Course Development: Maintenance of Composite Aircraft Structures

Process, Progress and Results

Charles Seaton – Principal Investigator, Edmonds Community College
General Comments
Course Caveats

This course…

- Provides an overview of the issues involved in composites’ maintenance and repair, beginning with a common level of knowledge of composite materials terminologies and concepts
- Is not intended to provide training that qualifies students as composite repair practitioners
Primary Deliverables

- Terminal Course Objectives (TCO)
  + Course Description Abstract
    (Purpose/intent, Student/participant, justification, development team*)
- Modules
- Safety Messages

- TCOs, Content, Assessments
- Progress – Focus on process

- FAA guidelines (precursor to policy) on training needs:
  Critical Composite Maintenance & Repair Issues

* World Class Team
Curriculum Development: Composite Materials Maintenance and Repair

Edmonds Community College

Cooperative Agreement Begins
August 2004

Develop Terminal Course Objectives (TCOs)
Workshop November 2004 (Seattle)
50+ World Experts

Global Teleconference April 2005

Develop Content
April – Sept 2005
Populate TCOs with written content

Course Enhancements
• Testimonials
• Videos
• Lab Instructions

Expanded Scope as a result of industry input

Chicago
60+ World Experts Consider:
• Consistency between Content and TCOs
• Proper Emphasis
• Modified Curriculum

Framework, Content and enhancements
Curriculum Development
Critical Elements

- Framework defined by Terminal Course Objectives (TCOs)
- Content to populate TCOs
- Assessment

- Deliverables: Publish TCOs, Content and curriculum enhancements by EOY 2005 – Phase I
- Deliverables (2006): Develop course and assessments – Phase II
Curriculum Development
Collaboration of Industry & Academia & Government

- Workshops during curriculum development
  - FAA/Industry/Academia Workshop in Seattle, WA (November/December 2004) *Establish course framework by identifying terminal course objectives* (TCOs)
  - Tele-conference (April 2005) ~10 participants
  - FAA Workshop (Chicago - Sept 2005) *Evaluate content relative to course framework as defined by TCOs*

- Results
  - 2004 workshop – 450 skills identified; 60+ TCOs; 11 major areas ('modules')
  - Workshop report posted on AMTAS web-site for review: Jan 05
  - Workshop attendees invited to evaluate progress and provide suggestions via tele-conference: April 28, 2005
  - Increase in scope, resulting in prerequisite course plus additional content detail and tools
  - Major Achievement: Consensus on course expectations
  - MODULES (11): ALLOWS US TO FOCUS ON WHAT'S IMPORTANT
Original Statement of Work
Revised Statement of Work

- Repair Course Development
  - Apr to Jul '05
  - Lecture/PowerPoint
  - Streaming Video
  - Testimonials
  - Safety Messages
  - ‘BlackBoard’ or equiv.

- Lab - Regional

- Content – Web Based

- 2008

TCO Development

Nov/Dec ’04 Workshop
**Curriculum Development**

*2005 Chicago Workshop*

- Modules: Grouped into Key Subject areas and provided to small teams for preliminary assessment before workshop
  - Published on website for participant viewing
  - Focus: Define issues based on content
- Objective: 2005/2006: Publish course content and other teaching tools in ‘public domain’
  - Terminal Course Objectives (TCOs), categorized by modules
  - Written content, corresponding to TCOs
  - Testimonials and Videos
  - Laboratory instructions
Modules

TCO A Module - Understand Basics of Composite Materials Technology
TCO B Module - Understand the Basics of Composite Materials Maintenance and Repair
TCO J Module - Understand other Critical Elements of Composite Maintenance and Repair
TCO C Module – Understand Roles and Responsibilities
TCO D Module – Recognize Composite Damage Types and Sources
TCO E Module – Identify and Describe Information Contained in Documentation
TCO F Module – Describe Composite Laminate Fabrication and Bonded Repair Methods
TCO G Module – Perform a Bonded Composite Repair
TCO H Module – Describe Composite Damage and Repair Inspection Procedures
TCO I Module – Describe Composite Laminate Bolted Assembly and Repair Methods, and Perform and Inspect a Bolted Composite Repair
TCO K Module – Case Team Studies
## Elements of Curriculum

*Relationship to Course Design*

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<td>Flight Safety Messages</td>
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| Morning    | 8:00 to 9:50                               | Primary Mode(s): Lecture | Topics: TCO [E] Identify & describe information contained in documentation  
E1: Describe requirements in material & process specifications and structural repair manuals  
E2: Demonstrate use of source documents  
E3: Identify & demonstrate use of regulatory documents  
E4: Understand the requirements and engineering approvals necessary for valid sources of technical information & maintenance instructions |
| Morning    | 9:10 to 10:10                               | Intermission           |                                                                        |
| Morning    | 10:10 to 12:00                             | Primary Mode(s): Lecture | Topics: TCO [F] Describe composite laminate fabrication & bonded repair methods  
F1: Understand the basics of composite laminate fabrication  
F2: Understand the basics of composite bonded repair  
F3: Describe the detailed processing steps necessary for laminate fabrication (factory), bonded repair (field), and Material Review Board (OEM)  
F4: Describe key characteristics and processing parameters for laminate fabrication  
F5: Identify typical processing defects which occur in composite laminate fabrication & bonded repair. |
| Afternoon  | 12:00 to 1:00                              | Lunch                  |                                                                        |
Safety Messages

1: Interlinked aspects of composite repair
2: Repair disposition
3: Repair documentation
4: Correct processing
5: In-service inspections
6: Procedures and post-repair of bonded repairs
7: Post-repair inspections
8: Bolted repairs
9: Importance of teamwork
Chicago Workshop
Issues Feedback and Discussion

Pre-Workshop
Panel of Experts

“Review/Discussion Session” Session 3
Panel Leader → Panel Discussion

“Interactive Session” Session 4
Participants’ Reaction → Moderator & Scribe

“Recap Session” Session 5
Moderator Reviews Feedback from Sessions 3 & 4

FAA/Edmonds Community College Workshop, Chicago
How Session 4 Worked

Break-out Group
(15-25 participants)
Convey Verbal Ideas and Post Written Feedback

Modular Content

Moderator
45 minutes per session
Facilitates Conversation and Feedback

Verbal Ideas

Scribe
Captures Verbal Ideas on Screen

Feedback Slips

Participants Post Ideas throughout Conference

Participants
Post Ideas
Issues Feedback: Workshop

Session 5 (Thursday Morning): Scribe Reviewed Section 3 & 4 Inputs

Themes

- TCO/Content Consistency
- Content Balance
- Primary Emphasis on Issues of Safety Concern
- Path to Complete Review and Update the Course Standard
Workshop Results

- Building curriculum framework: TCOs
  - Refined descriptions to better reflect intent
  - Prerequisite course contrasted with repair course – clarified in small group discussions
- Providing content to support TCOs
  - ‘Tightened up’ content
Next Steps

- Integrate feedback into TCOs and Content
- Publish outcomes on websites
  - Presentations
  - TCO and Content Revisions
Posting & Links of Workshop Results

Detail of Workshop: www.mpdc.biz

Overview: depts.washington.edu/amtas/

Links: www.niar.twsu.edu/newniar/
Material and Process Development Center

Welcome to the MPDC

The Material Science field is always changing and innovating, and we would like to help bring you closer to the cutting edge by offering you resources and training on the latest developments. If you are involved in the field and would like to contribute anything, please contact us.

We would like to mention that we just finished a major overhaul of our website with more to be added soon. We will be cleaning up and restructuring the content, as well as increasing the content. Your suggestions are welcomed.

Latest News and Events

10 - 2005

2005 FAA Chicago Workshop

Here you will find notes, movies and documentation on the 2005 FAA Workshop in Chicago.