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COLLEGIATE AVIATION REVIEW

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Of the

Collegiate Aviation Review

ACKNOWLEDGEMENTS

As the University Aviation Association continues to mature as an organization of aviation educators and the institutions they serve, so too has the scholarly activity conducted by UAA members increased in both quality and quantity. This is evident in the increased number of submissions to the *Collegiate Aviation Review*, which included ten papers for this edition. As a long-time member of the UAA Publications Committee, it is particularly gratifying to the Editor to see this growth in scholarly activity, along with the opportunities provided by the Association for members to share their work with others.

This year the *CAR* has a new "look", the product of the vision and hard work of a number of individuals, along with the generosity of our sponsors, **Mechtronix Systems, Inc**; **Cessna Aircraft Company**; **Morris Publishing**; the **University Aviation Association**; and **Purdue University**. Without the tireless efforts of Jacqueline Luedtke, Larry Carstenson, Frank Mitchell, and Gary Kiteley, the new and enhanced format of the *CAR* would not have been possible. My profound thanks to each of these colleagues, and to our sponsors.

No juried publication could exist, of course, unless experts in the field serve as anonymous reviewers. Indeed, the ultimate guarantors of quality and appropriateness of scholarly materials for a publication are the knowledge, integrity, and thoroughness of those who serve in this capacity. This year, a concerted effort was made to involve more of the professional members of UAA in the review process, with the goal of having four reviewers for each paper, and no individual reviewing more than one. The thoughtful, careful, and timely work of each of these professionals added substantively to the quality of the journal, and made my task as editor much easier. Thanks to each reviewer for performing this critically important work.

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Thomas Q. Carney, Ph.D.
Editor
August, 1999

STATEMENT OF OBJECTIVES

The *Collegiate Aviation Review* is published annually by the University Aviation Association, and is distributed to the members of the Association. Papers published in this volume were selected from submissions that were subjected to a blind peer review process, and were presented at the 1998 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 several objectives. These objectives are:

> 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 intelligence relative to aviation among institutions of higher education and governmental and industrial organizations in the aviation/aerospace field.
>
> To permit 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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Call for Papers

for the

2000 UAA Fall Education Conference

and the

Collegiate Aviation Review (CAR)

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 to a UAA conference to be selected by the UAA, if requested.

Authors should submit five double-spaced copies of the manuscript, conforming to the guidelines contained in the Publication Manual of the American Psychological Association, 4th Ed. (APA). If the manuscript is accepted for publication, the author(s) will be required to submit the manuscript on 3 ½ inch computer disk in either WordPerfect (6.0 or later version) or Microsoft Word format.

The UAA review process is a refereed process using "blind" peer reviewers. A list of all reviewers is available from the ***CAR*** editor and will be published in the ***CAR***.

All manuscripts must be mailed to the ***CAR*** editor with a postmark date no later than March 1, 2000, and should be sent to:

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Questions regarding the submission or publication process may be directed to the editor at (765) 494-9954 or may be sent by email to: tcarney@purdue.edu

Full-time graduate students are encouraged to submit manuscripts to the ***CAR*** for review in the graduate student category. A travel stipend up to $500 is available for the successful graduate student submissions. Contact the editor or UAA for additional information.

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Enhancing Global Competitiveness: Benchmarking Airline Operational Performance in Highly Regulated Environments

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ABSTRACT

Enhancing competitiveness in the global airline industry is at the forefront of attention with airlines, government, and the flying public. The seemingly unchecked growth of major airline alliances is heralded as an enhancement to global competition. However, like many mega-conglomerates, mega-airlines will face complications driven by size regardless of the many recitations of enhanced efficiency. Outlined herein is a conceptual model to serve as a decision tool for policy-makers, managers, and consumers of airline services. This model is developed using public data for the United States (U.S.) major airline industry available from the U.S. Department of Transportation, Federal Aviation Administration, the National Aeronautics and Space Administration, the National Transportation Safety Board, and other public and private sector sources. Looking at historical patterns of Airline Quality Rating results provides the basis for establishment of an industry benchmark for the purpose of enhancing airline operational performance. Applications from this example can be applied to the many competitive environments of the global industry and assist policy-makers faced with rapidly changing regulatory challenges.

INTRODUCTION

Looking at historical patterns of the Airline Quality Rating (AQR) may provide the basis for establishment of an industry benchmark for the purpose of enhancing airline operational performance. Benchmarking is a process that helps companies to find high performance levels in other organizations and to learn enough about how they are achieving those levels so the practice producing the high performance can be applied to one's own company (Keehley, Medlin, MacBride & Longmire, 1997). Enhancing competitiveness in the global airline industry is at the forefront of attention with airlines, government, and the flying public. The seemingly unchecked growth of major airline alliances is heralded as an enhancement to global competition. However, like many mega-conglomerates, mega-airlines will face complications driven by size regardless of the many recitations of enhanced efficiency.

Outlined herein is a conceptual model to serve as a decision-tool for policy makers, managers, and consumers of airline services. The AQR can serve as a model for other organizations on how to use data as a benchmark to help an organization or industry improve its performance. The AQR is a summary of month-by-month quality ratings for the major U.S. airlines during a one-year period. The AQR uses 19 data points such as pilot deviations, load factors and the number of accidents. (See Table 1). The AQR model uses publicly available data from the Department of Transportation, Federal Aviation Administration, National Aeronautics and Space Administration, National Transportation Safety Board, as well as other sources. Applications from the AQR can be applied to the many competitive environments of our global industry and assist policy-makers faced with rapidly changing regulatory challenges.

The AQR serves as an annually reported benchmark in the aviation industry. The ultimate benefit of benchmarking is enhanced competitiveness. An airline striving to improve its service identifies industry leaders and seeks to understand how the leaders achieve successful performance levels. The airline then adapts these strategies to their own organization. Benchmarking can best be described as "the continuous process of measuring products, services, and practices against the company's toughest competitors or those companies renowned as industry leaders" (Camp, 1992, p. 3).

Benchmarking can also be described as the "Consumer Reports" of the public and private sectors. It provides consumers with accurate and reliable information with which they can set standards, make comparisons, judge performances, and consequently make a purchasing decision. The AQR is an innovative example of a benchmark in the airline industry and can serve as a framework for organizations in other competitive environments. Using the Airline Quality Rating system and monthly performance data for each airline for the calendar year, individual and comparative ratings are reported. The AQR uses data points from key public sources and provides a starting point for monitoring the quality of an individual airline. With all of the competitive forces at play in the global airline industry, a basic quality assessment tool would be useful to various governments, competitors, and international airline travelers. The AQR applied to major U.S. carriers can also be applied to international airlines provided that comparable data are available. Consumers can use this ranking system to make comparisons and judge the various performances of the airlines.

Benchmark Purposes and Rationale

Many reasons exist to benchmark the performance of an organization or industry. First of all, it simply works. To the surprise of many organizations, benchmarking reveals sizable performance gaps. Alaska Airlines had a high rate of mishandled baggage in 1997, which placed it well below the industry average. This performance gap is now identified and can be improved. In fact, the 1998 AQR results showed a slight improvement in Alaska Airlines' mishandled baggage rate. The airline moved from being ranked tenth worst to ninth worst in baggage handling (Bowen & Headley, 1999). Secondly, recognition is likely to follow. Besides the internal benefits, external benefits such as publicity are likely to occur. The AQR is nationally broadcast to more than 50 million consumers on the major news networks and in major newspapers. As competition for this achievement increases, the airlines will undoubtedly seek to be the best and implement innovative and successful practices. Finally, airlines cannot afford not to benchmark. Airline consumer complaints rose 20 percent from 1996 to 1997 (Bowen & Headley, 1998). Consumers are demanding a high-quality return for their money.

Benchmarking works because it illustrates improvements in quality and performance. A perfect example is Continental Airlines. Continental was the most improved airline from 1996 to 1997 as they moved from fifth to third position. They improved their mishandled baggage rate and denied boardings, and had consistently good performance in all areas rated. The AQR scores over the years show that Continental Airlines is clearly the most improved of the major carriers. Their consistent improvement since 1994 has moved them from last to third on the quality scale.

Benchmarking can be defined by the following criteria; it must be successful over time, have quantifiable results, be innovative, be repeatable, and must not be linked to unique demographics (Keehley et al., 1997). The AQR qualifies as a benchmark by meeting all of these criteria. The AQR has a comprehensive database of success dating to 1991. Seven consecutive years of data have been collected and analyzed. The AQR has quantitative results derived from a weighted average of 19 factors with relevance to consumers when judging the quality of airline services. "The Airline Quality Rating approach focuses on quantitative factors rather than qualitative factors in order to provide a more objective result in assessing service quality levels across all major domestic airlines. The use of quantifiable, readily available data provides an objective starting point for monitoring the quality of service an individual airline might be providing and allows it to be directly compared with other competitors" (Bowen & Headley, 1997, p. 58). The AQR uses an innovative approach by combining basic ideas and raw material with a specific purpose in mind. "The objective in developing the AQR was to better organize readily available data for the consumer and offer it in a more useful, understandable, and objective form" (Bowen & Headley, 1997, p. 57). Another criteria of a benchmark is that it should be repeatable with some modifications. The AQR has been successfully repeated from 1991 to 1998. Minor modifications were made when the number of carriers changed from year to year. Finally, a good benchmark is not linked to unique demographics. "The results of a benchmark study are just a snapshot, or a moment in time. But when you add data from your industry and your organization to your benchmark subject's database, trends invariably start to emerge and become clear" (Finnigan, 1996, p. 144).

Defining Performance Measurement: The Airline Quality Rating

The majority of quality ratings available rely on subjective surveys of consumer opinion which are completed infrequently. This subjective approach yields a quality rating that is essentially non-comparable from survey to survey for any specific airline. Timeliness of survey based results can be problematic as well in the fast changing airline industry. Before the Airline Quality Rating, there was effectively no consistent method for monitoring the quality of airlines on a timely, objective, and comparable basis. With the introduction of the AQR, a multi-factor, weighted average approach became available. This approach had not been used before in the airline industry. The method relies on taking published, publicly available data that characterizes airline performance on critical quality factors important to consumers and combines them into a rating system. The final result is a rating for individual airlines with ratio scale properties comparable across airlines and across time.

The Airline Quality Rating is a weighted average of 19 factors that have important to consumers when judging the quality of airline services. Factors included in the rating scale were taken from an initial list of over 80 potential factors. Factors were screened to meet two basic criteria; 1) a factor must be obtainable from published data sources for each airline; and 2) a factor must have relevance to consumer concerns regarding airline quality. Data used in calculating ratings represent performance aspects (i.e. safety, on-time performance, financial stability, lost baggage, denied boardings) of airlines that are important to consumers. Many of the factors used are part of the Air Travel Consumer Report prepared by the U.S. Department of Transportation.

Final factors and weights were established by surveying airline industry experts, consumers, and public agency personnel regarding their opinion as to what consumers would rate as important in judging airline quality. Also, each weight and factor were assigned a plus or minus sign to reflect the nature of impact for that factor on a consumer's perception of quality. For instance, the factor that includes on-time performance is included as a positive factor because it is reported in terms of on-time successes, suggesting that a higher number is favorable to consumers. The weight for this factor is high due to the importance most consumers place on this aspect of airline service. Conversely, the factor that includes accidents is included as a negative factor because it is reported in terms of accidents relative to the industry experience, suggesting that a higher number is unfavorable to consumers. Because safety is important to most consumers the weight for this factor is also high. Weights and positive/negative signs are independent of each other. Weights reflect importance of the factor in consumer decision making, while signs reflect the direction of impact that the factor should have on the consumer's rating of airline quality. When all factors, weights, and impacts are combined for an airline and averaged, a single continuously scaled value is obtained. This value is comparable across airlines and across time periods.

Table 1
Airline Quality Rating Factors, Weights and Impact

	FACTOR	WEIGHT	IMPACT (+/-)
1	Average Age of Fleet	5.85	-
2	Number of Aircraft	4.54	+
3	On-Time	8.63	+
4	Load Factor	6.98	-
5	Pilot Deviations	8.03	-
6	Number of Accidents	8.38	-
7	Frequent Flier Awards	7.35	-
8	Flight Problems[a]	8.05	-
9	Denied Boardings[a]	8.03	-
10	Mishandled Baggage[a]	7.92	-
11	Fares[a]	7.60	-
12	Customer Service[a]	7.20	-
13	Refunds[a]	7.32	-
14	Ticketing/Boarding[a]	7.08	-
15	Advertising[a]	6.82	-
16	Credit[a]	5.94	-
17	Other[a]	7.34	-
18	Financial Stability	6.52	+
19	Average Seat-Mile Cost	4.49	-

Note: [a]Data for these factors are drawn from the Department of Transportation's monthly Air Travel Consumer Report.

The Airline Quality Rating methodology allows comparison of major airline domestic operations on a regular basis (as often as monthly) using a standard set of quality factors. Unlike other consumer opinion approaches, which rely on consumer surveys and subjective opinion, the AQR uses a mathematical formula that takes multiple weighted objective factors into account in arriving at a single rating for an airline. The rating scale is useful because it provides consumers and industry watchers a means for looking at comparative quality for each airline on a timely basis using objective, performance-based data.

The equation, known as the national Airline Quality Rating (AQR), where Q is quality, C is weight, and V is the value of the variables, is stated Q = W[i1-19] x F[i1-19]. Figure 1 presents the formula as a weighted average, which results in ratio scale numbers.

Figure 1
Weighted Average Formula for the AQR

$$AQR = \frac{- w_1F1 + w_2F2 + w_3F3 +/- \ldots w_{19}F19}{w_1 + w_2 + w_3 + \ldots w_{19}}$$

Note. From "Airline Quality Report," by B. Bowen and D. Headley, 1991, NIAR Report 91-11. Wichita State University.

Framing a Benchmark Procedure

Benchmarking asks two fundamental questions: how well is the agency doing and is the agency's performance improving or deteriorating? Only then should a third question be asked: is another company doing something better than this agency? The AQR can be used as a benchmark by the major airlines to answer these very questions. Northwest Airlines can look at the results and ask itself how their company is doing and if their performance is improving or deteriorating. Then they can look to see who is doing something better than they are. Northwest Airlines could look at the success of Southwest Airlines, the top ranked airline, to gain insight as to how they are successful. "Sharing experiences and learning from the experience of other organizations is the cheapest and most efficient, effective and compelling means for improving performance" (Keehley et al., 1997, p. 207).

Industry Week named the Xerox company best-in-class in benchmarking. Robert Camp from Xerox wrote a book on benchmarking in 1992, Benchmarking: The Search for Industry Best Practices that Lead to Superior Performance. Camp says the first step in benchmarking is to decide what to focus on. Select areas that are important to customers, critical success factors, areas for greatest improvement, competitive pressure points and problem areas (Richardson, 1992, p. 33). The air carriers realize that customer satisfaction is a key point to consumers and that consumers have a choice when selecting an air carrier. Using Northwest Airlines as an example, the company should seek out areas that are important to customers such as customer service, mishandled bags, fares, and denied boardings. They should choose problem areas such as on-time performance and focus on these areas for improvement.

Step two is to understand your company's own processes by clarifying, identifying, and prioritizing your own best practices. Benchmarking is best utilized where there is the opportunity for major payback and it is not advised to benchmark an organization's strengths. Because of the expense involved, a company should not necessarily benchmark a process in which they know they are successful. Instead, focus on performance areas that could provide the most significant return. For the airline industry, these areas could include improving on-time performance and reducing consumer complaints. Next, use people with knowledge and experience in the function. Benchmarking should be conducted by teams with the appropriate skills such as a team facilitator, analytical skills, and information search capability. A company should train the teams in the essentials of benchmarking. The fourth step is to make sure the teams are focused on best practices. Often times results or returns on assets are the focus of a company. The numbers however, do not tell anything about the process. In benchmarking, the numbers are only 10% of the activity whole processes are 90%. The next step is to find a company that does it the best. Benchmarking with more than one company gives validation that you are finding the best practice. US Airways, for example, can use Southwest, Alaska, Continental, or another airline they feel is doing something superior. The final step is to update. As processes and competition change over time, industry best practices should change accordingly (Camp, 1992).

Benchmark Procedural Validity and Reliability

The AQR has accomplished numerous objectives accepted as key ingredients of benchmarking. It is based on objective criteria, thereby eliminating perception and opinion. (Velocci, 1997). While based primarily on public sector data, realization and inclusion of private sector information provides substantial benefit. The AQR has spanned seven years, therefore encountering a changing business environment, public policy, and economic conditions. Metrics derived from publically available data sources insure accountability and validity through constant replication and constituent observation. As a methodology, AQR annual results have been subjected to peer review on numerous occasions. Widespread citation in academic literature, media reports, and airline reports continuously validate the mechanisms used to establish this industry benchmark. The details of this methodological approach and validation have been addressed in annual publication of results. A key test for data reliability is computation of Cronbach's Alpha. Reliability of the rating scale (See Table 2) was measured as extremely high (Bowen, Headley, & Lutte, 1993).

The reliability, as defined as the freedom from the random error and its ability to yield consistent results, is established by Cronbach's Alpha. (Bowen, Headley, & Luedtke, 1992). Cronbach's Alpha estimates the internal consistency reliability of a scale made up of a number of equally weighted items with values between zero and one. Coefficients above 0.6 are desirable and many would argue that values above 0.8 are needed for a developed scale. A reliability coefficient sets an upper limit for the (criterion) validity of a scale (Cronbach, 1951).

Table 2
Reliability Coefficient

Measure	Score	Scale	Result
Cronbach's Alpha	0.87	0-1.0	Extremely high validity

Controlling for Variability

Testing the AQR model involved basic concepts such as control limitation and standard deviation range comparisons to performance data and to model variability in the baseline year. A statistical process control charting established the upper control limitations and the lower control limitations. These limits represent a targeted range of variability based on one year of experience and are projected outward across the next year. Statistical process control testing for the AQR was calculated over 24 measurement periods to provide maximum representation of variability. This tool can be used with the AQR scores to set benchmark standards for individual airlines and for the airline industry. As a model, the AQR meets the prerequisites of accurate numerical data and chronologically recorded data (Bowen, Headley, & Lutte, 1993).

Common cause variability occurs when points are randomly distributed about the center line within the upper and lower control limits. Common cause variability involves more complicated factors that cannot be easily altered in the short-term. In the AQR these factors are areas such as financial stability, age of the fleet, and number of accidents. Common cause variability represents the level of quality that the organization or industry is capable of producing. It is entirely possible that an organization may be within control limits and still be performing at an inadequate level of quality to compete. The second type of variability is called local faults. Local faults are factors that are easily identifiable and can generally be controlled by employees. In the AQR these factors would be such things as mishandled baggage or customer complaints about service. A local fault is indicative of a situation that is temporarily out-of-control. Local faults are typically short-term and are often corrected by employees actually responsible for performance (Fellers, 1992).

The AQR Benchmark: Results in Action

The Airline Quality Rating was developed and first announced in early 1991 as an objective method of comparing airline performance on combined multiple factors important to consumers. Over a span of seven years the Airline Quality Rating has provided a summary of month-by-month quality ratings for the ten major U.S. airlines operating during this period. Using the AQR system and monthly performance data for each airline for the multi-year period provides comparative data for a longer term view of quality in the industry.

Since the Airline Quality Rating is comparable across airlines and across time, monthly rating results can be examined both individually and collectively. A composite industry average that combines the ten major airlines which are monitored each month on 19 criteria over the seven year span is represented in Table 3. Table 4 provides a summary of data.

Table 3
Benchmark Indicators 1991- 1997

AQR Result

1997	1996	1995	1994
0.0001	-0.0762	-0.0948	-0.1103
1993	1992	1991	
-0.0706	-0.0309	-0.0167	

Note. From "Airline Quality Report," by B. Bowen and D. Headley, 1991-1998, Aviation Monograph Reports. Wichita State University and University of Nebraska at Omaha.

Table 4
Summary of Data

Mean	-0.05629
Standard Deviation	0.04072
Standard Error	0.01539
Minimum	-0.1100
Maximum	0.000
Median	-0.07000
Lower 95% CI	-0.09395
Upper 95% CI	-0.09395

Note. t= 3.675 with 6 degrees of freedom
The two-tailed P value is 0.0106, considered significant

Continuing a trend started in 1994, the AQR industry average scores show an industry that is improving in quality. 1997 shows the largest change for industry average AQR scores of any of the past seven years. For 1997 the overall industry average AQR score was the highest of any of the seven years rated. The AQR score improvement was the most of any year-to-year score changes since 1991. While factors of on-time performance, involuntary denied boardings, and mishandled baggage are better, a 20% increase in the number of complaints filed with the Department of Transportation runs counter to a recovered industry. Financial performance has certainly improved along with some indicators of quality performance. Increased consumer dissatisfaction expressed by an increased volume of complaints seems to indicate that how things are done is just as important as what gets done.

The AQR was originally developed for the eventual purpose of benchmarking the U.S. major airline industry, which is highly competitive and highly regulated. The airlines clearly compete for the AQR rating. American Airlines launched a large marketing campaign when they were rated the number one in airline quality in 1991, 1992, and 1994. Regulatory officials, consumers, financial analysts, and others are interested in monitoring overall industry performance and the resulting effects of situational environment changes. Airlines must monitor operational performance to maintain competitiveness. Each airline must monitor performance to industry standard and previous case history for that air carrier. Thus each airline will have to know the effect of each operational performance indicator and act to effect change. Table 5 portrays each airlines' results for the seven year span. The order is from high to low score for the calendar year of 1997.

Table 5
Industry Average AQR Scores for U.S. Major Airlines

	1997	1996	1995	1994	1993	1992	1991
Southwest	0.346	0.306	0.221	0.211	0.252	0.251	0.220
Alaska	0.112						
Continental	0.069	-0.095	-0.340	-0.574	-0.540	-0.274	-0.266
American	0.050	0.033	0.164	0.225	0.231	0.290	0.323
United	0.041	0.031	0.058	0.123	0.176	0.214	0.168
Delta	0.000	-0.017	-0.024	-0.031	0.076	0.123	0.193
Northwest	-0.069	-0.100	-0.222	-0.210	-0.247	-0.193	-0.143
America West	-0.116	-0.275	-0.145	-0.282	-0.294	-0.267	-0.325
Trans World	-0.199	-0.302	-0.303	-0.307	-0.286	-0.398	-0.435
US Airways	-0.233	-0.267	-0.262	-0.148	-0.003	-0.024	0.115

	Mean	SD	SE	Min	Max
1997	0.0001	0.1678	0.0531	-0.2330	0.3460
1996	-0.0762	0.1939	0.0646	-0.3020	0.3060
1995	-0.0948	0.2077	0.0692	-0.3400	0.2210
1994	-0.1103	0.2671	0.0890	-0.5740	0.2250
1993	-0.0706	0.2805	0.0935	-0.5400	0.2520
1992	-0.0309	0.2603	0.0868	-0.3980	0.2900
1991	-0.0167	0.2773	0.0924	-0.4350	0.3230

Note. From "The 1998 Airline Quality Rating," by B. Bowen and D. Headley, 1998, Aviation Monograph Report 98-1. Wichita State University and University of Nebraska at Omaha.

Table 6
Monthly AQR Scores: Southwest Airlines

	1997	1996	1995	1994	1993	1992	1991
January	0.348	0.274	0.222	0.233	0.280	0.291	0.244
February	0.351	0.284	0.229	0.233	0.300	0.287	0.254
March	0.355	0.288	0.255	0.239	0.295	0.274	0.241
April	0.309	0.268	0.265	0.202	0.238	0.266	0.245
May	0.305	0.241	0.256	0.210	0.245	0.263	0.250
June	0.323	0.250	0.230	0.206	0.241	0.261	0.254
July	0.350	0.351	0.204	0.221	0.174	0.265	0.203
August	0.349	0.351	0.203	0.221	0.170	0.270	0.183
September	0.353	0.400	0.232	0.236	0.169	0.256	0.202
October	0.394	0.319	0.197	0.191	0.308	0.266	0.196
November	0.337	0.330	0.187	0.187	0.304	0.159	0.190
December	0.384	0.316	0.175	0.151	0.306	0.149	0.179
Average	0.346	0.306	0.221	0.211	0.252	0.251	0.220

	Mean	SD	SE	Min	Max
January	0.2703	0.0428	0.0162	0.2220	0.3480
February	0.2769	0.0427	0.0161	0.2290	0.3510
March	0.2781	0.0403	0.0152	0.2390	0.3550
April	0.2561	0.0329	0.0124	0.2020	0.3090
May	0.2529	0.0285	0.0108	0.2100	0.3050
June	0.2521	0.0362	0.0137	0.2060	0.3230
July	0.2526	0.0723	0.0273	0.1740	0.3510
August	0.2496	0.0757	0.0286	0.1700	0.3510
September	0.2640	0.0828	0.0313	0.1690	0.4000
October	0.2673	0.0777	0.0294	0.1910	0.3940
November	0.2420	0.0777	0.0294	0.1590	0.3370
December	0.2371	0.0957	0.0362	0.1490	0.3840

Note. From “The 1998 Airline Quality Rating,” by B. Bowen and D. Headley, 1998, Aviation Monograph Report 98-1. Wichita State University and University of Nebraska at Omaha.

As an example, Table 6 conveys the performance of 1997's leader, Southwest Airlines. This chart visually presents 1997's performance and provides the historical trend data for one year. Additionally, Table 6 shows performance over the seven year span which could set a higher benchmark for this individual carrier than use of the industry average as a benchmark. Identification of key benchmarks are available for any targeted point. Each airline will be able to analyze performance relative to the overall industry and past individual case.

Applications for the Benchmark Standard

In order for benchmarking to be successful, lasting performance improvements must be made. Sustaining the momentum is crucial to overcoming old practices and implementing new ones. New processes in organizations require constant attention and continual practice. Old practices must be unlearned. Three types of issues arise: ensuring the successful implementation and operation of best practice in organization, institutionalizing benchmarking as the way to search for best practices throughout the agency, and clearly defining the future of benchmarking for best practices as a means for bringing better service to customers (Keehley et al., 1997).

The major airlines are realizing that it is important to attract and retain customers. "Companies are learning that it is important to monitor customers' needs and wants and then strive to meet those needs and wants. If an airline fails to provide quality/satisfaction in its services (i.e. passenger satisfaction), it will lose its customers to its competitors" (Bowen & Headley, 1997, p. 61). "It is essential for all business organizations to retain existing customers and attract new ones. Since the signs from the service provider (emitter) are interpreted by the customer they can either strengthen or weaken the persuasive influence of the company and thereby affect its image and the customer response. It would be interesting to research what these signs are in the area of service provision and their impact on the loss or gain of trade" (Malver, 1988, p. 223). Studies may indicate signs, whether they are positive or negative, and the impact on the customer. These impacts determine whether the customer will remain or leave. You can perform research to detect signs that have "a common international interpretation and the same impact irrespective of the nationality of the passenger" (Malver, 1988, p. 223). Findings from this study may help the "company to improve the delivery of service and to contribute the development of the discipline itself" (Malver, 1988, p. 224). The results from the AQR could most certainly help the major airlines to improve their delivery of service. Alaska Airlines could improve the number of mishandled bags and involuntary denied boardings and American could improve its on-time performance. All of the major airlines can use the results to see how they compare against the competition and improve their respective services.

CONCLUSION

Benchmarking is not a solution to all of the problems an agency faces but "a powerful weapon in the performance improvement arsenal" (Keehley et al., 1997, p. 207). Benchmarking cannot solve all of the problems, but it allows an agency to look outward and provides the reason and methods that organizations need to seek out best practices and solve performance problems. The need for excellence will become even greater in the future as consumers become more demanding. "Budgets will shrink, the demand for accountability will increase, the need for demonstrable results will grow" (Keehely et al., 1997, p. 206). The use of the AQR as an industry benchmark can enhance airline operational performance.

Prior to the AQR, a consistent method for monitoring airline quality on a timely, objective, and comparable basis did not exist. For the first time in the airline industry, a rating was developed that used a multi-factor weighted average approach that resulted in a starting point for monitoring airline quality. The end result is a rating for individual airlines with ratio scale properties that can be compared across airlines and across time. Additionally, the rating turns data into a more useful and understandable form for consumers.

Because most airline operations are similar throughout the world, this approach can also be used by many countries to enhance the quality of their airlines. A global airline performance benchmark would be in the best interests of all the airlines and consumers. Such a benchmark could identify some basic performance factors that could be tracked internationally. The AQR offers a readily available blueprint of a benchmark that is applicable to global airline benchmarking and to other organizations and industries. It is envisioned that the AQR benchmark will provide a baseline for future comparative research. Such comparative research could include correlational studies. These studies could attempt to show a cause and effect relationship between the AQR and airline financial performance or the AQR and airline safety.

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Multiple Expert Evaluations of a PC Computer-Based Aviation Flight Training Device

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ABSTRACT

The usability of a personal computer based aviation-training device (PCATD) was investigated by conducting multiple expert evaluations. One group of experts performed a heuristic evaluation of the PCATD system. Experts in a second group evaluated the PCATD by conducting a cognitive-walkthrough analysis. An ethnographic analysis was also carried out by directly observing and interviewing the participating experts during the evaluations. Experts evaluated the usability of the PCATD as applied to various practical test standards used for instrument flight training. Strong consensus by the experts in both groups indicated that the PCATD was usable for fundamental flight training as required by the Federal Aviation Administration's Instrument Rating curriculum. Issues concerning various PCATD simulation fidelities and related inconsistencies in interface design were discovered. These issues caused concern over using the PCATD for training that could be applied to actual flight time.

STATEMENT OF THE PROBLEM

Aviation flight training and pilot certification within the US is administered by the US Department of Transportation's Federal Aviation Administration (FAA). In 1994, the FAA began to consider affordable innovations that might enhance the improvement of pilot performance (Beringer, 1996). The FAA focused on the use of off-the-shelf (OTS), flight training simulations that could be supported on personal computers (PCs). By 1997, the FAA had published its guidelines for approving personal computer-based aviation training devices (PCATD) for use in flight training ("Qualification and," 1997). At the time of this study, there were at least four commercial entities offering off-the-shelf PCATDs approved by the FAA (Chamberlain, 1998). Little is known about the usability characteristics for any of the currently approved PCATD systems.

The focus of this project was to conduct multiple expert usability evaluations of one selected PCATD system. Evaluations included expert usability (heuristic), cognitive walkthrough, and ethnographic analysis as applied to specific FAA training guidelines conducted on the PCATD. The identification and application of these techniques are discussed subsequently in this study.

Evaluation Goals

The first goal for this evaluation was to uncover new knowledge regarding the usability of PCATD systems by FAA Certified Flight Instructors (CFIs). CFIs selected as participating experts were highly experienced in the utilization of computer generated flight simulation. The information gained from this project was also used to make recommendations toward the improvement of interface design, and application of the PCATD as a flight-training tool.

LITERATURE REVIEW

Historical Overview of Flight Training Device Evaluation and Related Theory

The birth of the modern flight-training simulator is often attributed to Ed Link who created the "Link Trainer" in 1929 (Gunston, Pyle, & Chemel, 1992). The Link Trainer was described as a ground-based device that pilots could use to learn the basic skills needed to fly before leaving the ground (Gunston et al., 1992). Link trainers were designed to simulate the use of flight instruments typical of aircraft being produced during that time.

The realism or "fidelity" (Caro, 1988) of the Link Trainer was very low as compared to the flight simulator produced today. Simulation fidelity has been identified as a two dimensional measurement of the realism associated with physical and functional characteristics (Hays & Singer, 1989). The ability of a simulator to accurately represent the visual, spatial or kinesthetic characteristics of the flight environment is known as physical fidelity (Hays & Singer). Hays and Singer contrast the informational, or stimulus and response characteristics, as the functional fidelity of the simulation. Physical characteristics of the early Link Trainer emphasized attributes such as the location of flight controls and limited visual (spatial) training. Later models of the Link Trainer began to incorporate more accurate representations of information displayed on instruments in response to the pilot's actions in a training situation.

Since the advent of the Link Trainer, flight simulators have evolved to a state of technology that can completely duplicate the flight environment for a specific aircraft. It is now possible to competently train flight crewmembers (pilots) to fly a specific type of aircraft without ever using the actual aircraft as a part of the training program.[1] This current level of high fidelity flight simulation was developed from a need to train crewmembers to perform tasks not previously possible or to a skill level previously unattainable (Caro, 1988). The evolution of flight simulation technology was motivated and built upon learning theories advocated by cognitive scientists such as Charles Osgood and Edward Thorndike (Caro, 1988). These theories stipulated that successful learning from simulation requires that the simulation have a one-to-one relationship to reality (Caro, 1988). This approach to simulation design seeks high levels of fidelity as the characteristic that will foster successful learning. As physical and informational simulation reaches reality, learning will be more effective. For this reason, modern simulators have reached a level of high physical and informational reality. Bill Siuru and John Busick (1994) describe today's flight simulation as computer facilitated "virtual reality." They describe virtual reality as multi-sensory flight simulation that provides three dimensional sight and sound along with feedback for touch and motion (Siuru & Busick).

Since the late 1960s, the effectiveness of high fidelity in flight simulation has been questioned by several researchers (Macfarlane, 1997; Caro, 1988; Prophet & Boyd, 1970; Grimsley, 1969). Macfarlane (1997) stated, "…the evolution of flight simulation, as a realistic representation of flight parameters, has often overshadowed the practical value of simulators and led to a number of false assumptions about their training value" (p. 59). According to Macfarlane (1997), simulation fidelity should be evaluated in terms of “task fidelity” and “instructional fidelity” (p. 63). He defines task fidelity as the degree to which simulation is able to recreate the actual parameters of a mission, in terms of training and practice. Instructional fidelity is defined by Macfarlane as the effectiveness of the simulation, as part of an instructional system, to transfer knowledge to the training crewmembers. Macfarlane’s taxonomy for fidelity does not feature the importance of physical and knowledge realities as was stressed earlier for successful simulation design. Instead, proper simulation design is based upon first asking what it is to be accomplished, then designing or selecting the simulation that best meets that need.

Macfarlane (1997) further emphasizes this strategy by stating “Simulation should not be undertaken for simulation’s sake but rather for some predetermined purpose….” (p. 73). Proper instructional design and instructional systems development are essential to Macfarlane’s philosophy of simulation as applied to training. Simulations should be used to support the instructional design and the related systems necessary to meet the goals of the learning objective(s). Evaluation of simulator effectiveness should focus on the relationship between desired learning objectives and the simulation fidelity required to meet those specific objectives. High fidelity as a characteristic of simulation design does not insure effective crewmember training.

Paul Caro (1998) also supports Macfarlane’s reasoning by identifying the design characteristics that support effective, low fidelity flight simulators. Caro stated that fidelity should be designed around the elements of cues, discriminations, mediation, and generalizations. As an example of these criteria, consider a low fidelity computer based training (CBT) simulator. Assume that the example CBT unit has a standard computer monitor, keyboard, and mouse. The graphical user interface (GUI) depicted on the monitor only shows a few elements of the actual flight environment. According to Caro, cues are meanings assigned by the pilot to stimulus represented on the GUI. If the simulation environment offers the pilot an opportunity to learn and assign the correct meaning to the stimulus provided, then effective simulation has taken place without the need for high fidelity. Discrimination is the ability of the pilot to differentiate between various stimuli, and assign the proper meaning to each recognized stimulus. The CBT simulation need not offer realistic physical cues in order for the pilot to properly discriminate between various stimuli. As an example, the pilot could learn to discriminate and assign meaning to stimuli solely from on-screen text descriptions or audio explanations. Caro refers to simulation design elements that foster discrimination, such as on screen text descriptions, as mediations. Mediations also include generalizations, which are low fidelity representations that allow a transfer of knowledge to occur. Generalizations are elements of low fidelity that are used in simulation when the pilot already has knowledge of the element being represented by the generalization. For example, it may not be necessary to simulate the ability, or fidelity, to adjust a flight instrument if that pilot is already aware of how to adjust and use the flight instrument.

Low Fidelity Flight Training Simulation

The value and use of simulation as a training device in aviation has been well documented over the past 30 years (Beringer, 1996,). Over this period, the traditional emphasis of designing flight-training simulators with high fidelity characteristics has significantly increased the cost of aviation simulation devices. This expense has created an industry demand for lower cost, OTS low fidelity training devices (Wilson, 1998). The advent of the personal computer (PC) has facilitated the design and implementation of lower cost, low fidelity training devices. PC-CBT devices that properly match fidelity with learning objectives are now in demand by commercial, military, and civilian aviation training facilities (Sutton, 1998).

Within the US, simulators must be approved by the FAA for use in FAA required pilot or crew training programs. The FAA's responsibility regarding PC based flight simulation is to certify that the level of fidelity is compatible with the learning objectives associated with specific FAA training objectives. In this way, the FAA "qualifies" the fidelity of the simulation and "approves" the use of the simulator for specific training curriculum (Chamberlain, 1998).

In 1995, the FAA began to approve and qualify low fidelity PC Based Aviation Training Devices (PCATD). The primary motivation for the FAA's support of PCATD was to potentially reduce the overall cost of flight training to the industry and improve pilot procedural training as related to specific FAA training guidelines (Beringer, 1996). The FAA's approval of PCATD applies to specific primary instrument training guidelines published by the FAA (Federal Aviation Administration, 1997).

Little is known about the usability of low fidelity PCATDs as applied to flight training required for the Instrument Rating. A study conducted by Dennis Beringer (1996) compared a PCATD to alternate forms of FAA approved training. In this study, Beringer (p. 11) found that the examined PCATD had "…sufficient task fidelity to motivate generalizable behavior, producing outcomes that are comparable to those obtained in other simulation devices, in fact, aircraft." Beringer's study also incorporated a component of evaluation similar to a cognitive walkthrough. A cognitive walkthrough has been described by Miller and Jeffries (1992) as an evaluation that compares the ability of the interface to the user goals and expectations. In Beringer's (1996) study, the users (pilots) were asked to compare the PCATD fidelity to the "real world" aircraft. Overall, the users found the PCATD more sensitive than the actual aircraft and harder to fly (Beringer, 1996).

A more recent study conducted by Taylor, Lintern, Hulin, Talleur, Emanuel, and Phillips (1997) measured the effectiveness of PCATD training as compared to actual flight training. This study did not specifically evaluate the usability of the PCATD in the training environment. Methodology focused on the comparison of user performance indexes and FAA published guidelines using both the PCATD and actual aircraft training environments.

Simulation Evaluation

Shneiderman (1998) has stated that the primary goal for usability evaluations "…is to force as much possible of the evolutionary development into the prerelease phase, when change is relatively easy and inexpensive to accomplish" (p. 144). This philosophy for evaluation applies during the design, or formative stage of system development. Wilson (1998) describes how current CBT aviation simulation is designed with little opportunity for formative evaluation. Instead, most low fidelity aviation CBT simulators are being offered as a "proof of concept" product, whereby evaluation is primarily summative in the form of end-user feedback (p. 28). Literature offered by Beringer (1996) and Taylor et al. (1997) seems to also support this conclusion in regards to the PCATD. Emphasis on the evaluation of the PCATD has been focused on the transfer of learning as a proof of concept, rather than the evaluation of effective PCATD design.

METHODOLOGY

Evaluation Methods

The purpose of this evaluation was to assess the usability of a PCATD as applied to selected FAA Instrument Rating training guidelines. The evaluation concluded with recommendations on the improvement for PCATD interface design and application within the aviation-training environment.

The proposed PCATD evaluation was summative and conducted within an actual training environment. Shneiderman (1998) suggests that expert reviews be conducted as summative evaluations. He offers several models for expert evaluations that are particularly viable for the PCATD. First, Shneiderman suggests the heuristic evaluation as a method to "…critique an interface to determine conformance with a short list of design heuristics" (p. 126). In this study, the design heuristics that will be used are the "eight golden rules" for interface design as also suggested by Shneiderman (1998). Shneiderman's design rules will also be supplemented with criterion for "checklist evaluations" as provided by Ravden and Johnson (1989). Miller and Jeffries (1992) found that heuristic evaluations are very successful for discovering most of the major problems inherent to the design of a user interface. The heuristic evaluation was conducted to provide evidence for specific improvements in the PCATD interface design.

Cognitive walkthroughs are also suggested by Shneiderman (1998) and Wharton, Bradford, Jeffries and Franzke (1992) for evaluating the interface while conducting a specific task. This evaluation required experts to conduct training task as defined by FAA approved guidelines. Cognitive walkthroughs are based upon the evaluation theory of "learning by doing" and focus on basic usability principles (Wharton et al., 1992). Miller and Jeffries (1992) compared the advantages of various structured evaluation processes. They determined that cognitive walkthroughs are well suited for discovering problems with the interface as related to the user goals and assumptions. Therefore, the cognitive walkthrough should provide data leading to an assessment of the cues, discriminations, mediations, and generalizations (Caro, 1998) that will be experienced by the user of the PCATD interface.

It has been recommended that in addition to structured evaluations, the potential affects of culture or the social situation should also be factored into the evaluation (Sommerville, Bentley, Rodden, & Sawyer, 1994). Sommerville, et al (1994), and Shneiderman (1998) suggest using ethnographic observation as a complement to other forms of evaluation. An ethnographer for this evaluation was present for both the heuristic and cognitive walkthrough evaluations. Ethnographic observations and interpretations were made in order to help determine the factors not inherent to the PCATD that influence the evaluations conducted in the heuristic and cognitive walkthrough evaluations.

Subjects

Two groups consisting of three FAA Certified Flight Instructors (CFIs) were asked to participate in the evaluation. One group conducted the heuristic evaluation, while the other implemented the cognitive walkthrough. Experts were solicited from a population of CFIs having over ten years experience in the application and evaluation of flight training simulators. Miller and Jeffries (1992) found that as the relative expertise of evaluators increases, the fewer the number of experts that are required for the evaluation. In this evaluation, the same number of experts participated in both the heuristic and cognitive walkthrough evaluations as was used in previous successful studies conducted by Miller and Jeffries (1992).

Setting

The PCATD evaluations were conducted within the Aerospace Science Department (ASD) of a midwestern college. The CFIs participating in the evaluations were currently employed as faculty members of the ASD. The heuristic, cognitive walkthrough and ethnographic evaluations were conducted within the aviation simulation lab that is used by the ASD to train pilots.

Apparatus

The selected PCATD evaluated was full functioning, commercially available, and FAA approved. The PCATD simulates the flight environment for a single engine aircraft used for primary instrument flight training. The ASD is certified by the FAA to administer approved instrument flight training using the selected PCATD.

Procedure

All CFIs employed by the ASD were invited to volunteer as expert evaluators. Each participating CFI was professionally trained in human factors analysis and simulation based training. Under these circumstances, expert evaluations can be conducted within one to two days (Dumas & Redish, 1993). Each CFI was given thirty minutes to conduct their heuristic or cognitive walkthrough following a specified FAA training standard.

The FAA training standards followed were specified in the FAA's publication <u>Instrument Rating for Airplane, Helicopter, and Airship Practical Test Standards</u> ("Instrument Rating for," 1994) (PTS). The three CFIs conducting the heuristic evaluation were asked to select any three tasks referred to as "areas of operation" defined by the FAA's PTS. Each expert then used the PCATD to apply the three chosen operational areas of operation in any manner they deemed suitable to primary instrument instruction.

The PTS areas of operation were considered adequate for evaluation. Each area can be quickly evaluated, is stated in the user's words, provides enough information to complete the task, and is linked directly to the goals of the proposed evaluation (Dumas & Redish, 1993). As the heuristic evaluators explored their selected areas of operation, they were asked to write comments on a survey addressing "areas of concern" (Dumas & Redish, 1993). These areas of concern were related to the "eight golden rules" for interface design as suggested by Shneiderman (1998).

The CFIs participating in the cognitive walkthrough were asked to "practice" three pre-identified areas of operation contained within the PTS [2] using the PCATD. They then answered a post-task survey qualifying the PTS operations in relation to the cues, discriminations, mediation, and generalizations (Caro, 1998) inherent to the PCATD interface (see Appendix B).

A single ethnographer was also present for each of the expert evaluations. The ethnographer was an Instrument Ground Instructor with over ten years experience in flight simulator training and human factors associated with student interaction and CBT. The ethnographer observed each expert evaluator in both groups. Ethnographic examination uncovered how the common cultural values of the experts' influence their perception on the characteristics inherent to the PCATD. The primary goal of the ethnography was to detect the affect of culture on the perception, or experience [3] of using the PCATD (Gall, Borg, & Gall, 1996). As suggested by Sommerville, Bentley, Rodden and Sawyer (1994, p. 358), no specific set of instructions were provided to the experts concerning the ethnographic observation. However, the experts were encouraged to "think out loud" and discuss any aspect of the PCATD with the ethnographer. This strategy was successfully used by Karat, Campbell, and Fiegel (1992) in a study comparing techniques in user interface evaluation.

Analysis of the Data

Qualitative analysis was applied to the results obtained from the heuristic and ethnographic evaluations (see Appendix A). Specifically, a "hermeneutic circle" (Gall et al, 1996, p. 706) analysis was applied to the concerns and issues raised by each evaluator of the PCATD. In this analysis, meaning was interpreted from the concerns or comments made by each evaluator. Meaning was also applied to the overall concerns made by each evaluator and taken as a whole (Gall et al, 1996). Conclusions and recommendations were made regarding the usability of the PCATD, as based upon the analysis. Recommendations for improving the usability of the PCATD were also made.

A questionnaire measuring each evaluator's attitude regarding aspects of the PCATD usability was provided to each member of the cognitive walkthrough (see Appendix B). The questionnaire contained an ordinal scale measuring ten (10) levels of agreement for each area of concern (Gall et al, 1996). The questionnaire was pre-tested for clarity and understanding by various CFIs within the ASD. The experts used within the evaluation did not represent a normal population. Therefore, a Kruskal-Wallis ANOVA analysis was applied to the ordinal results provided by each expert (Gall et al, 1996, p. 297). Kruskal-Wallis ANOVA analysis provided quantitative results measuring the level of agreement between each expert's cognitive walkthrough evaluation. Qualitative conclusions were made based upon the quantitative analysis. Recommendations were made regarding the usability of the PCATD, as based upon the cognitive walkthrough analysis. Recommendations for improving the usability of the PCATD were also made based upon a synthesis of all evaluations and analyses.

RESULTS

Results of the Heuristic Evaluation

Three CFIs participated in the heuristic evaluation of the PCATD. Each CFI was given approximately 30 minutes to conduct their evaluation. Each heuristic evaluator wrote comments regarding "areas of concern" as they used the PCATD to explore their selected areas of operation (see Appendix A). These comments were qualitatively evaluated and related to Shneiderman's "eight golden rules" (1998).

Issues of simulator fidelity were characterized in terms of cues, discrimination, and mediation (Caro, 1998). The following results provide each question asked on the survey along with a qualitative analysis of the comments made by all three evaluators. Relevant ethnographic analysis is also included for each question.

Heuristic and Ethnographic Results

What are your concerns regarding the clarity of objects, or information, displayed on the PCATD screen and control system?

Two of the three evaluators remarked that the icons presented in the PCATD user interface were "too small" and depicted images that were "unknown" in terms of implied meaning or utility. The third evaluator felt that all of the PCATD interface elements presented were "clear and easy to identify."

According to Shneiderman (1998), shortcuts such as icons are "appreciated by knowledgeable and frequent users" (p. 74). Although knowledgeable, the experts were not frequent users of the specific PCATD being evaluated. Evaluators expressing concern regarding the ambiguity of the icons felt that an adequate solution would be to place short, abbreviated textual descriptions under each icon. This feature offered as a user option would consider the experience level of the user, as suggested by Shneiderman (1998) when considering combining text with icon representations.

Shneiderman (1998) also suggests that each icon should be designed in a "familiar and recognizable manner." Since the PCATD technology is relatively new, it was difficult for the evaluators to relate the icons presented to any pre-existing CBT interface designs. The icons represented in the evaluated PCATD may become familiar and recognizable standards in future PCATD systems. According to Caro (1998), the addition of textual descriptions would enhance the quality mediation as supported by the PCATD interface.

Ethnographic observation revealed that one of the evaluators had limited prior experience in viewing the user-interface for the evaluated PCATD. This probably accounts for his characterization of each element being clear and easy to identify. However, upon further questioning by the ethnographer, the evaluator agreed that the novice user would benefit from textural descriptions related to each specific icon.

What are your concerns regarding the compatibility of objects, or information displayed by the PCATD, to similar attributes as experienced in actual flight?

All three evaluators agreed that simulation fidelity of the PCATD as related to the actual flight environment was quite good. Ethnographic evaluation determined that the evaluators found certain flight maneuvers as "jerky" and "too rapid" in response fidelity. As suggested by Caro (1998), the cues provide by these unrealistic fidelities might deter the student pilot from learning the correct meaning of the stimulus being provided by the PCATD. All three evaluators felt that the cues provided during these maneuvers would be of minor concern to the novice student. They also felt that although fidelities in these maneuvers were not realistic, the actual outcome of the simulation was accurate enough to provide proper understanding of the learning objective by the student pilot.

What are your concerns regarding the consistency of PCATD performance and display as applied to each PTS area of operation that was conducted?

The cues, discriminations, and mediations provided by the PCATD while simulating flight were considered adequate for successfully conducting all but one area of operation contained within the PTS. It was determined by two of the evaluators that the PCATD did not allow the student to perform a flight maneuver referred to as a "stall." This deficiency in simulation fidelity was considered by all three evaluators as a serious issue requiring attention in software redesign and upgrade by the manufacture of the PCATD. Cues (Caro, 1998) provided during the stall maneuver were considered accurate. However, the simulation was not able to provide the correct "feedback" (Shneiderman, 1998) of the instance in time that the actual aerodynamic effect of the stall occurred.

What are your concerns regarding the ease of operating the PCATD?

Ethnographic observation determined that all three evaluators viewed the PCATD as "relatively easy to use." It was generally agreed that students having a very basic understanding of the personal computer would find the PCATD very easy to use. The rule of "consistency" (Shneiderman, 1998) as compared to other PC-based software was considered very strong as applied to the overall PCATD design.

However, one of the evaluators determined that it was not possible to "multi-task," or switch to other software applications while using the PCATD. Shneiderman (1998) suggests that design elements that cause a loss of user control can build anxiety and dissatisfaction. All three evaluators agreed that this design flaw would cause potential aggravation for the instructor using the PCATD in a training environment. It was felt that the lack of multi-tasking would have minimum impact on the student's ability to use the PCATD.

What were the best aspects of the PCATD for the student pilot as a user?

All three evaluators felt that the overall fidelity of the PCATD provided a positive experience for learning and building competency in the skill required by the FAA's PTS. The ability to repeat flight-training exercises in the level of fidelity offered by the PCATD was considered its strongest attribute.

What were the worst aspects of the PCATD for the student pilot as a user?

Two of the three evaluators found the design and fidelity of the flight control hardware unsatisfactory. Confusion was observed when all three evaluators attempted to manually adjust the radio frequencies required to operate the instruments being displayed by the simulation. The ethnographer noted that negative comments were made regarding the cues, discriminations, and mediations offered by the radio hardware interface. The evaluators felt that this design would cause the students confusion over simulation consistency (Shneiderman, 1998) as compared to the actual operation of aircraft radios in the flight environment.

Is there anything else about the PCATD you would like to add?

Two of the three evaluators added comments to this question. One evaluator suggested that an additional display containing "approach chart" information be added to the screen. Approach charts are used by pilots during the arrival and landing phase of flight. The evaluator stated that this feature would simulate fidelity comparable to various flight information systems used in the flight deck of an actual aircraft. This suggestion would potentially reduce the memory load on the user while improving the capability to assimilate information (Shneiderman, 1998) while using the PCATD.

Of particular interest were the comments made by the second evaluator responding to this question. This evaluator felt that the PCATD offered excellent fidelities for practice and instructor lead demonstrations. However, he did not believe that the fidelities for the hardware (manual controls) were sufficient to use the PCATD as training device that would meet certain experience requirements for FAA pilot certification. He stated that the PCATD was an excellent classroom-training device, but should not be used to replace any of the FAA's regulatory flight experience.

Further questioning of this evaluator determined that he had extensive experience with flight training simulators that offered the highest state-of-the-art fidelity. The prior experiences of this evaluator in regards to very high fidelity simulation technology might have biased his judgement against PCATD as sufficient in meeting the regulatory requirements of the FAA. It was also his opinion that the PCATD provided much more of a training process, rather than a simulation.

Results of the Cognitive Walkthrough Evaluation

Three CFIs participated in the cognitive walkthrough evaluation of the PCATD. Each CFI was given approximately 30 minutes to conduct their evaluation. All of the CFIs were of the male gender. Several female CFIs were invited to participate, but were unable to do so.

Each evaluator participating in the cognitive walkthrough was asked to "practice" three pre-identified areas of operation contained within the PTS [2] using the PCATD. They then answered a post-task survey qualifying the PTS operations in relation to the cues, discriminations, mediation, and generalizations (Caro, 1998) inherent to the PCATD interface (see Appendix B). Ordinal responses measured the level of agreement to each statement asked. A rank of one (1) represented an attitude of complete agreement. A rank of nine (9) represented an attitude of complete disagreement. The rank of ten (10) was used to indicate that the question was not applicable to the characteristic being evaluated. A Kruskal-Wallis ANOVA analysis was also conducted on the ordinal responses submitted on the survey for the cognitive walkthrough. This analysis measured the overall level of agreement (H statistic) between each evaluator's cognitive walkthrough.

Cognitive Walkthrough Results

None of the evaluators for the cognitive walkthrough responded with a rank of ten (10, or not applicable) to any of the survey questions (see Appendix B). The least level of agreement indicated from one of the evaluators was a four (4). This rank was assigned to the question, "The objects, or information, displayed on the PCATD screen are identifiable to those same elements as experienced in the actual flight environment" (see Appendix B). Rank level responses for the evaluation ranged from one (1) to four (4). The overall average (x) rank level of agreement to all questions by all evaluators was $x = 1.8$. Table 1 summarizes the average rank level (x_q) response for each of the questions administered in the cognitive walkthrough evaluation.

The Kruskal-Wallis ANOVA produced a relatively small test statistic ($H = 0.522$ with 2 degrees of freedom) indicating a strong level of agreement for the rank level responses provided by each evaluator of the cognitive walkthrough. It was further assumed that a significant difference between the responses would be considered to exist if the Kruskal-Wallis probability test was $p<0.05$. Kruskal-Wallis analysis on the rank responses produced a probability of $p=0.77$, indicating no statistically significant difference between the responses made by each evaluator.

Table 1
Average Rank Level (xq) Response for each Question Administered within the Cognitive Walkthrough Evaluation

Question (Q)	x_q
(Q) 1	2
(Q) 2	1.3
(Q) 3	2.3
(Q) 4	2
(Q) 5	2
(Q) 6	1.7
(Q) 7	1.3

Note. A rank of one (1) equaled complete agreement while a rank of nine (9) equaled complete disagreement. See Appendix B section titled "Cognitive Walkthrough Evaluation – Primary Questions for Levels of Agreement" for each specific question asked during the cognitive walkthrough evaluation.

Ethnographic observations conducted during the cognitive walkthrough resulted in similar conclusions as made by the evaluators for the heuristic evaluation. The evaluators for the cognitive walkthrough felt that PCATD simulation for flights conducted at (a) "slow speeds," (b) "high pitch attitudes," and in (c) "turbulence" resulted in consistencies (Shneiderman, 1998) not found in actual flight. One evaluator remarked that the visual fidelity of the "natural horizon [earth-sky boundary] caused visual disorientation." All of the experts in this evaluation experienced the same frustration as those in the cognitive walkthrough when attempting to control and adjust the simulated radio-navigation PCATD hardware. All evaluators stated that the consistency (Shneiderman, 1998) for cues, discriminations, and mediations (Caro, 1998) was very poor in terms of radio-navigational hardware. Further questioning by the ethnographer revealed that all three evaluators questioned the decision of the FAA to certify the PCATD as a training device that can be applied to actual training flight time as required by regulation. This concern was based upon the poor fidelities associated with the hardware incorporated within the PCATD design.

CONCLUSION

Discussion

Consensus of agreement was strong among the evaluators for both the heuristic and cognitive walkthrough evaluations conducted. Heuristic and ethnographic analysis of the PCATD confirmed similar areas of concern by each evaluator regarding the usability of the simulator as a training device for primary instrument students. The relatively small value of the Kruskal-Wallis test statistic H ($H=0.522$; $p=0.733$) indicated a strong level of agreement among the evaluators participating within the cognitive walkthrough.

Ethnographic analysis determined that all experts for heuristic and cognitive walkthrough felt that the usability of the PCATD was sufficient for training primary instrument students. All evaluators expressed strong concern over the design and fidelity of the PCATD hardware used to simulate aircraft control. One evaluator from the heuristic evaluation felt that the PCATD should not have been approved by the FAA as training that applied to flight time required by regulation. Ethnographic examination during the cognitive walkthrough discovered that all three experts had similar concerns regarding of the approval of the PCATD as an FAA approved training device.

A shortcoming to this evaluation was that all of the CFI's that volunteered to participate were of the male gender. An approximately equal number of female and male CFIs from the ASD were invited to participate in either of the evaluations. It is known that two of the ASD female CFIs had scheduling conflicts. Vardaman (1997) stated that males tend to like computers more than females. It would have been beneficial to this evaluation to incorporate the possible affect of gender and the CFI's qualification of the PCATD.

All of the experts from both evaluations felt that the PCATD was adequate for training each area of operation as described in the FAA's PTS. The only concern was the lack of consistency (Shneiderman, 1998) in fidelities for those areas of operation requiring slow flight speeds or extreme flight attitudes (position of aircraft). Results of the cognitive walkthrough evaluation support the conclusion that the PCATD is adequate for the training, and use by, student pilots pursuing primary instrument training.

Limitations of the Analysis

The primary objective of this study was to discover issues of usability regarding the PCATD design as applied to training required for the Instrument Rating. Conclusions made in this study were based upon the ethnographic observations and opinions made by expert evaluators. This study included six expert evaluators in addition to the ethnographer.

Jakob Nielson (1993) has provided evidence that on average, three to five experts offer the greatest incremental advantage for discovering issues of usability during an evaluation. However, Nielson also recommends that in the evaluation of mission critical systems, more evaluators should be used. Based upon the work by Nielson, this study recommends that future evaluations of the PCATD system should employ between seven and 15 expert evaluators. Nielson advises that on average, six evaluators will discover 80 percent of all relevant usability issues, while 15 evaluators will increase the probability to 90 percent.

A further limitation to the analysis of this evaluation was the length of time provided to conduct each evaluation. Each evaluator was provided with 30 minutes to conduct their review of the PCATD, exclusive of the time required to fill out each survey form. Nielson (1993) recommends that from one to two hours be provided for each expert to conduct their evaluation.

As a final concern, it is important to note that this study does not offer statistically significant data that can support inferential conclusions. This study did use valid methodology for exploring the issues of PCATD usability. However, it is strongly recommended that the number of expert evaluators be significantly increased for future PCATD evaluations offering conclusions supported by inferential statistics.

Recommendations

Based upon the usability investigations conducted in this study, the following recommendations are made for further investigation and potential improvement in PCATD usability and design:

1. Flight control hardware should be redesigned for consistency (Shneiderman, 1998). Particular attention should be focused on improving the cues, disseminations, and mediations (Caro, 1998) of the radio-

navigational hardware associated with the PCATD.

2. Improvements should be made in allowing the user to control the amount of interactions (Shneiderman, 1998) used to control the configuration of the PCATD simulation software. Icons, objects, and other information provided by the PCATD offered meaning that would only be understood by the experienced user of the PCATD.

3. Simulation for fidelities experienced during slow airspeeds, unusual attitudes, or turbulence require improvements in at least the visual cues (Caro, 1998) being displayed by the PCATD.

4. An option should be added allowing the PCATD user to display additional database information (such as approach charts) on a separate monitor consistent with actual flight deck configuration.

Further Recommendations for Study

Evaluators for this project expressed concern that the FAA approved the selected PCATD for use in meeting certain requirements of actual flight time required for pilot certification. This concern was based upon PCATD hardware related fidelity problems discovered in this study. Further research is recommended to determine the fidelities required for hardware design that would improve the interface consistency of the PCATD as related to the actual flight environment.

This study conducted expert and ethnographic evaluations of a selected PCATD simulator. Further research focused on the design and fidelity of the PCATD, as evaluated by the student pilot, should be considered. New efforts in research should also consider evaluating the PCATD interface during actual training conditions.

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FOOTNOTES

[1] This is often referred to as "zero flight time" or ZFT. Under ZFT, a training program is conducted entirely within the flight simulator. The aircraft is not used until training using the simulator is complete.

[2] Area IV (A) – straight and level flight; (C) rate climbs and descents; and (F) steep turns.

[3] Gall, Borg and Gall (1996, p.608) refer to this characteristic of cultural perception as "emic" ethnography. Emic ethnography attempts to qualify the affect of culture on the human perception of reality.

APPENDIX A

Heuristic Evaluation - Primary Questions for Areas of Concern

1. What are your concerns regarding the clarity of objects, or information, displayed on the PCATD screen and control system?
2. What are your concerns regarding the compatibility of objects, or information displayed by the PCATD, to similar attributes as experienced in actual flight?
3. What are your concerns regarding the consistency of PCATD performance and display as applied to each PTS area of operation that was conducted?
4. What are your concerns regarding the ease of operating the PCATD?
5. What were the best aspects of the PCATD for the student pilot as a user?
6. What were the worst aspects of the PCATD for the student pilot as a user?
7. Is there anything else about the PCATD you would like to add?

Appendix B

Cognitive Walkthrough Evaluation – Primary Questions for Levels of Agreement

Each comment will be answered using an ordinal scale measuring levels of agreement: ex. 1 = "strongly agree," to 9 = "strongly disagree" with 10 representing not applicable (NA) (Shneiderman, 1998, p.140). After conducting the three prescribed areas of operation, the expert will answer the following questions:

1. The student pilot will be able to interpret the objects, or information, displayed on the PCATD screen.
2. The student pilot will be able to relate the objects, or information, displayed on the screen to the required knowledge areas fundamental to primary instrument flight training.
3. The objects, or information, displayed on the PCATD screen are identifiable to those same elements as experienced in the actual flight environment.
4. Adequate information is provided on the PCATD screen for the student pilot to interpret the meaning of each object or action being simulated.
5. The overall simulation of the PCATD is adequate in terms of realism as applied to primary instrument training.
6. Response of the PCATD to user control input is adequate for primary instrument training.
7. As compared to other approved flight training devices, the PCATD is acceptable for primary instrument training.

An Examination of the U.S. Collegiate Aviation Workforce in Preparing the Next Generation of Aviation Faculty Members Beyond 2000

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ABSTRACT

Aviation as an academic field of study has evolved in the span of a century. As the new millennium approaches, collegiate aviation will be called upon to prepare a new generation of highly skilled workers. These workers need to be educated by current and future generations of aviation faculty members. The purpose of this study was to examine the US collegiate aviation workforce to determine if the next generation of faculty members are being adequately prepared. A descriptive study survey questionnaire was used to collect data for this study which was sent to US University Aviation Association (UAA) institutional members in order to ascertain their workforce needs. The study found that a significant amount of hiring for qualified aviation faculty members is already occurring. The survey results also indicated a substantial number of retirements is either taking place or is anticipated to take place by the year 2000. A very significant finding was that almost all of the respondents believe the public at large does not have an adequate understanding of collegiate aviation.

INTRODUCTION AND BACKGROUND

During the twentieth century, the entire field of aviation has advanced tremendously. From the historic flight at Kitty Hawk to routine daily transoceanic flights carrying a seemingly countless number of passengers from all walks of life, aviation still seems to be evolving at phenomenal rates. In the US alone, there are over 500 colleges and universities that offer some type of aviation related program (Collegiate Aviation Guide, 1994). According to Fuller and Truitt (1997), the academic field of aviation has matured from a more historic technical/vocational orientation to a present day contemporary study involving science, business and public administration, technology, and the social sciences found in modern day colleges and universities. These changes in the academic field of aviation have necessitated changes in the aviation educator's role as well. As the aviation academic field continues to evolve, a new generation of aviation faculty members must be prepared to fulfill the personnel needs of the industrial, governmental, and academic sectors of aviation beyond the year 2000.

Educators have several formidable challenges in preparing a new generation of aviation faculty members. The first challenge lies in the area of minimum requirements for employment. Unlike 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 faculty member is often more demanding. Unlike history and philosophy, aviation's technical/ vocational orientation started at the airfield and has evolved into a complex multi disciplinary academic field of study found in many colleges and universities (Fuller & Truitt, 1977). This evolution has precipitated a need for aviation faculty members to possess not only a graduate degree (with greater emphasis on the doctorate) and preferential teaching experience, but actual aviation practitioner oriented field experience combined with professional certification credentials.

Another challenge that seems to plague collegiate aviation is residual negative public perception. This adverse perception of aviation as a legitimate field of academic study still creates hurdles for current aviation faculty members to overcome and may hinder new faculty member entrants. Fortunately, there is evidence that improvement in public perception is gaining momentum. During the 1970s, the Dean of University of North Dakota (UND) School of Aerospace Sciences, John Odegard, stated, "The acceptability of aviation in the academic community has been painfully slow, but improvement appears to be rapidly on the upswing" (Matson, 1977, p. 178). By 1997, former president of Embry-Riddle Aeronautical University, Steven Sliwa, argued that aviation had still not reached general acceptance in higher education (University Aviation Association Newsletter, 1997). Specific areas of negative public perception may possibly include aviation's recent entrance to higher education in comparison to traditional fields of study, an absence of a longstanding record in research (Truitt & Kaps, 1995), and beliefs held by some traditional academicians that aviation belongs in technical schools and not colleges and universities.

Another area that has continually plagued aviation educators is a failure to reach a consensus on how educators collectively identify academic programs in the field. In a study conducted by Johnson (1997), 14 different terms or phrases were used by aviation educators to identify collegiate aviation.

METHODOLOGY

Subjects

The population for this study included all US UAA institutional members. The November 1997 UAA membership list indicated there were 100 US institutional members. Key assumptions made about the subjects during the study included: (a) University Aviation Association institutional members as representative experts in their field; (b) the data generated from the institutional members can be used to accurately assess how well aviation educators are doing in preparing a future generation of aviation faculty members; (c) the institutional members were current in academic matters concerning their hiring needs and could make reasonable assumptions about future hiring needs; and (d) the members responded to the questionnaire in a sincere manner using their professional, educational, and experiential expertise.

Research Instrument

The instrument used to collect the data was a survey questionnaire developed specifically for the study. The survey was distributed to all 100 US member institutions via US mail. A usable return rate of 56 surveys (56.0%) was received for the study. The survey was comprised of two sections. The first section incorporated a series of questions posed to the institutional members concerning their aviation faculty recruitment needs, hiring requirements, salary structures, experiential knowledge of their new hires, etc. In response to the survey questions, respondents were directed to choose from a series of short statements ranging from yes/no responses to minimum educational requirements. The second section of the survey instrument incorporated a demographic section. Responses left blank by institutional members were indicated by N/R (Not Reported). In evaluating the data presented in the following tables, rounding errors should be taken into consideration.

DATA ANALYSIS

Demographics

Data from the survey questionnaires were compiled from the software program, Minitab (1998). Demographic characteristics included gender, highest degree held, position, institutional affiliation, employment status, and institutional longevity. Of the 56 respondents, 55 (98.2%) are male, 46 (82.1%) are employed at a public institution, 26 (46.4%) are tenured, and 15 (26.8%) have at least 16 years of employment experience at their present institution. Thirty UAA institutional members (53.4%) are 51 years of age or older, 35 (62.5%) have 10,000 students or less at their institutions, 26 (46.5%) are at the associate professor level or higher, and 22 (39.3%) are employed at doctoral granting institutions of higher education. The percentage of female UAA institutional representatives in collegiate aviation has remained relatively unchanged from 1993 to 1998 (see Table 1). The percentages of female aviation faculty members depicted in Table 1 still remain far below the national average of 32.5 percent as indicated by the 1992 data from the US Department of Education (cited in The Chronicle of Higher Education: Almanac Issue, 1997).

Table 1
Gender by Year

	Female N %	Male N %	N/R N %	Total N %
1993*	5 (6.4)	74 (93.8)	0 (0.0)	79 (100.0)
1996**	1 (1.3)	74 (98.7)	0 (0.0)	75 (100.0)
1998	4 (7.1)	51 (91.1)	1 (1.8)	56 (100.0)

Note. The data in row 1* are from The Feasibility of Developing a Profession-ally Accredited Non-Engineering Aeronautical/Aerospace Science Doctoral Degree Program in US Universities (p. 38) by J. A. Johnson, 1993, Ann Arbor, MI: Master's Abstracts International. The data from row 2** are from An Analysis of Curriculum Design in Developing a Doctor of Philosophy Program in Aeronology (p. 59) by J. A. Johnson, 1997, Ann Arbor, MI: Dissertation Abstracts International.

Percentage wise, Table 2 illustrates a relatively stable trend in the highest degree held by UAA institutional member respondents in collegiate aviation during a recent five year period. Note that approximately one-half of the respondents have a master's degree as the highest degree held while only one-third of the respondents have a doctoral degree. Likewise, respondents in possession of an associate's degree as the highest degree held represent a very small percentage of all the respondents during the same time frame.

Table 2
Respondents' Highest Degree Held vs. Year

	Asso-ciate N %	Bache-lor's N %	Master's N %	Doc-torate N %	Total N %
1993*	3 (3.8)	11 (13.9)	42 (53.2)	23 (29.1)	79 (100.0)
1996**	1 (1.3)	13 (17.3)	32 (42.7)	28 (37.3)	74 (100.0)
1998	1 (1.9)	6 (11.1)	29 (53.7)	18 (33.3)	54 (100.0)

Note. The data in row 1* are from The Feasibility of Developing a Professionally Accredited Non-Engineering Aeronautical/Aerospace Science Doctoral Degree Program in US Universities (p. 39) by J. A. Johnson, 1993, Ann Arbor, MI: Master's Abstracts International. The data from row 2** are from An Analysis of Curriculum Design in Developing a Doctor of Philosophy Program in Aeronology (p. 59) by J. A. Johnson, 1997, Ann Arbor, MI: Dissertation Abstracts International.

Data Tabulations

The data from the study were incorporated into a series of tables. Some of the data illustrated in this section have been cross tabulated using demographic information to illustrate comparisons. In Table 3, almost one-half (N=24, 42.8%) of the respondents are recruiting faculty members predominantly at public institutions (N=20, 35.7%). Four respondents (7.1%) at private institutions are reportedly hiring faculty members. The hiring activity is indicative of the importance for all of collegiate aviation to actively encourage careers in the field.

Table 3
Respondents' Institutional Affiliation and Recruitment Status for Hiring Aviation Faculty Members at the Instructor, Assistant Professor, Associate Professor, or Professor Ranks

	Public N %	Private N %	N/R N %	Total N %
Hiring	20 (35.7)	4 (7.1)	0 (0.0)	24 (42.8)
Not Hiring	25 (44.6)	5 (8.9)	1 (1.8)	31 (55.4)
N/R	1 (1.8)	0 (0.0)	0 (0.0)	1 (1.8)
Total	46 (82.1)	9 (16.0)	1 (1.8)	56 (100.0)

Out of the 24 respondents (42.8%) hiring faculty members depicted in Table 4, most of the hiring taking place is at doctoral granting institutions of higher education (N=11, 19.6%) followed by community colleges (N=7, 12.5%). The least amount of hiring taking place is at bachelor degree granting institutions (N=1, 1.8%). Some hiring activity at master's degree granting institutions is also occurring (N=5, 8.9%). With respect to hiring inactivity, doctoral and associate degree granting institutions are evenly split at 11 members apiece (19.6%).

Table 4
Highest Degree Offered by Respondents' Institutions and Recruitment Status for Hiring Aviation Faculty Members at the Instructor, Assistant Professor, Associate Professor, or Professor Ranks

	Associate N %	Bachelor's N %	Master's N %	Doctorate N %	Total N %
Hiring	7 (12.5)	1 (1.8)	5 (8.9)	11 (19.6)	24 (42.8)
Not Hiring	11 (19.6)	4 (7.1)	5 (8.9)	11 (19.6)	31 (55.4)
N/R	0 (0.0)	1 (1.8)	0 (0.0)	0 (0.0)	1 (1.8)
Total	18 (32.1)	6 (10.7)	10 (17.9)	22 (39.2)	56 (100.0)

The data illustrated in Table 5 illustrate parallel trends to the data previously illustrated in Table 4. Note that in Table 4, 11 UAA institutional members (19.6%) at doctoral granting institutions are currently hiring compared to the same number of respondents who reported retirements or anticipated retirements in Table 5. The number of respondents reporting retirements substantially drops to four (7.1%) at master's degree granting institutions, two (3.6%) at four-year degree institutions, and three (5.4%) at community colleges. Slightly over one-quarter of all non-retirements are concentrated at the community colleges (N=15, 26.8%).

Table 5
Highest Degree Offered by Respondents' Institutions Versus Reported or Anticipated Retirements by the Year 2000

	Associate N %	Bachelor's N %	Master's N %	Doctorate N %	Total N %
Retire	3 (5.4)	2 (3.6)	4 (7.1)	11 (19.6)	20 (35.7)
None	15 (26.8)	4 (7.1)	5 (8.9)	11 (19.6)	35 (62.5)
N/R	0 (0.0)	0 (0.0)	1 (1.8)	0 (0.0)	1 (1.8)
Total	18 (32.2)	6 (10.7)	10 (17.9)	22 (39.2)	56 (100.0)

Table 6 indicates that a significant majority of the UAA respondents (N=35, 62.5%) require the master's degree as a minimum educational requirement for faculty new hires. Nine respondents (16.1%) report the bachelor's degree as a minimum prerequisite followed by seven (12.5%) who require the doctorate. Four respondents (7.1%) in the Other category have indicated specialized expertise in the form of a license or professional certification as a minimum educational requirement. Only one UAA institutional member (1.8%) did not respond.

Table 6
Minimum Educational Requirements for Aviation Faculty New Hires

Bachelor's N %	Master's N %	Doctorate N %	Other	N/R	Total
9 (16.1)	35 (62.5)	7 (12.5)	4 (7.1)	1 (1.8)	56 (100.0)

As shown in Table 7, slightly less than one-quarter of all the UAA respondents (N=22, 39.3%) believe that collegiate aviation is average in its effectiveness to promote and prepare a future generation of faculty members. Moreover, collegiate aviation's overall effectiveness does not seem to "make the grade" when combining Below Average and Poor responses which equates to nearly one-half (N=25, 44.6%) of the institutional membership who responded to the survey questionnaire. No one indicated that collegiate aviation's effectiveness was in the Excellent category while slightly less than one-fifth (N=9, 16.1%) of the reported membership was in the Good category.

Table 7
Collegiate Aviation's Effectiveness in Promoting and Preparing a Future Generation of Faculty Members

Excel-lent N %	Good N %	Average N %	Below Average N %	Poor N %	Total N %
0 (0.0)	9 (16.1)	22 (39.3)	16 (28.5)	9 (16.1)	56 (100.0)

Table 8 illustrates the UAA respondents' perceptions of their own salary structure in comparison to other aviation programs. Nearly one-half of the respondents (N=26, 46.4%) believe their salary structures are average in comparison to other programs. Only 3 respondents (5.4%) reported their salary structure as Poor. When combining Excellent and Good responses, slightly over one-quarter (N=15, 26.8%) of the members consider their salary structure better than average in comparison to other programs. Note the number of respondents in the Excellent/Good category equals the number of respondents in the Below Average/Poor category (N=15, 26.8%). In essence, a normal distribution exists around the concentration of Average responses.

Table 8
Respondents' Reported Salary Structure in Comparison to Other Aviation Programs

Excel-lent N %	Good N %	Average N %	Below Average N %	Poor N %	Total N %
7 (12.5)	8 (14.3)	26 (46.4)	12 (21.4)	3 (5.4)	56 (100.0)

The distribution of responses in Table 8 has a strong resemblance to the distribution of responses in Table 9. Again, nearly one-half of the respondents (N=26, 46.4%) believe their salary with respect to cost of living is average. Only one individual reported an earned salary vs. cost of living as Excellent. Collectively though, exactly one-quarter of the respondents (N=14, 25.0%) report their salaries as Excellent/Good. Thirteen (23.3%) of the reported UAA institutional membership report their salary as Below Average and only three members (5.4%) report a response of Poor.

Table 9
Respondents' Reported Salaries With Respect to Cost of Living

Excel-lent N %	Good N %	Average N %	Below Average N %	Poor N %	Total N %
1 (1.8)	13 (23.2)	26 (46.4)	13 (23.2)	3 (5.4)	56 (100.0)

Table 10 provides an illustration of the UAA institutional members' aviation program salary ranges. Reported salaries are clustered in the \$20,000 - \$59,000 range. The most prolific response was the \$40,000 - \$59,000 salary range reported by 36 respondents (64.3%). According to US Department of Education (as cited in The Chronicle of Higher Education: Almanac Issue, 1997), the average salary for all institutions of higher education adjusted for a nine month academic year (except those without academic ranks) are as follows: Professor, \$67,415; Associate Professor, \$49,695; Assistant Professor, \$41,041; Instructor, \$31,756; Lecturer, \$34,755; and No Rank, \$36,502. The overall average salary was \$52,556. Table 10 also depicts a very small percentage of salaries in the Less than \$20,000 and the \$100,000 or more category ranges at one response (1.8%) per category. Respondents reporting in the \$80,000 - \$99,000 category also comprise a very small percentage (N=2, 3.6%).

Table 10
Reported Salary Ranges
by UAA Institutional Members

Less than $20,000 N %	$20,000 – $39,000 N %	$40.000 – $59,000 N %
1 (1.8)	32 (57.1)	36 (64.3)
$60,000 – $79,000 N %	$80,000 – $99,000 N %	$100,000 or more N %
10 (17.9)	2 (3.6)	1 (1.8)

Note. Respondents were able to list more than one salary range.

In Table 11, 55 out of the 56 responding members indicated that public perception of collegiate aviation is inadequate. None of the members indicated adequate public perception. Only one respondent (1.8%) did not respond.

Table 11
Does the Public At Large Have
an Adequate Understanding
of Collegiate Aviation?

Yes N %	No N %	N/R N %	Total N %
0 (0.0)	55 (98.2)	1 (1.8)	56 (100.0)

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Overall, 24 UAA respondents (42.8%) indicated they were actively hiring new aviation faculty members for their programs. Most of the hiring taking place is at doctoral granting institutions of higher education (N=11, 19.6%) followed by community colleges (N=7, 12.5%). Data results also indicate that 11 doctoral institutions (19.6%) are either losing faculty members to retirements or will be losing faculty to retirements by the year 2000. This finding suggests that numerical retirements and hiring may be consistent at the doctoral level. The results also indicate that greater emphasis on preparing a future generation of aviation faculty members with earned doctorates is becoming increasingly important. In addition, the data indicate that preparing aviation faculty members for careers in community college settings is also an area of increasing importance. The results of the study indicate that 62.5 percent (N=35) of all the UAA respondents require, at a minimum, the master's degree for aviation faculty new hires. Significantly less (N=7, 12.5%) require the doctorate.

In the area of collegiate aviation's effectiveness in promoting and preparing a future generation of faculty members, 22 respondents (39.3%) reported Average. Below Average and Poor responses equated to nearly one-half of the respondents (N=25, 44.6%). In a related area, almost all of the UAA respondents (N=55, 98.2%) believe the public at large does not have an adequate understanding of collegiate aviation. Clearly, promoting aviation faculty careers and public awareness are two areas that collegiate aviation needs to improve upon.

The most commonly reported salary ranges are as follows: $40,000 - $59,000 (N=36, 64.3%) and $20,000 - $39,000 (N=32, 57.1%). The national average reported by the US Department of Education (cited in The Chronicle of Higher Education: Almanac Issue, 1997) for all professors (except those institutions without academic ranks) is $52,556. Nearly one-half of the UAA members (N=26, 46.4%) believe their program salaries are average with respect to cost of living while an additional 13

(N=23.2%) report their program salary structure is good.

Recommendations

Historically, other studies (Matson, 1977; Taylor, 1990; Truitt & Kaps, 1995; Johnson, 1997) have indicated that negative public perception of collegiate aviation has been problematic. Despite great strides in collegiate aviation in a relatively short period of time, inadequate public awareness still presents a problem as indicated by the data collected for this study. The identity issue still plagues collegiate aviation. How aviation educators are collectively identified in the academic field still remains obscure at best. Johnson (1997) found 14 different terms or phrases were used by aviation educators to identify collegiate aviation. The study also found a disturbing observation noted by several traditional scholars with no previous aviation experience: If aviation educators and scholars cannot articulate who they are as a collective body, then how do they expect us and the general public to identify who they are as well?

One solution is to redefine or invent a collective term or phrase to describe what we do and how we identify ourselves. By 1997, Johnson (1997) invented the word aeronology as "the study of the non-engineering aspects of aviation, aeronautics, and aerospace sciences and technologies" (p. 28). In the field of engineering, Narayanan (1999) has made reference to aeronology "as a subject bridging various disciplines in aerospace sciences" (p. 11) in a research proposal to the National Science Foundation (NSF). Regardless of what word or phrase is used, it is recommended that aviation as an academic field of study should resolve the identity issue. This should alleviate some internal and external perceptual problems.

Other recommendations include elevating the awareness of aviation related higher education opportunities to students and industry representatives. This can be accomplished at the institutional level or through involvement in national organizations such as UAA conferences. As the importance of aviation related research further escalates, the need to prepare a future generation of faculty members with earned doctorates becomes more imperative as well. By doing so, the academic vitality of aviation will be preserved by the preparation of a new generation of faculty members capable of addressing the demands of the twenty-first century and beyond.

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Assessing the Environment and Outcomes of Four-Year Aviation Programs: Does Program Quality Make a Difference?

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ABSTRACT

The higher education literature concerning academic program quality offers differing opinions as to which indicators should determine program quality (Cameron, 1987; Tan, 1992). Recently, greater attention has been focused upon the environment and the outcomes of higher education academic programs (Astin, 1991). The purpose of this study was to determine to what extent the highest quality U.S. four-year aviation programs follow current literature trends and emphasize environment and outcome indicators of quality. Students (N=447), faculty (N=167), and alumni (N=577) from high, medium, and low quality four-year aviation programs as determined in Lindseth's (1996) study, were surveyed using the Educational Testing Service's Program Self Assessment tool. The instrument measures perceptions of students, faculty, and alumni toward 16 composite characteristics or indicators of academic program quality. Results showed that except for the indicator internship experiences, the emphasis placed on environment and outcome indicators of academic program quality was not significantly different at the highest quality U.S. four-year aviation programs as compared to intermediate and low quality four-year aviation programs.

INTRODUCTION

The overriding theme in the literature concerning academic program quality is that scholars find it hard to agree on which indicators should be used to determine program quality (Cameron, 1987; Tan, 1992). As noted in reviews of research literature (Conrad & Blackburn, 1985b; Kuh, 1981; Tan, 1992), authors list many indicators that could be classified as input variables to the academic program such as facilities, equipment and dollars. However, an increasing number of environment (process) and outcome variables are being identified as well. For example, Astin's (1985, p. 60-61) "talent-development" concept of educational quality is that "true excellence lies in the institution's ability to affect its students and faculty favorably, to enhance their intellectual and scholarly development, and to make a positive difference in their lives." This view of quality, labeled the value-added view, does focus more on process (environment) and outcome indicators of quality.

Conrad and Pratt (1985) also present questions about processes such as how should an academic program commit resources to the academic processes involved in teaching, research, and service? Examples of these academic processes are faculty-student interactions and development of students' critical thinking and problem solving ability. Kolb's (1984) learning theory and Pace's (1979, 1984, 1990) quality of student effort theory are not factors in most quality ratings. The knowledge gained from research on learning and thinking and how academic programs may adopt curricula to reflect this knowledge is seldom addressed. The processes (environment) taking place within the design of an academic program can be very important indicators of program quality. In addition, the "extracurriculum" needs to be considered in an evaluation of academic program quality since the activities of students outside the classrooms certainly may enhance or detract from the overall learning experience of each student (Conrad & Pratt, 1985; Kuh, Schuh, Whitt & Associates, 1991). The extracurriculum may include events such as professional group meetings that are held on or nearby the campus.

All of these considerations point to a multidimensional approach in defining indicators of quality academic programs. Furthermore, quality indicators should be examined at the program level as well as the institutional level (Fairweather & Brown, 1991). According to the higher education literature, (Astin, 1985, 1991; Bogue & Saunders, 1992; Kuh, 1981; Kuh et al., 1991; Pace, 1990) focusing more on processes and outcomes will help gain a better perspective on the overall indicators of quality in academic programs. Thus to further investigate quality in one specific higher education academic program, the following research study of four-year aviation programs is presented.

Research Design

The purpose of this study was to determine to what extent the highest quality U.S. four-year aviation programs follow current literature trends and emphasize environment and outcome indicators of quality. It was a quantitative study of six of the top ten highest quality U.S. four-year aviation programs identified in Lindseth's (1996) study of academic program quality, as well as six randomly selected intermediate quality program and six randomly selected low quality programs. The overall ranking of all 68 U.S. four-year aviation programs (Lindseth, 1996) was used to select the 18 programs that were studied. From the overall rankings, the six highest quality programs were selected from the top ten programs identified in Lindseth's (1996) study. If one of the 18 aviation programs decided not to participate in the study, the seventh highest ranked program was selected for the top program sample and so forth. For the intermediate and low quality program samples, another program was randomly selected from the applicable category. Intermediate quality programs were those programs rated in the middle one-third of programs and low quality programs were those rated in the lower one-third of programs (Lindseth, 1996). Regardless of what criteria emerged as indicators of quality in Lindseth's (1998) grounded theory study of four-year aviation programs, determining whether the highest quality U.S. four-year aviation programs are following current literature trends and emphasizing environment and outcome variables of program quality seemed essential in a study of academic program quality.

Sample Population

In this research, the 18 U.S. four-year aviation programs were studied through an Educational Testing Service (ETS) Program Self-Assessment Survey filled out by faculty, students, and alumni from each of the 18 aviation programs. All undergraduate aviation students at each program, classified academically as seniors, comprised the student sample. The assumption was that senior students were better able to judge the program's quality than junior, sophomore, or freshman aviation students. All aviation faculty members at each program comprised the faculty sample. In additions, the 18 four-year aviation programs were asked to provide a list of alumni and their addresses who had graduated from the aviation program in the past ten years. A randomly selected sample (using a table of random numbers) of 50 alumni from each program was invited to participate in the study. The completed questionnaires from the faculty, students, and alumni were used to analyze to what extent the highest quality four-year aviation programs emphasize environment and outcome indicators of quality.

Instrumentation

The ETS's Program Self-Assessment Surveys were used as the measurement instruments. Each ETS instrument addresses whether U.S. four-year aviation programs emphasize key environment and outcome indicators of quality as measured by perceptions of students, faculty, and alumni. The instruments are Likert-scaled measurement instruments consisting of a 62-item program quality assessment questionnaire developed by Clark (1983) and the ETS. The instruments were initially developed for graduate programs but were modified for undergraduate academic programs. These instruments were chosen because they measure to what extent students, faculty, and alumni perceive their aviation program emphasizes key environment and outcome variables of program quality. Furthermore, the literature review showed that quality academic programs are shifting their focus from input variables to environment and outcome variables. The 16 composite indicators of quality that the ETS instruments measure are as follows (ETS, 1996):

1. **Environment for Learning**

   Extent to which members of the department work together to achieve program goals, provide a supportive environment characterized by mutual respect and concern between students and professors, and are open to new ideas and different scholarly points of view.

2. **Scholarly Excellence**

   Perceived scholarly and professional competency of the department faculty, academic ability and efforts of students, and intellectual stimulation in the program.

3. **Quality of Teaching**

   Assessment of faculty awareness of new developments in the field, teaching methods, grading procedures, preparation for classes, and interest in assisting students with their academic work.

4. **Faculty Concern for Students**

   Extent to which faculty members are perceived to be accessible, interested in the welfare and academic development of students, and aware of student needs, concerns, and suggestions.

5. **Curriculum**

   Ratings of the variety, depth, and availability of course and program offerings, program flexibility, opportunities for individual projects, and interactions with related departments.

6. **Departmental Procedures**

   Ratings of departmental policies and procedures, such as student participation in departmental decisions, relevance and administration of degree requirements, evaluation of students' progress toward the degree, academic and career advisement of students, and helpfulness to graduates in finding appropriate employment.

7. **Available Resources**

Adequacy of available facilities, such as libraries and laboratories, and overall adequacy of physical, financial, and support staff resources; perception of the institution's commitment to the program.

8. **Student Satisfaction with Program**

Self-reported student and alumni satisfaction with the program as reflected in judgments about the amount that has been learned, preparation for intended career, and willingness to recommend the program to a friend.

9. **Internship, Fieldwork, or Clinical Experiences**

Ratings of departmental training, supervision, and assigned duties; contribution of the experiences to academic and professional development; and adequacy of office space and equipment.

10. **Resource Accessibility**

Self-reported student satisfaction with opportunities for intellectual and social interaction among persons in the program, with student services and financial assistance, and with campus services for nonresident students.

11. **Employment Assistance**

Alumni assessment of the employment assistance received through the department's formal or informal efforts, individual professors, placement office, listings of openings from professional associations, and unsolicited letters sent to employers.

12. **Faculty Work Environment**

Self-reported faculty satisfaction with departmental objectives and procedures, academic freedom, opportunities to influence decisions, and relationships with other faculty members; faculty judgments of departmental management in such areas as planning, administration, and career development of faculty.

13. **Faculty Program Involvement**

Extent to which faculty members report involvement in the program: teaching required courses, participating in policy and curriculum decisions and departmental examinations, directing independent studies, supervising field work or internships, serving as a faculty advisor, and arranging student contacts with nonacademic professionals.

14. **Faculty Research Activities**

Extent to which faculty members report receiving awards for outstanding research or scholarly writing, editing professional journals, refereeing articles submitted to professional journals, and receiving grants to support research or other scholarly or creative work.

15. **Faculty Professional Activities**

Extent to which faculty members report serving on national review or advisory councils, holding office in regional or national professional associations, and receiving awards for outstanding teaching or professional practice.

16. **Student Accomplishments**

Self-reported student accomplishments in several categories of activity and recognition, including attendance and presentations at professional meetings; writing of scholarly papers, planning and involvement in research projects; development of professional skills and knowledge; recognition through prizes, awards, fellowships, training grants, or scholarships; and participation in department or program planning.

ETS developed similar but separate instruments for students, faculty and alumni. The reliability coefficient alpha for the instruments is *a*=.83 (Clark, 1983) for surveying graduate programs. A pilot test was accomplished on aviation faculty and students to check for reliability of the instruments for undergraduate aviation programs. A test-retest procedure was conducted 14 days apart for both the faculty and students. The faculty instrument test-retest correlation coefficient obtained was .93 ($p<.05$). The student instrument revealed a test-retest correlation coefficient of .83 ($p<.01$). With these relatively high values, the instruments appear to be reliable for use in researching program quality in U.S. four-year aviation programs.

To ensure content and construct validity of the instruments, a group of five experts were randomly selected from an official list of Council on Aviation Accreditation (CAA) accreditors received from CAA headquarters. These experts provided feedback as to whether each of the three instruments (faculty, student, and alumni) is a valid measure of four-year aviation program quality. Four of the five experts all agreed that all three instruments were valid measures of quality. The fifth expert was not able to respond due to other professional commitments. However, with four of the experts all in agreement, it was concluded that the instruments would be valid for this particular type of research on four-year aviation programs. The instruments consist of a section on perceptions of program quality and a demographic section. Applicable demographic items, as well as items suggested by the CAA panel of experts, were added to a supplemental section of each instrument.

Data Collection

The program administrators of each of the 18 aviation programs were contacted by telephone and the importance of the research study was explained along with the protocol procedures. An introductory consent letter was also sent to each administrator clarifying the research study. Two programs in each of the three groups (high, medium, and low quality programs) declined to participate for various reasons, ranging from time constraints on faculty and students to a perception that their input would be of little benefit given their particular circumstances (e.g., program was going to close, unionized faculty were on strike). Thus, two other programs in each group were selected and participation approval was obtained.

A research assistant to act in the researcher's behalf was obtained at each of the 18 programs. This was done to insure minimum sampling error and expeditious data collection. The research assistant was either the aviation program administrator, an aviation faculty member, or in one case, a graduate student. Each research assistant received training in regard to the protocol of the research. The assistants were then sent the appropriate number of faculty and senior-level student ETS questionnaires for their respective program. The research assistant distributed the questionnaires to all faculty and senior-level students along with cover letters at a convenient time during the semester. The purpose of the study and directions for the questionnaire were explained in the cover letter. The assistant collected and returned the questionnaires to the researcher, maintaining respondent confidentiality. Some programs were not able to allow class time for the students to complete the questionnaire. In these cases, the response rate suffered somewhat, however no program's response rate dropped below 40%. Also, some assistants were not as diligent as others to administer and collect the questionnaires. As a result it took four months to receive all the questionnaires.

The response rates for students and faculty were fairly similar between the two groups but within each group the low quality program students and faculty responded at a much higher rate than both the intermediate and high quality program students and faculty. A possible explanation for this may have been greater opportunity by the research assistant to contact faculty and student respondents at the low quality programs due to the program's small size, even though in a previous study program size did not correlate with program quality (Lindseth, 1996). The overall student response rate was 59% (N=447). Students from the highest quality programs responded at a rate of 54% (N=268), while the student response rate from intermediate quality programs was 63% (N=135), and from low quality programs 77% (N=44). The overall faculty response rate was 54% (N=167). The highest quality program faculty responded at a 49% rate (N=119), the intermediate quality program faculty responded at a 55% rate (N=31), and the low quality program faculty responded at an 88% rate (N=17).

The alumni responses were obtained through a mail survey of the ETS alumni questionnaire. Each of the 18 aviation programs did provide a listing of names and addresses of alumni who had graduated with an aviation degree during the past ten years. Fifty respondents were then randomly selected from the alumni lists. Seven programs had not graduated a total of 50 alumni in the past ten years, so all graduates of these programs in the past ten years (the entire population) were surveyed. A cover letter explaining the purpose of the research was sent to each alumnus along with the ETS alumni questionnaire. The overall response rate for the alumni after a postcard follow-up and an additional follow-up letter was 42% (N=577). The response rate for the alumni of the highest quality programs was 42% (N=286), for the intermediate group 40% (N=154), and for the lower quality group 43% (N=137).

Results and Analysis

The survey data gathered was analyzed utilizing the Statistical Package for Social Sciences (SPSS-X). Scores were analyzed separately for students, faculty, and alumni from each program. The response means, plus or minus the standard deviations for students, faculty, and alumni from each program for each applicable indicator of quality from the ETS instruments are displayed in Tables 1, 2, and 3.

Testing for Differences

To test for significant differences among student (N=447), faculty (N=167), and alumni (N=577) from the highest quality programs, intermediate quality, and lower quality programs, ANOVAs (analysis of variance) were computed using the statistical package SPSS-X. ANOVAs were accomplished for each of the applicable 16 composite indicators of quality on the ETS instrument.

ANOVAs on Student Data.

Of the eleven applicable student indicators, ANOVA analysis found significant differences in five of the eleven scales. A Scheffe test was accomplished to determine between which groups the means were significantly different. Table 1 displays these differences.

Interpreting the data from this table, three statistically significant determinations can be made. First, students attending intermediate quality aviation programs perceive a more conducive environment for learning and greater student accomplishment than students attending high quality programs. Second, students attending high quality programs perceive greater availability of resources and better internship experiences than students attending either intermediate or low quality aviation programs. Finally, students attending intermediate quality aviation programs perceive greater accessibility to resources than students attending low quality aviation programs.

Table 1.
Comparison of Means ± Standard Deviations and ANOVAs for Indicators of Quality as Rated by Students in High, Medium, and Low Quality Programs

	Students (N=447)				
	High Quality Programs (N=268)	Medium Quality Programs (N=135)	Low Quality Programs (N=44)	F Value	p=
Environment for Learning	2.93 ± .43[a]	3.10 ± .45[a]	2.97 ± .44	3.68	.0267
Scholarly Excellence	2.98 ± .43	2.99 ± .63	2.85 ± .51		NS
Quality of Teaching	2.97 ± .45	2.92 ± .65	2.92 ± .52		NS
Faculty Concern for Students	2.88 ± .48	3.04 ± .57	2.98 ± .57		NS
Curriculum	2.63 ± .54	2.52 ± .71	2.37 ± .58		NS
Departmental Procedures	2.65 ± .46	2.69 ± .62	2.61 ± .58		NS
Available Resources	2.78 ± .56[b]	2.41± .61[b]	2.12± .57[b]	22.46	.0000
Student Satisfaction with Program	3.32 ± .60	3.19 ± .68	3.16 ± .55		NS
Internships	3.15 ± .37[b]	2.90± .32[b]	2.69± .48[b]	8.76	.0004
Resource Accessibility	2.37 ± .60	2.56 ± .77[c]	2.19 ± .68[c]	4.31	.0144
Student Accomplishments	.38 ± .17[d]	.49 ± .19[d]	.45 ± .18	9.44	.0001

NS = Non-significant difference
[a]Significant differences exist between high quality programs and medium quality programs
[b]Significant differences exist between high quality programs and both medium and low quality programs
[c]Significant differences exist between medium quality programs and low quality programs
[d]Significant differences exist between high quality programs and medium quality programs

ANOVAs on faculty data. Only one of the eleven ETS indicators of quality scales showed significant differences between high, medium, and low quality programs (See Table 2). The environment for learning scale was rated significantly higher by the intermediate quality programs when compared to faculty ratings from the highest quality programs. All other scales showed no significant differences. Thus, the only statistically significant determination that can be made from the faculty questionnaires is intermediate quality program faculty perceive the environment for learning of their respective program at a higher level than faculty at the highest quality programs.

Table 2.
Comparison of Means ± Standard Deviations and ANOVAs for Indicators of Quality as Rated by Faculty in High, Medium, and Low Quality Programs

	Faculty (N=167)				
	High Quality Programs (N=119)	Medium Quality Programs (N=31)	Low Quality Programs (N=17)	F Value	p=
Environment for Learning	3.05 ± .39[a]	3.35 ± .38[a]	3.20 ± .45	4.04	.0211
Scholarly Excellence	2.96 ± .44	2.95 ± .38	3.01 ± .39		NS
Quality of Teaching	2.91 ± .55	3.10 ± .41	3.06 ± .59		NS
Faculty Concern for Students	3.06 ± .47	3.29 ± .39	3.29 ± .53		NS
Curriculum	2.72 ± .59	2.68 ± .69	2.51 ± .70		NS
Departmental Procedures	2.80 ± .55	2.99 ± .46	2.81 ± .47		NS
Available Resources	2.64 ± .65	2.36 ± .61	2.23 ± .77		NS
Faculty Work Environment	2.86 ± .46	3.06 ± .53	3.09 ± .46		NS
Faculty Program Involvement	1.84 ± .53	2.04 ±.90	1.98 ± .64		NS
Faculty Research Activities	1.81 ± .23	1.85 ± .23	1.87 ± .20		NS
Faculty Professional Activities	1.67 ± .32	1.67 ± .29	1.69 ± .23		NS

NS = Non-significant difference

[a]Significant differences exist between high quality programs and medium quality programs

ANOVAs on alumni data. For the ETS questionnaire sent to alumni, there were ten applicable indicators of quality. ANOVA analysis found significant differences in only two of the ten scales among the three groups of alumni. The two scales where significant differences were found were available resources and internships. A Scheffe test was done to determine between which groups the means were statistically significant. Table 3 displays these differences. From the data in Table 3, two statistically significant determinations can be made. The first addresses the indicator available resources. Alumni who attended the highest quality programs perceive they had greater availability of resources than alumni who attended either intermediate or low quality programs. Second, alumni graduating from high quality programs perceive greater benefit from their internship experiences than alumni graduating from low quality programs.

Table 3.
Comparison of Means ± Standard Deviations and
ANOVAs for Indicators of Quality as Rated by Alumni in
High, Medium, and Low Quality Programs

	Alumni (N=577)				
	High Quality Programs (N=286)	Medium Quality Programs (N=154)	Low Quality Programs (N=137)	F Value	p=
Environment for Learning	2.98 ± .41	2.94 ± .43	2.78 ± .57		NS
Scholarly Excellence	2.88 ± .58	2.72 ± .59	2.82 ± .62		NS
Quality of Teaching	2.95 ± .53	2.79 ± .59	2.85 ± .61		NS
Faculty Concern for Students	2.98 ± .54	2.87 ± .59	2.93 ± .70		NS
Curriculum	2.42 ± .65	2.29 ± .70	2.38 ± .63		NS
Departmental Procedures	2.43 ± .58	2.37 ± .63	2.39 ± .60		NS
Available Resources	2.90 ± .58[a]	2.25 ± .67[a]	2.26 ± .63[a]	30.06	.0000
Student Satisfaction with Program	3.03 ± .73	2.82 ± .74	3.00 ± .76		NS
Internships	3.03 ± .60[b]	2.70 ± .54	2.56 ± .74[b]	5.95	.0035
Employment Assistance	1.32 ± .63	1.27 ± .79	1.40 ± .59		NS

NS = Non-significant difference
[a]Significant differences exist between high quality programs and both medium and low quality programs
[b]Significant differences exist between high quality programs and low quality programs

DISCUSSION OF RESULTS AND ANALYSIS

Similar Emphasis on Environment and Outcome Indicators of Quality

This study focused on the environment and outcomes of U.S. four-year aviation programs. All of the ETS instrument scales examined environment and outcome variables to some extent except for the available resources scale. The environment and outcomes of four-year aviation programs are very important when using the ETS Program Self Assessment Survey tool.

In examining the mean scores by students, faculty, and alumni for each indicator of quality scale, as well as the totaled average student, faculty, and alumni mean score, several intermediate quality program means were higher than the high quality program means. Some of the low quality program means were also higher than the high quality program means. But why did this happen? Does this data invalidate previous research findings? A reason for the different results is because program quality was measured in another way in this study, (e.g., through the ETS survey instruments). When analyzing student, faculty, and alumni group means for significant differences, the results show that the highest quality aviation programs do not emphasize environment and outcome variables as indicators of quality, at least to no greater extent than the intermediate and low quality programs. In a few cases, the highest quality programs actually emphasize environment and outcome variables to a lesser extent.

However, to show that the differences are not very extensive among students, faculty, and alumni at the three groups of U.S. four-year aviation programs (high, medium, and low), additional comparisons were made. For example, among students, only five of the eleven applicable ETS indicators of quality scales showed significant differences between high, medium, and low quality program groups. Only two of these scales, available resources and internships, showed significant differences between students in the highest quality programs compared to students in both the medium quality programs and low quality programs. The internship scale measured an environment variable whereas the available resources scale was an input variable. On the other hand, the environment for learning and the student accomplishment scales were rated significantly higher by the intermediate quality group over the high quality group. Furthermore, although not significantly higher, the rated mean for these scales by the low quality group was also higher than the high quality group of aviation programs. The last significantly different rating in the student sample was on the scale resource accessibility. The medium quality program group rated it significantly higher than the low quality program group. Thus, only one of the eleven student ETS indicators of quality scales measuring environment or outcome variables was rated significantly higher by the highest quality programs. According to the students, it could be concluded that the highest quality four-year aviation programs are not emphasizing environment and outcome variables that are indicators of quality to any greater extent than intermediate or low quality aviation programs.

The survey completed by faculty from high quality, medium quality, and low quality programs found ten of the eleven indicators of quality scales had no significant differences between groups. The only significant difference appeared in the environment for learning scale. The intermediate quality program faculty rated their environment for learning significantly higher than the high quality program faculty. The low quality program faculty also rated this scale higher than the high quality program faculty, although not significantly. These results overwhelmingly indicate that according to the faculty, the highest quality programs are not emphasizing environment and outcome variables of indicators of quality to any greater extent than the intermediate or low quality program.

When examining the results from the alumni sample, the conclusions are similar to the student data. Of the ten applicable ETS instrument indicators of quality scales, two were found to have significant differences between alumni groups. These scales were available resources and internships. The available resources scale, an input variable scale, was rated significantly higher by the high quality program alumni as compared to both the medium quality and low quality program alumni. Similar to the student ratings, the internship scale was rated significantly higher by the high quality program alumni as compared to the low quality program alumni. Although the medium quality program alumni's mean rating on this scale was also lower than the high quality program alumni, it was not significant. Thus, just like the student category, the only indicator of quality scale rated significantly higher by the high quality programs that measures environment or outcome variables was the internship scale.

CONCLUSION

Considering the opinions from students, faculty, and alumni, the highest quality U.S. four-year aviation programs do not emphasize environment and outcome indicators of quality to any greater extent than intermediate and low quality aviation programs. According to the surveys from students, faculty, and alumni, the only area where more emphasis is placed by the highest quality programs on environment or outcome indicators of quality is the area of internship experiences. This emphasis should be maintained at the highest quality programs and the other programs should consider increasing emphasis in this area since the aviation industry experts placed a great deal of importance on performance of graduates, and generally speaking, these graduates had come from four-year aviation programs with very active internship programs. Thus, even though from previous research (Lindseth, 1996) aviation education experts generally agreed on which programs were of highest quality, only one of the environment and outcome indicators of quality focused upon in this study were emphasized to a greater extent at the highest quality programs when compared to the intermediate and lower quality programs. Based upon the results of this study, further research should be done on the importance of the internship experience as well as the importance of the environment for learning within collegiate aviation academic programs.

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Airport Internships:
Effectively Structuring a Departmental Rotation Internship

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Author Note

This study on the perceptions of airport managers regarding airport internships is one aspect of a paper entitled Airport internships: Combining formal education and practical experience for a successful airport management career, which was prepared as a requirement for the American Association of Airport Executives' (AAAE) Accreditation program. The remaining aspect of the AAAE paper, which was published in the *1998 Collegiate Aviation Review*, is a study on the views of airport managers regarding post-secondary aviation education. Findings presented do not necessarily reflect the views of my employer, the Hillsborough County Aviation Authority.

ABSTRACT

Preparing for a career in airport management not only requires appropriate education, but formal training as well. Too often, many college graduates are faced with no experience and entry-level airport management positions that require some experience. Unless a recent graduate is able to secure an airport internship, progression in the airport management field may seem daunting, if not impossible. To this end, this article presents findings on the expert opinions of airport managers nationwide regarding the most important airport departments in which an intern should gain experience, the benefits of internship programs, and the recommended structure of a departmental rotation airport internship program. Utilizing the 1996-97 AAAE Membership Directory and Yellow Pages of Corporate Members (American Association of Airport Executives, 1997), a written mail survey was sent to a nationwide random sample of 200 airport managers in January 1998. Results, which are presented using percentage distribution tables and descriptive statistics, show that the majority of airport managers view their careers as challenging and interesting, consider Finance along with Planning & Development the most important airport departments in which an intern should gain experience, and feel that an internship program is extremely beneficial to the intern, while also being beneficial to the airport.

INTRODUCTION

On-the-job training was once sufficient for the individual entering the field of airport management. In one sense, it still is. Today, however, this formal training program is known as airport internships. Individuals no longer may be able to enter the field with sufficient education alone. Experience is now a necessity and for those recently graduated, this experience may seem impossible to obtain. Airports offering internships are allowing individuals new to the field to apply knowledge gained in the classroom to practical airport business.

An article by Thiessee, NewMyer, and Widick (1992) details five traditional structures of an airport intern program. The first alternative is known as *job shadowing.* The intern becomes an administrative assistant to the airport manager, thereby learning by close managerial cooperation. Second, a *departmental rotation internship* allows the intern to rotate through the various departments at the airport, such as public relations, ground transportation, operations, and maintenance. At smaller airports without these separate departments, the job-shadowing role becomes more prevalent. The third alternative is a *single department-based internship,* which allows the student to gain experience in only one department. Although this is not advisable for airport management students, it is common for mechanical engineering students to intern solely in one area, such as the Facilities department at an airport. The *academic* internship seeks as its end goal a report, presentation, manual, or brochure/booklet. This arrangement begins with a short period of job shadowing, quickly followed by intense research on the task at hand. Finally, a *specific task* internship may be similar to the academic internship, but is designed to give interns experience that is task-oriented, not necessarily departmentally based.

The author conducted research to determine which of these five types of internships is most prevalent in the airport industry. Since the "Positions Open" section of AAAE's *Airport Report* appears to be the authoritative nationwide source of available airport internships, each issue of this newsletter was examined during the October 1992 through October 1997 time period. These 120 issues yielded 27 internship advertisements for a total of 35 available internship positions.

During these five years and of these 35 positions, 40 percent (14) had a title of Airport Management Intern, 34 percent (12) were recognized as Airport Interns, and 9 percent (3) were Administrative Interns. The majority of the appointments (51 percent) were for a term of two years. Nine percent advertised a 15-week (summer) training program. Other lengths were one year along with six months. Finally, 94 percent (33) were rotational in structure, explained by Theisse et al. (1992) as a *departmental rotation internship*. Due to the ubiquity of departmental rotation internships at airports offering internships, this paper focuses specifically on this arrangement. Appendix A is a listing, by airport, of the internship positions that were advertised during this time period.

The airport business is in a constant state of dynamics and as airport managers are responding to this change, so too should recent graduates. For this to be effectively accomplished, current airport managers, those aspiring to become such, and universities assisting with this task, should be aware of the perceptions of airport managers regarding four important areas: (a) descriptive words applicable to the airport management career, (b) the relative importance of airport departments in which to gain experience, (c) the benefits of airport internship programs, and (d) the recommended number of work days an airport intern should spend in each airport department.

As such, this paper details the findings of a survey sent to 200 randomly selected airport managers in a nationwide study. Their opinions on their airport management career, the relative importance of different airport departments in which an intern should gain experience, and the benefits of airport internship programs were sought. These responses allowed the author to devise formulae that may be adopted by airports to appropriately structure a departmental rotation internship at their airport. It is hoped that data presented and recommendations made will assist airport managers, recent graduates, and university aviation programs in becoming properly educated about the needs of the airport manager of tomorrow.

Methodology

Participants

In selecting participants for this study, the 1996-97 AAAE Membership Directory and Yellow Pages of Corporate Members (AAAE, 1997) was utilized. This directory contains a comprehensive listing of airport managers nationwide. Indeed, AAAE's membership is comprised of airport managers employed at the primary air carrier airports, accounting for 99 percent of nationwide enplanements, as well as at many of the smaller commercial service, reliever, and general aviation airports. Each individual member airport was counted to arrive at a total population of 690 airports. Out of this total, the goal was to receive 150 (n) usable surveys; therefore, assuming a response rate of 75 percent (p), the selected sample size was 200 (N) [n/p = N]. Each airport in the Directory was numbered alphabetically and a random numbers table [Table B-1 in the text by Alreck and Settle (1995)] was used to arrive at 200 randomly selected numbers. These numbers were then matched to the corresponding airports to arrive at a random sample of 200 airports to use for the study. This random sampling methodology was chosen for two reasons. First, it avoids the possibility of bias introduced by a nonrandom selection of sample elements. Second, it provides a probabilistic basis for the selection of a sample.

Survey Instrument

Since viewpoints were the main end product desired in this study, it was decided that a survey instrument would be utilized. Surveys can be designed to "measure things as simple as respondents' physical or demographic characteristics or as complex as their attitudes, preferences, or lifestyle patterns" (Alreck and Settle, 1995, p. 5). Further, because survey research uses sampling, information about an extremely large population can be obtained from a relatively small sample of people. As a result, the author designed a four-page survey instrument specifically for this study (see Appendix B). All questions were closed-ended to allow for easier coding of data. Further, many questions were scaled on a five point Likert scale. This was used to "obtain people's position on certain issues or conclusions" (Alreck & Settle, 1995, p. 116).

The survey begins with a definition of Airport Manager, which is defined as "the individual managing all facets of the day-to-day activities of the airport and known by such titles as Executive Director and Director of Aviation." Airport Intern is defined as "an individual working full- or part-time in a *temporary* status gaining experience in the airport management field." These definitions, which are defined by the author, were included to reduce any misunderstanding that might arise when these terms were encountered while completing the survey. The survey then progresses into Section A, which is composed of an adjective checklist. This section allowed some exploratory research into how airport managers view their career. This type of question was included for the benefit of current students who may be interested in knowing the percentage of survey respondents considering the career stressful or political, for example.

The next section focused on the departments at an airport to which an intern might be exposed. The section was scaled on a Likert scale to allow for responses of airport managers to be gauged on this five-point scale. Choices included 0 (*Don't Know)*, 1 (*Extremely Unimportant*), 2 (*Unimportant*), 3 (*Neutral*), 4 (*Important*), and 5 (*Extremely Important*). Participants were instructed to circle the number that most closely corresponded to their opinion about the importance of each airport department.

The section focusing on airport departments presented fifteen airport departments, listed in alphabetical order. The actual departments, ranging from Aircraft Rescue and Fire Fighting to Records Management, are most common to medium and large hub airports. The functions represented, however, are common to airports of any size.

Participants were also instructed to register their opinion regarding the benefits of airport internship programs in general. This section also consisted of a Likert scale with choices composed of 0 (*Don't Know)*, 1 (*Extremely Unimportant*), 2 (*Unimportant*), 3 (*Neutral*), 4 (*Important*), and 5 (*Extremely Important*).

Procedure

In the cover letter accompanying each survey, participants were instructed on the reason for the research, how they were chosen, the importance of their participation, the estimated time required to complete the survey, and the fact that participation was voluntary. Further, they were told to skip any questions they did not want to answer. As discussed earlier, the sample chosen was a simplified random sample without replacement, in that each participant had an equal probability of being selected, and once selected, would not be chosen again.

The section focusing on descriptive words stated, "Which of the following words describe your airport management career?" Participants were instructed to place a check next to any and all words that applied. Regarding airport departments, participants were asked, "For a successful career as an airport manager, how important do you feel practical experience is in each of the following airport departments?" Participants were instructed to circle the number corresponding to their feeling of department importance for each item. Finally, regarding the importance of internship programs, participants were asked, "In general, how beneficial do you feel an airport internship program is to the intern and the airport?" As with the previous section, participants were given a Likert scale and asked to circle the number most closely corresponding to their feeling of each item.

The 200 surveys were mailed on December 30, 1997. As of January 12, 1998, a response rate of 43 percent (86 surveys) had been received. Following the advice of Fowler (1993), a reminder postcard to all non-respondents was mailed emphasizing the importance of the study and the benefit of a high rate of response. One hundred and three postcards were mailed to all non-respondents on January 15, 1998. This reminder mailing gave recipients the opportunity to receive another survey by fax, but only one recipient made such a request. This second mailing resulted in a total survey response rate of 66 percent, with 132 usable surveys being returned by the established deadline.

Data Analysis

Once the surveys were returned, a statistical analysis program, SPSS for Windows, was utilized to analyze the survey results. Descriptive statistics were produced, including frequencies, means, and standard deviations. The results are reproduced in this article in a tabular format to allow for easy comparison among categories.

RESULTS

Demographics

As a result of the 34 percent (68) of survey recipients who did not respond, one may ask if this introduced non-response bias into the results. The respondents of this survey very closely match the AAAE membership at large. This membership, according to AAAE, is "truly representative of airport management throughout the country" (AAAE, 1998). AAAE membership is composed of non-hub, other commercial service, and general aviation airports (75%), large hub (5%), medium hub (8%), and small hub (12%) (Susan Lausch, AAAE, personal fax, February 20, 1998). The survey respondents were composed of non-hub, other commercial service, and general aviation (72%), large hub (7%), medium hub (9%), and small hub (13%). Therefore, due to the random nature of the design and the apparent random nature of responses, these survey results should prove statistically significant and may be generalized to the population of airport managers nationwide.

The respondents were 88 percent male and 12 percent female. Thirty-nine percent of participants were more than 50 years of age, with 34 percent and 23 percent being between 41 and 50 years of age and 30 to 40 years of age, respectively. Further, 45 percent of respondents are known as Airport Managers, with 20 percent being known as Airport Directors. It should be noted that although most airport managers are male, the number of females obtaining this position seems to be on the increase. In fact, according to a study in 1994 by Truitt, Hamman, and Palinkas, 94 percent of responding airport managers were males. Therefore, it appears that females are recognizing the opportunities in airport management and contributing to the diversity of this profession.

Descriptive Words

The first section of the survey listed 15 adjectives to allow airport managers to describe their airport management career. This exploratory research will prove helpful to students who are aspiring to enter the airport industry. Further, it gives current airport managers insight into how their peers view the career. Table 1 is a tabular display of those words and the numbers and percentages of respondents agreeing with each.

Table 1
Evaluation of Words Describing Airport Management Career

	Yes	No
Challenging	118 (90)	13 (10)
Competitive	53 (41)	78 (60)
Dangerous	6 (05)	125 (95)
Disappointing	12 (09)	119 (91)
Easy	6 (05)	125 (95)
Enjoyable	89 (68)	42 (32)
Exciting	76 (58)	55 (42)
Fulfilling	72 (55)	59 (45)
Important	88 (67)	43 (33)
Interesting	119 (91)	12 (09)
Low-Paying	23 (18)	108 (82)
Political	91 (70)	40 (31)
Rewarding	90 (69)	41 (31)
Secure	18 (14)	113 (86)
Stressful	83 (63)	48 (37)

Note 1: Number in parentheses represents percentages.
Note 2: Row percentages may not total 100 percent due to rounding.
Note 3: Words are listed in alphabetical order as they appeared on survey instrument.
Note 4: N = 131 for all cases.

Ninety-one percent of respondents feel their career is interesting and ninety percent feel it is challenging. These two words claimed the majority of positive responses; however, the following words were also identified by respondents as describing their airport management career: political (70%), rewarding (69%), enjoyable (68%), important (67%), stressful (63%), exciting (58%), and fulfilling (55%). Words receiving very little agreement are dangerous (5%) and easy (5%). Therefore, for those aspiring to be airport managers and wishing for an interesting and challenging career, the field of airport management would appear to be a reasonable choice. These students should also realize, however, that the field is political, stressful, and not very easy, according to the survey results.

Table 2
Evaluation of Words Describing Airport Management Career Ranking of Mean Ratings

Words	**M**	**SD**
Interesting	1.092	0.290
Challenging	1.099	0.300
Political	1.305	0.462
Rewarding	1.313	0.465
Enjoyable	1.321	0.469
Important	1.328	0.471
Stressful	1.366	0.484
Exciting	1.420	0.495
Fulfilling	1.450	0.499
Competitive	1.595	0.493
Low-paying	1.824	0.382
Secure	1.863	0.346
Disappointing	1.908	0.290
Dangerous	1.954	0.210
Easy	1.954	0.210

Note 1: Rating system utilized as follows:
1 = Yes (Agreed)
2 = No (Disagreed)
Note 2: Words are listed by ascending value of mean.
Note 3: M = Mean; SD = standard deviation

Table 2 is a listing of the descriptive statistics related to each word. Words are listed in ascending order by value of Mean. In other words, the lowest value Mean equates to the highest level of agreement. These data simply confirm the findings presented in the percentage distribution table (Table 1).

Airport Departments

In examining the importance of airport departments, the goal is to arrive at the most appropriate structure of a departmental rotation internship program. Specifically, which airport departments should the intern experience and how much time should be spent in each department? The answers to these questions will obviously vary with each airport as staffing and time allow. Nonetheless, it is informative to know those departments which are seen as important by airport managers, so those airports interested in providing departmental rotation internships may structure their program accordingly. Further, this information gives students insight into which departments are most important as they begin seeking practical experience within the airport industry. (Please refer to Tables 3 and 4.)

Combining the *important* and *extremely important* categories, Finance accompanied by Planning and Development tied for first place, each receiving 92 percent of responses in these two categories. Other departments viewed as *important* and *extremely important* were Properties and Contracts (89%), Operations (88%), Information/Public Relations (83%), General Aviation (76%), Facilities/ Maintenance (72%), Design and Construction (69%), and Human Resources (65%). At the other extreme, two departments which received the most marks for *extremely unimportant* and *unimportant* are International Commerce (34%) and Aircraft Rescue/Fire Fighting (27%). Airport managers feel these last two departments should not receive much emphasis in an internship program.

Table 3
Evaluation of Airport Departments

Airport Departments	Extremely Un-Important 1	Un-Important 2	Neutral 3	Important 4	Extremely Important 5	*n*
Aircraft Rescue/Fire Fighting	10 (08)	24 (19)	32 (25)	42 (32)	22 (17)	130
Records Management	6 (05)	19 (15)	42 (33)	45 (35)	17 (13)	129
Design and Construction	1 (01)	9 (07)	31 (24)	68 (53)	20 (16)	129
Communications Center	6 (05)	20 (16)	55 (43)	38 (30)	9 (07)	128
Facilities/Maintenance	1 (01)	3 (02)	32 (24)	70 (53)	25 (19)	131
Finance	1 (01)	1 (01)	9 (07)	61 (47)	59 (45)	131
General Aviation	0	8 (06)	23 (18)	71 (54)	29 (22)	131
Ground Transportation	2 (02)	25 (19)	53 (41)	45 (35)	5 (04)	130
Human Resources	0	5 (04)	39 (31)	53 (42)	29 (23)	126
Information/Public Relations	1 (01)	2 (02)	20 (16)	57 (45)	48 (38)	128
International Commerce	12 (11)	26 (23)	52 (46)	20 (18)	3 (03)	113
Operations	1 (01)	2 (02)	13 (10)	60 (46)	54 (42)	130
Planning and Development	0	1 (01)	10 (08)	70 (54)	49 (38)	130
Police/Security	5 (04)	18 (14)	48 (37)	48 (37)	10 (08)	129
Properties and Contracts	0	4 (03)	11 (08)	73 (56)	43 (33)	131

Note 1: Number in parentheses represents percentages
Note 2: Row percentages may not total 100 percent due to rounding
Note 3: *n* reflects all valid cases, excepting "Don't Know" responses and nonresponses

Table 4
Evaluation of Airport Departments
Ranking of Mean Ratings

Departments	**M**	**SD**
International Commerce	2.788	0.949
Communications Center	3.187	0.945
Ground Transportation	3.200	0.848
Police/Security	3.310	0.942
Aircraft Rescue/Fire Fighting	3.323	1.183
Records Management	3.372	1.039
Design and Construction	3.752	0.829
Human Resources	3.841	0.824
Facilities/Maintenance	3.878	0.765
General Aviation	3.924	0.800
Information/Public Relations	4.164	0.801
Properties and Contracts	4.183	0.710
Operations	4.262	0.763
Planning and Development	4.285	0.638
Finance	4.344	0.710

Note 1: Rating system provided for evaluators was as follows:
0 = Don't Know
1 = Extremely Unimportant
2 = Unimportant
3 = Neutral
4 = Important
5 = Extremely Important

Note 2: Only responses 1-5 were used in calculating statistics.
Note 3: M = mean; SD = standard deviation

In using these numbers to most efficiently structure a departmental rotation internship program, one must keep in mind that these data represent expert opinion of airport managers only. They do not take into account the views of interns who may wish to learn more about Aircraft Rescue/Fire Fighting, for example, even though it is considered of little importance to airport managers.

INTERNSHIP PROGRAM BENEFITS

For those airports and students still doubting the value of internships, it may prove helpful to analyze the extent of benefits, as stated by airport managers, of airport internships in general to both the airport and intern involved. These responses, therefore, do not necessarily focus solely on departmental rotation internships. It will first be insightful to examine the number of survey participants who have actually experienced an internship. Eighty-seven percent of respondents have never been employed as an airport intern. Of the 13 percent of respondents who have, only 5 individuals report this being a requirement for graduation. Furthermore, 53 percent of responding airports do not have an active internship program. Of those, 69 percent state they would not be willing and able to implement an internship program under sufficient guidance. Although the specific reasoning for this finding was not addressed in the survey, written comments indicated that lack of funding is a hindrance in implementing an internship program at some responding airports. However, eighteen airports are willing and able to implement such a program and five airports responded with maybe. As such, it is prudent to discuss the benefits associated with implementing an internship program.

Table 5
Evaluation of Airport Internship Program Benefits

	Extremely non-Beneficial	Non-Beneficial	Neutral	Beneficial	Extremely Beneficial	
Beneficiary	**1**	**2**	**3**	**4**	**5**	***n***
Intern	1 (01)	0	8 (07)	34 (29)	73 (63)	116
Airport	1 (01)	5 (05)	36 (36)	41 (41)	18 (18)	101

Note 1: Number in parentheses represents percentages.
Note 2: *n* reflects all valid cases

Sixty-three percent of respondents feel that an internship program is *extremely beneficial* to the intern, with 29 percent feeling it is *beneficial* to the intern. Benefits lessen but are still quite high with regard to airports. Fifty-nine percent of respondents feel internships are a combination of *extremely beneficial* and *beneficial* to airports. Thirty-six percent of participants are *neutral* on this subject. It is obvious, therefore, that benefits exist to a high degree for both interns and the airports employing them (Tables 5 and 6).

Table 6
Evaluation of Airport Internship Program Benefits
Ranking of Mean Ratings

Beneficiary	M	SD
Intern	4.661	0.789
Airport	4.025	1.136

Note 1: Rating system provided for evaluators was as follows:
0 = Don't Know
1 = Extremely Nonbeneficial
2 = Nonbeneficial
3 = Neutral
4 = Beneficial
5 = Extremely Beneficial
Note 2: Only responses 1-5 were used in calculating statistics.
Note 3: M = mean; SD = standard deviation

Recommended Structure of Departmental Rotation Airport Internship Program

As stated earlier, one of the purposes of this essay is to recommend to airport managers the most appropriate structure of a departmental rotation airport internship program. This section outlines the recommended structure for internship programs lasting two years, one and one-half years, and one year.

The procedure in structuring an internship program should occur in the following steps: (a) rank the departments at your airport using tables 3 and 4, (b) determine the amount of total time the intern will work at your airport, (c) use the formula outlined below to determine the number of days the intern should spend in each airport department.

The formulae, which were designed by the author as a result of this research effort, produce the number of days in which an intern should spend in each department according to the level of importance each department received in the survey. These formulae are guidelines only; however, the number of days suggested by the formulae correlate to the perceived importance of each department and are quite reasonable as a timeframe for each intern. If the intern program is for two years, the following formula should be used: $0.5\,(a + b) = y$ *days*. The first variable, a, is the percentage of *important* marks for that department, without the percent sign. Next, b is the percentage of *extremely important* marks for that department, without the percent sign. Finally, y is the actual number of workdays the intern should spend in that department on a continuous basis. If the intern program is for a length of one and one-half years, the following formula is suggested: $0.4\,(a + b) = y$ *days*. If the intern program is to last one year, use the following:
$0.3\,(a + b) = y$ *days*.

The formulae are designed to give the airport manager a rough rule-of-thumb to use in determining the length of time an intern should spend in each airport department. The reader must remember that the numbers generated by the formulae yield the actual number of workdays suggested. Fourteen days, for instance, equates to almost three calendar weeks, rather than two calendar weeks. The total numbers are based on a standard of 260 workdays per year. This equates to 21.6 working days per month. Therefore, if a formula yields 21.6 for a department, the airport manager should assign the intern to that department for an entire calendar month.

These formulae assume (a) that there is no "home" department to which the intern must return after each departmental rotation, (b) that time spent in each department is continuous, and (c) that a minimum of one workweek (five days) is spent in each department regardless of the level of perceived importance or equation result. For the actual amount of suggested time that should be spent in each department, depending on whether the internship is two years, one and one-half years, or one year, refer to Appendix C.

Extent of Experience Necessary

For those students aspiring to become airport managers, it will prove helpful to examine how airport managers feel regarding the number of years experience required to obtain such a position. Of those working at large hub airports, 66 percent state that 10 to 15 years of experience are needed to obtain a position of airport manager at a large hub airport. Of those working at a medium hub, 73 percent report that 10 to 15 years are needed to obtain a position of airport manager at a medium hub airport. Small hub respondents (71%) consider 15 years or less are necessary at a small hub airport. Non-hub respondents (97%) report that 15 years or less are necessary at a non-hub airport. Other commercial service respondents (92%) explain that less than 10 years is adequate at these airports. Finally, 98 percent of general aviation respondents report that less than fifteen years of experience are necessary to obtain a position of airport manager at a GA airport.

Fortunately, according to these numbers, airport management neophytes can reasonably expect to become an airport manager at a large hub airport by the age of 36. Assuming entry into the industry at the age of 21, probabilities increase that one will obtain a position of airport manager by the age of 36 as hubs decrease in size. In other words, it is much more feasible to obtain a position of airport manager at a general aviation airport by the age of 36 than a large hub. Even so, these numbers serve to motivate young individuals in the field who have such high aspirations.

Recommendations

The main purpose of this research is to offer recommendations regarding departmental rotation airport internships to aviation management students, universities, and airport managers. These recommendations will hopefully assist these parties in responding to the complex challenges that are to be expected in the next century.

Aviation management students

1. Review Tables 1 and 2 to determine if an airport manager career is truly desired.
2. Review Tables 3 and 4 to understand the perceived importance by airport managers of different airport departments.
3. Review Tables 5 and 6 to realize the benefits of airport internship programs.
4. Review Appendix A for an idea of which airports have offered internship programs in the past.

Universities

1. Encourage students to search early and thoroughly for internships.
2. Build a relationship with local airports to encourage their use of interns.
3. Utilize Appendix A to inform students of airports that have offered internship programs in the past.

Airport Managers

1. Seriously consider implementing an internship program if your airport has not already done so.

2. Study Tables 3 and 4 and Appendix C for guidance in appropriately structuring a departmental rotation internship program at your airport.

3. If your airport already has a non-rotational internship program in place, consider implementing a departmental rotation internship program. This type of internship is most common at airports, and appears to be most beneficial for both the airport and the students involved.

These recommendations summarize the main findings of this research. They are based mainly on the viewpoints of airport managers. Even so, these viewpoints represent current, expert opinions in the airport industry and should not be taken lightly.

Conclusion

The airport industry is currently experiencing unprecedented levels of growth. With this growth, airport managers are being forced to rely on innovative methods to obtain capital, educate employees, encourage competitive forces, and continue ensuring the safety and security of the flying public. These areas are best learned by on-the-job experience, supplemented with education. To enable airports to continue meeting the challenges that lie ahead, therefore, aspiring airport managers need to be given adequate opportunities early in their career to experience all sectors of the airport environment. Airport internships are an excellent choice in achieving this goal.

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Appendix C
Recommended Number of Workdays that Intern Should Spend in Each Airport Department

Airport Department	Important (4)	Extremely important (5)	Time allowed-	Time allowed-	Time allowed-
	a	B	Two Years (y)	1 1/2 Years (y)	1 Year (y)
Aircraft Rescue and Firefighting	32	17	25	17	12
Records Management	35	13	24	15	12
Design and Construction	53	16	35	20	16
Communications Center	30	7	19	10	9
Facilities/Maintenance	53	19	36	22	17
Finance	47	45	46	36	25
General Aviation	54	22	38	24	19
Ground Transportation	35	4	20	9	9
Human Resources	42	23	33	22	16
Information/Public Relations	45	38	42	32	22
International Commerce	18	3	11	5	5
Operations	46	42	44	34	24
Planning and Development	54	38	46	34	24
Police/Security	37	8	23	12	10
Properties and Contracts	56	33	45	31	23
TOTAL DAYS IN ALL DEPARTMENTS			483	324	242
TOTAL MONTHS IN ALL DEPARTMENTS			22	15	11
TOTAL MONTHS INTERN HAS AVAILABLE			24	18	12
NUMBER OF DAYS REMAINING AT END OF ROTATION			36	65	17

Note 1: Formulas are as follows:

Two years: 0.5 (a + b) = y days

1.5 years: 0.4 (a + b) = y days

One year: 0.3 (a + b) = y days

Note 2: All days have been rounded.

An Evaluation of a Major Airline Flight Internship Program: Participant's Perceptions of Curricular Preparation for, and Components of, the Internship

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ABSTRACT

This article presents the results of a follow-up survey administered to 110 former university interns who served a semester-long flight operations internship at United Airlines. The intent of the survey was to obtain the participant's opinions concerning their academic preparation for the internship experience, as well as their overall assessment of the internship experience itself. Of the 78 respondents, 75.7% indicated that their university aviation curriculum had prepared them "very well" or "well" for the internship. Further, 80.7% of all respondents indicated that the semester-long internship had a "great impact" or "significant impact" in helping them achieve their career goals. Also, 96.2% of all respondents said that they would recommend a United Airlines internship to students seeking an aviation career.

INTRODUCTION

In July 1987 Southern Illinois University at Carbondale (SIUC) and United Airlines signed a formal agreement to work together in establishing a flight operations internship partnership. Essentially, SIUC agreed to supply a well-prepared and pre-selected group of internship candidates. These candidates would then be evaluated during a one-to-two week "short internship" during which they would be formally interviewed for a semester-long "long internship". Since this agreement was signed, over 200 "short interns" and over 110 "long interns" (largely selected from the "short intern" group) have participated in this SIUC program.

As the university prepared for the celebration of the tenth anniversary of the signing of the internship agreement in 1997, SIUC faculty determined that this would be an excellent time to evaluate the flight operations internship program with United Airlines. The demographic results of this survey (characteristics of the interns, then current employment, etc.) is the topic of an article published in JAAER entitled, <u>A Pioneering University-Airline Flight Internship Program: A Follow-Up Study of Intern Participants</u> (1998). The purpose of this article is to present the results of survey data that address intern perceptions of curricular preparation for the United internship, and intern perceptions of United internship components.

Methodology

Survey Participants

Survey participants included all 110 SIUC aviation program students who participated in the United-SIUC "long internship" through August 1997. All 110 participants are also alumni of Southern Illinois University.

Survey Instrument Design

The survey instrument was a mail-in questionnaire. The instrument was composed of six sections and designed to collect two types of information. First, it collected data related to the respondent's personal and professional characteristics. For example, types of Federal Aviation Administration (FAA) Aero-nautical Certificates possessed, flight time and level of education were among the type of data collected. Data concerning personal and professional characteristics of the respondents have already been reported by NewMyer, Ruiz, and Worrells (1998). The second type of data collected is attitudinal in nature. Using a Likert Scale, data concerning attitudes toward the internship experience, classes taught at SIUC, and other relevant topics were collected. The Likert Scale was used to allow respondents to indicate the extent to which they agreed or disagreed with a statement. The Likert Scale was selected because of its simplicity and ease of use. Attitudes were assessed along a 5-point scale. The points ranged from 1 to 5. The scoring of statements was dependent upon the particular scale. For example, Section IV of the survey asks respondents to rate the helpfulness of aviation classes taught at SIUC. A high response (5) represents the highest degree of helpfulness, while a low response (1) represents the least helpfulness.

Research Design

The survey instrument was mailed to all 110 participants in the United-SIUC "long internship" program. The Department of Aviation Management and Flight in conjunction with the SIUC Alumni Association developed a comprehensive list of alumni addresses for graduates who participated in the United Airline "long internship". Three mailings were sent to these 110 alumni resulting in 78 responses, a return rate of 70.9%. A 70.9% response rate represents an acceptable sample. Miller and Schumaker discuss questionnaire follow-ups and the impact they have on response rates: The initial mailing of the letter of transmittal, questionnaire, and stamped return-addressed envelope will usually result in a response rate of from forty to sixty percent – that is, forty to sixty percent of the sample will typically return the questionnaires. The first follow-up correspondence usually brings ten to twenty percent more returns, and a second follow-up will add another five to ten percent to the return rate. If researchers can obtain a total return of seventy percent or better, they are doing very well. In many studies the return rate is closer to fifty or sixty percent.

The survey questionnaire addressed four specific areas. The first three areas attempted to gauge respondent attitudes toward SIUC Aviation Flight-Aviation Manage-ment coursework and specific components of the short and long internship. The fourth area allowed the respondent to provide overall evaluative comments on the United-SIUC internship program:

1. What Aviation Flight-Aviation Management coursework was most helpful in preparing intern candidates for the flight operations internship?

2. How valuable was the "short internship" (specifically, components of the short internship) in developing the respondent's understanding of the airline industry and their development as an aviation professional?

3. How valuable was the "long internship" (again, components of the long internship) in developing the respondent's understanding of the airline industry and their development as an aviation professional?

4. A series of overall evaluation questions addressing the value of the short and long internship to each respondent, how well the respondents believed they were prepared by SIUC for the internship and whether or not they would recommend the United Airlines Internship to others. Room was also left for essay responses from respond-ents who had additional questions.

Definitions

During the implementation of the United Airlines-Southern Illinois University Carbondale flight operations internship, two important learning opportunities were developed for SIUC students:

A. The Short Internship. This was initially a two week-long internship experience that took place at the United Airlines Flight Training Center in Denver, CO. This internship included a ground school on one of United's aircraft (usually the 767 since it was the only computerized, non-instructor ground school available in the late 1980's), presentations by key United personnel, tours, a group problem-solving activity and interviews for the long internship. In the early 1990's, the short internship was reduced to a one week experience with the ground school portion eliminated, but all of the other components mentioned above remained in the short internship. Ten SIUC students were allowed to participate in the short internship per semester. This was and still is an unpaid experience but United pays for the participants to fly to Denver and back from either St. Louis or Chicago. Students participating in the short internship were selected solely by United in the first years of the UA-SIUC relationship, but in later years they were selected by SIUC alone. Selection criteria for the short internship are: a minimum overall grade point average of 2.75 on a 4.0 scale; Federal Aviation Administration Commercial Pilot Certificate with Instrument and Multiengine Ratings required and Certified Flight Instructor (Airplane) prefer-red; a relatively "clean" driving record (Driving Under the Influence or Driving While Intoxicated arrests were considered "knockout" factors); and the applicant must be an Aviation Management major at SIUC, having flown a minimum amount with the SIUC Aviation Flight program.

B. The Long Internship. The long internship refers to the semester-long experience that students attending the "short" internship (see above) interviewed for during the one or two week short internship. This internship lasts for a full semester rather than one or two weeks, thus the label "long" internship. Students attending the long internship were initially assigned to either the Denver Flight Training Center or to the United Airlines World Headquarters in Chicago. This was expanded to include any United Airline's Flight Operations domicile (pilot base). So far SIUC interns have served at Honolulu, Miami, Chicago, Denver, Los Angeles, Dulles (Washington, D.C.) and San Francisco. Interns are assigned projects appropriate to their work locations. During their internship they are flown to San Francisco for a tour of United's Maintenance Operations Center I. and also to Everett, Washington, for a tour of the Boeing Plant. This is an unpaid position; however, successful long interns graduating from SIUC are given "guaranteed processing privileges" (i.e., a guaranteed flight officer interview with United).

Evaluation of SIUC Aviation Coursework

Respondents were asked to report, "…what Aviation Flight/ Aviation Management course work (see Appendix) was most helpful to you in preparing for the United – SIUC internship?" Response categories were: MH = most helpful, VH = very helpful, H = helpful, NVH = not very helpful, LH = least helpful and N/A = not applicable. Based on the responses to these questions, it was determined that more than half of the 78 respondents took eleven SIUC aviation courses, or groups of courses (see Table 1).

Table 2 reports combined data for the "most helpful/very helpful" responses on each course and the "least helpful/not very helpful" responses on each course. Table 2 also reports these data as the percent of those taking each course so that the reader can see how the respondents reported their evaluation within each course subject area as well as how the overall totals compare across all courses.

As indicated in Table 3, three courses or groups of courses were ranked by more than half of all respondents as being either "Most Helpful" or "Very Helpful". These courses included: Flight Training at SIUC, AVM 373-Airline Management, and AVM 385/ATS 332-Air Transport Labor Relations. Among the 36 respondents reporting that they have been hired by United, Flight Training at SIUC was ranked first as the "Most Helpful" and "Very Helpful" course or group of courses with 29 of 36 respondents rating it in this fashion. Flight Training at SIUC was followed by AVM 385/ATS 332-Air Transport Labor Relations and AVM 373-Airline Management tied for second with 23 respondents each, reflecting the "All Respondents" group result. When comparing the data in Table 2 and Table 3, it can be seen that, within the responses for each course, there is a slightly different ranking of courses between the two tables. The following ranking is arrived at by looking only at the total number of respondents who reported taking a specific course and then calculating the percentage of those who took only that course and ranked it as "Most Helpful/Very Helpful":

Course Title	Percent of Respondents taking the course who ranked it MH/VH
1. AVM 373-Airline Management	82.1%
2. Flight Training at SIUC	80.8%
3. AMT 205-Cabin Environment and Jet Transport Systems	65.2%
4. AMT 405-Flight Systems Management	64.7%
5. AMT 385/ATS 332-Air Transport Labor Relations	64.5%
6. AVM 402/ATS 421-Aviation Industry Career Development	58.8%

Using this method of ranking, all other courses were ranked 42.6% or lower (of those taking the course who rated it "Most Helpful/Very Helpful").

At the opposing end of the scale are those courses identified as "Least Helpful," or "Not Very Helpful" by all respondents. As noted in Table 4, AVM 370-Airport Planning was identified as the "Least Helpful" or "Not Very Helpful" course by 24 respondents, followed by AVM 372-Airport Management, ATS 383-Data Interpretation and ATS 364-Work Center Management in a three-way tie with 19 such responses. Among those hired by United, AVM 370-Airport Planning and AVM 372-Airport Management were tied as the "Least

Helpful" or "Not Very Helpful" course with a score of 13 responses each.

Short Internship Evaluation

Since the second year of the United Airlines – SIUC Flight Operations Internship Program, a "short" (one to two week long) internship program has been offered by United Airlines to SIUC student participants. Respondents to the survey were asked to evaluate eleven items related to their short internship experience at United, including their overall short internship experience. They were provided a Likert-type scale with the following response categories for each item: Most Valuable, Very Valuable, Valuable, Somewhat Valuable, Not Valuable and Not Applicable. As shown in Table 5, six items were rated "Most Valuable or Very Valuable" by 42 (53.8%) of all "short intern" evaluation respondents.

The following group of "Most Valuable/Very Valuable" short internship components varied slightly when ranked among the 36 respondents hired by United:

Respondents Hired by United

Interaction with United Personnel	72.2%
Experiencing the Airline Work Environment	69.4%
Presentation by United Personnel	69.4%
Interview for the "long internship"	66.7%
Short Internship Overall Experience	63.9%
Simulator Time	52.7%

When the top group ranked by the 42 respondents not hired by United, there were a couple of major differences in responses. First, the "Short Internship Overall Experience" fell from a 66.7% MV/VV rating by those hired to a 45.2% MV/VV rating by those not hired. Also, the "767 (or other) Ground School" dropped from 44.4% MV/VV for those hired to 28.6% MV/VV for those not hired. The "Group Project with other Interns" was conversely ranked much higher by those not hired (at a 52.4% MV/VV rating) than by those hired (38.9%). Similarly, "Tours of TK" were rated fairly high at 50.0% by those "not hired" and 36.1% by those "hired".

Overall, only two items were given ten or more total "Somewhat Valuable/Not Valuable" responses by <u>all</u> respondents who evaluated the "short intern-ship":

Group Project with other Interns	12
Tours of DEN/DIA	14

Evaluation of the Long Internship

In evaluating the "long" internship, respondents were again given a range of attitudinal questions with a Likert-type scale for response. The response options were the same as those provided for the short internship evaluation questions: Most Valuable (MV), Very Valuable (VV), Valuable (V), Somewhat Valuable (SV), Not Valuable (NV) and Not Applicable (N/A). Table 6 provides a combined consensus of the "Most Valuable/Very Valuable" responses and the "Not Valuable/Somewhat Valuable" responses.

The overall respondent group identified a very clear "Top 5" list of items in their responses, as all five items received over 80% respondent support:

Component	Percentage of Respondents
1. Your internship experience	88.5%
2. Observer Member of Crew (OMC) Privileges*	87.2%
3. "Long" Internship Overall Experience*	87.2%
4. Interaction with United Personnel (other than supervisor)	85.9%
5. Your assigned work location at United	80.8%

*Indicates a tie in ranking

Among those 36 respondents hired by United, this group of items stayed essentially the same, but in a slightly different order:

1. Your internship experience	86.1%
2. Interaction with United Personnel (other than supervisor)*	80.6%
3. Long internship overall experience*	80.6%
4. Your assigned work location at United*	77.8%
5. Observer Member of Crew (OMC) Privileges*	77.8%

*Indicates a tie in ranking

Among the 42 respondents not hired by United, OMC privileges jumped to the head of the list of items, but with the top five items again remaining the same items, while in yet another order of respondent preference:

1. OMC privileges	95.2%
2. "Long" Internship Overall Experience	92.9%
3. Interaction with United Personnel (other than supervisor)*	90.5%
4. Your internship experience*	90.5%
5. Your assigned work location at United	83.3%

*Indicates a tie in ranking

Respondents were also asked via an open-ended type of question to rank the three "Most Valuable and Least Valuable" components of the "long" internship. Table 7 reports the combined "Most Valuable" responses, which indicate that "Interaction with United Personnel" received the most combined first, second, third "Most Valuable" responses, followed by OMC privileges. These two items received approximately twice as many responses as the three items tied in third place.

As far as internship items receiving the most responses for "Least Valuable" (see Table 8), leading the pack was a combined "Tours" (MOC, Boeing, etc.) response.

While most respondents enjoyed these tours, they reported that they did not believe they were as valuable as other internship components. Also receiving significant responses were airline pass privileges (riding as a passenger, not to be confused with OMC privileges, which occur on the flight deck) and the intern project.

Overall Evaluation

At the end of the survey instrument respondents were asked to respond to one overall evaluative question each about the "short" internship, the "long" internship and the SIUC aviation curriculum.

Regarding the "short" internship, respondents were asked: "what impact has the 'short' internship experience had in achieving your aviation career goals"? As listed in Table 9, the response options given for this question were: Great Impact, Significant, Some, Little, No Impact and N/A (not applicable). The "Hired by United" is, for good reason, quite positive in its evaluation of the "short" internship with 75% of those respondents saying that the "short" internship had either "Great Impact or Significant Impact" on achieving their career goals. This differs substantially from the "Not Hired" by United respondent group which reported 38.1% of the responses in the "Great Impact or Significant Impact" categories. Also, 23.8% of the "Not Hired" respondents said that the "short" internship and "Little or No Impact," while none of the "Hired" respondents responded in these two categories.

Regarding the "long" internship, respondents were asked, "What impact has the "long" internship experience had in achieving your aviation career goals"? Again, respondents were given a Likert-type scale of six possible responses: Great impact, Significant, Some, Little, No Impact and N/A (not applicable). Again, as shown in Table 10, the "Hired" by United group of respondents was clear in their response: Nearly 92% said that the "long" internship had "Great Impact" on their career goal achievement. This compares to only 38.1% of the "Not Hired" group of respondents who answer "Great Impact". The two groups combined indicated 62.8% "Great Impact". On the other end of the scale 5 of all respondents (6.4%) indicated that the "long" internship had "No Impact" on their career goal achievement.

With regard to an overall evaluation of aviation department coursework at SIUC (see Table 11) respondents were asked to answer the following question using a Likert-type scale: "How well did the coursework in the aviation department at SIUC prepare you for your internship"? A total of 78.5% of the "Not Hired" by United group responded that the coursework prepared them "Very Well or Well" while only 72.2% of the "Hired" group responded in this manner.

Overall, a total of 4 respondents (3 in the "hired" group and 1 in the "Not Hired" group), or a total of 5.1% of the overall respondent group, answered "Not Much". There were no responses in the "Did Not" category.

A final structured question asked, "would you recommend a United Airlines internship to students seeking an aviation career?" A total of 75 respondents (96.2%) said that they "Would Recommend" the internship while 2 said that they would not. One respondent did not respond to this particular question.

CONCLUSIONS

The following conclusions can be derived about the respondent's perceptions of curricular preparation for a major airline flight internship program; as well as their overall views about the internship program and its components:

1. The "Most Helpful/Very Helpful" (MH/VH) coursework in preparing intern candidates for the flight operations internship at United are (when looking only at the total number of respondents who reported taking a specific course and then calculating the percentage of those who took only that course and marked it as MH/VH):

    A. AVM 373-Airline Management
    B. Flight Training at SIUC
    C. AMT 205-Cabin Environment and Jet Transport Systems
    D. AMT 405-Flight Systems Management
    E. AVM 385/ATS 332-Air Transport Labor Relations
    F. AVM 402/ATS 421-Aviation Industry Career Development

Also, when asked "How well did the coursework in the aviation department at SIUC prepare you for your internship," a total of 75.7% of survey respondents indicated "Very Well" or "Well" with another 17.9% responding "Moderately".

2. When asked to evaluate the "short" internship, six "short" internship components were rated as most valuable/very valuable by a majority of all respondents:

    A. Experiencing the airline work environment;
    B. Interaction with United personnel;
    C. Interview for the "Long" internship;
    D. Presentation by United Personnel;
    E. Short Internship Overall Experience; and,
    F. Simulator time.

When the respondents were asked, "What impact has the "short" internship experience had in achieving your aviation career goals", 55.1% of all respondents said that it had had either "Great Impact or Significant Impact" on achieving their career goals. This percentage went up to 75.0% for the subset of all respondents who were hired by United.

3. When asked how valuable the "long" internship had been in achieving career goals, 80.7% of all respondents reported that it has had "Great Impact or Significant Impact". This percentage went up to 91.7% for the "Hired by United" subset of respondents. When asked to evaluate components of the "long" internship, the following five items were ranked "Most Valuable" or "Very Valuable" by 80% or more of all respondents:

    A. Your Internship Experience;
    B. Observer Member of Crew (OMC) Privileges;
    C. "Long" Internship Overall Experiences;
    D. Interaction with United Personnel; and,
    E. Your Assigned Work Location with United.

4. In some areas of the survey there were significant differences in the responses between the "hired by United" group of respondents and the "not hired by United" group of respondents. For example, in rating the value of the short internship, 75% of the "hired" group reported it as being of "great" or "significant" impact while only 38.1% of the "not hired" group responded in this manner. Similarly, 91.7% of the "hired" group said that the long-internship had "great impact" on their career goal

achievement; only 38.1% of the "not hired" group reported in this way. A positive rating of the United Airlines internship program appears to be encouraged among those participants who have been hired by United.

5. When asked, "Would you recommend a United Airlines internship to students seeking an aviation career," 96.2% of respondents said that they "Would Recommend" the internship.

RECOMMENDATIONS

Research for this paper did not discover any comprehensive study on the success of an airline's flight operation internship program or curricula used in preparing students for such internships. One recommendation to airlines which conduct these types of internship programs is to establish a follow up mechanism to determine to what degree these programs are successful in meeting the goals of both internship participants; the airline and the students. A second recommendation would be to include curricular preparation questions in such a follow-up study to establish the correlation between curricular preparation and success in the internship program. The final recommendation is that United Airlines, having been in the flight operations internship business for over ten years, follow up with all of its flight operations interns from each of the participating universities. Such research would provide invaluable insight to the effect of various aviation-related curriculums, from a variety of institutions, on the success of flight operations internship programs, specifically for United Airlines.

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APPENDIX

Descriptions of SIUC Aviation Management courses cited in this study (SIUC Undergraduate Catalog, 1997):

ATS 364/Work Center Management. A study of the problems of managing a small working unit (division, department, work center, section, etc.) within a larger unit (agency, company, regional office, etc.) Included items will be work center goals identification, staffing needs, monitoring of work process reporting, work center communications, and interpersonal relations within the work center. (p. 105)

ATS 416/Applications of Technical Information. This course is designed to increase student competence in analyzing and utilizing the various types of technical information encountered by managers in technical fields. (p. 105)

ATS 383/Data Interpretation. A course designed for students beginning their major program of study to examine data use in their respective professions. Emphasis will be placed upon an understanding of the basic principles and techniques involved with analysis, synthesis, and utilization of data. (p. 105)

AMT 205/ Cabin Environment and Jet Transport Systems. Students will understand the atmospheric variables at different altitudes and the basic equipment required to cope with malfunction in the cabin pressurization and air-conditioning systems. Using the available information, jet transport aircraft and simulated training panels, they will understand the operation of and be able to identify the components of flight control systems, landing gear, fuel, anti-icing, and fire detection systems. They will be able to compare and analyze aircraft systems of current jet transport aircraft and to diagnose and resolve malfunction problems. They will have knowledge of procedures for aircraft ground handling, APU operation, and system servicing. (p. 156)

AMT 405/Flight Management Systems. Using industry type computer instruction and flight simulation trainers, the course will develop the knowledge for operation and management of autopilots, auto throttles, inertial reference systems, electronic instrument systems, and flight management computers on advanced technology type aircraft, such as the Boeing 737-400, 747-400, Douglas MD-81 and MD-11. (p. 157)

AVM 319/Aviation Occupational Internships. Each students will be assigned to a departmentally approved work site engaged in activities related to the student's academic program and career objectives. The student will be assigned to an unpaid internship position and will perform duties and services in an instructional setting as previously arranged with the sponsoring work site supervisor. (p. 159)

AVM 360/The Air Traffic Control System, Procedures and Rules. This course provides instruction in basic air traffic control procedures and phraseology used by personnel providing air traffic control services. Students will become familiar with Federal Aviation Administration handbook and federal aviation regulations that pertain to the operational responsibilities of an air traffic controller. (p. 159)

AVM 370/Airport Planning. To acquaint the student with the basic concepts of airport planning and construction, as well as an investigation of various regulatory agencies in the industry and their functions. (p. 159)

AVM 377/Aviation Industry Regulations. A study of various regulatory agencies of the industry and their functions. (p. 159)

AVM 372/Airport Management. A study of the operation of an airport devoted to the phases of lighting, fuel systems, field marking, field buildings, hangars, and surrounding community. (p. 159)

AVM 373/Airline Management. A study of the administrative aspects of airline operation and management including a detailed study of airline organizational structure. (p. 159)

AVM 374/General Aviation Operations. A study of general aviation operations including fixed base operations (fuel, sales, flight training, charter, etc.), corporate aviation (business aviation, corporate flight departments, executive air fleets, etc.) and the general aviation aircraft manufacturing industry. (p. 159)

AVM 375/Legal Aspects of Aviation. The student will develop an awareness of air transportation. The course will emphasize basic law as it relates to contracts, personnel, liabilities, and legal authority of governmental units and agencies. (p. 159)

AVM 376/Aviation Maintenance Management. To familiarize the student with the functions and responsibilities of the aviation maintenance manager. Maintenance management at the fixed based operator, commuter/regional airline, and national carrier levels will be studied. (p. 159)

AVM 377/Aviation Safety Management. This course will survey the various aspects of aviation flight and ground safety management. Weather, air traffic control, mechanical and human factors in aviation safety management will be reviewed. (p. 159)

AVM 385/Air Transport Labor Relations. Students will gain a general understanding of the economic situation of which labor-management problems represent a subset. They will develop a perspective on the evolution of labor relations in the United States economy and on how the interaction of labor and management differs throughout the world. The collective bargaining section introduces the student to the techniques of bargaining used by labor and management in their ongoing interactions. (p. 159)

AVM 386/Fiscal Aspects of Aviation Management. An introduction to the fiscal problems encountered in the administration of aviation facilities and airline operations. (p. 159)

AVM 402/Aviation Industry Career Development. Introduces students to the various elements involved in obtaining a position in their chosen career field. Topics included are: personal inventories, placement services, employment agencies, interviewing techniques, resumes, letters of application, references, and employment tests. Each student will develop a portfolio including personal and professional information related to individual career goals. (p. 160)

AVM 460/National Airspace System. This course provides instruction on the national airspace system, its purpose and major components. It defines the Federal Aviation Administration's role in the operation, maintenance and planning of the national airspace system. (p.160)

Table 1
Courses Taken in the Aviation Major

Course Title (n = 78)	Number Taking	%
1. Flight Training at SIUC	73	93.6
2. AVM 371-Aviation Industry Regulation	70	89.7
3. AVM 373-Airline Management	67	85.9
4. AVM 385/ATS 332-Air Transport Labor Relations	62	79.5
5. AVM 370-Airport Planning	61	78.2
6. AVM 372-Airport Management	60	76.9
7. ATS 364-Work Center Management	57	73.1
8. AVM 377-Aviation Safety Management	56	71.8
9. AVM 360-Air Traffic Control	55	70.5
10. ATS 416-Applications of Technical Information	54	69.0
11. AVM 386-Fiscal Aspects of Aviation Management	47	60.3
12. AVM 402/ATS 421- Aviation Industry Career Devel.	34	43.6
13. ATS 383-Data Interpretation	32	41.0
14. AVM 460-National Airspace System	28	35.9
15. AMT 205-Cabin Environment and Jet Transport Systems	23	29.5
16. AMT 405-Flight Management Systems	17	21.8

Note. Courses are listed ordinally by the total number of respondents taking each course. See Appendix for course descriptions.

Table 2
Combined Numbers of "Most Helpful/Very Helpful" and "Least Helpful/Not Very Helpful" Responses by Course

Course Title (n = 78)		Total	MH/VH %	LH/NVH	%
Flight Training	73	59	80.8	2	2.7
AVM 371	70	25	35.7	8	11.4
AVM 373	67	55	82.1	3	4.5
AVM 385/ATS 332*	62	40	64.5	3	4.8
AVM 370	61	9	14.8	24	39.3
AVM 372	60	15	25.0	19	31.7
ATS 364	57	8	14.0	19	33.3
AVM 377	56	20	35.7	7	12.5
AVM 360	55	9	34.5	13	23.6
ATS 416	54	1	20.4	12	22.2
AVM 386	47	20	42.6	10	21.3
AVM 402/ATS 421*	34	20	58.8	2	5.9
ATS 383	32	3	9.4	19	59.4
AVM 460	28	7	25.0	5	17.9
AMT 205	23	15	65.2	4	17.4
AMT 405	17	11	64.7	1	5.9

Note. Course Titles are listed ordinally by the total number of respondents taking each course. MH/VH = Most Helpful/Very Helpful (combined responses) and LH/NVH = Least Helpful/Not Very Helpful (combined responses). *ATS 421 converted to AVM 402 in 1996; ATS 332 converted to AVM 385 in 1996. See Appendix for course descriptions.

Table 3
Top 5 Courses Ranked as "Most Helpful" (MH) and "Very Helpful" (VH) by Respondent Group

All Respondents (n = 78) Course Title	MH	VH		Total
Flight Training at SIUC	32	27	=	59
Airline Management	28	27	=	55
Air Transport Labor Relations	12	28	=	40
Aviation Industry Regulations	4	21	=	25
Aviation Safety Management*	5	15	=	20
Fiscal Aspects of Aviation Management*	6	14	=	20
Aviation Industry Career Development*	13	7	=	20
Hired by United (n = 36)				
Flight Training at SIUC	14	15	=	29
Air Transport Labor Relations*	8	15	=	23
AVM 373 "Airline Management*	12	11	=	23
Aviation Industry Regulations	4	12	=	16
Aviation Safety Management	5	7	=	12
Not Hired by United (n = 42)				
Airline Management	16	16	=	32
Flight Training at S IUC	18	12	=	30
Air Transport Labor Relations	4	13	=	17
Fiscal Aspects of Aviation Management	4	9	=	13
Aviation Industry Career Development	7	5	=	12

Note. *Indicates a tie in ranking. See Appendix for course descriptions.

Table 4
Bottom 5 Courses Ranked as "Least Helpful" (LH) and "Not Very Helpful" (NVH) Respondent Group

All Respondents (n = 78) Course Title	LH	NVH		Total
Airport Planning	8	16	=	24
Airport Management*	5	14	=	19
Data Interpretation*	7	12	=	19
Work Center Management*	8	11	=	19
Air Traffic Control	5	8	=	13
Hired by United (n = 36)				
Airport Planning*	3	10	=	13
Airport Management*	3	10	=	13
Air Traffic Control	2	5	=	7
Fiscal Aspects of Aviation Management*	1	6	=	7
Data Interpretation*	0	4	=	4
Work Center Management*	4	0	=	4
Not Hired by United (n = 42)				
Data Interpretation*	7	8	=	15
Work Center Management*	4	11	=	15
Airport Planning	5	6	=	11
Applications of Technical Information	4	6	=	10
Air Traffic Control*	3	3	=	6
Airport Management*	2	4	=	6

Note. *Indicates a tie in ranking. See Appendix for course descriptions.

Table 5
Evaluation of "Short" Internship Experience

Overall Respondent Group (n = 78)

Course Title	MV/VV	NV/SV
Experiencing the airline work environment	61	0
Interaction with United personnel	59	1
Interview for the "long internship"	52	3
Presentation by United personnel	50	3
"Short internship" overall experience*	42	4
Simulator Time*	42	9
Group project with other interns	36	12
Tours of "TK"	34	7
Tours of EXO/WHQ	31	5
767 (or other) Ground School	28	4
Tours of DEN/DIA	24	14

Hired by United (n = 36)

Course Title	MV/VV	NV/SV
Interaction with United personnel	26	0
Experiencing the airline work environment*	25	0
Presentation by United personnel*	25	1
Interview for the "long internship"	24	2
"Short internship" overall experience	23	0
Simulator Time	19	7
767 (or other) Ground School	16	3
Group Project with other interns	14	5
Tours of TK	13	5
Tours of EXO/WHQ	12	2
Tours of DEN/DIA	9	6

Not Hired by United (n = 42)

Course Title	MV/VV	NV/SV
Experiencing the airline work environment	36	1
Interaction with United personnel	33	1
Interview for the "long internship"	28	1
Presentation by United personnel	25	2
Simulator Time	23	2
Group project with other interns	22	7
Tours of TK	21	2
Tours of EXO/WHQ*	19	3
"Short internship" overall experience*	19	4
Tours of DEN/DIA	15	8

767 (or other) Ground School	12	1

Note. Items listed in order of their "Most Valuable/Very Valuable" responses. *Indicates
a tie in ranking (MV/VV). MV/VV = Most Valuable/Very Valuable. NV/SV = Not Valuable/Somewhat Value.

Table 6

Evaluation of "Long" Internship Experience

Overall Respondent Group (n = 78)

Course Title	MV/VV	NV/SV
Your Internship Experience	69	4
Observer Member of Crew Privileges*	68	2
"Long" Internship Overall Experience*	68	2
Interaction with United Personnel (other than your supervisor)	67	2
Your assigned work location at United	63	5
Your internship supervisor	54	10
Simulator Time	47	7
Interaction with other Interns*	44	6
Tours of MOC at SFO*	44	4
Tours of the Boeing Plant	42	4
Specific Intern Project	40	15
Airline Pass Privileges	28	9
Visits to TK (if assigned elsewhere)	26	3

Hired by United (n = 36)

Your internship experience	31	1
Interaction with United Personnel* (other than supervisor)	29	1
Long internship overall experience*	29	0
Your assigned work location at United*	28	2
Observer Member of Crew Privileges*	28	2
Your internship supervisor	27	3
Simulator time	21	4
Tours of MOC at SFO	20	1
9. Tours of the Boeing Plant	19	3
Interaction with other interns*	18	1
Specific intern project*	18	1
Airline Pass Privileges	10	3

Visits to TK (if assigned elsewhere)	9	2
Not Hired by United (n = 42)		
Observer Member of Crew Privileges	40	0
"Long" Internship overall experience	39	2
Interaction with United Personnel*	38	1
Your internship experience*	38	3
Your assigned work location at United	35	3
Your internship supervisor	27	7
Simulator Time*	26	3
Interaction with other interns*	26	5
Tours of MOC at SFO	24	3
Tours of Boeing Plant	23	1
Specific intern project	22	10
Airline Pass Privileges	18	6
Visits to TK (if assigned elsewhere)	17	1

Note. Items listed in order of their combined "Most Valuable/Very Valuable" responses.
*Indicates a tie in ranking.

Table 7
Respondent Ranking of Most Valuable "Long" Internship Components

Combined First, Second and Third Responses	
Interaction with United Personnel	46
OMC Privileges	40
Overall Experience	23
Assigned Work Location*	23
Simulator Time/Experience*	23
Relationship with Internship Supervisor	18
Your Intern Experience	17

Note: All other components received less than ten responses. *Indicates a tie in ranking

Table 8
Respondent Ranking of Least Valuable "Long" Internship Components

Combined First, Second and Third Responses	
Tours (Boeing, MOC, etc.)	37
Airline Pass Privileges	28
Intern Project	21
Interaction with other Interns	16
Simulator Time/Experience	13
Visits to TK	11
Relationship with Supervisor	10

Note: All other components received less than 10 responses.

Table 9
Responses to the Question: "What impact has the "short internship experience had in achieving your aviation career goals?"

	Not Hired (n = 42)		Hired (n = 36)		Totals (n = 78)	
Response	Number	/ %	Number	/ %	Number	/ %
Great Impact	5	/11.9	15	/41.7	20	/25.6
Significant	11	/26.2	12	/33.3	23	/29.5
Some	10	/23.8	2	/ 5.6	12	/15.4
Little	7	/16.7	0	/ 0.0	7	/ 9.0
No Impact	3	/ 7.1	0	/ 0.0	3	/ 3.8
N/A	5	/11.9	7	/19.4	12	/15.4
No Response	1	/ 2.4	0	/ 0.0	1	/ 1.3
Total	42	/100%	36	/100%	78	/100%

Table 10
Responses to the Question: "What Impact has the "long" internship had in achieving your aviation career goals"?

	Not Hired ($\underline{n}$ = 42)		Hired ($\underline{n}$ = 36)		Totals ($\underline{n}$ = 78)	
Response	Number /	%	Number /	%	Number /	%
Great Impact	16	/38.1	33	/91.7	49	/62.8
Significant	14	/33.3	0	/ 0.0	14	/17.9
Some	8	/19.1	0	/ 0.0	8	/10.3
Little	0	/ 0.0	0	/ 0.0	0	/ 0.0
No Impact	3	/ 7.1	2	/ 5.5	5	/ 6.4
N/A	0	/ 0.0	1	/ 2.8	1	/ 1.3
No Response	1	/ 2.4	0	/ 0.0	1	/ 1.3
Totals	42	/100%	36	/100%	78	/100%

Table 11
Responses to the Question: "How well did the coursework in the aviation department at SIUC prepare you for your internship?"

	Not Hired ($\underline{n}$ = 42)		Hired ($\underline{n}$ = 36)		Totals ($\underline{n}$ = 78)	
Response	Number /	%	Number /	%	Number /	%
Very Well	10	/23.8	9	/25.0	19	/24.4
Well	23	/54.7	17	/47.2	40	/51.3
Moderately	7	/16.7	7	/19.5	14	/17.9
Not Much	1	/ 2.4	3	/ 8.3	4	/ 5.1
Did Not	0	/ 0.0	0	/ 0.0	0	/ 0.0
N/A	0	/ 0.0	0	/ 0.0	0	/ 0.0
No Response	1	/ 2.4	0	/ 0.0	1	/ 1.3
Totals	42	/100%	36	/100%	78	/100%