

Recent Research Regarding General Aviation Weather Safety Issues

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Outline

- A short summary of Embry-Riddle research studies involving General Aviation weather safety issues
 - Results of GA pilot weather encounters study
 - Results of Weather Technology in the Cockpit pilot education and training study
- Recommendations and the way ahead

2007-2009: Developing Proactive Methods for General Aviation Data Collection

- Joint study with Civil Aerospace Medical Institute and Clemson University
- Structured interviews with 24 GA pilots who had weather encounters requiring a weather assist
- Combined human factors and weather case study analysis approach
 - Produced categories related to weather hazard detection, product accuracy, pilot utilization, and related these to human factors issues (explanatory slide in backups)

Developing Proactive Methods for General Aviation Data Collection:

Interaction between Weather and Human Factor issues

| | <u>Weather Conditions / Product Accuracy</u> | | <u>Pilot Factors from Interviews</u> | | | |
|------------|--|--|--------------------------------------|------------|---------------------|--------------------------|
| # cases | Obs Network detected Y/N | Wx Product(s) accurate / inaccurate / non-existent | Lack of Apprec/ Understand Wx | Motivation | Conflicting Wx Info | Lack of Complete Wx Info |
| Total: 29* | 24 - Yes / 5 - No | 23 / 1 / 5 | 16 | 6 | 1 | 2 |

* some cases had multiple hazards encountered

2009-present: Weather Technology in the Cockpit: Pilot Education and Training Issues

- 2009-2011: Joint study with University of North Dakota and University of Alaska-Anchorage
- UND task was to develop GA user needs statement
- UA-A task was to develop GA user concept of ops
- ERAU tasks:
 1. Conduct research necessary to define the minimum pilot training required to use WTIC systems safely and effectively
 2. Develop guidance for pilot training and evaluation criteria.

Weather Technology In the Cockpit: Pilot Education and Training

Research strategy involved examining current weather-related advisory circulars and weather knowledge exam questions

Research team categorized 649 questions from FAA Private, Instrument, Commercial, and Air Transport pilot exams into one of the three weather knowledge categories and four levels of cognition

- **Knowledge categories:** Phenomenology, Hazard Products, Hazard Product Sources
- **Levels of Cognition:** Rote, Understanding, Application, Correlation (ref: Aviation Instructor's Handbook, Figure 2-10)

| Category / Cognition Level | Rote | Understanding | Application | Correlation | Total |
|--------------------------------|------------|---------------|-------------|-------------|------------|
| Weather Phenomenology | 65 | 227 | 42 | 19 | 353 |
| Weather Hazard Products | 94 | 146 | 17 | 2 | 259 |
| Weather Hazard Product Sources | 34 | 3 | 0 | 0 | 37 |
| Total | 193 | 376 | 59 | 21 | 649 |

Weather Technology In the Cockpit: Pilot Education and Training

Research strategy involved developing and evaluating an education/training module focused on a specific WTIC product (NEXRAD) for a specific weather situation (convective)

Employed Instructional Systems Design (ISD) methodology

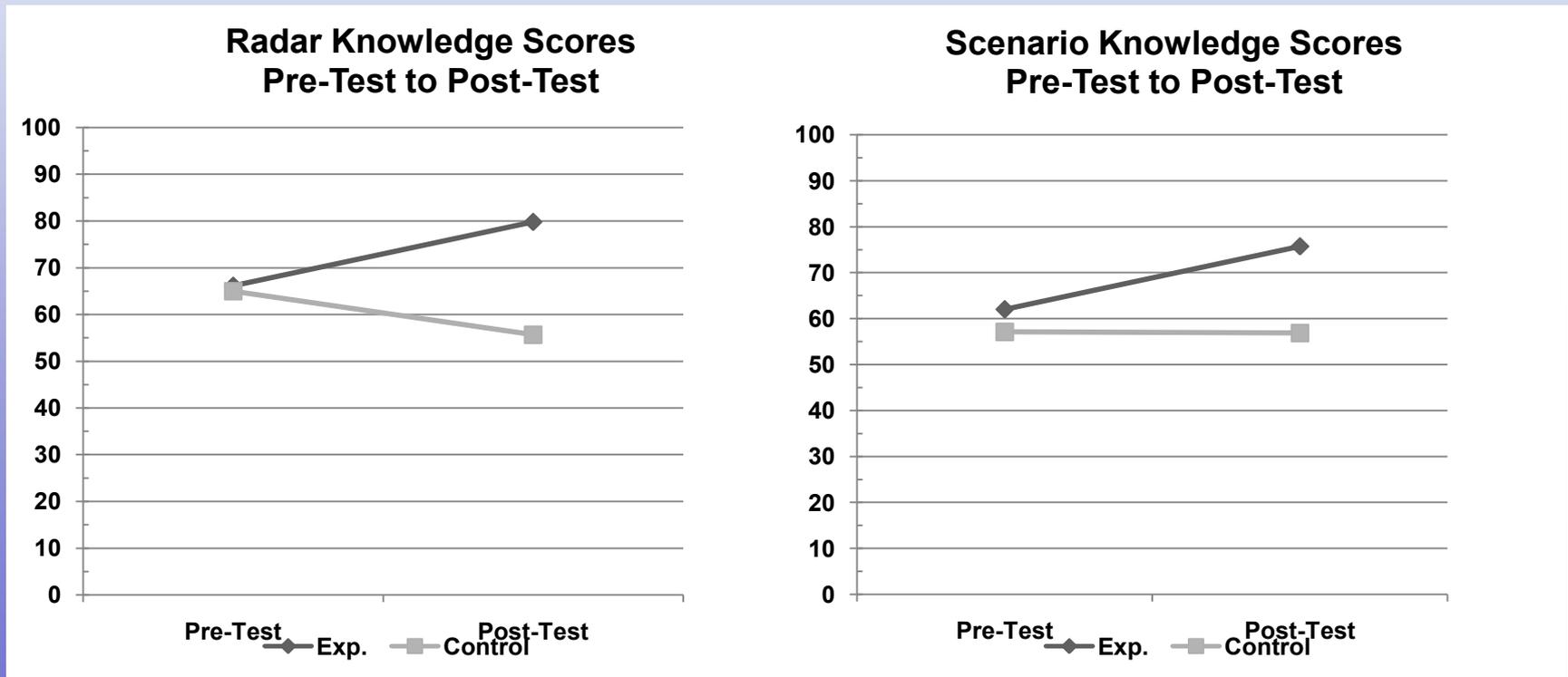
Tested on student pilots and flight instructors from Embry-Riddle's Flight Department during February-March 2011

Instructional sequence had four parts:

1. Pre-test on radar basics and products, including scenario-based questions
2. Formal education and training seminar
3. Post-test on radar basics and products, including scenario-based questions
4. Post-post-test designed to assess knowledge retention (scenario-based questions only)

Weather Technology In the Cockpit: Pilot Education and Training

Results of NEXRAD-based convective weather education / training module testing



Recommendations and The Way Ahead

- Recommended to the FAA that weather-related Advisory Circulars need to be updated and reorganized
- Recommended to the FAA that Practical Test Standards and Knowledge Banks need to be updated
- The Way Ahead:
 - Develop R&D roadmap for WTIC as it relates to the GA community (e.g., education/training on new applications using hand-held technology)
 - Expand testing of NEXRAD convective weather module to larger, more representative group of GA pilots

Backup Slides

Weather Conditions

Wx hazard not detected by observing network

Wx hazard detected by observing network



Weather Product

No wx hazard product

Wx hazard product inaccurate

Wx hazard product accurate



Weather Product Used?

No wx hazard product

Wx hazard product not used by pilot

Wx hazard product used by pilot

Developing Proactive Methods for General Aviation Data Collection:

Interaction between Weather and Human Factor issues

Human Factor issues

Lack of appreciation / understanding of the weather

Motivation (e.g., "get-home'it is")

Conflicting weather information

Lack of complete weather information

Result

Weather encounter / incident

No weather encounter / incident

No Human Factor issues

