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 Abstract
- Modules
- Safety Messages

Coordinated Release Through SAE CACRC and FAA Technical Center

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

Edmonds C.C. Website

FAA guidelines (precursor to policy) on training needs:

Critical Composite Maintenance & Repair Issues

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

Expanded Scope as a result of industry input

Develop Content

'Populate' TCOs with written content

April – Sept 2005

Course Enhancements

- **Testimonials**
- **Videos**
- **Lab Instructions**

Framework, Content and Enhancements

Chicago

60+ World Experts Consider:

- **Consistency between Content and TCOs**
- **Proper Emphasis**
- **Modified Curriculum**

Curriculum Development

Critical Elements

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

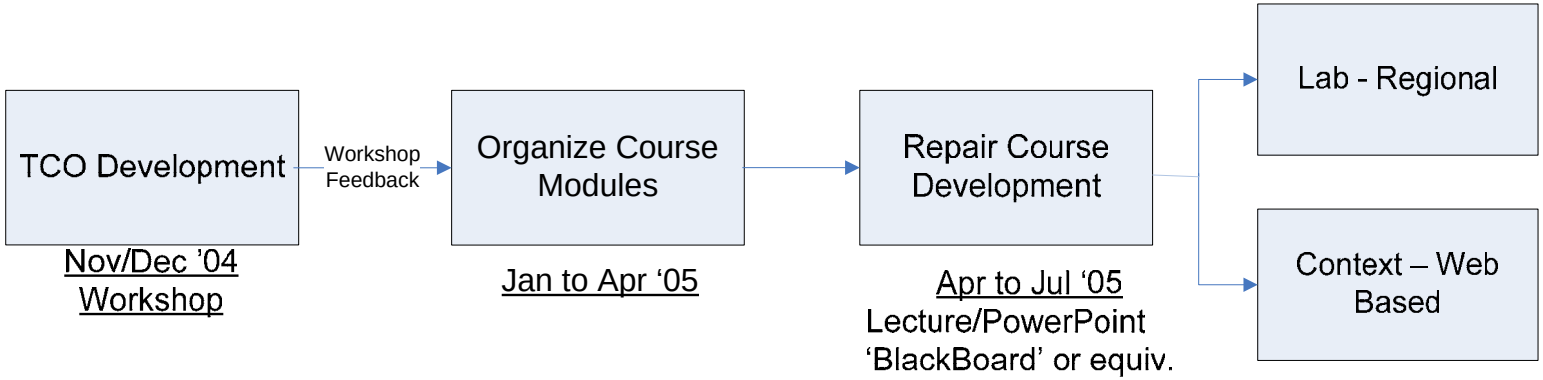
- Deliverables: Publish TCOs, Content and curriculum enhancements by EOY 2005 – Phase I
- Deliverables (2006): Develop course and assessments – Phase II

Curriculum Development

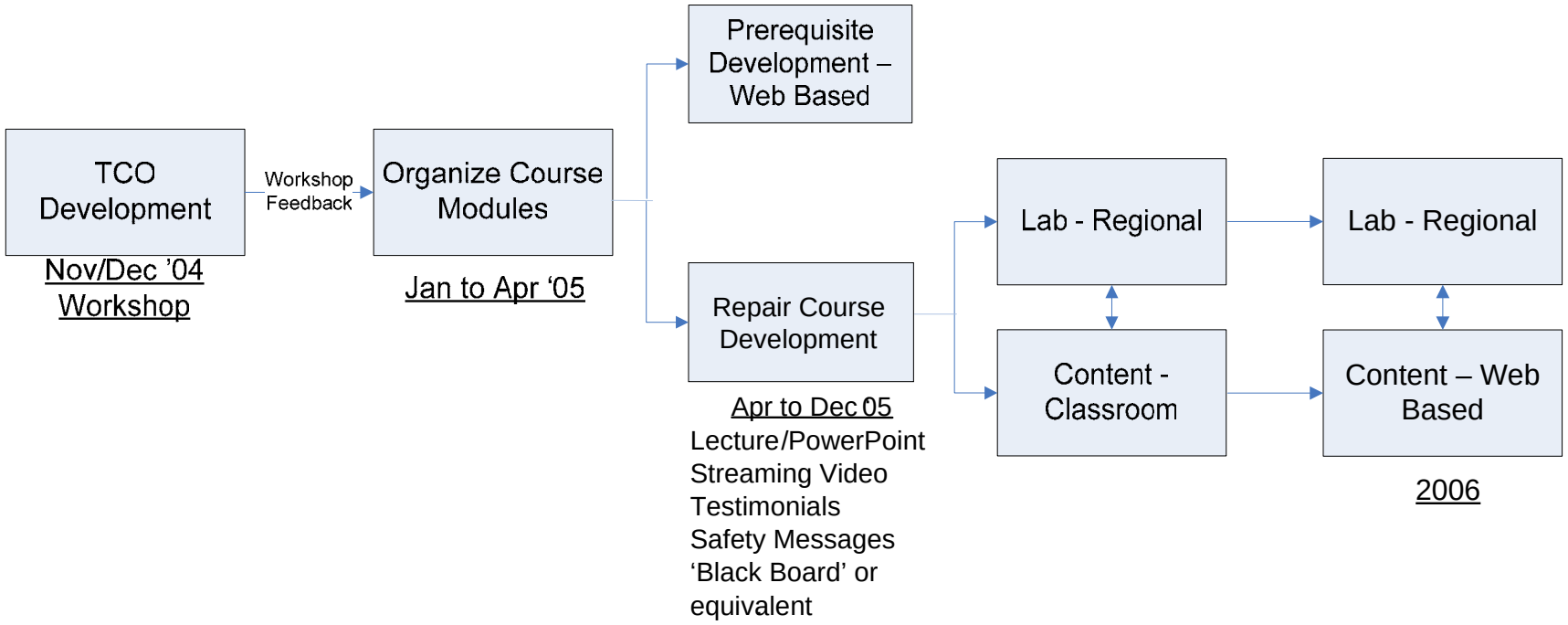
Collaboration of Industry & Academia & Government

- 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 teleconference: April 28, 2005
  - Increase in scope, resulting in prerequisite course plus additional content detail and tools
  - Major Achievement: Consensus on course expectations
  - 2005 workshop – Considerable feedback on content and TCOs currently being integrated into curriculum

Original Statement of Work



Revised Statement of Work



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

Elements (published)	Technique	Custom Curriculum
TCOs & Content		Learning techniques
Flight Safety Messages	STORY BOARD	Modified mix of elements
Testimonials		Teaching format
Videos		Target audience characteristics

Tuesday — Intro to Composite Maintenance & Repair Timeline

Morning
8:00 to 9:50

Primary Mode[s]:
Lecture

Supplemental Mode[s]:
P. Pt Presentation
Testimonial from Practitioner

Topics: TCO [E] Identify & describe information contained in documentations
- 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

Fight Safety Message #3

Total Time: 1hr 50min

Morning
9:10 to 10:10

Intermission

Total Time: 20 min

Morning
10:10 to 12:00

Primary Mode[s]:
Lecture

Supplemental Mode[s]:
P. Pt Presentation
Video
Testimonial from Practitioner

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.

Fight Safety Message #4

Total Time: 1hr 50min

Afternoon
12:00 to 1:00

Lunch

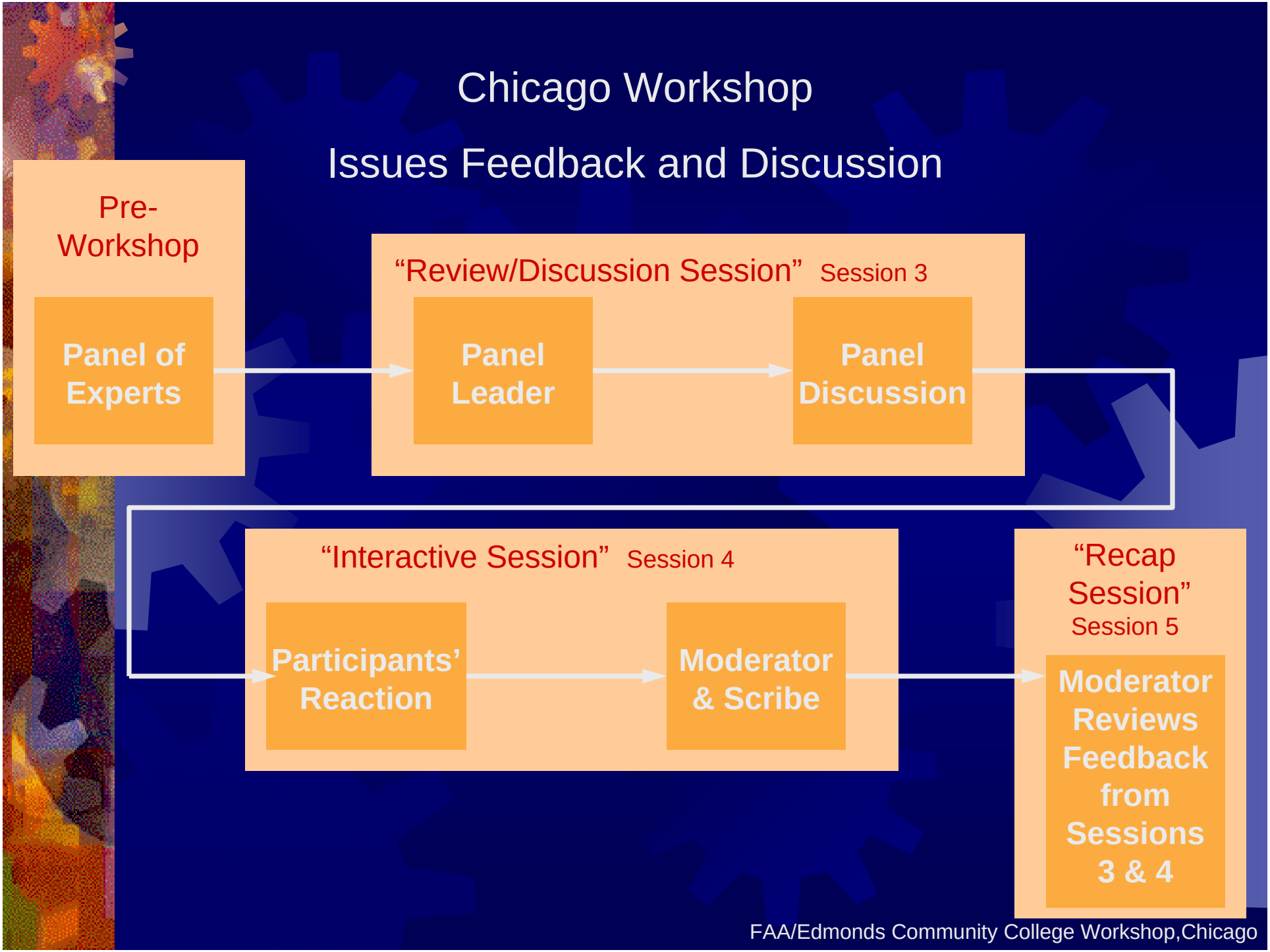
Total Time: 1 hr

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



How Session 4 Worked

45 minutes per session

Module Content

Facilitates Conversation and Feedback

Moderator

Verbal Ideas

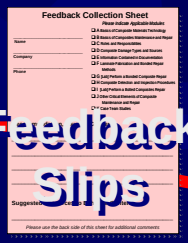
Scribe

Captures Verbal Ideas on Screen

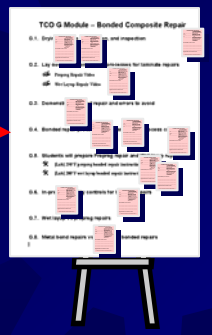
Break-out Group

(15-25 participants)

Convey Verbal Ideas and Post Written Feedback



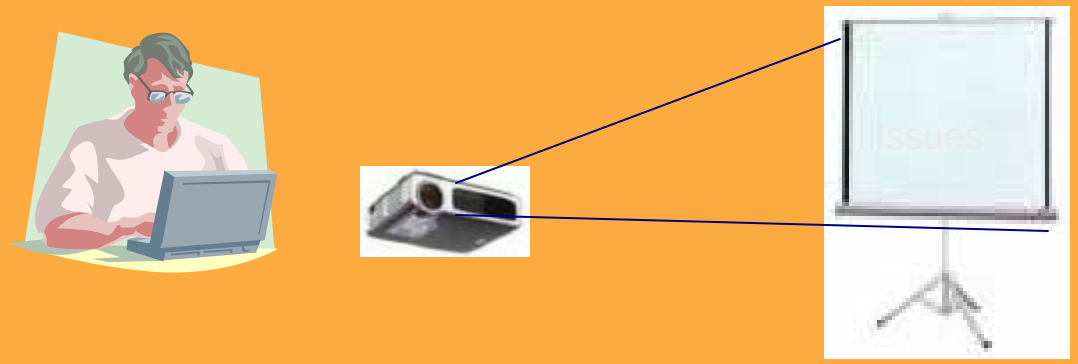
Feedback Slips



Participants Post Ideas throughout Conference

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

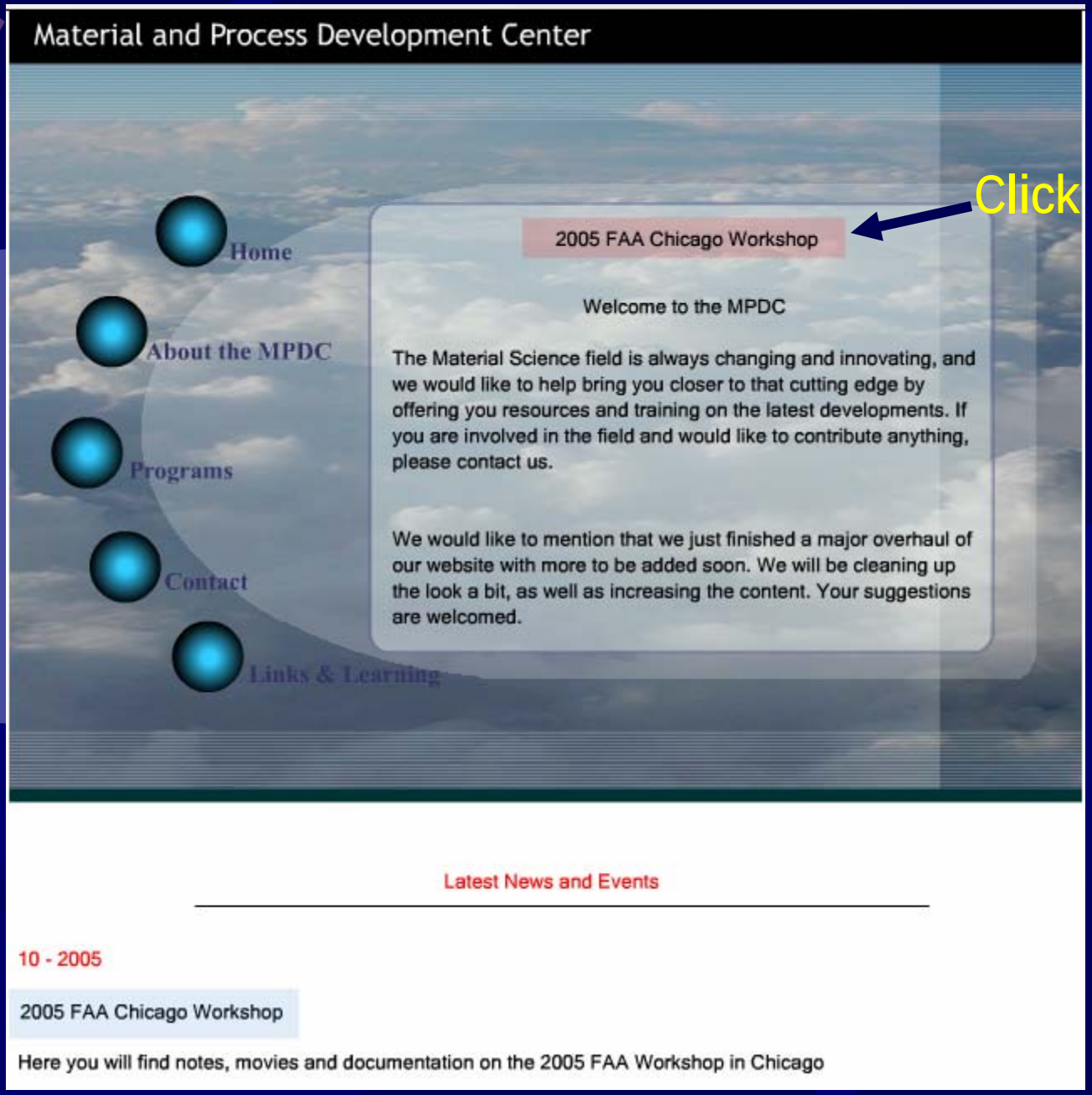
- Integrate feedback into TCOs and Content
- Publish outcomes on websites
  - Presentations
  - TCO and Content Revisions
- Compliance Approval

Next Steps: Posting & Links of Workshop Results

Detail of Workshop: www.mpdc.biz

Overview: depts.washington.edu/amtas/

Links: www.niar.twsu.edu/newniar/



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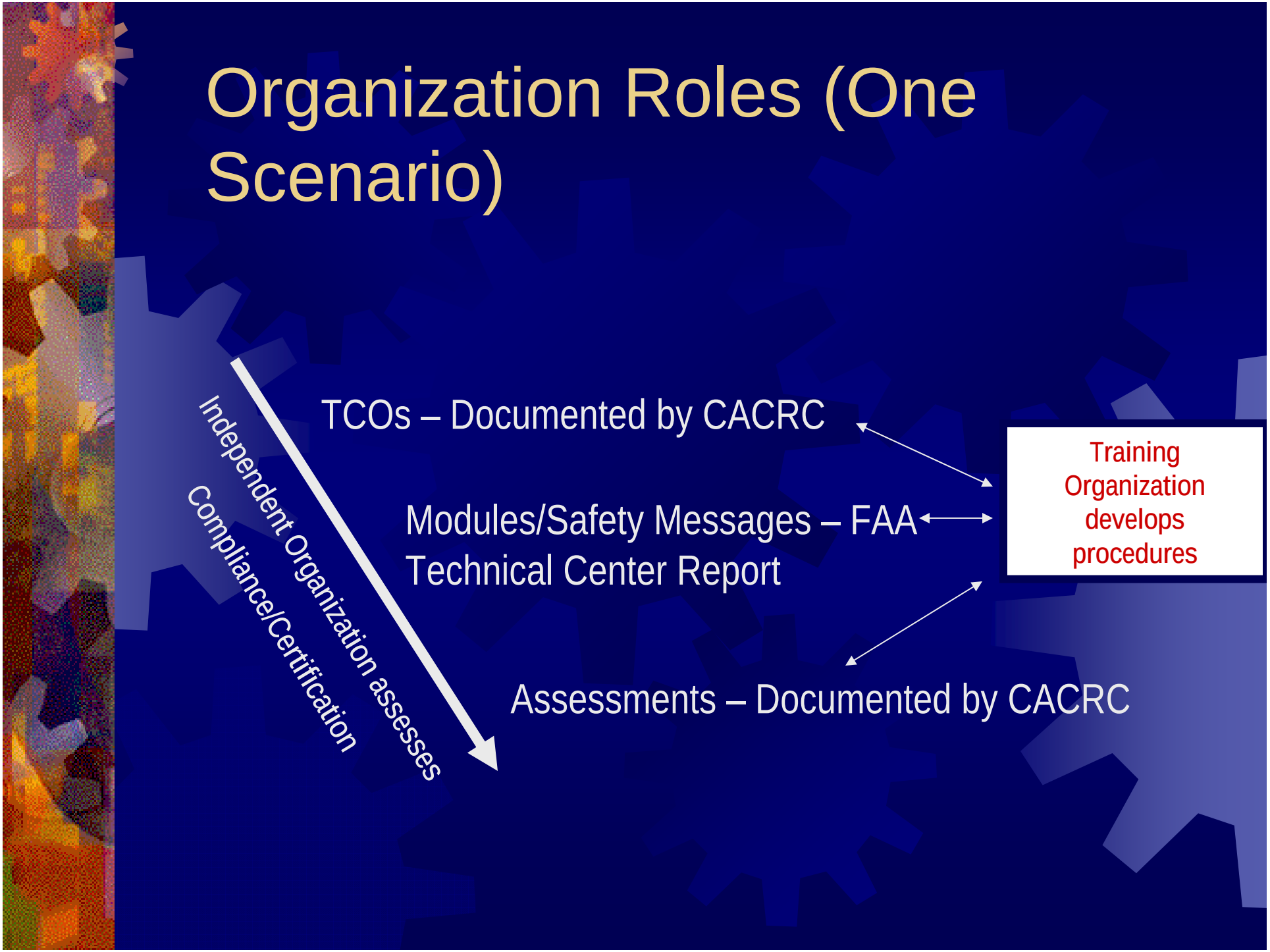
Next Steps: Compliance Approval

- Purpose – Validation of Trainer process to the TCOs, content and assessment of course
- One Scenario
  - Trainer documents curriculum
  - Independent organization assesses compliance (similar to ISO 9000, for example)

Organization Roles (One Scenario)



Next Steps: Curriculum Development

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