concerns (not addressed in the discussion on previous chart for damage detection, disposition and repair)

- Present practices & associated challenges

- Technical “Gaps”

- Regulation needs (missing rules & guidance)

- Urgent issues for next workshop
Discussion on Damage Threat Assessments

• Impact damage caused by different threats

• Damage from extreme temperature, moisture and chemical exposure

• Growth potential for combined damage scenarios

• Structural testing & analyses to substantiate inspection and repair for known threats (scatter, scale-up, assemblies)

• Process to disposition unsubstantiated damage threats

Did not get to this chart during breakout session
Discussion on Effects of Design Construction
(Substantiation of Inspection & Repair Methods)

- Experience with sandwich concepts
- Experience with stiffened-skin concepts
- Experience with secondary bonding
- Material toughness
- Advanced material forms & manufacturing methods

Did not get to this chart during breakout session