

# Gender Differences in the Aviation Flight Science Program: A Study of Performance

Lisa Whittaker

College of Aviation

February 23, 2006

# University Support

- Monthly meetings
  - August 2005 through May 2006
  - Dr. Evans, Vice Provost for Institutional Effectiveness, along with the other grant fellows met each month.
  - Outcomes: Guidance and lessons learned. Teamwork!
- Assessment Institute in Indianapolis, IUPUI
  - October, 2005
- HSIRB (Human Subjects Institutional Review Board)
  - Victoria Jansen – HSIRB approval
- Registrar's Office
  - FERPA Family Educational Rights and Privacy Act
- Office of Institutional Equity
  - Jim Gilchrist – data design and de-identification
  - Tracy Pottak – data collection and organization
- Office of Information Technology
  - Julie Scott – SPSS software and data analysis

# HSIRB Approval

- Since student records included confidential data, HSIRB approval was required.
- First step – CITI course
  - Required
- Second step – review of research proposal
  - Revisions required
  - Most important issue – de-identifying students
    - Accomplished with help of Jim Gilchrist
- Approval received on October 7, 2005.

# FERPA Approval

- Family Educational Rights and Privacy Act
  - Protects privacy of student educational records.
- Contacted Registrar's office
- Directed to "Informational Guidelines for Western Michigan University Faculty and Staff".
- No objections since data is de-identified.

# Purpose of Study

- Aviation is a good career field.
  - Challenging, lucrative, vital to the U.S. economy.
- However, women are underrepresented in the field of aviation.
- Research is needed to help explain reasons.

11% engineers

6 % pilots  
(3% professional)

1% maintenance  
technicians

12% aviation students  
(College of Aviation)

# Relationship of Study to Assessment

- Pressure exists within academia, industry and our government to increase the number of women into workforce, especially in Science, Technology, Engineering, and Math (STEM).
- Aviation is a subgroup of STEM
  - technology
- A literature review of gender differences in STEM revealed many factors.
  - (See handout for details)
  - Few studies have been published on gender differences in aviation.
  - Understanding the all of the factors is important in affecting change.

# Factors

- Gender preferences
  - career choice
- Stereotyping
  - male / female characteristics
- Career field identity
  - Masculine / feminine
- Anxiety
  - Math / performance
- Environment
  - Classroom
  - Work
  - Social
- Preparation
  - Early choices impact interests
- Teaching / learning methods
  - styles
- Population
  - One of the few
  - Population affects population
- Cognitive ability
  - Studies are inconsistent / contradictory
  - Women do excel in STEM
- Performance\*
  - Integral with self confidence
  - Integral with other factors

# Why Study Performance?

- Performance is measurable and is therefore suitable for a quantitative study.
- Performance is integral with many of the other factors.
  - Preparation
  - Anxiety
  - Stereotyping
  - Teaching / learning methods
  - Population
    - In order to increase population, we must understand performance issues.
- Performance is one of the criteria for admission.
- Insight into performance is one step in addressing the issue of population.

# Hypothesis

- The academic performance of female students, based on ACT scores and average GPAs, at the College of Aviation, will be equal to or greater than the performance of male students.

# Research Method

- Performance data was collected
  - Aviation Flight Science majors (only)
    - End of Spring 2003 semester
  - Data logged in Excel spread sheet
    - Hours and hours spent manipulating the data
- Recommendation from Assessment Grant Fellows:
  - Use Statistical Program for Social Sciences (SPSS) rather than Excel.

# Data Analysis

- SPSS software was obtained from OIT
  - ANOVA - Analysis Of Variance
    - Tests the hypothesis that the group means of the dependent variables are equal.
  - Dependent variables
    - Aggregate GPA
    - Composite ACT scores
  - Independent variables
    - Gender
      - Attribute: male or female
    - Class standing
      - Attribute: Freshmen / Sophomores or Junior / Seniors

# Descriptive Statistics

	Male Freshmen sophomores		Female freshmen / sophomores		Male juniors / seniors		Female juniors / seniors	
<b>Population N</b>	<b>137</b>		<b>16</b>		<b>286</b>		<b>46</b>	
Composite ACT scores	Mean 22.85	SD 3.510	Mean 22.69	SD 3.135	Mean 22.55	SD 3.482	Mean 23.41	SD 3.925
Accum. GPAs	Mean 2.839	SD .7851	Mean 3.024	SD .6906	Mean 3.143	SD .4696	Mean 3.213	SD .5460

# 2 x 2 ANOVA

## Composite ACT

Effect	Sums of Squares SS	Degrees of freedom df	Mean Square	F value	Significance ( $p < 0.050$ )
Gender	5.120	1	5.120	.413	.521
Status	1.860	1	1.860	.150	.699
Gender * Status	11.176	1	11.176	.900	.343
Error	5970.485	481	12.413		
Total	256396.0	485			

# 2 x 2 ANOVA

## Accumulated GPA

Effect	Sums of Squares SS	Degrees of freedom df	Mean Square	F value	Significance ( $p < 0.050$ )
Gender	.806	1	.806	2.409	.121
Status	3.002	1	3.002	8.967	.003*
Gender * Status	.164	1	.164	.489	.485
Error	203.886	609	.335		
Total	5986.487	613			

# Results

## ➤ Composite ACT scores

- There is no significant difference in
  - between male and female students
  - between classes (freshman/sophomore and Junior/Senior)
  - Between gender / class status

## ➤ Cumulative GPAs

- There is no significant difference in
  - Between male and female students
- There is a significant difference
  - Between freshmen/sophomores and junior / seniors, but gender was not a factor.
    - Junior / seniors had higher GPAs.

# Opportunities

- Process was a completely new experience.
  - Gained familiarization with experts and services available throughout the university.
- Calculating the budget without prior knowledge of time involved for each step.
  - Resulted in over estimating funds required.
    - University support / assistance greatly reduced time required
- Conducting statistical analysis.
  - Need to develop this skill area in order to continue independent research.
  - Fortunately, there were SMEs willing to help.

# Goals and Objectives

## ➤ Goal:

- The goal of the study was accomplished.
- The academic performance of female students, based on ACT scores and average GPAs, at the College of Aviation is equal to the performance of male students.

## ➤ Objectives:

The result of this study is an important step toward dispelling the myth that women cannot compete with their male counterparts.

- Therefore, we need to continue to research gender issues
- and increase awareness of issues and opportunities in STEM among
  - Administrators
  - Faculty
  - Students of all ages
    - Discuss recruitment, retention and classroom environment and teaching / learning styles.
- Put best practices to use.

# Future Research Projects

- This assessment study was very narrow. In order to validate the study, the scope needs to be expanded.
  - Conduct a longitudinal study
    - To determine trends in performance and retention.
  - Increase the population (students)
    - Collaborate with other aviation programs
  - Conduct qualitative studies to address other factors.

# Acknowledgement

- With the help of the university support system, every challenge was met with great cooperation, patience and efficiency, resulting in minimum frustration for me.