



AMTAS Institute Composites Courses

Presented to
AMTAS Spring 2007 Meeting

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April 12, 2007



AMTAS Overall Mission:

- Perform **research** studies
- Provide **educational** opportunities
- Facilitate **technology transfer**

pertinent to the use of advanced materials in transport aircraft.



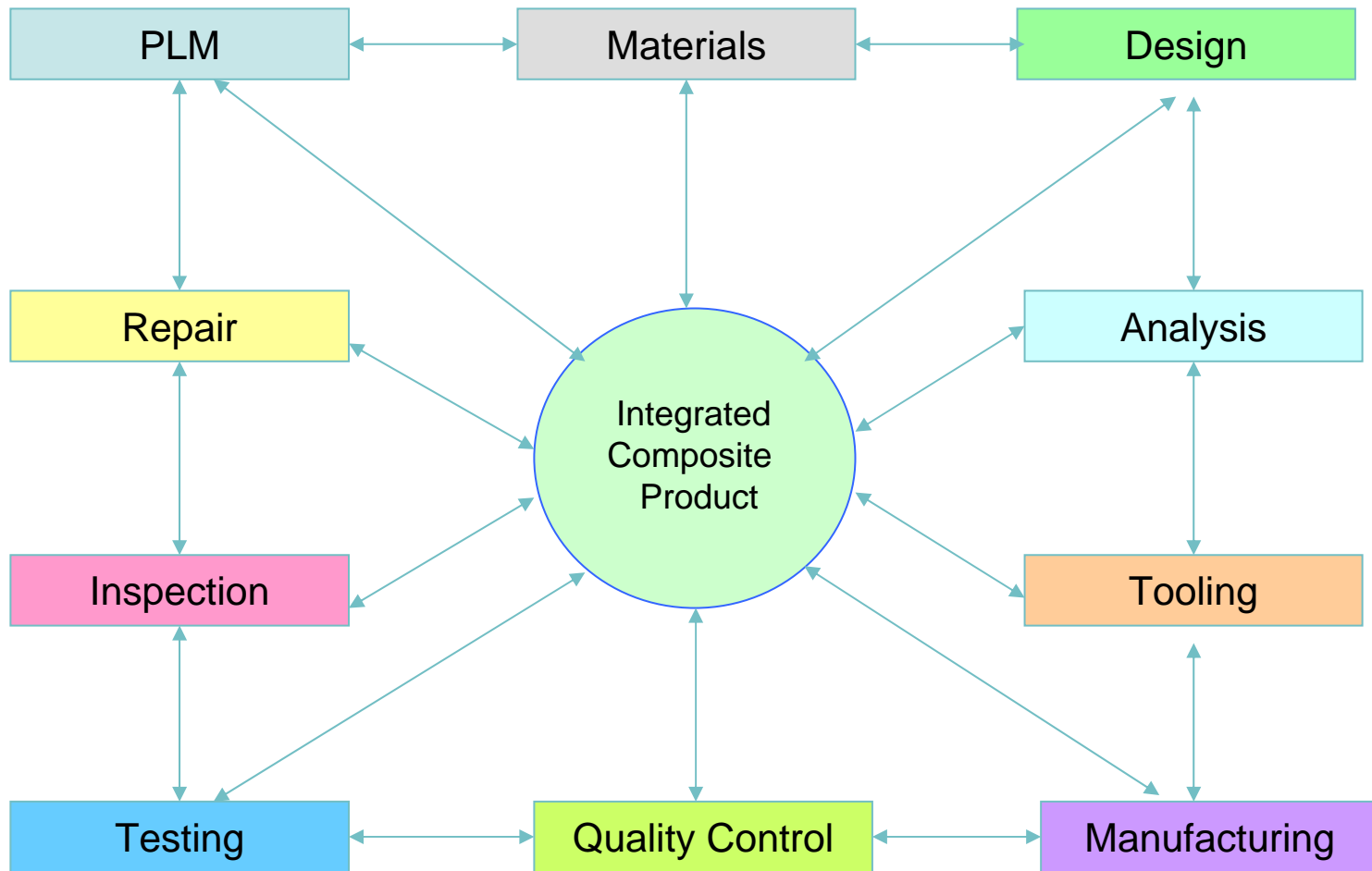
Center Mission:

Education

- Train new composites engineers
 - Enhance existing undergraduate/graduate composite courses (UW, WSU, OSU, Edmonds CC)
 - Develop new courses as necessary
 - Increase number of distance-learning courses

- Provide continuing education programs
 - **Develop short courses for practicing engineers (UW)**
 - Develop short courses for composite technicians (Edmonds CC)

Advanced Aircraft Composites





AMTAS Institute on Advanced Aircraft Composites

Course Information:

- Course Hours: *40 hours (5 days)*
- Location: *UW Campus*
- UW Credits: *4 CEUs*
- Course Fees: *\$2,500*
- Course Coordinator: *Prof. Kuen Lin (UW)*
- Industry Liaison: *Michael Richey (Boeing)*
- Registration Contact: *Emily West (UWEO/EPP)*
- Prerequisite: *B.S. in Engineering or Equivalent*
- Instructors: *12 instructors from UW, Boeing, Intec, and FAA*
- Courses Offered:
 - *September 18-22, 2006 (23 students)*
 - *March 19-23, 2007 (25 students)*



AMTAS Institute on Advanced Aircraft Composites

Course Highlights:

- The course covers introductory and state-of-the-art developments in 10 major areas of composites.
- The course includes hands-on laboratory components in composites manufacturing, machining, and testing.
- Taught by 12 top subject matter experts from academia, industry, and government with a combined total of over 250 years of R&D experience in composites.
- Over 50% of course content are derived from the public release version of UW/Boeing LTD Composite Certificate Programs.
- Course materials contain both fundamental and practical knowledge necessary to built aerospace composite structural hardware.



AMTAS 2006 Fall Institute on Advanced Aircraft Composites

Offered on September 18-22, 2006 in EE Building, UW

- 9/18 Topic 1 Overview and New Developments (8:00-10:50) Patrick Stickler (Boeing)**
- 9/18 Topic 2 Materials (11:00-12:00; 1:00-5:00) Bud Das/ Brian Flinn (UW)**
- 9/19 Topic 3 Tooling (8:00-12:00) David Dickson (Boeing)**
- 9/19 Topic 4 Manufacturing I (1:00-5:00) Bud Das (UW)/ Moe Soleiman (Boeing)**
- 9/20 Topic 5 Design Methodology (8:00-12:00) Chris Eastland (Boeing)**
- 9/20 Topic 6 Analysis Methods (1:00-5:00) Kuen Lin (UW)**
- 9/21 Topic 7 Manufacturing II (8:00-12:00; 1:00-2:00) Doug McCarville (Boeing)**
- 9/21 Topic 8 Testing Methods (2:00-5:00) Mark Tuttle (UW)/ Grant Pomeroy (Intec)**
- 9/22 Topic 9 Product Lifecycle Management (8:00-9:50) Ben Isarankura (Boeing)**
- 9/22 Topic 10 Nondestructive Inspection (10:00-12:00) Dave Swartz (FAA)**
- 9/22 Topic 11 Repair Techniques (1:00-5:00) Dave Swartz (FAA)**



AMTAS 2007 Spring Institute on Advanced Aircraft Composites

Offered on March 19-23, 2007 in Mary Gates Hall, UW

- 3/19 M Topic 1** **Overview and New Developments** (8:00-12:00, 4 hours)
Patrick Stickler (Boeing)
- 3/19 M Topic 2** **Materials** (1:00-5:00, 4 hours)
Bud Das (UW)
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- 3/20 T Topic 3** **Tooling** (8:00-10:00, 2 hours)
Kirk Skaggs (Boeing)
- 3/20 T Topic 4** **Manufacturing Fundamentals** (10:00-12:00, 2 hours)
Moe Soleiman (Boeing)
- 3/20 T Topic 5** **Manufacturing Lab Project** (1:00-5:00, 4 hours)
Brian Flinn (UW)/MSE Lab
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- 3/21 W Topic 6** **Manufacturing Processes** (8:00-12:00, 4 hours)
Doug McCarville (Boeing)
- 3/21 W Topic 7** **Testing Methods** (1:00-3:00, 2 hours)
Mark Tuttle (UW)
- 3/21 W Topic 8** **Machining & Testing Demonstration** (3:00-5:00, 2 hours)
Mark Tuttle (UW)/ME Lab



AMTAS 2007 Spring Institute on Advanced Aircraft Composites

3/22 Th Topic 9 **Analysis Methods** (8:00-12:00, 4 hours)
Kuen Lin (UW)

3/22 Th Topic 10 **Design Methodology** (1:00-5:00, 4 hours)
Chris Eastland (Boeing)

3/23 F Topic 11 **Damage Resistance and Tolerance** (8:00-10:00, 2 hours)
Paolo Feraboli (UW)

3/23 F Topic 12 **Nondestructive Inspection** (10:00-12:00, 2 hours)
Dave Swartz (FAA)

3/23 F Topic 13 **Repair Techniques** (1:00-5:00, 4 hours)
Dave Swartz (FAA)

Summary and Discussion
Kuen Lin (UW)

Website: <http://www.engr.washington.edu/epp/amtas/index.html>

Course Statistics

2006 Autumn Institute (9/18- 9/22/2006)

- **A total of 23 attendees**
 - 15 Boeing: Seattle (12)*, Wichita (2), Long Beach (1)
 - 5 C&D Zodiac, Marysville, WA; 1 Trulife, WA
 - Other States: 1 Wright Patterson AFB, OH
 - International: 1 Cytec, UK
- Boeing (65%); C&D Zodiac (22%), Others (13%).
- WA State (78%), Other States (17%), International (5%)

2007 Spring Institute (3/19- 3/23/2007)

- **A total of 25 attendees**
 - 11 Boeing**, Seattle
 - 5 C&D Zodiac, Marysville, WA; 1 Fatigue Technology, Seattle
 - Other States (3): 1 Alcan, NJ; 1 Gulfstream, TX; 1 DIAB, TX
 - International (5): 2 U. Manchester, UK; 2 Saab, Sweden; 1 Transport Canada
- Boeing (44%); C&D Zodiac (20%), Others (36%).
- WA State (68%), Other States (12%), International (20%)

* 5 Boeing participants were sponsored by Ed Wells ; ** 3 participants were sponsored by Ed Wells

Course Evaluation

5 =Excellent; 4 =Very Good; 3 =Good; 2=Fair; 1 =Poor; 0 =Very Poor

2006 Fall Institute (17 responses)

- | | |
|-------------------------------------------------------|------------|
| 1. The course as a whole was: | 4.4 |
| 2. The organization of course topics was: | 4.0 |
| 3. Instructors' effectiveness in teaching the course: | 3.9 |
| <i>Average of Items 1 to 3:</i> | 4.1 |

2007 Spring Institute (17 responses)

- | | |
|--------------------------------------------------------|------------|
| 1. The course as a whole was: | 4.2 |
| 2. The instructors' contributions to the course were: | 4.3 |
| 3. The overall quality of instruction was: | 4.2 |
| 4. Instructors' effectiveness in teaching was: | 4.0 |
| <i>Average of Items 1 to 4:</i> | 4.2 |
| 5. Instructors' use of class time was: | 4.0 |
| 6. Student confidence in instructors' knowledge was: | 4.5 |
| 7. Instructors' use of examples and illustrations was: | 4.3 |
| 8. The quality of course materials was: | 4.2 |
| <i>Average of All Items: 1 to 8</i> | 4.2 |

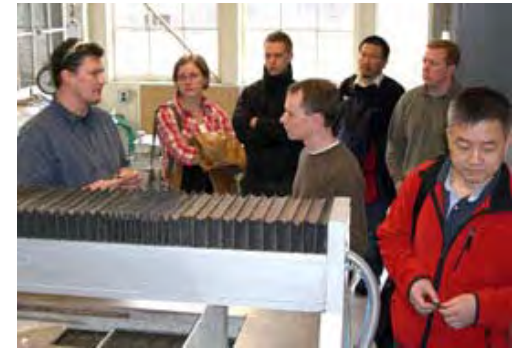
2007 AMTAS Institute Photos



Classroom lecture by Kirk Skaggs (Boeing)



Prof. Mark Tuttle demonstrating structural testing



Water jet cutting demonstration



Prof. Brian Flinn (UW) teaching composites lab projects



Students fabricating composite samples I



Composite fabrication practice



Future Course Offerings

I. Advanced Aircraft Composites from UW

- 2007 Autumn Institute (9/17- 9/21/2007)
- 2008 Spring Institute (March 2008)
- 2008 Autumn Institute (September 2008)

II. Specialized Courses from UW

- Bolted and Bonded Joints in Advanced Composites
- Finite Element Methods for Laminated Composites
- Manufacturing Processes for Advanced Composites
- Nanofiber Technology and Nanocomposites

III. Courses from Edmonds Community College

- Critical Composite Maintenance and Repair Issues I
- Critical Composite Maintenance and Repair Issues II



Summary

- Two AMTAS professional development courses on “Advanced Aircraft Composites” were successfully offered in September 2006 and March 2007 at UW.
- Participants in these two courses were from Boeing (Seattle, Wichita, Long Beach), government, academia, and other U.S. companies, and aerospace companies in UK, Sweden, Canada.
- The courses were highly rated by the participants. An excellent service of AMTAS to the aerospace industry was demonstrated.
- Future AMTAS composite course offerings from UW and Edmonds Community College were presented.



THANK YOU!

QUESTIONS?

COMMENTS?