Course Development Maintenance of Composite Aircraft Structures

The Joint Advanced Materials and Structures Center of Excellence

Course Development: Maintenance of Composite Aircraft Structures

- Motivation and Key Issues
  - Practical, introductory-level course for engineers, technicians and inspectors
- Objective
  - Develop framework, content and assessment criteria as a basis for curriculum training
  - Online course, with ‘hands-on’ laboratory, which will increase awareness of critical safety issues in composites’ maintenance
- Approach
  - Series of workshops and ‘beta’ class with experienced practitioners
  - Industry, regulatory and academic collaboration

FAA Sponsored Project Information

- Principal Investigators & Researchers
  - Charles Seaton, PI, Edmonds Community College
  - Cyndi Schaeffer, Executive Director, EdCC
- FAA Technical Monitor
  - Curt Davies, Acting
- Other FAA Personnel Involved
  - Larry Ilcewicz, Curt Davies
- Industry Participation
  - Boeing, Airbus, EASA, Hexcel, Heatcon, Abaris and others

Motivation and Key Issues

Build Awareness: Critical Composite Maintenance and Repair Issues

- ü Understand roles & responsibilities (importance of teamwork)
- ü Recognize composite damage types & sources (proper team reaction to possible service damage)
- ü Understand the inspection methods & procedures needed for detection, characterization and disposition of damage
- ü Understand regulations and importance of approved source documentation
- ü Realize the unique processing issues and quality controls needed for bonded composite repairs
- ü Realize the unique processing issues and quality controls needed for bolted composite repairs
- ü Realize need for more training to acquire technician, inspector or engineering skills (avoid working beyond skill limits)

Objectives

- Develop awareness course through industry consensus for a practical, introductory-level course for engineers, technicians and inspectors (Phases I – III)
  - Applicable for other decision-makers, such as production planners, purchasing agents and executive management
  - Short course (7 days, traditional classroom), including labs, worth 4 credits
  - Technical Center Report
    - Terminal Course Objectives (TCOs)
    - Safety messages
    - Narrative description of critical issues
    - Instructor's guide
    - Class design guidance
- Adapt content in technical center report to a web-based, distance learning format during Phase IV
- Develop generic structural repair manual for teaching documentation during Phase IV

Approach

- Series of workshops to bring regulators and industry together on technical issues

Awareness Course Process

Phase I (2004 – 2005)

Course Framework/Objectives

Phase II (2006)

Course Feedback

Beta class & LaboratorRhj 0 29ePha4x 8x 302007 91jo Wworshops

Awareness Course Process

Phase I (2004 – 2005)

Course Framework/Objectives

Phase II (2005 – 2006)

Course Feedback

Beta class & Laboratory

Chicago Workshop

Phase III (2006 – 2007)

FAA Technical Report

Refined final development steps

Final review by contributing experts

Phase IV (2007)

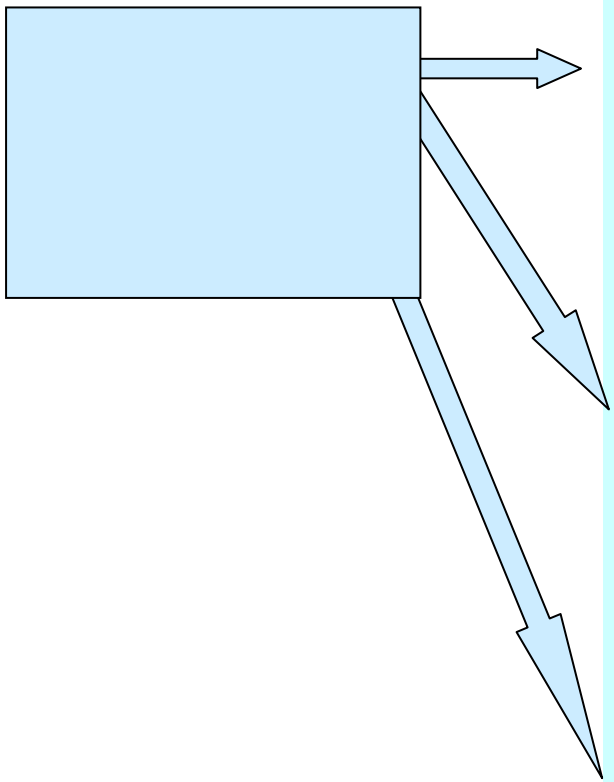
Online Course Development

Second Beta (on-line & laboratory) for feedback from 'non-experts'

Training Repair Manual (TRM)

Awareness Course Content

Base Knowledge



Prerequisite: Students take assessment prior to main course

Main Course

Understand the roles & responsibilities of key teammates

Recognize composite damage types and sources and describe composite damage and repair inspection procedures (2 labs)

Identify & describe information contained in documentation for approved maintenance & repair

Describe composite laminate fabrication, bonding, & bolted assembly methods and perform bonded & bolted repairs (2 labs)

Participate in case team studies (lab)

2006 Beta Class
Excerpts from Instructor's Guide

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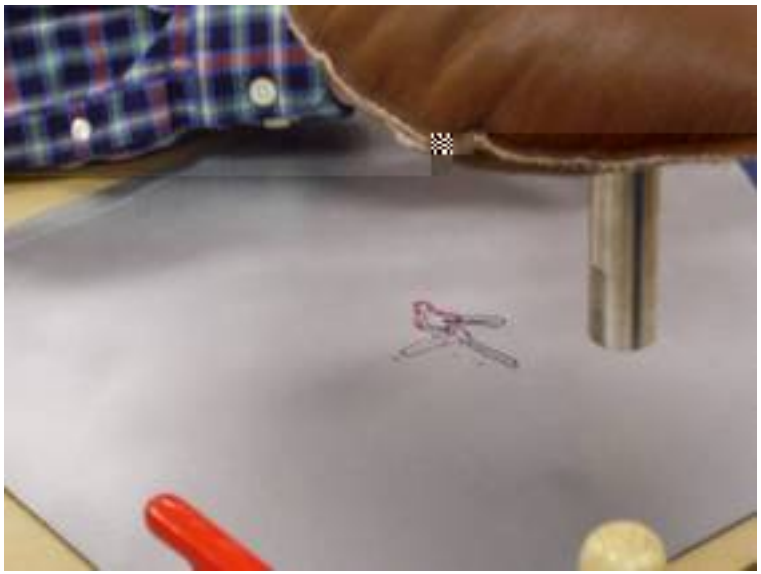


Mapping periphery of damage

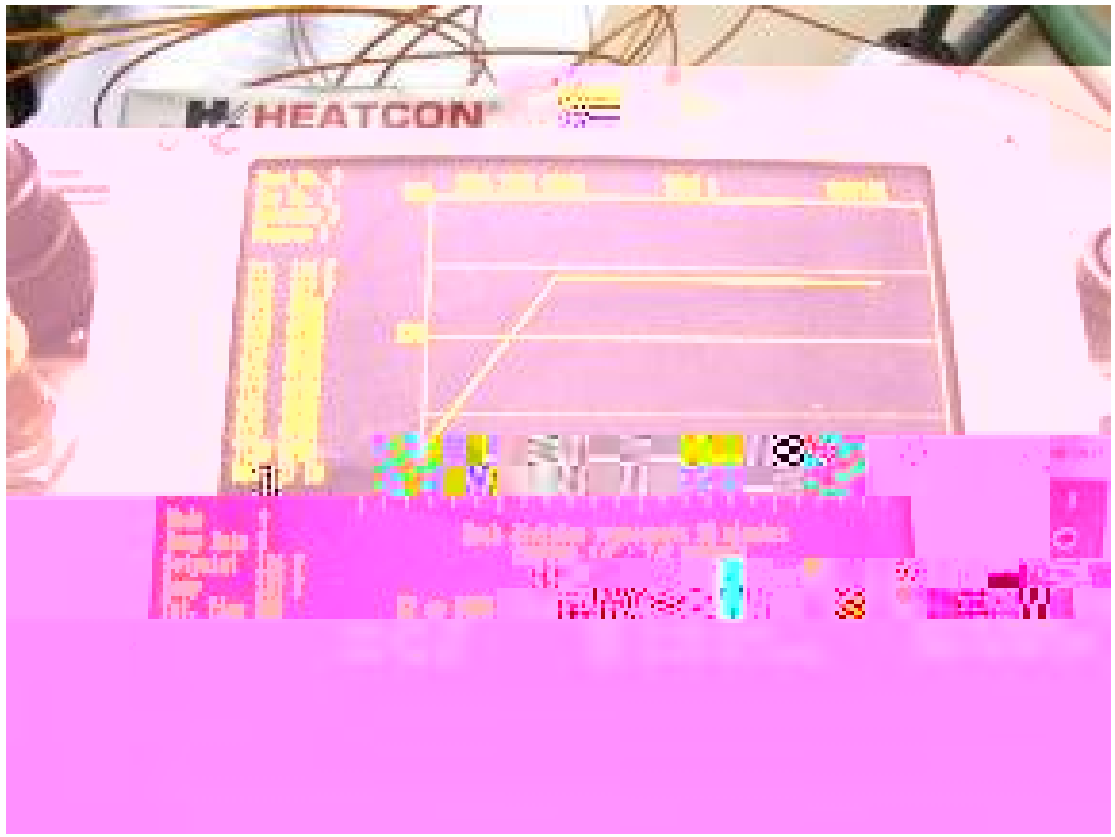
Mapping results utilizing pulse echo, tap test, and visual inspection

2006 Beta Class
Excerpts from Instructor's Guide

Courtesy of Heatcon Composite Systems

2006 Beta Class
Excerpts from Instructor's Guide

Graphic display from heat bonder controller



2006 Beta Class
Excerpts from Instructor's Guide S8EQMC 3M

What we have Learned

- Creating a standard course framework from diverse experts is possible!
  - Process of consensus
  - Feedback mechanisms
- Creating a standard course framework from diverse experts requires patience and considerable funding
- Synergy among dedicated industry, academia and regulatory organizations and people is high with sufficient interest
  - Must meet needs of organizations and individuals
  - Must fit with business interests of contributing organizations

Course Development Integration Role

- Terminal Course Objective development
  - Disciplined approach
  - Reveals gaps in content and balance
  - Can be applied to a variety of circumstances as an integration agent
- Curriculum development becomes a guide for establishing priorities
  - Provides a framework for achieving consensus