Evaluating Human Factors in Aviation Related Accidents and Incidents

by Melissa Brown

A Research Project Proposal

Submitted to the Worldwide Campus

In Partial Fulfillment of the Requirement

of Course ASCI 490, The Aeronautical Science Capstone Course,

for the Bachelor of Science in Aeronautics Degree

Embry-Riddle Aeronautical University

April 2016

Abstract

 The student is proposing an individual project which is an evaluation of aviation related accidents and incidents due to human factors. The student will demonstrate knowledge in all 11 program outcomes including aeronautical science, aviation legislation and law, aviation safety, and aviation management and objectives. Human factors are a common cause in aviation related accidents and incidents. The student will explore and analyze the reasoning behind human factors and provide recommendations to implement, change, or eliminate legislations to reduce the risk of aviation accidents and incidents due to human factors.

Evaluating Human Factors in Aviation Related Accidents and Incidents

**Statement of the Project**

 The purpose of this project is to determine the student’s understanding and skills of critical thinking, quantitative reasoning, information literacy, communication, scientific literacy, cultural literacy, lifelong personal growth, aviation and aeronautical science, aviation legislation and law, aviation safety, and aviation management and operations. This is an individual project in partial fulfillment of the requirements of the Aeronautical Science Capstone Course for the Bachelor of Science in Aeronautics degree.

**Introduction**

 Human factors are a common factor in aviation related accidents and incidents. Human factors can include stress, fatigue, disorientation, and illusions. Pilots and flight operators must ensure they are in a fit condition to fly in order to ensure a safe flight. It is important not to overestimate one’s physical and physiological conditions. A fatigued pilot flying in harsh weather conditions will not be as mentally capable to react fast enough in the case of loss of control of the aircraft. Throughout the years, various legislations have passed requiring regulation to prevent human factor related accidents and incidents. A document was published in order to centralize all flight deck displays and controls that made it easier for a pilot to operate an airplane, reducing the risk of human factor related incidents and accidents. In the case of American Airlines flight 1420, the pilots were fatigued and underwent situational stress because they were rushed and had encountered bad weather. The captain was unable to see the runway, but committed to the landing anyway, causing an accident killing 10 people and injuring 105 people. (Runway Overrun, 2001). Human Factors training is a way to provide knowledge to personnel on how human factors can be detrimental to aviation operations as well as integrate them into a work environment that requires concentration and caution. Training in human factors promotes awareness and can save costs in alleviating issues associated to human performance by preventing incidents from occurring.

**Program Outcomes to be Addressed**

**Critical Thinking**

*“The student will show evidence of knowledge at a synthesis level to define and solve problems within professional and personal environments” (ERAU, 2015, pp. 12).*

Critical thinking involves analysis, application, solutions, recommendations, and synthesis in order to solve problems and make decisions. The student will show an understanding of critical thinking by analyzing sources to validate the information and evaluate data that pertains to human factors. She will use that information to provide solutions and make recommendations. The sources needed include case studies and accident reports to review and evaluate. These sources will be obtained by scholarly journals and accident reports published by the National Transportation Safety Board.

**Quantitative Reasoning**

*“The student will show evidence of the use of digitally-enabled technology & analysis techniques to interpret data for the purpose of drawing valid conclusions and solving associated problems” (ERAU, 2015, pp. 14).*

Quantitative reasoning includes utilizing math, statistics, charts, graphs, tables, and other quantitative data in order to support or refute the student’s research. The skills of quantitative reasoning will be demonstrated by applying quantitative data to support her objectives. She will use this data to help in solving problems and making decisions. Accident reports will be researched will be analyzed to find similarities between them. The student will find peer-reviewed articles and valid publications supplying quantitative data related to human factors. This information will be found in publications issued by the Federal Aviation Administration.

**Information Literacy**

*“The student will show evidence of meaningful research, including gathering information from primary and secondary sources and incorporating and documenting source material in their writing” (ERAU, 2015, pp. 15).*

Information literacy is determining the level of validity between sources understanding the difference between primary and secondary sources. The student will demonstrate her skill in information literacy by obtaining informative sources of a recent date by valid author(s) and/or entities. The student will obtain peer-reviewed articles, scholarly journals, and publications from government entities.

**Communication**

*“The student will show evidence of communicating concepts in written, digital, and oral forms to present technical and non-technical information” (ERAU, 2015, pp. 16).*

Communication is applying thoughts into written and oral presentation that is clear and concise and has a logical flow and organization. It should effectively communicate the student’s objectives. The student will follow the APA guidelines and will include in-text citations and references. Her writing will be free of grammatical errors and will have a logical sequence. In order to do this, the student will utilize the APA Publication Manual.

**Scientific Literacy**

*“The student will show evidence of analyzing scientific evidence as it relates to the physical world and its interrelationship with human values and interests” (ERAU, 2015, pp. 18).*

 Scientific literacy is the use of general scientific evidence. The student will demonstrate her skill in scientific literacy by obtaining weather reports on accident days, assessing human physiology, and applying the laws of physics and mechanics to support her objectives. The student will also utilize meteorological, physiological, and aerodynamic information. This will be obtained from textbooks used for previous courses and accessing the archives from the Aviation Weather Center.

**Cultural Literacy**

*“The student will show evidence of the analysis of historic events, cultural artifacts and philosophical concepts” (ERAU, 2015, pp. 18).*

Cultural literacy is analyzing history contributions, and perspectives of various cultural groups and applying it to the student’s research. The student will reference different cultures: social, organizational, aviation, safety, and ethnic. Historical and cultural events will be analyzed and applied to make recommendations. The student will need to find sources of previous accidents, their respective probable causes, and recommendations by the National Transportation Safety Board (NTSB). These sources will be obtained by accident reports published by the NTSB.

**Lifelong Personal Growth**

*“The student will show evidence of the skills needed to enrich the quality of life through activities which enhance and promote lifetime learning” (ERAU, 2015, pp. 20).*

Lifelong personal growth pertains to a compilation of the knowledge and skills of various individuals in the industry over time leading to some type of change. The student will focus on assessing how education and training has impacted performance, evaluate professional development, and analyze diversity in professional responsibility. The student will obtain peer-reviewed articles and scholarly journals.

**Aviation/Aerospace/Aeronautical Science**

*“The student will show evidence of advanced concepts of aviation, aerospace, and aeronautics to solve problems commonly found in their respective industries” (ERAU, 2015, pp. 21).*

Aeronautical science includes the physics of flight, flight operations, human factors, flight physiology, and others. The student will apply aeronautical sciences and respective concepts to her objective, evaluate flight operations, assess air traffic control systems, and analyze human factors. Human factors can include stress, fatigue, disorientation, and illusions. Because aircraft cannot operate themselves, pilots are responsible for maintaining a safe flight. Pilots and flight operators must ensure they are in a fit condition to fly in order to prevent an accident or incident from occurring. As Reinhart states in *Basic Flight Physiology* (1996), “Denial of the importance of human factors compared to flying proficiency begins to take over our reasoning.” Therefore, it is important not to overestimate one’s physical and physiological conditions. A fatigued pilot flying in harsh weather conditions will not be as mentally capable to react fast enough in the case of loss of control of the aircraft. The student will obtain aeronautical science information pertaining to human factors in physiology and safety textbooks used in previous courses.

**Aviation Legislation and Law**

*“The student will show evidence of the basic concepts in national and international legislation and law as they pertain to the aviation, aerospace and aeronautics industries” (ERAU, 2015, pp. 22).*

Aviation legislation includes past, present, and future domestic or international regulations regarding the student’s objectives. This includes the analysis of all regulatory requirements as they impact and relate to human factors. The student will analyze and apply the impact of all laws and regulations that affect any aspects of the project and evaluate proposed or soon to be implemented laws. The student will also make recommendations to implement, change, or eliminate any laws or regulations as it relates to human factors. Throughout the years, various legislations have passed requiring regulation to prevent human factor related accidents and incidents. The FAA issued a guidance document in 2013 where “the objective of this effort is to have a single source reference document for human factors regulatory and guidancematerial for flight deck displays and controls, in the interest of improving aviation safety” (Donovan, C., Gabree, S., et al, 2013). The purpose of this document was to centralize all flight deck displays and controls that made it easier for a pilot to operate, reducing the risk of human factor related incidents and accidents. The student will retrieve information and quantitative data from government logs and documents, such as the Federal Aviation Administration and the National Transportation Safety Board. After analyzing data and reviewing current legislations, the student will make her own recommendations.

**Aviation Safety**

*“The student will show evidence of basic concepts in aviation safety as they pertain to the aviation, aerospace, aeronautics industry” (ERAU, 2015, pp. 24).*

Aviation safety refers to safety and security concepts, techniques, and procedures. The student will demonstrate knowledge of aviation safety by applying safety programs, agencies, and concepts. She will also identify the role human factors play in accident investigations by analyzing previous investigations and making recommendations. In the case of American Airlines flight 1420, the pilots were fatigued and underwent situational stress as they were rushed and encountered weather. The captain was unable to see the runway on which to land; however, he committed to the landing, and the aircraft overran the runway, crashed, killed 10 people and injured 105 people (Runway Overrun, 2001). The student will analyze accident reports issued by the National Transportation Safety Board and will access scholarly journals to obtain quantitative data regarding to incidents and accidents that list human factors as a probable cause.

**Aviation Management and Operations**

*“The student will show evidence of sound, ethical management principles within standard aviation, aerospace, and aeronautics operations” (ERAU, 2015, pp.25).*

Aviation management and operations is applying critical thinking to management of aviation operations including management concepts, techniques, and procedures. The student will analyze management techniques to personnel including respective training programs, evaluate impacts of failure in management, and recommend improvement to existing management and operations programs. According to Mario Pierobon (2014), who works in business development and project support and holds a Master’s Degree in Air Transport Management from the City University London, “Human factors training can provide the knowledge to understand important principles and procedures and to integrate them into the work environment.” Training in human factors promotes awareness and can save costs in alleviating issues associated to human performance by preventing incidents from occurring. The student will investigate peer-reviewed articles and scholarly journals to assess current management concepts and recommend any necessary changes.

References

Donovan, C., Gabree, S., Jo, Y.J., & Yeh, M. (November 2013). *Human factors considerations in the design and evaluation of flight deck displays and controls*. Cambridge, MA: Federal Aviation Administration

Embry-Riddle Aeronautical University. (2015). *College of aeronautics: Undergraduate capstone policy guide*. Retrieved from <https://erau.instructure.com/courses/6179/pages/coa-undergraduate-capstone-policy-guide?module_item_id=17735>

Pierobon, M. (2014, May 22). A Management Perspective On Human Factors In Ground Operations. *AviationPros.* Retrieved from <http://www.aviationpros.com/article/11411946/a-management-perspective-on-human-factors-in-ground-operations>

Reinhart, R.O., (1996). *Basic flight physiology.* New York, NY: The McGraw-Hill Companies, Inc.

Runway Overrun During Landing, American Airlines Flight 1420, McDonnell Douglas MD-82. (2001, October 23). *National Transportation Safety Board.* Retrieved from <http://www.ntsb.gov/investigations/AccidentReports/Pages/AAR0102.aspx>