# Collegiate Aviation Review

UNIVERSITY AVIATION ASSOCIATION


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# UNIVERSITY AVIATION ASSOCIATION

# COLLEGIATE AVIATION REVIEW

**Richard O. Fanjoy, Ph.D., Editor**
**Wendy S. Beckman, Ed.D., Associate Editor**

Cover Image: The cover depicts an Air Portugal Airbus A319-111 during push back from the gate to Faro, Portugal. The photo was located on airliners.net and is reprinted by permission of the photographer, Luis Rosa.

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Richard O. Fanjoy, Editor



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# Of the

# *Collegiate Aviation Review*

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The University Aviation Association gratefully acknowledges the generosity of Purdue University and Middle Tennessee State University in co-sponsoring this edition of the *Collegiate Aviation Review* (*CAR).*

No juried publication can excel, unless experts in the field serve as anonymous reviewers. Indeed, the ultimate guarantors of quality and appropriateness of scholarly materials for a professional journal are the knowledge, integrity, and thoroughness of those who serve in this capacity. The thoughtful, careful, and timely work of the Editorial Board and each of the following professionals added substantively to the quality of the journal, and made the editor's task much easier. Thanks are extended to each reviewer for performing this critically important work.

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In addition, the editors express thanks to Ms. Sheron Griggs, Purdue University, for her tireless and very effective efforts in assembling and formatting the manuscript.

# STATEMENT OF OBJECTIVES

The *Collegiate Aviation Review* is published semi-annually by the University Aviation Association. Papers published in this volume were selected from submissions that were subjected to a blind peer review process, for presentation at the 2009 Fall Education Conference of the Association.

The University Aviation Association is the only professional organization representing all levels of the non-engineering/technology element in collegiate aviation education. Working through its officers, trustees, committees and professional staff, the University Aviation Association plays a vital role in collegiate aviation and in the aviation industry.

The University Aviation Association accomplishes its goals through a number of objectives:

To encourage and promote the attainment of the highest standards in aviation education at the college level.

To provide a means of developing a cadre of aviation experts who make themselves available for such activities as consultation, aviation program evaluation, speaking assignments, and other professional contributions that stimulate and develop aviation education.

To furnish a national vehicle for the dissemination of knowledge relative to aviation among institutions of higher education and governmental and industrial organizations in the aviation/aerospace field.

To foster the interchange of information among institutions that offer non-engineering oriented aviation programs including business technology, transportation, and education.

To actively support aviation/aerospace-oriented teacher education with particular emphasis on the presentation of educational workshops and the development of educational materials in the aviation and aerospace fields.

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# for the

# 2010 UAA Fall Education Conference

# and the

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Both qualitative and quantitative research manuscripts are acceptable. All submissions must be accompanied by a statement that the manuscript has not been previously published and is not under consideration for publication elsewhere.

All authors will be required to sign a "Transfer of Copyright and Agreement to Present" statement in which (1) the copyright to any submitted paper which is subsequently published in the ***CAR*** will be assigned to the University Aviation Association (UAA) and in which (2) the authors agree to present any accepted paper at a UAA conference to be selected by the UAA, if requested.

Authors should email an electronic version of their manuscript to the editor, conforming to the guidelines contained in the *Publication Manual of the American Psychological Association,* 6th ed. (APA). The UAA review process incorporates editorial input and recommendations from "blind" peer reviewers. A list of all reviewers is available from the ***CAR*** editor and is published annually in the ***CAR.*** If the manuscript is accepted for the publication, the author(s) will be required to submit a final version of the manuscript via e-mail, in "camera-ready" Microsoft Word format, by the prescribed deadline. *Authors should use the previous year's CAR for guidance in format and page layout.*

All manuscripts must be emailed no later than December 1 (Spring Issue) or June 1 (Fall Issue), and should be sent to the editor, at CARjournal@purdue.edu.

Questions regarding the submission or publication process may be directed to the editor at (765) 494-5782, or may be sent by email to: CARjournal@purdue.edu.

Students are encouraged to submit manuscripts to the ***CAR***. A travel stipend up to $500 is available for successful student submissions. Please contact the editor or UAA for additional information.

## TABLE OF CONTENTS

# Culminating Experiences: A National Survey of Accredited Institutions

**Elizabeth Bjerke**
University of North Dakota

## ABSTRACT

During the summer of 2007 the Aviation Accreditation Board International (AABI) approved a new set of criteria to be used in accrediting aviation degree programs. One addition to the new criteria is the inclusion of creating a culminating experience for all aviation program options. The purpose of this study was to discover the importance placed on incorporating a culminating experience in the aviation program curriculum, and to determine which of the general outcomes were being assessed. The results of the survey (N=55) indicate that all programs felt the culminating experience was an important part of their degree program. However, there was a variance in the number of outcomes assessed and the appropriateness to assess each outcome.

## INTRODUCTION

In July of 2007, the Aviation Accreditation Board International's (AABI) Board of Trustees approved the new criteria based accreditation manual (AABI, n.d.). The new outcomes-based criteria replaced an older standards based approach to accrediting institutions of higher education. Outcomes based criteria places a greater emphasis and accountability on student learning, rather than focusing on curricular inputs.

AABI is a specialized accreditor that focuses on collegiate aviation education for both two-year and four-year, non-engineering related aviation programs. Specialized accreditation is not mandatory for institutions offering aviation education; in fact only 26% of University Aviation Administration's member institutions have AABI accredited programs (Prather, 2008). When seeking aviation accreditation there are six program options available: Aviation Management, Aviation Maintenance, Aviation Electronics, Aviation Studies, Flight Education, and Safety Science.

One significant change in the new AABI Criteria Manual is the inclusion of a culminating experience requirement for all program options falling under the baccalaureate criteria. The AABI (2009) culminating experience criterion is as follows:

> Each program MUST provide evidence of a significant culminating upper division experience in (AABI Program Option). Examples of a culminating experience include a capstone course, an internship, or a special project that builds on prior course work. Evidence may include student portfolios and other records of student achievement. (p. 19)

Prior to the new criteria, only the Aviation Management option required a culminating experience.

Another addition in the new criteria included 10 general outcomes for which graduates of accredited aviation programs must demonstrate either ability or knowledge. The AABI general outcomes are often referred to as 'outcomes a-j', thus the remainder of this article will post the corresponding letter to the outcome. Refer to Table 1 for a listing of the AABI approved general outcomes at the time of this study.

The purpose of this study was to discover what types of culminating experiences aviation programs were incorporating into their curriculum, and to determine which of the general outcomes were being analyzed, and how student learning was being assessed.

## REVIEW OF THE LITERATURE

A culminating experience, or capstone course, is an ideal part of the curriculum that allows students to demonstrate mastery of the knowledge and skills acquired during their educational journey. It can also serve as a tool for assessing program learning outcomes, as well as aiding faculty in conducting overall program evaluations of existing curriculum. Although culminating experience outcomes tend to be similar across fields of study, the approach taken may differ.

Table 1. *General Outcomes*

| AABI General Outcomes |
|---|
| a. An ability to apply knowledge of mathematics, science, and applied sciences |
| b. An ability to analyze and interpret data |
| c. An ability to function on multi-disciplinary teams |
| d. An understanding of professional and ethical responsibility |
| e. An ability to communicate effectively, including both written and verbal communication skills |
| f. A recognition of the need for, and an ability to engage in, life-long learning |
| g. A knowledge of contemporary issues |
| h. An ability to use the techniques, skills, and modern technology necessary for |
| i. An understanding of the national and international aviation environment |
| j. An ability to apply pertinent knowledge in identifying and solving problems. |

Note. From "Accreditation Criteria Manual", by Aviation Accreditation Board International, 2008, *Form 201*, p. 7.

Strategic Management or Business Policy is a typical capstone course for a business management degree program (Parente, Brown, & Warner, 2005). Due to the large number of accredited business programs there is an extensive amount of literature focusing on the implementation and forms of assessment of business capstone courses. Payne, Whitfield and Flynn (2002) propose a four phase approach to assessing business capstone courses combining the scholarship of teaching and learning with stakeholder theory. The four phases articulated were as follows: 1.) explore perspectives and practices elsewhere, 2.) examine institutional faculty perceptions and curricular concerns, 3.) discover student perceptions, and 4.) explore business community stakeholders. A more traditional approach to assessing student learning in a business capstone course is through competency based testing (Parente et al., 2005). Yet in another study (Payne, Flynn, & Whitfield, 2008) student's were interviewed when entering a capstone course in order to assess their degree of motivation. This approach aided faculty in developing and changing the course to fulfill the perceived needs of the students.

While the field of business management education tends to favor a capstone course approach to the culminating experience, the discipline of engineering employs a senior design project as its culminating experience. Many of these senior design courses work closely with industry to solve real world problems (Todd & Magleby, 2005; Jenkins, Pocock, Zuraski, Meade, Mitchell & Farrington, 2002; Padmanabhan & Katti, 2002). In a synthesis of research conducted after the initial Accreditation Board for Engineering and Technology (ABET) criteria change in requiring a 'senior-level design course', it was found that although a proliferation of new courses were created to meet the accreditation requirement, the format tended to vary greatly between programs (Dutson, Todd, Magleby & Sorensen, 1997). In a follow up study, Howe and Wilbarger (2005) surveyed ABET accredited institutions and found similar differences in formatting nearly a decade later. The survey also revealed a stronger trend towards industry involvement.

McKenzie, Trevisan, Davis and Beyerlein (2004) conducted a national survey of ABET accredited institutions regarding their use of the 'senior-level design course' in assessing the ABET general outcomes (a-k). It was found that 92% of the respondents felt that the capstone course played an important role in the overall educational experience of the students. The study also broke down the role in which the culminating experience played in the evaluation of each general outcome. Due to the likeness and similarities between the ABET general outcomes and the newly approved AABI general outcomes, permission to revise and use this survey tool for aviation education was obtained from the lead author. The survey tool was used to assist in answering the following research questions:

1.) What percentage of aviation programs have a defined culminating experience in their curriculum?
2.) How important is the culminating experience in the aviation program?
3.) Which AABI general outcomes are considered appropriate to assess in a culminating experience, and which AABI general outcomes are being assessed in the culminating experience?

## METHODOLOGY

*Participants*

During the fall of 2008 a survey was administered to all four-year AABI accredited institutions. A current listing of accredited programs was obtained from AABI. Only currently accredited programs were chosen for this study in order to better assess the implementation of the new outcomes-based criteria. At the time of this study there were 25 baccalaureate institutions consisting of 79 accredited programs. However due to the timeframe, no schools were yet accredited under the new criteria.

*Materials*

The survey tool used was adapted, with permission, from a similar study conducted for engineering education (McKenzie et al., 2004). Due to the similarity between the ABET and the AABI criteria, the survey tool was easily adapted for aviation education.

By replicating a previously conducted national study (McKenzie et al., 2004), many concerns of validity and reliability were addressed. However, the survey tool was also piloted by the Outcomes Resource and Training committee of AABI. This committee was made up of educators and industry representatives tasked with assisting AABI members during the transition to an outcomes-based accreditation.

A sample of the survey tool used is found in the appendix of this article.

*Procedures*

A survey packet was sent out via first class mail to 23 accredited institutions which are located in the United States. An identical packet was sent electronically to the two internationally accredited programs. The packet consisted of the following items: cover letter from researcher, support letter from AABI, separate survey questionnaire for each aviation accredited program at the institution and a self addressed stamp envelope for return purposes. For example, if an institution had three different aviation accredited programs such as Aviation Management, Flight Education and Aviation Studies, it would receive three separate survey tools to fill out. The rationale behind this method is that these are three different programs which may all have different culminating experiences defined.

The completed surveys were imported into both Microsoft Excel and SPSS version 16.0 for data analysis. In order to answer the stated research questions, both descriptive and inferential statistics were used. The following section states the results.

## FINDINGS

Of the 25 institutions holding AABI accredited status, 16 (64%) responded to this survey. More importantly, since the data was analyzed at the program level, of the 79 different accredited programs surveyed, 55 (70%) responded. Table 2 lists the program options which responded to the survey.

Table 2. *Program Options*

| Program Option | Number Responded | Percentage of Overall Responses |
|---|---|---|
| Aviation Management | 18 | 35.3% |
| Flight Education | 15 | 29.4% |
| Aviation Studies | 11 | 21.6% |
| Aviation Maintenance | 4 | 7.8% |
| Aviation Electronics | 3 | 5.9% |

Numerous Analysis of Variances (ANOVAs) were run between the program options and different variables on the survey with no significant differences being found. Thus the rest of the data analysis uses the entire data set together, and does not distinguish between program options.

Of the programs surveyed, 86.3% already had a culminating experience defined in their curriculum. The majority of the programs (60.8%) are utilizing a capstone course, while another 19.6% are using a combination of methods to fulfill the requirement such as various courses or an internship experience. The vast majority (82.4%) of the programs are conducting the culminating experience within one semester.

When asked of the importance that the culminating experience has on the institutions overall program all programs answered with either an important or very important response. The mean of the response on a five point scale was 4.75, with 5 indicating the highest level of importance.

In order to fully understand the role of the AABI general outcomes in the culminating experiences defined by each program, a series of questions were asked. First the respondents were asked which general outcomes they considered were appropriate to assess in the course. The mean numbers of outcomes considered appropriate to assess for the programs was 6.88 with a standard deviation of 2.18. Next the respondents were asked to identify which of the general outcomes they will assess in their culminating experience. The mean of the number of outcomes in which they will assess was 6.45 with a standard deviation of 2.27. Table 3 lists the results in order of greatest percentage to least percentage of assessments, and Figure 1 gives a graphical representation.

*Table 3*: General Outcomes and Assessment (N=55)

| AABI General Outcome | Appropriate to Assess in Culminating Experience | Will Assess in Culminating Experience |
|---|---|---|
| j. An ability to apply pertinent knowledge in identifying and solving problems. | 96% | 96% |
| b. An ability to analyze and interpret data | 94% | 94% |
| e. An ability to communicate effectively, including both written and verbal communication skills | 84% | 82% |
| c. An ability to function on multi-disciplinary teams | 80% | 76% |
| g. A knowledge of contemporary issues | 71% | 69% |
| d. An understanding of professional and ethical responsibility | 71% | 55% |
| h. An ability to use the techniques, skills, and modern technology necessary for professional practice | 69% | 65% |
| i. An understanding of the national and international aviation environment | 45% | 45% |
| a. An ability to apply knowledge of mathematics, science, and applied sciences | 41% | 33% |
| f. A recognition of the need for, and an ability to engage in, life-long learning | 37% | 29% |

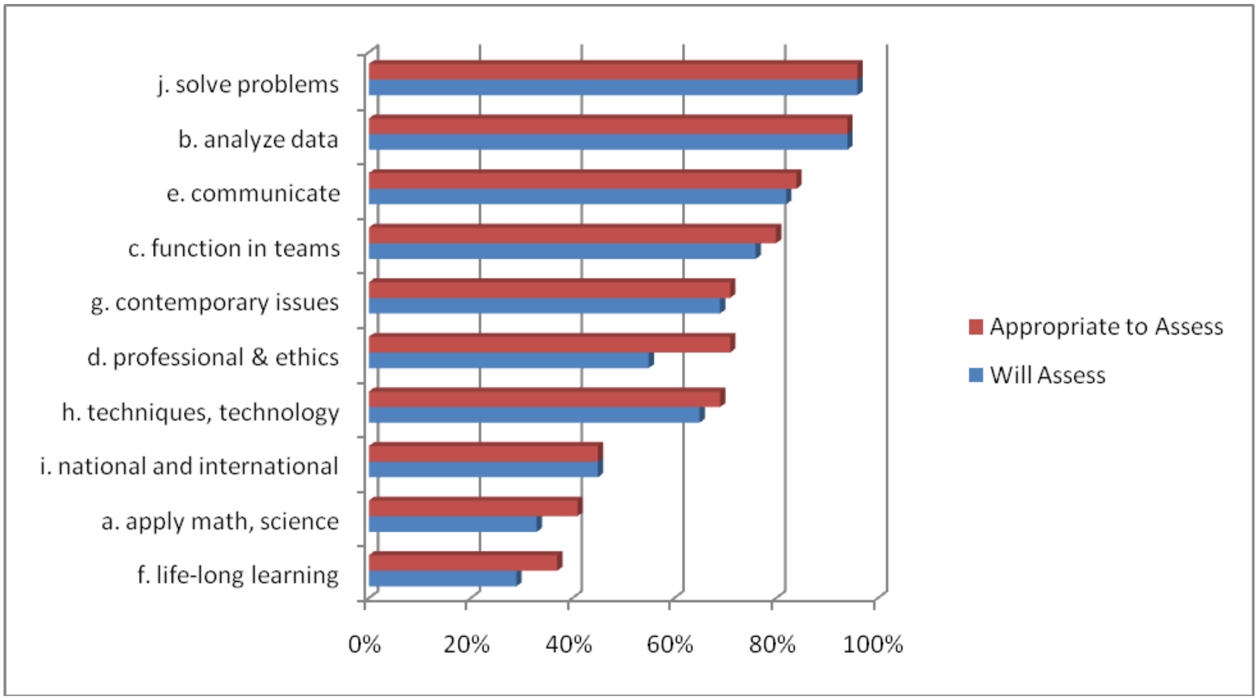


*Figure 1*. Outcomes in Graphical Form.

Further analysis was conducted to determine if there were any significant differences between general outcomes that the respondents felt were appropriate to assess, however were not planned on being assessed. A series of paired sample t-tests were performed between each paired variable. Only two variables were found to have a significant difference in the paired testing: d.) an understanding of professional and ethical responsibility and f.) recognition of the need for, and an ability to engage in, life-long learning.

The most significant difference occurred for the general outcome concerning professional and ethical considerations. While 71% of responders felt the outcome was appropriate to assess, only 55% stated that they plan to assess. This resulted in a $t(55) = -3.050$, $p=.004$. The other outcome regarding life-long learning had 37% of the responders stating they felt it appropriate to assess, however only 29% stated that they plan to assess that outcome in their culminating experience. This resulted in a $t(55) = -2.063$, $p=.044$.

## DISCUSSIONS AND RECOMMENDATIONS

Although the criteria of requiring a culminating experience are rather new to accredited aviation programs, the vast majority of accredited programs have already identified and/or created the experience in their curriculum. The programs surveyed all indicated the importance of this experience in their overall aviation education curricula. Aviation programs also appear to be tying the assessment activities of the culminating experience to specific AABI general outcomes. Of the 10 listed AABI general outcomes, schools plan to assess over six outcomes on average in their culminating experience.

However, the disparity between appropriateness to assess and planning to assess needs to be further evaluated. For instance, when evaluating the two variables mentioned in the previous section (professional/ethical considerations and life-long learning) two questions occur; why do significantly more programs feel that some outcomes are appropriate to assess yet have no plan to assess these outcomes in their culminating experience? If these goals are not assessed in the culminating experience, when will they be assessed? Lastly, aviation educators need to collectively determine and discuss what are some appropriate and effectives means of which to assess these less tangible general outcomes.

Prather (2008) found that the aviation industry as a whole is not fully aware of AABI or the role that it plays in accrediting aviation programs. Perhaps by following the lead taken by both business and engineering education, who closely tie their culminating experiences with industry support, aviation programs could benefit as well. It could prove to be the catalyst needed to achieve better industry recognition and awareness of collegiate aviation programs.

Further research needs to be conducted concerning culminating experiences in aviation education. A qualitative study consisting of interviews and document analysis of various capstone course syllabi would help facilitate an even more in-depth discussion on current practices and assessment techniques. Another area for further research would include the numerous non-accredited aviation programs to distinguish if any of them currently have, or plan to incorporate a defined culminating experience in their programs. Lastly, a similar follow-up survey needs to be conducted after all currently accredited programs complete their initial re-affirmation of accreditation under the new criteria. Aviation programs may use that process as a time of reflection to change their existing culminating experience to better assess the AABI general outcomes.

## CONCLUSION

As aviation educational programs embark on this new path toward outcomes-based accreditation, careful thought and planning needs to be exercised in meeting the new criteria. Aviation programs should use this opportunity to create effective and worthwhile culminating experiences to not only meet the new requirements of AABI accreditation, but to improve the quality of the educational experience for its students. By participating in dialogues with other aviation educators, and determining best practices in the field, all aviation programs can add a new element to their curriculum in order to best prepare its students for a successful career in the aviation industry.

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## APPENDIX

## Culminating Experience Survey

### Institution Demographics

1. Name of Institution: ________________________

2. AABI Program Option: ________________________

3. Degree Title: ________________________

4. In what year did or will you have your first accreditation visit under the new AABI outcomes based criteria? _______________________

5. How many students are currently in this aviation program option?

### Culminating Experience Questions

6. Does your program currently have a culminating experience defined as required per AABI Criteria 4.0? (Please circle)

   □ Yes □ No

   If not, are you currently in the process of developing such an experience?

7. What best describes your program's culminating experience?
   - □ Capstone Course
   - □ Internship
   - □ Special Project
   - □ Other (specify)__________________________________

8. What is the duration of your culminating experience?

   □ 1 semester □ 2 semesters □ other (please specify) ___________________

9. How important do you feel this course is for your program? (circle a number)

   Not Important 1 2 3 4 5 Extremely Important

10. Which of the following AABI defined general outcomes do you **consider appropriate to assess** in the culminating experience? (Check all that apply)

    □ a. An ability to apply knowledge of mathematics, science, and applied sciences
    □ b. An ability to analyze and interpret data
    □ c. An ability to function on multi-disciplinary teams
    □ d. An understanding of professional and ethical responsibility
    □ e. An ability to communicate effectively, including both written and verbal communication skills
    □ f. A recognition of the need for, and an ability to engage in, life-long learning
    □ g. A knowledge of contemporary issues
    □ h. An ability to use the techniques, skills, and modern technology necessary for professional practice
    □ i. An understanding of the national and international aviation environment
    □ j. An ability to apply pertinent knowledge in identifying and solving problems.

11. Which of the following AABI defined general outcomes **do you or will you assess** in the culminating experience? (Check all that apply)

□ a. An ability to apply knowledge of mathematics, science, and applied sciences
□ b. An ability to analyze and interpret data
□ c. An ability to function on multi-disciplinary teams
□ d. An understanding of professional and ethical responsibility
□ e. An ability to communicate effectively, including both written and verbal communication skills
□ f. A recognition of the need for, and an ability to engage in, life-long learning
□ g. A knowledge of contemporary issues
□ h. An ability to use the techniques, skills, and modern technology necessary for professional practice
□ i. An understanding of the national and international aviation environment
□ j. An ability to apply pertinent knowledge in identifying and solving problems.

12. What type of evidence/assignments do you use or expect to use to assess student learning during the culminating experience? (Check all that apply)

□ Exams
□ Individual Papers
□ Group Projects
□ Oral Presentations
□ Other (specify)____________________________________________

13. Comments:

## Female Flight Students: Perceptions of Barriers and Gender Biases within Collegiate Flight Programs

**Chad L. Depperschmidt and Timm J. Bliss**
Oklahoma State University

### Abstract

The purpose of this study was to determine the existence and extent of barriers and gender biases that propagate the under representation of females in collegiate aviation programs. Focusing on female flight students' personal perceptions of their collegiate aviation programs, four research questions were formulated and the findings were supported by using descriptive statistics. This study found: female flight students believed that the under representation of female flight students should be a primary concern for their collegiate aviation program; female flight students do not believe that negative remarks or biases due to gender exist within their collegiate flight program; female flight students do not believe there is a sufficient number of female professionals employed at their collegiate flight program; and that female flight students do believe that both scholarships and internships specifically offered for female flight students are adequately available from their collegiate flight programs. Women have remained underutilized and underrepresented as professional pilots in the United States air carrier industry. If the trend of under representation of females in collegiate flight programs remains unchanged, women will continue to account for a decreased role within the aviation industry.

### INTRODUCTION

Historically, the aviation industry has been dominated by males. While the percentage of females in aviation has continually risen over time, they do not constitute a significant representation within the industry. The percentage of active women airmen certificates compared to men has only increased 0.45 percent over the last ten years (Federal Aviation Administration – Table 1, 2008; Federal Aviation Administration – Table 2, 2008). Women only constitute approximately 6 percent of FAA certificated pilots (Women in Aviation International, 2000). Furthermore, the number of female commercial pilots with an airline transport rating in the United States has remained at 3 percent during the past decade, 1996-2006 (Women in Aviation International, 2006).

While females only constitute a small percentage of commercial pilots, they comprise a large resource pool for the commercial aviation industry in the United States (Turney, Karp, Bishop, et al., 2002). Therefore, the commercial aviation industry can significantly increase the amount of females seeking aviation careers if this trend of under representation can be reversed. Providing this opportunity will not only increase the number of females seeking aviation careers, but will enrich the overall talent pool for the commercial air transportation industry.

The under representation of female pilots is an important issue that the aviation industry needs to research and study. A starting point for research on the under representation of female pilots includes the collegiate flight programs where future pilots are typically introduced to the aviation industry. Since the collegiate flight program is the beginning of the journey for many pilot careers, any lessons that may be learned from the knowledge regarding the under representation of women in collegiate flight programs can perhaps be applied to help to solve the same issues throughout the industry. If collegiate flight programs have the capability to improve enrollment and retention rates of female flight students, this can have a ripple effect throughout the industry and will help increase the involvement of women pilots throughout the commercial aviation industry in the United States.

### RESEARCH METHODOLOGY

Guided by descriptive methodology, this 2007 study used a research instrument authored by the researchers. The instrument was administered nationally to 4-year public and private universities and 2-year public and private colleges offering comprehensive aviation curriculums, awarding either associate or bachelor degrees in aviation disciplines. Exploratory in nature, this study was designed to elicit information and perceptions related to the under representation of female flight students in collegiate aviation programs in the United States and act as a springboard for further related research.

The objective of the research instrument was to answer the following research questions:

1. Do female flight students believe the under representation of females should be a concern for their collegiate aviation program?
2. Do female flight students believe negative remarks and or biases due to gender exist in their collegiate aviation program? If so, do barriers and gender biases affect female retention within their collegiate aviation program?
3. Do female flight students believe their collegiate aviation program employs a sufficient number of female professionals (faculty, flight school administration, Certified Flight Instructors)?
4. Do female flight students believe academic incentives (scholarships and internships) specific to females are adequate within their collegiate aviation program?

## DESCRIPTION OF RESEARCH INSTRUMENT

The research instrument for this study was created to explore the perceptions of female flight students and identify demographic information related to themselves and their flight program. To ensure the highest level of quality, a pretest of the research instrument was given to eight professionals; representing eight different educational institutions within the field of collegiate aviation. These aviation professionals examined the research instrument to measure its focus related to the research topic and reviewed its clarity of instructions. The final design of the research instrument was modified by the researchers based on responses from this pretest group.

The research instrument was a structured questionnaire consisting of three parts: demographic information, Likert-scale interpretive questions, and personal comment section. The first part of the instrument requested demographic information (yes/no and multiple choice questions) related to the female flight student completing the survey, as well as their collegiate flight program. The second part offered Likert-scale questions with ordinal measurement pattern options ranging from: (1) Strongly Agree, (2) Agree, (3) Disagree, and (4) Strongly Disagree. These questions were intended to gain insight into the perceptions of the female flight student related to their collegiate flight program experiences. The final section of the research instrument consisted of a text box offering the female participants an opportunity to provide personal comments they believed would be appropriate to this study.

## SELECTION OF THE RESEARCH POPULATION

The population for this study was drawn from female aviation students participating in collegiate flight training. The collegiate flight programs solicited for this study were institutional members of the University Aviation Association (UAA) and represent both 2-year and 4-year collegiate flight programs geographically distributed across the United States. Sixty collegiate flight programs were identified as potential participants. Collegiate flight programs for this study were obtained from a 2006 UAA membership list. Only those collegiate flight programs offering comprehensive aviation curriculums; and awarding either associate or bachelor degrees in aviation disciplines were selected by the researchers to participate in this research study.

## RESULTS

Thirty of the sixty identified collegiate flight programs elected to participate in this study. From these thirty participating flight schools, 262 female flight students completed the research instrument. As shown in Figure 1, the thirty participating schools represent a uniform geographic distribution within the United States.

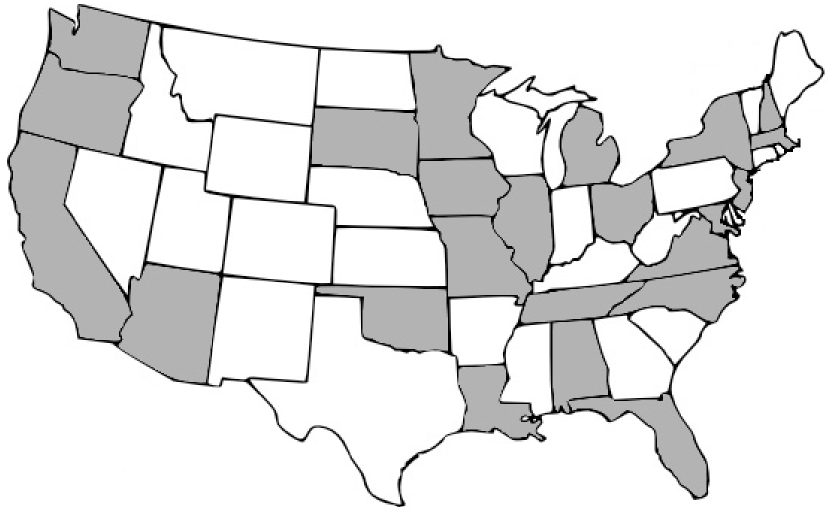

*Figure 1.* Geographic Distribution of Participating Collegiate Flight Programs. *Note: Shaded areas represent states of participating institutions.*

Of the thirty collegiate flight programs that participated in the study, there were eighteen 4-year public and private institutions (60 percent) and twelve 2-year public and private institutions (40 percent).

Each participating female flight student was asked to identify their academic classification. Table 1 indicates that of the 262 female respondents; 25 percent were freshman, 27 percent were sophomores, 21 percent were juniors, and 27 percent of females were seniors. Factors that influenced the female flight student to major in collegiate aviation were also solicited in this study. Fifty percent of the female flight students indicated no individual specifically influenced them to pursue flight training; it had always been a childhood dream. Only 20 percent of the students indicated they were influenced by their parent(s). Perhaps the reason for this low percentage is that only 17 percent of the female students stated their parent(s) were employed in the aviation industry.

Table 1. *Academic Classification of Female Flight Students*

| Academic Classification | Number of Respondents | Percentage of Respondents |
|---|---|---|
| Freshman | 65 | 25% |
| Sophomore | 70 | 27% |
| Junior | 56 | 21% |
| Senior | 71 | 27% |

In Table 2, full-time student enrollments were separated into five sub groups: 1-50; 51-100; 101-150; 151-200; and over 200. Forty-one percent of the female participants indicated their collegiate flight programs have full-time enrollments of less than 100 total students (male and female). The remaining students (59 percent) stated their flight programs have enrollments over 100 full-time students.

Table 2. *Full-Time Flight Students (Male & Female) Enrolled in Collegiate Flight Program*

| Full-Time Students Enrolled | Responses | Percentage of Responses |
|---|---|---|
| 1-50 | 44 | 17% |
| 51-100 | 61 | 24% |
| 101-150 | 56 | 22% |
| 151-200 | 60 | 23% |
| Over 200 | 36 | 14% |

Table 3 indicates the percentage of female full-time flight students enrolled in their respective collegiate flight program. When compared to the estimation of total (male and female) full-time flight students, female flight students represented a very small percentage of overall flight students. An overwhelming 98 percent of participating female students indicated that full-time female flight students accounted for less than 25 percent of total student enrollments in their collegiate flight program. Seventy percent of these females indicated that full-time females enrolled in their collegiate flight programs accounted for only 0-10 percent of total full-time flight students.

Table 3. *Percentage of Female Full-Time Flight Students Enrolled*

| Percentage Full-Time Female Students Enrolled | Responses | Percentage of Responses |
|---|---|---|
| 0-10% | 181 | 70% |
| 11-25% | 76 | 28% |
| 26-50% | 1 | 1% |
| Over 50% | 1 | 1% |

The female flight students' current flight certificate or rating is presented in Table 4. A higher number of responses, 279, were received from the female flight students because many of them were pursuing multiple certificates or ratings. The three most common flight certificate or ratings indicated were Private Pilot (24 percent), Commercial (25 percent), and Instrument (24 percent). Those who chose the option of other had the opportunity to identify their current flight certificate or rating; all responded Airline Transport Pilot (ATP).

Table 4. *Pursuant Flight Certificate/ Rating*

| Flight Certificate/ Rating | Responses | Percentage of Responses |
|---|---|---|
| Private Pilot | 66 | 24% |
| Commercial | 69 | 25% |
| Instrument | 67 | 24% |
| Multi-Engine | 27 | 10% |
| Multi-Engine (Instrument) | 10 | 3% |
| Certified Flight Instructor | 27 | 10% |
| Certified Flight Instructor (Instrument) | 7 | 2% |
| Other | 6 | 2% |

To understand the influence of female mentorship at each collegiate flight program, the survey asked flight students to identify the amount of employed female flight instructors and female flight administrators (Director, Manager, and Chief Flight Instructor). Table 5 indicates the percentage of employed female flight instructors employed in the respondents' collegiate flight program. An overwhelming 75 percent of respondents indicated their flight school only employed 0-5 female flight instructors. Of these respondents, eighteen percent indicated there were no female flight instructors employed at their flight school. And yet, one responding student thought there were adequate female flight instructors, commenting; "My flight program generally does an excellent job in hiring female flight instructors/professors. Because numbers lean towards men, they try to match female students with female CFI's."

Table 5. *Representation of Female Certified Flight Instructors Employed at Female Flight Students' Collegiate Flight Program*

| Number of Female Flight Instructors Employed | Responses | Percentage of Responses |
|---|---|---|
| 0 | 46 | 18% |
| 1-5 | 148 | 57% |
| 6-10 | 46 | 18% |
| 11-20 | 14 | 5% |
| Over 20 | 7 | 2% |

As indicated in Table 6, only a small percentage of surveyed collegiate flight programs had a female administrator. Only twenty respondents (8 percent) indicated their collegiate flight program had a female administrator, while 240 respondents (92 percent) did not have a female administrating their collegiate flight school. One of the students believed female leaders within her collegiate flight program was important, by commenting; "More female professors and instructors would definitely help in motivating other females to pursue a career in the aviation field."

Table 6. *Representation of Female Management at Collegiate Flight Schools*

| Female Administrator | Responses | Percentage of Responses |
|---|---|---|
| Yes | 20 | 8% |
| No | 240 | 92% |

Table 7, *Female Flight Students' Financial Sources for Flight Costs*, presents the financial source for funding the respondents' flight costs. The majority of the female flight students indicated multiple financial sources resulting in 355 total responses. Among the five survey choices, respondents indicated their primary financial source for flight costs: (1) parent(s), 33 percent; (2) school loans, 34 percent; (3) scholarships, 18 percent; (4) myself, 9 percent; and (5) other, 6 percent. The female students who chose the other option were asked to identify the funding source. Included in the choices were: retirement, spouse, Air Force ROTC, and Veterans grant. Over one-half, 52 percent, of the female students' responses indicated that school loans and scholarships were the primary financial sources for their flight costs.

Table 7. *Female Flight Students' Financial Sources for Flight Costs*

| Financial Source | Responses | Percentage of Responses |
|---|---|---|
| Parent(s) | 118 | 33% |
| School Loans | 121 | 34% |
| Scholarships | 63 | 18% |
| Myself | 32 | 9% |
| Other | 21 | 6% |

Likert-type statements that examine the female flight student's perceptions regarding the concern of their flight school to recruit and retain female flight students are presented in Table 8. Approximately one-half of the female respondents (55 percent) strongly agreed or agreed, compared with 45 percent that disagreed or strongly disagreed with the statement: *The under represented number of female flight students should be a primary concern of the aviation department at my institution.* Similar percentages were indicated when the student's were asked their perceptions of the following statement: *My aviation department/institution does an excellent job of recruiting females students to my collegiate flight program*. Fifty-six percent of the female students strongly agreed or agreed, while 44 percent either disagreed or strongly disagreed with this statement. One female stated; "Although there are not many female aviation students, I believe my school has done its best to recruit females and offers us the same opportunity as male students."

Table 8. *Female Flight Students' Perception of Institutional Recruitment and Retaining of Female Flight Students*

| Likert-Type Statements | SA | A | D | SD |
|---|---|---|---|---|
| The under represented number of female flight students should be a primary concern of the aviation department at my institution. | 59<br>23% | 83<br>32% | 105<br>40% | 13<br>5% |
| My aviation department/institution does an excellent job of recruiting females students to my collegiate flight program. | 20<br>8% | 126<br>48% | 100<br>39% | 14<br>5% |
| My aviation department/institution makes efforts to attract more young females (junior high and high school) to careers in aviation through educational opportunities and public outreach. | 17<br>7% | 121<br>47% | 102<br>39% | 18<br>7% |
| There are a sufficient number of professional females (faculty, flight school personnel, CFIs) in my collegiate flight program. | 16<br>6% | 113<br>43% | 107<br>41% | 25<br>10% |

Over half of respondents (54 percent) either strongly agreed or agreed with the statement: *My aviation department/institution makes efforts to attract more young females (junior high and high school) to careers in aviation through educational opportunities and public outreach.* The remaining 46 percent either disagreed or strongly disagreed with the statement. One female student actually wrote on her survey, "My aviation department has not made any effort to attract more young females to careers in aviation through educational opportunities and public outreach. It's as if they don't care."

Approximately half of the female flight students (51 percent) indicated they disagreed or strongly disagreed opposed to 49 percent that agreed or strongly agreed with the statement: *There are a sufficient number of professional females (faculty, flight school personnel, CFIs) in my collegiate flight program*. One responding female stated; "My flight program generally does an excellent job in hiring female flight instructors/professors." However; in support of the 51 percent of respondents that disagreed with the statement, one of the female students indicated: "I believe that female pilots are under more pressure and feel as if we have to exceed our ability to 'prove' we are just as able as male pilots. I would like to see more women pilots at my flight school as well as CFI's."

Table 9. *Female Flight Students' Perception of Institutional Financial Barriers and Opportunities*

| Likert-Type Statements | SA | A | D | SD |
|---|---|---|---|---|
| The current cost of flight training at my collegiate flight school has an affect on the ability of female flight students to pursue an aviation career (pilot) at my educational institution. | 14<br>5% | 72<br>28% | 124<br>48% | 50<br>19% |
| My aviation department/institution offers sufficient aviation scholarships to assist female students with their flight costs. | 37<br>14% | 117<br>45% | 87<br>34% | 18<br>7% |

Responding to the Likert-type statement in Table 9, *The current cost of flight training at my collegiate flight school has an effect on the ability of female flight student to pursue an aviation career (pilot) at my educational institution*, only 33 percent of the female students either agreed or strongly agreed that flight costs have an affect of them pursuing a professional pilot degree at their institution. The majority of females, 67 percent, disagreed or strongly disagreed that institutional flight costs affected their ability to pursue an aviation career.

Almost 60 percent of female flight students agreed or strongly agreed to the statement: *My aviation department/institution offers sufficient aviation scholarships to assist female students with their flight costs.* The remaining 41 percent of students disagreed or strongly disagreed with the statement, with one of the flight students stating on her survey; "One major concern of mine is the inadequate number of scholarships offered or made available to female students."

Table 10 lists the perceptions of the female flight student related to the following experiences: (1) favoritism toward male flight students regarding internships, scholarships, or flight instructor positions; (2) rude or offensive remarks targeted at female flight students; (3), existence of gender biases within the flight school, and (4) female flight students quitting flight training due to barriers and/or gender biases.

The majority of female flight students (85 percent) disagreed or strongly disagreed with the statement: *Favoritism towards male flight students (internships, scholarships, CFI positions) exists in my collegiate flight program.* The remaining 15 percent of female students agreed or strongly agreed that favoritism towards male flight students does actually exist within their flight program.

Eighty-five percent of female flight students disagreed or strongly disagreed while the other 15 percent of female students agreed or strongly agreed with the statement: *Negative (rude and offensive) comments regarding female flight students are frequent at my collegiate flight school*. While the majority of respondents indicated that negative or rude comments are not frequent, many of the responding female students expressed otherwise.

Table 10. *Female Flight Students' Perception of Gender Barriers, Biases, or Favoritism Against Female Flight Students*

| Likert-Type Statements | SA | A | D | SD |
|---|---|---|---|---|
| Favoritism towards male flight students (internships, scholarships, CFI positions) exists in my collegiate flight program. | 5<br>2% | 34<br>13% | 143<br>55% | 80<br>30% |
| Negative (rude and offensive) comments regarding female flight students are frequent at my collegiate flight school. | 5<br>2% | 33<br>13% | 114<br>43% | 110<br>42% |
| Gender "biases" exist in my collegiate flight program. | 6<br>2% | 53<br>20% | 110<br>42% | 93<br>36% |
| The primary reason female flight students quit collegiate flight programs is because of barriers and gender biases. | 7<br>3% | 23<br>9% | 134<br>51% | 98<br>37% |

One respondent indicated, "There is a tremendous amount of insults to females that go on at my school in a continuous way." Another student expressed her experiences by stating, "Female students have a hard time because of the ways male students talk. I get offended almost daily but keep going because I want to be in the organizations and on the flight team, but if the guys would clean up their language I think more females would join and stick with it. I know of females that don't get involved because of how the guys treat them and talk around them." Lastly, a third female flight student indicated, "I have encountered many students that discredit my achievements, such as my ability to pass check rides. Comments such as 'just wear a low-cut shirt and you'll pass your check ride' or 'you just passed because you're a girl' are very common."

Seventy-eight percent of female flight students either disagreed or strongly disagreed, compared to 22 percent who agreed or strongly agreed with the statement: *Gender "barriers" exist in my collegiate flight program.* Even though the majority of female respondents disagreed with this statement regarding gender barriers, most comments written by the female students related to the existence of gender barriers. One female student wrote,

> "At the flight center and on campus I feel that women have to work twice as hard to receive the same amount of recognition as males. I feel like I have to work and study to get ahead of the males so that I have 'evidence' of myself not being considered a 'joke' in the eyes of the management and staff. I've seen cases when I had a legitimate concern about why I was continually being put on standby for an aircraft and instructor, and when they were voiced I was pretty much laughed at and told to go away. When a male asked the same thing, things were changed for him. I had to climb the management ladder to get anything done. It finally worked, but took much longer."

Another respondent stated, "A lot of us girls feel that we need to work twice as hard as the men to get the same recognition. Most of the men are fine but it's the few that are biased and prejudiced that ruins it for others." This sentiment is continued by another female student, "My professors try to be very supportive; other males are for the majority awful towards me, they always assume we are management majors and a huge joke. Rarely taken seriously or respected." Perhaps, barriers and gender biases exist outside of the collegiate flight program as well, as one respondent remarked, "It does bother me when someone asks me what my major is and when I tell them they're always in shock."

Lastly, the majority of female flight students (88 percent) disagreed or strongly disagreed with the statement: *The primary reason female flight students quit collegiate flight programs is because of gender barriers and biases*. One student's opinion supports this perception by commenting, "Based on my own experience, it seems that much of the reason that many women quit aviation is a lack of confidence. They are comparable to men in skills and general knowledge, but they tend to be less confident in their abilities. Males often jump right into things like solo cross countries whereas females tend to be more worried about the consequences like not finding the airport, getting lost, or violating FAR's."

## CONCLUSIONS

Women constitute a small percentage of commercial pilots within the aviation industry. Currently, females represent approximately 2 percent of all airline captains in the United States (Guide to College, 2005). This research study sought to identify the existence of barriers or gender biases that contribute to the under representation of female students within collegiate aviation programs. With a better understanding of whether barriers or biases do actually exist within the collegiate flight environment and if they contribute to the under representation of female flight students; then actions can possibly be implemented and applied to encourage more women to seek professional careers as pilots.

Based on the data collected from this study, the majority of female flight students do not believe that negative remarks or biases due to gender exist at their collegiate flight program. Respondents indicated that overall, their collegiate flight program environments were respectful and supportive of female flight students. In support, one female flight student commented, "As a whole, my collegiate flight program, I think, is accepting of female flight students". Another respondent commented, "Overall flight training at my college is fair and equal between male and female students, after all, the airplane does not care what gender you are." Therefore; perhaps, the under representation of female flight students at the collegiate level may be affected by other factors than gender biases or barriers. One female flight student respondent commented, "I have found that the industry is male dominated not because of biases or barriers, but rather because it's just the "'norm'". I have never been discouraged or looked down upon based on my gender. If anything, I have been encouraged and people are genuinely interested in how to attract more females into the industry." Another respondent indicated that workload and commitment may be factors to this under representation issue. She commented, "I'm not entirely sure why an aviation career doesn't attract more females. Perhaps it is because of the strain of completing the flight practicum in addition to a classroom workload. Also because there are so many males in the industry, it seems intimidating for women to compete for jobs, even positions in the flight program. It is extremely high pressure and requires commitment."

However, the female respondents did indicate the under representation of female flight students at collegiate aviation programs should be a concern at their collegiate flight programs. Over half (55 percent) of the female students believed their under representation should be a concern for collegiate flight program administration. And yet, fifty-six percent of females indicated their collegiate flight program does an excellent job of recruiting female flight students to their program. While the respondents indicated that collegiate flight programs do a good job of recruiting female flight students, the total number of female flight students in collegiate programs still remains significantly small. Seventy percent of responding females indicated they represent only 0 to 10 percent of total enrolled flight students (male and female) in their collegiate flight program.

Possibly a barrier to this under representation problem, comments from female flight students indicated the need for additional female professionals employed at their collegiate flight programs. Only 8 percent of the females stated the administrator of their collegiate flight program was female; and fifty-one percent of respondents disagreed that there are a sufficient number of female professionals (faculty, flight school personnel, CFI's) at their collegiate flight program. Furthermore, 75 percent of respondents indicated there was only 0 to 5 female certified flight instructors employed at their collegiate aviation program. One respondent commented, "I think that identifying female pilots in the aviation industry plays a big role in motivating other females to pursue a career in the aviation field. More female professors and instructors would also definitely help." Another female flight student commented, "I find our flight schools problem is trying to recruit females to fly here. We are unique because our director and chief pilot are both female. We should be using it as an opportunity to go out into the local community and spread aviation to young girls."

The high cost of flight training can be a significant barrier to completing flight training at collegiate aviation programs. Often a degree in aviation flight can be among the most expensive four year degrees offered by the institution (Aviation College Decision, 2008). When indicating the financial sources for flight costs, the two most common responses were parents and school loans. However, almost 60 percent of responding female flight students believed their collegiate aviation program offers a sufficient amount of aviation scholarships to assist them with their overall flight costs.

While females have increased their representation in aviation throughout time, they still remain under represented. When represented as collegiate flight students, professional pilots within the commercial air carrier industry, and pilot certificate holders; women constitute a very small percentage when compared to males. Continued consideration should be given to the under representation of females within collegiate aviation and the commercial air carrier industry; and the existence of any barriers or gender biases discouraging female involvement in aviation.

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**Pathways to the Aviation Professoriate: An Investigation into the Attributes and Backgrounds of Professional Pilot Education Faculty**

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## ABSTRACT

The purpose of this study was to identify the pathways professional pilot program faculty take to reach their positions. Data were collected through a survey that was distributed via the internet using Survey Monkey. Pathways were defined by investigations into the occupational and educational histories of the faculty. Also, demographic attributes of the faculty were collected to create a comprehensive picture of the faculty. Statistical analysis of the survey data was conducted using SPSS Graduate Pack software. The findings of the study indicate that professional pilot faculty take a range of occupational and educational pathways to reach their positions in aviation higher education. Two primary pathways were identified: the military and the non-military (civilian). Each of these sub-groups had unique attributes and distinctive career paths. Although faculty take two primary, separate paths to the professoriate, all faculty reach their current position with similar levels of academic and flight credentials as well as length of industry experience. Aviation faculty of all types were found to have significant academic and industry qualifications and certifications. In addition, these individuals had extensive aviation experience.

## INTRODUCTION

### Overview of the Study

From 1940 to 2008, there has been significant research conducted on higher education faculty in the United States. Studies such as those by Wilson (1942), Finkelstein (1984), and Reybold (2003) have explored the general attributes of the U.S. professoriate. Detailed data on higher education faculty has been collected via the undertaking of the Department of Education through the National Survey of Postsecondary Faculty (NSOPF). Research has also been conducted on postsecondary faculty in specific subject areas (Reybold, 2003; Fleet, Rosser, Zufall, Pratt, Feldman, & Lemons, 2006) and of particular demographic attributes (Conley, 2005; Cross, 1991). Yet little data exists on higher education faculty who specialize in the training of pilots. The information that is available on professional pilot program faculty has been limited to demographic details. Further, the most current data is more than ten years old (Johnson, 1999).

This is problematic because of the growing importance that aviation higher education has assumed within the aerospace industry as the U.S. military, previously a major supplier of aviation professionals, has faced cutbacks while at the same time the industry, in general, has continued to grow (Echaore-McDavid, 2005). Exacerbating this is the need for highly qualified employees to operate and manage ever more complex aviation technologies which require employees with more advanced education (Brown, 2007; Echaore-McDavid, 2005; Hansen & Oster, 1997; Baty, 1985). In fact, airlines now have a strong preference towards college-educated pilots (Brown, 2007; Echaore-McDavid, 2005).

Clearly, more information on professional pilot program faculty is needed in order to better understand these individuals, where they come from, what types of career and education experiences they bring to higher education, and with this information, to make predictions about future faculty needs and from where such individuals may be drawn.

### Purpose of the Study

The purpose of this study was to determine the occupational and educational histories of individuals who are full-time aviation faculty at four-year University Aviation Association (UAA) member institutions in order to explore the career pathways these persons take to get to the professoriate.

## Research Objective and Research Questions

The research objective of the study was to determine the career pathways of individuals who are full-time professional pilot education faculty at four-year University Aviation Association (UAA) member institutions. This study sought answers to the following research questions:

1. What are the occupational histories of individuals who have become full-time professional pilot education faculty at four-year UAA member institutions?
2. What are the educational histories of individuals who have become full-time professional pilot education faculty at four-year UAA member institutions?
3. What are the demographic attributes of individuals who have become full-time professional pilot education faculty at four-year UAA member institutions?

## Significance of the Study

This study is of significance to the aviation industry, postsecondary aviation program administrators, professional pilot program faculty, and future aviation professionals. Moreover, organizations such as the University Aviation Association (UAA) and the Aviation Accreditation Board International (AABI) will benefit from an improved understanding of this critical component of aviation higher education. By learning about professional pilot program faculty, stakeholders can better comprehend who they are, where they have come from, and their general traits. With this information, stakeholders can improve their recruitment and retention efforts for such employees. These details will allow administrators and educational organizations to gain insight into the attributes that faculty should have to be competitive providers of quality education. Administrators also can gain the knowledge necessary for general purposes related to management of academic personnel such as understanding how certain faculty fit into the institution as a whole, as well as the types of classes that an individual should teach and be qualified to teach.

# REVIEW OF LITERATURE

## The Aviation Professoriate: Attributes, Education, and Experience

Through its expansion, aviation has become a pivotal component of the American economic and transportation infrastructure. Concerns about the supply of qualified pilots are a reality across the globe with many airlines having to reduce their minimum hiring requirements to staff their flights. Along with the aforementioned changes in the training and education of future pilots, higher education has taken center stage in the development of new aviation professionals (Donoghue, 2008). With such challenges the need for professional pilot educators has become a vital piece of the support structure. Even at the beginning of the military training slowdown, Luedtke (1993) found that "seventy-six percent of the institutions surveyed indicated their programs were growing and were projected to keep growing in the near future" (pp. 70-71). Johnson (1999) later reported that almost 50 percent of institutions were actively hiring, as well. Johnson (1999) found that aviation faculty retirements were projected to become more numerous starting in 2000 and continuing well into the next decade. This ensures the continued growth in need for aviation educators. Both Brown (2007) and Lindseth (1996) identified the critical importance of faculty to program quality. Thus, administrators must be concerned with the attributes, education, and experience of current and future faculty to assure the uninterrupted production of quality graduates.

### *Aviation Faculty Demographics*

Although there has been no thorough analysis of the attributes of aviation faculty, there are bits and pieces that can be gleaned from the limited literature that does exist. Accounts of the demographics of aviation faculty are scattered among a variety of research studies though this data was always collected as a secondary component of each study and all but one of such studies are more than ten years old. Baty (1985) collected indirect demographic data which showed that faculty ages were concentrated in the 30-39 and 50-59 ranges, with slightly less in the 40-49 range.

In 1987, NewMyer found that the average age of aviation faculty was 50.4 years and 90% of these faculty were male. Luedtke (1993) discovered a similar ratio with 212 of 237 faculty, (89.5%) being male. Johnson (1999) reported the results from his 1998 study of aviation programs which included some demographic information. Of these individuals, 7.1% were female, while the remaining 91.1% were male (with 1.8 percent not reported). In 2008, Ison (2008) collected data from 60 baccalaureate institutions which yielded information on 353 full-time aviation faculty members. Of these faculty members, 36 (10.1%) were female. The average distribution of aviation faculty per school was 5.88 with 5.28 male faculty per school and 0.6 female faculty per school. There is no data available on the ethnic or racial attributes of aviation faculty to date.

### *Aviation Faculty Educational Backgrounds*

Aviation programs have only recently begun to offer a doctoral degree, however, the generally accepted aviation terminal degree has historically been at the master's level (Embry Riddle Aeronautical University, 2009). In a study by NewMyer (1988), a majority of aviation professionals responded that the master's degree should be "the minimum degree necessary to enter [the] profession, an industry segment or a particular kind of occupation in [the] industry" (p. 33).

Johnson (1997) indicated that only 1.3% had an associate's degree, 17.3% had a bachelor's, 42.7% had a masters, 37.3% had a doctorate, and 1.3% reported another type of degree. In what seems to be an emerging trend in desirable credentials, Johnson (1999) stated "[u]nlike many traditional academic fields of study in higher education (e.g., history and philosophy) where the minimum benchmark for prospective faculty members is an earned doctoral degree, the benchmark for the prospective aviation employee is often more demanding [… there is now] a need for aviation faculty members to possess a graduate degree (with greater emphasis on the doctorate) and preferential teaching experience, [in addition to] actual aviation practitioner oriented field experience combined with professional certification credentials" (pp. 31-32).

Also, because of the small number of advanced degree programs in aviation, it is common for aviation faculty to have degrees in areas outside aviation (Kaps, 1995). The findings of Johnson (1999) agree with this observation, as more than 40% of respondents had received advanced degrees in education. The next largest areas of study in terms of percentage of degree holders were aviation (10.6%), business (6.6%), management (5.4%) and engineering (5.3%). Other areas of study included sociology, political science, physics, psychology, industrial technology, and then a variety of humanities and sciences (Johnson, 1997).

Aviation faculty also face educational and credential requirements that are directly associated with aviation. The awarding of flight certificates in a collegiate environment (for credit) requires certification under Federal Aviation Regulation (FAR) Part 141: "[A]ll flight and ground instruction is given by FAA certificated flight and ground instructors" (Lindseth, 1996, p. 9). Johnson (1997) reported that 18.7% of faculty had private pilot certificates, 60% had commercial certificates, 45.3% had an instrument rating, and 34.7% had an airline transport pilot (ATP) certificate, while 12% reported having no pilot certification. In addition, 57.3% stated that they had some level of flight instructor certification and 26.7% reported having a basic ground instructor certification, 40% had an advanced ground instructor, and 36% had an instrument ground instructor.

### *Aviation Faculty Experiential Backgrounds*

Although there appears to be a tremendous amount of variety among aviation faculty experiential backgrounds, there were larger groupings of individuals with similarities that have been identified. Forty-four percent of aviation education professionals reported moving into such positions from the military, 16.8% of individuals stated that they entered via general aviation, and 6.4% entered from the airline industry (NewMyer, 1989, 1987). Slightly more than 21% indicated that their first occupational position was within some component of aviation education (NewMyer, 1988). Haul and Johnson (1990) found that a majority of faculty at a prominent professional pilot education institution, Embry-Riddle Aeronautical University, were previously in the military. In addition to aviation experience, Baty (1985) found that the amount of teaching experience desired by aviation programs was up to three years; however the preferred amount of experience was three to five years.

Little additional data exists on the occupational and experiential backgrounds of aviation faculty. Kaps (1995) stated that aviation faculty typically receive training and experience in the industry environment prior to entering academics, though no data is made available on the types of training and/or experience. In another study, 26.8% of aviation institutional respondents reported that they had at least 16 years of employment experience within aviation education though no consequential data was made available on previous employment (Johnson, 1999). In a Delphi panel analysis of aviation program quality, the consensus of the participating subject matter experts was that aviation faculty should have a diverse mix of industry, military, airline, corporate, and general aviation experience (Brown, 2007). Simply, put aviation program faculty should come from a variety of experiential backgrounds.

### *Professional Pilot Educator Career Pathways*

There are two primary paths that professional pilot education faculty take to reach their positions in the professoriate. The civilian pathway is that in which an individual gains flight experience outside of the military. The civilian pathway has a plethora of possible sub-paths including corporate aviation, airlines, general aviation, and flight instruction. However, within the civilian pathway, individuals attain their flight and ground certifications in a similar manner gradually accumulating higher levels of qualifications (Hansen & Oster, 1997).

The alternative to the civilian conduit is the military pathway. Within this realm individuals receive their aviation experience through one of the many branches of the military. Of course, in a majority of aviation faculty positions, more than just industry and/or flight experience is necessary. Civilian persons must seek these additional qualifications, namely advanced education, either in sequence following undergraduate education or at some point later in life.

Military officer personnel, however, face unique educational requirements within the service that encourage the completion of a graduate education prior to exiting the service. Therefore it is not a surprise that persons having military backgrounds have been well suited for faculty positions and have typically made up a significant proportion of those individuals in aviation faculty positions (Echaore-McDavid, 2005; Hansen & Oster, 1997).

## METHODOLOGY

### Selection of the Population

The unit of analysis for this study was the individual professional pilot education faculty member who was full-time and was employed at a four-year University Aviation Association (UAA) member institution within the United States. The purpose of the survey component of the study was to collect data on the entire population of full-time collegiate professional pilot program faculty, therefore no sampling technique was necessary (Gravetter & Wallnau, 2007).

### Instrument

The instrument for this research was developed through a literature search of survey procedures and online research. This review was supplemented by aviation employment applications and Federal Aviation Administration forms. The initial survey was then evaluated by a panel of experts that included aviation faculty as well as faculty who have significant experience with developing survey instruments. The resultant survey was built in the Survey Monkey online platform and was designed to insure that it was simple, easy to use, and aesthetically pleasing (Van Selm & Jankowski, 2006; Alreck & Settle, 2004).

### Procedures

Initially, the most current (April 2008) University Aviation Association (UAA) institutional member listing was referenced to identify four-year institutions that offer aviation programs (University Aviation Association, 2008a). Once this list was compiled, it was cross-referenced with the *Collegiate Aviation Guide*, which provided detailed listings of collegiate aviation programs and the types of degrees that such schools award. Of a total of 101 institutional members, 70 met the criteria for this study (University Aviation Association, 2008b).

Next, the aviation program website of each of these institutions was mined for faculty contact information. Contact data was then entered into an Excel spreadsheet for organization and sorting purposes.

The mining process produced 329 potentially eligible individuals. It was necessary to eliminate persons who were ineligible for inclusion and those who were outside the confines of the study. Thirty-three individuals were identified who had left their positions, were not in teaching positions, or were not professional pilot faculty. An additional three were found to be part-time employees. A preliminary population to which the survey would be administered numbered 293 individuals. Five contacts of mixed media, as recommended by Dillman (2007), were adopted to maximize response rate. Individuals were sent four e-mails. Those persons who did not respond to the electronic inquiries were contacted one last time via U.S. mail and a telephone call.

## RESULTS

### Response Rate

A total of 293 surveys were distributed via email to aviation faculty at four-year, University Aviation Association (UAA) member institutions within the United States. Once it was determined that email blockage issues existed, 102 separate emails were sent that were specially designed to circumvent further filtration. Finally, 75 surveys were distributed via U.S. mail as a follow up to the emailed versions to those who had apparently not responded. A total of 40 phone calls were made to the remaining non-participating individuals. A total of 235 (80.2%) responses were received, of which 9 (3.1%) were refusals, resulting in 226 (77.1%) positive responses. Four (1.4%) responses were incomplete and omitted resulting in 222 (75.8%) completed responses. Sixteen (5.5%) were found to be ineligible because they were not full-time or did not have faculty status. An additional 13 (4.4%) were identified to be ineligible because they were not professional pilot faculty. The final number of eligible, completed responses was 193 (65.8%) (see Table 1).

The response rate of the survey component of this study was then compared to the response expectations within the research literature. According to the University of Texas at Austin (2007), "[a]cceptable response rates vary by how the survey is administered: Mail: 50% adequate, 60% good, 70% very good; Phone: 80% good; Email: 40% average, 50% good, 60% very good; Online: 30% average." Another study by Sheehan (2001) found that among 31 studies using online methods that were evaluated, the average response rate was 36.8 percent. In summary, the response rate for this research was found to be at an acceptable level for meaningful data analysis.

### Demographic Data

Among the 193 usable, eligible responses, 173 (89.6%) were male and 16 (8.3%) were female with an additional four (2.1%) who chose "prefer not to answer." Most respondents (41 or 21.2%) reported that they were between the ages of 56 and 60. The next largest age grouping, numbering 32 (16.6%) responses, were those aged 61 to 65. Fifty-two (26.8%) of faculty were over the age of 60 and 123 (63.7%) were found to be over the age of 50. Two individuals selected "prefer not to answer" for gender but stated they were aged 46-50 and 51-55 respectively. Table 2 displays a comprehensive listing of the demographic data of the respondents. A majority of respondents, 168 (87.0%), indicated that they were solely Caucasian/White. For a complete breakdown of demographic data, see Table 3.

Table 1. *Summary of Response Rate*

| | Returned | (vs. 293 total sent) |
|---|---|---|
| | N | (%) |
| Total replies | 235 | (80.2) |
| Refusals | 9 | (3.1) |
| Positive responses | 226 | (77.1) |
| Incomplete responses | 4 | (1.4) |
| Complete responses | 222 | 75.8) |
| Ineligible responses | 29 | (9.9) |
| Total usable, qualified responses | 193 | (65.8) |

Table 2. *Demographic Data of the Respondents: Age and Gender*

| | Female | Male | PNTA* | Total |
|---|---|---|---|---|
| | N (%) | N (%) | N (%) | N (%) |
| Under 25 | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| 25-30 | 3 (1.6) | 6 (3.1) | 0 (0.0) | 9 (4.7) |
| 31-35 | 2 (1.0) | 3 (1.6) | 0 (0.0) | 5 (2.6) |
| 36-40 | 3 (1.6) | 16 (8.3) | 0 (0.0) | 19 (9.9) |
| 41-45 | 1 (0.5) | 15 (7.8) | 0 (0.0) | 16 (8.3) |
| 46-50 | 3 (1.6) | 13 (6.7) | 1 (0.5) | 17 (8.8) |
| 51-55 | 3 (1.6) | 27 (13.9) | 1 (0.5) | 31 (16.0) |
| 56-60 | 0 (0.0) | 41 (21.2) | 0 (0.0) | 41 (21.2) |
| 61-65 | 1 (0.5) | 31 (16.1) | 0 (0.0) | 32 (16.6) |
| Over 65 | 0 (0.0) | 20 (10.4) | 0 (0.0) | 20 (10.4) |
| PNTA* | 0 (0.0) | 2 (1.0) | 2 (1.0) | 4 (2.0) |
| Total | 16 (8.3) | 173 (89.6) | 4 (2.1) | 193 (100) |

* Prefer not to answer

Table 3. *Demographic Data of the Respondents: Race/Ethnicity and Gender*

| | Female | Male | PNTA* | Total |
|---|---|---|---|---|
| | N (%) | N (%) | N (%) | N (%) |
| African American/Black | 0 (0.0) | 3 (1.6) | 0 (0.0) | 3 (1.6) |
| American Indian | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Alaska Native | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Asian American/Asian | 1 (0.5) | 1 (0.5) | 0 (0.0) | 2 (1.0) |
| Caucasian/White | 14 (6.7) | 156 (80.8) | 0 (0.0) | 168** (87.0) |
| Mexican American/Chicano | 0 (0.0) | 3 (1.6) | 0 (0.0) | 3 (1.6) |
| Native Hawaiian | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Pacific Islander | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Puerto Rican | 0 (0.0) | 2 (1.0) | 0 (0.0) | 2 (1.0) |
| Other Latino | 0 (0.0) | 2 (1.0) | 0 (0.0) | 2 (1.0) |
| PNTA* | 1 (0.5) | 5 (2.6) | 4 (2.1) | 10 (5.2) |
| Other | 1 (0.5) | 1 (0.5) | 0 (0.0) | 2 (1.0) |
| Multi-Ethnic/Racial | 0 (0.0) | 1 (0.5) | 0 (0.0) | 1 (0.5) |
| Total | 16** (8.3) | 173** (89.6) | 4 (2.1) | 193** (100) |

*Prefer not to answer

**One male and one female marked Caucasian/White and Other; those responses were removed from the total so as to delete the effects of double-counting.

### Faculty Rank

There were approximately equal numbers of tenured (95 or 49.2%) faculty versus non-tenured (98 or 50.8%) faculty. Among the non-tenured faculty, 16 (8.3%) indicated that they were not on a tenure track, but their institution did not have a tenure system. Thirty-six (18.7%) stated that they were not on a tenure track even though their institution had a tenure system. The remaining 46 (23.8%) were on a tenure track but had yet to attain tenure.

The majority of faculty were ranked at the associate professor level (72 or 37.3%) with those holding the rank of assistant professor a close second at 67 (34.7%) individuals. 38 (19.7%) reported being at the professor level. Four (2.0%) indicated they were titled as "instructor" and six (3.1%) were titled "lecturer." One individual (0.5%) indicated that there were no formal ranks at their institution. Five (2.6%) selected "other" with their open-ended responses as: aviation department chair, dean, associate dean, assistant professor/chief flight instructor, and dean college of aeronautics.

### Subject Areas

Among the 193 usable responses, there were a total of 738 selections made by respondents for the question concerning subject areas taught by individual faculty. Individuals who indicated that they only taught one non-professional pilot education subject (e.g. air traffic control) were excluded from the 193 usable responses. Percentages reported here are in terms of the 193 usable responses, as this better reflects the percentage of faculty that teach each subject area. Seventeen (8.8%) indicated they taught air traffic control and 35 (18.1%) selected aviation law. Sixty-eight (35.2%) taught aviation management and three (1.6%) taught logistics.

Higher numbers of participation were indicated in the "core" pilot knowledge subject areas: 56 (29.0%) taught aerodynamics, 71 (36.8%) taught aircraft systems, 91 (47.1%) taught pilot certification ground schools, 48 (24.8%) provided instruction in aircraft navigation, 20 (10.3%) taught avionics/advanced avionics usage, and aviation safety attracted 71 (36.8%) responses. Another 29 (15.0%) taught meteorology. A large number of responses were indicated for human and cognitive areas. Human factors was a subject taught by 65 (33.7%) respondents, crew resource management was taught by 58 (30.1%), and eight (4.1%) taught psychology. Airframe/powerplant maintenance was indicated by sixteen (8.3%) respondents and five (2.6%) taught avionics maintenance. Seventy-seven (39.9%) chose "other," although many responses could have possibly been categorized into the answers available in the survey.

### Educational backgrounds

Faculty were queried as to the highest level of education received, the year they received the associated degree, and in what subject area. Among the 193 qualified, usable responses, the largest group (116 or 60.1%) had a master's as their highest achieved degree. Forty-three (22.7%) had a Doctor of Philosophy (Ph.D.) and 17 (8.8%) had a Doctor of Education (Ed.D.). Nine (4.7%) had a first professional degree (such as an M.D. or J.D.) and five (2.6%) had a bachelor's degree as their highest education level completed. Two (1.0%) indicated that their highest achievement was an educational specialist degree. One individual (0.5%) noted multiple highest degrees at the master's level with individual degrees in public administration, aeronautical science, and business administration with a specialization in aviation. The mean length of time that a respondent has held this highest degree was 16.5 years (SD = 10.9). The longest length of time indicated was 46 years while the shortest was one year. For a complete breakdown of highest degrees and lower degrees, see Table 4.

A wide range of subject areas were provided by the respondents. For simplicity, major areas of study will be used to condense the findings. Most of the respondents (57 or 29.5%) reported that their highest degree was in an education related subject. The next largest group had received their highest degree in an aviation related subject (40 or 20.7%). Business was listed by 36 (18.7%) respondents and engineering followed with 18 (9.3%). Ten (5.2%) respondents reported social science/psychology as their highest degree and nine (4.7%) reported law. The remainder of subject areas were distributed among natural sciences (5 or 2.6%), public administration (5 or 2.6%), technological fields (5 or 2.6%), miscellaneous science/mathematics (3 or 1.6%), and those that fit into none of these other categories (5 or 2.6%). For a breakdown of degree areas of study, see Table 5.

Table 4. *Degree Levels of Faculty*

| | **Highest Degree** | **Secondary Degree** | **Tertiary Degree** | **Total Degrees** |
|---|---|---|---|---|
| | **N (%)** | **N (%)** | **N (%)** | **N (%)** |
| Doctor of Philosophy(Ph.D.) | 43 (7.4) | 0 (0.0) | 0 (0.0) | 43 (7.4) |
| Doctor of Education(Ed.D.) | 17 (3.0) | 0 (0.0) | 0 (0.0) | 17 (3.0) |
| First Professional | 9 (1.6) | 1 (0.1) | 0 (0.0) | 10 (1.7) |
| Master's | 116 (20.0) | 76 (13.4) | 13 (2.2) | 205 (35.6) |
| Bachelor's | 5 (0.9) | 110 (19.1) | 63 (11.0) | 178 (31.0) |
| Associate's | 0 (0.0) | 2 (0.3) | 16 (2.8) | 18 (3.1) |
| Other | 3 (0.6) | 1 (0.1) | 2 (0.3) | 6 (1.0) |
| None | 0 (0.0) | 3 (0.5) | 96 (16.7) | 99 (17.2) |
| Total | 193 (33.5) | 193 (33.5) | 190 (33.0) | 576 (100) |

Table 5. *Areas of Study of Faculty Degrees*

| | **Highest Degree** | **Secondary Degree** | **Tertiary Degree** | **Total** |
|---|---|---|---|---|
| | **N (%)** | **N (%)** | **N (%)** | **N (%)** |
| Education | 55 (11.5) | 16 (3.3) | 7 (1.4) | 78 (16.3) |
| Aviation | 39 (8.1) | 60 (12.5) | 33 (6.9) | 132 (27.6) |
| Business | 36 (7.5) | 37 (7.7) | 10 (2.1) | 83 (17.3) |
| Engineering | 14 (2.9) | 17 (3.5) | 13 (2.7) | 44 (8.4) |
| Social Science/Psychology | 11 (2.3) | 12 (2.5) | 12 (2.5) | 35 (7.3) |
| Law | 9 (1.9) | 0 (0.0) | 0 (0.0) | 9 (1.9) |
| Natural Sciences | 5 (1.0) | 20 (4.2) | 9 (1.9) | 34 (7.1) |
| Public Administration | 4 (0.8) | 4 (0.8) | 0 (0.0) | 8 (1.6) |
| Technology | 7 (1.4) | 6 (1.3) | 1 (0.2) | 14 (2.9) |
| Miscellaneous Sci/Math | 4 (0.8) | 3 (0.6) | 6 (1.3) | 13 (2.7) |
| Other or Multiple | 9 (1.9) | 15 (3.1) | 5 (1.0) | 29 (6.1) |
| Total | 193 (40.3) | 190 (39.7) | 96 (20.0) | 479 (100) |

### Occupational backgrounds

Occupational backgrounds of faculty were investigated by inquiring into their previous employment experiences. One hundred eighty-six (96.3%) of 193 respondents stated they were employed in an occupation prior to working in their current aviation faculty position. Their average length of service for those reporting more than one year within this position (183 or 98.4%) was 11.8 years (SD = 9.98).

Among those previously employed, 112 (58.0%) had an aviation related occupation of which 78 (40.4%) were employed in the role of pilot. Forty-two (21.7%) reported being in the military prior to taking their current position. Fourteen (7.5%) stated that they were previously self-employed. The remainder of those employed in non-aviation positions were scattered across occupational interests.

Looking further into the past occupations of the respondents, faculty were asked if they were employed prior to the aforementioned occupation. One hundred twelve (58.0%) reported previous employment. Their average length of service for those reporting more than one year within this position (107 or 95.5%) was 9.9 years (SD = 8.81). Among those previously employed, 59 (52.7%) had an aviation-related occupation of which 43 (38.4%) reported working in a pilot function. Twenty-nine (25.9%) individuals of the 112 stated that they were in the military at this point in their occupational history.

Faculty also were asked about their length of service in aviation higher education as well as their future plans associated with this field. The average length of experience in aviation higher education was 16.1 years (SD = 10.27) with the longest length being 43 years and the shortest being less than one year. A significant number of faculty (176 or 91.2%) reported that they planned to stay in aviation higher education.

## Aviation Qualifications

*Federal Aviation Administration Pilot Certifications*

Of the 193 usable, qualified responses, 179 (92.7%) individuals reported that they had Federal Aviation Administration (FAA) pilot certification(s). Overall, the non-duplicated certificate count at the Airline Transport Pilot (ATP) level was 100 (55.9%). At the Commercial Pilot level, there were 146 faculty (81.6%) and those with private pilot certificates numbered 40 (22.3%). Three (1.7%) were Student Pilots and one (0.5%) individual held a Recreational Pilot certificate. See Table 6 for a breakdown of the category and classes of certifications.

*Instrument and Type Ratings*

Faculty who reported being instrument-rated numbered 157 (this includes those with ATP certificates) which equates to 87.7% of those holding pilot certificates and 81.3% of all faculty. Seventy-one stated that they had aircraft type ratings. In terms of faculty with pilot certificates, 39.6% had a type rating. Among all faculty, 36.7% had this additional qualification. Each faculty reporting a type rating had an average of 1.7 types in which they were qualified. Faculty reported having type ratings in a variety of different aircraft including helicopters and large piston, turboprop, and jet airplanes.

*Instructor Certificates*

All respondents were directed to questions concerning their certification as flight and/or ground instructors. One hundred fifty-three (78.7%) reported having such certifications. All respondents who indicated they had an instructor certification noted that they had multiple certificates. Among all faculty members responding to the survey, 39 (20.2%) had a Basic Ground Instructor certificate, 78 (40.4%) had an Instrument Ground Instructor certificate, and 96 (49.7%) had an Advanced Ground Instructor certificate. One hundred thirteen (58.5%) stated that they held a Certified Flight Instructor (CFI) certificate. Another 103 (53.4%) noted that they had an Instrument Instructor (CFII) certificate and 94 (48.7%) had a Multi-Engine Instructor (MEI) certificate. Thirty-one (16.0%) stated they were Gold Seal flight instructors.

Table 6. *Federal Aviation Administration Pilot Certifications: Total Responses*

| | **Single Engine Land** | **Multi Engine Land** | **Single Engine Sea** | **Multi Engine Sea** | **Rotor* Heli*** | **Glider** | **Other** | **Total** |
|---|---|---|---|---|---|---|---|---|
| | **N (%)** | **N (%)** | **N (%)** | **N (%)** | **N (%)** | **N (%)** | **N (%)** | **N (%)** |
| Airline Transport | 12 (3.2) | 87 (23.1) | 3 (0.7) | 2 (0.5) | 5 (1.3) | 0 (0.0) | 1 (0.2) | 110 (29.3) |
| Commercial | 97 (25.8) | 68 (18.1) | 23 (6.1) | 0 (0.0) | 23 (6.1) | 8 (2.1) | 1 (0.2) | 220 (58.5) |
| Private | 29 (7.7) | 7 (1.8) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 5 (1.3) | 1 (0.2) | 42 (11.2) |
| Recreational | 1 (0.2) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 1 (0.2) |
| Student | 3 (0.7) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 3 (0.7) |
| Total | 142 (37.7) | 162 (43.0) | 26 (6.9) | 2 (0.5) | 28 (7.4) | 13 (3.4) | 3 (0.7) | 376 (100) |

*Rotor = Rotorcraft, Heli = Helicopter

### Military Service

One hundred six (54.9%) of all responses indicated that the faculty member served in the military in some capacity. Of those that stated such affiliation, 58 (54.7%) served in the Air Force, nineteen (17.9%) served in the Navy, 23 (21.7%) were in the Army, six (5.7%) served in the Marines, and four (3.8%) were in the Coast Guard. Ninety-four (88.7%) of those who served in the military stated they had an aviation-related duty or assignment during their time in the armed forces. Within these 94 responses, 47 (50.0%) described this function as an aircraft pilot duty (an additional two [2.1%] had non-discernable duties). When considering the total number of responses from all faculty, this indicates that 24.3% were military pilots.

### Analysis of Findings

Data extracted from the survey responses were analyzed for relationships using SPSS Graduate Pack 17 software. Descriptive statistics and chi-square tests were utilized to compare and contrast the attributes of military and non-military faculty (Gravetter and Wallnau, 2007, p. 582). In the limited cases that data lent itself to parametric statistical analysis, an independent measures *t* test was utilized (Gravetter & Wallnau, 2007, p. 311). A 0.05 alpha level was selected for all tests. This level was selected as no significant financial or policy decisions rest on the findings of this study, however, the researcher wanted an increased level of confidence that no relationships were caused by chance (University of New England, 2000; Gravetter & Wallnau, 2007).

Analysis of the mean lengths of time that degrees were held at different levels yielded a mean length of time of 11.7 years for doctoral degrees and for first professional degrees it was 15.1 years. Those indicating they had a master's degree held this level of achievement an average of 20.4 years. The mean length of time bachelors' degrees were held was 28.4 years (see Table 7).

An analysis of faculty rank and age was conducted using the cross-tabulation. The largest percentage of faculty was found to be ages 56-60. The largest concentration of faculty at the professor rank was 61-65 years old. At both the associate and assistant professor levels this highest concentration was at the 56-60 year range. An overwhelming majority of faculty at the professor level were over the age of 46 while faculty at lower ranks had more even distributions among young age groups. See Table 8 for a comprehensive review of faculty rank versus age.

Another age-related factor, age versus the number of years of participation in aviation higher education, was analyzed. Faculty were grouped as over 40 years old and 40 years and younger as well as by length of service which was defined as either more than five years or five years or less in aviation higher education. A chi-square test for independence found that the groupings were in fact statistically dissimilar ($X^2$ (1, $n$ = 193) = 9.945, $p$ = 0.002). The highest count was found to be in those who reported being over 40 and in aviation higher education for more than five years. Among newer faculty, it was found to be more likely that faculty would be older. Also, even among younger faculty, individuals were more likely to have been in aviation higher education for more than five years.

The relationship between military service and faculty age was evaluated using chi-square analysis. Four responses of "prefer not to answer" were excluded from the analysis. These two sets of data were found to be dependent as a statistically significant relationship was discovered ($X^2$ (1, $n$ = 189) = 34.958, $p < 0.05$). According to the data, military faculty were most likely to be over the age of 40.

The potential for a relationship between military service and the number of years of participation in aviation higher education was conducted using chi-square analysis. These two data sets were found to be unrelated ($X^2$ (1, $n$ = 193) = 0.348, $p$ = 0.555). An evaluation of the potential relationship between military service and subject area of highest degree held by faculty was conducted using chi-square analysis. These two data sets were found to be independent ($X^2$ (2, $n$ = 193) = 2.506, $p$ = 0.286).

Table 7. *Faculty Degrees: Years Held*

| | N | SD | Lowest | Highest | Mean |
|---|---|---|---|---|---|
| | | Year(s) Held | Year(s) Held | Year(s) Held | |
| Doctoral Degree | 60 | 8.21 | 1 | 33 | 11.7 |
| First Professional Degree | 9 | 11.64 | 1 | 31 | 15.1 |
| Master's Degree | 205 | 10.79 | 1 | 46 | 20.4 |
| Bachelor's Degree | 178 | 11.45 | 5 | 56 | 28.4 |
| Associate's Degree | 18 | 11.65 | 5 | 55 | 27.1 |
| Other Degree | 6 | 10.54 | 3 | 31 | 13.0 |

Chi-square analysis was again used to evaluate the independence of military service and highest flight qualifications held. These two data sets were found to be independent ($X^2$ (2, $n$ = 179) = 3.677, $p$ = 0.159).

An evaluation of the independence of military service from tenure status was conducted using chi-square analysis. A statistically significant relationship was found between these data sets ($X^2$ (1, $n$ = 193) = 4.410, $p$ = 0.036). A greater percentage of military faculty was not tenured or was not on a tenure track.

The relationship between military service and the highest degree held by faculty respondents was evaluated using chi-square analysis. A statistically significant relationship was detected ($X^2$ (2, $n$ = 193) = 6.378, $p$ = 0.041). Across all degree levels, it is more likely to encounter a military faculty member than one who had not served in the armed forces.

Chi-square analysis also was used to determine if there was a relationship between military service and the length of time in current position. There was no statistically significant relationship observed ($X^2$ (5, $n$ = 193) = 2.193, $p$ = 0.822).

In comparing the length of time, in years, faculty have participated in aviation higher education, there was no statistically significant difference between those who were previously in the military (M = 16.59, SD = 10.434) and those who were not (M = 15.59, SD = 10.091), $t$ (191) = 0.678, $p$ = 0.499 (two-tailed). However, there was a statistically significant difference between the years that have passed since receipt of the highest academic degree awarded between those who had served in the military (M = 19.22, SD = 10.466) and those who did not (M = 13.25, SD = 10.556), $t$ (191) = 3.924, $p < 0.05$ (two-tailed).

An analysis of the consistency among all subject areas taught (excluding those indicated as "other") between those who have served in the military and those with a civilian background was conducted using chi-square analysis. There were no statistically significant differences noted ($X^2$ (11, $n$ = 651) = 17.147, $p$ = 0.104). Within the "core" pilot knowledge subject areas (aerodynamics, pilot certification ground schools, navigation, avionics usage, systems, and aviation safety), there was no statistical significance between those who were in the military and those who were not ($X^2$ (4, $n$ = 357) = 8.449, $p$ = 0.076).

### Construction of Career Pathways

Upon the closing of the survey collection and the completion of the interviews, typical pathways that faculty have taken to reach their positions as postsecondary professional pilot educators were constructed. A wide range of the collected data was re-analyzed to identify any patterns or paths including raw survey responses, statistical analysis, and interview responses. "Typical" faculty paths and attributes began to emerge from the data. Two primary tracks were indicated. The first was the civilian track in which faculty never served in the military in any capacity. The second was the military track in which faculty spent a portion of their careers in the armed forces. Most on the military track spent a significant amount of their employment history as military personnel.

Table 8. *Faculty Rank versus Age*

| | Professor N (%) | Associate N (%) | Assistant N (%) | Lecturer N (%) | Instructor N (%) | Other N (%) | Total N (%) |
|---|---|---|---|---|---|---|---|
| Under 25 | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| 25-30 | 0 (0.0) | 0 (0.0) | 6 (3.1) | 1 (0.5) | 2 (1.0) | 0 (0.0) | 9 (4.7) |
| 31-35 | 0 (0.0) | 0 (0.0) | 3 (1.6) | 1 (0.5) | 1 (0.5) | 0 (0.0) | 5 (2.6) |
| 36-40 | 1 (0.5) | 9 (4.7) | 8 (4.1) | 0 (0.0) | 1 (0.5) | 0 (0.0) | 19 (9.8) |
| 41-45 | 0 (0.0) | 8 (4.1) | 7 (3.6) | 0 (0.0) | 0 (0.0) | 2 (1.0) | 17 (8.8) |
| 46-50 | 5 (2.6) | 7 (3.6) | 5 (2.6) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 17 (8.8) |
| 51-55 | 7 (3.6) | 13 (6.7) | 9 (4.7) | 1 (0.5) | 0 (0.0) | 0 (0.0) | 30 (15.5) |
| 56-60 | 8 (4.1) | 18 (9.3) | 13 (6.7) | 0 (0.0) | 0 (0.0) | 2 (1.0) | 41 (21.2) |
| 61-65 | 10 (5.2) | 10 (5.2) | 7 (3.6) | 3 (1.6) | 0 (0.0) | 1 (0.5) | 31 (16.0) |
| Over 65 | 5 (2.6) | 6 (3.1) | 9 (4.7) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 20 (10.4) |
| Prefer not to answer | 2 (1.0) | 1 (0.5) | 1 (0.5) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 4 (2.1) |
| Totals | 38 (19.7) | 72 (37.3) | 68 (35.2) | 6 (3.1) | 4 (2.1) | 5 (2.6) | 193 (100) |

*Occupational Pathways*

Occupational pathways were analyzed for flow of faculty from positions previous to their current role. The flows between different job functions were found to be too chaotic to lead to meaningful synthesis. Instead, flows were divided into aviation and non-aviation related categories. Looking backwards in time, 58% of faculty held an aviation related occupation prior to their current standing in higher education. 38.4% held a non-aviation occupation, while 3.6% held no previous job. Among those that reported previous experience in aviation prior to that point, 20.2% had an aviation-related job function, 14% had a non-aviation related job function, and 23.3% had no previous occupation. Among those who reported their most recent job as being non-aviation related, 10.3% preceded this occupation with an aviation related field, 13.1% with a non-aviation related field, and 15% reported no previous occupation.

*Educational Pathways*

Educational pathways were created by tracing how faculty progressed through the different levels of education they have achieved. Most faculty with a Ph.D., Ed.D., or first professional degree as their highest academic credential preceded this achievement with a master's degree. Most with the highest degree of master's first had a bachelor's degree. Among secondary degrees, those with masters were most likely to precede this achievement with a bachelor's degree, if they had pursued another degree. Those with a bachelor's were most likely to have received an associate's prior, if they had another degree. Subject areas in which faculty have their highest degree were most likely to be in education, aviation, or business (in descending order of percentages).

*Military Faculty Pathways*

The paths that military faculty took to reach their positions in aviation higher education were created by looking backwards from the present. Among all faculty that responded to the survey, 54.9% served in the military at some point in their career. 48.7% of faculty served in an aviation-related function while in the military. However, only 17.1% of faculty went straight from the military into an aviation faculty position. Prior to becoming an aviation faculty member, 15.5% held some kind of aviation-related position in the job force, while 22.3% held non-aviation related positions. A very small number (6%) were not employed prior to being in the military (see Figure 1).

*Civilian Faculty Pathways*

The paths that civilian faculty took to reach their positions in aviation higher education were created by looking backwards from the present. 42% of faculty were identified as civilian track individuals prior to taking their current position. Of these individuals, 36.7% reported being in an aviation-related occupation previously. 3.1% reported no previous employment and were by default identified as civilian track. Looking back another occupational step, 32.1% reported having no other employment. 9.9% did report employment, of which persons were equally distributed between aviation and non-aviation occupations (see Figure 2).

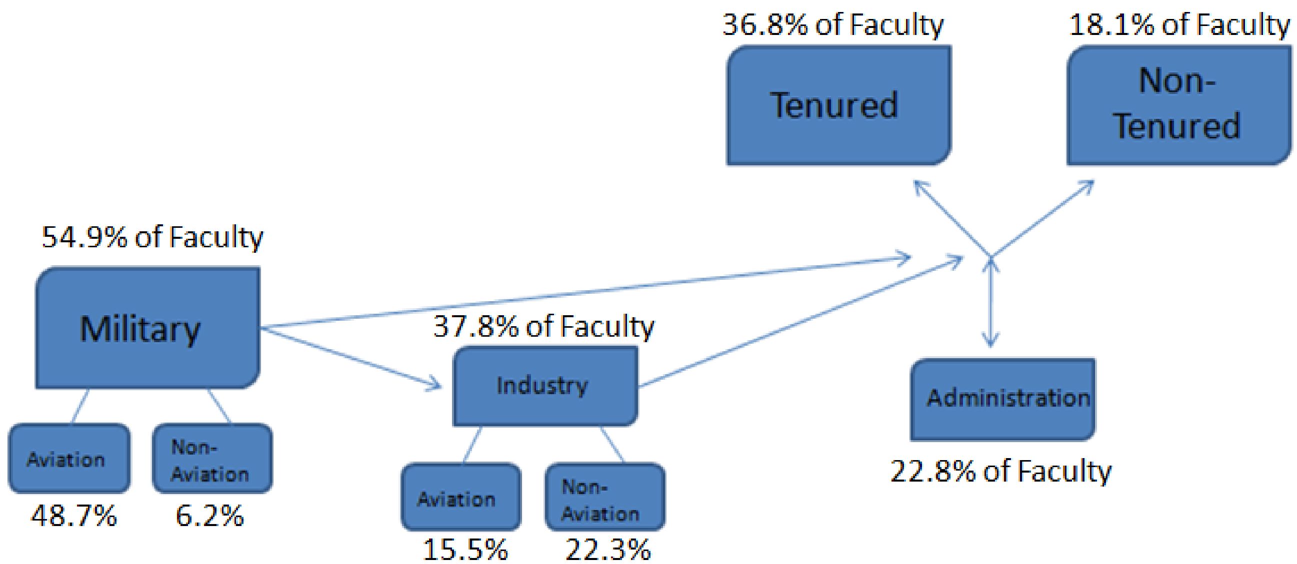


*Figure 1*. Military Faculty Pathway

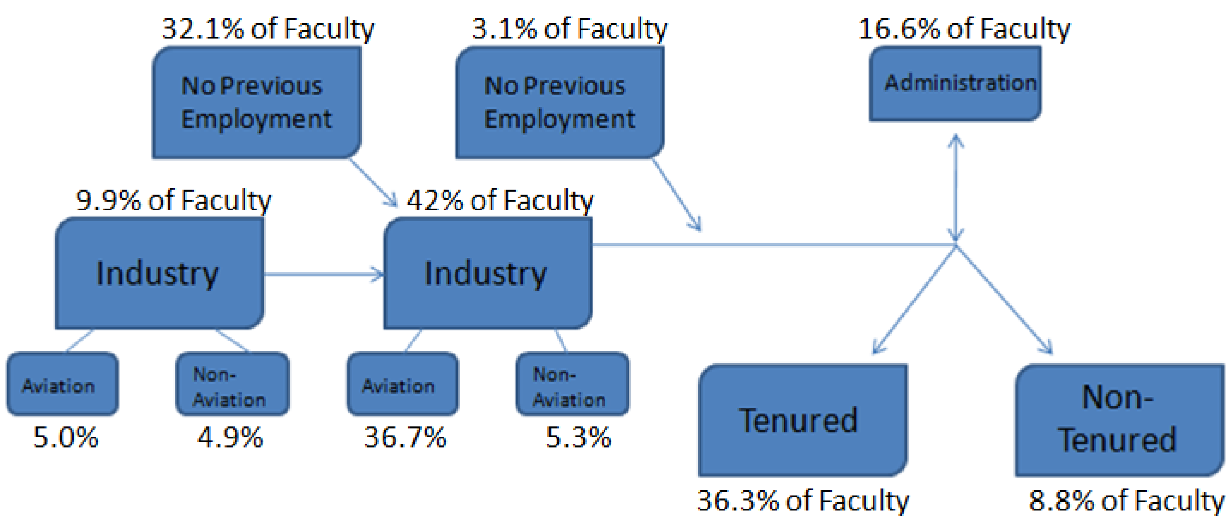


*Figure 2*. Civilian Faculty Pathway

## SUMMARY AND CONCLUSIONS

### Discussion of Findings

The survey was able to identify the occupational and educational histories that professional pilot faculty take as they moved through their primary career pathways. This allowed for the construction of two primary methods, the military and the non-military (or civilian); through which faculty reach their positions in aviation higher education. The similarities and the differences between these two groups conveyed characteristic profiles for each, allowing for a better understanding about how faculty in each subset reached their current positions. Further, the demographic attributes of all professional pilot faculty were identified providing an even more comprehensive description of these individuals.

It was noteworthy that there were, in fact, few dissimilarities between the groups. This means that although individuals trace different paths to the same end, they accumulate similar qualifications and skills over equivalent time frames (see Figure 3). The length of service in their current position and in aviation higher education in general was similar for faculty in both pathways. There were no statistically significant differences between the groups in terms of educational and flight qualifications. Also, the subject areas in which faculty taught were also found to be similar.

Although there were many equivalencies between the military and non-military tracks, there were some dissimilarities that were discovered. The most profound of differences among these groups is that of age. Military faculty were more senior than their non-military counterparts. In another item related to the age factor, a statistically significant difference was noted between military and non-military faculty in the length of time since an individual received the highest academic degree. This was not an unexpected finding since military faculty tend to be older, it is therefore more likely that they have received their education further back within their educational history. Finally, military faculty were slightly less likely to be tenured than non-military types.

## CONCLUSIONS

This study successfully identified the pathways professional pilot faculty take to reach positions in aviation higher education. Such detailed information about this group of higher education faculty is of great interest to all stakeholders in the aviation industry because of the vital role these individuals play in the construction of the future pilot workforce in the United States. From this information, higher education and aviation program administrators can develop a better understanding of their employees and what is considered the norm among such faculty at peer institutions. This data was collected through the use of a survey which was designed through an extensive literature review, was evaluated by a panel of experts, and was pilot tested. The majority of responses were collected via an internet-based interface.

In sum, the data provided by this study will be helpful to all types of aviation industry stakeholders, as well as a wide range of persons associated with higher education, as they seek to understand the professional pilot program faculty cohort. Since aviation programs reside within larger, often unrelated components of institutions of higher education (such as schools of engineering or business), it is paramount that the uniqueness of aviation faculty be understood and appreciated at all levels of the institution.

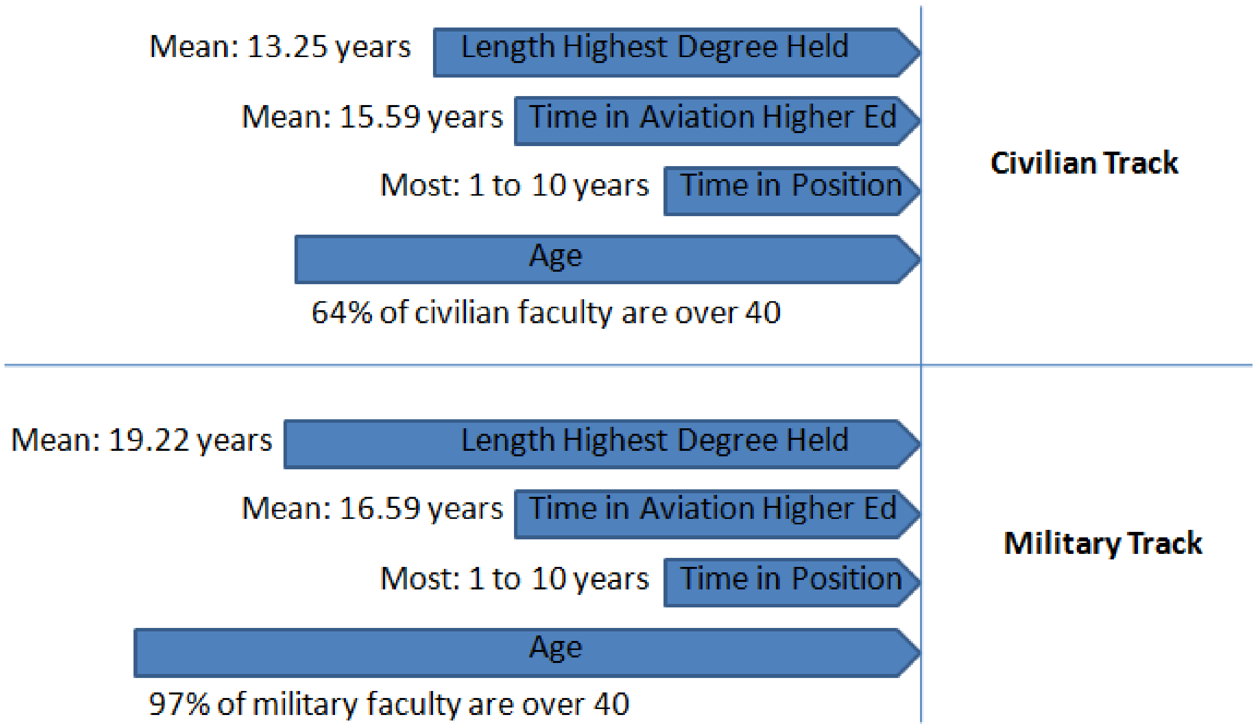


*Figure 3*. Comparison of the General Chronology of Postsecondary Professional Pilot Educator Careers: Civilian versus Military

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# Human Continuity through Crises in Aviation

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## ABSTRACT

Highly-trained employees are essential to airports and aviation organizations. It is very important for managers as well as peers to recognize post traumatic stress reactions or symptoms that employees may display when they have attended to a natural or manmade disaster. This research project has identified and documented that many organizations practice the first-response activities associated with a traumatic event, but engage in little or no training for the recovery phase of the event/incident, which may last a long period of time. The research has identified many strategies which should edify and augment a mental health recovery plan (MHRP) so that an employees' natural resiliency is enhanced, or those that are unable to return to normal function can be identified and receive the necessary mental health attention. The entire research project was funded by the Airport Cooperative Research Program (ACRP) as part of the National Academies.

## INTRODUCTION

This research project examines an aviation organization's ability to promote human resiliency and to provide guidance for those organizations to develop procedures and prepare for the impact of natural and manmade disasters they may face. The goal of this research is to prepare directors of airports and air carriers for the mental health recovery of employees, who have faced a traumatic event, and to promote and improve practices for enhancing employees' ability to successfully cope with such an event and build resilience.

## BACKGROUND

According to the Federal Aviation Administration's (FAA) 2008-2012 Flight Plan, "our skies are safe," the industry has achieved an incredibly low rate of commercial (airline) fatal accidents (FAA, 2008a, p.1). In the past ten years this rate has dropped 57 percent. The FAA has implemented many new and enhanced safety initiatives in the past with the hope of achieving the lowest rate practical. The aviation industry has inherent risk associated with it, which means that accidents will occur, but presently they occur at a very low rate. The nation's airlines transport nearly two million passengers per day and employ nearly half a million workers (Air Transport Association, 2007).

Natural disasters disrupt thousands of lives each year and can do unimaginable damage in mere moments. Whether the disaster is fire, flood, hurricane, earthquake or tornado, the threat is immediate to human life, and the recovery process is usually long term. Recently, Hurricanes Katrina and Rita bore down on the southern United States engulfing the states of Louisiana and Mississippi, forest fires have greatly impacted the western United States, and tornadoes and floods have ravaged the Midwest.

The aviation industry is not immune to the effects of a natural disaster as the organizations (airports, airlines, and FBOs) involved may become instantly crippled, with effects felt throughout their local areas. However, airports and air transportation become a vital link to receiving needed supplies and restoring order by allowing disaster relief workers to begin their work. In the case of Hurricane Katrina, the New Orleans - Louis Armstrong International Airport was the staging point for all egress and ingress of the afflicted areas. The airport became the virtual lifeline to the people of southern Louisiana (Blanchard, 2008).

## LITERATURE REVIEW AVIATION REQUIREMENTS – DISASTER/EMERGENCY PLANNING

*Air Carriers (Part 121, 125 and 135)*

The Federal Aviation Administration (FAA) currently requires all air carriers operating under 14 CFR 121, 125 or 135 to have established accident reporting procedures. These procedures must be published in the carrier's operations manual stipulated in 14 CFR 121.135, 125.73 and 135.23. Aside from this requirement, the FAA does not mandate any type of structured program dealing with issues of employee or operator resiliency after an accident; rather, the emphasis is keenly placed on an operator's ability to manage an acute emergency. 14 CFR 121.417 outlines the specific requirements needed by an air carrier in order to mitigate an actual emergency situation such as in-flight aircraft fires or hijackings, but does not list any post-event psychological or "trauma handling" regulations. Airlines that operate under 14 CFR 121 also have a regulatory requirement to assist family members of passengers cope with traumatic events under the 1996 Aviation Disaster and Family Assistance Act.

*Airports (GA and Part 139)*

In a review of the of the Airport Emergency Plan advisory circular (AC/150/5200-31B) currently in draft format, it appears the Federal Aviation Administration has initiated a number of changes for airports. This draft, if approved, will replace an advisory circular from 1999. The substantial changes suggested in the new advisory circular primarily relate to the addition of National Fire Protection Association standards for equipment and training related to airport firefighters and the application of the National Incident Management System (NIMS) and Incident Command System (ICS).

Section 8 of the advisory circular, Airport Emergency Planning (AEP), outlines health and medical planning. It is evident that the advisory circular is oriented toward treatment, transport, and evacuation of injured persons, or the response actions; but, the plan does not address the actual airport workers' mental health issues that may arise from working during traumatic events. However, section 6-8-2 (6) does address potential utilization of mental health agencies; the circular indicates that an airport should ensure that the appropriate mental health services are available for disaster victims, survivors, bystanders, responders and their families, and other airport care-givers during response and recovery (FAA, 2008b, p. 82).

The FAA introduces the idea of Critical Incident Stress Management (CISM), but clearly leaves the concept and its implementation up to each individual airport. It is not evident whether the FAA will direct an airport to implement any sort of mental health programs for airport workers. It should be noted that the FAA's advisory circular on emergency planning pertains only to FAR Part 139 airports, which are those airports that serve regularly scheduled air carrier (FAR Part 121) operations with aircraft operating with more than nine seats on board. General aviation (GA) airports and other aviation organizations that do not have particular regulations guiding their operations are not required to have well-developed emergency plans. Therefore, it is important that those entities take time to develop plans that deal with the possibility of a traumatic event or incident.

## WHAT IS PSYCHOLOGICAL TRUAMA AND WHAT CAUSES IT?

The physical and psychological response to any demand—positive or negative—is *stress*. Positive stress includes responses to events such as getting a promotion, getting married, or graduating from college. However, the term *stress* usually describes responses to negative demands such as taking a test, getting divorced, or performing under pressure. When faced with a source of negative stress, people must evaluate the situation, determine the realistic level of risk (and differentiating that from imagined or irrational perceptions of risk) and then evaluate how they are going to cope with the situation based on their own personal resources (e.g., physical strength, the ability to think clearly in a crisis, basic problem-solving abilities) and the potential for support from others (e.g., emotional support, access to necessary tangible resources; Lazarus, 1966; Lazarus & Folkman, 1984).

The most extreme form of negative stress is *traumatic stress*—stress resulting from a traumatic event or situation. People experience traumatic stress in response to events such as natural disasters like earthquakes or hurricanes, motor vehicle collisions, physical or sexual assault/abuse, combat, industrial accidents, diagnosis of a life-threatening illness, life-threatening medical situations like a heart attack, terrorist attacks, torture, or as in the present discussion, airline disasters (Noy, 2004).

During an actual traumatic event, this response is considered a normal, adaptive survival response to a situation that is perceived as life threatening. If an individual is able to establish safety by fighting or fleeing, it will often decrease, although not eliminate, the risk for long-term negative effects of the stressful event (Noy, 2004). However, traumatic events may not accommodate these survival responses, and individuals must attempt to cope with a situation that is perceived as life-threatening, uncontrollable, and/or inescapable—a situation that carries a higher risk for longer-term problems.

Life-threatening, inescapable situations can result in a different physical and psychological response—freezing or becoming immobilized. Although this response is less well understood from a physiological standpoint, it appears that the stress response activates a different part of the Autonomic Nervous System (ANS) that immobilizes the body and decreases the experience of pain or fear (e.g., people going limp and psychologically numb when being mauled by a bear) (Noy, 2004).

## POST TRAUMATIC STRESS AND HUMAN REACTIONS TO TRAUMA

When an individual continues to experience a persistent traumatic stress reaction after the traumatic event has past, or post-trauma, it is called *post-traumatic stress* (American Psychiatric Association, 2000). Thus, a stress response that was adaptive and normal during a time a crisis becomes maladaptive when it persists after the traumatic event has passed. Post-traumatic stress is a human survival reaction or elements of this reaction that occur when there is no actual threat present—*a survival reaction that occurs at the wrong time*. When post-traumatic stress is severe and persistent it is called *Post-Traumatic Stress Disorder* (PTSD) as described in the *Diagnostic and Statistical Manual of Mental Disorders: Text Revision (DSM-TR)*—the standard reference used for classifying and diagnosing psychiatric disorders (American Psychiatric Association, 2000).

According to the DSM-TR (American Psychiatric Association, 2000) diagnostic criteria, to qualify for a diagnosis of PTSD, one must have: (1) experienced an event that is life threatening or perceived as life threatening, (2) witnessed an event that is perceived as life threatening to others, or (3) heard about violence to or the unexpected or violent death of others. The latter can involve such things as watching a traumatic event unfold on television (e.g., Hurricane Katrina or the events of 9/11) or hearing about the death of a loved one—referred to as vicarious or secondary traumatization (Palm, Polusny & Follette, 2004).

Further, one must exhibit persistent evidence (i.e., lasting *more than one month*) of: (1) persistent *re-experiencing* of the traumatic event (e.g., intrusive memories or thoughts, flashbacks, nightmares); (2) *avoidance* of reminders or the trauma that can involve physical avoidance or psychological "avoidance" or numbness in the form of dissociation; and (3) *chronic hyper arousal* of the autonomic nervous system (e.g., difficulties sleeping, problems concentrating, hyper vigilance, increased anxiety, exaggerated startle response).

One must also exhibit severe impairments in daily functioning (e.g., impaired relationships, employment problems) in addition to the criteria just described. Individuals for whom these same symptoms persist for *less than one month* would be classified as having Acute Stress Disorder (ASD; American Psychiatric Association, 2000). As noted previously, dissociation or removing oneself mentally from an inescapable situation is one possible response to traumatic stress. There is evidence that if dissociation is present in the early or acute stages of the traumatic stress reaction, the risk is increased for developing subsequent PTSD (Birmes, Brunet, Carreras, Ducasse, Charlet, Lauque, Sztulman & Schmitt, 2003) although conflicting results have been reported (Wittman, Moergeli, & Schnyder, 2006).

Symptoms of PTSD usually appear within the first three months following exposure to the traumatic event. However, a significant number of individuals may also experience delayed-onset PTSD (Buckley, Blanchard, & Hickling, 1996) in which symptoms may not appear for months or years (American Psychiatric Association, 2000). The duration of PTSD also varies. For trauma victims with early-onset PTSD, PTSD has been shown to persist from months to years following the disaster (Galea, Nandi, & Vlahov, 2005). Even with appropriate treatment, PTSD can persist as a lifetime chronic condition with periods of exacerbation and remission of symptoms (Noy, 2004).

Much of the literature that addresses workplace critical incidents refers to manuals that provide procedures, support personnel, and guidance to manage the emergency (Federal Aviation Administration, 2008a). These publications greatly assist individuals who may not recall proper procedures or make an incorrect decision in the chaos of an emergency. With regard to personnel, publications and strategies are also available to provide guidance on critical incident stress management programs with the goal of improving resiliency and decreasing psychological trauma and its associated complications.

## BUSINESS CONTINUITY PLANNING

It is commonly known that most businesses pay more attention to the practical matters of a potential business interruption than planning for the people side of the business, yet it is quite apparent that personnel are the most valuable asset to a company in times of distress (Nowlan, 2008). Therefore, "human continuity" is a crucial variable in disaster planning for any organization. Determining what and how to respond to the human or mental health issues that may be present after a traumatic event are extremely important.

Organizations need to recognize that there are several vulnerable stakeholder groups including staff, community, customers, suppliers and family members when trauma is present. It is advisable for companies to consider the well-being of all groups when attempting to return to normal operations. Both family and community members represent a tremendous source for recovery for employees, which can aid in the recovery process and reduce down time (Paton, 1999). According to Paton (1999), local government agencies might pursue this cost effective strategy of establishing goodwill and consider a similar course of action. This course of action should be considered as a comprehensive human resources (HR) continuity plan, which considers traumatic impacts for its staff. This HR plan could use vulnerability data to screen staff so that the organization identifies the demands of key staff and what effects of trauma they may experience as a result of the event (Paton, 1999).

As a disaster may render certain employees or employee groups incapable of performing their jobs, it is the role of managers and human resources representatives to understand this issue and find the appropriate support that is needed. Paton (1999) explains that recent thinking about support programs for staff is focusing on developing resilient organizational cultures. This would include "empowering staff and managers, and providing them with the knowledge, and skills to design and implement appropriate intrinsic risk-reducing and recovery strategies". Due to the sheer magnitude of some events, this may prove to be a cost-effective strategy.

## METHODOLOGY AND DATA ANALYSIS

The research team visited five different airports and qualitatively interviewed 25 individuals with varying work duties and training backgrounds, during this project. The research team also felt it would be valuable to try and determine which airports across the country had mental health components to their airport emergency plans (AEP) and whether or not those airports would be open to including such an area to their plan. Therefore, the team conducted an online survey of commercial service and general aviation airports.

### Online Airport Survey

In order to determine the extent of post-disaster mental health crisis programs existing at airports in the United States, a survey was conducted among airport management personnel. A convenience sample was used from the membership roster of the American Association of Airport Executives (AAAE) 2008 National Conference attendees.

In general, representatives on the roster list were the highest ranking management official associated with a particular airport. Each member on the AAAE roster was sent an email which contained an internet link to an online survey instrument. This survey used the software on www.surveymonkey.com. To ensure anonymity, the survey did not require any participant to identify themselves or their airports. The survey was administered to representatives of 175 airports nationwide and 64 responded, for a response rate of 37%. The survey and its findings are listed in Table 1.

Table 1. *Online Survey Questions and Responses*

| Question | Response | Percent | N |
|---|---|---|---|
| In regard to your airport emergency plan (AEP), does your airport currently have any formal or informal program(s) designed to deal exclusively with the mental health trauma that employees may face after responding to aircraft accident or natural disaster? | Yes<br>No | 56.3<br>43.7 | 35<br>28 |
| If your organization has a mental health component for your employees, please describe. | Multiple open-ended responses | | |
| In the past 10 years, has your organization been exposed to any types of disasters? (Check all that apply). | Airline<br>General Aviation<br>Natural Disaster | 11.4<br>68.6<br>48.6 | 4<br>24<br>17 |
| Would you be in favor of a program/template that would help your organization initiate a program to assist employees coping with traumatic events (deal with what they have witnessed) in the course of responding to a disaster? | Yes<br>No<br>Don't Know | 62.5<br>9.4<br>28.1 | 40<br>6<br>18 |

The airport locations were divided among Alaskan, Central, Eastern, Great Lakes, New England, Northwest Mountain, Southern, Southwest, and Western Pacific regions . Type of Airport (based upon FAA criterion) included general aviation, non hub, small hub, medium hub, and large hub. The yearly enplanements included the following choices: no enplanements, less than 100,000 enplanements, 100,001 to 250,000 enplanements, 250,001 to 500,000 enplanements, and over 500,000 enplanements. The survey had 64 respondents which covered all regions except Alaskan and all types of airports and enplanement categories. In addition, exposure to natural, airline and general aviation disasters within the preceding ten years was recorded.

The first question that respondents answered was the following: "In regard to your Airport Emergency Plan (AEP), does your airport currently have any formal or informal program(s) designed to deal exclusively with the mental health trauma that employees may face after responding to an aircraft accident or natural disaster?" Thirty-six respondents indicated they do currently have a program in place to deal with employee mental health traumas post-accident, while 28 indicated that they do not have such programs. It should be noted that no definition of a "formal or informal program" was used within the survey, and the interpretation was left up to the respondent. It is possible there are wide variances between the structures and types of programs amongst those answering in the affirmative.

Secondly, a question asked was the following: "Would you be in favor of a program/template that would help your organization initiate a program to assist employees coping with traumatic events (deal with what they have witnessed) in the course of responding to a disaster?" Forty respondents indicated they would be in favor, with six not in favor and 18 uncertain. There was no significant difference between those organizations who had post-disaster mental health trauma programs in place and those who did not with regard to being in favor of implementing such a program,

$\chi^2$ (2, $N$ = 64) = .666, $p > .05$.

Within the preceding 10 years, airports who had experienced an airline disaster (n = 4), a general aviation disaster (n = 24), or a natural disaster (n = 17) reported no group differences in their preference for wanting post-disaster mental health programs, respectively.

$\chi^2$ (2, $N$ = 64) = 4.693, $p = .096$; $\chi^2$ (2, $N$ = 64) =1.233, $p > .05$; and, $\chi^2$ (2, $N$ = 64) = .205, $p > .05$,

Airport location, classification and number of annual enplanements also demonstrated no group differences with regard to favoring or not favoring the creation of a program,

$\chi^2$ (14, $N$ = 64) = 16.261, $p > .05$; $\chi^2$ (8, $N$ = 64) = 5.908, $p > .05$; and, $\chi^2$ (8, $N$ = 64) = 4.388, $p > .05$.

Interestingly, 36 of 64 (56%) respondents reported they already have a mental health recovery program in place at their airport. This does not seem to be congruent with the larger study's findings in the field. These results could possibly be explained with a wide variance of definitions as they pertain to a mental health recovery programs. For instance, it is possible that an airport may simply have a clause in their emergency plan to have employees contact the Red Cross or the Employee Assistance Program (EAP) should they encounter mental health trauma. While this may be a productive measure, it may not be comprehensive enough to completely assist employees with their own resiliency and would not be considered a "classic" mental health recovery program.

The majority of respondents feel a mental health recovery program is a worthwhile addition to their plan (62.5 %). This perception held true irrespective of whether the airport already had a plan in place or not and whether they had experienced an aviation or natural disaster within the past 10 years. Only 9.4% did not favor the idea of such a program, with 28.1% unsure.

From the data, it appears most airports would be open to some type of guidance on how to implement a mental health recovery program and integrate it within their emergency plan. Regarding the favorability of implementing a program, extensive regulation or cumbersome application could be the reason for the higher number of "unsure" respondents. However, a formal definition of such a plan would have to be thoroughly developed and applied in order to alleviate burdensome obstacles in implementation. This definition could also increase the robustness of currently implemented plans, whether they are simplistic or involved. In any event, further study into the issue of mental health recovery programs would generate more focused data of a recovery program as they operationally defined.

## RECOMMENDATIONS

In spite of the many defensive strategies and sound operating techniques employed, catastrophic aviation-related disasters occur. As any industry practitioner knows, it is vital to prepare for such events. Most preparation is aimed squarely on loss-of-life mitigation, scene preservation, and ultimately scenario reconstruction. However, an aspect that often gets overlooked involves the mental health monitoring, maintaining, and resilience of air carrier and airport employees. As with any critical incidence response, maintaining functional employee mental health is a vital component, and should be given due consideration prior to the occurrence of a catastrophic event.

Throughout the aviation industry, there are many different management structures in place at airports and air carriers. Delineating factors between such structures include size, resources and number of employees. Clearly, a large organization with several thousand employees will have different resources available than smaller operations with an employee or two. Irrespective of an organization's scope, there are several critical planning tasks the research team developed that should be common to all MHRPs and should be implemented as part of critical incident response plans. These tasks are defined below and outlined in figure 1.

**Step 1. Awareness and Cultural Integration**

The first planning task of all organizations should simply be making all employees and any affected individuals aware that the organization will now be implementing a MHRP. Ideally, this should be stated in an employee manual or Airport Master Plan (AMP). The concept should be introduced and emphasized via several communication channels including verbal, signage and written policy. By engaging in such emphasis, the concept of an MHRP can become interwoven with the organization's culture. In addition, this emphasis may help alleviate (but probably not eliminate) some of the well-documented phenomenon wherein some individuals are resistant to receiving mental health assistance.

**Step 2. Assessment of Mental Health Resource Availability**

In any disaster planning endeavor, it is critical to determine exactly what resources are available and which employees will be responsible for each of the necessary tasks. As previously discussed, most planning efforts focus on loss-of-life mitigation and scene preservation. As part of an MHRP, determining who will be responsible for overseeing the psychological-monitoring of the plan is equally important. Ideally, a licensed mental health practitioner who is employed by the organization would be the key person; however, it is very unlikely any organization would have the luxury of having such a person on staff.

However, almost all organizations have access to Employee Assistance Programs (EAPs). An EAP is a program in which employees have confidential access to mental health providers to help them through psychologically stressful events, like chemical dependence issues and traumatic personal events. Usually, these programs are accessed when an employee needs help and is willing to make first contact. In the case of implementing an MHRP, it is recommended that an EAP take more of a proactive status and actually seek out employees as part of the organizational team. Federal, state or locally governed organizations may be able to utilize a government sponsored EAP (at least for the purposes of use during catastrophic events). Even if an organization does not currently have access to an EAP, it is highly recommended the organization contracts with some mental health entity for the purposes of implementing an employee MHRP during critical incidents.

**Step 3. Embedding Mental Health Practitioners**

Many current mental health monitoring programs in place make use of peer-to-peer sessions, often termed "debriefings" or "defusings." Without a doubt, sound operating practices dictate that logistical and progress briefings be made so as to ensure all personnel maintain the appropriate levels of awareness and situation status.

At issue is the possibility of an employee experiencing Post Traumatic Stress Disorder (PTSD). The current evidence indicates that unless an employee experiencing PTSD is assessed and treated by a licensed mental health provider, an untrained peer counselor could potentially exacerbate the stress levels (albeit unintentionally) of the employee and prolong the PTSD episode. It is important to note that some employees report they greatly desire a peer-to-peer model, and believe such models have helped them in the past. However, the findings from the present study seem to belie this notion with some people and certainly demonstrate the requirement for more investigation into whether or not peer-based interventions should become the preferred treatment method.

In some cases, there is a stigma attached to seeking out professional mental health support from licensed providers. Given that the efficacy of peer-to-peer counseling is questionable at best, there seems to be a conundrum; how does an employer provide mental health assistance for their employees during a crisis when there is apprehension about seeking a professional and a peer may be unqualified to help? In order to overcome both obstacles, it is recommended that the employer embed licensed mental health professionals, preferably from the organization's EAP, as part of the internal team involved in a crisis. These professionals should literally "walk the scene" with all of the employees as everyone goes about their business of dealing with the catastrophe. Using this model as a component of a MHRP has proven to be effective and accepted by most employees as consistently demonstrated through the qualitative analysis of the project.

**Step 4. Preparations of the Mental Health Provider**

The embedded mental health provider should acquaint themselves with all of the available assessment and therapeutic techniques recognized as efficacious when treating PTSD or other associated trauma. A comprehensive and topical review of PTSD treatment for air carrier or airport crises can be found with the entire research document at the ACRP website http://www.trb.org/news/blurb_browse.asp?id=86.

**Step 5. Employee Training Program**

As part of the planning activities, all employees should be taught basic crisis management techniques and how to recognize PTSD symptoms. While peer-to-peer counseling should be limited, knowing how to recognize some symptoms in co-workers and advising the embedded mental health team member of such signs could prove helpful. In addition, a basic description of the cause, prognosis if left untreated, and long-term care principles regarding traumatic stress should be emphasized.

**Step 6. Establishment of a Mutual Aid Assistance Program**

Some airports participate in mutual aid groups whereby in the event of a natural crisis (hurricane, flood, etc.) other airports not affected will send personnel to staff critical functions. Certainly, this gives the ability for the airport to function; and, often airports are a vital asset during natural disaster recovery efforts. However, there is also a mental health component to participating in a mutual aid pact. Employees who work at an airport experiencing a natural disaster are often affected by the same disaster in their personal lives. They may be caught in a dilemma between continuing to work so as to support the airport's function or abandoning their posts so that they can deal with their own families and personal situations. By participating in a mutual aid group, an organization could help enable employees to deal with their personal situations and not make a difficult, stress-inducing decision between work and family.

This study identified two groups in existence at present. They are the Western Airports Disaster Operations Group (WESTDOG) and the South East Airports Disaster Operations Group (SEADOG). Contact with WESTDOG can be made through the Dallas-Ft. Worth International Airport (DFW) and contact with SEADOG can be done through Pensacola International Airport (PNS), Savannah/Hilton Head International Airport (SAV), or the Gulfport-Biloxi International Airport (GPT). Presently there are no known mutual aid programs between air carriers, and it is unlikely one could emerge due to competitive issues, operational complexities and regulatory oversight. However, intra-company mutual aid pacts should be considered between stations.

**Step 7. Assimilating the MHRP into Critical Incident Response Training**

The final step is to fully integrate MHRP concepts into any disaster/incident training undertaken by the organization. In the event of full-scale disaster simulations, the MHRP should also be simulated, practiced and evaluated so as to equip an organization with the necessary knowledge prior to an actual catastrophic event. As an example of such training, an organization could designate some employees to play a role of an overstressed employee by having that person exhibit certain symptoms that should be recognized by peers and evaluated by the embedded mental health provider.

The following figure outlines each of the steps for the planning phase of a MHRP.

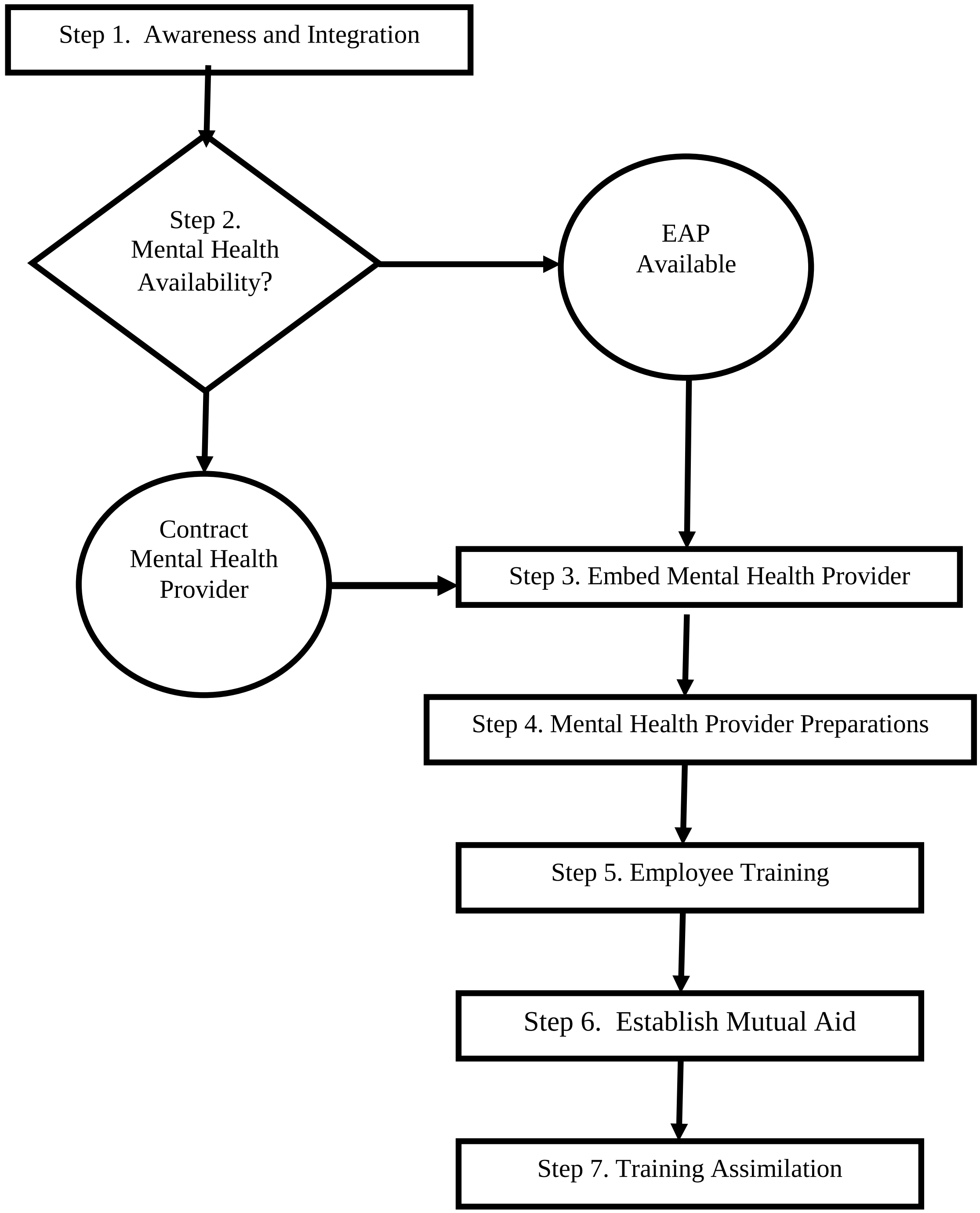


*Figure 1.* Mental Health Recovery Program Planning Steps

## CONCLUSION

Lastly, there is “no one size fits all” approach. Therefore careful consideration of an organization’s employee perceptions and post-event mental health status, and the organizational structure, culture, and communication network is critical in framing an appropriate response to the traumatic event and realizing the best possible course of action for all involved. Many state and federal organizations do posses well-vetted MHRPs, it is paramount that each entity gathers all the needed information to carefully craft their individual plan and to assess how that plan will enhance their employee’s resiliency in the face of trauma.

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# Investigating the Applicability of Multiple Intelligence Theory in Pilot Assessment and Training

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## ABSTRACT

This investigative paper and research explores the Theory of Multiple Intelligence (MI) as defined by Gardner (1983, 1999) and its applicability in the assessment and education of commercial pilots. Multiple intelligence theory proposes that individuals have eight distinct intelligences with strengths in one or more of the intellects. The authors suggest that MI theory is more useful in describing cognitive processes in aviators than singular (IQ score) or general intellect theories. Beyond just describing cognitions, MI theory could be used to improve pilot training by expanding on educational methods suggested by the Federal Aviation Administration (FAA). Currently, most instructional methods for pilots are traditional in nature, which utilize lectures, cognitive-behavioral techniques, and one-on-one tutorial lessons. MI theory has rarely been applied to the design of aviation education (Craig & Garcia, 2001). To determine a pilot's intelligence profile, the Multiple Intelligence Developmental Assessment Scale (MIDAS) was utilized in this investigation. From a sample of 31 professional aviators and 55 college flight students a common MI profile became evident. A descriptive analysis of the MIDAS scores indicated that both professional pilots and flight students scored high on Intrapersonal and Spatial Intelligence. The "pilot profile" found in this investigation replicates past research in the development of the MIDAS. Because most pilots in this study have similar profiles, educational programs could capitalize on these intellectual strengths. Furthermore, if a flight student scores low on important intellectual strengths for flight, instructional and learning strategies could be implemented to match the student's intellectual strengths.

## INTRODUCTION

What does it mean to be intelligent or how is one person more intelligent than another? "Because intelligence is assessed by members of a society, its conceptualization often takes several forms that can vary according to when, where, and how the assessment occurs" (Davidson & Downing, 2000, p. 34). Aviation has its own conceptualizations of pilot intelligence, which are often reflected in the various testing practices and evaluations that most pilots go through. The first battery of mental tests can be traced back to Sir Francis Galton during the late 1800s (Gregory, 2004; Kaufam & Lichtenberger, 1999). Galton studied gifted individuals and he believed that since people take in information through their senses the most intellectual person would have the greatest perceptual ability (Kaufam & Lichtenberger, 1999). The actual term "mental test" was not conceived until Cattell published his research in 1890 (cited in Gregory, 2004). Much of Cattell's work relied on Galtonian concepts. However, he incorporated some added features including the strength of a person's handshake, hypothetically indicating an individual's mental power. Surprisingly, these early mental tests were not scientifically scrutinized until 30 years later. Eventually, researchers tried to predict academic performance through the testing of sensory discrimination and reaction times (Wissler, 1901). Being unable to find positive correlation between test scores and academic achievement, Galtonian theories began to lose their appeal.

Early in the 1900's, Alfred Binet was asked by the French government to find a way to determine which students would not benefit from regular instruction (Armstrong, 2000; Gregory, 2004). Binet's assessment marked the first formal scale for measuring intelligence in children and was the beginning of modern intelligence testing (Gregory, 2004). In 1916, Terman and associates began revising the Binet-

Simon Intelligence Scales to produce the Stanford-Binet intelligence test and the resultant IQ (Intelligence Quotient) score. This swept through American intelligence testing and became one of the most popular and debatable subjects in psychology. The singular concept of IQ, or “g”, would be “etched” into intelligence testing for decades (Shearer, 2004a).

There are many ways to define intelligence (Wolman, 1985) and conceptually, intelligence can be whatever the mental test is attempting to measure (Boring, 1923). Many intelligence models that describe intellect through the lens of cognitive and physiological components are often identified as “IQ” (Davidson & Downing, 2000; Kaufam & Lichtenberger, 1999; The Psychological Corporation, 1997). Dissatisfied with the unitary view of intelligence (IQ), Howard Gardner proposed the theory of multiple intelligence (Gardner, 1983, 1993). Gardner (1999) defines intelligence as, “a biopsychological potential to process information that can be activated in a cultural setting to solve problems or create products that are of value in a culture” (p. 34).

Gardner’s definition of intelligence incorporates easily into aeronautical terms (Overchuk, 2008a, 2008b, 2008c). “Pilots are part of a unique culture (commercial aviation and aviation as whole) and they must continually process information to solve novel problems. A pilot must also deliver a service (product) that is reliable, yet maintain a balance between safe operations and reliability. These pilot potentials are highly valued by society and the flying public” (Overchuk, 2008a, p. 10).

Gardner initially suggested the existence of seven intelligences (Gardner, 1983). In 1999, he increased the number to eight distinct intelligences: Linguistic, Logical-mathematical, Spatial, Kinesthetic, Musical, Naturalist, Interpersonal and Intrapersonal (Gardner, 1999).

Linguistic intelligence is the “intellect of words” (Armstrong, 1999). People with this type of intelligence tend to be lawyers, editors, journalists, and educators (Armstrong, 2000; Shearer, 2004b). Logical-mathematical intelligence is the ability to use numbers successfully, reason well, and to have strong problem solving skills (Armstrong, 2000). This form of intelligence is found in scientists, pilots, accountants, and philosophers (Armstrong, 1999). Spatial intelligence is the ability to think in pictures and images. Individuals with this intelligence can transform and recreate different aspects of the visual-spatial world through mental imagery. Professions requiring strong spatial skills include aviation, architecture, and mechanical engineering.

Body-Kinesthetic intelligence is an expertise in using one’s whole body to express feelings, ideas, and to manipulate objects in goal directed behaviors (Armstrong, 2000; Shearer, 2004b). Surgeons, karate masters, athletes, and mechanics usually possess strong body-kinesthetic intelligence. Musical intelligence is the ability to perceive, appreciate, and produce different types of melodies. Individuals strong in this intelligence are sensitive to pitch, timber, and tone (Armstrong, 1999). People possessing strengths in this area compose music and tend to be music teachers (Lazear, 1991).

Interpersonal intelligence is the ability to detect the moods, feelings, intentions and to understand other people (Armstrong, 1999). Individuals with interpersonal intelligence tend to be successful educators, counselors, and psychologists. Intrapersonal intelligence is the capacity to think about thinking. Essential functions of this intelligence include goal-setting, self-appraisal, self-monitoring/correction and emotional self-management (Shearer, 2004b). Introspection and self-regulation are key features of this intellect. A person with a strong intrapersonal intelligence can be successful in most endeavors including careers in aviation, education, law enforcement and theology (Shearer, 2007). The final intelligence is the Naturalist. This intellect gives one the ability to empathize, recognize, and understand natural things (plants, animals, and biology). Naturalists have a sensitivity toward natural phenomenon, such as cloud formations and weather patterns (Armstrong, 2000).

People can have strengths in one or more of the eight intelligences and the intellects interact uniquely for each individual (Armstrong, 2000). Gardner suggests that it is better to describe intellect as those independent and interacting intellectual capacities (eight intelligences), because it will be more useful to educators than an enormous collection of sensory-perceptual modules or a single "all-purpose" intelligence (Gardner, 2006; Gardner & Moran, 2006). For example, sensory-perceptual and information processing theories explain human learning through a variety of models. These models emphasize that the human brain can be conceptualized as a computer (Anderson, 1995; Federal Aviation Administration, 2008). To the author's, these theories make important contributions to the science of learning. In general, these models stress the interplay of the sensory register, short-term memory, and long-term memory. Deep learning does not occur until information is successfully transferred to long-term memory. The use of Multiple Intelligence theory with related instructional and learning strategies may enhance this transfer. The theory of Multiple Intelligence validates what many educators' experience in the classroom (Chen, 2004; Kornhaber, 2004; Ucak, Bag, & Usak, 2006). Simply put, students learn and think in many different ways and complicated sensory perceptual models or all-purpose intelligence scores may not provide the instructor with enough information about the diverse learning requirements of his/her students. MI theory seems very applicable to flight education because the MI profile can be used as a template to develop lectures, enhance flight instruction strategies and possibly develop teaching/learning strategies based on the instructor's and the student's multiple intelligences (Overchuk, 2008c, 2009). The cognitive sciences do a great job of capturing some features of learning, unfortunately they are "decontextualized" from the process of flight education (Lintern, 1995).

As flight educators and commercial aviation personnel, it seems evident that pilots must utilize more intellectual domains than the culturally valued linguistic and logical-mathematical intelligences. Beyond having excellent flying skills, the pilot must have Interpersonal Intelligence so he/she can work with a multitude of people including, crewmembers, passengers, gate-agents, FAA Inspectors, air traffic controllers and dispatchers, among others. In order for these human interactions to operate smoothly, the pilot must tap into their interpersonal intelligence.

Pilots also need strong Intrapersonal Intelligence because they must self-monitor and self-regulate to stay within FAA regulations, stay vigilant, and to fulfill society's high expectations. In flight, where hundreds of lives are now dependent, these metacognitive abilities become increasingly important. Pilots must assess their personal limitations and abilities especially when navigating in and around adverse weather conditions. Beyond self-monitoring, the pilot must have self-understanding about their emotional and physical status. When emotionally charged events occur, pilots must make critical decisions about their ability to deal with flight operations. Understanding one's physical state is equally important because a pilot's physiological status influences flight safety.

When flying, aviators operate their aircraft in a three dimensional space which requires strong Spatial Intelligence. A pilot must be able to judge distance, anticipate closure rates, adjust decent/ascent rates, and stay oriented with the earth. With no visual cues during poor weather conditions, a pilot must be able to visualize or make mental pictures of their navigational track and position.

A strong understanding of the earth's weather patterns and changing environmental conditions are very important in the safe operation of the flight. To navigate safely through adverse conditions, the pilot must understand the nature and developmental characteristics of weather which is considered Naturalistic Intelligence. Aviators need the ability to discriminate and categorize the differences between hazardous weather patterns and safe cloud formations. The pilot must also be able to manipulate his/her aircraft like a precise instrument; therefore, Body-kinesthetic intelligence becomes important. Aircraft, like many machines, make somewhat predictable noises when they are functioning correctly or incorrectly. A pilot's Musical Intelligence can be used to detect subtle noises and harmonic pitch changes which could indicate possible problems in flight. Detecting rotor sound is particularly important for helicopter pilots. A technique used by some pilots to keep the rotor "on speed" is to listen for harmonic pitch changes in the main rotor system. After detecting the change in sound, the pilot then utilizes instruments to back up his/her interpretation.

Finally, the pilot must have strengths in the traditional and often most valued academic intelligences, Linguistic and Logical Mathematical intelligence. He/she must have Linguistic Intelligence in order to communicate clearly with ATC and the vast number of people involved in commercial aviation. Furthermore, aviation has its own unique language, which is sometimes difficult to master as a beginning pilot. Flying is a very dynamic process with varying challenges and novel problems. A pilot needs the Logical-mathematical intelligence so he/she can solve problems during critical situations. A pilot's Logical Intelligence can range from solving simple fuel calculations to developing innovative solutions to unforeseen emergencies.

The Aviation Instructor's Handbook is the FAA's primary publication suggesting/recommending ways to instruct and assess student pilots (Federal Aviation Administration, 2008). The FAA's publication provides a good overview of the instructional process including, the learning process, teaching strategies, testing methods, and human behaviors. Many of the theories are cognitive-behavioral which can be attributed to Thorndike's work and Bloom's hierarchical taxonomy (Bloom, Mesia, & Krathwohl, 1964; Bye & Henley, 2003). The FAA's instructor handbook also discusses some motivational behaviors and personality theory, with references leaning toward Freud's (1966) Defense Mechanisms, Maslow's (1970) Hierarchy of Needs and Jung's theory of personality (Federal Aviation Administration, 2008).

In an informal polling on the teaching strategies used by undergraduate flight instructors, the authors found that very few if any remembered or employed any teaching methodology suggested by the FAA. In fact, most flight instructors stated that studying for the Fundamentals of Instruction (found in the Aviation Instructor's Handbook) was the most undesirable part of becoming a flight instructor. Most instructors tend to use instructional methods that were taught to them by their instructors or use personal methods which were developed through trial and error. Based on these informal discussions a more applicable instructional and assessment method needs to be explored.

*Purpose of the Study*

In order to investigate the applicability of Multiple Intelligence Theory as an enhancement to aviation assessment and education there is a need to explore whether pilots have a Multiple Intelligence (MI) profile different from other professions. To measure an individual's Multiple Intelligence the Multiple Intelligence Developmental Assessment Scale (MIDAS) was used. This measure was chosen because it was specifically designed for educational assessment. If a distinct "pilot profile" is indicated, educational programs could improve teaching strategies by matching course delivery and presentation to the flight student's intelligence profile. If an aviation student does not match the "typical profile," educators could help students improve the less developed intelligences, they could assist the student in developing learning strategies that fit their intelligence profile, or they could utilize an instructional methodology that would match the student's intellectual strengths.

## METHOD

*Participants*

Eighty-six adult participants were divided into two groups, Professional Pilots and Flight Students. The professional pilot category included both fixed-wing and rotor-wing aviators. Their professional experience included emergency medical service (EMS), the airlines, corporate aviation, the National Test Pilot Academy, and the military. The professional pilot sample consisted of 31 males. Their mean age was 42.6 (SD=10.6). All described themselves as Caucasian, and one identified as Asian. Their average flight experience was 3154 fight hours. The Flight Student sample included 55 adult flight students enrolled in Kent State University's Aeronautics Program. These students were working on certificates and ratings ranging from Private Pilot through Certified Flight Instructor. The sample contained three Hispanic, 47 Caucasian and four selected not to indicate. There were 47 male and eight female students. The mean age was 21.5 (SD=3.4) and the average flight hours were 164.

*Instrumentation*

The MIDAS, was used to measure a participant's Multiple Intelligence strengths. The MIDAS provides information regarding intellectual development, activities, and intellectual predispositions (Shearer, 2007). This assessment also provides information based on an individual's experience, which can be used for assessment, personalized learning, and curriculum design. Results from the MIDAS Profile have been used to formulate personalized educational and career plans through the recognition of intellectual strength and potential. The MIDAS produces eight main scale scores, (Gardner's eight intelligences) indicating ones intellectual skill, knowledge, and developed ability as reported by the test taker. The subscales are a qualitative and descriptive understanding of one's skill within a particular intelligence. There are also three intellectual style scales. These scores indicate one's preferred way to solve problems. Scores from the intellectual styles suggest whether one is more inventive (Innovative Scale), practical (General Logic Scale) or social (Leadership Scale) in problem solving. In addition to the MIDAS, participants were asked to complete a data sheet requesting demographic information, including flight hours, pilot certificates, and career aspirations.

*Procedures*

This study was descriptive in nature and groups were not randomly assigned. Participants were asked to complete an informed consent form, a basic data sheet, and the MIDAS assessment. A description of the study was in the analysis packet and stated that the information gathered from the research was going to be used for educational improvement and the assessment of pilots. No deception was used in this study. To recruit professional pilots, companies were contacted asking for volunteers. Companies that agreed posted sign-up sheets and provided analysis packets for the pilots. NASA Glenn Research Center was also contacted to recruit volunteers from the National Test Pilot Academy. Test pilots who agreed to participate were given analysis packets in class. Flight students at Kent State University were asked to participate in the study for extra credit. All participants were asked to complete the questionnaire and assessment at their leisure and return it to the researcher. All completed assessments were collected and imported into SPSS for analysis. The results were compared to other professions (See Table 5).

## RESULTS

The mean frequency was calculated for all the MIDAS main scales and subscales. Both Professional Pilots and Flight Students scored high on Spatial Intelligence and Intrapersonal Intelligence respectively (See Tables 1-4). Professional Pilots mean scores on Spatial Intelligence was 66.07 (SD = 11.8) and a mean of 65.69 (SD = 11.76) on Intrapersonal Intelligence. Flight Student mean scores on Spatial Intelligence was 63.66 (SD = 13.6) and a mean score of 63.33 (SD = 9.88) on Intrapersonal Intelligence. For Professional Pilots and Flight Students the Subscale mean scores were in the high range on Spatial Problem Solving, Spatial Awareness, Personal Knowledge, and Working with Objects respectively.

## DISCUSSION

The results of this investigation report that there seems to be a "pilot profile." Pilots scored high on Spatial Intelligence and Intrapersonal Intelligence. This suggests that pilots "think in pictures and perceive the visual world accurately" (Shearer, 2007, p. 31). Pilots prefer to think in three dimensions and transform perceptions by re-creating one's visual experience via imagination. Pilots also report thinking about and understanding themselves by knowing their strengths and weaknesses, thus helping them plan effectively to achieve a goal. On the subscales, Professional Pilots and Flight Students employ the same four skills used within a particular intelligence. Pilots' indicated self-awareness in solving problems and spatial orientation dilemmas while moving self and objects through space. Pilots have an awareness of their ideas and the abilities to achieve personal goals. Furthermore, pilots report the ability to build, fix, and assemble things.

These reported intelligences or strengths seem very relevant to success in aviation. A pilot must be able to think and solve spatial problems while flying. There are important goals to achieve during flight making self-awareness an essential factor in the decision-making process. Pilots also must understand the mechanical function, interactions, and design of their aircraft. Having these intelligences is equally important for aviation education since pilots train for accuracy in flight and must have a strong understanding of aircraft systems. In theory, if a person is already strong in these intelligences then they may have an easier time with the current educational model used in aviation training.

The MI profile for pilots found in this study replicates other research conducted using the MIDAS (Shearer, 1996). Different professions seem to have their own unique profiles (Shearer, 2007). For example, music teachers tend to score high on Musical Intelligence, Linguistic Intelligence and Intrapersonal Intelligence respectively (see Table 5). They also have similar strengths within each intelligence which are quite different from the strengths indicated by pilots in this investigation.

Flight instructors will encounter different learning styles and differing abilities among their students. At present, it appears that little pre-assessment of a student's intellectual capabilities or learning styles are ever conducted. Most often, students must conform to the instructional techniques and methodologies used by their flight instructors. This learning is not always a simple transfer of knowledge, but involves the students ability to interact with the learning environment (Lintern, 1995). This interaction is done through a flight student's intellectual strengths and learning styles. Educators, including flight instructors, typically teach within their intelligence profile and learning style (Kallenbach & Viens, 2004). This teaching method (or comfort) does not always match the student's intellectual preference. Therefore, it is just as important for the flight instructor to know his/her own multiple intelligence profile as it is to know that of their students (Green & Tanner, 2005; Kallenbach & Viens, 2004). The idea of understanding oneself and his/her student is suggested by the FAA (Federal Aviation Administration, 2008). According to the FAA (2008), "The match or mismatch between the way an instructor teaches and the way a student learns contributes to student satisfaction or dissatisfaction. Students whose learning styles are compatible with the teaching styles of an instructor tend to retain information longer, apply it more effectively, learn more, and have a more positive attitude toward the course in general" (p. 3).

It seems that many flight instructors have limited knowledge of instructional strategies that they could use in various situations. They may also lack actual teaching experience which tends to become increasingly evident as flight instructors get hired by the airlines with minimal flight hours (Henley, 1991). Based on the results of this research, it appears that a possible reason why flight students complete their flight education is that their multiple intelligence profiles (or intellectual strengths) may be closely related to their instructors. The mean scores from the 86 participants in this investigation indicated that a pilot's intelligence strengths are located in the Spatial, Intrapersonal and Logical-mathematical domains (See Tables 1- 4). There are also similarities found in the learning styles of pilots (Kanske & Brewster, 2001). Research further suggests that gender differences relating to personality within the pilot population are less than what exists between males and females found in national norms outside of aviation (King, 1999).

In theory, if pilots have similar intelligence profiles, and are successful because of these intellectual similarities, then it may be that some students not fitting this profile may discontinue flight training due to frustration. A student may feel that he/she does not possess the "Right Stuff." Where, in reality, the learning material may have been presented poorly, the educational system may inadvertently be skewed toward a typical MI pilot profile, or the student may not have an awareness of the learning and study strategies necessary to capitalize on their intellectual strengths to assist them in succeeding in flight training.

From these observations and preliminary findings, the theory of multiple intelligences may be a very functional model to assess and educate aviators. Upon further research, it is possible that MI Theory could be included in the FAA's Flight Instructor Handbook. Instructional methodologies could be implemented to fit the "typical" pilot profile or be altered to fit more diverse MI Profiles. Based on the results of this investigation, it appears that MI theory may be more useful than some other psychological assessments because it does not overly rely on complicated terminology. Because of this, individuals new to flight instruction can easily grasp the concepts. Additionally, these concepts can be integrated with instructional and learning strategies to greatly enhance flight instruction and training.

This is the first in a series of investigations focusing on the use of multiple intelligence theory in improving aviation education. Future studies will include determining the instructional and learning strategies appropriate for enhancing learning for each of the intelligences. In addition, studies have recently begun exploring the effects of matching students and instructors with similar Multiple Intelligence profiles.

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## APPENDIX

Table 1. *Flight Student Main Scale Descriptive Statistics*

| Intelligence Scales | Mean | Standard Deviation |
|---|---|---|
| Spatial | 63.66 | 13.63 |
| Intrapersonal | 63.33 | 9.88 |
| Interpersonal | 59.71 | 12.29 |
| Kinesthetic | 57.65 | 12.86 |
| Logical | 56.82 | 14.34 |
| Naturalist | 54.32 | 15.48 |
| Linguist | 51.58 | 14.61 |
| Musical | 45.06 | 17.54 |

N = 55

Table 2. *Professional Pilot Main Scale Descriptive Statistics*

| Intelligence Scales | Mean | Standard Deviation |
|---|---|---|
| Spatial | 66.07 | 11.80 |
| Intrapersonal | 65.69 | 11.77 |
| Logical | 61.93 | 13.59 |
| Naturalist | 52.05 | 12.85 |
| Interpersonal | 51.04 | 17.68 |
| Linguist | 50.15 | 14.79 |
| Kinesthetic | 45.71 | 11.67 |
| Musical | 38.57 | 20.79 |

N = 31

**MIDAS Scale Score Categories for all Tables:**
100 - 80 = Very High
79 - 60 = High
59 - 40 = Moderate
39 - 20 = Low
19 - 0 = Very Low

Table 3. *Flight Student Descriptive Statistics of Subscales*

| Intelligence Subscales | Mean | Standard Deviation |
|---|---|---|
| Spatial Problem Solving | 72.55 | 16.18 |
| Spatial Awareness | 72.09 | 16.35 |
| Personal Knowledge | 68.12 | 14.17 |
| Working with Objects | 67.61 | 15.55 |
| Problem Solving | 64.55 | 19.39 |
| Social Persuasion | 64.24 | 16.95 |
| General Logic | 63.93 | 10.97 |
| School Math | 61.36 | 26.47 |

N = 55

Table 4. *Professional Pilots Descriptive Statistics of Subscales*

| Intelligence Subscales | Mean | Standard Deviation |
|---|---|---|
| Spatial Problem Solving | 79.84 | 13.51 |
| Spatial Awareness | 79.03 | 14.91 |
| Personal Knowledge | 69.25 | 12.97 |
| Working with Objects | 67.56 | 13.06 |
| School Math | 65.19 | 28.02 |
| Problem Solving | 64.91 | 18.50 |
| General Logic | 63.75 | 12.48 |
| Social Persuasion | 60.35 | 20.88 |

N = 31

Table 5. Comparison of Different Professions on Main scale and Subscale MIDAS Scores (Shearer, 2007)

| | **Pilots** | **%** | **Engineers** | **%** | **Lawyers** | **%** | **Business Consultants** | **%** |
|---|---|---|---|---|---|---|---|---|
| **Main scales** | Spatial | 67 | Math-Logic | 64 | Linguistic | 69 | Interpersonal | 70 |
| | Intrapersonal | 66 | Intrapersonal | 63 | Intrapersonal | 61 | Intrapersonal | 69 |
| | Math-logic | 62 | Spatial | 61 | Interpersonal | 60 | Math-logic | 60 |
| **Subscales** | Spatial Problem Solving | 81 | School Math | 80 | Writing/ Reading | 81 | Personal Knowledge | 79 |
| | Spatial Awareness | 80 | Spatial Problem Solving | 71 | Persuasion | 70 | Persuasion | 77 |
| | Personal Knowledge | 69 | Calculations | 69 | Rhetorical | 68 | Management | 75 |
| | Science | 68 | Spatial Awareness | 67 | Personal Knowledge | 68 | Work with People | 73 |
| | Work with Objects | NA | Personal Knowledge | 63 | Self Effective | 67 | Self Effective | 70 |

| | **Phys. Assts.** | **%** | **Naturalists** | **%** | **Educators, PhD** | **%** | **Music Teachers** | **%** |
|---|---|---|---|---|---|---|---|---|
| **Main scales** | Linguistic | 71 | Naturalist | 71 | Interpersonal | 72 | Musical | 74 |
| | Interpersonal | 69 | Intrapersonal | 61 | Linguistic | 71 | Linguistic | 69 |
| | Intrapersonal | 65 | Math-logic | 58 | Intrapersonal | 66 | Intrapersonal | 59 |
| **Subscales** | Writing/ Reading | 83 | Writing/ Reading | 79 | Management | 83 | Instrumental | 86 |
| | Management | 75 | Science | 70 | Writing/ Reading | 82 | Writing/ Reading | 79 |
| | Work with People | 74 | Personal Knowledge | 65 | Persuasion | 81 | Composing | 77 |
| | Spatial Problem Solving | 84 | Spatial Problem Solving | 63 | Work with People | 79 | Music Appreciation | 74 |
| | Social Awareness | 73 | Spatial Awareness | 63 | Personal Knowledge | 78 | Expressive Sense | 70 |

# Student Perceptions of Effective College Teachers

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## ABSTRACT

Being an effective college teacher is typically a major goal of all faculty, especially junior faculty on the tenure-track. As a new tenure-track faculty member interested in improving his teaching skills (and student ratings), the author surveyed aerospace students at Middle Tennessee State University over a three-year period to gain insight into what students consider to be an effective college teacher. The author's findings reveal that students prefer fun and interesting classes where material is clearly explained and reviews and study guides are provided to help students better prepare for tests. Students also most benefit from courses taught by motivated and passionate professors who make the class fun and interesting by incorporating a great deal of hands-on activities and group discussion. Further, they dislike a boring/monotone professor who lectures the entire class period and is unable to clearly explain the material. Finally, students value professors who are passionate and have a sincere desire to teach, show real respect/caring for students, and are knowledgeable of the subject they are teaching.

## INTRODUCTION

"There is no single 'best way' to teach" (Bain, 2004, p. 175).

As a relative newcomer to academia (beginning his fourth year), the author has been very interested in improving his abilities as an educator. Texts with titles such as, "Teaching First-Year College Students" (Erickson, Peters, & Strommer, 2006) were in large part, his guiding light during these early years. During this same time, however, the author was introduced to student evaluations. In essence, he was told, the students in his classes would evaluate his teaching effectiveness (in addition to possible peer evaluations). It became apparent that these student evaluations would need to be included in his Tenure and Promotion portfolio and would be relied upon to a great extent in measuring his teaching effectiveness. This concerned the author, as he had no idea how effective a teacher he was, nor how to improve upon his teaching. Thus, he began a three-year research effort to obtain information to supplement the formal student evaluations conducted in his classes and to improve upon his teaching.

## REVIEW OF LITERATURE

The author's research on this topic uncovered numerous texts focusing on effective teaching and effective student learning (Bain, 2004; Berk, 2002; Brookfield, 1990; Davis, 2009; Haile, Lang, 2008; McKeachie & Svinicki, 2006; Nilson, 2003; Timpson, Burgoyne, Jones, & Jones, 1997). The majority of these texts focus on effective teaching and/or effective student learning with an emphasis on what the professor should do, become, or include in their courses to reach students and enable these students to not only learn the material, but to enjoy the process and become lifelong learners as a result. Of particular value in not only improving his teaching, but also understanding students and their needs, is the text entitled "McKeachie's Teaching Tips," by McKeachie and Svinicki (2006). Currently in the 12$^{th}$ edition and with a number of chapters contributed by experienced educators, this book contains guidance on topics such as course preparation, making lectures more effective, assessing and evaluating, motivating students, incorporating technology in the classroom, and teaching large classes. As McKeachie (2006) points out in the introduction, however, "There is no one best way of teaching. If you are to continue to develop as a teacher, you will need well-practiced skills, but you also need fresh thinking about why some things worked or didn't work in your last class" (p. xviii). His book indeed provides that "fresh thinking" on this topic.

Additionally, there is a wealth of articles on the subject of effective teaching. Particularly helpful to the author were a series of articles by Rebecca Brent and Richard Felder, most of which appeared in *Chemical Engineering Education*. In one such article, entitled "Things I Wish They had Told Me," (Felder, 1994), the author endeavored to guide new faculty and prevent many of the typical mistakes made during the first few critical years. Regarding teaching, the author suggests finding a teaching mentor to work closely with. Additionally, he suggests:

- When teaching a class, give students something active to do at least every 20 minutes.
- Learn to identify students in your classes and greet them by name when you see them in the hall.
- Grade tough on homework, easier on time-bound tests.

As a new junior faculty member, the author reasoned that effective teaching would lead to effective student learning. Interestingly, he was introduced to a text on this very subject during the new faculty orientation held at Middle Tennessee State University (MTSU) in fall 2006. The text, authored by Ken Bain (2004), was appropriately titled, "What the Best College Teachers Do." Dr. Bain is currently Vice Provost for Instruction and Director of the Research Academy for University Learning at Montclair State University. He has been the founding director of four major teaching and learning centers: the Center for Teaching Excellence at New York University, the Searle Center for Teaching Excellence at Northwestern University, the Center for Teaching at Vanderbilt University, and the Research Academy for University Learning at Montclair State University.

His book details the findings of a 15-year study of 100 collegiate educators defined as the "best." "All had achieved," he explains, "remarkable success in helping their students learn in ways that made a sustained, substantial, and positive influence on how those students think, act, and feel" (Bain, 2004, p. 5). Although the study involved countless hours of observations, conversations, examination of course syllabi, assessments, and samples of student work, the research team also acquired data from students, insisting on "evidence that most of their students were highly satisfied with teaching and inspired . . . to continue to learn" (p. 7). As Bain (2004) notes, "if students emerged from the class hating the experience, they were less likely to continue learning, or even retain what they had supposedly gained from the class" (p. 7). His study concluded that:

- Without exception, outstanding teachers know their subjects extremely well. They are all active and accomplished scholars, artists, or scientists (p. 15).
- Exceptional teachers treat their lectures, discussion questions, problem-based sessions, and other elements of teaching as serious intellectual endeavors as intellectually demanding and important as their research and scholarship (p. 17).
- Simply put, the best teachers expect more (p. 18).
- While methods vary, the best teachers often try to create what we have come to call a 'natural critical learning environment.' In that environment, people learn by confronting intriguing, beautiful, or important problems, authentic tasks that will challenge them to grapple with ideas, rethink their assumptions, and examine their mental models of reality. These are challenging yet supportive conditions in which learners feel a sense of control over their education; work collaboratively with others; believe that their work will be considered fairly and honestly; try, fail, and receive feedback from expert learners in advance of and separate from any summative judgment of their effort (p. 18).
- Highly effective teachers tend to reflect a strong trust in students. They usually believe that students want to learn, and they assume, until proven otherwise, that they can (p. 18).
- All the teachers we studied have some systematic program -some more elaborate than others –to assess their own efforts and to make appropriate changes (p. 19).

## METHODOLOGY

### Purpose

This research effort was designed to elicit student feedback regarding the aspects of a course and the qualities of a professor considered valuable. In essence, the purpose of this research was to gain insight into what students consider to be an effective college teacher. To accomplish this, student responses were sought to the following four research questions:

1. What can I do to help you do your best in this course?
2. Think about a course you've taken in the past that worked really well for you. What was it about the course that made it work?
3. Now think about a course that didn't work so well. What was it about the course that made it work not so well?
4. What do you value in a professor?

### Participants

The potential participants in this longitudinal, qualitative study included all Aerospace students enrolled in one of the author's Junior- or Senior-level Aerospace courses at Middle Tennessee State University during the 2006-2007, 2007-08, and 2008-09 academic years. These courses included Airline Management, Airport Management, Airport Planning & Design, FBO Management, and Flight Safety. Rather than any of these courses being a "core" course required of all Aerospace students, the majority of those enrolled in these courses were Aerospace Administration (Management) majors, although other Aerospace majors were also represented (such as Dispatch & Scheduling, Professional Pilot, Maintenance Management, and Technology).

There were a total of 394 students included in the study. However, 29 of these students were in two of the author's classes simultaneously; thus, their responses were only counted once. This resulted in a total 365 unique student responses. It should be noted, however that some student answers bridged across several themes and thus the total number of themes does not equal the total number of unique student responses.

### Survey Instrument

Students were asked to answer the four open-ended questions previously noted on an index card during the first day of class each semester. In addition to answering these questions, students were asked to provide their name, hometown, major/concentration, reason for signing up for the course, number of hours working each week this semester, the extent of aviation industry experience they may have, and what they anticipate might be difficult for them in the course. Providing any of this information was optional for students, although the vast majority chose to respond to all items.

### Analysis

This research effort only collected qualitative data from students. As a result, content analysis was the method used to analyze the data. Specifically, once all responses were input into a Microsoft Word table, the author read each individual response and developed themes (or categories) for these responses. These themes then allowed a comparison of responses in a more organized fashion.

### Limitations

Due to the adoption of a convenience sampling technique, only Junior- and Senior-level Aerospace students attending one of the author's Aerospace courses at Middle Tennessee State University from 2006 to 2009 were included in this study. Therefore, no inferences can be drawn from these results to the population of collegiate aviation students nationwide.

## RESULTS

1. What can I do to help you do your best in this course?

| Theme | Number of Responses |
|---|---|
| Clearly explain material | 71 |
| Reviews/Study Guides | 54 |
| Make it fun/interesting | 45 |
| Clear expectations | 37 |
| Relate to real-world | 26 |
| Be available | 25 |
| Use visuals/Powerpoints | 21 |
| Post/make available slides/lecture notes | 12 |

| Theme (cont'd) | Number of Responses |
|---|---|
| Personable/Encouraging/Flexible | 12 |
| Hands-on activities/Experiential learning | 11 |
| Ask/Answer questions | 10 |
| Appropriate pace | 9 |
| Help students | 8 |
| Minimal work required | 6 |
| Good grade/able to graduate | 3 |
| Discuss career opportunities | 1 |

2. Think about a course you've taken in the past that worked really well for you. What was it about the course that made it work?

| Theme | Number of Responses |
|---|---|
| Fun/interesting | 52 |
| Hands-on activities/exp learning/discussion/groups | 49 |
| Motivated/energetic/passionate/ humorous professor | 44 |
| Reviews/study guides | 29 |
| Practical application/relate to real-world/experience | 28 |
| Visuals/Powerpoints | 19 |
| Clear expectations | 17 |
| Clearly explained material | 16 |
| Laid-back professor | 14 |
| Student enjoyed subject | 13 |
| Organized/knowledgeable/well-prepared professor | 13 |
| Minimal work required/low expectations | 11 |
| Slides/Lecture notes posted on-line/made available | 7 |
| Verify class comprehension | 7 |
| Instructor availability | 7 |
| More than just lecture | 6 |
| Help students | 4 |
| Challenged me | 2 |
| Guest speaker | 1 |
| Group exams | 1 |

3. Now think about a course that didn't work so well. What was it about the course that made it work <u>not</u> so well?

| Theme | Number of Responses |
|---|---|
| Boring class/monotone professor | 62 |
| Straight lecture | 50 |
| Did not clearly explain material | 22 |
| Professor not organized | 18 |
| Too fast-paced | 17 |
| Too many/pointless activities | 16 |
| Poor communicator | 16 |
| No review/study guides | 16 |
| Professor had no respect/concern for students | 16 |
| No class participation/interaction/hands-on activities | 15 |
| Difficult tests | 15 |
| No clear objectives/expectations | 15 |
| Disliked subject | 12 |
| Tested on material not covered in class | 12 |
| Professor not motivated, doesn't enjoy teaching | 12 |
| Too much material | 10 |
| Professor not knowledgeable | 8 |
| Professor was impersonal | 6 |
| Professor was not available | 6 |
| Class was too difficult | 6 |
| Students had to teach themselves | 5 |
| Group projects | 4 |
| No real-world application | 4 |
| No control over class | 3 |
| Large class | 2 |
| Pop quizzes | 2 |
| On-line class | 2 |
| Didn't learn much | 1 |

4. What do you value in a professor?

| Theme | Number of Responses |
|---|---|
| Sincere desire to teach/passionate | 81 |
| Respect/caring for students | 67 |
| Knowledgeable | 37 |
| Accessibility/Availability | 37 |
| Approachable/Friendly | 35 |
| Honesty/Integrity/ Professionalism | 34 |
| Ability to make class fun/interesting | 30 |
| Flexible/easy going/laid back | 29 |
| Industry experience | 20 |
| Explains subject matter clearly | 20 |
| Sense of humor | 20 |
| Ability to communicate effectively | 17 |
| Understanding | 15 |
| Organized | 9 |
| Fair | 8 |
| Confidence | 5 |
| Challenges students to higher level | 4 |

## DISCUSSION

By examining the top three themes in each of these four categories, it is possible to gain insight into student perceptions regarding the qualities of an effective (or ineffective) teacher. Clearly, the content analysis (as revealed in each table) reveals themes subscribed to by a large number of students, as well as those themes only subscribed to by small numbers of students. Regardless, all possible themes that could be developed from the responses are listed.

Students were first asked, "What can I do to help you do your best in this course? The vast majority were looking for clearly explained material. If the professor ineffectively explains the course material, students find it difficult to do well in the class. As one student encouraged, "Explain everything." The next most popular theme was providing reviews and/or study guides. These reviews and study guides, students reasoned, will enable them to perform better on tests/exams than if they had no such guidance. As one student shared, "Guide me on the course matter that will be covered on the tests. Surprises are no fun!" The third most popular theme was for the professor to make it fun and/or interesting. The vast majority of students participating in this research effort detest "boring" classes. Indeed, they have a true desire to attend class if the professor makes it fun and interesting. As one student stated, "Just don't bore me to death." By combining these three most popular themes in one course, it would seem that to most help students, the professor should make every effort to have a fun and interesting class where material is clearly explained and reviews and study guides are provided to students to help them better prepare for tests.

The second question asked students to think about a course that worked really well for them and explain what it was, specifically, about that course that made it work for them. The most popular theme in response to this question was that the course was fun and/or interesting. As one student shared, "The teacher made the class interesting and enjoyable. You wanted to go to class because you didn't want to miss the enjoyment of the teacher's enthusiasm." With many classrooms full of "disengaged, unmotivated, and unchallenged" students, this comment is worthy of consideration (Bliss, 2002, p. 10). Bain (2004) provides insight into why a fun and interesting class is necessary, by explaining that "if students study only because they want to get a good grade or be the best in the class, they do not achieve as much as they do when they learn because they are interested" (p. 33). The next most popular theme was the inclusion of hands-on activities/experiential learning/discussion/groups. This goes hand-in-hand with the first response, as these activities typically make a class more fun/interesting. Bliss (2002) refers to this as the "creative context" and explains that "the ideal creative classroom should cultivate the creativity of both the students and the instructor" (p. 11). The third most popular theme in this category was a motivated/energetic/passionate/humorous professor. Typical student comments included "The professor was funny," The instructor was passionate about the subject," and "The teacher was very energetic." As Bain (2004) explains, "Many students . . . talked about 'something she does' and told us they 'can't explain it,' but that certain teaching inspired their efforts" (p. 121). By combining these three most popular themes in one course, it would seem that the courses that work most well for students are taught by motivated and passionate professors who make the class fun and interesting by incorporating a great deal of hands-on activities and group discussion.

The third question asked students to share their thoughts on a course that did not work well for them. The most popular theme centered around a boring or monotone professor. This does indeed seem to contrast with the energetic and passionate professor that students preferred in response to question two. Further it is supported by Sandel's statement (as cited in Bain, 2004, p. 109) that "Teaching is 'above all' about commanding attention and holding it." The second most popular theme involved a course in which the professor utilized straight lecture. Although the lecture has been the standard way to impart knowledge to students, it is clear that, according to students participating in this research effort, it is not appreciated. And in fact, if that is what characterizes a class, it is likely not going to work well for students, which of course, means that students are not enhancing their knowledge about a topic (and learning outcomes are not being met). As Bain (2004) explains, "The lecture . . . is not used as an encyclopedic coverage of some subject, or as a way to impress students with how much the teacher knows. We found no great teachers who relied solely on lectures" (p. 107). The third most popular theme shared by students involved courses in which material was not clearly explained by the professor. This contrasts with the most popular theme in question one which involves what a professor can do to help a student do their best in a course (clearly explain material). By combining these three most popular themes in one course, it would seem that courses that did not work well for students were those in which a boring/monotone professor lectured the entire class period and was unable to clearly explain the material.

The fourth and final question simply asked of students what they valued in a professor. The most popular theme in this category involved passionate professors with a sincere desire to teach. This response is similar to the third most popular theme in response to question two. As one student shared, "I value professors who love what they do and are more than happy to share their passion with the class." The second most popular theme in this category involved professors who show respect and caring toward students. Quite a few students responded to this question quite simply, with "They care about their students." Bain (2004) discovered this as well, and explained that "the best teachers tended to look for and appreciate the value of each individual student" (p. 72). The third most popular theme in this category focused on knowledgeable professors. One student succinctly responded with, "Subject matter expert." Fortunately for new faculty asked to teach courses for which they may not be subject matter experts, it would appear from these comments that a professor with little knowledge of the subject may fair well as long as they have a sincere desire to teach and a real respect for their students. By combining these three most popular themes in one course, it would seem that students most value professors who are passionate and have a sincere desire to teach, show real respect/caring for students, and are knowledgeable of the subject they are teaching.

## RECOMMENDATIONS

The purpose of this research was to shed light on what makes an effective college teacher. Whereas Bain (2004) mostly examined the practices of highly effective professors, this research focused solely on student perceptions. It must be emphasized, however, that student comments and student ratings should not be considered in isolation. Indeed, as Bain (2004) admits, "A professor could get high marks on all the conventionally right practices yet have little positive influence on student learning." As a result, all junior faculty are encouraged to develop teaching portfolios, obtain peer evaluations from colleagues, and retain evidence of student learning via projects and other evidence, to supplement student ratings.

At the same time, according to Entwistle and Tait (as cited in Bain, 2004, p. 165), "Different kinds of learners might give the same experience conflicting ratings. [For example,] "Deep learners said they liked courses that pushed them to explore conceptual meanings and implications, whereas their classmates who were surface learners hated such experiences." Thus, all student comments and ratings should be considered in light of this. In fact, a professor may receive high marks in one course and low marks in another, simply due to the type of student learner in each of these classes and whether the material is conceptual or not.

Based on the findings of this research effort, the following recommendations are offered (with the caveat that the findings of this research effort were obtained using a convenience sample and may not be inferred to collegiate aviation programs nationwide):

- Professors should make every attempt to clearly explain subject matter covered during each class and further, ensure that students comprehend that subject matter.
- Although the goal in collegiate aviation should be student learning and comprehension, rather than satisfactory student grades, students have operated in a grade-centered learning environment for 12-plus years. As a result, students are very concerned about their grades and earning a high GPA. Professors can minimize student anxiety in this regard by reviewing material prior to exams and/or providing study guides.
- Professors should make every attempt to create fun and interesting classes. Students typically characterize classes in these terms which involve hands-on activities, experiential learning, discussion and group work.
- Professors should be passionate not only about their field, but also about teaching college students. Energy needs to be apparent in every class and professors should also lighten-up and use humor in the class to maintain student interest.
- Professors should be knowledgeable about their material and have actual experience in the field if at all possible.
- Professors should exhibit a high-level of caring and respect for students. Students should understand that the professor is concerned about their learning the material and doing well in the course.
- At all costs, professors should avoid straight lecture classes and being known as the "monotone, boring" professor.

## CONCLUSION

In conclusion, there are many qualities of effective college professors, some of which are easier to acquire than others. Clearly, students want to enjoy their educational experience, and professors can play a large part in making this happen. At the same time, junior faculty must remember that (as Bain, 2004 explains) "High ratings from students indicate success only if I am satisfied with the quality of what I'm asking them to do intellectually, and that is reflected not in the ratings but in my syllabus, assignments, and the ways I grade their work. Low ratings, on the other hand, usually tell me I've failed to reach my students" (Bain, 2004, p. 166).

Therefore, while student perceptions provide great insight into qualities of effective college professors, at least in their minds, we as faculty also speak highly of academic rigor and typically know what is best for the students. That being said, faculty should endeavor to challenge individual students in an academically-rich context that maintains student interest and involvement. As Paul Baker stated (in Bain, 2004), "My strongest feeling about teaching is that you must begin with the student. As a teacher you do not begin to teach, thinking of your own ego and what you know . . . The moments of the class must belong to the student – not the students, but to the very undivided student. You don't teach a class. You teach a student" (p. 97).

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# Estimating FBO Employment in the United States

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## ABSTRACT

The purpose of this paper is to document the number, distribution, and categories of employees working at fixed base operators (FBOs) in the United States (U.S.). A secondary purpose is to document the types of services offered by FBOs in the U.S. The methodology used in this paper was a combination of literature review and survey research. In the literature review, the U.S. Census Bureau's North American Industry Classification System was consulted along with private sources such as the World Aerospace Database (WAD), the Independent Fixed Base Operators Association, and the National Air Transportation Association. In the survey, a total of 3,211 FBOs were sent a one page survey regarding FBO employment and services, of which only 941 FBOs returned a survey (or 29.3%). This response rate limits the results of the survey to describe the characteristics of the study group only and not the entire FBO sector of the aviation industry. The respondents reported a total of 15,965 employees. An additional 61,169 employees were found at FBOs listed in the WAD, with 4,454 of those at FBOs covered by the survey, leaving a total of 56,715 additional employees not covered by the survey. Combining the two totals provides a total of 72,680 employees at FBOs in the U.S.

## INTRODUCTION

The services provided by fixed base operators (FBOs) have been a staple of general aviation since the earliest days of flight. The FBOs in the United States (U.S.) provide a variety of services such as line service, aircraft maintenance, new and used aircraft sales, parts sales, flight training, and aircraft charter services (Wells & Chadbourne, 2003). These organizations provide a conduit through which the general public may gain access to the aviation community. The nation's FBOs provide a valuable contribution to the aviation industry which deserves further investigation. Identifying the contribution of domestic FBOs to the national aviation industry will enable a better understanding of the composition of general aviation and its effect on the aviation industry.

This paper provides a method to identify the contribution made to the aviation industry by FBOs through two indicators. First, this paper documents the number, distribution, and categories of employment at FBOs in the U.S. The second method used to document contribution is to identify the number, types, and breadth of services offered by domestic FBOs. This paper is significant because it supplies the aviation community with a more detailed description of the characteristics of the FBO sector than currently exists.

## LITERATURE REVIEW

The literature reviewed for this study concentrated on sources that identify companies providing services similar to FBO related activities. Three sources were utilized to create a list of FBOs in the U.S. It was also necessary to examine the literature for sources indicating the number of employees engaged in FBO related work. Federal industry classifications were used to identify definitions of aviation employment categories.

Before the authors could search for documentation regarding the type of work performed by FBOs and the number of employees employed in the FBO sector, it was important to identify a comprehensive definition for an FBO. Wells and Chadbourne (2003) provide the most thorough definition of FBO related work:

> The principal business of fixed base operators is line service, which includes the retail sales of fuel and oil, minor repairs, emergency service and other flight continuation services for general aviation aircraft. They also maintain storage facilities for private airplanes, provide continuing maintenance and overhaul services, and usually have small and medium-sized airplanes

> available for charter. Some of the larger FBOs are active in selling new and used airplanes, and some operate flying schools. A few of the larger operators are equipped to offer complete flight service arrangements for business firms, including supplying both aircraft and crews (p. 64).

Conceivably a better descriptor more reflective of the array of services offered at these facilities would be "General Aviation Service Center" or "Aviation Service Business," but the commonly accepted definition of an FBO provided by Wells and Chadbourne gives the authors a foundation from which to identify FBO-type companies (Rodwell, 2003, p.2).

Four primary sources were used to gain an understanding of the breadth of the FBO industry in the U.S.: (1) U.S. Census Bureau's North American Industry Classification System (NAICS), (2) The World Aerospace Database (WAD), (3) the Independent Fixed Base Operator Association (IFBOA) member list (www.ifboa.aero), and (4) an FBO search engine maintained by AC-U-KWIK (www.acukwik.com). The AC-U-KWIK web site was eventually used to generate the mailing list for the survey associated with this study.

**U.S. Census Bureau**

The Census Bureau provides a classification system by which the occupations within our economy are divided into different sectors and subsectors. The system is known as the NAICS, and it "is the standard used by Federal statistical agencies in classifying business establishments" (NAICS, 2008, Introduction Section, ¶ 1). For the purposes of this study, the NAICS was used to identify official classifications of aviation employment as defined by the federal government.

According to the Report on the American Workforce (U.S. Department of Labor [DOL], 2001), the "NAICS divides the economy into 20 sectors....Industries within these sectors are grouped according to the production criterion" (DOL, p. 99). Each grouped sector is divided into different categories and subcategories. Each level of the NAICS provides industry employment categorization with increasing specificity. Aviation related employment categories are found in two major sectors within the NAICS; sector 48 (Transportation and Warehousing) and sector 61 (Educational Services). Most of the aviation industry employment categories are encompassed within the transportation and warehousing sector of the NAICS.

The industry is divided into three broad categories: (1) scheduled air transportation, (2) non-scheduled air transportation, and (3) support activities for air transportation. Aviation flight training is included in the educational services sector: 61-educational services.

The activities associated with scheduled air transportation are described as those involving "transportation of passengers and/or cargo over regular routes and on regular schedules" (NAICS, 2007, p. 348). This category does not represent the activities of the FBO industry because an FBO's activities do not involve operating within *regular schedules* and do not necessarily involve regular routes.

The nonscheduled air transportation sector is more closely related to the activities of FBOs. This sub-sector of air transportation is defined as those organizations that are "primarily engaged in (1) providing air transportation of passengers and/or cargo with no regular routes and regular schedules or (2) providing specialty flying services with no regular routes and regular schedules using general purpose aircraft" (NAICS, 2007, p. 349). This definition provides two characteristics that are similar to FBO related activities. Irregular schedules and routes are related to charter operations which is a component of the FBO industry. The inclusion of "general purpose aircraft" into the definition is also characteristic of FBO activities such as charter operations and flight instruction. But these activities do not fully encompass the range of FBO related activities.

The third NAICS employment category related to aviation is called support activities for air transportation. This sector is divided into more detailed sub-sectors: (1) airport operations and (2) other support activities for air transportation. The airport operations category is defined by the NAICS as activities such as "(1) operating international, national, or civil airports or public flying fields or (2) supporting airport operations…, such as rental of hangar space, air traffic control services, baggage handling services, and cargo handling services" (NAICS, 2007, p. 365). The hangar space rental is the only portion of this definition that relates to the activities of FBOs. Other Support Activities for Air Transportation is defined as a broad generalized category that could be related to many of the activities typically performed by an FBO.

Flight training is the last category of employment within the NAICS that applies directly to the FBO industry. This employment sector is defined as "establishments primarily engaged in offering aviation and flight training" (NAICS, 2007, p. 481).

### World Aerospace Database

The World Aerospace Database (WAD) was examined to identify a current listing of FBOs and their employees. The WAD is a key provider of data for service related organizations within the aerospace industry. These organizations include airlines, manufacturers, MRO repair stations, airports, distributors/suppliers, product/service vendors and aviation/aerospace professionals for commercial, military & business aviation. The WAD was examined as a preliminary source for survey recipients, but AC-U-KWIK later proved to be a more comprehensive resource for FBOs in the U.S. The directory was used to identify the published number of domestic FBOs and their employee data, though not all organizations disclose this information in the WAD.

### Independent Fixed Based Operator Association

The IFBOA is an organization whose mission is to "increase the marketability and profitability of its members through the interchange of knowledge, enhanced purchasing capabilities, shared marketing, and common objectives" (IFBOA, 2008, Mission Statement). The IFBOA provides a list of nearly 100 members on their website, but no employment data was provided through by this organization.

### AC-U-KWIK

The last source of FBO data reviewed was a website known as "AC-U-KWIK: Your Global Resource for Aviation Information" (www.acukwik.com). This resource provided the most comprehensive list of FBOs in the U.S. As described in the following section, this website provides a list of more than 3,000 organizations performing FBOs related services. This was the source used to generate the mailing list for the employment survey.

## METHODOLOGY

This section describes the process used to create a mailing list for the distribution of the survey. The survey provides the number of persons employed by the responding FBOs. This section also provides a description of the method used to calculate the number of companies and their employees published in the WAD. The WAD list of FBO employees was used to identify a baseline of published FBO employee numbers.

### Survey Mailing List

The researchers attempted this survey previously, but the response rate was less than 17% which warranted another survey using a different resource to identify a survey population. In order to increase the response rate for the second survey attempt, the researchers identified three sources for a recipient list. The three sources were AC-U-KWIK, the WAD, and the IFBOA.

The number of organizations listed by AC-U-KWIK was more than the combined total of the number of FBOs indicated in the WAD and the number of members of the IFBOA. This provided justification to use the FBOs listed by AC-U-KWIK to create the survey population. A copy of this survey instrument used for this study and the accompanying letter of introduction can be found in Appendix A. What follows is a description of the process used to generate the survey mailing list from AC-U-KWIK.

An initial list of FBOs in the U.S. was generated from AC-U-KWIK which can be accessed at acukwik.com. The main page of this web site has several tabs indicating different areas of the website. The tab called "FBOs" provides access to a list of states in the U.S. Each state has a link connecting it to a list of all

FBOs in that state that subscribe to the AC-U-KWIK service.

Next, a list of domestic FBOs was created using the information from the link to each state. The list contains the name of the FBO, the four-character International Civil Aviation Organization (ICAO) airport identifier, mailing address, and phone number. Most of the FBOs in AC-U-KWIK included a mailing address, but some only included a phone number. For those not containing an address within the link, further inquiry was required. Three techniques were used to identify the mailing addresses for these companies. First, the phone number provided in the link to the FBOs information was used to locate these addresses. This was done through a reverse phone number lookup process. This service can be done through White Pages.com (www.whitepages.com /reverse_phone).

The second method used to locate missing addresses was to search for the company name and other specific information relating to the company in an internet search engine. The third method used to locate the missing addresses for airports involved accessing data through an airport database managed by GCR & Associates, Inc. (www.gcr1.com/5010Web/).

An address was found for most FBOs listed in the AC-U-KWIK data base, the list contained 3,242 fixed base operators in the United States. Some mailing addresses for the organizations on the list could not be located. Therefore, 163 organizations were removed from the list. The total number of FBOs acquired from AC-U-KWIK was 3,079 organizations. In addition to the list assembled from AC-U-KWIK, another group of FBOs was included in the mailing list. These FBOs were added from a group of survey respondents from the previous survey of FBOs conducted between 2006 and 2007. The list of previous survey respondents contained 521 FBOs. The previous group of survey respondents was cross-referenced with the newly assembled list of 3,079 FBOs, and 133 of these organizations were not included in the new list and were therefore added to the mailing list. The final mailing list contained 3,211 survey recipients.

### Calculating the WAD Employment Number

The WAD is an annual publication published by Aviation Week that contains a directory of aviation services. Section D13 of the WAD contains aviation organizations categorized as “fixed base operators and companies in ground handling and suppliers of aviation gas, jet fuel or oil” (WAD, 2008, p. 934).

This section provided a list of companies that participate in FBO related activities. This list was refined to include only those FBOs in the U.S. The information related to each company in the WAD FBO section was transferred to spreadsheet software. As mentioned previously, not all of the companies listed in the WAD provide the number of employees working for their organization. The number of FBOs and their employees published in the WAD was easily calculated from this list.

## RESULTS

### U.S. Census Bureau

There are four NAICS employment categories that apply to the FBO sector: (1) non-scheduled air transportation, (2) support activities for air transportation, (3) other support activities for air transportation, and (4) flight training. According to the 2002 NAICS report, 7,999 establishments employ 175,560 workers. Table 1 provides a summation of the NAICS employment categories relevant to the FBO sector of the aviation industry.

Table 1: *NAICS Air Transportation Classifications Relevant to FBO Survey*

| NAICS Code | NAICS Code Title | Establishments | Employees |
|---|---|---|---|
| 48121 | Nonscheduled Air Transportation | 2,182 | 32,008 |
| 488119 | Other Airport Operations | 1,484 | 57,309 |
| 48819 | Other Support Activities for Air Transportation | 3,342 | 71,088 |
| 611512 | Flight training | 991 | 15,155 |
| **Totals** | | 7,999 | 175,560 |

### World Aerospace Database

The list of FBOs in the United States from the WAD includes 480 companies providing FBO services, ground handling, and fuel services. The number of employees reported in the WAD is 124,696, but this is a misleading representation of the FBO employment picture. Two companies were removed from the list. They are Conoco Philips Company of Bartlesville, Oklahoma and Marathon Ashland Petroleum, LLC of Findlay, Ohio. Each of these organizations is involved in petroleum refining and distribution.

The two companies mentioned above report a combination of 63,800 employees in their organizations. Conoco Phillips reports 35,800 employees, and Marathon Ashland Petroleum, LLC reports 28,000 employees. Removing these two organizations and their respective employees will provide a clearer vision of the FBO employment industry according to the WAD. The new total of FBO employees is 61,169 being reported by 478 companies.

From this data the WAD revealed overall that as of 2008, there are 61,169 people employed at FBOs throughout the country. It was determined that 71 of the 941 FBOs who responded to our survey were also contained in the WAD results. This equaled a total of 4,454 employees, leaving 56,715 employees for consideration from the WAD data. The WAD employee data, when combined with the results of the survey, indicated a total of 72,680 employees at FBOs throughout the U.S.

### Survey Responses

The survey was distributed to 3,211 organizations performing FBO related services through three mailings. Of those mailed out, 17.7% (567) were returned successfully with complete information. Just over 3% (101) of the surveys mailed to the FBOs were classified as "return to sender". Ninety-three of these addresses were corrected for the second mailing. The great majority (79% or 2,537) of the surveys sent to the FBOs did not respond to the first mailing of the survey.

The second mailing contained 2,630 surveys. This mailing yielded 234 (8.9%) positive responses and 63 (2.4%) returned to sender responses. Nearly 89% (2,333) of the mailed survey recipients did not respond to the second mailing of the survey. Sixty-two of the "return to sender" surveys were corrected for the third mailing. The third mailing was distributed to 2,396 participants. As of December 3, 2008, the final day of survey submission, the third mailing of the survey resulted in 154 positive responses or 6.43% of surveys sent as part of the third mailing of the survey. Table 2 illustrates the number of FBO companies that responded to the survey.

Table 2: *Survey response results of three mailings of the FBO survey.*

| ***Survey Results*** | | |
|---|---|---|
| Recipients | 3,211 | ***Rates*** |
| Responses | 941 | 29.30% |
| No Response | 2,055 | 63.99% |
| Return to Sender | 215 | 6.70% |

The authors disseminated 3,211 mailings to FBOs across the country in three groups of mailings. Of these, 941 FBOs responded yielding a return rate of 29.3%. A key limitation to this study is the result of the low response rate. The survey responses cannot be generalized to the national FBO population but are intended to describe the characteristics of the survey respondents. For the survey, participants were asked to provide the total number of employees, number of employees in various categories as well as services offered at their respective FBO.

### Survey Employment Results

The following results reflect information within the context of the survey and do not necessarily reflect FBO employment nationwide. Employees at the 941 FBOs which respond to the survey totaled 15,965. A further breakdown of the position(s) filled by those employees into specific employment categories and the number employed were also provided. These categories included: management, flight instruction/pilot, A & P mechanics, avionics technician, line service, customer service and other personnel. These employee totals are shown in figure 1.

### Reported FBO Employment by State

FBOs from each state responded to the survey and reported the number of employees in the specific categories.

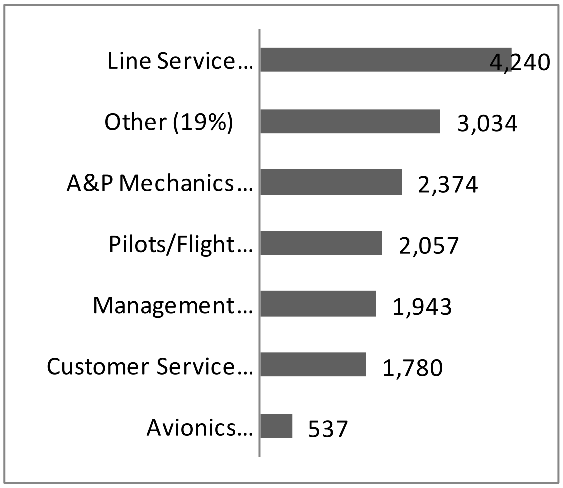


*Figure 1:* Top reported FBO employment categories.

The top 20 states in terms of total employees in each category are shown in Table 3. These states and FBOs were selected due to the volume of the statistics collected. The top twenty states and FBOs encompass a large representation of the survey results. These states employ 12,218 of 15,965 (76.5%) employees reported, while the top 20 FBOs account for 33.6% of the total number of employees reported by respondents. The top 20 states also accounted for 70% of management employees, 80% of flight instruction employees, 81% of mechanics, 93% of avionics employees, 69% of line service employees and 74% of customer service employees.

The states, in terms of total FBO employment, are shown in Table 4. Note that Illinois and Michigan, with reported totals of 2,488 and 1,326 employees respectively, are far and away the largest employers of FBO employees. Illinois and Michigan also had the highest number of reporting FBOs in the top 20, with three each (Table 4). Following Illinois and Michigan were Florida with 925 employees, Oregon with 706 employees and Indiana with 621 employees. Of these top five states, in terms of employment, only Illinois was in the top five for the number of FBOs reporting from each state. Illinois had 48 FBOs reporting, followed by Ohio with 46, Texas with 44, Minnesota with 41 and Missouri with 36.

## Employment at the Top Twenty Participating FBO's

The 20 largest FBOs that responded to the surveys reported a total of 5,370 employees. The top 20 FBOs in terms of total employment are shown in Table 5. Note that the top 20 FBOs account for 33.6% of the total number of employees reported by respondents. As noted in the figure, there are six FBOs that currently employ more than 200 employees: Midcoast Aviation (Cahokia, IL), Duncan Aviation (Battle Creek, MI), Stevens Aviation INC. (Conestee, SC), Million Air (Salt Lake City, UT), Standard Aero (Springfield, IL) and Pentastar Aviation (Walerford, MI). The Midcoast Aviation total of 1,400 employees is the largest FBO employer by far. The remaining sixteen FBO's in the top 20 each had 100 or more employees.

The preceding table represents the top twenty FBOs according to their total employment and total employment by category reported. The top 20 FBOs represent operators where total employment ranged from 1,400 employees to 100 employees. These 20 FBOs reported 5,201 employees out of the 15,965 total and account for nearly one-third, 32.6% of the total employment of all 941 respondents.

Figure 1 shows the number of employees per category that these 20 employers reported.

## FBO Services Offered Nationwide

Given the wide array of functions that FBOs provide, respondents were asked to report the services offered at their particular FBO. These services included: fuel, charter, flight instruction, aircraft rental, aircraft sales, aerial surveying, pilot supplies, glider towing, airframe/powerplant repairs, avionics, aircraft storage, parachute jumping and crop dusting. The data revealed that nationally, many of the traditional services such as fueling, maintenance and flight instruction are more frequently reported than those considered to be more "specialized" and are available far less often. Of the 941 FBOs responding to the survey, the greatest single activity nationwide was the provision of fuel service at 95%. The second most substantial activity was aircraft storage at 69%.

Table 3: *Employment categories by state*

| Company | City | State | Total | Mgmt. | Flight Instructor | Mechanics | Avionics | Line Service | Customer Service |
|---|---|---|---|---|---|---|---|---|---|
| Midcoast Aviation | Cahokia | IL | 1400 | 34 | 0 | 120 | 120 | 25 | 6 |
| Duncan Aviation | Battle Creek | MI | 700 | 22 | 0 | 187 | 64 | 34 | 48 |
| Stevens Aviation, Inc | Conestee | SC | 358 | 25 | 14 | 140 | 38 | 48 | 8 |
| Million Air | Salt Lake City | UT | 320 | 25 | 36 | 30 | 0 | 57 | 6 |
| Standard Aero | Springfield | IL | 250 | 8 | 0 | 75 | 30 | 4 | 50 |
| Pentastar Aviation | Walerford | MI | 210 | 11 | 46 | 35 | 11 | 12 | 6 |
| Hillsboro Aviation, Inc | Hillsboro | OR | 198 | 14 | 100 | 21 | 5 | 13 | 15 |
| Epps Aviation | Atlanta | GA | 196 | 0 | 0 | 0 | 0 | 0 | 0 |
| Western Aircraft, Inc | Boise | ID | 175 | 22 | 8 | 49 | 15 | 25 | 8 |
| Atlantic Aero | Greensboro | NC | 169 | 5 | 0 | 57 | 7 | 14 | 3 |
| Meridian | Teterboro | NJ | 156 | 11 | 58 | 13 | 1 | 46 | 9 |
| Banyon Air Service | Ft. Lauderdale | FL | 156 | 19 | 0 | 27 | 14 | 36 | 9 |
| Landmark Aviation | Sioux Falls | SD | 145 | 9 | 33 | 24 | 10 | 32 | 9 |
| Spokane Airways Inc | Spokane | WA | 130 | 5 | 4 | 3 | 0 | 5 | 4 |
| Northern Air | Grand Rapids | MI | 116 | 6 | 37 | 19 | 0 | 14 | 22 |
| Jet Source, Inc. | Carlsbad | CA | 113 | 8 | 17 | 10 | 6 | 27 | 9 |
| Landmark Aviation | Scottsdale | AZ | 106 | 4 | 11 | 25 | 3 | 45 | 18 |
| The Flightstar Corp | Savoy | IL | 103 | 19 | 20 | 25 | 1 | 11 | 13 |
| DB Aviation INC | Waukegan | IL | 100 | 20 | 30 | 15 | 0 | 20 | 5 |
| Eagle Creek | Indianapolis | IN | 100 | 8 | 13 | 42 | 8 | 7 | 12 |

The frequency of the other services at the FBOs were reported as follows: 55% provide pilot supplies, 46% perform A & P repairs, 45% offer flight instruction, 39% provide aircraft rental, 27% provide charter, 25% report aircraft sales, 12% service avionics, 10% have freight, 9% conduct aerial survey, 8% provide crop dusting, 3% offer parachute jumping and 2% have glider towing.

## FBO Services Offered by State

FBOs from each state responded to the survey and reported the types of services offered at their respective FBO. Many states ranked in the top five for different service categories. Ohio was in the top five for all services except glider towing, crop dusting and aerial survey. Note that the state of Ohio led in 8 of the 13 services offered. Illinois was in the top five for every service except for glider towing. Other notable states that ranked in the top five of different types of service categories included: Iowa (8), Minnesota (7), Wisconsin (5) and Tennessee (4). There were three other states that ranked in the top 5 in three service categories, which included Texas, Florida and Indiana.

## Employment categories at the Top Twenty Reporting FBOs

The frequency of the services offered at these facilities is shown in Figure 2. Interestingly, these top twenty FBOs reveal similarity with the national trend that the chief activity is aircraft fueling at 100%. However, unlike the reported tendency, aircraft maintenance was reported at 95%. Charter services were also much higher at 85%, with avionics repair and aircraft storage higher and served equally at 80%. Aircraft sales were more prevalent offered at 65% of these FBOs. Pilot supplies were offered at 40% and freight services were conducted by only 20% of the respondents. Surprisingly, just 10% of these

FBOs provided aircraft rental as well as instruction. Aerial Survey services were provided at only one of the top twenty for 5% and none of the top twenty respondents offered crop dusting, parachute jumping, or glider towing.

Table 4: *Reporting employees by state*

| Total Employees by State | | | |
|---|---|---|---|
| State | Total | State | Total |
| IL | 2488 | SD | 208 |
| MI | 1326 | AZ | 206 |
| FL | 925 | VA | 204 |
| OR | 706 | KY | 188 |
| IN | 621 | NM | 166 |
| CA | 554 | NE | 162 |
| OH | 517 | MT | 153 |
| UT | 494 | MA | 150 |
| MN | 472 | WY | 139 |
| NC | 449 | NV | 117 |
| SC | 431 | OK | 106 |
| WI | 421 | AL | 88 |
| TX | 402 | LA | 83 |
| GA | 389 | AR | 80 |
| NY | 386 | CT | 78 |
| WA | 367 | ND | 76 |
| ID | 360 | MS | 75 |
| NJ | 339 | WV | 72 |
| CO | 305 | ME | 67 |
| MO | 266 | NH | 54 |
| IA | 265 | HI | 34 |
| PA | 260 | MD | 33 |
| TN | 254 | VT | 11 |
| KS | 222 | DE | 11 |
| AK | 221 | | |

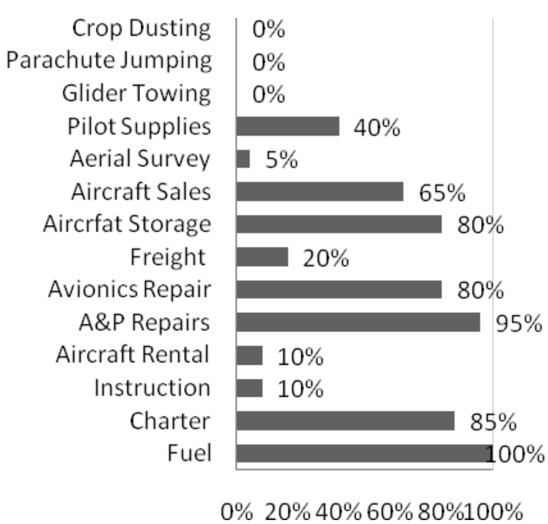


*Figure 2.* Services offered by the Top 20 responding FBOs

## CONCLUSIONS

There has been little research or tabulation work done in the area of FBO employment. Figures on this subject are very difficult to find and are not contained in any United States Department of Labor statistical summary that the researchers could find. Nor were data contained in any available industry association publications. After two attempts at surveying general aviation FBOs for employment information, there is no doubt that this is an industry segment that either does not respond well to surveys, or is not used to being surveyed. This tendency is reflected in the relatively low response rate to the surveys. Using the NAICS data from the U.S. Census Bureau provides relevant employment numbers which show that as of 2001, nearly 8,000 establishments have over 175,000 employees engaged in FBO activity. This data provides a good source of overall employment numbers but lacks the detail of employment in specific job categories, services provided or regional influence within the field.

The WAD data shows very strong FBO employment in the South and Southeast regions of the country. Accordingly the states of Texas, Florida and Virginia accounted for nearly 64% of all FBO employment nationwide. By combining our survey total with the WAD total we yield a net of 72,680 employees at FBOs in the United States of America with insight into type of employment found and the services offered. The three largest FBO employment categories were line service, mechanic and pilot/flight instructor. These data revealed that the most prevalent services provided by these employers were fuel services, aircraft storage, aircraft maintenance/avionics and charter/flight instruction.

Table 5: *Top 20 reporting companies and associated employment categories*

| Company | City | State | Total | Mgmt. | Flight Instructor | Mechanics | Avionics | Line Service | Customer Service |
|---|---|---|---|---|---|---|---|---|---|
| Midcoast Aviation | Cahokia | IL | 1400 | 34 | 0 | 120 | 120 | 25 | 6 |
| Duncan Aviation | Battle Creek | MI | 700 | 22 | 0 | 187 | 64 | 34 | 48 |
| Stevens Aviation, Inc | Conestee | SC | 358 | 25 | 14 | 140 | 38 | 48 | 8 |
| Million Air | Salt Lake City | UT | 320 | 25 | 36 | 30 | 0 | 57 | 6 |
| Standard Aero | Springfield | IL | 250 | 8 | 0 | 75 | 30 | 4 | 50 |
| Pentastar Aviation | Walerford | MI | 210 | 11 | 46 | 35 | 11 | 12 | 6 |
| Hillsboro Aviation, Inc | Hillsboro | OR | 198 | 14 | 100 | 21 | 5 | 13 | 15 |
| Epps Aviation | Atlanta | GA | 196 | 0 | 0 | 0 | 0 | 0 | 0 |
| Western Aircraft, Inc | Boise | ID | 175 | 22 | 8 | 49 | 15 | 25 | 8 |
| Atlantic Aero | Greensboro | NC | 169 | 5 | 0 | 57 | 7 | 14 | 3 |
| Meridian | Teterboro | NJ | 156 | 11 | 58 | 13 | 1 | 46 | 9 |
| Banyon Air Service | Ft. Lauderdale | FL | 156 | 19 | 0 | 27 | 14 | 36 | 9 |
| Landmark Aviation | Sioux Falls | SD | 145 | 9 | 33 | 24 | 10 | 32 | 9 |
| Spokane Airways Inc | Spokane | WA | 130 | 5 | 4 | 3 | 0 | 5 | 4 |
| Northern Air | Grand Rapids | MI | 116 | 6 | 37 | 19 | 0 | 14 | 22 |
| Jet Source, Inc. | Carlsbad | CA | 113 | 8 | 17 | 10 | 6 | 27 | 9 |
| Landmark Aviation | Scottsdale | AZ | 106 | 4 | 11 | 25 | 3 | 45 | 18 |
| The Flightstar Corp | Savoy | IL | 103 | 19 | 20 | 25 | 1 | 11 | 13 |
| DB Aviation INC | Waukegan | IL | 100 | 20 | 30 | 15 | 0 | 20 | 5 |
| Eagle Creek | Indianapolis | IN | 100 | 8 | 13 | 42 | 8 | 7 | 12 |

## APPENDIX A

FBO Employment Survey

Aviation Management and Flight
Applied Sciences & Arts, Room 126
Southern Illinois University Carbondale
1365 Douglas Drive
Carbondale, Illinois 62901
Fax: 618-453-7286

*The purpose of this research is to update a study of aviation employment that was completed in 2003. One aspect of the research is to obtain an estimate of employment at Fixed-Base Operators in the USA. If you wish your FBO's employment numbers to remain confidential, please inform us so that we may protect that confidentiality. In any case, Southern Illinois University Carbondale will not publish the names of those contacted for this survey.*

***FBO Information***

**Name of FBO**: ______________________________ **Airport Served**: ____________________

Contact Person/Job Title ____________________ E-mail ____________________

Address ____________________ Phone ____________________

City, State, ZIP Code ________________________________________

Do you wish your employment data to remain confidential? Yes ☐ No ☐

***Employment-Indicate the number of employees by the category of employment listed below:***

**Total Number of Employees at this FBO:** ____________________

How many employees are included in each category below?
(Insert number of employees in space provided)

- ☐ Management ____________________
- ☐ Pilots/Flight Instructors ____________
- ☐ A & P Mechanics _______________
- ☐ Avionics Technicians _____________
- ☐ Line Service ________________
- ☐ Customer Service _____________
- ☐ Other ______________________
- ☐ Other ______________________

***Services Offered***

What services are offered at this FBO? (Check all that apply)

- ☐ Fuel
- ☐ Charter
- ☐ Flight instruction
- ☐ Aircraft rental
- ☐ Aircraft sales
- ☐ Aerial surveying
- ☐ Pilot supplies
- ☐ Glider towing
- ☐ Airframe/Powerplant repairs
- ☐ Air freight
- ☐ Avionics
- ☐ Aircraft storage
- ☐ Parachute jumping
- ☐ Crop dusting
- ☐ Other _______________
- ☐ Other _______________

***Additional Comments***

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