

3-25-2015

## Toward Developing an Academic Discipline

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### Scholarly Commons Citation

Brady, T., & Stolzer, A. J. (2015). Toward Developing an Academic Discipline. , (). Retrieved from <https://commons.erau.edu/publication/80>

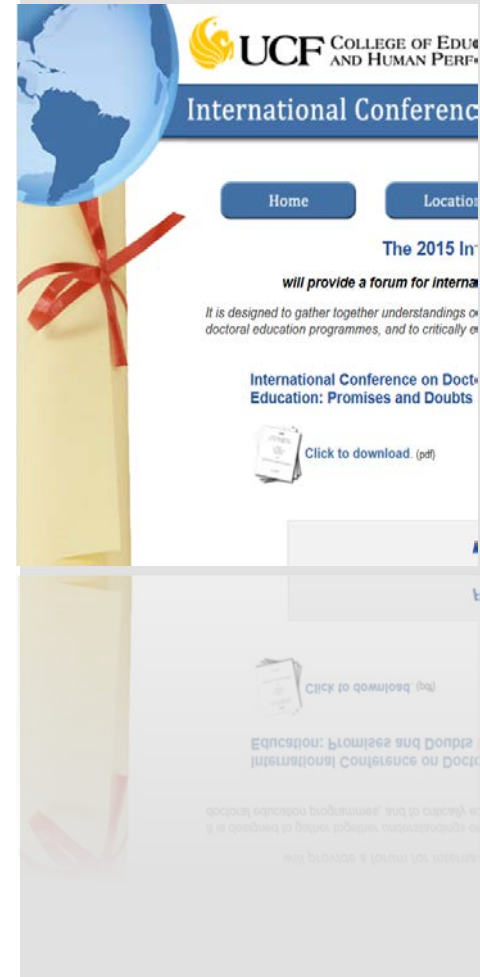
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# Toward Developing an Academic Discipline

Tim Brady, Ph.D.

Alan J. Stolzer, Ph.D.

**EMBRY-RIDDLE**  
AERONAUTICAL UNIVERSITY





- Founded in 1926
- Campuses in Daytona Beach, FL; Prescott, AZ, and Worldwide – more than 150 locations
- 70+ bachelors, master's, and doctoral degrees in aviation, aerospace, engineering, business, and science
- Largest aviation and aerospace university in the world
- Major research center



**EMBRY-RIDDLE**™  
AERONAUTICAL UNIVERSITY

# What makes a Discipline?

- “a particular area of study, esp. a subject studied at a college or university” (Cambridge Online Dictionaries)
- Definable body of knowledge
- Scholars who contribute to that body of knowledge
- Teachers who teach in the field
- Community who identify with the field
- Refereed journal(s)
- Discipline offers a doctorate as the terminal degree



## A Dean's Vision

- Central Missouri State University Department Chair, Power and Transportation
- Multi-university Ph.D. program Technology Management through Indiana State University
- Needs analysis survey showed high interest in aviation specialization
- Accepted new position, that of Dean of College of Aviation at Embry-Riddle Aeronautical University
- Vision for aviation Ph.D. was established

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# Justification for Degree

- Foundational reasons to develop the Ph.D.
  - Aviation Research
  - Student/Market Demand
  - Maturation of the Discipline



# Aviation Research

- Aviation is a \$2.2 trillion industry worldwide
- Research is needed throughout the industry
  - Flight deck automation
  - NextGen
  - Aging aircraft
  - Human factors
  - Airport technology
  - Safety management
  - Propulsion systems
  - Unmanned aerial systems
  - Many others
- Skilled aviation researchers are in high-demand



## Level of Demand

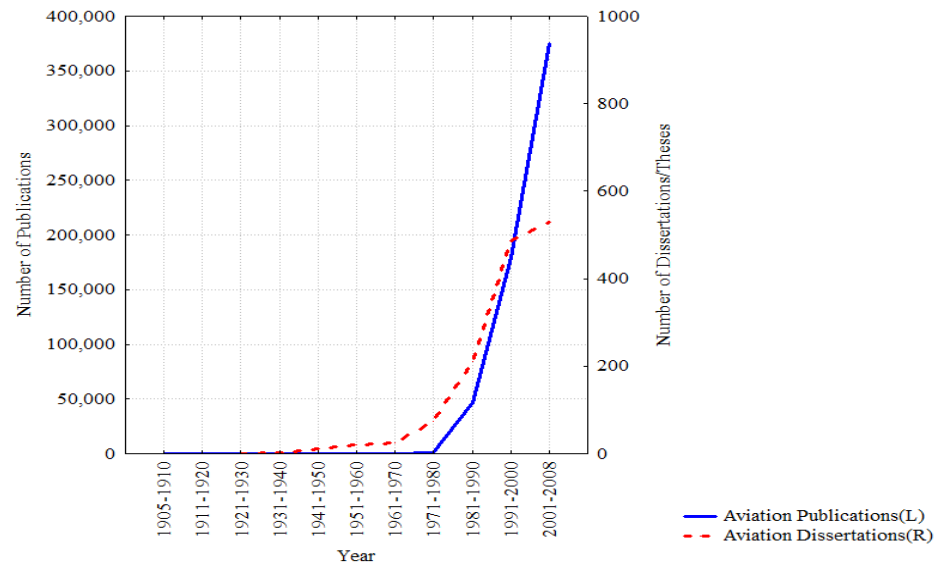
- Analysis was begun in September 2007
- 10,356 surveys provided to students and alumni
- 2,303 surveys were completed
- 1,903 indicated Strongly Agree or Somewhat Agree
  - “I would be interested in enrolling in ERAU’s Ph.D. in Aviation program”
- 78% responded positively to the question
  - “I am more likely to enroll in ERAU’s Ph.D. in Aviation if it is online.”
- 68% of those responding were 32 years of age or older
- 67% were employed in the aviation/aerospace industry





# Maturing Discipline

- 2008 survey of several scholarship databases
- Prior to 1970 trivial number of aviation-related articles
- Early 2000's more than 350,000 aviation articles appeared in publications
- Aviation-related doctoral dissertations has grown exponentially since 1930's



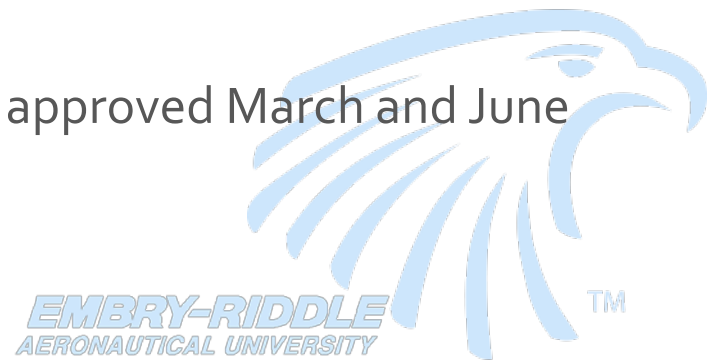
# Challenges

- Initial proposal for degree was not favored by the university
  - First Ph.D. for the University
    - Level III (Master's Degree) to Level V (Ph.D. Degree)
    - Encouraged to pursue a Professional Doctorate
  - First Ph.D. in aviation in the United States
  - Offered online involving all three ERAU campus



# Institutional Approval

- Fall of 2007, dean briefed the new provost to request the authority to start the formal process to develop the degree.
- Academic degree approval process
- ERAU President and provost committed full support
- Board of Trustees approved March and June 2008



# SACS Approval

- Substantive change application
  - Level III to Level V
- “The addition of courses or programs of study at a degree or credential level different from that which is included in the institution’s current accreditation or reaffirmation.”
- Details of report
  - General institutional Data
  - Current and Projected Enrollment
  - The Rationale and Requirements for the New Program
  - Faculty Resources and Qualifications
  - Financial Resources
  - Library Facilities
  - Physical Facilities



# SACS Approval Cont.

- Application was submitted on April 24, 2008
- January 2009 - SACS denied the application
- “Address faculty qualification issues”
- “...ensure faculty have terminal degrees that relate to the courses they are teaching...”
  - Chicken and egg problem: How? ERAU is creating a new discipline.



# SACS Approval Cont.

- Faculty were selected who possess a doctorate in another field with academic and professional backgrounds that match the subject matter being taught
- Solution: created a process to map course learning objectives to faculty degrees, scholarship, experience, etc.
- Application was resubmitted in April 2009 and approved July 2009



# Program Particulars

- Mission – *To produce outstanding scholars for careers in research and teaching in the aviation field.*
- Highly competitive admissions process – admit 15-18 students each year
- Master's degree, GRE, recommendation letters, research statement, etc.
- One week residency program each year
- 12 courses – all delivered online
  - 4 core (safety, law, history, economics)
  - 4 stats and research methodology
  - 4 specialization (safety and HF, operations, intradisciplinary)
- 2-day qualifying exam
- 18 credit hour dissertation



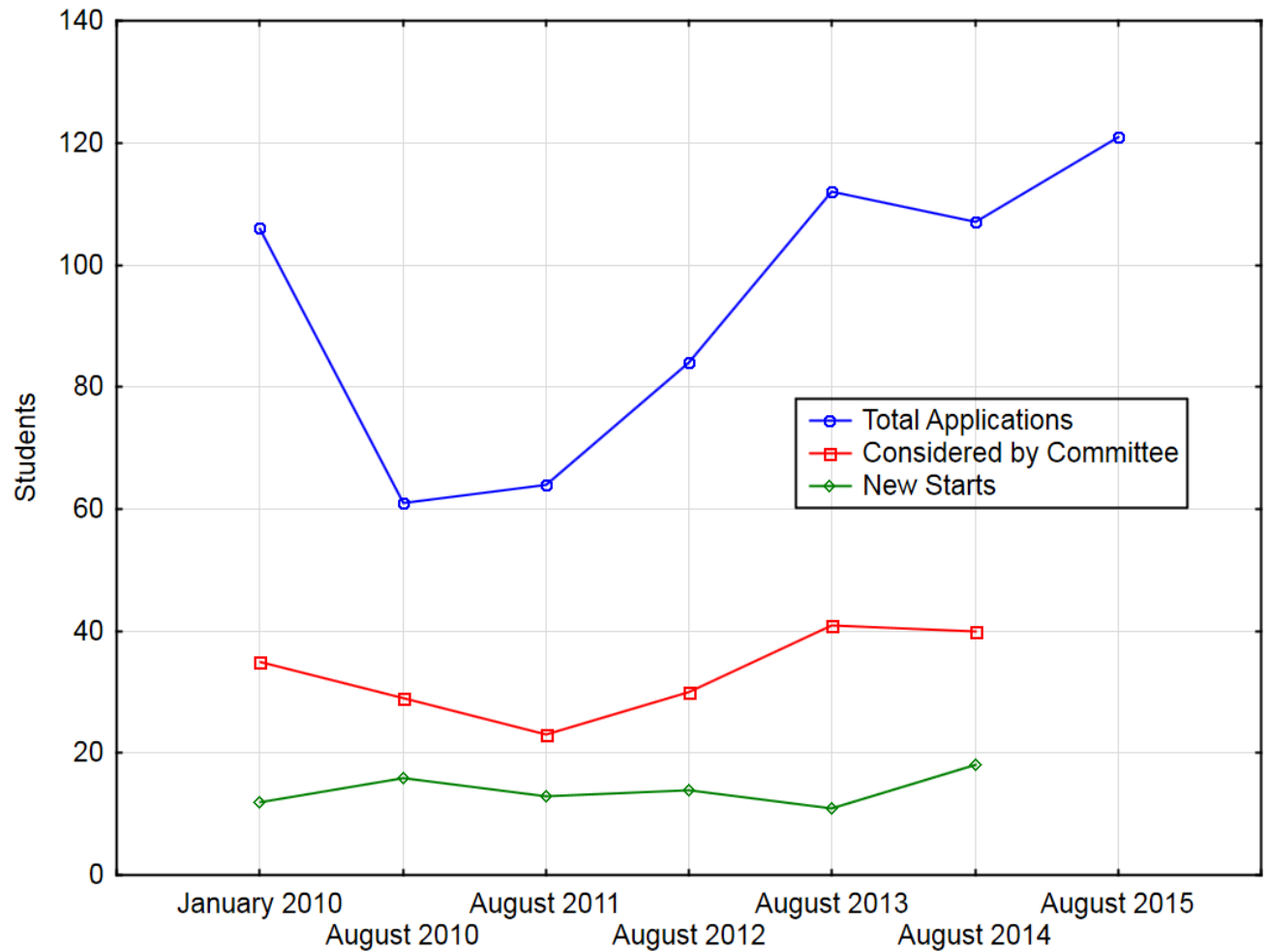
## Program Particulars Cont.

- As of 2014, enrollment is 65
- Mid-career professionals; mean age is 42
- Nine students have defended and graduated, 14 more are candidates in the dissertation phase





# Number Applications vs Admits



# 2014 Cohort



# Poster Session During 2014 Residency



# Doctoral Faculty



**Tim Brady**  
*Ph.D., Higher Education, Saint Louis Univ.*



**Bruce Conway**  
*Ph.D., Engineering Management, Old Dominion Univ.*



**Haydee Cuevas**  
*Ph.D., Human Factors, Univ. of Central Florida*



**Dave Esser**  
*Ph.D., Org and Mngt Leadership, Capella Univ.*



**Mark Friend**  
*Ed.D., Safety Management, West Virginia Univ.*



**Steven Hampton**  
*Ed.D., Higher Education, Nova Southeastern Univ.*



**Irwin Price**  
*Ph.D., Economics, Boston Univ.*



**Frank Richey**  
*D.B.A., Airline Strategic Mngt, Nova Southeastern Univ.*



**John Sabel**  
*J.D., Duquesne Univ.*



**Alan Stolzer**  
*Ph.D., Quality Engineering, Indiana State Univ.*



**Dothang Truong**  
*Ph.D., Manufacturing Management, Toledo Univ.*



**Scott Shappell**  
*Ph.D., Neuroscience, Univ. of Texas*



## Completed Dissertations

### Validation of New Technology Using Legacy Metrics: Examination of SURF-IA Alerting for Runway Incursion Incidents

Purpose	The purpose of this study will be to determine the validity of using runway incursion statistics derived from the FAA/ICAO RISC model as a metric for determining the benefit of SURF-IA flight-deck equipage for mitigating runway incursions.
Hypothesis	The null hypothesis ( $H_0$ ) will be that there is no difference in the runway incursions classified as <i>serious</i> (Category A or Category B) using the RISC model and the runway incursions alerting as serious (Warnings or Cautions) on the CDTI using the SURF-IA model.
Research Methodology	Statistical Analysis of Archival Data Using Expert Raters
Advisor	Alan Stolzer, Ph.D.



## Completed Dissertations

### Collaborative Audio Transcription and Repair as a Method for Novice Pilots to Learn Approach Briefing Crew Resource Management (CRM) Skills

Purpose	The purpose of this study is to examine whether the proposed Collaborative Transcription and Repair Based Training (CTRBT) method is an effective way for novice pilots to learn CRM skills. The study will gauge effectiveness in three dimensions: the ability of students to perform the CTRBT method, the reactions of students to the CTRBT method, and evidence of CRM learning related to the CTRBT method.
Research Methodology	Quasi- Experimental
Advisor	Dave Esser, Ph.D.



## Completed Dissertations

### Identification of Causal Paths and Prediction of Runway Incursion Risk Using Bayesian Belief Networks

Purpose	The purpose of this study is to evaluate the feasibility and effectiveness of Bayesian belief network models, supported by structured expert elicitation, as a tool to examine causal factors and dynamic causal paths to RI events (regardless of Federal Aviation Regulations under which an aircraft is operated) in the U.S.
Research Questions	The present research addresses two questions, the first of which informs the latter. First, what are the interacting causal factors that lead to RIs in the U.S.? Second, can runway incursions in the U.S. and their dynamic causal factors and interactions be modeled through the use of a Bayesian belief network supported by expert-elicited data?
Research Methodology	BBN model development; expert elicitation
Advisor	Dothang Truong, Ph.D.

# Completed Dissertations



## Analysis of General Aviation Aircraft Accident Data by Aircraft Certification Basis

Purpose	The purpose of this study was to analyze the frequency of general aviation airplane accidents and accident rates on the basis of aircraft certification to determine whether or not differences in certification rules had an influence on accidents.
Hypotheses	Eight hypotheses such as: There is no significant difference in the frequency of accidents among airplanes certified in Part 23, CAR 3, LSA, or E-AB categories with regard to LOC accidents from 2004 to 2011.
Research Methodology	Mixed methods using Chi-Square, ANCOVA, and text mining analysis of archival data
Advisor	Tim Brady, Ph.D.





## Completed Dissertations

### The Effects of Ethical Leadership and Organizational Safety Culture on Safety Outcomes

Purpose	The purpose of this study is to develop and evaluate a model linking ethical leadership and an ethical workplace climate with measurable safety outcomes expressed as occupational injuries.
Research Questions	<ul style="list-style-type: none"><li>• Can an effective model be developed linking ethical leadership and an ethical workplace climate with occupational injuries?</li><li>• If so what is the strength of that model?</li><li>• How is the model moderated or mediated by measures of organizational safety?</li></ul>
Research Methodology	Structural equation modeling – path analysis. Data gathered via a survey.
Advisor	Tim Brady, Ph.D.



## Completed Dissertations

### An Analysis of Airport Surface Deviations using the Human Factors Analysis and Classification System (HFACS)

Purpose	To analyze NTSB reports using the HFACS framework to develop an understanding of the human error causal factors associated airport surface deviations (ASD).
Research Questions	<ul style="list-style-type: none"><li>• What are the human error causal factors, their characteristics, and their interrelationships discovered from applying the HFACS framework to ASD reports?</li><li>• Are the discovered ASD causal factors and their impact dependent upon the type of operation, i.e., Part 121, 135, or 91?</li></ul>
Research Methodology	HFACS analysis of archival data
Advisor	Scott Shappell, Ph.D.

# Completed Dissertations



## Effect of Air Carrier Restructuring Strategies on Post-bankruptcy Performance

Purpose	The purpose of this study is to measure the effectiveness and impact of operational, managerial, financial, and portfolio restructuring strategies on post-bankruptcy performance of air carriers emerging from Chapter 11.
Research Questions	<ul style="list-style-type: none"><li>• What is the relationship between [strategy] restructuring on post-bankruptcy performance during the post-bankruptcy period? [strategy = operational, managerial, financial, portfolio]</li></ul>
Research Methodology	Multilevel exploratory factor analysis and multilevel modeling using archival data.
Advisor	Alan Stolzer, Ph.D.



## Completed Dissertations

### National Culture: Understanding the Impact of Cross-culture on Airline Pilots' Safety Performance in the Middle-East and North Africa (MENA) Region

Purpose	The purpose of this study is to determine if cross-cultural flight deck crew composition is related to increased error levels.
Research Questions	<ul style="list-style-type: none"><li>• To what extent can we predict an unsafe performance event based on the national combination of pilots?</li></ul>
Research Methodology	Multi-dimensional chi-square tests, discriminant analysis and multinomial logistic regression, Spearman's $r$ correlation tests on archival data.
Advisor	Tim Brady, Ph.D.

# Completed Dissertations



## Economic Interrelationships and Impacts of the Aviation/Aerospace Industry in the State of Florida Using Input/Output Analysis

Purpose	The purpose of this quantitative, descriptive study is to develop current, comprehensive estimates of the magnitude and importance of the aviation and aerospace industry to all other Florida industries.
Research Questions	<ul style="list-style-type: none"><li>• What is the composition of the aviation and aerospace industry in the FL and county economy in terms of employment and economic output?</li><li>• What are the interdependencies of the industry's economic relationships with other industries in FL and the county?</li><li>• What would be the impact on the regional economy of FL and the county if a university research park was created?</li></ul>
Research Methodology	Input-Output analysis using archival data
Advisor	Tim Brady, Ph.D.

# Very Active Student Scholarship

Prediction of Runway Incursion Risk Using Bayesian Belief Networks



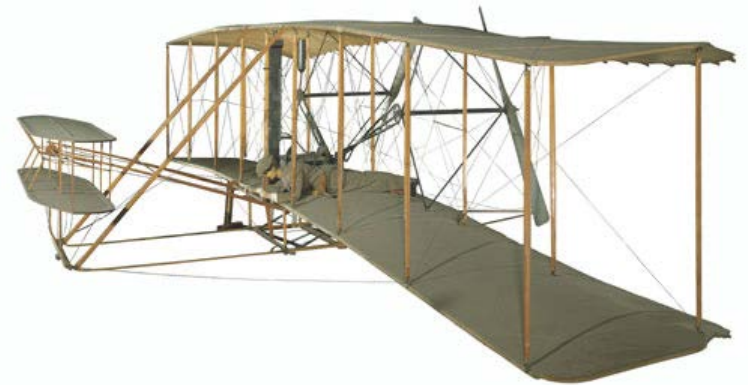
Graduate Research Award Program on Public-Sector Aviation Issues, FAA, ACRP, TRB/National Academies, 2012-2013. \$10,000

Other forms of scholarship accomplished by our students:

- 25+ refereed articles
- numerous non-refereed articles
- 7 students have participated in FAA-funded faculty research and produced three technical reports
- 1 student co-authored book on business aviation management
- 1 student awarded Student Researcher of the Year award by FAA Center of Excellence
- 8 aviation law lessons published by the Center for Computer-Assisted Legal Instruction
- Numerous presentations and proceedings

# Selected Discipline Color

- Unique opportunity to define the academic color that defined the new discipline (e.g., orange for engineering, drab for business, purple for law)
  - Could have been royal blue for philosophy, but we desired something unique to the field
- Selected silver due to the significance of the Wright Flyer to aviation



December  
2013  
Graduates





December  
2014  
Graduates



# Medallion Ceremony



Questions?

