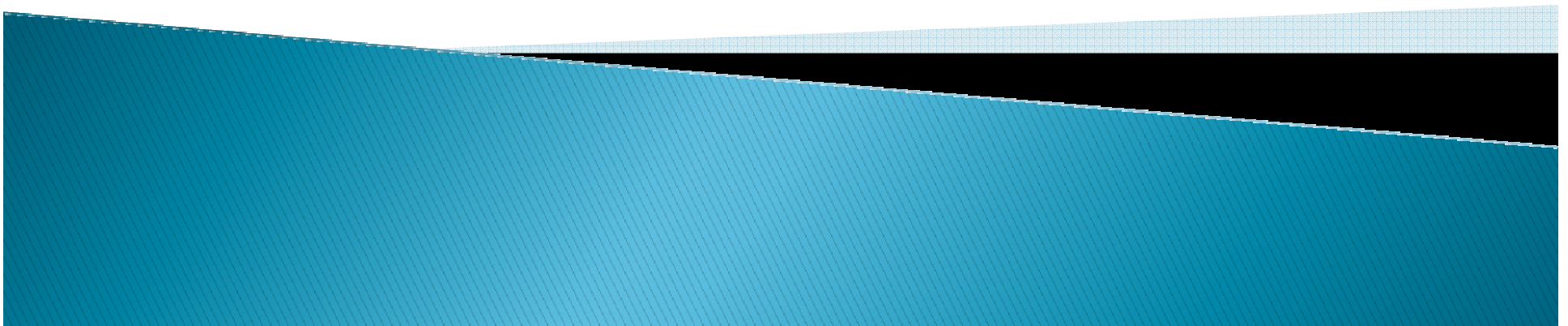


FAA Composite Training Initiatives

Damage Tolerance Workshop

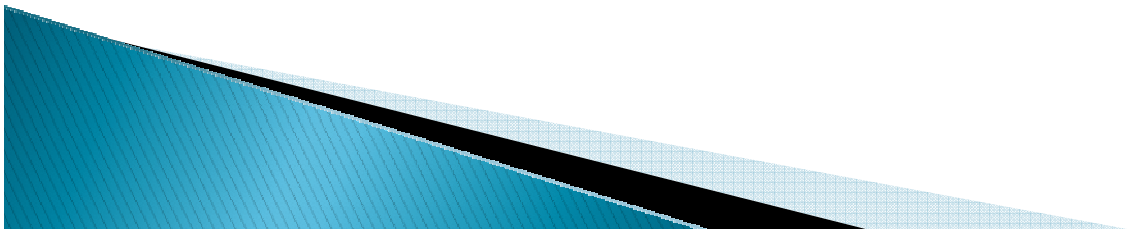
June 5 2009

Charles Seaton – Edmonds Community College



Presentation Topics

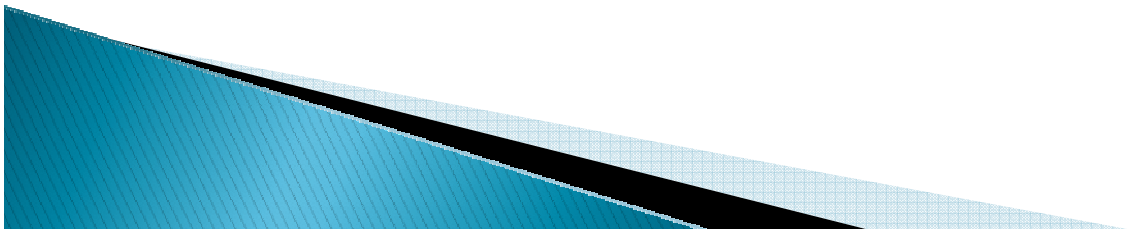
- ▶ Education justification
- ▶ Strategies
- ▶ Development issues and format options
- ▶ Current initiatives
 - CMH17 Certification of Composite Aircraft (classroom)
 - Composite Maintenance Technology (online)
- ▶ Resources
- ▶ Survey



Composites Education

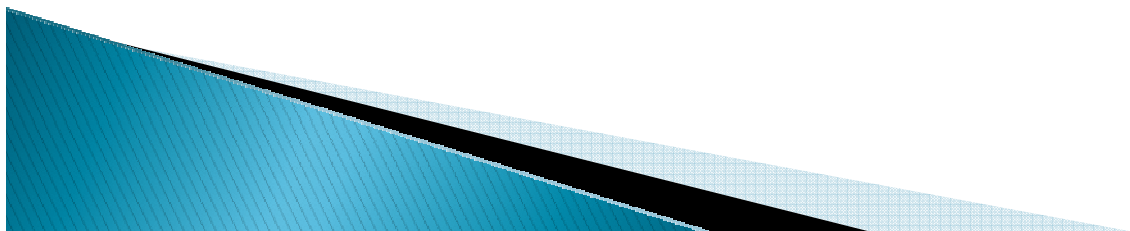
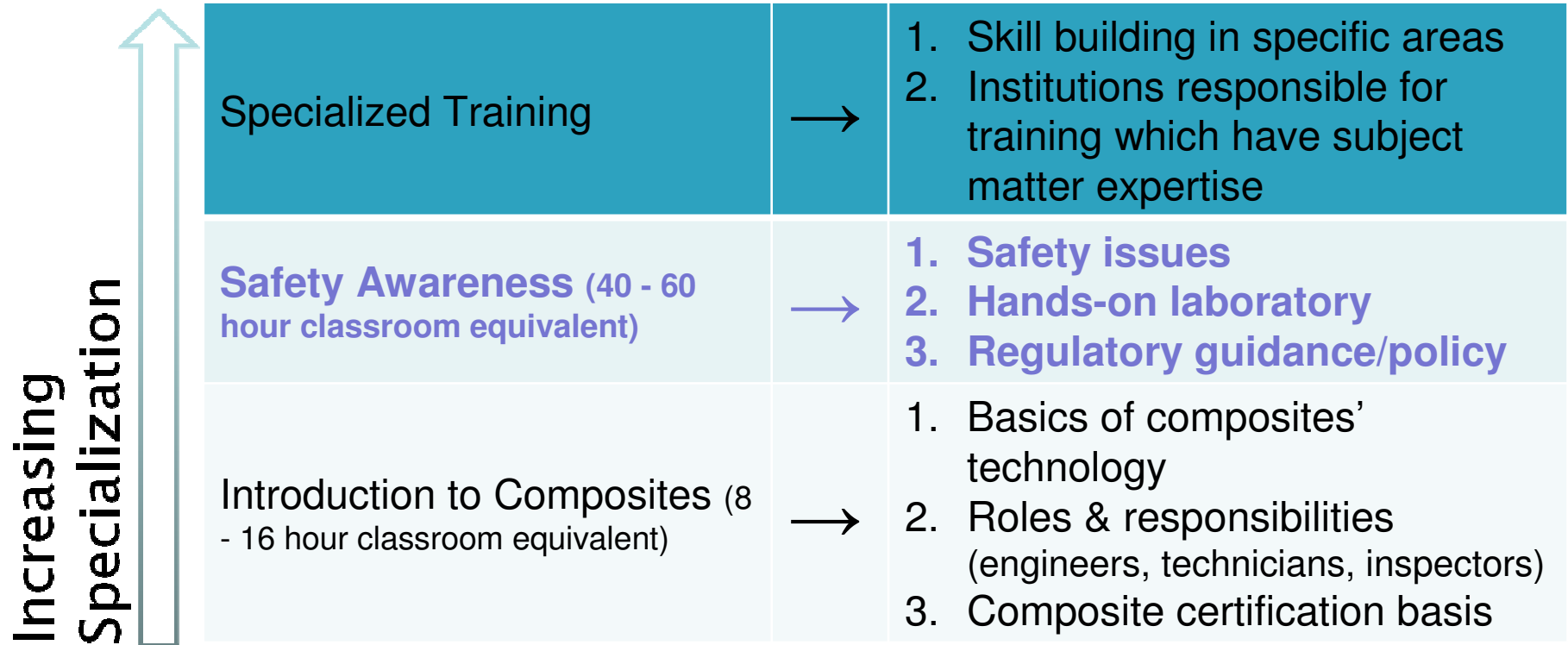
Justification

Industry	Skill development via on-the-job training
Education gaps	Talent pool versus identified institutions to address subject matter regarded as important in composites
Education delivery options	Classroom, laboratory, distance (on-line)
Educators	Availability of training expertise



Composites Education

Strategies to Meet Practical Educational Needs

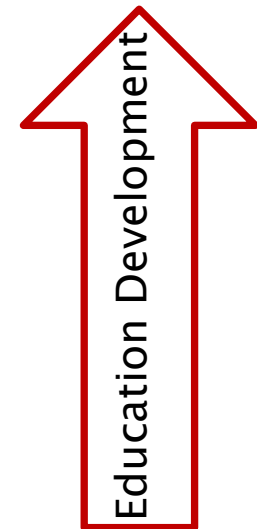
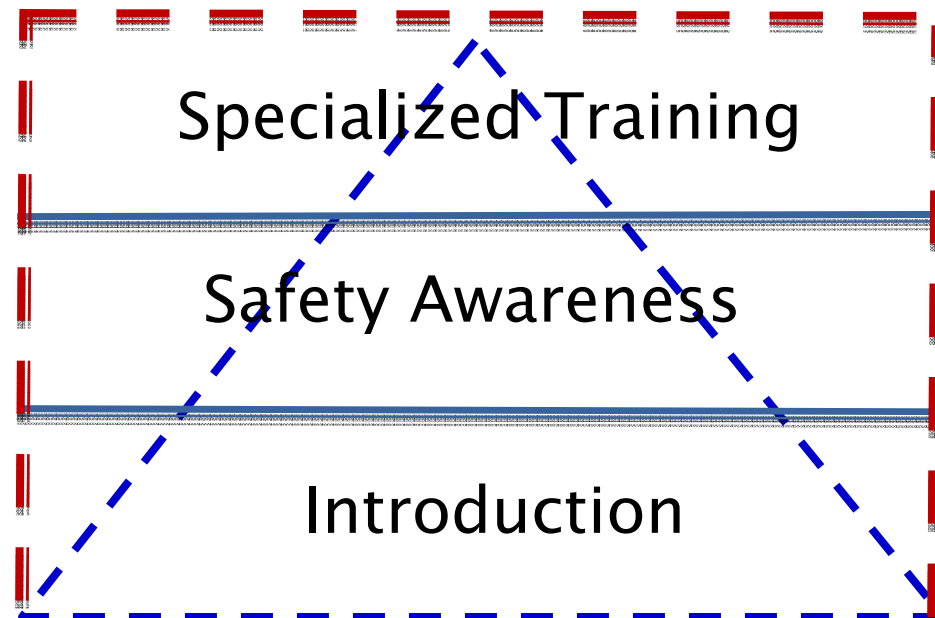
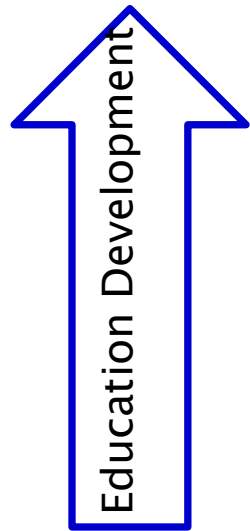


Composites Education Strategies

FAA and Industry Participation in Development

FAA Facilitator

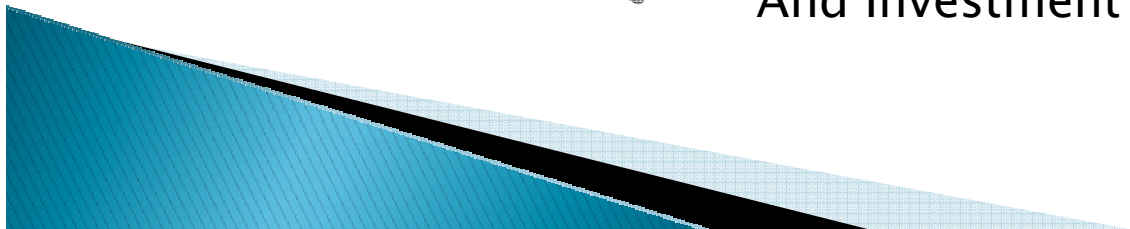
Industry Sponsor



FAA Sponsor

← Degree of Involvement
And Investment →

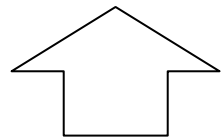
Industry Support →



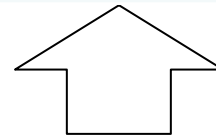
Composites Education Strategies

Road Map (Illustrations of Subject Emphasis)

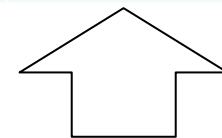
Source Documentation			△
Allowables Development		△	
NDI	△		△
Fatigue & Damage Tolerance		△	
M&P Spec's	△	△	△



Manufacturing



Structural Design



Maintenance

Introduction and Safety Awareness Courses
form the foundation for specialized training

(3 tracks)

Composites Education Current Initiatives

Subject Matter Emphasis

Crash dynamics and energy absorption of composite airframe structures	Composite Structural Analysis & Test Protocol
Safety risk management	Tooling
Emerging material forms and processes (e.g., VARTM, RTM, Chopped Fiber, etc.)	Flammability and composite high temperature performance issues
Damage Types and Sources	Lamination Processes
Source Documentation	Resin Transfer Molding
Regulatory Requirements	Mechanical Assembly
Conformity Guidelines	Static Strength Substantiation
Bonded Composite Repair	Fatigue and Damage Tolerance
Inspection Procedures	Material Qualification
Laminate Bolted Assembly and Repair	Allowables and Design Value Development
Structural Bonding (composite and metal)	Material and Process Specifications
Environmental protection incl. lightning strike	Manufacturing Automation

Composites Education

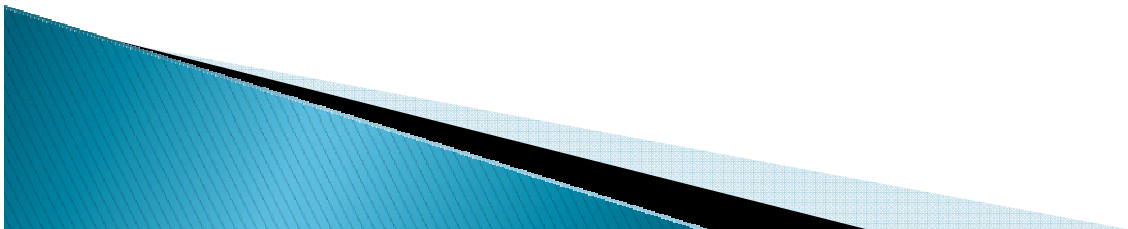
Development - Format Options

Classroom:

- ▶ Face-to-face interaction
- ▶ **Expensive, limited availability of experienced practitioners**

Laboratory:

- ▶ Learning reinforcement of classroom/on-line teaching points
- ▶ **Expensive**

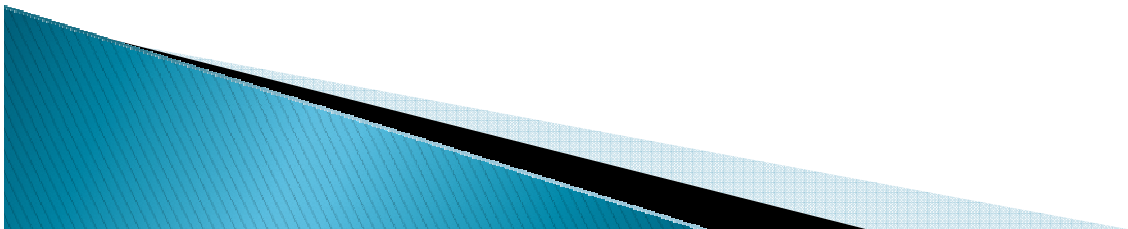


Composites Education

Development – Format Options

Online (Distance Learning):

- ▶ Widely used for providing global access to students
- ▶ Cost-effective by eliminating travel costs
- ▶ Students can select convenient time to fit busy schedules
- ▶ Wide availability of experienced practitioners in discussions (affordable expertise)
- ▶ **Requires computer literacy and internet access**



Composites Education

Current Initiatives

	Conceptual	Developing	Mature
Specialized	Subject Matter TBD		
Safety Awareness		CMT Classroom (Safety Issues) Regional laboratory site identification	CMT Online (Safety Issues) w/Laboratory (Locations TBD)
Introduction			CMH17 Tutorial CMT (Prerequisite)

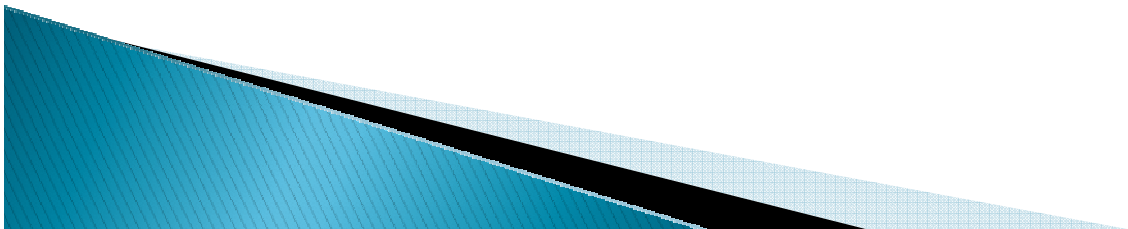
CMT: Composite Maintenance Technology: Prerequisite, Safety Issues Main Course and Laboratory

CMH-17 Tutorial - Certification and Compliance Basis for Composite Aircraft

Composites Education Current Initiatives

CMH-17 Composite Certification Basics (*6-hour Tutorial*)

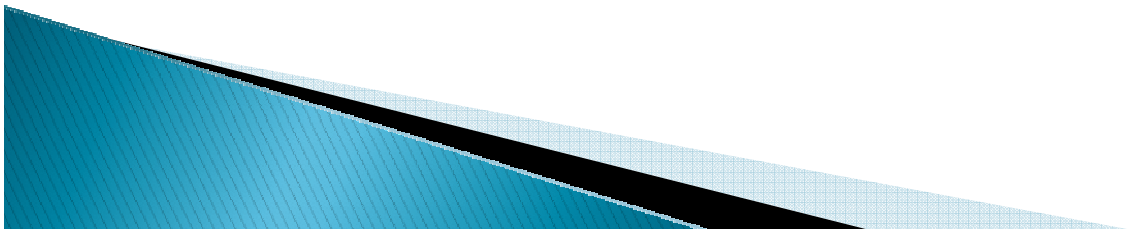
- ▶ Based on New CMH-17 Chapter
- ▶ Available through CMH-17
mj@materials-sciences.com (215) 542-8400
- ▶ Content
 - Initial airworthiness (design and production certification)
 - Continued airworthiness (maintenance and modifications)
- ▶ Development and delivery personnel
 - Larry Ilcewicz: FAA
 - Simon Waite: EASA
 - Hank Offermann: FAA (retired)
 - Charles Seaton: FAA Consultant



Composites Education Current Initiatives

CMH-17 Composite Certification Basics *(6-hour Tutorial)*

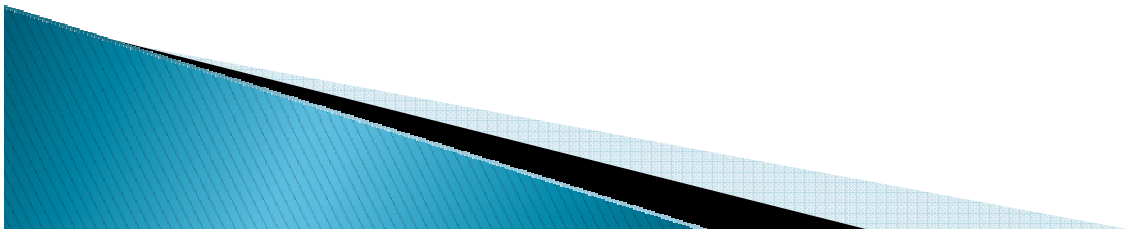
- ▶ General certification discussions
- ▶ Regulations
- ▶ Design substantiation
- ▶ Production
- ▶ Maintenance
- ▶ Guidance and reports



Composites Education Current Initiatives

Composite Maintenance Technology (CMT)

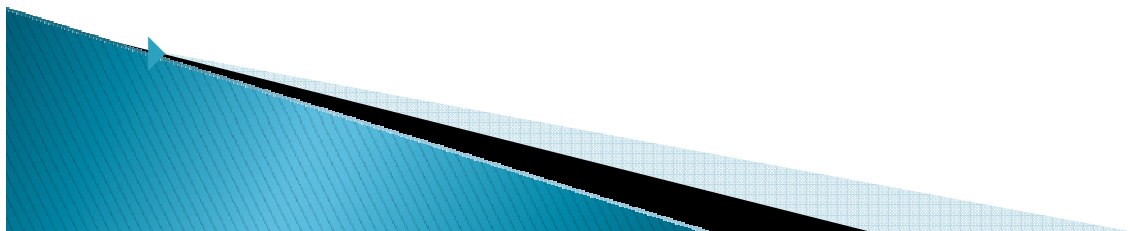
- ▶ Based on 3 years of industry feedback
 - Available through Edmonds Community charles.seaton@edcc.edu (425) 508-2368
- ▶ Implementation
 - Basic knowledge (online) – Self-study with assessment (pass/fail) – 10 hours over 2-week period
 - Maintenance and repair (online) – Asynchronous discussions – 60 hours over 6-week period
 - Multimedia
 - Subject matter expert involvement
 - Learning through discussion by professional facilitator
 - Laboratory (optional) – 3-day at regional location
- ▶ Course offering: Fall 2009



Composites Education Current Initiatives

Composite Maintenance Technology (CMT)

- ▶ Online format: Low-cost, flexible and accommodated to individual time constraints
- ▶ Who can benefit?
 - **Aerospace professionals** who are in transition to composite materials technology and maintenance practice
 - **Decision-makers** who require in-sight into the unique safety and technology issues associated with composite materials
 - **Entry-level students** who require a foundation class in composite materials maintenance and safety

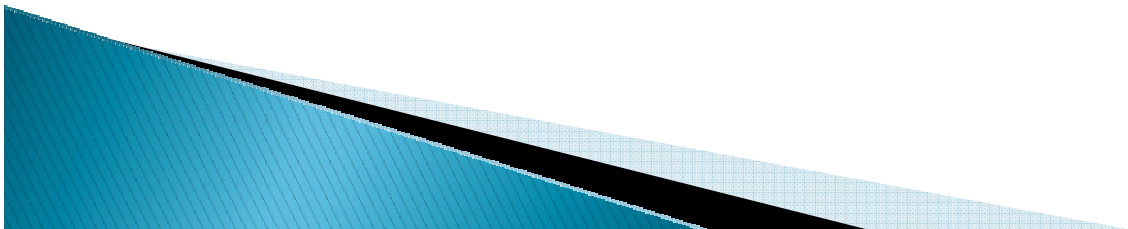


Composites Education Current Initiatives

CMT Course Content

Prerequisite to CMT Course

- Overview of technology
- Terminology familiarity
- 10 hour student time commitment (2 weeks)
- ▶ **Subjects**
 - Composite materials technology
 - Maintenance and repair overview
 - Regulatory requirements
 - Metal bonding

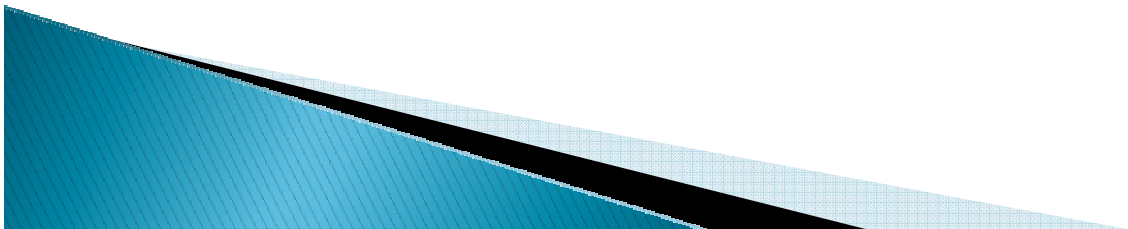


Composites Education Current Initiatives

CMT Course Content

CMT Course

- Composite maintenance safety issues
- Primary learning through discussions
- 60 hour student time commitment (6 weeks)
- ▶ **Subjects**
 - Roles and responsibilities
 - Source documentation
 - Damage types, sources and disposition
 - Inspection procedures
 - Laminate fabrication and repair
 - Bolted repair



Composites Education Current Initiatives

CMT Course Content

CMT Course Learning Approach

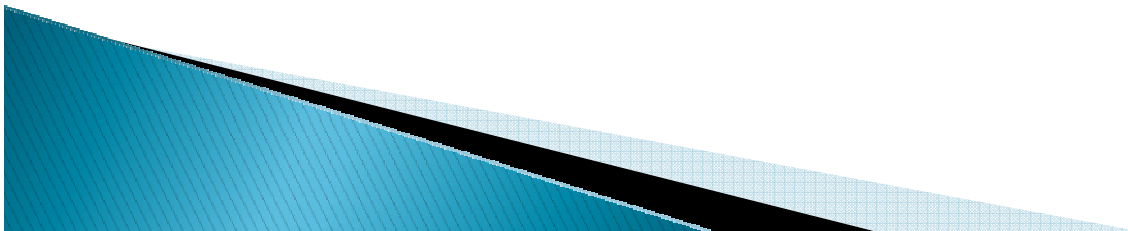
- ▶ Involvement of subject matter experts in discussion forums
- ▶ Safety messages
- ▶ Multimedia
 - Expert testimonials
 - Movie clips
- ▶ Sample Clip
 - Testimonial
 - Overview (Boeing/CACRC, Delta Rocket Explosion)
 - Pulse Echo inspection demonstration



Composites Education

CMT Multimedia

Video Clip Excerpts



Composites Education Current Initiatives

CMT Online Discussion (with SMEs)

Week One: Slight Skin Damage

195

An aircraft shows a slight indentation on its skin, discovered during a routine walk-around of an aircraft. You note that the indent is observable up to 20 feet away, but looks, to the layman, to be minor. As a dedicated airline employee, you recognize the importance of getting the aircraft back into service quickly. Describe how you might react differently if the damage is on a metal versus composite material component.

Week Three: Underlying Damage

221

As someone very familiar with metal skin repair on airplanes as an inspector, you are confident that you will transition fairly easily into the practice of composite materials maintenance. However, your son ran across a disturbing article at the following link: https://www.flightsafety.org/asw/mar07/asw_mar07_p17-21.pdf

Within that article was the following graphic:

Composite Underlying Damage

Within that article, was the attached picture depicting types of damage. How does this awareness course adequately prepare you, or not prepare you, in your profession, and how should you respond as a result?

Composites Education

Resources Currently Available – Summary

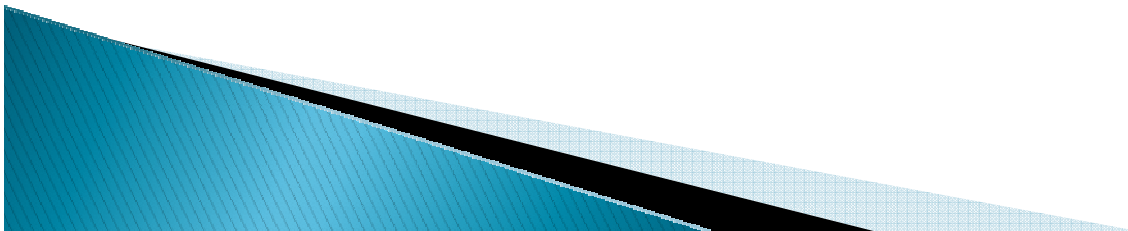
- CMH17 Tutorial
- Composites Maintenance Technology (CMT) – Online
- Reports
 - ✓ FAA JAMS Technical Report (DOT/FAA/AR-08), written by C. Seaton, Edmonds Community College
 - ✓ FAA Technical Document*, written by L. Cheng and L. Ilcewicz
 - ✓ SAE CACRC AIR 5719 (Summer 2009)

* Available from Lester Cheng (Small Airplane Directorate)



Composites Education Survey

- ▶ Forms will be passed out during the lunch break
- ▶ Please pass forms to the left of the tables or hand to administrators at reception table outside room

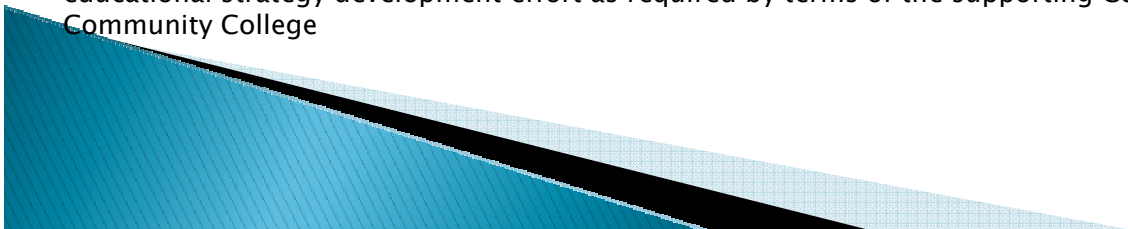


Composites Education Survey

Printed Name & Signature:

1. The FAA is committed to developing composites introductory and safety awareness courses. Please indicate the importance of the following courses to the aerospace industry (1 to 5, with 5 being highest importance).
 1. CMH 17 certification tutorial (available at CMH17 working sessions, online in work)
 2. Composites Maintenance (available online, classroom in-work)
 3. Composites Manufacturing (In-work)
 4. Composites Structural Design (In-work)
2. Areas of specialized training were proposed in this seminar. Please circle the areas of interest in the chart on the reverse side of this form. Indicate any areas of interest not listed (Use reverse side under 'additional comments').
3. Three teaching delivery formats were discussed (classroom, laboratory, online distance):
 1. Which delivery format , or combination of formats, would be of greatest interest (in a generic subject matter)?
 2. Are there any subjects that might lean towards one format(s) over another? Please describe.

Your feedback to the FAA educational effort provides important feedback, and your participation acknowledges your contribution to the educational strategy development effort as required by terms of the supporting Cooperative Agreement between the FAA and Edmonds Community College



Composites Education Survey

Crash dynamics and energy absorption of composite airframe structures	Composite Structural Analysis & Test Protocol	Manufacturing Automation
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Emerging material forms and processes (e.g., VARTM, RTM, Chopped Fiber, etc.)	Flammability and composite high temperature performance issues	Environmental protection incl. lightning strike
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Inspection Procedures	Material Qualification	Regulatory Requirements
Laminate Bolted Assembly and Repair	Allowables and Design Value Development	Static Strength Substantiation

Additional Comments:

