National Training Aircraft Symposium (NTAS)

2017 - Training Pilots of the Future: Techniques & Technology

Aug 16th, 8:15 AM - 9:45 AM

A Preliminary Comparison of Pilots' Weather Minimums and Actual Decision-Making

Nathan W. Walters
Embry-Riddle Aeronautical University, nathanwray187@gmail.com

Mattie Milner
Embry-Riddle Aeronautical University, milnerm1@my.erau.edu

Daniel A. Marte
Embry-Riddle Aeronautical University, marted@my.erau.edu

Evan A. Adkins
Embry-Riddle Aeronautical University, adkinse3@my.erau.edu

Marie Aidonidis
Embry-Riddle Aeronautical University, aidonidm@my.erau.edu

See next page for additional authors

Presenter Information

Nathan W. Walters, Mattie Milner, Daniel A. Marte, Evan A. Adkins, Marie Aidonidis, Matt B. Pierce, Abigail K. Pasmore, Angela Roccasecca, Stephen Rice, and Scott R. Winter

EMBRY-RIDDLE
Aeronautical University
FLORIDA | ARIZONA | WORLDWIDE

A Preliminary Comparison of Pilot's Weather Minimums and Actual Decision Making: A Case Study

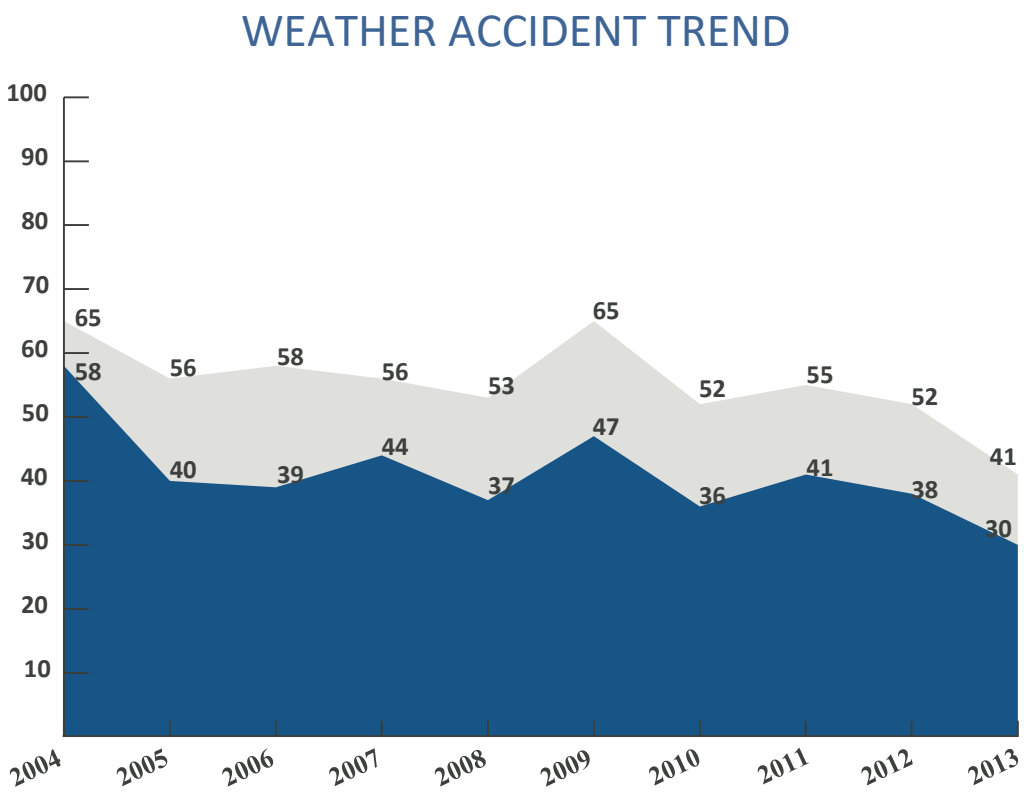
Nathan W. Walters, M. Nicole Milner, Daniel A. Marte, Evan A. Adkins, Marie Aidonidis, Matthew B. Pierce, Abigail K. Pasmore, Angela Roccasecca, Stephen Rice, & Scott R. Winter

Problem Statement

- Adverse weather conditions remain a leading cause in aviation accidents.

The Problem

- Pilots continue to make poor decisions when flying in severe weather conditions.
- Training and technology have provided little assistance.



Kenny, D. J. (2016) Eds. Knill, B., Pangborn, T., & Sable, A. 25th Joseph T. Nall Report: General Aviation Accidents in 2013. AOPA Air Safety Institute.

Purpose

Baseline Personal Minimums					
Weather Condition		VFR	MVFR	IFR	LIFR
Ceiling					
	Day	2,500		800	
	Night	5,000		999	
Visibility					
	Day	4 miles		1 mile	
	Night	8 miles		3 miles	
Turbulence		SE	ME	Make/Model	
	Surface Wind Speed	10 knots	15 knots		
	Surface Wind Gust	5 knots	8 knots		
	Crosswind Component	7	7		
Performance		SE	ME	Make/Model	
	Shortest runway	2,500	4,500		
	Highest terrain	6,000	3,000		
	Highest density altitude	3,000	3,000		

Research Questions

- What is the difference in distance between pilot's stated personal minimums and their actions toward a missed approach during missions where the cloud cover is lower than expected?
  - Distance below personal minimums
  - Distance below federal minimums

EMBRY-RIDDLE Aeronautical University
FLORIDA | ARIZONA | WORLDWIDE

Method & Design

Participants	Equipment	Conditions	Design
• 35 Instrument Rated pilots (4 female) from Embry-Riddle Aeronautical University • Mean age: 23 • Compensation: $25	• Elite-1000 flight simulator • Desktop Computer • iPad • Aviation Safety Attitude Scale • Hazardous Attitude Scale	• Controlled Laboratory Environment • Cloud cover reached the ground • No ability to detect obstacles by using visuals • Non-towered airport	• Simple correlational design • Descriptive statistics • CITI certified researchers • ERAU Institutional Review Board • Signed consent by all participants

EMBRY-RIDDLE Aeronautical University
FLORIDA | ARIZONA | WORLDWIDE

By the Numbers – Preliminary Results

Total Participants	Participants who flew below stated personal minimums (SPM)	Participants who flew below federal minimums
35 Instrument Rated Pilots	24 (69%) Instrument Rated Pilots	22 (63%) Instrument Rated Pilots

EMBRY-RIDDLE Aeronautical University
FLORIDA | ARIZONA | WORLDWIDE

Participants Totals – Preliminary Results

Total Participants	Average stated personal minimums (SPM): All participants	Average point "missed approach" executed: All participants
35 Instrument Rated Pilots	367 ft. (MSL)	226.59 ft. (MSL)

EMBRY-RIDDLE Aeronautical University
FLORIDA | ARIZONA | WORLDWIDE

Preliminary results – Stated Personal Minimums (SPM)

24 (69%) Participants flew below (SPM)	Distance these 24 participants flew below their stated personal minimums	Average height at which these 24 participants executed "missed approach"
On average the SPM of 24 (69%) participants equals 443 ft (MSL)	231 ft	211.8 ft. (MSL)

EMBRY-RIDDLE Aeronautical University
FLORIDA | ARIZONA | WORLDWIDE

Participants who flew below Federal Minimums – Preliminary Results

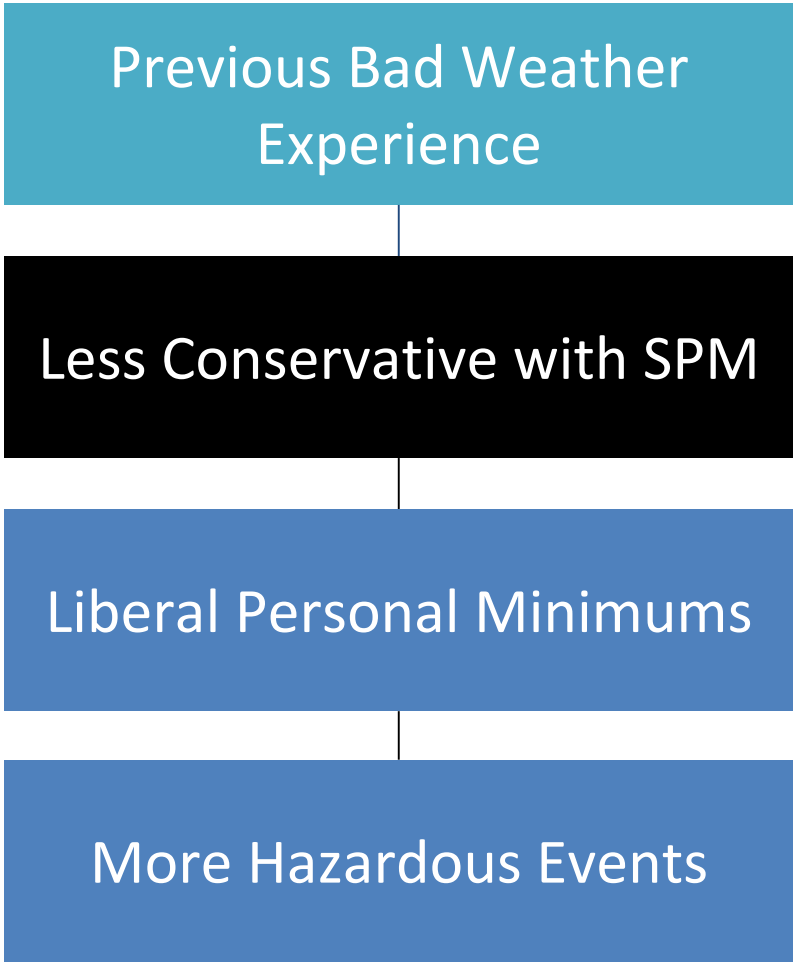
Federal regulated minimums for ILS	22 out of 35 (63%) instrument rated pilots	Feet (MSL) at which these 22 (63%) pilots executed miss
213 ft. (MSL)	On average flew 40 ft. below federal regulated minimums	On average these pilots executed missed approach at 173 ft MSL

EMBRY-RIDDLE
Aeronautical University
FLORIDA | ARIZONA | WORLDWIDE

Discussion

Weather Ceiling Minimums

- Personal minimums were first introduced in 1996.

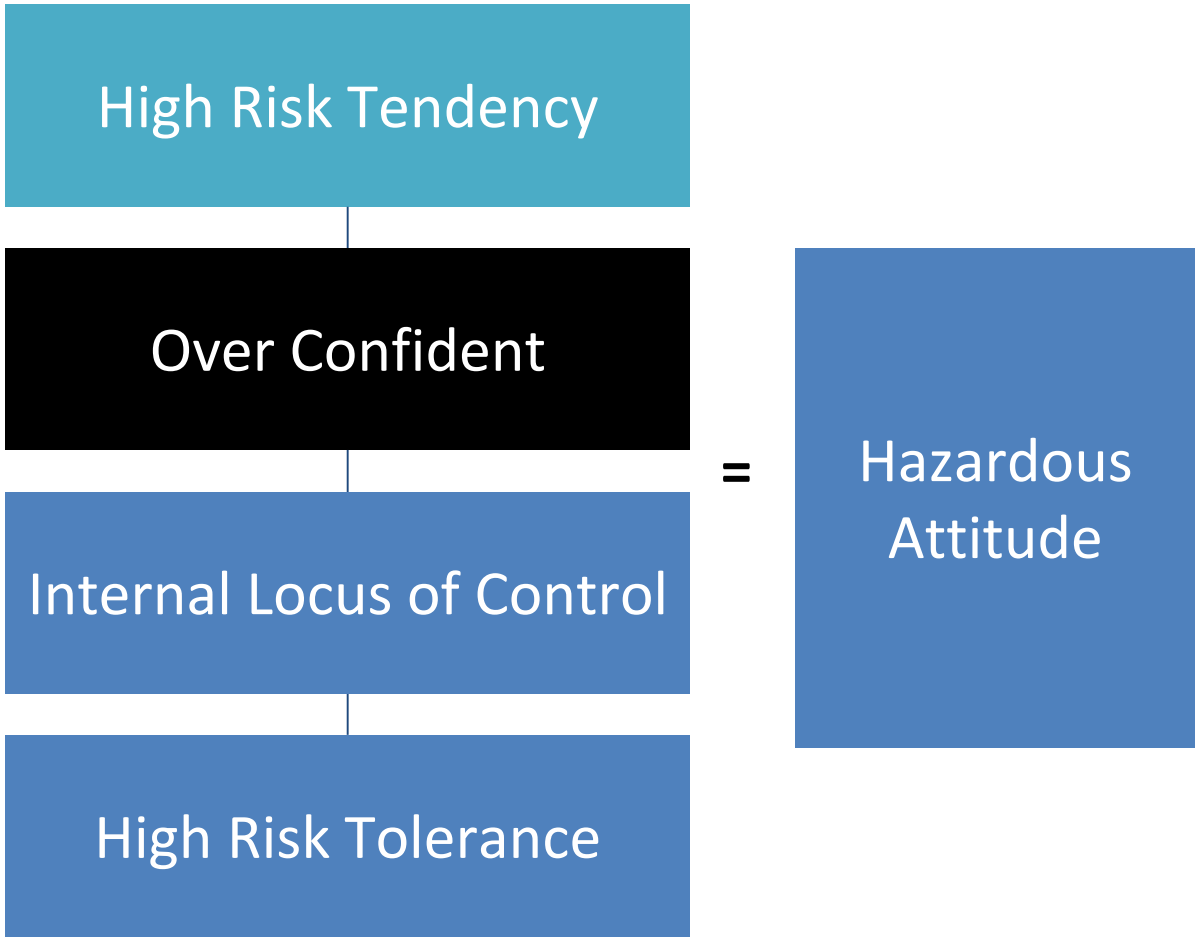


Decision Making

- What factors affect decision making?
- Particularly, what factors influence risky decision making?

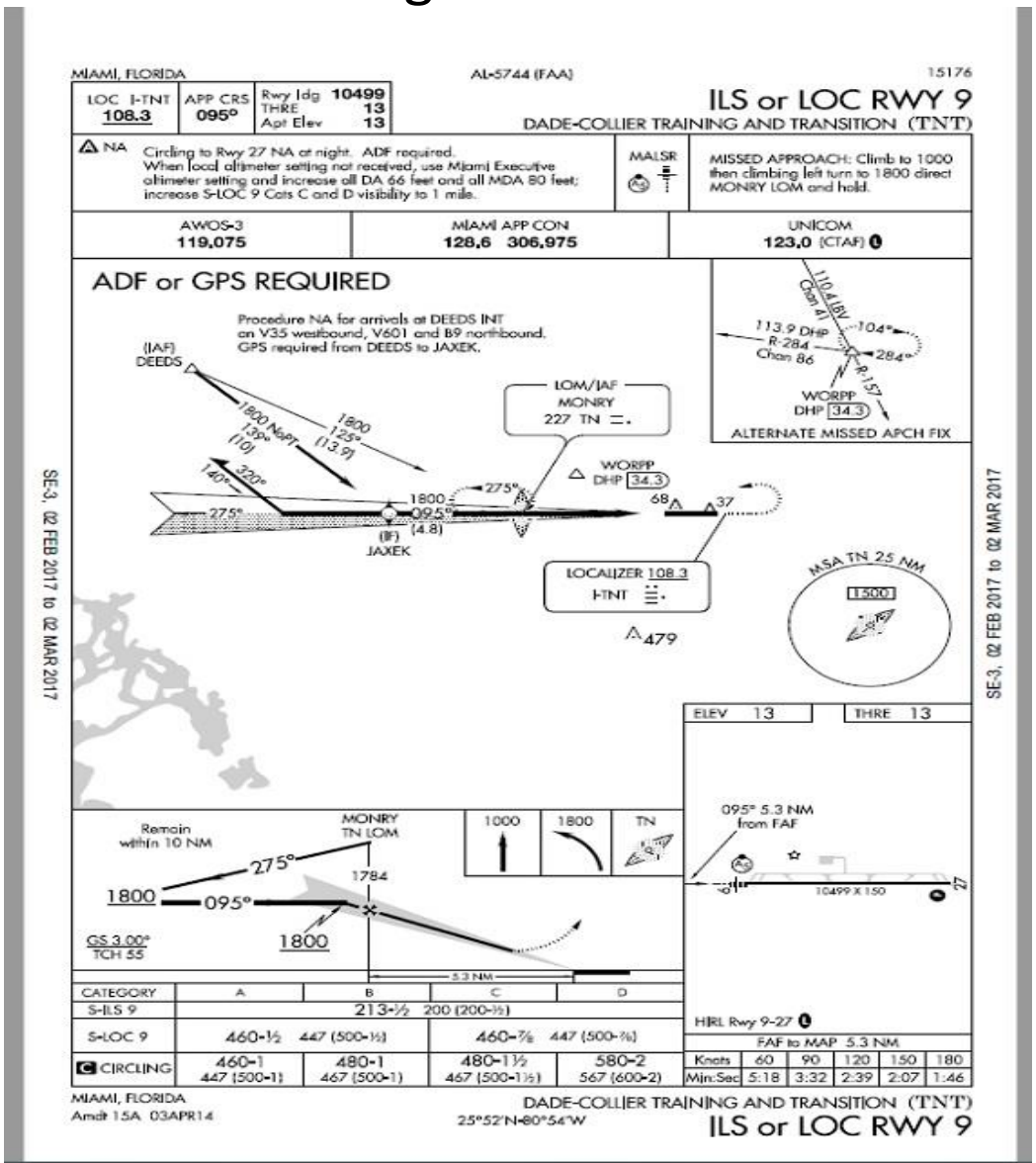
Attitudes

- Can training improve response times to weather hazards for those with high risk tendencies?



Case Study: One Example

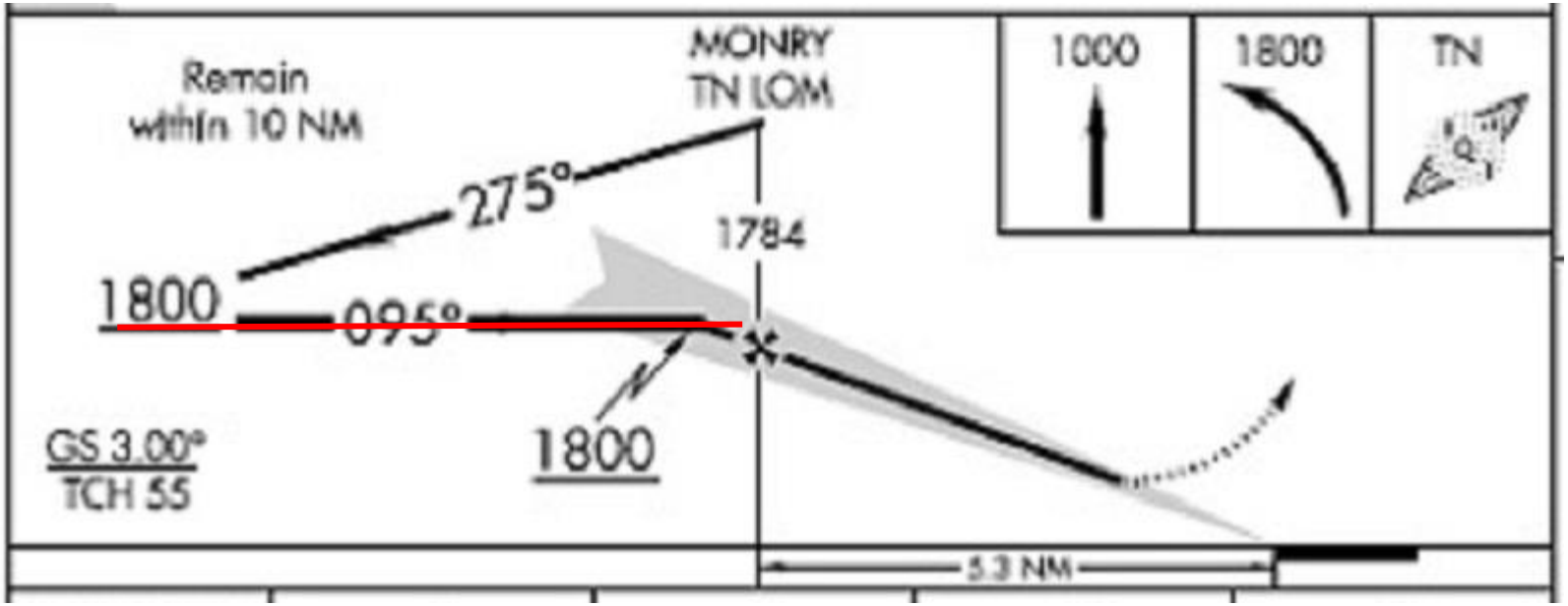
Flight Chart



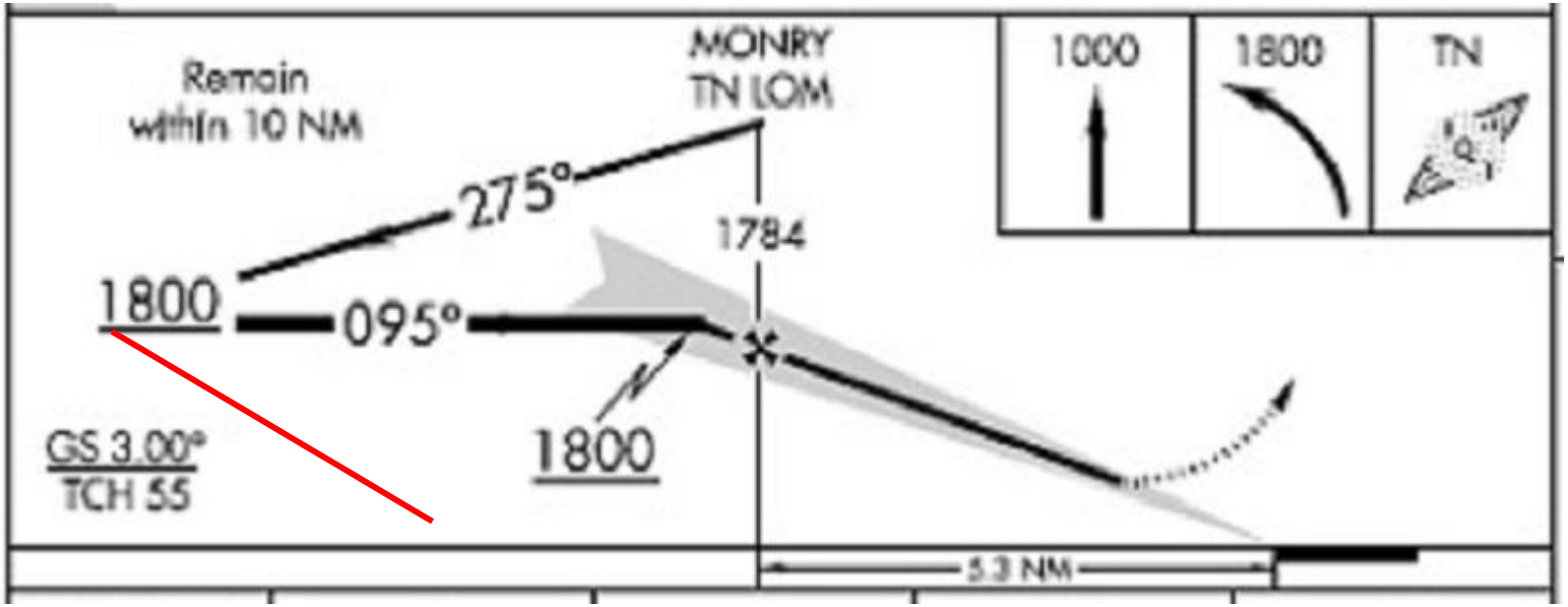
What Happened?

- One pilot did not correctly identify the information from his display.

Normal Flight Path



Estimated Participant Flight Path



Then this happened!

Which Led to This!

EMBRY-RIDDLE
Aeronautical University
FLORIDA | ARIZONA | WORLDWIDE

Lessons Learned

References

Arkes, H. R., & Blumer, C. (1985). The psychology of sunk cost. *Organizational Behavior and Human Decisions Processes, 35*, 124-140.

Ball, J. (2008). The impact of training on general aviation pilots' ability to make strategic weather-related decisions. Federal Aviation Administration.

Goh, J. & Wiegmann, D. (2001). An investigation of the factors that contribute to pilots' decisions to continue visual flight rules flight into adverse weather. *Proceedings of the 45th Annual Meeting of the Human Factors and Ergonomics Society, Santa Monica, CA.*

Ji, M., Lan, J., & Yang, S. (2011). The impact of risk tolerance, risk perception and hazardous attitude on safety operation among airline pilots in China. *Safety Science, 49*, 1412-1420.

Kenny, D. J. (YEAR) Eds. Knill, B., Pangborn, T., & Sable, A. 25th Joseph T. Nall Report: General Aviation Accidents in 2013. AOPA Air Safety Institute.

You, X., Ji, M., & Han, H. (2013). The effects of risk perception and flight experience on airline pilots' locus of control with regard to safety operation behavior. *Accident Analysis and Prevention, 57*, 131-139.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica: Journal of the econometric society*, *47*(2), 263-291.

Kahneman, D., & Tversky, A. (1984). Choices, values, and frames. *American psychologist*, *39*(4), 341.

Renn, O. (1998). The role of risk perception for risk management. *Reliability Engineering and Safety Science, 59*, 49-62.

EMBRY-RIDDLE
Aeronautical University
FLORIDA | ARIZONA | WORLDWIDE

Questions