

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 disbonds 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

*Did not get to
this chart during
breakout session*

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**