



Course Development: Critical Composite Maintenance and Repair Issues

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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*

Agenda for Course Review

- ✦ Process
- ✦ Progress in Course Beta (Online)
- ✦ Learning Effectiveness and Tools used in Beta
- ✦ Special Areas of Focus
 - ✦ Testimonials
 - ✦ Discussion Boards
- ✦ Student Demographics and Participation
- ✦ Collateral Benefits

Process



Progress – Phase IV ‘Beta’ 2007

Prerequisite
(2 weeks)



Oct 1 – Oct 15

Basics of Composites'
Technology - Online

Awareness
Course
(6 weeks)



Oct 16 – Nov 25

Critical Composites
Maintenance - Online

Hands-on
Laboratory
(3 days)



Nov 27 - 28

Capstone (Abaris
Training – Reno, NV)

Learning Effectiveness

Students learn best by:

- ✦ Being exposed to meaning before content
- ✦ Learning through self-discovery
- ✦ Repetition

Learning Tools

Meaning Before
Content

Self-Discovery

Repetition

1 Minute Testimonials

Awareness Video (Boeing/CACRC)

Web Links

Discussion Boards

Exams (2)

Group Project

Prior Week Teaching
Points

Testimonials

(Providing meaning before content)



Blending Testimonials and Discussion Boards

- ✦ Opening thread borrows from testimonial
 - ✦ [Seaton] Doctor Armstrong was limited to approximately 1 minute in his 'testimonial', so was unable to describe all the circumstances around his repair scenario. Assume, however, that he has been complete in his description. Each of you pick one significant question to ask him regarding compliance.
- ✦ Sample Questions
 - ✦ "What was the type of fiber form, fiber style, and ply lay-up originally used for the engine and for the repair?"
 - ✦ "Is it acceptable per the SRM to use 2 plies of the lighter cloth in lieu of 1 ply of the heavier cloth?"
 - ✦ I've either missed out on a very important part of this discussion and I'm about to ask an award-winning and the dumbest question on our discussion board but "who is Dr. Armstrong"?

Discussion Boards

- ★ Students learn by interacting with each other and by self-discovering Teaching Points
- ★ Two topics per week (5 weeks)
- ★ Facilitator – Uses questioning technique to guide students to teaching points

Discussion Board Example

- Thread: Are any of you aware of a situation whereby the 'approved' NDI technique seems to not represent the full extent of composites' damage even though approved procedures were followed? What was the result? (Seaton)
 - I was involved in a violation a few years ago where the OEM required a pulse echo ultrasound and the carrier did a tap test. A question that I asked the engineer who approved the tap test was: "what are your NDI qualifications to determine that a tap test met the requirements of the OEM?" I then asked him to explain the differences and what each method could detect. Little episode cost the carrier over \$50,000.00. (FAA Student)
 - Does it happen that a technique proposed by the OEM to "map out" damage might not be the right one? Will the operator, MRO etc make recommendations to modify or change the method of inspection? (Transport Canada Student)
 - The operator is always free to question an OEM. They don't have all of the answers and learn from operators who may have seen or heard of a better method. (FAA Student)
- **TEACHING POINT:** ...the extent of damage must be assessed by personnel qualified in the appropriate inspection techniques

Discussion Board Example

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 - What was the root cause of this problem? Was it a) lack of training and education, b) Someone who 'didn't know what he/she didn't know', c) a 'John Wayne' mentality, d) Other? Comments, Class? (Seaton)
 - Many things led up to this including mechanics not realizing that this was a critical area of the component, the SRM didn't allow repairs in this area (gotta read the SRM to know this) and a whole host of other issues. As with most things we stumbled on this by accident. (FAA Student)
 - If findings like this are found mostly by accident, is there a way to increase the chances of early detection of violations like this before they become critical? Or does it just come down to internal procedures of the carrier. (GA Student)
- **TEACHING POINT:** ...Recognize his/her skill limits in practice and where to find assistance

Classroom Demographics (28)

✦ Industry (Large OEM and General Aviation)	10
✦ Military	5
✦ Regulators	11
✦ College	2

Participation in Discussion Boards (9 days)

9500 'hits' in class

7873 Hits

8 p.m. 10/24

612 Posts

8 p.m. 10/24



'Collateral' Benefits to Industry and FAA beyond Training

- ✦ Case studies – Identifies issues that can be related to safety initiatives through organizations such as CACRC
- ✦ R&D Feedback
- ✦ Group project: Objective is for students to derive an inspection checklist for evaluating maintenance operations

Summary

- ✦ Enthusiastic Class – less than 15% are uninvolved
- ✦ Wide range of experiences blends well
 - ✦ More experience – teachers and facilitators
 - ✦ Less experience – no threat from asking ‘dumb’ questions
 - ✦ Expertise usually limited to specific topic
- ✦ Feedback to date is positive, even from ‘skeptics’